



TGA4522-XCC-2

Ka and Q Band GaAs Driver Amplifier

Product Overview

The Qorvo TGA4522-XCC-2 is a compact Driver Amplifier MMIC for Ka-band and Q-band applications. The part is designed using Qorvo's 0.15um power pHEMT production process.

TGA4522-XCC-2 nominally provides 27.5 dBm saturated output power, and 27 dBm output power at 1 dB Gain compression @ 38 GHz. It also has typical gain of 18 dB, and return loss of 15 dB

TGA4522-XCC-2 is ideally suited for low-cost emerging markets such as Digital Radio, Point-to-Point Radio and Point-to-Point Multi Point Communications.

TGA4522-XCC-2 is 100% DC and RF tested on-wafer to ensure performance compliance.

Lead-Free & RoHS complaint



Product Features

- Frequency Range: 33 – 47 GHz
- Psat: 27.5 dBm
- P1dB: 27 dBm @ 38 GHz
- Gain: 18 dB
- Return loss: 15 dB
- OTOI: 36 dBm at Pin = 8 dBm/Tone
- Bias: Vd = 6 V @ Idq = 400 mA
- 0.15 um 3MI pMHET Technology
- Chip Dimensions: 2.0 x 1.45 x 0.10 mm

Applications

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

Ordering Information

Part No.	Description
107662	TGA4522-XCC-2, Gel Pack, Qty 100



Absolute Maximum Ratings

Parameter	Min Value	Max Value	Units
Drain Voltage, V_d ^{2/}	-	8	V
Gate Voltage, V_g	-2	0	V
Drain Current, I_d ^{2/ 3/}	-	700	mA
Gate Current, I_g ^{3/}	-	16	mA
Power Dissipation, P_{diss} ^{2/}	-	4.2	W
RF Input Power, CW, $T = 25^\circ\text{C}$	-	23	dBm
Channel Temperature, T_{ch} ^{5/ 6/}	-	200	$^\circ\text{C}$
Mounting Temperature (30 Seconds)	-	320	$^\circ\text{C}$
Storage Temperature	-65	150	$^\circ\text{C}$

Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied. Extended application of Absolute Maximum Rating conditions may reduce device reliability.

- 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 $7.3\text{E}+3$ 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.



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Recommended Operating Conditions

Parameter	Value	Units
Drain Voltage	6	V
Drain Current (quiescent, I _{DQ})	400	mA
Gate Voltage (typical)	-0.6	V
Operating Temperature Range	-40 to 85	°C

