



JH5351BND

Description

The JH5351BND is a high precision non-isolated buck driver with active PFC, specially designed for universal input offline constant current LED lighting. The driver with on-chip PFC circuit achieves high power factor and low THD. Operating in critical conduction mode, the power MOSFET switching loss is reduced and the inductor is fully utilized.

The JH5351BND integrates a 650V power MOSFET. With few external components, the LED output current can be precisely controlled.

The JH5351BND remove the VCC capacitor,COMP capacitor and Rcs resistor to simplify the external BOM. And it utilizes patented current detection,with few external components,it achieves high precision output current,excellent line regulation and load regulation.

The JH5351BND are built-in JFET start-up and IC power supply circuit, which enable the system to quickly start, and reduce the external power supply components, achieve smaller volume.

The JH5351BND offers rich protection functions to improve the system reliability, including LED load short protection.The system reliability is further improved by the thermal regulation function.The output current is reduced when the driver is in condition of over temperature.

Adopts SOT33-5 package.

Features

- Active-PFC for High PF and Low THD.
- No VCC and COMP capacitor.
- Integrated current sense resistor.
- Critical Conduction Mode Operation.
- LED Short Protection.
- Cycle by Cycle Current Limit.
- Thermal Regulation Function.
- Adopts SOT33-5 package.

Applications

- LED Bulb
- LED tube
- Other LED Light





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Typical Application

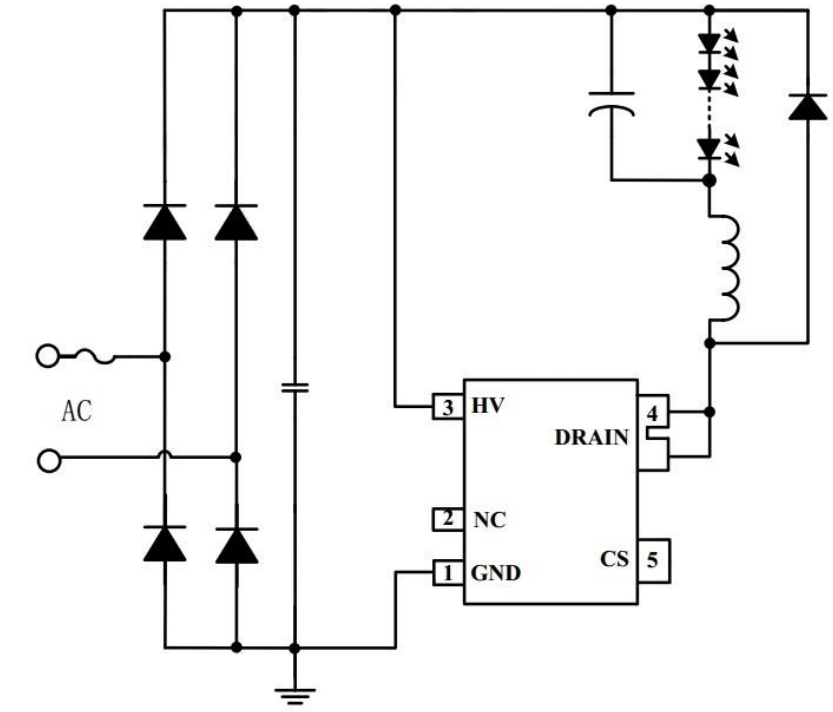


Figure 1. Typical application circuit for JH5351BND

Ordering Information

Order codes				Marking	Package
Halogen-Tube	Halogen-Free-Tube	Halogen-Reel	Halogen-Free-Reel		
N/A	N/A	N/A	JH5351B-ND-AR	JH5351	SOT33-5

Pin Configuration and Marking Information

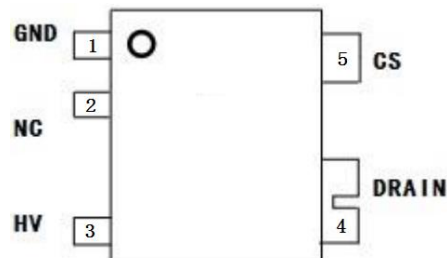


Figure 2. Pin configuration





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Pin Definition

Pin No.	Name	Description
1	GND	Ground.
2	NC	No Connection.
3	HV	IC high voltage power supply.
4	DRAIN	Internal HV Power MOSFET Drain.
5	CS	CS Floating –ILED is fixed internally.

