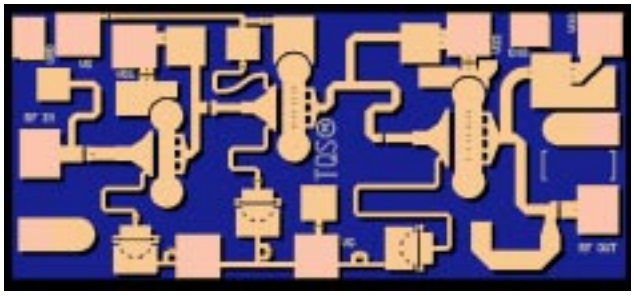
32 - 47 GHz Wide Band Driver Amplifier TGA4521-EPU



Key Features

- Frequency Range: 32 - 47 GHz
- 24 dBm Nominal Psat @ 38 GHz
- 23 dBm P1dB @ 38 GHz
- 15 dB Nominal Gain @ 38 GHz
- 32 dBm OTOI @ 16dBm/Tone
- Bias: 5-6 V @ 200 mA Idq
- 0.25 um 3MI pHEMT Technology
- Chip Dimensions 1.60 x 0.75 x 0.10 mm (0.063 x 0.030 x 0.004 in)

Product Description

The TriQuint TGA4521-EPU is a compact Driver Amplifier MMIC for Ka-band and Q-band applications. The part is designed using TriQuint's proven standard 0.25um power pHEMT production process.

The TGA4521-EPU nominally provides 24 dBm saturated output power, and 23 dBm output power at 1dB Gain compression @ 38 GHz. It also has typical gain 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.

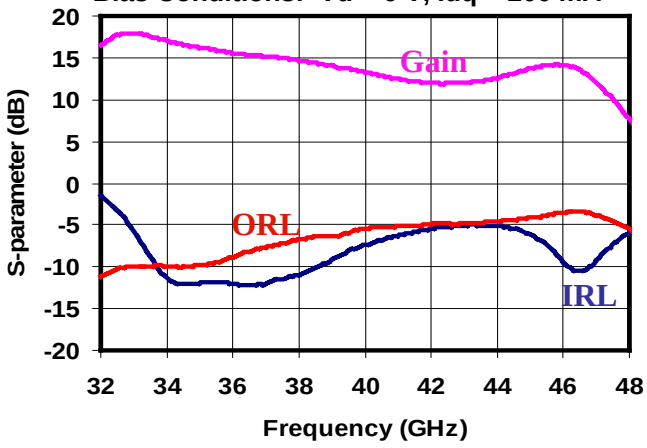
The TGA4521-EPU is 100% DC and RF tested on-wafer to ensure performance compliance.

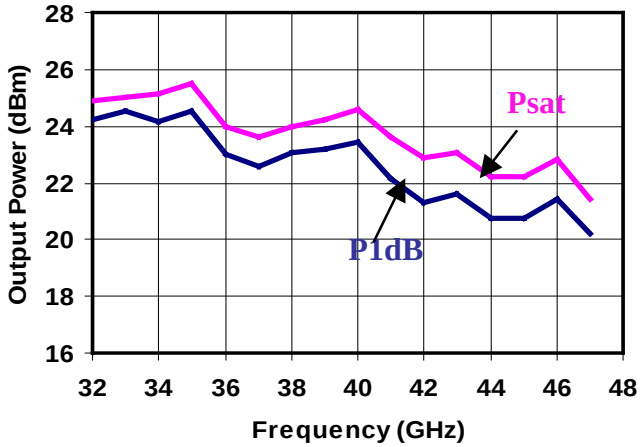
Primary Applications

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

Measured Fixtured Data

Bias Conditions: Vd = 6 V, Idq = 200 mA





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
Vd	Drain Voltage	8 V	2/
Vg	Gate Voltage Range	-2 TO 0 V	
Id	Drain Current	350 mA	2/ 3/
$\|Ig\|$	Gate Current	9 mA	3/
P_{IN}	Input Continuous Wave Power	20 dBm	
P_D	Power Dissipation	See note 4/	2/
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/ For a median life time of 1E+6 hrs, Power dissipation is limited to:

$$P_D(max) = (150\ ^0C - T_{BASE}\ ^0C) / 70\ (^0C/W)$$

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.

