



Non-isolated Buck Type Constant Current LED Driver

Description

D80232 is a high precision Buck LED constant current driver. The chip operates in the inductor current critical continuous mode, suitable for non-isolated buck type LED to 100Vac-300Vac input voltage range of the constant current power supply.

D80232 integrated 500V power MOSFET, using patented demagnetization detection technology and technology of high voltage power supply, without auxiliary winding for power supply and detection, the peripheral devices are simple, saving the cost and size of the system.

D80232 is with high precision current sampling circuit, the patent constant current control technology, realize high precision LED constant current output and excellent line voltage adjustment rate. Chip operate inductor current in the critical mode, the output current will not change with the change of inductance and LED operating voltage, excellent load adjustment rate.

D80232 has multiple protection functions, including LED short-circuit protection, under voltage protection, chip overheating temperature regulating function, etc..

D80232 is available TO-92 package.

Features

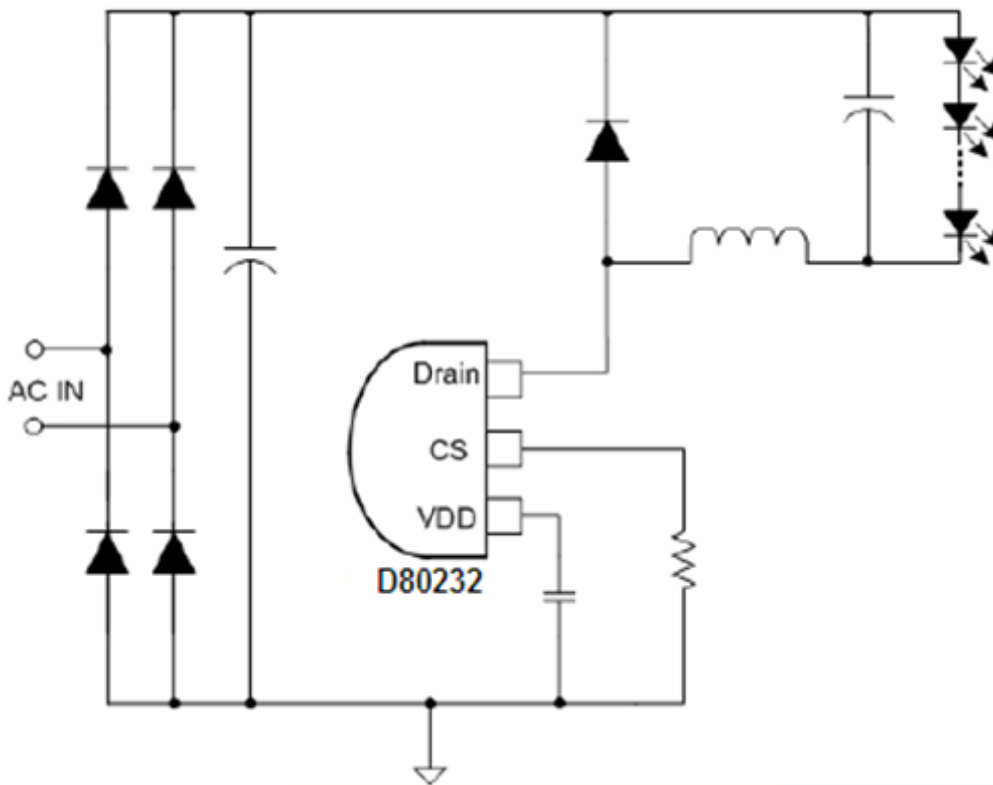
- Single chip integrated 500V power MOSFET
- Integrated high voltage power supply function
- The inductor current critical continuous mode
- Without auxiliary winding detection and power supply
- Wide range input voltage
- $\pm 5\%$ LED output current accuracy
- LED short circuit protection
- Chip power supply under voltage protection
- Overheating adjustment function
- Available TO-92 package

