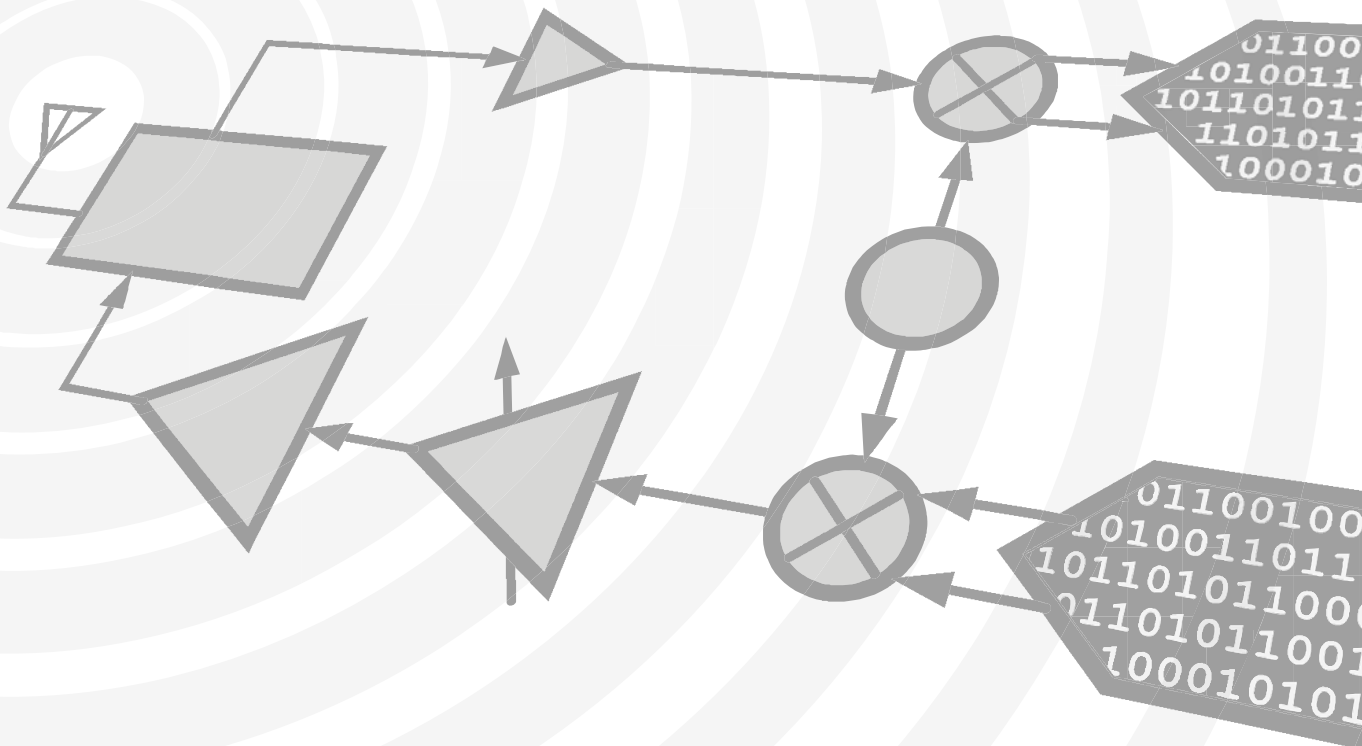


Analog Devices Welcomes Hittite Microwave Corporation

NO CONTENT ON THE ATTACHED DOCUMENT HAS CHANGED



HMC414* Product Page Quick Links

Last Content Update: 08/30/2016

[Comparable Parts](#)

View a parametric search of comparable parts

[Evaluation Kits](#)

- HMC414MS8G Evaluation Board

[Documentation](#)

Application Notes

- AN-1363: Meeting Biasing Requirements of Externally Biased RF/Microwave Amplifiers with Active Bias Controllers
- Broadband Biasing of Amplifiers General Application Note
- MMIC Amplifier Biasing Procedure Application Note
- Thermal Management for Surface Mount Components General Application Note

Data Sheet

- HMC414 Data Sheet

[Tools and Simulations](#)

- HMC414 S-Parameter

[Reference Materials](#)

