TGA2622-SM

9 – 10 GHz 35 Watt GaN Power Amplifier

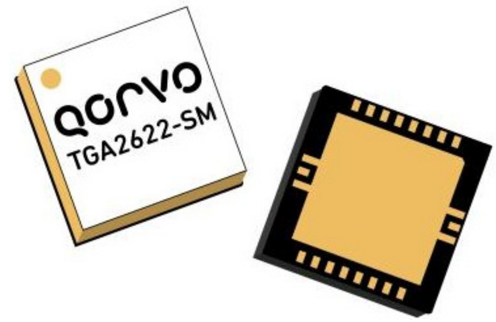
Product Description

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.

Evaluation boards are available upon request.



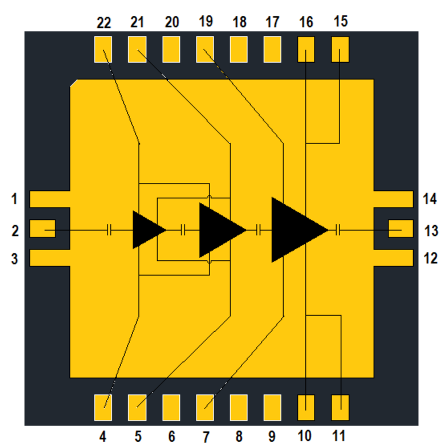
QFN 7x7 mm 22L

Product Features

- Frequency Range: 9 – 10 GHz
- P_{SAT}: 45.5 dBm @ P_{IN} = 18 dBm
- PAE: 42% @ P_{IN} = 18 dBm
- Power Gain: 27.5 dB @ P_{IN} = 18 dBm
- Bias: V_D = 28 V, I_{DQ} = 290 mA, V_G = -2.3 V Typical (Pulsed V_D: 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	ECCN	Description
TGA2622-SM	3A001.b.2.b	9 – 10 GHz 35 W GaN Power Amplifier

Electrical Specifications

Test conditions unless otherwise noted: 25 °C, V_D = 28 V, I_{DQ} = 290 mA, V_G = –2.3 V Typical,
Pulsed V_D: PW = 100 us, DC = 10%

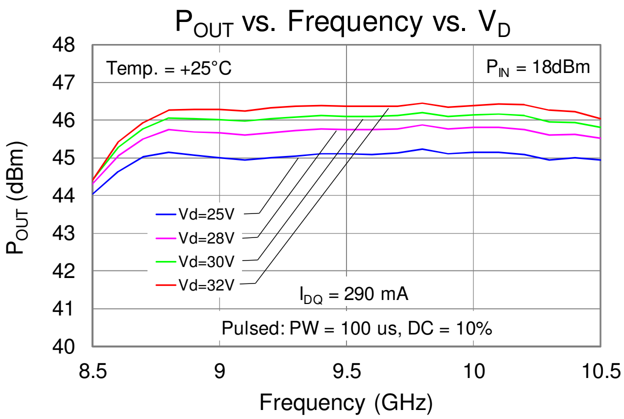
Parameter		Min	Typ	Max	Units
Operational Frequency Range		9	–	10	GHz
Output Power @ P_{IN} = 18 dBm	Frequency = 9 GHz	45	45.7	–	dBm
	Frequency = 9.5 GHz	45	45.8	–	dBm
	Frequency = 10 GHz	45	45.8	–	dBm
Power Added Efficiency @ P_{IN} = 18 dBm	Frequency = 9 GHz	40	46.4	–	%
	Frequency = 9.5 GHz	40	46.4	–	
	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 (Pin = 18dBm)		–	-0.02	–	dBm/°C

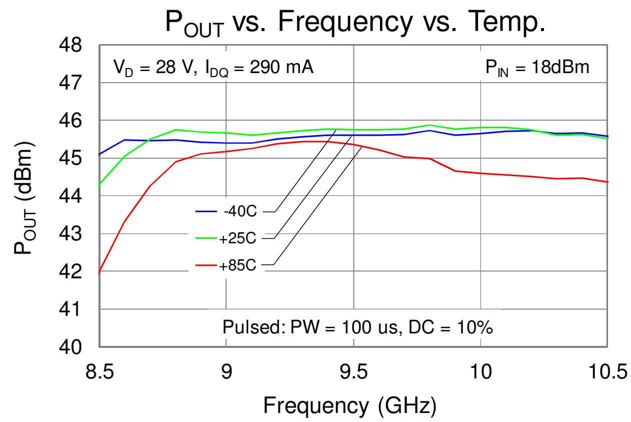
Recommended Operating Conditions

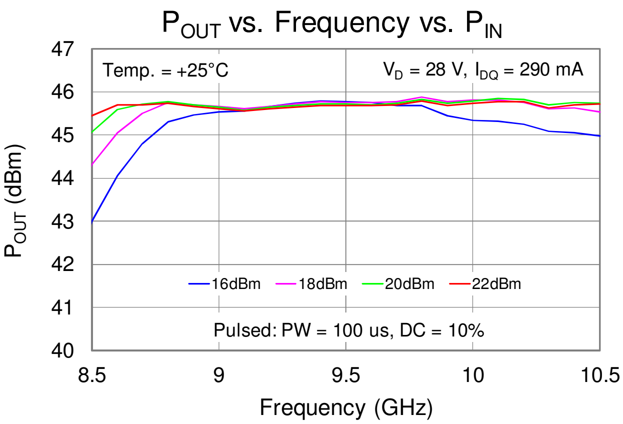
Parameter	Value
Drain Voltage	28 V
Drain Current (quiescent, I_{DQ})	290 mA
Gate Voltage	-2.3 V
Operating Temperature Range	–40 to 85 °C

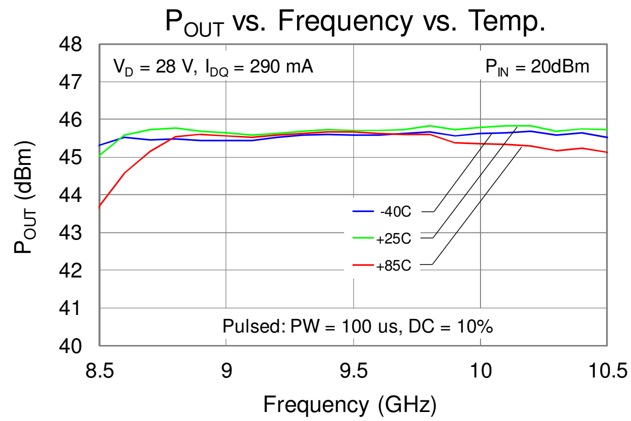
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

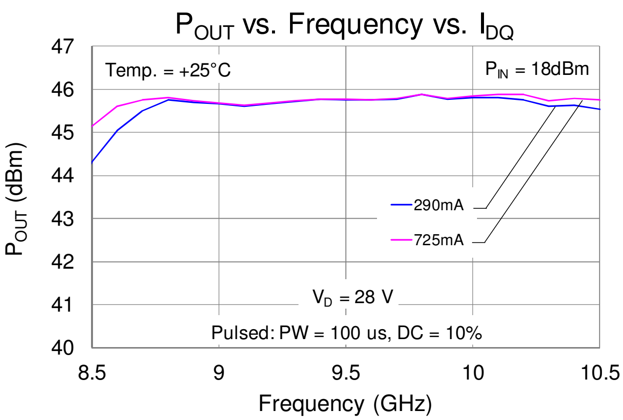
Performance Plots – Large Signal (Pulsed)

