Fairchild charger solution

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Fairchild AC-DC Power Solution

A,PSR solution		B,HARD SWITCHING				C,QRC MODEL	
PWM		FSQ211	4W	FSQ311	8W	FSCQ0565RT	60W
FAN100	7.5W	FSQ100	6W	FSQ321	8W	FSCQ0765RT	85W
FAN102	7.5W	FSQ110	8W	FSQ0165RN	10W	FSCQ0965RT	110W
SGP400	15W	FSQ0170RNA	10W	FSQ0265RN	12W	FSCQ1265RT	140W
		FSQ0270RNA	12W	FSQ0365RN	14W	FSCQ1565RT	170W
PWM+MOSFET		FSQ0370RNA	14W	FSQ0565RW	41W	FSCQ1565RP	210W
FSEZ1216	7.5W	FSDM0465RE	40W	FSQ0765RW	48W		
FSEZ1016A	7.5W	FSDM0565RE	50W				
FSEZ2016	15W	FSDM07652RE	60W				
Charger		Charger		Charger		DVD+RW	
LED Power		LED Power		Adapter		CRT	
		Adapter		DVD/DVB			
		DVD/DVB					

Fairchild AC-DC Power Solution

D,PWM	E,PFC	F,PMW+PFC	G,LLC Solution
FAN6859A	FAN7527	FAN4800	FSFR2100
FAN7602B	FAN7528	FAN4803	FSFR2000
SG5851	FAN7530	ML4803	FSFR1900
SG6741	SG6961	SG6931	FSFR1800
FAN6742	SG6980	SG6932	
FAN6751			
FAN6747			
SG6846			
QRC			
FAN6300			
Charger	>75W case		LCD TV
Adapter			LED Power
Printer			

PSR Solution:

PWM controller: FAN100,FAN102, FAN400A

Combo IC: FSZE1016A(SO-7),FSEZ1216NY (DIP8)

SSR solution:
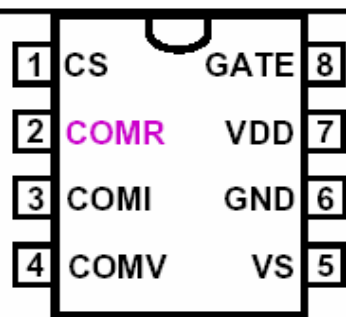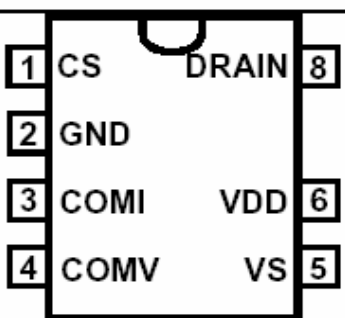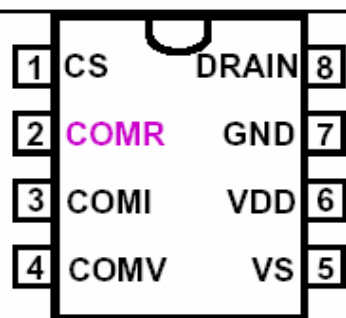
PWM controller: SG6859A,FAN7602B
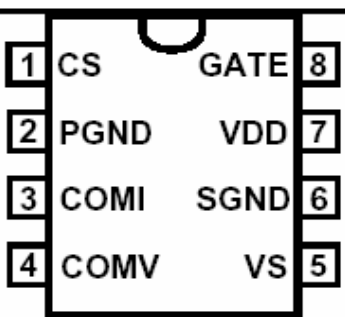
Combo IC: FSQ211,FSQ100,FSQ110,FSQ0170RNA, FSQ0270RNA,FSQ0370RNA,
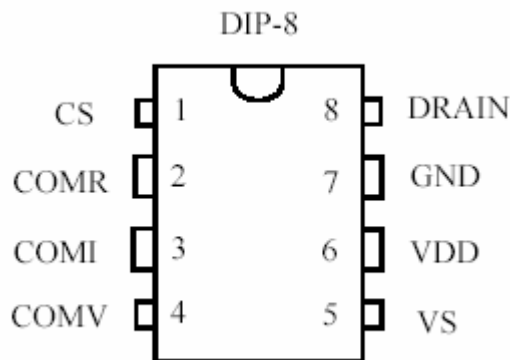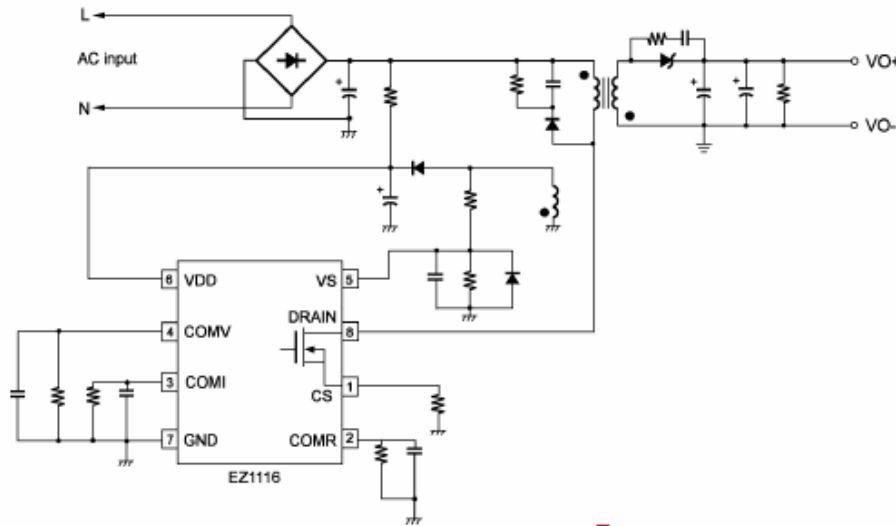
FSDM0465RE, FSDM0565RE,FSDM07652RE

FSQ311,FSQ321,FSQ0165RN,FSQ0265RN,FSQ0365RN

FSQ0465R,FSQ0565R,FSQ0765R

*PSR:初级侧稳压恒流

SSR:次级侧稳压恒流

A, PSR Product Feature

	Device replace plan		Device replace plan	
CV	+/-10%	+/-7%	+/-5%	+/-5%
CC	+/-10%	+/-7%	+/-10%	+/-7%
Ripple	200mV	100mV	200mV	100mV
PSR Controller	SGP100 => FAN100		SGP101 => FAN102	
PSR Switch	EZ1016 => EZ1016A		EZ1116 => EZ1216	

