



# QPA2363C

## 50 MHz – 4000 MHz Active Bias Cascadable SiGe HBT

### General Description

Qorvo's QPA2363C is a high performance SiGe HBT MMIC amplifier utilizing a Darlington configuration with a patented active bias network. The active bias network provides stable current over temperature and process Beta variations. Designed to run directly from a 3V supply, the QPA2363C does not require a dropping resistor as compared to typical Darlington amplifiers. The QPA2363C is designed for high linearity 3V gain block applications that require small size and minimal external components. It is internally matched to 50  $\Omega$ .

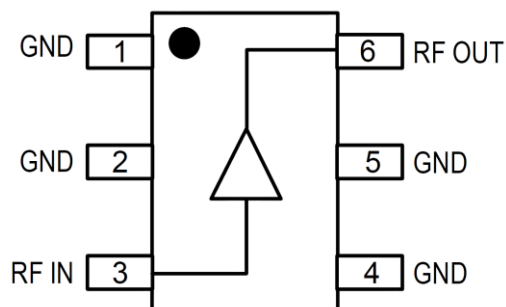


6 Lead SOT-363 Package

### Product Features

- Single Fixed 3V Supply
- No Dropping Resistor Required
- Patented Self-Bias Circuitry
- P1dB=+11.0dBm at 1950MHz
- OIP3=+22.6dBm at 1950MHz
- Robust 1000V ESD, Class 1C HBM

### Functional Block Diagram



Top View

### Applications

- Instrumentation
- Repeaters
- Boosters
- PA Driver Amplifier
- Cellular, PCS, GSM, UMTS
- IF Amplifier
- Wireless Data, Satellite

### Ordering Information

| Part No.        | Description                          |
|-----------------|--------------------------------------|
| QPA2363CTR7     | 3000 pieces on a 7" reel (standard)  |
| QPA2363CSQ      | 25 Piece Sample Bag                  |
| QPA2363CSR      | 100 Pieces on 7" Reel                |
| QPA2363CPCCK401 | 850 MHz, EVB with 5 Piece Sample Bag |

## Absolute Maximum Ratings

| Parameter                | Rating         |
|--------------------------|----------------|
| Storage Temp             | -55 to +150 °C |
| Device Voltage ( $V_D$ ) | +4 V           |
| Device Current ( $I_D$ ) | 55 mA          |
| RF Input Power           | +12 dBm        |

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.

## Recommended Operating Conditions

| Parameter                      | Min | Typ  | Max  | Units |
|--------------------------------|-----|------|------|-------|
| Operating Temperature          | -40 |      | +105 | °C    |
| Junction Temperature ( $T_J$ ) |     |      | +125 | °C    |
| Device Operating Voltage       |     | +3.0 |      | V     |

