



# TGA2624-SM

## 9–10 GHz 20 W GaN Power Amplifier

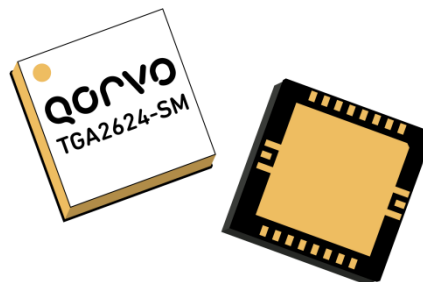
### General Description

Qorvo's TGA2624-SM is a packaged, high power X-Band amplifier fabricated on Qorvo's production 0.25  $\mu\text{m}$  GaN on SiC process. Operating from 9-10 GHz, the TGA2624-SM typically generates 20 W of saturated output power with a power-added efficiency greater than 40% and 25 dB of large signal gain.

The TGA2624-SM is packaged in a 7 x 7 mm 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 TGA2624-SM offers excellent power, PAE and gain performance that can save costs on existing platforms while enabling the development of future systems.

Lead-free and RoHS compliant.

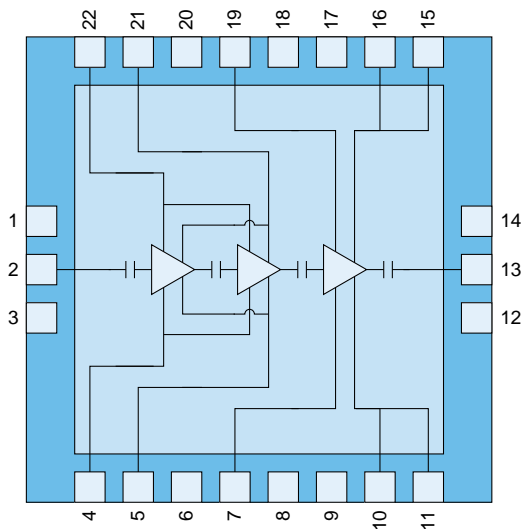
Evaluation boards are available upon request.



### Product Features

- Frequency Range: 9–10 GHz
- $P_{\text{SAT}}$ : 43 dBm @  $P_{\text{IN}} = 18$  dBm
- PAE: >40% @  $P_{\text{IN}} = 18$  dBm
- Power Gain: 25 dB @  $P_{\text{IN}} = 18$  dBm
- Bias:  $V_D = 28$  V,  $I_{DQ} = 365$  mA (Pulsed  $V_D$ : PW = 100  $\mu\text{s}$  and DC = 10 %)
- Package Dimensions: 7 x 7 x 1.75 mm

### Functional Block Diagram



### Applications

- Weather and Marine Radar

### Ordering Information

Part	Description
TGA2624-SM	9–10 GHz 20 W GaN Power Amplifier
TGA2624-SM EVB	Evaluation Board

## Absolute Maximum Ratings

Parameter	Value/Range
Drain Voltage ( $V_D$ )	40 V
Gate Voltage Range ( $V_G$ )	-8 to 0 V
Drain Current ( $I_D$ )	3.8 A
Gate Current ( $I_G$ )	See plot page 3
Power Dissipation ( $P_{DISS}$ ), 85 °C, CW	44 W
Input Power ( $P_{IN}$ ), CW, 50 $\Omega$ , $V_D = 28$ V, 85 °C	25 dBm
Input Power ( $P_{IN}$ ), CW, VSWR 6:1, $V_D = 28$ V, 85 °C	19 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/Range
Drain Voltage ( $V_D$ ): Pulsed	28 V
Drain Current ( $I_{DQ}$ )	365 mA
Gate Voltage Range ( $V_G$ )	-2.8 to -2.0 V
Temperature ( $T_{BASE}$ )	-40 to 85 °C

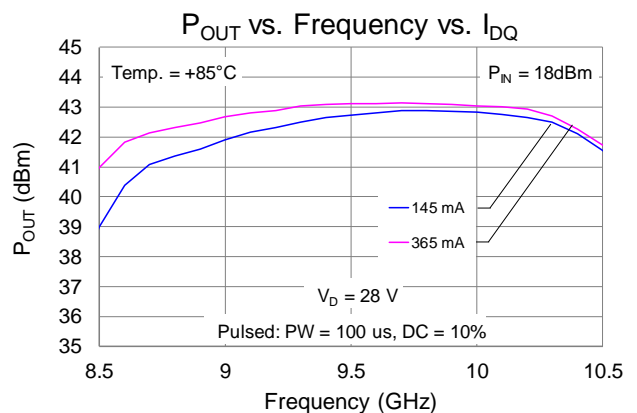
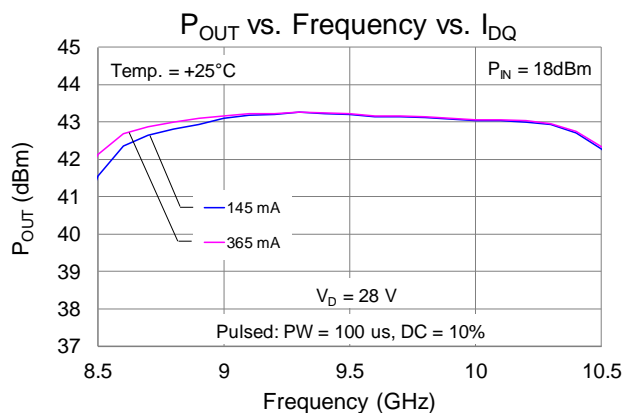
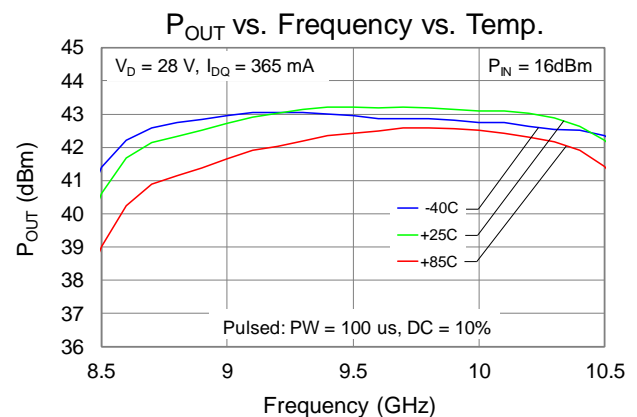
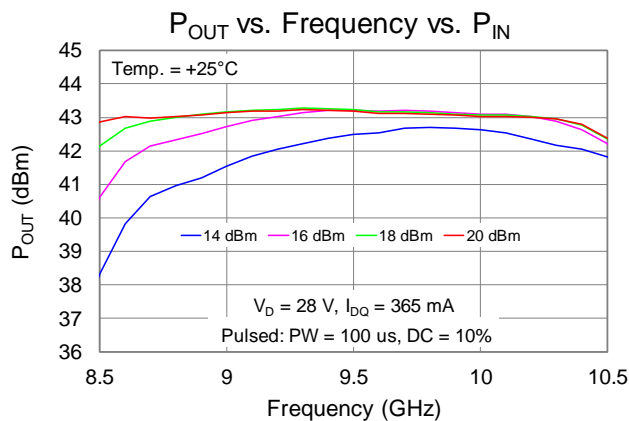
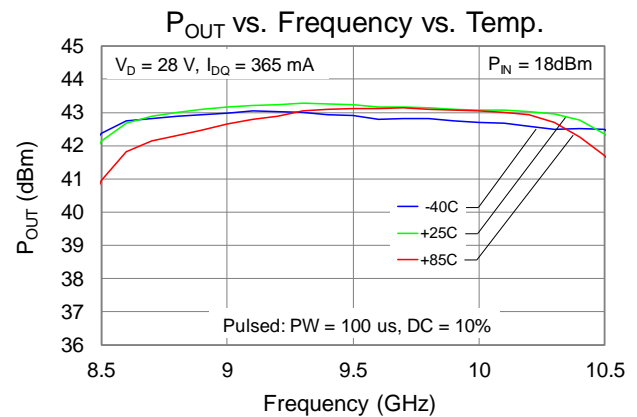
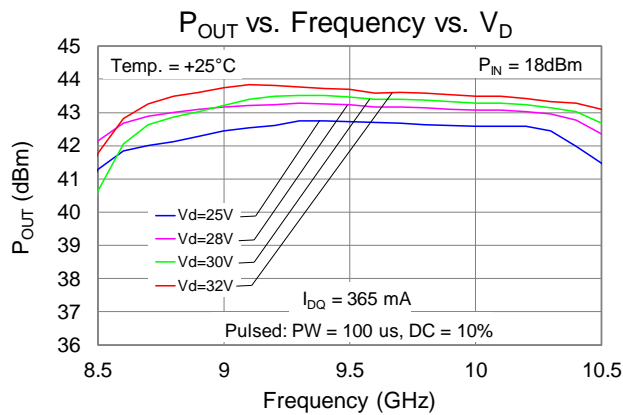
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

