# HMC574AMS8E

v01.0316

## GaAs MMIC 5 WATT T/R SWITCH DC - 3 GHz

### Typical Applications

The HMC574AMS8E is ideal for:

- Cellular/3G Infrastructure
- Private Mobile Radio Handsets
- WLAN, WiMAX & WiBro
- Automotive Telematics
- Test Equipment

### Features

Low Insertion Loss: 0.3 dB

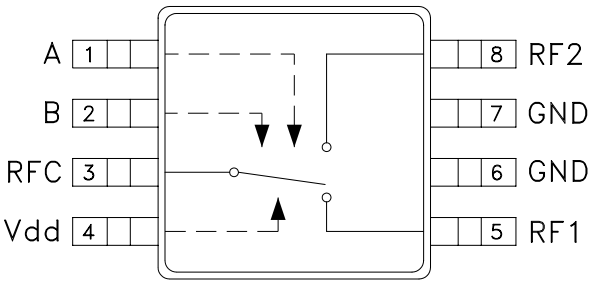
High Third Order Intercept: +63 dBm

Isolation: 30 dB

Single Positive Supply: +3 to +8V

SMT Package: MSOP8

### Functional Diagram




### General Description

The HMC574AMS8E is low-cost SPDT switch in 8-lead MSOP packages for use in transmit/receive applications which requires very low distortion at high incident power levels. The device can control signals from DC to 3 GHz and is especially suited for Cellular/3G infrastructure, WiMAX and WiBro applications with only 0.3 dB typical insertion loss. The design provides 5 watt power handling performance and +63 dBm third order intercept at +8 Volt bias. RF1 and RF2 are reflective shorts when "Off".

### Electrical Specifications, $T_A$ = +25° C, Vctl = 0/+5 Vdc, Vdd = +5 Vdc (Unless Otherwise Stated), 50 Ohm System

| Parameter | | Frequency | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Insertion Loss | | DC - 1.0 GHz<br>DC - 2.0 GHz<br>DC - 2.5 GHz<br>DC - 3.0 GHz | | 0.25<br>0.3<br>0.4<br>0.5 | 0.5<br>0.6<br>0.7<br>0.8 | dB<br>dB<br>dB<br>dB |
| Isolation | | DC - 1.0 GHz<br>DC - 2.0 GHz<br>DC - 2.5 GHz<br>DC - 3.0 GHz | 26<br>24<br>21<br>16 | 30<br>28<br>25<br>20 | | dB<br>dB<br>dB<br>dB |
| Return Loss | | DC - 1.0 GHz<br>DC - 2.0 GHz<br>DC - 2.5 GHz<br>DC - 3.0 GHz | | 35<br>30<br>25<br>22 | | dB<br>dB<br>dB<br>dB |
| Input Power for 1dB Compression | Vctl = 0/+3V<br>Vctl = 0/+5V<br>Vctl = 0/+8V | 0.5 - 3.0 GHz | 31<br>35<br>37 | 34<br>38<br>39 | | dBm<br>dBm<br>dBm |
| Input Third Order Intercept<br>$P_{tone}$ = Two-tone Input Power (Each Tone) | Vctl = 0/+3V, $P_{tone}$ = +23 dBm<br>Vctl = 0/+5V, $P_{tone}$ = +27 dBm<br>Vctl = 0/+8V, $P_{tone}$ = +27 dBm | 0.5 - 3.0 GHz | | 63<br>63<br>63 | | dBm<br>dBm<br>dBm |
| Switching Characteristics | | DC - 3.0 GHz | | | | |
| | tRISE, tFALL (10/90% RF) | | | 40 | | ns |
| | tON, tOFF (50% CTL to 10/90% RF) | | | 70 | | ns |

