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GaAs pHEMT MMIC POWER AMPLIFIER, 0.2 - 22 GHz

Typical Applications

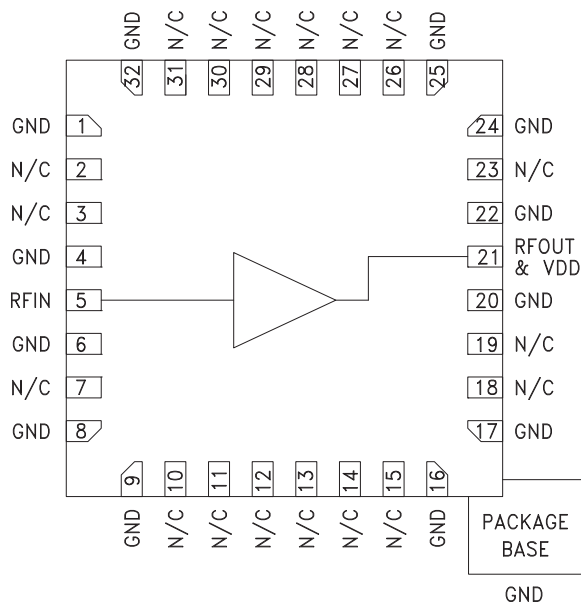
The HMC907LP5E is ideal for:

- Test Instrumentation
- Microwave Radio & VSAT
- Military & Space
- Telecom Infrastructure
- Fiber Optics

Features

- High P1dB Output Power: +26 dBm
- High Gain: 12 dB
- High Output IP3: +36 dBm
- Single Supply: +10 V @ 350 mA
- 50 Ohm Matched Input/Output
- 32 Lead 5x5 mm SMT Package: 25 mm²

Functional Diagram

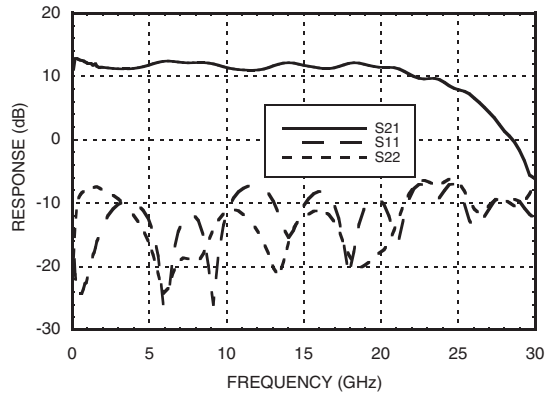
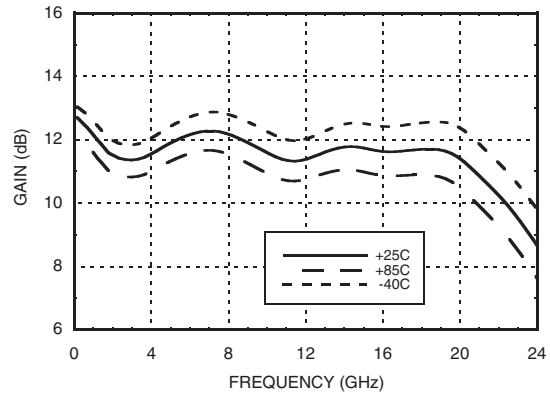
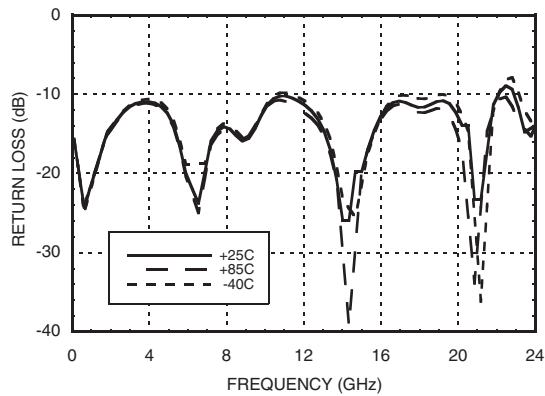
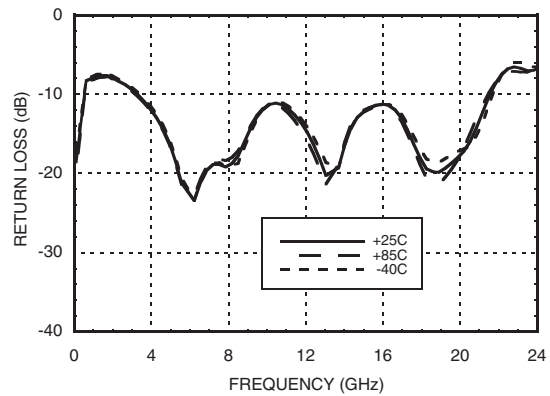
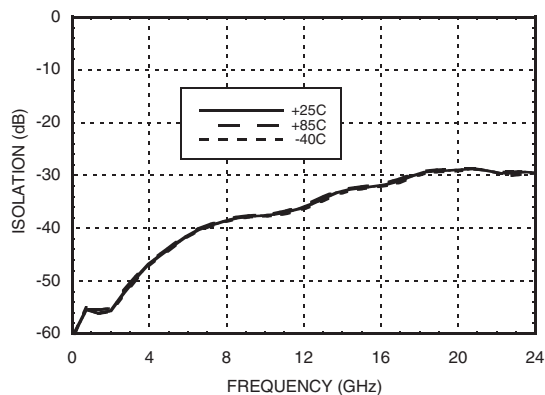
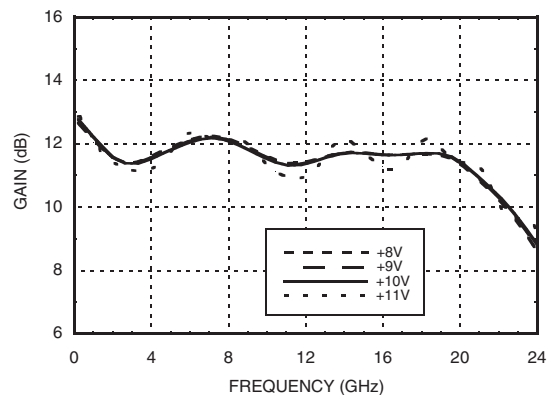


