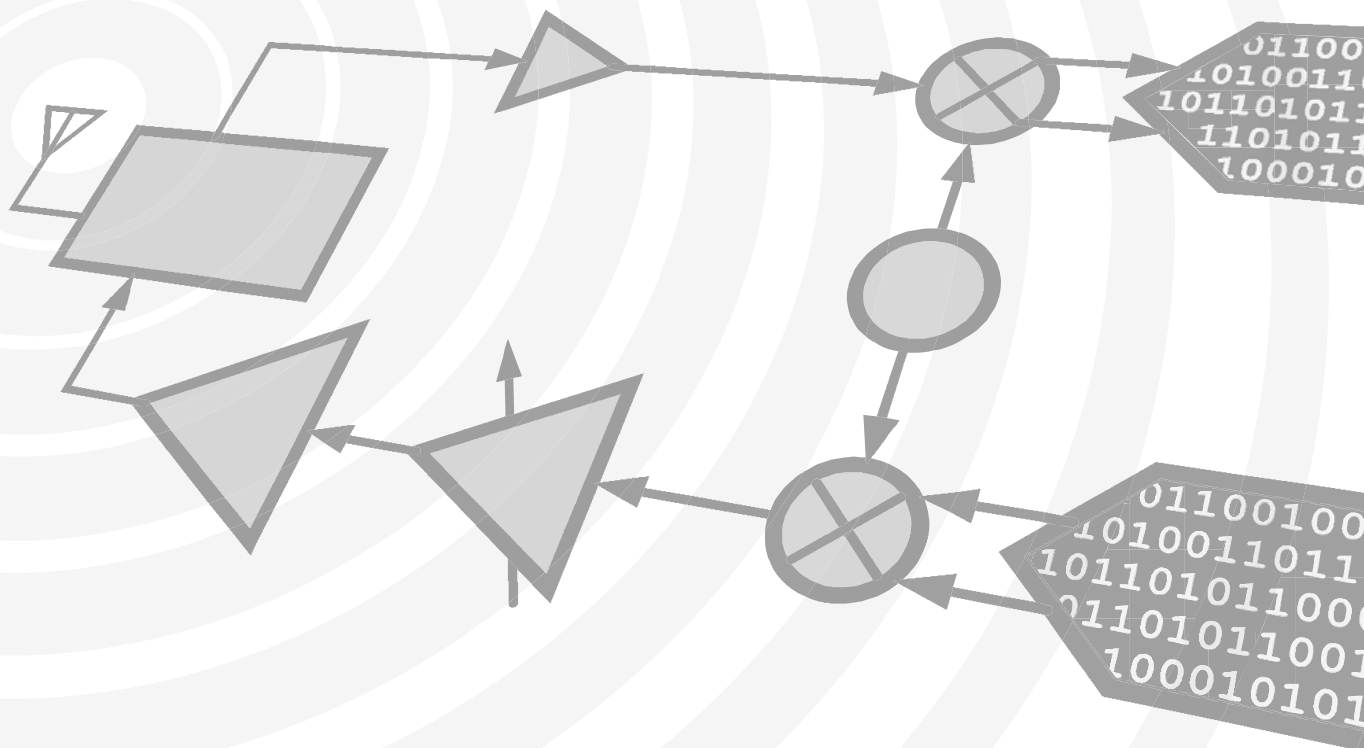




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MICROWAVE CORPORATION v01.0314



# HMC1082LP4E

## GaAs pHEMT MMIC MEDIUM POWER AMPLIFIER, 5.5 - 18 GHz

### Typical Applications

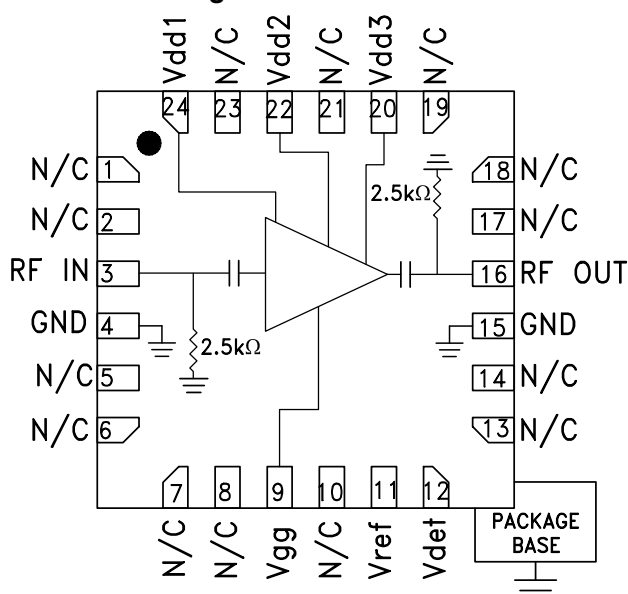
The HMC1082LP4E is ideal for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios
- VSAT & SATCOM
- Marine Radar
- Military EW & ECM

