RFMD + TriQuint = Qorvo

TGA2219-CP

13.4 to 16.5 GHz, 25W GaN Power Amplifier

Applications

- Commercial VSAT
- Military Satcom
- Datalinks
- Radar

Product Features

- Frequency Range: 13.4 – 16.5 GHz
- Pout: 44 dBm @ P_{IN} = 16 dBm
- PAE: > 31% @ P_{IN} = 16 dBm
- Large Signal Gain: 28 dB @ P_{IN} = 16 dBm
- Small Signal Gain: > 30 dB
- Bias: V_D = 28 V, I_{DQ} = 450 mA, V_G = -2.7 V Typical
- Package base is pure Cu offering superior thermal management
- Process Technology: TQGaN15
- Package Dimensions: 15.2 x 15.2 x 3.5 mm

General Description

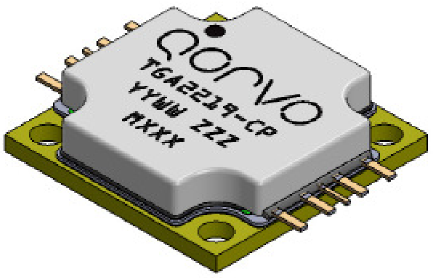
TriQuint's TGA2219-CP is a 3-stage, 25 W power amplifier operating over the 13.4 to 16.5 GHz band. Fabricated on TriQuint's production 0.15um GaN on SiC technology, this high performance amplifier offers > 30dB small-signal gain with 31% PAE, allowing the system designer to achieve superior performance levels in a cost efficient manner.

The TGA2219-CP is offered in a 10-lead 15 x 15 mm bolt-down package. Assembled with a pure-copper base, coupled with its high efficiency, the TGA2219-CP minimizes the strain on the system-level cooling requirements, further reducing system operating costs. Superior electrical performance and thermal management makes the TGA2219-CP ideal for supporting communications and radar applications in both commercial and military markets.

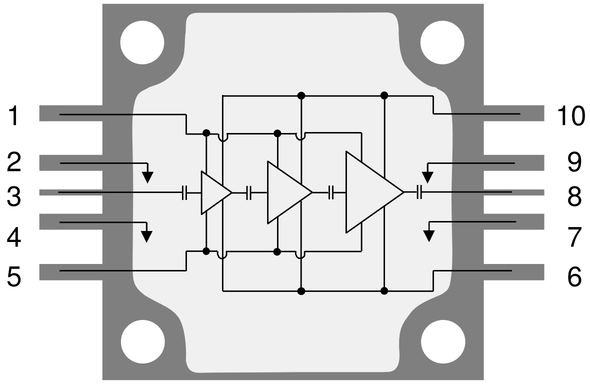
Both RF ports have integrated DC blocking capacitors and are fully matched to 50 Ohms.

Lead free and RoHS compliant.

Evaluation Boards are available upon request.



Functional Block Diagram



Pin Configuration

Pad No.	Symbol
1, 5	V_G
2, 4, 7, 9	GND
3	RF_{IN}
6, 10	V_D
8	RF_{OUT}

Ordering Information

Part	ECCN	Description
TGA2219-CP	3A001.b.2.c	13.4 – 16.5 GHz, 25 W GaN Power Amplifier

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	29.5 V
Gate Voltage Range (V_G)	-8 to 0 V
Drain Current (I_D)	7.2 A
Gate Current (I_G)	See plot on page 3
Power Dissipation (P_{DISS}), 85 °C	80 W
Input Power (P_{IN}), CW, 50Ω, V_D = 28 V, I_{DQ} = 450 mA, 85 °C	30 dBm
Input Power (P_{IN}), CW, VSWR 3:1, V_D = 28 V, I_{DQ} = 450 mA, 85 °C	27 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})	450 mA
Gate Voltage (V_G)	–2.7 V (Typ.)

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} = 450 mA, V_G = –2.7 V Typ, CW.

Parameter	Min	Typical	Max	Units
Operational Frequency Range	13.4		16.5	GHz
Small Signal Gain		> 30		dB
Input Return Loss		> 15		dB
Output Return Loss		> 5		dB
Output Power @ Pin = 16 dBm		44		dBm
Power Added Efficiency @ Pin = 16 dBm		> 31		%
Small Signal Gain Temperature Coefficient		-0.08		dB/°C
Output Power Temperature Coefficient (Temp: -40 °C – 85 °C @ Pin = 16dBm)		-0.011		dBm/°C
Recommended Operating Voltage		20 to 28	28	V

Thermal and Reliability Information

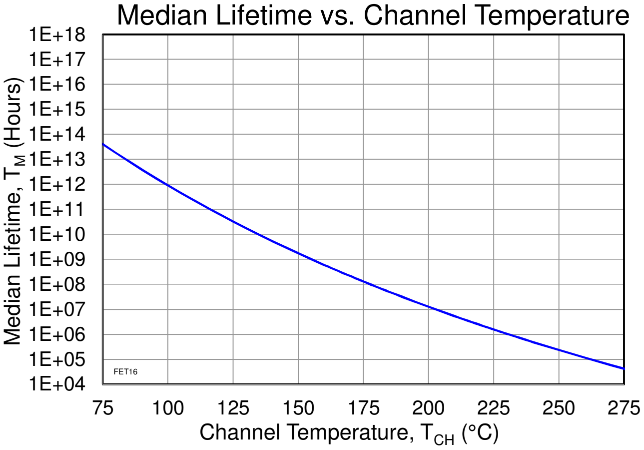
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	T_{BASE} = 85℃, V_D = 28 V (CW) At I_{DQ} = 450 mA, P_{DISS} = 12.8 W	2.38	℃/W
Channel Temperature (T_{CH}) (Quiescent)		115	℃
Median Lifetime (T_M)		5.58E+11	Hrs
Thermal Resistance (θ_{JC}) (1)	T_{BASE} = 85℃, V_D = 28 V (CW) At Freq = 14 GHz, P_{IN} = 18 dBm: I_{DQ} = 450 mA, I_{D_Drive} = 2.9 A P_{OUT} = 44 dBm, P_{DISS} = 57 W	2.39	℃/W
Channel Temperature (T_{CH}) (Under RF drive)		221	℃
Median Lifetime (T_M)		1.02E+7	Hrs

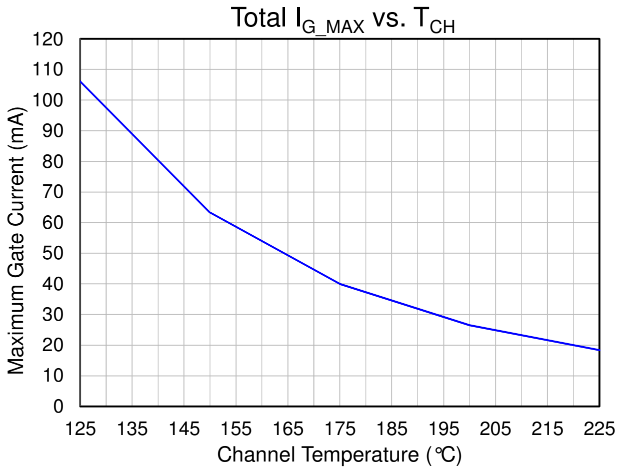
Notes:

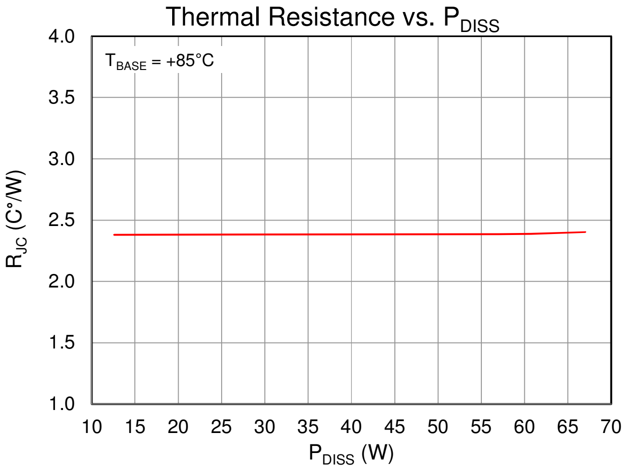
1. Thermal resistance measured to back of package.

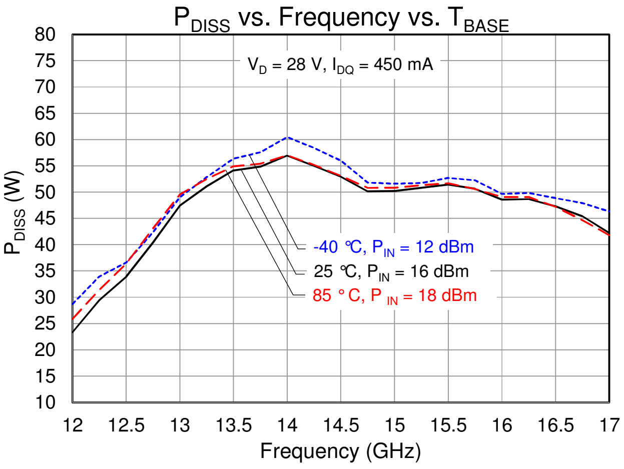
Median Lifetime

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



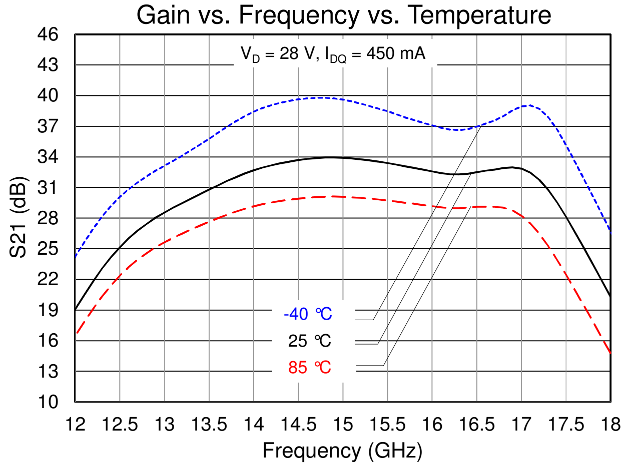


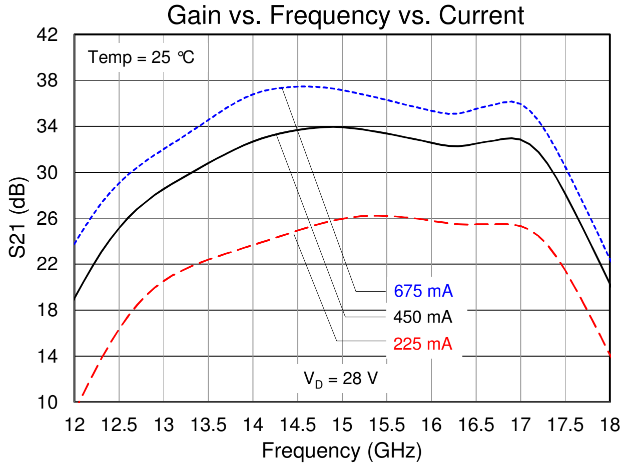


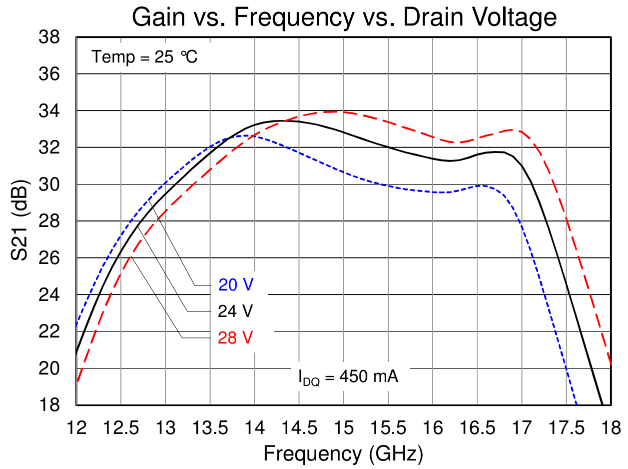


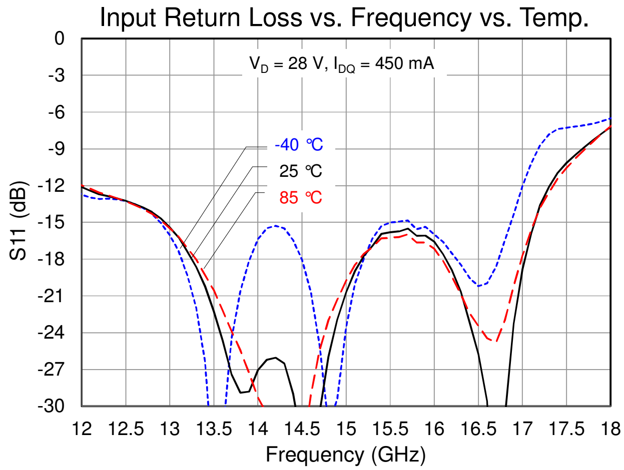
Typical Performance: Small Signal

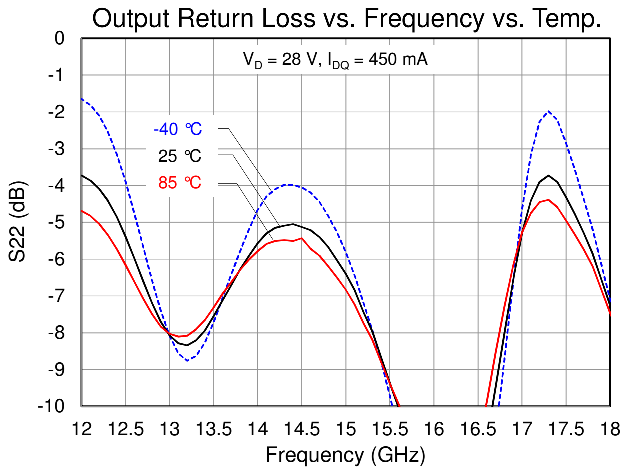
Conditions unless otherwise specified: V_D = 28 V, I_{DQ} = 450 mA, V_G = -2.7 V Typical, CW.





