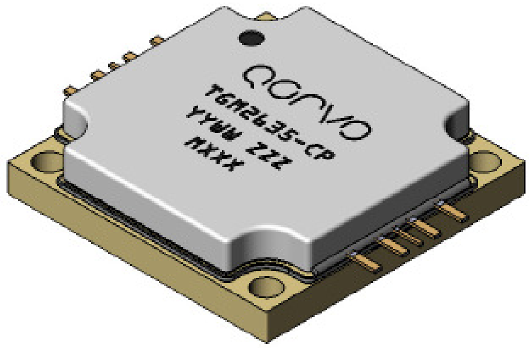
Applications

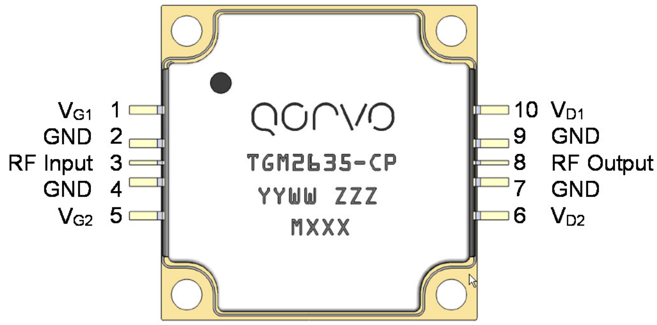
- X-band Radar
- Satellite Communications
- Data Links



Product Features

- Frequency Range: 7.9 – 11 GHz
- P_{SAT}: > 50 dBm (P_{IN} = 28 dBm)
- PAE: > 35% (P_{IN} = 28 dBm)
- Large Signal Gain: > 22 dB (P_{IN} = 28 dBm)
- Small Signal Gain: > 26 dB
- Bias: V_D = 28 V, I_{DQ} = 1.3 A, V_G = -2.6 V Typical
- Package Dimensions: 19.05 x 19.05 x 4.52 mm
- Performance Under Pulsed Operation

Functional Block Diagram



General Description

Qorvo's TGM2635–CP is a packaged X-band, high power amplifier fabricated on Qorvo's production 0.25um GaN on SiC process. The TGM2635–CP operates from 7.9 – 11 GHz and provides 100 W of saturated output power with 22.5 dB of large signal gain and greater than 35 % power–added efficiency.

The TGM2635-CP is packaged in a 10-lead 19.05 x 19.05 mm bolt-down package with a pure Cu base for superior thermal management. Both RF ports are internally DC blocked and matched to 50 ohms allowing for simple system integration.

The TGM2635-CP is ideally suited for both military and commercial X–Band radar systems, satellite communications systems, and data links.

Lead-free and RoHS compliant.

Evaluation boards are available upon request.

Pad Configuration

Pad No.	Symbol
1	V_{G1}
2, 4, 7, 9	GND
3	RF Input
5	V_{G2}
6	V_{D2}
8	RF Output
10	V_{D1}

Ordering Information

Part	ECCN	Description
TGM2635-CP	3A001.b.2.b	X-band 100 W GaN Power Amplifier

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Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	40 V
Gate Voltage Range (V_G)	-8 to -0 V
Drain Current (I_D)	16 A
Gate Current (I_G) at T_{CH} = 200 °C	-52 / 124 mA
Power Dissipation (P_{DISS}), 85°C, Pulsed; PW = 100 us, DC = 10%	316 W
Input Power (P_{IN}), 50 Ω, 85°C, V_D = 28 V, Pulsed; PW = 100 us, DC = 10%	33 dBm
Input Power (P_{IN}), 85°C, VSWR 3:1, V_D = 28 V, Pulsed; PW = 100 us, DC = 10%	33 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.

Recommended Operating Conditions

Parameter	Value
Drain Voltage (V_D)	28 V
Drain Current (I_{DQ})	1.3 A (Total)
Gate Voltage (V_G)	-2.6 V (Typ.)
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} = 1.3 A, V_G = -2.6 V Typical, PW = 100 us, Duty Cycle = 10%

Parameter	Min	Typical	Max	Units
Operational Frequency Range	7.9		11	GHz
Small Signal Gain		> 26		dB
Input Return Loss		> 12		dB
Output Return Loss		> 12		dB
Power Gain (P_{IN} = 28 dBm), Pulsed		> 22.5		dB
Output Power (P_{IN} = 28 dBm), Pulsed		> 50		dBm
Power Added Efficiency (P_{IN} = 28 dBm), Pulsed		> 35		%
Small Signal Gain Temperature Coefficient		-0.064		dB/°C
Output Power Temperature Coefficient (Temp: 25 °C – 85 °C, P_{IN} = 28 dBm)		-0.010		dB/°C
Recommended Operating Voltage	20	28	30	V

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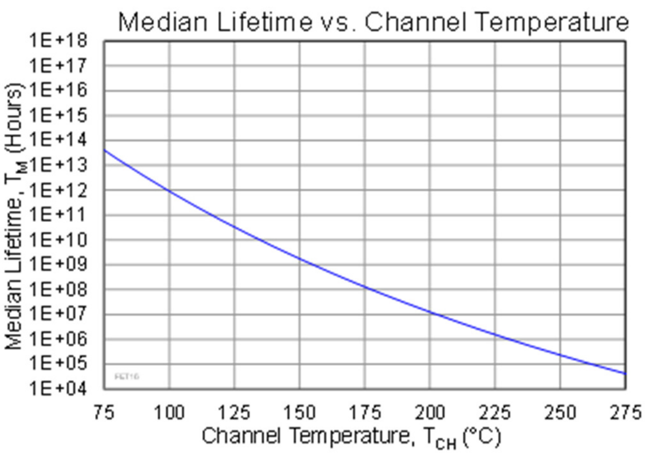
Thermal and Reliability Information

