

LT3580EDD Boost/ Inverting Regulator

DESCRIPTION

Demonstration circuits 1144A-A and 1144A-B feature the [LT[®]3580EDD](#) in Boost/Inverting Regulator configurations. The demo circuits demonstrate small size and low component count. The boost is designed to convert a 3V to 10V source to 12V at 300mA while the inverter converts a 5V to 12V source to -12V at 350mA. Both converters use only one feedback resistor to set the output voltage.

The LT3580 operates with inputs as high as 32V but in these demo boards the input is limited by the voltage rating of the input capacitors and the magnitude of the boost output. In a boost converter the input needs to be less than the output.

Care must be taken when operating the LT3580 at high input voltages as the junction temperature increases due to higher internal dissipation. Higher switching frequencies also increase the internal dissipation.

The LT3580 gets powered from the main input in both, DC1144A-A and DC1144A-B, but there is an option for a

linear regulator built into the board that will allow the IC to be powered from a lower voltage. If this option is used, just cut the trace as shown in Figure 6 and install the optional emitter follower regulator on the back of the board.

The DC1144A-B can easily be configured into a SEPIC converter, just switch the positions of L2 and D2 as shown in Figure 6.

The LT3580 includes many other features such as Synchronization to external clock, User Configurable Undervoltage Lockout, Soft-start, Frequency Foldback, and it is easily configured as boost or inverting converter.

These circuits are intended for space-conscious applications such as Local Bias Supplies, TFT-LCD Bias Supplies, GPS Receivers, VFD Bias Supplies and DSL Modems.

Design files for this circuit board are available at <http://www.linear.com/demo/DC1144A>

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PERFORMANCE SUMMARY Specifications are at T_A = 25°C

Performance Summary DC1144A-A

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---------------------|----------------------|---|-------|-----|-------|-------|
| V _{IN} | Input Supply Range | | 3 | | 10 | V |
| V _{OUT} | Output Voltage Range | V _{IN} = 3V, I _{LOAD} = 300mA | 11.64 | 12 | 12.36 | V |
| Ripple | | V _{IN} = 3.6V, I _{LOAD} = 300mA | | 40 | | mV |
| Efficiency | | V _{IN} = 4.2V, I _{LOAD} = 350mA | | 88 | | % |
| Switching Frequency | | | | 1 | | MHz |

Performance Summary DC1144A-B

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNITS |
|---------------------|----------------------|---|--------|-----|--------|-------|
| V _{IN} | Input Supply Range | | 5 | | 12 | V |
| V _{OUT} | Output Voltage Range | V _{IN} = 5V, I _{LOAD} = 350mA | -11.64 | -12 | -12.36 | V |
| Ripple | | V _{IN} = 5V, I _{LOAD} = 350mA | | 10 | | mV |
| Efficiency | | V _{IN} = 5V, I _{LOAD} = 350mA | | 80 | | % |
| Switching Frequency | | | | 2 | | MHz |

QUICK START PROCEDURE

Demonstration circuit 1144A is easy to set up to evaluate the performance of the LT3580EDD. Refer to **Error! Reference source not found.** and Figure 2 for proper measurement equipment setup and follow the procedure below:

NOTE: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the VIN or VOUT and GND terminals. See **Error! Reference source not found.** for proper scope probe technique.

1. Place jumpers in the following positions:
JP1 ON
2. With power off, connect the input power supply to VIN and GND.
3. Turn on the power at the input.
4. Check for the proper output voltages.

NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

5. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

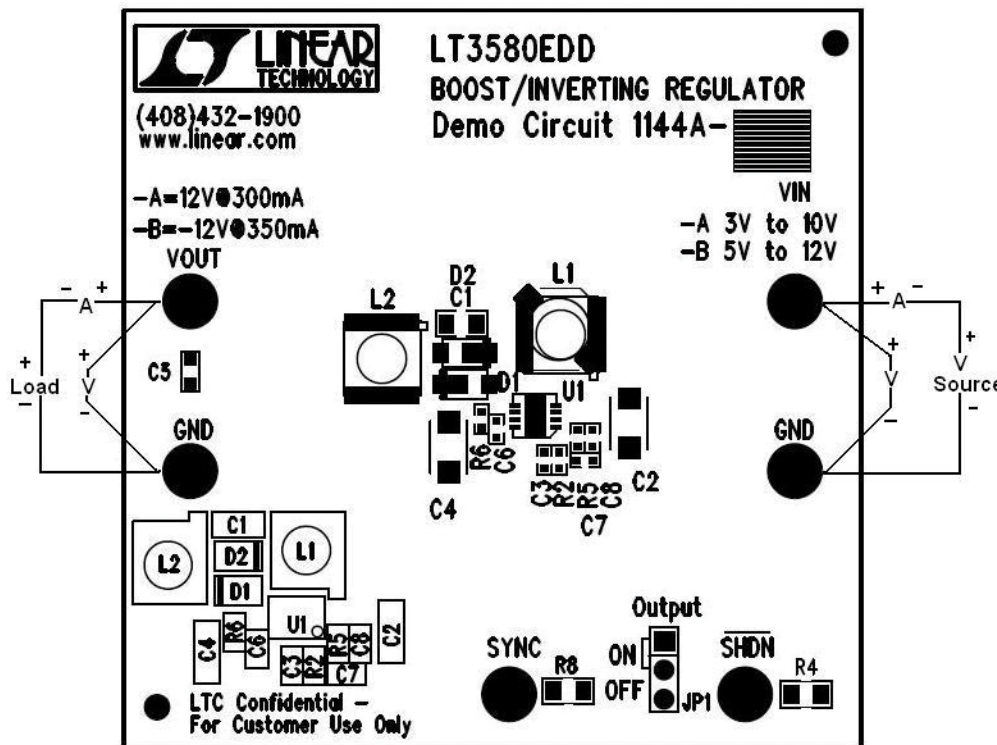


Figure 1. Proper Measurement Equipment for DC1144A-A

QUICK START PROCEDURE

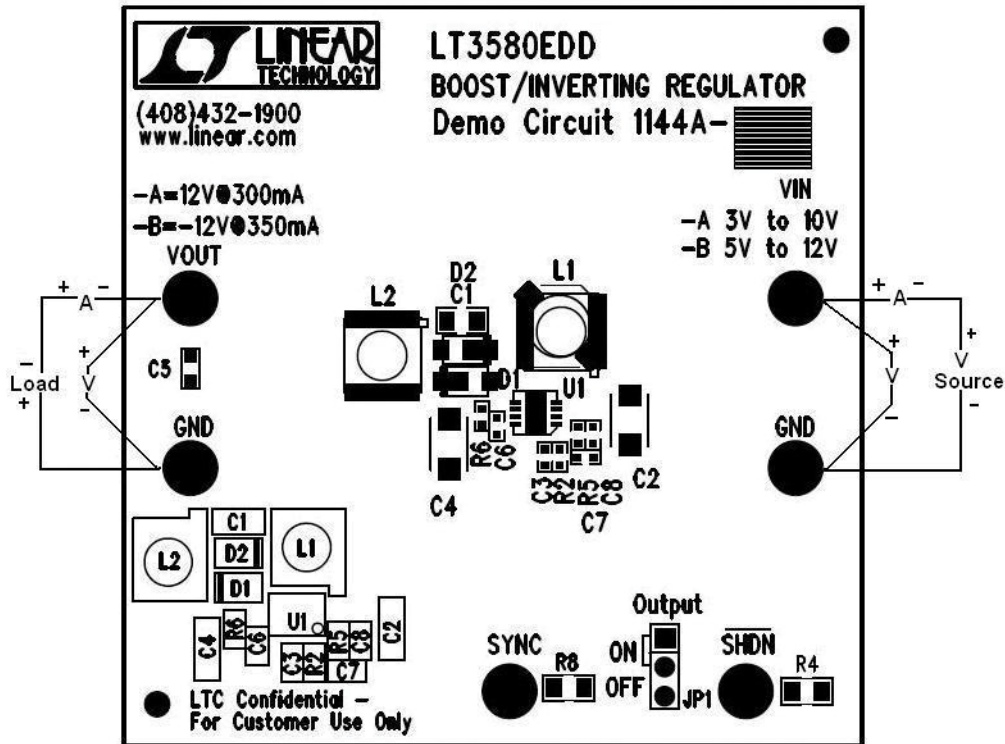


Figure 2. Proper Measurement Equipment for DC1144A-B

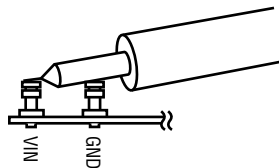


Figure 3. Measurement Input and Output Ripple

QUICK START PROCEDURE

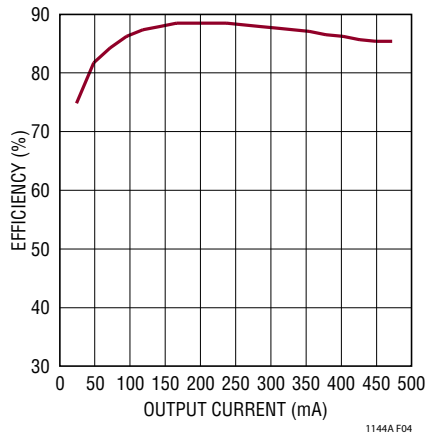


Figure 4. Boost Converter Efficiency at 4.2V_{IN}

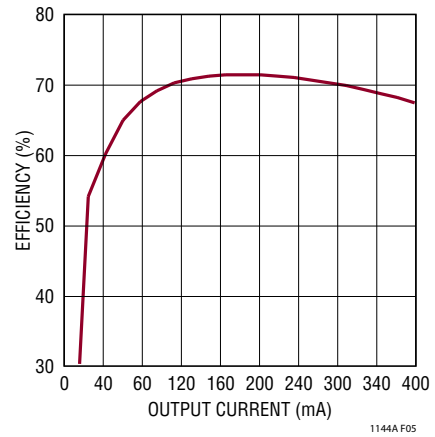


Figure 5. Inverting Regulator Efficiency at 5V_{IN}

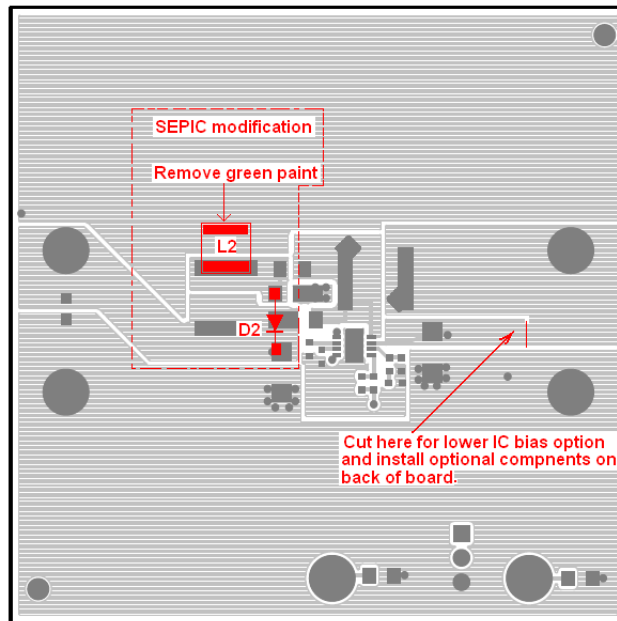


Figure 6. Optional Modifications to Convert DC1144A-B to ZEPIC Converter and/or Use Separate Regulator to Bias IC

