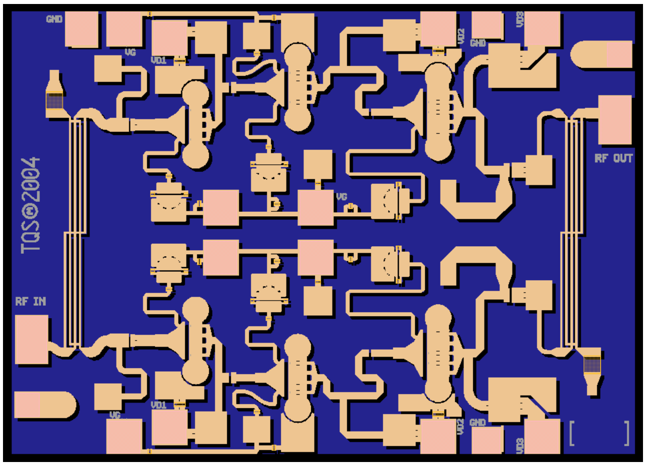
33 – 47 GHz Wide Band Driver Amplifier



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 um 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 0.15um 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.

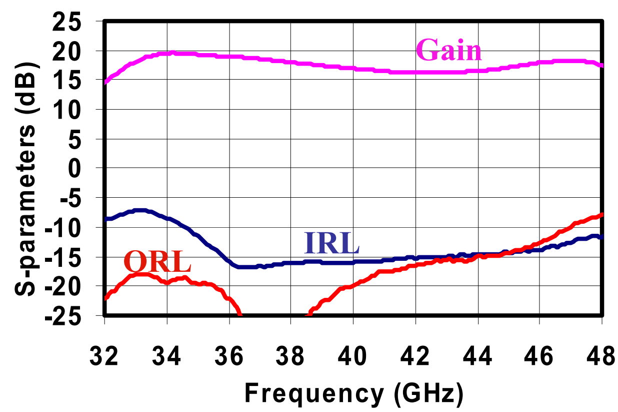
The part is ideally suited for low cost emerging markets such as Digital Radio, Point-to-Point Radio and Point-to-Multi Point Communications.

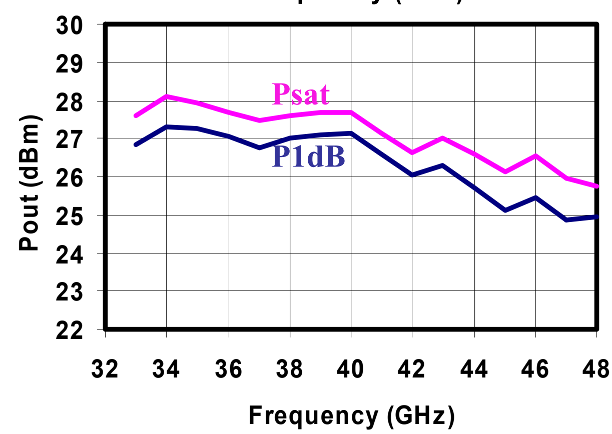
The TGA4522 is 100% DC and RF tested on-wafer to ensure performance compliance.

Lead-Free & RoHS compliant.

Measured Fixtured Data

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





Datasheet subject to change without notice

TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
Vd	Drain Voltage	8 V	2/
Vg	Gate Voltage Range	-2 TO 0 V	
Id	Drain Current	700 mA	2/ 3/
$\lvert Ig \rvert$	Gate Current	16 mA	3/
P_{IN}	Input Continuous Wave Power	23 dBm	
P_D	Power Dissipation	4.2 W	2/
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 RF applied) at a base plate temperature of 70 °C, the median life is 7.3E+3 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.

TriQuint Semiconductor: www. triquint.com (972)994-8465 Fax (972)994-8504 Info-mmw@tqs.com

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

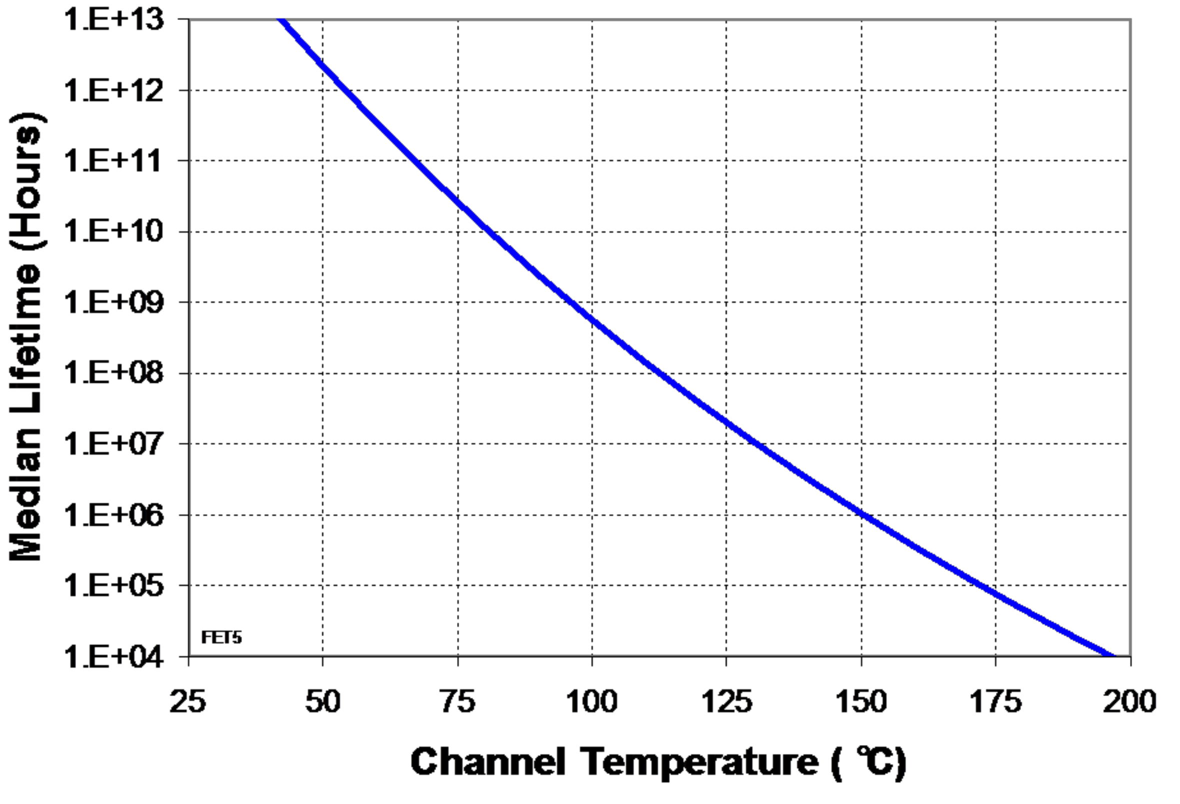
PARAMETER	TYPICAL	UNITS
Frequency Range	33 - 47	GHz
Drain Voltage, Vd	6.0	V
Drain Current, Id	400	mA
Gate Voltage, Vg	-0.6	V
Small Signal Gain, S21	18	dB
Input Return Loss, S11	15	dB
Output Return Loss, S22	15	dB
Output Power @ 1dB Gain Compression, P1dB	26	dBm
Saturated Power, Psat	27	dBm
OTOI @ 19dBm/Tone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

