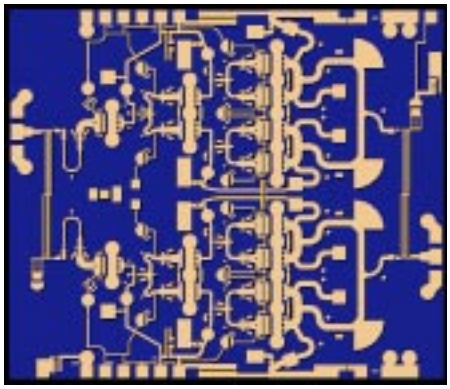
TriQuint SEMICONDUCTOR

Advance Product Information
February 10, 2006

K-Band High Power Amplifier

TGA4022



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 um 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 um 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.

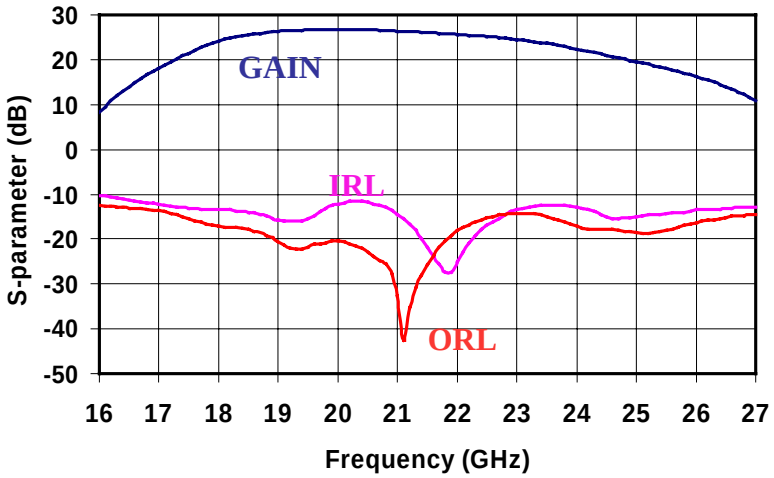
The part is ideally suited for markets such as Point-to-Point Radio, Point-to-Multipoint Communications, and K-Band Satellite Communications both commercial and military.

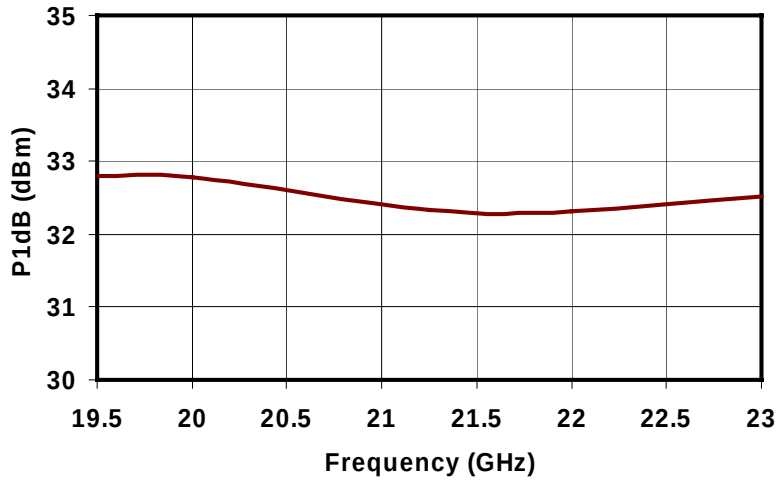
The TGA4022 is 100% DC and RF tested on-wafer to ensure performance compliance.

Lead-Free & RoHS compliant.

Measured Fixtured Data

Bias Conditions: Vd =7.0 V, Id =840 mA





Note: Devices is early in the characterization process prior to finalizing all electrical specifications. Specifications are subject to change without notice

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TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
Vd	Drain Voltage	8 V	2/
Vg	Gate Voltage Range	-1 TO + 0 V	
Id	Drain Current	1.5 A	2/ 3/
$\|Ig\|$	Gate Current	56 mA	3/
P_{IN}	Input Continuous Wave Power	26 dBm	
P_D	Power Dissipation	7.4 W	2/ 4/
T_{CH}	Operating Channel Temperature	150 ^{0}C	5/ 6/
T_M	Mounting Temperature (30 Seconds)	320 ^{0}C	
T_{STG}	Storage Temperature	-65 to 150 ^{0}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^{0}C, the median life is 1.0E+6 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 ^{0}C, Nominal)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNITS
$I_{DSS,Q1}$	Saturated Drain Current	60	171	282	mA
$G_{M,Q1}$	Transconductance	132	210	318	mS
$V_{BVGS,Q1}$	Breakdown Voltage Gate_Source	-30	-15	-8	V
$V_{BVGD,Q1-Q7}$	Breakdown Voltage Gate_Drain	-30	-16	-12	V
$V_{P,Q1-Q14}$	Pinch-off Voltage	-1.5	-1	-0.5	V

Q1 is 600 um FET, Q1-Q7 is 2800 um FET, Q1-Q14 is 8400 um FET.