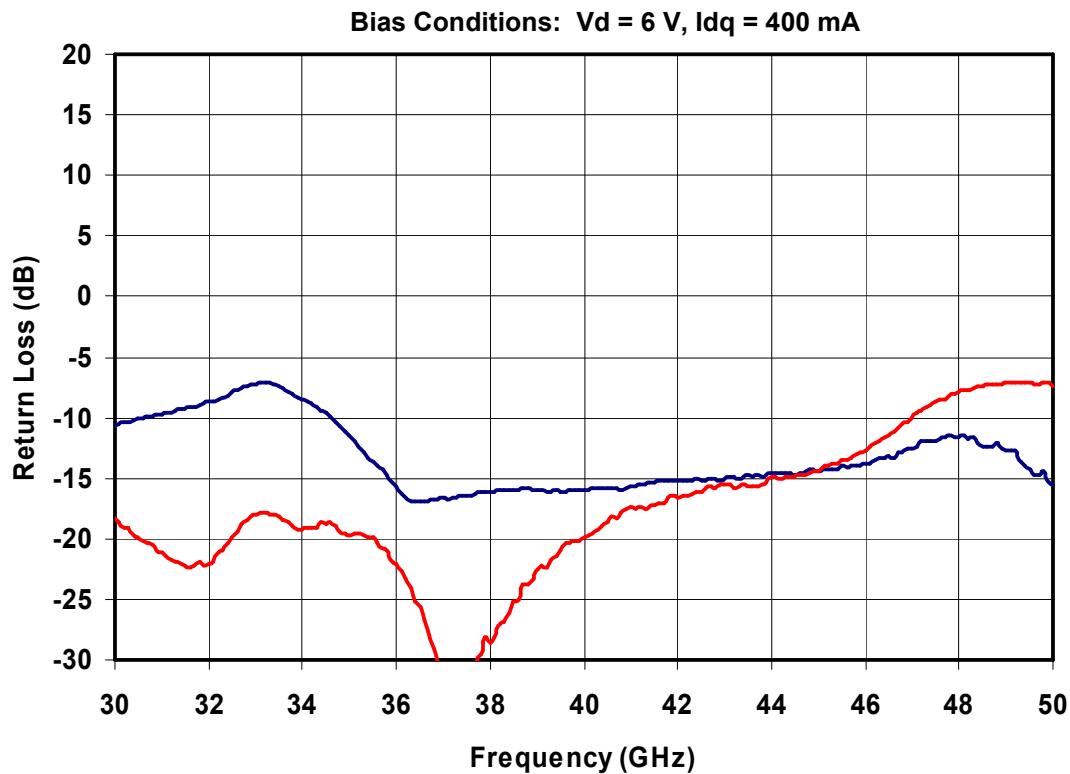
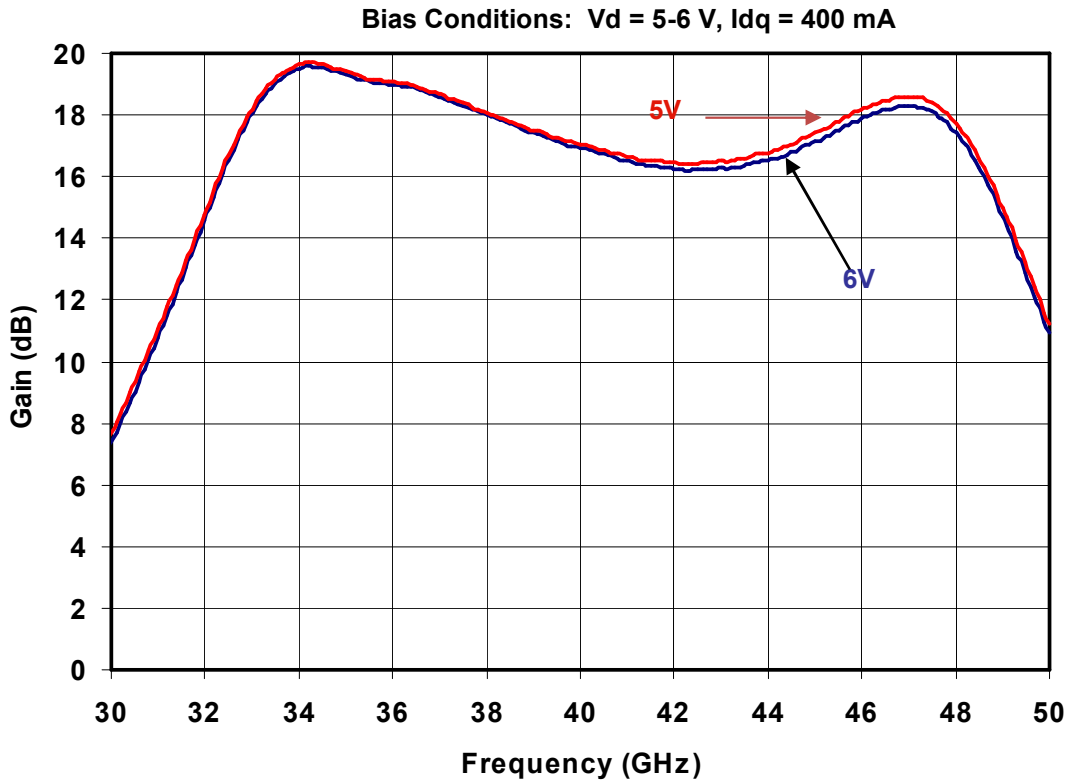
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

Test Conditions unless otherwise stated: V_D = 6V, I_{DQ} = 400mA, 25 °C. Data de-embedded to device reference planes

