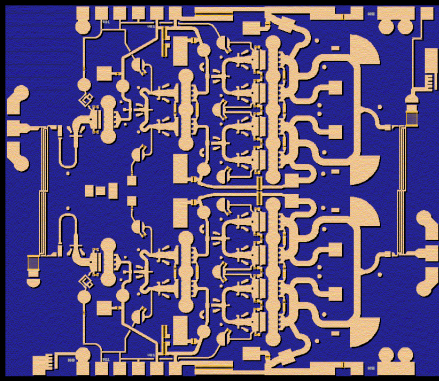


K Band High Power Amplifier



Key Features

- Frequency Range: 18 - 23 GHz
- 26 dB Nominal Gain
- 32.5 dBm Nominal P1dB
- 15dB Nominal Return Loss
- Bias 7.0 V, 840 mA
- 0.25 μ m 2MI pHEMT Technology
- Chip Dimensions 3.65 x 3.14 x 0.10 mm
(0.144 x 0.124 x 0.004 in)

Primary Applications

- Point-to-Point Radio
- Point-to-Multipoint Communications
- K-Band Sat-Com

Product Description

The TriQuint TGA4022 is a compact High Power Amplifier MMIC for K-band applications. The part is designed using TriQuint's proven standard 0.25 μ m power pHEMT production process.

The TGA4022 nominally provides 32.5dBm of Output Power @ 1dB Gain Compression from 18 - 23GHz. The MMIC also provides 26dB Gain and 15dB typical Return Loss.

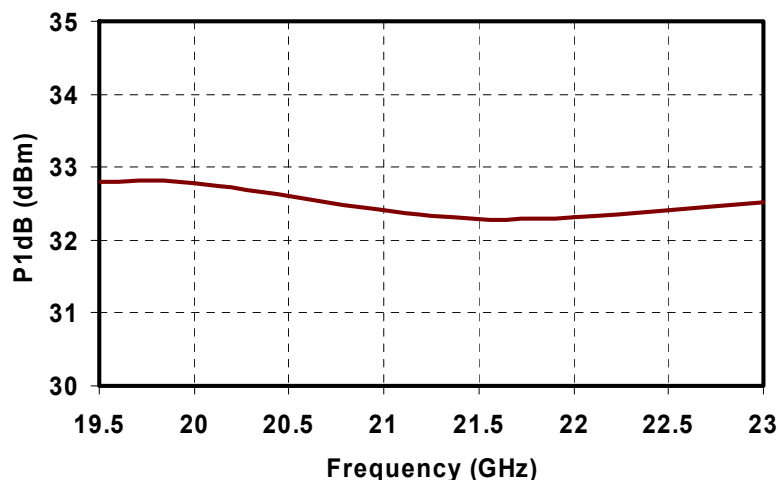
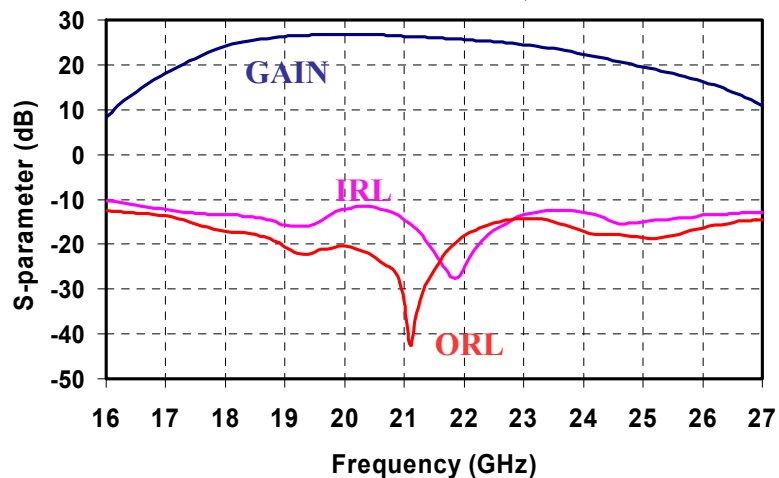
The part is ideally suited for markets such as Point-to-Point Radio, Point-to-Multipoint Communications, and K-Band Satellite Communications both commercial and military.

