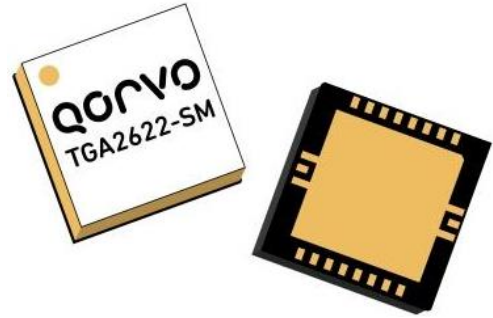


### Product Description

Qorvo's TGA2622-SM is a packaged, high power X-Band amplifier fabricated on Qorvo's production 0.25um GaN on SiC process. Operating from 9-10GHz, the TGA2622-SM typically generates 35W of saturated output power with a power-added efficiency greater than 42% and 27.5dB of large signal gain.

The TGA2622-SM is packaged in a 7x7mm air-cavity, laminate based QFN. Both RF ports are internally DC blocked and matched to 50 ohms enabling simple system integration. Ideally suited for pulsed applications, the TGA2622-SM offers superior power, PAE and gain performance that can save costs on existing platforms while enabling the development of future systems.

Lead-free and RoHS compliant.



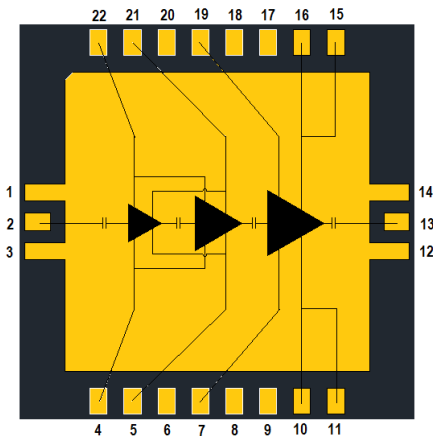
QFN 7x7 mm 22L

### Product Features

- Frequency Range: 9 – 10 GHz
- P<sub>SAT</sub>: 45.5 dBm @ PIN = 18 dBm
- PAE: 42% @ PIN = 18 dBm
- Power Gain: 27.5 dB @ PIN = 18 dBm
- Bias: V<sub>D</sub> = 28 V, I<sub>DQ</sub> = 290 mA  
(Pulsed V<sub>D</sub>: PW = 100 us and DC = 10 %)
- Package Dimensions: 7 x 7 x 1.75 mm

*Performance is typical across frequency. Please reference electrical specification table and data plots for more details.*

### Functional Block Diagram



### Applications

- Weather and Marine Radar

### Ordering Information

Part	Description
TGA2622-SM	9 – 10 GHz 35 W GaN Power Amplifier
TGA2622-SM EVB	Evaluation Board



# TGA2622-SM

## 9 – 10 GHz 35 Watt GaN Power Amplifier

### Absolute Maximum Ratings

Parameter	Value
Drain Voltage ( $V_D$ )	40 V
Gate Voltage Range ( $V_G$ )	-8 to 0V
Drain Current ( $I_D$ )	4.3 A
Gate Current ( $I_G$ )	See page 11
Power Dissipation ( $P_{DISS}$ ), 85°C, CW	88 W
Input Power ( $P_{IN}$ ), CW, 50Ω, $V_D = 28V$ , 85°C	24 dBm
Input Power ( $P_{IN}$ ), CW, VSWR 3:1, $V_D = 28V$ , 85°C	24 dBm
Mounting Temperature (30 seconds)	260 °C
Storage Temperature	-55 to 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.

### Recommended Operating Conditions

Parameter	Value
Drain Voltage ( $V_D$ )	28 V
Drain Current (quiescent, $I_{DQ}$ )	290 mA
Gate Voltage Range ( $V_G$ )	-2.8 to -2.0 V
Operating Temperature Range	-40 to 85 °C

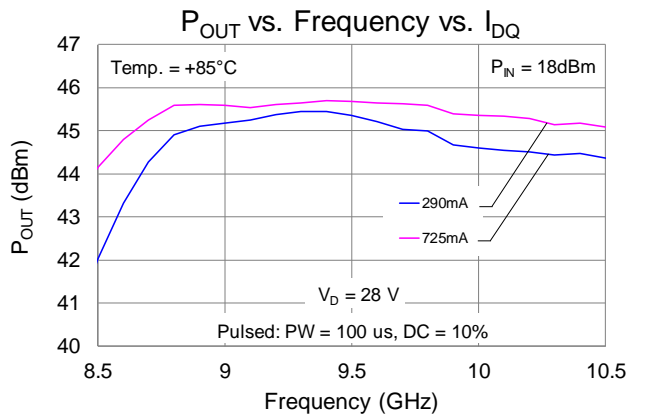
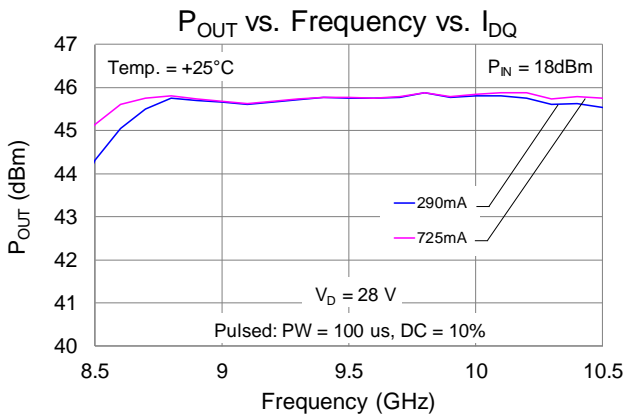
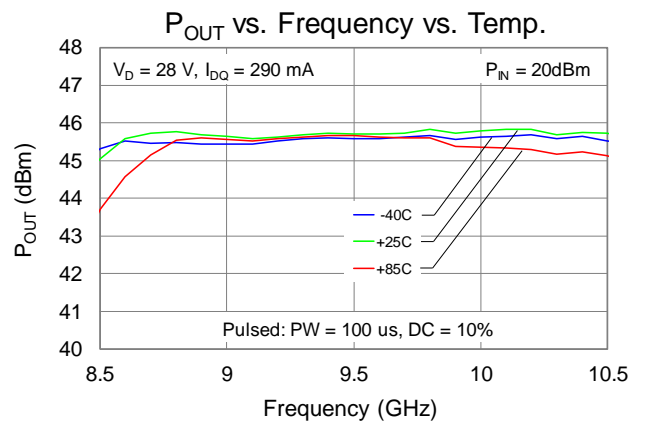
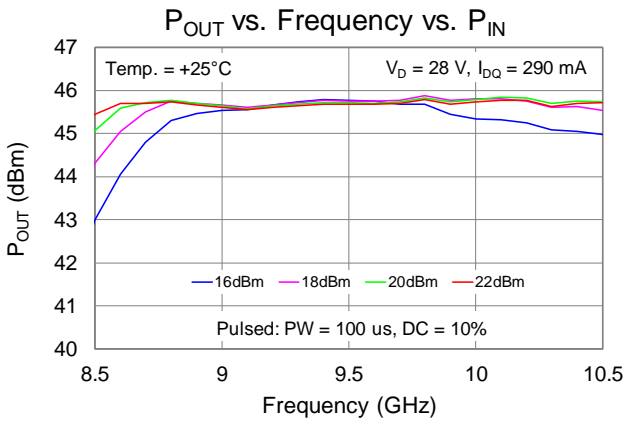
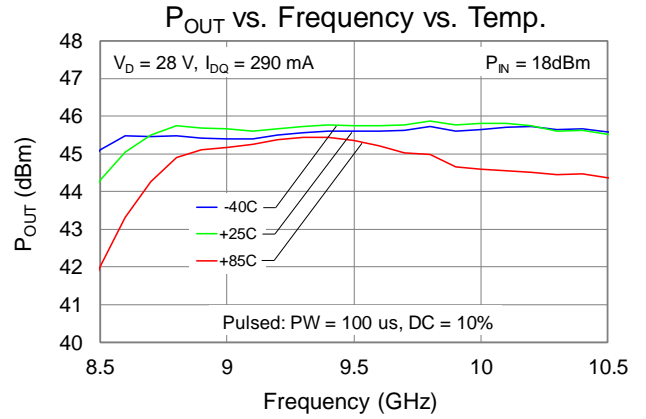
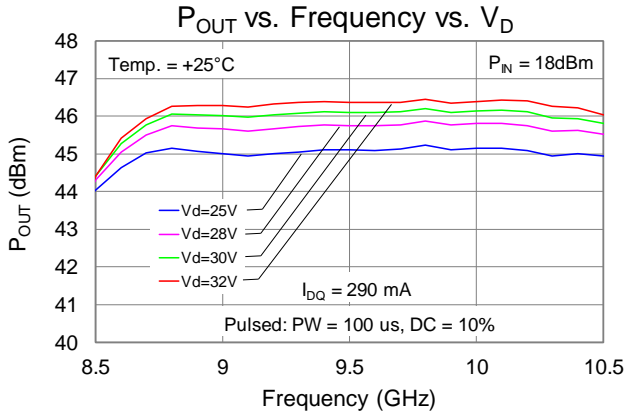
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

