

LTC3637EMSE High Efficiency 76V, 1A Step-Down Converter

DESCRIPTION

Demonstration circuit 2056A is a 76V input, 1A output DC/DC power supply featuring the LTC[®]3637. The IC operates in a high efficiency Burst Mode[®] operation and includes an internal high side power MOSFET. The board will accept an input voltage between 4V and 76V, and provide jumper selected output voltages of 1.8V, 3.3V, 5V and an option for additional voltages. The IC includes internal soft-start and a provision for increasing soft-start time.

Included on the board is an ON/OFF jumper that can also be configured as a precision undervoltage lockout.

Output voltage between 800mV and V_{IN} can be programmed using optional resistors. (Higher voltage rating output capacitors may be required.)

The LTC3637 data sheet gives a complete description of the IC operation and application information. The data sheet must be read in conjunction with this quick start guide.

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

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

PERFORMANCE SUMMARY Specifications are at $T_A = 25^\circ\text{C}$

| PARAMETER | CONDITION | VALUE |
|-----------------------------------|---|-----------------------|
| Input Voltage Range | | 4V to 76V |
| 1.8V Output Voltage | $V_{IN} = 12\text{V}, I_{OUT} = 0\text{A to } 1\text{A}$ | $1.8\text{V} \pm 2\%$ |
| 3.3V Output Voltage | $V_{IN} = 12\text{V}, I_{OUT} = 0\text{A to } 1\text{A}$ | $3.3\text{V} \pm 2\%$ |
| 5V Output Voltage | $V_{IN} = 12\text{V}, I_{OUT} = 0\text{A to } 1\text{A}$ | $5\text{V} \pm 2\%$ |
| Maximum Output Current, I_{OUT} | $V_{IN} = 4\text{V to } 76\text{V}, V_{OUT} = 1.8\text{V}, 3.3\text{V or } 5\text{V}$ | 1A |
| Typical Efficiency | $V_{IN} = 12\text{V}, V_{OUT} = 5\text{V}, I_{OUT} = 1\text{A}$ | 85.5% |
| Typical Output Ripple | $V_{IN} = 76\text{V}, V_{OUT} = 5\text{V}, I_{OUT} = 1\text{A} (20\text{MHz BW})$ | 109mV _{P-P} |

QUICK START PROCEDURE

Demonstration circuit 2056A is easy to set up to evaluate the performance of the LTC3637. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply (set for 0V) to VIN and GND (input return).
2. Select 5V output using jumper JP1 (B position) and JP2 (A position). Select ON position for JP3.
3. Connect the 5V output load between VOUT and GND (Initial load: no load).
4. Connect the DVMs to the input and outputs.
5. Turn on the input power supply and slowly increase to 12V. Check for the proper output voltages. (5V output should be within $5V \pm 2\%$.)
6. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage and other parameters.

7. With power off, move jumpers JP1 and JP2 to the other fixed voltage settings (1.8V or 3.3V). Repeat steps 5 and 6. Check for the proper out-put voltage and other parameters.

Note: When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe. See Figure 2 for the proper scope probe technique. Short, stiff leads need to be soldered to the (+) and (-) terminals of an output capacitor. The probe's ground ring needs to touch the (-) lead and the probe tip needs to touch the (+) lead.

Additional Notes

1. **CAUTION: Be careful when testing with high voltage. High voltage can result in an electric shock if care is not taken.**
2. For 5V output, V_{IN} input voltage should be at least 5V or higher.

