



# 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, $V_d$ <sup>2/</sup>             | -         | 8         | V                |
| Gate Voltage, $V_g$                            | -2        | 0         | V                |
| Drain Current, $I_d$ <sup>2/ 3/</sup>          | -         | 700       | mA               |
| Gate Current, $I_g$ <sup>3/</sup>              | -         | 16        | mA               |
| Power Dissipation, $P_{diss}$ <sup>2/</sup>    | -         | 4.2       | W                |
| RF Input Power, CW, $T = 25^\circ\text{C}$     | -         | 23        | dBm              |
| Channel Temperature, $T_{ch}$ <sup>5/ 6/</sup> | -         | 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  $70^\circ\text{C}$ , 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.



# TGA4522-XCC-2

## Ka and Q Band GaAs Driver Amplifier

### Recommended Operating Conditions

| Parameter                                   | Value     | Units |
|---|-----------|-------|
| Drain Voltage                               | 6         | V     |
| Drain Current (quiescent, I <sub>DQ</sub> ) | 400       | mA    |
| Gate Voltage (typical)                      | -0.6      | V     |
| Operating Temperature Range                 | -40 to 85 | °C    |

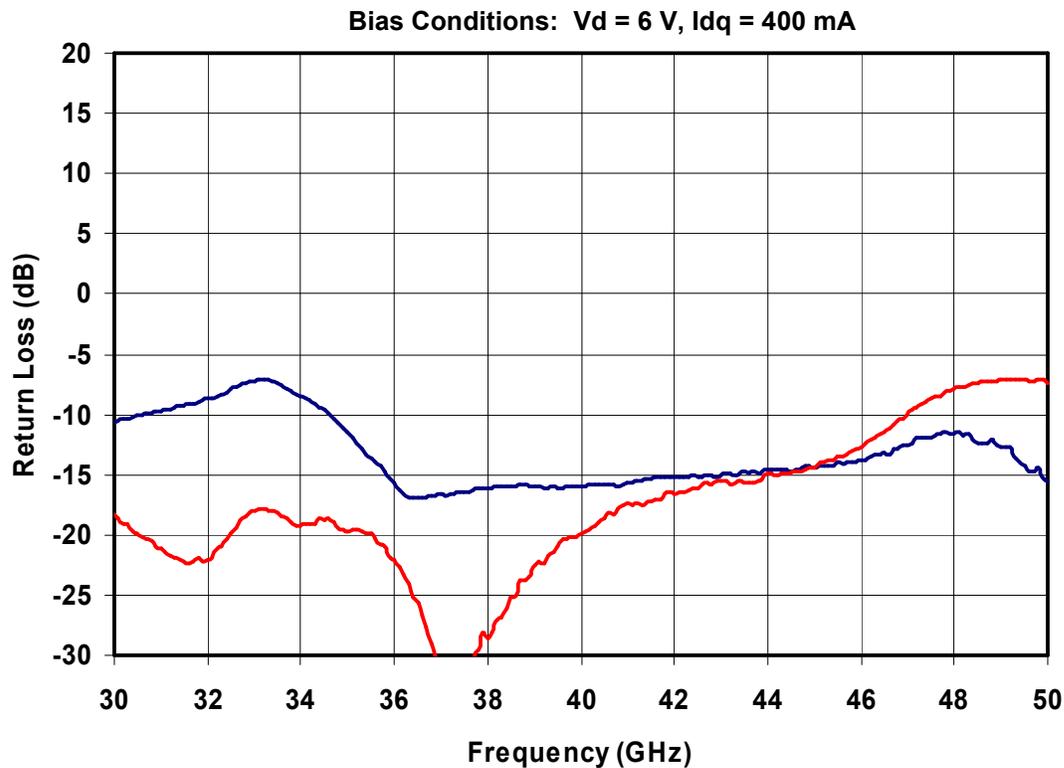
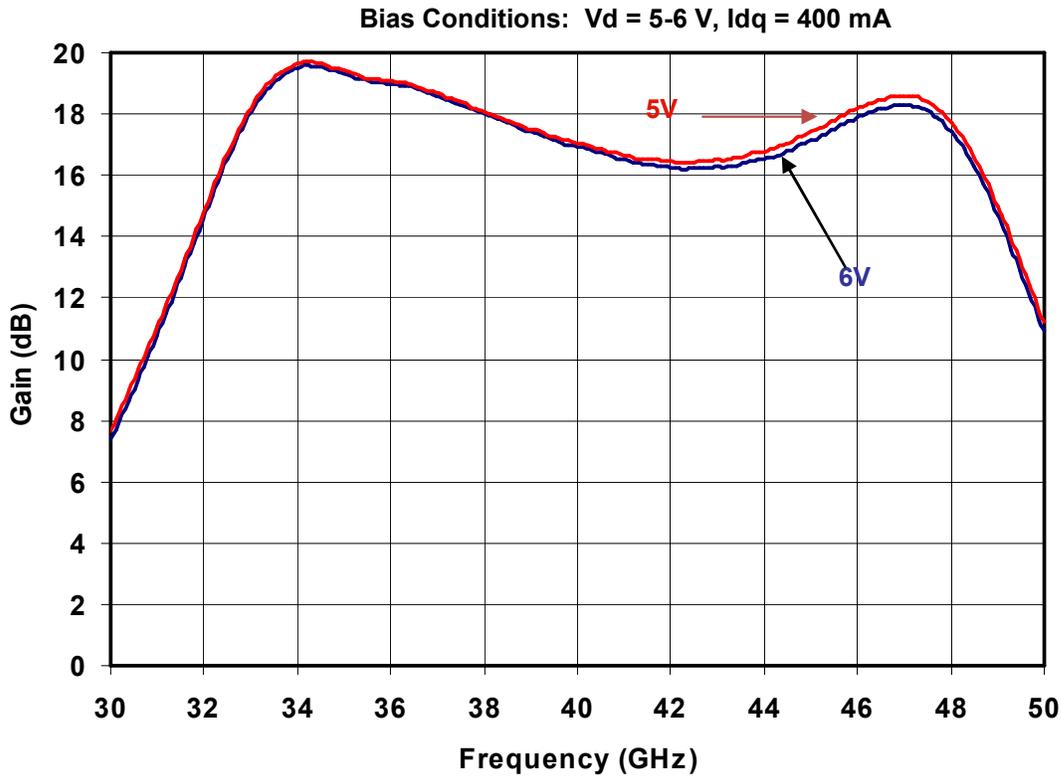
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