### Features

- High Saturated Output Power: 26 dBm @ 26% PAE
- High Output IP3: 35 dBm
- High Gain: 22 dB
- High P1dB Output Power: 24 dBm
- DC Supply: +5V @ 220 mA
- Compact 24 Lead 4x4 mm SMT Package: 16 mm<sup>2</sup>

### Functional Diagram



### General Description

The HMC1082LP4E is a GaAs pHEMT MMIC driver amplifier with an integrated temperature compensated on-chip power detector which operates between 5.5 and 18 GHz. The amplifier provides 22 dB of gain, +35 dBm Output IP3, and +24 dBm of output power at 1 dB gain compression, while requiring 220 mA from a +5V supply. The HMC1082LP4E is capable of supplying +26 dBm of saturated output power with 26 % PAE and is housed in a compact leadless 4x4 mm plastic surface mount package.

The HMC1082LP4E is an ideal driver amplifier for a wide range of applications including point-to-point radio from 5.5 to 18 GHz and marine radar at 9 GHz. The HMC1082LP4E may also be used for 6 to 18 GHz EW and ECM applications.

### Electrical Specifications

$T_A = +25^\circ\text{C}$ ,  $V_{dd1} = V_{dd2} = V_{dd3} = +5\text{V}$ ,  $I_{dd} = +220\text{mA}$  <sup>[1]</sup>

| Parameter                                         | Min  | Typ.      | Max | Min  | Typ.     | Max | Min  | Typ     | Max | Units |
|---------------------------------------------------|------|-----------|-----|------|----------|-----|------|---------|-----|-------|
| Frequency Range                                   |      | 5.5 - 6.5 |     |      | 6.5 - 17 |     |      | 17 - 18 |     | GHz   |
| Gain                                              | 21.5 | 23.5      |     | 20.5 | 22.5     |     | 20   | 22      |     | dB    |
| Gain Variation over temperature                   |      | 0.0121    |     |      | 0.0101   |     |      | 0.015   |     | dB/°C |
| Input Return Loss                                 |      | 22        |     |      | 12       |     |      | 7.5     |     | dBm   |
| Output Return Loss                                |      | 10        |     |      | 14       |     |      | 17.5    |     | dBm   |
| Output Power for 1 dB Compression (P1dB)          | 21   | 24        |     | 21   | 24       |     | 20.5 | 23.5    |     | dBm   |
| Saturated Output Power (Psat)                     |      | 25.5      |     |      | 26       |     |      | 24.5    |     | dBm   |
| Output Third Order Intercept (IP3) <sup>[2]</sup> |      | 36        |     |      | 35       |     |      | 33.5    |     | dBm   |
| Supply Current (Idd)                              |      | 220       |     |      | 220      |     |      | 220     |     | mA    |

[1] Adjust Vgg between -2 to 0V to achieve Idd = 220mA typical

[2] Measurement taken at Pout / tone = +12dBm

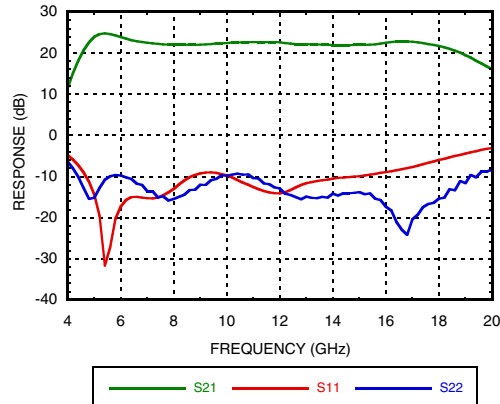
For price, delivery and to place orders: Hittite Microwave Corporation, 2 Elizabeth Drive, Chelmsford, MA 01824

Phone: 978-250-3343 Fax: 978-250-3373 Order On-line at [www.hittite.com](http://www.hittite.com)

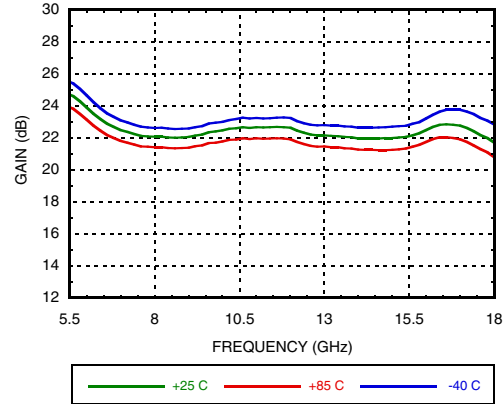
Application Support: Phone: 978-250-3343 or [apps@hittite.com](mailto:apps@hittite.com)

