



GaAs MMIC SPDT NON-REFLECTIVE POSITIVE CONTROL SWITCH, DC* - 6 GHz

Typical Applications

This switch is suitable for usage in DC - 6.0 GHz 50-Ohm or 75-Ohm systems:

- Broadband
- Fiber Optics
- Switched Filter Banks
- Wireless below 6.0 GHz

Features

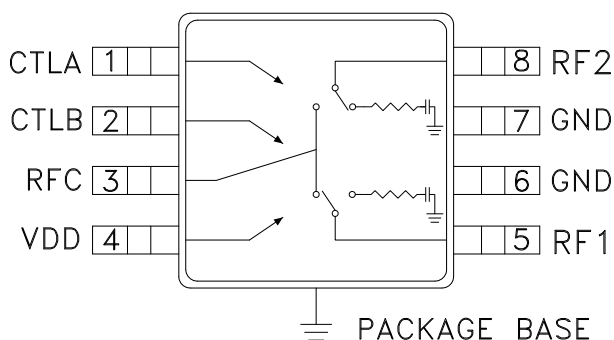
Broadband Performance: DC - 6 GHz

High Isolation: 42 dB@ 6 GHz

Low Insertion Loss: 1.6 dB@ 6 GHz

MSOP8G SMT Package

Functional Diagram



General Description

The HMC336MS8G & HMC336MS8GE are broadband non-reflective GaAs MESFET SPDT switches in low cost 8 lead MSOP8G surface mount packages with an exposed ground paddle. Covering DC to 6 GHz, this switch offers high isolation and low insertion loss. The switch operates using a positive control voltage of 0/+5 Volts, and requires a fixed bias of +5V. This switch is suitable for usage in 50-Ohm or 75-Ohm systems.

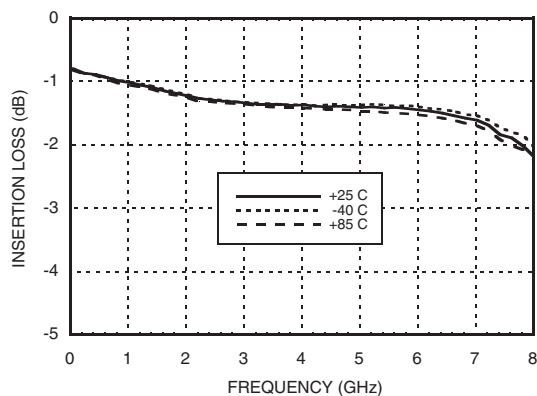
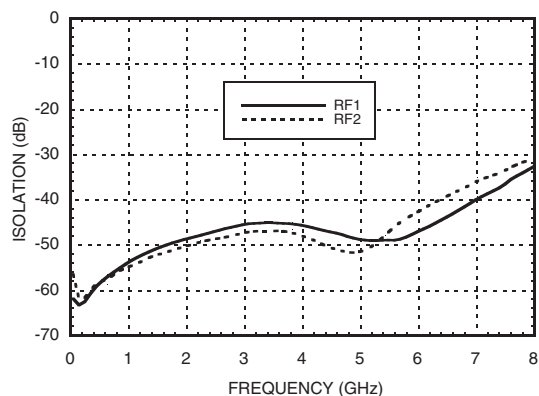
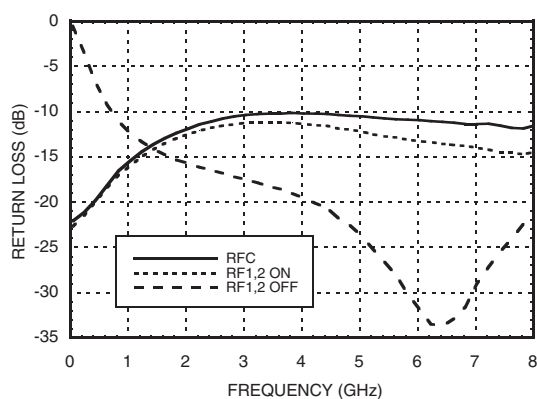
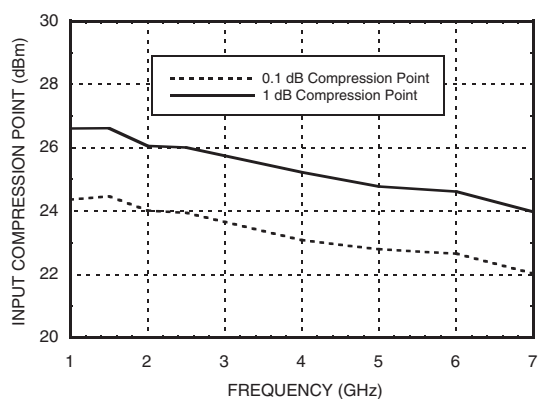
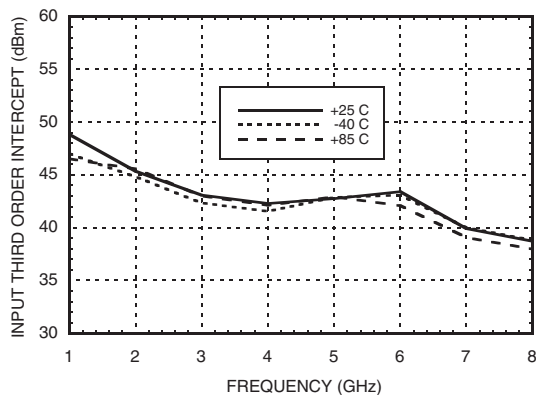
Electrical Specifications, $T_A = +25^\circ \text{C}$, With 0/+5V Control, 50 Ohm System