QUICK START PROCEDURE

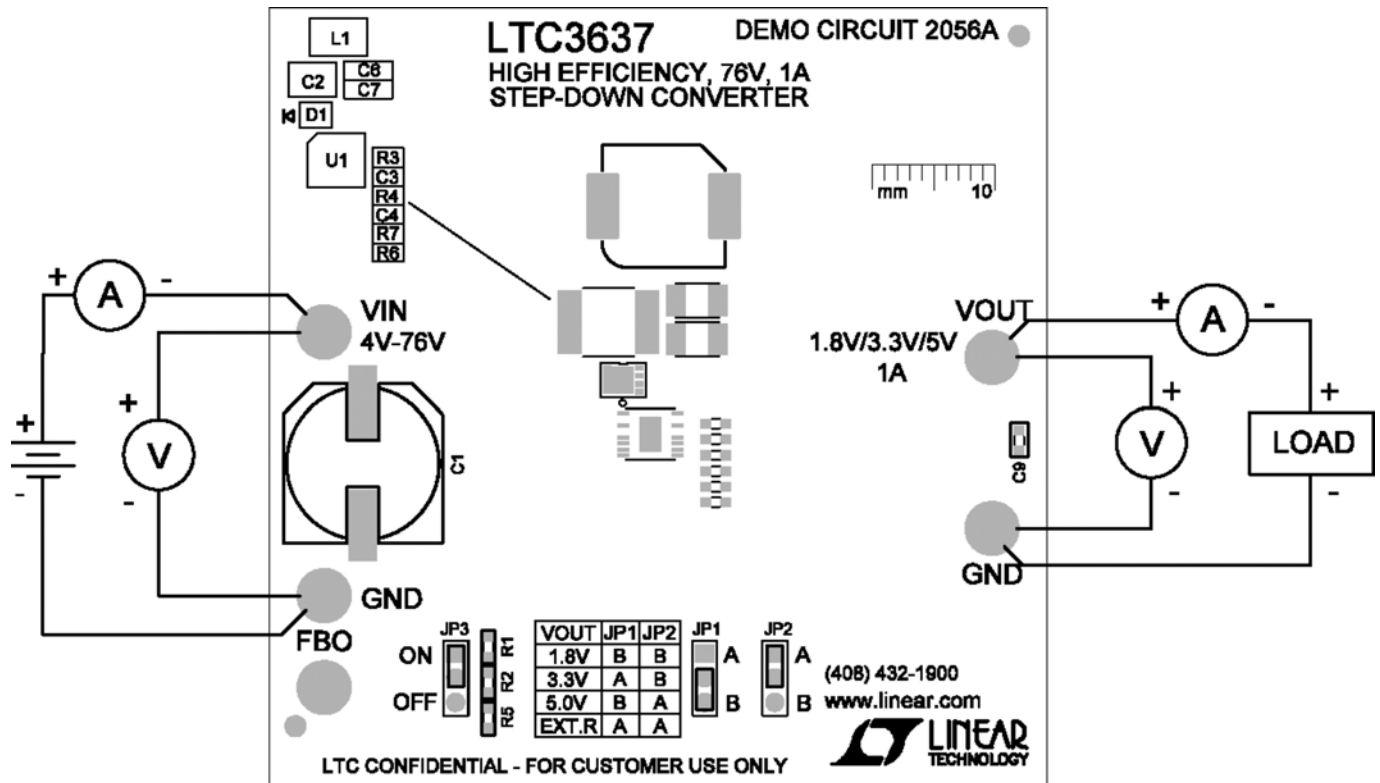