## GaAs pHEMT MMIC MEDIUM POWER AMPLIFIER, 5.5 - 18 GHz

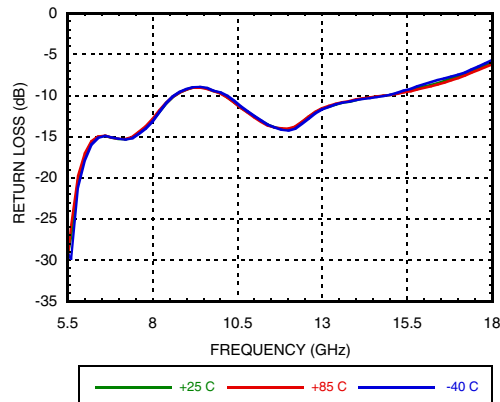
**Broadband Gain & Return Loss**



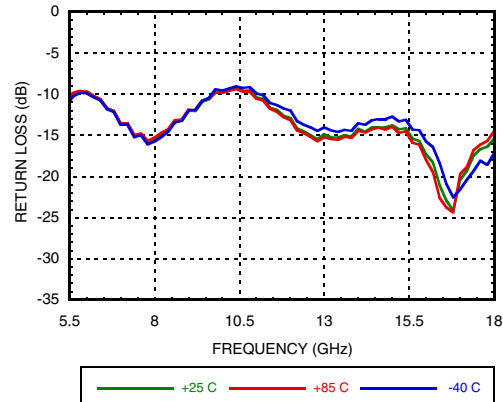
**Gain vs. Temperature**



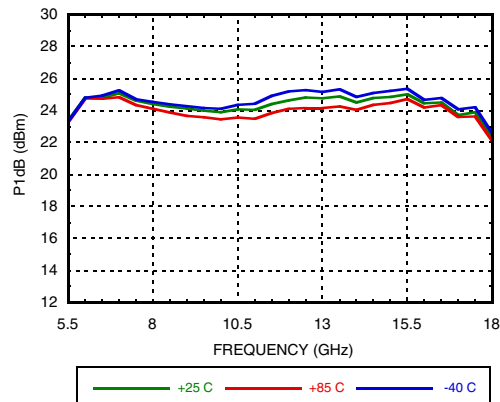
**Input Return Loss vs. Temperature**



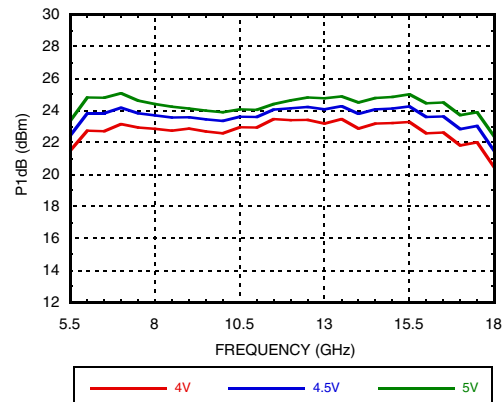
**Output Return Loss vs. Temperature**



**P1dB vs. Temperature**



**P1dB vs. Supply Voltage**





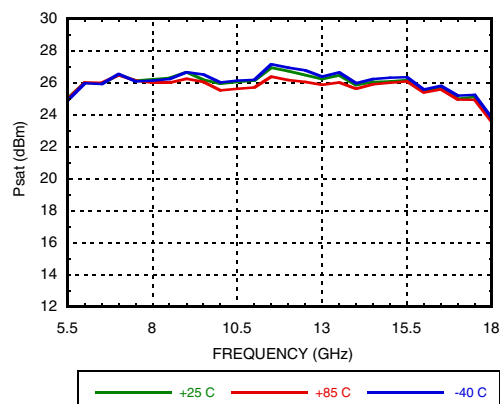
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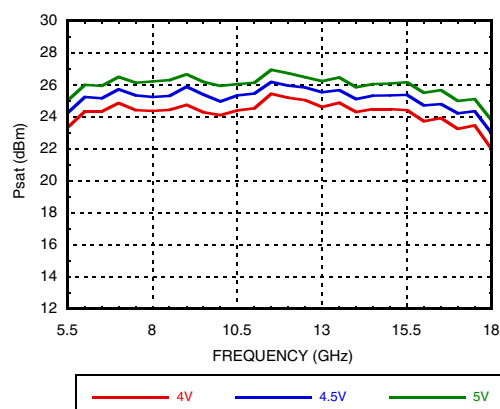
# HMC1082LP4E

