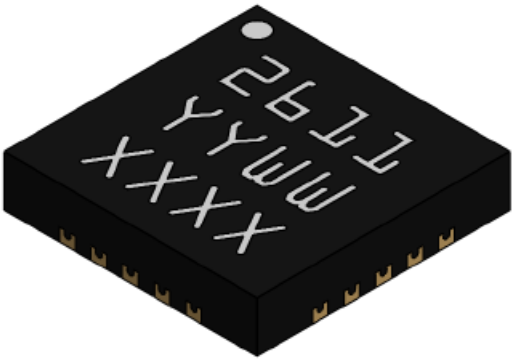
TGA2611-SM

2 – 6 GHz GaN LNA



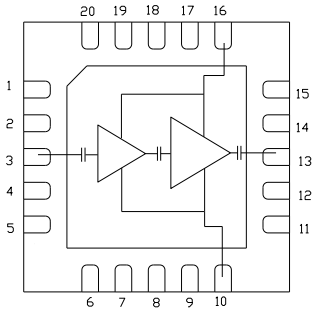
Product Description

Qorvo's TGA2611-SM is a packaged broadband Low Noise Amplifier fabricated on Qorvo's QGaN25 0.25 um GaN on SiC process. The TGA2611-SM operates from 2 to 6 GHz and typically provides >18 dBm P1dB, > 22 dB of small signal gain and 30 dBm of OTOI with 1.0 dB NF. In addition to the high overall electrical performance, this GaN amplifier also provides a high level of input power robustness which allows more flexibility in designing the receive chain circuit protection.

The TGA2611-SM is available in a low cost, surface mount 20-lead 4x4 mm plastic QFN. It is ideally suited to support both radar and satellite communication applications.

Both RF ports have intergraded DC blocking caps and are fully matched to 50 ohms.

Functional Block Diagram



Product Features

- Frequency Range: 2 – 6 GHz
- NF: 1.0 dB
- OTOI: 30 dBm @ P_{OUT}/Tone = 18 dBm
- Small Signal Gain: 22 dB
- Return Loss: > 10 dB
- P1dB: 18 dBm; P_{SAT} = 26 dBm @ P_{IN} = 10 dBm
- Bias: V_D = 10 V, I_{DQ} = 100 mA; V_G = - 2.3 V (Typical)
- Package Dimensions: 4.0 x 4.0 x 0.85 mm

Applications

- Commercial & Military Radar
- Communications

Ordering Information

Part No.	Description
TGA2611-SM	2 – 6 GHz GaN LNA
1097070	TGA2611-SM Evaluation Board

Absolute Maximum Ratings

Parameter	Range / Value	Units
Drain Voltage (V_D)	+40	V
Gate Voltage (V_G)	−5 to 0	V
Drain Current (I_D)	300	mA
Gate Current (I_G)	17	mA
Power Dissipation, 85 °C (P_{DISS})	6	W
RF Input Power, CW, 50 Ω	30	dBm
Channel Temperature (T_{CH})	+275	°C
Mounting Temperature (30 seconds maximum)	+260	°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	
Drain Voltage (V_D)	10 V
Gate Voltage (V_G)	-2.3 V Typical
Quiescent Drain Current (I_{DQ})	100 mA
Temperature (T_{BASE})	-40 to 85 °C

Electrical performance is measured under conditions noted in the electrical specifications table. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

Parameter	Conditions	Min	Typ	Max	Units
Operational Frequency Range		2		6	GHz
Small Signal Gain			> 22		dB
Input Return Loss			> 10		dB
Output Return Loss			> 10		dB
Noise Figure			1		dB
Output Power @ 1 dB Gain Compression (P_{1dB})			> 18		dBm
Output TOI	P_{OUT} / Tone = 18 dBm, Δf = 10 MHz		30		dBm
Small Signal Gain Temperature Coefficient			−0.03		dB / °C
Noise Figure Temperature Coefficient			0.007		dB / °C

Test conditions unless otherwise noted: T_{BASE} = +25 °C, V_D = 10V, I_{DQ} = 100mA, V_G = -2.3V Typical, CW

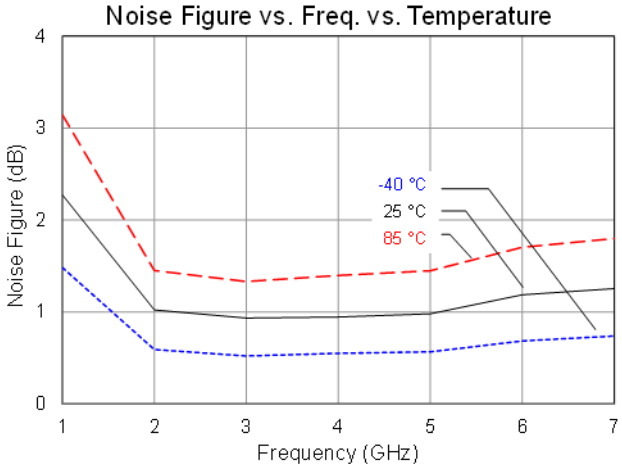
Thermal and Reliability Information

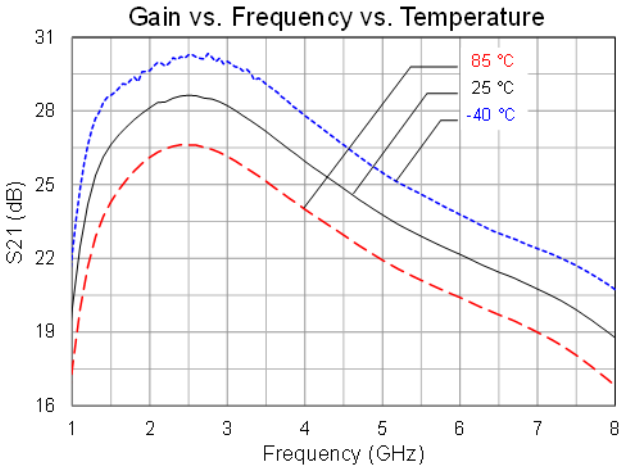
Parameter	Values	Units	Conditions
Thermal Resistance (θ_{JC}) (1,2,3)	12.6	°C/W	T_{BASE} = +85 °C, V_D = 10 V, I_{DQ} = 100 mA, I_{D_DRIVE} = 195 mA, P_{IN} = 10 dBm, P_{OUT} = 28 dBm, Freq. = 4 GHz, P_{DISS} = 1.3 W, CW
Channel Temperature (T_{CH})	101.4	°C	

