

DESCRIPTION

Demonstration circuit 1268A-A, 1268A-B is a high voltage and high current LED driver controller. The VIN pin input voltage is as high as 40V. The LED output voltage is as high as 60V. The demonstration circuit is assembled as a boost topology from 8-40V input and up to 55V LED output at 1A with an open LED status pin (-A) or a sync input pin (-B). DC1268A features PWM dimming, analog dimming, shutdown, and open LED overvoltage protection. Efficiency at 12VIN is as high as 93% for 50W output.

The switching frequency is set at 400kHz to accommodate the automotive switching frequency range. Small ceramic input and output capacitors are used to save space and cost and a high voltage 60V external power switch and a 60V catch diode are used for up to 55W (55V at 1A) output as assembled. The open LED overvoltage protection will limit the output to approximately 56V if the LED string is opened. For low input voltage operation, the CTRL pin voltage is reduced as the input voltage drops below 9V, reducing LED brightness and restraining the peak switch currents in order to limit inductor and switch size. UVLO is employed to turn the LEDs off when VIN drops below 8V.

DC1268A PWM dimming is simple. The boost topology LED string returns to the LED- terminal and the PWM dimming MOSFET turns the LED string on and off given an input to the PWM dimming terminal. For the highest pwm dimming ratio, it is recommended to use 100Hz as a pwm dimming frequency. Information

regarding PWM dimming ratios and performance can be found in the LT3755/-1 datasheet in the applications section.

Soft-start is provided with a simple and small capacitor to maintain control of the switch current during turn on for high power designs.

Modifications can be made to the DC1268A in order to convert the board from a boost topology LED driver to any other topology. Buck-boost mode, buck mode, and SEPIC schematics are provided in Figures 6-8. Please consult the factory or LT3755/-1 datasheet for details regarding how to customize the DC1268A or how to design different topologies for custom specifications.

The LT3755, LT3755-1 datasheet gives a complete description of the part, operation and applications information. The datasheet must be read in conjunction with this Quick Start Guide for demonstration circuit 1268A-A, 1268A-B. The LT3755, LT3755-1 is assembled in a small 16-lead plastic QFN package with a thermally enhanced ground pad. Proper board layout is essential for maximum thermal performance. See the datasheet section 'Layout Considerations'.

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

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Table 1. Typical Performance Summary for DC1268A-A/B

PARAMETER	CONDITION	VALUE (TYPICAL)
Input Voltage PVIN Range	Operating	8V-40V
Switching Frequency	R8 = 28.7k	400kHz
I _{LED}		1A
Maximum Output Voltage - Open LED Voltage		56V
Efficiency	PVIN=12V V _{LED} =50V I _{LED} =1A	93%
Under Voltage Lockout		8V
Peak Switch Current Limit	RS1 = 0.015Ω	6.6A

QUICK START PROCEDURE

Demonstration circuit 1268A-A, 1268A-B is easy to set up to evaluate the performance of the LT3755, LT3755-1. Follow the procedure below:

NOTE: Make sure that the PVIN DC input voltage does not exceed 40V.

1. Connect a string of LEDs with forward voltage less than 55V, but greater than the PVIN voltage, to the LED+ and LED- (Boost) terminals on the PCB as shown in Figure 1.
2. Connect the shutdown terminal to GND.

3. With power off, connect the PVIN power supply to the PVIN and GND terminals within the ranges specified on the PCB.
4. Connect the PWM terminal. If PWM is not used, connect PWM to a 5V source or to IntVcc on the PCB. PWM must be pulled high to work. For -B, the SYNC input can be left floating.
5. Turn the PVIN power supply on.
6. Release the shutdown/GND connection.
7. Observe the LED string running at the programmed LED current.
8. For PWM dimming, connect a PWM 100Hz or higher signal to the PWM terminal.
9. Observe the reduction of brightness in the LED string when PWM dimming.