## GaAs pHEMT MMIC MEDIUM POWER AMPLIFIER, 5.5 - 18 GHz

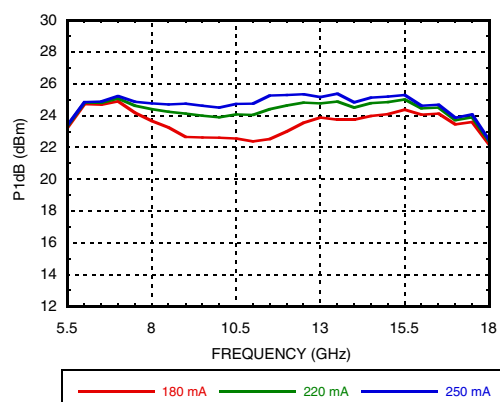
**Psat vs. Temperature**



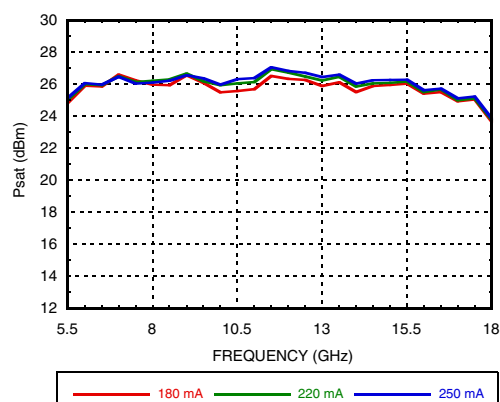
**Psat vs. Supply Voltage**



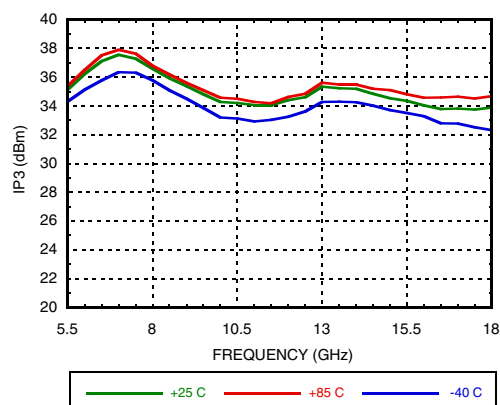
**P1dB vs. Supply Current**



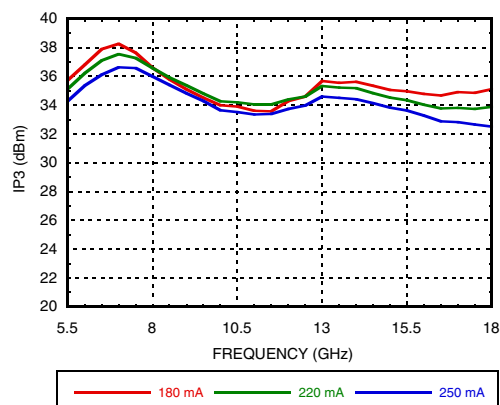
**Psat vs. Supply Current**



**Output IP3 vs. Temperature <sup>[1]</sup>**



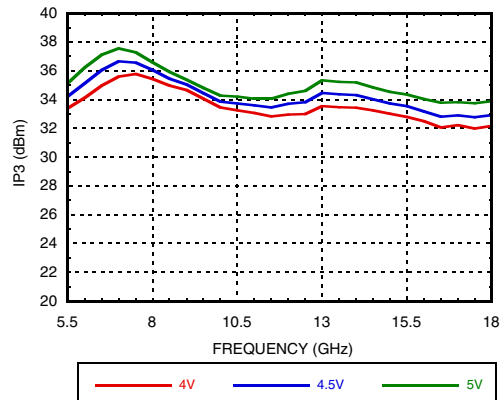
**Output IP3 vs. Supply Current <sup>[1]</sup>**



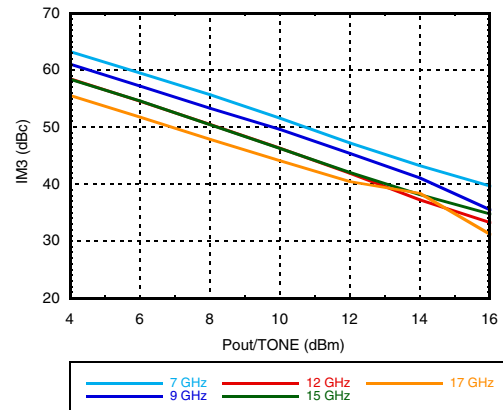
[1] Pout/Tone = +12 dBm

## GaAs pHEMT MMIC MEDIUM POWER AMPLIFIER, 5.5 - 18 GHz

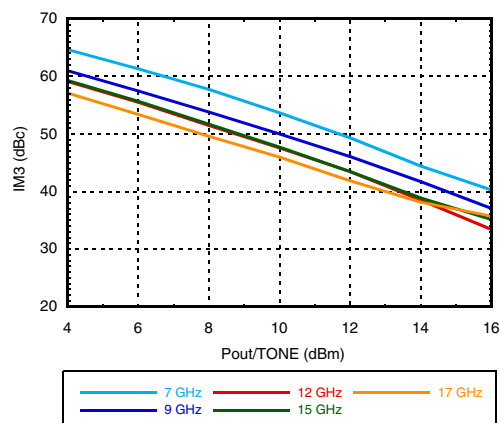
**Output IP3 vs. Supply Voltage** <sup>[1]</sup>



