

## 12 CHANNELS, LINEAR LED DRIVER

### DESCRIPTION

The IS32LT3132 is a linear programmable current regulator featuring 12 high-side output channels, with each channel capable of up to 100mA. It is equipped with a UART interface that is compatible with CANFD PHY for communication with a master microcontroller or ECU. The host microcontroller employs a command and response protocol to effectively manage the read and write operations of registers on one or multiple IS32LT3132 devices. Each output can individually support 12-bit PWM dimming and 8-bit DC current adjustment. The output channels can be combined to provide a higher current drive capability up to a maximum of 1.2A.

For added system reliability, the IS32LT3132 integrates fault detection circuitry for open/short string, single LED short, and over temperature conditions. Faults are recorded in registers which can be accessed by an external MCU. To optimize EMI performance, the IS32LT3132 features spread spectrum on the internal PWM and LED channel outputs have programmable slew rate control and phase delay to mitigate EMI and power supply inrush current.

The IS32LT3132 is targeted at pixel-controlled automotive lighting market, such as interior and exterior animation light. It is offered in a thermally enhanced eTSSOP-24 and WFQFN-32 (5mm×5mm) packages.

### QUICK START

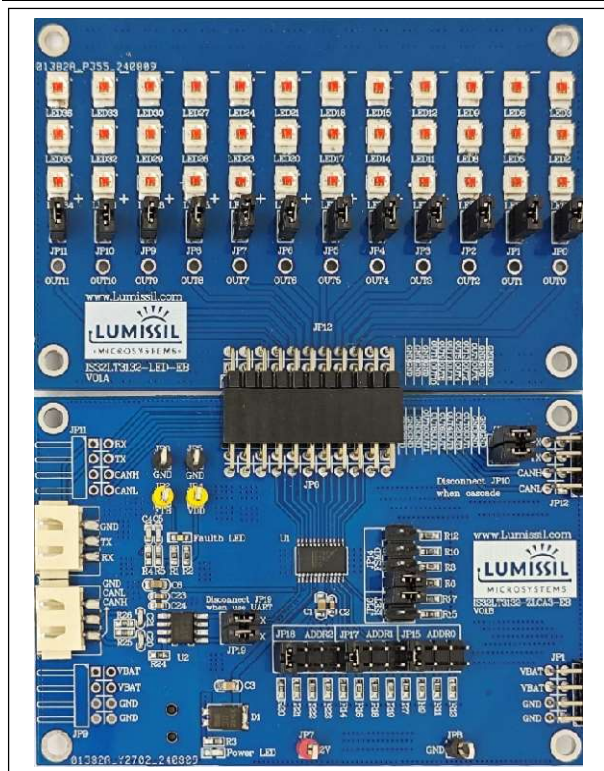


Figure 1: Photo of IS32LT3132- Evaluation Board

### FEATURES

- Wide input voltage supply from 4.5V to 16V
- UART Communication Interface with Lumibus protocol
  - UART compatible with CAN physical layer, 100kbps~1Mbps baud rate
  - CRC to ensure robustness of communication
  - Support up to maximum 64 addressable devices
  - Watchdog timer to support fail-safe mode
- 12 channels high-side current output
  - Up to 100mA channel current set by resistor
  - $\pm 3\%$  device-to-device output current accuracy
  - Combined for higher current capability with same current accuracy
  - Low headroom voltage of 680mV (Typ.) at 100mA
- Individual PWM dimming to each channel
  - 4096 steps (12-bit) PWM duty cycle setting
    - 7+5-bit
    - 12-bit
    - 8-bit
  - Phase delay minimizes inrush current (6 groups)
- Programmable PWM frequency up to 64kHz
- Current slew rate control and spread spectrum optimize EMI performance
- Individual 8-bit DC current adjustment to each channel
- 64-step global DC current setting
- Fault protection with reporting
  - Fail safe modes selection
  - LED string open/short detect
  - Single LED short detect
  - Programmable fault reporting delay time
  - Programmable over temperature current roll off
  - Thermal shutdown
  - CRC error detection
  - Overcurrent (ISET pin short to GND)
  - ISET pin open
  - Fault pin pull down fault
  - LED undervoltage
- AEC-Q100 Qualification in process with Temperature Grade 1:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
- Operating temperature range ( $-40^{\circ}\text{C}$  ~  $+150^{\circ}\text{C}$ )
- eTSSOP-24 and WFQFN-32 (5mm×5mm) packages
- RoHS & Halogen-Free Compliance
- TSCA Compliance

