LTC5562
Wideband Low Power Active Mixer

DESCRIPTION

The LTC®5562 is a versatile low power mixer optimized for applications requiring very wide input bandwidth, low distortion, and low LO leakage. This mixer can be used for either upconverting or downconverting applications, and provides a nominal conversion gain of 1dB. Demonstration circuit 2483A-A showcases the LTC5562 mixer for upconverting applications while demonstration circuit 2483A-B is tuned for downconverting applications. The differential inputs are optimized for use with 1:1 transmission-line baluns, allowing very wideband impedance matching. The LTC5562 uses a 3.3V supply for low power consumption and an enable pin allows the part to be shut down for further power savings. The total mixer current is adjustable, allowing for even further power savings. The standard match frequency ranges for each board are outlined in the table below.

DEMO BOARD	INPUT RANGE	LO RANGE	OUTPUT RANGE
DC2483A-A	30MHz to 3GHz	2.8GHz to 3.4GHz	3.3GHz to 3.7GHz
DC2483A-B	30MHz to 3GHz	0.4GHz to 1.4GHz	10MHz to 550MHz

Design files for this circuit board are available at http://www.linear.com/demo/DC2483A-A

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ABSOLUTE MAXIMUM INPUT RATINGS

Supply Voltage (V_{CC}, OUT^+, OUT^-) 4V
Enable Input Voltage (EN) ..... –0.3V to V_{CC} + 0.3V
LO^+, LO^- Input Power (1GHz to 7GHz) 10dBm
IN^+, IN^- Power (10MHz to 7GHz) 15dBm
LGND Voltage ..... –0.3V to 1V
Operating Temperature Range (T_C) ..... –40°C to 105°C
Junction Temperature (T_J) ..... 150°C
Storage Temperature Range ..... –65°C to 150°C

CAUTION: THIS PART IS SENSITIVE TO ELECTROSTATIC DISCHARGE (ESD). OBSERVE PROPER ESD PRECAUTIONS WHEN HANDLING THE LTC5562.