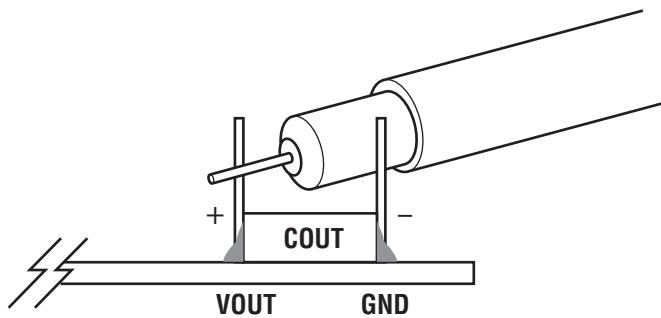
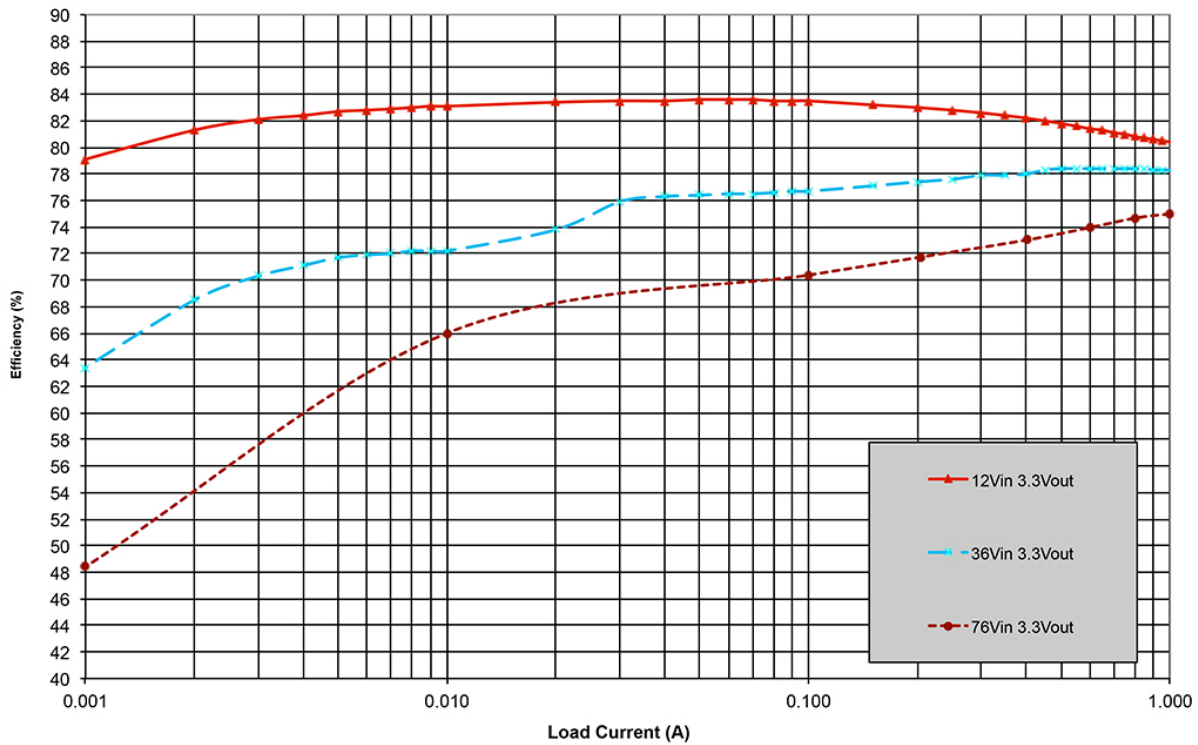


