



## Non-isolated buck LED constant current switch

### Description

The D80216 is a LED driver constant current switch with high accuracy original edge feedback. This chip is manufactured with 550V single chip integration process, with high stability and fast starting speed, suitable for non-isolated buck LED constant current power within 9W.

D80216 uses original feedback model, without secondary sampling feedback and compensation circuit. Internal high voltage start-up circuit can easily realize autonomous power supply, and no need to start resistor and auxiliary winding. Single coil inductor scheme can simplify production processes and boost productivity. The unique patent of POWER MOS can complete discharge detection without feedback pin, and achieve over voltage protection and open/short protection. Different from dual chip similar joint package product, D80215 is the most compact and stable solution.

D80216 Internal line voltage compensation with high precision current sampling, can realize  $\pm 5\%$  current accuracy in full input voltage range without current compensative circuit. High voltage turns on the circuit, to bring fast boosting time for system.

D80216 incorporates several protection features: under voltage lockout, leading edge blanking, LED open circuit protection, short circuit protection, over current protection, loop open circuit protection and over temperature protection etc., greatly increased the stability of the system.

### Feature

- Original feedback constant current control
- 550V single chip integrated power tube, more stable
- 550V high voltage supply, light on demand, the most impact scheme.
- Overheating drop current protection. High temperature and no strobe light
- Patent technology, no feedback pin
- $\pm 5\%$  Constant current output precision
- LED open / short circuit protection
- LED overvoltage protection
- CS resistance short-circuit protection
- SOP-8/TO-94 Package

### Application

- LED bulb lamp, candle lamp
- LED down light, kitchen light
- other LED lighting



## Applications

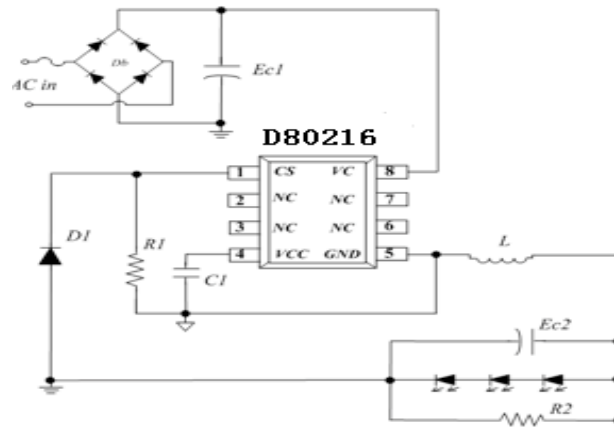


Fig. 1 Schematic diagram of the D80216 application

## Pin package diagram

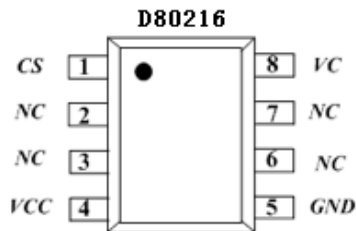


Figure 2 SOP feet



Figure 3 TO-94 feet

## Pin description

Pin name	The main description
CS	The primary side current detection pin
NC	No connection
VCC	Chip power supply
GND	Signal and power
VC	Internal power tube voltage input



## Application of limit parameter (Note1)

Parameters	Range
VCC – GND	-0.3V ~ 6V
VC- GND	0.3V ~ 550V
CS - GND	0.3V ~ 6V
Operating temperature range	.-20°C to +125°C
Junction temperature range	-20°C to +125°C
Storage temperature range	-40°C to +150°C
Electrostatic protection human model	2000V (Note2)
Electrostatic protection machine model	500V

**Note1:** The maximum limit value means, in practical application chip would be permanent damaged beyond that value, and also express the stress value that chip can bear. However we don't advise chip work on the limit condition or beyond "recommended operating conditions". The chip reliability will be affected if long time working in the maximum rated working conditions.

**Note2:** Human model, 100pF capacitor discharges through 1.5K ohm resistance.

## Electrical characteristics (unless otherwise specified, VCC=6V and Ta=25oC)

Description	Symbol	minimum value	typical value	maximum value	Company
<b>CS pin part</b>					
overcurrent limit voltage	Vcs		0.62		V
Leading edge blanking time	LEB		480		nS
<b>VCC pin part</b>					
Starting current	Istart		200		uA
VCC startup voltage	Vcc(on)		5.2		V
VCC turn off voltage	Vcc(off)		3.1		V
VCC quiescent current	Ivcc		0.2		mA
<b>working frequency</b>					
Minimum working frequency	F_min		7		KHz
Maximum operating frequency	F_max		85		KHz
<b>Over temperature protection</b>					
Over temperature protection	T_otp		150		°C
Temperature hysteresis	T_hsy		25		°C
<b>Power tube</b>					



Power tube conductor resistance	Rds_on		20		ohm
Breakdown voltage	BVcbo	550			V

## Function block diagram

### 1, starting circuit

D80216 system integrated with 500V voltage power tube can directly start circuit through the high voltage, without traditional external boot and auxiliary winding, which greatly simplifies the system cost. Compared with traditional resistor divider power supply, D80215 must be more efficiency and faster on the electric machine starting time.