SGP100 => FAN100

1 CS	GATE 8
2 PGND	VDD 7
3 COMI	SGND 6
4 COMV	VS 5

SGP101 => FAN102

1 CS	GATE 8
2 COMR	VDD 7
3 COMI	GND 6
4 COMV	VS 5

EZ1016 => EZ1016A

1 CS	DRAIN 8
2 GND	
3 COMI	VDD 6
4 COMV	VS 5

EZ1116 => EZ1216

1 CS	DRAIN 8
2 COMR	GND 7
3 COMI	VDD 6
4 COMV	VS 5

FAIRCHILD SEMICONDUCTOR

EZ1116

DIP-8

CS	1		8	DRAIN
COMR	2		7	GND
COMI	3		6	VDD
COMV	4		5	VS

FEATURES

- Constant-voltage (CV) and Constant-current (CC) Control Without Secondary-feedback Circuitry
- Green-mode Function: PWM Frequency Linearly Decreasing
- Fixed PWM Frequency at 42kHz with Frequency Hopping to Solve EMI Problem
- Cable Compensation in CV mode
- Low Start-up Current 10μA(TYP.)
- Low Operating Current 6.5mA(TYP.)
- Peak-current-mode Control in CV mode
- Cycle-by-cycle Current Limiting
- VDD Over-voltage Protection with Latch
- VDD Under-voltage Lockout (UVLO)
- Gate Output Maximum Voltage Clamped at 18V
- Fixed Over-temperature Protection with Latch
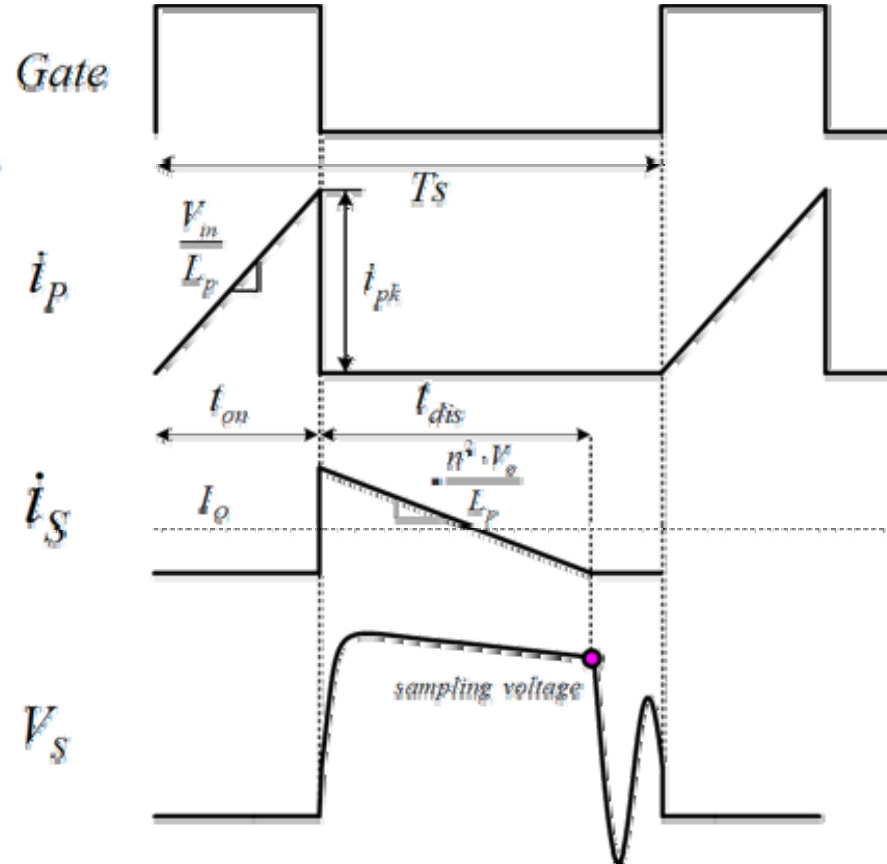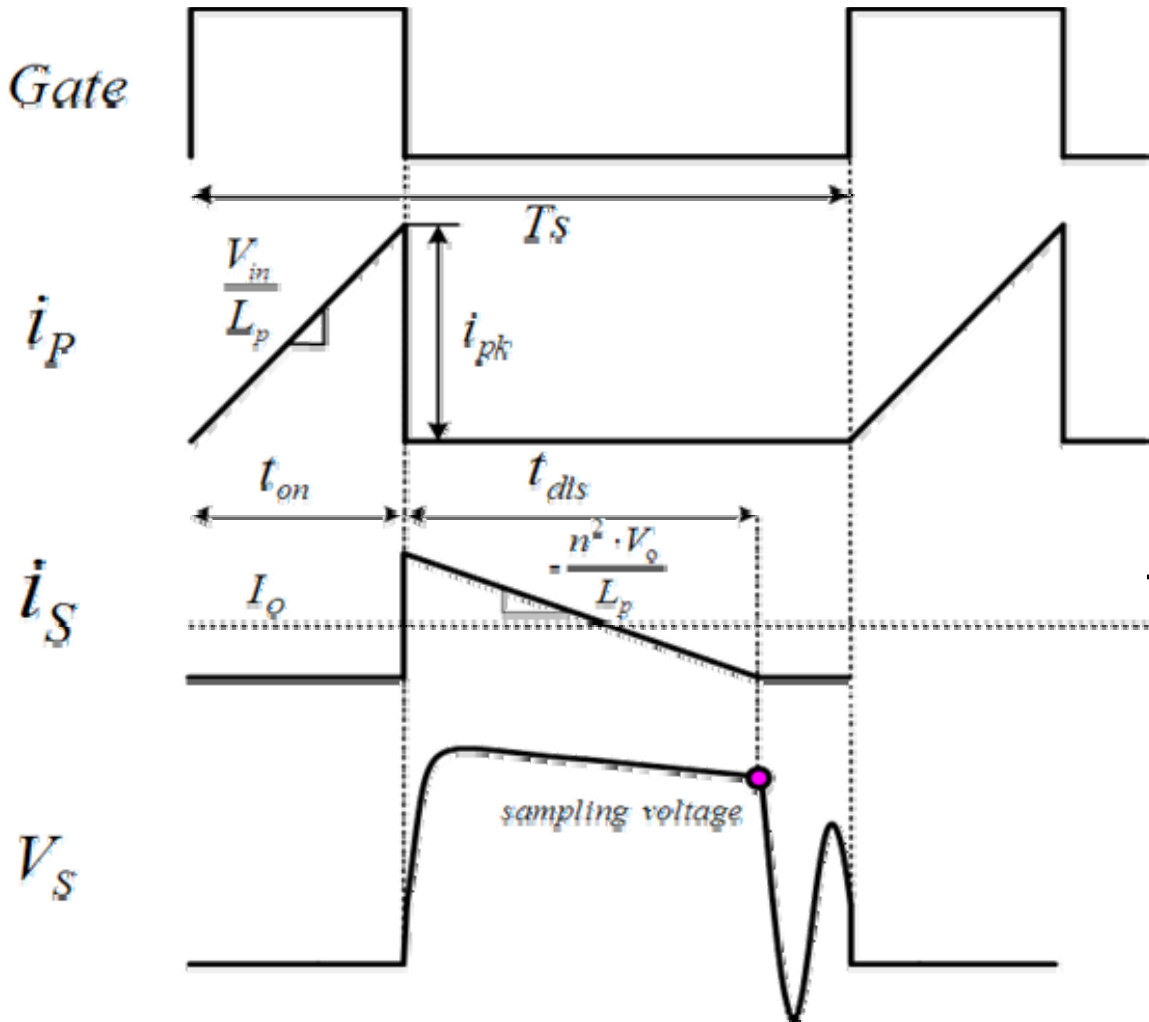- DIP-8 Package Available
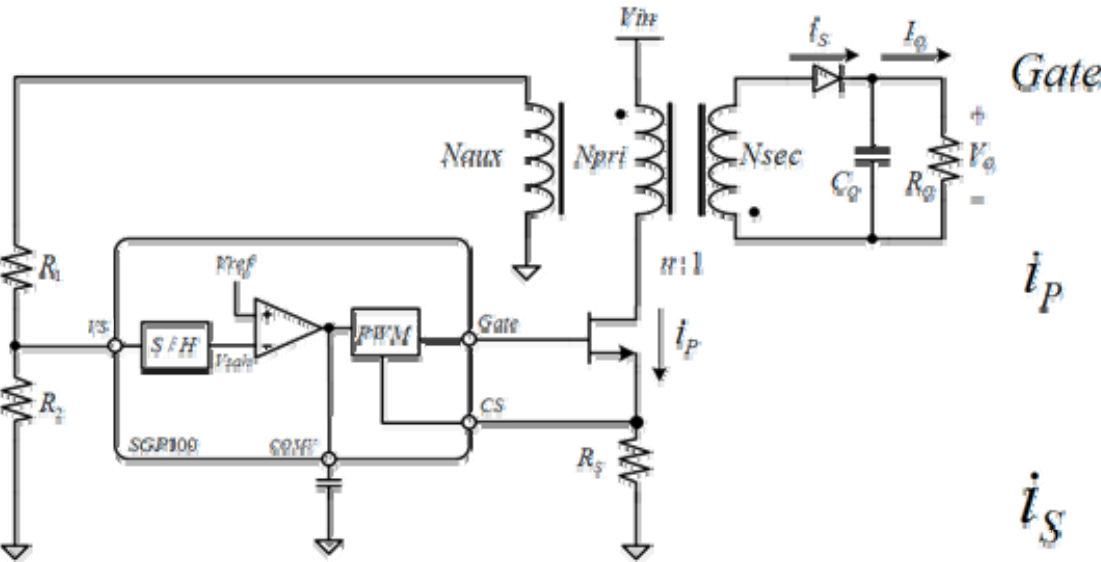
CV mode operation Block

