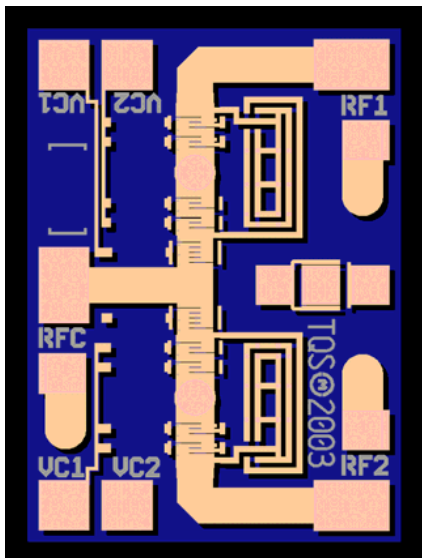


High Power DC - 18GHz SPDT FET Switch TGS2306-EPU

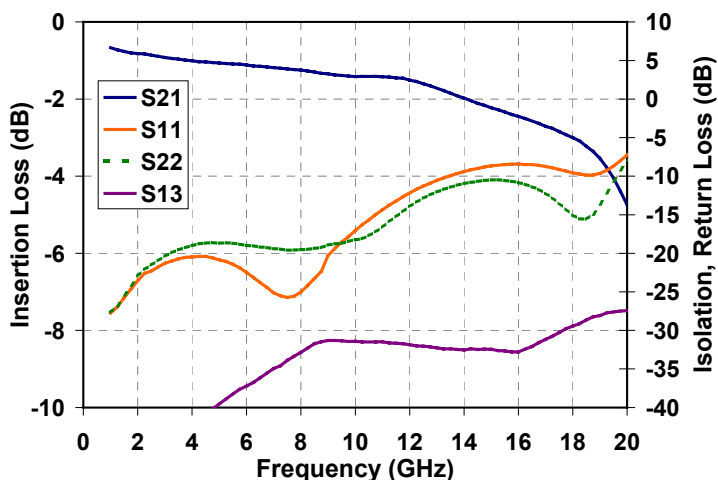


Key Features and Performance

- 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 μ 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 _C	Control Voltage	-7 V	<u>1/</u> <u>2/</u>
I _C	Control Current	2.25 mA	<u>1/</u> <u>2/</u>
P _{IN}	Input Continuous Wave Power	TBD	<u>1/</u> <u>2/</u>
P _D	Power Dissipation	TBD	<u>1/</u> <u>2/</u> <u>3/</u>
T _{CH}	Operating Channel Temperature	150 °C	<u>4/</u>
T _M	Mounting Temperature (30 Seconds)	320 °C	
T _{STG}	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_D 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.