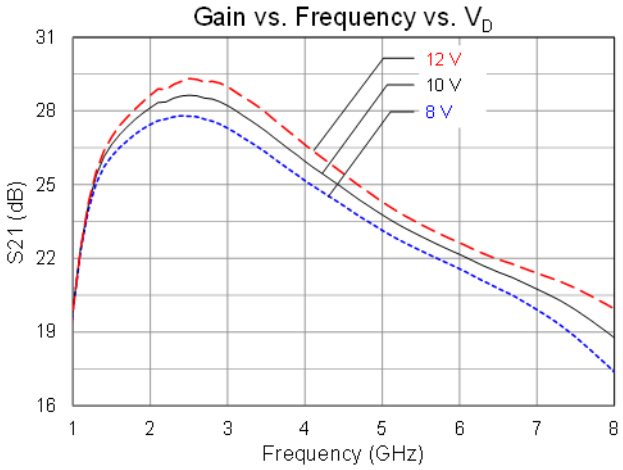
Notes:
1. Thermal resistance is measured to package backside
2. Base or ambient temperature is 85 °C
3. Refer to the following document: GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates

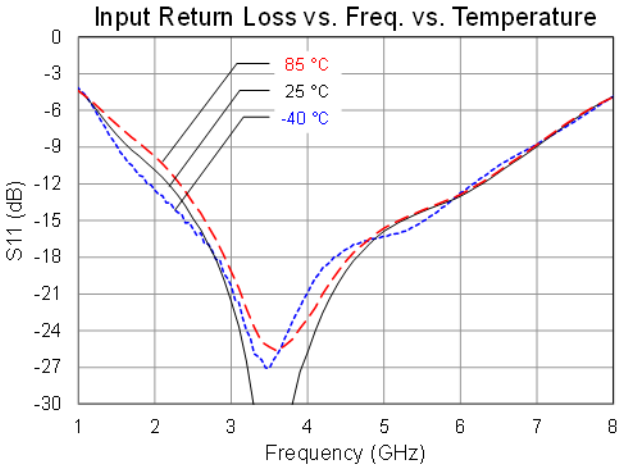
Performance Plots – Small Signal

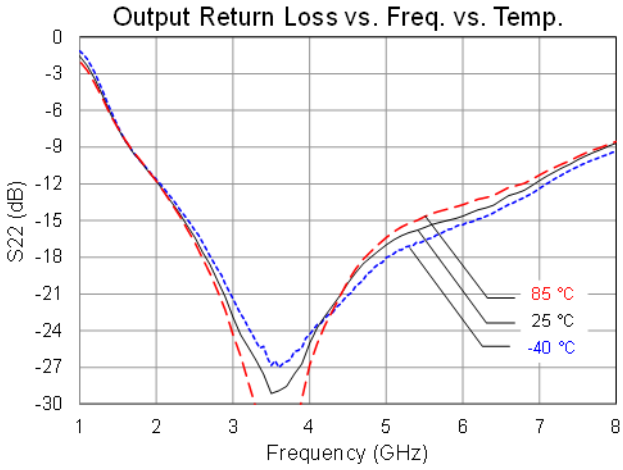
Conditions unless otherwise specified: V_D = 10 V, I_{DQ} = 100 mA, V_G = -2.3 V Typical, CW





