

## DESCRIPTION

Demonstration circuit 747 is a log-linear RF/IF detector featuring the LT<sup>®</sup>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  $\pm 3\text{dB}$  nonlinearity is 90dB (from  $-76\text{dBm}$  to  $14\text{dBm}$ , single-

ended  $50\Omega$  input). The detector output voltage slope is normally  $20\text{mV/dB}$ , and the typical temperature coefficient is  $0.01\text{dB/}^\circ\text{C}$  at 200MHz.

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

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**Table 1. Typical Performance Summary ( $V_{CC} = 3\text{V}$ ,  $\text{ENBL} = 3\text{V}$ ,  $T_A = 25^\circ\text{C}$ , 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	500 $\mu\text{A}$
ENBL Voltage	Low, Chip Disabled	0.3V max
	High, Chip Enabled	1.0V min
ENBL Input Current	$V_{\text{ENBL}} = 0\text{V}$	0 $\mu\text{A}$
	$V_{\text{ENBL}} = 3\text{V}$	100 $\mu\text{A}$
RF/IF Input DC Common Mode Voltage		$(V_{CC} - 0.4)\text{V}$
Small-Signal Impedance	Measured at 200MHz	$1.73\text{k}\Omega // 1.45\text{pF}$
Output Start Voltage	No Input Signal Present	0.4V
Response Time	Input from $-30\text{dBm}$ to $0\text{dBm}$ , $C_{\text{LOAD}} = 2.5\text{pF}$	110ns
Baseband Modulation Bandwidth	Output Load Capacitance = $2.5\text{pF}$	6MHz
Input Frequency Range	Operation at lower frequency is possible. See LT5537 datasheet.	10MHz to 1GHz
Maximum Input Power for Monotonic Output	50 $\Omega$ Termination	
	200MHz	14.0dBm
	600MHz	11.6dBm
	1GHz	9.4dBm

### f = 10MHz

Linear Dynamic Range	$\pm 3\text{dB}$ Error	88.8dB
	$\pm 1\text{dB}$ Error	72.5dB
Slope	$R1 = 33\text{k}$ (The output slope is adjustable using $R1$ .)	19.6mV/dB
Intercept	$V_{\text{OUT}} = 0\text{V}$ , 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	$P_{\text{IN}} = -20\text{dBm}$	-0.007dB/ $^\circ\text{C}$

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## LOG-LINEAR RF/IF DETECTOR

### f = 100MHz

Linear Dynamic Range	±3dB Error	90.5dB
	±1dB Error	82.8dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	20.3mV/dB
Intercept	V <sub>OUT</sub> = 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 <sub>IN</sub> = -20dBm	-0.004dB/°C

### f = 200MHz

Linear Dynamic Range	±3dB Error	90.3dB
	±1dB Error	83.5dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	21.2mV/dB
Intercept	V <sub>OUT</sub> = 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 <sub>IN</sub> = -20dBm	0.010dB/°C

### f = 400MHz

Linear Dynamic Range	±3dB Error	88.2dB
	±1dB Error	70.8dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	23.1mV/dB
Intercept	V <sub>OUT</sub> = 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 <sub>IN</sub> = -20dBm	0.019dB/°C

### f = 600MHz

Linear Dynamic Range	±3dB Error	85.8dB
	±1dB Error	72.5dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	25.2mV/dB
Intercept	V <sub>OUT</sub> = 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 <sub>IN</sub> = -20dBm	0.026dB/°C

### f = 1GHz

Linear Dynamic Range	±3dB Error	63.5dB
	±1dB Error	51.7dB
Slope	R1 = 33k (The output slope is adjustable using R1.)	31.4mV/dB
Intercept	V <sub>OUT</sub> = 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 <sub>IN</sub> = -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<sub>CC</sub> 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<sub>CC</sub> 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<sub>CC</sub>. The voltages on the ENBL test point must never exceed V<sub>CC</sub> + 0.2V.

