



GaAs MMIC SP4T NON-REFLECTIVE SWITCH, DC - 12 GHz

Typical Applications

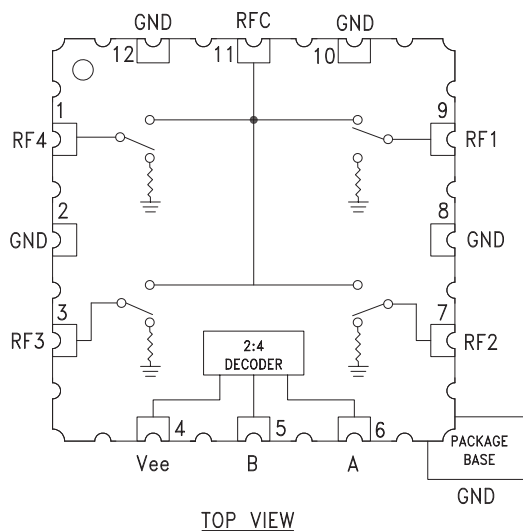
This switch is suitable for DC - 12.0 GHz 50-Ohm Systems

- Telecom Infrastructure
- Military Radio, Radar & ECM
- Space Systems
- Test Instrumentation

Features

- Broadband Performance: DC - 12 GHz
- High Isolation: 42 dB@ 6 GHz
- Low Insertion Loss: 1.8 dB@ 6 GHz
- Integrated 2:4 TTL Decoder
- Hermetic SMT Package, 25 mm²
- Screening to MIL-PRF-38535 (Class B or S) Available

Functional Diagram



General Description

The HMC344LH5 is a broadband non-reflective GaAs MESFET SP4T switch in a hermetic SMT leadless package. Covering DC to 12 GHz, this switch offers high isolation and low insertion loss. 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. Simple external level shifting circuitry allows this switch to be controlled with most TTL/CMOS positive logic families. The HMC344LH5 allows the use of surface mount manufacturing techniques and is suitable for high reliability military, industrial and space applications.

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

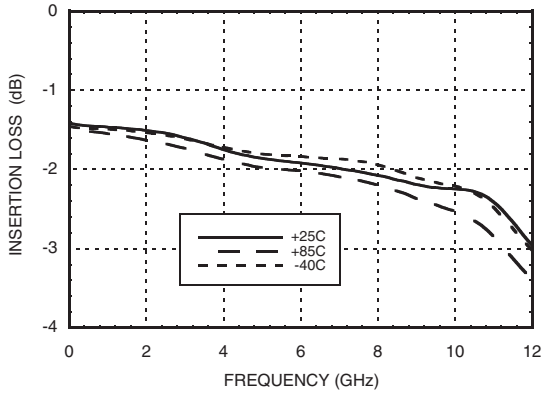
| Parameter | Frequency | Min. | Typ. | Max. | Units |
|---|----------------|---------------|------|------|-------|
| Insertion Loss | DC - 2.0 GHz | | 1.5 | 1.9 | dB |
| | DC - 6.0 GHz | | 1.8 | 2.2 | dB |
| | DC - 8.0 GHz | | 2.1 | 2.5 | dB |
| | DC - 12.0 GHz | | 3.0 | 3.4 | dB |
| Isolation | DC - 2.0 GHz | 48 | 53 | | dB |
| | DC - 4.0 GHz | 43 | 48 | | dB |
| | DC - 6.0 GHz | 37 | 42 | | dB |
| | DC - 8.0 GHz | 35 | 40 | | dB |
| Return Loss | "On State" | DC - 10.0 GHz | | 17 | dB |
| | | DC - 12.0 GHz | | 12 | dB |
| Return Loss | "Off State" | DC - 8.0 GHz | | 16 | dB |
| | | DC - 12.0 GHz | | 10 | dB |
| Input Power for 1 dB Compression | 0.5 - 12.0 GHz | 24 | 27 | | dBm |
| Input Third Order Intercept (Two-Tone Input Power = +7 dBm Each Tone) | 0.5 - 4.0 GHz | | 50 | | dBm |
| | 4.0 - 8.0 GHz | | 47 | | dBm |
| | 8.0 - 12.0 GHz | | 44 | | dBm |
| Switching Characteristics tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF) | DC - 12.0 GHz | | 35 | | ns |
| | | | 75 | | ns |

