

# LT8580 Boost/SEPIC/Inverting Regulator

## DESCRIPTION

Demonstration circuits 2186A-A and 2186A-B feature the LT8580EDD in boost/inverting 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 120mA. The inverter converts a 5V to 12V source to -12V at 150mA. Please refer to Figures 4 and 5 below for maximum load current at different input voltage levels.

Both converters use only one feedback resistor to set the output voltage.

The **LT<sup>®</sup>8580** can operate with inputs as high as 40V but in these demo circuits, the input is limited by the voltage rating of the input capacitors, and the magnitude of the boost output voltage.

DC2186 includes an optional charge pump circuit on the back of the board, for higher output voltages. If this circuit is used, remove R11 and recalculate the feedback resistor. The same output node will have the output of the charge pump.

The LT8580 includes many other features such as synchronization to external clock, user configurable under-voltage lockout, soft-start, frequency foldback, and it is easily configured as boost, SEPIC or inverting converter.

The data sheet gives a complete description of the device, operation and application information. The data sheet must be read in conjunction with this demo manual for DC2186A.

**Design files for this circuit board are available at <http://www.linear.com/demo/DC2186A>**

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## PERFORMANCE SUMMARY DC2186A-A Specifications are at $T_A = 25^\circ\text{C}$

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
$V_{IN}$	Input Supply Range		3		10	V
$V_{OUT}$	Output Voltage Range	$V_{IN} = 3V, I_{LOAD} = 120mA$	11.64	12	12.36	V
RIPPLE		$V_{IN} = 3V, I_{LOAD} = 120mA$		25		mV
EFFICIENCY		$V_{IN} = 5V, I_{LOAD} = 200mA$		88		%
SWITCHING FREQUENCY				1.5		MHz

## PERFORMANCE SUMMARY DC2186A-B Specifications are at $T_A = 25^\circ\text{C}$

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
$V_{IN}$	Input Supply Range		5		12	V
$V_{OUT}$	Output Voltage Range	$V_{IN} = 5V, I_{LOAD} = 150mA$	-11.64	-12	-12.36	V
RIPPLE		$V_{IN} = 5V, I_{LOAD} = 150mA$		5		mV
EFFICIENCY		$V_{IN} = 12V, I_{LOAD} = 200mA$		82		%
SWITCHING FREQUENCY				1.5		MHz

## QUICK START PROCEDURE

DC2186A is easy to set up to evaluate the performance of the LT8580. Refer to Figures 1 and 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  $V_{IN}$  or  $V_{OUT}$  and GND terminals. See Figure 3 for proper scope probe technique.

1. With power off, connect the input power supply to  $V_{IN}$  and GND.

2. Turn on the power at the input.

NOTE: Make sure that the input voltage does not exceed 10V for DC2186A-A and 12V for DC2186A-B.