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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	200	mA
Gate Voltage, Vg	-0.5	V
Small Signal Gain, S21	12	dB
Input Return Loss, S11	7	dB
Output Return Loss, S22	7	dB
Output Power @ 1dB Gain Compression, P1dB	23	dBm
Saturated Power, Psat	25	dBm

TABLE III
THERMAL INFORMATION

PARAMETER	TEST CONDITIONS	T_{CH} (^{O}C)	$R_{\theta JC}$ (°C/W)	T_M (HRS)
$R_{\theta JC}$ Thermal Resistance (channel to Case)	Vd = 5 V Id = 200 mA Pdiss = 1.0 W	140	70	2.4E+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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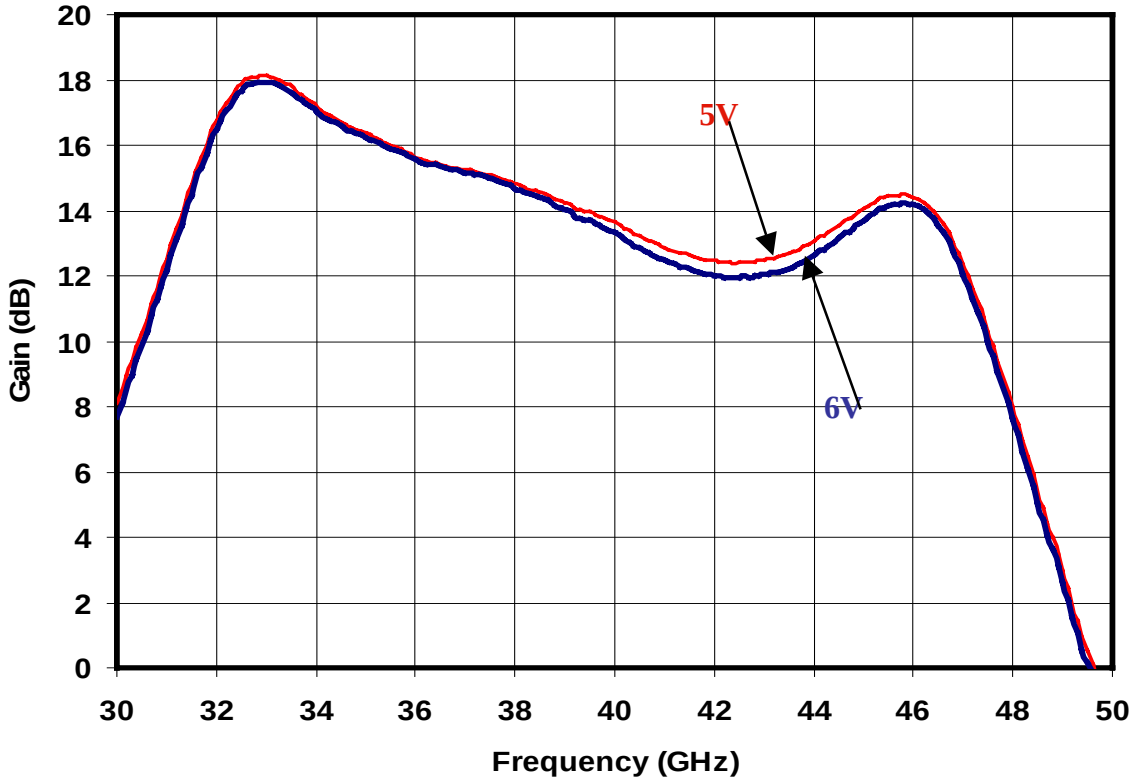
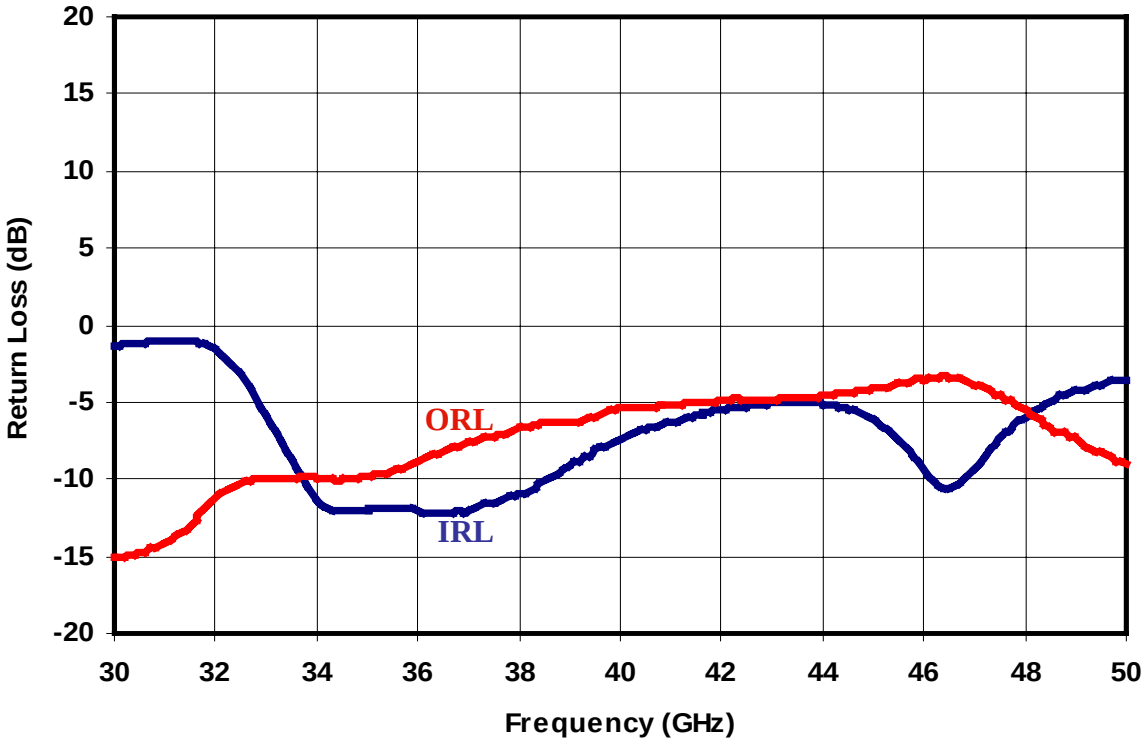
Preliminary Measured Data

