

# 大功率LED驱动芯片介绍

***BY Jacken Zhang (K3672)***

## Lighting Products

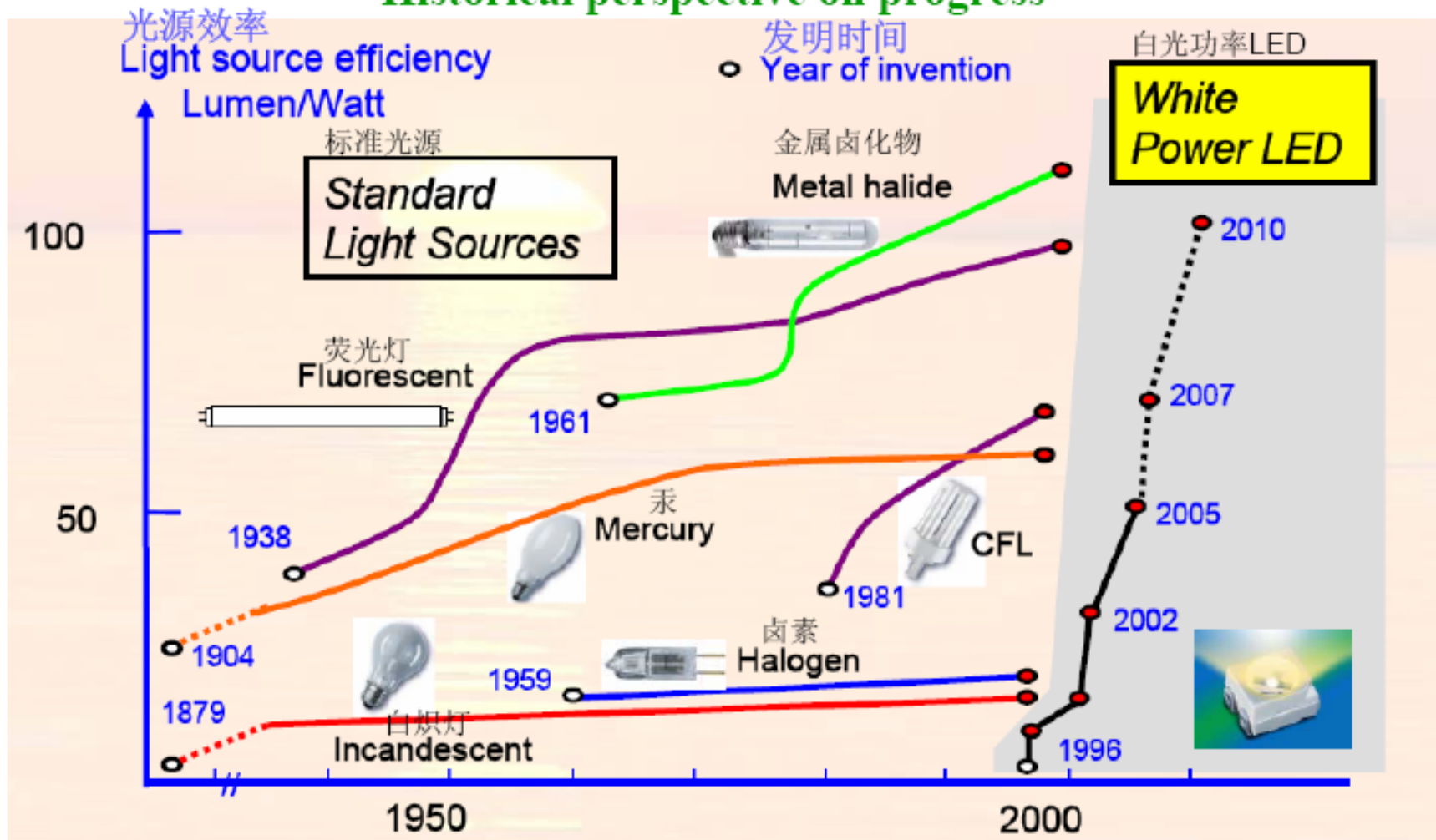
### DC to DC section

- 28V(MAX)/350mA Step-down LED driver—CAT4201
- 350mA Step-up LED driver—CAT4240
- 1A/25v No inductor LED Driver—CAT4101
- 3-CH 25V/175mA RGB LED Driver—CAT4103
- 4-Bit Power-LED Driver—STP04CM596
- 25V 4\*175mA High current LED Driver—CAT4104
- High brightness white LED Driver—TPS61165
- 1.5A/40V DC/DC converter—NCP3063
- 1.5A/40V LED driver—NCP3065
- Low Cost Analog LED driver--NCP4001
- High Voltage High Current LED Driver—NUD4301
- Low Voltage LED Driver—NCP1100
- Low Voltage High Current LED Driver—NCP1421

### AC to DC section

- 1-4W AC/DC LED driver—ACT35
- Integrated MOSFET LED Driver—NCP1014/27
- High Voltage LED Driver ---NCP1200/1216
- PFC High Power LED Driver—NCP1651
- Auxiliary Supply Feedback LED Driver —VIPer100

## 历史发展展望 Historical perspective on progress





光效



15



20



60

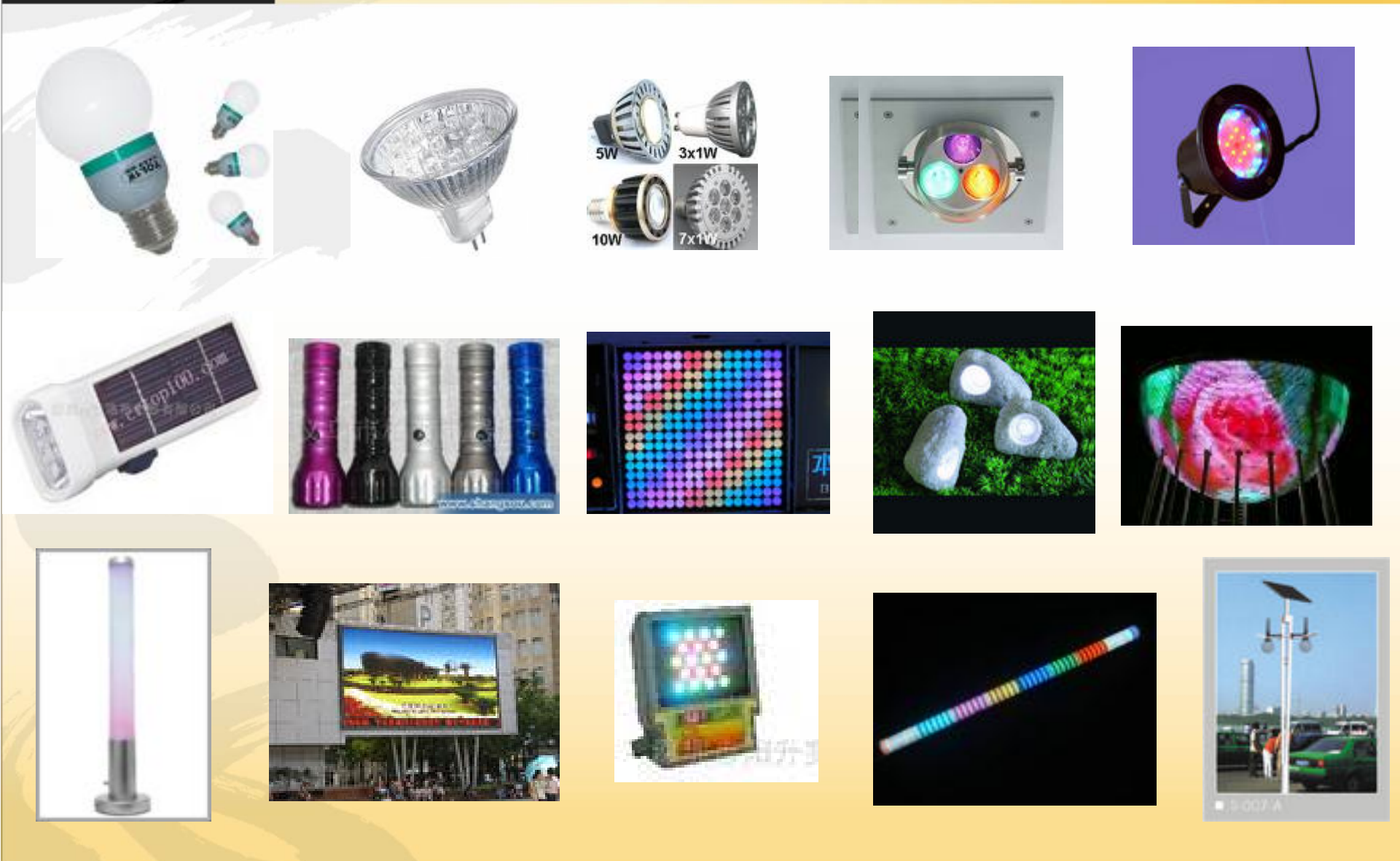


80



200

光源种类	光效 Lm/w	色温 K	显色系数 Ra	平均寿命 (小时)
节能灯	50-60	2700-5000	85	6000
低压钠灯	200	1700	44	28000
LED	<b>&gt;80</b>	2700-6000	80-85	100000

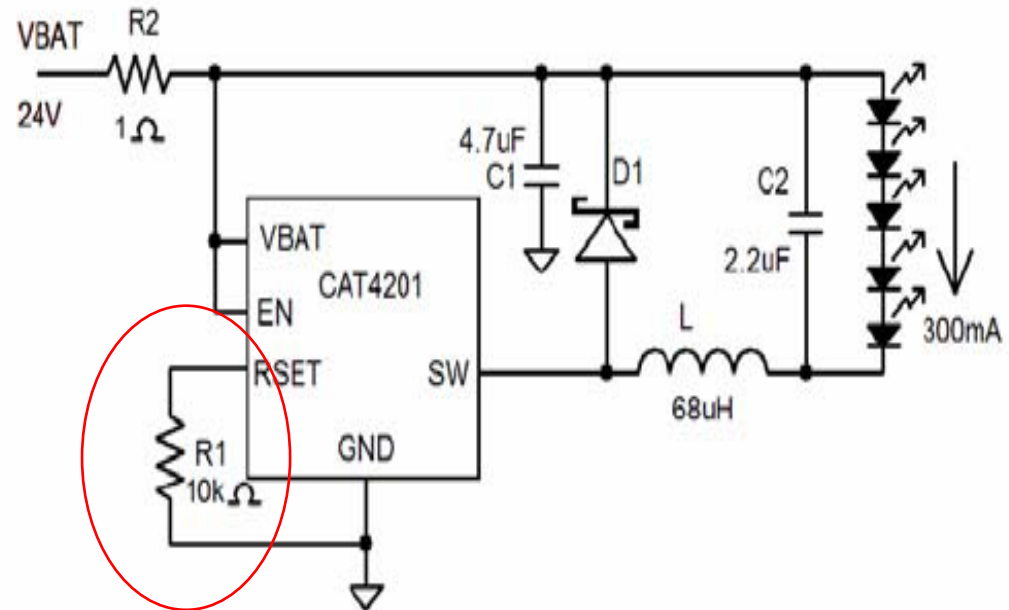


# DC to DC section

# 1: Step-down LED driver —CAT4201

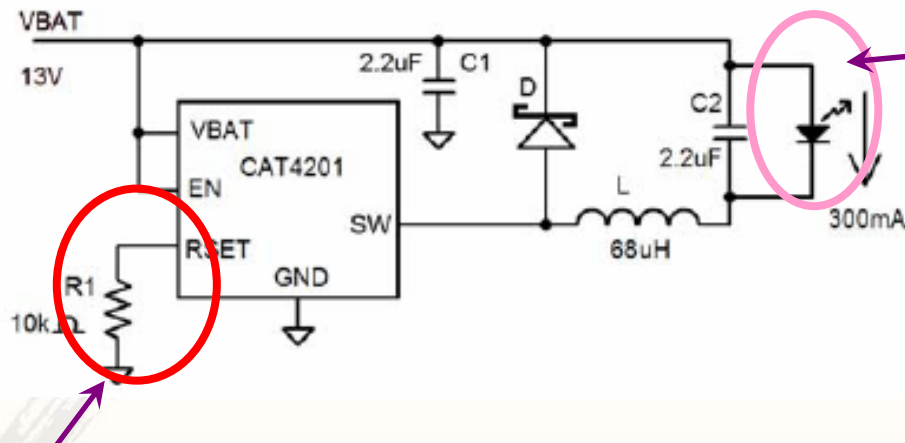


- 6-28V 宽电压工作范围
- 最多可驱动1W\*6颗LED
- BOOST工作方式，高效率
- 电流设定恒流精度高
- 封装小，空间利用率高
- 可并联使用，驱动功率可倍增
- 驱动电流0~350m A



