



TGA2611

2 – 6 GHz GaN Low Noise Amplifier

Product Overview

Qorvo's TGA2611 is a broadband Low Noise Amplifier fabricated on Qorvo's production 0.25 μm GaN on SiC process (QGaN25). Covering 2–6 GHz, the TGA2611 can provide 22 dBm P1dB power, 25 dB of small signal gain, 1.5 dB of noise figure and 32 dBm of OTOI. In addition to the high overall electrical performance, this GaN amplifier also provides a high level of input power robustness. Able to survive up to 2 W of input power without performance degradation, Qorvo's TGA2611 provides flexibility regarding receive chain protection never seen before with GaAs technology.

Fully matched to 50 ohms with integrated DC blocking caps on both I/O ports, the TGA2611 is ideally suited for radar and satellite communication applications.



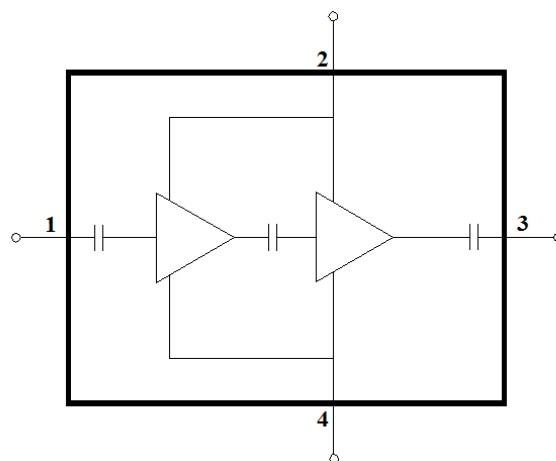
Key Features

- Frequency Range: 2–6 GHz
- NF: 1.5 dB
- OTOI: 32 dBm
- Small Signal Gain: 25 dB
- Return Loss: >10 dB
- P1dB: 22 dBm
- RF input power survivability: 33 dBm (CW)
- Bias: $V_D = 10\text{ V}$, $I_{DQ} = 110\text{ mA}$, $V_G = -2.3\text{ V}$ Typical
- Chip Dimensions: 2.1 x 1.5 x 0.10 mm

Applications

- Commercial and Military Radar
- Satellite Communications

Functional Block Diagram



Ordering Information

Part No.	Description
TGA2611	2 – 6 GHz GaN LNA, Gel Pack, Qty 50
1110610	TGA2611 Evaluation Board, Qty 1

Absolute Maximum Ratings

Parameter	Rating	Units
Drain Voltage (V_D)	40	V
Drain Current (I_D)	200	mA
Gate Voltage Range (V_G)	-5 to 0	V
Gate Current (I_G)	-1 to 4.2	mA
RF Input Power (50 Ω , CW)	33	dBm
Power Dissipation, 85 °C (P_{DISS})	6	W
Channel Temperature, T_{CH}	275	°C
Mounting Temperature (30 seconds)	320	°C
Storage Temperature	-55 to 150	°C

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Recommended Operating Conditions

Parameter	Value	Units
Drain Voltage (V_D)	10	V
Drain Current (quiescent, I_{DQ})	110	mA
Gate Voltage (V_G typical)	-2.3	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.