### Electrical Specifications

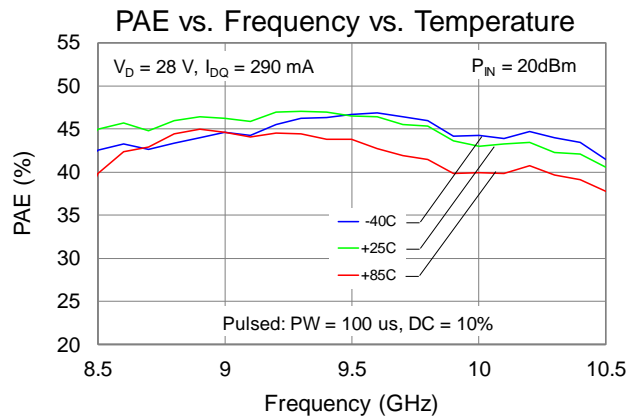
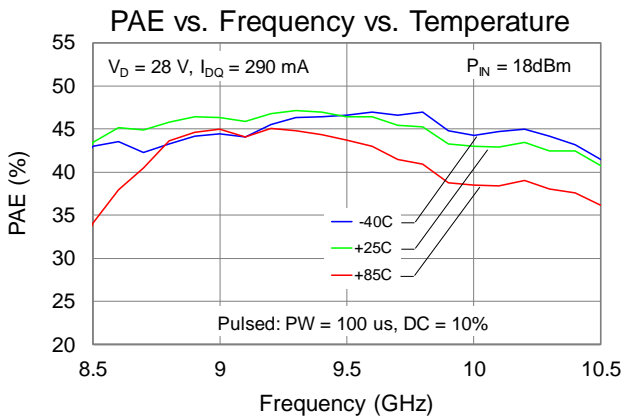
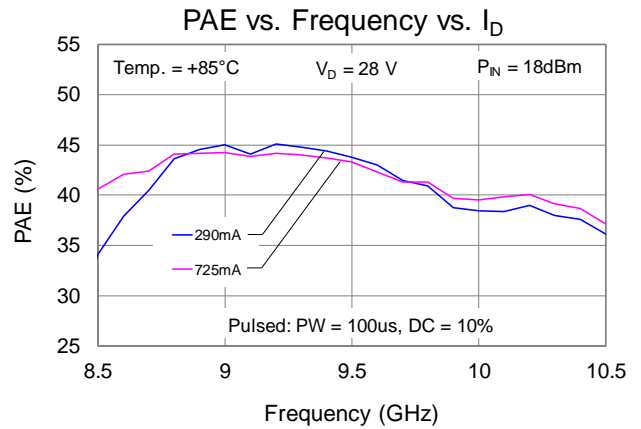
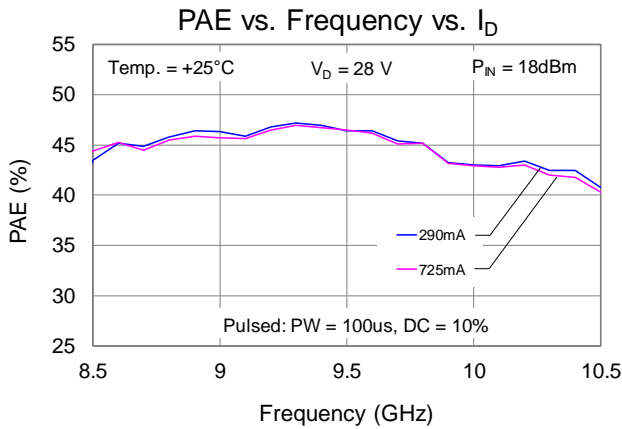
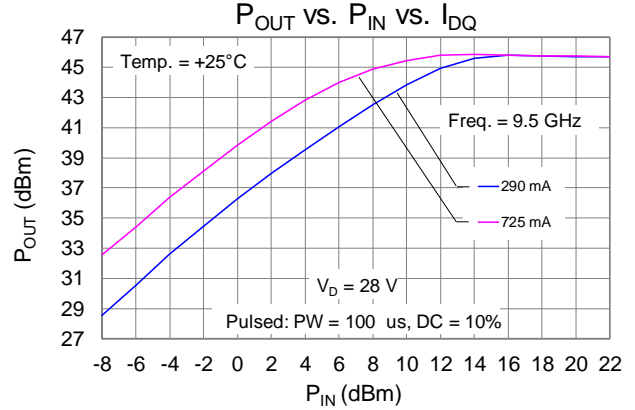
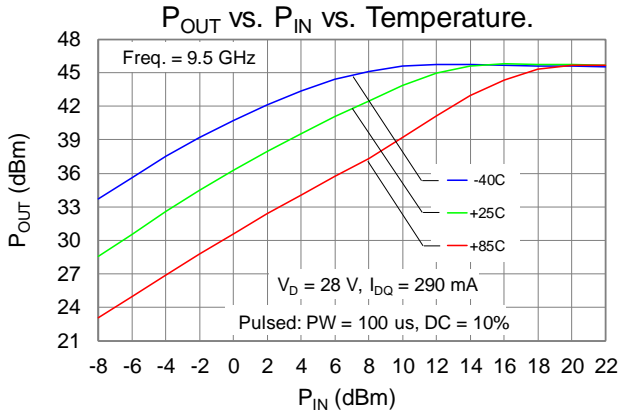
Test conditions unless otherwise noted: 25 °C,  $V_D = 28 V$ ,  $I_{DQ} = 290 mA$ , Pulsed  $V_D$ : PW = 100 us, DC = 10%

Parameter		Min	Typ	Max	Units
Operational Frequency Range		9	–	10	GHz
Output Power @ $P_{IN} = 18 dBm$	Frequency = 9 GHz	45	45.7	–	dBm
	Frequency = 9.5 GHz	45	45.8	–	dBm
	Frequency = 10 GHz	45	45.8	–	dBm
Power Added Efficiency @ $P_{IN} = 18 dBm$	Frequency = 9 GHz	40	46.4	–	%
	Frequency = 9.5 GHz	40	46.4	–	
	Frequency = 10 GHz	35	43	–	
Small Signal Gain	Frequency = 9 GHz	–	31.5	–	dB
	Frequency = 9.5 GHz	–	32.7	–	
	Frequency = 10 GHz	–	31.4	–	
Input Return Loss	Frequency = 9 GHz	–	14.7	–	dB
	Frequency = 9.5 GHz	–	15	–	
	Frequency = 10 GHz	–	11	–	
Output Return Loss	Frequency = 9 GHz	–	10.6	–	dB
	Frequency = 9.5 GHz	–	9.3	–	
	Frequency = 10 GHz	–	12	–	
Output Power Temperature Coefficient From 25°C to 85°C ( $P_{in} = 18dBm$ )		–	-0.02	–	dBm/°C