$$Vo = V_{REF} \cdot \frac{R_1 + R_2}{R_2} \cdot \frac{N_S}{N_A} \ ,$$

$V_{REF} = 2.5 \ V \ with \ \pm 1\% \ tolerance \ \&$

$output \ rectifier \ temp.\text{-}coeff. \ compensation$

SGP10x smaples the voltage after end of discgarge-time of inductor current. The sampled voltage (*Vsah*) will then be compared with the precise internal reference voltage (*Vref*) to determine the on-time of the MOSFET
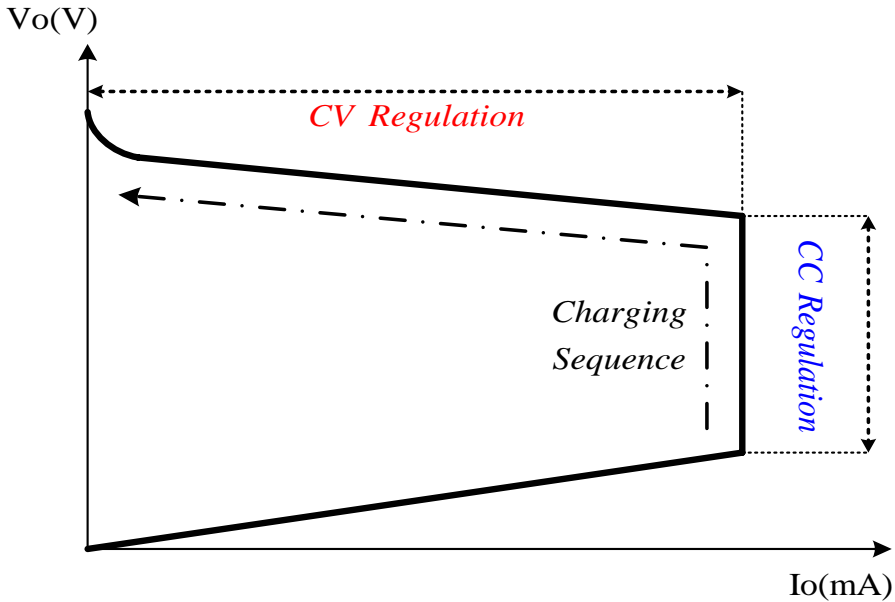
$$\rightarrow I_o = \frac{1}{2T_S} \cdot \left[T_{dis} \cdot i_{S,pk} \right]$$

$$= \frac{1}{2T_S} \cdot \left[n_p \cdot i_{pk} \cdot T_{dis} \right]$$

Constant Current operation (CC)

CV & CC Regulation Charging Sequence

Vo(V)

CV Regulation

Charging Sequence

CC Regulation

Io(mA)