Internal Block Diagram

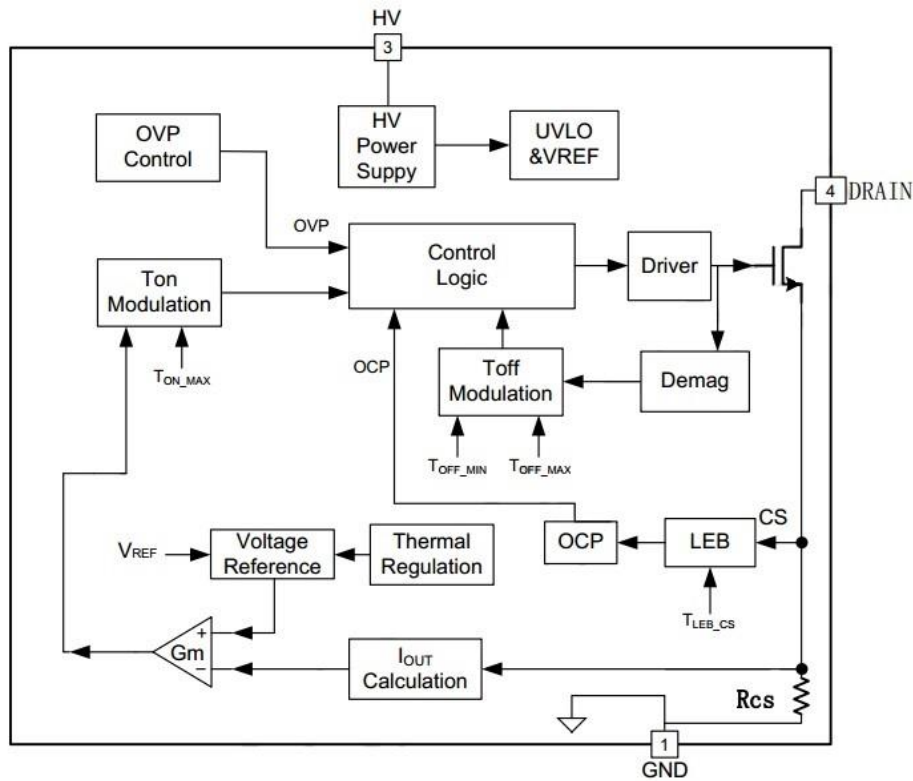


Figure 3. JH5351BND Internal Block Diagram

Absolute Maximum Ratings (note1)

Symbol	Parameters	Range	Units
DRAIN	Internal HV MOSFET drain voltage	650	V
HV	IC high voltage power supply	650	V
P_{DMAX}	Power dissipation (note2)	0.4	W
θ_{JA}	Thermal resistance (Junction to Ambient)	155	$^{\circ}\text{C}/\text{W}$
T_J	Operating junction temperature	-40 to 150	$^{\circ}\text{C}$
T_{STG}	Storage temperature range	-55 to 150	$^{\circ}\text{C}$





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Note 1: Stresses beyond those listed “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 (Notes 3, 4) (Unless otherwise specified, HV=100V and $T_A=25\text{ }^\circ\text{C}$)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
High Voltage Power Supply (HV)						
ICC	IC Operating Current	No switching		0.3	0.6	mA
Output LED Current (CS)						
I _{LED}	Fixed LED Current			98		mA
Internal Timing Control						
T _{ON_MAX}	Maximum On Time			6.0		μs
T _{OFF_MAX}	Maximum Off Time			200		μs
Current Sense Section						
V _{CS_LIMIT}	CS Peak Voltage Limitation			2		V
T _{LEB_CS}	Leading Edge Blanking Time for Current Sense			300		ns
T _{DELAY}	Switch off Delay Time			200		ns
Compensation Section						
V _{REF}	Internal Reference Voltage			270		mV
OVP Control						
V _{OVP}	Shutdown voltage	L=2mH I _{LED} =98mA		110		V
T _{OVP_RST}	ROVP recovery Time			40		mS
K	OVP Constant			1.8		
Power MOSFET Section						





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R_{DS_ON}	Static Drain-source On-resistance	$V_{GS}=10V/I_{DS}=0.5A$		13.2		Ω
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V/I_{DS}=250\mu A$	650			V
I_{DSS}	Power MOSFET Drain Leakage Current	$V_{GS}=0V/V_{DS}=650V$			1	μA
Thermal Regulation Section						
T_{REG}	Thermal Regulation Temperature			140		$^{\circ}C$

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

Note4: the maximum and minimum parameters specified are guaranteed by test, the typical value are guaranteed by design, characterization and statistical analysis





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Application Information

The JH5351BND is a high precision non-isolated APFC buck LED driver, specially designed for universal mains with constant current control. The driver with on-chip PFC circuit achieves high power factor, low THD and high efficiency.

1 Start Up

After system is powered on, the system starts switching very quickly, and the output voltage rises up gradually, and the inductor peak current also rises up. The LED current hence achieves a soft start without overshoot.

2 Constant Current Control

The JH5351BND integrate LED current sensing resistor in the IC.

The current in LED can be calculated by the equation:

$$I_{LED} \approx \frac{V_{REF}}{R_{cs}} + 98$$

Where,

V_{REF} : Internal reference voltage

R_{cs} : The current sensing resistor value

3 Thermal Regulation

The JH5351BND integrates thermal regulation function. When the system is over temperature, the output current is gradually reduced, the output power and thermal dissipation are also reduced. The system temperature is regulated and the system reliability is improved.

