



**THE DATASHEET OF
HMC322ALP4E**



GAAS MMIC SP8T NON-REFLECTIVE SWITCH, DC - 8 GHz

Typical Applications

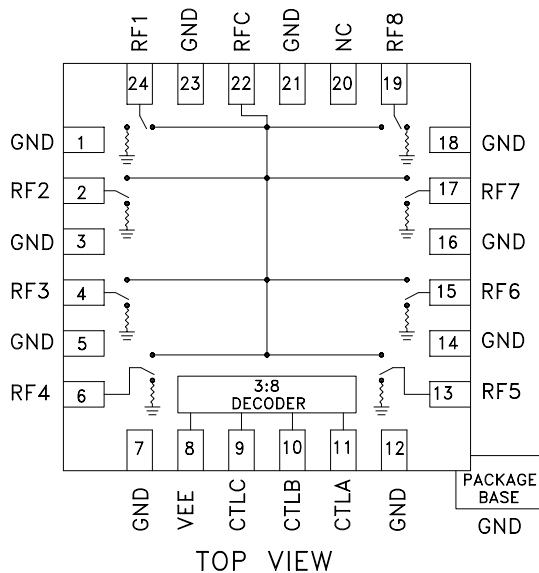
This switch is suitable for usage in DC - 8.0 GHz 50-Ohm or 75-Ohm systems:

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

Features

- Broadband Performance: DC - 8.0 GHz
- High Isolation: >30 dB@ 6 GHz
- Low Insertion Loss: 2.4 dB@ 6 GHz
- Integrated 3:8 TTL Decoder
- 24 Lead 4x4mm QFN Package: 9 mm²

Functional Diagram



General Description

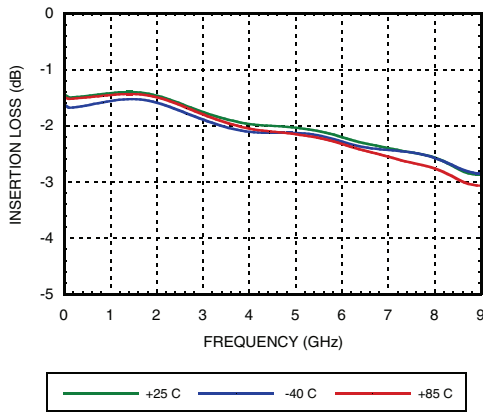
The HMC322ALP4E is a broadband non-reflective GaAs MESFET SP8T switch in a low cost leadless surface mount package. Covering DC to 8 GHz, this switch offers high isolation and low insertion loss. This switch also includes an on board binary decoder circuit which reduces the required logic control lines to three. The switch operates using a negative 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

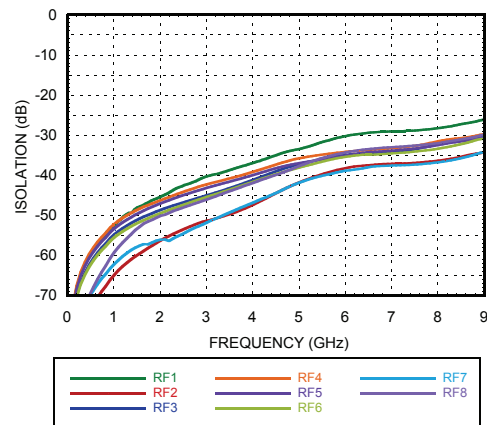
| Parameter | Frequency | Min. | Typ. | Max. | Units |
|--|---------------|----------------------------------|------|------|-------|
| Insertion Loss | DC - 2.0 GHz | | 1.8 | 2.5 | dB |
| | DC - 4.0 GHz | | 2.0 | 2.7 | dB |
| | DC - 8.0 GHz | | 2.5 | 2.9 | dB |
| Isolation | DC - 2.0 GHz | 35 | 50 | | dB |
| | DC - 4.0 GHz | 30 | 45 | | dB |
| | DC - 6.0 GHz | 25 | 40 | | dB |
| | DC - 8.0 GHz | 20 | 35 | | dB |
| Return Loss | "On State" | DC - 2.0 GHz | 9 | 17 | dB |
| | | DC - 8.0 GHz | 6 | 15 | dB |
| Return Loss | "Off State" | DC - 8.0 GHz | 7 | 20 | dB |
| Input Power for 1 dB Compression | 0.5 - 8.0 GHz | 19 | 26 | | dBm |
| Input Third Order Intercept (Two-Tone Input Power = +7 dBm Each Tone) | 0.5 - 8.0 GHz | 36 | 40 | | dBm |
| Switching Characteristics tRISE, tFALL (10/90% RF) | DC - 8.0 GHz | | 25 | | ns |
| | | tON, tOFF (50% CTL to 10/90% RF) | | 150 | |

