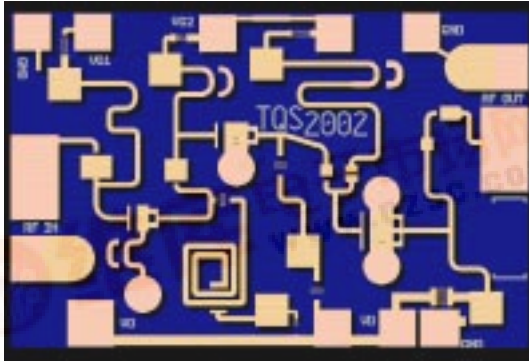




# Advance Product Information July 19, 2005

## K Band Low Noise Amplifier

## TGA4506

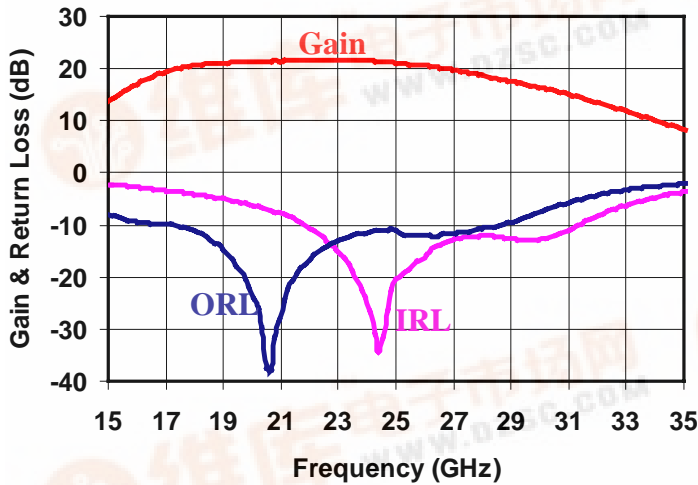


### Key Features

- Typical Frequency Range: 20 - 27 GHz
- 21 dB Nominal Gain
- 2.2 dB Nominal Noise Figure
- 12 dBm Nominal P1dB
- Bias 3.5 V, 60 mA
- 0.15 um 3MI pHEMT Technology
- Chip Dimensions 1.2 x 0.8 x 0.1 mm  
(0.047 x 0.031 x 0.004) in

### Preliminary Measured Data

Bias Conditions:  $V_d = 3.5\text{ V}$ ,  $I_d = 60\text{ mA}$



### Primary Applications

- Point-to-Point Radio
- Point-to-MultiPoint Radio
- LMDS

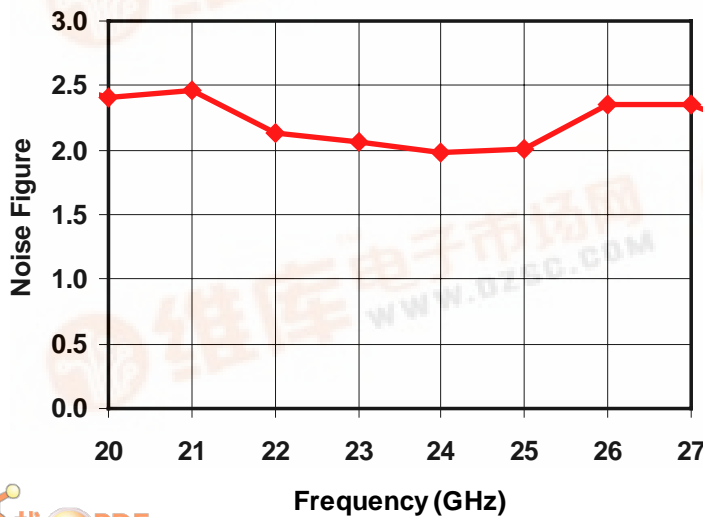


TABLE I  
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
V <sub>d</sub>	Drain Voltage	5 V	<u>2/</u>
V <sub>g</sub>	Gate Voltage Range	-1 TO +0.5 V	
I <sub>d</sub>	Drain Current	190 mA	<u>2/ 3/</u>
I <sub>g</sub>	Gate Current	6 mA	<u>3/</u>
P <sub>IN</sub>	Input Continuous Wave Power	TBD	
P <sub>D</sub>	Power Dissipation	TBD	<u>2/ 4/</u>
T <sub>CH</sub>	Operating Channel Temperature	150 °C	<u>5/ 6/</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/ Total current for the entire MMIC.
- 4/ When operated at this bias condition with a base plate temperature of TBD, the median life is reduced from TBD to TBD hrs.
- 5/ 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.
- 6/ These ratings apply to each individual FET.

