

**FEATURES**

**Fixed gain of 20 dB**  
**Operation up to 1000 MHz**  
**+37.3 dBm OIP3 at 70 MHz**  
**Noise Figure 2.9 dB at 70 MHz**  
**Input/output internally matched to 75  $\Omega$**   
**Temperature and power supply stable**  
**Power supply: 5 V**  
**Power supply current: 66 mA**  
**1000 V ESD (Class 1C)**

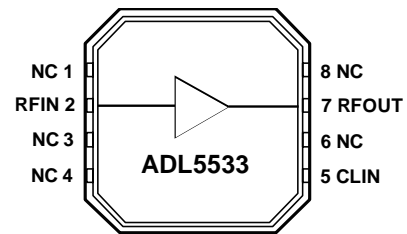
**FUNCTIONAL BLOCK DIAGRAM**

Figure 1. Block Diagram

**GENERAL DESCRIPTION**

The ADL5533 is a fixed-gain, linear amplifier that operates at frequencies up to 1000 MHz. Intended for use in a wide variety of applications, including broadband, CATV, cable modem and FTTH.

The fixed gain of 20 dB is stable over frequency, temperature, power supply and from device to device. OIP3 is +37.3 dBm with an output compression point of +18.8 dBm and a noise figure of 2.9 dB.

The ADL5533 is single-ended and internally matched to 75  $\Omega$  with an input return loss of 10 dB. Only input/output ac-

coupling capacitors, a power supply decoupling capacitor and external inductor are required for operation.

This amplifier operates with a supply voltage of +5V, consuming 66 mA of supply current.

The ADL5533, fabricated on a GaAs HBT process, and has an ESD rating of 1000 V (Class 1C). The device is packaged in a 3mm x 3mm LFCSP that uses an exposed paddle for excellent thermal impedance and operates from -40°C to +85°C. A fully populated evaluation board is available.

**Rev. PrC 5/07**

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**TABLE OF CONTENTS**

|                                |   |  |   |
|--------------------------------|---|--|---|
| Features .....                 | 1 | ESD Caution.....                                 | 4 |
| Functional Block Diagram ..... | 1 | Pin Configuration and Function Descriptions..... | 5 |
| General Description .....      | 1 | Typical Performance Characteristics .....        | 6 |
| Revision History .....         | 2 | Evaluation Board .....                           | 7 |
| Specifications.....            | 3 | Outline Dimensions .....                         | 9 |
| Absolute Maximum Ratings.....  | 4 | Ordering Guide .....                             | 9 |

**REVISION HISTORY**

5/07—Rev. PrC: Preliminary Version

## SPECIFICATIONS

$V_{CC} = 5\text{ V}$ ,  $T = 25^\circ\text{C}$ , unless otherwise noted.