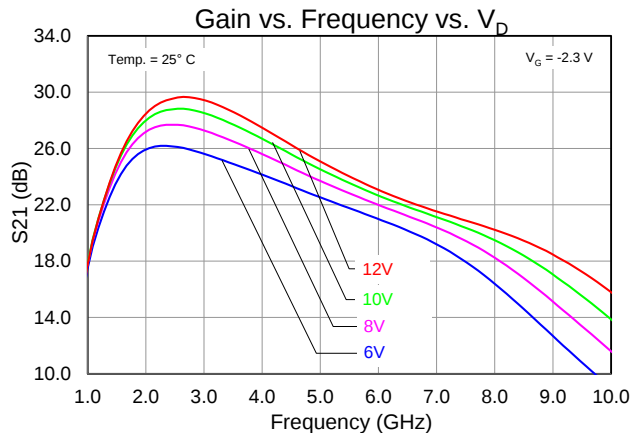
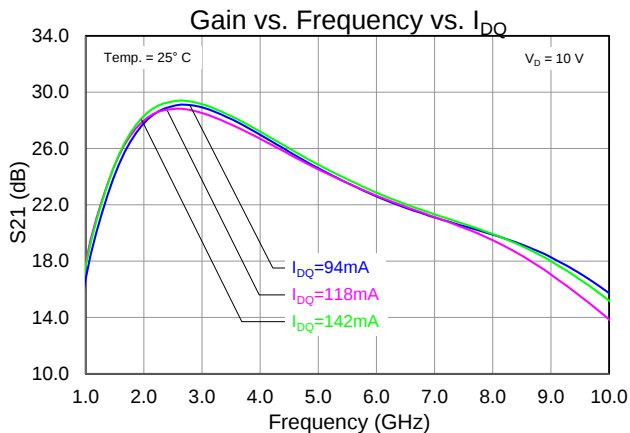
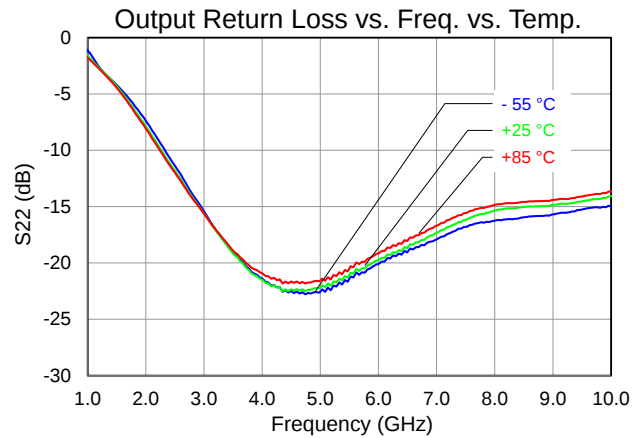
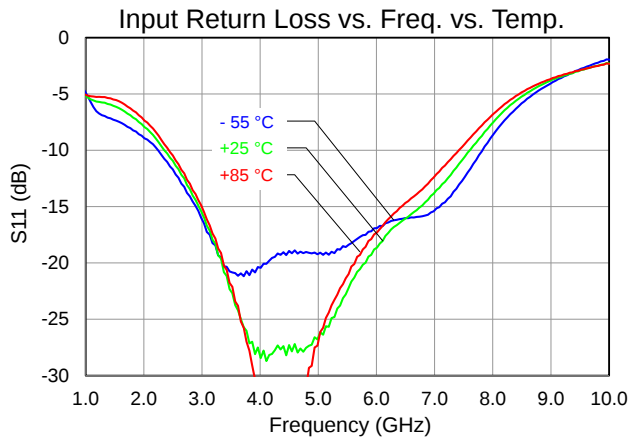
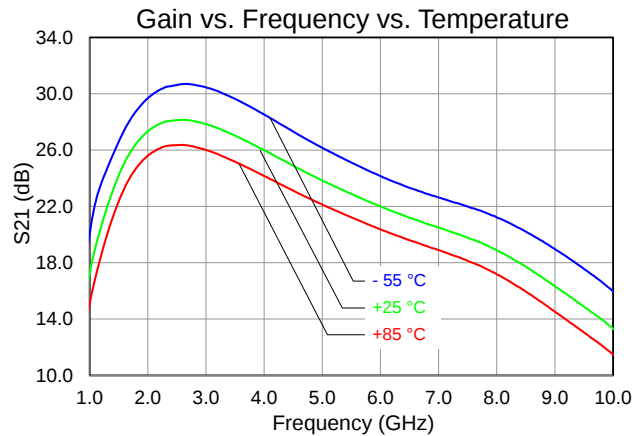
Electrical Specifications

Test conditions unless otherwise noted: $V_D = +10$ V, $I_{DQ} = 110$ mA, Temp. = +25 °C. Data de-embedded to MMIC bond wires.

Parameter	Min	Typ	Max	Units
Operating Frequency	2		6	GHz
Small Signal Gain		25		dB
Input Return Loss		>10		dB
Output Return Loss		>10		dB
Noise Figure		1.5		dB
Output Power at 1 dB Gain Compression		22		dBm
Input Power Survivability (CW)		33		dBm
Output TOI		32		dBm
Gain Temperature Coefficient		-0.03		dB/°C
Noise Figure Temperature Coefficient		0.007		dB/°C

