HMC322ALP4E

v01.0316

GAAS MMIC SP8T NON-REFLECTIVE 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 - 8.0 GHz

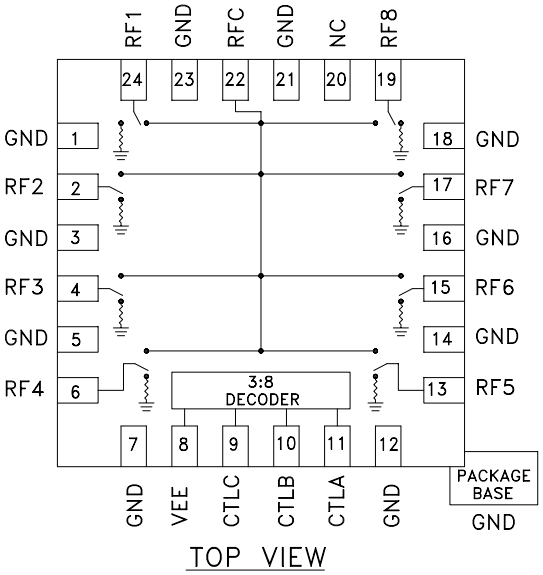
High Isolation: >30 dB@ 6 GHz

Low Insertion Loss: 2.4 dB@ 6 GHz

Integrated 3:8 TTL Decoder

24 Lead 4x4mm QFN Package: 9 mm²

Functional Diagram



General Description

The HMC322ALP4E is a broadband non-reflective GaAs MESFET SP8T 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 three. The switch operates using a negative 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.

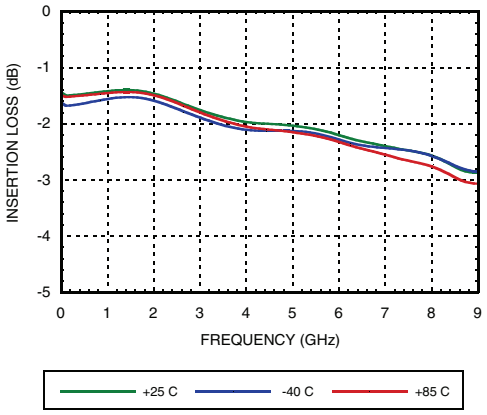
Electrical Specifications, T_A = +25° C, With 0/-5V Control, 50 Ohm System

Parameter		Frequency	Min.	Typ.	Max.	Units
Insertion Loss		DC - 2.0 GHz DC - 4.0 GHz DC - 8.0 GHz		1.8 2.0 2.5	2.5 2.7 2.9	dB dB dB
Isolation		DC - 2.0 GHz DC - 4.0 GHz DC - 6.0 GHz DC - 8.0 GHz	35 30 25 20	50 45 40 35		dB dB dB dB
Return Loss	"On State"	DC - 2.0 GHz DC - 8.0 GHz	9 6	17 15		dB dB
Return Loss	"Off State"	DC - 8.0 GHz	7	20		dB
Input Power for 1 dB Compression		0.5 - 8.0 GHz	19	26		dBm
Input Third Order Intercept (Two-Tone Input Power = +7 dBm Each Tone)		0.5 - 8.0 GHz	36	40		dBm
Switching Characteristics tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF)		DC - 8.0 GHz		25 150		ns ns

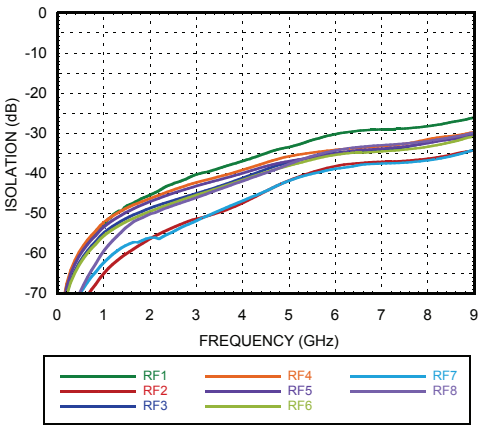
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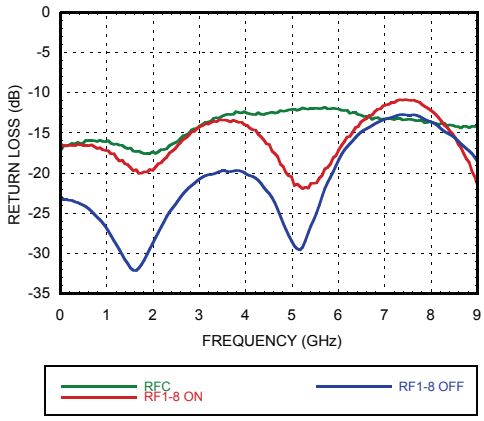
Insertion Loss vs. Temperature



