20 MHz to 500 MHz IF Amplifier

Preliminary Technical Data

ADL5534

FEATURES

Fixed gain of 20 dB
Operation up to 500 MHz
Input/output internally matched to 50 Ω
Integrated bias control circuit
OIP3 of 40.4 dBm at 70 MHz
P1dB of 20.4 dBm at 70 MHz
Noise Figure of 2.6 dB at 70 MHz
Single 5 V power supply
Power supply current of 90 mA per amplifier
ADL5531 20 dB gain single-channel version
± 1 kV ESD (Class 1C)

FUNCTIONAL BLOCK DIAGRAM

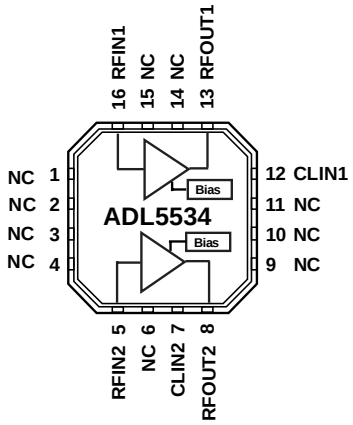

Figure 1. Block Diagram

GENERAL DESCRIPTION

The ADL5534 contains two independent broadband, fixed-gain, linear amplifiers that operates at frequencies up to 500 MHz. The device can be used in a wide variety of applications including cellular, satellite, broadband, and instrumentation equipment.

The ADL5534 has a fixed gain 20 dB and is stable over frequency, temperature, power supply and from device to device. The ADL5534 is single-ended and internally matched to 50 Ω. Only input/output ac-coupling capacitors, power supply decoupling capacitors, and an external bias inductor is required for operation for each channel.

The ADL5534 is fabricated on a GaAs HBT process, and has an ESD rating of ± 1 kV (Class 1C). The device is packaged in a 16-lead 5mm x 5mm LFCSP that uses an exposed paddle for excellent thermal impedance.

The ADL5534 consumes 90 mA per channel on a single +5 V supply and is fully specified for operation from −40°C to +85°C.

The ADL5531 is the 20 dB gain single-channel version, and fully populated evaluation boards for each IFA are available.

Rev. PrE 2/08

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REVISION HISTORY

2/08—Rev. PrE: Preliminary Version

SPECIFICATIONS

V_{CC} = 5 V, T = 25°C, unless otherwise noted.

Table 1.

Parameter	Conditions	Min	Typ	Max	Unit
OVERALL FUNCTION					
Frequency Range		20		500	MHz
Gain vs. Frequency	± 50 MHz. Center Frequency = 190 MHz or 380 MHz		±0.2		dB
Input Return Loss (S11)	30 MHz to 500 MHz		-10		dB
Output Return Loss (S22)	30 MHz to 500 MHz		-10		dB
Isolation (RFIN1 to RFOUT2 and RFIN2 to RFOUT1)	Frequency = 200 MHz		-36.5		dB
Isolation (RFIN1 to RFOUT2 and RFIN2 to RFOUT1)	Frequency = 500 MHz		-30.6		dB
FREQUENCY = 70 MHz					
Gain			21.0		dB
vs. Temperature	−40°C ≤ T_A ≤ +85°C		±.25		dB
Output 1 dB Compression Point			20.4		dBm
Output Third-Order Intercept	Δf = 1 MHz, Output Power (P_{OUT}) = 0 dBm (per tone)		40.4		dBm
Noise Figure			2.6		dB
FREQUENCY = 190 MHz					
Gain			20.4		dB
vs. Temperature	−40°C ≤ T_A ≤ +85°C		±.25		dB
Output 1 dB Compression Point			20.6		dBm
Output Third-Order Intercept	Δf = 1 MHz, Output Power (P_{OUT}) = 0 dBm (per tone)		38.9		dBm
Noise Figure			2.8		dB
FREQUENCY = 380 MHz					
Gain			19.8		dB
vs. Temperature	−40°C ≤ T_A ≤ +85°C		±.25		dB
Output 1 dB Compression Point			20.4		dBm
Output Third-Order Intercept	Δf = 1 MHz, Output Power (P_{OUT}) = 0 dBm (per tone)		36.3		dBm
Noise Figure			3.0		dB
POWER INTERFACE	Pins RFOUT, Vcc				
Supply Voltage		4.75	5	5.25	V
Supply Current	Current Consumption is Specified Per Amplifier		90		mA
vs. Temperature	−40°C ≤ T_A ≤ +85°C (Specified Per Amplifier)		104		mA
Power Dissipation	VPOS = 5V (Specified Per Amplifier)		450		mW

