



## GaAs MMIC SP8T NON-REFLECTIVE SWITCH, DC - 2.5 GHz

### Typical Applications

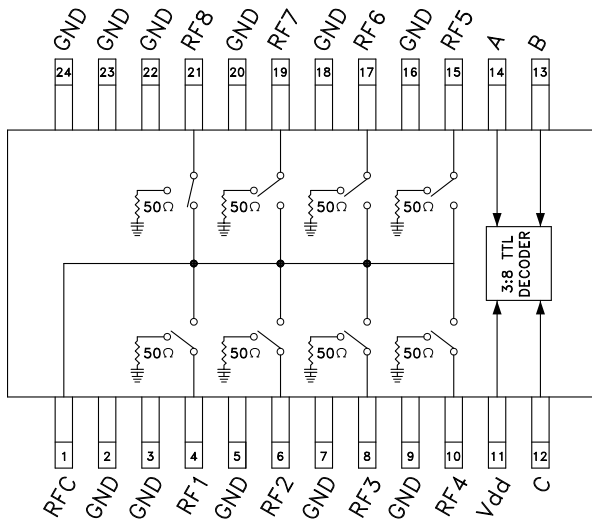
The HMC253QS24 / HMC253QS24E is ideal for DC - 2.5 GHz applications:

- CATV/DBS
- CDMA
- Cellular/PCS

### Features

- Low Insertion Loss (2 GHz): 1.3dB
- Single Positive Supply:  $V_{dd} = +5V$
- Integrated 3:8 TTL Decoder
- 24 Lead QSOP Package

### Functional Diagram



### General Description

The HMC253QS24 & HMC253QS24E are low-cost non-reflective SP8T switches in 24-lead QSOP packages featuring wideband operation from DC to 2.5 GHz. The switch offers a single positive bias and true TTL/CMOS compatibility. A 3:8 decoder is integrated on the switch requiring only 3 control lines and a positive bias to select each path. The HMC253QS24 & HMC253QS24E SP8T will replace multiple configurations of SP4T and SPDT MMIC switches.

### Electrical Specifications,

$T_a = +25^\circ C$ , For TTL Control and  $V_{dd} = +5V$  in a 50 Ohm system

Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 1.0 GHz		1.1	1.5	dB
	DC - 2.0 GHz		1.3	1.7	dB
	DC - 2.5 GHz		1.8	2.4	dB
Isolation	DC - 1.0 GHz	32	36		dB
	DC - 2.0 GHz	26	30		dB
	DC - 2.5 GHz	24	28		dB
Return Loss	"On State"	DC - 1.0 GHz	14	18	dB
		DC - 2.0 GHz	9	12	dB
		DC - 2.5 GHz	6	8	dB
Return Loss (RF1-8)	"Off State"	0.3 - 2.5 GHz	7	10	dB
		0.5 - 2.5 GHz	10	13	dB
Input Power for 1 dB Compression	0.3 - 2.5 GHz	20	23		dBm
Input Third Order Intercept (Two-Tone Input Power = +7 dBm Each Tone)	0.3 - 2.5 GHz	40	43		dBm
Switching Characteristics	0.3 - 2.5 GHz	tRISE, tFALL (10/90% RF)		30	ns
		tON, tOFF (50% CTL to 10/90% RF)		100	ns