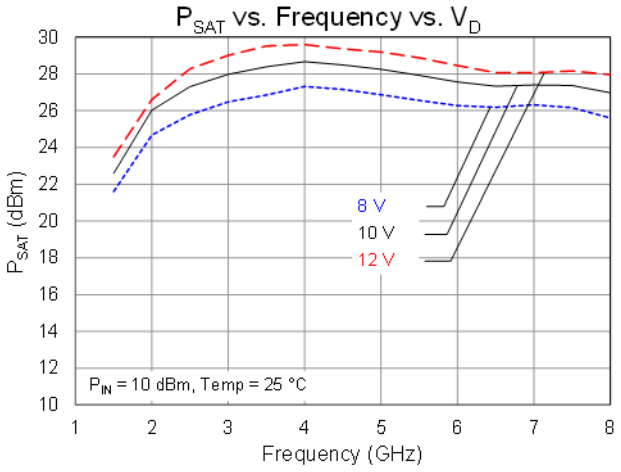


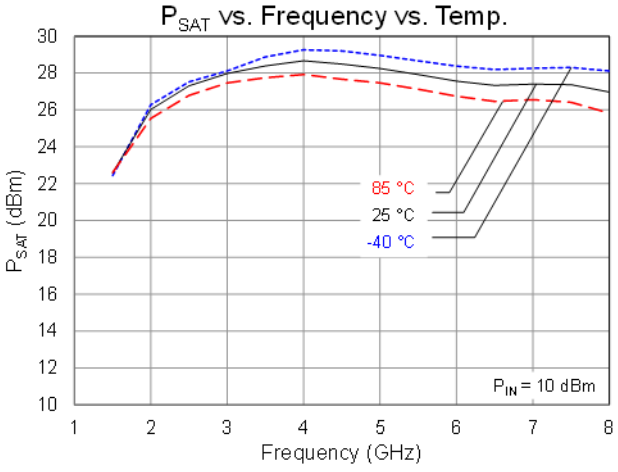


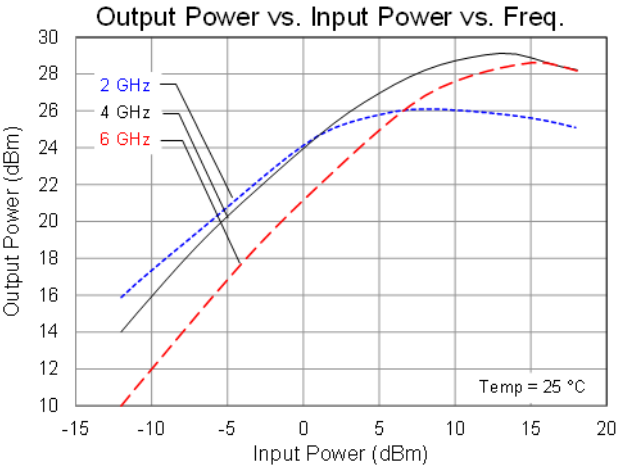


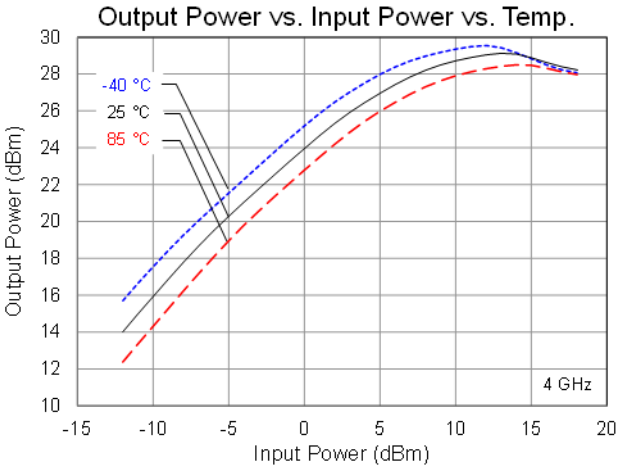
Performance Plots – Large Signal

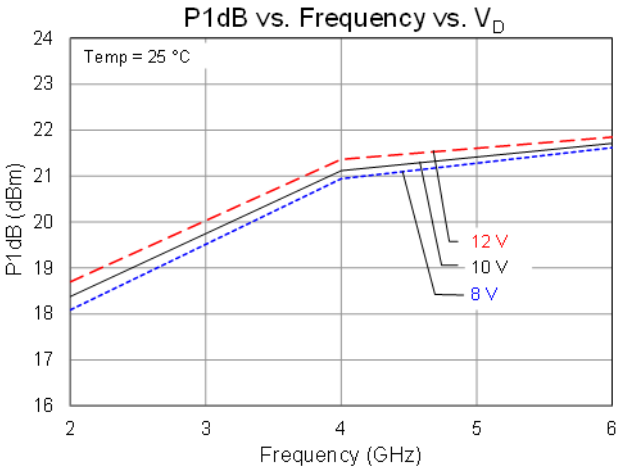
Conditions unless otherwise specified: V_D = 10 V, I_{DQ} = 100 mA, V_G = -2.3 V Typical, CW

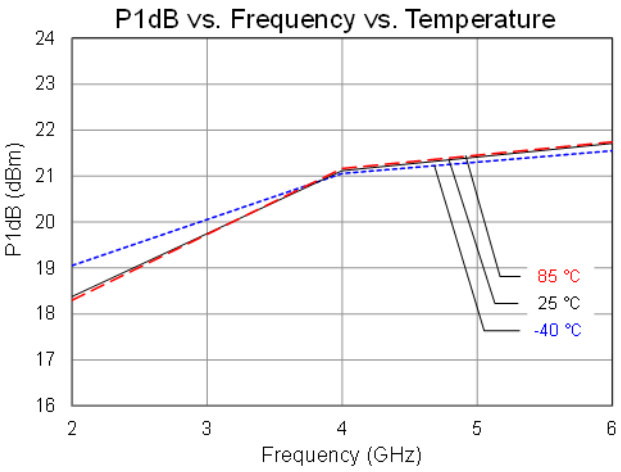








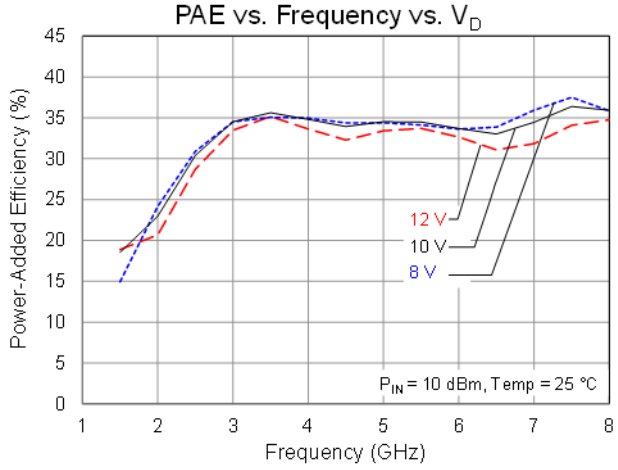




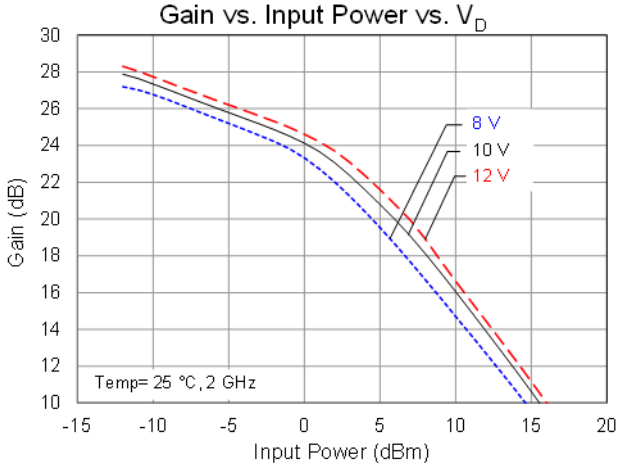
Performance Plots – Large Signal

Conditions unless otherwise specified: V_D = 10 V, I_{DQ} = 100 mA, V_G = -2.3 V Typical, CW