Bias Conditions: Vd = 5 - 6 V, Idq = 200 mA



Bias Conditions: Vd = 6 V, Idq = 200 mA



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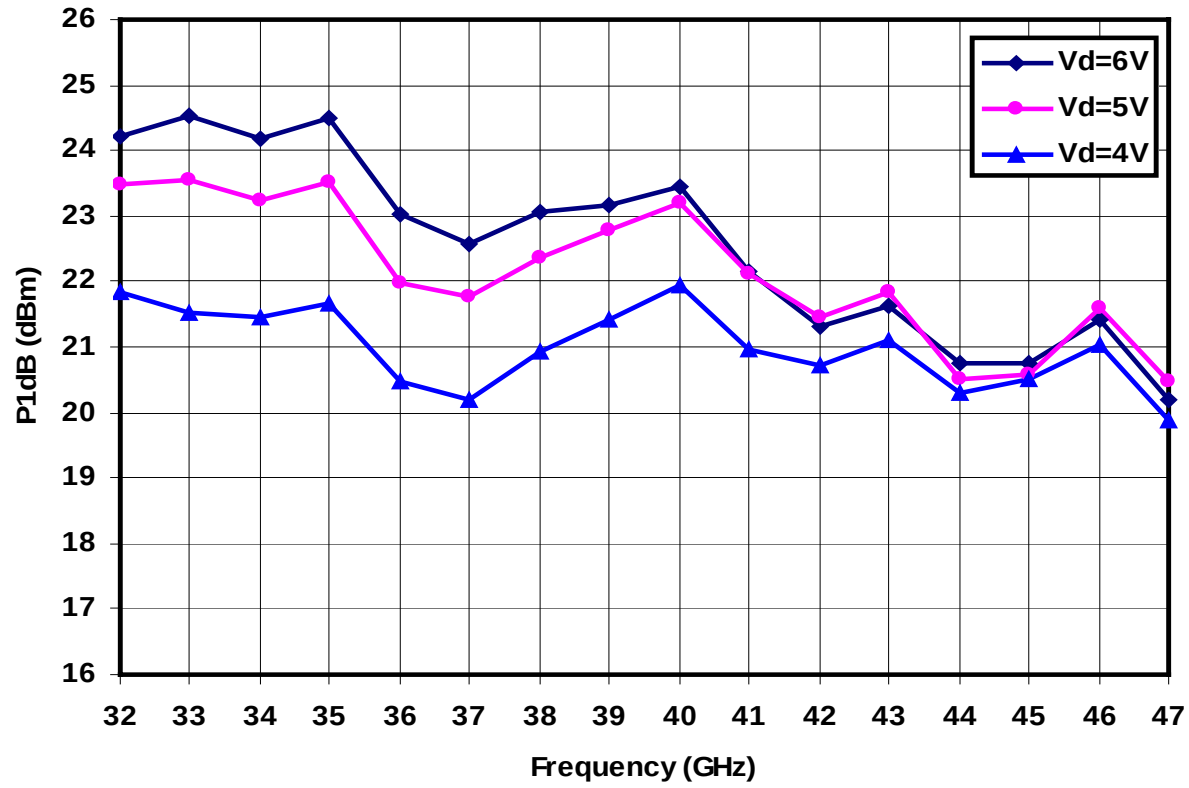
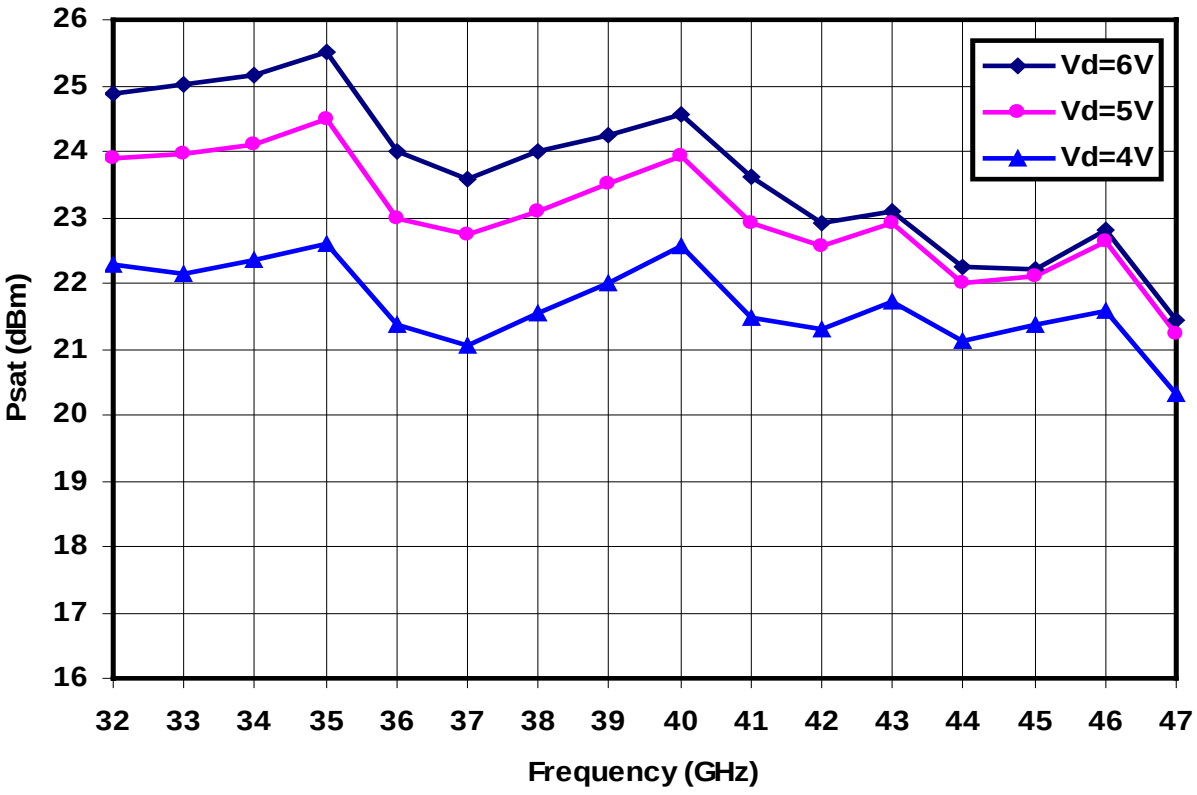
Preliminary Measured Data

