LTM8045
Inverting/SEPIC µModule Converter with Up to 700mA Output

DESCRIPTION

Demo circuit DC1533A features the LTM®8045, an inverting/SEPIC µModule converter delivering up to 700mA of output current. DC1533A is configured as an inverting converter, but can be easily changed to a SEPIC configuration for non-inverting step-up or step-down functionality. The user adjustable features of the LTM8045 such as output voltage, switching frequency, soft-start period and undervoltage lockout can be changed on DC1533A simply by modifying or installing the appropriate resistors or capacitor. The LTM8045 data sheet must be read in conjunction with this demo manual to properly use or modify demo circuit DC1533A.

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

PERFORMANCE SUMMARY (T_A = 25°C)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Minimum Input Voltage, V_{IN}				2.8	V
Maximum Input Voltage, V_{IN}		18			V
Regulator Output Voltage, V_{OUT}^-	R2 = 60.4k	–4.83		–5.19	V
Maximum Output Current, I_{OUT}^-	V_{IN} = 5V V_{IN} = 12V	430 580			mA mA
Efficiency	V_{IN} = 5V, I_{OUT}^- = 400mA		80		%
Switching Frequency	R1 = 130k		700		kHz

BOARD PHOTO

QUICK START PROCEDURE

Demo circuit DC1533A is an easy way to evaluate the performance of the LTM8045. Refer to Figure 1 for the proper measurement equipment setup and Figure 2 for the maximum output current versus input voltage, then follow the procedure below:

NOTE: Do not hot-plug the V_{IN} terminal at high input voltages. Hot-plugging a power supply through wire leads to the demonstration circuit can cause the voltage on the extremely low ESR ceramic input capacitor to ring to twice its DC value. In order to protect the LTM8045, an aluminum electrolytic capacitor with higher ESR is placed at the input terminals. This may protect against some, but not all, input transients due to a hot-plugged power supply. See Application Note 88 for more details.

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. Place JP1 in the ON position.
2. Connect the power supply (with power off), load, and meters as shown in Figure 1.
3. After all connections are made, turn on the input power and verify that the output voltage is –5V.

NOTE: If the output voltage is too low, temporarily disconnect the load to make sure that the load is not set too high.

4. 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.

NOTE: See the section that follows for instructions to convert DC1533A to a $5V_{OUT}$ SEPIC with a positive V_{OUT}.