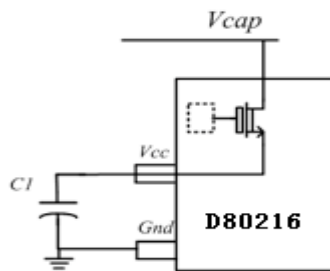


Figure 3: schematic diagram of power supply

### 2, Output constant current setting

The chip internal detects original side peak current transformer by cycle; CS connects to comparator inside of internal peak current, compared with internal reference voltage, so as to control the power tube switch.

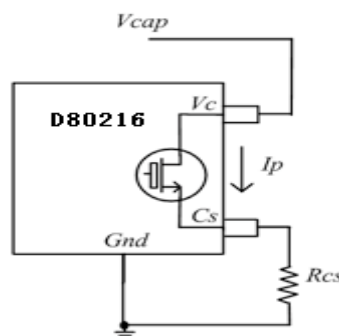




Figure 4: constant current chart

The primary side current:  $I_p = V_{cs} / R_{cs}$

The LED output current:  $I_{out} = 1/2 \times I_p$

Where:  $V_{cs}$  is the chip internal current threshold

$R_{cs}$  is a current detection resistor

The output current can be reasonably set according to the current sampling resistor.

### 3, the inductance calculation

D80216 work in the inductor current critical mode, in each work cycle, the inductor current linear rise from zero to peak, when closed the inductor current linear decline from the peak to zero, at that time the chip internal control power tube open again:

$$T_{on} = L \cdot I_{pk} / (V_{cap} - V_{led})$$

$$T_{off} = L \cdot I_{pk} / V_{led}$$

Combined with more than two formulas available:

$$L = V_{led} \cdot (V_{cap} - V_{led}) / F \cdot I_{pk} \cdot V_{cap}$$

Where:  $T_{on}$  is the conduction time,  $T_{off}$  is closing time

$L$  is the energy storage inductor

$I_{pk}$  is the peak inductor current

$V_{cap}$  is a bus voltage after rectification

$V_{led}$  is the output voltage drop on LED

$F$  is the working frequency of the system

### 4, the protection function

D80216 incorporates several protection features, including intelligent pre judgment of current protection, over temperature current protection, LED open circuit, short circuit protection, CS resistance short-circuit protection. Once the system enter into protection mode, internal chip will automatically shut



off the high voltage power supply, Vcc voltage start to drop; when the Vcc voltage drops to protection threshold, the system automatically restart; system enters hiccup detection mode, until return to normal.

## 5, the D80216 design skills

In the design of D80216 PCB board performance, according to the following principles:

Capacitor besides VCC should be close to the chip VCC and GND pins.

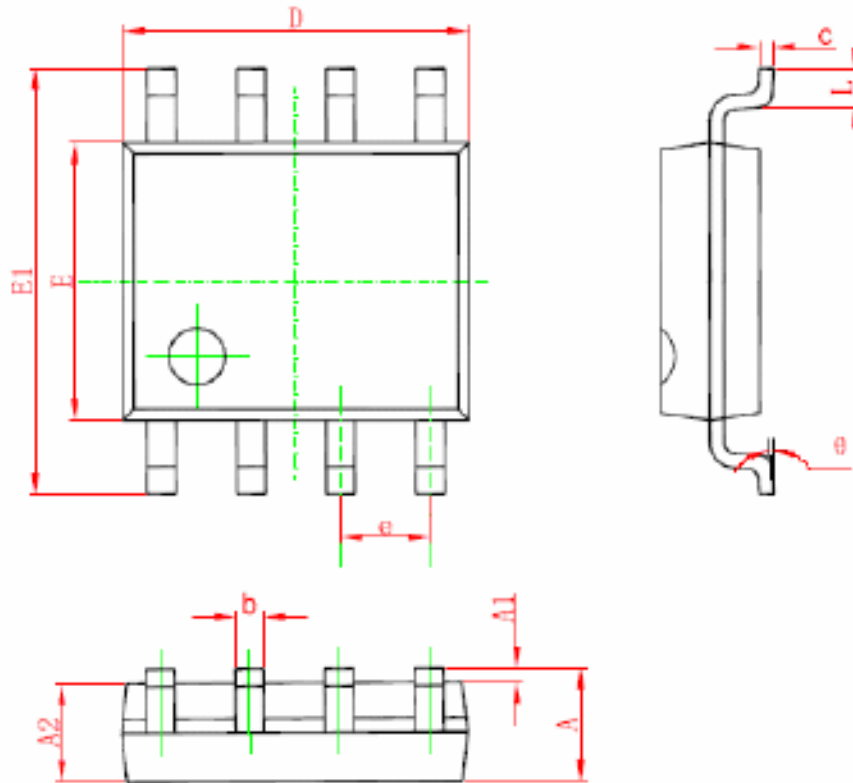
Reduce power loop area, such as loop area of inductance; power tube, that can effectively reduce the EMI radiation.

