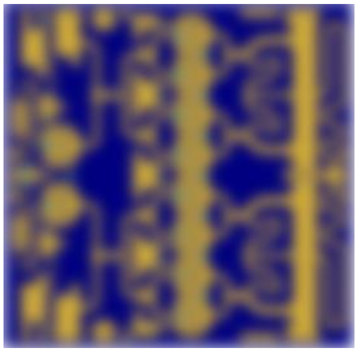
TGA2307

5.0 – 6.0 GHz 50 W GaN Power Amplifier



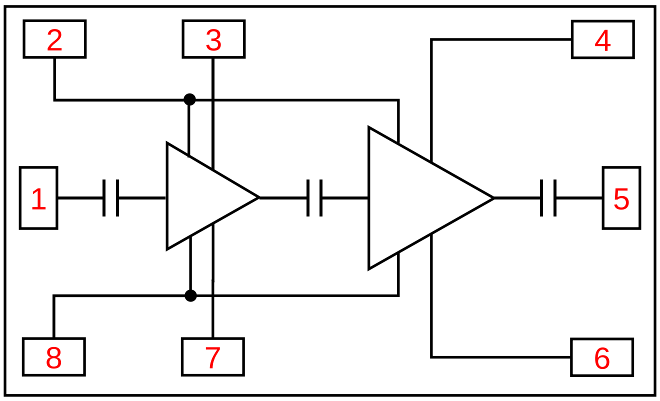
Product Overview

Qorvo's TGA2307 is a MMIC power amplifier fabricated on Qorvo's production 0.25um GaN on SiC process. Operating from 5 – 6 GHz, the TGA2307 produces greater than 47 dBm of saturated output power with power-added efficiency greater than 40 % and large signal gain greater than 20 dB.

Both ports are fully matched to 50 ohms with integrated DC blocking capacitors thereby simplifying system integration. The TGA2307's performance makes it well suited for both commercial and military applications.

Lead-free and RoHS compliant.

Functional Block Diagram



Key Features

- Frequency Range: 5.0 – 6.0 GHz
- Output Power (P_{IN} = 27 dBm): > 47 dBm
- Power Added Efficiency (P_{IN} = 27 dBm): > 40 %
- Small Signal Gain: > 26 dB
- Input Return Loss: > 18 dB
- Large Signal Gain (P_{IN} = 27 dBm): > 20 dB
- Bias Condition: V_D = 28 V, I_{DQ} = 1000 mA
- Chip Dimensions: 4.280 x 4.260 x 0.100 mm

Performance is typical across frequency. Please reference electrical specification table and data plots for more details.

Applications

- C-Band Radar
- Satellite Communication

Ordering Information

Part No.	Description
TGA2307	5.0 – 6.0 GHz 50 W GaN Power Amplifier
TGA2307S2	Samples (2 pcs.)
TGA2307EVB	Evaluation Board for TGA2307

Absolute Maximum Ratings

Parameter	Value / Range
Drain Voltage (V_D)	40 V
Gate Voltage Range (V_G)	−8 to +1 V
Peak Drain Current (I_D)	7.2 A
Gate Current (I_G)	See plot, pg. 11
Power Dissipation (P_{DISS}), 85°C	96 W
Input Power (P_{IN}), Pulsed, 50Ω, V_D=28V, I_{DQ}=1000mA, 85 °C	33 dBm
Input Power (P_{IN}), Pulsed, 3:1 VSWR, V_D=28V, I_{DQ}=1000mA, 85 °C	33 dBm
Mounting Temperature (30 seconds)	320 °C
Storage Temperature	−65 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})	1000 mA
Gate Voltage (V_G), Typical	−2.5 V
Operating Temperature	−40 to +85 °C

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

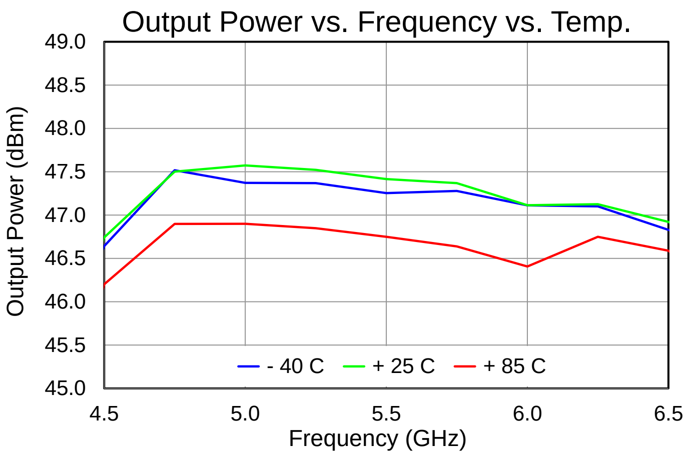
Electrical Specifications

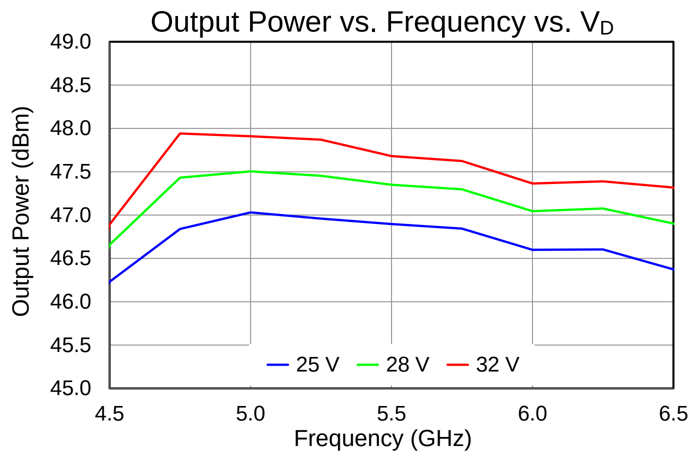
Parameter		Min	Typ	Max	Units
Operational Frequency Range		5.0		6.0	GHz
Output Power (P_{IN} = 27 dBm)	5.0 GHz 5.5 GHz 6.0 GHz		47.6 47.4 47.1		dBm dBm dBm
Power Added Efficiency (P_{IN} = 27 dBm)	5.0 GHz 5.5 GHz 6.0 GHz		45.7 43.1 42.1		% % %
Small Signal Gain (CW) (I_{DQ} = 500 mA)	5.0 GHz 5.5 GHz 6.0 GHz		24.7 24.3 24.8		dB dB dB
Input Return Loss (CW) (I_{DQ} = 500 mA)	5.0 GHz 5.5 GHz 6.0 GHz		26 22 25		dB dB dB
Output Return Loss (CW) (I_{DQ} = 500 mA)	5.0 GHz 5.5 GHz 6.0 GHz		10 8 8		dB dB dB
2nd Harmonic Performance			See plots pg. 7,8		
3rd Harmonic Performance			See plots pg. 7,8		
Output Power Temp. Coeff. (85 – 25 °C, P_{IN} = 27 dBm))			-0.012		dB/°C
Sm. Signal Gain Temperature Coefficient (85 to −40 °C)			-0.044		dB/°C