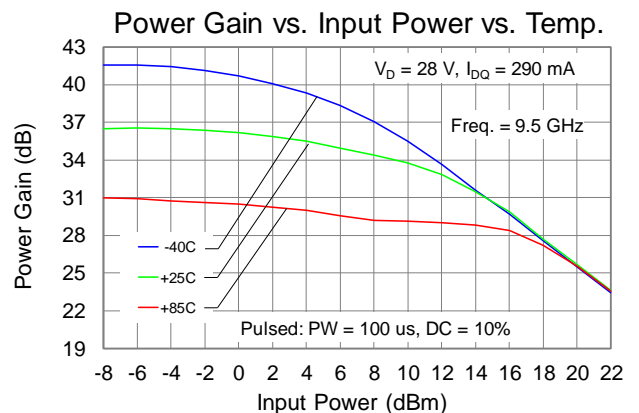
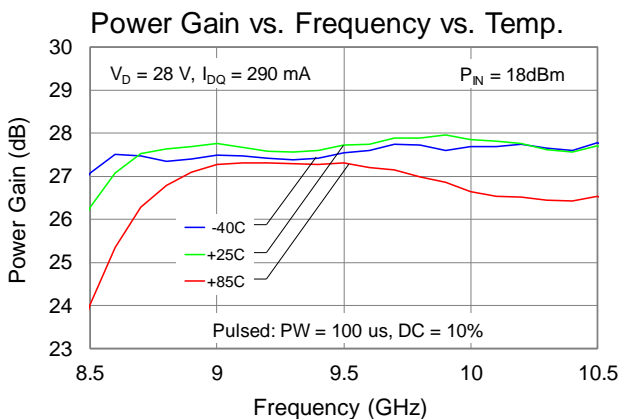
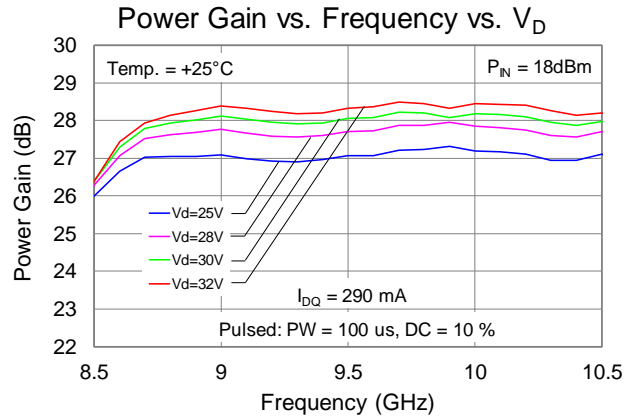
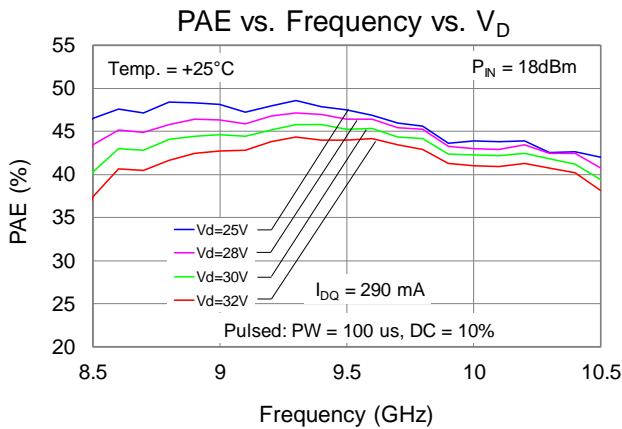
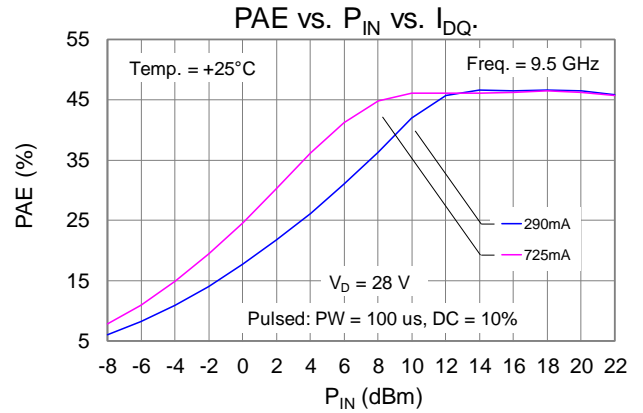
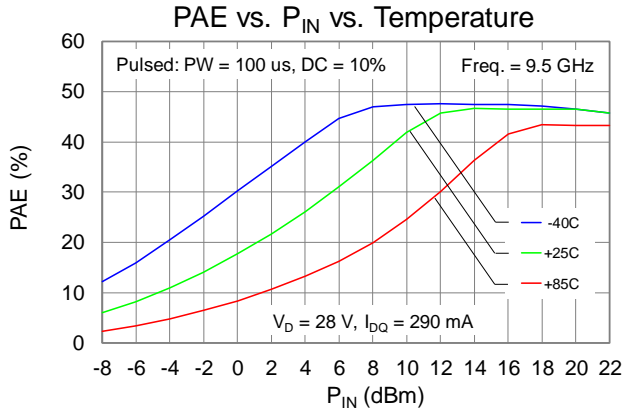
### Performance Plots – Large Signal (Pulsed)



