



# TGA2583-SM

## 2.7 to 3.7 GHz, 10 W GaN Power Amplifier

### General Description

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  $\mu\text{m}$  GaN on SiC process (QGaN25).

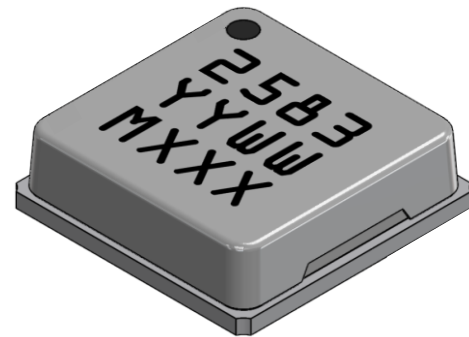
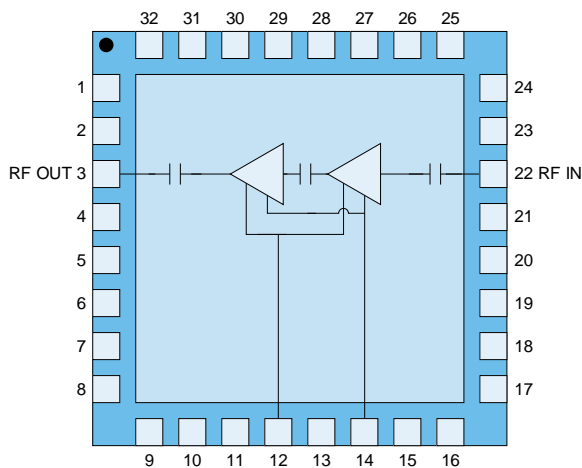
The TGA2583-SM typically provides 41.4 dBm of saturated output power, > 50% power-added efficiency, and 33 dB small signal gain. It can operate under both pulse and CW conditions.

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

### Functional Block Diagram



Air Cavity Package

### Product 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:  $V_D = 25\text{--}32\text{ V}$  (CW or Pulsed),  $I_{DQ} = 175\text{ mA}$
- Pulsed  $V_D$ :  $PW = 100\text{ us}$ ,  $DC = 10\%$
- Package Dimensions: 5.0 x 5.0 x 1.45 mm

### Applications

- Commercial and Military Radar

### Ordering Information

Part	Description
TGA2583-SM	2.7–3.7 GHz, 10 W GaN Power Amplifier
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 $\Omega$ , 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.