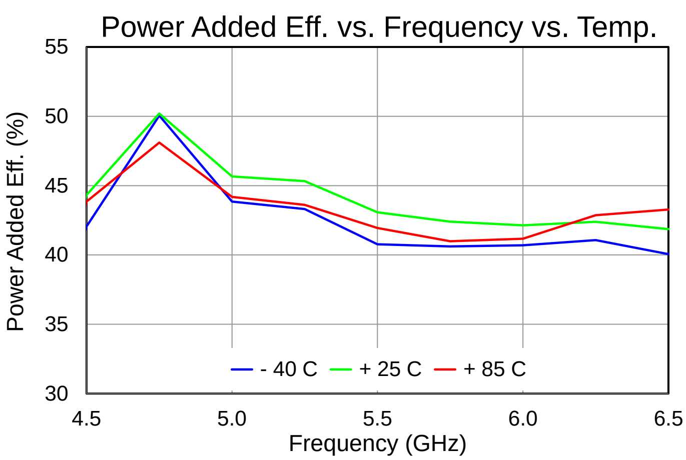
Test conditions, unless otherwise noted: T = 25 °C, V_D = 28 V, I_{DQ} = 1000 mA, Typical, PW = 100 us, Duty Cycle = 10%

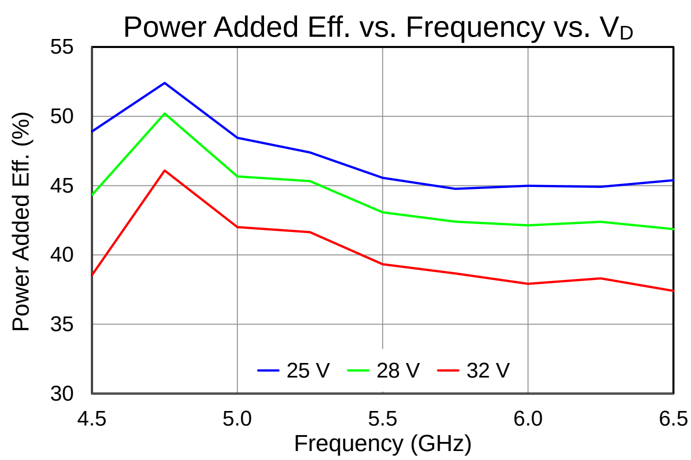
Performance Plots – Large Signal

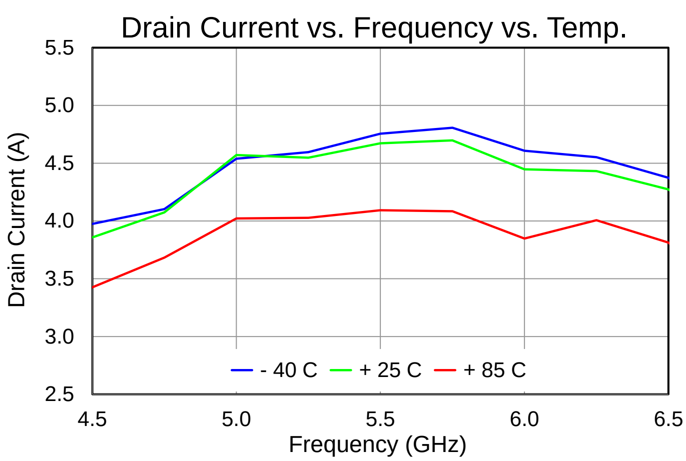
Test conditions unless otherwise noted: V_D = 28 V, I_{DQ} = 1000 mA, P_{IN} = 27 dBm, T = 25 °C, PW = 100 us, Duty Cycle = 10%

