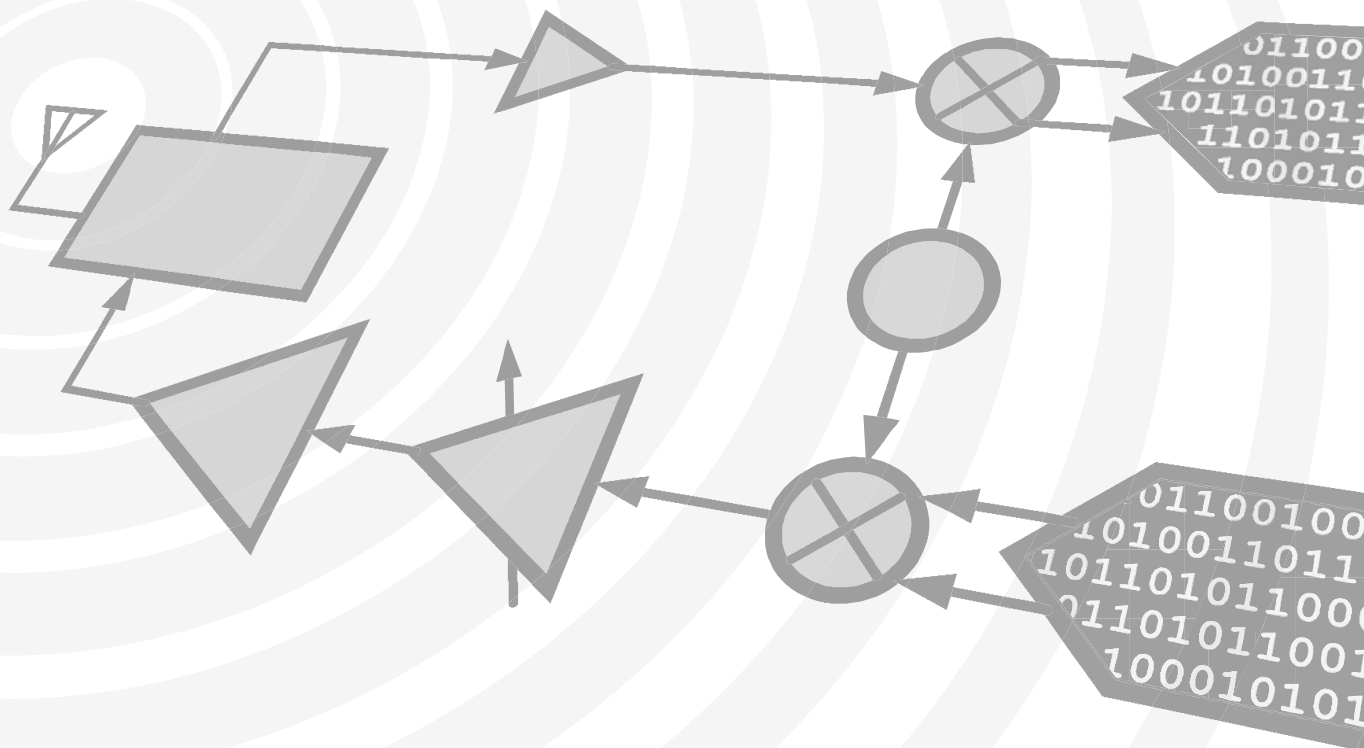




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MICROWAVE CORPORATION v06.0514



# HMC451LC3

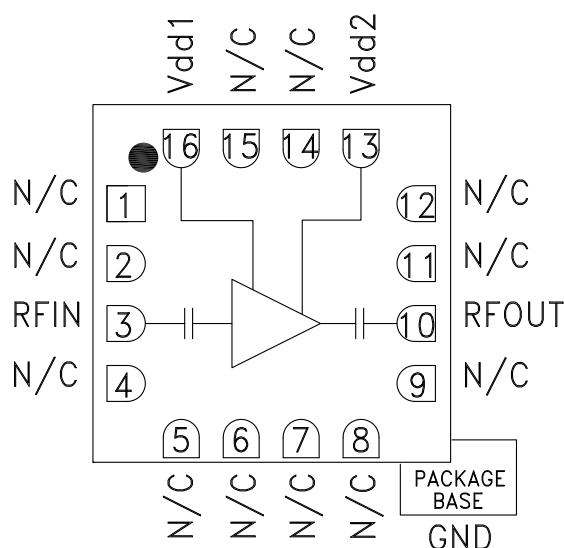
## GaAs PHEMT MMIC MEDIUM POWER AMPLIFIER, 5 - 20 GHz

