

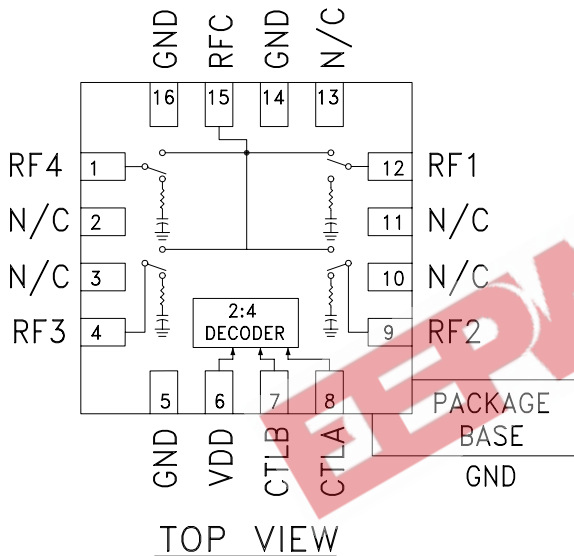
GaAs MMIC SP4T NON-REFLECTIVE POSITIVE CONTROL SWITCH, DC* - 8.0 GHz

Typical Applications

This switch is suitable for usage in DC - 8.0 GHz 50-Ohm or 75-Ohm systems:

- Broadband
- Fiber Optics
- Switched Filter Banks
- Wireless below 8 GHz

Functional Diagram



Features

- Broadband Performance: DC - 8.0 GHz
- High Isolation: 35 dB@ 6 GHz
- Low Insertion Loss: 2.2 dB@ 6 GHz
- Integrated Positive Supply 2:4 TTL Decoder
- 3 mm x 3 mm x 1 mm SMT Package

General Description

The HMC345LP3 is a broadband non-reflective GaAs MESFET SP4T switch in a low cost leadless surface mount package. Covering DC to 8 GHz, this switch offers high isolation and low insertion loss. This switch also includes an on board binary decoder circuit which reduces the required logic control lines to two. The switch operates using a positive control voltage of 0/+5V, and requires a fixed bias of +5V.

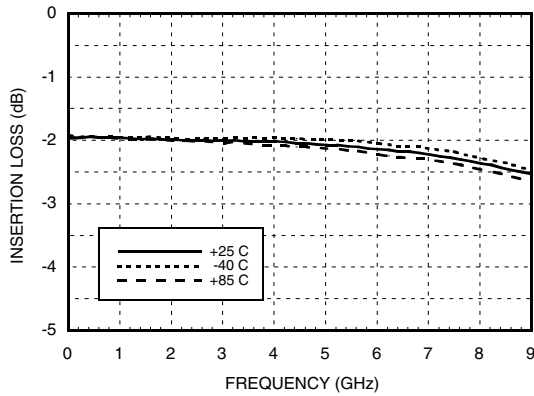
* Blocking capacitors are required at ports RFC and RF1, 2, 3, & 4. Their value will determine the lowest transmission frequency.

Electrical Specifications, $T_A = +25^\circ C$, With 0/+5V Control, 50 Ohm System