DIP-8

CS	1	8	DRAIN
COMR	2	7	GND
COMI	3	6	VDD
COMV	4	5	VS

CC Regulation   *CV Regulation*

decreasing output impedance

V_{COMV} V_{COMI}

4.5V

*Maximum Output Power*

Charging Sequence   *Deep Green Mode*

As the output load increases, *VCOMV* will gradually rise until the system shifts into the CC regulation region. At the same time, *VCOMV* increases to 4.5V and the MOSEFT's on-time is controlled by *VCOMI*.
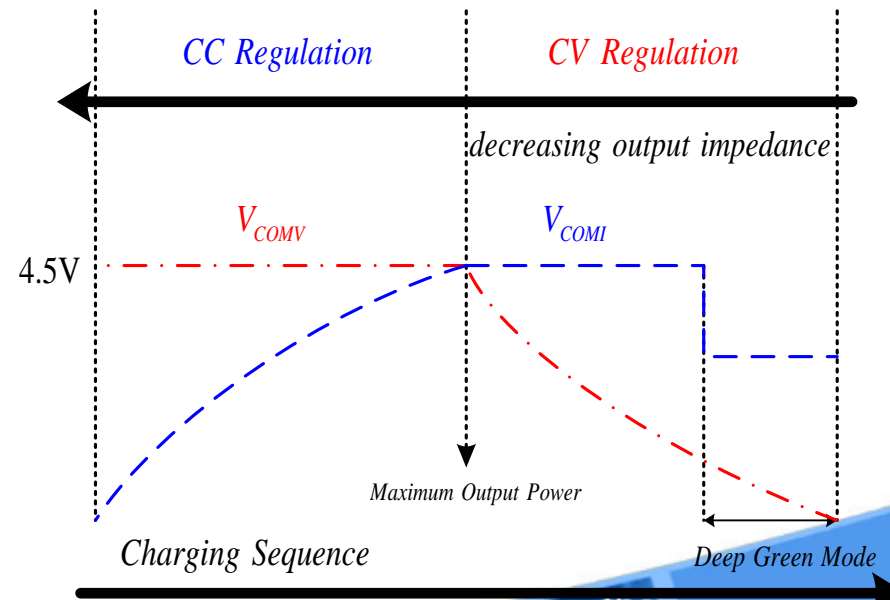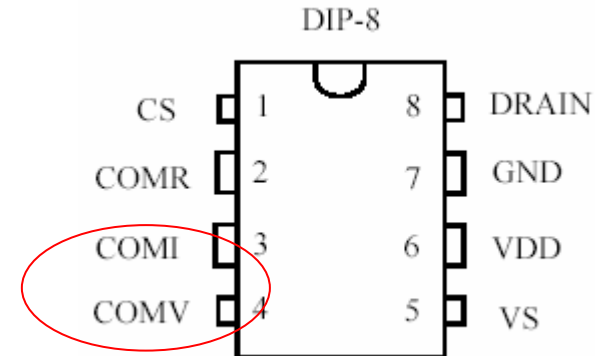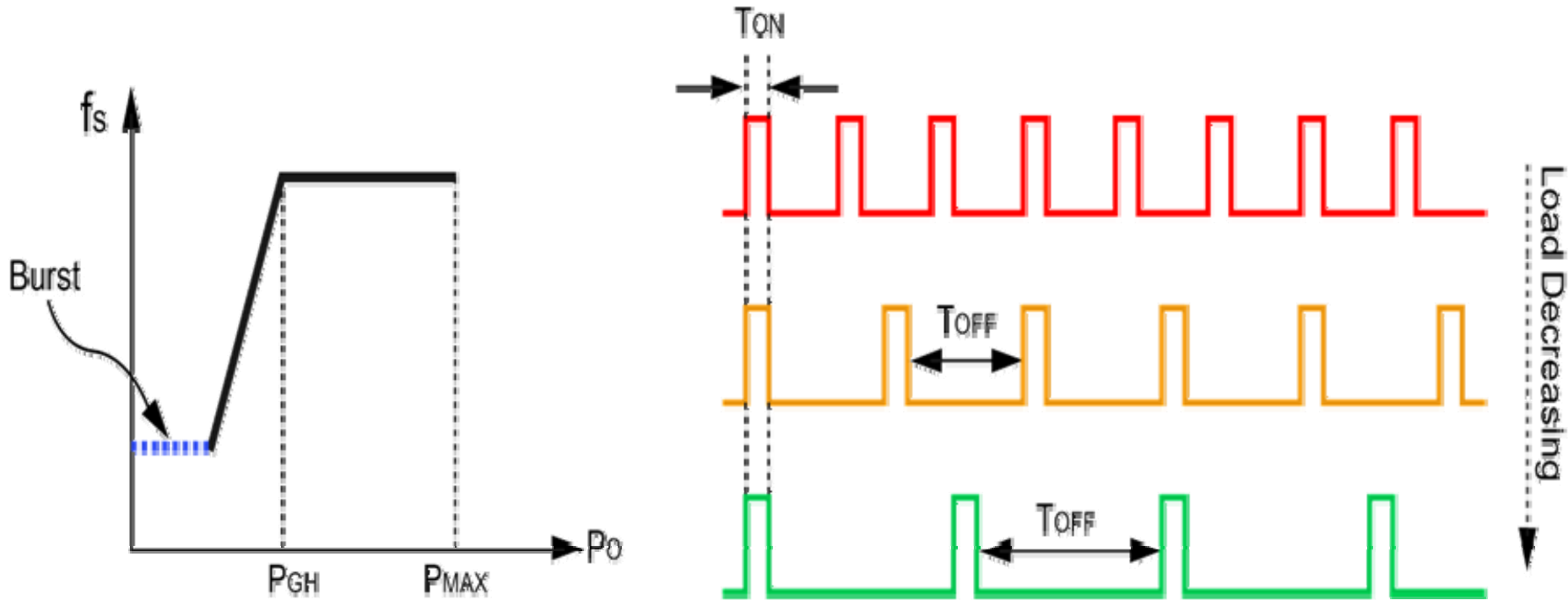
The proprietary green-mode function of the FAN100 provides off-time modulation to linearly decrease the PWM frequency at light-conditions.

Gate Signal

44.6KHz

+/- 2.6KHz

39.4KHz

Frequency Hopping Period → 3mS

Frequency Hopping for EMI

OSC
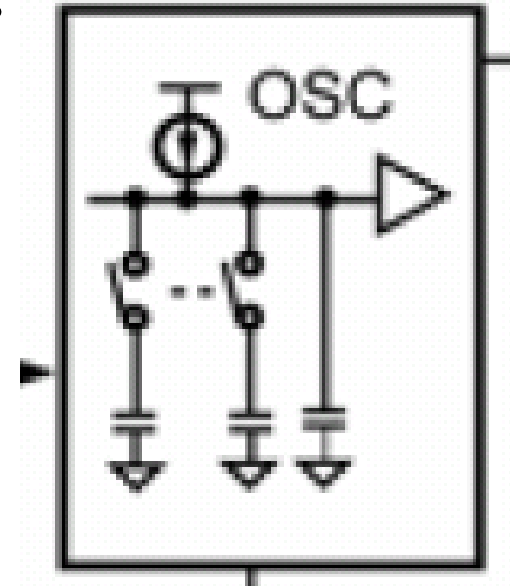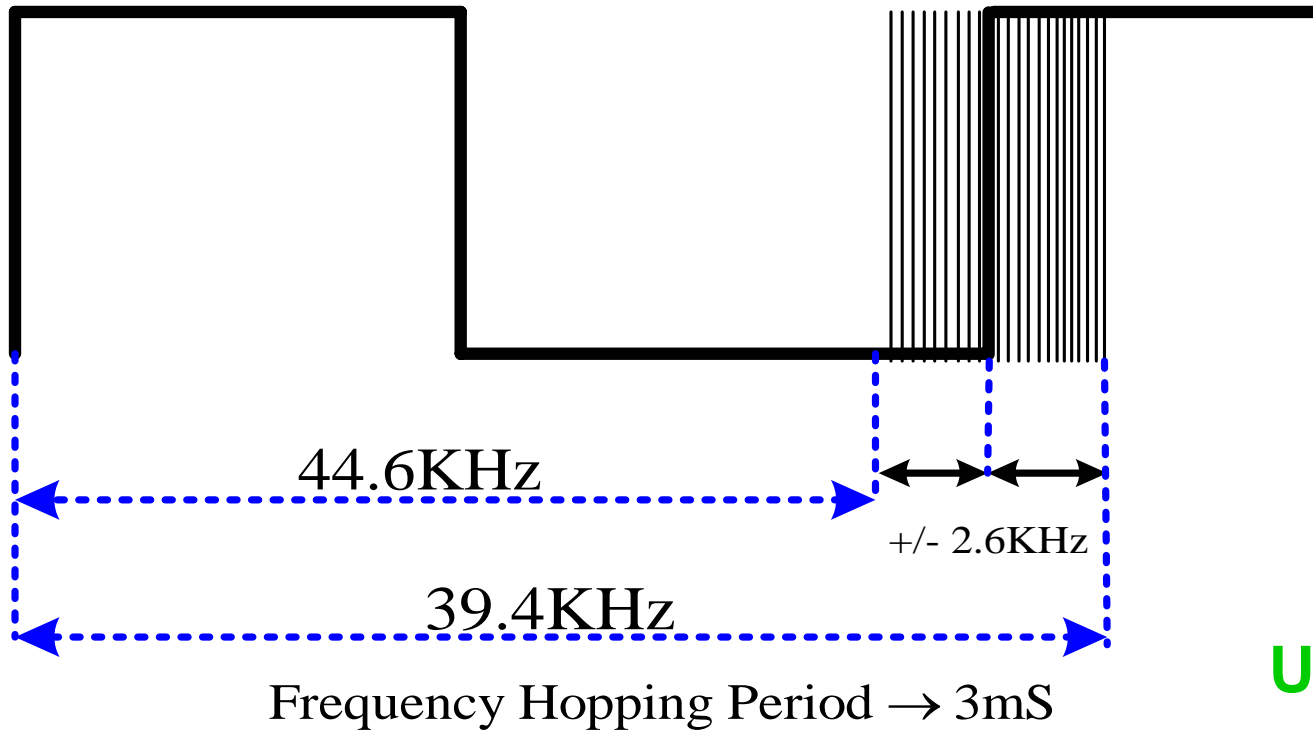
US patent:7026851

