

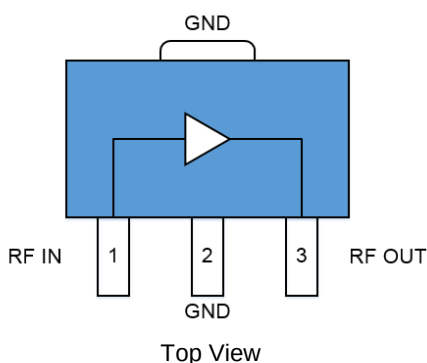
### Product Overview

The QPA6489A is a high performance SiGe HBT MMIC amplifier. A Darlington configuration provides high FT and excellent thermal performance. The heterojunction increases breakdown voltage and minimizes leakage current between junctions. Cancellation of emitter junction non-linearities results in higher suppression of intermodulation products.

The QPA6489A may be operated from a variety of supply voltages by using a voltage dropping resistor. Two DC-blocking capacitors, bypass capacitors and an optional RF choke complete the circuit required for operation of this internally matched 50 ohm device.

The QPA6489A is assembled in an industry standard SOT-89 package that is lead-free and RoHS-compliant.

### Functional Block Diagram



3 Lead SOT-89 Package

### Key Features

- DC to 3500 MHz Operation
- Single Positive Voltage Supply
- Cascadable 50  $\Omega$
- High Gain: 19.2 dB at 1950 MHz
- Output IP3: +31.9 dBm typical at 1950 MHz
- Noise Figure: 3.4 dB Typical at 1950 MHz
- Robust 1000 V Class 1C HBM ESD Rating
- Low Thermal Resistance SOT-89 Package
- Lead-free / RoHS-Compliant

### Applications

- Cellular, PCS, GSM, UMTS
- Power Amplifier Driver
- IF/RF Buffer Amplifier
- Wireless Data, Satellite

### Ordering Information

| Part No.       | Description                          |
|----------------|--------------------------------------|
| QPA6489ASQ     | 25 Piece Sample Bag                  |
| QPA6489ASR     | 100 Pieces on 7" Reel                |
| QPA6489ATR13   | 3000 pieces on a 13" reel            |
| QPA6489APCK401 | 850 MHz, EVB with 5 Piece Sample Bag |

## Absolute Maximum Ratings

| Parameter                            | Rating         |
|--------------------------------------|----------------|
| Storage Temp                         | –55 to +150 °C |
| Device Voltage ( $V_D$ )             | +7 V           |
| Device Current ( $I_D$ )             | 150 mA         |
| RF Input Power ( $Z_L = 50 \Omega$ ) | +18 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    |

