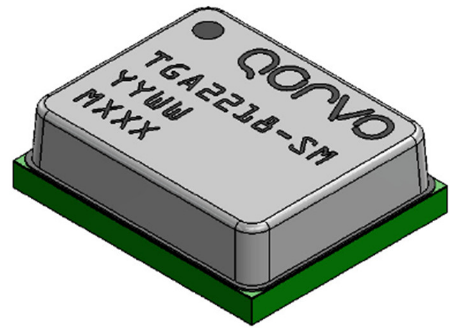
RFMD + TriQuint = Qorvo

Applications

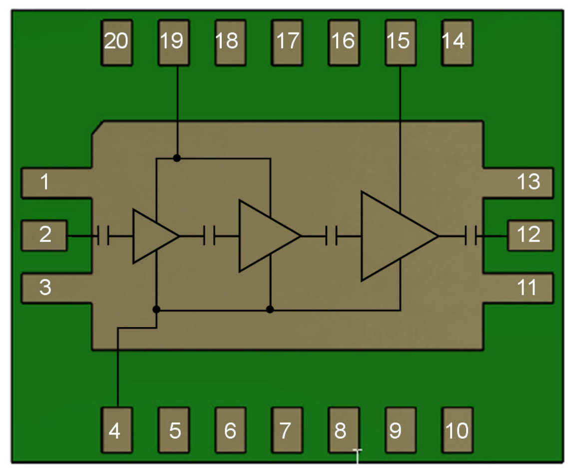
- Satellite Communications
- Data Link
- Radar



Product Features

- Frequency Range: 13.4 – 16.5 GHz
- P_{SAT}: > 41 dBm (P_{IN} = 18 dBm)
- PAE: > 29% (P_{IN} = 18 dBm)
- Large Signal Gain: > 23 dB
- Small Signal Gain: > 28 dB
- Bias: V_D = 28 V, I_{DQ} = 225 mA, V_G = -2.6 V Typical
- Package Dimensions: 5.50 x 4.50 x 1.67 mm
- Performance Under CW Operation

Functional Block Diagram



General Description

Qorvo's TGA2218–SM is a packaged Ku-band, high power MMIC amplifier fabricated on Qorvo's production 0.15um GaN on SiC process. The TGA2218–SM operates from 13.4 – 16.5 GHz and provides greater than 12 W of saturated output power with 23 dB of large signal gain and greater than 29% power–added efficiency.

This high performance combination provides system designers the flexibility to improve system performance while reducing size and cost.

The TGA2218–SM is fully matched to 50 Ohms with integrated DC blocking capacitors on the RF ports simplifying system integration. It is ideally suited for military and commercial Ku-band radar and satellite communication systems.

Lead-free and RoHS compliant.

Evaluation boards are available upon request.

Pad Configuration

Pad No.	Symbol
1, 3, 11, 13	GND
2	RF Input
4	V_{G123}
5-10, 14, 16-18, 20	No Connect
12	RF Output
15	V_{D3}
19	V_{D12}

Ordering Information

Part	ECCN	Description
TGA2218-SM	3A001.b.2.c	13.4 – 16.5 GHz 12 W GaN Power Amplifier

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Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	29.5 V
Gate Voltage Range (V_G)	−8 to 0 V
Drain Current (I_{D12})	1.15 A
Drain Current (I_{D3})	1.03 A
Gate Current	See plot on page 3
Power Dissipation (P_{DISS}), 85°C, CW	35 W
Input Power (P_{IN}), CW, 50Ω, V_D = 28 V, I_{DQ} = 225 mA, 85°C	30 dBm
Input Power (P_{IN}), CW, VSWR 3:1, V_D = 28 V, I_{DQ} = 225 mA, 85°C	27 dBm
Channel Temperature (T_{CH})	275 °C
Mounting Temperature (30 seconds)	260 °C
Storage Temperature	−40 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})	225 mA (Total)
Gate Voltage (V_G)	−2.6 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} = 225 mA, V_G = −2.6 V Typical, CW

Parameter	Min	Typical	Max	Units
Operational Frequency Range	13.4		16.5	GHz
Small Signal Gain		> 28		dB
Input Return Loss		> 15		dB
Output Return Loss		> 5		dB
Power Gain (Pin = 18 dBm)		> 23		dB
Output Power (Pin = 18 dBm)		> 41		dBm
Power Added Efficiency (Pin = 18 dBm)		> 29		%
Small Signal Gain Temperature Coefficient		−0.11		dB/°C
Output Power Temperature Coefficient (Temp: 25 °C – 85 °C @ Pin = 18 dBm)		−0.01		dB/°C
Recommended Operating Voltage		20 to 28	28	V

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Thermal and Reliability Information

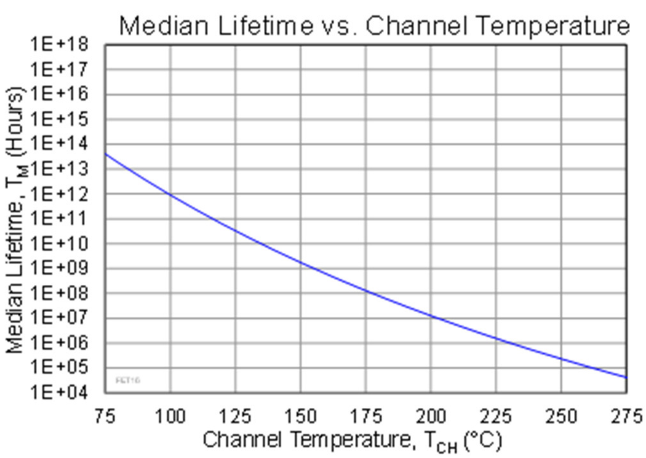
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) [1]	T_{base} = 85°C V_D = 28 V, I_{DQ} = 225 mA P_{DISS} = 6.3 W	4.44	ºC/W
Channel Temperature (T_{CH}) (No RF drive)		113	°C
Median Lifetime (T_M)		1.53E11	Hrs

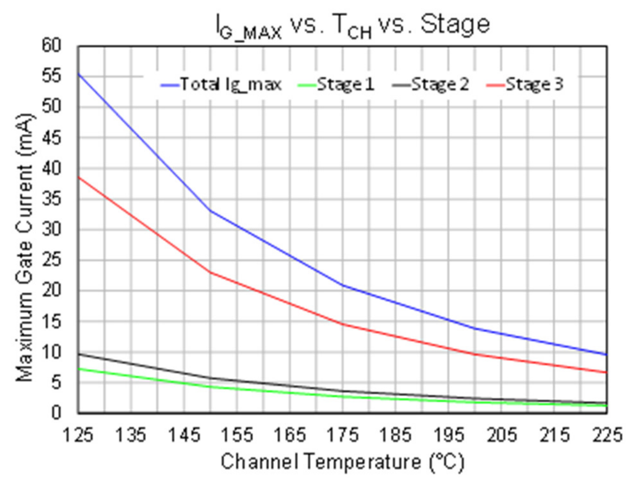
Thermal Resistance (θ_{JC}) [1]	T_{base} = 85°C, CW , V_D = 28 V, I_{DQ} = 225 mA Freq = 16.00 GHz, I_{D_Drive} = 1.46 A, P_{IN} = 20 dBm, P_{OUT} = 40.7 dBm, P_{DISS} = 29.16 W	4.46	ºC/W
Channel Temperature (T_{CH}) (Under RF drive)		215	°C
Median Lifetime (T_M)		6.52E6	Hrs

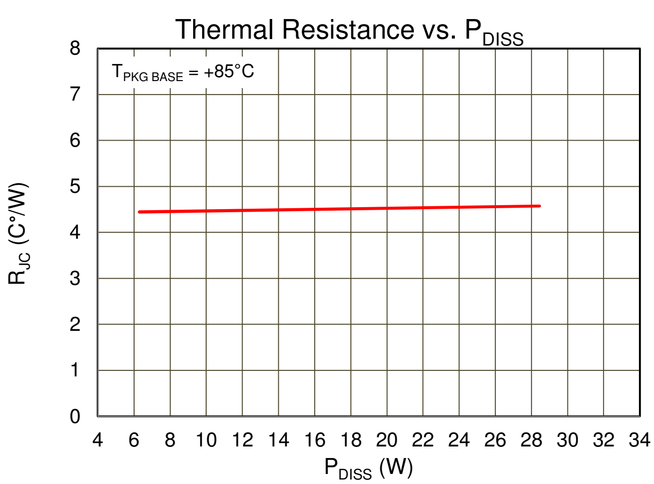
Notes:
1. Thermal resistance measured to back of package.

