TGA2583-SM

2.7 to 3.7 GHz, 10 W GaN Power Amplifier

Product Overview

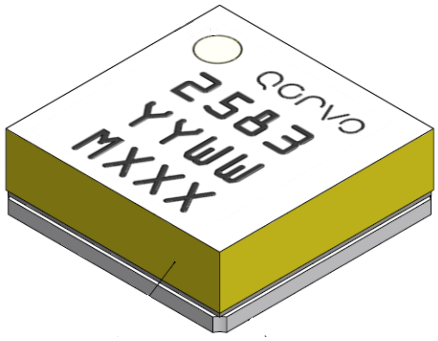
Qorvo's TGA2583-SM is a packaged MMIC power amplifier which operates from 2.7 to 3.7 GHz. The TGA2583-SM is designed using Qorvo's production 0.25 µm GaN on SiC process (QGaN25).

The TGA2583-SM typically provides 41.4 dBm of saturated output power, > 50% power-added efficiency, and 33 dB small signal gain. It can operate under both pulse and CW conditions.

The TGA2583-SM is available in a low-cost, surface mount 32 lead 5 x 5 AIN QFN. It is ideally suited to support both commercial and defense related radar applications.

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

Lead-free and RoHS compliant

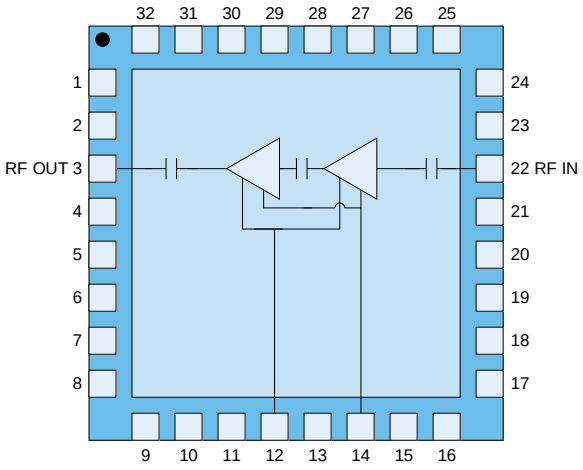


Air Cavity Package

Key Features

- Frequency Range: 2.7–3.7 GHz
- P_{SAT}: 41.4 dBm
- PAE: 50 %
- Small Signal Gain: 33 dB
- Return Loss: 12 dB
- Bias: V_D = 25–32 V (CW or Pulsed), I_{DQ} = 175 mA
- Pulsed V_D: PW = 100 us, DC = 10 %
- Package Dimensions: 5.0 x 5.0 x 1.625 mm

Functional Block Diagram



Top View

Applications

- Commercial and Military Radar

Ordering Information

Part No.	Description
TGA2583-SM	2.7–3.7 GHz, 10 W GaN Power
TGA2583-SM EVB	Evaluation Board

Absolute Maximum Ratings

Parameter	Value / Range
Drain Voltage (V_D)	40 V
Gate Voltage Range (V_G)	−8 to 0 V
Drain Current (I_D)	1530 mA
Gate Current (I_G)	−5.4 to 11.5 mA
Power Dissipation (P_{DISS}), 85 °C	27 W
Input Power (P_{IN}), CW, 50 Ω, 85 °C	30 dBm
Input Power (P_{IN}), CW, V_{SWR} 10:1, V_D = 28 V, 85 °C	23 dBm
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 / Range
Drain Voltage (V_D)	25–32 V
Drain Current (I_{DQ})	175–350 mA
Drain Current Under RF Drive (I_{D_DRIVE})	See plots pg. 6
Gate Voltage Range (V_G)	−2.8 to −2.0 V
Gate Current Under RF Drive (I_{G_DRIVE})	See plots p. 7

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

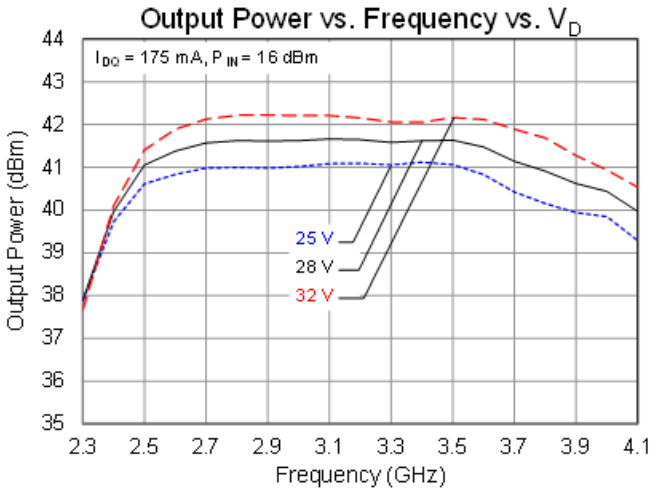
Electrical Specifications

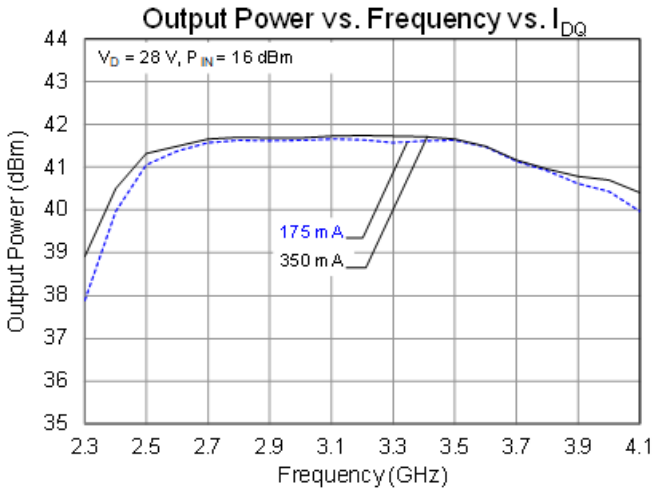
Test conditions unless otherwise noted: 25 °C, V_D = 28 V, I_{DQ} = 175 mA, Pulsed V_D: PW = 100 us, DC = 10 %