Quality Documentation

- HMC Legacy PCN: MS##, MS##E and MS##G,MS##GE packages - Relocation of pre-existing production equipment to new building
- Package/Assembly Qualification Test Report: MS8G (QTR: 2014-00393)
- PCN: MS, QS, SOT, SOIC packages - Sn/Pb plating vendor change
- Semiconductor Qualification Test Report: GaAs HBT-B (QTR: 2013-00229)

[Design Resources](#)

- HMC414 Material Declaration
- PCN-PDN Information
- Quality And Reliability
- Symbols and Footprints

[Discussions](#)

View all HMC414 EngineerZone Discussions

[Sample and Buy](#)

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[Technical Support](#)

Submit a technical question or find your regional support number

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Typical Applications

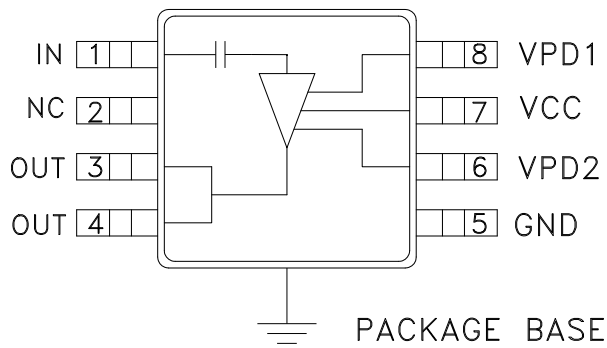
This amplifier is ideal for use as a power amplifier for 2.2 - 2.7 GHz applications:

- BLUETOOTH
- MMDS

Features

- Gain: 20 dB
- Saturated Power: +30 dBm
- 32% PAE
- Supply Voltage: +2.75V to +5V
- Power Down Capability
- Low External Part Count

Functional Diagram



General Description

The HMC414MS8G & HMC414MS8GE are high efficiency GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC Power amplifiers which operate between 2.2 and 2.8 GHz. The amplifier is packaged in a low cost, surface mount 8 leaded package with an exposed base for improved RF and thermal performance. With a minimum of external components, the amplifier provides 20 dB of gain, +30 dBm of saturated power at 32% PAE from a +5V supply voltage. The amplifier can also operate with a 3.6V supply. Vpd can be used for full power down or RF output power/current control.

Electrical Specifications, $T_A = +25^\circ \text{C}$, As a Function of V_s , $V_{pd} = 3.6\text{V}$

| Parameter | $V_s = 3.6\text{V}$ | | | $V_s = 5\text{V}$ | | | Units |
|--|------------------------------------|------|------|-------------------|------|------|--------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| Frequency Range | 2.2 - 2.8 | | | 2.2 - 2.8 | | | GHz |
| Gain | 17 | 20 | 25 | 17 | 20 | 25 | dB |
| Gain Variation Over Temperature | | 0.03 | 0.04 | | 0.03 | 0.04 | dB/ °C |
| Input Return Loss | | 8 | | | 8 | | dB |
| Output Return Loss | | 9 | | | 9 | | dB |
| Output Power for 1 dB Compression (P1dB) | 21 | 25 | | 23 | 27 | | dBm |
| Saturated Output Power (P _{sat}) | | 27 | | | 30 | | dBm |
| Output Third Order Intercept (IP3) | 30 | 35 | | 35 | 39 | | dBm |
| Noise Figure | | 6.5 | | | 7.0 | | dB |
| Supply Current (I _{cq}) | V _{pd} = 0V / 3.6V | | | 0.002 / 300 | | | mA |
| Control Current (I _{pd}) | V _{pd} = 3.6V | | | 7 | | | mA |
| Switching Speed | t _{ON} , t _{OFF} | | | 45 | | | ns |

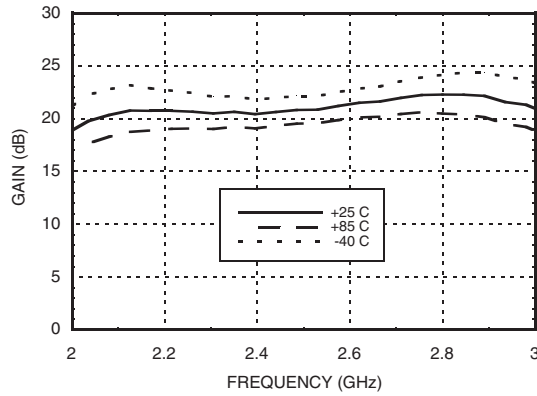
For price, delivery, and to place orders, please contact Hittite Microwave Corporation:
 20 Alpha Road, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373
 Order On-line at www.hittite.com



