



RFFM8800

Wi-Fi Front End Module

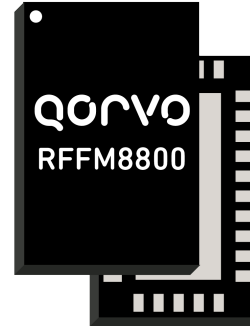
Product Overview

The Qorvo® RFFM8800 is an integrated dual band front end module (FEM) designed for Wi-Fi 4 systems. The compact form factor and integrated matching minimizes layout area in the application.

Performance is focused on optimizing the 2.4GHz and 5GHz PAs for a voltage range from 3 to 4.8V supply voltage that conserves power consumption while maintaining the highest linear output power.

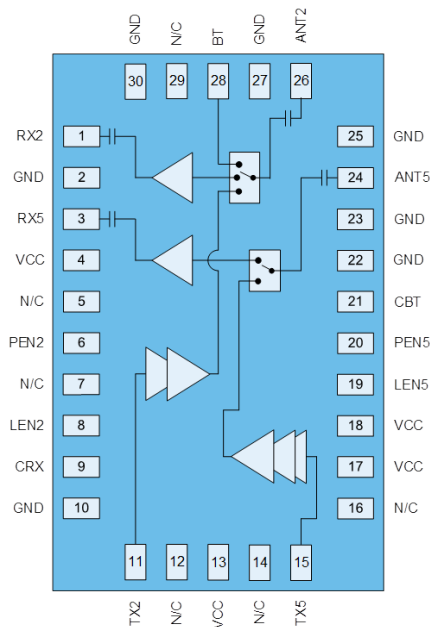
The topology lends itself to applications where 2.4GHz and 5GHz can be run independently on different antennas.

The RFFM8800 integrates a 2.4GHz and 5GHz power amplifier (PA), regulator, a 5GHz single pole two-throw switch (SP2T), a 2.4GHz single-pole three-throw switch and 2.4GHz and 5GHz low noise amplifiers (LNA).



30 Pin 3x5 mm Laminate Package

Functional Block Diagram



Top View

Key Features

- 5150-5850MHz & 2412 – 2484MHz
- 5GHz $P_{OUT} = +17.5\text{dBm}$ MCS7 HT20 -30dB Dynamic EVM
- 2.4GHz $P_{OUT} = +18.5\text{dBm}$ MCS7 HT20 -30dB Dynamic EVM
- 2.4GHz $P_{OUT} = +21.5\text{dBm}$ 11b Spectral Mask Compliance
- 5GHz 28dB & 2.4GHz 24dB Tx Gain
- 5GHz 2.5dB & 2.4GHz 2dB Noise Figure
- 5GHz 14dB & 2.4GHz 12dB Rx Gain

Applications

- Access Points
- Wireless Routers
- Residential Gateways
- Customer Premise Equipment
- Internet of Things

Ordering Information

| Part Number | Description |
|-----------------|------------------------------------|
| RFFM8800SB | Sample bag with 5 pieces |
| RFFM8800SQ | Sample bag with 25 pieces |
| RFFM8800SR | 7" reel with 100 pieces |
| RFFM8800TR13 | 13" reel with 2500 pieces |
| RFFM8800PCK-410 | Assembled Evaluation Board + 5 pcs |

Absolute Maximum Ratings

| Parameter | Conditions | Rating |
|-----------------------|---|---------------|
| DC Supply Voltage | | -0.5 to +5.4V |
| Control Voltage | PEN5, PEN2, LEN5 & LEN2 | -0.5 to +5V |
| Storage Temperature | | -40 to 150 °C |
| RF Input Power at TX5 | Into 50 Ω Load for 802.11a-n (No Damage), Transmit Mode | +5 dBm |
| RF Input Power at TX2 | Into 50 Ω Load for 802.11b-n (No Damage), Transmit Mode | +0 dBm |
| RF Input Power at ANT | (No Damage), Receive LNA On Mode, CW | +0 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 Frequency | 2.412 | | 2.484 | GHz |
| | 5.15 | | 5.850 | GHz |
| Device Voltage (V _{CC} & V _{DD}) | +3 | +3.3 | +4.8 | V |
| Control Voltage – High | +2.8 | +3.1 | +4.6 | V |
| Control Voltage - Low | 0 | | +0.2 | V |
| T _{OPERATING} | -10 | | +75 | °C |
| Extended T _{OPERATING} | -40 | | +85 | °C |