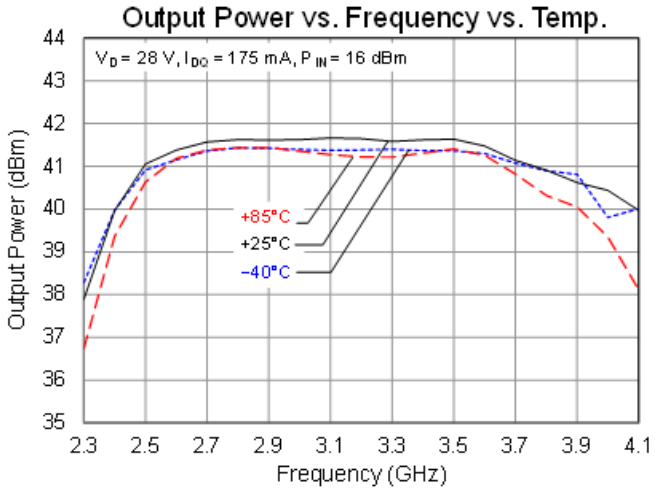
Parameter	Min	Typ	Max	Units
Operational Frequency Range	2.7		3.7	GHz
Small Signal Gain (CW)		33		dB
Input Return Loss (CW)		16		dB
Output Return Loss (CW)		11		dB
Output Power at Saturation (P_{IN} = 16 dBm)	40.5	41.6		dBm
Power-Added Efficiency (P_{IN} = 16 dBm)	50	54		%
Gate Leakage (V_D = 10 V, V_G = −3.7 V)	−5.98		−0.0001	mA
Gain Temperature Coefficient		−0.05		dB/°C
Power Temperature Coefficient		−0.005		dBm/°C

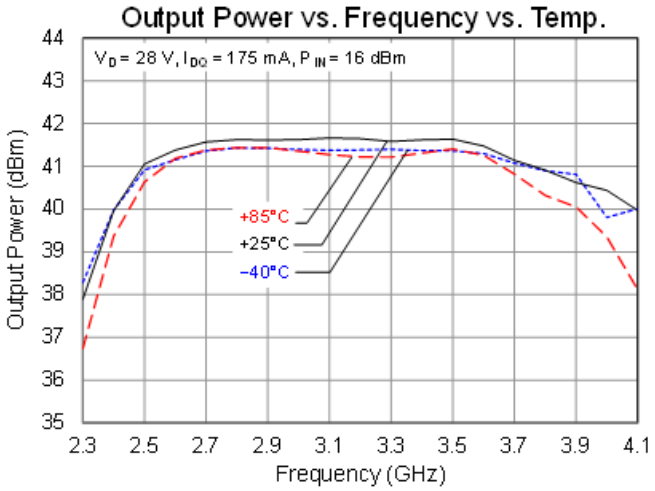
Performance Plots – Large Signal (Pulsed)

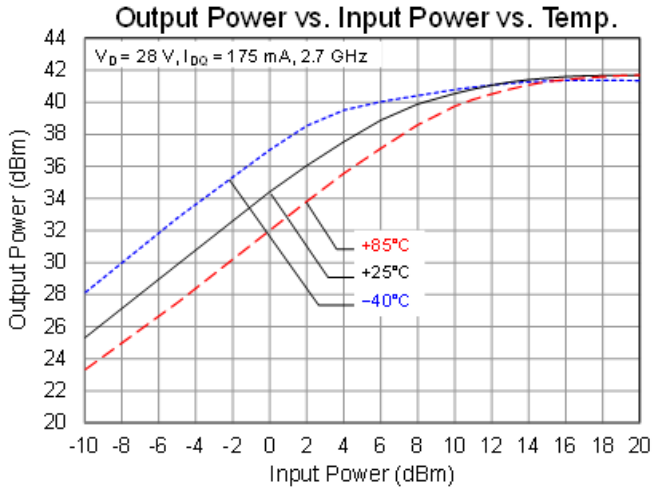
Condition: Pulsed V_D, Pulse Width = 100 us, Duty Cycle = 10%





