SWITCHES - BYPASS - SMT

ANALOG DEVICES

HMC199AMS8 / 199AMS8E

v00.0814

DUAL SPDT SWITCH DC - 2.5 GHz

Typical Applications

The HMC199AMS8 / 199AMS8E is ideal for:

- Cellular
- ISM Basestations
- PCS

Features

RoHS-Compliant Product

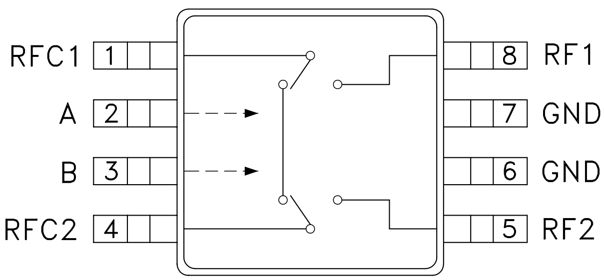
Integrated Dual SPDTs

Low Insertion Loss: <0.5 dB @ 2 GHz

Positive Control: 0/+5V, 0/+3V

Ultra Small MSOP8 Package: 14.8 mm^2

Functional Diagram



General Description

The HMC199AMS8 & HMC199AMS8E are low-cost general purpose dual SPDT GaAs “bypass” switches in 8-lead MSOP packages covering DC to 2.5 GHz. These four-RF-port components integrate two SPDT switches and a through line onto a single IC. The designs provide low insertion loss of less than 0.5 dB while switching passive or active external circuit components in and out of the signal path. Port to port isolations are typically 25 to 30 dB. On-chip circuitry enables positive voltage control operation at very low DC currents with control inputs compatible with CMOS and most TTL logic families. Applications include LNA or filter bypass switching and single bit attenuator switching. The HMC199AMS8E is a RoHS-compliant product.

Electrical Specifications, T_A = +25° C, Vctl = 0/+5 Vdc, 50 Ohm System

Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 1.0 GHz DC - 2.0 GHz DC - 2.5 GHz		0.3 0.4 0.6	0.6 0.8 1.0	dB dB dB
Isolation (Between Ports RFC1 and RFC2 / RF1 / RF2)	DC - 2.0 GHz DC - 2.5 GHz	22 17	25 22		dB dB
Return Loss (On State, Any Port)	DC - 2.0 GHz DC - 2.5 GHz	20 20	30 30		dB dB
Input Power for 1 dB Compression	0.5 - 2.0 GHz	25	28		dBm
Input Third Order Intercept (Two-tone Input Power = 13 dBm Each Tone)	0.5 - 2.0 GHz	40	55		dBm
Switching Characteristics tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF)	DC - 2.5 GHz		 20 40		 ns ns

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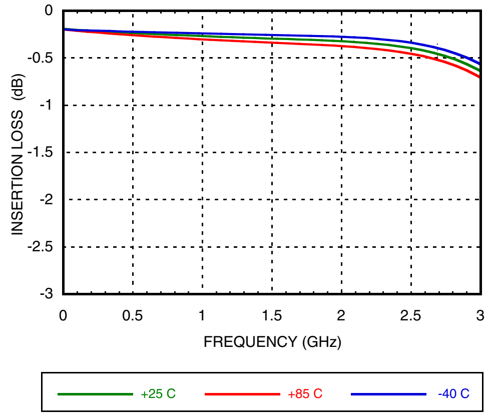
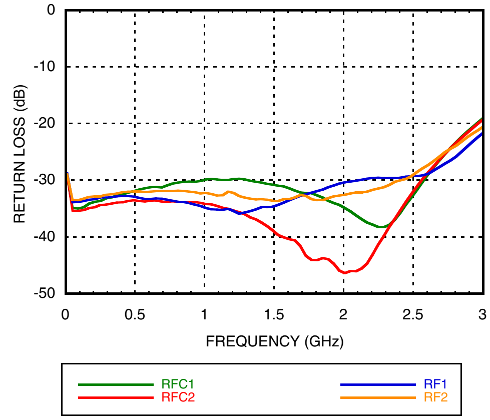
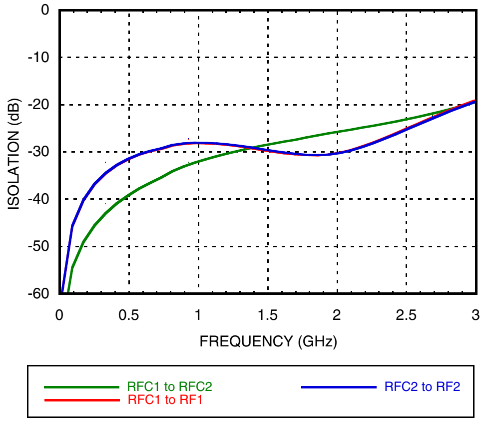
Insertion Loss



