

### Typical Applications

The HMC172QS24 is ideal for:

- Basestation Infrastructure

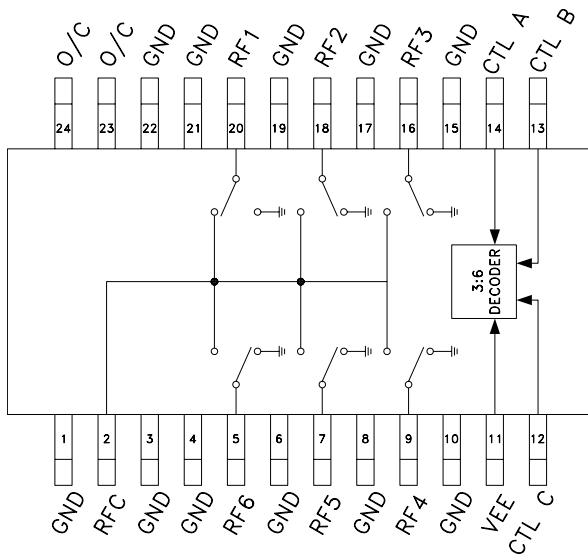
### Features

Low Insertion Loss (1 GHz): 0.6 dB

Integrated 3:6 Decoder

24 Lead QSOP Package

### Functional Diagram



### General Description

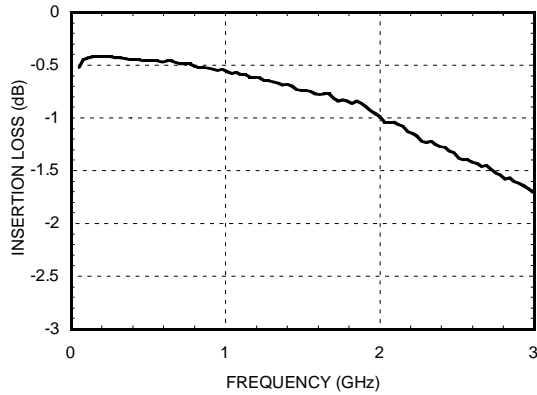
The HMC172QS24 is a low-cost SP6T switch in a 24-lead QSOP package for use in antenna diversity, switched filter banks, gain/attenuation selection, and general channel multiplexing applications. The switch can control signals up to 2.5 GHz and is especially suited for 800-1000 MHz and 1700-2000 MHz basestation applications. A 3:6 decoder is integrated on the switch, requiring only 3 control lines and a negative bias to select each RF path. The 3:6 decoder replaces 12 control lines normally required by GaAs SP6T switches. Switch outputs are reflective shorts when "off". The QSOP24 package occupies the same area as a 14-lead SOIC. See positive bias/TTL SP6T version HMC252QS24.

### Electrical Specifications,

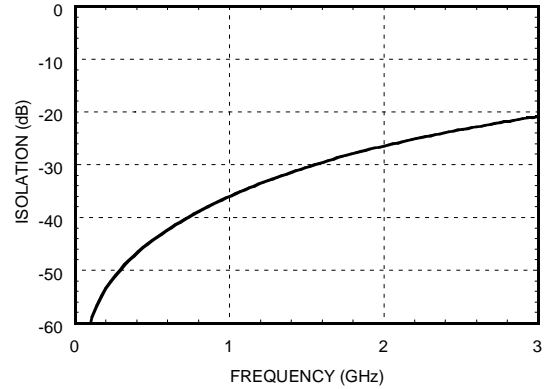
$T_A = +25^\circ\text{C}$ , For 0/-5V Control and Vee = -5V in a 50 Ohm System

Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 0.5 GHz		0.5	0.8	dB
	DC - 1.0 GHz		0.6	0.9	dB
	DC - 2.0 GHz		1.0	1.5	dB
	DC - 2.5 GHz		1.5	2.0	dB
Isolation	DC - 0.5 GHz	36	41		dB
	DC - 1.0 GHz	31	35		dB
	DC - 2.0 GHz	22	26		dB
	DC - 2.5 GHz	19	23		dB
Return Loss	DC - 1.0 GHz	19	23		dB
	DC - 2.0 GHz	7	11		dB
	DC - 2.5 GHz	5	8		dB
Input Power for 1 dB Compression	50 MHz		22		dBm
	0.5 - 2.5 GHz		24		dBm
Input Third Order Intercept	50 MHz		35		dBm
	0.5 - 2.5 GHz		40		dBm
Switching Characteristics	DC - 2.5 GHz				
		tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF)		25 50	ns ns

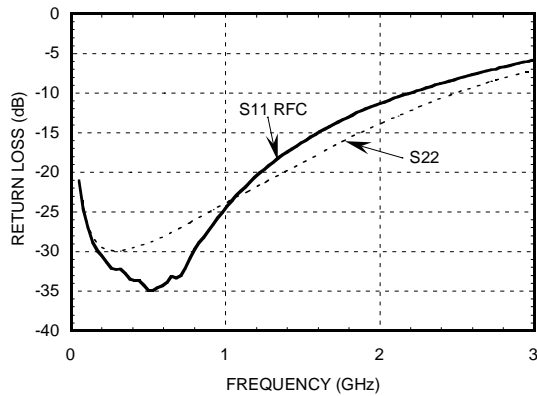
**Insertion Loss**



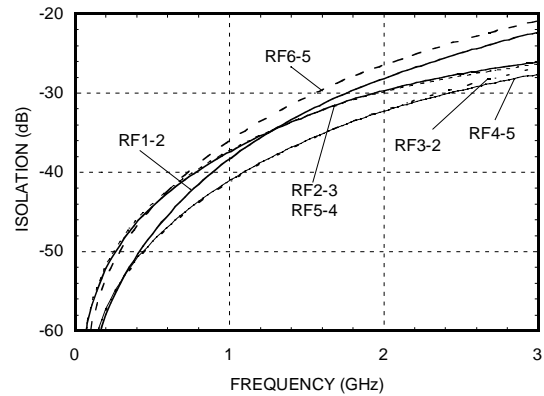
**Isolation**



**Return Loss**



**Isolation Between several RF I/Os**



# HMC172QS24

## GaAs MMIC SP6T SWITCH

### DC - 2.5 GHz

#### Truth Table

Control Input			Signal Path State
A	B	C	RFCOM to:
High	High	High	RF1
Low	High	High	RF2
High	Low	High	RF3
Low	Low	High	RF4
High	High	Low	RF5
Low	High	Low	RF6
High	Low	Low	ALL OFF
Low	Low	Low	ALL OFF

#### Bias Voltage & Current

Vee Range = -5.0 Vdc ± 10%		
Vee (Vdc)	Iee (Typ.) (mA)	Iee (Max.) (mA)
-5.0	5.0	8.5

