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 DC11144A-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 DC11144A-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 V_{IN} 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.

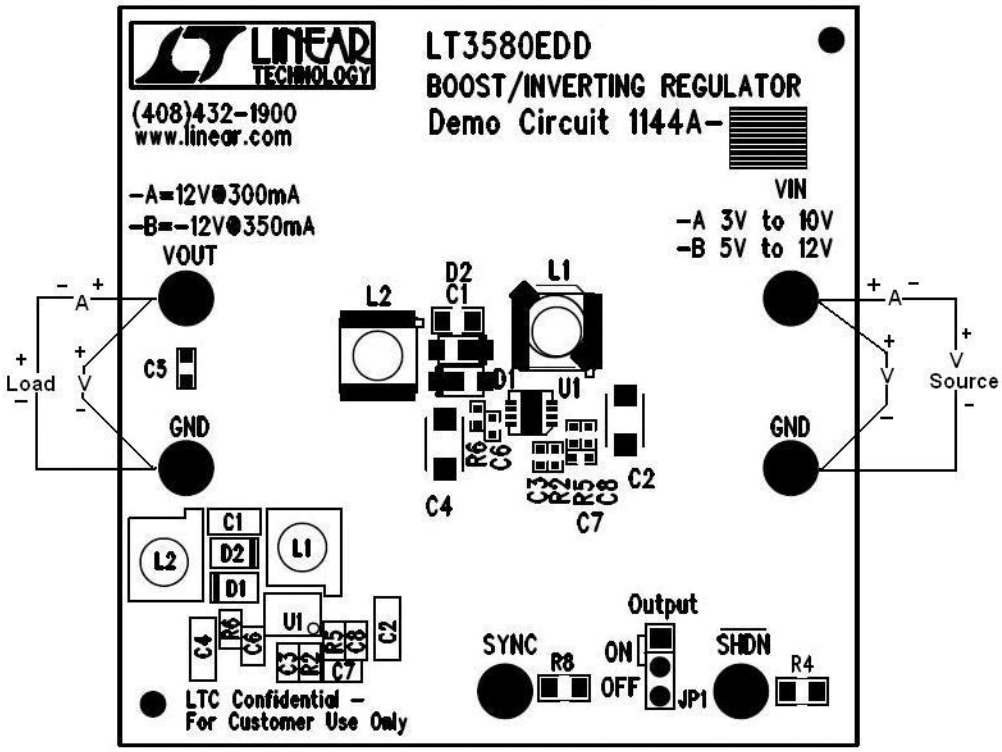


Figure 1. Proper Measurement Equipment for DC1144A-A

QUICK START PROCEDURE

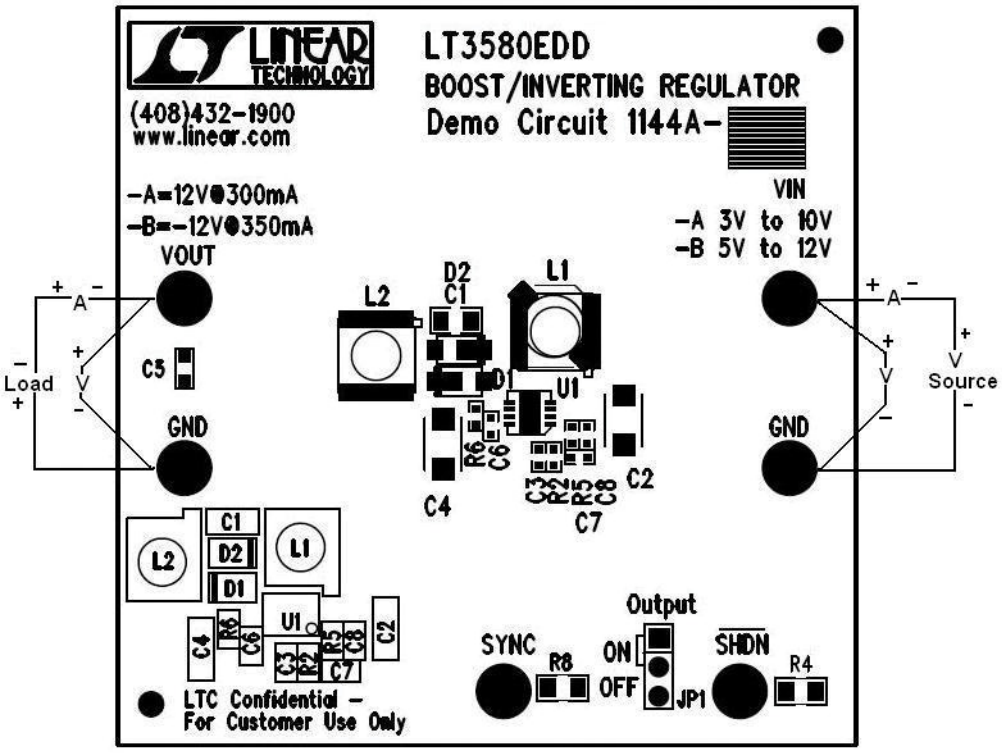


Figure 2. Proper Measurement Equipment for DC1144A-B