D: Central Rectifier CMR1U-01M  
L: Sumida CDRH6D28-680

Vin=6v-28v

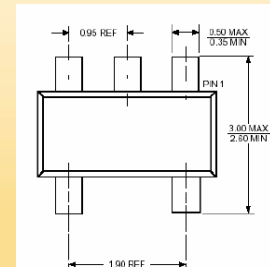
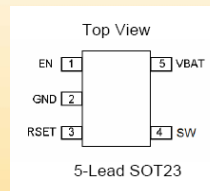


1W 大功率 LED



LED current (mA)	R1 (kΩ)
100	33
150	21
200	15
250	12
300	10
350	8.25

Table 1. R1 Resistor Selection





# 驱动6颗1W LED

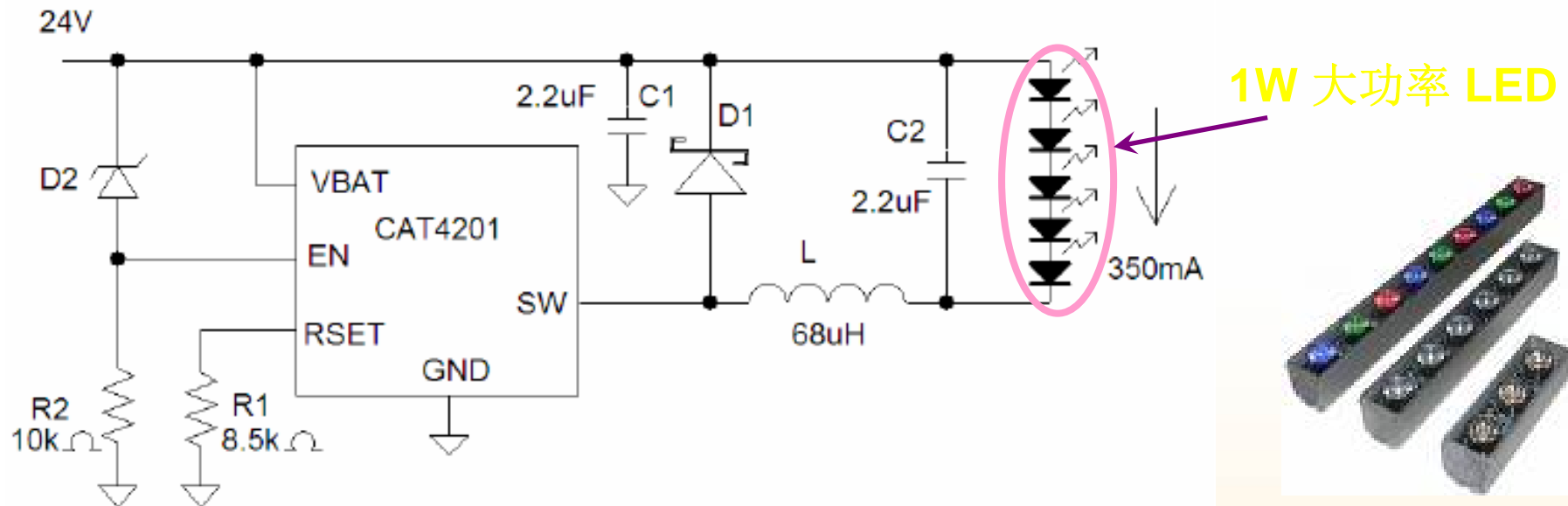
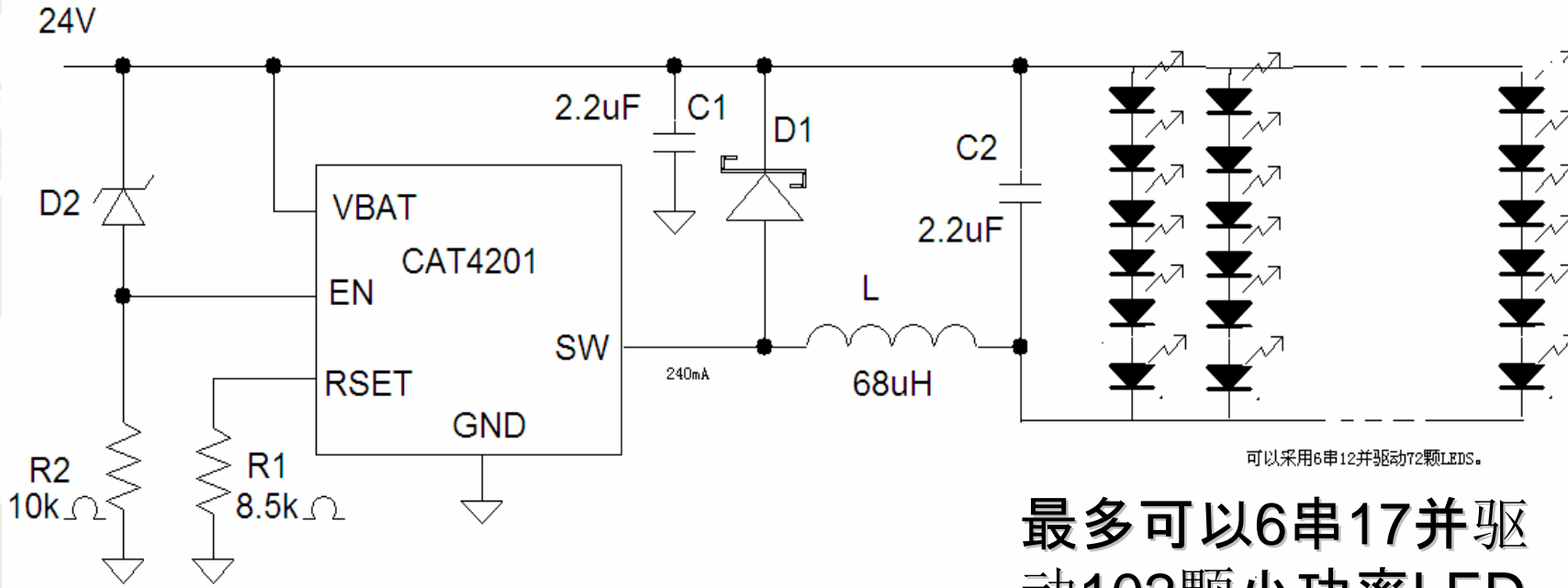


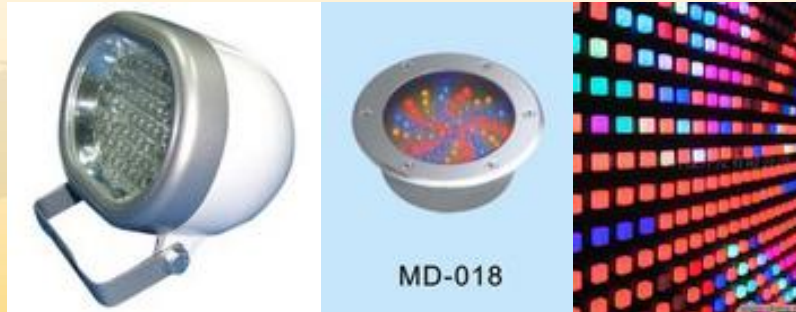
Figure 1. Application Circuit



# 驱动小功率LED



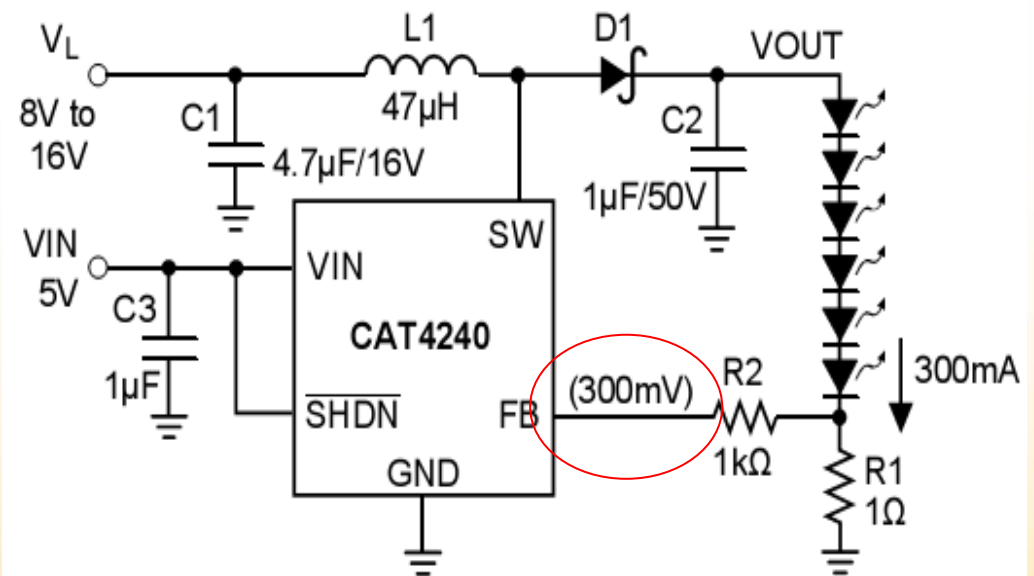
**最多可以6串17并驱动102颗小功率LED**

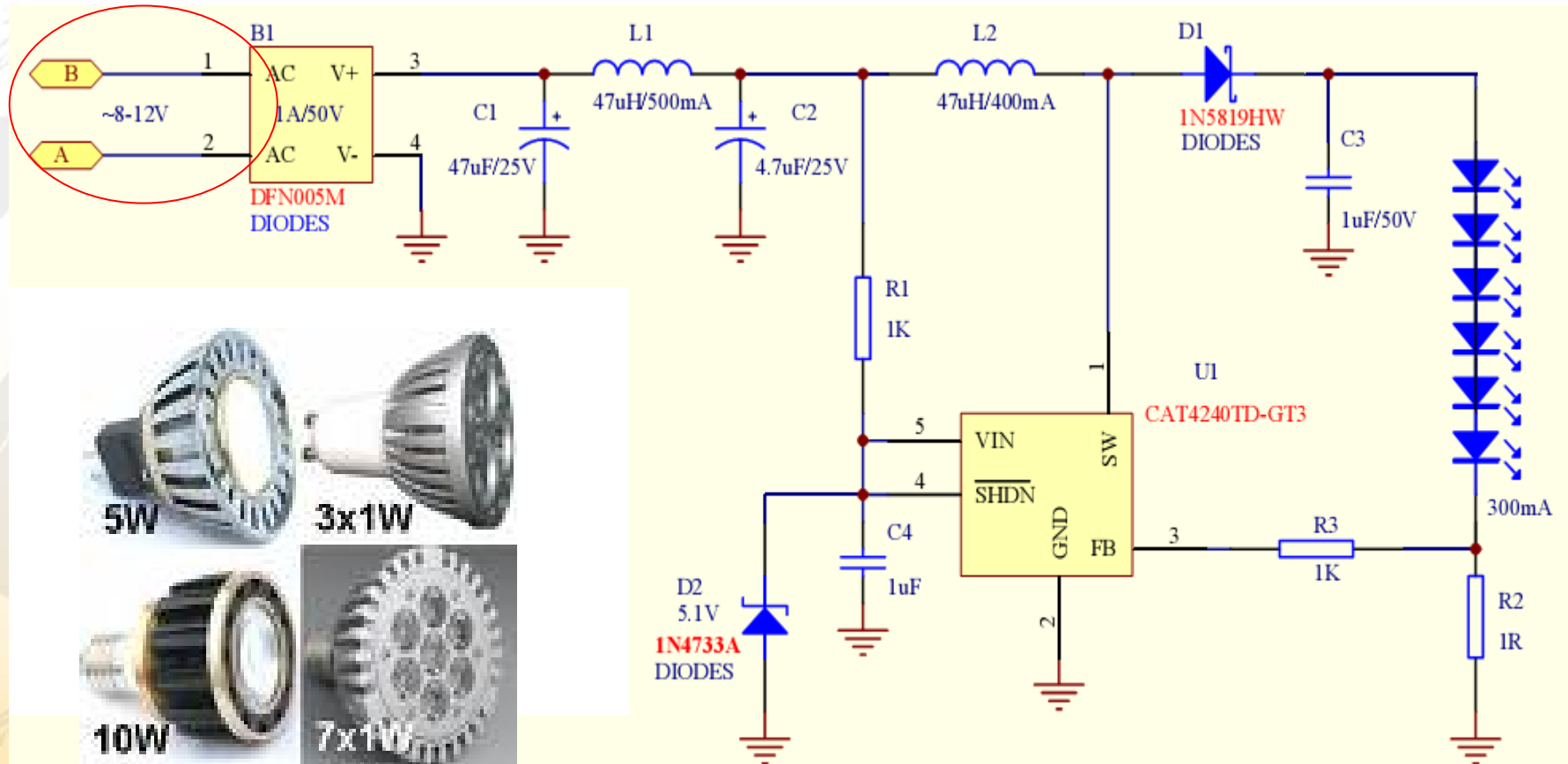




- 升压工作方式
- 最多可驱动1W\*6颗LED
- BOOST工作方式，高效率
- 电流设定 $FB=300mV$ ，低功耗
- 封装小，空间利用率高
- 驱动电流0~350m A