### RECOMMENDED EQUIPMENT

- 12.0V, 3A power supply

### ABSOLUTE MAXIMUM RATINGS

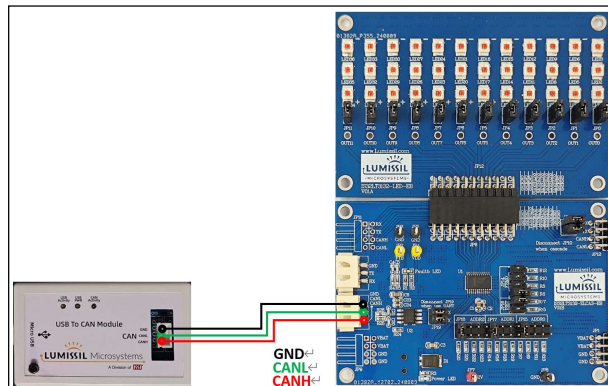
- $\leq 20\text{V}$  power supply

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

## PROCEDURE

The IS32LT3132 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.**



**Figure 2: Photo of CAN Module Connected to Evaluation Board**

- 1) Short JP14 R6 (10k $\Omega$ ) header, short JP16 R17 (33k $\Omega$ ) header
- 2) Short JP15 R7 (10k $\Omega$ ), JP17 R14 (10k $\Omega$ ), JP18 R20 (10k $\Omega$ ) header
- 3) Short JP10, please open it when cascade
- 4) Short JP19, please open it when use UART

- 5) Connect JP6 to LED board header
- 6) LED board short JP0~JP11 header
- 7) Connect the DC-12V to JP7(12V), GND to JP8(GND) header, or plug in the 12V Power adapter input to Power adapter interface (CN1).
- 8) Connect CN2 (CANH, CANL, GND) header to CAN Module CANH, CANL, GND header
- 9) Turn on the power supply. If the EVB no response, please check for circuit fault.

## EVALUATION BOARD OPERATION

The IS32LT3132 ADDR0, ADDR1, ADDR2 for the device address to select jumpers, through different combinations can be set different device addresses, the default device address is 0x80 (R7, R14, R20). ISET is IS32LT3132 current setting item, R15 (10k $\Omega$ ) corresponding to the channel output maximum 100mA current, R17 (33k $\Omega$ ) corresponding to the channel output maximum 33mA current, the default connection to R17. FSMD is the IS32LT3132 fail-safe mode selection, the default connection R6 (10k $\Omega$ ) is normal mode, R8, R10, R12 is different FSMD mode. Short R8 the device will enter fail-safe Mode 1 and the outputs will be determined by OTP(B0h~BAh) registers. Short R10 the device will enter fail-safe Mode 2 and all outputs will be forced into completely off. Short R12 the device will enter fail-safe Mode 3 and all outputs will be forced into fully on (with 98% PWM duty cycle).

## ORDERING INFORMATION

| Part No.            | Temperature Range            | Package              |
|---------------------|------------------------------|----------------------|
| IS32LT3132-ZLCA3-EB | -40°C to +125°C (Automotive) | eTSSOP-24, Lead-free |

**Table 1: Ordering Information**

For pricing, delivery, and ordering information, please contacts Lumissil's analog marketing team at [analog@Lumissil.com](mailto:analog@Lumissil.com) or (408) 969-6600.

