

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 642

## HIGH LINEARITY UPCONVERTING MIXER

LT5521

### DESCRIPTION

Demonstration circuit 642 is an upconverting mixer featuring the LT<sup>®</sup>5521. The LT<sup>®</sup>5521 is a 10MHz to 3.7GHz High Linearity Up/Downconverting Mixer optimized for wireless and cable infrastructure applications. A high-speed, internally matched LO amplifier drives a double-balanced mixer core, allowing the use of a low power, single-ended LO source.

The IF port can be easily matched to a broad range of frequencies for use in many different applications.

Demonstration circuit 642 is designed for an RF output frequency range from 1.75GHz to 2.15GHz and is optimized for a 250MHz IF input frequency.

**Design files for this circuit board are available. Call the LTC factory.**

LT is a registered trademark of Linear Technology Corporation.

Table 1. Typical Performance Summary ( $T_A = 25^\circ\text{C}$ )

| PARAMETER                             | CONDITION ( $f_{IF} = 250\text{MHz}$ , $f_{LO} = 1700\text{MHz}$ )     | VALUE              |
|---------------------------------------|------------------------------------------------------------------------|--------------------|
| Supply Voltage                        |                                                                        | 4.5V to 5.25V      |
| Supply Current                        | $V_{CC} = 5\text{V}$ , EN = High                                       | 82mA               |
| Maximum Shutdown Current              | $V_{CC} = 5\text{V}$ , EN = Low                                        | 100 $\mu\text{A}$  |
| RF Frequency Range                    |                                                                        | 1.75GHz to 2.15GHz |
| IF Input Return Loss                  | $Z_0 = 50$ , with external matching                                    | 15dB               |
| LO Input Return Loss                  | $Z_0 = 50$                                                             | 12dB               |
| RF Output Return Loss                 | $Z_0 = 50$                                                             | 12dB               |
| LO Input Power                        |                                                                        | -10dBm to 0dBm     |
| Conversion Gain                       | $P_{IF} = -7\text{dBm}$ , $P_{LO} = -5\text{dBm}$                      | -0.5dB             |
| SSB Noise Figure                      | $P_{LO} = -5\text{dBm}$                                                | 12.5dB             |
| Input 3 <sup>rd</sup> Order Intercept | 2-Tone, -7dBm/Tone, $\Delta f = 5\text{MHz}$ , $P_{LO} = -5\text{dBm}$ | +24.2dBm           |
| Input 2 <sup>nd</sup> Order Intercept | 2-Tone, -7dBm/Tone, $\Delta f = 5\text{MHz}$ , $P_{LO} = -5\text{dBm}$ | +49dBm             |
| Input 1dB Compression                 | $P_{LO} = -5\text{dBm}$                                                | +10dBm             |
| LO to RF leakage                      | $P_{LO} = -5\text{dBm}$                                                | -42dBm             |
| LO to IF leakage                      | $P_{LO} = -5\text{dBm}$                                                | -40dBm             |

## APPLICATION NOTE

### FREQUENCY RANGE

Demonstration circuit 642 is optimized for an IF input frequency of 250MHz. This frequency is set by the input IF matching components on the PCB. Other values may be used to maintain best performance for IF frequencies ranging from 10MHz to 3GHz.

### CURRENT CONSUMPTION

If lower power consumption is required, the LT<sup>®</sup>5521's supply current can be reduced by increasing the value

of the DC return resistors, R1, R2. Operation at a lower supply current will, however, degrade linearity.

### LO TO RF LEAKAGE

Minimum LO to RF leakage is realized when R1 & R2 are closely matched; 0.1% tolerance resistors are recommended for this reason. Resistors with a greater tolerance (ie; 1%) may be used with some degradation of LO to RF leakage.

## QUICK START PROCEDURE

Demonstration circuit 642 is easy to set up to evaluate the performance of the LT<sup>®</sup>5521. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

#### NOTE:

- a. Use high performance signal generators with low harmonic output for 2<sup>nd</sup> & 3<sup>rd</sup> order distortion measurements. Otherwise, low-pass filters at the signal generator outputs should be used to suppress harmonics, particularly the 2<sup>nd</sup> harmonic.
  - b. High quality combiners that provide a 50 ohm termination on all ports and have good port-to-port isolation should be used. Attenuators on the outputs of the signal generators are recommended to further improve source isolation and to reduce reflection into the sources.
1. Connect all test equipment as shown in Figure 1.
  2. Set the DC power supply's current limit to 90mA, and adjust output voltage to 5V.
  3. Connect Vcc to the 5V DC supply, and then connect EN to 5V; the mixer is enabled (on).
  4. Set Signal Generator #1 to provide a 1700MHz, -5dBm, CW signal to the demo board LO input port.
  5. Set the Signal Generators #2 and #3 to provide two -10dBm CW signals to the demo board RF input port—one at 250MHz, and the other at 255MHz.
  6. To measure 3<sup>rd</sup> order distortion and conversion gain, set the Spectrum Analyzer start and stop frequencies to 1940MHz and 1965MHz, respectively. Sufficient spectrum analyzer input attenuation should be used to avoid distortion in the instrument.
  7. The 3<sup>rd</sup> order intercept point is equal to  $(P_1 - P_3) / 2 + P_{in}$ , where  $P_1$  is the power level of the two fundamental output tones at 1950MHz and 1955MHz,  $P_3$  is the 3<sup>rd</sup> order product at 1945MHz and 1960MHz, and  $P_{in}$  is the input power (in this case, -7dBm). All units are in dBm.
  8. To measure input 2<sup>nd</sup> order distortion, set the Spectrum Analyzer start and stop frequencies to 2204MHz and 2206MHz, respectively. Sufficient spectrum analyzer input attenuation should be used to avoid distortion in the instrument.
  9. The 2<sup>nd</sup> order intercept point is equal to  $P_1 - P_2 + P_{in}$ , where  $P_1$  is the power level of the fundamental output tone at 1950MHz,  $P_2$  is the 2<sup>nd</sup> order product at 2205MHz, and  $P_{in}$  is the input power (in this case, -7dBm). All units are in dBm.