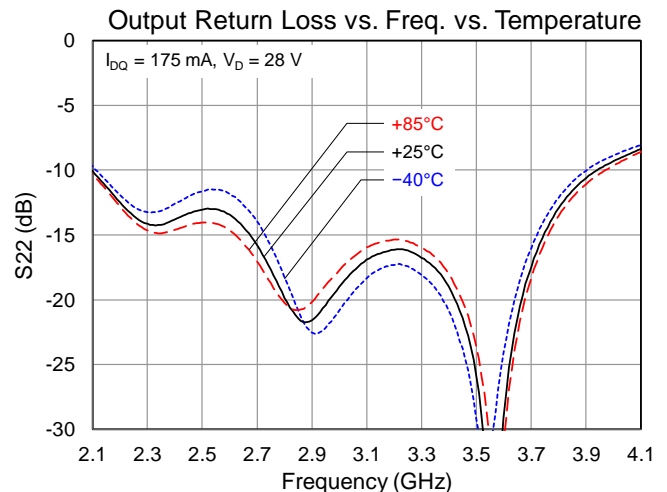
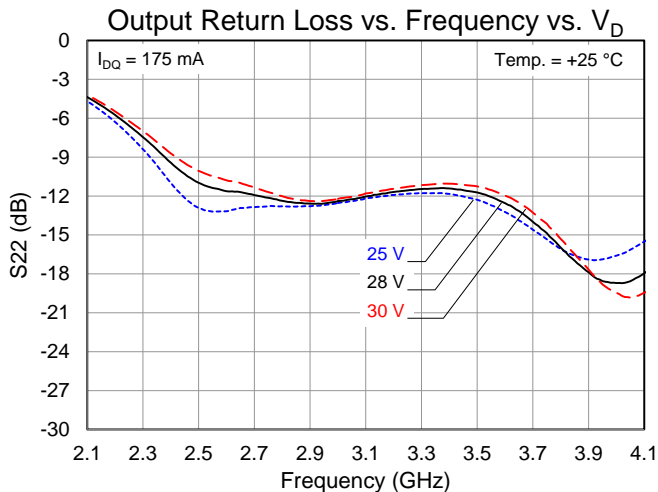
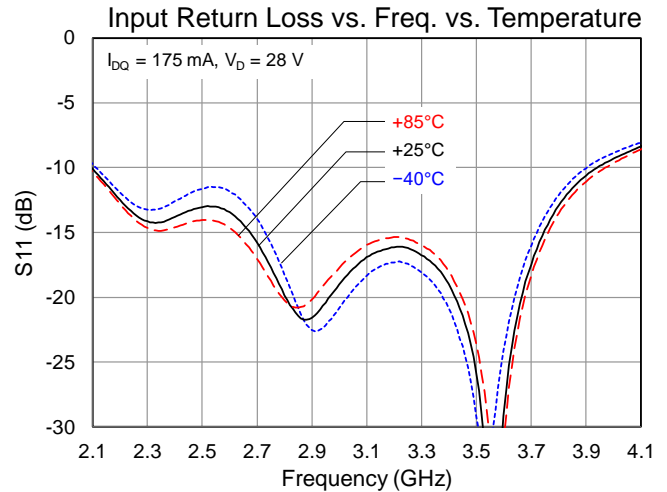
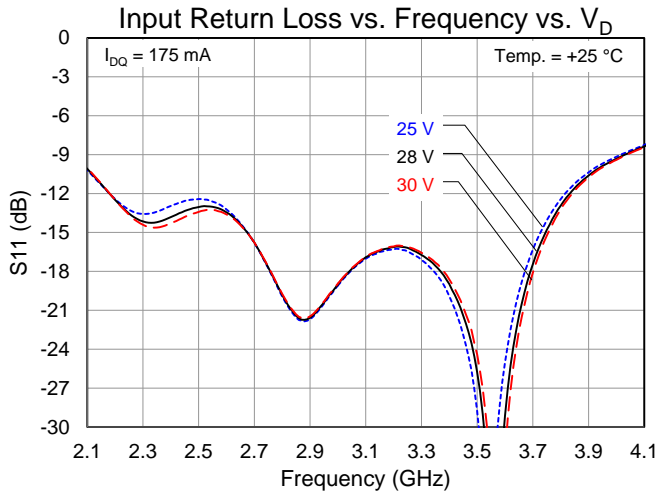
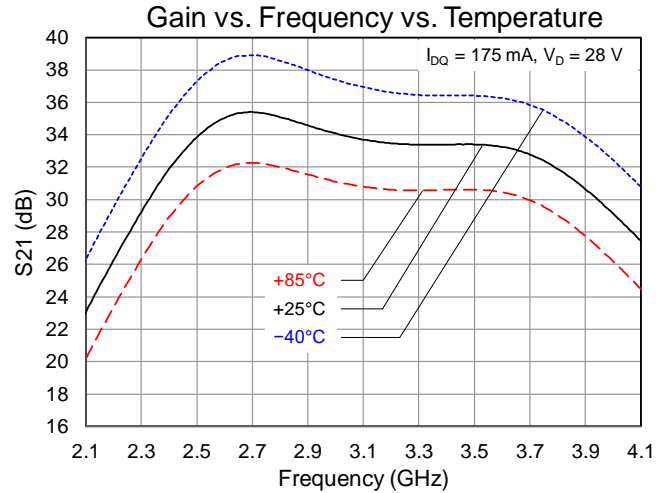
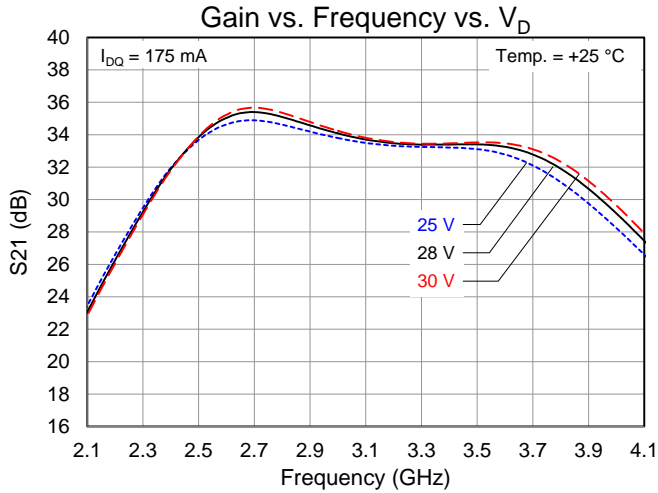
## Electrical Specifications