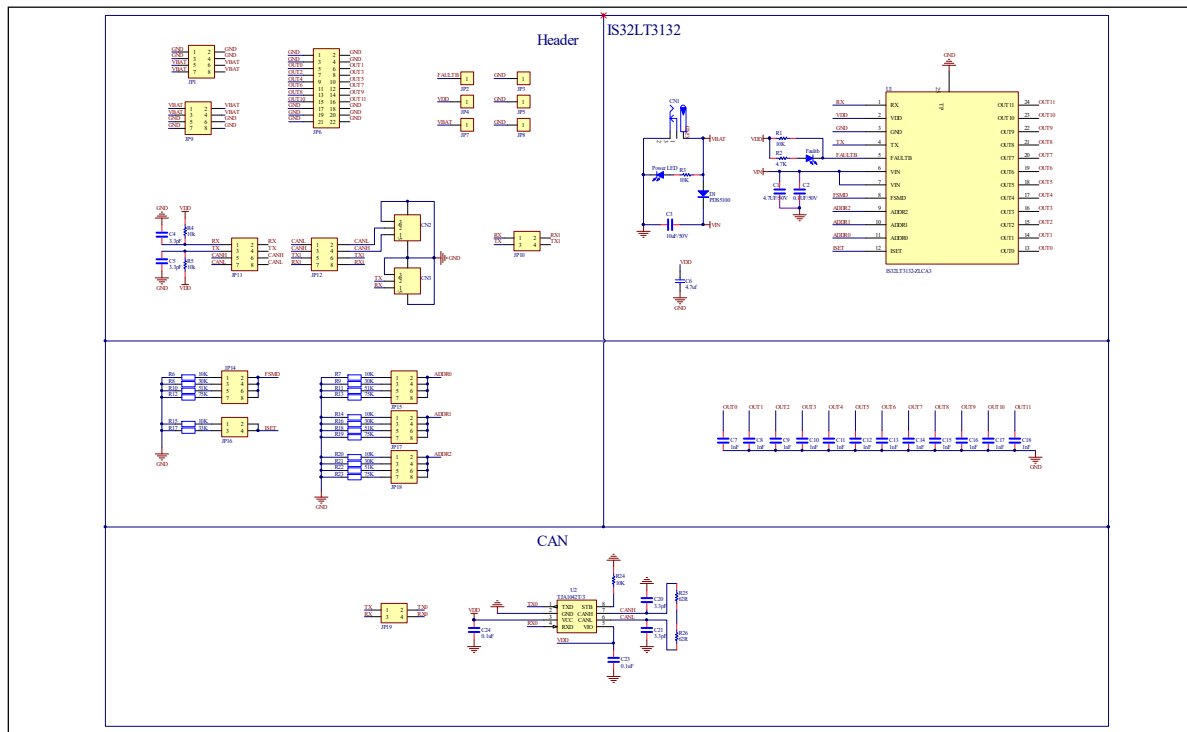


Figure 3: IS32LT3132-ZLCA3 Application Schematic

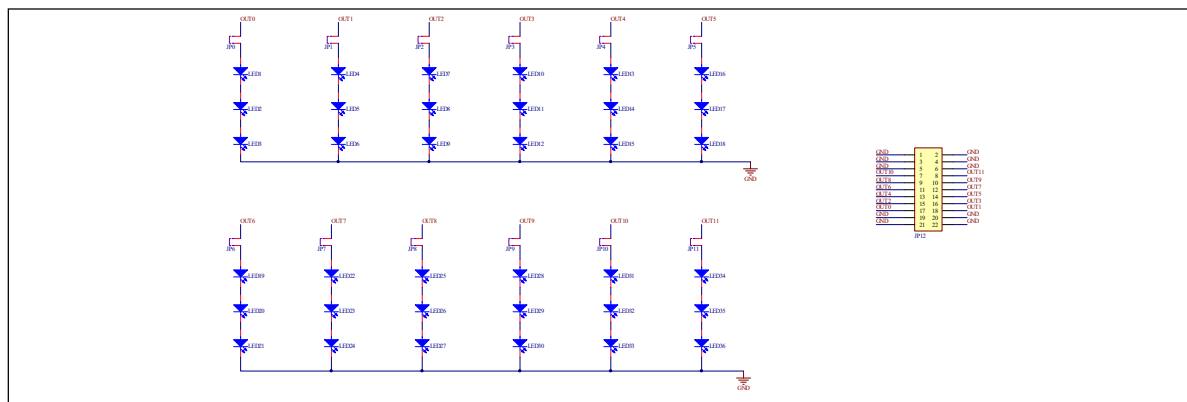


Figure 4: 18 channel LED Application Schematic

**BILL OF MATERIALS**

| Name            | Symbol                                     | Description                             | Qty | Supplier  | Part No.             |
|-----------------|--------------------------------------------|-----------------------------------------|-----|-----------|----------------------|
| LED Driver      | U1                                         | LED Driver                              | 1   | Lumissil  | IS32LT3132           |
| CAN Transceiver | U2                                         | Transceiver                             | 1   | NXP       | TJA1042T/3           |
| Schottky Diodes | D1                                         | Diode, 5A, 100V, PowerDI-5              | 1   | DIODES    | PDS5100              |
| DC Power Outlet | CN1                                        | DC-050, 12V                             | 1   | SHOU HAN  | DC-050-2.5-T         |
| Connector       | CN2, CN3                                   | CAN/UART Connector, XH2.54              | 2   | XUNPU     | WAFER-XH2.54-3PWB    |
| Resistor        | R1, R3, R4, R5, R6, R7, R14, R15, R20, R24 | RES, 10k, 1/16W, $\pm 5\%$ , SMD        | 10  | Yageo     | RC0603JR-072KL       |
| Resistor        | R2                                         | RES, 4.7k, 1/16W, $\pm 5\%$ , SMD       | 1   | Yageo     | RC0603JR-074K7KL     |
| Resistor        | R8, R9, R16, R21                           | RES, 30k, 1/16W, $\pm 1\%$ , SMD        | 4   | Yageo     | RC0603JR-0730KL      |
| Resistor        | R17                                        | RES, 33k, 1/10W, $\pm 1\%$ , SMD        | 1   | Yageo     | RC0603JR-0733KL      |
