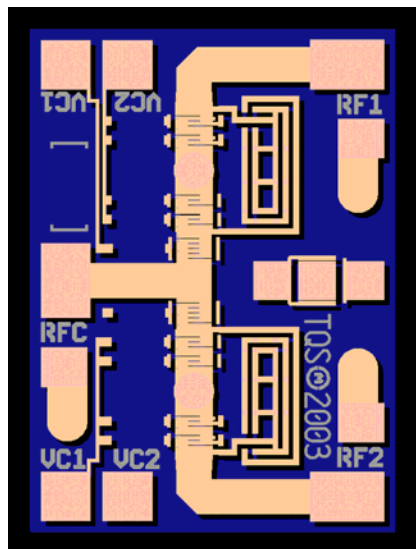


# High Power DC - 18GHz SPDT FET Switch      TGS2306-EPU

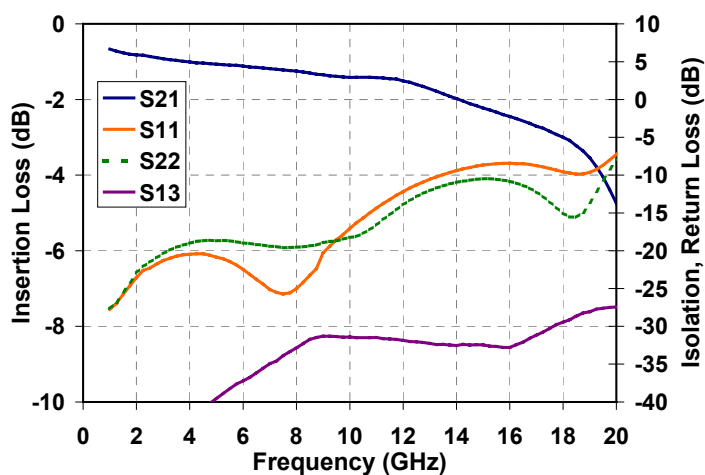


## Key Features and Performance

- DC - 18 GHz Frequency Range
- 29 dBm Input P1dB @  $V_C = -5V$
- > 30 dB Isolation
- <1 nsec switching speed
- Control Voltage Application from Either Side of MMIC
- -3V or -5V Control Voltage
- 0.5 $\mu$ m pHEMT 3MI Technology
- Chip Dimensions:  
0.83 x 1.11 x 0.10 mm  
(0.033 x 0.044 x 0.004 inches)

## Preliminary Measured Performance

$V_{C1} = 0V$ ;  $V_{C2} = -5V$



## Description

The TriQuint TGS2306-EPU is a GaAs single-pole, double-throw (SPDT) FET monolithic switch designed to operate over the DC to 18GHz frequency range. This switch not only maintains a high isolation loss and a low insertion loss across a wide bandwidth, but also has very low power consumption and high power handling of 29dBm or greater input P1dB at  $V_C = 5V$ . These advantages, along with the small size of the chip, make the TGS2306-EPU ideal for use in high-speed radar and communication applications.

*Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.*

**TABLE I  
MAXIMUM RATINGS**

| Symbol           | Parameter                            | Value         | Notes                         |
|------------------|--------------------------------------|---------------|-------------------------------|
| V <sub>C</sub>   | Control Voltage                      | -7 V          | <u>1/</u> <u>2/</u>           |
| I <sub>C</sub>   | Control Current                      | 2.25 mA       | <u>1/</u> <u>2/</u>           |
| P <sub>IN</sub>  | Input Continuous Wave Power          | TBD           | <u>1/</u> <u>2/</u>           |
| P <sub>D</sub>   | Power Dissipation                    | TBD           | <u>1/</u> <u>2/</u> <u>3/</u> |
| T <sub>CH</sub>  | Operating Channel Temperature        | 150 °C        | <u>4/</u>                     |
| T <sub>M</sub>   | Mounting Temperature<br>(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> at a package base temperature of 70°C
- 3/ When operated at this bias condition with a baseplate temperature of 70°C, the MTTF is reduced to 1.0E+6 hours
- 4/ Junction operating temperature will directly affect the device median time to failure (MTTF). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.