Application

- LED candle lamp
- LED bulb lamp
- LED tube light
- Other LED lighting



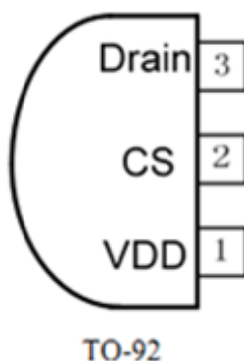
Typical Application



Type	Package	Electric internal resistor (Ω)	Input 175 - 300V		Input 100 - 300V	
			Maximum output current (mA)	Maximum output power (W)	Maximum output current (mA)	Maximum output power (W)
D80232	TO92	12	180mA	20W	150mA	12W



Pin Configuration



Pin Definition

Pin NO.	Pin name	Description
1	VDD	Chip power source.
2	CS	Chip ground and current sampling.
3	Drain	Internal high voltage MOSFET drain.

Absolute Maximum Ratings

Parameter	Range	Unit
supply voltage	7	V
VDD clamp current	10	mA
Internal power MOSFET drain	-0.3 to 500	V
Thermal resistance (TO-92)	83	°C/W
Maximum junction temperature	150	°C
Operating temperature range	-40 to 85	°C
Storage temperature range	-65 to 150	°C
ESD human body model	3	KV
ESD machine model	300	V

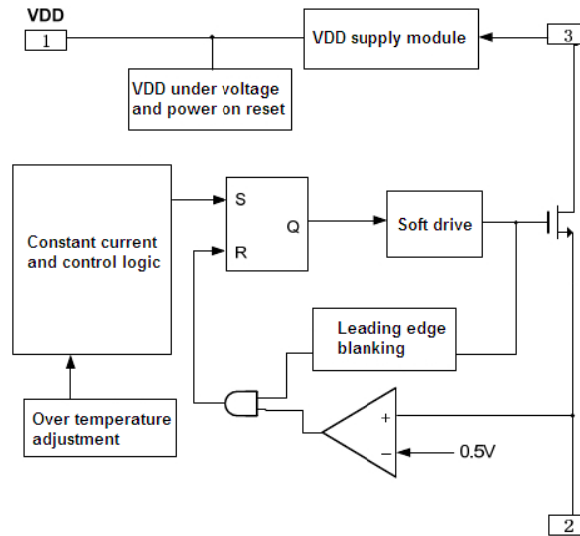


Electrical Characteristics (Unless otherwise specified, T_A =25 °C)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Power supply part (VDD pin)						
I_VDD	Static current			150	260	uA
VDD	Operating voltage of VDD			5.8	6.2	V
UVLO(OFF)	VDD under voltage protection			5.3		V
Ivdd_start	VDD starting-up current			1		mA
Internal control time						
Tmin_OFF	Minimum off time			2		uSec
T_off_max	Maximum degaussing time			250		uSec
T_on_max	Maximum turn-on time			50		uSec
Temperature regulation						
T_reg	Over temperature frequency reducing temperature			155		°C
Current detection						
T_blanking	CS leading edge blanking time			500		nSec
Vth_OC	Cycle by cycle current limit threshold		485	500	515	mV
TD_OC	Chip off delay			150		nSec
D80232 Internal power MOSFET						
BVdss	Drain-Source Breakdown Voltage		500			V
Rdson	Static Drain-source On-resistance	V(Drain)=50mA		12		Ω
Idss	Power MOSFET Drain Leakage Current				10	uA



Internal structure diagram



Application information

D80232 is a special LED lighting and constant current driver, used for non isolated buck type LED driver. Using patented constant current architecture and control method, integrated 500V power MOSFET, only need a few peripheral components can achieve constant current excellent characteristics. And no auxiliary winding power supply and detection, the system cost is very low.

Start – up

Power system, bus wire voltage charge the VCC capacitance through the JFET, when the voltage reaches the VCC threshold, the internal control circuit is started to operate. When the chip operates normally, JFET still to provide operating current .

