# HMC784AMS8GE

v01.0117

## GaAs MMIC 10 WATT T/R SWITCH DC - 4 GHz

### Typical Applications

The HMC784AMS8GE is ideal for:

- Cellular/4G Infrastructure
- WiMAX, WiBro & Fixed Wireless
- Automotive Telematics
- Mobile Radio
- Test Equipment

### Features

Input P1dB: +40 dBm @ Vdd = +8V

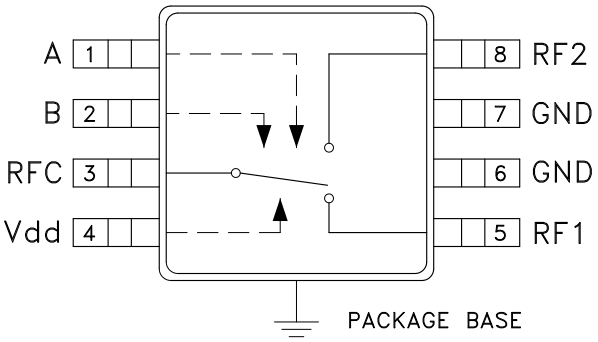
High Third Order Intercept: +60 dBm

Positive Control: +3 to +8 V

Low Insertion Loss: 0.3 dB

MSOP8G Package: 14.8 $mm^2$

### Functional Diagram




### General Description

The HMC784AMS8GE is a high power SPDT switch in an 8-lead MSOPG package for use in transmit-receive applications which require very low distortion at high input signal power levels. The device can control signals from DC to 4 GHz. The design provides exceptional intermodulation performance; > +60 dBm third order intercept at +5V bias. RF1 and RF2 are reflective shorts when "OFF". On-chip circuitry allows single positive supply operation from +3 Vdc to +8 Vdc at very low DC current with control inputs compatible with CMOS logic families.

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

| Parameter | Frequency | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Insertion Loss | DC - 1.0 GHz | | 0.3 | 0.6 | dB |
| | DC - 2.0 GHz | | 0.3 | 0.8 | dB |
| | DC - 2.5 GHz | | 0.4 | 0.9 | dB |
| | DC - 3.0 GHz | | 0.4 | 1.0 | dB |
| | DC - 4.0 GHz | | 0.7 | 1.5 | dB |
| Isolation | DC - 4.0 GHz | 24 | 28 | | dB |
| Return Loss (On State) | DC - 1.0 GHz | | 30 | | dB |
| | DC - 2.0 GHz | | 26 | | dB |
| | DC - 3.0 GHz | | 20 | | dB |
| | DC - 4.0 GHz | | 14 | | dB |
| Input Power for 0.1dB Compression | Vdd = +3V | 1.0 - 4.0 GHz | 31 | | dBm |
| | Vdd = +5V | | 36 | | dBm |
| | Vdd = +8V | | 38 | | dBm |
| Input Power for 1dB Compression | Vdd = +3V | 0.1 - 4.0 GHz | 32 | 33 | dBm |
| | Vdd = +5V | | 35 | 38 | dBm |
| | Vdd = +8V | | 38 | 40 | dBm |
| Input Third Order Intercept (Two-tone input power = +27 dBm each tone) | 0.02 - 0.1 GHz | | | 61 | dBm |
| | 0.1 - 2.0 GHz | | | 62 | dBm |
| | 0.1 - 3.0 GHz | | | 61 | dBm |
| | 0.1 - 4.0 GHz | | | 60 | dBm |
| Switching Characteristics | | | | | |
| tRISE, tFALL (10/90% RF) | DC - 4.0 GHz | | 82 | | ns |
| tON, tOFF (50% CTL to 10/90% RF) | | | 112 | | 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*

# HMC784A* PRODUCT PAGE QUICK LINKS

**Last Content Update: 02/23/2017**

## COMPARABLE PARTS

View a parametric search of comparable parts.

## EVALUATION KITS

- HMC784AMS8G Evaluation Board

## DOCUMENTATION

**Data Sheet**

- HMC784AMS8GE: GaAs MMIC 10 Watt T/R Switch DC - 4 GHz Data Sheet

## DESIGN RESOURCES

- HMC784A Material Declaration
- PCN-PDN Information
- Quality And Reliability
- Symbols and Footprints

## DISCUSSIONS

View all HMC784A EngineerZone Discussions.

