

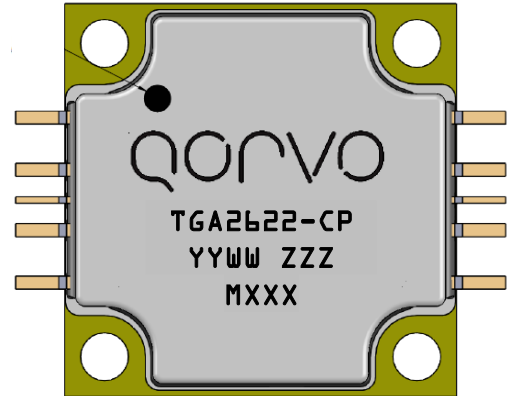
Product Description

Qorvo's TGA2622-CP is a packaged high-power X-Band amplifier fabricated on Qorvo's QGaN25 0.25 um GaN on SiC process. Operating from 9 to 10 GHz, the TGA2622-CP achieves 35 W saturated output power, a power-added efficiency of greater than 43 %, and power gain of 27.5 dB.

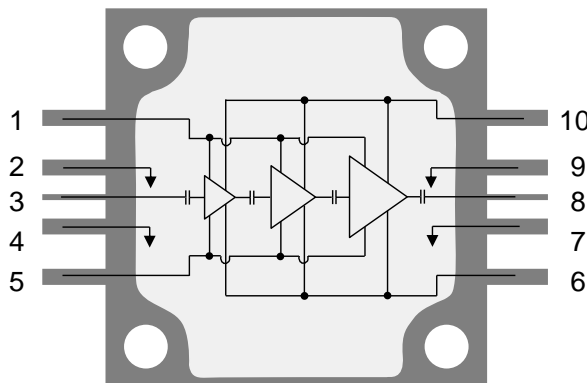
The TGA2622-CP is packaged in a 10-lead 15x15 mm bolt-down package with a Cu base for superior thermal management. It can support a range of bias voltages and performs well under CW and pulsed conditions. Both RF ports are internally DC blocked and matched to 50 ohms allowing for simple system integration.

The TGA2622-CP is ideally suited for both commercial and defense applications.

Lead free and RoHS compliant.



Functional Block Diagram



Product Features

- Frequency Range: 9 – 10 GHz
- P_{SAT} : 45.5 dBm @ $P_{IN} = 18$ dBm
- PAE: > 43 % @ $P_{IN} = 18$ dBm
- Power Gain: 27.5 dB @ $P_{IN} = 18$ dBm
- Bias: $V_D = 28$ V, $I_{DQ} = 290$ mA, $V_G = -2.7$ V typical, pulsed ($PW = 100$ μ s, DC = 10 %)
- Package Dimensions: 15.2 x 15.2 x 3.5 mm
- Package base is pure Cu offering superior thermal management

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

Applications

- Weather and Marine Radar.

Ordering Information

Part No.	Description
TGA2622-CP	9 – 10 GHz 35 W GaN Power Amplifier
1113526	TGA2622-CP Evaluation Board (EVB)

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)	4.3 A
Gate Current (I_G)	See plot page 11
Power Dissipation (P_{DISS}), 85 °C	107 W
Input Power, CW, 50 Ω , (P_{IN})	24 dBm
Input Power, CW, VSWR 3:1, $V_D = 28$ V, 85 °C, (P_{IN})	24 dBm
Mounting Temperature	Refer to Assembly Notes, page 14
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: PW = 100 μ s, DC = 10 %	28 V
Drain Current (I_{DQ})	290 mA
Gate Voltage (V_G)	-2.7 V (Typ.)
Temperature (T_{BASE})	-40 to 85 °C

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

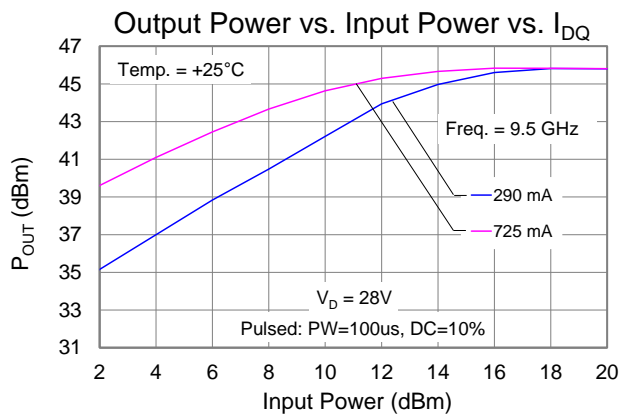
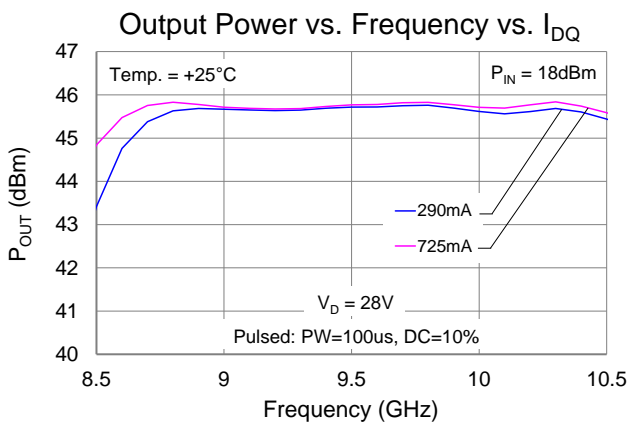
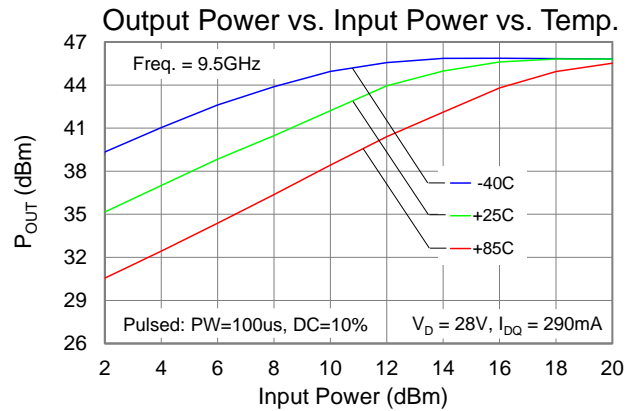
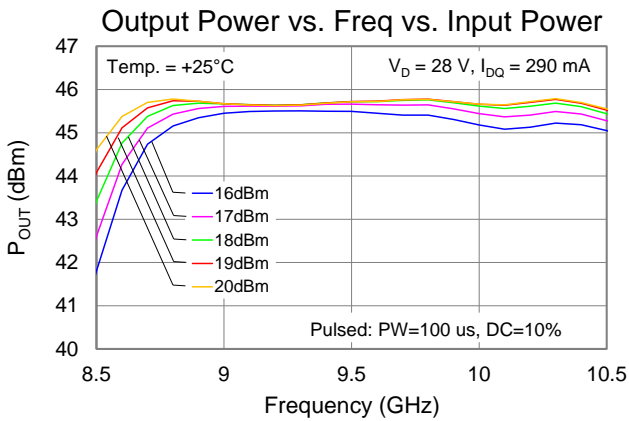
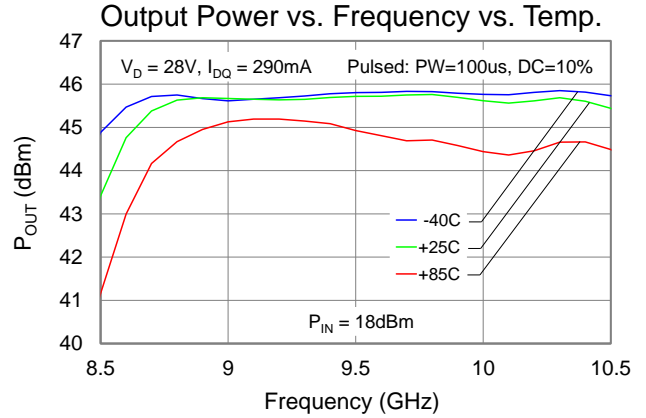
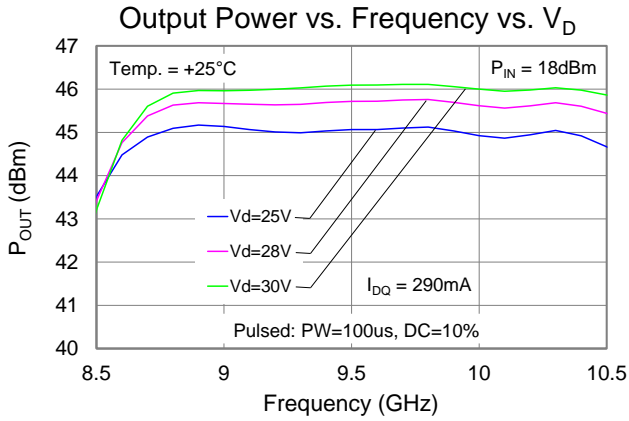
Electrical Specifications

