

### Description

BP5151HC is a high current precision Linear LED Driver, integrated with High Voltage regulation switchers and JFET supply, specially designed for AC line LED strings forwarded with high voltage and low current.

In application, it supports a quite small BOM benefit from no ECAP and no Magnetics, compile with EMI and safety standard.

BP5151HC can drive precision constant current by option of an external resistor, and set up the LED strings in group linear compile with THD performance. Typical 40mA LED current is optimized for 220V line voltage.

BP5151HC invite an external resistor to fulfill the line regulation and adjust the output current following input voltage.

### Features

- ◆ High integration, all SMTs in small size.
- ◆ No ECAPs and magnetics
- ◆ Integrated with 500V HV MOS, saved on safety components.
- ◆ Fast startup
- ◆ LED current set by external resistors with  $\pm 5\%$  accuracy.
- ◆ On chip thermal regulation
- ◆ Compensation for line regulation
- ◆ In ESOP8 package
- ◆ Temperature adjustment with  $\pm 3^{\circ}\text{C}$  accuracy

### Application

- ◆ GU10/E27 LED retrofit lamps
- ◆ LED candle
- ◆ Other LED lighting

### Typical Application

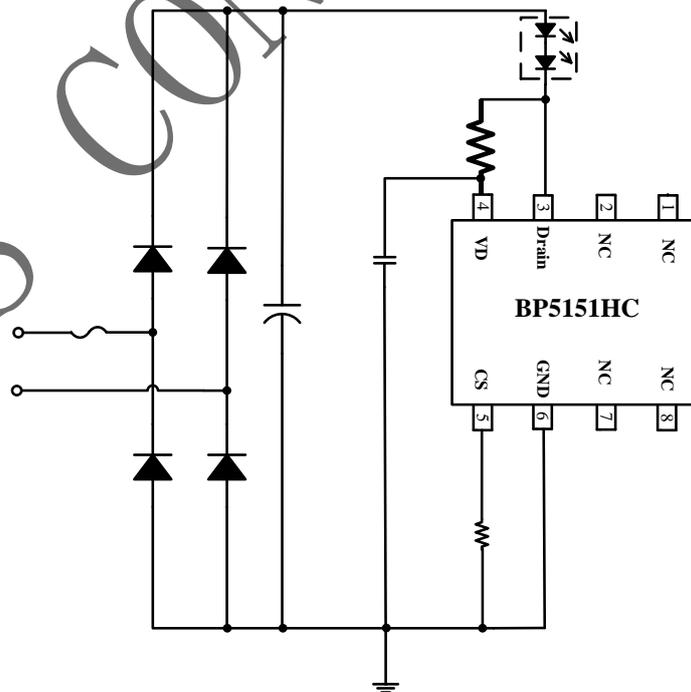
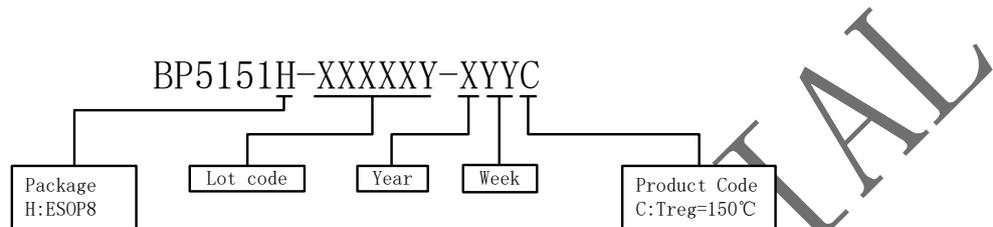


Fig.1 BP5151HC Typical Application

### Order Information

Part Number	Package	Temperature	Temperature adjustment	Packing Method	Mark
BP5151HC	ESOP8	-40 °C to 105 °C	T <sub>REG</sub> : 150 °C	Tape 4000 pcs/reel	BP5151H XXXXXY YYC



### Pin mapping

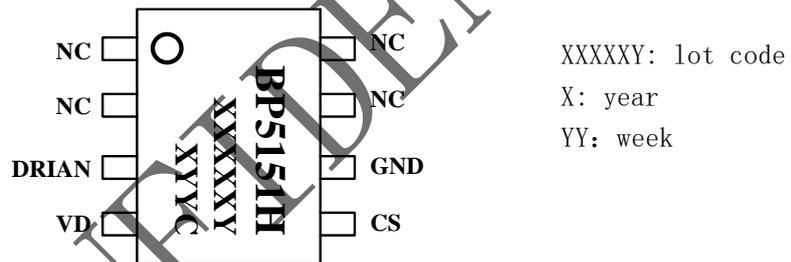


Fig 2 BP5151HC Pin Mapping

### Pin Descriptions

Pin No.	Pin Name	Descriptions
1,2,7,8	NC	Not connect
3	D	Drain for LED string
4	VD	Drain signal input, need connect resistor to Drain Pin
5	CS	Current sense, connect the current sense resistor to GND
6	GND	IC ground