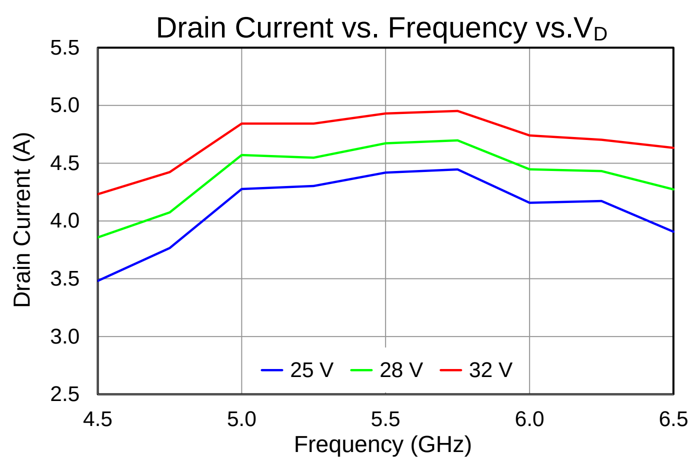






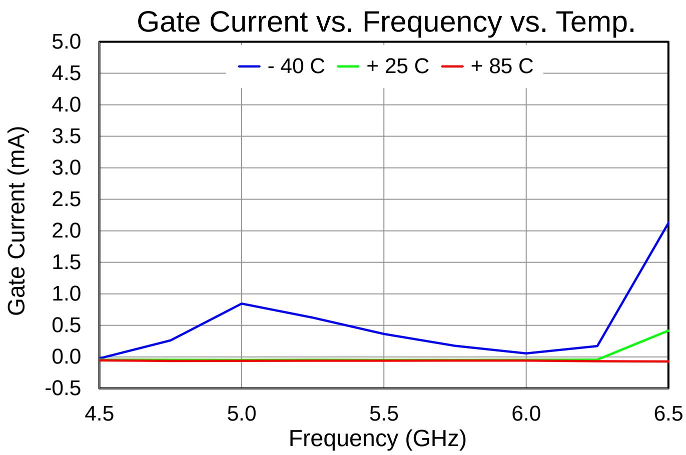


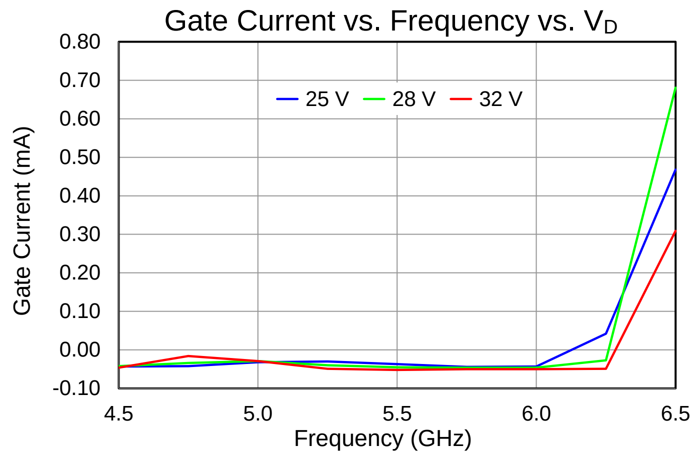


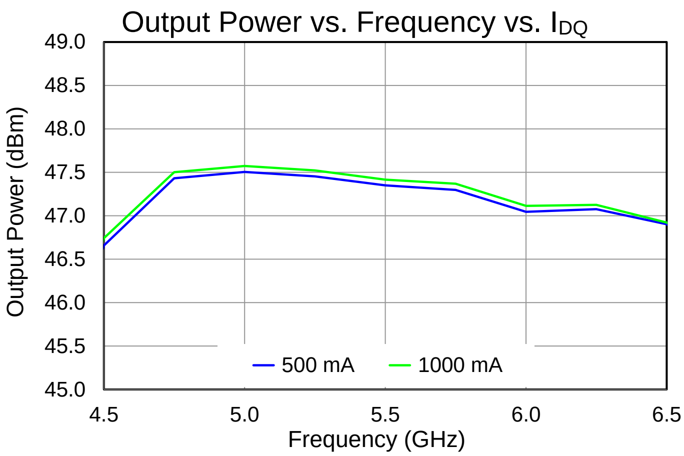


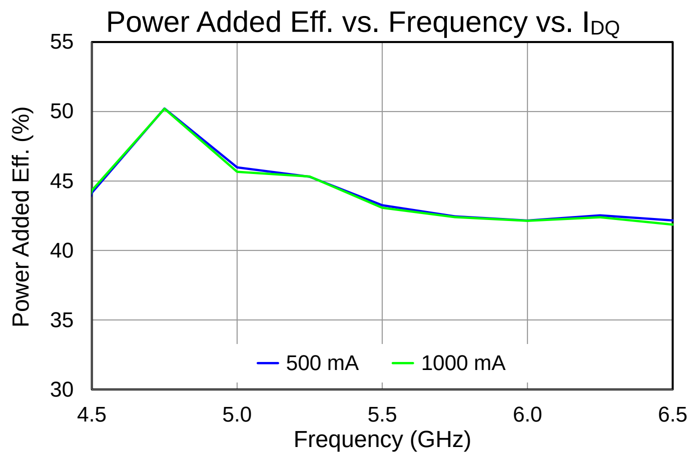
Performance Plots – Large Signal

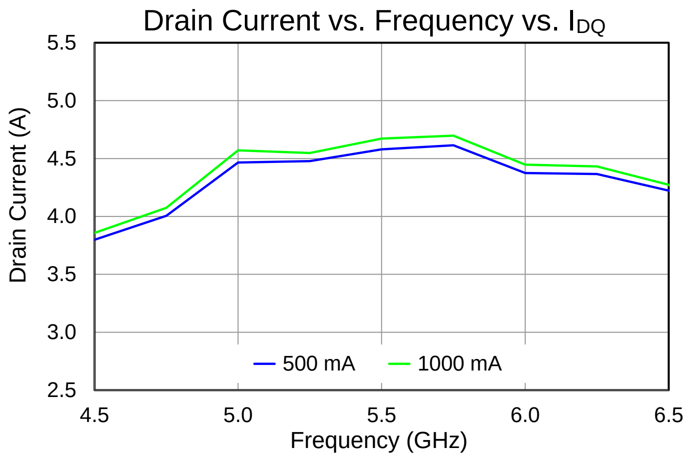
Test conditions unless otherwise noted: V_D = 28 V, I_{DQ} = 1000 mA, P_{IN} = 27 dBm, T = 25 °C, PW = 100 us, Duty Cycle = 10%





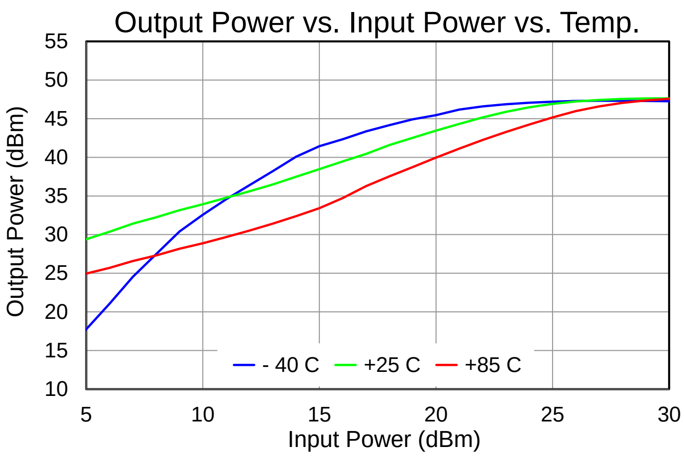


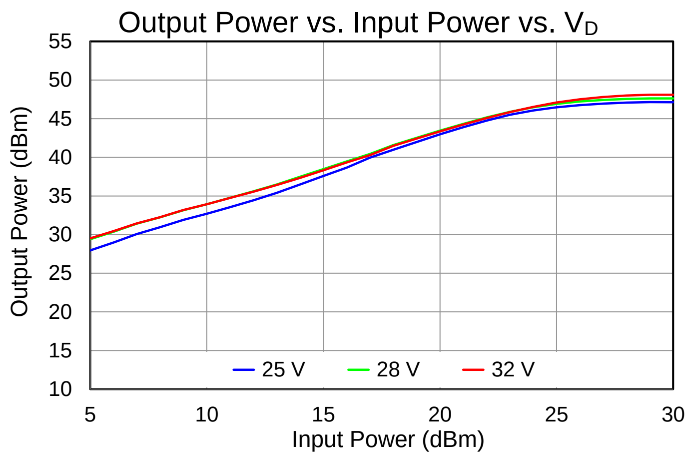


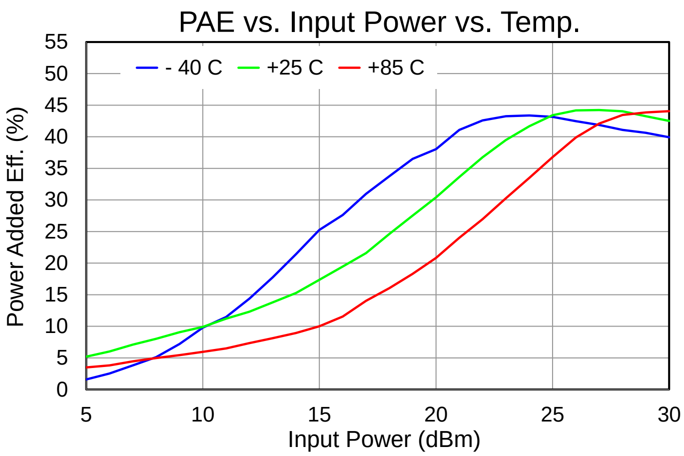


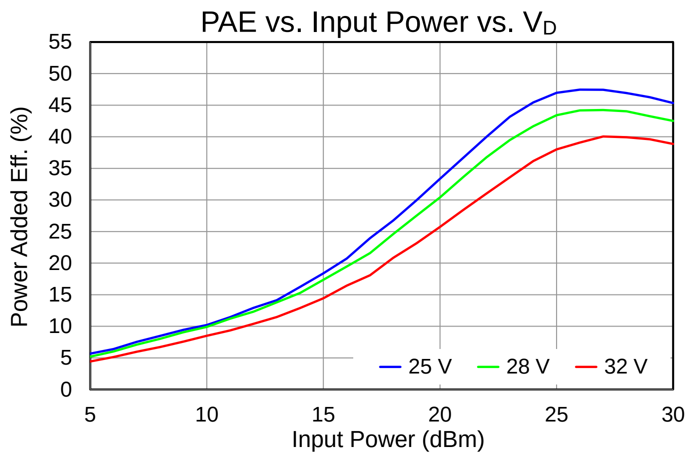
Performance Plots – Large Signal

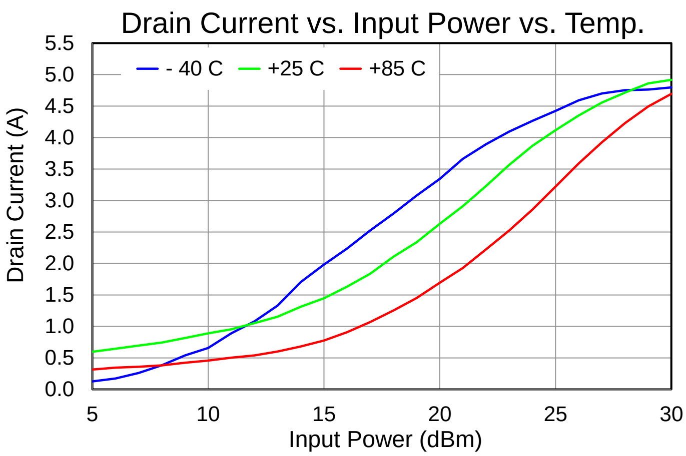
Test conditions unless otherwise noted: V_D = 28 V, I_{DQ} = 500 mA, Freq. = 5.5 GHz, T = 25 °C, PW = 100 us, Duty Cycle = 10%

