TGA2700

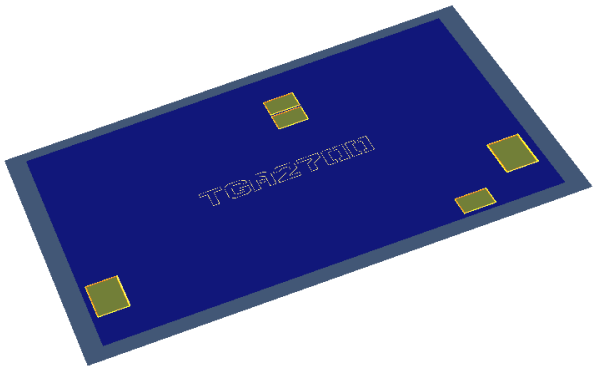
X – Band Driver Amplifier

General Description

TGA2700 is an X-band driver amplifier that operates between 7-13 GHz. The amplifier is designed using Qorvo's proven standard 0.25 um 3MI pHEMT production process.

The TGA2700 can provide a typical 30dBm output power at +10 dBm input power and has a high small signal gain of 25 dB. With a small die size of 1.57 x 1.33 mm, the device has DC blockings at both input and output for easy system integration.

The TGA2700 is 100% DC and RF tested on-wafer to ensure performance compliance.



Product Features

- Frequency Range: 7-13 GHz
- 25 dB Nominal Gain
- 30dBm Output Power @ Pin=10dBm
- 12 dB Input Return Loss
- 10 dB Output Return Loss
- 0.25 um 3MI pHEMT Technology
- Nominal Bias 9V @ 300 mA / 225 mA
- Chip Dimensions: 1.57 x 1.33 x 0.10 mm (0.062 x 0.052 x 0.004 in)

Applications

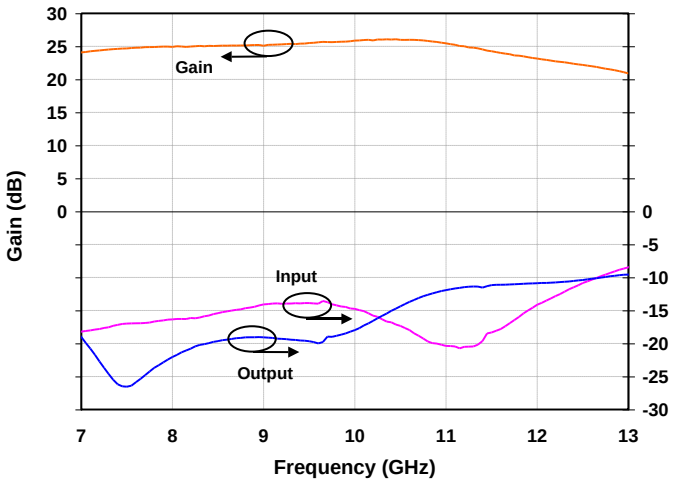
General Communication Applications
Point to Point Radios
Electronic Warfare Applications

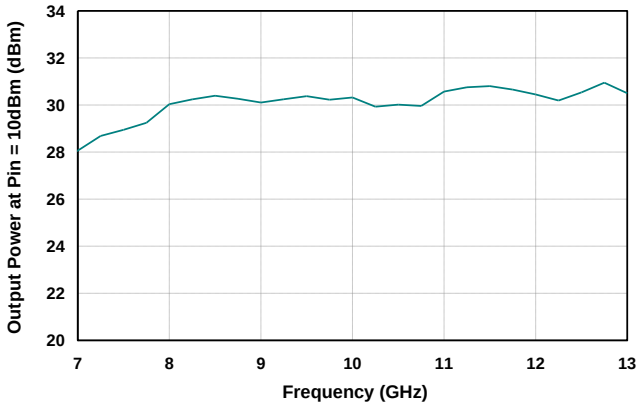
Ordering Information

Part	Description
TGA2700	X-Band Driver Amplifier
TGA2700EVB	TGA2700 Evaluation Board, Qty 1

Measured Performance

Bias conditions: Vd = 9 V, Idq = 300 mA





Absolute Maximum Ratings

Parameter	Min Value	Max Value	Units
Drain Voltage (V_D)	-	10 V	V
Gate Voltage Range (V_G)	-1.2	0	V
Drain Current (I_{DS_DRIVE})	-	536	mA
Gate Current (I_G)	-	14	mA
Power Dissipation (P_{DISS})	-	3.7	W
Input Power, (CW, 50 Ω)	-	20	dBm
Channel temperature (T_{CH})	-	200	°C
Mounting Temperature (30 Seconds maximum)	-	320	°C
Storage Temperature	-65	150	°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.

Recommended Operating Conditions

Parameter	Value	Units
Drain Voltage	9	V
Drain Current (quiescent, I_{DQ})	300	mA
Gate Voltage (typical)	−0.7	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.