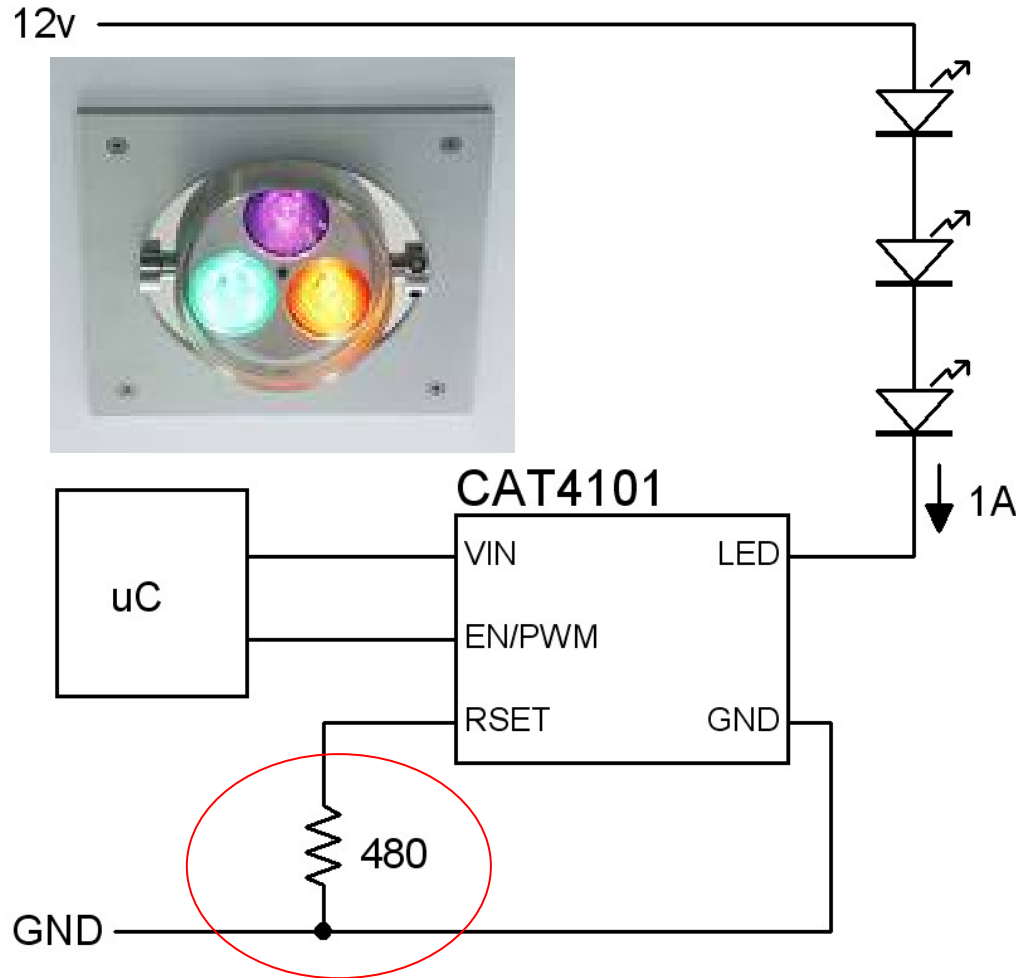
### Typical Application Circuit



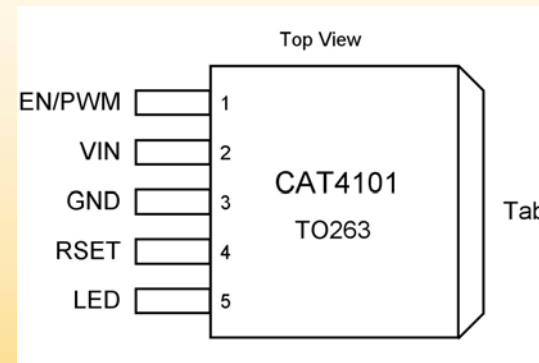


Planned

## CAT4101



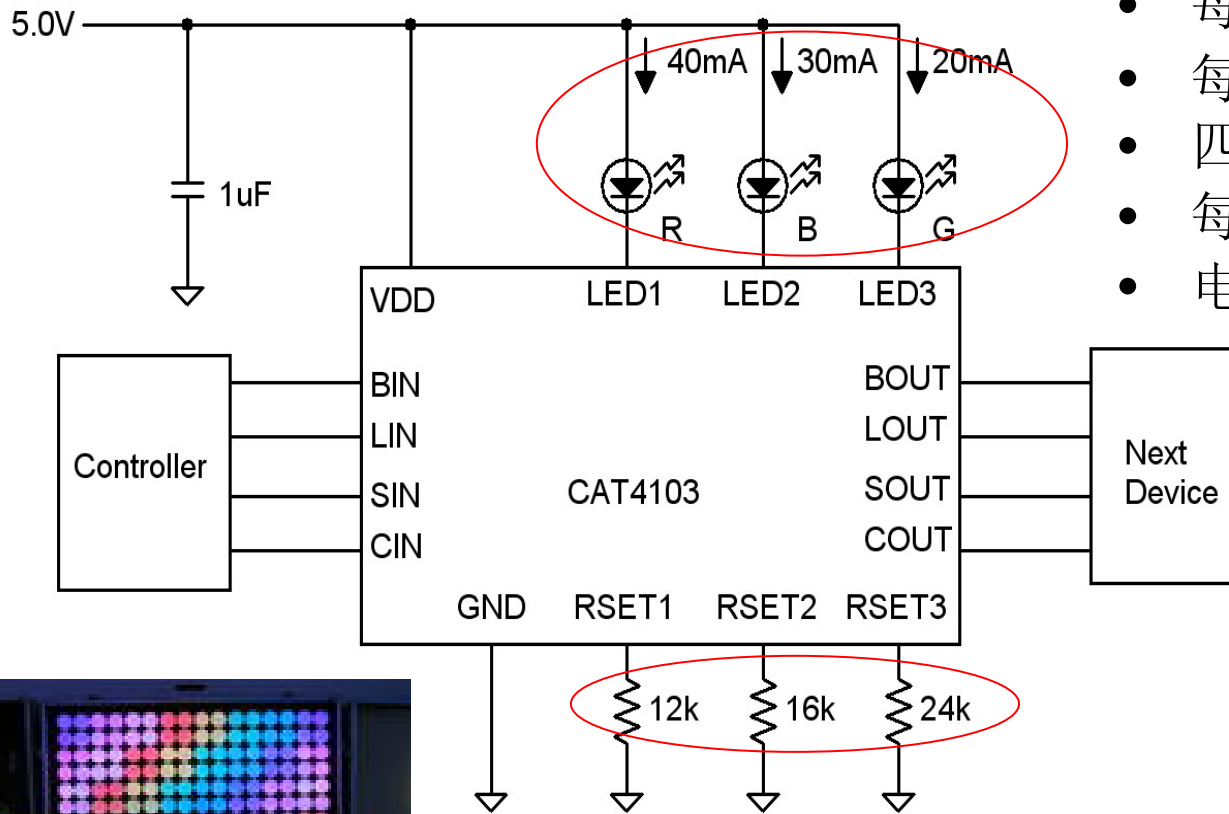
- 驱动脚最高耐压25V
- 最大驱动电流可达1A
- 外置电阻调节电流
- 电路简洁,无干扰
- PWM控制



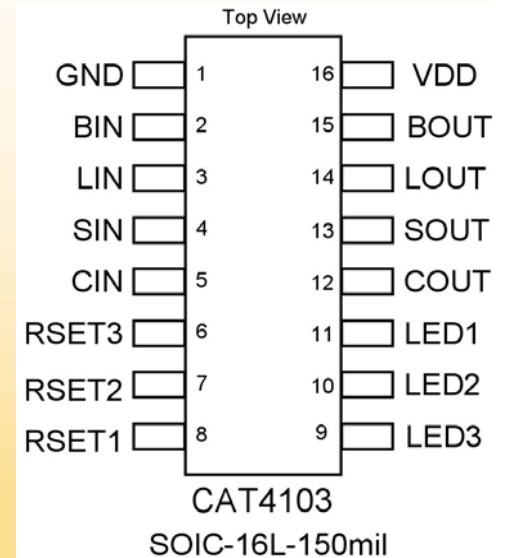
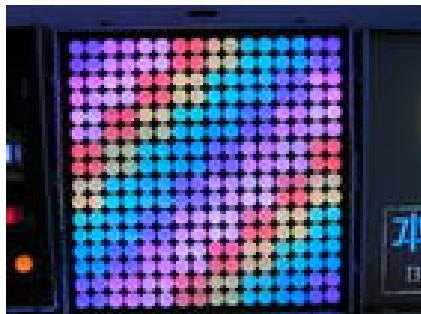
# 4: 3-CH 25V/175mA RGB

