BP5178GCL

TRIAC Dimmable Single String LED Driver

Description

BP5178GCL is a high current and high precision TRIAC dimmable Linear LED Driver，integrated with High Voltage regulation MOSFET and JFET supply, specially designed for AC line LED strings forwarded with high voltage and low current. In application, it complies with EMI and safety standard with no Magnetics and filters.

BP5178GCL can drive precision constant current by option of an external resistor, optimizing input current at different input voltage to achieve better system efficiency and power factor.

BP5178GCL adopted intelligent bleeder control, to achieve better system efficiency and dimming performance.

BP5178GCL can select different thermal regulation temperature by different RTH pin setting. IC will decrease the output current with IC junction temperature higher than internal thermal regulation temperature.

Features

- Simple BOM, small size
- Excellent dimming performance
- PF>0.7
- Integrated with 350V HV MOS
- Good line regulation
- Fast startup
- ±5% LED output current consistency
- LED current set by external resistors
- Adjustable IC internal thermal regulation
- ESOP-8 Package

Application

- GU10/E27 LED bulb/lamps
- Other LED lighting

Typical Application

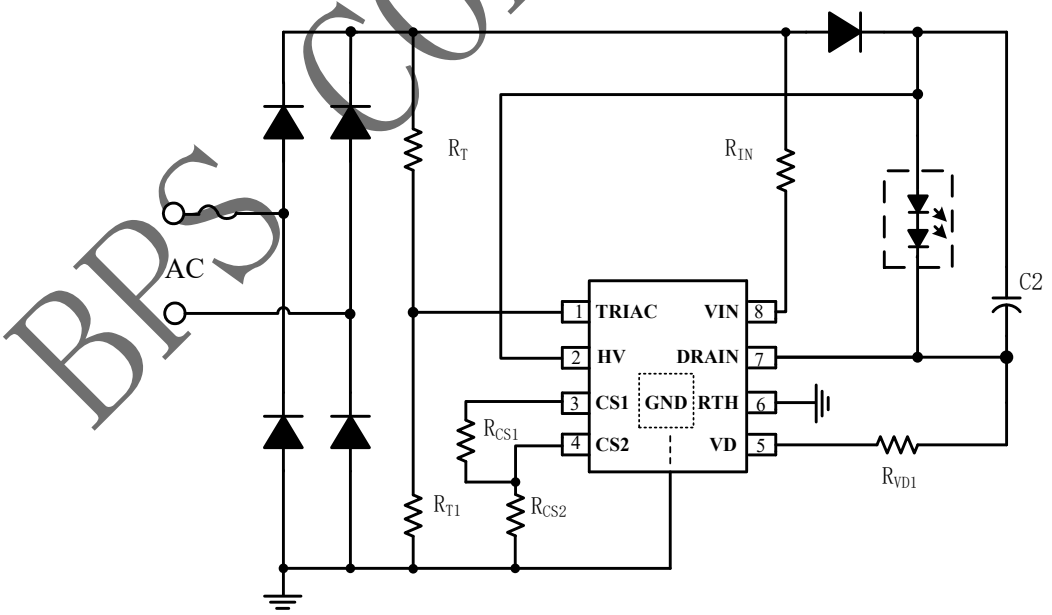


Figure 1 BP5178GCL typical application circuits

Ordering Information

Part Number	Package	Temperature	Packing Method	Mark
BP5178GCL	ESOP-8	-40 ℃ to 105 ℃	Tape 4,000 pcs/reel	BP5178G XXXXXYL XYWWC

Pin mapping

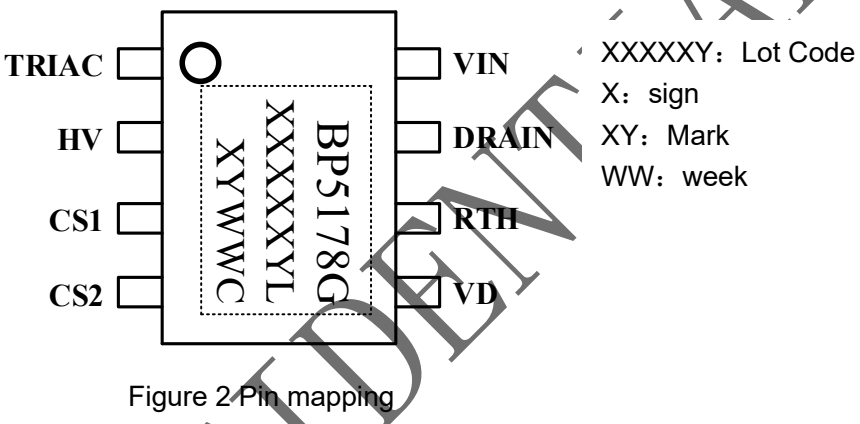


Figure 2 Pin mapping

Pin Descriptions

Pin No.	Pin Name	Descriptions
1	TRIAC	TRIAC detect pin
2	HV	IC High voltage power supply
3	CS1	Bleeder current sense, connect resistor to CS2
4	CS2	LED current sense, connect resistor to GND
5	VD	Input voltage sense, line regulation compensation
6	RTH	Thermal regulation setting, connect resistor to GND
7	DRAIN	Drain of internal power MOS
8	VIN	Drain of internal bleeder circuit power MOS
EXP PAD	GND	IC ground

