TGA2218-SM

13.4–16.5 GHz 12 W GaN Power Amplifier

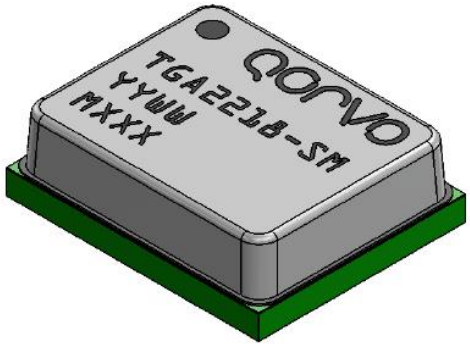
Product Overview

Qorvo's TGA2218–SM is a packaged Ku-band, high power MMIC amplifier fabricated on Qorvo's production 0.15 um 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.

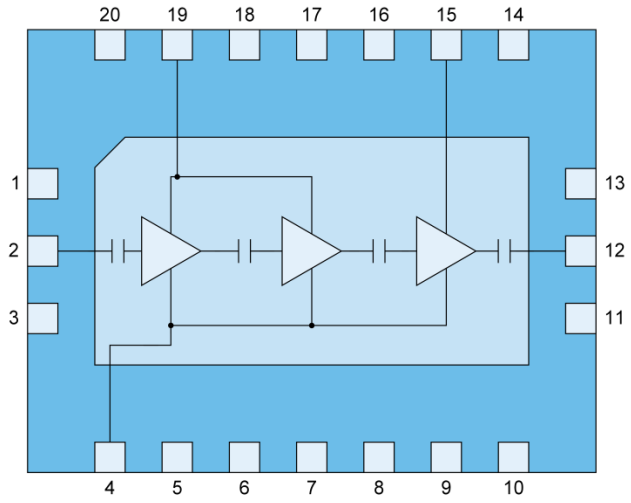
Lead-free and RoHS compliant.



Key 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

Functional Block Diagram



Applications

- Satellite Communications
- Data Link
- Radar

Ordering Information

Part No.	Description
TGA2218-SM	13.4–16.5 GHz 12 W GaN Power Amplifier
TGA2218-SM EVB	Evaluation Board

Absolute Maximum Ratings

Parameter	Value/Range
Drain Voltage (V_D)	29.5 V
Gate Voltage Ra nge (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, 50 Ω, 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
Mounting Temperature (30 seconds)	260 °C
Storage Temperature	−40°C 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)	28 V
Drain Current (I_{DQ})	225 mA (Total)
Gate Voltage (V_G)	−2.6 V (Typ.)

Electrical Specifications

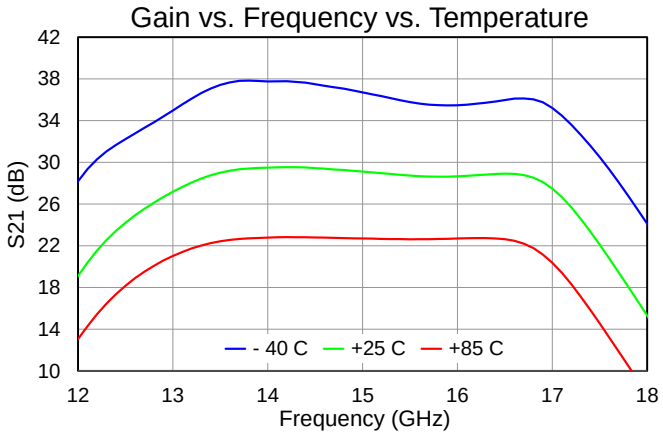
Test conditions unless otherwise noted: 25 °C, V_D = 28 V, I_{DQ} = 225 mA, V_G = −2.6 V Typical, CW

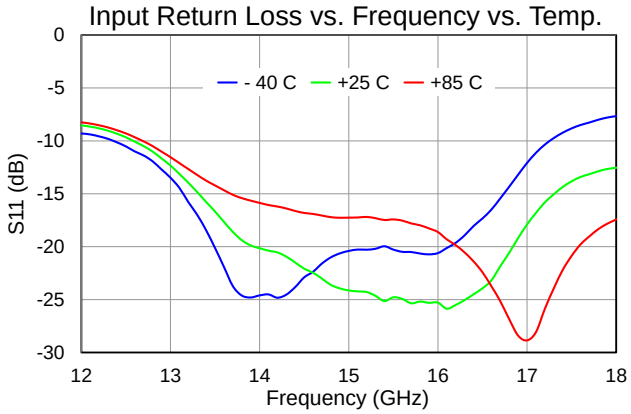
Parameter	Min	Type	Max	Units
Operational Frequency Range	13.4		16.5	GHz
Small Signal Gain		> 28		dB
Input Return Loss		> 15		dB
Output Return Loss		> 5		dB
Power Gain (P_{IN} = 18 dBm)		> 23		dB
Output Power (P_{IN} = 18 dBm)		> 41		dBm
Power Added Efficiency (P_{IN} = 18 dBm)		> 29		%
Small Signal Gain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

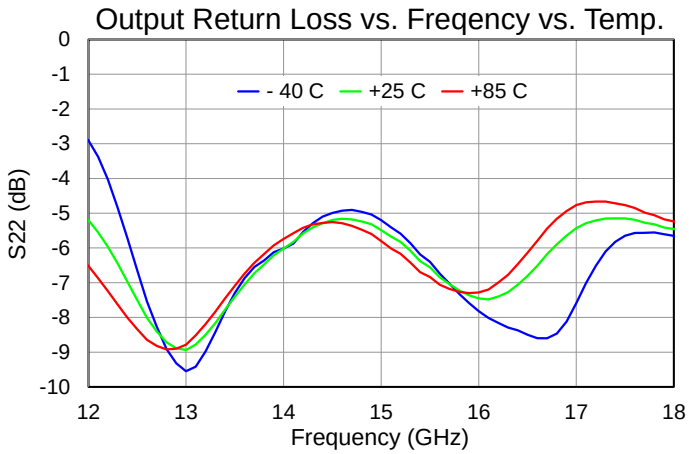
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

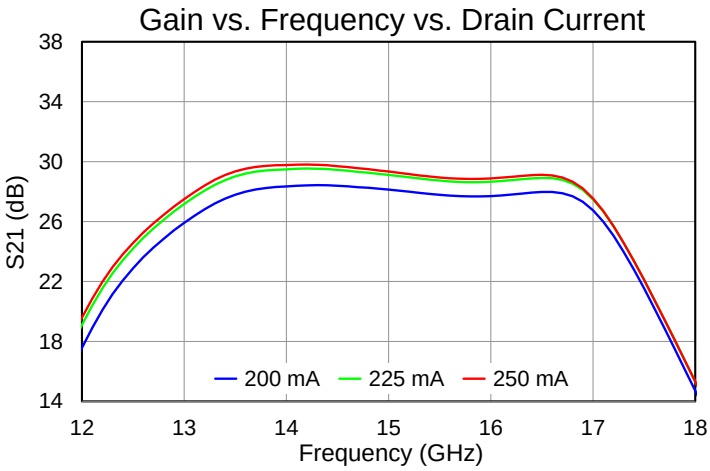
Typical Performance: Small Signal

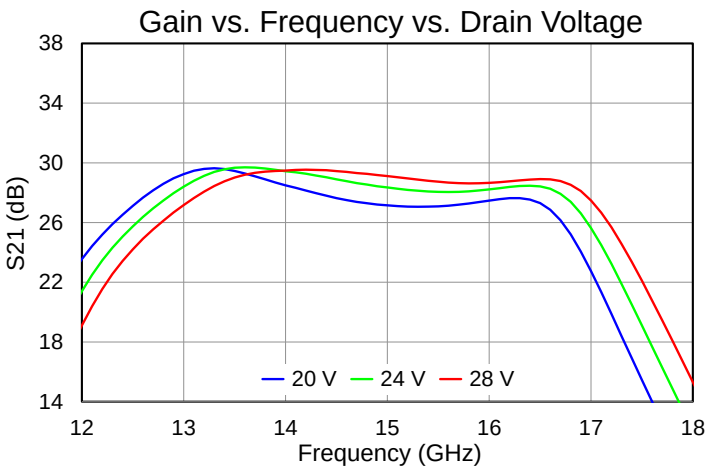
Test conditions unless otherwise noted: 25 °C, V_D = 28 V, I_{DQ} = 225 mA, CW





