HMC309MS8

GaAs MMIC 2.4 GHz FRONT-END LNA / SWITCH

Typical Applications

LNA & Transmit/Receive Switch Front-End for 2.4 GHz Applications:

- 802.11 WLAN
- BLUETOOTH
- HomeRF
- ISM Radios

Features

Gain: 8 dB

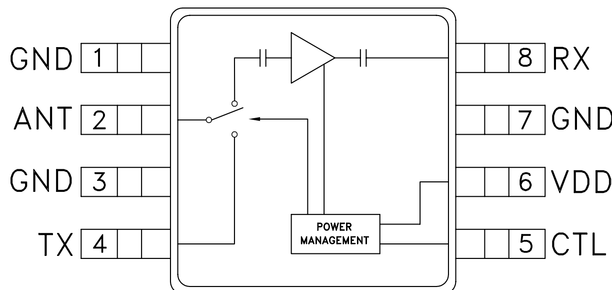
Noise Figure: 2.5 dB

Integrated LNA & Switch

Integrated Power Control: +3V Operation

Ultra Small Package: MSOP8

Functional Diagram



General Description

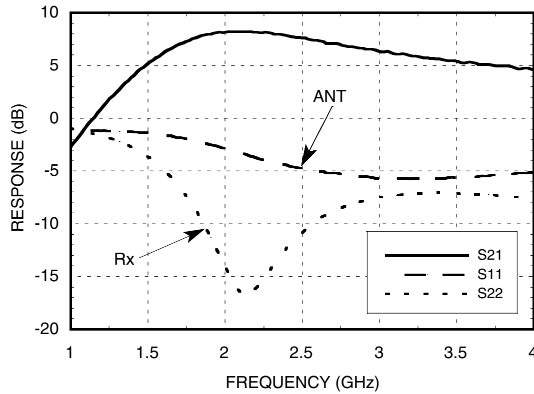
The HMC309MS8 is a versatile integrated low noise amplifier (LNA) and transmit/receive switch front-end for 2.3 to 2.5 GHz spread spectrum applications. The LNA offers 8 dB gain and 2.5 dB noise figure while the transmit switch path has 0.5 dB insertion loss and better than +30 dBm linear power handling. Using a single control line, the LNA is powered down when the switch Tx port is selected minimizing Idd current consumption to 5 mA in the Rx mode and 200 uA in the Tx mode at Vdd = +3V bias. The HMC309MS8 may be directly interfaced with popular 2.4 GHz transceiver chips. At a height of 0.040” (1.0mm), the MSOP8 package is ideal for low profile portable wireless devices.

Electrical Specifications, T_A = +25° C, Vdd = +3V

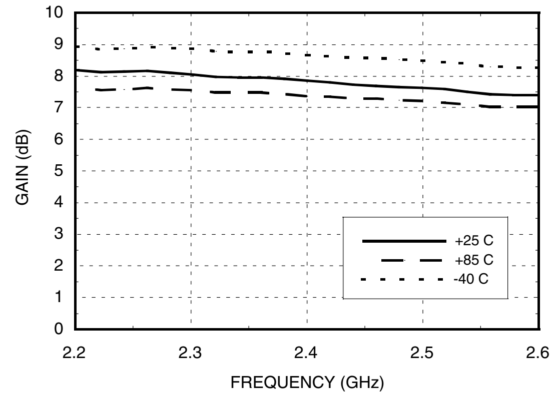
Parameter	LNA (Rx) Path			Swtiched Path			Units
	Min.	Typ.	Max.	Min.	Typ.	Max.	
Frequency Range		2.3 - 2.5			2.3 - 2.5		GHz
Gain	5	8	10	-0.6	-0.4		dB
Gain Variation over Temperature		0.012	0.02				dB/°C
Noise Figure		2.5	3.8		0.45		dB
Input Return Loss		5		14	25		dB
Output Return Loss		13		16	20		dB
Output Power for 1 dB Compression (P1dB)*	2	6		30	33		dBm
Output or Input Third Order Intercept (IP3)*	5	8		27	40		dBm
Supply Current (Idd)		5	10		0.2	0.4	mA

* The LNA P1dB & IP3 are referenced to the Rx pin output while the switch P1dB & IP3 are referenced to the Tx pin