### Electrical Specifications

Test Conditions unless otherwise stated: V<sub>D</sub> = 6V, I<sub>DQ</sub> = 400mA, 25 °C. Data de-embedded to device reference planes

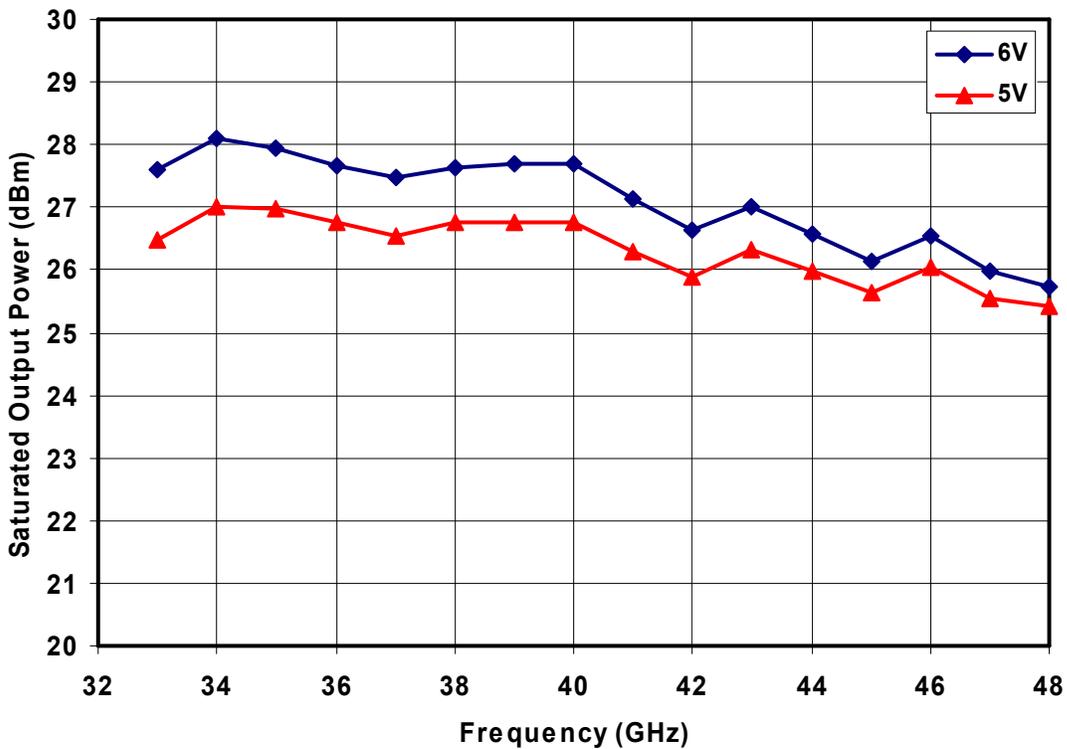
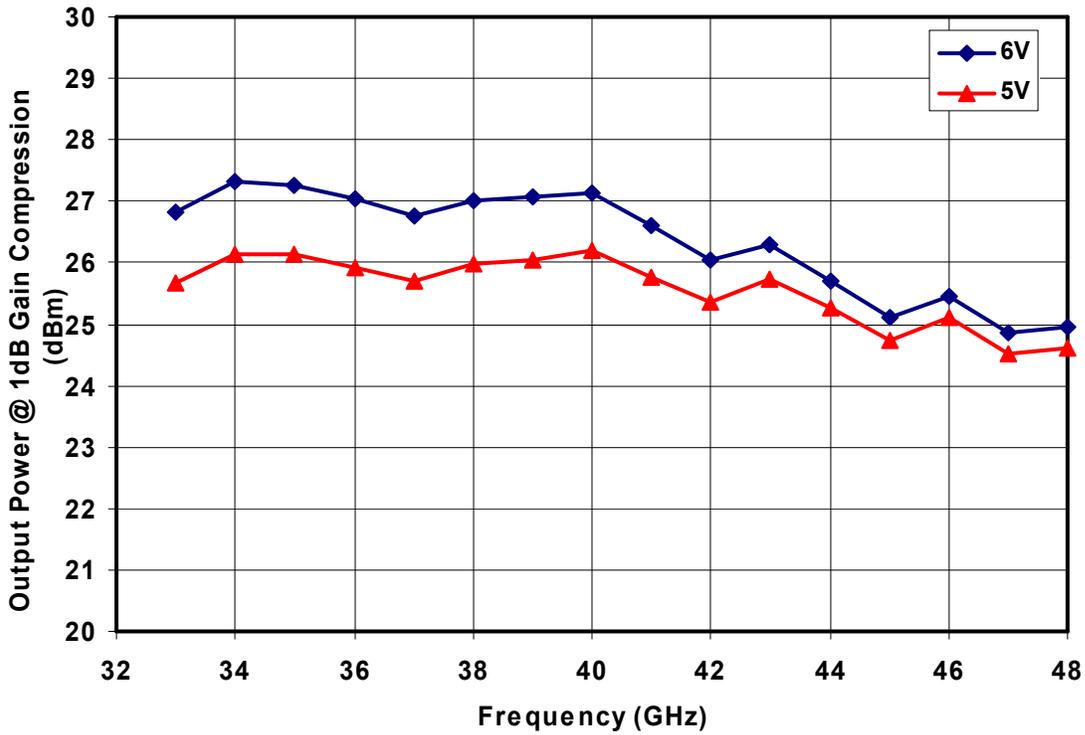
| Parameter                       | Min | Typical | Max | Units |
|---------------------------------|-----|---------|-----|-------|
| Frequency                       | 33  |         | 47  | GHz   |
| Small Signal Gain               |     | 18      |     | dB    |
| Input Return Loss               |     | 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



