

## 42V, 2.5A Micropower Synchronous Step-Down Regulator with Current Sense

### DESCRIPTION

Demonstration circuit 1750A is a 42V, 2.5A micropower synchronous step-down regulator with current sense featuring the LT<sup>®</sup>8611. The LT8611 is a compact, high efficiency, high speed synchronous monolithic step-down switching regulator that consumes only 2.5 $\mu$ A of quiescent current when output is regulated at 3.3V. Top and bottom power switches, compensation components and other necessary circuits are inside of the LT8611 to minimize external components and simplify design.

The demonstration circuit has output current limit set at 2.5A by default. The current limit can be moved to the input side for application where input supply current is limited, such as energy harvesting application. ICTRL and IMON on the board set and monitor the regulated current respectively. The SYNC pin on the demo board is grounded by default for low ripple Burst Mode<sup>®</sup> operation. To synchronize to an external clock, move JP1 to SYNC and apply the external

clock to the SYNC turret. Once JP1 is on SYNC position, a DC voltage of higher than 2V or INTV<sub>CC</sub> can be applied to the SYNC turret for pulse skipping operation. Figure 1 shows the efficiency of the circuit at 12V input.

The demo board has an EMI filter installed. The EMI performance of the board is shown on Figure 2. Figure 3 shows the EMI performance of the board running at 1MHz switching frequency. The limit in Figure 2 and Figure 3 is EN55022 Class B. Both figures show the circuit passes the test with a wide margin. To use the EMI filter, the input should be tied to VEMI, not VIN.

The LT8611 datasheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this quick start guide for demo circuit 1750A.

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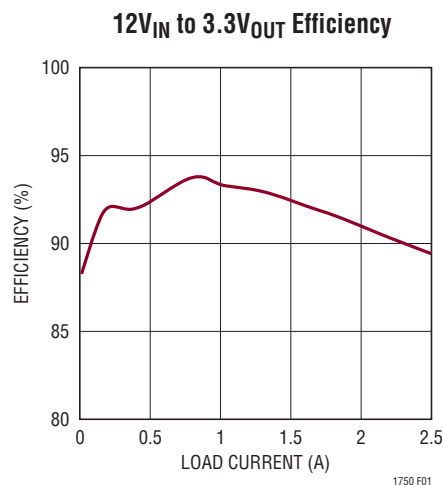


Figure 1. LT8611 Efficiency from 12V to 3.3V (R5 = 0)