## Electrical Specifications

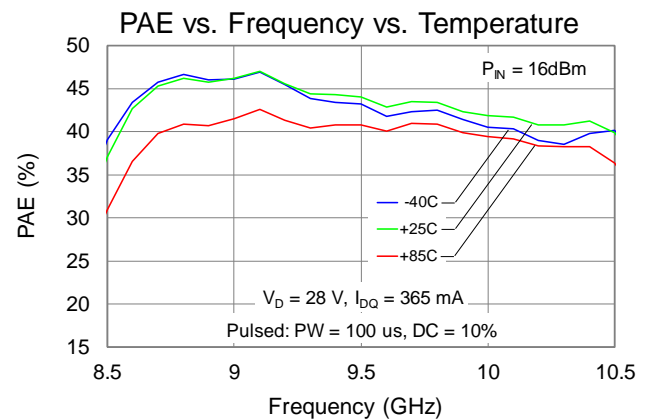
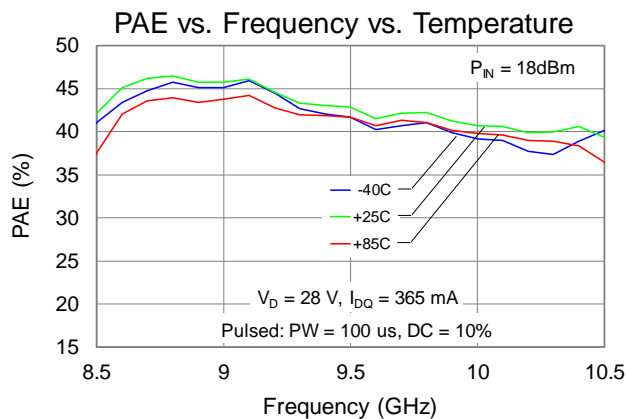
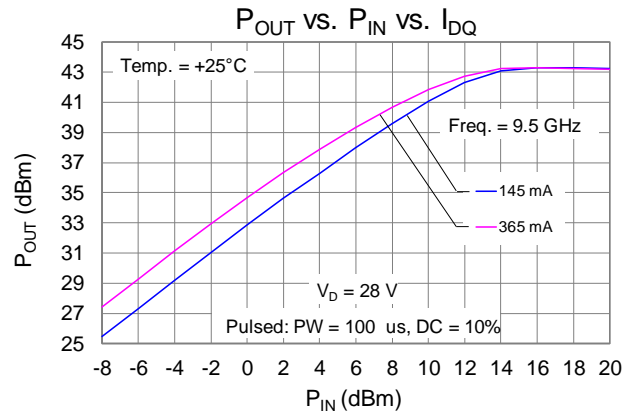
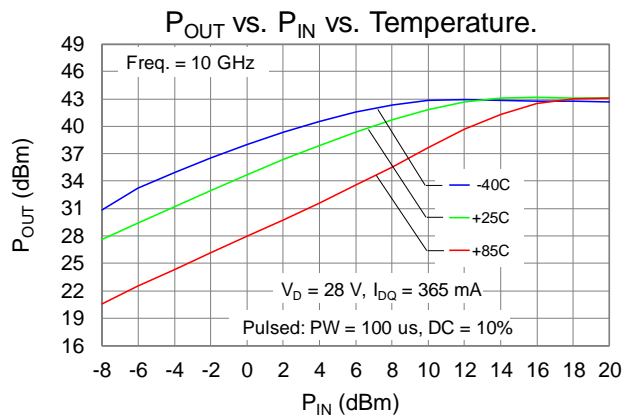
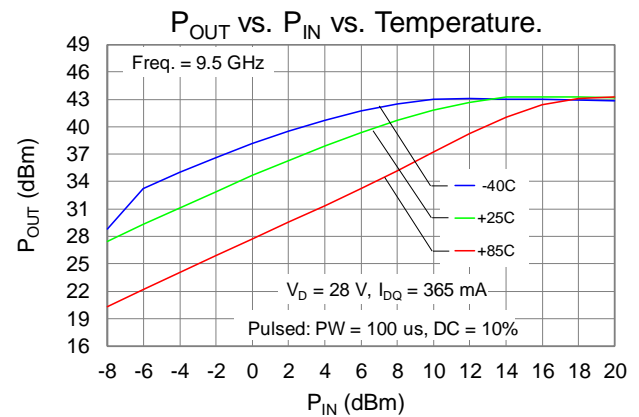
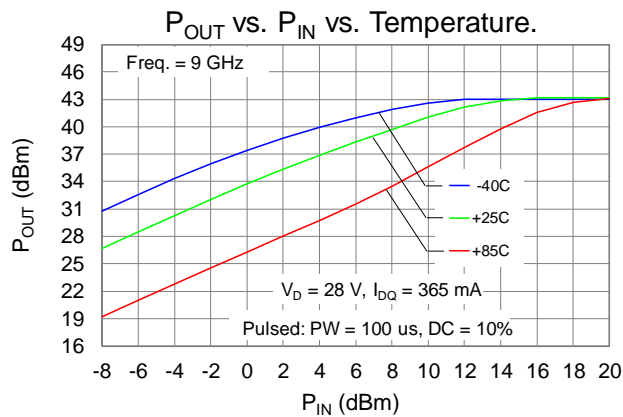
Test conditions unless otherwise noted: 25 °C,  $V_D = 28$  V,  $I_{DQ} = 365$  mA, Pulsed  $V_D$ : PW = 100  $\mu$ s, DC = 10 %

Parameter	Min	Typical	Max	Units
Operational Frequency Range	9		10	GHz
Small Signal Gain		>34		dB
Input Return Loss		>9		dB
Output Return Loss		>8.5		dB
Output Power ( $P_{IN} = 18$ dBm)	42	43		dBm
Power Added Efficiency ( $P_{IN} = 18$ dBm)	30	>40		%
Power Gain ( $P_{IN} = 18$ dBm)		25		dB
Output Power Temperature Coefficient From 25 °C to 85 °C ( $P_{IN} = 18$ dBm)		-0.02		dBm/°C
Recommended Operating Voltage:	20	28	32	V
Gate Leakage ( $V_D = 10$ V, $V_G = -3.7$ V)	-8.3			mA