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

Parameter	Min	Typical	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

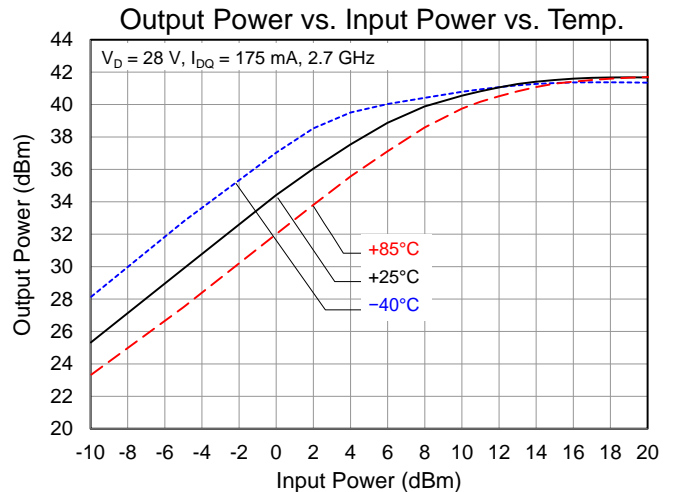
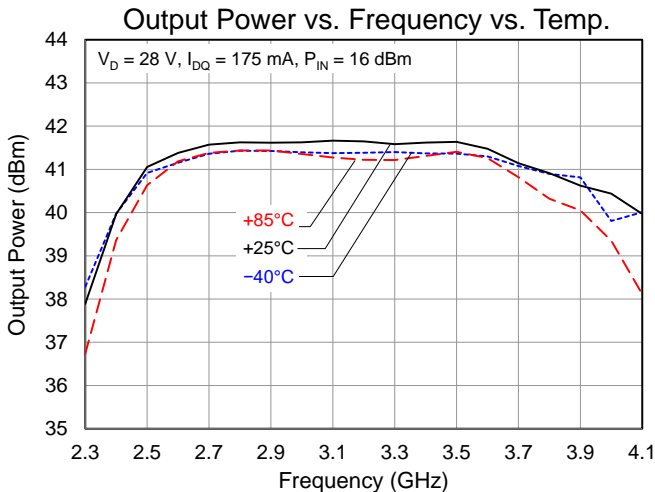
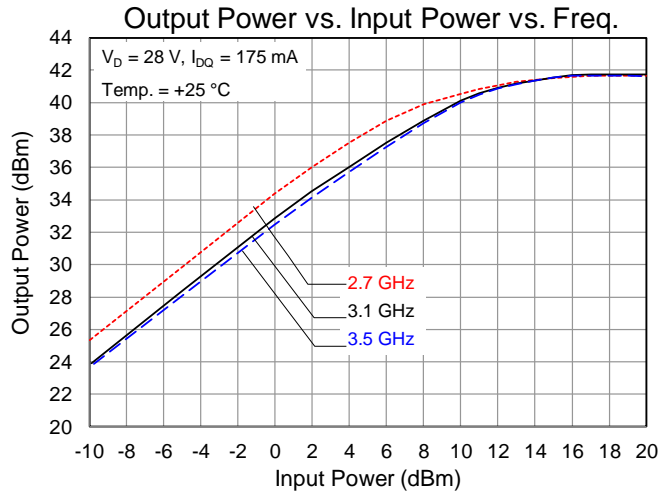
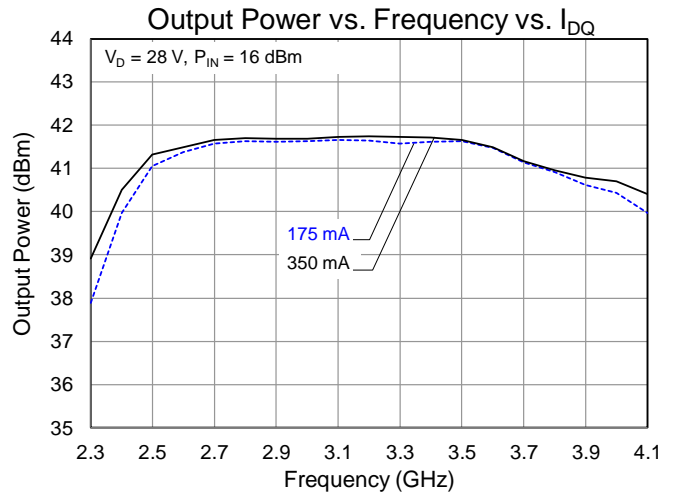
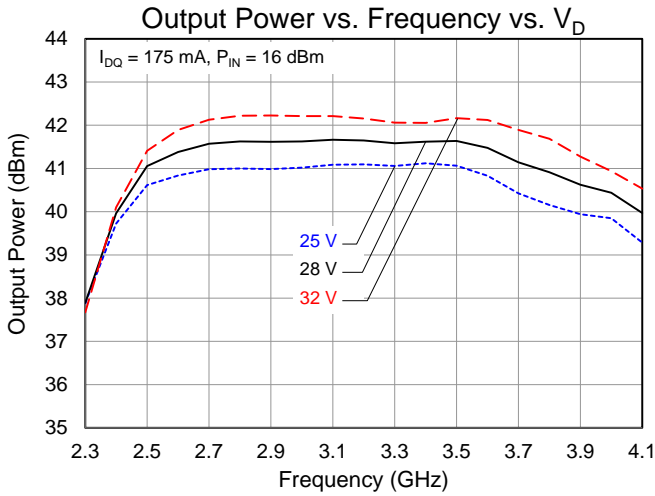
**Typical Performance: Small Signal**