The TGA4022 is 100% DC and RF tested on-wafer to ensure performance compliance.

Lead-Free & RoHS compliant.

Measured Fixtured Data

Bias Conditions: $V_d = 7.0$ V, $I_d = 840$ mA



Datasheet subject to change without notice.

TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
V _d	Drain Voltage	8 V	<u>2/</u>
V _g	Gate Voltage Range	-1 TO + 0 V	
I _d	Drain Current	1.5 A	<u>2/ 3/</u>
I _g	Gate Current	56 mA	<u>3/</u>
P _{IN}	Input Continuous Wave Power	26 dBm	
P _D	Power Dissipation	12 W	<u>2/ 4/</u>
T _{CH}	Operating Channel Temperature	200 °C	<u>5/ 6/</u>
	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 2.3E4 hrs.
- 5/ 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.
- 6/ These ratings apply to each individual FET.

TABLE II
DC PROBE TESTS
(T_a = 25 °C, Nominal)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNITS
I _{DSS,Q1}	Saturated Drain Current	120	180	240	mA
G _{M,Q1}	Transconductance	162	240	318	mS
V _{BVGS}	Breakdown Voltage Gate_Source	-30	-15	-12	V
V _{BVGD}	Breakdown Voltage Gate_Drain	-30	-16	-12	V
V _P	Pinch-off Voltage	-1.35	-1	-0.65	V

Q1 is 600 um FET

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

PARAMETER	TYPICAL	UNITS
Frequency Range	18 - 23	GHz
Drain Voltage, Vd	7.0	V
Drain Current, Id	840	mA
Small Signal Gain, S21	26	dB
Input Return Loss, S11	15	dB
Output Return Loss, S22	20	dB
Pout @ 1dB Gain Compression, P1dB	32.5	dBm

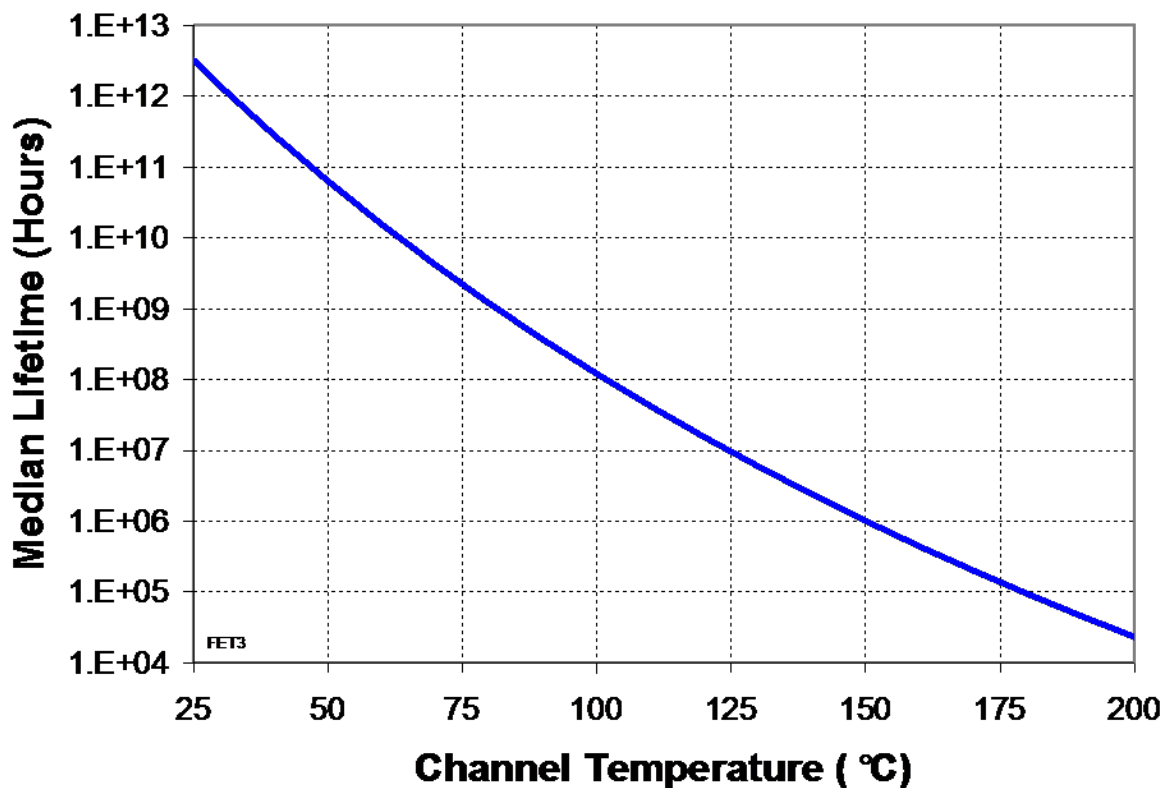
Note: Temperature coefficient on Gain -0.036 dB/°C

