Non-isolatedBuck Type LED Driver

Description

D8076D is anon-isolated bulk type LED constant current driver with active PFC, system operating at the bottom of the switch mode, high conversion efficiency, low EMI, high PF, the output current automatically adapt to changes in the amount of inductance and the output voltage, so as to achieve constant current drive LED.

D8076D internal integrated 600V power MOSFET, only a few peripheral devices are needed to achieve excellent constant current output.

D8076Dintegrated multiple protection function, including over voltage protect, short circuit protection, cycle by cycle current protect, dynamic temperature compensation, temperature protection and soft start, and so on.

D8076D has an extremely low start-up current and operating current, can be in full voltage (85VAC~265VAC) range, efficient driver LED.

D8076D is support SOP-7.

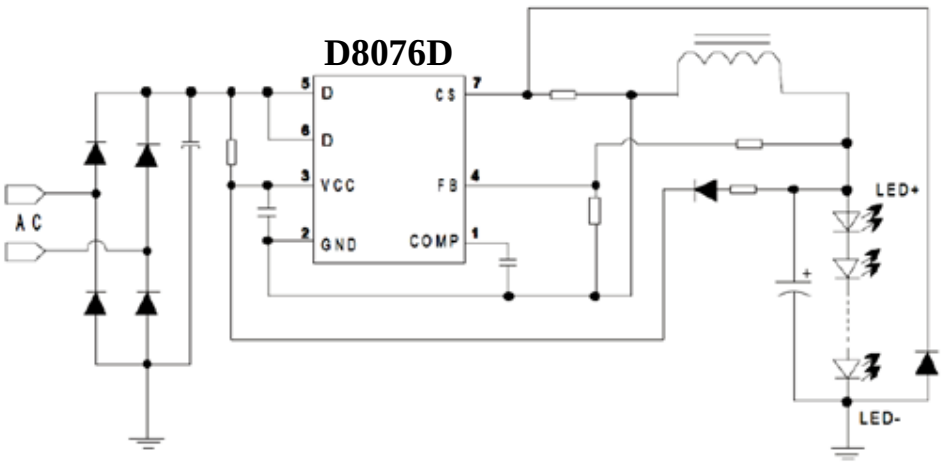
Feature

- High PF, low THD
- Dynamic temperature compensation
- Internal 600V power MOSFET
- No auxiliarycoil supplypower
- Output current high up to 260mA
- The bottom of the switch, high efficiency, low EMI
- Automatic compensation inductance change
- Automatic adaptive output voltage change
- LED short circuit protection
- Over voltage protection
- Chip over heating temperature protection
- Open circuit protect
- Few peripheral components
- SOP-7 package

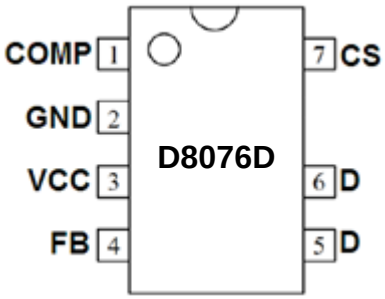
Application

- LED driving power

Typical Application



PIN Configuration



Pin Definition

Pin No.	Name	Description
1	COMP	Loop compensation point, connect capacitor to GND.
2	GND	Ground.
3	VCC	Power supply.
4	FB	Feedback signal input
5, 6	D	Built in high voltage MOSFET Drain
7	CS	Current sampling and internal high voltage MOSFET source

Absolute Maximum Ratings(Note1)

Symbol	Parameter	Range	Units
VCC	Supply voltage input	-0.3 ~ 8.5	V
V_D	Internal power MOSFET drain voltage	-0.3 ~ 600	V
V_{CS}	CS current sampling voltage	-0.3 ~ 7	V
V_{FB}	Feedback voltage input	-0.3 ~ 7	V
V_{COMP}	Loop compensation PIN voltage	-0.37	V
P_{DMAX}	Power	0.5	W
T_J	Maximum operating junction temperature	150	℃
T_{STG}	Minimum / maximum storage temperature	-55~155	℃

Note1: Absolute Maximum Ratings is beyond the operating range, the chip may damage. The recommended operating range is defined within this range, the device functions is normally, but not completely guarantee that meet individual performance index.