General Description

The HMC907LP5E is a GaAs MMIC pHEMT Distributed Power Amplifier which operates between 0.2 and 22 GHz. This self-biased power amplifier provides 12 dB of gain, +36 dBm output IP3 and +26 dBm of output power at 1 dB gain compression while requiring only 350 mA from a +10 V supply. Gain flatness is excellent at ±0.7 dB from 0.2 to 22 GHz making the HMC907LP5E ideal for EW, ECM, Radar and test equipment applications. The HMC907LP5E amplifier I/Os are internally matched to 50 Ohms facilitating integration into Multi-Chip-Modules (MCMs) and is packaged in a leadless QFN 5x5 mm surface mount package, and requires no external matching components.

Electrical Specifications, $T_A = +25\text{ }^\circ\text{C}$, $V_{dd} = +10\text{ V}$, $I_{dd} = 350\text{ mA}$

| Parameter | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | Units |
|---|----------|------|------|---------|-------|------|---------|-------|------|--------|
| Frequency Range | 0.2 - 10 | | | 10 - 18 | | | 18 - 22 | | | GHz |
| Gain | 10 | 12 | | 10 | 11.5 | | 10 | 11.5 | | dB |
| Gain Flatness | | ±0.7 | | | ±0.6 | | | ±0.7 | | dB |
| Gain Variation Over Temperature | | 0.01 | | | 0.013 | | | 0.014 | | dB/ °C |
| Input Return Loss | | 15 | | | 9 | | | 8 | | dB |
| Output Return Loss | | 13 | | | 12 | | | 8 | | dB |
| Output Power for 1 dB Compression (P1dB) | 23 | 26 | | 21 | 25 | | 19.5 | 21.5 | | dBm |
| Saturated Output Power (P _{sat}) | | 28.5 | | | 27 | | | 24.5 | | dBm |
| Output Third Order Intercept (IP3) | | 36 | | | 34 | | | 31 | | dBm |
| Noise Figure | | 3.5 | | | 3.5 | | | 4 | | dB |
| Supply Current (I _{dd}) (V _{dd} = 10V) | | 350 | 400 | | 350 | 400 | | 350 | 400 | mA |

