# HMC427ALP3E

v02.1016

## GaAs MMIC POSITIVE CONTROL TRANSFER SWITCH, DC* - 8GHz

### Typical Applications

The HMC427ALP3E is ideal for:

- Test Instrumentation
- Fiber Optics & Broadband Telecom
- Basestation Infrastructure
- Microwave Radio & VSAT
- Military Radios, Radar, & ECM

### Features

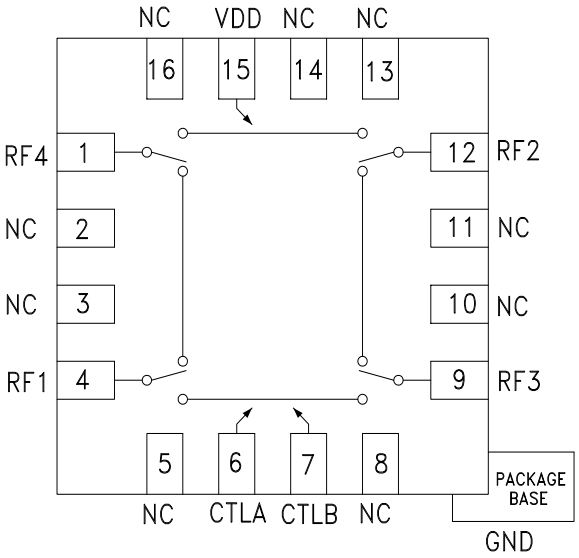
High Isolation: 40 ~ 45 dB thru 6 GHz

Low Insertion Loss: 1.5 dB at 6 GHz

Non-Reflective Design

3x3mm SMT Package

### Functional Diagram




### General Description

The HMC427ALP3E is a low loss broadband positive control transfer switch in leadless surface mount package. Covering DC to 8 GHz, this switch offers high isolation and low insertion loss. The switch operates using a positive control voltage of 0/+5V and requires a fixed bias of +5V at < 20 µA.

** Blocking capacitors are required at ports RF1, 2, 3, & 4. Their value will determine the lowest transmission frequency.*

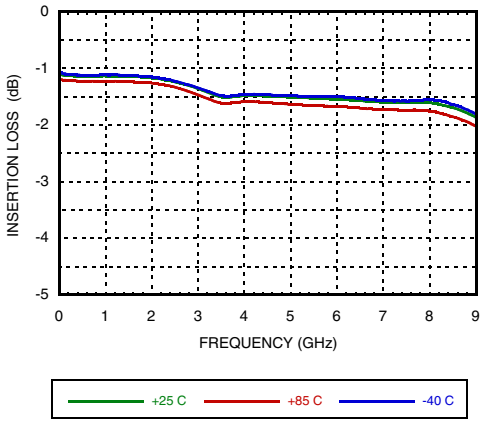
### Electrical Specifications, $T_A$ = +25° C, VDD = 5V , With 0/+5V Control, 50 Ohm System

| Parameter | Frequency | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Insertion Loss | DC - 6.0 GHz<br>DC - 8.0 GHz | | 1.5<br>1.8 | 2<br>2.1 | dB<br>dB |
| Isolation | DC - 1.0 GHz<br>DC - 2.0 GHz<br>DC - 6.0 GHz<br>DC - 8.0 GHz | 45<br>40<br>36<br>35 | 50<br>45<br>43<br>43 | | dB<br>dB<br>dB<br>dB |
| Return Loss | DC - 6.0 GHz<br>DC - 8.0 GHz | | 18<br>18 | | dB<br>dB |
| Input Power for 1 dB Compression | 1.0 - 8.0 GHz | 25 | 26 | | dBm<br>dBm |
| Input Third Order Intercept<br>(Two-Tone Input Power= +12 dBm Each Tone, 1 MHz Tone Separation) | 1.0 - 8.0 GHz | 40 | 43 | | dBm<br>dBm |
| Switching Characteristics<br>tRISE, tFALL (10/90% RF)<br>tON, tOFF (50% CTL to 10/90% RF) | DC - 8.0 GHz | | <br>2<br>10 | | <br>ns<br>ns |

