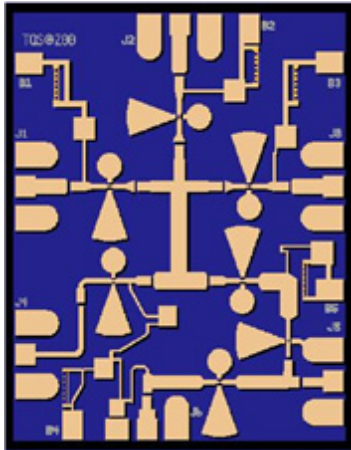


# 77 GHz Transceiver Switch

# TGS4307



### Key Features

- I/O Compatible with MA4GC6772
- 3 Antenna Ports
- Receive, Source, and LO Ports
- 2.5 dB RX/TX Insertion Loss Typical
- 40 dB Source/Mixer Isolation Typical
- 25 dB Ant/Ant Isolation Typical
- Bias Supply: 1.3V@40mA
- Die Size: 1.70 x 2.16 x 0.1 mm

### Primary Applications

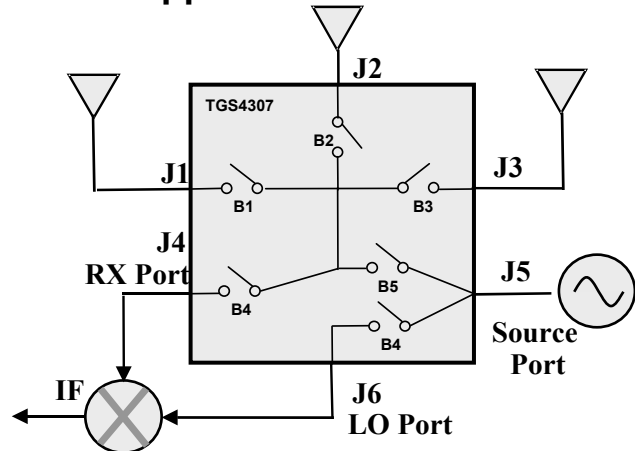
- Automotive Radar
- Instrumentation

### Product Description

The TGS4307 is a 77 GHz switch matrix for use in automotive radar transceivers. The switch is designed using TriQuint's proven VPIN diode production process.

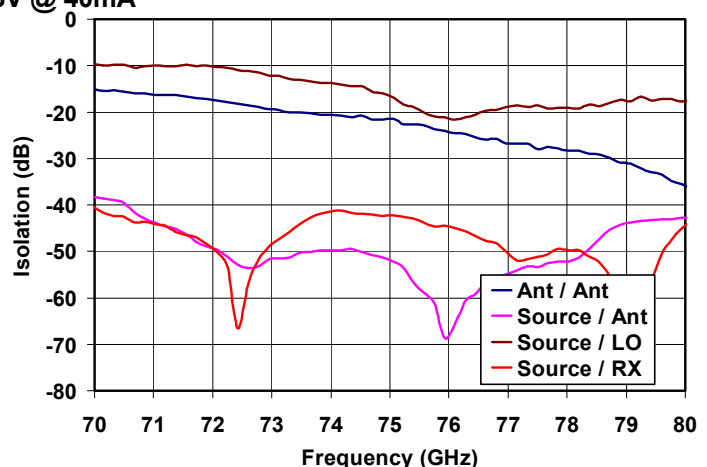
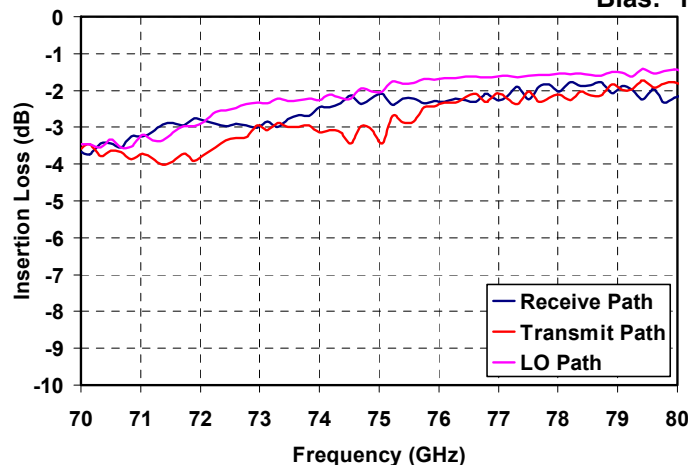
Three antenna ports may be selected independently and directed to a source (J5) or a receive (J4) port. Additionally, the source port can be directed to the LO port for use with a downconverting mixer.