The wire of CS sampling resistor should be close to earth wire, can effectively reduce the coupling noise, and improve sampling accuracy.

Increasing the laying copper area of VC pin can improve the chip cooling effect



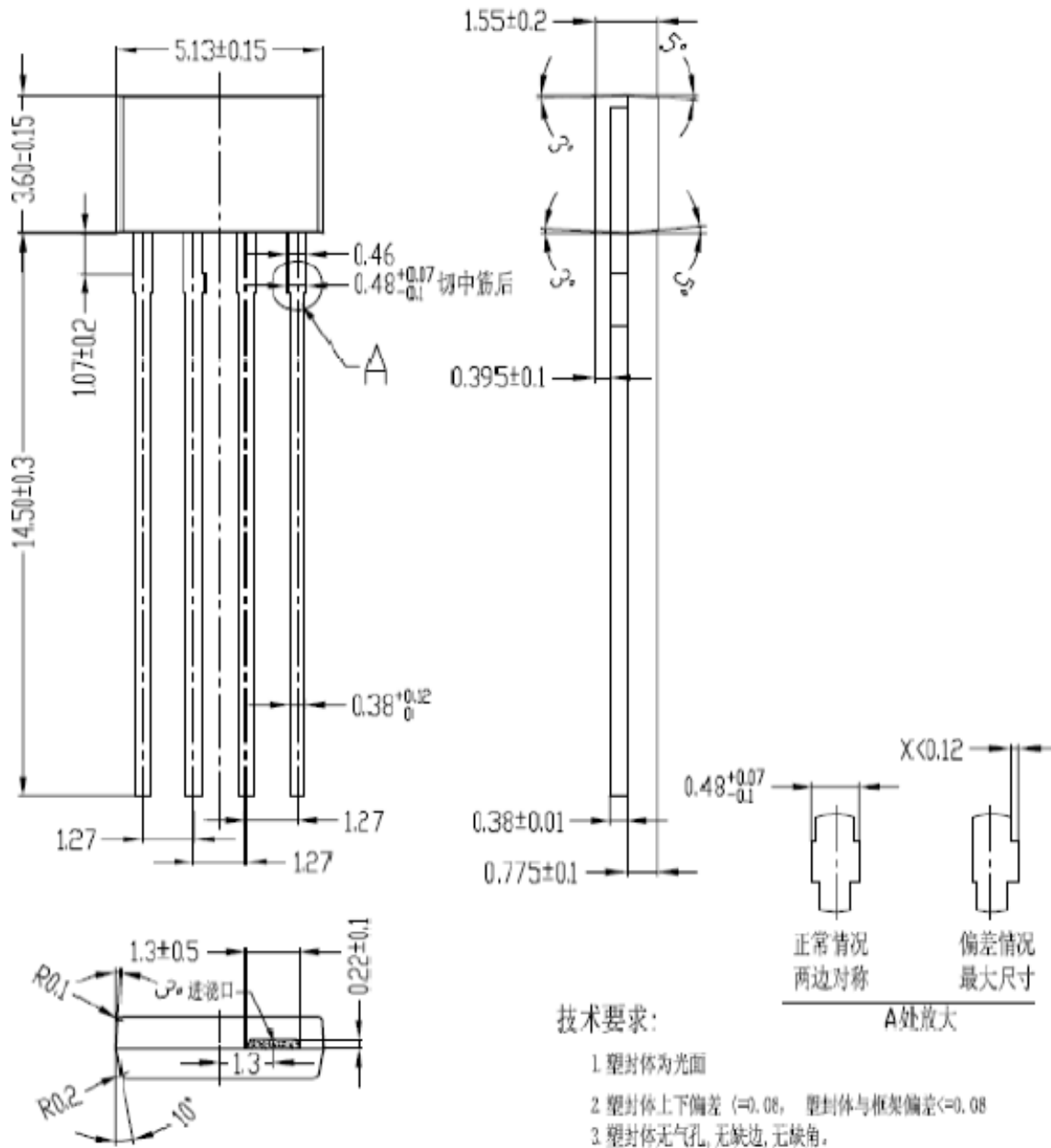
## SOP-8 packaging instruction



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



## TO-94 packaging instruction



### 技术要求:

- 1 塑封体为光面
- 2 塑封体上下偏差  $\leq 0.08$ , 塑封体与框架偏差  $\leq 0.08$
- 3 塑封体无气孔, 无缺边, 无缺角.
- 4 塑封体未注公差  $\pm 0.1$ , 角度公差  $\pm 1^\circ$





日期 Date	版本 Version	说明 Description	制作人 producer	工程师 Engineer	状态 Status
2014-4-25	A0		Elva	林剑波	Denia