

LOW NOISE AMPLIFIER WITH AGC 2.3 - 2.5 GHz

FEBRUARY 2001

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Features

LNA w/ 30 dB Gain Control

+3V Operation

Ideal for 802.11, HomeRF,
& BLUETOOTH Applications

No External Components

Ultra Small 8 Lead MSOP:
14.8 mm² x 1mm High



General Description

The HMC287MS8 is a low cost Low Noise Amplifier (LNA) for spread spectrum applications including BLUETOOTH, HomeRF, 802.11 WLAN and 2.5 GHz radios. The LNA offers 22 dB of gain and a 2.5 dB noise figure from a single positive +3V supply that requires only 9mA. The HMC287MS8G can be used as a variable gain LNA, offering 30 dB of gain control, which is controlled with a 0 to 3V analog voltage. The typical output 1dB compression point is +3 dBm and OIP3 is +7 dBm when in the maximum gain state. The compact LNA design utilizes on-chip matching for repeatable gain and noise figure performance and eliminates the need for external matching circuitry to reduce the overall size of the LNA function.

Guaranteed Performance, $V_{dd} = +3V$, -40 to $+85$ deg C

Parameter*	Min.	Typ.	Max.	Units
Frequency Range	2.3 - 2.5			GHz
Gain ($V_{CTL} = 0V$) @ 25°C	17	22	28	dB
Gain Variation over Temperature		0.03	0.04	dB/ °C
Gain Adjustment Range (V_{CTL} 0 to +3V)		30		dB
Noise Figure ($V_{CTL} = 0V$)		2.5	3.0	dB
Input Return Loss	5	10		dB
Output Return Loss	3	6		dB
Output 1dB Compression (P1dB)	-2	3		dBm
Output Third Order Intercept (IP3)	3	7		dBm
Recommended Supply Voltage (V_{dd})	2.75	3.0	3.25	Vdc
Control Voltage (V_{CTL})	0		V_{dd}	Vdc
Supply Current (I_{dd}) ($V_{dd} = +3.0$ Vdc)		9	15	mA

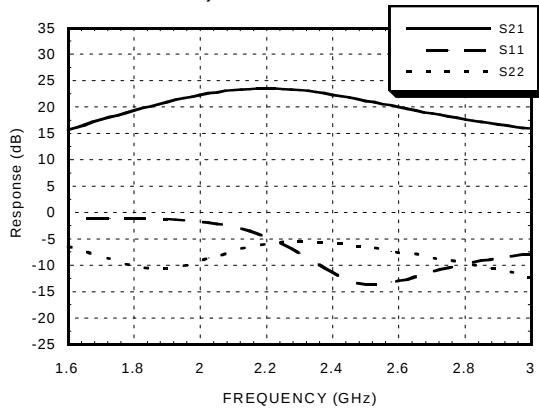
* Specifications refer to the maximum gain state ($V_{ctl} = 0V$) unless otherwise noted.

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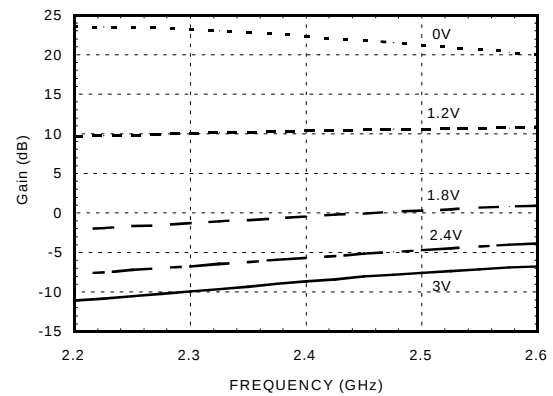
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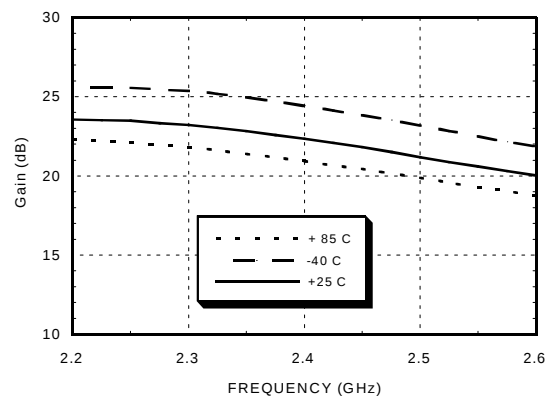
Broadband Gain & Return Loss, $V_{ctl} = 0V$