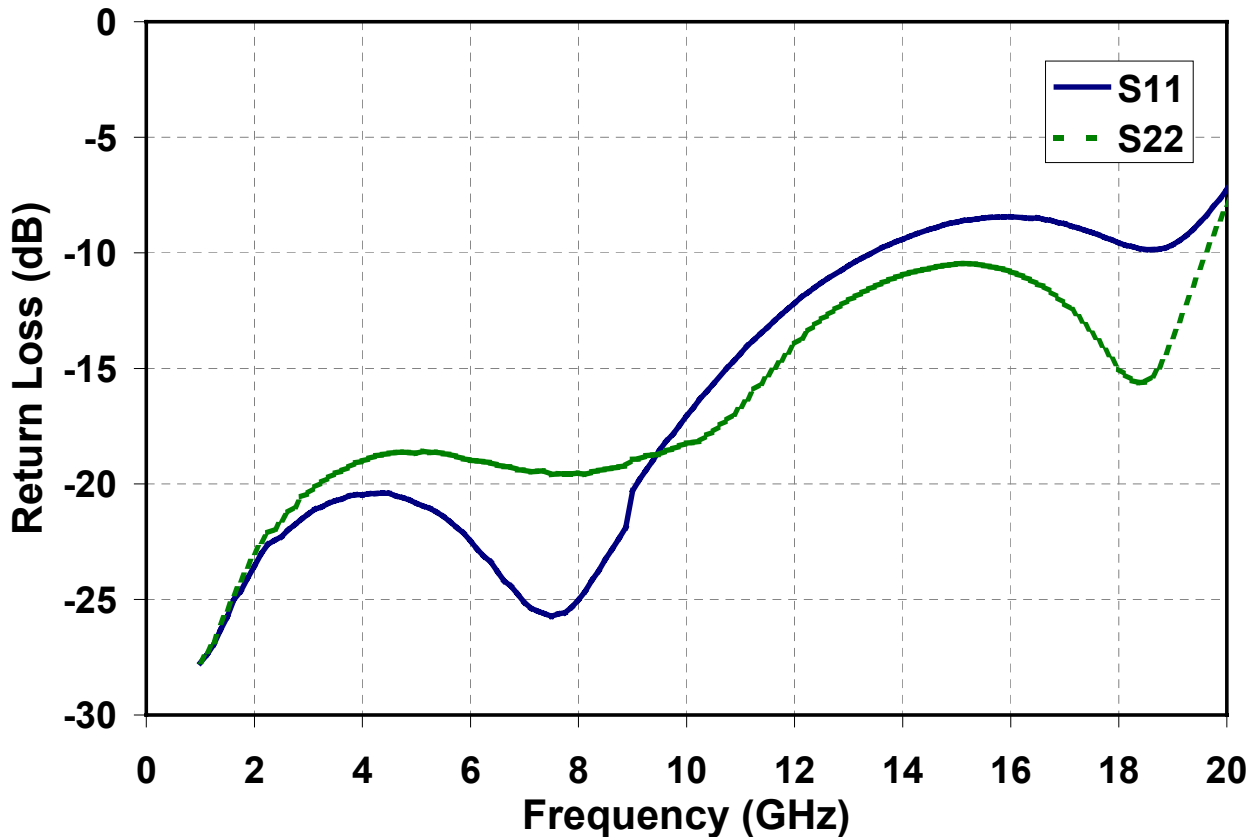
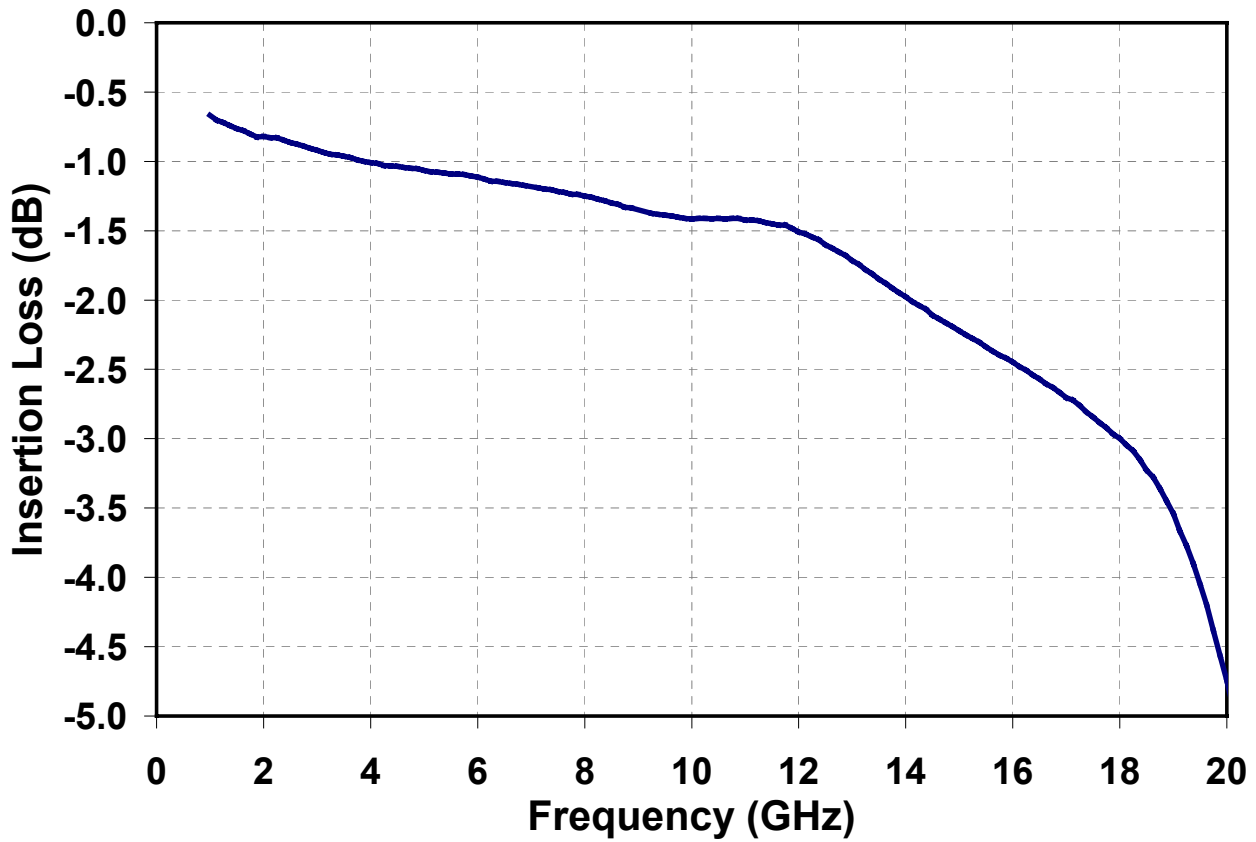
**TABLE II
TRUTH TABLE**