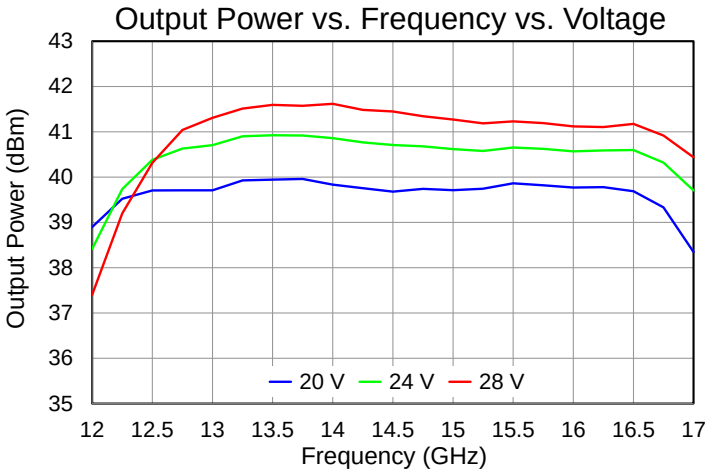


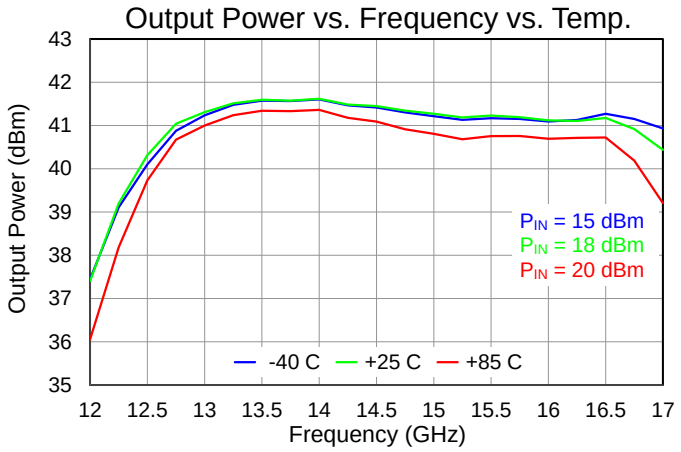


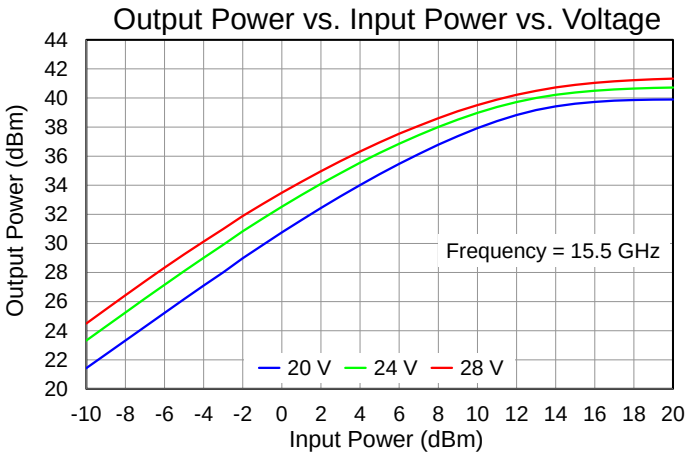


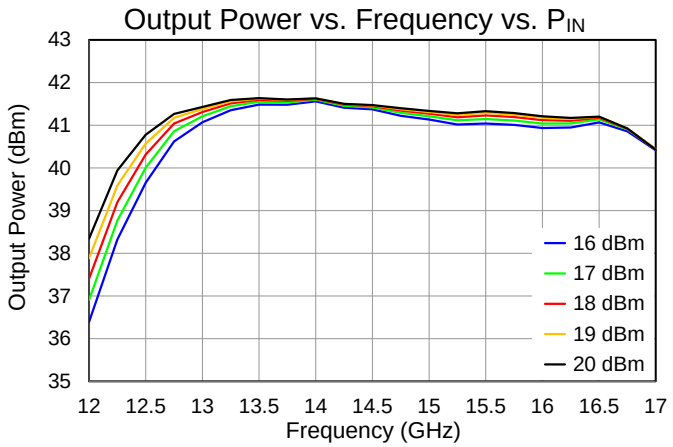
Typical Performance: CW Power Operation

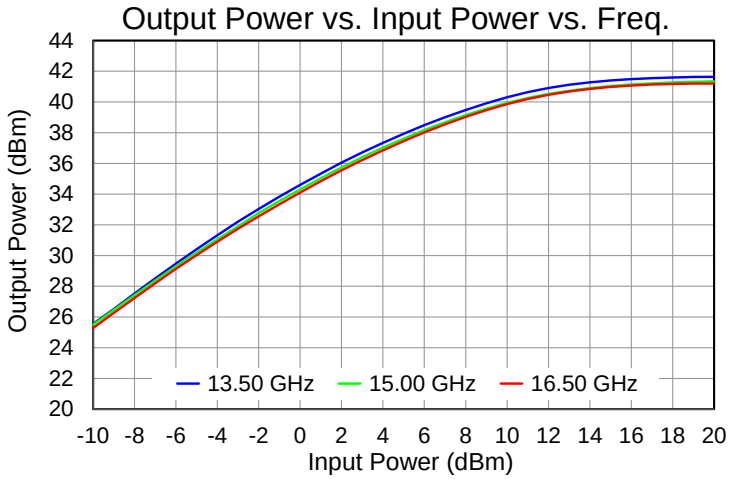
Test conditions unless otherwise noted: 25 °C, V_D = 28 V, I_{DQ} = 225 mA