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High Voltage Linear LED Driver

## Absolute Limit (Note1)

Symbol	Parameter	Range	Unit
D	500V HV interface	500	V
I <sub>D_MAX</sub>	Saturation current @ T <sub>J_max</sub>	80	mA
CS	Low voltage pins	-0.3~6	V
VD	Compensation pins interface	-0.3~6	V
P <sub>DMAX</sub>	Power dissipation (note 2)	1.25	W
θ <sub>JA</sub>	Thermal Resistor	100	°C/W
T <sub>J</sub>	Junction Temperature	-40 to 150	°C
T <sub>STG</sub>	Storage temperature range	-55 to 150	°C
	ESD (Note 3)	2	KV

**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<sub>JMAX</sub>, θ<sub>JA</sub>, and environment temperature (T<sub>A</sub>). The maximum power dissipation is the lower one between P<sub>DMAX</sub> = (T<sub>JMAX</sub>-T<sub>A</sub>) / θ<sub>JA</sub> and the number listed in the maximum table.

**Note 3:** Human Body mode, 100pF capacitor discharge on 1.5KΩ resistor



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## Electrical Characteristics (note4, 5) (unless specified, otherwise T<sub>A</sub>=25 °C)

Symbol	description	Test condition	Min.	Typ.	Max.	UNIT
<b>Operation Current</b>						
I <sub>CC</sub>	Operation current	D=30V		95	160	uA
<b>Current Sense</b>						
V <sub>REF</sub>	Ref. for string1	D=30V, R <sub>CS</sub> =120Ω		600		mV
<b>Thermal Regulation</b>						
T <sub>REG</sub>	Thermal Regulation	BP5151HC		150		°C

Note 4: Production testing of the chip is performed at 25°C.

Note 5: The maximum and minimum parameters specified are guaranteed by test, the typical values are guaranteed by design, characterization and statistical analysis

### Block Diagram

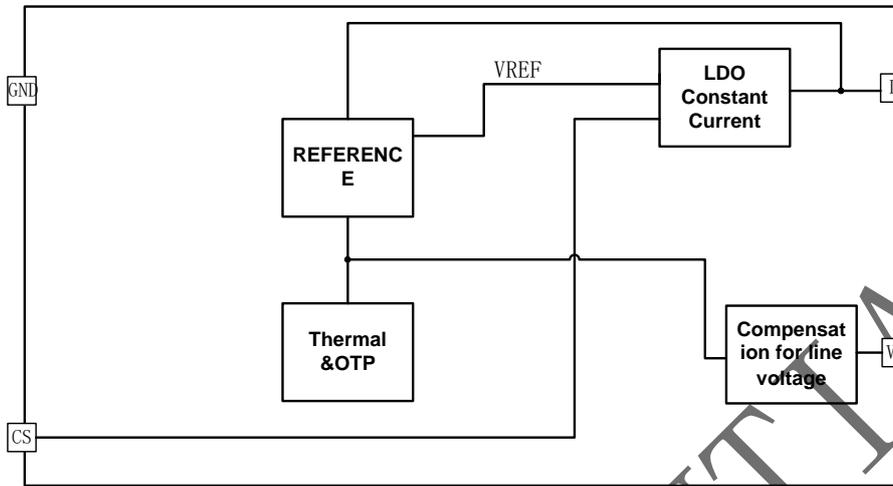


Fig3 BP5151HC Block Diagram

### Application Information

BP5151HC is designed for linear driving LED strings with high forward voltage low LED current in line condition.

#### 1 Supply

After system power on, the chip is supplied by JEFT through D, starting work once voltage on D above 10V.

#### 2 Operation principle

BP5151HC auto adjust the LED strings in working according to line voltage and extend the LED working slots in every main cycles with purpose of output  $I_m$  maintenance and LED availability improvement. For different application, the forward voltage should match the input voltage to obtain higher efficiency, like 110V and 220V respectively.

#### 3 Current configuration

BP5151HC supports high precision LED current set by external resistors.

Current for LED string defined as:

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

As recommended, in application case of 220V line condition, set the LED less than 40mA depend on thermal capability of heatsinking.

#### 4 Compensation for line voltage

IC has a line voltage compensation function. As the input voltage increases, the voltage on Drain increases. The reference voltage is reduced by the VD pin, which reduces the output current and achieves better linear regulation.

The decreased value is defined as:

$$V_{REF} = 0.6V - \frac{2.1K\Omega}{R_D} * V_D$$

#### 5 Thermal regulation

BP5151HC has thermal regulation available on chip to balance the power delivering and temperature increasing. To improve the system reliability, the output current to be regulated lower down refer to the junction temperature.



