



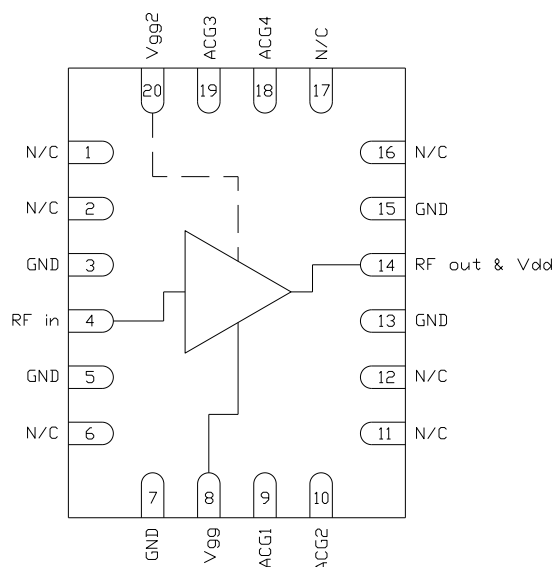
# CMD311P34

## DC-20 GHz Distributed Driver Amplifier

### Product Overview

The CMD311P34 is wideband GaAs MMIC distributed amplifier housed in a leadless 3x4 mm plastic surface mount package. The amplifier operates from DC to 20 GHz and delivers greater than 12 dB of gain with a corresponding output 1 dB compression point of +11 dBm and noise figure of 2.5 dB at 10 GHz. The CMD311P34 is a 50 ohm matched design which eliminates the need for RF port matching.

### Functional Block Diagram



Note:  $V_{gg2}$  is optional for gain control

### Key Features

- Wideband Performance
- Low Noise Figure
- High Linearity
- Low Current Consumption
- Pb-Free RoHS Compliant 3x4 QFN Package

### Ordering Information

| Part No.      | Description        |
|---------------|--------------------|
| CMD311P34     | 100 pcs on 7" reel |
| CMD311P34-EVB | Evaluation Board   |

### Electrical Performance ( $V_{dd} = 5.0$ V, $V_{gg} = 5.0$ V, $T_A = 25^\circ$ C, $F = 10$ GHz)

| Parameter          | Min | Typ     | Max | Units |
|--------------------|-----|---------|-----|-------|
| Frequency Range    |     | DC - 20 |     | GHz   |
| Gain               |     | 12      |     | dB    |
| Noise Figure       |     | 2.5     |     | dB    |
| Input Return Loss  |     | 20      |     | dB    |
| Output Return Loss |     | 20      |     | dB    |
| Output P1dB        |     | 11      |     | dBm   |
| Output IP3         |     | 22      |     | dBm   |
| Supply Current     |     | 40      |     | mA    |

## Absolute Maximum Ratings

| Parameter                     | Rating        |
|-------------------------------|---------------|
| Drain Voltage, $V_{dd}$       | 9.0           |
| Gate Voltage, $V_{gg}$        | 6.0           |
| RF Input Power                | +20 dBm       |
| Channel Temperature, $T_{ch}$ | 150° C        |
| Power Dissipation, $P_{diss}$ | 789 mW        |
| Thermal Resistance, $Q_{JC}$  | 82.4° C/W     |
| Operating Temperature         | -40 to 85° C  |
| Storage Temperature           | -55 to 150° C |

Exceeding any one or combination of the maximum ratings may cause permanent damage to the device.

## Recommended Operating Conditions

| Parameter | Min | Typ | Max | Units |
|-----------|-----|-----|-----|-------|
| $V_{dd}$  | 3.0 | 5.0 | 8.0 | V     |
| $I_{dd}$  |     | 40  |     | mA    |
| $V_{gg}$  |     | 5.0 |     | V     |
| $I_{gg}$  |     | 1.5 |     | mA    |

Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

## Drain Current vs. Drain Voltage

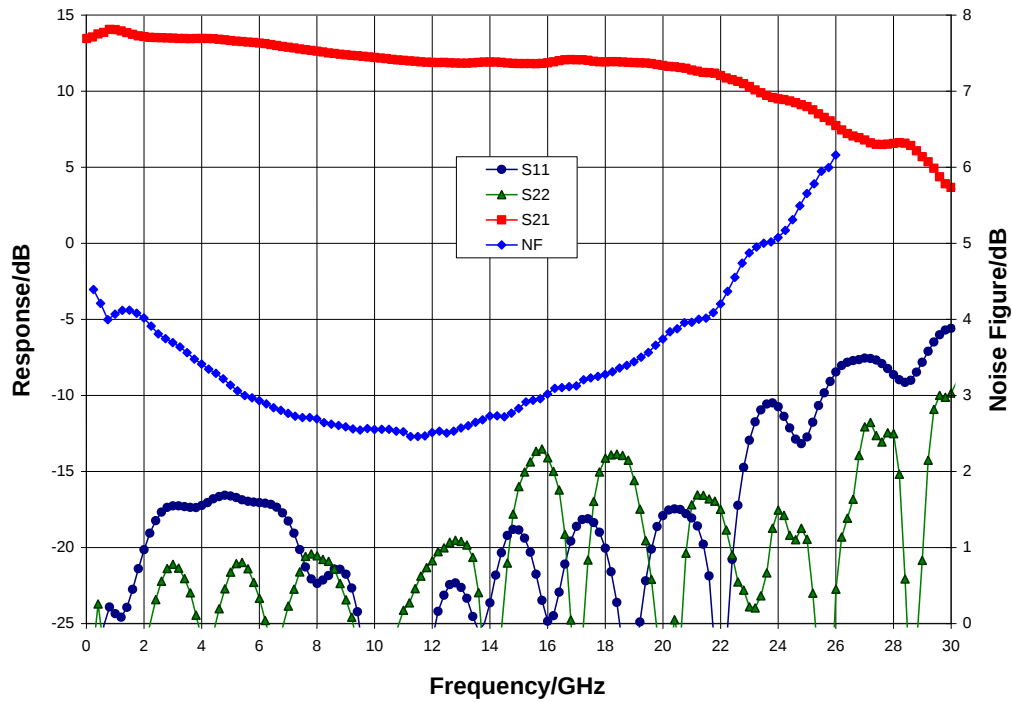
| $V_{dd}$ (V) | $I_{dd}$ (mA) |
|--------------|---------------|
| 3.0          | 19            |
| 4.0          | 29            |
| 5.0          | 40            |

