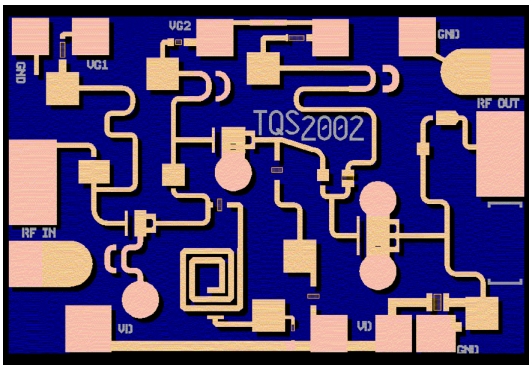
TriQuint SEMICONDUCTOR

TGA4506

K Band Low Noise Amplifier

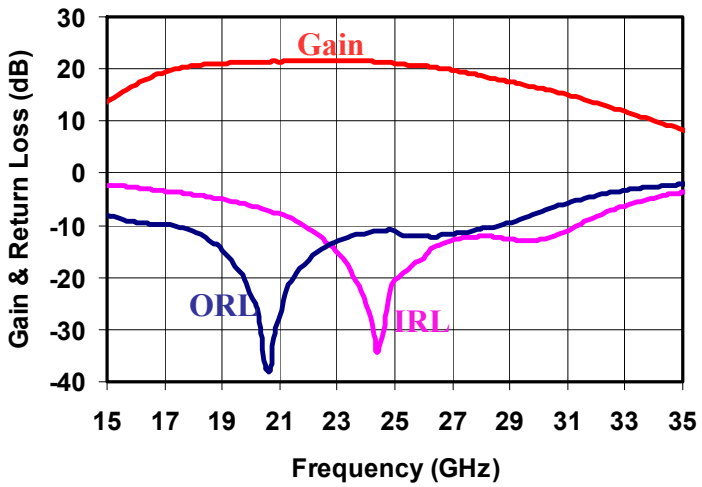


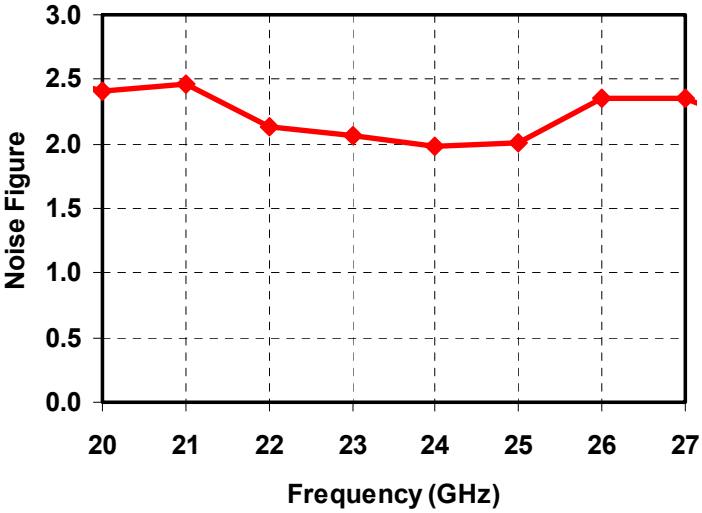
Key Features

- 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: Vd = 3.5 V, Id = 60 mA





Primary Applications

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

TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
Vd	Drain Voltage	5 V	2/
Vg	Gate Voltage Range	-1 TO +0.5 V	
Id	Drain Current	190 mA	2/ 3/
$\|Ig\|$	Gate Current	6 mA	3/
P_{IN}	Input Continuous Wave Power	12 dBm	
P_D	Power Dissipation	0.95 W	2/ 4/
T_{CH}	Operating Channel Temperature	200°C	5/ 6/
	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.

3/ Total current for the entire MMIC.

4/ When operated at this bias condition with a base plate temperature of 70 °C, the median life is reduced to 1.9E3 hrs.