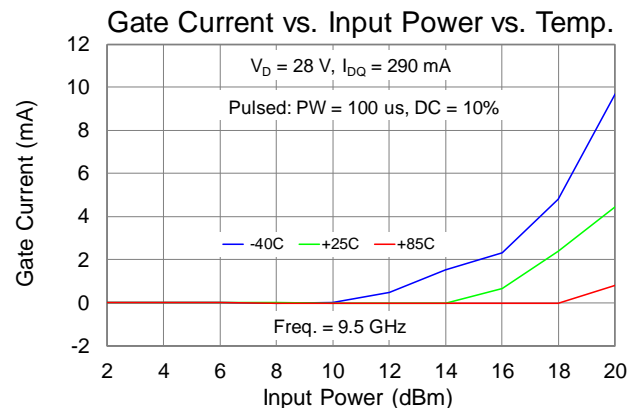
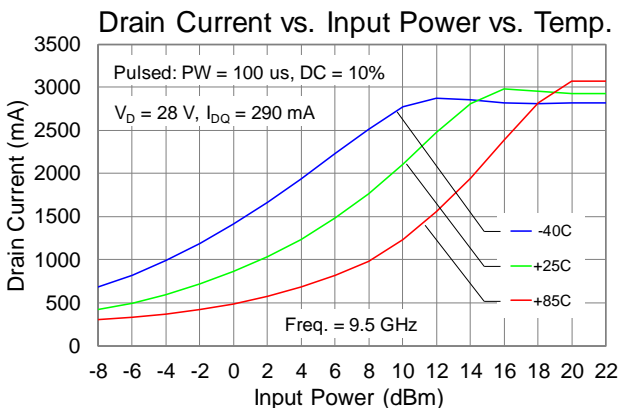
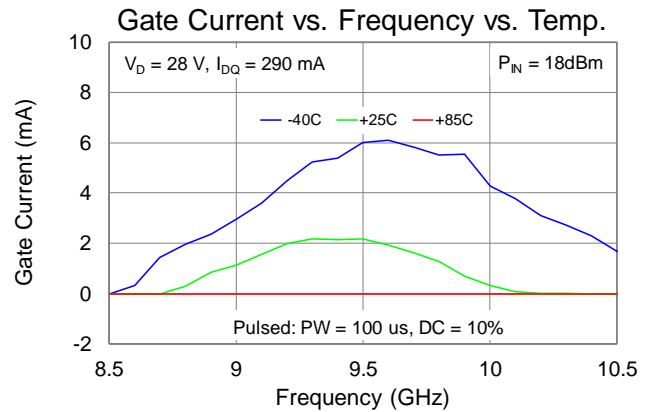
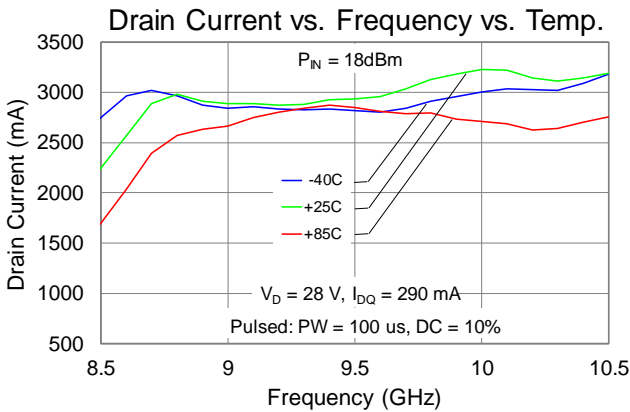
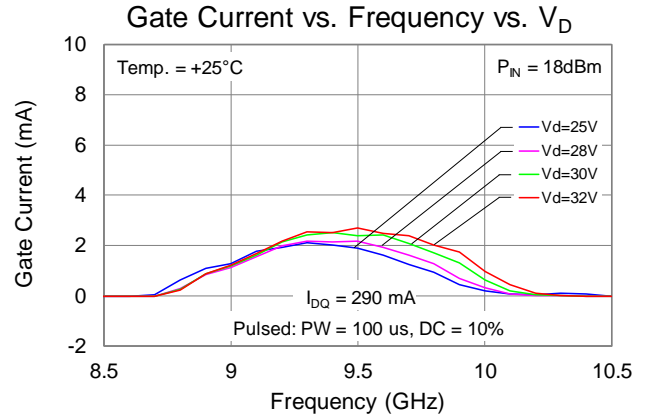
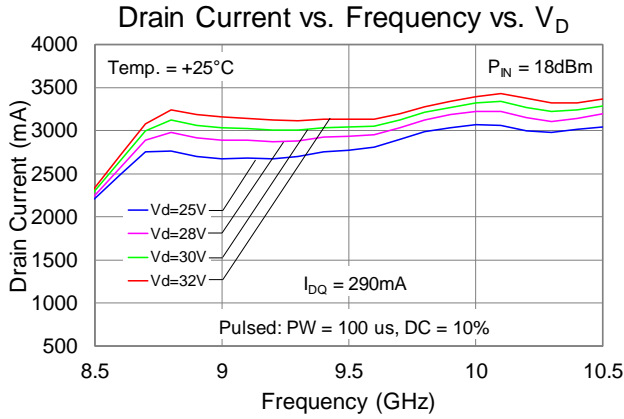
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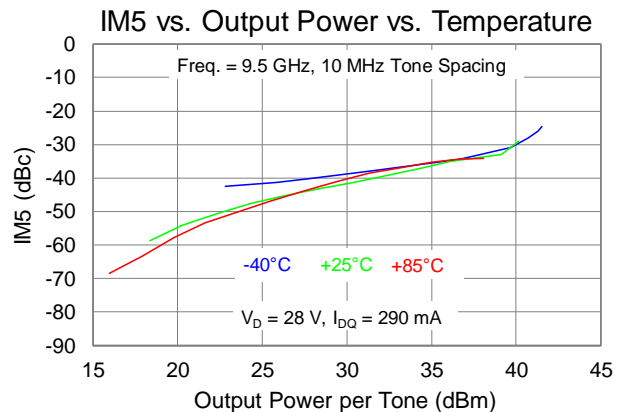
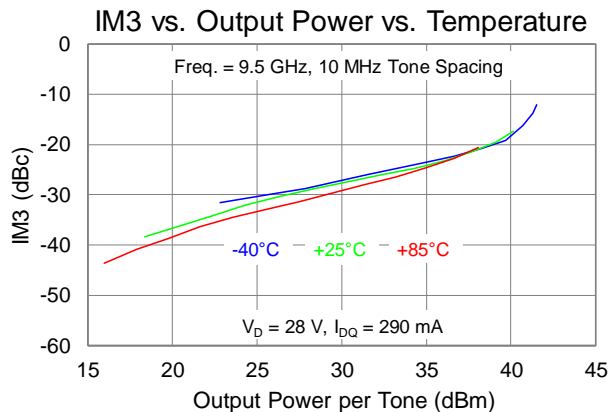
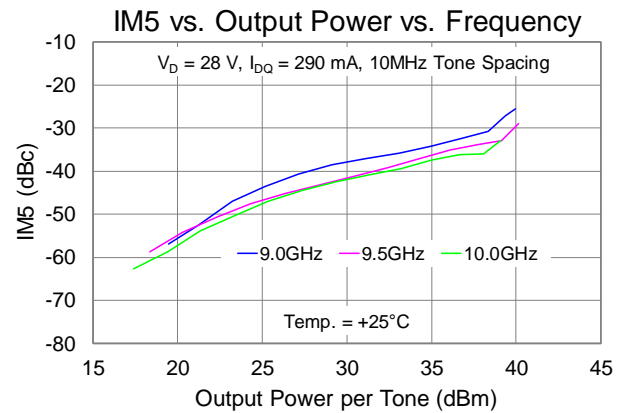
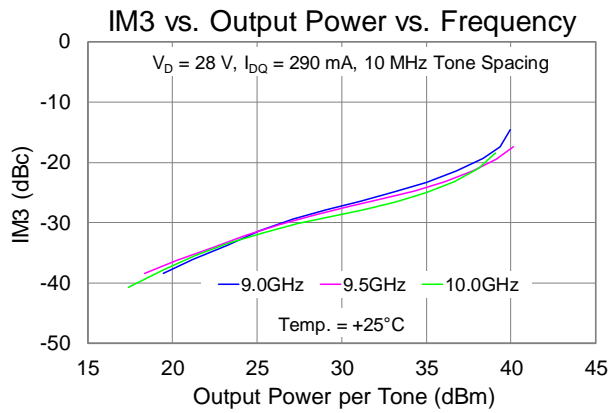
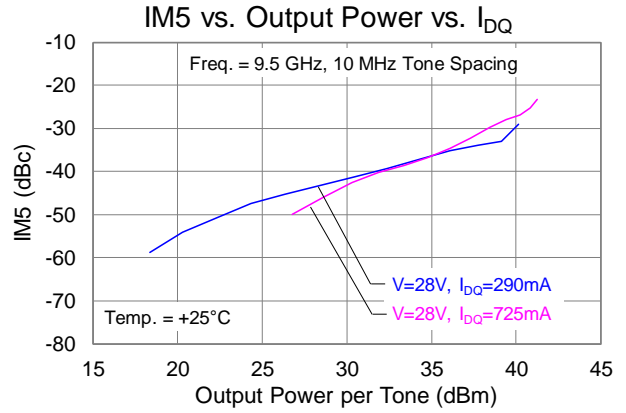
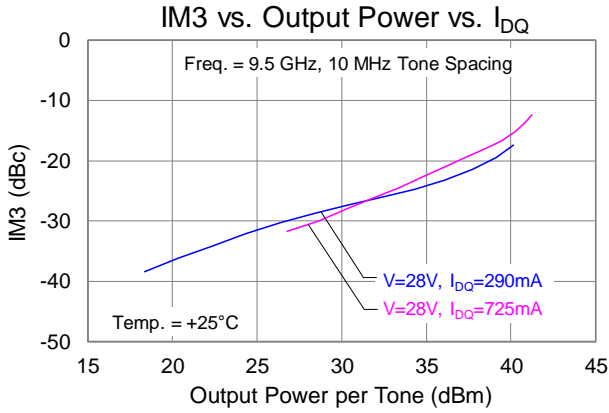
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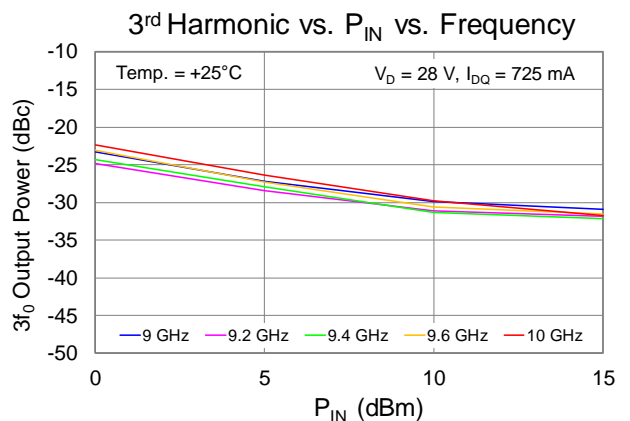
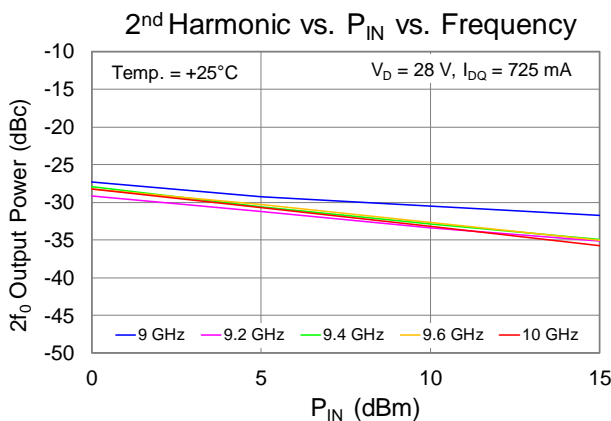
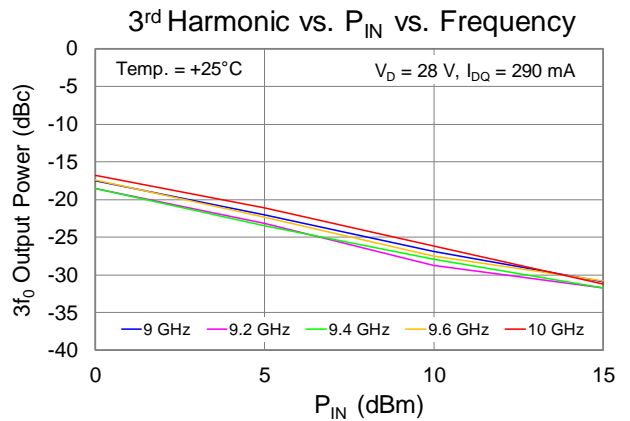
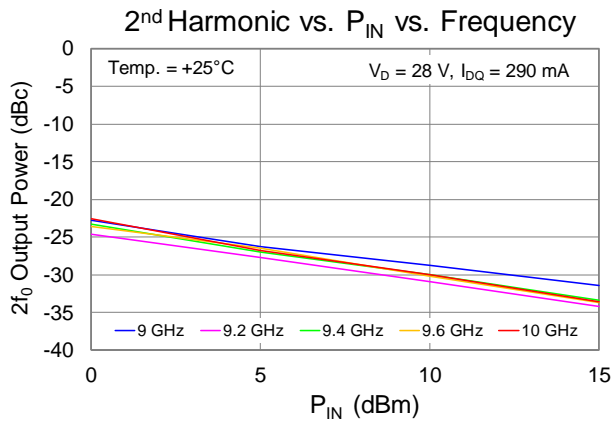
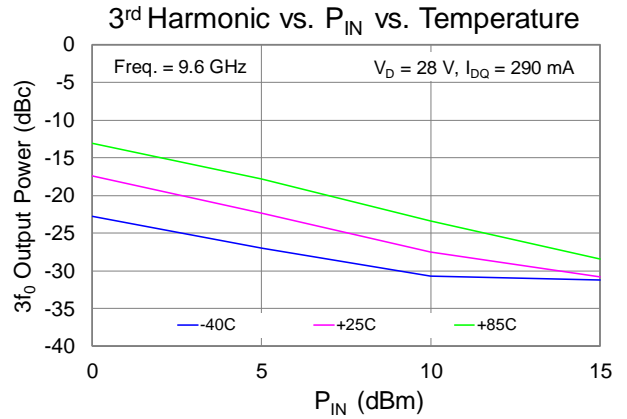
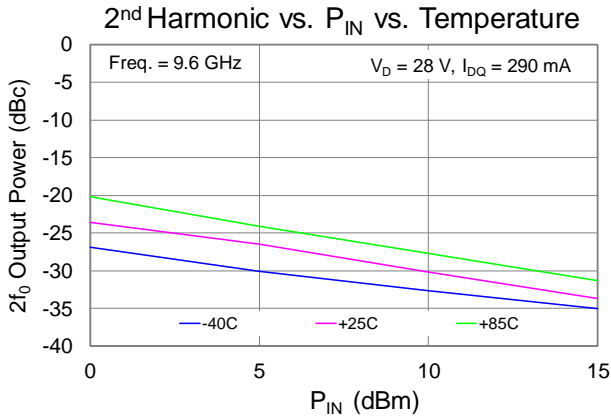
### Performance Plots – Large Signal (Pulsed)