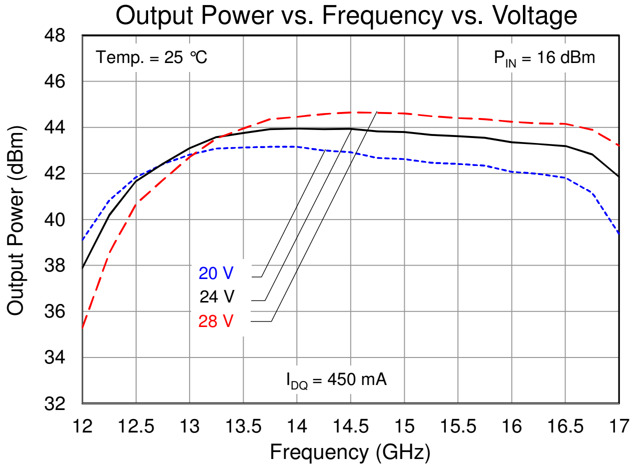


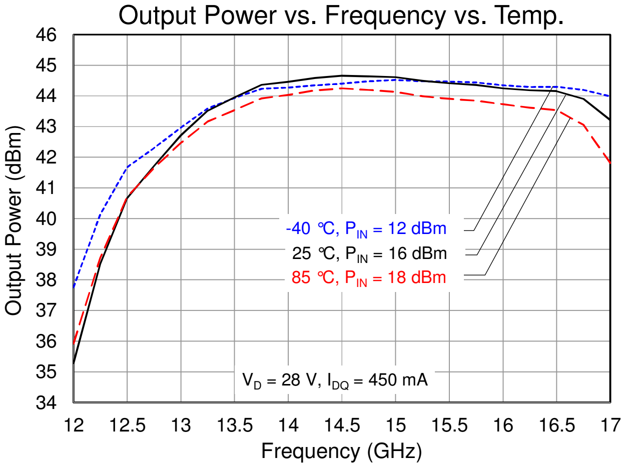


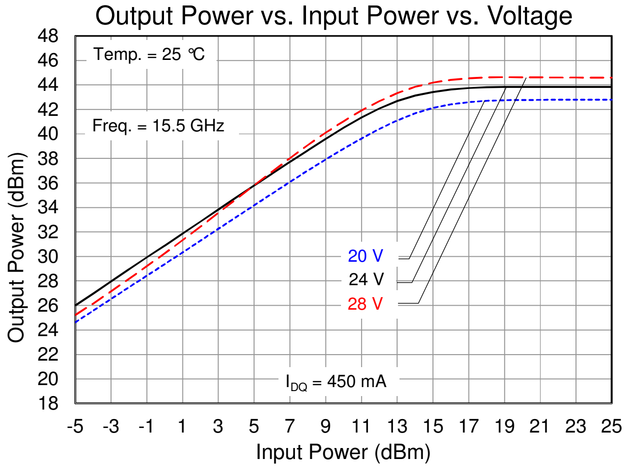


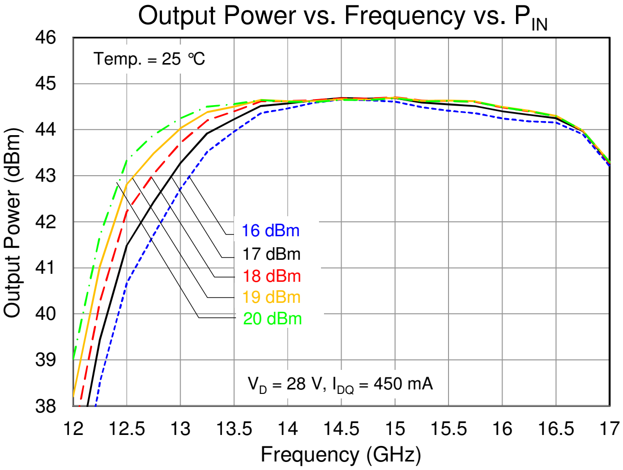
Typical Performance: Large Signal

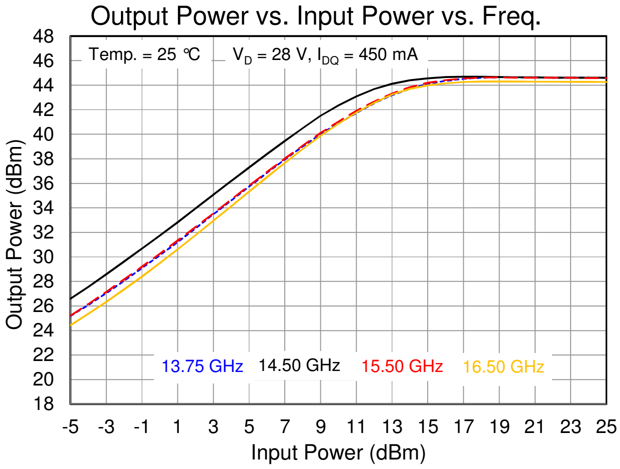
Conditions unless otherwise specified: V_D = 28 V, I_{DQ} = 450 mA, -2.7 V Typical, CW.











Typical Performance: Large Signal

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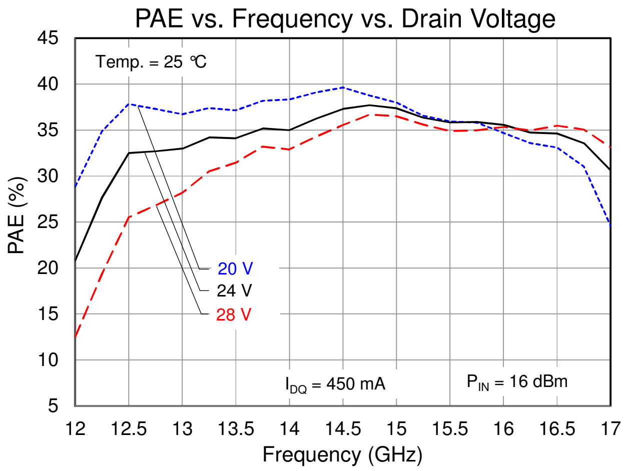

