

Analog Devices Welcomes Hittite Microwave Corporation

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Typical Applications

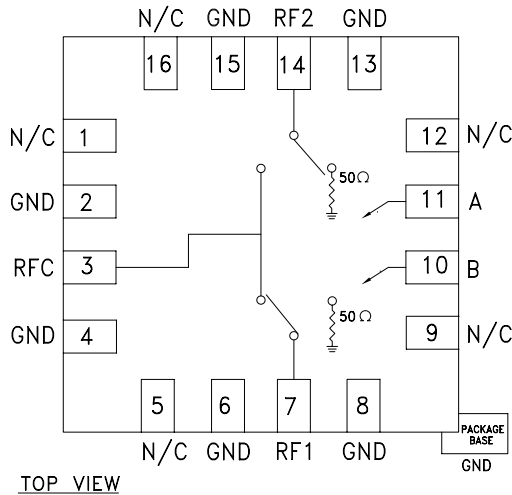
The HMC547LP3 & HMC547LP3E is ideal for:

- Basestation Infrastructure
- Fiber Optics & Broadband Telecom
- Microwave Radio & VSAT
- Military Radios, Radar, & ECM
- Test Instrumentation

Features

- High Isolation: >50 dB up to 5 GHz
>45 dB up to 15 GHz
- Low Insertion Loss: 1.6 dB @ 10 GHz
2 dB @ 20 GHz
- Fast Switching
- Non-Reflective Design
- QFN SMT Package, 9 mm²

Functional Diagram

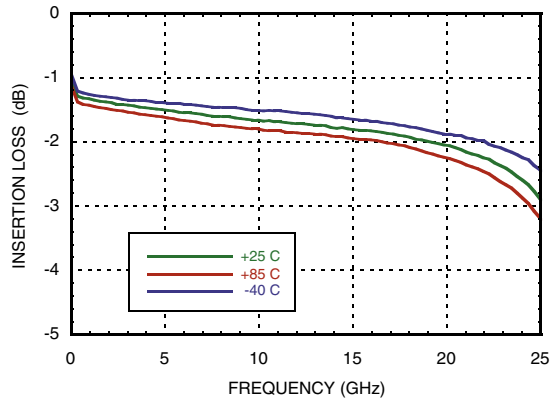
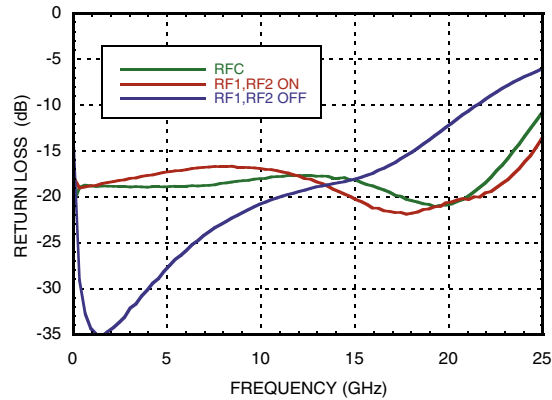
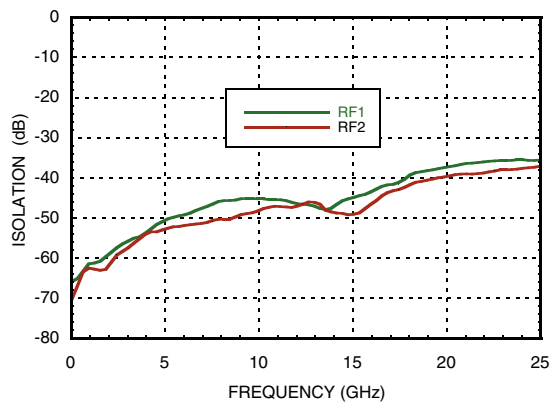
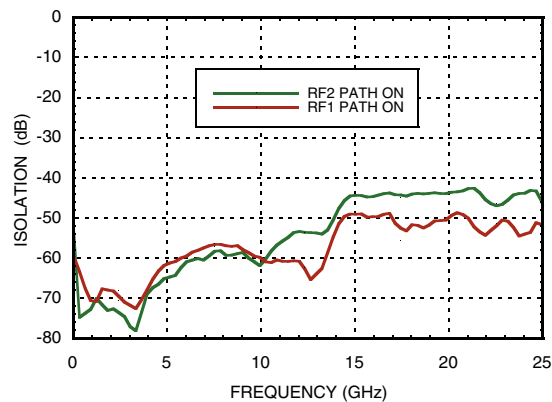
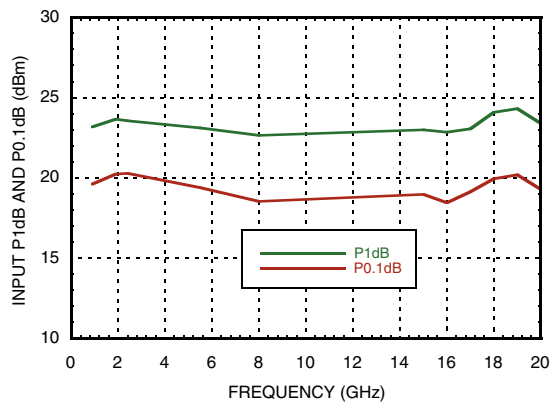
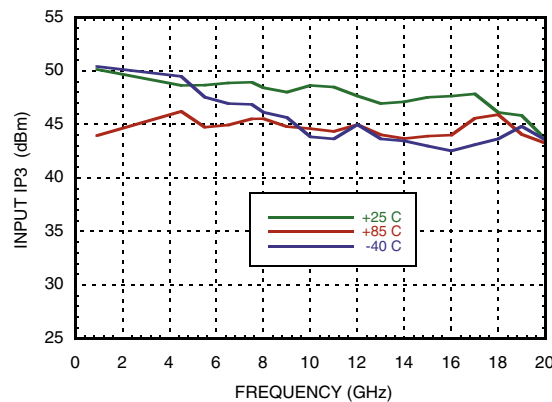