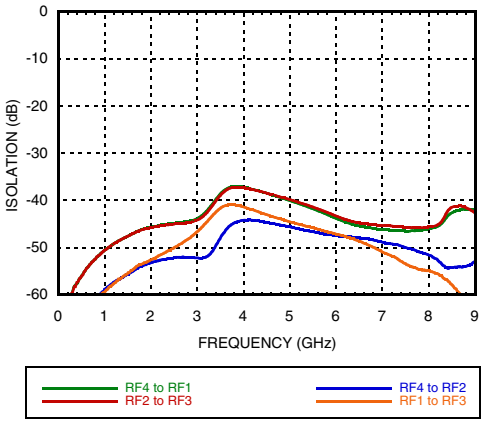


*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

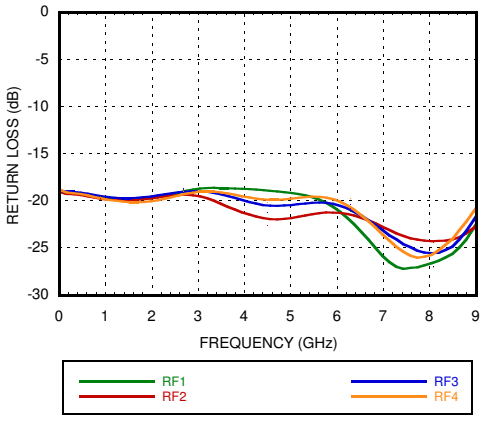
### Insertion Loss vs. Temperature



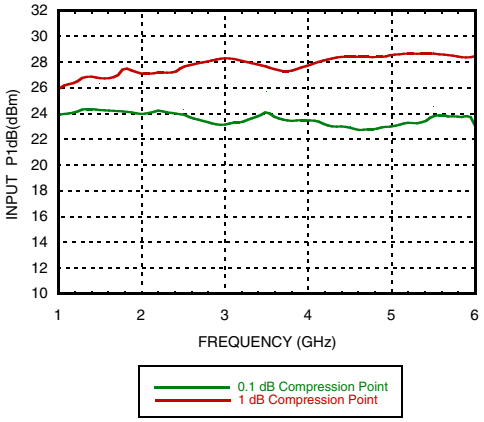

### Isolation



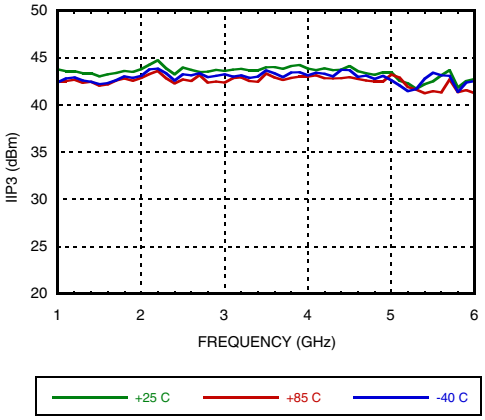

### Return Loss




### 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 (CTRLA & CTRLB) | -0.5V to VDD +1.0 VDC |
| Channel Temperature | 150 °C |
| Thermal Resistance | 130 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| Maximum Input Power | +25.5 dBm (DC - 2 GHz) |
| | +27 dBm (2 GHz - 8 GHz) |
| ESD Sensitivity (HBM) | Class 1A |
| ESD Sensitivity (FICDM) | Class IV |

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OBSERVE HANDLING PRECAUTIONS

*Note:*
*DC blocking capacitors are required at ports RF1, 2, 3, & 4. Their value will determine the lowest transmission frequency.*

## Bias Voltage & Current

| VDD Range = +5 VDC ± 10 % | | |
|---|---|---|
| **VDD (VDC)** | **IDD (Typ.) (µA)** | **IDD (Max.) (µA)** |
| +5 | 5 | 10 |

## Control Voltages

| **State** | **Bias Condition** |
|---|---|
| Low | 0 to +0.2 VDC at < 1 µA Typical |
| High | Vdd ± 0.2 VDC at < 1 µA Typical |

