GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 350 - 550 MHz

Typical Applications

The HMC356LP3 / HMC356LP3E is ideal for basestation receivers:

- GSM 450 & GSM 480
- CDMA 450
- Private Land Mobile Radio

Features

Noise Figure: ≤1.0 dB

+38 dBm Output IP3

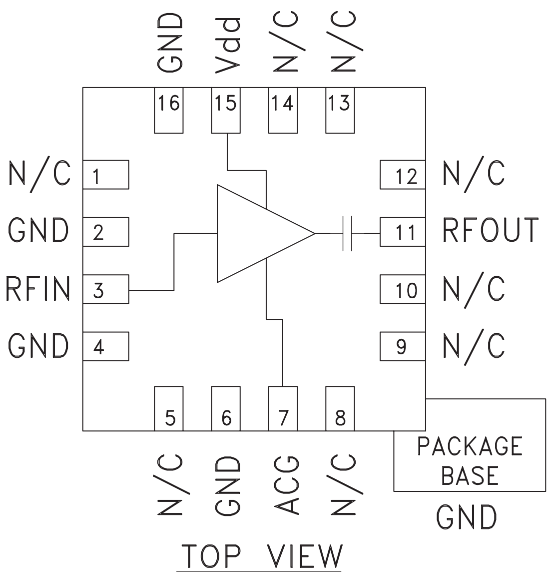
Gain: 17 dB

Very Stable Gain vs. Supply & Temperature

Single Supply: +5V @ 104 mA

50 Ohm Matched Output

Functional Diagram



General Description

The HMC356LP3 & HMC356LP3E are high dynamic range GaAs PHEMT MMIC Low Noise Amplifiers is ideal for GSM & CDMA cellular basestation and Mobile Radio front-end receivers operating between 350 and 550 MHz. This LNA has been optimized to provide 1.0 dB noise figure, 17 dB gain and +38 dBm output IP3 from a single supply of +5V @ 104 mA. Input and output return losses are 15 dB typical, with the LNA requiring only four external components to optimize the RF input match, RF ground and DC bias. For applications which require improved noise figure, please see the HMC616LP3(E).

Electrical Specifications, T_A = +25° C, Vs = +5V

Parameter	Min.	Typ.	Max.	Units
Frequency Range		350 - 550		MHz
Gain	15	17		dB
Gain Variation Over Temperature		0.0032	0.010	dB / °C
Noise Figure		1.0	1.4	dB
Input Return Loss		17		dB
Output Return Loss		12		dB
Reverse Isolation		24		dB
Output Power for 1dB Compression (P1dB)	17	21		dBm
Saturated Output Power (Psat)		22.5		dBm
Output Third Order Intercept (IP3) (-20 dBm Input Power per tone, 1 MHz tone spacing)	34	38		dBm
Supply Current (Idd)		104		mA

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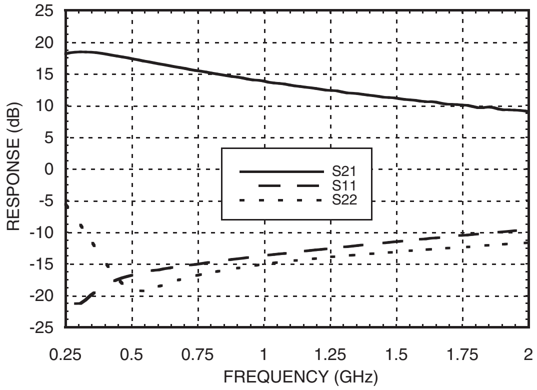
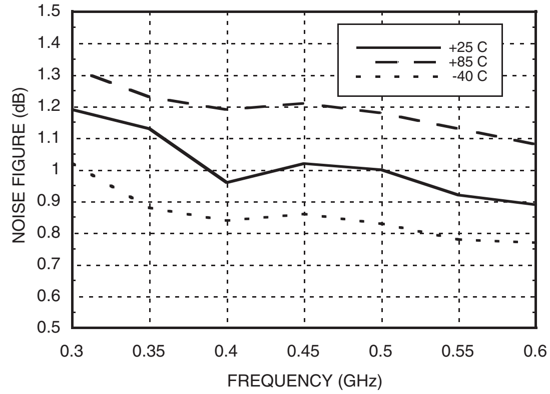
Application Support: Phone: 1-800-ANALOG-D*