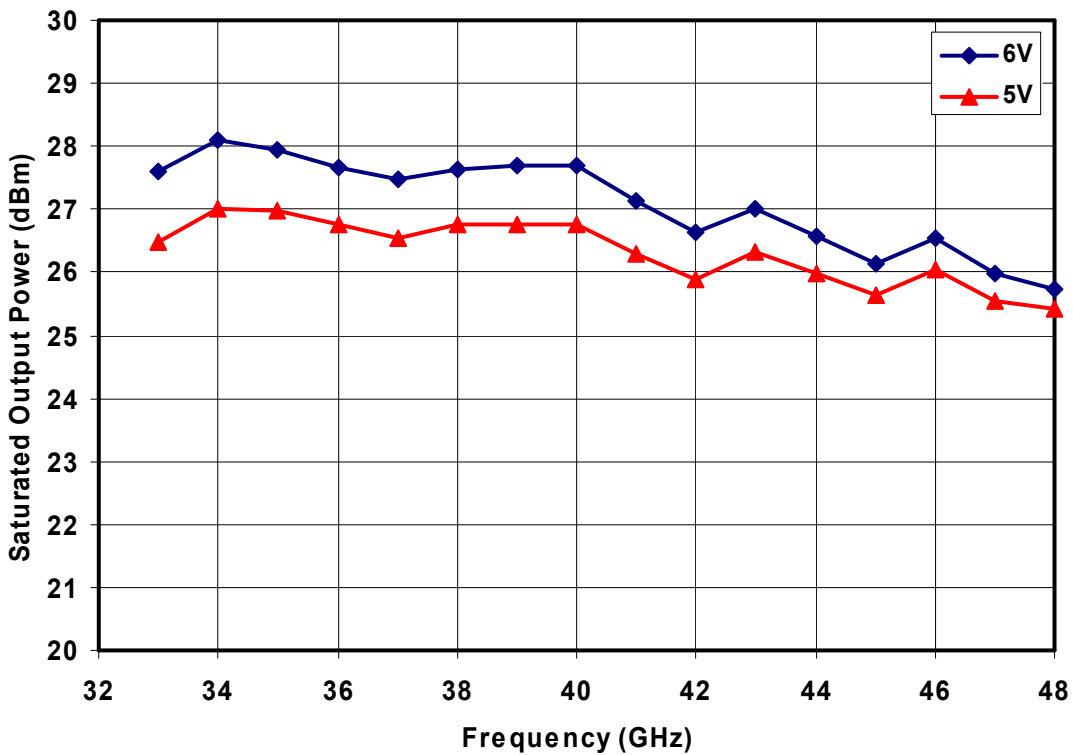
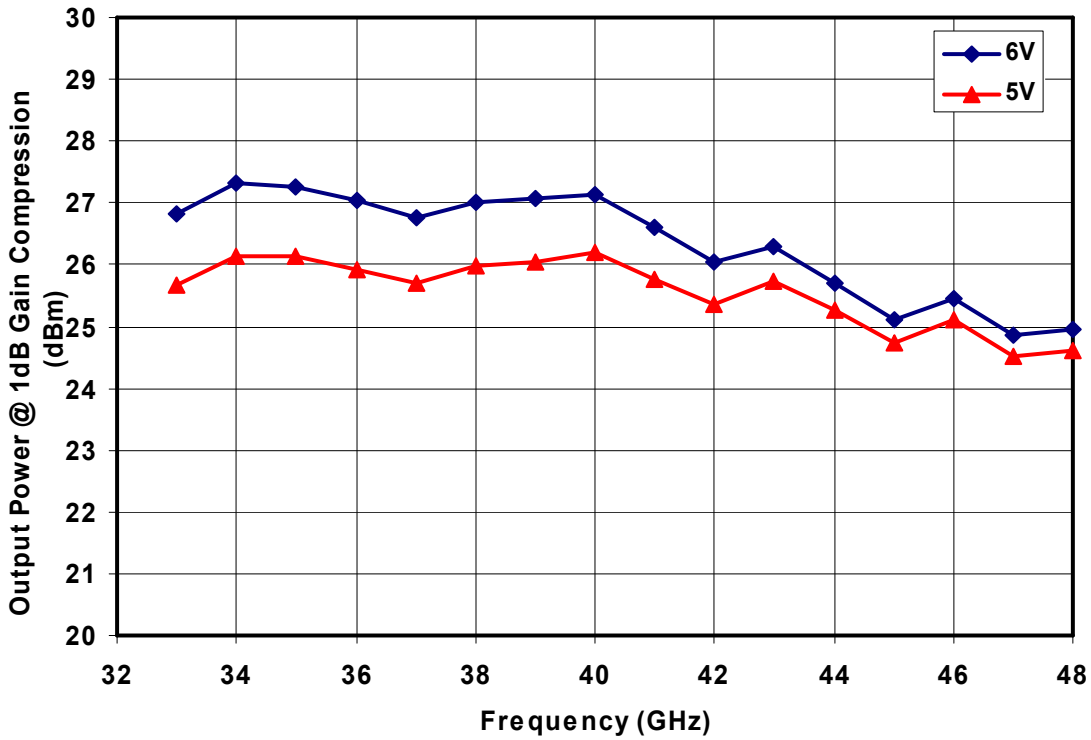
Parameter	Min	Typical	Max	Units
Frequency	33		47	GHz
Small Signal Gain		18		dB
Input Return Loss		15		dB
Output Return Loss		15		dB
Output Power at Saturation		27		dBm
Output Power at 1dB Compression		26		dBm
Output TOI @ 19 dBm/Tone		36		dBm