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

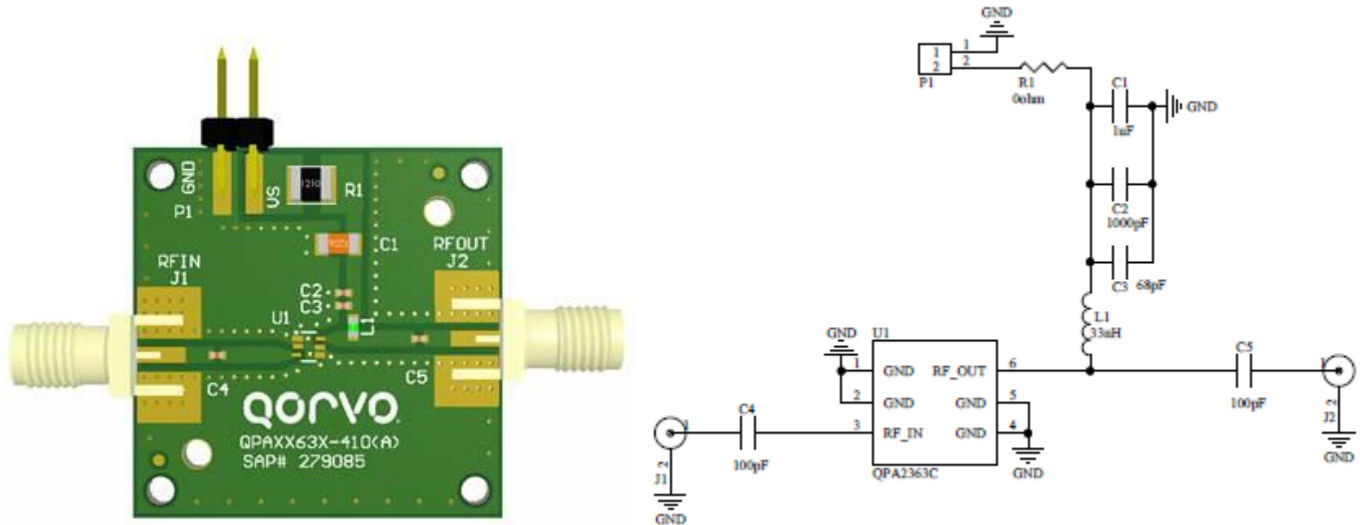
## Electrical Specifications

| Parameter                         | Conditions | Min | Typ   | Max | Units |
|-----------------------------------|------------|-----|-------|-----|-------|
| Small Signal Gain                 | 850 MHz    |     | 17.3  |     | dB    |
|                                   | 1950 MHz   |     | 13.4  |     | dB    |
|                                   | 2400 MHz   |     | 12.0  |     | dB    |
| Output Power at 1dB Compression   | 850 MHz    |     | +12.7 |     | dBm   |
|                                   | 1950 MHz   |     | +11.0 |     | dBm   |
|                                   | 2400 MHz   |     | +9.6  |     | dBm   |
| Output Third Intercept Point      | 850 MHz    |     | +23.2 |     | dBm   |
|                                   | 1950 MHz   |     | +22.6 |     | dBm   |
|                                   | 2400 MHz   |     | +21.4 |     | dBm   |
| Input Return Loss                 | 1950 MHz   |     | 16.3  |     | dB    |
| Output Return Loss                | 1950 MHz   |     | 13.2  |     | dB    |
| Noise Figure                      | 1950 MHz   |     | 4.5   |     | dB    |
| Device Operating Current          |            |     | 26    |     | mA    |
| Thermal Resistance, $\theta_{jc}$ |            |     | 142   |     | °C/W  |

Notes:

- Test conditions unless otherwise noted:  $V_S = +3V$ ,  $I_D = 26\text{ mA Typ.}$ , OIP3 Tone Spacing=1 MHz,  $P_{OUT}$  per tone = -5 dBm, 50  $\Omega$  system, Temp = +25 °C

## Evaluation Board and Schematic – 850 MHz Application Circuit



## Bill of Material – 850 MHz Application Circuit

| Reference | Value   | Description                              | Manufacturer          | Part Number        |
|-----------|---------|------------------------------------------|-----------------------|--------------------|
| n/a       | n/a     | PCB, QPA2363C                            | Qorvo                 | QPAXX63X-410(A)    |
| C1        | 1 uF    | CAP, 10%, 25V, X7R, 1206                 | Murata Electronics    | GRM31MR71E105KA01L |
| C2        | 1000 pF | CAP, 10%, 50V, X7R, 0402                 | Murata Electronics    | GRM155R71H102KA01D |
| C3        | 68 pF   | CAP, 5%, 50V, C0G, 0402                  | Murata Electronics    | GRM1555C1H680JA01D |
| C4, C5    | 100 pF  | CAP, 5%, 50V, C0G, 0402                  | Murata Electronics    | GRM1555C1H101JA01D |
| R1        | 0 Ω     | RES, 0 Ω, 1210                           | KOA Speer Electronics | RK73Z2ETTD         |
| L1        | 33 nH   | IND, 5%, M/L, 0603                       | Murata Electronics    | LL1608-FSL33NJ     |
| J1, J2    | n/a     | CONN, SMA, EL, FLT, 0.068" SPE-000318    | Amphenol RF Asia Corp | 901-10426          |
| U1        | n/a     | HBT MMIC Amplifier                       | Qorvo                 | QPA2363C           |
| J3, J4    | n/a     | CONN, HDR, ST, 1x2, 0.100", Hi-temp, T/H | Samtec Inc            | HTSW-102-07-G-S    |

## Component Values for Specific Frequencies

| Frequency | 500 MHz | 850 MHz | 1950 MHz | 2400 MHz | 3500 MHz |
|-----------|---------|---------|----------|----------|----------|
| C4, C5    | 220 pF  | 100 pF  | 68 pF    | 56 pF    | 39 pF    |
| C3        | 100 pF  | 68 pF   | 22 pF    | 22 pF    | 15 pF    |
| L1        | 68 nH   | 33 nH   | 22 nH    | 18 nH    | 15 nH    |