## SAMPLE AND BUY

Visit the product page to see pricing options.

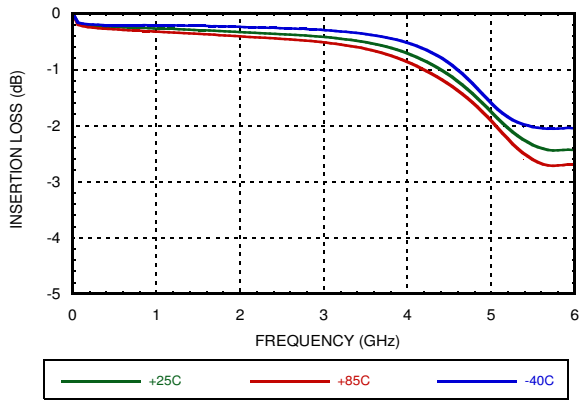
## TECHNICAL SUPPORT

Submit a technical question or find your regional support number.

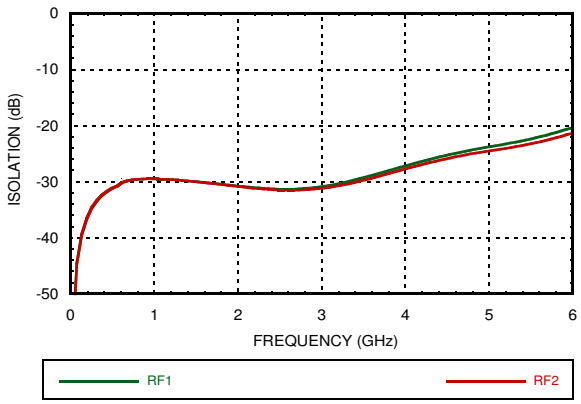
## DOCUMENT FEEDBACK

Submit feedback for this data sheet.