FAIRCHILD SEMICONDUCTOR

INPUT PARAMETER		
Input Vac.min	90.000	V
Input Vac.max	264.000	V
Bulk Cap.	11.000	uF
Output Voltage (A)-High	5.200	V
Output Current (A)	0.750	A
Output Voltage (B)-Low	5.200	V
Output Current (B)	0.750	A
V_F	0.500	V
V_{Fa}	0.700	V
B_{max}	0.280	Tesla
Ae	19.200	mm^2
Fs (Switching frequency)	42.000	KHz
Estimated Efficiency,"A"	0.670	
Estimated Efficiency,"B"	0.450	
Np:Ns	13.500	
Na:Ns	3.000	
R2 (Divider Resistor)	20.000	K ohm
$R_{IN(Start-Up Resistor)}$	1500.000	K ohm
V_{DD} Cap.	10.000	uF

SYSTEM PARAMETER		
V_O,"B"	1.983	V
$V_{O(OVP)}$	9.067	V
V_{DD}	16.400	V
$V_{dc,max}$	373.296	V
$V_{ds,max}$	450.246	V
$V_{F,max}$	32.852	V
$V_{dc,min}$,"A"	100.132	V
$D_{on.max}$,"A"	0.342	
I_{PK},"A"	0.340	A
$I_{SEC,PK}$,"A"	4.584	A
$I_{P,RMS}$,"A"	0.115	A
$V_{dc,min}$,"B"	112.668	V
$D_{on.max}$,"B"	0.229	
Ts	23.810	uS
R1 (Divider Resistor)	116.800	K
$T_{D\_ON(turn-on time)}$	2.306	S
Rs (Current Sense Resistor)	2.014	ohm

TRANSFORMER SPEC.		
Lp	2.404	mH
Naux	33.744	T
Npri	151.847	T
Nsec	11.248	T

franchise

B, SSR PWM Solution-SG6859A
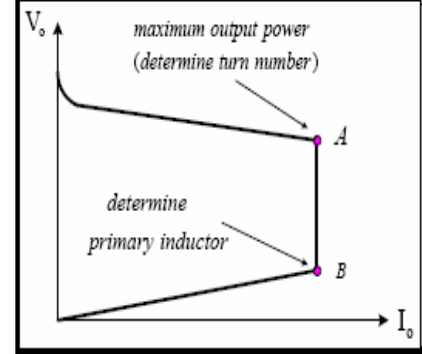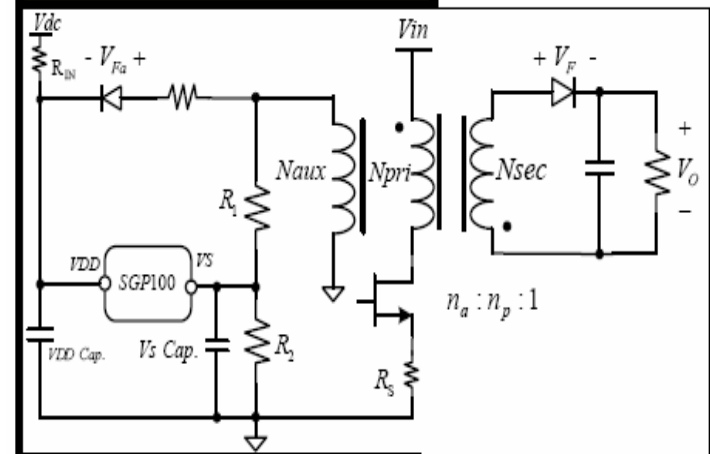
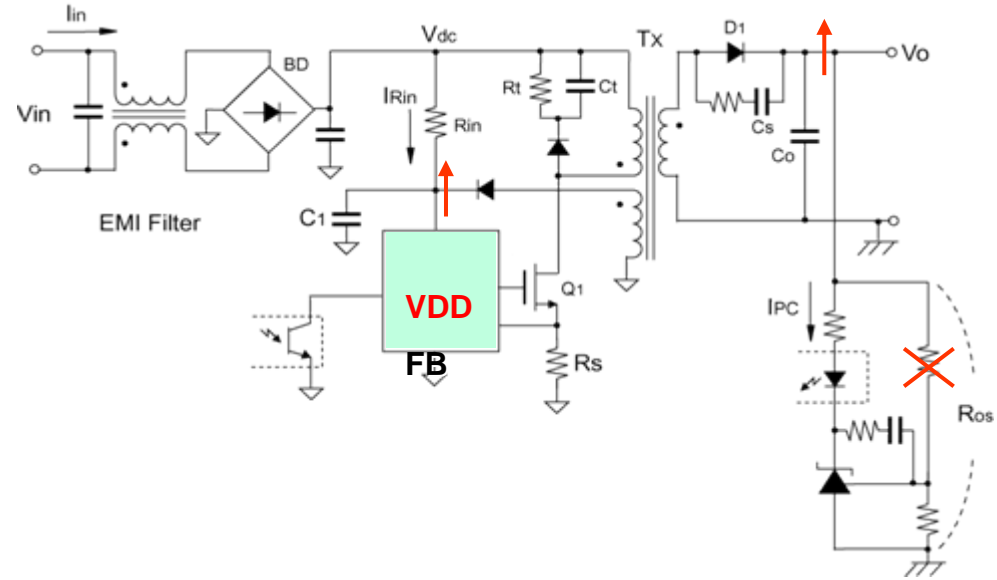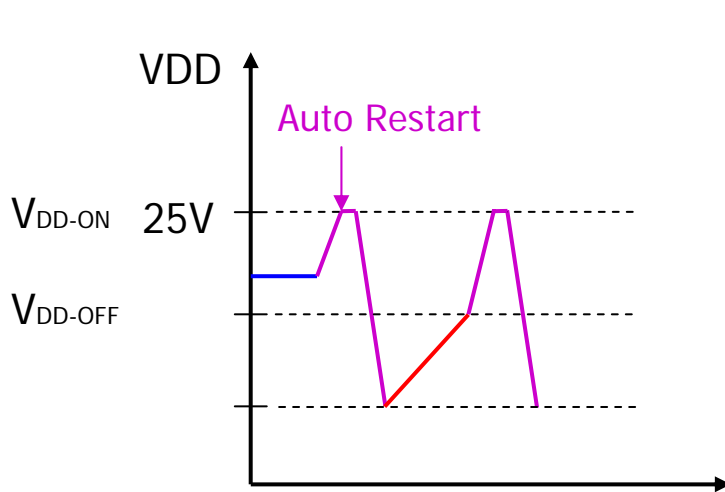- **Features**