Selected RF Output	V _{C1}	V _{C2}
RF Out 1	0 V	-5 V
RF Out 2	-5 V	0 V

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.

Fixtured Measurement

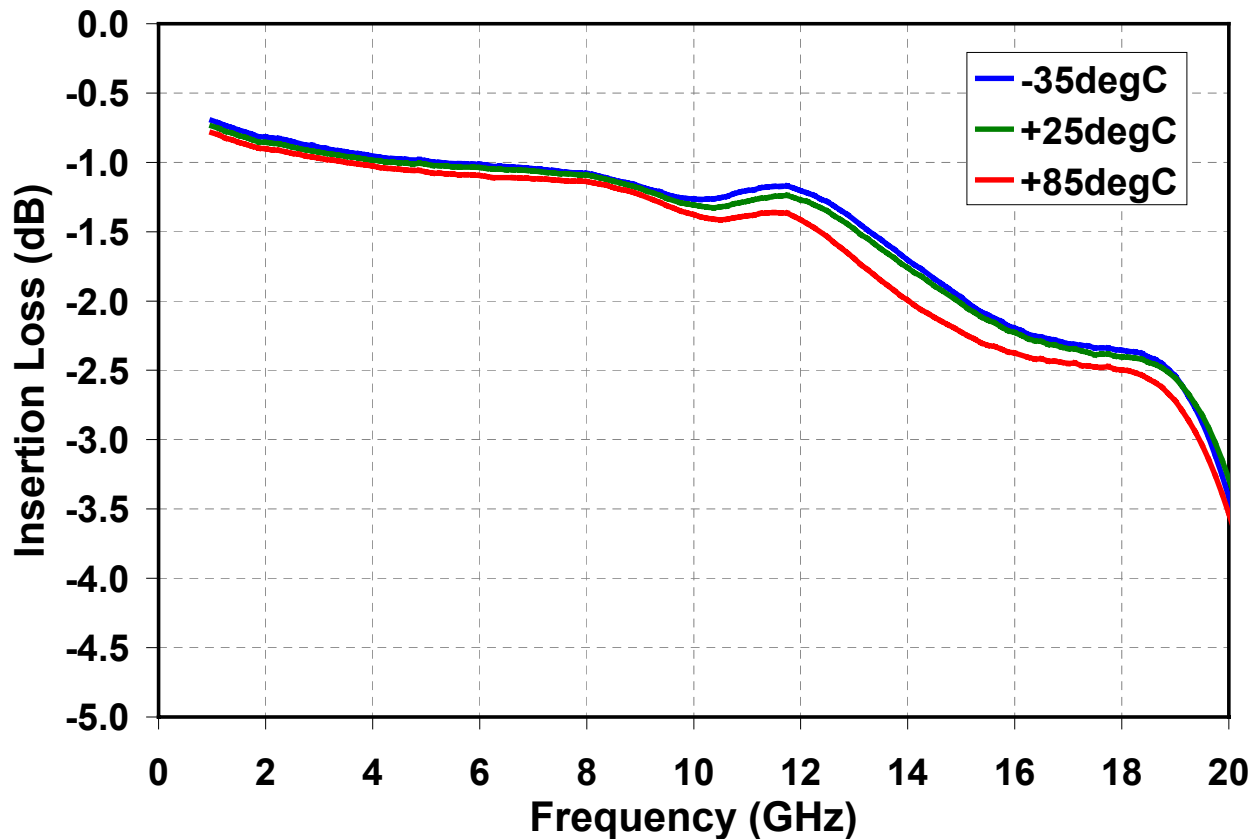
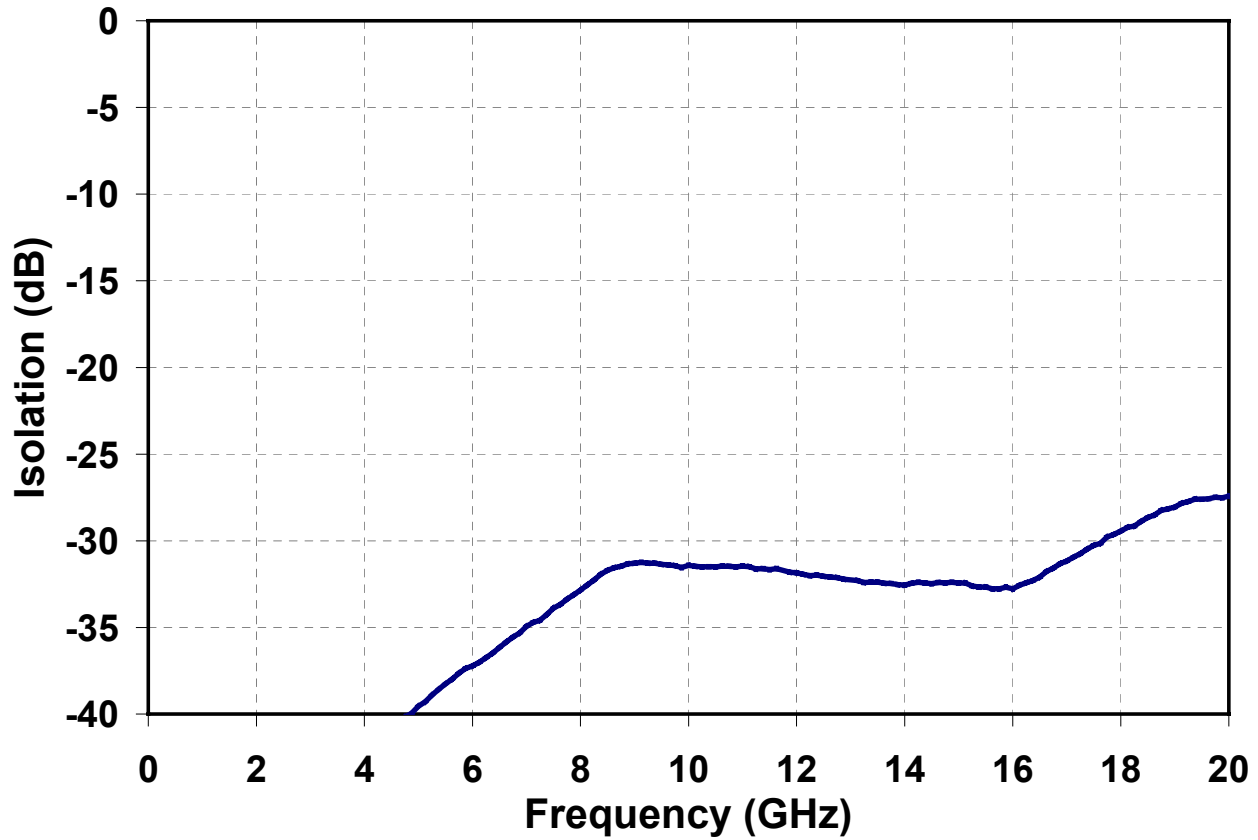
TGS2306-EPU



