

### Typical Applications

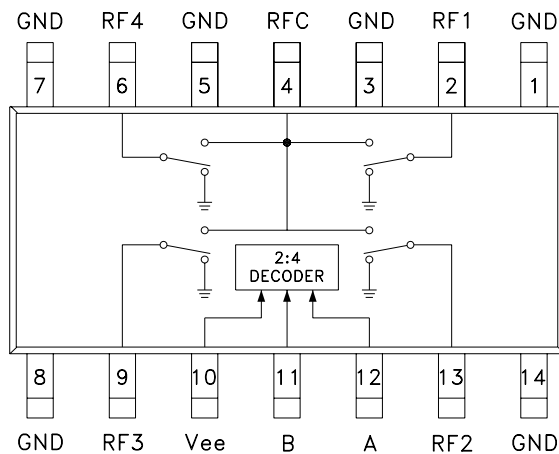
The HMC165S14 is ideal for:

- Basestation Infrastructure
- CATV & DBS

### Features

- Low Insertion Loss: 0.4 dBm
- Integrated 2:4 Decoder
- 14 Lead SOIC Package

### Functional Diagram



### General Description

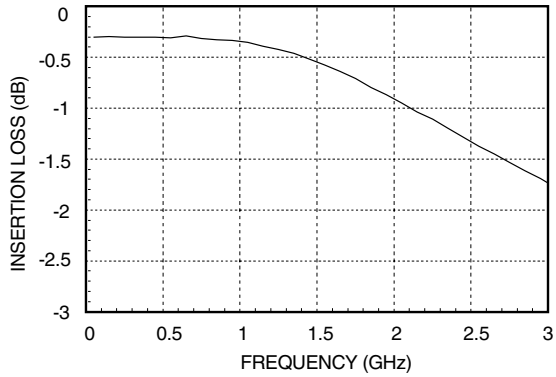
The HMC165S14 is a low-cost SP4T switch in a 14-lead SOIC package for use in antenna diversity, switched filter banks, gain/attenuation selection, and general channel multiplexing applications. The switch can control signals up to 2.0 GHz and is especially suited for 800-1000 MHz basestation applications. A 2:4 decoder is integrated on the switch, requiring only 2 control lines and a negative bias to select each RF path. Switch outputs are reflective shorts when "Off". The 2:4 decoder replaces 4 to 8 control lines normally required by GaAs SP4T switches. See positive bias/TTL SP4T HMC241QS16.

### Electrical Specifications,

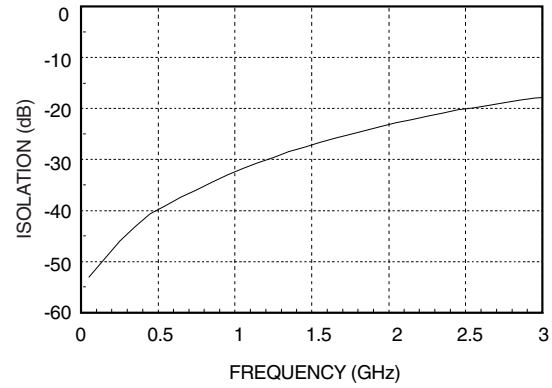
$T_A = +25^\circ C$ , For 0/-5V Control and Vee = -5V in a 50 Ohm System

Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 0.5 GHz		0.3	0.6	dB
	DC - 1.0 GHz		0.5	0.8	dB
	DC - 2.0 GHz		1.0	1.3	dB
Isolation	DC - 0.5 GHz	35	39		dB
	DC - 1.0 GHz	28	32		dB
	DC - 2.0 GHz	20	24		dB
Return Loss	DC - 1.0 GHz	16	20		dB
	DC - 2.0 GHz	8.5	11		dB
Input Power for 1dB Compression	50 MHz		22		dBm
	0.5 - 2.0 GHz		24		dBm
Input Third Order Intercept	50 MHz		35		dBm
	0.5 - 2.0 GHz		42		dBm
Switching Characteristics	DC - 2.0 GHz				
		tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF)		25 50	ns ns

