

Main/sub dual-channel LED driver

Description

SN3135 is a main/sub dual-channel LED driver. When the main channel works, it is a constant current source driving the main LED and the current is set by an external resistor connected to the I_{SET} pin. It needs only 0.1V dropout voltage for 200mA output current. When the sub-channel works, the chip would pull down sub LED's cathode to ground.

Normally there is only one channel on, the main channel and the sub channel can switch with each other. Sweeping power supply from high voltage to low voltage, main channel switches to sub-channel while UV pin is below undervoltage threshold 1.17V (SN3135-01 typical) or 1.23V (SN3135-02 typical); Sweeping power supply from low voltage to high voltage, the sub-channel switches to the main channel while UV pin is 80mV (typical) higher than the undervoltage threshold. Additionally, the main channel has short protection function, when the main LED is shorted, the chip would switch to sub-channel automatically.

Features

- Power supply undervoltage detect
- Main channel short protection
- Over-temperature protection
- Input voltage range: 2.7V~5.5V
- main and sub channel current set by external resistor
- Main channel V_{dp}=0.1V
- Low quiescent current
- Assembled in SOP-8 package

Application

- Miner lamp
- Other LED lighting

Typical application circuit

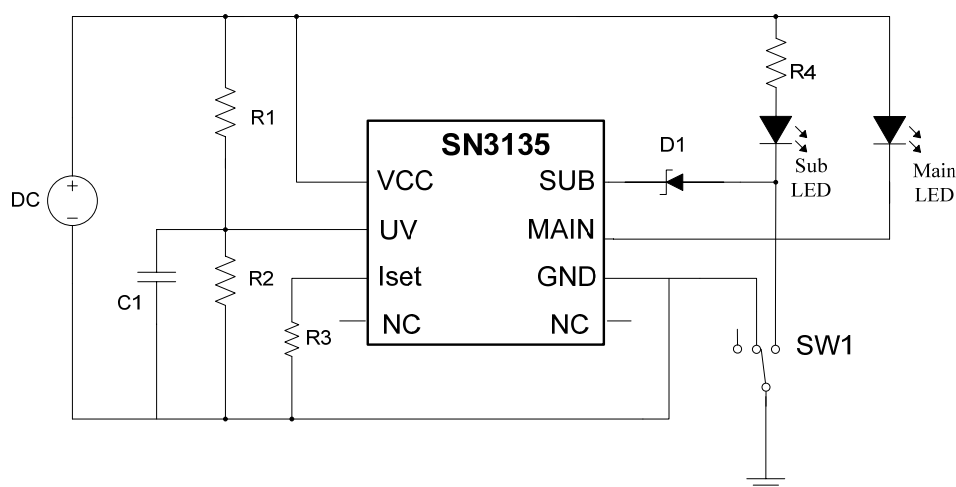
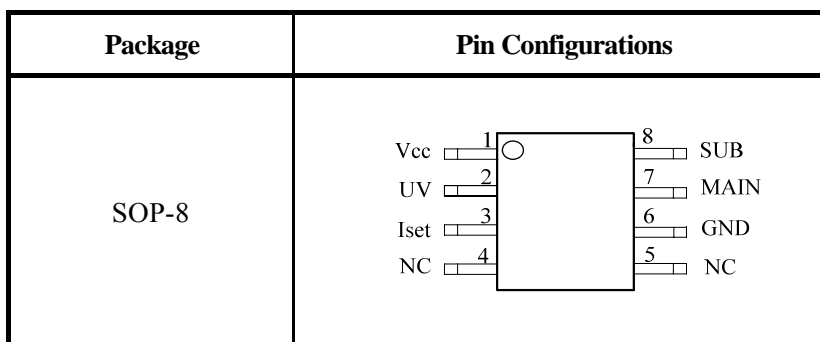


