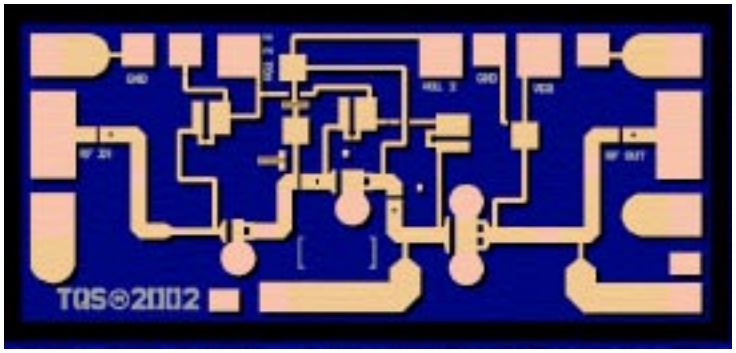
Ka Band Low Noise Amplifier

TGA4508

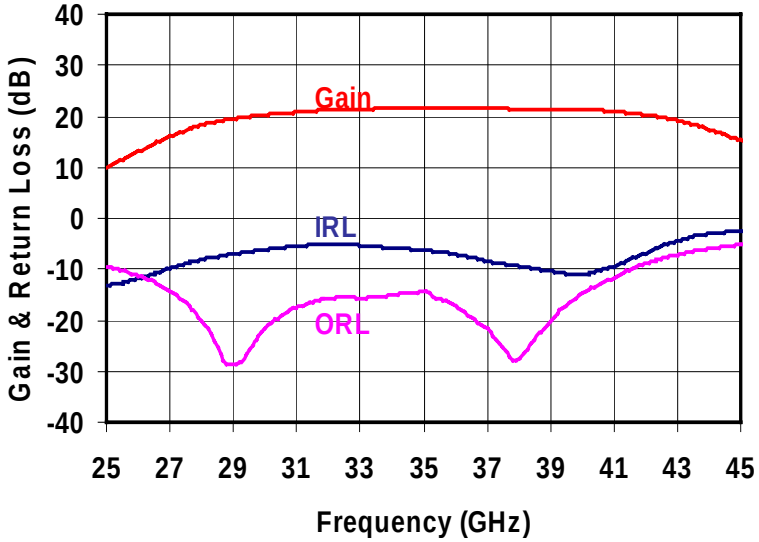


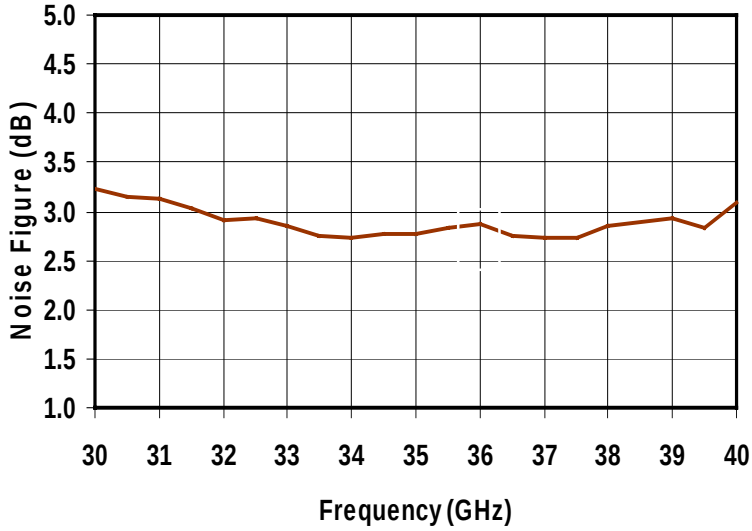
Key Features

- Typical Frequency Range: 30 - 42 GHz
- 21 dB Nominal Gain
- 2.8 dB Nominal Noise Figure
- 14 dBm Nominal P1dB @ 38 GHz
- Bias 3 V, 40mA
- 0.15 um 3MI pHEMT Technology
- Chip Dimensions 1.7 x 0.8 x 0.1 mm (0.067 x 0.031 x 0.004) in

Preliminary Measured Data

Bias Conditions: Vd = 3 V, Id = 40 mA





Primary Applications

- Point-to-Point Radio
- Point-to-MultiPoint Radio
- Ka Band VSAT

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

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TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
V^+	Positive Supply Voltage	5 V	2/
Vg1	Gate 1 Supply Voltage Range	-1 V TO 0 V	
I^+	Positive Supply Current	190 mA	2/
$\| I_G \|$	Gate Supply Current	6 mA	
P_{IN}	Input Continuous Wave Power	12 dBm	2/
P_D	Power Dissipation	0.37 W	2/, 3/
T_{CH}	Operating Channel Temperature	117 °C	4/, 5/
T_M	Mounting Temperature (30 Seconds)	320 °C	
T_{STG}	Storage Temperature	-65 to 117 °C	

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

2/ Current is defined under no RF drive conditions. Combinations of supply voltage, supply current, input power, and output power shall not exceed P_D.