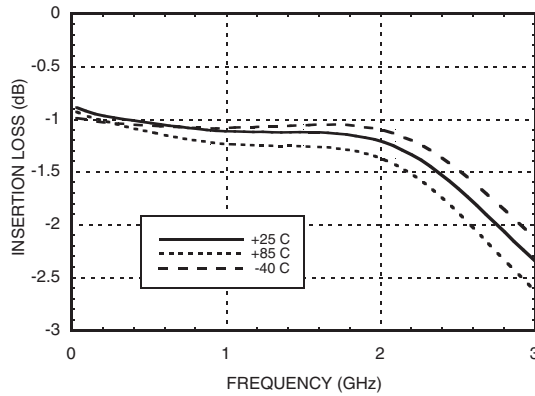
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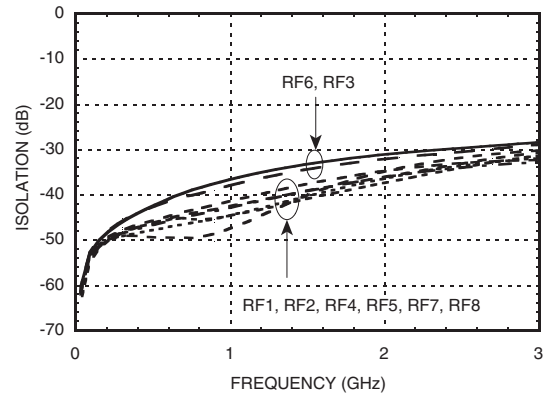
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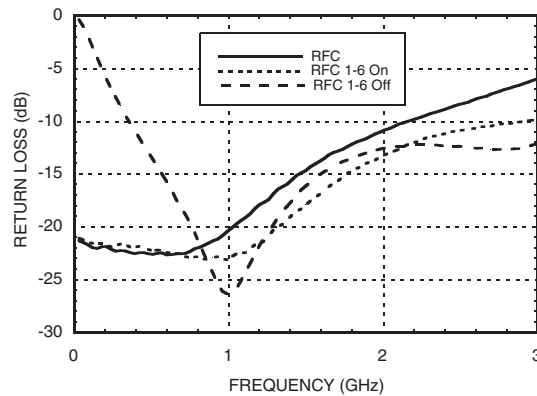
### Insertion Loss



### Isolation



### Return Loss



### Bias Voltage & Current

Vdd Range = +5.0 Vdc ± 10%		
Vdd (Vdc)	Idd (Typ.) (mA)	Idd (Max.) (mA)
+5.0	6.0	9.0

### TTL/CMOS Control Voltages

State	Bias Condition
Low	0 to +0.8 Vdc @ 5 uA Typ.
High	+2.0 to +5.0 Vdc @ 70 uA Typ.

### 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.

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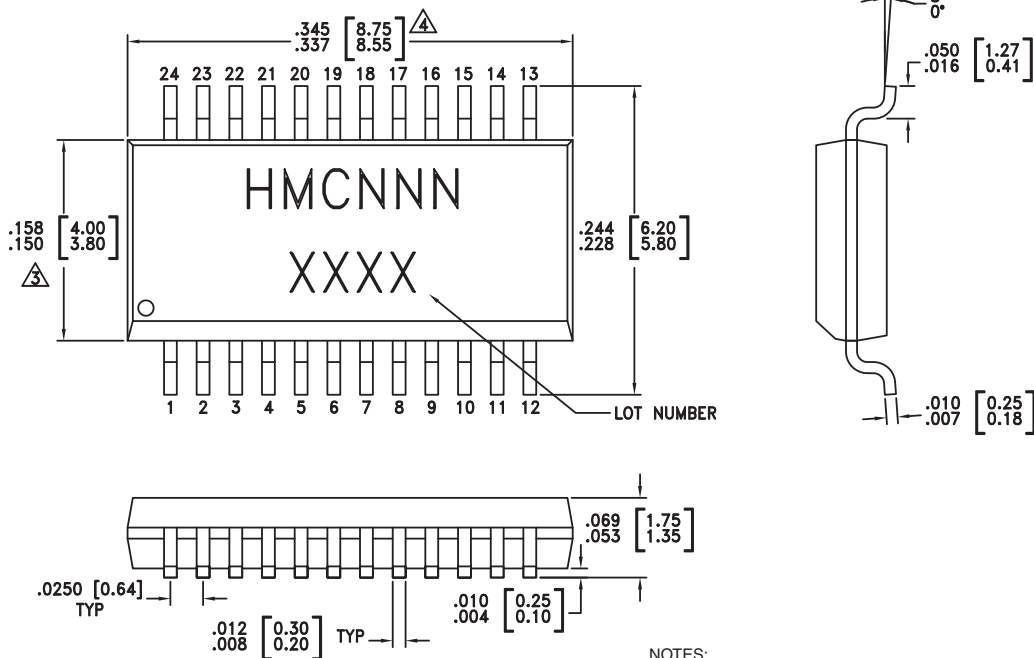
**Absolute Maximum Ratings**