Electrical Characteristics（Note 4, 5）（Unless otherwise specified,T_A =25 ℃）

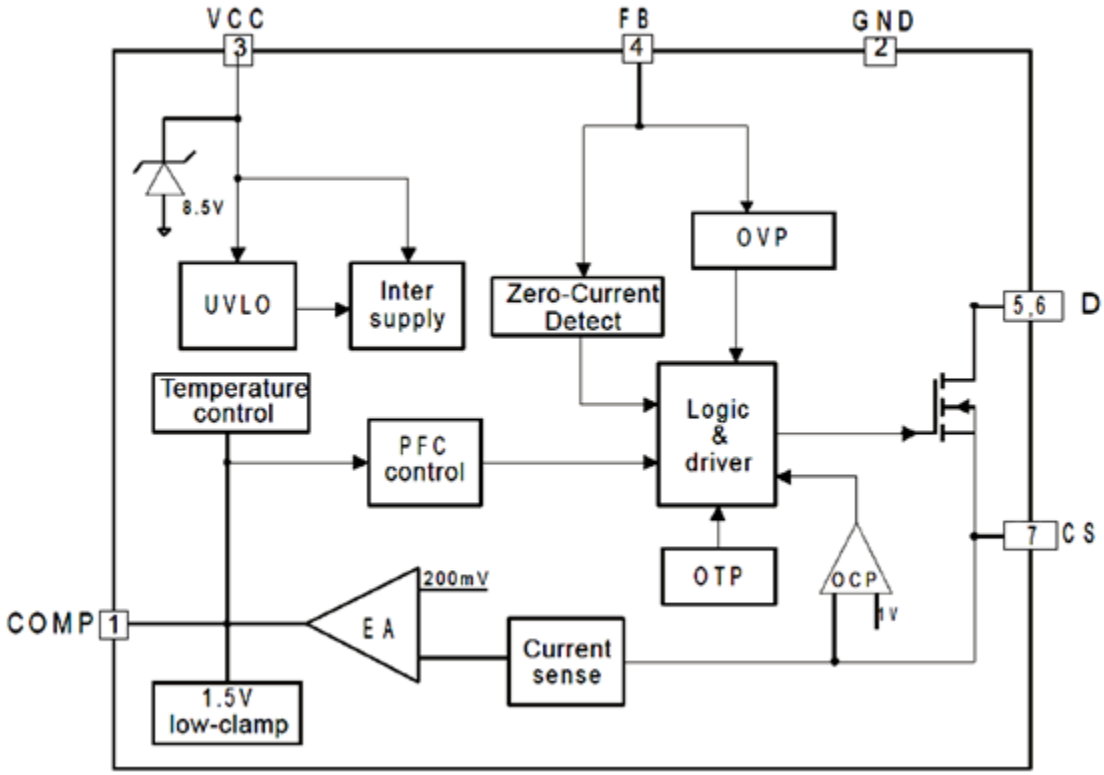
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Power supply voltage						
V_{CC_CLAMP}	V_{CC}Clamp voltage		7.8	8.5	9.3	V
I_{CC_CLAMP}	V_{CC} clamp current				5	mA
V_{CC_ST}	Chip start-up voltage	VCC rise		7.5		V
V_{UVLO_HYS}	Hysteresis of under voltage protection	VCC drop		1.5		V
I_{ST}	Starting current	VCC<VCC_ST-0.5V		70	100	μA
I_{OP}	Operating current			400		μA
Current sampling section						
V_{OCP}	Over current protection threshold			1		V
T_{LEB}	Current sampling blanking time			350		ns
Td	Turn off delay			200		ns
Loop compensation						
V_{REF}	Internal reference voltage		194	200	206	mV
V_{CL}	Comp under voltage clamp			1.5		V
V_{CH}				4		V
Internal drive						
T_{OFF_MIN}	Minimum demagnetization time			3		us
T_{ON_MAX}	Maximum demagnetization time			20		us
Feedback input section						
V_{FB}	OVP threshold voltage			1.6		V
V_{ZCD}	Zero crossing check threshold			0.2		V

High voltage power MOSFET section						
R_{DS_ON}	High voltage MOSFET conduction resistance	V_{GS}=10V, I_D=0.5A		7		Ω
V_{DS}	MOSFET drain source breakdown voltage	V_{GS}=0V, I_D=250uA	600			V
Overheating temperature protection						
T_{SD}	Overheating shutdown voltage			160		℃
T_{SD_HYS}	Overheating protect sluggish			30		℃

Note 4: The typical parameters values is tested under typical parameters, in 25 ℃.

