

此时谐振电感电流  $i_{Lr}$  等于 0, 谐振电容电压为  $-V_m$ , 主开关管  $Q_1$ 、 $Q_2$  两端的电压开始下降到零, 这样可以零电压开通  $Q_1$  和  $Q_2$ 。

## 2. 开关模式 2 [ $t_1, t_2$ ] [参考图 7.11(b)]

由于辅助二极管  $D_{a2}$  的阻断作用, 当  $i_{Lr}$  下降到零后不能反方向流动, 在  $t_1$  时刻后可以零电流关断辅助管。

在  $t_1$  时刻零电压开通主开关管  $Q_1$ 、 $Q_2$ , 加在变压器原边绕组上的电压为电源电压  $V_{in}$ , 其励磁电流  $i_M$  从 0 开始线性上升, 即

$$i_M(t) = \frac{V_{in}}{L_M}(t - t_1) \quad (7.137)$$

饱和电感很快饱和,  $D_{R1}$  导通,  $D_{R2}$  关断, 原边开始为负载供电。变压器原边电流  $i_p$  为折算到原边的负载电流和励磁电流之和, 即

$$i_p(t) = \frac{I_o}{K} + i_M(t) = \frac{I_o}{K} + \frac{V_{in}}{L_M}(t - t_1) \quad (7.138)$$

在  $t_2$  时刻, 关断主开关管  $Q_1$  和  $Q_2$ , 此时励磁电流和原边绕组电流分别为:

$$I_M(t_2) = \frac{V_{in} T_{on}}{L_M} \quad (7.139)$$

$$I_p(t_2) = \frac{I_o}{K} + \frac{V_{in} T_{on}}{L_M} \quad (7.140)$$

式中  $T_{on}$  为主开关管的导通时间。

## 3. 开关模式 3 [ $t_2, t_3$ ] [参考图 7.11(c)]

$t_2$  时刻主开关管  $Q_1$  和  $Q_2$  关断后, 整流管  $D_{R1}$  继续导通, 此时折算到原边的负载电流  $I_o/K$  和励磁电流  $i_M$  通过辅助二极管  $D_{a3}$  和  $D_{a4}$  同时给谐振电容  $C_r$  充电。一般  $i_M \ll I_o/K$ , 可以忽略, 因此  $C_r$  的电压从  $-V_m$  开始线性上升, 同样  $Q_1$  和  $Q_2$  两端的电压也是线性上升的。

$$v_{Cr}(t) = -V_m + \frac{1}{C_r} \cdot \frac{I_o}{K} (t - t_2) \quad (7.141)$$

由于  $C_r$  限制了  $Q_1$  和  $Q_2$  上的电压上升率, 因此  $Q_1$  和  $Q_2$  是零电压关断的。

在这段时间里, 励磁电流为:

$$i_M(t) = I_M(t_2) + \frac{V_{in}}{L_M}(t - t_2) - \frac{1}{2L_M C_r} \cdot \frac{I_o}{K} (t - t_2)^2 \quad (7.142)$$

在  $t_3$  时刻,  $C_r$  的电压上升到 0。开关模式 3 的持续时间为:

$$t_{23} = KC_r V_m / I_o \quad (7.143)$$

此时励磁电流达到正向最大值  $I_{M(+)}$ 。

$$I_{M(+)} = \frac{V_{in} T_{on}}{L_M} + \frac{KC_r V_{in}^2}{2L_M I_o} \quad (7.144)$$

## 4. 开关模式 4 [ $t_3, t_4$ ] [参考图 7.11(d)]

在此开关模式中,  $C_r$  的电压从 0 继续上升, 加在变压器原边绕组的电压为负向电压,

因此副边绕组的电压也为负,饱和电感电流下降到零,整流管  $D_{R1}$  关断,负载电流流经续流二极管  $D_{R2}$ ,原边电流为励磁电流。这时励磁电感与谐振电容  $C_r$  谐振工作,励磁电流从  $I_{M(+)}$  开始减小,谐振电容电压从 0 继续上升。

$$v_{Cr}(t) = I_{M(+)} Z_{M1} \sin \omega_{M1} (t - t_3) \quad (7.145)$$

$$i_p(t) = i_M(t) = I_{M(+)} \cos \omega_{M1} (t - t_3) \quad (7.146)$$

式中  $Z_{M1} = \sqrt{L_M / C_r}$ , 是励磁电感与谐振电容的特征阻抗;  $\omega_{M1} = 1 / \sqrt{L_M C_r}$ , 是励磁电感与谐振电容的谐振角频率。

在  $t_4$  时刻,谐振电容电压上升到  $V_{in}$ ,开关模式 4 结束。它的持续时间为:

$$t_{34} = \frac{1}{\omega_{M1}} \sin^{-1} \left( \frac{V_{in}}{I_{M(+)} Z_{M1}} \right) \quad (7.147)$$

此时励磁电流为:

$$I_M(t_4) = I_{M(+)} \sqrt{1 - \left( \frac{V_{in}}{I_{M(+)} Z_{M1}} \right)^2} \quad (7.148)$$

### 5. 开关模式 5 [ $t_4, t_5$ ] [参考图 7.11(e)]

当谐振电容电压  $v_{Cr}$  上升到  $V_{in}$  后,二极管  $D_1$  和  $D_2$  导通,将  $v_{Cr}$  箝在  $V_{in}$ ,励磁电流流过  $D_1$  和  $D_2$ ,并且线性下降。

$$i_M(t) = I_M(t_4) - \frac{V_{in}}{L_M} (t - t_4) \quad (7.149)$$

在  $t_5$  时刻,励磁电流减小到零,变压器完成磁复位,主开关管  $Q_1$  和  $Q_2$  两端的电压从  $V_{in}$  下降到  $\frac{1}{2} V_{in}$ 。

开关模式 5 的持续时间为:

$$t_{45} = \frac{L_M I_M(t_4)}{V_{in}} \quad (7.150)$$

### 6. 开关模式 6 [ $t_5, t_6$ ] [参考图 7.11(f)]

在此开关模式中,负载电流流过续流二极管  $D_{R2}$ 。

在  $t_6$  时刻,辅助开关管开通,开始另一个开关周期。

## 7.7.2 参数设计

本节讨论谐振电感和谐振电容的参数设计。

### 1. 谐振电容

从上面的分析可以知道,谐振电容的大小决定主开关管关断时电压的上升率,上升率越小,主开关管关断时电流和电压的交叠区越小,关断损耗就越小。在工程设计中,一般使开关管在最大负载条件下关断时,其电压上升到电源电压的时间为  $(2 \sim 3) t_f$ ,  $t_f$  为主开关管的关断时间,这样可由下式决定谐振电容的大小。

$$C_r = \frac{I_o}{K} \cdot \frac{(2 \sim 3) t_f}{V_{in}} \quad (7.151)$$

谐振电容的电压应力为电源电压  $V_{in}$ 。

## 2. 谐振电感

为了不影响主电路的 PWM 工作,一般使辅助电路的工作时间很小,为:

$$t_{01} = \frac{T_r}{2} = \pi \sqrt{L_r C_r} = \frac{1}{N} T_s \quad (7.152)$$

式中  $N=6\sim 10$ ,  $T_s$  为开关周期。

根据上式可以得到谐振电感的大小。

$$L_r = \left( \frac{T_s}{N\pi} \right)^2 \cdot \frac{1}{C_r} \quad (7.153)$$

### 7.7.3 ZVT 双管正激变换器的优点

从上面的分析可以看出,ZVT 双管正激变换器的优点是:

- ① 采用一套辅助电路就可以实现两只主开关管的零电压开关;
- ② 辅助电路的工作没有增加主开关管的电压和电流应力;
- ③ 辅助开关管是零电流开关;
- ④ 无需另加磁复位电路。

## 7.8 ZCT 双管正激变换器

当选用 IGBT 作为主开关管时,为了避免电流拖尾现象,可以使主开关管工作在零电

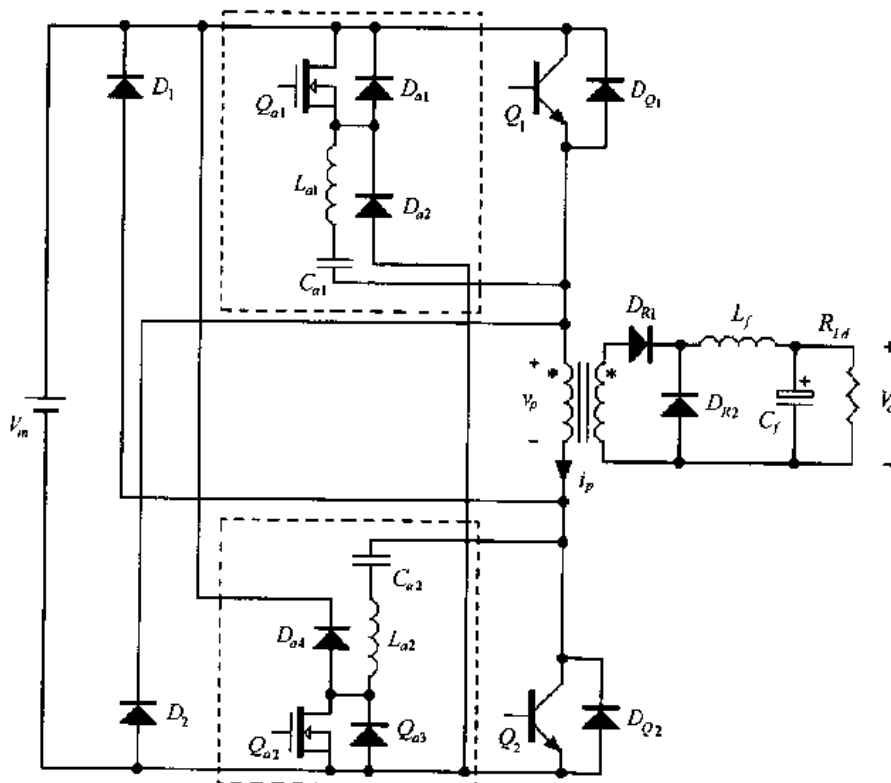


图 7.12 ZCT 双管正激变换器的主电路

流开关条件下。文献[32]提出了 ZCT 双管正激变换器,如图 7.12 所示。

该电路采用了两套辅助电路,如虚框内所示,它们分别实现两只主开关管的零电流开关。每套辅助电路的工作原理与第六章介绍的 ZCT PWM 变换器的工作原理一样,这里不再重复。

ZCT 双管正激变换器的优点是实现了主开关管的零电流关断,但是主开关管是硬开通,而且由于需要两套辅助电路,电路结构比较复杂。

## 本章小结

本章讨论了正激变换器的磁复位技术,它们具有以下特点:

① 在复位绕组箝位技术、RCD 箝位技术、LCD 箝拉技术和 ZVT 箝位技术中,主开关管的结电容使变压器双向磁化,但结电容一般很小,变压器的反向磁化电流  $I_{M(-)}$  也很小。而有源箝位技术是双向对称磁化。

② ZVT PWM 正激变换器实现了主开关管的零电压开关,其他箝位技术的主开关管均为硬开通。

③ ZVT PWM 正激变换器的主开关管的电压应力最高,大于  $2V_{inmax}$ ;复位绕组箝位技术中主开关管的电压应力次之,为  $2V_{inmax}$ ;RCD 箝位技术、LCD 箝位技术和有源箝位技术的电压应力一样,均小于  $2V_{inmax}$ 。

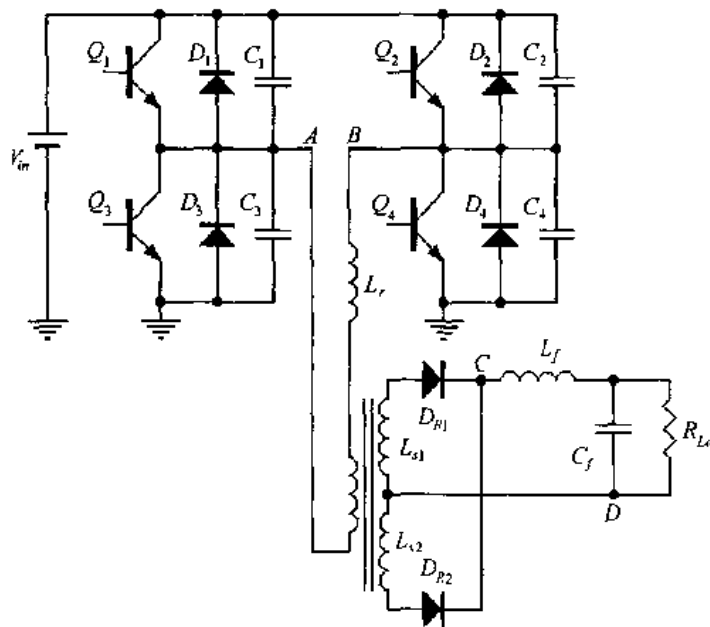
④ RCD 箝位技术的箝位网络是有损耗的,其变换效率较低;LCD 箝位技术采用的是无损箝位网络,变换效率比 RCD 箝位技术高一些;ZVT PWM 正激变换器实现了开关管的零电压开关,因此其变换效率高于 RCD 箝位技术和 LCD 箝位技术;有源箝位技术的电路结构比 ZVT PWM 正激变换器简单,虽然主开关管是容性开通的,但辅助开关管是零电压开关的,其变换效率高于 ZVT PWM 正激变换器。

本章同时介绍了 ZVT 双管正激变换器和 ZCT 双管正激变换器的工作原理。ZVT 正激变换器只用一套辅助电路就可以实现两只主开关管的零电压开关,而且辅助电路的工作没有增加主开关管的电压和电流应力,适用于中大功率、输入电压较高的应用场合。ZCT 双管正激变换器需要两套辅助电路来分别实现两只主开关管的零电流关断,电路结构比较复杂。

## 第八章 移相控制 ZVS PWM DC/DC 全桥变换器

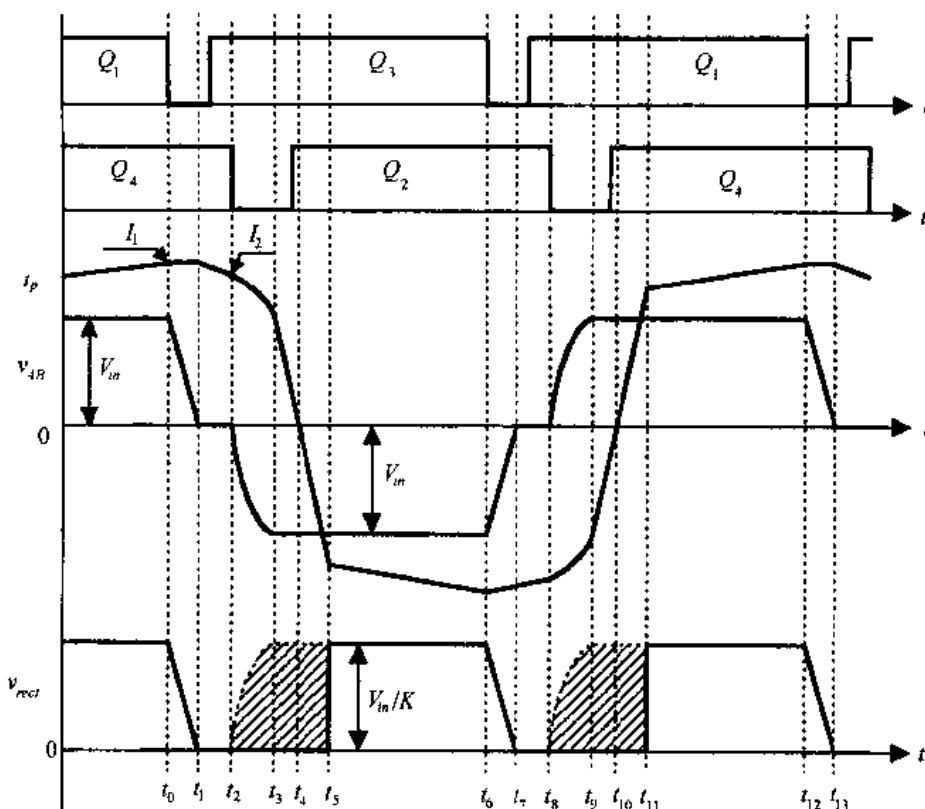
### 8.1 引言

在 DC/DC 变换器中, Buck、Boost、Buck/Boost、Cuk、Sepic、Zeta、Forward 和 Flyback 等单管构成的变换器一般应用于中小功率场合。而在中大功率场合, 一般采用全桥变换器, 全桥变换器的控制方式较多, 目前研究得比较多的控制方式为移相控制方式。在这种控制方式下, 全桥变换器可以实现零电压开关、零电压零电流开关和零电流开关三种软开关方式。本章分析移相控制零电压开关 PWM DC/DC 全桥变换器(Phase-shifted zero-voltage-switching pwm dc/dc full-bridge converter, PS ZVS FB Converter), 其利用变压器的漏感或原边串联电感和功率管的寄生电容来实现开关管的零电压开关, 其电路结构及主要波形如图 8.1 所示。其中,  $D_1 \sim D_4$  分别是  $Q_1 \sim Q_4$  的内部寄生二极管,  $C_1 \sim C_4$  分别是  $Q_1 \sim Q_4$  的寄生电容或外接电容。  $L_r$  是谐振电感, 它包括了变压器的漏感。每个桥臂的两个功率管成  $180^\circ$  互补导通, 两个桥臂的导通角相差一个相位, 即移相角, 通过调节移相角的大小来调节输出电压。  $Q_1$  和  $Q_3$  分别超前于  $Q_4$  和  $Q_2$  一个相位, 称  $Q_1$  和  $Q_3$  组成的桥臂为超前桥臂,  $Q_2$  和  $Q_4$  组成的桥臂则为滞后桥臂。



(a) 主电路

图 8.1 移相控制 ZVS PWM DC/DC 全桥变换器的主电路及其主要波形



(b) 主要波形  
图 8.1 (续)

## 8.2 工作原理

在一个开关周期中,移相控制 ZVS PWM DC/DC 全桥变换器有 12 种开关模式,图 8.2 给出了该变换器在不同开关模式下的等效电路。在分析之前,作出如下假设:

- ① 所有开关管、二极管均为理想器件;
- ② 所有电感、电容和变压器均为理想元件;
- ③  $C_1 = C_3 = C_{lead}$ ,  $C_2 = C_4 = C_{lag}$ ;
- ④  $L_f \gg L_r/K^2$ ,  $K$  是变压器原副匝比。

### 1. 开关模式 0 [ $t_0$ 时刻] [参考图 8.2(a)]

在  $t_0$  时刻,  $Q_1$  和  $Q_4$  导通。原边电流  $i_p$  流经  $Q_1$ 、谐振电感  $L_r$ 、变压器原边绕组以及  $Q_4$ 。整流管  $D_{R1}$  导通,  $D_{R2}$  截止, 原边给负载供电。

### 2. 开关模式 1 [ $t_0, t_1$ ] [参考图 8.2(b)]

在  $t_0$  时刻关断  $Q_1$ , 原边电流  $i_p$  从  $Q_1$  中转移到  $C_3$  和  $C_1$  支路中, 给  $C_1$  充电, 同时  $C_3$  被放电。在这个时段里, 谐振电感  $L_r$  和滤波电感  $L_f$  是串联的, 而且  $L_f$  很大, 可以认为  $i_p$  近似不变, 类似于一个恒流源。电容  $C_1$  的电压从零开始线性上升, 电容  $C_3$  的电压从  $V_{in}$  开始线性下降, 因此  $Q_1$  是零电压关断。  $i_p$  和  $C_1$ 、 $C_3$  的电压的表达式分别为:

$$i_p(t) = I_p(t_0) \equiv I_1 \quad (8.1)$$

$$v_{C1}(t) = \frac{I_1}{2C_{lead}}(t - t_0) \quad (8.2)$$

$$v_{C3}(t) = V_{in} - \frac{I_1}{2C_{lead}}(t - t_0) \quad (8.3)$$

在  $t_1$  时刻,  $C_3$  的电压下降到零,  $Q_3$  的反并二极管  $D_3$  自然导通, 开关模态 1 结束。该模态的时间为:

$$t_{01} = 2C_{lead}V_{in}/I_1 \quad (8.4)$$

### 3. 开关模态 2 [ $t_1, t_2$ ] [参考图 8.2(c)]

$D_3$  导通后, 将  $Q_3$  的电压箝在零位, 此时开通  $Q_3$ , 则  $Q_3$  是零电压开通。虽然这时候  $Q_3$  被开通, 但  $Q_3$  并没有电流流过, 原边电流由  $D_3$  流通。  $Q_3$  和  $Q_1$  驱动信号之间的死区时间  $t_{d(lead)} > t_{01}$ , 即

$$t_{d(lead)} > 2C_{lead}V_{in}/I_1 \quad (8.5)$$

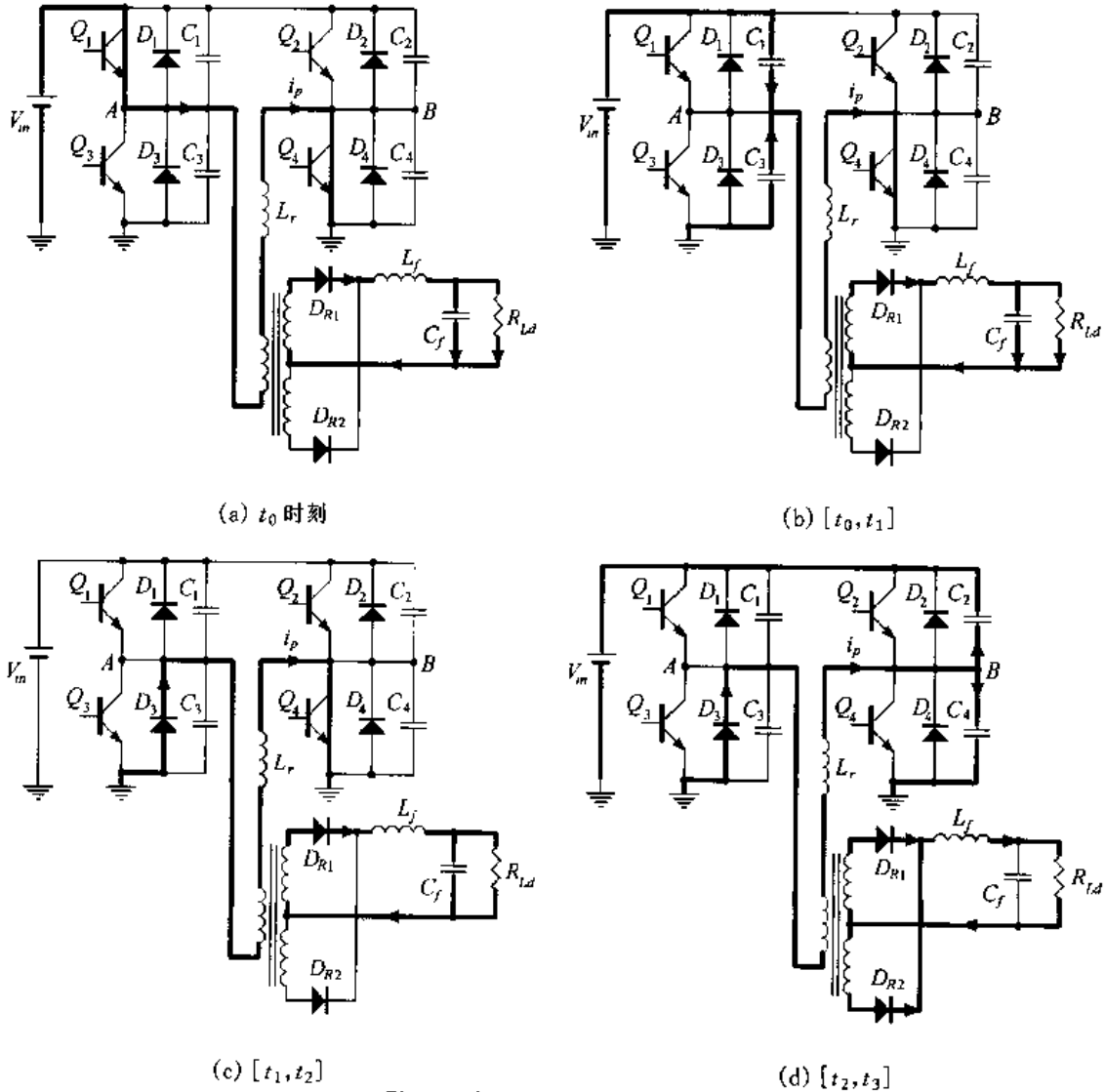


图 8.2 各种开关模态的等效电路

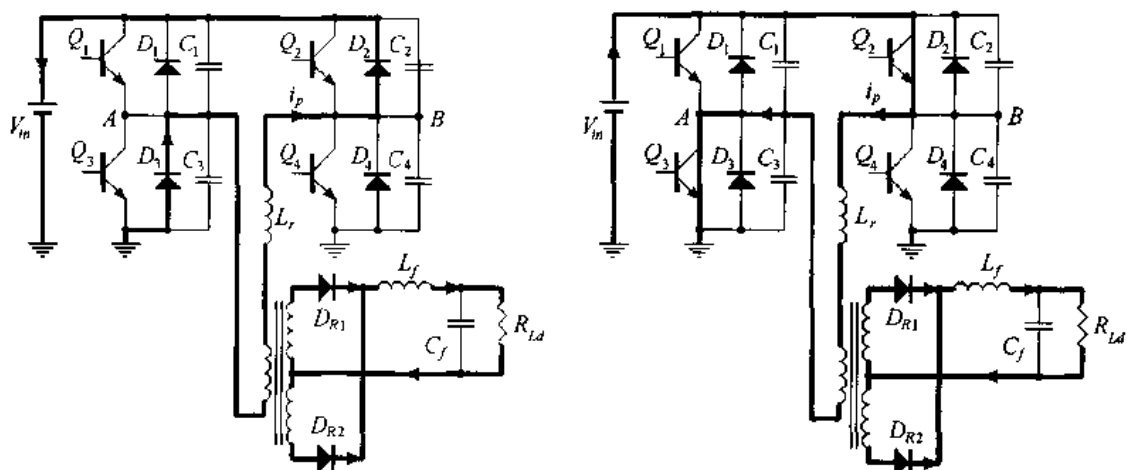
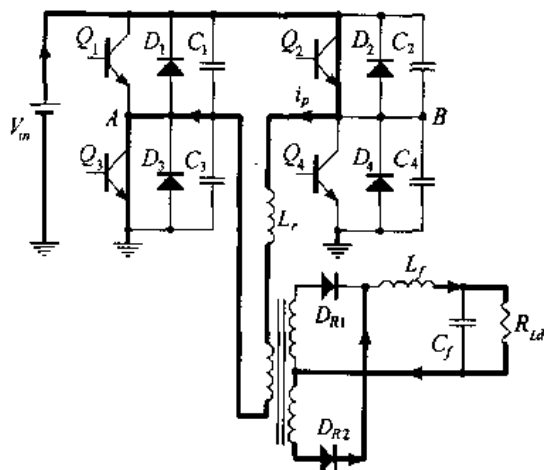
(e)  $[t_3, t_4]$ (f)  $[t_4, t_5]$ (g)  $[t_5, t_6]$ 

图 8.2(续)

在这段时间里,原边电流等于折算到原边的滤波电感电流,即

$$i_p(t) = i_{L_f}(t)/K \quad (8.6)$$

在  $t_2$  时刻,原边电流下降到  $I_2$ 。

#### 4. 开关模式 3 $[t_2, t_3]$ [参考图 8.2(d)]

在  $t_2$  时刻,关断  $Q_4$ ,原边电流  $i_p$  转移到  $C_2$  和  $C_4$  中,一方面抽走  $C_2$  上的电荷,另一方面同时又给  $C_4$  充电。由于  $C_2$  和  $C_4$  的存在, $Q_4$  的电压是从零慢慢上升的,因此  $Q_4$  是零电压关断。此时  $v_{AB} = -v_{C4}$ ,  $v_{AB}$  的极性自零变为负,变压器副边绕组电势下正上负,整流二极管  $D_{R2}$  导通,副边绕组  $L_{s2}$  中开始流过电流。由于整流管  $D_{R1}$  和  $D_{R2}$  同时导通,将变压器副边绕组短接,变压器副边绕组电压为零,原边绕组电压也为零,  $v_{AB}$  直接加在谐振电感  $L_r$  上,因此在这段时间里实际上谐振电感  $L_r$  和  $C_2, C_4$  在谐振工作。原边电



流  $i_p$  和电容  $C_2$ 、 $C_4$  的电压分别为:

$$i_p(t) = I_2 \cos \omega(t - t_2) \quad (8.7)$$

$$v_{C4}(t) = Z_p I_2 \sin \omega(t - t_2) \quad (8.8)$$

$$v_{C2}(t) = V_{in} - Z_p I_2 \sin \omega(t - t_2) \quad (8.9)$$

式中  $Z_p = \sqrt{\frac{L_r}{2C_{lag}}}$ ,  $\omega = \frac{1}{\sqrt{2L_r C_{lag}}}$ 。

在  $t_3$  时刻,  $C_4$  的电压上升到  $V_{in}$ ,  $D_2$  自然导通, 结束该开关模态。它的持续时间为:

$$t_{23} = \frac{1}{\omega} \sin^{-1} \frac{V_{in}}{Z_p I_2} \quad (8.10)$$

#### 5. 开关模态 4 [ $t_3, t_4$ ] [参考图 8.2(e)]

在  $t_3$  时刻,  $D_2$  自然导通, 将  $Q_2$  的电压箝在零位, 此时就可以开通  $Q_2$ ,  $Q_3$  是零电压开通。  $Q_2$  和  $Q_4$  驱动信号之间的死区时间  $t_{d(lag)} > t_{23}$ , 即

$$t_{d(lag)} > \frac{1}{\omega} \sin^{-1} \frac{V_{in}}{Z_p I_2} \quad (8.11)$$

虽然此时  $Q_2$  已开通, 但  $Q_2$  不流过电流,  $i_p$  由  $D_2$  流通, 谐振电感的储能回馈给输入电源。由于副边两个整流管同时导通, 因此变压器副边绕组电压为零, 原边绕组电压也为零, 这样电源电压  $V_{in}$  加在谐振电感  $L_r$  两端, 原边电流  $i_p$  线性下降。

$$i_p(t) = I_p(t_3) - \frac{V_{in}}{L_r}(t - t_3) \quad (8.12)$$

到  $t_4$  时刻, 原边电流从  $I_p(t_3)$  下降到零, 二极管  $D_2$  和  $D_3$  自然关断,  $Q_2$  和  $Q_3$  中将流过电流。开关模态 4 的持续时间为:

$$t_{34} = L_r \cdot I_p(t_3) / V_{in} \quad (8.13)$$

#### 6. 开关模态 5 [ $t_4, t_5$ ] [参考图 8.2(f)]

在  $t_4$  时刻, 原边电流由正方向过零, 并且向负方向增加, 流经  $Q_2$  和  $Q_3$ 。由于原边电流仍不足以提供负载电流, 负载电流仍由两个整流管提供回路, 因此原边绕组电压仍然为零, 加在谐振电感两端电压是电源电压  $V_{in}$ , 原边电流反向线性增加。

$$i_p(t) = -\frac{V_{in}}{L_r}(t - t_4) \quad (8.14)$$

到  $t_5$  时刻, 原边电流达到折算到原边的负载电流  $-I_{Lf}(t_5)/K$  值, 该开关模态结束。此时, 整流管  $D_{R1}$  关断,  $D_{R2}$  流过全部负载电流。开关模态 5 的持续时间为:

$$t_{45} = \frac{L_r \cdot I_{Lf}(t_5) / K}{V_{in}} \quad (8.15)$$

#### 7. 开关模态 6 [ $t_5, t_6$ ] [参考图 8.2(g)]

在这段时间里, 电源给负载供电, 原边电流为:

$$i_p(t) = -\frac{V_{in} - KV_o}{L_r + K^2 L_f}(t - t_5) \quad (8.16)$$

因为  $L_r \ll K^2 L_f$ , 式(8.16)可简化为下式:

$$i_p(t) = -\frac{V_{in}/K - V_o}{KL_f}(t - t_5) \quad (8.17)$$

在  $t_6$  时刻,  $Q_3$  关断, 变换器开始另一个半周期的工作, 其工作情况类似于上述的半个周期。

### 8.3 两个桥臂实现 ZVS 的差异

#### 1. 实现 ZVS 的条件

由第二节的分析可以知道, 要实现开关管的零电压开通, 必须有足够的能量用来:

- ① 抽走将要开通的开关管的结电容(或外部附加电容)上的电荷;
  - ② 给同一桥臂关断的开关管的结电容(或外部附加电容)充电;
- 同时, 考虑到变压器的原边绕组电容, 还要有一部分能量用来:
- ③ 抽走变压器原边绕组寄生电容  $C_{TR}$  上的电荷。

也就是说, 要实现开关管的零电压开通, 必须满足下式:

$$E > \frac{1}{2} C_i V_{in}^2 + \frac{1}{2} C_i V_{in}^2 + \frac{1}{2} C_{TR} V_{in}^2 = C_i V_{in}^2 + \frac{1}{2} C_{TR} V_{in}^2 \quad (i = lead, lag) \quad (8.18)$$

#### 2. 超前桥臂实现 ZVS

超前桥臂容易实现 ZVS。在超前桥臂开关过程中, 输出滤波电感  $L_f$  是与谐振电感  $L_r$  串联的, 此时用来实现 ZVS 的能量是  $L_f$  和  $L_r$  中的能量。一般来说,  $L_f$  很大, 在超前桥臂开关过程中, 其电流近似不变, 类似于一个恒流源。这个能量很容易满足式(8.18)。

#### 3. 滞后桥臂实现 ZVS

滞后桥臂要实现 ZVS 比较困难。在滞后桥臂开关过程中, 变压器副边是短路的, 此时整个变换器就被分为两部分, 一部分是原边电流逐渐改变流通方向, 其流通过程由逆变桥提供; 另一部分是负载电流由整流桥提供续流回路, 负载侧与变压器原边没有关系。此时用来实现 ZVS 的能量只是谐振电感中的能量, 如果不满足式(8.19), 那么就无法实现 ZVS。

$$\frac{1}{2} L_r I_2^2 > C_{lag} V_{in}^2 + \frac{1}{2} C_{TR} V_{in}^2 \quad (8.19)$$

由于输出滤波电感  $L_f$  不参与滞后桥臂 ZVS 的实现, 较超前桥臂而言, 滞后桥臂实现 ZVS 就要困难得多, 因为谐振电感比输出滤波电感要小得多。

### 8.4 实现 ZVS 的策略及副边占空比的丢失

从上面的讨论中可以知道, 超前桥臂容易实现 ZVS, 而滞后桥臂则要困难些。只要满足条件使滞后桥臂实现 ZVS, 那么超前桥臂就肯定可以实现 ZVS。因此 PS ZVS PWM 全桥变换器实现 ZVS 的关键在于滞后桥臂。滞后桥臂实现 ZVS 的条件就是式(8.19)。

(8.19)中可以看出,要满足它,要么增加谐振电感  $L_r$ ,要么增加  $I_2$ 。

### 1. 增加励磁电流

对于一定的谐振电感  $L_r$ ,必须有一个最小的  $I_2$  值  $I_{2\min}$  来保证谐振电感  $L_r$  中的能量  $I_{2\min}^2$  能实现 ZVS。文献[34]提出了用增加励磁电流  $I_M$  的办法来实现 ZVS,实质上提高  $I_{2\min}$ 。

由于增加了励磁电流  $I_M$ ,原边电流在负载电流的基础上多了一份励磁电流,因而增它的最大电流值,也使通态损耗加大。同时,励磁电流的增大,增大了变压器损耗。在励磁电流的选取上,应充分考虑器件和变压器损耗。