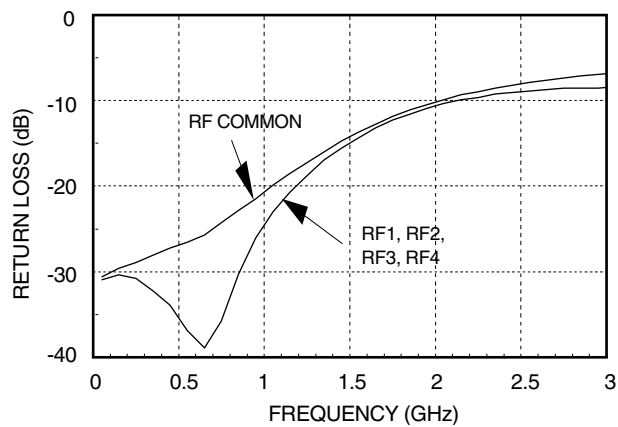
**Insertion Loss**



**Isolation**



**Return Loss**



### Bias Voltage & Current

Vee Range = -5.0 Vdc ± 10%		
Vee (Vdc)	Iee (Typ.) (mA)	Iee (Max.) (mA)
-5.0	3.0	6.0

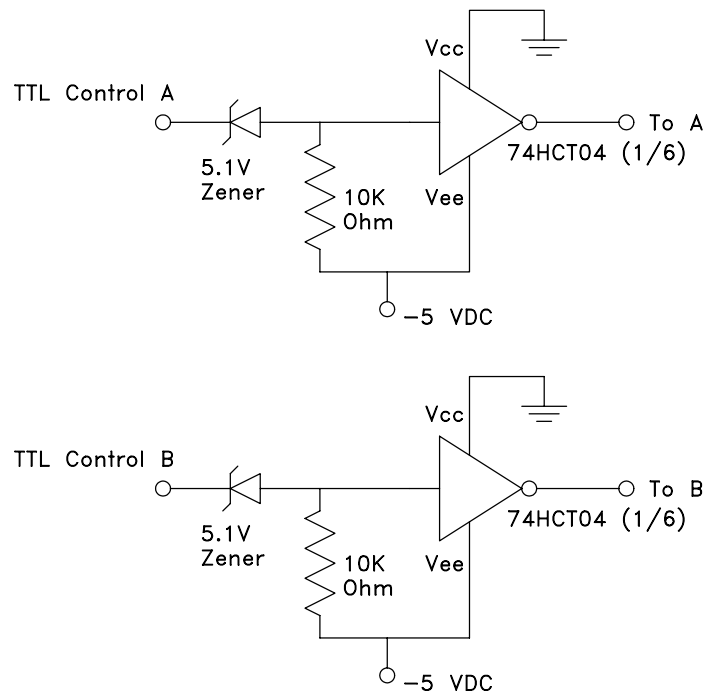
### Control Voltages

State	Bias Condition
Low	0 to -3 VDC @ 220uA Typ.
High	Vee -0.8 VDC @ 100uA Max.

### Truth Table

Control Input		Signal Path State
A	B	RFCOM to:
High	High	RF1
Low	High	RF2
High	Low	RF3
Low	Low	RF4