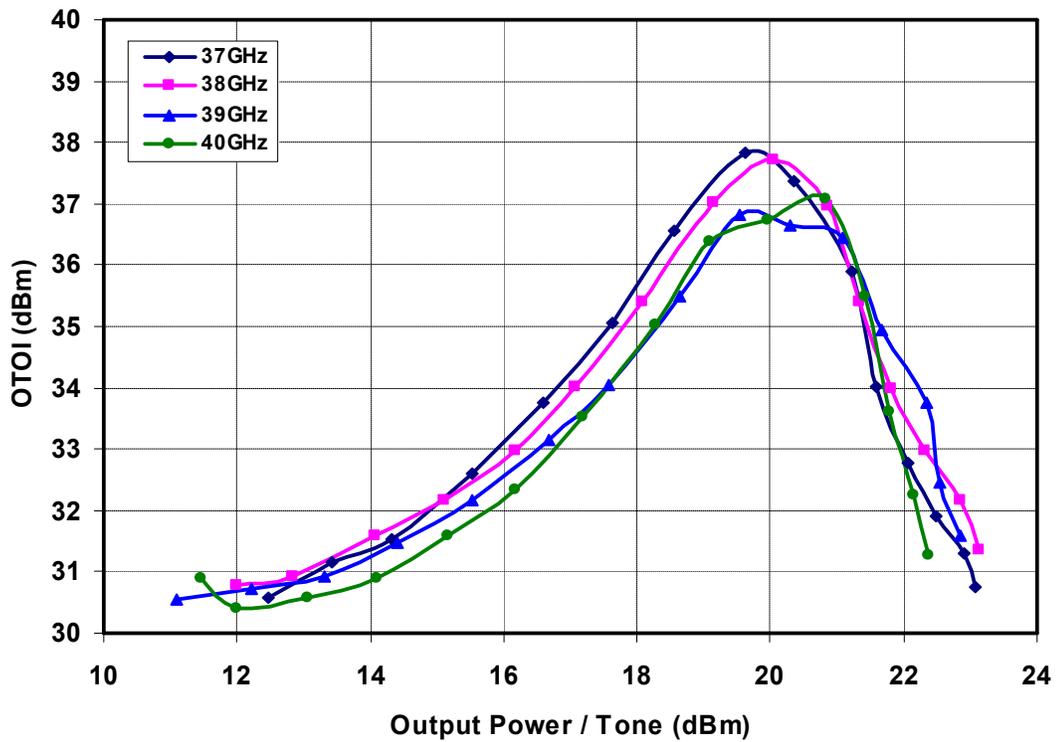
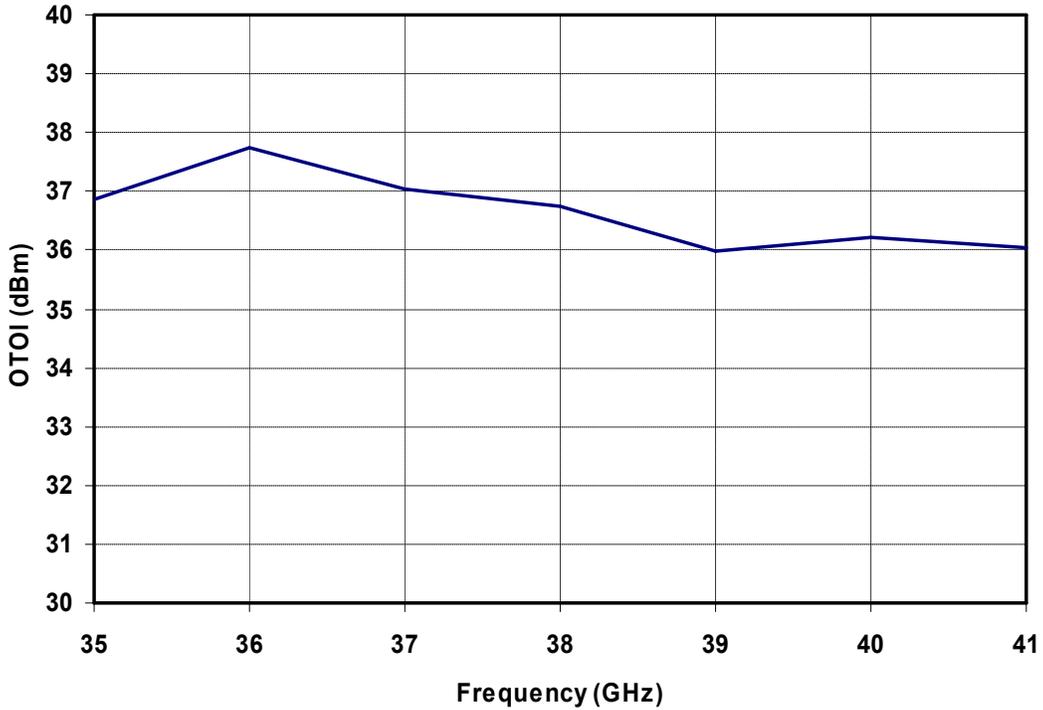
TGA4522-XCC-2 Performance Plots – Output Power vs. VD