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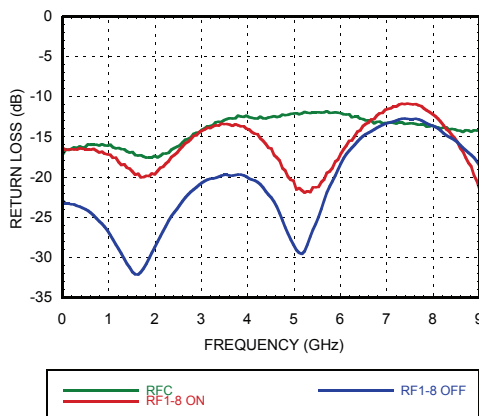
Insertion Loss vs. Temperature



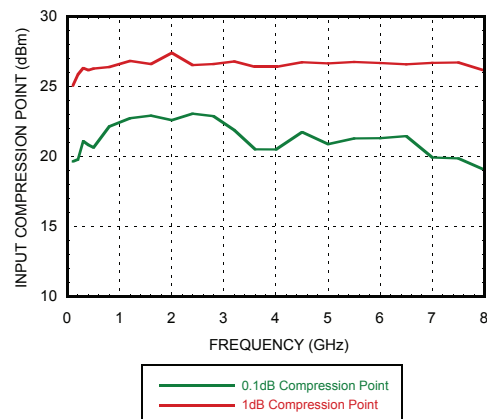
Isolation



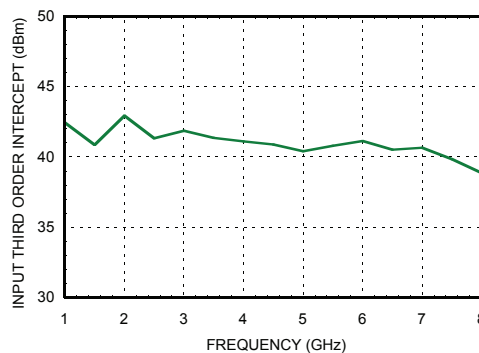
Return Loss



0.1 and 1 dB Input Compression Point



Input Third Order Intercept Point



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Bias Voltage & Current

| Vee Range = -5.0 Vdc \pm 10% | | |
|--------------------------------|-----------------------------|-----------------------------|
| Vee (Vdc) | I _{ee} (Typ.) (mA) | I _{ee} (Max.) (mA) |
| -5.0 | 5.0 | 9.0 |

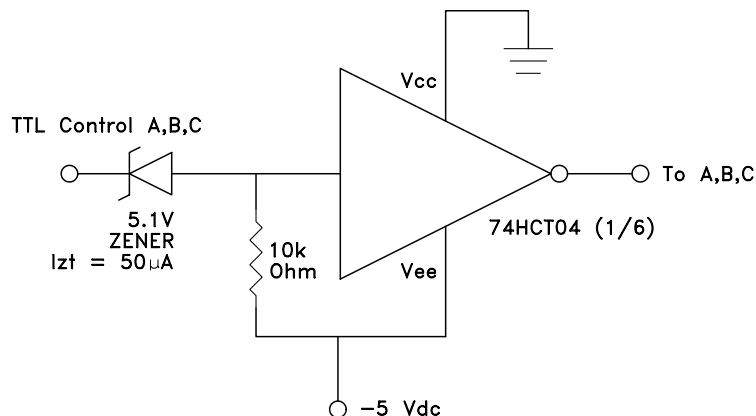
Control Voltages

| State | Bias Condition |
|-------|------------------------------------|
| Low | -3V to 0 Vdc @ 25 μ A Typical |
| High | -5 to -4.2 Vdc @ 5 μ A Typical |