## Electrical Specifications ( $V_{dd} = 5.0$ V, $V_{gg} = 5.0$ V, $T_A = 25^\circ$ C)

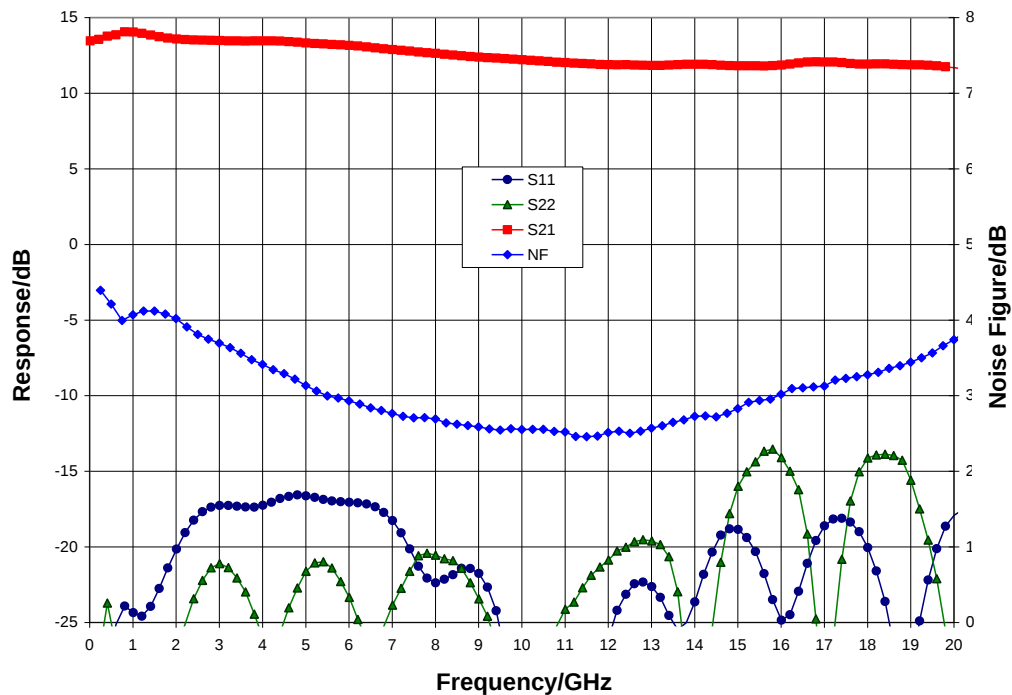
| Parameter                            | Min     | Typ   | Max | Min     | Typ   | Max | Units |
|--------------------------------------|---------|-------|-----|---------|-------|-----|-------|
| Frequency Range                      | DC - 10 |       |     | 10 - 20 |       |     | GHz   |
| Gain                                 | 9.5     | 13    |     | 9       | 12    |     | dB    |
| Noise Figure                         |         | 3     |     |         | 3     |     | dB    |
| Input Return Loss                    |         | 17    |     |         | 18    |     | dB    |
| Output Return Loss                   |         | 22    |     |         | 15    |     | dB    |
| Output P1dB                          | 8       | 11    |     | 7       | 10    |     | dBm   |
| Output IP3                           |         | 22    |     |         | 20    |     | dBm   |
| Supply Current                       | 28      | 40    | 52  | 28      | 40    | 52  | mA    |
| Gain Temperature Coefficient         |         | 0.013 |     |         | 0.02  |     | dB/°C |
| Noise Figure Temperature Coefficient |         | 0.01  |     |         | 0.015 |     | dB/°C |

## Typical Performance

Broadband Performance,  $V_{dd} = 5.0$  V,  $V_{gg} = 5.0$  V,  $T_A = 25^\circ$  C

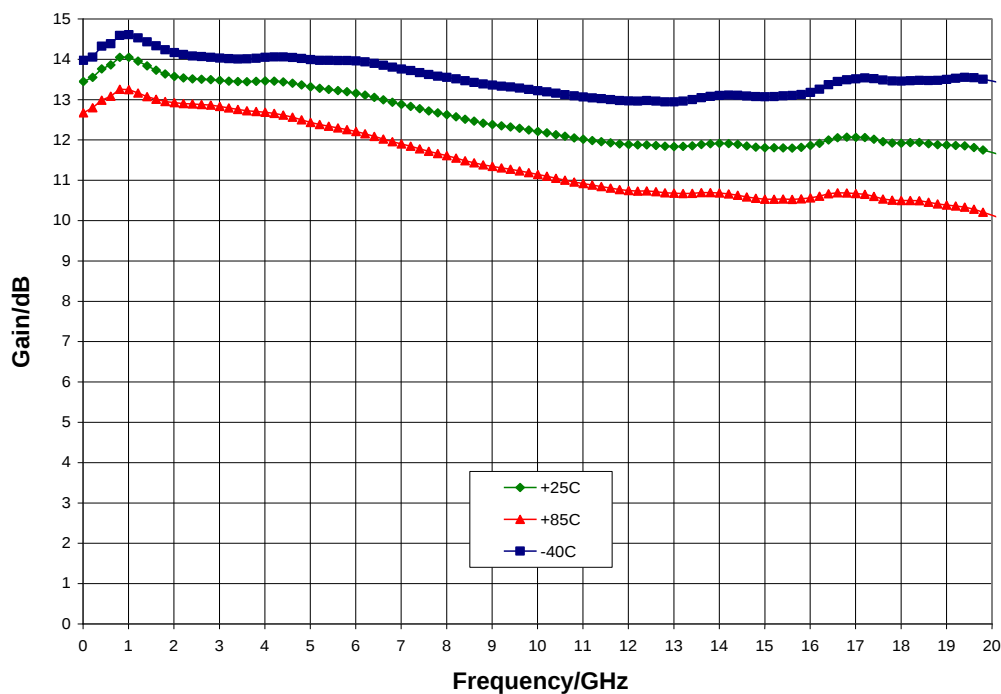


Narrow-band Performance,  $V_{dd} = 5.0$  V,  $V_{gg} = 5.0$  V,  $T_A = 25^\circ$  C