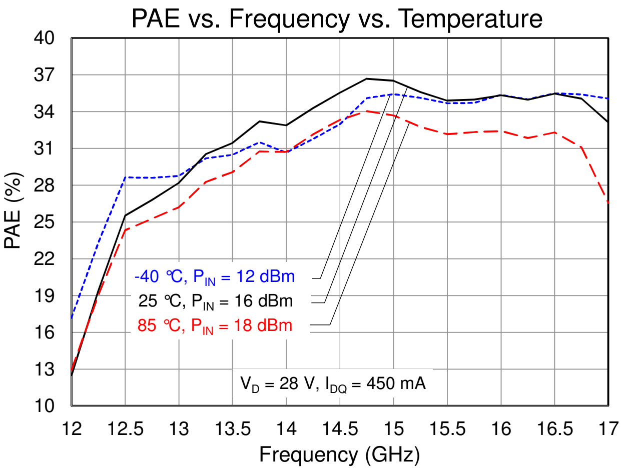

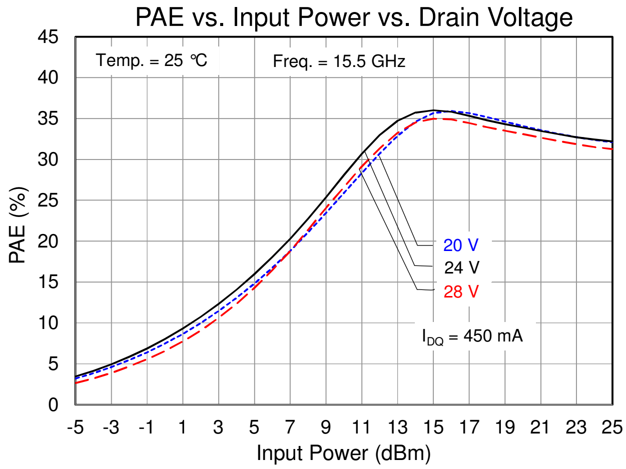

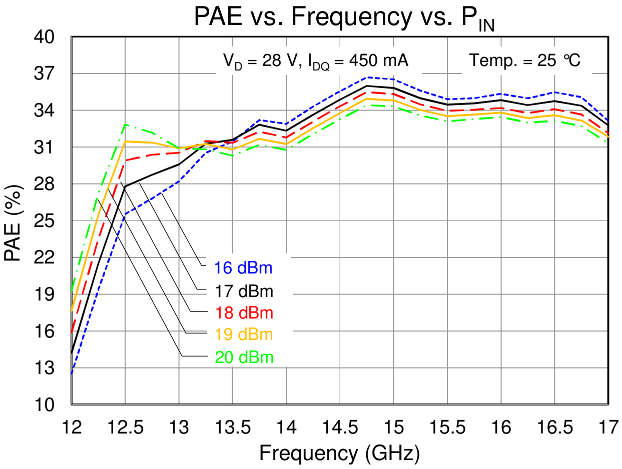

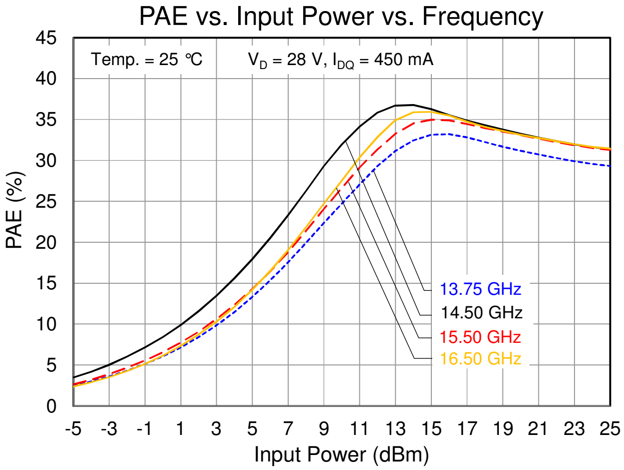

Typical Performance: Large Signal

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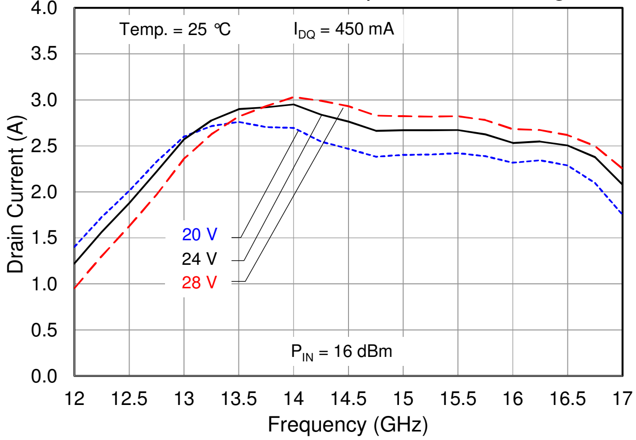
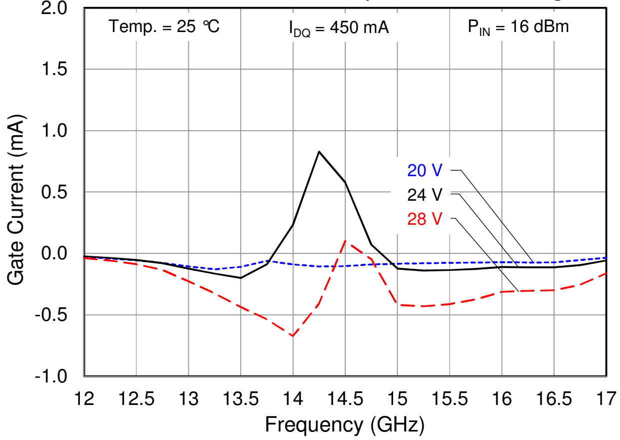
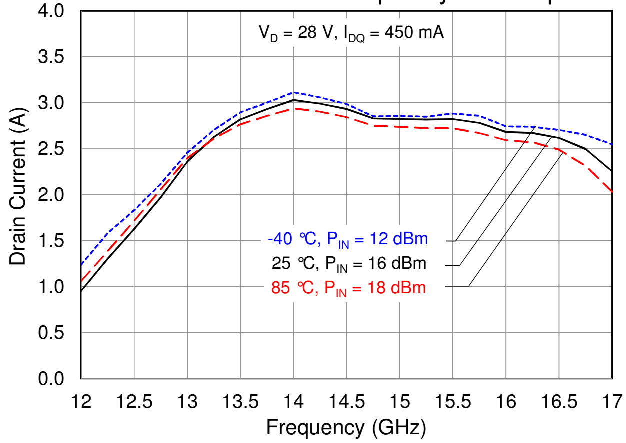
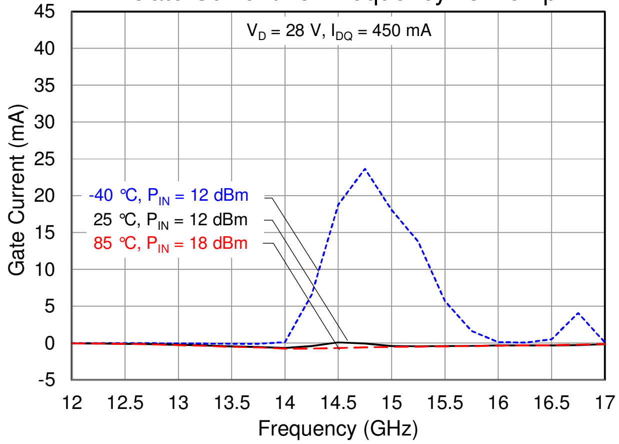
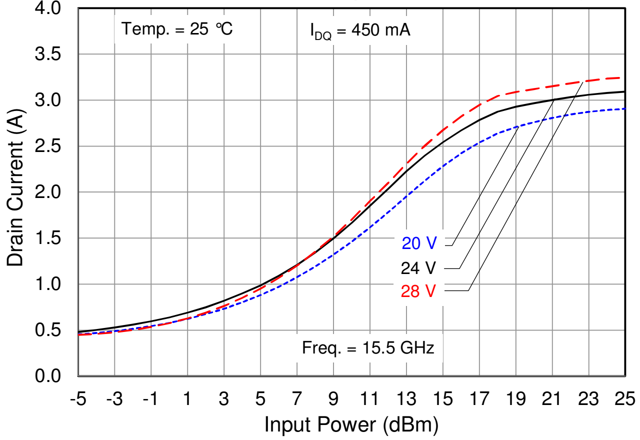
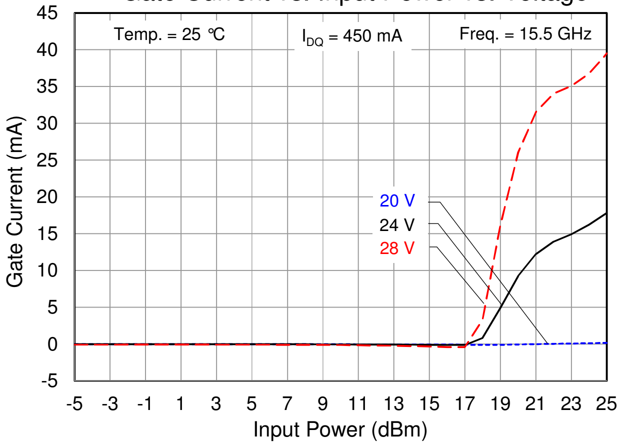

