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

Typical Applications

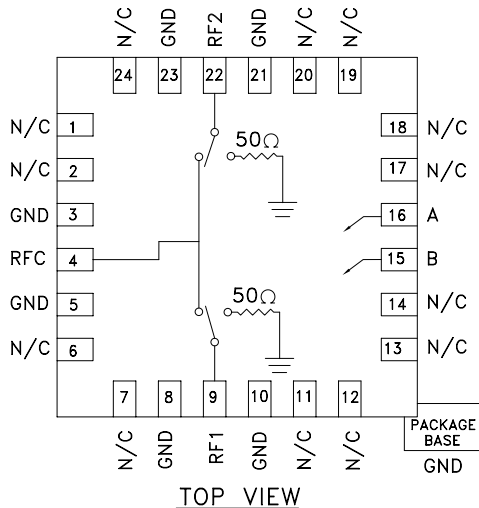
The HMC232ALP4E is ideal for:

- Telecom Infrastructure
- Microwave Radio & VSAT
- Military Radios, Radar & ECM
- Test Instrumentation

Features

- Isolation: 57 dB @ 3 GHz
50 dB @ 6 GHz
- Input P1dB: +30 dBm
- Insertion Loss: 1.5 dB Typical @ 6 GHz
- Non-Reflective Design
- 24 Lead 4x4mm QFN Package: 16mm²
- Included in the HMC-DK005 Designer's Kit

Functional Diagram



General Description

The HMC232ALP4E is a broadband high isolation non-reflective GaAs MESFET SPDT switch in a low cost leadless QFN surface mount plastic package. Covering DC to 12 GHz, the switch features >57dB isolation up to 3 GHz and >45 dB isolation up to 12 GHz. Input P1dB compression is +30 dBm typical, while input IP3 is +48 dBm. The switch operates using complementary negative control voltage logic lines of -5/0V and requires no bias supply.

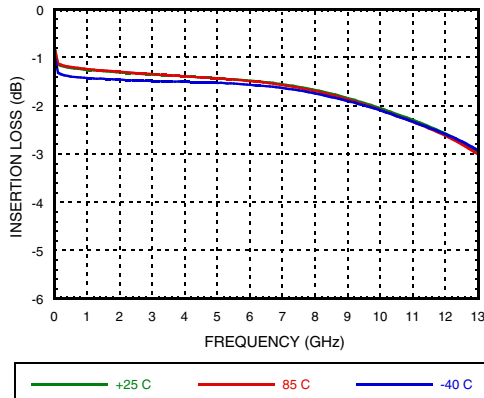
Electrical Specifications, $T_A = +25^\circ C$, With 0/-5V Control, 50 Ohm System

| Parameter | Frequency | Min. | Typ. | Max. | Units |
|---|----------------|---------------|------|------|-------|
| Insertion Loss | DC - 3.0 GHz | | 1.4 | 1.7 | dB |
| | DC - 6.0 GHz | | 1.5 | 1.8 | dB |
| | DC - 9.0 GHz | | 2.0 | 2.3 | dB |
| | DC - 12.0 GHz | | 2.5 | 3.1 | dB |
| Isolation | DC - 3.0 GHz | 52 | 57 | | dB |
| | DC - 6.0 GHz | 45 | 50 | | dB |
| | DC - 9.0 GHz | 42 | 47 | | dB |
| | DC - 12.0 GHz | 40 | 45 | | dB |
| Return Loss | "On State" | DC - 6.0 GHz | | 18 | dB |
| | | DC - 9.0 GHz | | 14 | dB |
| | | DC - 12.0 GHz | | 12 | dB |
| Return Loss RF1, RF2 | "Off State" | DC - 12.0 GHz | | 14 | dB |
| Input Power for 1 dB Compression | 0.5 - 12.0 GHz | 26 | 30 | | dBm |
| Input Third Order Intercept (Two-Tone Input Power= +10 dBm Each Tone, 1 MHz Tone Separation) | 0.5 - 12.0 GHz | 45 | 48 | | dBm |
| Switching Characteristics tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF) | DC - 12.0 GHz | | 6 | | ns |
| | | | 25 | | ns |

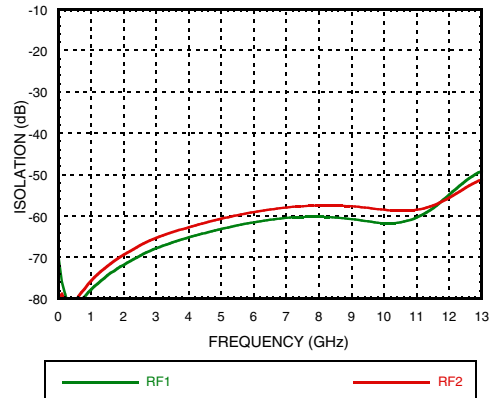


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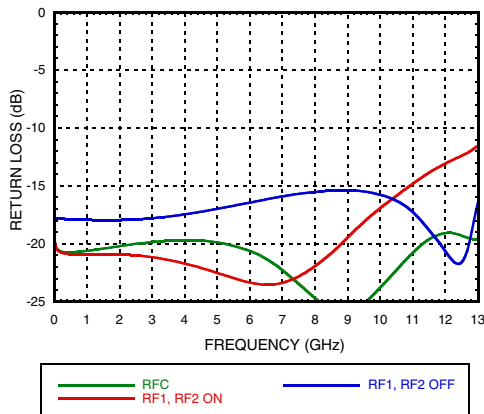
Insertion Loss