3/ When operated at this power dissipation with a base plate temperature of 70 °C, the median life is 1 E+6 hours.

4/ Junction operating temperature will directly affect the device median time to failure (T_M). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.

5/ These ratings apply to each individual FET.

TABLE II
DC PROBE TESTS
(Ta = 25 ^{0}C, Nominal)

SYMBOL	PARAMETER	MINIMUM	MAXIMUM	UNITS
V_{BVGS3}	Breakdown Voltage gate-source	-30	-5	V
V_{BVGD3}	Breakdown Voltage gate-drain	-30	-5	V
$V_{P1,2,3}$	Pinch-off Voltage	-1.0	-0.1	V

Q1 is 100 um FET, Q2 is 200 um FET, Q3 is 300 um FET

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

PARAMETER	TYPICAL	UNITS
Drain Voltage, Vd	3	V
Drain Current, Id	40	mA
Gate Voltage, Vg	-0.5 to 0	V
Small Signal Gain, S21	21	dB
Input Return Loss, S11	8	dB
Output Return Loss, S22	15	dB
Noise Figure, NF	2.8	dB
Output Power @ 1 dB Compression Gain @ 38 GHz, P1dB	14	dBm

TABLE IV
THERMAL INFORMATION*

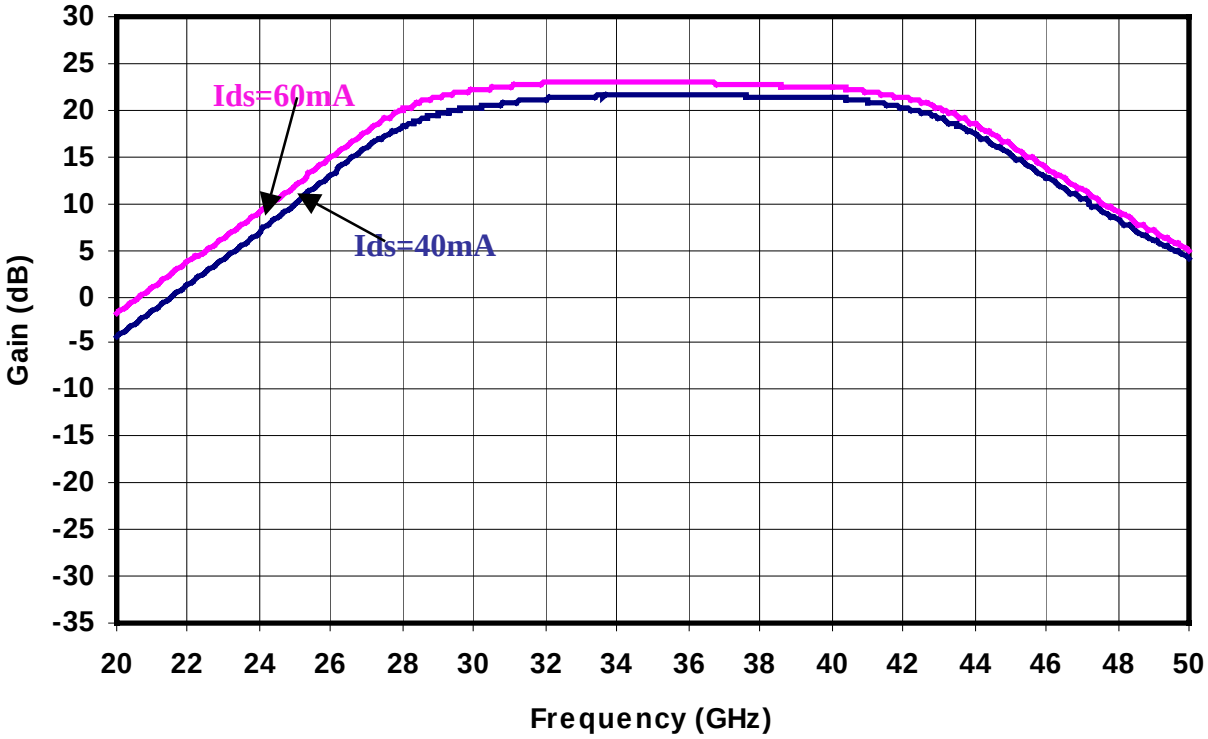
PARAMETER	TEST CONDITIONS	T_{CH} (^{o}C)	$R_{\theta JC}$ (°C/W)	T_M (HRS)
$R_{\theta JC}$ Thermal Resistance (channel to backside of carrier)	Vd = 3 V I_D = 40 mA Pdiss = 0.12 W	85	125	2.2 E+13