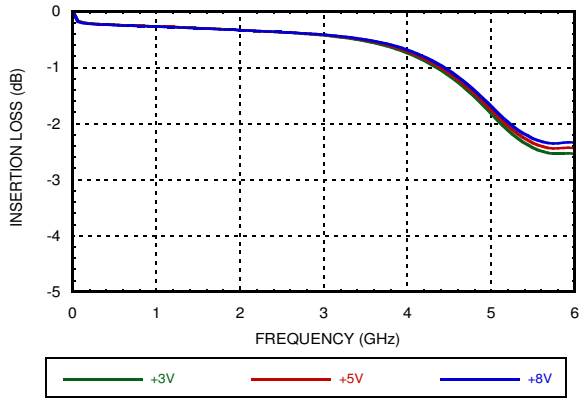
### Insertion Loss vs. Temperature



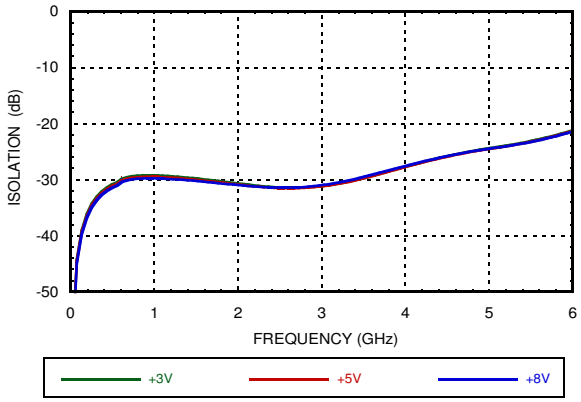

### Isolation



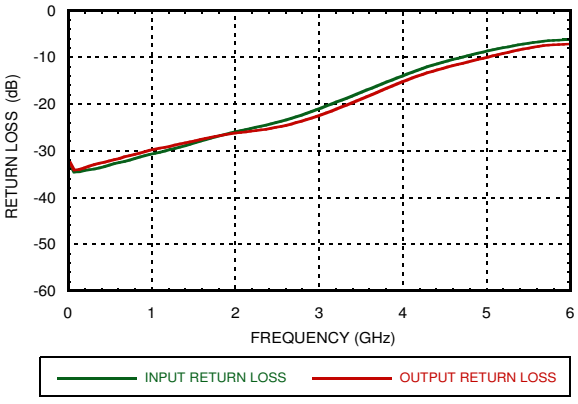

### Insertion Loss vs. Vdd



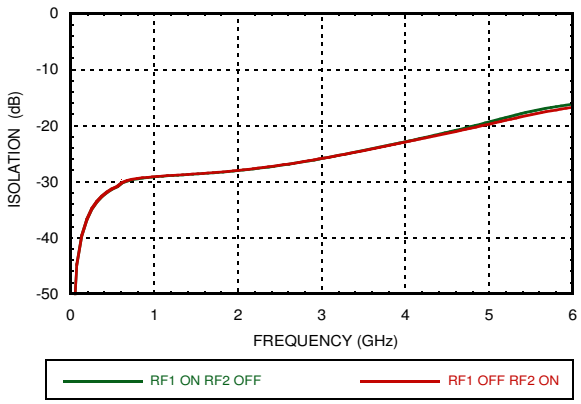

### Isolation vs. Vdd



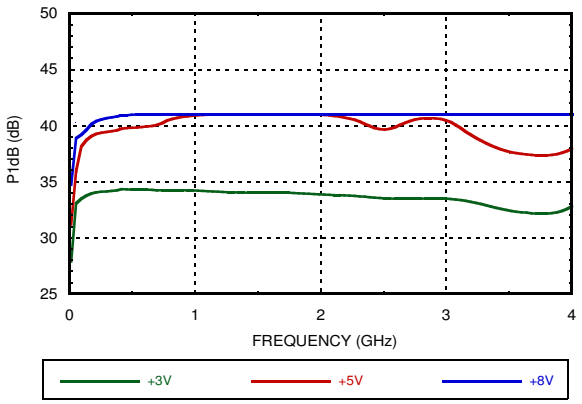

### Return Loss



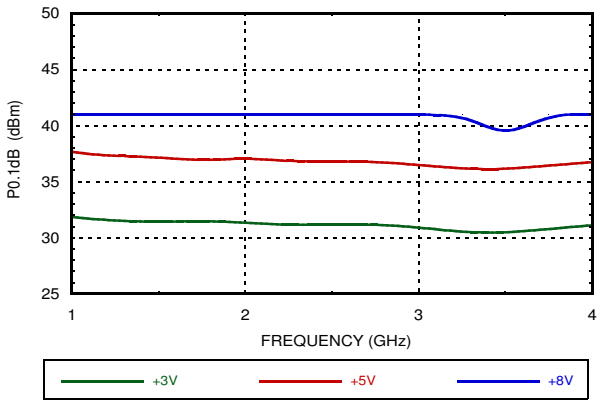

### RF1 to RF2 Isolation



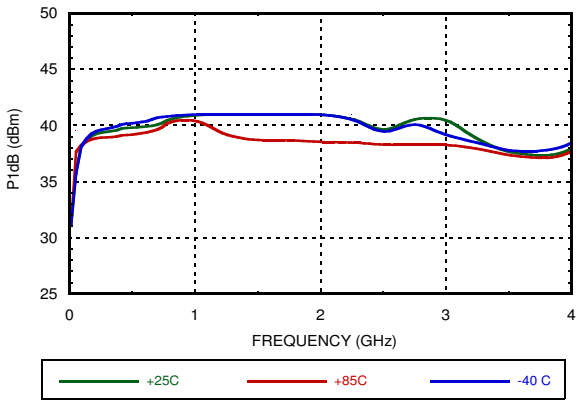
### Input P1dB vs. Vdd



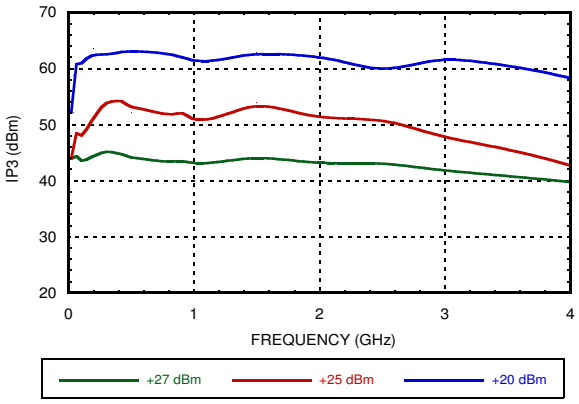