  - Programmable PWM frequency by RI Pin
  - Green-mode operation for power saving
  - Sense pin Built-in Saw Limit for Line compensation
  - Built-in Leading Edge Blanking
  - VDD Over Voltage Protection(Auto Restart)
  - Built-in Slope Compensation
  - Frequency hopping
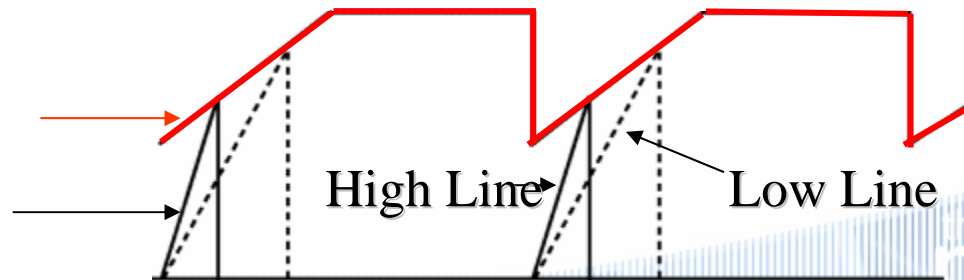 - Open-loop protection

SG6859

SOT 23-6 package
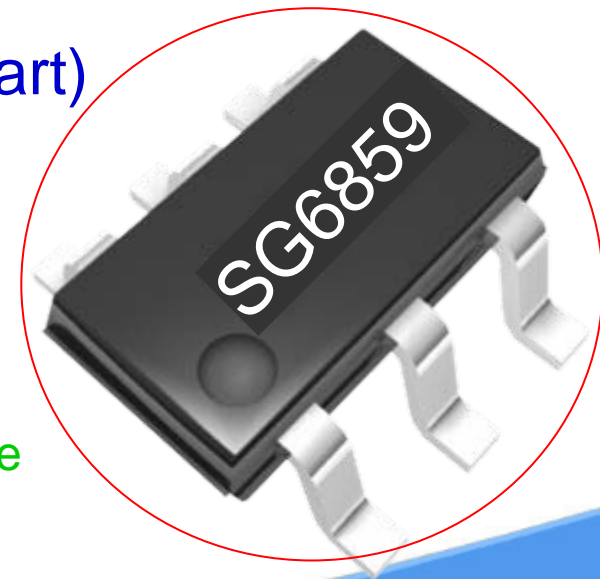
the power franchise
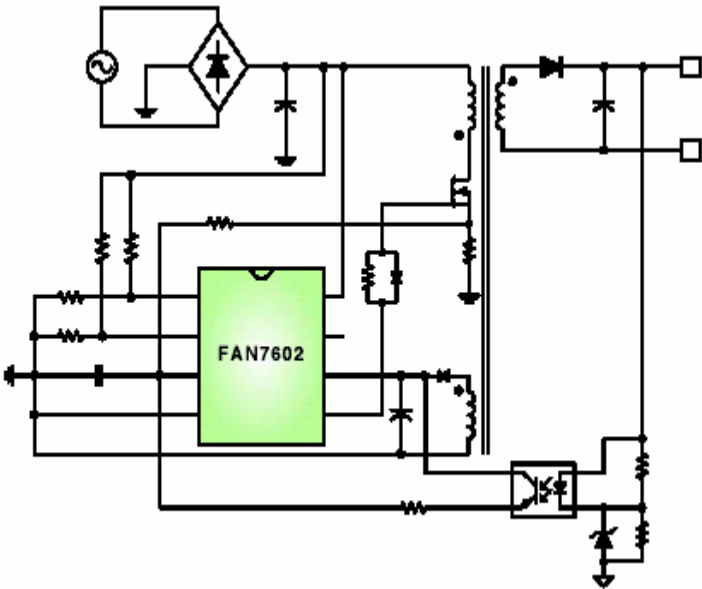
VDD Over Voltage Protection-SG6859A

Saw Limiter for Line Compensation-SG6859A
Constant Output Power under Universal AC input
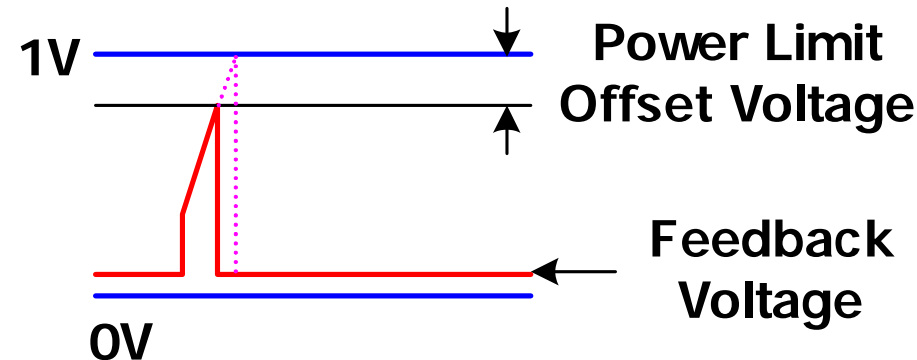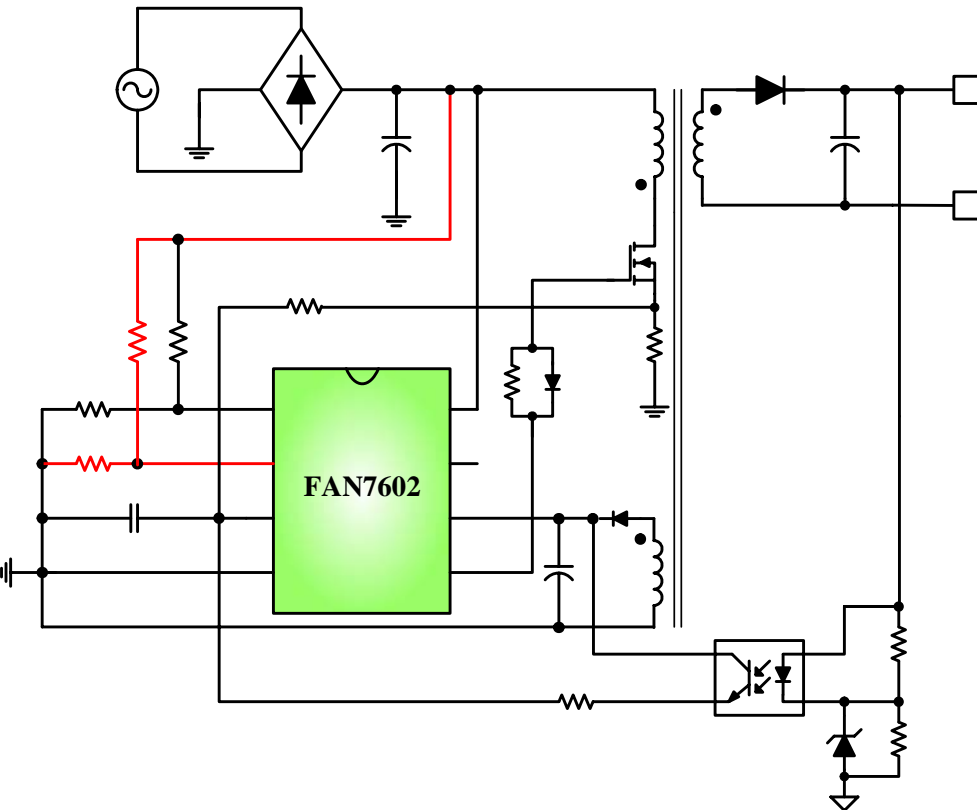
B, SSR PWM Solution—FAN7602B