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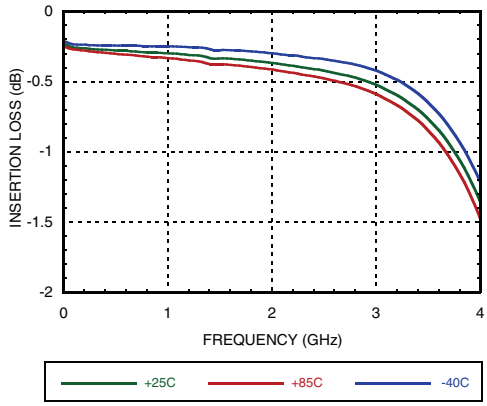
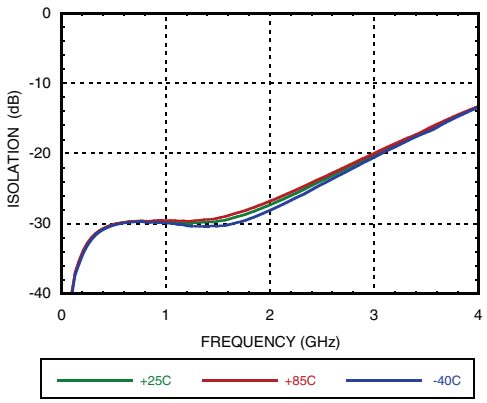
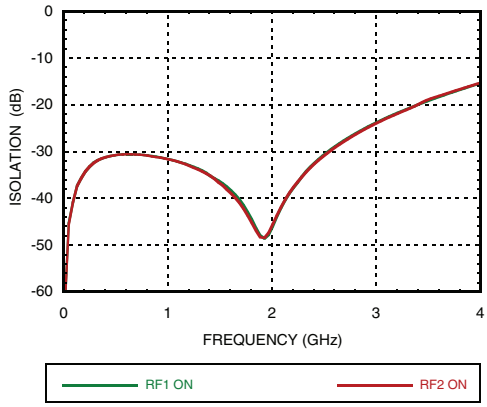
### Insertion Loss



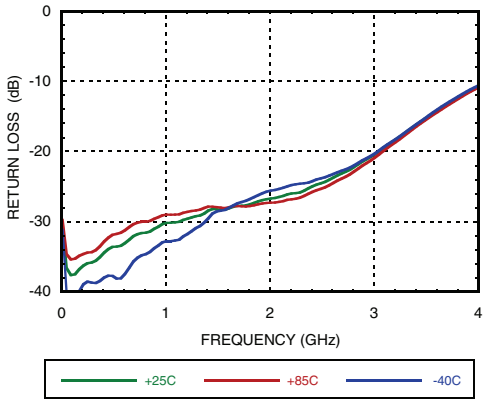

### Isolation Between RFC & RF1/RF2



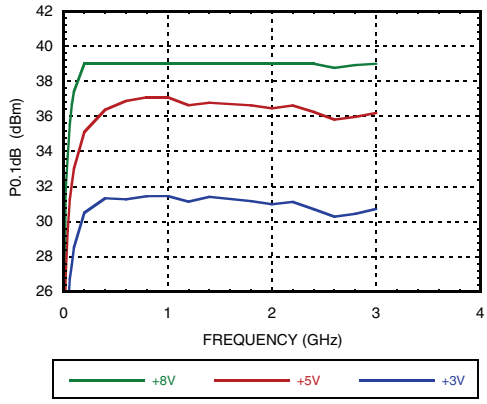

### RF1 to RF2 Isolation




### Return Loss




### Input P0.1dB vs. Vdd

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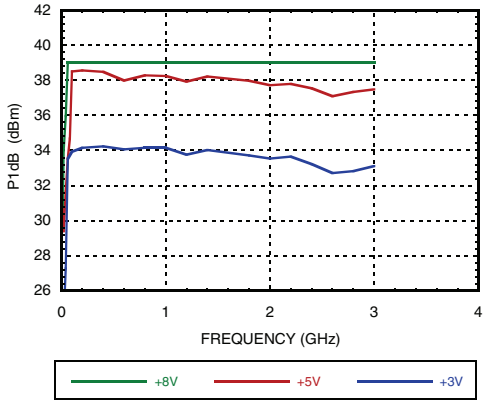
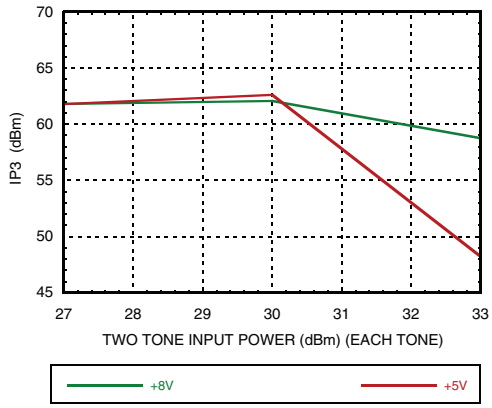
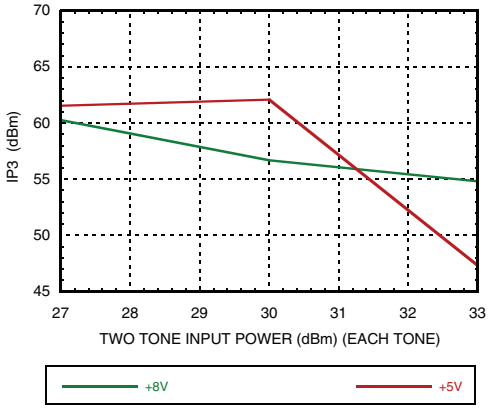