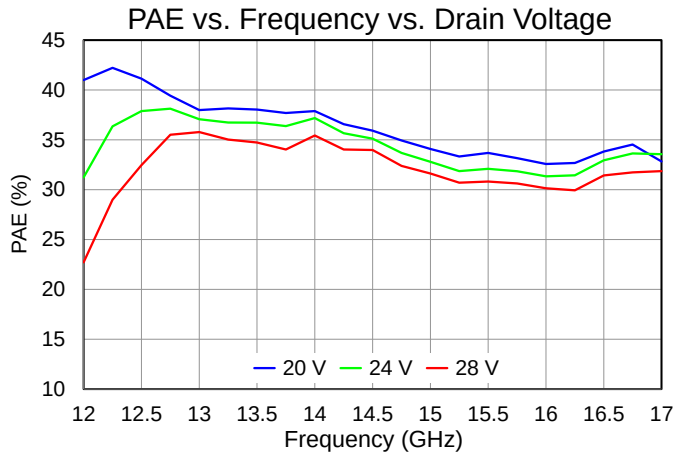


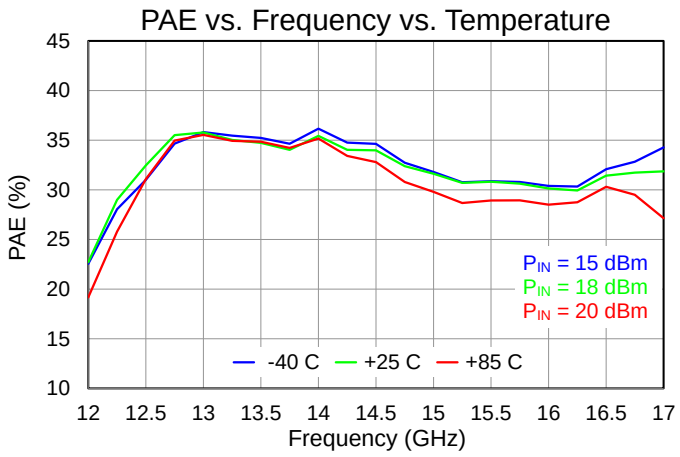


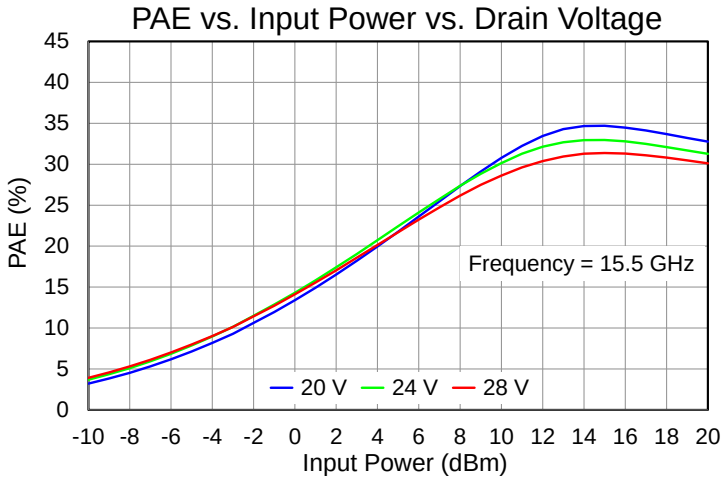


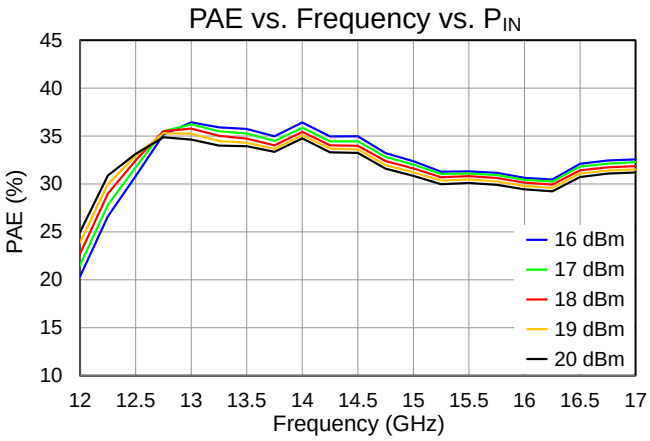
Typical Performance: CW Power Operation

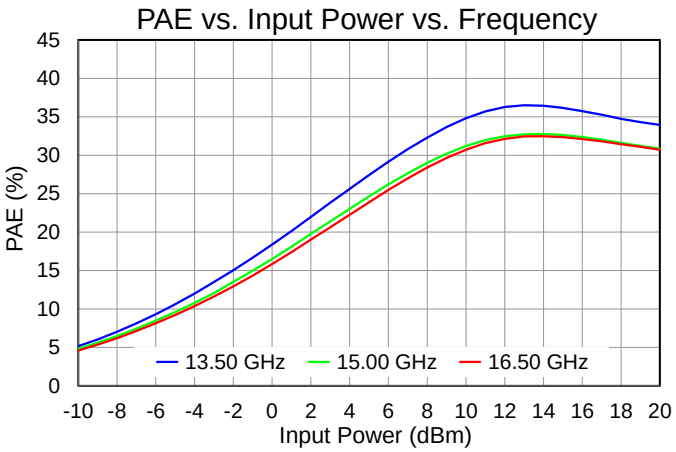
Test conditions unless otherwise noted: 25 °C, V_D = 28 V, I_{DQ} = 225 mA





