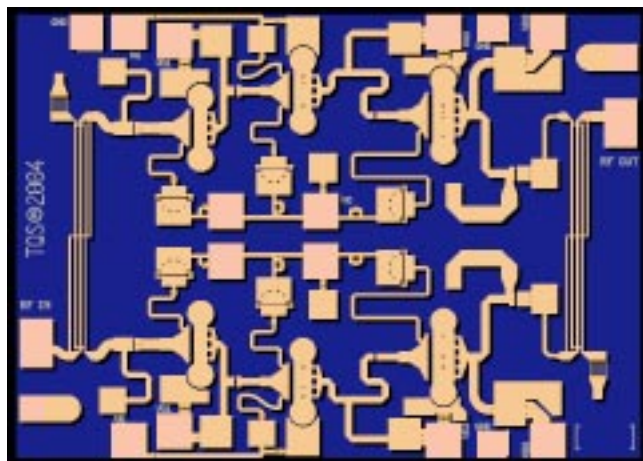


33 - 47 GHz Wide Band Driver Amplifier

TGA4522



Key Features

- Frequency Range: 33 - 47 GHz
- 27.5 dBm Nominal Psat @ 38GHz
- 27 dBm P1dB @ 38 GHz
- 36 dBm OTOI @ Pin = 19 dBm/Tone
- 18 dB Nominal Gain @ 38GHz
- 15 dB Nominal Return Loss @ 38GHz
- Bias: 6 V @ 400 mA Idq
- 0.15 μ m 3MI pHEMT Technology
- Chip Dimensions 2.00 x 1.45 x 0.10 mm
(0.079 x 0.057 x 0.004 in)

Primary Applications

- Digital Radio
- Point-to-Point Radio
- Point-to-Multipoint Communications
- Military SAT-COM

Product Description

The TriQuint TGA4522 is a compact Driver Amplifier MMIC for Ka-band and Q-band applications. The part is designed using TriQuint's 0.15 μ m power pHEMT production process.

The TGA4522 nominally provides 27.5 dBm saturated output power, and 27 dBm output power at 1dB Gain compression @ 38 GHz. It also has typical gain of 18 dB, and return loss of 15 dB.

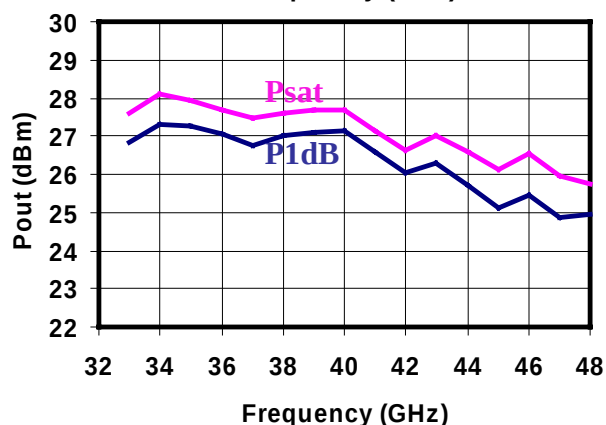
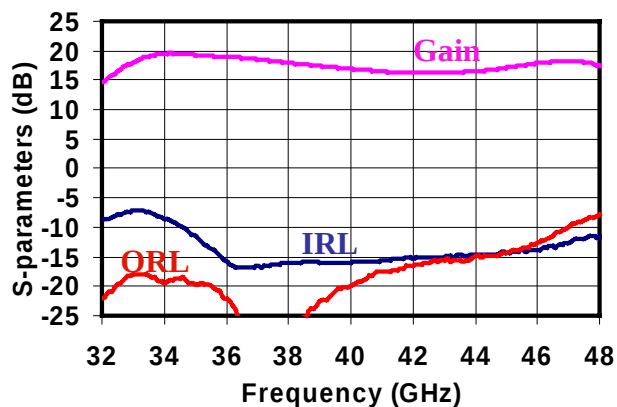
The part is ideally suited for low cost emerging markets such as Digital Radio, Point-to-Point Radio and Point-to-Multi Point Communications.

The TGA4522 is 100% DC and RF tested on-wafer to ensure performance compliance.

Lead-Free & RoHS compliant.

Measured Fixtured Data

Bias Conditions: Vd = 6 V, Idq = 400 mA



Note: Devices is early in the characterization process prior to finalizing all electrical specifications. Specifications are 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	-2 TO 0 V	
I _d	Drain Current	700 mA	<u>2/</u> <u>3/</u>
I _g	Gate Current	16 mA	<u>3/</u>
P _{IN}	Input Continuous Wave Power	23 dBm	
P _D	Power Dissipation	See note <u>4/</u>	<u>2/</u>
T _{CH}	Operating Channel Temperature	150 °C	<u>5/</u> <u>6/</u>
T _M	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/ For a median life time of 1E+6 hrs, Power dissipation is limited to:

$$P_D(\text{max}) = (150\text{ }^{\circ}\text{C} - T_{\text{BASE}}\text{ }^{\circ}\text{C}) / 35.5\text{ (}^{\circ}\text{C/W)}$$

Where T_{BASE} is the base plate temperature.