### Typical Applications

The HMC451LC3 is ideal for use as a medium power amplifier for:

- Microwave Radio & VSAT
- Military & Space
- Test Equipment & Sensors
- Fiber Optics
- LO Driver for HMC Mixers

### Functional Diagram



### Features

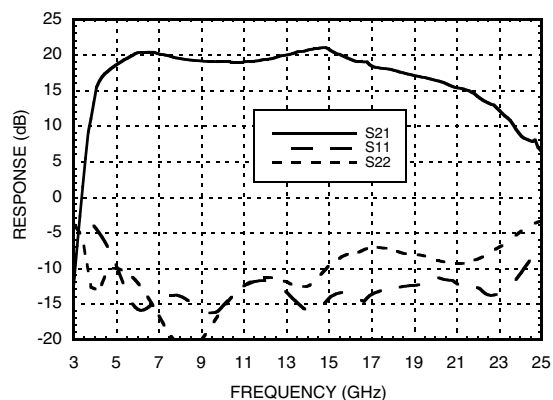
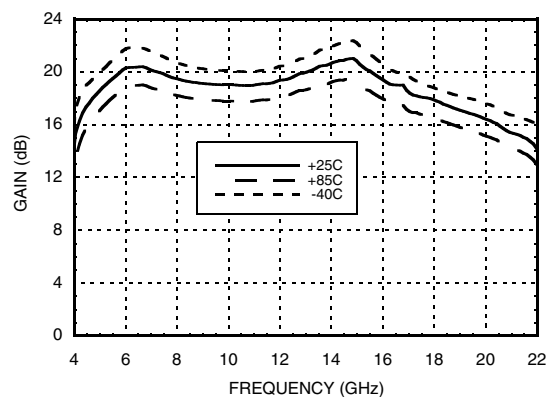
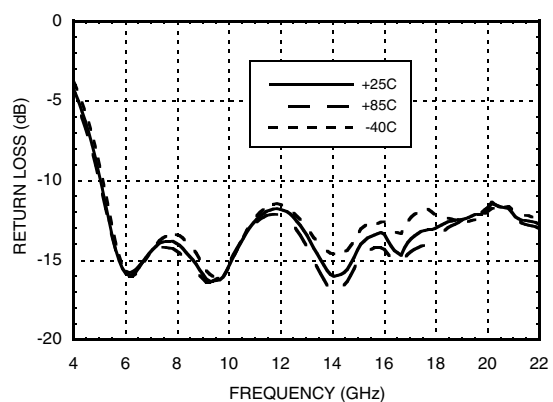
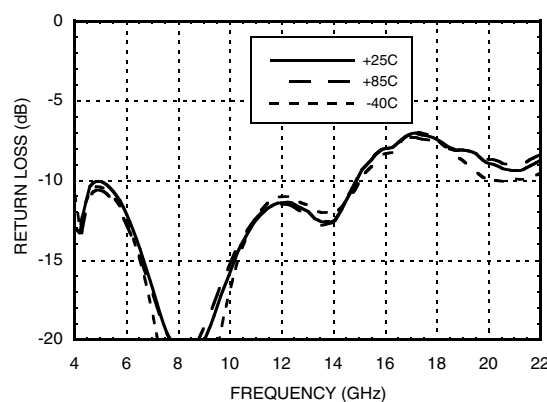
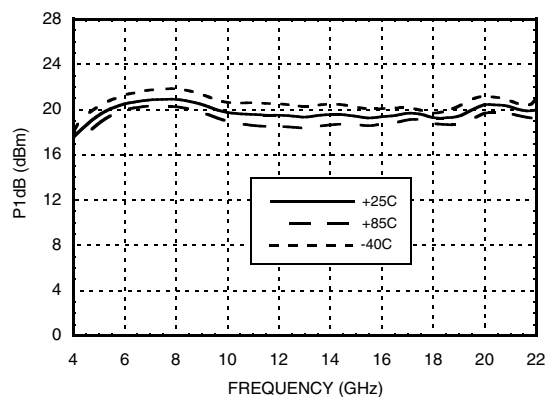
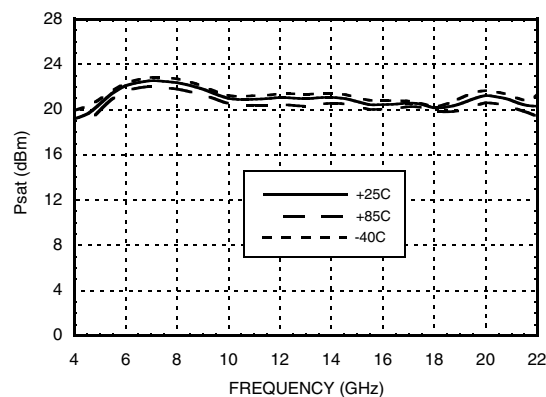
- Gain: 19 dB
- Saturated Power: +21 dBm @ 21% PAE
- Output IP3: +30 dBm
- Single Supply: +5V @ 114 mA
- 50 Ohm Matched Input/Output
- RoHS Compliant 3 x 3 mm SMT package