Note 5: Specifications, the maximum / minimum specification range ensure by testing, typical value ensure by test or statistical analysis.

Internal structure diagram



Application information

D8076D is an active PFC non isolated buck type constant current driving integrated circuit, integrated high voltage 600V MOSFET. D8076D use the bottom switching mode, automatic adaptive inductorinductance and the output voltage changes, requiring only a few peripheral components to realize constant current LED driver.

Start-up

Start-up current is very low, the typical value is 70uA (Maximum value is 100uA), if the system start-up voltage is 85V, the start-up resistor be set as:

$$R = \frac{85 \times \sqrt{2}}{100} = 1.2M$$

IC power supply

After D8076D start-up, IC power supply form output voltage, the D6 select fast recovery rectifier diode for diode. Current limiting resistor R4:

$$R4 = (1 - D) \times \frac{V_{LED} - 9}{400uA}$$

D is the duty cycle, 400uA is chip normal operating current, V_{LED} is output load voltage, the resistor power consumption:

$$P_{R4} = \frac{(V_{LED} - 9)^2}{R4} \times (1 - D)$$

For example

Solution requirement: input voltage is 180 ~ 260Vac, output voltage 36 ~ 80V, output current 240mA

Above the solution, the resistance R4 should be require as bellow:

1, The minimum input voltage is 180V, when the minimum output voltage is 36V the condition is (the weakest supply voltage), D=36/180/1.414=0.141，R4=(1-0.141)×(36-9) / 400uA=58K.

2, The maximum input voltage is 260Vac, the maximum output voltage is 80V (the strongest supply voltage), the resistor power loss condition is: D=80/260/1.414=0.218, the resistor power loss is P=(80-9)×(80-9) /58×(1-0.218)=68 mW.

Collection resistor

D8076D is anon-isolated bulk type LED controller with high PF, system operating at the bottom of the switch mode. It needsjust a few peripheral devices to achieve high accuracy

of the constant current output. System detects the inductor peak current, real-timecontinuous. CSPIN connects chip inside, and compare with the internal 200mV voltage, internal operational amplifier output COMP to adjust conduction time, to make the CS average value equal to 200mA after the system is stable. In addition, CS also set up a 1V cycle by cycle overcurrent protection threshold.

The formula for LED output current is

$$I_{LED} = \frac{0.2V}{R_{CS}}$$

FB voltage detection

The voltage of the FB PIN determines the operating state of the system. When the FB voltage is more than 1.6V (typical value), D8076D will automatically determine for output over-voltage protection,the system will enter the power-saving hiccup mode,the output voltage of the overvoltage protection as bellow:

$$\boldsymbol{V_{OVP} = 1.6 \times \frac{R2 + R3}{R3}}$$

R2, R3, please refer to the typical application schematic diagram, which R3=1K. (not higher than 2K), constant value in the formula above 1.6 in system design should use 1.3, if Vovp=90V,from the above formula can calculate the R2=56K. Here, we can take the resistor of 60K (choose a nominal value as big as possible). Due to the VFB2 is between 1.3 - 1.9, choice of capacitor C4 pressure voltage should be used to 1.9 to calculate, Vovp = 1.9 ×（1+60）/ 1 =116V, and C4 pressure voltage choice must be higher than this voltage, here you can select 200V capacitor. D8076D enters hiccup mode, automatic detects voltage output, when the output voltage is less than the Vovp, the system will re entering the normal operating state.

Output open / short circuit protect

D8076D integrate output open / short circuit protection, once it detect open/short circuit, system will automatic enter hiccup mode, till to open / short circuit protect condition remove.

Overheating automatic adjust the output current

D8076D is include overheating adjusting function, the output current is reduce gradually when the drive power overheating, so as to control the output power and temperature rising, to make the power temperature keep in the fixed value, to improve system reliability. The chip internal overheating temperature set in 135℃.

Input filter capacitor

In order to get a high PF value, the input capacitor cannot be too large, the proposed 10-100nF.

Power factor

D8076D built in the active PFC control circuit, it can get a high PF value and low THD.