Absolute Limit(Note 1)

Symbol	Parameter	Range	Units
VIN	Drain of internal bleeder circuit power MOS	-0.3~350	V
DRAIN	Drain of internal power MOS	-0.3~350	V
HV	IC High voltage power supply	-0.3~350	V
TRIAC, CS1, CS2, VD, RTH	Low voltage pins	-0.3~7	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 in spec.*

Note 2: *The maximum power dissipation decreases 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(note 4, 5) （unless specified, otherwise T_A=25℃）

Symbol	Description	Test condition	Min.	Typ.	Max.	Unit
Power supply						
I_{OP}	IC operating current			200		uA
Current sense						
V_{CS1}	Current sense 1			240		mV
V_{CS2}	Current sense 2		855	900	945	mV
V_{CS2_clamp}	Current sense 2 minimum clamp			255		mV
Power MOSFET						
BV_{DSS_VIN}	VIN breakdown voltage	V_{GS}=0V/I_{DS}=250uA	350			V
I_{DSS_VIN}	VIN saturation current			40		mA
BV_{DSS}	Drain break down	V_{GS}=0V/I_{DS}=250uA	350			V
I_{DSS}	Drain saturation current			280		mA
Thermal Regulation						
T_{REG1}	Thermal regulation 1	RTH floating		135		℃
T_{REG2}	Thermal regulation 2	RTH short to GND		150		℃

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

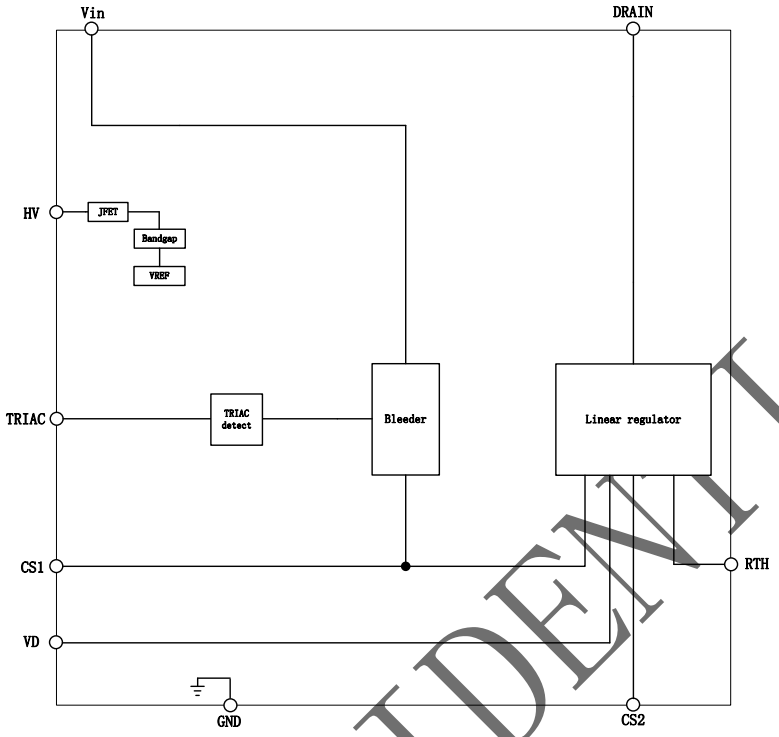


Figure 3 BP5178GCL block diagram

Application Information

BP5178GCL is a high current precision TRIAC dimmable 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.

1 Power Supply

After system power on, the chip is supplied by JEFT through HV pin, starting work once internal voltage reach power on threshold.

2 Operation

BP5178GCL can drive precision constant current by option of an external resistor, optimizing input current at different input voltage to achieve better system efficiency and power factor.

3 Bleeder Control

BP5178GCL adopted intelligent bleeder control, to achieve better system efficiency and dimming performance. Bleeder will be turned off if there is no TRIAC dimmer detected. Bleeder current can be set by different resistance at CS1 pin.

$$I_{BLEEDING} = \frac{V_{CS1}}{R_{CS1} + R_{CS2}}$$

4 Current control, output setting

BP5178GCL can setting accurate output current by different resistance at CS2 and VD pin.

Main power current calculate：

$$I_{LED} = \frac{V_{CS2}}{R_{CS2}}$$

As recommended, at 120Vac line voltage input condition, set the input power less than 10W

depend on thermal capability of heatsinking.

When VD pin voltage is higher than 0.5V, V_{CS2} reference voltage start varies opposite with VD voltage, and will be clamped at minimum 300mV.