Gain & Return Loss

Gain vs. Temperature

Input Return Loss vs. Temperature

Output Return Loss vs. Temperature

Reverse Isolation vs. Temperature

Gain vs. Vdd




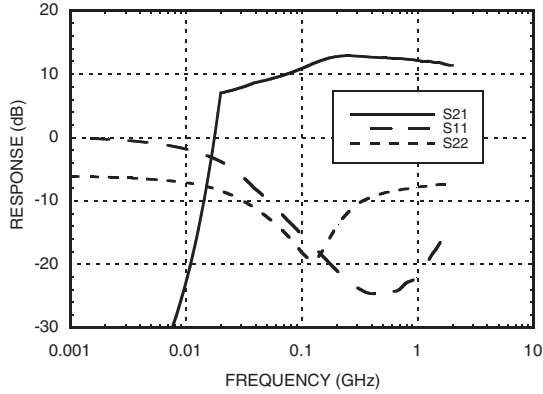
MICROWAVE CORPORATION v00.0510



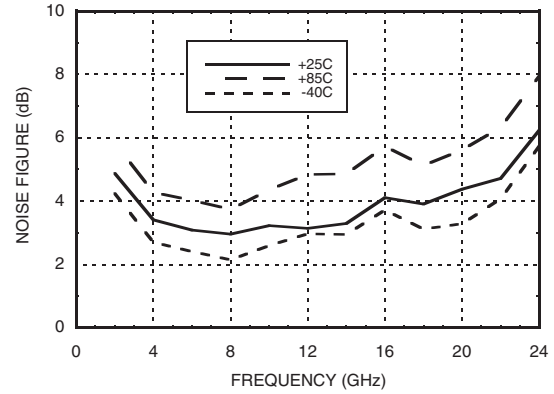
HMC907LP5E

GaAs pHEMT MMIC POWER AMPLIFIER, 0.2 - 22 GHz

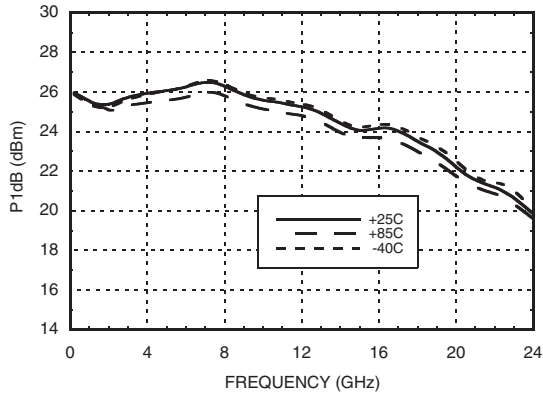
Low Frequency Gain & Return Loss



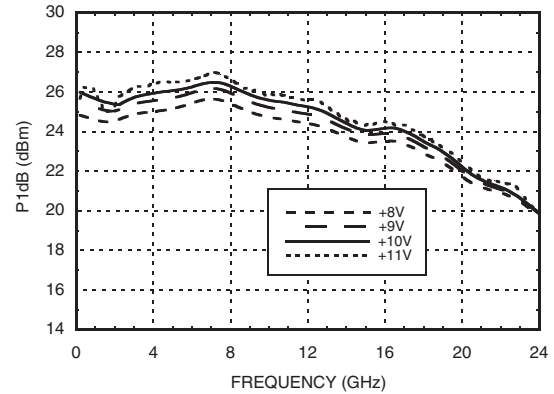