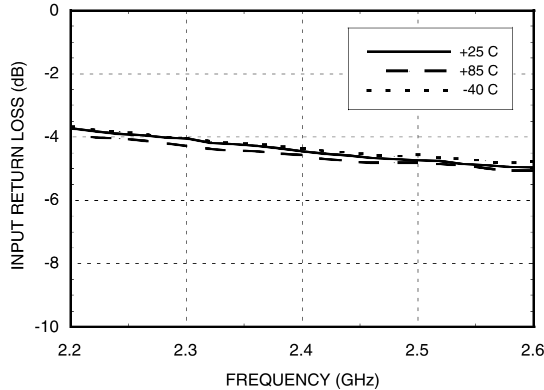
LNA Broadband Gain & Return Loss



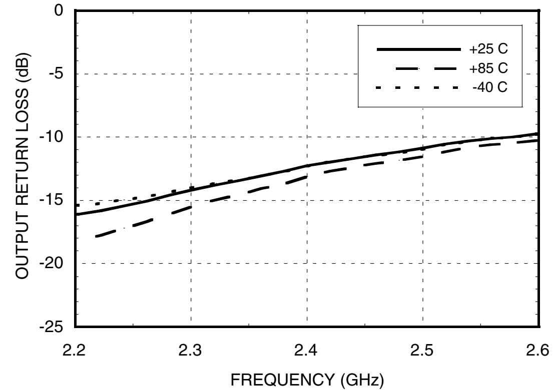
LNA Gain vs. Temperature, ANT to Rx



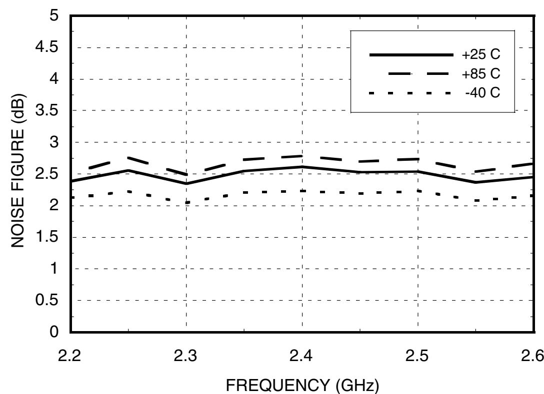
LNA Input Return Loss @ ANT vs. Temperature



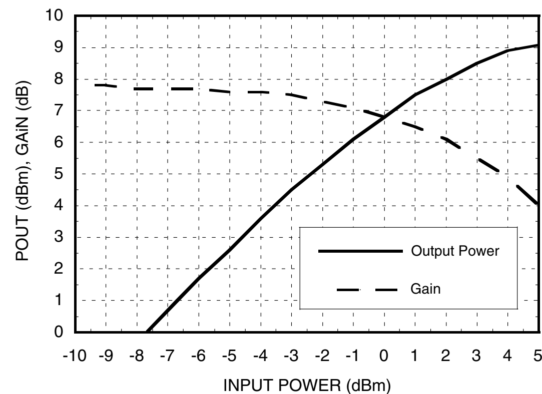
LNA Output Return Loss @ Rx vs. Temperature



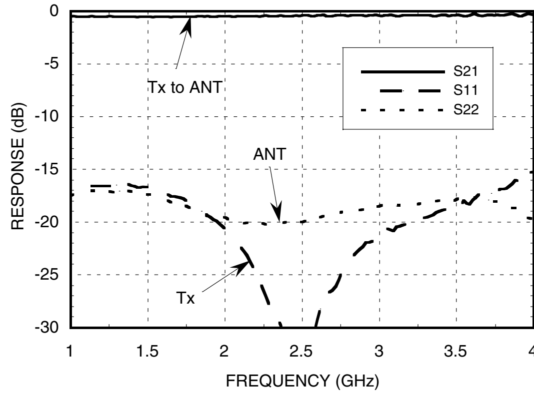
LNA Noise Figure vs. Temperature, ANT to Rx



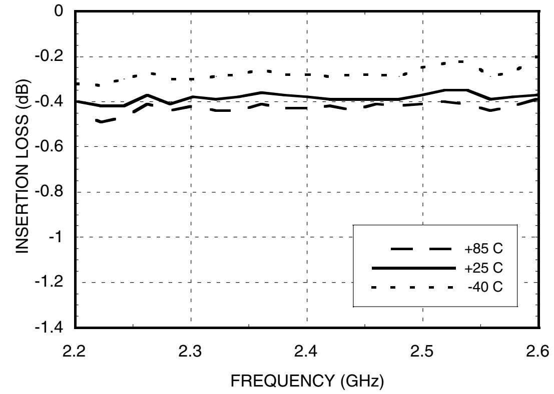
LNA Power Compression@ 2.4 GHz



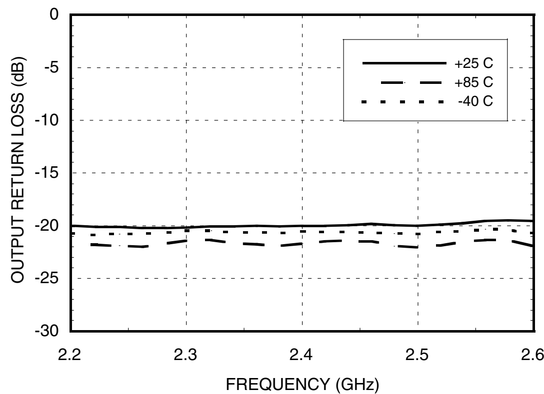
Switch Path Broadband Insertion Loss & Return Loss