### Input P0.1dB vs. Vdd



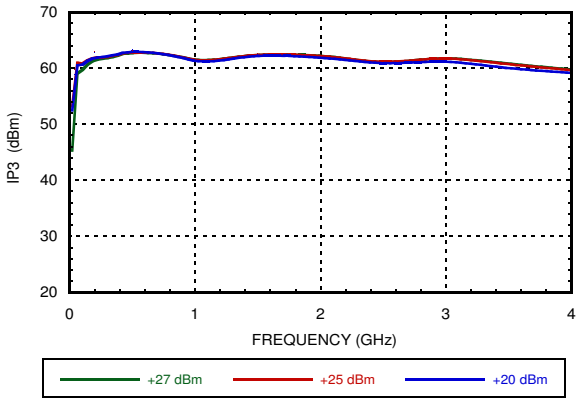

### Input P1dB vs. Temperature @ Vdd = +5V



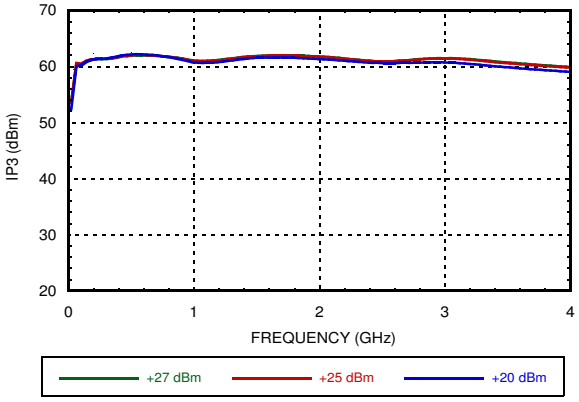

### Input IP3 vs. Tone Power @ Vdd = +3V



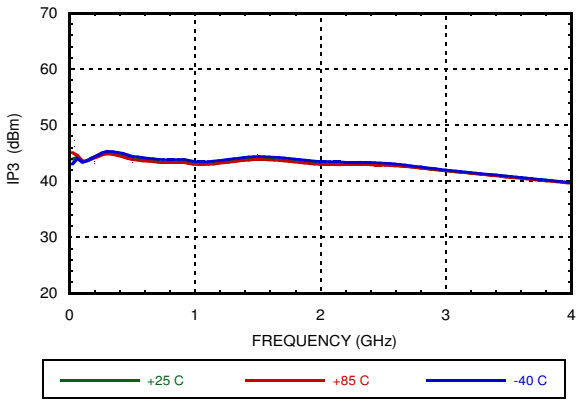

### Input IP3 vs. Tone Power @ Vdd = +5V



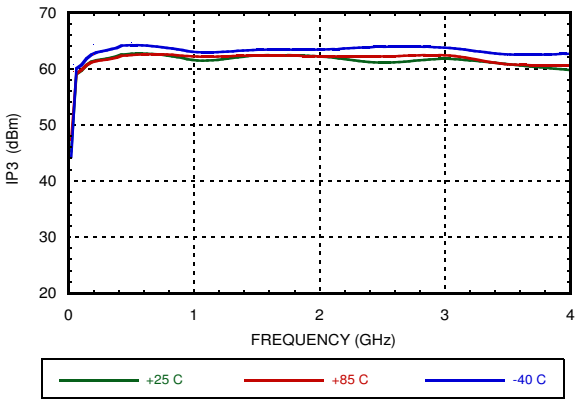

### Input IP3 vs. Tone Power @ Vdd = +8V



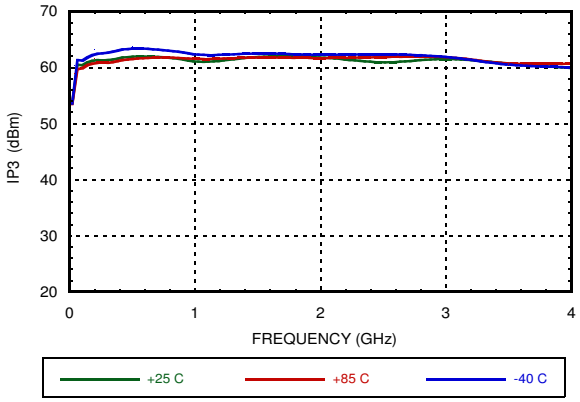
### Input IP3 vs. Temperature 27 dBm Tones, Vdd = +3V



