LT3599
4-Channel 120mA LED Driver with +/-1.5% Current Matching

DESCRIPTION

WARNING!

Do not look directly at operating LEDs.
This circuit produces light that can damage eyes.

NOTE: This document is for Demo Circuit **1327B**.

Demonstration circuit 1327B is a 4-Channel 120mA LED Driver with +/-1.5% Current Matching featuring the LT3599. The LT3599 is a step-up DC/DC converter designed to drive up to 4-strings of LEDs at an output voltage up to 44V. The LED strings are connected to internal current sources where the current level is set with an external resistor.

The demonstration circuit drives 80mA through each LED string. Each string can have up to 10 white LEDs. The circuit operation frequency is set to 1MHz. Parameters such as the LED current; the switching frequency, etc can be modified easily based on the demo circuit. When a string is not used, tie its LED pin to V_{OUT}. Any unused string is no longer in the regulation loop. Direct paralleling multiple strings together to achieve higher current per string is allowed. To paralleling strings, tie the respective LEDn pins together. OPENLED indicator flags if any string is left open. To improve efficiency, it is recommended that V_{IN} is between 3.1V and 5.5V. The V_{IN} bias capacitor of the demo circuit is rated at 6.3V. PWM dimming ratio can be as high as 3000:1. The soft start will not start until the 1st PWM pulse is presented.

The LT3599 datasheet gives complete descriptions 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 1327B.

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

LT, LTC, LTM, LT are trademarks of Linear Technology Corporation. Other product names may be trademarks of the companies that manufacture the products.

PERFORMANCE SUMMARY Specifications are at TA = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		3.1		5.5*	V
PV_{IN}	Power Input Supply Range**		8		16	V
I_Q	Quiescent Current	PWM=0V, Not switching		3	5	mA
F_{SW}	Switching Frequency		0.9	1	1.1	MHz
I_{LED}	LED String Current		77.6	80	82.4	mA
I_M	LED String Current Matching***			+/-0.25	+/-1.5	%
Eff	Efficiency	V_{IN} = 3.3V; PV_{IN} = 12V; I_{LED} = 80mA		90		%
D_{PWM}	PWM dimming ratio	PVIN = 12V		3000:1		

*: Limited by the voltage rating of the bypass capacitor, C3, on the demo circuit. The IC rating is 30V.
**: PV_{IN} below 8V causes current derating but the circuit operates fine. PV_{IN} between 16V and 40V may be acceptable depending on the number of LEDs, desired LED current, etc. Power dissipation needs to be taken into considerations if PV_{IN} is greater than the Maximum LED string voltage.
***: Specifications apply over the full operating temperature range.

QUICK START PROCEDURE

Demonstration circuit 1327B is easy to set up to evaluate the performance of the LT3599. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply to VIN and GND.

2. Connect the power input power supply to PVIN and GND.

3. Tie PWM to VIN or a PWM signal.

4. Connect LED strings to LED*n*+ and LED*n*-. If any string is not used, tie LED*n*- to LED*n*+, where *n* is the string number (between 1 and 4).

5. Turn on power supplies for VIN and PVIN.

6. A PWM signal needs to be applied if PWM is not tied to VIN.

7. If analog dimming is to be tested by varying the level of CTRL pin voltage, remove R15 to prevent triggering UVLO at low PVIN (<10V).

8. Removing R15 disables the programmed UVLO and LED current derating. If those functions are required in the test in 7, use two independent resistor dividers for UVLO and CTRL.