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

## Electrical Specifications

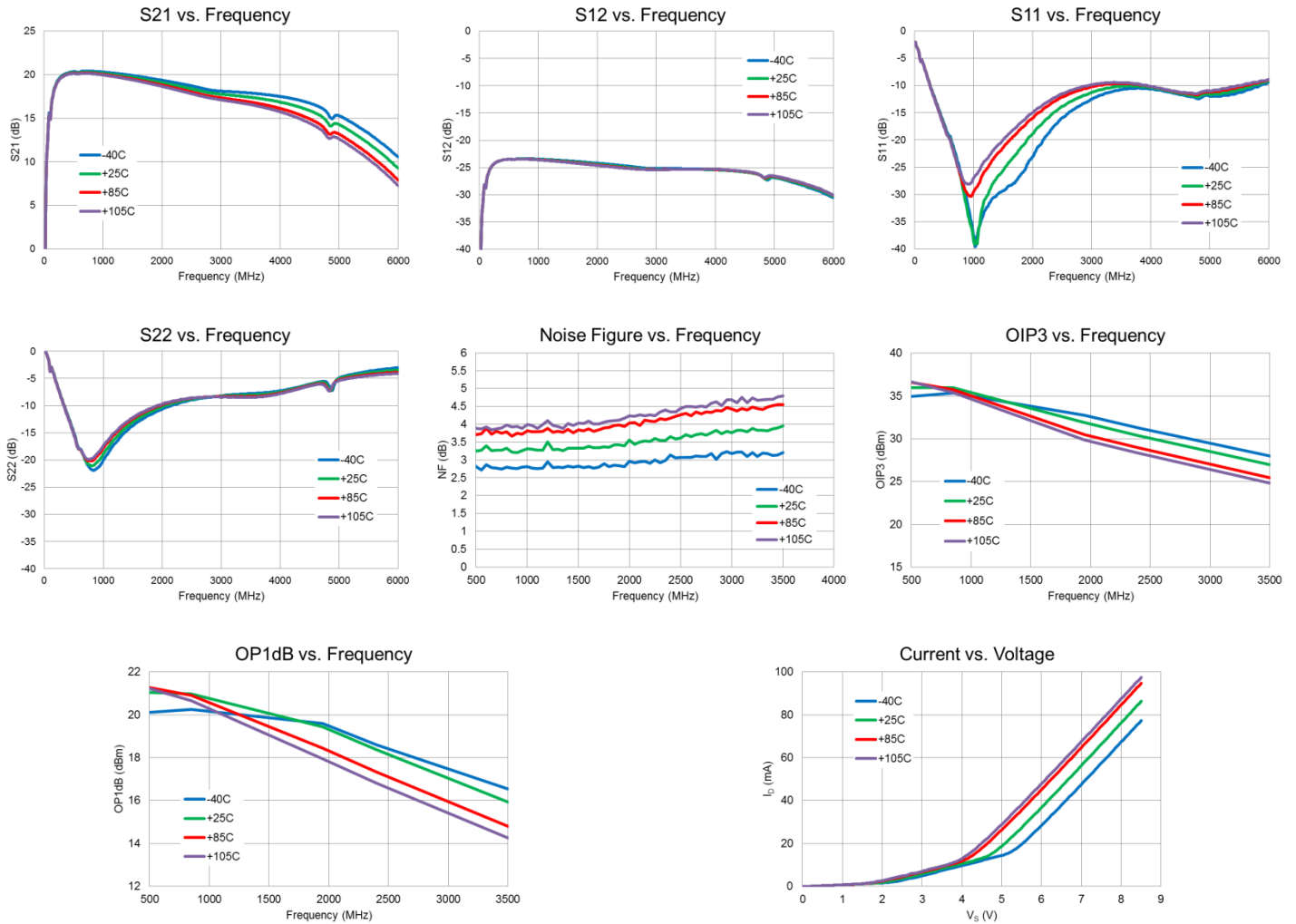
| Parameter                       | Conditions | Min  | Typ   | Max  | Units |
|---------------------------------|------------|------|-------|------|-------|
| Small Signal Gain,  S21         | 850 MHz    |      | 20.3  |      | dB    |
|                                 | 1950 MHz   |      | 19.2  |      |       |
|                                 | 2400 MHz   |      | 18.5  |      |       |
| Output Power at 1dB Compression | 850 MHz    |      | +20.1 |      | dBm   |
|                                 | 1950 MHz   |      | +19.4 |      |       |
|                                 | 2400 MHz   |      | +18.4 |      |       |
| Output Third Intercept Point    | 500 MHz    |      | +36.0 |      | dBm   |
|                                 | 850 MHz    |      | +36.0 |      |       |
|                                 | 1950 MHz   |      | +31.9 |      |       |
| Input Return Loss,  S11         | 2400 MHz   |      | +30.4 |      | dB    |
|                                 | 850 MHz    |      | 30.7  |      |       |
|                                 | 1950 MHz   |      | 19.4  |      |       |
| Output Return Loss,  S22        | 2400 MHz   |      | 14.7  |      | dB    |
|                                 | 850 MHz    |      | 20.9  |      |       |
|                                 | 1950 MHz   |      | 10.4  |      |       |
| Reverse Isolation,  S12         | 2400 MHz   |      | 9.0   |      | dB    |
|                                 | 850 MHz    |      | 23.5  |      |       |
|                                 | 1950 MHz   |      | 24.3  |      |       |
| Noise Figure                    | 2400 MHz   |      | 24.8  |      | dB    |
|                                 | 850 MHz    |      | 3.2   |      |       |
|                                 | 1950 MHz   |      | 3.4   |      |       |
| Device Operating Voltage        |            | +4.7 | +5.1  | +5.5 | V     |
| Device Operating Current        |            |      | 75    |      | mA    |
| Thermal Resistance              |            |      | 37    |      | °C/W  |