| Resistor        | R10, R11, R18, R22                         | RES, 51k, 1/10W, $\pm 1\%$ , SMD        | 4   | Yageo     | RC0603JR-0751KL      |
| Resistor        | R12, R13, R19, R23                         | RES, 75k, 1/10W, $\pm 1\%$ , SMD        | 4   | Yageo     | RC0603JR-0775KL      |
| Resistor        | R25, R26                                   | RES, 62R, 1/10W, $\pm 5\%$ , SMD        | 2   | Yageo     | RC0603JR-0762RL      |
| Capacitor       | C4, C5, C20, C21                           | CAP, 3.3pF, 50V, $\pm 8\%$ , SMD        | 4   | Yageo     | CQ0603CRNPO9BN3R3    |
| Capacitor       | C7~C18                                     | CAP, 1nF, 16V, $\pm 5\%$ , SMD          | 12  | Yageo     | CC0603JRX7R7BB102    |
| Capacitor       | C2, C23, C24                               | CAP, 0.1 $\mu$ F, 16V, $\pm 20\%$ , SMD | 3   | Yageo     | CC0603MRX7R7BB104    |
| Capacitor       | C1, C6                                     | CAP, 4.7 $\mu$ F, 50V, $\pm 20\%$ , SMD | 2   | Yageo     | CC0805KKX5R9BB475    |
| Capacitor       | C3                                         | CAP, 10 $\mu$ F, 50V, $\pm 20\%$ , SMD  | 1   | Yageo     | CC0805MRX7R7BB105    |
| LED             | FAULTB LED                                 | Diode, LED Red, SMD                     | 1   | Everlight | 19-213/R6C-AN2Q1B/3T |
| LED             | Power LED                                  | Diode, LED Green, SMD                   | 1   | Everlight | 19-213/GHC-YR1S2M/3T |

Bill of Materials, refer to Figure 3 above.

**FxLED 3×12 NUM ARRAY**

| Name | Symbol     | Description            | Qty | Supplier               | Part No.    |
|------|------------|------------------------|-----|------------------------|-------------|
| LED  | LED1~LED36 | Diode, LED Yellow, SMD | 36  | LEIRI photoelectricity | C35Y590-120 |

Bill of Materials, refer to Figure 4 above.