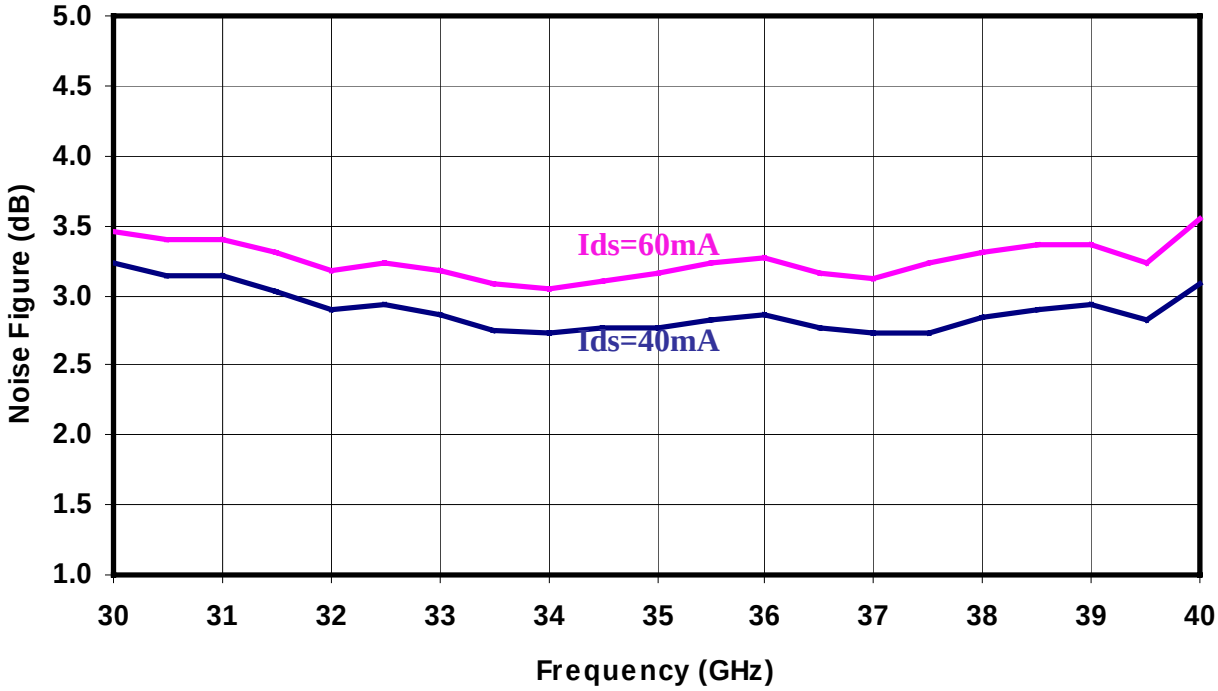
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

