DETAILED 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.

LTC is a trademark of Linear Technology Corporation

Table 1. Typical Performance Summary (VCC = 3V, ENBL = 3V, TA = 25°C, unless otherwise noted. Test circuit shown in Figure 1.)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITION</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td></td>
<td>2.7V to 5.25V</td>
</tr>
<tr>
<td>Supply Current</td>
<td></td>
<td>13.5mA</td>
</tr>
<tr>
<td>Shutdown Current</td>
<td>ENBL = Low</td>
<td>500µA</td>
</tr>
<tr>
<td>ENBL Voltage</td>
<td>Low, Chip Disabled</td>
<td>0.3V max</td>
</tr>
<tr>
<td></td>
<td>High, Chip Enabled</td>
<td>1.0V min</td>
</tr>
<tr>
<td>ENBL Input Current</td>
<td>VENBL = 0V</td>
<td>0µA</td>
</tr>
<tr>
<td></td>
<td>VENBL = 3V</td>
<td>100µA</td>
</tr>
<tr>
<td>RF/IF Input DC Common Mode Voltage</td>
<td></td>
<td>(VCC – 0.4) V</td>
</tr>
<tr>
<td>Small-Signal Impedance</td>
<td>Measured at 200MHz</td>
<td>1.73kΩ // 1.45pF</td>
</tr>
<tr>
<td>Output Start Voltage</td>
<td>No Input Signal Present</td>
<td>0.4V</td>
</tr>
<tr>
<td>Response Time</td>
<td>Input from –30dBm to 0dBm, CLOAD = 2.5pF</td>
<td>110ns</td>
</tr>
<tr>
<td>Baseband Modulation Bandwidth</td>
<td>Output Load Capacitance = 2.5pF</td>
<td>6MHz</td>
</tr>
<tr>
<td>Input Frequency Range</td>
<td>Operation at lower frequency is possible. See LT5537 datasheet.</td>
<td>10MHz to 1GHz</td>
</tr>
<tr>
<td>Maximum Input Power for Monotonic Output</td>
<td>50Ω Termination</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200MHz</td>
<td>14.0dBm</td>
</tr>
<tr>
<td></td>
<td>600MHz</td>
<td>11.6dBm</td>
</tr>
<tr>
<td></td>
<td>1GHz</td>
<td>9.4dBm</td>
</tr>
</tbody>
</table>

f = 10MHz

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Dynamic Range</td>
<td>±3dB Error 88.8dB</td>
</tr>
<tr>
<td></td>
<td>±1dB Error 72.5dB</td>
</tr>
<tr>
<td>Slope</td>
<td>R1 = 33k (The output slope is adjustable using R1.) 19.6mV/db</td>
</tr>
<tr>
<td>Intercept</td>
<td>VOUT = 0V, extrapolated -97dBm</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Sensitivity can be improved by as much as 10dB by using a narrow-band input matching network. See LT5537 datasheet. -76.7dBm</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>PIN = -20dBm -0.007dB/°C</td>
</tr>
<tr>
<td>f (MHz)</td>
<td>Linear Dynamic Range</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------</td>
</tr>
<tr>
<td>100</td>
<td>±3dB Error</td>
</tr>
<tr>
<td>200</td>
<td>±3dB Error</td>
</tr>
<tr>
<td>400</td>
<td>±3dB Error</td>
</tr>
<tr>
<td>600</td>
<td>±3dB Error</td>
</tr>
<tr>
<td>1000</td>
<td>±3dB Error</td>
</tr>
</tbody>
</table>

- **Slope**
  - R1 = 33k (The output slope is adjustable using R1.)

- **Intercept**
  - V_{OUT} = 0V, extrapolated

- **Sensitivity**
  - Sensitivity can be improved by as much as 10dB by using a narrow-band input matching network. See LT5537 datasheet.

- **Temperature Coefficient**
  - See LT5537 datasheet.
QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 747
LOG-LINEAR RF/IF DETECTOR

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](image-url)