TGA4522-XCC-2 Performance Plots – IRL and Gain



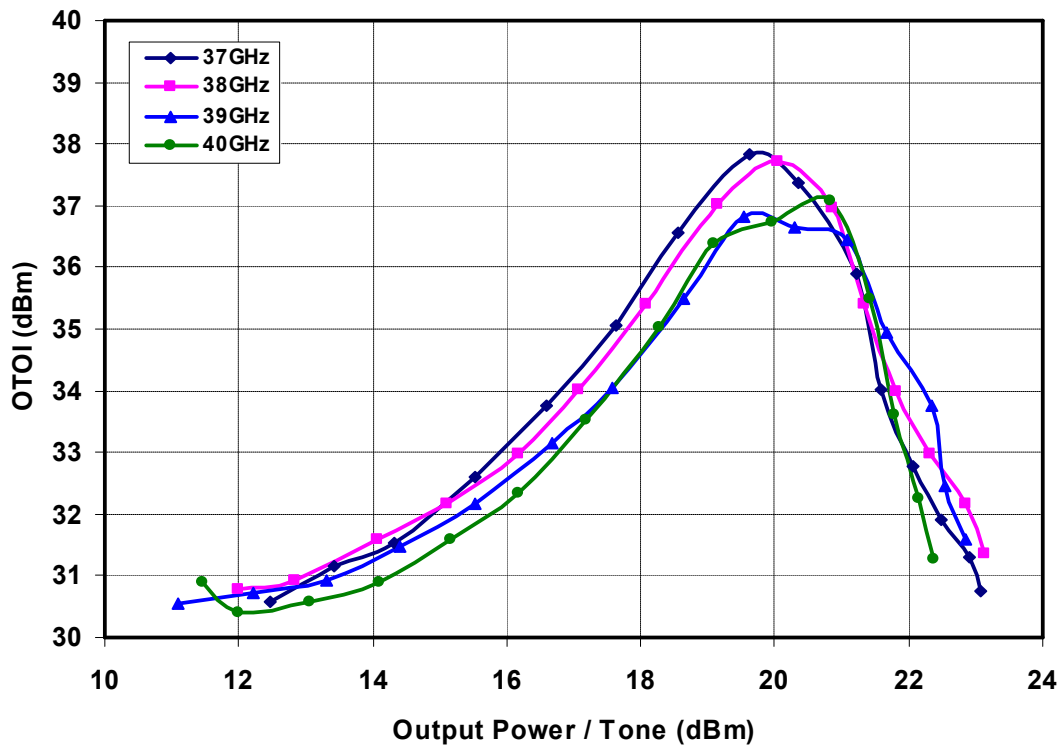
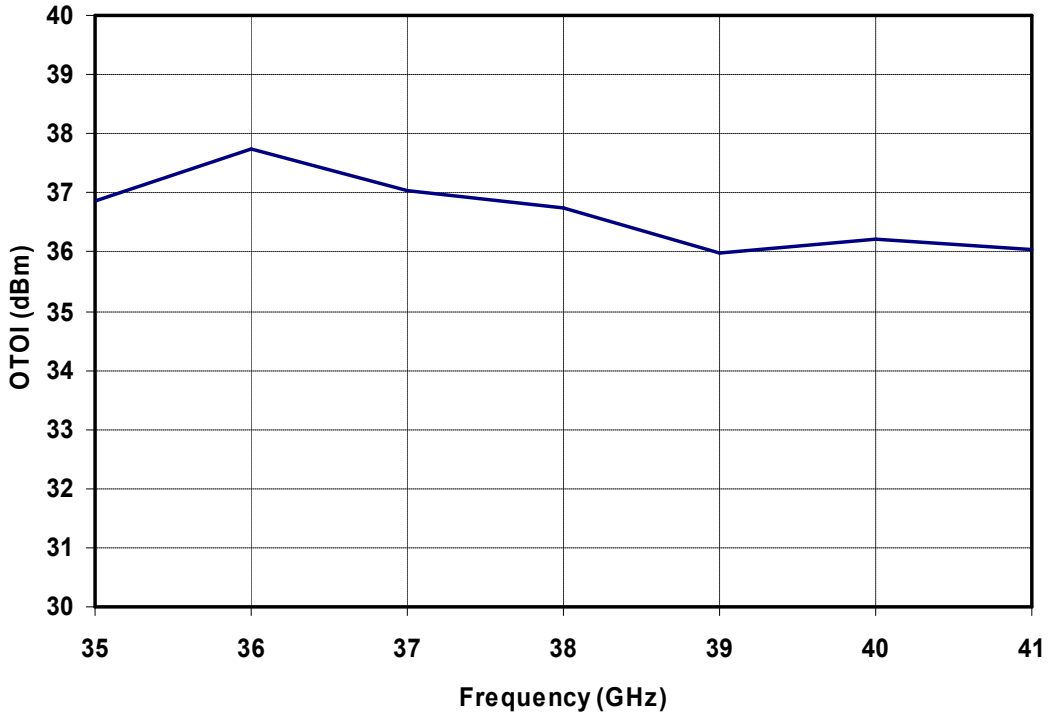
TGA4522-XCC-2 Performance Plots – Output Power vs. VD