Condition: CW



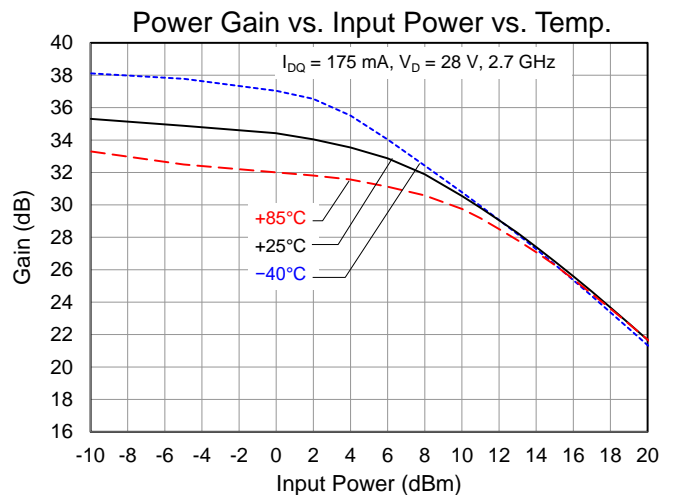
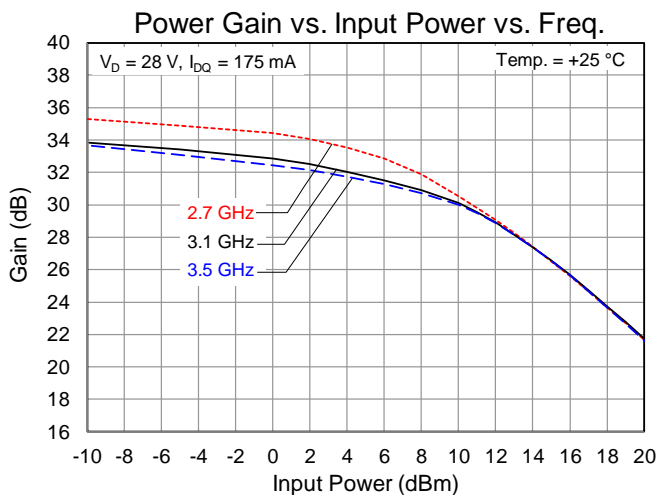
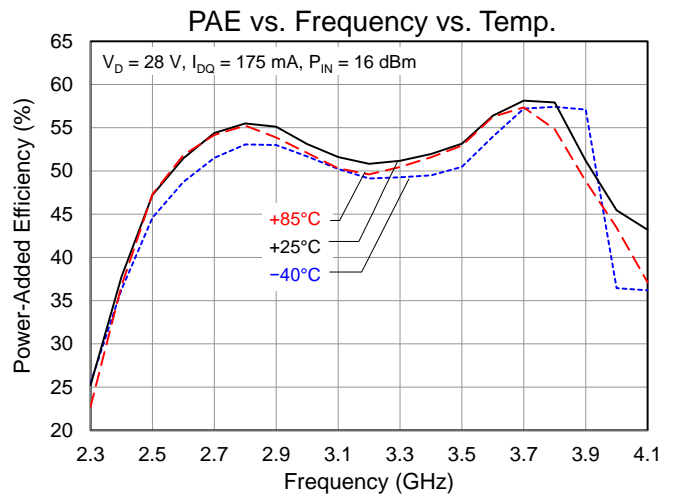
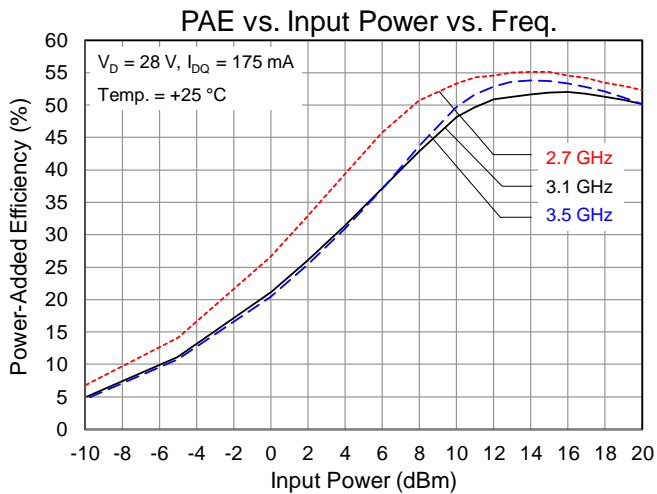
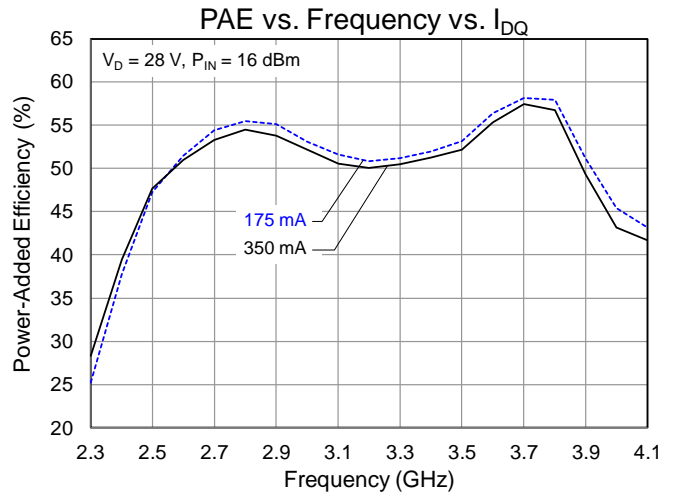
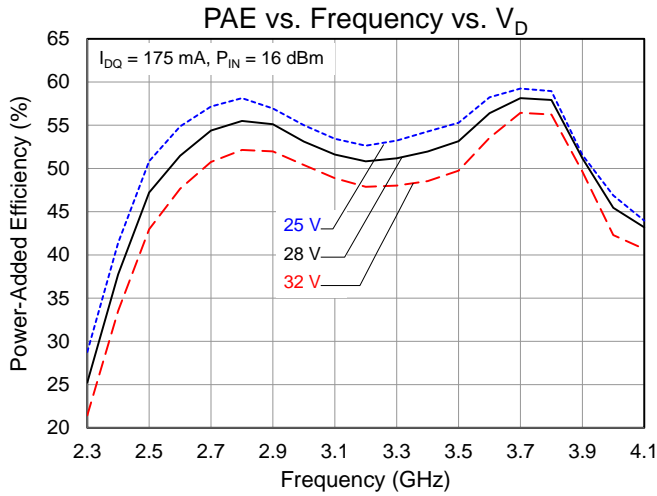
**Typical Performance: Large Signal**