TABLE IV
THERMAL INFORMATION

PARAMETER	TEST CONDITIONS	T _{CH} (°C)	θ _{JC} (°C/W)	T _m (HRS)
θ _{JC} Thermal Resistance (channel to backside of Carrier)	V _d = 7 V I _d = 1 A P _{diss} = 7 W	146	10.8	1.5 E+6

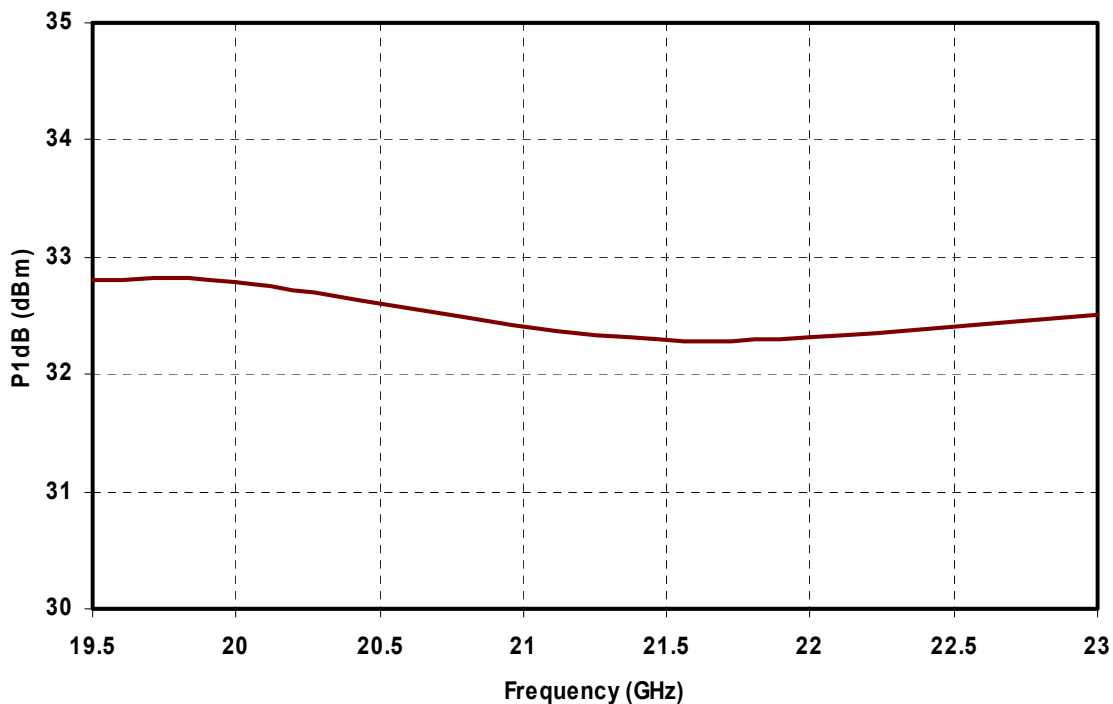
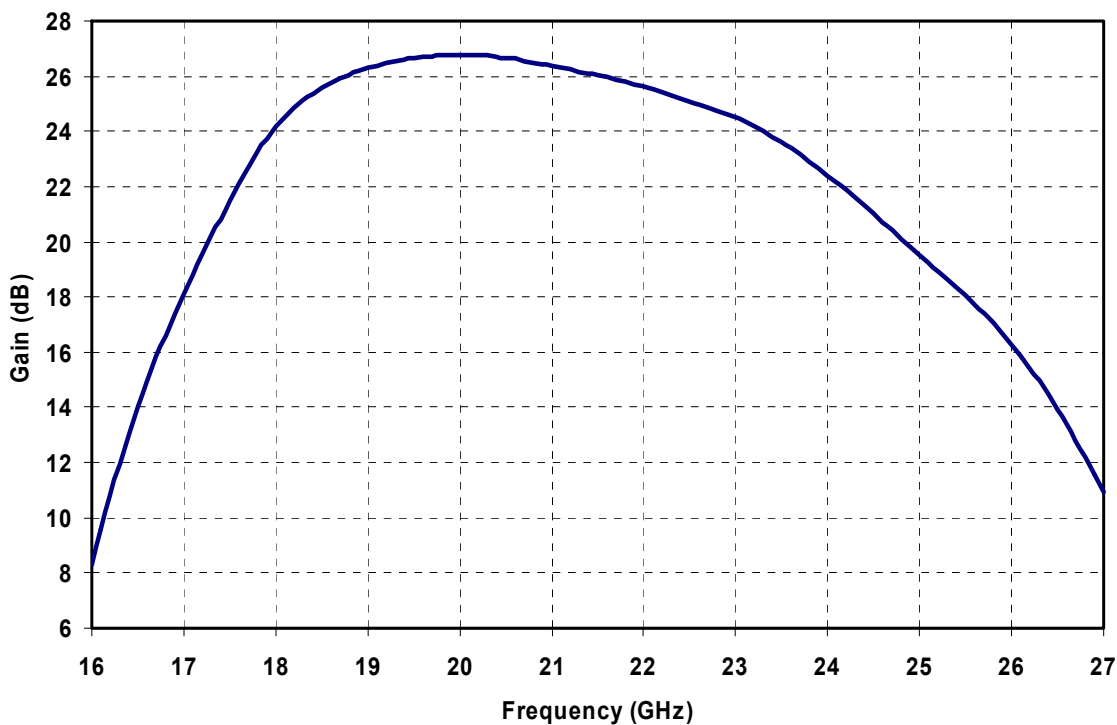
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70 °C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