General Description

The HMC547LP3 & HMC547LP3E are general purpose broadband high isolation non-reflective GaAs MESFET SPDT switches in low cost leadless QFN surface mount plastic packages. Covering DC to 20 GHz, the switch offers high isolation and low insertion loss. The switch features >50 dB isolation up to 5 GHz and >45 dB isolation up to 15 GHz. The switch operates using complementary negative control voltage logic lines of -5/0V and requires no bias supply. The HMC547LP3 & HMC547LP3E are packaged in leadless QFN 3x3 mm surface mount packages.

Electrical Specifications, $T_A = +25^\circ \text{C}$, With 0/-5V Control, 50 Ohm System

| Parameter | Frequency | Min. | Typ. | Max. | Units |
|---|----------------|---------------|------|------|-------|
| Insertion Loss | DC - 6.0 GHz | | 1.5 | 1.9 | dB |
| | DC - 10.0 GHz | | 1.6 | 2.0 | dB |
| | DC - 15.0 GHz | | 1.8 | 2.2 | dB |
| | DC - 20.0 GHz | | 2.0 | 2.5 | dB |
| Isolation | DC - 6.0 GHz | 45 | 50 | | dB |
| | DC - 15.0 GHz | 40 | 45 | | dB |
| | DC - 20.0 GHz | 33 | 38 | | dB |
| Return Loss | "On State" | DC - 20.0 GHz | 17 | | dB |
| Return Loss RF1, RF2 | "Off State" | DC - 6.0 GHz | 25 | | dB |
| | DC - 15.0 GHz | 17 | | dB | |
| | DC - 20.0 GHz | 13 | | dB | |
| Input Power for 1 dB Compression | 0.5 - 20.0 GHz | 20 | 23 | | dBm |
| Input Third Order Intercept (Two-Tone Input Power= +7 dBm Each Tone) | 0.5 - 10.0 GHz | | 48 | | dBm |
| | 0.5 - 20.0 GHz | | 45 | | dBm |
| Switching Characteristics tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF) | DC - 20 GHz | | 3 | | ns |
| | | | 6 | | ns |


Insertion Loss

Return Loss

Isolation Between Ports RFC and RF1/RF2

Isolation Between Ports RF1 and RF2

Input P1dB and P0.1dB Compression Point

Input Third Order Intercept Point



GaAs MMIC SPDT NON-REFLECTIVE SWITCH, DC - 20 GHz
Absolute Maximum Ratings

| | |
|--|-----------------|
| RF Input Power (Vctl = -5V) | +30 dBm |
| Control Voltage Range (A & B) | +0.5V to -7.5 V |
| Hot Switch Power Level (Vctl = -5V) | +23 dBm |
| Channel Temperature | 150 °C |
| Continuous Pdiss (T=85°C) (derate 4 mW/°C about 85°C) | 0.26 W |
| Thermal Resistance (Insertion Loss Path) | 420 °C/W |
| Thermal Resistance (Terminated Path) | 250 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| ESD Sensitivity (HBM) | Class 1A |