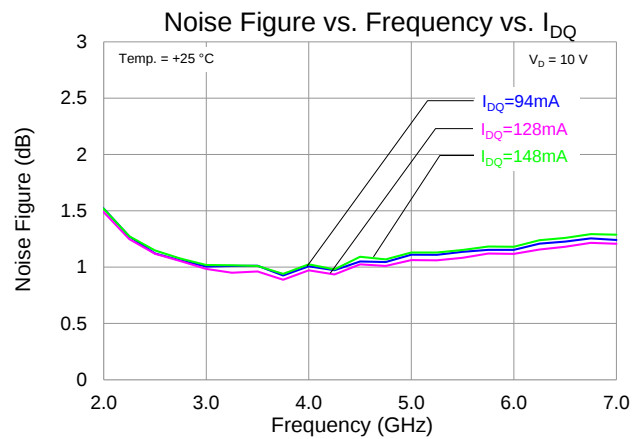
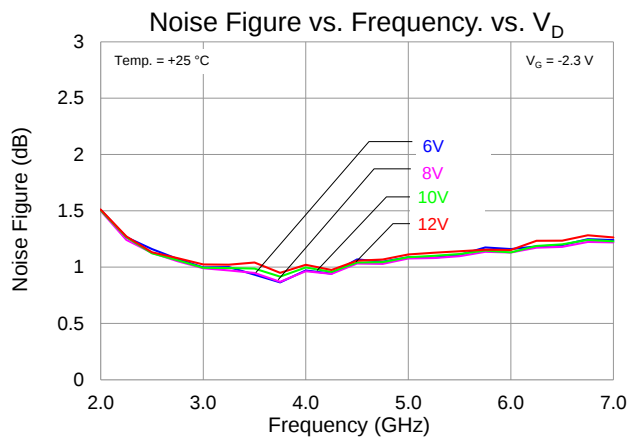
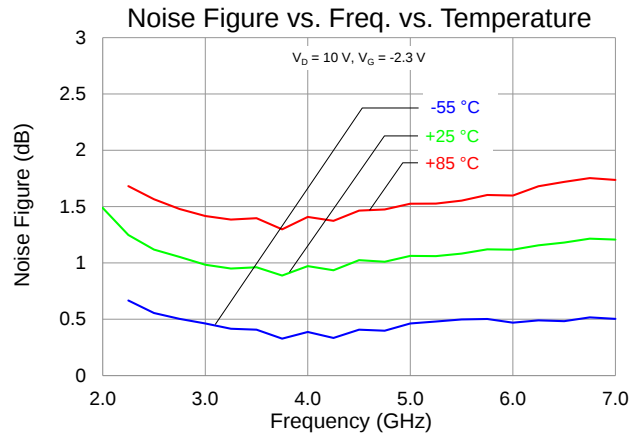
Performance Plots – Small Signal

Test conditions unless otherwise noted: $V_D = +10\text{ V}$, $I_{DQ} = 110\text{ mA}$, Temp. = $+25\text{ }^{\circ}\text{C}$.