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
ELECTRICAL CHARACTERISTICS
(Ta = 25 °C Nominal)

PARAMETER	TYPICAL	UNITS
Frequency Range	33 - 47	GHz
Drain Voltage, Vd	6.0	V
Drain Current, Id	400	mA
Gate Voltage, Vg	-0.6	V
Small Signal Gain, S21	18	dB
Input Return Loss, S11	15	dB
Output Return Loss, S22	15	dB
Output Power @ 1dB Gain Compression, P1dB	26	dBm
Saturated Power, Psat	27	dBm
OTOI @ 19dBm/Tone	36	dBm

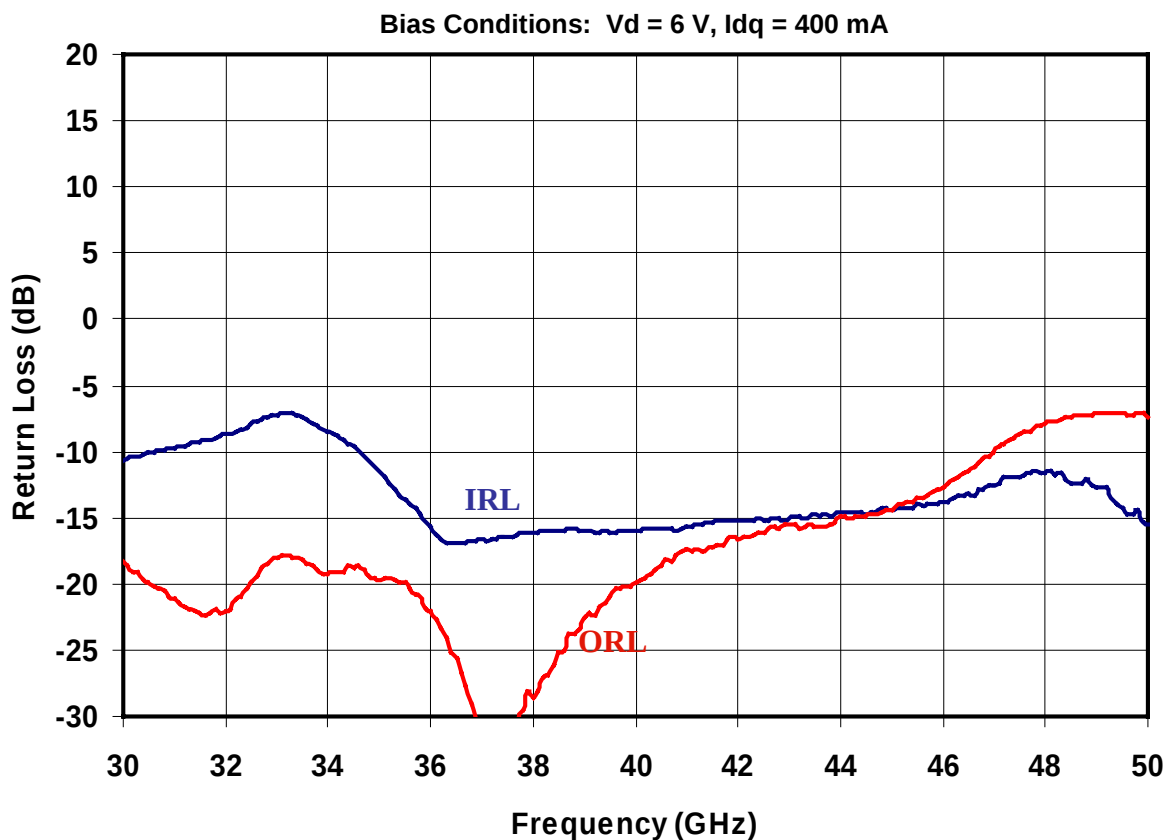
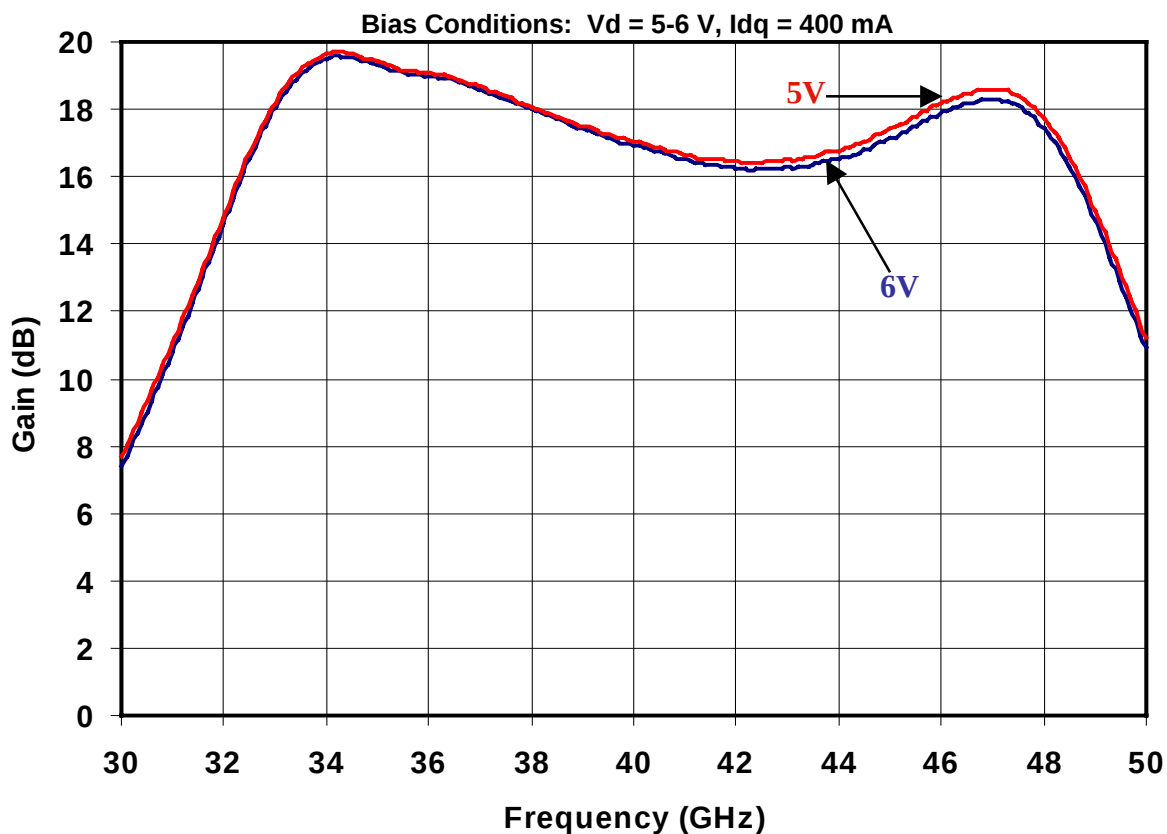
TABLE III
THERMAL INFORMATION

PARAMETER	TEST CONDITIONS	T _{CH} (°C)	R _{θJC} (°C/W)	T _M (HRS)
R _{θJC} Thermal Resistance (channel to Case)	Vd = 6 V Idq = 400 mA Pdiss = 2.4 W	144	30.8	1.7E+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.