**TABLE II**  
**DC PROBE TESTS**  
(Ta = 25 °C Nominal)

SYMBOL	PARAMETER	MINIMUM	MAXIMUM	VALUE
V <sub>P3</sub>	Pinch-off Voltage	-1.0	-0.1	V

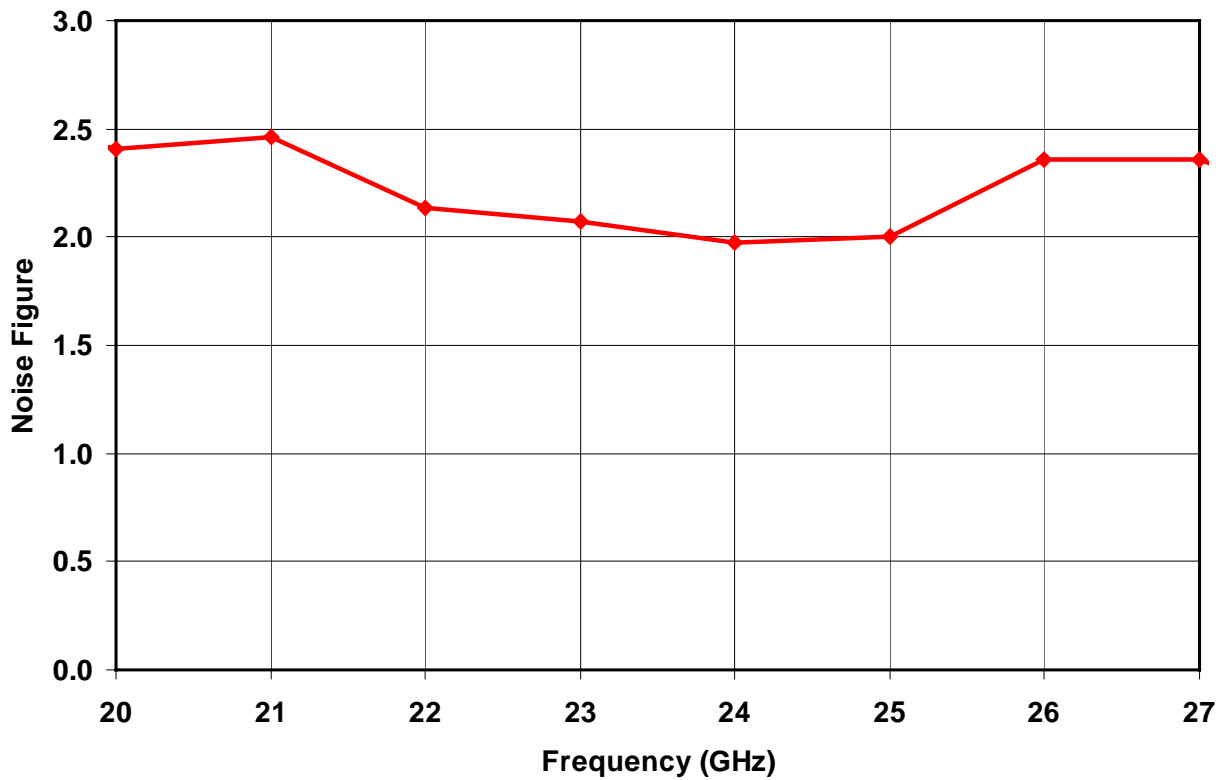
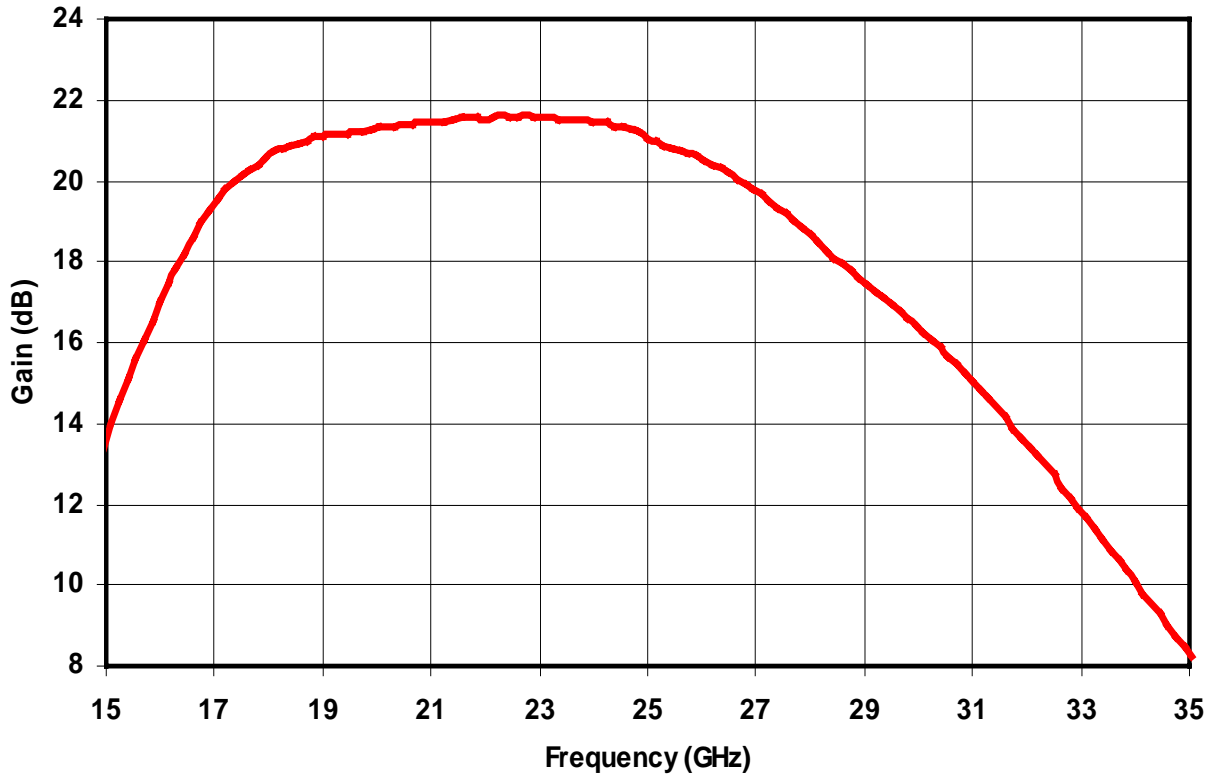
Q3 is 300 um FET