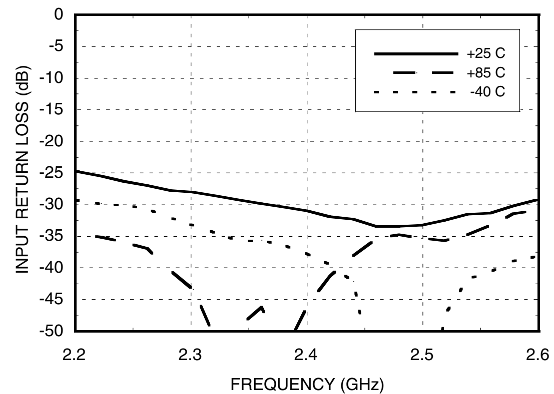
Switch Path Insertion Loss vs. Temperature, Tx to ANT



Switch Path Input Return Loss @ Tx vs. Temperature



Switch Path Output Return Loss @ ANT vs. Temperature

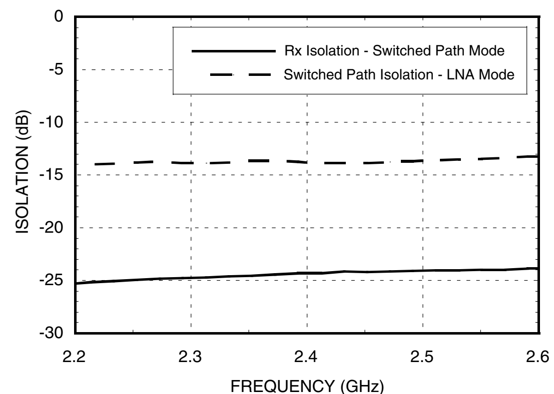


IP3 vs. Temperature

	Frequency = 2.4 GHz	
Temperature	LNA (Rx) Path	Switched Path
-40 °C	8.3	41.4
+25 °C	8.2	39.6
+85 °C	7.8	44.2

All levels in dBm
LNA path Output IP3 referenced to Rx port
Switched path Input IP3 referenced to Tx port

Tx/Rx Isolation



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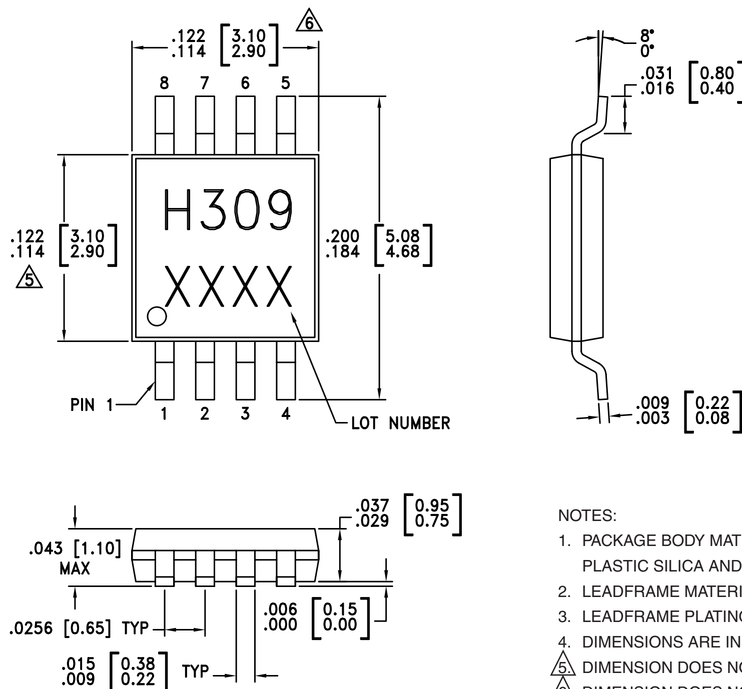
20 Alpha Road Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373
Order Online at www.hittite.com

Absolute Maximum Ratings

Drain Bias Voltage (Vdd)	+8.0 Vdc
Control Voltage Range (CTL)	-0.2V to Vdd
Input Power @ ANT (LNA “ON”, Vdd = +3.0 Vdc)	+10 dBm
Input Power @ Tx (Switch “ON”, Vdd = +3.0 Vdc)	+34 dBm
Channel Temperature	150 °C
Continuous Pdiss (T = 85 °C) (derate 0.6 mW/°C above 85 °C)	0.039 W
Thermal Resistance (channel to lead)	1666 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