For price, delivery, and to place orders, please contact Hittite Microwave Corporation:
 20 Alpha Road, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373
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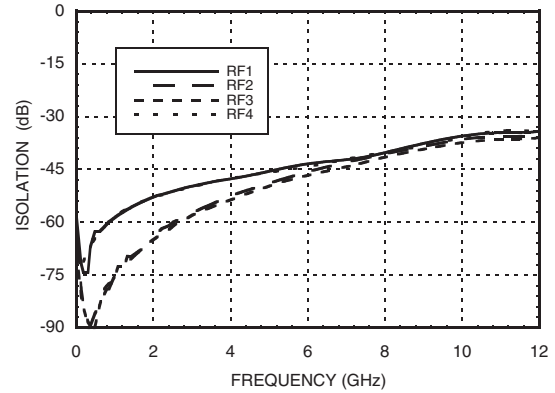


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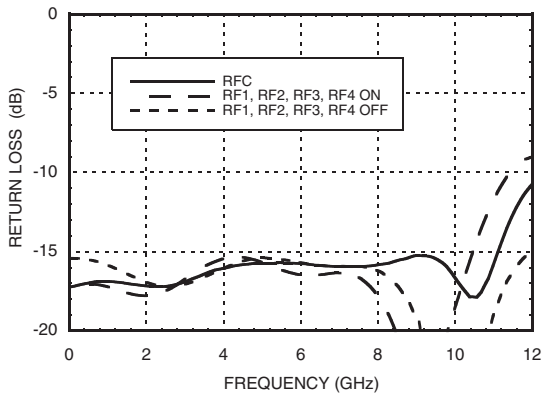
Insertion Loss vs. Temperature



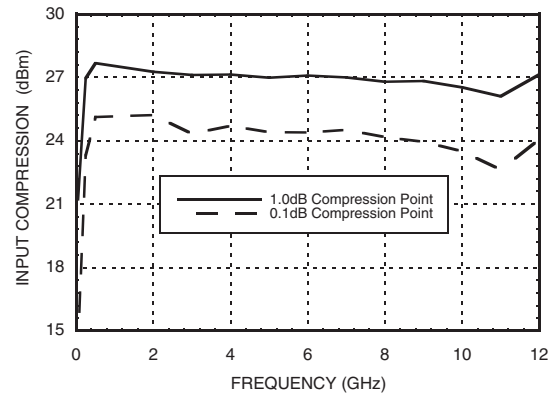
Isolation



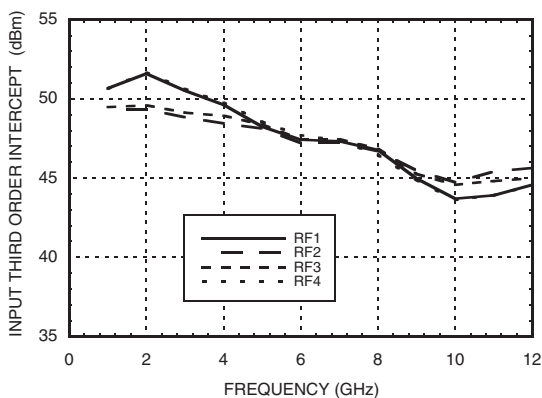
Return Loss



0.1 and 1 dB Input Compression Point



Input Third Order Intercept Point



Bias Voltage & Current

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

Control Voltages

| State | Bias Condition |
|-------|-------------------------------|
| Low | -3V to 0 Vdc @ 40 uA Typical |
| High | -5 to -4.2 Vdc @ 5 uA Typical |