### Typical Performance – 850 MHz Application Circuit

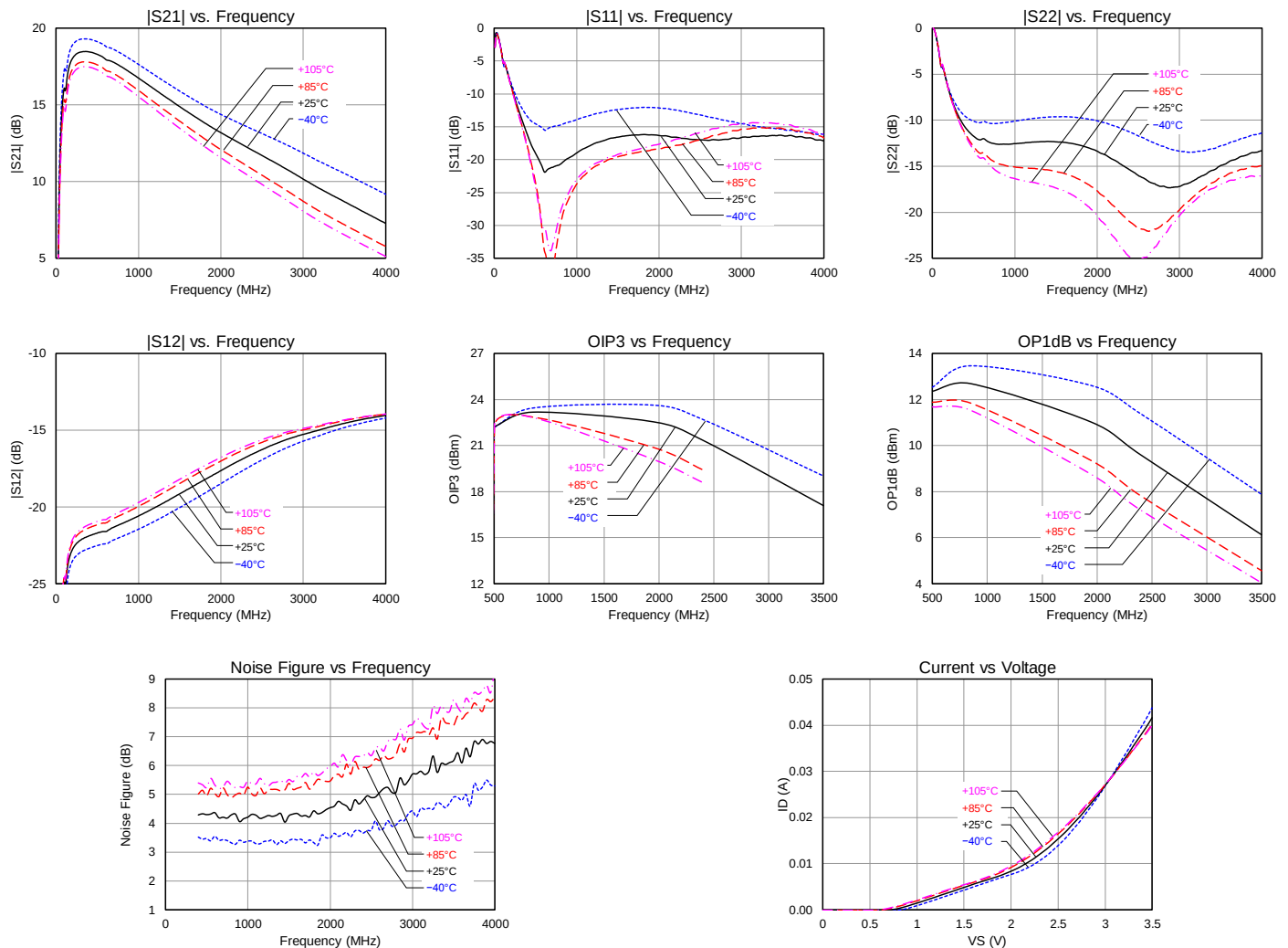
| Parameter                       | Typical Value |       |       |       |       | Units |
|---------------------------------|---------------|-------|-------|-------|-------|-------|
| Frequency                       | 500           | 850   | 1950  | 2400  | 3500  | MHz   |
| Small Signal Gain               | 18.3          | 17.3  | 13.4  | 12.0  | 8.7   | dB    |
| Output Third Intercept Point    | +22.4         | +23.2 | +22.6 | +21.4 | +17.1 | dBm   |
| Output Power at 1dB Compression | +12.4         | +12.7 | +11.0 | +9.6  | +6.1  | dBm   |
| Input Return Loss               | 19.0          | 20.2  | 16.3  | 16.9  | 16.3  | dB    |
| Output Return Loss              | 11.7          | 12.6  | 13.2  | 15.4  | 14.9  | dB    |
| Reverse Isolation               | 21.7          | 21.0  | 17.8  | 16.5  | 14.6  | dB    |
| Noise Figure                    | 4.3           | 4.3   | 4.5   | 4.8   | 6.2   | dB    |