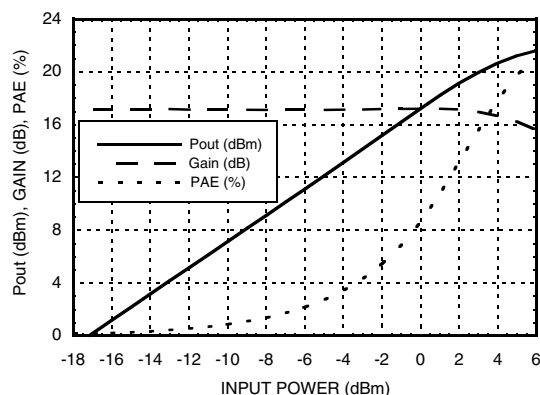
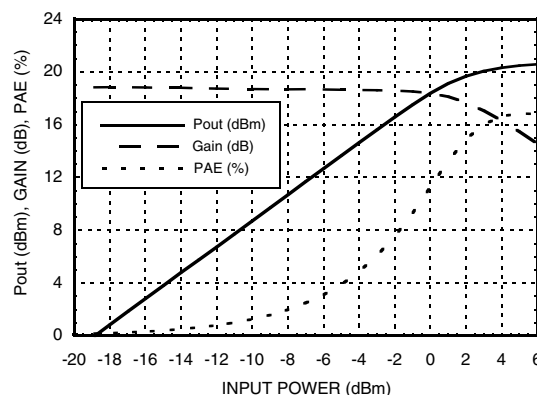
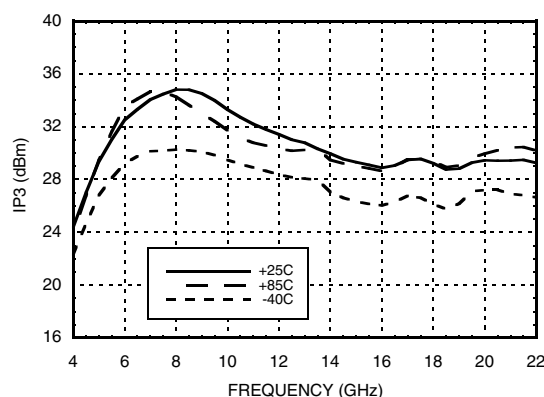
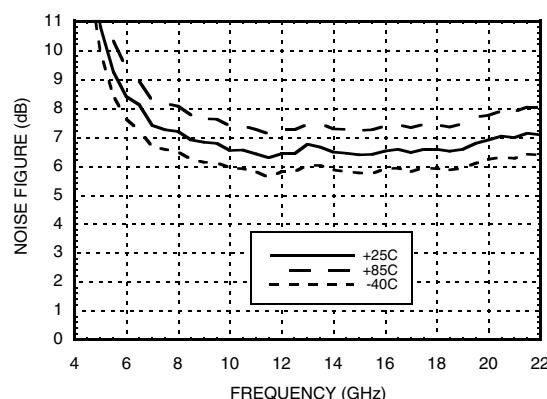
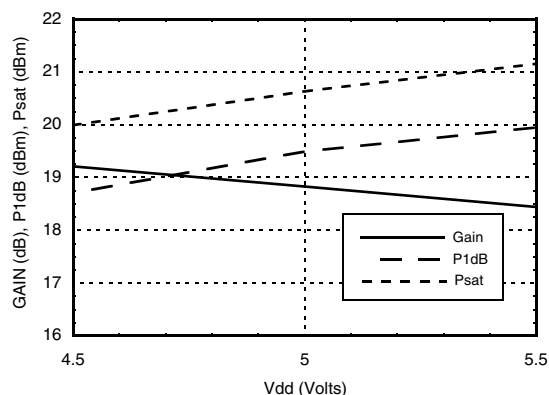
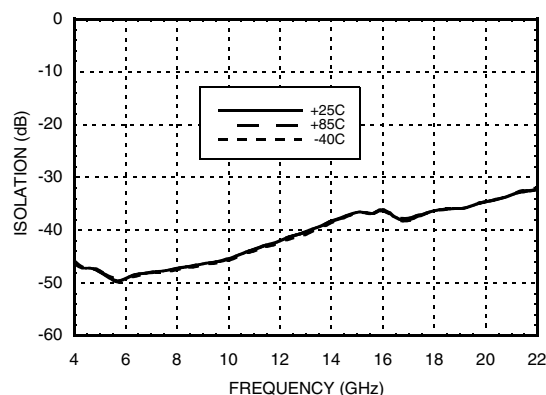
### General Description