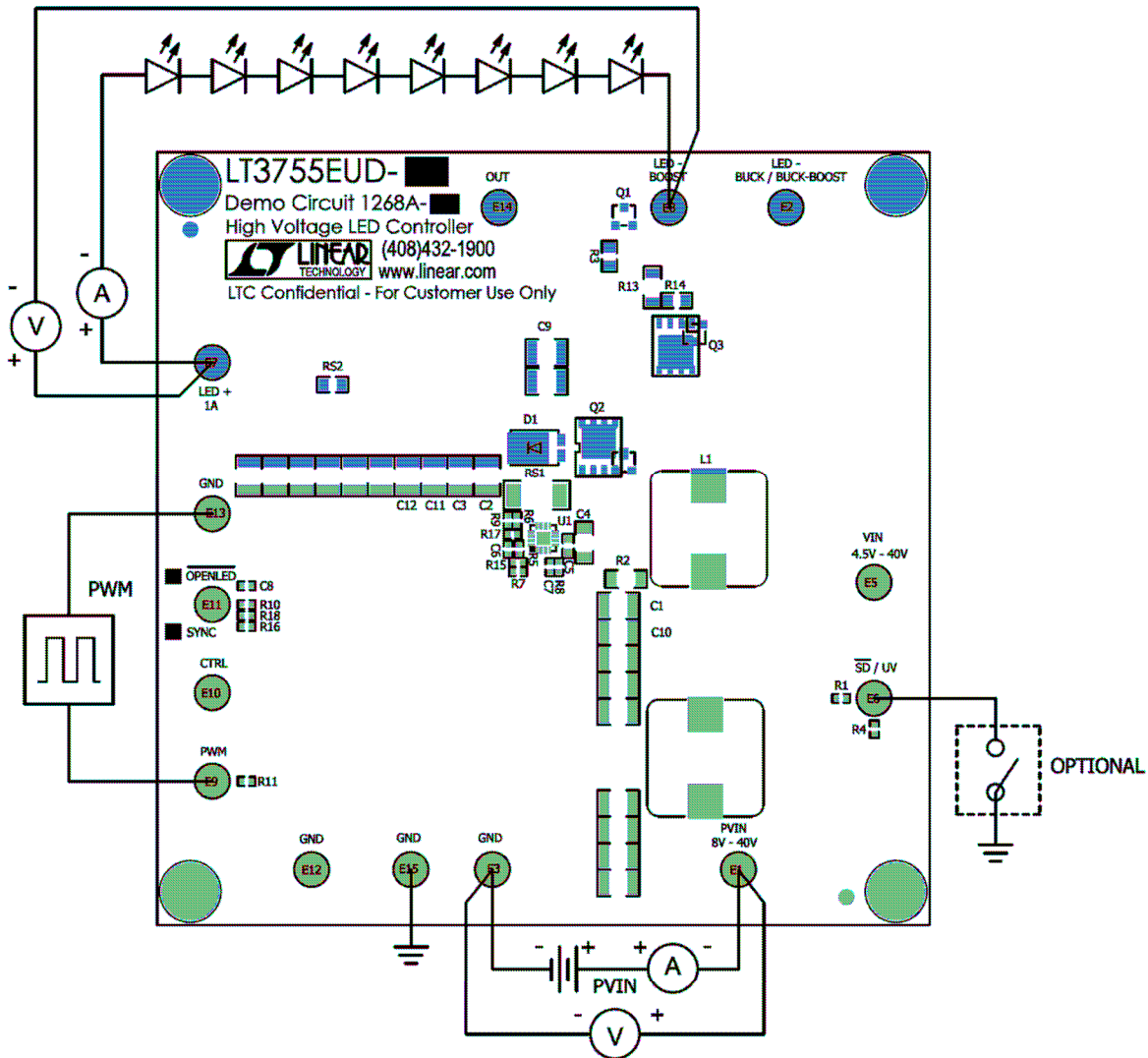


Figure 1. Test procedure setup drawing for DC1268A-A and DC1268A-B

TWO ICs, THREE TOPOLOGIES

DC1268A features two build versions. DC1268A-A uses the LT3755EUD with an open LED status and DC1268A-B uses the LT3755EUD-1 with sync. Each board is clearly marked indicating which IC is used. The schematic for each is attached to this document. The open LED indicator terminal has a pull-

up resistor to the internal 7V regulator IntVcc. The – B version with the sync terminal has an RC filter between the PWM input pin and the SYNC input pin. This filter provides a small delay between the PWM signal and the SYNC input when PWM is used in order to optimize high PWM dimming ratio waveforms. If high ratios are not needed, this RC filter may not be needed. If the sync input is used, this filter may be removed. Please note that when PWM and SYNC are both used, optimal PWM dimming occurs when there is at least a 200ns delay

from the PWM rising edge and the SYNC rising edge – with the PWM edge occurring first. For more questions regarding this matter, please consult the factory.

Although DC1268A-A/B is assembled as a boost topology LED driver, it can be reconfigured for buck-boost mode, buck mode and SEPIC LED driver topologies. A few schematics featuring these other topologies are attached. Please keep in mind that the chosen topology should reflect the relationship between the entire input voltage range and the LED voltage range. Other circuit requirements such as short circuit between terminals or ground can be affected by the choice of LED driver topology.

TERMINAL OPTIONS

DC1268A-A/B has both PVIN and VIN terminals. The schematic shows that the PVIN and VIN terminals are shorted together with a resistor. As assembled, only the PVIN terminal needs 8V to 40V power in order for the board to operate. However, resistor R2 can be removed and the VIN terminal can be connected to a

separate supply from the PVIN terminal. The VIN terminal is tied directly to the VIN pin.

The VOUT terminal is available for the customer to monitor the state of the output capacitor directly. The VOUT terminal can also be used as an input for buck mode topology.

The PWM terminal must be pulled high in order for the board to operate. It is preferred that the PWM terminal/pin is tied to IntVcc of the controller if PWM dimming is not used, but for board evaluation it can be tied to an external 5V source as well.