BOARD PHOTO

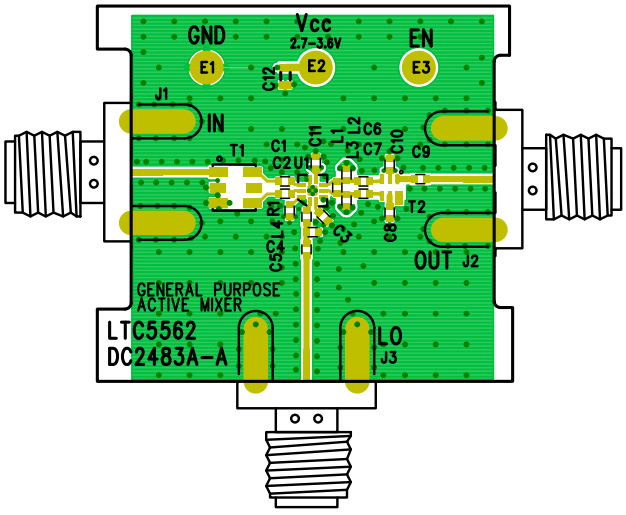


Figure 1. DC2483A-A

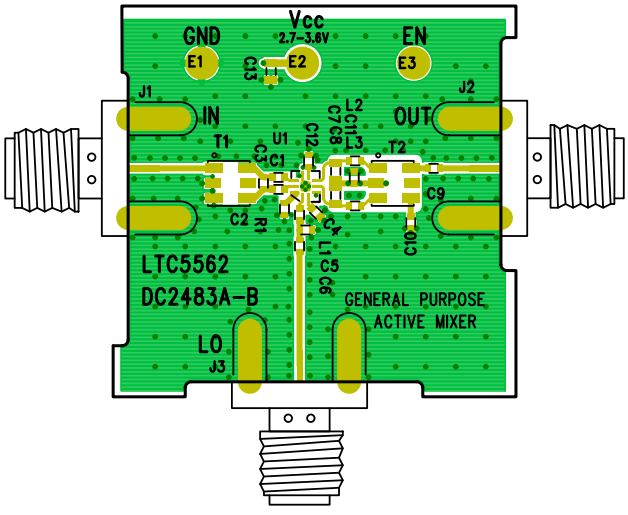


Figure 2. DC2483A-B

NOTES ON TEST EQUIPMENT SETUP

- High performance signal generators with low harmonic outputs should be used for 2-tone measurements. Otherwise, lowpass filters at the signal generator outputs should be used to suppress harmonics.
- High quality combiners should be used to present a broadband 50Ω termination on all ports as well as provide good port-to-port isolation. Adding attenuator pads further improves source isolation and helps prevent the signal generators from producing intermodulation products.
- Spectrum analyzers can produce significant internal distortion products if they are overdriven. Generally, spectrum analyzers are designed to operate at their best with about –30dBm to –40dBm at their input. The spectrum analyzer's input attenuation setting should be used to avoid saturating the instrument.
- Set the spectrum analyzer's input attenuation depending on the spectrum analyzer used.
- Before performing measurements on the DUT, the system performance should be evaluated to ensure that a clean input signal is obtained and that the spectrum analyzer's internal distortion is minimized.

