October 28, 2002

Demo board DC468A Quick Start Guide.

Introduction

Demo board DC468A with LT5506 IC is a 40 MHz to 500 MHz monolithic integrated quadrature demodulator with variable gain amplifier (VGA), designed for low voltage operation. It supports standards that use linear modulation format. The chip consists of a VGA, quadrature down-converting mixers and lowpass noise filters. The LO port consists of a divide-by-two stage and LO buffers. The IC provides all building blocks for IF down-conversion to I and Q baseband signals with a single supply voltage of 1.8 V to 5.25 V. The VGA gain has a linear-in-dB relationship to the control input voltage. Hard-clipping amplifiers at the mixer outputs reduce the recovery time from a signal overload condition. The lowpass filters reduce the out-of-band noise and spurious frequency components. The cut-off frequency of the noise filters is approximately 8.8 MHz. The external 2XLO frequency is required to be twice the IF input frequency for the mixers. The standby mode provides reduced supply current and fast transient response into the normal operating mode when the I/Q outputs are AC-coupled to a baseband chip.

EN and STBY pins

Table 1 below shows demo board dipswitch setting for different operating modes.

ENABLE		**STANDBY**		**Mode**
EN Logic Level	**EN** Dipswitch position	**STBY** Logic Level	**STBY** Dipswitch position	
LOW	* Upper	LOW	* Upper	Shutdown
LOW	* Upper	HIGH	* Lower	Standby
HIGH	Lower	LOW or HIGH	Upper or Lower	Normal Operation
* NOTE: References for dipswitch positions (Upper and Lower) are given with regards to the demo board orientation shown on Figure 1.				

Table 1. Setting for Different Operating Modes

Test and measurement set-up

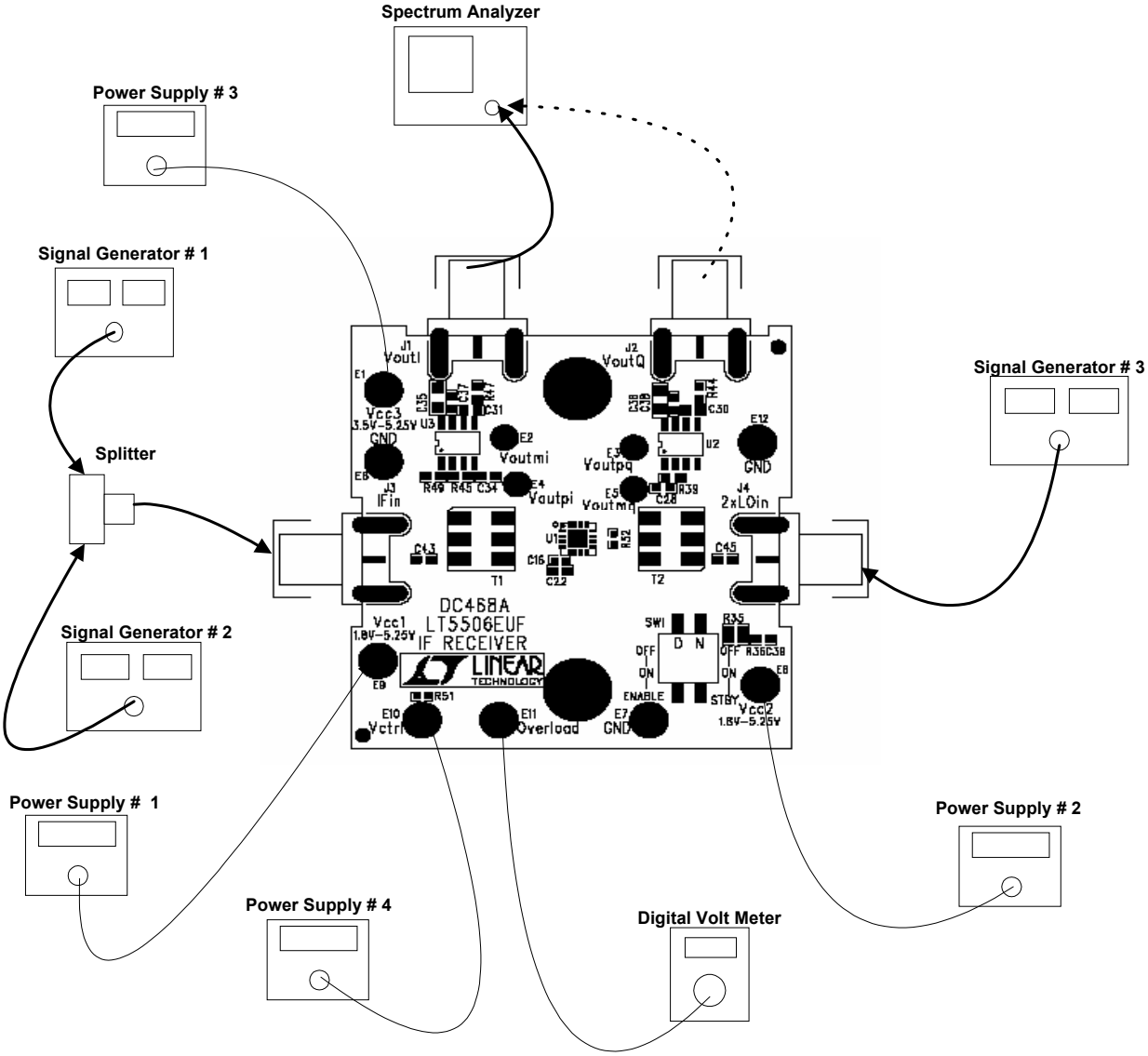

Figure 1. Test and measurement set-up

DC power consumption measurements:

1) Connect test equipment and Power supplies to the demo board as shown in Figure 1.
2) Set Power Supply #1 and Power Supply #2 to +3.0 V.
   NOTE: One Power Supply can be used as well. For precise Current Consumption measurements both Power Supplies are preferred.
3) Set Power Supply #3 Between +3.0 V and +5.25 V. This is the voltage source for the two Op-Amps U2 and U3.
4) Set Power Supply #4 to 0 V (minimum gain).
5) Shutdown Mode
   a) Set dipswitches for EN and STBY to Logic LOW state (Refer to Table 1).
   b) Measure Current in Vcc1. It should be approximately 0.2 μA.
6) Standby Mode
   a) Set EN dipswitch to Logic LOW state (Refer to Table 1).
   b) Set STBY dipswitch to Logic HIGH state (Refer to Table 1).
   c) Measure Current in Vcc1. It should be approximately 3.6 mA.
7) Normal Operation Mode
   a) Set EN dipswitch to Logic HIGH state (Refer to Table 1).
   b) Set STBY dipswitch to either Logic HIGH or Logic LOW state (Refer to Table 1).
   c) Measure Current in Vcc1. It should be approximately 27 mA.

Total Harmonic Distortion Measurements:

1) Use setting steps 1 to 4 from previous DC power consumption measurements.
2) Set dipswitches of EN and STBY to Logic HIGH state (Refer to Table 1). The IC is in Normal Operation Mode.
3) Set Signal Generator # 1 for f_{IF}=280.0 MHz, CW mode, with P_{IF} = –40 dBm.
4) Set Signal Generator # 2 for f_{IF} =280.1 MHz, CW mode, with P_{IF} = –40 dBm.
5) Set Signal Generator # 3 for f_{LO}=570 MHz, CW mode, with P_{LO} = -3 dBm.
6) Set the Spectrum Analyzer to the following:
   a) Center Frequency = 4.9 MHz.
   b) Frequency Span = 1 MHz.
   c) Amplitude Reference Level = 0 dBm.
   d) Res. BW = 10 kHz,
   e) Vid. BW = 30 kHz.
   Two CW tones will be on the screen of the spectrum analyzer, at 4.9 MHz and 5.0 MHz.
7) Slowly adjust the power supply #4 for V_{ctrl} (V_{ctrl} or Gain Control Voltage) to set the output tones at –10 dBm. NOTE: Do not adjust this voltage above the Vcc1.
   If necessary, adjust the P_{IF} of either Signal Generator #1 or Signal Generator #2 so that the two tones are equivalent in level or Power value (power delta of 0.3 dB or less, preferably).
8) Record the actual value of the two tones on the Spectrum Analyzer. These are the two Fundamental tones.
9) Set the Spectrum Analyzer to the following:
   a) Center Frequency = 4.8 MHz.
   b) Frequency Span = 50 kHz.
   c) Amplitude Reference Level = –30 dBm.
   d) Averaging = ON.
   e) Measure the lower IM3 Product on the Spectrum Analyzer at 4.8 MHz.

10) Repeat step 9 for the Upper IM3 product at 5.1 MHz.
    NOTE: IM5 and IM7 products can be measured with higher input signal levels.

Base Band Low Pass Filter, IF Detect (Overload) and Phase & Amplitude mismatch measurements:

1) Use setting steps 1 to 4 from previous DC power consumption measurements.
2) Set signal generator # 3 for f_{LO}=570 MHz, CW mode, with P_{LO}= –3 dBm.
3) Set Signal Generator # 1 for f_{IF}=286.0 MHz, CW mode, with P_{IF}= –30 dBm. Turn "Off" the RF output for the signal generator #2.
4) Set dipswitches EN and STBY to Logic HIGH state (Refer to Table 1). The IC is in Normal Operation Mode.
5) Set the Spectrum Analyzer to the following:
   a) Start Frequency = 100 kHz.
   b) Stop Frequency = 20 MHz.
   c) Amplitude Reference Level = 0 dBm.
   d) Res. BW = 100 kHz.
6) Slowly adjust the Power Supply #4 for V_{ctrl} (Gain Control Voltage) to set the output tone at –4 dBm.
7) BaseBand Filters frequency response can be measured by sweeping input IF frequency from 286 MHz to 305 MHz. Correspondingly, BB output will have 1 to 20 MHz sweep. In case of manual frequency sweep of IF input, the Spectrum Analyzer should be in "Maximum Hold" mode. One marker should be placed at 1 MHz point as a reference and another marker should be placed at the point where the frequency response of the BB filter has a 3.0 dB drop. This represents the 3.0 dB corner frequency of the BB filter.
8) IF Detector (Overload) measurement:
   a) Change Signal Generator # 1 Output power with 1 or 2 dB step size, to provide –30 to +8 dBm at the IF input of the demo board. Note: splitter/combiner can be removed from the test set-up or corrections for the splitter loss should be considered.
   b) IF Detector (Overload) Output voltage should be in a range of 0.3 to 1.2 Volts correspondingly.
9) BaseBand Phase and Amplitude mismatch measurements.
   a) Connect two (vertical) inputs of the oscilloscope to BB outputs.
      NOTE: An Oscilloscope of 1GHz or faster is recommended. Calibration and identical connecting cables are required. Measurements should be done with internal or external 50-ohm termination resistors.
   b) Measure Phase and Amplitude error. Phase error should be ± 3.0 degrees maximum. Amplitude error should be within ± 0.5 dB.
      NOTE: If available, an Impedance Analyzer like the HP 4192A is recommended for BB Phase and Amplitude mismatch measurements.

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