



# TGA2583-SM

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

### General Description

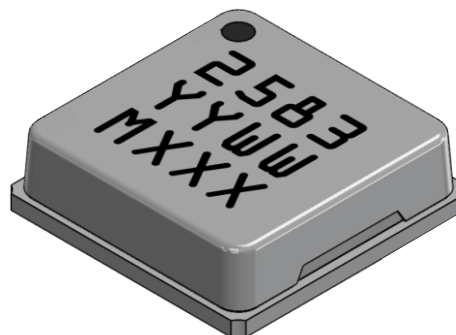
Qorvo's TGA2583-SM is a packaged MMIC power amplifier which operates from 2.7 to 3.7 GHz. The TGA2583-SM is designed using Qorvo's production 0.25  $\mu\text{m}$  GaN on SiC process (QGaN25).

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

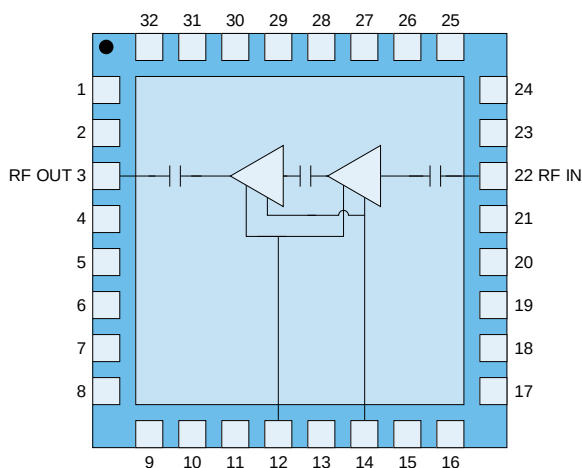


Air Cavity Package

### Product Features

- Frequency Range: 2.7–3.7 GHz