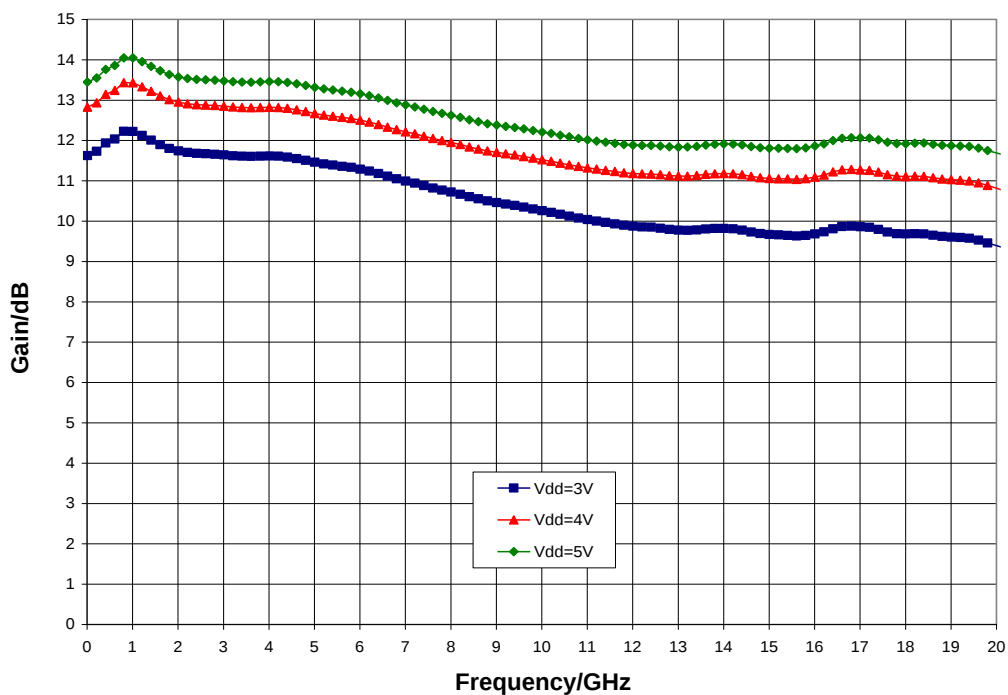


## Typical Performance

Gain vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 5.0\text{ V}$

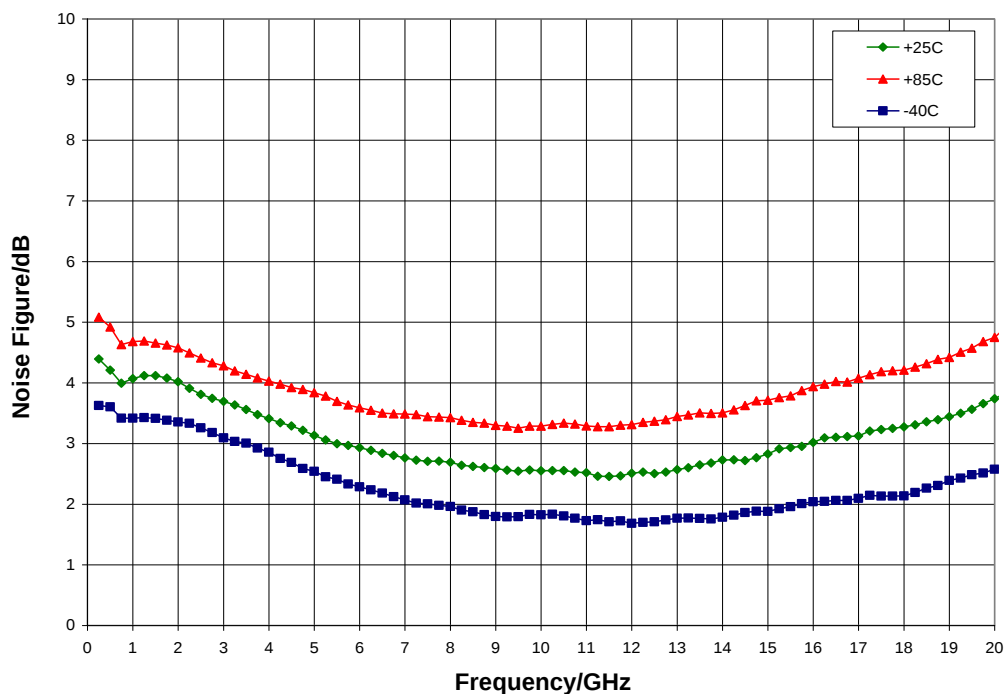


Gain vs.  $V_{dd}$ ,  $V_{gg} = V_{dd}$ ,  $T_A = 25^\circ\text{C}$

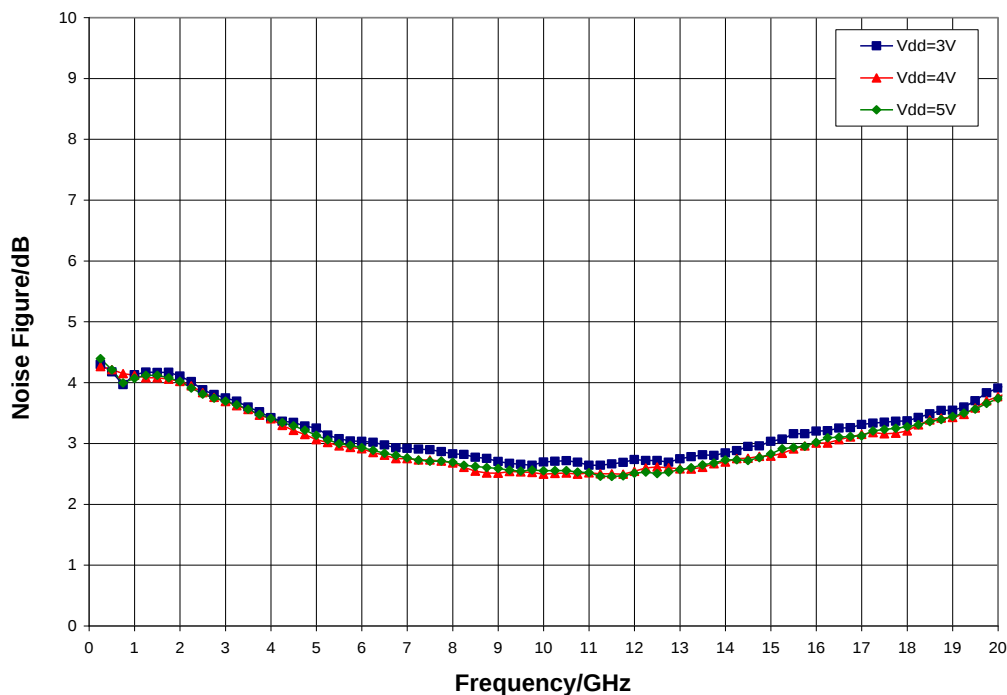


## Typical Performance

Noise Figure vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 5.0\text{ V}$

