BP5153HT

TRIAC Dimming

Multi-channel Linear LED Driver

Description

BP5153HT 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.

BP5153HT can drive precision constant current by option of an external resistor, and set up the LED strings in group linear compatible with TRIAC dimmer. Typical 9W is optimized for 120V line voltage. BP5153HT integrates internal thermal regulation function to prevent over driving in high input voltage.

BP5153HT integrates active bleeding current control to improve TRIAC dimmer compatibility. BP5153HT automatically adjust the output current following input voltage to improve PF and THD.

Features

- Compatible with TRIAC dimmer.
- High integration，all SMTs in small size.
- No ECAPs and magnetics.
- Integrated with 500V HV MOS, saved on safety components.
- Align working with ±20% tolerance on line voltage.
- Fast startup.
- LED current set by external resistors with ±5% accuracy.
- In SOP8-EP package.

Application

- GU10/E27 LED retrofit lamps
- LED spot light/ floodlit lamps
- Other LED lighting

Typical Application

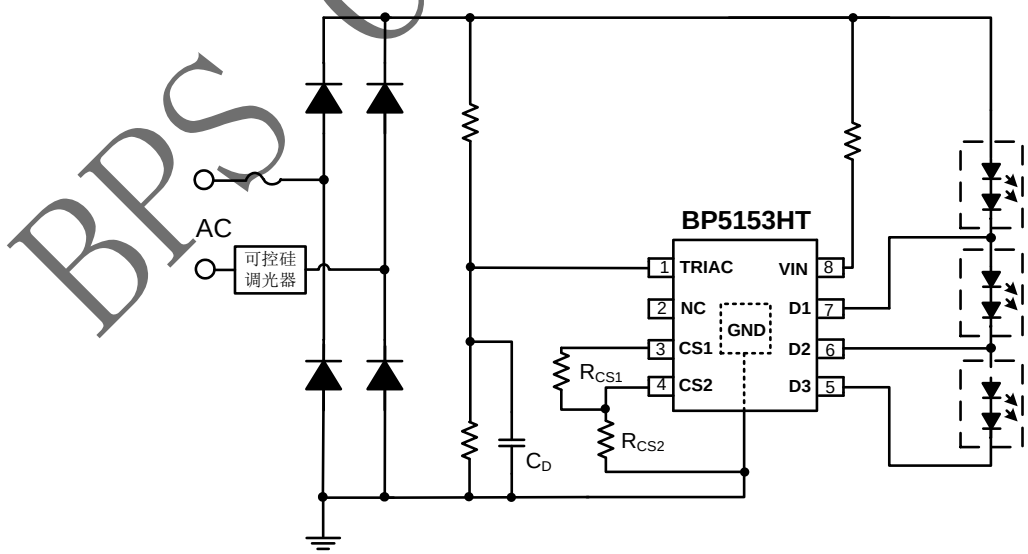
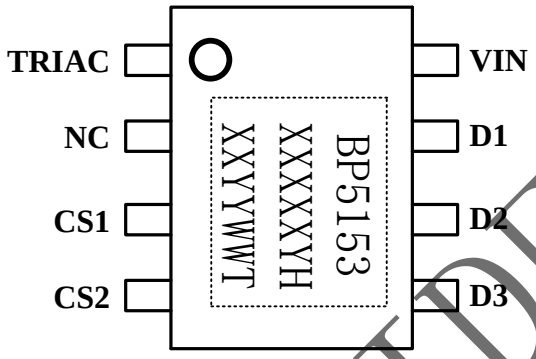


Fig.1 BP5153HT Typical Application

Order Information

Part Number	Package	Temperature	Packing Method	Mark
BP5153HT	SOP8-EP	-40 ℃ to 105 ℃	Tape 4,000 pcs/reel	BP5153 XXXXXYH XXYYWWT

Pin mapping



XXXXXY：Lot Code
XXYY：Mark
WW： Week

Fig 2 Pin Mapping

Pin Descriptions

Pin No.	Pin Name	Descriptions
1	TRIAC	TRIAC dimming control
2	NC	Floating
3	CS1	Bleeding current setting Pin, connect the current sense resistor to CS2
4	CS2	LED Current sense, connect the current sense resistor to GND Pin
5	D3	Drain for LED string3
6	D2	Drain for LED string2
7	D1	Drain for LED string1
8	VIN	High voltage power supply Pin
EXP Pad	GND	IC ground, heat dissipation enhancement

Absolute Limit (Note1)

Symbol	Parameter	Range	Unit
VIN, D1, D2,D3	500V HV pins	500	V
CS1,CS2,TRIAC	Low voltage pins	-0.3~6	V
P_{DMAX}	Power dissipation (note 2)	1.25	W
θ_{JA}	Thermal Resistor	100	℃/W
T_J	Junction Temperature	-40 to 150	℃
T_{STG}	Storage temperature range	-55 to 150	℃