TABLE III
THERMAL INFORMATION

PARAMETER	TEST CONDITIONS	T_{CH} (°C)	$R_{\theta JC}$ (°C/W)	Tm (HRS)
$R_{\theta JC}$ 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.

Median Lifetime (Tm) vs. Channel Temperature



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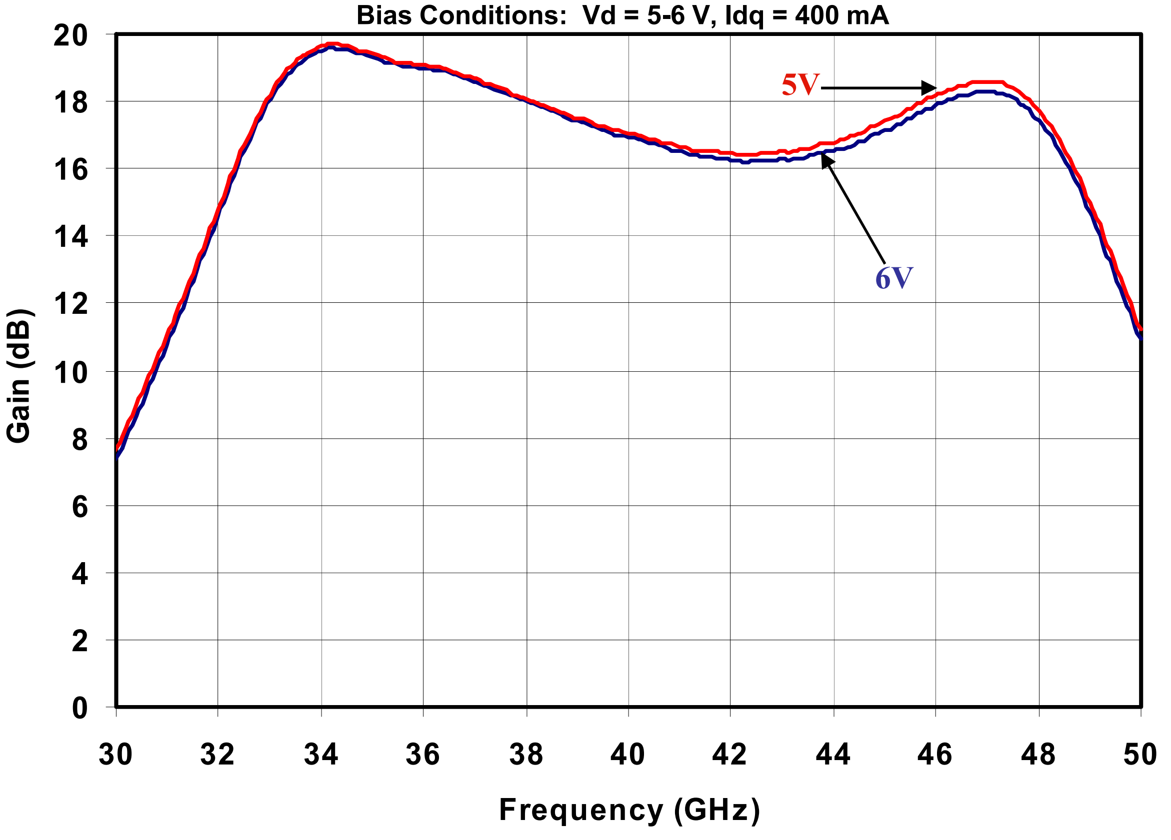
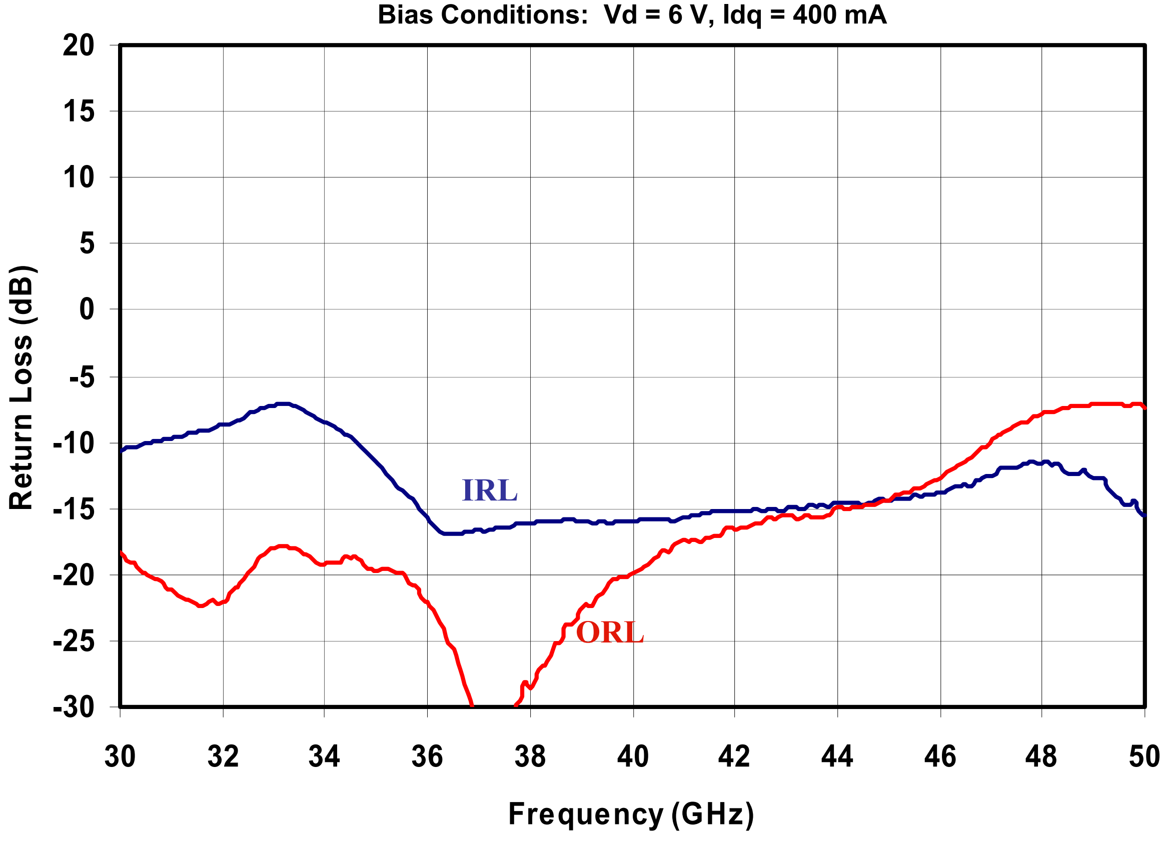
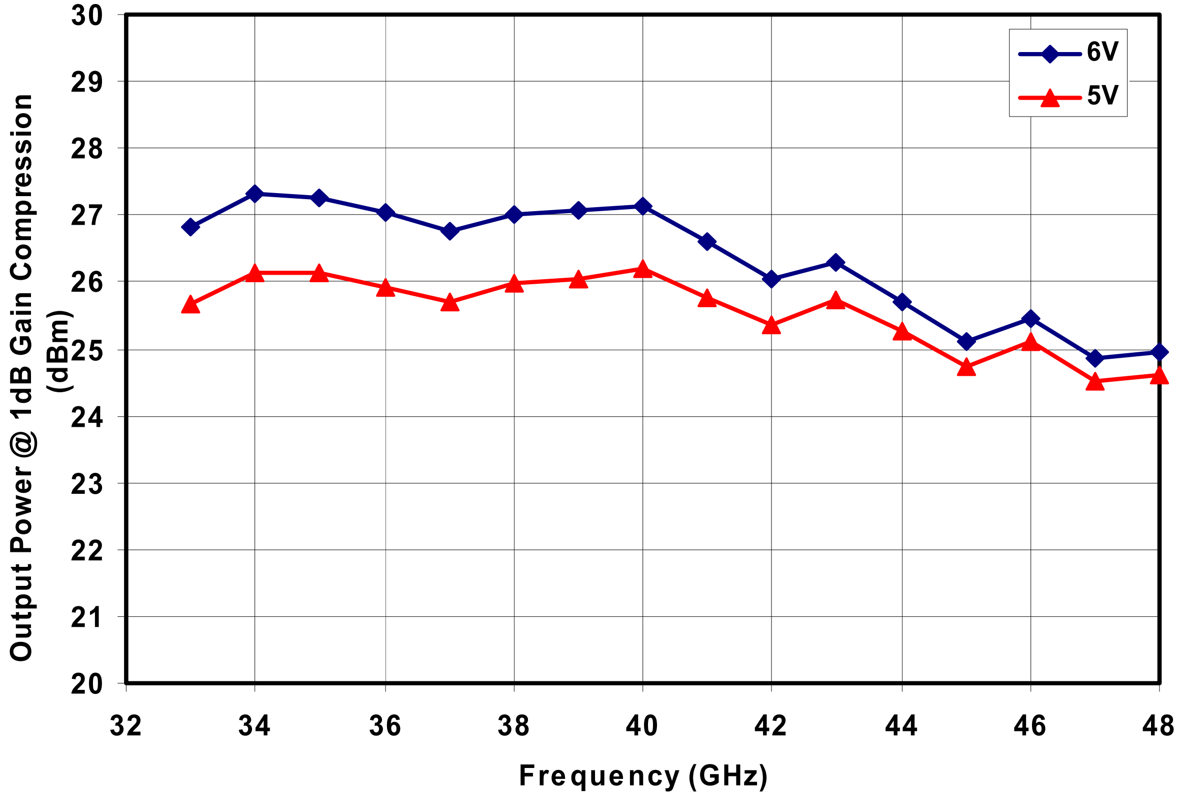
Measured Data