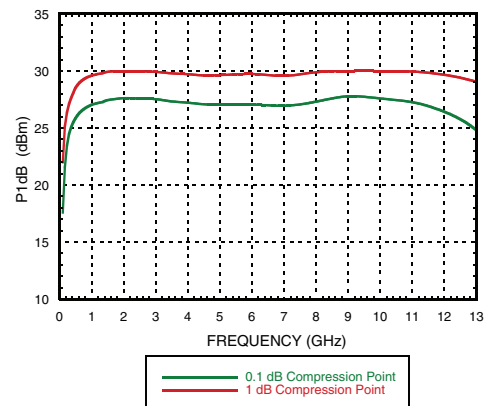
Isolation



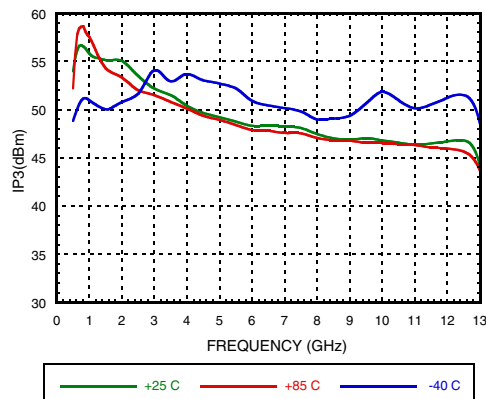
Return Loss



0.1 and 1 dB Input Compression Point



Input Third Order Intercept Point





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Absolute Maximum Ratings

| | |
|---|------------------------|
| RF Input Power (Vctl = -5V) (0.5 - 12 GHz) | |
| Insertion Loss Path Terminated Path | +30.9 dBm +23.7 dBm |
| Control Voltage Range (A & B) | +1V to -7.5V |
| Channel Temperature | 150 °C |
| Thermal Resistance (R _{TH}) (channel to ground paddle) | |
| Insertion Loss Path Terminated Path | 88.5 °C/W 277 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

Control Voltages

| State | Bias Condition |
|-------|--|
| Low | 0 to -0.2V @ 0.2 uA Max. |
| High | -5V @ 2 uA Typ. to -7V @ 20 uA Typ. (±0.5 Vdc) |

Truth Table

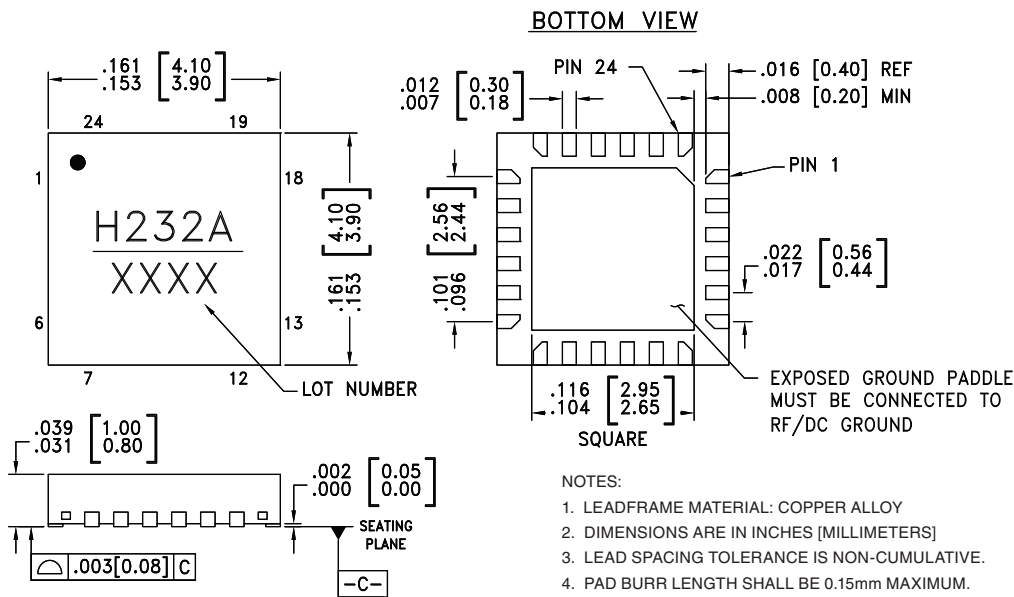
| Control Input | | Signal Path State | |
|---------------|------|-------------------|------------|
| A | B | RFC to RF1 | RFC to RF2 |
| High | Low | ON | OFF |
| Low | High | OFF | ON |

Caution: Do not "Hot Switch" power levels greater than +27 dBm (Vctl = 0/-5 Vdc).