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



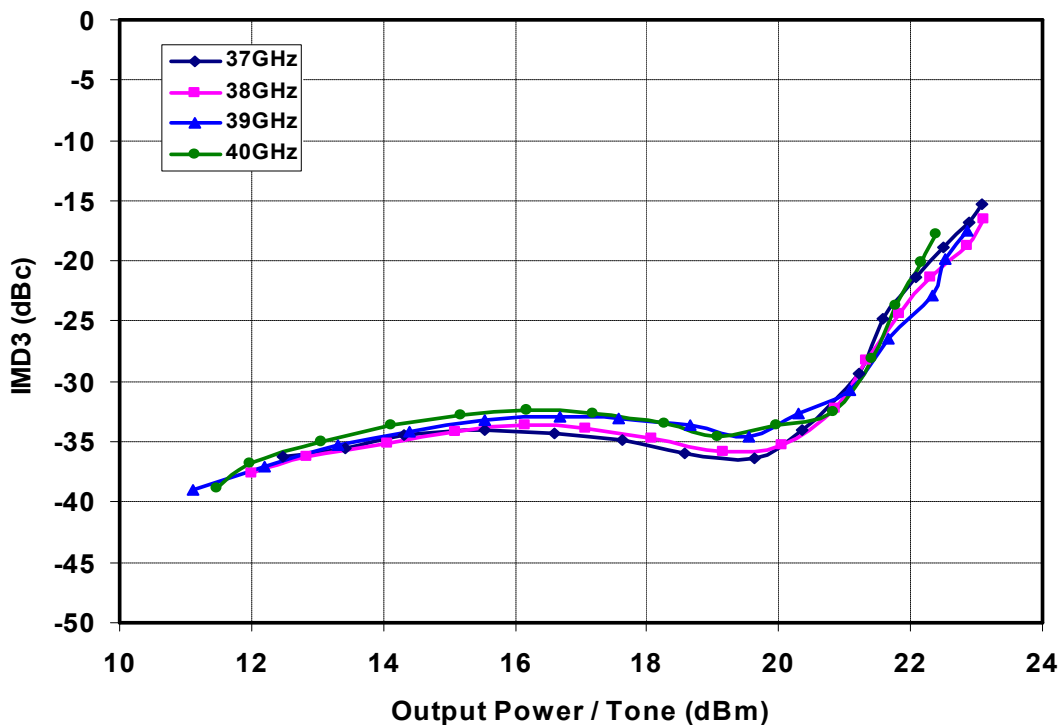
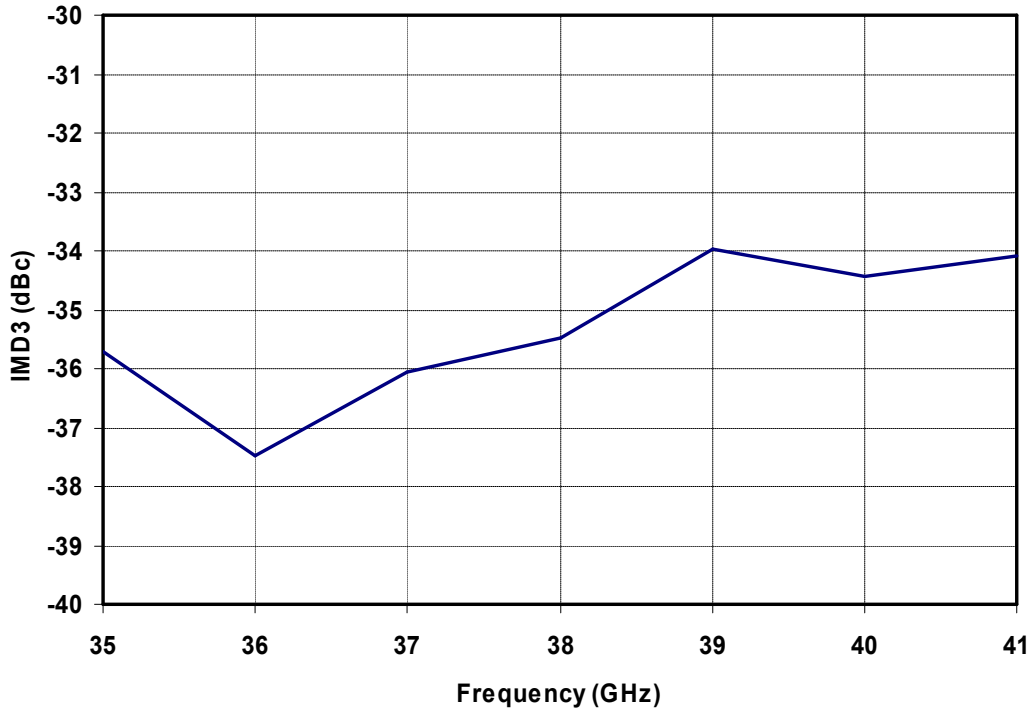
TGA4522-XCC-2 Performance Plots – OTOI