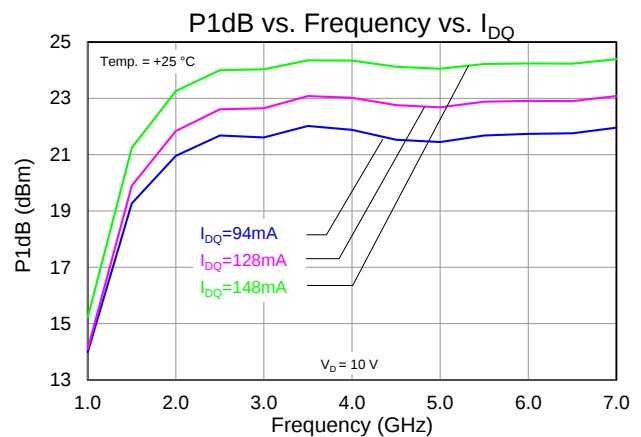
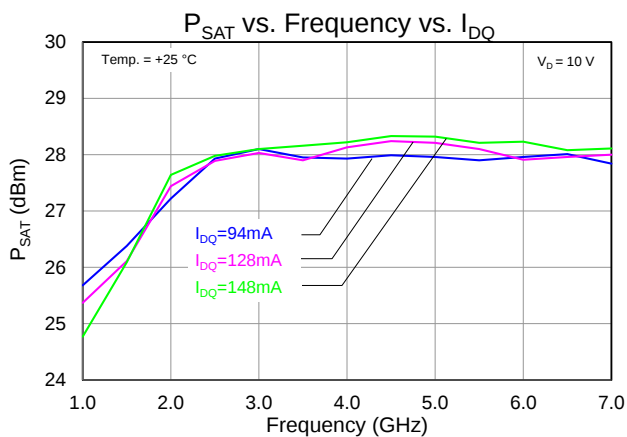
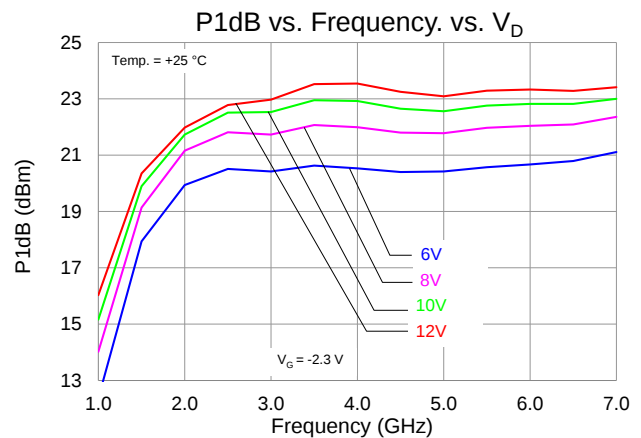
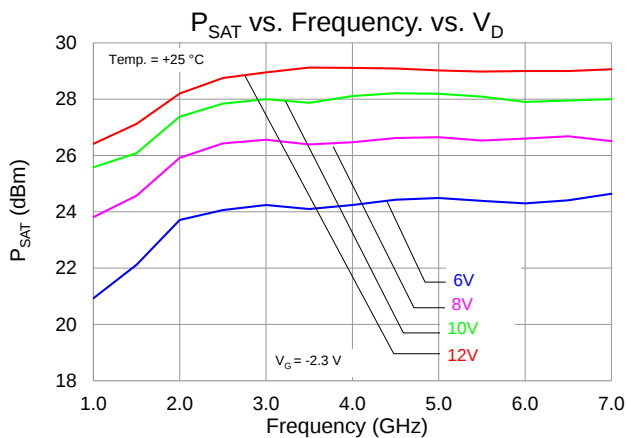
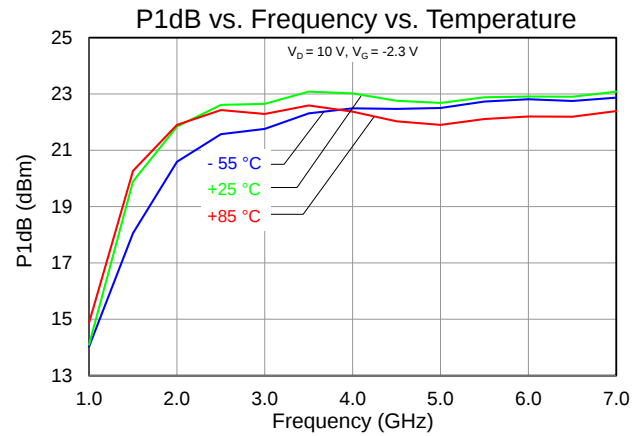
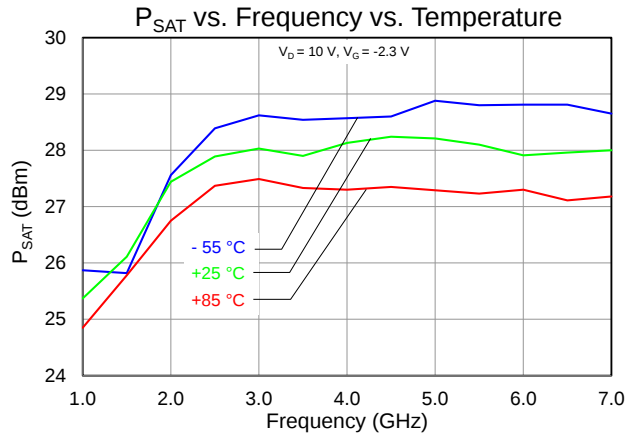
Performance Plots – Noise Figure

Test conditions unless otherwise noted: $V_D = +10\text{ V}$, $I_{DQ} = 110\text{ mA}$, Temp. = $+25\text{ }^{\circ}\text{C}$.