Constant current control and output current setting

The chip detect the inductance peak current cycle by cycle, CS connected to the internal peak current comparator input, compared with the internal 500mV threshold voltage, when the voltage reaches CS the internal detection threshold, power MOSFET off.

Inductance peak current:

$$I_{pk} = \frac{500mV}{R_{cs}}$$

R_{cs} is current sampling resistor value.

Output of CS comparator includes a 500ns leading edge blanking time.

LED output current formula is as follows:

$$I = \frac{I_{pk}}{2}$$



I_{pk} is the inductor peak current.

Inductance

D80232 operates in the inductor current critical mode, power MOSFET turn-on, current through inductance begins to rise from zero, turn-on time:

$$T_{ON} = \frac{L \times I_{pk}}{V_{IN} - V_{LED}}$$

Inductance peak current as bellow:

$$I_{pk} = \frac{500mV}{R_{cs}}$$

L is the inductance, I_{pk} is the peak of inductance current, V_{IN} is the bus wire voltage after the rectified voltage output: V_{LED} is LED turn on voltage.

When the power MOSFET shut off, the current through the inductance drop down from the peak, when the inductance current drops to zero, the chip logic will turn on MOSFET, again. Power MOSFET off time:

$$T_{OFF} = \frac{L \times I_{pk}}{V_{LED}}$$

Inductance calculation formula

$$L = \frac{V_{LED} \times (V_{IN} - V_{LED})}{f \times I_{pk} \times V_{IN}}$$

f is the operating frequency of the system. D80232 system frequency and input voltage is proportional, the frequency of D80232 system settings, the minimum operating frequency select to the lowest input voltage system setting. When the input voltage is most high, the system frequency is most high.

D80232 set the system minimum and maximum demagnetization time, respectively: 2.5us and 250us. From T_{OFF} calculation formula, if the inductance is very small, the T_{OFF} is likely to be less than demagnetizations minimum time, the system will enter the current and inductance intermittent mode, LED output current will deviate from the design values. When the inductance is large, T_{OFF} may exceed demagnetization time, then the system will enter the inductance and current continuous mode, the LED output current will also deviate from the design values. So, selecting the appropriate inductance value is very important.

Minimum shut-off time

D80232 integrates the minimum shut off time control, typical is 2.5us. The minimum



shut off time can prevent the burr voltage disturbing at power MOSFET turned off at the beginning. It is obvious, when transformer leakage inductance is big and output voltage is low.

Power MOSFET soft driving

D80232 has a built-in soft drive, soft drive mode is to improve the performance of EMI system, realize the balance of power and the reliability, EMI

Protection function

D80232 built-in multiple protection functions, including the LED short circuit protection, VCC under voltage protection, chip over heating temperature regulation. When the LED is short circuited, the system operating at 3KHZ low frequency, so the power consumption is very low.

Over heating regulating function

D80232 has an overheating regulatory function. In the driving power overheating, reduce the output current, so as to control the output power and the temperature rise, to fix the power temperature in the fixed value, in order to improve the reliability of the system. The overheating point is 155°C.

PCB design

In the design of D80232 PCB, you should observe the following:

VDD bypass capacitor

VDD bypass capacitor close to the VCC pin.

CS sampling resistor

The copper foil connecting between CS sampling resistor and VDD bypass capacitance should be as short as possible.

The power loop area

Reducing power loop area is to reduce EMI. Such as power inductance, power MOSFET, bus wire capacitance loop area, and power inductance, rectifier diode, output capacitance loop area.