| Parameter | Frequency | Min. | Typ. | Max. | Units |
|--|---------------|----------------------------------|------|------|-------|
| Insertion Loss | DC - 2.0 GHz | | 1.2 | 1.6 | dB |
| | DC - 4.0 GHz | | 1.4 | 1.8 | dB |
| | DC - 6.0 GHz | | 1.6 | 2.0 | dB |
| Isolation | DC - 2.0 GHz | 42 | 47 | | dB |
| | DC - 4.0 GHz | 39 | 44 | | dB |
| | DC - 6.0 GHz | 37 | 42 | | dB |
| Return Loss | "On State" | DC - 2.0 GHz | 9 | 12 | dB |
| | | DC - 6.0 GHz | 6 | 9 | dB |
| Return Loss (RF1, RF2) | "Off State" | 2.0 - 6.0 GHz | 13 | 18 | dB |
| Input Power for 1 dB Compression | 0.5 - 6.0 GHz | 20 | 25 | | dBm |
| Input Third Order Intercept (Two-Tone Input Power = +7 dBm Each Tone, 1 MHz Tone Spacing) | 0.5 - 6.0 GHz | 37 | 42 | | dBm |
| Switching Characteristics | DC - 6.0 GHz | tRISE, tFALL (10/90% RF) | 8 | | ns |
| | | tON, tOFF (50% CTL to 10/90% RF) | 20 | | ns |

* DC blocking capacitors are required at ports RFC, RF1 and RF2.
Their value will determine the lowest transmission frequency.

HMC336MS8G / 336MS8GE

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Insertion Loss vs. Temperature

Isolation

Return Loss

0.1 and 1 dB Input Compression Point

Input Third Order Intercept Point


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Absolute Maximum Ratings

| | |
|-------------------------------|-----------------------|
| Bias Voltage Range (Vdd) | +7.0 Vdc |
| Control Voltage Range (A & B) | -0.5V to Vdd +1.0 Vdc |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| Maximum Input Power | +28 dBm |
| ESD Sensitivity (HBM) | Class 1A |

Note:

DC blocking capacitors are required at ports RFC and RF1, 2. Their value will determine the lowest transmission frequency.