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## 6 PCB Layout design

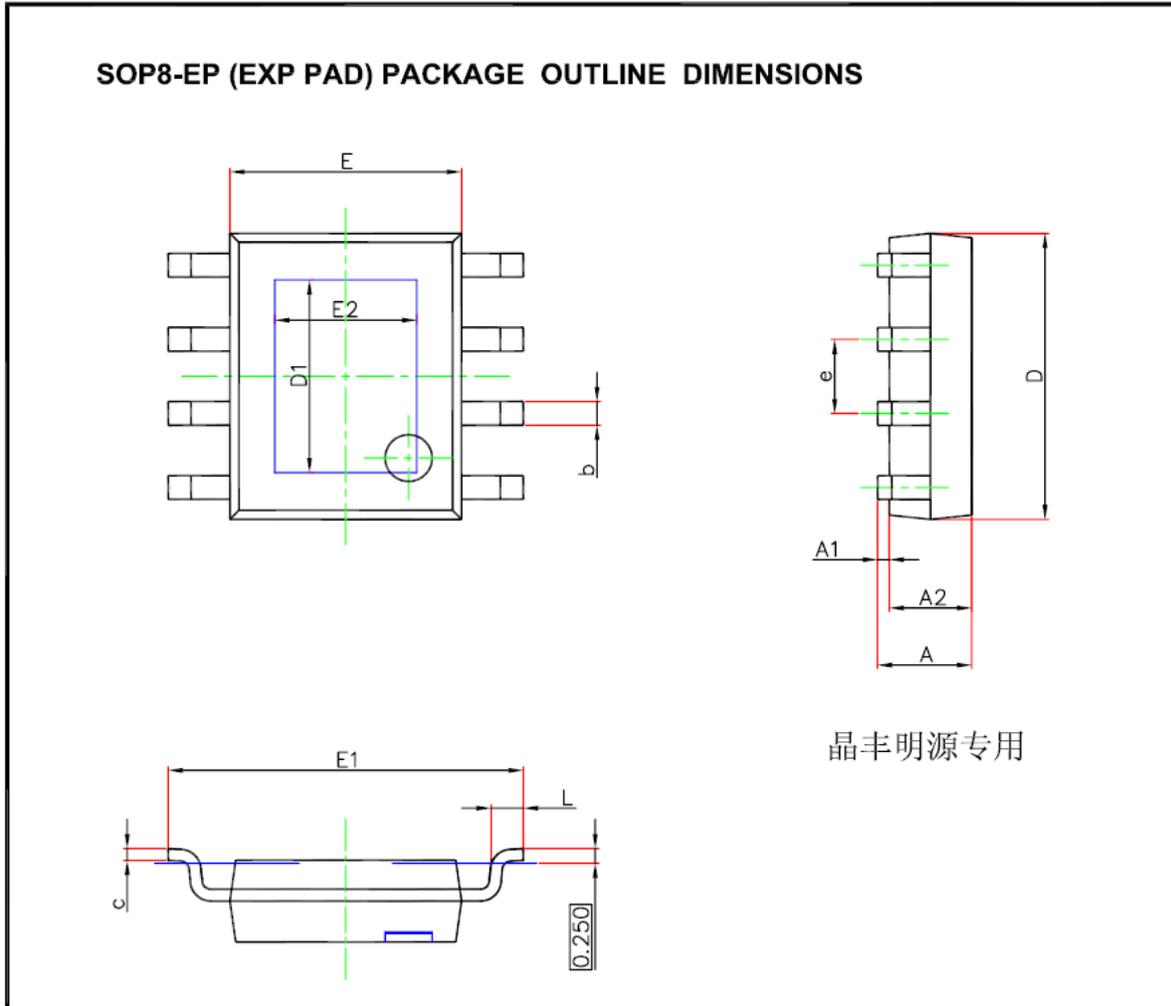
Suggestion for BP5151HC PCB layout:

GND: Use the trace for current sense resistor as short as possible. Extend the copper area for D Pin to improve good thermal condition.

Heat sinking: BP5151HC adopted ESOP8 package to strengthen the thermal dissipation, so that extend thermal pad for further.

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### Package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.700	0.053	0.067
A1	0.000	0.100	0.000	0.004
A2	1.350	1.550	0.053	0.061
c	0.170	0.250	0.007	0.010
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
L	0.400	1.270	0.016	0.050
b	0.330	0.510	0.013	0.020
D	4.700	5.100	0.185	0.201
D1	3.202	3.402	0.126	0.134
e	1.270 BASIC		0.050 BASIC	
θ	0°	8°	0°	8°