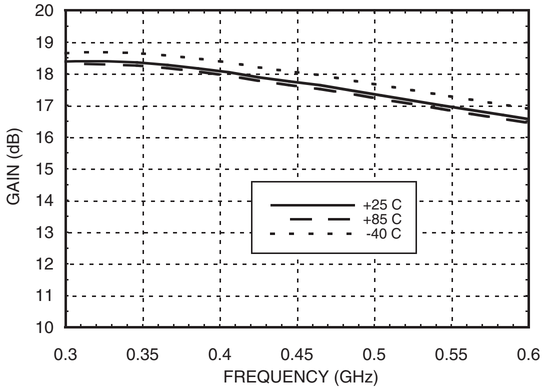
Broadband Gain & Return Loss



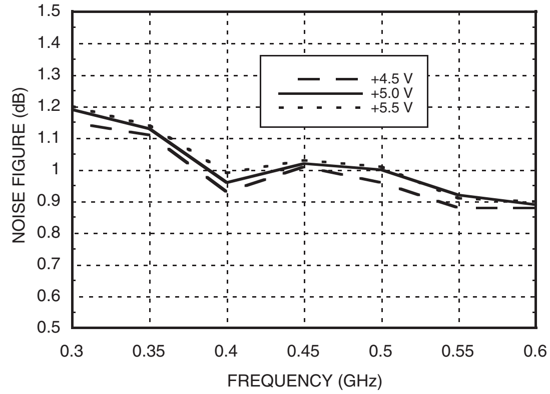
Noise Figure vs. Temperature



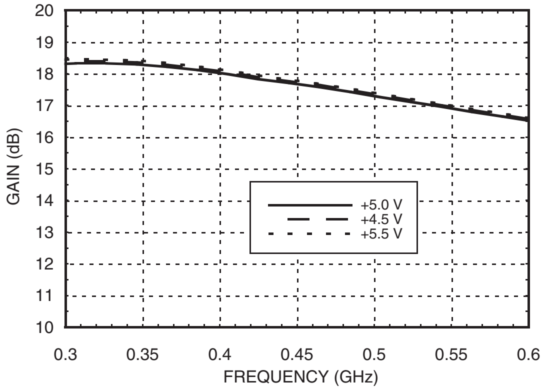
Gain vs. Temperature



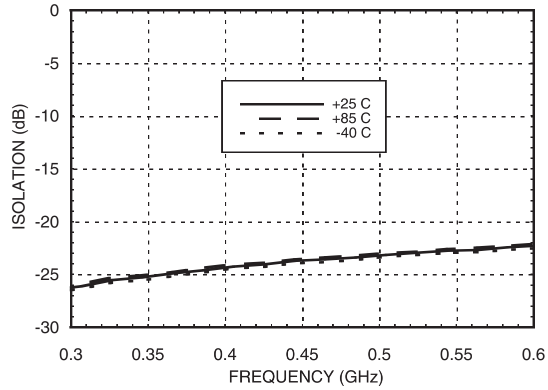
Noise Figure vs. Vdd



Gain vs. Vdd



Reverse Isolation



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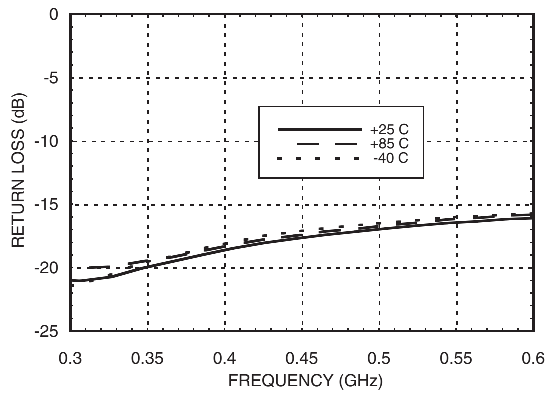
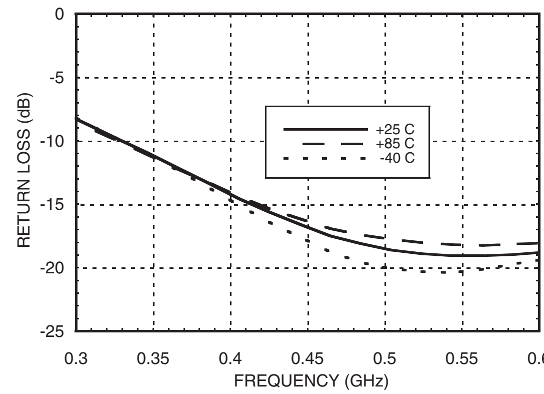
GaAs PHEMT MMIC LOW NOISE AMPLIFIER, 350 - 550 MHz