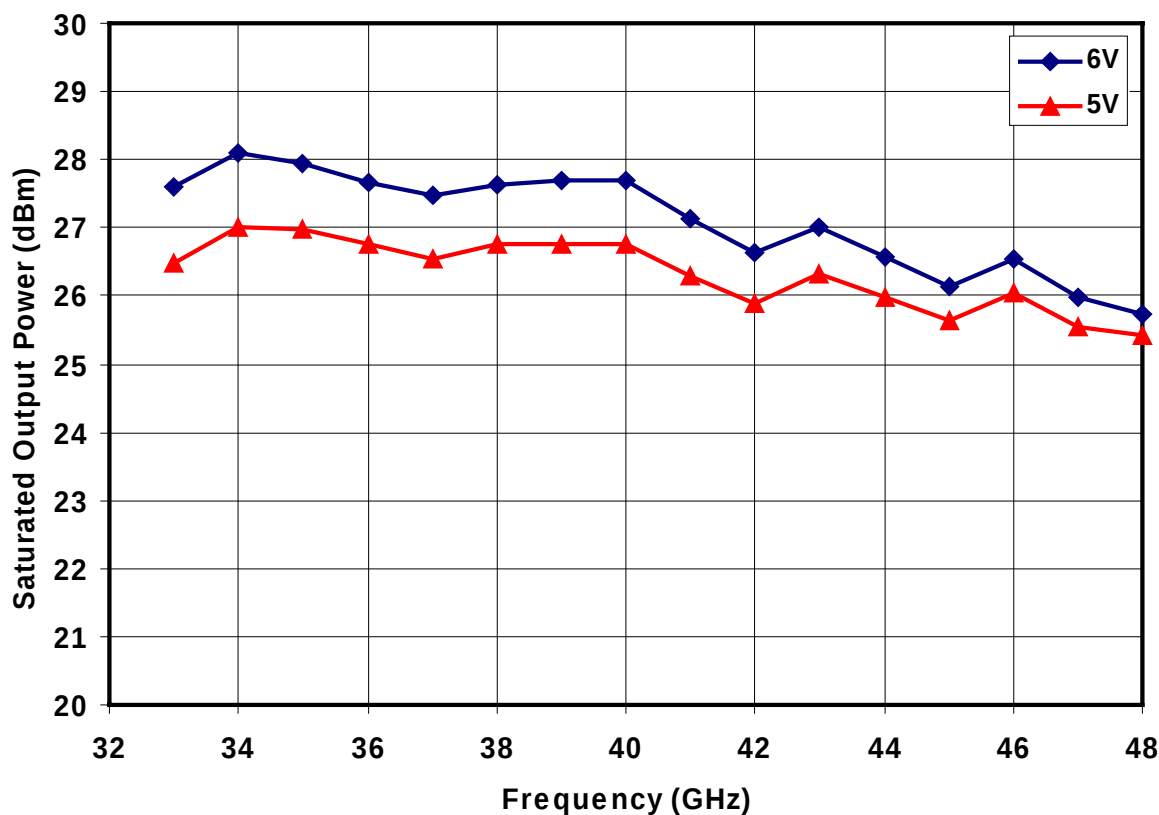
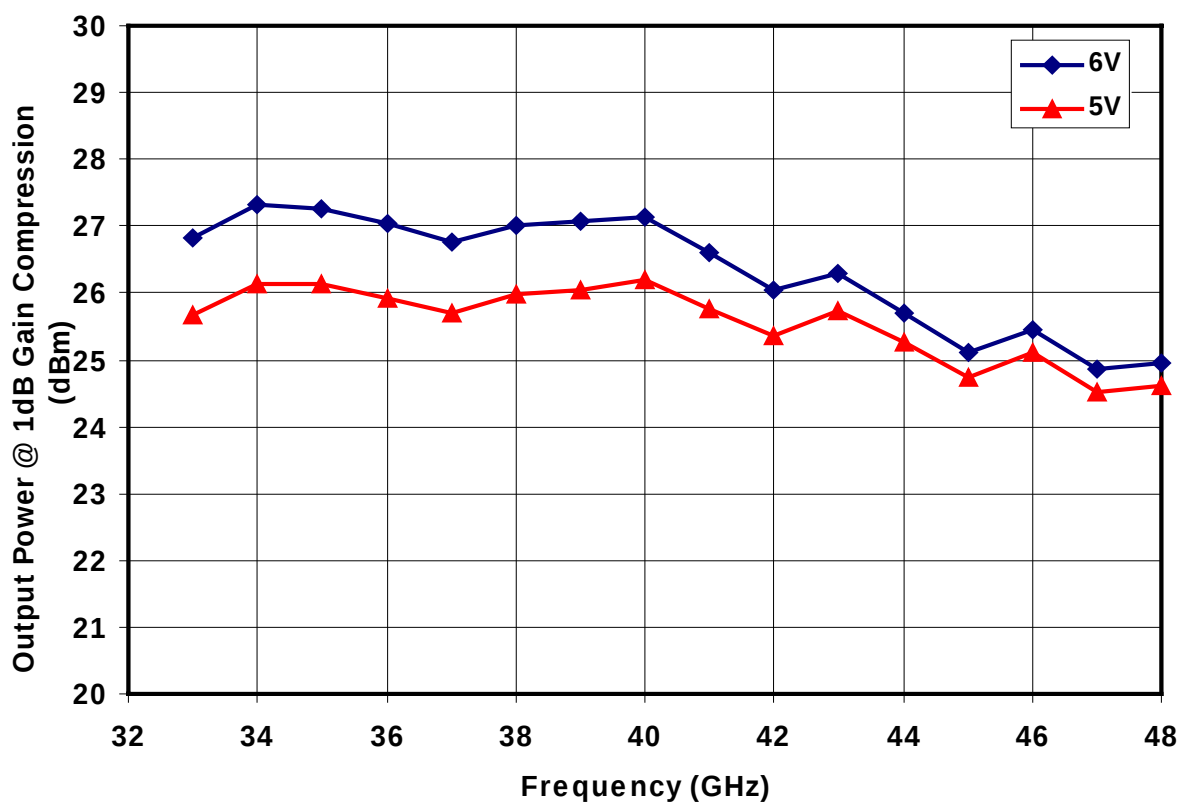
Measured Data