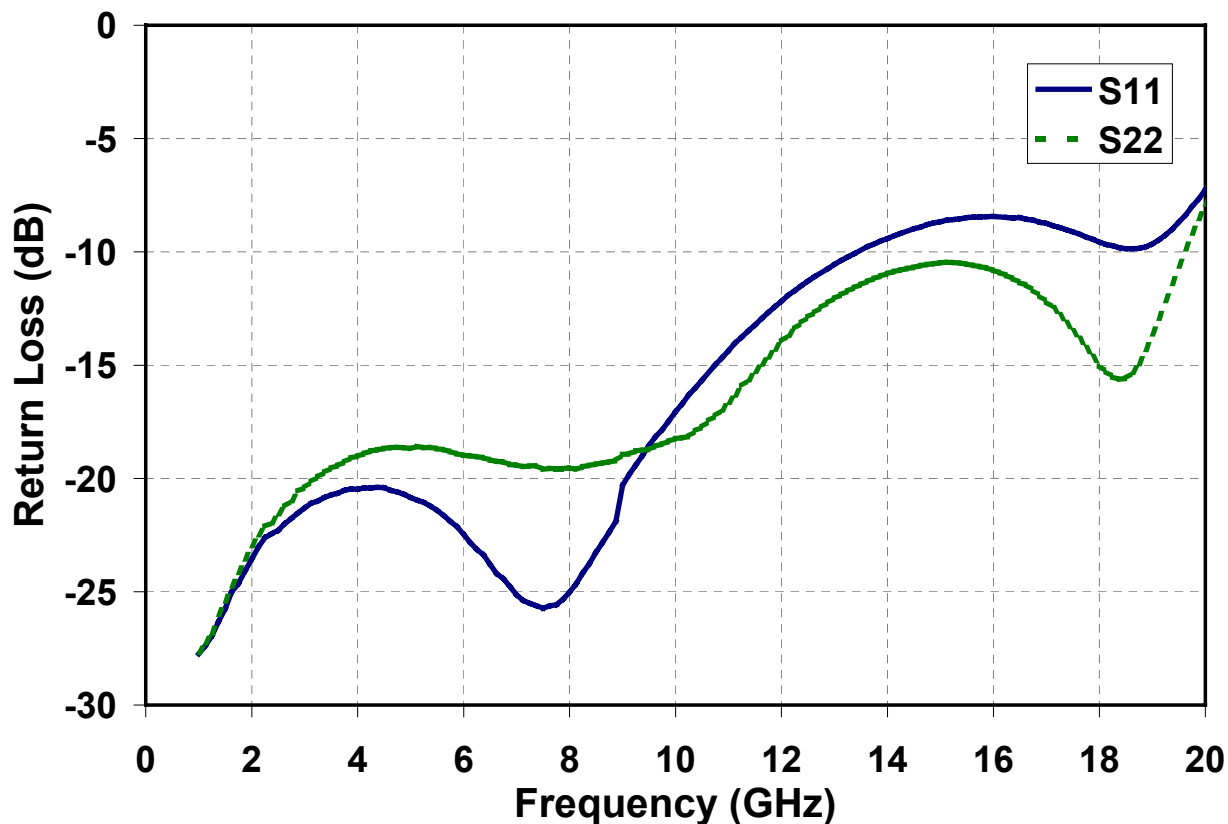
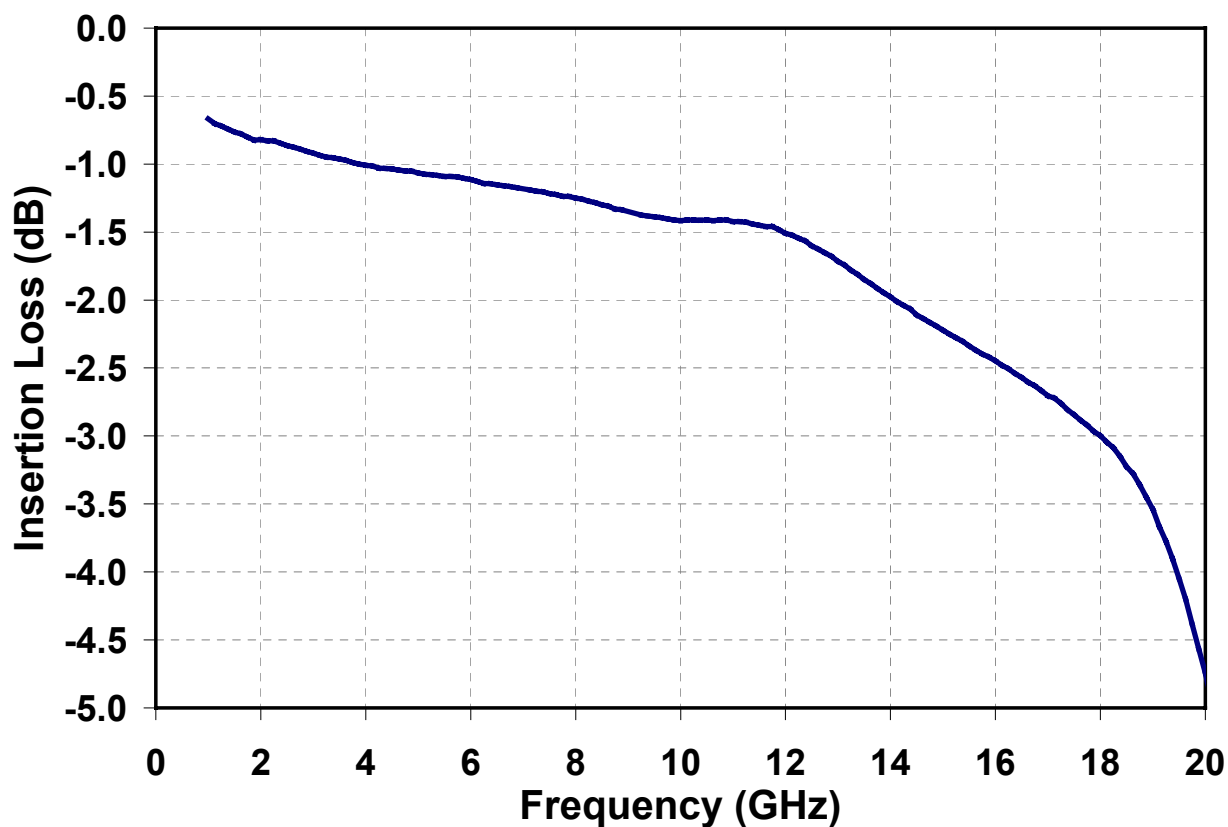
**TABLE II  
TRUTH TABLE**