### Performance Plots – Linearity (CW)

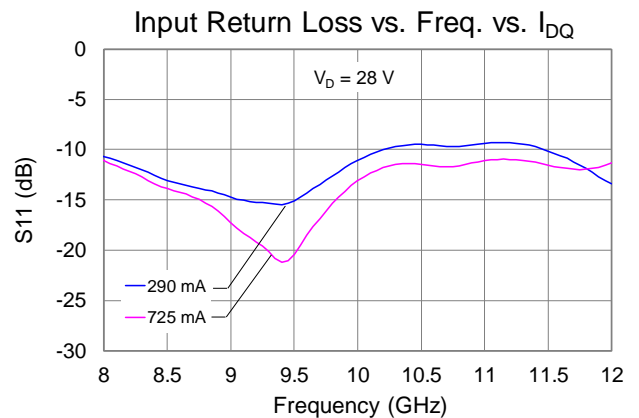
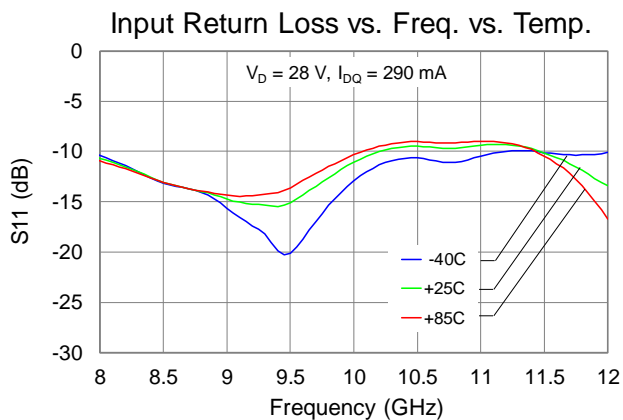
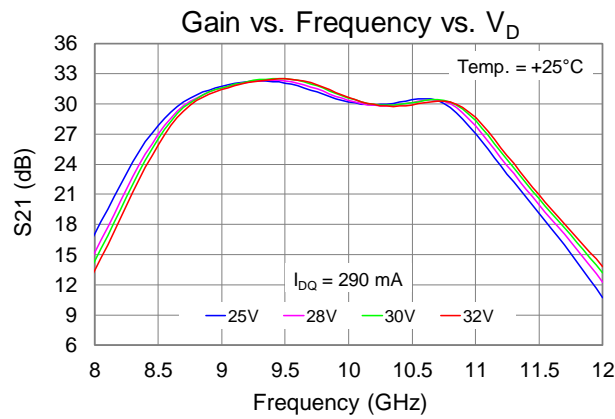
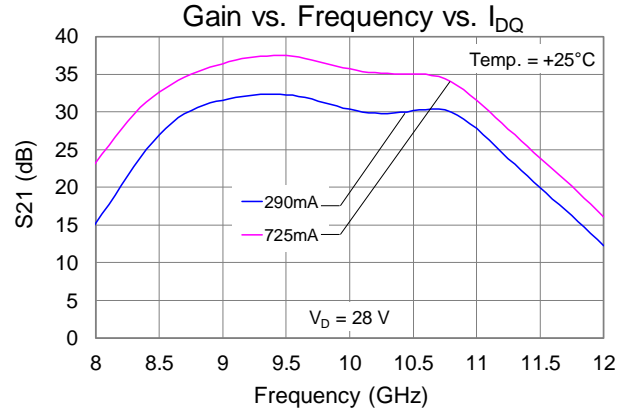
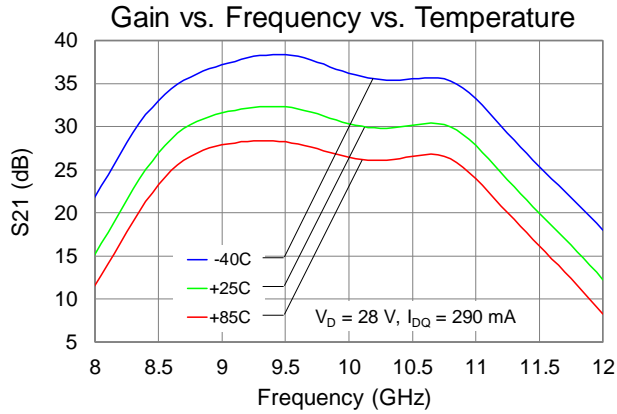