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



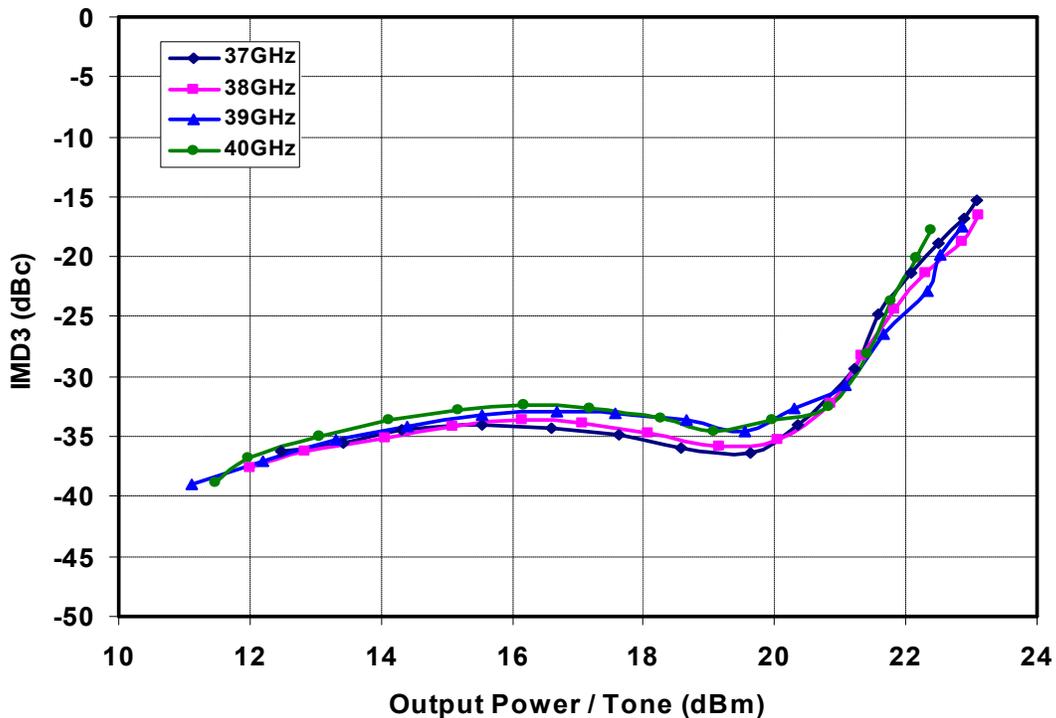
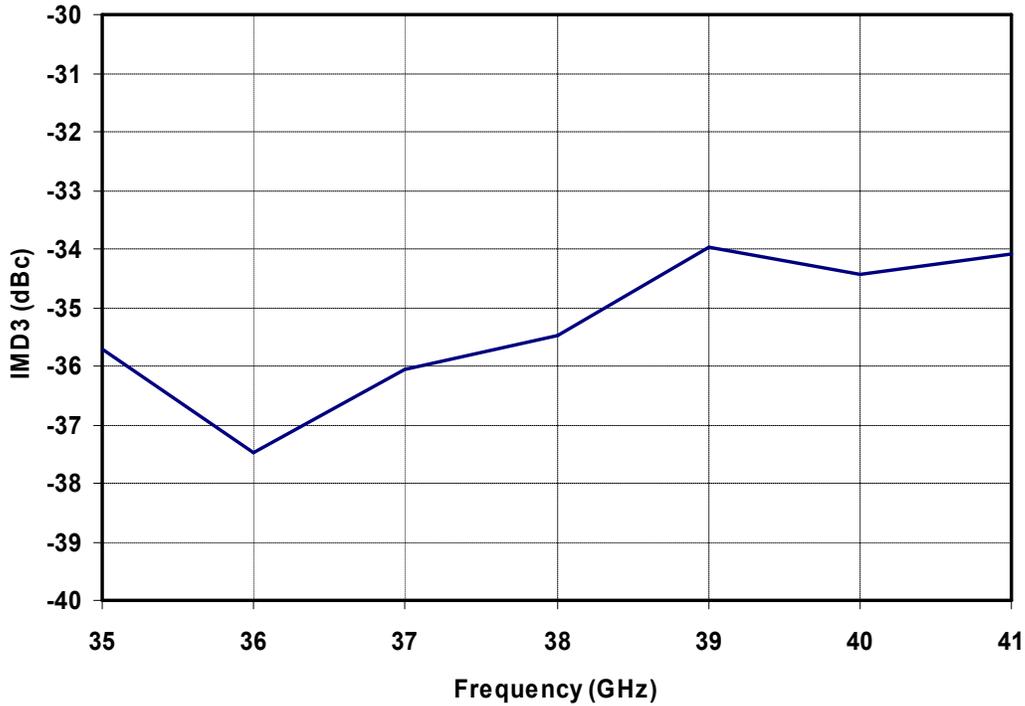
TGA4522-XCC-2 Performance Plots – OTOI