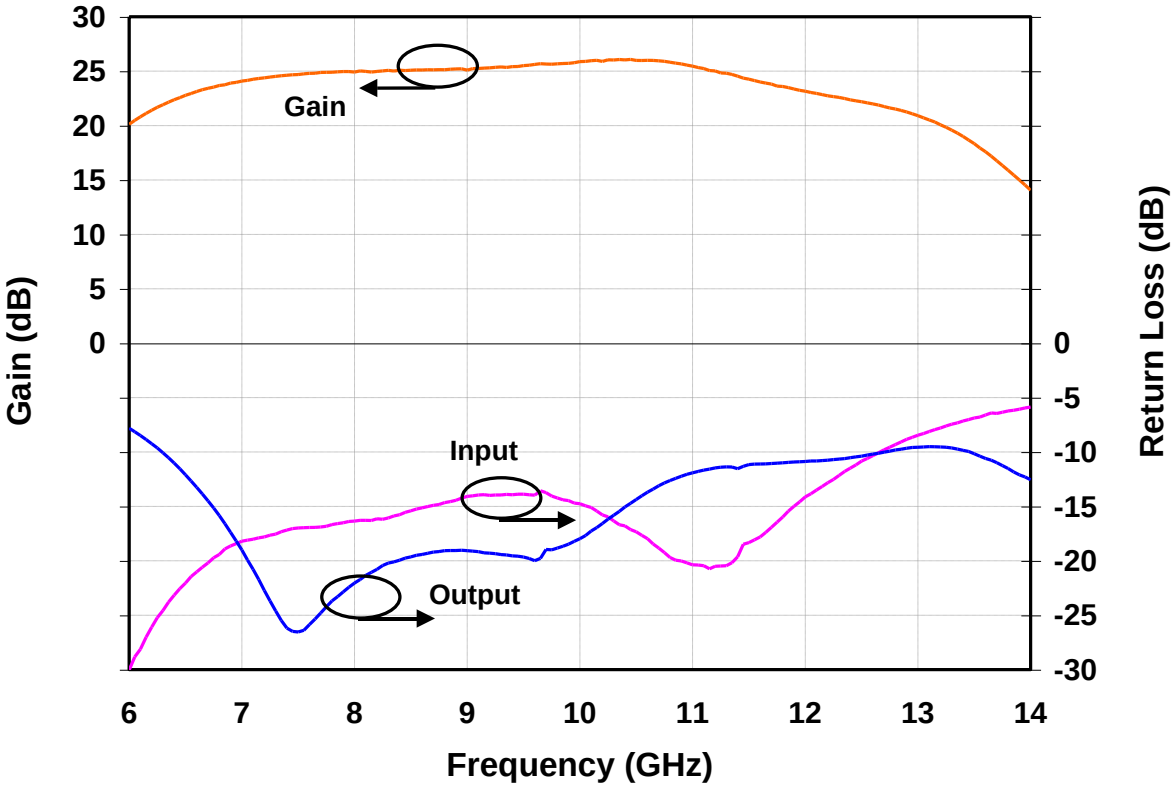
Electrical Specifications

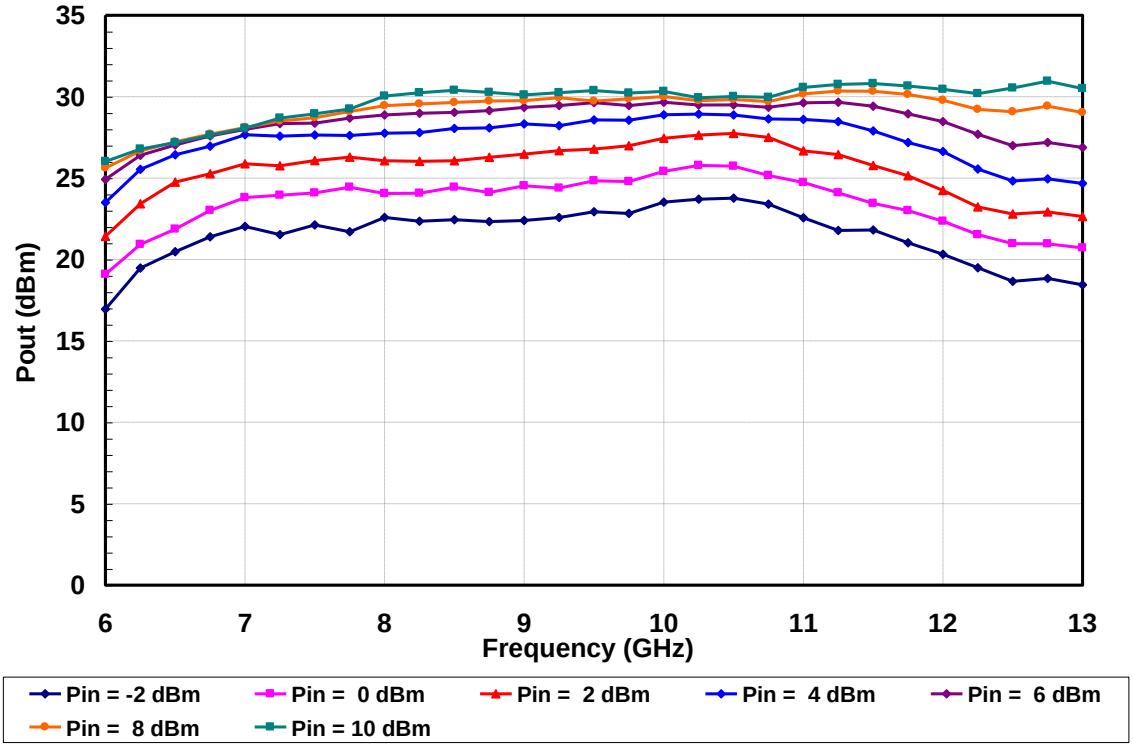
Test conditions unless otherwise noted: 25 °C, V_D = 9 V, I_{DQ} = 300 mA, V_G = - 0.7 V typical.
Data de-embedded to device, bond wire effects are included in data.

Parameter	Min	Typical	Max	Units
Operating Frequency Range	7.0		13.0	GHz
Small Signal Gain		25		dB
Input Return Loss		12		dB
Output Return Loss		10		dB
Output Power		30		dBm
Power Added Efficiency (@ Pin = 10 dBm)		27		%
Output TOI (Pin/Tone = -5 dBm, 10 MHz tone spacing)		36		dBm

Performance Plots – Small and Large Signals

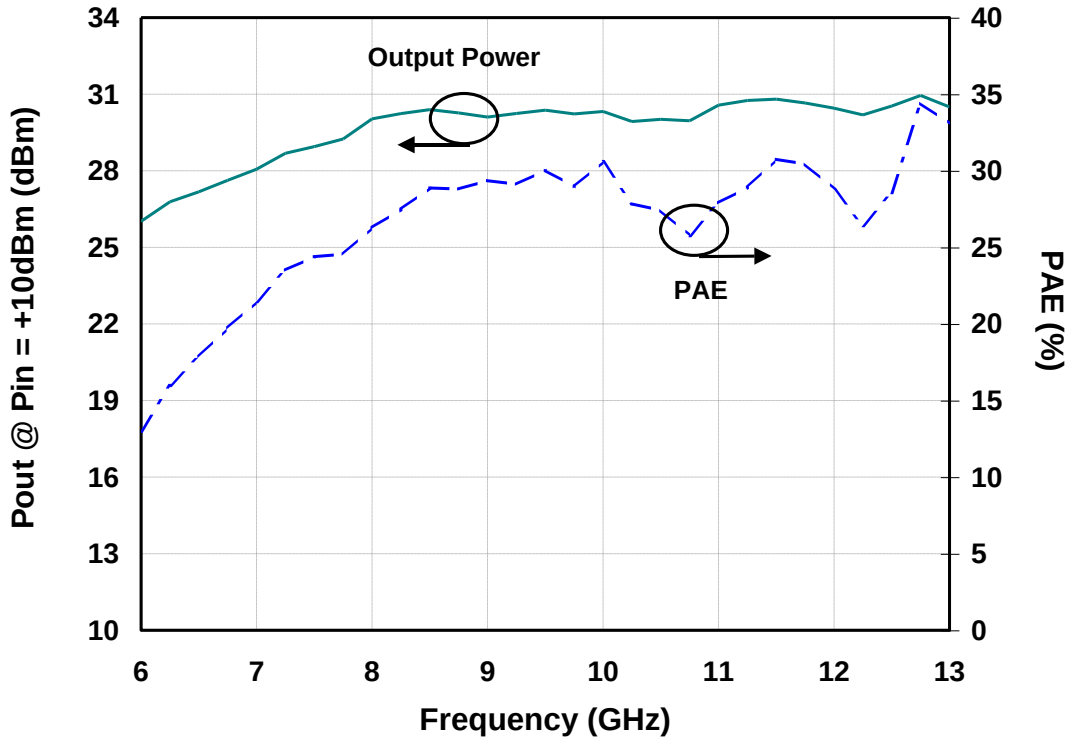
Test Conditions unless otherwise stated: VD = 9 V, IDQ = 300 mA, 25 °C