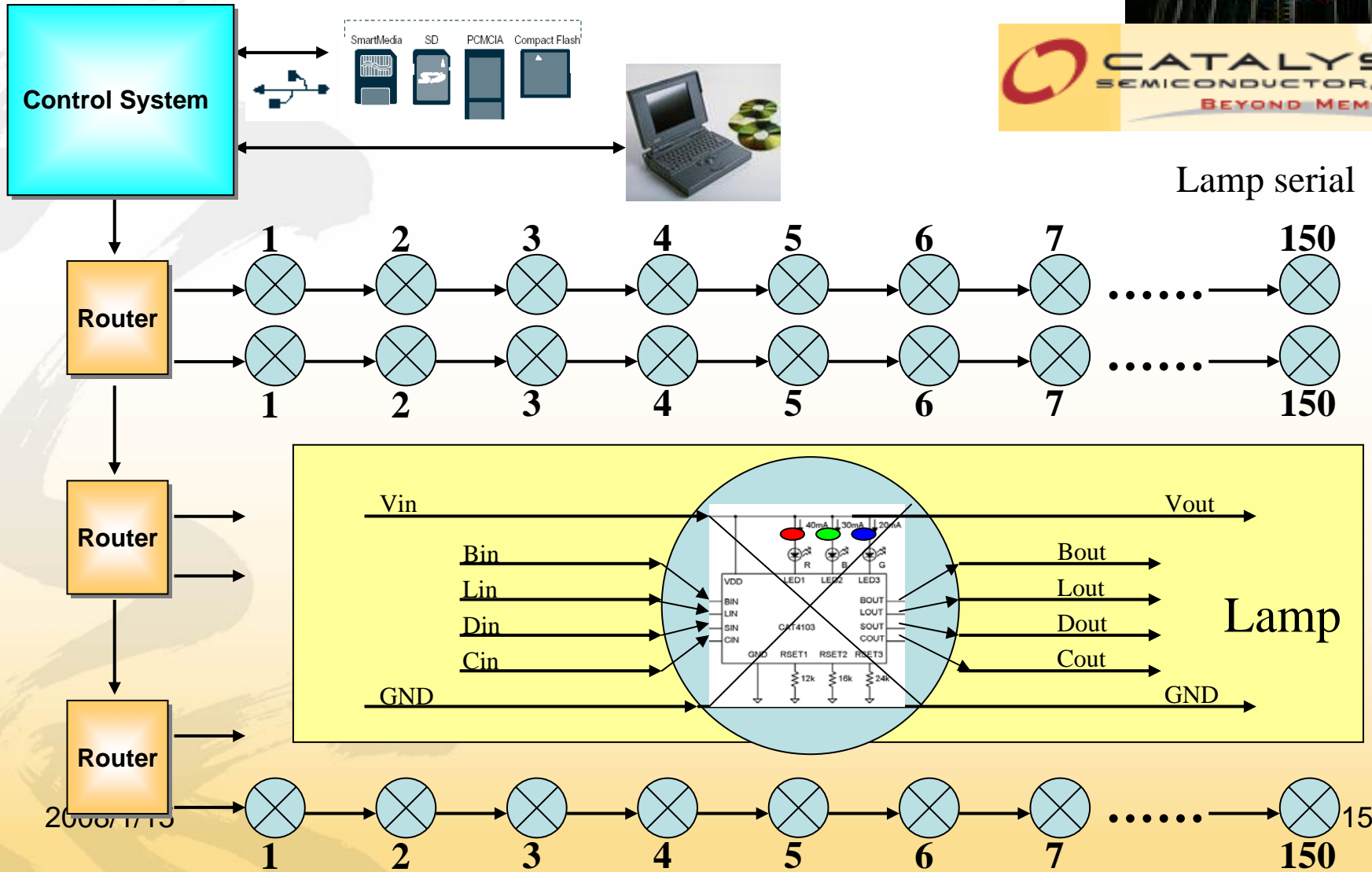
## LED Driver—CAT4103

熱點  
HOTSPOT

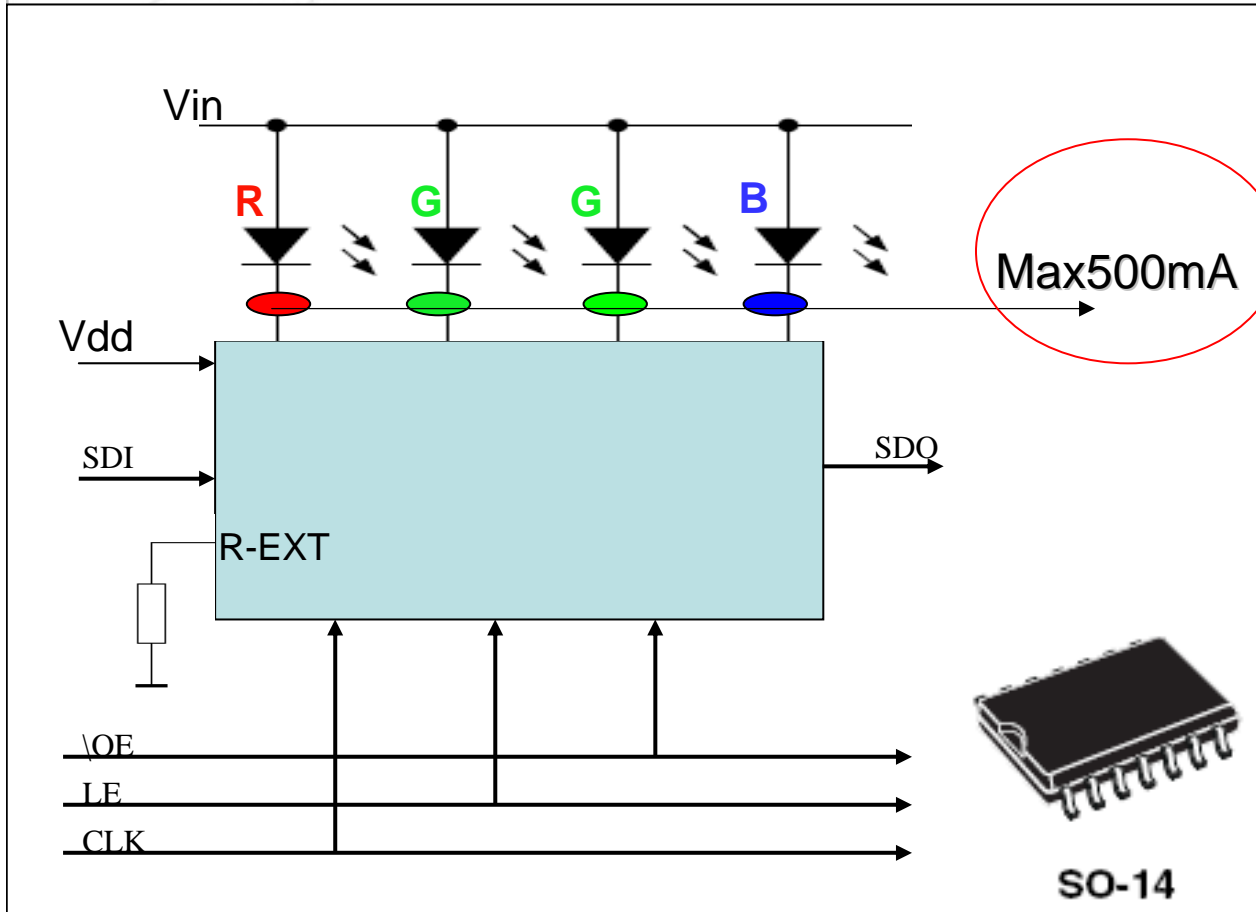


- 每通道最高耐压可达25V
- 每通道电流外置电阻调节
- 四线信号控制,全彩变化
- 每通道最大电流175mA
- 电路简洁,应用便利





# 5: 4-Bit Power-LED Driver —STP04CM596

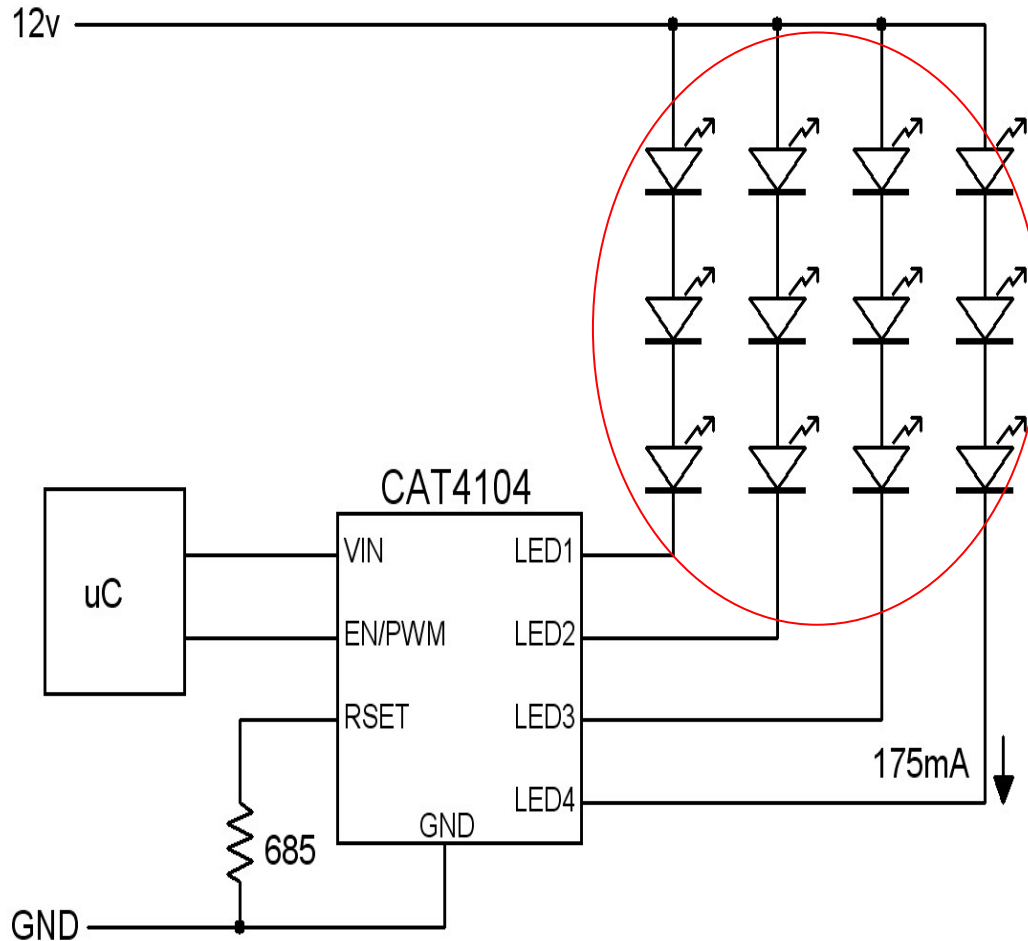


- 每通道最高耐压16V
- 外置电阻调节电流
- 四线信号控制,全彩变化
- 每通道驱动电流80-500mA
- 电路简洁,应用便利



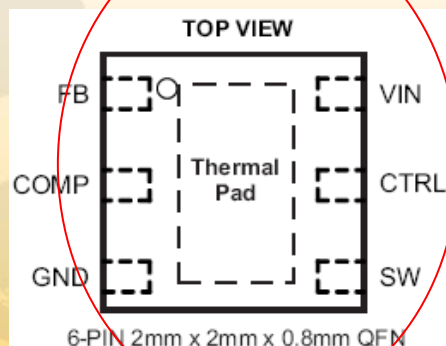
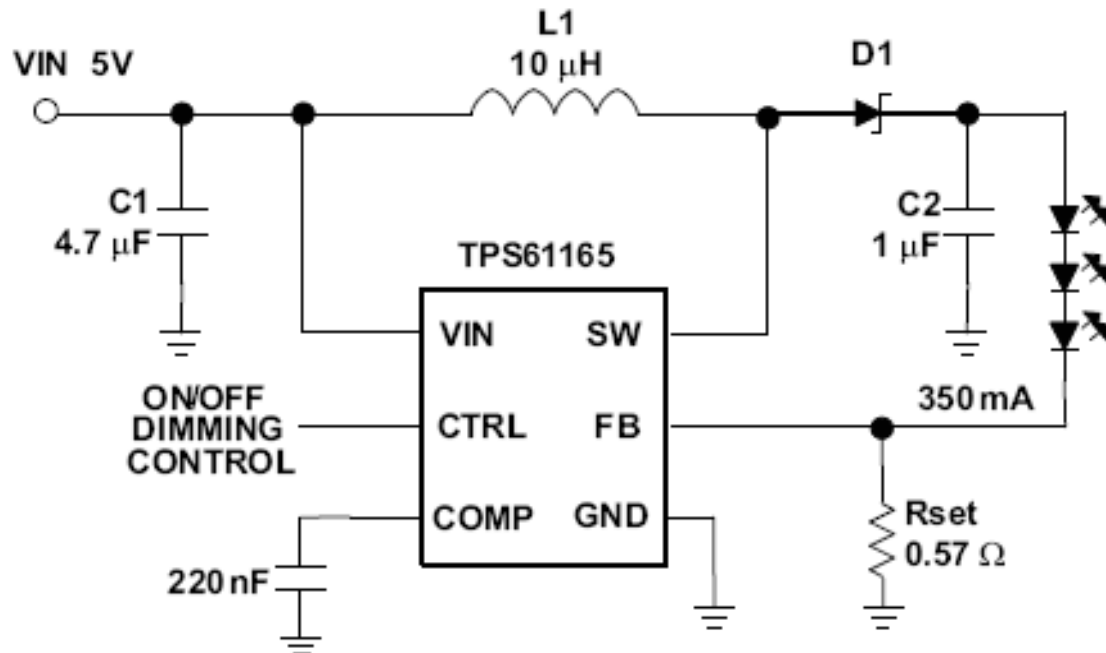
# 6: 25V 4\*175mA High current LED Driver—CAT4104

Planned



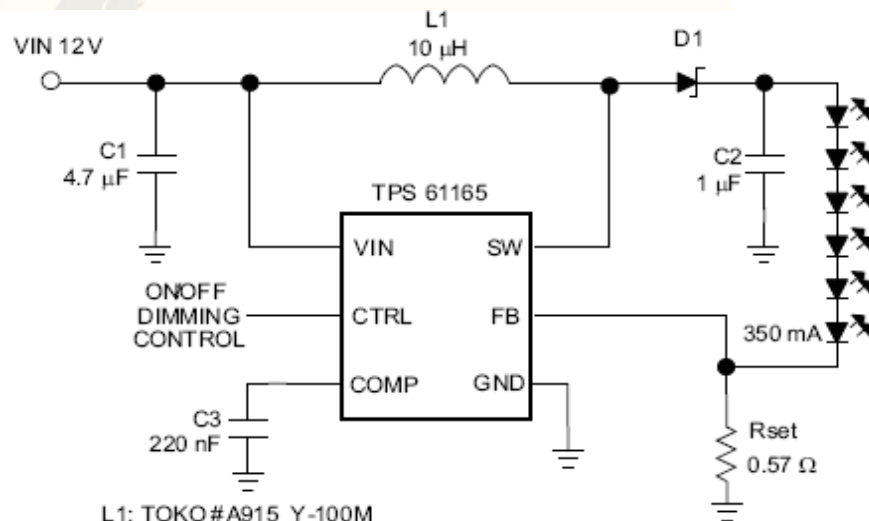
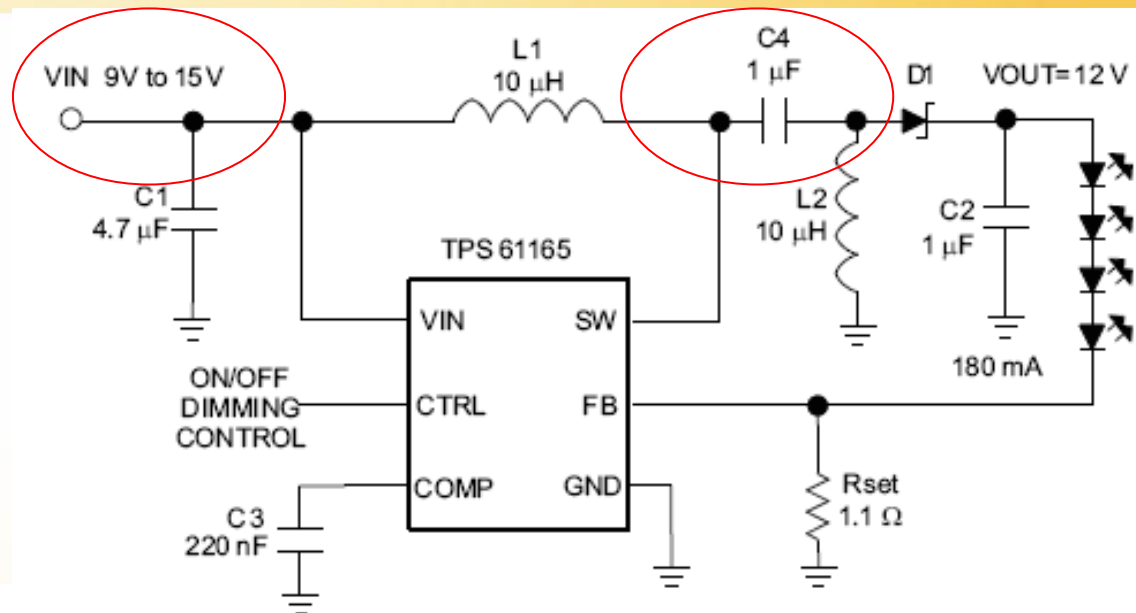
- 每通道耐压可达**25V**
- 电流外置电阻调节
- **PWM**控制
- 每通道最大电流**175mA**
- 电路简洁,应用便利
- **SOP8**脚封装

