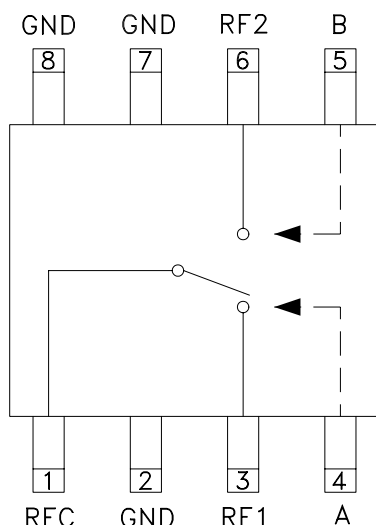


### Typical Applications

The HMC239S8 is ideal for:

- MMDS & WirelessLAN
- Basestation Infrastructure
- Portable Wireless

### Functional Diagram



### Features

Low Insertion Loss: 0.4 dB

High Isolation: 35 dB

Fast Switching Speed: 2ns

High Input IP3: +50 dBm

### General Description

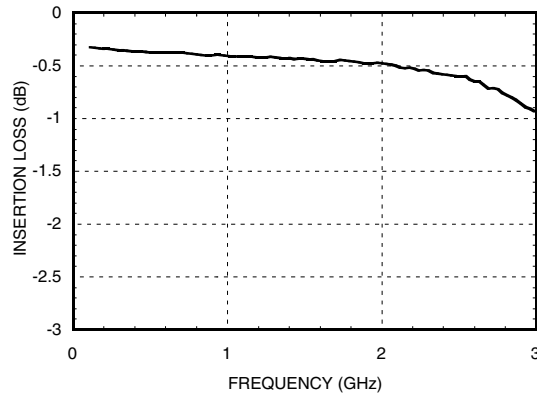
The HMC239S8 is a low-cost GaAs MMIC SPDT switch in an 8-lead SOIC package. The switch can control signals from DC to 2.5 GHz. It is especially suited for low or medium power applications which require extremely fast switching with minimal insertion loss. The two control voltages require a minimal amount of DC current which is optimal for battery powered radio systems. RF1 and RF2 are reflective shorts when "Off".

### Electrical Specifications, $T_a = +25^\circ\text{C}$ , $V_{ctl} = 0\text{-}5\text{V}$ , 50 Ohm System

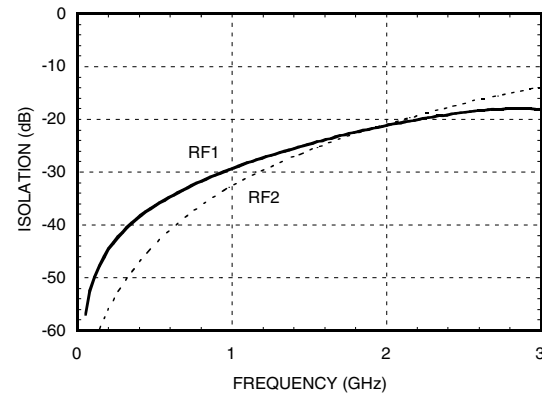
Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 0.1 GHz		0.4	0.6	dB
	DC - 0.5 GHz		0.4	0.6	dB
	DC - 1.0 GHz		0.5	0.7	dB
	DC - 2.0 GHz		0.6	0.8	dB
	DC - 2.5 GHz		0.7	1.0	dB
Isolation	DC - 0.5 GHz	33	36		dB
	DC - 1.0 GHz	26	29		dB
	DC - 2.0 GHz	18	21		dB
	DC - 2.5 GHz	14	17		dB
Return Loss	DC - 1.0 GHz	18	21		dB
	DC - 2.0 GHz	17	21		dB
	DC - 2.5 GHz	15	20		dB
Input Power for 1dB Compression	0.5 - 1.0 GHz	25	29		dBm
	0.5 - 2.5 GHz	23	27		dBm
Input Third Order Intercept (Two-Tone Input Power = +7 dBm Each Tone)	0.5 - 1.0 GHz	45	50		dBm
	0.5 - 2.5 GHz	44	49		dBm
Switching Characteristics	DC - 2.5 GHz				
			2		ns
			10		ns