Drain Current vs. Freq. vs. Drain Voltage


Gate Current vs. Freq. vs. Drain Voltage


Drain Current vs. Frequency vs. Temp.

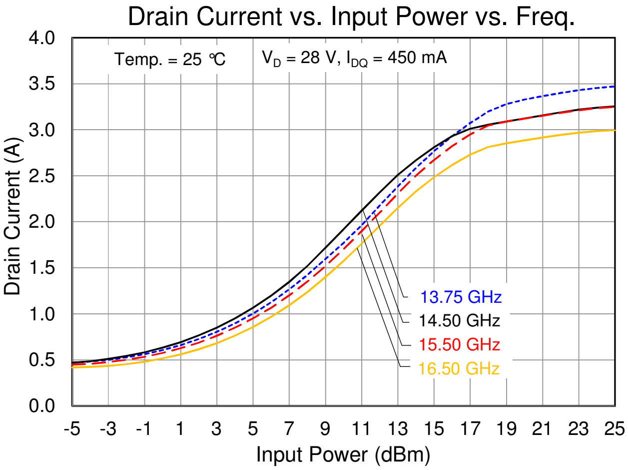

Gate Current vs. Frequency vs. Temp.

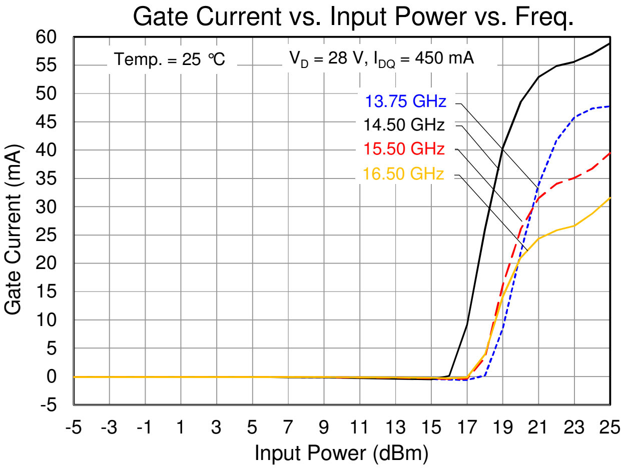

Drain Current vs. Input Power vs. Voltage

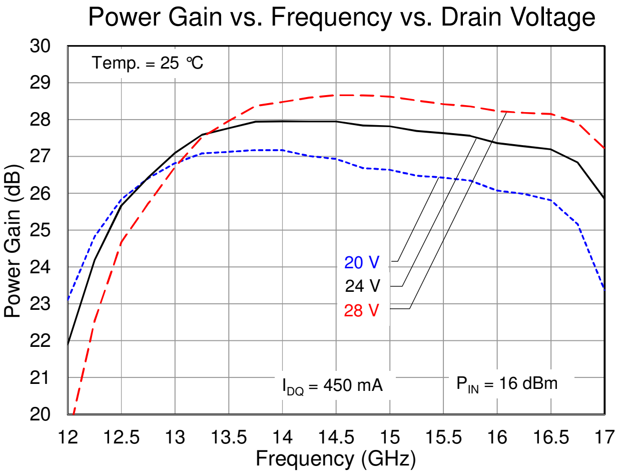

Gate Current vs. Input Power vs. Voltage

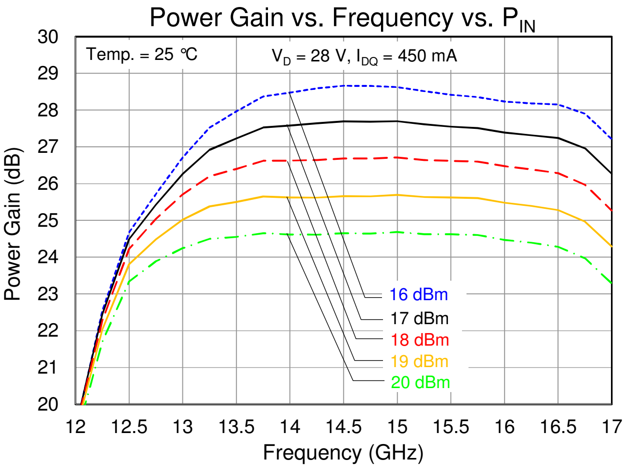
Typical Performance: Large Signal

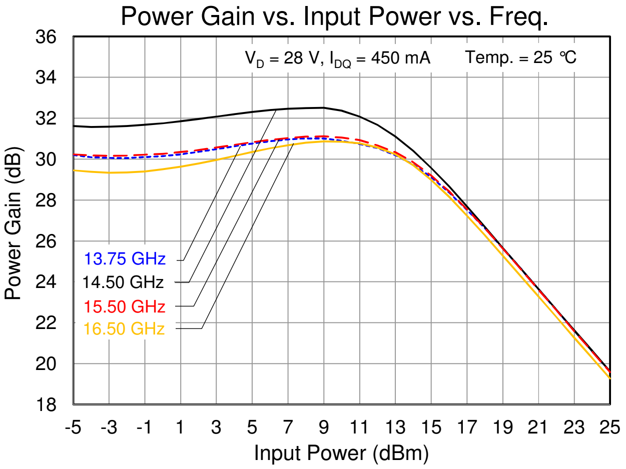
Conditions unless otherwise specified: V_D = 28 V, I_{DQ} = 450 mA, V_G = -2.7 V Typical, CW.