### Radar Application Schematic



### Measured Fixtured Data

Bias: 1.3V @ 40mA



Note: Datasheet is subject to change without notice.

**TABLE I**  
**MAXIMUM RATINGS 1/**

| SYMBOL           | PARAMETER                           | VALUE         | NOTES                 |
|------------------|-------------------------------------|---------------|-----------------------|
| V <sup>+</sup>   | Positive Supply Voltage             | 2 V           | <u>2/</u>             |
| V <sup>-</sup>   | Negative Supply Voltage             | -8 V          | <u>2/</u>             |
| I <sup>+</sup>   | Positive Supply Current (Quiescent) | 80 mA         | <u>2/</u> , <u>3/</u> |
| P <sub>IN</sub>  | Input Continuous Wave Power         | TBD           |                       |
| P <sub>D</sub>   | Power Dissipation                   | 160 mW        | <u>2/</u>             |
| T <sub>M</sub>   | Mounting Temperature (30 Seconds)   | 320 °C        |                       |
| T <sub>STG</sub> | Storage Temperature                 | -65 to 150 °C |                       |

1/ These ratings represent the maximum operable values for this device.

2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed P<sub>D</sub>.

3/ Control line B1, B2, B3 maximum current = 20 mA

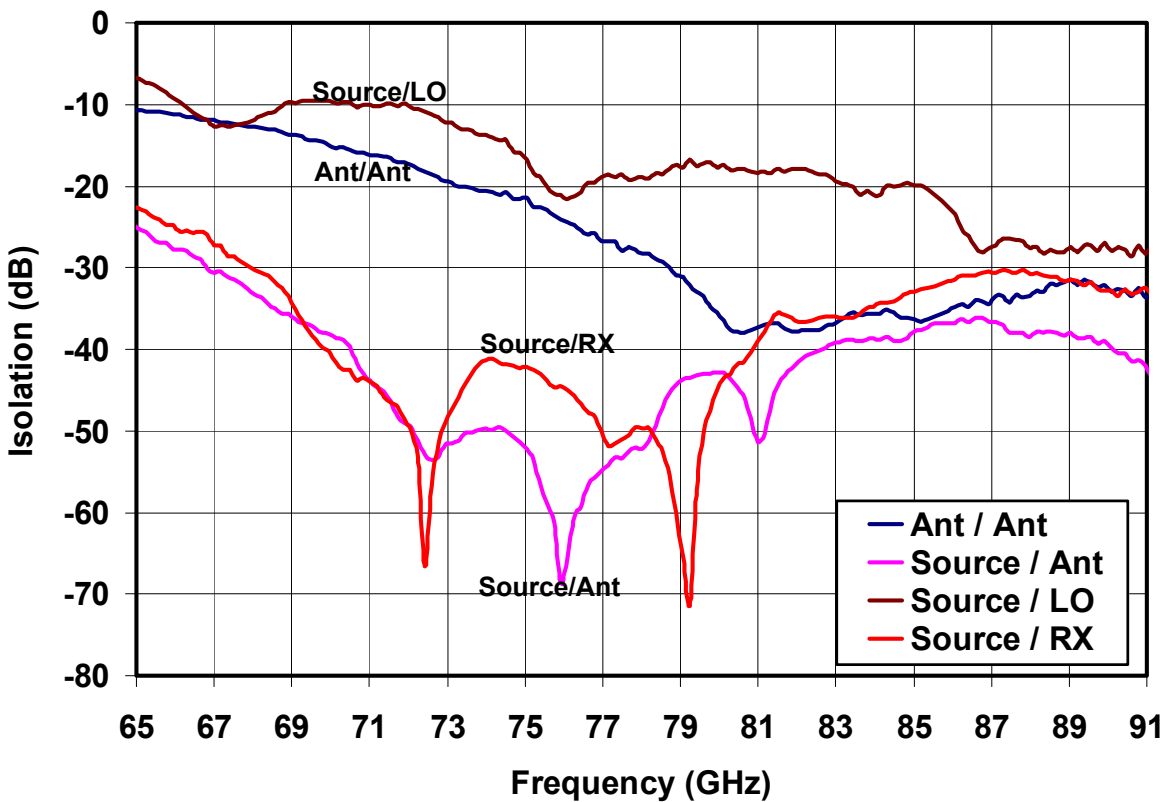
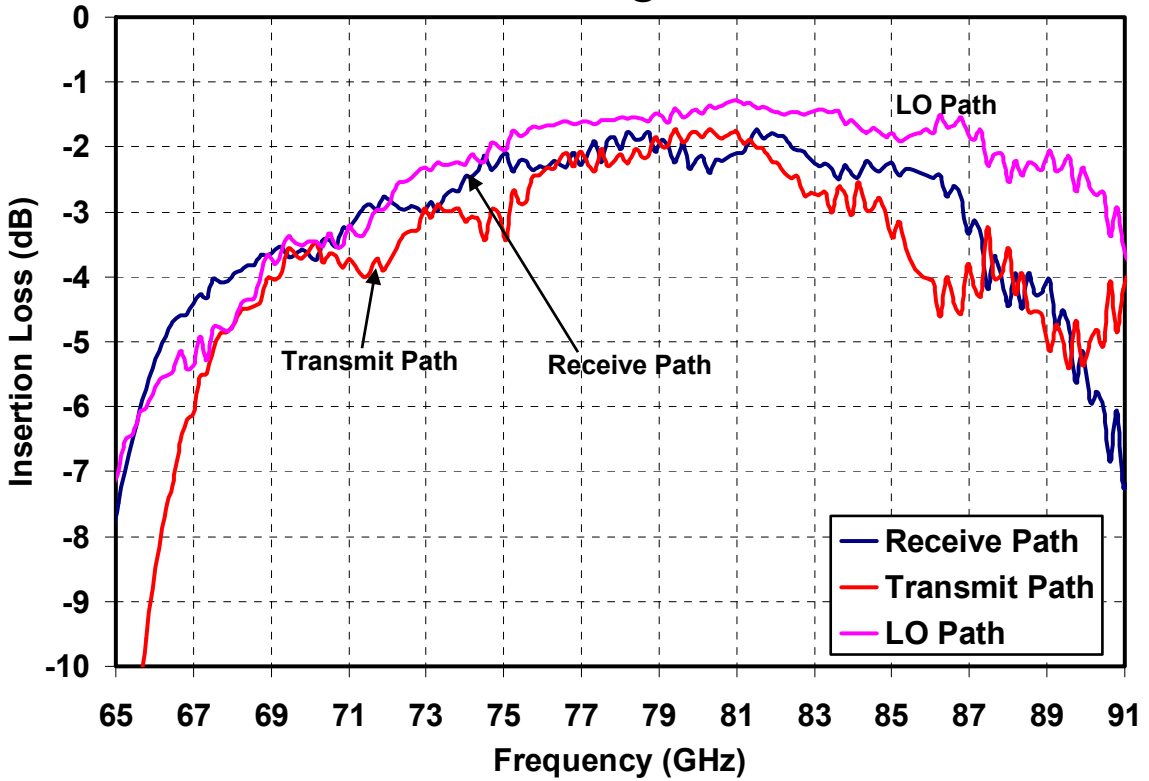
Control line B4, B5 maximum current = 40 mA