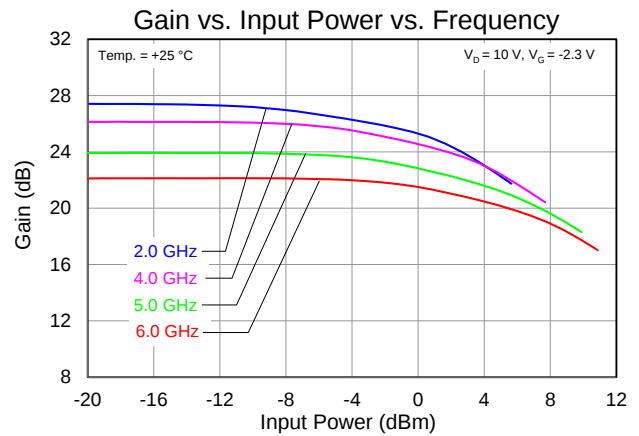
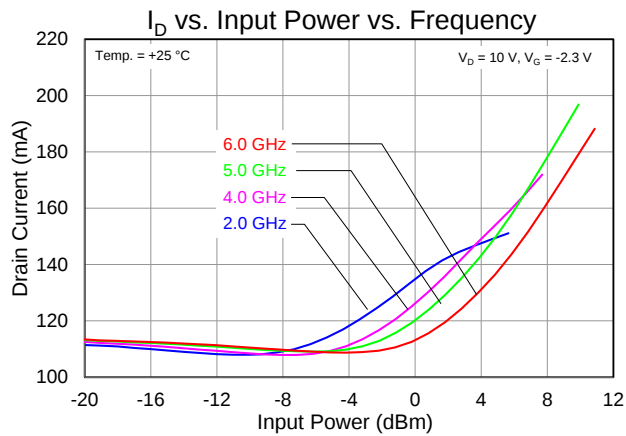
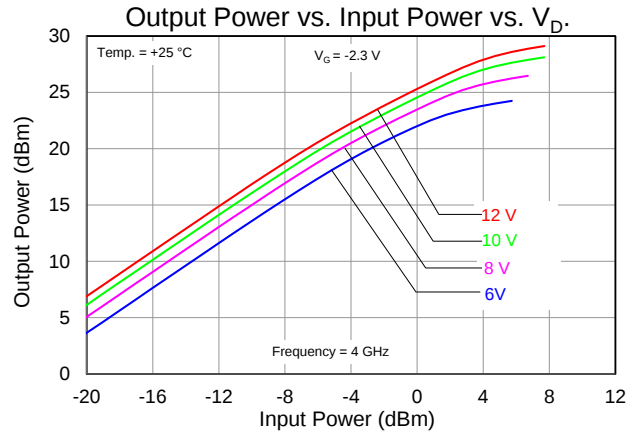
Performance Plots – Large Signal

Test conditions unless otherwise noted: $V_D = +10$ V, $I_{DQ} = 110$ mA, Temp. = +25 °C



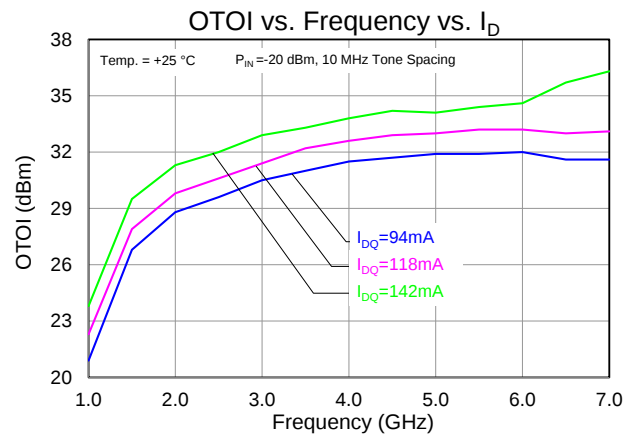
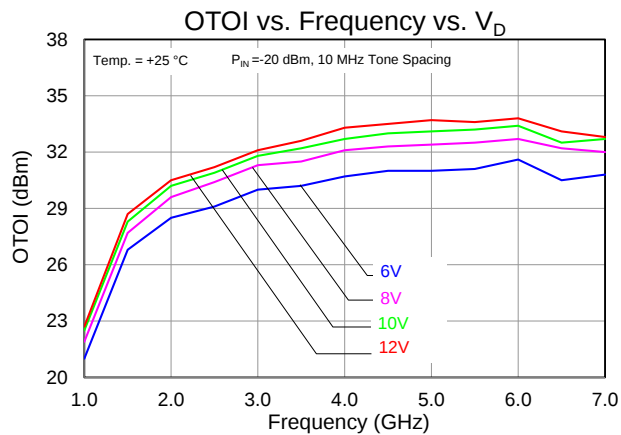
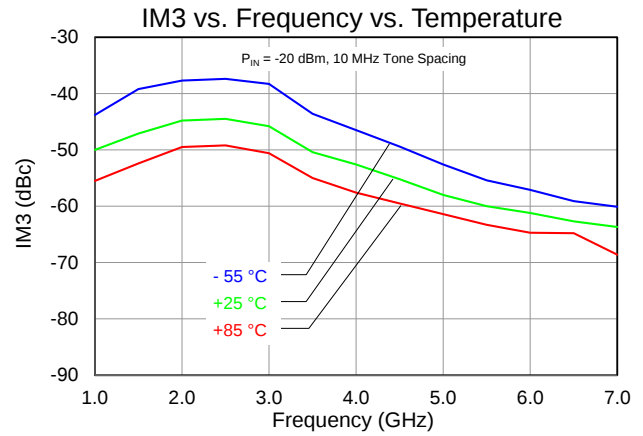
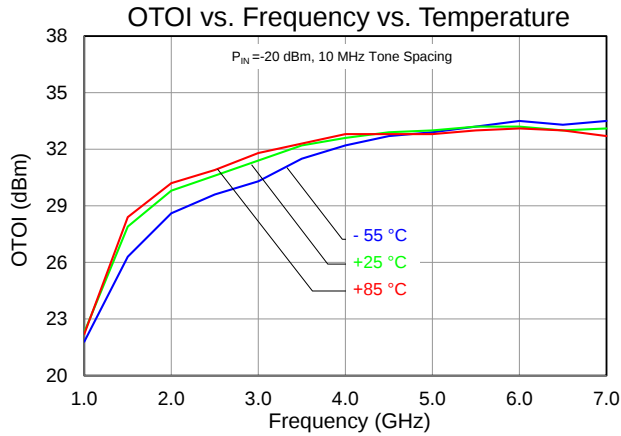
Performance Plots – Large Signal