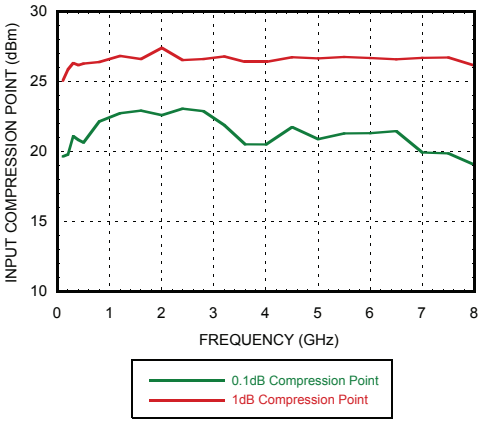
Isolation



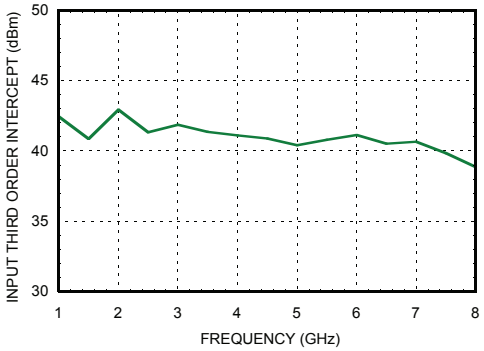
Return Loss



0.1 and 1 dB Input Compression Point



Input Third Order Intercept Point



Bias Voltage & Current

Vee Range = -5.0 Vdc ± 10%		
Vee (Vdc)	Iee (Typ.) (mA)	Iee (Max.) (mA)
-5.0	5.0	9.0

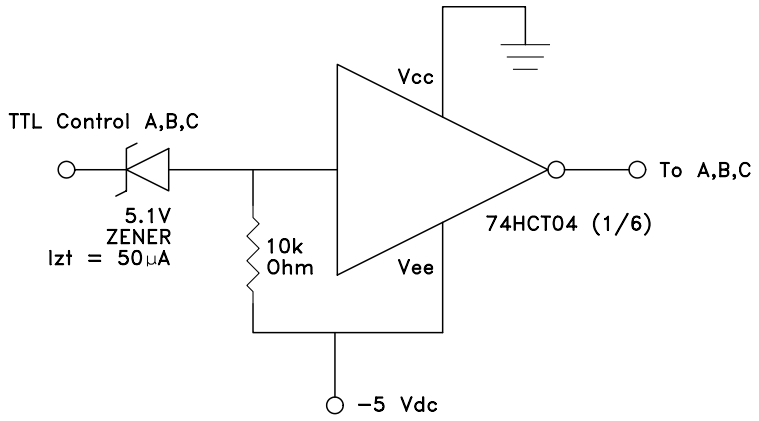
Control Voltages

State	Bias Condition
Low	-3V to 0 Vdc @ 25 µA Typical
High	-5 to -4.2 Vdc @ 5 µA Typical

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	RF7
Low	Low	Low	RF8

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 gates Vee pin and to Vee (pin 8) of the RF Switch.

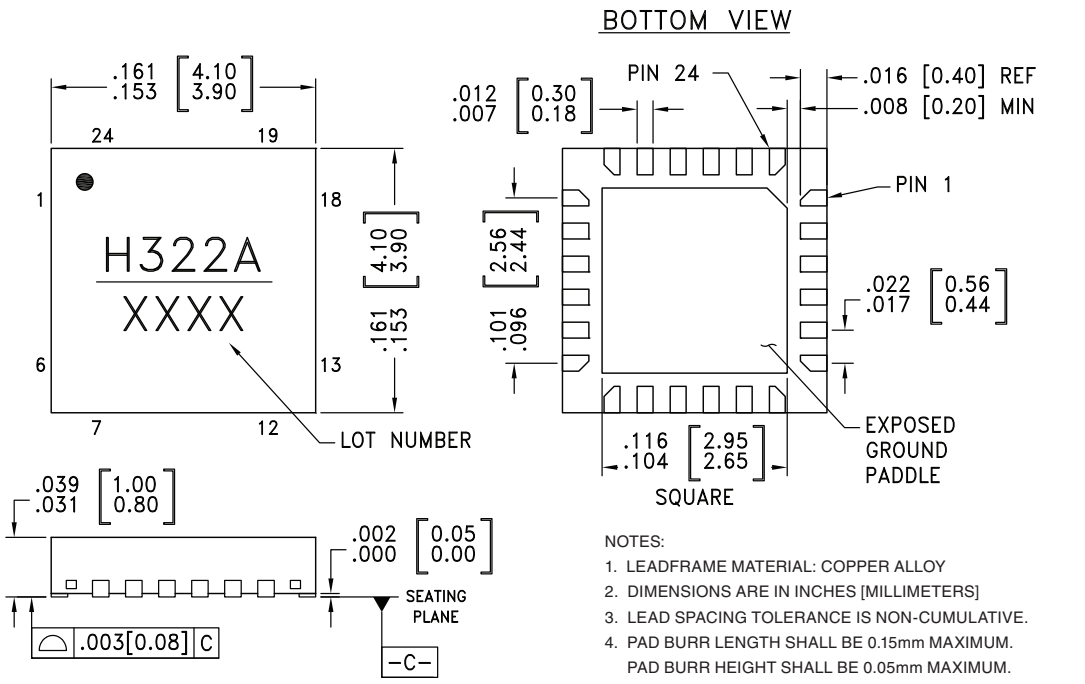
GAAS MMIC SP8T NON-REFLECTIVE SWITCH, DC - 8 GHz