3. Check for the proper output voltage.

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

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

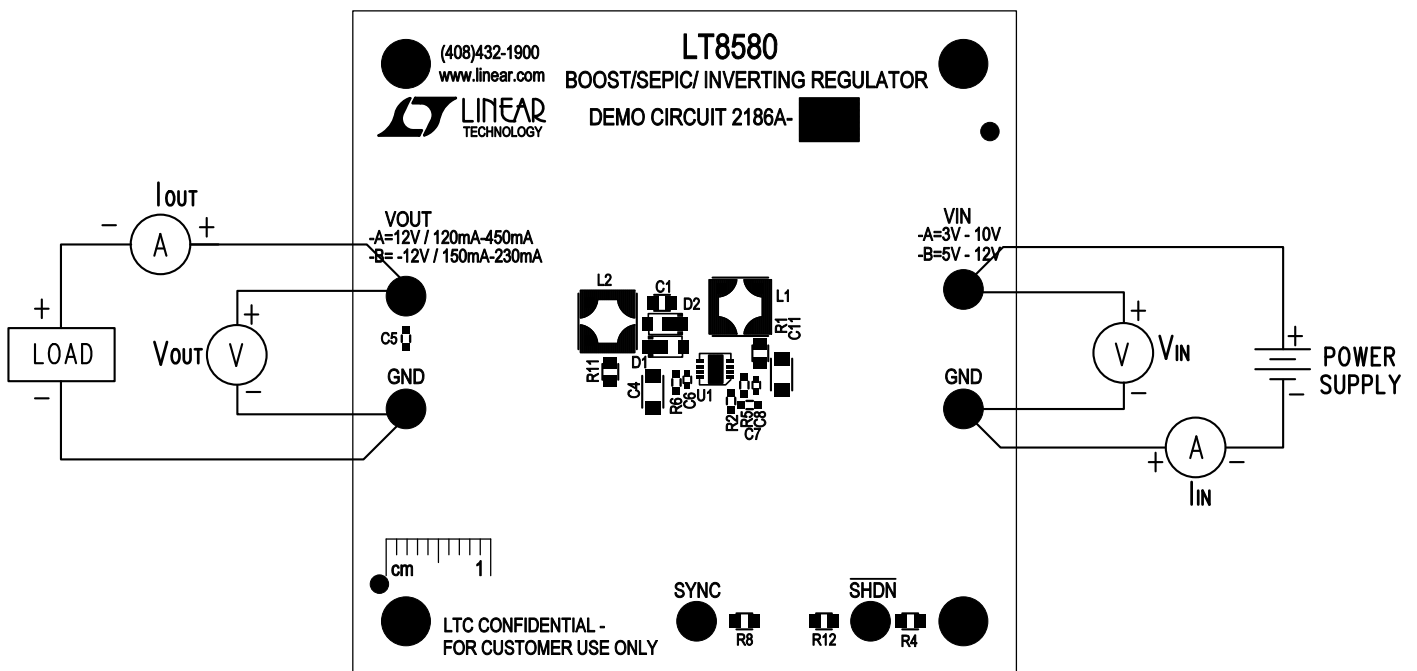


Figure 1. DC2186A-A Proper Equipment Setup