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

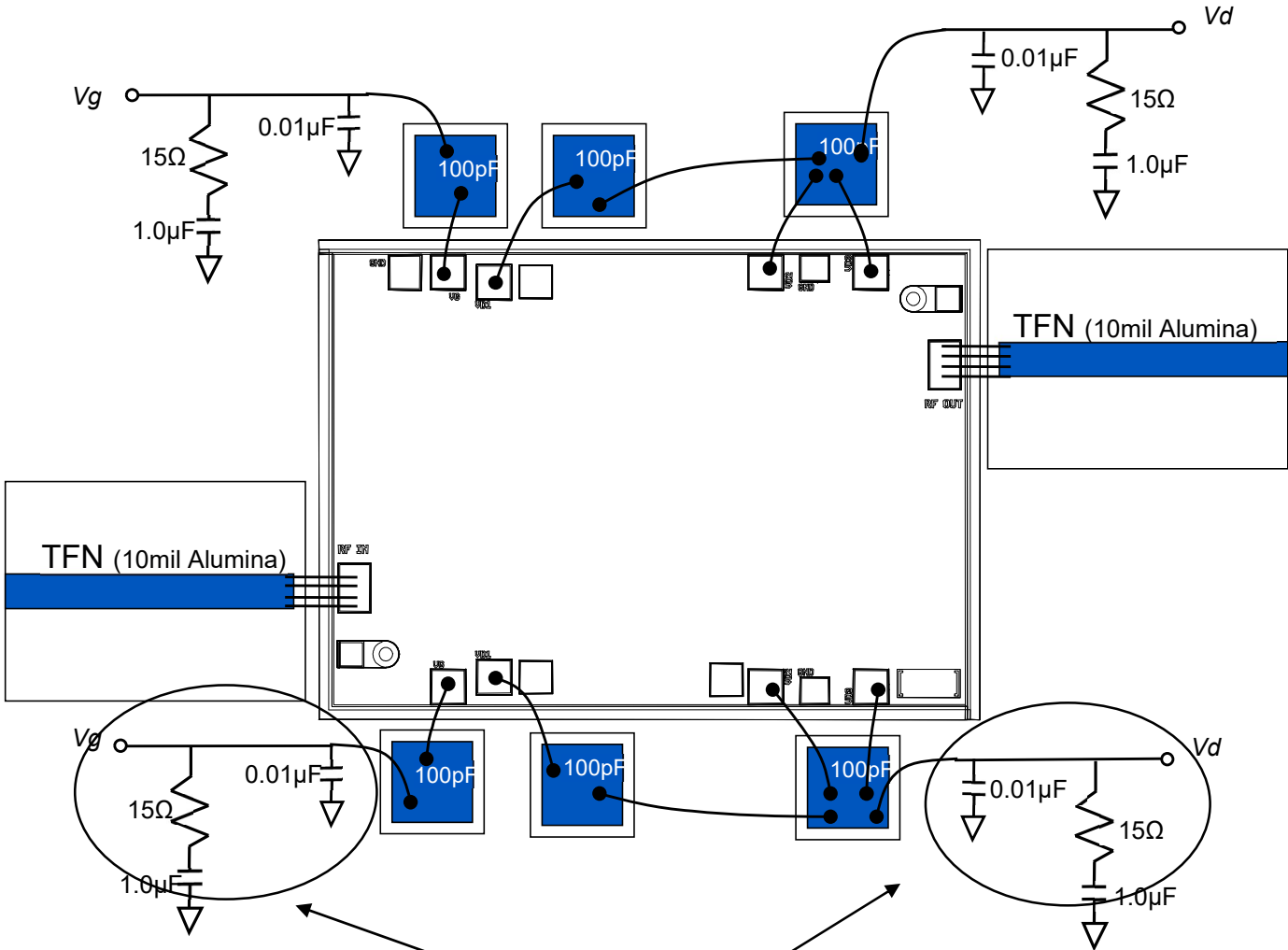


TGA4522-XCC-2 Performance Plots – IMD3

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



Recommended Chip Assembly Diagram



To reduce these components (0.01μF, 15Ω, 1.0μF) connect:
Vg @ bottom to Vg @ top