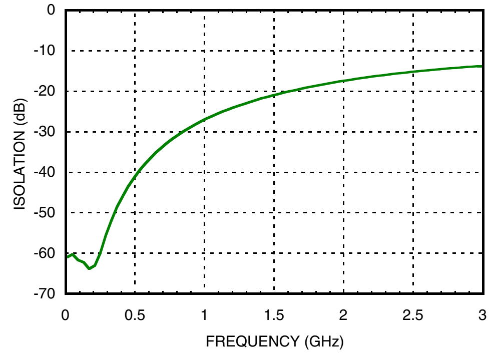
Return Loss



Isolation Between Ports RFC1 and RFC2 / RF1 / RF2

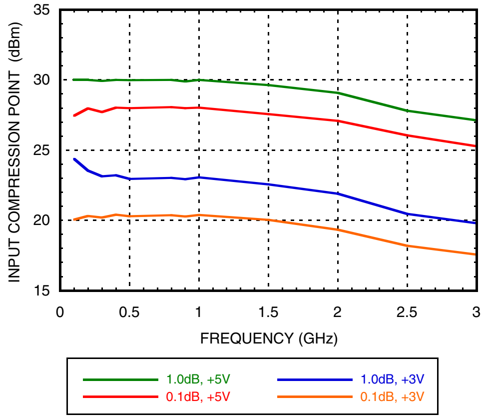


Isolation Between Ports RF1 and RF2

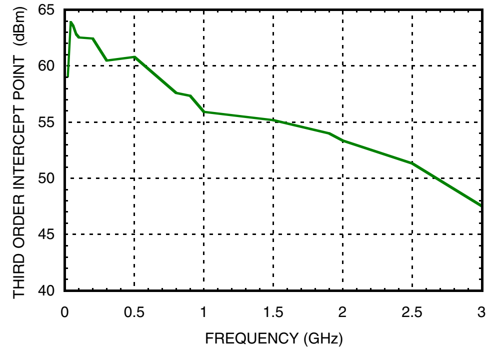


Note: RFC1 - RFC2 is in insertion loss state

0.1 and 1 dB Compression Point



Input Third Order Intercept Point



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DUAL SPDT SWITCH
DC - 2.5 GHz

Absolute Maximum Ratings

RF Input Power V_{CTL} = 0/+5V	+29.3 dBm
Control Voltage Range (A & B)	-0.5 to +7.5 Vdc
Channel Temperature	150 °C
Continuous Pdiss (T = 85 °C) (derate 5.85 mW/°C above 85 °C)	0.38 W
Thermal Resistance	171 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class 1A

Truth Table

**Control Input Tolerances are ± 0.5 Vdc*

Control Input*		Control Current (Typical)		Signal Path		
A (Vdc)	B (Vdc)	Ia (μA)	Ib (μA)	RFC1 to RFC2	RFC1 to RF1	RFC2 to RF2
0	+5	-1	1	ON	OFF	OFF
+5	0	1	-1	OFF	ON	ON
0	+3	-0.1	0.1	ON	OFF	OFF
+3	0	0.1	-0.1	OFF	ON	ON

DC blocking capacitors are required at ports RFC1, RFC2, RF1, RF2. Choose value for lowest frequency of operation.