TGA4522



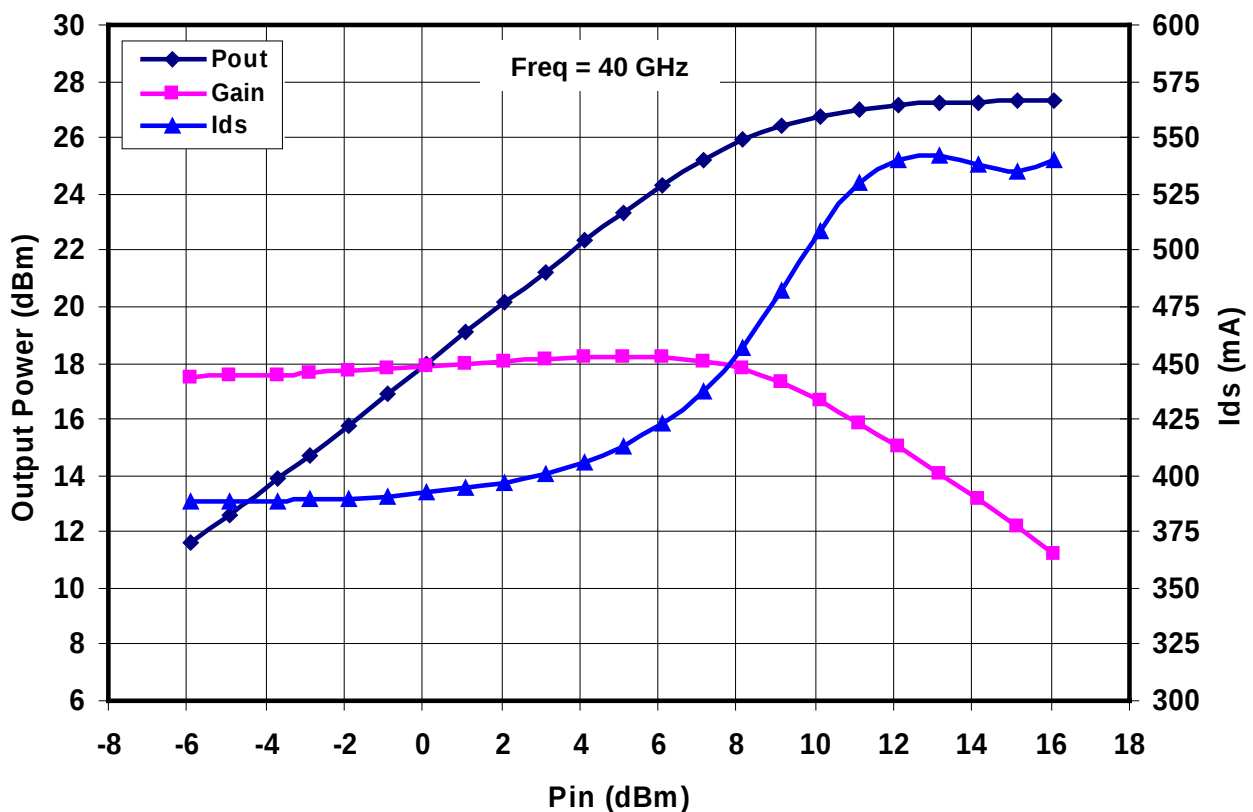
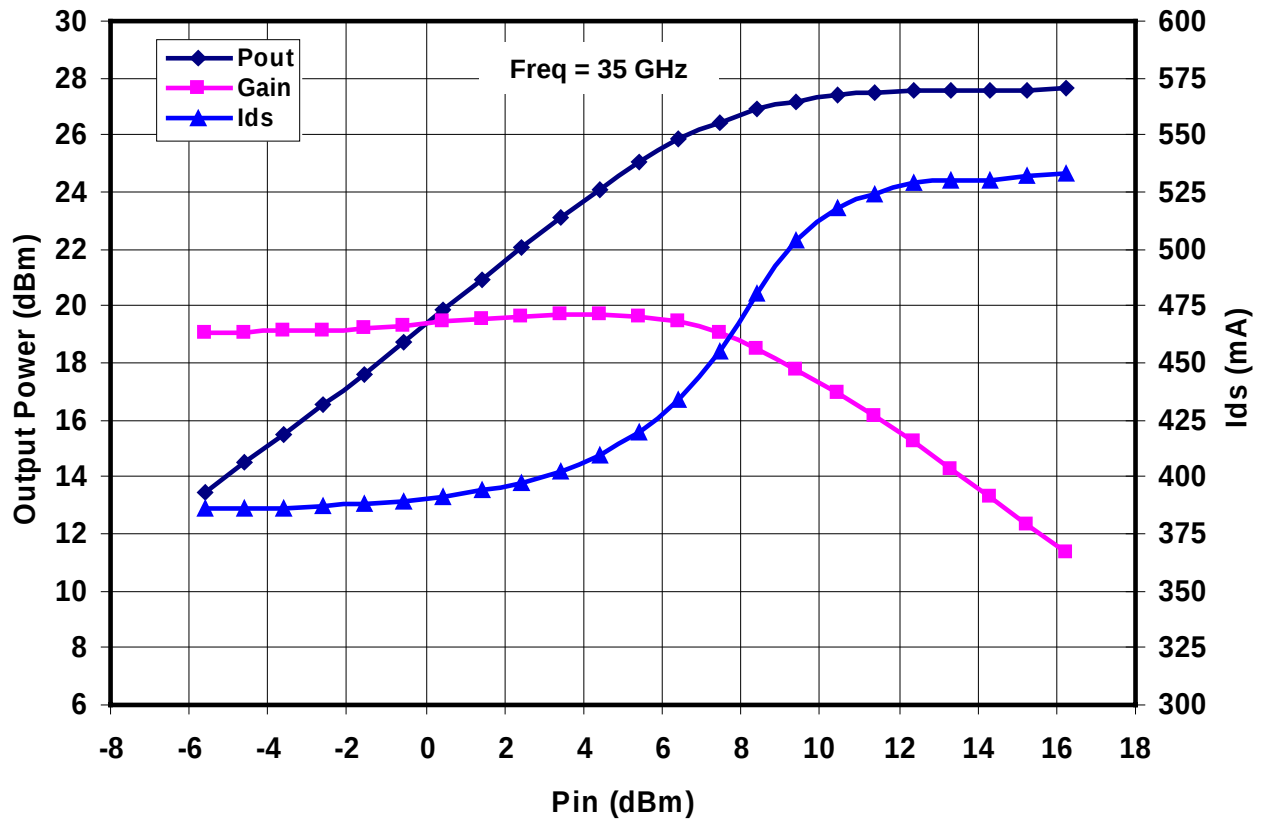
Measured Data

