

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.

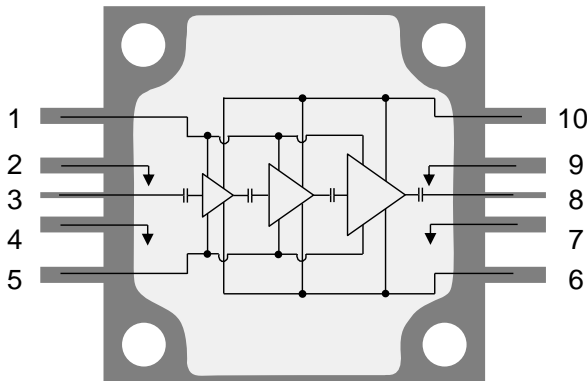
The TGA2622-CP is packaged in a 10-lead 15x15 mm bolt-down package with a Cu base for superior thermal management. It can support a range of bias voltages and performs well under CW and pulsed conditions. Both RF ports are internally DC blocked and matched to 50 ohms allowing for simple system integration.

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 (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: 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.

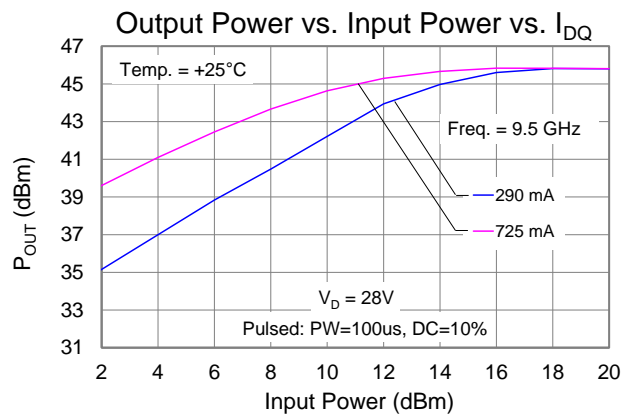
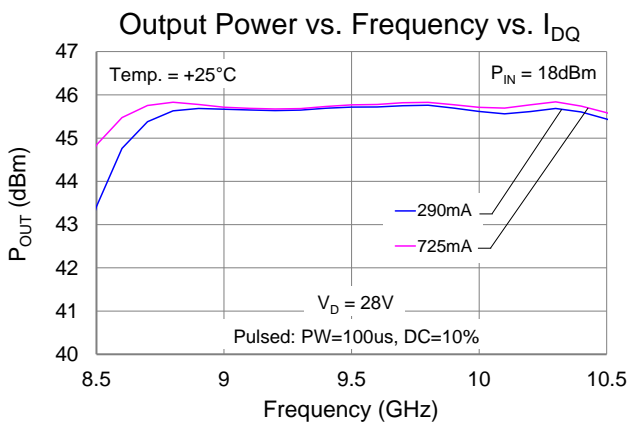
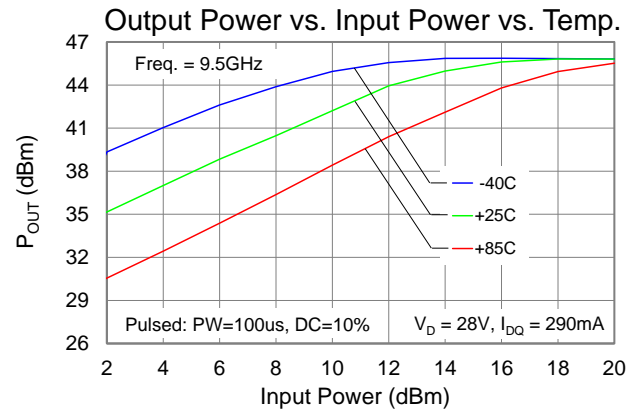
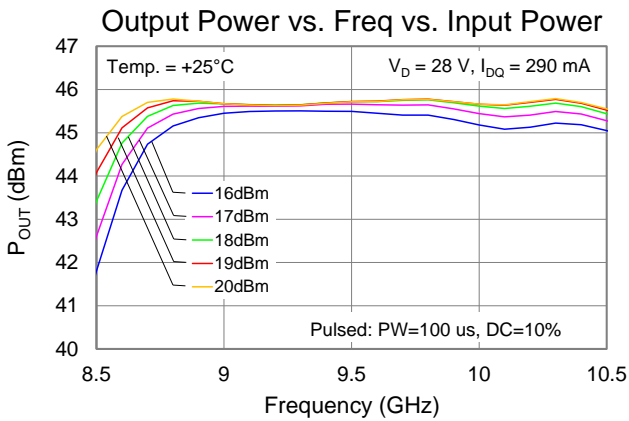
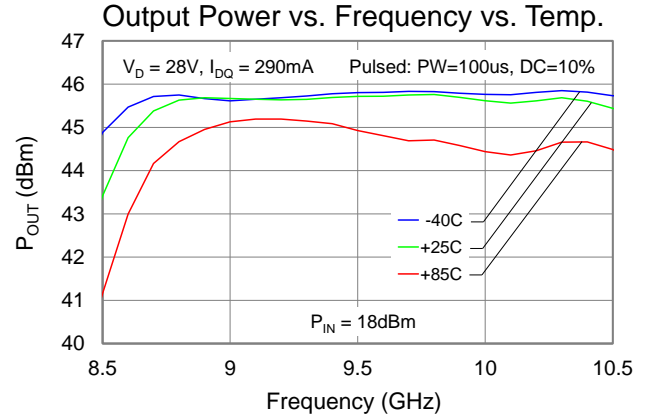
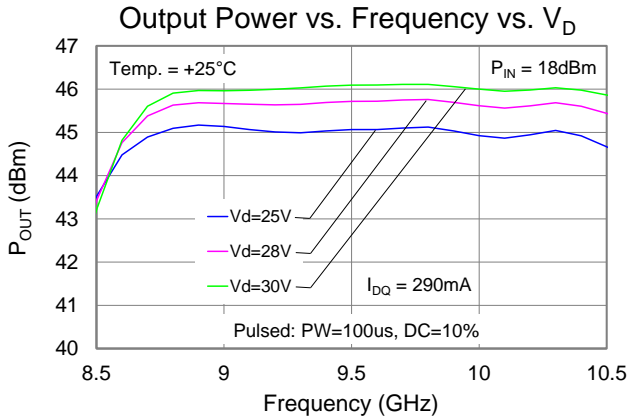
Electrical Specifications

| 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.

