



## SMT PHEMT LOW NOISE AMPLIFIER, 17 - 26 GHz

### Typical Applications

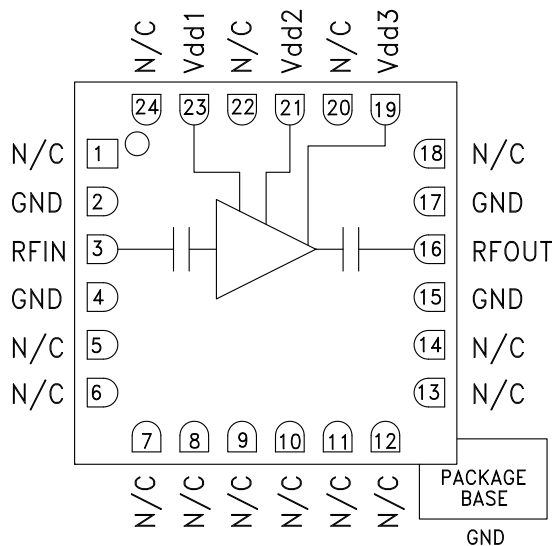
The HMC517LC4 is ideal for use as a LNA or driver amplifier for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios & VSAT
- Test Equipment and Sensors
- Military

### Features

- Noise Figure: 2.5 dB
- Gain: 19 dB
- OIP3: +23 dBm
- Single Supply: +3V @ 67 mA
- 50 Ohm Matched Input/Output
- RoHS Compliant 4 x 4 mm Package

### Functional Diagram



### General Description

The HMC517LC4 chip is a high dynamic range GaAs pHEMT MMIC Low Noise Amplifier (LNA) housed in a leadless “Pb free” RoHS compliant SMT package. The HMC517LC4 provides 19 dB of small signal gain, 2.5 dB of noise figure and has an output IP3 of +23 dBm. The P1dB output power of +13 dBm enables the LNA to also function as a LO driver for balanced, I/Q or image reject mixers. The HMC517LC4 allows the use of surface mount manufacturing techniques.

### Electrical Specifications, $T_A = +25^\circ\text{C}$ , $V_{dd\ 1, 2, 3} = +3V$

| Parameter  | Min.    | Typ. | Max.    | Min. | Typ. | Max. | Units  |
|--|---------|------|---------|------|------|------|--------|
| Frequency Range  | 17 - 22 |      | 22 - 26 |      |      |      | GHz    |
| Gain   | 16      | 19   |         | 15   | 18   |      | dB     |
| Gain Variation Over Temperature                          |         | 0.02 | 0.03    |      | 0.02 | 0.03 | dB/ °C |
| Noise Figure   |         | 2.5  | 3.1     |      | 2.6  | 3.3  | dB     |
| Input Return Loss  |         | 15   |         |      | 15   |      | dB     |
| Output Return Loss                                       |         | 11   |         |      | 17   |      | dB     |
| Output Power for 1 dB Compression (P1dB)                 |         | 12   |         |      | 13   |      | dBm    |
| Saturated Output Power (Psat)                            |         | 15   |         |      | 16   |      | dBm    |
| Output Third Order Intercept (IP3)                       |         | 23   |         |      | 24   |      | dBm    |
| Supply Current (I <sub>dd</sub> )(V <sub>dd</sub> = +3V) |         | 67   |         |      | 67   |      | mA     |