5/ Junction operating temperature will directly affect the device median time to failure (Tm). 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 ^{0}C Nominal)

SYMBOL	PARAMETER	MINIMUM	MAXIMUM	VALUE
V_{P3}	Pinch-off Voltage	-1.0	-0.1	V

Q3 is 300 um FET

TABLE III
ELECTRICAL CHARACTERISTICS
(Ta = 25 ^{0}C Nominal)

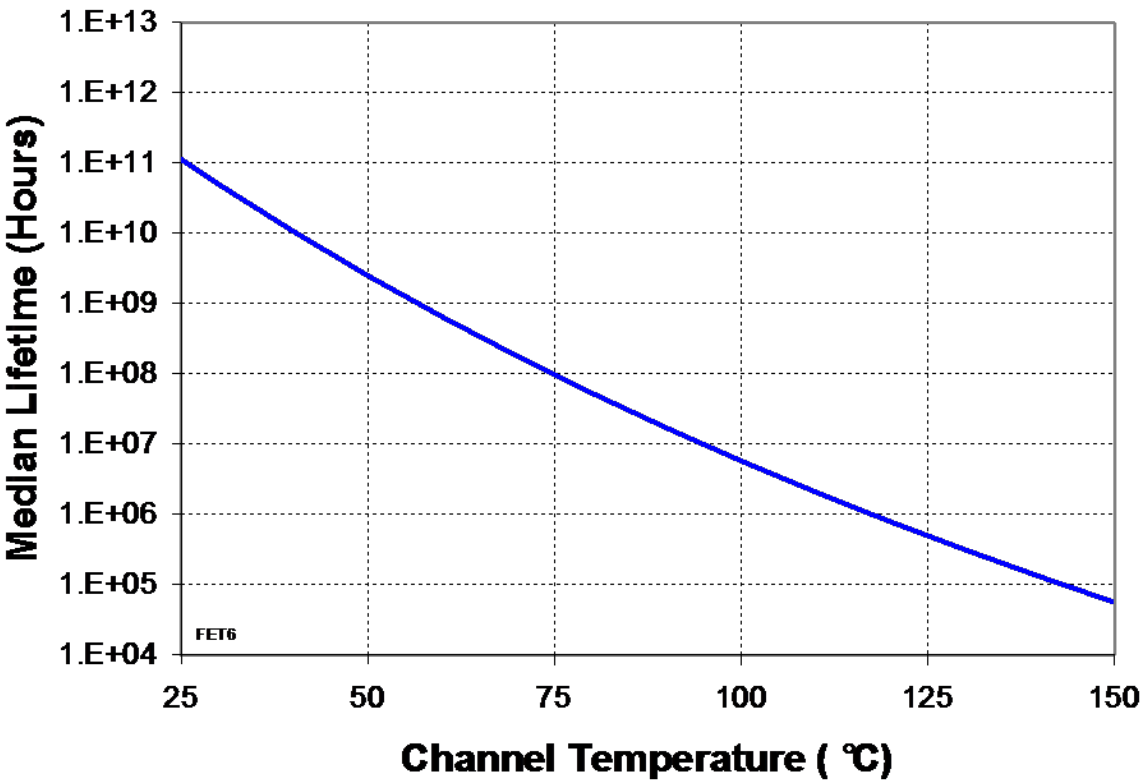
PARAMETER	TYPICAL	UNITS
Drain Voltage, Vd	3.5	V
Drain Current, Id	60	mA
Gate Voltage, Vg	-0.5 to 0	V
Small Signal Gain, S21	21	dB
Input Return Loss, S11	15	dB
Output Return Loss, S22	11	dB
Noise Figure, NF	2.2	dB
Output Power @ 1 dB Compression Gain, P1dB	12	dBm

TABLE IV
THERMAL INFORMATION

PARAMETER	TEST CONDITIONS	T_{CH} (°C)	θ_{JC} (°C/W)	Tm (HRS)
θ_{JC} Thermal Resistance (channel to Case)	Vd = 3.5 V Id = 60 mA Pdiss = 0.21 W	98	133	7.2E+6