The HMC451LC3 is an efficient GaAs PHEMT MMIC Medium Power Amplifier housed in a leadless RoHS compliant SMT package. Operating between 5 and 20 GHz, the amplifier provides 19 dB of gain, +21 dBm of saturated power and 21% PAE from a single +5V supply. This 50 Ohm matched amplifier does not require any external components and the RF I/O's are DC blocked, making it an ideal linear gain block or driver for HMC SMT mixers. The HMC451LC3 allows the use of surface mount manufacturing techniques.

### Electrical Specifications, $T_A = +25^\circ \text{C}$ , $V_{dd1} = V_{dd2} = +5\text{V}$

| Parameter                                | Min.   | Typ.  | Max.  | Min.    | Typ.  | Max.  | Min.    | Typ.  | Max.  | Units |
|--|--------|-------|-------|---------|-------|-------|---------|-------|-------|-------|
| Frequency Range                          | 5 - 15 |       |       | 15 - 18 |       |       | 18 - 20 |       |       | GHz   |
| Gain                                     | 16     | 19    |       | 15      | 18    |       | 14      | 17    |       | dB    |
| Gain Variation Over Temperature          |        | 0.015 | 0.025 |         | 0.015 | 0.025 |         | 0.015 | 0.025 | dB/°C |
| Input Return Loss                        |        | 13    |       |         | 13    |       |         | 12    |       | dB    |
| Output Return Loss                       |        | 12    |       |         | 8     |       |         | 8     |       | dB    |
| Output Power for 1 dB Compression (P1dB) | 16.5   | 19.5  |       | 16      | 19    |       | 16.5    | 19.5  |       | dBm   |
| Saturated Output Power (Psat)            |        | 21    |       |         | 20.5  |       |         | 21    |       | dBm   |
| Output Third Order Intercept (IP3)       |        | 32    |       |         | 29    |       |         | 29    |       | dBm   |
| Noise Figure                             |        | 7     |       |         | 6.5   |       |         | 7     |       | dB    |
| Supply Current (Idd)                     |        | 114   |       |         | 114   |       |         | 114   |       | mA    |