The CTRL terminal is used for analog dimming. The CTRL pin is tied directly to the terminal and it is already being used to reduce the LED current when VIN drops too low. The CTRL pin voltage can easily be overridden with an external voltage supply and the resistor divider from VIN can be removed.

The shutdown/undervoltage terminal is used to shut down the demonstration circuit. Tie the terminal to GND and the converter will stop switching. The PWMOUT pin will go low and the PWM dimming MOSFET will be turned off. As long as the PWM dimming MOSFET is used properly, the LEDs will not turn on during shutdown.

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1268A-A, 1268A-B HIGH VOLTAGE LED CONTROLLER

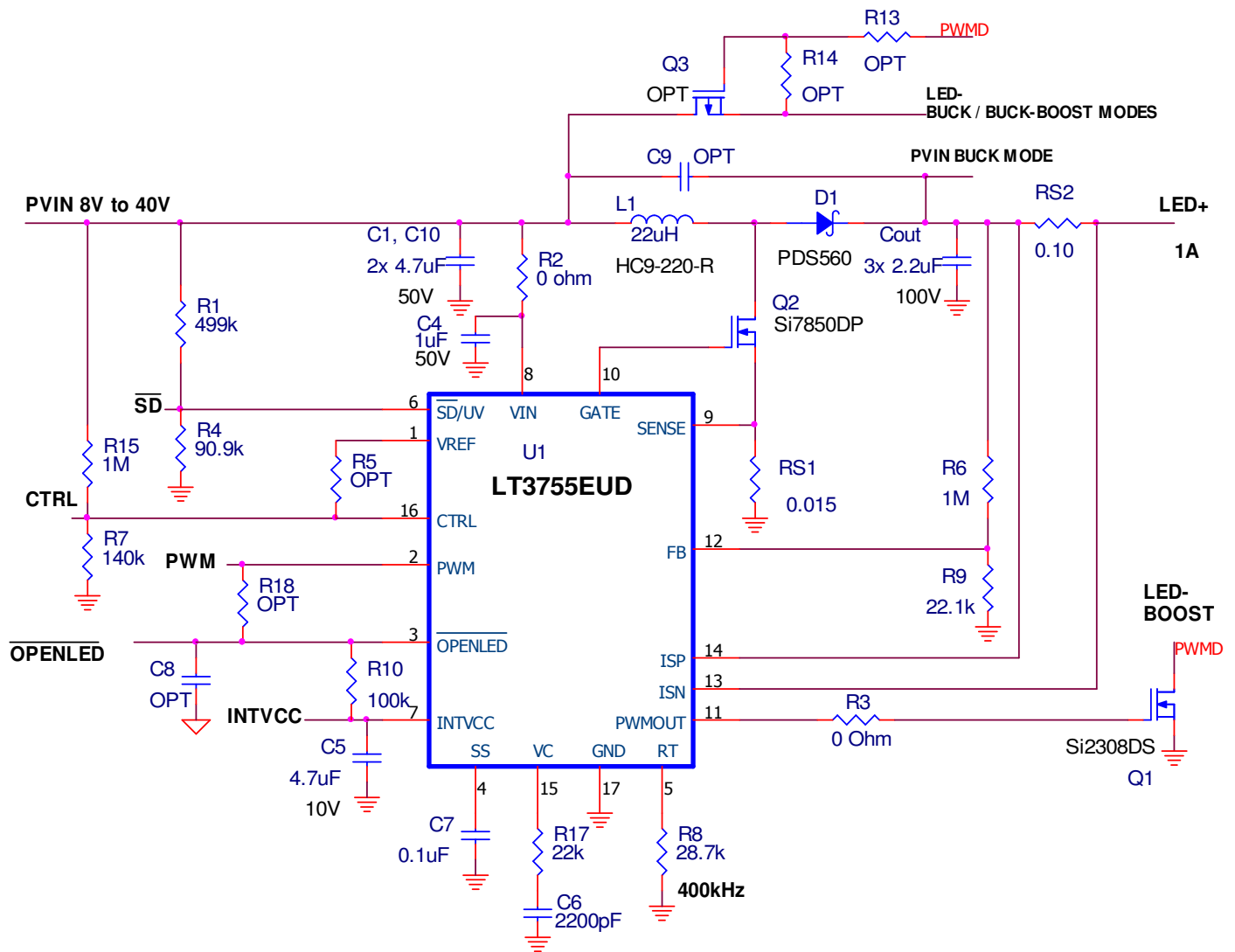


Figure 2. DC1268A-A featuring LT3755 and Open LED flag.