Bias Conditions: $V_d = 6\text{ V}$, $I_{dq} = 400\text{ mA}$



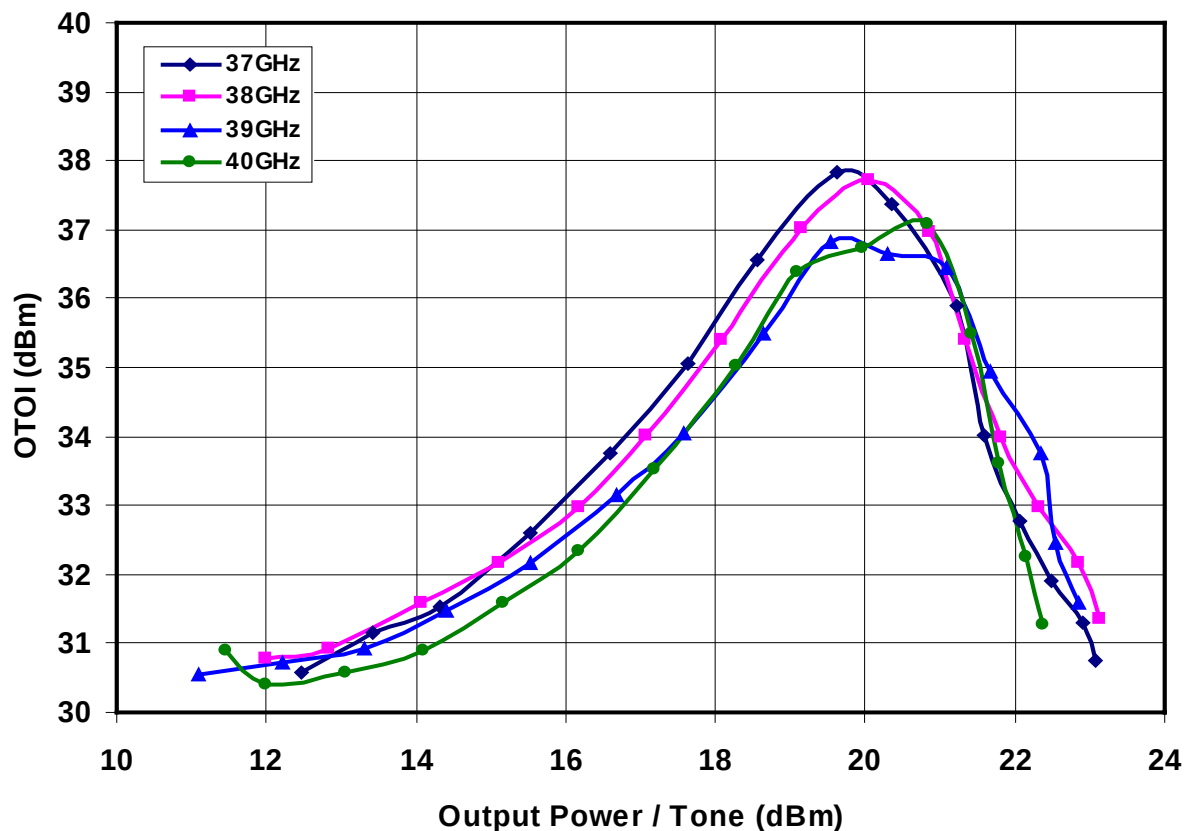
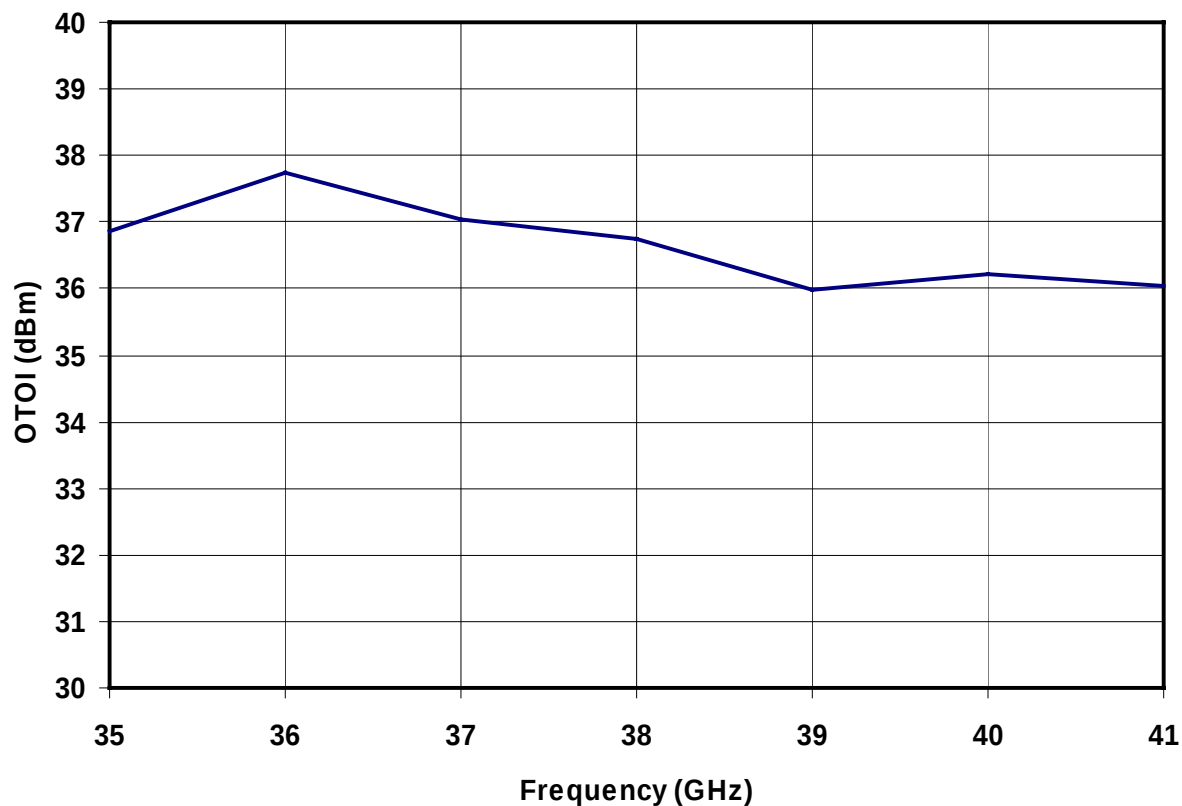
Measured Data