**QUICK START PROCEDURE**

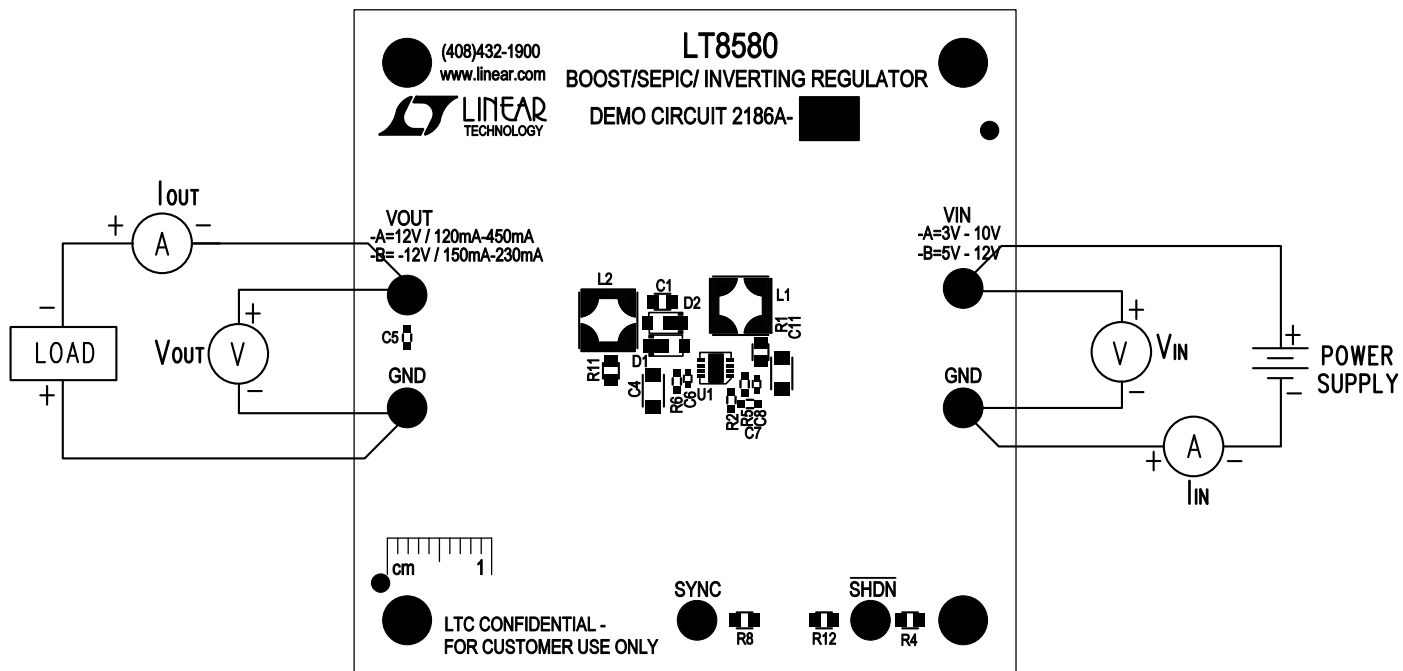


Figure 2. DC2186A-B Proper Equipment Setup

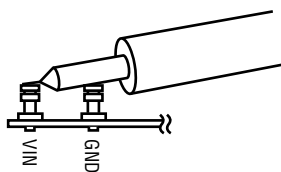
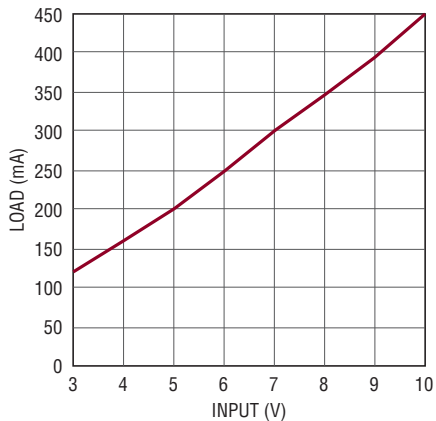


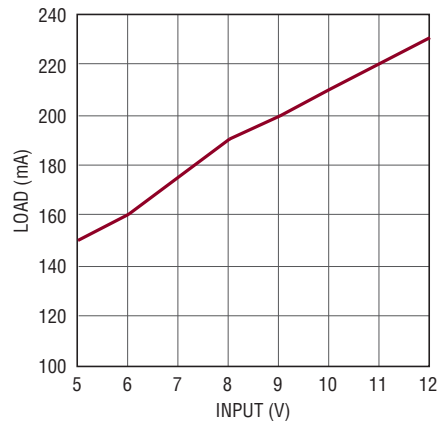
Figure 3. Measuring Input or Output Ripple