| Selected RF Output | V <sub>C1</sub> | V <sub>C2</sub> |
|--------------------|-----------------|-----------------|
| RF Out 1           | 0 V             | -5 V            |
| RF Out 2           | -5 V            | 0 V             |

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**Fixtured Measurement**

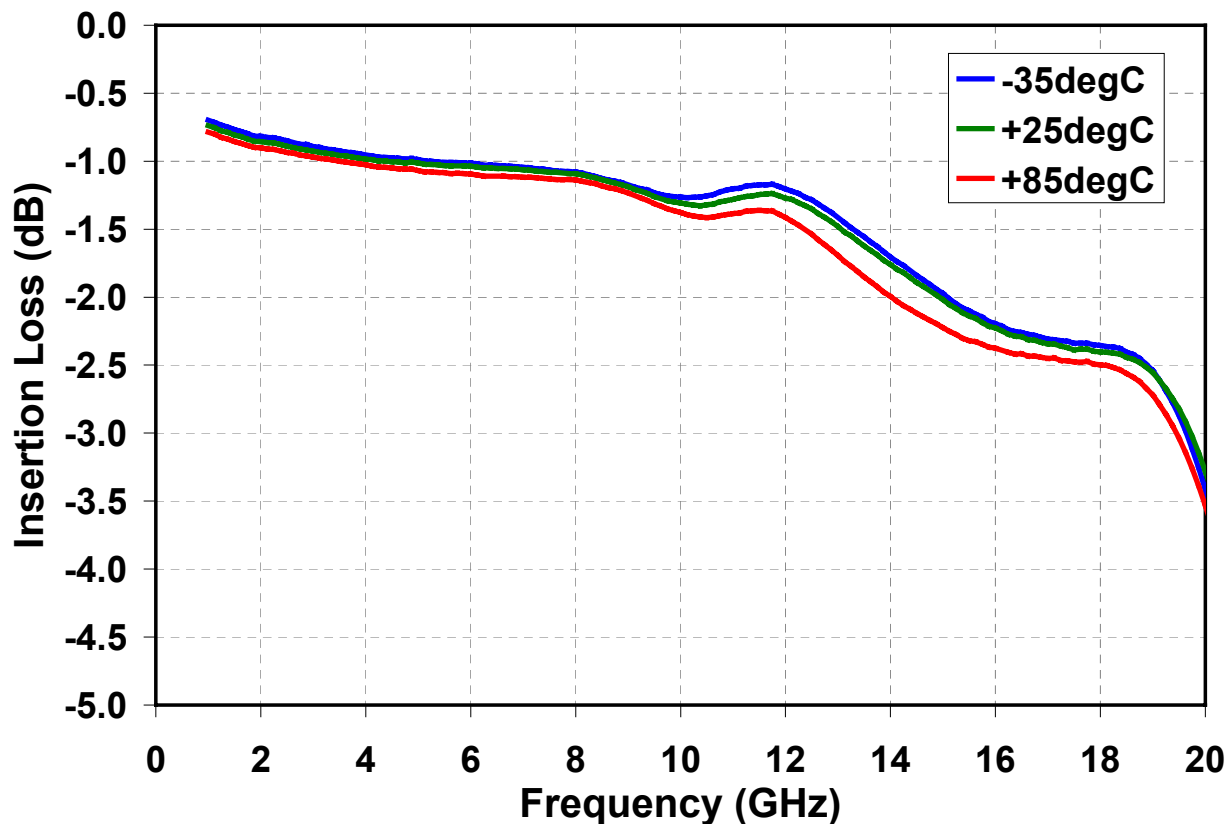
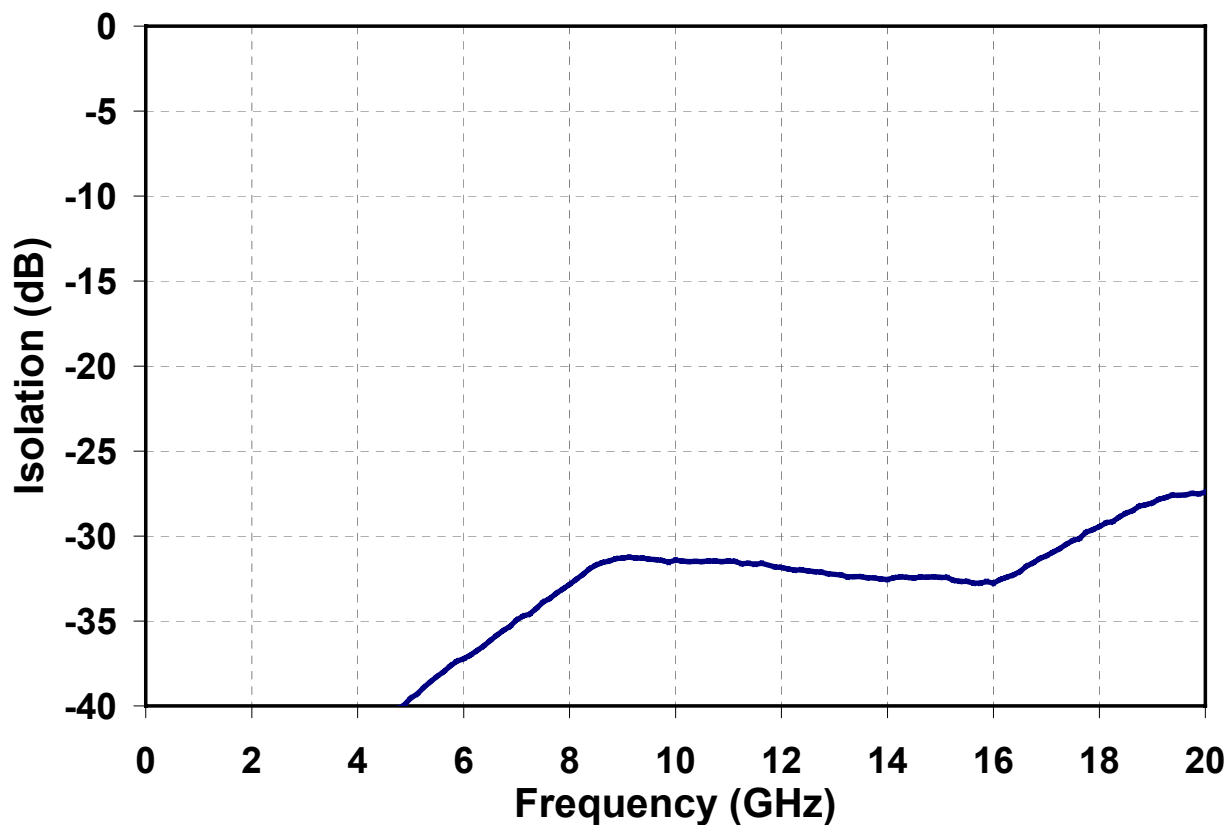
**TGS2306-EPU**