Bias Conditions: $V_d = 6\text{ V}$, $I_{dq} = 400\text{ mA}$



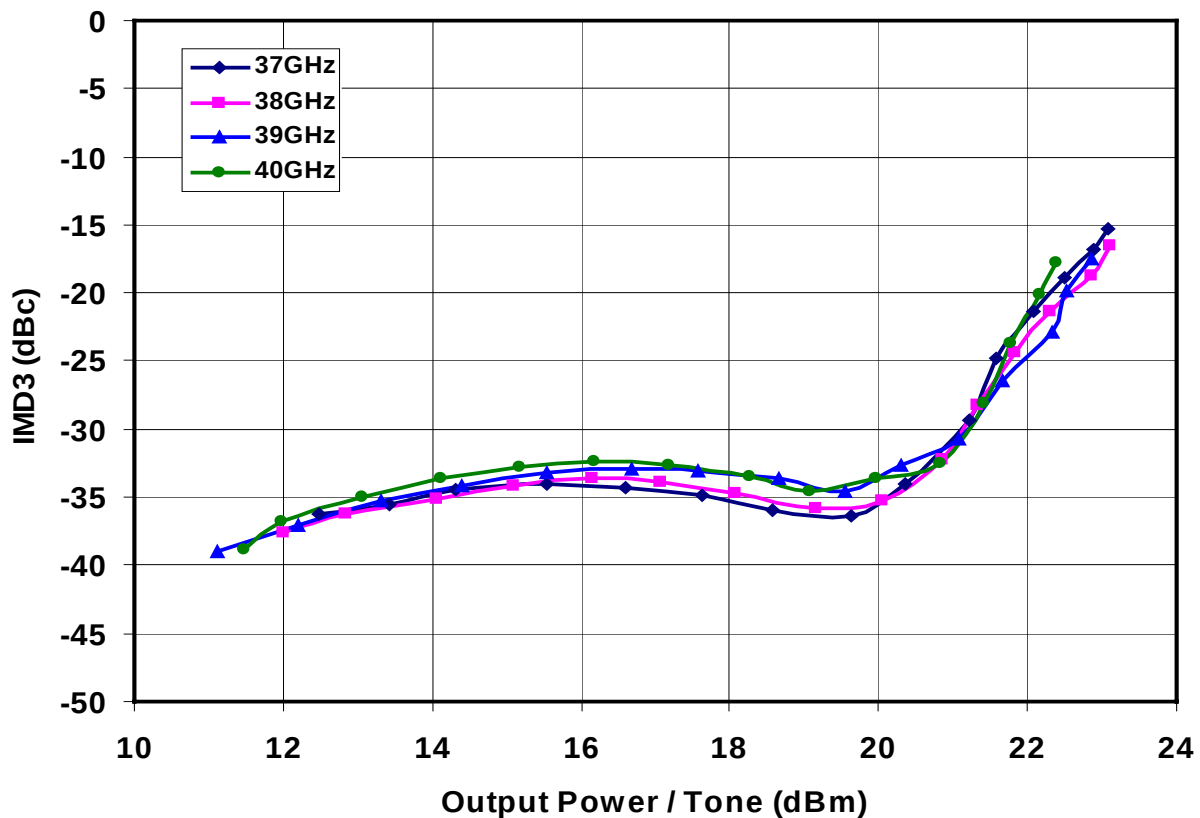
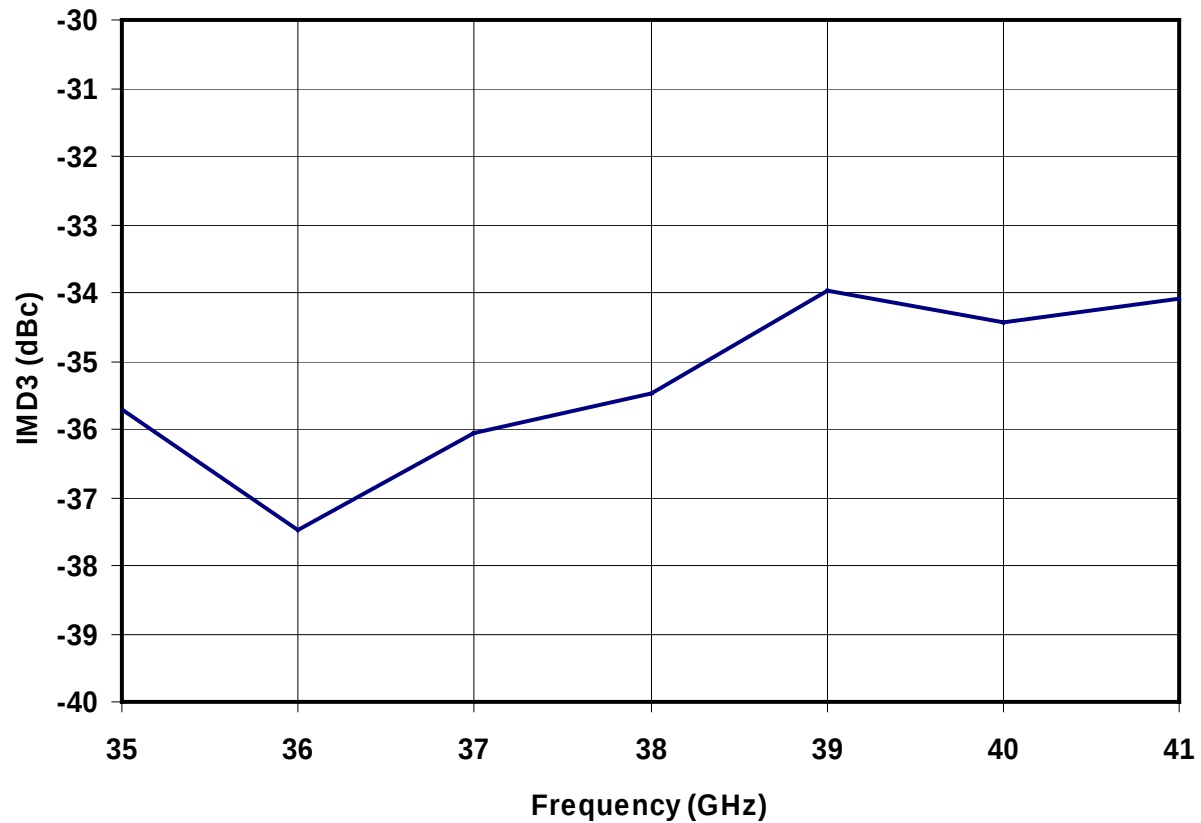
Measured Data