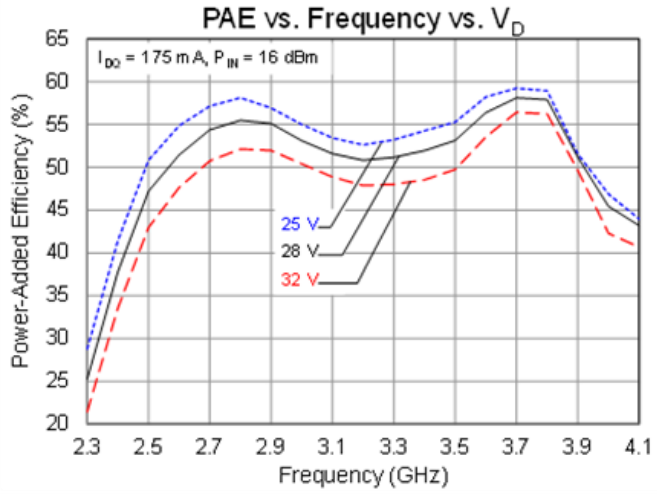


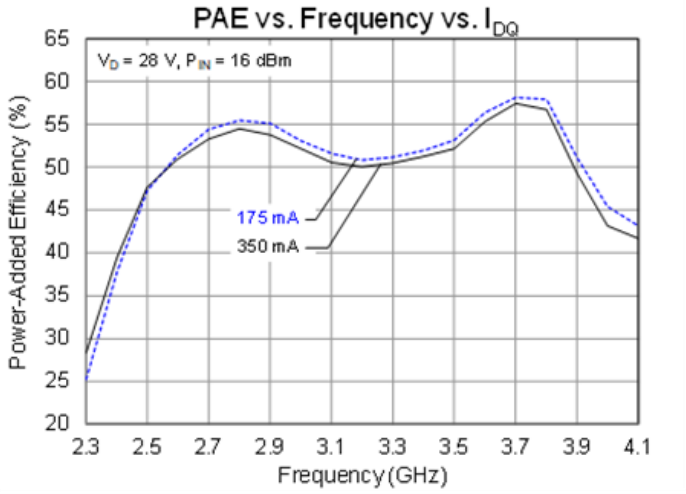


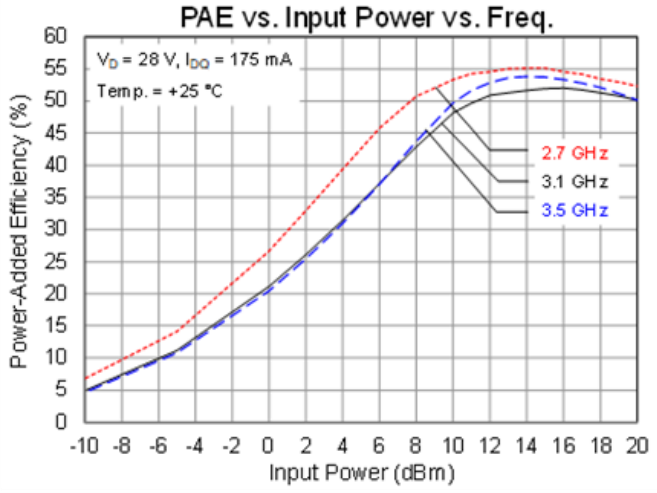


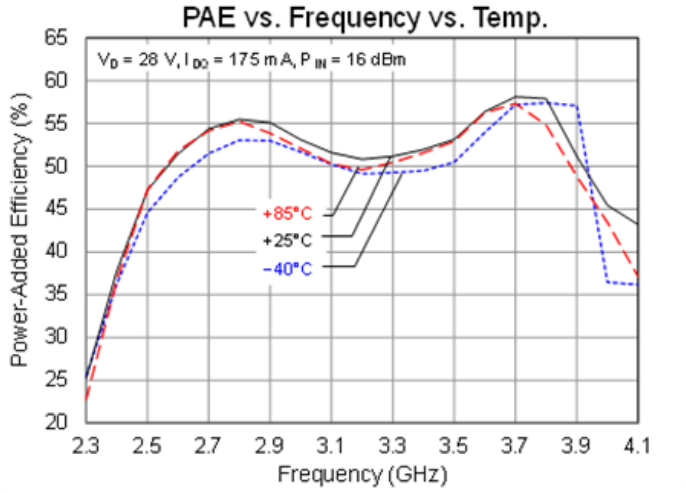
Performance Plots – Large Signal (Pulsed)

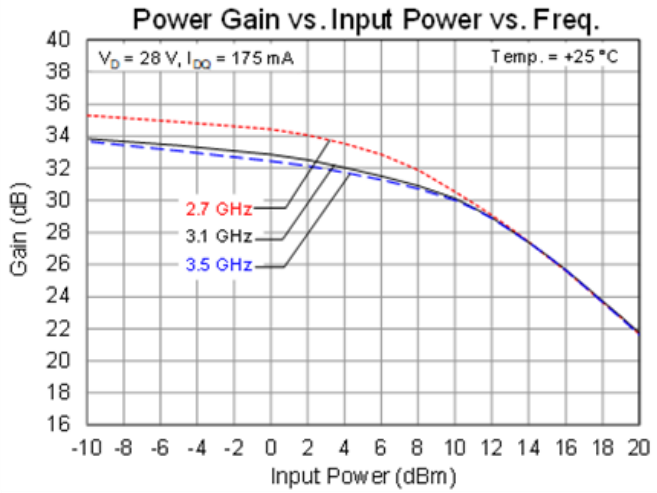
Condition: Pulsed V_D, Pulse Width = 100 us, Duty Cycle = 10%

