HMC321LP4 / 321LP4E

v03.0805

GaAs MMIC SP8T NON-REFLECTIVE POSITIVE CONTROL SWITCH, DC* - 8 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

Features

Broadband Performance: DC - 8 GHz

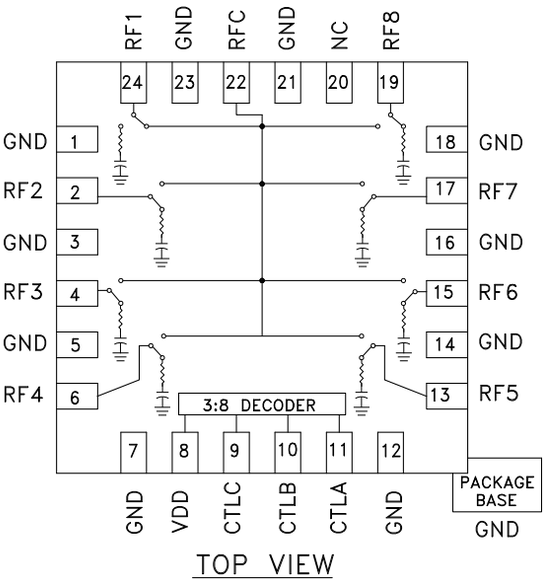
High Isolation: >30 dB@ 6 GHz

Low Insertion Loss: 2.5 dB@ 6 GHz

Integrated Positve Supply 3:8 TTL Decoder

4x4 mm SMT Package

Functional Diagram



TOP VIEW

General Description

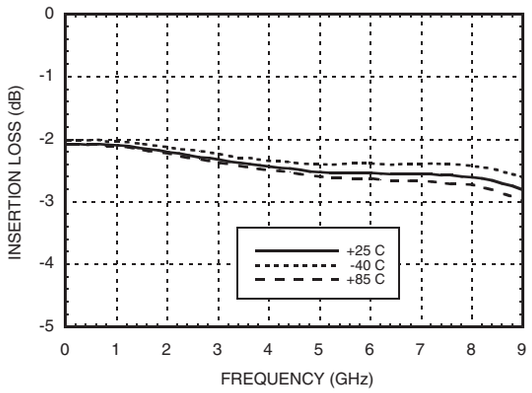
The HMC321LP4 & HMC321LP4E are broadband non-reflective GaAs MESFET SP8T switches in low cost leadless surface mount packages. Covering DC to 8 GHz, this switch offers high isolation and low insertion loss. This switch also includes an on board binary decoder circuit which reduces the required logic control lines to three. The switch operates using a positive control voltage of 0/+5 volts, and requires a fixed bias of +5v. This switch is suitable for usage in 50-Ohm or 75-Ohm systems.

** DC blocking capacitors are required at ports RFC and RF1, 2, 3, 4, 5, 6, 7, 8. Their value will determine the lowest transmission frequency.*

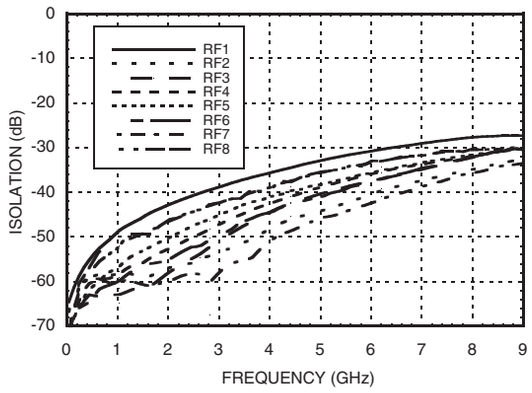
Electrical Specifications, T_A = +25° C, With 0/+5V Control, 50 Ohm System

Parameter		Frequency	Min.	Typ.	Max.	Units
Insertion Loss		DC - 2.0 GHz DC - 4.0 GHz DC - 8.0 GHz		2.3 2.5 2.7	2.7 2.9 3.1	dB dB dB
Isolation		DC - 2.0 GHz DC - 4.0 GHz DC - 6.0 GHz DC - 8.0 GHz	35 30 25 20	40 35 30 25		dB dB dB dB
Return Loss	"On State"	DC - 4.0 GHz DC - 8.0 GHz	8 7	12 10		dB dB
Return Loss (RF1 - RF8)	"Off State"	2.0 - 8.0 GHz	7	12		dB
Input Power for 1 dB Compression		0.5 - 8.0 GHz	19	23		dBm
Input Third Order Intercept (Two-tone Input Power = +7 dBm Each Tone, 1 MHz Spacing)		0.5 - 8.0 GHz	33	40		dBm
Switching Characteristics tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF)		DC - 8.0 GHz		50 150		ns ns