### Performance Plots – Linearity (CW)

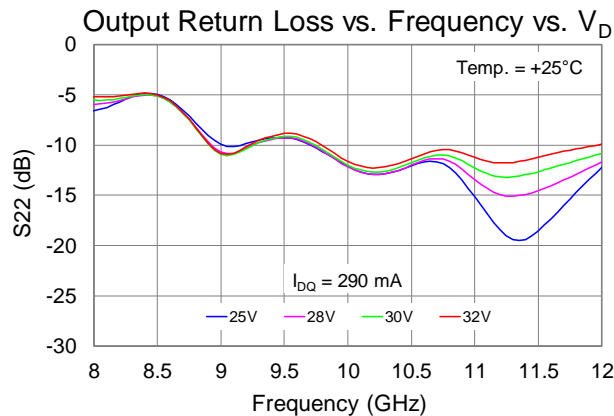
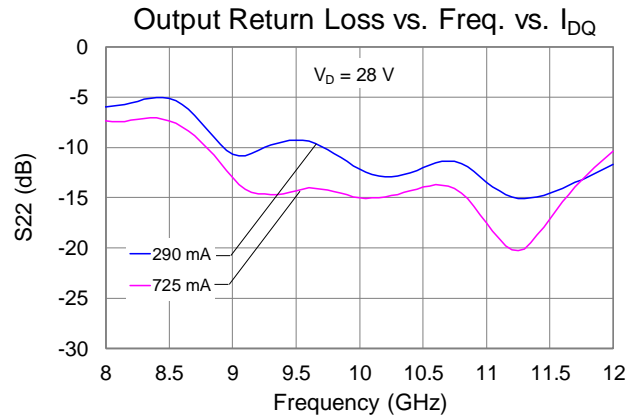
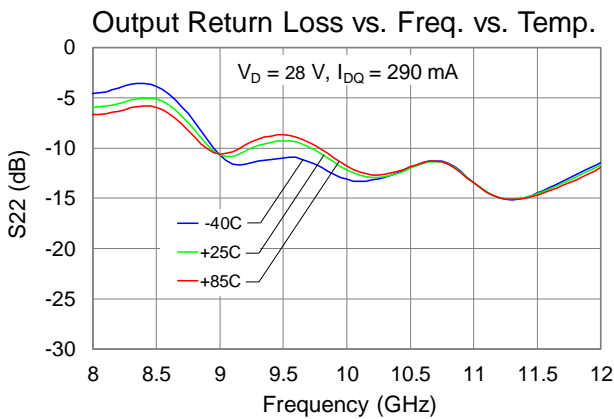
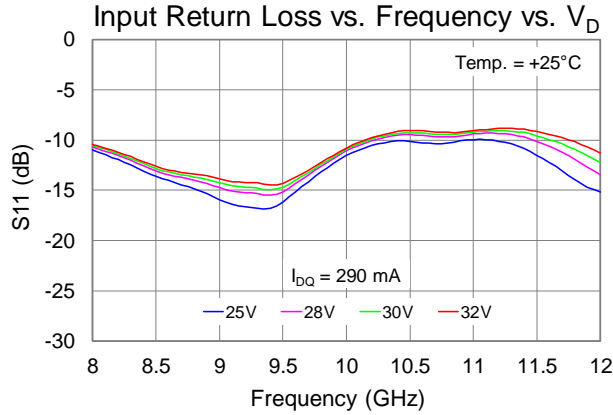




### Performance Plots – Small Signal (CW)



### Performance Plots – Small Signal (CW)



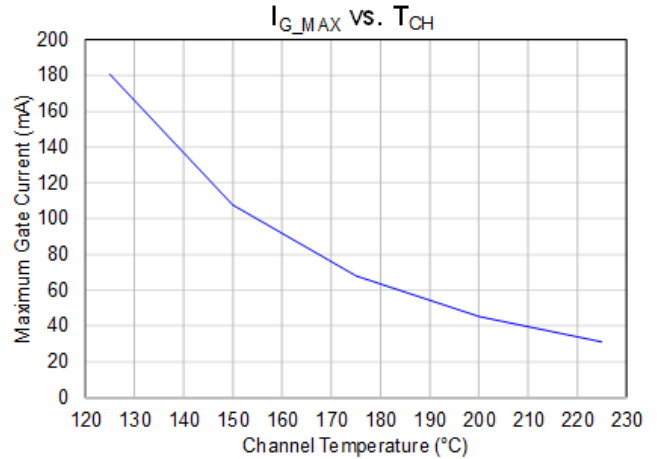
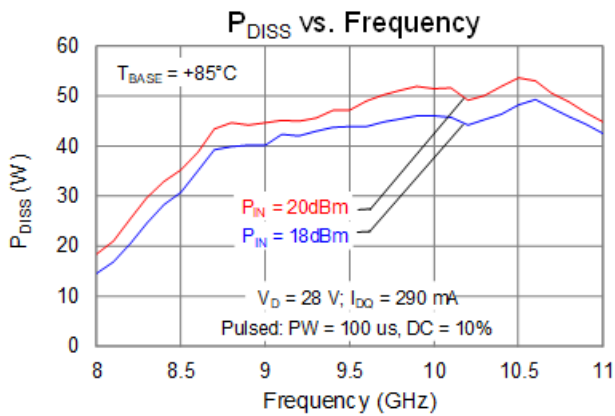
### Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance ( $\theta_{JC}$ ) <sup>(1)</sup>	$V_D = 28\text{ V}$ , $I_{DQ} = 290\text{ mA}$ , (Pulsed $V_D$ : $PW = 100\text{ us}$ , $DC = 10\%$ ), $T_{base} = 85\text{ }^\circ\text{C}$ ; $P_{DISS} = 8.12\text{ W}$	0.51	$^\circ\text{C/W}$
Channel Temperature ( $T_{CH}$ ) (No RF drive) <sup>2</sup>		89.1	$^\circ\text{C}$
Thermal Resistance ( $\theta_{JC}$ ) <sup>(1)</sup>	$T_{base} = 85\text{ }^\circ\text{C}$ , $V_D = 28\text{ V}$ , $I_{DQ} = 290\text{ mA}$ , (Pulsed $V_D$ : $PW = 100\text{ us}$ , $DC = 10\%$ ), $I_{D\_Drive} = 3.1\text{ A}$ , $P_{IN} = 20\text{ dBm}$ , $P_{OUT} = 45.4\text{ dBm}$ , $P_{DISS} = 52\text{ W}$	0.83	$^\circ\text{C/W}$
Channel Temperature ( $T_{CH}$ ) (With RF drive) <sup>2</sup>		128.2	$^\circ\text{C}$