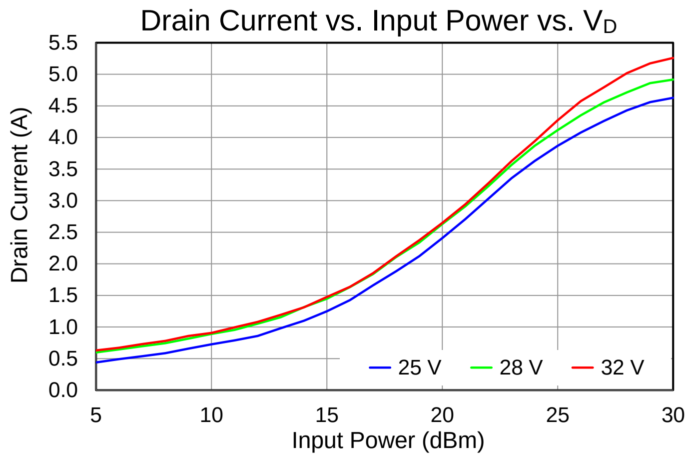






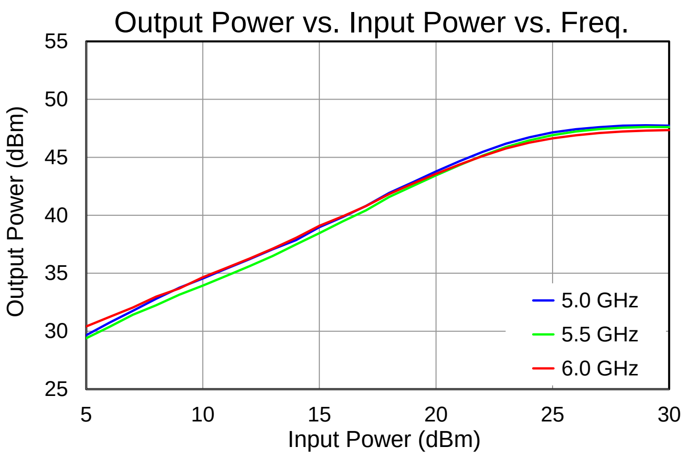


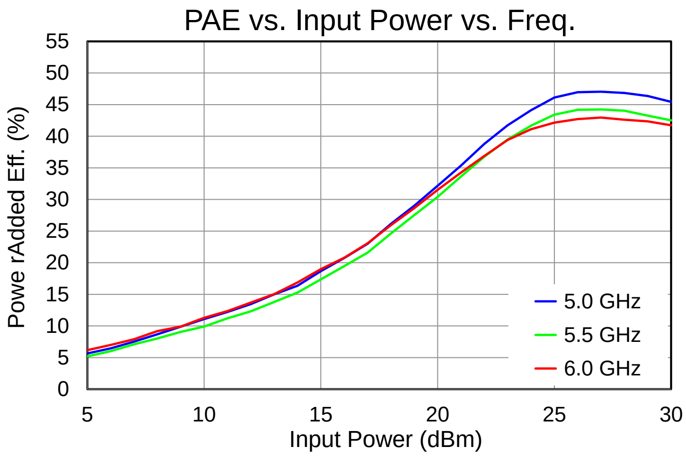


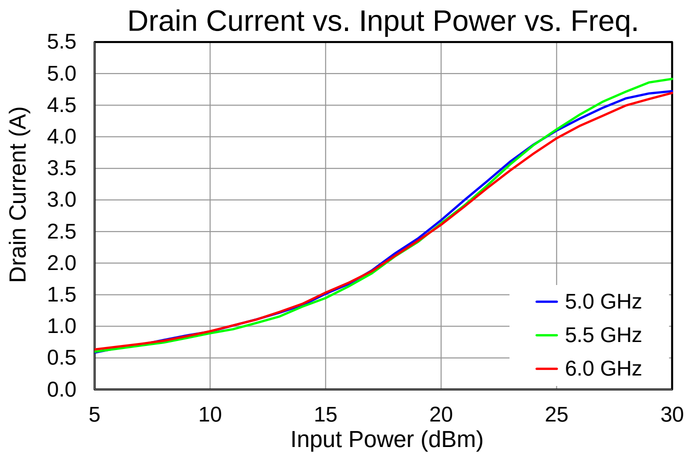


Performance Plots – Large Signal

Test conditions unless otherwise noted: V_D = 28 V, I_{DQ} = 500 mA, T = 25 °C, PW = 100 us, Duty Cycle = 10%