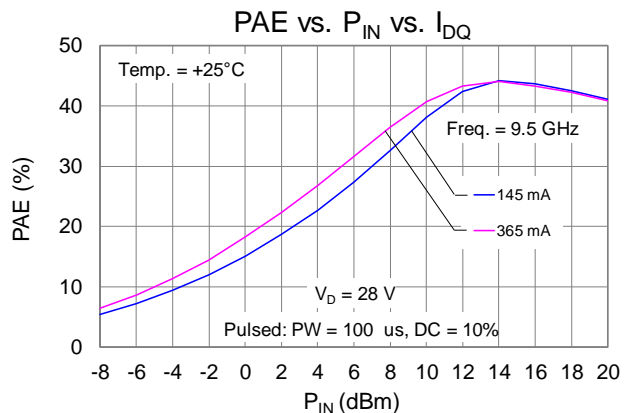
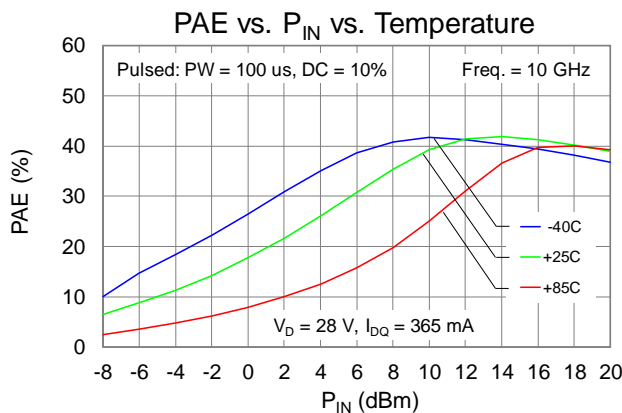
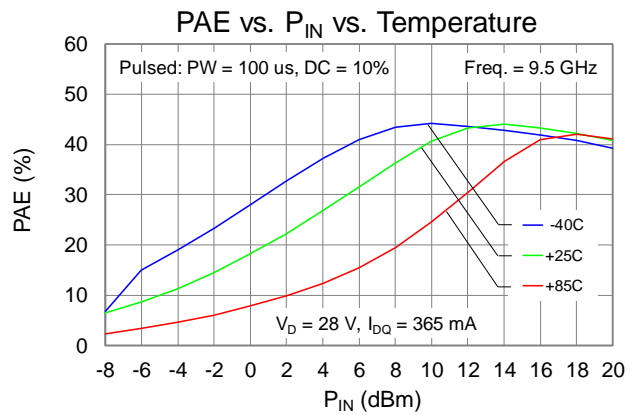
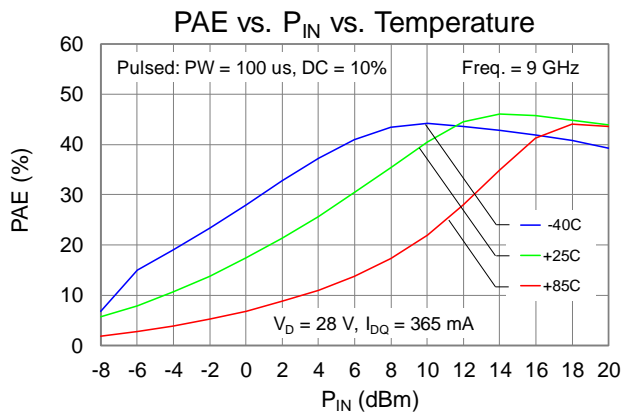
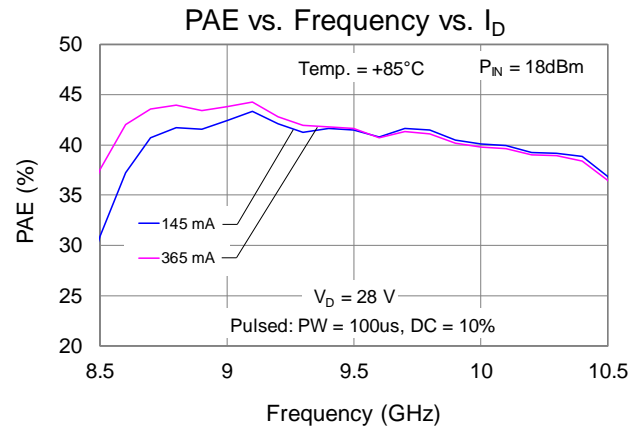
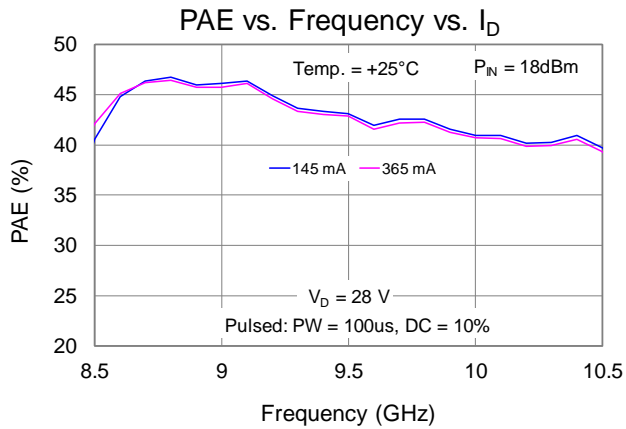
## Typical Performance: Large Signal (Pulsed Operation)