ABSOLUTE MAXIMUM RATINGS

Table 2.

Parameter	Rating
Supply Voltage, VPOS	5.5 V
Input Power Per Amplifier(re: 50 Ω)	+12 dBm
Internal Power Dissipation Per Amplifier (Paddle Soldered)	650 mW
θ_{JA} (Paddle Soldered)	TBD °C/W
Maximum Junction Temperature	150 °C
Operating Temperature Range	−40°C to +85°C
Storage Temperature Range	−65°C to +150°C
(Soldering 60 sec)	240°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

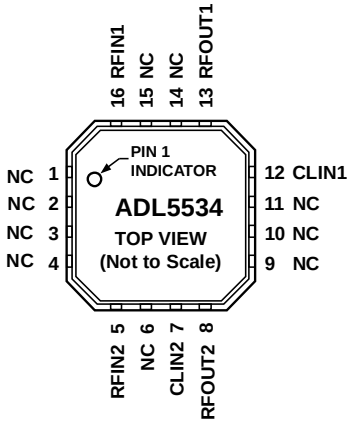

Figure 2.

Table 3. Pin Function Descriptions

Pin No.	Mnemonic	Description
1, 2, 3, 4, 6, 9, 10, 11, 14, 15	NC	No connect.
5, 16	RFIN2, RFIN1	RF Input: Requires a DC blocking capacitor. Use a 10 nF capacitor for normal operation.
8, 13	RFOUT2, RFOUT1	RF Output and Bias: DC bias is provided to this pin through an inductor. A 470 nH inductor is recommended for normal operation. RF path requires a DC blocking capacitor. Use a 10 nF capacitor for normal operation.
7, 12	CLIN2, CLIN1	A 1 nF capacitor connected between 7 and ground an Pin12 and ground provides decoupling for the on board linearizer.
	Exposed Paddle	Internally connected to GND. Solder to a low impedance ground plane