Distortion vs. Frequency

Control Input	Input Third Order Intercept (dBm) 0 dBm Each Tone	
(Vdc)	900 MHz	1900 MHz
+5	56	52
+3	52	47

Compression vs. Frequency

	Carrier at 900MHz		Carrier at 1900MHz	
CTL Input	Input Power for 0.1 dB Compression	Input Power for 1.0 dB Compression	Input Power for 0.1 dB Compression	Input Power for 1.0 dB Compression
(Vdc)	(dBm)	(dBm)	(dBm)	(dBm)
+5	28	30	27	29
+3	20	23	20	22

Caution: Do not operate continuously at RF power input greater than 1 dB compression and do not "hot switch" power levels greater than +22 dBm (Control = 0/+5Vdc).

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

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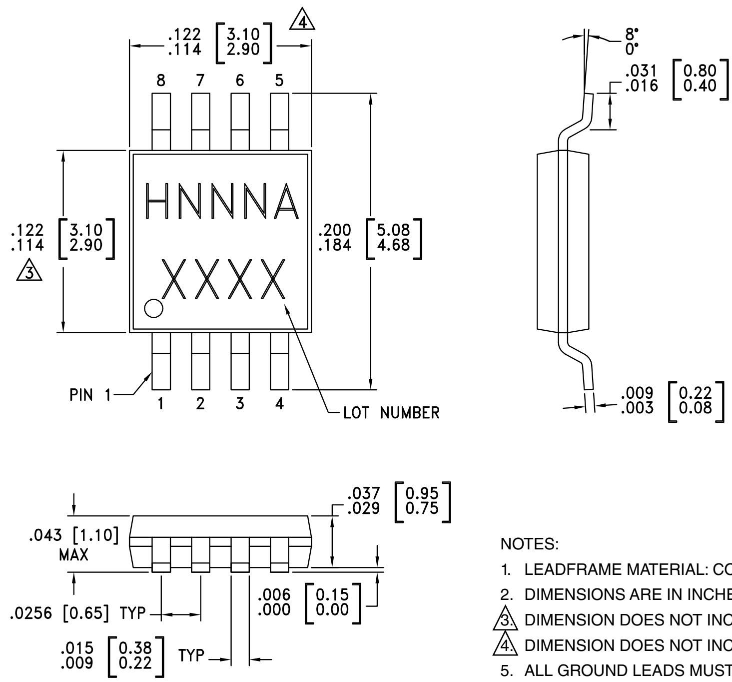
DUAL SPDT SWITCH DC - 2.5 GHz

Outline Drawing



NOTES:

1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS].
3. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
4. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
5. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [3]
HMC199AMS8	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 [1]	H199A XXXX
HMC199AMS8E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	H199A XXXX

[1] Max peak reflow temperature of 235 °C
[2] Max peak reflow temperature of 260 °C
[3] 4-Digit lot number XXXX

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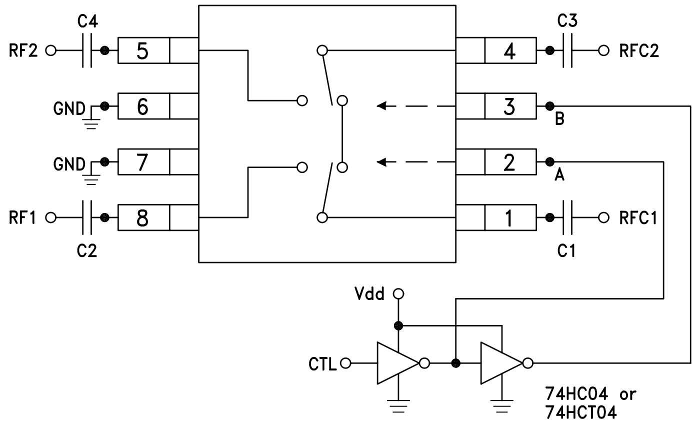
Typical Application Circuit



Notes:

1. Set A/B control to 0/+5V, Vdd = +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 = 5 to 7 Volts applied to the CMOS logic gates.
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 = +7V and A/B set to 0/+7V.