### Notes:

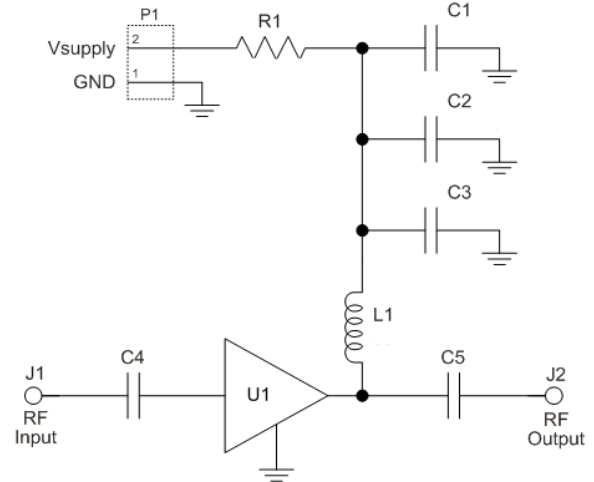
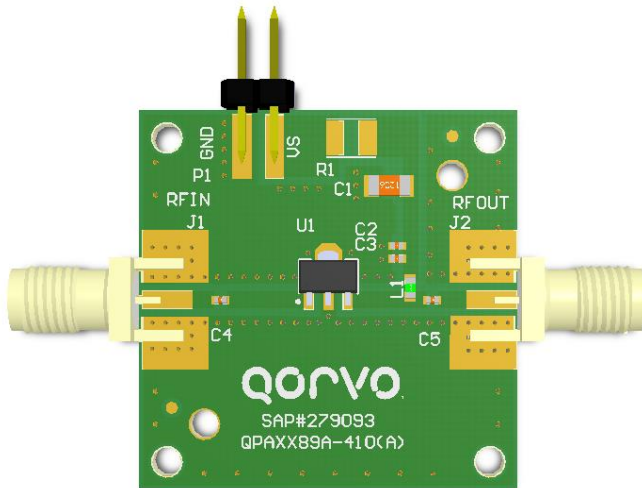
- Test conditions unless otherwise noted:  $V_S = +8$  V,  $R_{BIAS} = 39 \Omega$ ,  $I_D = 75$  mA Typ., OIP3 Tone Spacing = 1 MHz,  $P_{OUT}$  per tone = 0 dBm,  $T_{LEAD} = +25^\circ\text{C}$ ,  $Z_S = Z_L = 50 \Omega$

## Performance Plots – 850 MHz Application Circuit

Test conditions unless otherwise noted:  $V_S = +8\text{ V}$ ,  $R_{BIAS} = 39\ \Omega$ ,  $I_D = 75\text{ mA Typ.}$



## 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                                      | Qorvo                        | QPAXX89X-410(A)    |
| U1        | n/a     | HBT MMIC Amplifier                       | Qorvo                        | QPA6489A           |
| 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        | 39 Ω    | RES, 5%, 1/2W, 1210                      | Panasonic Industrial Devices | ERJ-P14F39R0U      |
| 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          |
| P1        | n/a     | CONN, HDR, ST, 1x2, 0.100", Hi-temp, T/H | Samtec Inc                   | HTSW-102-07-G-S    |

## Component Values for Specific Frequencies

| Reference Designator | 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    |