Noise Figure



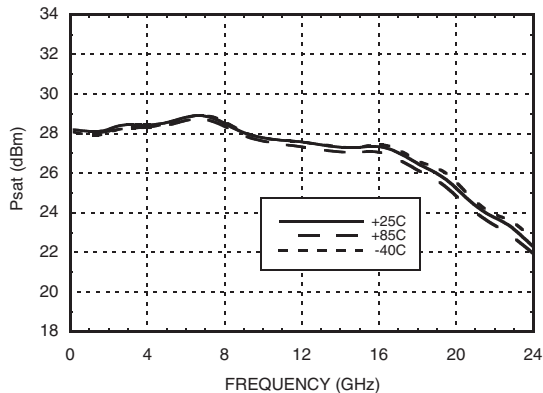
P1dB vs. Temperature



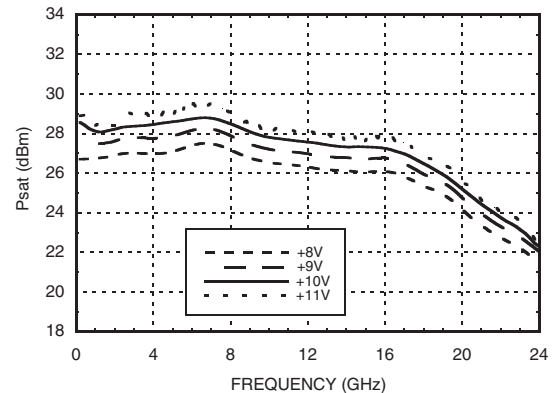
P1dB vs. Vdd



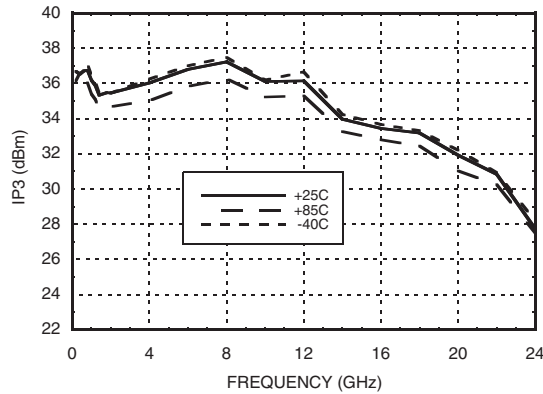
Psat vs. Temperature



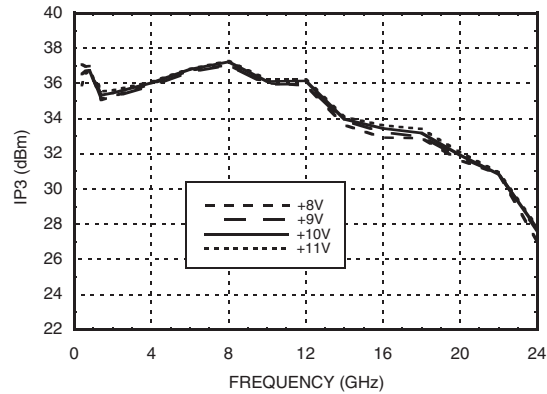
Psat vs. Vdd



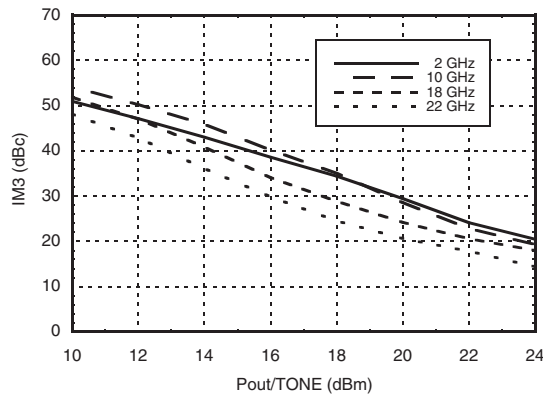
**Output IP3 vs.
Temperature @ Pout = 16 dBm / Tone**



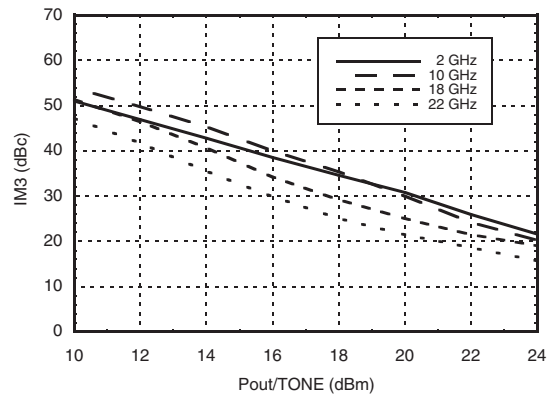
Output IP3 vs. Vdd @ Pout = 16 dBm / Tone