TYPICAL PERFORMANCE CHARACTERISTICS

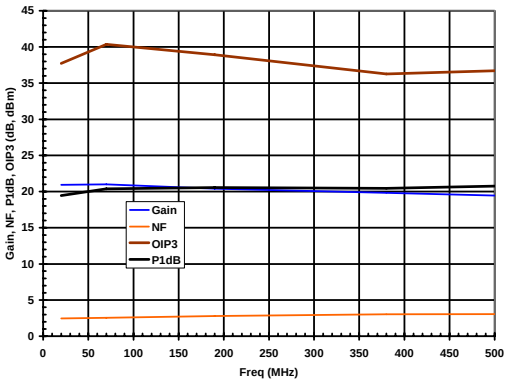

Figure 3 ADL5534 Gain, Noise Figure, OIP3 and P1dB vs Frequency

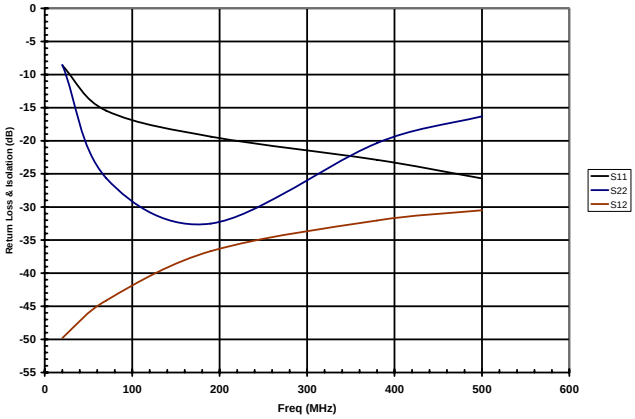

Figure 5 ADL5534 Input / Output Return Loss and Reverse Isolation vs Frequency

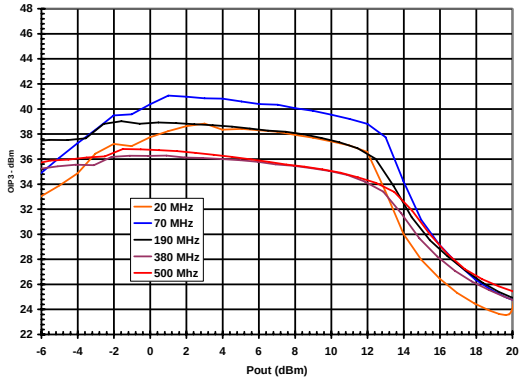

Figure 4 ADL5534 OIP3 vs Pout and Frequency

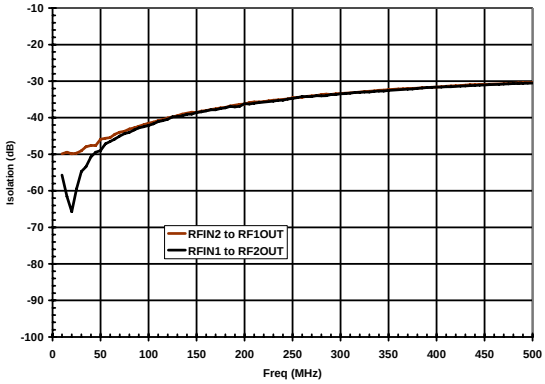

Figure 6. ADL5534 Input to alternate Output Isolation

EVALUATION BOARD

Figure 7 shows the schematic for the ADL5534 evaluation board. The board is powered by a single 5 V supply. The components used on the board are listed in. Table 4 Transformers, T1 and T2 are provided so the ADL5534 maybe configured as a balanced amplifier. Applying 5V to Vpos will bias the amplifier corresponding to RFIN1 - RFOUT2.

Applying 5 V toVpos1 will bias the amplifier corresponding to RFIN2 – RFOUT2 To bias both amplifiers from a single supply, connect 5V to Vpos or Vpos1 and attach a jumper across W3