Feature

- Green Function Control
- Built-In Start_Up Switch, 600V
- Burst Mode Operation
- Internal Soft Start (10ms)
- Input Power Limit Function
- Under Voltage Lock Out (UVLO):12V / 8V
- Over Voltage Protection (OVP) : 19V
- Over Load Protection (22ms)
- Line Under Voltage Protection (Brown Out Protection)
- Fixed Frequency Operation (65kHz) with Jittering ($\pm$ 2kHz,125Hz)
- Output Current : +450mA/-600mA (Vcc=14V)
- 8DIP

Vstr	NC	Vcc	Out
8	7	6	5

FAN7602 YWW

LUVP	Latch/ Plimit	CS/FB	GND
1	2	3	4
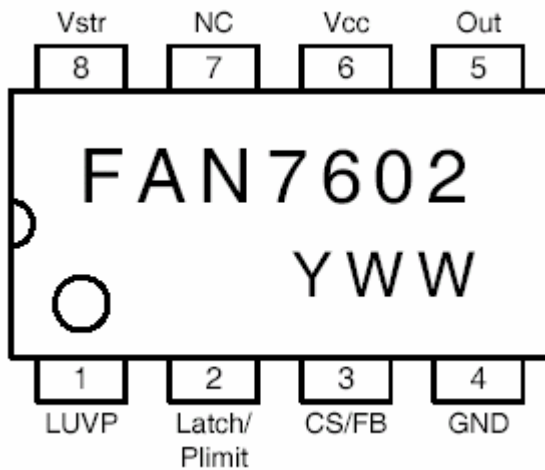
❑ **To limit max. power for wide input voltage range in CCM**

1V

Power Limit
Offset Voltage

Feedback
Voltage

0V

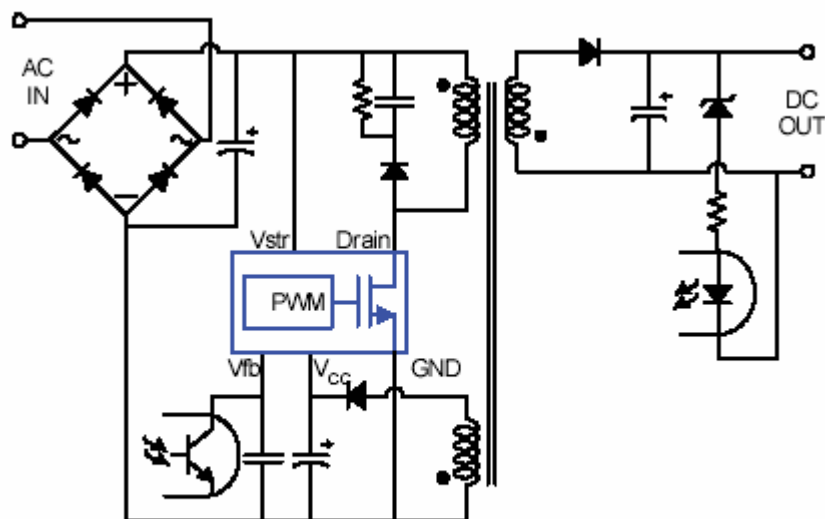| Demo board test result with power limit				
Vin	85Vac	110Vac	220Vac	265Vac
Max. output current	4.32A	4.59A	4.4A	4.14A

Figure 1. **Typical Flyback Application**

Features

- Internal Avalanche-Rugged SenseFET
- Precision Fixed Operating Frequency (67KHz)
- Burst-Mode Operation
- Internal Start-up Circuit
- Pulse-by-Pulse Current Limiting
- Over-Voltage Protection (OVP)
- Overload Protection (OLP)
- Internal Thermal Shutdown Function (TSD)
- Auto-Restart Mode
- Under-Voltage Lockout (UVLO) with Hysteresis
- Built-in Soft Start
- Secondary-Side Regulation

FAIRCHILD SEMICONDUCTOR®

高压启动开关
内部集成高压启动开关，可直接接高压，内部通过电流源向VCC电容充电，当达到启动电压后关闭，与高压断开，高压端不在提供电流，没有损耗，提高效率

软启动（soft start）
内部提供15mS软启动功能，减小电源启动时通过MOSFET的电流和电压应力

间歇工作（Burst Mode）
轻载时➜输出电压上升➜反馈脚的电压降低➜降低到一定程度时开关停止➜输出电压下降 ➜反馈脚上升到一定程度开关恢复
这个过程大量地减少开关动作，减小了开关损耗