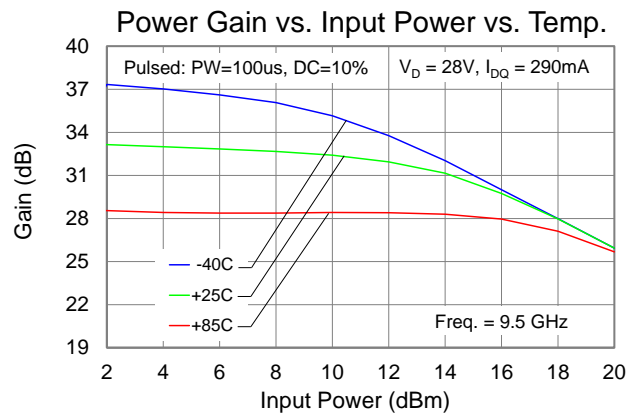
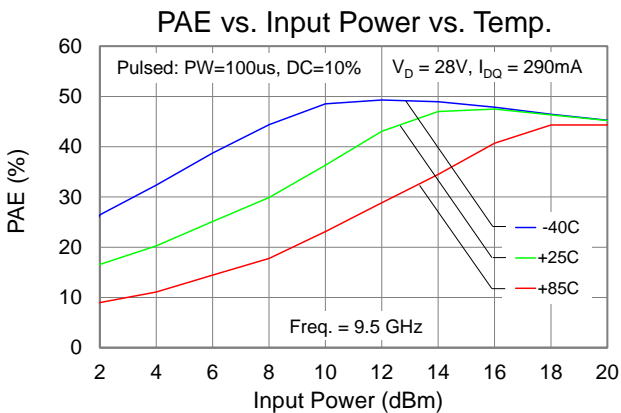
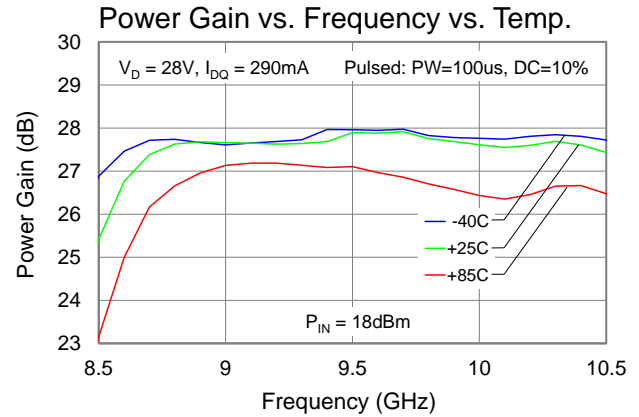
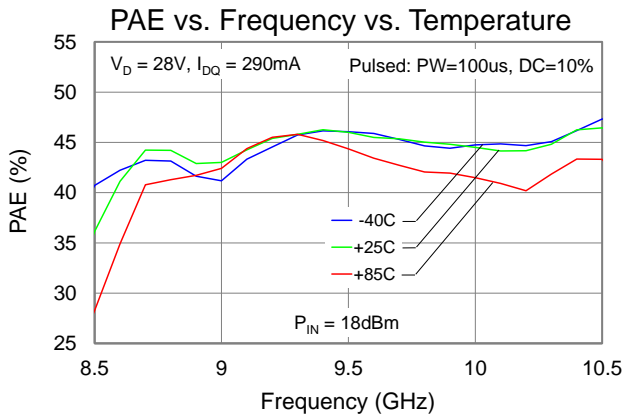
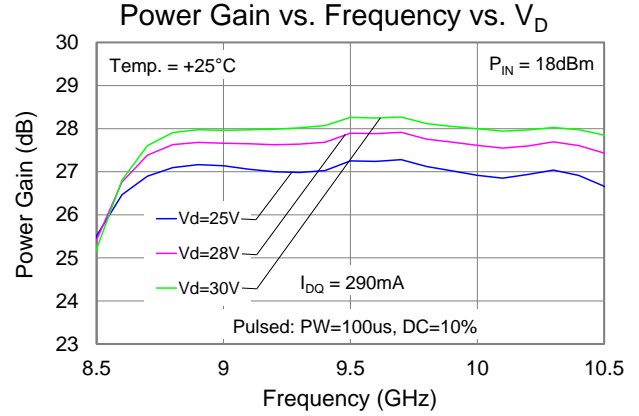
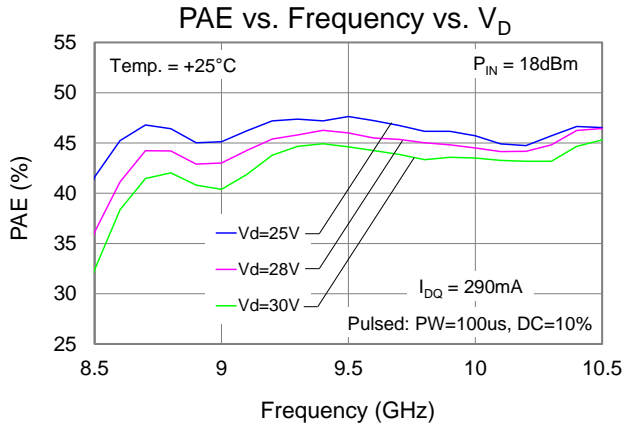
Typical Performance – Large Signal (Pulsed)