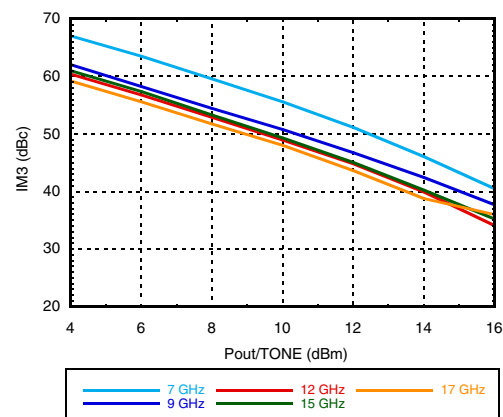
**Output IM3 @ Vdd = +4V**



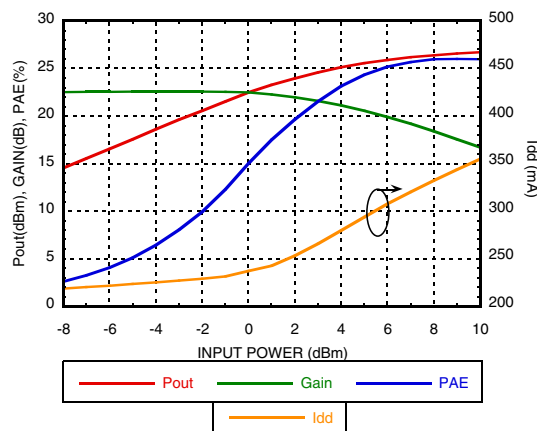
**Output IM3 @ Vdd = +4.5V**



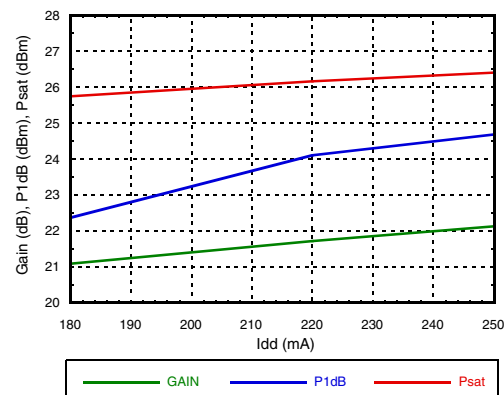
**Output IM3 @ Vdd = +5V**



**Power Compression @ 12 GHz**



**Gain & Power vs. Supply Current**



[1] Pout/Tone = +12 dBm



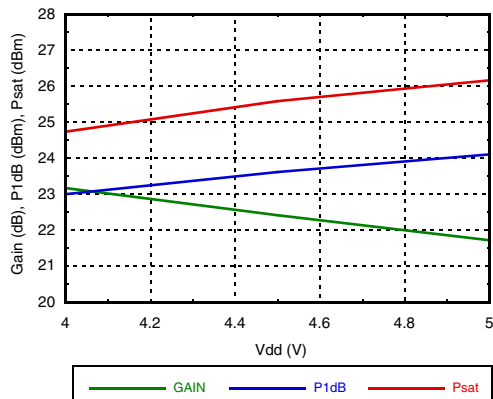
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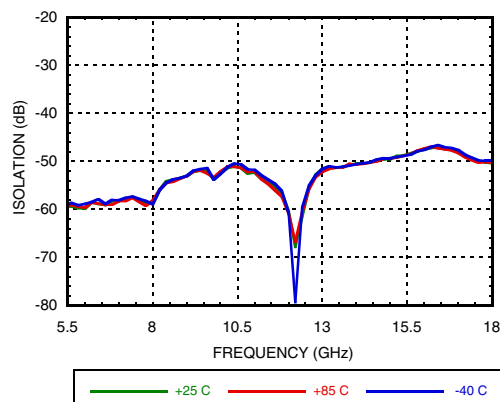
# HMC1082LP4E