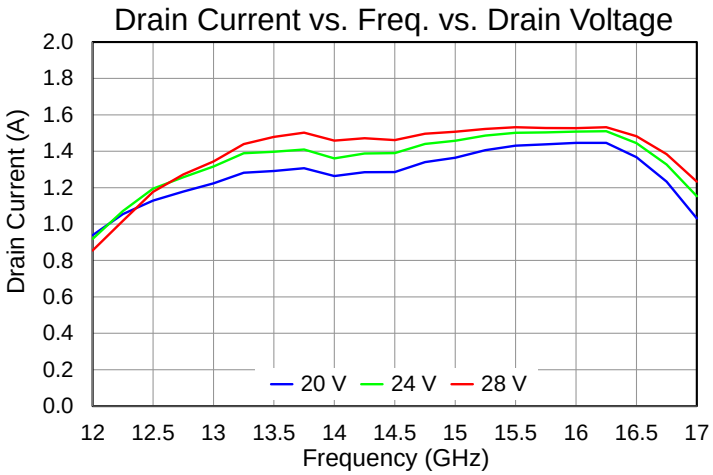


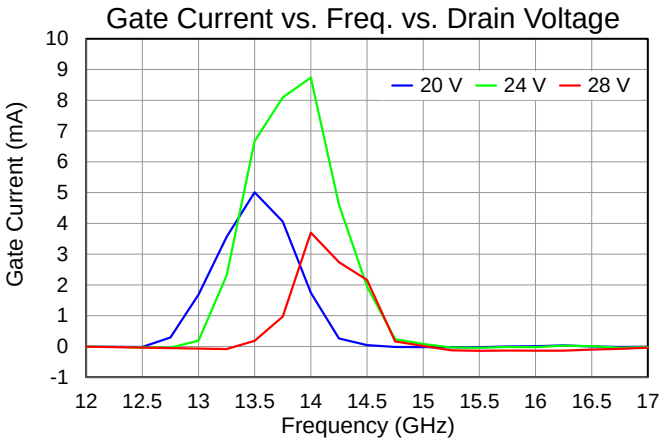


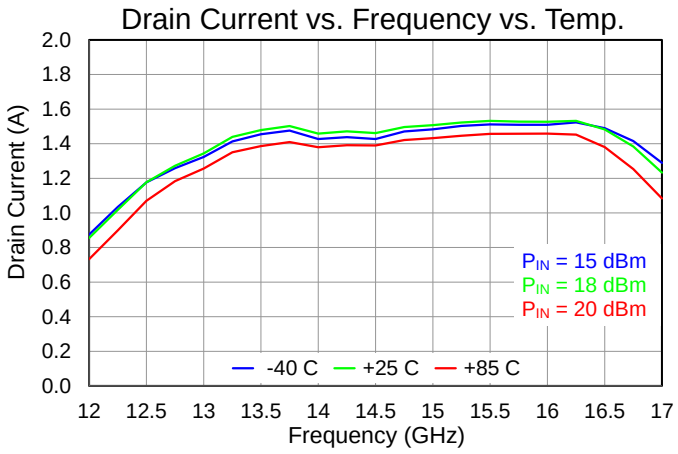


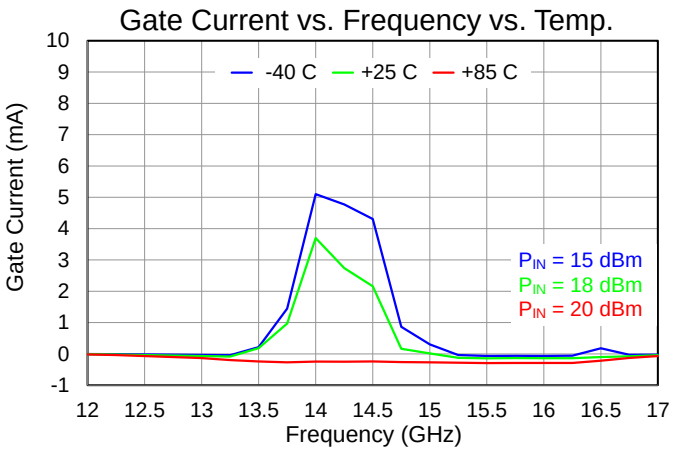
Typical Performance: CW Power Operation

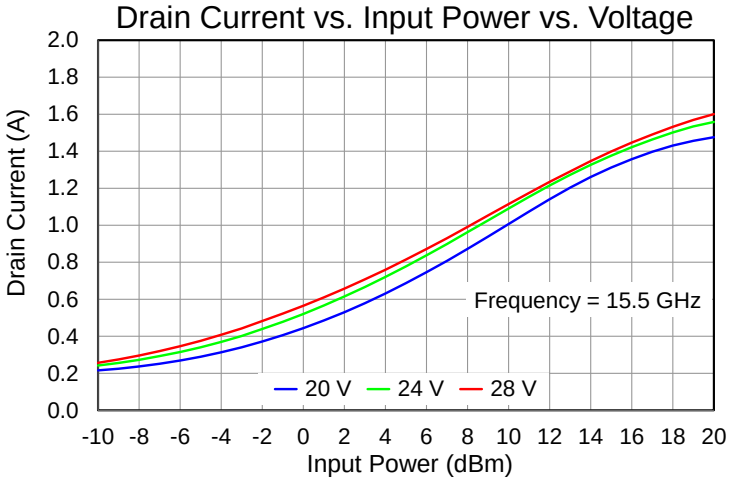
Test conditions unless otherwise noted: 25 °C, V_D = 28 V, I_{DQ} = 225 mA