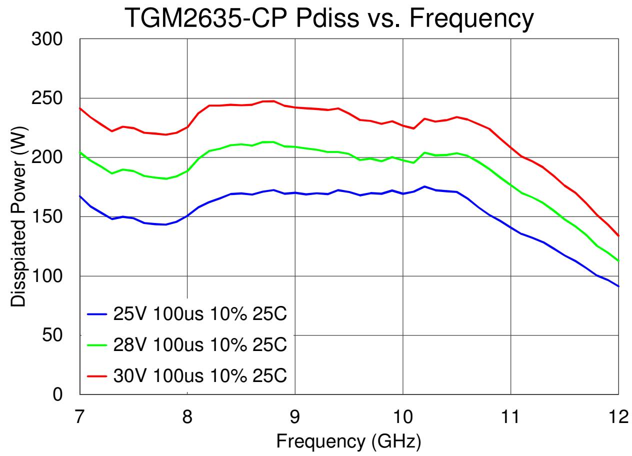
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) [1]	T_{base} = 85°C V_D = 28 V, I_{DQ} = 1.3 A P_{DISS} = 36.4 W	0.60	ºC/W
Channel Temperature (T_{CH}) (No RF drive)		107	°C
Median Lifetime (T_M)		3.44E11	Hrs
Thermal Resistance (θ_{JC}) [1]	T_{base} = 85°C, V_D = 28 V, I_{DQ} = 1.3 A, Freq = 9.0 GHz, I_{D_Drive} = 11 A, P_{IN} = 28 dBm, P_{OUT} = 50.0 dBm, P_{DISS} = 173 W, PW = 100 us, DC = 10%	0.47	ºC/W
Channel Temperature (T_{CH}) (Under RF drive)		166	°C
Median Lifetime (T_M)		3.21E08	Hrs
Thermal Resistance (θ_{JC}) [1]	T_{base} = 85°C, V_D = 28 V, I_{DQ} = 1.3 A, Freq = 9.0 GHz, I_{D_Drive} = 12 A, P_{IN} = 31 dBm, P_{OUT} = 50.5 dBm, P_{DISS} = 195 W, PW = 100 us, DC = 10%	0.47	ºC/W
Channel Temperature (T_{CH}) (Under RF drive)		176	°C
Median Lifetime (T_M)		1.18E08	Hrs

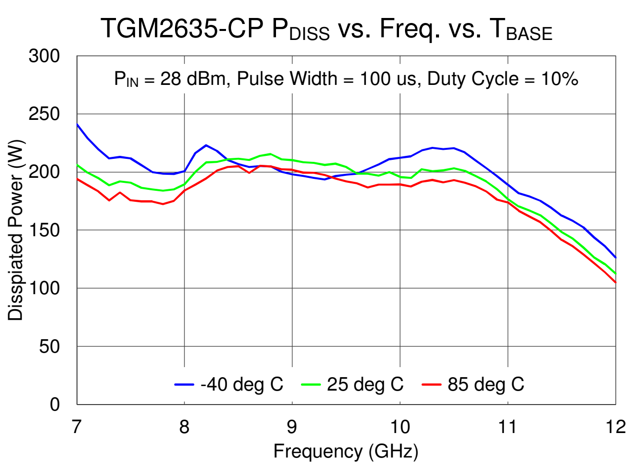
Notes:
1. Thermal resistance measured to back of package.

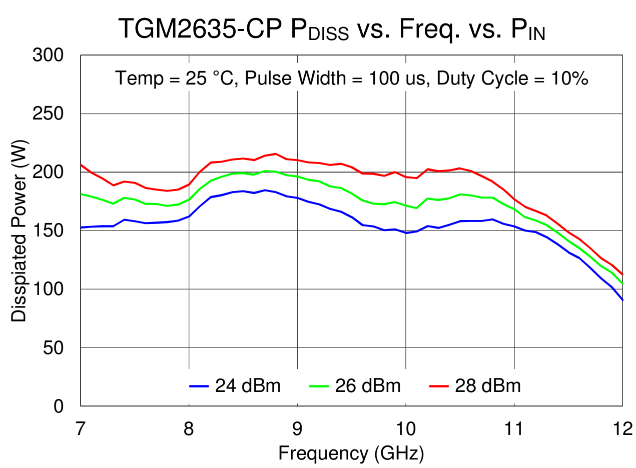
Median Lifetime

Test Conditions: V_D = 28 V; Failure Criteria = 10% reduction in I_{D_MAX}









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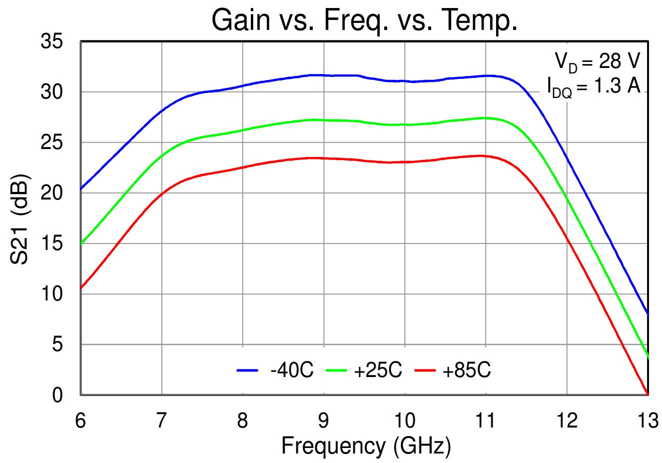
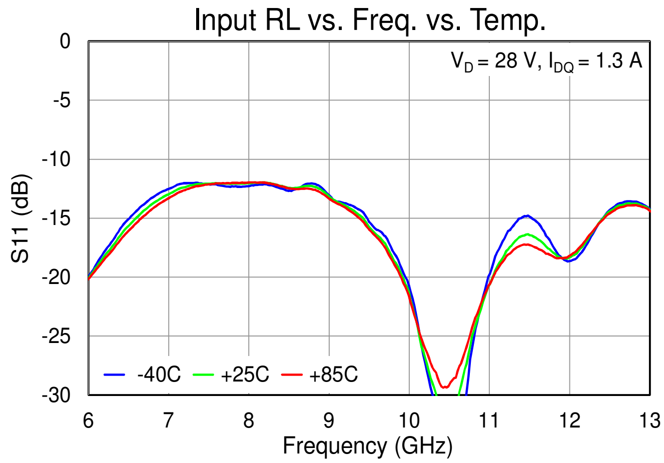
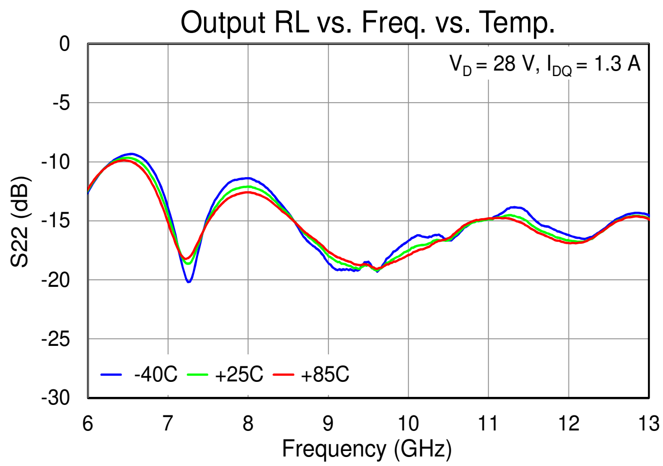
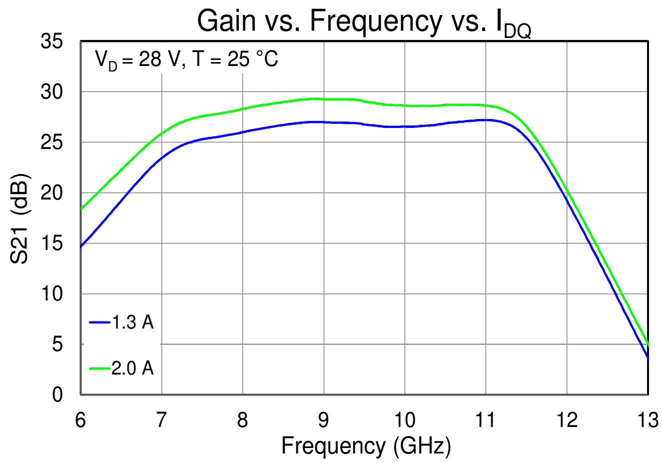
Typical Performance: Small Signal (CW)