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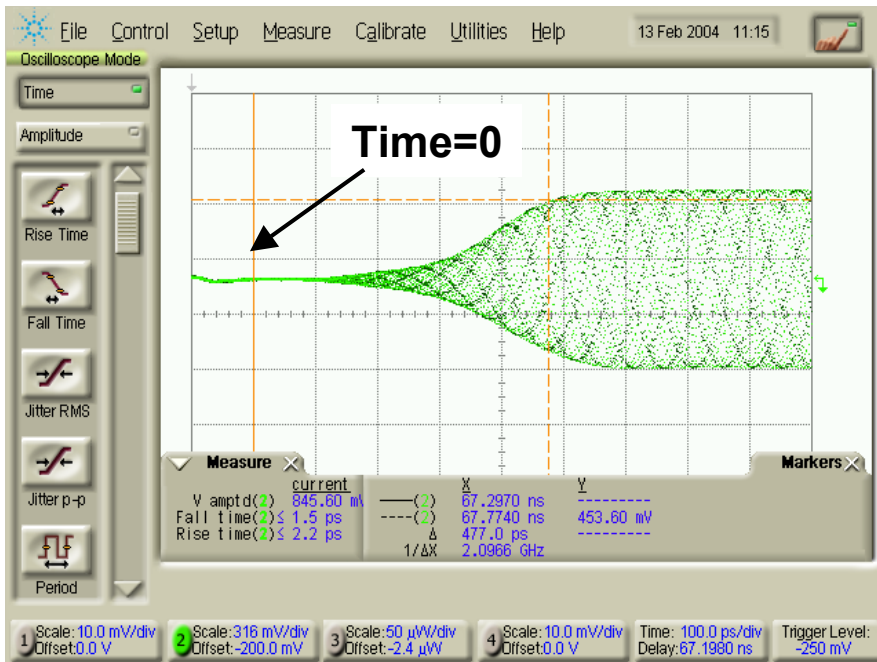
Fixtured Measurement

TGS2306-EPU



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.