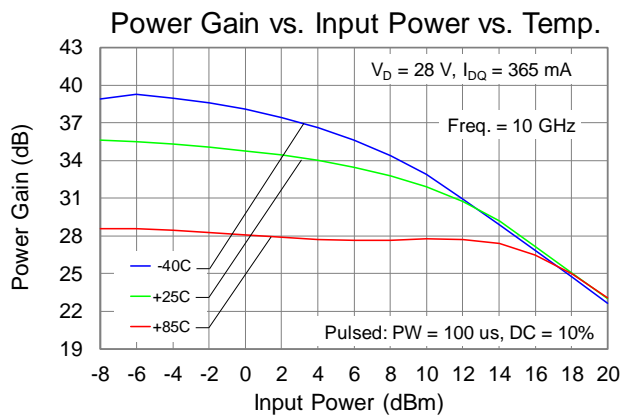
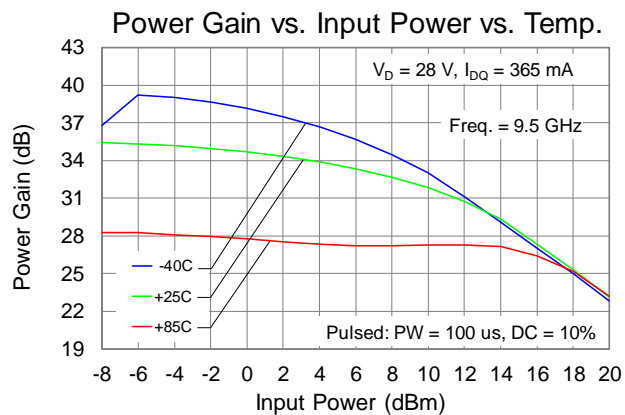
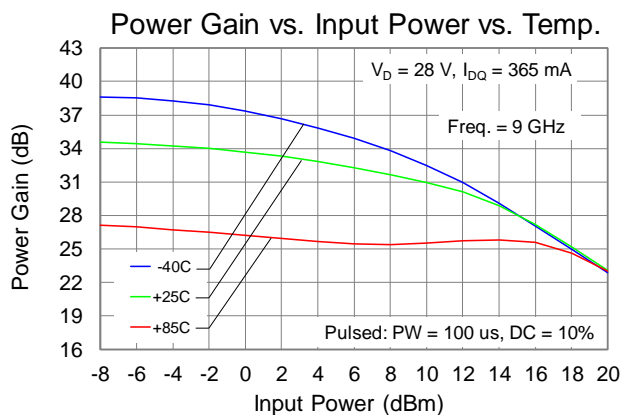
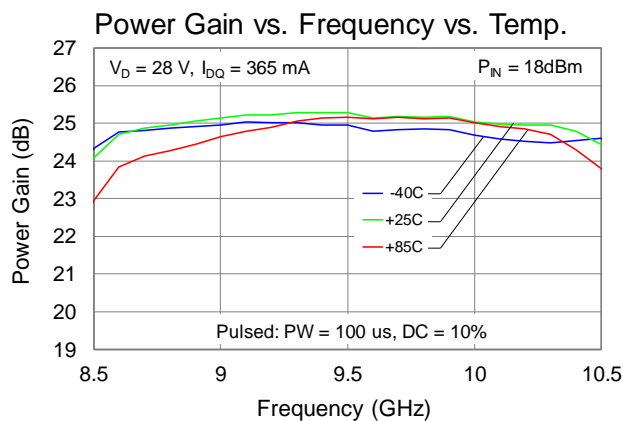
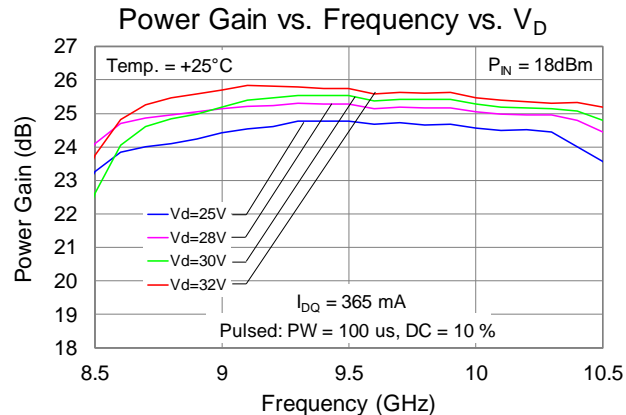
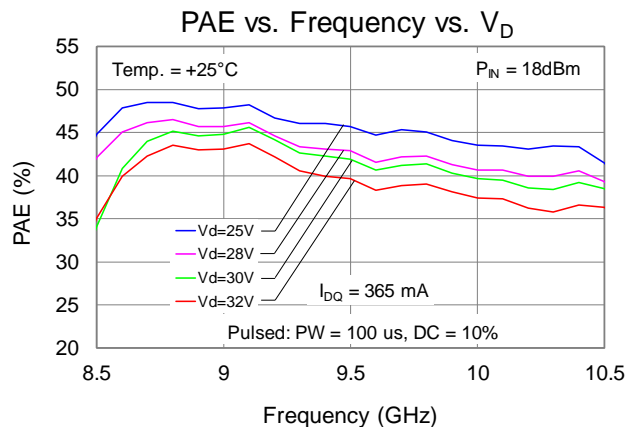
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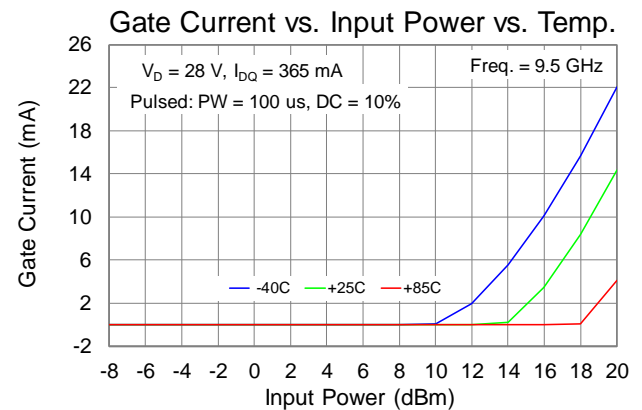
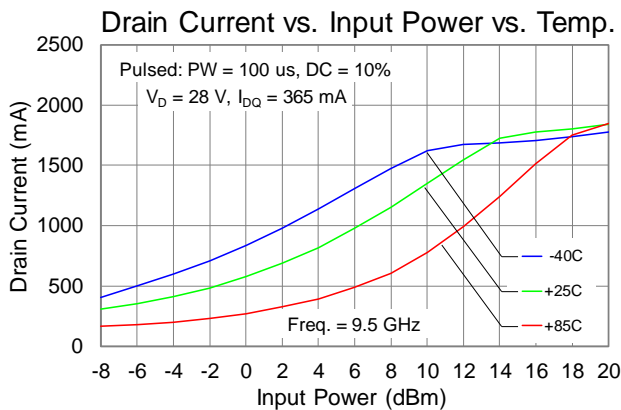
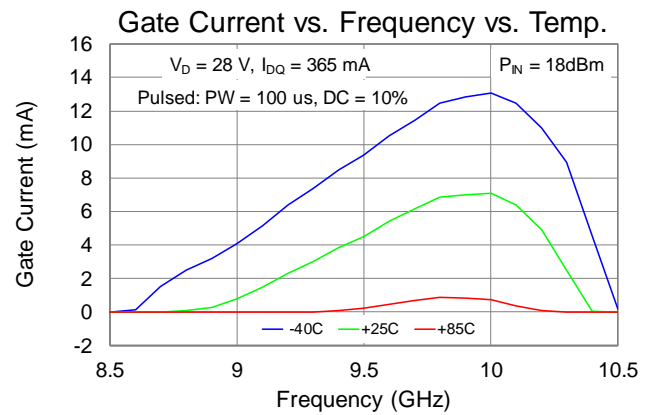
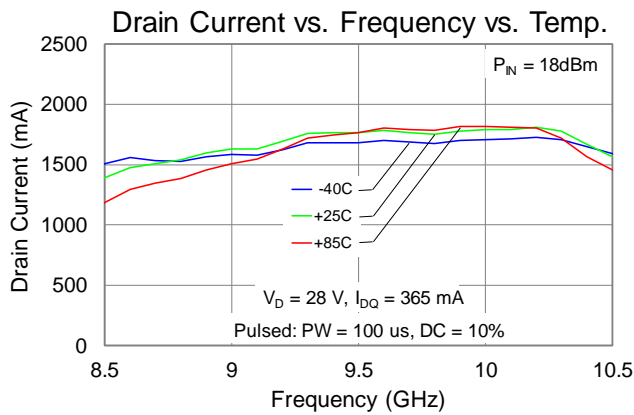
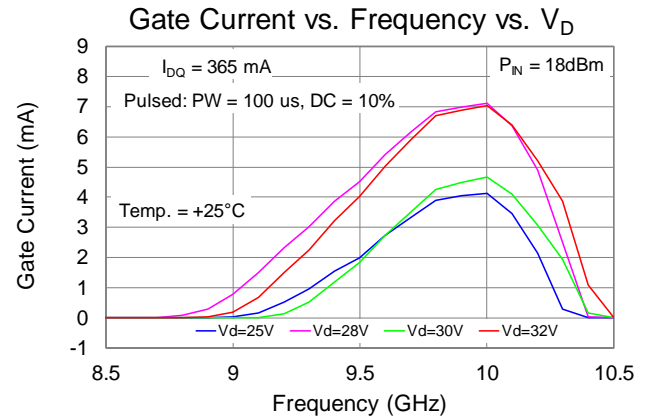
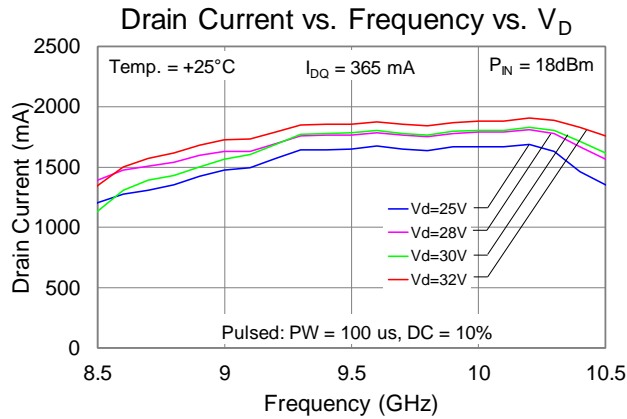