**Table 1.**

| Parameter                     | Conditions  | Min  | Typ        | Max  | Unit |
|-------------------------------|---|------|------------|------|------|
| <b>OVERALL FUNCTION</b>       |   |      |            |      |      |
| Frequency Range               |   | 30   |            | 1000 | MHz  |
| Gain vs. Frequency            | $\pm 50\text{ MHz}$ . Center Frequency = 190 MHz or 380 MHz               |      | $\pm 0.25$ |      | dB   |
| Input Return Loss (S11)       | 50 MHz to 750 MHz   |      | -10        |      | dB   |
| Output Return Loss (S22)      | 50 MHz to 750 MHz   |      | -10        |      | dB   |
| <b>FREQUENCY = 70 MHz</b>     |   |      |            |      |      |
| Gain                          |   |      | 19.8       |      | dB   |
| vs. Temperature               | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$                       |      | $\pm 0.25$ |      | dB   |
| Output 1 dB Compression Point |   |      | 18.7       |      | dBm  |
| Output Third-Order Intercept  | $\Delta f = 1\text{ MHz}$ , Output Power ( $P_{OUT}$ ) = 0 dBm (per tone) |      | 37.3       |      | dBm  |
| Output Second Order Intercept | $\Delta f = 1\text{ MHz}$ , Output Power ( $P_{OUT}$ ) = 0 dBm (per tone) |      | TBD        |      | dBm  |
| Noise Figure                  |   |      | 2.9        |      | dB   |
| <b>FREQUENCY = 380 MHz</b>    |   |      |            |      |      |
| Gain                          |   |      | 18.6       |      | dB   |
| vs. Temperature               | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$                       |      | $\pm 0.25$ |      | dB   |
| Output 1 dB Compression Point |   |      | 18.8       |      | dBm  |
| Output Third-Order Intercept  | $\Delta f = 1\text{ MHz}$ , Output Power ( $P_{OUT}$ ) = 0 dBm (per tone) |      | 35.7       |      | dBm  |
| Output Second Order Intercept | $\Delta f = 1\text{ MHz}$ , Output Power ( $P_{OUT}$ ) = 0 dBm (per tone) |      | TBD        |      | dBm  |
| Noise Figure                  |   |      | 3.1        |      | dB   |
| <b>FREQUENCY = 820 MHz</b>    |   |      |            |      |      |
| Gain                          |   |      | 16.8       |      | dB   |
| vs. Temperature               | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$                       |      | $\pm 0.25$ |      | dB   |
| Output 1 dB Compression Point |   |      | 18.3       |      | dBm  |
| Output Third-Order Intercept  | $\Delta f = 1\text{ MHz}$ , Output Power ( $P_{OUT}$ ) = 0 dBm (per tone) |      | 34.5       |      | dBm  |
| Output Second Order Intercept | $\Delta f = 1\text{ MHz}$ , Output Power ( $P_{OUT}$ ) = 0 dBm (per tone) |      | TBD        |      | dBm  |
| Noise Figure                  |   |      | 3.2        |      | dB   |
| <b>POWER INTERFACE</b>        |   |      |            |      |      |
| Supply Voltage                | Pins RFOUT, $V_{CC}$  | 4.75 | 5          | 5.25 | V    |
| Supply Current                |   |      | 66         |      | mA   |
| vs. Temperature               | $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$                       |      | 75         |      | mA   |
| Power Dissipation             | $V_{POS} = 5\text{ V}$  |      | 330        |      | mW   |

## ABSOLUTE MAXIMUM RATINGS

Table 2.

| Parameter                                       | Rating  |
|---|---|
| Supply Voltage, VPOS                            | 5.5 V   |
| Input Power (re: 75 $\Omega$ )                  | +12 dBm   |
| Internal Power Dissipation (Paddle Soldered)    | 650 mW  |
| $\theta_{JA}$ (Paddle Soldered)                 | TBD $^{\circ}\text{C}/\text{W}$   |
| Maximum Junction Temperature                    | TBD $^{\circ}\text{C}$  |
| Operating Temperature Range                     | $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$                            |
| Storage Temperature Range<br>(Soldering 60 sec) | $-65^{\circ}\text{C}$ to $+150^{\circ}\text{C}$<br>240 $^{\circ}\text{C}$ |

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### ESD CAUTION



**ESD (electrostatic discharge) sensitive device.** Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

## PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

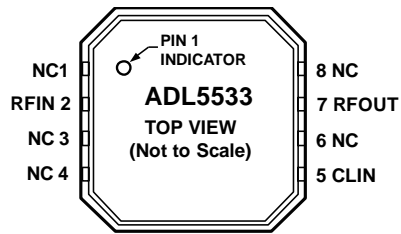


Figure 2. Pin Configuration

Table 3. Pin Function Descriptions Single

| Pin No.       | Mnemonic               | Description   |
|---------------|------------------------|---|
| 2             | RFIN                   | RF Input: Requires a DC blocking capacitor.   |
| 7             | RFOUT                  | RF Output and Bias: DC bias is provided to this pin through an inductor. RF path requires a DC blocking capacitor.  |
| 1, 3, 4, 6, 8 | NC                     | No Connect  |
| 5             | CLIN<br>Exposed Paddle | A 10 nF capacitor connected between pin 5 and ground provides decoupling for the on board linearizer. Internally connected to GND. Solder to a low impedance ground plane |