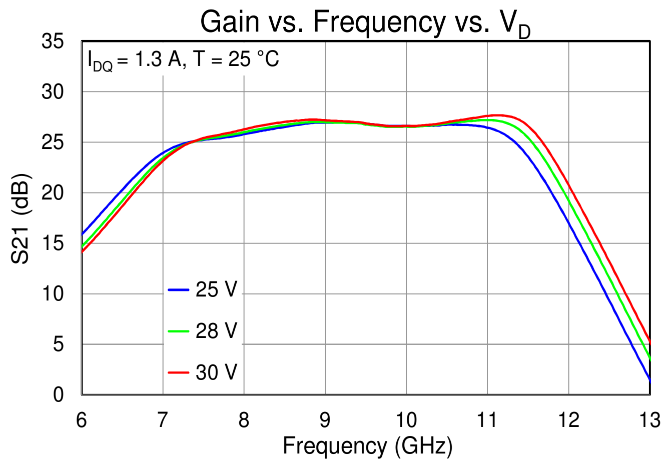
Test conditions unless otherwise noted: 25 °C , V_D = 28 V











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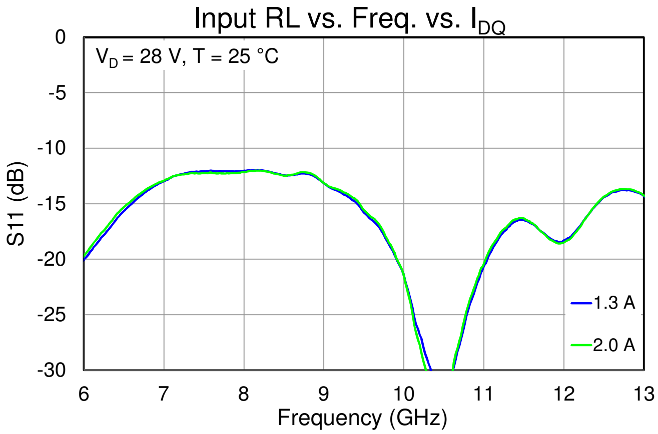
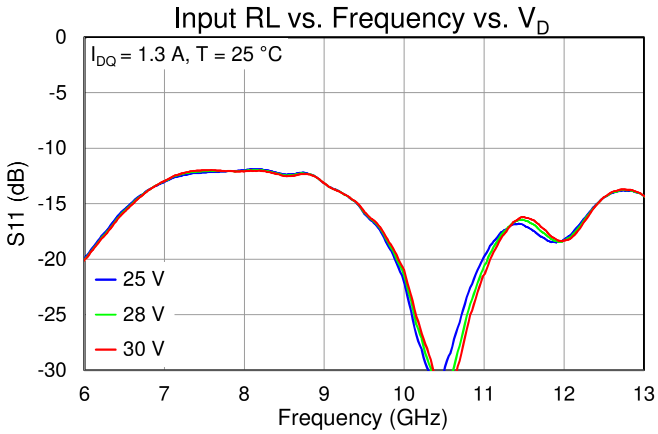
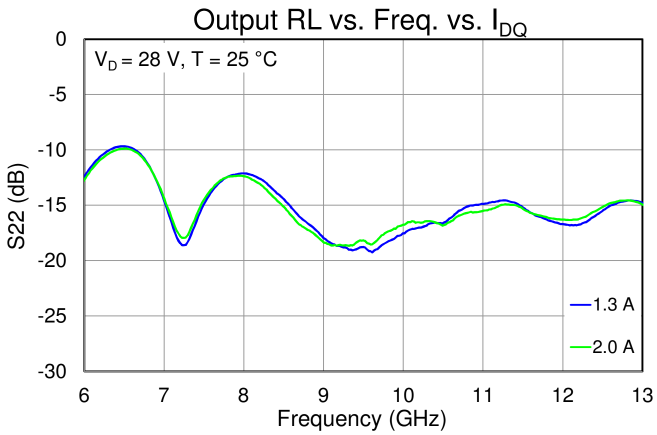
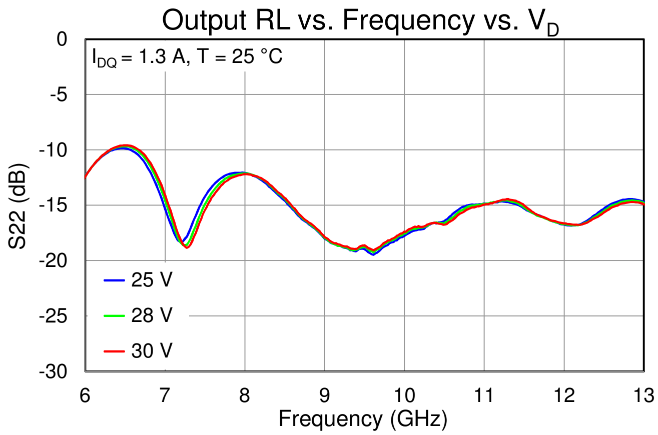
Typical Performance: Small Signal (CW)