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

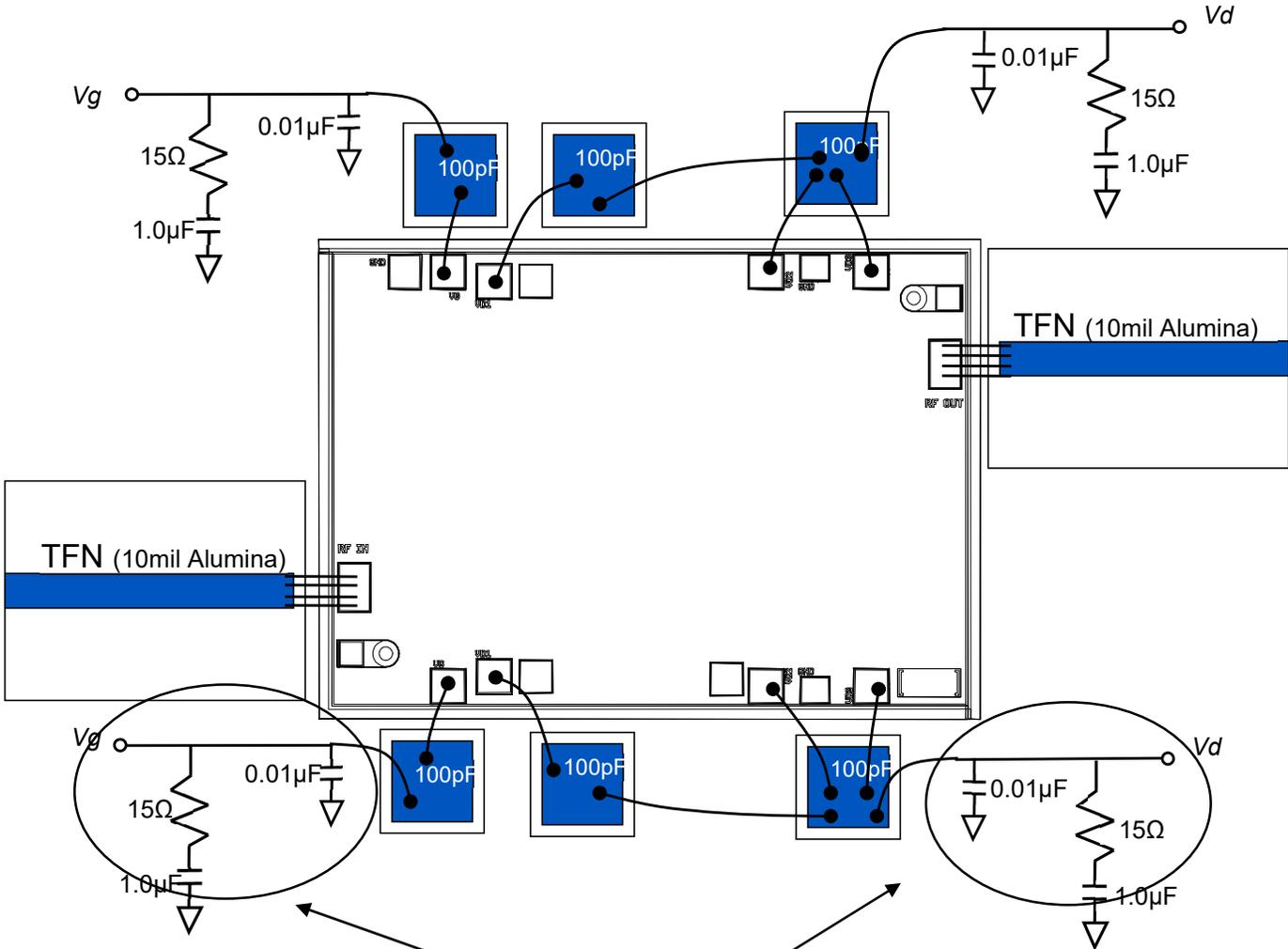


TGA4522-XCC-2 Performance Plots – IMD3

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



### 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  $I_d$**

## Assembly Process Notes

---