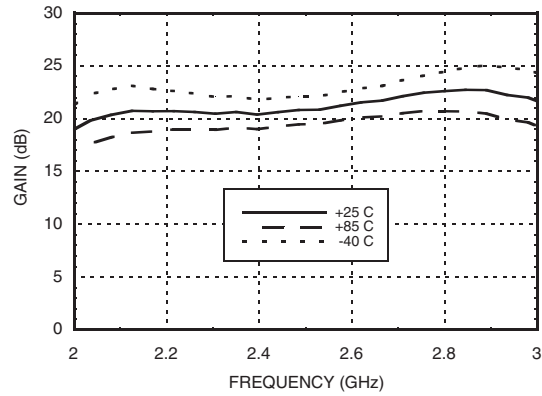
HMC414MS8G / 414MS8GE

**GaAs InGaP HBT MMIC
POWER AMPLIFIER, 2.2 - 2.8 GHz**

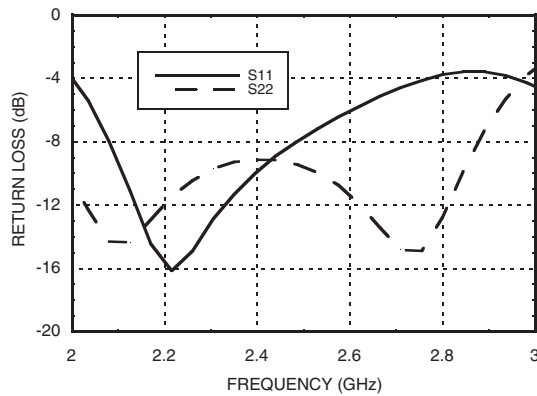
Gain vs. Temperature, Vs= 3.6V



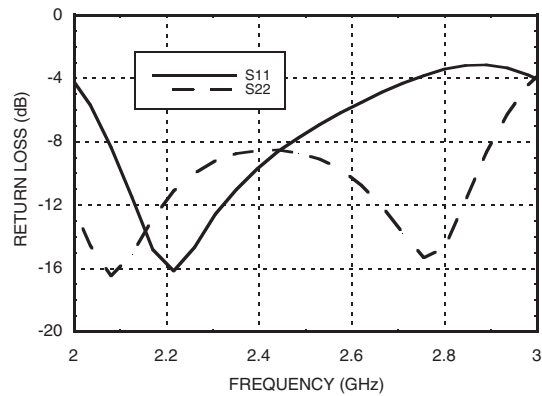
Gain vs. Temperature, Vs= 5V



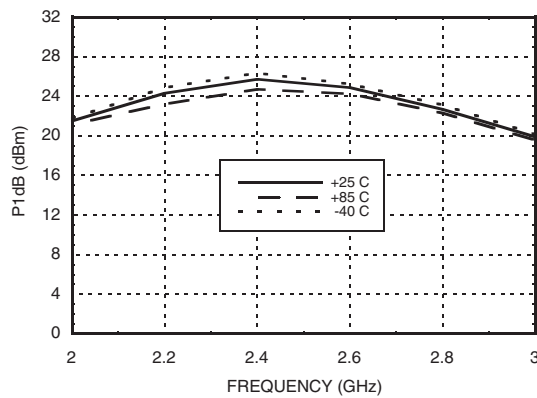
Return Loss, Vs= 3.6V



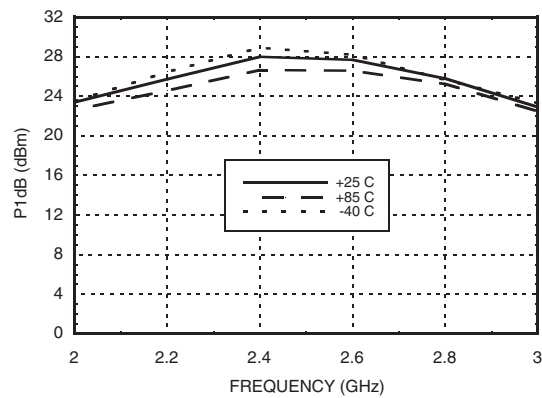
Return Loss, Vs= 5V