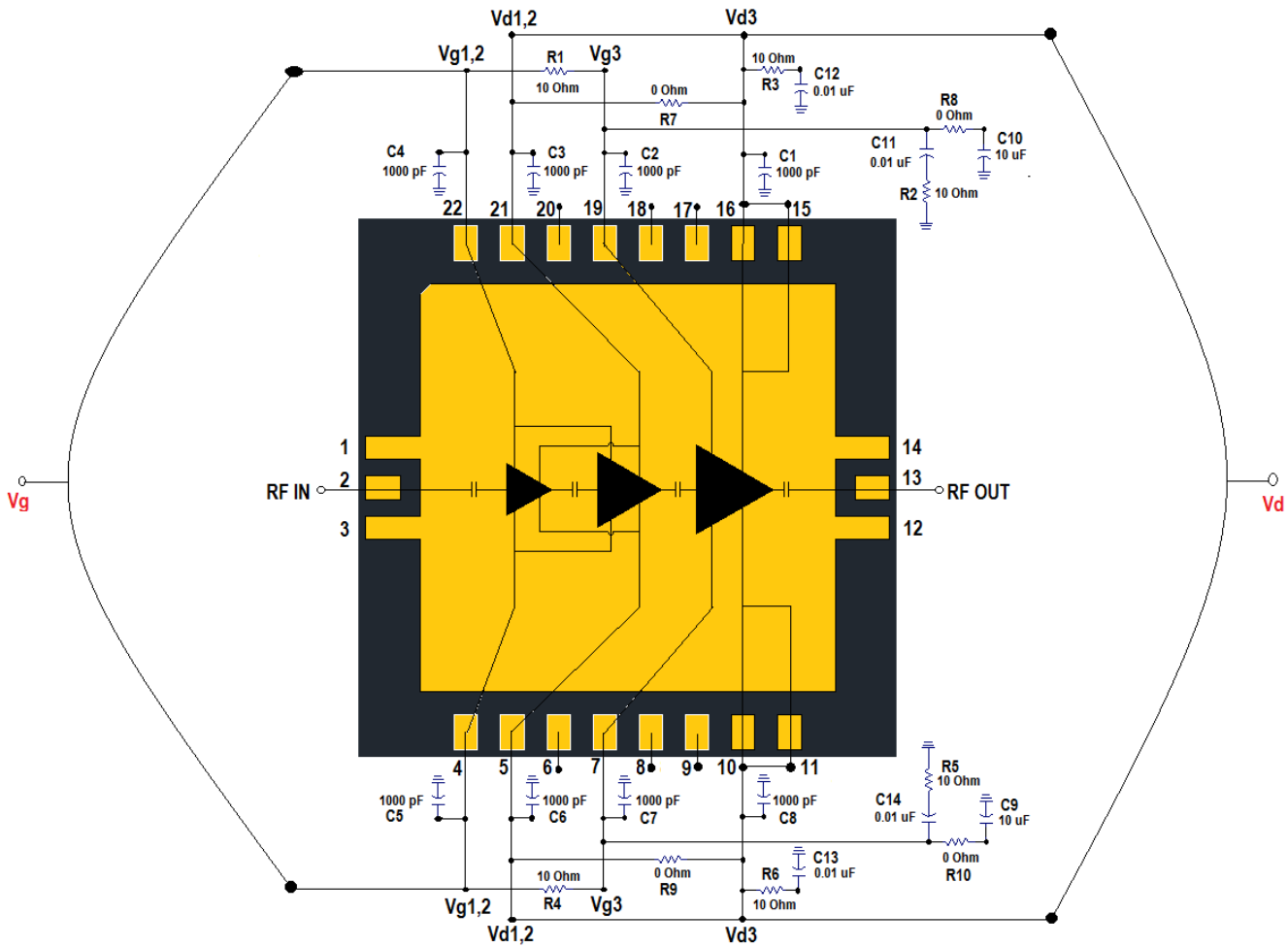
Notes:

- Thermal Resistance referenced to the back of the package.
- IR scan equivalent. Refer to the following document: [GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates](#)

### Power Dissipation and Maximum Gate Current



### Applications Circuit



#### Notes:

1.  $V_G$ : must be biased from both sides -  $V_{G1,2}$  &  $V_{G3}$  can be tied together.
2.  $V_D$ : must be biased from both sides -  $V_{D1,2}$  &  $V_{D3}$  can be tied together.

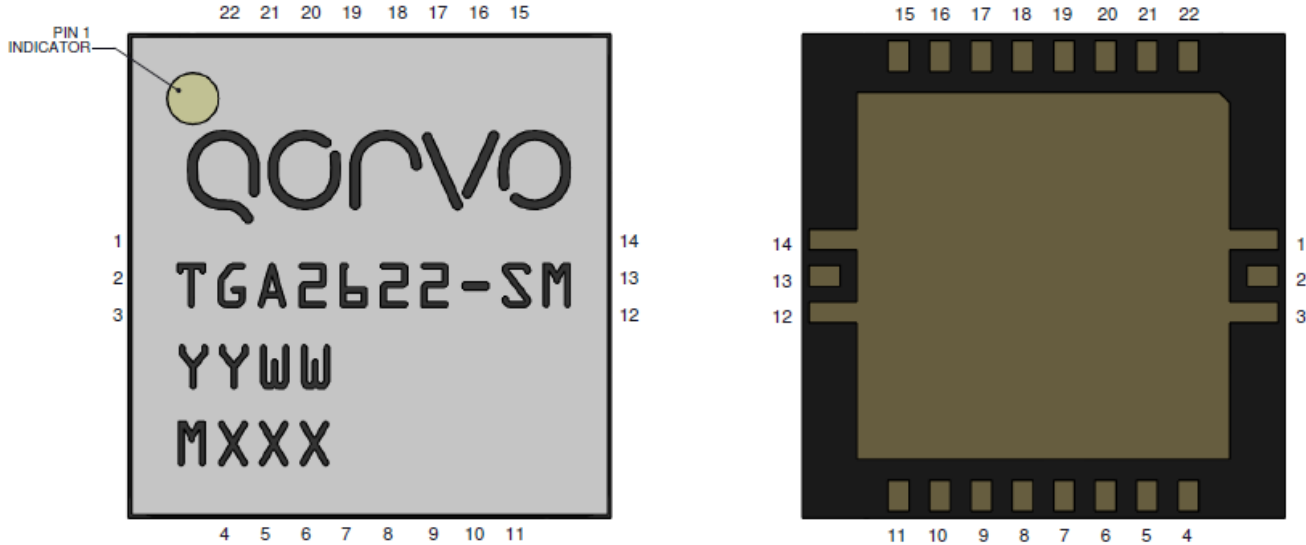
### Bias Up Procedure

1. Set  $I_D$  limit to 3.5 A,  $I_G$  limit to 25 mA
2. Set  $V_G$  to -5.0 V (for pinch-off)
3. Set  $V_D$  +28 V; Ensure  $I_{DQ}$  is approx. 0 mA
4. Adjust  $V_G$  more positive until  $I_{DQ} = 290\text{mA}$  ( $V_G \sim -2.3$  V Typical)
5. Apply RF signal

### Bias Down Procedure

1. Turn off RF supply
2. Reduce  $V_G$  to -5.0V. Ensure  $I_{DQ} \sim 0\text{mA}$
3. Set  $V_D$  to 0 V
4. Turn off  $V_D$  supply
5. Turn off  $V_G$  supply