- $P_{\text{SAT}}$ : 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  $V_D$ :  $PW = 100\text{ }\mu\text{s}$ ,  $DC = 10\text{ }\%$
- Package Dimensions: 5.0 x 5.0 x 1.45 mm

### Functional Block Diagram



### 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.

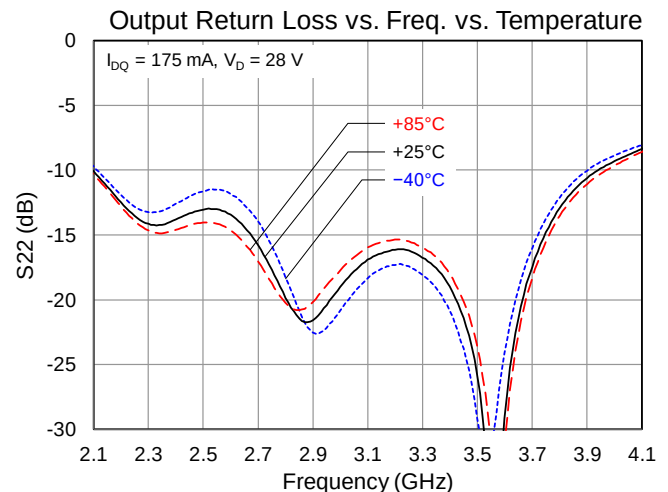
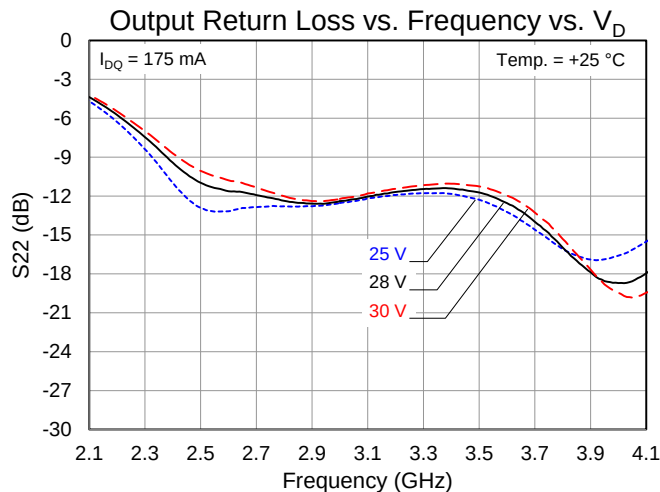
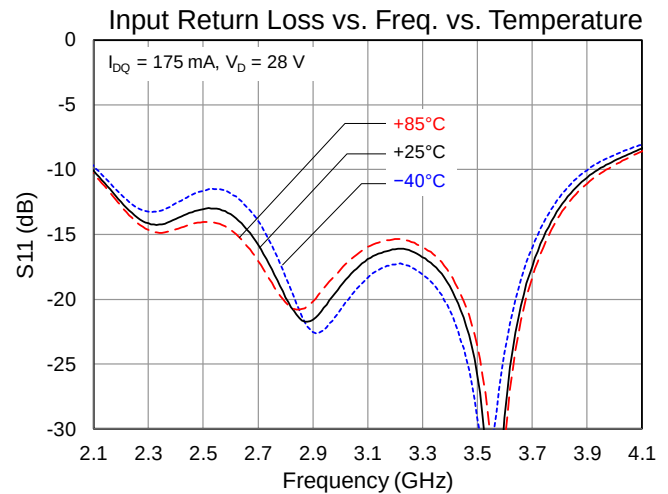
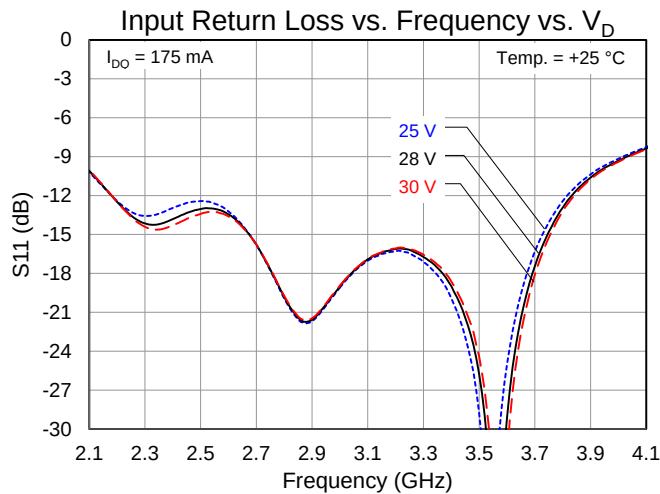
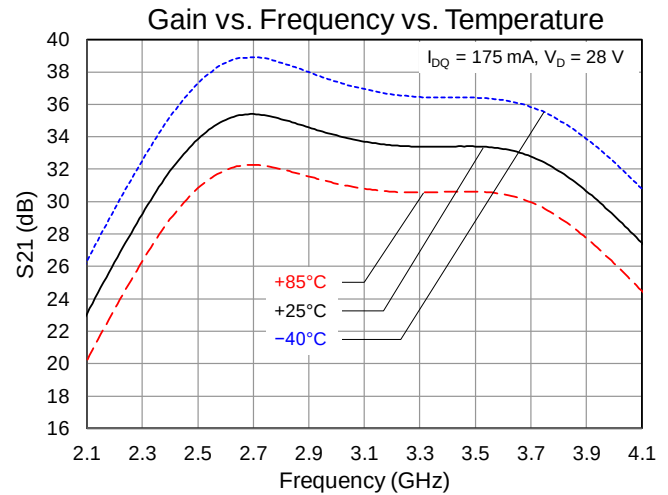
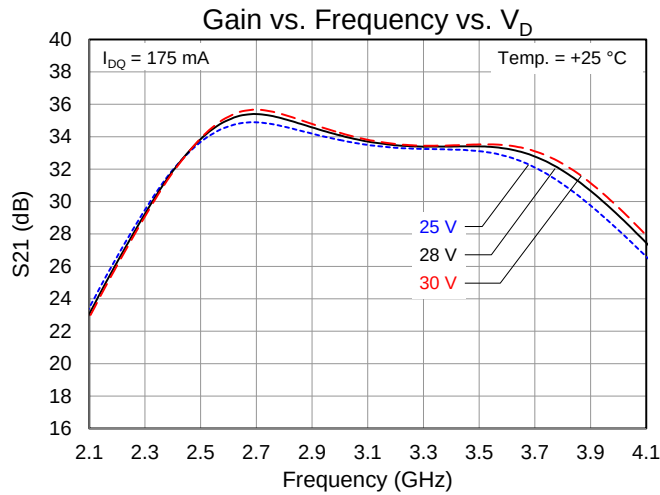
## Electrical Specifications