PROPER TEST SETUPS

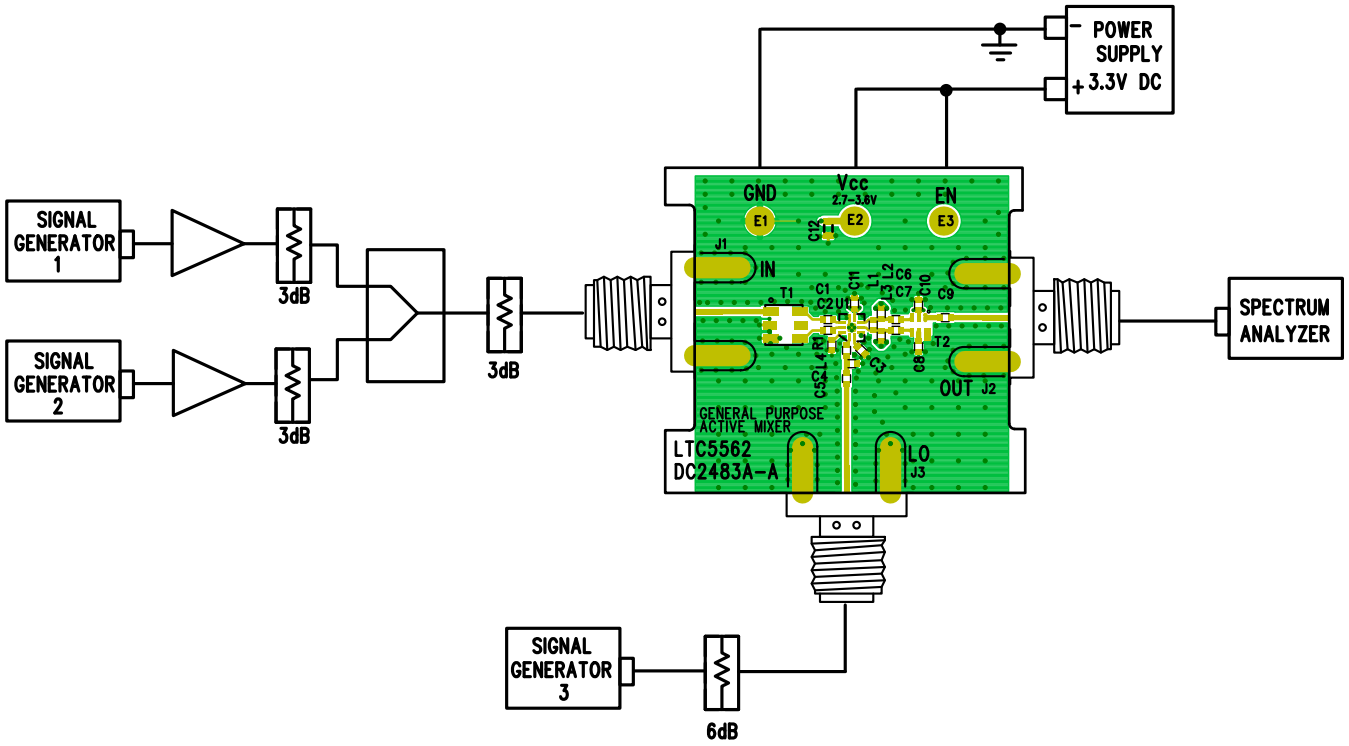


Figure 3. DC2483A-A Upconverter Two-Tone Test Setup

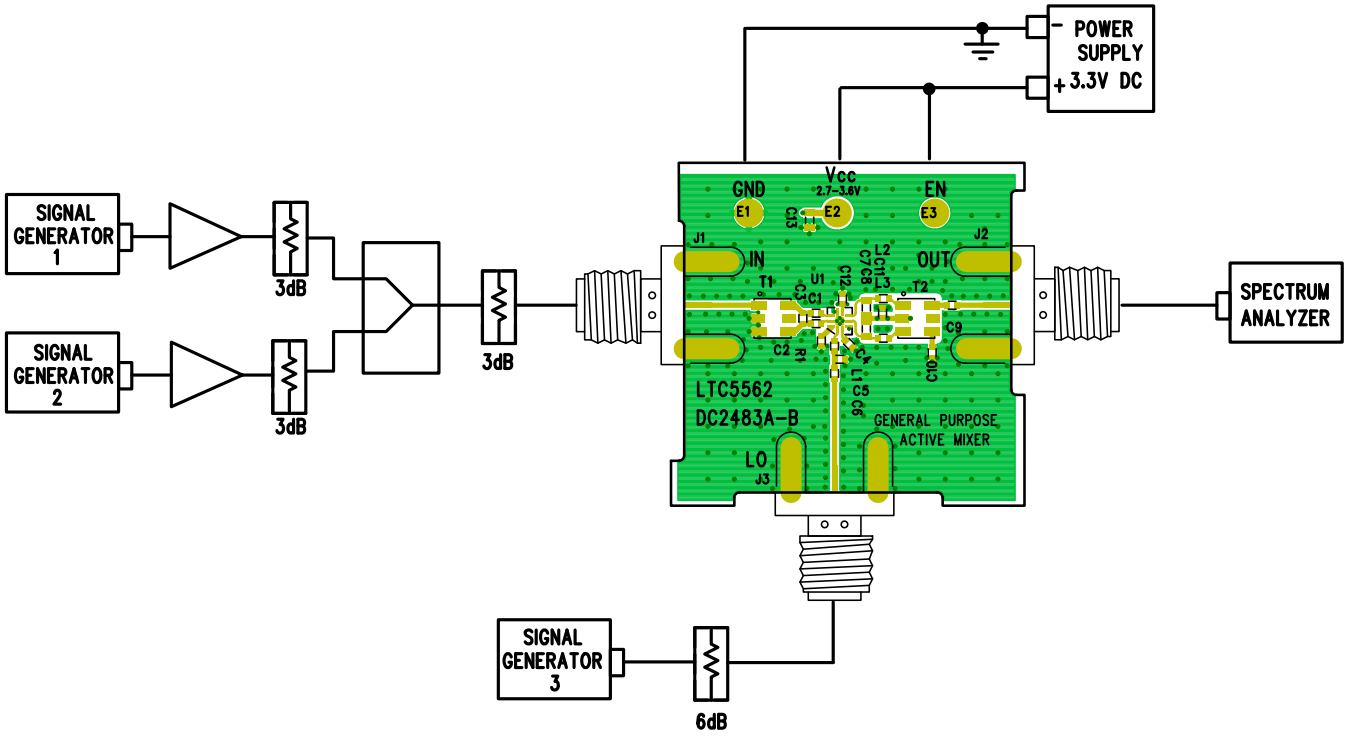


Figure 4. DC2483A-B Downconverter Two-Tone Test Setup

QUICK START PROCEDURE (DC2483A-A)

1. Connect all test equipment as shown in Figure 3.
2. Set the power supply output voltage to 3.3V and set the current limit to 60mA.
3. Connect the ground and V_{CC} turrets to the power supply.

   BE SURE TO CONNECT THE V_{CC} TURRET BEFORE THE EN TURRET TO ENSURE THAT THE PART DOES NOT GET DAMAGED. ALSO, REMOVE POWER FROM EN TURRET BEFORE REMOVING POWER FROM THE V_{CC} TURRET.
4. Connect the EN turret to the power supply.
5. Set the LO signal generator to provide a 3360MHz CW signal at about 0dBm to the demo board's LO port.
6. Set the RF signal generators to provide one 239MHz CW signal and one 241MHz CW signal. The signals should be applied to the 2-way combiner. The output of the combiner should be applied to the demo board's RF input port. The two tones should be set to –12dBm each at the mixer's RF input port.
7. Set the spectrum analyzer's center frequency to 3600MHz.
8. Perform various measurements (conversion gain, OIP3, LO leakage, etc.).