**TABLE II**  
**ELECTRICAL CHARACTERISTICS**  
(T<sub>a</sub> = 25 °C Nominal)

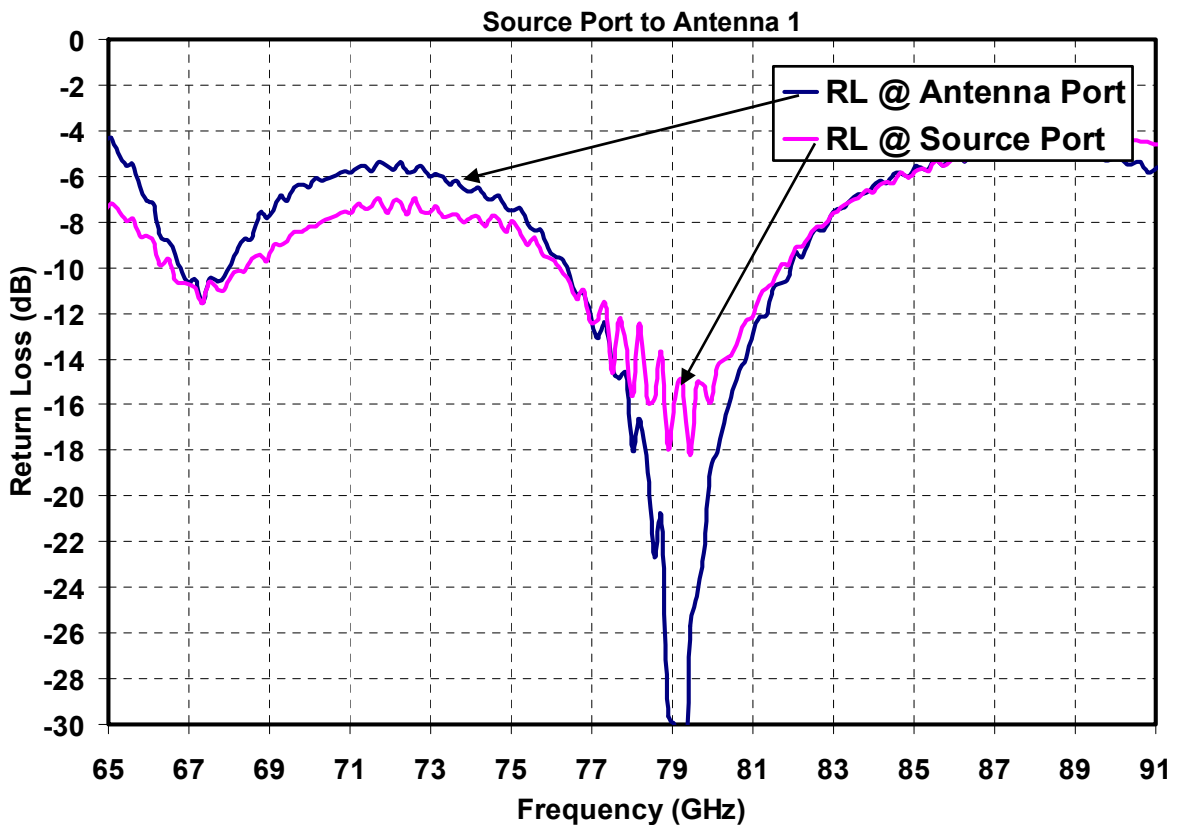
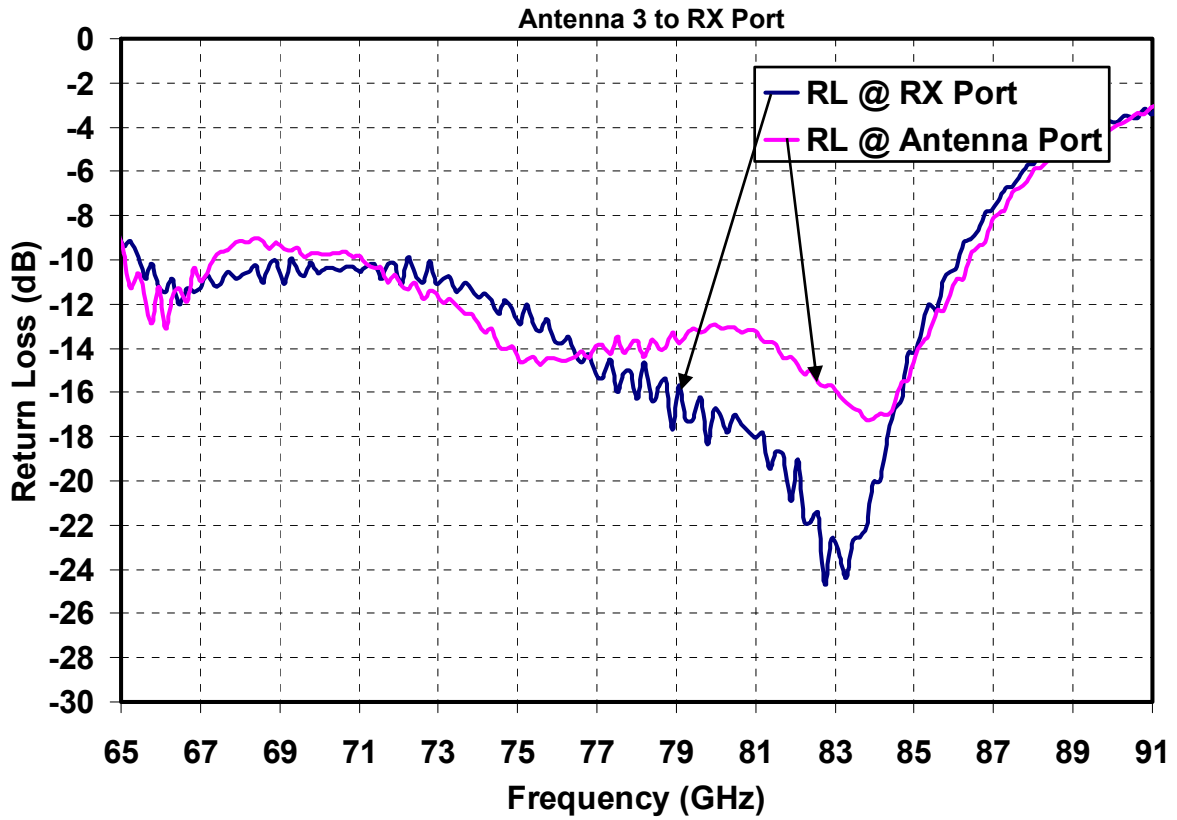
| PARAMETER   | TYPICAL     | UNITS |
|---|-------------|-------|
| Frequency Range                                     | 75 - 80     | GHz   |
| Bias Supply   | 1.3V @ 40mA |       |
| Insertion Loss, Port J3 to J4 (RX)                  | 2.5         | dB    |
| Insertion Loss, Port J1 to J5 (TX)                  | 2.5         | dB    |
| Insertion Loss Source to LO, Port J5 to J6 (RX)     | 1.8         | dB    |
| Isolation Source to RX, Port J4 to J5 (RX)          | >40         | dB    |
| Isolation Source to Antenna, Port J1 to J5 (RX)     | >40         | dB    |
| Isolation Antenna to Antenna, Port J1 to J3 (RX,TX) | 25          | dB    |
| Isolation Source to LO, Port J5 to J6 (TX)          | 20          | dB    |
| Return Loss   | >8          | dB    |