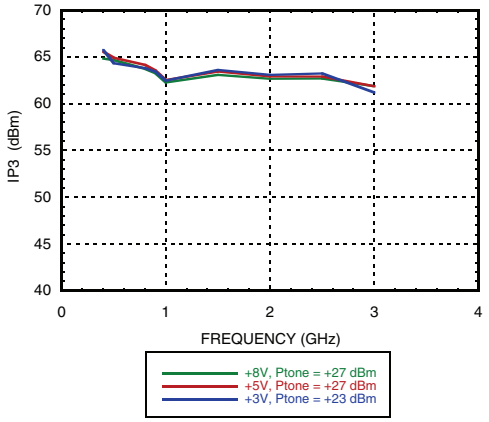
### Input IP3 vs. Input Power @ 900 MHz



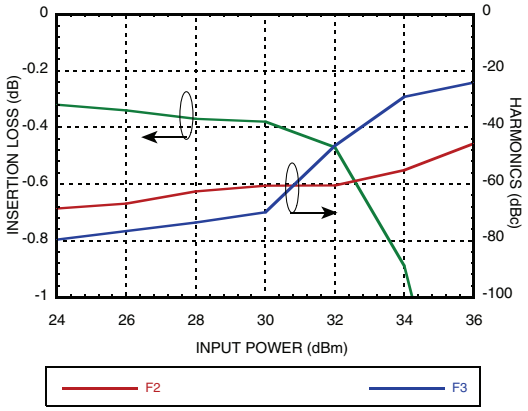

### Input IP3 vs. Input Power @ 1900 MHz



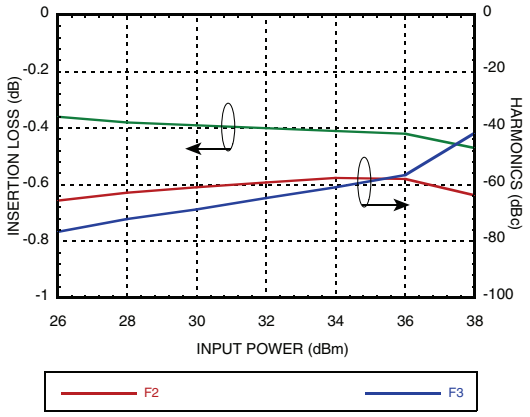

### Input Third Order Intercept



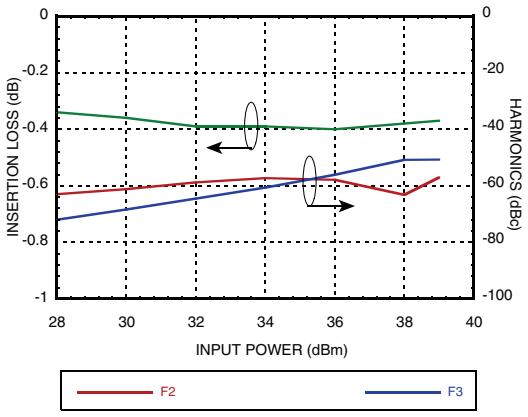

### 2nd & 3rd Harmonics @ 900 MHz
### Vdd = +3 Volts



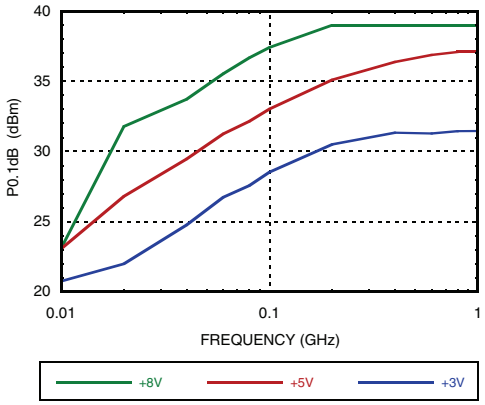

### 2nd & 3rd Harmonics @ 900 MHz
### Vdd = +5 Volts



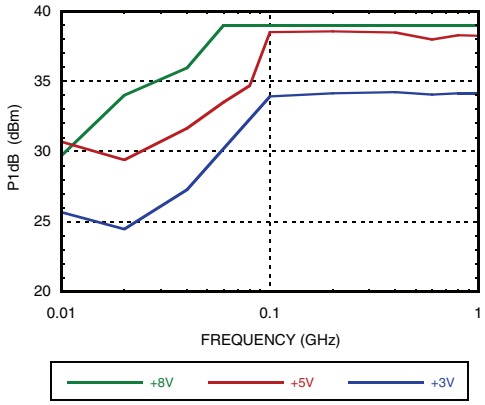

### 2nd & 3rd Harmonics @ 900 MHz
### Vdd = +8 Volts



### Input P0.1dB vs. Vdd




### Input P1dB vs. Vdd




### Absolute Maximum Ratings

| | | |
|---|---|---|
| Max. Input Power $V_{dd}$ = 0/+8V | 0.5 - 2.5 GHz | 39 dBm |
| Bias Voltage Range (Vdd) | | -0.2 to +10 Vdc |