PARTS LIST

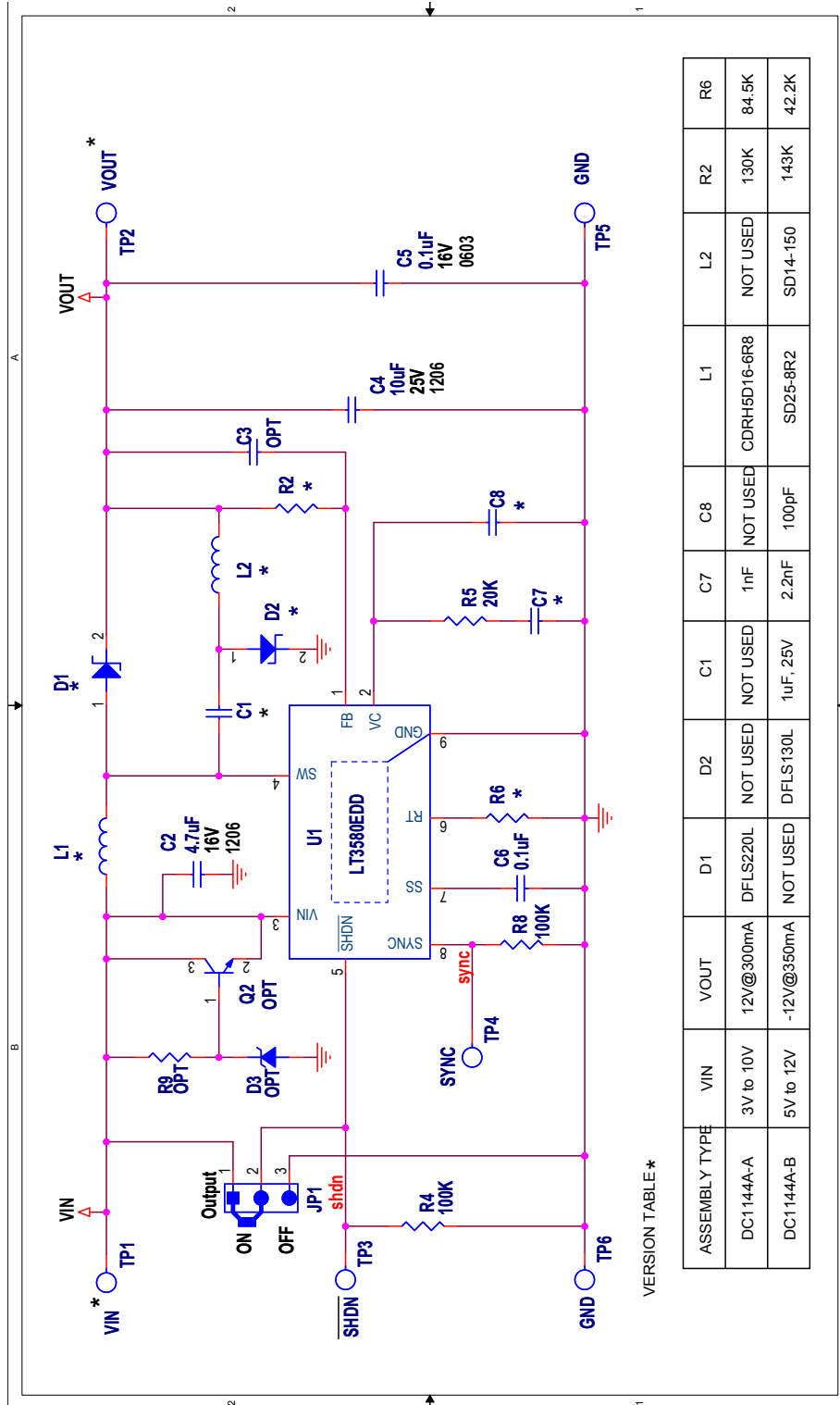
| QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|--|-----------|--|----------------------------------|
| Required Circuit Components for Boost Converter | | | |
| 1 | C2 | CAP., X5R, 4.7µF, 16V, 20% 1206 | TAIYOYUDEN, EMK316BJ475ML |
| 1 | C4 | CAP., X5R, 10µF, 25V, 20% 1206 | TAIYOYUDEN, TMK316ABJ106ML-T |
| 1 | C7 | CAP., X7R, 1000pF, 16V, 10% 0402 | MURATA, GRM155R71C102KA01D |
| 1 | D1 | DIODE, SCHOTTKY RECTIFIER 2A, POWER D123 | DIODES INC., DFLS220L-7 |
| 1 | L1 | INDUCTOR, 6.8µH | SUMIDA, CDRH5D16NP-6R8NC |
| 1 | R2 | RES., CHIP, 130k, 1/6W, 1% 0402 | VISHAY, CRCW0402133KFKEKED |
| 1 | R5 | RES., CHIP, 20k, 1/16W, 1% 0402 | VISHAY, CRCW040220K0KFKEKED |
| 1 | R6 | RES., CHIP, 84.5k, 1/6W, 1% 0402 | VISHAY, CRCW040284K5KFKEKED |
| 1 | | FAB, PRINTED CIRCUIT BOARD | DEMO CIRCUIT 1144A-A |
| 1 | C6 | CAP., X7R, 0.1µF, 16V, 10% 0402 | AVX, 0402YC104KAT2A |
| 1 | U1 | LT3580EDD, 8-LEAD PLASTIC DFN (3X3) | LINEAR TECH., LT3580EDD#PBF |
| Additional Demo Board Circuit Components | | | |
| 0 | C3 (OPT) | CAP., 0402 | |
| 1 | C5 | CAP., X7R, 0.1µF, 16V, 10% 0603 | AVX, 0603YC104KAT2A |
| 0 | C8 (OPT) | CAP., 0402 | |
| 0 | D3 (OPT) | | |
| 6 | TP1-TP6 | TESTPOINT, TURRET | MILL MAX 2501-2-00-80-00-00-07-0 |