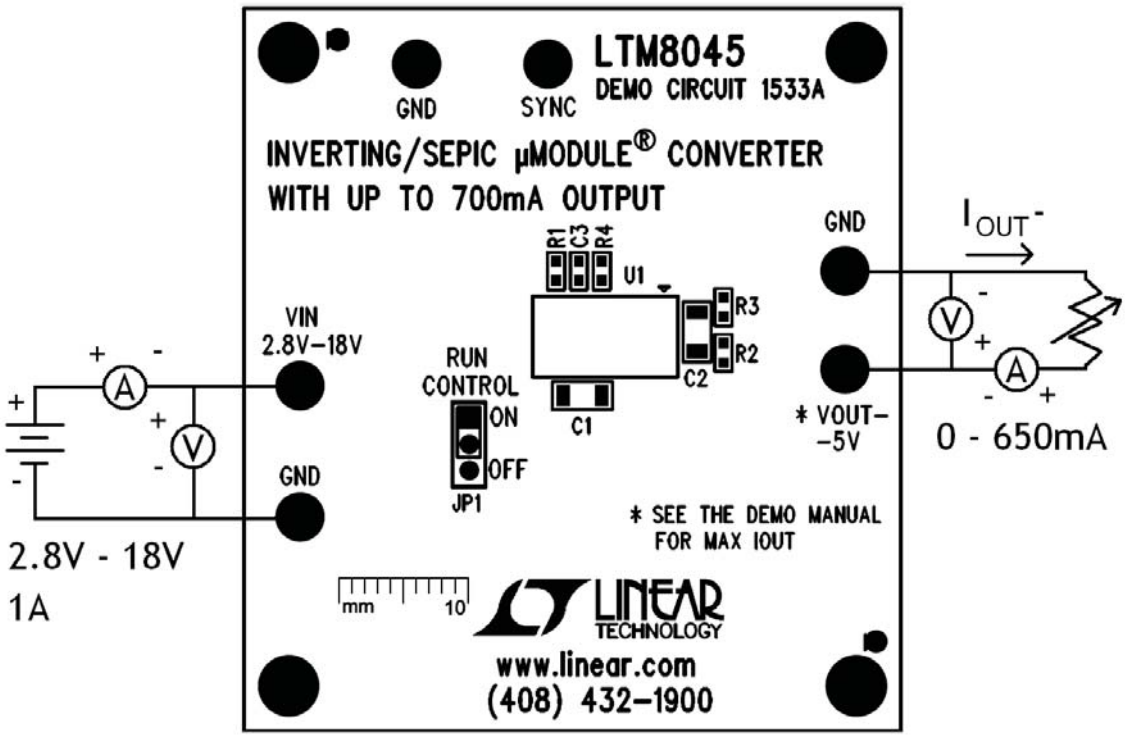


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

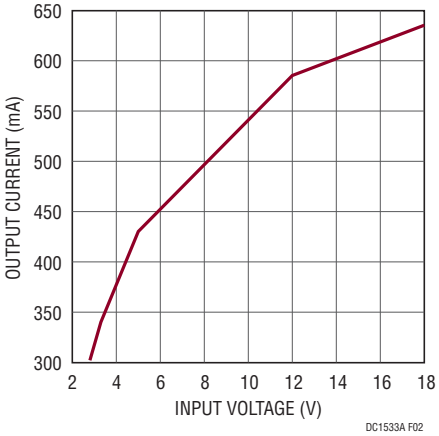


Figure 2. Maximum Output Current vs Input Voltage for V_{OUT} = –5V

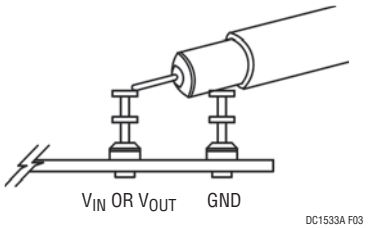


Figure 3. Proper Scope Probe Technique

Instructions to Convert DC1533A to a $5V_{OUT}$ SEPIC with a Positive V_{OUT}

1. Start with DC1533A. Disconnect all supplies and loads.
2. Remove R2 and install R3 = 45.3k as shown in Figure 4. R3 MUST BE PRESENT BEFORE OPERATION OTHERWISE THE LTM8045 MAY BE DAMAGED.

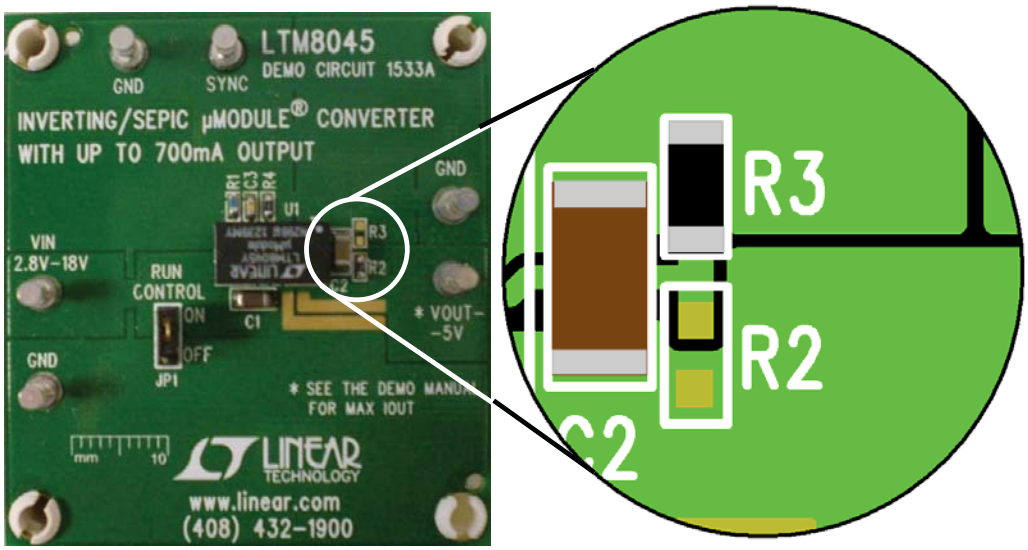


Figure 4

3. Make three cuts on the top copper to separate the terminal labeled GND from the ground plane, as shown in Figure 5. The terminal labeled GND is now V_{OUT}^{+}.