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 (note4, 5) （unless specified, otherwise T_A=25 ℃）

Symbol	description	Test condition	Min.	Typ.	Max.	UNIT
Power Supply						
I_{CC}	Operation current	VIN=30V		200		uA
BV_{DVIN}	VIN breaking down voltage		500			V
I_{DSS_VIN}	VIN saturation current			40		mA
Current Sense						
V_{REF_VIN}	Ref for VIN	V_{VIN}=30V, R_{CS}=120Ω		495		mV
V_{REF1}	Ref. for string1	V_{VIN}, V_{D1}=30V, R_{CS} =120Ω		450		mV
V_{REF2}	Ref. for string2	V_{VIN}, V_{D2}=30V, R_{CS} =120Ω		600		mV
V_{REF3}	Ref. for string3	V_{VIN}, V_{D3}=30V, R_{CS} =120Ω		900		mV
LED String Connect Pin (D1,D2,D3,D4)						
BV_{D1}	D1 breaking down voltage		500			V
I_{DSS1}	D1 saturation current			60		mA
BV_{D2}	D2 breaking down voltage		500			V
I_{DSS2}	D2 saturation current			80		mA
BV_{D3}	D3 breaking down voltage		500			V
I_{DSS3}	D3 saturation current			140		mA
Thermal regulation						
T_{REG}	Thermal Regulation trigger temperature			140		℃

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 value are guaranteed by design, characterization and statistical analysis*