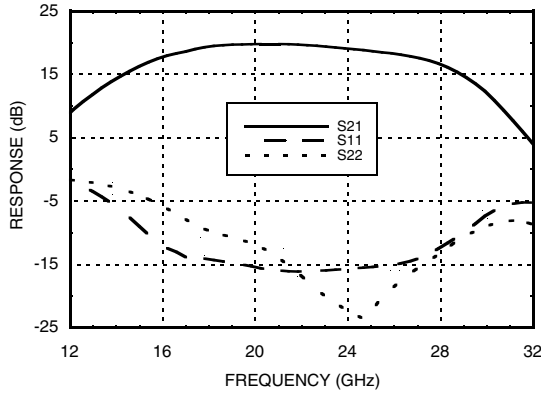
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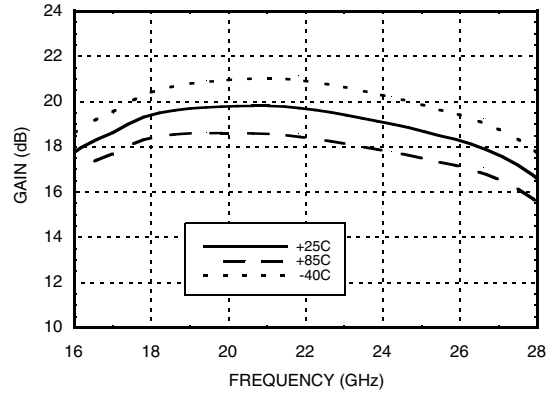


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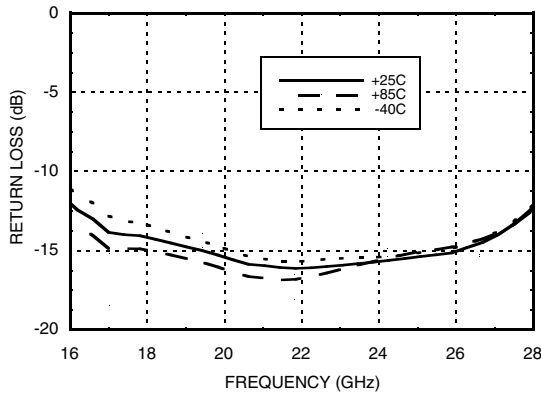
**Broadband Gain & Return Loss**