## GaAs pHEMT MMIC MEDIUM POWER AMPLIFIER, 5.5 - 18 GHz

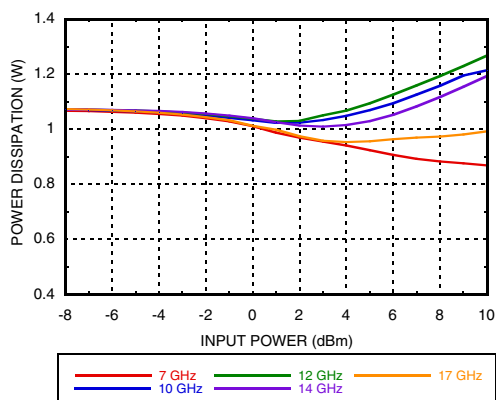
**Gain & Power vs. Supply Voltage**



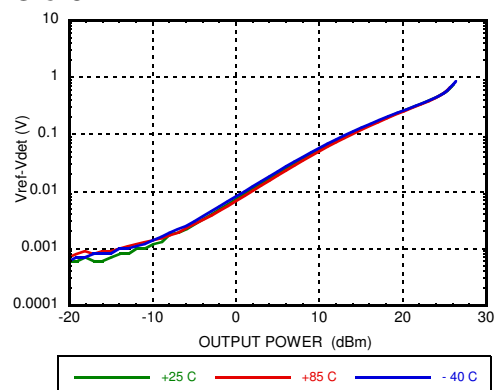
**Reverse Isolation vs. Temperature**



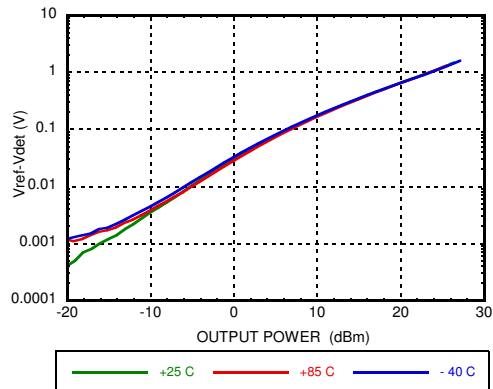
**Power Dissipation**



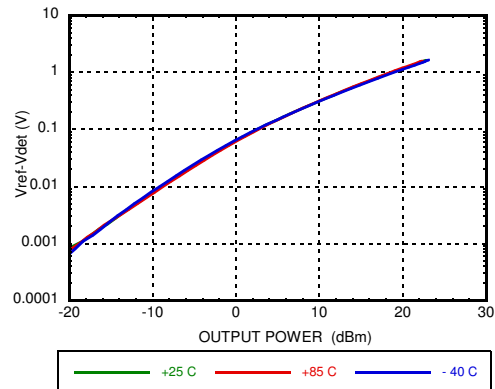
**Detector Voltage vs. Temperature  
@ 6 GHz**



**Detector Voltage vs. Temperature  
@ 12 GHz**



**Detector Voltage vs. Temperature  
@ 18 GHz**



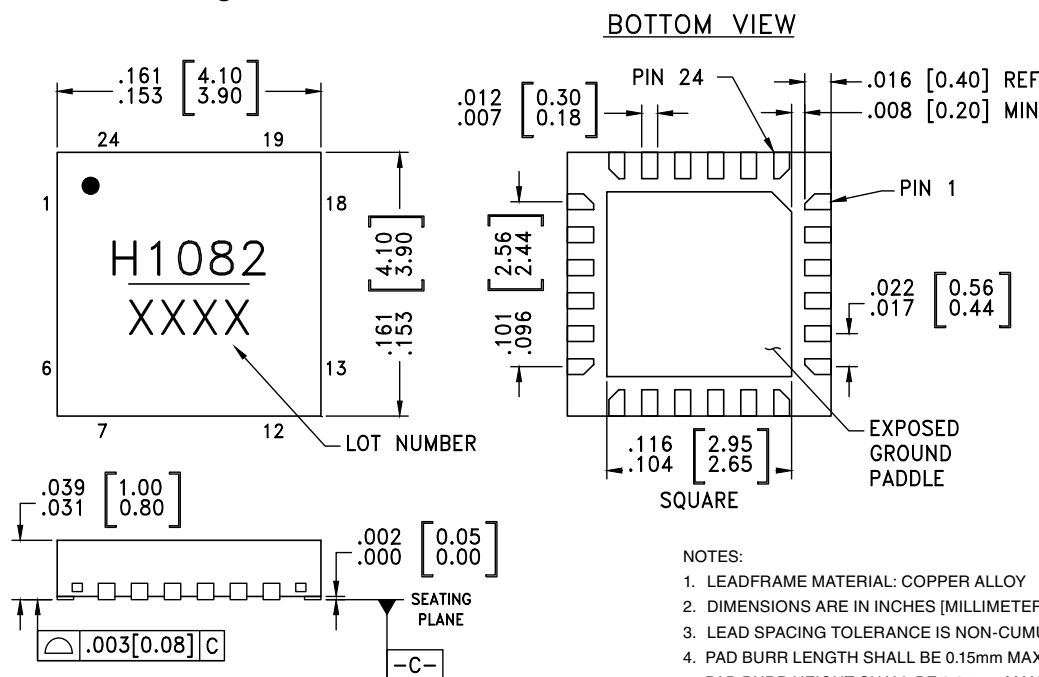
**GaAs pHEMT MMIC MEDIUM  
POWER AMPLIFIER, 5.5 - 18 GHz**
**Absolute Maximum Ratings**

|                                                                      |                      |
|----------------------------------------------------------------------|----------------------|
| Drain Bias Voltage (Vdd)                                             | 5.5V                 |
| RF Input Power (RFIN)                                                | 20 dBm               |
| Channel Temperature                                                  | 175 °C               |
| Continuous P <sub>diss</sub> (T=85 °C)<br>(derate 20mW/°C)           | 1.81W                |
| Thermal Resistance (R <sub>TH</sub> )<br>(junction to ground paddle) | 49.8 °C/W            |
| Operating Temperature                                                | -40°C to +85°C       |
| Storage Temperature                                                  | -65°C to 150°C       |
| ESD Sensitivity (HBM)                                                | Class 0, Passed 100V |

**Typical Supply Current vs. Vdd**

| Vdd (V) | Idd (mA) |
|---------|----------|
| +4      | 220      |
| +4.5    | 220      |
| +5      | 220      |

Adjust V<sub>gg1</sub> to achieve Idd = 220mA

**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**
**Outline Drawing**

**Package Information**

| Part Number | Package Body Material                              | Lead Finish   | MSL Rating <sup>[2]</sup> | Package Marking <sup>[1]</sup> |
|-------------|----------------------------------------------------|---------------|---------------------------|--------------------------------|
| HMC1082LP4E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1                      | H1082<br>XXXX                  |