Parameter	Min	Typ	Max	Units
Operational Frequency Range	9		10	GHz
Small Signal Gain		30		dB
Input Return Loss		> 11		dB
Output Return Loss		> 8		dB
Output Power @ $P_{IN} = 18$ dBm		45.5		dBm
Power Added Efficiency @ $P_{IN} = 18$ dBm		> 43		%
Power Gain @ $P_{IN} = 18$ dBm		27.5		dB
Output Power Temperature Coefficient (25 °C to 85 °C only)	Pulsed	-0.019		dBm/°C
	CW	-0.023		
Recommended Operating Voltage	20	28	32	V

Test conditions unless otherwise noted: 25 °C, $V_D = 28$ V (PW = 100 μ s, DC = 10 %), $I_{DQ} = 290$ mA, $V_G = -2.7$ V typical.

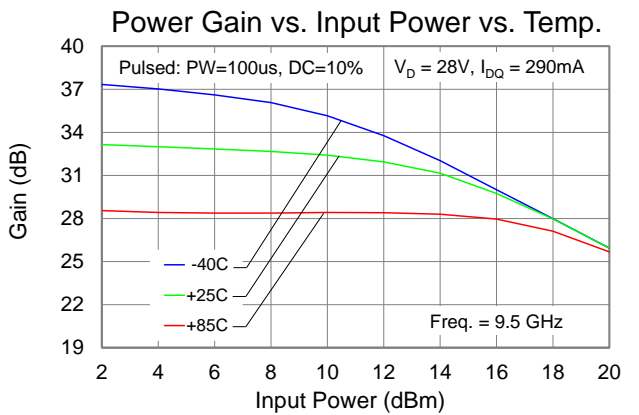
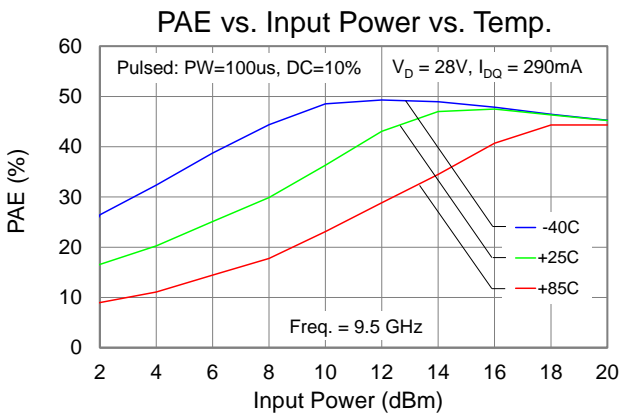
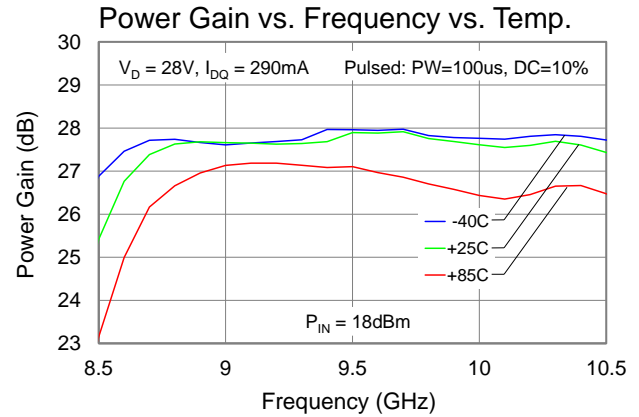
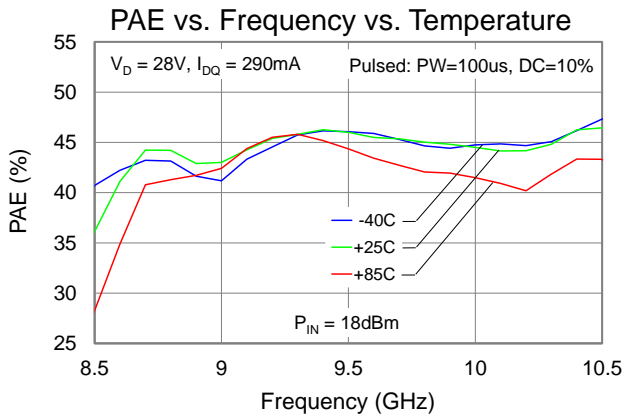
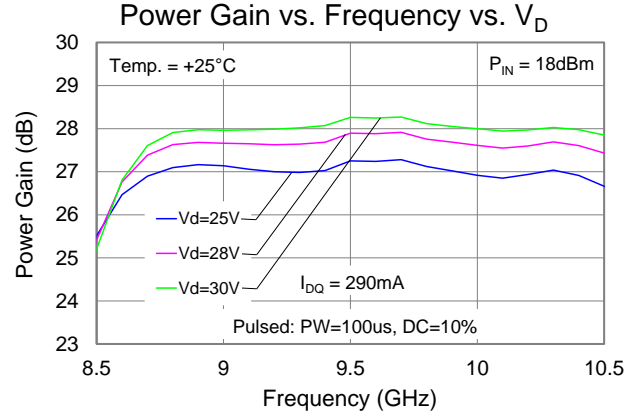
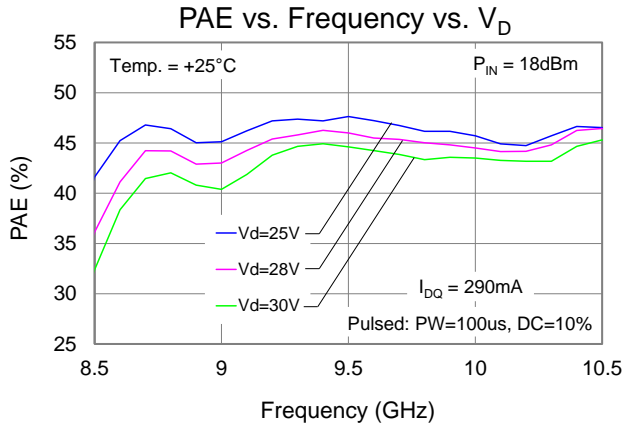
Typical Performance – Large Signal (Pulsed)

Conditions unless otherwise specified: $V_D = 28\text{ V}$, $I_{DQ} = 290\text{ mA}$, $V_G = -2.7\text{ V}$ typical.