Truth Table

| Control Input | | | Signal Path State |
|---------------|------|------|-------------------|
| A | B | C | RFCOM to: |
| High | High | High | RF1 |
| Low | High | High | RF2 |
| High | Low | High | RF3 |
| Low | Low | High | RF4 |
| High | High | Low | RF5 |
| Low | High | Low | RF6 |
| High | Low | Low | RF7 |
| Low | Low | Low | RF8 |

TTL Interface Circuit



Note:

Control inputs A, B, and C can be driven directly with TTL logic with -5 Volts applied to the HCT logic gates Vee pin and to Vee (pin 8) of the RF Switch.

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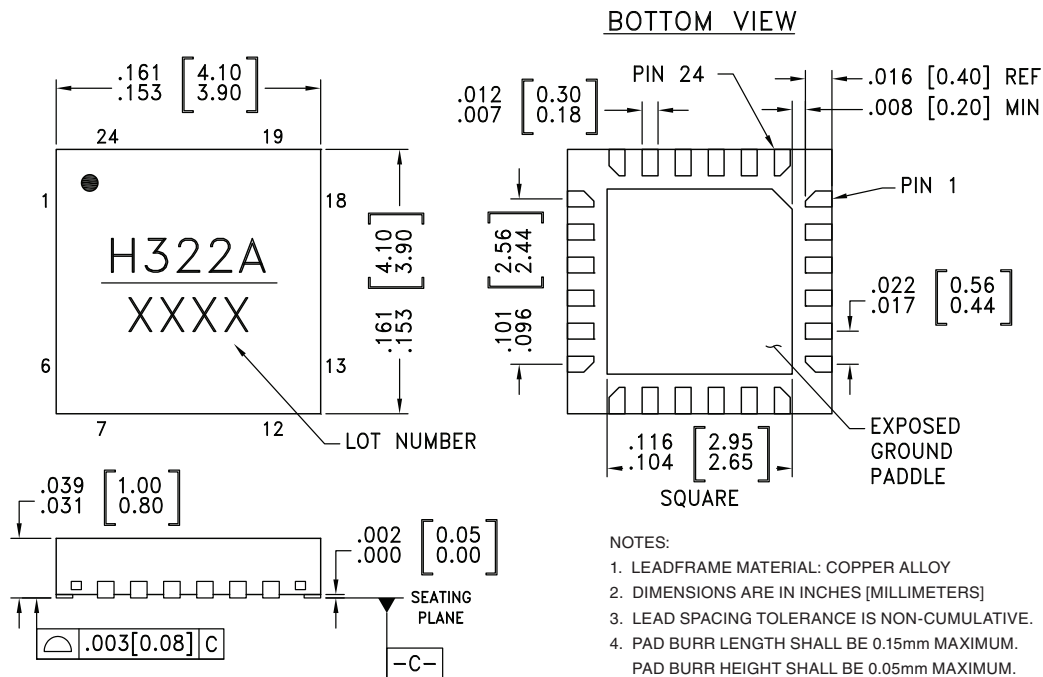
Absolute Maximum Ratings

| | |
|---|-----------------------|
| Bias Voltage Range (Vee) | -7.0 Vdc |
| Control Voltage Range (A, B, & C) | Vee -0.5V to +1.0 Vdc |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| Maximum Input Power | |
| Insertion Loss Path | 26.5 dBm |
| Terminated Path | 24 dBm |
| Channel Temperature | 150 °C |
| Continuous Pdiss (T = 85 °C) (derate 5.34 mW / °C) | 0.348 W |
| Thermal Resistance | |
| Insertion Loss Path | 184 °C / W |
| Terminated Path | 243 °C / W |
| ESD Sensitivity (HBM) | Class 1A |



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



NOTES:

- LEADFRAME MATERIAL: COPPER ALLOY
- DIMENSIONS ARE IN INCHES [MILLIMETERS]
- LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
- PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM.
PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
- PACKAGE WARP SHALL NOT EXCEED 0.05mm.
- ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
- REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED LAND PATTERN.