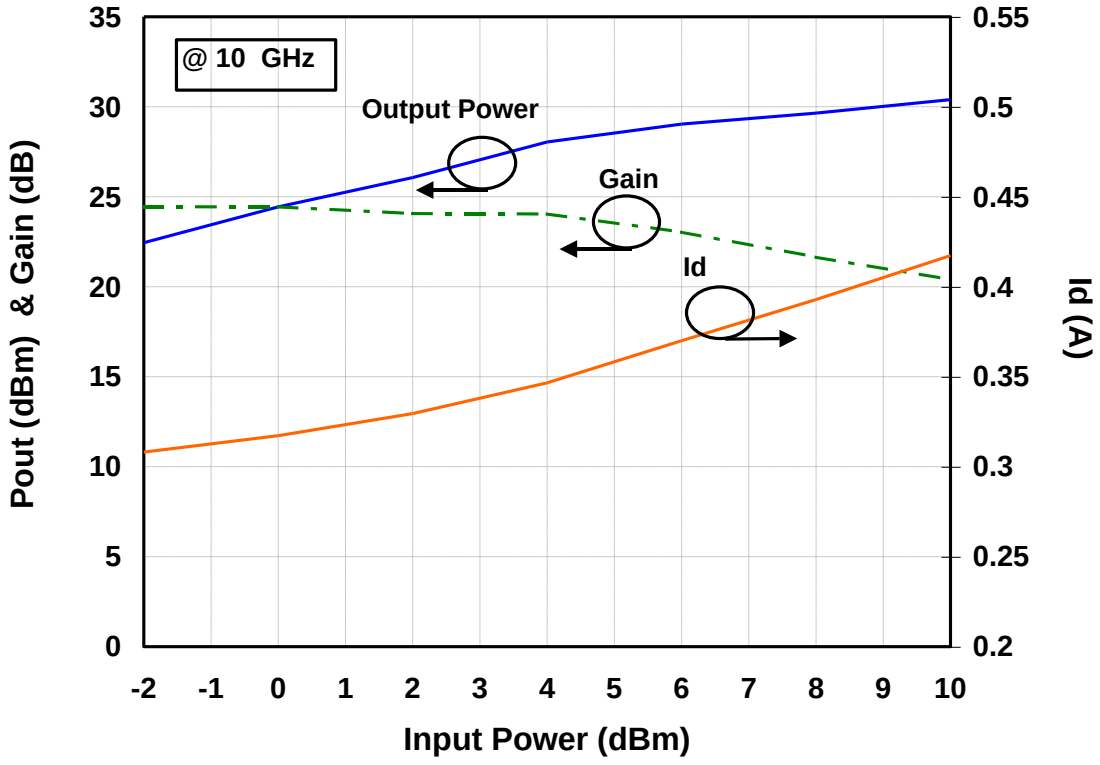




Performance Plots – Large Signal

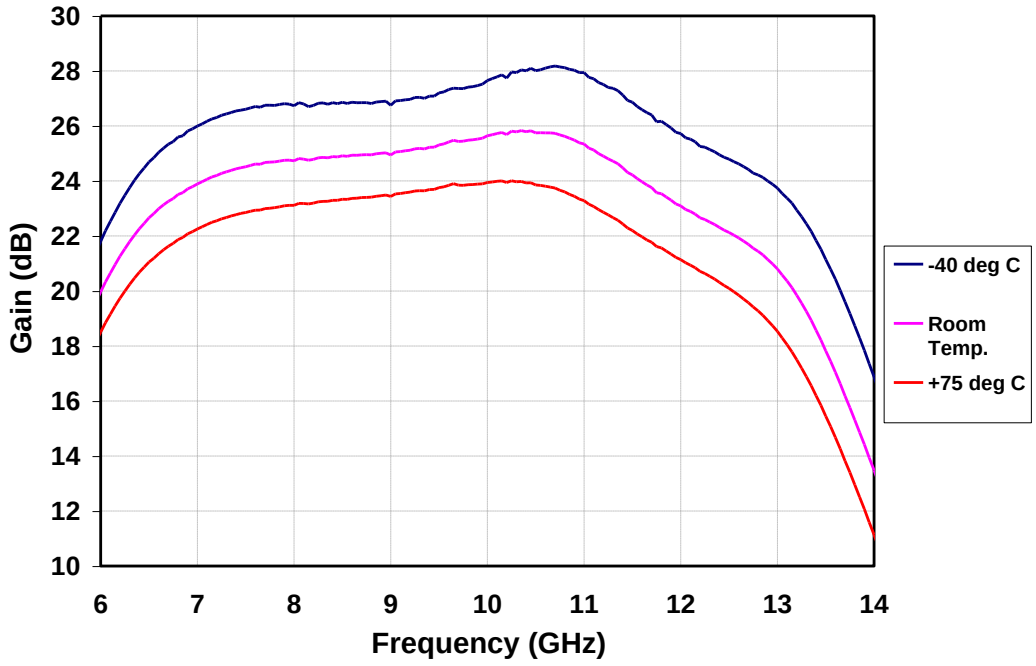
Test Conditions unless otherwise stated: VD = 9 V, IDQ = 300 mA, 25 °C

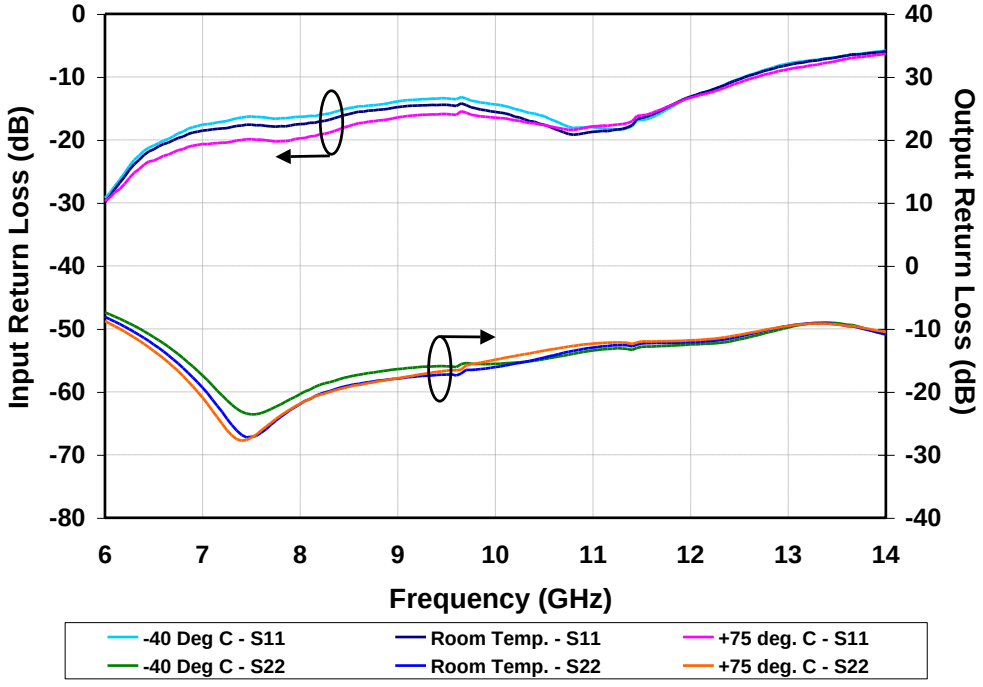




Performance Plots – Small Signal

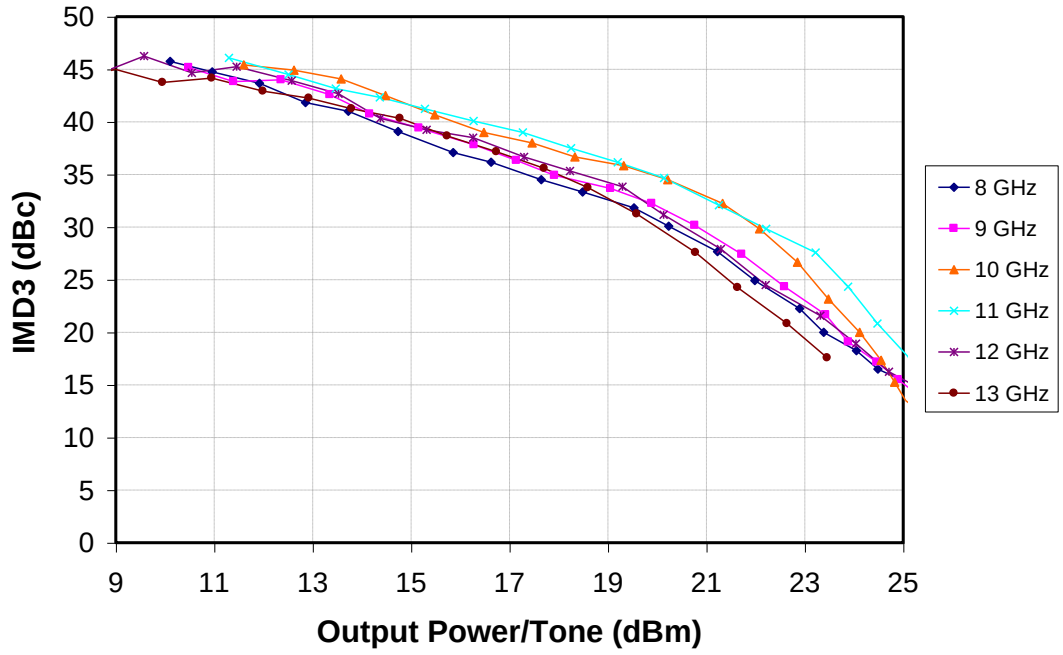
Test Conditions unless otherwise stated: VD = 9 V, IDQ = 300 mA, 25 °C