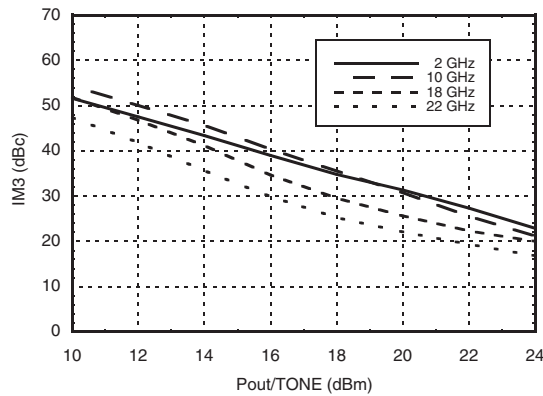
Output IM3 @ Vdd = 8V



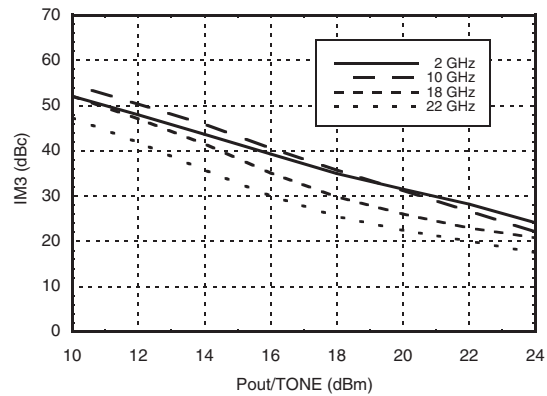
Output IM3 @ Vdd = 9V



Output IM3 @ Vdd = 10V



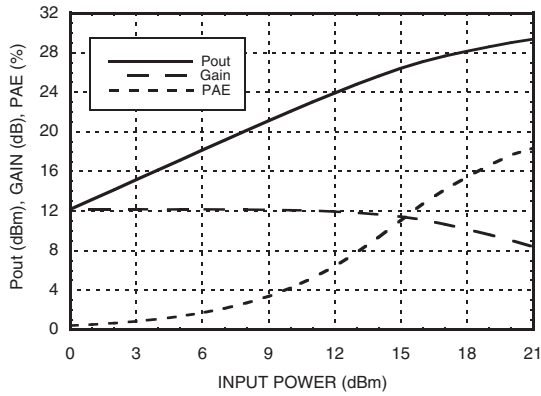
Output IM3 @ Vdd = 11V



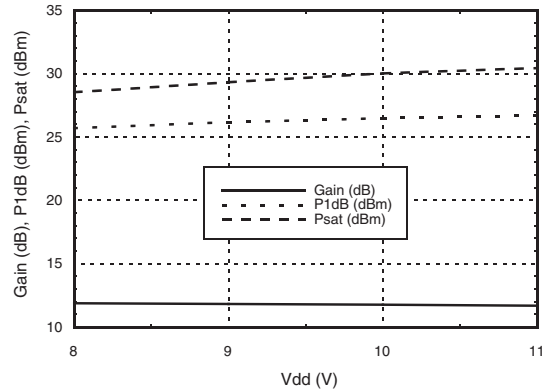


**GaAs pHEMT MMIC
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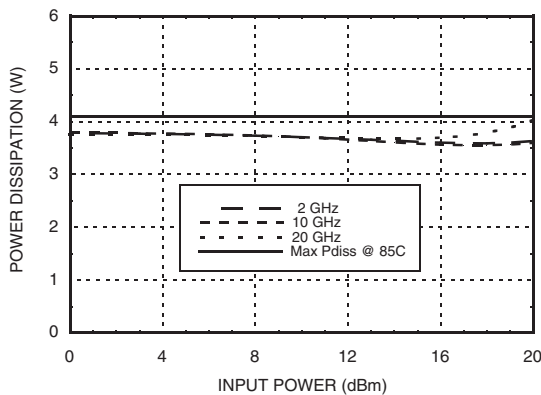
Power Compression @ 10 GHz



