

LT3592: Step-Down 500mA LED Driver with 10:1 Dimming

DESCRIPTION

Demonstration circuit 1205A features the LT3592 36V step-down 500mA LED driver with 10:1 dimming. The demonstration circuit is designed to drive two red 500mA LEDs mounted on the PCB from a wide input voltage range. The high 2.2MHz switching frequency permits the use of a small inductor and ceramic capacitors to save space and cost. Current mode control provides fast transient response and cycle-by-cycle current limit for short-circuit protection. The LEDs have two brightness settings. With BRIGHT pulled high or left floating, the two red LEDs are driven with 500mA. With BRIGHT pulled to GND, the LED current drops to 50mA for 10:1 analog dimming.

The typical efficiency of the LT3592 DC1205A is 85% with 12V_{IN} and the two LEDs at 4.6V total with 500mA as shown in Figure 1. Although the board is stuffed with two red LEDs, different LED strings can be powered from

the LT3592. The minimum input voltage to run the step-down converter at 2.2MHz with a given string of LEDs is shown in Figure 2.

The LT3592 data sheet gives a complete description of the part, operation and applications information. The data sheet must be read in conjunction with this Demo Manual for DC1205A. The LT3592 is assembled in a 10-lead plastic DFN (3mm × 2mm) DDB package with a thermally enhanced ground pad. Proper board layout is essential for maximum thermal performance. See the data sheet section Layout Hints.

Design files for this circuit board are available at <http://www.linear.com/demo>

LT, LT, LTC, LTM, Linear Technology and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

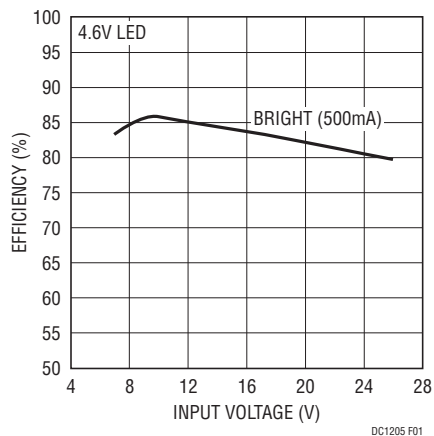


Figure 1. Input Voltage vs Efficiency

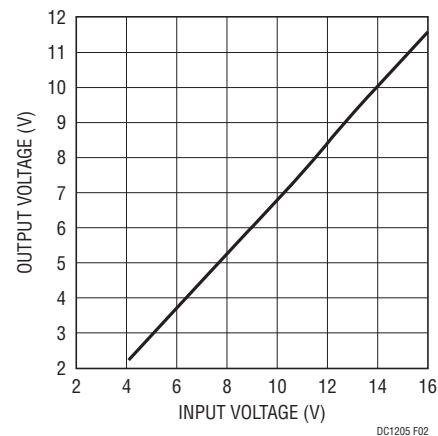


Figure 2. Minimum Input Voltage vs LED Voltage

QUICK START PROCEDURE

Demonstration circuit 1205A is easy to set up for evaluating the LT3592 36V step-down 500mA LED driver with 10:1 dimming. Follow the test procedure outlined below and see Figure 3.

1. Set up DC1205A as shown in Figure 3 with hand-held multimeters, and a bench supply (power turned off) with voltage greater than the LED string (approximately 3.5V to 5V) and less than 36V.
2. Turn on the bench power supply and observe a constant 500mA through the string of LEDs with BRIGHT terminal floating.

3. Tie BRIGHT terminal to GND terminal and observe the LED current dropping to 50mA as brightness also decreases.
4. Use the $\overline{\text{SHDN}}$ terminal to turn the LEDs on and off by respectively floating or grounding the terminal.