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

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

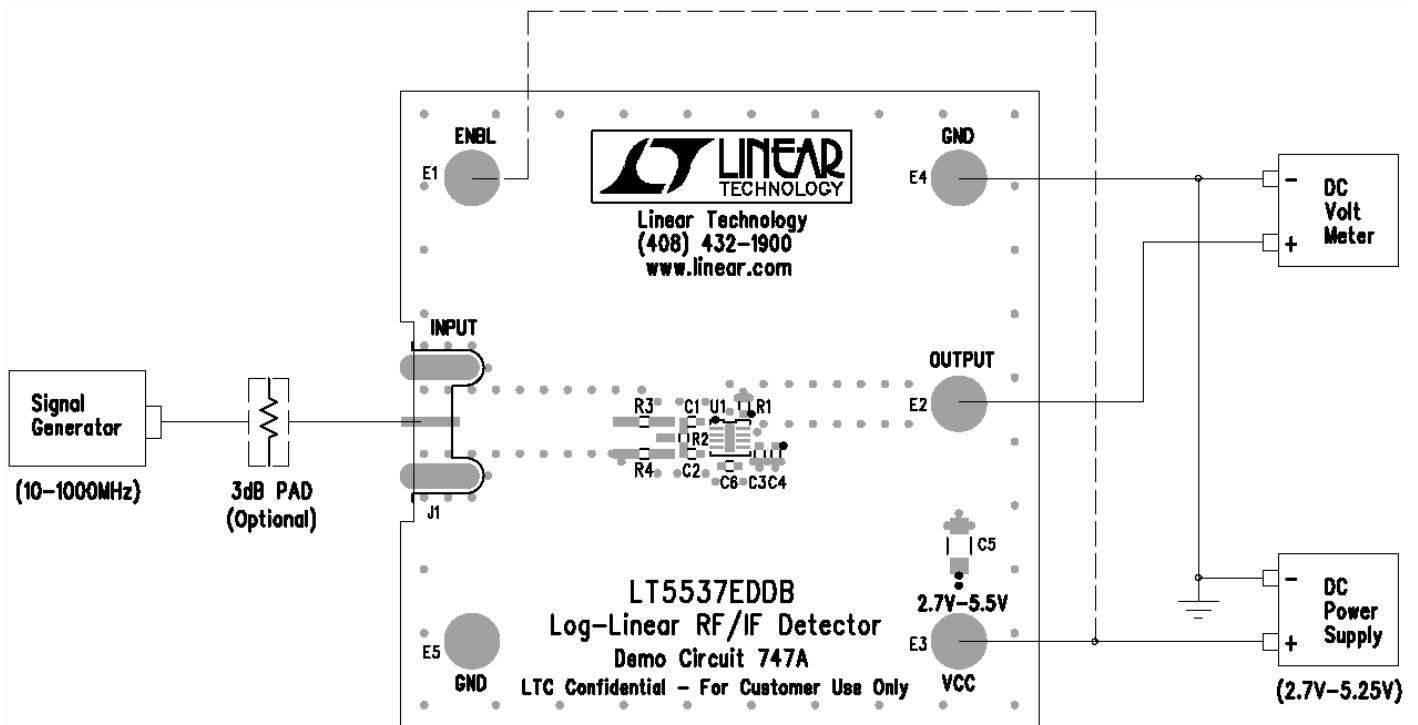
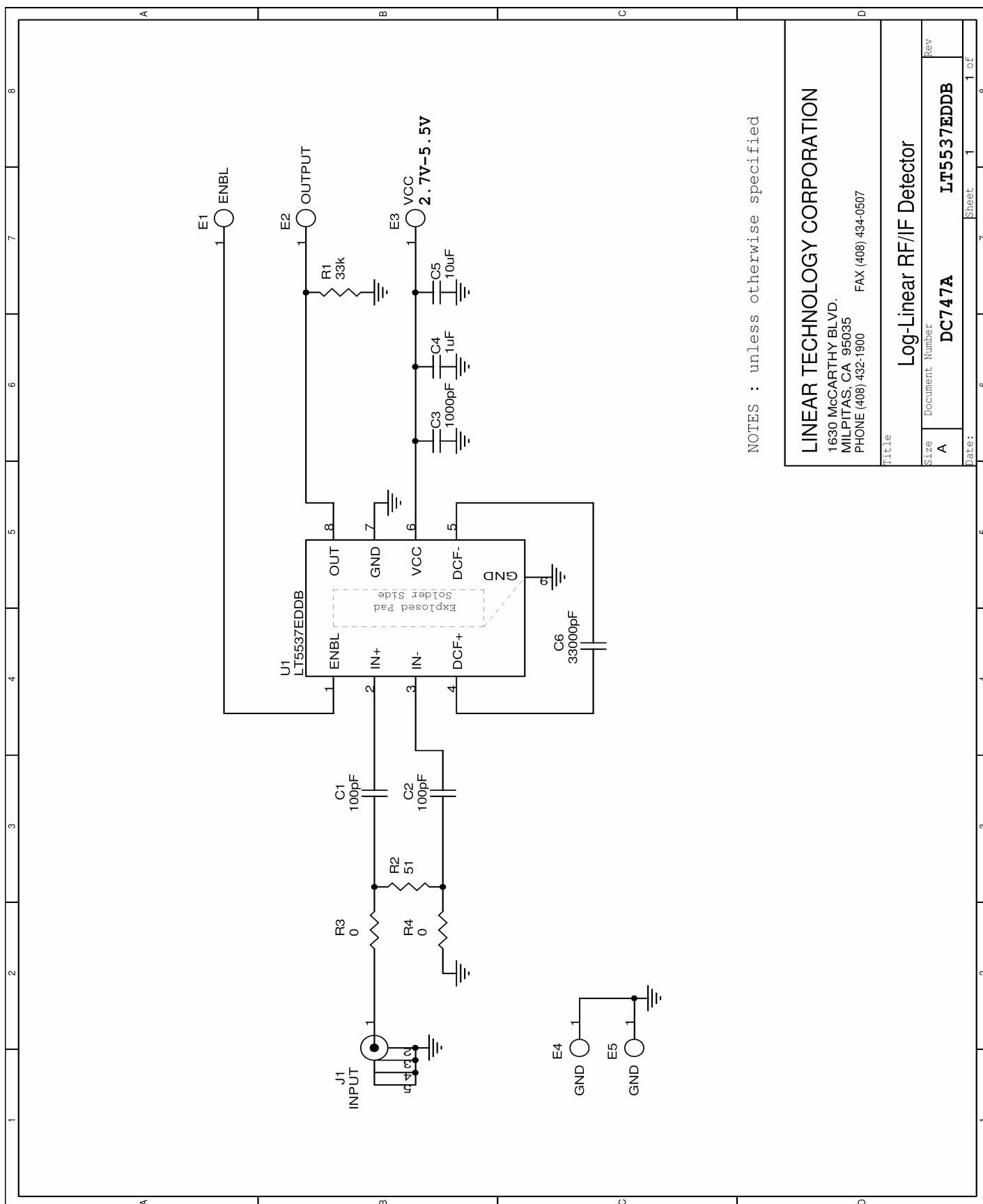


Figure 1. Proper Measurement Equipment Setup

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 747

## LOG-LINEAR RF/IF DETECTOR



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Log-Linear RF/IF Detector

Size	Document Number	Rev
A	DC747A	LT5537EDDB

Date: Sheet 1 of 8

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