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300<sup>0</sup>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:

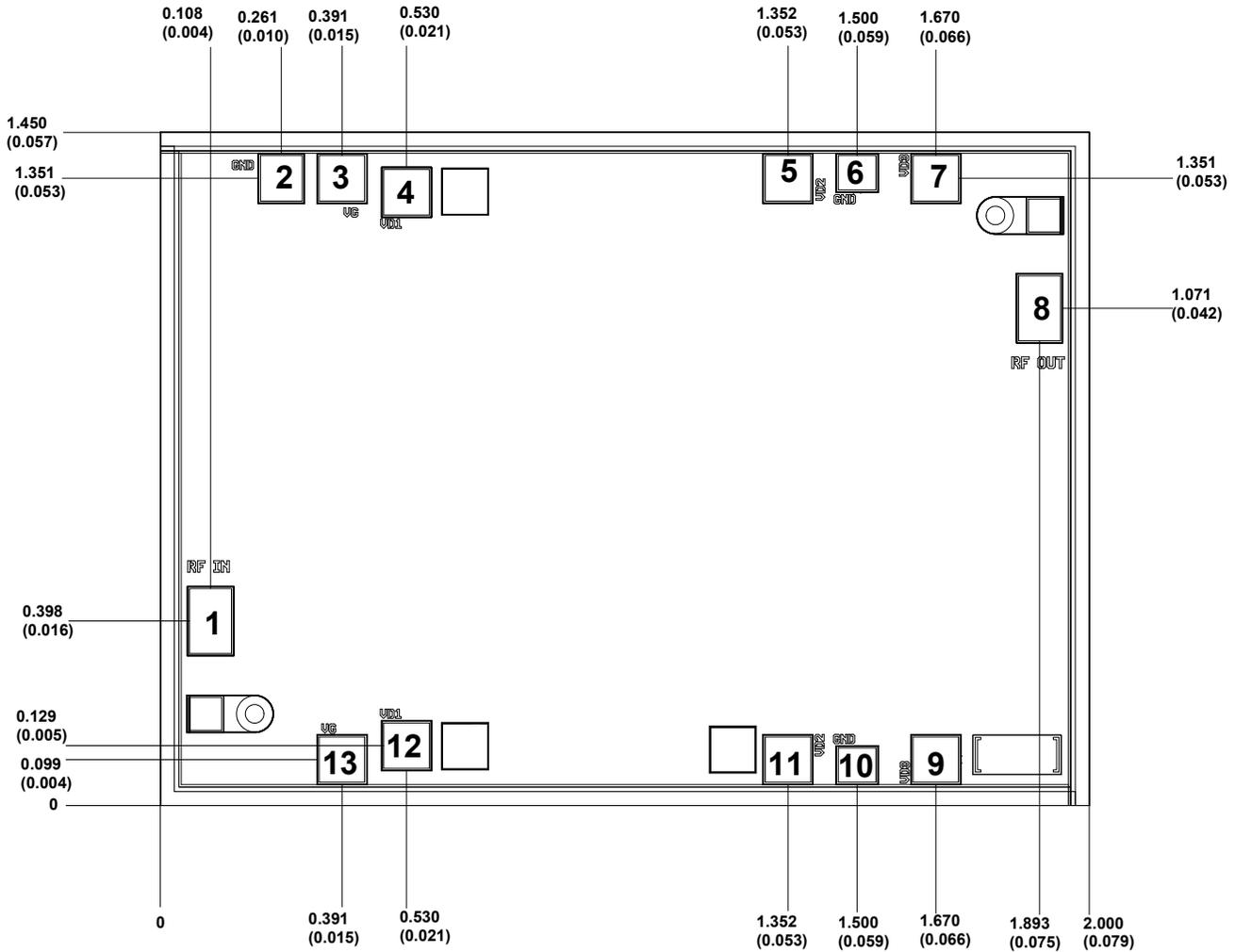
- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is 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<sup>0</sup>C.