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



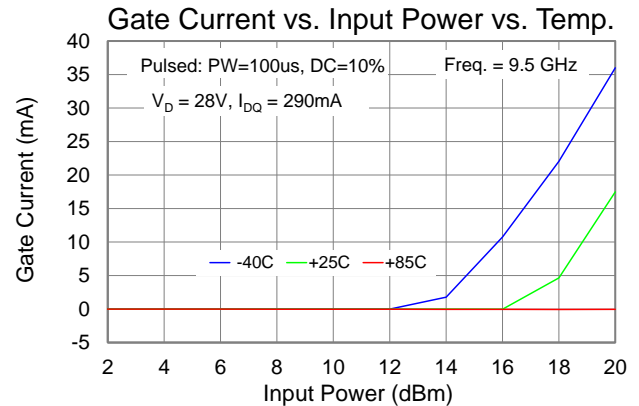
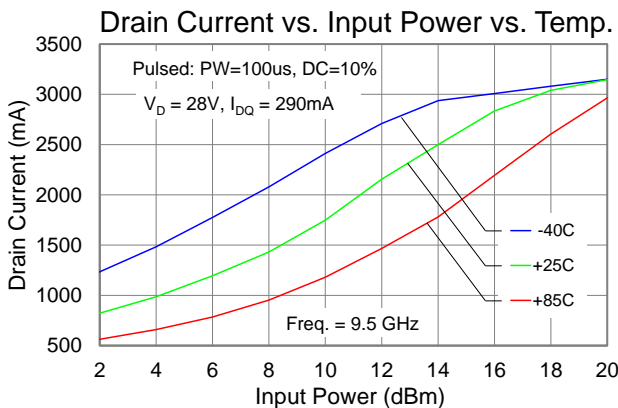
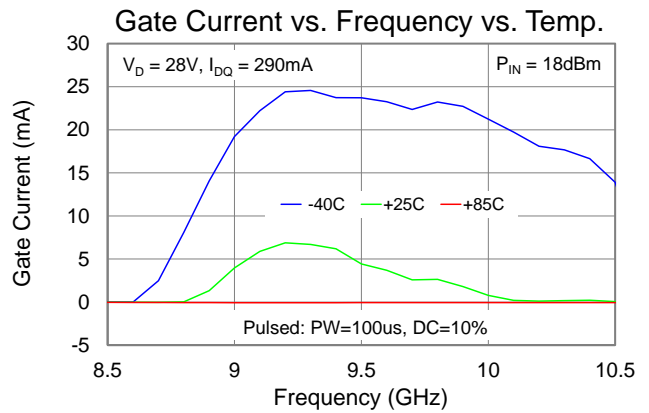
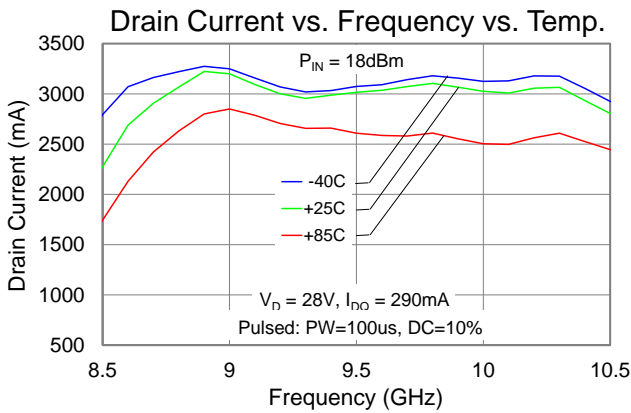
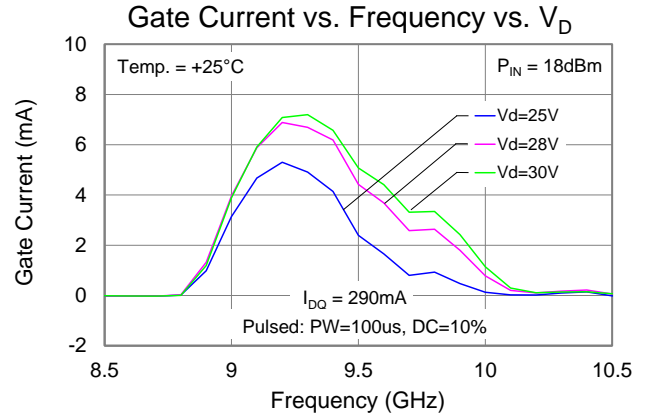
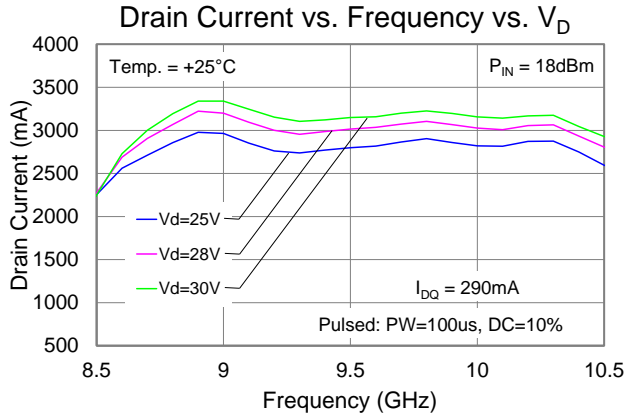
Typical Performance – Large Signal (Pulsed)

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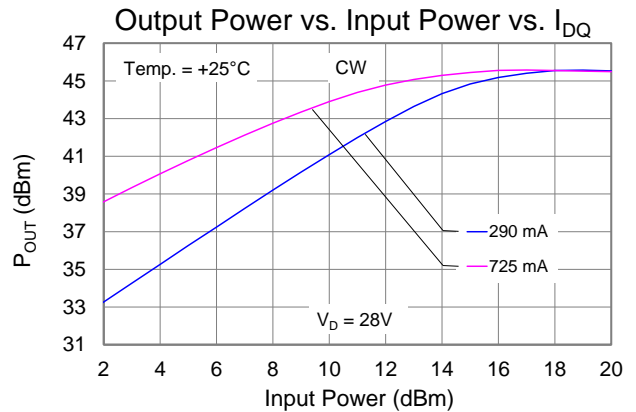
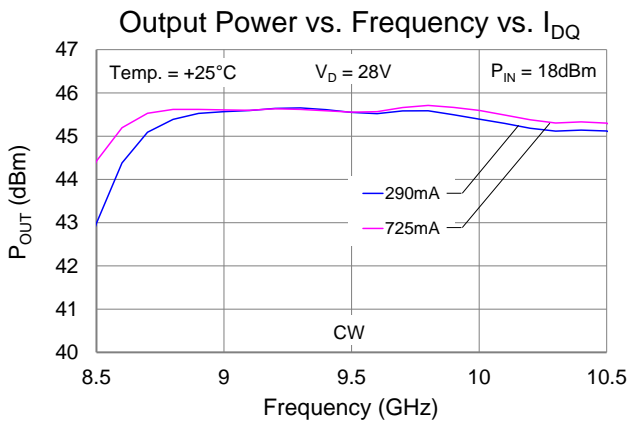
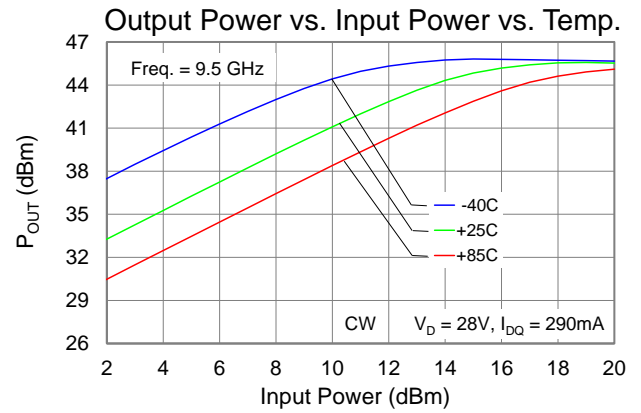
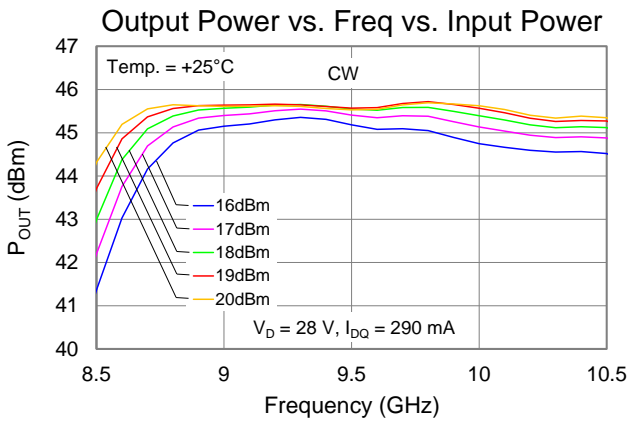
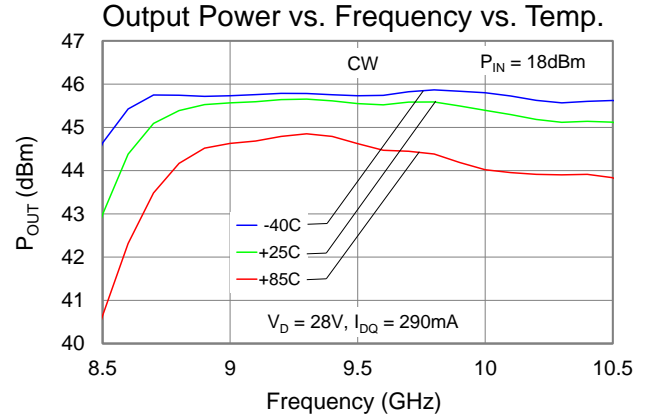
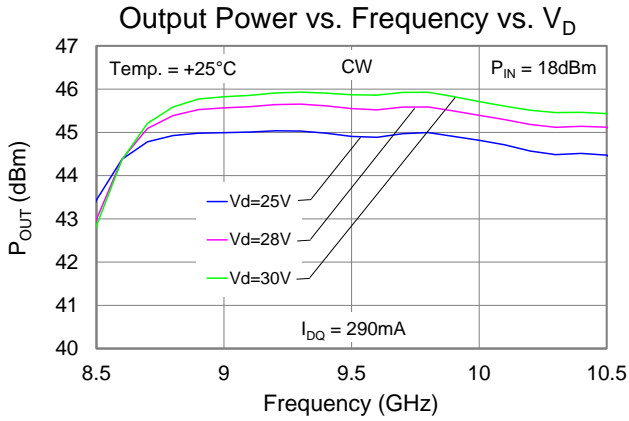
Typical Performance – Large Signal (Pulsed)