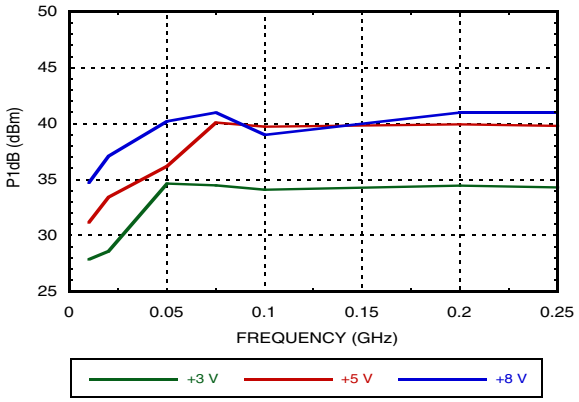

### Input IP3 vs. Temperature 27 dBm Tones, Vdd = +5V



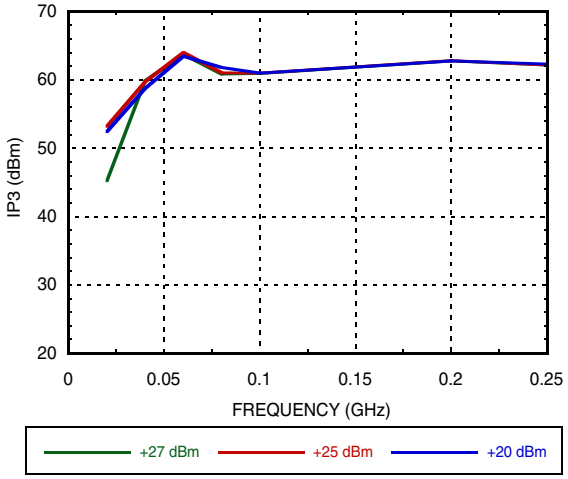

### Input IP3 vs. Temperature 27 dBm Tones, Vdd = +8V




### Input P1dB vs. Vdd




### Input IP3 vs. Tone Power @ Vdd = +5V



## Bias Voltage & Current

| Vdd (V) | Typical Idd (µA) |
|---|---|
| +3 | 0.5 |
| +5 | 2 |
| +8 | 20 |

## Control Voltages & Currents

| State | Vdd = +3V (µA) | Vdd = +5V (µA) | Vdd = +8V (µA) |
|---|---|---|---|
| Low (0 to +0.2V) | 0.5 | 2.0 | 20 |
| High (Vdd ±0.2V) | 0.1 | 0.1 | 0.1 |