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

5GHz Electrical Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|--|--|------|------|------|---------|
| TRANSMIT (TX5-ANT5) MODE | | | | | |
| Unless otherwise noted: f=5150-5850MHz, V_{CC}=3.3V, T=+25°C, PEN5=High | | | | | |
| Wi-Fi 4 HT40 Output Power | MCS7 64QAM 11n | | 17.5 | | dBm |
| Dynamic EVM | | | -31 | -30 | dB |
| ACP11n Spectral Mask | P _{OUT} = +16 dBm, f _C +/-11 MHz | | -23 | -20 | dBc |
| | P _{OUT} = +16 dBm, f _C +/-20 MHz | | -30 | -28 | dBc |
| | P _{OUT} = +16 dBm, f _C +/-30 MHz | | -43 | -40 | dBc |
| ACP11a Spectral Mask | P _{OUT} = +17.5 dBm, f _C +/-11 MHz | | -23 | -20 | dBc |
| | P _{OUT} = +17.5 dBm, f _C +/-20 MHz | | -30 | -28 | dBc |
| | P _{OUT} = +17.5 dBm, f _C +/-30 MHz | | -43 | -40 | dBc |
| Gain | | 25.5 | 28 | 31 | dB |
| TX5 Port Return Loss | | 5 | 10 | | dB |
| ANT Port Return Loss | | 15 | 20 | | dB |
| Quiescent Current | RF Off | | 150 | | mA |
| Operating Current | P _{OUT} = +17.5 dBm | | 215 | 260 | mA |
| 2 nd Harmonics | P _{OUT} = +17.5 dBm, BW = 1MHz | | -24 | -20 | dBm/MHz |
| 3 rd Harmonics | P _{OUT} = +17.5 dBm, BW = 1MHz | | -45 | -40 | dBm/MHz |

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---------------------------------------|--|------|------|------|---------------|
| RECEIVE (ANT5-RX5) LNA ON MODE | Unless otherwise noted: $f=5150-5925\text{MHz}$, $V_{CC}=5\text{V}$, $T=+25^\circ\text{C}$, $BS=High$, $C1=Low$, $C0=Low$ & $SLP=High$ | | | | |
| Gain | | 11 | 14 | 17 | dB |
| Out of Band Gain | $f = 800-1900\text{MHz}$ | | 7 | | dB |
| Noise Figure | | | 2.5 | 3.5 | dB |
| RX5 Port Return Loss | | | 9 | | dB |
| ANT5 Port Return Loss | | | 9 | | dB |
| Input P_{1dB} | | -20 | -15 | | dBm |
| Input IP3 | | | -5 | | dBm |
| LNA Turn On Time | | | | 800 | nS |
| Rx Operating Current | | | 10 | 15 | mA |
| GENERAL SPECIFICATIONS | Unless otherwise noted: $f=5150-5925\text{MHz}$, $V_{CC}=5\text{V}$, $T=+25^\circ\text{C}$, Switching Time Power Accuracy $\pm 1\text{dB}$ | | | | |
| Control Current - High | LEN5 | | 2 | | μA |
| Control Current - High | CRX, CBT | | 5 | | μA |
| Switch Control Speed | | | | 100 | nS |
| Turn On/Off Time | $10 \leftrightarrow 90\%$ of total gain or power off gain | | 200 | 1000 | nS |
| PA Stability - Output VSWR | No Spurious above -41.25dBm/MHz , $P_{OUT} = 0$ to 17 dBm , CW Signal | | 4:1 | | |