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

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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) | 157 °C/W |
| Continuous Pdiss (T= 85 °C) (derate 6.4 mW/°C above 85 °C) | 0.42 W |
| Thermal Resistance (Terminated Path) | 264 °C/W |
| Continuous Pdiss (T= 85 °C) (derate 3.8 mW/°C above 85 °C) | 0.25 W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| Maximum Input Power | +28 dBm (0.5 - 12.0 GHz) |
| ESD Sensitivity (HBM) | Class 1A |

Truth Table

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

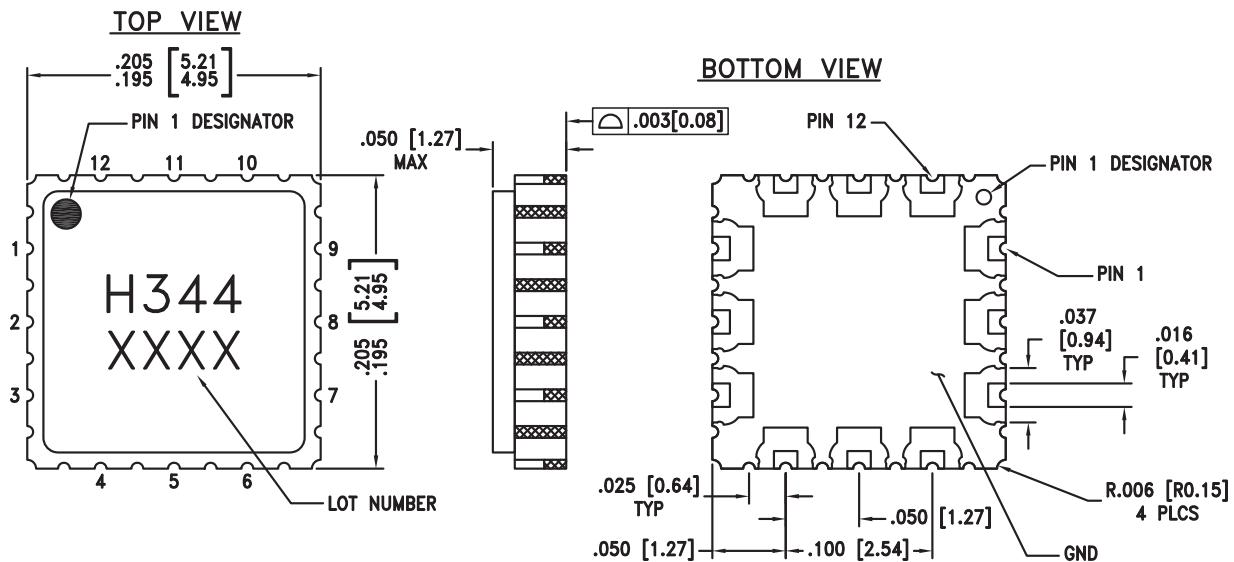


ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

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SWITCHES - SMT

Outline Drawing




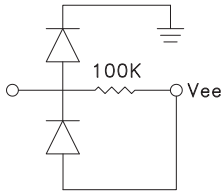
NOTES:

1. PACKAGE BODY MATERIAL: CERAMIC & KOVAR
2. LEAD AND GROUND PADDLE PLATING: GOLD 40 - 80 MICROINCHES.
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
5. PAD BURR LENGTH 0.15mm MAX.
PAD BURR HEIGHT 0.25mm MAX.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