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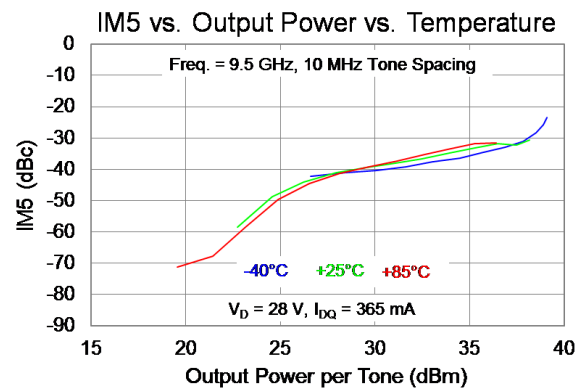
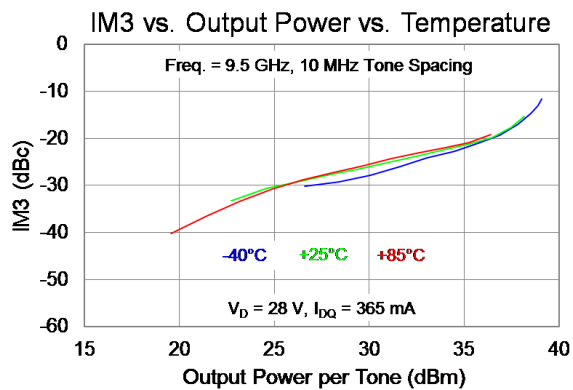
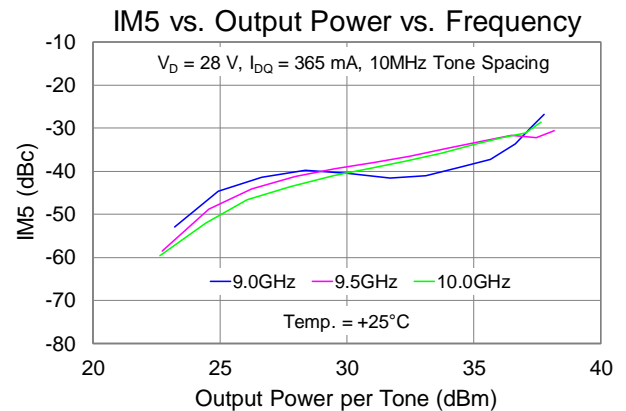
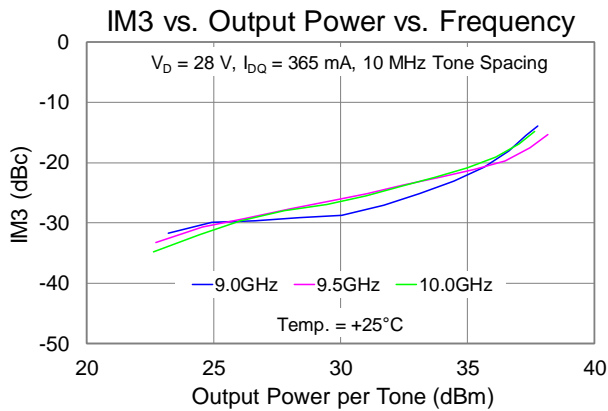
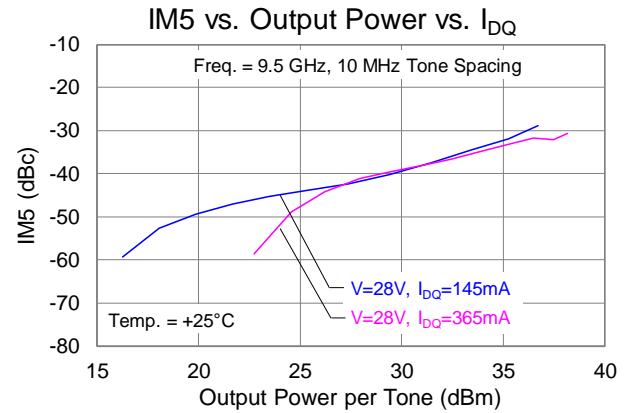
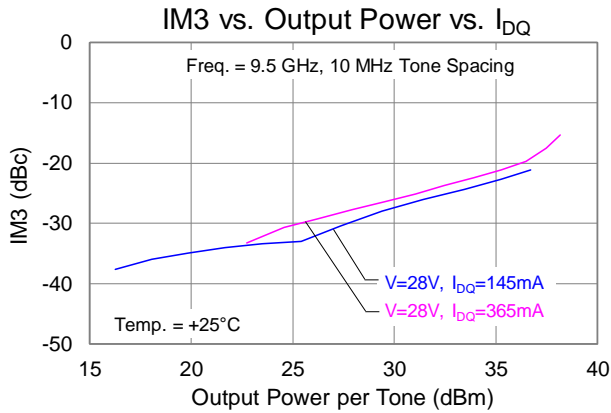
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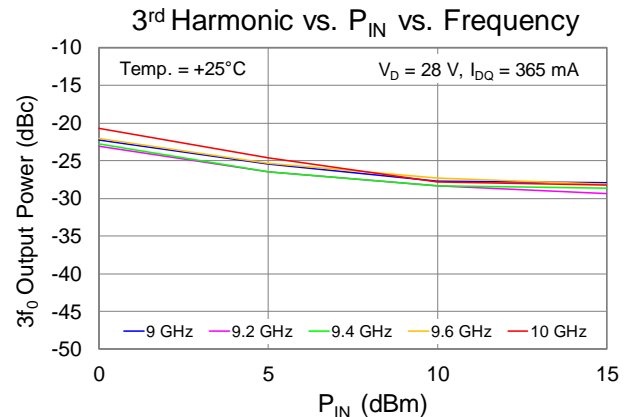
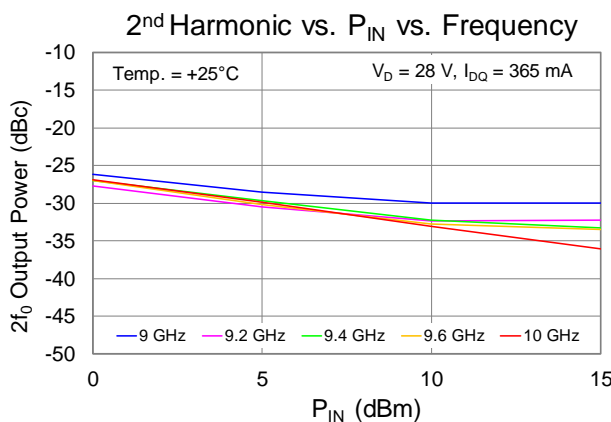
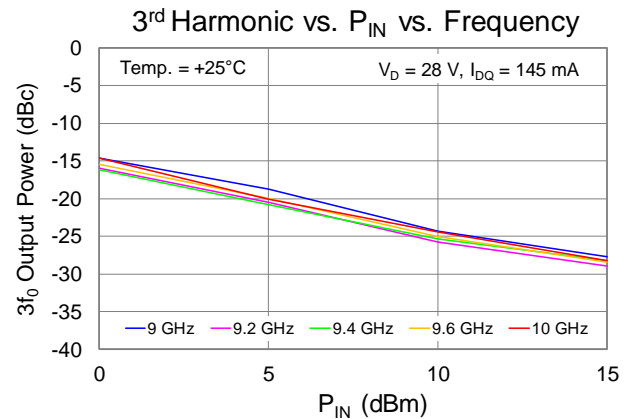
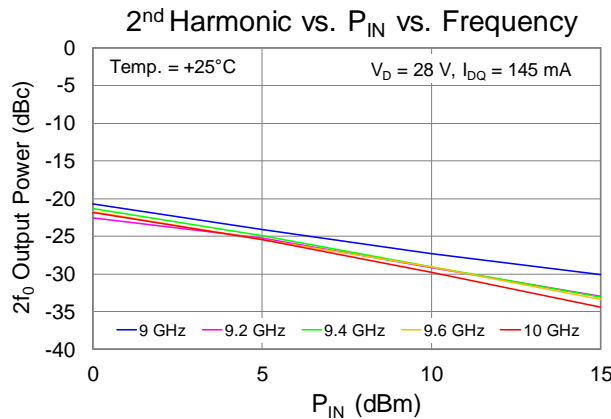
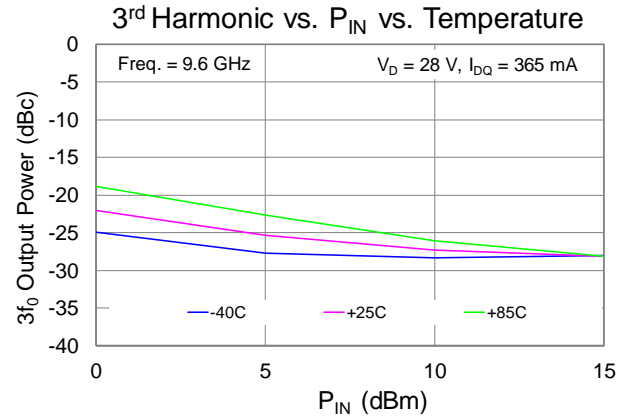
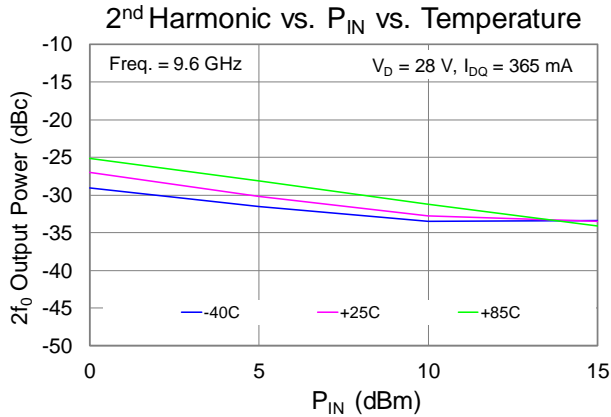