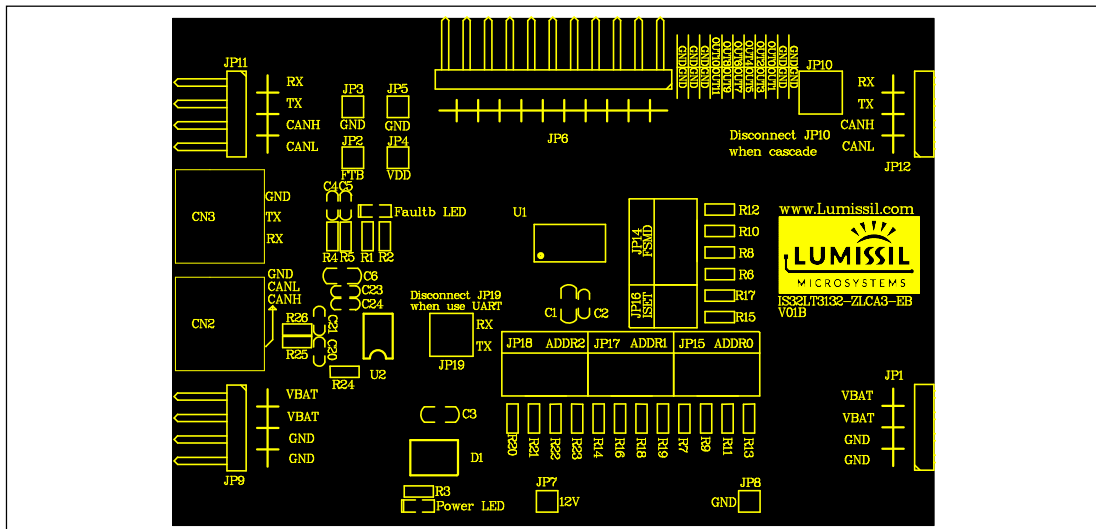


Figure 5: Board Component Placement Guide - Top Layer

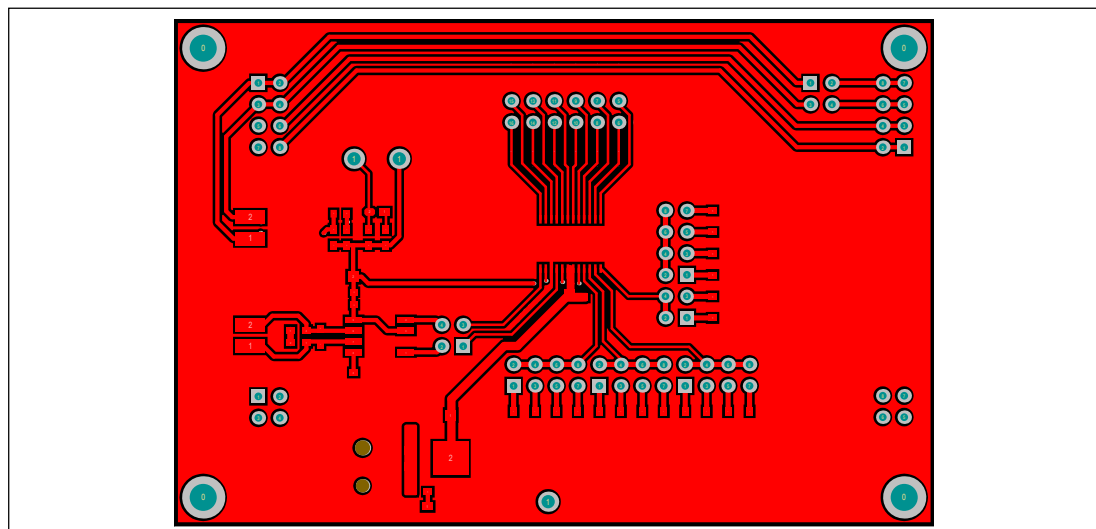


Figure 6: Board PCB Layout - Top Layer

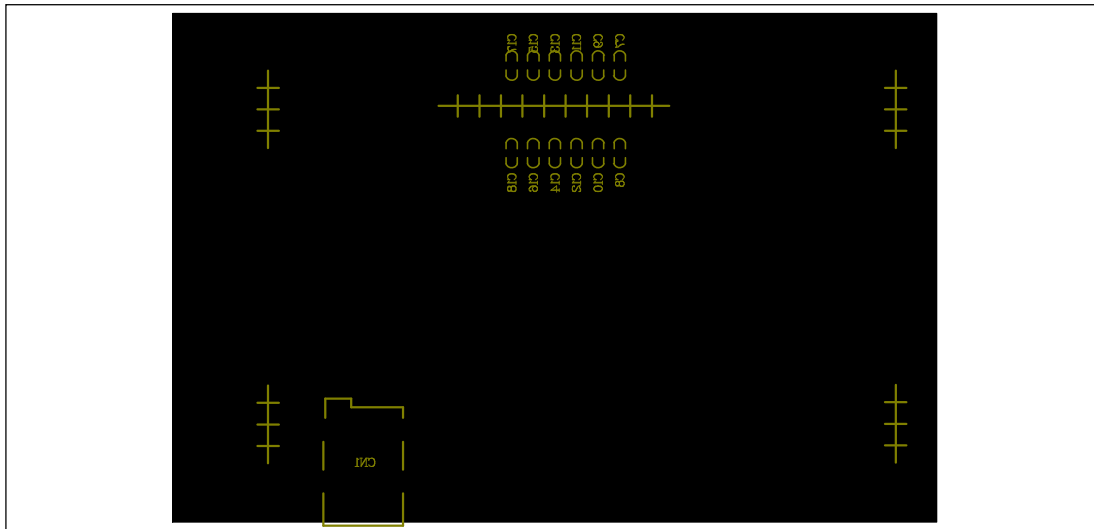