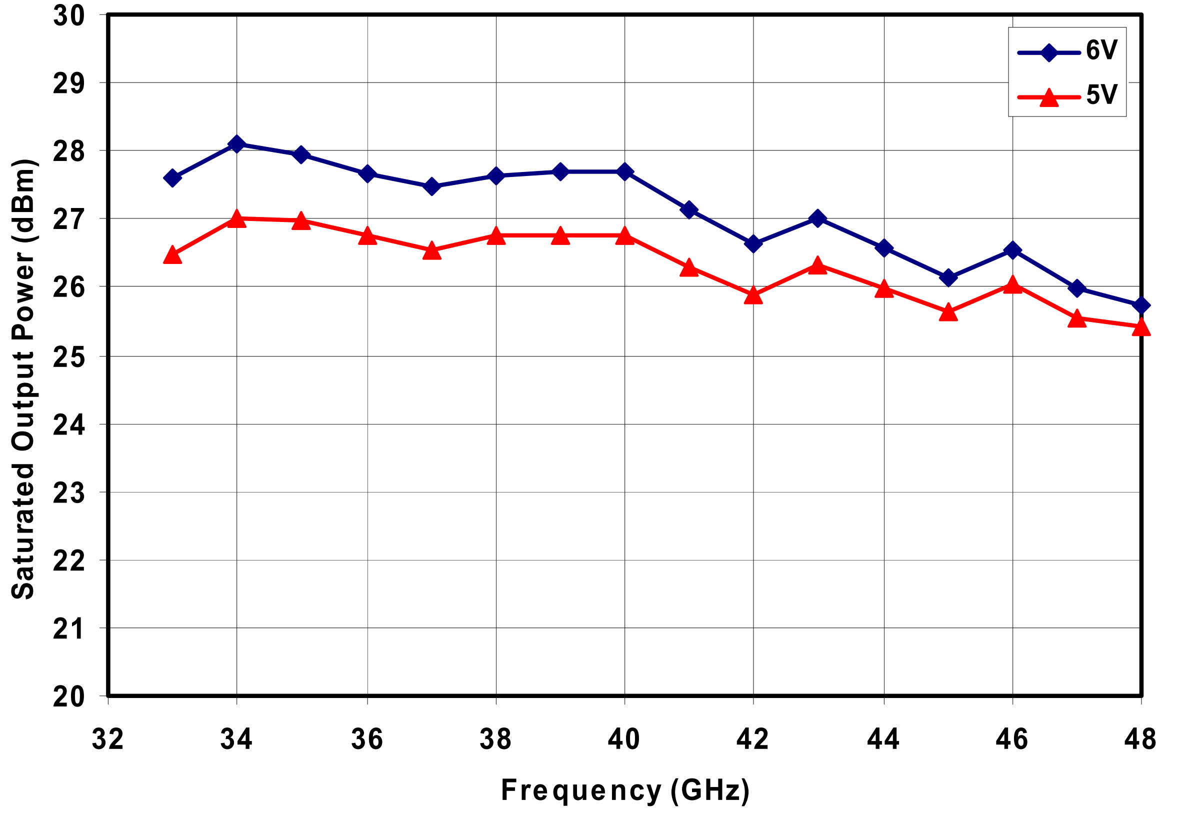




Measured Data

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