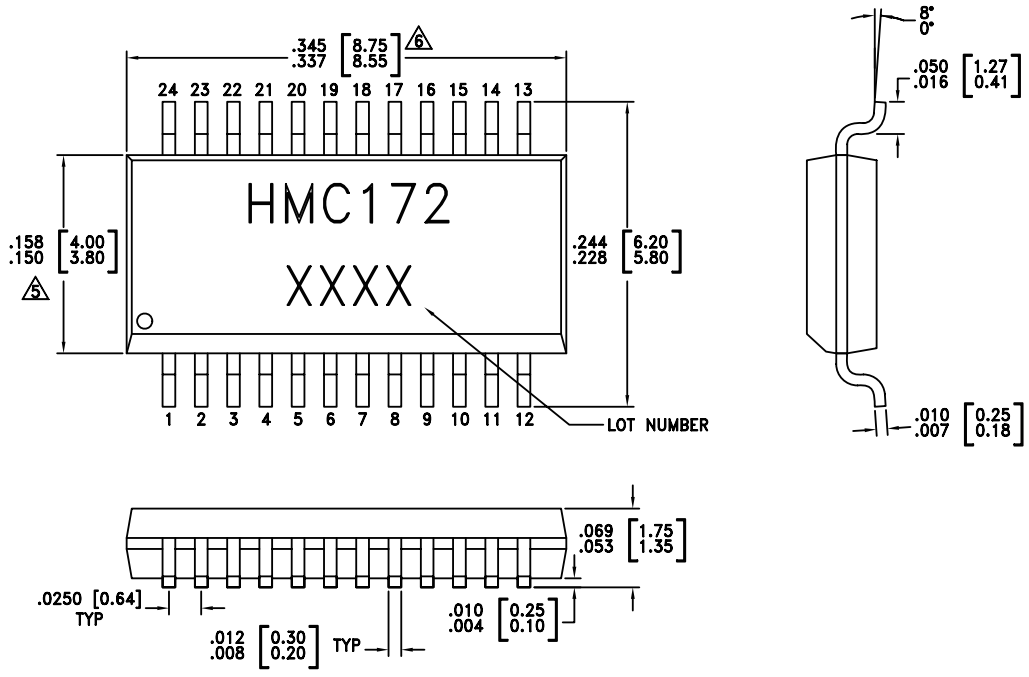
#### Control Voltages

State	Bias Condition
Low	0 to -3 VDC @ 250uA Typ.
High	Vee +0.8 VDC @ 100uA Max.

**Absolute Maximum Ratings**

Bias Voltage Range (Port Vee)	-7.0 Vdc
Control Voltage Range (A & B)	Vee -0.5V to +1.0 Vdc
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
Maximum Input Power	+26 dBm (<500MHz) +29 dBm (>500MHz)

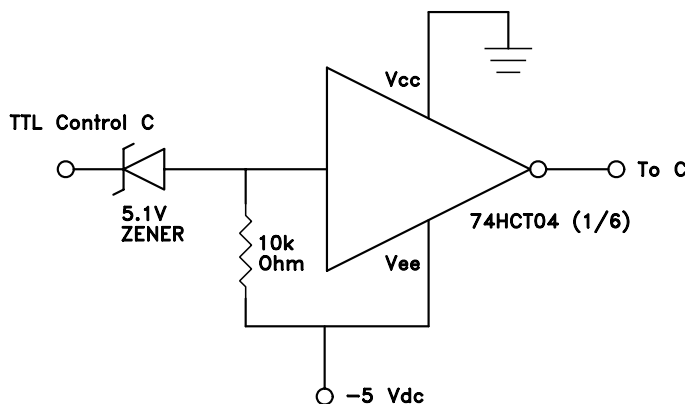
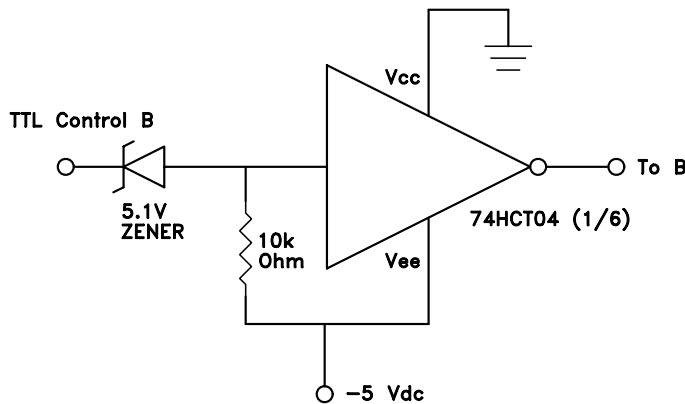
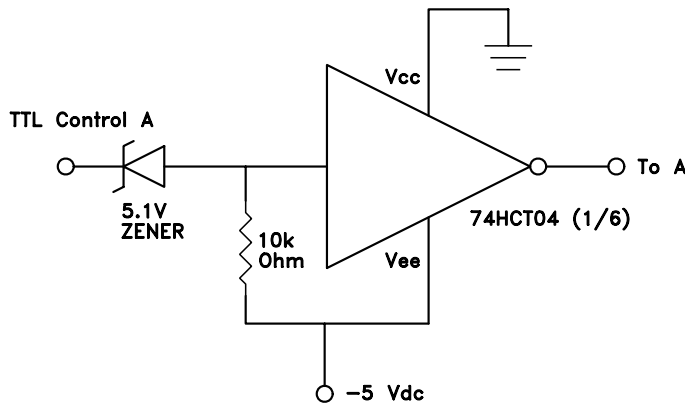
**Outline Drawing**