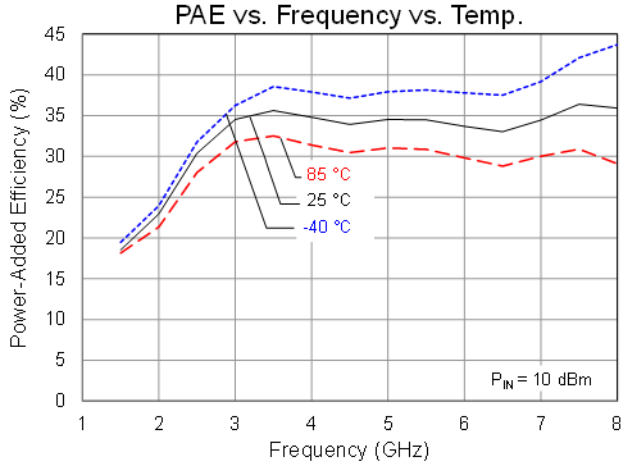
PAE vs. Frequency vs. V_D



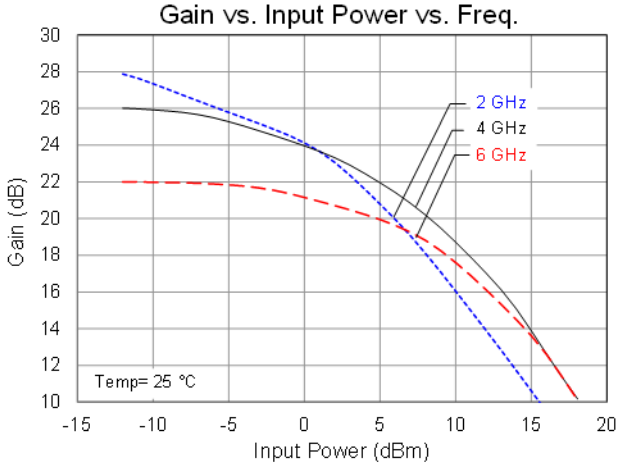
Gain vs. Input Power vs. V_D



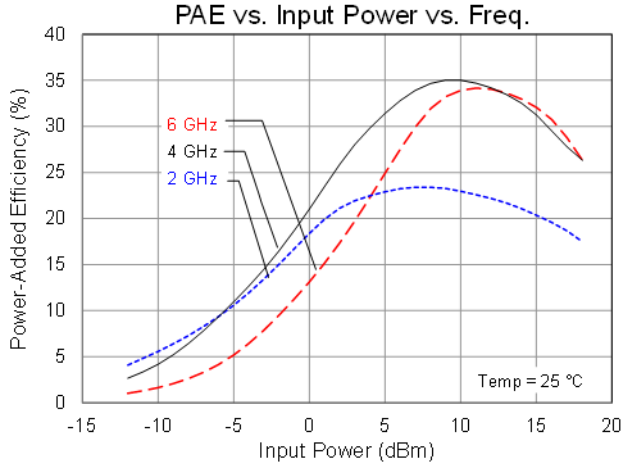
PAE vs. Frequency vs. Temp.



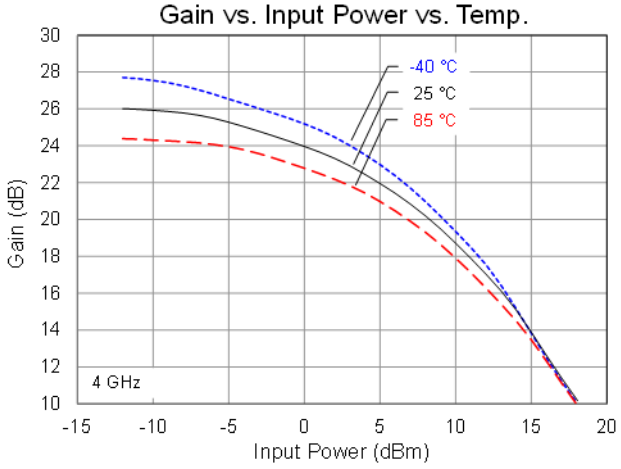
Gain vs. Input Power vs. Freq.



PAE vs. Input Power vs. Freq.

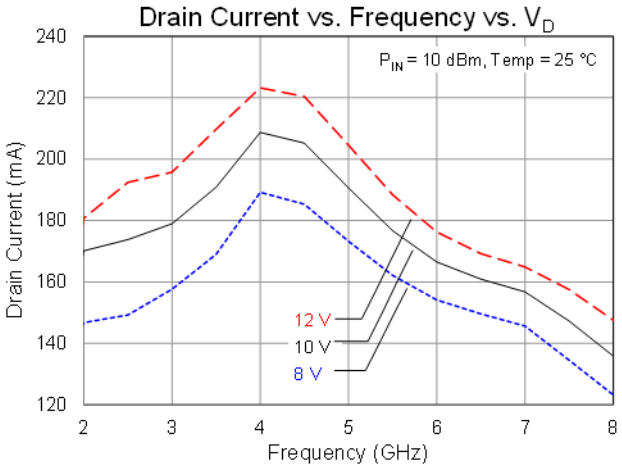


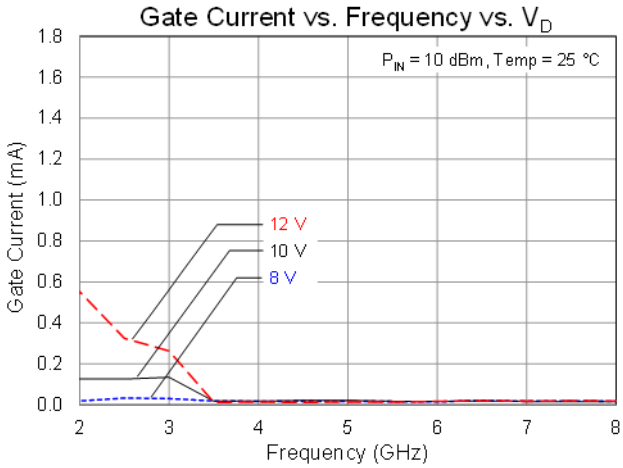
Gain vs. Input Power vs. Temp.