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



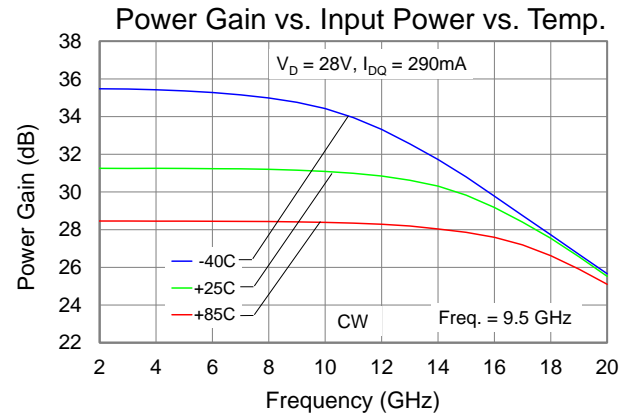
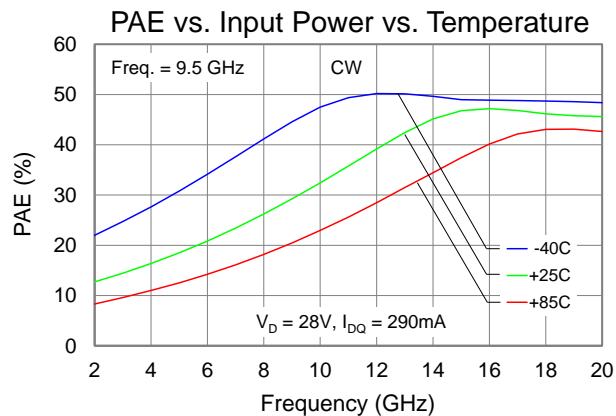
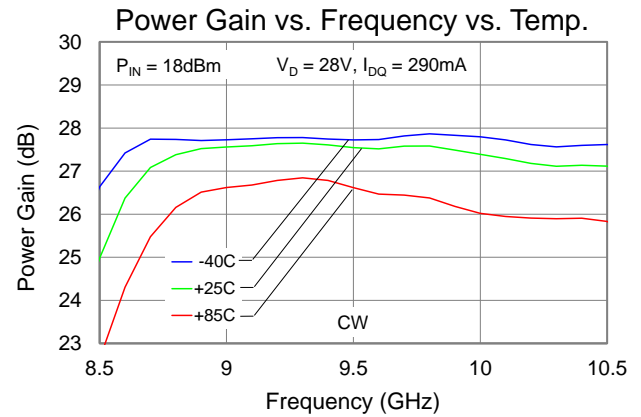
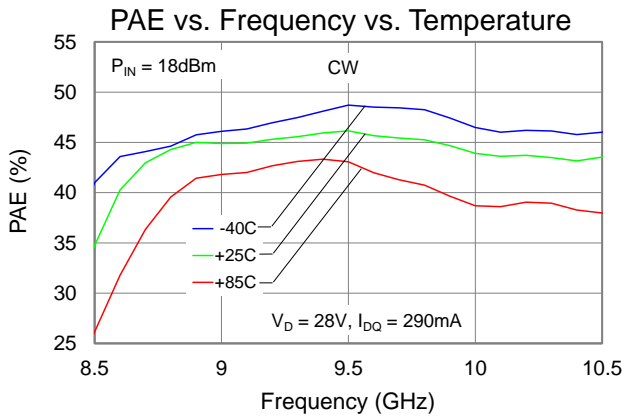
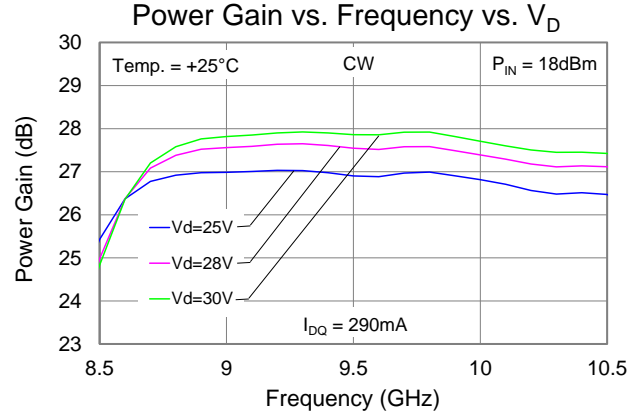
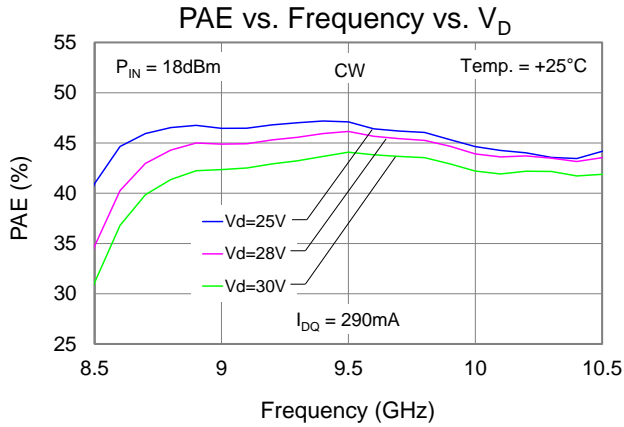
Performance Plots – Large Signal (CW)