2.4GHz Electrical Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---------------------------------|--|------|------|------|-------|
| TRANSMIT MODE (TX2-ANT2) | Unless otherwise noted: $f=2412-2484\text{MHz}$, $V_{CC}=5\text{V}$, $T=+25^\circ\text{C}$, $PEN2=High$ | | | | |
| Wi-Fi 4 HT20 Output Power | MCS7 64QAM 11n | | 17.5 | | dBm |
| Dynamic EVM | | | | -34 | dB |
| Wi-Fi 4 HT20 Output Power | MCS7 64QAM 11n | | 18.5 | | dBm |
| Dynamic EVM | | | -32 | -30 | dB |
| 11g Output Power | 54Mbps | | 18 | | dBm |
| Dynamic EVM | | | -35 | -34 | dB |
| 11g Output Power | 54Mbps | | 19.5 | | dBm |
| Dynamic EVM | | | -32 | -30 | dB |
| Wi-Fi 4 Spectral Mask | $P_{OUT} = +18\text{ dBm}$, $f_C \pm 11\text{ MHz}$ | | -23 | -20 | dBc |
| | $P_{OUT} = +18\text{ dBm}$, $f_C \pm 20\text{ MHz}$ | | -30 | -28 | dBc |
| | $P_{OUT} = +18\text{ dBm}$, $f_C \pm 30\text{ MHz}$ | | -48 | -45 | dBc |
| 11g Spectral Mask | $P_{OUT} = +19.5\text{ dBm}$, $f_C \pm 11\text{ MHz}$ | | -23 | -20 | dBc |
| | $P_{OUT} = +19.5\text{ dBm}$, $f_C \pm 20\text{ MHz}$ | | -30 | -25 | dBc |
| | $P_{OUT} = +19.5\text{ dBm}$, $f_C \pm 30\text{ MHz}$ | | -43 | -40 | dBc |
| 11b Spectral Mask | $P_{OUT} = +21.5\text{ dBm}$, $f_C \pm 11\text{ MHz}$ | | -34 | -32 | dBc |
| | $P_{OUT} = +21.5\text{ dBm}$, $f_C \pm 22\text{ MHz}$ | | -54 | -52 | dBc |
| Gain | | 21 | 24 | 27.5 | dB |
| Gain Variance Slope | Across any 40MHz Channel | -1 | | +1 | dB |
| | Across any 20MHz Channel | -0.5 | | +0.5 | dB |