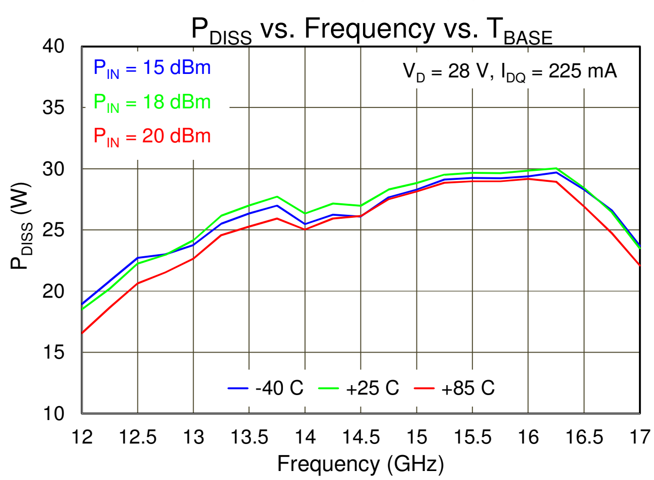
Median Lifetime

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









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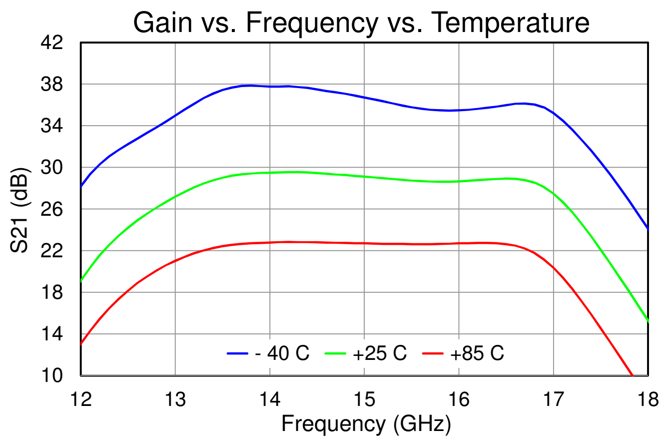
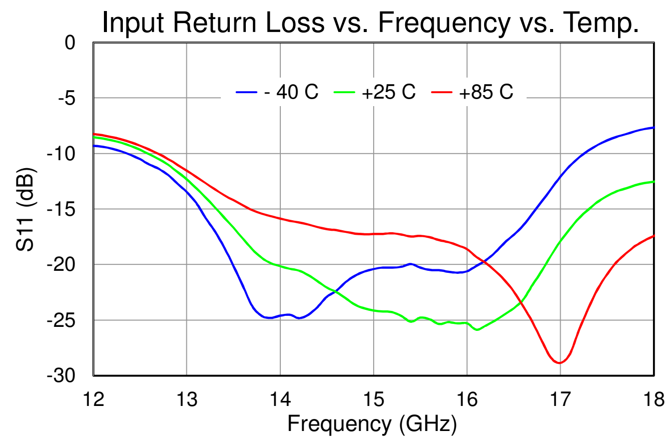
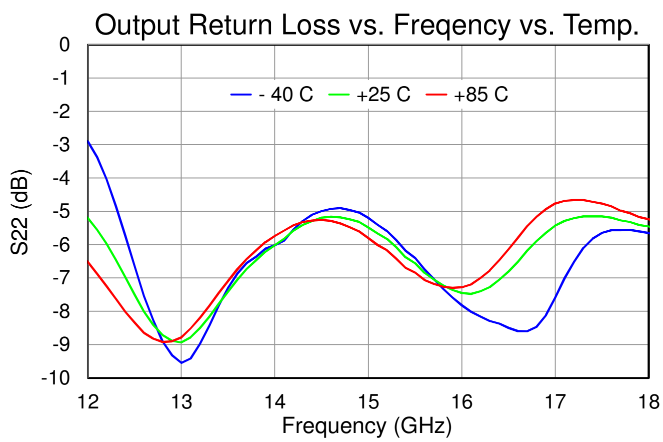
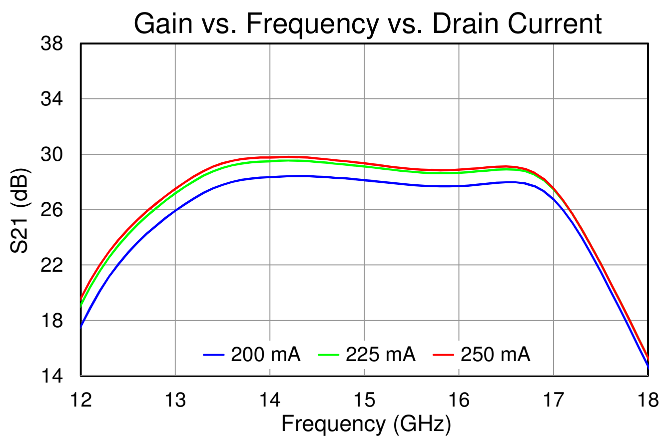
Typical Performance: Small Signal

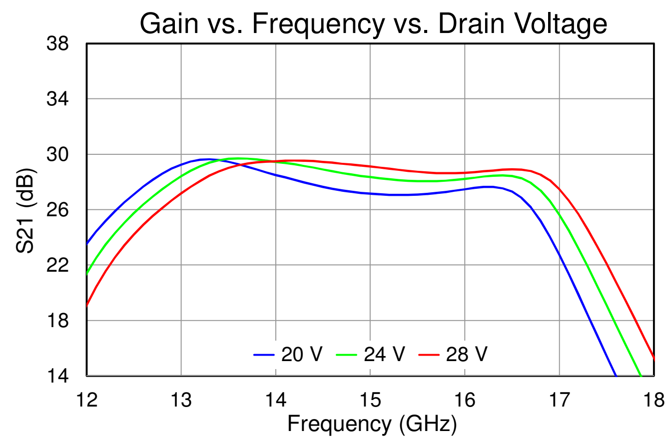
Test conditions unless otherwise noted: 25 °C , V_D = 28 V, I_{DQ} = 225 mA