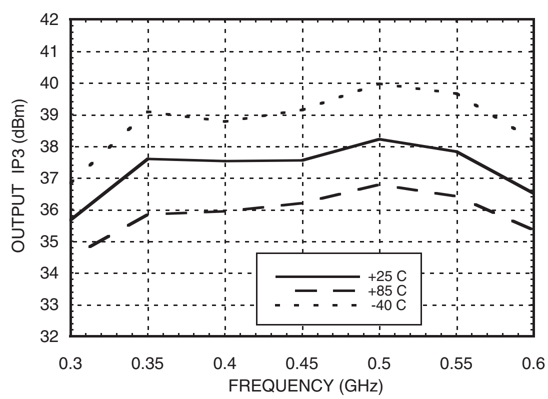
Input Return Loss vs. Temperature



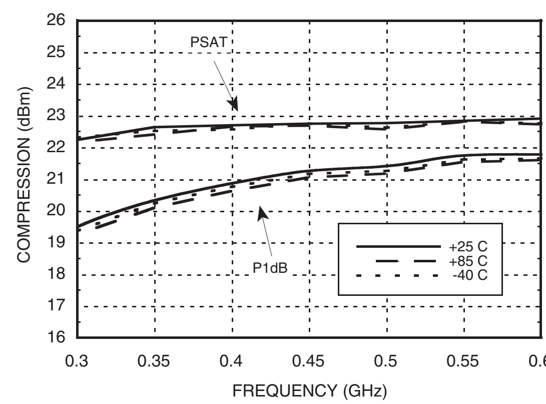
Output Return Loss vs. Temperature



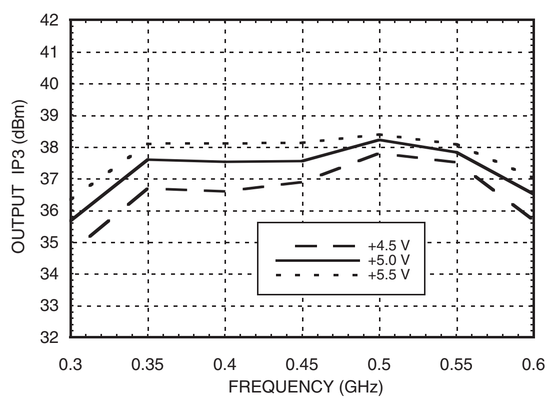
Output IP3 vs. Temperature



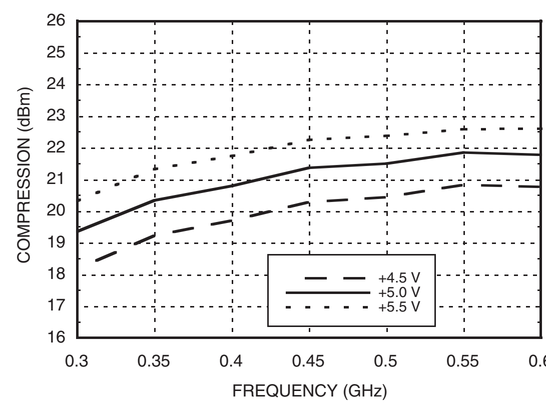
P1dB & Psat vs. Temperature



Output IP3 vs. Vdd



P1dB vs. Vdd



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Absolute Maximum Ratings

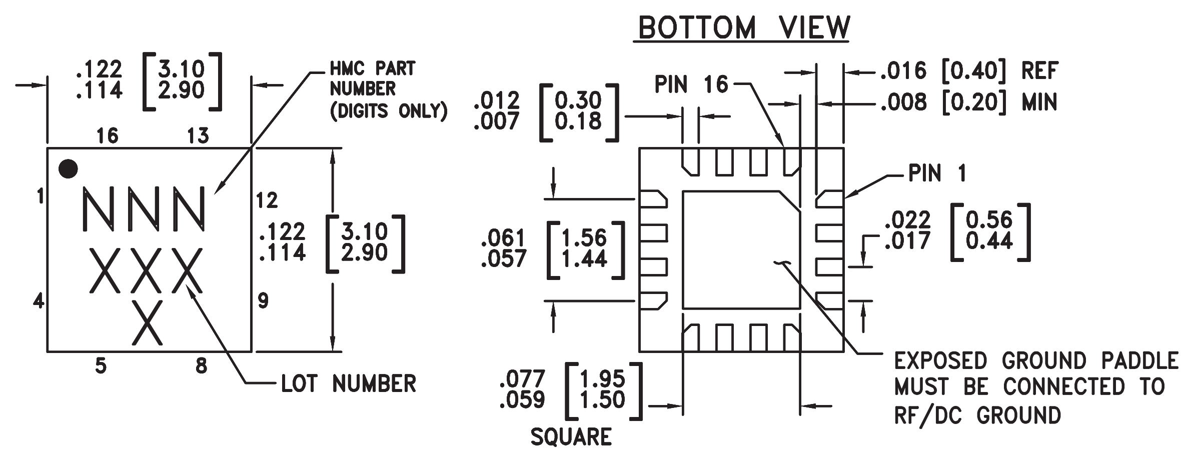
Drain Bias Voltage (Vdd)	+8.0 Vdc
RF Input Power (RFIN)(Vdd = +5.0 Vdc)	+15 dBm
Channel Temperature	150 °C
Continuous Pdiss (T = 85 °C) (derate 14 mW/°C above 85 °C)	0.910 W
Thermal Resistance (channel to ground paddle)	71.4 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

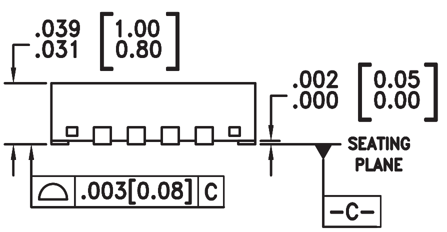
Typical Supply Current vs. Vdd

Vdd (Vdc)	Idd (mA)
+4.5	103
+5.0	104
+5.5	105

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing





NOTES:
1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
4. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM.
   PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
7. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED LAND PATTERN.

Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [3]