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

TABLE IV
THERMAL INFORMATION

PARAMETER	TEST CONDITIONS	T_{CH} (^{O}C)	$R_{\theta JC}$ ($^\circ$C/W)	T_M (HRS)
$R_{\theta JC}$ Thermal Resistance (channel to backside of Carrier)	Vd = 7 V Id = 1 A Pdiss = 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.

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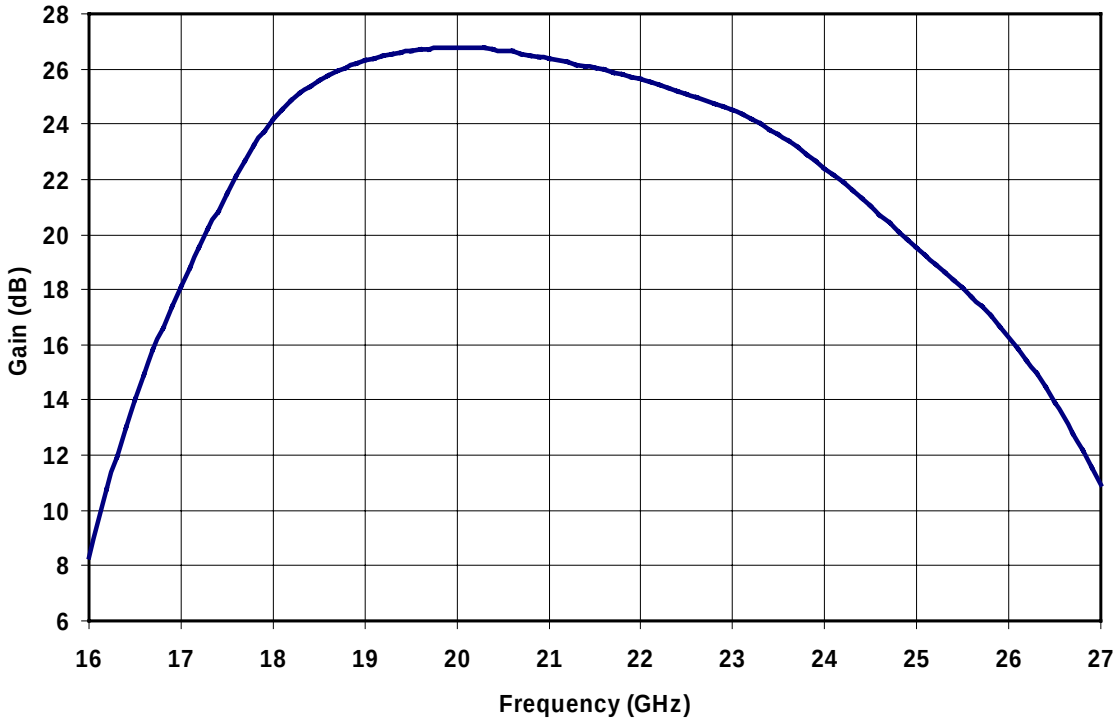
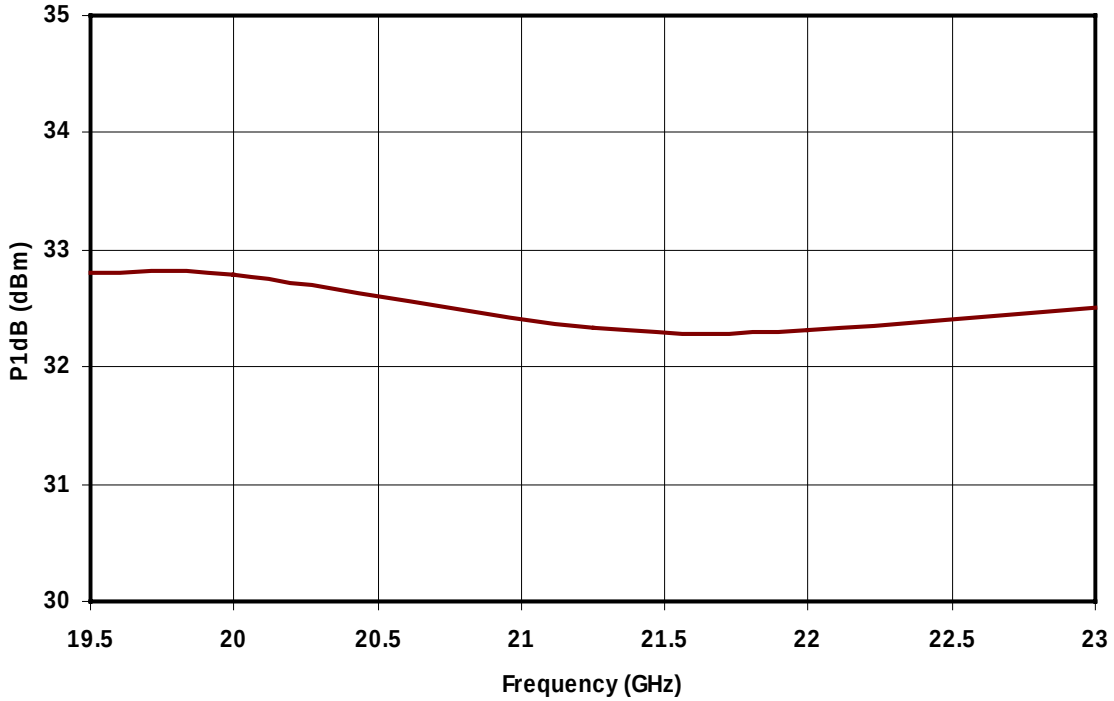
Preliminary Measured Data

