DESCRIPTION

Demonstration circuit 747 is a log-linear RF/IF detector featuring the LT®5537.

The LT5537 is a wide dynamic range RF/IF log detector, operational from below 10MHz to 1000MHz. The lower limit of the operating frequency range can be extended to near DC by the use of an external capacitor. The input dynamic range at 200MHz with ±3dB nonlinearity is 90dB (from –76dBm to 14dBm, single-ended 50Ω input). The detector output voltage slope is normally 20mV/dB, and the typical temperature coefficient is 0.01dB/°C at 200MHz.

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

Table 1. Typical Performance Summary (V_{CC} = 3V, ENBL = 3V, T_A = 25°C, unless otherwise noted. Test circuit shown in Figure 1.)

PARAMETER	CONDITION	VALUE
Supply Voltage		2.7V to 5.25V
Supply Current		13.5mA
Shutdown Current	ENBL = Low	500µA
ENBL Voltage	Low, Chip Disabled	0.3V max
	High, Chip Enabled	1.0V min
ENBL Input Current	V_{ENBL} = 0V	0µA
	V_{ENBL} = 3V	100µA
RF/IF Input DC Common Mode Voltage		(V_{CC} – 0.4) V
Small-Signal Impedance	Measured at 200MHz	1.73kΩ // 1.45pF
Output Start Voltage	No Input Signal Present	0.4V
Response Time	Input from –30dBm to 0dBm, C_{LOAD} = 2.5pF	110ns
Baseband Modulation Bandwidth	Output Load Capacitance = 2.5pF	6MHz
Input Frequency Range	Operation at lower frequency is possible. See LT5537 datasheet.	10MHz to 1GHz
Maximum Input Power for Monotonic Output	50Ω Termination	
	200MHz	14.0dBm
	600MHz	11.6dBm
	1GHz	9.4dBm
f = 10MHz		
Linear Dynamic Range	±3dB Error	88.8dB
	±1dB Error	72.5dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	19.6mV/dB
Intercept	V_{OUT} = 0V, extrapolated	-97dBm
Sensitivity	Sensitivity can be improved by as much as 10dB by using a narrow-band input matching network. See LT5537 datasheet.	-76.7dBm
Temperature Coefficient	P_{IN} = -20dBm	-0.007dB/°C

f = 100MHz		
Linear Dynamic Range	±3dB Error ±1dB Error	90.5dB 82.8dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	20.3mV/dB
Intercept	V_{OUT} = 0V, extrapolated	-95dBm
Sensitivity	Sensitivity can be improved by as much as 10dB by using a narrow-band input matching network. See LT5537 datasheet.	-77dBm
Temperature Coefficient	P_{IN} = -20dBm	-0.004dB/°C
f = 200MHz		
Linear Dynamic Range	±3dB Error ±1dB Error	90.3dB 83.5dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	21.2mV/dB
Intercept	V_{OUT} = 0V, extrapolated	-94dBm
Sensitivity	Sensitivity can be improved by as much as 10dB by using a narrow-band input matching network. See LT5537 datasheet.	-76.4dBm
Temperature Coefficient	P_{IN} = -20dBm	0.010dB/°C
f = 400MHz		
Linear Dynamic Range	±3dB Error ±1dB Error	88.2dB 70.8dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	23.1mV/dB
Intercept	V_{OUT} = 0V, extrapolated	-91dBm
Sensitivity	Sensitivity can be improved by as much as 10dB by using a narrow-band input matching network. See LT5537 datasheet.	-75.3dBm
Temperature Coefficient	P_{IN} = -20dBm	0.019dB/°C
f = 600MHz		
Linear Dynamic Range	±3dB Error ±1dB Error	85.8dB 72.5dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	25.2mV/dB
Intercept	V_{OUT} = 0V, extrapolated	-89dBm
Sensitivity	Sensitivity can be improved by as much as 10dB by using a narrow-band input matching network. See LT5537 datasheet.	-74.1dBm
Temperature Coefficient	P_{IN} = -20dBm	0.026dB/°C
f = 1GHz		
Linear Dynamic Range	±3dB Error ±1dB Error	63.5dB 51.7dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	31.4mV/dB
Intercept	V_{OUT} = 0V, extrapolated	-80dBm
Sensitivity	Sensitivity can be improved by as much as 10dB by using a narrow-band input matching network. See LT5537 datasheet.	-69.2dBm
Temperature Coefficient	P_{IN} = -20dBm	0.031dB/°C

QUICK START PROCEDURE

Demonstration circuit 747 is easy to set up to evaluate the performance of the LT5537. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Connect voltmeter's negative (-) lead to demo board GND test point (E4 or E5).
2. Connect voltmeter's positive (+) lead to the demo board OUTPUT test point (E2).
3. Connect DC power supply's negative (-) output to demo board GND test point (E4 or E5).
4. Connect DC power supply's positive (+) output (2.7V to 5.25V) to demo board V_{CC} test point (E3).

