DESCRIPTION

DC1436A is a 16-Channel High Voltage LED Driver featuring the LT3754. The LT3754 drives up to 50mA per string and has a maximum LED string voltage of 45V. DC1436A is set at 1MHz switching frequency for smallest inductor and capacitor size as well as maximum PWM dimming performance. Overvoltage protection is set at 55V in case the LEDs are removed from the circuit. If the LEDs are opened, the FAULT terminal output flag goes low and reports the fault condition. The VIN terminal is powered from 10-14V input separated from the 24V PVIN supply for best thermal performance. If one or more of the 16 LED channels is not used, its LED pin or terminal should be tied to LED+ to disable it. Multiple channels can be tied in parallel by tying their LED1-16 pins together.

The LT3754 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 1436A. The LT3754 is assembled in a small 32-lead (5mm x 5mm) 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 DC1436A

PARAMETER	CONDITION	VALUE (TYPICAL)
PVIN Power Input Voltage Range	Operating	20V - 28V
VIN Pin Input Voltage Range	Operating	8V - 14V
Switching Frequency	RT=39.2k	1MHz
LED String Current $I_{LED(1-16)}$	R14=5.76k	50mA
OVP Open LED Voltage	R8=11k R7=20k	55V
Efficiency	PVIN=24V VIN=10V V_{LED}=45V $I_{LED1-16}$=50mA	92%
Under Voltage Lockout	R1=499k R4=40.2k	20.1V
Low Voltage Turn-On (UVLO + V_{HYST})		21.4V
Peak Switch Current Limit	RS1 = 0.015Ω	3.3A

QUICK START PROCEDURE

Demonstration circuit 1436A is easy to set up to evaluate the performance of the LT3754. Follow the procedure below:

NOTE: PWM must be pulled high to work. If PWM is not used, tie PWM high or connect to REF on the PCB using resistor R9.

1. Connect strings of LEDs with forward voltage less than 45V, but greater than the PVIN voltage, to the LED+ and LED1-16 terminals on the PCB as shown in Figure 1. Tie any unused LED1-16 pins directly to VOUT (LED+) to disable that channel.
2. Connect the shutdown terminal to GND.
3. With power off, connect the PVIN power supply to the PVIN and GND terminals within the range specified on the PCB. Make sure that the PVIN DC input voltage does not exceed the forward voltage of the LED string.
4. With power off, connect the VIN power supply to the VIN and GND terminals within the range specified on the PCB.
5. Connect the PWM terminal. If PWM is not used, tie PWM high or connect to REF on the PCB using resistor R9. PWM must be pulled high to work.
6. Turn the PVIN power supply on.
7. Turn the VIN power supply on after PVIN.
8. Release the shutdown-to-GND connection.
9. Observe the LED strings running at the programmed LED current.

NOTE: For PWM dimming, connect a PWM (100Hz or higher) signal to the PWM terminal and observe the reduction of brightness in the LED string when PWM dimming.