Absolute Maximum Ratings

Bias Voltage Range (Vee)	-7.0 Vdc
Control Voltage Range (A, B, & C)	Vee -0.5V to +1.0 Vdc
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
Maximum Input Power Insertion Loss Path Terminated Path	 26.5 dBm 24 dBm
Channel Temperature	150 ° C
Continuous Pdiss (T = 85 ° C) (derate 5.34 mW / ° C)	0.348 W
Thermal Resistance Insertion Loss Path Terminated Path	 184 ° C / W 243 ° C / W
ESD Sensitivity (HBM)	Class 1A

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



NOTES:

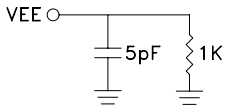
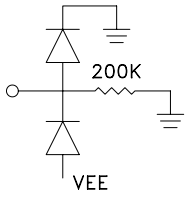
1. LEADFRAME MATERIAL: COPPER ALLOY
2. DIMENSIONS ARE IN INCHES [MILLIMETERS]
3. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
4. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM. PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED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

Package Information

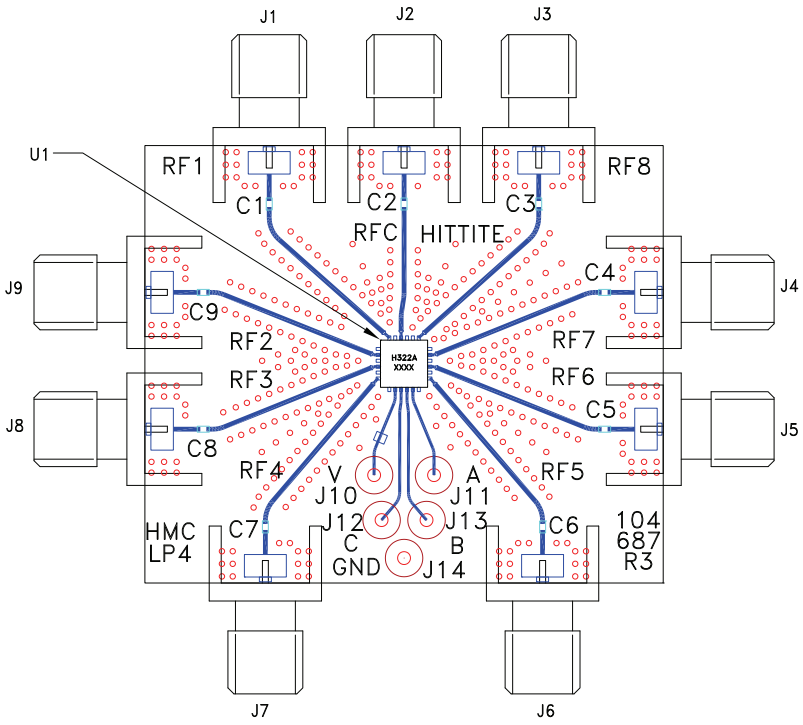
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [2]
HMC322ALP4E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL3 [1]	H322A XXXX

[1] Max peak reflow temperature of 260 °C
[2] 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 if RF line potential is not equal to 0V.	
8	VEE	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 EV1HMC322ALP4 [1]

Item	Description
J1 - J9	PCB Mount SMA RF Connector
J10 - J14	DC Pin
C1 - C9	100 pF Capacitor, 0402 Pkg.
U1	HMC322ALP4E SP8T Switch
PCB [2]	104687 Evaluation PCB 1.73"x1.46"

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the 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 Analog Devices Inc. upon request.