**GaAs PHEMT MMIC MEDIUM  
POWER AMPLIFIER, 5 - 20 GHz**
**Broadband Gain & Return Loss**

**Gain vs. Temperature**

**Input Return Loss vs. Temperature**

**Output Return Loss vs. Temperature**

**P1dB vs. Temperature**

**Psat vs. Temperature**


**GaAs PHEMT MMIC MEDIUM  
POWER AMPLIFIER, 5 - 20 GHz**
**Power Compression @ 10 GHz**

**Power Compression @ 20 GHz**

**Output IP3 vs. Temperature**

**Noise Figure vs. Temperature**

**Gain, P1dB & PSAT  
vs. Supply Voltage @ 11 GHz**

**Reverse Isolation vs. Temperature**


**GaAs PHEMT MMIC MEDIUM  
POWER AMPLIFIER, 5 - 20 GHz**
**Absolute Maximum Ratings**

|   |                |
|---|----------------|
| Drain Bias Voltage ( $V_{dd1} = V_{dd2}$ )                              | +5.5 Vdc       |
| RF Input Power (RFIN)( $V_{dd} = +5V_{dc}$ )                            | +10 dBm        |
| Channel Temperature   | 175 °C         |
| Continuous $P_{diss}$ ( $T = 85$ °C)<br>(derate 12.4 mW/°C above 85 °C) | 1.1 W          |
| Thermal Resistance<br>(channel to ground paddle)                        | 80 °C/W        |
| Storage Temperature   | -65 to +150 °C |
| Operating Temperature   | -40 to +85 °C  |

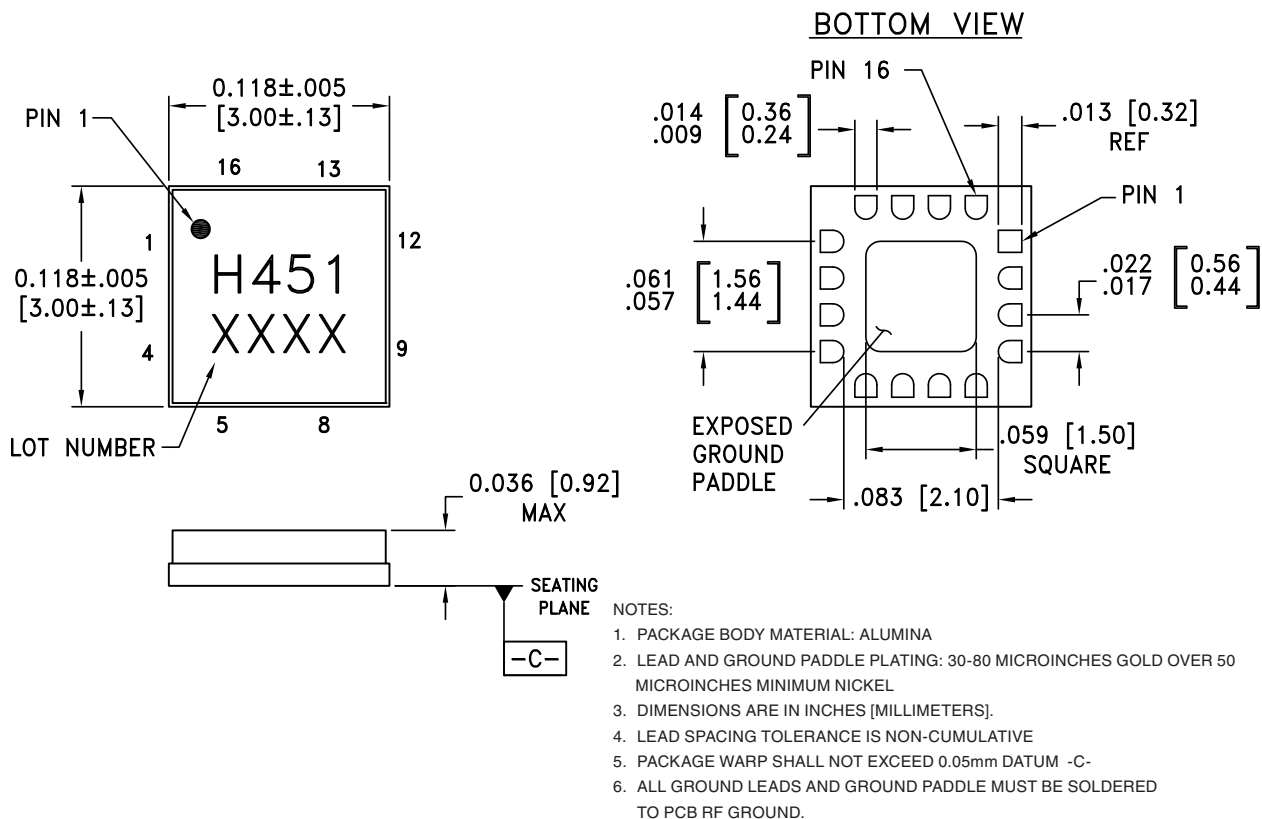
**Typical Supply Current vs.  $V_{dd1} = V_{dd2}$** 

