

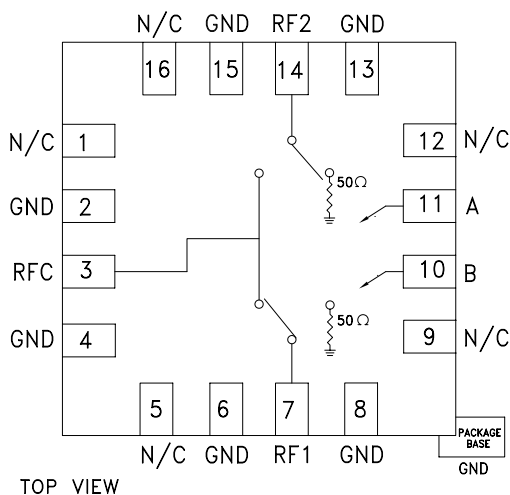
## GaAs MMIC SPDT NON-REFLECTIVE SWITCH, DC - 14 GHz

### Typical Applications

The HMC347ALP3E is ideal for:

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

### Functional Diagram



### Features

- High Isolation: >54 dB up to 3 GHz  
>44 dB up to 10 GHz
- Low Insertion Loss: 1.8 dB @ 10 GHz
- Non-Reflective Design
- 3x3 mm QFN SMT Package

### General Description

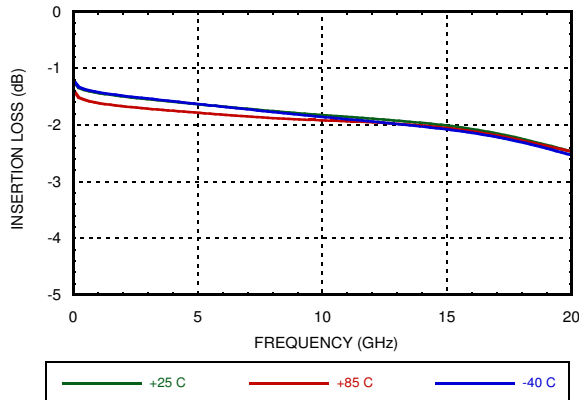
The HMC347ALP3E is a broadband high isolation non-reflective GaAs pHEMT SPDT switch in low cost leadless QFN surface mount plastic package. Covering DC to 14 GHz, the switch offers high isolation and low insertion loss. The switch features >54 dB isolation up to 3 GHz and >44 dB isolation up to 13 GHz. The switch operates using complementary negative control voltage logic lines of -5/0V and requires no bias supply.

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

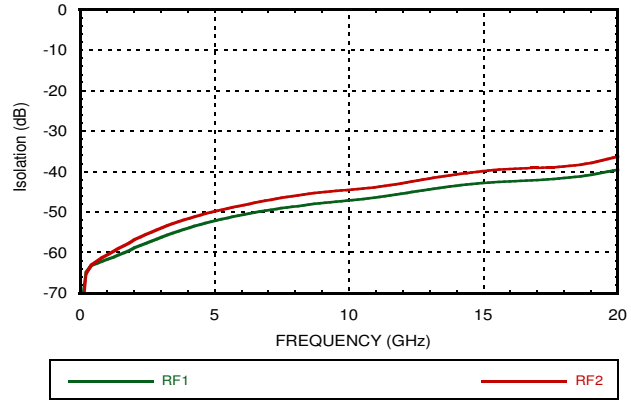
| Parameter                                                               | Frequency      | Min. | Typ. | Max. | Units |
|-------------------------------------------------------------------------|----------------|------|------|------|-------|
| Insertion Loss                                                          | DC - 3.0 GHz   |      | 1.5  | 1.9  | dB    |
|                                                                         | DC - 6.0 GHz   |      | 1.7  | 2.1  | dB    |
|                                                                         | DC - 12.0 GHz  |      | 1.9  | 2.4  | dB    |
|                                                                         | DC - 14.0 GHz  |      | 2.0  | 2.5  | dB    |
| Isolation                                                               | DC - 3.0 GHz   | 50   | 54   |      | dB    |
|                                                                         | DC - 6.0 GHz   | 44   | 48   |      | dB    |
|                                                                         | DC - 12.0 GHz  | 40   | 44   |      | dB    |
|                                                                         | DC - 14.0 GHz  | 34   | 40   |      | dB    |
| Return Loss RFC                                                         | DC - 6.0 GHz   | 14   | 17   |      | dB    |
|                                                                         | DC - 14.0 GHz  | 12   | 17   |      | dB    |
| Return Loss RF1, RF2                                                    | DC - 6.0 GHz   | 23   | 26   |      | dB    |
|                                                                         | DC - 14.0 GHz  | 15   | 18   |      | dB    |
| Input Power for 1 dB Compression                                        | 0.5 - 14.0 GHz | 24   | 29   |      | dBm   |
| Input Third Order Intercept<br>(Two-Tone Input Power= +7 dBm Each Tone) | 0.5 - 14.0 GHz | 42   | 47   |      | dBm   |
| Switching Characteristics                                               | DC - 14 GHz    |      |      |      |       |
|                                                                         |                |      | 2    |      | ns    |
|                                                                         |                |      | 10   |      | ns    |