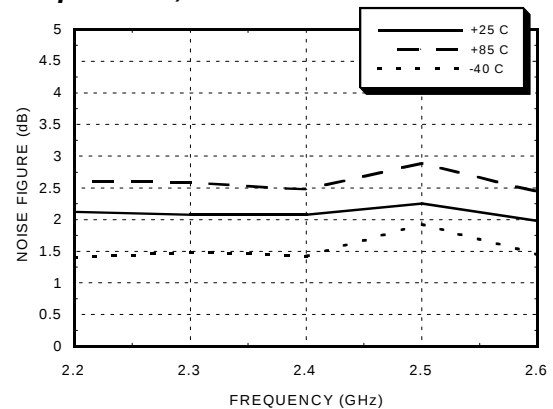
Gain Over Control Voltage Range



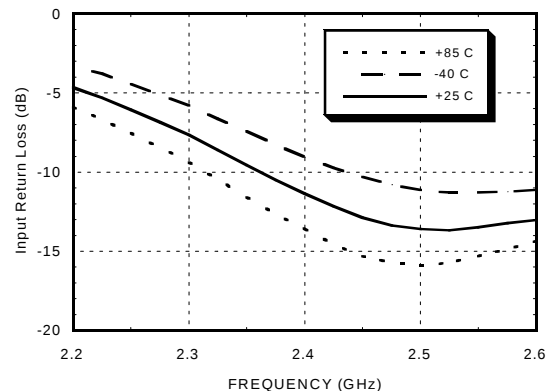
Gain vs. Temperature, $V_{ctl} = 0V$



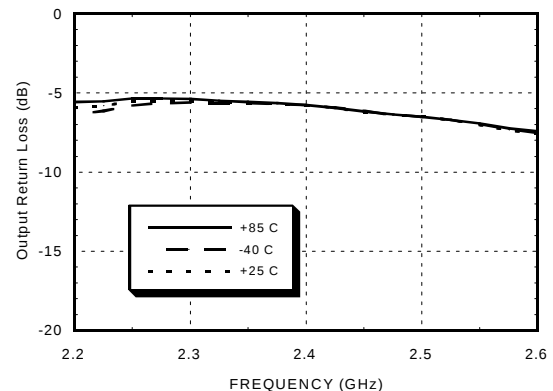
Noise Figure vs. Temperature, $V_{ctl} = 0V$



Input Return Loss vs. Temperature, $V_{ctl} = 0V$



Output Return Loss vs. Temperature, $V_{ctl} = 0V$



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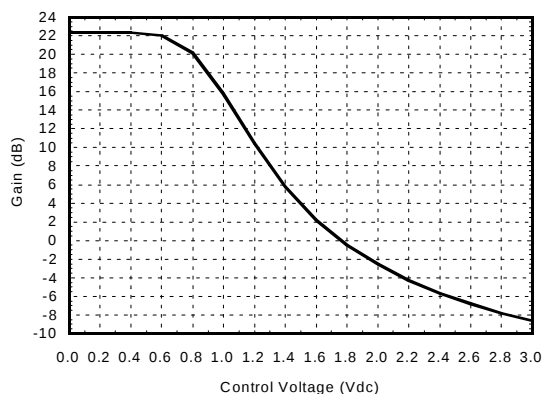


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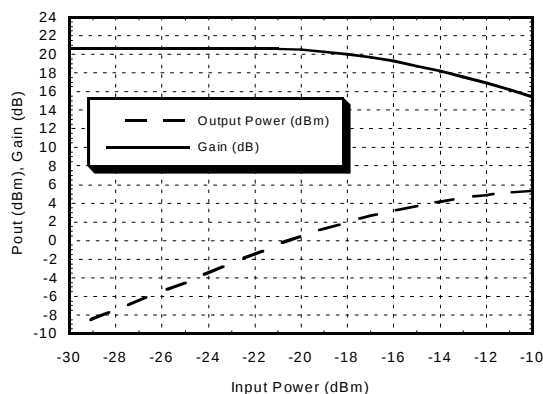
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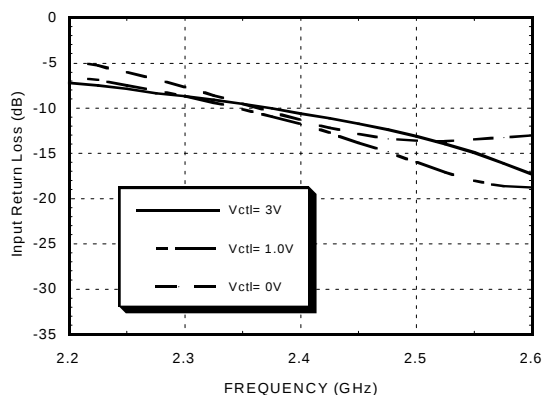
Gain vs. Control Voltage @ 2.4 GHz