Block Diagram

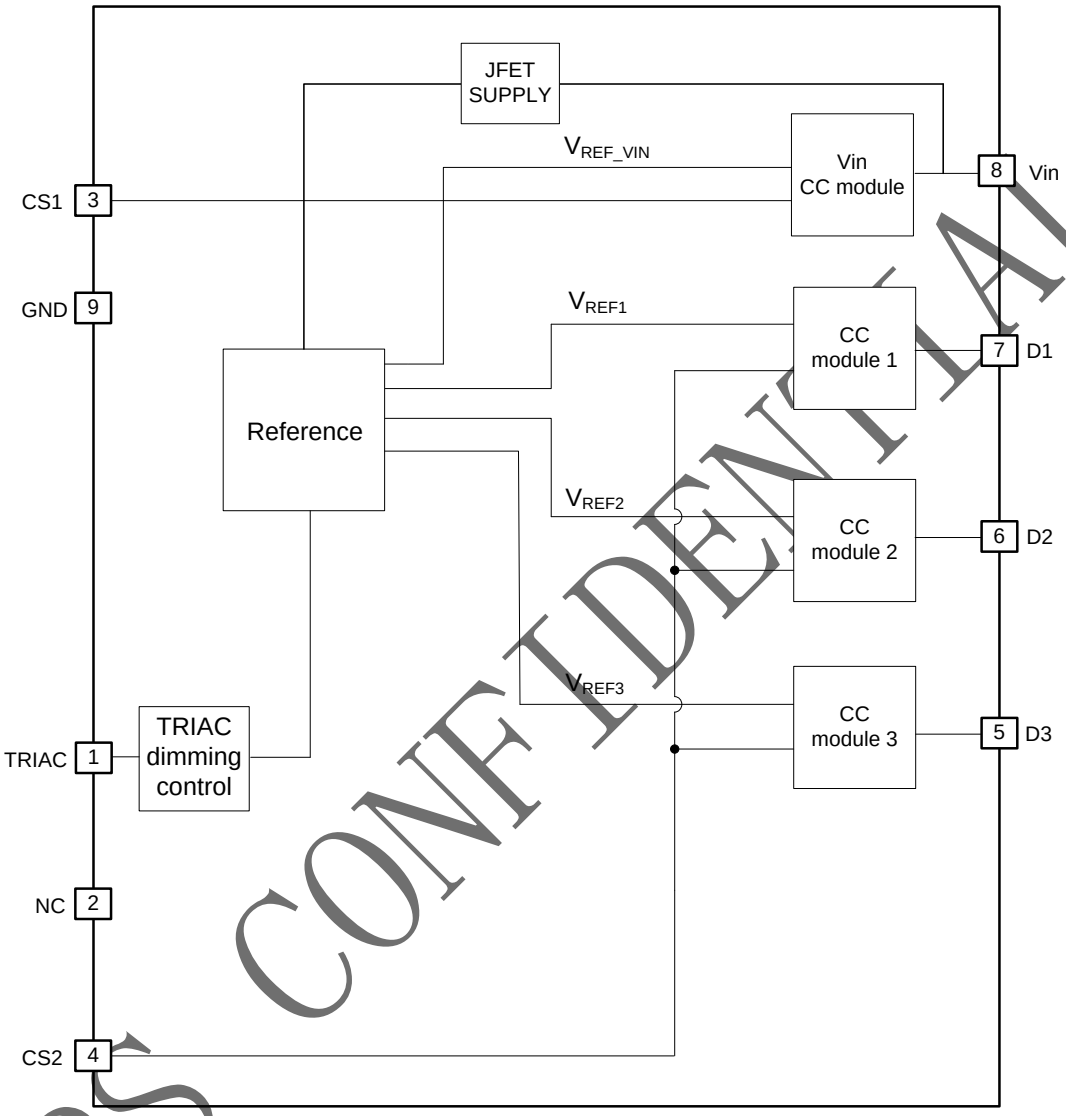


Fig3 BP5153HT Block Diagram

Application Information

BP5153HT 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 VIN, starting work once voltage on VIN above 10V.

2 Operation principle

BP5153HT 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 luminous maintenance and LED availability improvement. For different application, LED forward voltage of all strings

should match the input voltage, like 110V and 220V respectively.

3 Current configuration

BP5153HT supports high precision LED current set by external resistors.

Current for each string defined as：

$$I_{LED\_n} = \frac{Vref_n}{Rcs}$$

n=1,2,3 refer to the different reference voltage for each string.

As recommended, at 120Vac line voltage input condition, set the input power less than 10W; at 220Vac line voltage input condition, set the input power less than 12W depend on thermal capability of heatsinking.

4 Thermal regulation

BP5153HT has thermal regulation available to balance the power delivering and temperature increasing. To improve the system reliability, the output current to be regulated lower refer to the junction temperature. BP5153HT internal thermal regulation temperature is 140℃.

PCB Layout design

Suggestion for BP5153HT PCB layout：

GND

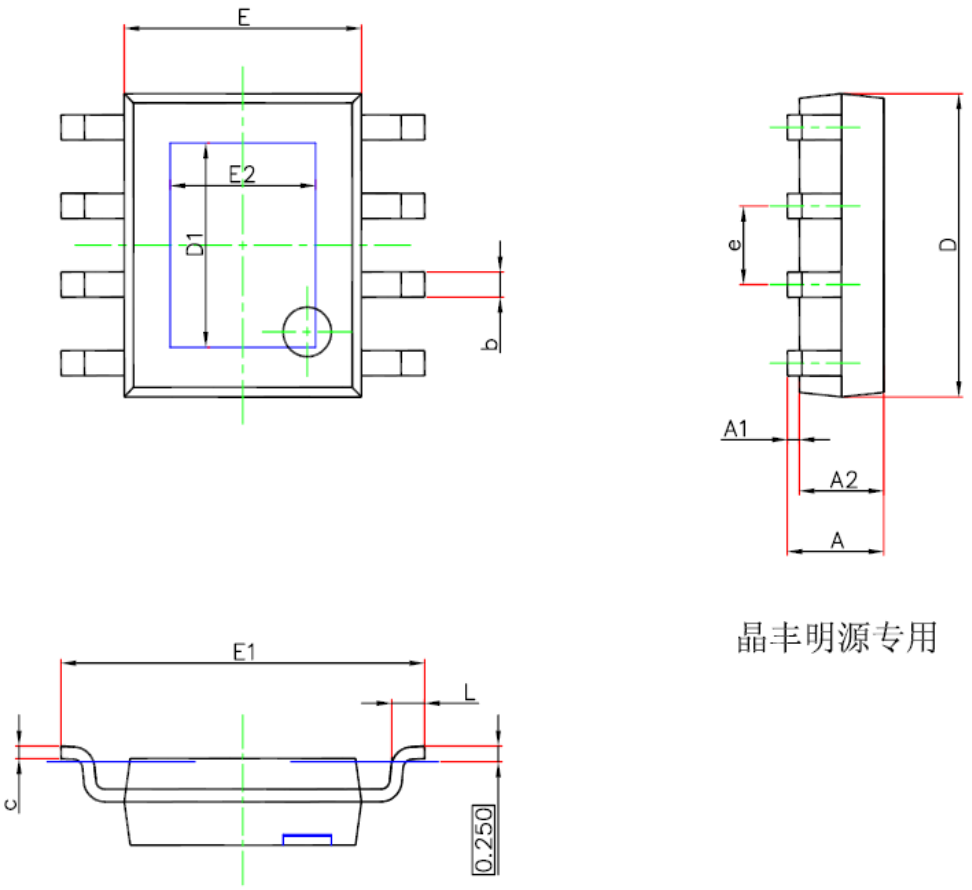
Use the trace for current sense resistor as short as possible. Extend the copper area for each Drain Pin to improve good thermal condition.

Heat sinking

BP5153HT adopted SOP8-EP package to strengthen the thermal dissipation, keep good connection of exposed pad to ground for better thermal dissipation.

Package

SOP8-EP (EXP PAD) PACKAGE OUTLINE DIMENSIONS



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°