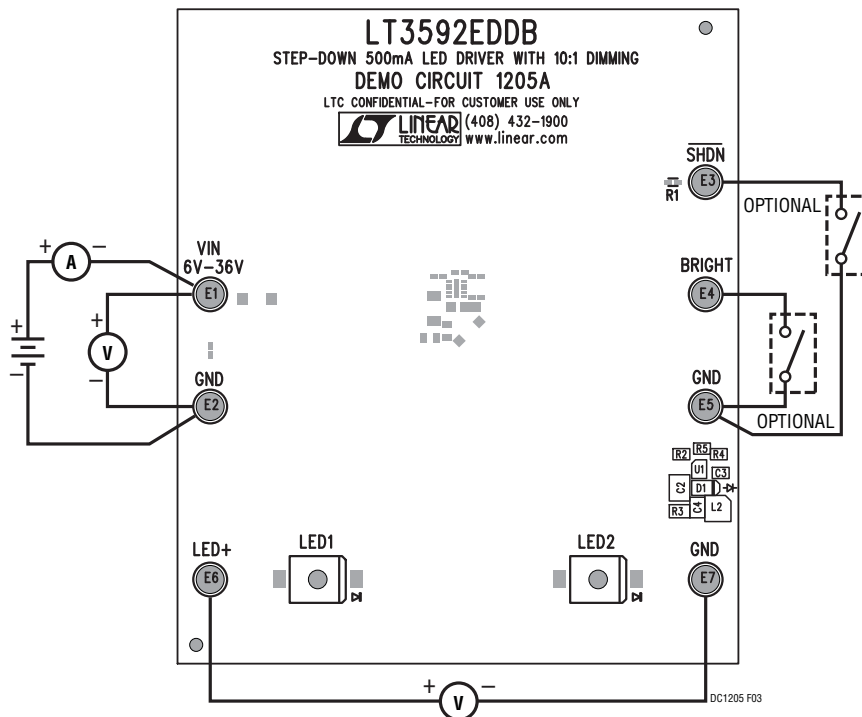
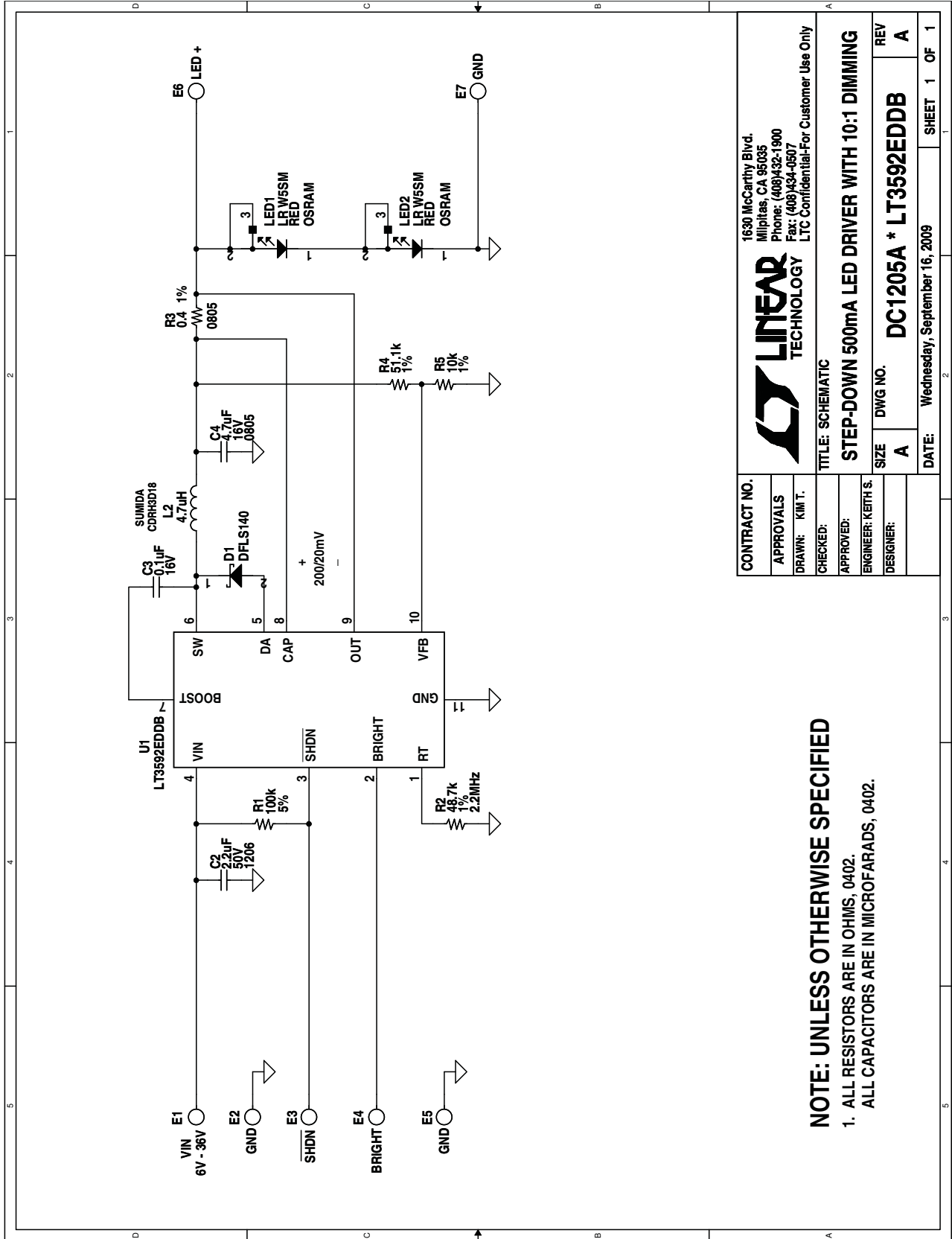


