

# LT3496EUFD

## Triple Step-Down LED Driver

### DESCRIPTION

#### WARNING!

**Do not look directly at operating LED.**

This circuit produces light that can damage eyes.

Demonstration circuit 986 is a Triple Step-Down LED Driver featuring the LT3496. The LT3496 is a triple output DC/DC converter designed to operate as current sources for driving high current LEDs. On the demo board, the default current for each output channel is 500mA. Setting CTRL voltage to be less than 1V will control the current sense voltage to be one-tenth of CTRL voltage, therefore, reduce the LED current. The output current should not exceed the rated current of the LEDs used. The LED current thermal derating should be considered to protect the LEDs. The maximum voltage of an LED string the demo board can drive is limited by the duty cycle and the input voltage of the LT3496. The demo board default switching frequency is 2.1MHz. At this frequency, the maximum duty cycle is 70% (MIN). Lower the switching frequency results in higher maximum duty cycle.

The maximum power input voltage ( $PV_{IN}$ ) is 45V. As a result, each channel of the demo board can drive up to ~31V total LED voltage.

Adjustable switching frequency allows optimization of the efficiency and the external component size. At 2.1MHz, 93% efficiency can be achieved at 500mA with minimum solution size.

Each of the three regulators on the demo board is independently operated. The PWM dimming feature of the LT3496 allows True Color PWM dimming with the dimming ratio of 5000:1. Additional analog dimming is possible.

The LT3496 datasheet gives complete description of the part, operation and application information. The datasheet must be read in conjunction with this quick start guide for working on or modifying the demo circuit 986.

**Design files for this circuit board are available. Call the LTC factory.**

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### PERFORMANCE SUMMARY

Specifications are at  $T_A = 25^\circ\text{C}$

| SYMBOL    | PARAMETER                      | CONDITIONS                                                                                    | MIN | TYP    | MAX | UNITS |
|-----------|--------------------------------|-----------------------------------------------------------------------------------------------|-----|--------|-----|-------|
| $PV_{IN}$ | Power Input Supply *           |                                                                                               |     |        | 45  | V     |
| $V_{IN}$  | Chip Bias Input Supply **      |                                                                                               | 3   |        | 5.5 | V     |
| $V_{LED}$ | Output LED Voltage, per Output | $PV_{IN} = 45V, I_{LED} = 500mA, F_{sw} = 2.1MHz$                                             |     |        | 31  | V     |
| $I_{LED}$ | Output LED Current, per Output |                                                                                               | 485 | 500    | 515 | mA    |
| $F_{SW}$  | Switching Frequency            | $F_{ADJ} = V_{REF}$                                                                           | 1.9 | 2.1    | 2.3 | MHz   |
| $\eta$    | Conversion Efficiency          | $I_{LED} = 500mA, PV_{IN} = 33V, V_{IN} = 3.3V, 10 \text{ Red LEDs}$                          |     | 93     |     | %     |
| $P_{OUT}$ | Maximum Total Output Power     | $I_{LED} = 500mA$                                                                             |     |        | 45  | W     |
| $PWM_D$   | PWM Dimming Ratio              | PWM Frequency = 100Hz, $PV_{IN} = 33V, V_{IN} = 3.3V, 3 \text{ White LEDs at } 300mA, 2.1MHz$ |     | 5000:1 |     |       |

\* 45V is the absolute maximum rating of the LT3496. This rating should not be exceeded under any condition.

\*\*  $V_{IN}$  of the demo board is limited by the choice of the input capacitor. The LT3496 input range is 3V-30V with transient protection to 40V.

## QUICK START PROCEDURE

Demonstration circuit 986 is easy to set up to evaluate the performance of the LT3496EUFD. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. With power off, connect an input power supply to  $V_{IN}$  and GND. To achieve highest efficiency, a low voltage supply, such as 3.3V or 5V, is recommended.
2. With power off, connect a second input power supply to  $PV_{IN}$  and GND. The  $PV_{IN}$  absolute maximum rating is 45V.
3. If an output channel  $n$  is not used, the  $PWM_n$  should be tied to GND.
4. With power off, connect an LED string to an output channel interested. Connect the anode of the first

LED to the  $LED_n$ . Connect the cathode of the last LED to the  $LED_n$ . All three channels can operate simultaneously or individually.

5. Turn on  $PV_{IN}$  power supply.
6. Turn on  $V_{IN}$  power supply.
7. Check for the proper LED current and LED string voltage.  
**NOTE.** If there is no output, turn off the power supplies. Check all connections.
8. Once the proper output current/voltage are established, adjust the parameters within the operating range and observe the output current regulation, efficiency and other parameters.
9. To observe PWM dimming, turn off all power supplies. Connect the  $PWM_n$  to a pulse generator. Then repeat step 5 – 8.