Condition: Pulsed  $V_D$ , Pulse Width = 100  $\mu$ s, Duty Cycle = 10%



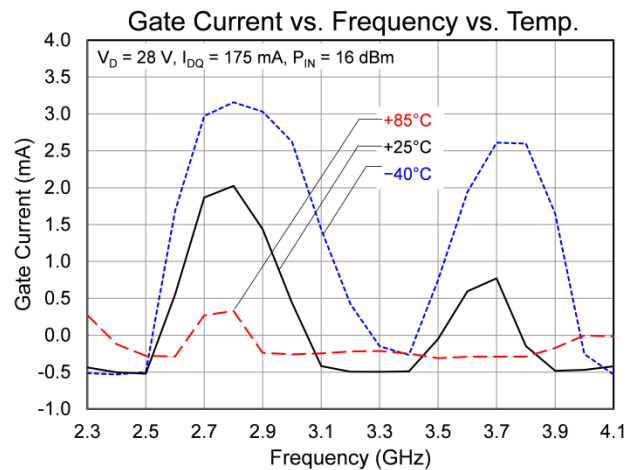
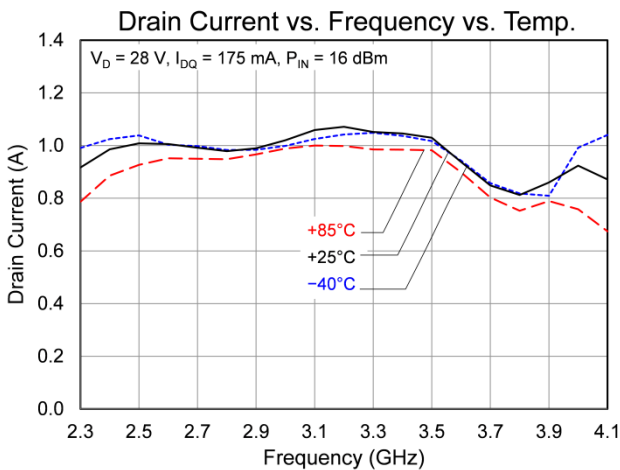
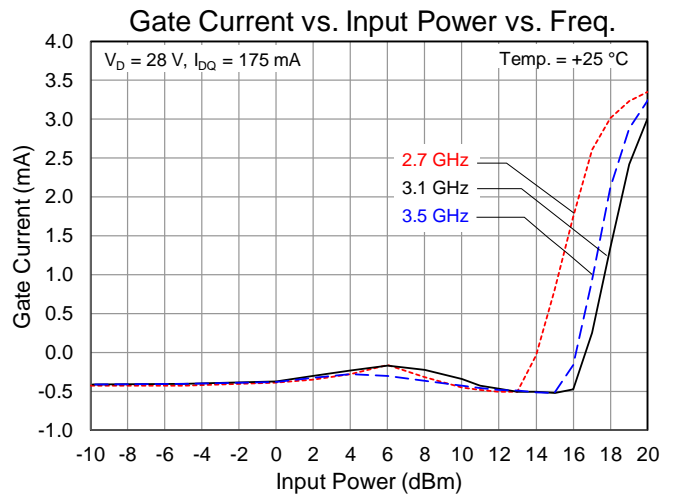
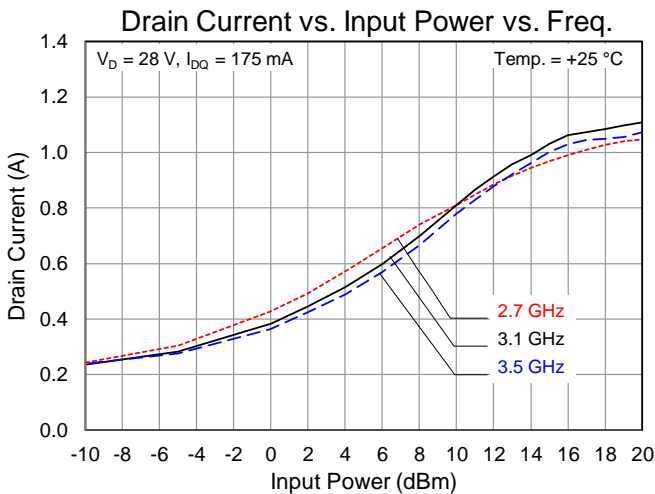
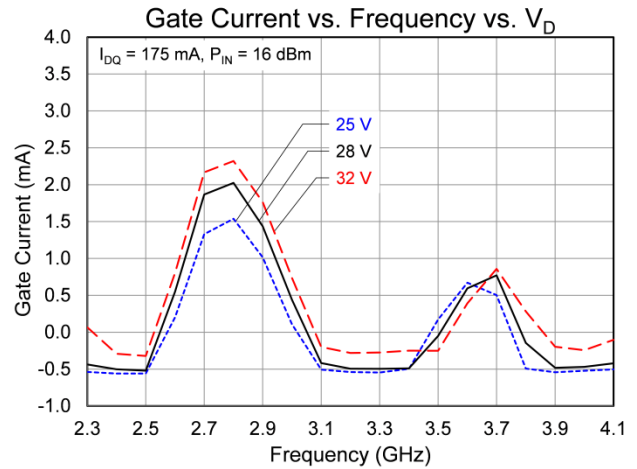
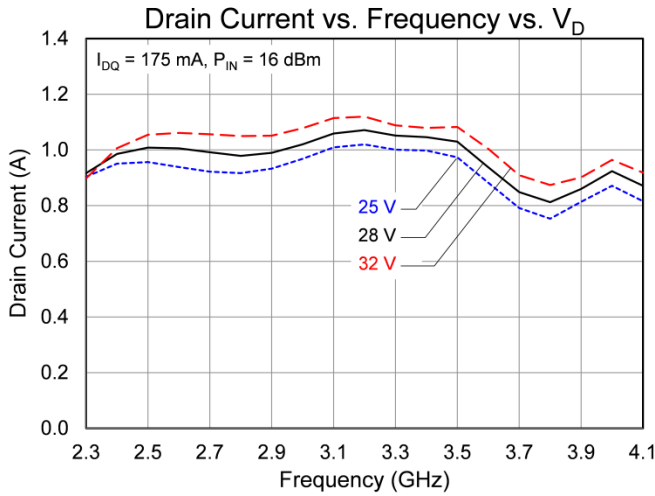
## Typical Performance: Large Signal