Figure 1. Proper Measurement Equipment Setup

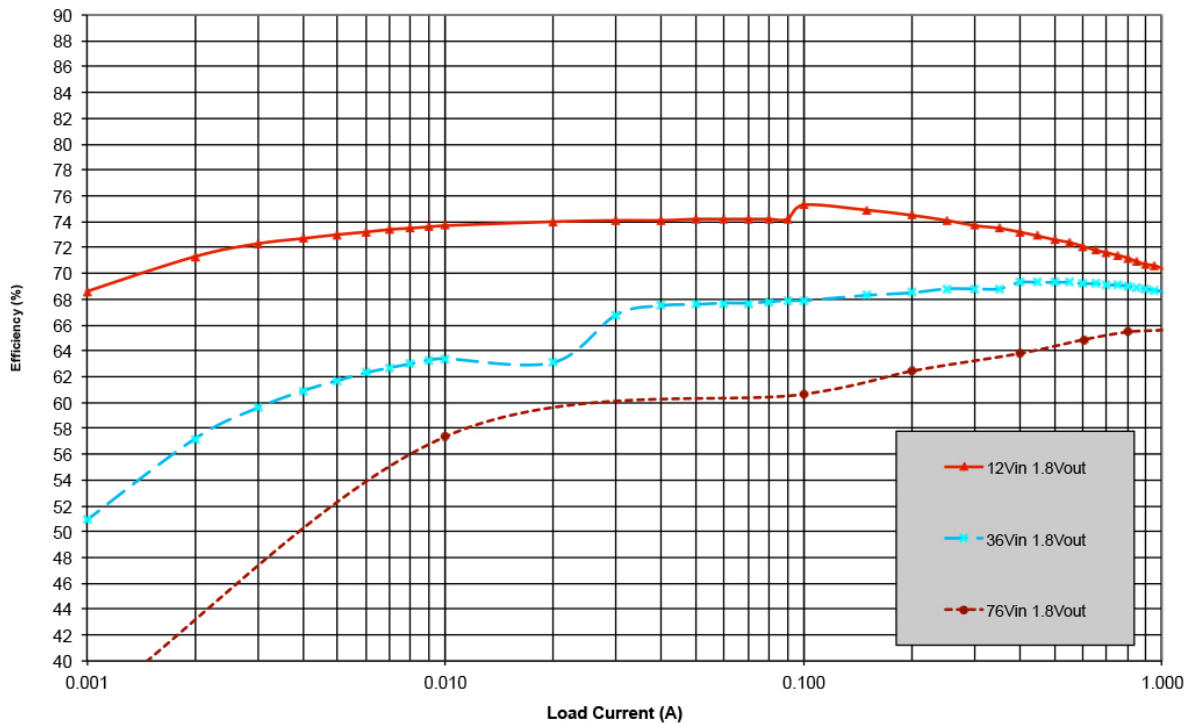


QUICK START PROCEDURE

LTC3637 3.3V_{OUT} Efficiency vs Load Current

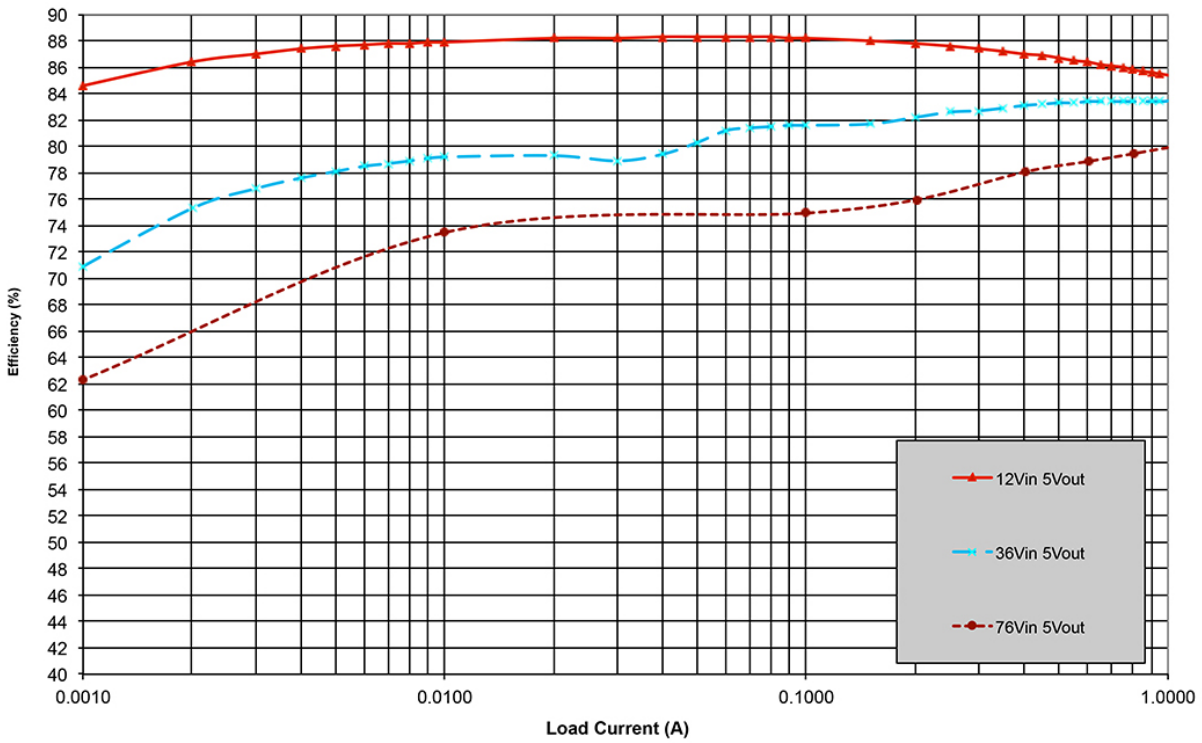


LTC3637 1.8V_{OUT} Efficiency vs Load Current



QUICK START PROCEDURE

LTC3637 5V_{OUT} Efficiency vs Load Current

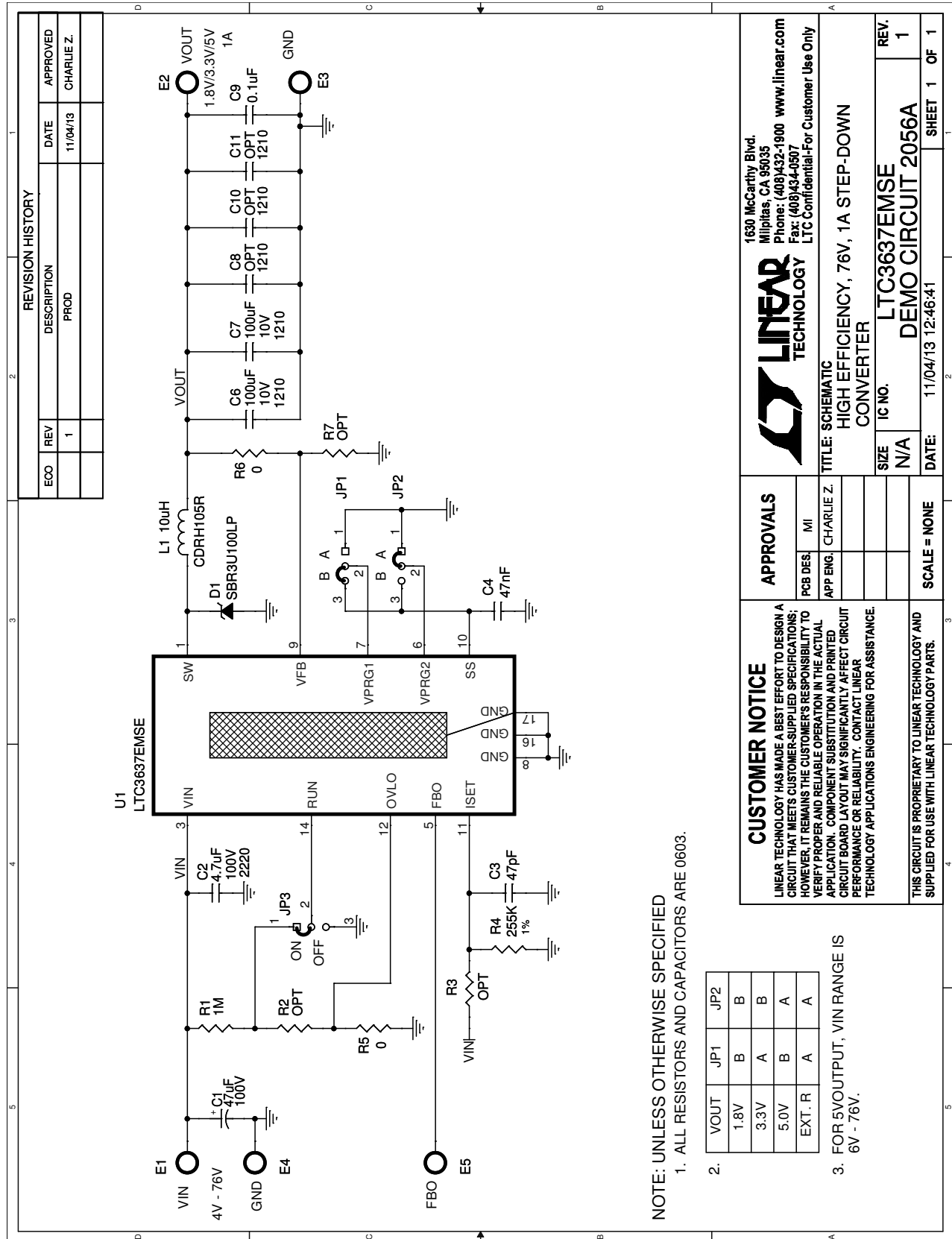


DEMO MANUAL DC2056A

PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|---|-----|--------------------|---|-------------------------------------|
| Required Circuit Components | | | | |
| 1 | 1 | C1 | CAP, 47 μ F 20% 100V ALUM | NIPPON CHEMI-CON EMVY101ARA470MKE0S |
| 2 | 1 | C2 | CAP, 2220 4.7 μ F 20% 100V X7R | TDK C5750X7R2A475M |
| 3 | 1 | C3 | CAP, 0603 47pF 5% 50V C0G | AVX 06035A470JAT2 |