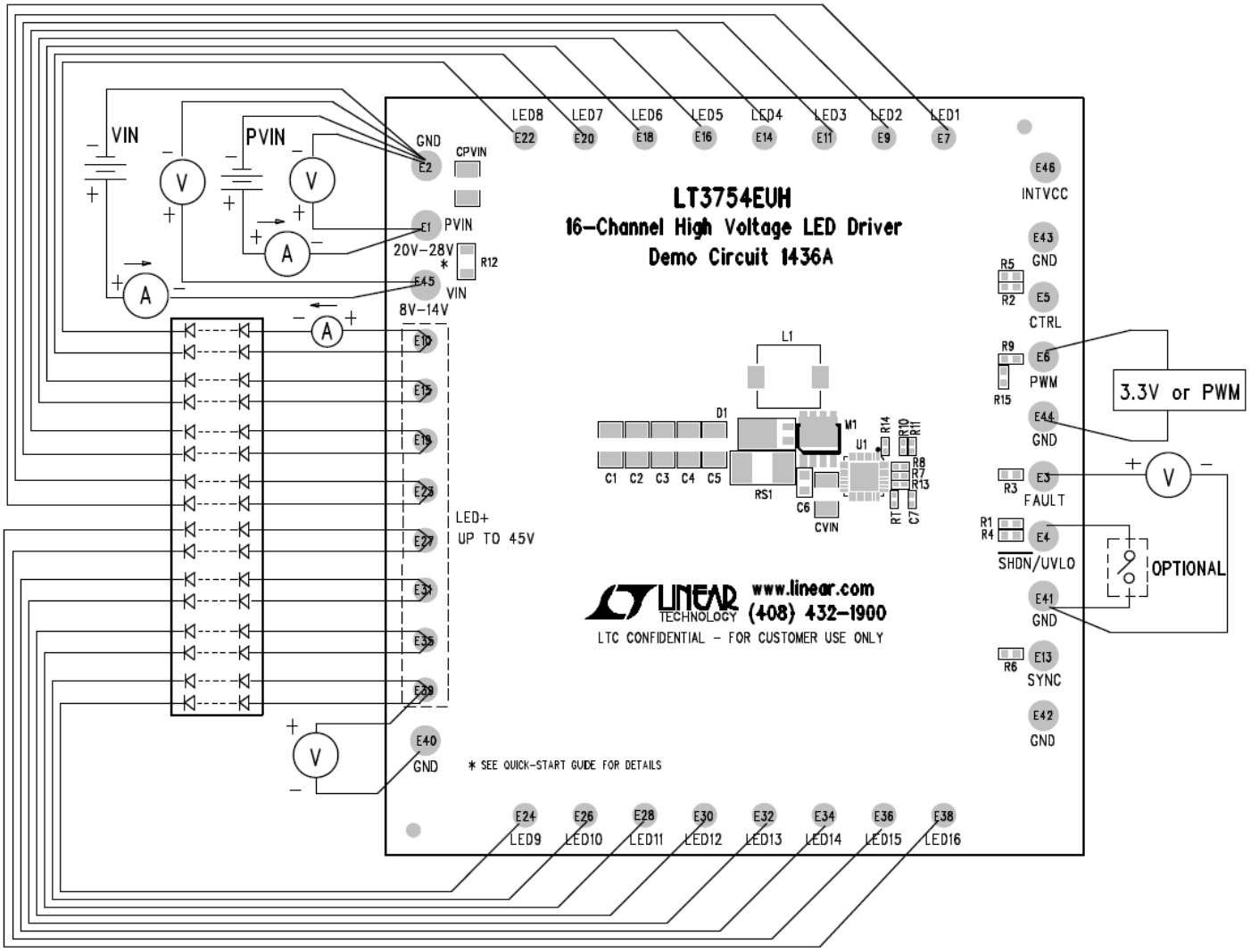


Figure 1. Proper Measurement Setup Drawing

TERMINAL OPTIONS

FAULT – The $\overline{\text{FAULT}}$ terminal is tied directly to the FAULT pin. If there is a fault condition, the FAULT terminal is pulled low. When there is no fault, the terminal is pulled up to VIN. This terminal can be monitored with a voltage meter, tied to the input of another device, or left floating.

$\overline{\text{SHDN}}$/UVLO – This terminal is tied directly to the $\overline{\text{SHDN}}$/UVLO pin. A resistor divider from PVIN to GND sets the voltage on this terminal/pin. These resistors can be easily adjusted for both the UVLO level and the amount of rising hysteresis. See the datasheet for details. The terminal can also be used to shut the IC down and turn off the LEDs. Tie the terminal directly to GND in order to place the IC in shutdown and turn off the LEDs.

CTRL – This terminal is tied directly to the CTRL pin. As assembled, there is a 1MΩ resistor pulling the CTRL pin up to REF. The CTRL pin voltage can be adjusted for analog dimming as

shown in the datasheet. Either a voltage on the CTRL terminal can be driven to dim the LEDs or a resistor divider (R2 and R5) from PVIN to GND can be added to reduce the CTRL voltage as PVIN drops too low. Pulling the CTRL pin to GND turns the LEDs off.

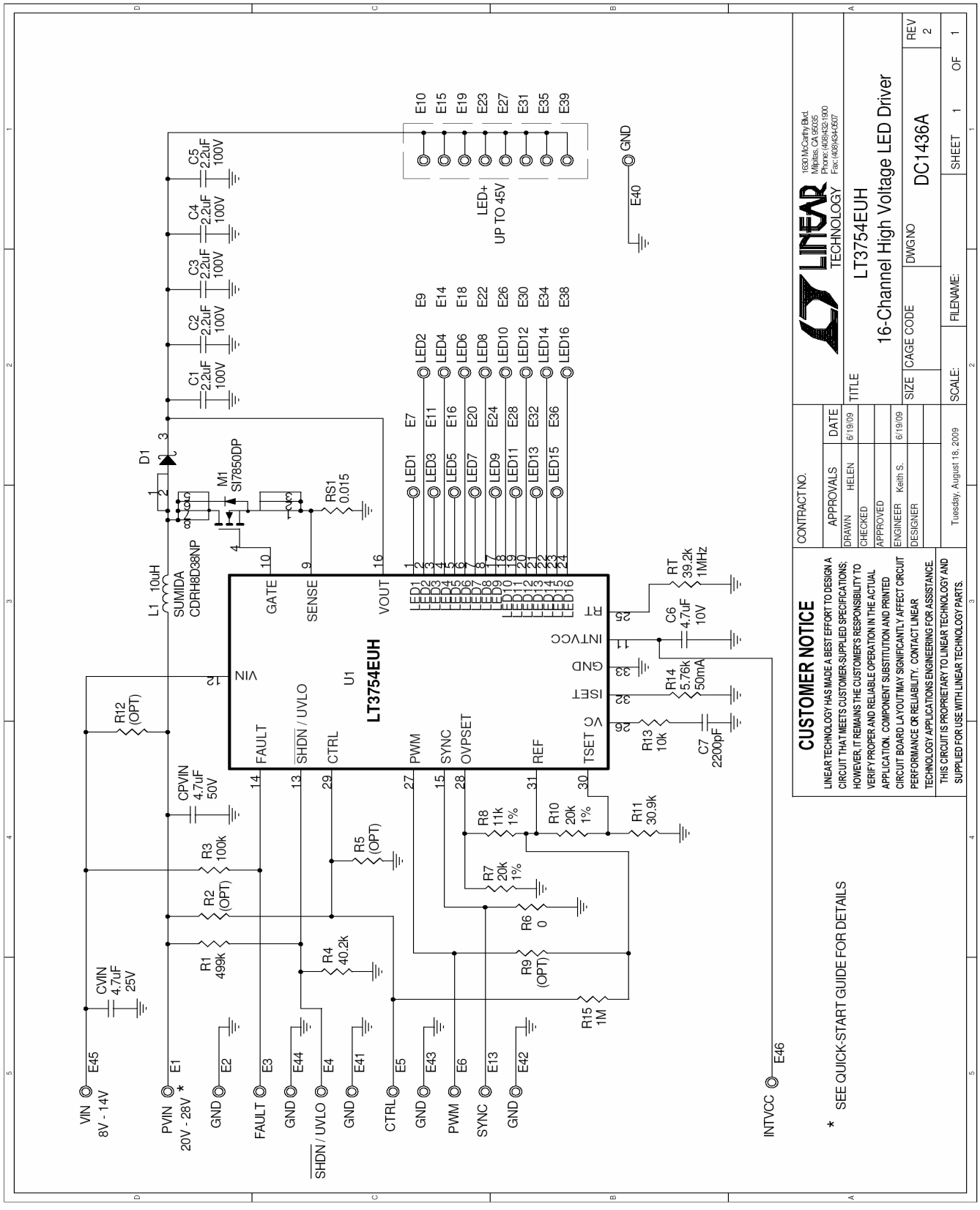
PWM – This terminal is tied directly to the PWM pin. As shown in the datasheet, an input PWM waveform turns the LEDs ON and OFF. Dimming frequency and dimming range are discussed in the datasheet. When PWM dimming is not being used, tie PWM to REF with a zero ohm resistor (R9) or place a 3.3V or 5V DC source on the PWM terminal.

