



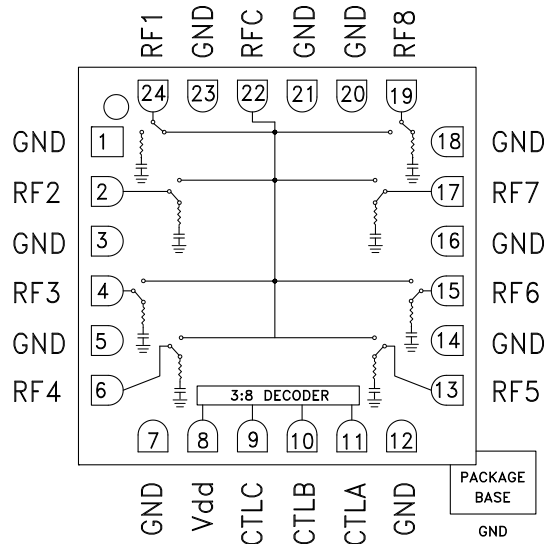
## GaAs MMIC SP8T NON-REFLECTIVE SWITCH, DC - 3.5 GHz

### Typical Applications

The HMC253LC4 is ideal for:

- Basestations & Repeaters
- WiMAX/WiBro & Fixed Wireless
- Cellular/3G Infrastructure
- CATV/DBS
- Military & Hi-Rel

### Functional Diagram



### Features

- Ceramic, RoHS Compliant 4x4mm SMT Package
- Non-Reflective Topology
- Low Insertion Loss: 1.2 dB
- Single Positive Supply:  $V_{dd} = +5V$
- Integrated 3:8 TTL/CMOS Decoder: 0/+3V

### General Description

The HMC253LC4 is a non-reflective SP8T switch in a leadless RoHS compliant 4x4 mm ceramic SMT package featuring wideband operation from DC to 3.5 GHz. The switch offers a single positive bias and true TTL/CMOS compatibility enabling it to operate with 0/+3V control and a +5V supply. A 3:8 decoder is integrated on the switch requiring only 3 control lines and a positive bias to select each path. The HMC253LC4 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 - 2.0 GHz  |               | 1.1  | 1.5  | dB    |
|                                                                          | DC - 3.0 GHz  |               | 1.2  | 1.6  | dB    |
|                                                                          | DC - 3.5 GHz  |               | 1.3  | 1.7  | dB    |
| Isolation                                                                | DC - 2.0 GHz  | 35            | 40   |      | dB    |
|                                                                          | DC - 3.0 GHz  | 31            | 36   |      | dB    |
|                                                                          | DC - 3.5 GHz  | 30            | 35   |      | dB    |
| Return Loss                                                              | "On State"    | 0.3 - 3.0 GHz | 15   | 18   | dB    |
|                                                                          |               | 0.3 - 3.5 GHz | 12   | 14   | dB    |
| Return Loss (RF1-8)                                                      | "Off State"   | 0.3 - 3.5 GHz | 7    | 10   | dB    |
|                                                                          |               | 0.5 - 3.5 GHz | 10   | 14   | dB    |
| Input Power for 1 dB Compression                                         | 0.5 - 3.5 GHz | 20            | 24   |      | dBm   |
| Input Third Order Intercept<br>(Two-Tone Input Power = +7 dBm Each Tone) | 0.5 - 3.5 GHz | 40            | 43   |      | dBm   |
| Switching Characteristics                                                | 0.3 - 3.5 GHz |               |      |      |       |
| tRISE, tFALL (10/90% RF)                                                 |               |               | 30   |      | ns    |
| tON, tOFF (50% CTL to 10/90% RF)                                         |               |               | 100  |      | ns    |

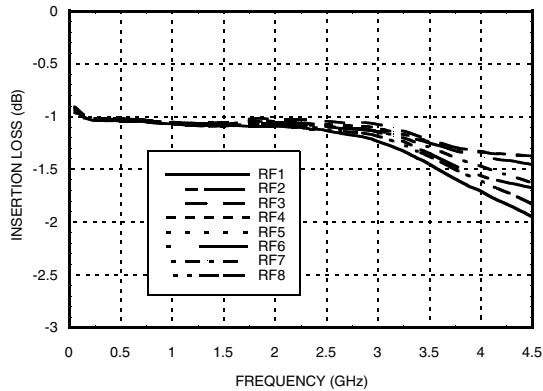
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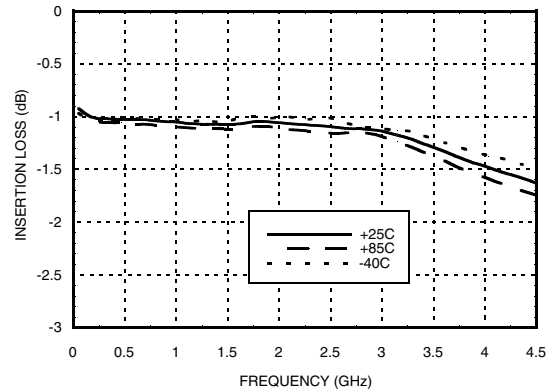