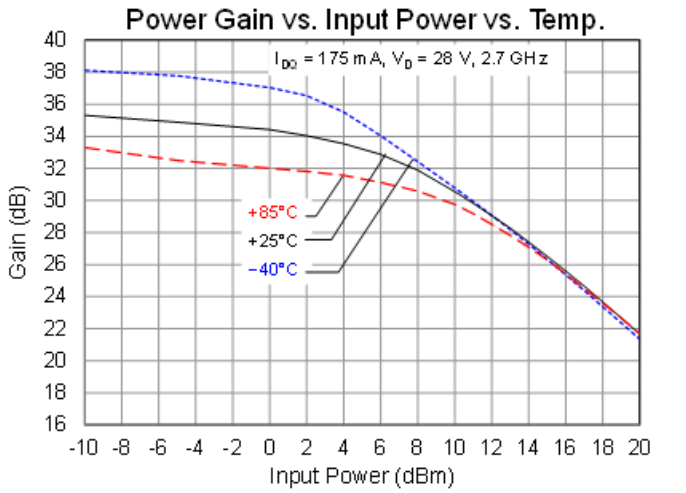






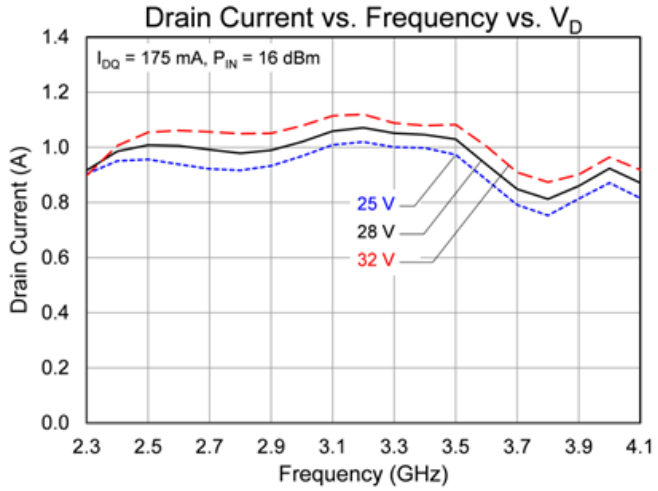


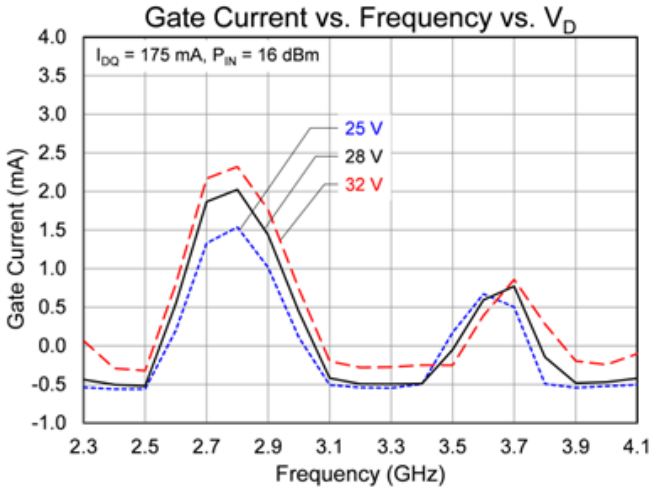


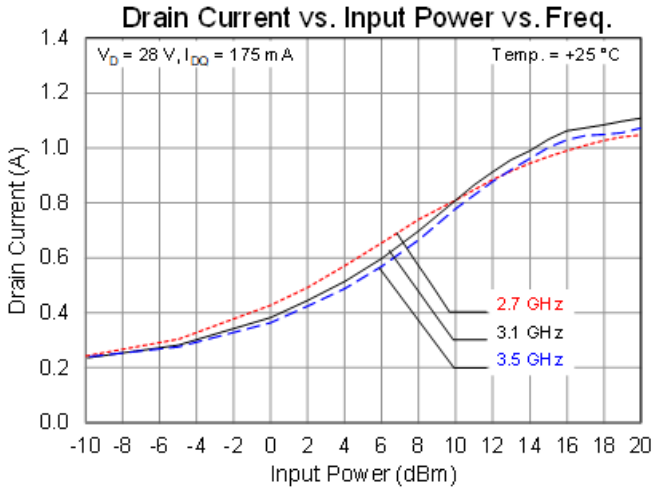


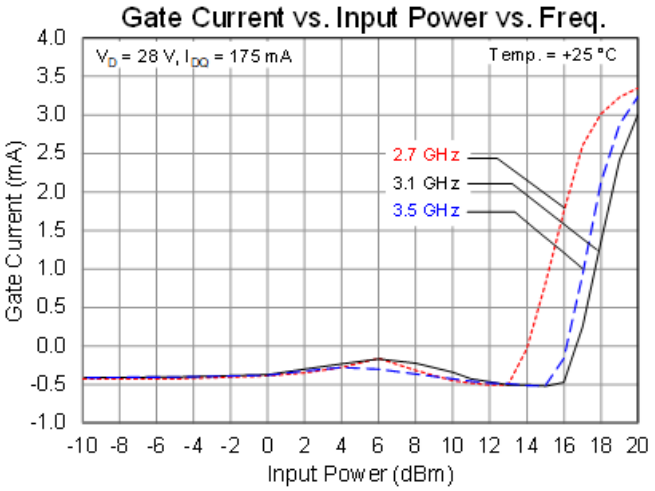
Performance Plots – Large Signal (Pulsed)

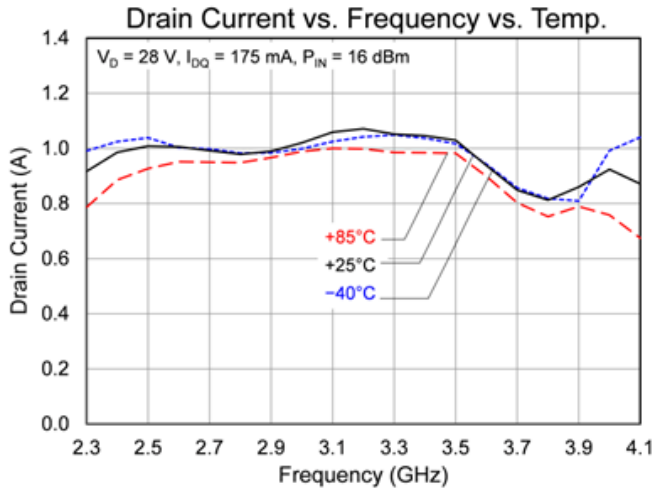
Condition: Pulsed V_D, Pulse Width = 100 us, Duty Cycle = 10%