Figure1

Pin configurations



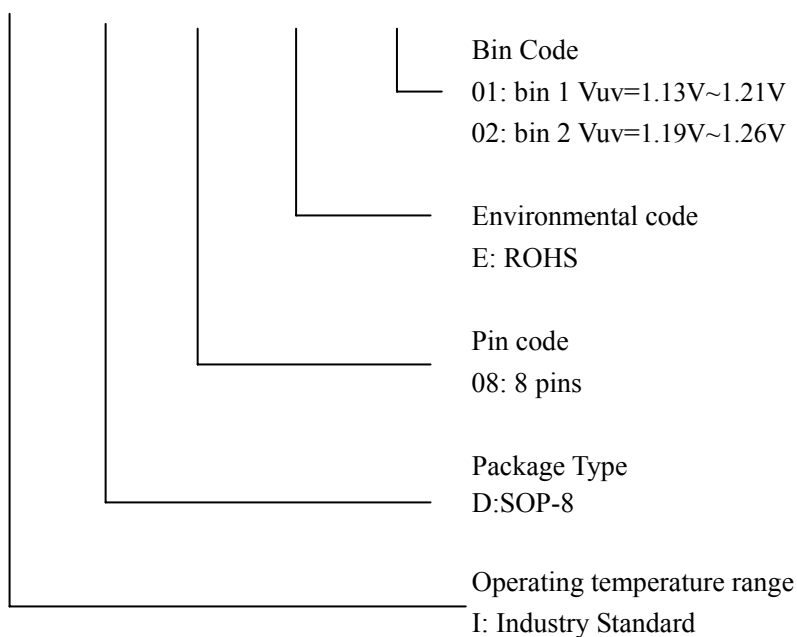
Pin description

Name	PinNo.	description
V _{CC}	1	Power supply input
UV	2	The pin detects under-voltage. Decouple to ground with 0.1uf capacitor close to device
I _{SET}	3	The pin sets the main LED current with external resistor
GND	6	The pin connects to ground.
MAIN	7	Connect to the cathode of main LED
SUB	8	Connect to the cathode of sub LED
NC	4, 5	Not connect

Ordering Information

Order number	Quantity per reel	Operating Temperature range	V _{UV}
SN3135ID08E-01	2,500	-40°C to 85°C	1.13V~1.21V
SN3135ID08E-02	2,500	-40°C to 85°C	1.19V~1.26V

SN3135 - I D 08 E - 0X



Maximum ratings

V _{CC} ----- -0.3V to 6.5V	I _{MAIN} -----500mA
UV,Iset,Sub,Main----- -0.3V to 6.5V	I _{SUB} -----300mA
T _J ----- 150°C	Operating condition
Ts(Storage temperature)----- -65°C to 150°C	V _{cc} -----2.7V to 5.5V
ESD(human body mode)-----4kV	T _A (Ambient temperature)----- -40°C to 85°C

Electrical characteristics(Test conditions: V_{CC}=3.6V,T_{amb}=25°C unless otherwise stated)

Symbol	Parameter	Condition	Min	Typical	Max	Unit	
V _{CC}	Input voltage		2.7		5.5	V	
I _{cc}	Quiescent current	V _{cc} =2.7V~5.5V,no load, 5.5V>V _{uv} >1.4V		250	320	μA	
I _{ratio}	Ratio of I _{MAIN} to I _{SET}	V _{CC} =4.2V, R _{set} =30K		8000			
V _{ISET}	Voltage of I _{SET} pin			1.2		V	
I _{accuracy}	Current accuracy of main LED	V _{cc} = 2.7V ~ 5.5V, V _{main} =0.5V		±5		%	
V _{dp}	Main channel current source dropout voltage	R _{set} =47K,I _{out} =204mA			0.2	V	
R _{sub}	Sub-channel “ ON” resistance	V _{cc} =2.7V~5.5V			2.0	ohm	
V _{UV}	Undervoltage threshold of UV pin	Switch from main-LED to sub-LED when V _{UV} sweeps from high voltage to low voltage	SN3135-01	1.13	1.17	121	V
			SN3135-02	1.19	1.23	1.26	
V _{UVHYS}	Comparator hysteresis of UV pin(Upper threshold - Undervoltage threshold)	Switch from sub-LED to main-LED when V _{UV} sweeps from low voltage to high voltage(Upper threshold); Switch from main-LED to sub-LED when V _{UV} sweeps from high voltage to low voltage(Undervoltage threshold)		80		mV	
T _{SD}	Thermal protection Threshold			160		°C	
R _{θJA}	Junction to ambient	SOP-8		128		°C/W	