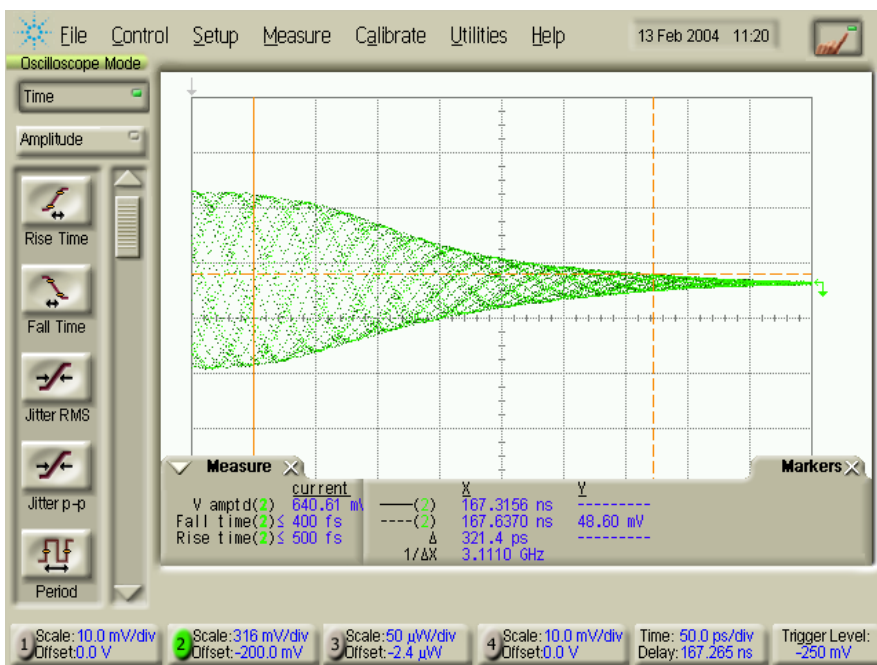
Switching Speed Measurements



Off to On

**50% Control
Signal to 90%
RF = 480 psec**

100 psec/div



On to Off

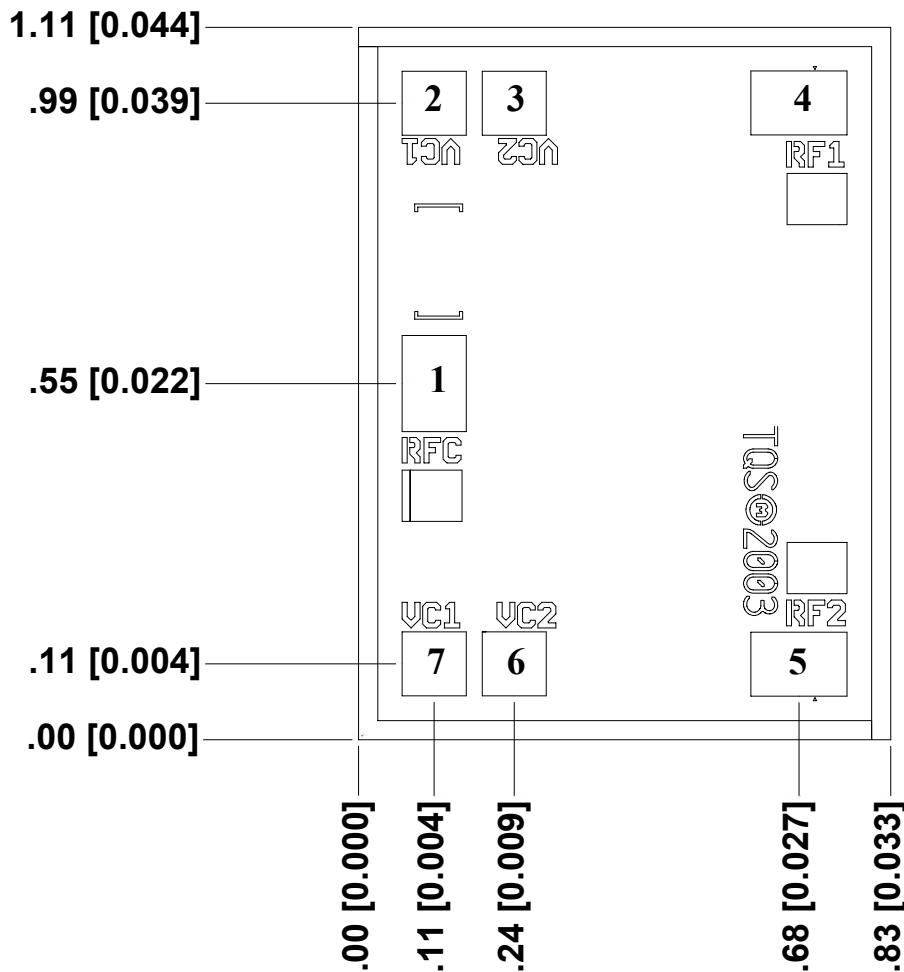
**50% Control
Signal to 10%
RF = 320 psec**