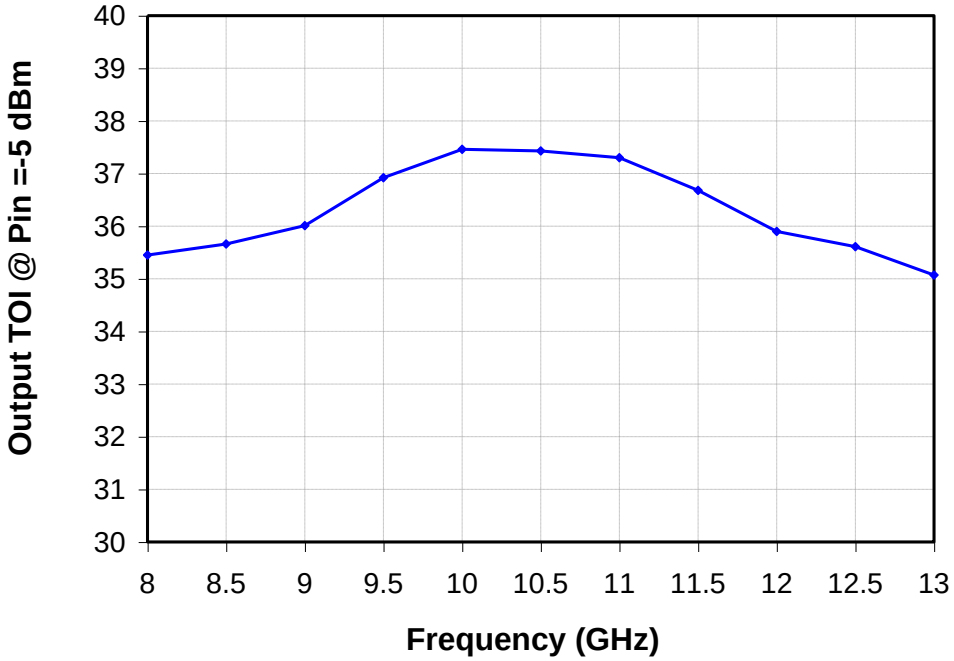




Performance Plots – Linearity

Test Conditions unless otherwise stated: VD = 9 V, IDQ = 300 mA, Tone Spacing = 10 MHz, 25 °C





Performance Plots – Linearity

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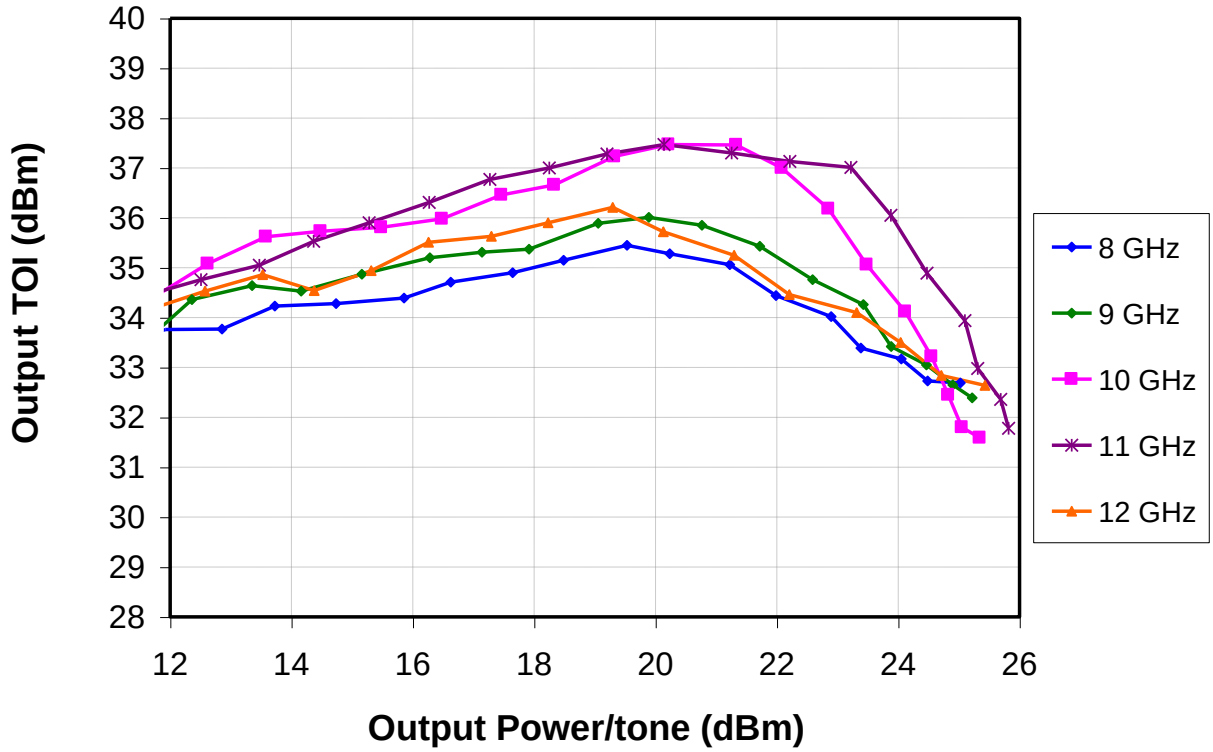
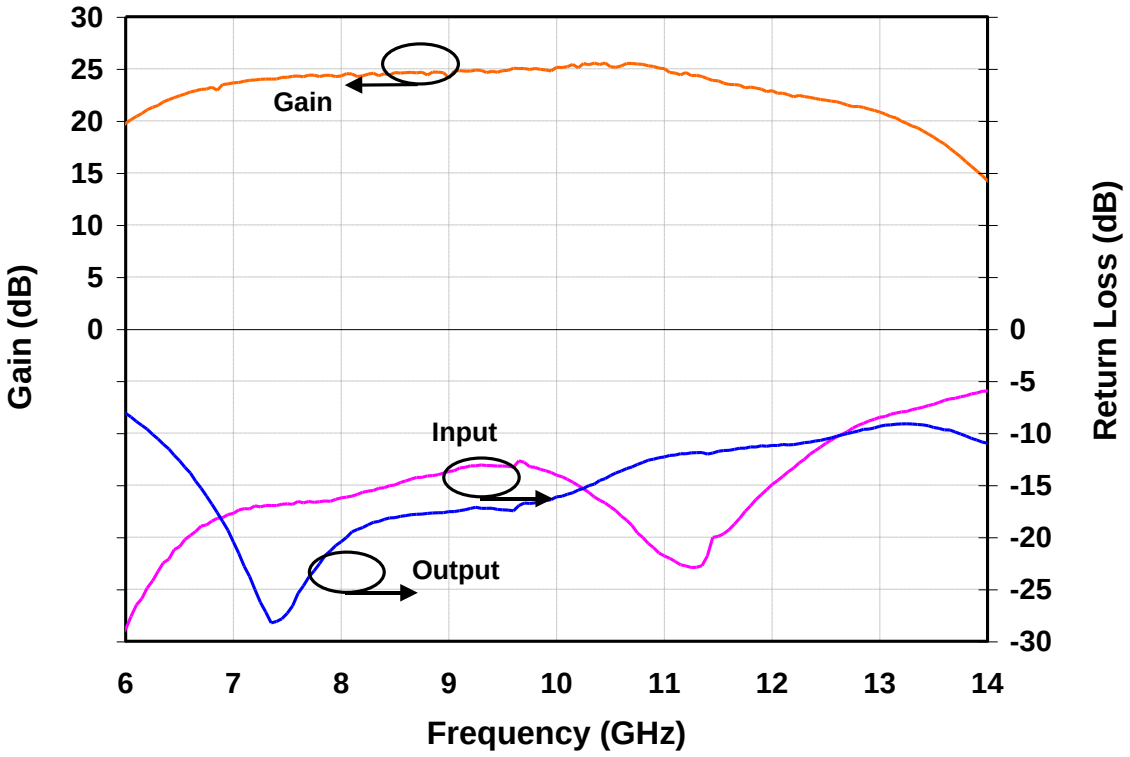
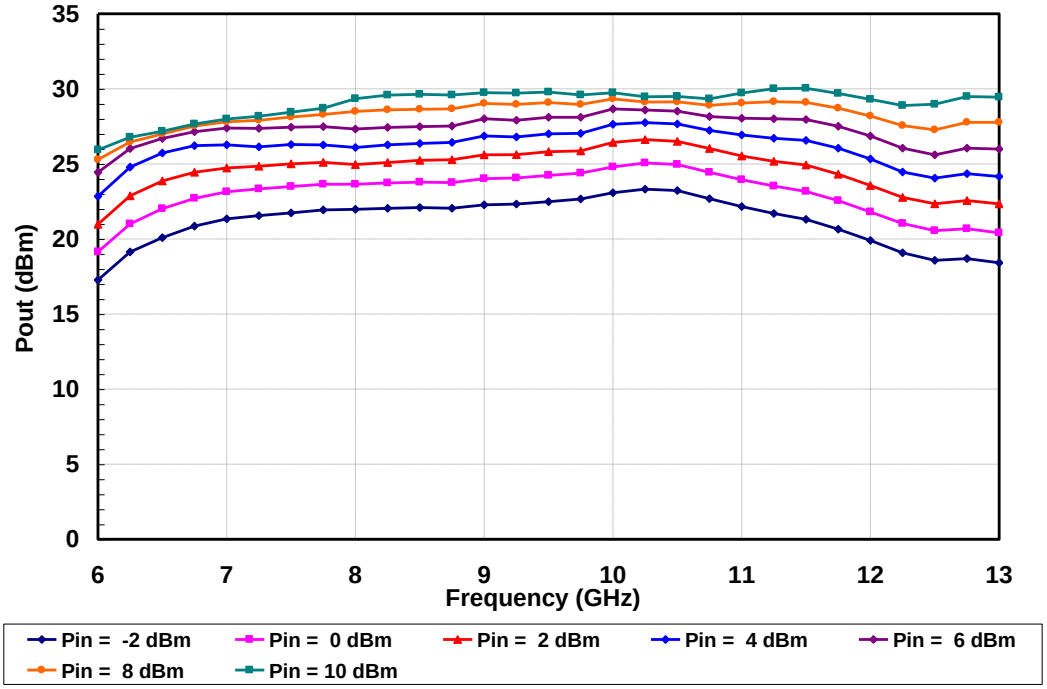