Figure 3. Proper Measurement Equipment Setup

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
REQUIRED CIRCUIT COMPONENTS				
1	1	C2	Capacitor, X7R, 2.2 μ F, 50V, 10%, 1206	Murata, GCM31CR71H225KA55
2	1	C3	Capacitor, X7R, 0.1 μ F, 16V, 10%, 0402	TDK, C1005X7R1C104K
3	1	C4	Capacitor, X5R, 4.7 μ F, 16V, 10%, 0805	TDK, C2012X5R1C475K
4	1	D1	Diode, Schottky, 1A, POWERDI123	Diode Inc., DFLS140-7-F
6	2	LED2, LED1	LED, Golden Dragon, Red, LED-SFH4230	Osram, LR W5SM-HYJY-1
7	1	L2	Inductor, PWR, 4.7 μ H, L-CDRH3D18	Sumida, CDRH3D18NP-4R7NC
9	1	R2	Resistor, Chip, 48.7k, 1/16W, 2.2MHz, 1%, 0402	Vishay, CRCW040248K7FKED
10	1	R3	Resistor, 0.4 Ω , 1%, 1/4W, 0805	Susumu International USA Inc., RL1220S-R40-F
11	1	R4	Resistor, Chip, 51.1k, 1/16W, 1%, 0402	Vishay, CRCW040251K1FKED
12	1	R5	Resistor, Chip, 10k, 1/16W, 1%, 0402	Vishay, CRCW040210K0FKED
13	1	U1	IC, LT3592EDDB#PBF, DFN10DDB	Linear Tech, LT3592EDDB#PBF
ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS				
8	1	R1	Resistor, Chip, 100k, 1/16W, 1%, 0402	Vishay, CRCW0402100KFKED
HARDWARE FOR DEMO BOARD ONLY				
5	7	E1-E7	TP, Turret, 0.094"	Mill-Max, 2501-2-00-80-00-00-07-0

