



v04.0604

HMC344LP3

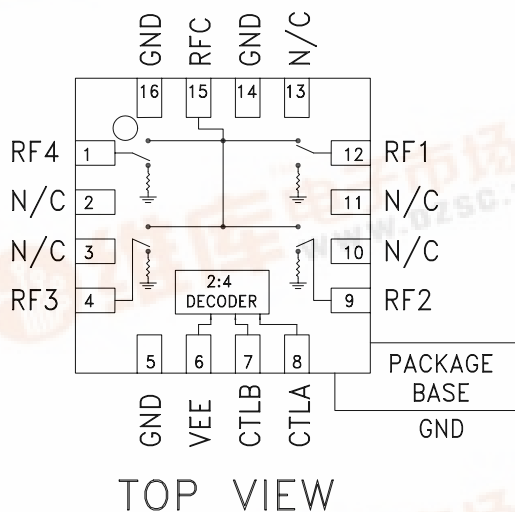
GaAs MMIC SP4T NON-REFLECTIVE SWITCH, DC - 8.0 GHz

Typical Applications

This switch is suitable for usage in DC - 8.0 GHz 50-Ohm or 75-Ohm systems:

- Broadband
- Fiber Optics
- Switched Filter Banks
- Wireless below 8 GHz

Functional Diagram



Features

- Broadband Performance: DC - 8.0 GHz
- High Isolation: 40 dB@ 6 GHz
- Low Insertion Loss: 1.8 dB@ 6 GHz
- Integrated 2:4 TTL Decoder
- LP3 SMT Package

General Description

The HMC344LP3 is a broadband non-reflective GaAs MESFET SP4T switch in a low cost lead-less surface mount package. Covering DC to 8 GHz, this switch offers high isolation and low insertion loss and extends the frequency coverage of Hittite's SP4T switch product line. This switch also includes an on board binary decoder circuit which reduces the required logic control lines to two. The switch operates using a negative control voltage of 0/-5V, and requires a fixed bias of -5V.

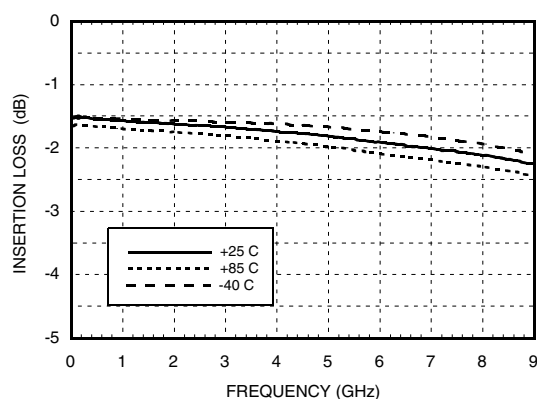
Electrical Specifications, $T_A = +25^\circ \text{C}$, With 0/-5V Control, 50 Ohm System

| Parameter | Frequency | Min. | Typ. | Max. | Units |
|--|--------------|---------------|------|------|-------|
| Insertion Loss | DC - 2.0 GHz | | 1.6 | 2.0 | dB |
| | DC - 6.0 GHz | | 1.8 | 2.2 | dB |
| | DC - 8.0 GHz | | 2.1 | 2.5 | dB |
| Isolation | DC - 2.0 GHz | 43 | 48 | | dB |
| | DC - 4.0 GHz | 36 | 41 | | dB |
| | DC - 6.0 GHz | 34 | 40 | | dB |
| | DC - 8.0 GHz | 31 | 36 | | dB |
| Return Loss | DC - 2.0 GHz | 12 | 15 | | dB |
| | DC - 4.0 GHz | 9 | 12 | | dB |
| | DC - 6.0 GHz | 8 | 11 | | dB |
| | DC - 8.0 GHz | 5 | 8 | | dB |
| Return Loss | "Off State" | DC - 8.0 GHz | 7 | 10 | dB |
| Input Power for 1 dB Compression | | 0.5 - 8.0 GHz | 17 | 21 | dBm |
| Input Third Order Intercept (Two-Tone Input Power = +7 dBm Each Tone) | | 0.5 - 8.0 GHz | 37 | 40 | dBm |
| Switching Characteristics | | DC - 8.0 GHz | | | |
| RISE, FALL (10/90% RF) | | | 35 | | ns |
| ON, OFF (50% CTL to 10/90% RF) | | | 150 | | ns |