## Truth Table

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

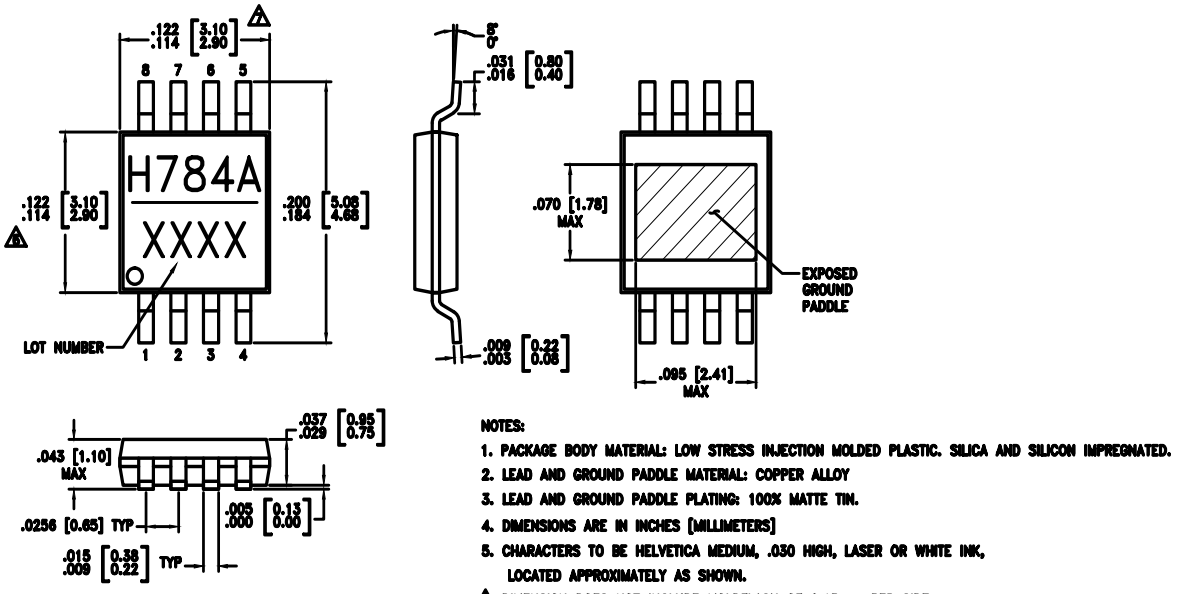
## Absolute Maximum Ratings

| | |
|---|---|
| RF Input Power (Vdd = +8V, 50 Ohm source & load impedances) | +39 dBm (T = +85 °C) |
| Supply Voltage Range (Vdd) (Vctl = 0V) | -0.2 to +9V |
| Control Voltage Range (A & B) | -0.2 to Vdd +0.5V |
| Channel Temperature | 150 °C |
| Continuous Pdiss (T = 85 °C) (derate 25 mW/°C above 85 °C) | 1.217 W |
| Thermal Resistance (Channel to ground paddle) | 53.4 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| ESD Rating | Class 1A HBM |

*Note: DC blocking capacitors are required at ports RFC, RF1 and RF2. Their value will determine the lowest transmission frequency.*

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

## Outline Drawing




NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC. SILICA AND SILICON IMPREGNATED.
2. LEAD AND GROUND PADDLE MATERIAL: COPPER ALLOY
3. LEAD AND GROUND PADDLE 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.

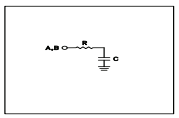
## Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [1] |
|---|---|---|---|---|
| HMC784AMS8GE | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [2] | H784A<br>XXXX |

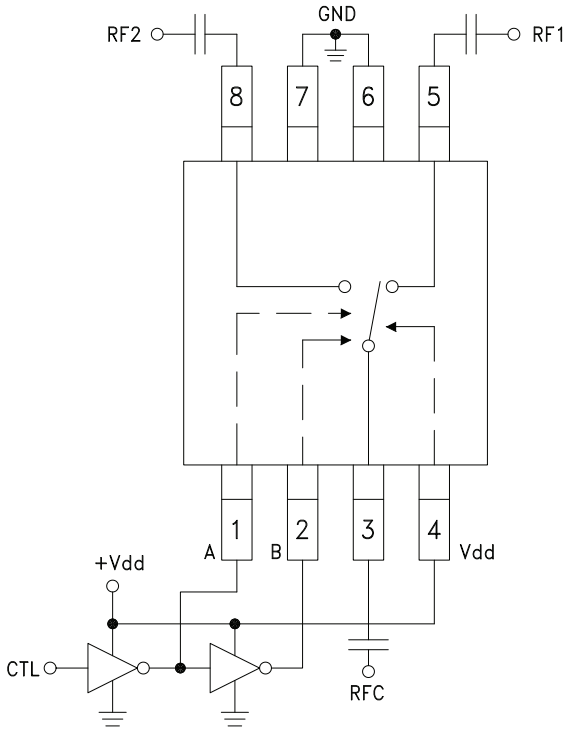
[1] 4-Digit lot number XXXX

[2] Max peak reflow temperature of 260 °C

## 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 Ohms. Blocking capacitors are required. | |
| 4 | Vdd | Supply Voltage | |
| 6, 7 | GND | Package bottom must also be connected to PCB RF ground. |   |