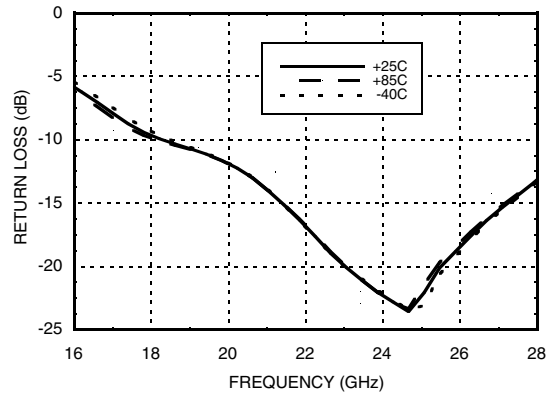
**Gain vs. Temperature**



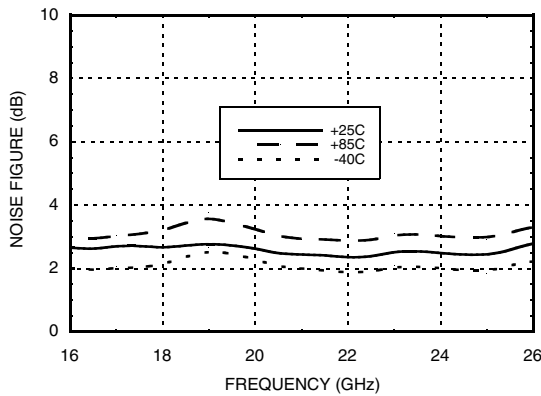
**Input Return Loss vs. Temperature**



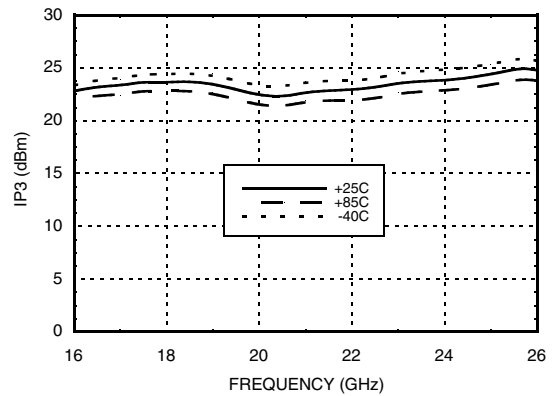
**Output Return Loss vs. Temperature**



**Noise Figure vs. Temperature**



**Output IP3 vs. Temperature**



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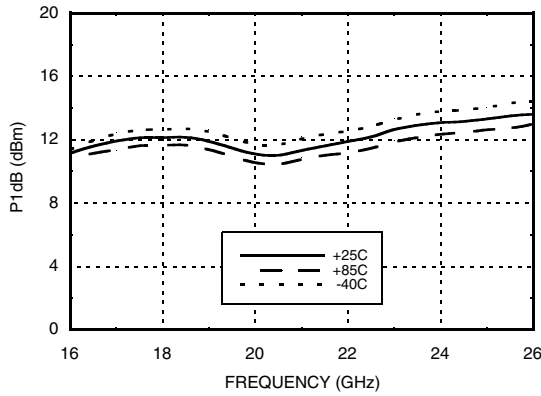
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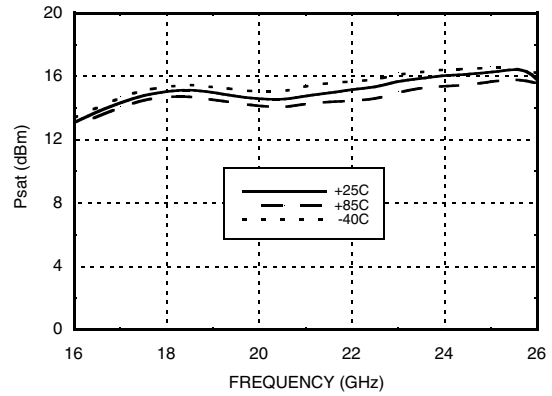
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LOW NOISE AMPLIFIERS - SMT

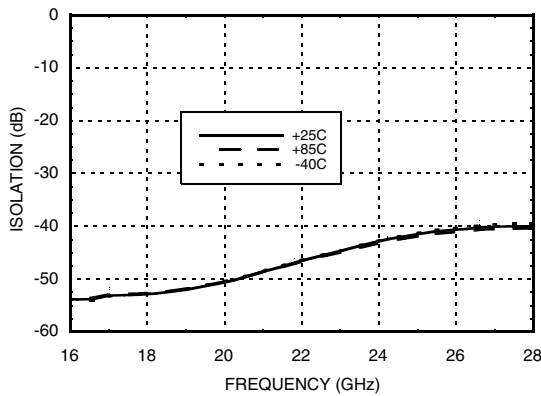
**P1dB vs. Temperature**



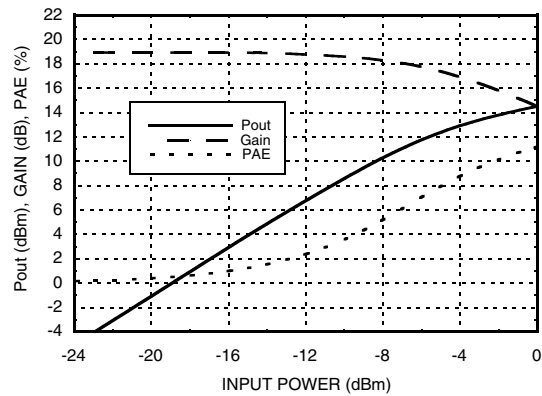
**Psat vs. Temperature**



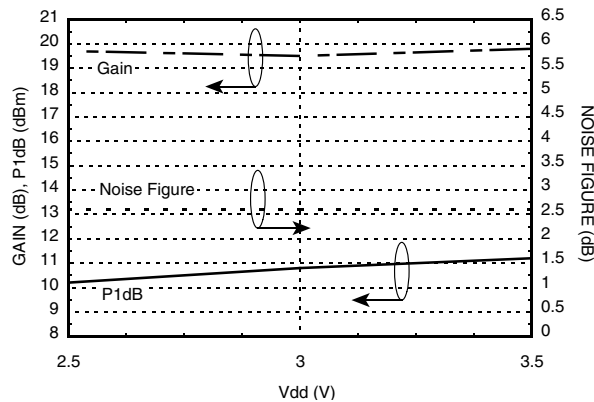
**Reverse Isolation vs. Temperature**



**Power Compression @ 21 GHz**



**Gain, Noise Figure & Power vs. Supply Voltage @ 21 GHz**



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## SMT PHEMT LOW NOISE AMPLIFIER, 17 - 26 GHz