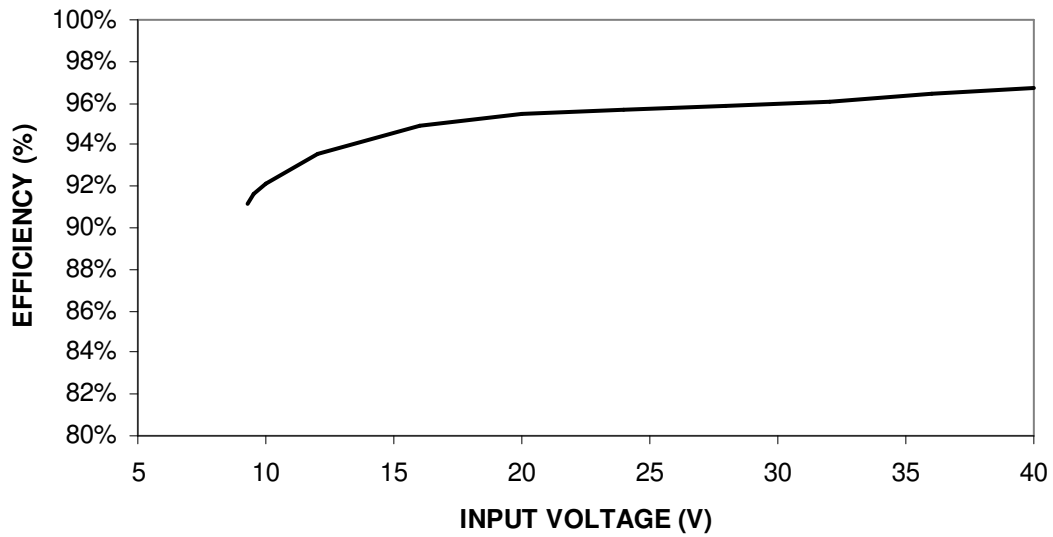


Figure 3. DC1268A-A/B Efficiency with 50V LEDs at 1A

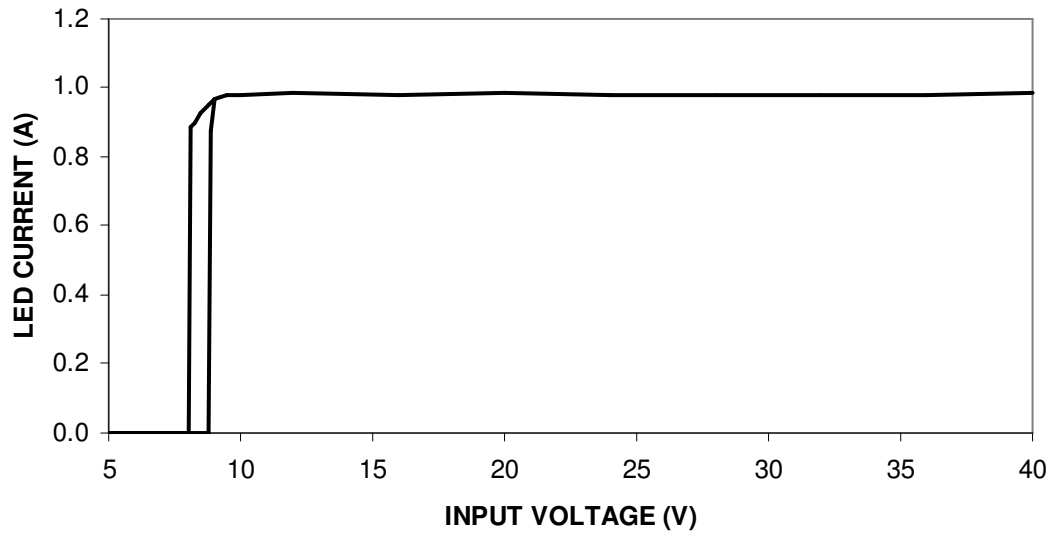


Figure 4. DC1268A-A/B LED Current Drops at Low VIN (CTRL) and Turns Off at Lower VIN (UVLO)

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1268A-A, 1268A-B HIGH VOLTAGE LED CONTROLLER