Vd @ bottom to Vd @ top

Bias Conditions: $V_d = 6\text{ V}$
 $V_g = \sim -0.6\text{ V}$ to get 400mA I_d

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:

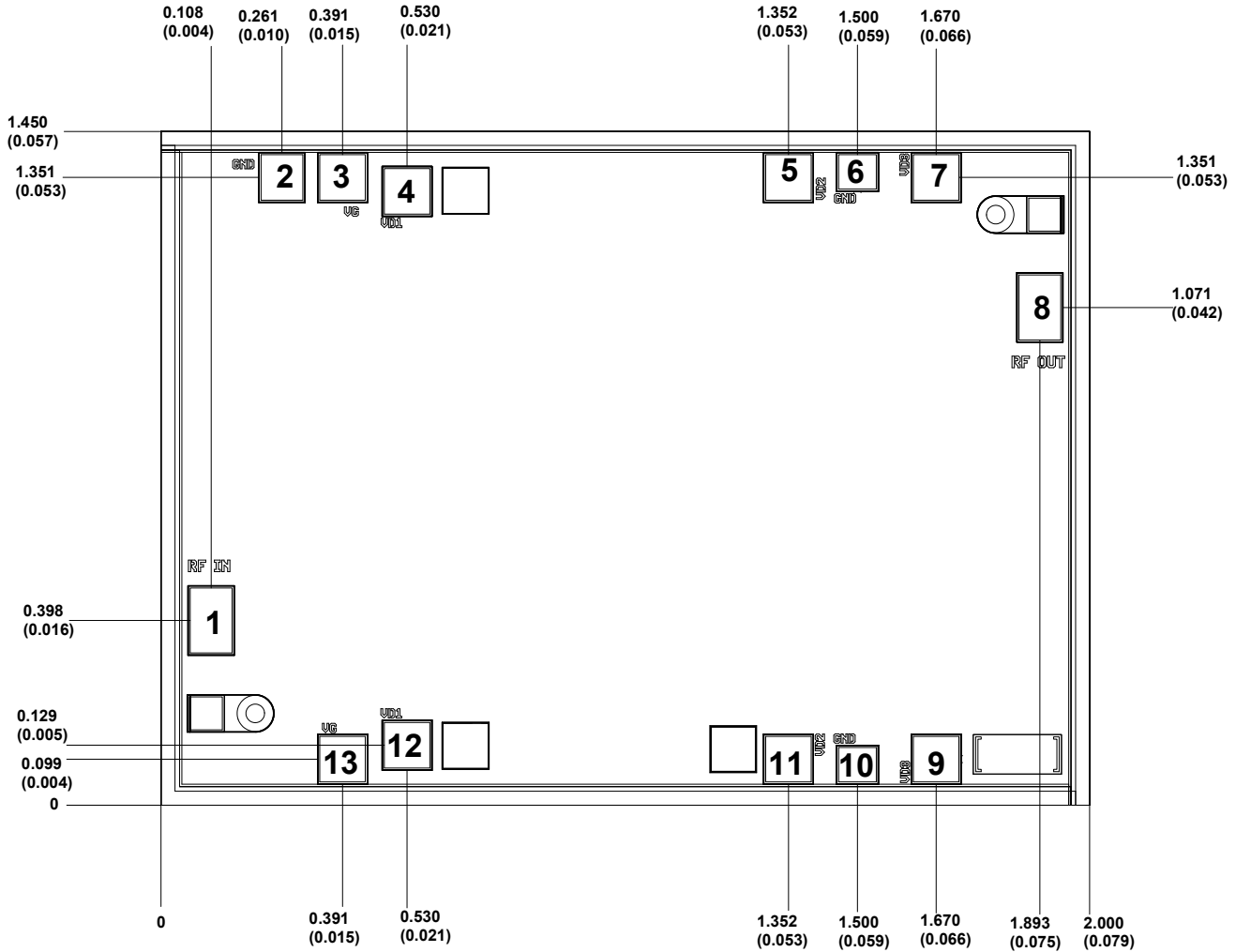
- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is 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.