### Absolute Maximum Ratings

|  |                |
|--|----------------|
| Drain Bias Voltage (Vdd1, Vdd2, Vdd3)                                    | +5.5 Vdc       |
| RF Input Power (RFIN)(Vdd = +3.0 Vdc)                                    | +2 dBm         |
| Channel Temperature  | 175 °C         |
| Continuous P <sub>diss</sub> (T= 85 °C)<br>(derate 29 mW/°C above 85 °C) | 2.65 W         |
| Thermal Resistance<br>(channel to die bottom)                            | 34 °C/W        |
| Storage Temperature  | -65 to +150 °C |
| Operating Temperature  | -40 to +85 °C  |
| ESD Sensitivity (HBM)  | Class 1A       |

### Typical Supply Current vs. Vdd

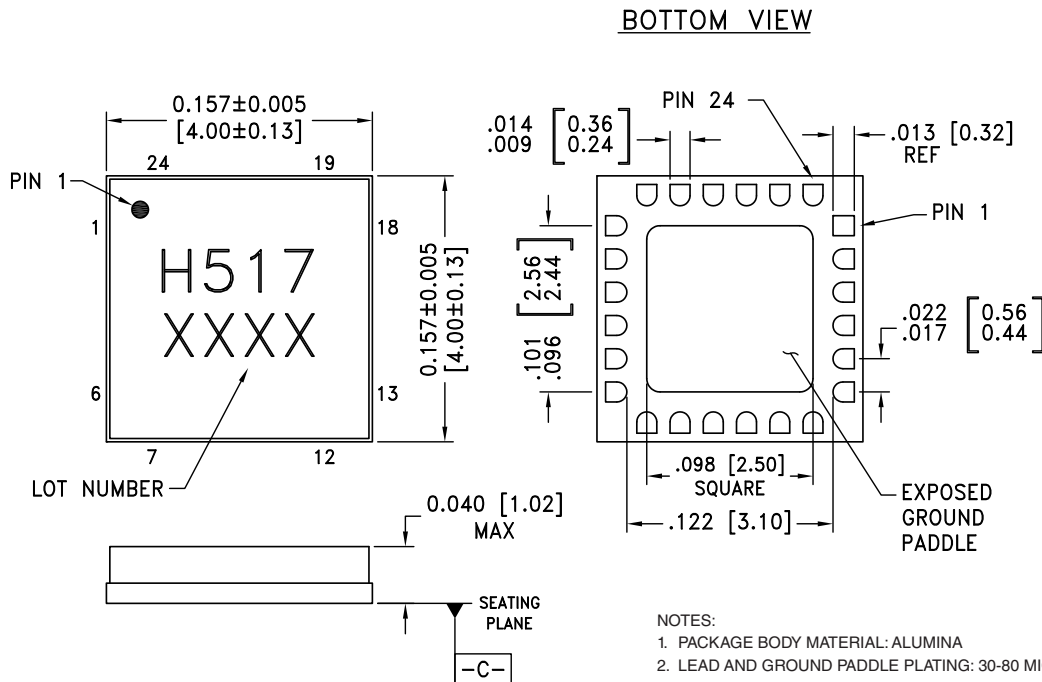
| Vdd (V) | I <sub>dd</sub> (mA) |
|---------|----------------------|
| +2.5    | 66                   |
| +3.0    | 68                   |
| +3.5    | 71                   |

Note: Amplifier will operate over full voltage range shown above.



ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

### Outline Drawing



#### NOTES:

1. PACKAGE BODY MATERIAL: ALUMINA
2. LEAD AND GROUND PADDLE PLATING: 30-80 MICROINCHES GOLD OVER 50 MICROINCHES MINIMUM NICKEL
3. DIMENSIONS ARE IN INCHES [MILLIMETERS]
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm DATUM
6. 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 <sup>[2]</sup> |
|-------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC517LC4   | Alumina, White        | Gold over Nickel | MSL3 <sup>[1]</sup> | H517<br>XXXX                   |

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX



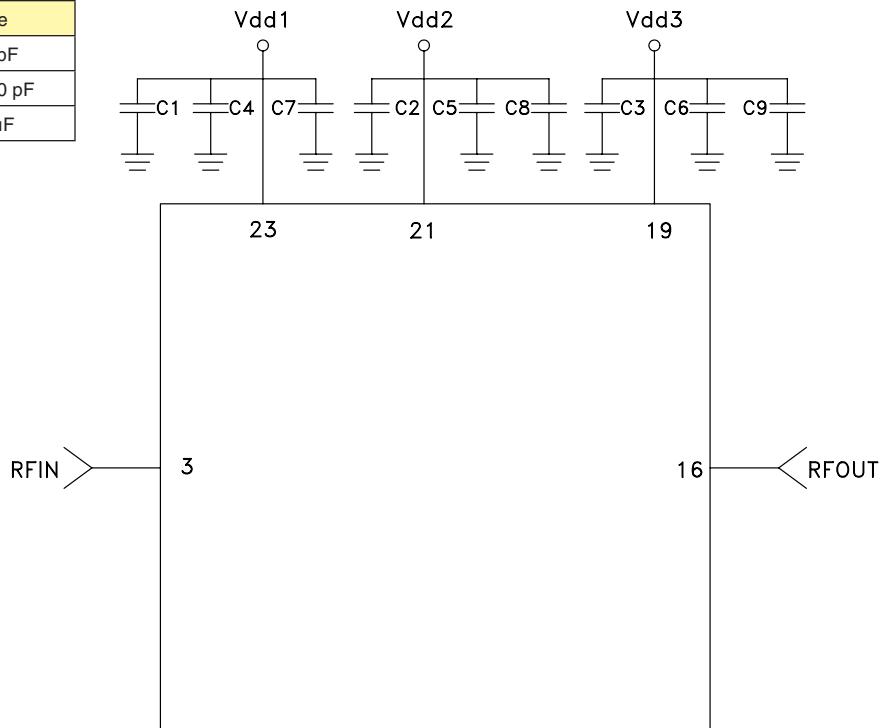
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**Pin Descriptions**

| Pin Number                | Function   | Description   | Interface Schematic  |
|---------------------------|------------|---|----------------------|
| 1, 5 - 14, 18, 20, 22, 24 | N/C        | This pin may be connected to RF/DC ground. Performance will not be affected.                                    |                      |
| 3                         | RFIN       | This pin is AC coupled and matched to 50 Ohms.  | RFIN ○ —  —          |
| 23, 21, 19                | Vdd1, 2, 3 | Power Supply Voltage for the amplifier. External bypass capacitors of 100 pF, 1,000 pF and 2.2 μF are required. | ○ Vdd1,2,3<br>  <br> |
| 16                        | RFOUT      | This pin is AC coupled and matched to 50 Ohms.  | —  — ○ RFOUT         |
| 2, 4, 15, 17              | GND        | These pins and package bottom must be connected to RF/DC ground.  | ○ GND<br>  <br>      |

**Application Circuit**

| Component  | Value    |
|------------|----------|
| C1, C2, C3 | 100 pF   |
| C4, C5, C6 | 1,000 pF |
| C7, C8, C9 | 2.2 μF   |