Bias Conditions: Vd = 4 - 6 V, Idq = 200 mA





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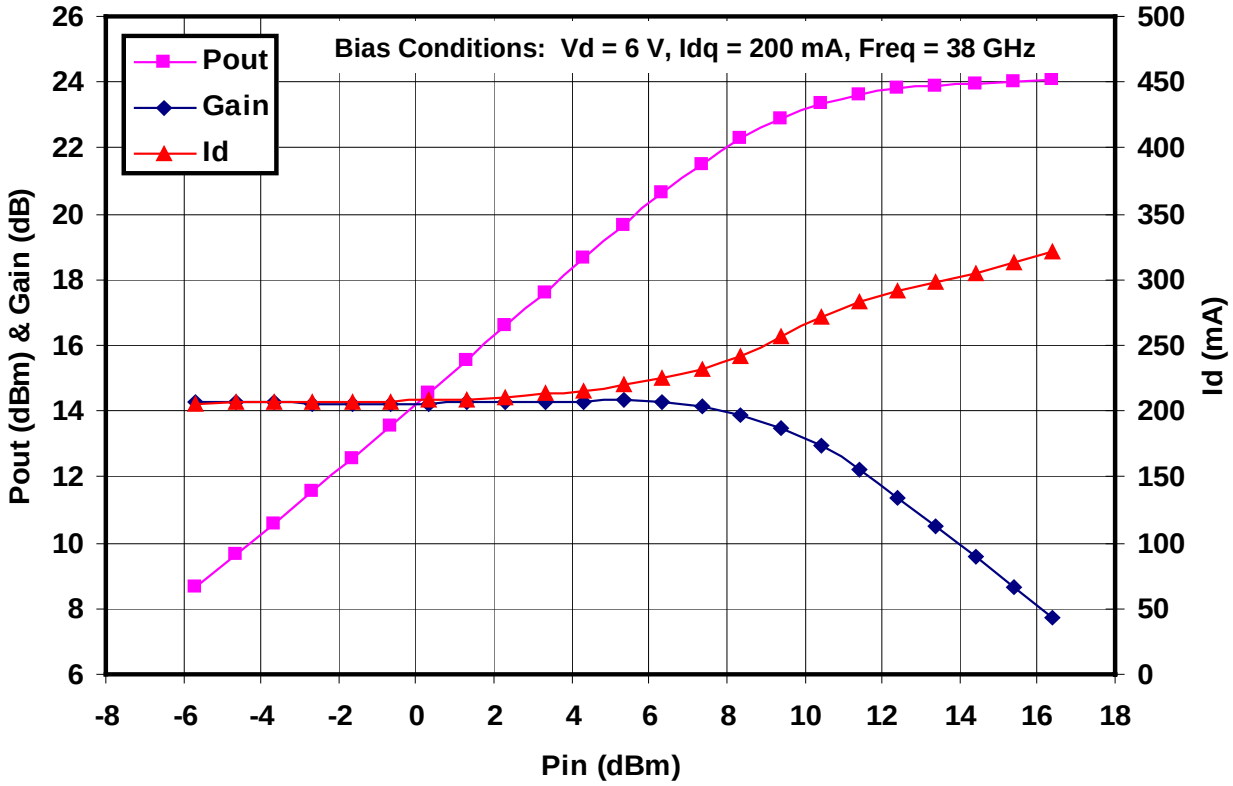
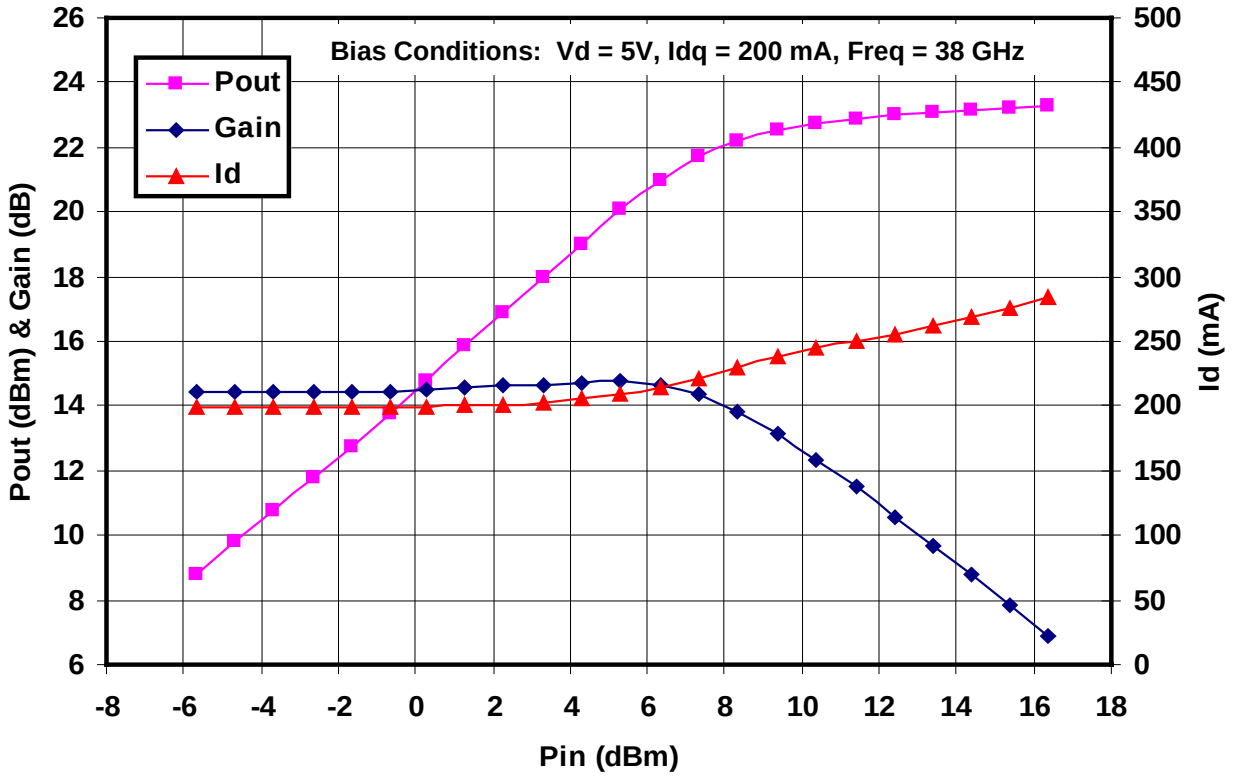
Preliminary Measured Data