<sup>[1]</sup> 4-Digit lot number XXXX

<sup>[2]</sup> Max peak reflow temperature of 260 °C

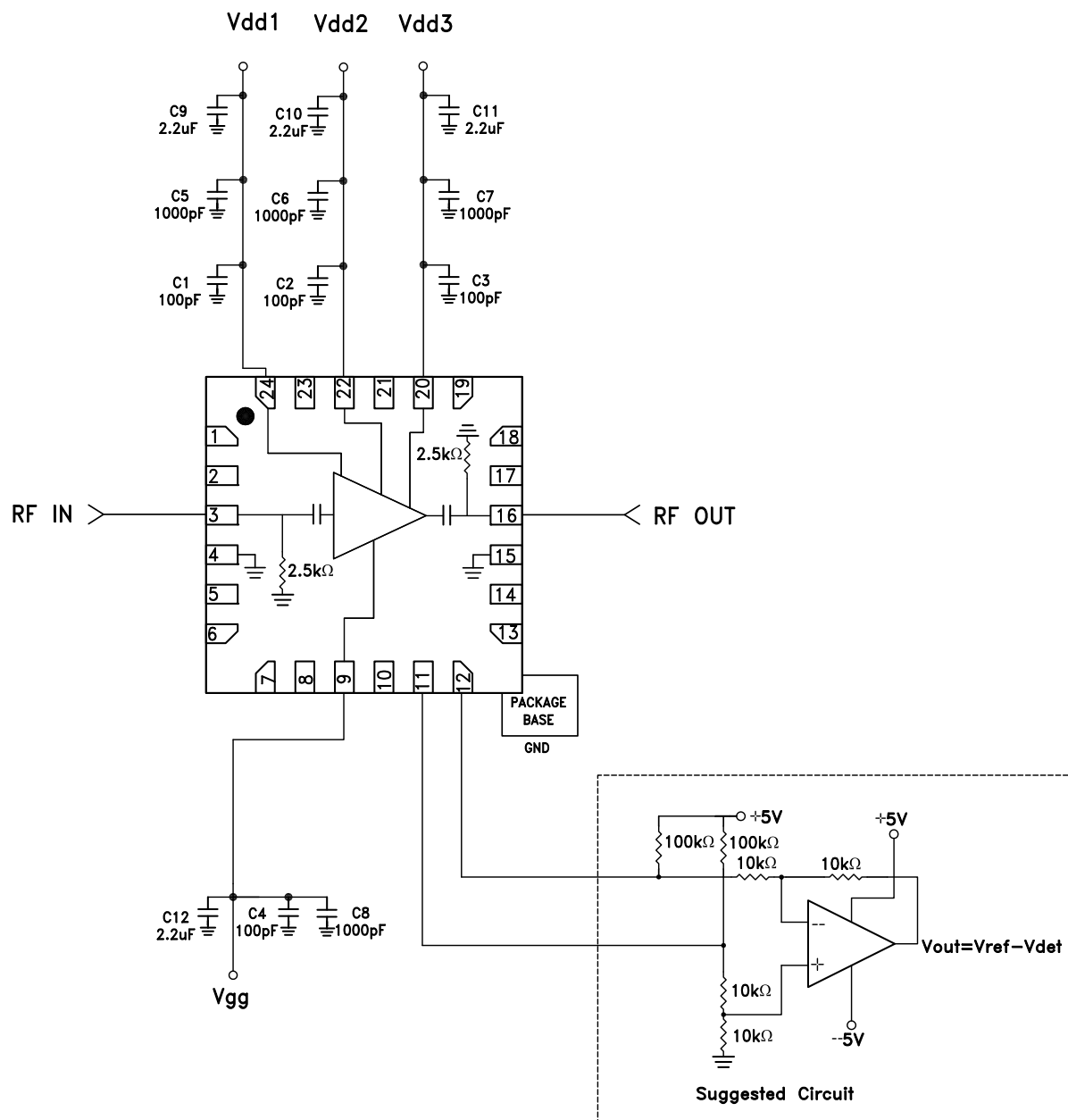




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**HMC1082LP4E****GaAs pHEMT MMIC MEDIUM  
POWER AMPLIFIER, 5.5 - 18 GHz****Pin Descriptions**

| Pin Number                                       | Function         | Description                                                                                                                               | Pin Schematic |
|--------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1, 2, 5, 6, 7, 8, 10, 13, 14, 17, 18, 19, 21, 23 | N/C              | These pins are not connected internally, however all data shown herein was measured with these pins connected to RF/DC ground externally. |               |
| 3                                                | RF IN            | This pin is DC coupled and matched to 50 Ohms.                                                                                            |               |
| 4, 15                                            | GND              | These pins and package bottom must be connected to RF/DC ground.                                                                          |               |
| 9                                                | Vgg              | Gate control for amplifier. External bypass capacitors of 1000pF, 100pF and 2.2uF are required.                                           |               |
| 11                                               | Vref             | DC bias of diode biased through external resistor used for temperature compensation of Vdet. See application circuit.                     |               |
| 12                                               | Vdet             | DC voltage representing RF output power rectified by diode which is biased through an external resistor. See application circuit.         |               |
| 16                                               | RF OUT           | This pin is DC coupled and matched to 50 Ohms.                                                                                            |               |
| 24, 22, 20                                       | Vdd1, Vdd2, Vdd3 | Drain bias voltage for amplifier. External bypass capacitors of 1000pF, 100pF and 2.2uF are required.                                     |               |

