Features

ÿ Constant current setting 5ÿ60mA, constant current accuracy ±5% ÿ No EMI problem in chip application ÿ Built-in 500V high voltage MOSFET ÿ With over-temperature current reduction function ÿ The chip can share the PCB board with LED ÿ Simple peripheral circuit, low cost, small finished product volume ÿ Package form ESOP4

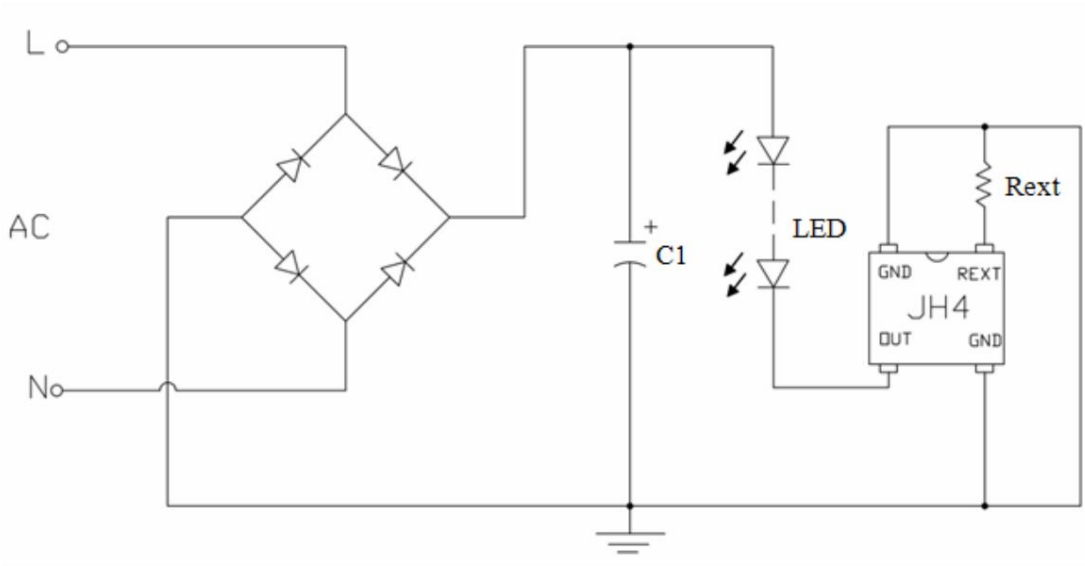
Application Areas

ÿ Filament lamp
ÿ LED bulb, downlight, etc. ÿ Other low power LED lighting

Product Description

JH4 is a single-channel high-voltage LED linear constant current control chip. It uses linear constant current technology. The current accuracy can be controlled within ±5%. The output current is set to 5mA~60mA through the external Rext resistor. If you need to increase the current output, you can also use multiple chips in parallel to increase the current output capacity. JH4 has a built-in over-temperature current reduction function to ensure the safety and reliability of the system. JH4 does not require an inductor or transformer on the periphery. The system application is simple, with very few peripheral devices and

Typical application circuit



Note: The power supply in the above figure can be an AC power supply or a DC power supply.

JH4 application circuit diagram, LED can be connected in series, parallel, or in combination; C1 is an electrolytic capacitor used to reduce Vin voltage ripple; Rext resistor is used to set LED working current. The larger the value of electrolytic capacitor C1, the smaller the voltage Vin ripple, and the smaller the voltage ripple of JH4 OUT port. C1 value is based on LED The greater the current, the greater the capacitance of C1.

Pin Diagram

Pin Description

Serial number pin name	describe
1	GND Chip ground
2	OUT Power input and constant current output port
3	GND Chip ground
4	REXT Output current setting port

Limit parameters (Note **1)**

parameter	Numeric	unit
OUT port voltage REXT	-0.5 to 500	V
port voltage IOUT max	-0.5 to 7.5	V
Maximum output current @ Ta = 25 ÿ PDmax Power	100	mA
dissipation @ Ta = **25ÿ (2)** Operating junction	0.45	W
temperature	-40 to 150	ÿ
Storage	-55 to 150	ÿ
temperature Soldering temperature (soldering 10 seconds)	260	ÿ
ESD Capability (HBM Human Body	2	KV

Simulator) (1) Stresses beyond the listed “Absolute Maximum Ratings” may cause permanent damage to the device. Absolute Maximum Ratings are stress ratings. The device may not function properly under high or low temperatures and stress conditions, so it is not recommended to operate the device under these conditions.