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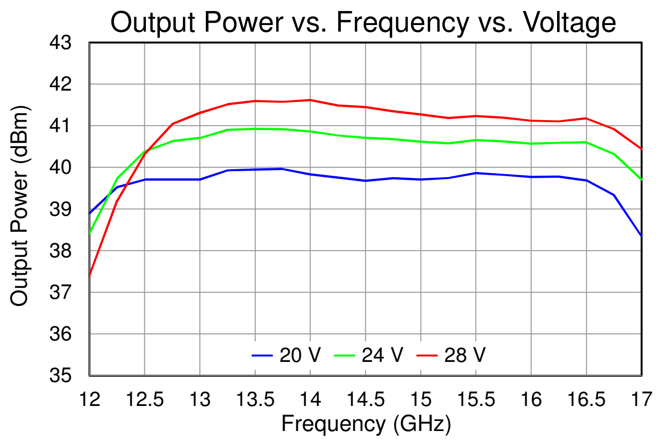
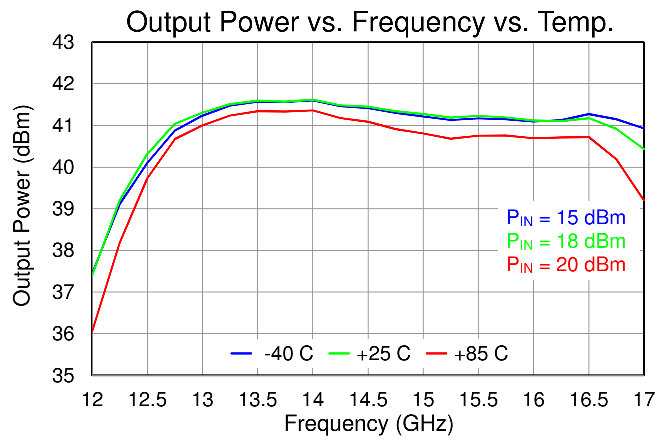
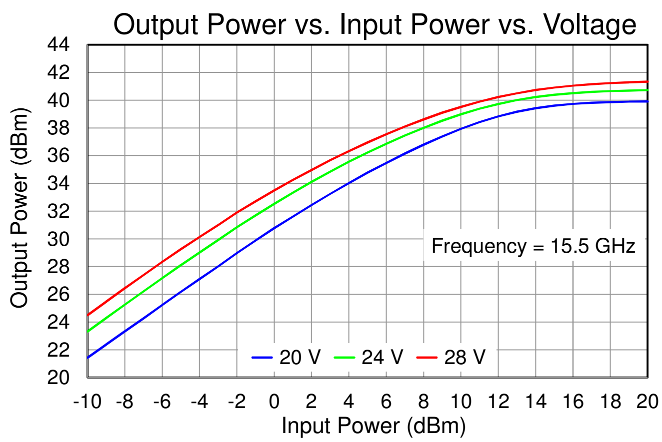
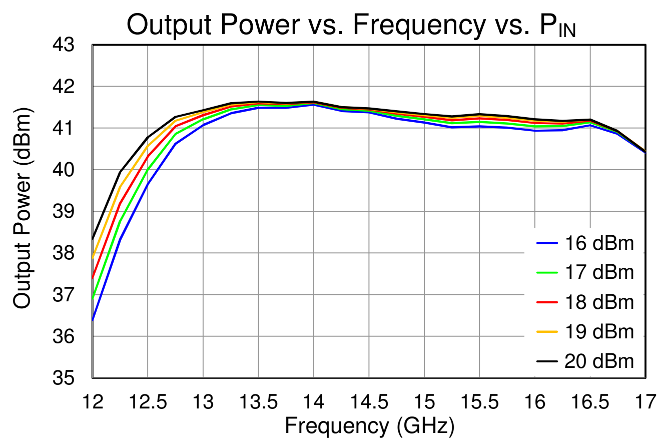
Typical Performance: CW Power Operation

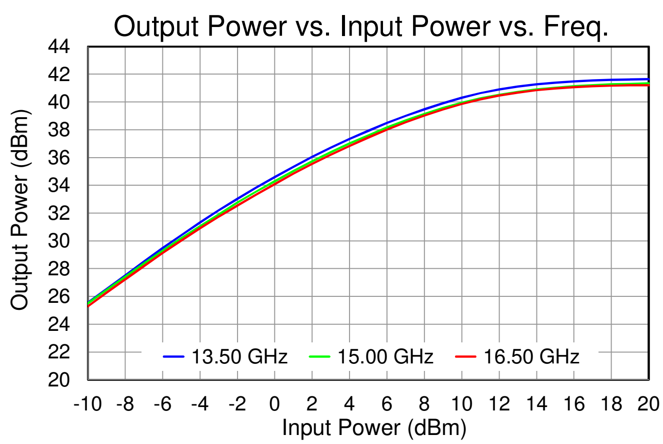
Test conditions unless otherwise noted: 25 °C , V_D = 28 V, I_{DQ} = 225 mA











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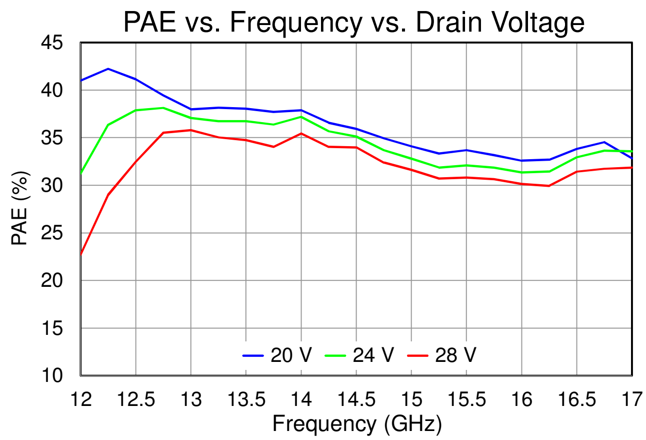
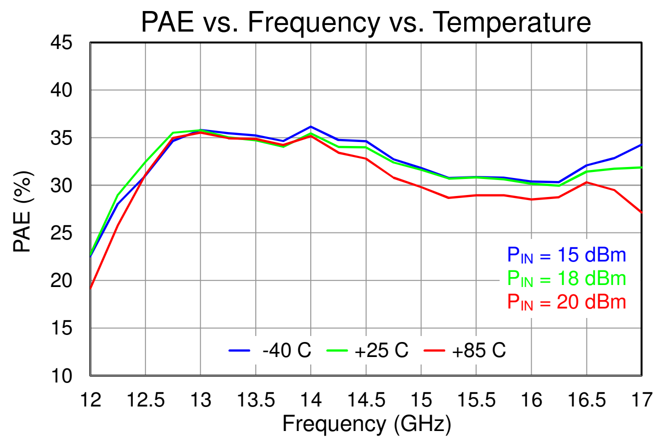
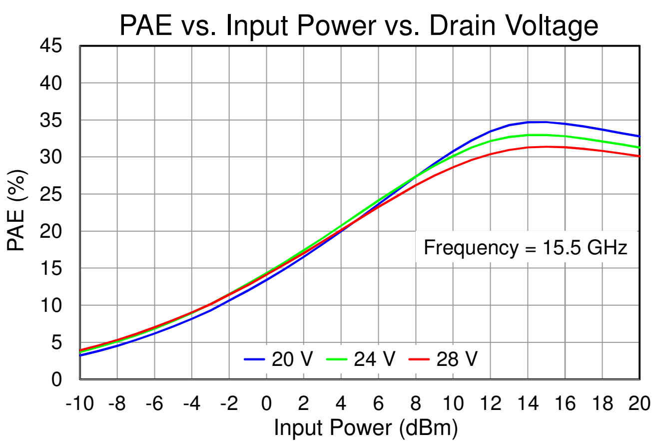
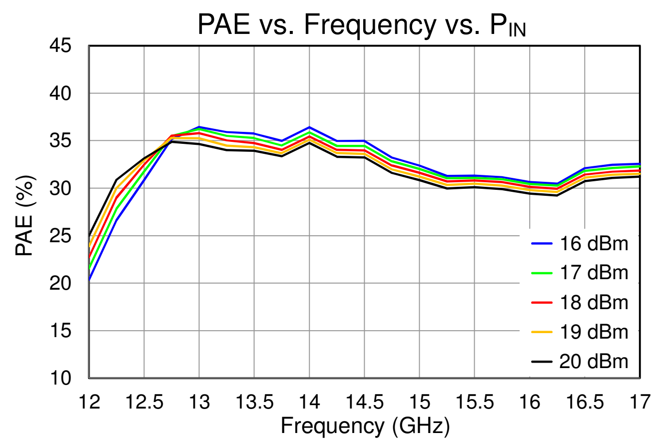
Typical Performance: CW Power Operation