**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.

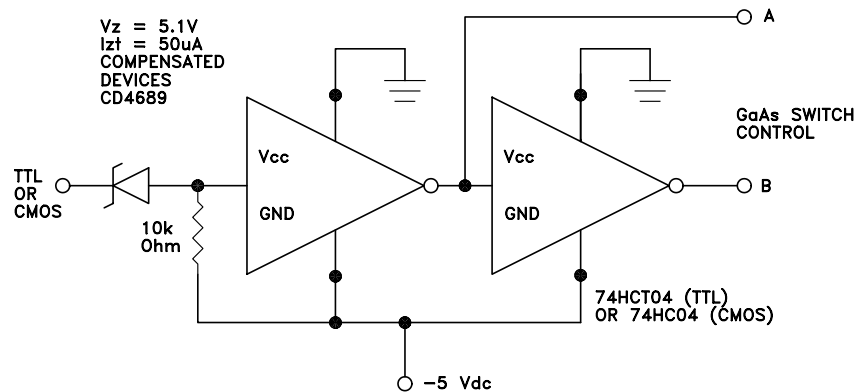
Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [2] |
|-------------|--|---------------|------------|---------------------|
| HMC232ALP4E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [1] | H232A XXXX |

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX

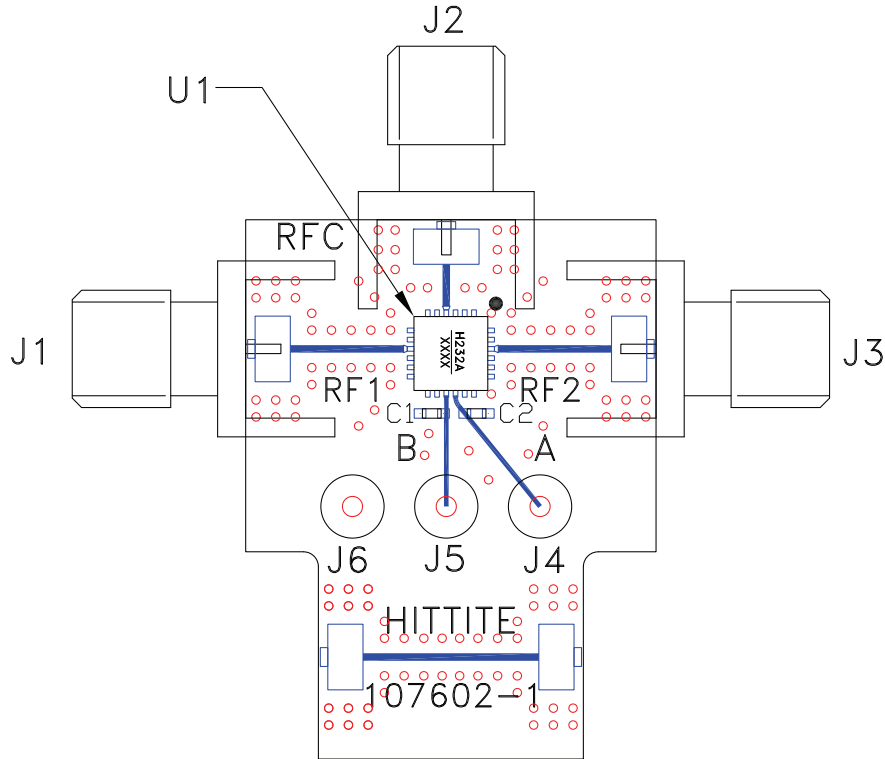
Suggested Driver Circuit



Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|--|---------------|--|---------------------|
| 1, 2, 6, 7, 11, 12, 13, 14, 17, 18, 19, 20, 24 | N/C | The pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally. | |
| 3, 5, 8, 10, 21, 23 | GND | Package bottom must also be connected to PCB RF ground. | |
| 4, 9, 22 | 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. | |
| 15 | B | See truth table and control voltage table. | |
| 16 | A | See truth table and control voltage table. | |

Evaluation PCB



List of Materials for Evaluation PCB EV1HMC232ALP4 [1]

| Item | Description |
|---------|-----------------------------|
| J1 - J3 | PCB Mount SMA RF Connector |
| J4 - J6 | DC Pin |
| C1, C2 | 100 pF Capacitor, 0603 Pkg. |
| U1 | HMC232ALP4E SPDT Switch |
| PCB [2] | 107602 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.



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SWITCH, DC - 12 GHz**

Notes:



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- Поставка более 17-ти миллионов наименований электронных компонентов;
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- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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