Control Voltages

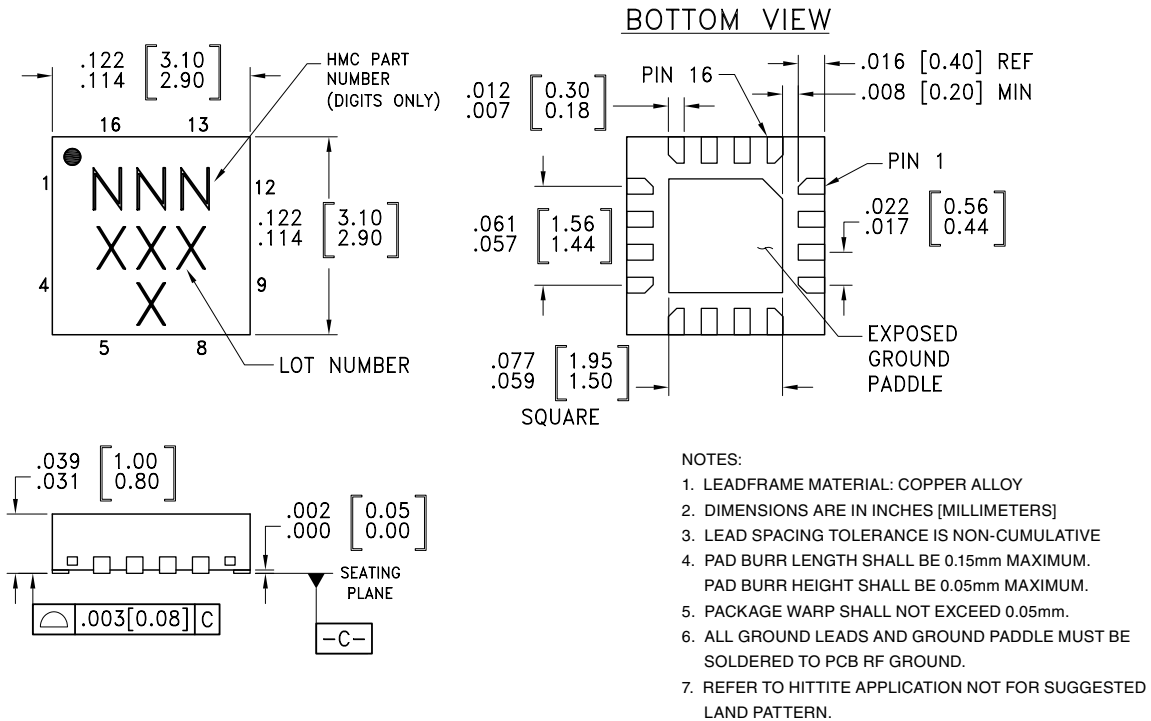
| State | Bias Condition |
|-------|---|
| Low | 0 to -0.5V @ 10 uA Max. |
| High | -5V @ 3 uA Typ. to -7V @ 10 uA Typ. (± 0.5 V) |

Truth Table

| Control Input | | Signal Path State | |
|---------------|------|-------------------|------------|
| A | B | RFC to RF1 | RFC to RF2 |
| High | Low | On | Off |
| Low | High | Off | On |



**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

Outline Drawing

Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[3] |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC547LP3 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 ^[1] | 547 XXXX |
| HMC547LP3E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 ^[2] | 547 XXXX |


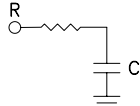
[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

