

IS32LT3120+IS31SE5100 DUAL CHANNEL LINEAR LED DRIVER WITH FADE IN/FADE OUT

DESCRIPTION

The IS32LT3120 is a linear programmable current regulator consisting of 2 output channels capable of up to 200mA each. Each channel features an ON/OFF input pin to toggle the channel between the OFF condition and the source condition.

The IS31SE5100 is an ultra low power, fully integrated 8-channel solution for capacitive touch-buttons applications. The chip allows electrodes to project sense fields through any dielectric such as glass or plastic. On-chip calibration logic continuously monitors the environment and automatically adjusts on-and-off threshold levels to prevent false sensor activation.

On this DEMO, IS31SE5100 directly toggle the ON/OFF input pins of IS32LT3120 to achieve the capacitor pads controlling the both string LEDs.

FEATURES

- Dual output channels source up to 200mA each
- Independent debounced ON/OFF control for each channel
- Programmable current via a single external resistor
- Programmable fade in, fade out via external resistor
 - Pull down resistor value sets fade speed
 - Gamma corrected fade in/out algorithm
- Fault protection:
 - LED string shorted to GND
 - Over temperature
- IS32LT3120 with SOP-8-EP and IS31SE5100 with QFN-24 (4mm × 4mm) packages
- IS32LT3120
 - Automotive grade - AEC-Q100 (pending)
 - Operating temperature range from -40°C ~ +125°C

QUICK START



Figure 1: Photo of IS32LT3120+IS31SE5100 Evaluation Board

RECOMMENDED EQUIPMENT

- 12V, 1A DC power supply

ABSOLUTE MAXIMUM RATINGS

- ≤ 45V power supply

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

PROCEDURE

The 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 ground terminal of the power supply to the GND and the positive terminal to the VCC. **Note: The V_{CC} supply should be set close to the IS32LT3120 minimal headroom voltage of 0.9V (V_{CC} – V_{outx}) for best thermal performance. The board can be operated with a larger headroom voltage as long as the increase in package temperature is monitored. Exceeding the device package temperature specification will cause the device to enter thermal protection mode.**
- 2) The fade time of both channels is adjusted by the variable resistor (RW1). Turn RW1 counter clockwise to decrease fade time, and clockwise to increase fade time. Once the desired fade time is set, measure the resistor value across TP1 and GND. Use this measured resistor value to replace the variable resistor RW1 and R3 (see schematic Figure 2).
- 3) The output current of both channels (OUT1 and OUT2) is adjusted by the variable resistor (RW2). Turn RW2 counter clockwise to decrease the output current of both channels, and clockwise to increase the output current of both channels. The test point TP2 can be used to detect the resistor value at the ISET pin. The final resistance can be measured with an ohm meter across TP2 and GND pins. Use this measured resistor value to replace the variable resistor RW2 and R4 (see schematic Figure 2).
- 4) Momentary touch pads (K1, K2) are used to individually enable/disable the Outx LED channels. Touch K1 to enable the onboard LED string for channel 1. Touch K2 to enable the onboard LED string for channel 2.
- 5) JP1 is used to connect the IS32LT3120 OUT1 (pin 4) to the onboard LED string (LED1, LED3 and LED5). JP2 connects the device OUT2 (pin 5) to the onboard LED string (LED2, LED4, LED6). Use one of the green terminal blocks to connect an external LED string. Remove the corresponding jumper header (JP1 or JP2) to disable the onboard LED string.

Note: Connecting an external LED string without removing the onboard string jumper header will drive both onboard and external LED strings in parallel resulting in lower current drive to both strings.

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- 6) The on board LED string size can be adjusted from 1 to 3 LEDs by using jumper headers JP3~JP6. Connecting the header to pins 2-3 disables the corresponding LED, ie JP3 pins 2-3 disables LED3. To enable all the LED3~LED6 connect JP3~JP6 to pins 1-2.

ORDERING INFORMATION

Part No.	Temperature Range	Package
IS32LT3120-GRLA3-EBSE5100	-40°C ~ +125°C (Automotive)	SOP-8-EP, Lead-free
IS31SE5100-QFLS2-TR	-40°C ~ +85°C (Industrial)	QFN-24, Lead-free

Table 1: Ordering Information

For pricing, delivery, and ordering information, please contact ISSI's analog marketing team at analog@issi.com or (408) 969-6600.