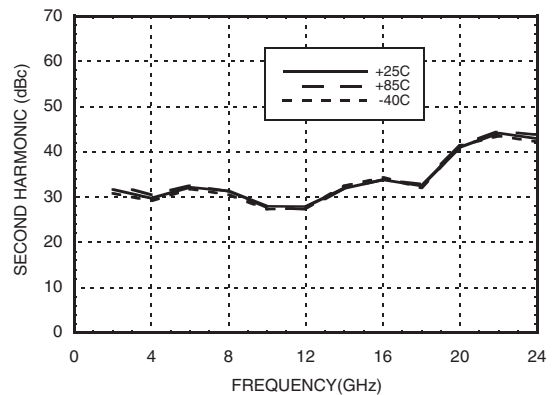
Gain & Power Supply vs. Supply Current @ 10 GHz



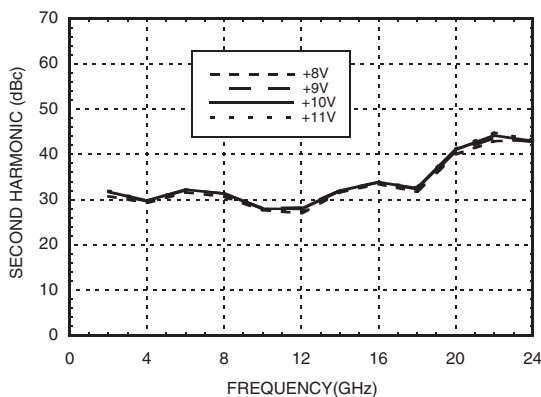
Power Dissipation



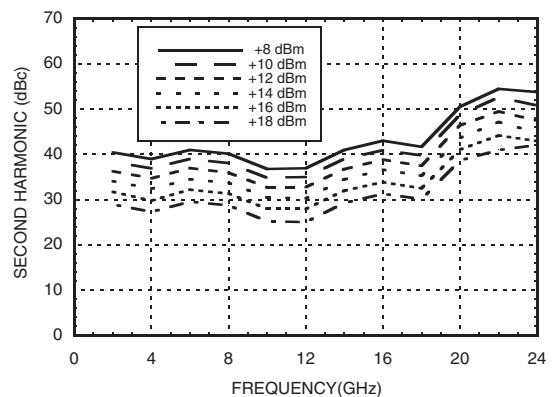
Second Harmonics vs. Temperature @ Pout = 16 dBm, Vdd = 10V



Second Harmonics vs. Vdd @ Pout = 16 dBm



Second Harmonics vs. Pout @ Vdd = 10V



Absolute Maximum Ratings

| | |
|--|--------------|
| Drain Bias Voltage (Vdd) | +11 Vdc |
| RF Input Power (RFIN)(Vdd = +11V) | +20 dBm |
| Channel Temperature | 150 °C |
| Continuous Pdiss (T= 85 °C) (derate 63 mW/°C above 85 °C) | 4.1 W |
| Thermal Resistance (channel to ground paddle) | 15.9 °C/W |
| Storage Temperature | -65 to 150°C |
| Operating Temperature | -55 to 85 °C |
| ESD Sensitivity (HBM) | Class 1A |