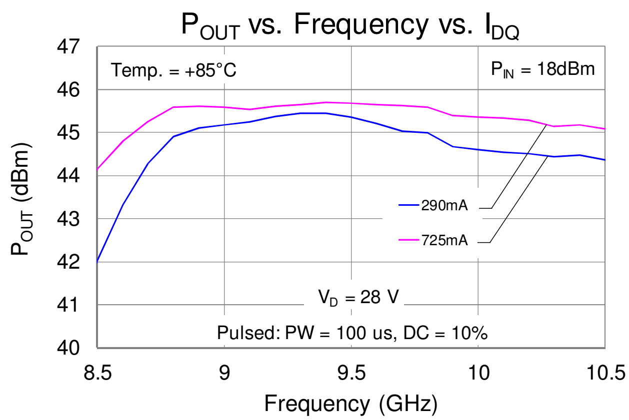












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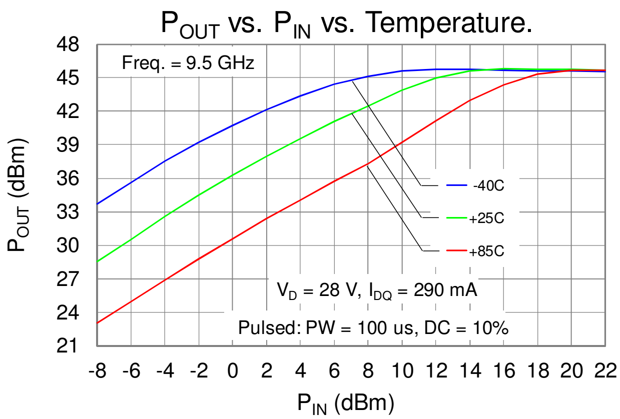

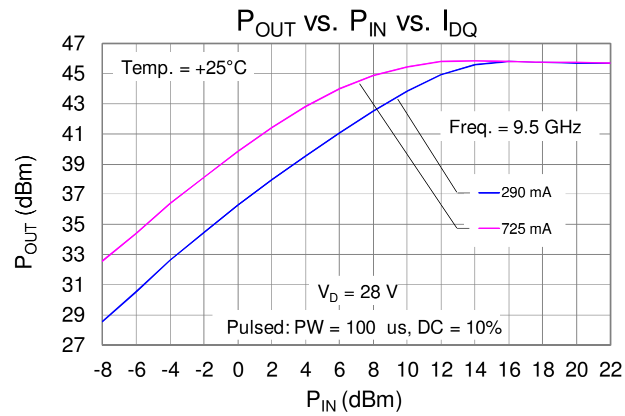

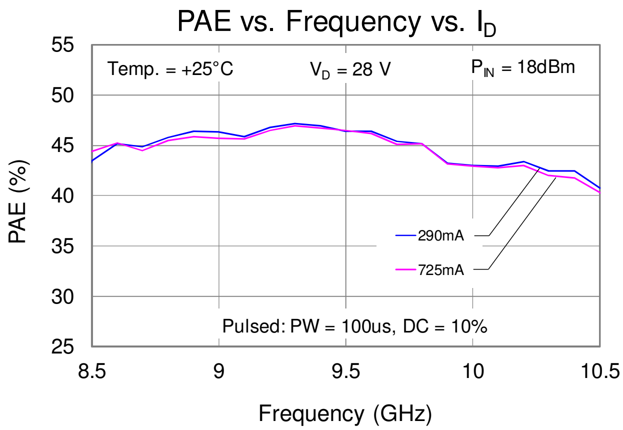

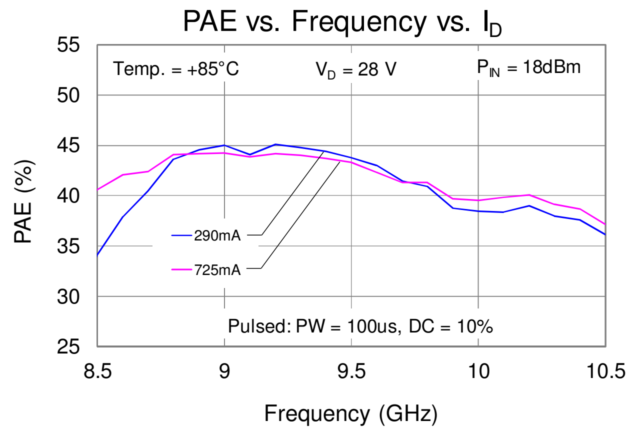

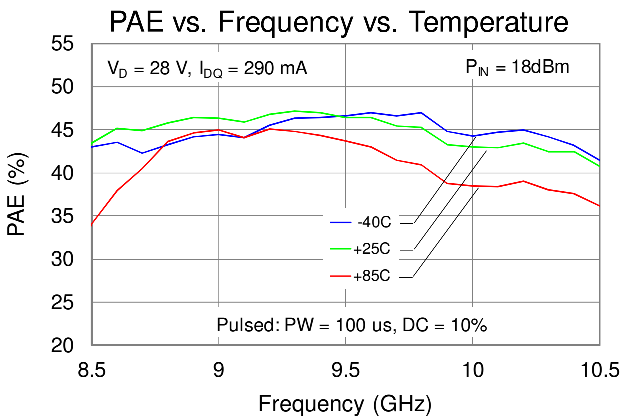

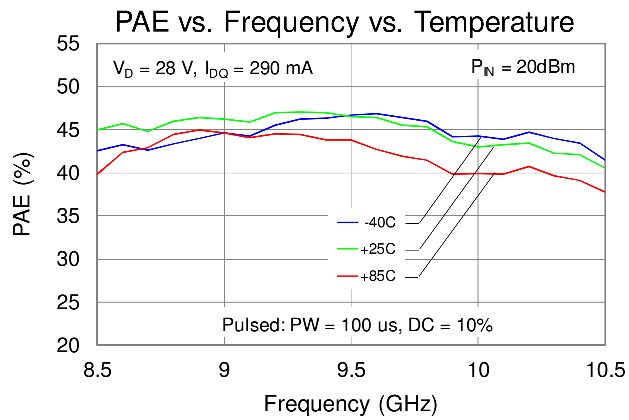

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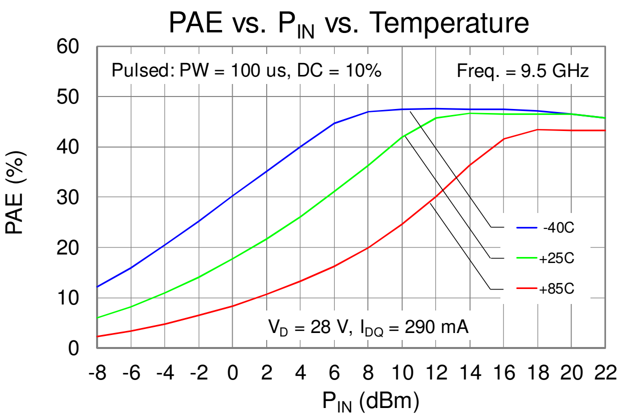