Figure 7: Board Component Placement Guide - Bottom Layer

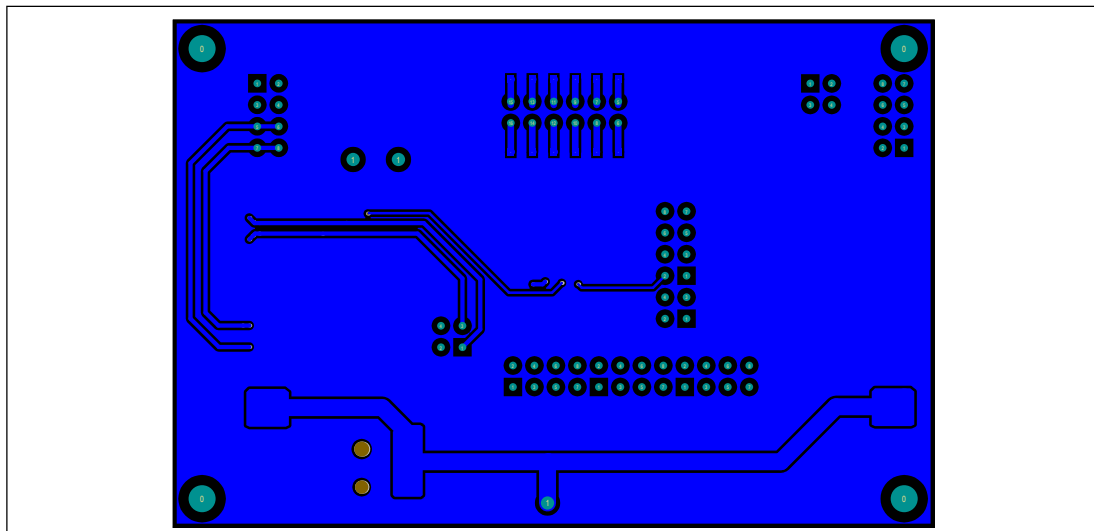


Figure 8: Board PCB Layout - Bottom Layer

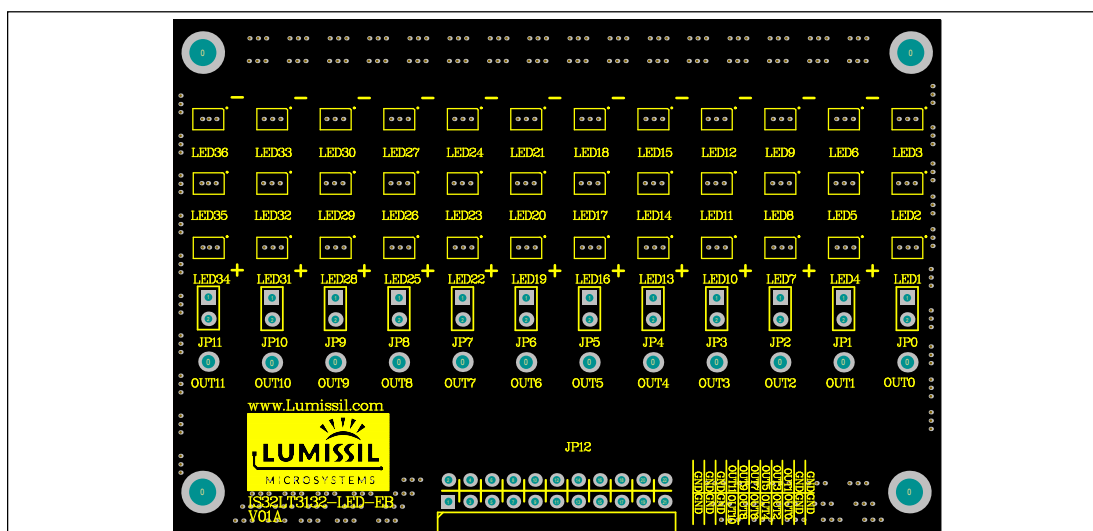


Figure 9: LED Board Component Placement Guide - Top Layer