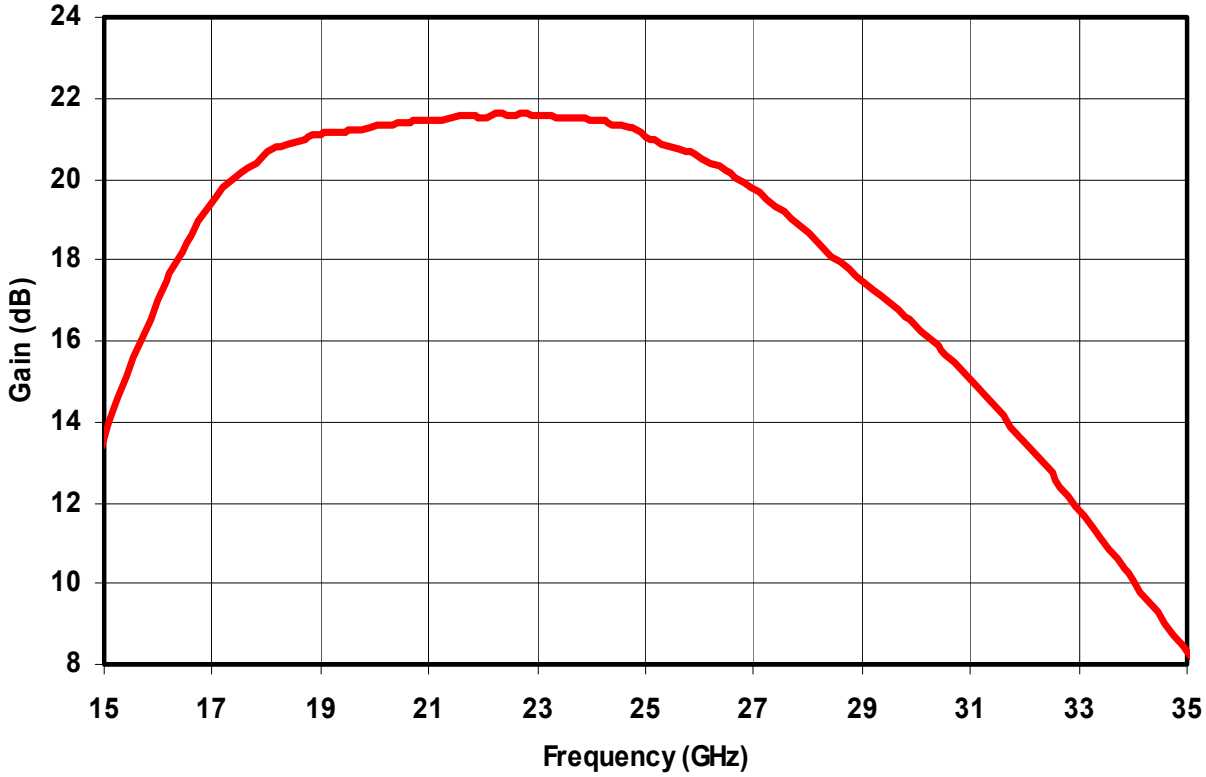
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

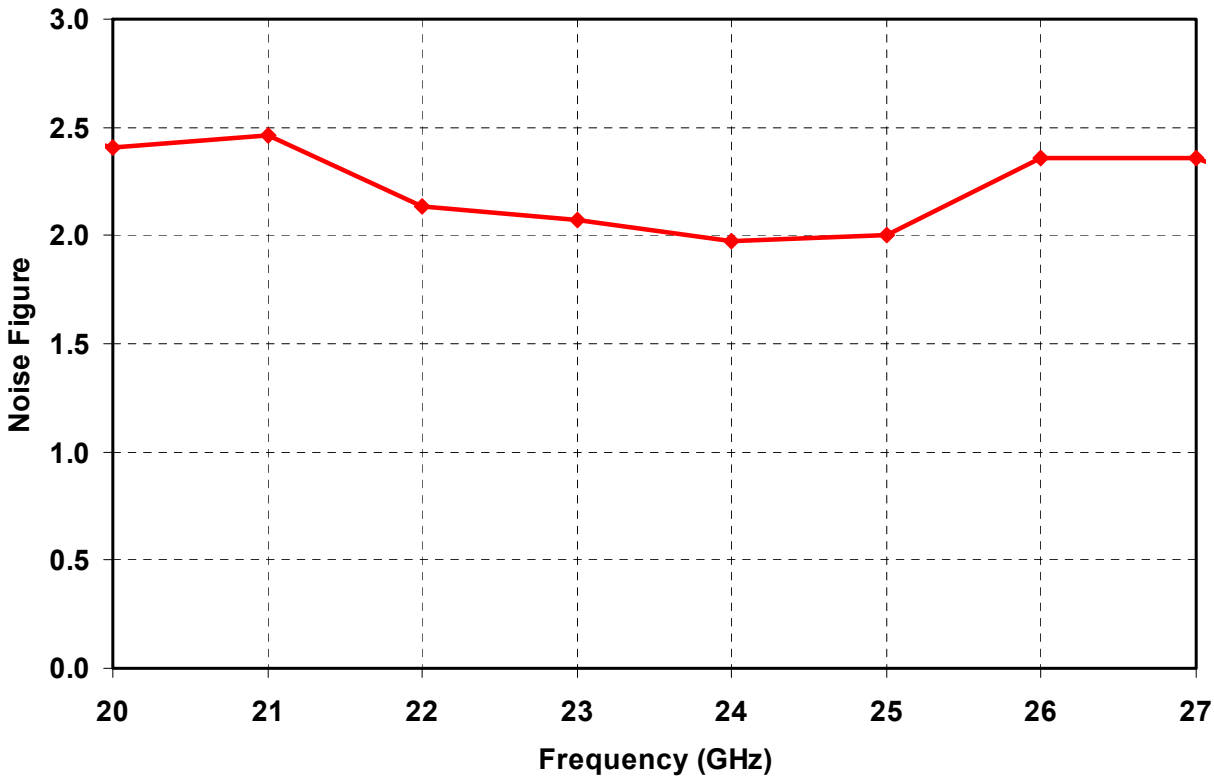
Median Lifetime (Tm) vs. Channel Temperature



