

BP5131JC

High Voltage Linear LED Driver

Description

BP5131JC is a high-precision linear constant current LED driver, integrated with high-voltage power supply via JFETs. It is specially designed for LED strings with high voltage and low current supplied by mains voltage. Needless for magnetic components, LED driver system can achieve small size and EMI compliance in application.

BP5131JC allows precise setting for LED current via external resistor. It also has an over-temperature regulation function to ensure high reliability of the system.

BP5131JC is available with the package of SOT89-3.



Features

- ◆ High integration for very simple peripheral circuits
- ◆ No magnetic components
- ◆ Integrated with 500V MOSFET
- ◆ Fast startup
- ◆ $\pm 5\%$ accuracy for LED current
- ◆ LED current set externally
- ◆ Over temperature regulation integrated
- ◆ SOT89-3 package

Application

- ◆ GU10/E27 LED bulbs, spotlights
- ◆ LED candle lights
- ◆ Other LED lights

Typical Application

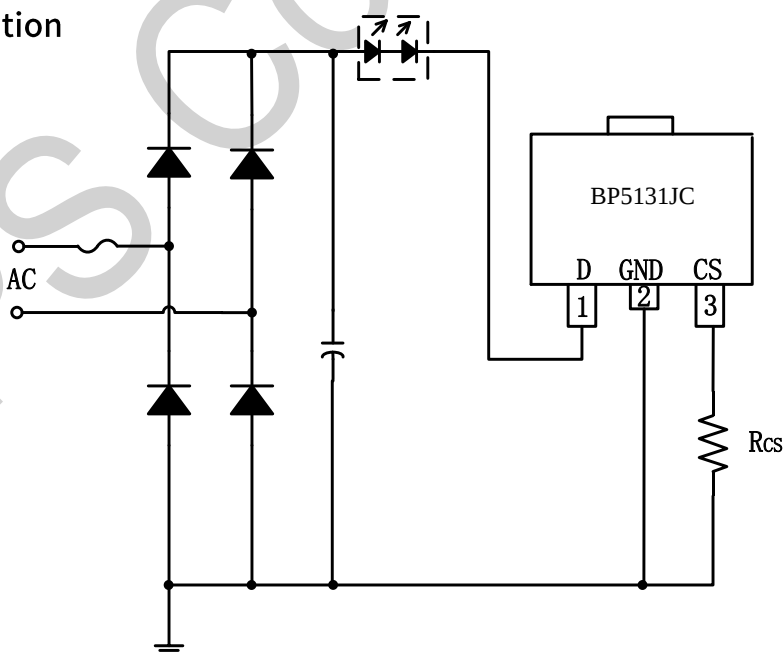
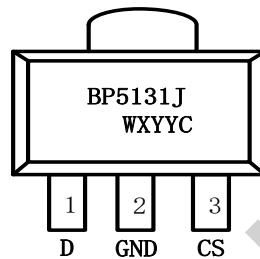


Fig.1 BP5131JC Typical Application

Order Information

Part Number	Package	Temperature	Packing Method	Mark
BP5131JC	SOT89-3	-40 °C to 105 °C	Tape 4000 pcs/reel	BP5131JC WXYXC

Pin mapping



WX: Sign
YY: Week
C: Product Code

Fig 2 BP5131JC Pin Mapping

Pin Definition

Pin No.	Pin Name	Descriptions
1	D	Drain for LED string
2	GND	IC ground
3	CS	Current sense, connect the current sense resistor to GND

Absolute Maximum Ratings (Note1)

Symbol	Parameter	Range	Unit
D	The voltage of internal MOSFET' s drain	500	V
I _{D_MAX}	Saturation current @ T _{J_max}	80	mA
CS	The voltage of current sense pin	-0.3~6	V
P _{DMAX}	Power dissipation (note 2)	1.25	W
θ _{JA}	Thermal resistance	100	°C/W
T _J	Junction temperature range	-40 to 150	°C
T _{STG}	Storage temperature range	-55 to 150	°C

Note 1: Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. Under “recommended operating conditions” the device operation is assured, but some particular parameter may not be achieved. The electrical characteristics table defines the operation range of the device, the electrical characteristics is assured on DC and AC voltage by test program. For the parameters without minimum and maximum value in the EC table, the typical value defines the operation range, the accuracy is not guaranteed by spec.