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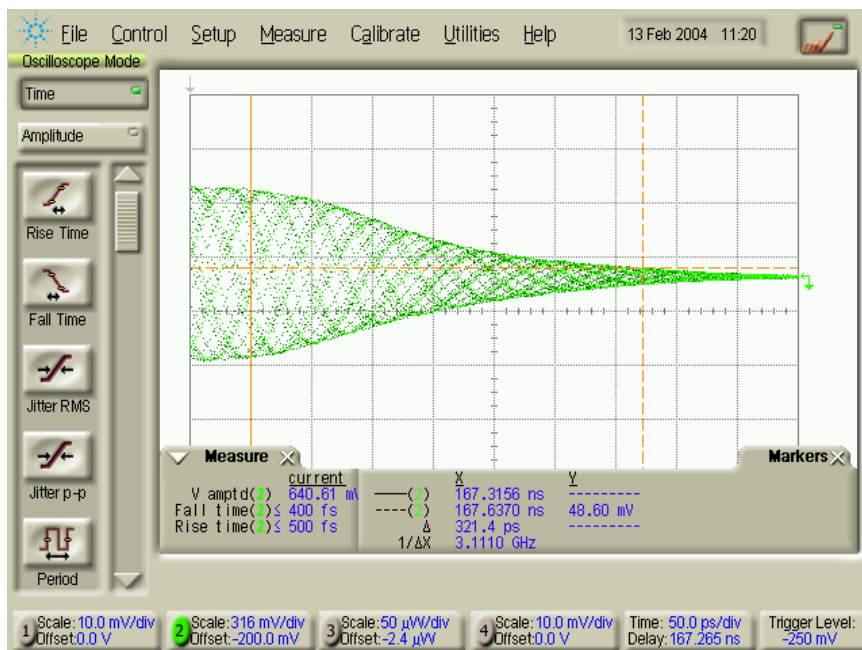
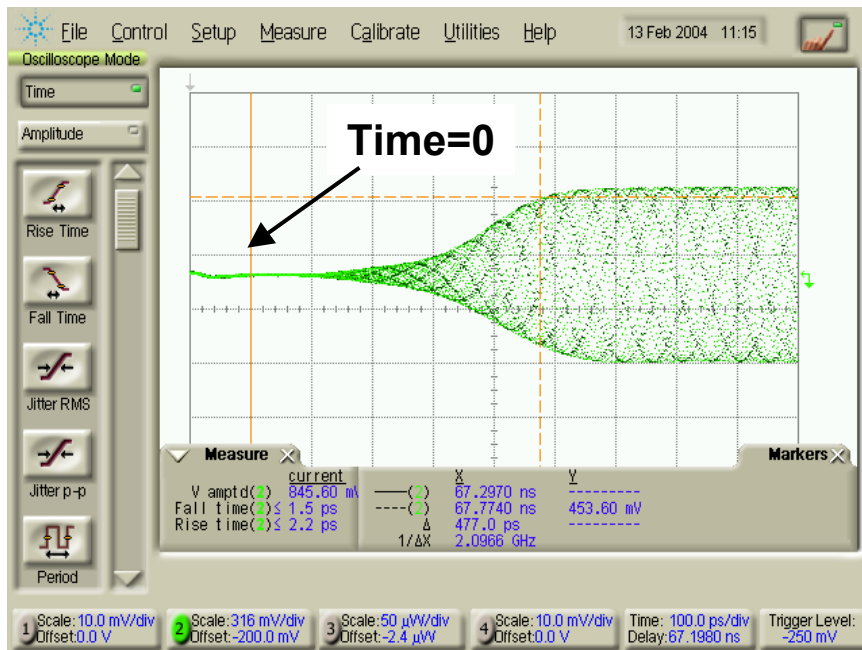
**Fixtured Measurement**