| 1 | JP1 | 0.079 SINGLE ROW HEADER, 3 PIN | SAMTEC, TMM103-02-L-S |
| 1 | XJP | SHUNT | SAMTEC, 2SN-BK-G |
| 0 | Q2 (OPT) | | |
| 2 | R4, R8 | RES., CHIP, 100k, 1/10W, 1% 0805 | VISHAY, CRCW0805100KFKEA |
| 0 | R9 (OPT) | | |
| Required Circuit Components for Inverting Regulator | | | |
| 1 | C1 | CAP., X5R, 1µF, 25V, 10%, 0805 | AVX, 08053D105KAT |
| 1 | C2 | CAP., X5R, 4.7µF, 16V, 20% 1206 | TAIYOYUDEN, EMK316BJ475ML |
| 1 | C4 | CAP., X5R, 10µF, 25V, 20% 1206 | TAIYOYUDEN, TMK316ABJ106ML-T |
| 1 | C6 | CAP., X5R, 0.1µF, 16V, 10% 0402 | AVX, 0402YC104KAT2A |
| 1 | C7 | CAP., X7R, 2200pF, 16V, 10% 0402 | MURATA, GRM155R71C222KA01D |
| 1 | C8 | CAP., NPO, 100pF, 25, 10%, 0402 | AVX, 04023A101KAT2A |
| 1 | D2 | DIODE, SCHOTTKY RECTIFIER 2A, POWER D123 | DIODES INC., DFLS130L-7 |
| 1 | L1 | INDUCTOR, 8.2µH | COOPER BUSSMANN, SD25-8R2-R |
| 1 | L2 | INDUCTOR, 15µH | COOPER BUSSMANN, SD14-150-R |
| 1 | R2 | RES., CHIP, 143k, 1/6W, 1% 0402 | VISHAY, CRCW0402143KFKEKED |
| 1 | R5 | RES., CHIP, 20k, 1/16W, 1% 0402 | VISHAY, CRCW040220K0KFKEKED |
| 1 | R6 | RES., CHIP, 42.2k, 1/6W, 1% 0402 | VISHAY, CRCW040242K2KFKEKED |
| 1 | | FAB, PRINTED CIRCUIT BOARD | DEMO CIRCUIT 1144A-B |
| 1 | U1 | LT3580EDD, 8-LEAD PLASTIC DFN (3X3) | LINEAR TECH., LT3580EDD#PBF |