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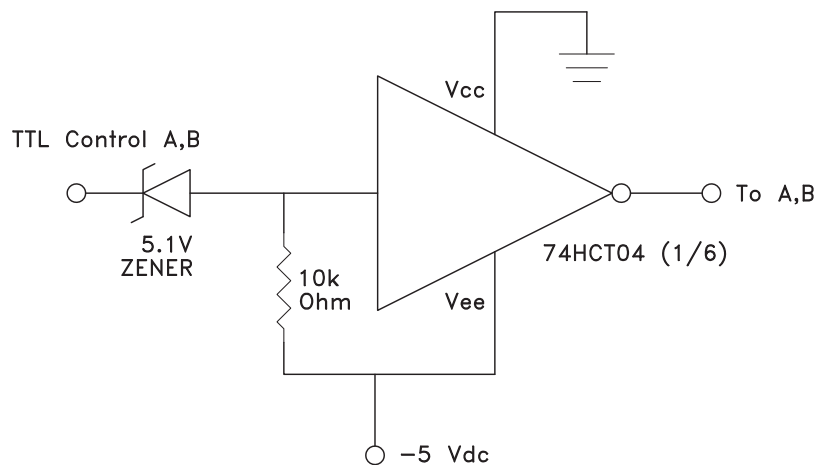
Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|-------------------|----------------------------|---|---|
| 1, 3, 7, 9, 11 | 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, 8, 10, 12 | GND | Package base must also be connected to PCB RF ground. |  |
| 4 | Vee | Supply Voltage -5V ± 10% | |
| 5 | B | See truth table and control voltage table. |  |
| 6 | A | See truth table and control voltage table. | |

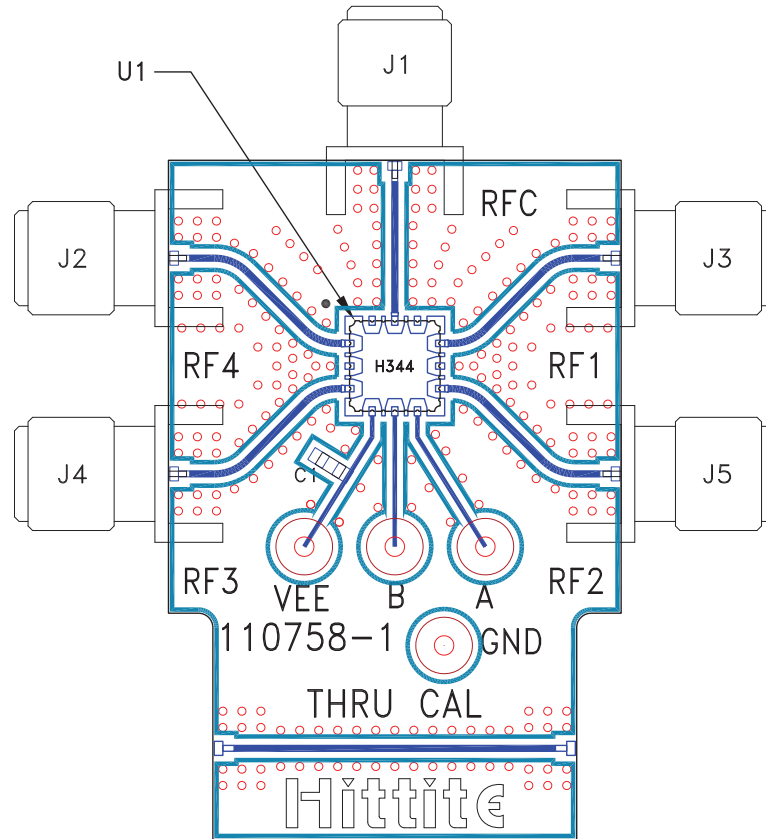
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SWITCHES - SMT

TTL Interface Circuit



Evaluation PCB



List of Materials for Evaluation PCB 110760 ^[1]

| Item | Description |
|---------|-----------------------------|
| J1 - J5 | PCB Mount SMA RF Connector |
| J6 - J9 | DC Pin |
| C1 | 10k pF Capacitor, 0603 Pkg. |
| U1 | HMC344LH5 SP4T Switch |
| PCB [2] | 110758 Evaluation PCB |

[1] Reference this number when ordering complete evaluation PCB

[2] 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 package base 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.



v05.0505



HMC344LH5

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