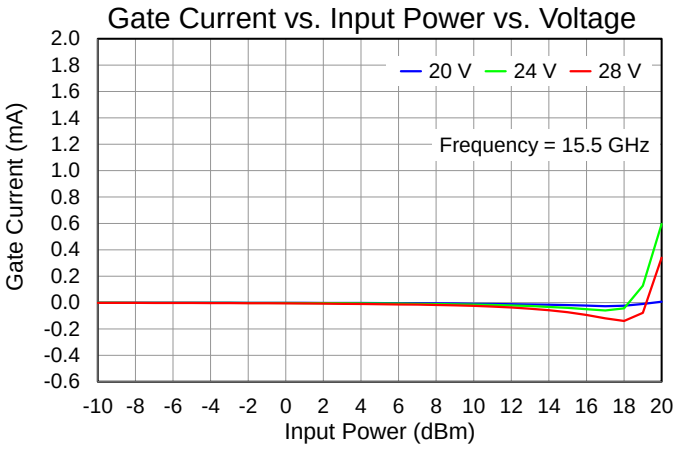






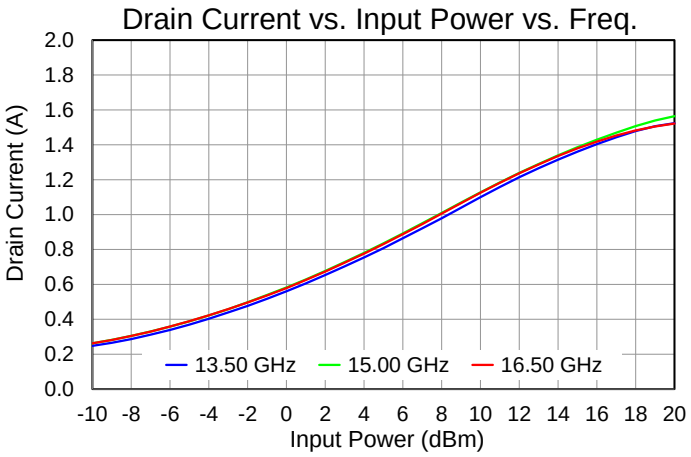


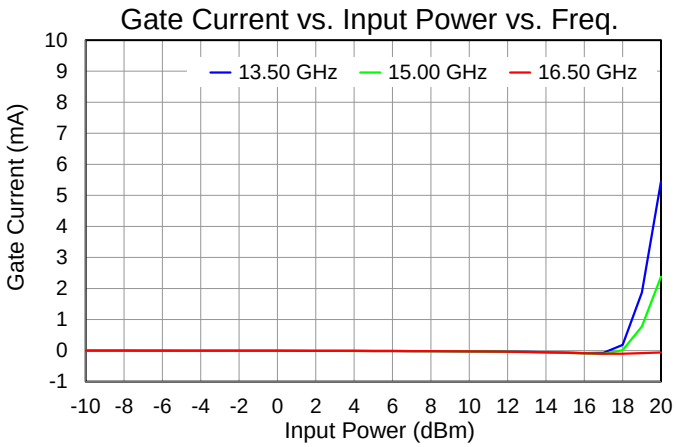


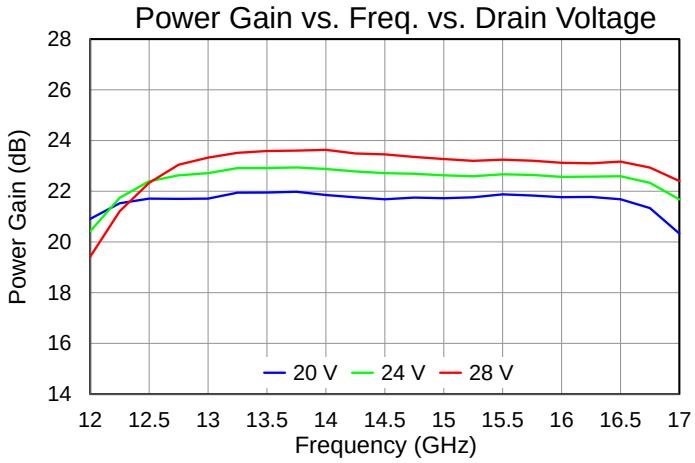


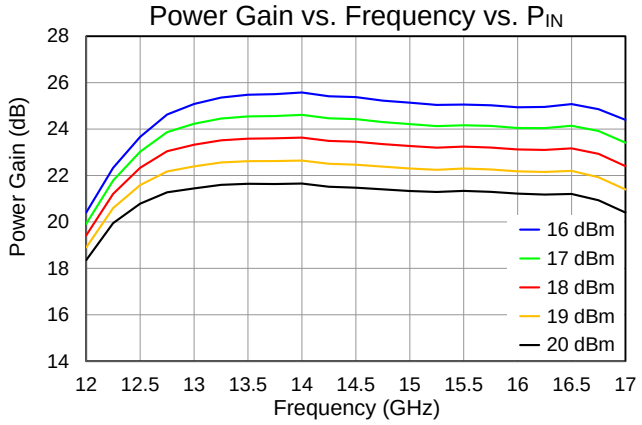
Typical Performance: CW Power Operation

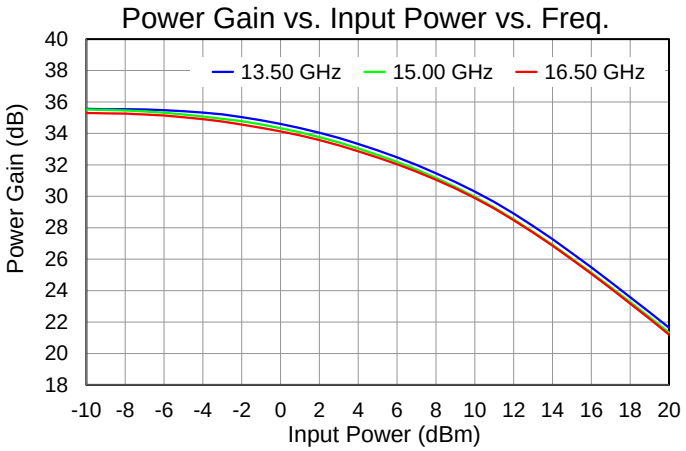
Test conditions unless otherwise noted: 25 °C, V_D = 28 V, I_{DQ} = 225 mA

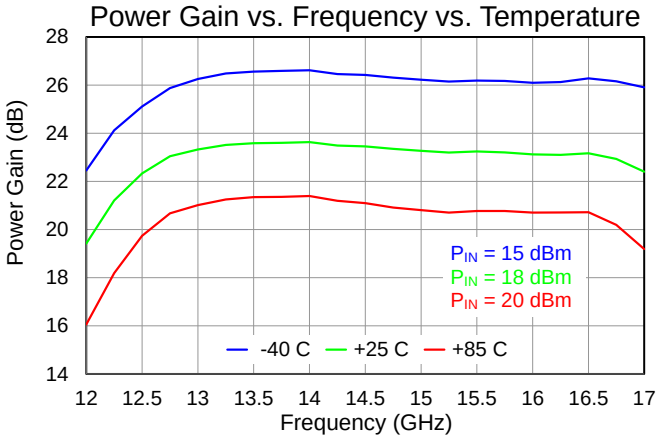






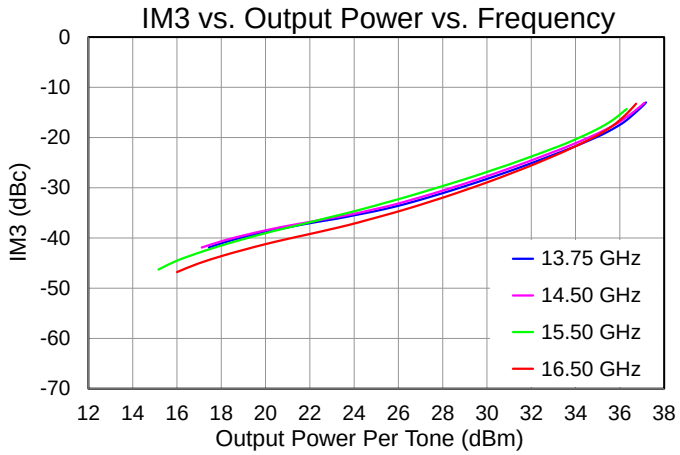


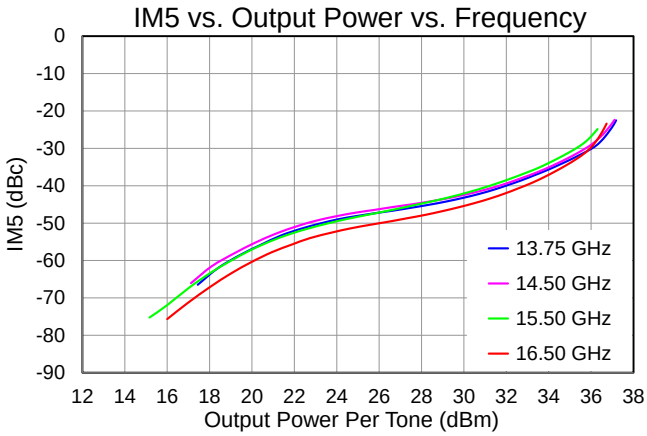


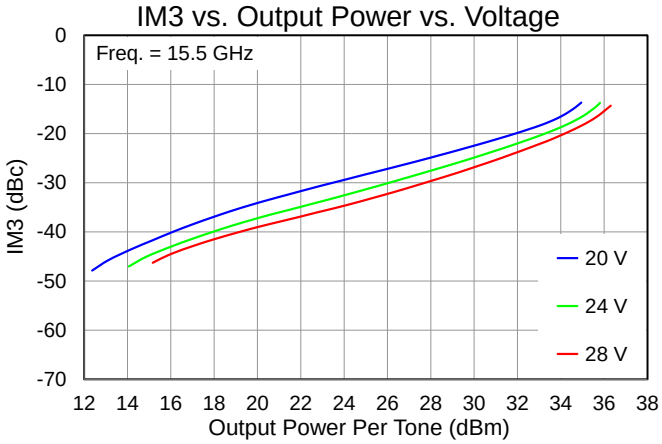


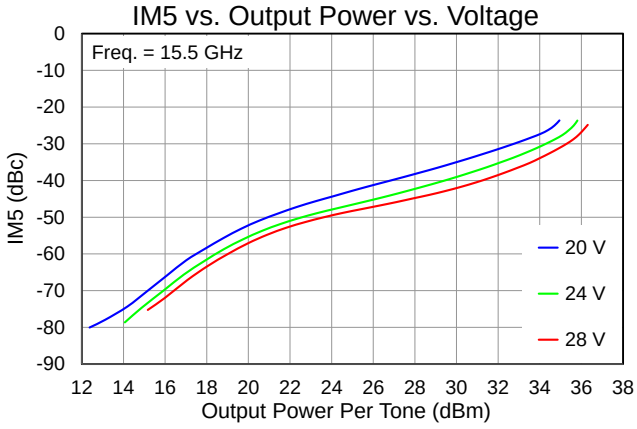
Typical Performance: Linearity

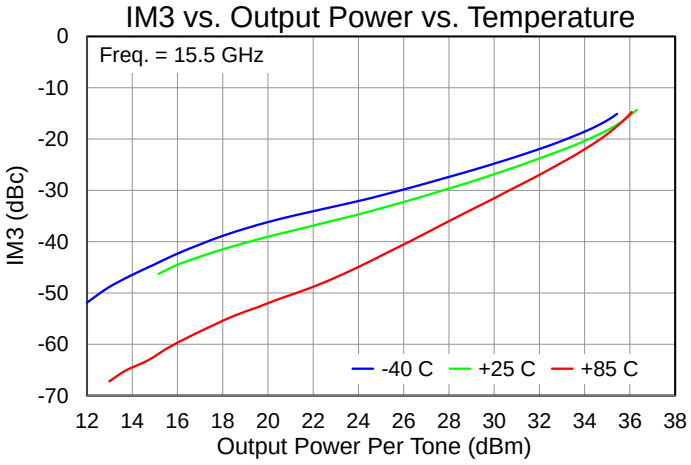
Test conditions unless otherwise noted: 25 °C, V_D = 28 V, I_{DQ} = 225 mA, CW, 1 MHz Tone Spacing