**GaAs MMIC SPDT NON-REFLECTIVE  
SWITCH, DC - 14 GHz**

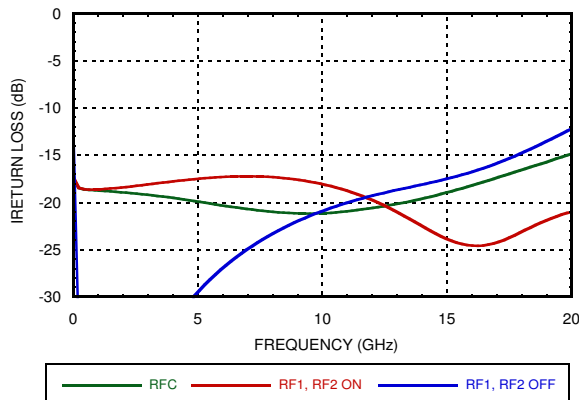
**Insertion Loss**



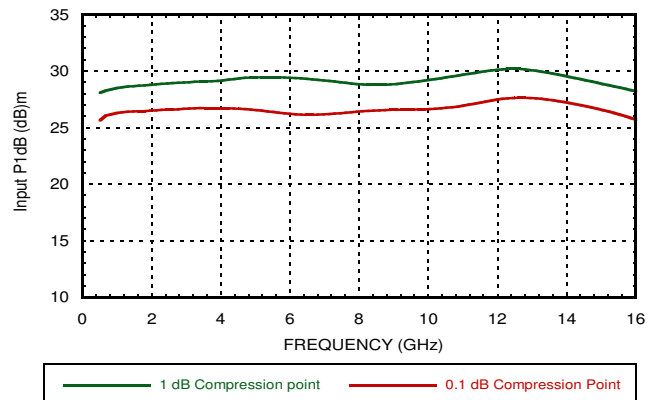
**Isolation**



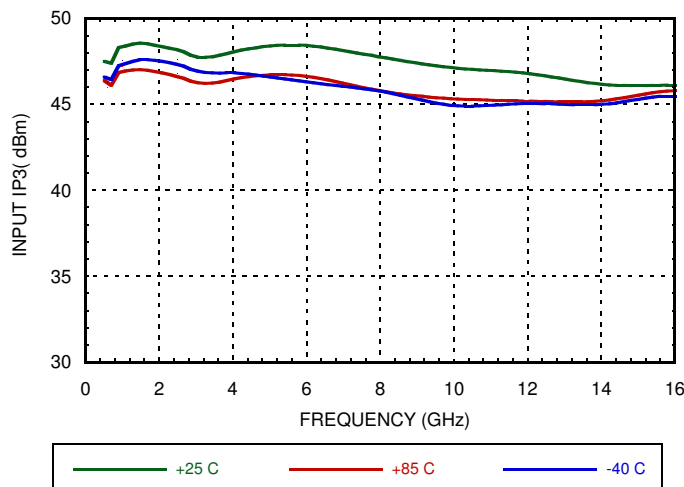
**Return Loss**



**0.1 and 1 dB Input Compression Point**



**Input Third Order Intercept Point**



**GaAs MMIC SPDT NON-REFLECTIVE  
SWITCH, DC - 14 GHz**
**Absolute Maximum Ratings**

|                                          |                   |
|------------------------------------------|-------------------|
| RF Input Power (Vctl = -5V)              | +27 dBm           |
| Control Voltage Range (A & B)            | +0.5V to -7.5 Vdc |
| Hot Switch Power Level (Vctl = -5 V)     | +23 dBm           |
| Channel Temperature                      | 150 °C            |
| Terminated Power Level (Vctl = -5V)      | +25dBm            |
| Thermal Resistance (Insertion Loss Path) | 118 °C/W          |
| Thermal Resistance (Terminated Path)     | 200 °C/W          |
| Storage Temperature                      | -65 to +150 °C    |