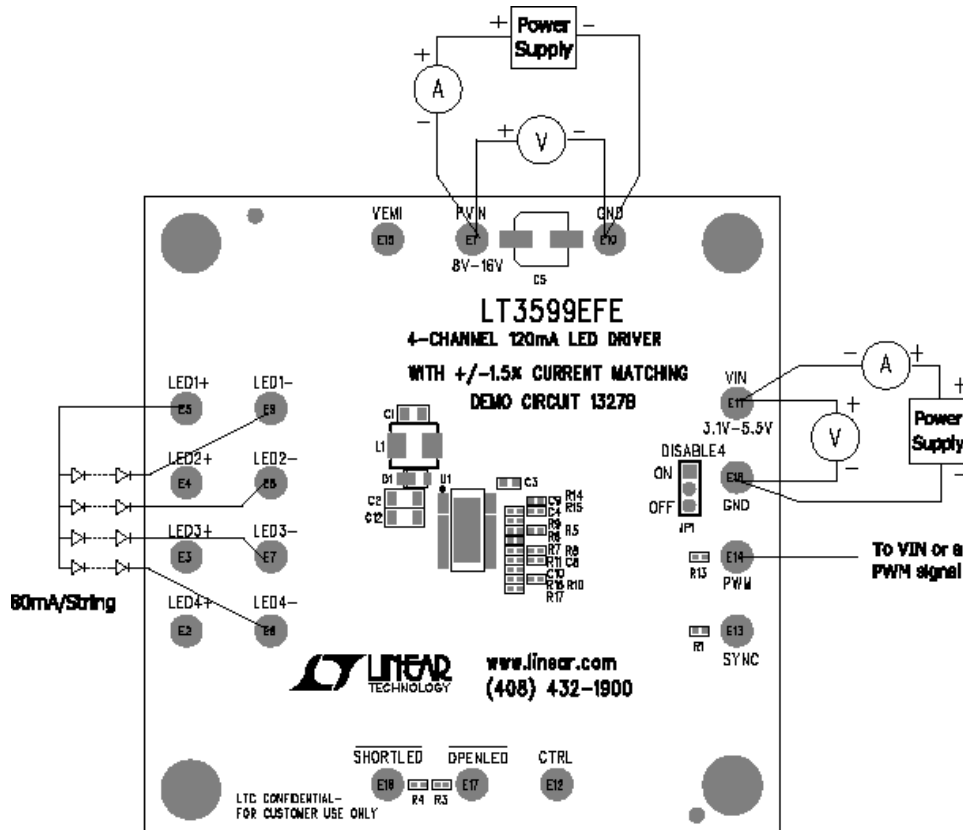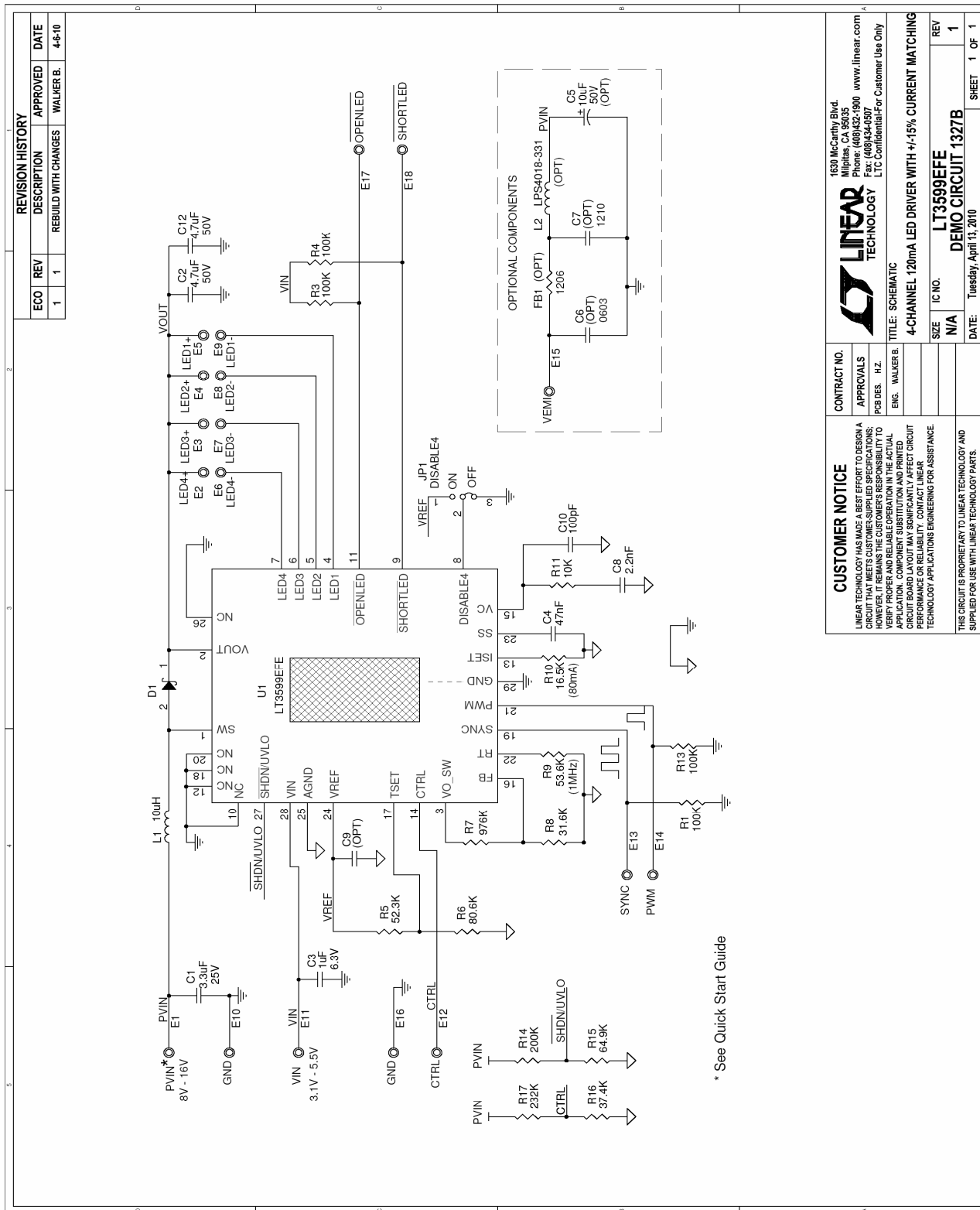**9.** Check for the proper LED voltage and current.