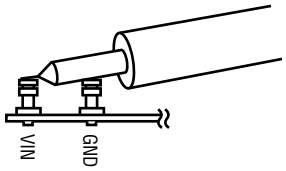


Figure 3. Measurement Input and Output Ripple

QUICK START PROCEDURE

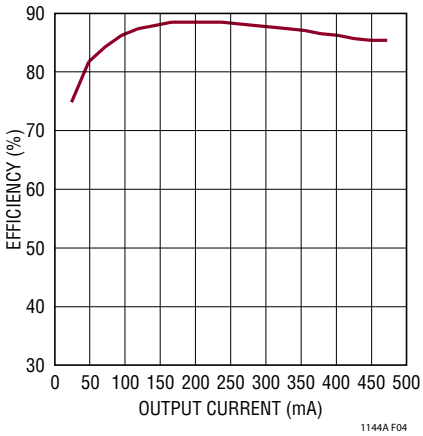


Figure 4. Boost Converter Efficiency at 4.2V_{IN}

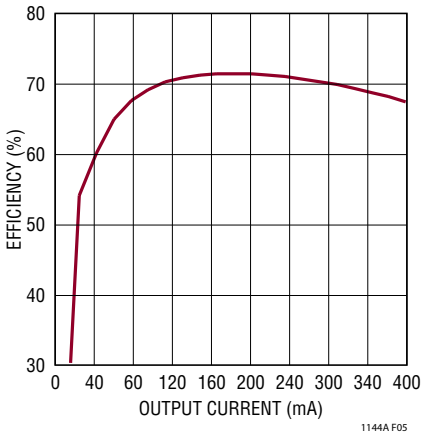


Figure 5. Inverting Regulator Efficiency at 5V_{IN}

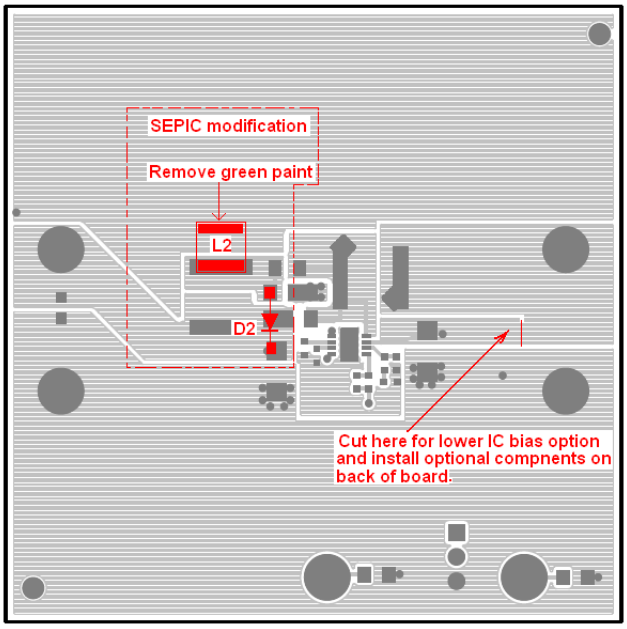


Figure 6. Optional Modifications to Convert DC1144A-B to ZEPIC Converter and/or Use Separate Regulator to Bias IC