## DESCRIPTION

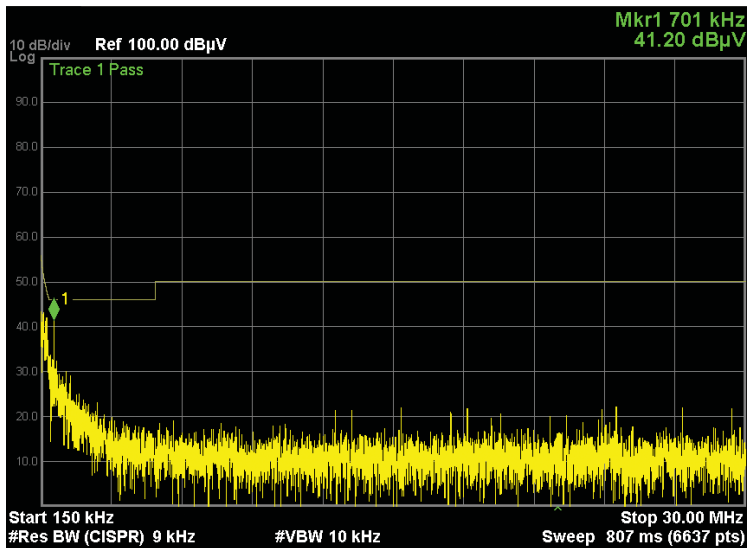


Figure 2. LT8611 Demo Circuit EMI Performance, Switching Frequency = 700kHz

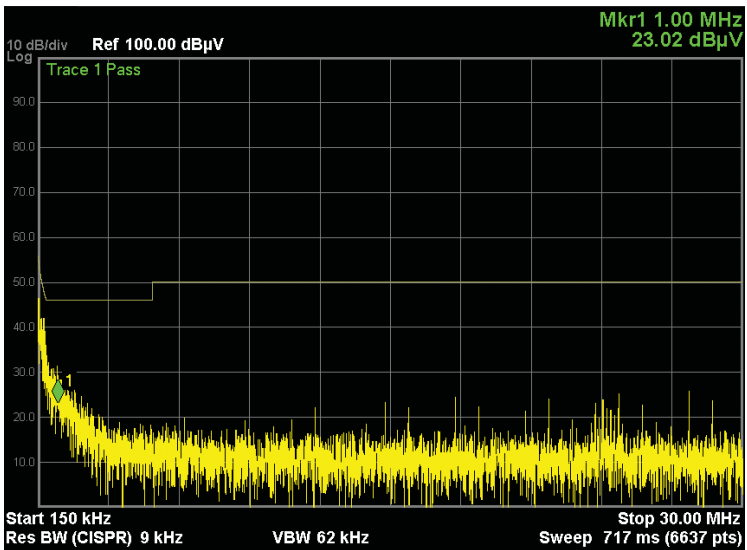


Figure 3. LT8611 Demo Circuit EMI Performance, Switching Frequency = 1MHz

## PERFORMANCE SUMMARY (T<sub>A</sub> = 25°C)

| SYMBOL           | PARAMETER              | CONDITIONS                    | MIN   | TYP | MAX   | UNITS |
|------------------|------------------------|-------------------------------|-------|-----|-------|-------|
| V <sub>IN</sub>  | Input Supply Range     |                               | 3.8   |     | 42    | V     |
| V <sub>OUT</sub> | Output Voltage         |                               | 3.168 | 3.3 | 3.465 | V     |
| I <sub>OUT</sub> | Maximum Output Current |                               |       | 2.5 |       | A     |
| F <sub>SW</sub>  | Switching Frequency    |                               | 630   | 700 | 770   | kHz   |
| EFE              | Efficiency at DC       | I <sub>OUT</sub> = 1A, R5 = 0 |       | 93  |       | %     |

dc1750af

## QUICK START PROCEDURE

Demonstration circuit 1750A is easy to set up to evaluate the performance of the LT8611. Refer to Figure 4 and Figure 5 for proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply to VIN and GND.
2. With power off, connect the load VOUT and GND.
3. Check JP1 setting
4. Turn on the power at the input.
5. Carefully evaluate other design parameters as needed.