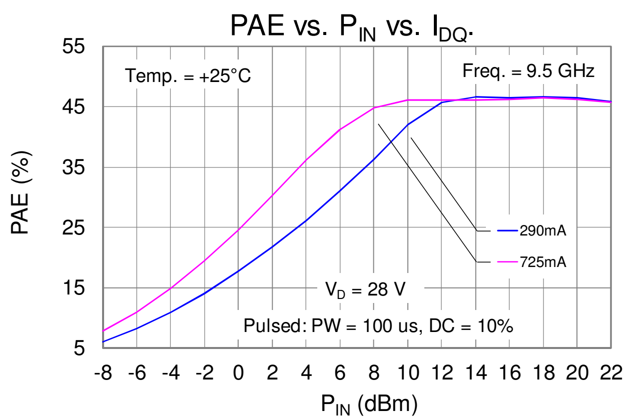

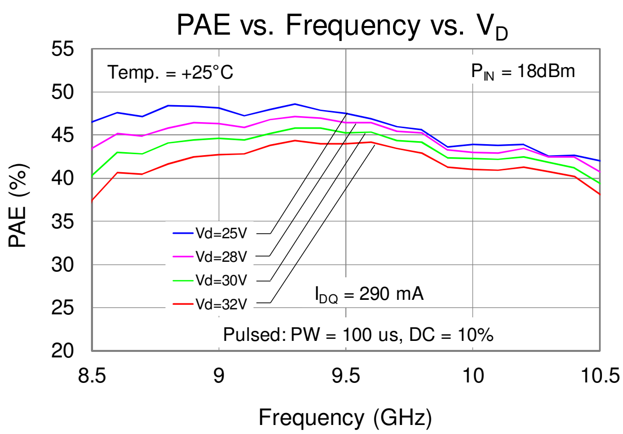

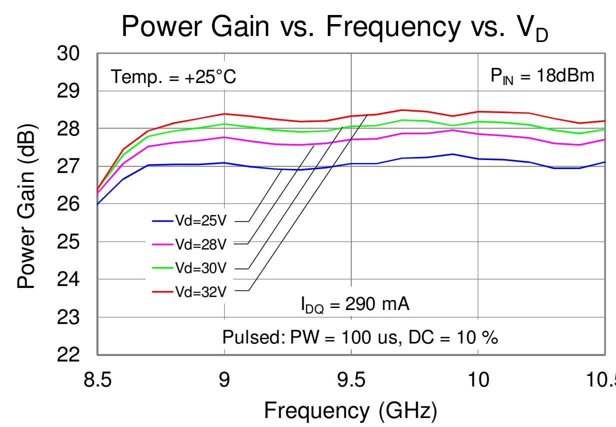

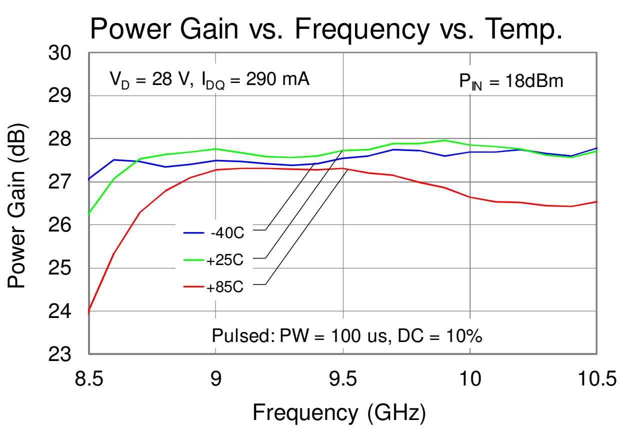

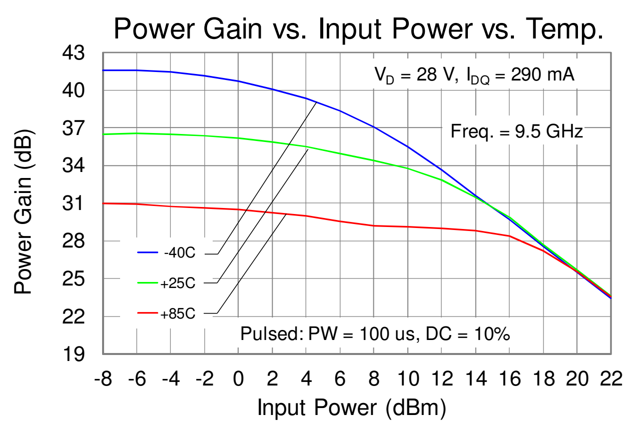

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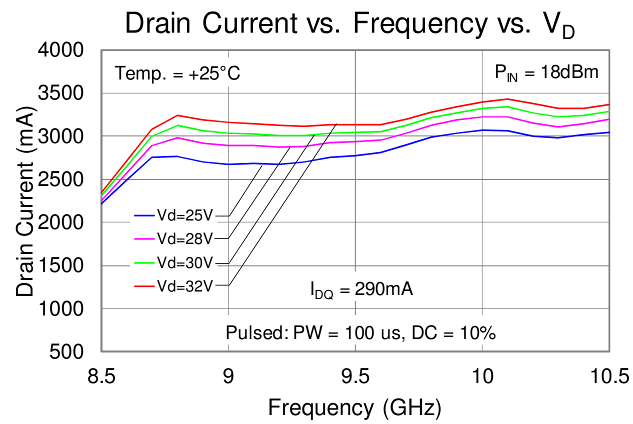
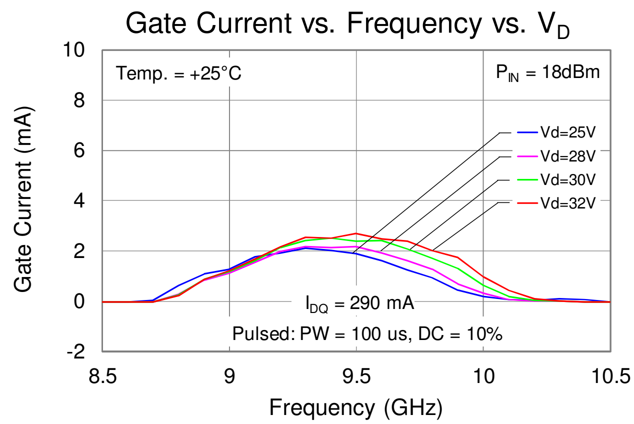
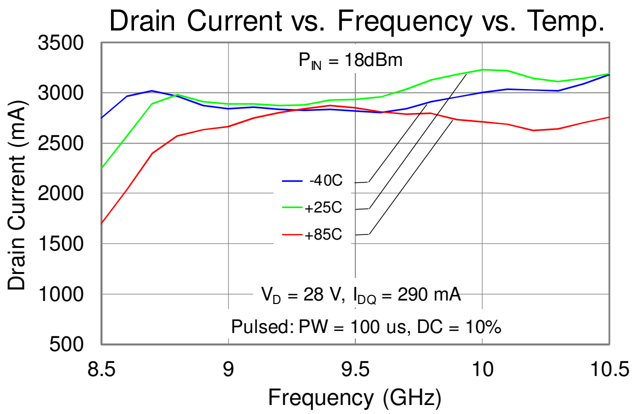
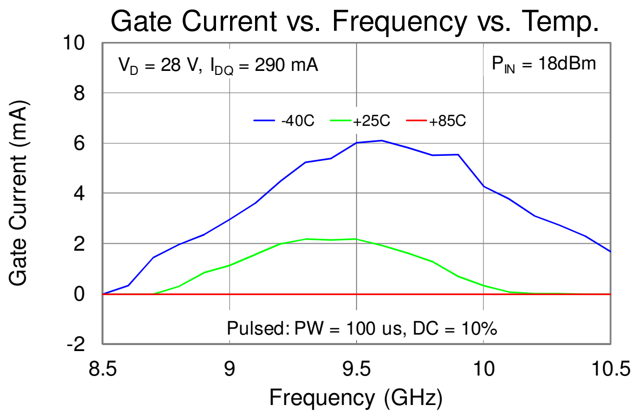
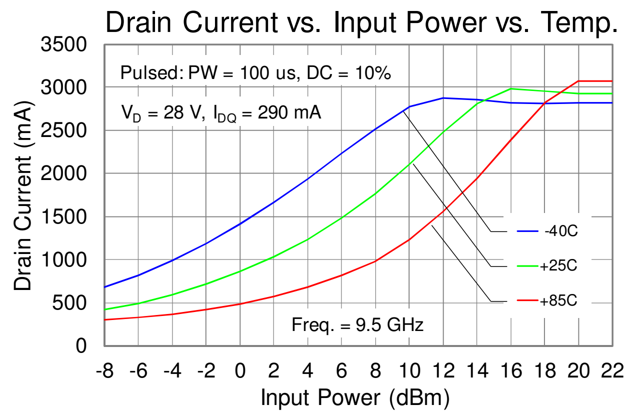
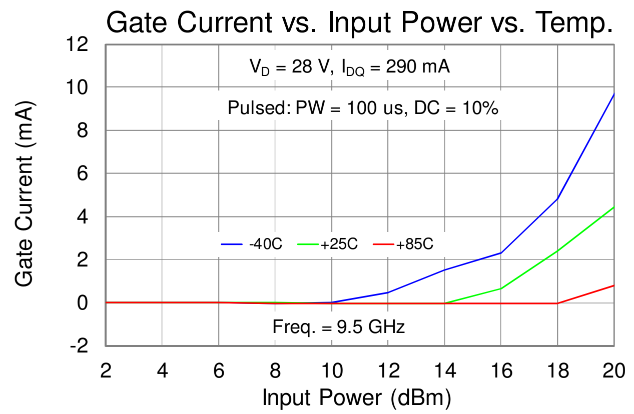