Measured Data

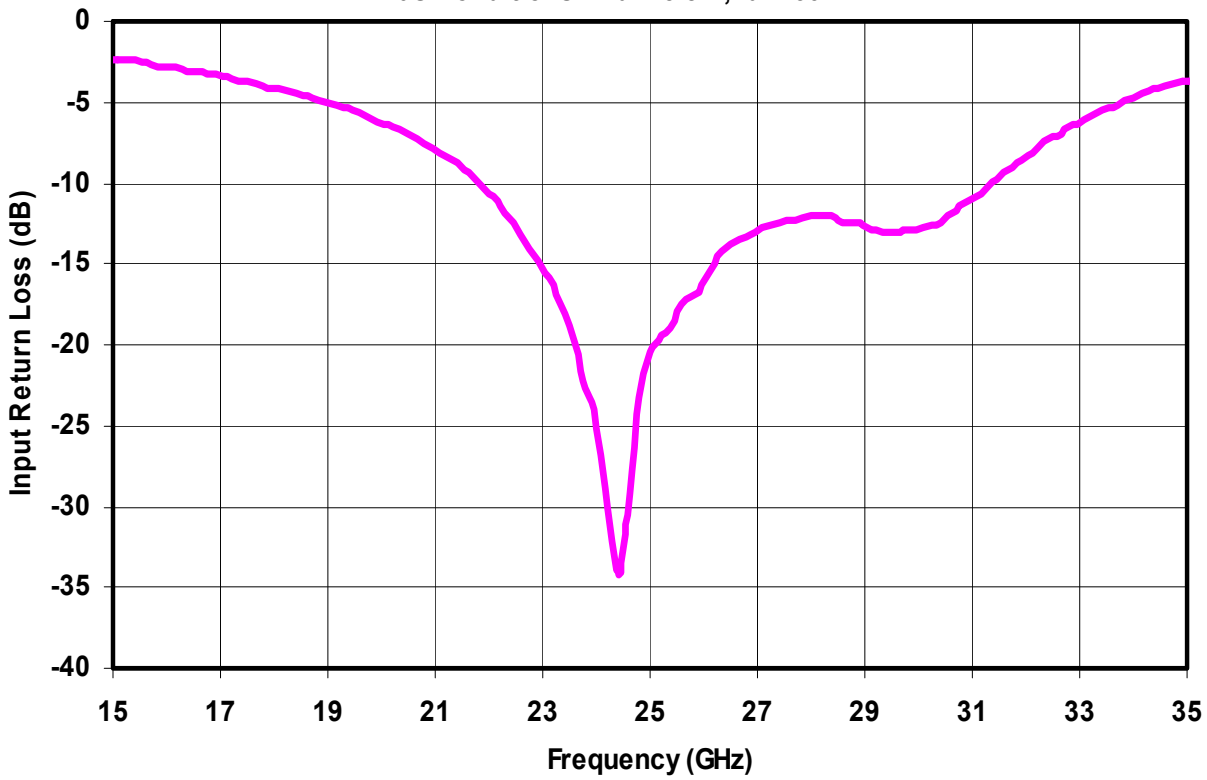
Bias Conditions: Vd = 3.5 V, Id = 60 mA

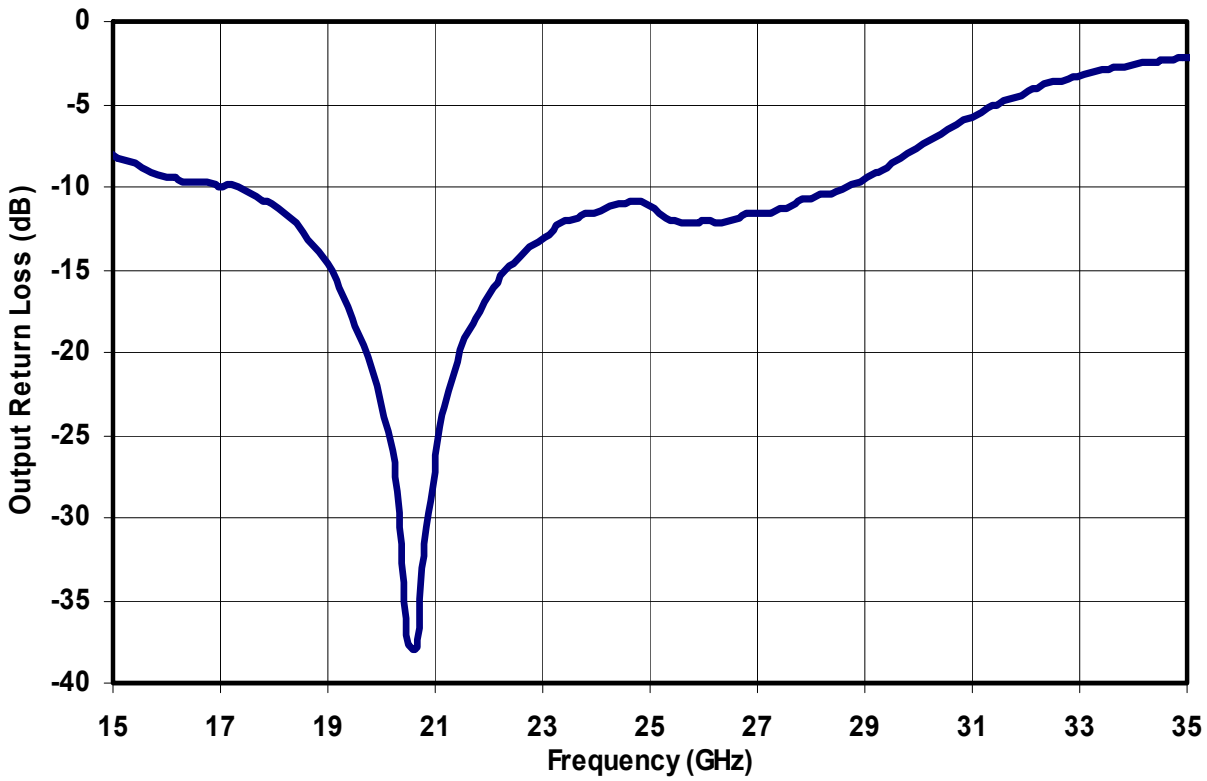




Measured Data

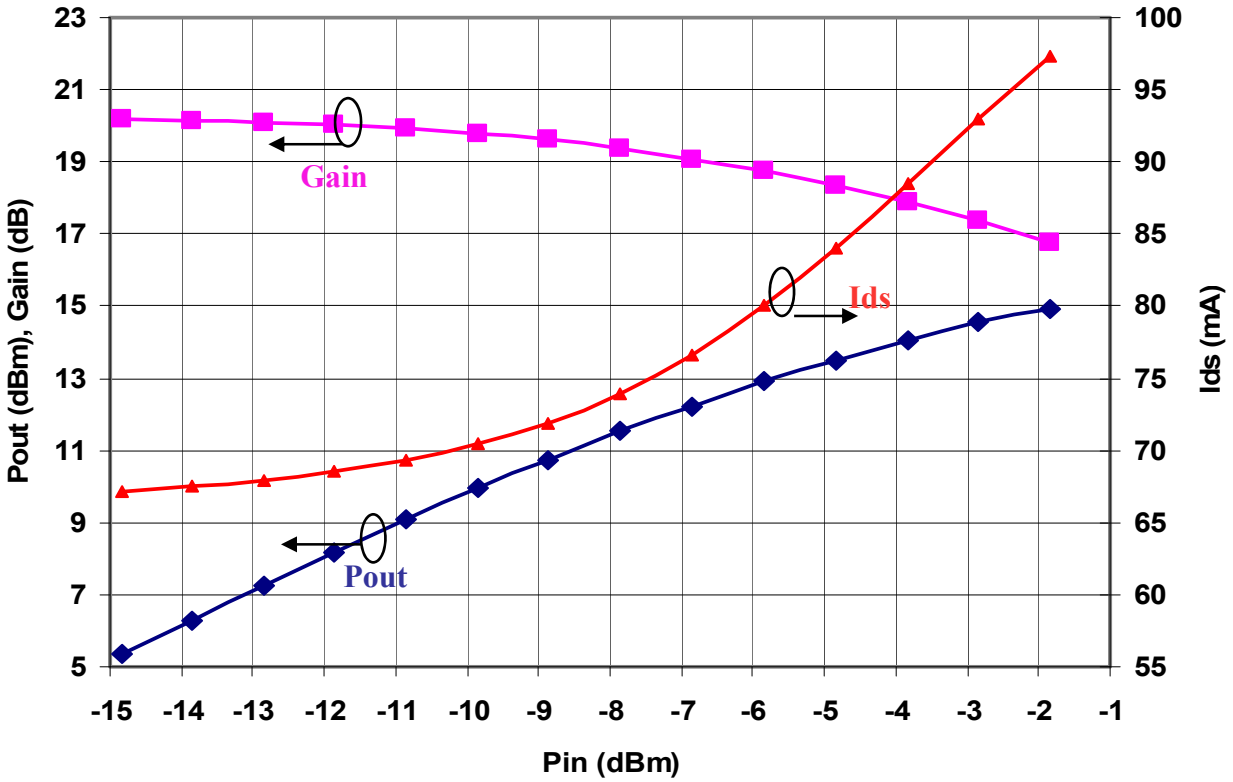
Bias Conditions: Vd = 3.5 V, Id = 60 mA