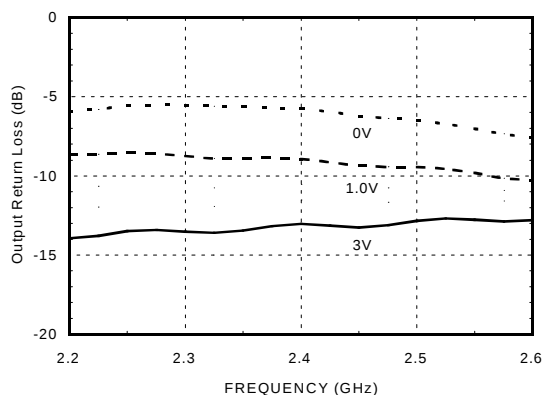
Power Compression @2.4 GHz, VCTL= 0V



Input Return Loss Over Control Voltage Range



Output Return Loss Over Control Voltage Range

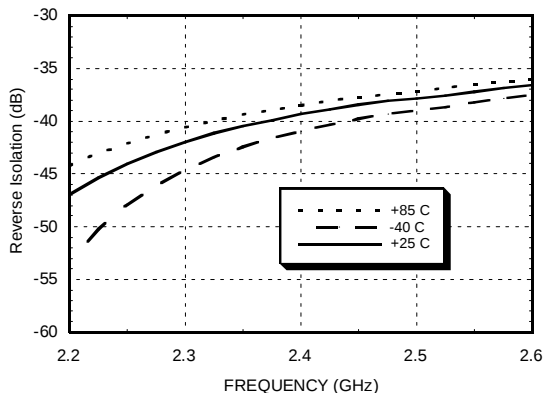


Noise Figure and Output IP3 vs. Control Voltage

Frequency = 2.4 GHz		
VCTL	Noise Figure (dB)	OIP3 (dBm)*
0V	2.5	7.1
1.7V	4.0	-4.4
3.0V	10.0	-12.9

* Two-tone input power= -30 dBm per tone.

Reverse Isolation vs. Temperature, Vctl = 0V

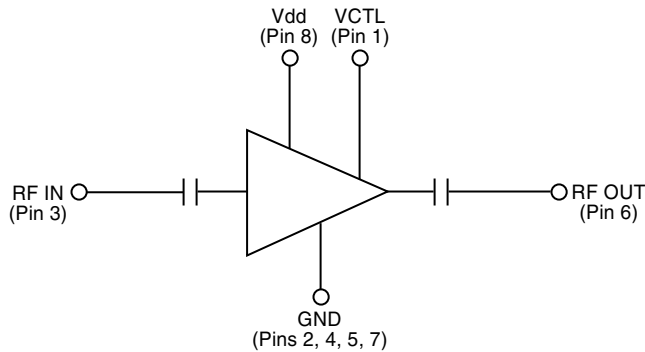


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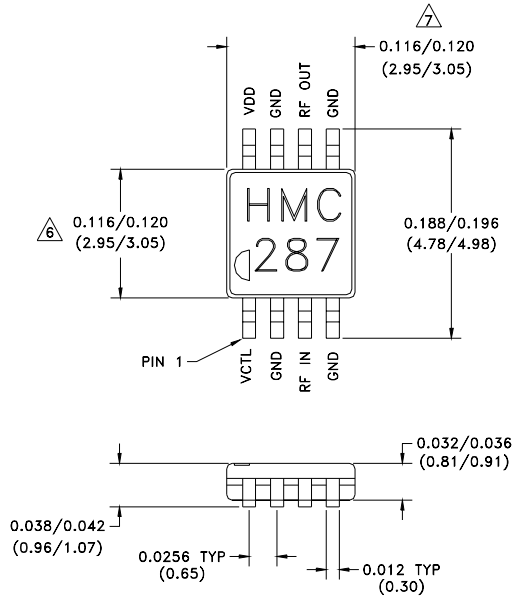
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Schematic



Note: Internal DC Blocks on RF I/O's are included on HMC287MS8.