Note 2: The maximum power dissipation decrease if temperature rise, it is decided by T_{JMAX}, θ_{JA}, and environment temperature (T_A). The maximum power dissipation is the lower one between $P_{DMAX} = (T_{JMAX} - T_A) / \theta_{JA}$ and the number listed in the maximum table.

Electrical Characteristics (note3, 4) (unless specified, otherwise $T_A=25\text{ }^{\circ}\text{C}$)

Symbol	description	Test condition	Min.	Typ.	Max.	UNIT
Operation Current						
I_{CC}	Operation current	D=30V		90	160	μA
Current Sense						
V_{REF}	Current sense reference voltage	D=30V, $R_{CS}=120\Omega$		600		mV
Thermal Regulation						
T_{REG}	Thermal Regulation			150		$^{\circ}\text{C}$

Note 3: Production testing of the chip is performed at 25°C .

Note 4: The maximum and minimum parameters specified are guaranteed by test, the typical value are guaranteed by design, characterization and statistical analysis

Block Diagram

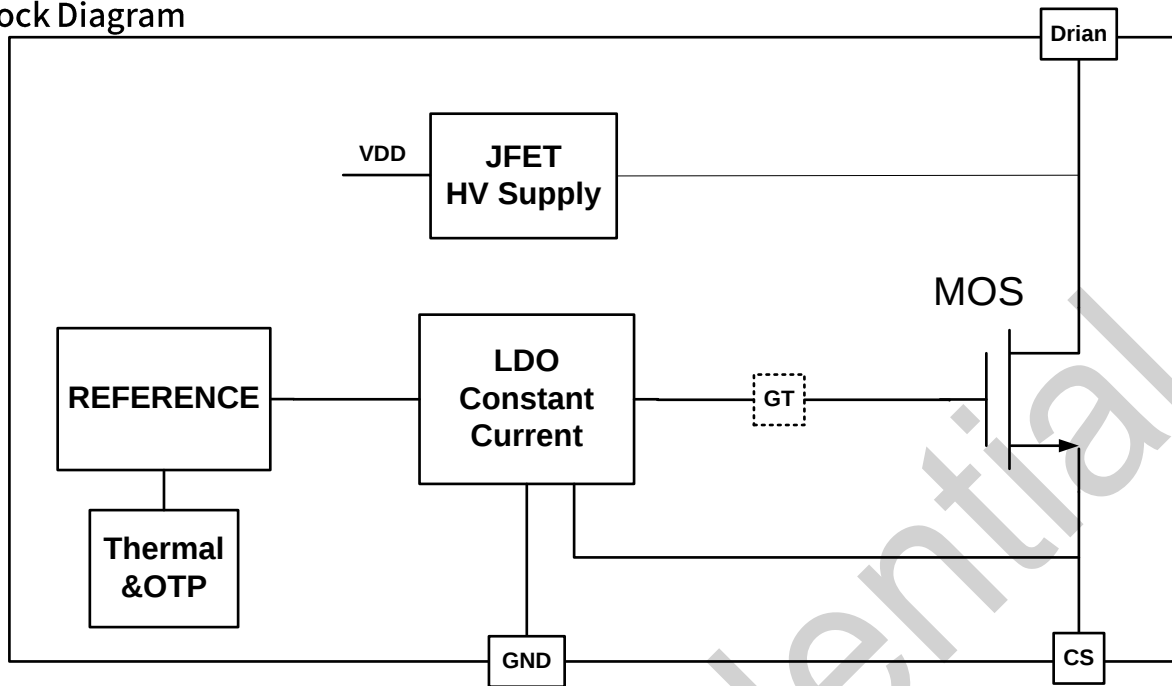


Fig3 BP5131JC Block Diagram

Application Information

BP5131JC is a high-precision linear constant current LED driver for LED strings with high voltage low LED current in AC line application.