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



## Typical Performance: Large Signal

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



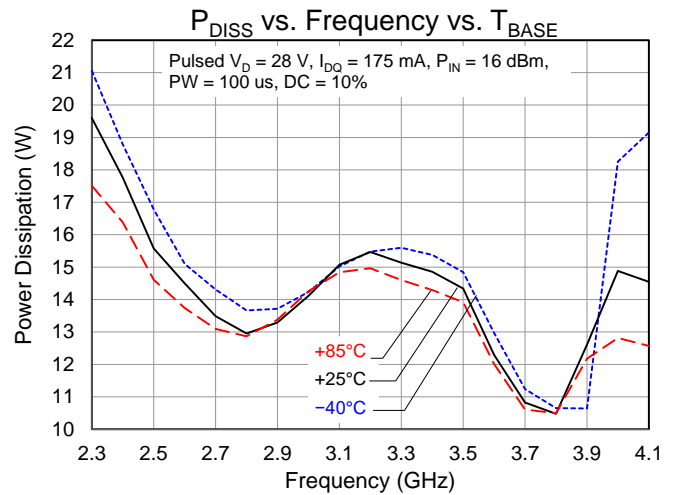
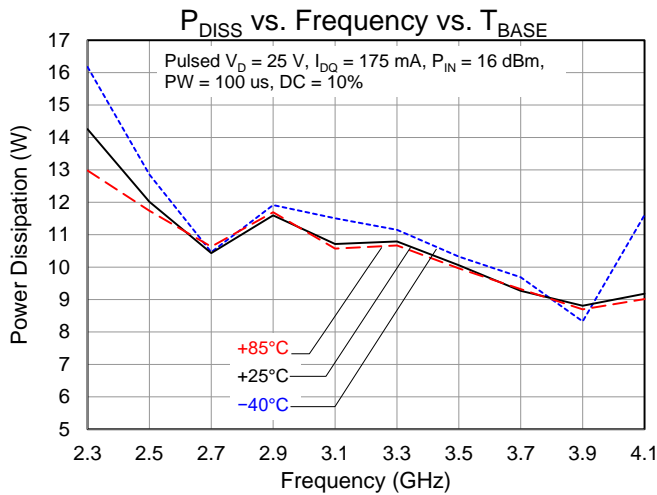
## Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance ( $\theta_{JC}$ ) <sup>(1)</sup>	$T_{BASE} = 85^{\circ}\text{C}$ , $V_D = 28\text{ V}$ , $PW = 100\text{ }\mu\text{s}$ , $DC = 10\%$ ,	2.592	$^{\circ}\text{C}/\text{W}$
Channel Temperature ( $T_{CH}$ ) (Under RF drive) <sup>(2)</sup>	Freq = 3.2 GHz, $P_{IN} = 16\text{ dBm}$ , $I_{DQ} = 175\text{ mA}$ , $I_{D\_Drive} = 999\text{ mA}$ , $P_{OUT} = 41.2\text{ dBm}$ , $P_{DISS} = 15.0\text{ W}$	124.2	$^{\circ}\text{C}$

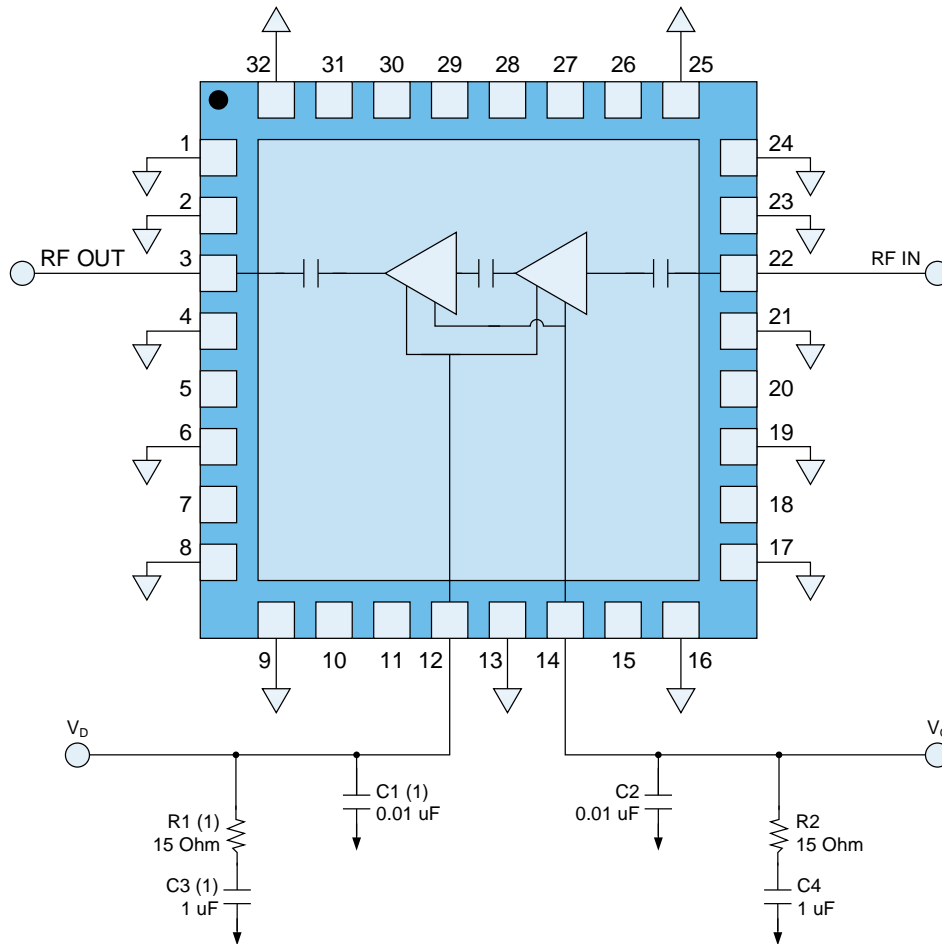
Notes:

1. Thermal resistance is determined to the back of the package.
2. IR scan equivalent. Refer to the following document: [GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates](#)