### 2. 增大谐振电感

由于励磁电流与负载无关,因而在轻载时,变换器的效率很低。实现 ZVS 的另一种方式是增加谐振电感。要在一定的负载范围内实现 ZVS,就可以知道一个最小的负载电流,根据这个电流,忽略励磁电流,可得到  $I_2$  的最小值  $I_{2\min}$ ,利用式(8.19)计算出所需的最小谐振电感。

### 3. 副边占空比的丢失

副边占空比的丢失是 PS ZVS PWM 全桥变换器中一个重要的现象。所谓副边占空比丢失,就是说副边的占空比  $D_s$  小于原边的占空比  $D_p$ ,即:  $D_s < D_p$ ,其差值就是副边占空比丢失  $D_{loss}$ :

$$D_{loss} = D_p - D_s \quad (8.20)$$

产生副边占空比丢失的原因是:存在原边电流从正向(或负向)变化到负向(或正向)负载电流的时间,即图 8.1 中的  $[t_2, t_5]$  和  $[t_8, t_{11}]$  时段。在这段时间里,虽然原边有正电压方波(或负电压方波),但原边不足以提供负载电流,副边整流桥的所有二极管导通,负载处于续流状态,其两端电压为零。这样副边就丢失了  $[t_2, t_5]$  和  $[t_8, t_{11}]$  这部分电压方波,在图 8.1 中,阴影部分就是副边丢失的电压方波。这部分时间与二分之一开关周期的比值就是副边的占空比丢失  $D_{loss}$ ,即

$$D_{loss} = \frac{t_{25}}{T_s/2} \quad (8.21)$$

而

$$t_{25} = \frac{L_r \cdot [I_2 - I_{Lf}(t_5)/K]}{V_{in}} \quad (8.22)$$

那么,有:

$$D_{loss} = \frac{2L_r \cdot [I_2 - I_{Lf}(t_5)/K]}{V_{in} \cdot T_s} \quad (8.23)$$

从式(8.23)中可以知道:①  $L_r$  越大,  $D_{loss}$  越大;② 负载越大,  $D_{loss}$  越大;③  $V_{in}$  越低,  $D_{loss}$  越大。

$D_{loss}$  的产生使  $D_s$  减小,为了得到所要求的输出电压,就必须减小原副边的匝比。而匝比的减小,带来两个问题:①原边电流增加,开关管电流峰值也要增加,通态损耗加大;

②副边整流桥的耐压值要增加。为了减小  $D_{loss}$ , 提高  $D_s$ , 可以采用饱和电感的办法, 就是将谐振电感  $L_r$  改为饱和电感, 但还是存在  $D_{loss}$ 。

## 8.5 整流二极管的换流情况

在 PS ZVS PWM 全桥变换器中, 变压器在  $[t_2, t_5]$  时间里工作在短路状态, 本节讨论在这个特殊的工作状态下整流二极管的换流情况。一般而言, 输出整流电路有两种, 一种是四个整流二极管构成的全桥整流方式, 另一种是两个整流二极管构成的双半波整流方式, 即全波整流方式。当输出电压比较高、输出电流比较小时, 一般采用全桥整流方式。当输出电压比较低、输出电流比较大时, 为了减小整流桥的通态损耗, 提高变换器的效率, 一般选用全波整流方式。

无论采用何种整流方式, 如果忽略励磁电流, 变压器原副边的电压和电流关系为:

$$v_s = v_p / K \quad (8.24)$$

$$i_p = i_s / K \quad (8.25)$$

### 8.5.1 全桥整流方式

在  $[t_2, t_5]$  时间里, 由于所有整流管同时导通, 将变压器的副边电压箝在零位, 这时变压器的原边电压也为零。这样, 原边电流与副边无关, 仅仅决定于电源电压和谐振电感的大小。图 8.3 是全桥整流方式下的电路结构。

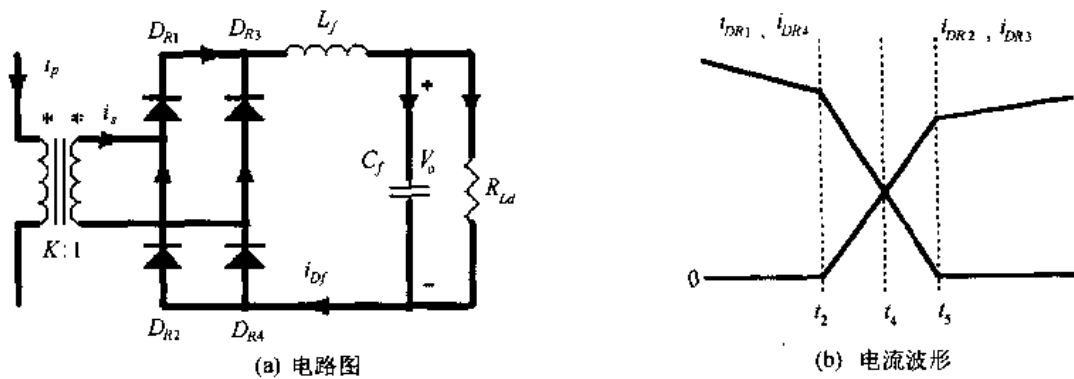


图 8.3 全桥整流方式

在  $t_2$  时刻, 负载电流流经  $D_{R1}$  和  $D_{R4}$ 。在  $[t_2, t_5]$  时段里, 变压器原边电流  $i_p$  减小, 其副边电流  $i_s$  也减小, 小于输出滤波电感电流, 即  $i_s < i_{Lf}$ ,  $i_s$  不足以提供负载电流。此时  $D_{R2}$  和  $D_{R3}$  导通, 为负载提供不足部分的电流。各个电流的关系式为:

$$i_{DR1} + i_{DR3} = i_{Lf} \quad (8.26)$$

$$i_{DR3} + i_s = i_{DR4} \quad (8.27)$$

一般  $D_{R1} \sim D_{R4}$  是同一型号的器件, 而  $D_{R1}$  和  $D_{R4}$ 、 $D_{R2}$  和  $D_{R3}$  的工作情况是一样的, 即

$$i_{DR1} = i_{DR4} \quad (8.28)$$

$$i_{DR2} = i_{DR3} \quad (8.29)$$

根据式(8.26)~(8.29)以及变压器的原副边电流关系式(8.25),可以得出整流管的电流表达式:

$$i_{DR1} = i_{DR4} = \frac{1}{2}(i_{Lf} + Ki_p) \quad (8.30)$$

$$i_{DR2} = i_{DR3} = \frac{1}{2}(i_{Lf} - Ki_p) \quad (8.31)$$

根据上面两式,可以知道整流管的换流情况:

①  $[t_2, t_4]$ 时段,  $i_p > 0$ ,  $D_{R1}$ 和  $D_{R4}$ 中流过的电流大于  $D_{R2}$ 和  $D_{R3}$ 流过的电流,即

$$i_{DR1} = i_{DR4} > i_{DR2} = i_{DR3} \quad (8.32)$$

② 在  $t_4$ 时刻,  $i_p = 0$ ,四个整流管中流过的电流相等,均为负载电流的一半,即

$$i_{DR1} = i_{DR4} = i_{DR2} = i_{DR3} = i_{Lf}/2 \quad (8.33)$$

③  $[t_4, t_5]$ 时段,  $i_p < 0$ ,  $D_{R1}$ 和  $D_{R4}$ 中流过的电流小于  $D_{R2}$ 和  $D_{R3}$ 流过的电流,即

$$i_{DR1} = i_{DR4} < i_{DR2} = i_{DR3} \quad (8.34)$$

④ 在  $t_5$ 时刻,  $i_p = -i_{Lf}/K$ ,  $D_{R2}$ 和  $D_{R3}$ 流过全部负载电流,  $D_{R1}$ 和  $D_{R4}$ 的电流为零,

即

$$i_{DR2} = i_{DR3} = i_{Lf} \quad (8.35)$$

$$i_{DR1} = i_{DR4} = 0 \quad (8.36)$$

此时,  $D_{R1}$ 和  $D_{R4}$ 关断,  $D_{R2}$ 和  $D_{R3}$ 承担全部负载电流,从而完成了整流二极管的换流过程。

### 8.5.2 全波整流方式

图 8.4 给出了全波整流方式的电路图,各个电流的参考方向如图所示,这样有:

$$i_{s1} = i_{DR1} \quad (8.37)$$

$$i_{s2} = -i_{DR2} \quad (8.38)$$

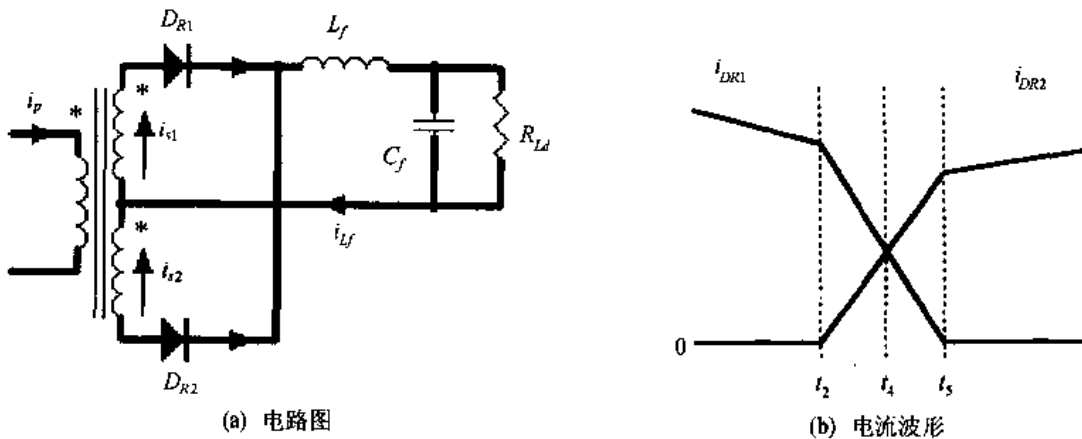


图 8.4 全波整流方式

在  $t_2$ 时刻,负载电流流经  $D_{R1}$ 。在  $[t_2, t_5]$ 时段里,变压器原边电流减小,其副边绕组  $L_{s1}$ 的电流也减小,小于输出滤波电感电流,即  $i_{s1} < i_{Lf}$ ,  $i_{s1}$ 不足以提供负载电流,此时  $D_{R2}$ 导通,由副边绕组  $L_{s2}$ 为负载提供不足部分的电流,即

$$i_{DR1} + i_{DR2} = i_{Lf} \quad (8.39)$$

变压器原副边的电流关系为:

$$i_{s1} + i_{s2} = Ki_p \quad (8.40)$$

由式(8.37)~(8.40)可以解出各个电流的表达式:

$$i_{s1} = \frac{1}{2}(i_{Lf} + Ki_p) \quad (8.41)$$

$$i_{s2} = -\frac{1}{2}(i_{Lf} - Ki_p) \quad (8.42)$$

$$i_{DR1} = \frac{1}{2}(i_{Lf} + Ki_p) \quad (8.43)$$

$$i_{DR2} = \frac{1}{2}(i_{Lf} - Ki_p) \quad (8.44)$$

根据式(8.43)和(8.44),可以知道整流管的换流情况:

①  $[t_2, t_4]$ 时段,  $i_p > 0$ , 流过  $D_{R1}$  的电流大于流过  $D_{R2}$  的电流, 即

$$i_{DR1} > i_{DR2} \quad (8.45)$$

② 在  $t_4$  时刻,  $i_p = 0$ , 两个整流管中流过的电流相等, 均为负载电流的一半, 即

$$i_{DR1} = i_{DR2} = i_{Lf}/2 \quad (8.46)$$

③  $[t_4, t_5]$ 时段,  $i_p < 0$ ,  $D_{R1}$  中流过的电流小于  $D_{R2}$  中流过的电流, 即

$$i_{DR1} < i_{DR2} \quad (8.47)$$

④ 在  $t_5$  时刻,  $i_p = -i_{Lf}/K$ ,  $D_{R2}$  中流过全部负载电流,  $D_{R1}$  中的电流为零, 即

$$i_{DR2} = i_{Lf} \quad (8.48)$$

$$i_{DR1} = 0 \quad (8.49)$$

此时,  $D_{R1}$  关断,  $D_{R2}$  承担全部负载电流, 从而完成整流管的换流过程。

## 8.6 仿真和实验结果

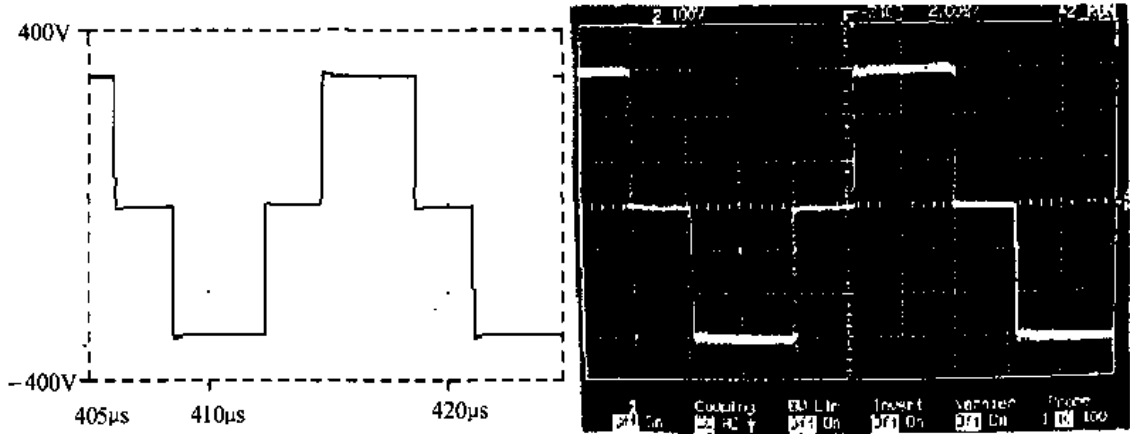
本节利用 PSPICE 软件对 PS ZVS PWM 全桥变换器作了仿真分析。并采用此方案, 研制成功 48V/10A 通讯电源。

仿真和实验所用的主要数据为:

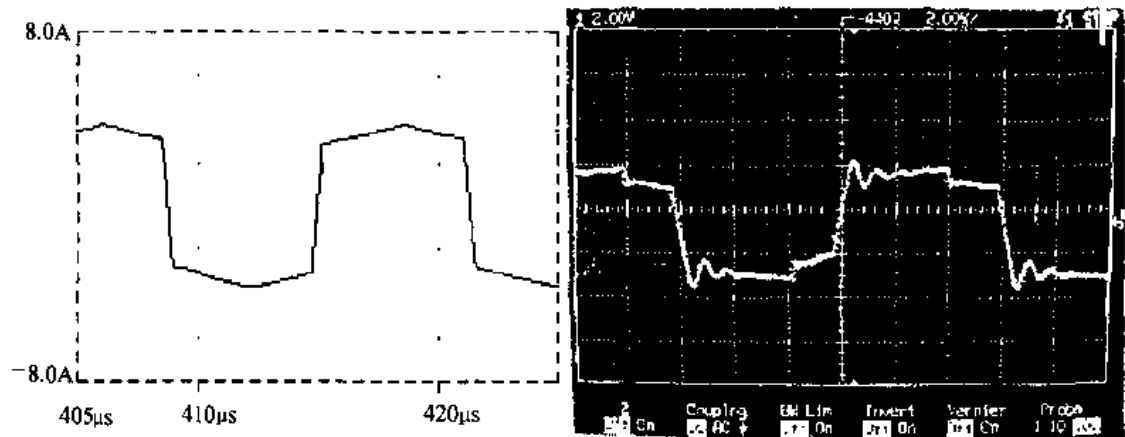
- 输入直流电压:  $V_{in} = 310\text{VDC}$ ;
- 输出直流电压:  $V_o = 52.8\text{VDC}$ ;
- $Q_1(D_1 \& C_1) \sim Q_4(D_4 \& C_4)$ : IRF840;
- 谐振电感:  $L_r = 26\mu\text{H}$ ;
- 变压器原副边匝比:  $K = 3$ ;
- 输出滤波电感:  $L_f = 88\mu\text{H}$ ;
- 输出滤波电容:  $C_f = 6600\mu\text{F}$ ;
- 开关频率:  $f_s = 80\text{kHz}$ 。

图 8.5 是输出 10A/52.8V 时的仿真(左图)和实验(右图)波形, 其中图 8.5(a)是  $v_{AB}$  的波形, 图 8.5(b)是原边电流波形, 图 8.5(c)是副边整流后的电压波形。从波形中可以看出, 所有波形均很干净, 原边电流由于有谐振电感的存在, 没有传统硬开关变换器所出现的开通电流尖峰。副边电压有少许振荡, 这是输出整流管的反向恢复和变压器的副边

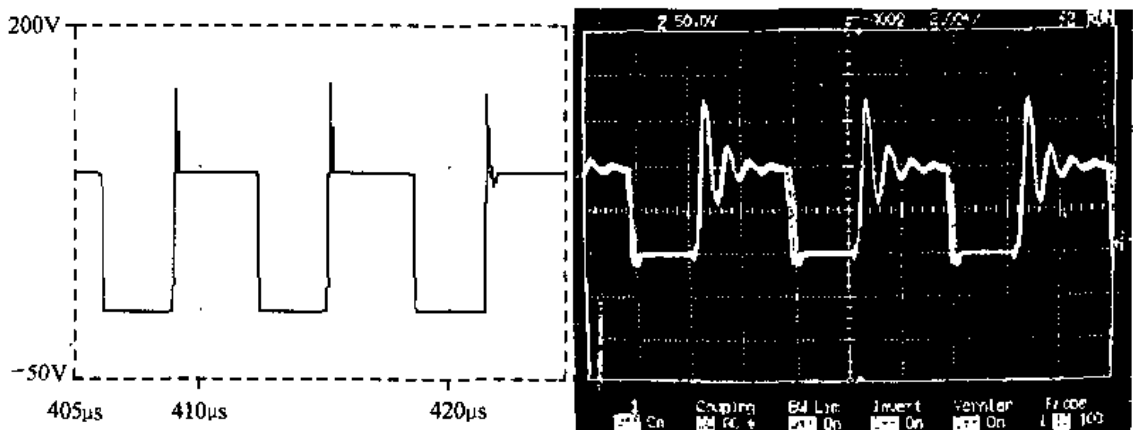
漏感造成的。图 8.5(d)是滞后桥臂的一个开关管的驱动波形及其漏源极电压  $v_{DS}$  波形, 从中可以看出, 当驱动电压变为正方向时, 开关管的漏源极电压已经为零, 其内部寄生的反并二极管已经导通, 此时开通开关管就是零电压开通; 而当开关管关断时, 其结电容限制了  $v_{DS}$  的上升率, 因此开关管是零电压关断的。由此说明移相控制方案实现了开关管的零电压开关。