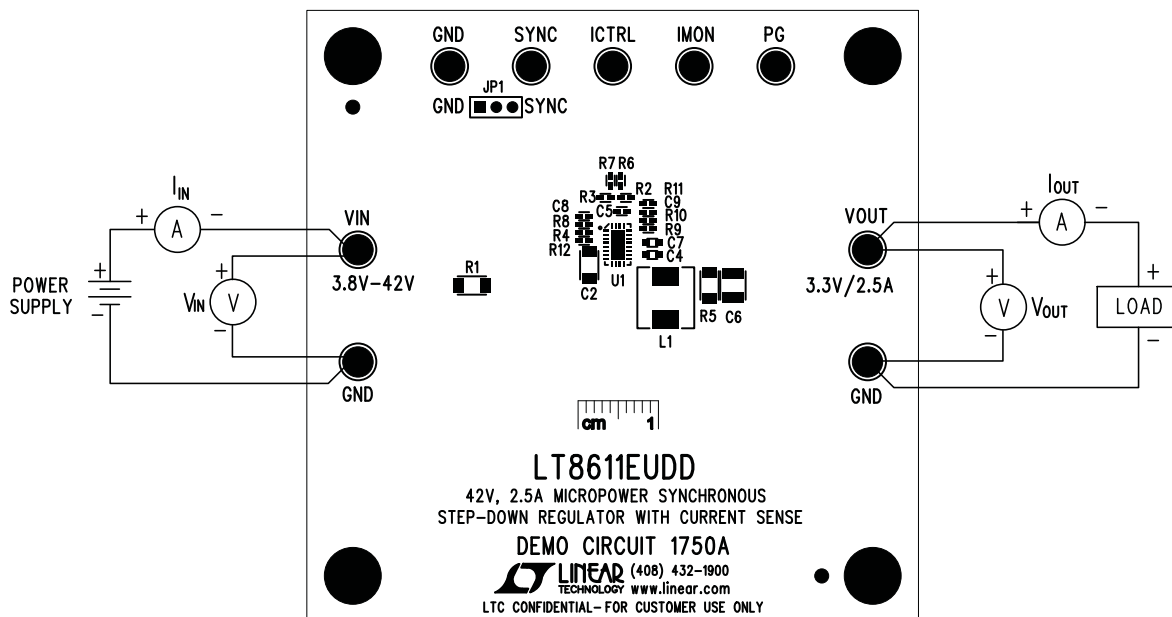


Figure 4. Proper Measurement Equipment Setup

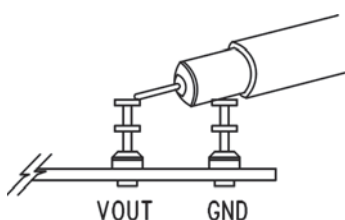


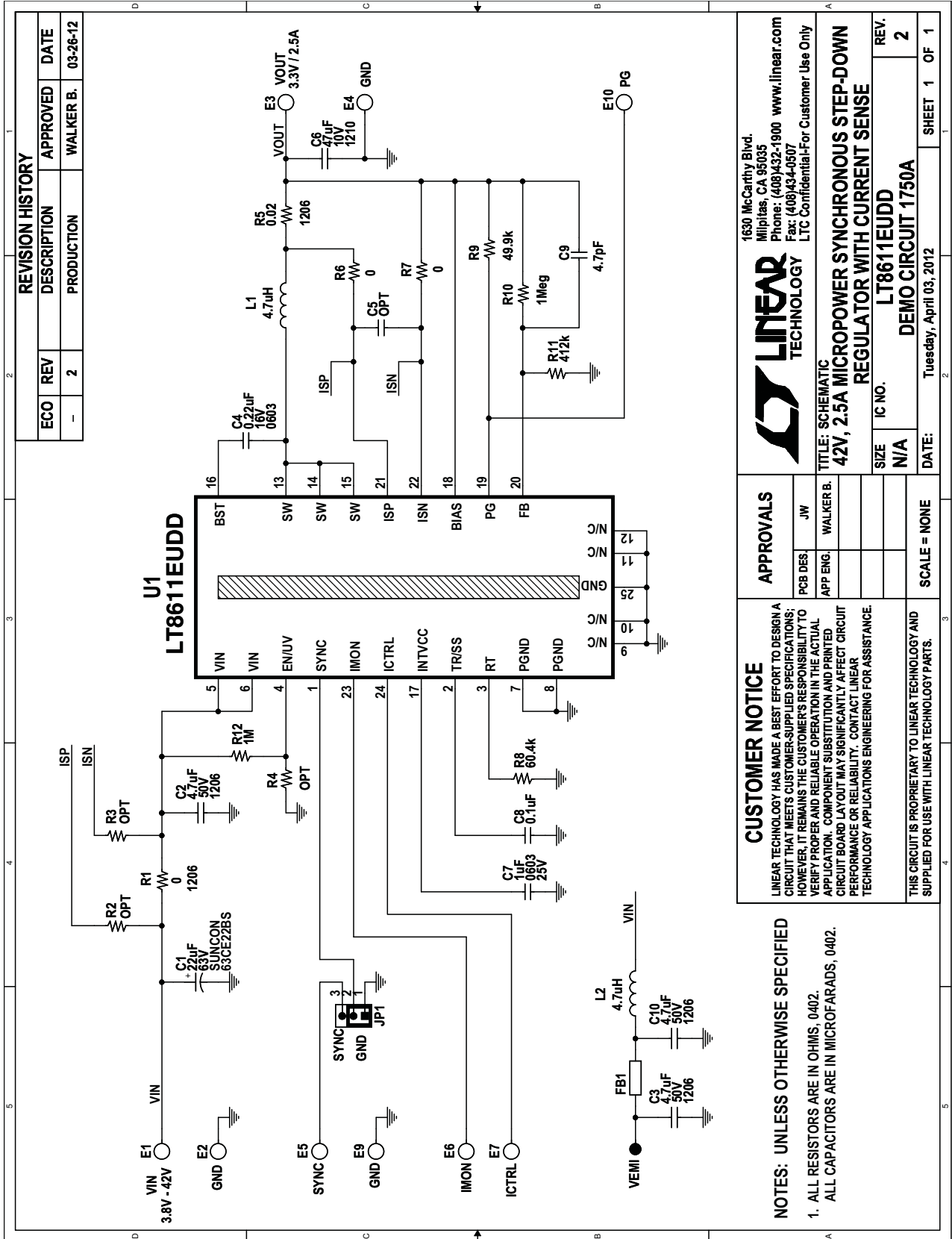
Figure 5. Measure Output Ripple

# DEMO MANUAL DC1750A

## PARTS LIST

| ITEM                                             | QTY | REFERENCE      | PART DESCRIPTION               | MANUFACTURER/PART NUMBER    |
|--------------------------------------------------|-----|----------------|--------------------------------|-----------------------------|
| <b>Required Circuit Components</b>               |     |                |                                |                             |
| 1                                                | 1   | C2             | CAP, CER 4.7 $\mu$ F 50V 1206  | TAIYO YUDEN UMK316BJ475KL   |
| 2                                                | 1   | C4             | CAP, CER 0.22 $\mu$ F 16V 0603 | TAIYO YUDEN EMK107BJ224KA-T |
| 3                                                | 1   | C6             | CAP, CER 47 $\mu$ F 10V 1210   | MURATA, GRM32ER71A476K      |
| 4                                                | 1   | C7             | CAP, CER 1.0 $\mu$ F 25V 0603  | MURATA GRM188R71E105K       |
| 5                                                | 1   | C8             | CAP, CER 0.1 $\mu$ F 0402      | AVX, 0402YD104KAT2A         |
| 6                                                | 1   | C9             | CAP, CER 4.7pF 25V 0402        | AVX, 04023A4R7CAT           |
| 7                                                | 1   | L1             | IND, 4.7 $\mu$ H               | COILTRONICS HCM0703-4R7-R   |
| 8                                                | 1   | R5             | RES, 0.02 $\Omega$ 1% 1206     | VISHAY, WSL1206R0200FEA     |
| 9                                                | 1   | R8             | RES, 60.4k 1% 0402             | VISHAY, CRCW040260K4FKED    |
| 10                                               | 1   | R9             | RES, 49.9k 1% 0402             | VISHAY, CRCW040249K9FKED    |
| 11                                               | 2   | R10, R12       | RES, 1M 1% 0402                | VISHAY, CRCW04021M00FKED    |
| 12                                               | 1   | R11            | RES, 412k 1% 0402              | VISHAY, CRCW0402412KFKED    |
| 13                                               | 1   | U1             | IC, LT8611EUDD QFN24EUDD       | LINEAR TECH.CORP.LT8611EUDD |
| <b>Additional Demo Board Circuit Components</b>  |     |                |                                |                             |
| 1                                                | 1   | C1             | CAP, ALUM 22 $\mu$ F 63V       | SUNCON 63CE22BS             |
