

### Typical Applications

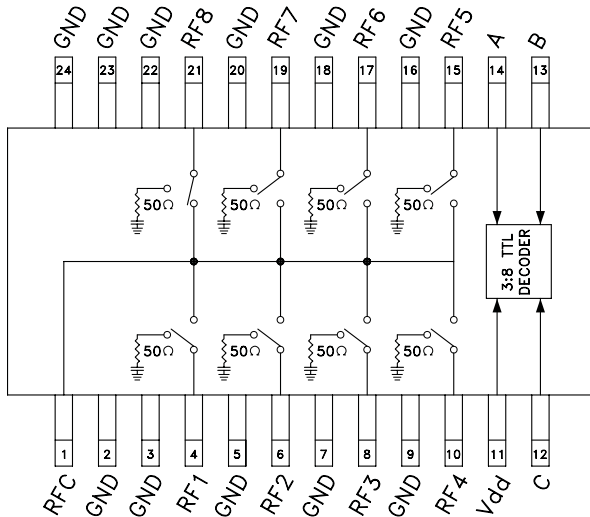
The HMC253QS24 / HMC253QS24E is ideal for DC - 2.5 GHz applications:

- 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

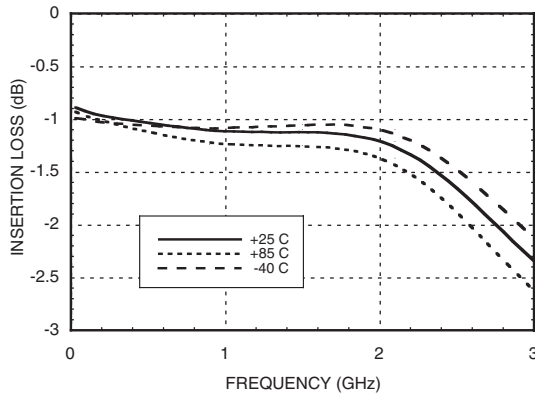
The HMC253QS24 & HMC253QS24E are low-cost non-reflective SP8T switches in 24-lead QSOP packages featuring wideband operation from DC to 2.5 GHz. The switch offers a single positive bias and true TTL/CMOS compatibility. A 3:8 decoder is integrated on the switch requiring only 3 control lines and a positive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

### Electrical Specifications,

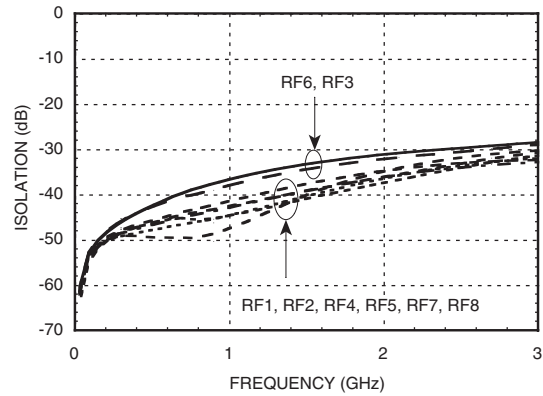
$T_a = +25^\circ C$ , For TTL Control and  $V_{dd} = +5V$  in a 50 Ohm system

| 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<br>(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    |