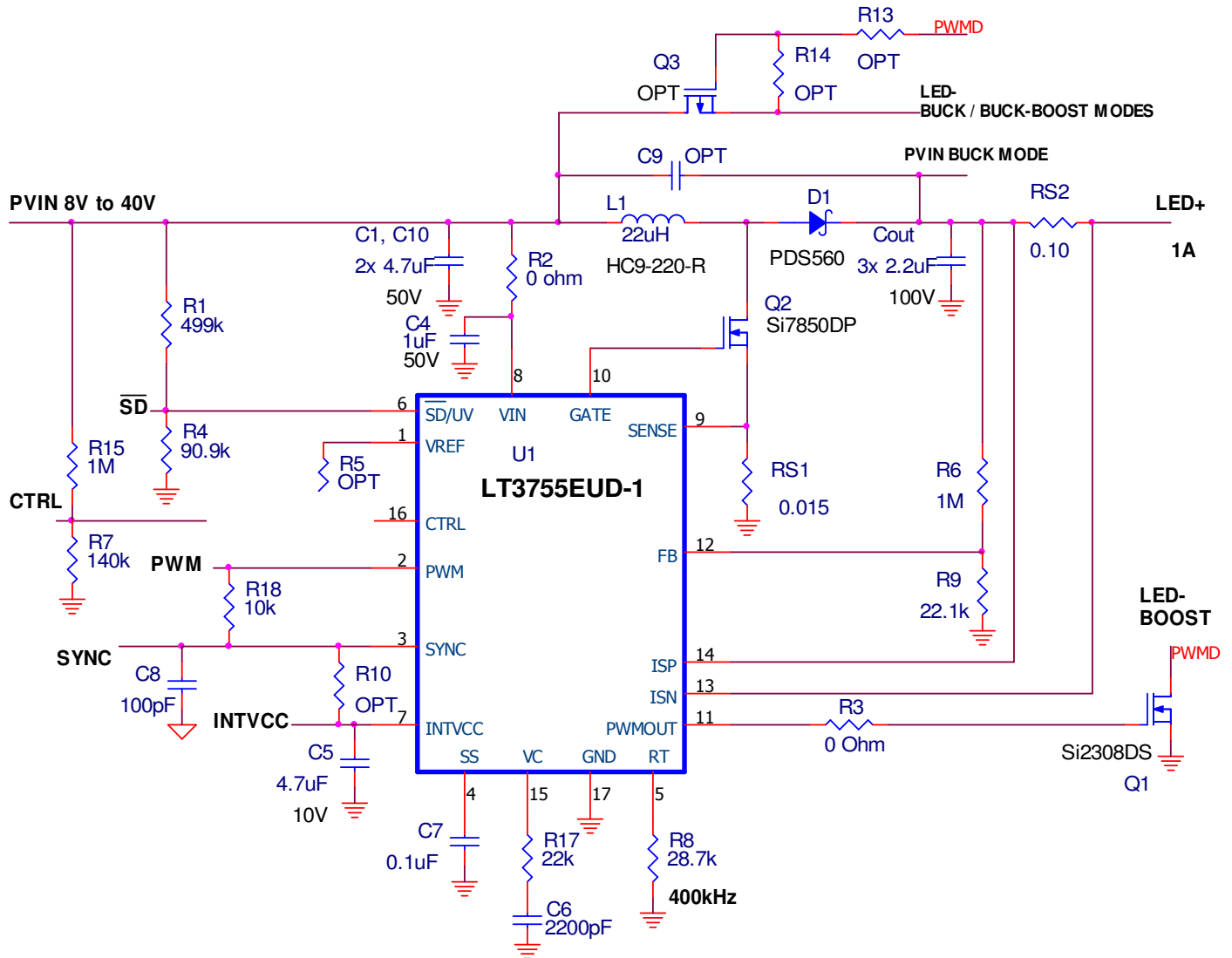


Figure 5. DC1268A-B featuring LT3755-1 and SYNC input.

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1268A-A, 1268A-B HIGH VOLTAGE LED CONTROLLER