P1dB vs. Temperature, Vs= 3.6V



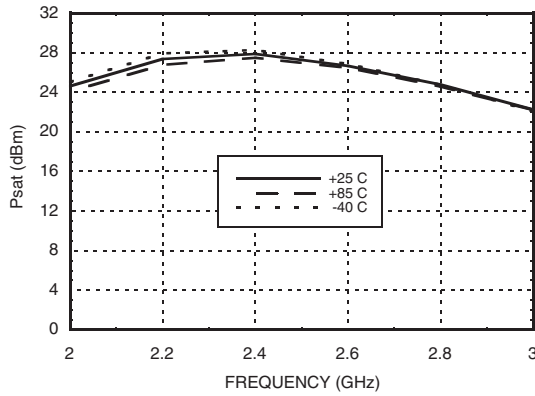
P1dB vs. Temperature, Vs= 5V



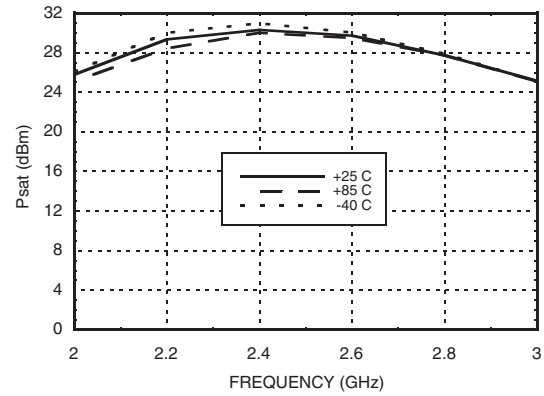
11

LINEAR & POWER AMPLIFIERS - SMT

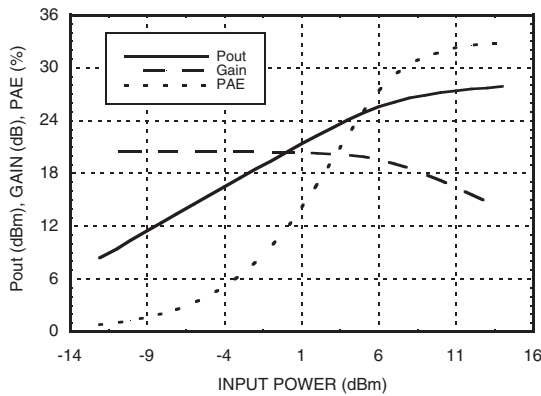
Psat vs. Temperature, Vs= 3.6V



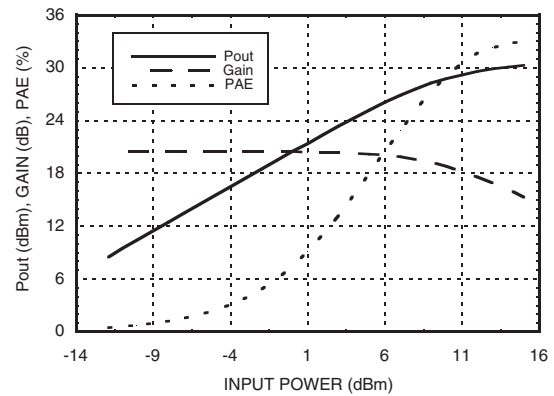
Psat vs. Temperature, Vs= 5V



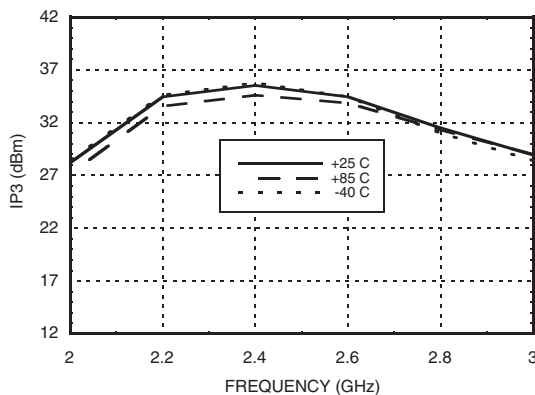
Power Compression@ 2.4 GHz, Vs= 3.6V