**Preliminary Measured Data**

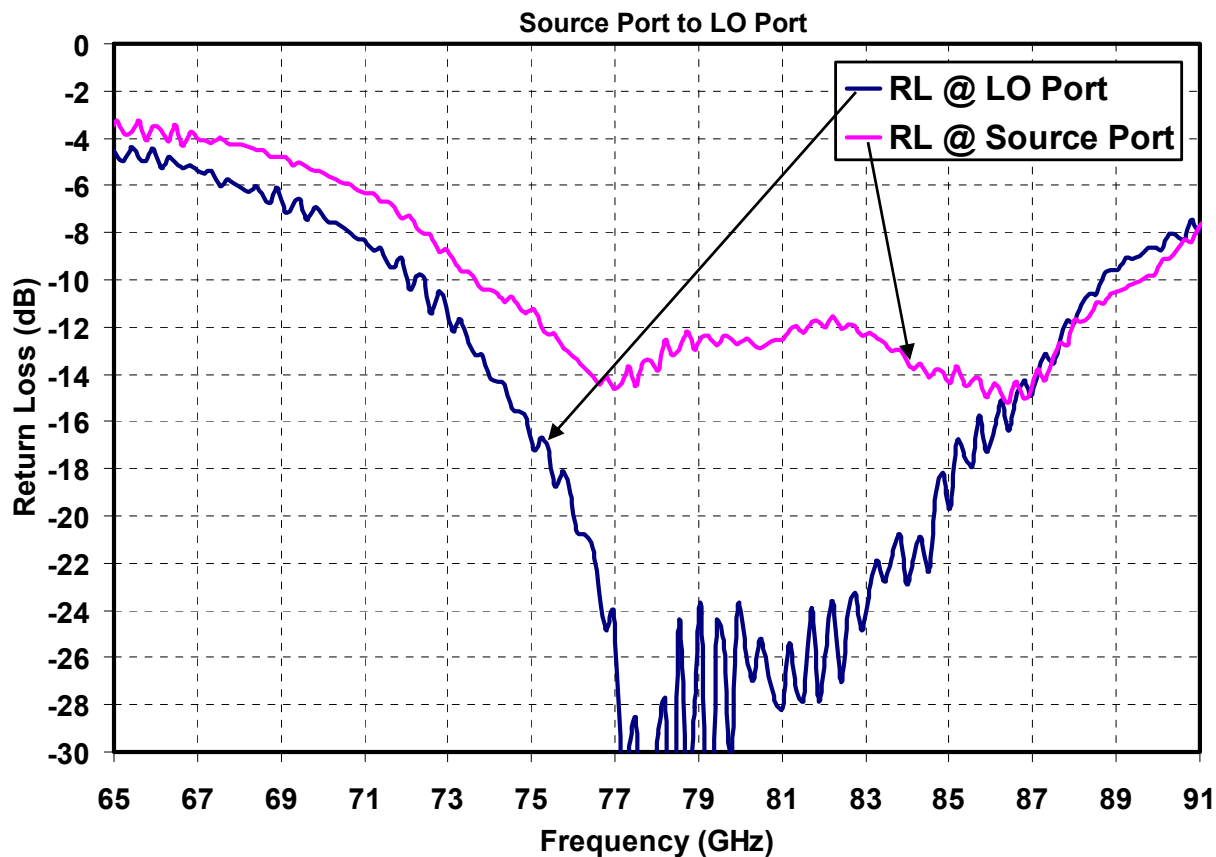
Bias: 1.3V @ 40mA



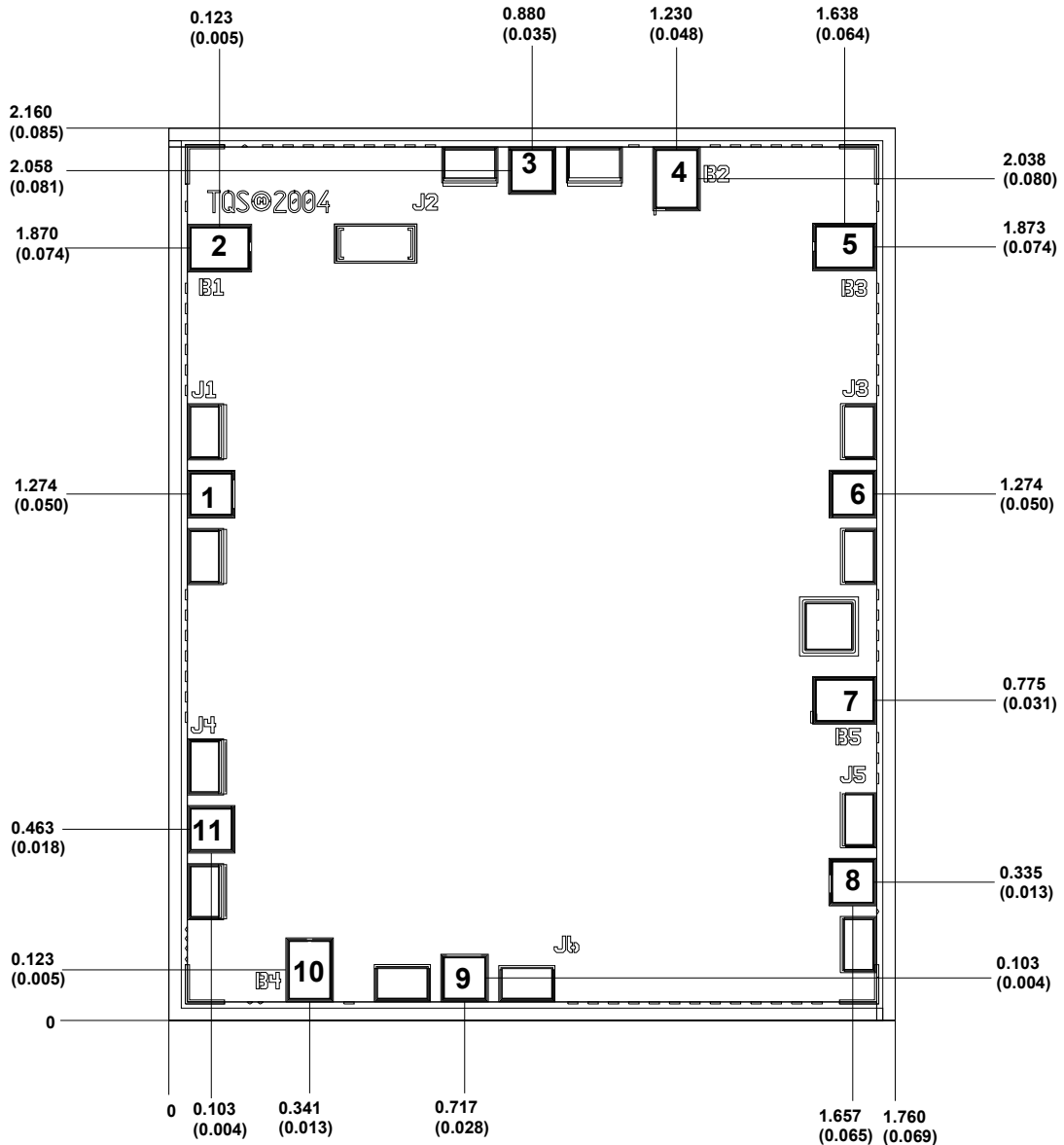
### Preliminary Measured Data



### Preliminary Measured Data



Mechanical Drawing



Units: millimeters (inches)  
 Thickness: 0.1016 (0.004)  
 Chip edge to bond pad dimensions are shown to center of bond pads  
 Chip size tolerance: +/- 0.05 (0.002)  
 GND IS BACKSIDE OF MMIC