***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 #                   | Function | Dimensions (mm) | Dimensions (inches) |
|------------------------------|----------|-----------------|---------------------|
| 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

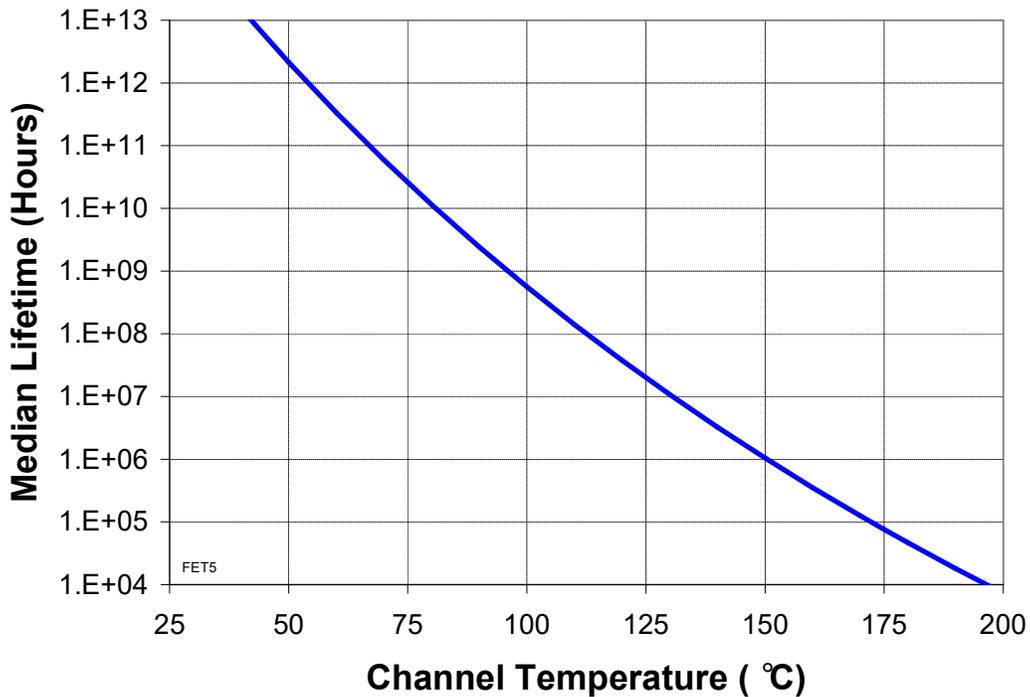
| Parameter   | Test Conditions                  | Value  | Units |
|---|----------------------------------|--------|-------|
| Thermal Resistance ( $\theta_{JC}$ ) <sup>(1)</sup> | Tbase = 70 °C                    | 30.8   | °C/W  |
| Channel Temperature ( $T_{CH}$ )                    | Vd = 6 V, Id = 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 (C<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) Free
- SVHC Free

## Contact Information

---

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

**Tel:** 1-844-890-8163

**Web:** [www.qorvo.com](http://www.qorvo.com)

**Email:** [customer.support@qorvo.com](mailto:customer.support@qorvo.com)

## Important Notice

---

The information contained herein is believed to be reliable; however, Qorvo makes no warranties regarding the information contained herein and assumes no responsibility or liability whatsoever for the use of the information contained herein. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Qorvo products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information. **THIS INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

Without limiting the generality of the foregoing, Qorvo products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.

Copyright 2024 © Qorvo, Inc. | Qorvo is a registered trademark of Qorvo, Inc.