Performance Plots – Small and Large Signals

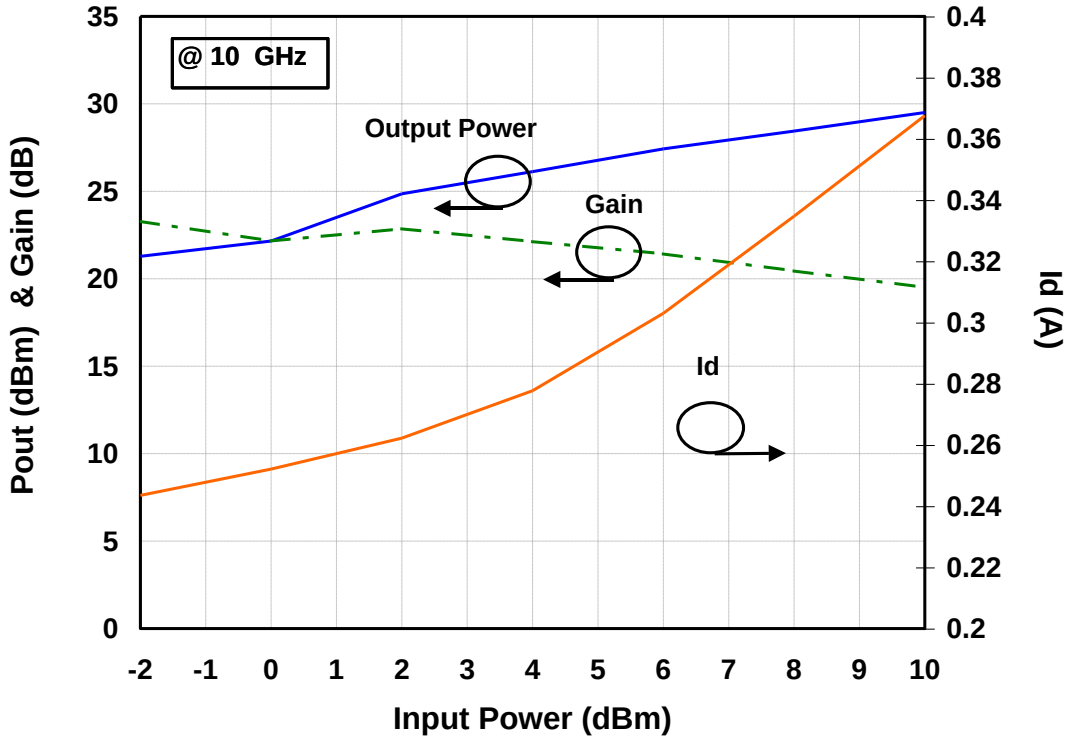
Test Conditions unless otherwise stated: VD = 9 V, IDQ = 225 mA, 25 °C