## Power Dissipation



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

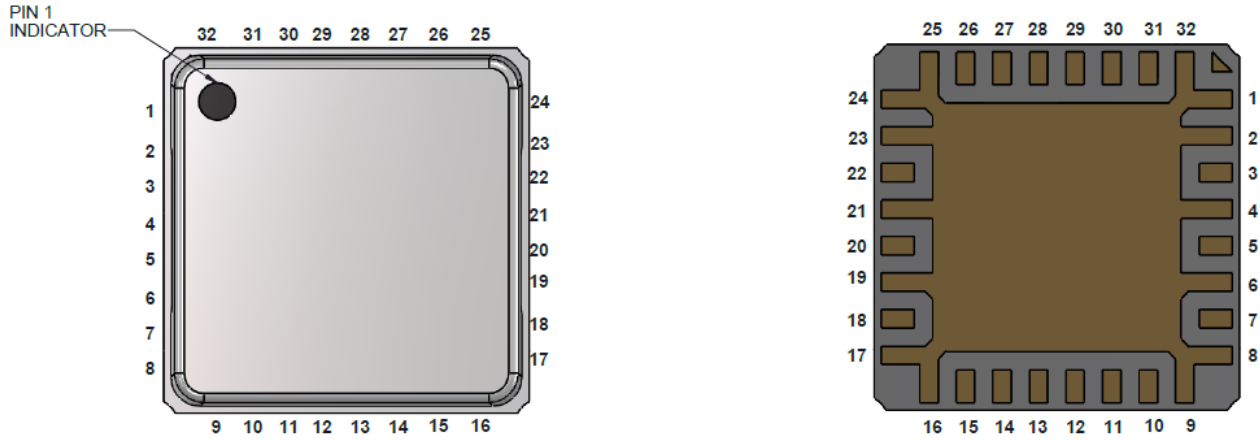
Set  $V_D$  to 0 V

Turn off  $V_D$  supply

Turn off  $V_G$  supply



## Pin Layout

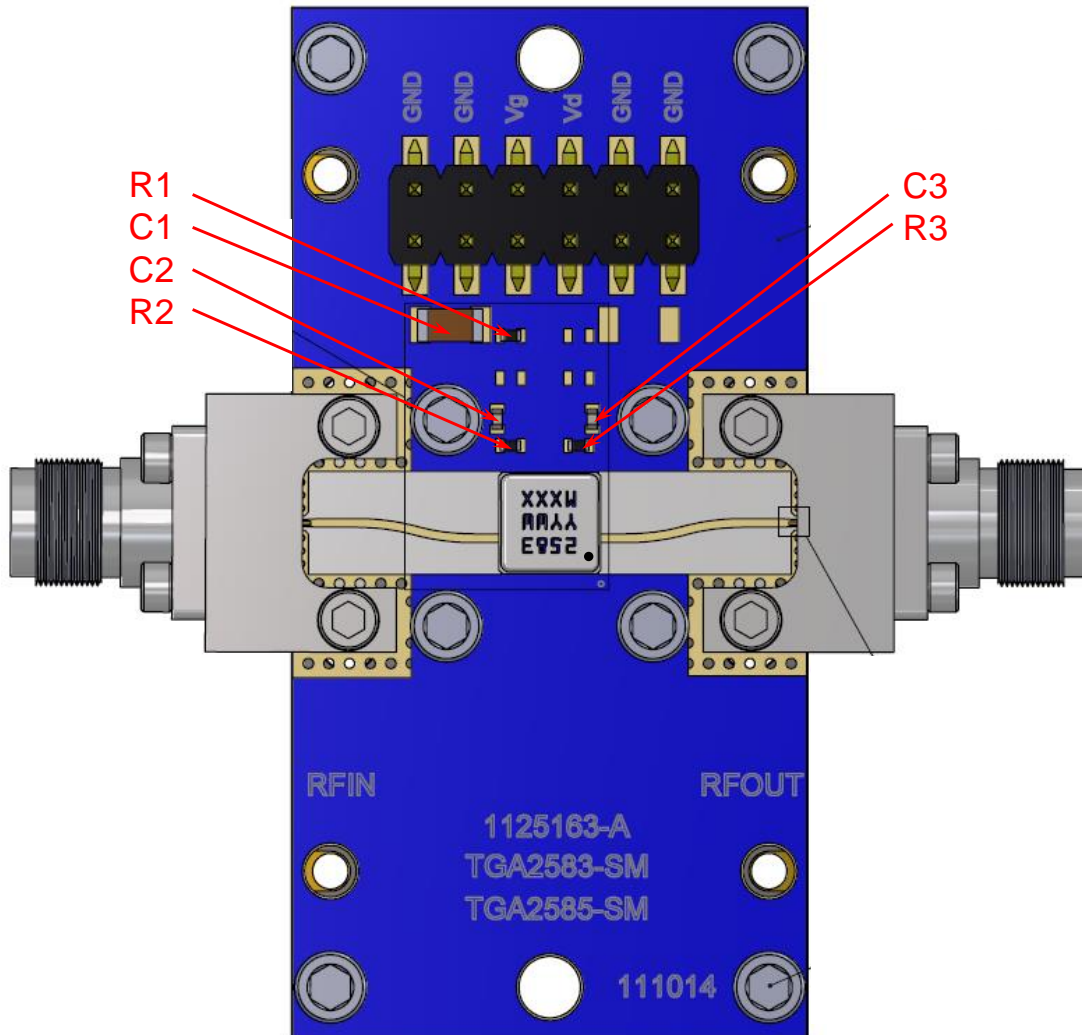


PIN ASSIGNMENT

## Pin Description

Pin 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 $\Omega$ ; 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 $\Omega$ ; DC blocked
33	GND	Ground Paddle. Multiple vias should be employed to minimize inductance and thermal resistance.