Bias Conditions: $V_d = 6\text{ V}$, $I_{dq} = 400\text{ mA}$, $\Delta f = 10\text{ MHz}$ @ 19dBm/Tone

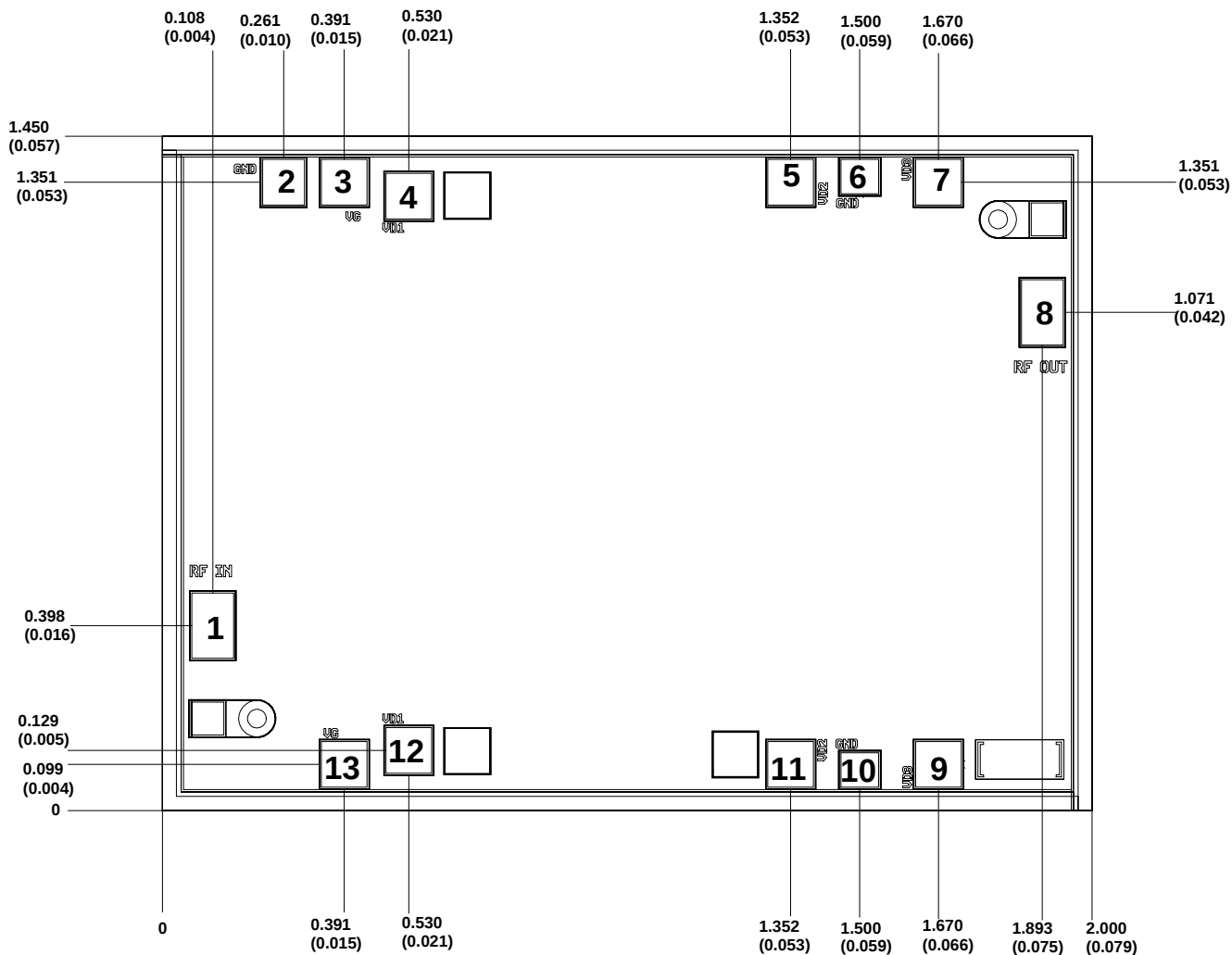


Measured Data

Bias Conditions: $V_d = 6\text{ V}$, $I_{dq} = 400\text{ mA}$, $\Delta f = 10\text{ MHz}$ @ 19dBm/Tone



Mechanical Drawing



Units: millimeters (inches)

Thickness: 0.100 (0.004)

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

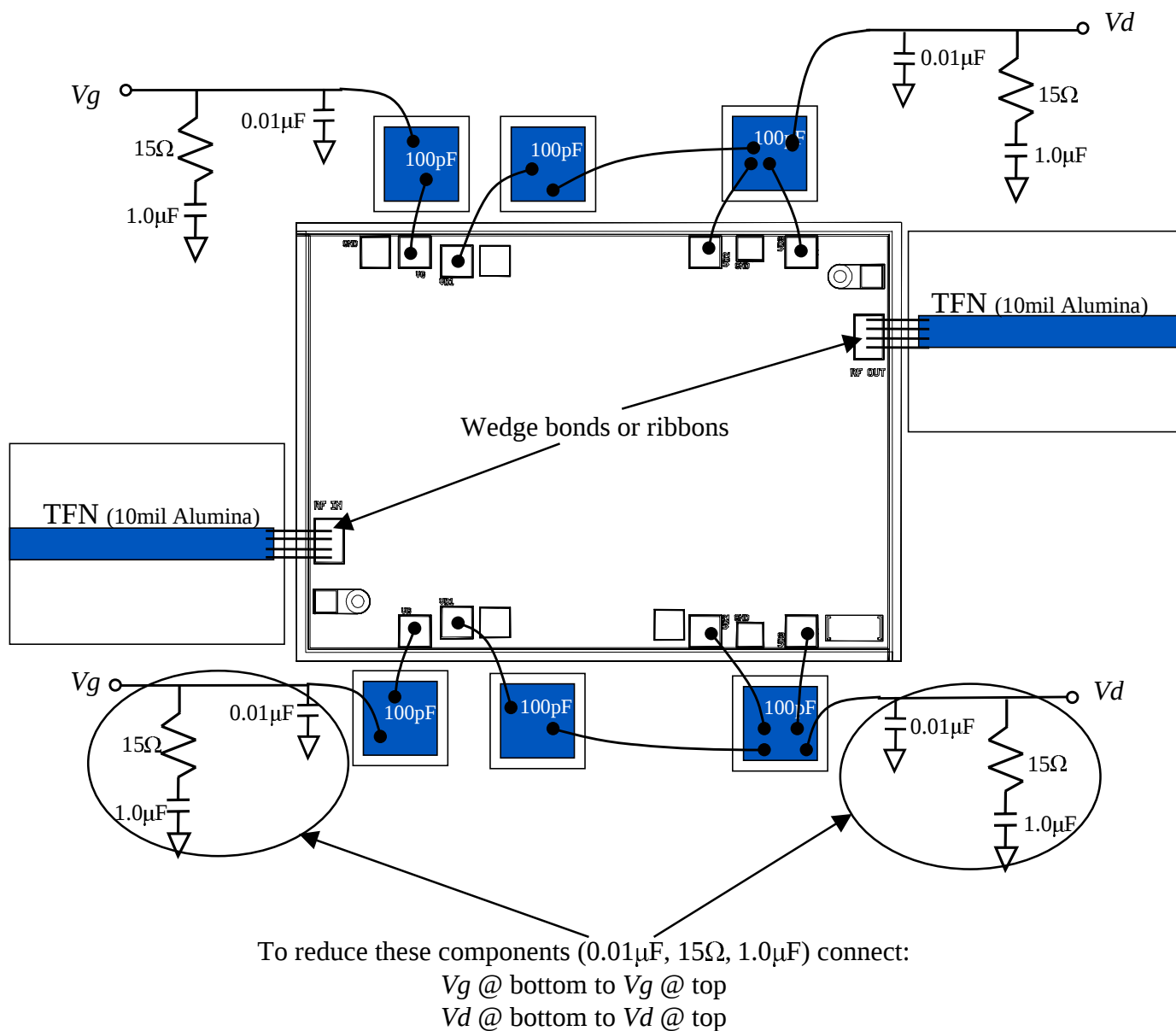
Chip size tolerance: +/- 0.051 (0.002)

GND is back side of MMIC

Bond pad #1	(RF In)	0.100 x 0.150	(0.004 x 0.006)
Bond pad #2	(N/C)	0.100 x 0.108	(0.004 x 0.004)
Bond pad #3, 13	(Vg)	0.108 x 0.108	(0.004 x 0.004)
Bond pad #4, 5, 7, 9, 11, 12	(Vd)	0.108 x 0.108	(0.004 x 0.004)
Bond pad #6, 10	(N/C)	0.091 x 0.084	(0.004 x 0.003)
Bond pad #8	(RF Out)	0.100 x 0.150	(0.004 x 0.006)

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

Recommended Chip Assembly Diagram



Bias Conditions: Vd = 6 V

Vg = ~ -0.6 V to get 400mA Id

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.