Bias Voltage Range (Port Vdd)	+7.0 Vdc
Control Voltage Range (A, B, C)	-0.5V to Vdd +1Vdc
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
Maximum Input Power Vdd = +5V	+20 dBm (0.05 - 0.5 GHz) +24 dBm (0.5 - 2.5 GHz)



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

**Outline Drawing**



**NOTES:**

1. LEADFRAME MATERIAL: COPPER ALLOY
2. 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.
5. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

**Package Information**

Part Number	Package Body Material	Leadframe Plating	MSL Rating	Package Marking <sup>[3]</sup>
HMC253QS24	Low Stress Injection Molding Plastic Silica and Silicon Impregnated	Sn/Pb Solder	MSL1 <sup>[1]</sup>	HMC253 XXXX
HMC253QS24E	RoHS-compliant Low Stress Injection Molding Plastic Silica and Silicon Impregnated	100% Matte Tin	MSL1 <sup>[2]</sup>	HMC253 XXXX

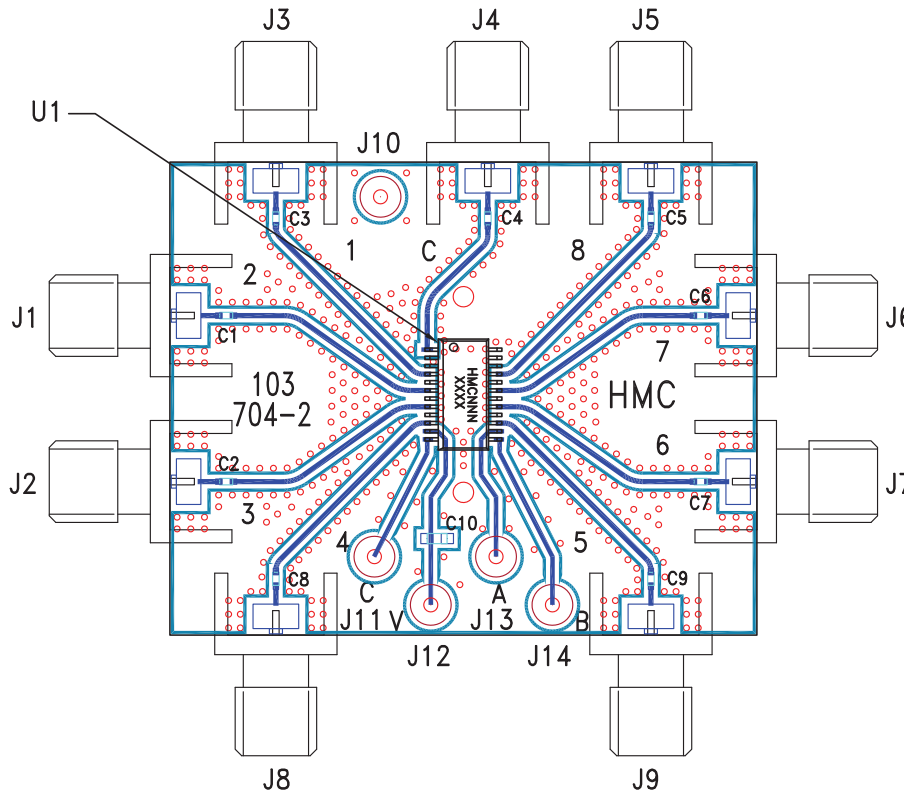
[1] Max peak reflow temperature of 235 °C  
 [2] Max peak reflow temperature of 260 °C  
 [3] 4-Digit lot number XXXX

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### Evaluation Circuit Board



### List of Materials for Evaluation PCB 103706 [1]

Item	Description
J1 - J9	PCB Mount SMA Connector
J10 - J14	DC Pin
C1 - C9	100 pF Capacitor, 0402 Pkg.
C10	0.01 uF Capacitor, 0603 Pkg.
U1	HMC253QS24 / HMC253QS24E SP8T Switch
PCB [2]	103704 Eval Board

[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 ports should have 50 ohm impedance while the package ground leads should be connected directly to the ground plane similar to that shown above. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation circuit board shown above is available from Hittite Microwave Corporation upon request.

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