Power supply

After system power on, the chip is supplied by pin D through internal high-voltage JFET, and it starts to work when the voltage at the pin D exceeds 10V.

Current configuration

BP5131JC allows precise setting for LED current via external resistor. The LED current is calculated as the following:

$$I_{LED} = \frac{V_{ref}}{R_{cs}}$$

V_{ref} is the current sense reference voltage;

R_{cs} is the external current sense resistor.

Considering the temperature rise of IC, the LED current is recommended below 30mA at 220Vac and

below 50mA at 110Vac respectively.

Over temperature regulation

BP5131JC has an over-temperature regulation function that gradually reduces the output current when overheated. Thus it keeps the temperature rise at the set value to improve the reliability of the system.

The inner setting value of over temperature regulation could refer to the EC table above.

PCB Layout design

Suggestions for BP5131JC PCB layout:

GND

The trace for current sense resistor to GND should be as short as possible. And the GND copper area should be as large as possible to reduce thermal resistance and enhance heat dissipation.

Heat sink

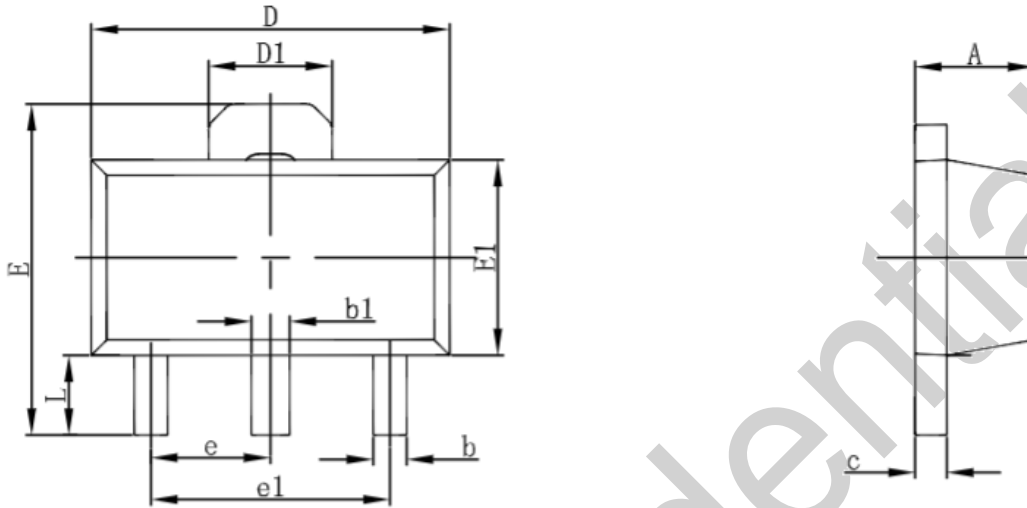
BP5131JC adopts SOT89-3 package with a heat sink (connected to GND inside the chip) on the

bottom for enhanced thermal dissipation, so it is necessary to connect the heatsink to the PCB copper area as large as possible.

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Physical Dimensions

SOT89-3 PACKAGE OUTLINE DIMENNSIONS



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.40	—	1.70
b	0.30	—	0.50
b1	0.36	—	0.56
c	0.35	—	0.50
D	4.40	—	4.70
D1	1.55REF		
E	3.878	—	4.478
E1	2.35	—	2.65
e	1.00	—	2.00
e1	2.00	—	4.00
L	0.80	—	1.20

Revision Information

Revision	Date	Notes
Rev.1.0	2023/05	Preliminary

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