QUICK START PROCEDURE (DC2483A-B)

1. Connect all test equipment as shown in Figure 4.
2. Set the power supply output voltage to 3.3V and set the current limit to 60mA.
3. Connect the ground and V_{CC} turrets to the power supply.

   BE SURE TO CONNECT THE V_{CC} TURRET BEFORE THE EN TURRET TO ENSURE THAT THE PART DOES NOT GET DAMAGED. ALSO, REMOVE POWER FROM EN TURRET BEFORE REMOVING POWER FROM THE V_{CC} TURRET.
4. Connect the EN turret to the power supply.
5. Set the LO signal generator to provide a 1040MHz CW signal at about 0dBm to the demo board's LO port.
6. Set the RF signal generators to provide one 899MHz CW signal and one 901MHz CW signal. The signals should be applied to the 2-way combiner. The output of the combiner should be applied to the demo board's RF input port. The two tones should be set to –12dBm each at the mixer's RF input port.
7. Set the spectrum analyzer's center frequency to 140MHz.
8. Perform various measurements (conversion gain, OIP3, LO leakage, etc.).

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
DC2483A-A Required Circuit Components				
1	5	C1-C3, C8, C9	CAP., 1000pF, X7R, 50V, 10%, 0402	MURATA GRM155R71H102KA01D
2	3	C4, C6, C7	CAP., 1.2pF, C0G, 50V, ±0.25pF, 0402	MURATA GJM1555C1H1R2CB01D
3	1	C5	CAP., 10pF, C0G, 50V, 5%, 0402	MURATA GRM1555C1H100JA01D
4	2	C10, C11	CAP., 10nF, X7R, 50V, 10%, 0402	MURATA GRM155R71H103KA88D
5	1	C12	CAP., 2.2µF, X5R, 10V, 10%, 0603	MURATA GRM188R61A225KE34D
6	3	E1, E2, E3	TEST POINT, TURRET, 0.064", MTG. HOLE	MILL-MAX 2308-2-00-80-00-00-07-0
7	3	J1-J3	CONN., SMA, 50Ω EDGE-LAUNCH	CINCH CONNECTIVITY 142-0701-851
8	3	L1-L3	IND., 3.6nH, 2%, 0402, WIRE-WOUND	COILCRAFT 0402HP-3N6XGLW
9	1	L4	IND., 1.5nH, ±0.3nH, 0402, MULTILAYER	MURATA LQG15HS1N5S02D
10	1	R1	RES., 0Ω JUMPER, 0402	VISHAY CRCW04020000Z0ED
11	1	T1	XFMR, 1:1, 4.5MHz to 3000MHz	MINI-CIRCUITS TC1-1-13M+
12	1	T2	XFMR, 4:1, 3300MHz to 4200MHz	MINI-CIRCUITS NCS4-442+
13	1	U1	IC, LTC5562IUC, QFN 10-PIN, 2mm × 2mm	LINEAR TECH LTC5562IUC#PBF
DC2483A-B Required Circuit Components				
1	4	C1, C2, C4, C6	CAP., 1000pF, X7R, 50V, 10%, 0402, SINGLE SOURCE ONLY	MURATA, GRM155R71H102KA01D
2	2	C3, C5	CAP., OPTION, 0402	DNI
3	2	C7, C8	CAP., OPTION, 0603	DNI
4	3	C9, C10, R1	RES., 0Ω JUMPER, 0402	VISHAY, CRCW04020000Z0ED
5	2	C11, C12	CAP., 10nF, X7R, 50V, 10%, 0402, SINGLE SOURCE ONLY	MURATA, GRM155R71H103KA88D
6	1	C13	CAP., 2.2µF, X5R, 10V, 10%, 0603, SINGLE SOURCE ONLY	MURATA, GRM188R61A225KE34D
7	3	E1, E2, E3	TEST POINT, TURRET, 0.064", MTG. HOLE	MILL-MAX, 2308-2-00-80-00-00-07-0
8	3	J1, J2, J3	CONN., SMA, 50Ω EDGE-LAUNCH	CINCH CONNECTIVITY, 142-0701-851
9	1	L1	IND., 7.5nH, 2%, 0402, WIRE-WOUND	COILCRAFT, 0402HP-7N5XGLW
10	2	L2, L3	IND., 100nH, 5%, 0402, WIRE-WOUND	COILCRAFT, 0402AF-101XJL
11	1	T1	XFMR, 1:1, 4.5MHz to 3000MHz	MINI-CIRCUITS, TC1-1-13M+
12	1	T2	XFMR, 8:1, 2MHz to 500MHz	MINI-CIRCUITS, TC8-1-10LN+
13	1	U1	IC, LTC5562IUC, QFN 10-PIN, 2mm × 2mm	LINEAR TECH, LTC5562IUC#PBF

