IS31LT3360 AIC LED Driver Evaluation Board Guide

Description

The IS31LT3360 is a continuous mode inductive step-down converter, designed for driving a single LED or multiple series connected LEDs efficiently from a voltage source higher than the LED voltage. The chip operates from an input supply between 6V and 40V and provides an externally adjustable output current of up to 1.2A. The IS31LT3360 includes an integrated output switch and a high-side output current sensing circuit, which uses an external resistor to set the nominal average output current. Output current can be adjusted linearly by applying an external control signal to the ADJ pin. The ADJ pin will accept either a DC voltage or a PWM waveform. This will provide either a continuous or a gated output current. Applying a voltage of 0.2V or lower to the ADJ pin turns the output off and switches the chip into a low current standby state. The chip is assembled in SOT89-5 package. IS31LT3360 AIC DEMO board is used in RGB lamp or the general LED lamp.

Features

- Internal 40V power switch
- 6V to 40V V_{IN}
- Open-circuit protection
- Thermal shutdown protection
- I_{OUTPUT} =1.2A (max output current)
- 98% efficiency (max)
- 1200:1 dimming rate (typical)
- 3% I_{OUTPUT} accuracy (typical)
- PWM and DC line control mechanism
  - Single pin On/Off
  - Brightness control
- 1MHz switching frequency (max)
- SOT89-5 package
- Low part count and system resource overhead

Quick Start

Figure 1: IS31LT3360 AIC Evaluation Board Photo

Recommended Equipment

- 60VDC power supply
- 3 x LED panel (1W LED, 10 LEDs in series on each panel)
- Multi-meter

Recommended I/O Ratings

- Input: 6-40VDC
- Output: 1-10 LEDs in series (333mA)

Note: The input voltage must be 5V higher than the output voltage ($\sum V_F$).

Absolute Maximum Ratings

- Input voltage ≤ 40VDC

Caution: Do not exceed the conditions listed above, otherwise the board will be damaged.

Ordering Information

Part No	Temperature Range	IC Package
IS31LT3360-SDLS3-EBAIC	-40 to +85C (Industrial)	SOT89-5

Table 1: IS31LT3360 AIC Ordering Information

For information about ordering, delivery, and pricing, please contact ISSI at analog_mkt@issi.com or (408)969-6600.

Procedure

The IS31LT3360 AIC evaluation board is fully assembled and tested. Follow the steps listed below to verify board operation.

Caution: Do not turn on the power supply until all connections are completed.

1. Connect the terminals of the power supply to the AC1 and AC2 pin(If the board don't have the rectifier(D1-D4), Connect the positive terminal of the power supply to the DC+ of the board and the negative terminal of power supply to the DC- of the board) .
2. Connect the negative of the one of LED panel (LED arrays) to the LED1- terminal. And connect the positive of the same LED panel (LED arrays) to the LED1+ terminal.
3. Connect the other two LED panels to LED2 and LED3 as above.
4. Turn on the power supply to drive LED current and watch for lighting.

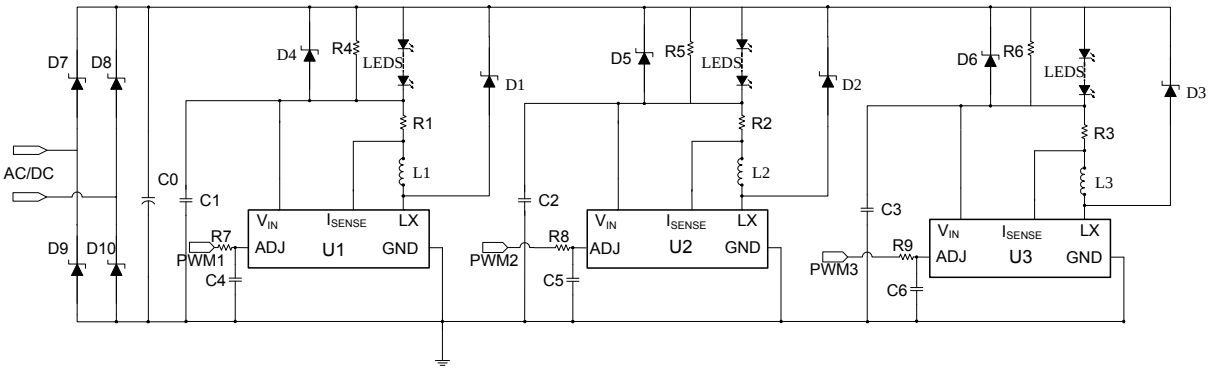

Figure 2: IS31LT3360 AIC Application Schematic

Application Notes

- C8-10 are optional components that enhance filtering of noise coupling from ADJ pin.
- D4-6 are optional component that serve to protect the IC during heavy load surge during the power on phase.