EVALUATION BOARD OPERATION

IS32LT3120 evaluation board drives two strings of WLEDs. There are two variable resistors used for adjusting the fade time (RW1), LED current (RW2).

SETTING THE FADE TIME

The fade time, either in or out, for both channels is the same, and is set by a single external programming resistor (R_{TSET}). The fade time is programmable by Equation (1):

$$t \approx R_{TSET} \times 2.5 \mu s \quad (1)$$

For example, $R_{TSET}=100k\Omega$, fade time is about 0.25s.

Note: In order to get the optimized effect, the recommended fading time is between 1.5s ($R_{TSET}=600k\Omega$) and 0.25s ($R_{TSET}=100k\Omega$).

If the TSET pin is tied directly to GND, the fade in/out function is canceled and the ramp time is about 73 μ s, or 'instant on'. However, the debounce feature of the ENx pin is not disabled.

OUTPUT CURRENT SETTING

A single programming resistor (R_{ISET}) controls the maximum output current for both output channels simultaneously. The programming resistor may be computed using the following Equation:

$$R_{ISET} = \frac{2000}{I_{SET}} \quad (10k\Omega \leq R_{ISET} \leq 100k\Omega)$$

The device is protected from an output over current condition caused by an accidental short circuit of the ISET pin, by internally limiting the maximum current in the event of an ISET short circuit to 260mA.

THERMAL ROLLOFF

The output current of both channels will be equal to the set value so long as the die temperature of the IC remains below 125°C (Typical). If the die temperature exceeds this threshold, the output current of the device will begin to reduce at a rate of 3%/°C.

The roll off slope is related to ISET value. When $I_{SET}=20mA$, the roll off slope is about 3.7%. When $I_{SET}=200mA$, the roll off slope is about 2.2%

FAULT DETECTION

An output shorted to GND fault is detected if the output voltage on a channel drops below the low voltage threshold V_{SCD} and remains below the threshold for t_{FD} . The channel (OUTx) with the short condition will reduce its output current to 20% of I_{SET} .

When short condition is removed, output current will recover to original value.

When output current is larger than limit value, about 260mA, the output current will be clamped. When the open fault condition is recovered, there will be a large current pulse about 10 μ s.

TOUCH PAD SENSITIVITY ADJUSTING

Sensitivity can be adjusted by the external capacitor or internal register.

The value of capacitor is higher the sensitivity is lower; value of capacitor is lower the sensitivity is higher.

The SS bit of Configuration Register (00h) is used to modulate sensitivity. By setting the SS bit to "00" sensitivity is normal. Sensitivity is high when SS bit is set to "01". Sensitivity is low when SS bit is set to "10". Setting SS bit to "11" is not a valid state.

Please refer to the datasheet to get more information about is31se5100.

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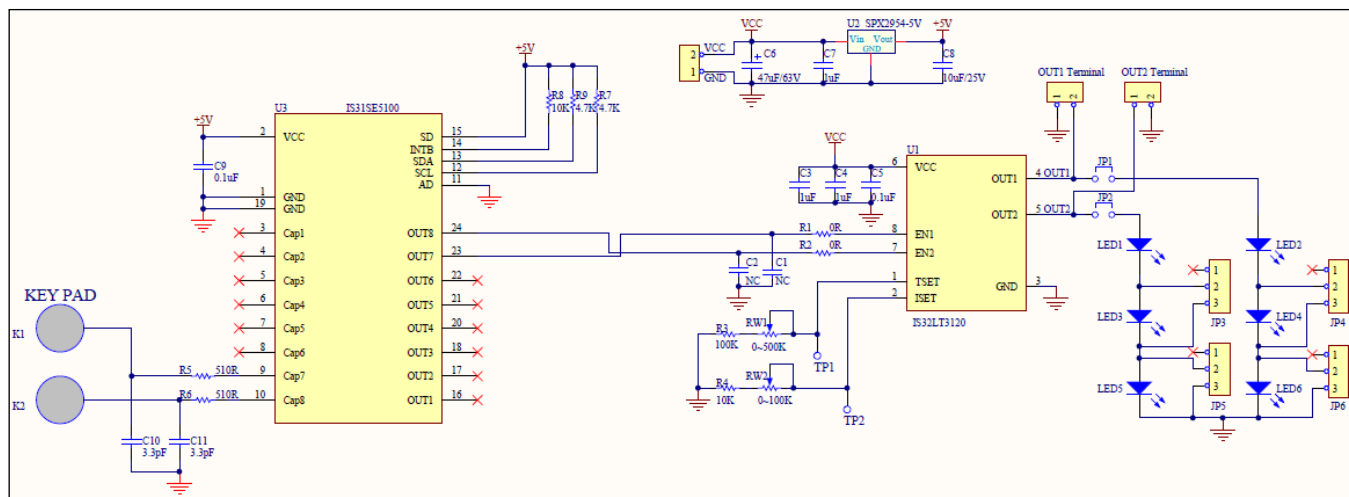