## QUICK START PROCEDURE



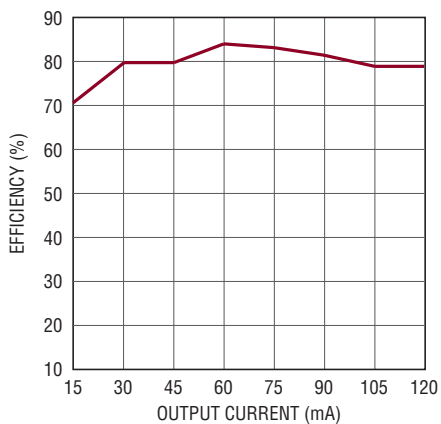
DC2186A F04

Figure 4. DC2186A-A Maximum Load Current vs Input Voltage



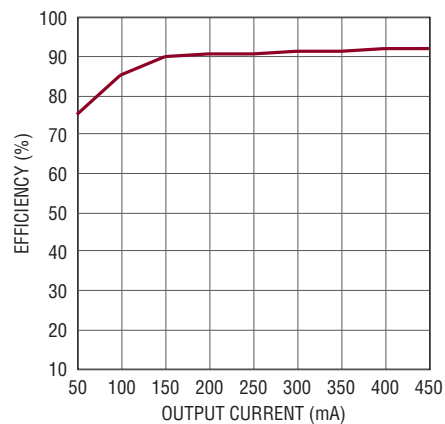
DC2186A F05

Figure 5. DC2186A-B Maximum Load Current vs Input Voltage



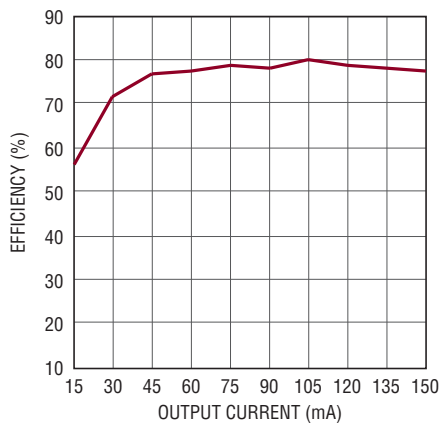
DC2186A F06

Figure 6. DC2186A-A Efficiency at 3V<sub>IN</sub>



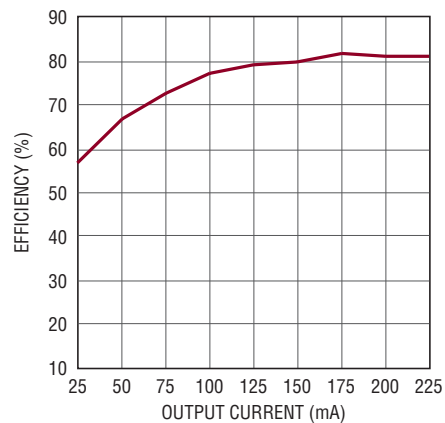
DC2186A F07

Figure 7. DC2186A-A Efficiency at 10V<sub>IN</sub>



DC2186A F08

Figure 8. DC2186A-B Efficiency at 5V<sub>IN</sub>



DC2186A F09

Figure 9. DC2186A-B Efficiency at 12V<sub>IN</sub>

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>DC2186A-A Required Circuit Components</b>				
1	2	C4, C11	CAP., X7R, 4.7µF, 16V, 10% 1206	MURATA, GRM31CR71C475KA01L
2	1	C5	CAP., X7R, 0.1µF, 16V, 10% 0603	MURATA, GRM188R71C104KA01D
3	1	C6	CAP., X7R, 0.1µF, 16V, 10% 0402	MURATA, GRM155R71C104KA88D
4	1	C7	CAP., X7R, 3.3nF, 16V, 10% 0603	AVX, 0603YC332KAT2A
5	1	C8	CAP., COG, 47pF, 16V, 5% 0402	MURATA, GRM1555C1E470JA01D
6	1	D1	DIODE, DFSL130L PowerDI123	DIODES., DFSL130L-7
7	1	L1	INDUCTOR, 15µH, SD18	COOPER, SD18-150-R
8	2	R1, R11	RES., CHIP., 0Ω, 1/8W, 0805	VISHAY, CRCW08050000Z0EA
9	1	R2	RES., CHIP., 130k, 1/10W, 1%, 0603	VISHAY, CRCW0603130KFKEA
10	1	R5	RES., CHIP., 6.04k, 1/10W, 1%, 0603	VISHAY, CRCW06036K04FKEA
11	1	R4	RES., CHIP., 10k, 1/8W, 1%, 0805	VISHAY, CRCW080510K0FKEA
12	1	R6	RES., CHIP., 56.2k, 1/10W, 1%, 0603	VISHAY, CRCW060356K2FKEA
13	1	R8	RES., CHIP., 100k, 1/8W, 1%, 0805	VISHAY, CRCW0805100KFKEA
14	1	R12	RES., CHIP., 11.3k, 1/8W, 1%, 0805	VISHAY, CRCW080511K3FKEA
15	1	U1	IC., LT8580EDD 8L DFN	LINEAR TECH., LT8580EDD#TRPBF
<b>Additional Demo Board Circuit Components</b>				
1	0	C9 (OPT)	CAP., 0805	
2	0	C10 (OPT)	CAP., 1206	
3	0	D3, D4 (OPT)	DIODE, Di123	
4	0	C1 (OPT)	CAP., 0805	
5	0	D2 (OPT)	DIODE, PowerDI123	
6	0	L2 (OPT)	INDUCTOR	
7	0	R9, R10 (OPT)	RES., CHIP., 0805	
<b>Hardware: For Demo Board Only</b>				
1	6	E1-E6	TESTPOINT, TURRET, .094" PBF	MILL-MAX, 2501-2-00-80-00-00-07-0
2	4	MH1-MH4	STAND-OFF, NYLON 0.25"	KEYSTONE, 8831(SNAP ON)