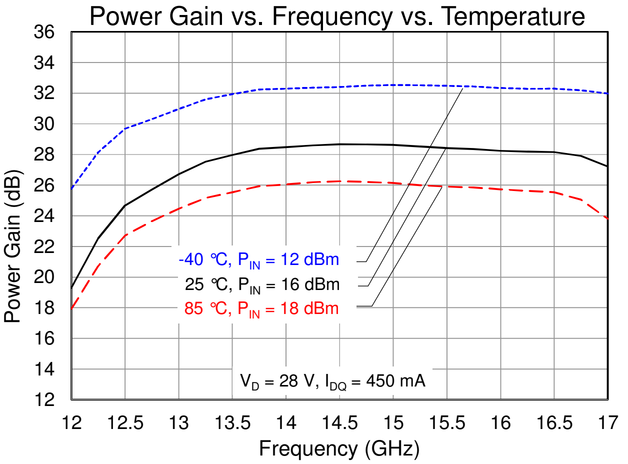








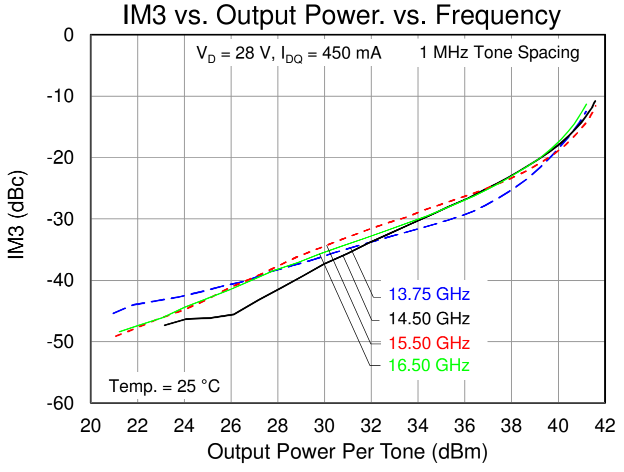




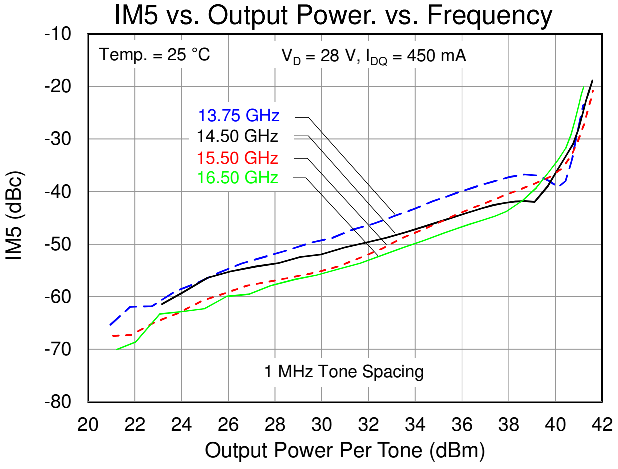
Typical Performance: Linearity

Conditions unless otherwise specified: V_D = 28 V, I_{DQ} = 450 mA, V_G = -2.7 V Typical, CW.