Test conditions unless otherwise noted: $V_D = +10\text{ V}$, $I_{DQ} = 110\text{ mA}$, Temp. = $+25\text{ }^{\circ}\text{C}$

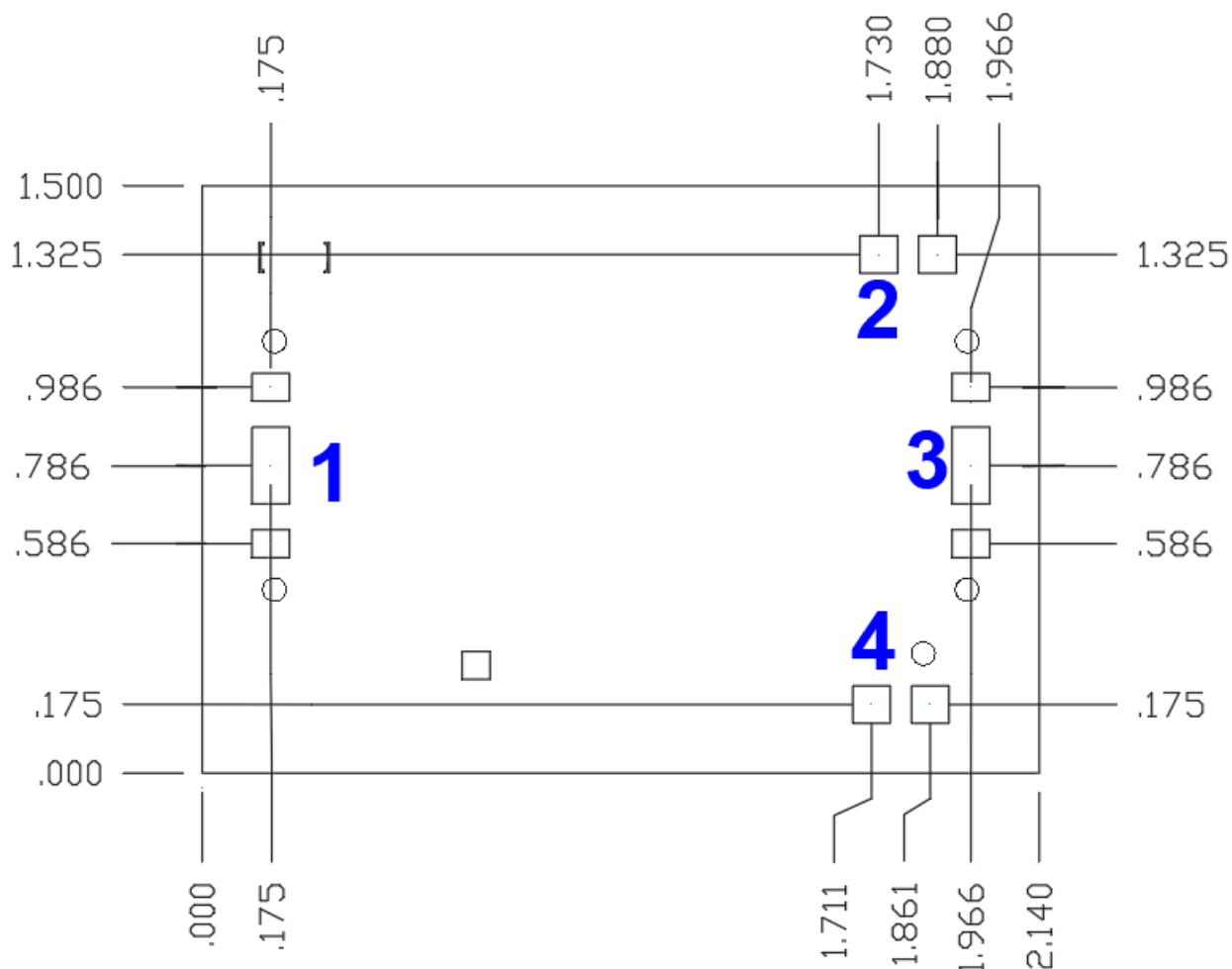


Performance Plots – Linearity

Test conditions unless otherwise noted: $V_D = +10\text{ V}$, $I_{DQ} = 110\text{ mA}$, Temp. = $+25\text{ }^\circ\text{C}$



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. Ground is backside of die

Pad No.	Label	Pad Size (mm)	Description
1	RF In	0.096 x 0.196	RF Input; matched to 50 ohms, DC blocked.
2	V _D	0.096 x 0.096	Drain voltage, V _D . Bias network required; refer to Application Circuit.