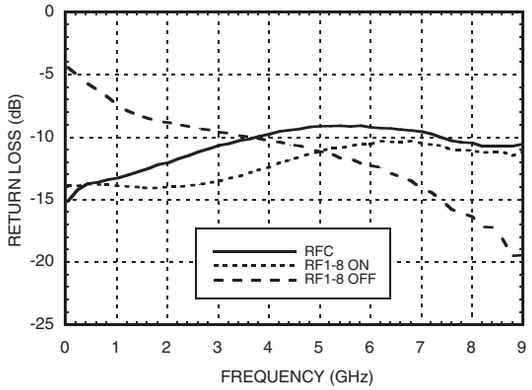
Insertion Loss vs. Temperature



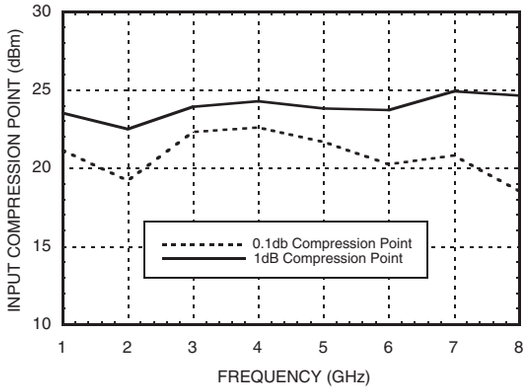
Isolation



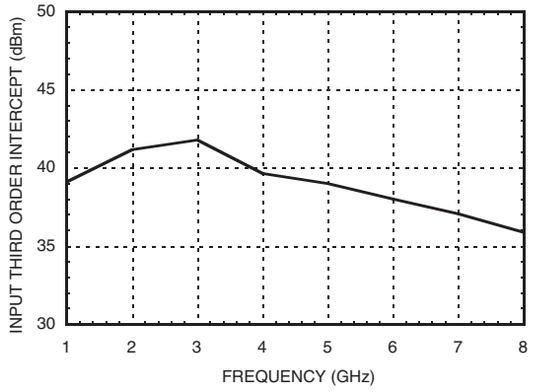
Return Loss



0.1 and 1 dB Input Compression Point



Input Third Order Intercept Point



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Bias Voltage & Current

Vdd Range = +5.0 Vdc ± 10%		
Vdd (Vdc)	Idd (Typ.) (mA)	Idd (Max.) (mA)
+5.0	5.0	9.0

Control Voltages

State	Bias Condition
Low	0 to +0.8 Vdc @ 5 uA Typical
High	+2.0 to +5.0 Vdc @ 25 uA Typical

Truth Table

Control Input			Signal Path State
A	B	C	RFCOM to:
Low	Low	Low	RF1
High	Low	Low	RF2
Low	High	Low	RF3
High	High	Low	RF4
Low	Low	High	RF5
High	Low	High	RF6
Low	High	High	RF7
High	High	High	RF8

Note:
DC blocking capacitors are required at ports RFC and RF1, 2, 3, 4, 5, 6, 7, 8. Their value will determine the lowest transmission frequency.

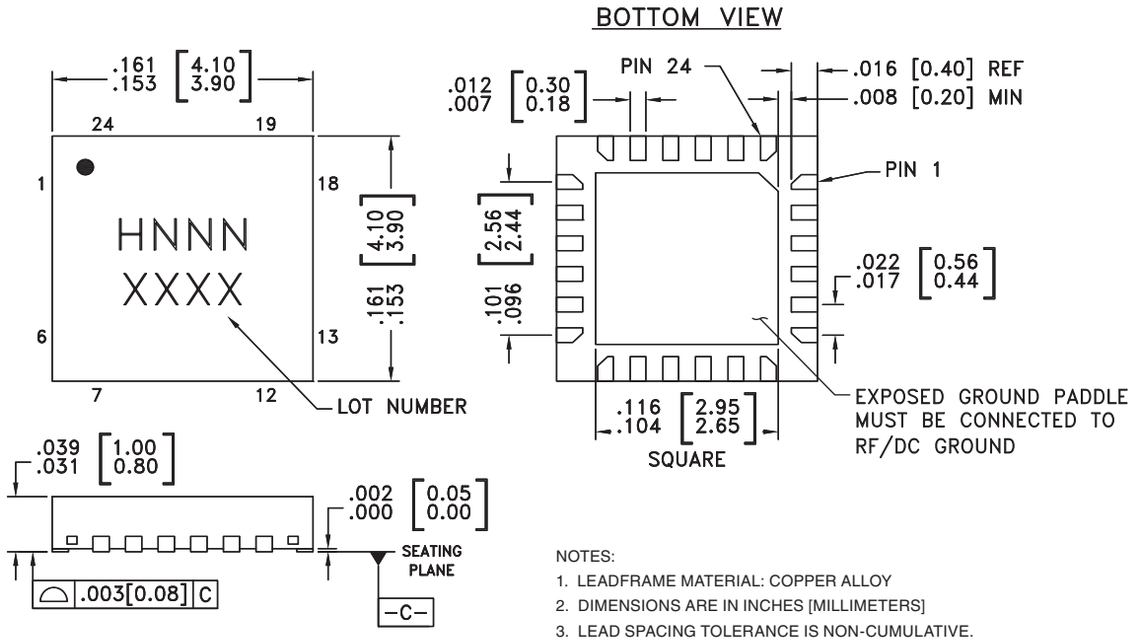
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Absolute Maximum Ratings