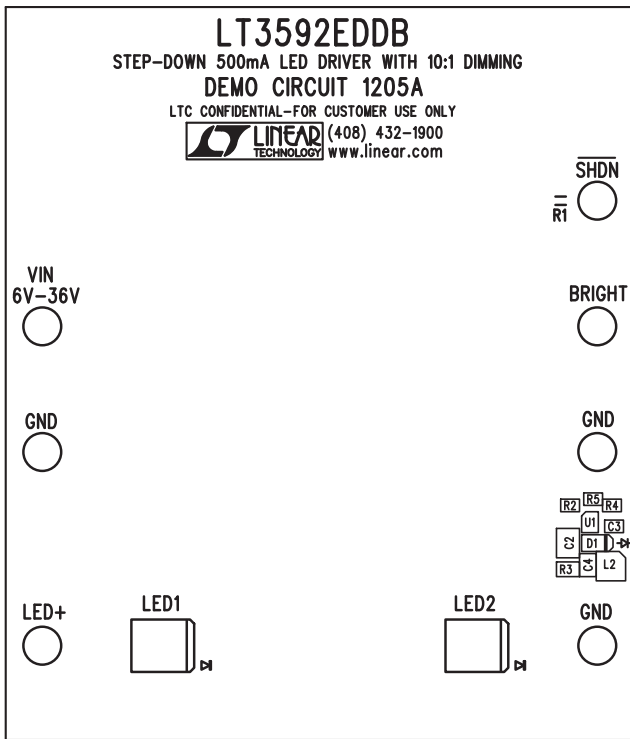
SCHEMATIC DIAGRAM



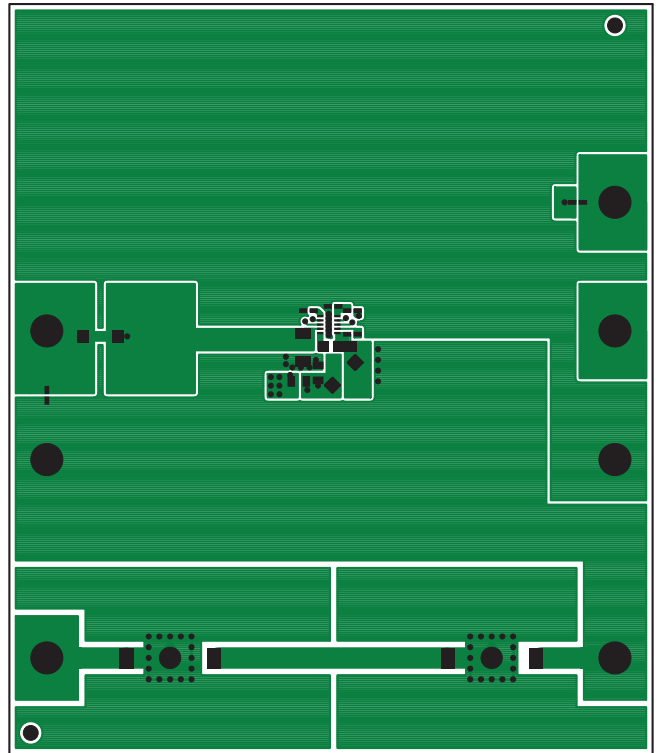
CONTRACT NO.		1630 McCarthy Blvd. Milpitas, CA 95035 Phone: (408)432-1900 Fax: (408)434-0907 LTC Confidential-For Customer Use Only	
APPROVALS		LINEAR TECHNOLOGY	
DRAWN: KIM T.		TITLE: SCHEMATIC	
CHECKED:		STEP-DOWN 500mA LED DRIVER WITH 10:1 DIMMING	
APPROVED:		SIZE	REV
ENGINEER: KETH S.		A	A
DESIGNER:		DWG NO.	DC1205A * LT3592EDDB
		DATE:	WEDNESDAY, SEPTEMBER 16, 2009
		SHEET	1 OF 1