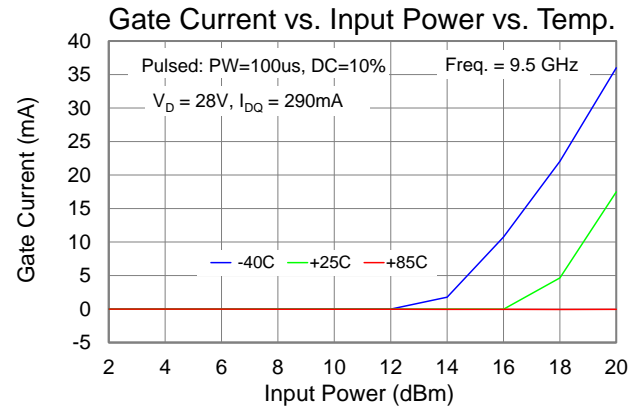
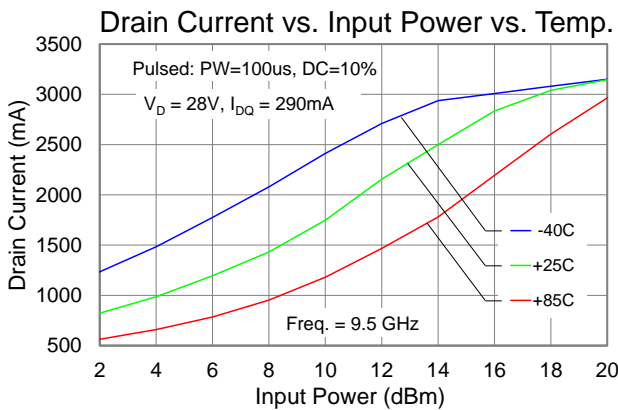
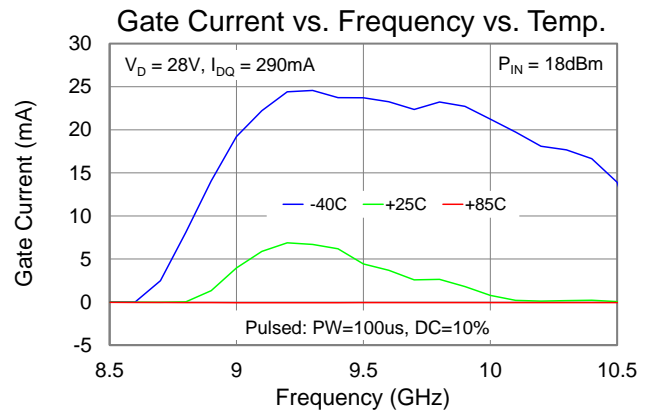
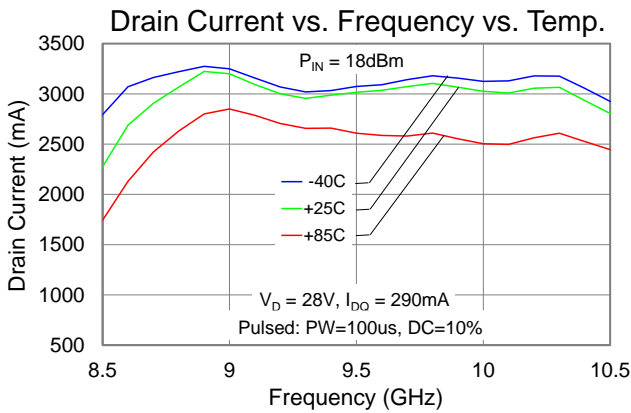
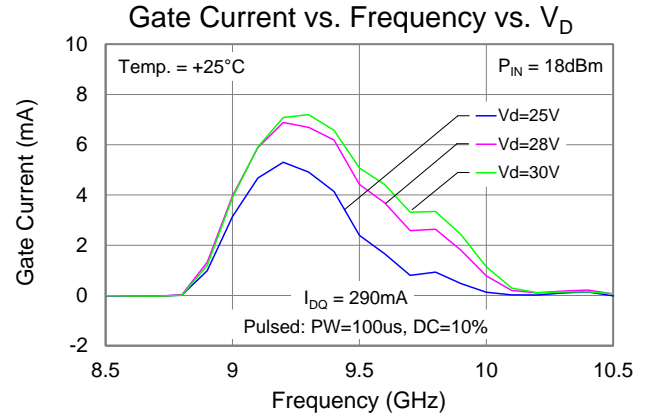
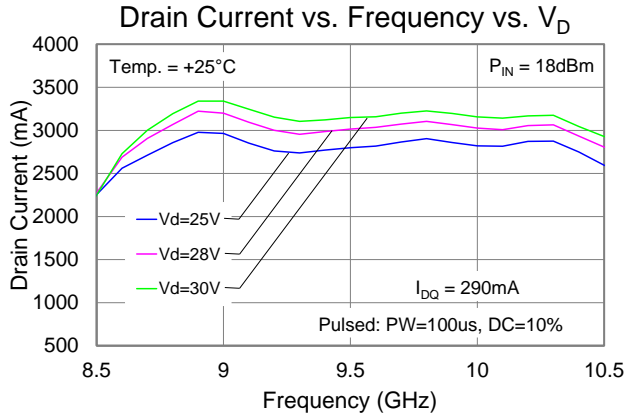
Typical Performance – Large Signal (Pulsed)

Conditions unless otherwise specified: $V_D = 28\text{ V}$, $I_{DQ} = 290\text{ mA}$, $V_G = -2.7\text{ V}$ typical.



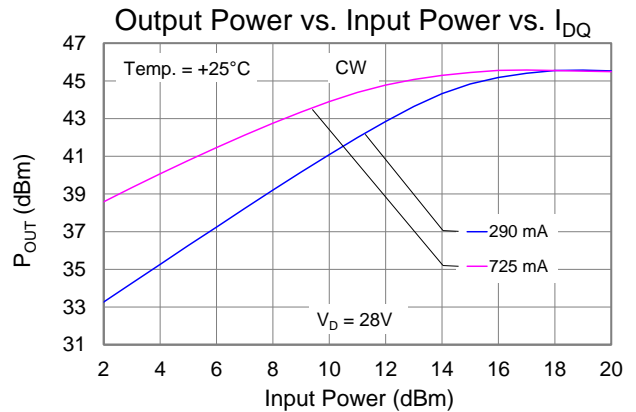
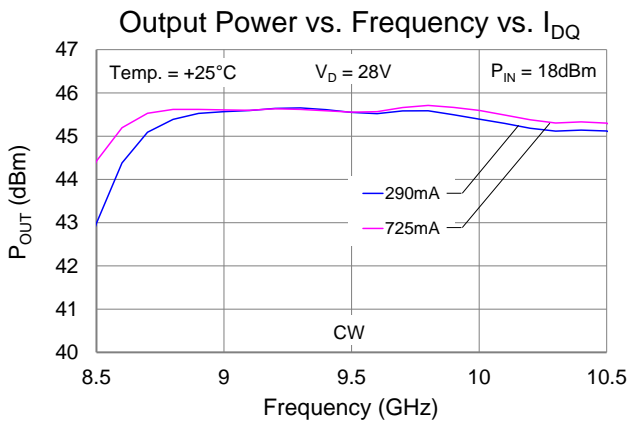
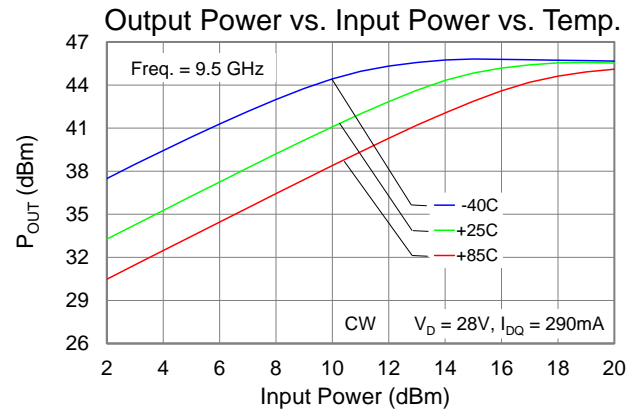
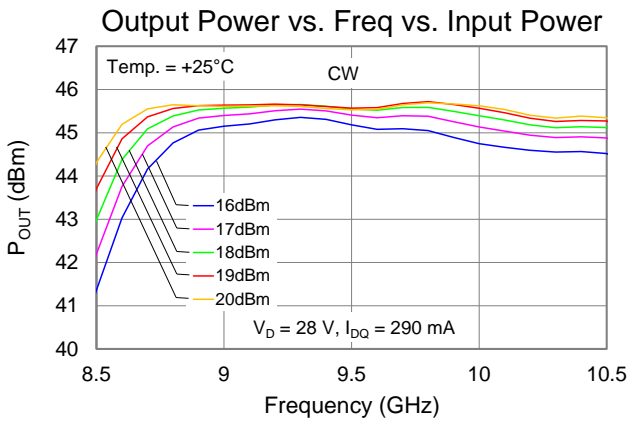
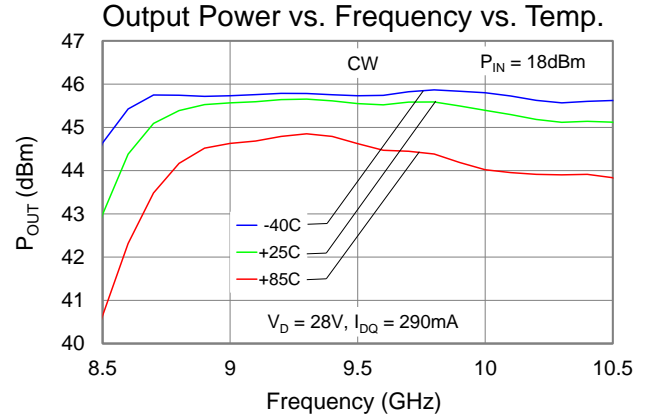
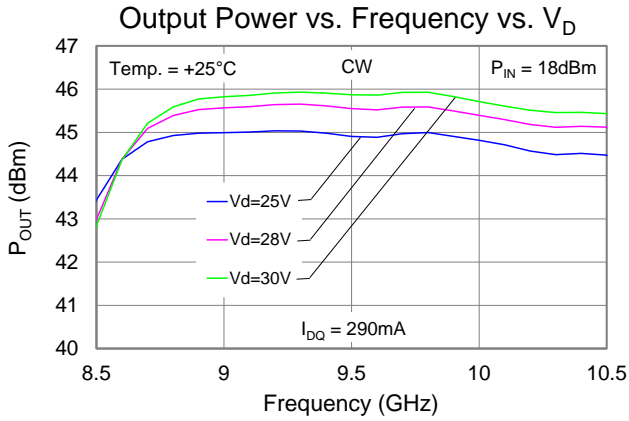
Typical Performance – Large Signal (Pulsed)