DEMO MANUAL DC1144A

PARTS LIST

| QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|---|-----------|---------------------------------------|----------------------------------|
| Additional Demo Board Circuit Components | | | |
| 0 | C3 (OPT) | CAP., 0402 | |
| 1 | C5 | CAP., X7R, 0.1 μ F, 16V, 10% 0603 | AVX, 0603YC104KAT2A |
| 0 | D3 (OPT) | | |
| 6 | TP1-TP6 | TESTPOINT, TURRET | MILL MAX 2501-2-00-80-00-00-07-0 |
| 1 | JP1 | 0.079 SINGLE ROW HEADER, 3 PIN | SAMTEC, TMM103-02-L-S |
| 1 | XJP | SHUNT | SAMTEC, 2SN-BK-G |
| 0 | Q2 (OPT) | | |
| 2 | R4, R8 | RES., CHIP, 100k, 1/10W, 1% 0805 | VISHAY, CRCW0805100KFKEA |
| 0 | R9 (OPT) | | |

SCHEMATIC DIAGRAM



VERSION TABLE *

| ASSEMBLY TYPE | VIN | VOUT | D1 | D2 | C1 | C7 | C8 | L1 | L2 | R2 | R6 |
|---------------|-----------|------------|----------|----------|----------|-------|----------|--------------|----------|------|-------|
| DC1144A-A | 3V to 10V | 12V@300mA | DFLS220L | NOT USED | NOT USED | 1nF | NOT USED | CDRH6D16-6R8 | NOT USED | 130K | 84.5K |
| DC1144A-B | 5V to 12V | -12V@350mA | NOT USED | DFLS130L | 1uF, 25V | 2.2nF | 100pF | SD25-8R2 | SD14-150 | 143K | 42.2K |

DEMO MANUAL DC1144A

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