Under extreme operating conditions, the reliability of the device may be affected.

(2) Maximum power dissipation PDmax = (TJmax-TA)/ÿJA. The maximum power dissipation will decrease as the ambient temperature increases.

Recommended operating conditions

parameter	Numeric	unit
Operating Junction Temperature	-40 to 125	ÿ
Range Output Current Range	5 to 60	mA

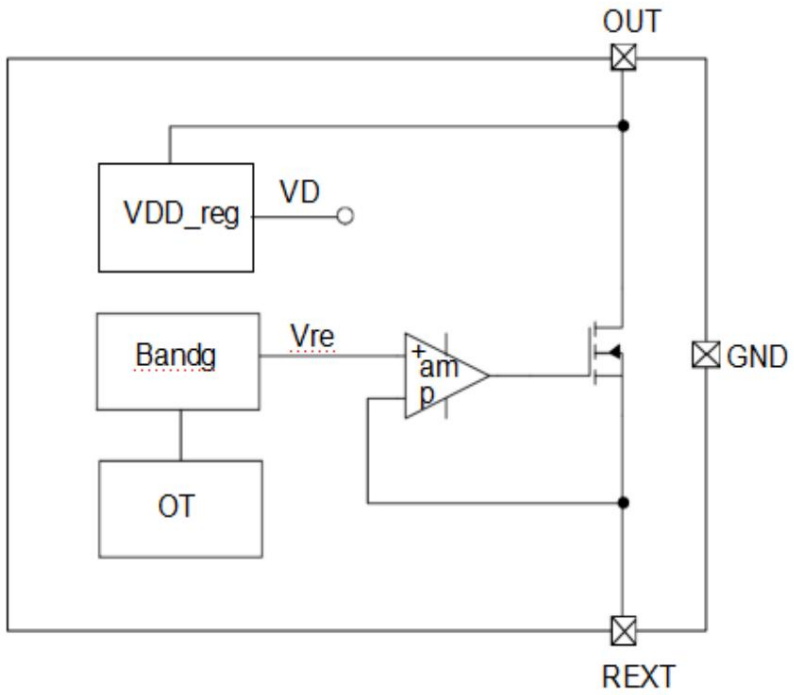
Electrical parameters **(ambient** temperature **25°C ,** Unless otherwise stated) (Note 3)

symbol	illustrate	condition	Min.	Typ.	Max.	Unit
VOUT-MIN	Constant current inflection point	Iout=30mA		6.5		V
		Iout=60mA		8		V
VOUT-BV	OUT port voltage			450		V
IOUT	recommended output current			5	60	mA
IDD	Quiescent Current	V = 10V , REXT Floating		28	210	uA
VREXT	REXT Reference voltage	V = 10V	570	600	630	mV
DIOUT	IOUT constant current accuracy	IOUT=30mA	-5		+5	%
TSC	Current negative temperature compensation starting point (Note 4)			145		ÿ

(3) The minimum and maximum parameter ranges in the specification are guaranteed by testing, and the typical values are guaranteed by design, testing or statistical analysis.

(4) The starting point of current negative temperature compensation is the chip internal set temperature of 145°C.

Internal Function Block Diagram



Functional Description

JH4 is a single-channel high-voltage linear constant current LED driver chip using linear constant current technology. The driving current of the LED string can be set by an external resistor, and JH4 integrates an OTP function to ensure the safety and reliability of the system. The following is a detailed description of each function:

• **LED** current setting

JH4 can set the current when the LED is lit by an external resistor connected to the REXT pin. ILED=VREXT/RREXT, VREXT is 600mV, and the recommended output current range is 5~60mA.