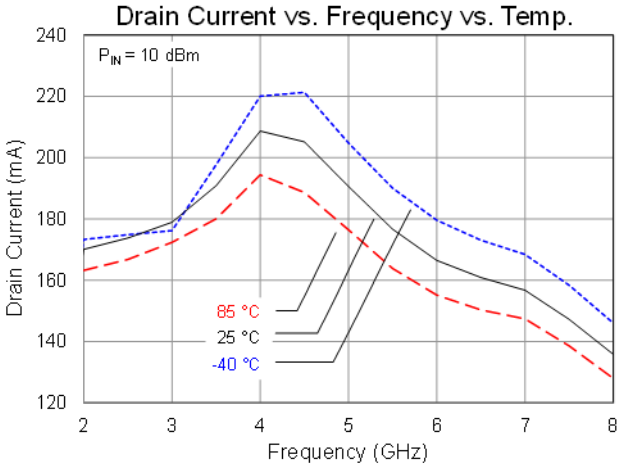


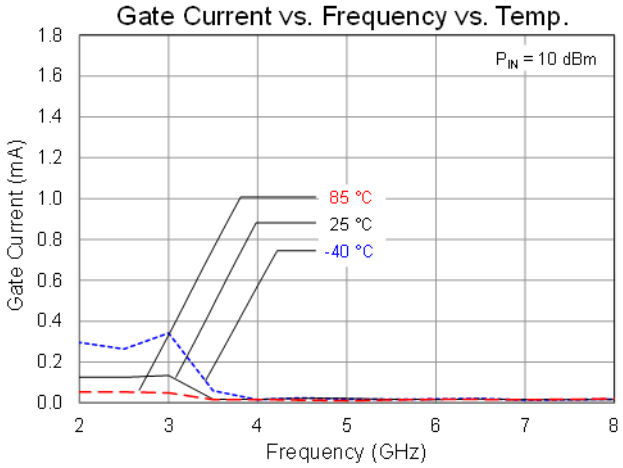
Performance Plots – Large Signal

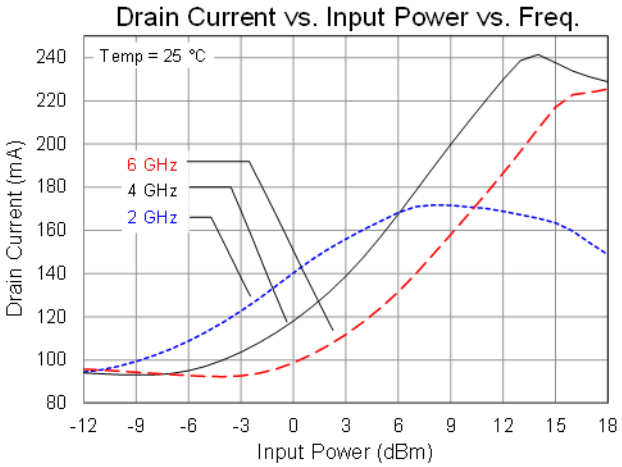
Conditions unless otherwise specified: V_D = 10 V, I_{DQ} = 100 mA, V_G = -2.3 V Typical, CW

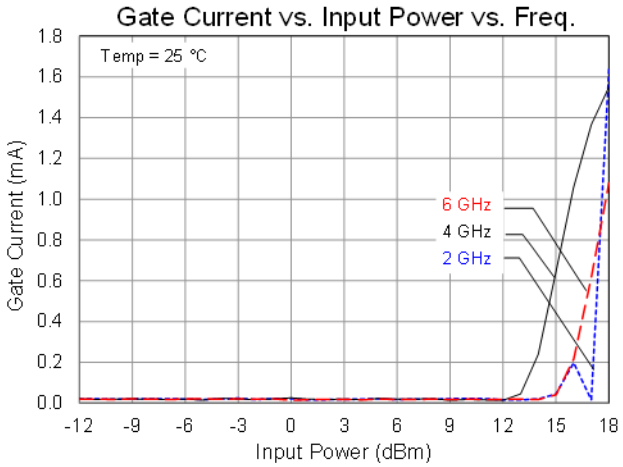






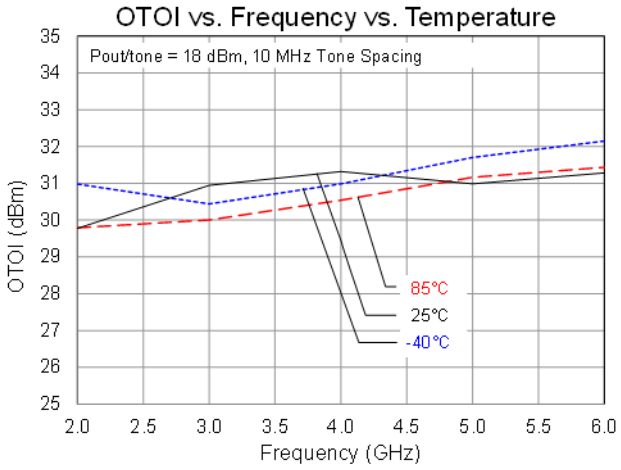


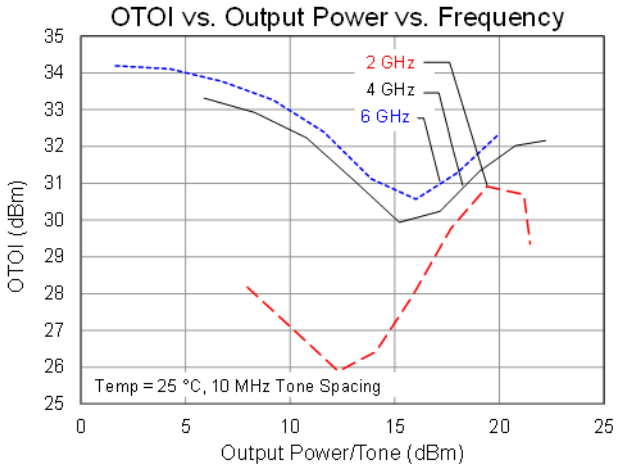


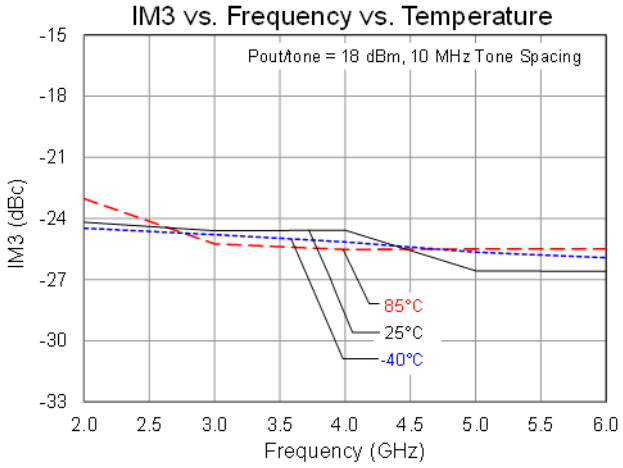


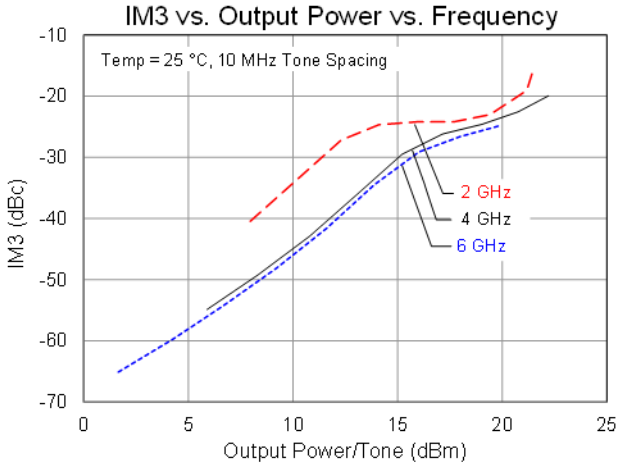
Performance Plots – Linearity

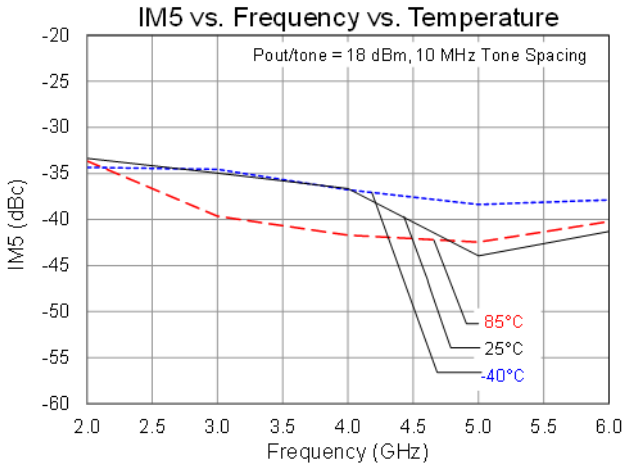
Conditions unless otherwise specified: V_D = 10 V, I_{DQ} = 100 mA, V_G = -2.3 V Typical, CW