**GaAs MMIC SP8T NON-REFLECTIVE  
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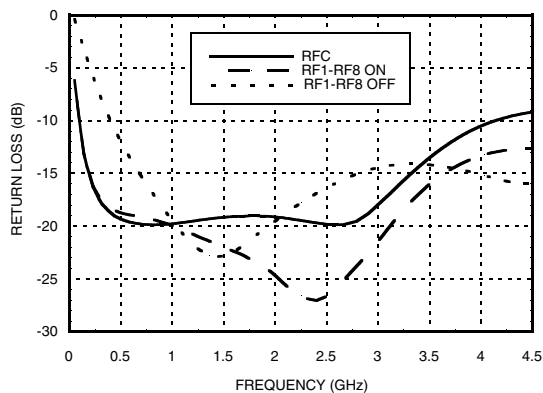
**Insertion Loss**



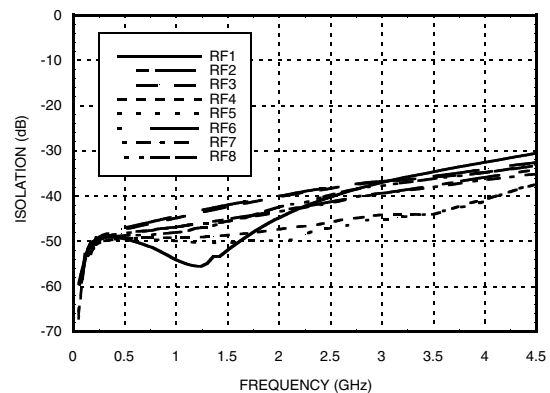
**Insertion Loss vs. Temperature**



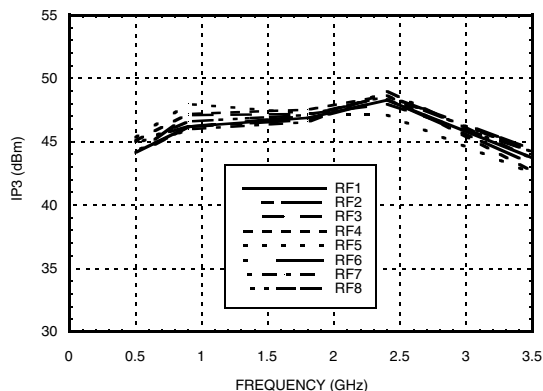
**Return Loss**



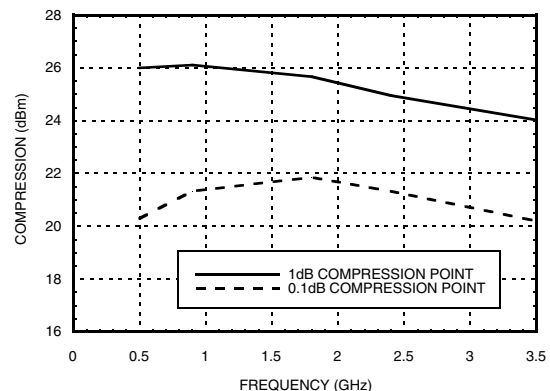
**Isolation**



**Input IP3**



**Input Compression**





## GaAs MMIC SP8T NON-REFLECTIVE SWITCH, DC - 3.5 GHz

### Bias Voltage & Current

| Vdd Range = +5 Vdc $\pm$ 10% |                 |                 |
|------------------------------|-----------------|-----------------|
| Vdd (Vdc)                    | Idd (Typ.) (mA) | Idd (Max.) (mA) |
| +5                           | 6.0             | 9.0             |

### TTL/CMOS Control Voltages

| State | Bias Condition                   |
|-------|----------------------------------|
| Low   | 0 to +0.8 Vdc @ 5 $\mu$ A Typ.   |
| High  | +2.0 to +5 Vdc @ 70 $\mu$ A Typ. |

**NOTE:**

DC Blocking capacitors are required at ports RFC and RF1, 2, 3, 4, 5, 6, 7, 8.

### 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               |

### Absolute Maximum Ratings

|                                  |                                                     |
|----------------------------------|-----------------------------------------------------|
| Bias Voltage Range (Port Vdd)    | +7.0 Vdc                                            |
| Control Voltage Range (A, B, C)  | -0.5V to Vdd +1Vdc                                  |
| Channel Temperature              | 150 °C                                              |
| 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>+25 dBm (0.5 - 3.5 GHz) |