# 7: High Brightness White LED Driver—TPS61165



- 3-18V 升压工作模式
- 可驱动3颗LED
- BOOST工作方式,高效率
- 2\*2\*0.8 QFN 小封装

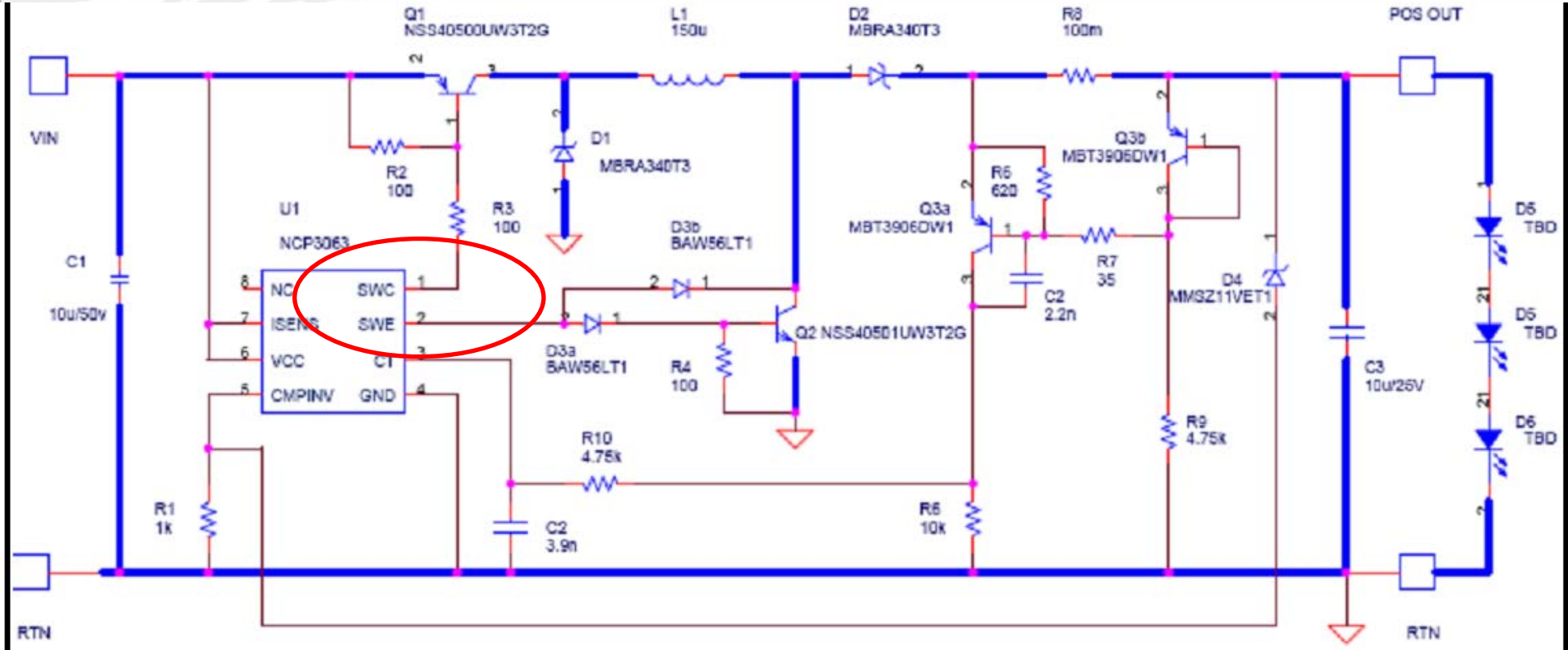
2008/1/15



L1: TOKO #A915 Y-100M  
 C1: Murata GRM188R61A475K  
 C2: Murata GRM188R61E105K  
 D1: ONsemi MBR0540T1  
 LED: OSRAM LW-W5SM

L1, L2: TOKO #A915 Y-100M  
 C1: Murata GRM188R61A475K  
 C2: Murata GRM188R61E105K  
 C4: Murata GRM188R61H105K  
 D1: ONsemi MBR0540T1  
 \*L1, L2 can be replaced by 1:1 transformer

# 8: 1.5A/40V DC/DC converter —NCP3063



- 该方案同时实现升降压,满足电源输入的宽范围.
- 过压保护
- 恒流调节



# 9: 1.5A/40V LED driver —NCP3065

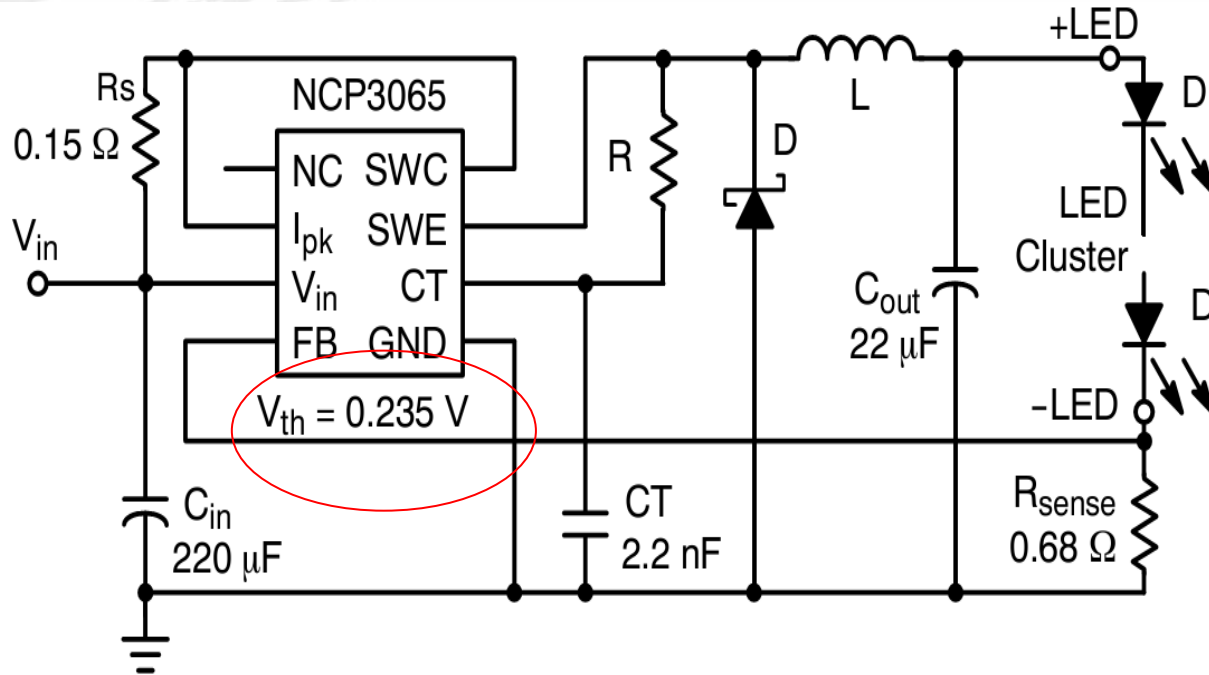
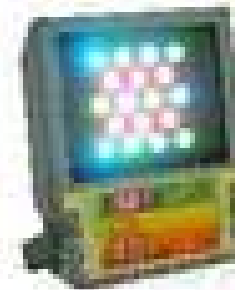
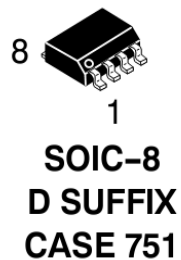


Figure 1. Typical Buck Application Circuit

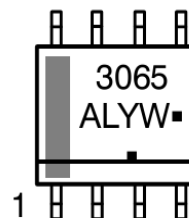



## 特征

- 最大电流1.5A,最大输入电压40V
- SOP8封装
- 过流过热保护
- 升压和降压均可实现.



## MARKING DIAGRAMS



LED Driver	Application	$V_{IN}$	$I_{LED}$	$V_F$
		(V)	(mA)	(V)
 安森美半导体 ON Semiconductor®  BUCK	12 V <sub>DC</sub> 1 W LED	10 - 14	350	3.6
	12 V <sub>DC</sub> 3 W LED	10 - 14	700 or 350	3.6 or 7.2
	12 V <sub>DC</sub> 5 W LED	10 - 14	700 or 1000	7.2 or 3.6
	24 V <sub>DC</sub> 5 W LED	21 - 27	350	14
	24 V <sub>DC</sub> 10 W LED	21 - 27	700	14
	12 V <sub>AC</sub> 1 W LED	14 - 20	350	3.6
	12 V <sub>AC</sub> 3 W LED	14 - 20	700 or 350	3.6 or 7.2
	12 V <sub>AC</sub> 5 W LED	14 - 20	700 or 1000	7.2 or 3.6
	12 V <sub>AC</sub> 5 W	14 - 20	350	14
	12 V <sub>AC</sub> 15 W	21 - 27	1000	14