**TGS2306-EPU**



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## Switching Speed Measurements

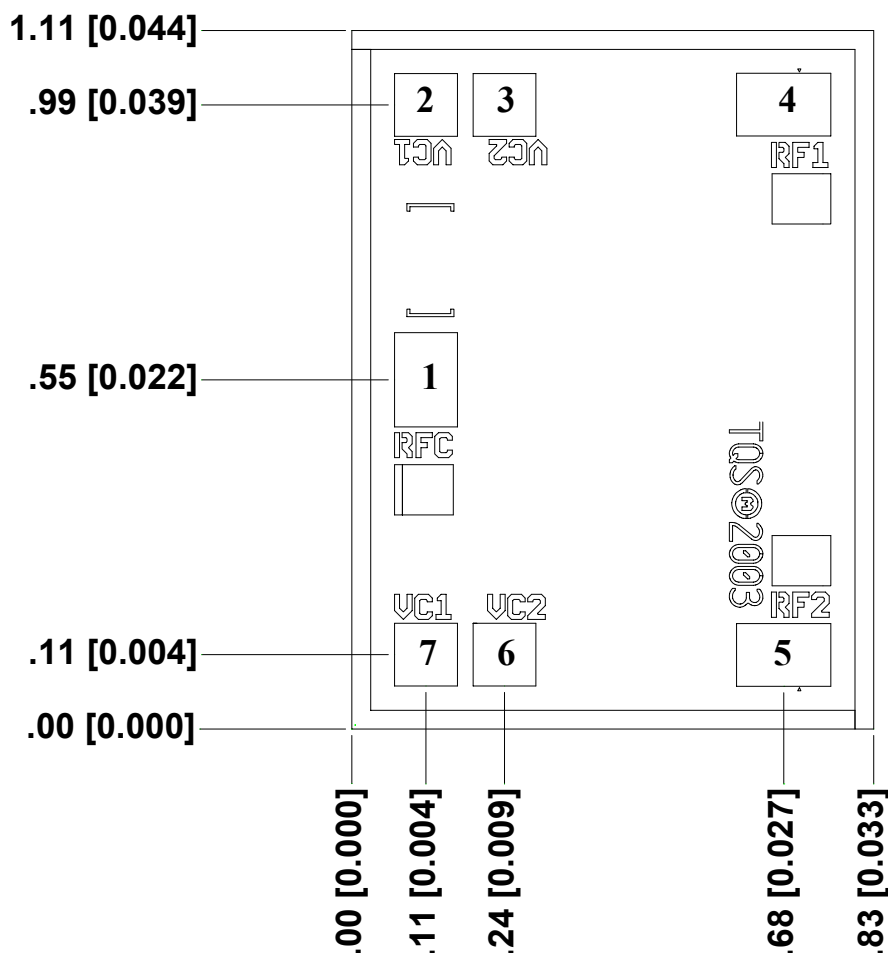


Measurement performed using a pulse generator with 100 psec rise/fall times driving 50 ohm transmission lines that were terminated in 50 ohms and attached to the VC1 and VC2 control inputs. Pulse generator provided complementary outputs.

*Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.*

## Mechanical Drawing

**TGS2306-EPU**



**Units: millimeters [inches]**

**Thickness: 0.10 [0.004] (reference only)**

**Chip edge to bond pad dimensions are shown to center of bond pads.**

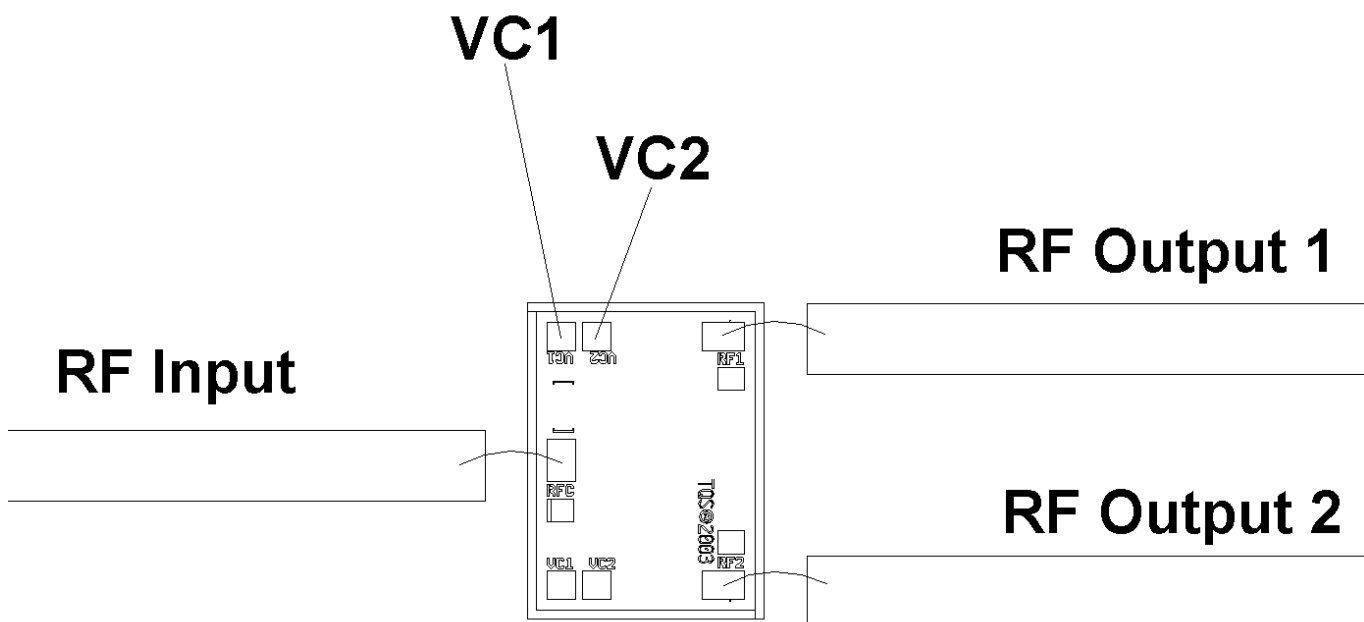
**Chip size tolerance:  $\pm 0.05$  [0.002]**

**RF ground through backside**

|                    |                    |                    |                        |
|--------------------|--------------------|--------------------|------------------------|
| <b>Bond Pad #1</b> | <b>RF Input</b>    | <b>0.10 x 0.20</b> | <b>[0.004 x 0.008]</b> |
| <b>Bond Pad #2</b> | <b>VC1</b>         | <b>0.10 x 0.10</b> | <b>[0.004 x 0.004]</b> |
| <b>Bond Pad #3</b> | <b>VC2</b>         | <b>0.10 x 0.10</b> | <b>[0.004 x 0.004]</b> |
| <b>Bond Pad #4</b> | <b>RF Output 1</b> | <b>0.20 x 0.10</b> | <b>[0.008 x 0.004]</b> |
| <b>Bond Pad #5</b> | <b>RF Output 2</b> | <b>0.20 x 0.10</b> | <b>[0.008 x 0.004]</b> |
| <b>Bond Pad #6</b> | <b>VC2</b>         | <b>0.10 x 0.10</b> | <b>[0.004 x 0.004]</b> |
| <b>Bond Pad #7</b> | <b>VC1</b>         | <b>0.10 x 0.10</b> | <b>[0.004 x 0.004]</b> |

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## Chip Assembly & Bonding Diagram



For optimum insertion loss and return loss, a single 0.001" bondwire of length 35 mils should be used. This will be approximately 0.42nH. Differences in bondwire length will have an impact on switch performance.

$V_{C1}$  &  $V_{C2}$  can be applied from either side of the MMIC.

DC blocks are required for the RF input and output.

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

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## **Assembly Process Notes**

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300°C. (30 seconds maximum)
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- No fluxes should be utilized.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.
- Microwave or radiant curing should not be used because of differential heating.
- Coefficient of thermal expansion matching is critical.

Interconnect process assembly notes:

- Thermosonic ball bonding is the preferred interconnect technique.
- Force, time, and ultrasonics are critical parameters.
- Aluminum wire should not be used.
- Maximum stage temperature is 200°C.

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

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