Typical Supply Current vs. Vdd

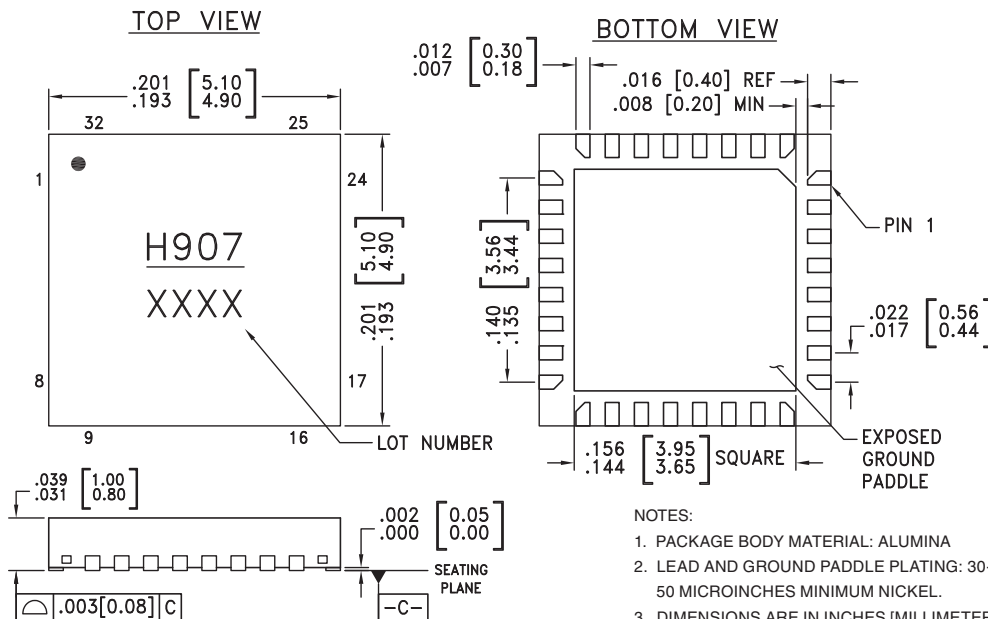
| Vdd (V) | Idd (mA) |
|---------|----------|
| +8 | 335 |
| +9 | 343 |
| +10 | 350 |
| +11 | 357 |



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

9

Outline Drawing



Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[1] |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC907LP5E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 ^[2] | H907 XXXX |