### TTL Interface Circuit



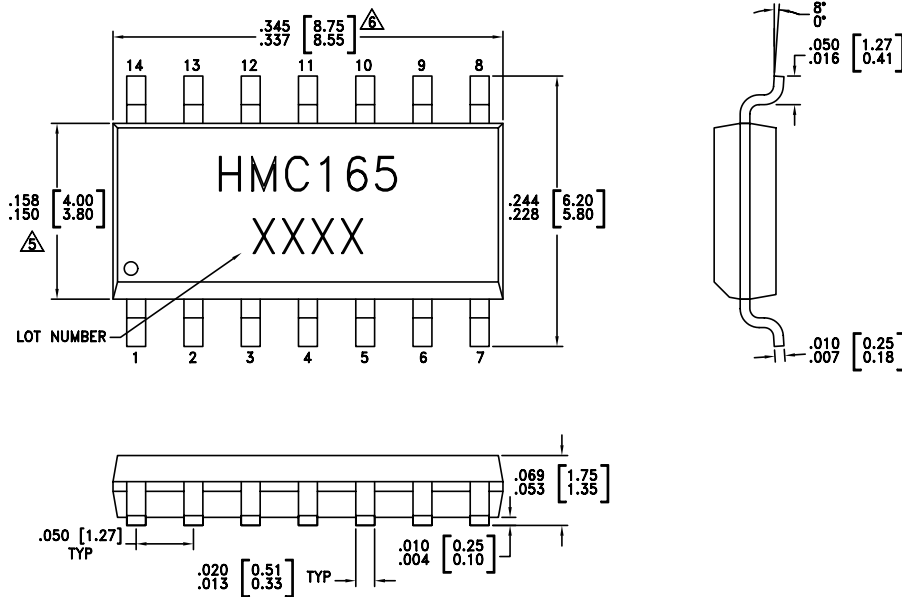
**Note:**

Control inputs A and B can be driven directly with TTL logic with -5 Volts applied to the HCT logic gates (Vee) and to Vee (pin 10) of the RF switch.

**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	+27 dBm (<500MHz) +30 dBm (>500MHz)

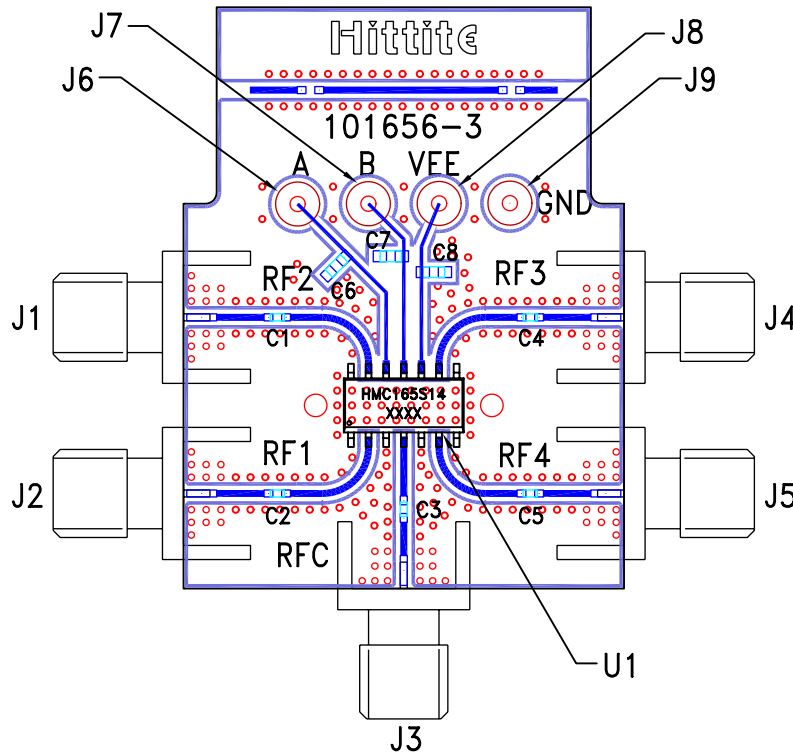
**Outline Drawing**



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].
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.

### Evaluation PCB



### List of Material

Item	Description
J1 - J5	PC Mount SMA RF Connector
J6 - J9	DC Pin
C1 - C5	330 pF capacitor, 0402 Pkg.
C6 - C8	10,000 pF capacitor, 0603 Pkg.
U1	HMC165S14 SP4T Switch
PCB*	101656 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 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.

**Notes:**