Figure 2: IS32LT3120+IS31SE5100 Application Schematic

BILL OF MATERIALS

Name	Symbol	Description	Qty	Supplier	Part No.
LED Driver	U1	LED Driver	1	ISSI	IS32LT3120
LDO	U2	5V Low-Dropout Regulator	1	SIPEX	SPX2954-5V
Touch Sensor	U3	Capacitive Touch Sensor	1	ISSI	IS31SE5100
Resistor	R1,R2	RES,0ohm,1/10W,±5%,SMD	2	YAGEO	RL0603JR-0700RL
Resistor	R3	RES,100k,1/4W,±1%,SMD	1	YAGEO	RC1206FR-07100KL
Resistor	R4	RES,10k,1/4W,±1%,SMD	1	YAGEO	RC1206FR-0710KL
Resistor	R5,R6	RES,510R,1/4W,±5%,SMD	2	YAGEO	RC1206JR-07510RL
Variable Resistor	RW1	Potentiometer,500k±10%,0.5W	1	Bourns	3386P-1-504
Variable Resistor	RW2	Potentiometer,100k±10%,0.5W	1	Bourns	3386P-1-104
Capacitor	C3,C4,C7	CAP,1µF,50V,±10%,SMD	3	YAGEO	CC0805JKX7R9BB105
Capacitor	C6	CAP,47µF,63V,±10%,SMD	1		
Capacitor	C8	CAP,10uF,25V, ±10%,SMD	1	YAGEO	CC0805JKX7R8BB106
Capacitor	C5,C9	CAP,0.1µF,50V,±10%,SMD	2	YAGEO	CC0603JKX7R9BB104
Capacitor	C10,C11	CAP,3.3pF,50V, ±10%,SMD	2	YAGEO	CC0603JKX7R9BB330
	C1,C2	Not installed	2		
Terminal blocks	OUT1,OUT2	Output green terminal blocks	2		

Bill of materials, refer to Figure 2 above.

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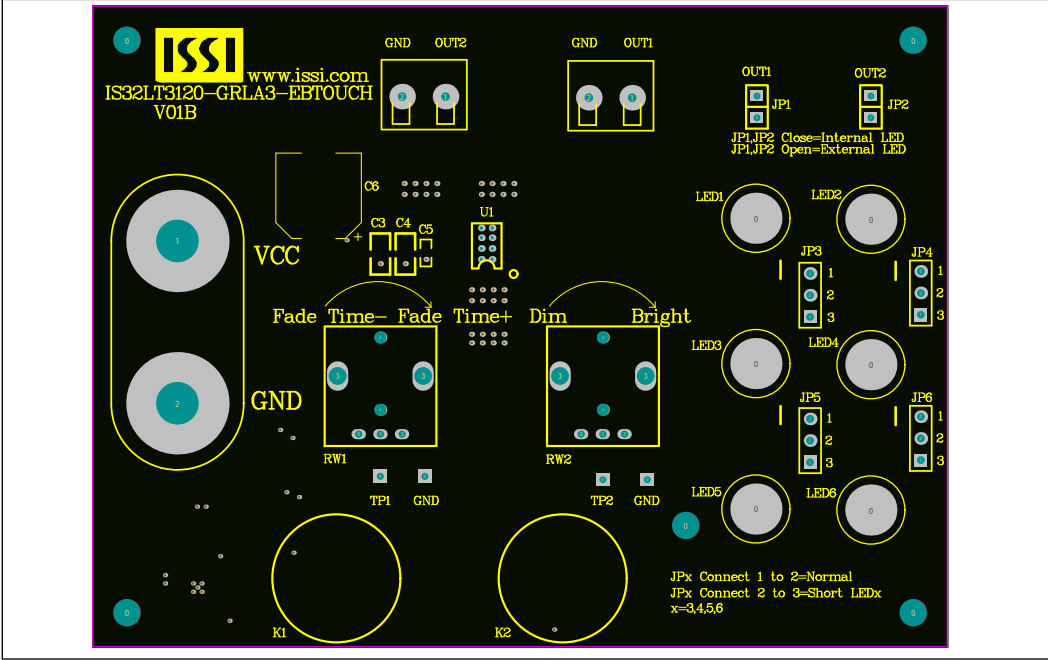