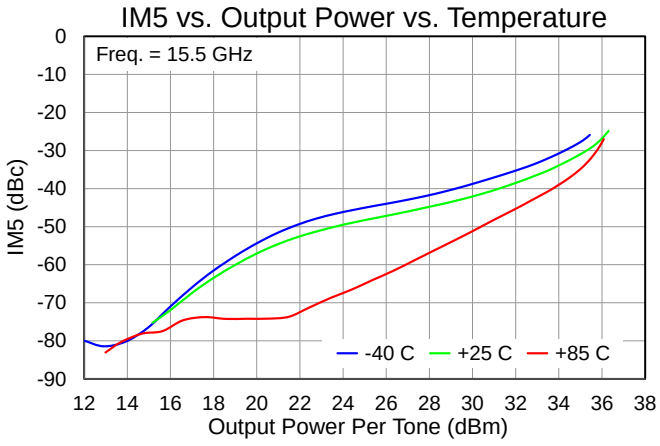






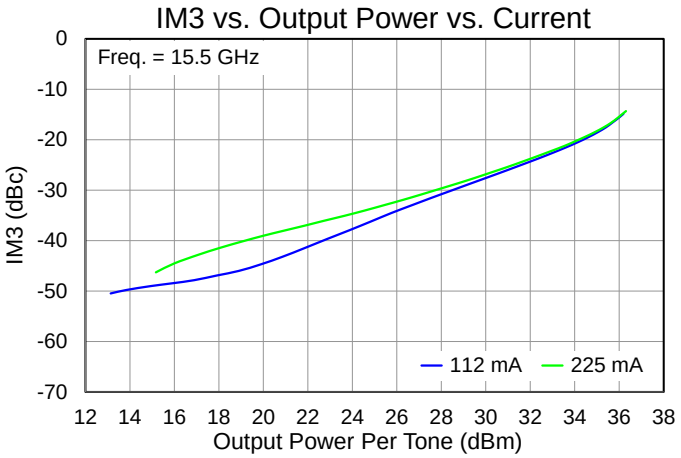


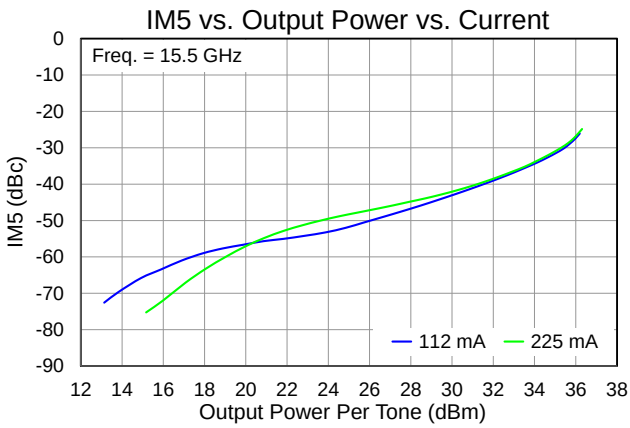


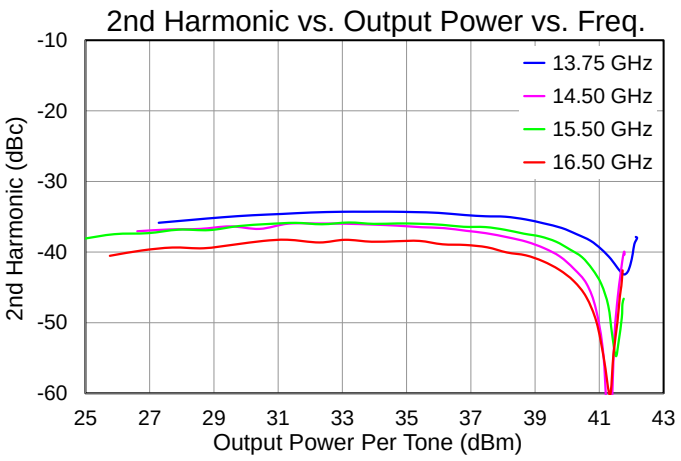


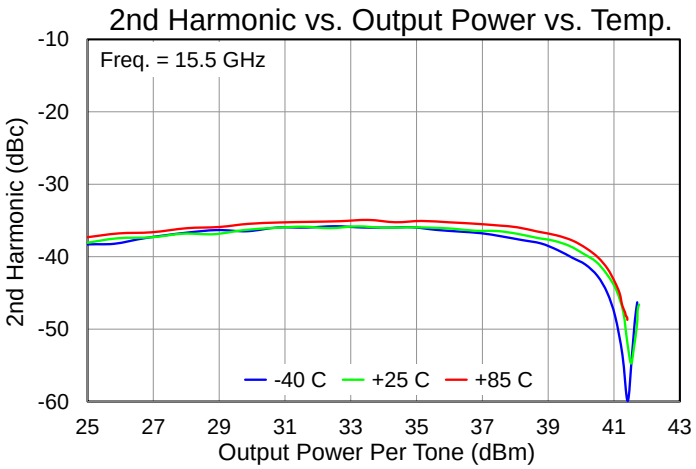
Typical Performance: Linearity

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







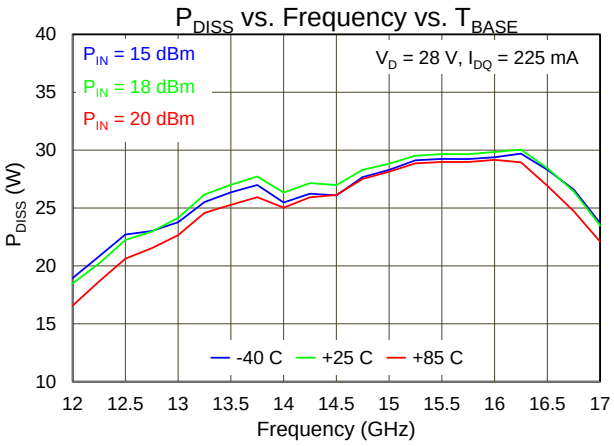


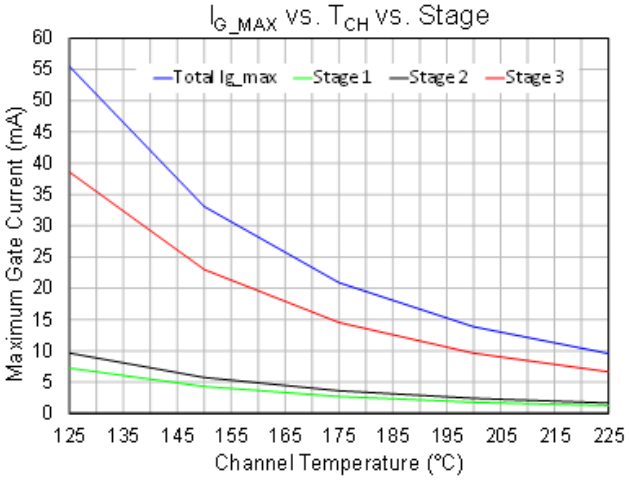
Thermal and Reliability Information

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	2.96	ºC/W
Channel Temperature (T_{CH}) (no RF drive)(2)		103.7	°C
Thermal Resistance (θ_{JC}) (1)	T_{base} = 85°C, CW , V_D = 28 V, I_{DQ} = 225 mA Freq = 16 GHz, I_{D_Drive} = 1.46 A, P_{IN} = 20 dBm, P_{OUT} = 40.7 dBm, P_{DISS} = 29.16 W	2.90	ºC/W
Channel Temperature (T_{CH}) (with RF drive) (2)		169.4	°C