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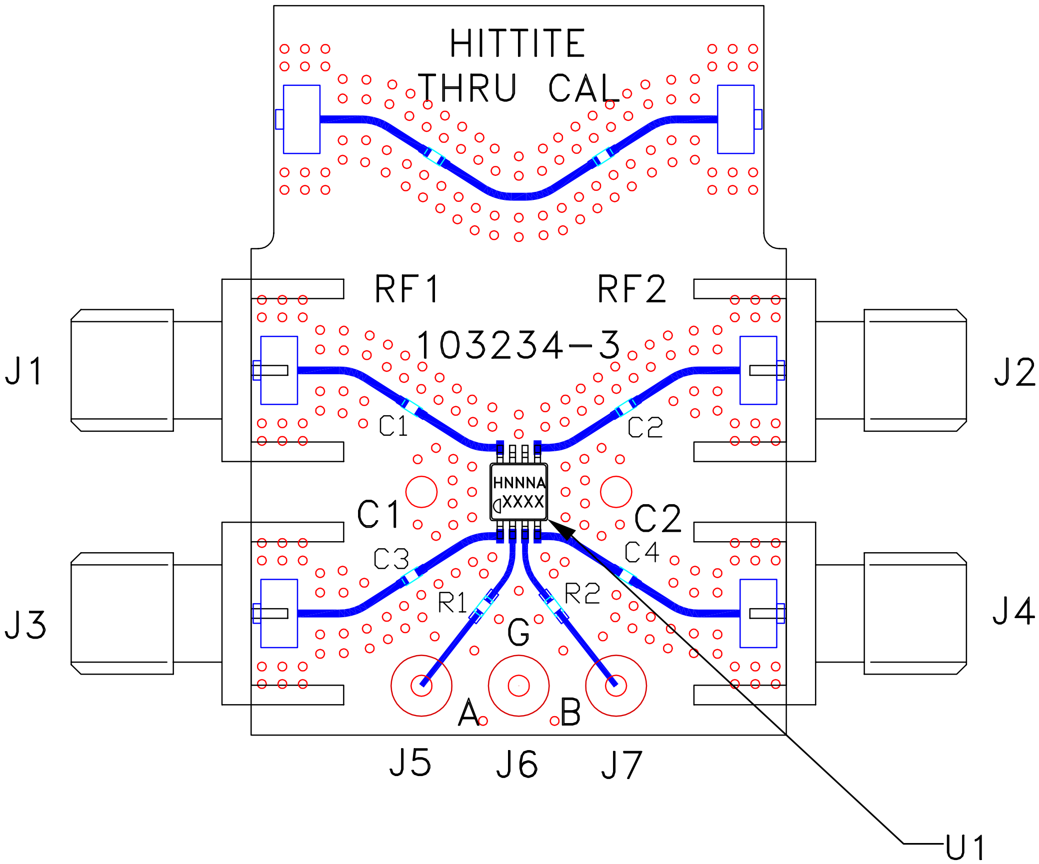
Evaluation PCB



List of Materials for Evaluation PCB EV1HMC199AMS8 [1]

Item	Description
J1 - J4	PCB Mount SMA RF Connector
J5 - J7	DC Pin
C1 - C4	Chip Capacitor, 0402 Pkg. Choose value for lowest frequency of operation. 330 pF is provided on PCB.
R1 - R2	100 Ohm Resistor, 0402 Pkg.
U1	HMC199AMS8 / 199AMS8E Bypass Switch
PCB [2]	103234 Evaluation PCB 1.5” x 1.5”

[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 ports should have 50 ohm impedance. The evaluation circuit board shown above is available from Hittite Microwave Corporation upon request.

**R1 & R2 = 100 Ohm.*
These optional resistors will provide more RF path to control circuit isolation.

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