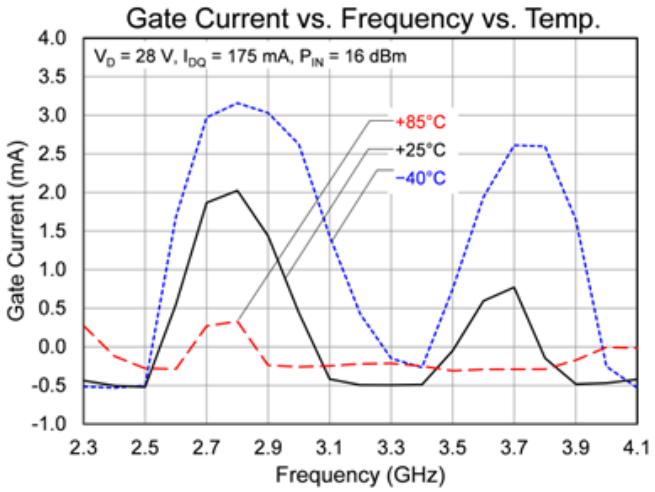






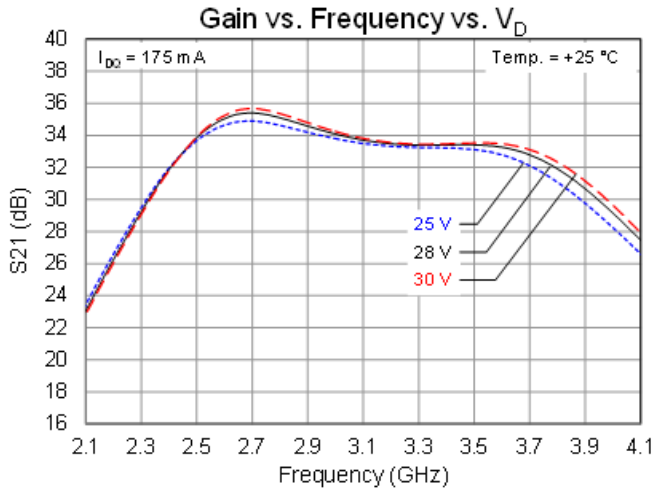


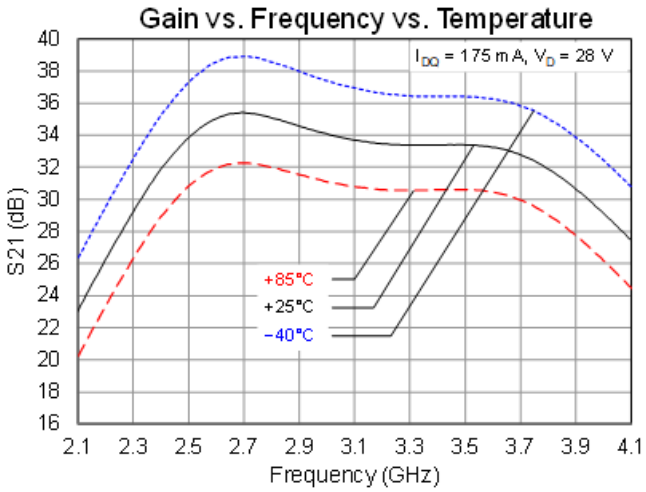


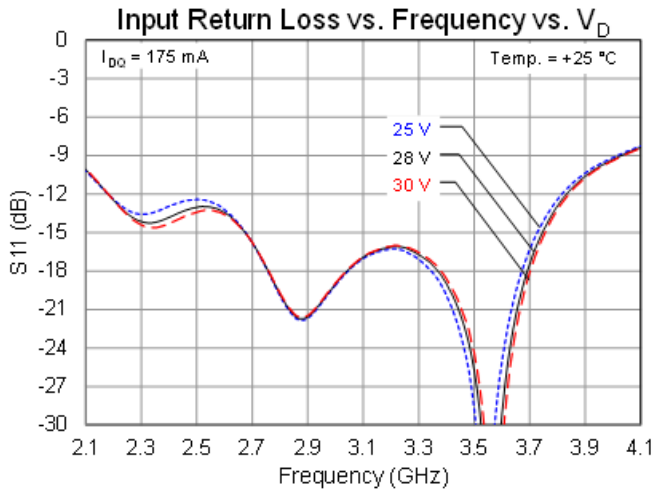


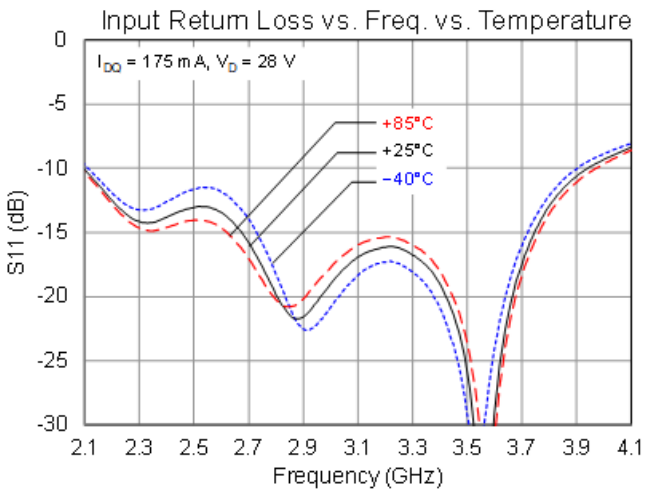
Performance Plots – Small Signal

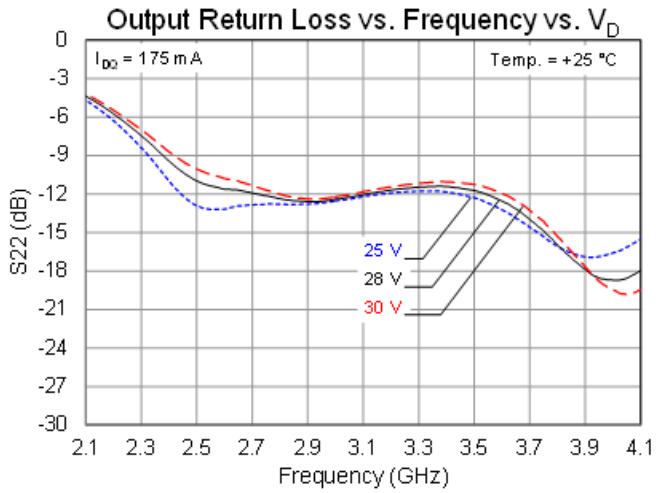
Condition: CW

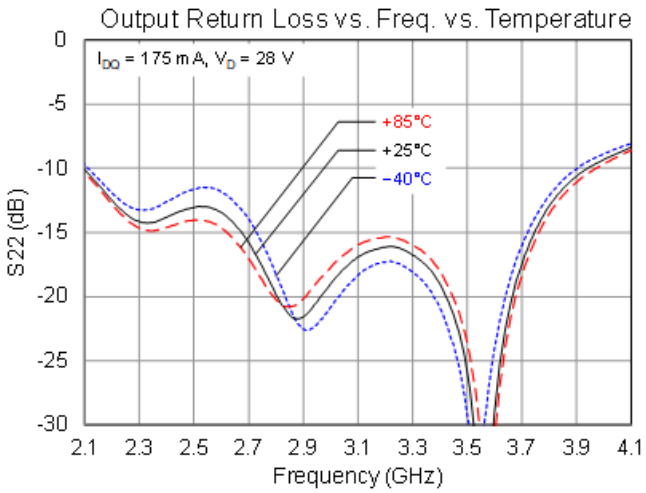










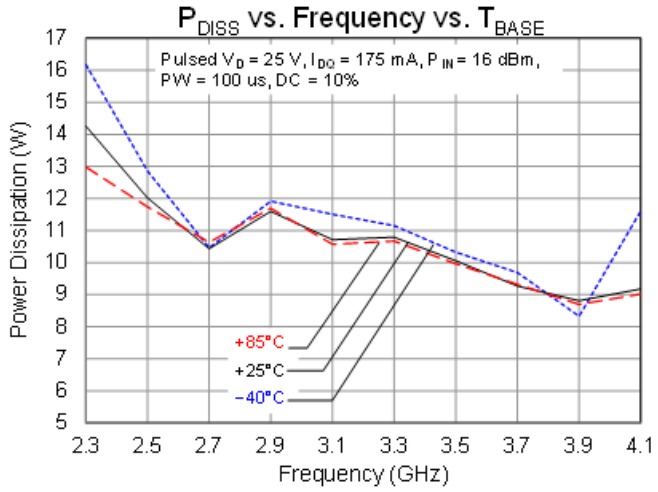


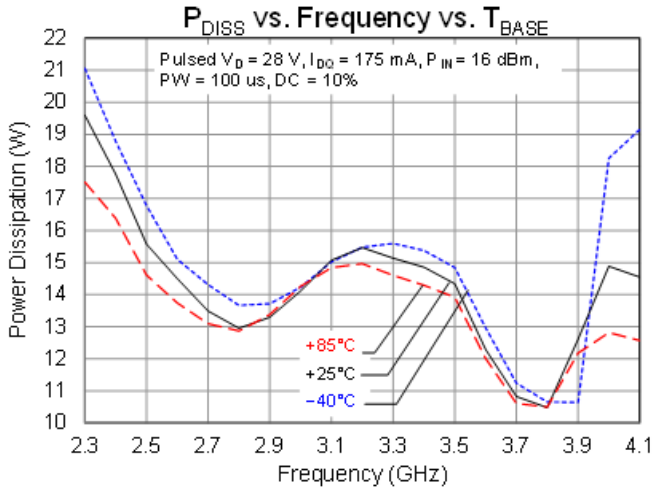
