LTC3454EDD
High Efficiency Buck-Boost Flash LED Driver

DESCRIPTION

Demonstration circuit 875 is a high efficiency buck-boost flash LED driver featuring the LTC3454EDD. The board has two circuits optimized for different applications: a small footprint solution featuring 350mA, 300ms LED flash current or 150mA constant LED torch current, and a high current solution featuring 400 / 600 / 1000mA constant-current operation. The input voltage range of 2.7V to 5.5V is suitable for a single Lithium-Ion battery or three AAA batteries in series. The Li-Ion input range, high LED flash current with separate torch mode current setting, internal synchronous power switches, minimal and low-profile external components, and simple design makes the LTC3454 the top solution for highly efficient, space-constrained cellular telephone camera flash solutions.

The high current solution is activated by depressing momentary switches 'EN1' and 'EN2' in accordance with the table provided on the silkscreen, or connecting the corresponding terminals to 'VIN' with a jumper wire. An LED capable of handling 1A of current, such as the LUMILED LXHL-LW3C, will be needed to be connected to the LED+ and LED- thru-holes. The small footprint solution is turned on and off by pressing the 'ON/OFF' button. A 'TORCH' button turns the LED on at 150mA for cellular telephone video recording. The 'FLASH' button flashes the LED at 350mA for 300ms for cellular telephone camera flash operation. The buttons control the state of the PIC microcontroller IC that is programmed with DC875 software. The PIC keeps the LED from being flashed constantly, preventing overheating and burnout. The PIC also controls the flash time. When no buttons are pressed for a short time, the PIC turns off and the circuit enters low-power mode for battery-life preservation. A red/green LED indicates the state of the PIC. The LED is ready to flash or torch if the state indicator is blipping green. If the indicator is not on, the PIC is turned off. For a brief time after the flash has occurred, the state-indicator LED is red, indicating that another flash cannot happen, even if the button is pressed, until the red LED is off and the green LED is blipping again. Alternatively, the torch and flash modes can be enabled by connecting 'EN1' (torch), or' EN1' and 'EN2' (flash) to 'VIN', as indicated in the table.

WARNING- Do not pull down the 'ENx' pins on the small current solution while the PIC is active, as damage to the PIC outputs may result.

WARNING- The small footprint solution LED can be permanently damaged if the flash mode is engaged for more than a few seconds.

The PIC control circuit may be used to control the high current solution circuit by connecting the 'EN1' and 'EN2' pins of each solution in parallel, and applying power to both circuits. Typical efficiency for the demo circuits are presented in Figure 2. Higher efficiency can be obtained by selecting larger inductors with lower ESR.

The LTC3454 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 875. In addition the AOT2015 datasheet (www.aot.com) must be read to understand thermal and LED current constraints for varying flash current pulse-widths and intensity. The LTC3454 is assembled in a small low profile DFN package. 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.

Table 1. Performance Summary (T_A = 25°C)

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		2.7V
Maximum Input Voltage		5.5V
Maximum (Guaranteed) Output Voltage	I_L = 1A	4.95V
Output Current I_{OUT} – small footprint solution	V_{IN} = 2.7V to 5.5V	150 / 200 / 350mA
Output Current I_{OUT} – high current solution	V_{IN} = 2.7V to 5.5V	400 / 600 / 1000mA
Maximum Output Voltage		4.9V
Typical Output Ripple V_{OUT}	V_{IN} = 4.2V, I_{OUT} = 1.0A (20MHz BW)	10mV_{P-P}
Typical Output Regulation	Line	±0.5%
Nominal Switching Frequency		1.0MHz
Efficiency	V_{IN} = 4.2V, I_{OUT} = 150mA	92% Typical
	V_{IN} = 4.2V, I_{OUT} = 1000mA	86% Typical

QUICK START PROCEDURE

Demonstration circuit 875 is easy to set up to evaluate the performance of the LTC3454EDD. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Preset a DC source capable of 5.5V at 2.5A to 4V.
2. Connect a high current LED capable of handling 1A of current to the LED+ and LED- thru-holes as shown on Figure 1.
3. With power off, connect the input power supply to 'VIN' and 'GND' of the circuit solution of interest.
4. Turn on the power at the input. The input voltage may be varied between 2.7V and 5.5VDC.