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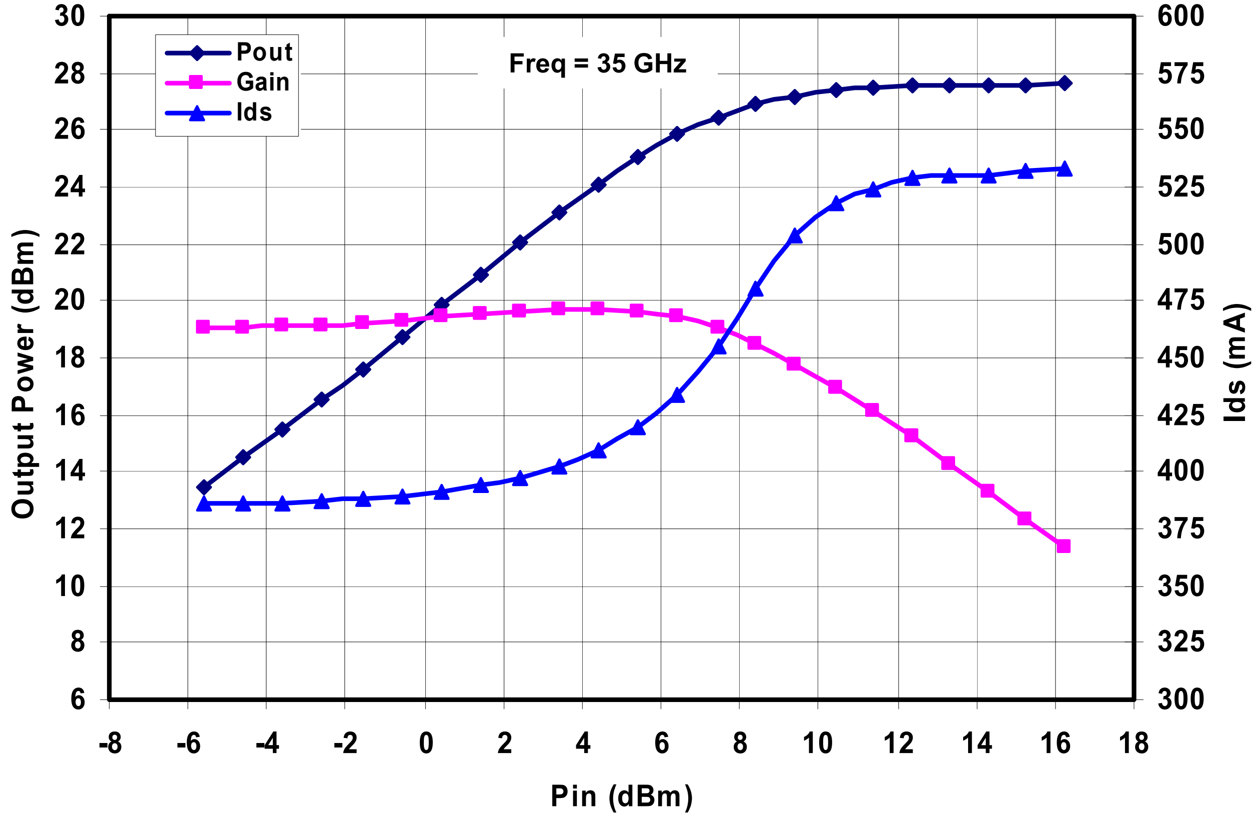