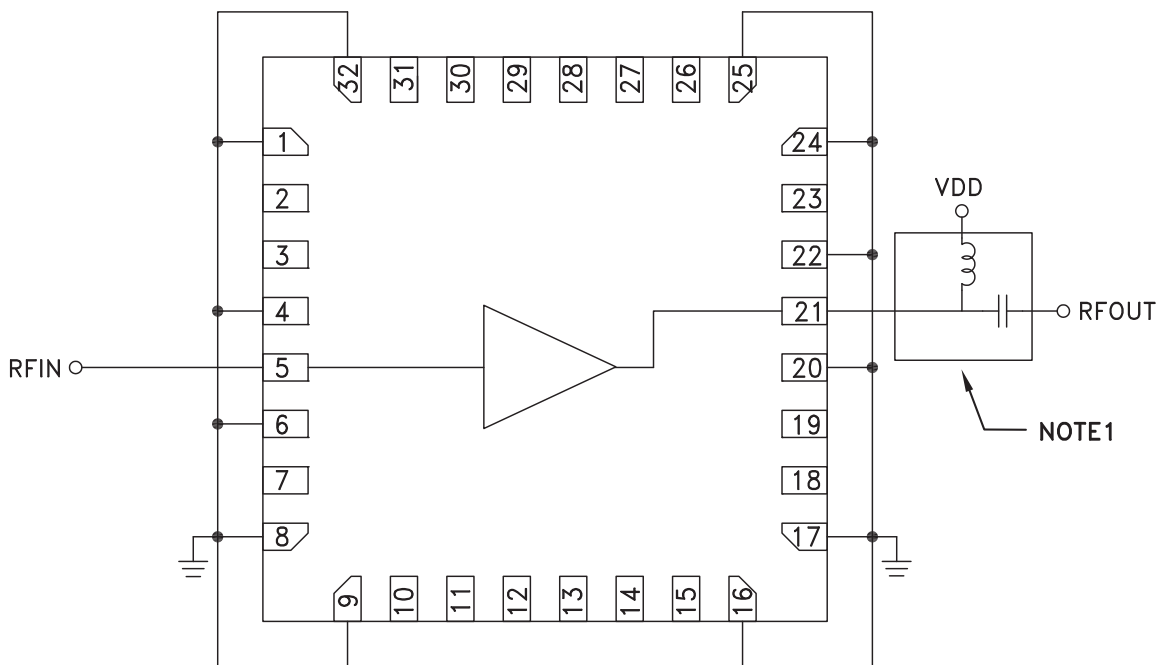
[1] 4-Digit lot number XXXX

[2] Max peak reflow temperature of 260 °C

Pin Descriptions

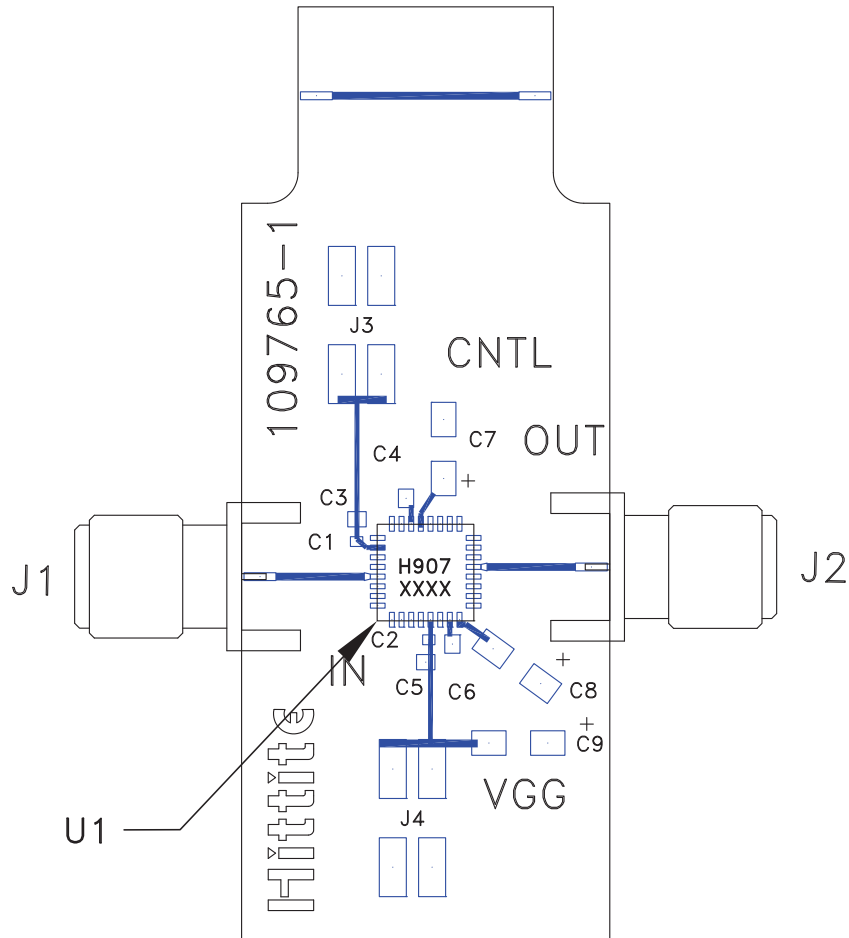
| Pin Number | Function | Description | Interface Schematic |
|---|-------------|--|---------------------|
| 1, 4, 6, 8, 9, 16, 17, 20, 22, 24, 25, 32 | GND | Package bottom has exposed metal paddle that must be connected to RF/DC ground. | |
| 2, 3, 7, 10 - 15, 18, 19, 23, 26 - 31 | N/C | The pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally. | |
| 5 | RFIN | This pin is DC coupled and matched to 50 Ohms. Blocking capacitor is required. | |
| 21 | RFOUT & Vdd | RF output for amplifier. Connect DC bias (Vdd) network to provide drain current (Idd). See application circuit herein. | |

Application Circuit



NOTE 1: Drain Bias (Vdd) must be applied through a broadband bias tee or external bias network.

Evaluation PCB



List of Materials for Evaluation PCB 130812 [1]

| Item | Description |
|---------|----------------------------|
| J1, J2 | SMA Connector |
| U1 | HMC907LP5E Power Amplifier |
| PCB [2] | 109765 Evaluation PCB |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350 or Arlon FR4

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 board should be mounted to an appropriate heat sink. The evaluation circuit board shown is available from Hittite upon request.

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