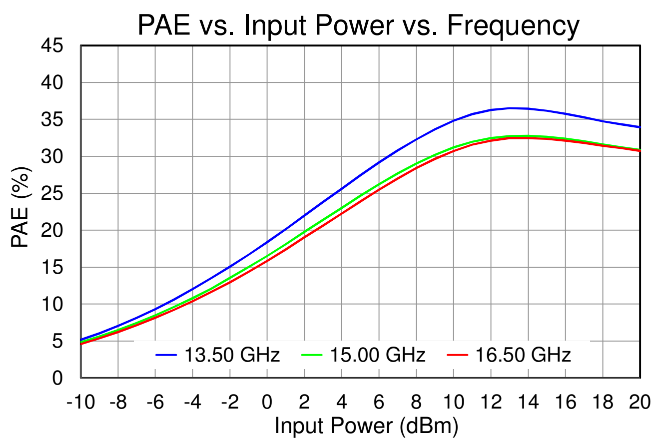
Test conditions unless otherwise noted: 25 °C , V_D = 28 V, I_{DQ} = 225 mA











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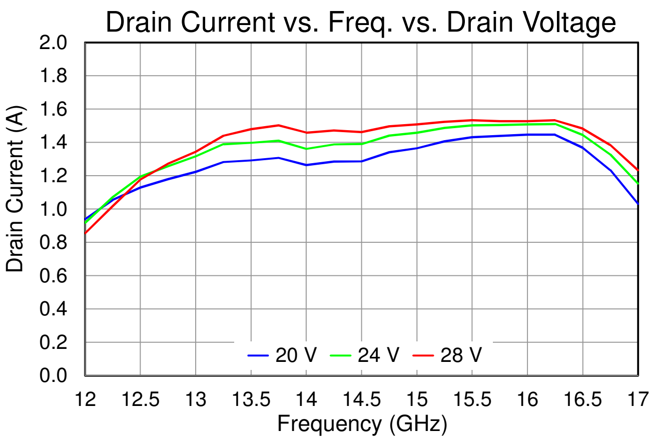
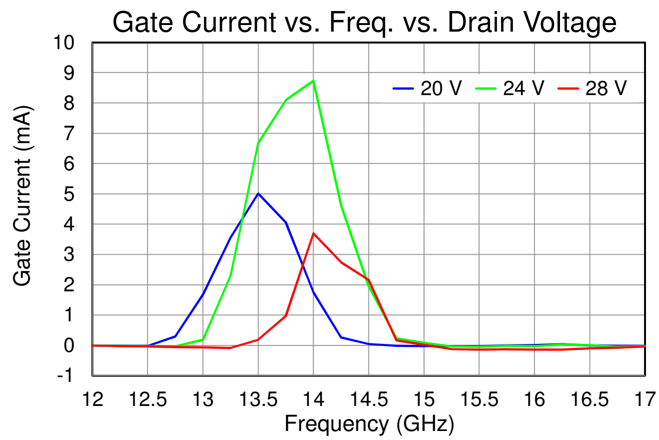
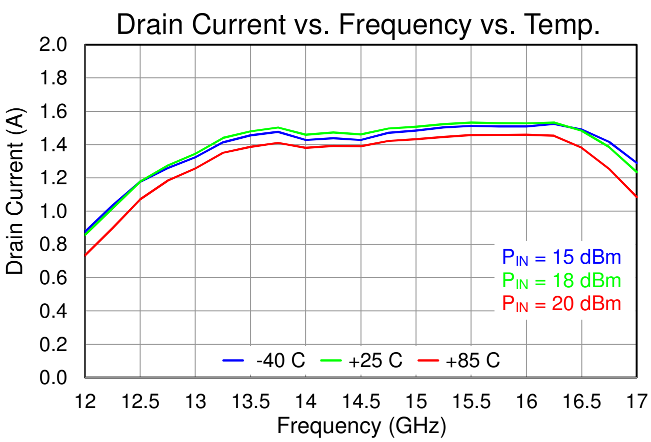
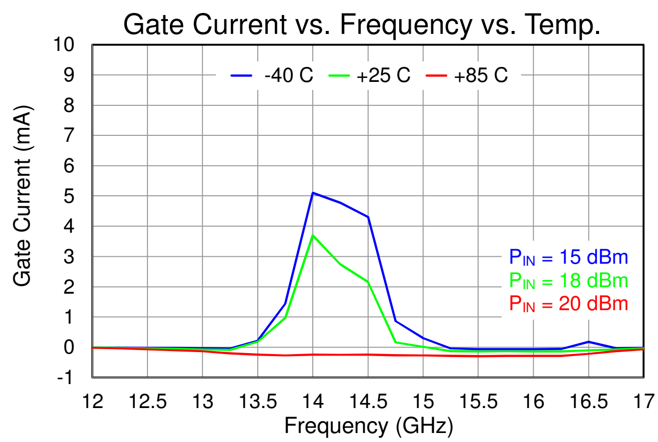
Typical Performance: CW Power Operation

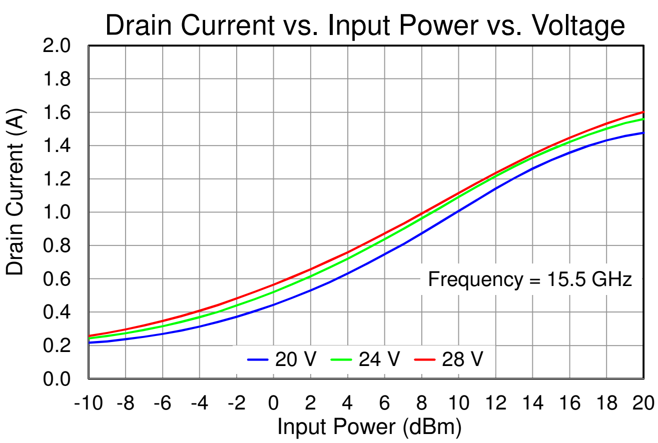
Test conditions unless otherwise noted: 25 °C , V_D = 28 V, I_{DQ} = 225 mA

