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# IS31LT3135-V1, IS31LT3135-V2 Dual Ch. (Main/Sub) LED Driver Evaluation Board Guide



## Description

The IS31LT3135 is a dual-channel LED driver that has two modes of operation; it can function as the main-channel driver or as a sub-channel source. When operating in main mode, the device functions as a constant current source that outputs an adjustable current, via an external resistor, through the main LED. The device is operable with a dropout voltage of 0.1V while driving a 200mA current. When operating as a sub-channel driver, the IC grounds the LED's cathode. The device normally operates with a single channel powered on, allowing for quick switching between the main and sub channel modes. A sweeping power supply that operates between high and low voltages, allows for simple switching between sub/main-channel modes, even during conditions where the UV pin is below the 1.17V (typical) UV threshold IS31LT3135-V1; or 1.23V (typical) UV threshold for IS31LT3135-V2. The sweeping power supply allows sub-channel to main channel switching during conditions where the UV pin is  $\geq 80\text{mV}$  than the UV threshold. In addition, the main channel features short protection via switching to sub-channel if any abnormal behaviors occur in the main-channel LED circuitry.

## Features

- Power supply under-voltage detection
- Main-channel LED short protection
- Over-temperature protection
- Input voltage range: 2.7V to 5.5V
- Main/sub-channel adjustable output current
- (Set via user-configurable external resistors)
- Main-channel dropout  $V_{DP}=0.1\text{V}$
- Ultra-low quiescent current
- SOP-8 Package, small PCB footprint size

## Ordering Information

Part Number	Temperature Range	IC Package
IS31LT3135-V1GRSL2-EB IS31LT3135-V2GRSL2-EB	-40°C to +85°C (Industrial Grade)	SOP-8 (5mm x 4mm)

Table 1: Ordering Information for IS31LT3135-V1/V2 evaluation board.

Customers with inquiries regarding pricing, delivery, part availability, and related information, can reach ISSI Analog marketing via either of the following methods:

- Email: [analog\\_mkt@issi.com](mailto:analog_mkt@issi.com) / Phone: +1 (408) 969-6600

## Quick Start

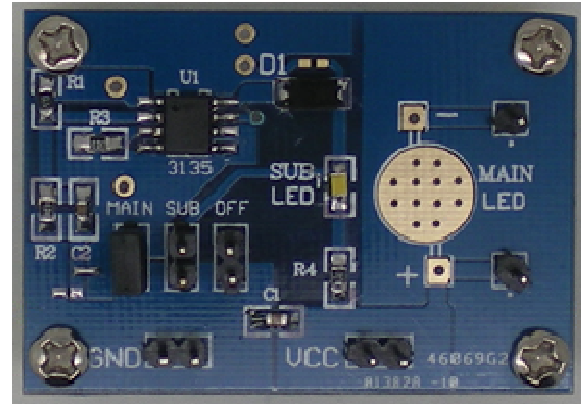


Figure 1: Photo of IS31LT3135V1/V2 evaluation board

## Recommended Equipment

- 5VDC Power supply
- 1W LED
- Multi-meter

## Recommended I/O Ratings

- Power supply voltage: 3.8VDC
- Output of  $I_{\text{MAIN}}$ : 320mA per LED
- Output of  $I_{\text{SUB}}$ : 20mA per LED

Note: When the power supply voltage  $\geq$  LED voltage rating, extra voltage is dissipated through the main-channel, causing a drop in system efficiency and an increase in wasted energy.

## Absolute Maximum Ratings

- Input voltage  $\leq 5\text{VDC}$

Caution: Do not exceed the input voltage conditions listed above to avoid risking permanent damage to the board.

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## Procedure

The IS31LT3135 evaluation board comes assembled and equipped with the purpose of allowing the user to easily demonstrate, or evaluate, functions of the IC driver. In order to verify device operation, please follow the listed directions carefully.

**Caution:** When powering on the circuit; ensure that all connections are properly linked to complete the board circuitry.

1. Connect the negative terminal of the power supply to the GND pin.
2. Connect the positive terminal of supply to the VCC pin.
3. Connect the negative end of the LED panel (LED arrays) to the LED- terminal.
4. Connect the positive end of the LED panel (LED arrays) to the LED+ terminal.
5. After ensuring connections are sound and that the circuit is complete, turn on the power supply to drive current through the LED panel (LED arrays) and perform evaluation.