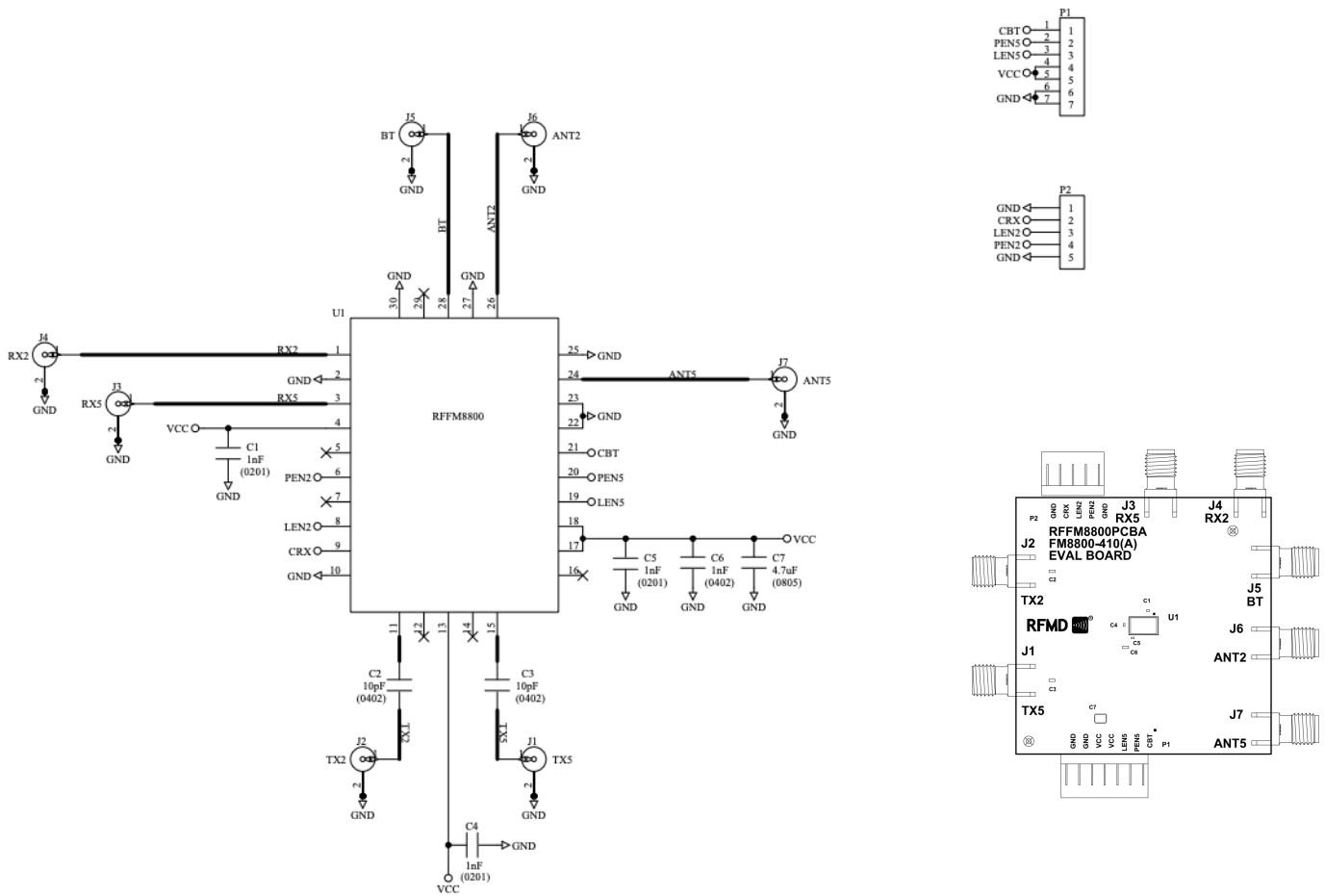
| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---------------------------------------|--|------|------|------|---------------|
| | Any 100MHz bandwidth | -2 | | +2 | dB |
| Out of Band Gain | $f = 1600-1660\text{MHz}$ | | | -12 | dBc |
| TX2 Port Return Loss | | 8 | 12 | | dB |
| ANT2 Port Return Loss | | | 12 | | dB |
| Isolation | ANT2-BT | | 18 | | |
| | ANT2-RX2 | | 35 | | |
| FEM Leakage Current | RF Off, $V_{CC} = 4.8\text{V}$ | | 5 | | μA |
| Operating Current | $P_{OUT} = +19.5\text{dBm}$ | | 190 | 230 | mA |
| 2 nd Harmonics | $P_{OUT} = +21.5\text{ dBm}$, 1Mbps DSSS BW = 1MHz, up to 3:1 load | | -25 | -22 | dBm/MHz |
| 3 rd Harmonics | $P_{OUT} = +21.5\text{ dBm}$, 1Mbps DSSS BW = 1MHz, up to 3:1 load | | -40 | | dBm/MHz |
| RECEIVE (ANT2-RX2) LNA ON MODE | Unless otherwise noted: $f=2412-2484\text{MHz}$, $V_{CC}=5\text{V}$, $T=+25^\circ\text{C}$, BS=Low, C1=Low, C0=Low, SLP=High | | | | |
| Gain | | 10 | 12 | 15 | dB |
| Gain Flatness | Across any 40 MHz Channel | | 0.25 | +0.4 | dB |
| Noise Figure | | | 2 | 2.5 | dB |
| RX2 Port Return Loss | | 6 | 10 | | dB |
| ANT2 Port Return Loss | | 5 | 8 | | dB |
| Isolation | ANT2-BT | | 21 | | |
| Input P_{1dB} | | -10 | -5 | | dBm |
| Input IP3 | | | 2 | | dBm |
| Rx Operating Current | | | 10 | 13 | mA |
| BLUETOOTH (ANT2-BT) MODE | Unless otherwise noted: $f=2412-2484\text{MHz}$, $V_{CC}=5\text{V}$, $T=+25^\circ\text{C}$, *BS=Low, C1=Low, C0=High, SLP=High | | | | |
| Insertion Loss | $P_{IN}/P_{OUT} > 20\text{ dBm}$ | | 0.7 | 0.9 | dB |
| BT Port Return Loss | | | 15 | | dB |
| ANT2 Port Return Loss | | | 20 | | dB |
| Isolation | ANT2-RX2 | | 35 | | dBm |
| GENERAL SPECIFICATIONS | Unless otherwise noted: $f=2412-2484\text{MHz}$, $V_{CC}=5\text{V}$, $T=+25^\circ\text{C}$, Switching Time Power Accuracy +/-1dB | | | | |
| Control Current - High | LEN2 | | 60 | 120 | μA |
| Turn On/Off Time | 10 \leftrightarrow 90% of total gain or power off gain | | 200 | 800 | nS |
| PA Stability - Output VSWR | No Spurious above -41.25dBm/MHz, $P_{OUT} = 0$ to 21 dBm, CW Signal | | 4:1 | | |