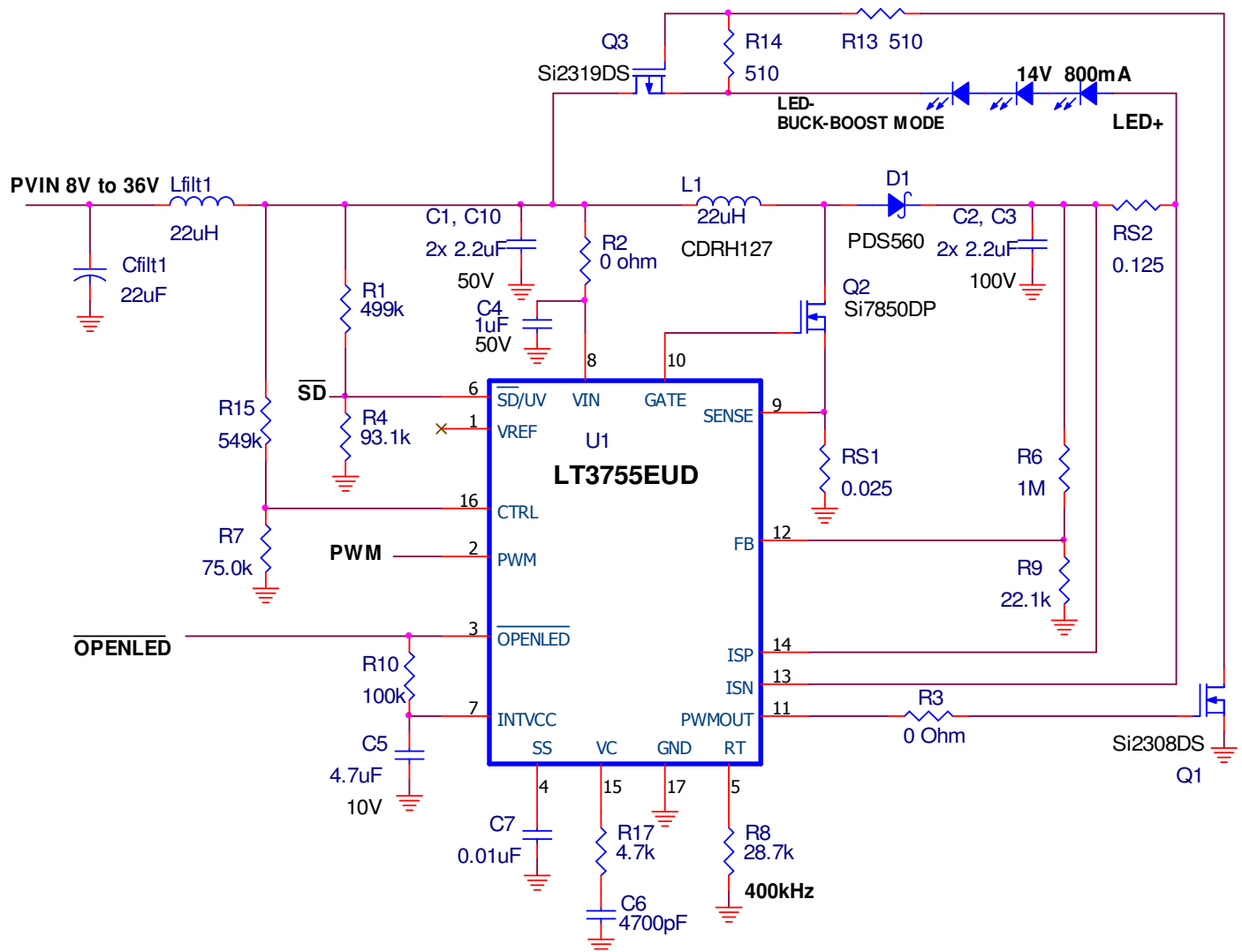


Figure 6. DC1268A-A Customized Buck-Boost Mode LED Driver Schematic

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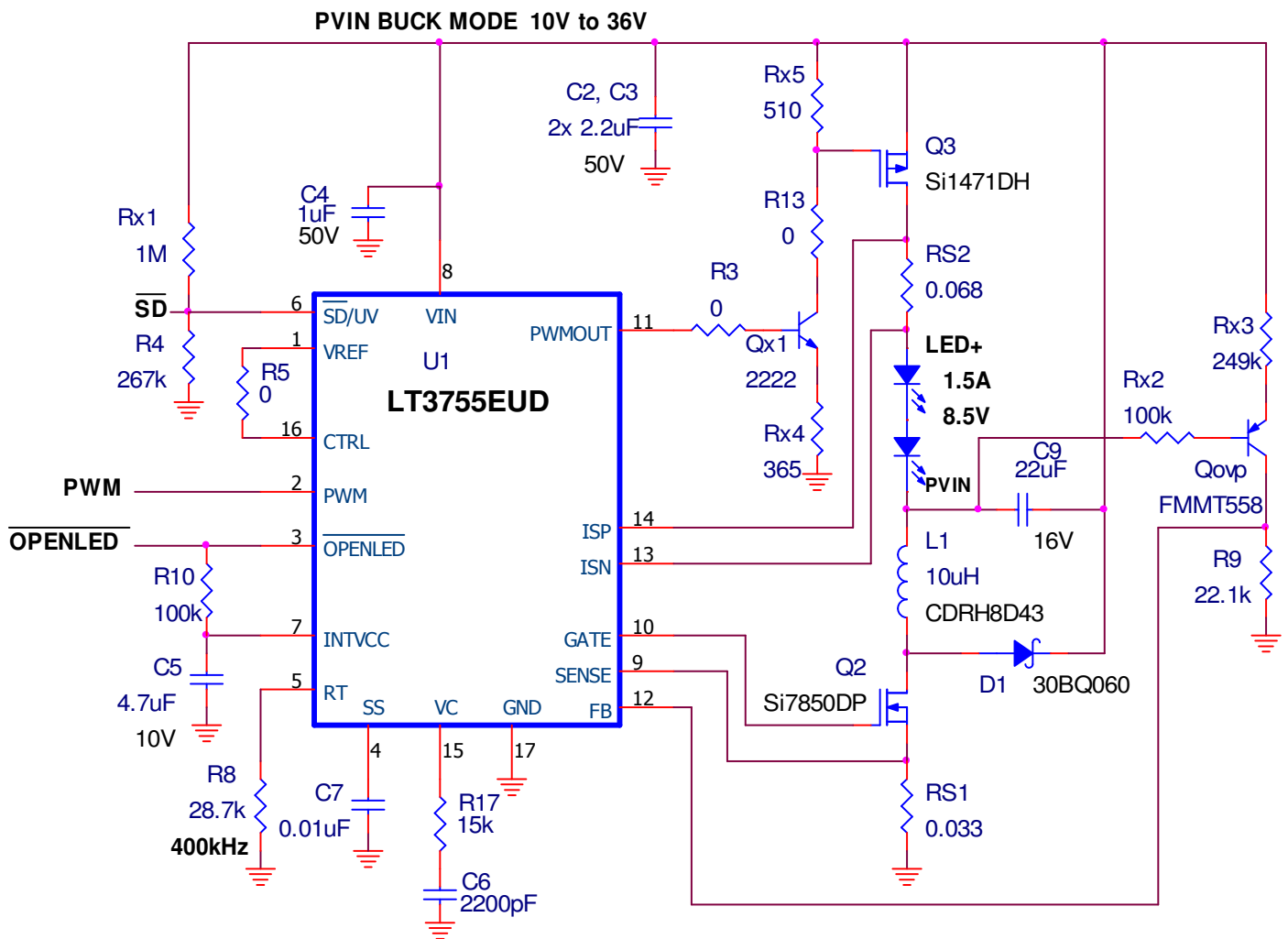