SCHEMATIC DIAGRAM

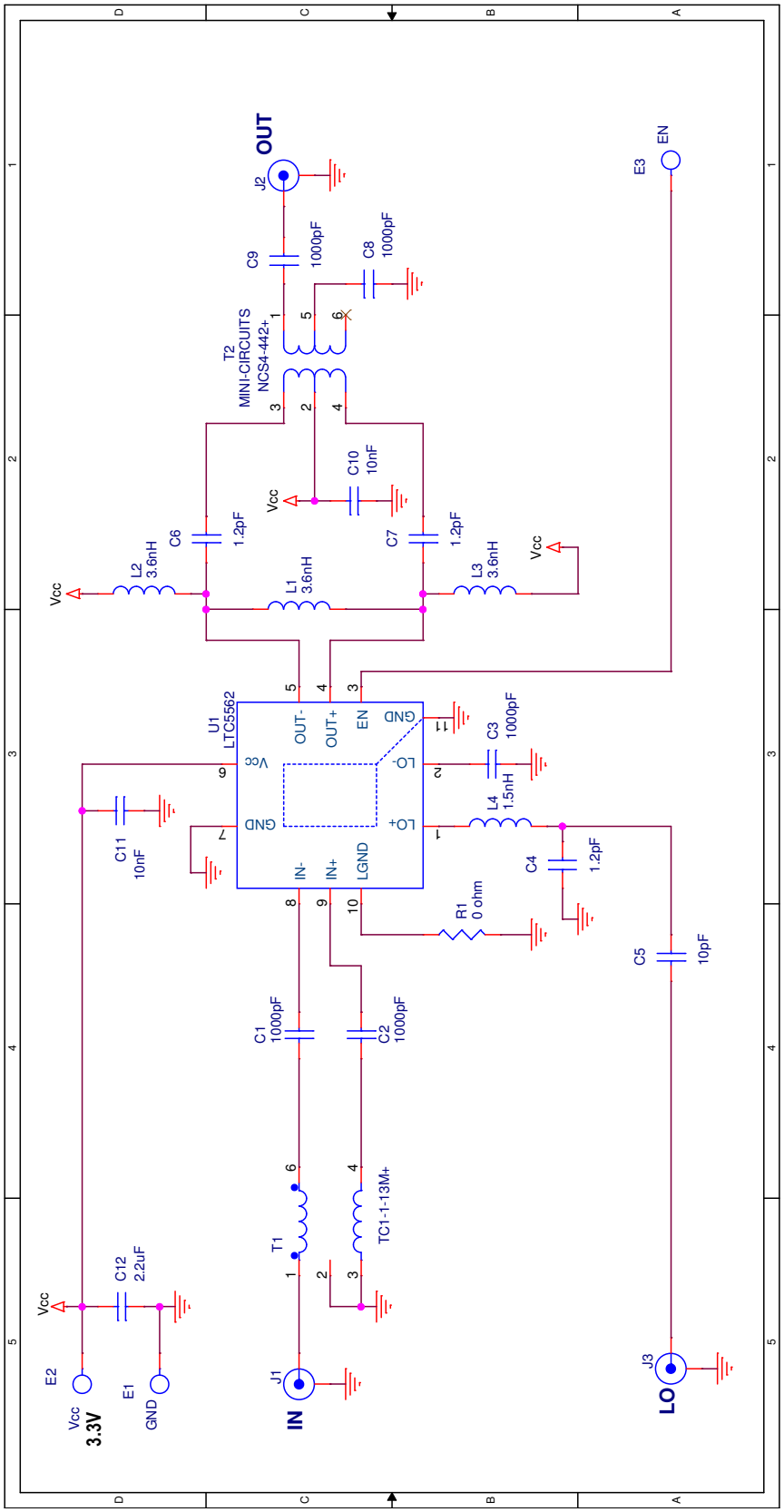


Figure 5. DC2483A-A Upconverter Schematic

SCHEMATIC DIAGRAM

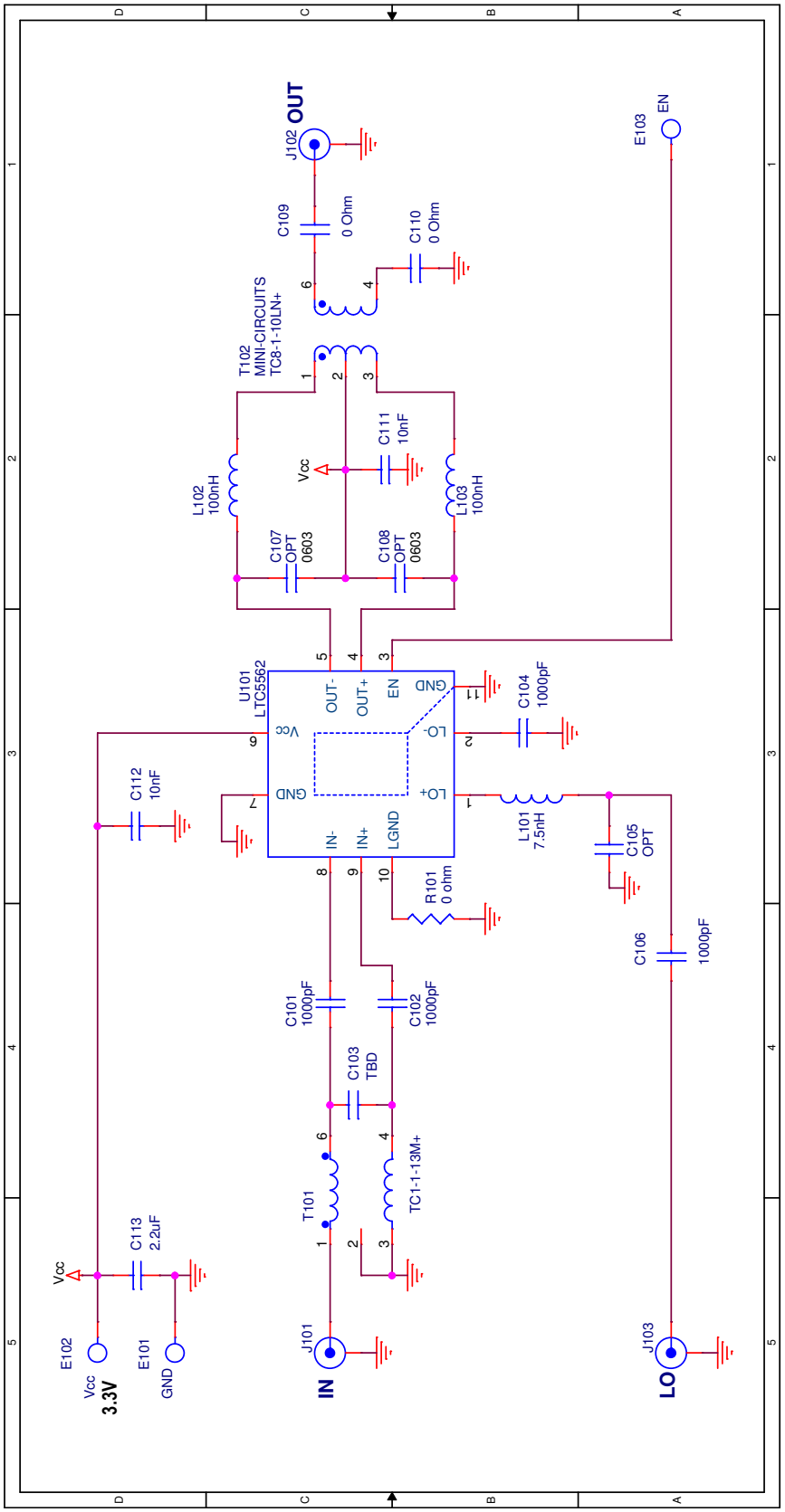


Figure 6. DC2483A-B Downconverter Schematic

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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.

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