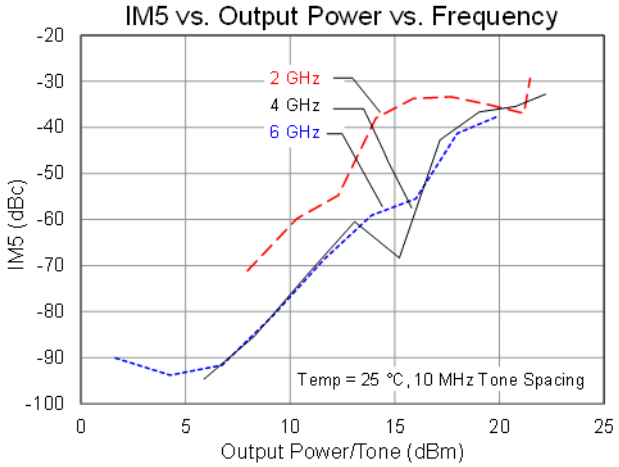






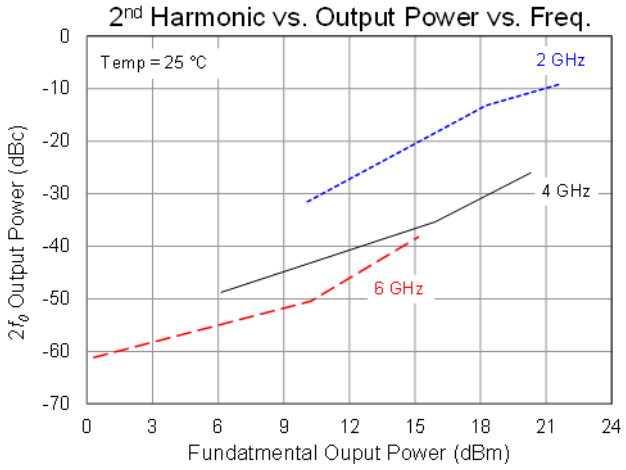


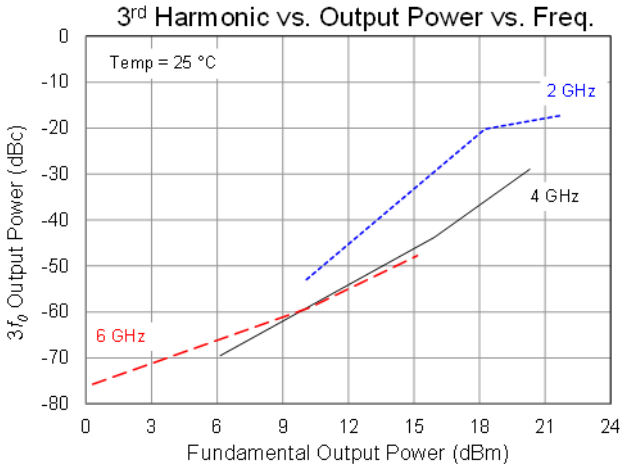


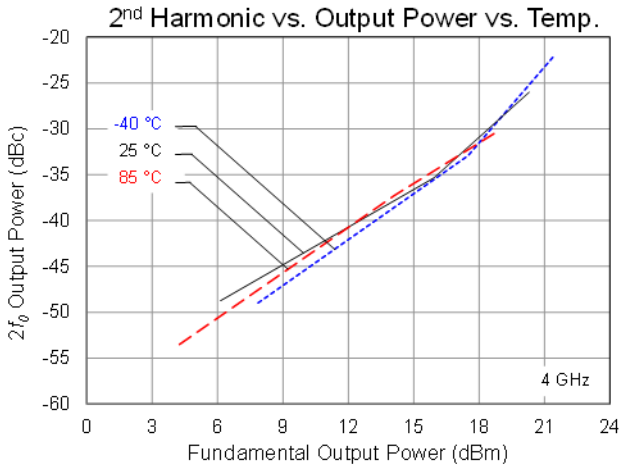


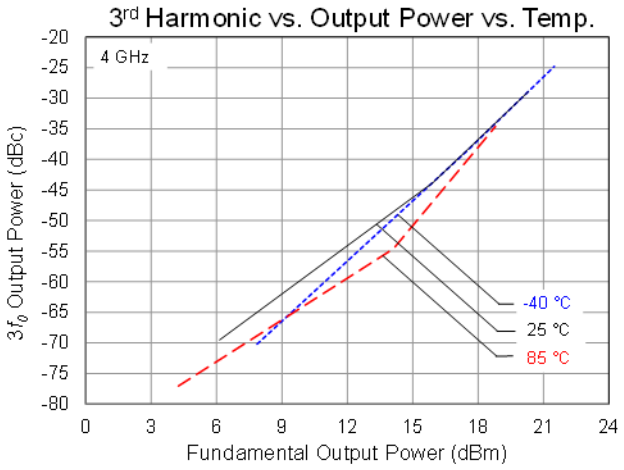
Performance Plots – Harmonic

Conditions unless otherwise specified: V_D = 10 V, I_{DQ} = 100 mA, V_G = -2.3 V Typical, CW