Figure 3: Board Component Placement Guide - Top Layer

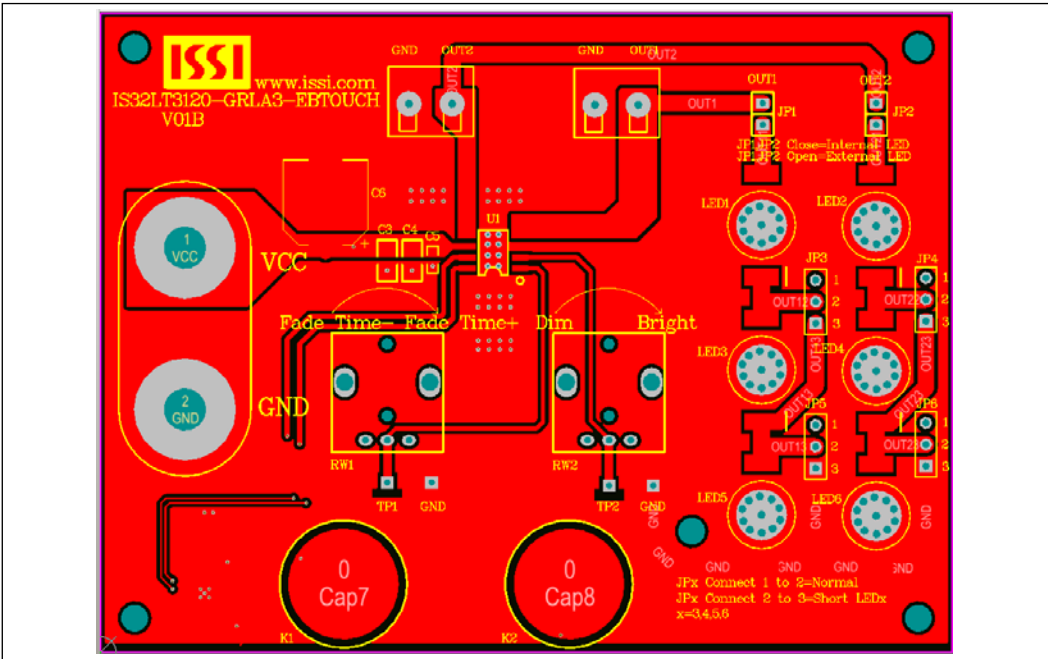


Figure 4: Board PCB Layout - Top Layer

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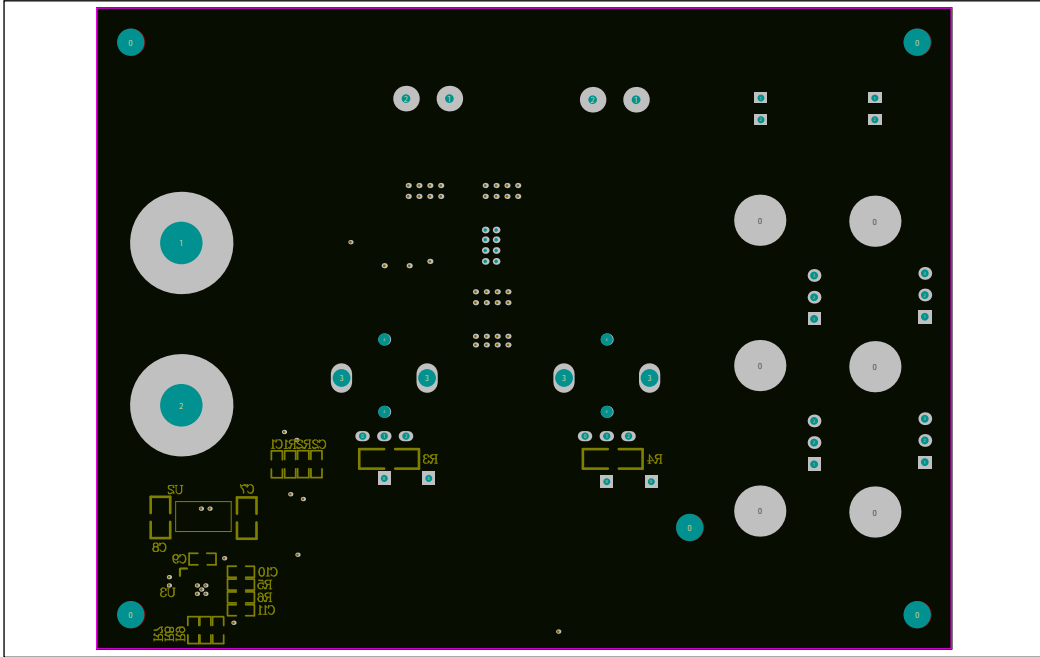