Bias Conditions: Vd = 7.0 V, Id = 840 mA, Room Temperature





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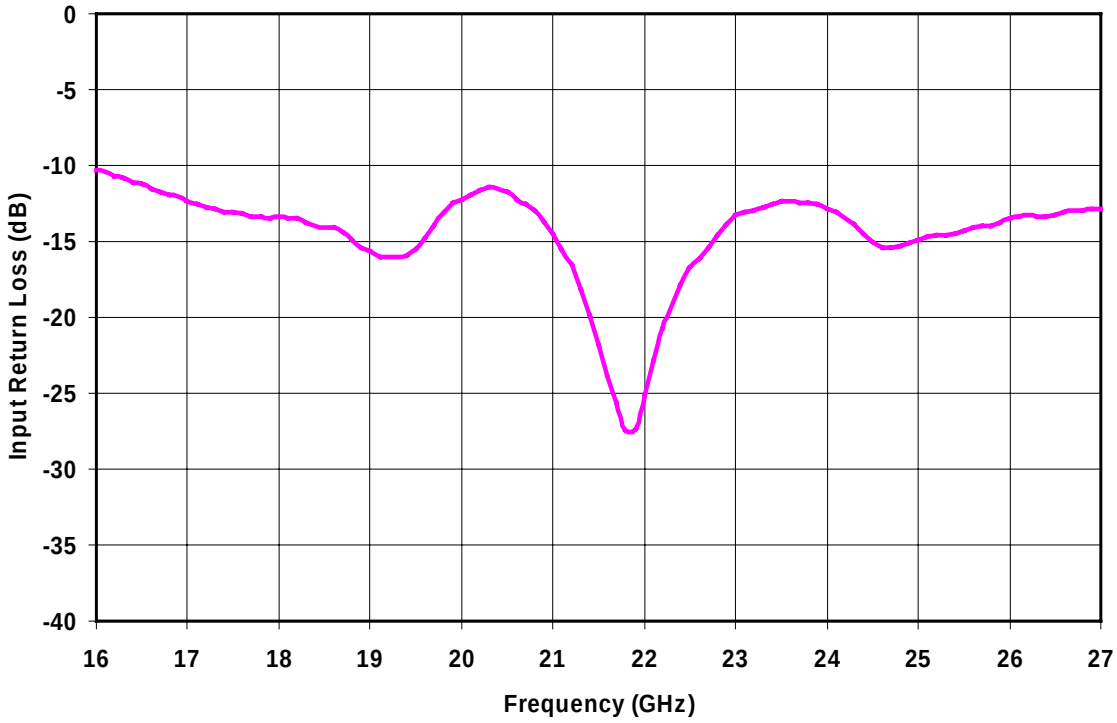