PCB LAYOUT AND FILM

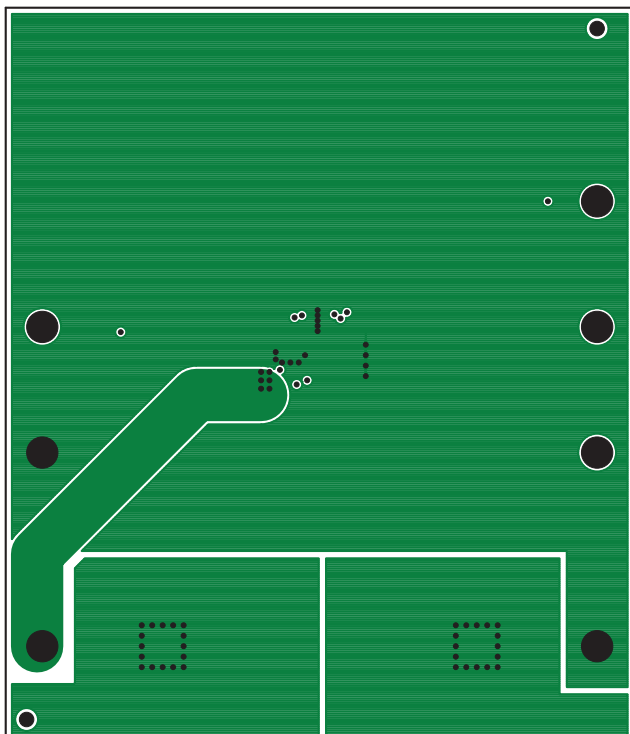
Top Silkscreen



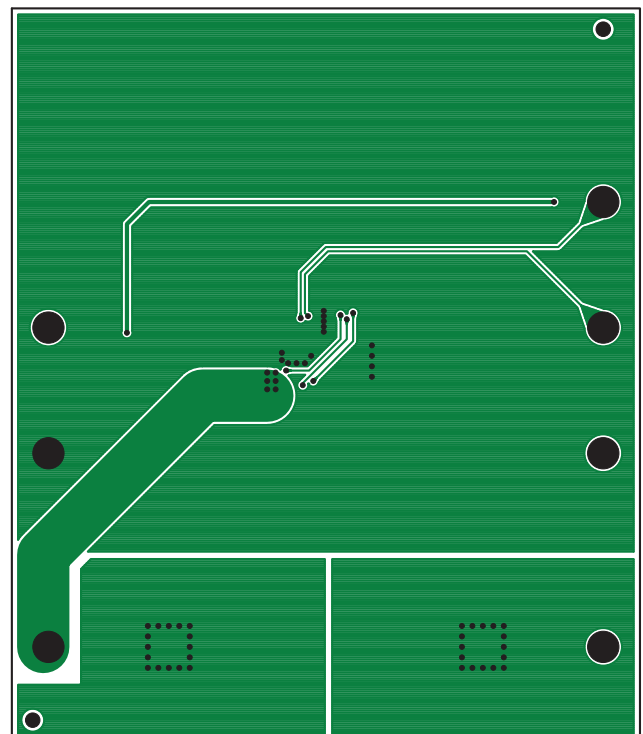
Layer 1—Top Layer



Layer 2—GND Plane 1

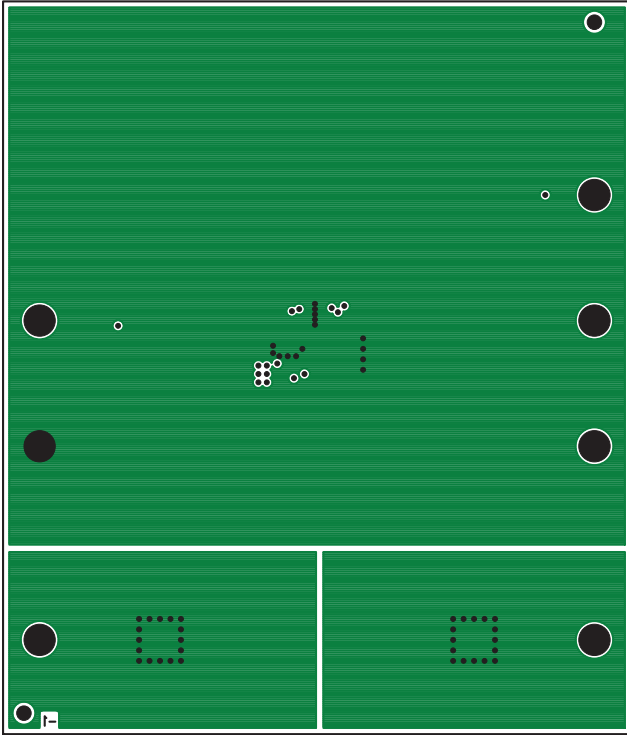


Layer 3—GND Plane 2

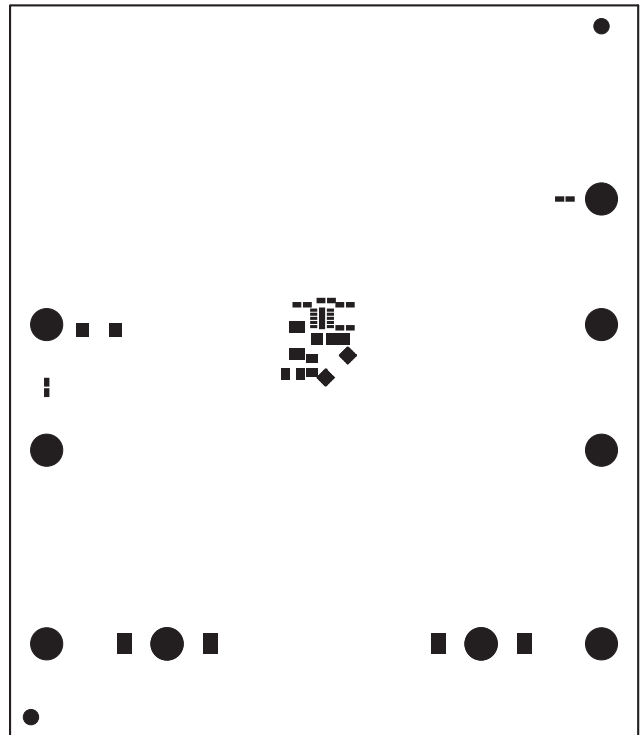


PCB LAYOUT AND FILM

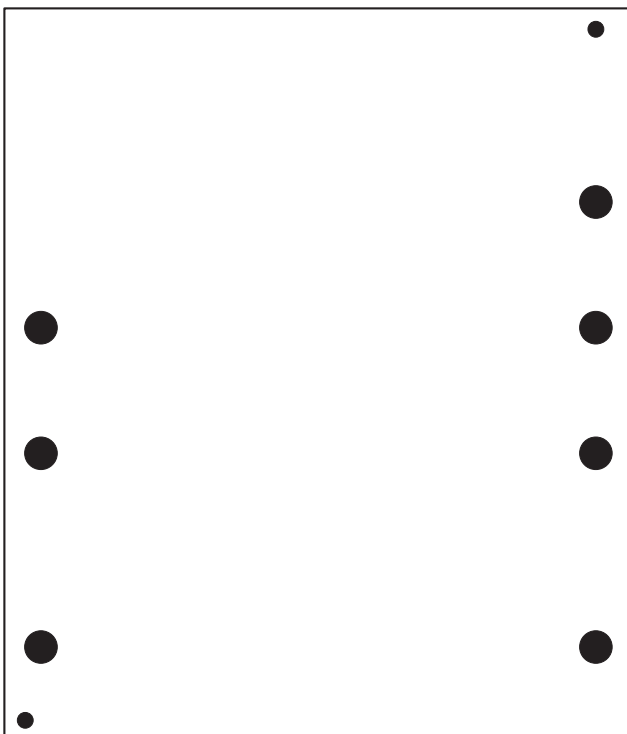
Layer 4—Bottom Layer



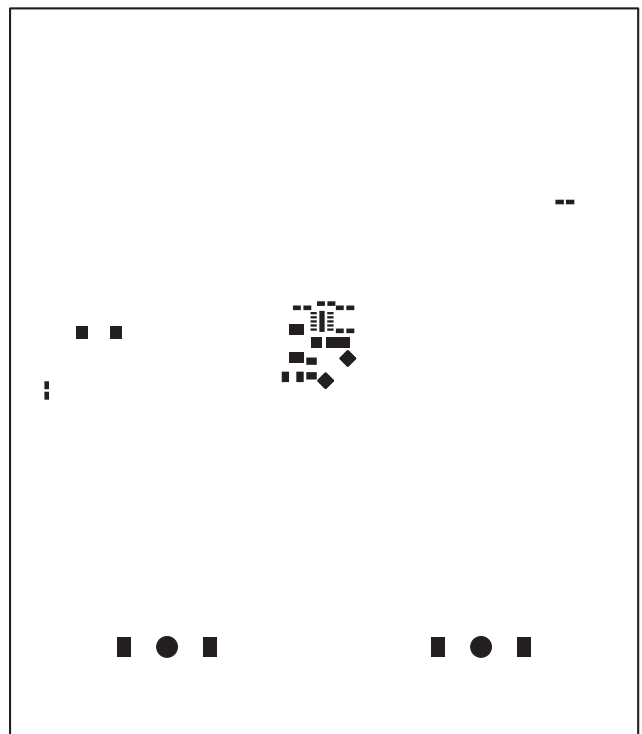
Top Solder Mask



Bottom Solder Mask



Top Solder Paste Mask



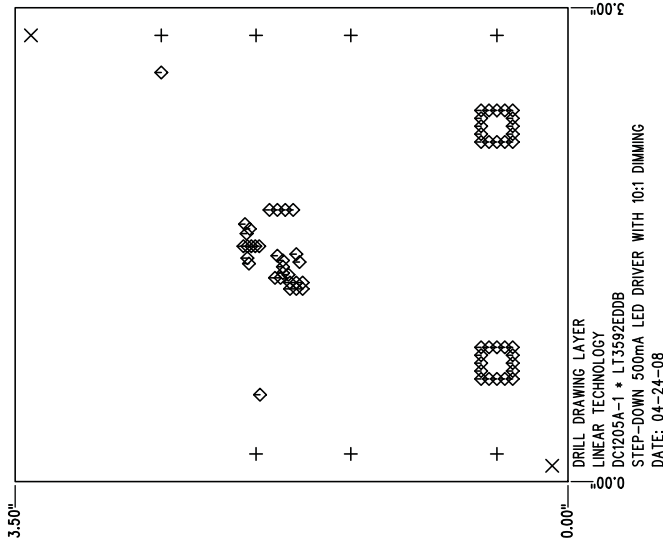
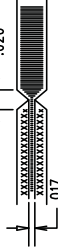
FABRICATION DRAWING

REVISIONS			
REV	DESCRIPTION	APPR	DATE
A	FINAL FABRICATION	KS	04-24-08

SIZE	QTY	SYM	PLATED	TOL
0.094	7	+	YES	+/-0.003"
0.07	2	X	NO	+/-0.003"
0.012	63	◇	YES	+/-0.003"

NOTES: UNLESS OTHERWISE SPECIFIED

- FAB PER IPC-A-600
- MATERIAL: EPOXY FIBERGLASS, NEMA GRADE FR-4
FINISHED THICKNESS TO BE 0.062" +/- .005"
TOTAL OF 4 LAYERS WITH 2 OZ. CU ON THE