| Control Voltage Range (A & B) | | -0.2 to +Vdd Vdc |
| Channel Temperature | | 150 °C |
| Continuous Pdiss ( T= + 85 °C) (derate 10 mW/°C above 85 °C) | | 0.775W |
| Thermal Resistance | | 83.9 °C/W |
| Storage Temperature | | -65 to +150 °C |
| Operating Temperature | | -40 to +85 °C |
| ESD Sensitivity (HBM) | | Class 1A |

DC Blocks are required at ports RFC, RF1 and RF2

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

### Bias Voltage & Current

| Vdd (Vdc) | Typical Idd (µA) |
|---|---|
| +3 | 0.5 |
| +5 | 1 |
| +8 | 20 |

### Control Voltages

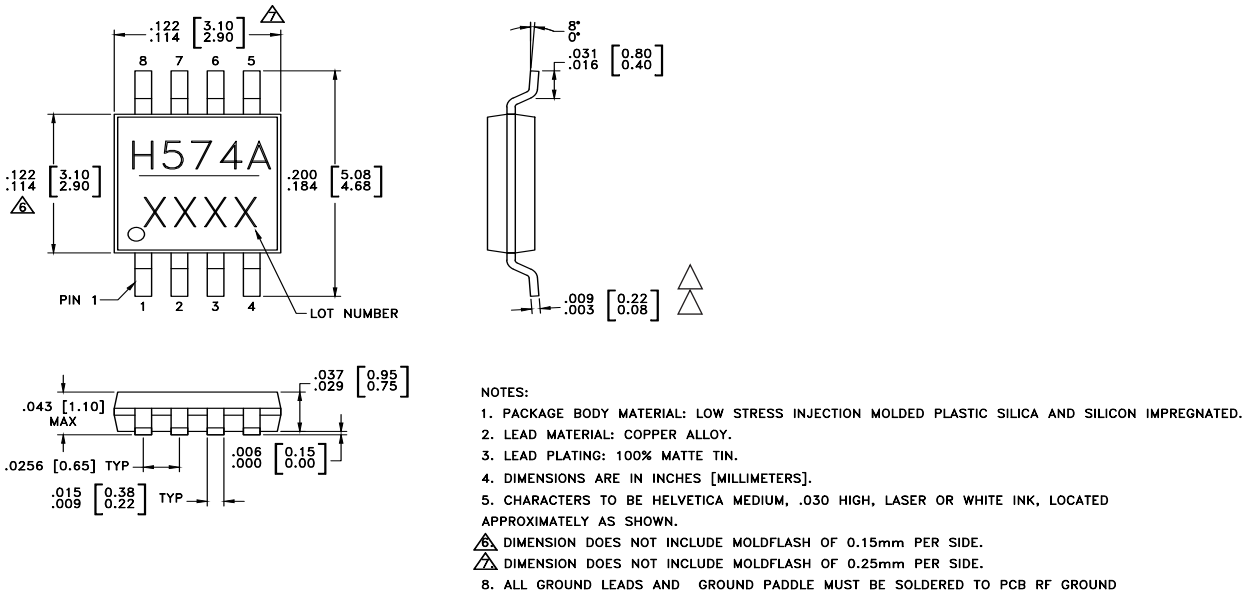
| State | Bias Condition |
|---|---|
| Low | 0 to +0.2 Vdc @ 1 µA Typical |
| High | Vdd ± 0.2 Vdc @ 1 µA Typical |