Median Lifetime (T_m) vs. Channel Temperature



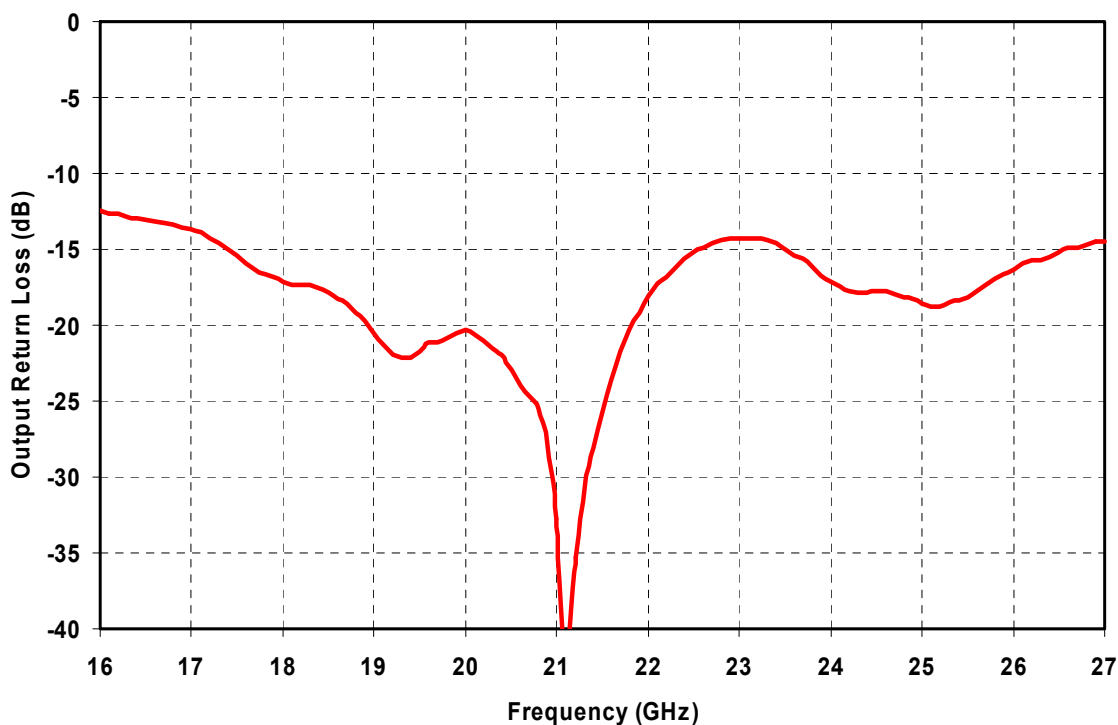
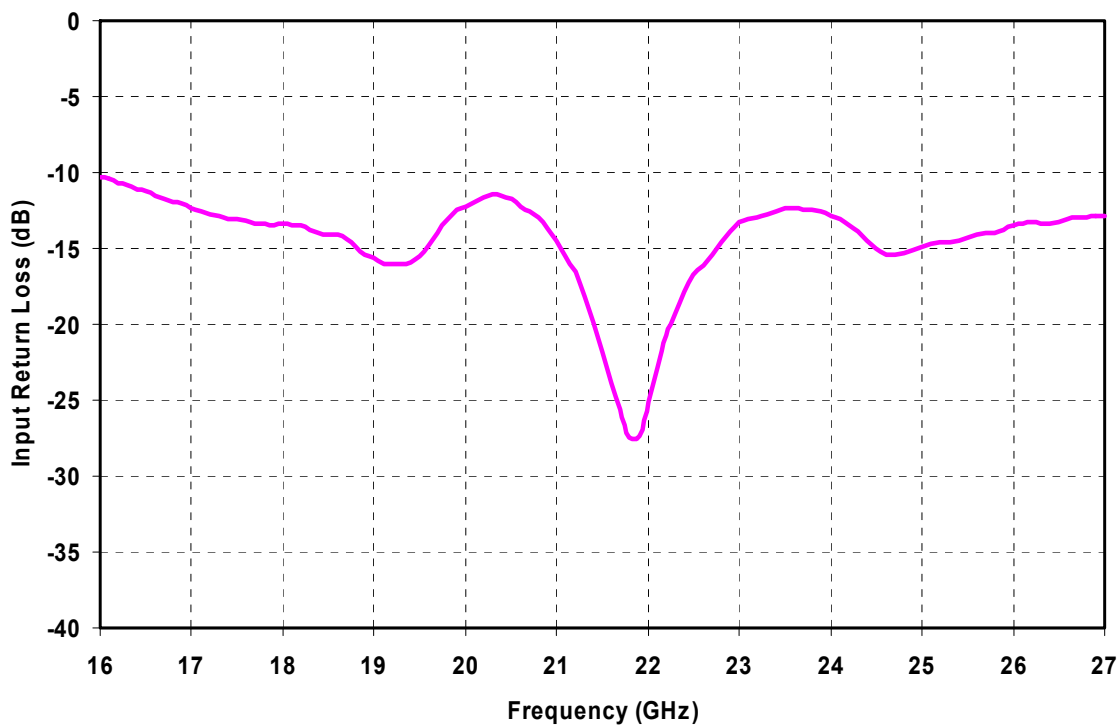
Preliminary Measured Data