**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

Bias Voltage & Current

| Vdd (Vdc) | Idd (Typ.) (μA) | Idd (Max.) (μA) |
|-----------|-----------------|-----------------|
| +5.0 | 35 | 100 |

Control Voltages

| State | Bias Condition |
|-------|------------------------------|
| Low | 0 to 0.2 Vdc @ 35 μA Typical |
| High | +5 Vdc @ 10 μA Typical |

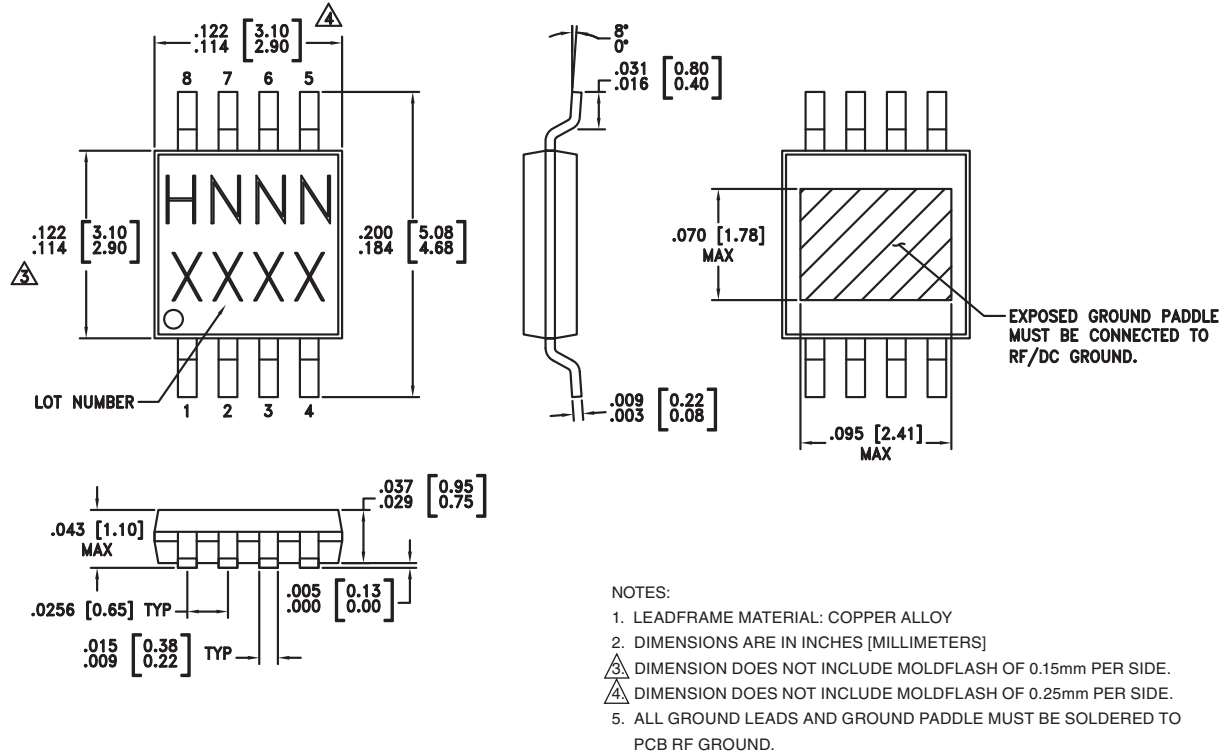
Truth Table

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

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Outline Drawing



Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[3] |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC336MS8G | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 ^[1] | H336 XXXX |
| HMC336MS8GE | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 ^[2] | H336 XXXX |

[1] Max peak reflow temperature of 235 °C

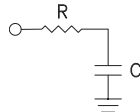
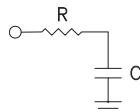

