DEMO CIRCUIT 928
QUICK START GUIDE

LTC3452EUF
SYNCHRONOUS BUCK-BOOST
MAIN/CAMERA WHITE LED DRIVER

DESCRIPTION

WARNING!

Do not look directly at operating LED.

This circuit produces light that can damage eyes.

Demonstration circuit 928 is a SYNCHRONOUS BUCK-BOOST MAIN/CAMERA WHITE LED DRIVER featuring the LTC3452EUF.

The circuit drives two banks of LEDs: one 250mA flash device, and a bank of 5 LEDs at 20mA each for backlighting. The backlight LED currents are typically matched within 2%. The input voltage range of 2.7V to 5.5V is suitable for a single Lithium-Ion battery or three AAA batteries in series. Some of the many features include: Lithium-Ion battery input voltage range, flash LED output, separate, dimmable backlight outputs, internal synchronous power switches, minimal and low-profile external components, and simple design; therefore the LTC3452 is the top solution for highly efficient, space-constrained, cellular telephone camera flash solutions.

The flash output (LED_H) is activated by depressing The 'FLASH' momentary switch, or connecting the 'ENH' terminal to 'V_{IN}' with a jumper wire.

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

The backlight outputs (LED_{L1-5}) are activated by depressing The 'DISPLAY' momentary switch, or connecting the 'ENL' terminal to 'V_{IN} ' with a jumper wire. The backlight intensity can be modulated by applying a 10kHz pwm signal to the 'ENL' terminal, as indicated in the table.

Figure 2 shows efficiency at 200mA flash output with various 4.7uH inductors.

The LTC3452 datasheet gives a complete description of the part along with operation and applications information. The datasheet must be read in conjunction with this Quick Start Guide for demonstration circuit 928. In addition, the Nichia NSCW100 datasheet (www.nichia.com) and 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 LTC3452 is offered in a small low profile QFN 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.

PERFORMANCE SUMMARY

Specifications are at TA = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		2.7		5.5	V
V_{OUT}	Output Voltage Range				4.4	V
I_{OUT}	Output Current – LED_H	V_{IN} = 2.7V to 5.5V		250		mA
I_{OUT}	Output Current – LED_{L1} through LED_{L5}	V_{IN} = 2.7V to 5.5V		20		mA each
$V_{OUT\ P-P}$	Output Ripple	V_{IN} = 4.2V, I_{OUT} = 20mA (20MHz BW)		10		mV_{P-P}
I_{REG}	Output Regulation	Line, V_{IN} = 2.7V to 5.5V		±1.0		%
F_{SW}	Switching Frequency			1.0		MHz
P_{OUT}/P_{IN}	Efficiency	V_{IN} = 4.2V, I_{OUT} = 200mA		85		%

QUICK START PROCEDURE

Demonstration circuit 928 is easy to set up to evaluate the performance of the LTC3452EUF. Refer to Figure1 for proper measurement equipment setup and follow the procedure below:

NOTE. When measuring output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the output voltage ripple by touching the probe tip directly across the output capacitor. See Figure 2 for proper scope probe technique.

1. Preset a dc source capable of 5.5V at 1A to 4V.

2. With power off, connect the input power supply to 'VIN' and 'GND' of the circuit.

3. Turn on the power at the input. The input voltage may be varied between 2.7V and 5.5VDC .

NOTE. Make sure that the input voltage does not exceed 5.5V.

4. Press 'DISPLAY' to observe a constant 20mA x 5 LED backlight for displays.

5. Press 'FLASH' to observe a 250mA camera flash.

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

6. Alternatively, the backlight and flash modes can be enabled by connecting 'ENL' (backlight), or 'ENH' (flash) to 'VIN'.

7. The backlight intensity can be modulated by applying a 10kHz, 2V pwm signal to the 'ENL' terminal. Output current will vary with duty cycle, as indicated in the table on the board.