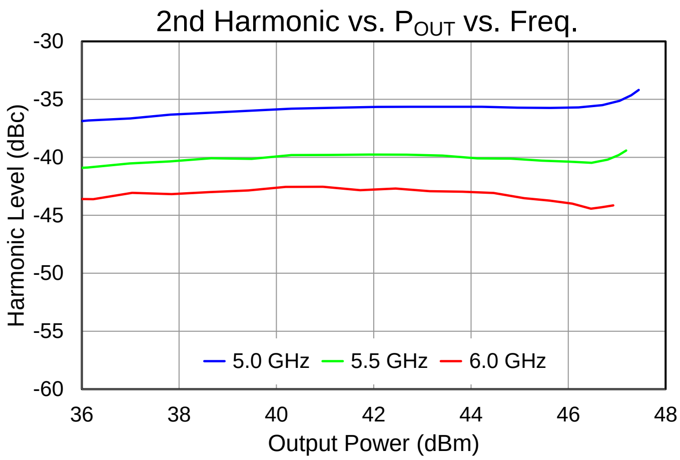


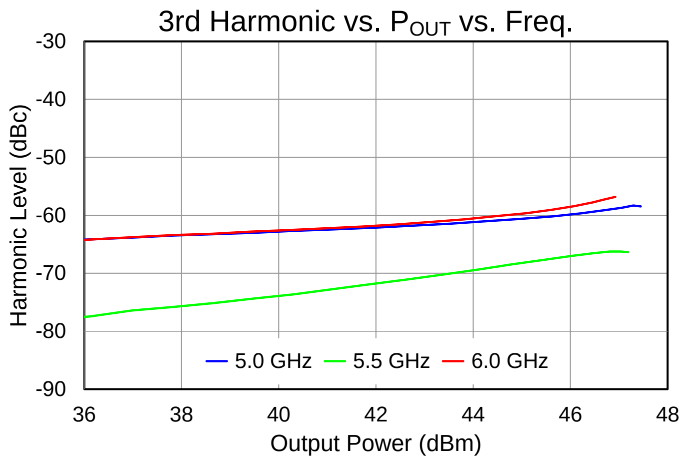


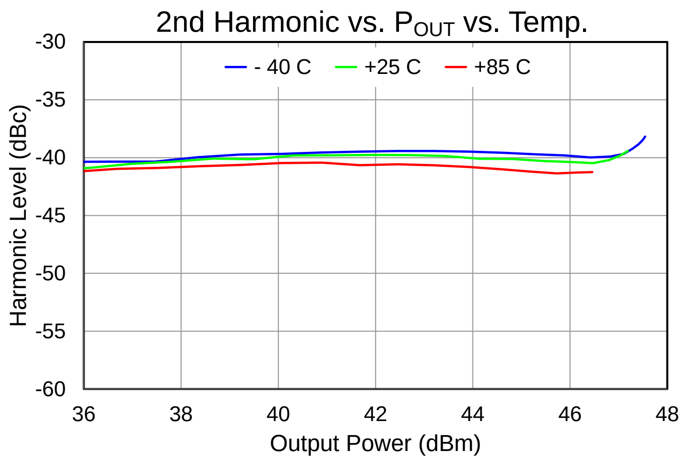


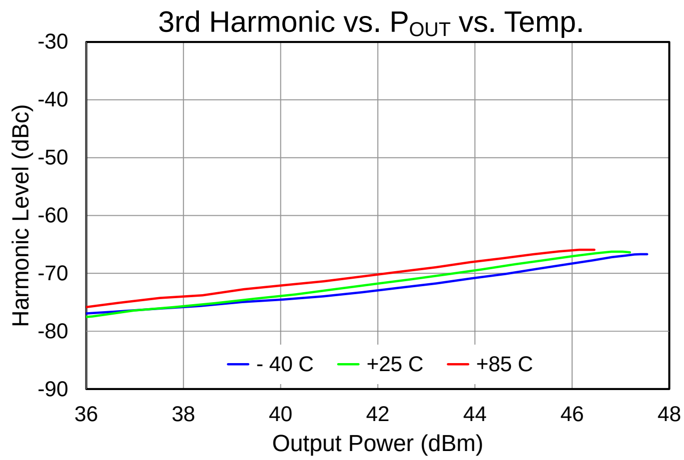
Performance Plots – Harmonics

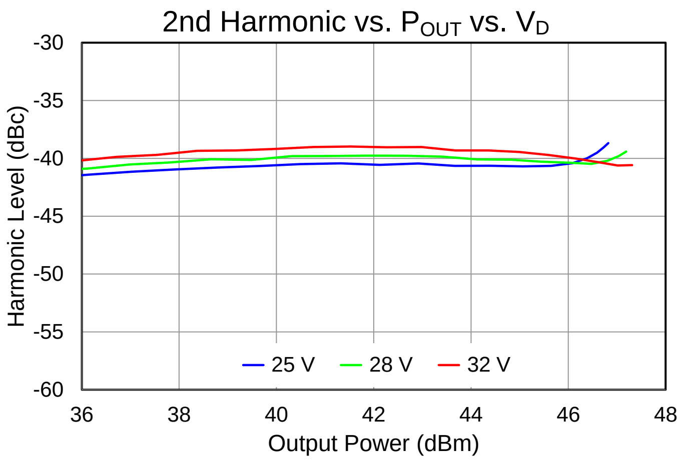
Test conditions unless otherwise noted: V_D = 28 V, I_{DQ} = 500 mA, P_{IN} = 27 dBm, PW = 100 us, Duty Cycle = 10%

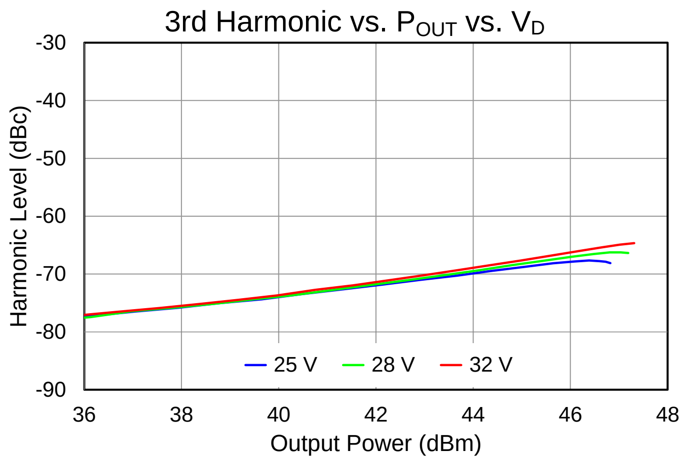












Performance Plots – Harmonics

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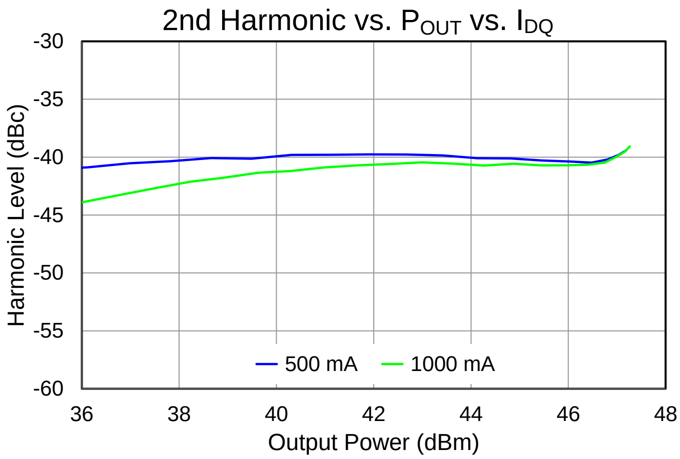
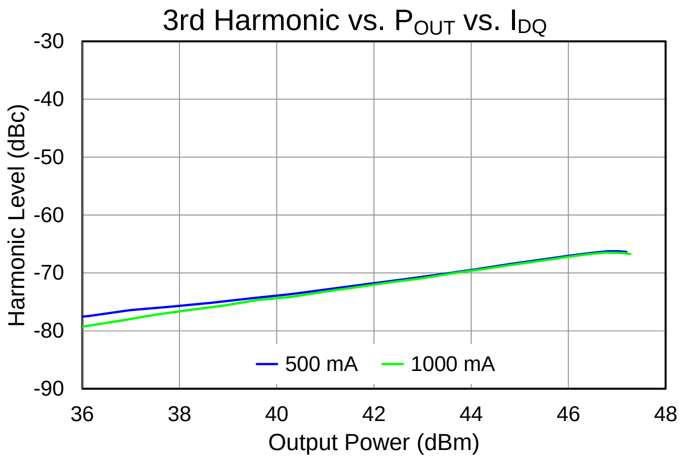
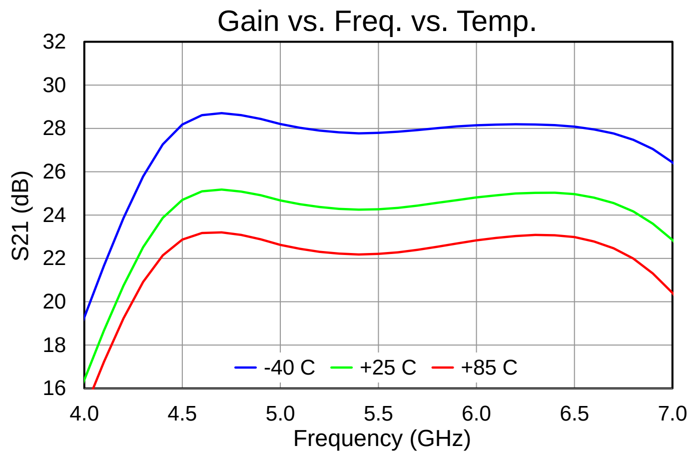
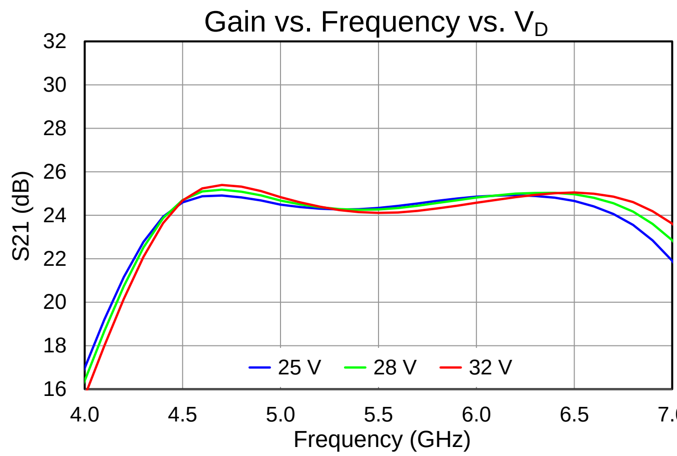