Logic Truth Table

| Mode # | Mode | PEN2 | LEN2 | PEN5 | LEN5 | CRX | CBT |
|--------|-------------------------------|------|------|------|------|------|------|
| 0 | All Off | Low | Low | Low | Low | Low | Low |
| 1 | Bluetooth | Low | Low | Low | Low | Low | High |
| 2 | Bluetooth & 5GHz Receive | Low | Low | Low | High | High | High |
| 3 | Bluetooth & 5GHz Transmit | Low | Low | High | Low | Low | High |
| 4 | 2.4GHz Transmit | High | Low | Low | Low | Low | Low |
| 5 | 2.4GHz Receive | Low | High | Low | Low | High | Low |
| 6 | 5GHz Transmit | Low | Low | High | Low | Low | Low |
| 7 | 5GHz Receive | Low | Low | Low | High | High | Low |
| 8 | 5GHz Receive & 2.4GHz Receive | Low | High | Low | High | High | Low |

Notes:

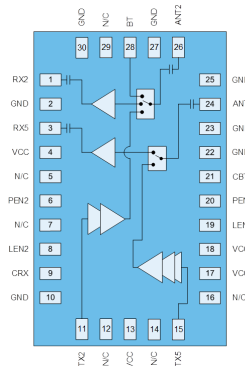
Evaluation Board Schematic



Bill of Material

| Ref. Des. | Value | Description | Manuf. | Part number |
|-----------------------------------|--------------|---------------------------------------|-----------|--------------------|
| - | - | Printed Circuit Board | | |
| U1 | - | Dualband Wi-Fi Front End Module | Qorvo | RFFM8800 |
| C1, C2, C3, C4, C5, C7, C8, C11 | 1000 pF | Capacitor, Chip, 10%, 50V, X7R, 0402 | Murata | GRM155R71H102KA01D |
| C10, C12, C14, C15, C16, C17, C18 | 10 pF | Capacitor, Chip, 5%, 50V, C0G, 0402 | Murata | GRM1555C1H100JA01D |
| C13 | 1 μ F | Capacitor, Chip, 10%, 6.3V, X5R, 0402 | Murata | GRM155R60J105KE19D |
| C200 | 0.1 μ F | Capacitor, Chip, 10%, 25V, X7R, 0603 | Kernet | C0603C104K3RAC |
| C27, C28 | 4.7 μ F | Capacitor, Chip, 10%, 10V, X5R, 1206 | Murata | GRM31CR61A475KA01L |
| R50 | 3K Ω | Resistor, Chip, 5%, 1/10W, 0805 | Panasonic | ERJ-6GEYJ302 |
| R51, R52 | 10K Ω | Resistor, Chip, 5%, 1/10W, 0805 | Panasonic | ERJ-6GEYJ103 |
| C9, C19, C20, C21, C22, C23, C24 | - | Do Not Install | | |