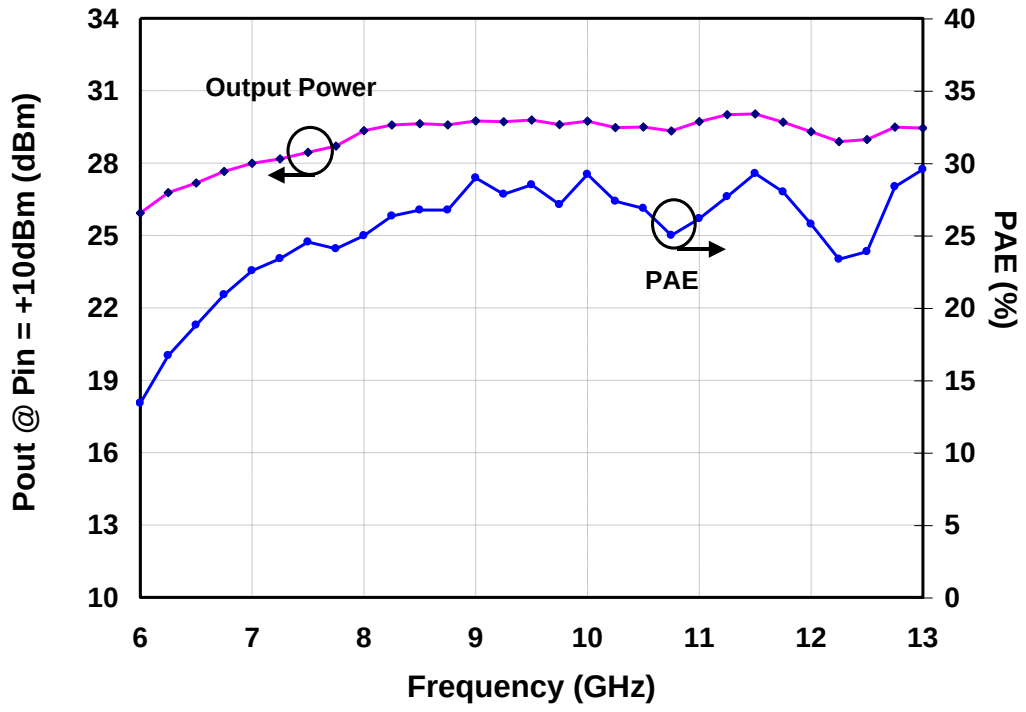




Performance Plots – Large Signal

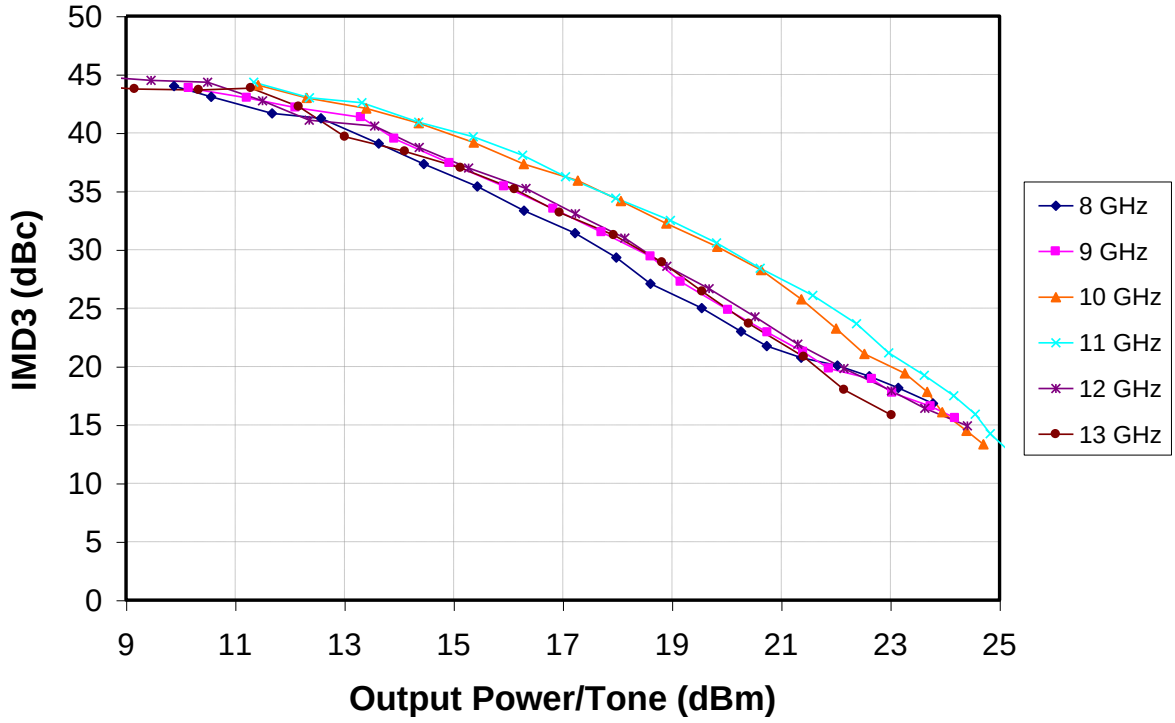
Test Conditions unless otherwise stated: VD = 9 V, IDQ = 225 mA, 25 °C.