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC})(1)	T_{BASE} = 85°C, V_D = 28 V, PW = 100 us, DC = 10 %, Freq = 3.2 GHz, P_{IN} = 16 dBm, I_{DQ} = 175 mA, I_{D_Drive} = 999 mA, P_{OUT} = 41.2 dBm, P_{DISS} = 15.0 W	2.592	°C/W
Channel Temperature (T_{CH}) (Under RF drive)(2)		124.2	°C

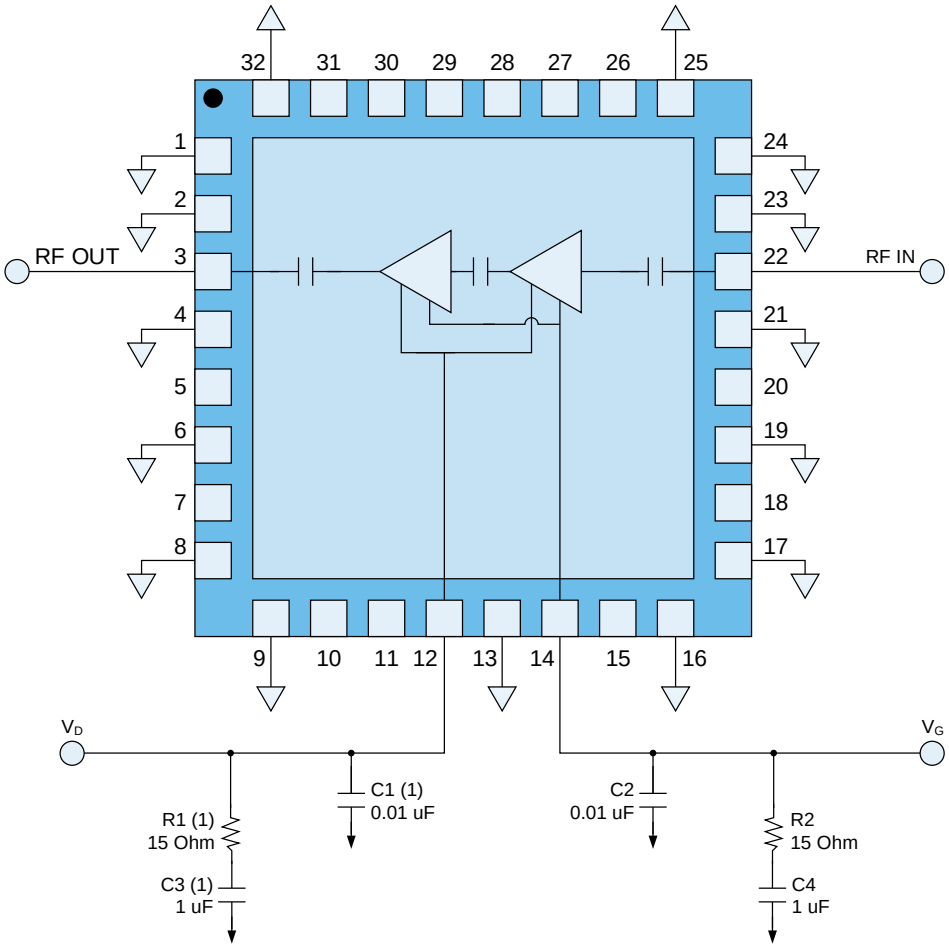
Notes:
1. Thermal resistance determined to the back of the package (fixed at 85 °C)
2. IR scan equivalent. Refer to the following document: GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates

Dissipated Power





Applications Information



Notes:
1. Remove if pulsing on drain

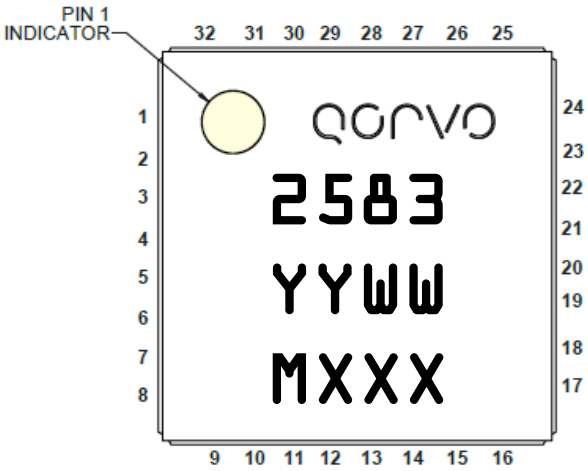
Bias-Up Procedure

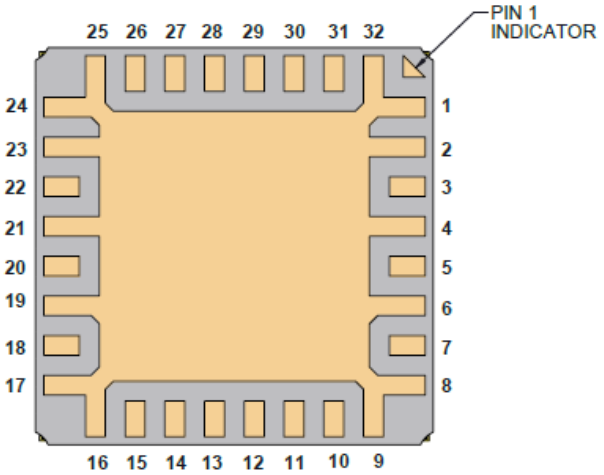
Set I_D limit to 1.53 A, I_G limit to 8 mA
Apply −5 V to V_G
Apply + 25 V to V_D; ensure I_{DQ} is approx. 0 mA
Adjust V_G until I_{DQ} = 175 mA
Turn on RF supply

Bias-Down Procedure

Turn off RF signal
Reduce V_G to −5 V; ensure I_{DQ} is approx. 0 mA
Set V_D to 0 V
Turn off V_D supply
Turn off V_G supply

Pin Layout

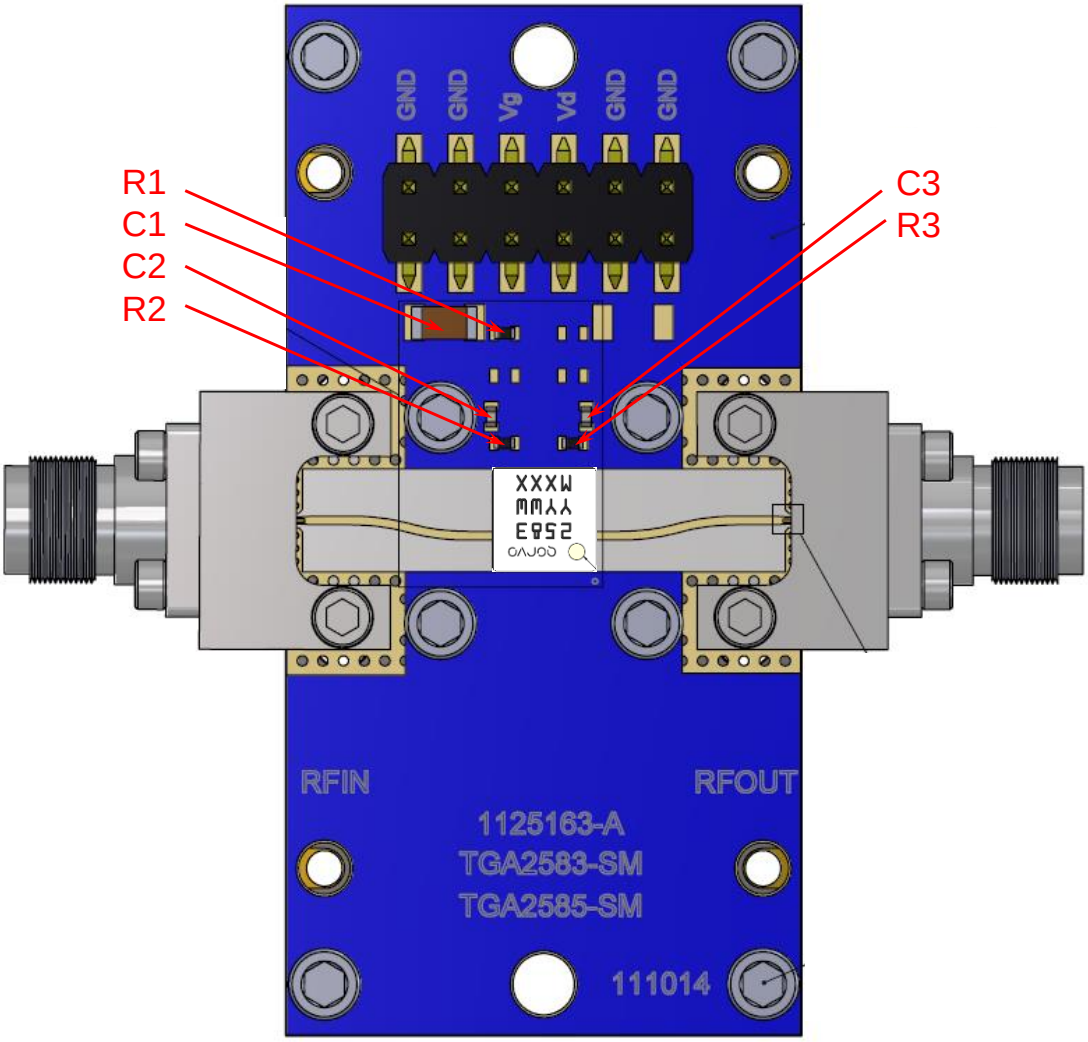




Bond Pad Description

Pad No.	Symbol	Description
1, 2, 4, 6, 8-9, 13, 16–17, 19, 21, 23–25, 32	GND	Connected to ground paddle (pin 33); must be grounded on PCB
3	RF OUT	Output; matched to 50 Ω; DC blocked
5, 7, 10, 11, 15, 18, 20, 26–31	NC	No connection; grounding of PCB pads recommended but not required.
12	DRAIN	Drain voltage; bias network is required; see recommended Application Information on page 8
14	GATE	Gate voltage; bias network is required; see recommended Application Information on page 8
22	RF IN	Input; matched to 50 Ω; DC blocked
33	GND	Ground Paddle. Multiple vias should be employed to minimize inductance and thermal resistance.