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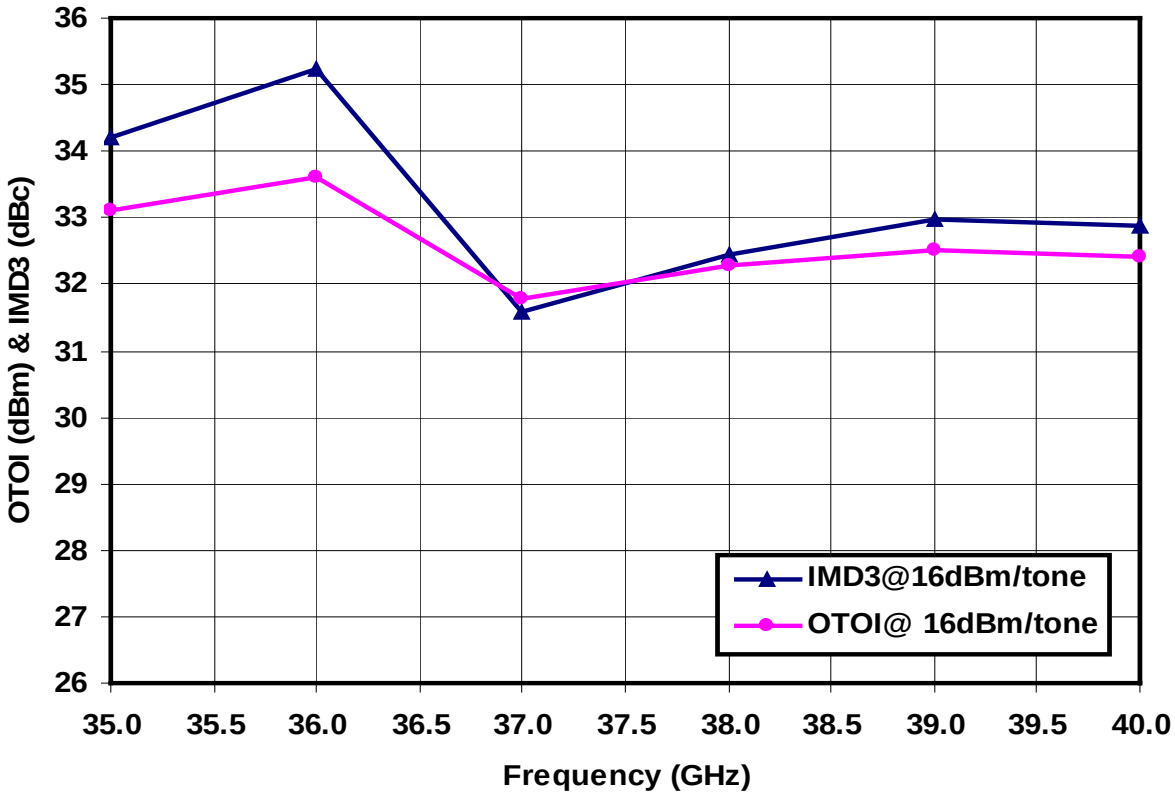
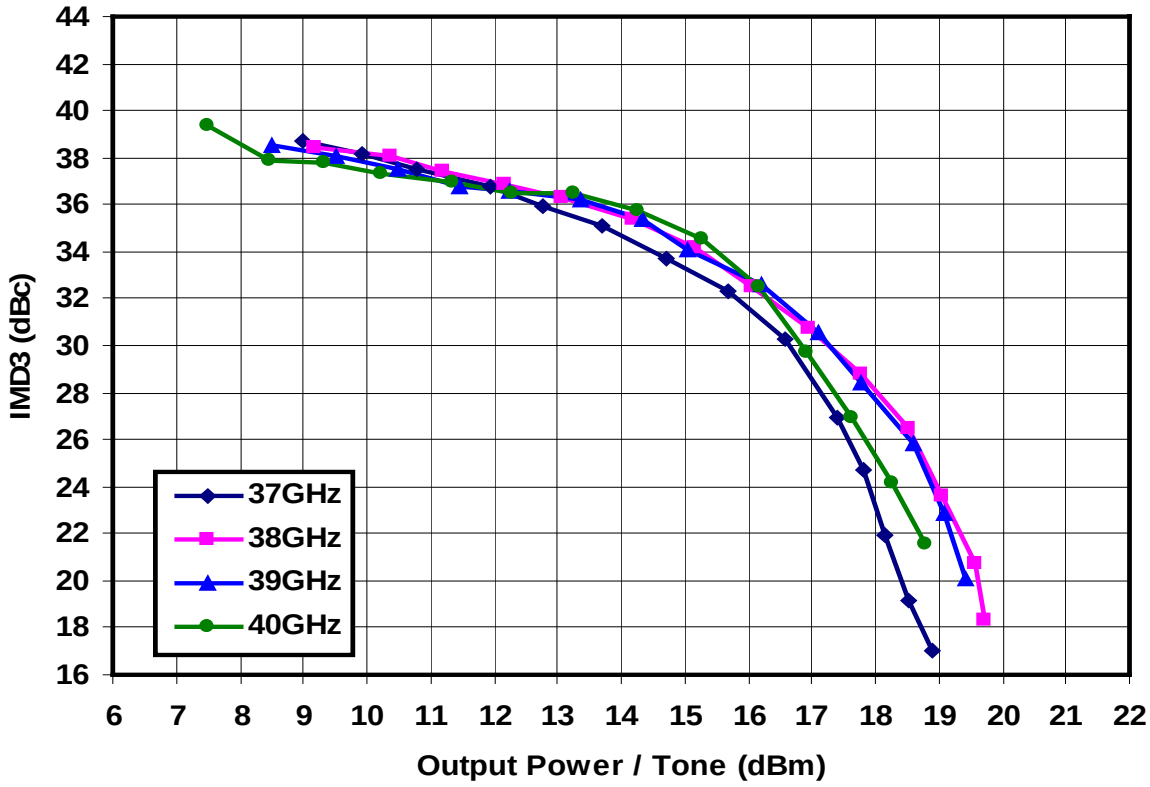
Preliminary Measured Data