Outline



Absolute Maximum Ratings

Supply Voltage (Vdd)	+7.0 Vdc
Control Voltage Range (CTL)	-0.2V to Vdd
Input Power	0 dBm
Channel Temperature (Tc)	175 °C
Continuous Pdiss (Ta= 85°C) (derate 5.62 mW/°C above 85°C)	506 mW
Storage Temperature	-65 to +150 °C
Operating Temperature	-55 to +85 °C

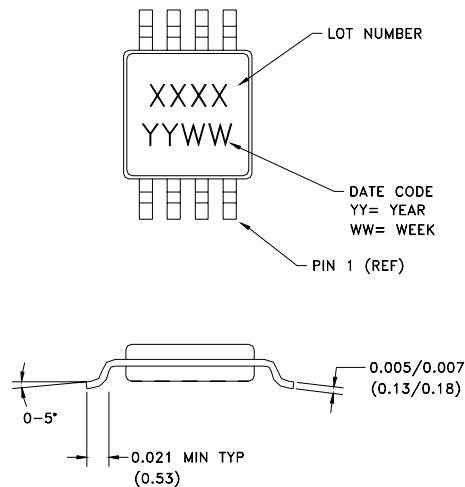
Gain Control

VCTL (Vdc)	Gain State	Typical ICTL (uA)
0.0	Maximum	25
1.5	Middle	25
Vdd	Minimum	25

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- MATERIAL:
A) PACKAGE BODY - LOW STRESS INJECTION MOLDED PLASTIC, SILICA & SILICONE IMPREGNATED.
B) LEADFRAME MATERIAL: COPPER ALLOY
- PLATING: LEAD - TIN SOLDER PLATE
- DIMENSIONS ARE IN INCHES (MILLIMETERS).
UNLESS OTHERWISE SPECIFIED ALL TOL. ARE ± 0.005 (± 0.13).
- ALL UNLABELED LEADS ARE GROUND.
- CHARACTERS TO BE HELVETICA MEDIUM, APPROX. .020 HIGH WHITE INK, LOCATED APPROXIMATELY AS SHOWN.



DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15 MM PER SIDE
DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25 MM PER SIDE

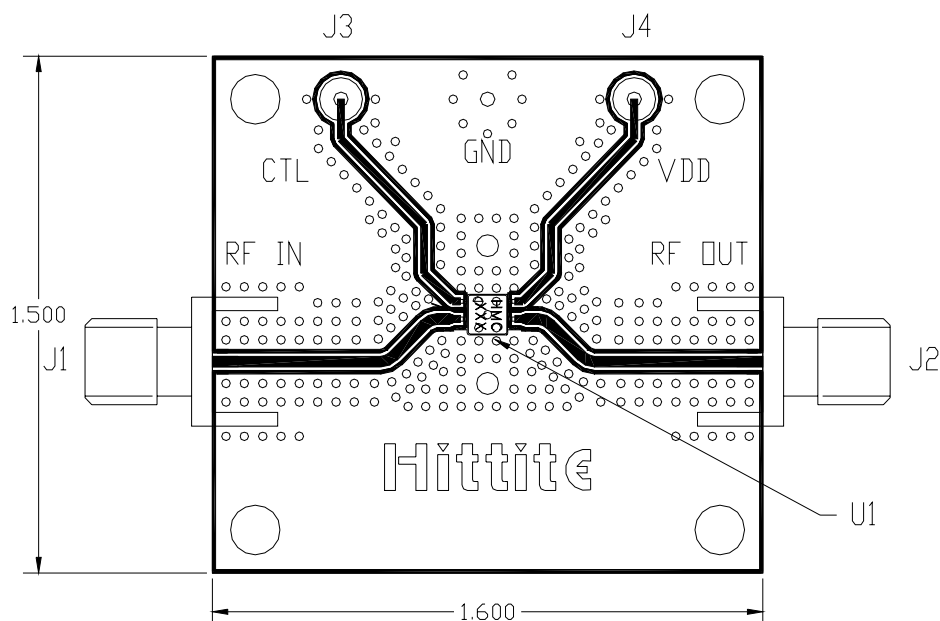
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Evaluation PCB for HMC287MS8

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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 above. A sufficient number of VIA holes should be used to connect the top and bottom ground planes. The evaluation circuit board as shown is available from Hittite upon request.

List of Material

Item	Description
J1, J2	PC Mount SMA Connector
J3, J4	DC Pin
U1	HMC287MS8 Amplifier
PCB*	Eval Board 1.6" x 1.5"
*Circuit Board Material: Rogers 4350	

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NOTES:

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