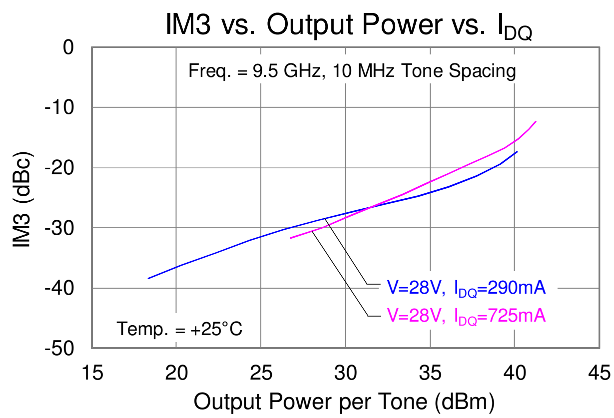


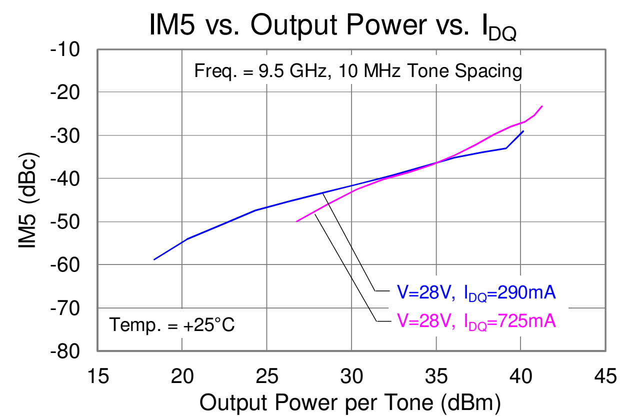


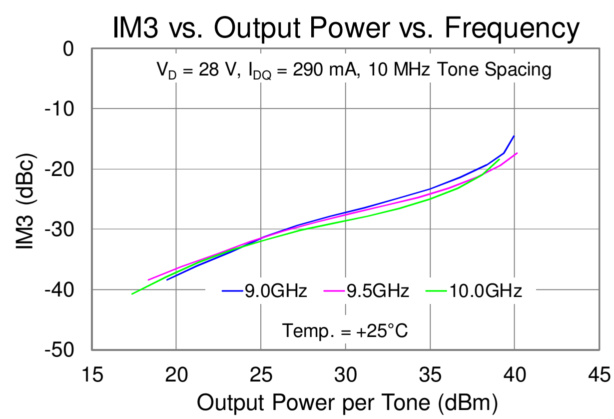


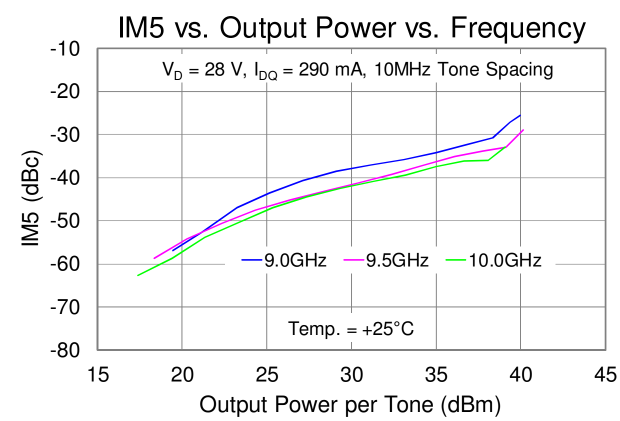


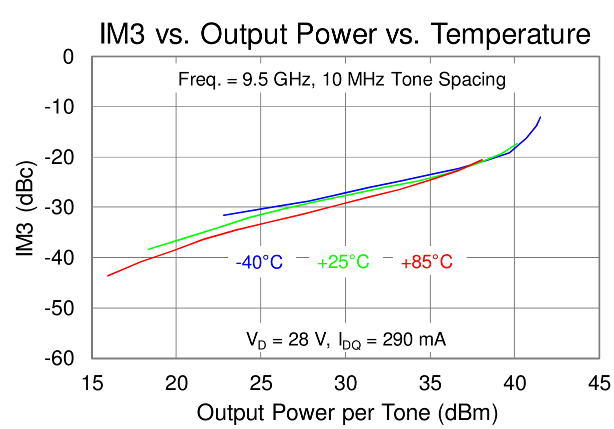
Performance Plots – Linearity (CW)