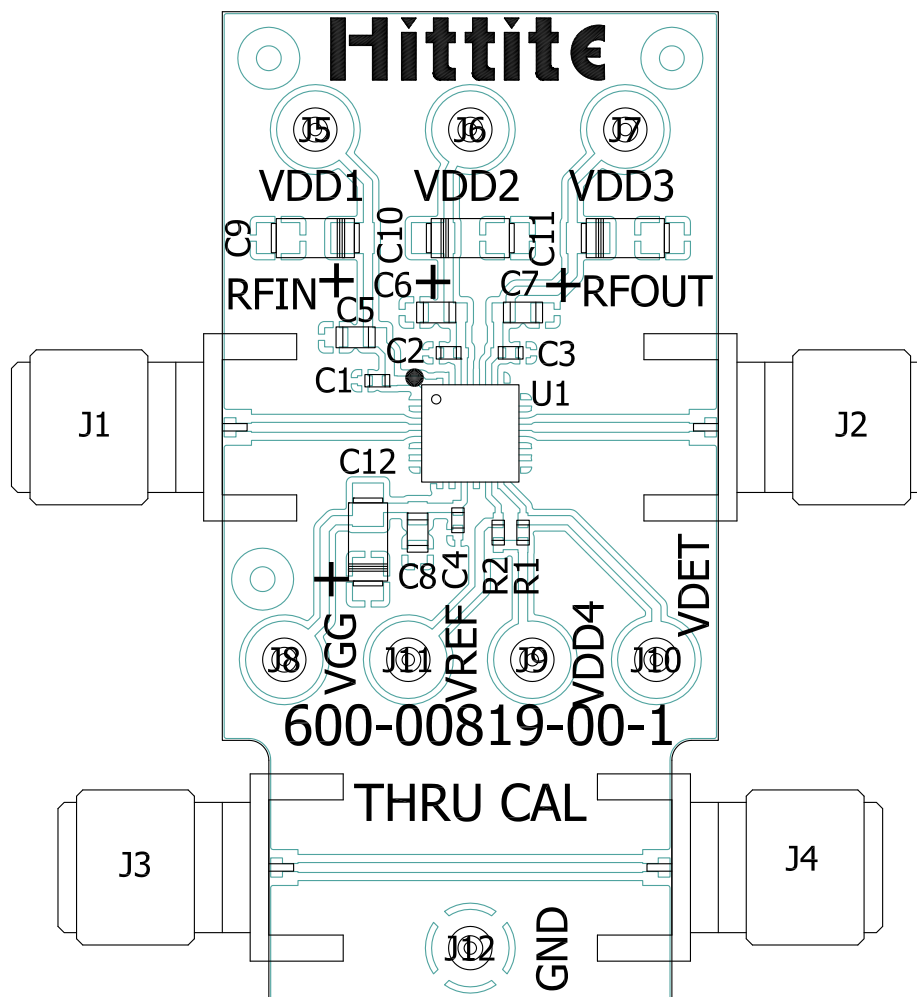
**Application Circuit**




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**HMC1082LP4E**

**GaAs pHEMT MMIC MEDIUM  
POWER AMPLIFIER, 5.5 - 18 GHz**

**Evaluation PCB****List of Materials for Evaluation PCB EV1HMC1082LP4 [1]**

| Item     | Description                   |
|----------|-------------------------------|
| J1, J2   | PCB Mount SMA RF Connector    |
| J5 - J12 | DC Pin                        |
| C1 - C4  | 100pF Capacitor, 0402 Pkg.    |
| C5 - C8  | 1000pF Capacitor, 0402 Pkg.   |
| C9 - C12 | 2.2uF Capacitor, 0402 Pkg.    |
| R1, R2   | 40.2k Ohm Resistor, 0402 Pkg. |
| U1       | HMC1082LP4E                   |
| PCB [2]  | 600-00819-00 Evaluation Board |

[1] Reference this number when ordering Complete Evaluation PCB

[2] Circuit Board Material: Rogers 4350 or Arlon 25FR

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.

For price, delivery and to place orders: Hittite Microwave Corporation, 2 Elizabeth Drive, Chelmsford, MA 01824

Phone: 978-250-3343 Fax: 978-250-3373 Order On-line at [www.hittite.com](http://www.hittite.com)

Application Support: Phone: 978-250-3343 or [apps@hittite.com](mailto:apps@hittite.com)



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POWER AMPLIFIER, 5.5 - 18 GHz**

**Notes:**

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