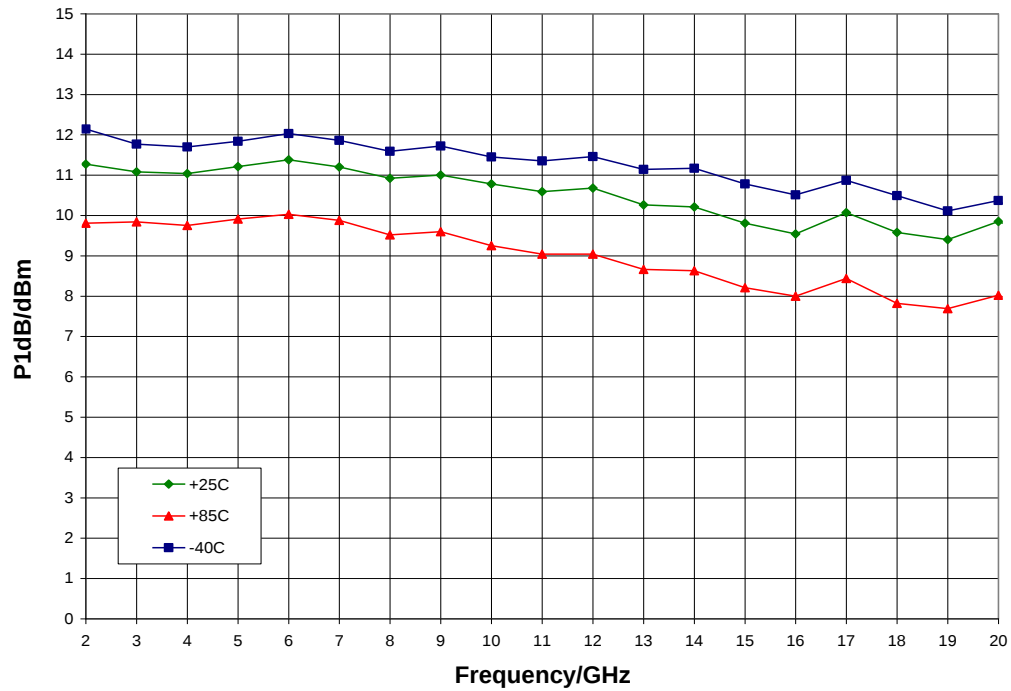


Noise Figure vs.  $V_{dd}$ ,  $V_{gg} = V_{dd}$ ,  $T_A = 25^\circ\text{C}$

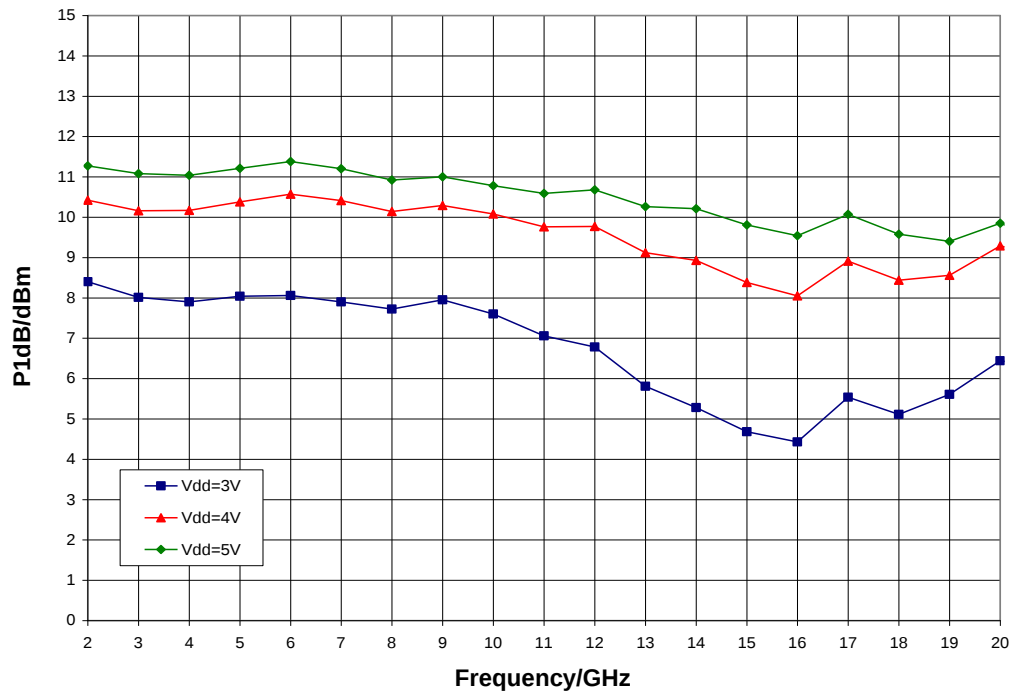


## Typical Performance

P1dB vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 5.0\text{ V}$

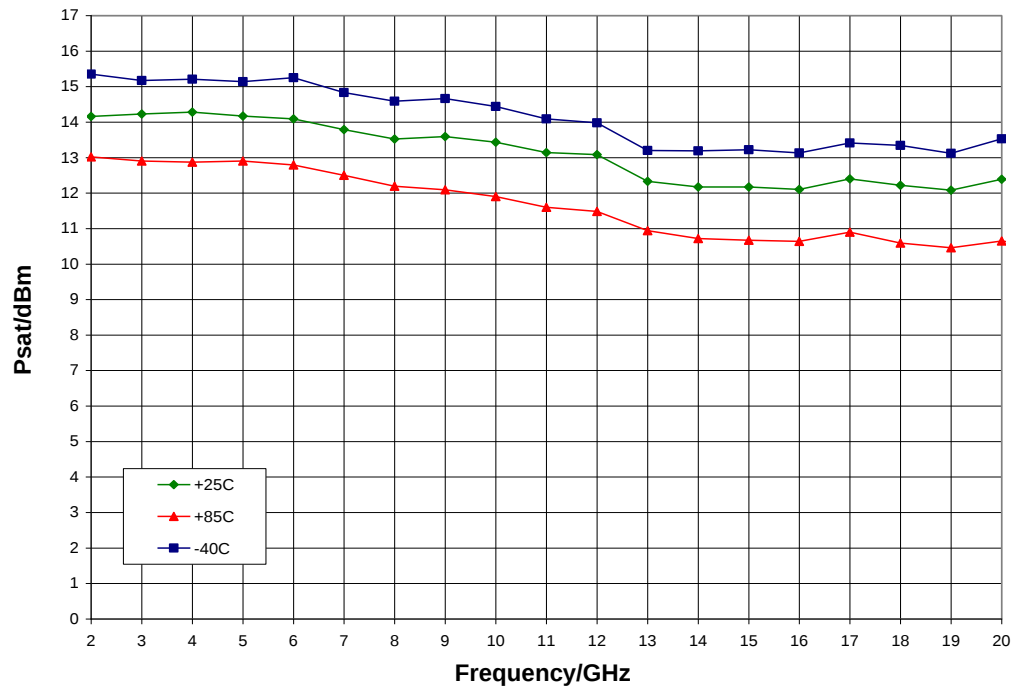


P1dB vs.  $V_{dd}$ ,  $V_{gg} = V_{dd}$ ,  $T_A = 25^\circ\text{C}$

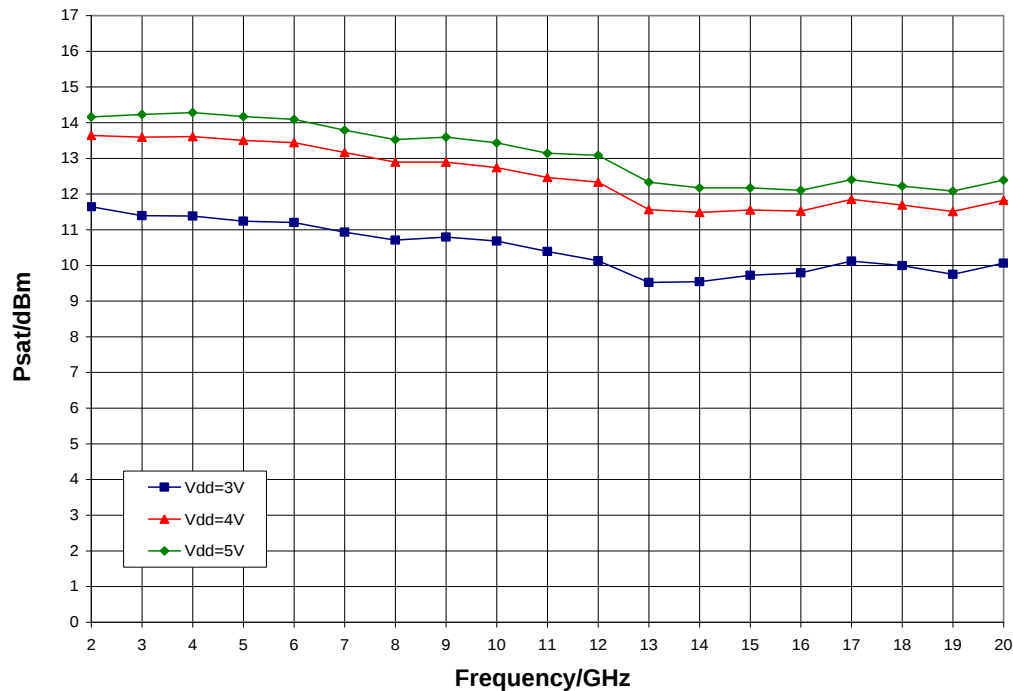


## Typical Performance

Psat vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 5.0\text{ V}$