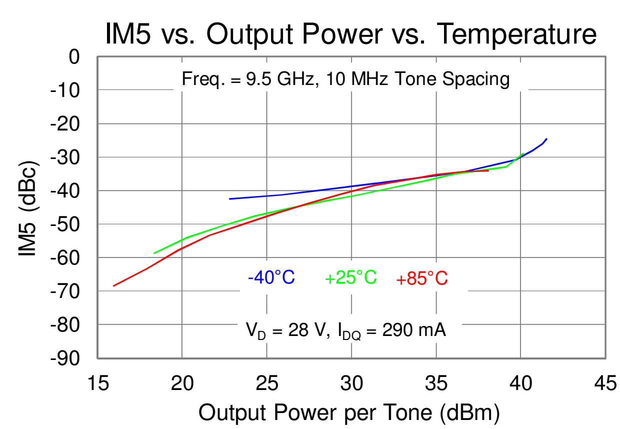












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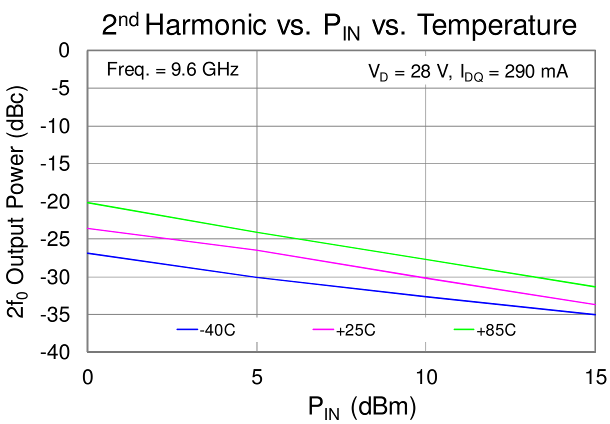
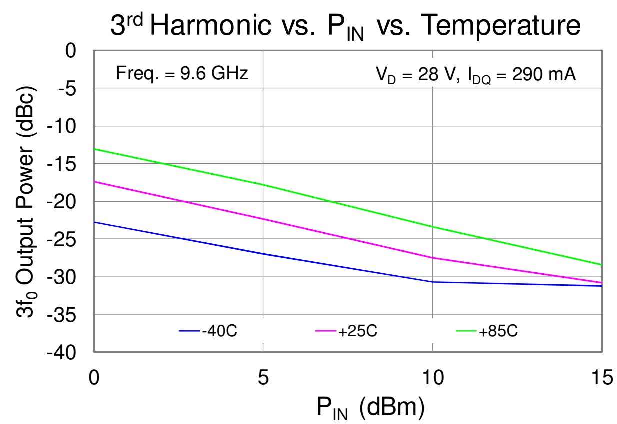
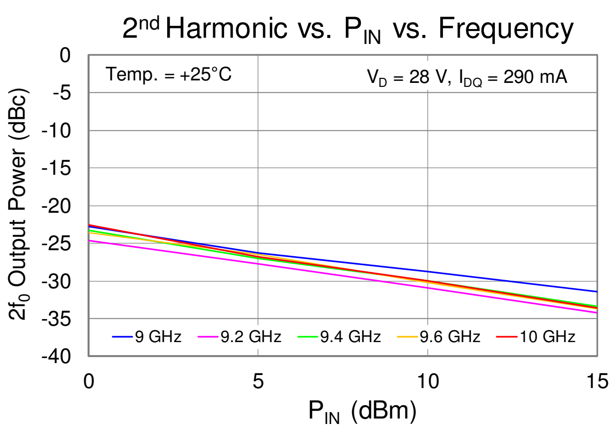
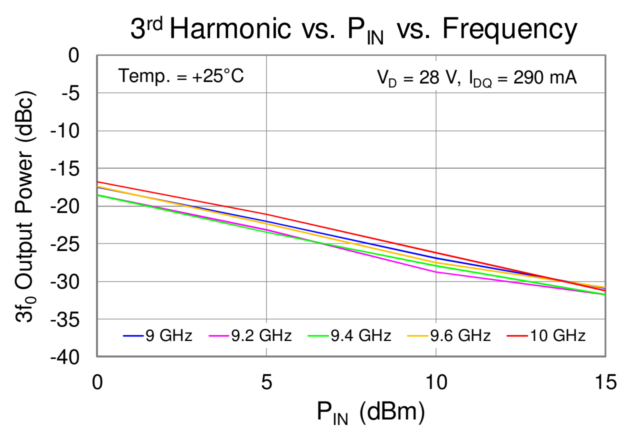
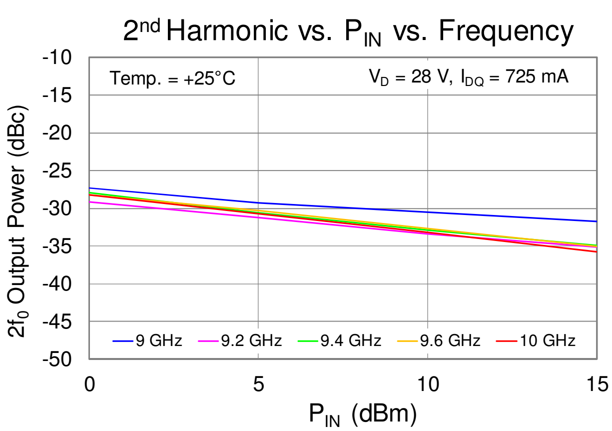
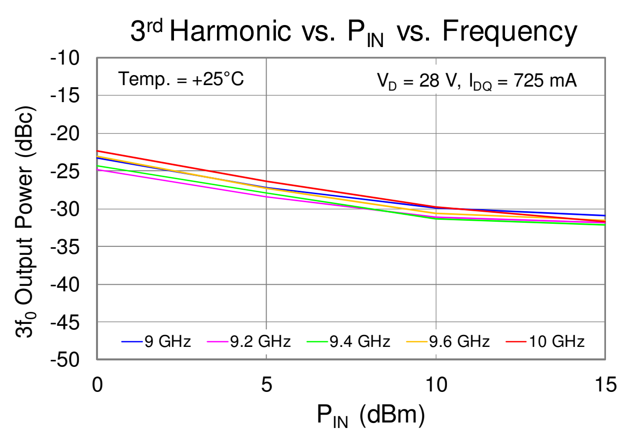




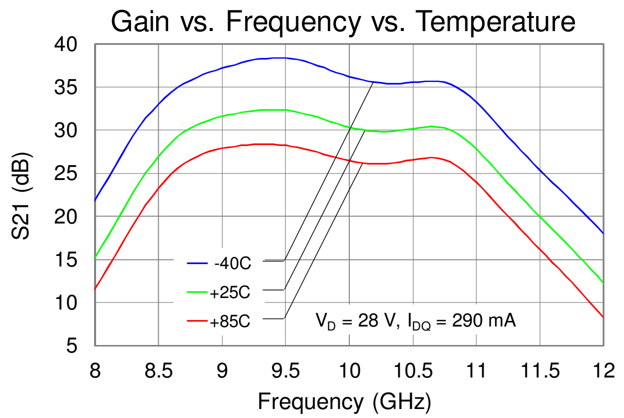


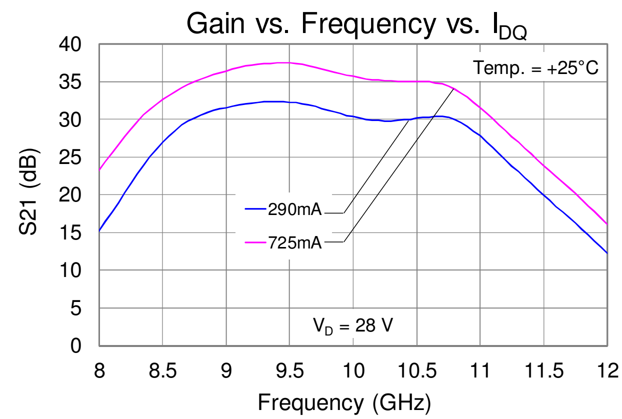


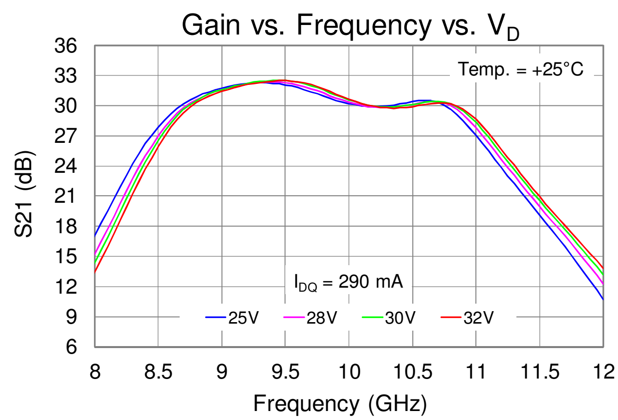


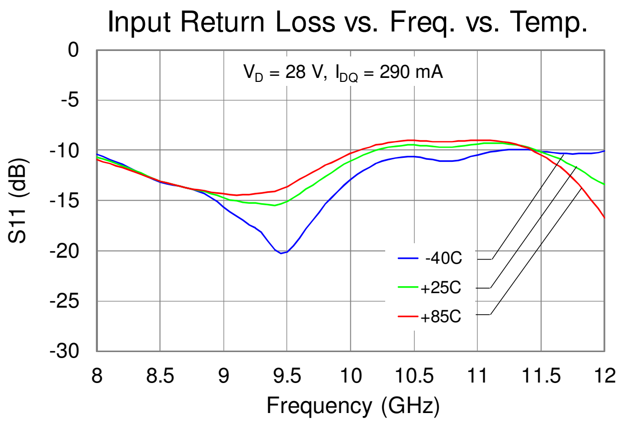


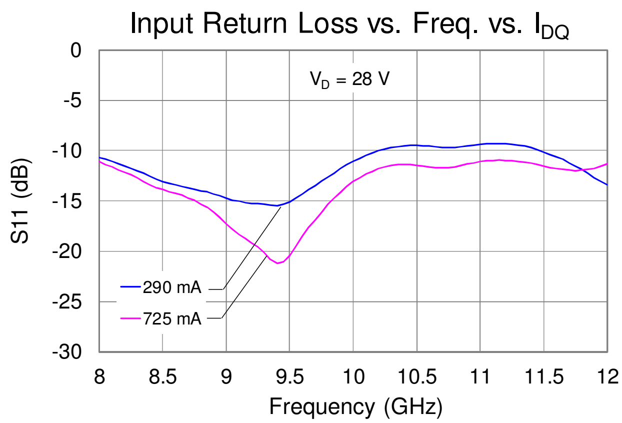
Performance Plots – Small Signal (CW)