# DEMO MANUAL DC2186A

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>DC2186A-B Required Circuit Components</b>				
1	1	C1	CAP., X5R, 1 $\mu$ F, 25V, 10% 0805	AVX, 08053D105KAT2A
2	2	C4, C11	CAP., X7R, 4.7 $\mu$ F, 16V, 10% 1206	MURATA, GRM31CR71C475KA01L
3	1	C5	CAP., X7R, 0.1 $\mu$ F, 16V, 10% 0603	MURATA, GRM188R71C104KA01D
4	1	C6	CAP., X7R, 0.1 $\mu$ F, 16V, 10% 0402	MURATA, GRM155R71C104KA88D
5	1	C7	CAP., X7R, 2.2nF, 16V, 10% 0603	AVX, 0603YC222KAT2A
6	1	C8	CAP., COG, 47pF, 16V, 5% 0402	MURATA, GRM1555C1E470JA01D
7	1	D2	DIODE, DFLS130L PowerDI123	DIODES., DFLS130L-7
8	2	L1, L2	INDUCTOR, 33 $\mu$ H, SD18	COOPER, SD18-330-R
9	2	R1, R11	RES., CHIP., 0 $\Omega$ , 1/8W, 0805	VISHAY, CRCW08050000Z0EA
10	1	R2	RES., CHIP., 143k, 1/10W, 1%, 0603	VISHAY, CRCW0603143KFKEA
11	1	R4	RES., CHIP., 10k, 1/8W, 1%, 0805	VISHAY, CRCW080510K0FKEA
12	1	R5	RES., CHIP., 20k, 1/10W, 1%, 0603	VISHAY, CRCW060320K0FKEA
13	1	R6	RES., CHIP., 56.2k, 1/10W, 1%, 0603	VISHAY, CRCW060356K2FKEA
14	1	R8	RES., CHIP., 100k, 1/8W, 1%, 0805	VISHAY, CRCW0805100KFKEA
15	1	R12	RES., CHIP., 22.1k, 1/8W, 1%, 0805	VISHAY, CRCW080522K1FKEA
16	1	U1	IC., LT8580EDD 8L DFN	LINEAR TECH., LT8580EDD#TRPBF
<b>Additional Demo Board Circuit Components</b>				
1	0	C9 (OPT)	CAP., 0805	
2	0	C10 (OPT)	CAP., 1206	
3	0	D3, D4 (OPT)	DIODE, Di123	
4	0	D1 (OPT)	DIODE, PowerDI123	
5	0	R9, R10 (OPT)	RES., CHIP., 0805	
<b>Hardware: For Demo Board Only</b>				
1	6	E1-E6	TESTPOINT, TURRET, .094" PBF	MILL-MAX, 2501-2-00-80-00-00-07-0
2	4	MH1-MH4	STAND-OFF, NYLON 0.25"	KEYSTONE, 8831(SNAP ON)



# DEMO MANUAL DC2186A

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