   NOTE: Do not exceed 5.5V, the absolute maximum supply voltage.

5. Connect signal generator's output to demo board INPUT port (SMA connector J1) via coaxial cable. A 3dB attenuator may be inserted to improve input match.
6. Using a jumper cable, connect demo board V_{CC} test point (E3) to ENBL test point (E1). Now the detector is enabled (on) and is ready for measurement.

   NOTE: Make sure that the power is not applied to ENBL before it is applied to V_{CC}. The voltages on the ENBL test point must never exceed V_{CC} + 0.2V.

7. Apply RF input signal and measure OUTPUT DC voltages.

   NOTE: Do not exceed +22dBm, the absolute maximum RF input power.

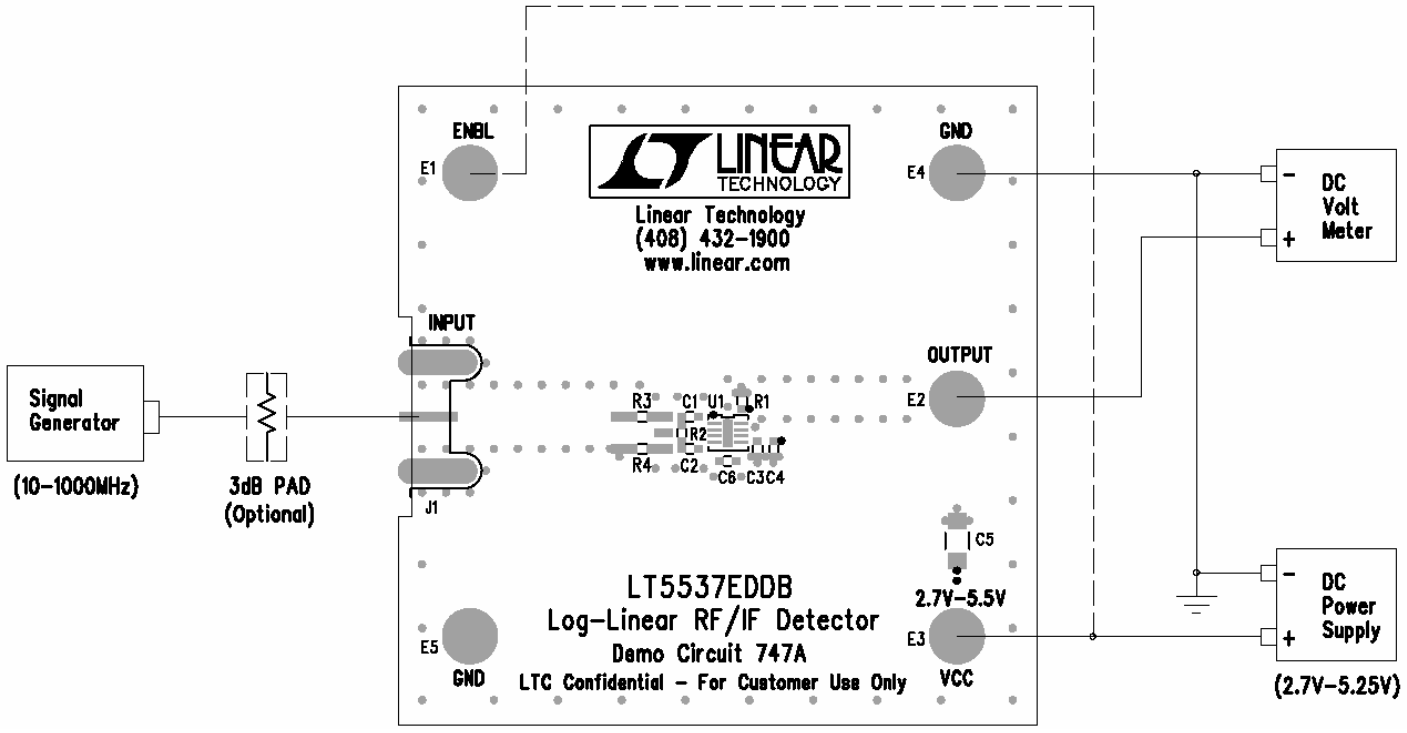
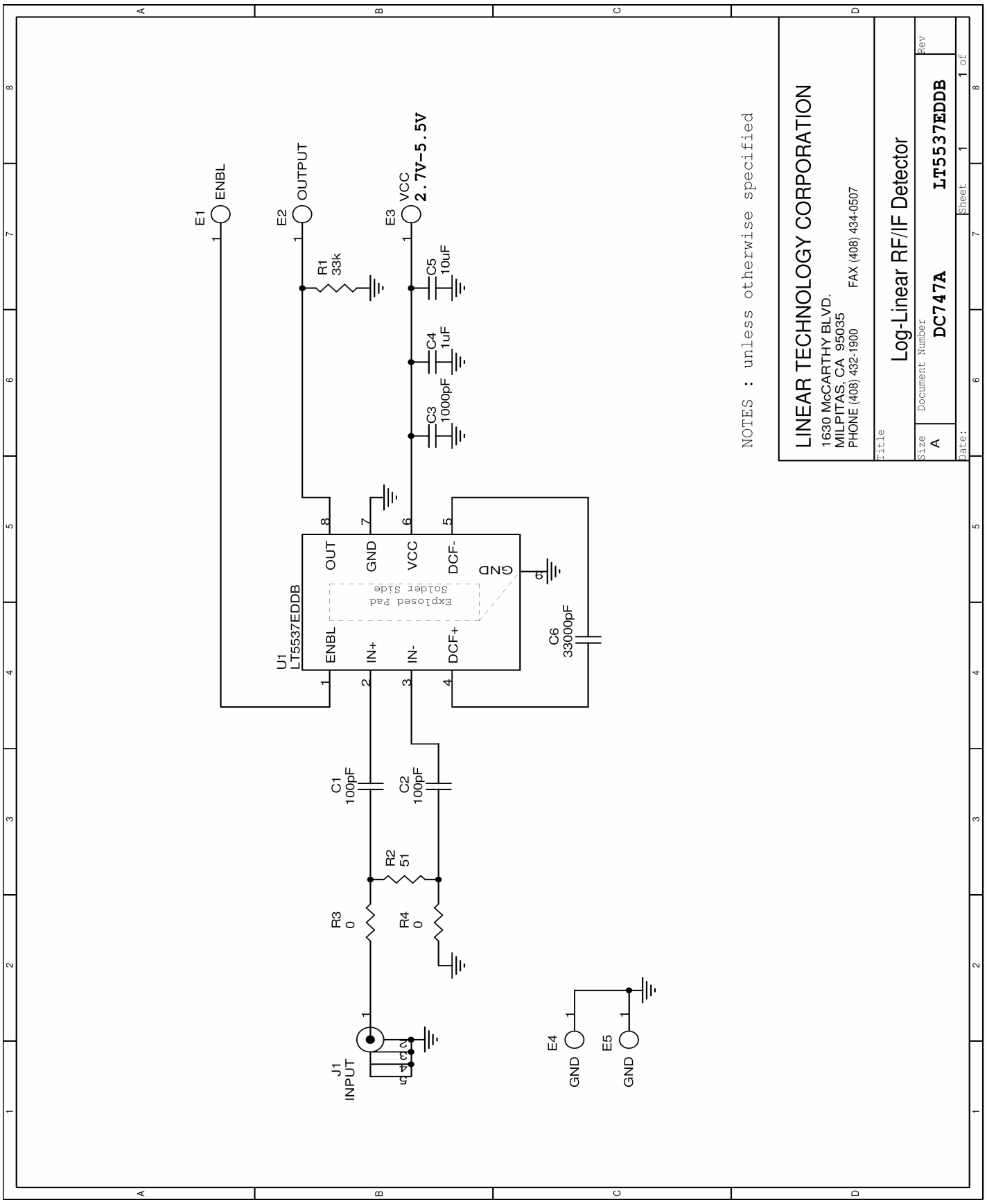


Figure 1. Proper Measurement Equipment Setup


E1
ENBL
E2
OUTPUT
E3
VCC
2.7V-5.5V
R1
33k
C5
10uF
C4
1uF
C3
1000pF
U1
LT5537EDDB
OUT
GND
VCC
DCF-
ENBL
IN+
IN-
DCF+
GND
Exposed Pad
Solder Side
C6
33000pF
C1
100pF
C2
100pF
R2
51
R3
0
R4
0
J1
INPUT
E4
GND
E5
GND
NOTES : unless otherwise specified
LINEAR TECHNOLOGY CORPORATION
1630 McCARTHY BLVD.
MILPITAS, CA 95035
PHONE (408) 432-1900
FAX (408) 434-0507
Title
Log-Linear RF/IF Detector
Size
A
Document Number
DC747A
LT5537EDDB
Rev
Date:
Sheet
1
of
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