Bias Conditions: Vd = 6 V, Idq = 200 mA, Δf=10MHz





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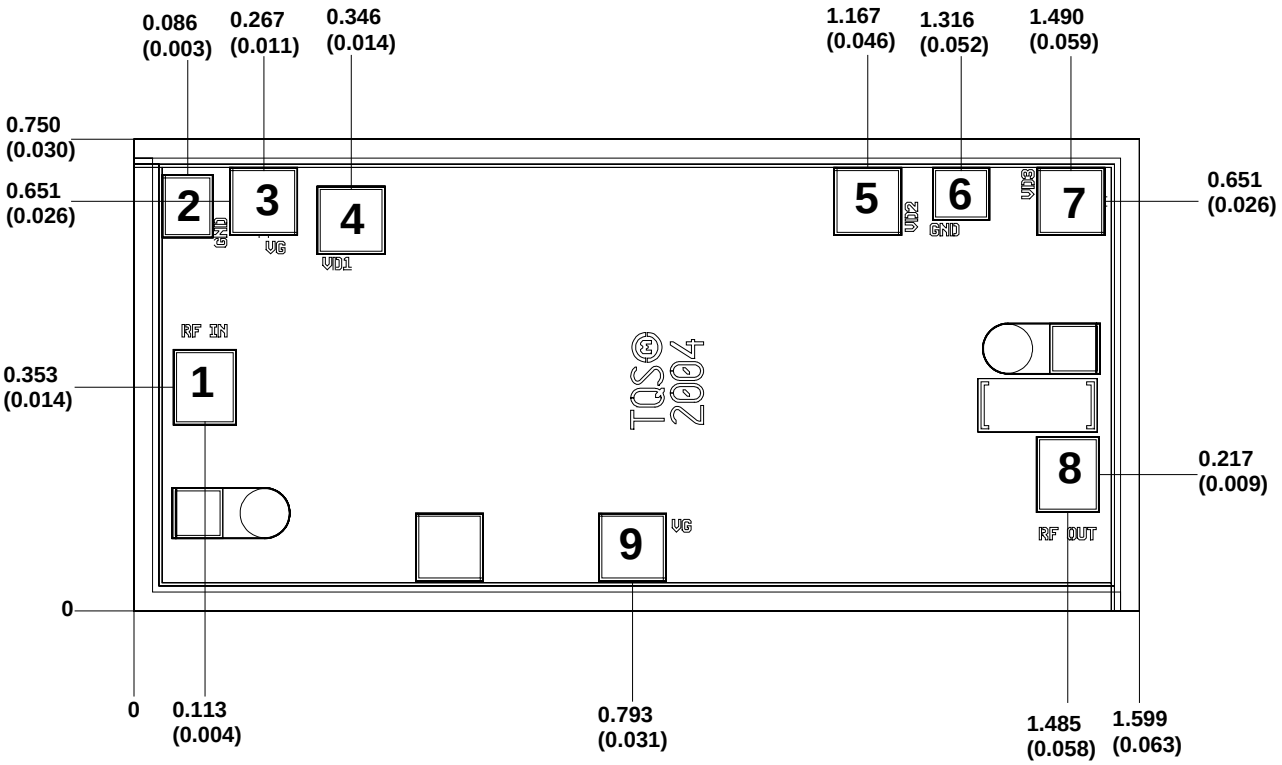
Mechanical Drawing