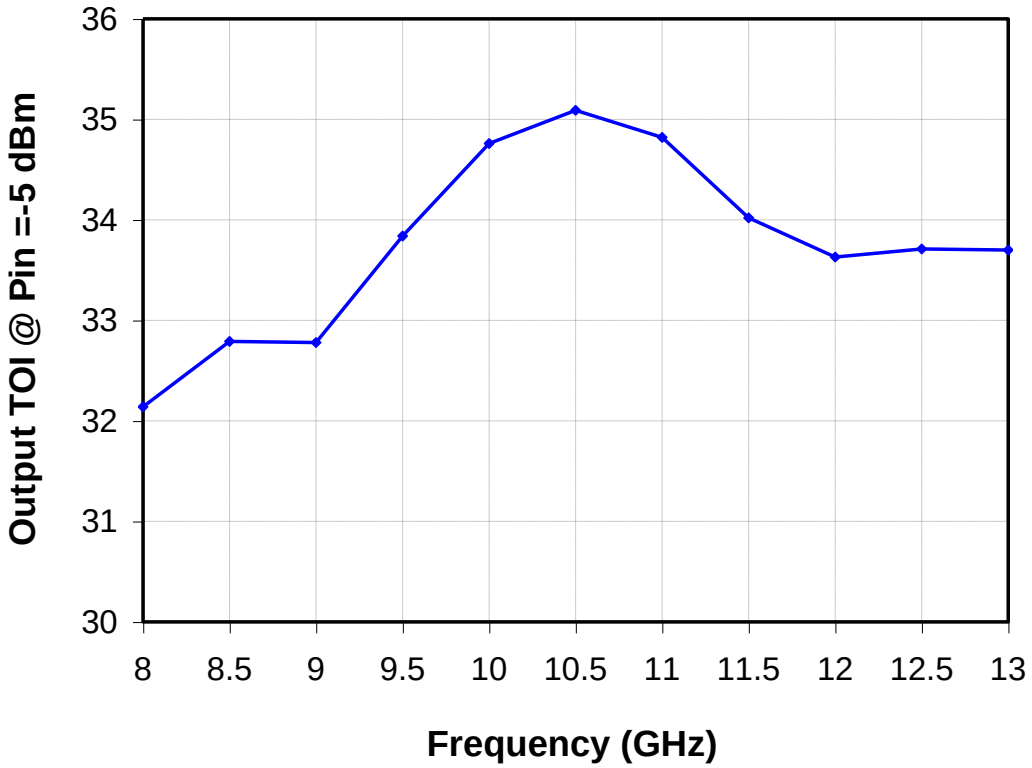




Performance Plots – Linearity

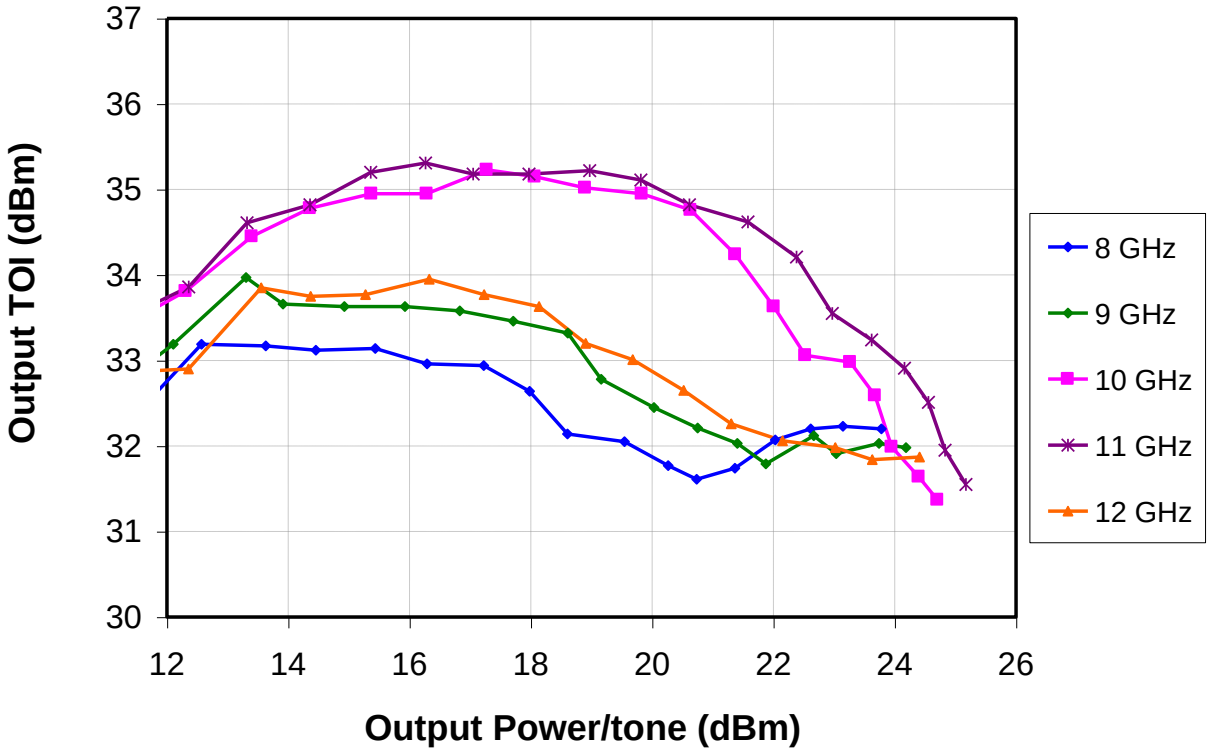
Test Conditions unless otherwise stated: VD = 9 V, IDQ = 225 mA, Tone Spacing = 10 MHz, 25 °C.





Performance Plots – Linearity

Test Conditions unless otherwise stated: VD = 9 V, IDQ = 225 mA, Tone Spacing = 10 MHz, 25 °C.

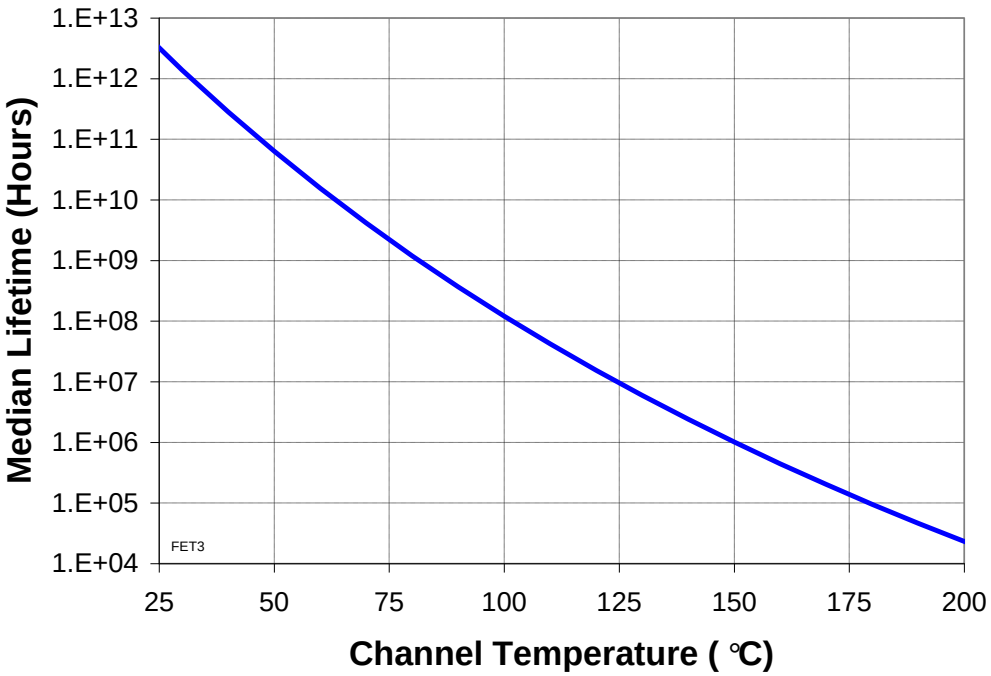


Thermal and Reliability Information

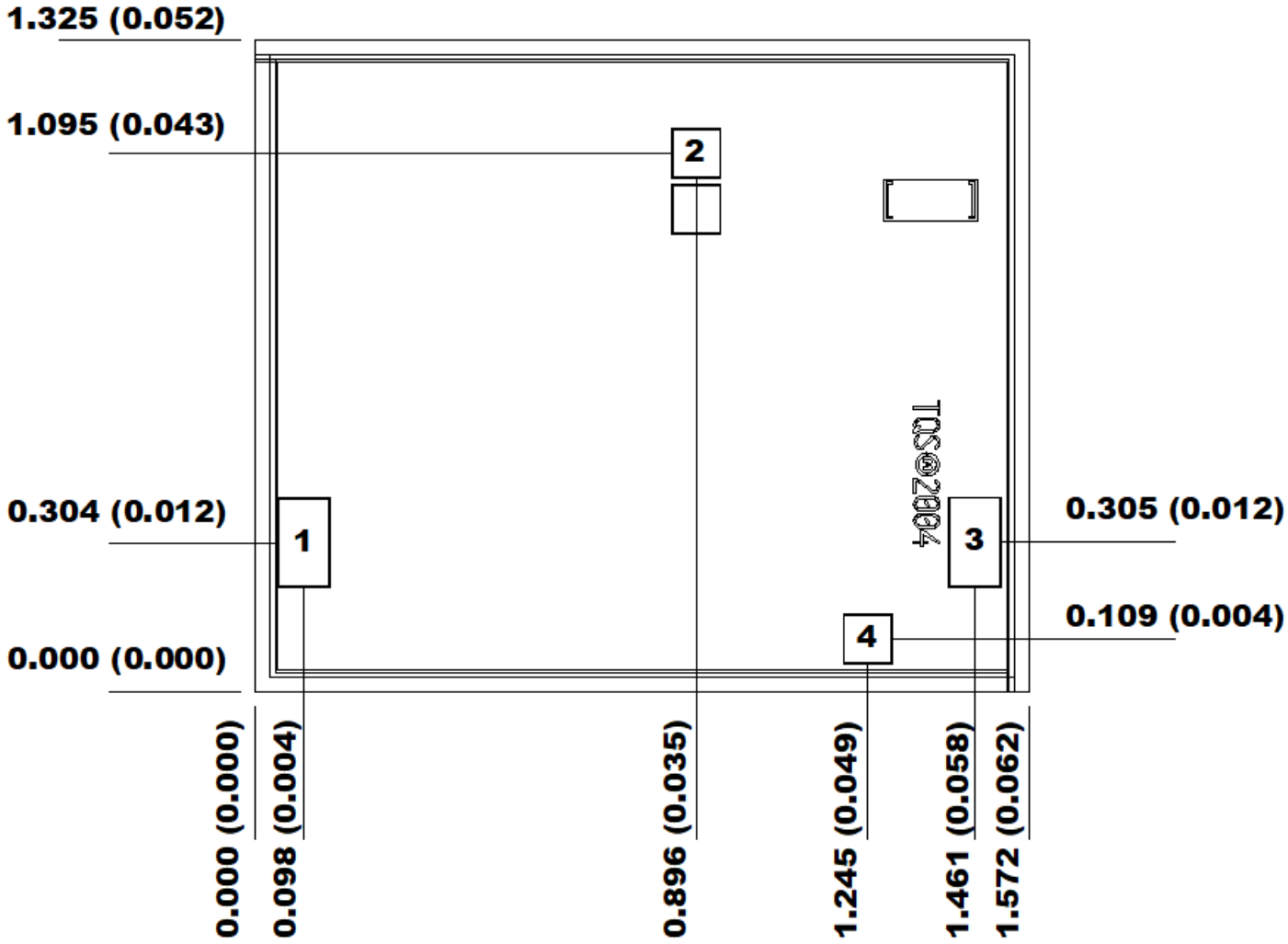
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	T_{base} = 70°C, V_D = 9 V, I_{DQ} = 225 mA Quiescent/Small Signal operation P_{DISS} = 2.0 W	34.7	°C/W
Channel Temperature (T_{CH})		140.0	°C
Median Lifetime (T_M)		2.4E06	Hrs