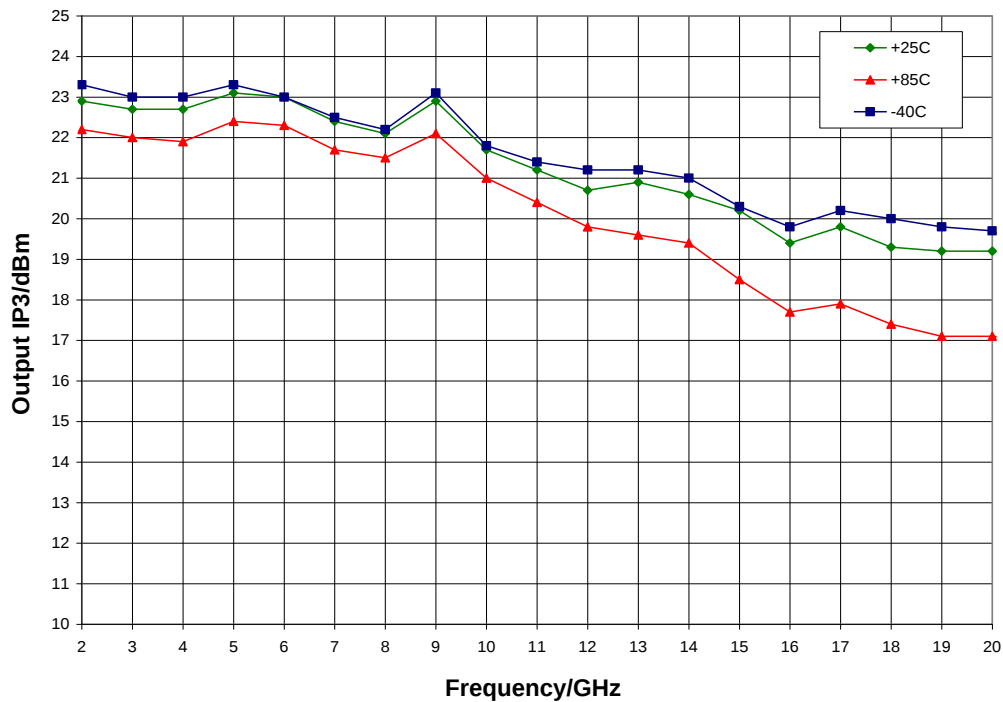


Psat vs.  $V_{dd}$ ,  $V_{gg} = V_{dd}$ ,  $T_A = 25^\circ\text{C}$

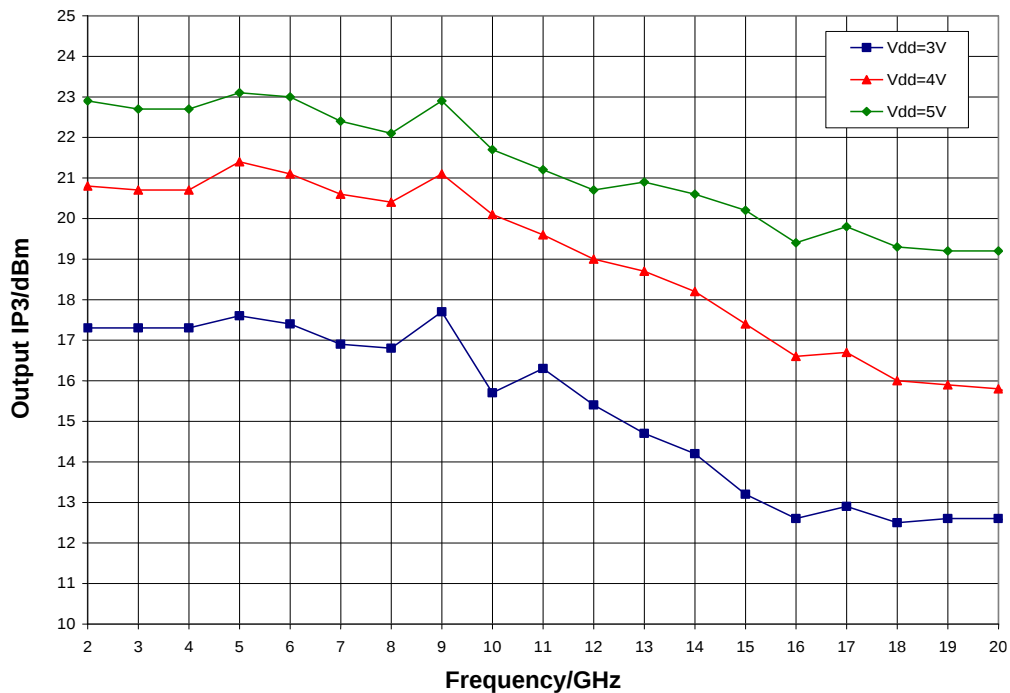


## Typical Performance

Output IP3 vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 5.0\text{ V}$

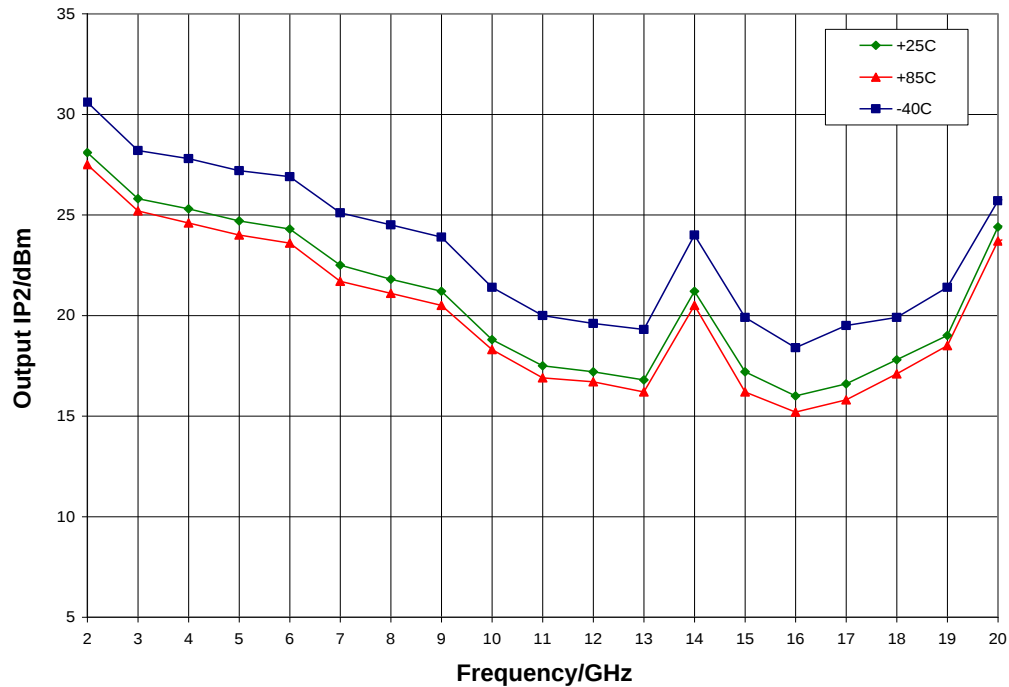


Output IP3 vs.  $V_{dd}$ ,  $V_{gg} = V_{dd}$ ,  $T_A = 25^\circ\text{C}$

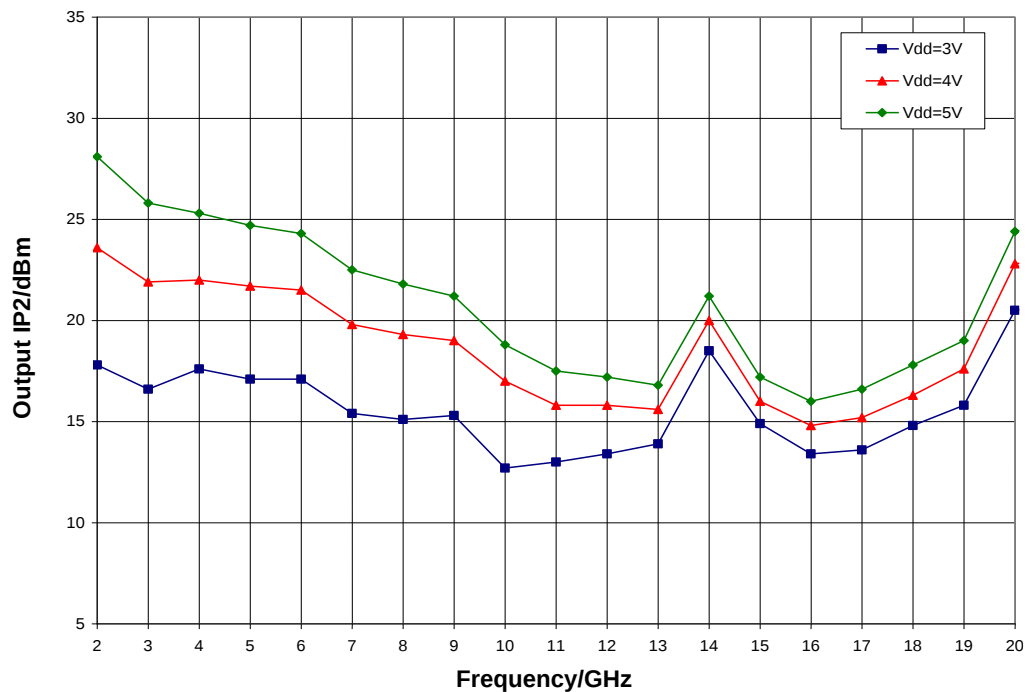


