

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<sub>H</sub>) is activated by depressing The 'FLASH' momentary switch, or connecting the 'ENH' terminal to 'V<sub>IN</sub>' with a jumper wire.

**WARNING-** The LED<sub>H</sub> LED can be permanently damaged if the flash mode is engaged for more than a few seconds.

The backlight outputs (LED<sub>L1-5</sub>) are activated by depressing The 'DISPLAY' momentary switch, or connecting the 'ENL' terminal to 'V<sub>IN</sub>' 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](http://www.nichia.com)) and the AOT2015 datasheet ([www.aot.com](http://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.**

LT, LTC, LTM, LT, Burst Mode, OPTI-LOOP, Over-The-Top and PolyPhase are registered trademarks of Linear Technology Corporation. Adaptive Power, C-Load, DirectSense, Easy Drive, FilterCAD, Hot Swap, LinearView,  $\mu$ Module, Micropower SwitcherCAD, Multimode Dimming, No Latency  $\Delta\Sigma$ , No Latency Delta-Sigma, No R<sub>SENSE</sub>, Operational Filter, PanelProtect, PowerPath, PowerSOT, SmartStart, SoftSpan, Stage Shedding, SwitcherCAD, ThinSOT, UltraFast and VLDO 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 <sub>IN</sub>	Input Supply Range		2.7		5.5	V
V <sub>OUT</sub>	Output Voltage Range				4.4	V
I <sub>OUT</sub>	Output Current – LED <sub>H</sub>	V <sub>IN</sub> = 2.7V to 5.5V		250		mA
I <sub>OUT</sub>	Output Current – LED <sub>L1</sub> through LED <sub>L5</sub>	V <sub>IN</sub> = 2.7V to 5.5V		20		mA each
V <sub>OUT P-P</sub>	Output Ripple	V <sub>IN</sub> = 4.2V, I <sub>OUT</sub> = 20mA (20MHz BW)		10		mV <sub>P-P</sub>
I <sub>REG</sub>	Output Regulation	Line, V <sub>IN</sub> = 2.7V to 5.5V		±1.0		%
F <sub>SW</sub>	Switching Frequency			1.0		MHz
P <sub>OUT</sub> /P <sub>IN</sub>	Efficiency	V <sub>IN</sub> = 4.2V, I <sub>OUT</sub> = 200mA		85		%

## QUICK START PROCEDURE

Demonstration circuit 928 is easy to set up to evaluate the performance of the LTC3452EUF. Refer to Figure 1 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.