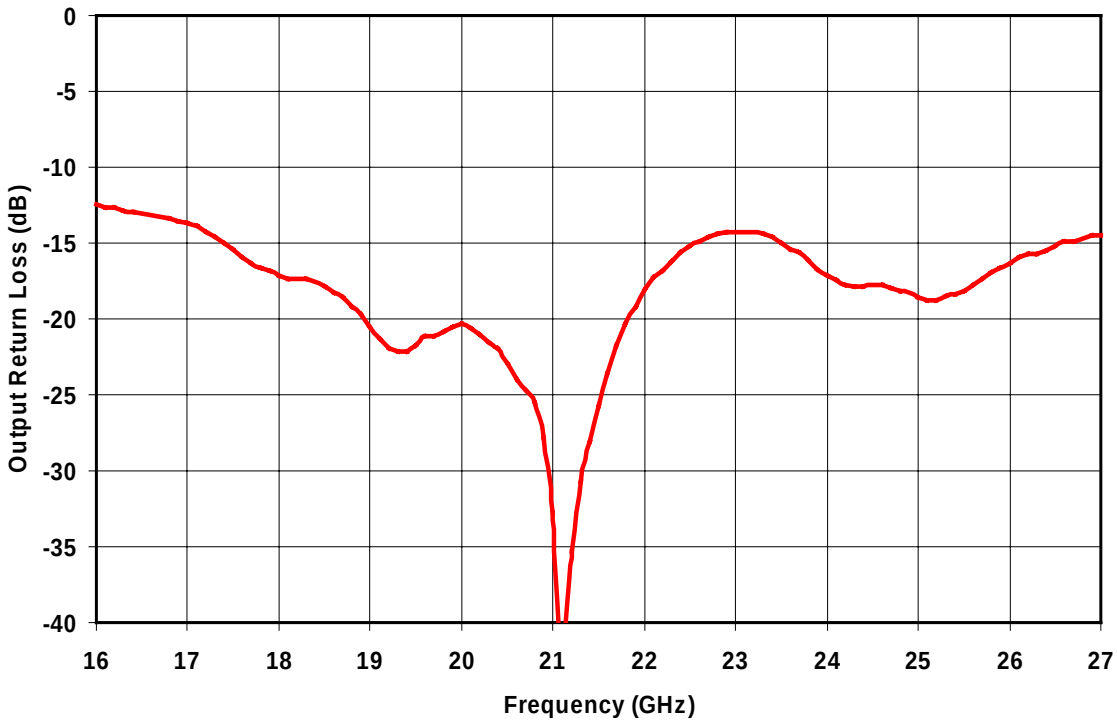

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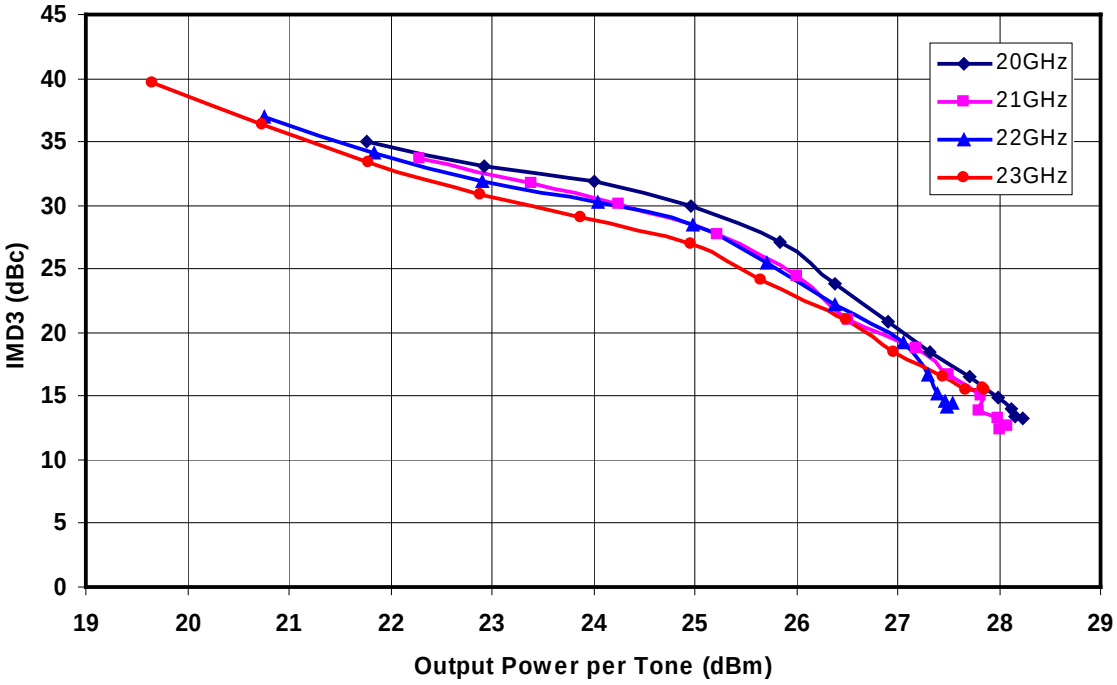