## GaAs MMIC SPDT SWITCH DC - 2.5 GHz

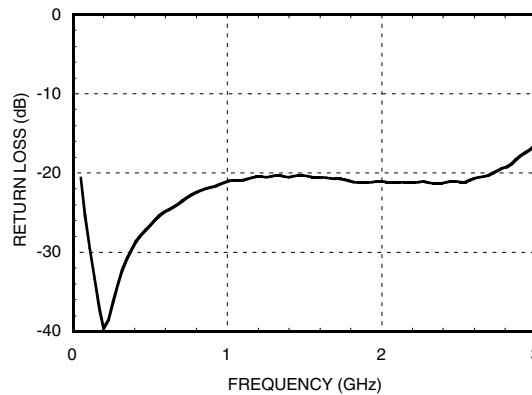
**Insertion Loss**



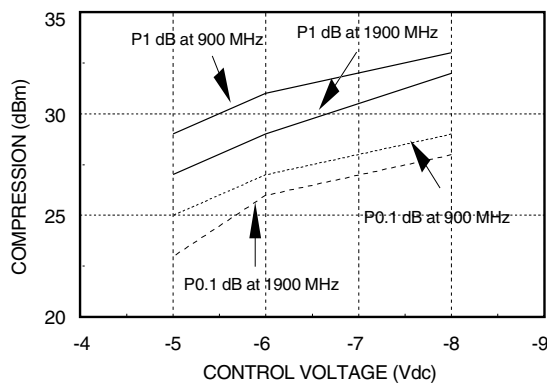
**Isolation**



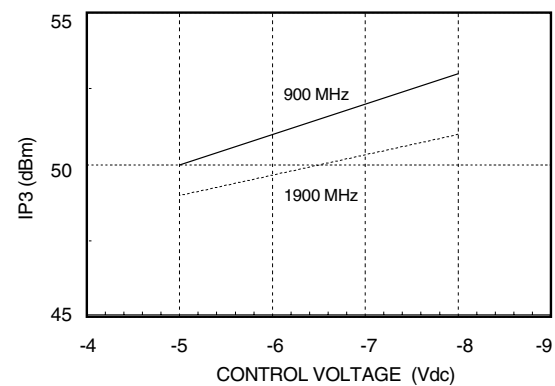
**Return Loss**



**Input 0.1 and 1.0 dB  
Compression vs. Control Voltage**



**Input Third Order  
Distortion vs. Control Voltage**



## GaAs MMIC SPDT SWITCH DC - 2.5 GHz

### Truth Table

\*Control Input Voltage Tolerances are  $\pm 0.2$  Vdc.

Control Input*		Control Current		Signal Path State	
A (Vdc)	B (Vdc)	Ia (uA)	Ib (uA)	RF to RF1	RF to RF2
-5	0	-25	10	ON	OFF
0	-5	10	-25	OFF	ON
-6	0	-75	30	ON	OFF
0	-6	30	-75	OFF	ON
-7	0	-130	60	ON	OFF
0	-7	60	-130	OFF	ON
-8	0	-190	80	ON	OFF
0	-8	80	-190	OFF	ON

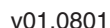
### Compression vs. Bias Voltage

Control Input (Vdc)	Carrier at 900 MHz		Carrier at 1900 MHz	
	Input Power for 0.1 dB Compression (dBm)	Input Power for 1.0 dB Compression (dBm)	Input Power for 0.1 dB Compression (dBm)	Input Power for 1.0 dB Compression (dBm)
-5	25	29	23	27
-6	27	31	26	29
-8	29	33	28	32

Caution: Do not operate in 1 dB compression at power levels above +30 dBm and do not "hot switch" power levels greater than +20 dBm (Vctl= -5 Vdc).