Bill of Materials

Name	Description	Symbol	Qty	Supplier	Part No.
Capacitor	Aluminum, 220uF,50V	C0	1		
Capacitor	100nF,50V, Surface-mount	C1,C2,C3	3		
Capacitor	10nF,50V, Surface-mount	C4,C5,C6	3		
Resistor	6.8KΩ±5%,0805, Surface-mount	R4,R5,R6	3		
Resistor	1KΩ±5%,0805, Surface-mount	R7,R8,R9	3		
Resistor	0.3Ω±1%,0805, Surface-mount	R1,R2,R3	3		
Diode	Schottky, SS26,2A,60V	D1-D3,D7-D10	7		
Zener Diode	Zener, 39V,0.25W	D4,D5,D6	3		
Inductor	47uH,Isat≥600A, Surface-mount	L1,L2,L3	3		
Driver	Inductive Step-down LED Driver	U1,U2,U3	3	ISSI	IS31LT3360 AIC

Table 2: Bill of Materials; Refer to Figure 2.

Detailed Description

LED Current Control

The nominal average output current in the LED(s) is determined by the value of the external current sense resistor (R_S) connected between V_{IN} and I_{SENSE} and in is given by:

$$I_{OUT_{nominal}} = \frac{0.1}{R_S} ; for\ R_S > 0.082\Omega$$

The table below gives values of nominal average output current for several preferred values of current setting resistor (Rs) in Figure 2: Application Schematic.

R_S (Ω)	I_{OUT} (mA)
0.082	1200
0.1	1000
0.15	667
0.3	333

Table 3: Current Sense Resistance vs. Nominal Output Current

V_{sense} is divided into two ranges for enhanced output current accuracy, and is explained in bin 3 more in depth. The above values assume a floating ADJ pin and a nominal voltage V_{REF} =1.2V. Note that R_S=0.082Ω is the minimum allowed value of sense resistor under these conditions to maintain switch current below the specified maximum value. It is possible to use different values of R_S if the ADJ pin is driven from an external voltage.

Inductor Selection

Recommended inductances range from 47μH to 220μH. Higher inductances are igher supply voltages and low output current in order to minimize errors due to switching delays, which result in increased ripple and lower efficiency. Higher values of inductance also result in a smaller change in output current over the supply voltage range. The inductor should be mounted as close to LX pin as possible with low resistance connections to LX and V_{IN} pins.

PCB Layout Guide

Decoupling capacitors and coil

It is particularly important to mount the coil and the input decoupling capacitor close to the chip to minimize parasitic resistance and inductance, which will degrade efficiency. The input decoupling capacitor (0.1uF fixed) must be placed as close to the Vin and GND pins as possible. It is also important to take account of any trace resistance in series with current sense resistor R_S.

LX pin

The LX pin of the chip is a fast switching node, so PCB traces should be kept as short as possible. To minimize ground 'bounce', the ground pin of the chip should be soldered directly to the ground plane.

ADJ pin

The ADJ pin is a high impedance input, so when left floating, PCB traces to this pin should be as short as possible to reduce noise pickup. ADJ pin can also be connected to a voltage between 1.2V~5V. In this case, the internal circuit will clamp the output current at the value which is set by ADJ=1.2V.

High voltage traces

Avoid running any high voltage traces close to the ADJ pin, to reduce the risk of leakage due to board contamination. Any such leakage may raise the ADJ pin voltage and cause excessive output current. A ground ring placed around the ADJ pin will minimize changes in output current under these conditions.

PCB Layout

Physical dimensions (L x W x H): 55mm x 21mm x 22mm

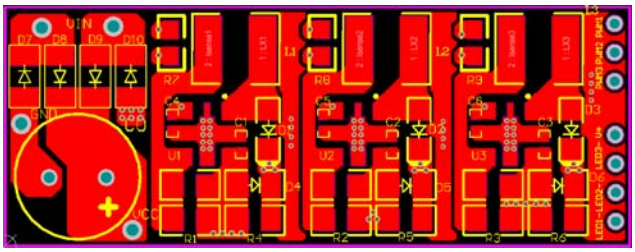

Figure 3: PCB Layout-Top Layer

Figure 4: PCB Layout-Bottom Layer

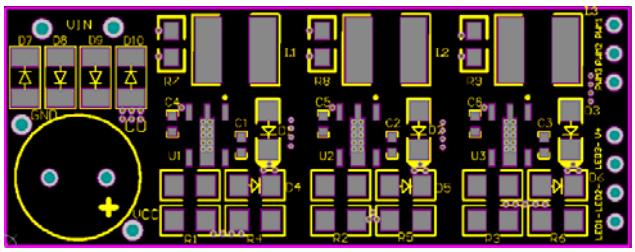

Figure 5: Component Placement Guide -Top Layer

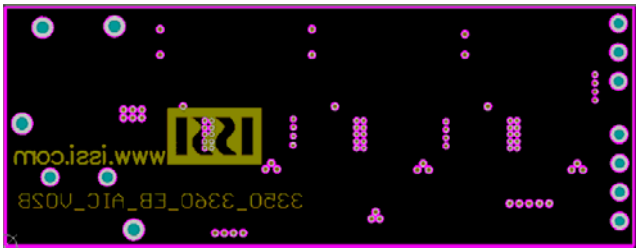

Figure 6: Component Placement Guide -Bottom Layer