• Over temperature protection (OTP)

JH4 integrates over-temperature protection function. When the internal temperature of the chip reaches 145ÿ, the system output current begins to gradually decrease. When the temperature drops below 145ÿ, the output current will automatically return to normal value, as shown in Fig3. In this way, the system temperature is limited and the system reliability is also improved.

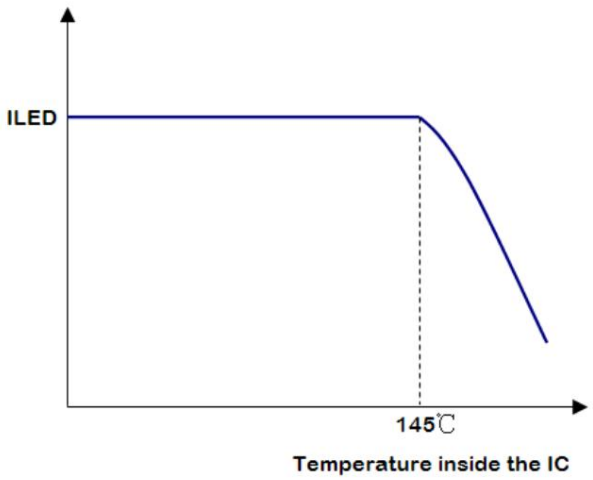


Fig 3 On Chip Thermal Fold-back Protection

• Application Guide

1. Since the chip is subject to residual voltage in the circuit, it is recommended to make the LED voltage close to the voltage after AC rectification in the design, which can improve the efficiency of the system. At the same time, the LED voltage should not be too large. When the input voltage is less than the LED voltage, the LED cannot work properly. It is recommended that the chip power consumption be less than 0.45W.

The system needs good heat dissipation to make the chip work within the appropriate temperature range. It is best to choose an aluminum substrate for the PCB board and add a heat dissipation base for the entire lamp. If the system output power is too large, resulting in a high operating temperature of the chip, it is recommended to use multiple chips in parallel.

• **PCB** layout guidelines

A good layout is very important for the reliable operation of the system. To achieve better performance, it is recommended to follow the following requirements when laying out:

1. The RREXT resistor should be close to the chip pins and the ground loop should be as short as possible. As shown in point A in Fig4.
2. The actual output power of the system is related to the heat dissipation of the PCB board and the lamp housing. The actual application power needs to match the heat dissipation conditions.
3. The IC substrate and PCB need to use solder paste technology to ensure that the IC substrate and PCB The contact is good, and the red glue process is prohibited for IC substrate.
4. The IC substrate is copper-plated to increase the copper area of the GND at the bottom of the chip for heat dissipation and reliability as shown in point B of Fig4. The copper is laid as shown in Fig5.
5. The distance between the copper leakage of the IC substrate pad and the OUT port must be at least 0.7mm spacing.