Test conditions unless otherwise noted: 25 °C , V_D = 28 V









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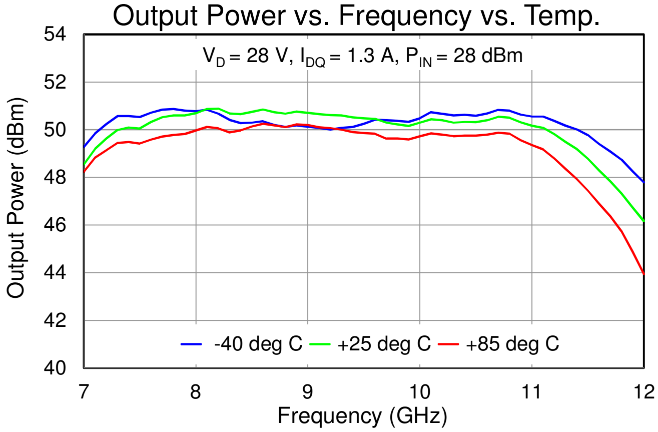
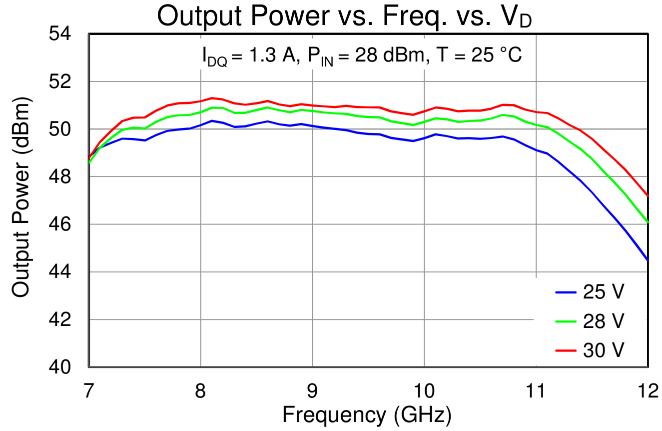
Typical Performance: Large Signal (Pulsed)

Test conditions unless otherwise noted: 25 °C , V_D = 28 V, I_{DQ} = 1.3 A, PW = 100 us, Duty Cycle = 10%

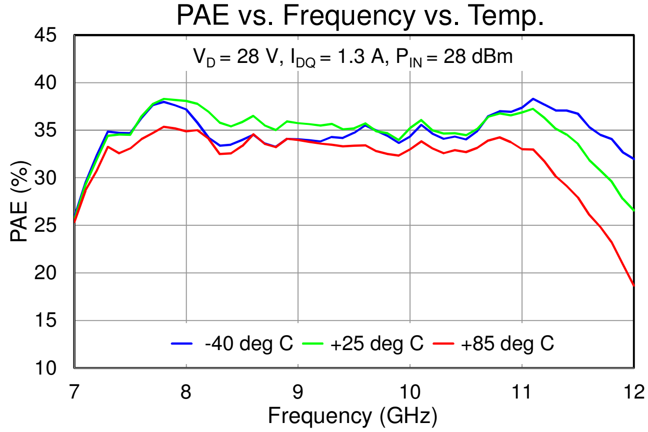
Output Power vs. Frequency vs. Temp.



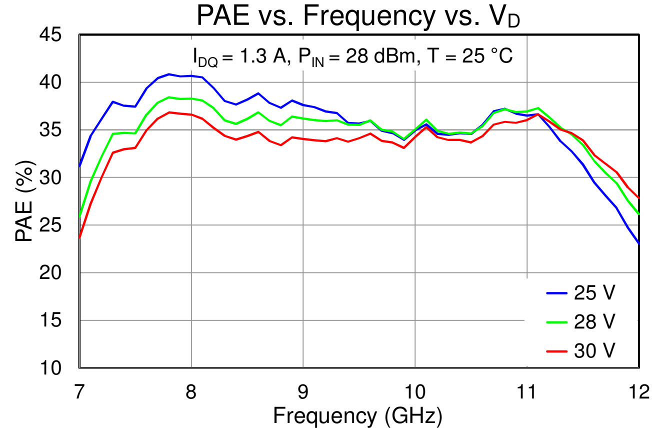
Output Power vs. Freq. vs. V_D



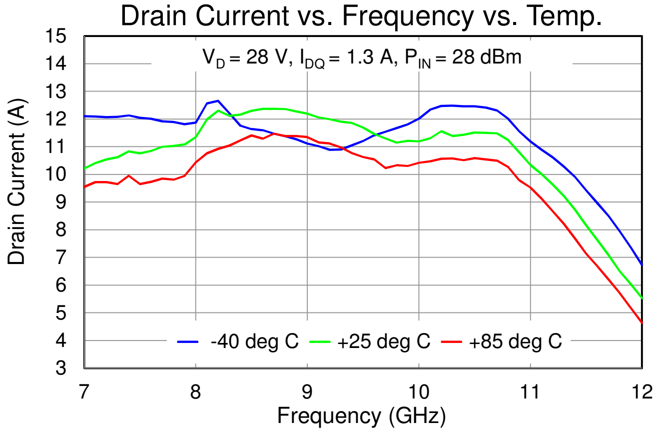
PAE vs. Frequency vs. Temp.



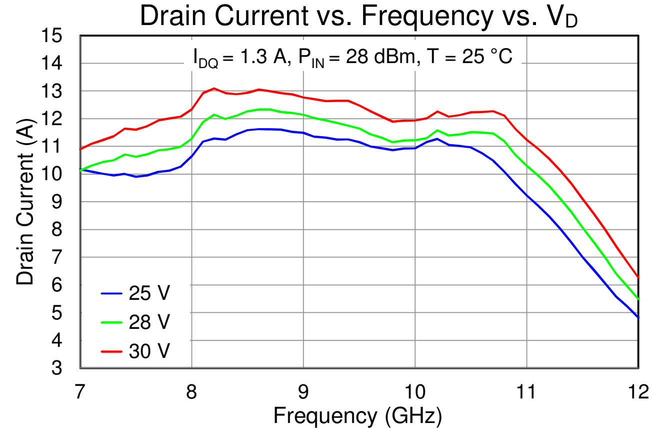
PAE vs. Frequency vs. V_D



Drain Current vs. Frequency vs. Temp.