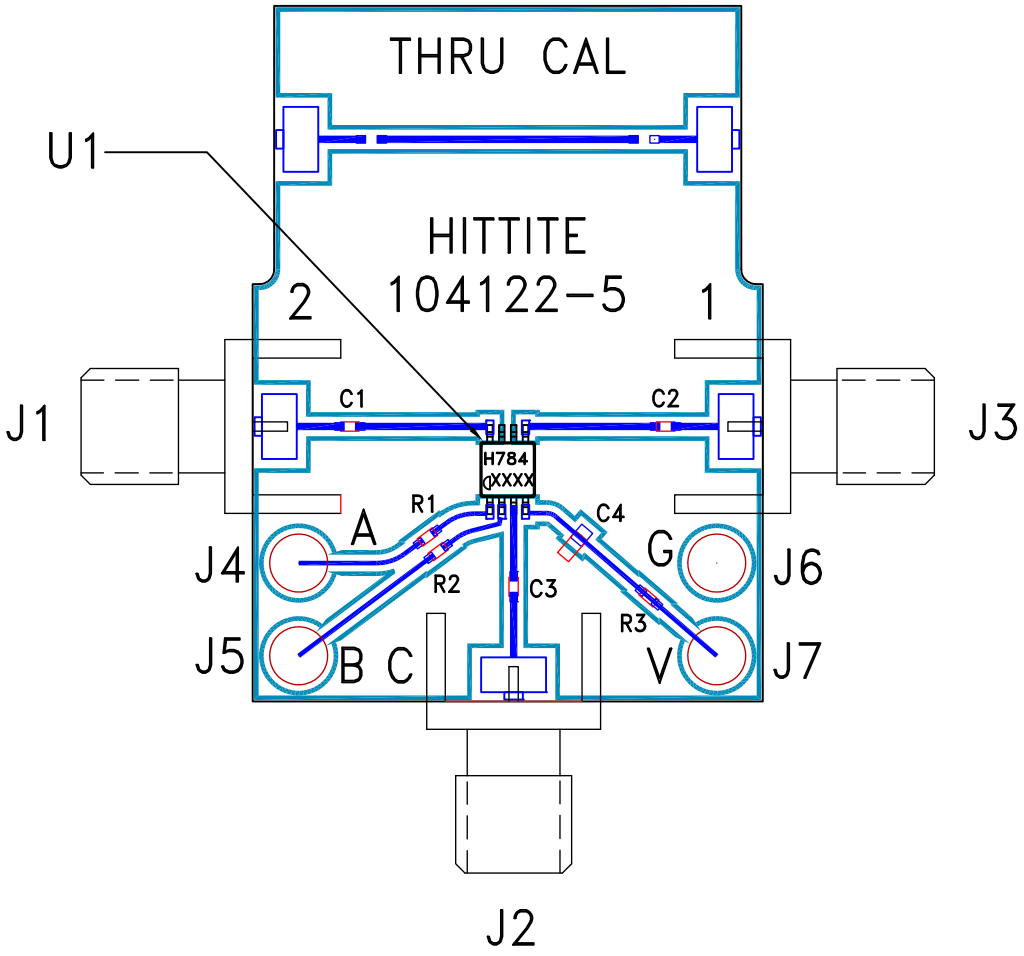
## Typical Application Circuit




Notes:

1. Set logic gate and switch Vdd:
   For Vdd = +3V to +7V, use HCT series logic to provide a TTL driver interface.
   For Vdd = +3V to +8V, use NXP Hex Inverter, HEF 4069UB or similar.
2. Control inputs A/B can be driven directly with CMOS logic 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 V 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 EV1HMC784AMS8G [1]

| Item | Description |
|---|---|
| J1 - J3 | PCB Mount SMA RF Connector |
| J4 - J7 | DC Pin |
| C1 - C3 | 100 pF capacitor, 0402 Pkg. |
| C4 | 10 KpF capacitor, 0603 Pkg. |
| R1 - R3 | 100 Ohm Resistor, 0402 Pkg. |
| U1 | HMC784AMS8GE 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 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 Inc. upon request.