# THE DATASHEET OF

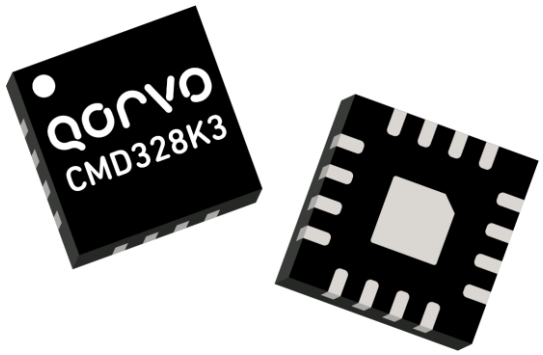
# CMD328K3

# CMD328K3

## 6-18 GHz Low Noise Amplifier

## Product Overview

The CMD328K3 is a broadband MMIC low noise amplifier housed in a leadless 3x3 mm plastic surface mount air cavity package. The CMD328K3 is ideally suited for EW and communications systems where small size and low power consumption are needed. The broadband device delivers greater than 27 dB of gain with a corresponding output 1 dB compression point of +12 dBm and a noise figure of 1.4 dB. The CMD328K3 is a 50 ohm matched design thereby eliminating the need for external DC blocks and RF port matching. The CMD328K3 amplifier is the perfect alternative to costly hybrid amplifiers.

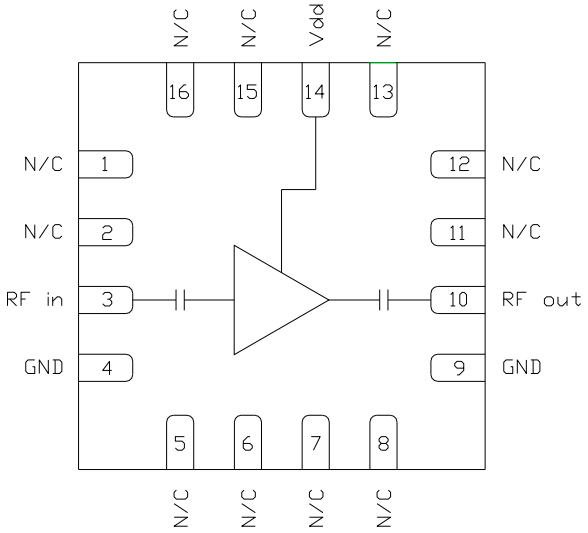



## Key Features

- Ultra low noise figure
- High gain broadband performance
- Single supply voltage: +3.0V @ 52 mA
- Compact 3x3 QFN package

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

## Functional Block Diagram




## Applications

- EW systems
- Communication systems
- Low noise receiver systems

## Ordering Information

| Part No. | Description |
|---|---|
| CMD328K3 | Tape & Reel, 7” Reel, Qty: 500 |
| CMD328K3-EVB | CMD328K3 EVB, Qty:1 |

## Absolute Maximum Ratings

| Parameter | Min | Max | Units |
|---|---|---|---|
| Drain Voltage, Vdd | - | 5 | V |
| RF Input Power | - | 20 | dBm |
| Channel Temperate, Tch | - | 150 | °C |
| Power Dissipation, Pdiss | - | 409 | mW |
| Storage Temperature | -55 | 150 | °C |

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

## Thermal and Reliability Information

| Parameter | Test Conditions | Value | Units |
|---|---|---|---|
| Thermal Resistance ($\theta_{JC}$) (1) | $T_{BASE}$ = 85 °C<br>Quiescent bias, small signal operations, CW<br>$P_{DISS}$ = 0.156 W | 158.8 | ºC/W |
| Channel Temperature ($T_{CH}$) (1) | | 110 | °C |
| Median Lifetime ($T_M$) | | 3.87E7 | Hrs |

Notes:
1. Thermal resistance referenced to the back of the package.

## Recommended Operating Conditions

| Parameter | Min | Typ. | Max | Units |
|---|---|---|---|---|
| Vdd | 2 | 3 | 4 | V |
| Idd | | 52 | | mA |
| Temperature Range | -55 | +25 | +85 | °C |