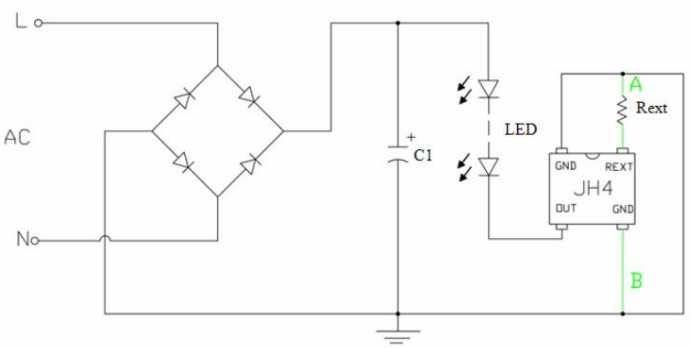


Fig 4 PCB Layout Guidelines

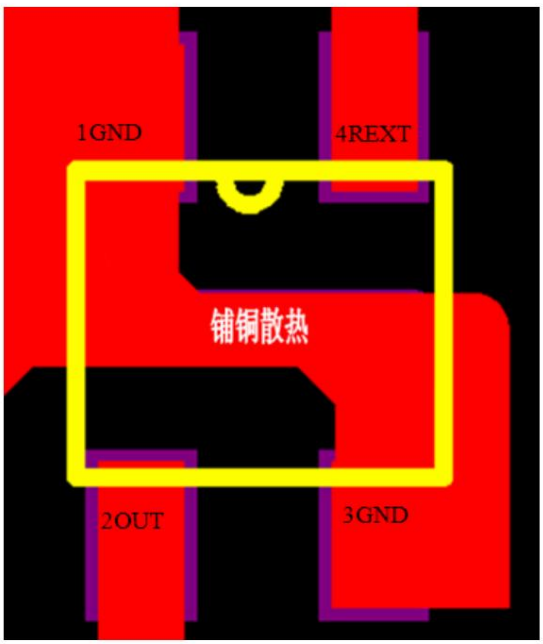


Fig 5 Suggested pad layout

OUT 端口输出电流特性

JH4的 OUT 端口输出电流计算公式：

$$I_{OUT} = \frac{V_{REXT}}{Rext} = \frac{0.6V}{Rext(\Omega)} (A)。$$

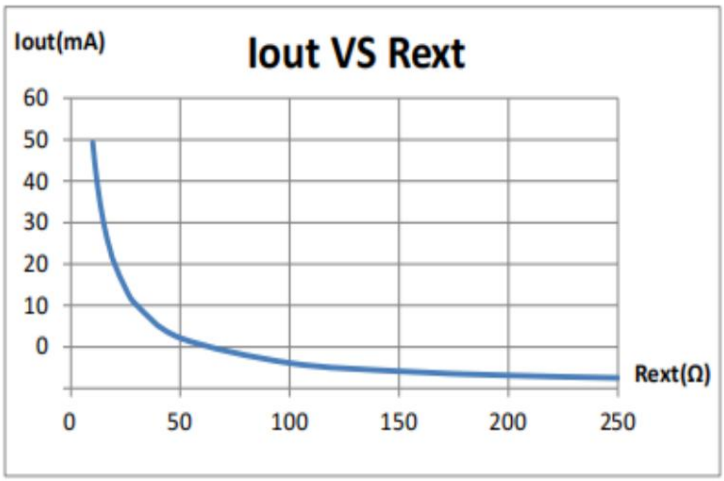


图 1. JH4输出电流与 Rext 电阻关系曲线

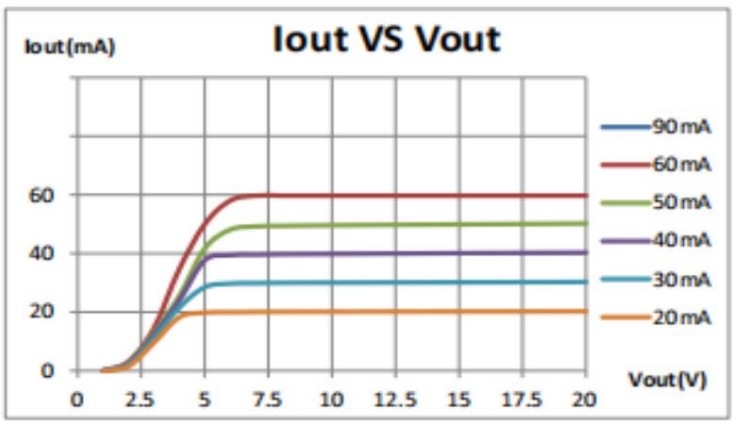


图 2. JH4恒流曲线图

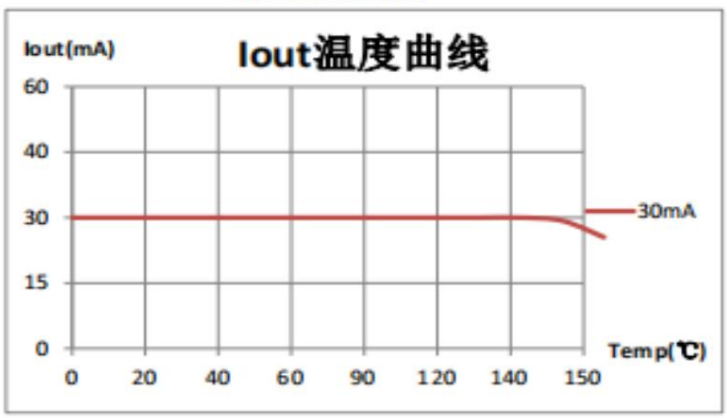