## Typical Performance

Output IP2 vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 5.0\text{ V}$

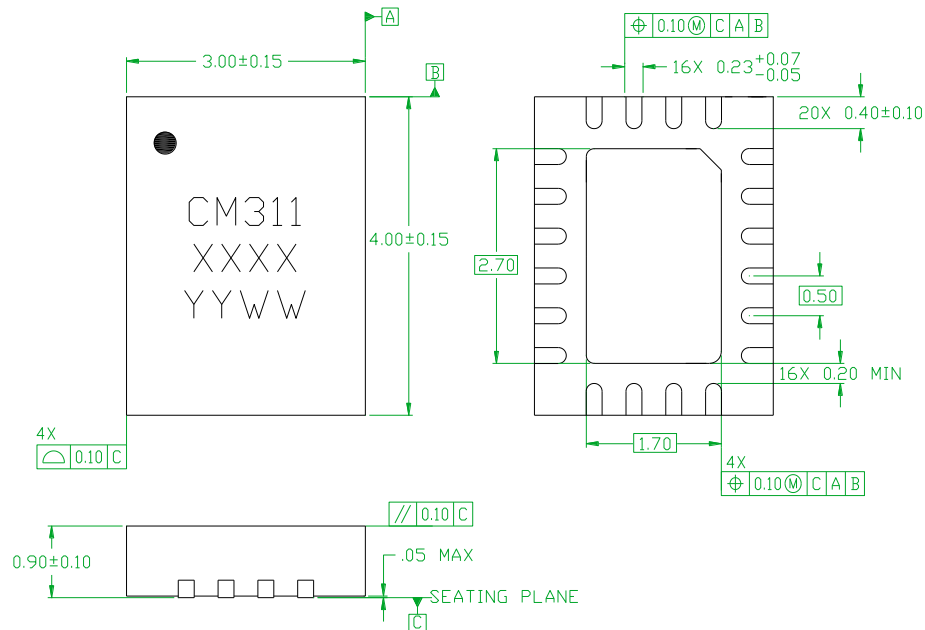


Output IP2 vs.  $V_{dd}$ ,  $V_{gg} = V_{dd}$ ,  $T_A = 25^\circ\text{C}$



## Mechanical Information

### Package Information and Dimensions



#### Notes:

1. Dimensions are in millimeters
2. RoHS compliant mold compound
3. Lead frame material: Copper alloy
4. Lead finish: 100% matte Sn
5. Indicated dimension/tolerance applies to leads and exposed pad

### Recommended PCB Land Pattern

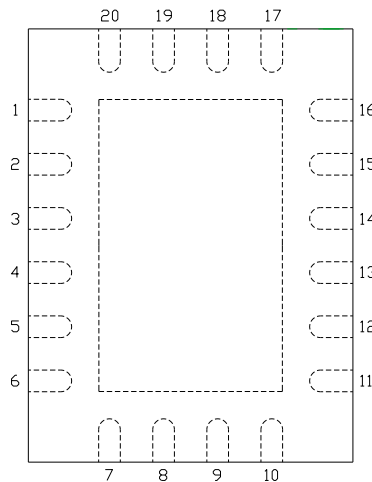
Qorvo recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Qorvo Application Note AN 105 for a recommended land pattern approach.

### Recommended Solder Reflow Profile

Qorvo recommends screen printing with belt furnace reflow to ensure proper solder reflow and device attach. Please review Qorvo Application Note AN 102 for a recommended solder reflow profile.