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

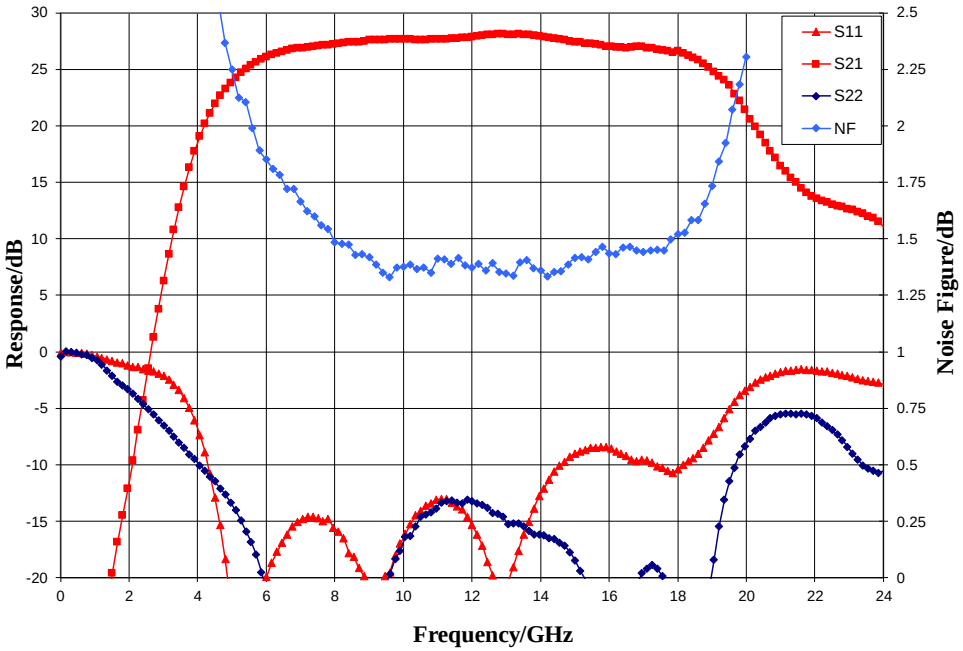
## Electrical Specifications

Test conditions unless otherwise noted: Vdd = 3V, $T_A$ = 25 °C
Data de-embedded of fixture losses

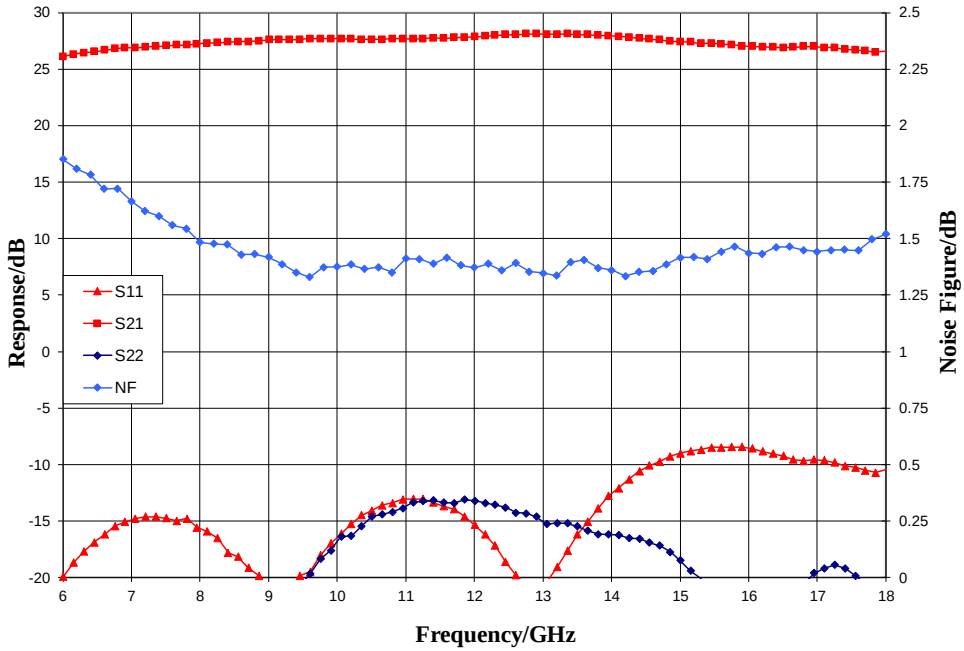
| Parameter | Min | Typ. | Max | Units |
|---|---|---|---|---|
| RF Operational Frequency Range | 6 | – | 18 | GHz |
| Gain | 23 | 26 | – | dB |
| Noise Figure | – | 1.8 | 2.3 | dB |
| Input Return Loss | – | 15 | – | dB |
| Output Return Loss | – | 20 | – | dB |
| Output Power ($P_{1dB}$) | | 12 | – | dBm |
| Output IP3 | | 24 | | dBm |
| Supply Current | 30 | 52 | 75 | mA |
| Gain Temperature Coefficient | | -0.025 | | dB/°C |
| Noise Figure Temperature Coefficient | | 0.008 | | dB/°C |