安森美半导体  
ON Semiconductor®

NUD4001

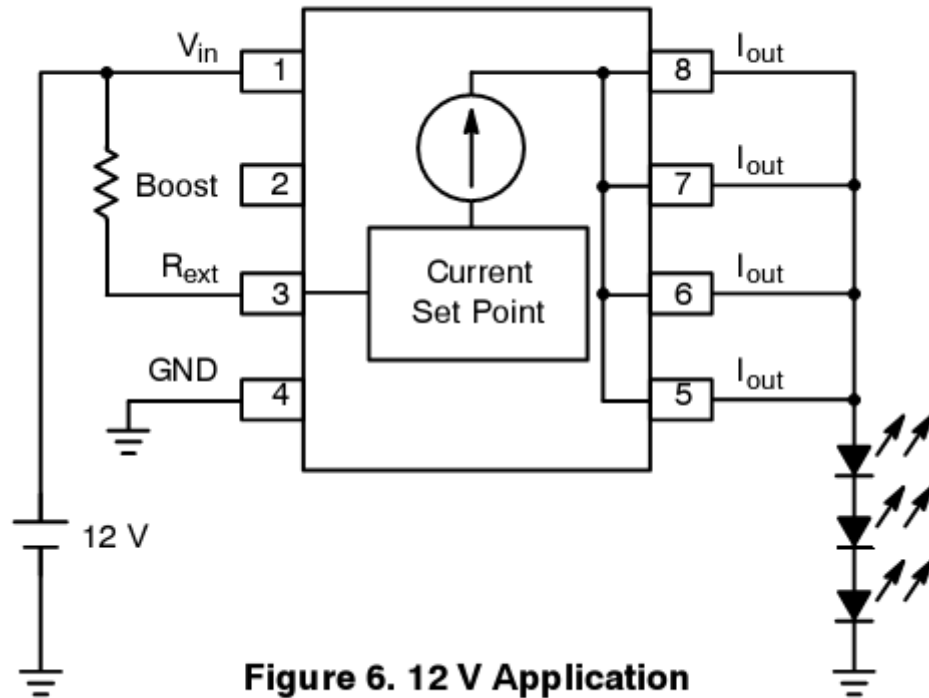


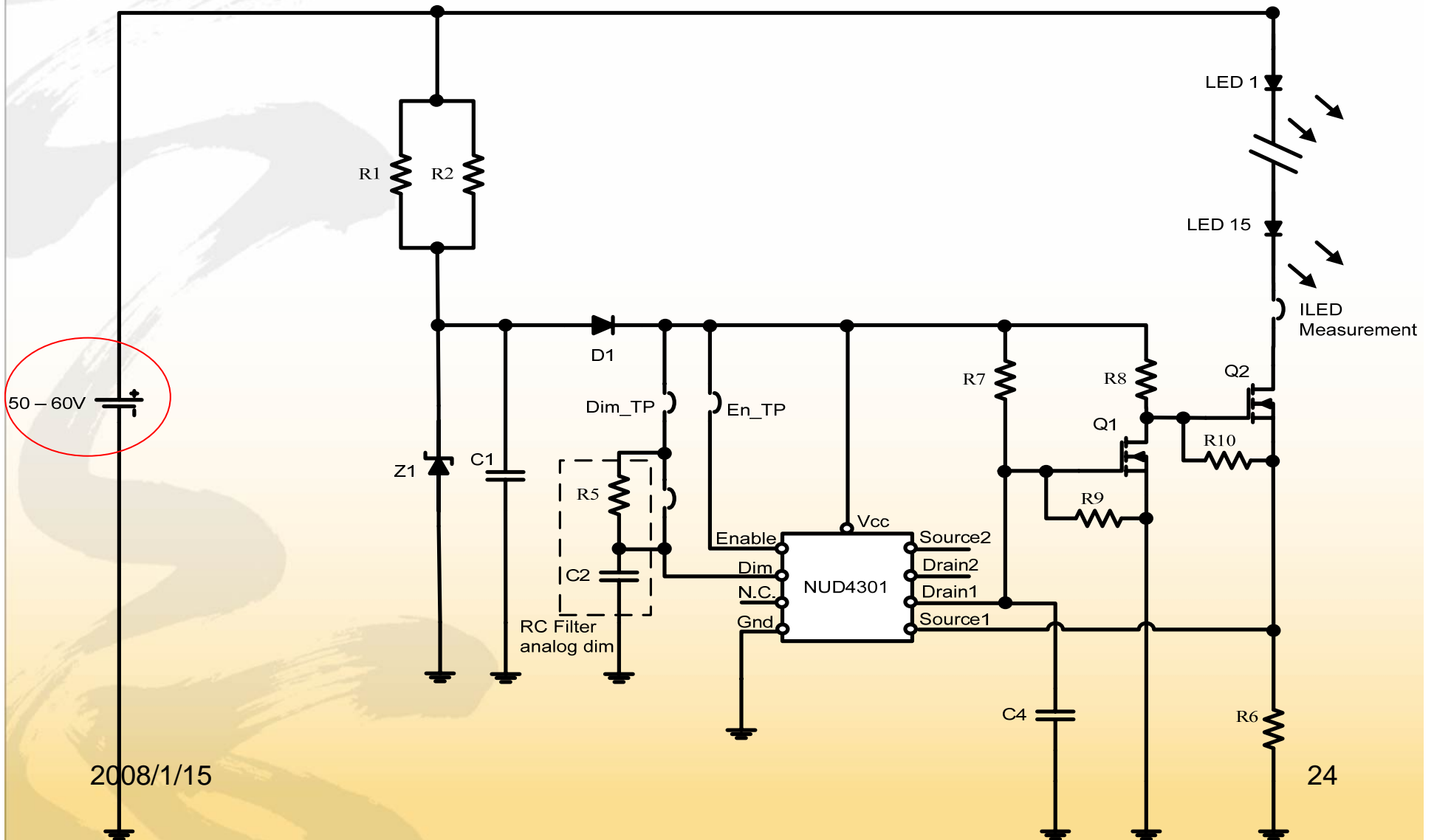
Figure 6. 12 V Application  
(Series LED's Array)



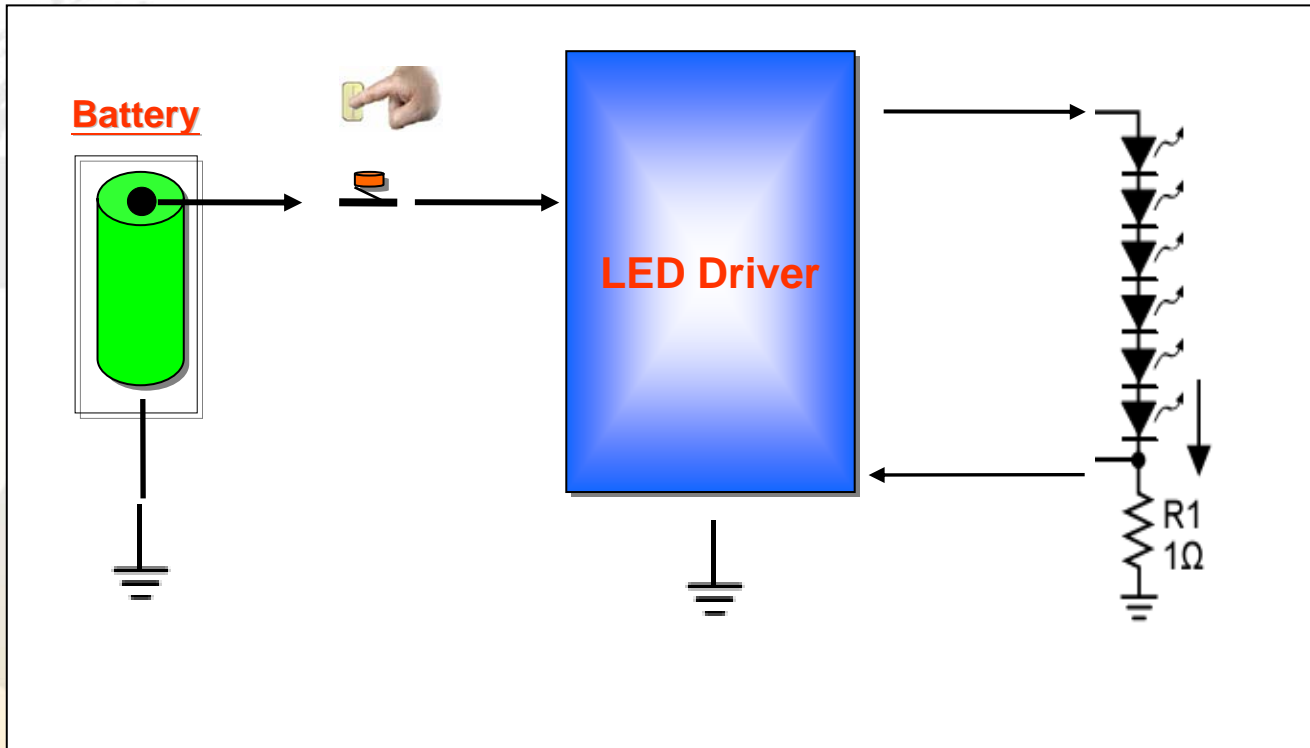
## 特征

- 最大电流1.5A,最大输入电压40V
- SOP8封装
- 过流过热保护
- 升压和降压均可实现.

# 11: High Voltage LED driver --NCP4301







NCP1421

NCP1400

CAT4139

TPS61160

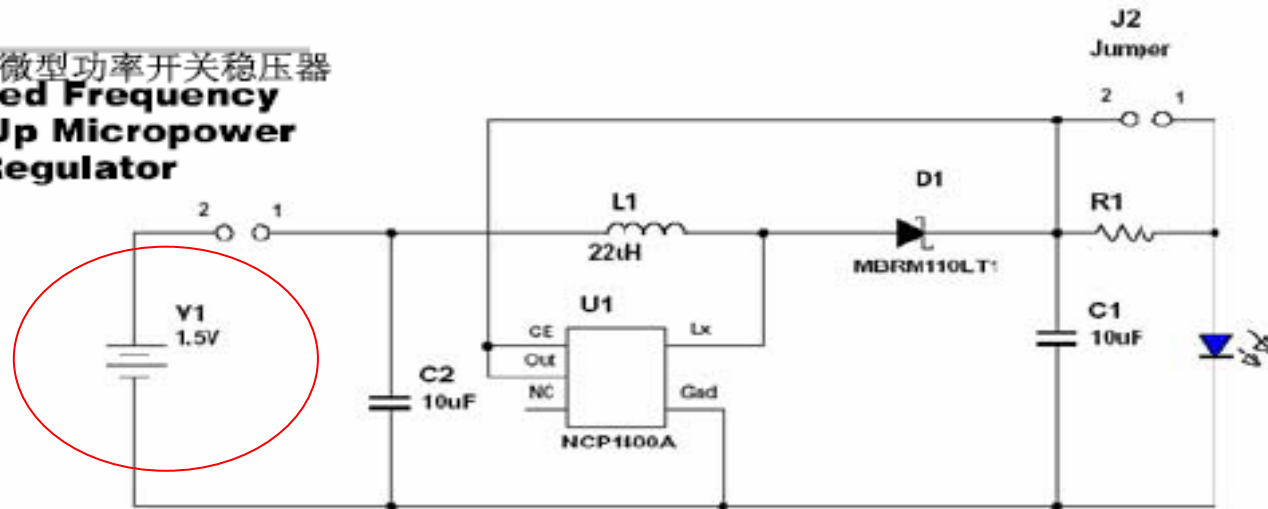
TPS61081



## 1 & 2个电池的简单LED手电筒 升压拓扑结构 $V_{out} \gg V_{in}$ 1 & 2 cell simple LED torch boost topology $V_{out} \gg V_{in}$

### NCP1400A

定频PWM步升微型功率开关稳压器  
100 mA, Fixed Frequency  
PWM Step-Up Micropower  
Switching Regulator



对于1个电池的应用，NCP1400A 5 V 设计可用小型轻薄的SOT23-5封装向单个LED提供50 mA，电阻R1被J2短路

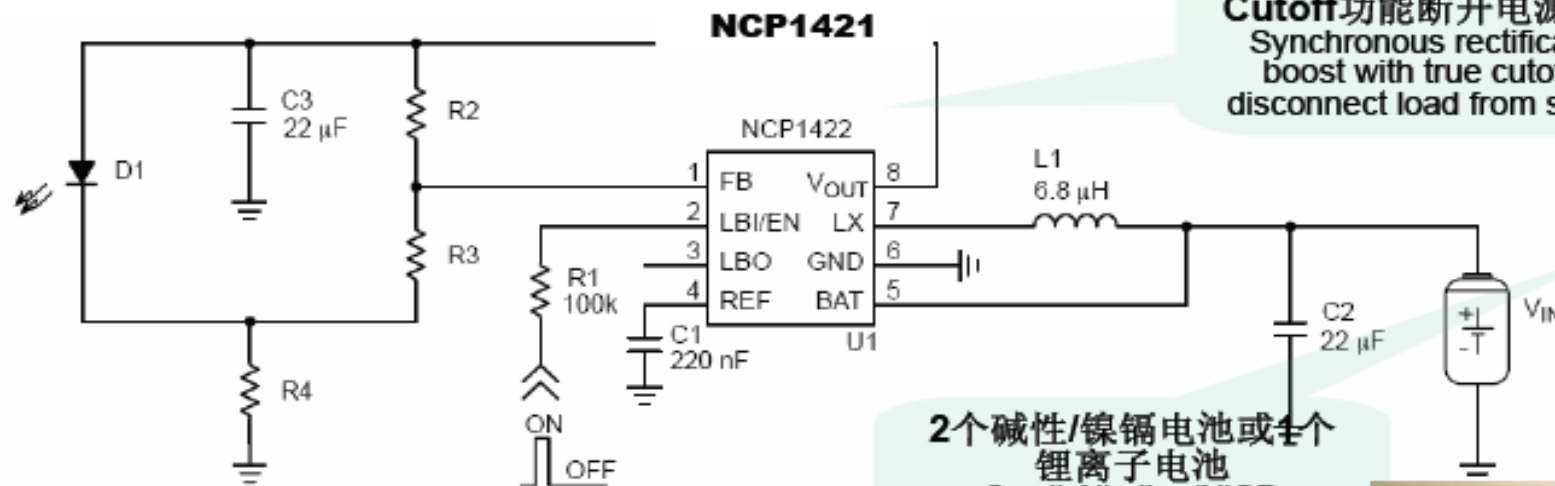
For 1 cell applications, the NCP1400A 5 V design can supply 50 mA to a single LED from a small thin SOT23-5 package, resistor R1 is shorted by J2