Notes:
1. Thermal resistance is referenced to back of the metal carrier.
2. Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted on a 20 mil CuMo carrier.
3. Worst case thermal condition is small signal or no RF applied.

Median Lifetime vs Channel Temperature



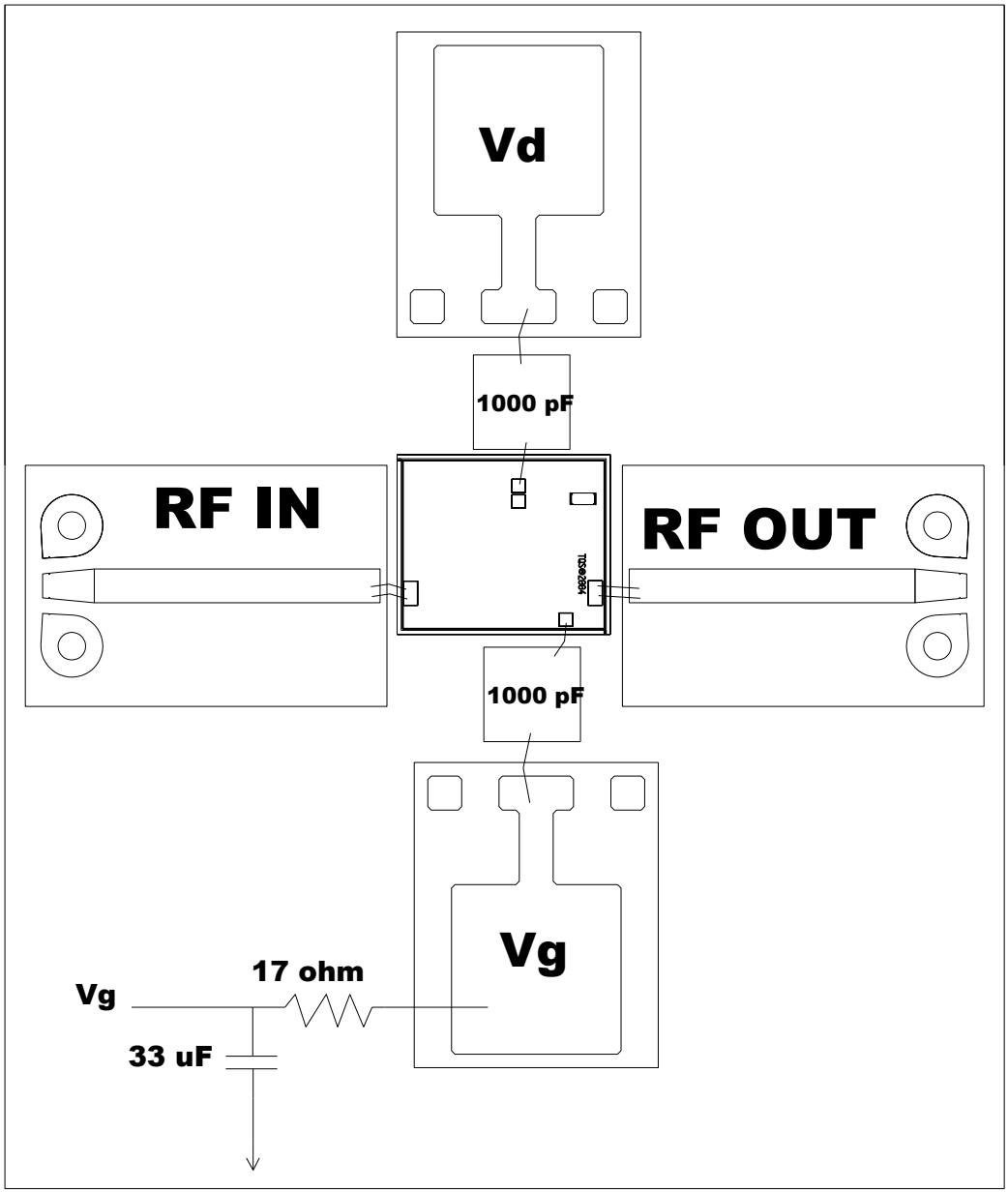
Mechanical Drawing and Bond Pad Description



Unit: millimeters. Die thickness: 0.10, Die x, y size tolerance: +/- 0.050
Chip edge to bond pad dimensions are shown to center of pad
Backside of die is ground

Pad No.	Label	Pad Size (um)	Description
1	RF Input	0.105 x 0.180	RF Input Port, matched to 50 ohms, DC blocked
2	VD	0.098 x 0.098	Drain Voltage
3	RF output	0.105 x 0.180	RF Output Port, matched to 50 ohms, DC blocked
4	VG	0.098 x 0.098	Gate Voltage Control

Circuit Assembly and Biasing Sequence



Bias-up Procedure
1. Set I_D limit to 536 mA, I_G limit to 14 mA
2. Set V_G to −1.2 V
3. Set V_D +9 V
4. Adjust V_G more positive until I_{DQ} = 300mA (V_G ~ −0.7 V Typical)
5. Apply RF signal

Bias-down Procedure
1. Turn off RF signal
2. Reduce V_G to −1.2 V. Ensure I_{DQ} ~ 0mA
3. Set V_D to 0V
4. Turn off V_D supply
5. Turn off V_G supply

Assembly Notes

Component placement and adhesive attachment assembly:

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 (i.e. epoxy) can be used in low-power applications.
Curing should be done in a convection oven; proper exhaust is a safety concern.

Reflow process assembly:

Use AuSn (80/20) solder and limit exposure to temperatures above 300 °C to 3-4 minutes, maximum.
An alloy station or conveyor furnace with reducing atmosphere should be used.
Do not use any kind of flux.
Coefficient of thermal expansion matching is critical for long-term reliability.
Devices must be stored in a dry nitrogen atmosphere.

Interconnect process assembly:

Thermosonic ball bonding is the preferred interconnect technique.
Force, time, and ultrasonic are critical parameters.
Aluminum wire should not be used.
Devices with small pad sizes should be bonded with 0.0007-inch wire.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	TBD	ESDA / JEDEC JS-001-2012
ESD – Charged Device Model (CDM)	TBD	ESDA / JEDEC JS-002-2014

Caution!
ESD-Sensitive Device

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 ($C_{15}H_{12}Br_4O_2$) Free
- PFOS 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**

Email: **customer.support@qorvo.com**

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