(a)  $v_{AB}$  的波形  
(实验结果的时间标尺:  $2\mu\text{s}/\text{div}$ ; 电压标尺:  $100\text{V}/\text{div}$ )

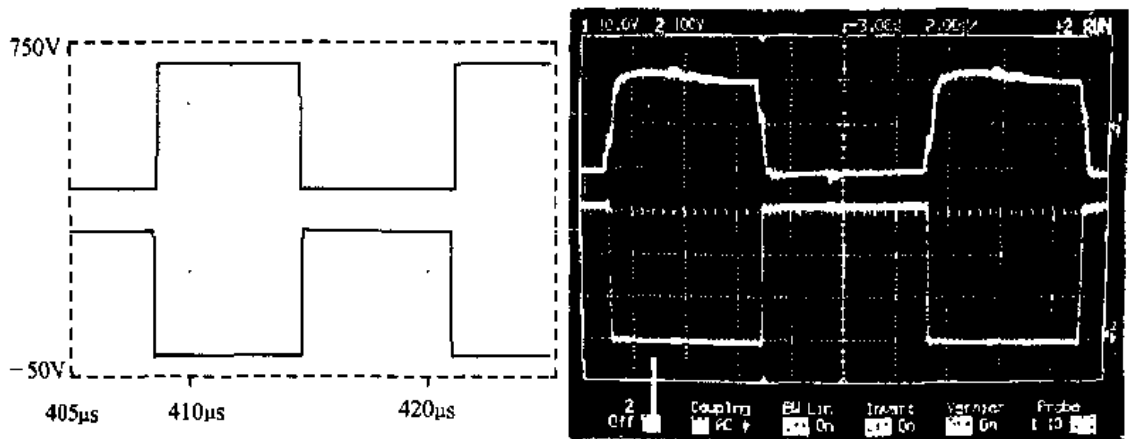


(b) 原边电流波形  
(实验结果的时间标尺:  $2\mu\text{s}/\text{div}$ ; 电流标尺:  $1\text{A}/\text{div}$ )



(c) 副边整流后的电压波形  
(实验结果的时间标尺:  $2\mu\text{s}/\text{div}$ ; 电压标尺:  $50\text{V}/\text{div}$ )

图 8.5 移相控制 ZVS PWM DC/DC 全桥变换器的仿真和实验波形



(d) 开关管的驱动波形(上面)及其漏源极电压波形(下面)  
(实验结果的时间标尺:  $2\mu\text{s}/\text{div}$ ; 电压标尺:  $10\text{V}/\text{div}$ (上),  $100\text{V}/\text{div}$ (下))

图 8.5(续)

图 8.6 和图 8.7 分别是全桥整流方式和全波整流方式下的电压和电流波形。该图说明在两种整流方式下,变压器的原、副边电压和电流的关系符合变压器的基本规律。即

$$v_s = v_p / K \quad (\text{全桥整流方式}) \quad (8.50)$$

$$i_s = Ki_p \quad (\text{全桥整流方式}) \quad (8.51)$$

$$v_{s1} = v_{s2} = v_p / K \quad (\text{全波整流方式}) \quad (8.52)$$

$$i_{s1} + i_{s2} = Ki_p \quad (\text{全波整流方式}) \quad (8.53)$$

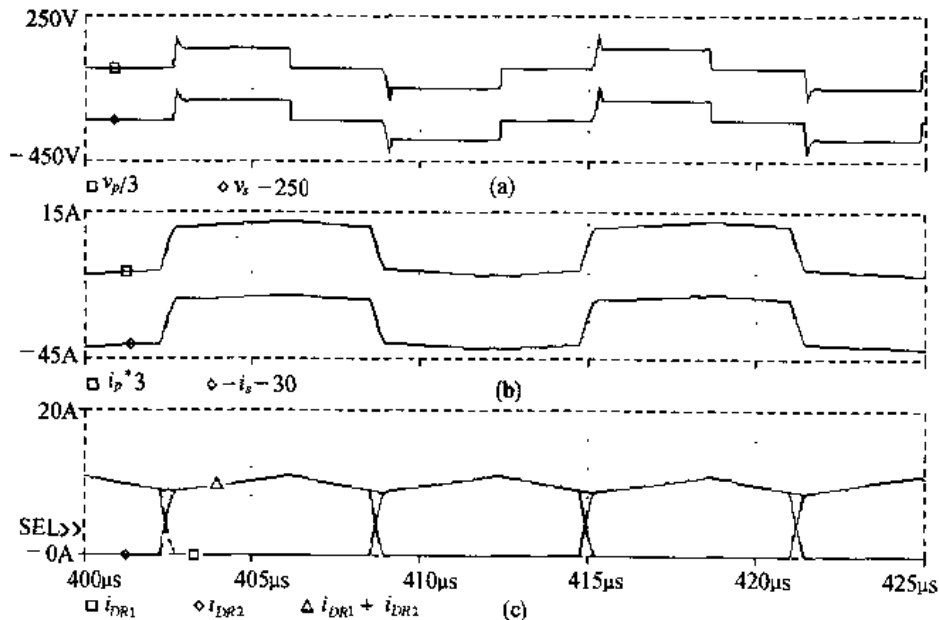


图 8.6 全桥整流方式

上面四个表达式是基于图 8.3 和图 8.4 的电流和电压的参考方向的。

图 8.6(c)和图 8.7(c)表明当原边电流不足以提供负载电流时,整流桥的所有二极管同时导通,为负载提供续流回路。



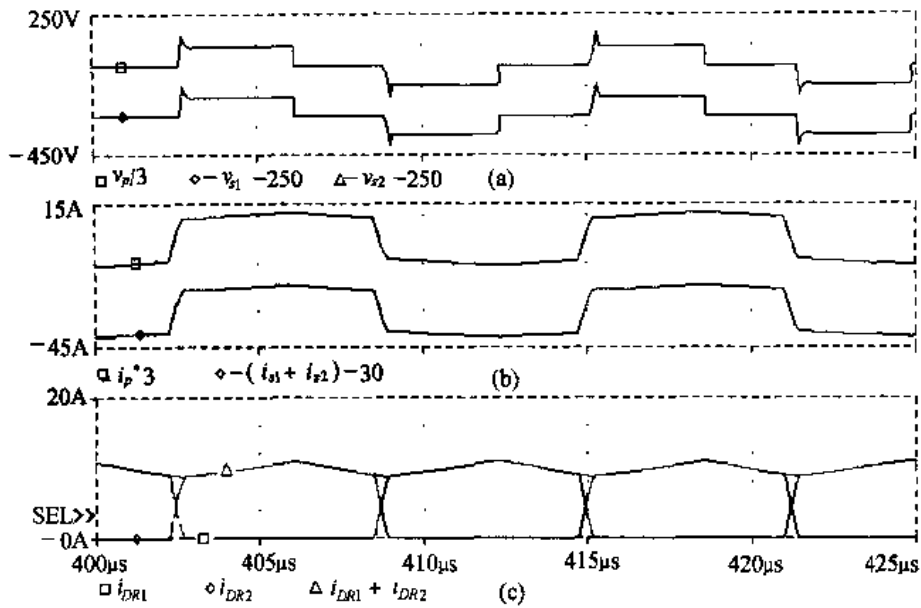
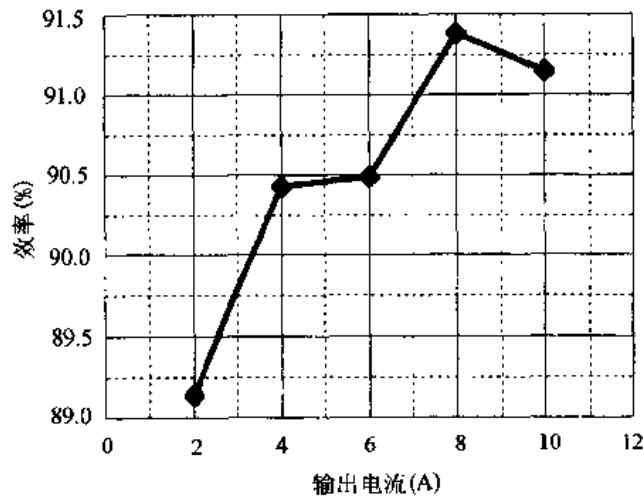


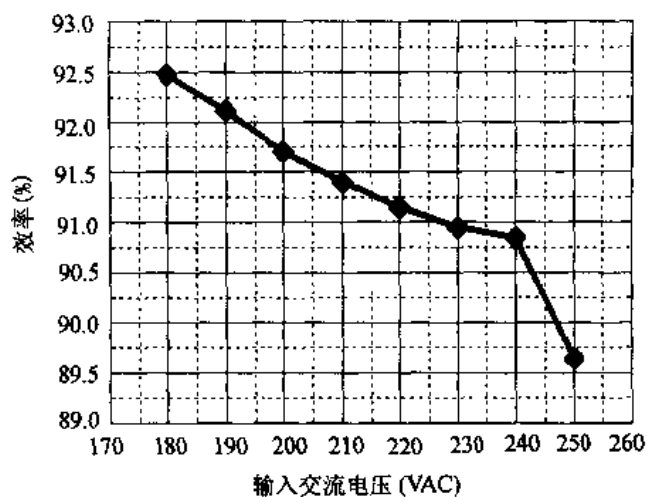
图 8.7 全波整流方式

图 8.8 给出了该电源的整机变换效率曲线,其中图 8.8(a)是在额定输入 220V 交流电,不同的输出电流下电源的变换效率。图中表明,在 8A 时效率最高,10A 时效率大于 91%。图 8.8(b)是输出满载 10A 时,在不同的输入交流电压时电源的变换效率。图中表明,在输入电压保证能输出满载电压的前提下,输入电压越高,变换效率越低。这是因为移相控制方案中存在零状态,此时原边电流处于自然续流状态。在这段时间里,原边电压没有能量传递到输出级,而在变压器、谐振电感和开关管中却存在通态损耗。而且输入电压越高,零状态所占时间越长。因此要提高变换效率,就要充分利用输入电压的时间,减小零状态的时间。



(a) 效率与输出电流的关系图

图 8.8 采用移相控制 ZVS PWM DC/DC 全桥变换器的电源的效率曲线



(b) 输出满载时效率与输入电压的关系图

图 8.8(续)

## 本章小结

本章分析了移相控制 ZVS PWM DC/DC 全桥变换器的基本原理。通过以上分析,可以得出以下结论:

- ① 移相控制零电压开关 PWM 变换器工作于零电压开关条件下,因而大大减小了开关损耗,有利于提高开关频率,减小变换器的体积和重量;
- ② 无论副边是全桥整流方式还是全波整流方式,变压器原副边的电压电流是符合变压器的基本规律的;
- ③ 超前桥臂比滞后桥臂容易实现零电压开关;
- ④ 由于谐振电感串联于主回路中,副边存在占空比丢失。

## 第九章 移相控制 ZVZCS PWM DC/DC 全桥变换器

### 9.1 引言

在第八章中,我们讨论了移相控制 ZVS PWM DC/DC 全桥变换器,它利用变压器的漏感和开关管(MOSFET)的结电容来实现开关管的零电压开关,拓扑结构简洁,同时又实现了恒定频率控制,广泛应用在中、大功率场合。

由于 MOSFET 导通时相当于一个电阻,其通态损耗较大。为了减小通态损耗,可以选用 IGBT 来替代 MOSFET 作主开关管,尤其是在输入电压很高、输出功率很大时。但是,IGBT 在关断时存在电流拖尾现象,由此产生较大的关断损耗。为了减小关断损耗,有必要给 IGBT 并联一个较大的电容。虽然这样可以减小 IGBT 的关断损耗,但也限制了开关频率的提高,变换器一般只能工作在 20kHz 左右。为了解决 IGBT 的电流拖尾问题,IGBT 最好工作在零电流开关状态。

本章讨论一种移相控制 ZVZCS PWM DC/DC 全桥变换器,它可以实现超前桥臂的零电压开关和滞后桥臂的零电流开关。其主电路和主要波形如图 9.1 所示。 $Q_1$  和  $Q_3$  构成超前桥臂, $Q_2$  和  $Q_4$  构成滞后桥臂。 $D_1$  和  $D_3$  分别是  $Q_1$  和  $Q_3$  的反并联二极管, $C_1$  和  $C_3$  分别是  $Q_1$  和  $Q_3$  的并联电容, $L_{lk}$  是变压器的漏感。与移相控制 ZVS PWM DC/DC 全桥变换器相比,移相控制 ZVZCS PWM DC/DC 全桥变换器增加了一个阻断电容  $C_b$ ,同时在滞后桥臂的开关管中串联了一个二极管,没有并联电容。

### 9.2 工作原理

在一个开关周期中,变换器有 10 种开关模态,其等效电路如图 9.2 所示。在分析之前,作如下假设:

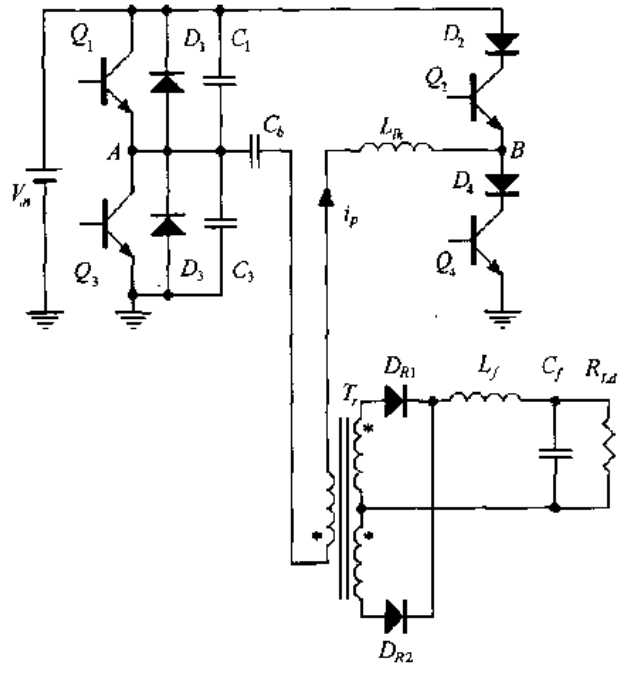
- ① 所有开关管、二极管均为理想器件;
- ② 电感、电容均为理想元件;
- ③ 阻断电容  $C_b$  足够大;
- ④  $C_1 = C_3 = C_r$ ;
- ⑤  $K^2 L_f \gg L_{lk}$ ,  $K$  为变压器原副边匝比。

#### 1. 开关模态 0 [ $t_0$ 时刻] [参考图 9.2(a)]

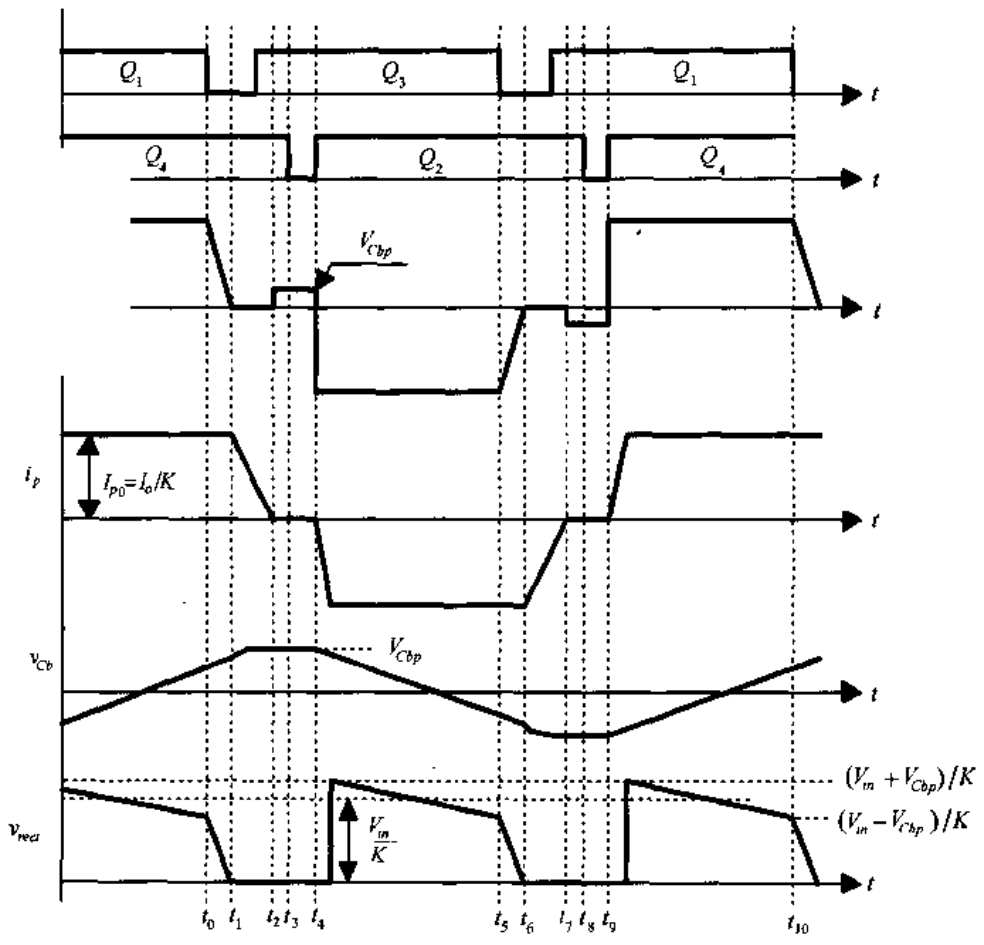
在  $t_0$  时刻, $Q_1$  和  $Q_4$  导通。原边电流  $i_p$  给阻断电容  $C_b$  充电。这里假设输出滤波电感足够大,可以将它看成是一个电流源。此时,原边电流为  $I_{p0} = I_o/K$ ,  $I_o$  是输出负载电流。阻断电容  $C_b$  电压为  $V_{Cb}(t_0)$ 。