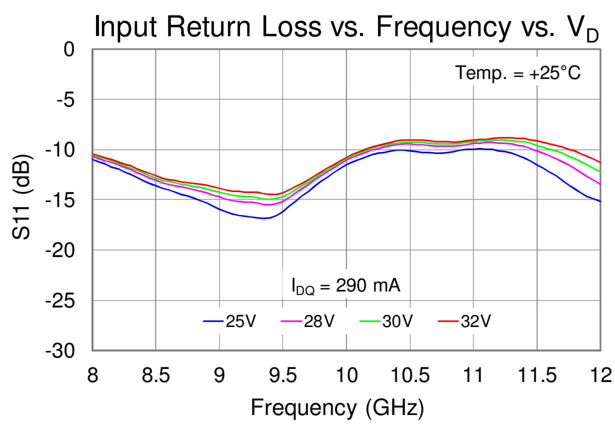


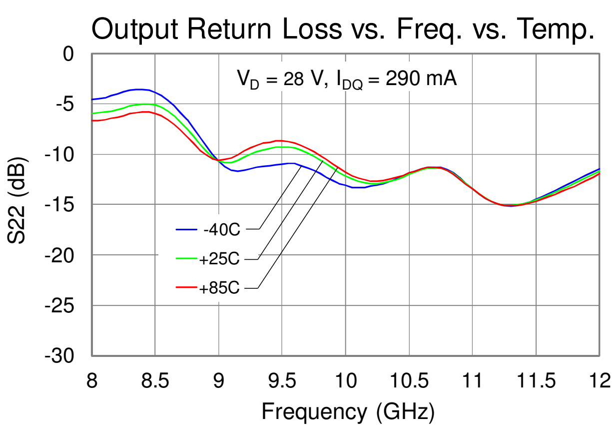


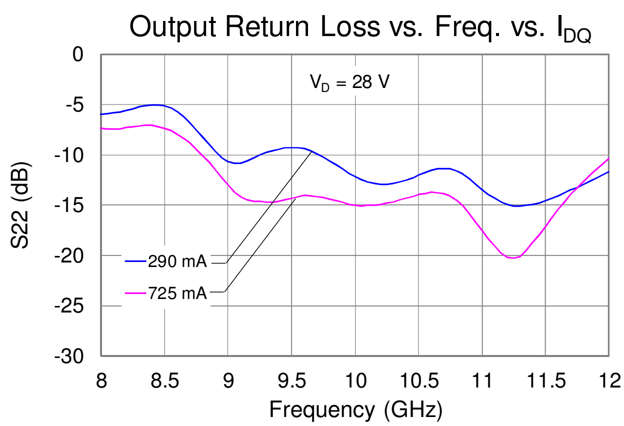


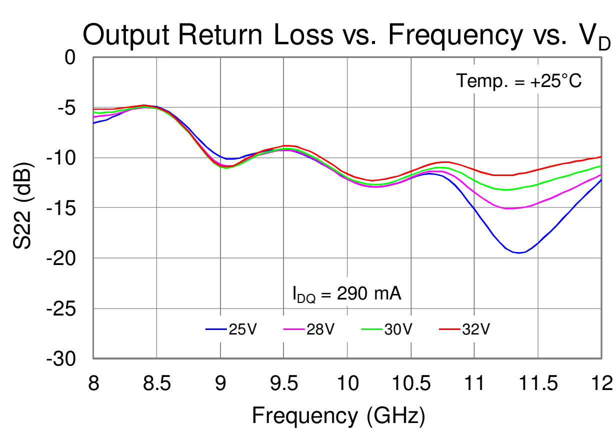


Performance Plots – Small Signal (CW)









Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) [1]	V_D = 28 V, I_{DQ} = 290 mA, (Pulsed V_D : PW = 100 us, DC = 10 %), T_{base} = 85 ℃; P_{DISS} = 8.12 W	1.06	ºC/W
Channel Temperature (T_{CH}) (No RF drive)		94	℃
Median Lifetime (T_M)		2.16 x 10^12	Hrs

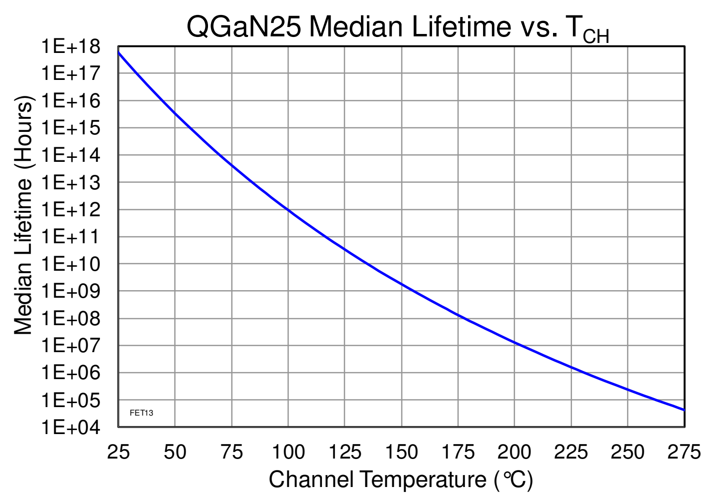
Thermal Resistance (θ_{JC}) [1]	V_D = 28 V, I_{DQ} = 290 mA, (Pulsed V_D : PW = 100 us, DC = 10 %), T_{base} = 85 ℃, V_D = 28 V, I_{D_Drive} = 3.1 A, P_{IN} = 20 dBm, P_{OUT} = 45.4 dBm, P_{DISS} = 52 W	1.21	ºC/W
Channel Temperature (T_{CH}) (Under RF drive)		148	℃
Median Lifetime (T_M)		2.19 x 10^9	Hrs

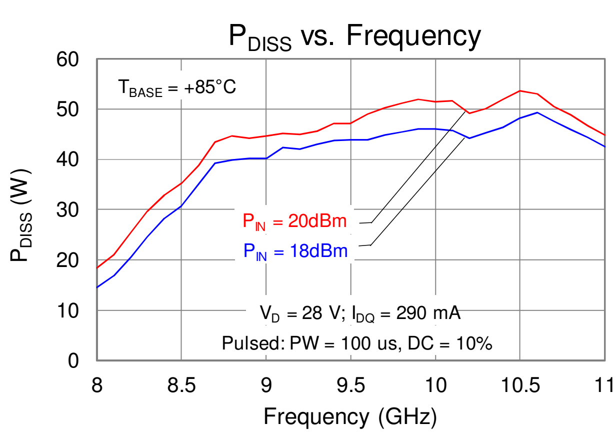
Notes:

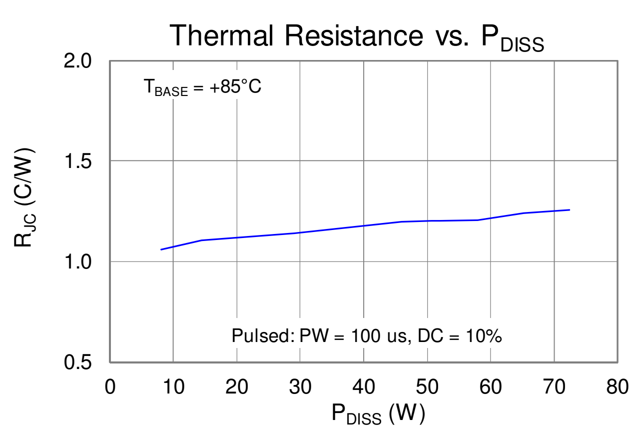
1. Thermal Resistance measured to back of package.