TYPICAL PERFORMANCE CHARACTERISTICS

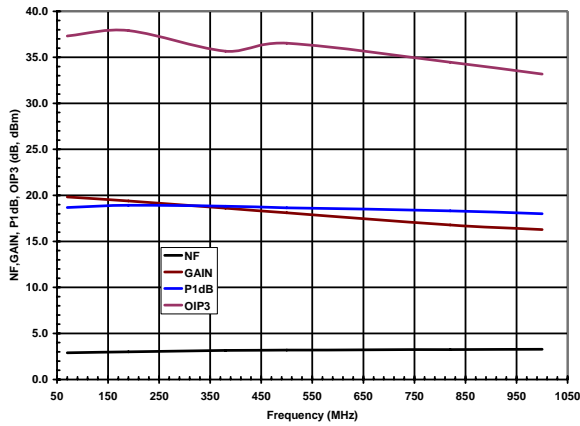


Figure 3 ADL5533 Gain, Noise Figure, OIP3 and P1dB vs Frequency

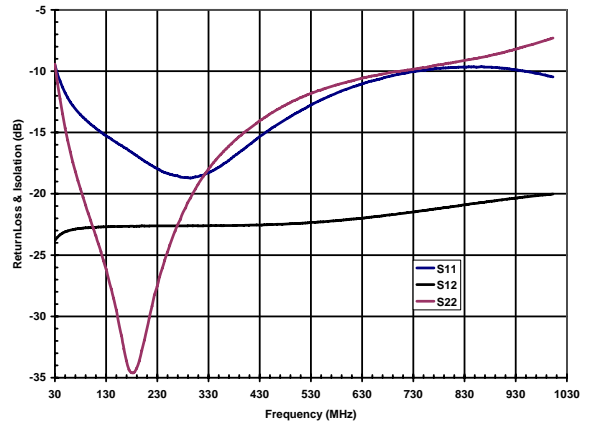


Figure 5 ADL5533 Input / Output Return Loss and Reverse Isolation vs Frequency

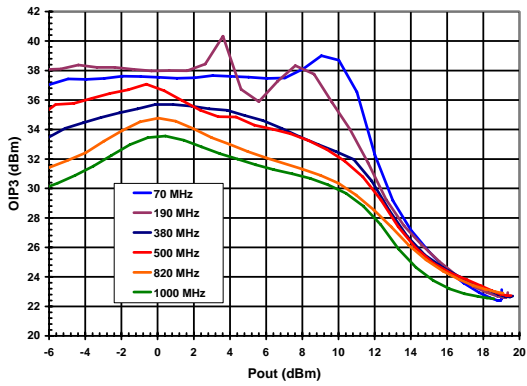


Figure 4 ADL5533 OIP3 vs Pout and Frequency

### EVALUATION BOARD

Figure 6 shows the schematic for the ADL, 5533 evaluation board. The board is powered by a single 5 V supply.

The components used on the board are listed in. Table 4 Power can be applied to the board through clip-on leads (Vcc, Gnd), or through Jumper W1.