Typical operating condition

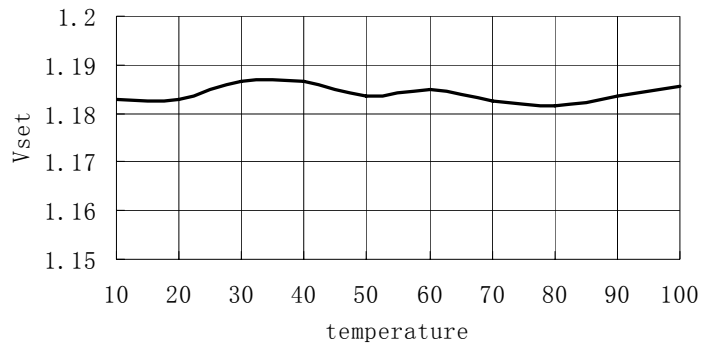


Figure 2 Iset pin voltage change with the temperature

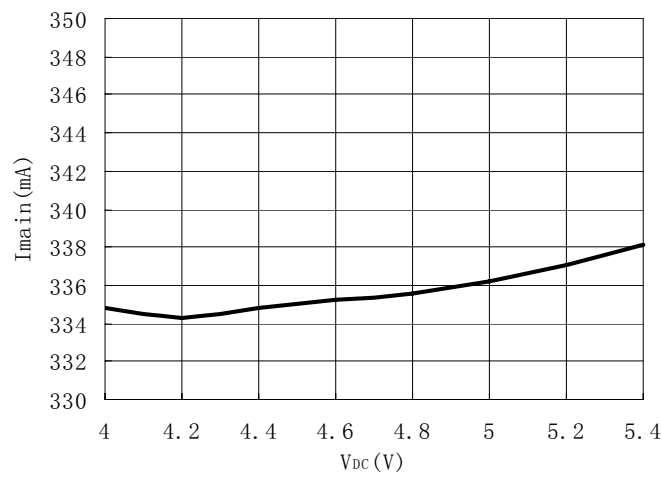


Figure3 Main LED current change with power supply

Application Notes**Main LED current set**

Current of the main LED is set by resistor connected to Iset pin, the voltage of Iset pin is 1.2V, it is constant even if the environment temperature and power supply voltage changes.(Refer to figure2, figure3), the current of main channel is 8000 times to the current of Iset pin, it is computed as:

$$I_{\text{main}} = 8000 * \frac{V_{\text{set}}}{R_{\text{set}}}$$

Main LED current flows through the MAIN pin to ground. There is only 0.1V voltage dropout when the main channel current is 200mA.(Note 1)

Sub LED current set

Sub-LED current flows through SUB to ground, the current can be set by the resistor of SUB pin, it is computed as:

$$I_{\text{sub}} = \frac{V_{\text{CC}} - V_{\text{F2}} - V_{\text{d2}}}{R_{\text{SUB}}}$$

V_{CC} is power supply voltage, V_{F2} is the sub-LED voltage. V_{d2} is the diode voltage (Refer to figure1), its value should be as small as possible

Undervoltage threshold set

UV pin has undervoltage detect function and the undervoltage threshold gets a 0.8v hysteresis to avoid error operation caused by power supply ripple. Sweeping power supply from high voltage to low voltage, main channel switches to sub-channel while UV pin is below undervoltage threshold 1.17V (SN3135-01 typical)or 1.23V(SN3135-02 typical); Sweeping power supply from low voltage to high voltage, the sub-channel switches to the main channel while UV pin is 80mV (typical)higher than the undervoltage threshold. Uuv is set by the ratio of resistor of R1 and R2(Refer to figure1).