对于2个电池的应用，驱动器可以向单个LED提供100 mA，此外电流限制电阻与LED串联

For 2 cell applications the driver can source 100 mA to a single LED with the addition of a current limiting resistor in series with the LED

## 高达350 mA 的手电筒/闪光灯实例 优化用于2个电池（基于镍）

Up to 350 mA torch/flashlight example optimized for 2 cell primary (Ni-based)

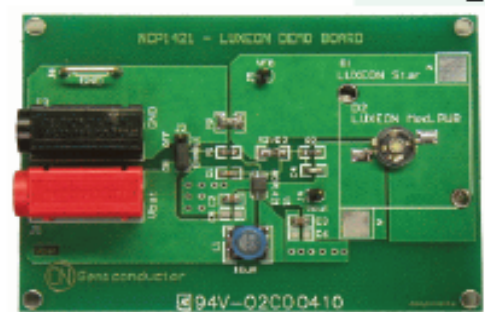


同步整流升压用True-Cutoff功能断开电源负载  
Synchronous rectification boost with true cutoff to disconnect load from source

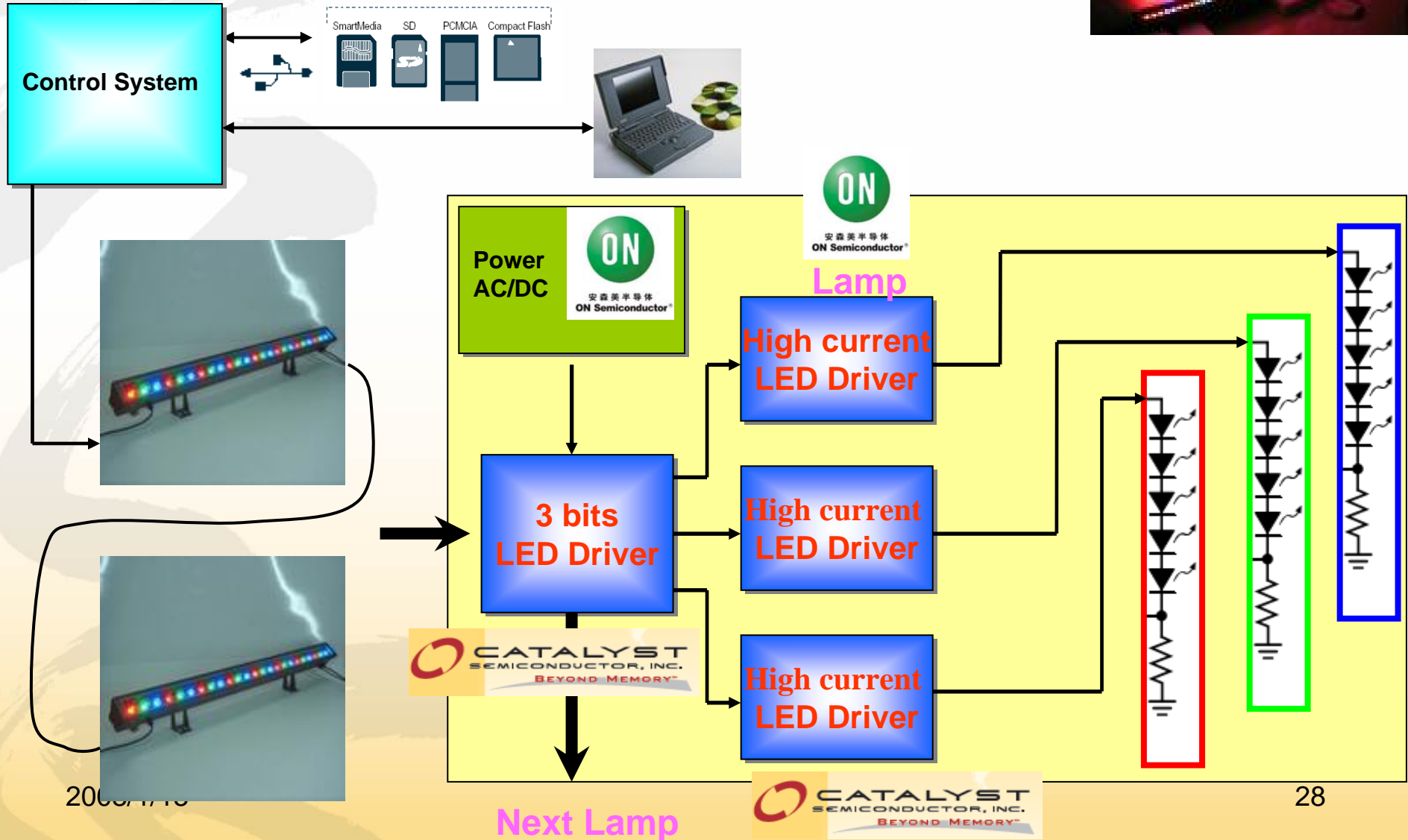
2个碱性/镍镉电池或1个锂离子电池  
2 cell Alkaline/NiCD cell Lithium Primary



**AND8171/D**  
大功率白光LED闪光灯NCP1421/2参考设计  
**NCP1421/2 Reference Designs for High-Power White LED Flash**



## 洗墙灯 Block Diagram

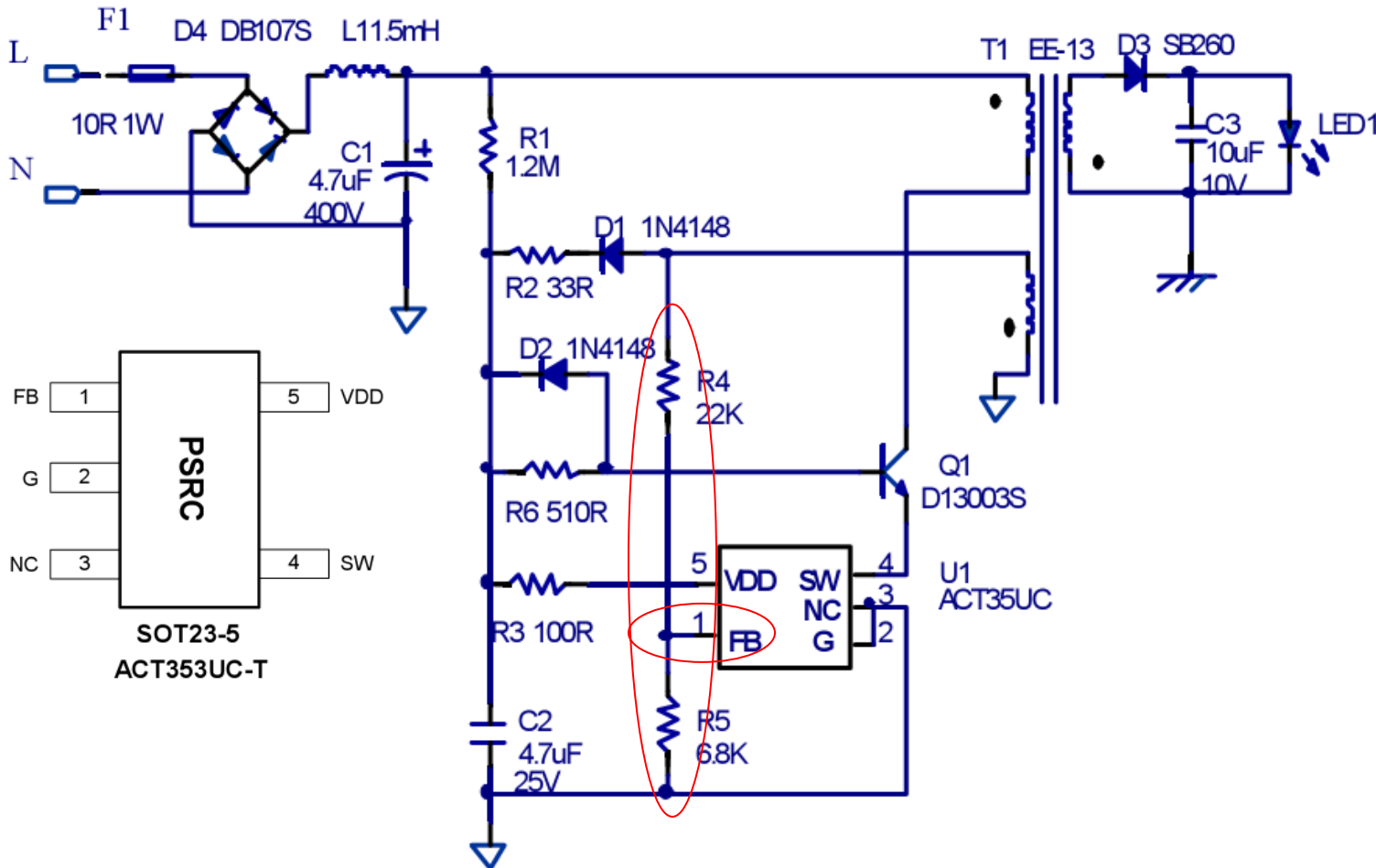


- 洗墙灯
- 投射灯
- 埋地灯
- GPS屏
- 大功率手电筒
- 汽车照明
- 交通灯
- 矿灯照明
- LED装饰照明
- 其他应用



# AC to DC section

# 1: 1-4W AC/DC LED driver —ACT35



## NCP1014/27 LED驱动器Gen2 演示板

### NCP1014/27 LED driver Gen2 demo board



安森美半导体为NCP1014提供了一个集成高压MOSFET的离线PWM交换器，用通用交流电源供电时最高能够提供8 W功率 ON Semiconductor offers the NCP1014 an offline PWM switcher with integrated high voltage MOSFET capable of providing up to 8 W when powered from a universal ac main.

NCP1014 LED驱动器演示板是经优化适用于恒流应用的完全隔离的交流—直流转换器 The NCP1014 LED driver board is a fully isolated ac-dc converter optimized for constant current applications.

350 mA / 22 Vdc 变压器设计以及700 mA / 17 Vdc配置 (NCP1014/NCP1027) 350 mA / 22 Vdc transformer design as well as 700 mA / 17 Vdc configuration (NCP1014/NCP1027)

注：用替代的变压器用于230 Vac 交流电源，转换器最高能够提供19 W (NCP1014) 或 25 W (NCP1027) Note with an alternate transformer for 230 Vac ac main, the converter is capable of delivering up to 19 W (NCP1014) or 25 W (NCP1027)

#### 应用 Applications

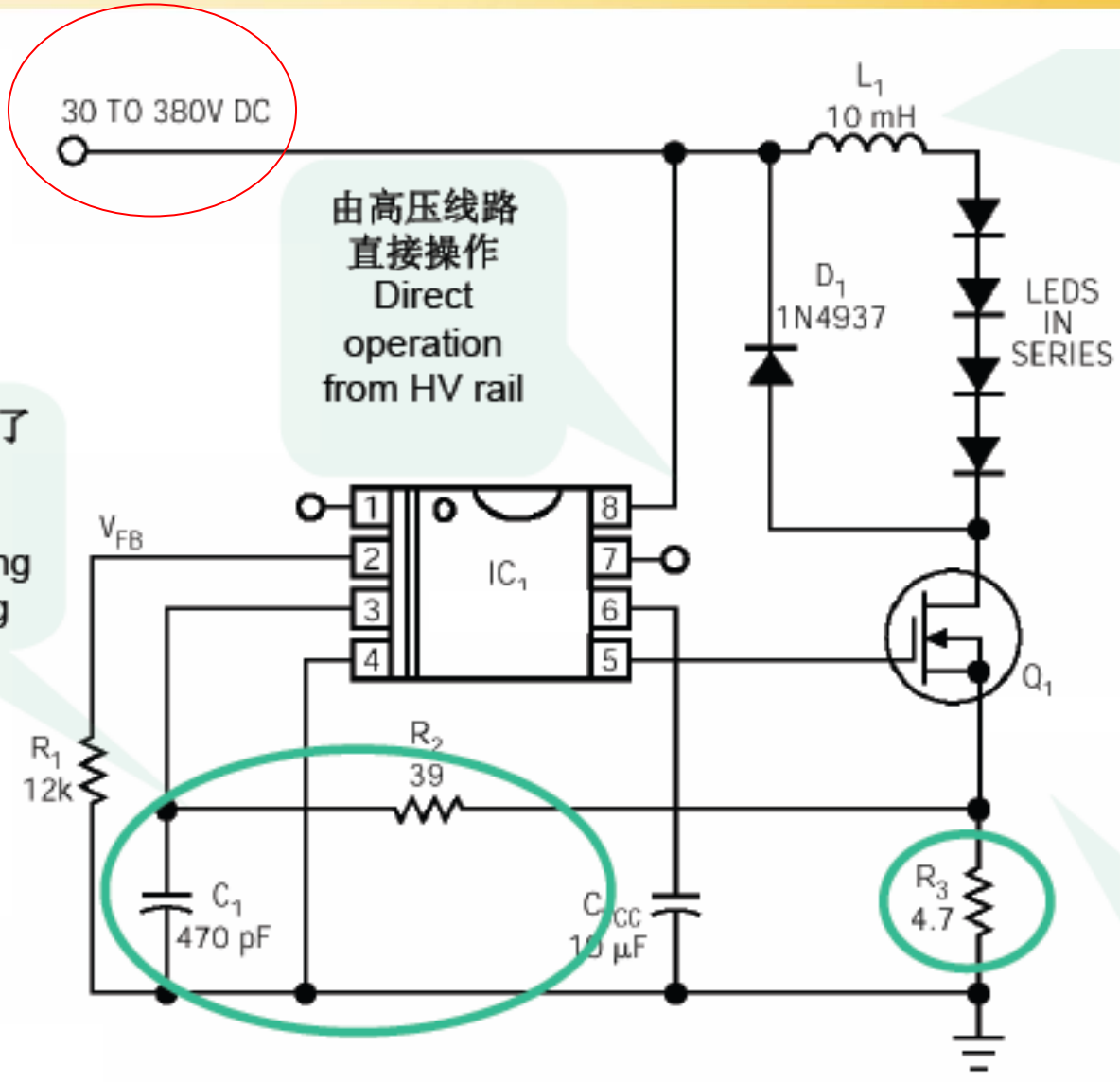
- LED稳定器 LED ballasts
- 标志和通道照明 Signage and channel lighting
- 建筑照明 Architectural lighting
- 显示屏照明 Display lighting
- 任务照明 Task lighting