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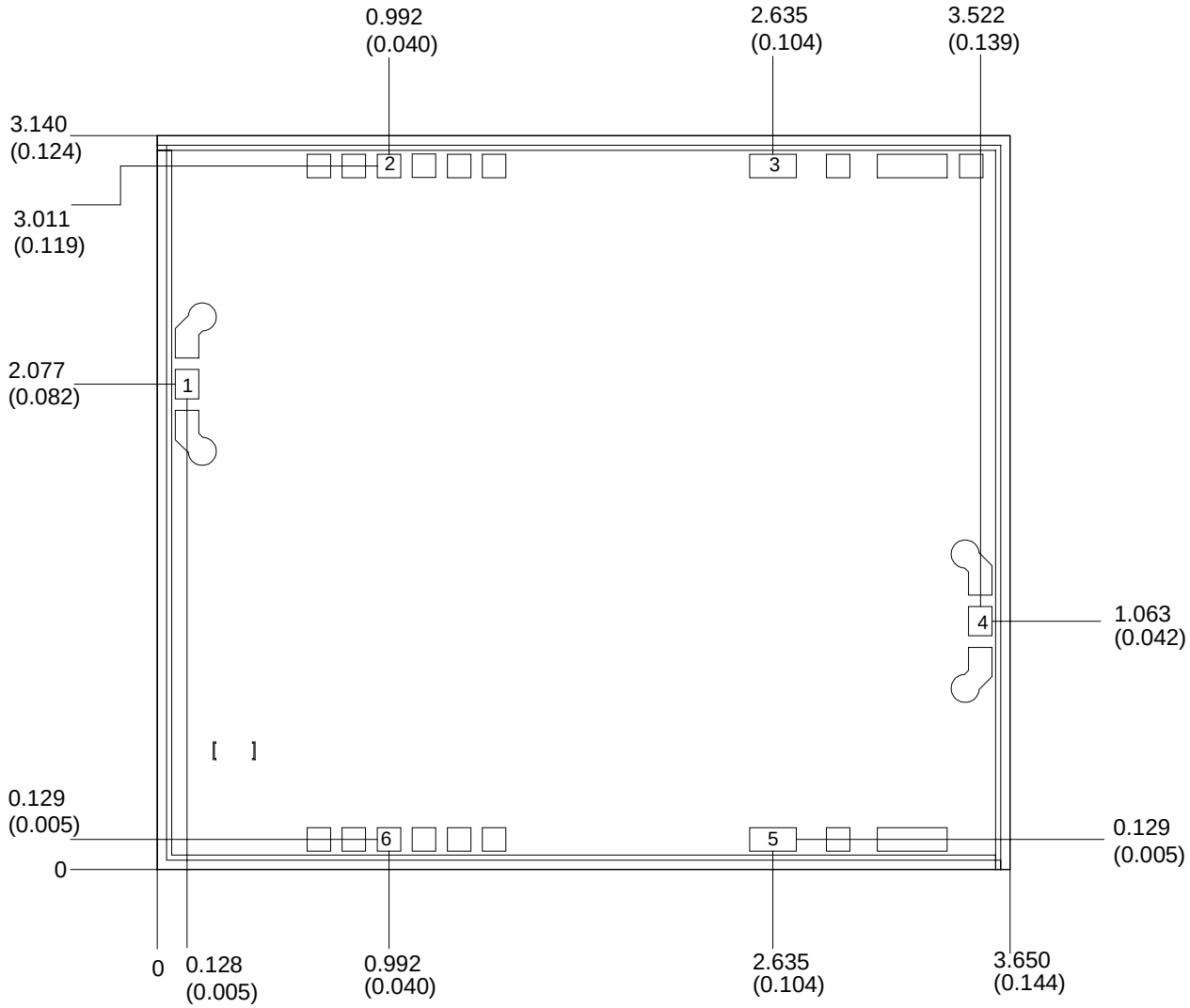
Mechanical Drawing



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.