#### 2. 开关模态 1 [ $t_0, t_1$ ] [参考图 9.2(b)]

在  $t_0$  时刻关断  $Q_1$ ,  $i_p$  从  $Q_1$  中转移到  $C_3$  和  $C_1$  中,给  $C_1$  充电,同时  $C_3$  被放电。在



(a) 主电路



(b) 主要波形

图 9.1 移相控制 ZVZCS PWM DC/DC 全桥变换器

这个时段里,漏感  $L_{lk}$  和滤波电感  $L_f$  是串联的,而且  $L_f$  很大,可以认为  $i_p$  近似不变,类似于一个恒流源,其大小为  $I_{p0} = I_o/K$ 。原边电流  $i_p$  继续给阻断电容  $C_b$  充电。 $C_1$  的电压从零开始线性上升, $C_3$  的电压从  $V_{in}$  开始线性下降,因此  $Q_1$  是零电压关断。

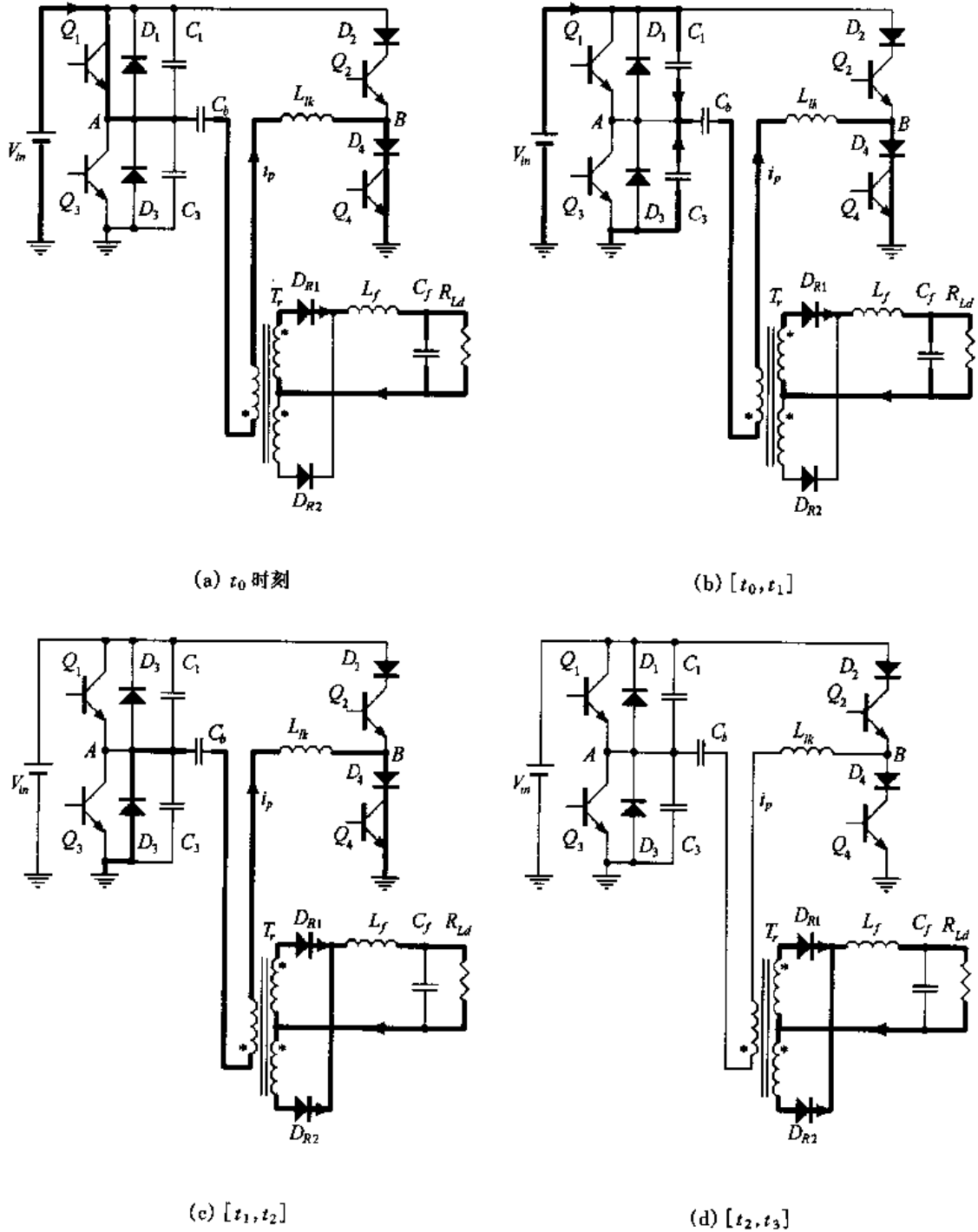


图 9.2 各个开关模式的等效电路

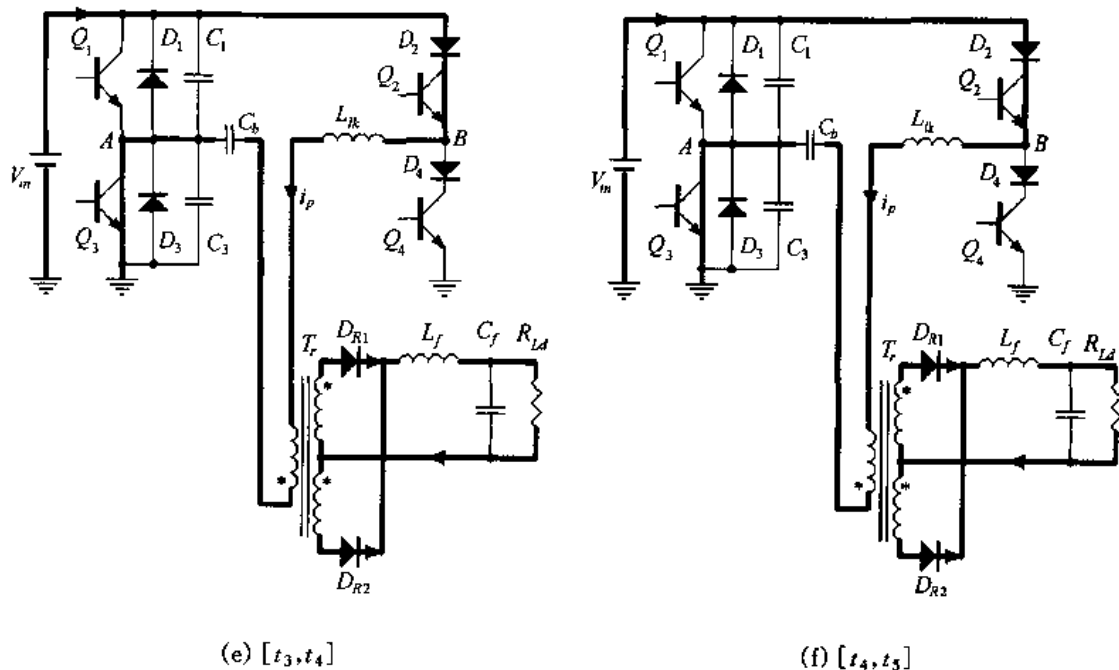


图 9.2 (续)

$$v_{Cb}(t) = V_{Cb}(t_0) + \frac{I_{p0}}{C_b}(t - t_0) \quad (9.1)$$

$$v_{C1}(t) = \frac{I_{p0}}{2C_r}(t - t_0) \quad (9.2)$$

$$v_{C3}(t) = V_{in} - \frac{I_{p0}}{2C_r}(t - t_0) \quad (9.3)$$

在  $t_1$  时刻,  $C_3$  的电压下降到零,  $Q_3$  的反并二极管  $D_3$  自然导通, 从而结束开关模式 1。该模式的持续时间为:

$$t_{01} = 2C_r V_{in} / I_{p0} \quad (9.4)$$

在  $t_1$  时刻, 阻断电容  $C_b$  上的电压为:

$$V_{Cb}(t_1) = V_{Cb}(t_0) + 2 \cdot \frac{C_r V_{in}}{C_b} \quad (9.5)$$

### 3. 开关模式 2 [ $t_1, t_2$ ] [参考图 9.2(c)]

$D_3$  导通后, 开通  $Q_3$ ,  $Q_3$  是零电压开通。  $Q_3$  与  $Q_1$  驱动信号之间的死区时间  $t_{d(lead)} > t_{01}$ , 即

$$t_{d(lead)} > \frac{2C_r V_{in}}{I_{p0}} \quad (9.6)$$

在这段时间里,  $D_3$  和  $Q_4$  导通,  $A$ 、 $B$  两点电压  $v_{AB}$  等于零。此时加在变压器原边绕组和漏感上的电压为阻断电容电压  $v_{Cb}$ , 原边电流开始减小, 同时变压器原边电压极性改变, 副边感应电势成为下正上负。变压器副边两个整流二极管  $D_{R1}$  和  $D_{R2}$  同时导通, 因此变压器原、副边绕组电压均为零。此时阻断电容的电压全部加在漏感上, 原边电流减小, 阻断电容电压上升。由于漏感较小, 而阻断电容较大, 因此可认为在这个开关模式中, 阻

断电容电压基本不变,原边电流基本是线性减小,即

$$v_{Cb}(t) = V_{Cb}(t_1) \equiv V_{Cb} \quad (9.7)$$

$$i_p(t) = I_{p0} - \frac{V_{Cb}}{L_{lk}}(t - t_1) \quad (9.8)$$

在  $t_2$  时刻,原边电流下降到零。该开关模式的持续时间为:

$$t_{12} = \frac{L_{lk} \cdot I_{p0}}{V_{Cb}} \quad (9.9)$$

#### 4. 开关模式 3 [ $t_2, t_3$ ] [参考图 9.2(d)]

在开关模式 3 中,原边电流为  $i_p = 0$ , A 点对地电压为  $v_A = 0$ , B 点对地电压为  $v_B = -V_{Cb}$ 。副边两个整流管同时导通,均分负载电流。

#### 5. 开关模式 4 [ $t_3, t_4$ ] [参考图 9.2(e)]

在  $t_3$  时刻,关断  $Q_4$ ,此时  $Q_4$  中并没有电流流过,因此  $Q_4$  是零电流关断。在很小的延时后,开通  $Q_2$ ,由于漏感的存在,原边电流不能突变, $Q_2$  是零电流开通。

由于原边电流不足以提供负载电流,副边两个整流管依然同时导通,变压器的原、副边绕组被箝在零电压。此时加在漏感两端的电压为  $-(V_{in} + V_{Cb})$ ,原边电流从零开始反方向线性增加。

$$i_p(t) = -\frac{V_{in} + V_{Cb}}{L_{lk}}(t - t_3) \quad (9.10)$$

在  $t_4$  时刻,原边电流反方向增加到负载电流。该开关模式的持续时间为:

$$t_{34} = \frac{L_{lk} \cdot I_{p0}}{V_{in} + V_{Cb}} \quad (9.11)$$

#### 6. 开关模式 5 [ $t_4, t_5$ ] [参考图 9.2(f)]

从  $t_4$  时刻开始,原边为负载提供能量,同时给阻断电容反向充电。输出整流管  $D_{R1}$  自然关断,所有负载电流均流过  $D_{R2}$ 。在这个开关模式中,

$$v_{Cb}(t) = V_{Cb} - \frac{I_{p0}}{C_b} \cdot (t - t_4) \quad (9.12)$$

在  $t_5$  时刻,

$$V_{Cb}(t_5) = V_{Cb} - \frac{I_{p0}}{C_b} \cdot t_{45} \quad (9.13)$$

阻断电容上的电压为下一次  $Q_2$  零电流关断和  $Q_4$  零电流开通作准备。在  $t_5$  时刻,关断  $Q_3$ ,开始另一个半周期 [ $t_5, t_{10}$ ],其工作情况类似于前面描述的 [ $t_0, t_5$ ]。

阻断电容电压在  $t_6$  时刻达到负的最大值  $-V_{Cb}$ ,而 [ $t_5, t_6$ ] 时段与 [ $t_0, t_1$ ] 时段是类似的,因此有:

$$V_{Cb}(t_6) = V_{Cb}(t_5) - 2 \frac{C_r V_{in}}{C_b} = V_{Cb} - \frac{I_{p0}}{C_b} \cdot t_{45} - 2 \cdot \frac{C_r V_{in}}{C_b} = -V_{Cb} \quad (9.14)$$

一般  $C_r \ll C_b$ ,那么上式可简化为:

$$V_{Cb} = \frac{I_{p0}}{2C_b} \cdot t_{45} \quad (9.15)$$

### 9.3 参数设计

#### 1. 实现滞后桥臂 ZCS 的条件

从上一节的分析中可以知道,要实现滞后桥臂的 ZCS,原边电流  $i_p$  必须在滞后桥臂开通之前从负载电流减小到零。从式(9.9)和(9.15)可以推出  $i_p$  从负载电流减小到零的时间  $t_{12}$ 为:

$$t_{12} = \frac{2L_{lk}C_b}{t_{45}} = \frac{2L_{lk}C_b}{D_y T_s / 2} = \frac{4L_{lk}C_b}{D_y T_s} \quad (9.16)$$

式中  $D_y$  是占空比,  $T_s$  是开关周期。

从式(9.16)中可以看出,  $t_{12}$  与负载电流无关,与占空比  $D_y$  成反比。也就是说可以在任意负载和输入电压变化范围内实现滞后桥臂的零电流开关。

#### 2. 最大占空比 $D_{y\max}$

从图 9.3 中可以知道,本变换器的最大占空比  $D_{y\max}$  由下式决定:

$$D_{y\max} = 1 - \frac{t_{12} + T_{ZCS}}{T_s / 2} \quad (9.17)$$

式中  $T_{ZCS}$  是实现滞后桥臂 ZCS 的时间,它取决于开关管的关断特性。

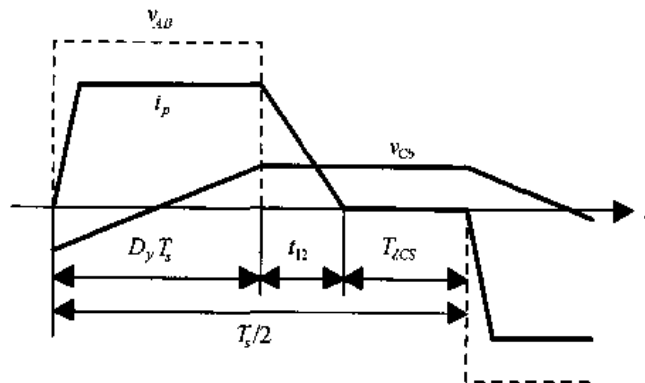


图 9.3 最大占空比的确定

#### 3. 滞后桥臂的电压应力

在开关模态 3 中,原边电流  $i_p$  为零,  $v_B = -V_{Cb}$ , 滞后桥臂开关管上的电压为:

$$V_{Q2} = V_{in} + V_{Cb} \quad (9.18)$$

$$V_{Q4} = -V_{Cb} \quad (9.19)$$

从上面两个表达式可知,滞后桥臂开关管的电压应力为  $V_{in} + V_{Cb}$ , 而且要承受反向电压  $V_{Cb}$ , 因此滞后桥臂要串联二极管。



#### 4. 阻断电容的选择

阻断电容  $C_b$  的选择受到两个因素的制约:

① 从式(9.16)和(9.17)中可知,为了提高  $D_{y\max}$ ,  $C_b$  应当尽量小;② 从式(9.18)和(9.19)中可知,为了降低滞后桥臂的电压应力和反向电压,  $C_b$  应当尽量大。

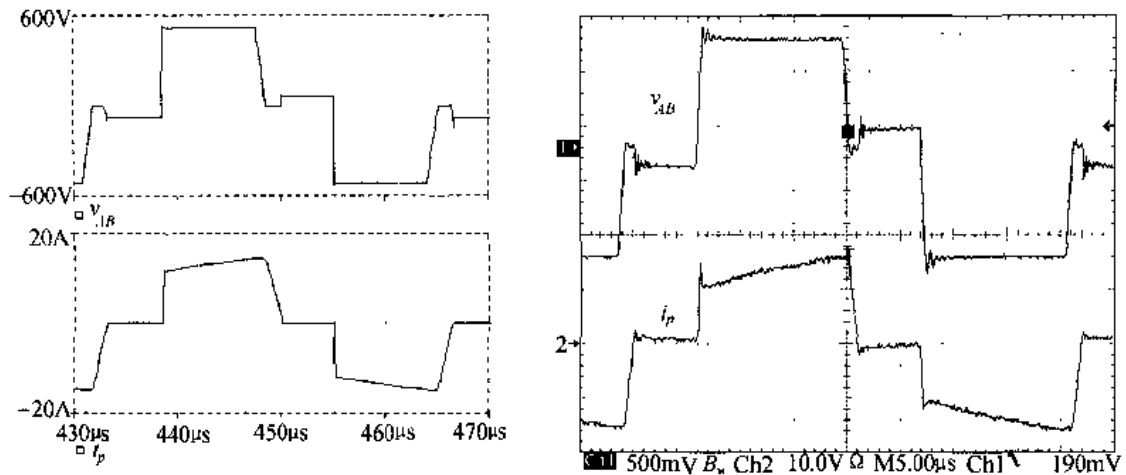
因此要权衡选择  $C_b$ ,一般在输出满载时,阻断电容电压峰值  $V_{Cb_p} = 20\% V_{in}$ 。

## 9.4 仿真与实验结果

本节采用 PSPICE 软件对该变换器做了仿真分析,并采用此方案,研制成功 48V/100A 通讯用开关电源。仿真和实验所用的参数为:

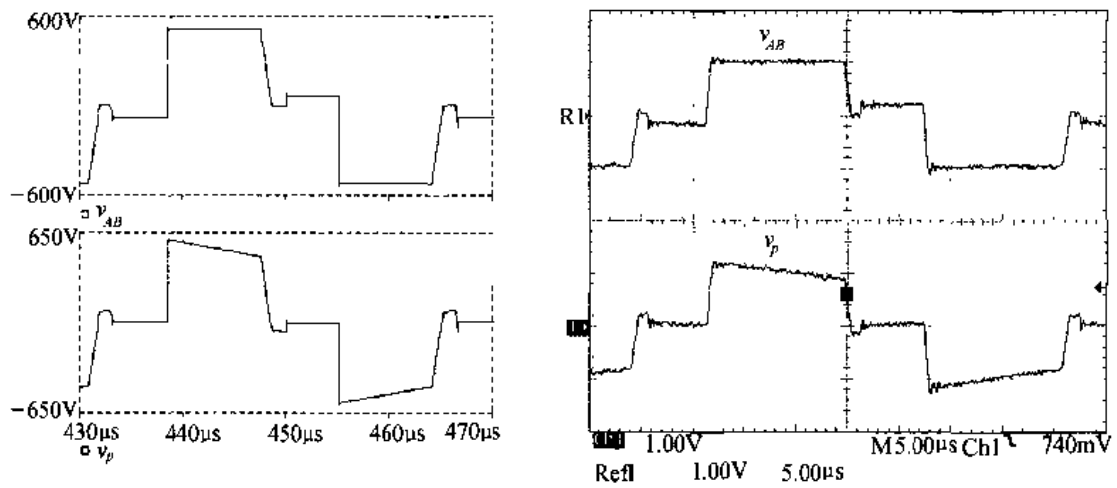
- 输入直流电压:  $V_{in} = 530\text{VDC}$ ;
- 输出直流电压:  $V_o = 52.8\text{VDC}$ ;
- 变压器原副边匝比:  $K = 5.5$ ;
- 变压器原边漏感:  $L_{lk} = 10\mu\text{H}$ ;
- 阻断电容:  $C_b = 2\mu\text{F}$ ;
- 并联电容:  $C_1 = C_3 = C_r = 15\text{nF}$ ;
- 输出滤波电感:  $L_f = 30\mu\text{H}$ ;
- 输出滤波电容:  $C_f = 10000\mu\text{F}$ ;
- 开关管: IGBT, VII50-12Q3;
- 串联二极管为: DSEP2 × 31-03A;
- 输出整流二极管: MEK95-06 DA;
- 开关频率:  $f_s = 30\text{kHz}$ 。

图 9.4 给出了在输出满载 100A 时的仿真和实验波形对比图,其中,左图为仿真波形,右图为实验波形。图 9.4(a)是原边电压  $v_{AB}$  和原边电流  $i_p$  波形。该图表明当  $v_{AB} = 0$  时,阻断电容  $C_b$  上的电压使  $i_p$  从折算到原边的负载电流减小到零,从而实现滞后桥臂的零电流开关。与 PS ZVS PWM 全桥变换器相比,本变换器不存在原边环流,因而可以提高变换效率。图 9.4(b)是  $v_{AB}$  和变压器原边电压  $v_p$  波形,由于有阻断电容的电压,  $v_p$  不是一个方波,但其平均值与 PS ZVS PWM 全桥变换器一样。图 9.4(c)是阻断电容的电压波形,当原边电流正向流动时,阻断电容电压是增加的;而当原边电流反向流动时,阻断电容电压是减小的。图 9.4(d)是滞后桥臂开关管的电流和驱动波形,该图说明滞后桥臂是零电流开关的。图 9.4(e)是超前桥臂开关管的电压和驱动波形,该图说明超前桥臂是零电压开关的。图 9.4(f)是超前桥臂和滞后桥臂的电压波形,由于超前桥臂有反并二极管,其电压应力为输入直流电压  $V_{in}$ ;而滞后桥臂没有反并二极管,其电压应力为  $V_{in} + V_{Cb_p}$ ,而且有反向电压  $-V_{Cb_p}$ ,因此需要串联二极管来承受这个反向电压。



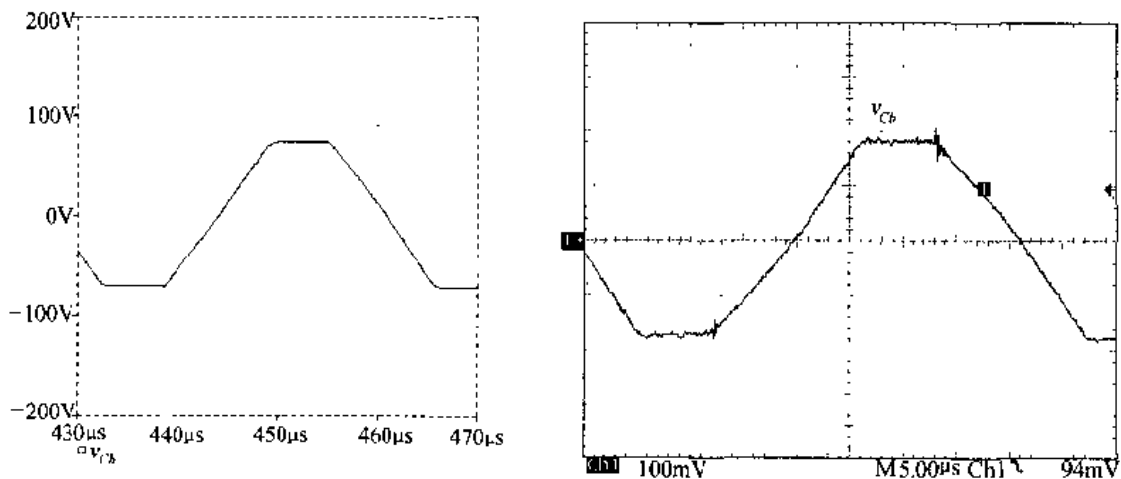
(a) 原边电压  $v_{AB}$ (上面曲线)和原边电流  $i_p$ (下面曲线)

(实验波形的时间标尺:  $5\mu\text{s}/\text{div}$ , 电压标尺:  $250\text{V}/\text{div}$ , 电流标尺:  $10\text{A}/\text{div}$ )



(b)  $v_{AB}$ (上面曲线)和原边电压  $v_p$ (下面曲线)

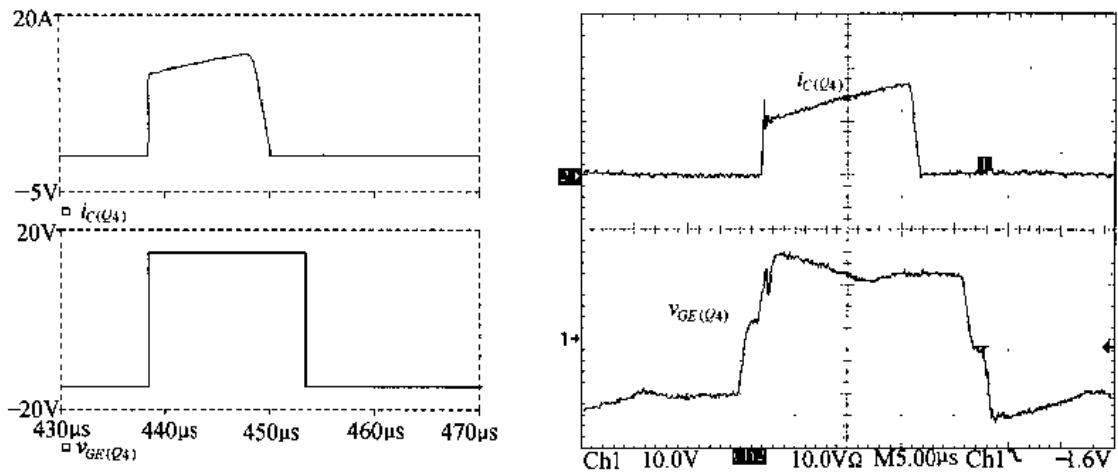
(实验波形的时间标尺:  $5\mu\text{s}/\text{div}$ , 电压标尺:  $500\text{V}/\text{div}$ )



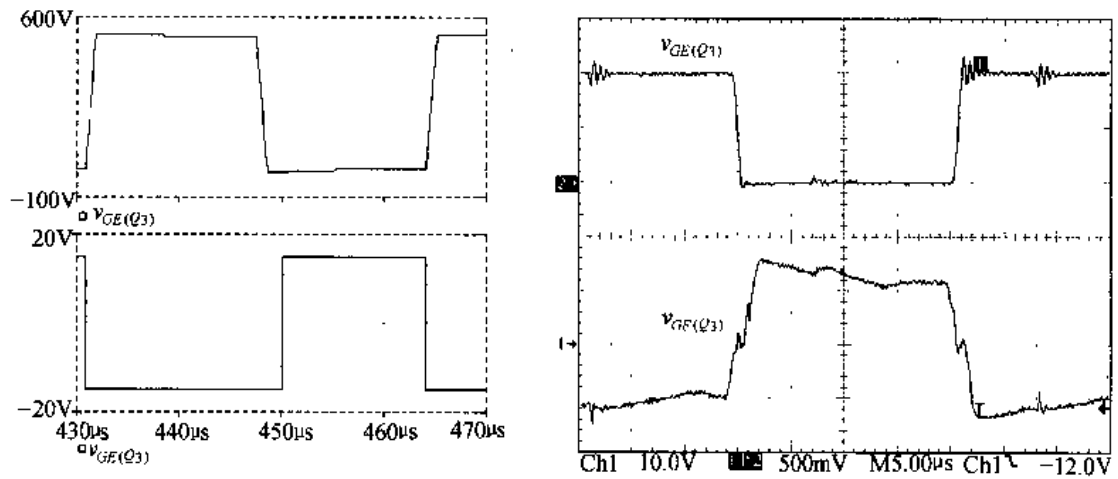
(c) 阻断电容电压  $v_{CB}$

(实验波形的时间标尺:  $5\mu\text{s}/\text{div}$ , 电压标尺:  $50\text{V}/\text{div}$ )

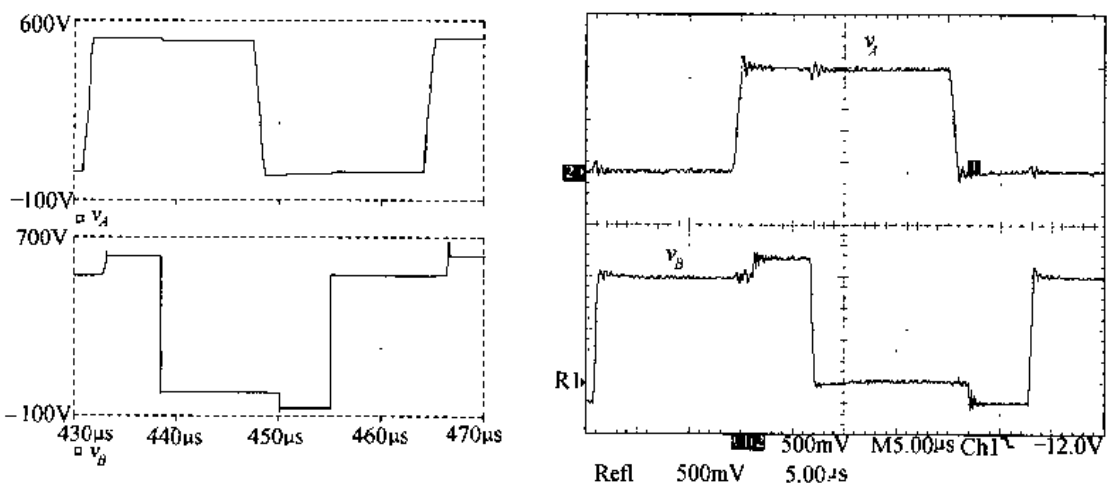
图 9.4 移相控制 ZVZCS PWM DC/DC 全桥变换器的仿真与实验结果



(d) 滞后桥臂中  $Q_4$  的 C 极电流  $i_{C(Q4)}$  (上面曲线) 和驱动电压  $v_{GE(Q4)}$  (下面曲线)  
 (实验波形的时间标尺:  $5\mu\text{s}/\text{div}$ , 电流标尺:  $10\text{A}/\text{div}$ , 电压标尺:  $10\text{V}/\text{div}$ )



(e) 超前桥臂中  $Q_3$  的 CE 极电压  $v_{CE(Q3)}$  (上面曲线) 和驱动电压  $v_{GE(Q3)}$  (下面曲线)  
 (实验波形的时间标尺:  $5\mu\text{s}/\text{div}$ , 电压标尺:  $250\text{V}/\text{div}$  (上),  $10\text{V}/\text{div}$  (下))



(f) 超前桥臂中点电压  $v_A$  (上面曲线) 和滞后桥臂中点电压  $v_B$  (下面曲线)  
 (实验波形的时间标尺:  $5\mu\text{s}/\text{div}$ , 电压标尺:  $250\text{V}/\text{div}$ )

图 9.4 (续)

图 9.5 给出了电源在额定输入 380V 交流电时,不同的输出电流的整机变换效率。在 60A 时,变换效率最高,超过了 94%,在满载输出 100A 时变换效率为 93.8%,而采用 ZVS PWM DC/DC 全桥变换器方案时满载效率为 92%。这主要是因为 ZVZCS PWM DC/DC 全桥变换器方案在零状态时变压器和开关管中不存在通态损耗。

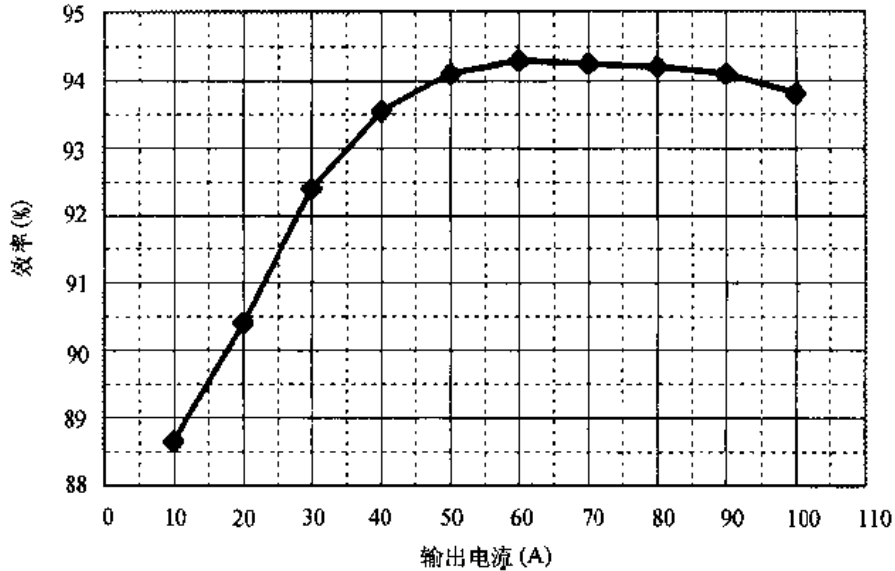


图 9.5 变换效率图

## 本章小结

本章介绍了移相控制 ZVZCS PWM DC/DC 全桥变换器的工作原理及其参数设计,并给出了仿真和实验结果。该变换器有如下优点:

- ① 实现了超前桥臂的零电压开关;
- ② 可以在任意负载和输入电压变化范围内实现滞后桥臂的零电流开关;
- ③ 不存在 ZVS PWM DC/DC 全桥变换器的原边环流,提高了变换器的变换效率。

# 第十章 移相控制 ZCS PWM DC/DC 全桥变换器

## 10.1 引言

第八章讨论的移相控制 ZVS PWM 全桥变换器利用变压器的漏感或原边串联电感和功率管的寄生电容来实现开关管的零电压开关。第九章讨论的移相控制 ZVZCS PWM 全桥变换器实现了超前桥臂的零电压开关和滞后桥臂的零电流开关。因此超前桥臂一般选用 MOSFET, 而滞后桥臂选用 IGBT, 这样可以提高变换器的变换效率。如果移相控制 ZVZCS PWM 全桥变换器的超前桥臂也选用 IGBT, 它的开关频率可比采用 IGBT 作为主开关管的移相控制 ZVS PWM DC/DC 全桥变换器的要高一些, 但超前桥臂的零电压开关还是限制了开关频率的提高。如果选用 IGBT 作为主功率开关管, 又要求提高开关频率的提高, 所有开关管必须均实现零电流开关。

本章讨论一种所有开关管均实现 ZCS 的 PWM DC/DC 全桥变换器。图 10.1 给出了该变换器的主电路和主要波形。从图中可以看出, 该电路的基本结构实际上是电流型全桥变换器, 其外特性与 Boost 电路一样。  $L_b$  是升压电感;  $Q_1 \sim Q_4$  是主开关管,  $D_1 \sim D_4$  分别是  $Q_1 \sim Q_4$  的串联二极管, 使  $Q_1 \sim Q_4$  只能单方向导通, 同时承受反向电压;  $L_{lk}$  是变压器的漏感,  $C_r$  是谐振电容。该变换器同样采用移相控制,  $Q_4$  和  $Q_3$  的驱动信号分别超前于  $Q_1$  和  $Q_2$ , 因此称  $Q_3$  和  $Q_4$  为超前管,  $Q_1$  和  $Q_2$  为滞后管。移相控制 ZVS PWM DC/DC 全桥变换器的同一桥臂两只开关管的驱动信号之间有一个死区时间, 使开关管实现 ZVS。而移相控制 ZCS PWM DC/DC 全桥变换器则不同, 它的两只超前管(或滞后管)之间有一个重叠的时间, 用来实现开关管的 ZCS。