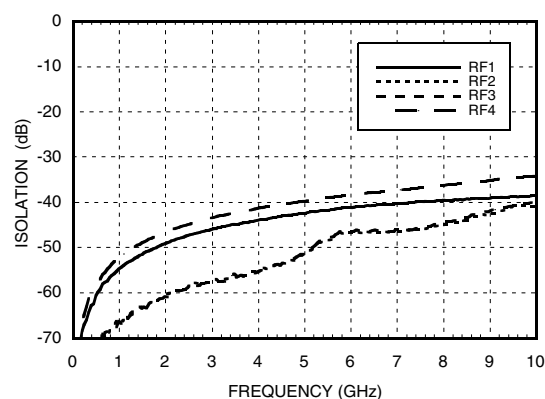


GaAs MMIC SP4T NON-REFLECTIVE SWITCH, DC - 8.0 GHz

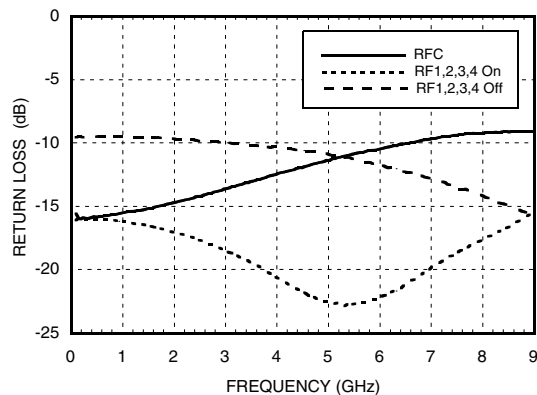
Insertion Loss vs. Temperature



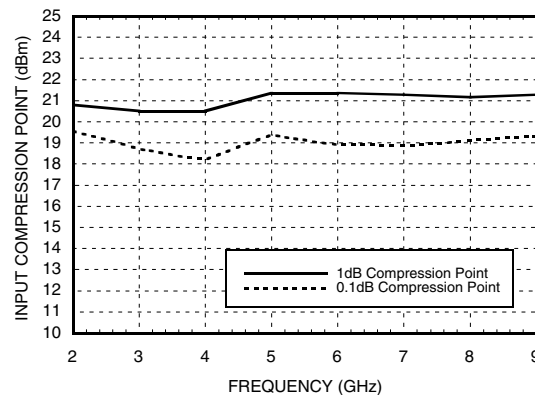
Isolation



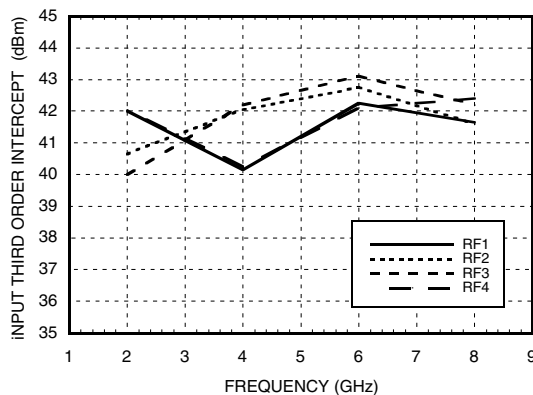
Return Loss



0.1 and 1 dB Input Compression Point



Input Third Order Intercept Point



* Isolation is recorded above insertion loss & measured at output of switch.

GaAs MMIC SP4T NON-REFLECTIVE SWITCH, DC - 8.0 GHz

Absolute Maximum Ratings

| | |
|--|-----------------------|
| Bias Voltage Range (Vee) | -7.0 Vdc |
| Control Voltage Range (A & B) | Vee -0.5V to +1.0 Vdc |
| Channel Temperature | 150 °C |
| Thermal Resistance (Insertion Loss Path) | 143 °C/W |
| Thermal Resistance (Terminated Path) | 1,030 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| Maximum Input Power | +24 dBm |

Bias Voltage & Current

| Vee Range = -5.0 Vdc ± 10% | | |
|----------------------------|-----------------|-----------------|
| Vee (Vdc) | Iee (Typ.) (mA) | Iee (Max.) (mA) |
| -5.0 | 3.0 | 6.0 |