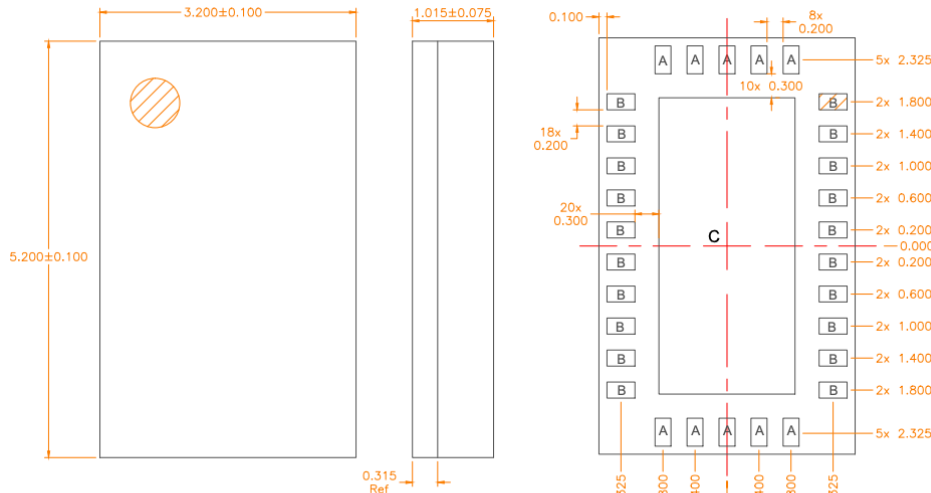
Pin Configuration and Description



| Pin Number | Label | Description |
|------------|-------|--|
| 1 | RX2 | 2.4GHz RF output from the low noise amplifier. Internally matched to 50 Ω |
| 2 | GND | Ground connection |
| 3 | RX5 | 5GHz RF output from the low noise amplifier. Internally matched to 50 Ω |
| 4 | VCC | Supply voltage |
| 5 | NC | No electrical connection |
| 6 | PEN2 | Control pin |
| 7 | NC | No electrical connection |
| 8 | LEN2 | Control pin |
| 9 | CRX | Control pin |
| 10 | GND | Ground connection |
| 11 | TX2 | RF input. Internally matched to 50 Ω and DC blocked. |
| 12 | NC | No electrical connection |
| 13 | VCC | Supply voltage |
| 14 | NC | No electrical connection |
| 15 | TX5 | RF input. Internally matched to 50 Ω and DC blocked. |
| 16 | NC | No electrical connection |
| 17 | VCC | Supply voltage |
| 18 | VCC | Supply voltage |
| 19 | LEN5 | Control pin |
| 20 | PEN5 | Control pin |
| 21 | CBT | Control pin |
| 22 | GND | Ground connection |
| 23 | GND | Ground connection |
| 24 | ANT5 | RF bi-directional antenna port. Internally matched to 50 Ω. |
| 25 | GND | Ground connection |
| 26 | ANT2 | RF bi-directional antenna port. Internally matched to 50 Ω. |
| 27 | GND | Ground connection |
| 28 | BT | Bi-directional 2.4GHz RF input and output. Internally matched to 50 Ω |
| 29 | NC | No electrical connection |
| 30 | GND | Ground connection |
| Pkg Base | GND | RF/DC ground. Use recommended via pattern to minimize inductance and thermal resistance. See PCB Mounting Pattern for suggested footprint. |