|                               |                               |
|-------------------------------|-------------------------------|
| Bond Pad # 1 (Antenna Port 1) | 0.100 x 0.100 (0.004 x 0.004) |
| Bond Pad # 2 (VB1)            | 0.140 x 0.100 (0.006 x 0.004) |
| Bond Pad # 3 (Antenna Port 2) | 0.100 x 0.100 (0.004 x 0.004) |
| Bond Pad # 4 (VB2)            | 0.100 x 0.140 (0.004 x 0.006) |
| Bond Pad # 5 (VB3)            | 0.140 x 0.100 (0.006 x 0.004) |
| Bond Pad # 6 (Antenna Port 3) | 0.100 x 0.100 (0.004 x 0.004) |
| Bond Pad # 7 (VB5)            | 0.140 x 0.100 (0.006 x 0.004) |
| Bond Pad # 8 (Source Port)    | 0.100 x 0.100 (0.004 x 0.004) |
| Bond Pad # 9 (LO Port)        | 0.100 x 0.100 (0.004 x 0.004) |
| Bond Pad # 10 (VB4)           | 0.100 x 0.140 (0.004 x 0.006) |
| Bond Pad # 11 (Receiver Port) | 0.100 x 0.100 (0.004 x 0.004) |

**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

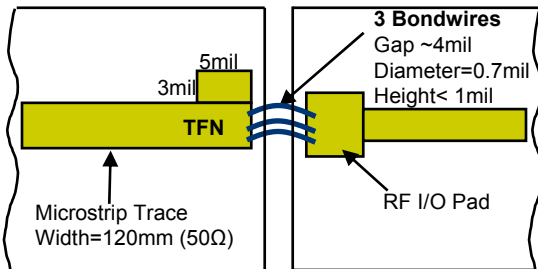
## Assembly Drawing

### External Interface (TFN)

Substrate: Alumina  