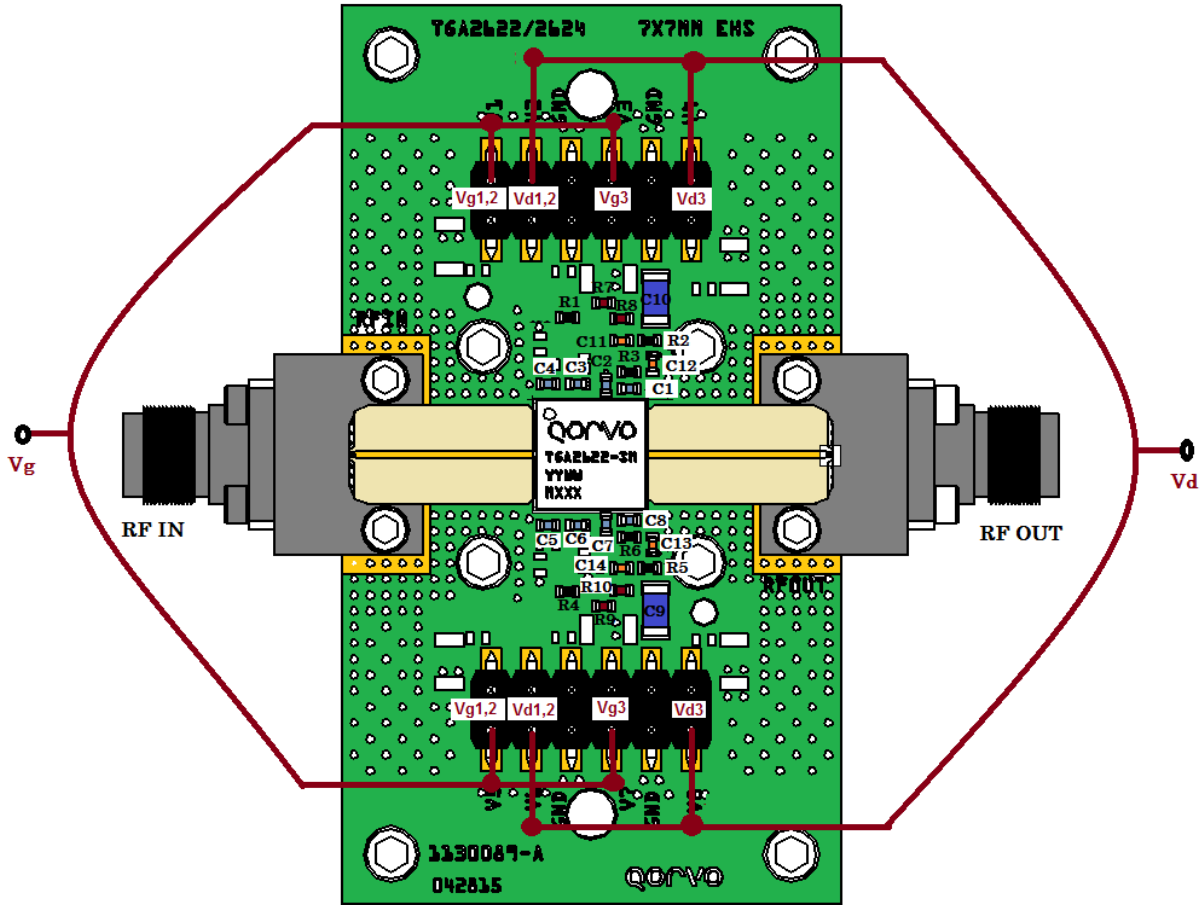
### Pin Layout



### Pin Description

Pin No.	Symbol	Description
1, 3, 12, 14	GND	Must be grounded on the PCB
2	RF <sub>IN</sub>	Input; matched to 50 Ω; DC blocked
4, 22	V <sub>G1,2</sub>	Gate Voltages 1,2; Bias network is required; must be biased from both sides; see recommended Application Information on page 12.
5, 21	V <sub>D1,2</sub>	Drain voltages 1,2; Bias network is required; must be biased from both sides; see recommended Application Information on page 12.
6, 8, 9, 17, 18, 20	N/C	No internal connection
7, 19	V <sub>G3</sub>	Gate Voltage 3; Bias network is required; must be biased from both sides; see recommended Application Information on page 12.
10, 11, 15, 16	V <sub>D3</sub>	Drain voltage 3; Bias network is required; must be biased from both sides; see recommended Application Information on page 12.
13	RF <sub>OUT</sub>	Output; matched to 50 Ω; DC blocked

### Evaluation Board Layout

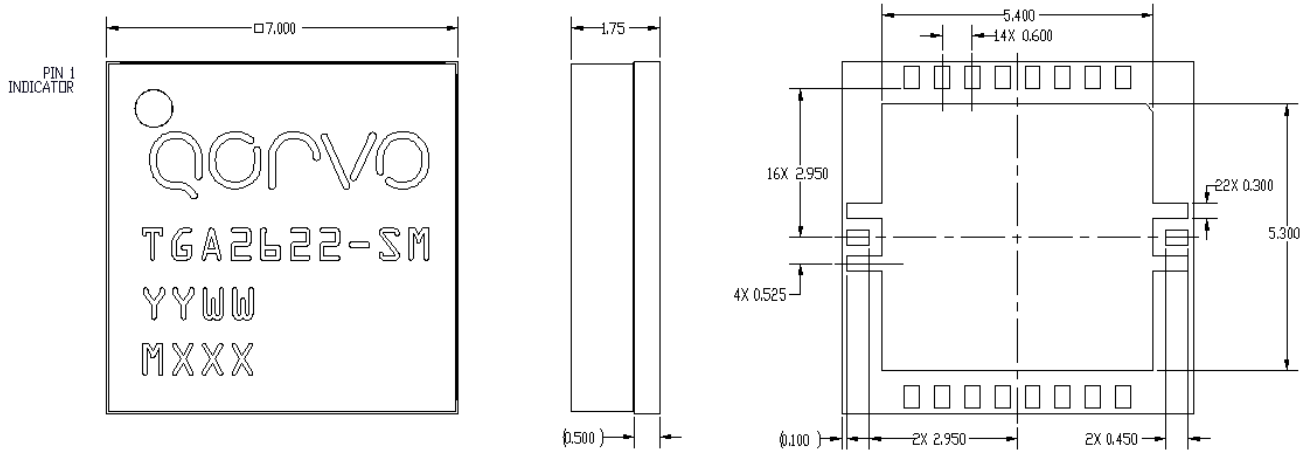


Notes: Both Top and Bottom Vd and Vg must be biased.

### Bill of Materials

Reference Des.	Value	Description	Manuf.	Part Number
C1 – C8	1000 pF	Cap, 0402, 100 V, 10%, X7R	Various	
C9 – C10	10 $\mu$ F	Cap, 1206, 50 V, 20%, X5R	Various	
C11 – C14	0.01 $\mu$ F	Cap, 0402, 50 V, 10%, X7R	Various	
R1 – R6	10 ohms	Res, 0402, 50 V, 5%, SMD	Various	
R7 – R10	0 ohms	Res, 0402, jumpers required for the above EVB	Various	

### Mechanical Information



Units: Millimeters (mm)

Tolerances: unless specified

x.xx = ± 0.25; x.xxx = ± 0.100

Materials:

Base: Laminate Substrate

Lid: Laminate

All metalized features are gold plated

Part is epoxy sealed

Marking:

TGA2622-SM: Part number

YY: Part Assembly year

WW: Part Assembly week

MXXX: Batch ID

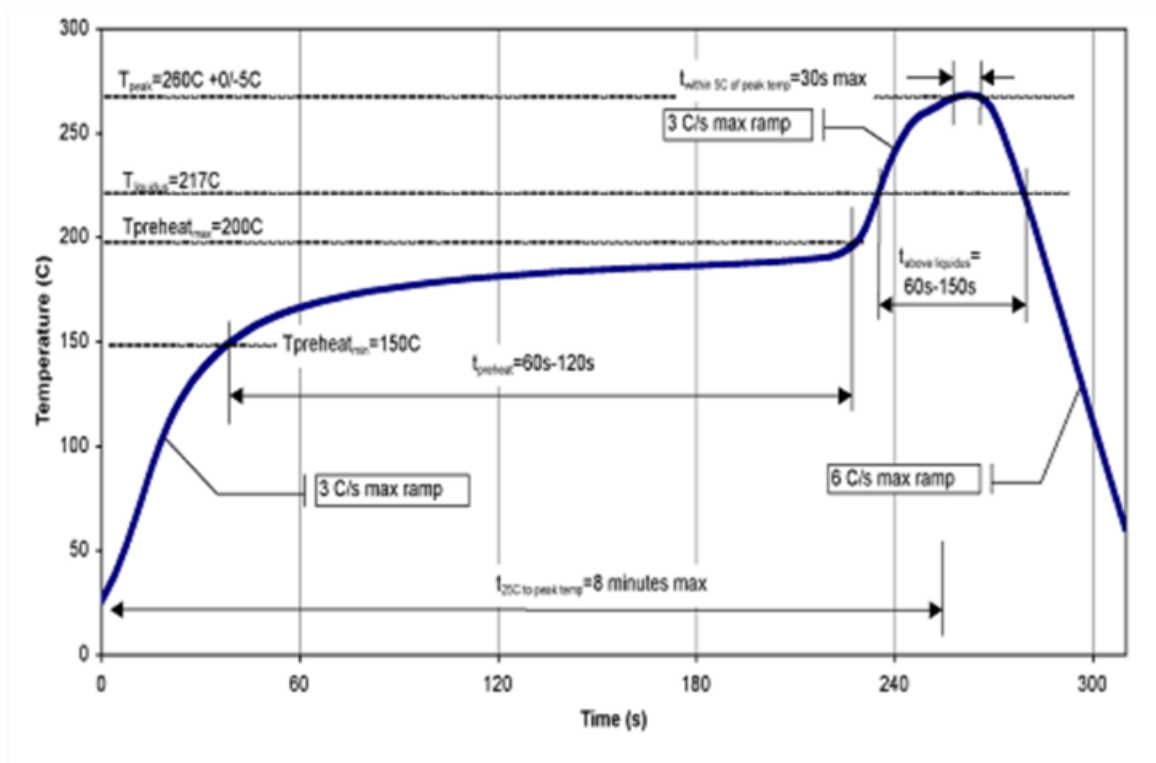
## Assembly Notes

Compatible with lead-free soldering processes with 260°C peak reflow temperature.

This package is air-cavity and non-hermetic, and therefore cannot be subjected to aqueous washing. The use of no-clean solder to avoid washing after soldering is highly recommended.

Contact plating: Ni-Au.

Solder rework not recommended.



Recommended Soldering Temperature Profile