## Typical Performance: Linearity (CW Operation)

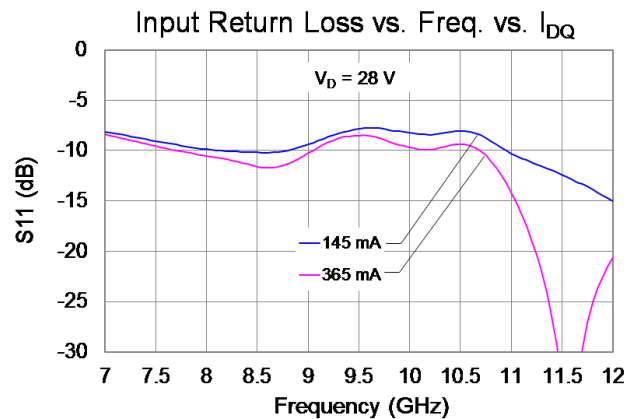
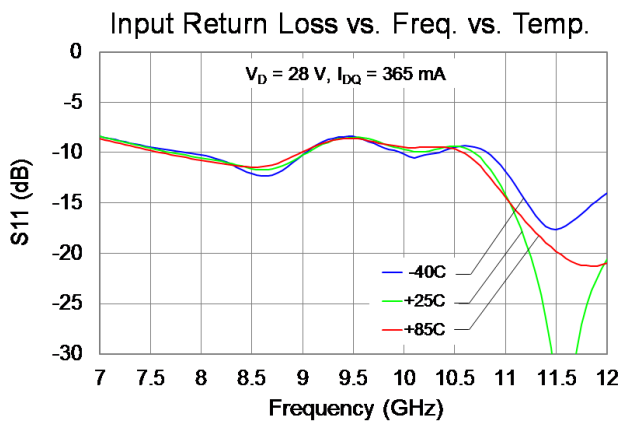
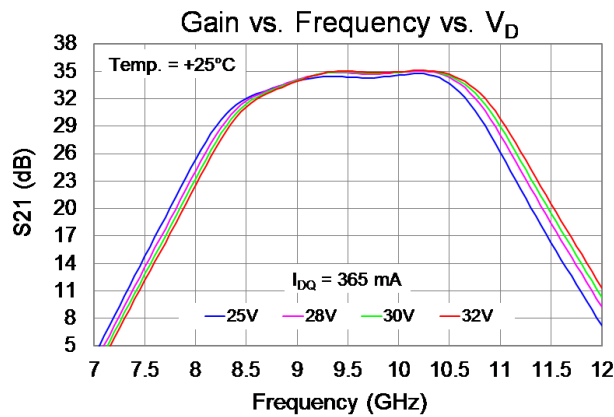
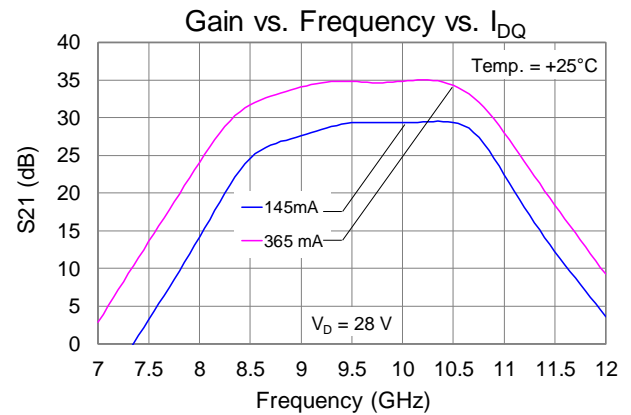
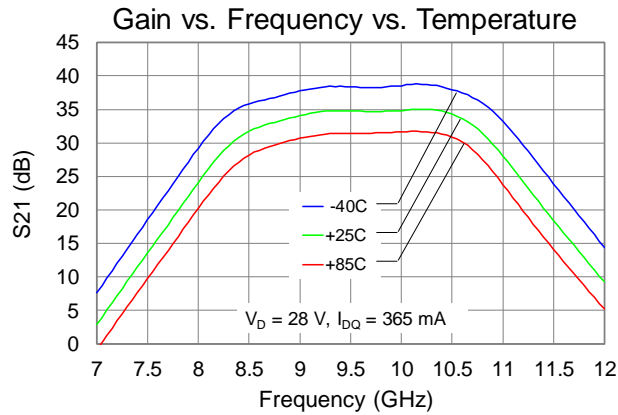




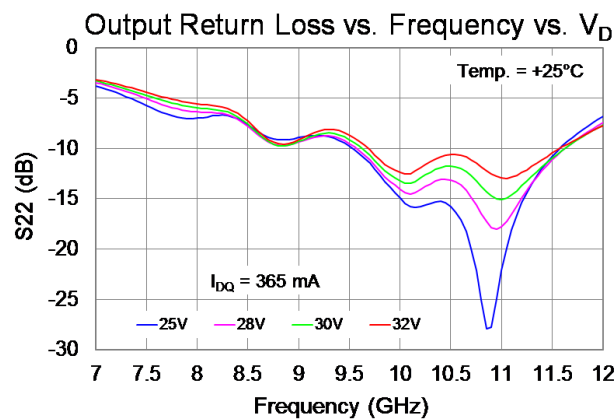
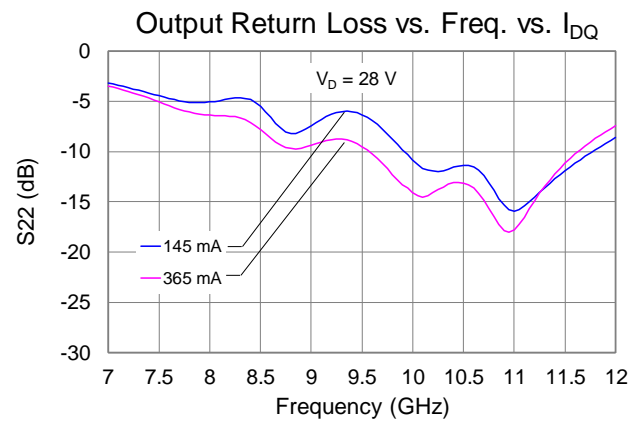
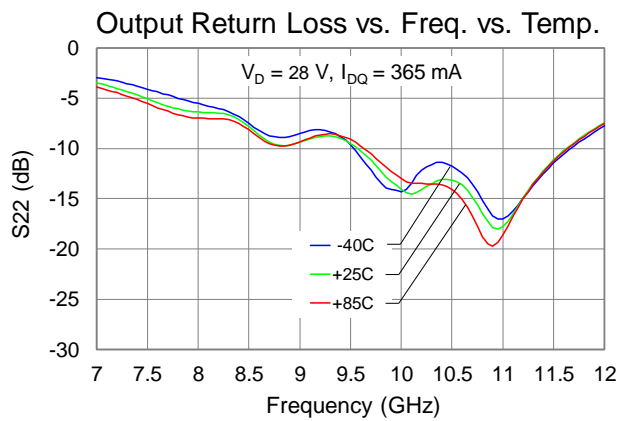
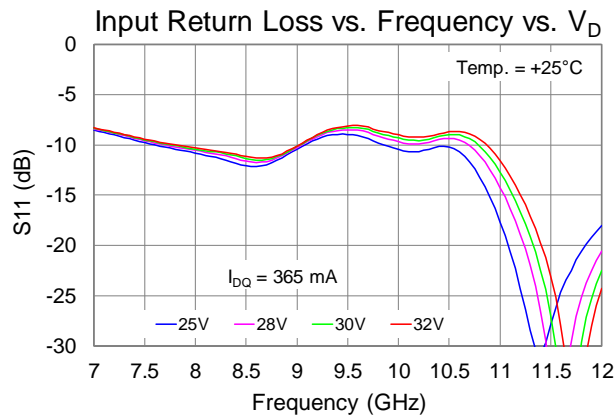
## Typical Performance: Linearity (CW Operation)