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



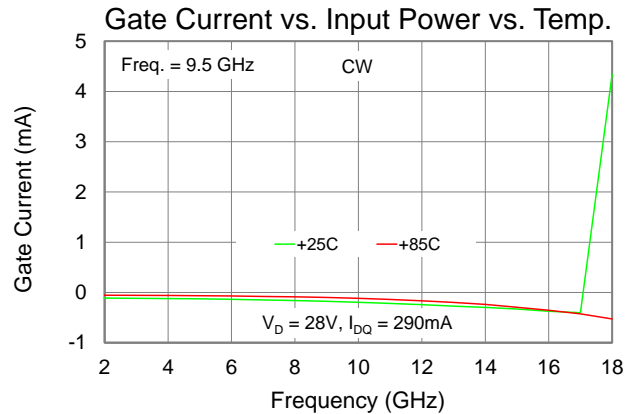
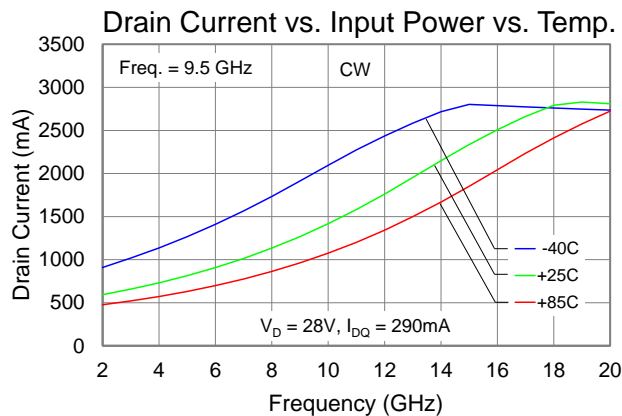
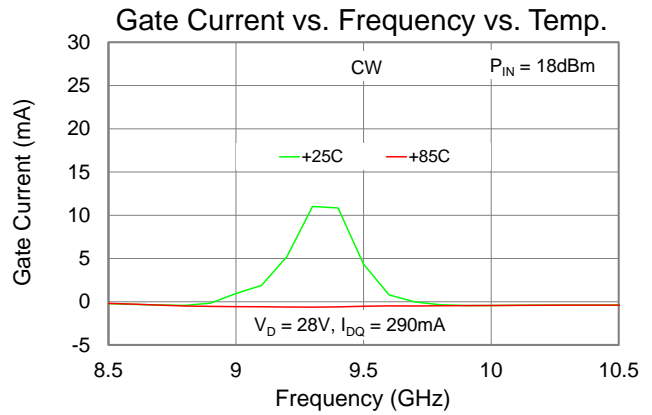
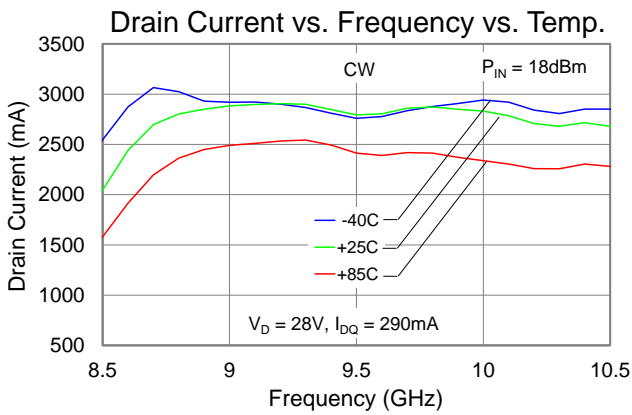
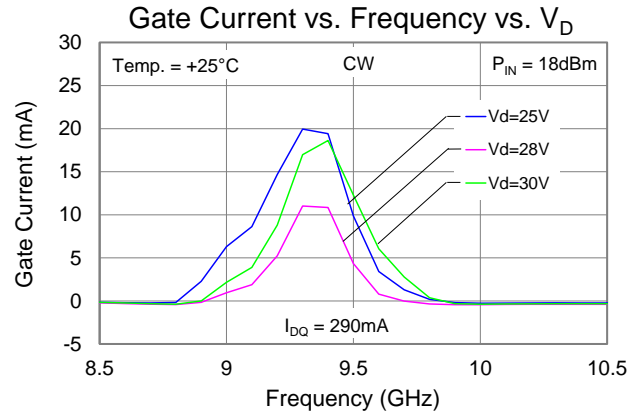
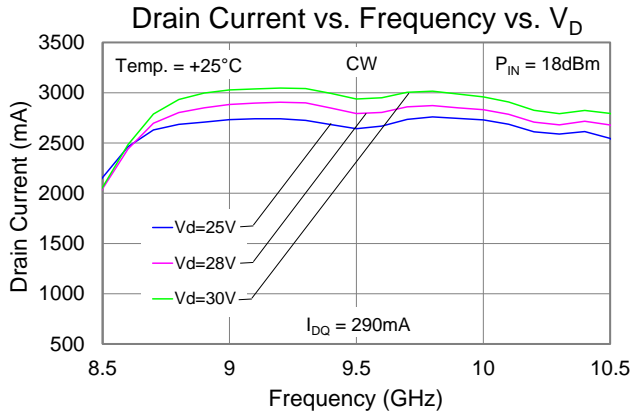
Performance Plots – Large Signal (CW)