## Typical Performance – Vdd = 3 V, $T_A$ = 25 °C

Broad Band Performance

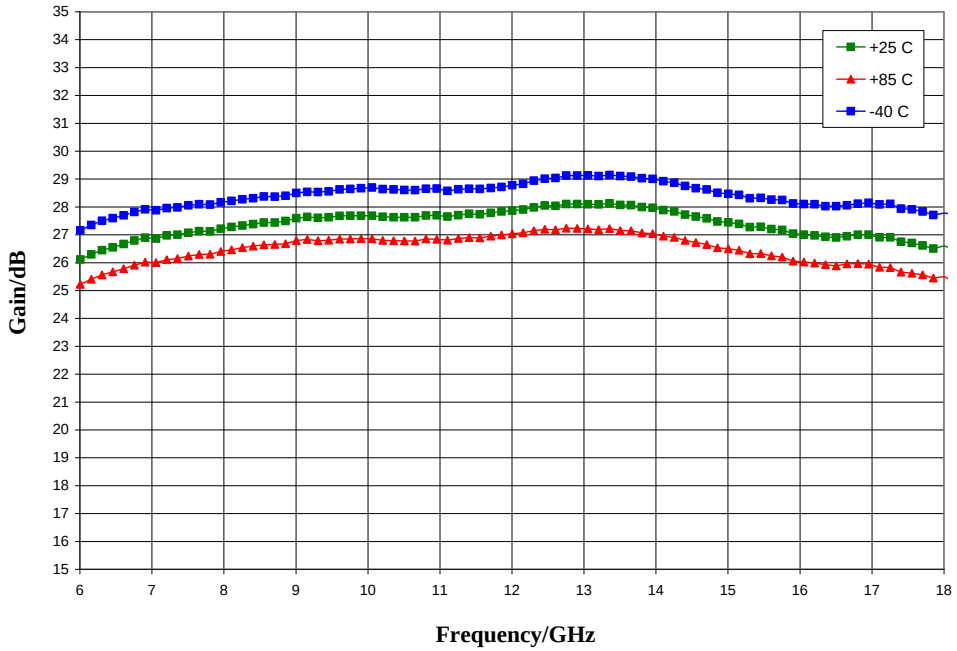



Narrow Band Performance

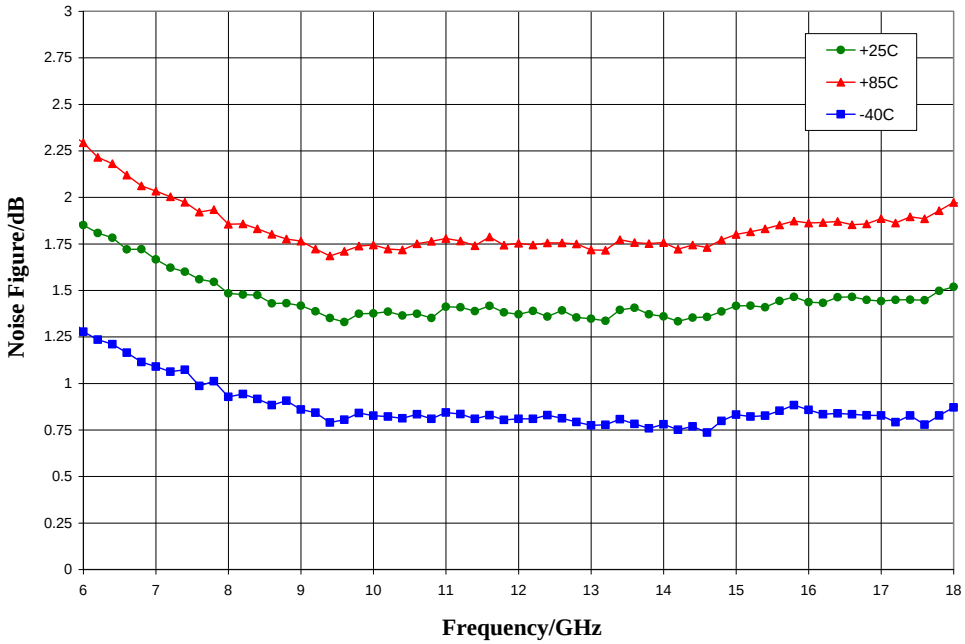


## Typical Performance – Vdd = 3 V

Gain vs Temperature

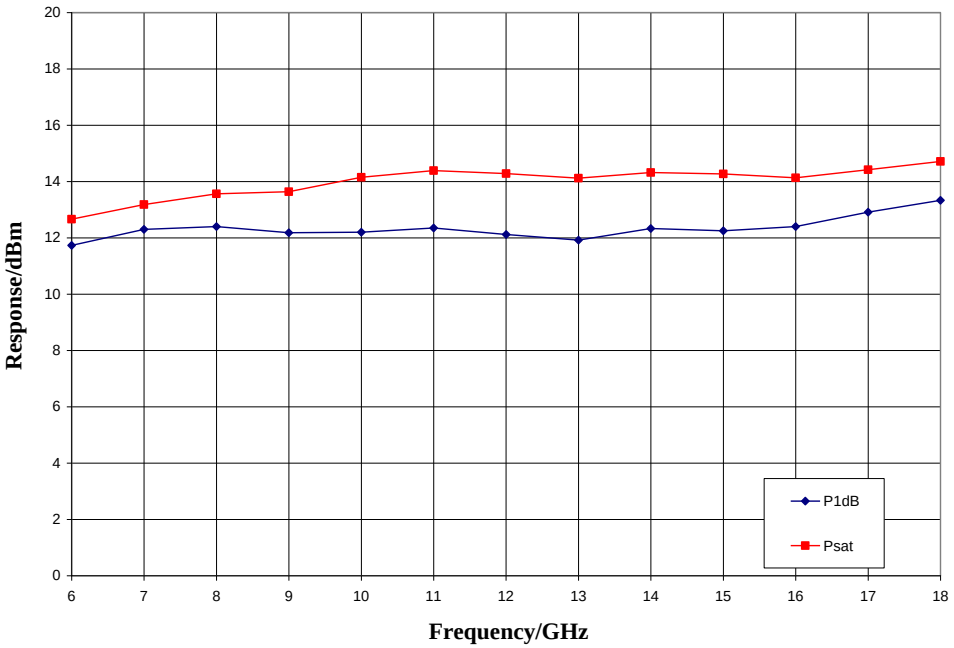



NF vs Temperature

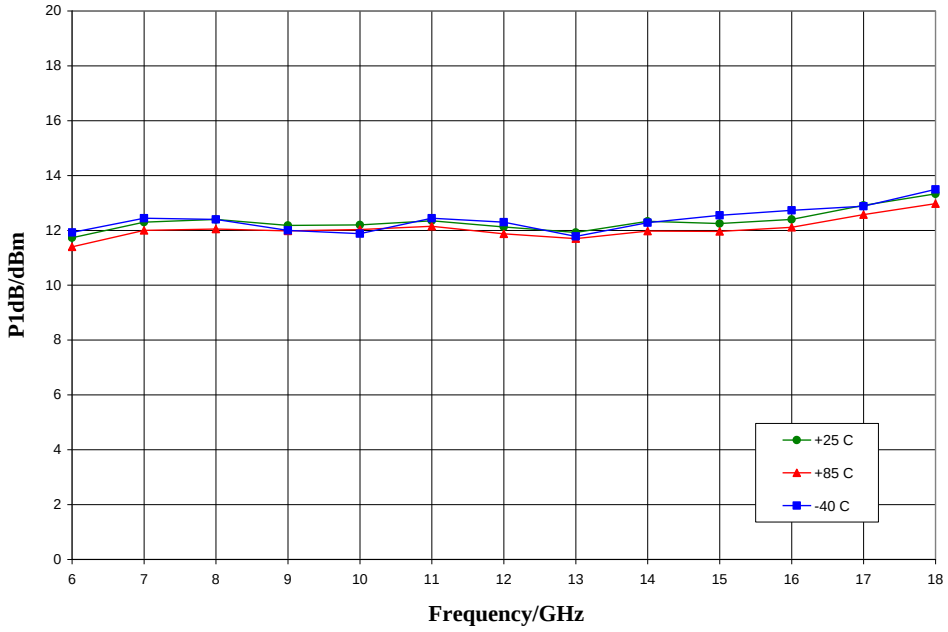