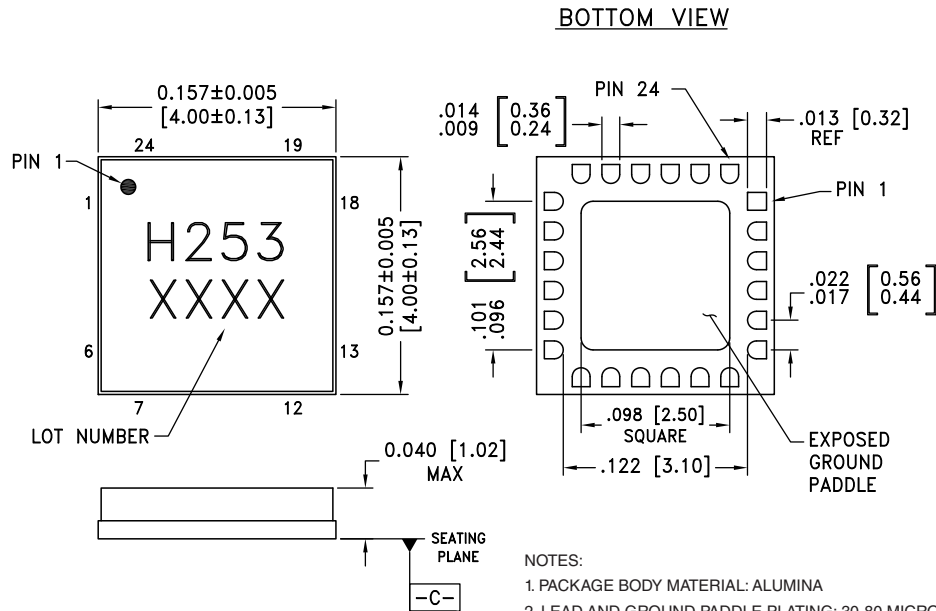


**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**



## GaAs MMIC SP8T NON-REFLECTIVE SWITCH, DC - 3.5 GHz

### Outline Drawing



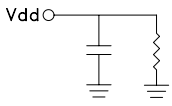
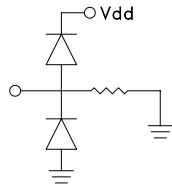
### Package Information

| Part Number | Package Body Material | Lead Finish      | MSL Rating          | Package Marking <sup>[2]</sup> |
|-------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC253LC4   | Alumina, White        | Gold over Nickel | MSL3 <sup>[1]</sup> | H253<br>XXXX                   |

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX

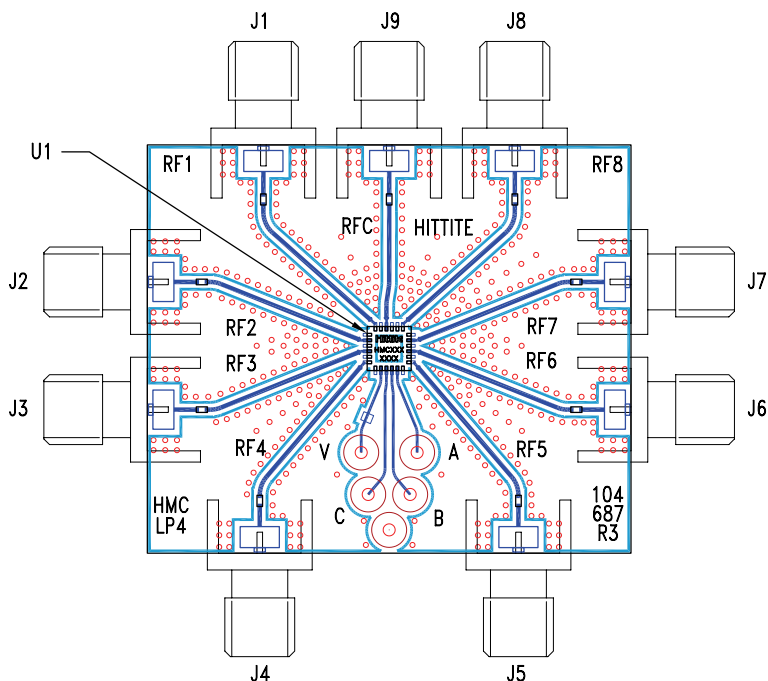

**GaAs MMIC SP8T NON-REFLECTIVE  
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**Pin Descriptions**

| Pin Number                             | Function        | Description                                                                       | Interface Schematic                                                                 |
|----------------------------------------|-----------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1, 3, 5, 7, 12, 14, 16, 18, 20, 21, 23 | GND             | Package bottom has exposed metal paddle that must also be connected to RF ground. |  |
| 2, 4, 6, 13, 15, 17, 19, 22, 24        | RF1 - RF8 & RFC | This pin is DC coupled and matched to 50 Ohms. Blocking capacitors are required.  |                                                                                     |
| 8                                      | Vdd             | Supply Voltage +5 Vdc $\pm 10\%$                                                  |  |
| 9                                      | CTL C           | See truth table and control voltage table.                                        |  |
| 10                                     | CTL B           |                                                                                   |                                                                                     |
| 11                                     | CTL A           |                                                                                   |                                                                                     |



**GaAs MMIC SP8T NON-REFLECTIVE  
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**Evaluation Circuit Board**



**List of Materials for Evaluation PCB 107780 [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        | HMC253LC4 SP8T Switch        |
| PCB [2]   | 104687 Eval Board            |

[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 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.