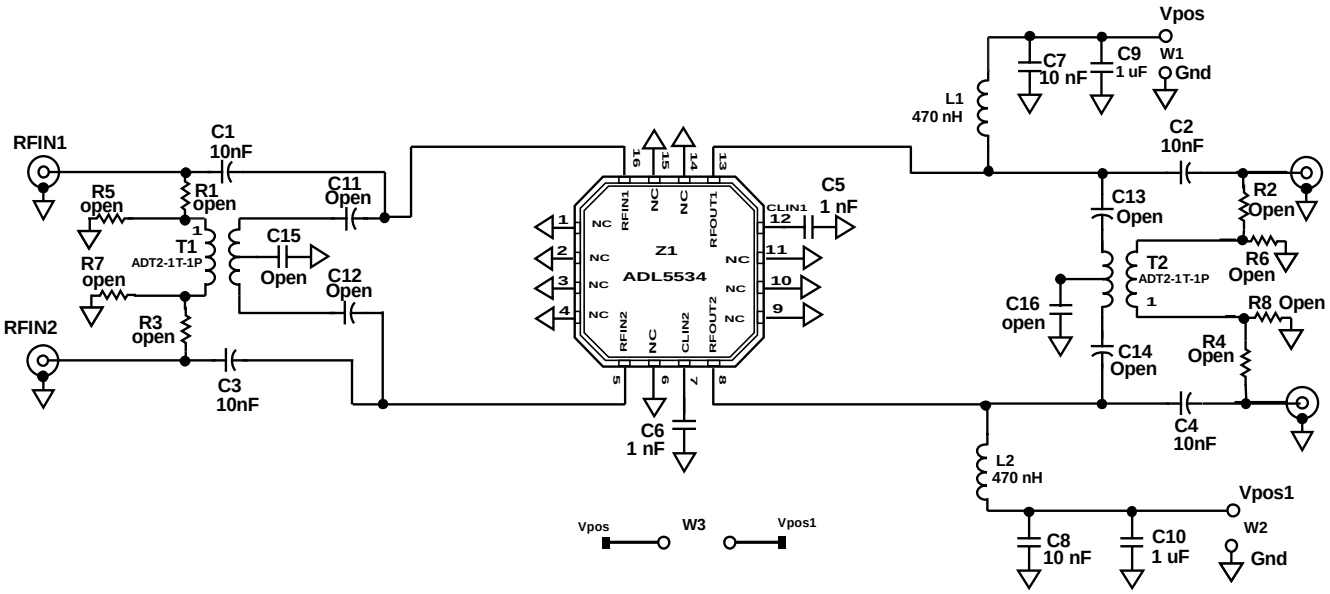

Figure 7. Evaluation Board Schematic

Table 4. Evaluation Board Configuration Options

Component	Function	Default Value
C1, C2, C3, C4	AC-coupling capacitors.	10 nF 0402
C5, C6	Provides decoupling for the on board linearizer.	1 nF 0603
R1, R2, R3, R4, R5, R6, R7 R8	Optional components used for Configuring ADL5534 as a balanced amplifier.	Open 0603
T1, T2	T1 and T2 are 50 Ω t o100 Ω impedance transformers used to configure the ADL5534 as a balanced amplifier. T1 and T2 are used to present a 100 Ω differential impedance to the ADL5534.	MiniCircuits ADT2-1T-1P
C11, C12, C13, C14, C15, C16	Optional components used for Configuring ADL5534 as a balanced amplifier.	C11-C14: Open 0402 C15,C16: Open 0402
C9, C10	Power Supply decoupling capacitors capacitor.	1 uF 0603
C7, C8	Power Supply decoupling capacitors capacitor.	10 nF 0603
L1, L2	DC bias inductor.	470 nH 1008CS
VCC & GND	Clip-on terminals for power supply.	VCC Red GND Black
W1,W2	2-pin jumper for connection of ground and supply via cable.	
W3	2-pin jumper use to connect Vpos to Vpos1	Open

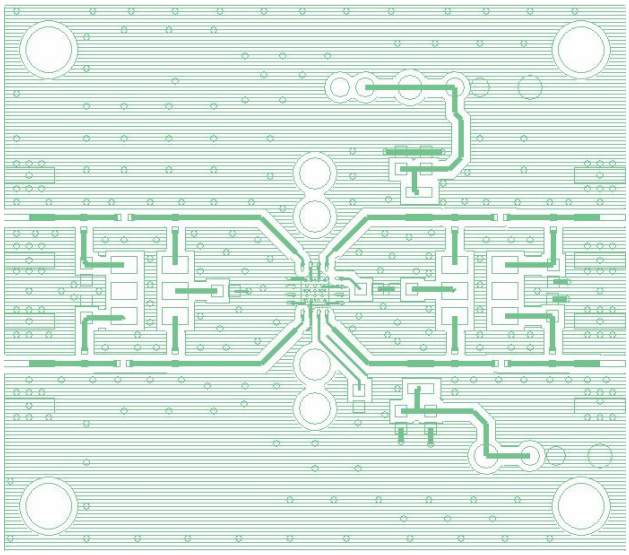

Figure 8. Evaluation Board Layout (Top)