## Typical Performance: Small Signal (CW Operation)



## Typical Performance: Small Signal (CW Operation)



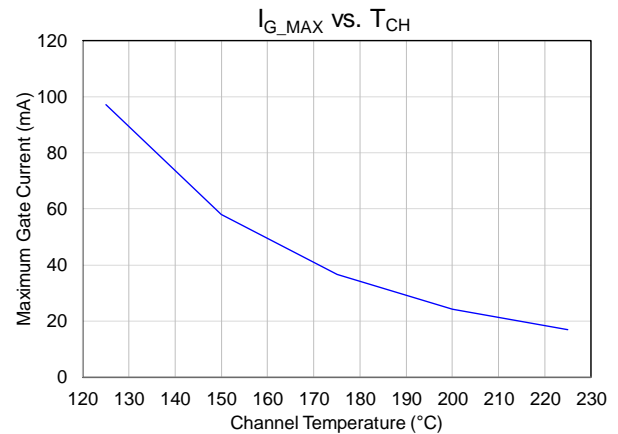
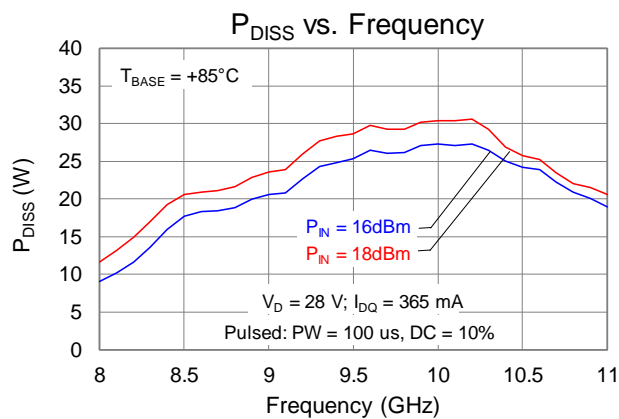
## Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance ( $\theta_{JC}$ ) <sup>1</sup>	$T_{BASE} = 85^\circ\text{C}$ ; $V_D = 28\text{ V}$ , $I_{DQ} = 365\text{ mA}$ , (Pulsed $V_D$ : $PW = 100\text{ us}$ , $DC = 10\%$ ), $P_{DISS} = 10.22\text{ W}$	1.31	$^\circ\text{C/W}$
Channel Temperature ( $T_{CH}$ ) (No RF drive) <sup>2</sup>		98.4	$^\circ\text{C}$
Thermal Resistance ( $\theta_{JC}$ ) <sup>1</sup>	$T_{BASE} = 85^\circ\text{C}$ ; $V_D = 28\text{ V}$ , $I_{DQ} = 365\text{ mA}$ , (Pulsed $V_D$ : $PW = 100\text{ us}$ , $DC = 10\%$ ), $I_{D\_Drive} = 1.8\text{ A}$ , $P_{IN} = 18\text{ dBm}$ , $P_{OUT} = 43\text{ dBm}$ , $P_{DISS} = 30\text{ W}$	1.59	$^\circ\text{C/W}$
Channel Temperature ( $T_{CH}$ ) (Under RF drive) <sup>2</sup>		132.8	$^\circ\text{C}$

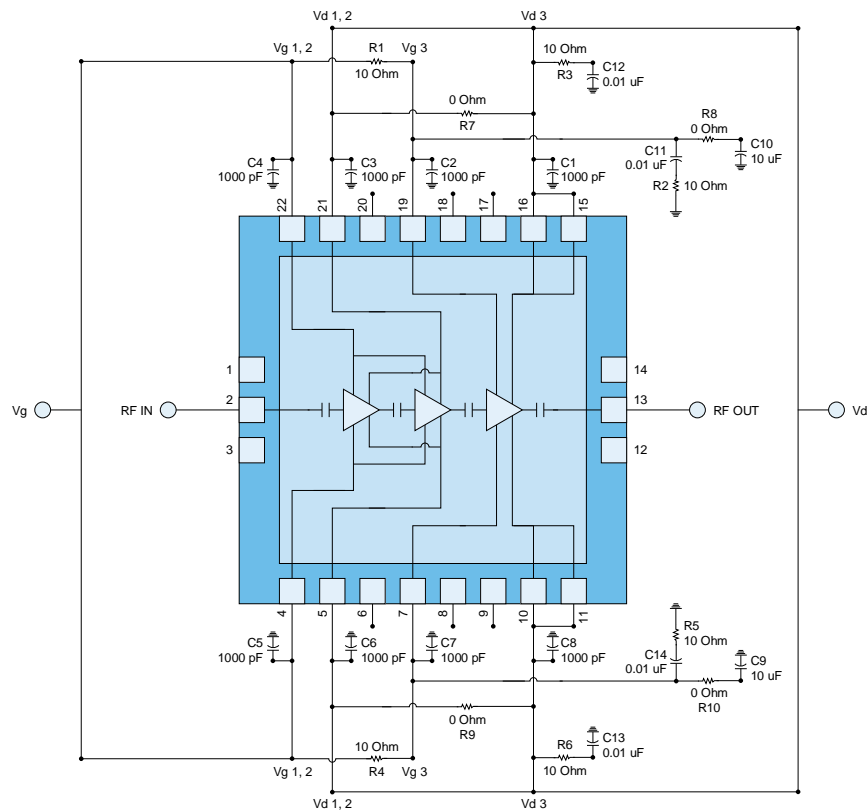
### Notes:

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

## Power Dissipation and Maximum Gate Current



## Application Information



### 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.

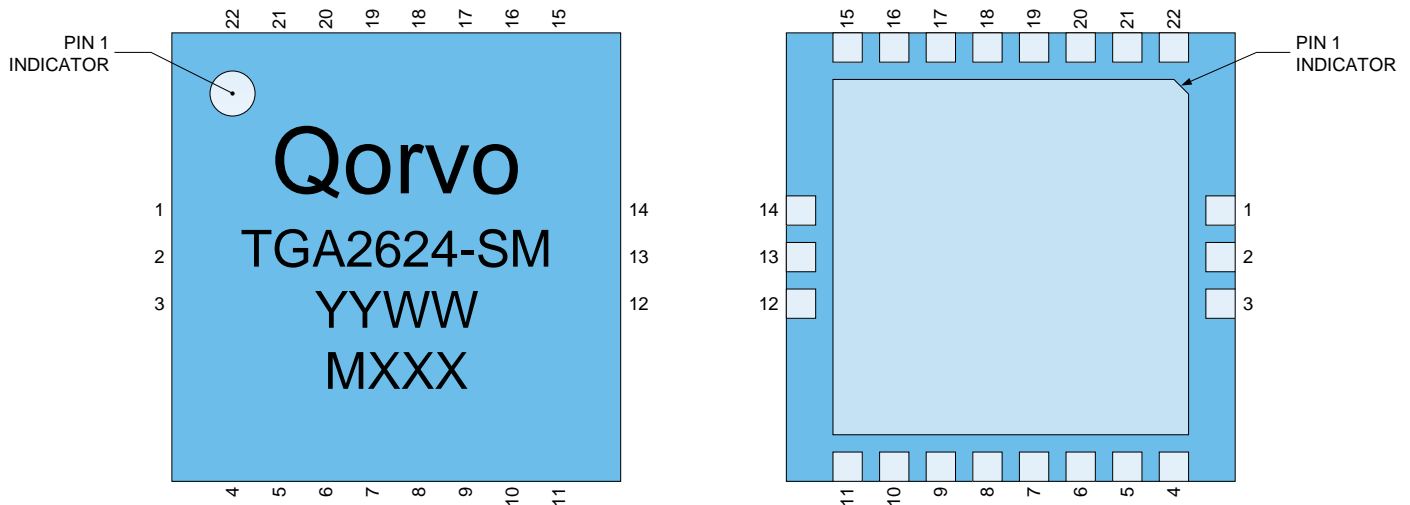
### Bias-up Procedure

Set  $I_D$  limit to 2 A,  $I_G$  limit to 25 mA  
 Apply -5.0 V to  $V_G$  (for pinch-off)  
 Increase  $V_D$  to +28 V; Ensure  $I_{DQ}$  is approx. 0 mA  
 Adjust  $V_G$  more positive until  $I_{DQ} = 365$  mA  $V_G \sim -2.5$  V typ  
 Apply RF signal

### Bias-down Procedure

Turn off RF signal  
 Reduce  $V_G$  to -5 V; ensure  $I_{DQ}$  is approx. 0 mA  
 Set  $V_D$  to 0 V  
 Turn off  $V_D$  supply  
 Turn off  $V_G$  supply