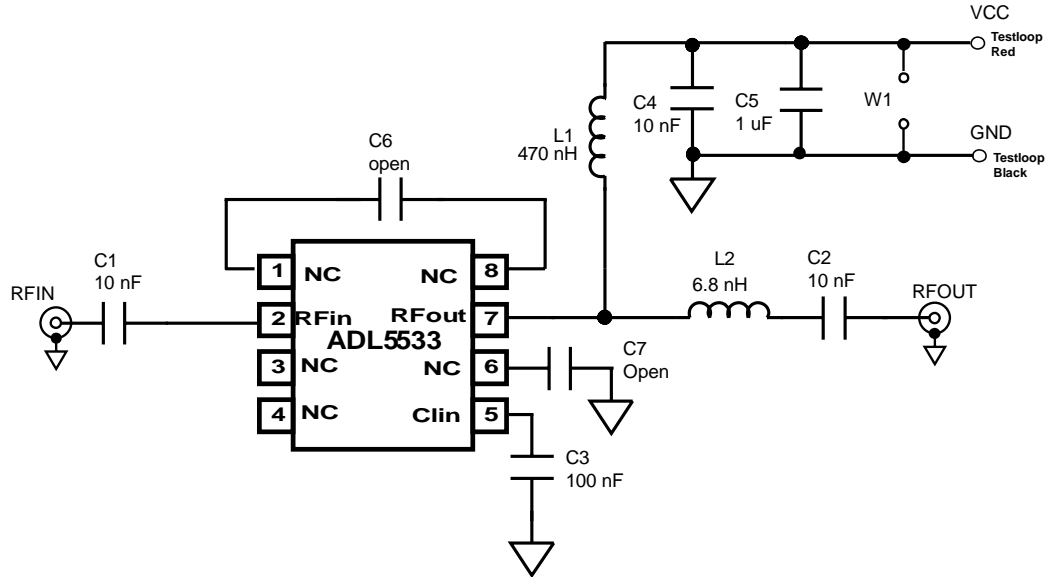


Figure 6. Evaluation Board Schematic

Table 4. Evaluation Board Configuration Options

| Component   | Function  | Default Value                |
|-------------|---|------------------------------|
| C1, C2      | AC-coupling capacitors.                                     | 10 nF 0402                   |
| C3,         | Compensates for internal non linearities                    | C3 100 nF 0603               |
| C4, C5      | Power Supply decoupling capacitors capacitor.               | C4 10 nF 0603<br>C5 1uF 0603 |
| C6, C7      |   | Open 0603                    |
| L1          | DC bias inductor.   | 470 nH L0603                 |
| L2          | Output matching element.                                    | 6.8 nH L0603                 |
| VCC & GND   | Clip-on terminals for power supply.                         | VCC Red<br>GND Black         |
| RFIN, RFOUT | RF input and output interface                               | 75 ohm "F" type connectors   |
| W1          | 2-pin jumper for connection of ground and supply via cable. |                              |

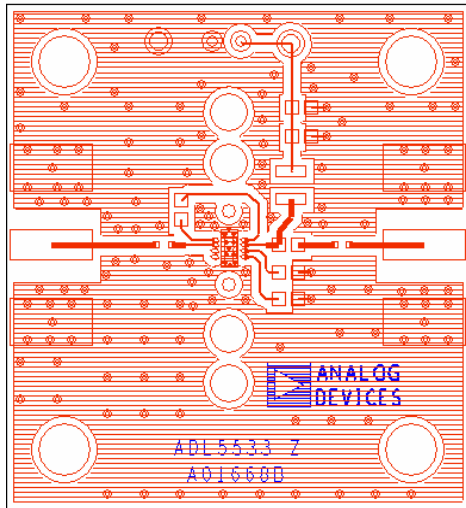


Figure 7. Evaluation Board Layout (Top)

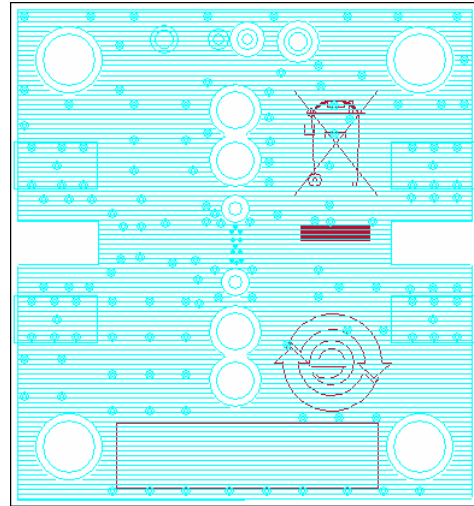


Figure 8. Evaluation Board Layout (Bottom)



### OUTLINE DIMENSIONS

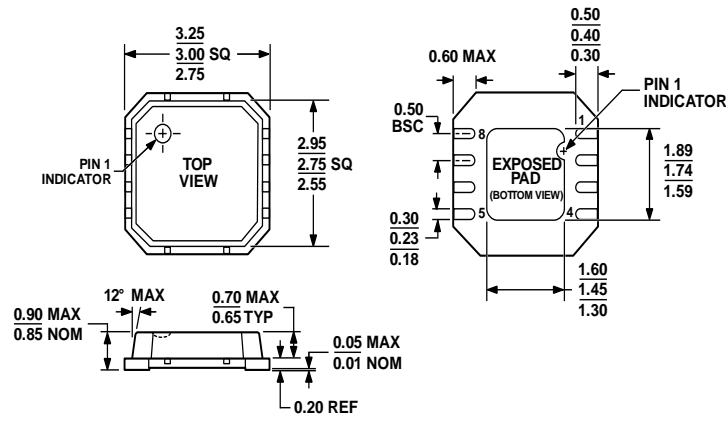


Figure 9. 8-Lead Lead Frame Chip Scale Package [LFCSP\_VD]  
 3mm x 3mm Body, Very Thin, Dual Lead  
 CP-8-2  
 Dimensions shown in millimeters

### ORDERING GUIDE

| Model                       | Temperature Range | Package Description        | Package Option | Branding | Ordering Quantity |
|-----------------------------|-------------------|----------------------------|----------------|----------|-------------------|
| ADL5533ACPZ-R7 <sup>1</sup> | -40°C to +85°C    | 8-Lead LFCSP Tape and Reel | CP-8-2         |          |                   |
| ADL5533ACPZ-WP <sup>1</sup> | -40°C to +85°C    | 8-Lead LFCSP Waffle Pack   | CP-8-2         |          |                   |
| ADL5533-EVALZ               |                   | Evaluation Board           |                |          |                   |

<sup>1</sup> Z = Pb-free part.