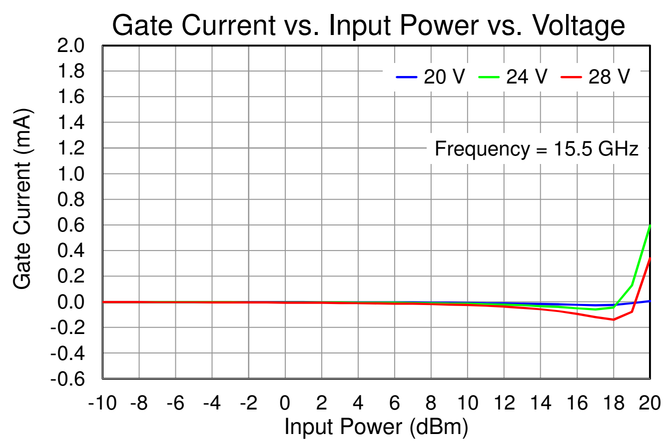












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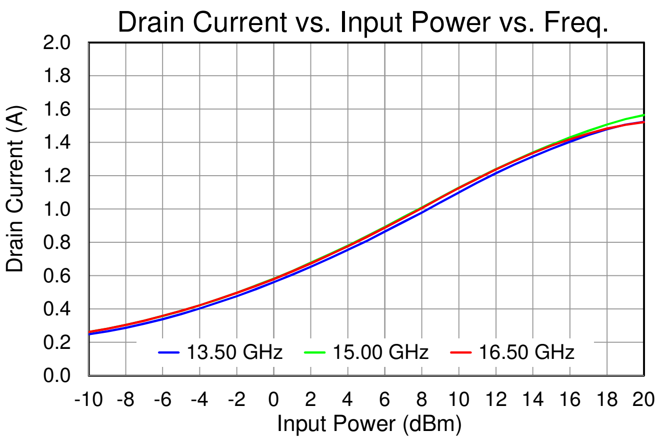
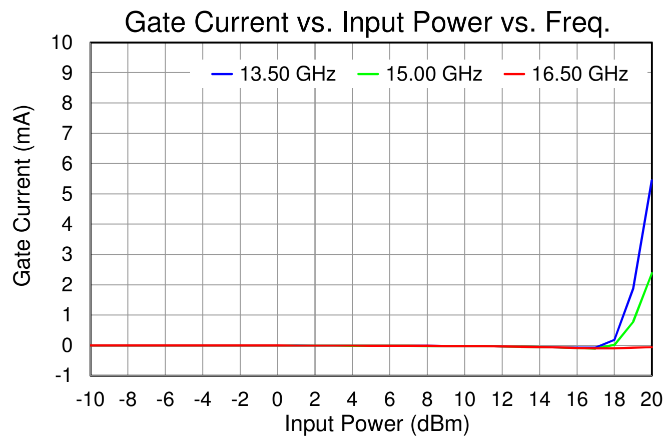
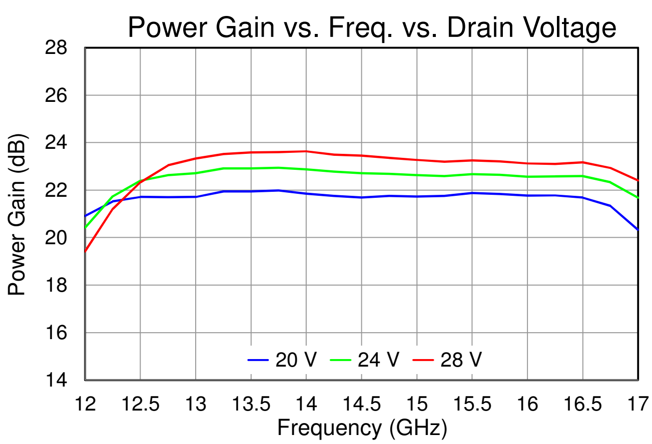
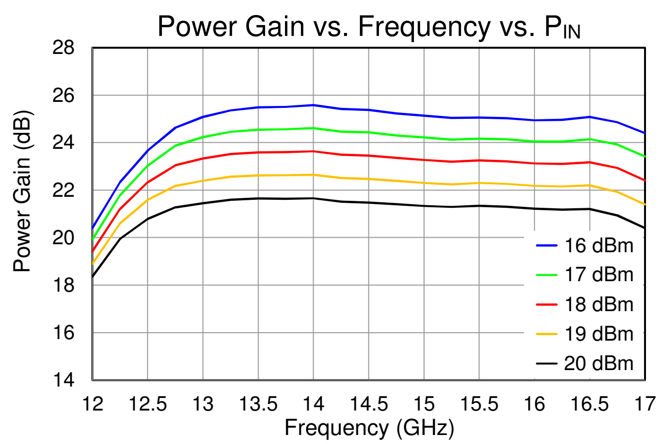
Typical Performance: CW Power Operation

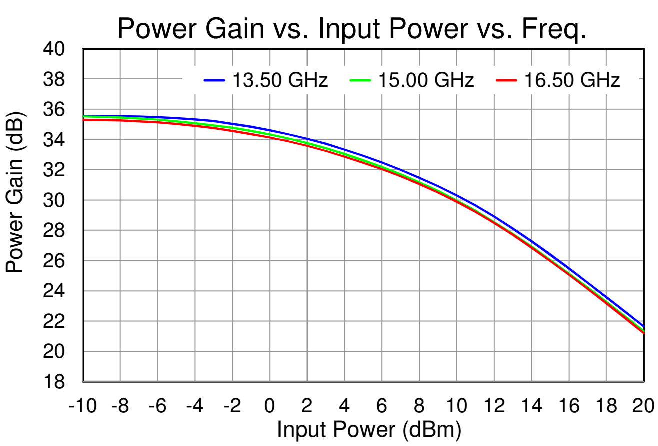
Test conditions unless otherwise noted: 25 °C , V_D = 28 V, I_{DQ} = 225 mA