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Measured Data

Bias Conditions: Vd = 3 V, Id = 40mA/60mA

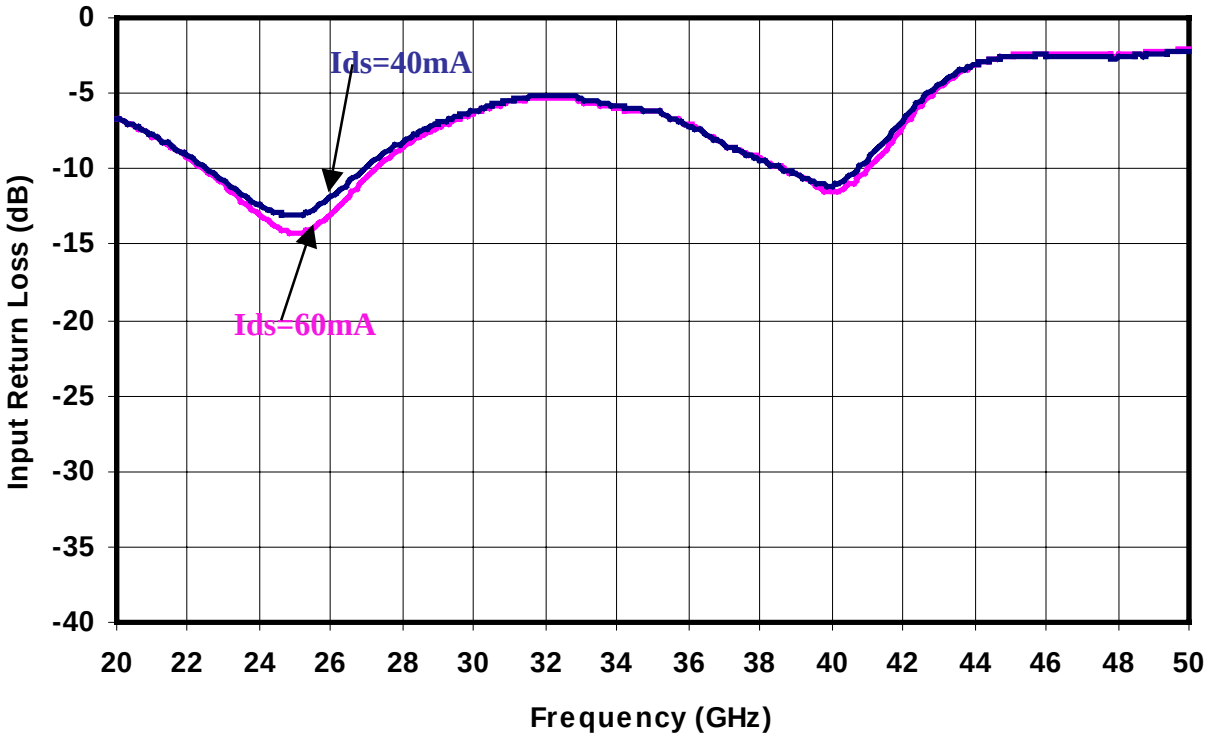