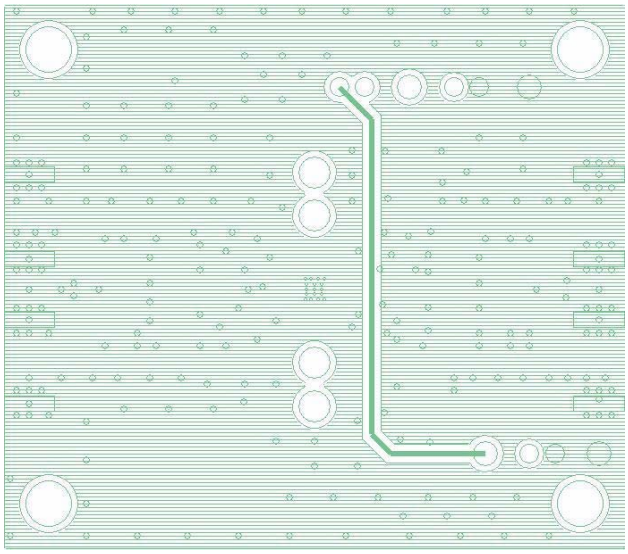

Figure 9. Evaluation Board Layout (Bottom)

OUTLINE DIMENSIONS

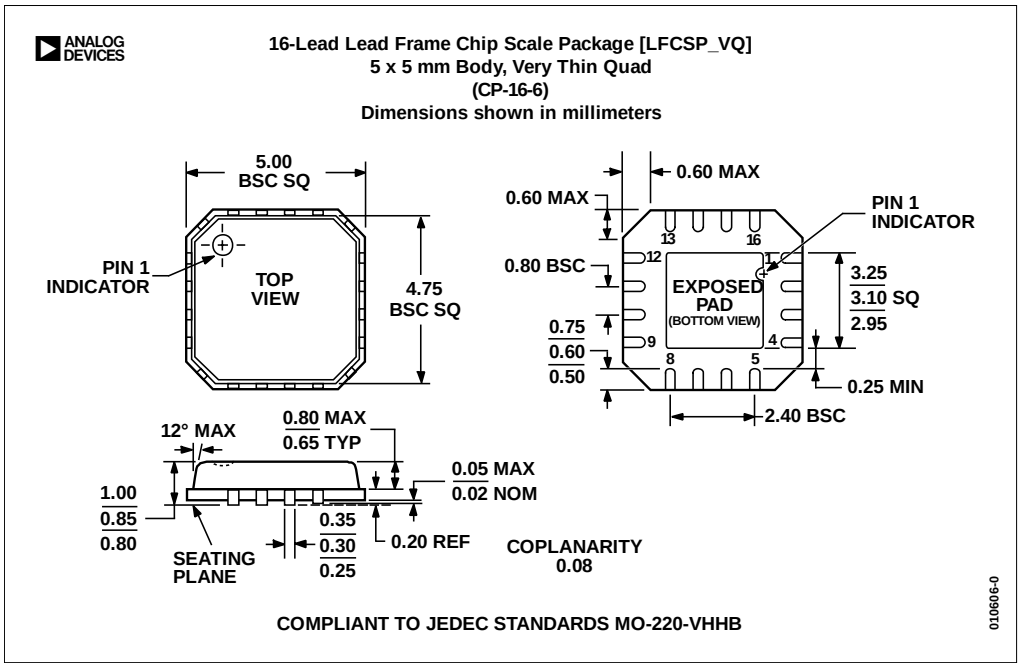

Figure 10. 16-Lead Lead Frame Chip Scale Package [LFCSP_VQ]
5mm × 5 mm Body, Very Thin, Quad Lead
CP-16-6
Dimensions shown in millimeters

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Branding	Ordering Quantity
ADL5534ACPZ-R7[1]	−40°C to +85°C	8-Lead LFCSP_VQ, Tape and Reel	CP-16-6		
ADL5534-EVALZ[1]		Evaluation Board			

[1] Z = RoHS Compliant part.

PR06836-0-2/08(PrE)