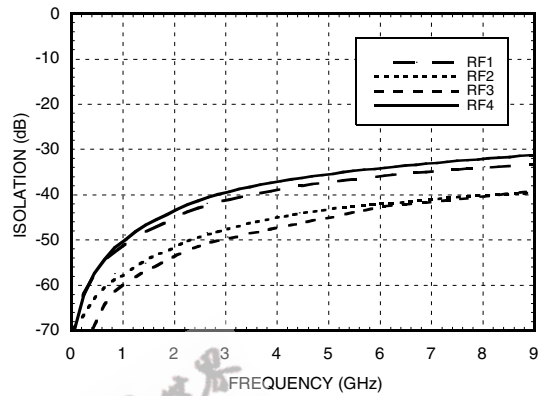
Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 2.0 GHz		2.0	2.4	dB
	DC - 6.0 GHz		2.2	2.6	dB
	DC - 8.0 GHz		2.4	2.9	dB
Isolation	DC - 2.0 GHz	37	42		dB
	DC - 4.0 GHz	32	37		dB
	DC - 6.0 GHz	31	35		dB
	DC - 8.0 GHz	27	32		dB
Return Loss	DC - 2.0 GHz	10	13		dB
	DC - 4.0 GHz	8	11		dB
	DC - 6.0 GHz	7	10		dB
	DC - 8.0 GHz	6	9		dB
Return Loss (RF1 - RF4)	"Off State"	2.0 - 8.0 GHz	6	10	dB
Input Power for 1 dB Compression	2.0 - 8.0 GHz	17	21		dBm
Input Third Order Intercept (Two-Tone Input Power = +7 dBm Each Tone, 1MHz Tone Separation)	2.0 - 8.0 GHz	37	45		dBm
Switching Characteristics	DC - 8.0 GHz	tRISE, tFALL (10/90% RF)	50		ns
		tON, tOFF (50% CTL to 10/90% RF)	120		ns

GaAs MMIC SP4T NON-REFLECTIVE POSITIVE CONTROL SWITCH, DC - 8.0 GHz

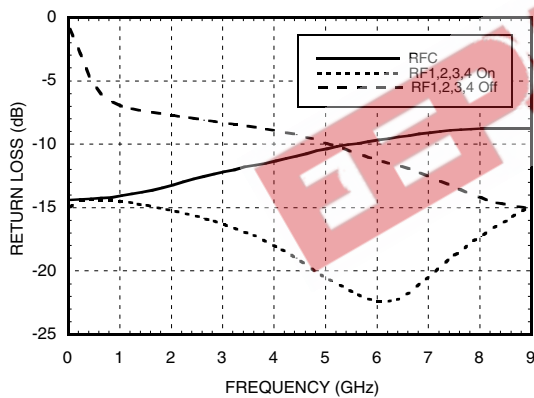
Insertion Loss vs. Temperature



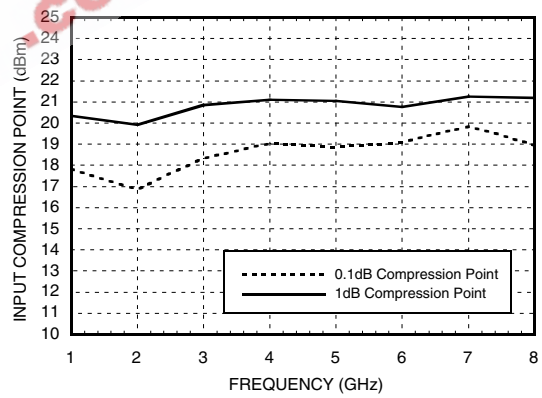
Isolation



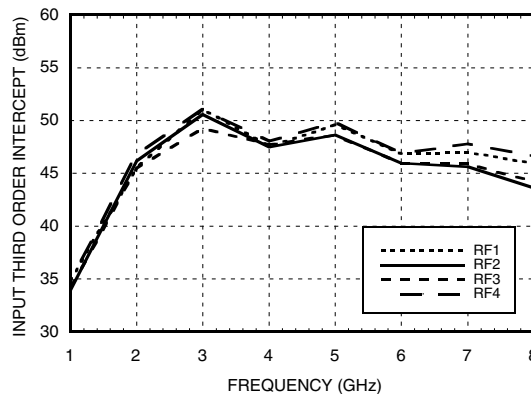
Return Loss



0.1 and 1 dB Input Compression Point



Input Third Order Intercept Point



* Isolation is recorded above insertion loss & measured at output of switch.