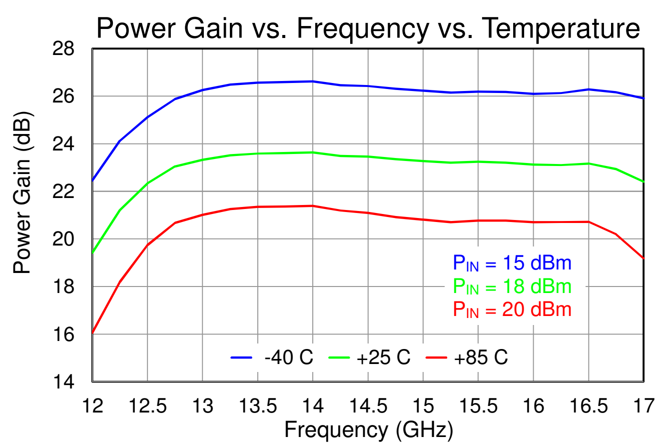












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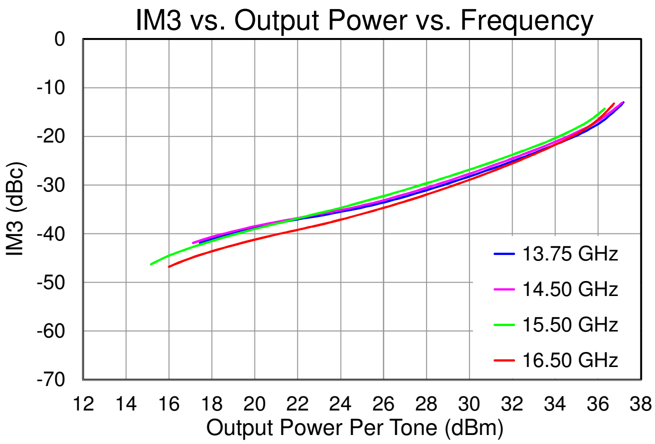
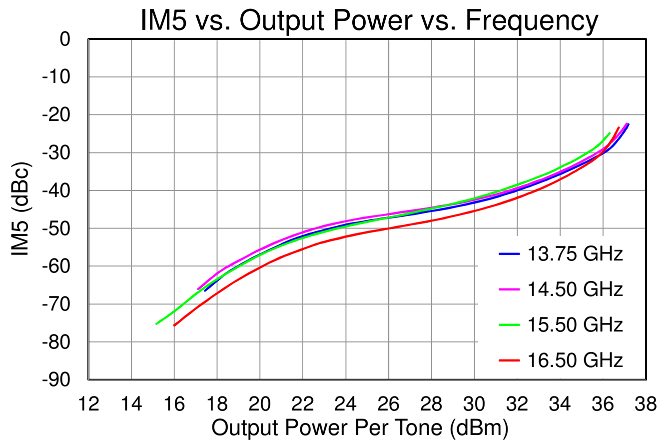
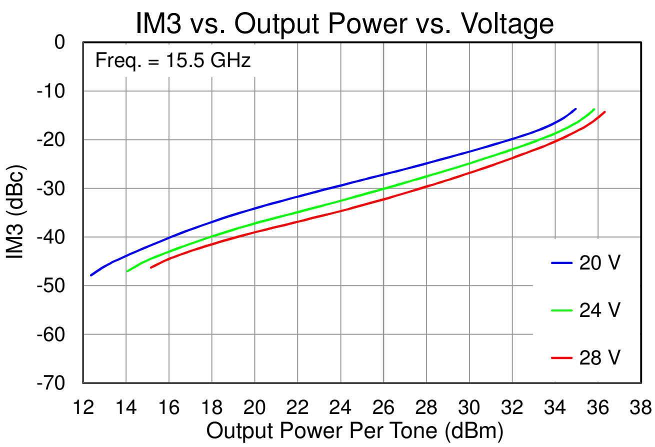
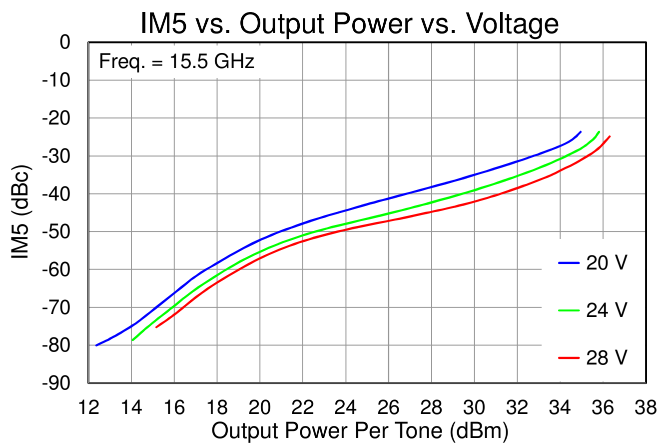
Typical Performance: Linearity

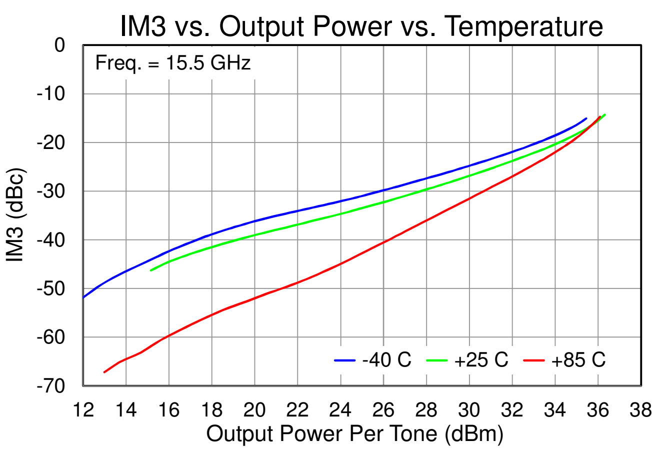
Test conditions unless otherwise noted: 25 °C , V_D = 28 V, I_{DQ} = 225 mA, 1 MHz Tone Spacing

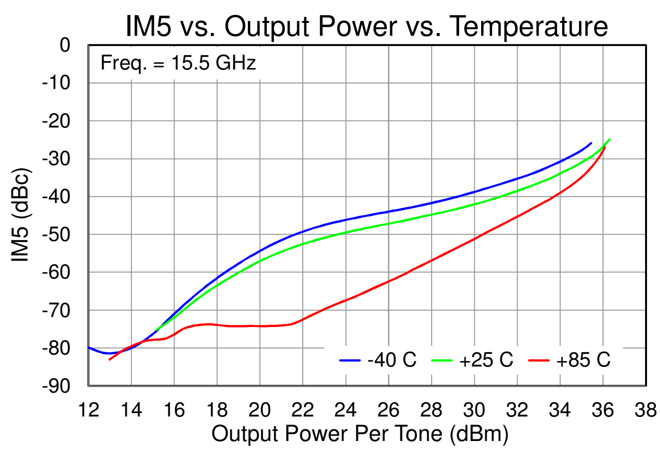












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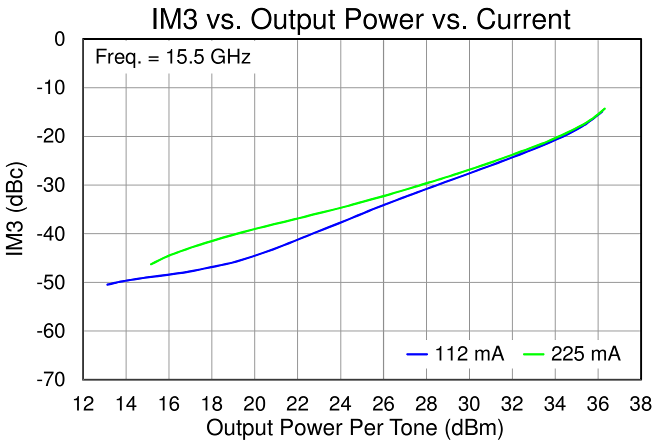
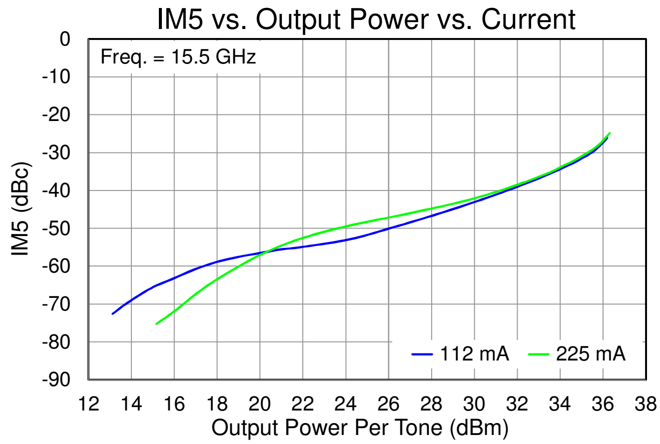
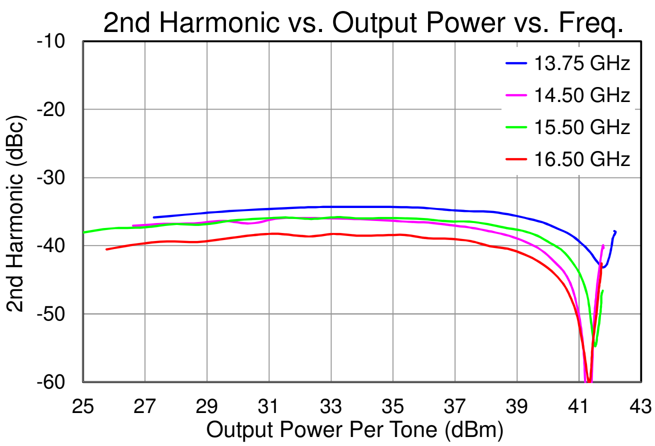
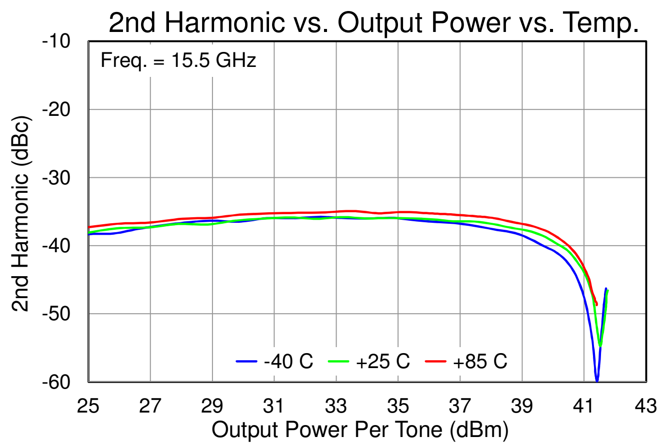
Typical Performance: Linearity