Bias Conditions: $V_d = 7.0$ V, $I_d = 840$ mA, Room Temperature



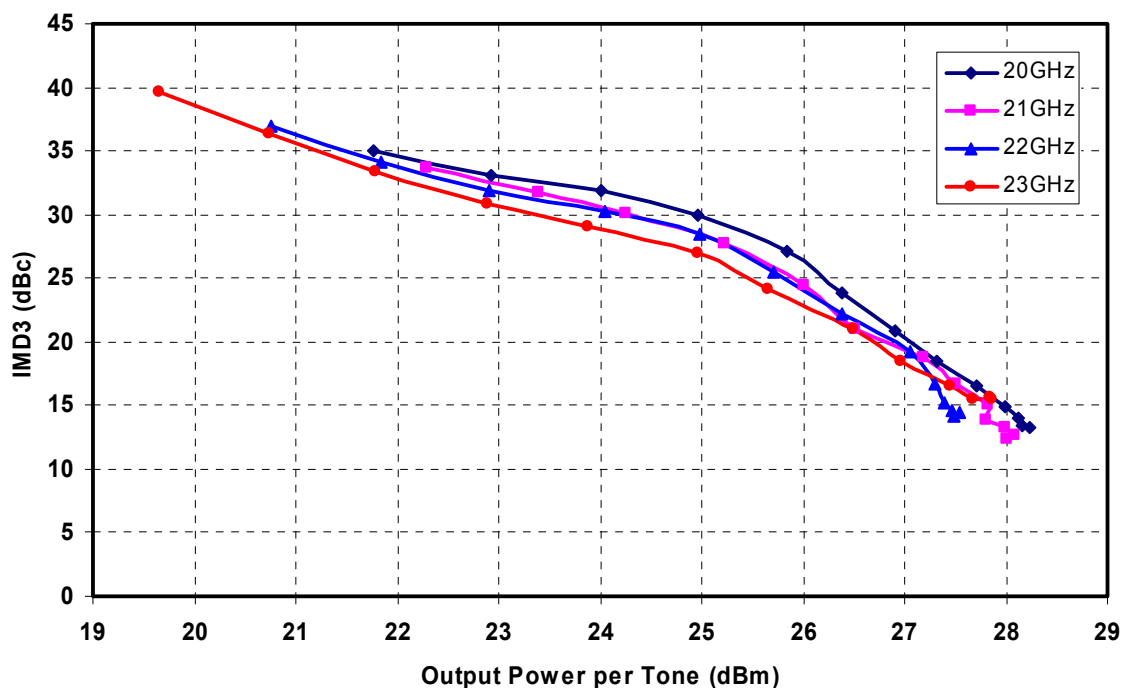
Preliminary Measured Data

Bias Conditions: $V_d = 7.0\text{ V}$, $I_d = 840\text{ mA}$, Room Temperature

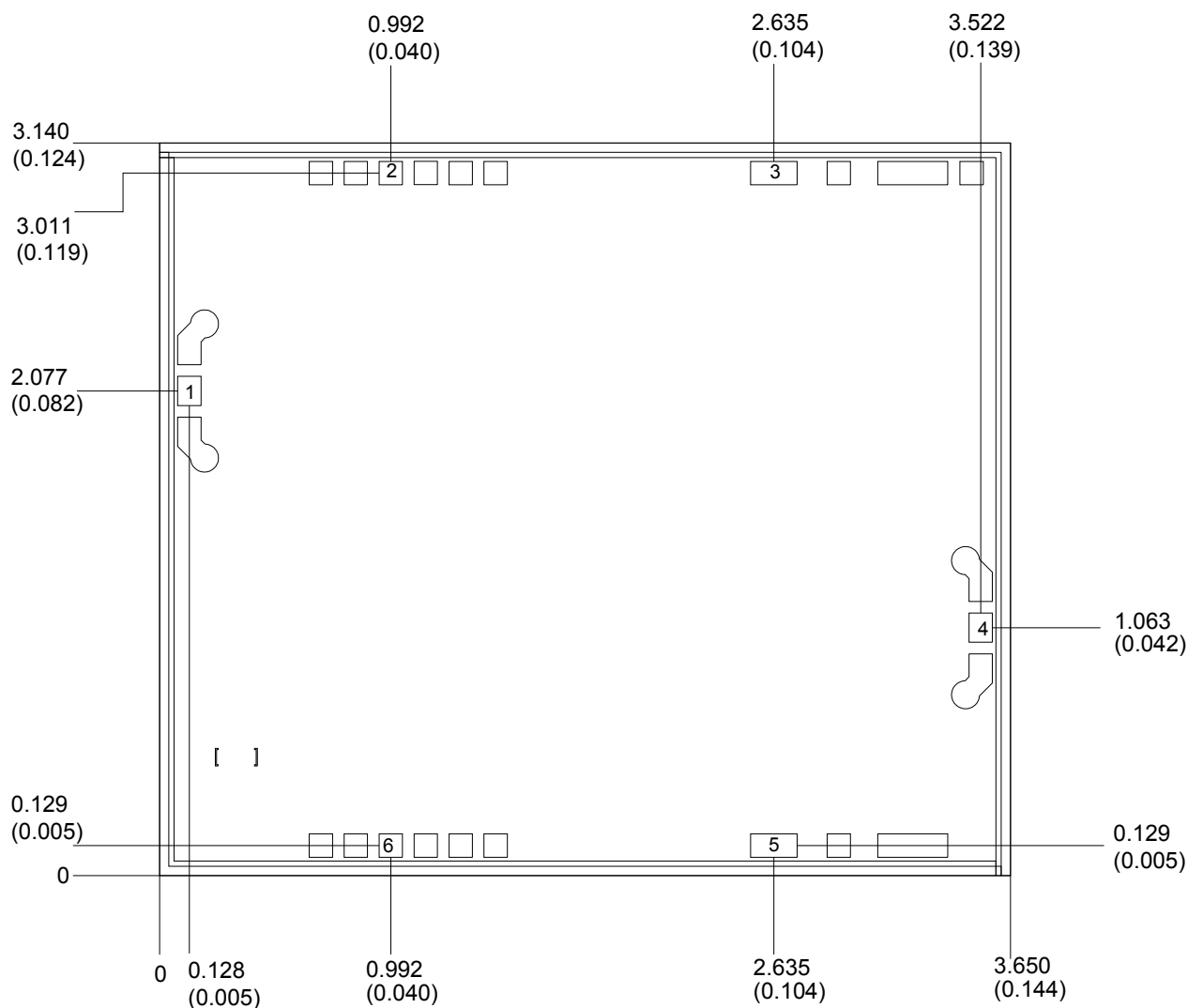


Preliminary Measured Data

Bias Conditions: $V_d = 7.0$ V, $I_d = 840$ mA, Room Temperature



Mechanical Drawing



Units: Millimeters (inches)

Thickness: 0.100 (0.004)

Chip size to bond pad dimensions are shown to center of bond pad

Chip size tolerance: +/- 0.051 (0.002)

RF Ground is backside of MMIC

Bond pad #1: (RF In) 0.100 X 0.125 (0.004 X 0.005)