**TABLE III**  
**ELECTRICAL CHARACTERISTICS**  
(Ta = 25 °C Nominal)

PARAMETER	TYPICAL	UNITS
Drain Voltage, Vd	3.5	V
Drain Current, Id	60	mA
Gate Voltage, Vg	-0.5 to 0	V
Small Signal Gain, S21	21	dB
Input Return Loss, S11	15	dB
Output Return Loss, S22	11	dB
Noise Figure, NF	2.2	dB
Output Power @ 1 dB Compression Gain, P1dB	12	dBm

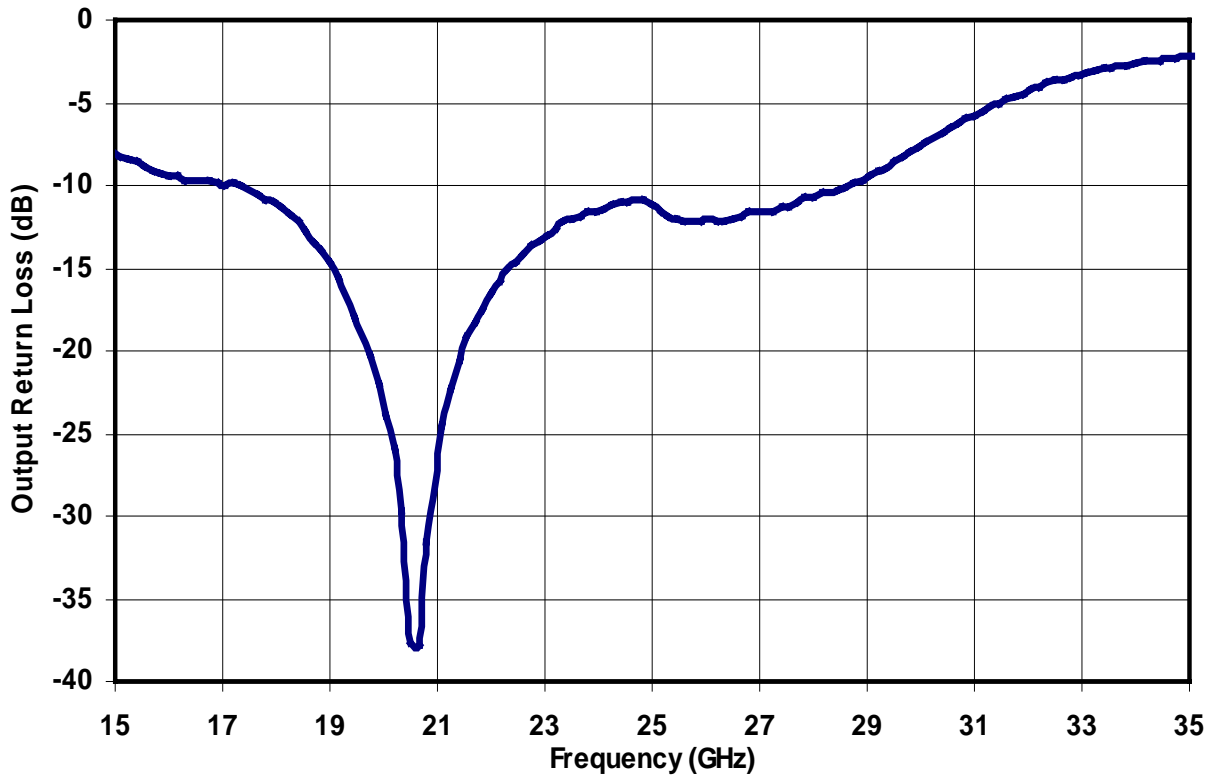
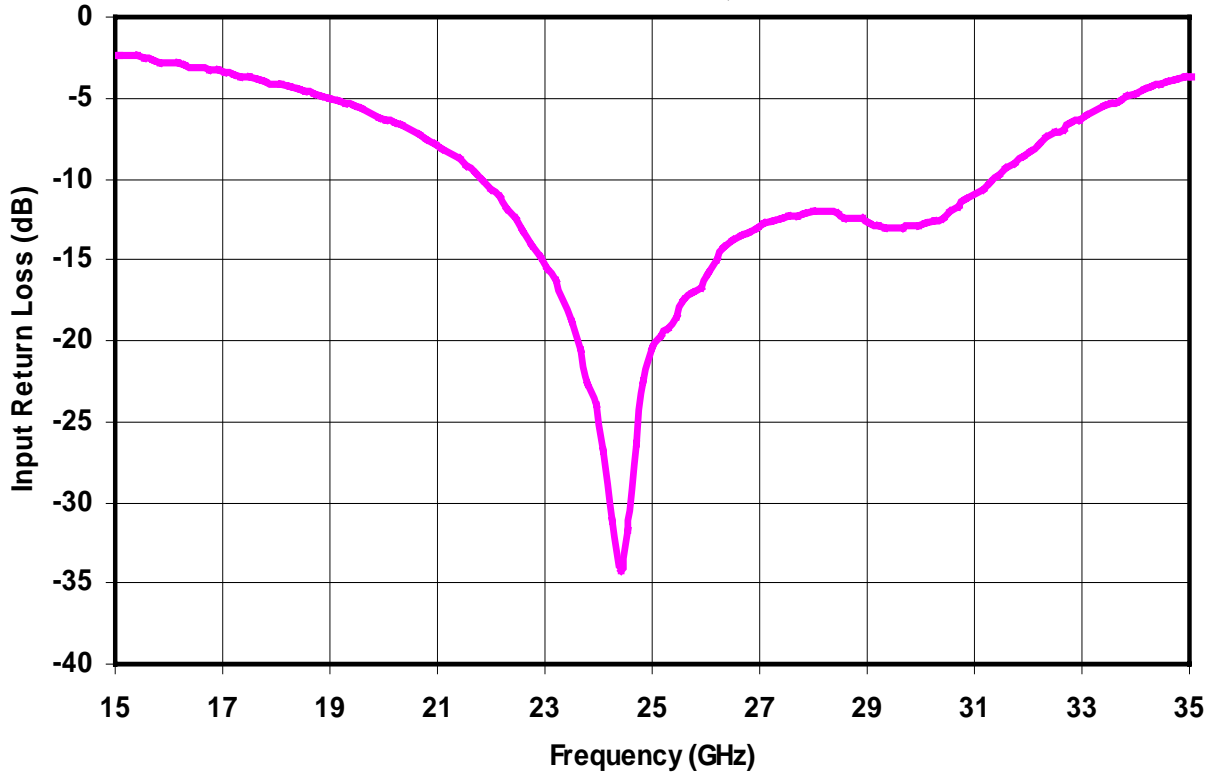
### Measured Data