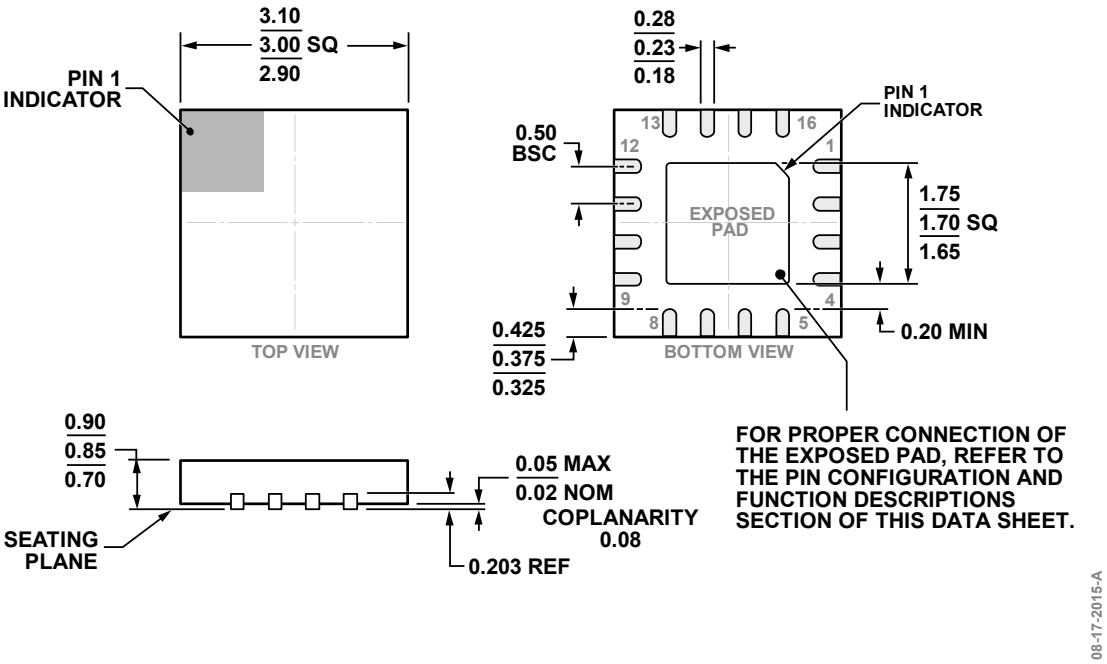
## Truth Table

| **Control Input** | | **Signal Path State** | | | |
|---|---|---|---|---|---|
| A | B | RF4 to RF2 | RF1 to RF3 | RF4 to RF1 | RF2 to RF3 |
| Low | High | On | On | Off | Off |
| High | Low | Off | Off | On | On |

# GaAs MMIC POSITIVE CONTROL TRANSFER SWITCH, DC* - 8GHz



## Outline Drawing

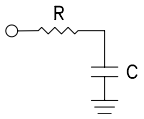
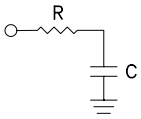



## Package Information

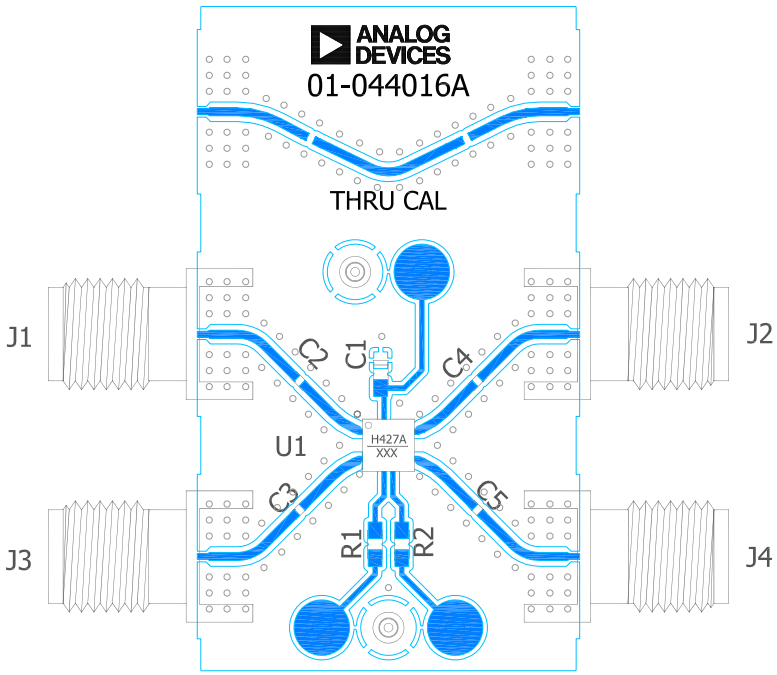
| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [2] |
|---|---|---|---|---|
| HMC427ALP3E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL3[1] | H427A<br>XXXX |

[1] Max peak reflow temperature of 260 °C
[2] 4-Digit lot number XXXX

## Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 4, 9, 12 | RF4, RF1, RF3, RF2 | This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required. | |
| 2, 3, 5, 8, 10, 11, 13, 14, 16 | NC | This pin should be connected to PCB RF ground to maximize isolation. | |
| | GND | Package bottom has exposed metal paddle that must be connected to PCB RF ground. |   |
| 6 | CTRLA | See truth table and control voltage table. |   |
| 7 | CTRLB | See truth table and control voltage table. | |
| 15 | VDD | Supply Voltage +5V ± 10%. |   |

### Evaluation PCB




### List of Materials for Evaluation PCB EV1HMC427ALP3E [1]

| Item | Description |
|---|---|
| J1 - J4 | PCB Mount SMA RF Connector |
| J5 - J8 | DC Pin |
| C1 | 1000 pF Capacitor, 0603 Pkg. |
| C2 - C5 | 100 pF Capacitor, 0402 Pkg. |
| R1 - R2 | 100 Ohm Resistor, 0603 Pkg. |
| U1 | HMC427ALP3E<br>Transfer Switch |
| PCB [2] | Evaluation PCB 01-044016A |

[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 bottom should be connected directly to the ground plane similar to that shown above. The evaluation circuit board shown above is available from Analog Devices upon request.