Figure 7. DC1268A-A Customized Buck Mode LED Driver Schematic

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1268A-A, 1268A-B HIGH VOLTAGE LED CONTROLLER

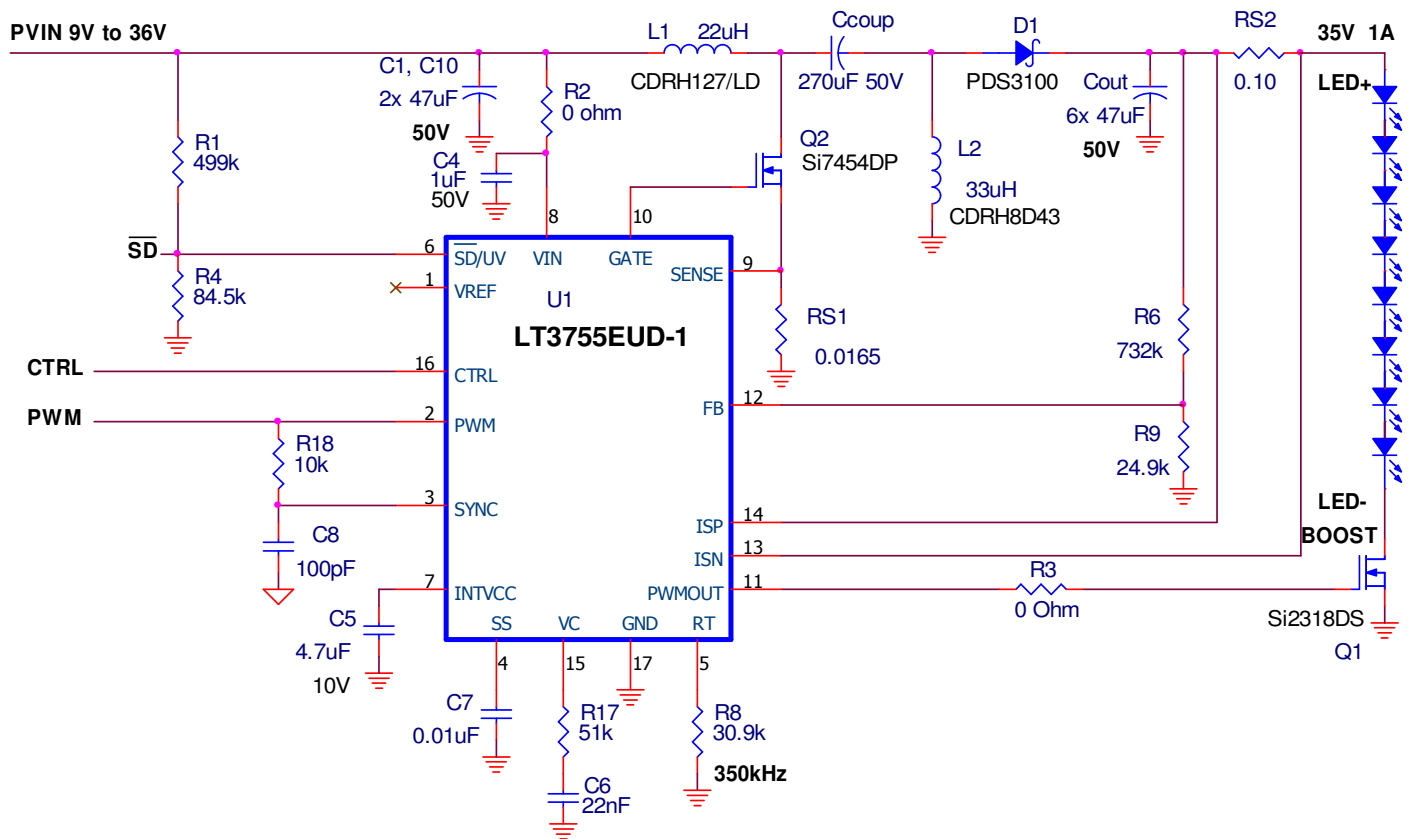
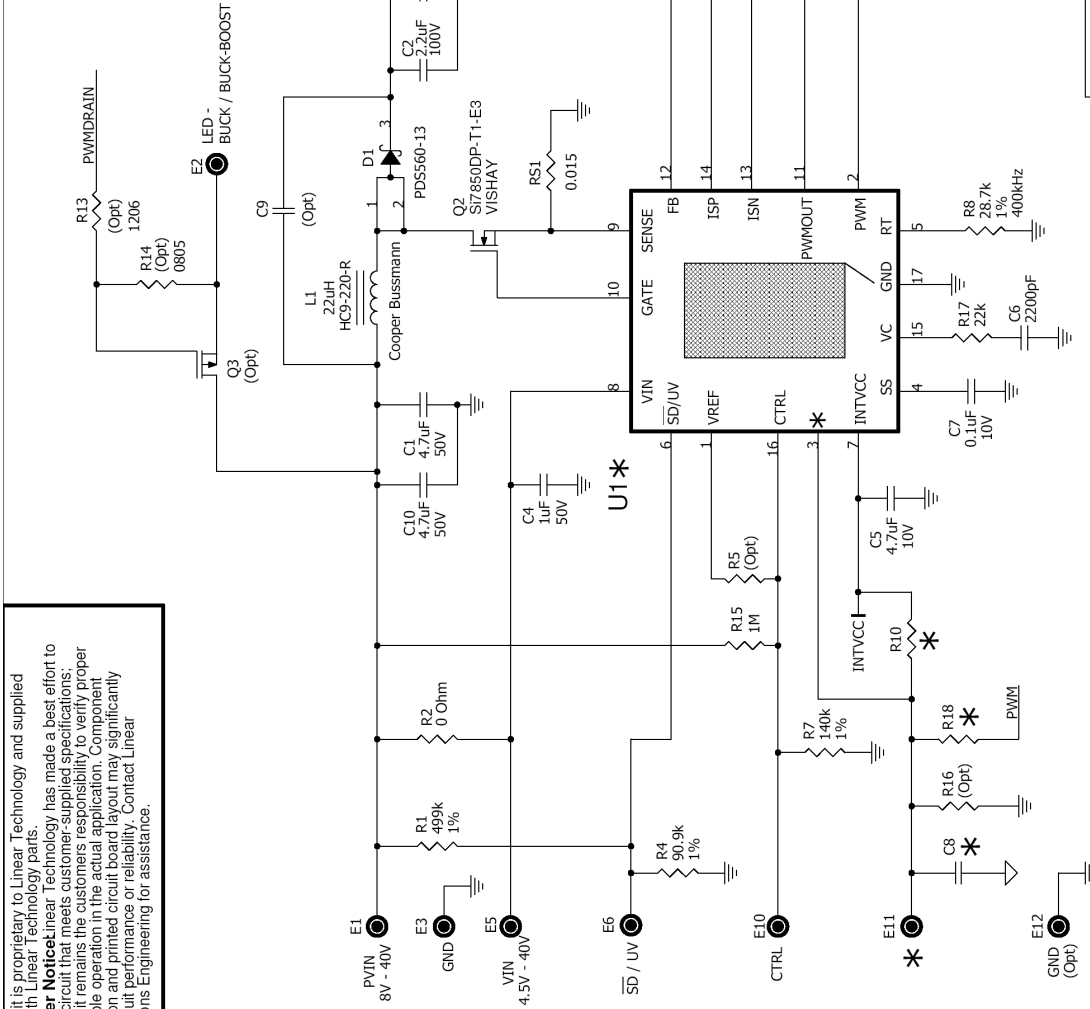