Median Lifetime

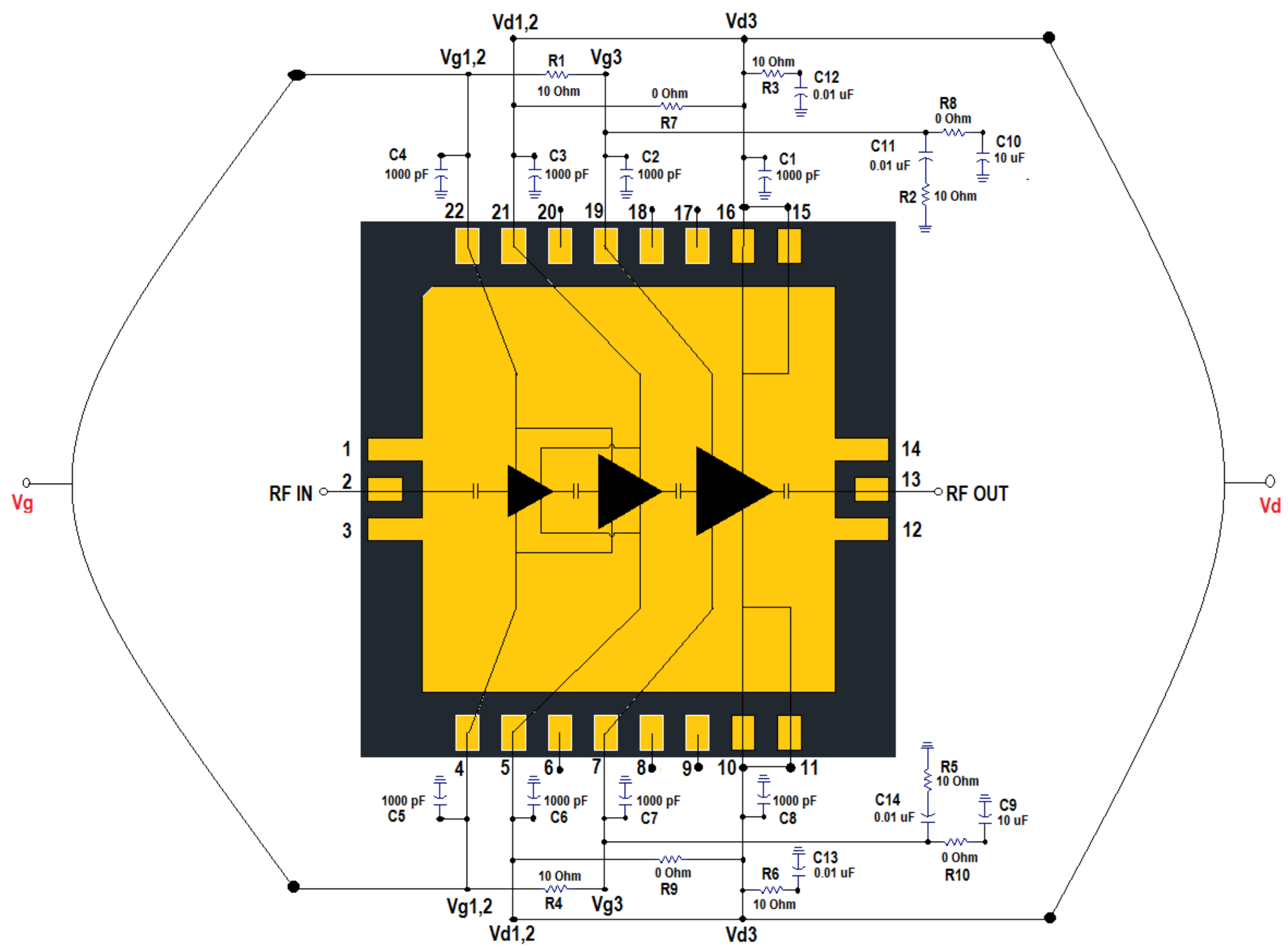
Test Conditions: V_D = +40 V; Failure Criteria = 10 % reduction in I_{D_MAX} during DC Life Testing







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.

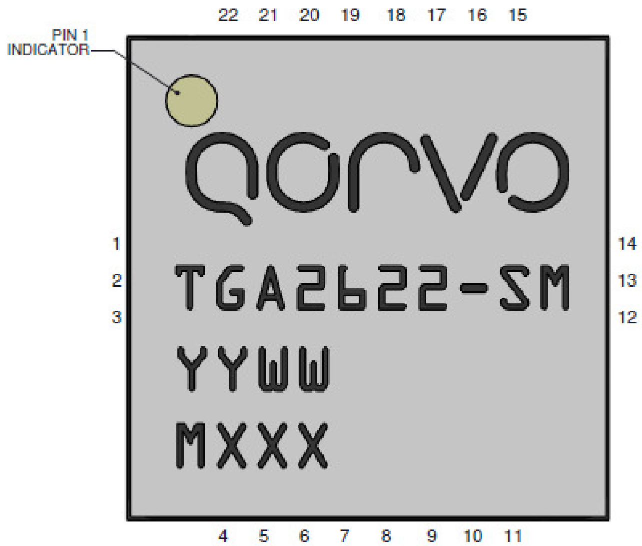
Bias Up Procedure

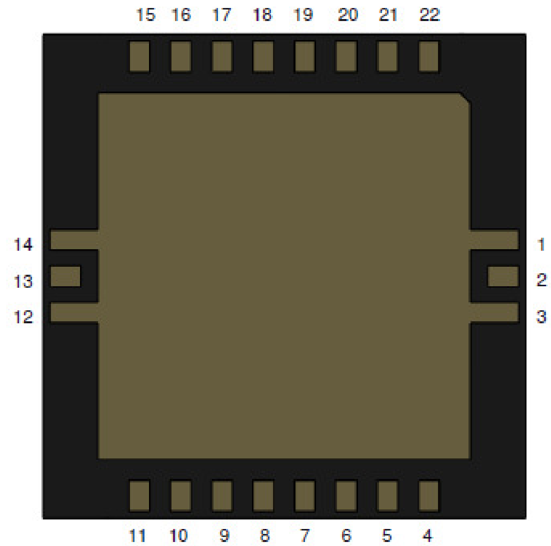
1. Set I_D limit to 3.5 A, I_G limit to 25 mA
2. Set V_G to –5.0 V (for pinch-off)
3. Set V_D +28 V; Ensure I_{DQ} is approx. 0 mA
4. Adjust V_G more positive until I_{DQ} = 290mA (V_G ~ –2.3 V Typical)
5. Apply RF signal