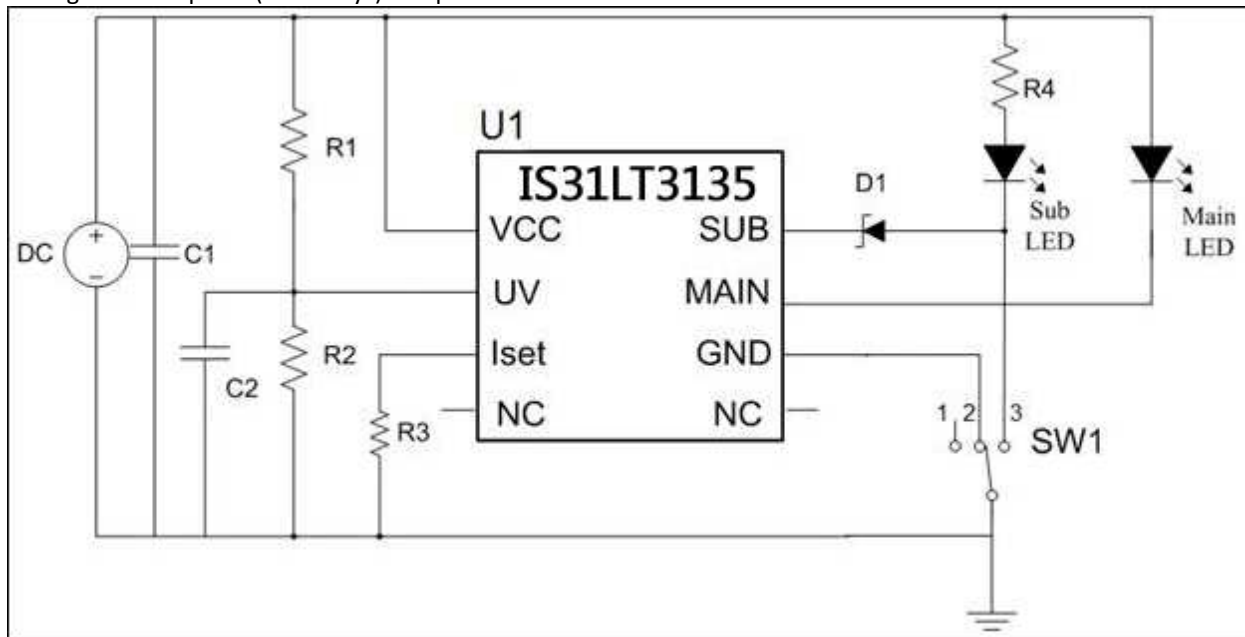


Figure 2: IS31LT3135 evaluation board circuit schematic.

## Bill of Materials

Name	Description	Symbol	Quantity
Capacitor	10uF±20%,16V, Surface-mount, 0805	C1	1
	100nF±20%,50V, Surface-mount, 0603	C2	1
Resistor	51KΩ±1%, Surface-mount, 0805 (V1)	R1	1
	47KΩ±1%, Surface-mount, 0805 (V2)		
	30KΩ±1%, Surface-mount, 0805	R2	1
	30KΩ±1%, Surface-mount, 0805	R3	1
	33Ω±1%, Surface-mount, 0805	R4	1
Diode	Schottky type, SS16,1A, 60V, SMA	D1	1
HBLED Driver IC	IS31LT3135, SOP-8 Package	U1	1

Table 2: IS31LT3135 Bill of Materials. Refer to Figure 2 for specific component locations

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## Device Operation

### Main-Channel LED Output Current

The main-channel LED current is adjusted by using a resistor connected to I<sub>SET</sub> pin. The voltage of I<sub>SET</sub> pin will remain at 1.2V, independent of external factors including transient temperature and source voltage fluctuations. The through the main-channel LED is calculated by using the following equation:

$$I_{\text{MAIN}} = 8000 \times \frac{V_{\text{SET}}}{R_{\text{SET}}}$$

The main-channel current will continue through the LED to the GND pin. 0.1V dropout voltage occurs when the main-channel current is  $\leq 200\text{mA}$ .

Sub-channel LED current originates from the SUB terminal to ground, and likewise its corresponding LED current can be set via an external resistor.

$$I_{\text{SUB}} = \frac{V_{\text{CC}} - V_{\text{F2}} - V_{\text{D2}}}{R_4 + R_{\text{SUB}}}$$

$V_{\text{CC}}$  is the power supply voltage.  $V_{\text{F2}}$  is the sub-LED voltage.  $V_{\text{D2}}$  denotes the diode voltage and its value should be minimized.

### UV Threshold Configuration

The UV pin detects any voltage swings and compensates by utilizing 0.8v hysteresis. This form of error correction mechanism will ensure reliable device operation, even when the power supply experiences an unwanted ripple effect. Sweeping power supply from a high to low voltage, results in main channel switch to sub-channel while UV pin is below the UV threshold of 1.17V (IS31LT3135-V1 typical) or 1.23V (IS31LT3135-V2 typical.) Sweeping power supply from a low to high voltage, will cause the sub-channel mode to switch back to main-channel operation, under conditions where UV pin is 80mV higher than the UV threshold.  $U_{\text{UV}}$  is set by the ratio of resistor R1 over resistor R2.

When  $\left(\frac{R_2}{R_1 + R_2}\right)V_{\text{CC}} = 1.17\text{V} (V1) \text{ or } 1.23\text{V} (V2)$ ; an immediate switch from main to sub-channel operation

occurs. Lithium-ion batteries typically maintain a voltage level of 3.7V during discharge, so the recommended UV threshold is 3.4V. Typically resistors R1 and R2 are set to 10K $\Omega$  magnitude (i.e.51k $\Omega$ ) Small resistance values for R1 and R2 will translate to losses in heat or efficiency. To minimize these losses, it is recommended to derive precise values for the resistors so that the end device operates with the highest efficiency rate achievable.