Conditions unless otherwise specified: $V_D = 28\text{ V}$, $I_{DQ} = 290\text{ mA}$, $V_G = -2.7\text{ V}$ typical.



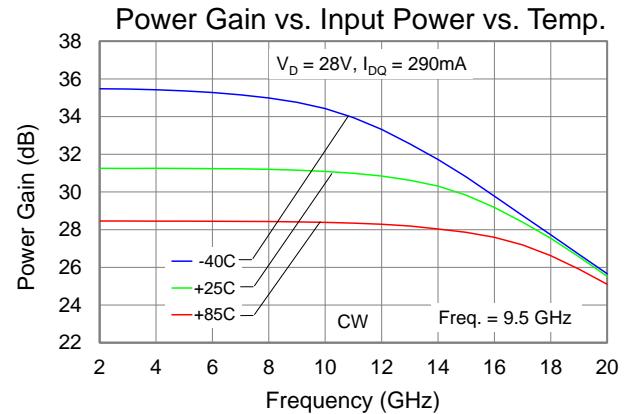
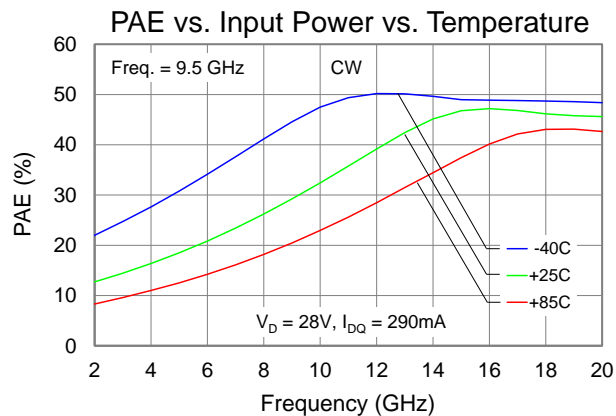
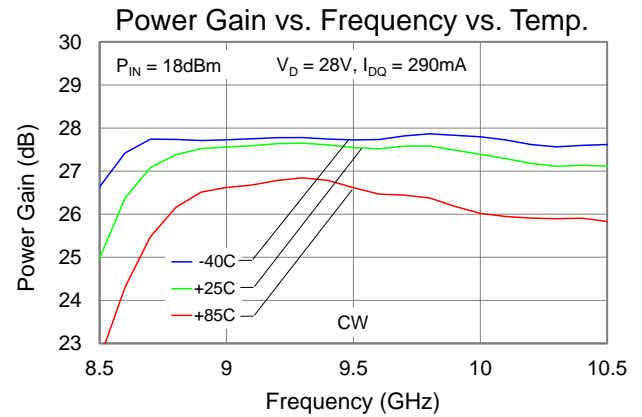
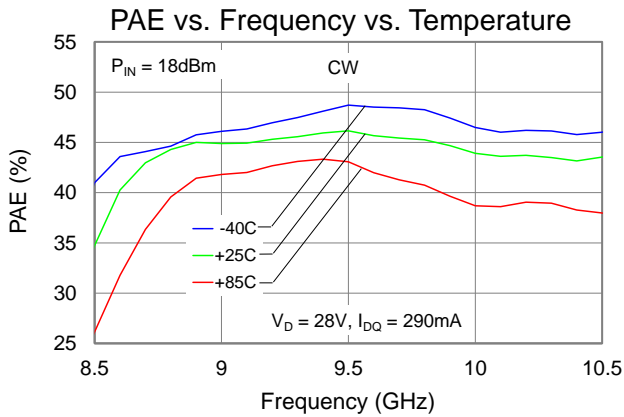
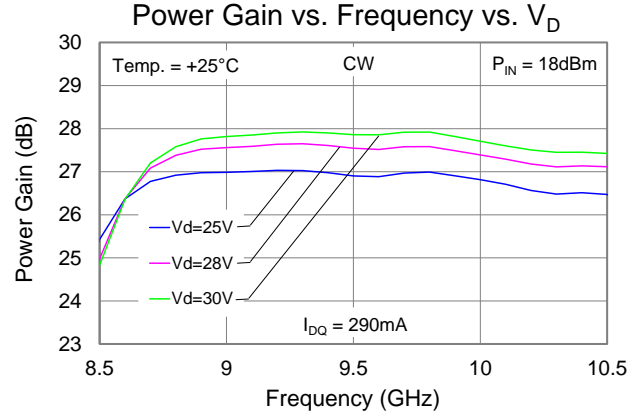
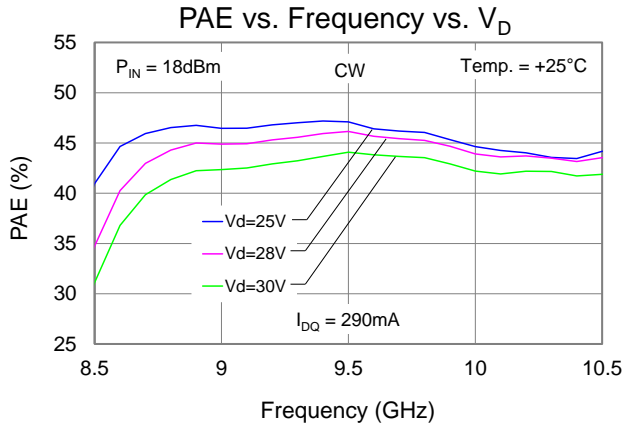
Performance Plots – Large Signal (CW)

Conditions unless otherwise specified: $V_D = 28\text{ V}$, $I_{DQ} = 290\text{ mA}$, $V_G = -2.7\text{ V}$ typical.