When $\frac{R_2}{R_1 + R_2} V_{\text{CC}} = 1.17\text{V}$ or 1.23V , chip

switches from the main channel to the sub-channel.

Typically, Li battery voltage maintains at 3.7V during

discharge stage, so it is recommended to set the undervoltage threshold at 3.4V.

Typically R1 and R2 are set to 10kohm magnitude (eg: 51kohm), the current flows through R1 and R2 is large if the value of R1 and R2 are small, which reduce system efficiency. We can specify the value of R2, and then compute the value of R1 based on the ratio.

Main LED short protection

When the main LED is shorted, chip would switch to sub-channel automatically.

Over-temperature protection

When the chip temperature reaches 160 °C, the chip turns off automatically. And when temperature goes back to 140 °C, the chip turns on then.

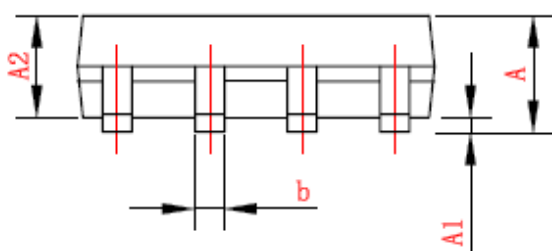
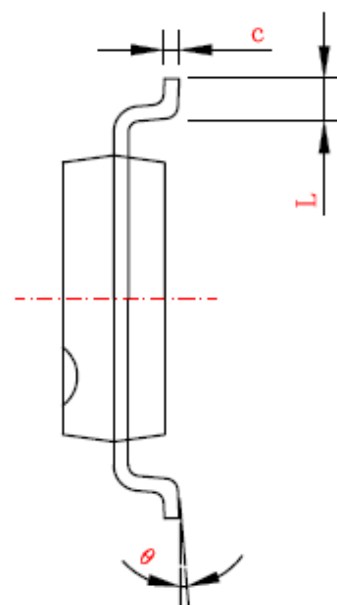
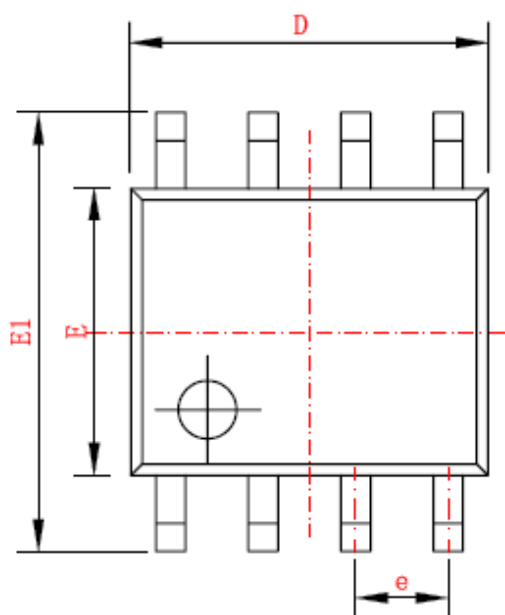
PCB layout reference

The switch should be placed at the low voltage point (Refer to figure 1) to avoid an instant spark while switching. The traces between GND pin and Iset pin to real ground should be as short as possible and as wide as possible to improve the main LED current accuracy and undervoltage threshold accuracy. Adding a 0.1uf capacitor connected to UV pin can reduce the noise pick-up at this pin.

Note1:when power supply voltage is larger than LED's voltage, the extra voltage would be added on Main pin, which would reduce the efficiency of system.

Package Information

SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.450TYP		0.057TYP	
b	0.350	0.490	0.014	0.019
c	0.178	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.240	0.228	0.246
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°		