Bias Conditions:  $V_d = 3.5\text{ V}$ ,  $I_d = 60\text{ mA}$



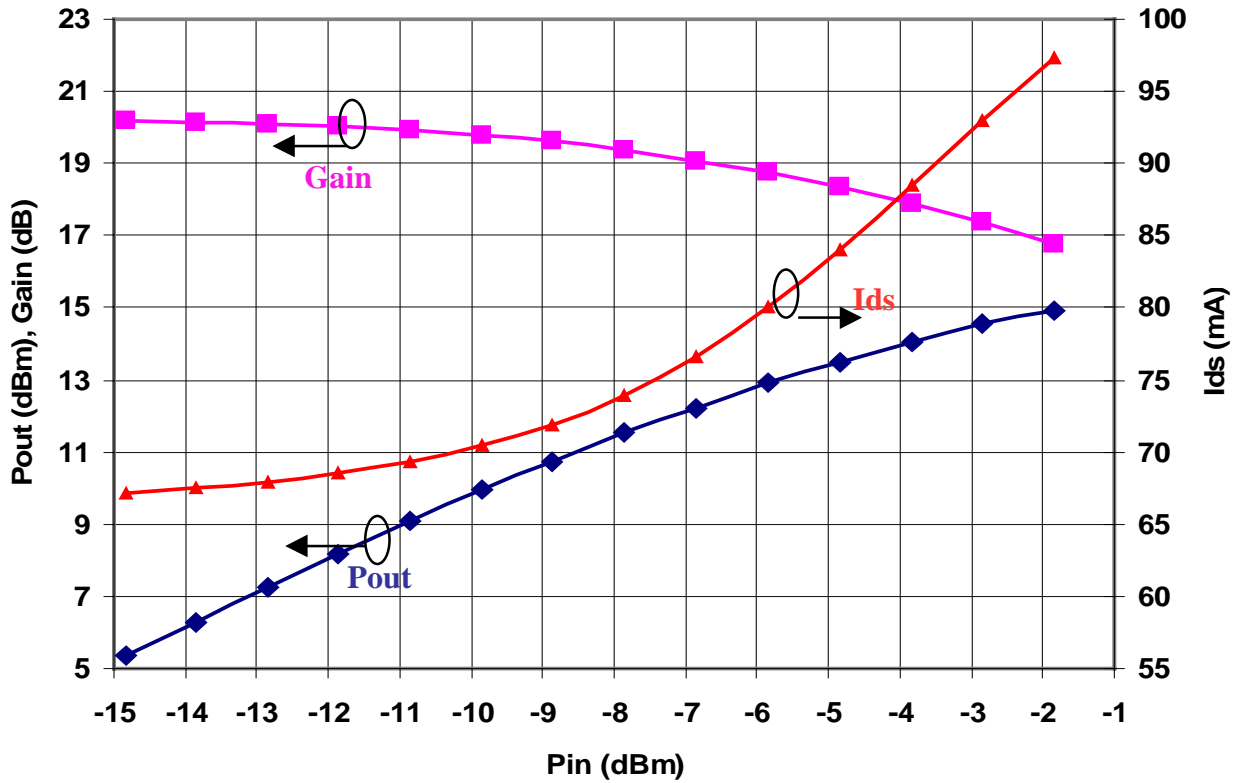
### Measured Data

Bias Conditions:  $V_d = 3.5\text{ V}$ ,  $I_d = 60\text{ mA}$

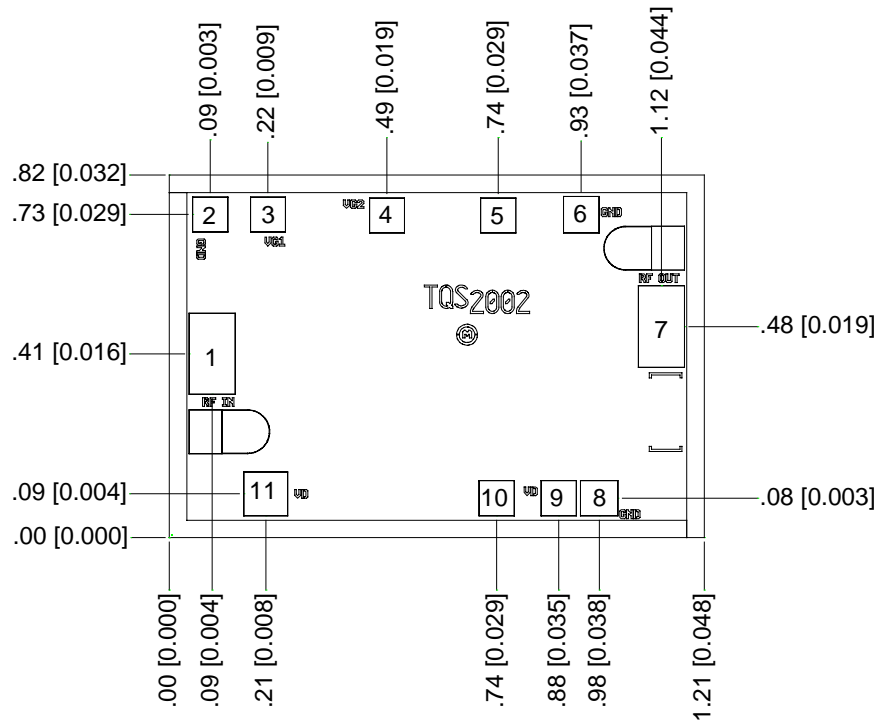


**Measured Data**

Bias Conditions:  $V_d = 3.5\text{ V}$ ,  $I_d = 60\text{ mA}$ , Freq @ 24 GHz



**Mechanical Drawing**

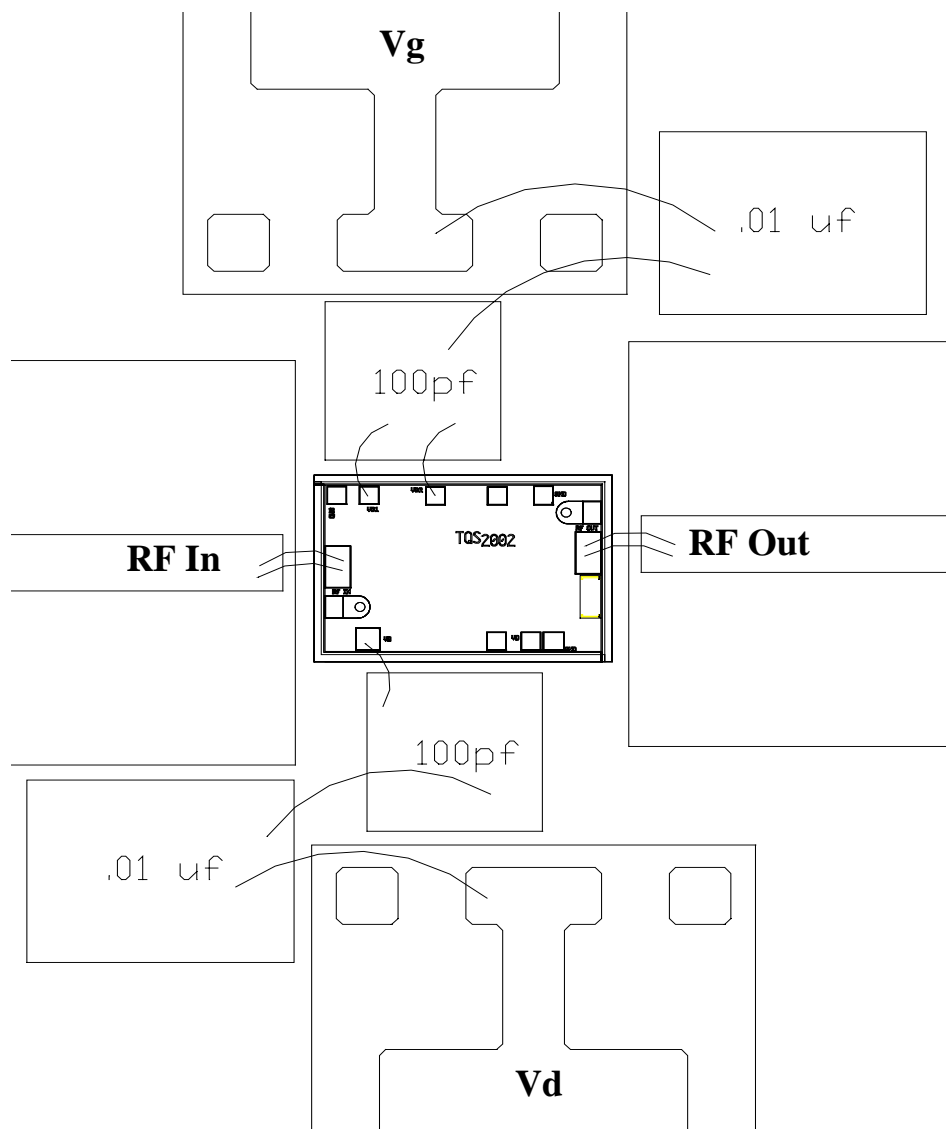


Units: millimeters [inches]  
 Thickness: 0.10 [0.004] (reference only)  
 Chip edge to bond pad dimensions are shown to center of bond pads.  