Bias Down Procedure

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

Pin Layout

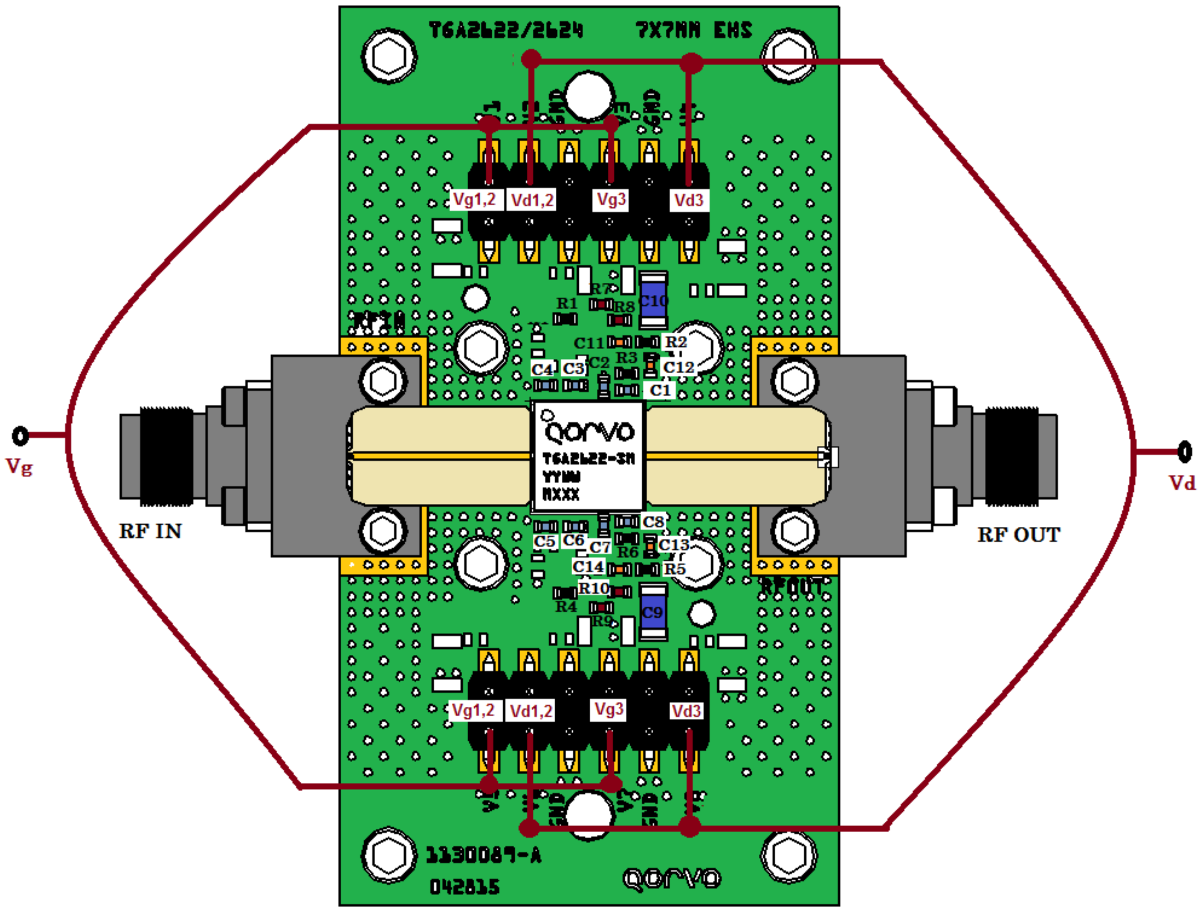




Pin Description

Pin No.	Symbol	Description
1, 3, 12, 14	GND	Must be grounded on the PCB
2	RF_{IN}	Input; matched to 50 Ω; DC blocked
4, 22	$V_{G1,2}$	Gate Voltages 1,2; Bias network is required; must be biased from both sides; see recommended Application Information on page 12.
5, 21	$V_{D1,2}$	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_{G3}	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_{D3}	Drain voltage 3; Bias network is required; must be biased from both sides; see recommended Application Information on page 12.
13	RF_{OUT}	Output; matched to 50 Ω; DC blocked

Evaluation Board Layout

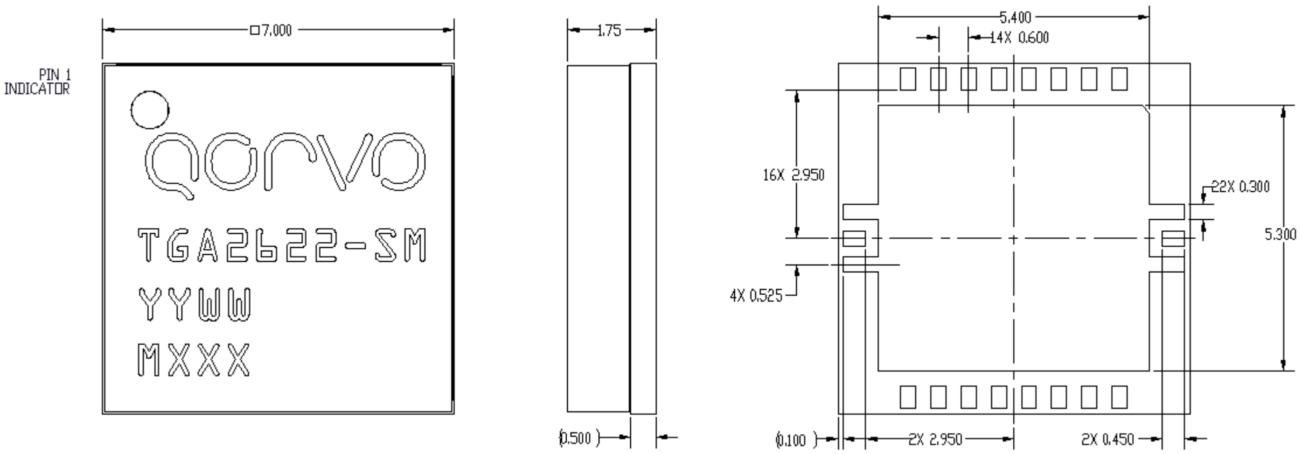


Notes: Both Top and Bottom VD and VG must be biased.

Bill of Materials

Reference Des.	Value	Description	Manuf.	Part Number
C1 – C8	1000 pF	Cap, 0402, 100 V, 10%, X7R	Various	
C9 – C10	10 µF	Cap, 1206, 50 V, 20%, X5R	Various	
C11 – C14	0.01 µF	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



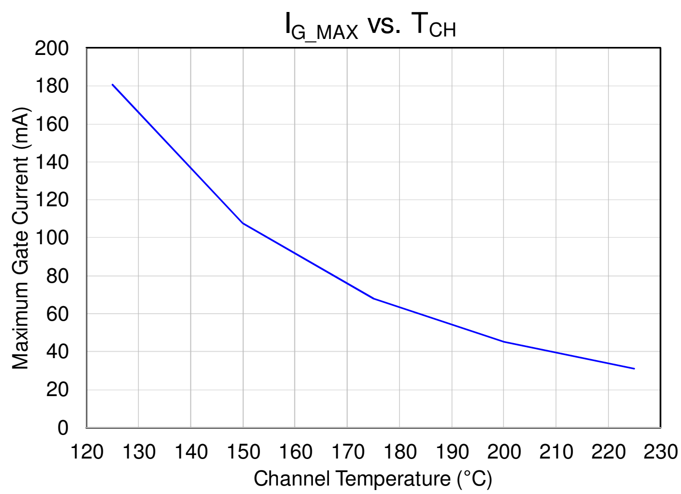
Units: Millimeters (mm)
Tolerances: unless specified
x.xx = ± 0.25; x.xxx = ± 0.100
Materials:
Base: Laminate Substrate
Lid: Laminate
All metalized features are gold plated
Part is epoxy sealed
Marking:
TGA2622-SM: Part number
YY: Part Assembly year
WW: Part Assembly week
MXXX: Batch ID

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 I_{G_MAX} plot
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
Channel Temperature (T_{CH})	275 °C
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.

Notes:



Recommended Soldering Temperature Profile