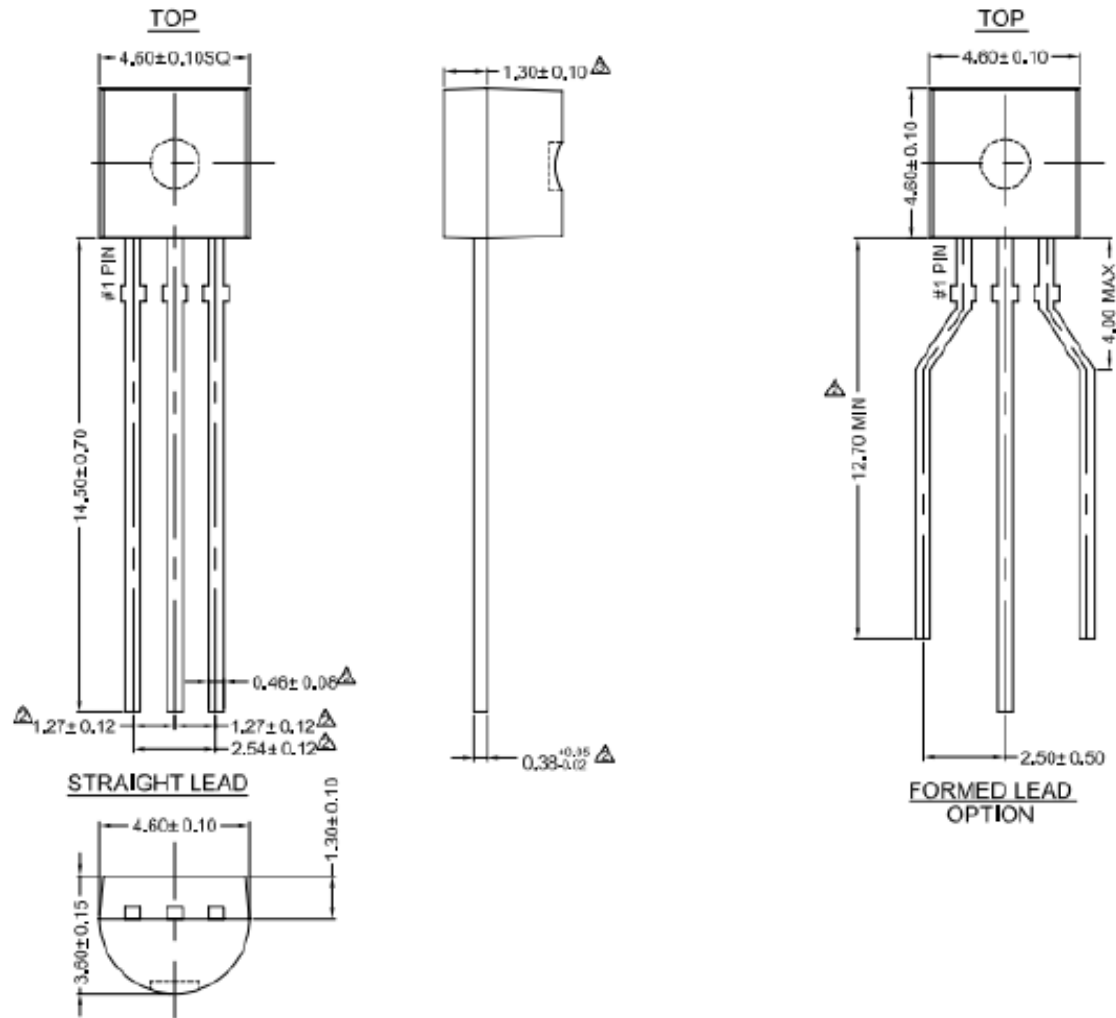
CS pin

Increasing copper area of CS pin is to improve chip cooling.



Physical Dimensions

TO-92





日期 Date	版本 Version	说明 Description	排版 Typeseting	工程师 Engineer	状态 Status
2015-7-13	A0_J	/	Jasper	/	Cancel
2015-6-5	A1_J	/	Jasper	/	Cancel
2015-7-13	A3_J	/	Jasper	/	Cancel
2016-1-22	A4_J	Correct typical application	Jasper	/	Active