Bias Voltage Range (Port Vdd)	+7.0 Vdc
Control Voltage Range (A, B, & C)	-0.5V to Vdd +1.0 Vdc
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
Maximum Input Power Vdd = +5V	+26 dBm
ESD Sensitivity (HBM)	Class 1A

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



NOTES:

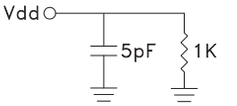
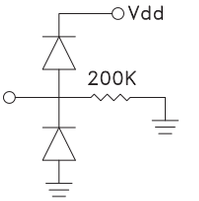
1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
4. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM. PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
7. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED LAND PATTERN.

Package Information

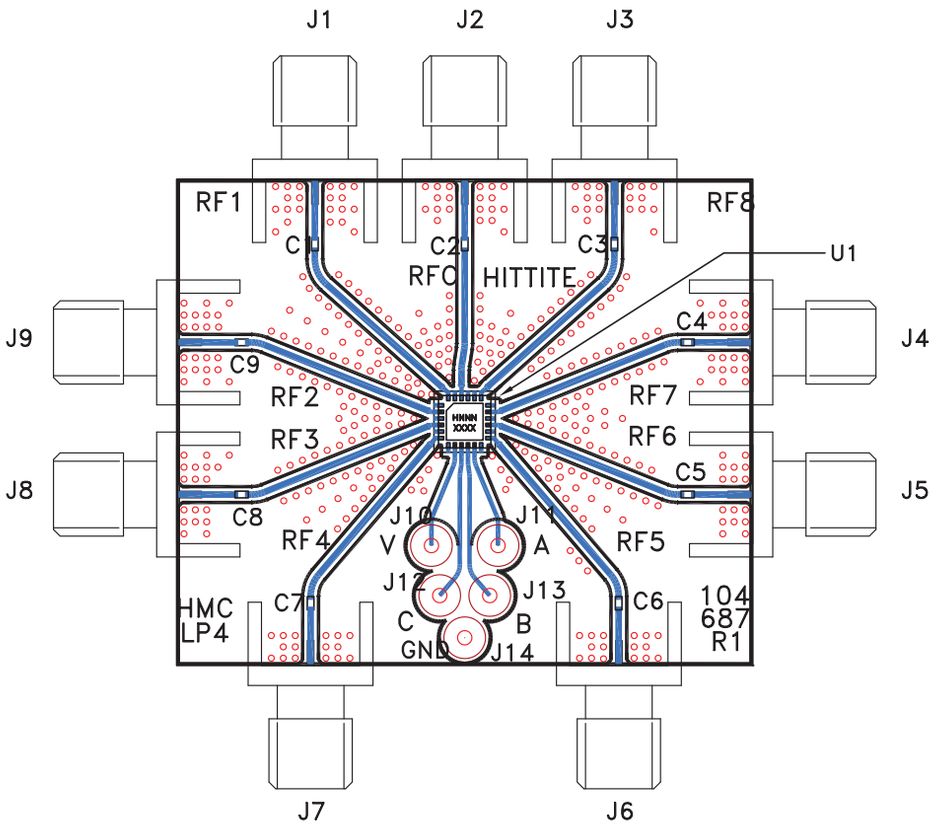
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [3]
HMC321LP4	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 [1]	H321 XXXX
HMC321LP4E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 [2]	H321 XXXX

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

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 3, 5, 7, 12, 14, 16, 18, 21, 23	GND	Package bottom has exposed metal paddle that must also be connected to PCB RF ground.	
2, 4, 6, 13, 15, 17, 19, 22, 24	RF1 - RF8 & RFC	This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required.	
8	VDD	Supply Voltage +5V ± 10%	
9	CTLC	See truth table and control voltage table.	
10	CTLB	See truth table and control voltage table.	
11	CTLA	See truth table and control voltage table.	
20	N/C	This pin should be connected to PCB RF ground to maximize isolation.	

Evaluation PCB



List of Materials for Evaluation PCB 104769 [1]

Item	Description
J1 - J9	PCB Mount SMA RF Connector
J10 - J14	DC Pin
C1 - C9	100 pF Capacitor, 0402 Pkg.
U1	HMC321LP4 / HMC321LP4E SP8T Switch
PCB [2]	104687 Evaluation PCB 1.73" x 1.46"

[1] Reference this number when ordering complete evaluation PCB

[2] 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.