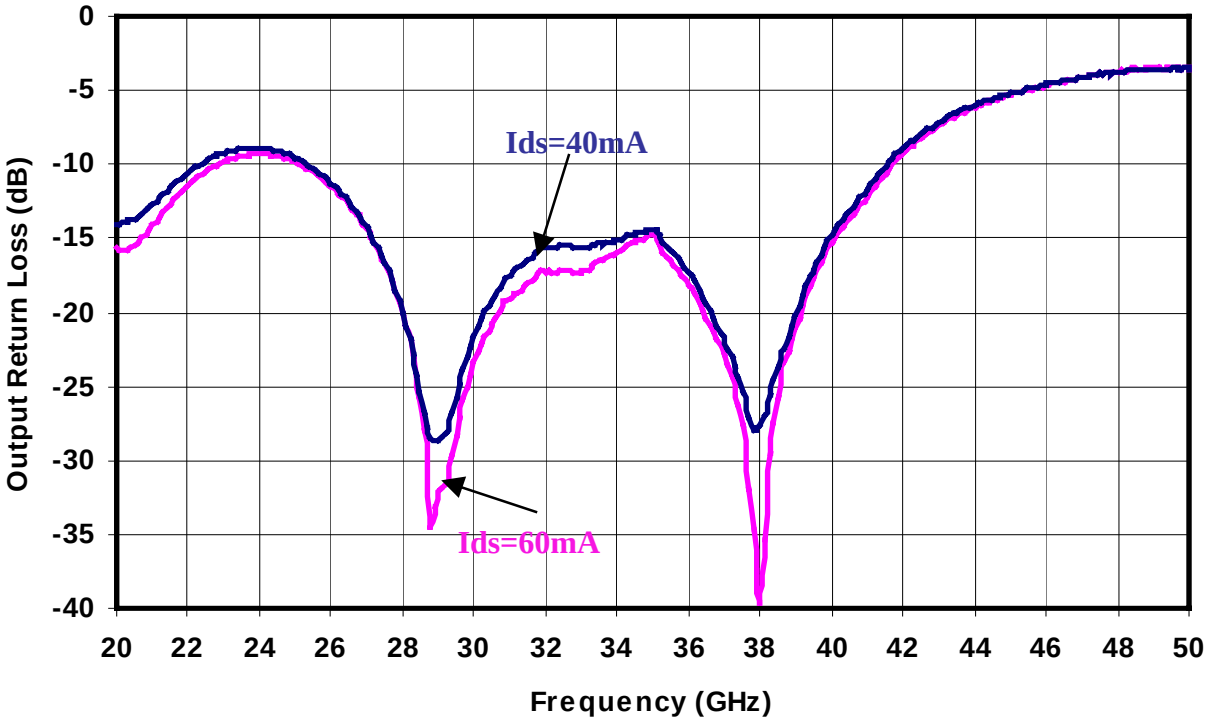


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Measured Data