OUTER LAYERS AND 1 OZ. CU ON THE INNER LAYERS.
FLAMMABILITY RATING: 94 V-0 MINIMUM .
- SIZE: CUT TO DIMENSIONS AND TOLERANCES SHOWN.
0.00" ARE PRIMARY DATUMS.
- DRILLING: DRILL HOLES PER SCHEDULE. PLATE THROUGH
HOLES WITH COPPER, 0.001" THICK MIN.
ALL HOLE SIZES ARE SPECIFIED AFTER PLATING.
HOLE LOCATION TOLERANCES ARE +/-0.003"
IN RELATION TO CENTER
- FINISH: SMOBC USING LPI BOTH SIDES, COLOR GREEN.
GOLD IMMERSION. USE LEAD FREE SOLDER FOR PROTOTYPE.
FOR SILKSCREEN: USE WHITE NON-CONDUCTIVE INK.
- DO NOT ALTER ARTWORK e.g. TO ADD LOGO OR DATE CODE.
PAD SIZE CAN BE MODIFIED TO MEET END FINISH.
- PCBS ARE TO BE ROHS COMPLIANT.
- SCORING FOR PANELIZED PCB:



SHOWN FROM COMPONENT SIDE

APPROVALS		DATE	
DRAWN			
CHECK			
DESIGN		KIM T.	04-24-08
ENGR		KEITH S.	04-24-08
SCALE = NONE		SIZE	A
		DEMO	DC1205A * LT13592EDDB
		REV.	A
		SHT 1 of 1	

LINEAR TECHNOLOGY
 1630 MCCARTHY BLVD
 MILPITAS, CA 95035
 TEL: (415) 964-7000
 FAX: (415) 964-7070
 WWW.LINEARTECH.COM
 © 2008 LINEAR TECHNOLOGY
 ALL RIGHTS RESERVED
 NOT FOR SALE
 NOT FOR DISTRIBUTION
 NOT FOR CUSTOMER USE ONLY

TITLE: FABRICATION DRAWING
 STEP-DOWN 500mA LED DRIVER WITH 10:1 DIMMING

DEMO MANUAL DC1205A

DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.**

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

No License is granted under any patent right or other intellectual property whatsoever. **LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

LTC currently services a variety of customers for products around the world, and therefore this transaction **is not exclusive**.

Please read the DEMO BOARD manual prior to handling the product. Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged.**

This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

Mailing Address:

Linear Technology
1630 McCarthy Blvd.
Milpitas, CA 95035

Copyright © 2004, Linear Technology Corporation