| 2                                                | 1   | C10            | CAP, CER 4.7 $\mu$ F 50V 1206  | TAIYO YUDEN UMK316BJ475KL   |
| 3                                                | 1   | C3             | CAP, CER 4.7 $\mu$ F 50V 1206  | MURATA, GRM31CR71H475K      |
| 4                                                | 0   | C5             | CAP, OPT 0402                  | OPT                         |
| 5                                                | 1   | FB1            | FERRITE BEAD 0805              | TDK, MPZ2012S221A           |
| 6                                                | 1   | L2             | IND, 4.7 $\mu$ H               | VISHAY, IHLP2020BZ-ER4R7M01 |
| 7                                                | 1   | R1             | RES, 0 $\Omega$ 1206           | AAC CJ18-000M               |
| 8                                                | 0   | R2, R3, R4     | RES, OPT 0402                  | OPT                         |
| 9                                                | 2   | R6, R7         | RES, 0 $\Omega$ 0402           | AAC, CJ05-000M              |
| <b>Hardware/Components (For Demo Board Only)</b> |     |                |                                |                             |
| 1                                                | 9   | E1-E7, E9, E10 | TESTPOINT TURRET 0.094"        | MILL-MAX-2501-2             |
| 2                                                | 1   | JP1            | HEADER 1X3 0.079"              | SAMTEC, TMM-103-02-L-S      |
| 3                                                | 1   | XJP1           | SHUNT, 0.079" CENTER           | SAMTEC, 2SN-BK-G            |
| 4                                                | 4   | MH1-MH4        | STAND-OFF, NYLON 0.50" TALL    | KEYSTONE, 8833 (SNAP ON)    |

**SCHEMATIC DIAGRAM**



| REVISION HISTORY |     |             |           |          |
|------------------|-----|-------------|-----------|----------|
| ECO              | REV | DESCRIPTION | APPROVED  | DATE     |
| -                | 2   | PRODUCTION  | WALKER B. | 03-26-12 |

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**TITLE: SCHEMATIC**  
**42V, 2.5A MICROPOWER SYNCHRONOUS STEP-DOWN REGULATOR WITH CURRENT SENSE**

SIZE: N/A IC NO.: **LT8611EUDD** REV.: **2**

DATE: Tuesday, April 03, 2012 SHEET 1 OF 1

**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.

**APPROVALS**

|          |           |
|----------|-----------|
| PCB DES. | JW        |
| APP ENG. | WALKER B. |

SCALE = NONE

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

**NOTES: UNLESS OTHERWISE SPECIFIED**

- ALL RESISTORS ARE IN OHMS, 0402.  
 ALL CAPACITORS ARE IN MICROFARADS, 0402.

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