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 |

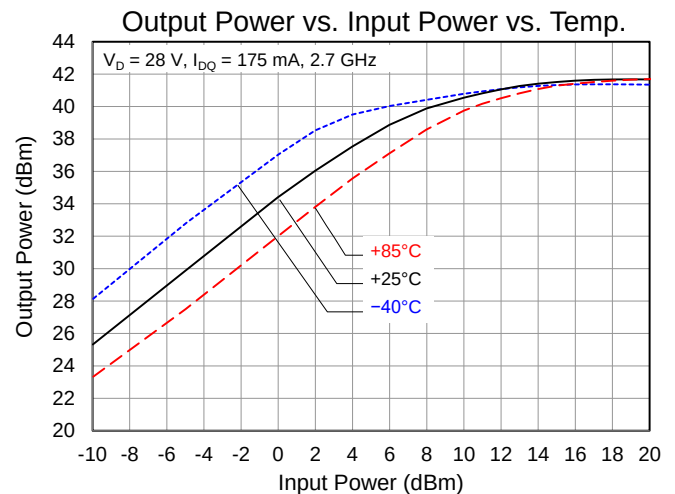
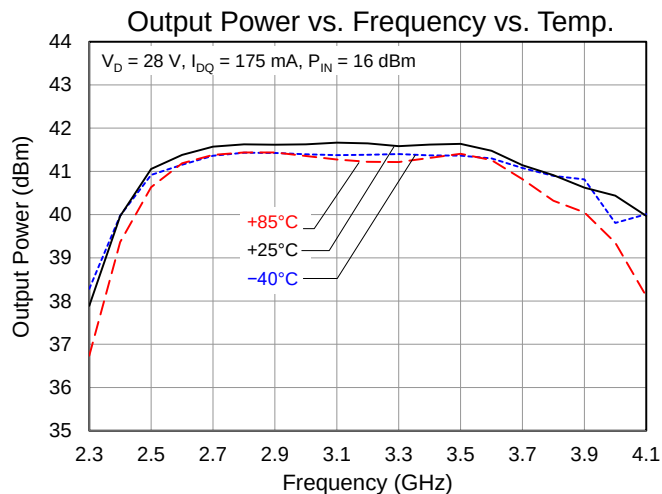
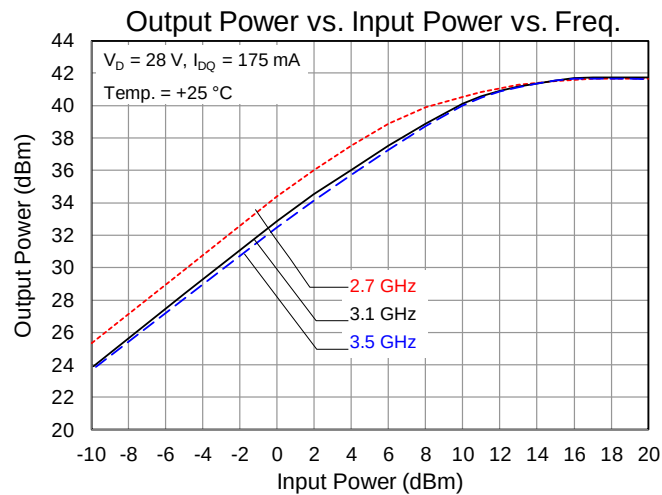
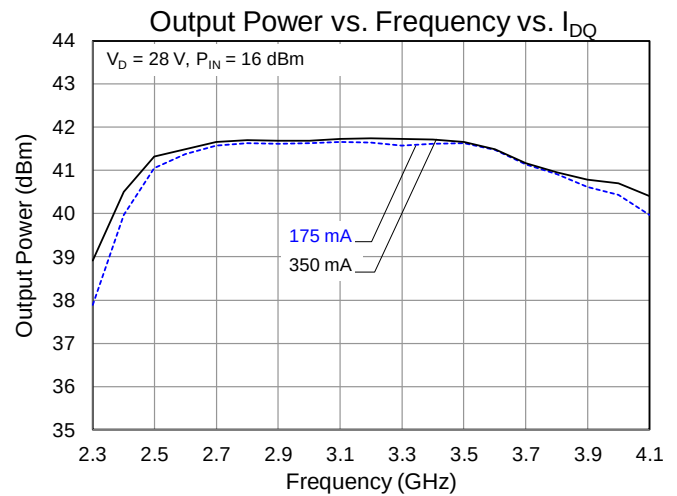
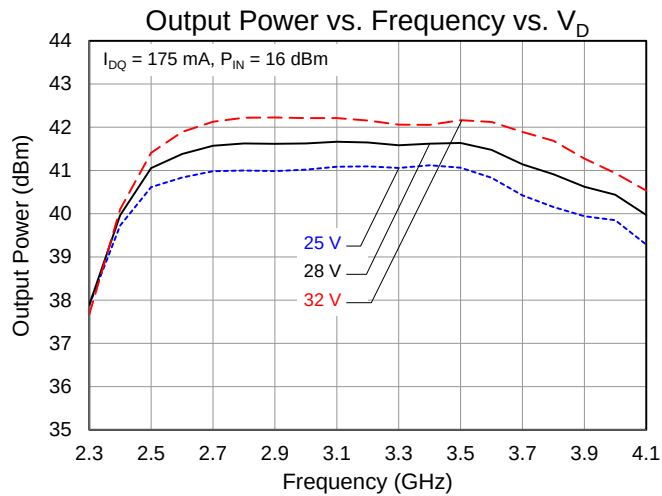
## Typical Performance: Small Signal