| $V_{dd1} = V_{dd2}$ (V) | $I_{dd1} = I_{dd2}$ (mA) |
|-------------------------|--------------------------|
| +4.5                    | 111                      |
| +5.0                    | 114                      |
| +5.5                    | 116                      |

Note: Amplifier will operate over full voltage range shown above



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

**Outline Drawing**

**Package Information**

| Part Number | Package Body Material | Lead Finish      | MSL Rating          | Package Marking <sup>[2]</sup> |
|-------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC451LC3   | Alumina, White        | Gold over Nickel | MSL3 <sup>[1]</sup> | H451<br>XXXX                   |

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX

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)





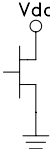
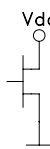

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**HMC451LC3**

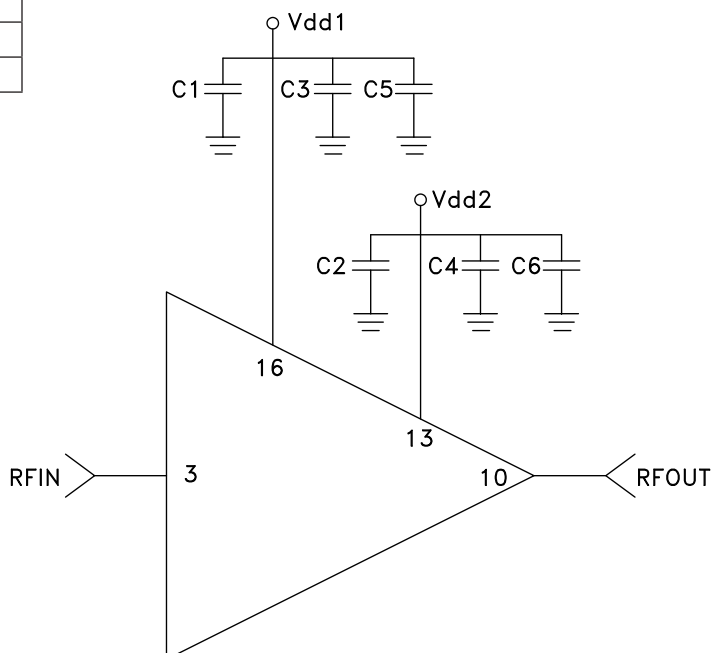
**GaAs PHEMT MMIC MEDIUM  
POWER AMPLIFIER, 5 - 20 GHz**