Notes:

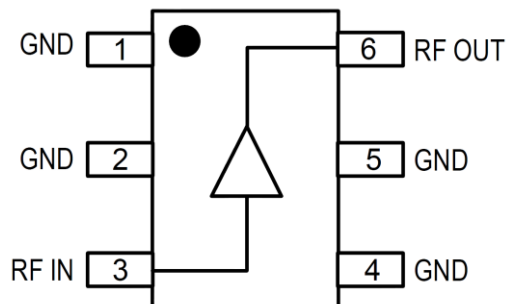
- Test conditions:  $V_S = +3V$ ,  $I_D = 26\text{ mA}$  Typ., OIP3 Tone Spacing=1MHz,  $P_{OUT}$  per tone = -5 dBm, 50  $\Omega$  system, Temp = +25 °C

### Performance Plots – 850 MHz Application Circuit

Test conditions unless otherwise noted:  $V_S = +3.0V$ ,  $I_D = 26\text{ mA}$ , Temp. = +25 °C



## Pin Configuration and Description

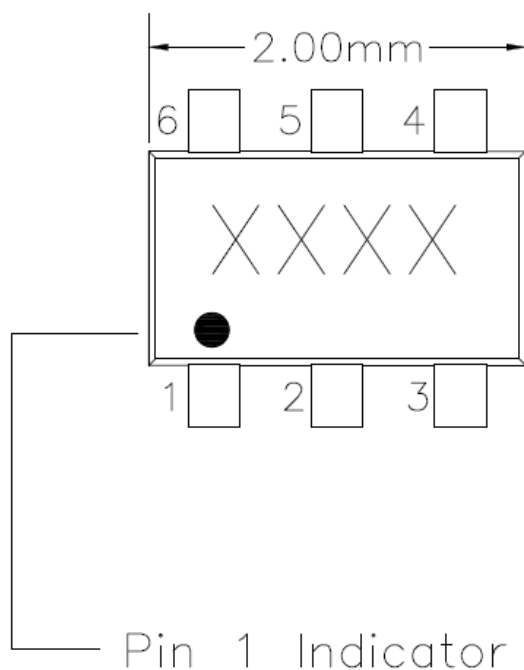


Top View

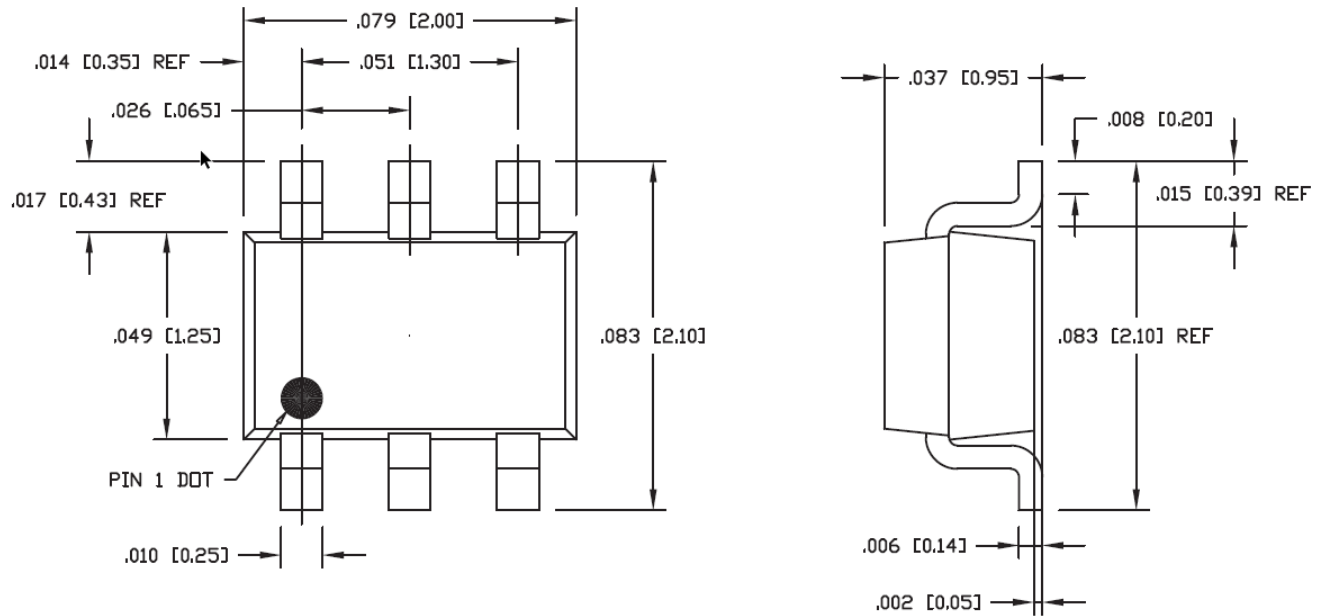
| Pad No.    | Label             | Description                                                                                                                     |
|------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 1, 2, 4, 5 | GND               | Connection to ground. Use via holes in PCB for best performance to reduce lead inductance as close to ground leads as possible  |
| 3          | RF <sub>IN</sub>  | RF Input Pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.             |
| 6          | RF <sub>OUT</sub> | RF Output and Bias Pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper operation. |