Condition: CW



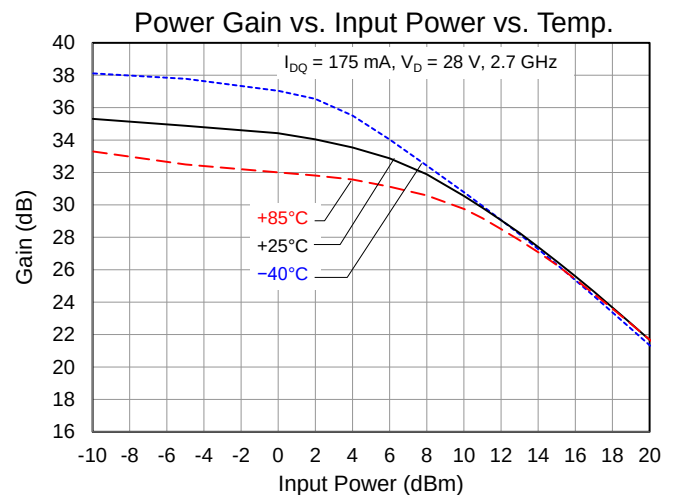
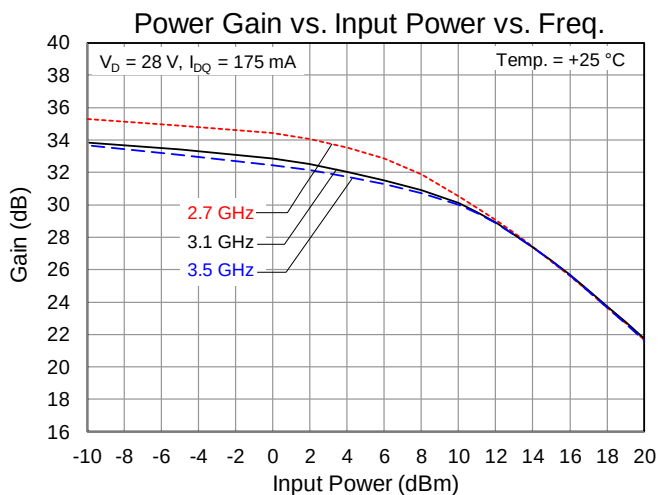
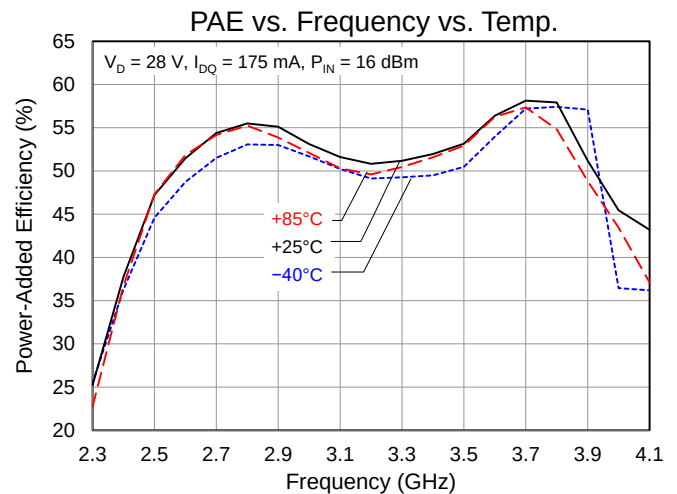
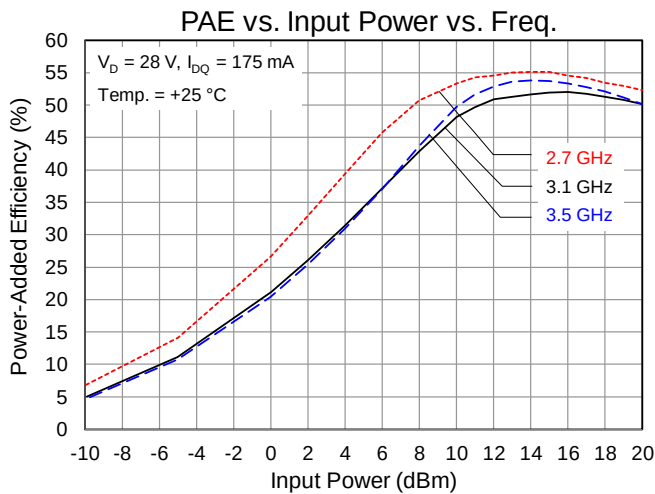
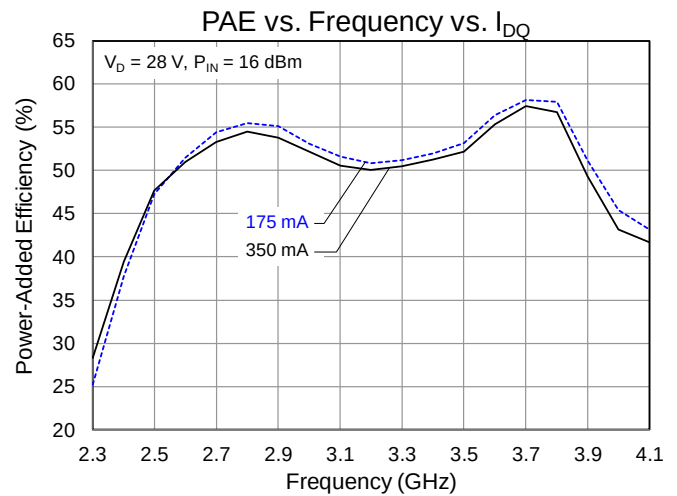
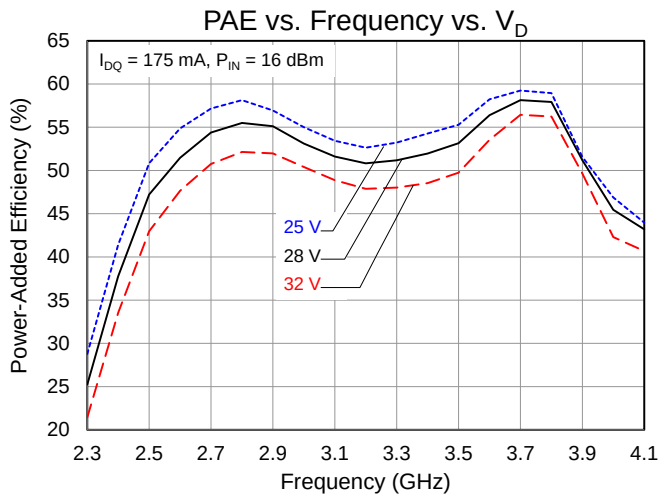
## Typical Performance: Large Signal