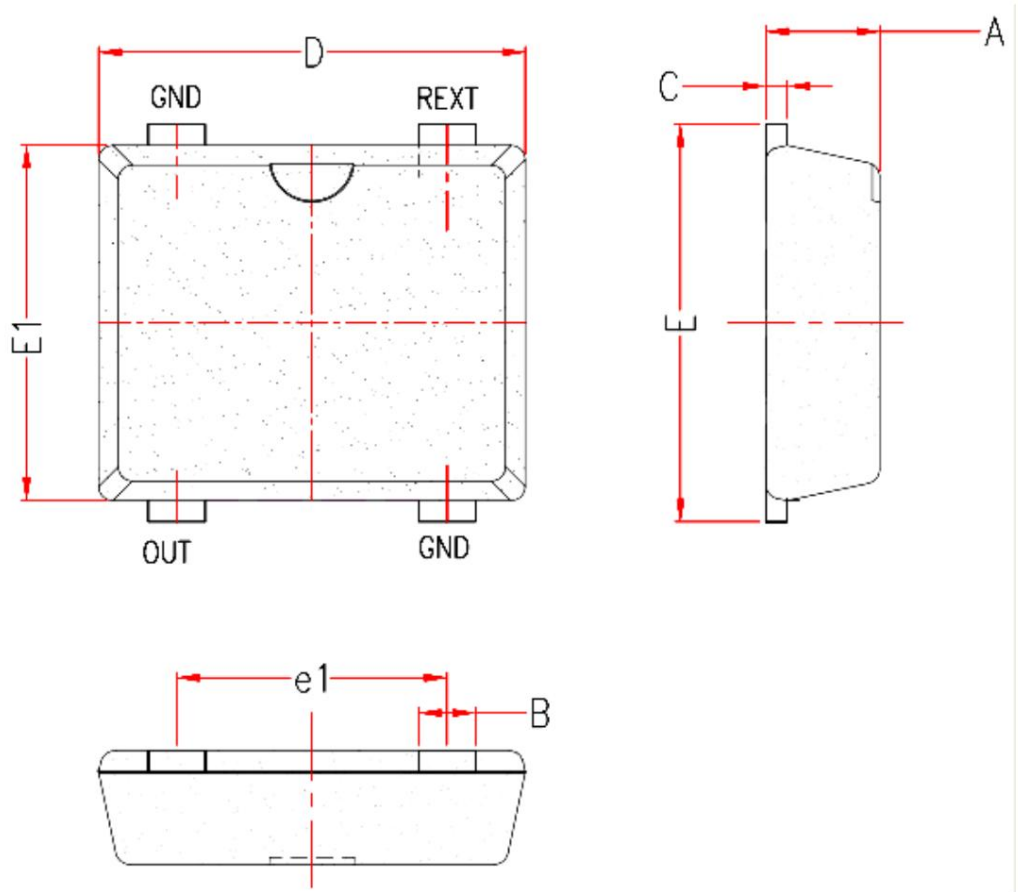


图 3. JH4输出电流温度特性（注 7）

注 7：芯片焊接到 2cm*2cm，厚度为 1mm 的铝基板上。

Package size



Dimensions In Millimeters			
Symbol	Min	TYP	Max
A	0.65	0.75	0.85
B	0.3	0.4	0.5
C	0.12	0.15	0.18
D	2.8	3.0	3.2
E	2.6	2.8	3.0
E1	2.3	2.5	2.7
e1	1.7	1.9	2.1

Packing method and quantity

model	Encapsulation	Packing	Packing quantity		
JH4	ESOP4	method 13 inch reel	15K/reel	30K/box	300K/box

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