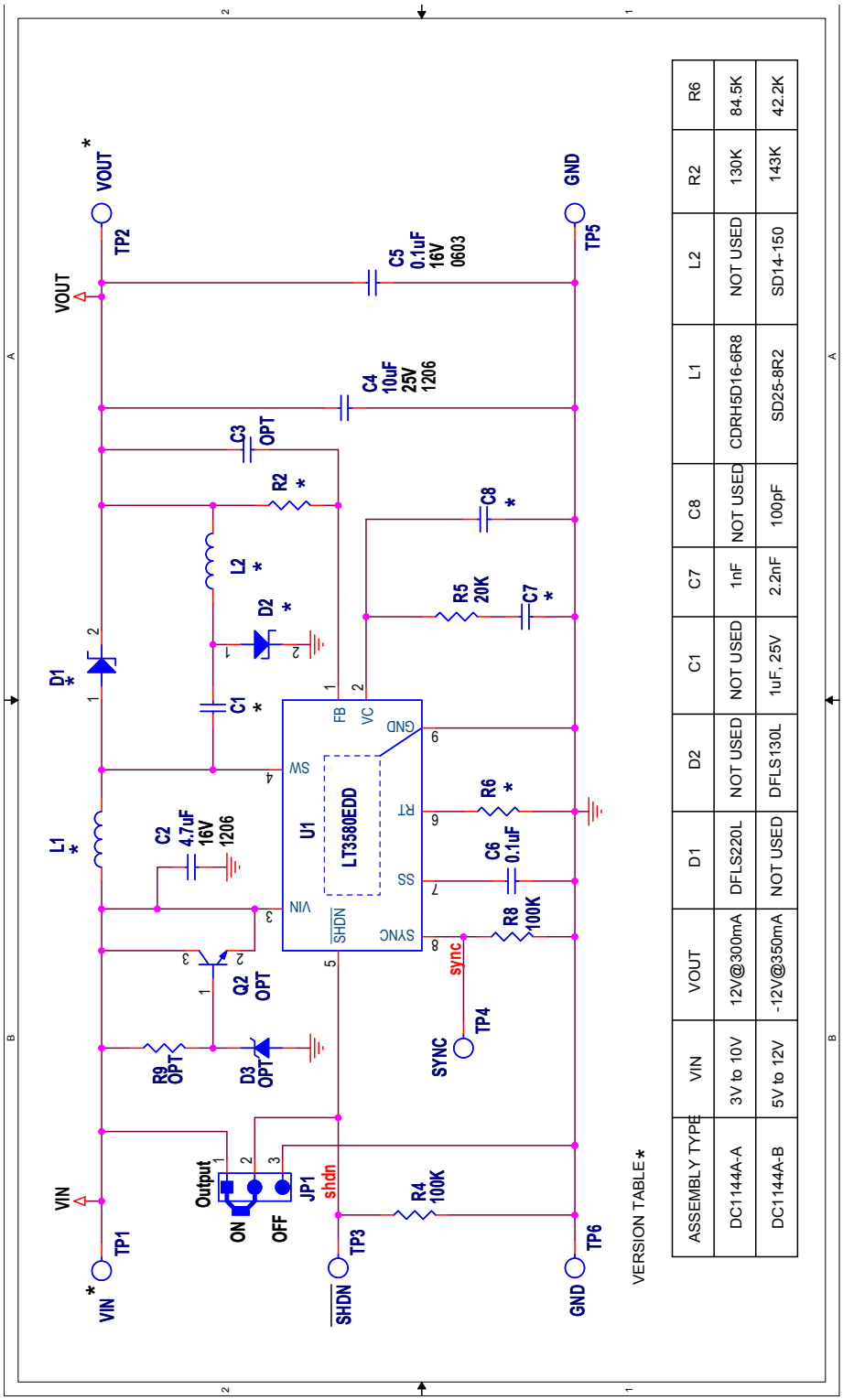
PARTS LIST

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, CRCW0402133KFKED
1	R5	RES., CHIP, 20k, 1/16W, 1% 0402	VISHAY, CRCW040220K0FKED
1	R6	RES., CHIP, 84.5k, 1/6W, 1% 0402	VISHAY, CRCW040284K5FKED
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, CRCW0402143KFKED
1	R5	RES., CHIP, 20k, 1/16W, 1% 0402	VISHAY, CRCW040220K0FKED
1	R6	RES., CHIP, 42.2k, 1/6W, 1% 0402	VISHAY, CRCW040242K2FKED
1		FAB, PRINTED CIRCUIT BOARD	DEMO CIRCUIT 1144A-B
1	U1	LT3580EDD, 8-LEAD PLASTIC DFN (3X3)	LINEAR TECH., LT3580EDD#PBF

PARTS LIST

QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Additional Demo Board Circuit Components			
0	C3 (OPT)	CAP., 0402	
1	C5	CAP., X7R, 0.1µF, 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



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	CDRH5D16-6R8	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

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