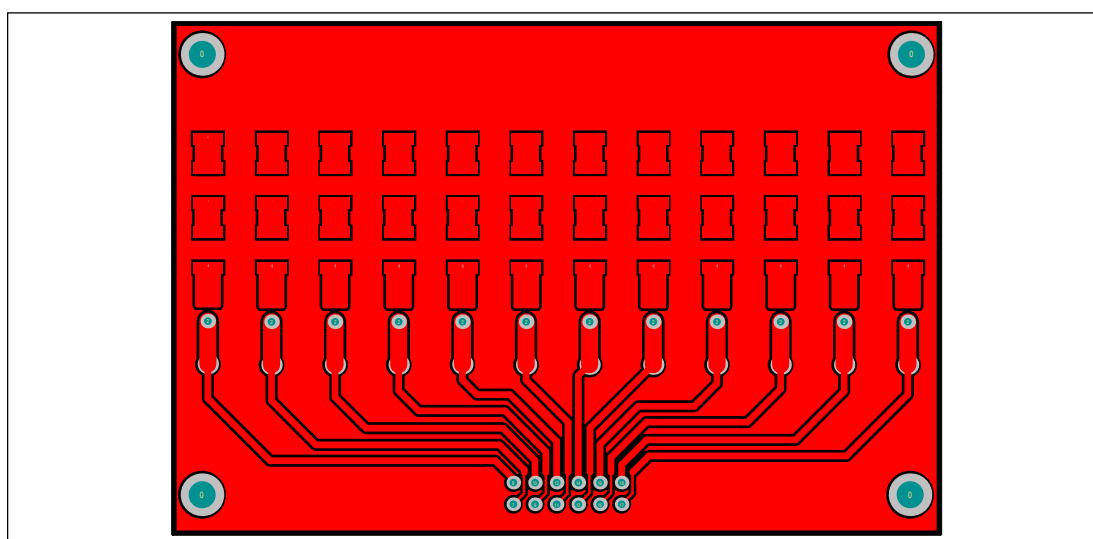
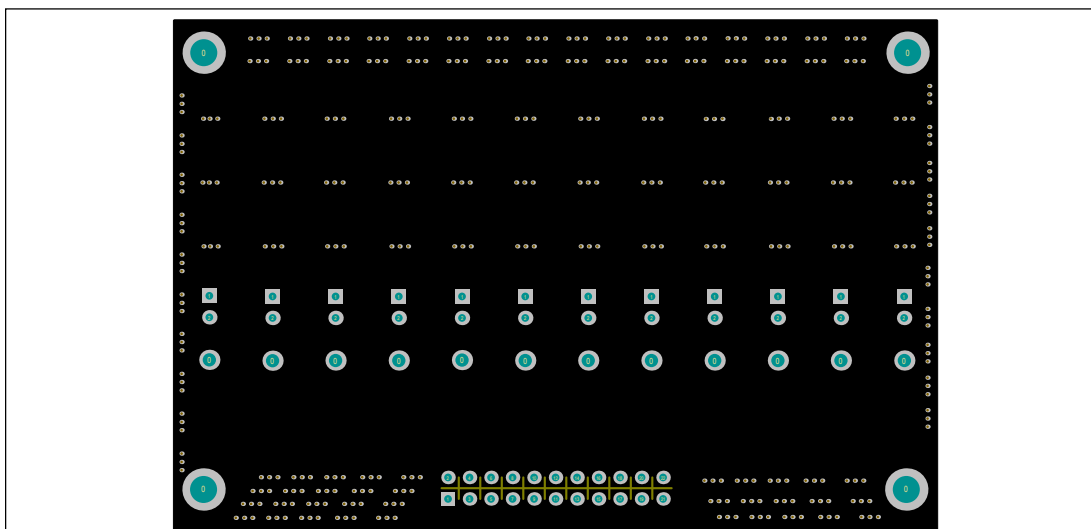
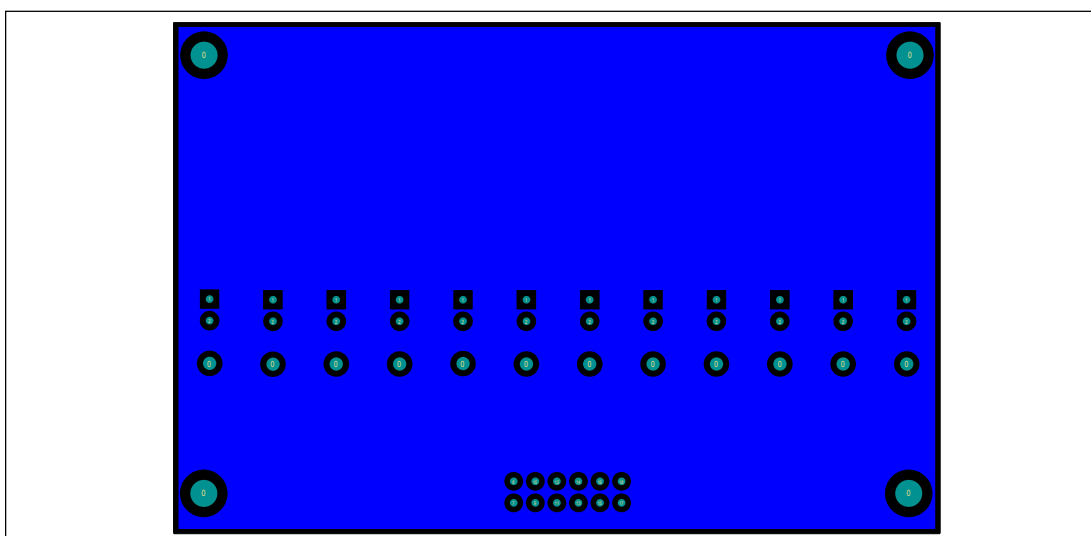


Figure 10: LED Board PCB Layout - Top Layer



**Figure 11: LED Board Component Placement Guide - Bottom Layer**



**Figure 12: LED Board PCB Layout - Bottom Layer**

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### REVISION HISTORY

| Revision | Detail Information | Date       |
|----------|--------------------|------------|
| A        | Initial release    | 2024.08.21 |