Drain Current vs. Frequency vs. V_D



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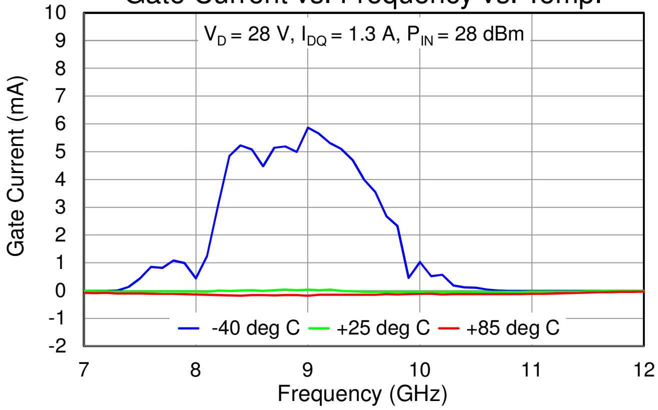
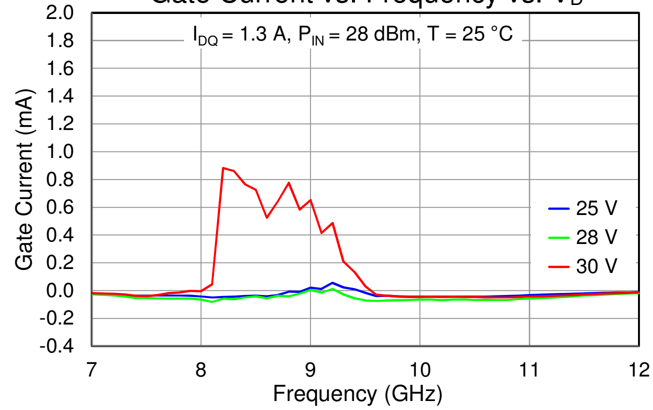
Typical Performance: Large Signal (Pulsed)

Test conditions unless otherwise noted: 25 °C , V_D = 28 V, I_{DQ} = 1.3 A, PW = 100 us, Duty Cycle = 10%

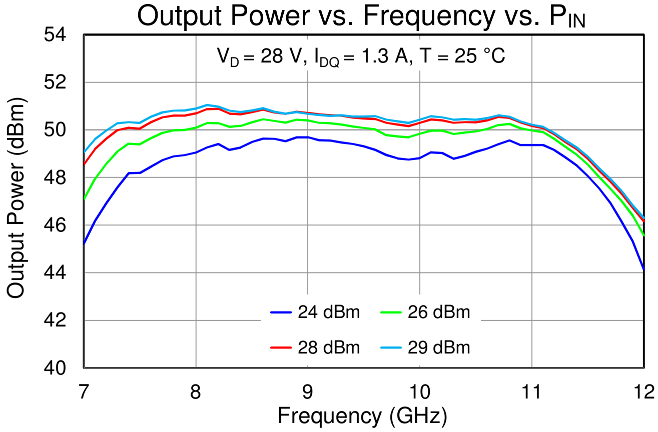
Gate Current vs. Frequency vs. Temp.