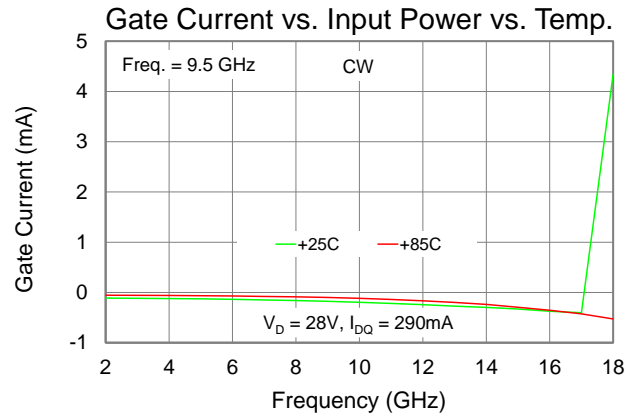
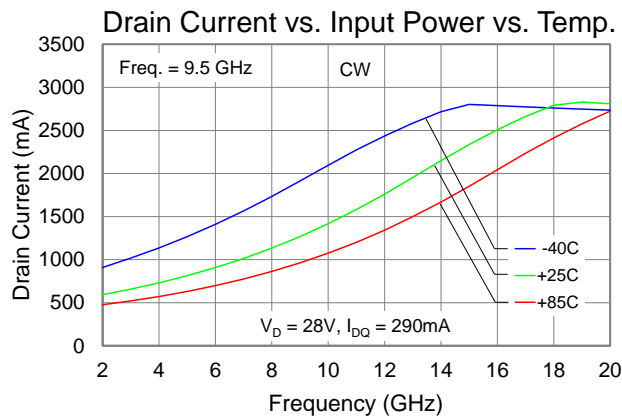
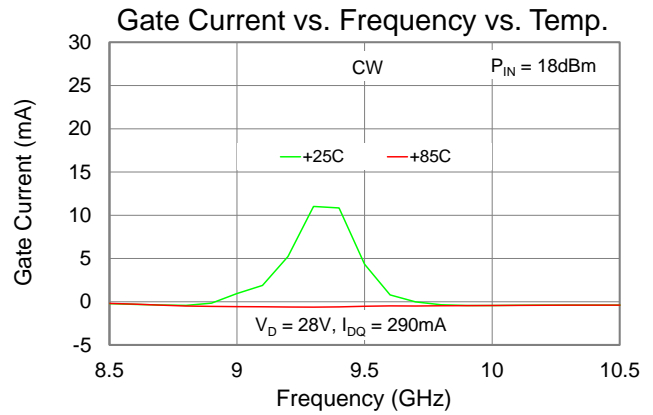
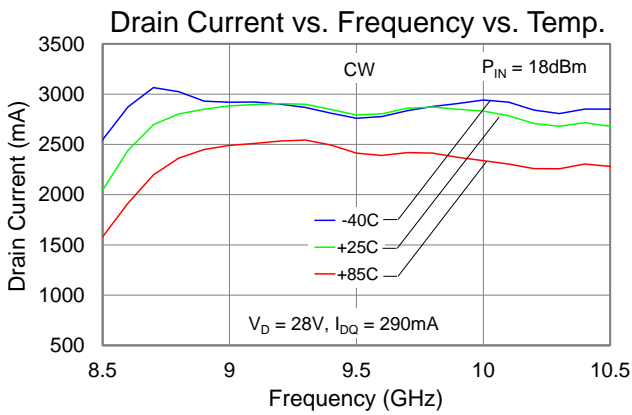
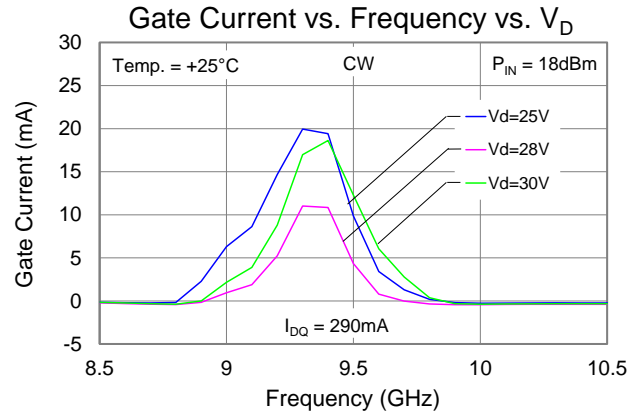
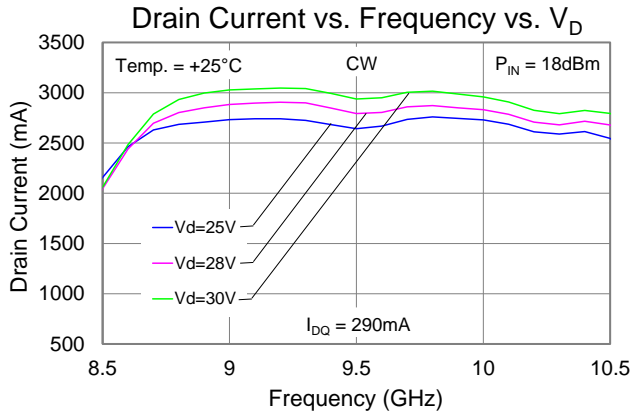
Performance Plots – Large Signal (CW)

Conditions unless otherwise specified: $V_D = 28\text{ V}$, $I_{DQ} = 290\text{ mA}$, $V_G = -2.7\text{ V}$ typical.



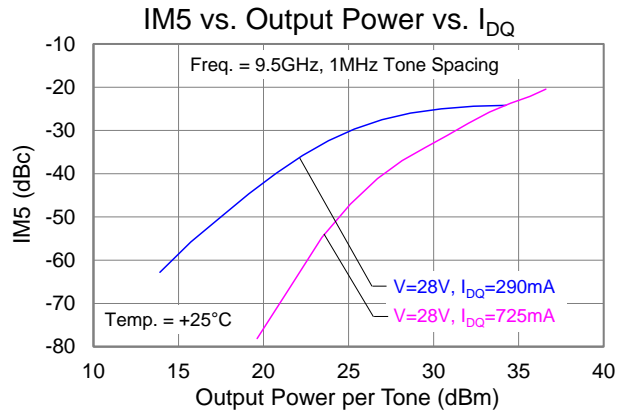
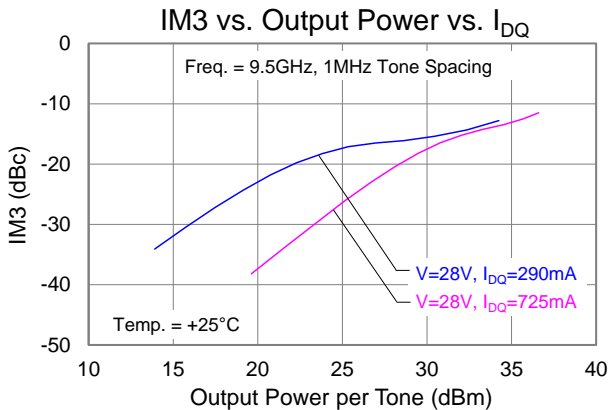
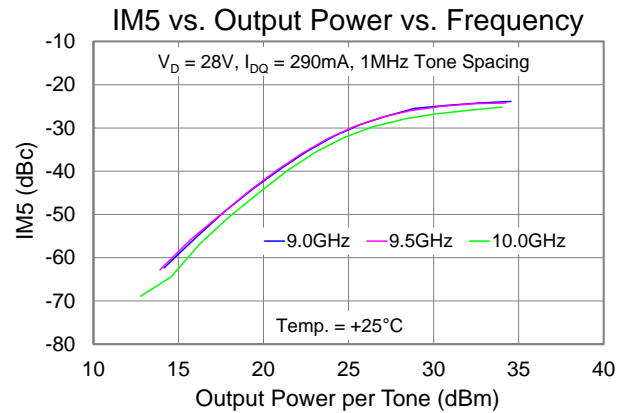
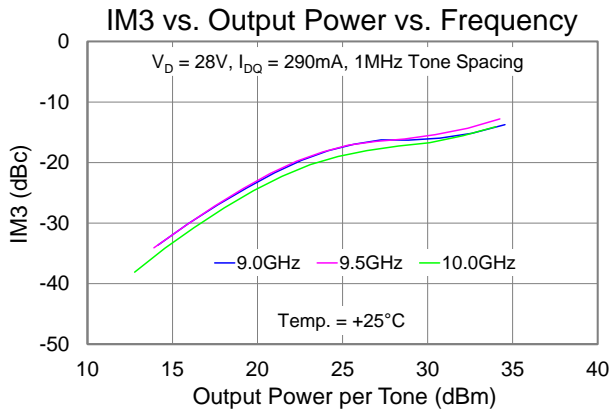
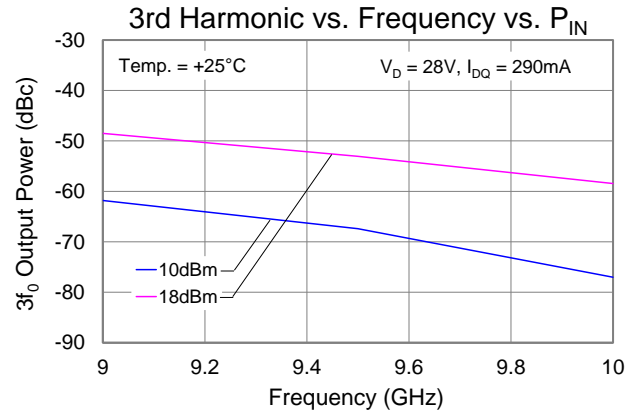
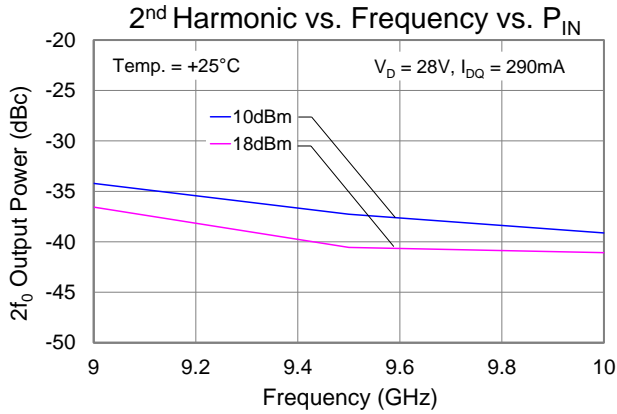
Performance Plots – Large Signal (CW)