NOTES:

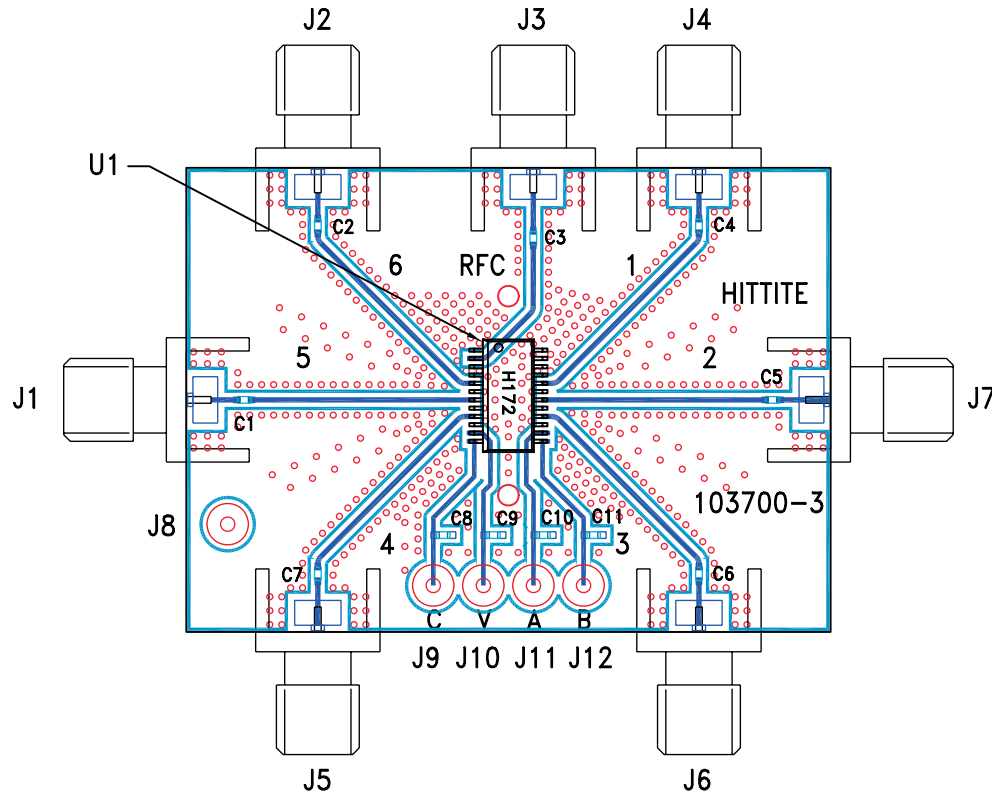
1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEADFRAME MATERIAL: COPPER ALLOY
3. LEADFRAME PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
- ⚠ DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
- ⚠ DIMENSION DOES NOT INCLUDE MOLDFLASH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

**TTL Interface Circuit**



*Note:*  
Control inputs A, B, and C can be driven directly with TTL logic with -5 Volts applied to the HCT logic gate Vee and to pin 11 (Vee) of the RF switch.

### Evaluation Circuit Board



### List of Material

Item	Description
J1 - J7	PC Mount SMA RF Connector
J8 - J12	DC Pin
C1 - C7	100 pF Capacitor, 0402 Pkg.
C8 - C11	10,000 pF capacitor, 0603 Pkg.
U1	HMC172QS24 SP6T Switch
PCB*	103700 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.