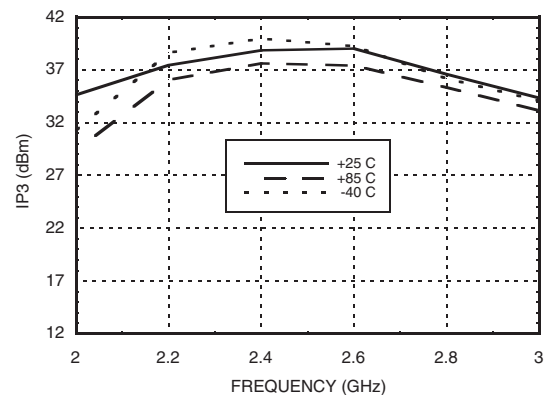
Power Compression@ 2.4 GHz, Vs= 5V



Output IP3 vs. Temperature, Vs= 3.6V



Output IP3 vs. Temperature, Vs= 5V

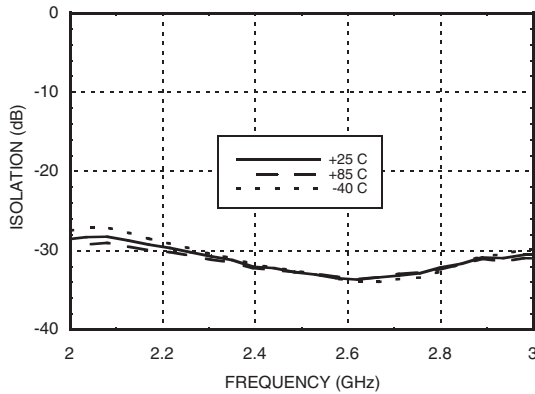




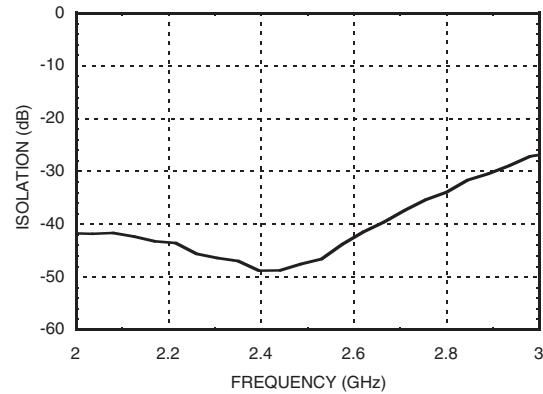
HMC414MS8G / 414MS8GE

GaAs InGaP HBT MMIC POWER AMPLIFIER, 2.2 - 2.8 GHz

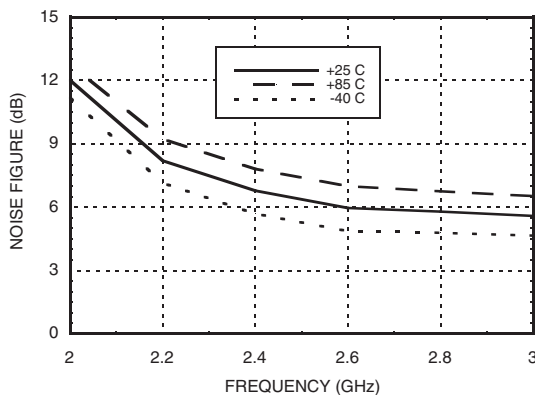
Reverse Isolation vs. Temperature, Vs= 3.6V