Conditions unless otherwise specified: $V_D = 28\text{ V}$, $I_{DQ} = 290\text{ mA}$, $V_G = -2.7\text{ V}$ typical.



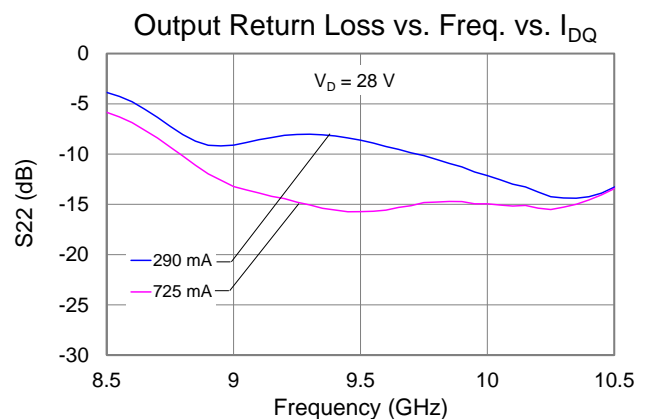
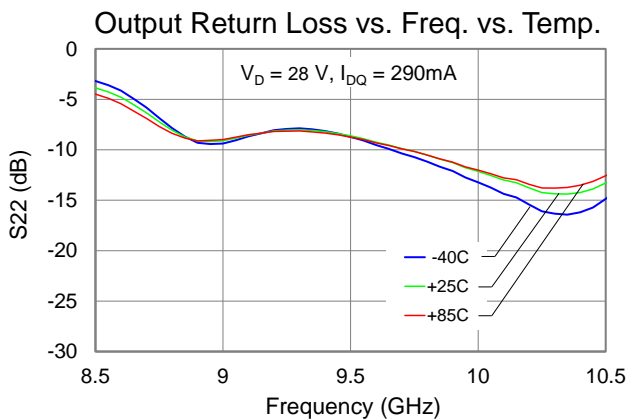
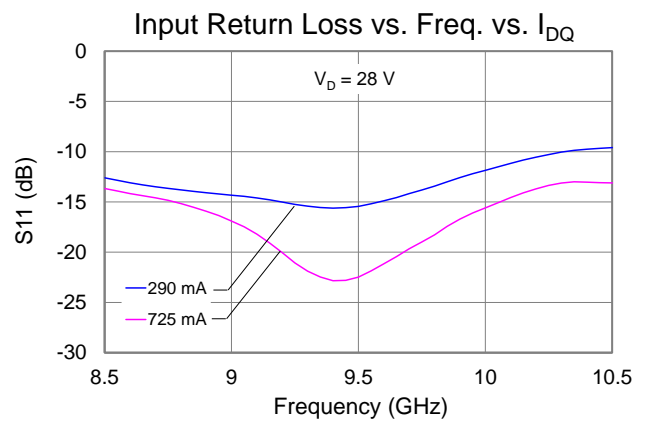
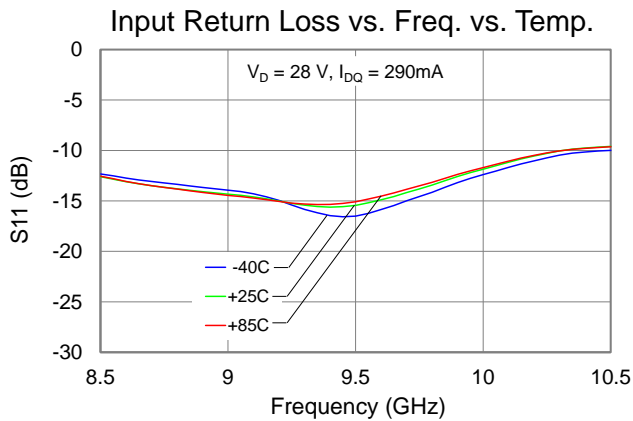
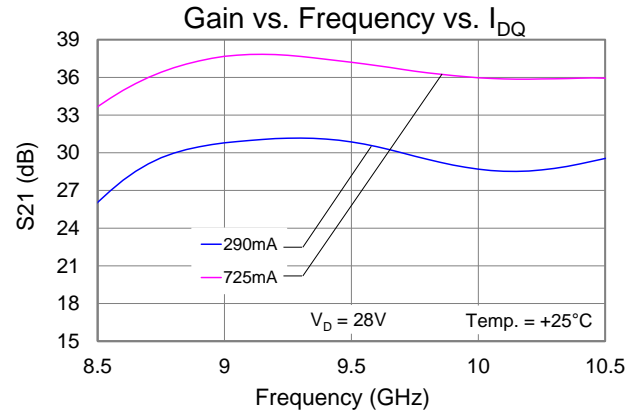
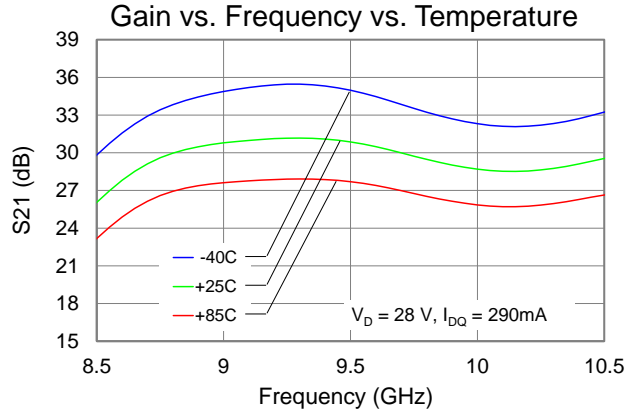
Typical Performance – Linearity (CW)

Conditions unless otherwise specified: $V_D = 28\text{ V}$, $I_{DQ} = 290\text{ mA}$, $V_G = -2.7\text{ V}$ typical.