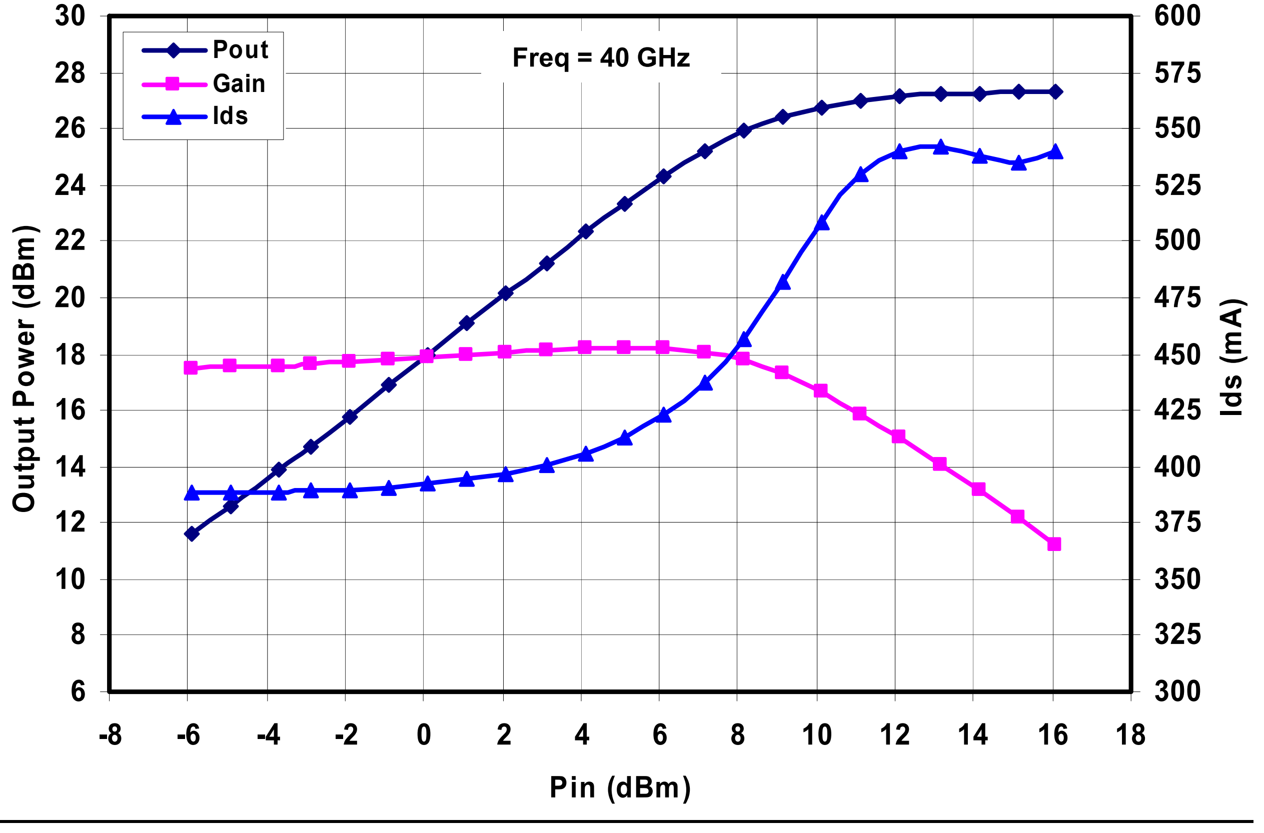
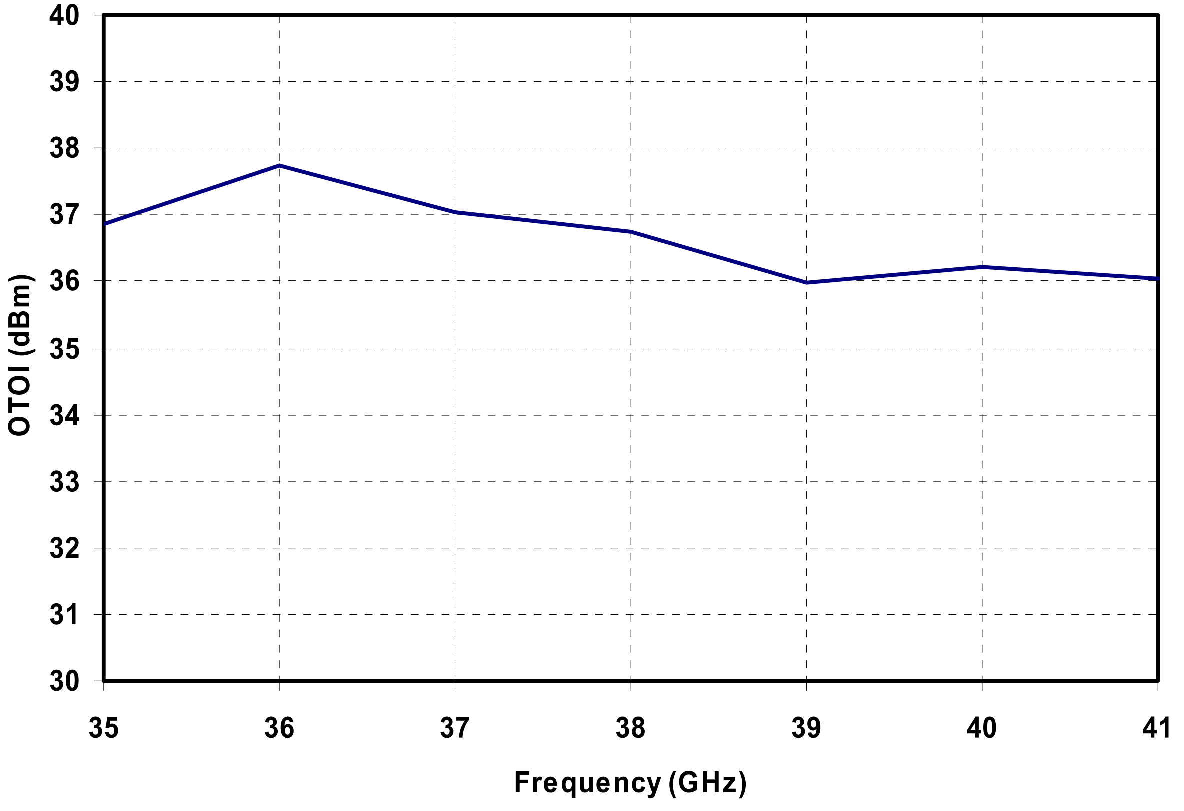
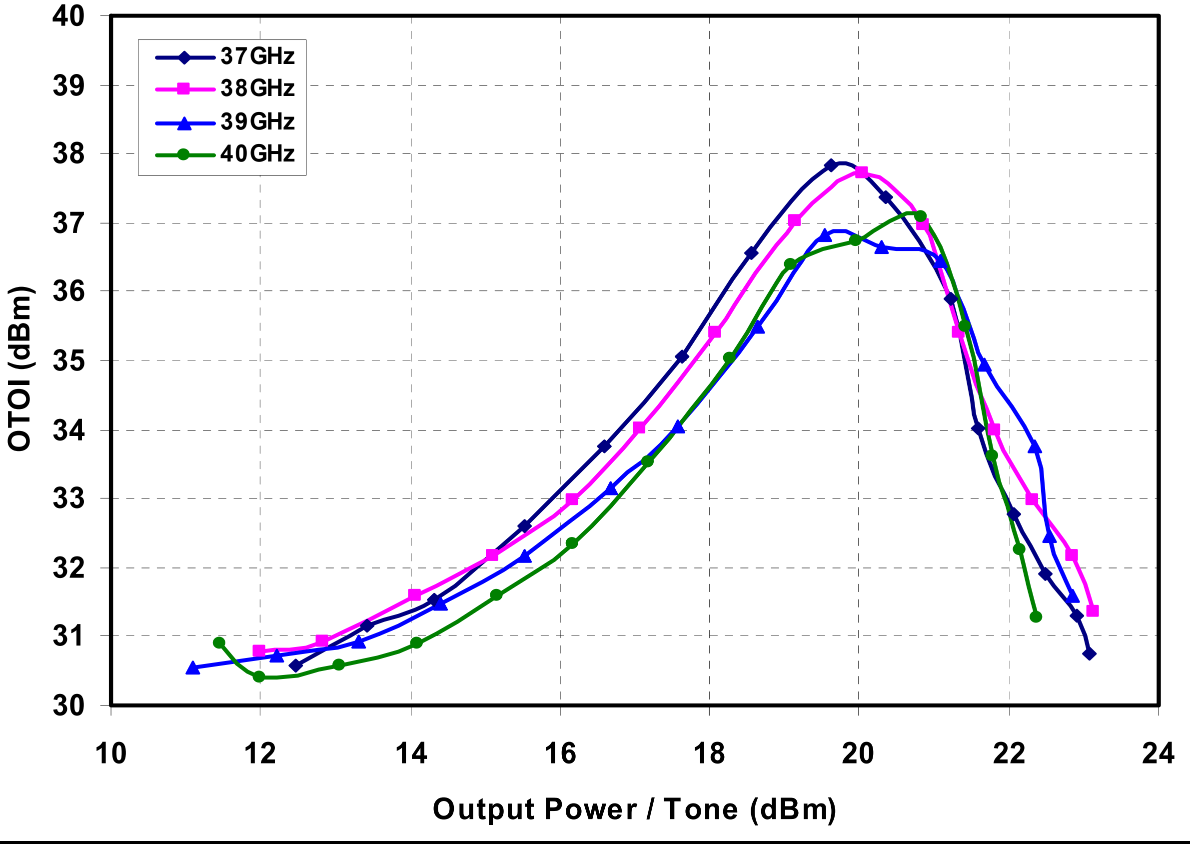