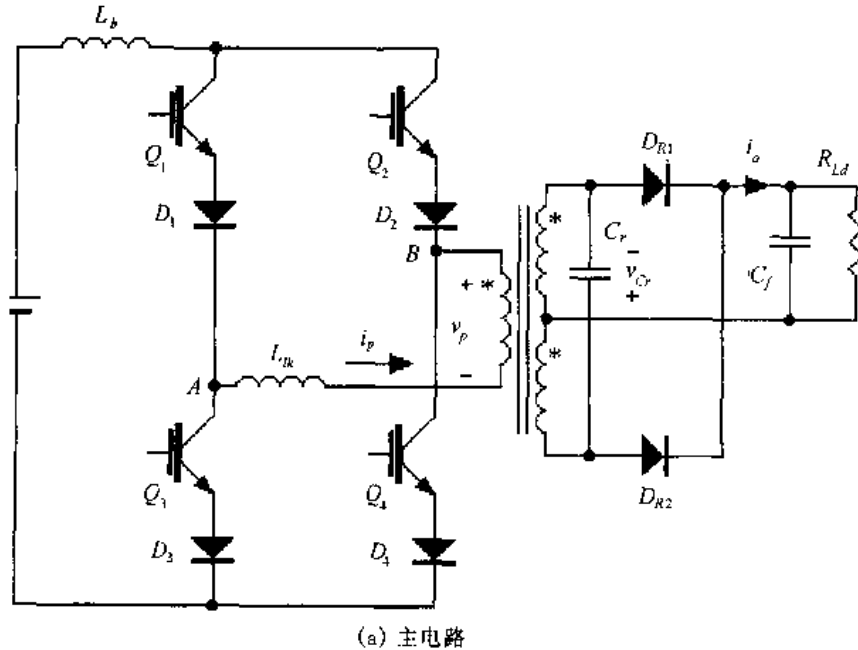
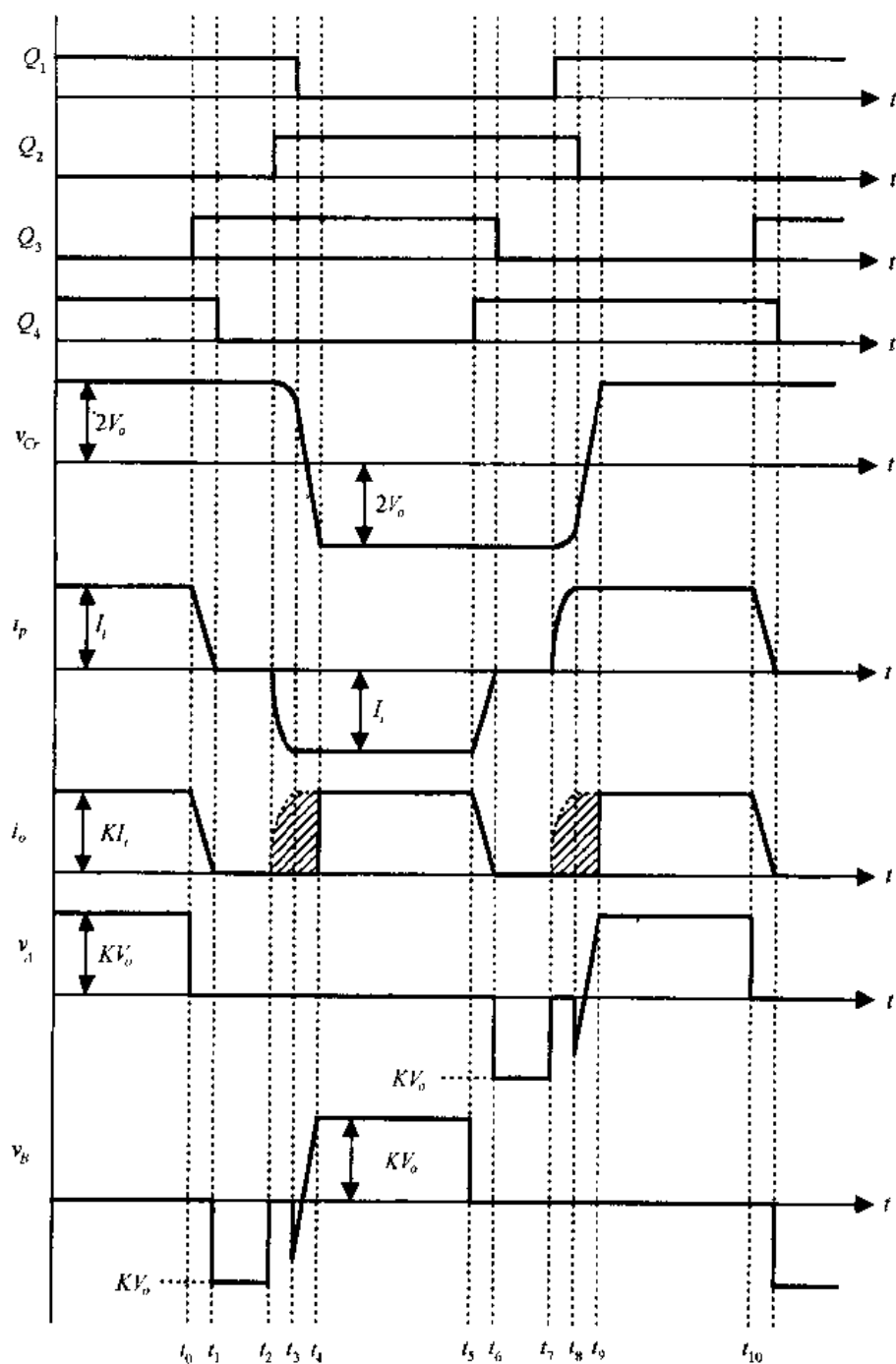


图 10.1 移相控制 ZCS PWM DC/DC 全桥变换器



(b) 主要波形  
图 10.1(续)

## 10.2 工作原理

在一个开关周期中,移相控制 ZCS PWM DC/DC 全桥变换器有 10 种开关模态,图 10.2 给出了该变换器在不同开关模态下的等效电路。在分析之前,作出如下假设:

- ① 所有开关管、二极管均为理想器件;

② 所有电感、电容和变压器均为理想元件；

③  $L_b \gg L_{lk}$ ；

④  $L_b$  足够大，在一个开关周期中，其电流基本保持不变，为  $I_i$ ，这样  $L_b$  和输入电压  $V_{in}$  可以看成是一个电流为  $I_i$  的恒流源；

⑤  $C_f$  足够大，在一个开关周期中，其电压基本保持不变，为  $V_o$ ，这样  $C_f$  和负载电阻可以看成是一个电压为  $V_o$  的恒压源；

⑥  $K$  是变压器原副边匝比。

### 1. 开关模态 0 [ $t_0$ 时刻] [参考图 10.2(a)]

在  $t_0$  时刻， $Q_1$  和  $Q_4$  导通。输入电流  $I_i$  流经  $Q_1$ ，漏感  $L_{lk}$ ，变压器原边绕组以及  $Q_4$ 。副边电流  $i_o$  流经整流管  $D_{R2}$ 。此刻，原边电流  $I_p(t_0) = I_i$ ，谐振电容电压为  $V_{Cr}(t_0) = 2V_o$ 。

### 2. 开关模态 1 [ $t_0, t_1$ ] [参考图 10.2(b)]

在  $t_0$  时刻开通  $Q_3$ ，在这段时间里， $Q_1$ 、 $Q_3$  和  $Q_4$  均导通，副边电流  $i_o$  流经整流管  $D_{R2}$ 。变压器原边绕组电压为  $v_p = -KV_o$ ，该电压全部加在漏感  $L_{lk}$  上，使原边电流  $i_p$  线性减小，即

$$i_p(t) = I_i - \frac{KV_o}{L_{lk}}(t - t_0) \quad (10.1)$$

$Q_4$  中的电流向  $Q_3$  中转移， $Q_3$  的电流从零线性上升，即

$$i_{Q3}(t) = \frac{KV_o}{L_{lk}}(t - t_0) \quad (10.2)$$

谐振电容电压为：

$$v_{Cr}(t) = 2V_o \quad (10.3)$$

输出电流  $i_o$  也是线性减小的，即

$$i_o(t) = KI_i - \frac{K^2V_o}{L_{lk}}(t - t_0) \quad (10.4)$$

在  $t_1$  时刻，原边电流  $i_p$  减小到零， $Q_4$  的电流为零， $Q_3$  的电流上升到输入电流  $I_i$ ，输出电流  $i_o$  和输出整流二极管  $D_{R2}$  的电流也减小到零， $D_{R2}$  自然关断，不存在反向恢复问题。该开关模态的持续时间为：

$$t_{01} = \frac{L_{lk}I_i}{KV_o} \quad (10.5)$$

### 3. 开关模态 2 [ $t_1, t_2$ ] [参考图 10.2(c)]

在这段时间里，输入电流  $I_i$  流经  $Q_1$  和  $Q_3$ ，负载则通过输出滤波电容供电，与 Boost 电路一样。而原边电压依然为  $v_p = -KV_o$ ，由于  $D_4$  的阻断作用， $i_p$  不能反向流动，一直保持为零。原边电压就加在  $Q_4$  和  $D_4$  上，由于  $Q_4$  没有承受反压的能力，此反压为  $D_4$  所承受。因此  $Q_4$  的串联二极管  $D_4$  起到两个作用：①使  $Q_4$  的电流单方向流动；②为  $Q_4$  承受反向电压。在此开关模态中， $Q_4$  的电流一直为零，关断  $Q_4$ ，则  $Q_4$  是零电流关断。

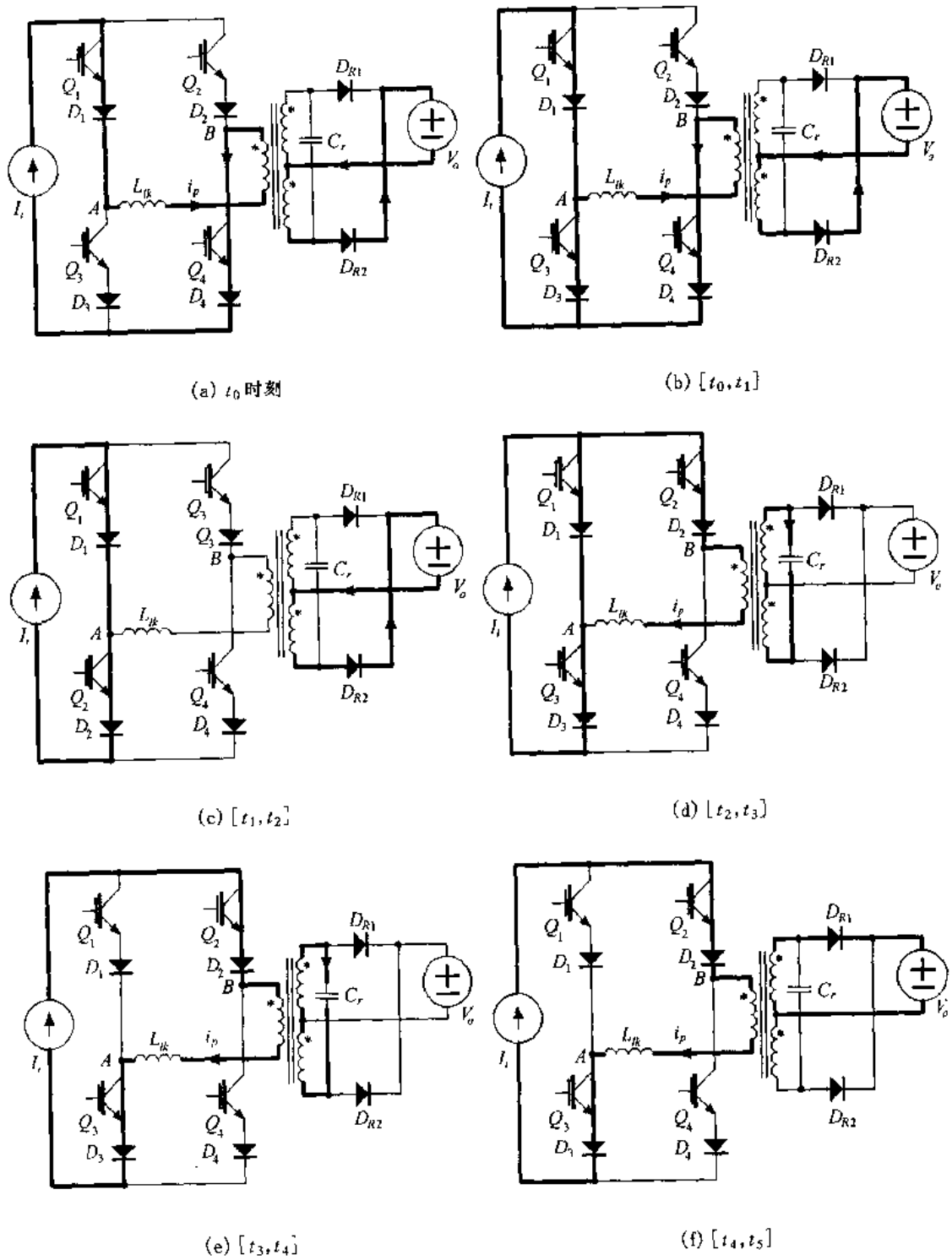


图 10.2 各种开关模式的等效电路

#### 4. 开关模式 3 $[t_2, t_3]$ [参考图 10.2(d)]

在  $t_2$  时刻, 开通  $Q_2$ 。原边电流  $i_p$  从零开始反向增长, 谐振电容开始放电, 其电压开始从  $2V_0$  减小。实质上, 漏感开始与谐振电容谐振工作, 原边电流和谐振电容电压的表达式分别为:



$$i_p(t) = -\frac{2V_o}{Z_p} \sin\omega(t-t_2) \quad (10.6)$$

$$v_{Cr}(t) = 2V_o \cos\omega(t-t_2) \quad (10.7)$$

式中  $Z_p = \sqrt{\frac{L_{lk}}{C_r}}$ ,  $\omega = \frac{K}{\sqrt{L_{lk}C_r}}$ 。

而  $Q_1$  中的电流为:

$$i_{Q1}(t) = I_i - \frac{2V_o}{Z_p} \sin\omega(t-t_2) \quad (10.8)$$

从式(10.6)中可以看出,原边电流是从零呈正弦上升的,因此  $Q_2$  是零电流开通。

在  $t_3$  时刻,原边电流反向增加到  $-I_i$ ,  $Q_1$  的电流减小到零。此时关断  $Q_1$ ,则  $Q_1$  是零电流关断。开关模态 3 的持续时间为:

$$t_{23} = \frac{1}{\omega} \sin^{-1}\left(\frac{Z_p I_i}{2V_o}\right) \quad (10.9)$$

在  $t_3$  时刻,谐振电容电压为:

$$V_{Cr}(t_3) = \sqrt{4V_o^2 - (Z_p I_i)^2} \quad (10.10)$$

在这段时间里,负载通过输出滤波电容供电。

#### 5. 开关模态 4 [ $t_3, t_4$ ] [参考图 10.2(e)]

在此开关模态中,原边电流为  $I_i$ ,折算到副边的电流  $KI_i$  给谐振电容充电,谐振电容电压线性下降,即

$$v_{Cr}(t) = V_{Cr}(t_3) - \frac{KI_i}{C_r}(t-t_3) \quad (10.11)$$

在  $t_4$  时刻,谐振电容电压达到  $-2V_o$ ,开关模态 4 结束。此开关模态的持续时间为:

$$t_{34} = \frac{[V_{Cr}(t_3) + 2V_o]C_r}{KI_i} \quad (10.12)$$

在这段时间里,虽然原边电流为  $I_i$ ,负载依然通过输出滤波电容供电。

#### 6. 开关模态 5 [ $t_4, t_5$ ] [参考图 10.2(f)]

在  $t_4$  时刻,由于谐振电容电压达到  $-2V_o$ ,此时输出整流二极管  $D_{R2}$  导通,原边开始给负载提供电流。

$$i_o = KI_i \quad (10.13)$$

在  $t_5$  时刻,  $Q_4$  开通,变换器开始另一个半周期的工作,其工作情况类似于上述的半个周期。

## 10.3 超前管和滞后管实现 ZCS 的差异

### 1. 实现 ZCS 的条件

由第二节的分析可以知道,要实现开关管的零电流关断,必须有足够的能量来使即将关断的开关管的电流减小到零。

对于超前管来说,即需要足够的能量来使原边漏感的电流从  $I_i$  减小到零,那么必须满足下式:

$$E > \frac{1}{2} L_{lk} I_i^2 \quad (10.14)$$

而对于滞后管来说,即需要足够的能量来使原边漏感的电流从零上升到  $I_i$ ,那么同样必须满足上式。

也就是说,要实现开关管的零电流开关,必须满足式(10.14)。

## 2. 超前管实现 ZCS

从开关模式 1 中可以看出,超前管容易实现 ZCS。这是因为在超前管开关过程中,输出滤波电容  $C_f$  是与谐振电容  $C_r$  相并联的,此时用来实现 ZCS 的能量是  $C_f$  和  $C_r$  中的能量。一般来说,  $C_f$  很大,在超前管开关过程中,其电压基本不变,相当于一个恒压源。这个能量很容易满足式(10.14)。

## 3. 滞后管实现 ZCS

滞后管要实现 ZCS 比较困难。在滞后管开关过程中,两个输出整流管是关断的,负载由  $C_f$  供电。此时用来实现 ZCS 的能量只是谐振电容的能量,如果不满足式(10.15),那么就无法实现 ZCS。

$$\frac{1}{2} C_r (2V_o)^2 > \frac{1}{2} L_{lk} I_i^2 \quad (10.15)$$

由于输出滤波电容  $C_f$  不参与滞后管 ZCS 的实现,较超前管而言,滞后管实现 ZCS 就要困难得多,因为谐振电容比输出滤波电容要小得多。

# 10.4 实现 ZCS 的策略及电流占空比的丢失

## 1. 实现 ZCS 的策略

从上而的讨论中可以知道,超前管容易实现 ZCS,而滞后管则要困难些。只要满足条件使滞后管能够实现 ZCS,那么超前管就肯定可以实现 ZCS。因此 PS ZCS PWM 全桥变换器实现 ZCS 的关键在于滞后管。滞后管实现 ZCS 的条件就是式(10.15)。要满足式(10.15)只有增大谐振电容  $C_r$ 。