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



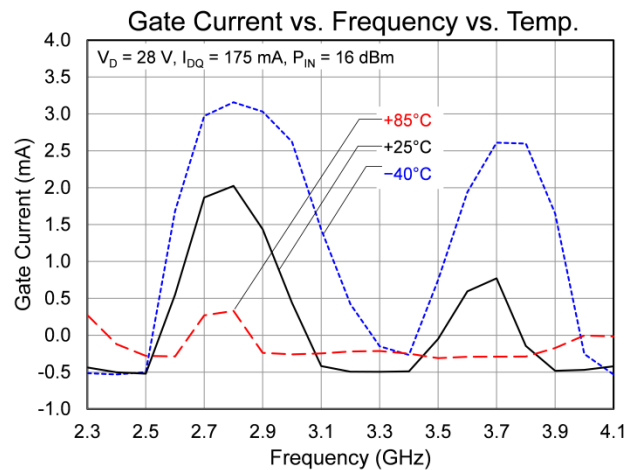
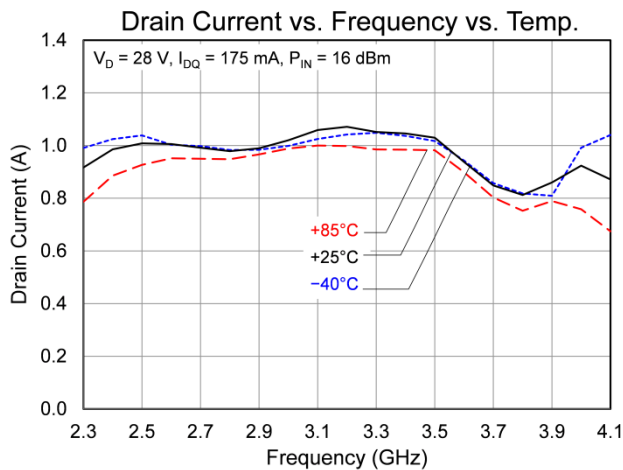
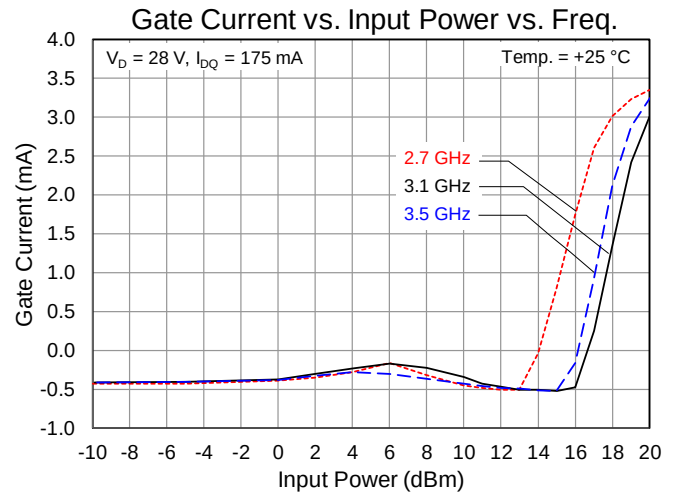
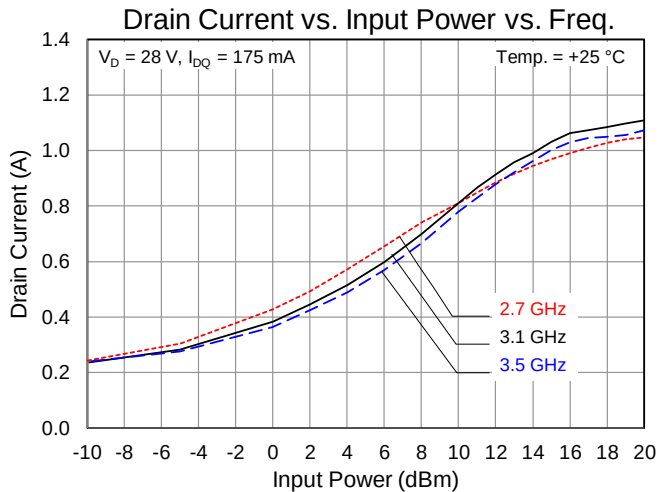
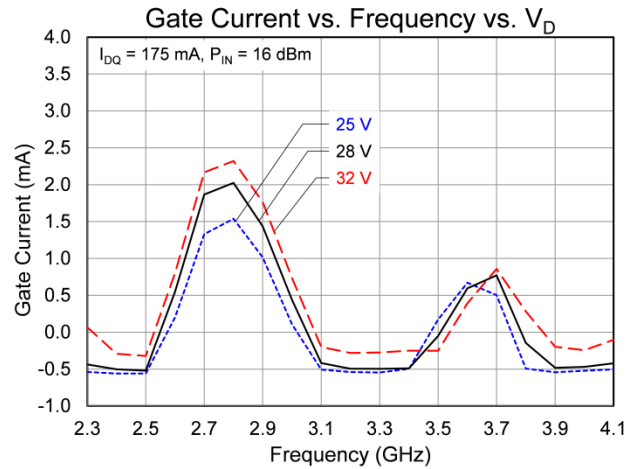
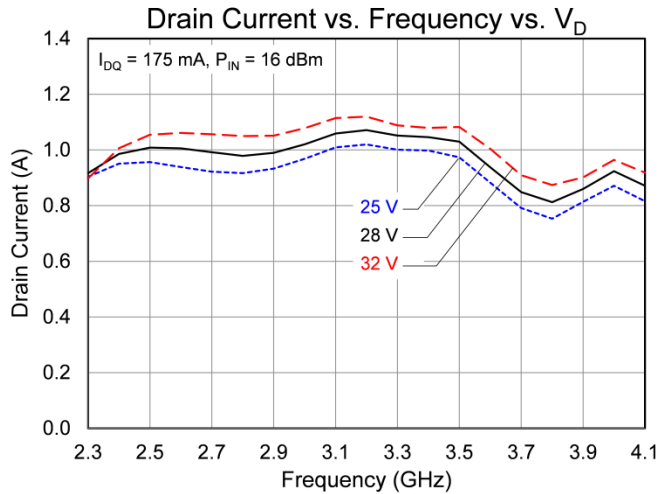
## Typical Performance: Large Signal