Measured Data

Bias Conditions: Vd = 6 V, Idq = 400 mA, Δf=10MHz @ 19dBm/Tone





Measured Data

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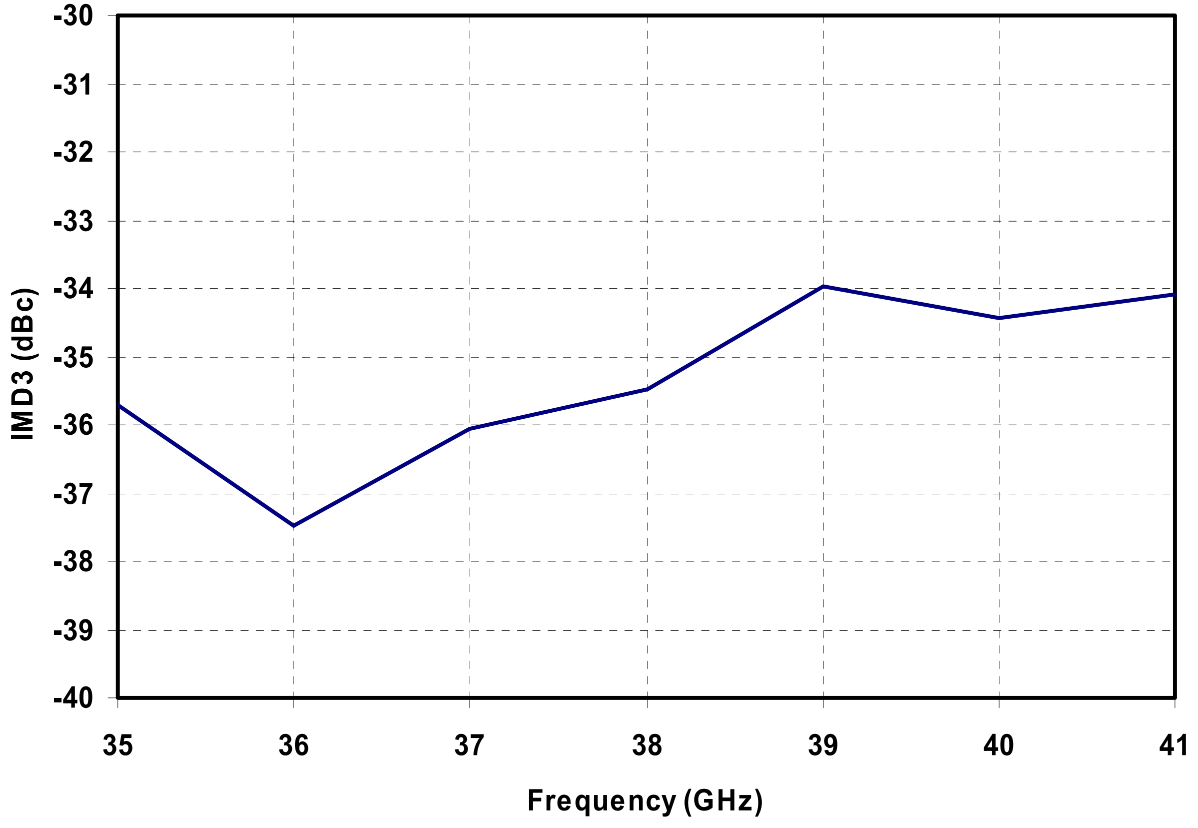
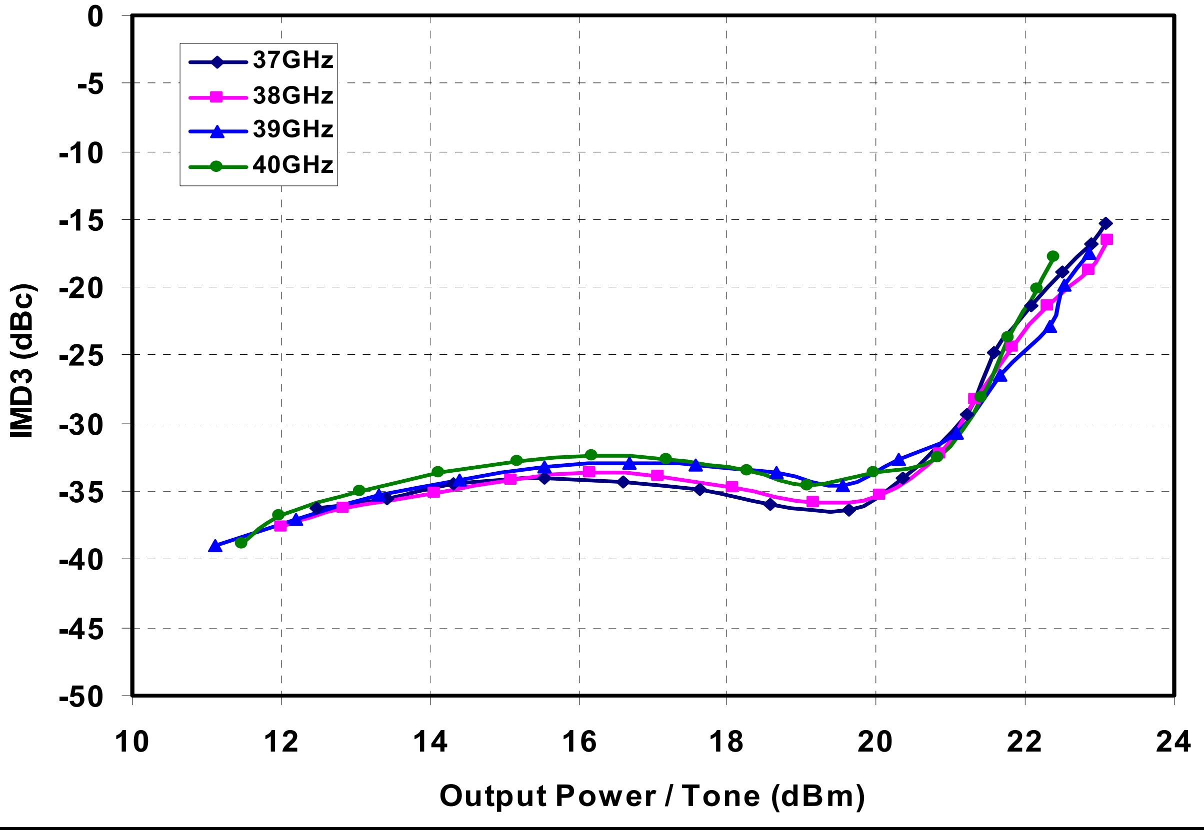
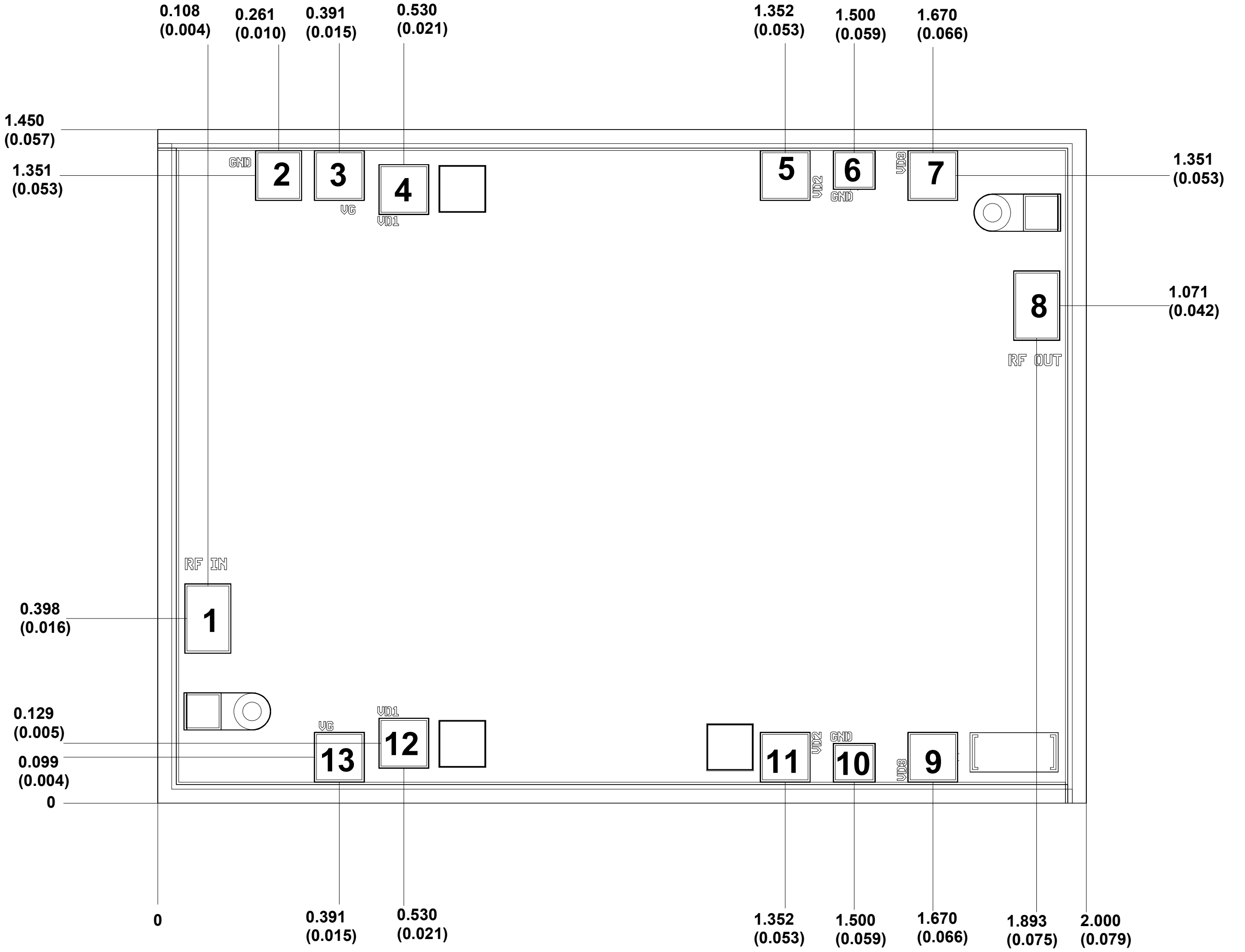