| 4 | 1 | C4 | CAP, 0603 47nF 10% 25V X7R | AVX 06033C473KAT |
| 5 | 2 | C6, C7 | CAP, 1210 100 μ F 20% 10V X5R | MURATA GRM32ER61A107ME20L |
| 6 | 1 | C9 | CAP, 0603 0.1 μ F 10% 25V X7R | AVX 06033C104KAT2A |
| 7 | 1 | D1 | DIODE, SUPER BARRIER RECTIFIER | DIODES INC. SBR3U100LP |
| 8 | 1 | L1 | IND, 10 μ H 30% 4.45A SMD | SUMIDA CDRH105RNP-100NC |
| 9 | 1 | R1 | RES, 0603 1M 5% 1/10W | NIC NRC06J105TRF |
| 10 | 1 | R4 | RES, 0603 255k 1% 1/10W | VISHAY CRCW0603255KFKEA |
| 11 | 2 | R5, R6 | RES, 0603 0 Ω JUMPER | VISHAY CRCW06030000Z0EA |
| 12 | 1 | U1 | IC, HIGH EFFICIENCY STEP-DOWN CONVERTER | LINEAR TECH. LTC3637EMSE |
| Additional Demo Board Circuit Components | | | | |
| 1 | 0 | C8, C10, C11 | CAP, 1210 OPTION | OPTION |
| 2 | 0 | R2, R3, R7 | RES, 0603 OPTION | OPTION |
| Hardware | | | | |
| 1 | 5 | E1, E2, E3, E4, E5 | TURRET | MILL MAX 2501-2-00-80-00-00-07-0 |
| 2 | 3 | JP1, JP2, JP3 | HEADER, 3-PIN, 2mm | SAMTEC TMM-103-02-L-S |
| 3 | 3 | JP1, JP2, JP3 | SHUNT, 2mm | SAMTEC 2SN-BK-G |

SCHEMATIC DIAGRAM



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

APPROVALS
 PCB DES: MI
 APP ENG: CHARLIE Z.

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.

TITLE: SCHEMATIC
HIGH EFFICIENCY, 76V, 1A STEP-DOWN CONVERTER

| | | |
|-------|--------------------|--------------|
| SIZE | IC NO. | REV. |
| N/A | LTC3637EMSE | 1 |
| DATE: | DEMO CIRCUIT 2056A | |
| | 11/04/13 12:46:41 | SHEET 1 OF 1 |

SCALE = NONE

DEMO MANUAL DC2056A

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