### Truth Table

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

# GaAs MMIC 5 WATT T/R SWITCH DC - 3 GHz

## Outline Drawing




NOTES:

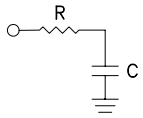
1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEAD MATERIAL: COPPER ALLOY.
3. LEAD PLATING: 100% MATTE TIN.
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. CHARACTERS TO BE HELVETICA MEDIUM, .030 HIGH, LASER OR WHITE INK, LOCATED APPROXIMATELY AS SHOWN.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
7. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
8. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND

## Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [2] |
|---|---|---|---|---|
| HMC574AMS8E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [1] | H574A<br>XXXX |

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

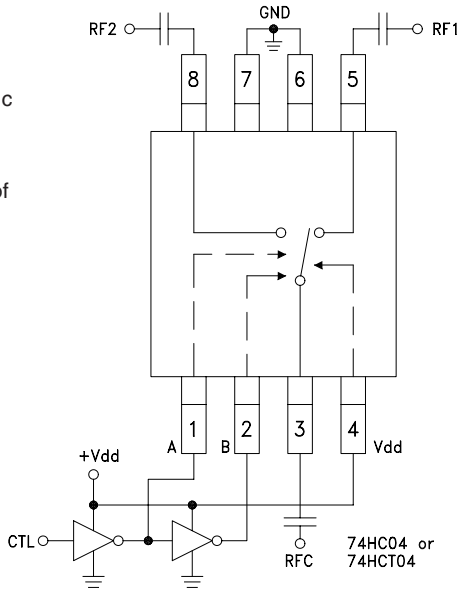
## Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1 | A | See truth table and control voltage table. |   |
| 2 | B | 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. | |
| 6, 7 | GND | This pin must be connected to RF/DC ground. | |

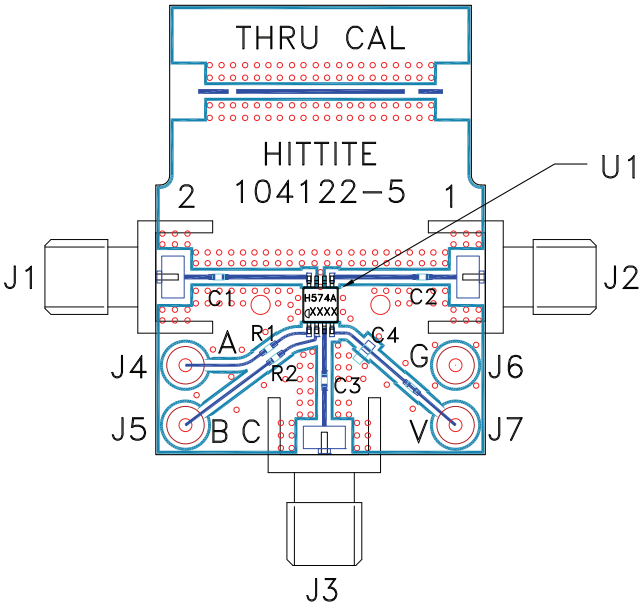
## Typical Application Circuit

Notes:

1. Set logic gate and switch Vdd = +3V to +5V and use HCT series logic to provide a TTL driver interface.
2. Control inputs A/B can be driven directly with CMOS logic (HC) with Vdd of +3 to +8 Volts applied to the CMOS logic gates and to pin 4 of the RF switch.
3. DC Blocking capacitors are required for each RF port as shown. Capacitor value determines lowest frequency of operation.
4. Highest RF signal power capability is achieved with Vdd set to +8V. The switch will operate properly (but at lower RF power capability) at bias voltages down to +3V.




## Evaluation Circuit Board




## List of Materials for Evaluation PCB EV1HMC574AMS8 [1]

| Item | Description |
|---|---|
| J1 - J3 | PCB Mount SMA RF Connector |
| J4 - J7 | DC Pin |
| C1 - C3 | 100 pF capacitor, 0402 Pkg. |
| C4 | 10,000 pF capacitor, 0603 Pkg. |
| R1, R2 | 100 Ohm resistor, 0402 Pkg. |
| U1 | HMC574AMS8E T/R Switch |
| PCB [2] | 104122 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.

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