## Typical Performance – Vdd = 3 V

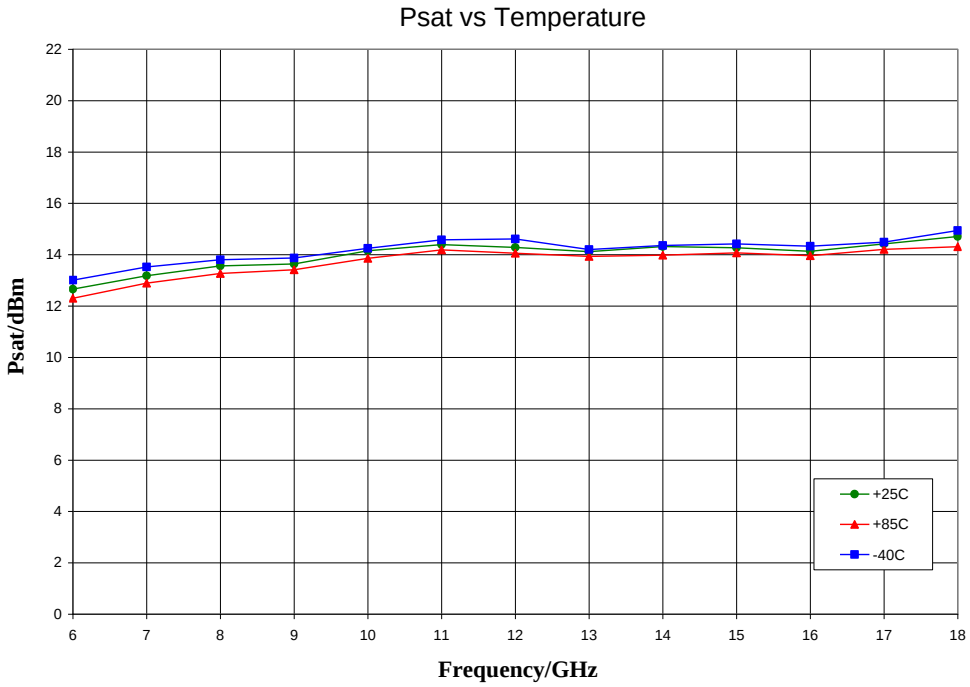
Power Performance

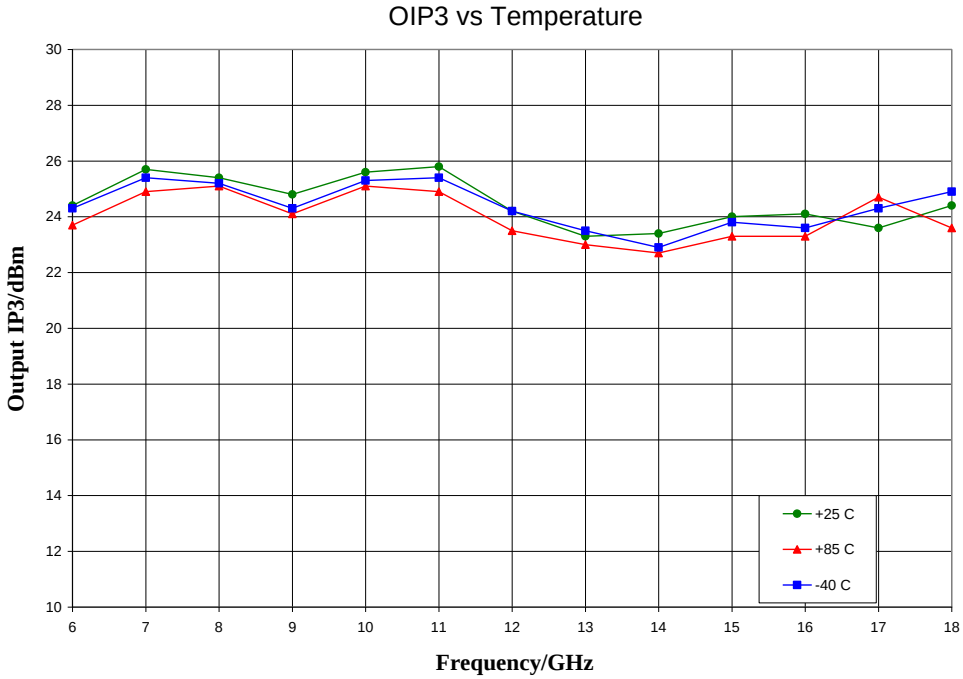



P1dB vs Temperature

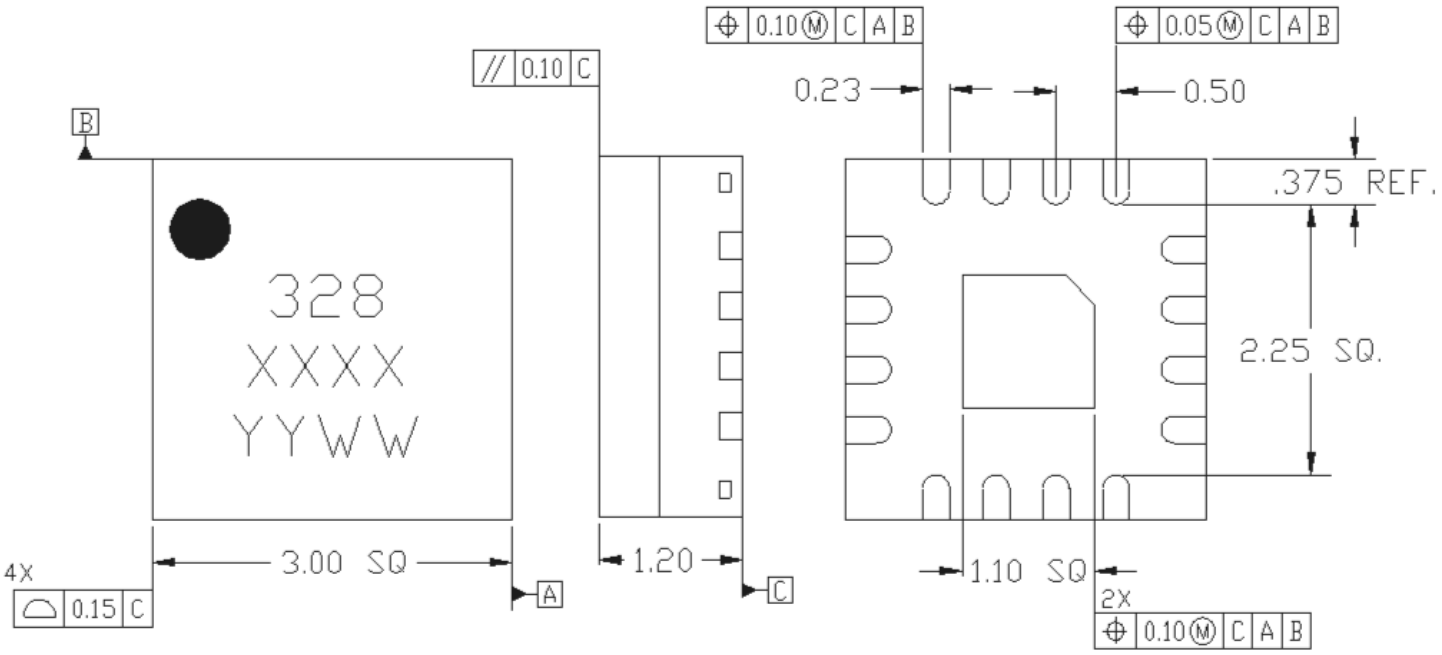


## Typical Performance – Vdd = 3 V



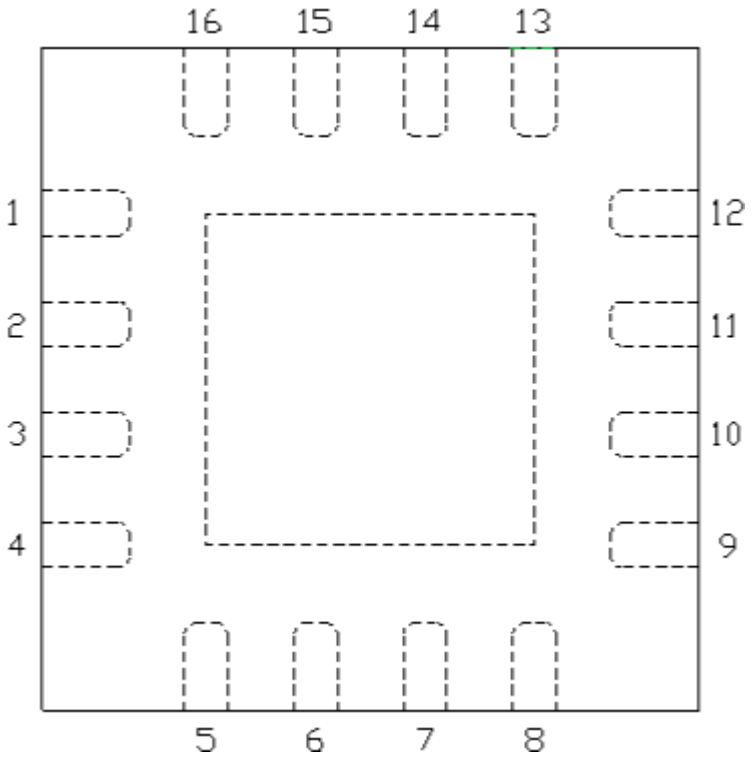
## Mechanical Information



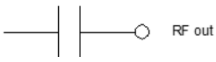
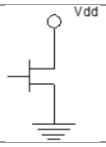

NOTES:
1. ALL DIMENSION SHOWN AS mm. CONTROLLING DIMENSION ARE IN mm.
2. MATERIAL: COPPER ALLOY LEAD FRAME
3. LEAD FINISH: ELECTROLESS NICKEL ELECTROLESS PALLADIUM IMMERSION GOLD (ENEPIG) PLATING.
4. MARKING:
   LINE 1: PART NUMBER AS INDICATED
   LINE 2: LOT NUMBER
   LINE 3: DATE CODE SHALL CONSIST OF THE LAST 2 DIGITS OF THE YEAR OF MANUFACTURE FOLLOWED BY A 2-DIGIT WEEK CODE.
5. ALTERNATE PIN #1 IDENTIFIER WITH CORNER CHAMFER ON GROUND PADDLE IS ACCEPTABLE.

**Notes:**
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 refer to Qorvo Application Note AN 105 for a recommended land pattern approach.