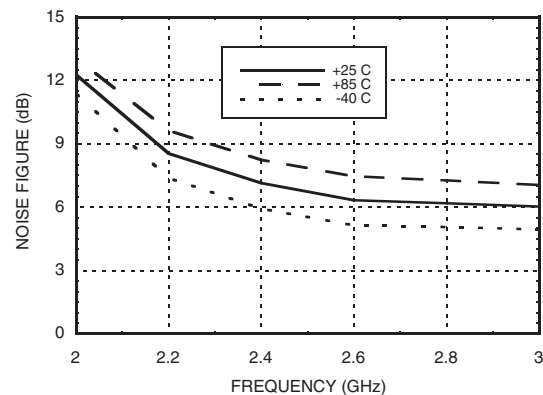
Power Down Isolation, Vs= 3.6V



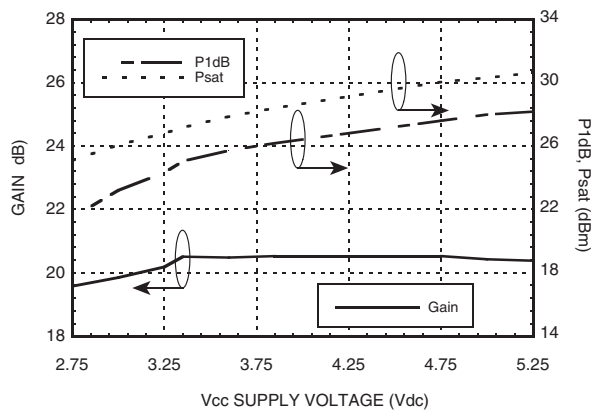
Noise Figure vs. Temperature, Vs= 3.6V



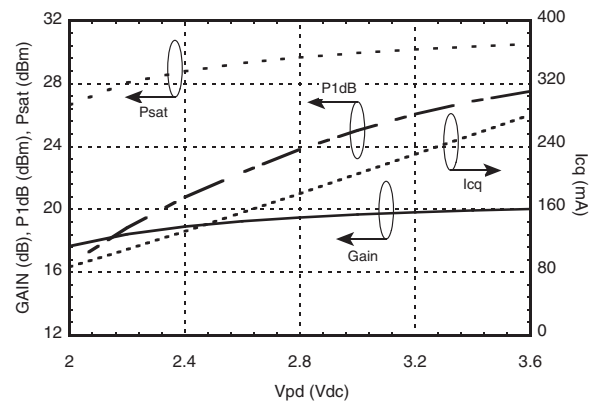
Noise Figure vs. Temperature, Vs= 5V



Gain & Power vs. Supply Voltage



Gain, Power & Quiescent Supply Current vs Vpd@ 2.4 GHz



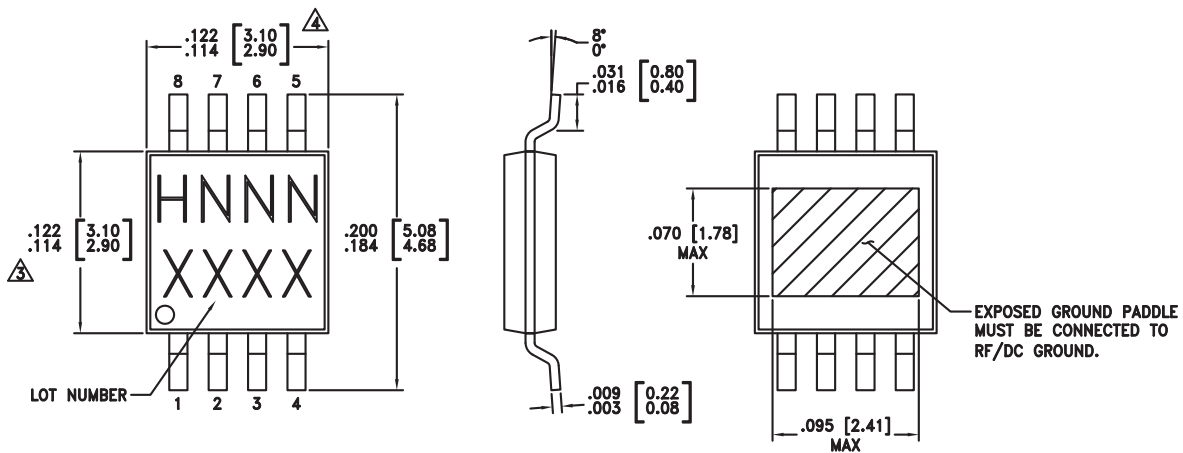
Absolute Maximum Ratings

| | |
|---|----------------|
| Collector Bias Voltage (Vcc) | +5.5 Vdc |
| Control Voltage (Vpd1, Vpd2) | +4.0 Vdc |
| RF Input Power (RFIN)(Vs = +5.0, Vpd = +3.6 Vdc) | +17 dBm |
| Junction Temperature | 150 °C |
| Continuous P _{diss} (T = 85 °C) (derate 27 mW/°C above 85 °C) | 1.755 W |
| Thermal Resistance (junction to ground paddle) | 37 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