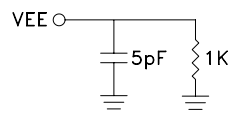
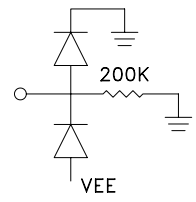
Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[2] |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC322ALP4E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL3 ^[1] | H322A XXXX |

[1] Max peak reflow temperature of 260 °C

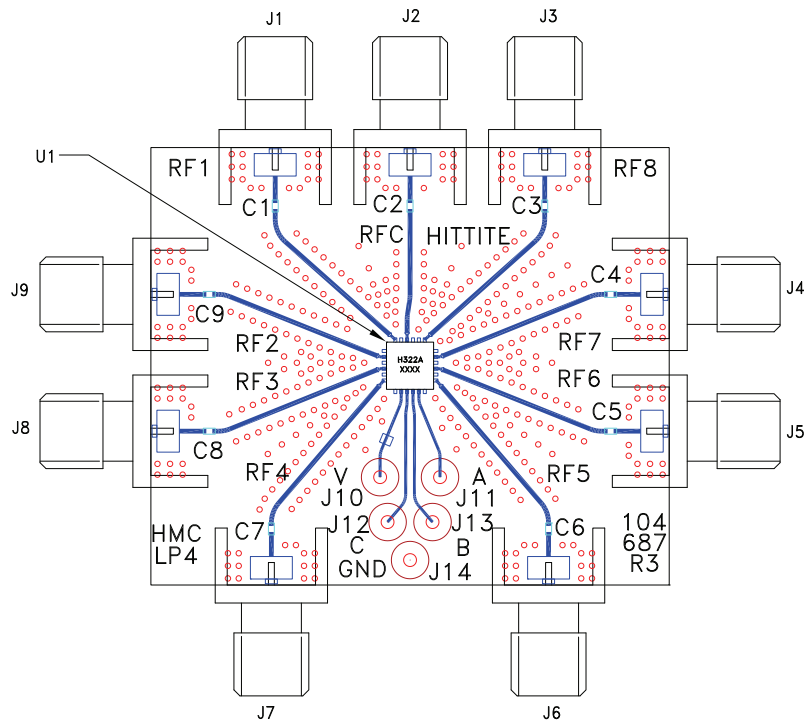
[2] 4-Digit lot number XXXX

**GAAS MMIC SP8T NON-REFLECTIVE
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Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|--|--------------------|---|--|
| 1, 3, 5, 7, 12, 14, 16, 18, 21, 23 | GND | Package bottom has exposed metal paddle that must also be connected to PCB RF ground. |  |
| 2, 4, 6, 13, 15, 17, 19, 22, 24 | RF1 - RF8 & RFC | This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required if RF line potential is not equal to 0V. | |
| 8 | VEE | Supply Voltage = $-5V \pm 10\%$ |  |
| 9 | CTL C | See truth table and control voltage table. |  |
| 10 | CTL B | See truth table and control voltage table. | |
| 11 | CTL A | See truth table and control voltage table. | |
| 20 | N/C | This pin should be connected to PCB RF ground to maximize isolation. | |

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Evaluation PCB



List of Materials for Evaluation PCB EV1HMC322ALP4 [1]

| Item | Description |
|-----------|-----------------------------------|
| J1 - J9 | PCB Mount SMA RF Connector |
| J10 - J14 | DC Pin |
| C1 - C9 | 100 pF Capacitor, 0402 Pkg. |
| U1 | HMC322ALP4E SP8T Switch |
| PCB [2] | 104687 Evaluation PCB 1.73"x1.46" |

[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 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 Analog Devices Inc. upon request.

Looking for pricing, stock, or lifecycle information?

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