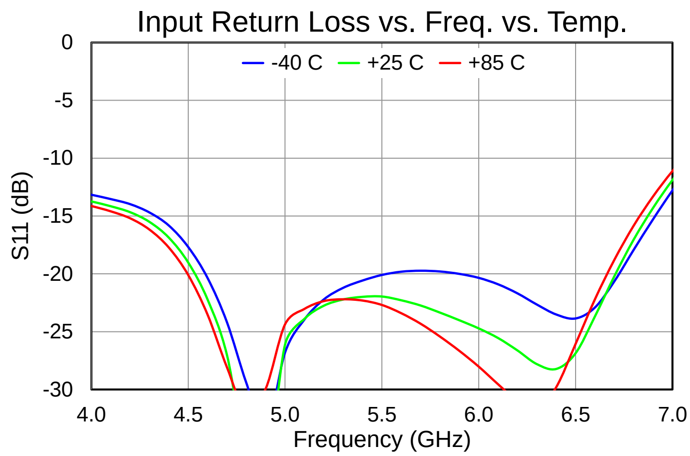


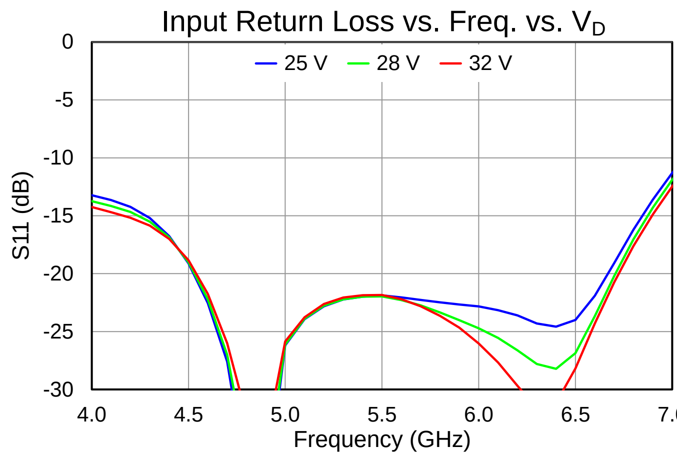
Performance Plots – Small Signal (CW)

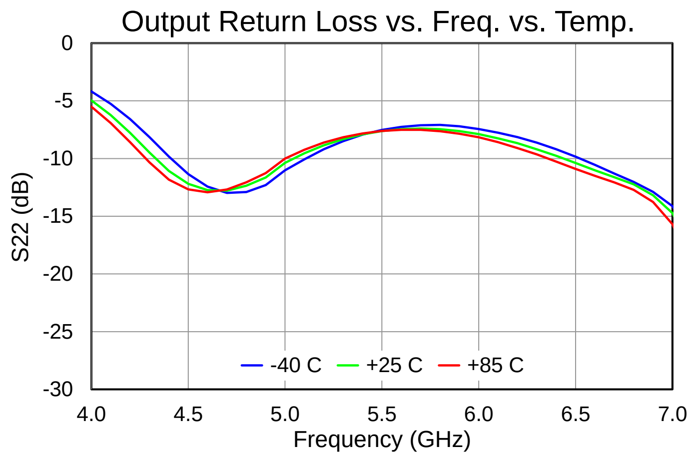
Test conditions unless otherwise noted: Vd = 28 V, Idq = 500 mA, T = 25 °C

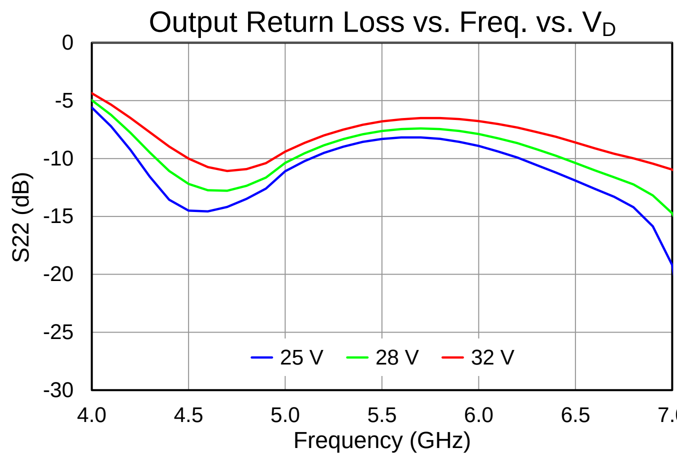






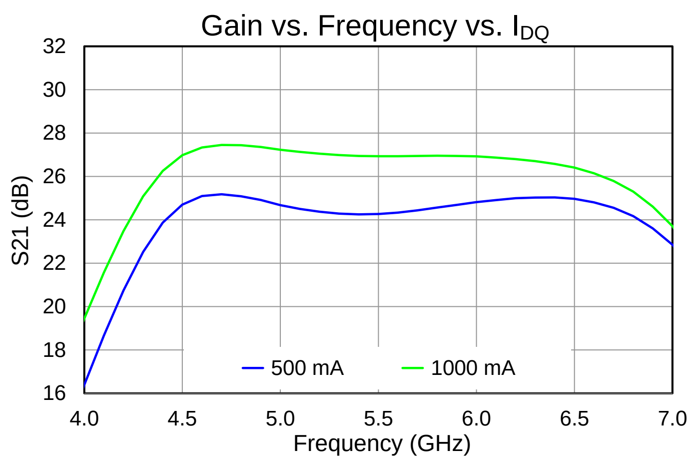


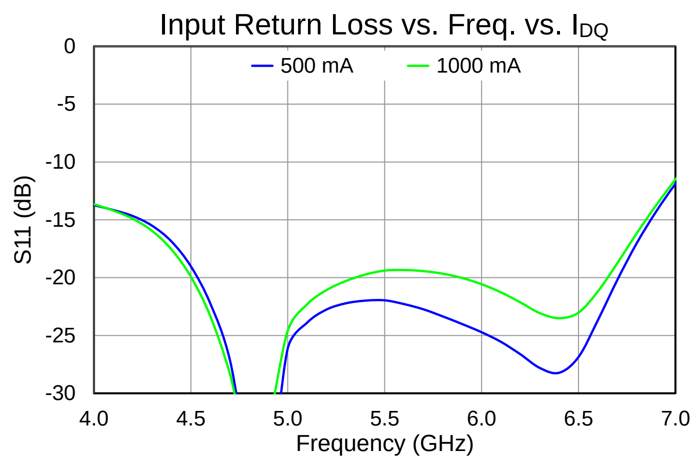


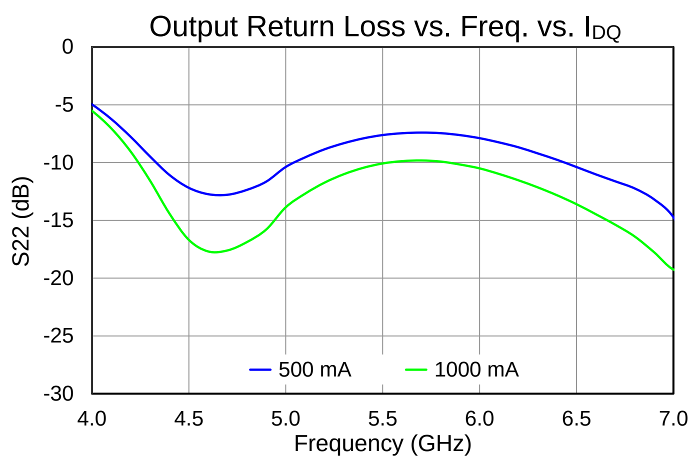


Performance Plots – Small Signal (CW)