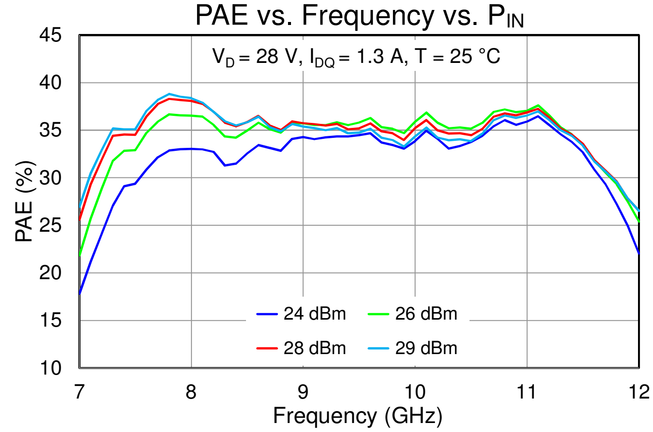
Gate Current vs. Frequency vs. V_D



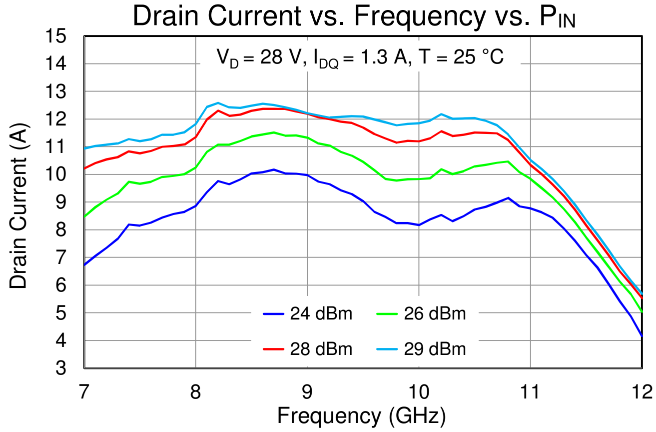
Output Power vs. Frequency vs. P_{IN}



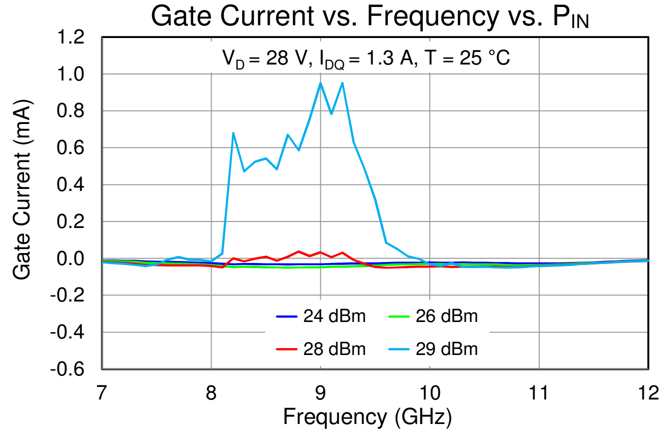
PAE vs. Frequency vs. P_{IN}



Drain Current vs. Frequency vs. P_{IN}



Gate Current vs. Frequency vs. P_{IN}



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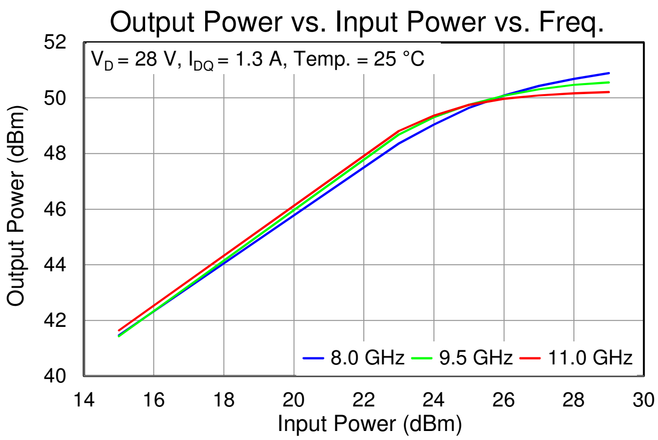
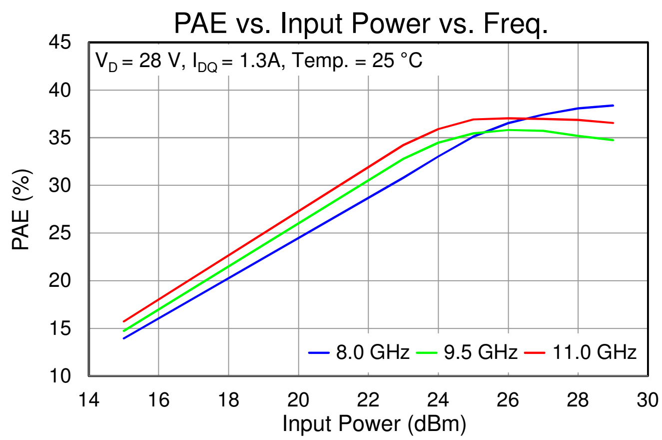
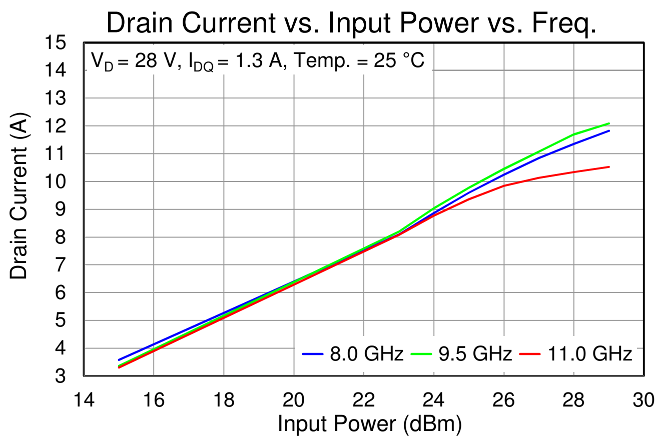
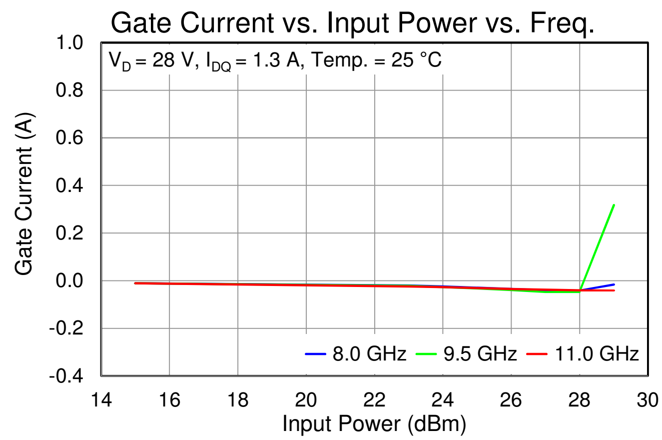
Typical Performance: Large Signal (Pulsed)

Test conditions unless otherwise noted: 25 °C , V_D = 28 V, I_{DQ} = 1.3 A, PW = 100 us, Duty Cycle = 10%









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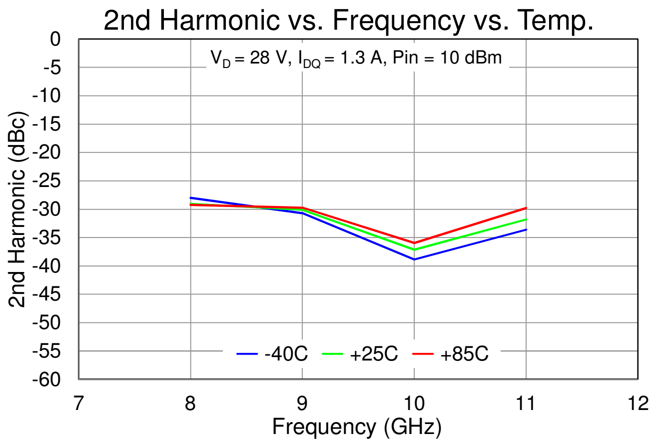
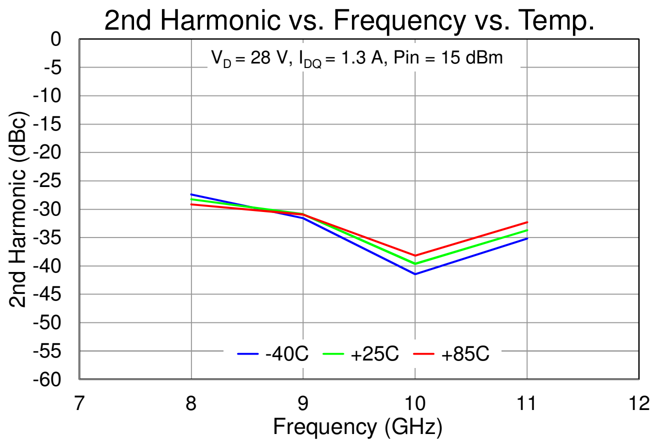
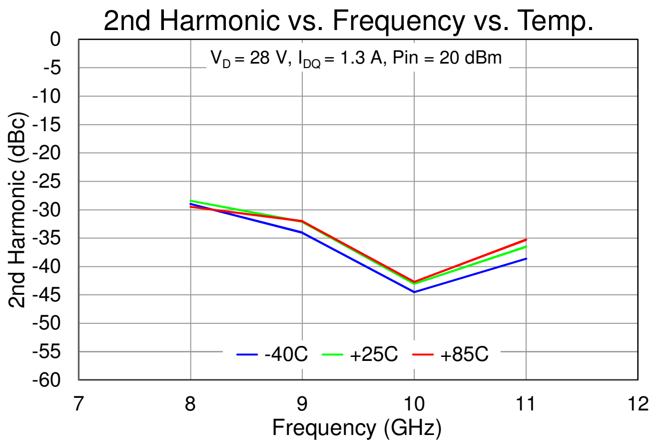
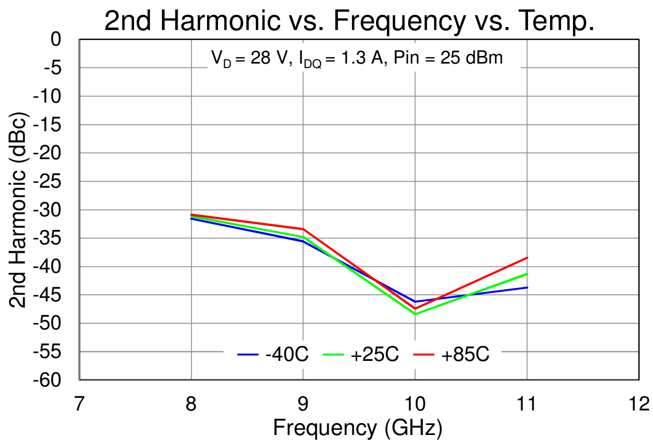
Typical Performance: Large Signal (Pulsed)