Typical Performance – Small Signal (CW)

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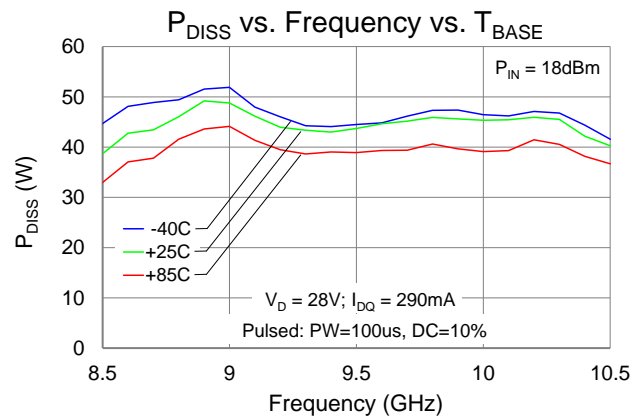
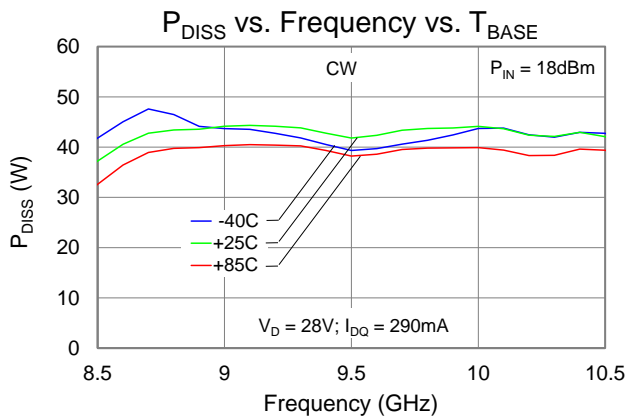
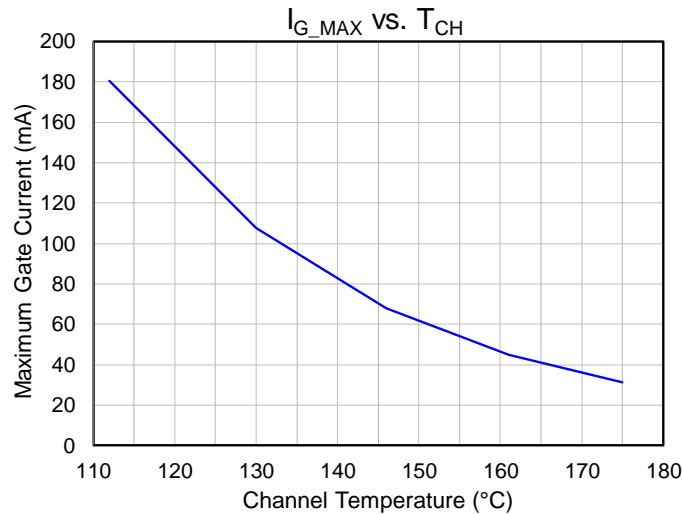
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) ⁽¹⁾	CW, $V_D = 28\text{ V}$, $I_{DQ} = 290\text{ mA}$,	1.222	$^{\circ}\text{C}/\text{W}$
Channel Temperature (T_{CH}) (under RF drive)	$T_{BASE} = 85^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{D_Drive} = 2.7\text{ A}$ $P_{IN} = 20\text{ dBm}$, $P_{OUT} = 44.8\text{ dBm}$, $P_{DISS} = 45\text{ W}$	140	$^{\circ}\text{C}$
Thermal Resistance (θ_{JC}) ⁽¹⁾	$V_D = 28\text{ V}$, $I_{DQ} = 290\text{ mA}$,	0.788	$^{\circ}\text{C}/\text{W}$
Channel Temperature (T_{CH}) (under RF drive)	(Pulsed: $PW = 100\text{ }\mu\text{s}$, $DC = 10\%$), $T_{BASE} = 85^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{D_Drive} = 3.2\text{ A}$ $P_{IN} = 20\text{ dBm}$, $P_{OUT} = 45.6\text{ dBm}$, $P_{DISS} = 52\text{ W}$	126	$^{\circ}\text{C}$

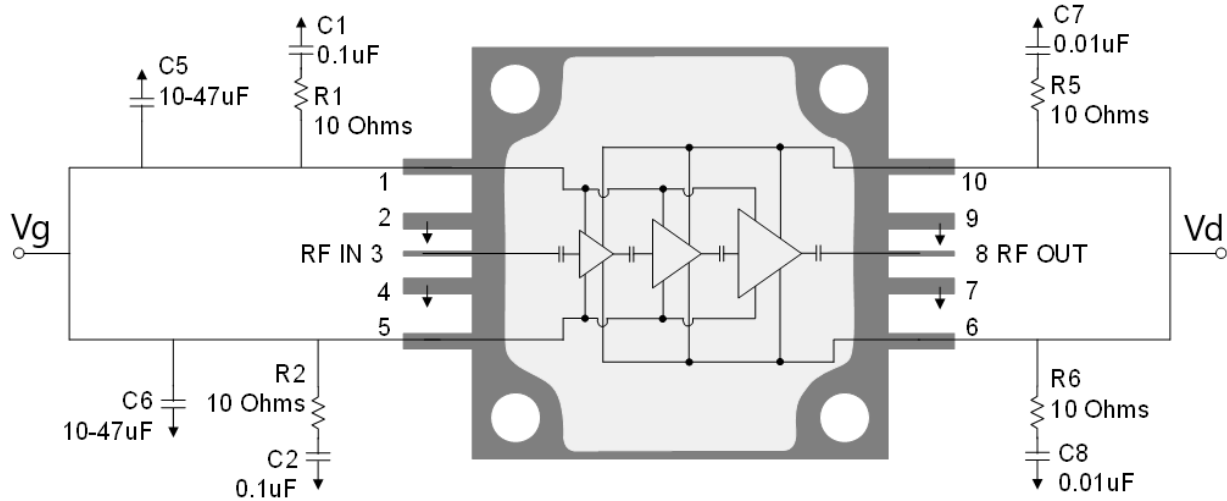
Notes:

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

Power Dissipation and Maximum Gate Current



Applications Information and Pin Layout



Bias Up Procedure

1. Set I_D limit to 3.5 A, I_G limit to 25 mA
2. Apply -5 V to V_G
3. Apply $+28\text{ V}$ to V_D ; ensure I_{DQ} is approx. 0 mA
4. Adjust V_G until $I_{DQ} = 290\text{ mA}$ ($V_G \sim -2.7\text{ V Typ.}$).
5. Turn on RF supply