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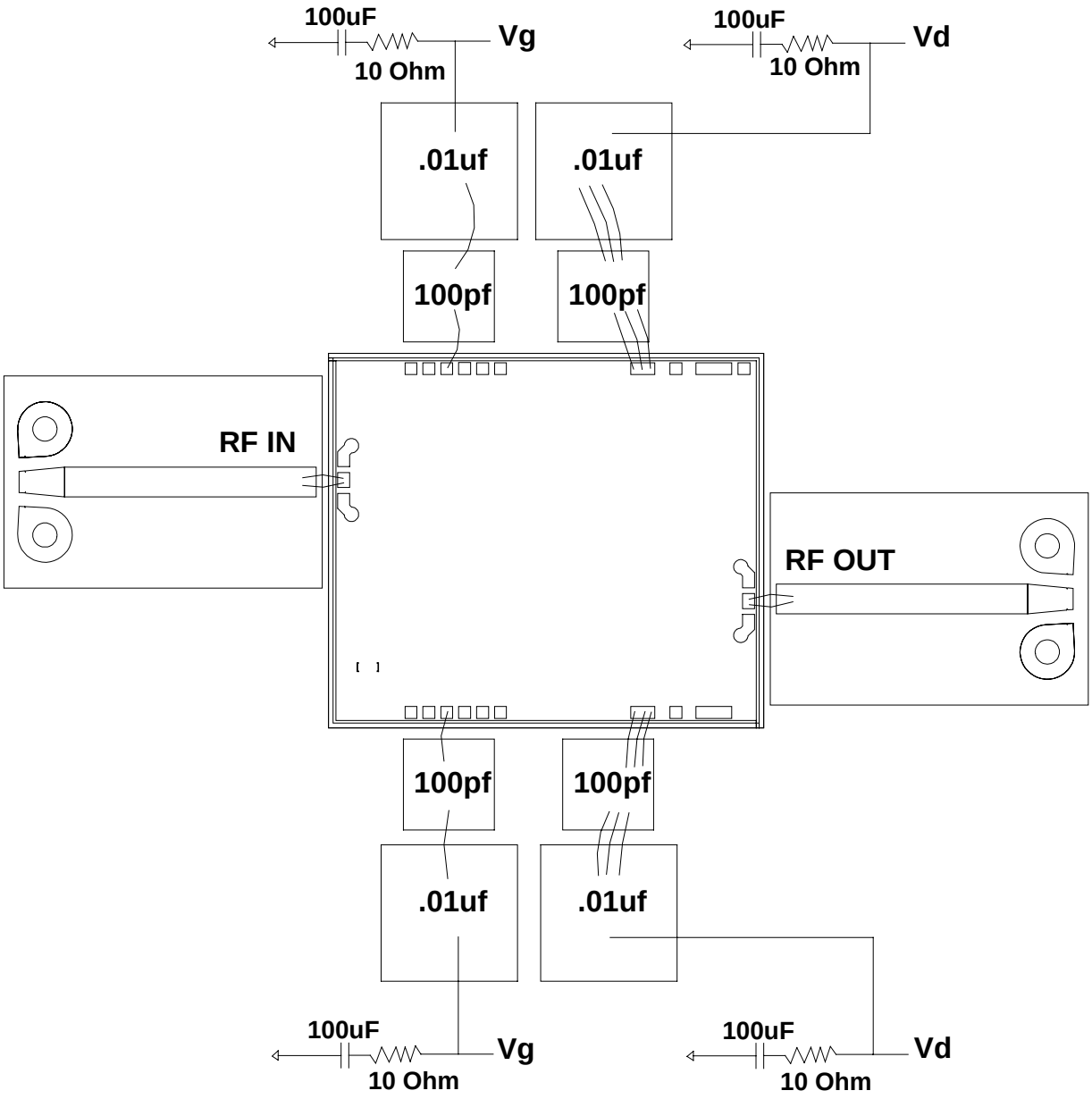
Recommended Chip Assembly Diagram



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Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300^0C (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 200^0C.

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