## Pin Descriptions

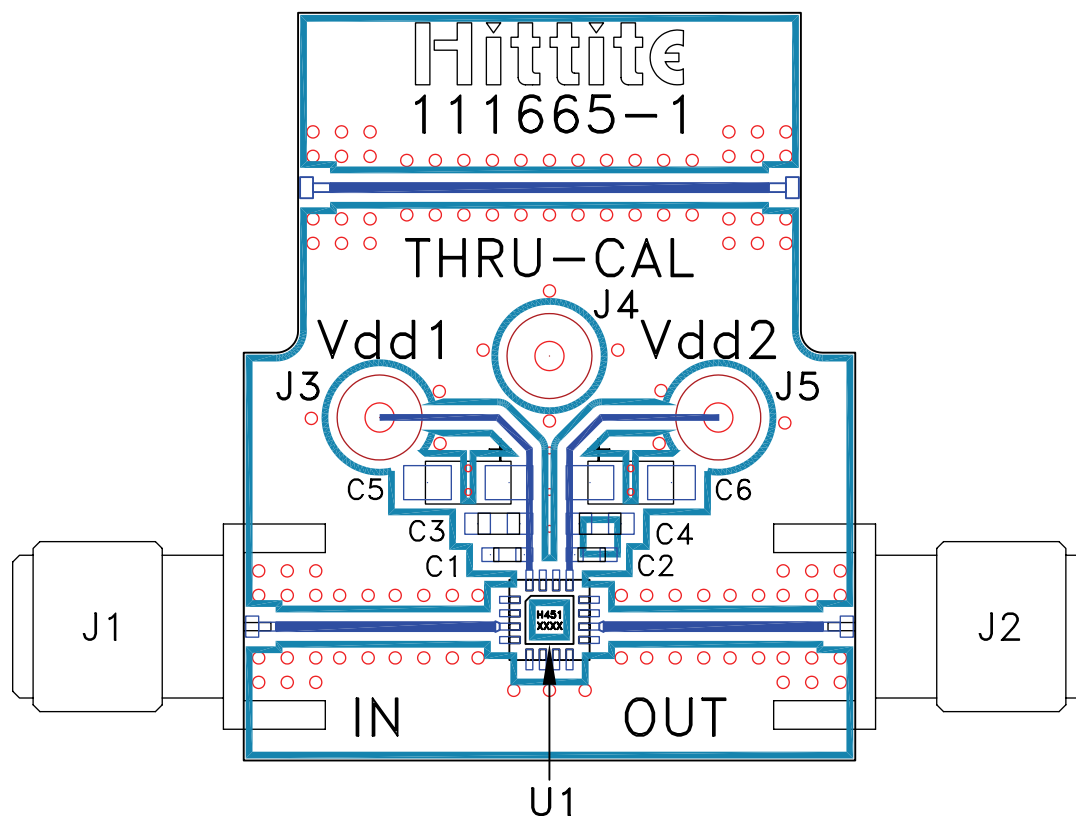
| Pin Number                  | Function | Description  | Interface Schematic   |
|-----------------------------|----------|--|---|
| 1, 2, 4 - 9, 11, 12, 14, 15 | N/C      | This pin may be connected to RF/DC ground. Performance will not be affected.   |   |
| 3                           | RFIN     | This pin is AC coupled and matched to 50 Ohms from 5 - 20 GHz.   | RFIN   |
| 10                          | RFOUT    | This pin is AC coupled and matched to 50 Ohms from 5 - 20 GHz.   |  RFOUT |
| 13                          | Vdd2     | Power Supply Voltage for the amplifier. External bypass capacitors of 100 pF, 1,000 pF and 2.2 $\mu$ F are required. |        |
| 16                          | Vdd1     | Power Supply Voltage for the amplifier. External bypass capacitors of 100 pF, 1,000 pF and 2.2 $\mu$ F are required. |        |
|                             | GND      | Package bottom must be connected to RF/DC ground.  |       |

## Application Circuit

| Component | Value       |
|-----------|-------------|
| C1, C2    | 100 pF      |
| C3, C4    | 1,000 pF    |
| C5, C6    | 2.2 $\mu$ F |



**Evaluation PCB**



**List of Materials for Evaluation PCB 111667 [1]**

| Item    | Description                     |
|---------|---------------------------------|
| J1 - J2 | PCB Mount SMA Connector         |
| J3 - J5 | DC Pin                          |
| C1, C2  | 100 pF Capacitor, 0402 Pkg.     |
| C3, C4  | 1000 pF Capacitor, 0603 Pkg.    |
| C5, C6  | 2.2 $\mu$ F Capacitor, Tantalum |
| U1      | HMC451LC3 Amplifier             |
| PCB [2] | 111665 Evaluation PCB, 10 mils  |

[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.