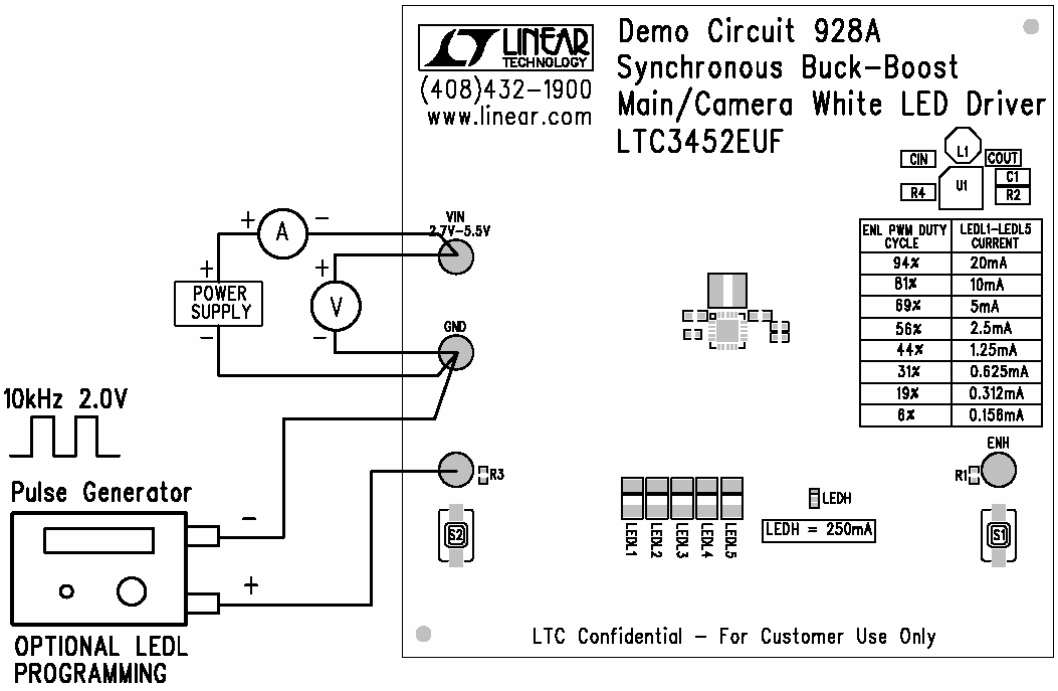


Figure 1. Proper Measurement Equipment Setup

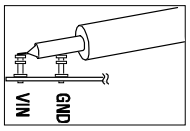


Figure 2. Measuring Input or Output Ripple

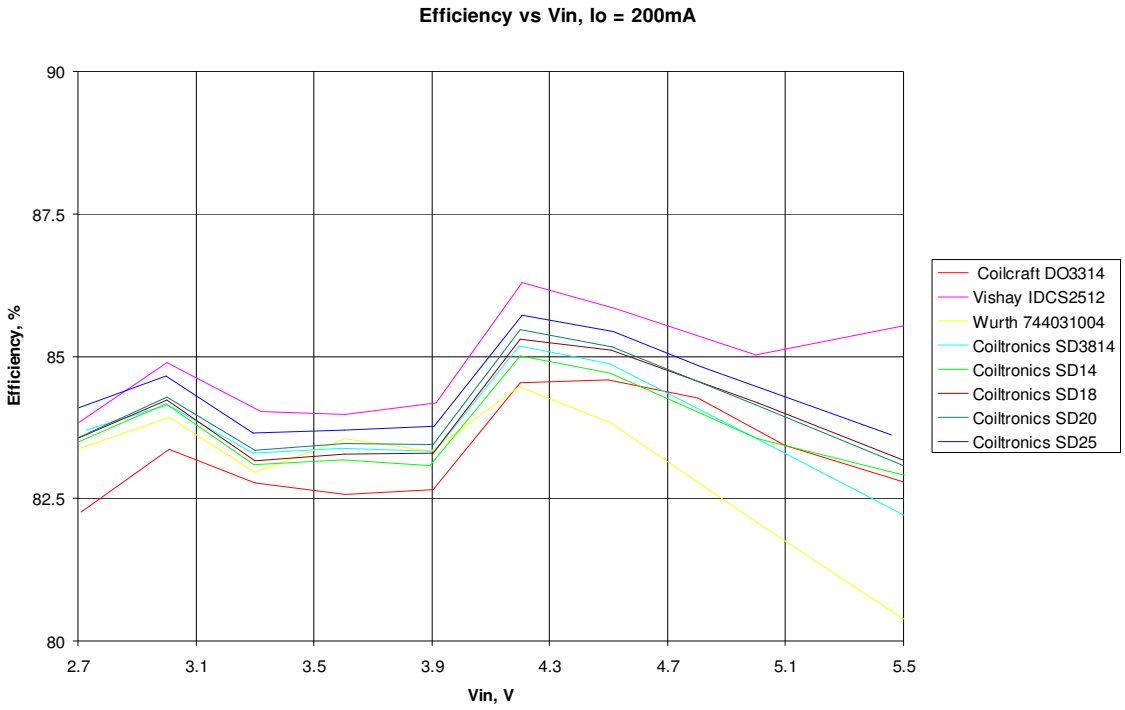
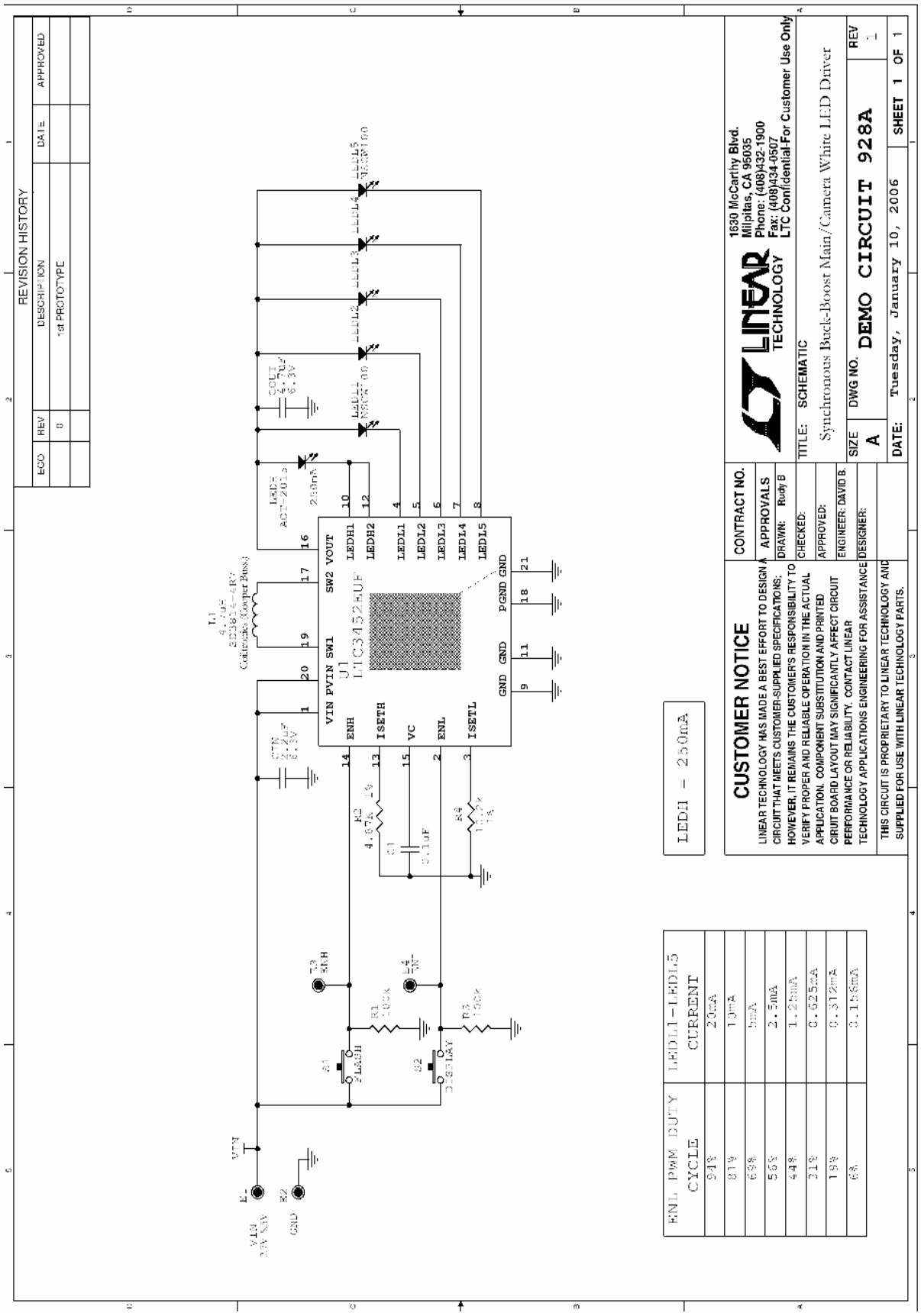


Figure 3. Efficiency


REVISION HISTORY
ECO
REV
DESCRIPTION
DATE
APPROVED
0
1st PROTOTYPE
U1
LTC3452EUF
VIN PVIN SW1
SW2 VOUT
LED1H
LED2H
LED1L
LED2L
LED3L
LED4L
LED5L
ENH
ISETH
VC
ENL
ISETL
GND GND PGND GND
LED1 = 25mA
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 CIRUIT 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
DRAWN: Rudy B
CHECKED:
APPROVED:
ENGINEER: DAVID B.
DESIGNER:
LINEAR TECHNOLOGY
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
LTC Confidential-For Customer Use Only
TITLE: SCHEMATIC
Synchronous Buck-Boost Main/Camera White LED Driver
SIZE A
DWG NO. DEMO CIRCUIT 928A
REV 1
DATE: Tuesday, January 10, 2006
SHEET 1 OF 1
PWM DUTY CYCLE
LED1-LED15 CURRENT
94%
20mA
81%
10mA
69%
5mA
56%
2.5mA
44%
1.25mA
31%
0.625mA
19%
0.312mA
8%
0.156mA