 $\epsilon_r=9.8$   
Thickness=5mil

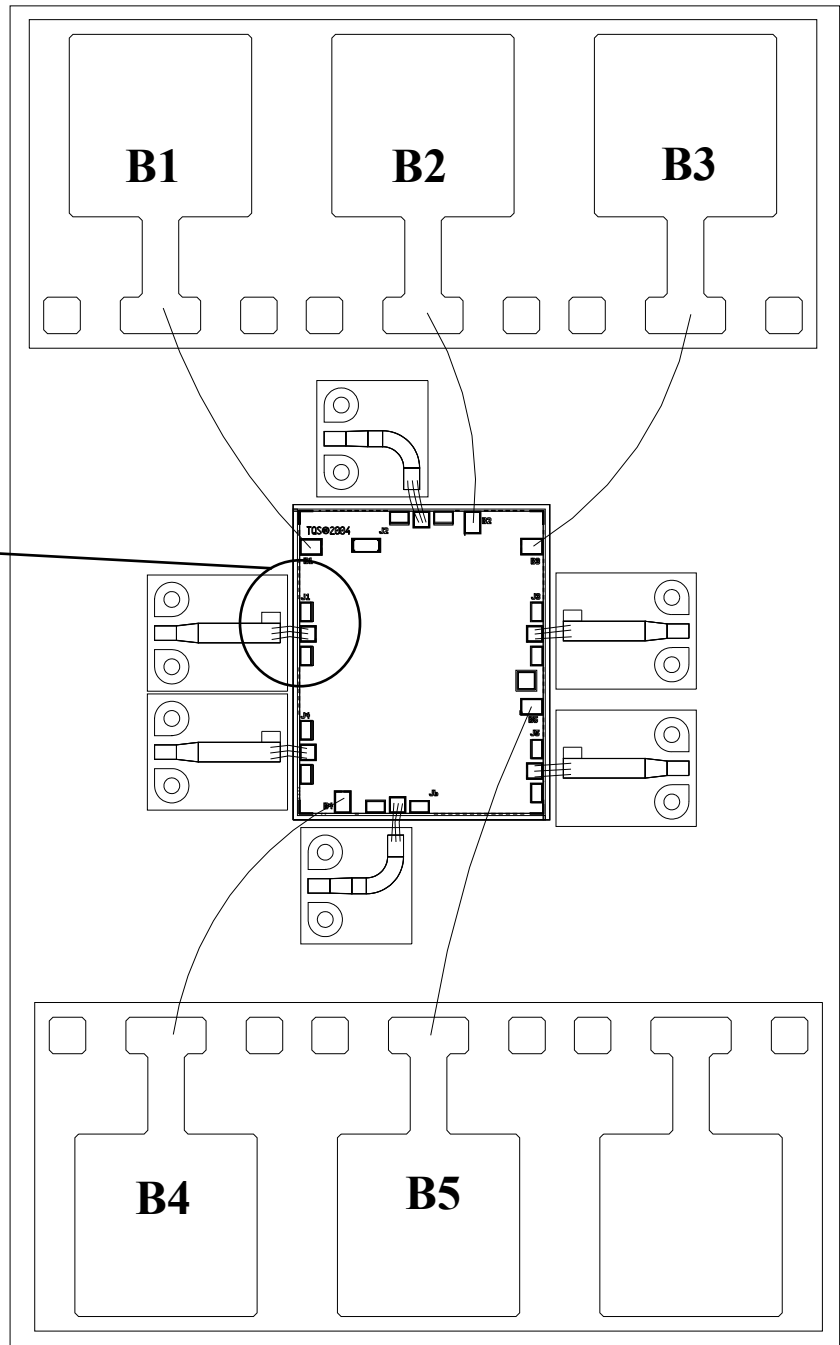
### Switch MMIC

Substrate: GaAs  
 $\epsilon_r=12.9$   
Thickness=4mil



Note: Ribbon bond is acceptable  
(instead of 3 bondwires)

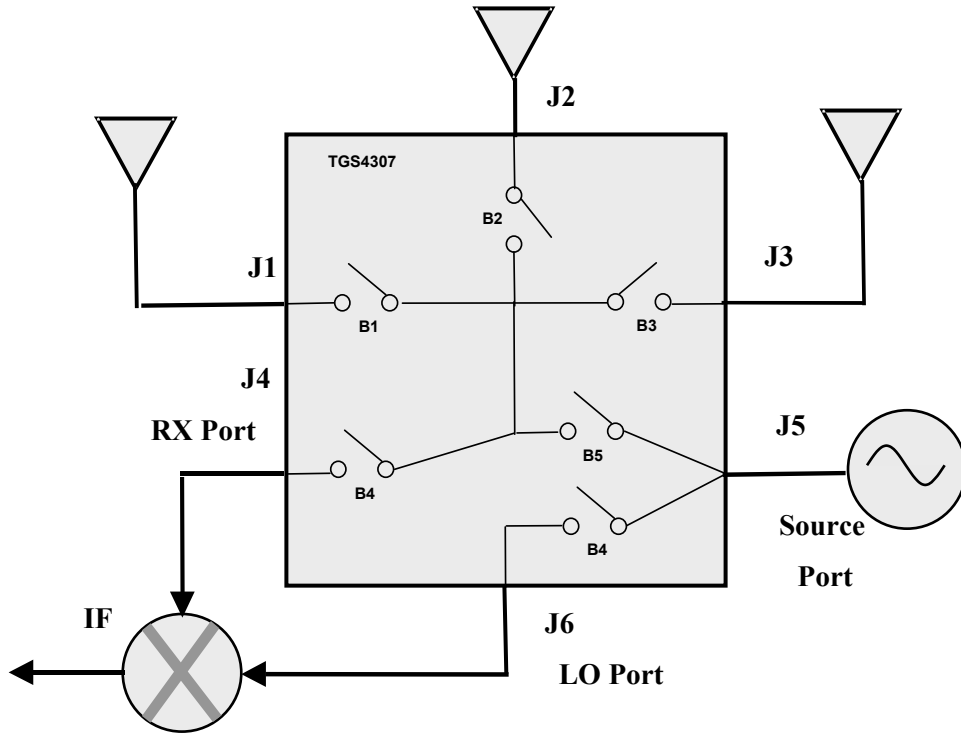
### Recommended Interconnect Scheme



Note: Unused Ports should be terminated with 50 Ω.

**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

## Application Schematic



### Bias State Table

| Function | Selected Antenna<br>(B1, B2, or B3) | Unused Antennas<br>(B1, B2, or B3) | B4    | B5    |
|----------|-------------------------------------|------------------------------------|-------|-------|
| Transmit | -5 to 0V                            | +10mA each                         | +20mA | 0V    |
| Receive  | -5 to 0V                            | +10mA each                         | 0V    | +20mA |

Forward voltage is ~ +1.3V to achieve bias current

*GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.*