## 2. 电流占空比的丢失

电流占空比的丢失是 PS ZCS PWM 全桥变换器中一个特有的现象。所谓电流占空比丢失,就是说输出电流的占空比  $D_s$  小于原边电流的占空比  $D_p$ ,即:  $D_s < D_p$ ,其差值就是电流占空比丢失  $D_{loss}$ :

$$D_{loss} = D_p - D_s \quad (10.16)$$

产生电流占空比丢失的原因是:存在谐振电容电压从正向(或负向)变化到负向(或正向)输出电压的时间,即图 10.1 中的  $[t_2, t_4]$  和  $[t_7, t_9]$  时段。在这段时间里,虽然原边有正电流方波(或负电流方波),但谐振电容电压不足以使输出整流管导通,负载由输出滤波

电容供电,这时输出电流  $i_o$  为零,输出电流就丢失了  $[t_2, t_4]$  和  $[t_7, t_9]$  这部分电流方波。在图 10.1 中,阴影部分就是副边丢失的电流方波,这部分时间与二分之一开关周期的比值就是电流占空比丢失  $D_{loss}$ ,即

$$D_{loss} = \frac{t_{24}}{T_s/2} \quad (10.17)$$

一般来说,  $t_{23}$  相对于  $t_{34}$  较小,因此上式可改写为:

$$D_{loss} = \frac{t_{34}}{T_s/2} \quad (10.18)$$

而

$$t_{34} = \frac{[\sqrt{4V_o^2 - (Z_p I_i)^2} + 2V_o] C_r}{K I_i} \quad (10.19)$$

那么,有:

$$D_{loss} = \frac{2 \cdot [\sqrt{4V_o^2 - (Z_p I_i)^2} + 2V_o] \cdot C_r}{K I_i T_s} \quad (10.20)$$

从式(10.20)中可以知道:①  $C_r$  越大,  $D_{loss}$  越大;② 输出电压  $V_o$  越高,  $D_{loss}$  越大。

$D_{loss}$  的产生使副边有效的电流占空比  $D_s$  减小,为了在负载上得到所要求的输出电压,就必须提高变压器原副边的匝比。而匝比的提高带来两个问题:① 副边整流管的电流增加,导通损耗增加;② 原边逆变桥的开关管的耐压值要增加。

## 10.5 仿真结果与分析

本节对 PS ZCS PWM 全桥变换器作了仿真分析,仿真所用的主要数据为:

- 输入直流电压:  $V_{in} = 100\text{VDC}$ ;
- 输出直流电压:  $V_o = 52.8\text{VDC}$ ;
- 谐振电感:  $L_{lk} = 12\mu\text{H}$ ;
- 谐振电容:  $C_r = 22\text{nF}$ ;
- 变压器原副边匝比:  $K = 3.2$ ;
- 升压电感:  $L_b = 800\mu\text{H}$ ;
- 输出滤波电容:  $C_f = 470\mu\text{F}$ ;
- 开关频率:  $f_s = 100\text{kHz}$ 。

图 10.3 是输出 52.8V、200W 时的仿真结果。通过对原边电流  $i_p$  和副边输出电流  $i_o$  波形的比较,可以看出存在输出电流占空比丢失的现象,这是因为谐振电容电压  $v_C$  不能突变,存在从正电压(或负电压)到负电压(或正电压)的过渡时间,即图中两条虚线之间的部分。

图 10.3 的第 4 个波形是开关管  $Q_3$  上的电压波形,该波形表明  $Q_3$  上存在负电压,由于  $Q_3$  不能承受反压,因此必须给  $Q_3$  串联一个二极管  $D_3$ 。

图 10.4 分别给出了开关管  $Q_1$  和  $Q_3$  的驱动电压及其电流波形,从中可以看出,当开关管开通时,由于谐振电感限制了电流的上升率,其电流从零慢慢增加,开关管是零电流开通。当开关管关断时,其电流已经减小到零,开关管是零电流关断。因此开关管是零电流开关的。

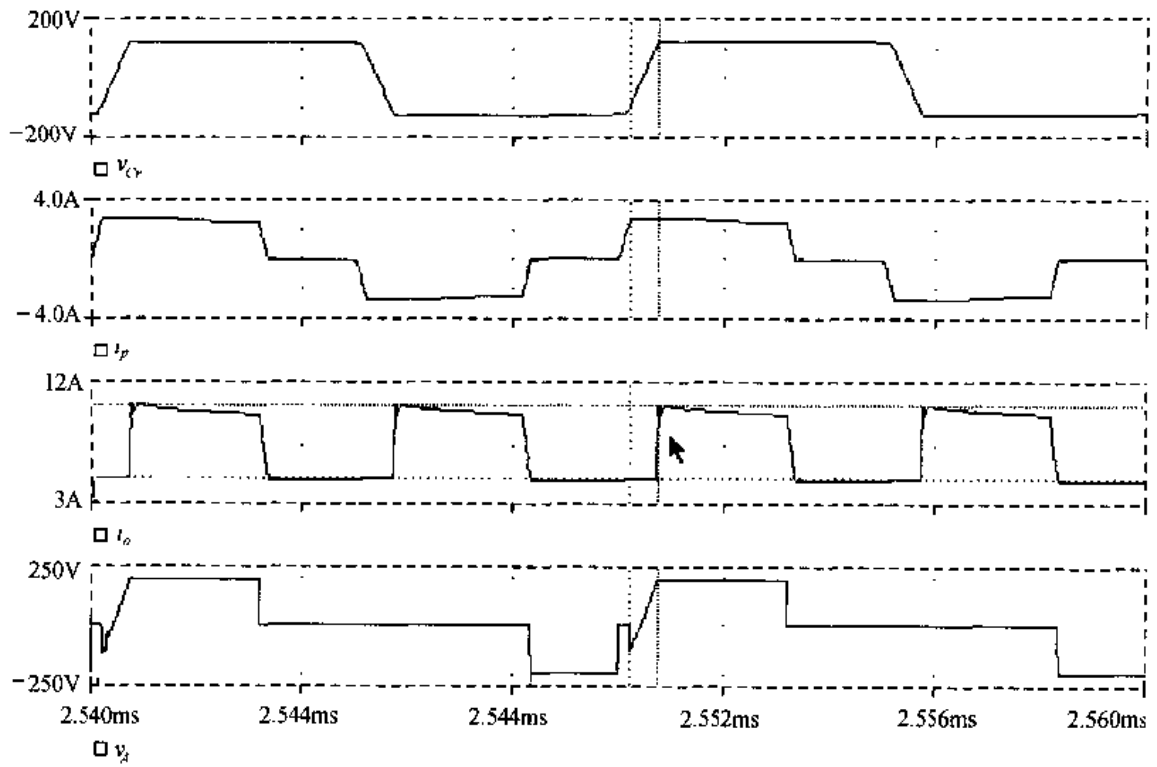
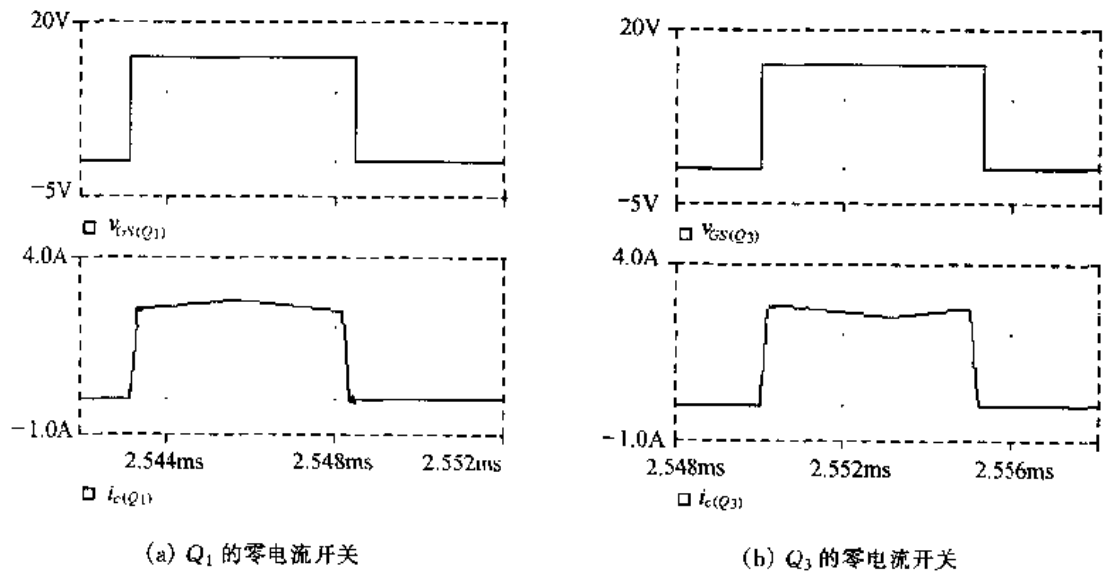


图 10.3 PS ZCS PWM 全桥变换器的仿真结果



(a)  $Q_1$  的零电流开关

(b)  $Q_3$  的零电流开关

图 10.4 开关管的零电流开关

图 10.5 是输出整流管的电流和电压波形,该图表明输出整流管是零电压开关的。在关断时,其电流已经减小到零,因此不存在反向恢复问题。

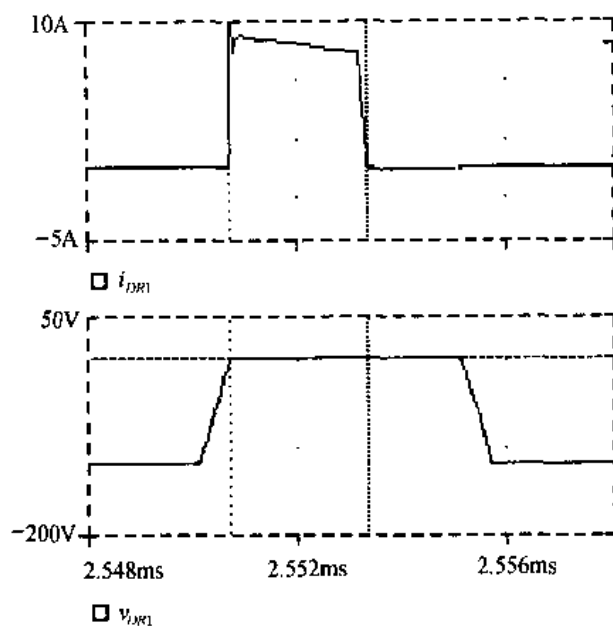


图 10.5 输出整流管的零电压开关

## 本章小结

本章分析了移相控制 ZCS PWM DC/DC 全桥变换器的基本原理。通过以上分析,可以得出以下结论:

① 该变换器的开关管实现了零电流开关,因而大大减小了开关损耗,适用于采用 IGBT、BJT 等少子导电的开关器件,避免了电流拖尾,从而可以提高开关频率,减小变换器的体积和重量;

② 超前管比滞后管容易实现零电流开关;

③ 谐振电容的存在使得副边输出电流存在占空比丢失;

④ 输出整流管实现了零电压开关,不存在反向恢复问题。

## 参 考 文 献

- [1] 丁道宏, 电力电子技术, 航空工业出版社, 1992 年
- [2] 叶慧贞、杨兴洲, 开关稳压电源, 国防工业出版社, 1990 年
- [3] 叶治政、叶靖国, 开关稳压电源, 高等教育出版社, 1989 年
- [4] 蔡宣三、龚绍文, 高频功率电子学(第一版), 科学出版社, 1993 年
- [5] 张占松、蔡宣三, 开关电源的原理与设计, 电子工业出版社, 1998 年
- [6] 何希才、江云霞, 现代电力电子技术, 国防工业出版社, 1996 年
- [7] 张廷鹏、吴铁军、徐明、张生舟, 通信用高频开关电源, 人民邮电出版社, 1997 年
- [8] 阮新波、严仰光, 脉宽调制 DC/DC 全桥变换器的软开关技术, 科学出版社, 1999 年
- [9] R. Oruganti, F. C. Lee, "Resonant power processors Part 1: state plane analysis", IEEE Trans. IA, Nov./Dec., 1985, pp 1453—1461
- [10] R Oruganti, F C Lee, "State - plane analysis of parallel resonant converters", IEEE PESC, 1985, pp 56—73
- [11] F C Lee, "High-frequency quasi-resonant and multi-resonant converter technologies", Proceedings of the International Conference on Industrial Electronics, 1988, pp 509—521
- [12] K H Liu, F C Lee, "Resonant switches—a unified approach to improved performances of switching converters", Proceedings of the International Telecommunications Energy Conference, 1984, pp 344—351
- [13] K H Liu, R Oruganti and F C Lee, "Resonant switches — topologies and characteristics", Proceedings of the Power Electronics Specialists Conference, 1985, pp 62—67
- [14] K. H. Liu, F. C. Lee, "Zero-voltage-switching techniques in dc/dc converter circuits", Proceedings of the Power Electronics Specialists Conference, 1986, pp. 58—70
- [15] W. A. Tabisz, F. C. Lee, "Zero-voltage-switching multi-resonant technique—a novel approach to improve performance of high frequency quasi-resonant converters", Proceedings of the Power Electronics Specialists Conference, 1988, pp. 9—17
- [16] W. A. Tabisz, F. C. Lee, "A novel zero-voltage-switching multi-resonant forward converter", Proceedings of the High Frequency Conversion Conference, 1988, pp. 309—318
- [17] W. A. Tabisz, F. C. Lee, "Dc analysis and design of zero-voltage-switching multi-resonant converters", Proceedings of the Power Electronics Specialists Conference, 1989, pp. 243—251
- [18] Ivo. Barbi et al., "Buck quasi-resonant converter operating at constant frequency: analysis, design and experimentation", IEEE Trans. on Power Electronics, Vol. 5, No. 3, 1990, pp. 276—283
- [19] G. Hua, F. C. Lee, "A new class of zero-voltage-switched pwm converters", Proceedings of the High Frequency Conversion Conference, 1991, pp. 244—251
- [20] G. Hua, C. S. Leu, Y. M. Jiang and F. C. Lee, "Novel zero-voltage-transition pwm converters", Proceedings of the Power Electronics Specialists Conference, 1992, pp. 55—61
- [21] Yan Zhu, Daohong Ding, "An improved family of zero-voltage-transition pwm converters", Proceedings of International Power Electronics & Motion Control Conference, 1996, pp. 317—321
- [22] G. Hua, E. X. Yang, Y. M. Jiang and F. C. Lee, "Novel zero-current-transition pwm converters", Proceedings of the Power Electronics Specialists Conference, 1993, pp. 538—544
- [23] H. Mao, F. C. Lee, X. Zhou and D. Boroyevich, "Improved zero-current-transition converters for high power applications", Proceedings of the Industrial Application Society Annual Meeting, 1996, pp. 1145—1152
- [24] C. S. Leu, G. C. Hua, and F. C. Lee, "Comparison of forward topologies with various reset schemes", Proceedings of VPEC, 1991, pp. 101—109
- [25] C. S. Leu, G. C. Hua, F. C. Lee and C. Zhou, "Analysis and design of R-C-D clamp forward converter", Proceedings of

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreyckak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34



- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昫, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34

- VPEC, 1992, pp. 113—120
- [26] M. Domb, R. Redl, and N. O. Sokal, "Nondissipative turn-off snubber alleviates switching power dissipation, secondary breakdown stress and  $V_{CE}$  overshoot: analysis, design procedure and experimental verification", IEEE PESC, 1982, pp. 445—454
- [27] R. Watson, G. C. Hua, and F. C. Lee, "Characterization of an active clamp flyback topology for dc/dc conversion and power factor correction applications", Proceedings of VPEC, 1993, pp. 133—143
- [28] 陈卫昉, 正-反激组合式变换器的分析与实现, 南京航空航天大学工学博士学位论文, 1998年5月
- [29] 陈道炼, 软开关 PWM 组合式航空静止变流器研究, 南京航空航天大学工学博士学位论文, 1998年10月
- [30] B. Carsten, "Design techniques for transformer active reset circuits at high frequency and power level", Proceedings of HFPC, 1990, pp. 235—246
- [31] Xiaodong Sun, Xuansan Cai and Guisong Huang, "A novel two-transistor forward zvt-pwm converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 311—315
- [32] Wei Bao, Xuansan Cai and Xiaodong Sun, "A novel zct-pwm two-transistor forward converter", Proceedings of International Power Electronics and Motion Control Conference, 1997, pp. 526—530
- [33] 阮新波, 移相控制零电压开关 PWM 变换器的研究, 南京航空航天大学工学博士学位论文, 1996年5月
- [34] D. M. Sable, F. C. Lee, "The operation of a full-bridge, zero-voltage-switched pwm converter", Proceedings of Virginia Power Electronics Center Seminar, 1989, pp. 92—97
- [35] Q. Chen, A. W. Loft and F. C. Lee, "Design trade-offs in 5-V output off-line zero-voltage, pwm converter", International Telecommunications Energy Conference, 1991, pp. 616—623
- [36] 阮新波、严仰光, 移相控制零电压开关 PWM 变换器中输出整流二极管的换流分析, 电气自动化, 1997年增刊, pp. 236—240
- [37] 阮新波、严仰光, 采用辅助谐振网络实现零电压开关的移相控制全桥变换器, 电工技术学报, 第2期, 第13卷, 1998年4月, pp. 47—52
- [38] Bill Andreycak, "Design review: 500 watt, 400W/in<sup>3</sup> phase shifted zvt power converter", Unitrode Power Supply Design Seminar Manual SEM-900, 1993
- [39] J. G. Cho, J. A. Sabate, G. C. Hua, and F. C. Lee, "Zero-voltage and zero-current-switching full-bridge pwm converter for high power applications", IEEE-PESC, 1994, pp. 102—108
- [40] 阮新波, PWM DC/DC 全桥变换器的软开关技术研究, 南京航空航天大学博士后研究报告, 1998年6月
- [41] Ruan Xinbo and Yan Yangguang, "An improved phase-shifted zero-voltage and zero-current switching pwm converter", IEEE-APEC, 1998, pp. 811—815
- [42] 崔益彬, 相移软开关 PWM 技术的研究, 清华大学硕士学位论文, 1997年
- [43] G. Hua and F. C. Lee, "A novel full-bridge zero-current-switched pwm converters", Proceedings of the European Power Electronics Conference, 1991, pp. 29—34