过压保护（OVP）
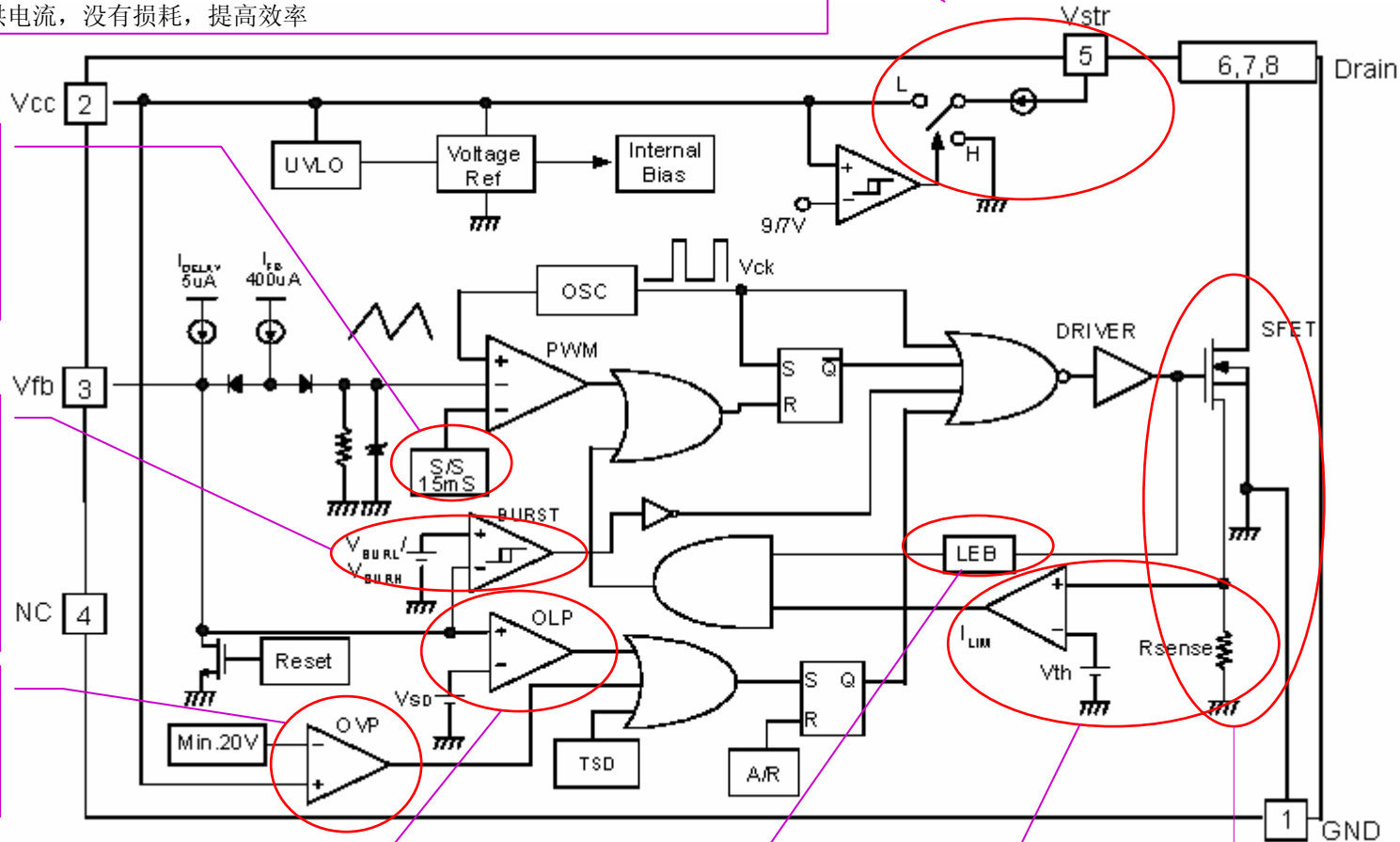当反馈开路或其他原因引起VCC上升到20V时产生保护

过载保护（OLP）
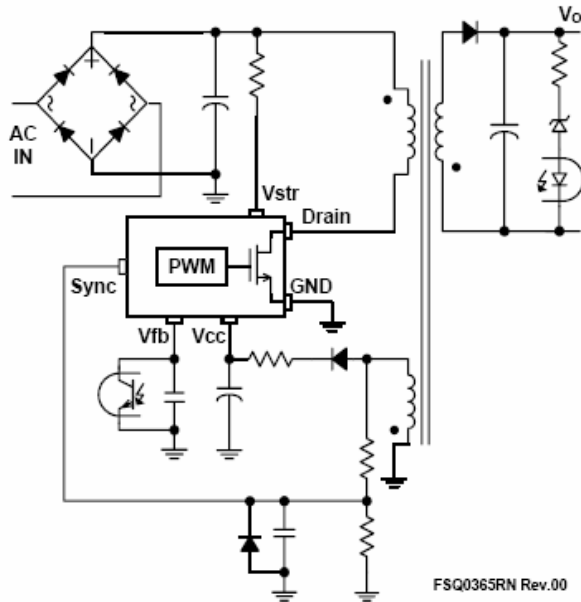当过载时，输出电压变低，光耦趋向开路，接在反馈脚的电容电压会上升到一个较高的值，当达到Vsd时，触发OLP

前沿消引（LEB）
避开电流上升的前沿尖峰，消除因此引起的误动作干扰

峰值电流检测
提供逐周期过电流保护

内部集成增强型650V/700V的SenseFET（比例电流感应，省却外部电流采样电阻，极大减小功耗）

Diagram labels: Vcc 2, Vfb 3, NC 4, Vstr, 5, 6,7,8 Drain, 1 GND, UVLO, Voltage Ref, Internal Bias, 9/7V, OSC, Vck, PWM, DRIVER, SFET, I_DELAY 5uA, I_FB 400uA, S/S 15mS, BURST, V_BURL / V_BURH, OLP, Reset, Vsd, Min.20V, OVP, TSD, A/R, S Q R, LEB, I_LIM, Vth, Rsense

FAIRCHILD SEMICONDUCTOR®

FSQ0365RN Rev.00

Features

- Green mode PWM controller.
- Optimized for Valley Switching (VSC)
- 650V MOSFET integrated.
- High-Efficiency through Minimum Voltage Switching.
- Built-in Soft-Start (15mS)
- UVLO, VDD OVP, OLP and TSD.
- DIP8/ TO-220 package available.
- **Extremely narrow frequency range than conventional QRC**

8-DIP	
8-LSOP	
GND	Drain
Vcc	Drain
Vfb	Drain
Sync	Vstr

TO-220

6. V_{str}
5. Sync
4. FB
3. V_{CC}
2. GND
1. Drain

the power franchise
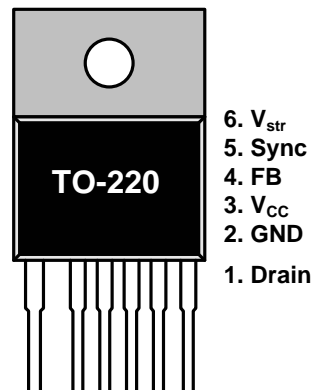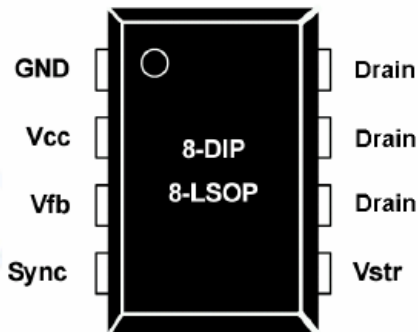
- Switch is turned on at the minimum V_{DS} (Valley voltage)

- Once switch is turned on, the valley voltage is ignored during the blanking time (t_B) → Next turn-on is prohibited during t_B

- After the blanking time, the minimum V_{DS} is detected only during the detection time window (t_w)

- If sync doesn't resonate within t_B, the switch is forced to turn on at the end of t_B(CCM operation)

- The switching frequency is within some range regardless of input voltage and load variation

- Normally the switching frequency is within extremely narrow range during the valley switching

$$\frac{1}{t_B} \le f_{SW} \le \frac{1}{t_B + T_{RESONANT}}$$