   NOTE: Make sure the input voltage does not exceed 5.5V. The schottky diodes, D1 for the small footprint solution and D2 for the high current solution, were added for applications in which VIN is greater than 4.5V.

SMALL FOOTPRINT SOLUTION:

5. If the state-indicator LED, LED2, is not blipping green, press the 'ON/OFF' button to turn on the circuit.
6. Press 'FLASH' to observe a 300ms, 350mA camera flash.
7. Press 'TORCH' to observe a constant 150mA LED light for recording video.
8. Press 'TORCH' to turn off the 150mA video mode.
9. Press 'ON/OFF' to turn off the circuit or let the circuit turn off by not pressing any buttons for approximately 10 seconds.
10. Alternatively, the torch and flash modes can be enabled by connecting 'EN1' (torch), or 'EN1' and 'EN2' (flash) to 'VIN', as indicated in the table.

WARNING- The small footprint solution LED can be permanently damaged if the flash mode is engaged for more than a few seconds.

HIGH CURRENT SOLUTION:

11. Press 'EN1' to observe a 400mA LED illumination.

12. Press 'EN2' to observe a 600mA LED illumination.

13. Press 'EN1' and 'EN2' to observe a 1000mA LED illumination.

14. As an alternative to pressing 'EN1' and/or 'EN2', the corresponding terminals may be connected to 'VIN'.

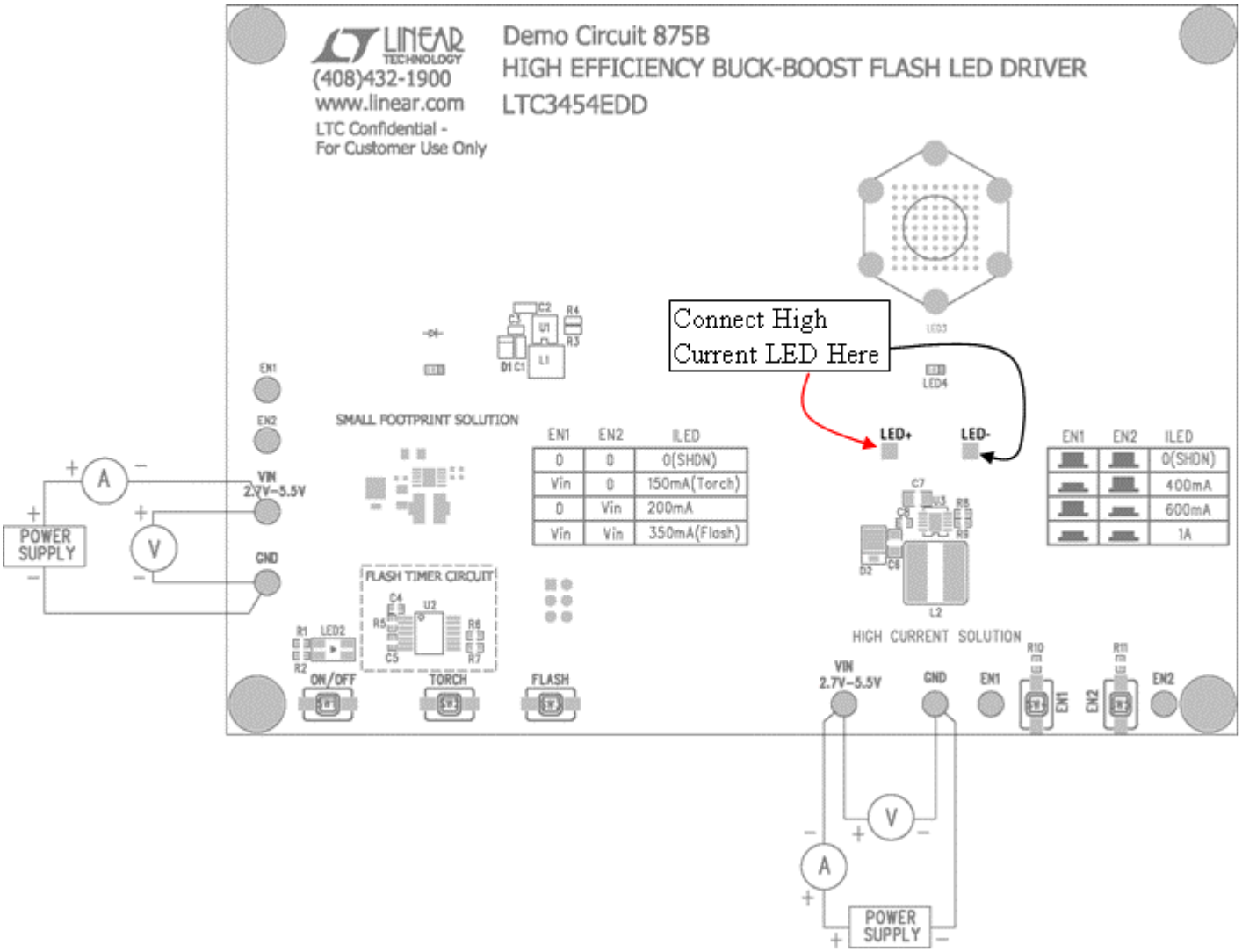

Figure 1. Proper Measurement Equipment Set

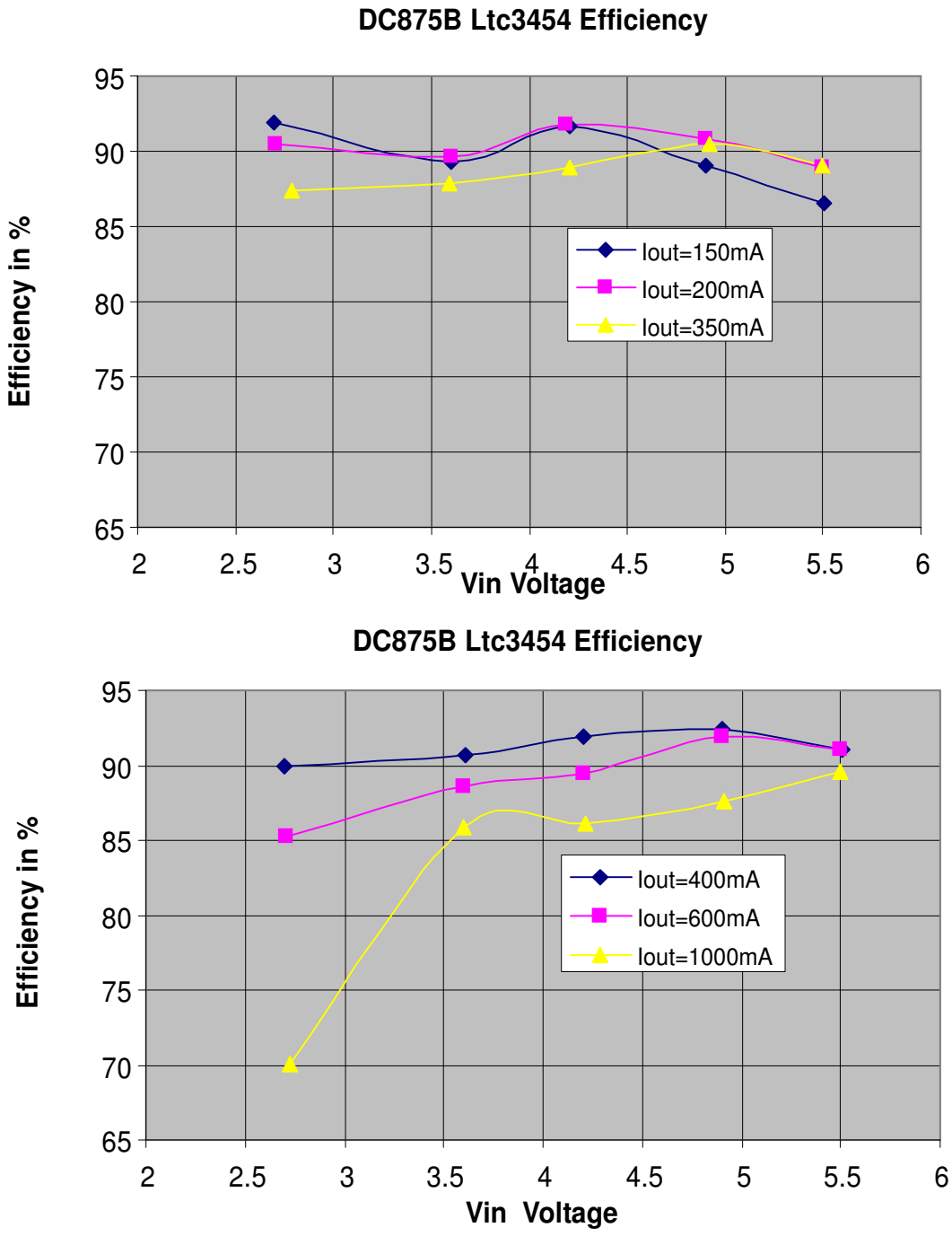

Figure 2. Efficiency

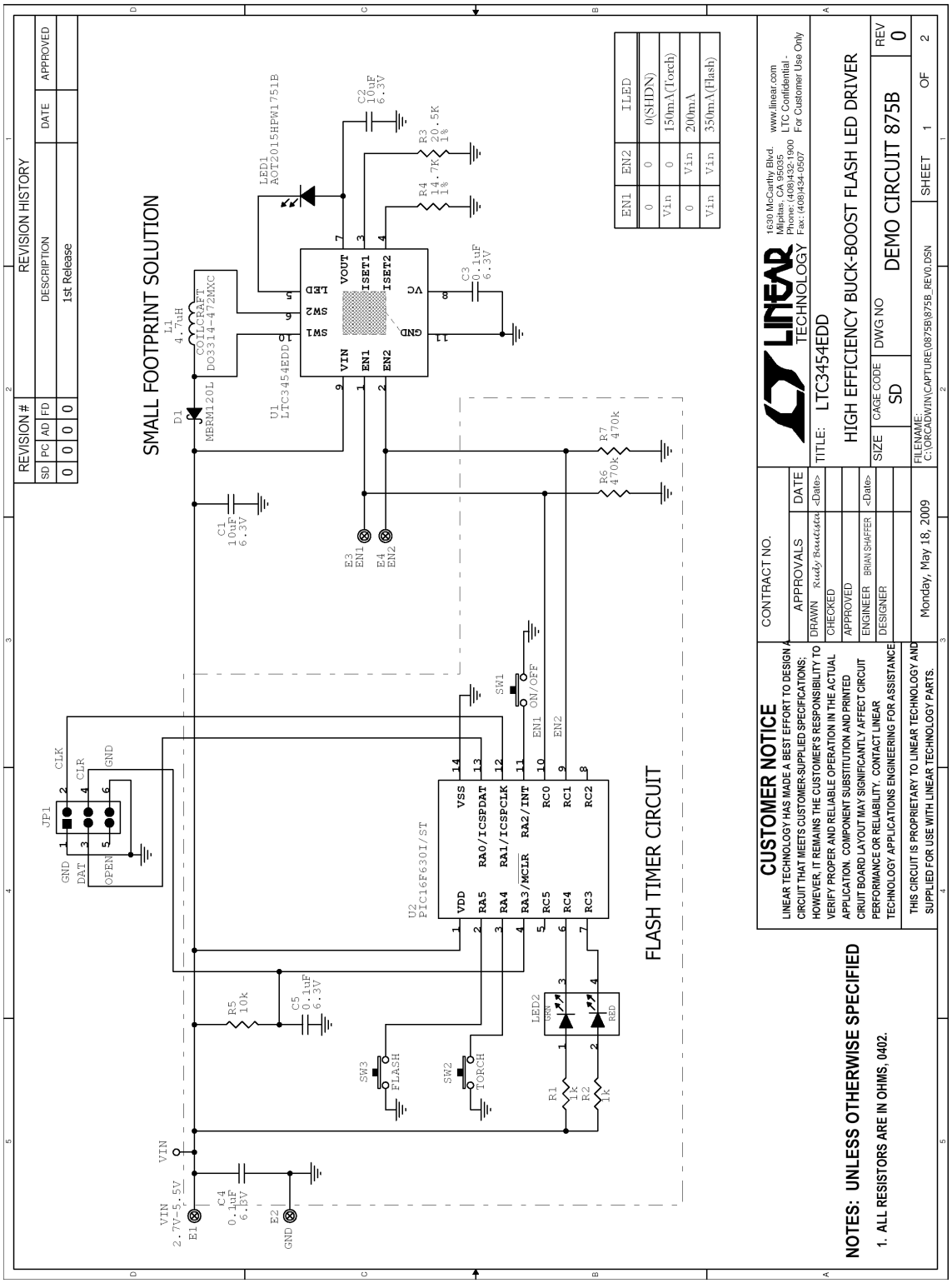

Figure 3. Schematic: Small Footprint Solution

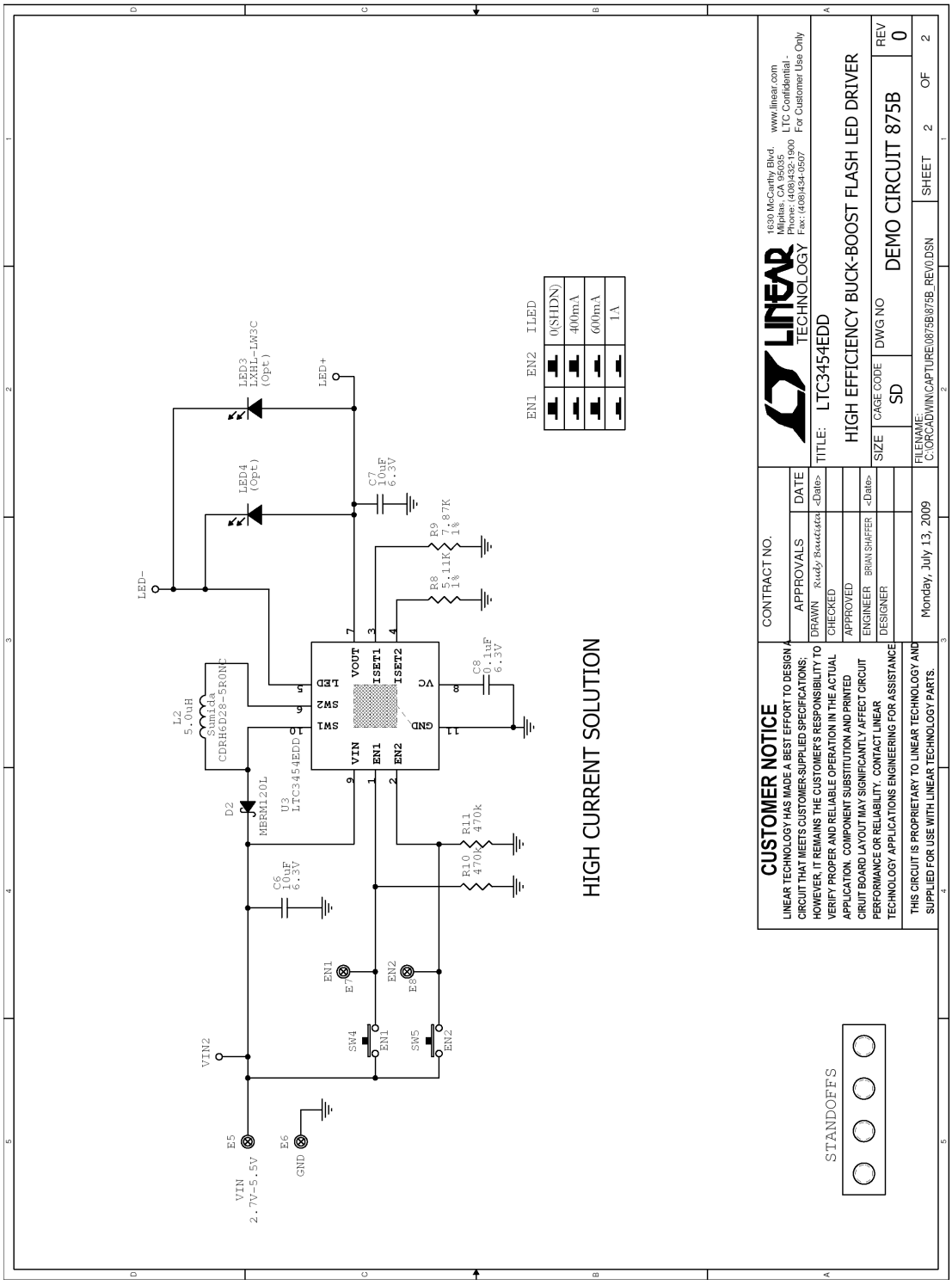

Figure 4. Schematic: High Current Solution