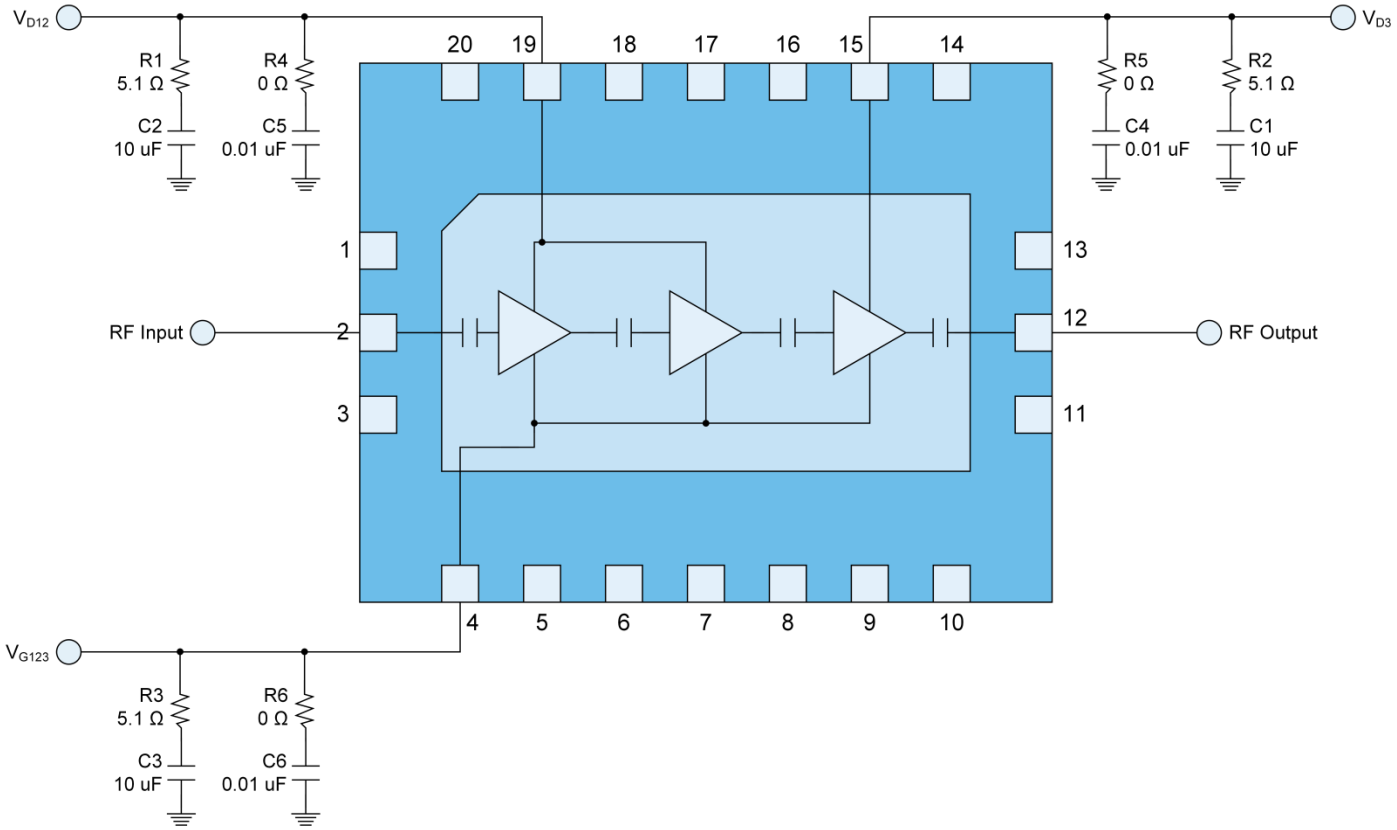
Notes:
1. Thermal resistance measured to back of package.
2. Refer to the following document: GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates

Power Dissipation and Maximum Gate Current





Application Circuit



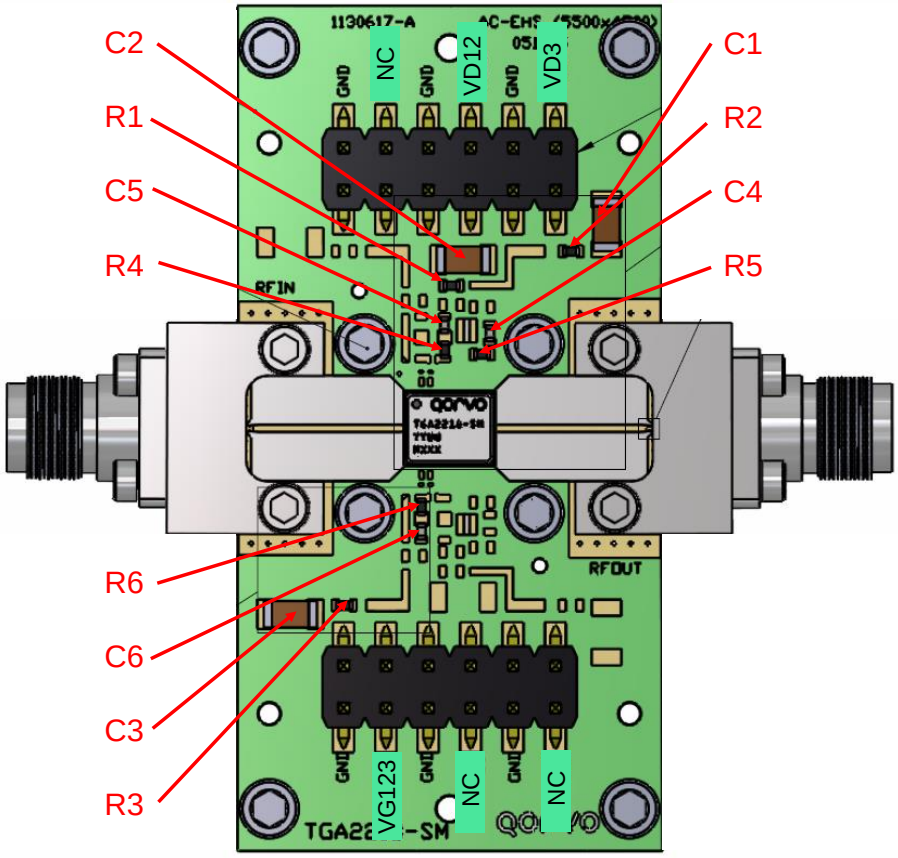
Bias-up Procedure

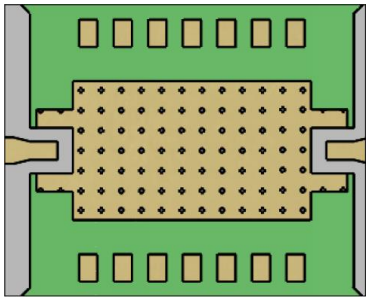
1. Set I_D limit to 1800 mA, I_G limit to 20 mA
2. Set V_G to −5.0 V
3. Set V_D +28 V
4. Adjust V_G more positive until I_{DQ} = 225 mA (V_G ~ −2.6 V Typical)
5. Apply RF signal