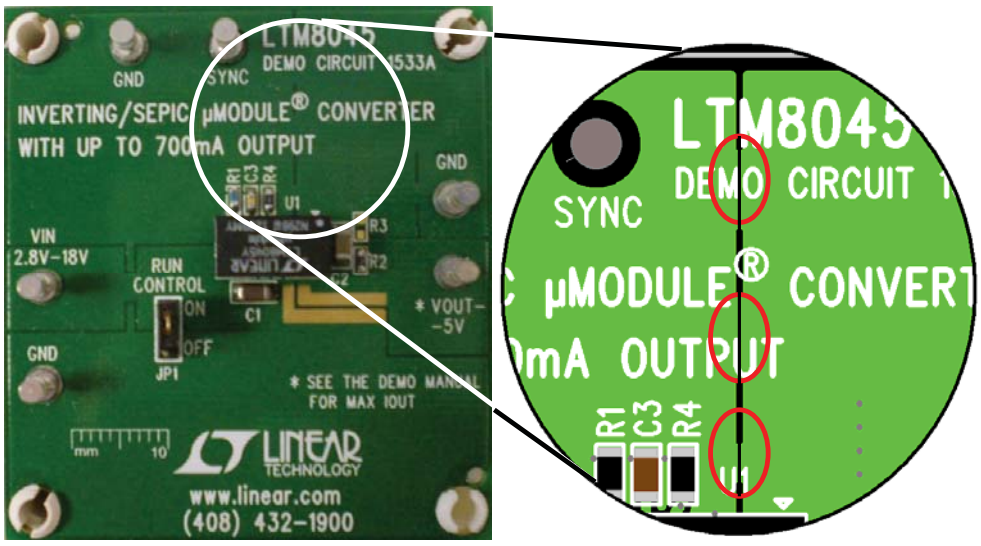


Figure 5

4. Solder the exposed copper together with braid to connect the terminal labeled V_{OUT}^- to the ground plane, as shown in Figure 6. The terminal labeled V_{OUT}^- is now GND.