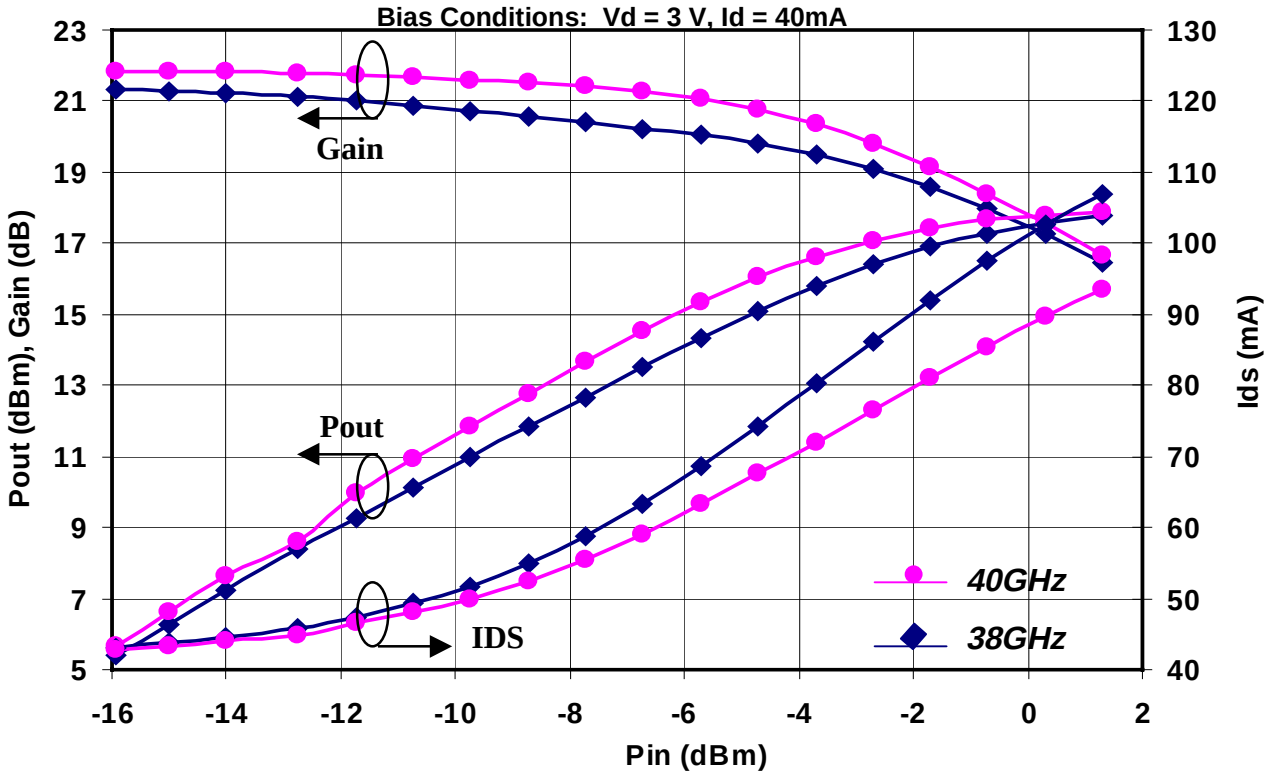
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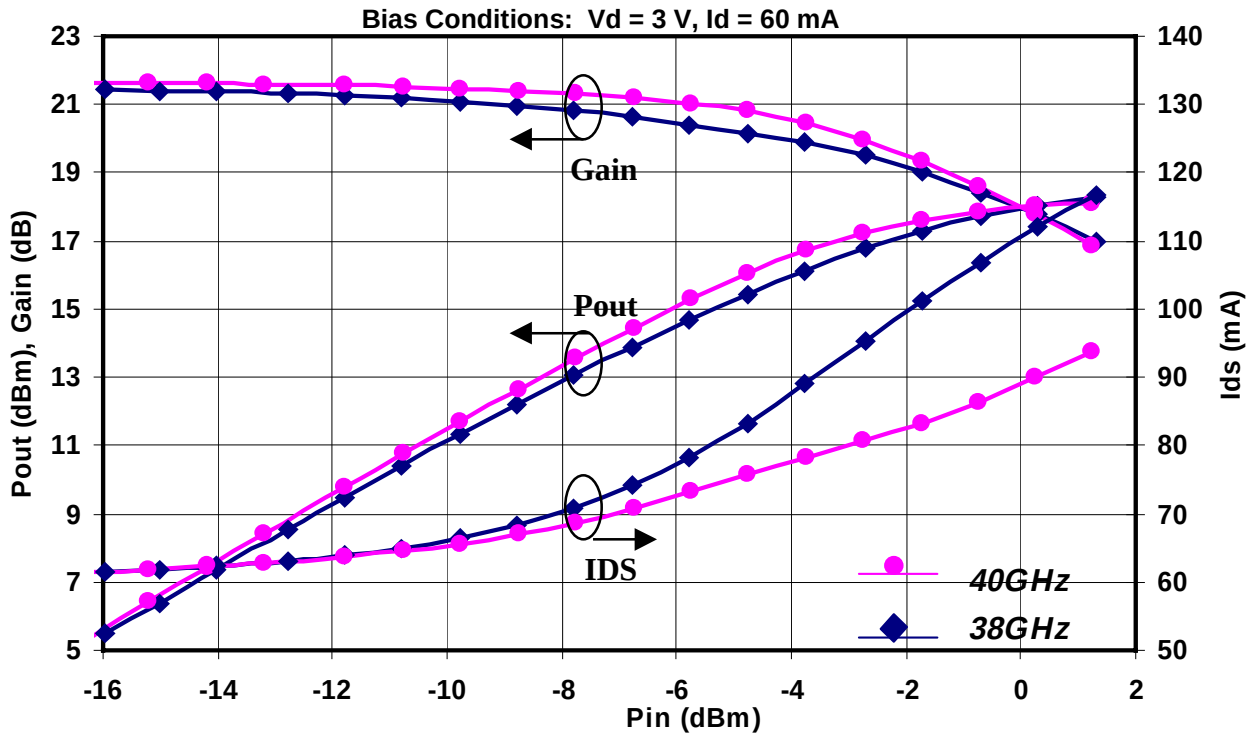