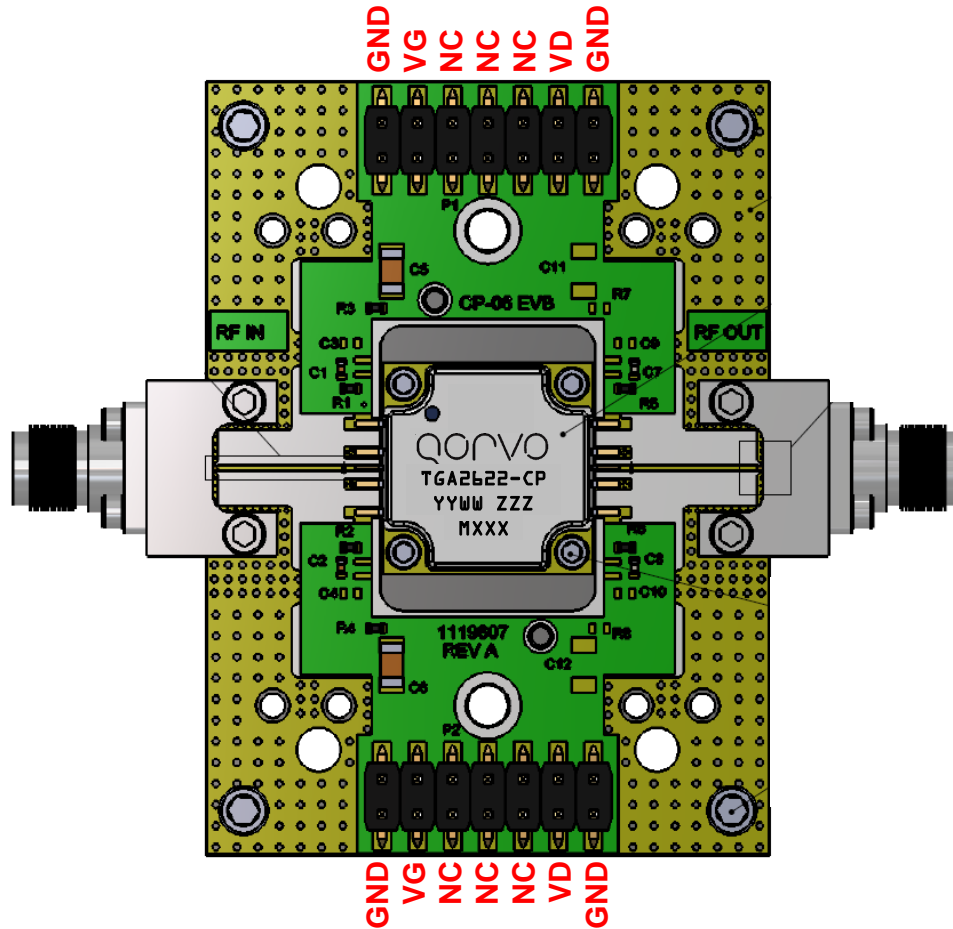
Bias Down Procedure

1. Turn off RF supply
2. Reduce V_G to -5 V ; ensure I_{DQ} is approx. 0 mA
3. Set V_D to 0 V
4. Turn off V_D supply
5. Turn off V_G supply

Pin Description

Pad No.	Symbol	Description
1, 5	V_G	Gate Voltage; Bias network is required; must be biased from both sides; see recommended Application Information above.
3	RF_{IN}	Output; matched to $50\ \Omega$; DC blocked
2, 4, 7, 9	GND	Must be grounded on the PCB.
6, 10	V_D	Drain voltage; Bias network is required; must be biased from both sides; see recommended Application Information above.
8	RF_{OUT}	Input; matched to $50\ \Omega$; DC blocked

Evaluation Board (EVB)



NOTES:

- (1) Both Top and Bottom Vd and Vg must be biased.
- (2) PCB is made from Rogers 4003C dielectric, 0.008 inch thick. 0.5 oz. copper both sides.

Bill of Materials

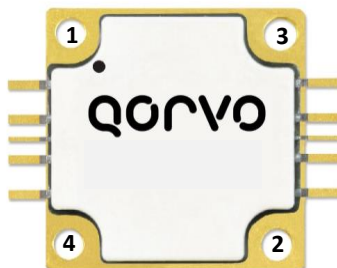
Reference Des.	Value	Description	Manuf.	Part Number
C1, C2	0.1 uF	Cap, 0402, 50 V, 10%, X7R	Various	
C5, C6	10-47 uF	Cap, 1206, 50 V, 20%, X5R (10 V is OK)	Various	
C7, C8	0.01 uF	Cap, 0402, 50V, 10%, X7R	Various	
R1, R2, R5, R6	10 Ω	Res, 0402, 50V, 5%	Various	
R3, R4	0 Ω	Res, 0402, jumper required for the above EVB design	Various	

Assembly Notes

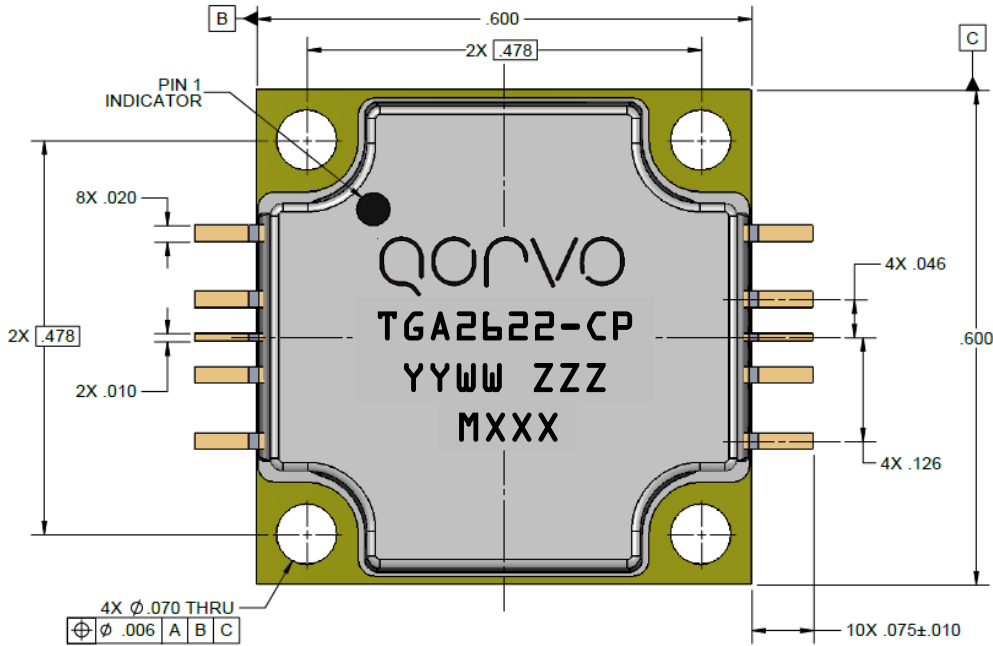
1. Carefully clean the PC board, base plate, and package leads with alcohol. Allow it to dry fully.
2. To improve the thermal and RF performance, Qorvo recommends attaching a heat sink to the bottom of the package and apply either a thermal compound (Arctic Silver 5 recommended) or a .004 inch (maximum thickness) Indium shim between the heat sink and the package. Refer to the applications note [Application of Arctic Silver 5 Thermal Compound and Indium Shims for Qorvo CP-style Packaged Components](#) for more information.
3. The component leads should be manually soldered. Apply a low residue solder alloy meeting J-STD-001 (ROLO, ROL1 or equivalent) with a liquidus temperature below 220 °C to each pin of the TGA2622-CP. The use of low residue/no-clean flux (ROLO, ROL1) is recommended. The package lead temperature should not exceed 260 deg C. Each solder connection should be completed within 2 to 5 seconds. Adding flux during hand soldering of the component leads with localized spot cleaning is acceptable. Soldering irons meeting the requirements of J-STD-001, Appendix A are acceptable.
4. The leads should be soldered in a staggered or star pattern from side to side, and never solder two adjacent leads. This allows the heat to dissipate on each lead, and not cause the adjacent leads to become de-soldered and damaged or displaced.



5. The packaged part should not be subjected to conventional SMT automated solder reflow processes.
6. (The following is for information only. There are many variables in a second level assembly that Qorvo does not control, so Qorvo does not recommend an absolute torque value.) Use screws to attach the component to the heat sink. A suggested final torque value is 16 in-oz. for a 0-80 screw. Start with screws finger tight, then torque to 8 in-oz., then torque to final value. Use the following tightening pattern:



Mechanical Information



NOTES:

1. MATERIALS
PACKAGE BASE: COPPER
LEADS: ALLOY 194
LID: PLASTIC
FINISH: GOLD
2. PART IS EPOXY SEALED
3. UNITS: INCHES
4. TOLERANCES (UNLESS NOTED):
.XX = ± .01
.XXX = ± .005
5. MARKINGS
PART NUMBER: TGA2622-CP
WORK YEAR: YY
WORK WEEK: WW
SERIAL NUMBER: ZZZ
BATCH ID: MXXX