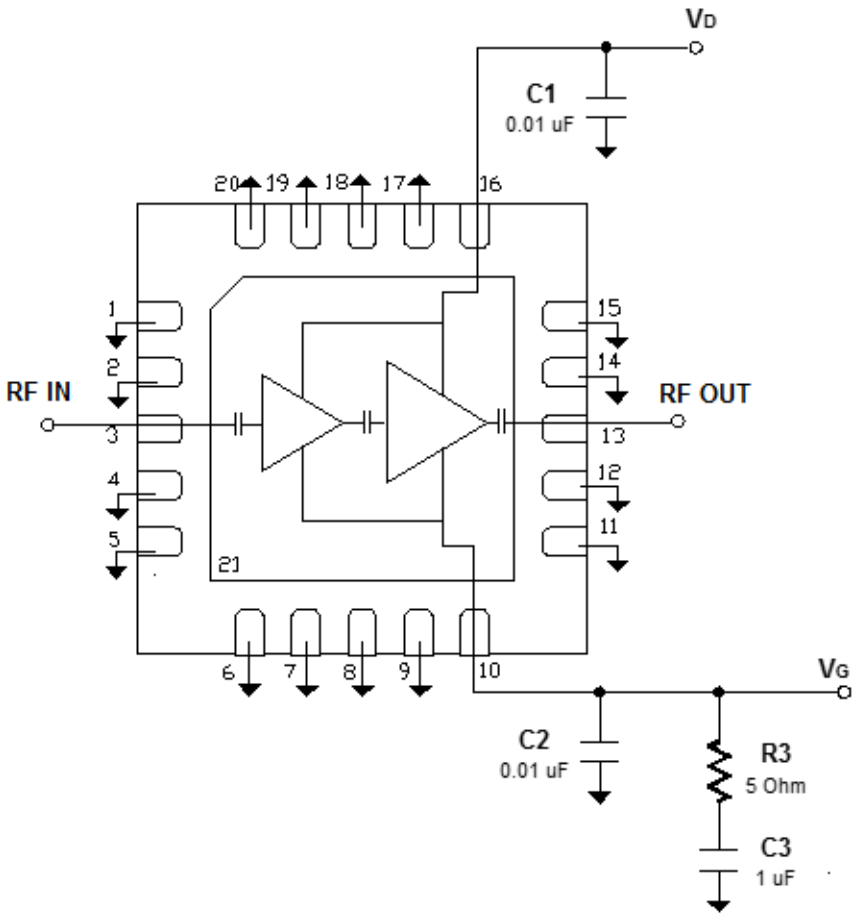








Application Circuit



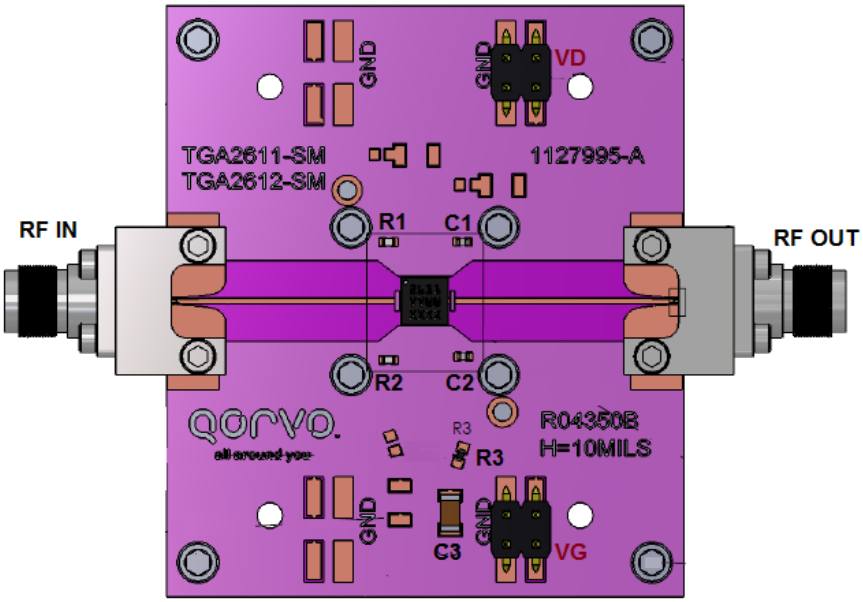
Bias Up Procedure

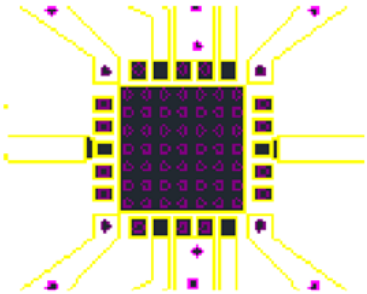
1. Set I_D limit to 300 mA, I_G limit to 3 mA
2. Set V_G to -5.0V
3. Set V_D +10V
4. Adjust V_G more positive until I_{DQ} = 100 mA. (V_G ~ -2.3 V Typical)
5. Apply RF signal

Bias Down Procedure

1. Turn off RF signal
2. Set V_G to -5.0V. Ensure I_{DQ} ~ 0mA
3. Set V_D to 0V
4. Turn off V_D supply
5. Turn off V_G supply

Evaluation Board Layout





MOUNTING DETAIL

The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-01A-5.

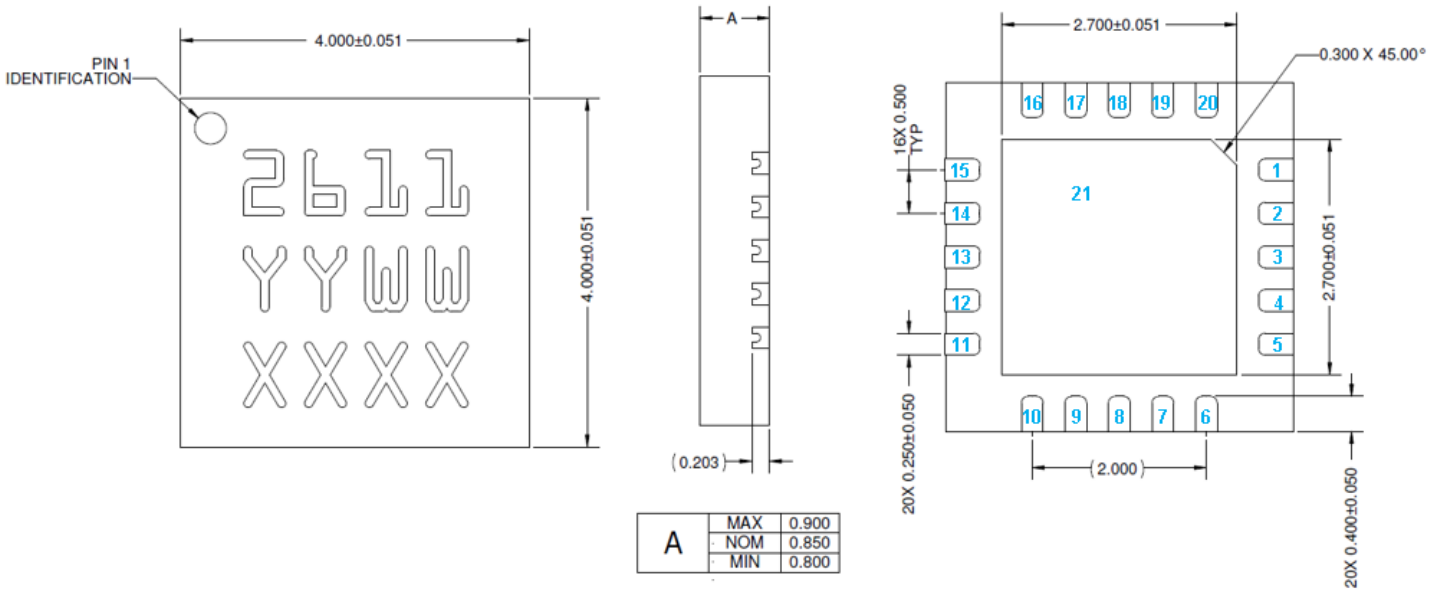
The pad pattern shown has been developed and tested for optimized assembly at Qorvo. The PCB land pattern has been developed to accommodate lead tolerances. Since processes vary from company to company, careful process development is recommended