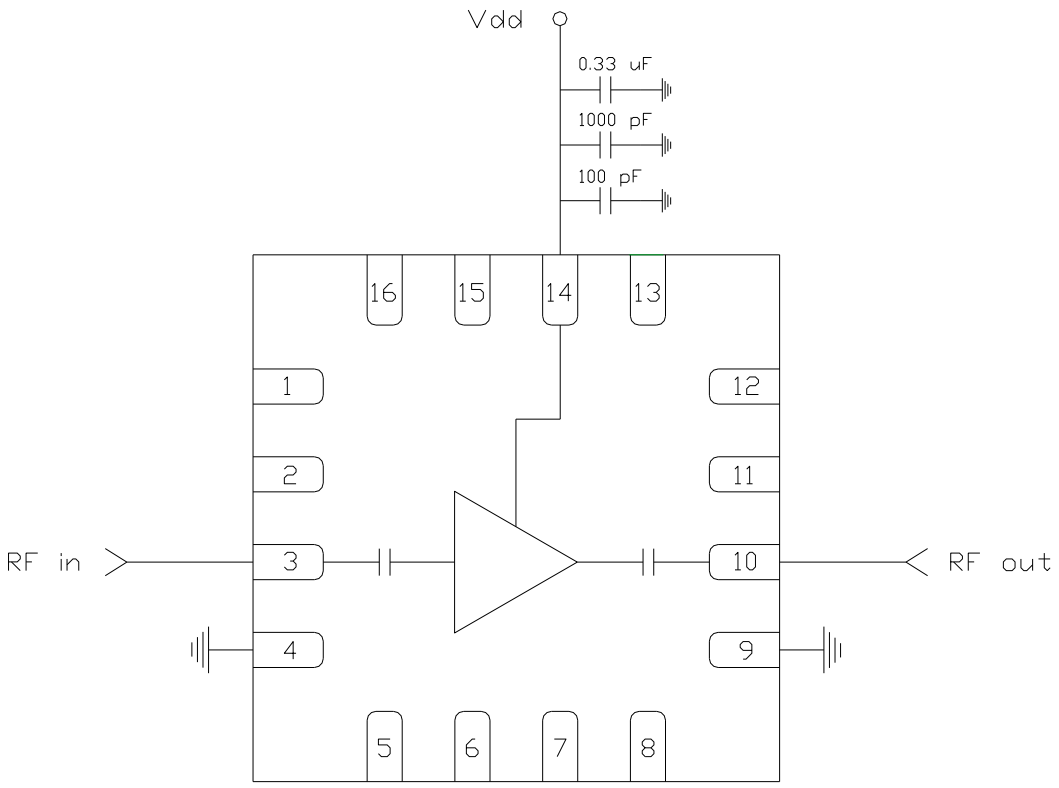
## Pin Diagram




## Pin Function Descriptions

| Pin | Function | Description | Schematic |
|---|---|---|---|
| 3 | RF in | DC Blocked, 50 Ohm matched |   |
| 10 | RF out | DC Blocked, 50 Ohm matched |   |
| 14 | Vdd | Powe supply voltage<br>Decoupling and bypass caps required |   |
| 1, 2, 5 - 9, 11 -13, 15, 16 | N.C | No internal connections, can be grounded | |
| 4, 9 | Ground | Connect to RF/DC ground |   |
| Backside | Ground | Connect to RF/DC ground |   |