GaAs MMIC SP4T NON-REFLECTIVE POSITIVE CONTROL SWITCH, DC - 8.0 GHz

Truth Table

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

Bias Voltage & Current

Vdd Range = +5.0 Vdc ± 10%		
Vdd (Vdc)	Idd (Typ.) (mA)	Idd (Max.) (mA)
+5.0	3.0	6.0

Control Voltages

State	Bias Condition
Low	0 to +0.8 Vdc @ 5 uA Typical
High	+2.0 to +5.0 Vdc @ 60 uA Typical

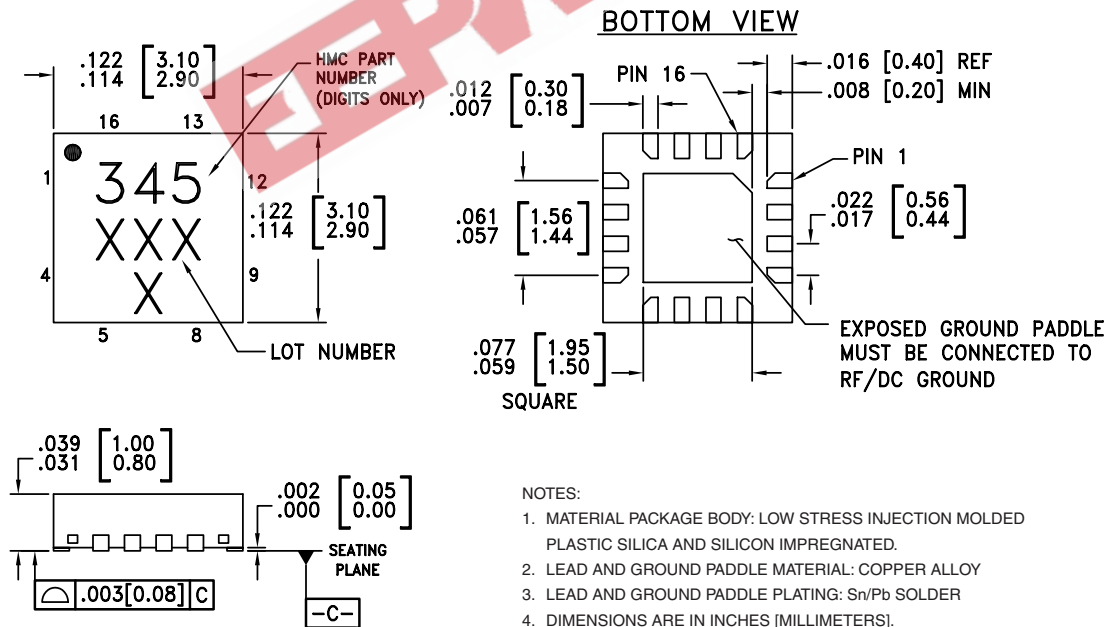
GaAs MMIC SP4T NON-REFLECTIVE POSITIVE CONTROL SWITCH, DC - 8.0 GHz

Absolute Maximum Ratings

Bias Voltage Range (Vdd)	+7.0 Vdc
Control Voltage Range (A & B)	-0.5V to Vdd +1.0 Vdc
Channel Temperature	150 °C
Thermal Resistance (Insertion Loss Path)	143 °C/W
Thermal Resistance (Terminated Path)	1030 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
Maximum Input Power	+24 dBm

Note: DC blocking capacitors are required at ports RFC and RF1, 2, 3, & 4. Their value will determine the lowest transmission frequency.

Outline Drawing


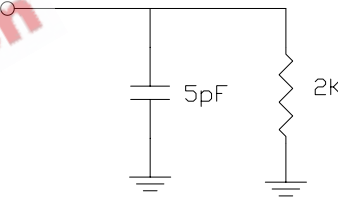
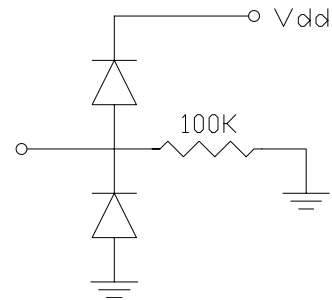
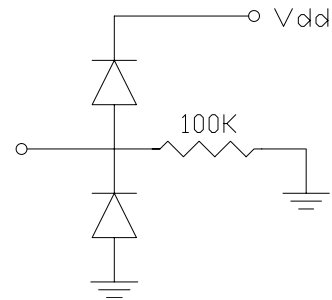


NOTES:

1. MATERIAL PACKAGE BODY: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEAD AND GROUND PADDLE MATERIAL: COPPER ALLOY
3. LEAD AND GROUND PADDLE PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
6. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM. PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
7. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
8. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
9. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED PCB LAND PATTERN.