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Measured Data

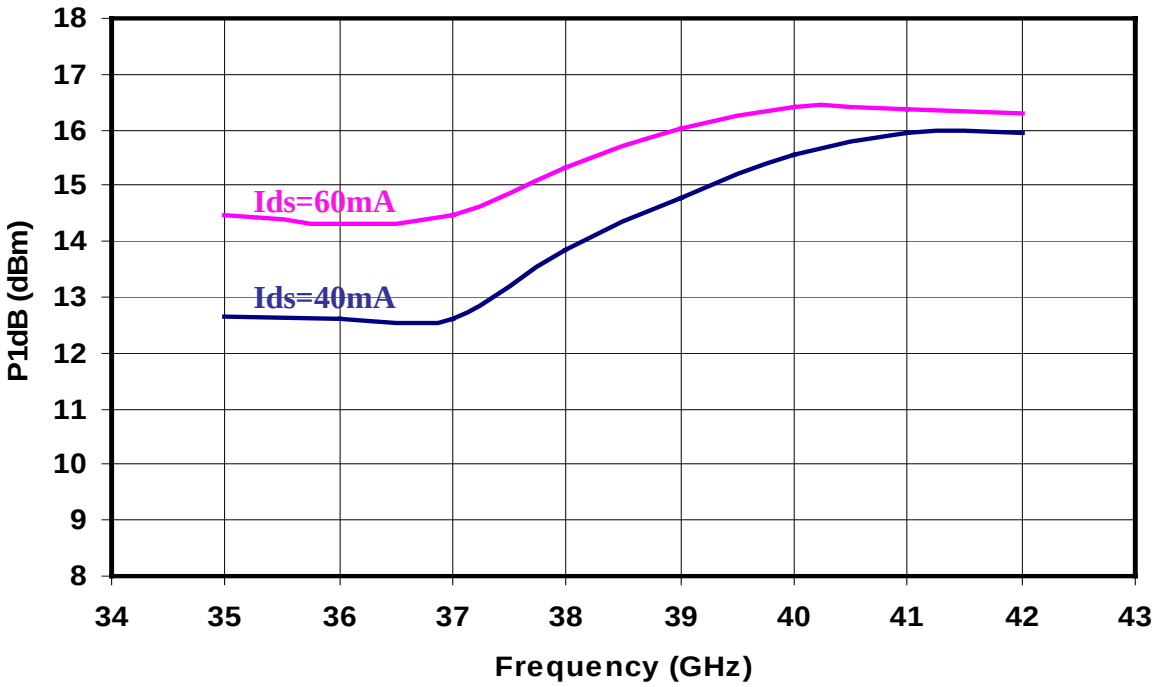




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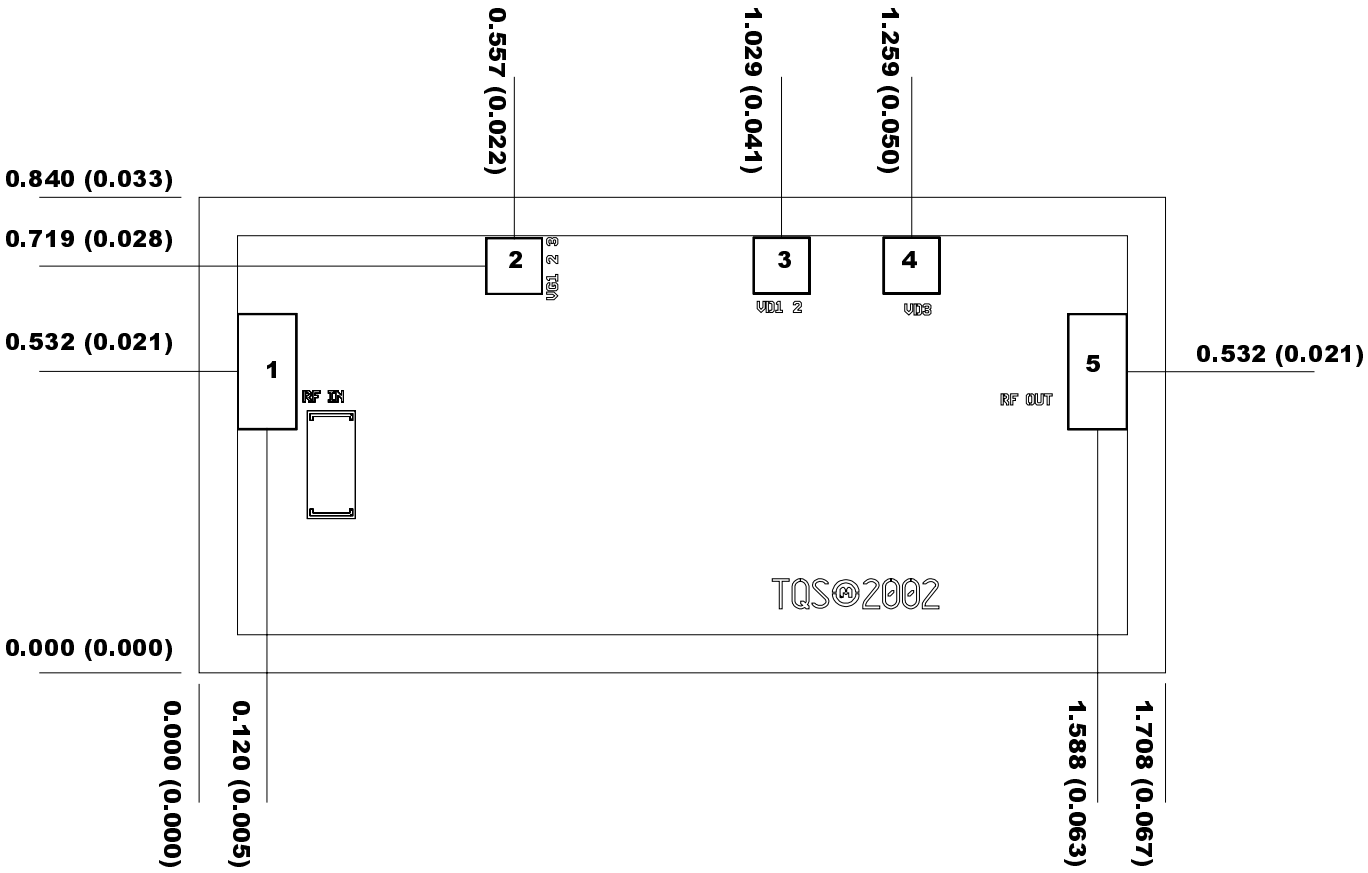
Measured Data