50 psec/div

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



Units: millimeters [inches]

Thickness: 0.10 [0.004] (reference only)

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

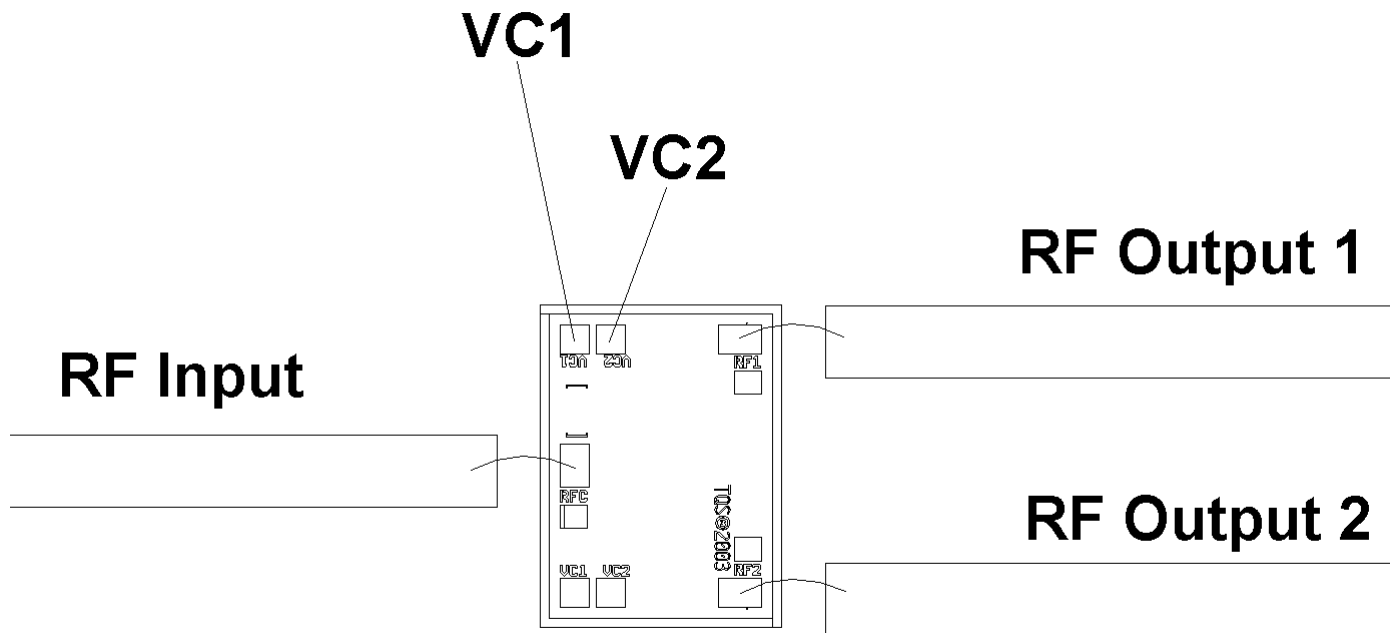
Chip size tolerance: ±0.05 [0.002]

RF ground through backside

Bond Pad #1	RF Input	0.10 x 0.20	[0.004 x 0.008]
Bond Pad #2	VC1	0.10 x 0.10	[0.004 x 0.004]
Bond Pad #3	VC2	0.10 x 0.10	[0.004 x 0.004]
Bond Pad #4	RF Output 1	0.20 x 0.10	[0.008 x 0.004]
Bond Pad #5	RF Output 2	0.20 x 0.10	[0.008 x 0.004]
Bond Pad #6	VC2	0.10 x 0.10	[0.004 x 0.004]
Bond Pad #7	VC1	0.10 x 0.10	[0.004 x 0.004]

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.

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.

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.

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.

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.