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



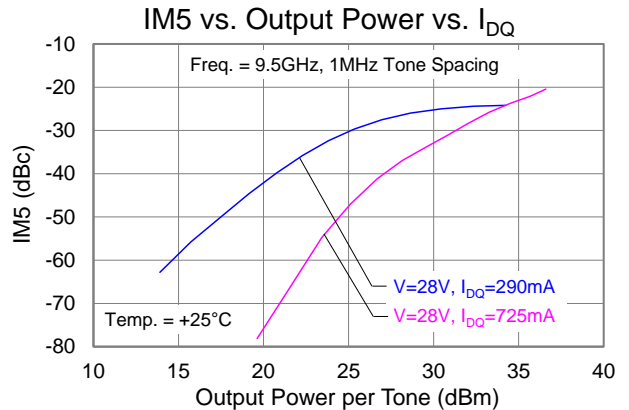
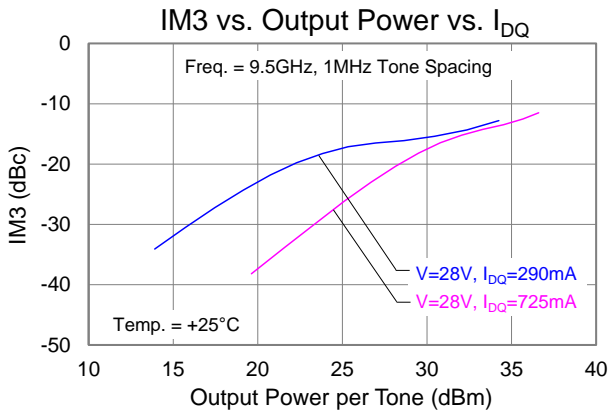
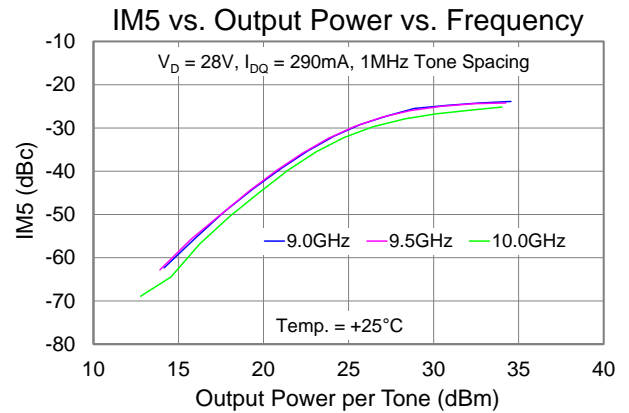
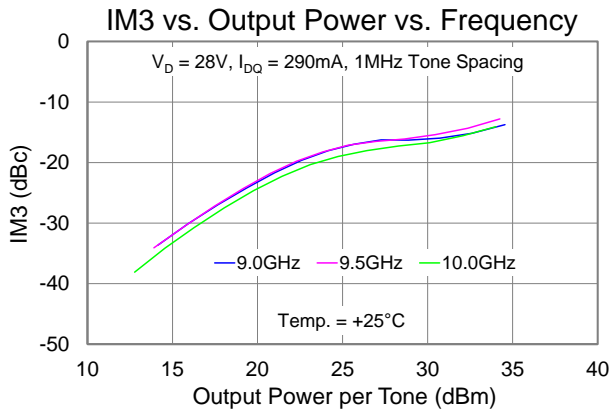
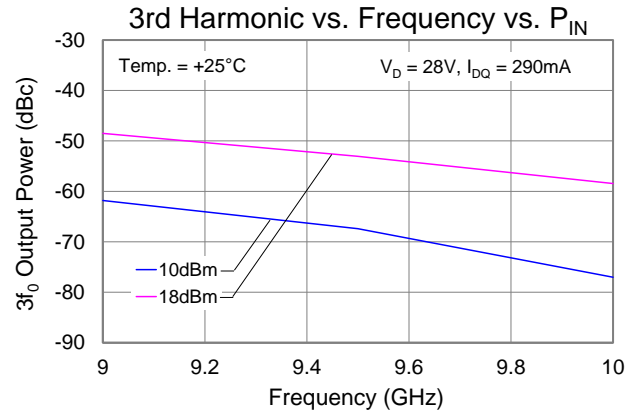
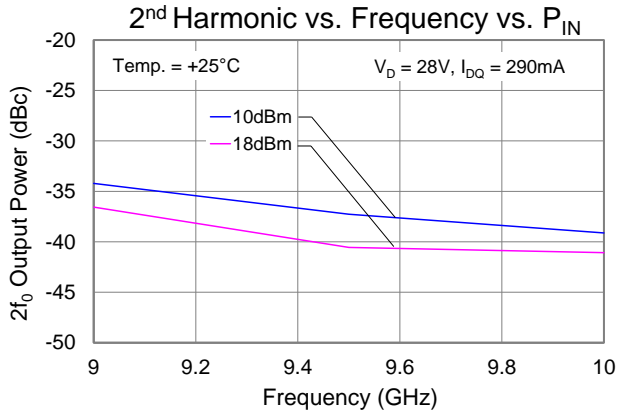
Performance Plots – Large Signal (CW)

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



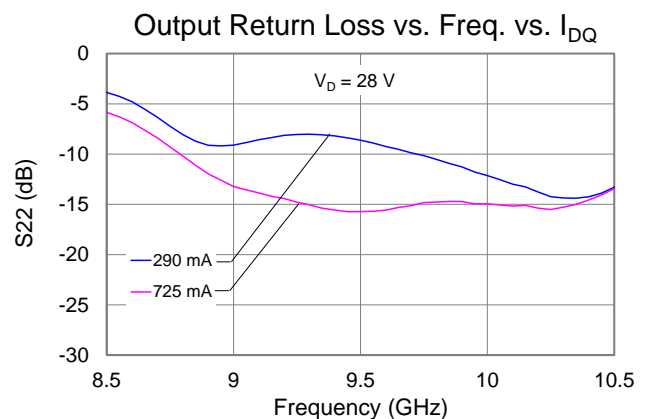
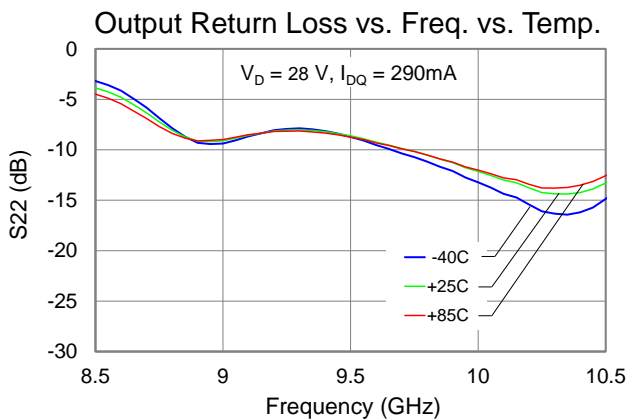
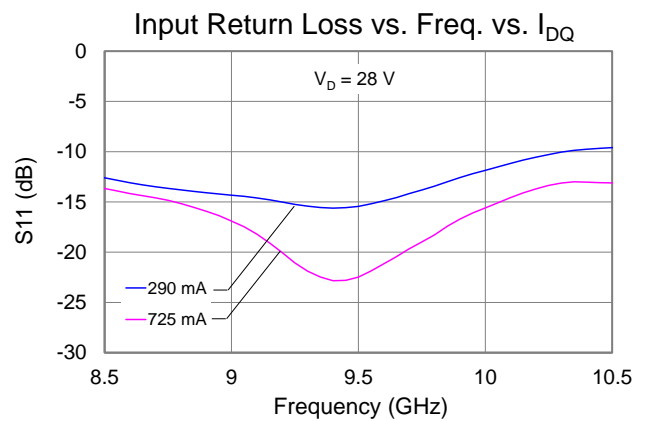
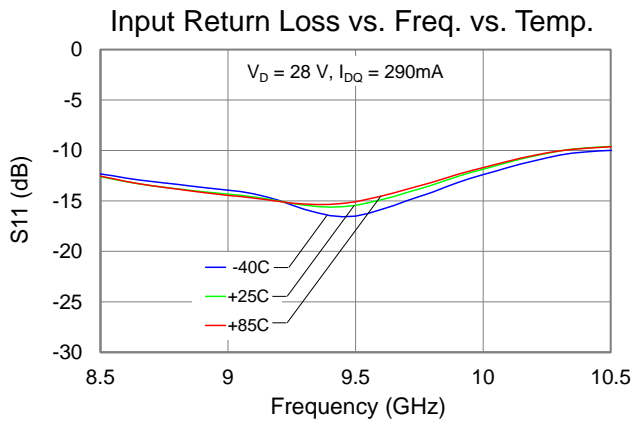
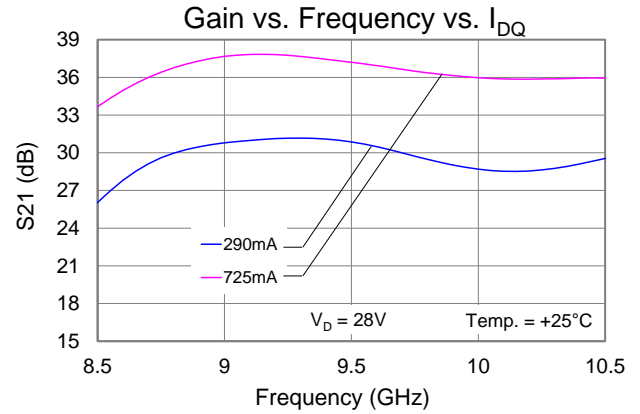
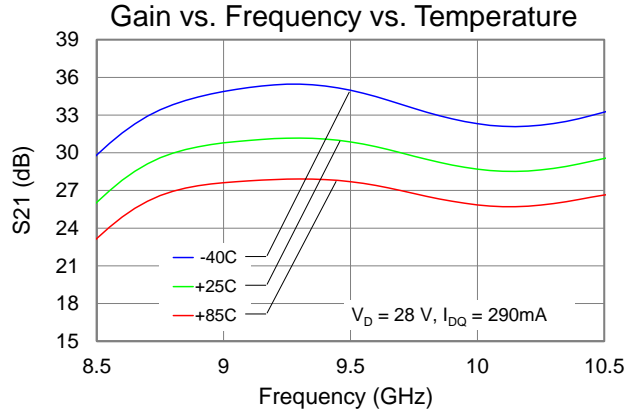
Typical Performance – Linearity (CW)