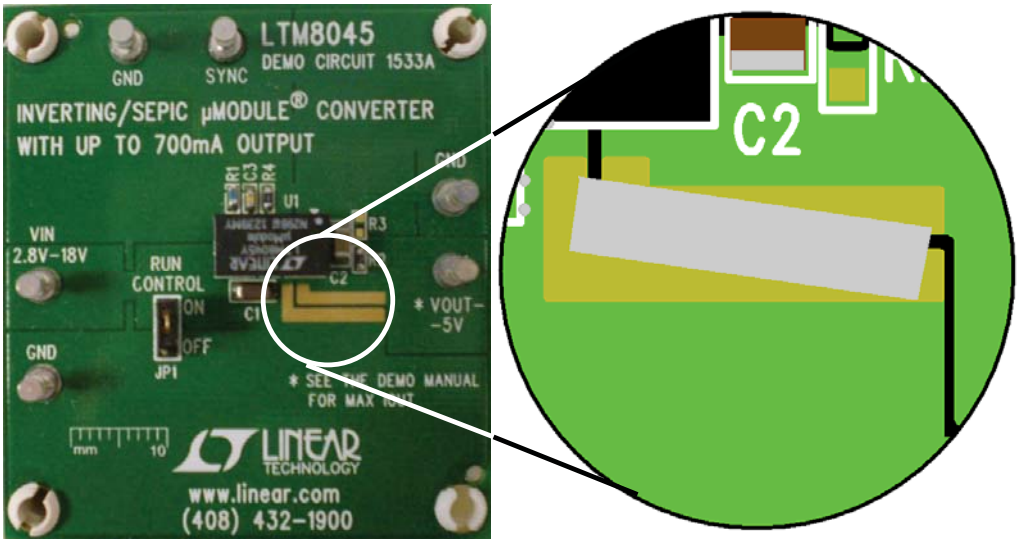


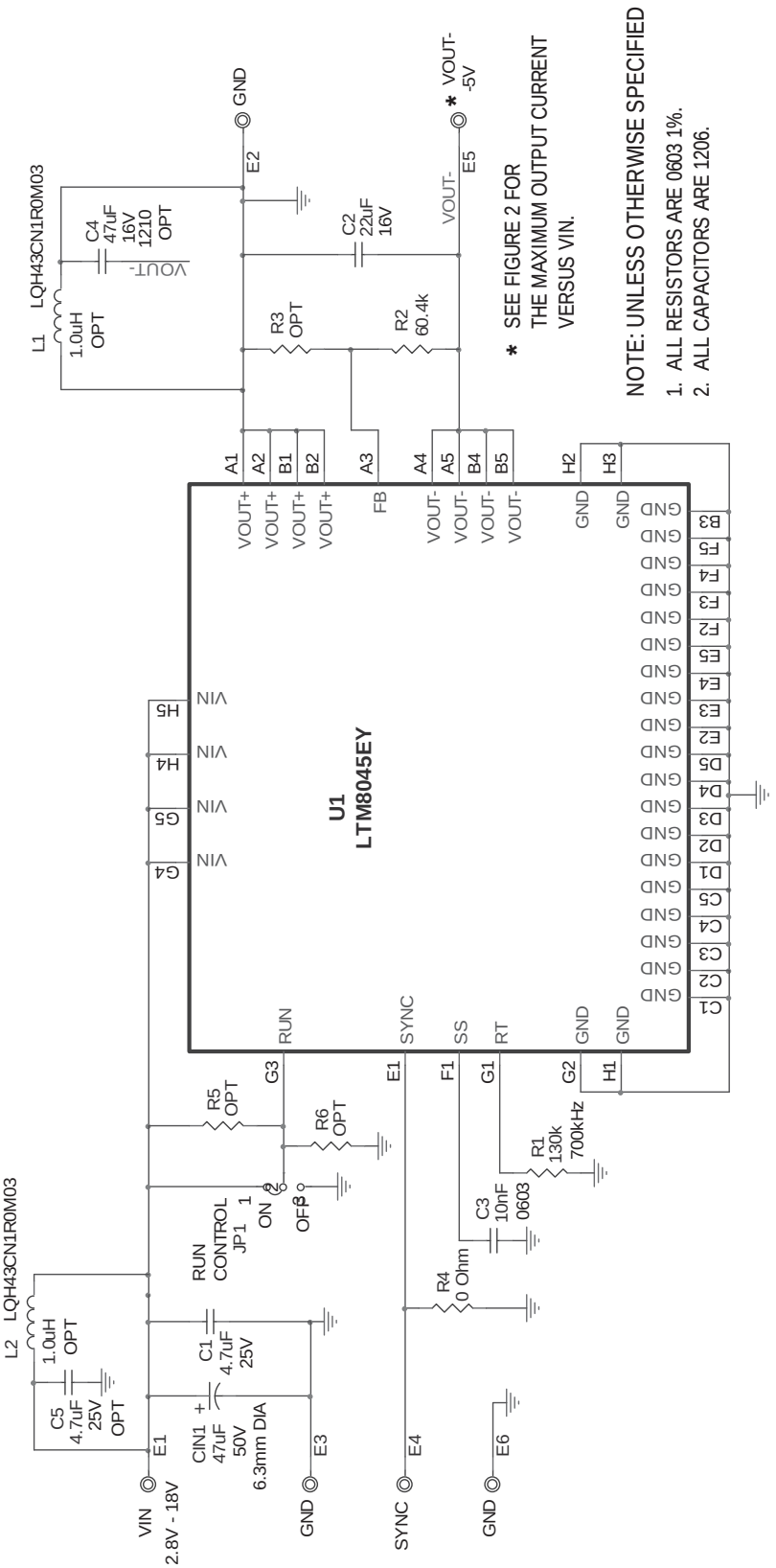
Figure 6

5. Change C2 to 100µF 6.3V 1206 or 1210. Change R1 to 115k to optimize the switching frequency.

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP., X7R, 4.7µF, 25V, 10%, 1206	NIC, NMC1206X7R475K25TRPLPF
2	1	C2	CAP., X5R, 22µF, 16V, 10%, 1206	AVX, 1206YD226KAT2A
3	1	C3	CAP., X7R, 10nF, 16V, 10%, 0603	AVX, 0603YC103KAT2A
4	1	R1	RES., CHIP, 130k, 1% ,0603	VIAHSY, CRCW0603130KFKEA
5	1	R2	RES., CHIP, 60.4k, 1% , 0603	VISHAY, CRCW060360K4FKED
6	1	U1	I.C., LTM8045EY#PBF, BGA	LINEAR TECH., LTM8045EY#PBF
Optional Demo Circuit Components				
1	0	CIN1	CAP., SMT, 47µF, 50V	SUNCON, 50CE47BS
2	0	C4	CAP., X7R, 47µF, 16V, 20%, 1210	
3	0	C5	CAP., X7R, 4.7µF, 25V, 10%, 1206	
4	0	L1, L2	IND., 1.0µH, 20%,1812	MURATA, LQH43CN1R0M03
5	0	R3	RES., 0603	
6	0	R4	RES., CHIP, 0Ω, 0603	VISHAY, CRCW06030000Z0EA
7	0	R5, R6	RES., CHIP, 0603	
Hardware				
1	6	E1-E6	TESTPOINT, TURRET, .095"	MILL-MAX, 2501-2-00-80-00-00-07-0
2	1	JP1	2MM SINGLE ROW HEADER, 3 PIN	SAMTEC, TMM-103-02-L-S
3	1	XJP1	SHUNT, .079" CENTER	SAMTEC, 2SN-BK-G
4	4	(STAND-OFF)	STAND-OFF, NYLON 0.375" TALL	KEYSTONE, 8832(SNAP ON)

SCHEMATIC DIAGRAM



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