Test conditions unless otherwise noted: 25 °C , V_D = 28 V, I_{DQ} = 225 mA, 1 MHz Tone Spacing









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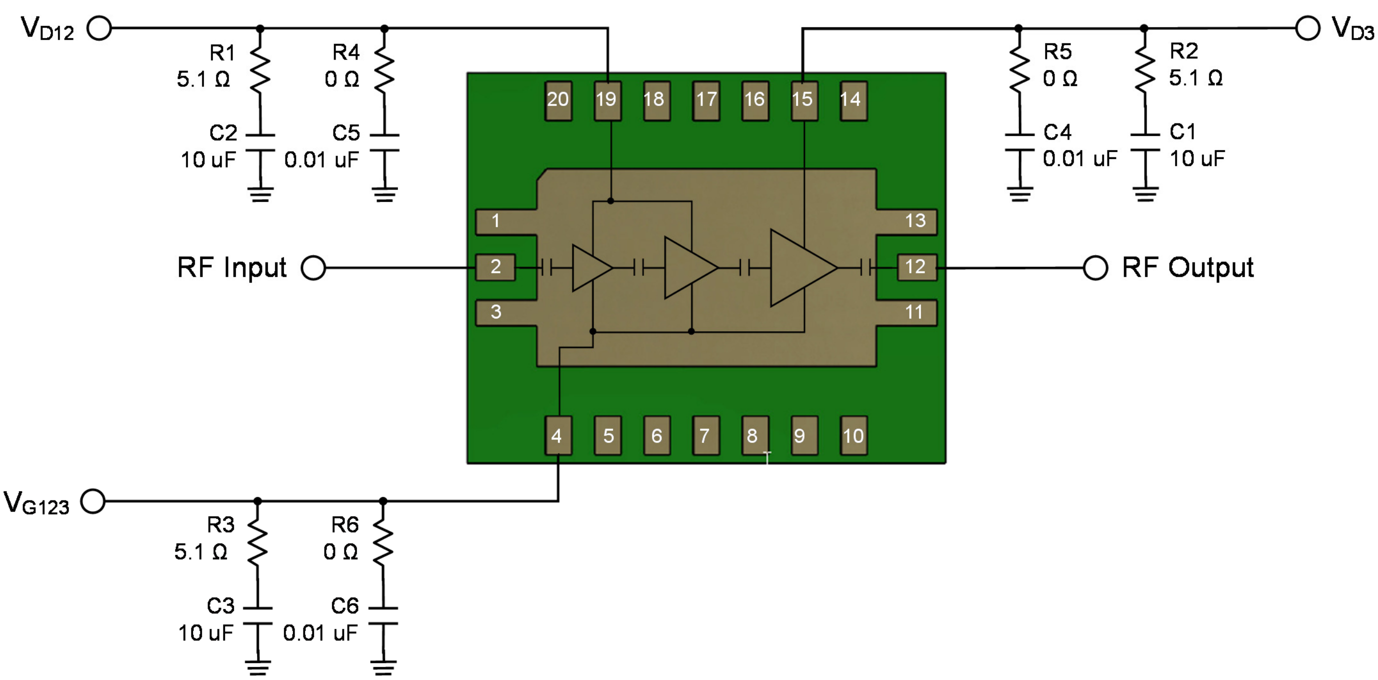
Application Circuit



Note:
VD12 and VD3 use a common power supply

Bias-up Procedure
1. Set I_D limit to 1800 mA, I_G limit to 20mA
2. Set V_G to –5.0 V
3. Set V_D +28 V
4. Adjust V_G more positive until I_{DQ} = 225mA (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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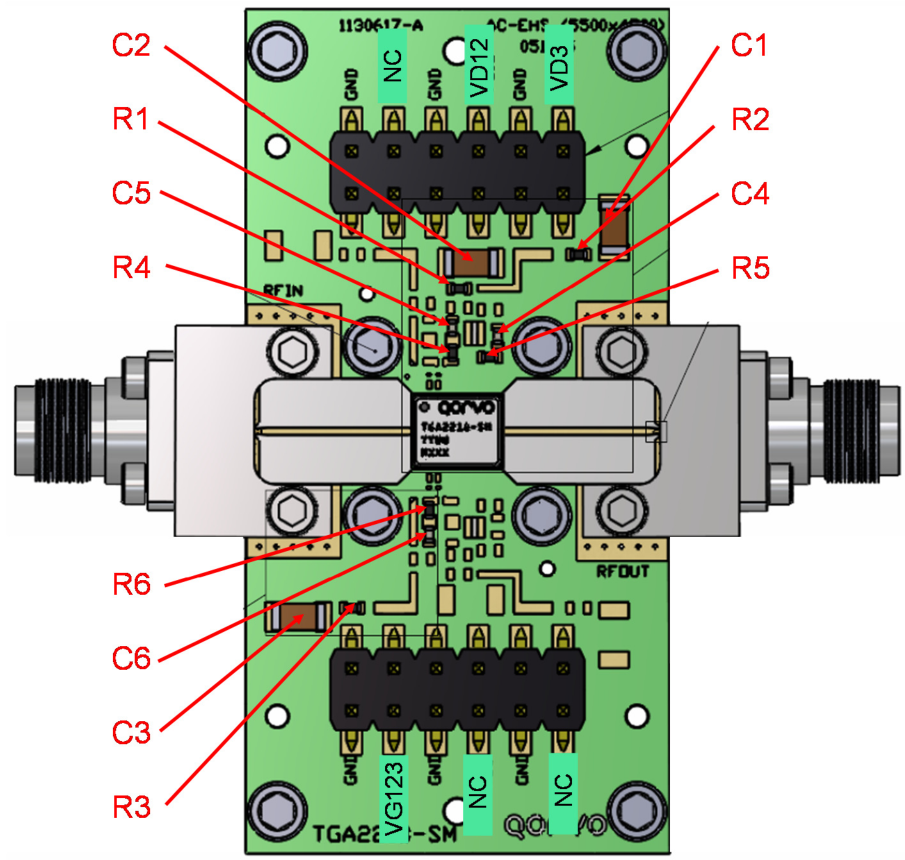
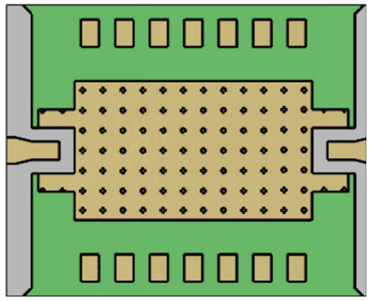
Evaluation Board and Mounting Detail





Mounting Area Detail

RF Layer is 0.008" thick Rogers Corp. RO40003C (ε_r = 3.35). Metal layers are 0.5 oz. copper. The microstrip line at the connector interface is optimized for the Southwest Microwave end launch connector 1092-01A-5.