| Operating Temperature                    | -55 to +85 °C     |
| ESD Sensitivity (HBM)                    | Class 1A          |

**Control Voltages**

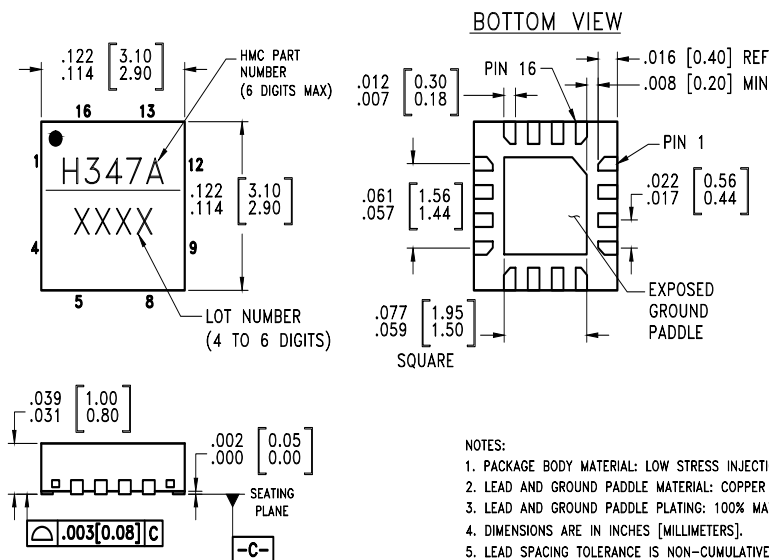
| State | Bias Condition                                |
|-------|-----------------------------------------------|
| Low   | 0 to -0.5V @ 10 uA Max.                       |
| High  | -5V @ 3uA Typ. to -7V @ 40 uA Max (± 0.5 Vdc) |

**Truth Table**

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



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

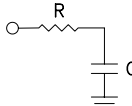
**GaAs MMIC SPDT NON-REFLECTIVE  
SWITCH, DC - 14 GHz**
**Outline Drawing**

**Package Information**

| Part Number | Package Body Material                              | Lead Finish   | MSL Rating          | Package Marking <sup>[2]</sup> |
|-------------|----------------------------------------------------|---------------|---------------------|--------------------------------|
| HMC347ALP3E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL3 <sup>[1]</sup> | H347A<br>XXXX                  |