Outline Drawing



NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEADFRAME MATERIAL: COPPER ALLOY
3. LEADFRAME PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

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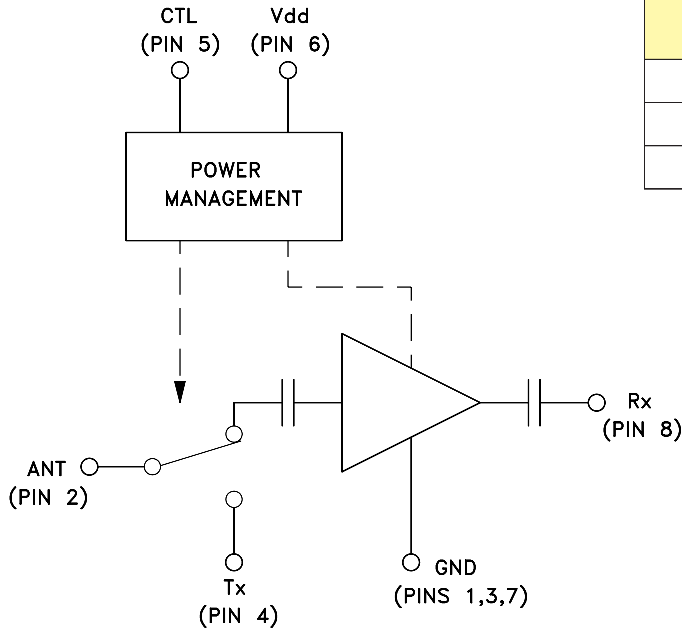
Application Circuit



Truth Table

Control Input Tolerances are ± 0.2 Vdc.

Control Input (Vdc)	Signal Path	
CTL	ANT to Rx	Tx to ANT
0	On	Off
+3	Off	On

Note: DC blocking capacitors are required on the ANT port (Pin 2) and the Tx port (Pin 4).

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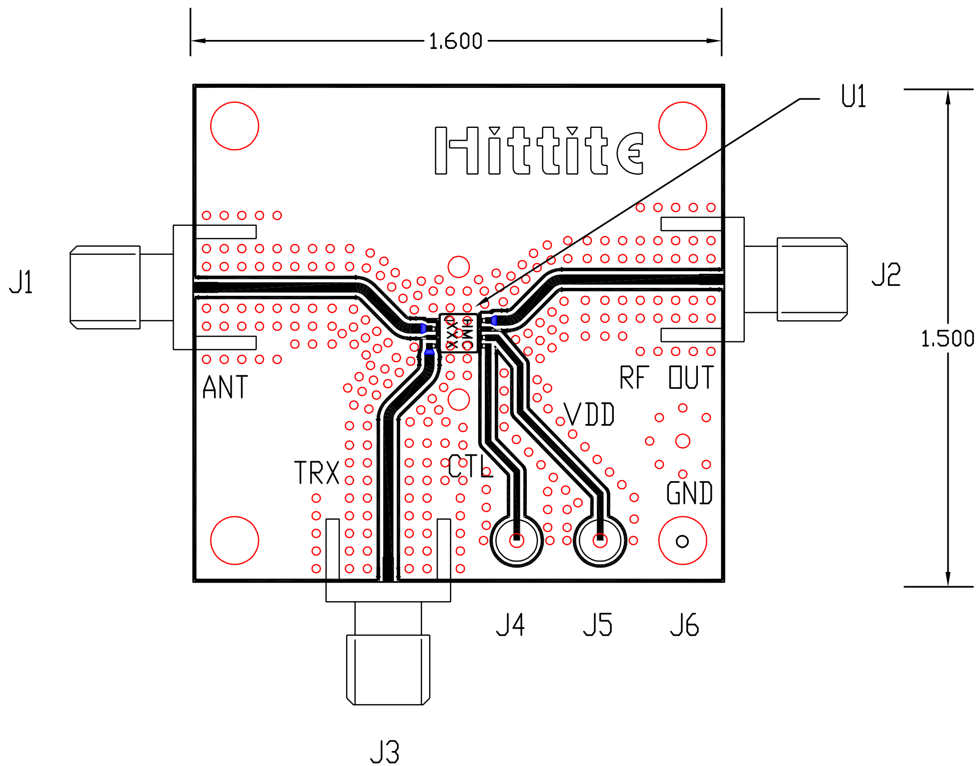
Evaluation PCB



List of Material

Item	Description
J1, J2, J3	PC Mount SMA Connector
J4, J5, J6	DC Pins
U1	HMC309MS8 Amplifier
PCB*	Evaluation Board 1.5" x 1.55"
*Circuit Board Material: Roger 4350	

The circuit board used in the final application should use RF circuit design techniques. Signal lines should have 50 ohm impedance while the package ground leads 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.