Bias-down Procedure

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

Evaluation Board and Mounting Detail





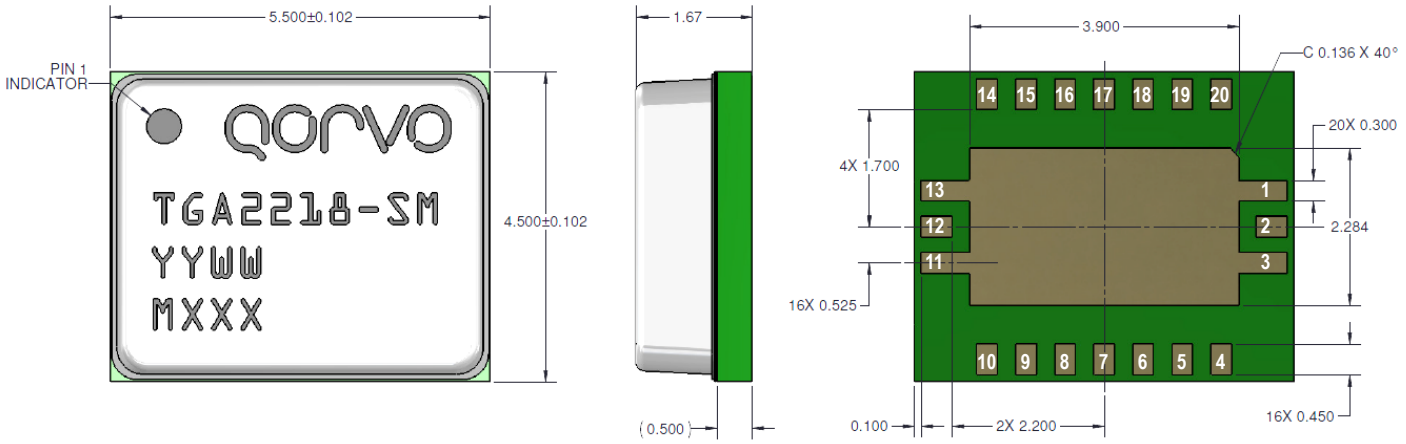
Mounting Area Detail

RF Layer is 0.008” thick Rogers Corp. RO40003C (εr = 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	

Mechanical Drawing & Pad Description



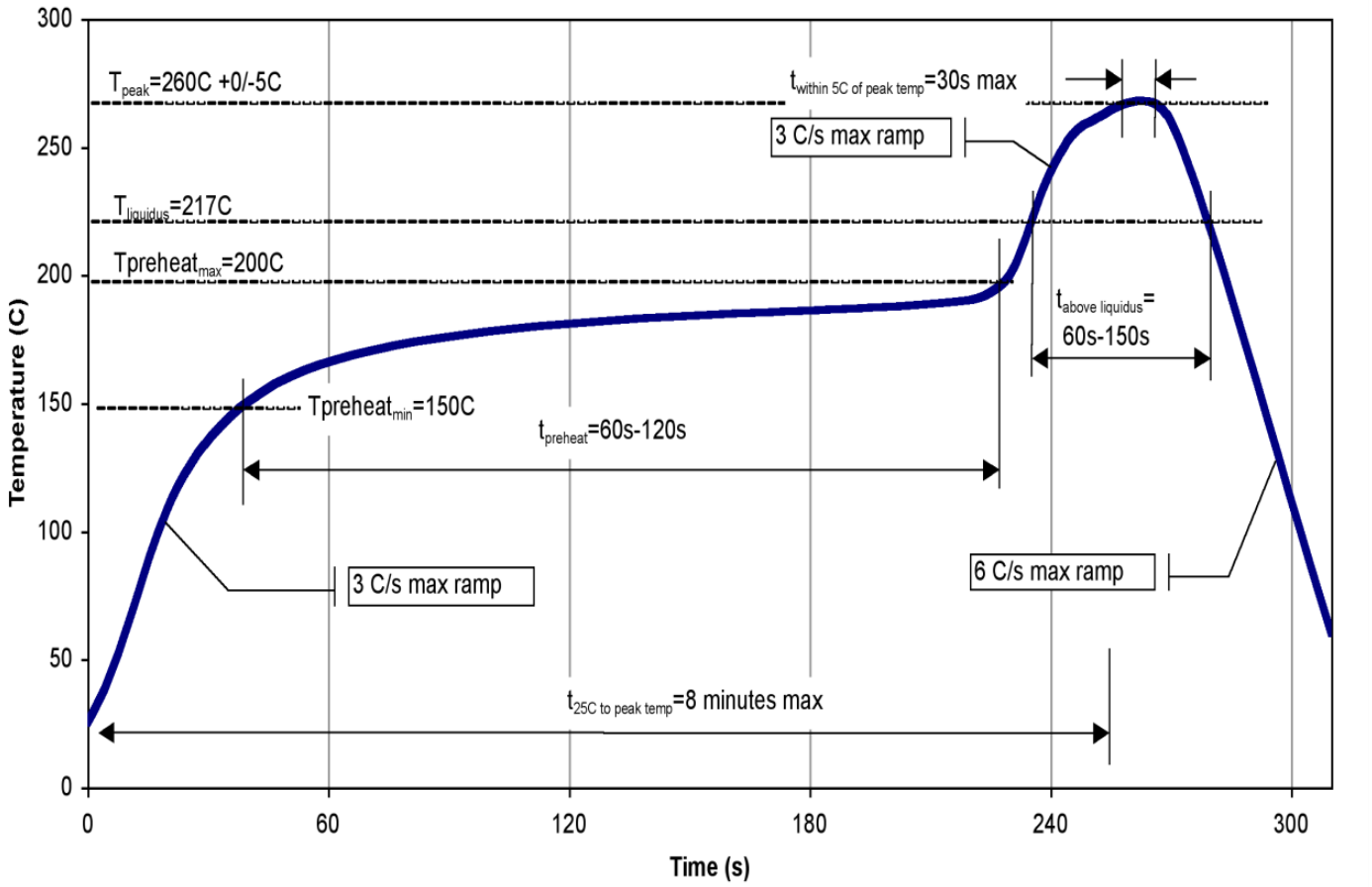
PART MARKING

TGA2218-SM: Part Number
YY: Part Assembly Year
WW: Part Assembly Week
MXXX: Batch ID

Dimensions in millimeters

Pad Number	Symbol	Description
1, 3, 11, 13	GND	RF Ground (including center pad).
2	RF Input	RF Input; matched to 50 Ω; 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.

Recommended Soldering Temperature Profile



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	1A	ANSI/ESD/JEDEC JS-001
ESD – Charge Device Model (CDM)	C2A	ANSI/ESD/JEDEC JS-002
MSL – Moisture Sensitivity Level	MSL3	IPC/JEDEC J-STD-020

Caution!

ESD-Sensitive Device

Solderability

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 part is compliant with 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
- Antimony Free
- TBBP-A (C15H12Br402) Free
- PFOS Free

Contact Information

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

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

Important Notice

The information contained herein is believed to be reliable; however, Qorvo makes no warranties regarding the information contained herein and assumes no responsibility or liability whatsoever for the use of the information contained herein. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Qorvo products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information. **THIS INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE**.

Without limiting the generality of the foregoing, Qorvo products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.

OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- 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**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

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

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А