[1] Max peak reflow temperature of 260 °C

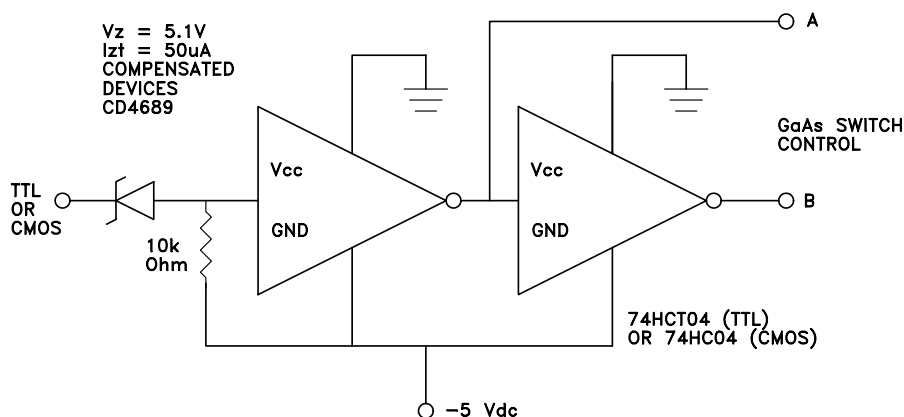
[2] 4-Digit lot number XXXX

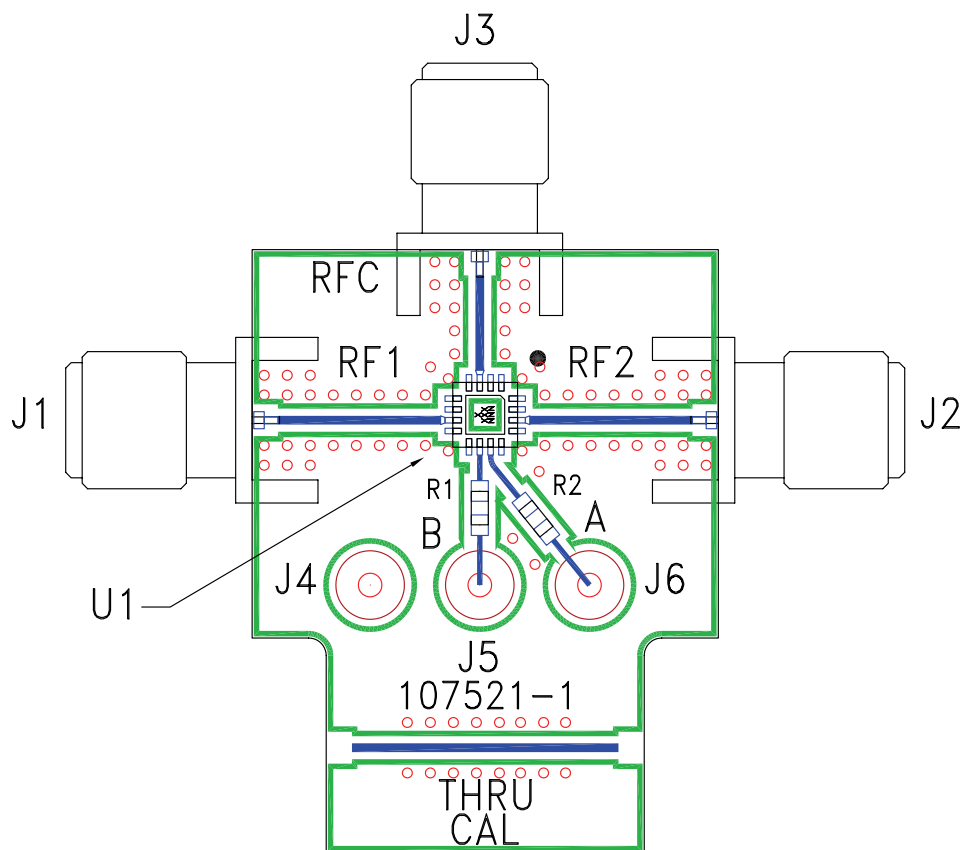
**GaAs MMIC SPDT NON-REFLECTIVE  
SWITCH, DC - 14 GHz**
**Pin Descriptions**

| Pin Number         | Function      | Description                                                                                                             | Interface Schematic                                                                 |
|--------------------|---------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1, 5, 9, 12, 16    | N/C           | This pin should be connected to PCB RF ground to maximize isolation                                                     |                                                                                     |
| 2, 4, 6, 8, 13, 15 | GND           | Package bottom has exposed metal paddle that must also be connected to PCB RF ground.                                   |  |
| 3, 7, 14           | 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. |                                                                                     |
| 10                 | CTLB          | See truth table and control voltage table.                                                                              |  |
| 11                 | CTLA          | See truth table and control voltage table.                                                                              |                                                                                     |

7

SWITCHES - CHIP

**Suggested Driver Circuit**


**GaAs MMIC SPDT NON-REFLECTIVE  
SWITCH, DC - 14 GHz**
**Evaluation PCB**

**List of Materials for EV1HMC347ALP3 <sup>[1]</sup>**

| Item    | Description                 |
|---------|-----------------------------|
| J1 - J3 | PCB Mount SRI SMA Connector |
| J4 - J6 | DC Pin                      |
| R1 - R2 | 100 Ohm Resistor, 0603 Pkg. |
| U1      | HMC347ALP3E<br>SPDT Switch  |
| PCB [2] | 107521 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 Analog Devices Inc. upon request.