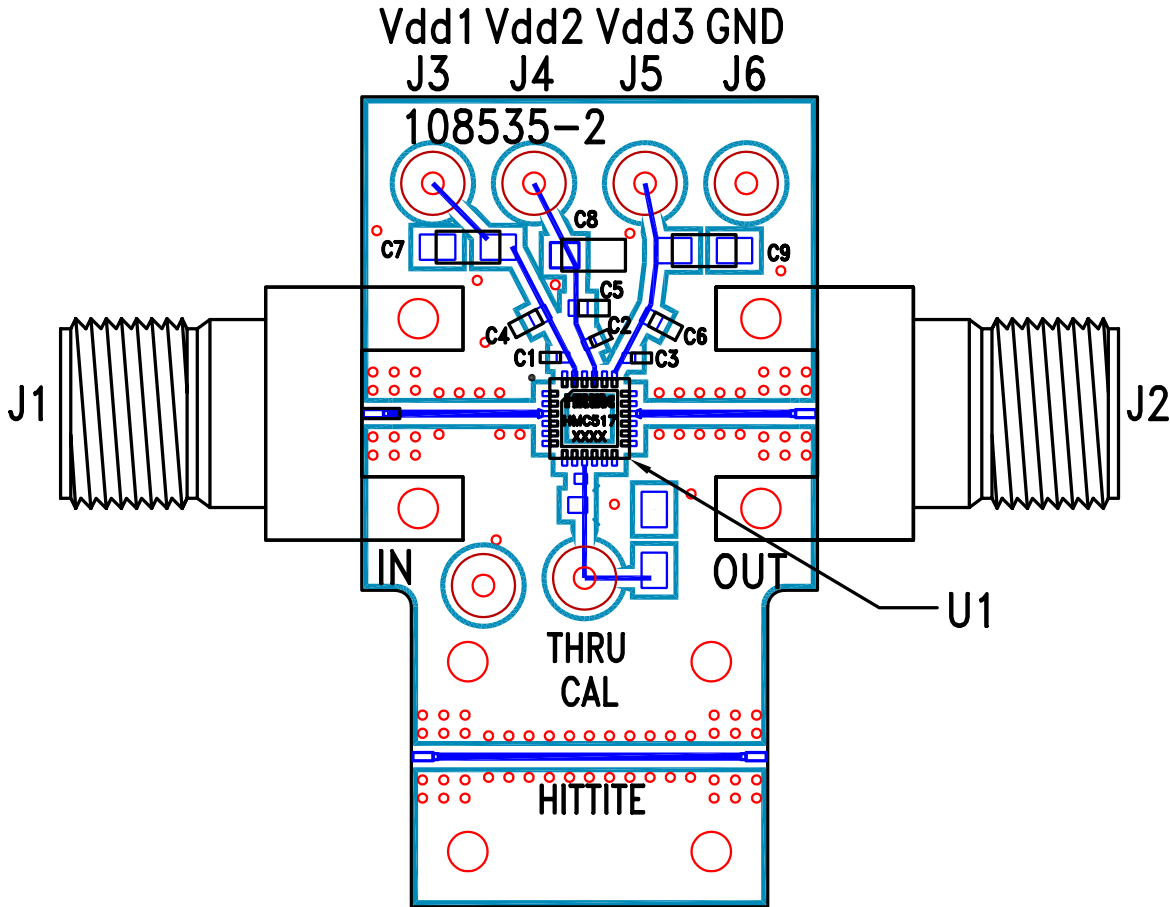
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**Evaluation PCB**



**List of Materials for Evaluation PCB 108537 [1]**

| Item    | Description                   |
|---------|-------------------------------|
| J1 - J2 | PCB Mount K Connector         |
| J3 - J6 | DC Pin                        |
| C1 - C3 | 100 pF Capacitor, 0402 Pkg.   |
| C4 - C6 | 1,000 pF Capacitor, 0603 Pkg. |
| C7 - C9 | 2.2 μF Capacitor, Tantalum    |
| U1      | HMC517LC4 Amplifier           |
| PCB [2] | 108535 Evaluation PCB         |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

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.