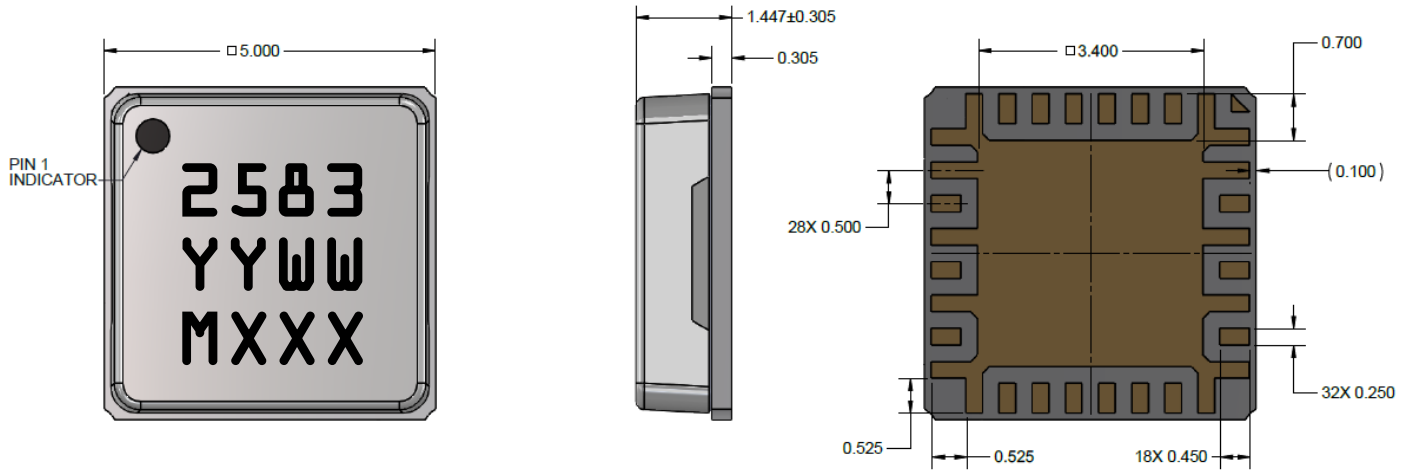
Evaluation Board



Bill of Material

Reference Des.	Value	Description	Manuf.	Part Number
C1	10 $\mu$ F	CAP, 10uF, 20%, 50V, 20%, X5R, 1206	Various	
C2, C3	0.01 $\mu$ F	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	RF Connector, 2.92 mm, Female	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: Plastic

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

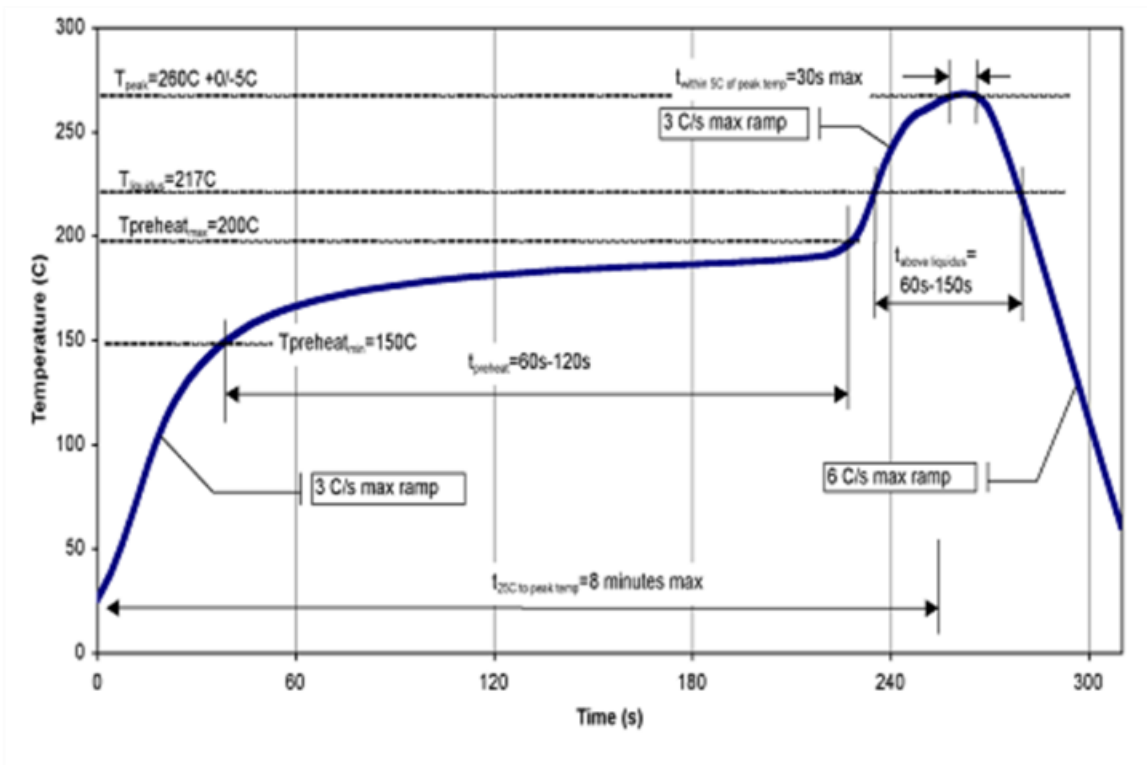
Assembly Notes

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