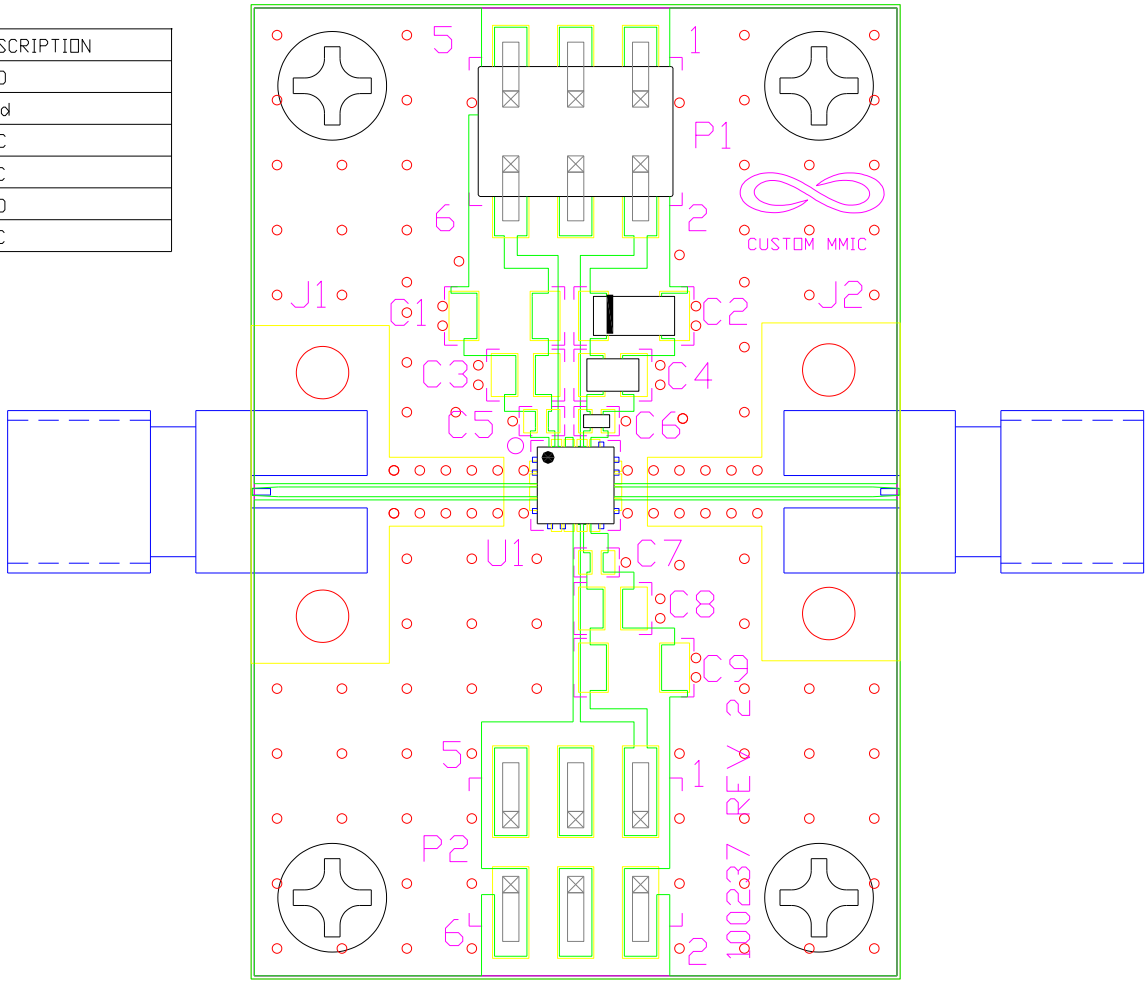
## Application Circuit




**Biasing and Operation:**
The CMD328K3 is biased with a single 3.0V positive drain supply. No bias procedure required, RF can be applied at any time.

## Evaluation Board and BOM

| P1 | DESCRIPTION |
|---|---|
| 1 | GND |
| 2 | Vdd |
| 3 | N/C |
| 4 | N/C |
| 5 | GND |
| 6 | N/C |




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.

RF layer is 0.01” thick Rogers Corp. RO4350 ($\varepsilon_r$ = 3.48). Metal layers are 0.5 oz. copper.

## Bill of Material – Evaluation Board

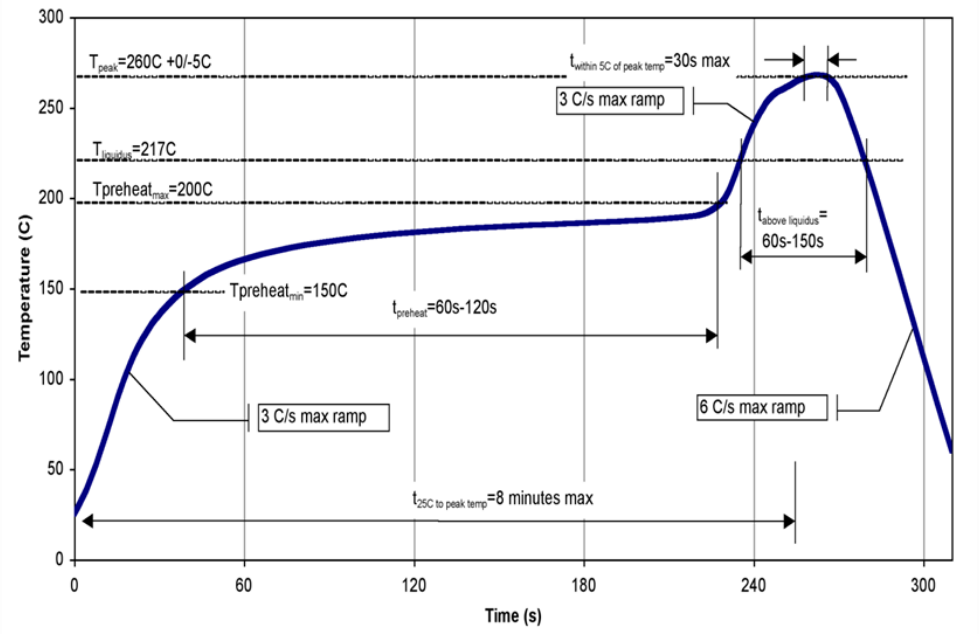
| Ref. Des. | Value | Description | Manuf. | Part Number |
|---|---|---|---|---|
| J1, J2 | | SMA End Launch Connector | Various | |
| C2 | 0.33 uF | CAP, 0.33 uF, 1206, +/- 10%, 16V | Various | |
| C4 | 1000 pF | CAP 1000 pF, 0603, +/-10% 16V | Various | |
| C6 | 100 pF | CAP, 00pF, 0402, +/- 10%, 16V | Various | |

Note: Components (Capacitors, Resistors and Inductors) not shown in the BOM list are not populated.

## Solderability

1. Compatible with the latest version of J-STD-020, Lead-free solder, peak reflow temperature: 260 °C.
2. Refer to Qorvo Application Note AN102 for more reflow and assembly details.

## Recommended Soldering Temperature Profile



## Handling Precautions

| Parameter | Rating | Standard |
|---|---|---|
| ESD – Human Body Model (HBM) | 1a | ANSI / ESD / JEDEC JS-001 |
| ESD – Charge Device Model (CDM) | C2b | ANSI / ESD / JEDEC JS-002 |
| MSL – Convection Reflow 235 °C | 3 | 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 ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Fre
- 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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