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 0.120**	**(0.004 x 0.005)**
Bond pad #2	**(N/C)**	**0.081 x 0.100**	**(0.003 x 0.004)**
Bond pad #3, 9	**(Vg)**	**0.108 x 0.108**	**(0.004 x 0.004)**
Bond pad #4, 5, 7	**(Vd)**	**0.108 x 0.108**	**(0.004 x 0.004)**
Bond pad #6	**(N/C)**	**0.091 x 0.084**	**(0.004 x 0.003)**
Bond pad #8	**(RF Out)**	**0.100 x 0.120**	**(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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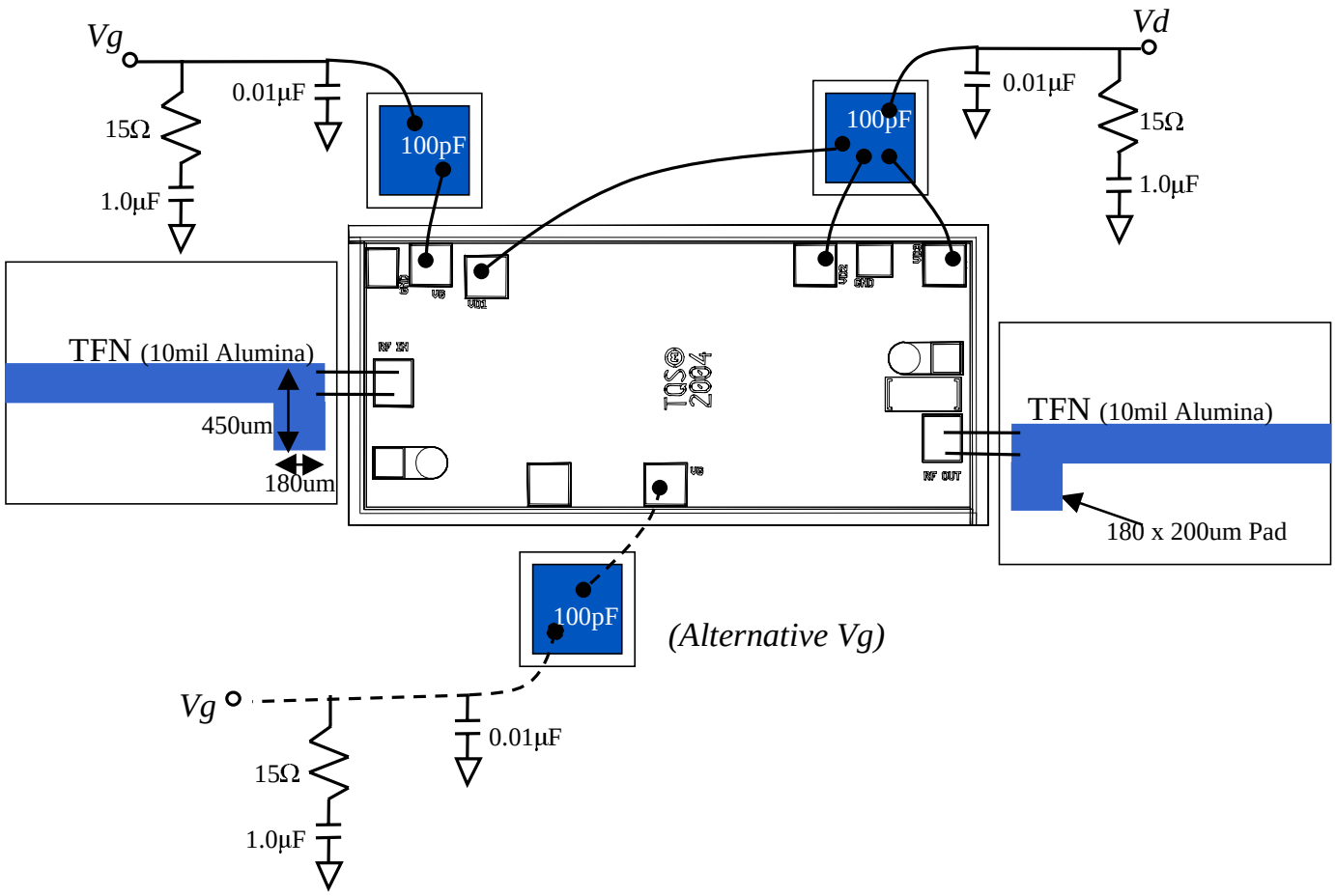
Recommended Chip Assembly Diagram



Bias Conditions: Vd = 4 - 6 V
Vg = ~ -0.5 V to get 200mA 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 300^0C (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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