Figure 8. DC1268A-B Customized SEPIC Schematic with PWM Dimming and Aluminum Electrolytic Capacitors

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1268A-A, 1268A-B HIGH VOLTAGE LED CONTROLLER

This circuit is proprietary to Linear Technology and supplied for use with Linear Technology parts.
Customer Notice: Linear Technology has made a best effort to design a circuit that meets customer-supplied specifications. It is the customer's responsibility to ensure proper and reliable operation in the actual application. Component substitution and printed circuit board layout may significantly affect circuit performance or reliability. Contact Linear Applications Engineering for assistance.

REVISION HISTORY				
ECO	REV	DESCRIPTION	DATE	APPROVED
	0	1st PROTOTYPE		



APPROVALS		LINEAR TECHNOLOGY CORPORATION	
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APPROVED:		For Customer Use Only	
CHECKED:		Title: LT3755EUD-1	High Voltage LED Controller
		Document Number	Demo Circuit 1268A
		SD	Rev 3
Date:	Tuesday, June 03, 2008	C:\ORCAD\WINCAPTURE\1268A\1268A_02_REV3.DSN	Sheet 1 of 1

* ASSY	U1(IC)	R10	R18	C8	E11 (Name)	U1-3 (Name)
-A	LT3755EUD	100k	OPT	OPT	OPENLED	OPENLED
-B	LT3755EUD-1	OPT	10k	100pF	SYNC	SYNC