Multiple vias should be employed under the package center paddle to minimize inductance resistance.

Bill of Materials

Reference Des.	Value	Description	Manuf.	Part Number
C1, C2	0.01 µF	Cap, 0402, 50 V, 10%, X7R	Various	–
C3	1 µF	Cap, 1206, 50 V, 10%, X7R	Various	–
R1, R2	0 Ω	Res, 0402, 5% (Required for above EVB design)	Various	
R3	5 Ω	Res, 0603, 5%	Various	–

Mechanical Information, Pin Configuration and Description



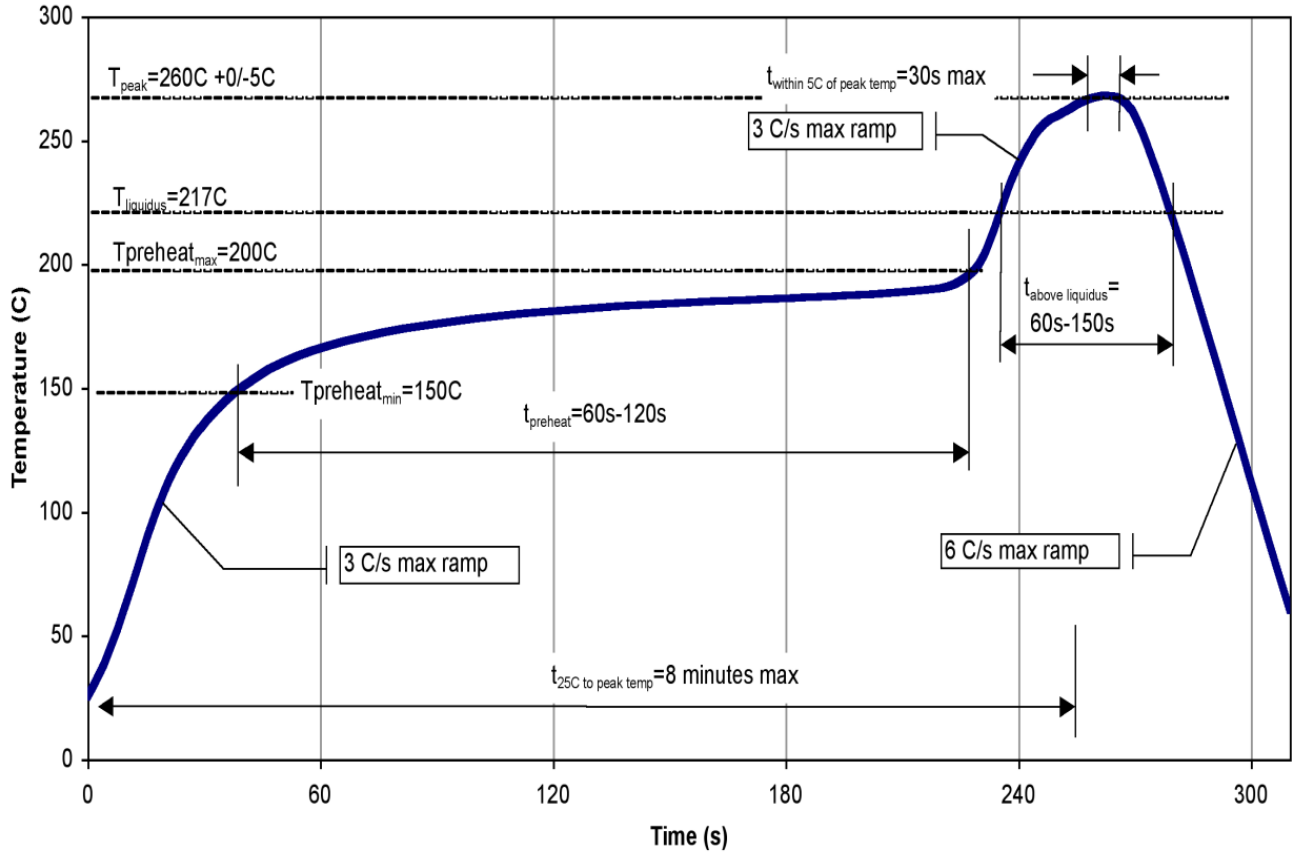
Dimensions: mm
Tolerance unless otherwise specified: +/- 0.127, angles = 0.5 °
Package is mold encapsulated with NiPdAu plated leads
Part Marking: 2611 = Part Number, YY = Part Assembly Year, WW = Part Assembly Week, MXXX = Batch ID

Pin No.	Label	Description
1-2, 4-9, 11, 12, 14, 15, 17-20	N/C	Recommend grounding on PCB for improved package isolation. Connected to ground paddle (21)
3	RF Input	RF input, matched to 50 Ω, DC blocked
10	V_G	Gate voltage. Bias network required
13	RF Output	RF output, matched to 50 Ω, DC blocked
16	V_D	Drain voltage. Bias network required.
21	GND	Ground Paddle. Multiple vias should be employed to minimize inductance and thermal resistance.

Solderability

1. Compatible with the latest version of J-STD-020, Lead-free solder, 260 °C peak reflow temperature.

Recommended Soldering Temperature Profile



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1A	ESDA / JEDEC JS-001-2012
ESD – Charge Device Model (CDM)	Class C2	JESD22-C101
MSL – 260 °C Convection Reflow	Level 3	JEDEC standard IPC/JEDEC-J-STD-020

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
- SVHC Free

Contact Information

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

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Web: www.qorvo.com

Email: customer.support@qorvo.com

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