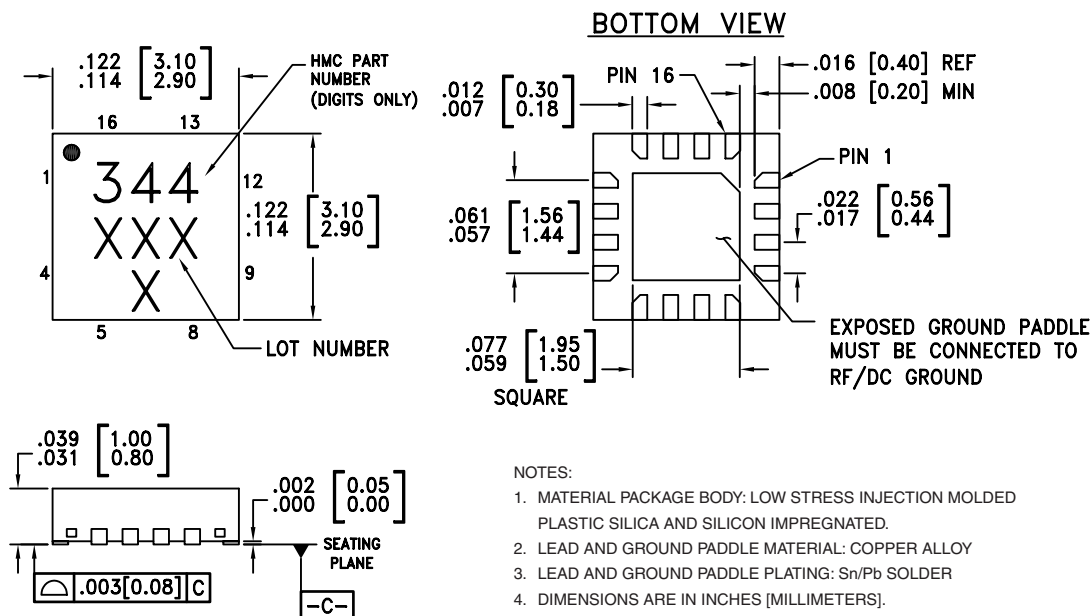
Truth Table

| Control Input | | Signal Path State |
|---------------|------|-------------------|
| A | B | RFCOM to: |
| High | High | RF1 |
| Low | High | RF2 |
| High | Low | RF3 |
| Low | Low | RF4 |

Control Voltages

| State | Bias Condition |
|-------|-------------------------------|
| Low | -3V to 0 Vdc @ 60 uA Typical |
| High | -5 to -4.2 Vdc @ 5 uA Typical |

Outline Drawing

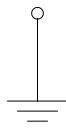

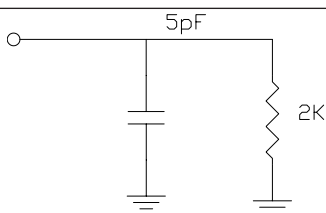
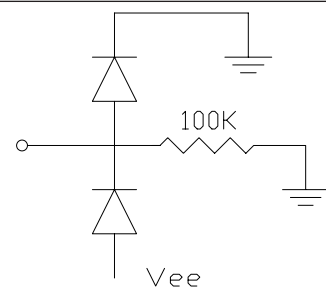


NOTES:

1. MATERIAL PACKAGE BODY: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEAD AND GROUND PADDLE MATERIAL: COPPER ALLOY
3. LEAD AND GROUND PADDLE PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
6. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM.
PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
7. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
8. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
9. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED PCB LAND PATTERN.

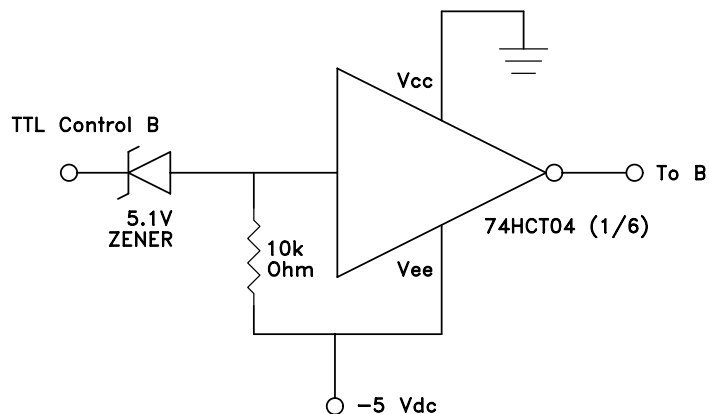
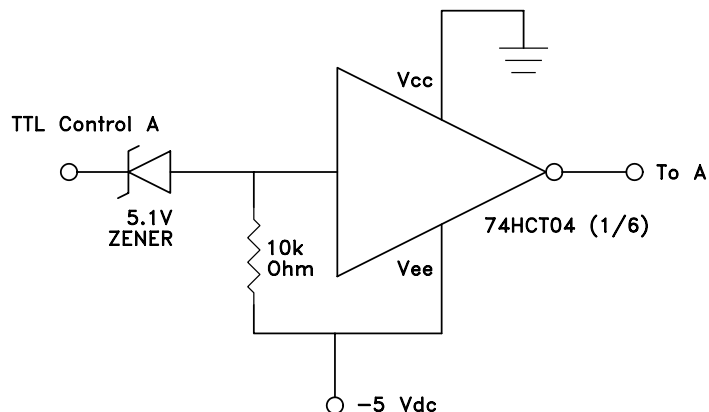
GaAs MMIC SP4T NON-REFLECTIVE SWITCH, DC - 8.0 GHz

Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---------------------|----------------------------|---|---|
| 1, 4, 9, 12, 15 | RF4, RF3, RF2, RF1, RFC | This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required if RF line potential is not equal to 0V. | |
| 2, 3, 10, 11, 13 | N/C | This pin should be connected to PCB RF ground to maximize isolation. |  |
| 5, 14, 16 | GND | Package bottom has exposed metal paddle that must also be connected to PCB RF ground. |  |
| 6 | VEE | Supply Voltage -5V \pm 10% |  |
| 7 | CTLB | See truth table and control voltage table. |  |
| 8 | CTLA | See truth table and control voltage table. | |

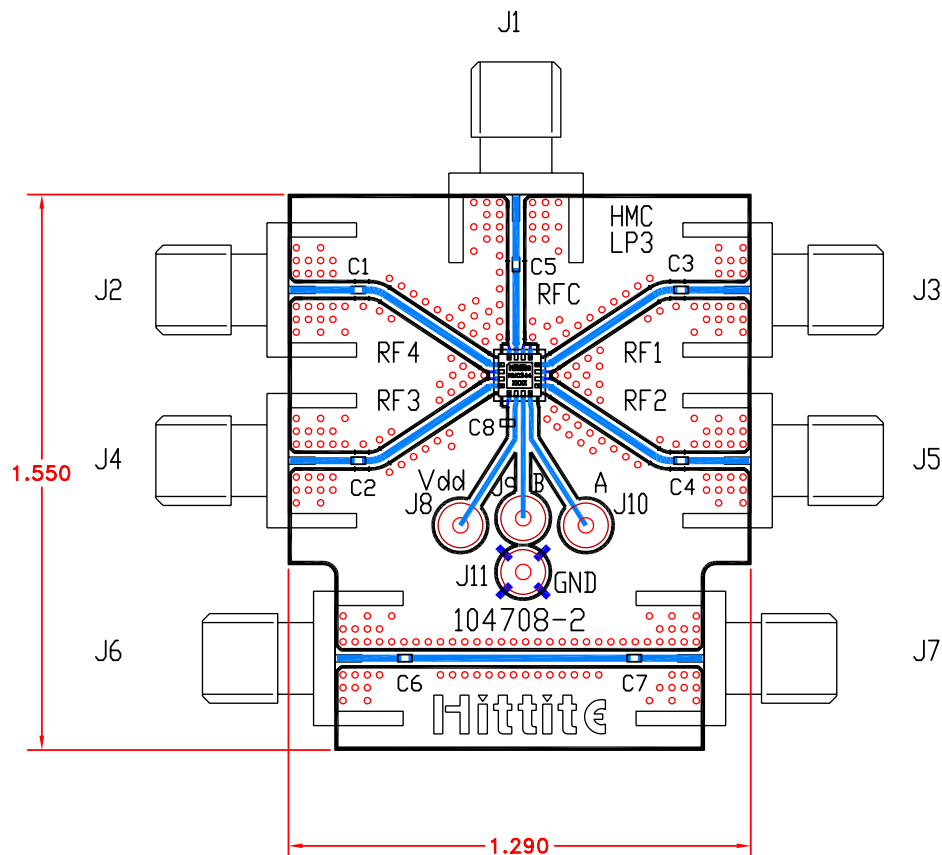
***GaAs MMIC SP4T NON-REFLECTIVE
SWITCH, DC - 8.0 GHz***

TTL Interface Circuit



GaAs MMIC SP4T NON-REFLECTIVE SWITCH, DC - 8.0 GHz

Evaluation PCB



List of Material

| Item | Description |
|---------------------------------------|-----------------------------------|
| J1 - J7 | PC Mount SMA RF Connector |
| J8 - J11 | DC Pin |
| C1 - C7 | 100 pF Capacitor, 0402 Pkg. |
| C8 | 10k pF Capacitor, 0603 Pkg. |
| U1 | HMC344LP3 SP4T Switch |
| PCB* | 104708 Evaluation PCB 1.29"x1.55" |
| * Circuit Board Material: Rogers 4350 | |

The circuit board used in the final 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 backside ground slug 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.