## Package Marking

XXXX is an Alpha-numeric trace code.



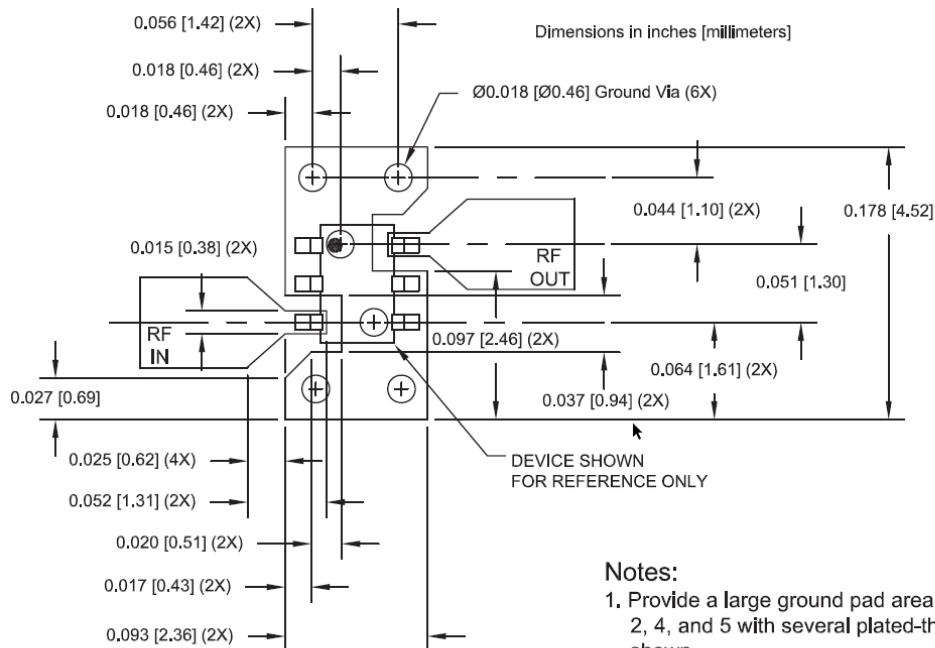
## Package Dimensions



**Notes:**

1. All dimensions are in inches (millimeters). Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y15.5-2009.

## PCB Mounting Pattern



**Notes:**

1. Provide a large ground pad area under device pins 1, 2, 4, and 5 with several plated-through holes placed as shown.
2. 1/2 ounce finished copper thickness is recommended.
3. RF I/O lines are 50Ω

**Notes:**

1. All dimensions are in inches (millimeters). Angles are in degrees.

## Handling Precautions

| Parameter                        | Rating   | Standard                 |
|----------------------------------|----------|--------------------------|
| ESD – Human Body Model (HBM)     | Class 1C | ESDA / JEDEC JS-001-2014 |
| ESD – Charged Device Model (CDM) | Class C3 | ESDA / JEDEC JS-002-2014 |
| MSL – Moisture Sensitivity Level | Level 1  | IPC/JEDEC J-STD-020      |



Caution!  
ESD-Sensitive Device

## Solderability

Compatible with lead-free (260°C max. reflow temp.) soldering process.

Solder profiles available upon request.

Contact plating: Matte Sn

## 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:

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

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

For technical questions and application information: **Email:** [appsupport@qorvo.com](mailto:appsupport@qorvo.com)

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