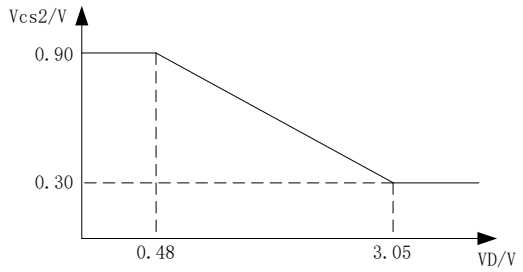


Figure 4 VD Compensation curve

5 Thermal regulation

BP5178GCL 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 refer to the junction temperature. IC thermal regulation temperature can be set by RTH.

6 Heat sink enhancement

For higher input power application：

- Use aluminum substrate PCB
- Increase GND pad copper area
- Reduce LED bulb circumstance temperature

7 PCB Layout

Suggestion for BP5178GCL PCB layout：

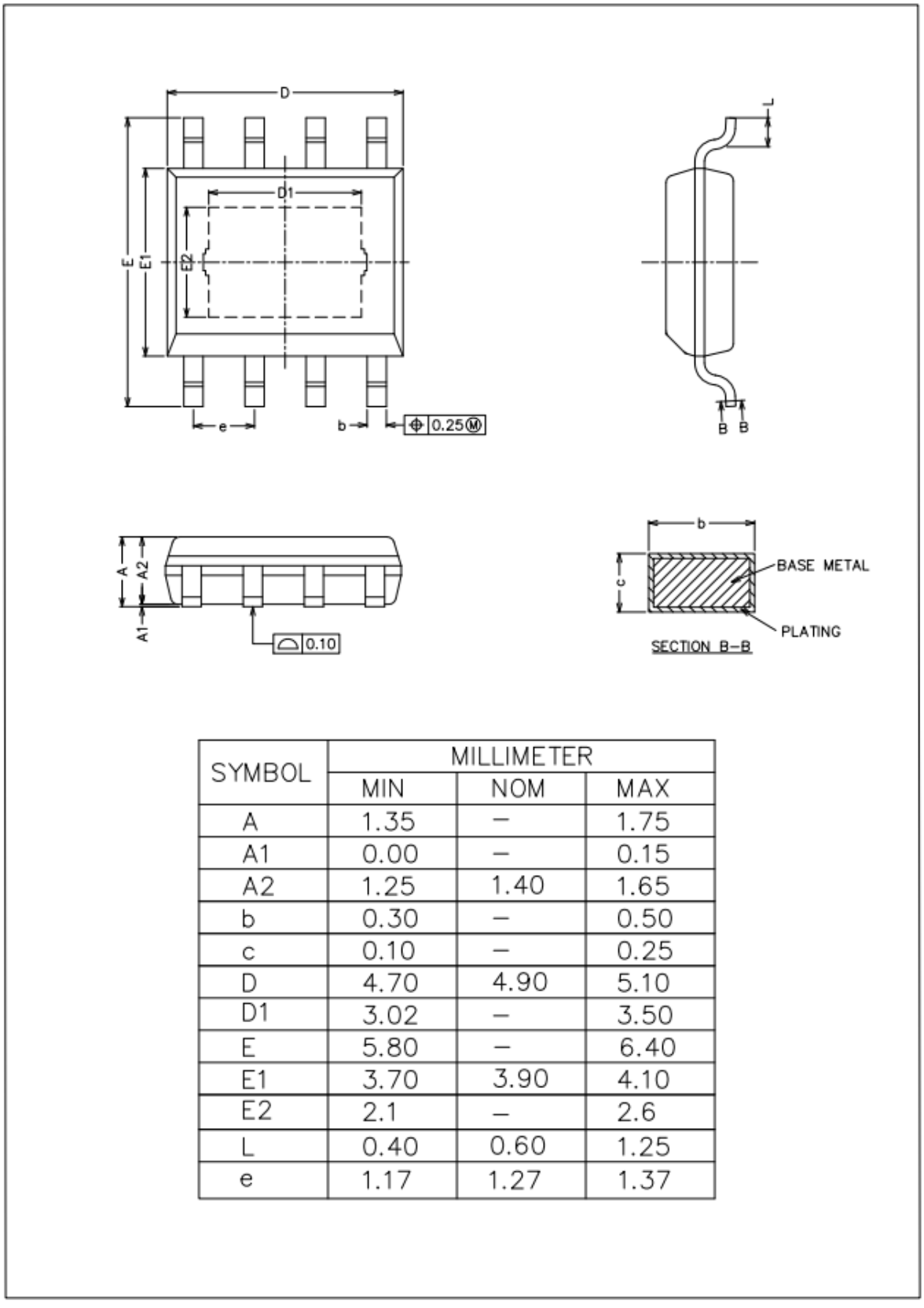
GND

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

Heat sinking

BP5178GCL adopted SOP8-EP package to strengthen the thermal dissipation, keep good connection of exposed pad to ground for better thermal dissipation.

封装信息



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.35	–	1.75
A1	0.00	–	0.15
A2	1.25	1.40	1.65
b	0.30	–	0.50
c	0.10	–	0.25
D	4.70	4.90	5.10
D1	3.02	–	3.50
E	5.80	–	6.40
E1	3.70	3.90	4.10
E2	2.1	–	2.6
L	0.40	0.60	1.25
e	1.17	1.27	1.37

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