#### 主要特性 Key Features

- 输入电压范围从90到265 Vac Input voltage range from 90 to 265 Vac
- 连续输出功率高达8 W Continuous output power up to 8 W
- 输出开路电压钳制 Output Open Circuit voltage clamping
- 频率抖动可降低EMI标记 Frequency jittering for reduced EMI signature
- 内置热关机保护 Built in thermal shutdown protection



# 3: High Voltage LED driver —NCP1200/1216



安森美半导体  
ON Semiconductor®

NCP1200 系列或  
NCP1216 系列  
NCP1200 Series or  
NCP1216 Series  
design ideas

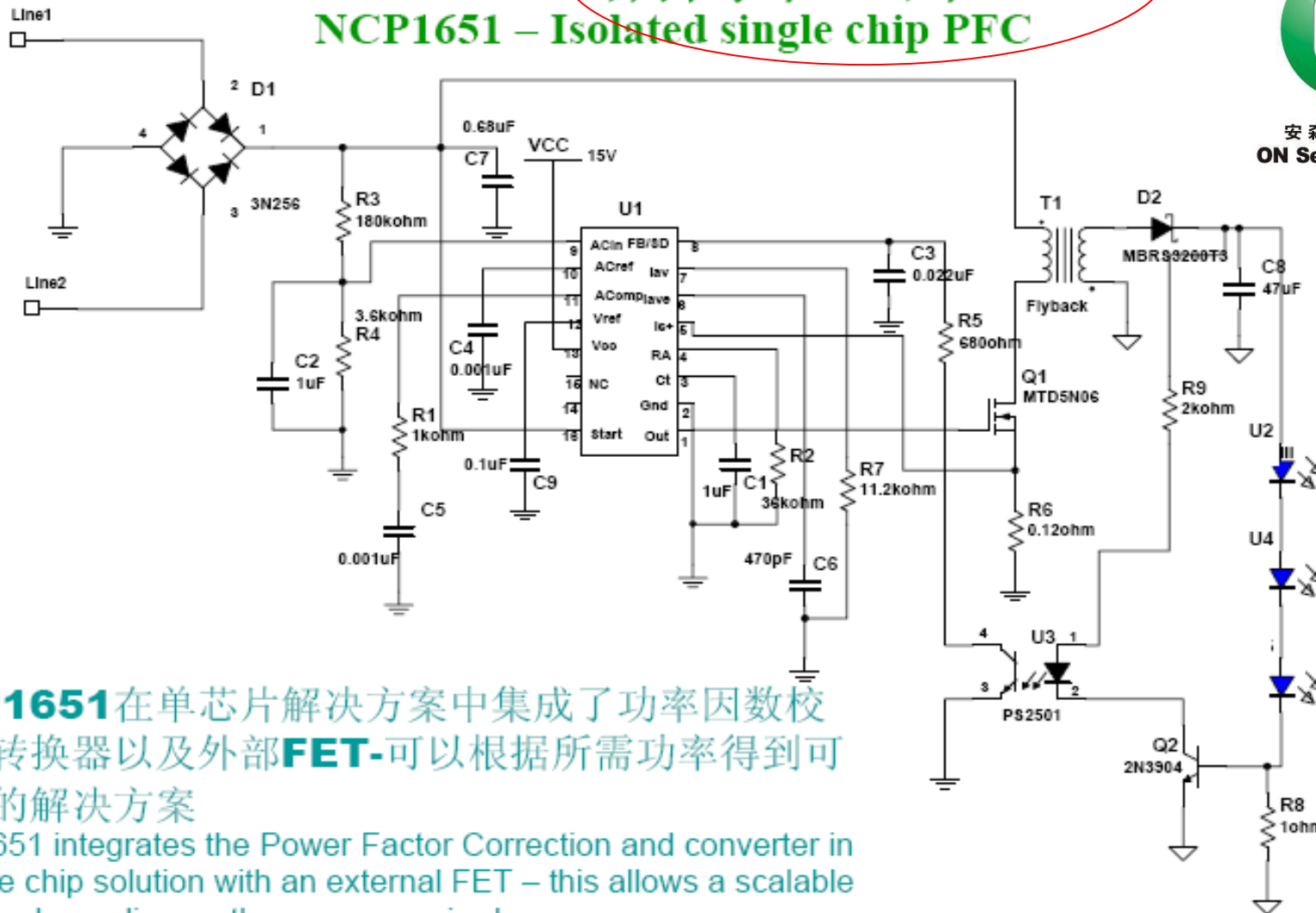
PWM controller drives LEDs

# 4: PFC High Power LED driver—NCP1651

## NCP1651 – 隔离单芯片PFC NCP1651 – Isolated single chip PFC



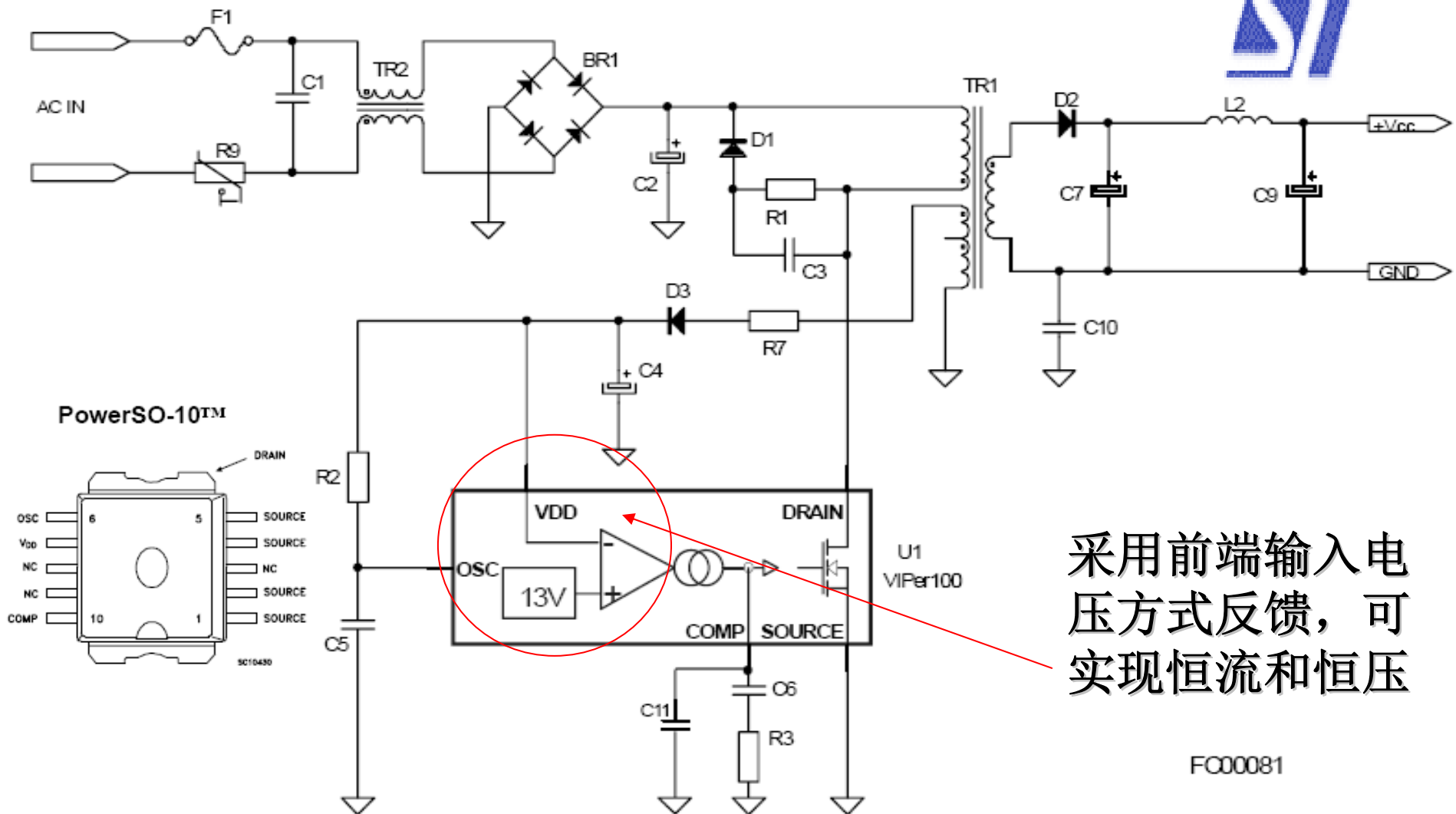
安森美半导体  
ON Semiconductor®



**NCP1651**在单芯片解决方案中集成了功率因数校正和转换器以及外部**FET**-可以根据所需功率得到可缩放的解决方案

NCP1651 integrates the Power Factor Correction and converter in a single chip solution with an external FET – this allows a scalable solution depending on the power required

# 5: Auxiliary Supply Feedback LED driver—VIPer100

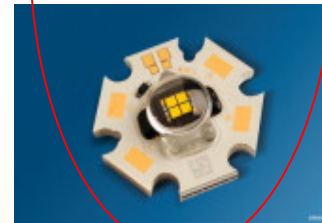


# Some products



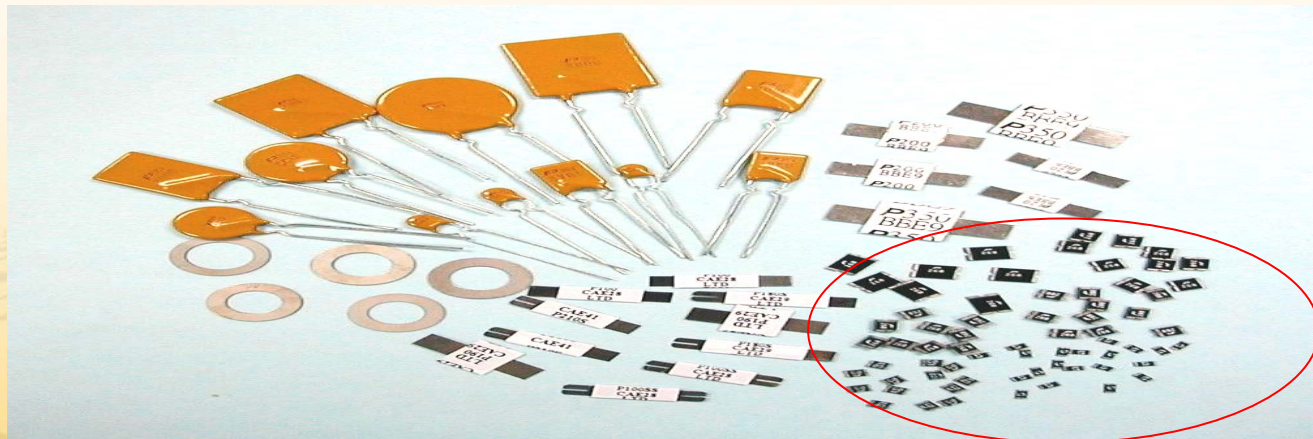
**OSRAM**

**LED**



**PTTC**

保护器件



2008/1/15