### Short-Circuit Protection Mechanism

When the main-channel LED is shorted, IS31LT3135 will automatically switch to sub-channel mode.

### PCB layout reference

The switch should be placed in an area with low voltages, to avoid an instant spark while switching. The traces between GND pin and I<sub>SET</sub> pin to real ground should be as short and wide as possible, with the purpose of improving the main LED current accuracy and under voltage threshold accuracy. Adding a 0.1 $\mu\text{F}$ , capacitor may also help with this purpose.

# IS31LT3135-V1, IS31LT3135-V2 Dual Ch. (Main/Sub) LED Driver Evaluation Board Guide

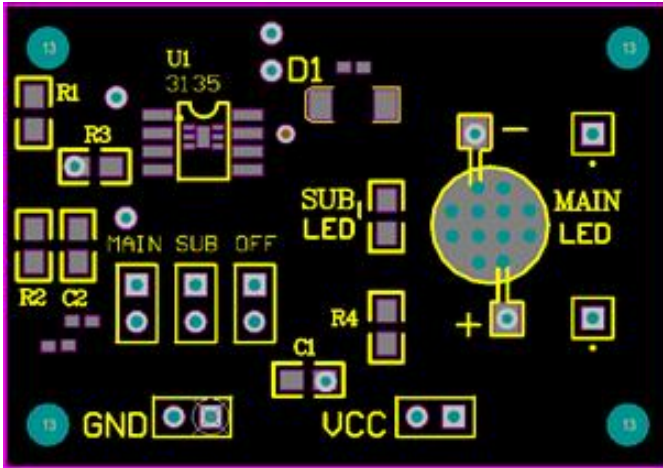


Figure 3: Component Placement: Top Layer

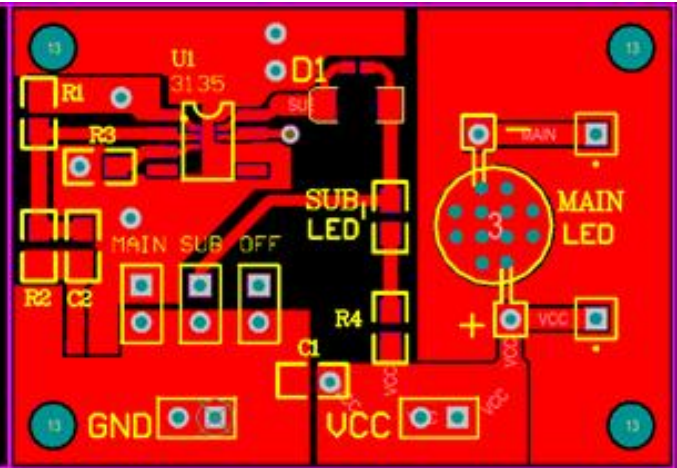


Figure 4: PCB Layout- Top Layer

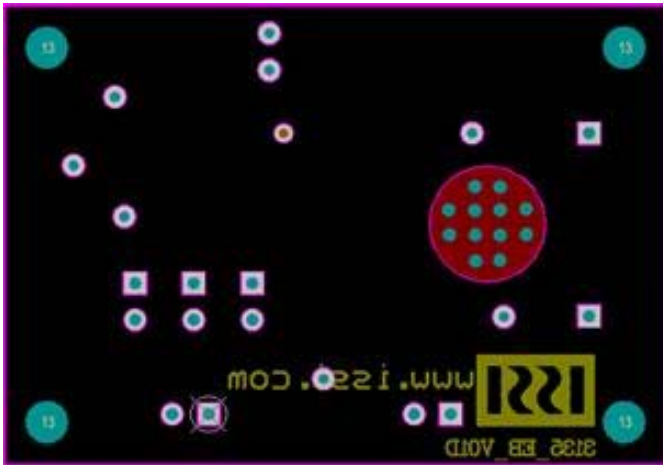


Figure 5: Component Placement Guide -Bottom Layer

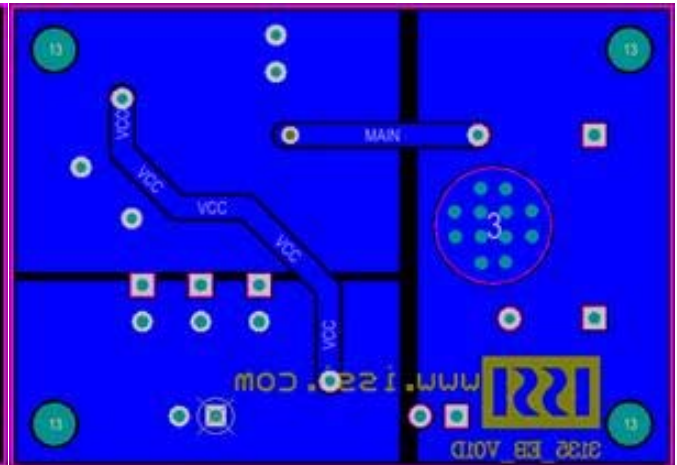


Figure 6: Board PCB Layout-Bottom Layer

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