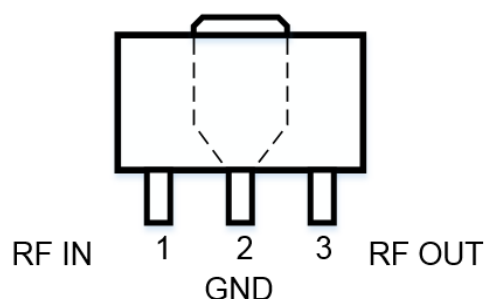
## Bias Resistor Values for Specific Supply Voltages

| Reference Designator                      | V <sub>S</sub> =+6 V | V <sub>S</sub> =+8 V | V <sub>S</sub> =+10 V | V <sub>S</sub> =+12 V |
|-------------------------------------------|----------------------|----------------------|-----------------------|-----------------------|
| R1 ( R <sub>BIAS</sub> ) <sup>(1,2)</sup> | 12 Ω                 | 39 Ω                 | 62 Ω                  | 91 Ω                  |

Notes:

1. Bias resistor improves current stability over temperature
2. Bias Resistance =  $R_{BIAS} + R_{LDC} = (V_S - V_D) / I_D$

## Pin Configuration and Description

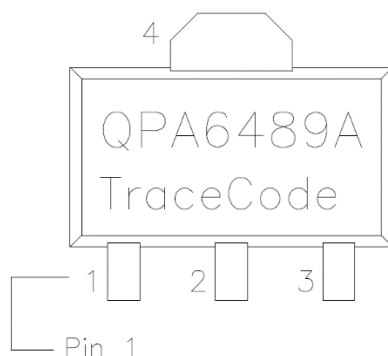


Top View

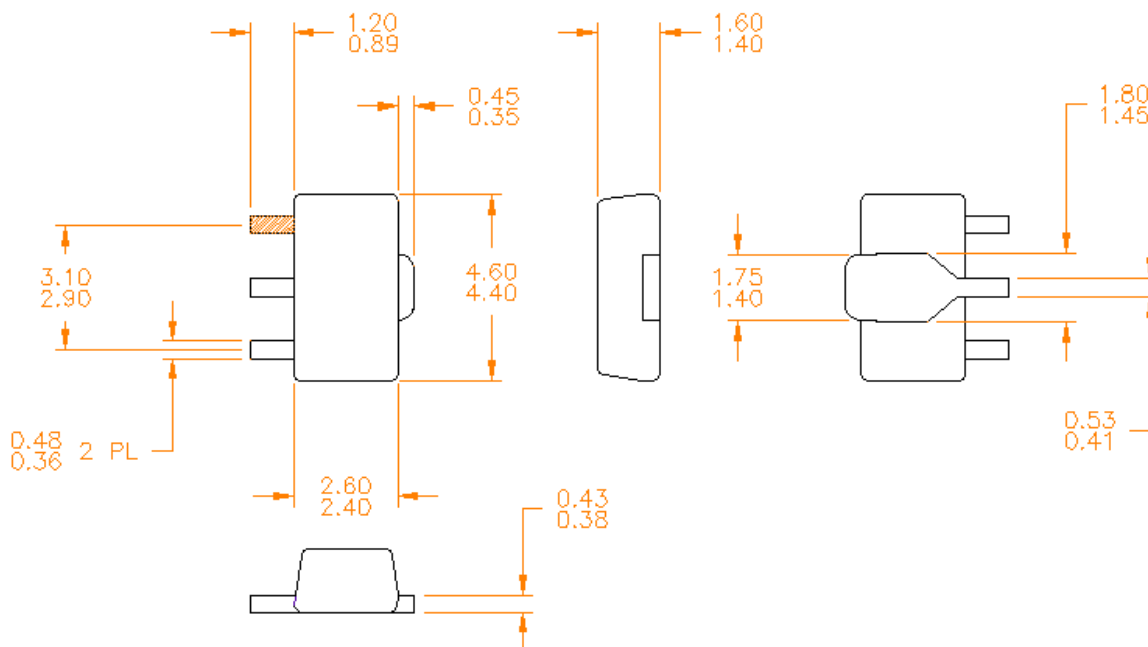
| Pad No.         | Label                   | Description                                                                                                                                                               |
|-----------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1               | RF <sub>IN</sub>        | RF Input Pin. DC voltage is present on this pin therefore this pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.           |
| 2               | 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>OUT</sub> /Bias | RF Output and Bias Pin. DC voltage is present on this pin therefore this pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. |
| Backside Paddle | GND                     | Exposed area on the bottom side of the package needs to be soldered to the ground plane of the board for optimum thermal and RF performance.                              |