Mechanical Drawing

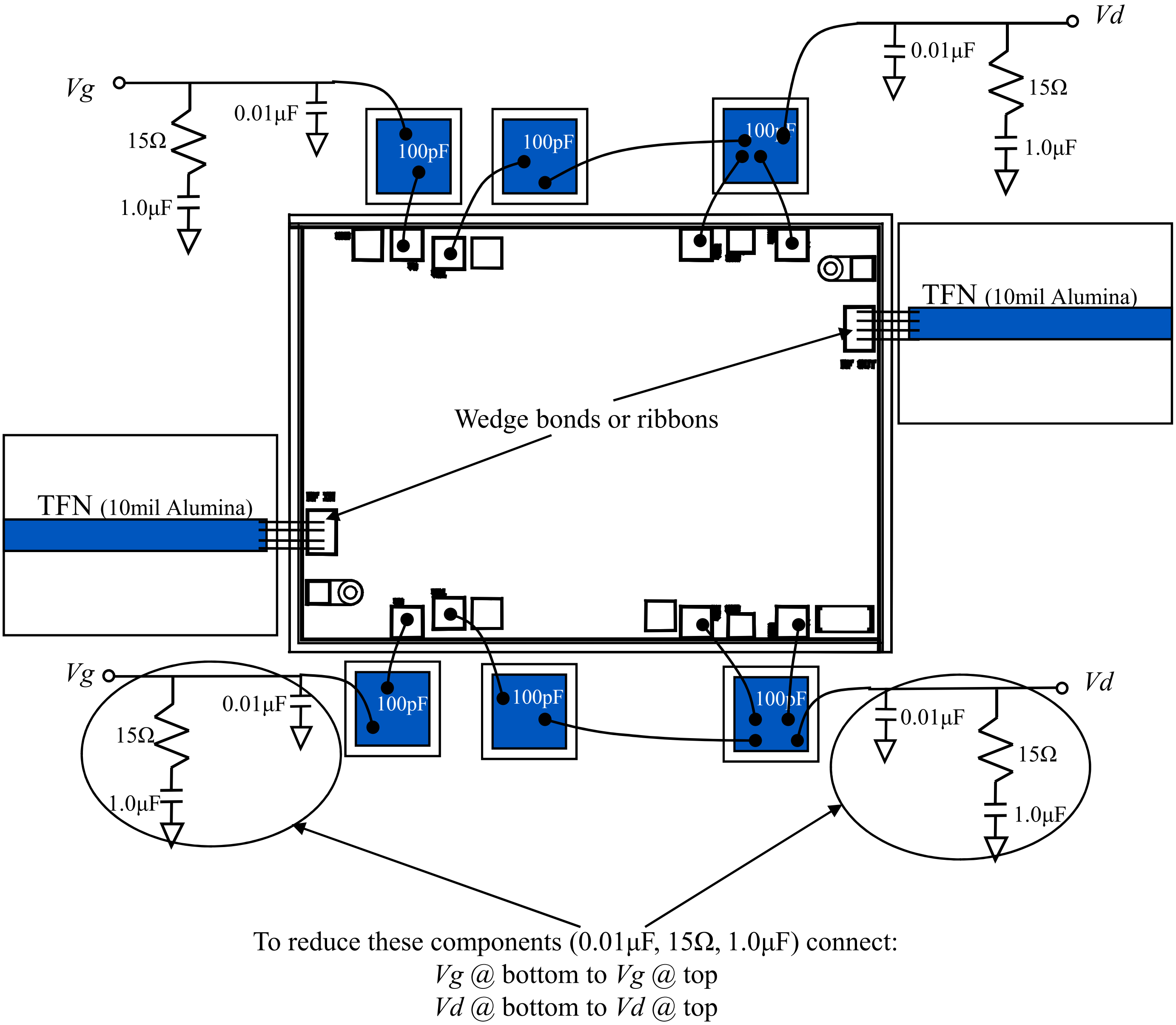


Units: millimeters (inches)
Thickness: 0.100 (0.004)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)
GND is back side of MMIC

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

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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^{0}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^{0}C.

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