NOTES:

- LEADFRAME MATERIAL: COPPER ALLOY
- DIMENSIONS ARE IN INCHES [MILLIMETERS].
- \triangle DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
- \triangle DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
- ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[3] |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC414MS8G | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 ^[1] | H414 XXXX |
| HMC414MS8GE | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 ^[2] | H414 XXXX |

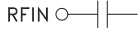
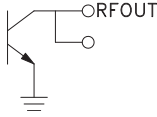

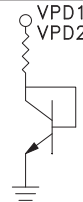
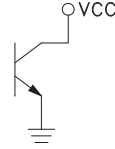
[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

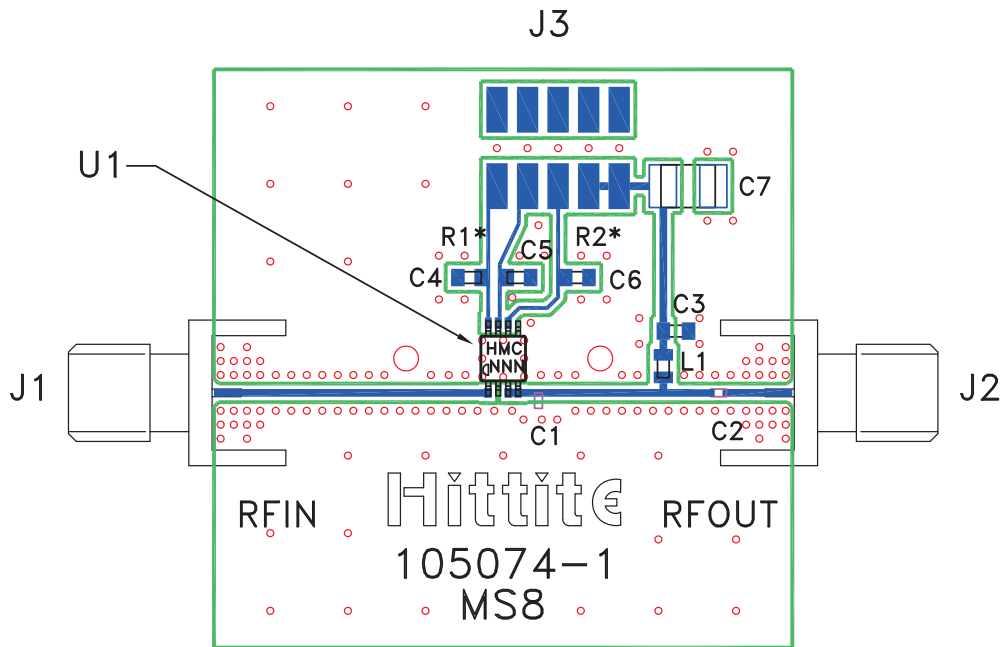
[3] 4-Digit lot number XXXX



Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|------------|------------|--|---|
| 1 | RFIN | This pin is AC coupled and matched to 50 Ohms. |  |
| 2 | NC | Not Connected. | |
| 3, 4 | RFOUT | RF output and DC bias for the output stage. |  |
| 5 | GND | Ground: Backside of package has exposed metal ground slug that must be connected to ground thru a short path. Vias under the device are required. |  |
| 6, 8 | Vpd1, Vpd2 | Power control pin. For maximum power, this pin should be connected to 3.6V. For 5V operation, a dropping resistor is required. A higher voltage is not recommended. For lower idle current, this voltage can be reduced. |  |
| 7 | Vcc | Power supply voltage for the first amplifier stage. An external bypass capacitor of 330 pF is required as shown in the application schematic. |  |

Evaluation PCB



* For 5V operation on Vctl line, select R1, R2 such that 3.6V is presented on Pins 6 and 8.