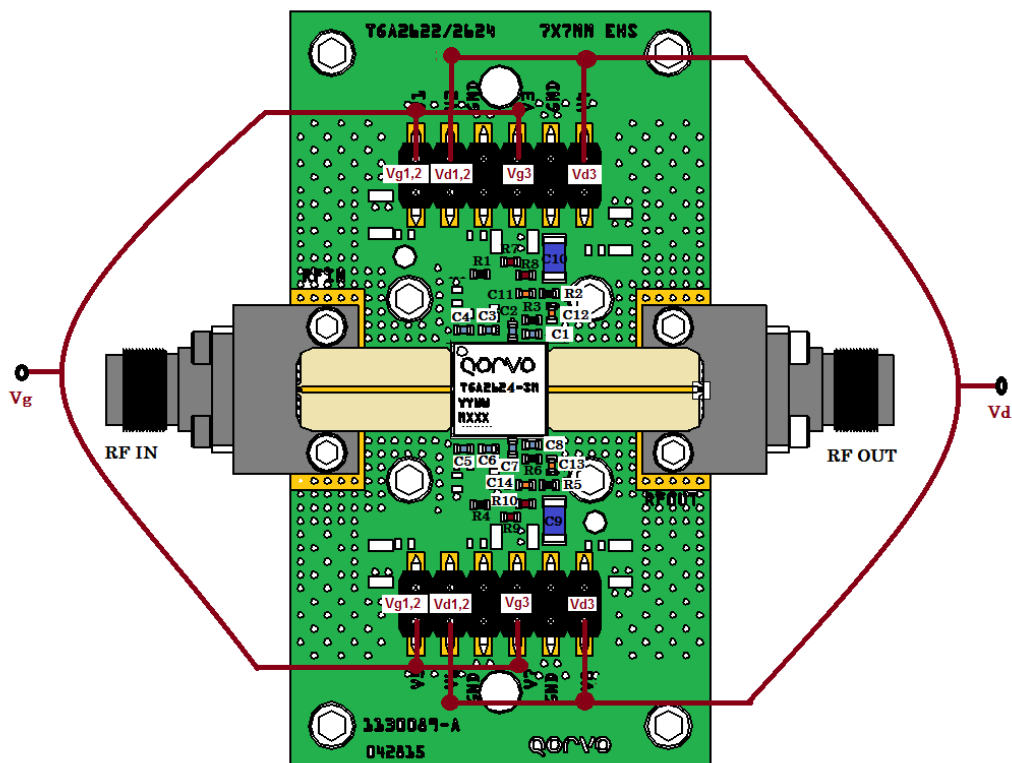
## Pin Layout



## 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 $\Omega$ ; 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 13.
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 13.
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 13.
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 13.
13	RF <sub>OUT</sub>	Output; matched to 50 $\Omega$ ; DC blocked

## Evaluation Board Layout



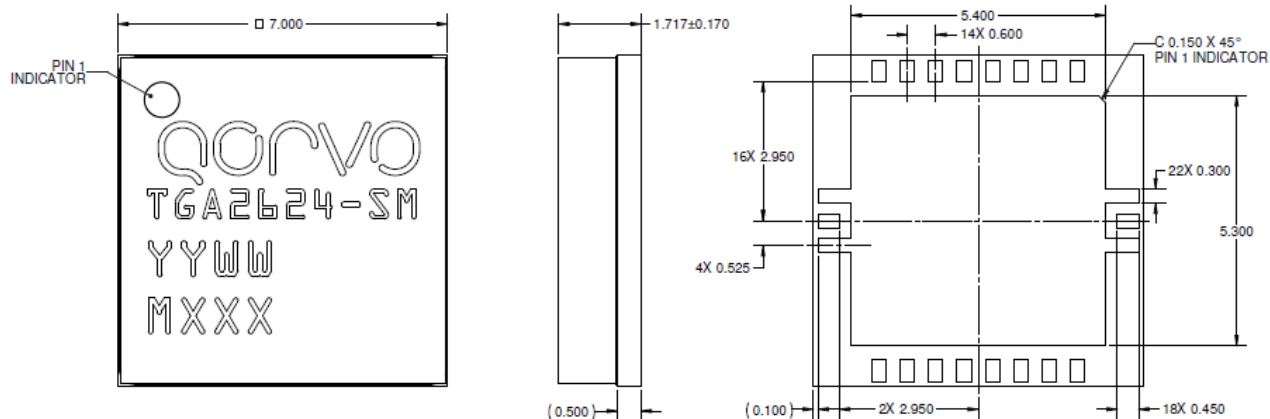
### Notes:

- Both Top and Bottom  $V_D$  and  $V_G$  must be biased

## Bill of Material

Reference Design	Value	Description	Manufacture	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:

TGA2624-SM: Part number

YY: Part Assembly year

WW: Part Assembly week

MXXX: Batch ID



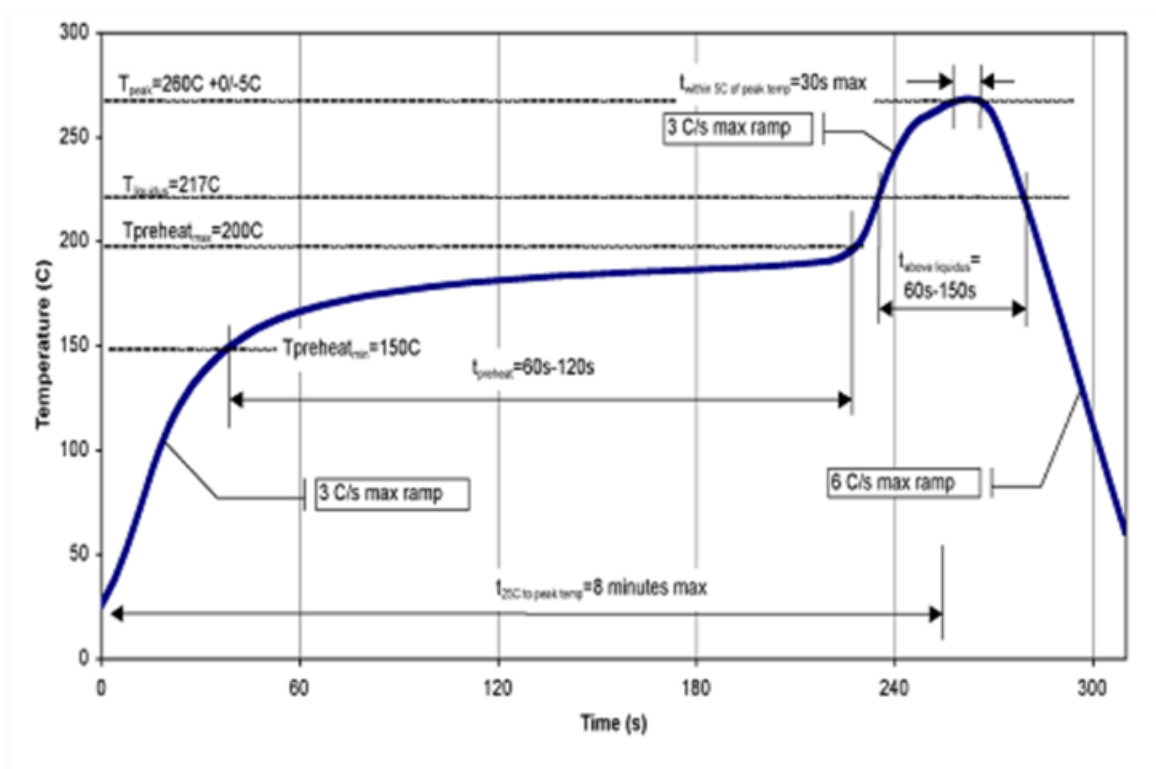
## Assembly Notes

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

## Handling Precautions

Parameter	Rating	Standard
ESD-Human Body Model (HBM)	1A	JEDEC/JESD22-A114
MSL-Moisture Sensitivity Level	MSL3	JEDEC/IPC/JEDEC J-STD-020



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
- Antimony Free
- TBBP-A (C<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) Free
- PFOS Free

## Contact Information

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

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

Tel: 1-844-890-8163

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

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