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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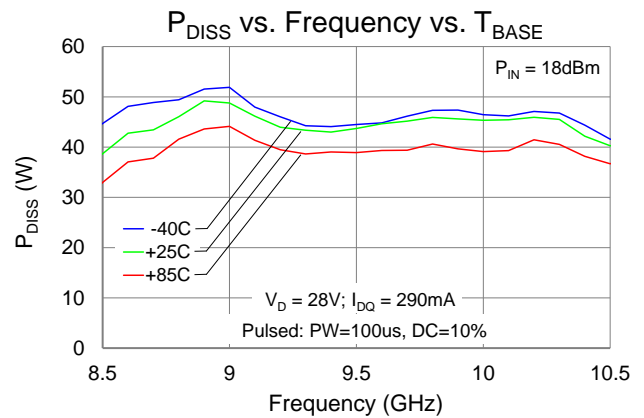
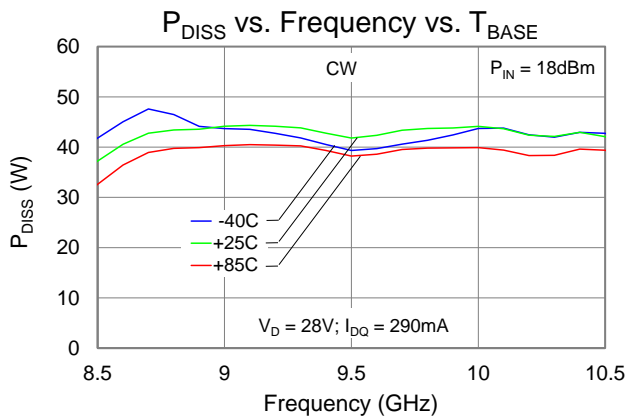
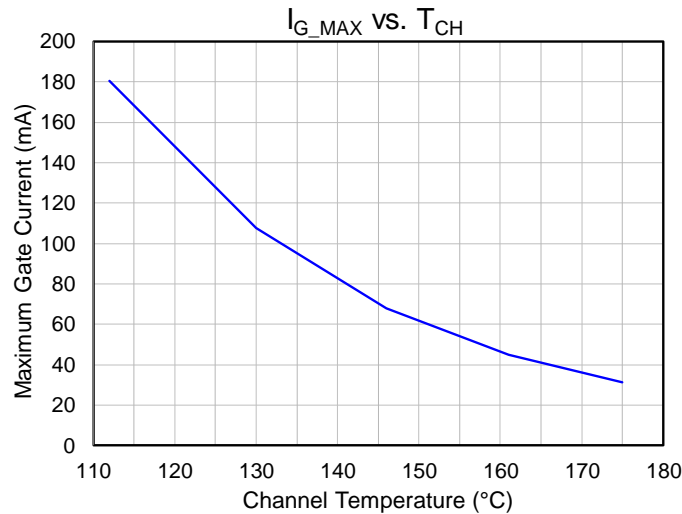
Thermal and Reliability Information

| 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: $PW = 100\ \mu\text{s}$, $DC = 10\%$), $T_{BASE} = 85^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{D_Drive} = 3.2\text{ A}$ $P_{IN} = 20\text{ dBm}$, $P_{OUT} = 45.6\text{ dBm}$, $P_{DISS} = 52\text{ W}$ | 126 | $^{\circ}\text{C}$ |

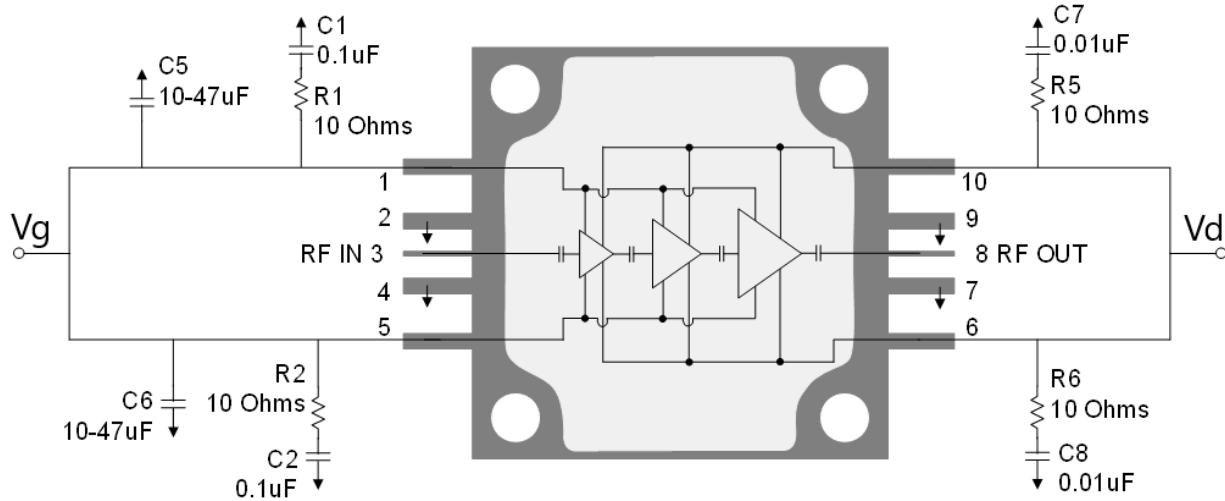
Notes:

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

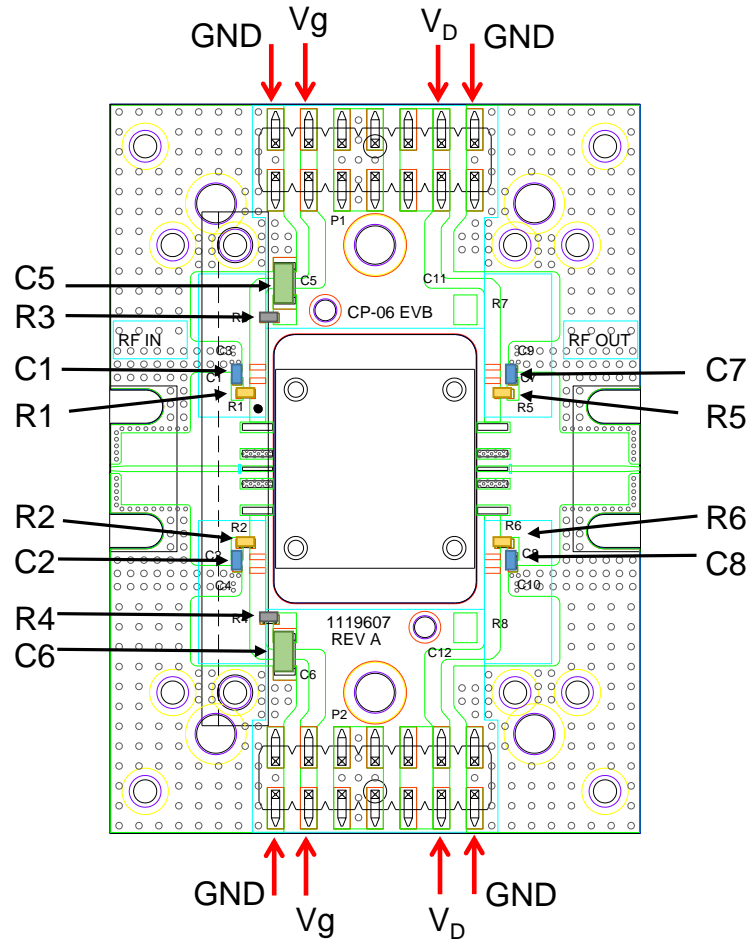
Bias Down Procedure

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:

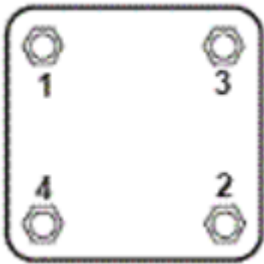
- (1) Both Top and Bottom V_d and V_g must be biased.
- (2) PCB is made from Rogers 4003C dielectric, 0.008 inch thick. 0.5 oz. copper both sides.

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 | |

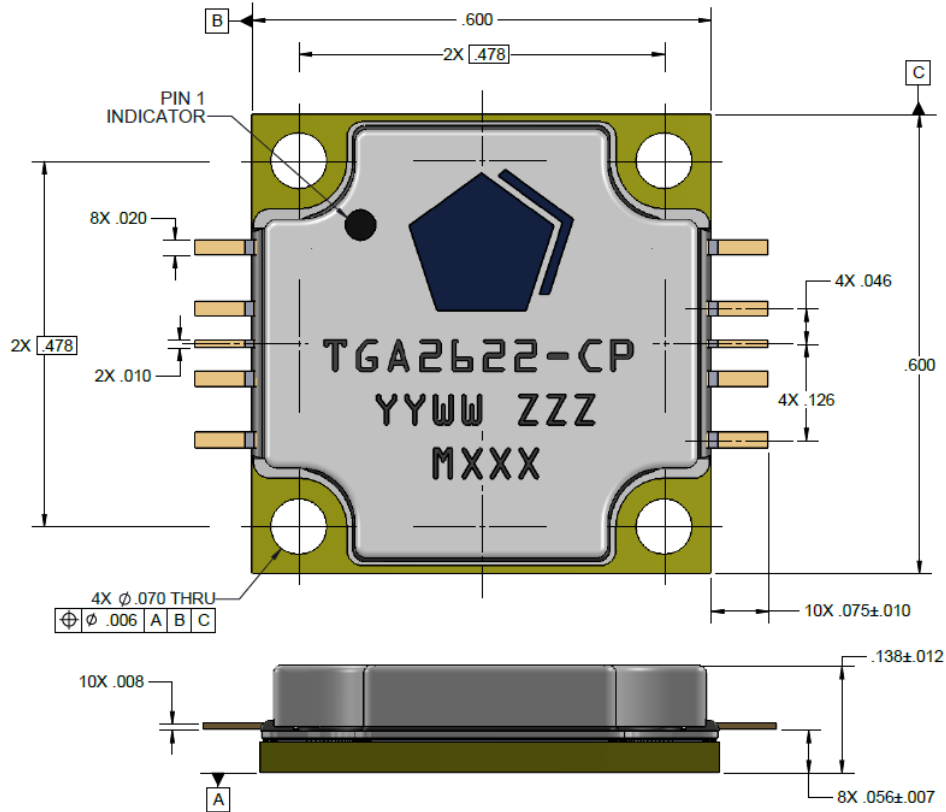
Assembly Notes

1. Carefully clean the PC board 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 PCB and apply thermal compound (Arctic Silver 5 recommended) or 4 mil indium shim between the heat sink and the package.
3. (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 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:



4. Apply no-flux solder to each pin of the TGA2622-CP. The component leads should be manually soldered, and the package cannot be subjected to conventional reflow processes. The use of no-clean solder to avoid washing after soldering is recommended.

Mechanical Information



Units: inches

Tolerances: unless specified

x.xx = ± 0.01

x.xxx = ± 0.005

Materials:

Base: Copper

Lid: Plastic

All metalized features are gold plated

Part is epoxy sealed

Marking:

2622: Part number

YY: Part Assembly year

WW: Part Assembly week

ZZZ: Serial Number

MXXX: Batch ID

Handling Precautions

| Parameter | Rating | Standard |
|----------------------------------|--------|--------------------------|
| ESD – Human Body Model (HBM) | 1B | ESDA / JEDEC JS-001-2014 |
| ESD – Charged Device Model (CDM) | C1 | ESDA / JEDEC JS-002-2014 |
| MSL – Moisture Sensitivity Level | N/A | |



Caution!
ESD-Sensitive Device

Solderability

The component leads should be manually soldered, and the package cannot be subjected to conventional reflow processes. Soldering of the component leads is compatible with the latest version of J-STD-020, lead-free solder, 260 °C. The use of no-clean solder to avoid washing after soldering is recommended.

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 (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

Contact Information

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

- Web:** www.qorvo.com
Tel: 1-844-890-8163
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Important Notice

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- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».



JONHON

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ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

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