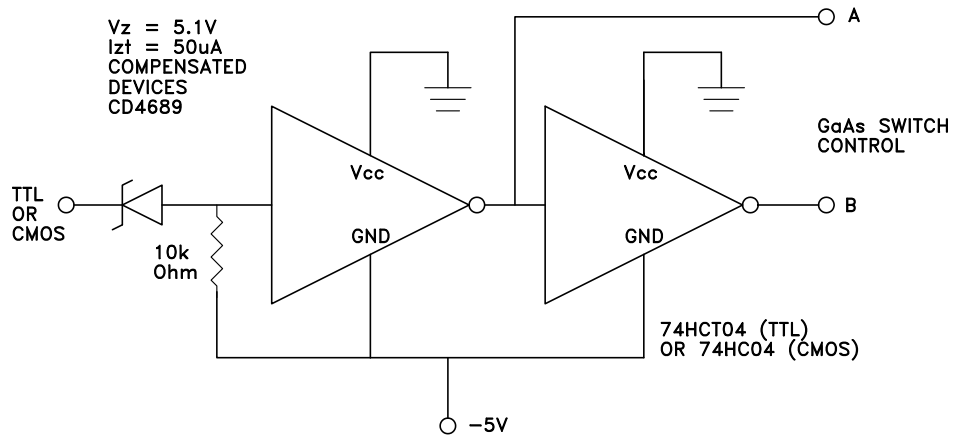
[3] 4-Digit lot number XXXX



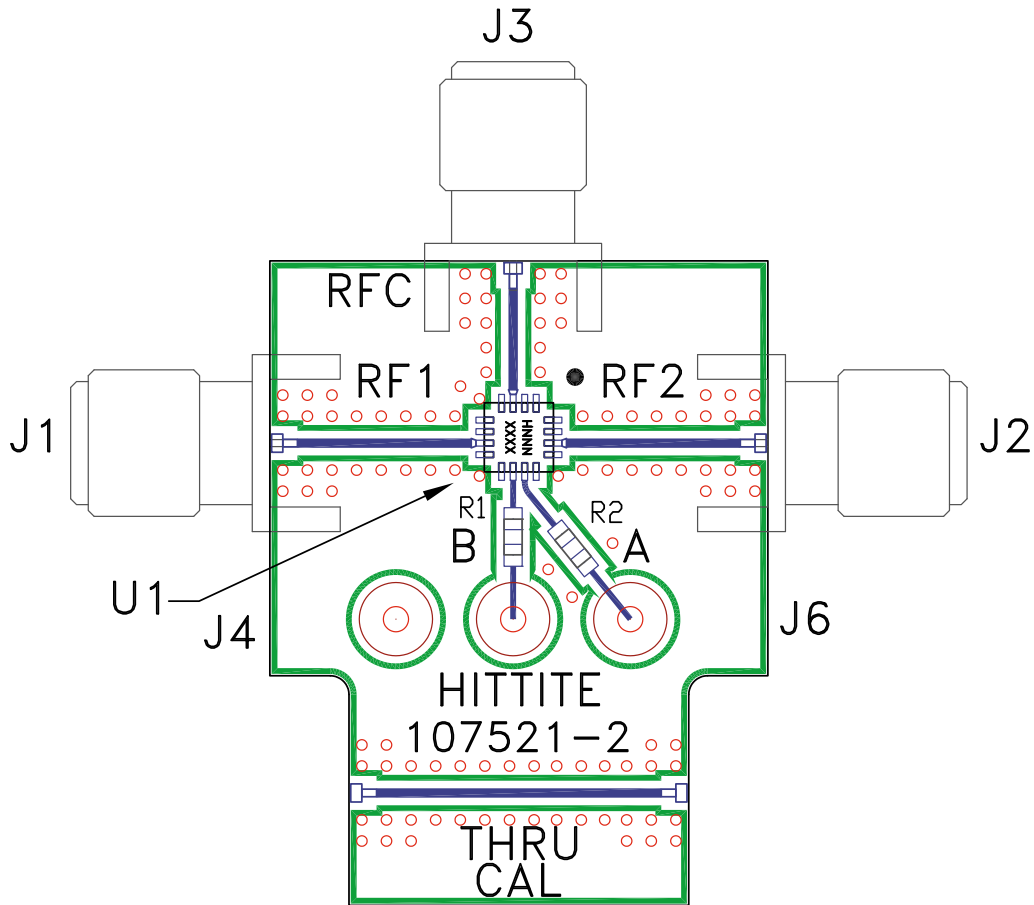
Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|--------------------|---------------|---|---|
| 1, 5, 9, 12, 16 | N/C | This pin should be connected to PCB RF ground to maximize isolation | |
| 2, 4, 6, 8, 13, 15 | GND | Package bottom has exposed metal paddle that must also be connected to PCB RF ground. |  |
| 3, 7, 14 | RFC, RF1, RF2 | This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required if RF line potential is not equal to 0V. | |
| 10 | B | See truth table and control voltage table. |  |
| 11 | A | See truth table and control voltage table. | |

Suggested Driver Circuit



Evaluation PCB



List of Materials for Evaluation PCB 105711 [1]

| Item | Description |
|---------|------------------------------------|
| J1 - J3 | PCB Mount SRI SMA Connector |
| J4 - J6 | DC Pin |
| R1 - R2 | 100 Ohm Resistor, 0603 Pkg. |
| U1 | HMC547LP3 / HMC547LP3E SPDT Switch |
| PCB [2] | 107521 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 be generated with proper RF circuit design techniques. Signal lines at the RF port should have 50 Ohm impedance and the package ground leads and package bottom should be connected directly to the ground plane similar to that shown above. The evaluation circuit board shown above is available from Hittite Microwave Corporation upon request.