Mechanical Drawing & Pad Description



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)

Thermal and Reliability Information

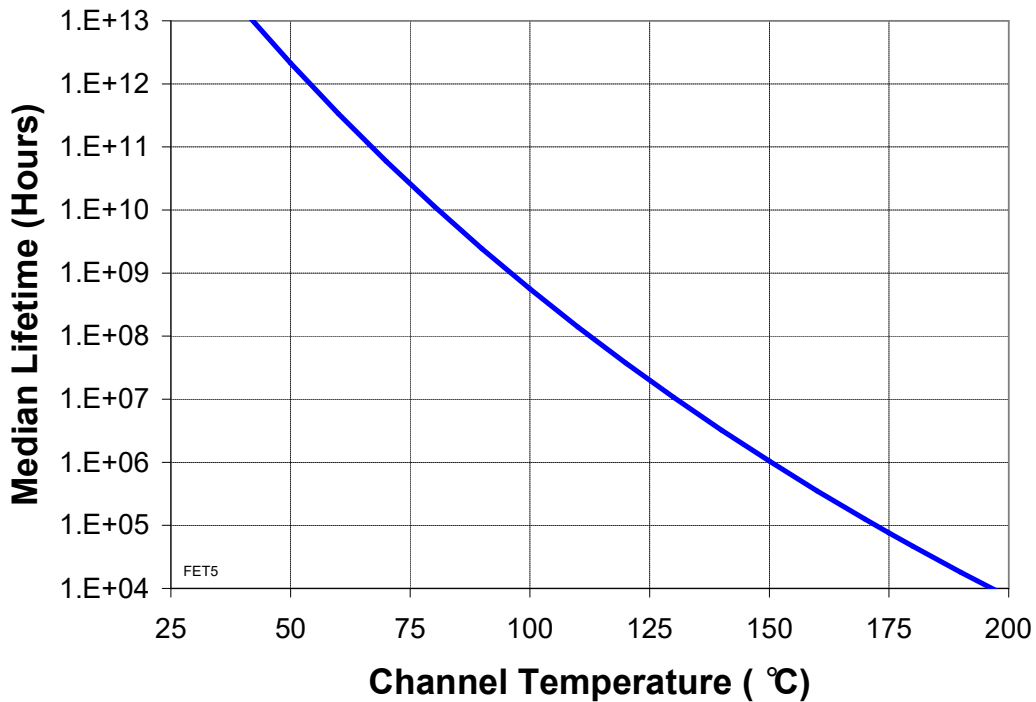
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) ⁽¹⁾	Tbase = 70 °C	30.8	°C/W
Channel Temperature (T_{CH})	Vd = 6 V, Id = 400 mA, Quiescent	144	°C
Median Lifetime (T_M)	Pdiss = 2.4 W	1.7E06	Hrs

Notes:

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

Test Conditions: $V_D = 6\text{ V}$
Failure Criteria = 10% reduction in I_{D_MAX}





RoHS Compliance

This product is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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