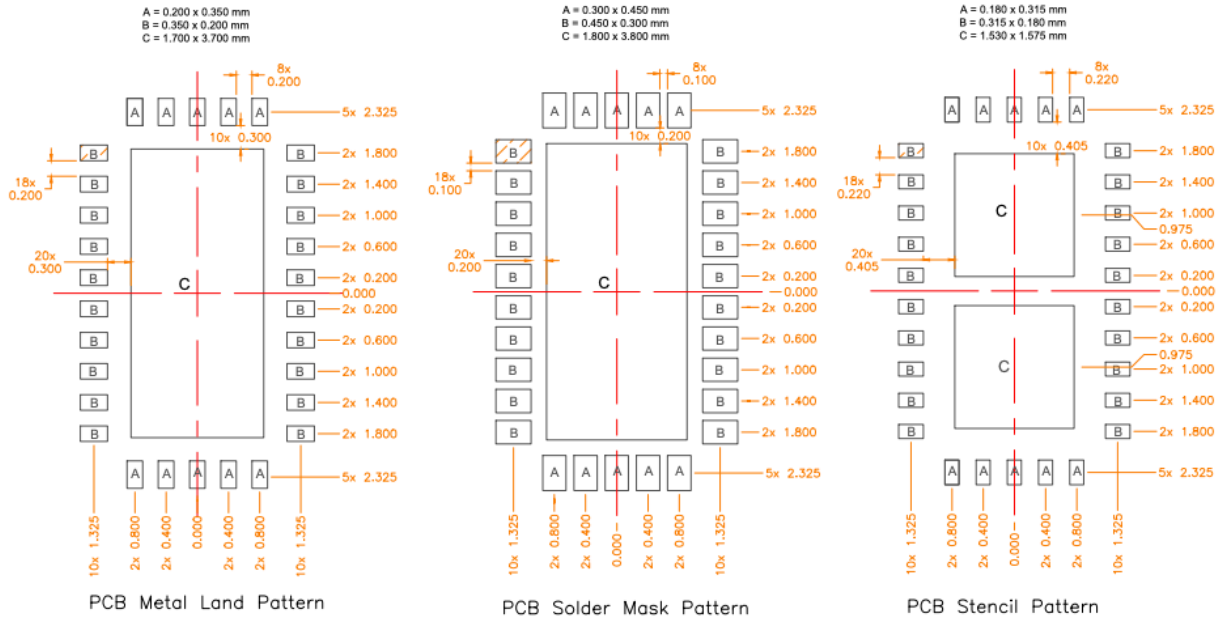
Mechanical Information

Dimensions and PCB Mounting Pattern



Notes:
1. Shaded area represents Pin 1 location.

A = 0.200 x 0.350 mm
B = 0.350 x 0.200 mm
C = 1.700 x 3.700 mm



Notes:
1. Shaded area represents Pin 1 location.

- Notes:
1. All dimensions are in millimeters. Angles are in degrees.
 2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
 3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

Handling Precautions

| Parameter | Rating | Standard |
|----------------------------------|-----------------------------------|---------------------|
| ESD – Human Body Model (HBM) | 500V – RF Pins 1000V – DC Pins | JESD22-A144 |
| ESD – Charged Device Model (CDM) | III (500V) | JESD22-C101C |
| MSL – Moisture Sensitivity Level | Level 3 | IPC/JEDEC J-STD-020 |



Caution!

ESD sensitive device

Solderability

Compatible with both lead-free (260 °C max. reflow temperature) and tin/lead (245 °C max. reflow temperature) soldering processes.

Package lead plating: Electrolytic plated Au over Ni

RoHS Compliance

This part is compliant with the 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 (C₁₅H₁₂Br₄O₂) Free
- 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

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 2019 © Qorvo, Inc. | Qorvo is a registered trademark of Qorvo, Inc.

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9