Bias Conditions: Vd = 3 V, Id = 40mA/60mA



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Mechanical Drawing



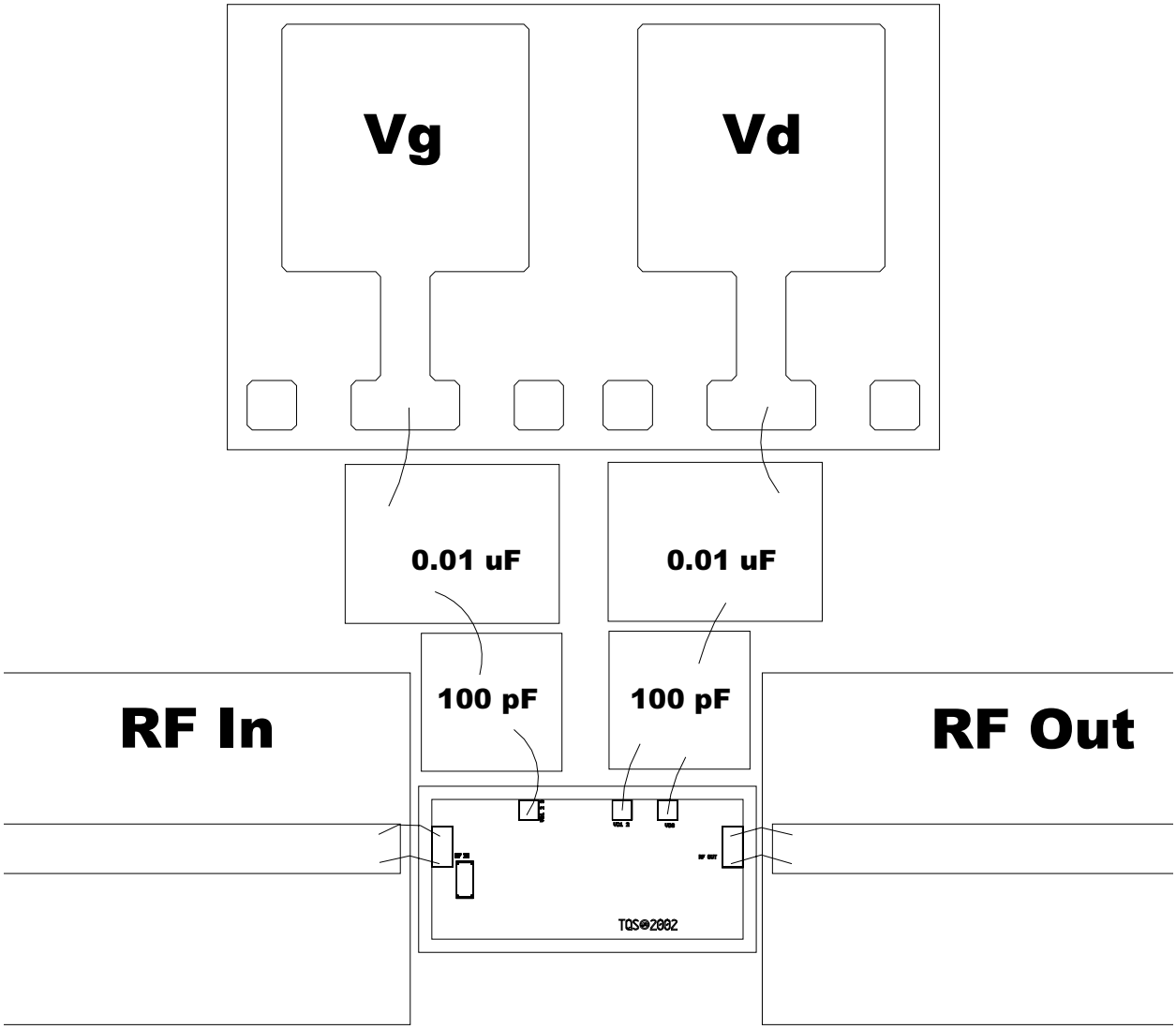
Units: Millimeters (Inches)
Thickness: 0.100 (0.004)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)

GND IS BACKSIDE OF MMIC

Bond pad #1	**(RF In)**	**0.100 x 0.200 (0.004 x 0.008)**
Bond pad #2	**(Vg)**	**0.100 x 0.100 (0.004 x 0.004)**
Bond pad #3	**(Vd1,2)**	**0.100 x 0.100 (0.004 x 0.004)**
Bond pad #4	**(Vd3)**	**0.100 x 0.100 (0.004 x 0.004)**
Bond pad #5	**(RF Out)**	**0.100 x 0.200 (0.004 x 0.008)**

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

Chip Assembly Diagram



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 for 30 sec
- 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.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.
- 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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