SYNC – This terminal is tied directly to the SYNC pin. As assembled, SYNC is disabled and tied directly to GND with a zero ohm resistor (R6). For SYNC to be used, R6 must be removed and a SYNC signal must be applied to this terminal.

INTVCC – This terminal is tied directly to the INTVCC pin. This terminal is provided to be able to monitor the voltage on the INTVCC regulator or to provide an external INTVCC source to the IC. In some low voltage applications, INTVCC can be tied directly to PVIN or VIN. See the datasheet for details. For normal operation, leave this terminal floating.

LED+ and LED1-16 - The eight LED+ terminals are the output voltage of the boost regulator and they are all tied together on the PCB. The anodes of the LED strings should be tied to these terminals and the cathodes to LED1-16 terminals. If an LED1-16 terminal is not used, it should be tied directly to LED+. If all LED+ to LED1-16 connections are left floating or are opened during operation, DC1436A powers the output to 55V as programmed by OVPSET. It is okay to connect LEDs to the LED+ and LED1-16 terminals when it is powered to OVP. See datasheet for details.

LED1-16 terminals can be tied together to get more than 50mA per LED string. Pairs of LED1-16 terminals can be tied together for 8x 100mA LED strings as an example. Individually, each LED1-16 pin can source a maximum of 50mA, but they can be tied together for more.


LT3754EUH
U1
VIN
FAULT
SHDN / UVLO
CTRL
PWM
SYNC
OVPSET
REF
TSET
ISET
GND
INTVCC
RT
GATE
SENSE
VOUT
L1 10uH
SUMIDA
CDRH8D38NP
D1
M1
SI7850DP
RS1
0.015
CPVIN
4.7uF
50V
CVIN
4.7uF
25V
C1 2.2uF 100V
C2 2.2uF 100V
C3 2.2uF 100V
C4 2.2uF 100V
C5 2.2uF 100V
C6
4.7uF
10V
C7
2200pF
R1
499k
R2
(OPT)
R3
100k
R4
40.2k
R5
(OPT)
R6
0
R7
20k
1%
R8
11k
1%
R9
(OPT)
R10
20k
1%
R11
30.9k
R12
(OPT)
R13
10k
R14
5.76k
50mA
R15
1M
RT
39.2k
1MHz
LED1 E7
LED2 E9
LED3 E11
LED4 E14
LED5 E16
LED6 E18
LED7 E20
LED8 E22
LED9 E24
LED10 E26
LED11 E28
LED12 E30
LED13 E32
LED14 E34
LED15 E36
LED16 E38
LED+
UP TO 45V
E10 E15 E19 E23 E27 E31 E35 E39
E40
GND
VIN
8V - 14V
E45
PVIN
20V - 28V *
E1
GND E2
FAULT E3
GND E44
GND E4
GND E41
CTRL E5
GND E43
PWM E6
SYNC E13
GND E42
SHDN / UVLO
INTVCC E46
* SEE QUICK-START GUIDE FOR DETAILS
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TITLE
LT3754EUH
16-Channel High Voltage LED Driver
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DWG NO
DC1436A
REV 2
SHEET 1 OF 1