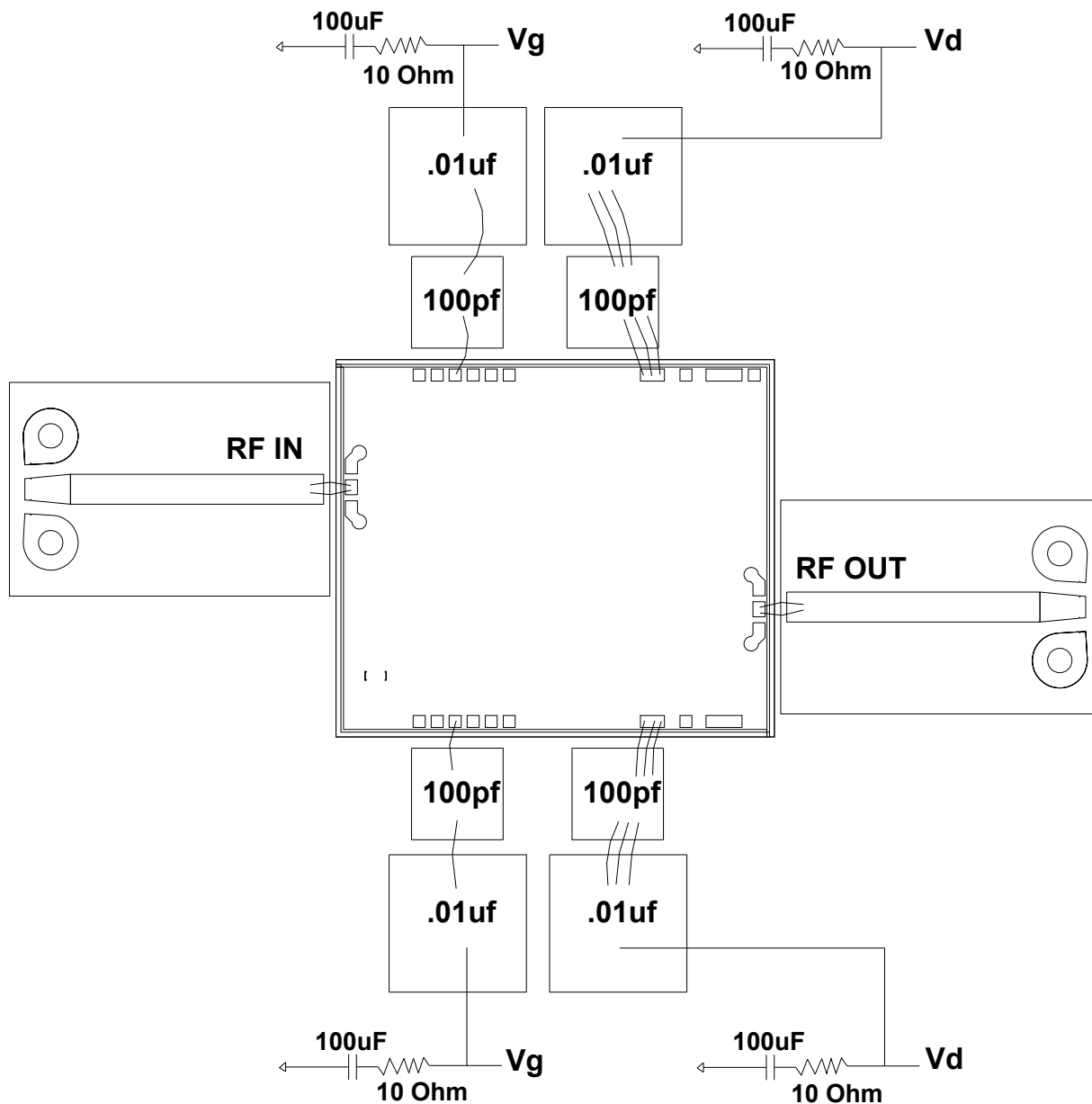
Bond pad #2, #6: (Vg) 0.100 X 0.100 (0.004 X 0.004)

Bond pad #3, #5: (Vd) 0.200 X 0.100 (0.008 X 0.004)

Bond pad #4: (RF Out) 0.100 X 0.125 (0.004 X 0.005)

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

Recommended 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 300⁰C (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 200⁰C.

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

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