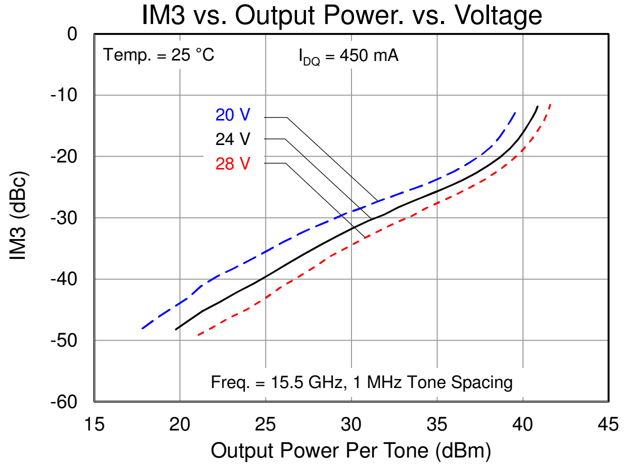
IM3 vs. Output Power. vs. Frequency



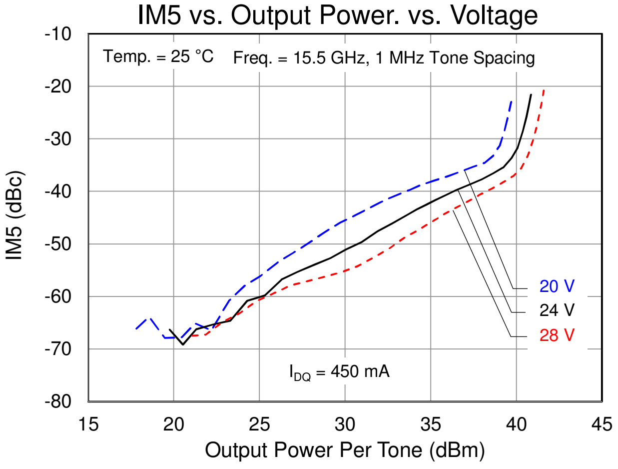
IM5 vs. Output Power. vs. Frequency



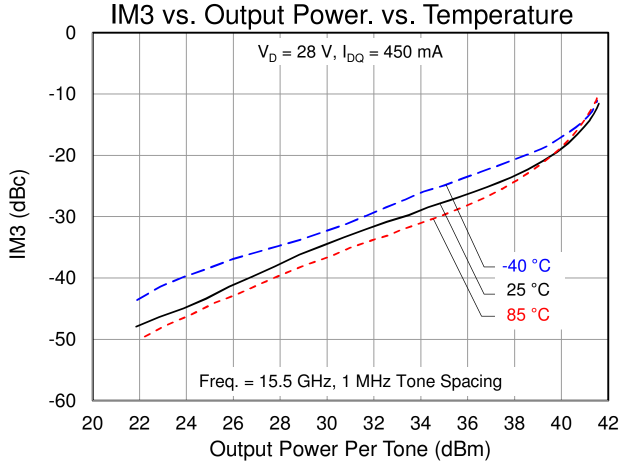
IM3 vs. Output Power. vs. Voltage



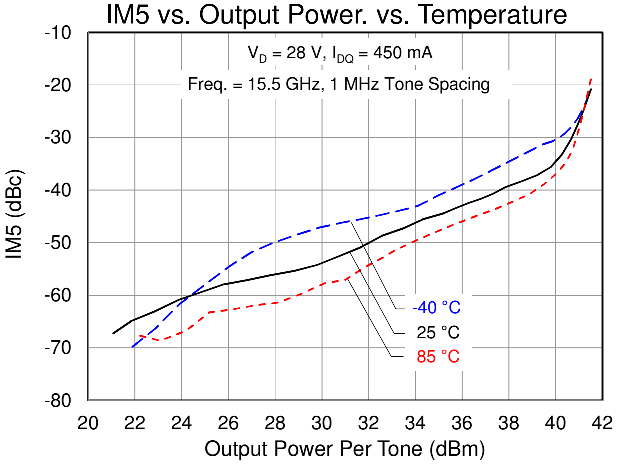
IM5 vs. Output Power. vs. Voltage



IM3 vs. Output Power. vs. Temperature

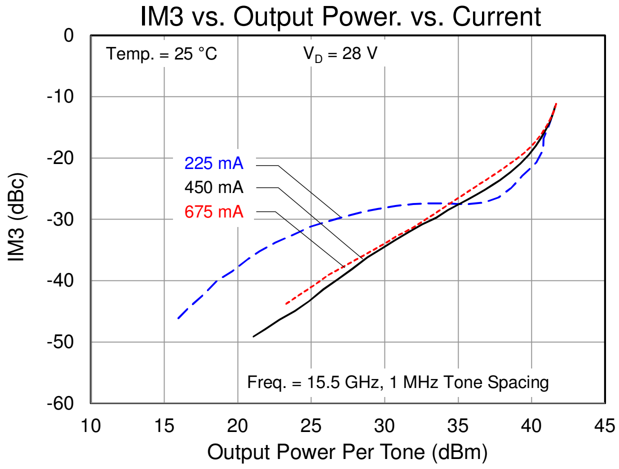


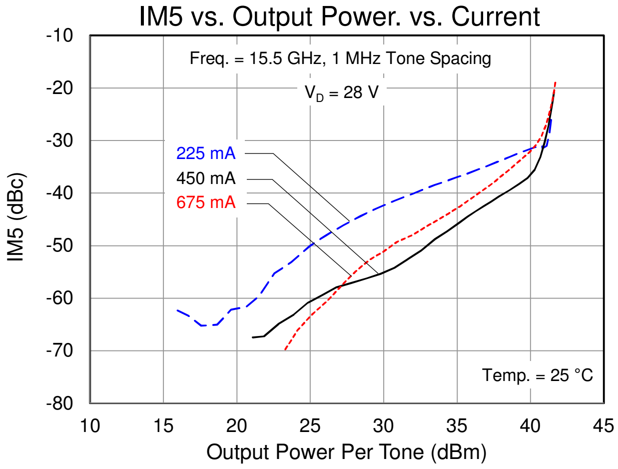
IM5 vs. Output Power. vs. Temperature

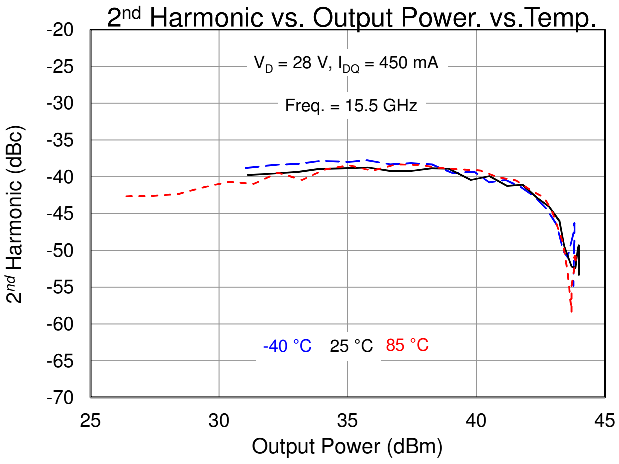


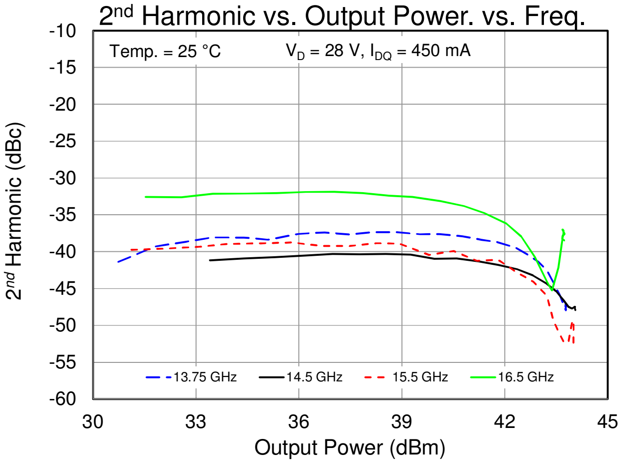
Typical Performance: Large Signal

Conditions unless otherwise specified: V_D = 28 V, I_{DQ} = 450 mA, V_G = -2.7 V Typical, CW.

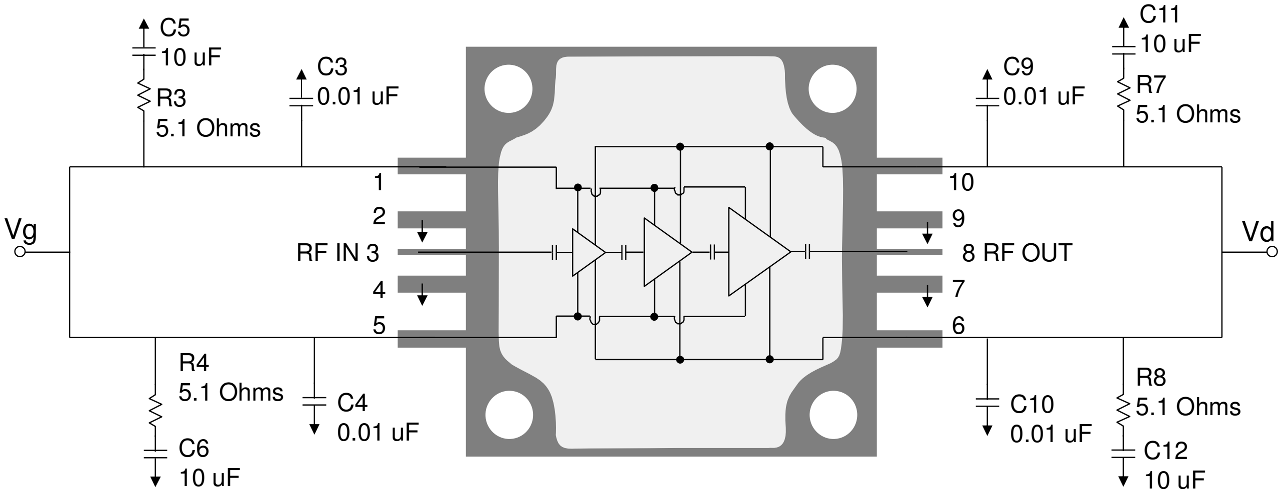








Applications Information and Pin Layout



Notes: V_G and V_D can be biased from either side of top or bottom.