Test conditions unless otherwise noted: Vd = 28 V, Idq = 500 mA, T = 25 °C





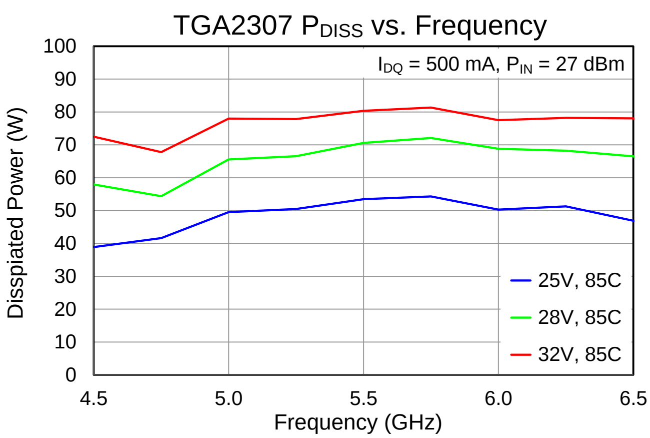


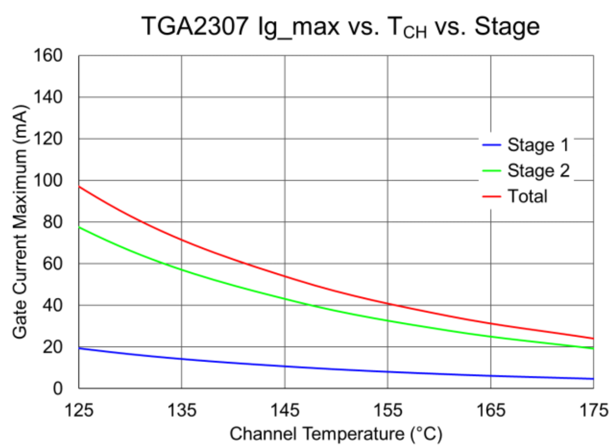
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	T_{base} = 85 °C, V_D = 28 V, I_{DQ} = 1.0 A, Freq = 5.75 GHz, I_{D_Drive} = 4.08 A, P_{IN} = 27 dBm, P_{OUT} = 46.6 dBm, P_{DISS} = 65.7 W, PW = 100 us, DC = 10%	0.79	ºC/W
Channel Temperature, T_{CH} (Under RF)		137	°C

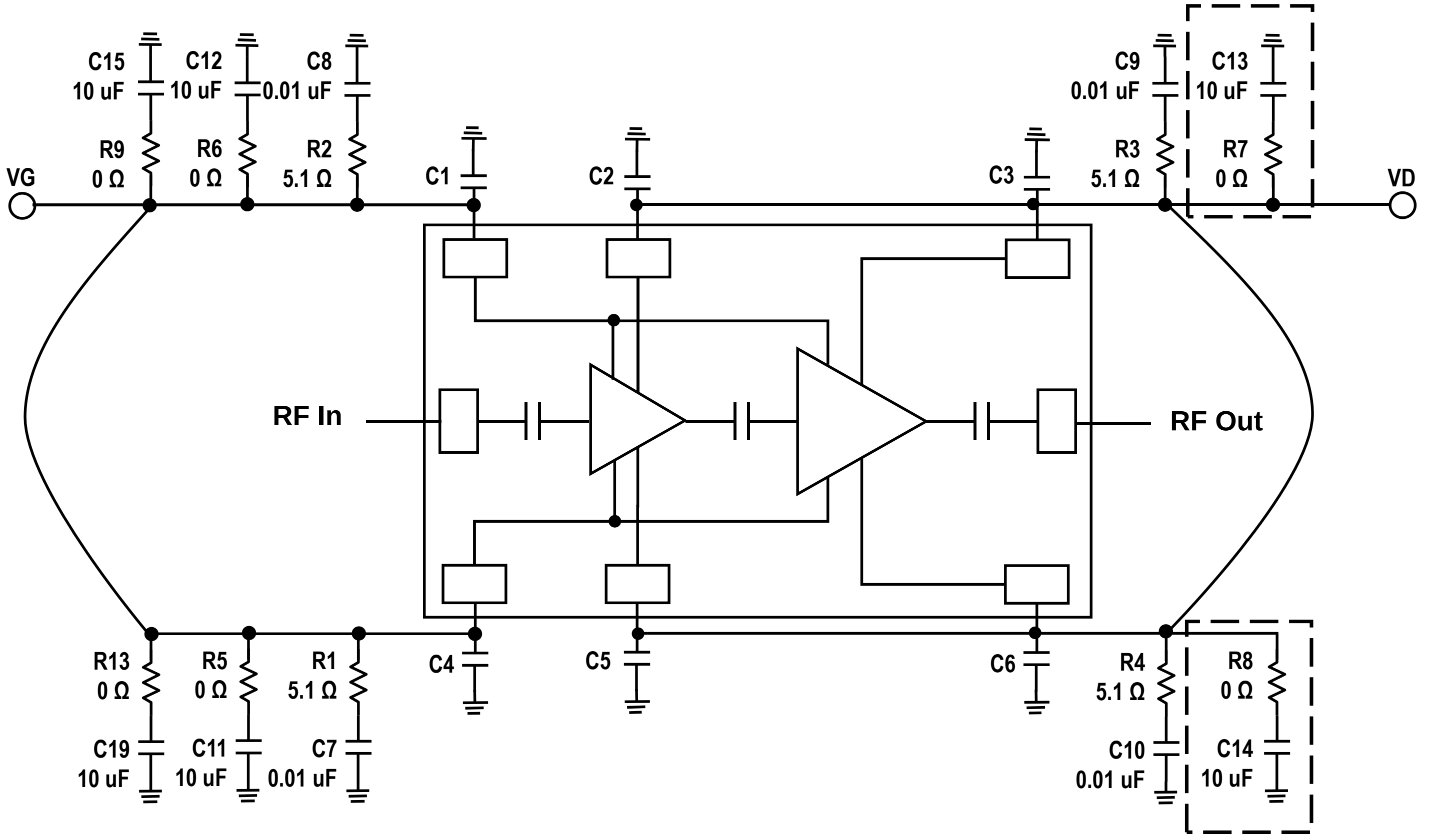
Notes:
1. Die mounted to 20 mil CuMo carrier plate with AuSn solder. Thermal resistance determined to the back of carrier (85 °C).
2. Refer to the following document: GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates

Power Dissipation and Maximum Gate Current





Applications Information and Bias Procedure



Notes:

1. V_G & V_D need to be biased from both sides.
2. R7, R8, C13, C14 should be added if the TGA2307 is to be used with a fixed voltage (non-pulsed) drain bias.