HMC356LP3	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 [1]	356 XXXX
HMC356LP3E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	<u>356</u> XXXX

[1] Max peak reflow temperature of 235 °C
[2] Max peak reflow temperature of 260 °C
[3] 4-Digit lot number XXXX

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HMC356LP3 / 356LP3E

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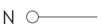
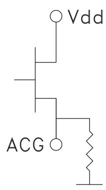
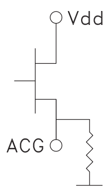
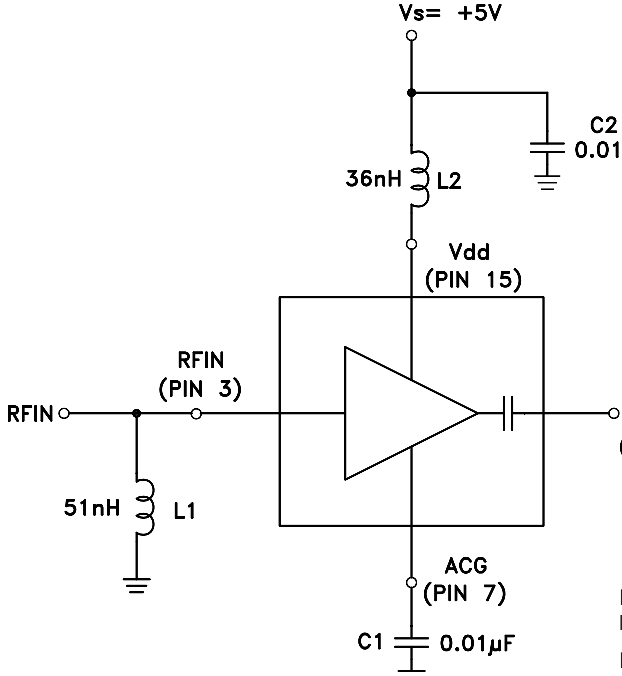
Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 5, 8, 9, 10, 12, 13, 14	N/C	No connection necessary. These pins may be connected to RF/DC ground.	
2, 4, 6,16	GND	These pins and package ground paddle must be connected to RF/DC ground.	
3	RFIN	This pin is matched to 50 Ohms with a 51 nH inductor to ground. See Application Circuit.	
7	ACG	AC Ground - An external capacitor of 0.01µF to ground is required for low frequency bypassing. See Application Circuit for further details.	
11	RFOUT	This pin is AC coupled and matched to 50 Ohms.	
15	Vdd	Power supply voltage. Choke inductor and bypass capacitor are required. See application circuit.	