## Package Marking

‘Trace Code’ is a 4-character Alpha-numeric code.



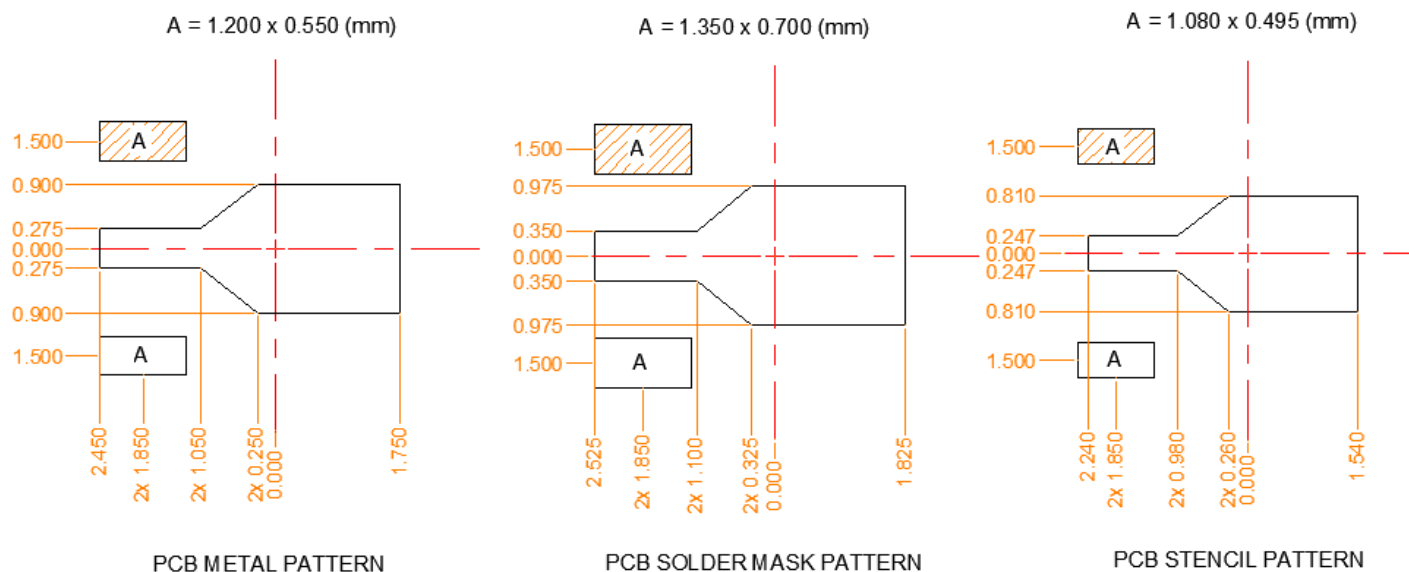
## Package Dimensions



Notes:

1. All dimensions are in millimeters. Angles are in degrees.

## PCB Mounting Pattern



## 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 2  | 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 Tin

## 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:

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

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

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

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

## Important Notice

The information contained herein is believed to be reliable; however, Qorvo makes no warranties regarding the information contained herein and assumes no responsibility or liability whatsoever for the use of the information contained herein. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Qorvo products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information. **THIS INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

Without limiting the generality of the foregoing, Qorvo products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.

Copyright 2016 © Qorvo, Inc. | Qorvo is a registered trademark of Qorvo, Inc.

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А