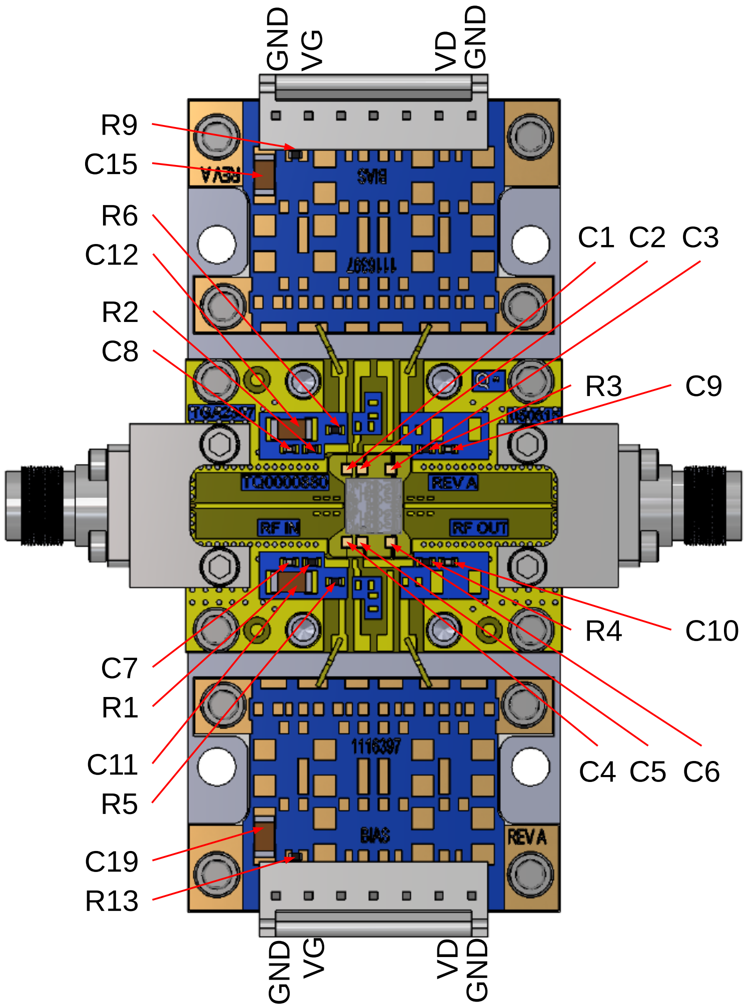
Bias-Up Procedure

1. Set I_D limit (CW) to 5500 mA, I_G limit to 140 mA
2. Set V_G to −5.0 V
4. Set V_D +28 V
5. Adjust V_G more positive until $I_{DQ} \approx$ 1000 mA (V_G ~ −2.8 V Typical)
6. Apply RF signal

Bias-Down Procedure

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

Evaluation Board (EVB) Layout Assembly

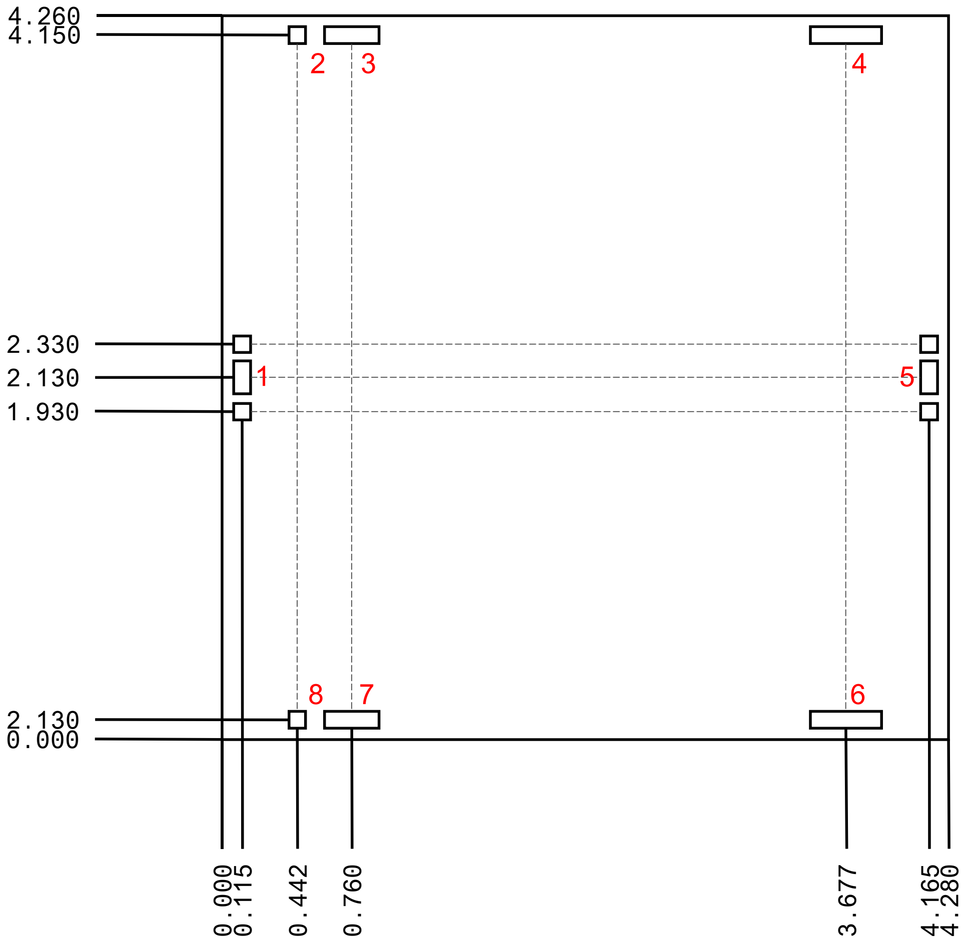


Notes:
1. V_G and V_D must be biased from both sides (top and bottom).

Bill of Materials

Reference Des.	Value	Description	Manuf.	Part Number
C1 – C6	100 pF // 10000 pF	CAP, 10000pF, ±20%, 50V, X7R, 30X30, SL	Presidio	MVB3030X103M2H5C1F
C7 – C10	0.1 uF	CAP, 0.01uF, ±10%, 50V, X7R, 0402	Various	
C11, C12, C15, C19	10 uF	CAP, CER, 10UF, 25V, 20%, X5R, 1206	Various	
R1 – R4	0 Ohm	RES, 0 OHM, 5%, 0402	Various	
R5, R6, R9, R13	5.1 Ohm	RESISTOR, 5.1 OHM, 5%, 0402, SMD	Various	

Mechanical Information and Bond Pad Description



Units: millimeters
Thickness: 0.100
Die x,y size tolerance: ± 0.050
Ground is backside of die

Bond Pad Description

Pad No.	Symbol	Pad Size (mm)	Description
1	RF IN	100 x 200	RF Input; matched to 50 Ω, DC blocked
2, 8	V_G	100 x 100	Gate voltage for stage 1. Bias network is required; see Application Circuit on page 12 as an example.
3, 7	V_{D1}	318 x 100	Drain voltage for stage 1. Bias network is required; see Application Circuit on page 12 as an example.
4, 6	V_{D2}	418 x 100	Drain voltage for stage 2. Bias network is required; see Application Circuit on page 12 as an example.
5	RF OUT	100 x 200	RF Output; matched to 50 Ω, DC blocked

Assembly Notes

Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.

Reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300 °C to 3 – 4 minutes, maximum.
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- Do not use any kind of flux.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

Interconnect process assembly notes:

- Thermosonic ball bonding is the preferred interconnect technique.
- Force, time, and ultrasonic are critical parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	TBD	ANSI/ESDA/JEDEC JS-001

Caution!
ESD-Sensitive Device

Solderability

Use only AuSn (80/20) solder, and limit exposure to temperatures above 300 °C to 3 – 4 minutes, maximum.

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
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) 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**

Email: **customer.support@qorvo.com**

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OCEAN CHIPS

Океан Электроники

Поставка электронных компонентов

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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»**.

«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).

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