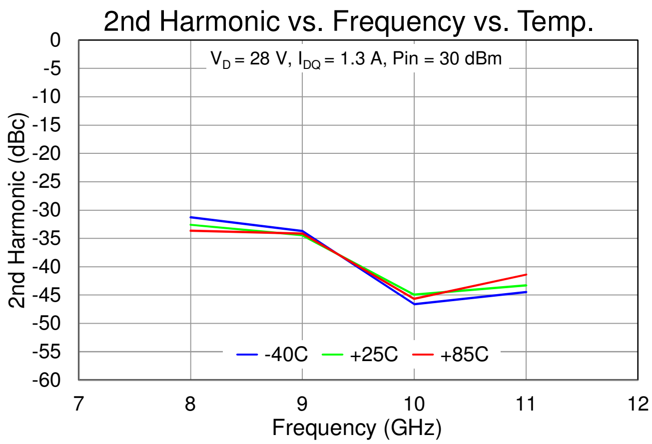
Test conditions unless otherwise noted: 25 ℃ , V_D = 28 V, I_{DQ} = 1.3 A, PW = 100 us, Duty Cycle = 10%

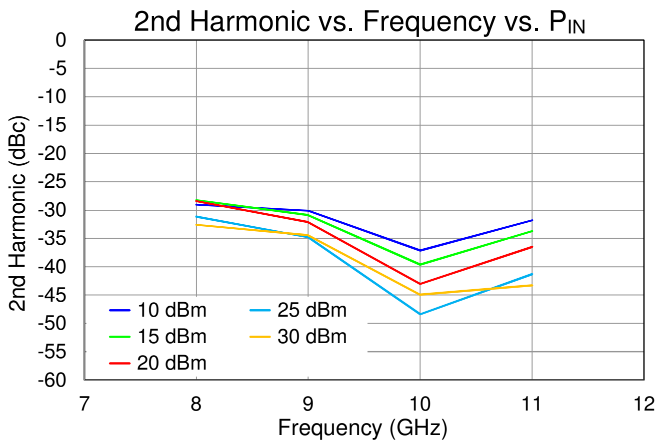












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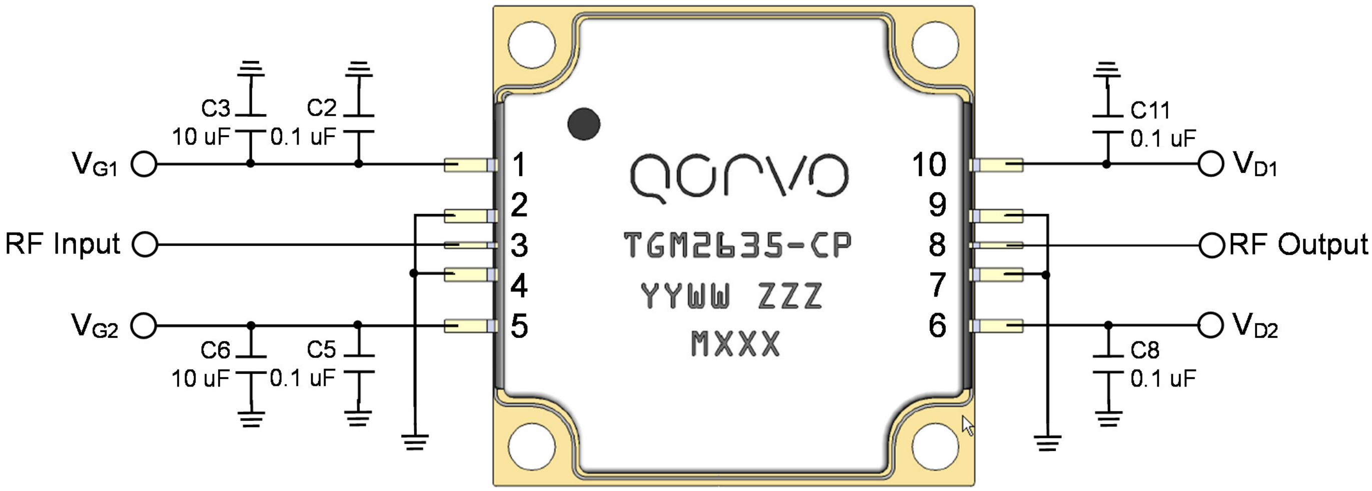
Disclaimer: Subject to change without notice

Application Circuit



Note:
V_{G1} and V_{G2}, and V_{D1} and V_{D2}, respectively, can be tied together.

Bias-up Procedure

1. Set I_D limit to 16 A, I_G limit to 124 mA
2. Set V_G to –5.0 V
3. Set V_D +28 V
4. Adjust V_G more positive until I_{DQ} = 1.3 A (V_G ~ –2.6 V Typical)
5. Apply RF signal