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



## Typical Performance: Large Signal

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



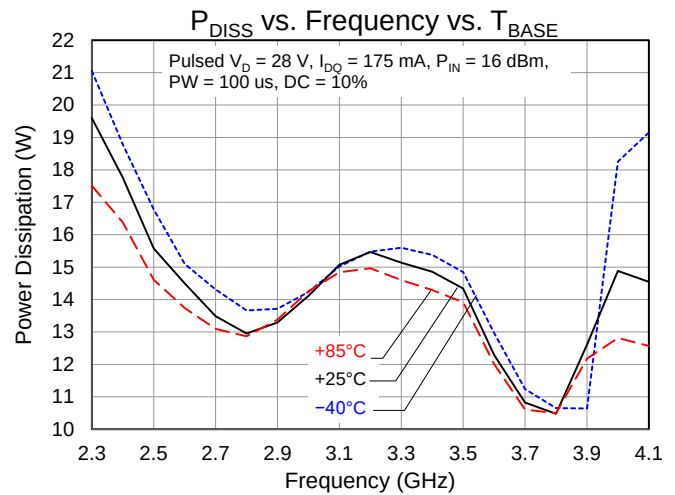
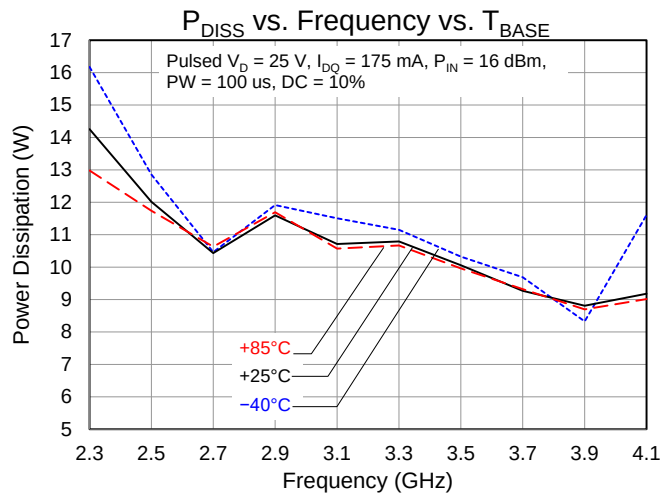
## Thermal and Reliability Information

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

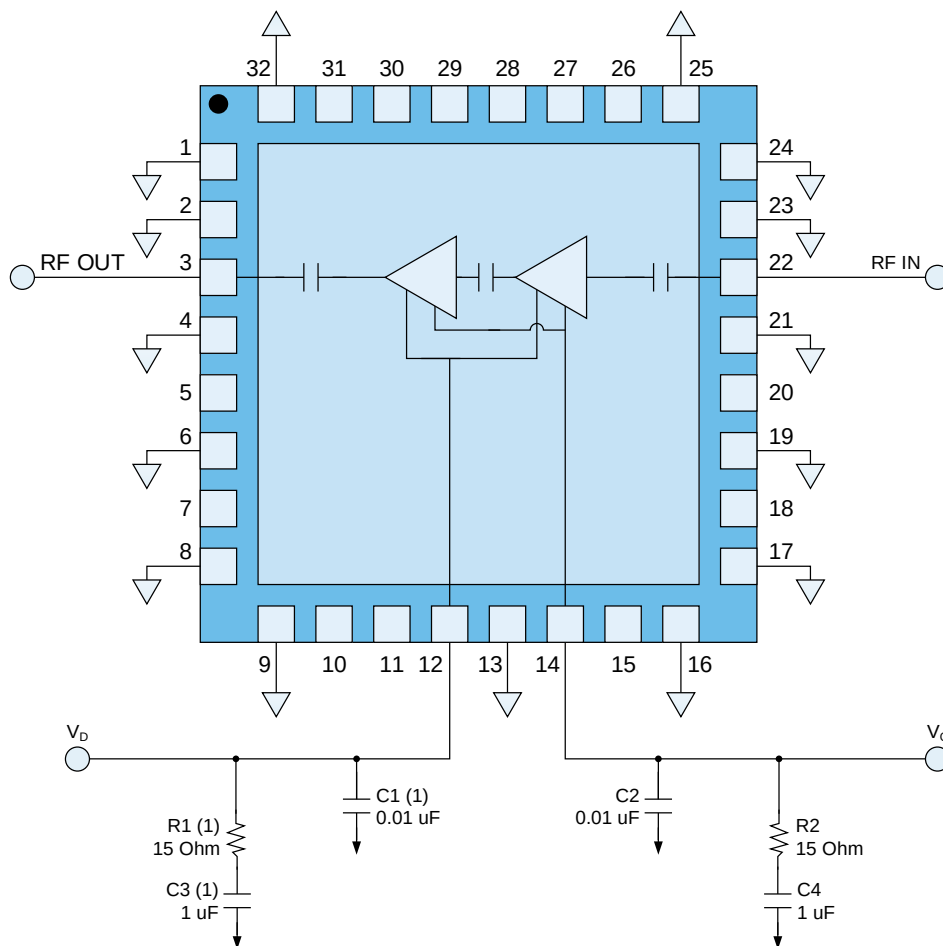
Notes:

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

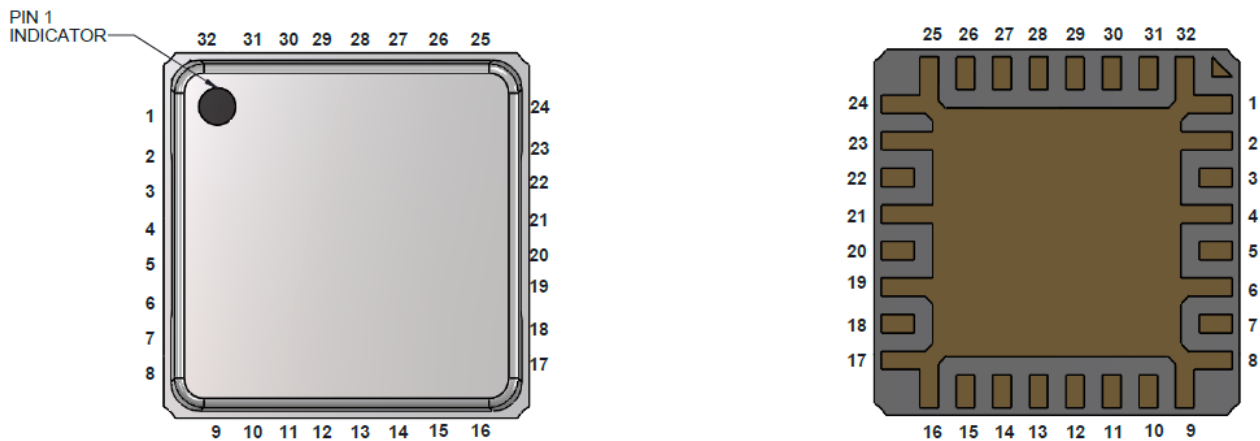
Set  $V_D$  to 0 V

Turn off  $V_D$  supply

Turn off  $V_G$  supply



Pin Layout

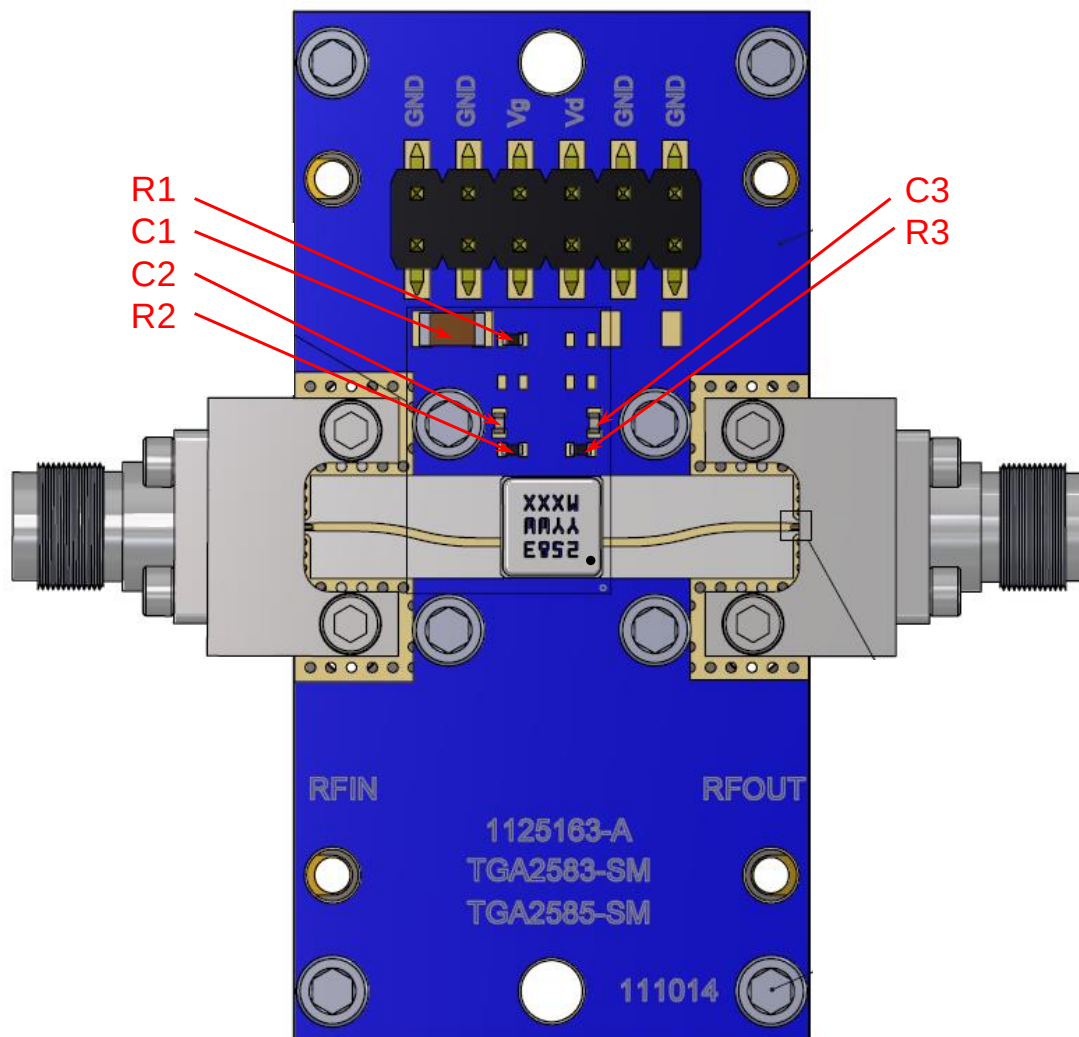


PIN ASSIGNMENT

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. |

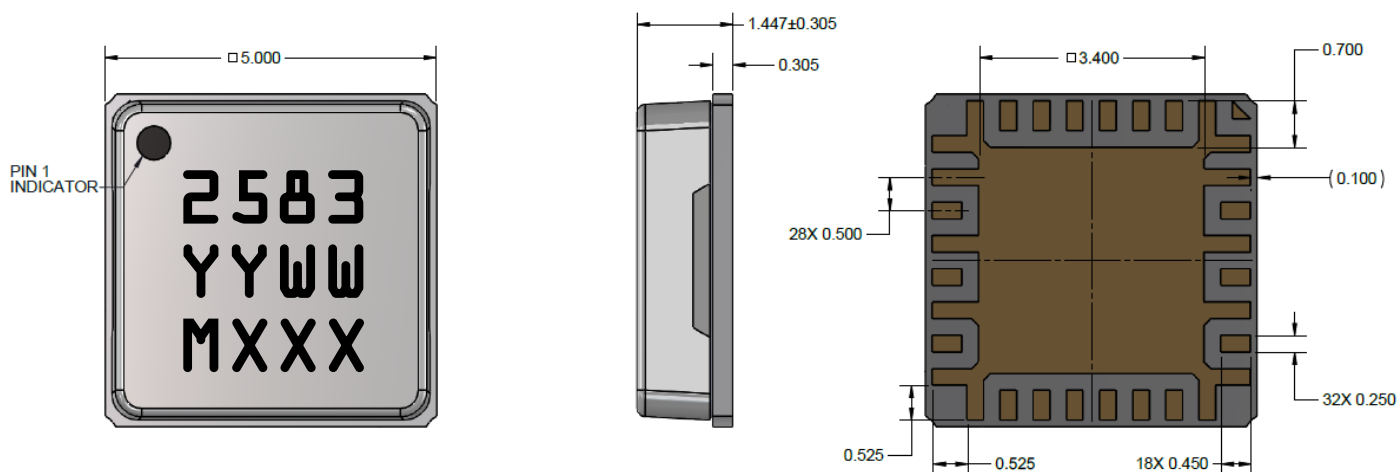
## Evaluation Board



## 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

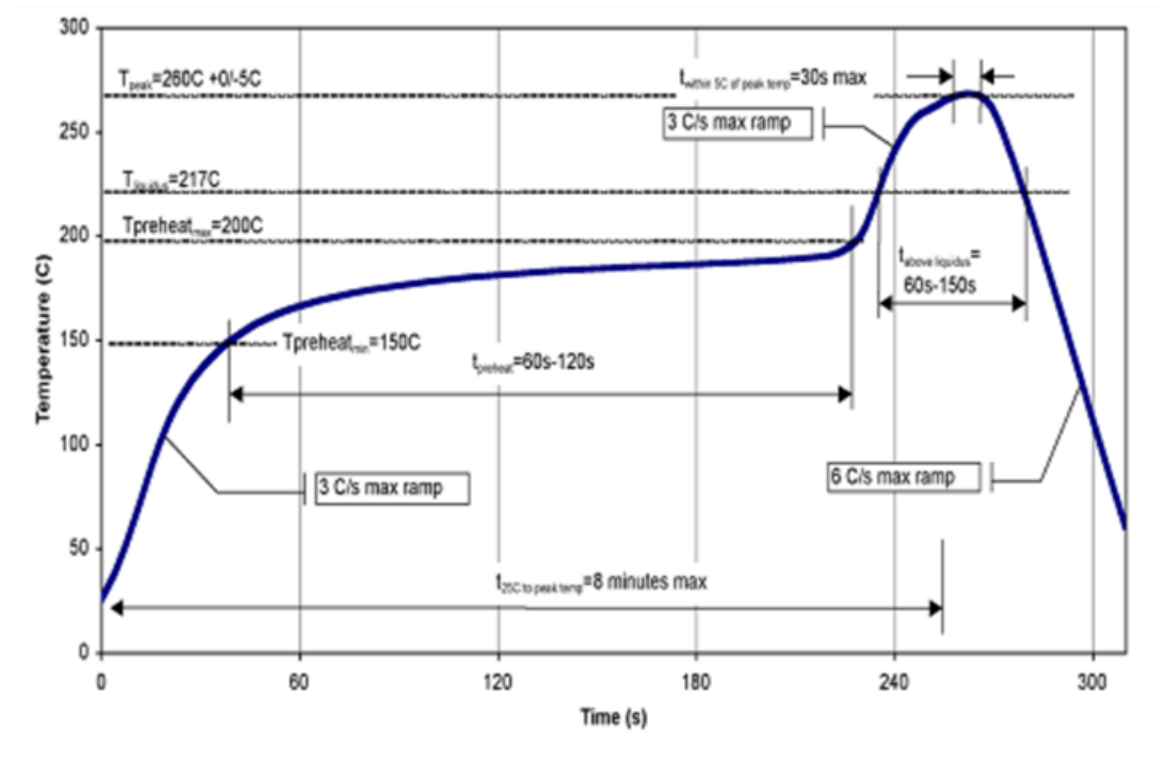
## Assembly Notes

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

## 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

## 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<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) Free
- PFOS Free
- SVHC Free

## Contact Information

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

**Web:** [www.qorvo.com](http://www.qorvo.com)

**Tel:** 1-844-890-8163

**Email:** [customer.support@qorvo.com](mailto:customer.support@qorvo.com)

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