4 Protection Functions

The JH5351BND offers rich protection functions to improve the system reliability.

When the LED is shorted circuit, the

switching frequency will work under 5 kHz.

When the output is shorted or the inductor is saturated, the CS peak voltage will be relatively high. When CS voltage reaches the internal limitation (2V), the power MOSFET will be turned off instantaneously. This cycle by cycle current limitation can help protecting power MOSFET, inductor and output diode.

The ROVP function is also integrated in the IC, the LED open protection voltage is fixed with 110V, with $L=2mH$. $I_{LED}=98mA$. The V_{OVP} is given by:

$$V_{ovp} \approx \frac{L(mH) \times I_{LED}(mA)}{K}$$

where,

L is the inductor value

K is constant is 1.8

5 PCB Layouts

The following guidelines should be followed in PCB layout:

Ground Path

Keep a short and wide ground path for current sense resistor.

The Area of Power Loop

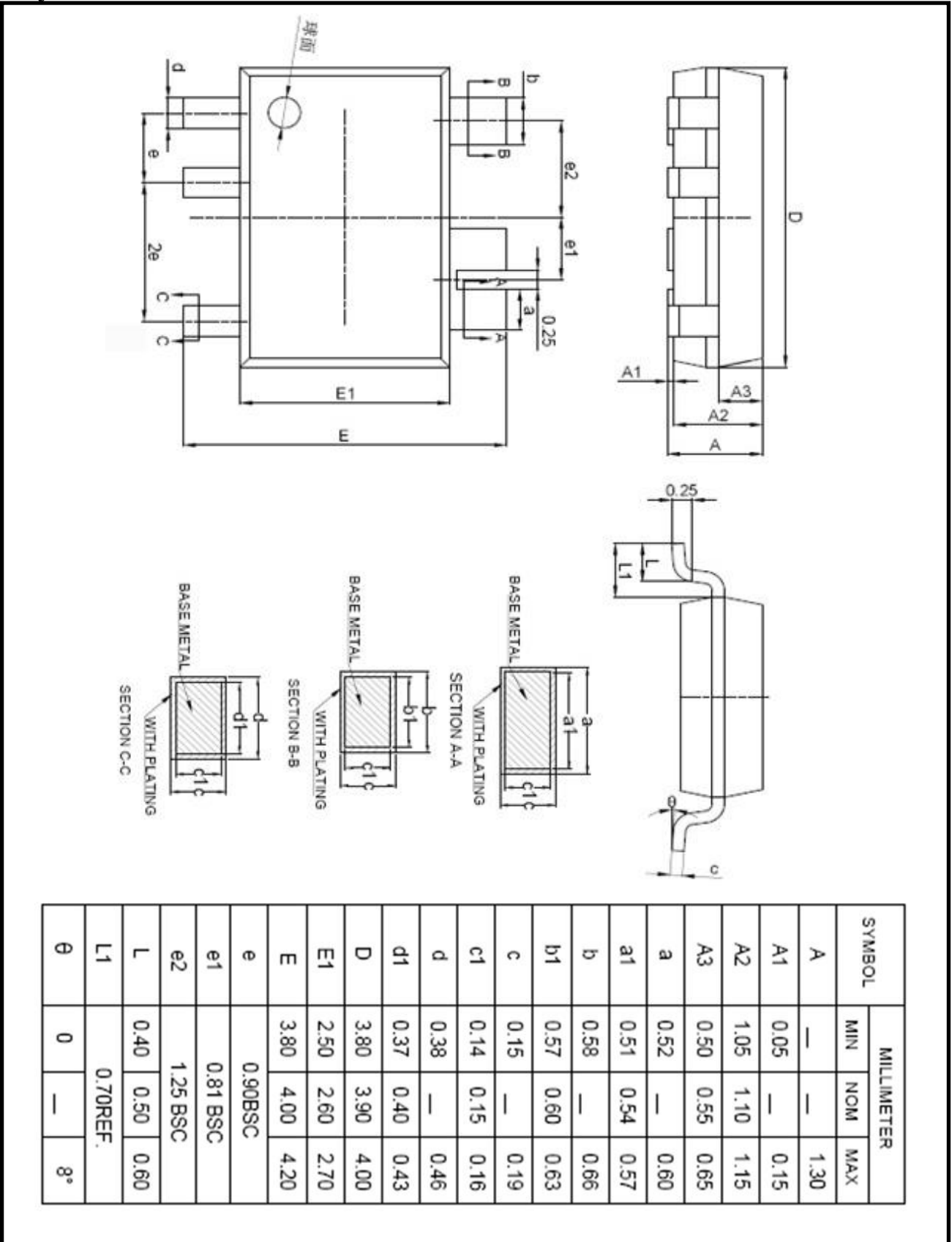
The area of main current loop should be as small as possible to reduce EMI radiation.





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Physical Dimensions SOT33-5





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注意事项

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