Bias-down Procedure

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

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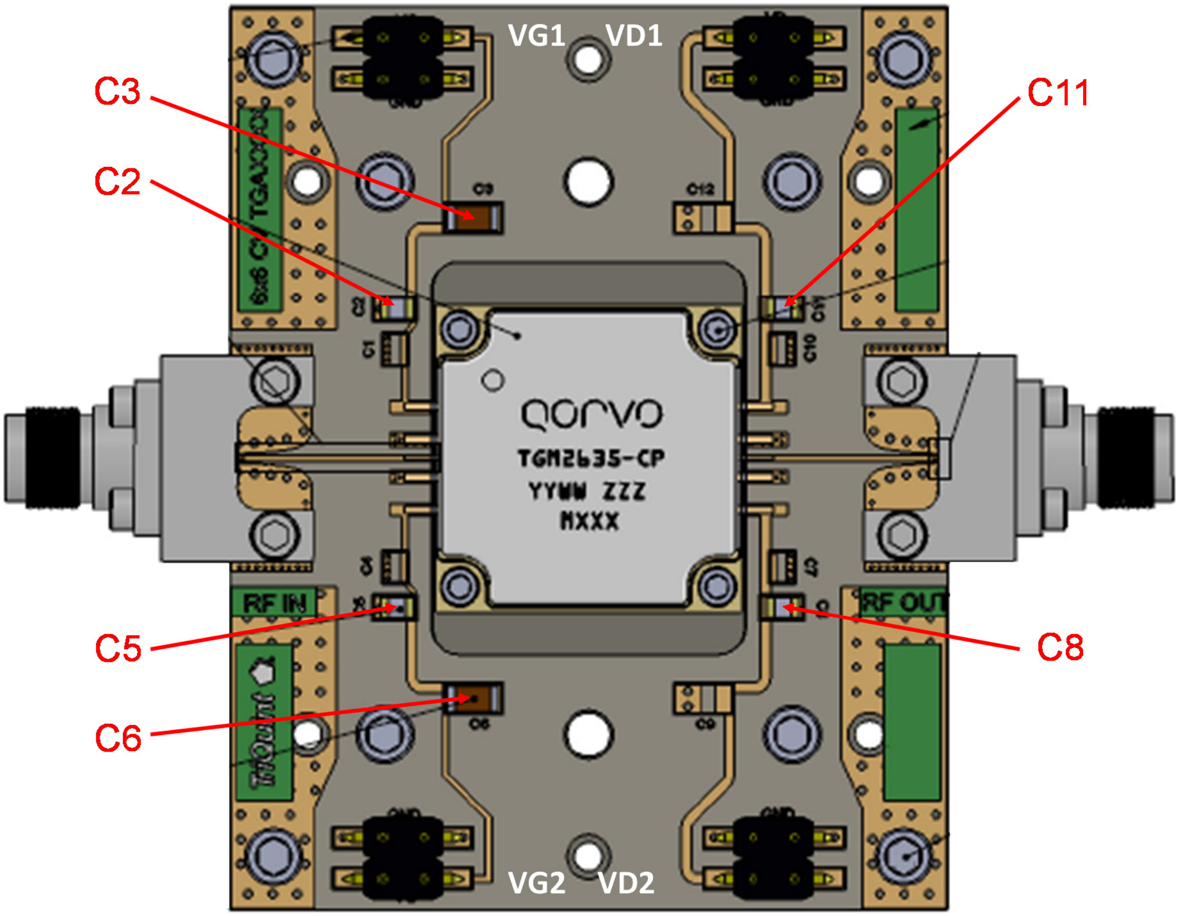
Evaluation Board and Mounting Detail



RF Layer is 0.008" thick Rogers Corp. RO40003C (ε_r = 3.35). Metal layers are 1.0 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-02A-5.

V_{G1} and V_{G2}, and V_{D1} and V_{D2}, respectively, can be tied together.

Reference Des.	Component	Value	Manuf.	Part Number
C3, C6	Surface Mount Cap	10 uF, ±20 %, 50 V (1206), X5R	Various	
C2, C5, C8, C11	Surface Mount Cap	0.1 uF, ±10 %, 50 V (0805), X7R	Various	

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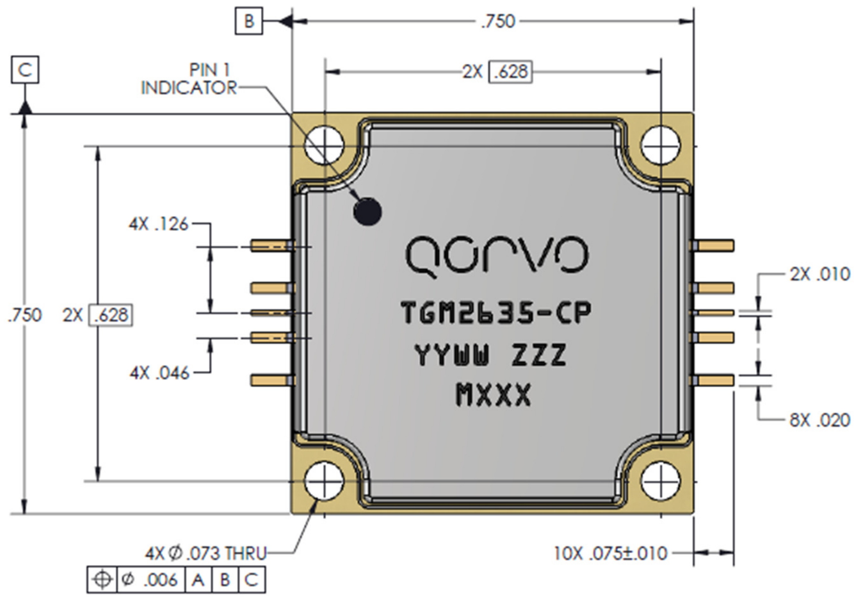
Mechanical Drawing & Pad Description



NOTES:
1. MATERIALS:
   PACKAGE BASE: COPPER
   FINISH: GOLD
   LEADS: ALLOY 194
   FINISH: GOLD
   LID: LCP (LIQUID CRYSTAL POLYMER)
2. PART IS EPOXY SEALED.
3. PART MARKING:
   TGA2219-CP : PART NUMBER
   YY : PART ASSEMBLY YEAR
   WW : PART ASSEMBLY WEEK
   ZZZ : SERIAL NUMBER
   MXXX : BATCH ID

Dimensions in inches

Pin Number	Label	Description
1	V_{G1}	Gate voltage stage 1. Bias network is required; see Application Circuit as an example
2, 4, 7, 9	GND	RF Ground
3	RF Input	RF Input; matched to 50Ω; DC Blocked
5	V_{G2}	Gate voltage stage 2. Bias network is required; see Application Circuit as an example
6	V_{D2}	Drain voltage stage 2. Bias network is required; see Application Circuit as an example.
8	RF Output	RF Output; matched to 50Ω; DC Blocked, DC Shorted
10	V_{D1}	Drain voltage stage 1. Bias network is required; see Application Circuit as an example

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Assembly Notes

1. Clean the PCB, heat sink, and module with alcohol. Allow it to dry fully.
2. Nylock screws are recommended for mounting the TGM2635-CP to a heat sink.
3. To improve the thermal and RF performance, we recommend the following:
   a. Mount the part to a high thermal conductivity heat sink.
   b. Apply Arctic Silver thermal compound or a 4 mils thick indium shim between the package and the heat sink.
   c. Do not mount the part to a PCB, even when using thermal vias.
4. Apply solder to each pin of the TGM2635-CP.
5. Clean the assembly with alcohol.

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Product Compliance Information

ESD Sensitivity Ratings

Caution! ESD-Sensitive Device

ESD Rating: TBD
Value: TBD
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

MSL Rating

Level 5a at 260 °C convection reflow
The part is rated Moisture Sensitivity Level 5a
JEDEC standard IPC/JEDEC J-STD-020.

ECCN

US Department of Commerce: 3A001.b.2.b

Solderability

Compatible with the latest version of J-STD-020 Lead free solder, 260 °C.

RoHS–Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_40_2$) Free
- PFOS Free
- SVHC Free

Contact Information

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

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Email: info-sales@triquint.com **Fax:** +1.972.994.8504

For technical questions and application information: **Email:** info-products@triquint.com

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