3	RF Out	0.096 x 0.196	RF Output; matched to 50 ohms, DC blocked.
4	V _G	0.096 x 0.096	Gate voltage, V _G . Bias network required; refer to Application Circuit.

Assembly Notes

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

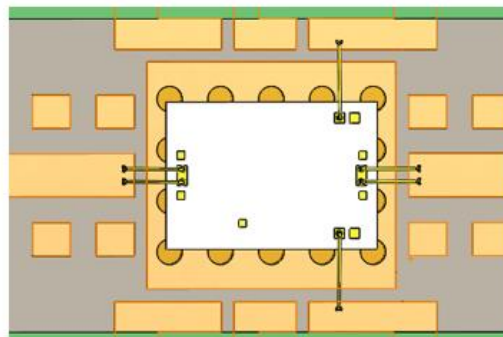
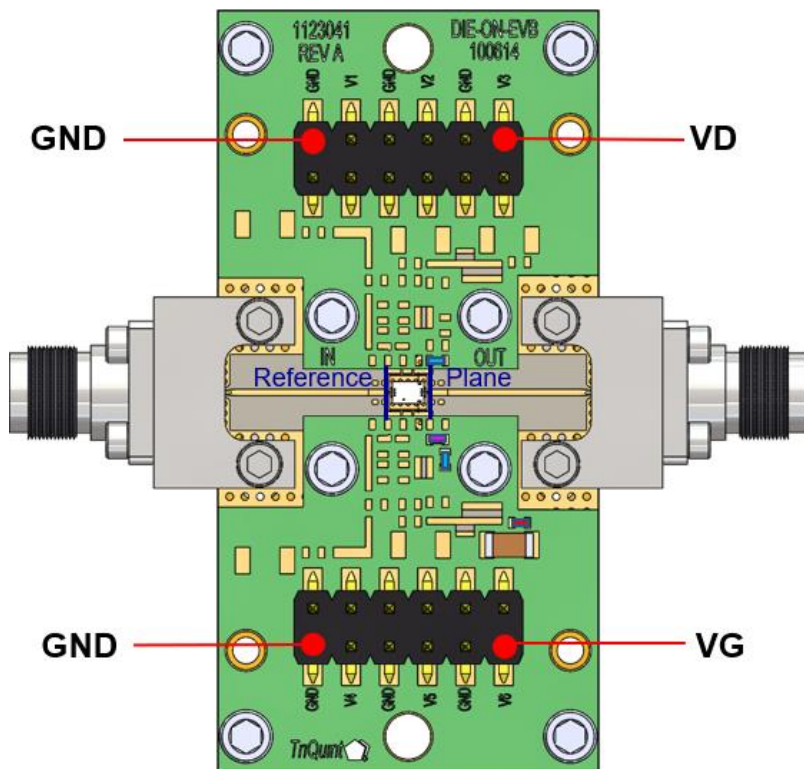
Reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300°C to 3-4 minutes, maximum.
- Conductive epoxy die attach is recommended for PCB mounting.
- Bonding pads plating: Au.
- 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 notes:

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

Evaluation Board and BOM



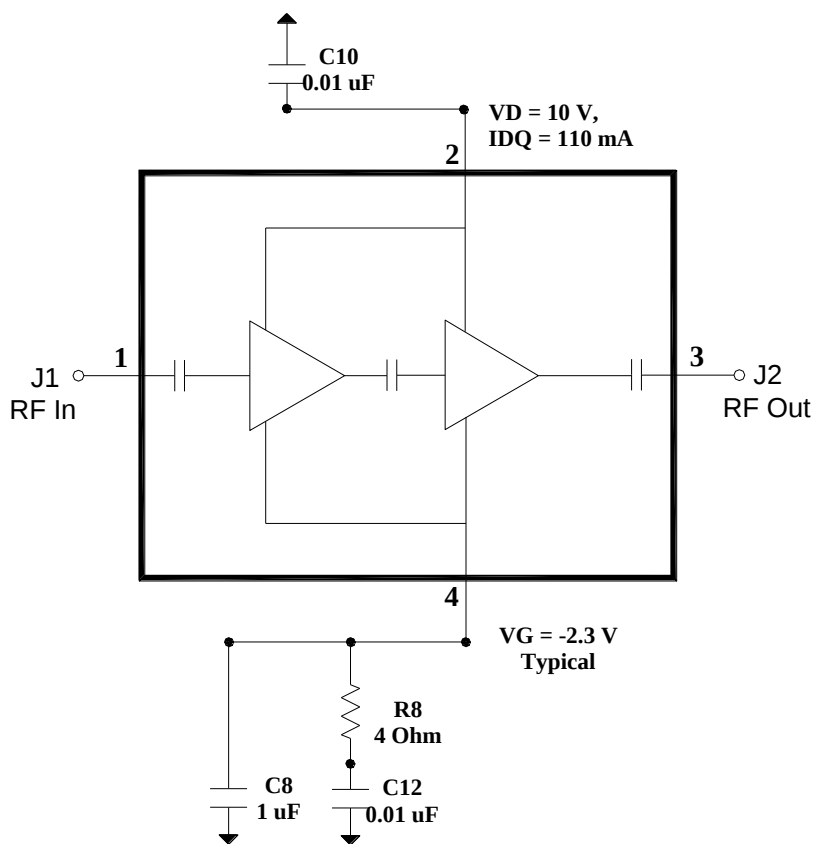
- R8
- C10, C12
- R1
- C8

RF Layer is 0.008" thick Rogers Corp. RO4003C ($\epsilon_r = 3.35$). Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-01A-5. PCB level tuning at input side is recommended for optimal performance.

Bill of Material – Evaluation Board

Ref. Des.	Value	Description	Manuf.	Part Number
C10, C12	0.01 uF	CAP 0.01UF +/-10% 50V, 0402, ROHS	Various	
R8	4 Ohm	Res 4Ohm +/-10%, 0402, 1/10 W	Various	
R1	0 Ohm	Res 0 Ohm +/-10%, 0402	Various	
C8	10 uF	CAP 10UF 10V 10% 50V, 1206, ROHS	Various	
RF IN, RF OUT	2.92 mm	2.92 MM END LAUNCH CONNECTOR	Southwest Microwave	1092-01A-5

Application Circuit and Biasing Sequence



Notes:

1. Can use separate gate and drain for individual stage controls.

Bias-up Procedure

1. Set I_D limit to 175 mA, I_G limit to 1 mA
2. Set V_G to -5 V for pinch off
3. Set $V_D = +10$ V
4. Adjust V_G more positive until $I_{DQ} = 110$ mA ($V_G \approx -2.3$ V Typical)
5. Apply RF signal

Bias-down Procedure

1. Turn off RF signal
2. Reduce V_G to -5 V. Ensure $I_{DQ} \approx 0$ mA
3. Set V_D to 0V
4. Turn off V_D supply
5. Turn off V_G supply

Thermal and Reliability Information

Parameter	Values	Units	Conditions
Thermal Resistance (θ_{JC}) ^(1,2,3) , Quiescent, TX	11.5	°C/W	$V_D = 10V$, $I_{DQ} = 110mA$, $P_{DISS} = 1.1W$ $T_{baseplate} = 85^{\circ}C$
Channel Temperature (T_{CH}), Quiescent, TX	97.7	°C	

Notes:

1. Thermal resistance is measured to package backside
2. Base or ambient temperature is 85 °C
3. Refer to the following document: [GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates](#)

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	TBD	ESDA / JEDEC JS-001-2012



Caution!
ESD-Sensitive Device

RoHS Compliance

This part is compliant with 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
- 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

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.

© 2020 Qorvo US, Inc. All rights reserved. This document is subject to copyright laws in various jurisdictions worldwide and may not be reproduced or distributed, in whole or in part, without the express written consent of Qorvo US, Inc.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Qorvo:](#)

[TGA2611](#) [TGA2611, EVAL BOARD](#)