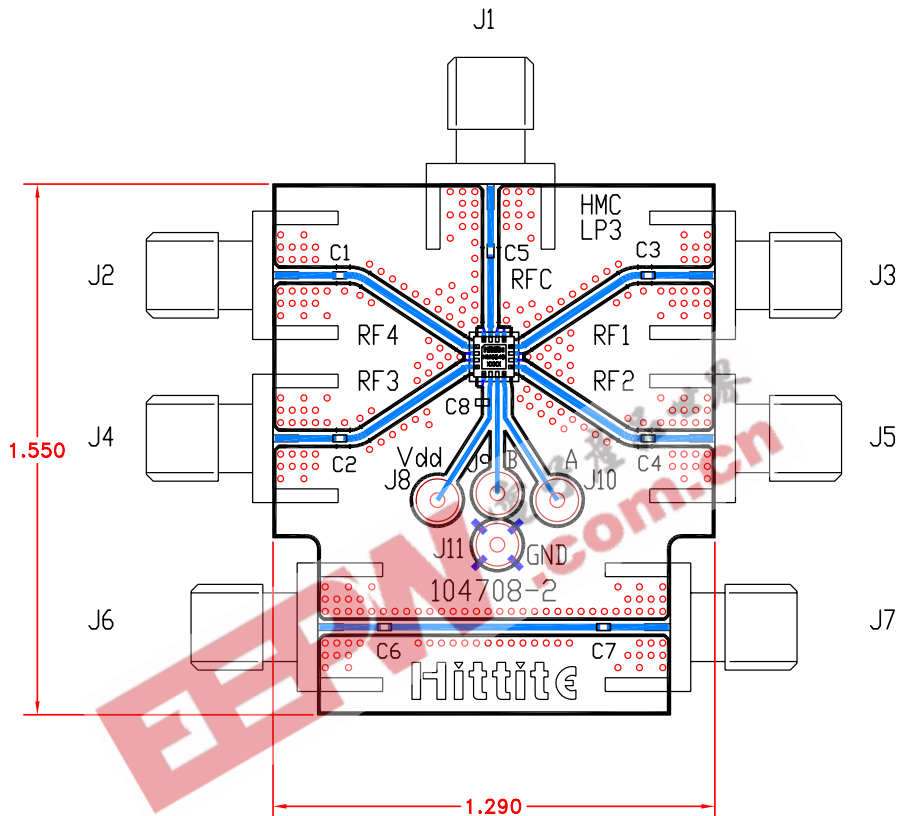
GaAs MMIC SP4T NON-REFLECTIVE POSITIVE CONTROL SWITCH, DC - 8.0 GHz

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 4, 9, 12, 15	RF4, RF3, RF2, RF1, RFC	This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required.	
2, 3, 10, 11, 13	N/C	This pin should be connected to PCB RF ground to maximize isolation.	
5, 14, 16	GND	Package bottom has exposed metal paddle that must also be connected to PCB RF ground.	
6	VDD	Supply Voltage +5V ± 10%	
7	CTLB	See truth table and control voltage table.	
8	CTLA	See truth table and control voltage table.	

GaAs MMIC SP4T NON-REFLECTIVE POSITIVE CONTROL SWITCH, DC - 8.0 GHz

Evaluation PCB



List of Material

Item	Description
J1 - J7	PC Mount SMA RF Connector
J8 - J11	DC Pin
C1 - C7	100 pF Capacitor, 0402 Pkg.
C8	10k pF Capacitor, 0603 Pkg.
U1	HMC345LP3 SP4T Switch
PCB*	104708 Evaluation PCB 1.29"x1.55"
* 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 backside ground slug 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.