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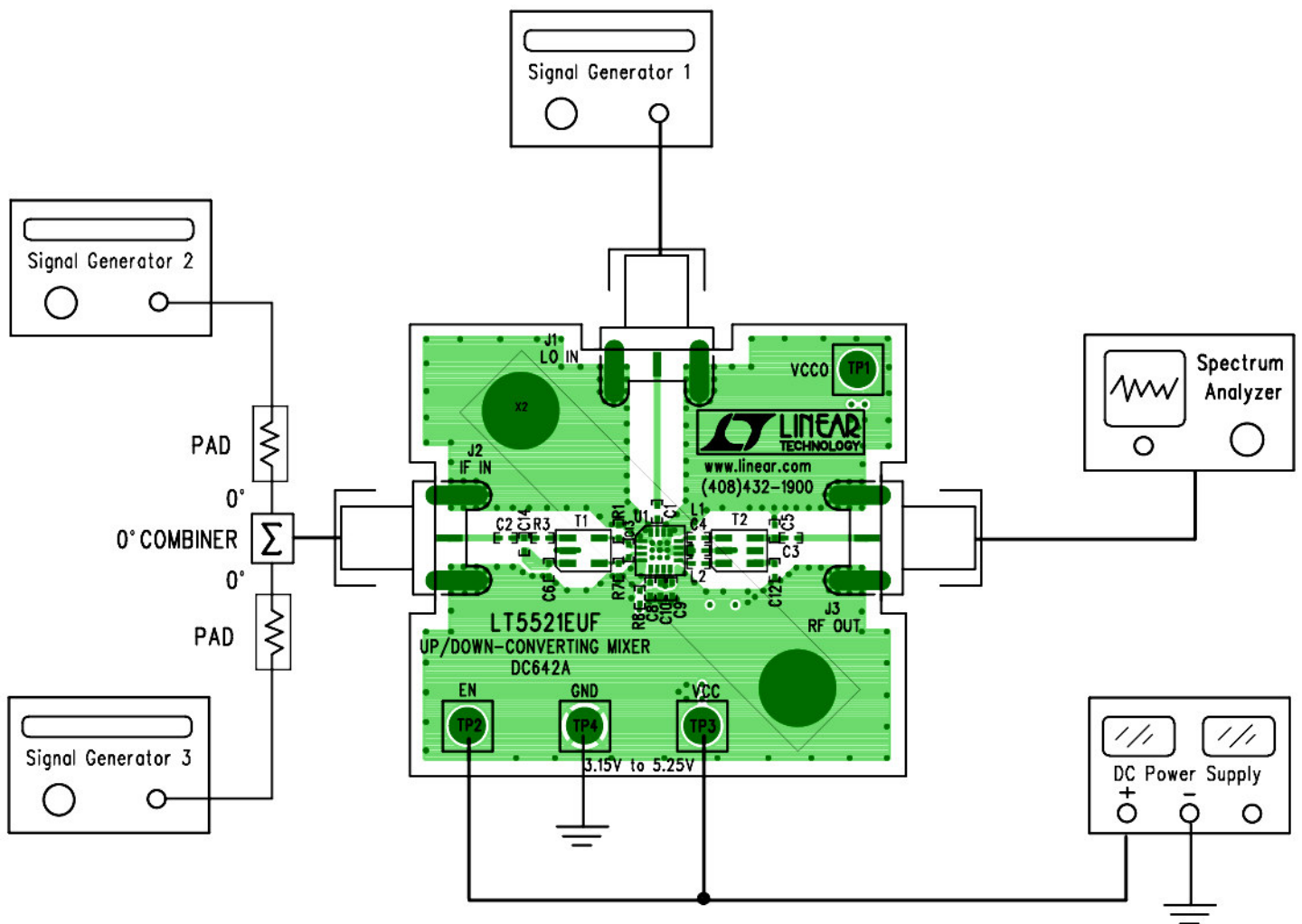


Figure 1. Proper Measurement Equipment Setup

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