### Pin Description

#### Pin Diagram

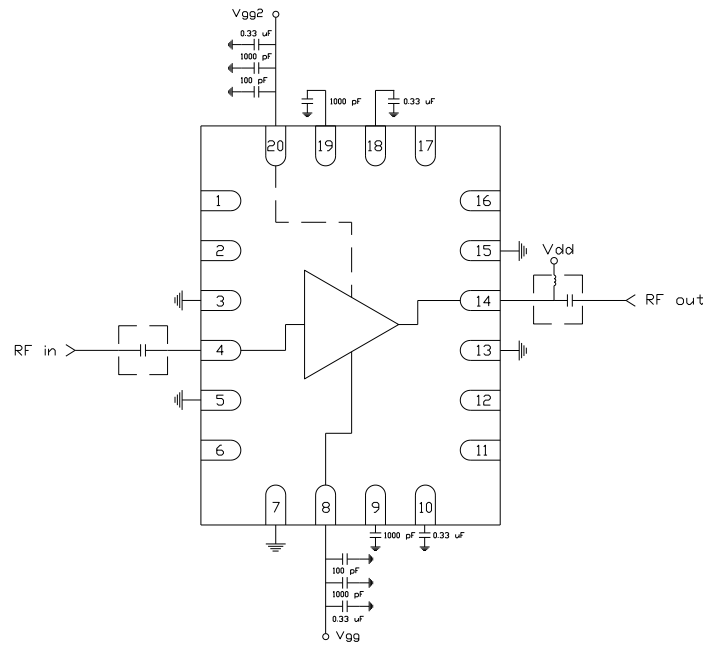


#### Functional Description

| Pad                         | Function                 | Description                                                                                                        | Schematic |
|-----------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------|-----------|
| 1, 2, 6, 11, 12, 16, 17     | N/C                      | No connection required<br>These pins may be connected to RF / DC ground                                            |           |
| 4                           | RF in                    | 50 ohm matched input                                                                                               |           |
| 7                           | Ground                   | This pin must be connected to RF / DC ground for nominal operation                                                 |           |
| 8                           | V <sub>gg</sub>          | Power supply voltage<br>Decoupling and bypass caps required                                                        |           |
| 9, 19                       | ACG1, 3                  | Low frequency termination<br>Attach bypass capacitor per application circuit                                       |           |
| 10, 18                      | ACG2, 4                  | Low frequency termination<br>Attach bypass capacitor per application circuit                                       |           |
| 14                          | RF out & V <sub>dd</sub> | Supply voltage and 50 ohm matched output                                                                           |           |
| 20                          | V <sub>gg2</sub>         | Optional supply voltage for gain control<br>Decoupling and bypass caps required<br>Pin must be left open if unused |           |
| 3, 5, 13, 15 and die paddle | Ground                   | Connect to RF / DC ground                                                                                          |           |

## Applications Information

### Application Circuit



Note: Drain voltage ( $V_{dd}$ ) must be applied through a broadband bias tee or external bias network. External DC block is required on RF input.

### Biasing and Operation

The CMD311P34 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain voltage is set to +5.0 V. The recommended gate voltage is +5.0 V.

Turn ON procedure:

1. Apply drain voltage  $V_{dd}$  and set to +5 V
2. Apply gate voltage  $V_{gg}$  and set to +5 V

Turn OFF procedure:

1. Turn off gate voltage  $V_{gg}$
2. Turn off drain voltage  $V_{dd}$

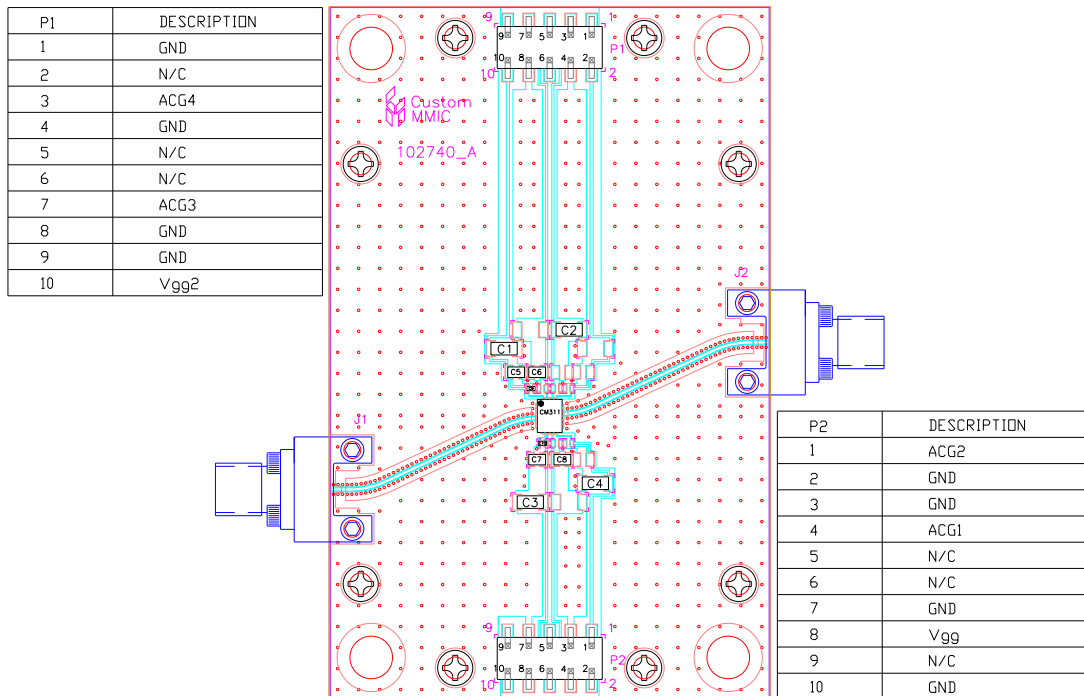
RF power can be applied at any time.

**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

## Applications Information

### Evaluation Board

The circuit board shown has been developed for optimized assembly at Qorvo. A sufficient number of via holes should be used to connect the top and bottom ground planes. As surface mount processes vary, careful process development is recommended.



### Bill of Material

| Designator | Value        | Description                |
|------------|--------------|----------------------------|
| J1, J2     |              | SMA End Launch Connector   |
| P1, P2     |              | 10 Pin DC Header           |
| C1 - C4    | 0.33 $\mu$ F | Capacitor, Tantalum        |
| C5 - C8    | 1000 pF      | Capacitor, 0603            |
| C9, C10    | 100 pF       | Capacitor, 0402            |
| U1         |              | CMD311P34 Driver Amplifier |
| PCB        |              | 102740 Evaluation PCB      |

## Handling Precautions

| Parameter                        | Rating   | Standard                 |
|----------------------------------|----------|--------------------------|
| ESD – Human Body Model (HBM)     | Class 1A | ESDA / JEDEC JS-001-2012 |
| MSL – Moisture Sensitivity Level | Level 1  | 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
- Antimony Free
- TBBP-A (C<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) Free
- SVHC Free
- PFOS Free
- Halogen Free



## Contact Information

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

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

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

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