Figure 5: Board Component Placement Guide - Bottom Layer

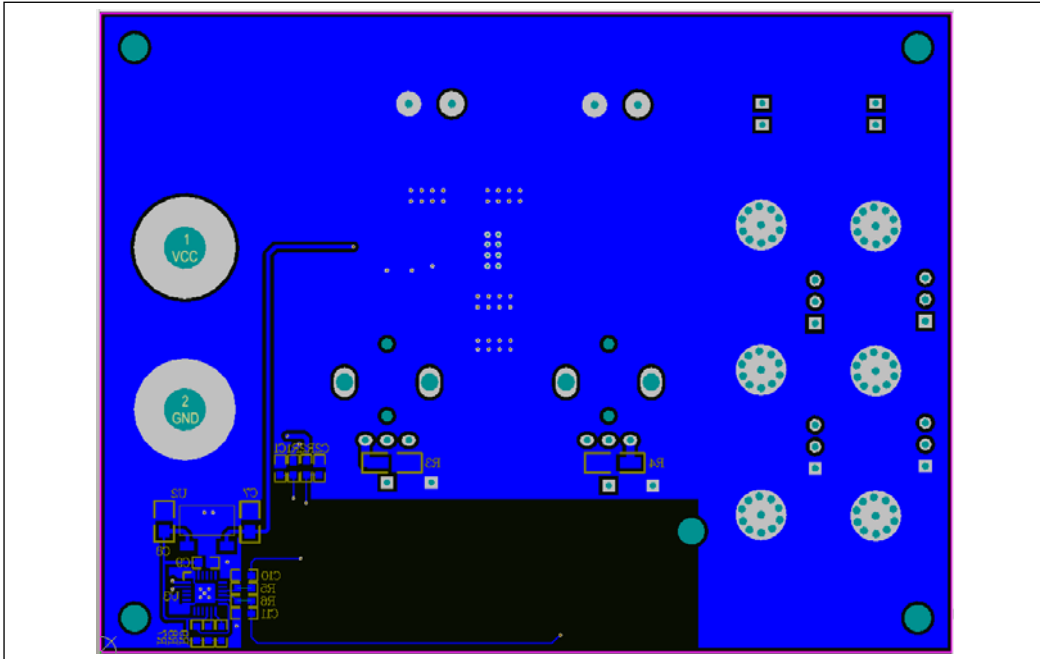


Figure 6: Board PCB Layout - Bottom Layer

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