List of Materials for Evaluation PCB 105006 [1]

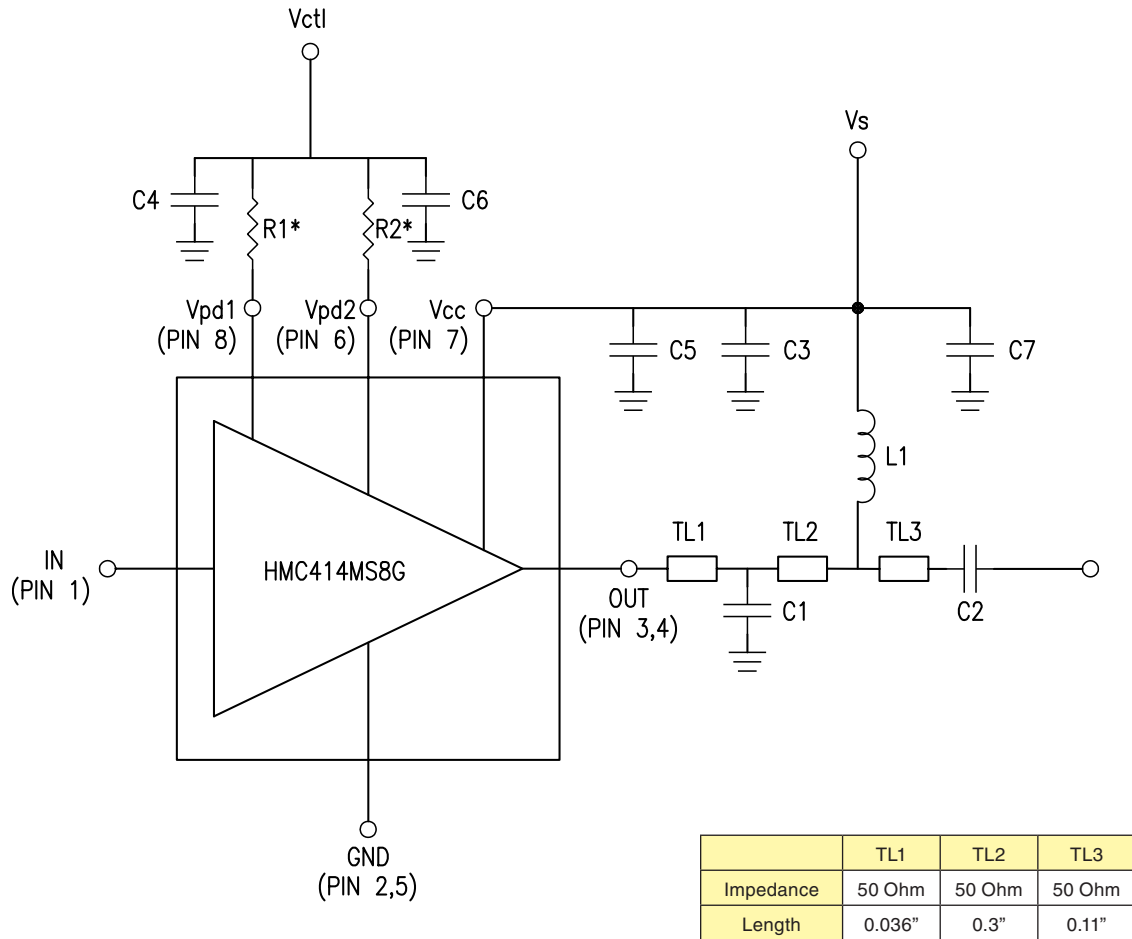
| Item | Description |
|---------|------------------------------------|
| J1 - J2 | PCB Mount SMA RF Connector |
| J3 | 2 mm DC Header |
| C1 | 2.7 pF Capacitor, 0603 Pkg. |
| C2 | 100 pF Capacitor, 0402 Pkg. |
| C3 - C6 | 330 pF Capacitor, 0603 Pkg. |
| C7 | 2.2 μF Capacitor, Tantalum |
| L1 | 18nH Inductor 0603 Pkg. |
| U1 | HMC414MS8G / HMC414MS8GE Amplifier |
| PCB [2] | 105074 Eval Board |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 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 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 board should be mounted to an appropriate heat sink. The evaluation circuit board shown is available from Hittite upon request.

Application Circuit



* For 5V operation on Vctl line, select R1, R2 such that 3.6V is presented on Pins 6 and 8.