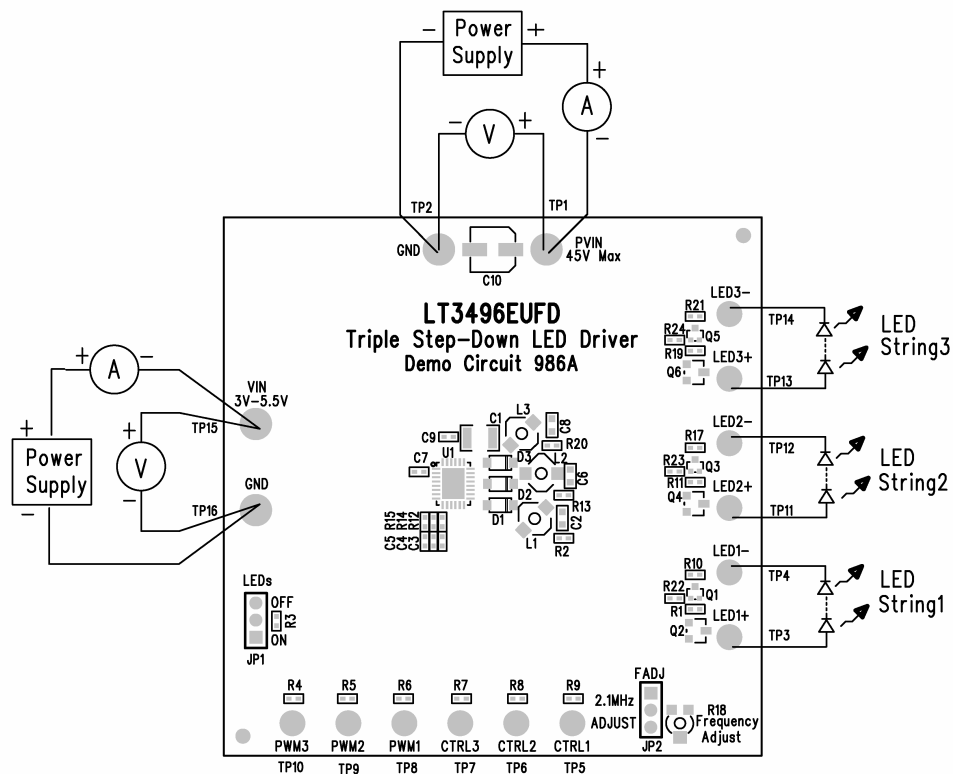
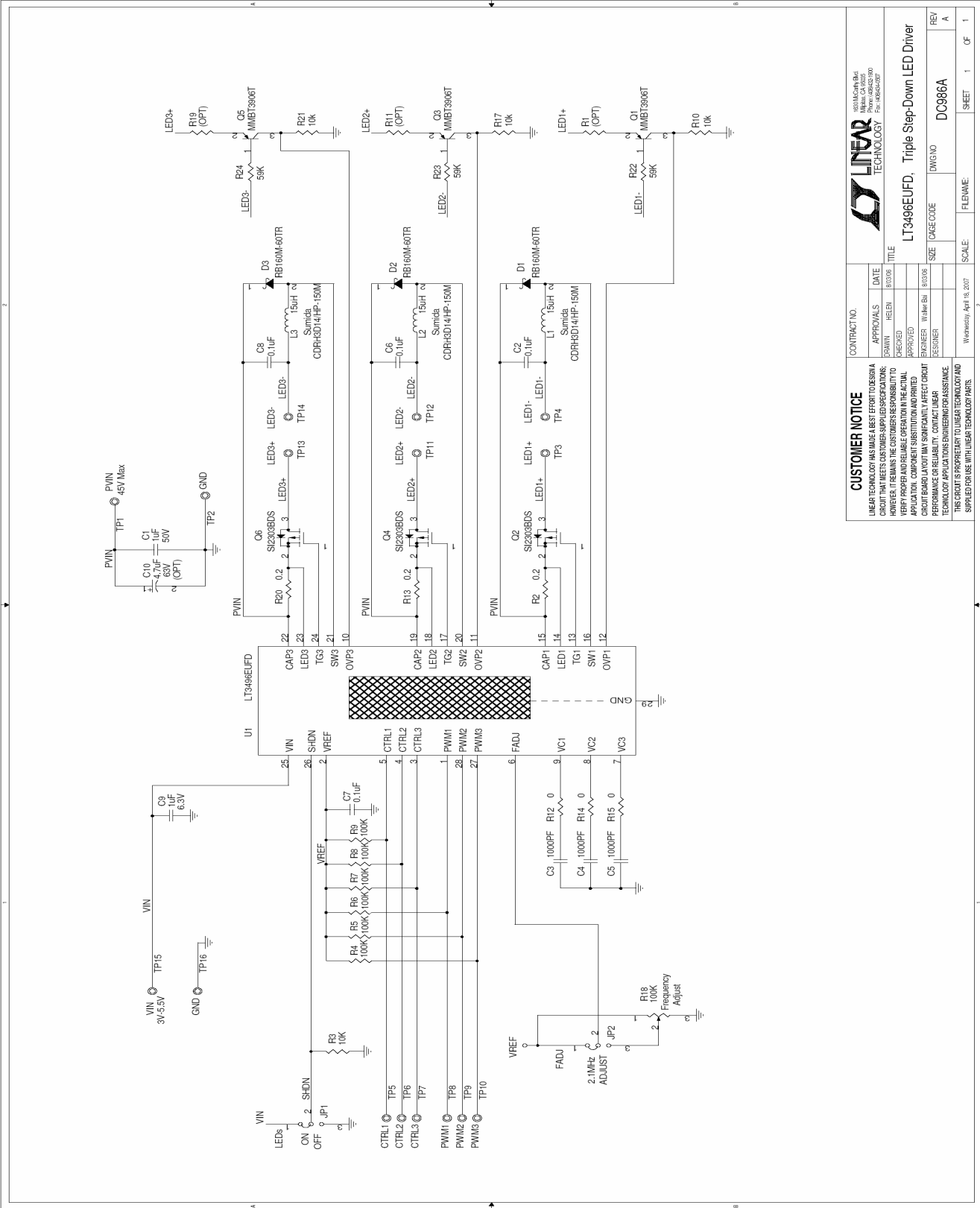


Figure 1. Proper Measurement Equipment Setup



|                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |             |  |            |  |
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| CONTRACT NO.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  | APPROVALS   |  | DATE       |  |
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