Bias-up Procedure

1. Set I_D limit to 3.5 A, I_G limit to 65 mA
2. Apply –5 V to V_G
3. Apply +28 V to V_D; ensure I_{DQ} is approx. 0 mA
4. Adjust V_G until I_{DQ} = 450 mA (V_G ~ –2.7 V Typ.).
5. Turn on RF supply

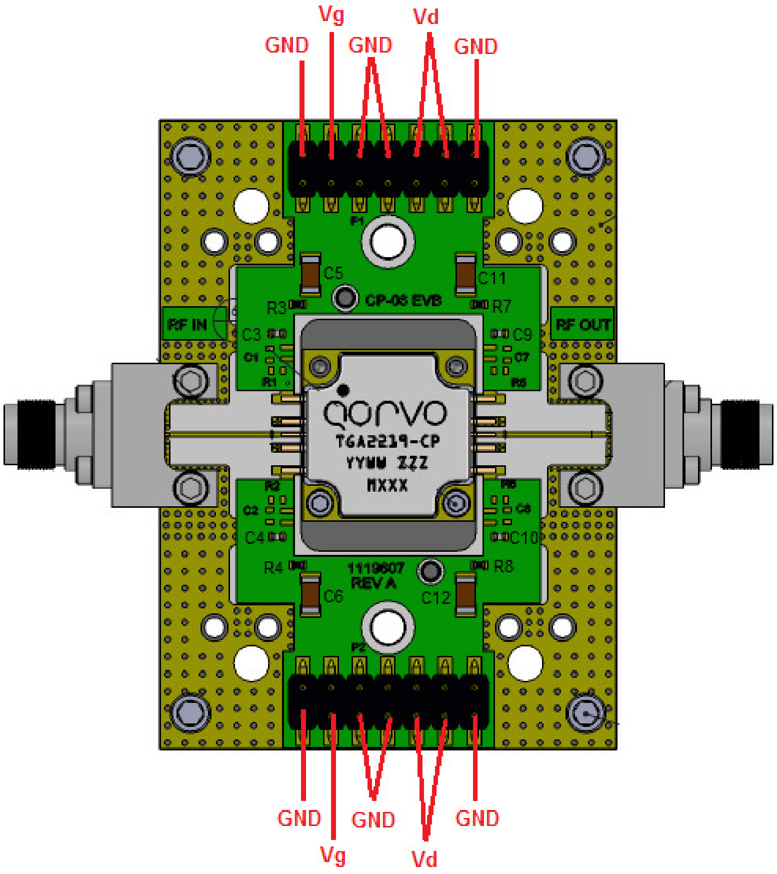
Bias-down Procedure

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

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

Evaluation Board



NOTE: V_G and V_D can be biased from either side of top or bottom.

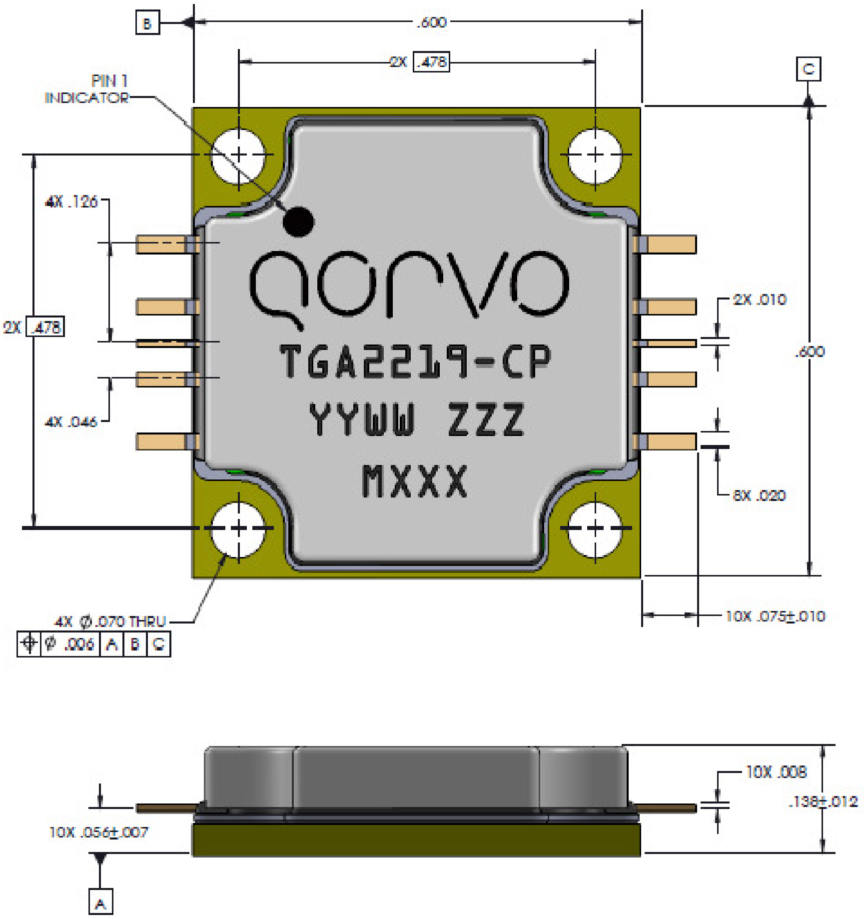
Bill of Material

Reference Des.	Value	Description	Manuf.	Part Number
C3, C4, C9, C10	0.01 µF	Cap, 0402, 50 V, 10%, X7R	Various	
C5, C6, C11, C12	10 µF	Cap, 1206, 50 V, 20%, X5R	Various	
R3, R4, R7, R8	5.1 Ohm	Res, 0402, 50V, 5%	Various	

Assembly Notes

1. Clean the board or module with alcohol. Allow it to dry fully.
2. Nylock screws are recommended for mounting the TGA2219-CP to the board.
3. To improve the thermal and RF performance, we recommend the following:
   a. Apply a small amount thermal compound (Arctic Silver) or 4 mils indium shim between the package and the board.
   b. Attach a heat sink to the bottom of the board and apply thermal grease or 4 mils indium shim between the heat sink and the board.
4. Apply solder to each pin of the TGA2219-CP.
5. Clean the assembly with alcohol.

Mechanical Information



Units: inches
Tolerances: unless specified
x.xx = ± 0.01
x.xxx = ± 0.005
Materials:
Base: Copper
Lid: LCD (Liquid Crystal Polymer)
All metalized features are gold plated
Part is epoxy sealed
Marking:
2219-CP: Part number
YY: Part Assembly year
WW: Part Assembly week
ZZZ: Serial Number
MXXX: Batch ID