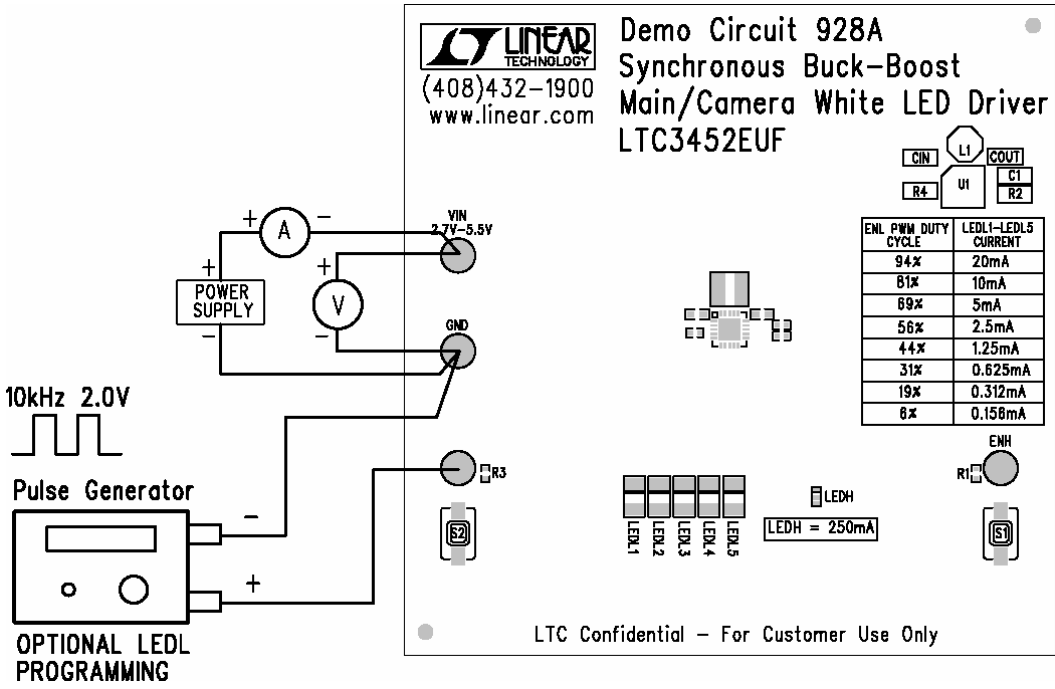


Figure 1. Proper Measurement Equipment Setup

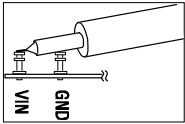
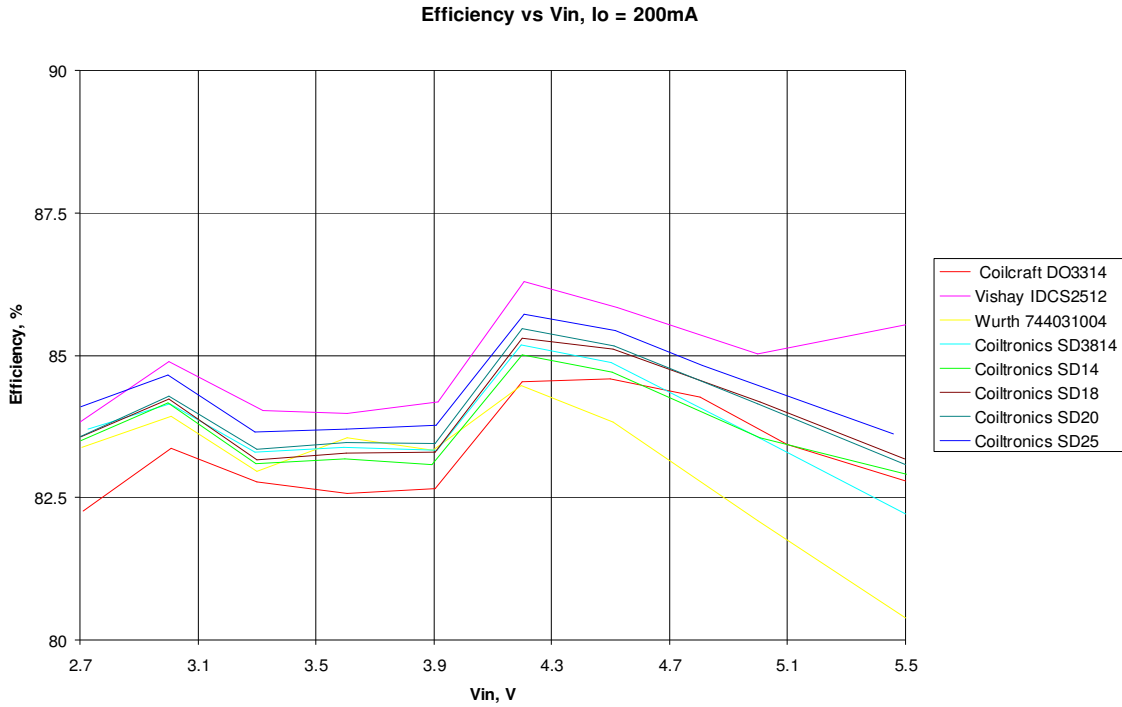
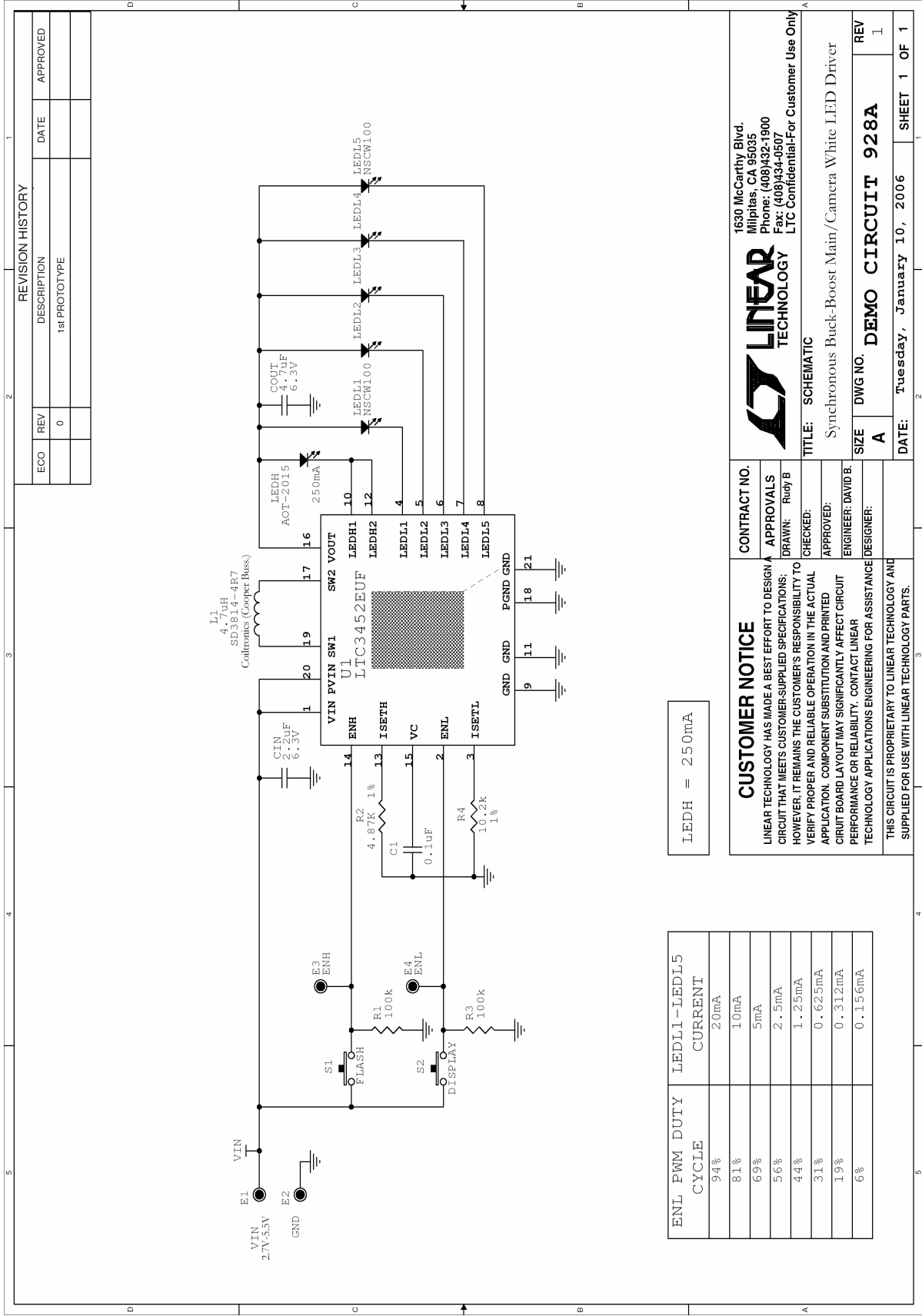


Figure 2. Measuring Input or Output Ripple



**Figure 3. Efficiency**



REVISION HISTORY				
ECO	REV	DESCRIPTION	DATE	APPROVED
	0	1st PROTOTYPE		

LEDH = 250mA

ENL PWM DUTY CYCLE	LEDL1-LEDL5 CURRENT
94%	20mA
81%	10mA
69%	5mA
56%	2.5mA
44%	1.25mA
31%	0.625mA
19%	0.312mA
6%	0.156mA

**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 OR RELIABILITY ENGINEERING FOR ASSISTANCE.  
 THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

**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

**CONTRACT NO. APPROVALS**  
 DRAWN: Rudy B  
 CHECKED:  
 APPROVED:  
 ENGINEER: DAVID B.  
 DESIGNER:

**SIZE DWG NO. DEMO CIRCUIT 928A**  
**DATE: Tuesday, January 10, 2006**

**REVISION HISTORY**  
 REV 1  
 SHEET 1 OF 1

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А