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

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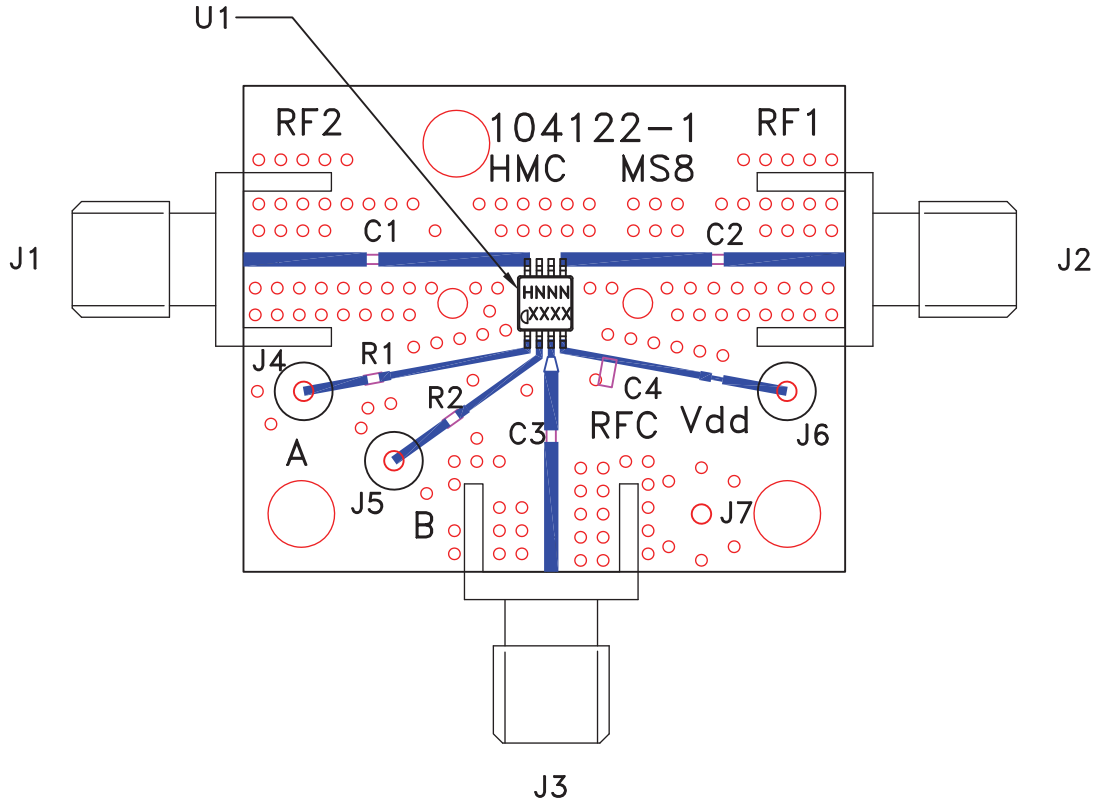
Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|------------|---------------|--|---|
| 1 | CTLA | See truth table and control voltage table. |  |
| 2 | CTLB | See truth table and control voltage table. | |
| 3, 5, 8 | RFC, RF1, RF2 | This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required. | |
| 4 | VDD | Supply Voltage. This pin may be left floating with degradation of power performance by approximately 1.5 dB. |  |
| 6, 7 | GND | Package bottom has exposed metal paddle that must also be connected to PCB RF ground. |  |

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Evaluation PCB



List of Materials for Evaluation PCB 104124 ^[1]

| Item | Description |
|--------------------|--------------------------------------|
| J1 - J3 | PCB Mount SMA RF Connector |
| J4 - J7 | DC Pin |
| C1 - C3 | 100 pF Capacitor, 0402 Pkg. |
| C4 | 10k pF Capacitor, 0603 Pkg. |
| R1 - R2 | 100 Ohm Resistor, 0402 Pkg. |
| U1 | HMC336MS8G / HMC336MS8GE SPDT Switch |
| PCB ^[2] | 104122 Evaluation PCB 1.05"x1.30" |

[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 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.