Figure 1. Proper Measurement Equipment Setup

REVISION HISTORY

ECO	REV	DESCRIPTION	APPROVED	DATE
1	1	REBUILD WITH CHANGES	WALKER B.	4-6-10

CUSTOMER NOTICE

LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

CONTRACT NO.

APPROVALS
PCB DES.   H.Z.
ENG.   WALKER B.

1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900   www.linear.com
Fax: (408)434-0507
LTC Confidential-For Customer Use Only

TITLE: SCHEMATIC

4-CHANNEL 120mA LED DRIVER WITH +/-15% CURRENT MATCHING

IC NO.   LT3599EFE
DEMO CIRCUIT 1327B

SIZE   N/A

REV   1

DATE: Tuesday, April 13, 2010

SHEET   1   OF   1

LINEAR TECHNOLOGY

OPTIONAL COMPONENTS

* See Quick Start Guide

U1 LT3599EFE

Key component labels:
- L1 10uH
- D1
- C1 3.3uF 25V
- C2 4.7uF 50V
- C3 1uF 6.3V
- C4 47nF
- C5 10uF 50V (OPT)
- C6 (OPT) 0603
- C7 (OPT) 1210
- C8 2.2nF
- C9 (OPT)
- C10 100pF
- C12 4.7uF 50V
- R1 100K
- R3 100K
- R4 100K
- R5 52.3K
- R6 80.6K
- R7 976K
- R8 31.6K
- R9 53.6K (1MHz)
- R10 16.5K (80mA)
- R11 10K
- R13 100K
- R14 200K
- R15 64.9K
- R16 37.4K
- R17 232K
- FB1 (OPT) 1206
- L2 LPS4018-331 (OPT)
- JP1 DISABLE4

Pin labels: LED4, LED3, LED2, LED1, OPENLED, SHORTLED, DISABLE4, VC, SS, ISET, GND, PWM, SYNC, RT, FB, VO_SW, CTRL, TSET, VREF, AGND, VIN, SHDN/UVLO, NC, VOUT, SW

PVIN* E1   PVIN 8V - 16V
GND E10
VIN E11   VIN 3.1V - 5.5V
GND E16
CTRL E12   CTRL
E13 SYNC
E14 PWM
E15 VEMI
E17 OPENLED
E18 SHORTLED
LED1+ E5 / LED1- E9
LED2+ E4 / LED2- E8
LED3+ E3 / LED3- E7
LED4+ E2 / LED4- E6

VREF, VIN, VOUT, VOUT
2 ON 3 OFF