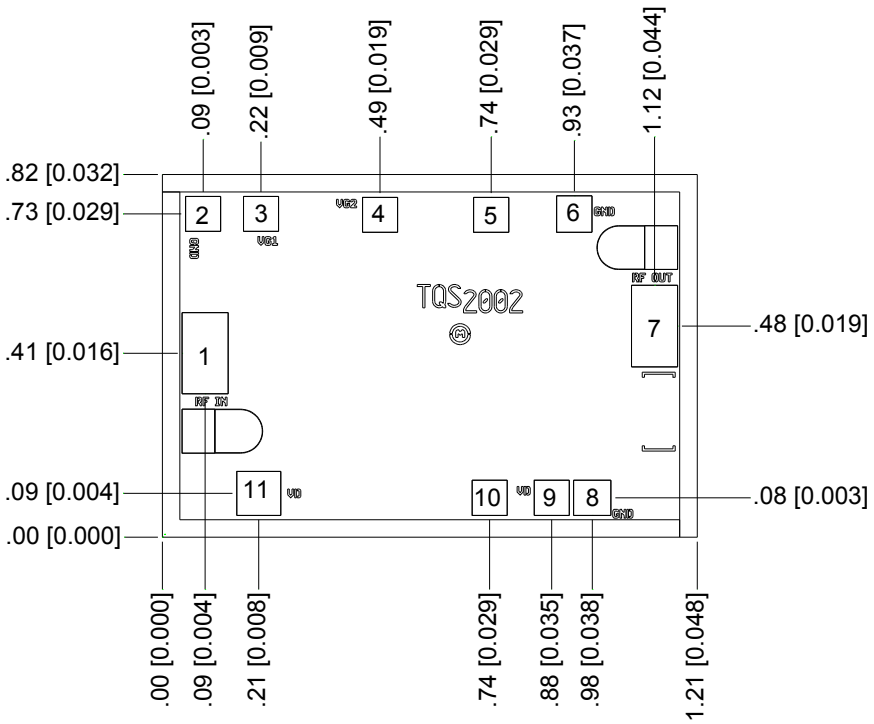


Measured Data

Bias Conditions: Vd = 3.5 V, Id = 60 mA, Freq @ 24 GHz



Mechanical Drawing

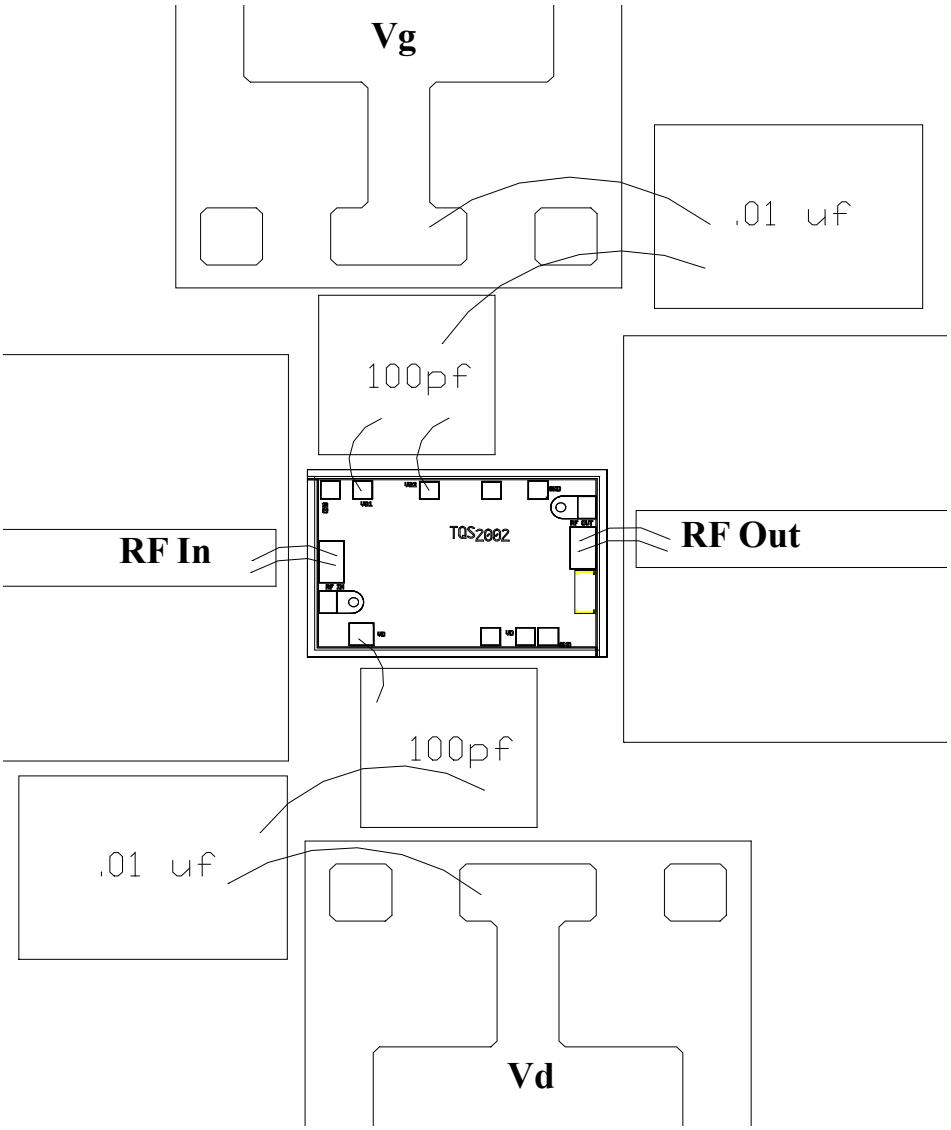


Units: millimeters [inches]
Thickness: 0.10 [0.004] (reference only)
Chip edge to bond pad dimensions are shown to center of bond pads.
Chip size tolerance: ±0.05 [0.002]
RF ground through backside

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

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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 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.

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