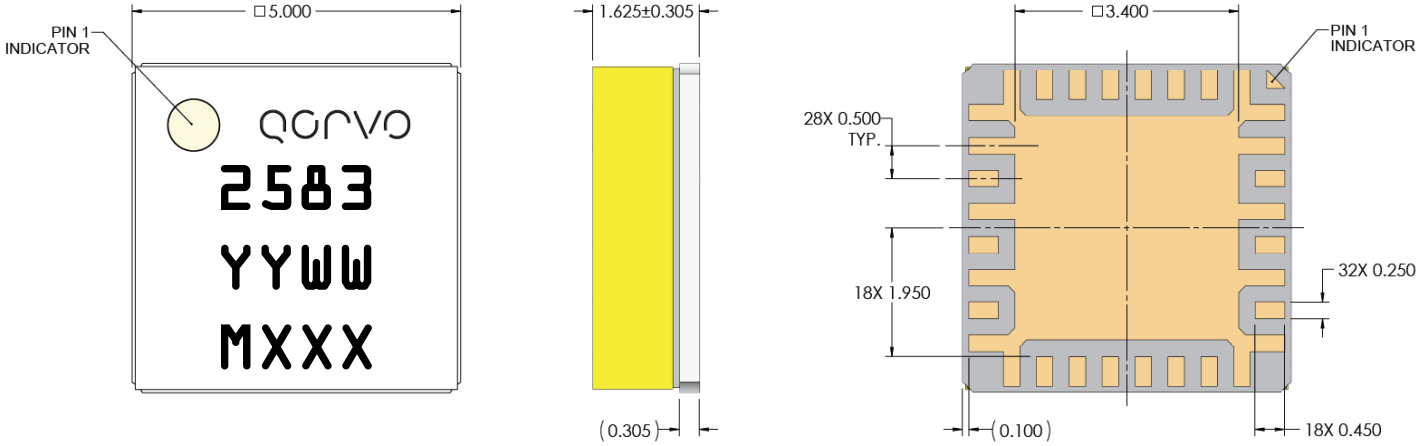
Evaluation Board



Bill of Materials

Reference Des.	Value	Description	Manuf.	Part Number
C1	10 µF	CAP, 10uF, 20%, 50V, 20%, X5R, 1206	Various	
C2, C3	0.01 µF	CAP, 0.01uF, 10%, 50V, X7R, 0402	Various	
R1, R2	10 Ohm	RES, 10 OHM, 5%, 0.1W, 0402	Various	
J1, J2	2.92 mm	Female End Launch Connector	Southwest Microwave	1092-01A-5

Mechanical Information



Units: millimeters
Tolerances: unless otherwise specified
x.xx = ± 0.25
x.xxx = ± 0.127
Materials:
Base: Ceramic
Lid: Laminate
All metalized features are gold plated
Part is epoxy sealed
Marking:
2583: Part number
YY: Part Assembly year
WW: Part Assembly week
MXXX: Batch ID

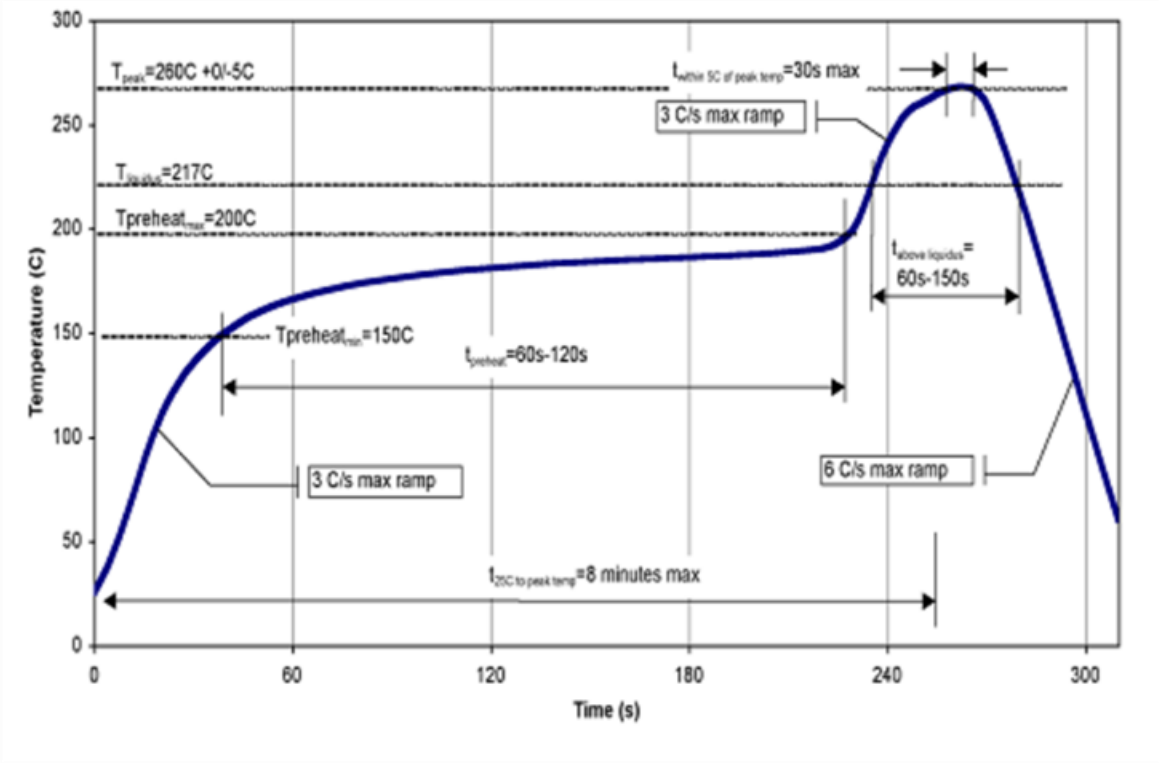
Assembly Notes

Compatible with lead-free soldering processes with 260°C peak reflow temperature.

This package is air-cavity and non-hermetic, and therefore cannot be subjected to aqueous washing. The use of no-clean solder to avoid washing after soldering is highly recommended.

Contact plating: Ni-Au.

Solder rework not recommended.



Recommended Soldering Temperature Profile

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	1B	JEDEC/JESD22-A114
ESD – Charge Device Model (CDM)	C3	JEDEC/JESD22-C101
MSL – Moisture Sensitivity Level	MSL3	JEDEC/IPC/JEDEC J-STD-020

Caution!
ESD-Sensitive Device

Solderability

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

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 ($C_{15}H_{12}Br_4O_2$) 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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