Application & Evaluation PCB Circuit



Note 1: Choose value of capacitor C1 for low frequency bypassing. A 0.01 µF ±10% capacitor is recommended.

Note 2: L1, L2 and C1 should be located as close to pins as possible.

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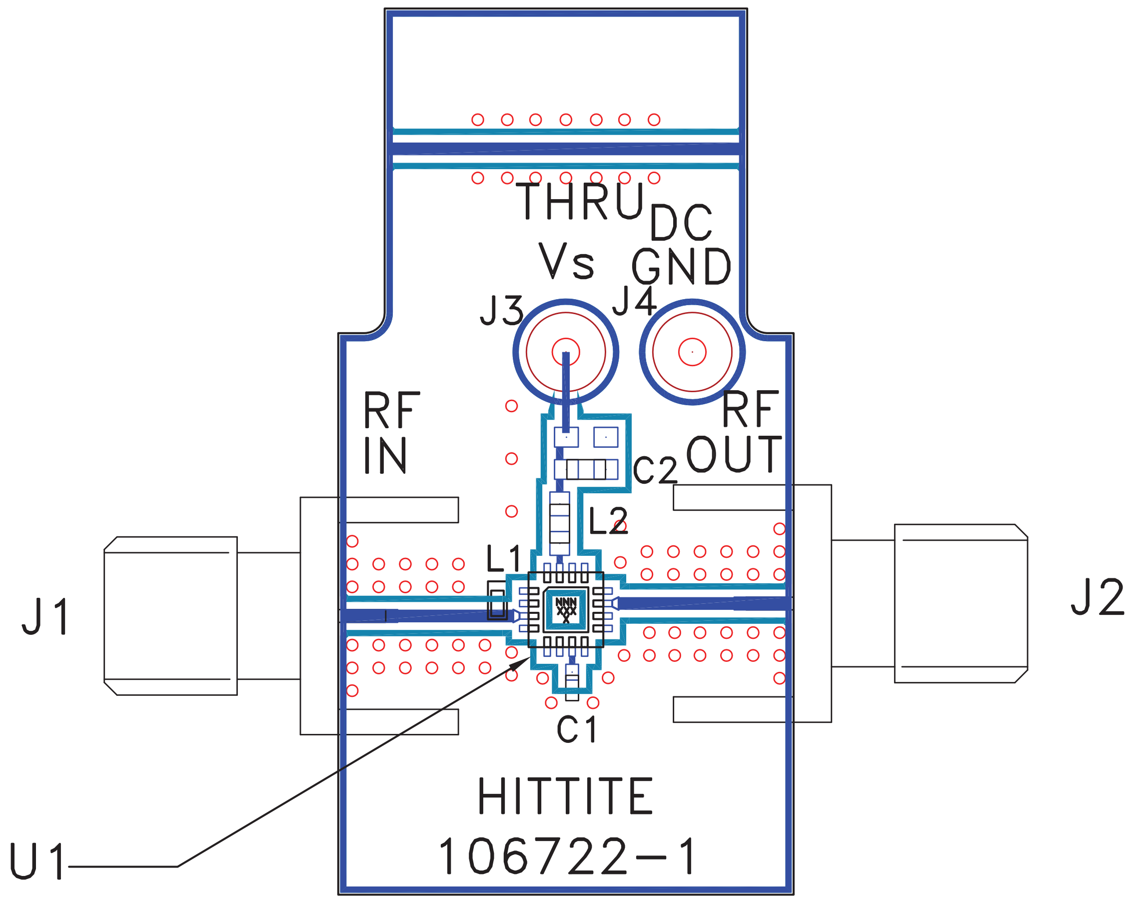
Evaluation PCB



List of Materials for Evaluation PCB 107795 [1]

Item	Description
J1 - J2	PCB Mount SMA RF Connector
J3 - J4	DC Pin
C1	10,000 pF Capacitor, 0402 Pkg.
C2	10,000 pF Capacitor, 0603 Pkg.
L1	51 nH Inductor, 0402 Pkg.
L2	36 nH Inductor, 0603 Pkg.
U1	HMC356LP3 / HMC356LP3E Amplifier
PCB [2]	106722 Evaluation PCB

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation circuit board shown is available from Hittite upon request.

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