 Chip size tolerance:  $\pm 0.05$  [0.002]  
 RF ground through backside

Bond Pad #1	<b>RF Input</b>	0.11 x 0.19	[0.004 x 0.007]
Bond Pad #2	<b>N/C</b>	0.08 x 0.08	[0.003 x 0.003]
Bond Pad #3	<b>VG1</b>	0.08 x 0.08	[0.003 x 0.003]
Bond Pad #4	<b>VG2</b>	0.08 x 0.08	[0.003 x 0.003]
Bond Pad #5	<b>N/C</b>	0.08 x 0.08	[0.003 x 0.003]
Bond Pad #6	<b>N/C</b>	0.08 x 0.08	[0.003 x 0.003]
Bond Pad #7	<b>RF Output</b>	0.11 x 0.19	[0.004 x 0.007]
Bond Pad #8	<b>N/C</b>	0.09 x 0.08	[0.004 x 0.003]
Bond Pad #9	<b>VD</b>	0.09 x 0.08	[0.004 x 0.003]
Bond Pad #10	<b>VD</b>	0.09 x 0.08	[0.004 x 0.003]
Bond Pad #11	<b>VD</b>	0.10 x 0.10	[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.**

### Chip Assembly Diagram



All three Vd pads (pad # 9, 10, 11 from mechanical drawing) do not need to be connected

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



## **Assembly Process Notes**

### Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300°C (30 seconds max).
- 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.***