Multiple vias should be employed under package center paddle to minimize inductance and thermal resistance.

Reference Des.	Component	Value	Manuf.	Part Number
C1 – C3	Surface Mount Cap	10 uF, ±20 %, 50 V (1206), X5R	Various	
C4 – C6	Surface Mount Cap	0.01 uF, ±10 %, 50 V (0402), X7R	Various	
R1 – R3	Surface Mount Res	5.1 Ohm, ±5 % (0402)	Various	
R4 – R6	Surface Mount Res	0.0 Ohm, ±5 % (0402)	Various	

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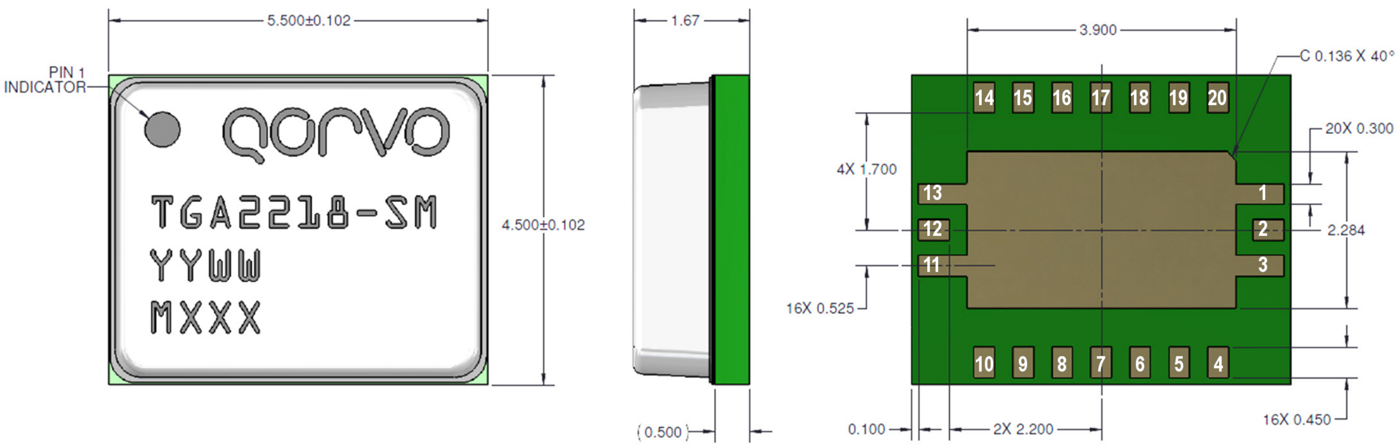
Mechanical Drawing & Pad Description



PART MARKING

TGA2218-SM: Part Number

YY: Part Assembly Year

WW: Part Assembly Week

MXXX: Batch ID

Dimensions in millimeters

Pin Number	Label	Description
1, 3, 11, 13	GND	RF Ground (including center pad)
2	RF Input	RF Input; matched to 50Ω; DC Blocked
4	V_{G123}	Gate voltage stages 1-2-3. Bias network is required; see Application Circuit as an example
5-10, 14, 16-18, 20	NC	No Connection in package; grounding may improve performance
12	RF Output	RF Output; matched to 50Ω; DC Blocked
15	V_{D3}	Drain voltage stage 3. Bias network is required; see Application Circuit as an example
19	V_{D12}	Drain voltage stages 1-2. Bias network is required; see Application Circuit as an example

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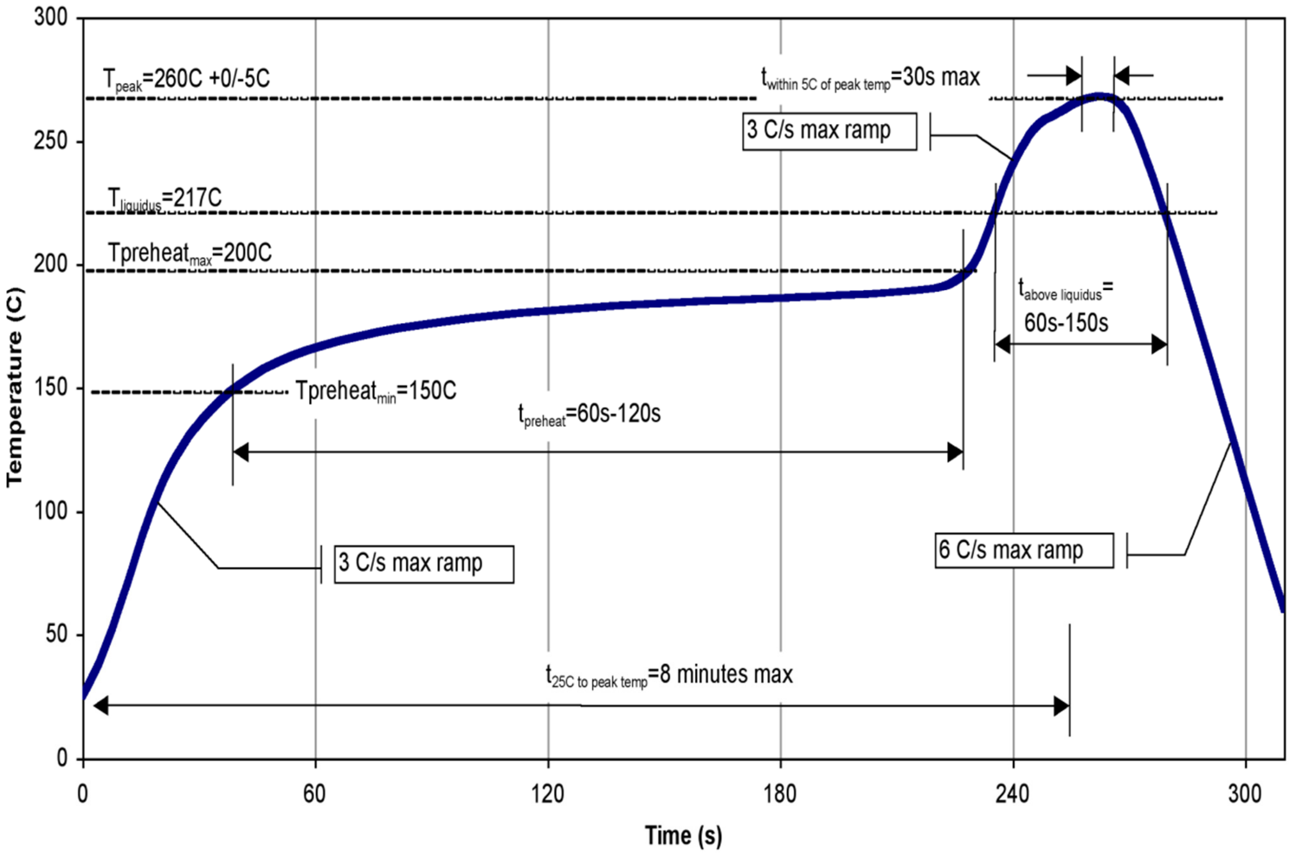
Recommended Soldering Temperature Profile



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