### Distortion vs. Bias Voltage

Control Input (Vdc)	Third Order Intercept (dBm) +7 dBm Each Tone	
	900 MHz	1900 MHz
-5	50	49
-8	53	51



***GaAs MMIC SPDT SWITCH  
DC - 2.5 GHz***

Max. Input Power (VCTL = 0/-8V)	0.05 GHz 0.5 - 2 GHz	+27 dBm +34 dBm
Control Voltage Range (A & B)		+2 to -12 Vdc
Storage Temperature		-65 to +150 °C
Operating Temperature		-40 to +85 °C

The drawing shows the HMC239 package with the following dimensions:

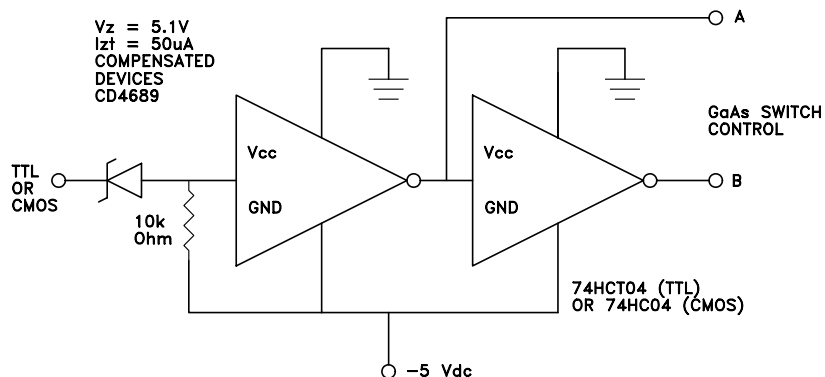
- Top View:**
  - Pin pitch (center-to-center): .197 [5.00] / .189 [4.80]
  - Pin width: .050 [1.27] TYP
  - Pin height: .069 [1.75] / .053 [1.35]
  - Package width: .244 [6.20] / .228 [5.80]
  - Package height: .158 [4.00] / .150 [3.80]
  - Lot number location: Indicated by a circle and a line pointing to the bottom-left corner.
- Side View:**
  - Pin height: .069 [1.75] / .053 [1.35]
  - Pin width: .050 [1.27] TYP
  - Pin thickness: .010 [0.25] / .004 [0.10]
  - Pin spacing: .020 [0.51] / .013 [0.33]

NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEADFRAME MATERIAL: COPPER ALLOY
3. LEADFRAME PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

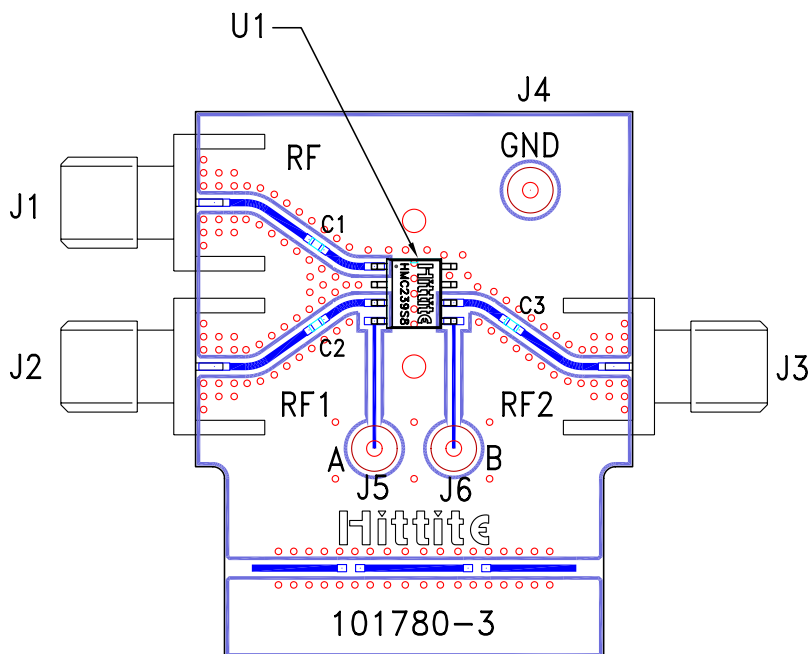
**GaAs MMIC SPDT SWITCH  
DC - 2.5 GHz**

**Typical Application Circuit**



Simple driver using inexpensive standard logic ICs provides fast switching using minimum DC current.

### Evaluation Circuit Board



### List of Material

Item	Description
J1 - J3	PC Mount SMA RF Connector
J4 - J6	DC Pin
C1 - C3	330 pF capacitor, 0402 Pkg.
U1	HMC239S8 SPDT Switch
PCB*	101780 Evaluation PCB
* 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 Hittite Microwave Corporation upon request.