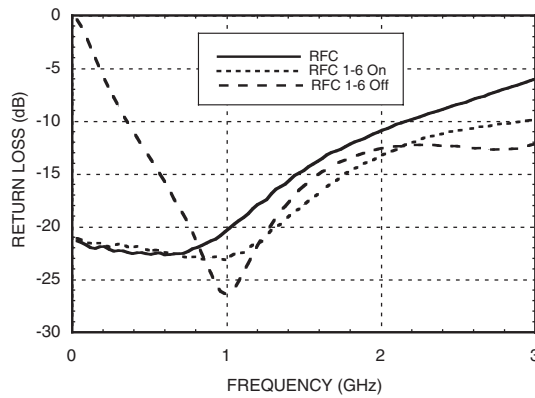
### Insertion Loss



### 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.

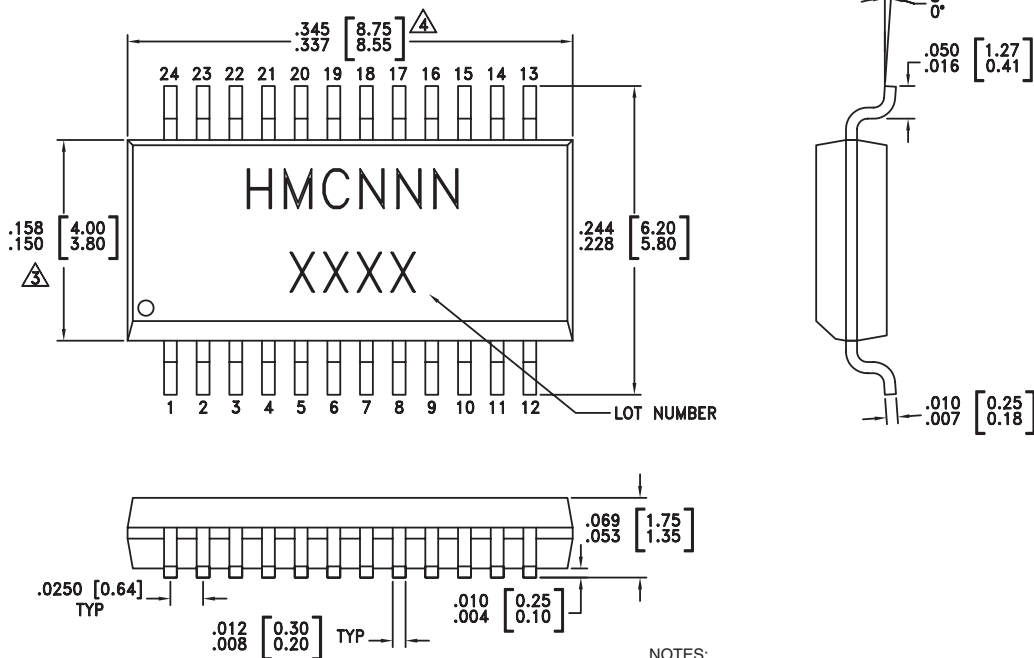
### Absolute Maximum Ratings

|                                  |   |
|----------------------------------|---|
| 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<br>Vdd = +5V | +20 dBm (0.05 - 0.5 GHz)<br>+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

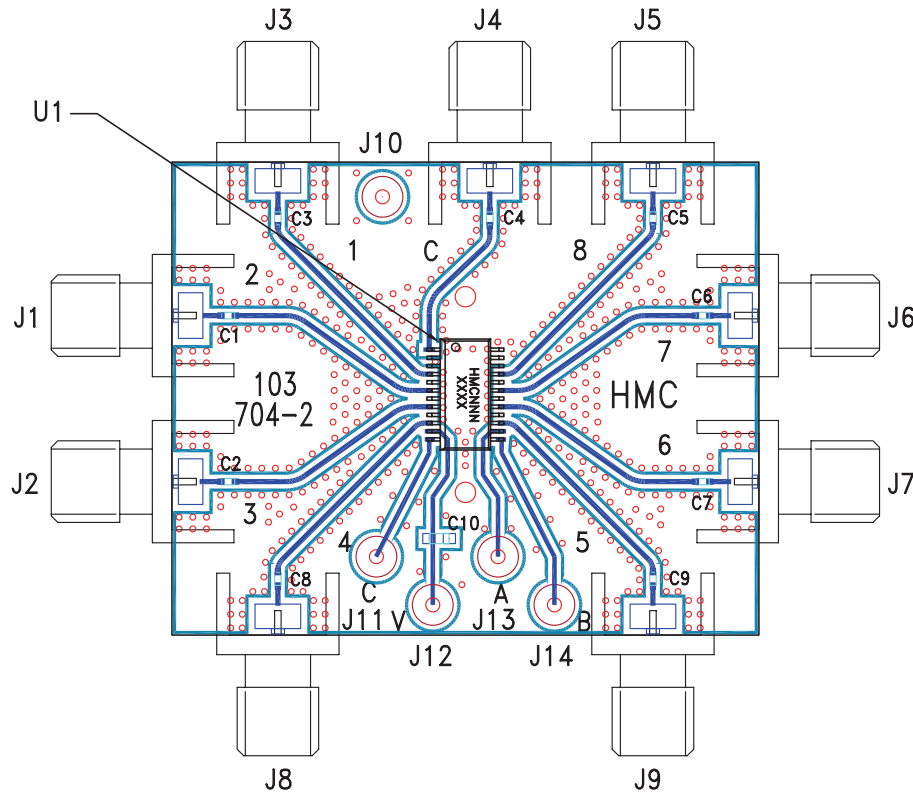
| Part Number | Package Body Material  | Leadframe Plating | MSL Rating          | Package Marking <sup>[3]</sup> |
|-------------|--|-------------------|---------------------|--------------------------------|
| HMC253QS24  | Low Stress Injection Molding Plastic Silica and Silicon Impregnated       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

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

### 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.