PCB Design

In the design of D8076D PCB, need to follow the guidelines:

Bypass capacitor

Bypass capacitor of VCC need to close to the chip VCC and GND PINs.

GND wire

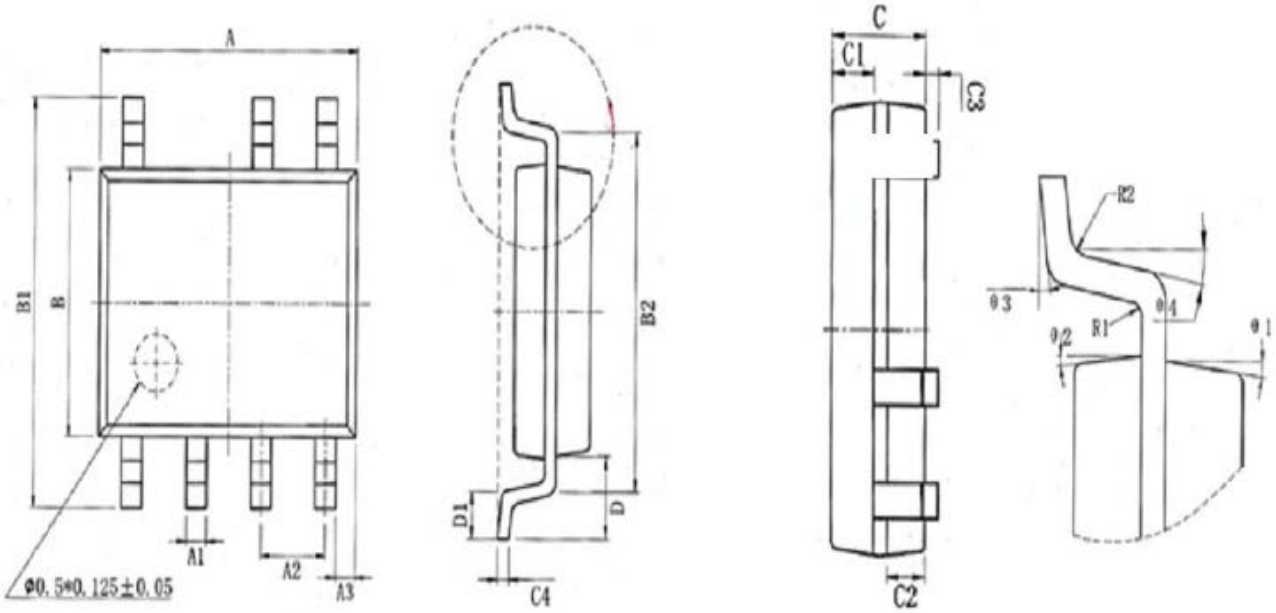
The power wire of GND of current sampling resistor should be as short as possible. In addition, chip's GND wire andothers small signal GND requires a separate connection to the Bulk capacitor ground.

The power loop area

To reduce the EMI, the power loop circuit should be as small as possible. The Chip should be away from the continuous flow diode and other heating elements

Package Dimensions

SOP-7



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.8	5	0.189	0.1968
A1	0.356	0.456	0.014	0.018
A2	1.27(BSC)		0.05(BSC)	
A3	0.345(BSC)		0.0136(BSC)	
B	3.8	4	0.1496	0.1575
B1	5.8	6.2	0.2283	0.2441
B2	5(BSC)		0.1968(BSC)	
C	1.450	1.550	0.0571	0.061
C1	0.55	0.65	0.0217	0.0256
C2	0.55	0.65	0.0217	0.0256
C3	0.05	0.2	0.002	0.0079
C4	0.203	0.233	0.0080	0.0092
D	1.05(BSC)		0.041(BSC)	
D1	0.4	0.8	0.0157	0.0315
R1	0.2(BSC)		0.0079(BSC)	
R2	0.2(BSC)		0.0079(BSC)	
θ1	14^0(BSC)		14^0(BSC)	
θ2	13^0(BSC)		13^0(BSC)	
θ3	0^0	8^0	0^0	8^0
θ4	4^0	12^0	4^0	12^0

日期 Date	版本 Version	说明 Description	排版 Typesetting	工程师 Engineer	状态 Status
2016-1-04	A0_J	/	Jasper	/	Cancel
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