

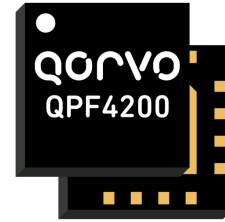
Product Overview

The Qorvo® QPF4200 is an integrated front end module (FEM) designed for Wi-Fi 6 (802.11ax) systems. The compact form factor and integrated matching minimizes layout area in the application.

Performance is focused on optimizing the PA for a 5 V supply voltage that conserves power consumption while maintaining the highest linear output power and leading edge throughput. Receive path matches the optimal technologies to maximize Rx sensitivity through noise figure performance that is consistent over a wider variety of conditions.

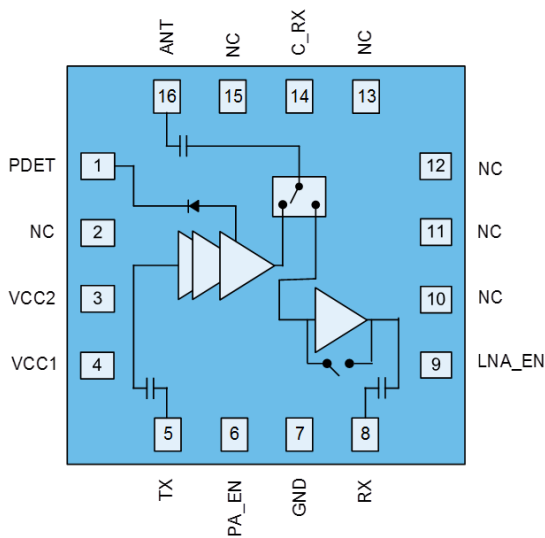
Integrated die level filtering for 2nd and 3rd harmonics as well as 5 GHz rejection for DBDC operation are included.

The QPF4200 integrates a 2.4 GHz power amplifier (PA), regulator, single pole two throw switch (SP2T), bypassable low noise amplifier (LNA) and DC power detector into a single device



16 Pin 3x3 mm Laminate Package

Functional Block Diagram



Top View

Key Features

- 2412-2484 MHz
- P_{OUT} = +19 dBm MCS11 HE40 -43 dB Dynamic EVM
- P_{OUT} = +21 dBm MCS9 VHT40 -35 dB Dynamic EVM
- P_{OUT} = +22.5 dBm MCS7 VHT40 -30 dB Dynamic EVM
- P_{OUT} = +25 dBm HT20 MCS0 Spectral Mask Compliance
- P_{OUT} = +26 dBm 11b Spectral Mask Compliance
- Optimized for +5 V Operation
- 33 dB Tx Gain
- 2.1 dB Noise Figure
- 15.5 dB Rx Gain & 6 dB Bypass Loss
- 25 dB 5 GHz Rejection on Rx Path
- Integrated DC Power Detector

Applications

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

Ordering Information

| Part Number | Description |
|----------------|----------------------------|
| QPF4200SB | Sample bag with 5 pieces |
| QPF4200SQ | Sample bag with 25 pieces |
| QPF4200SR | 7" reel with 100 pieces |
| QPF4200TR13-5K | 13" reel with 5,000 pieces |
| QPF4200EVB-01 | Assembled Evaluation Board |



Absolute Maximum Ratings

| Parameter | Conditions | Rating |
|-------------------------|---|----------------|
| DC Supply Voltage | | -0.5 to +5.5 V |
| Control Voltage | | -0.5 to <+5.5V |
| Storage Temperature | | -40 to 150 °C |
| Junction Temperature | | 150 °C |
| RF Input Power at TX_IN | Into 50Ω Load for 802.11b-ax (No Damage), Transmit Mode | +10 dBm |
| RF Input Power at ANT | (No Damage), Receive LNA On Mode, CW | +10 dBm |
| RF Input Power at ANT | (No Damage), Receive Bypass Mode, CW | +28 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 | 2412 | | 2484 | MHz |
| Extended Operating Frequency | 2400 | | 2500 | MHz |
| Device Voltage (V _{CC}) | +4.75 | +5 | +5.25 | V |
| Extended Device Voltage (V _{CC}) | +3.0 | | +5.5 | V |
| Control Voltage – High (PA_EN, LNA_EN & C_RX) | +1.4 | +3 | +3.6 | V |
| Control Voltage – Low (PA_EN, LNA_EN & C_RX) | 0 | | +0.6 | V |
| T _{OPERATING} * | -40 | | +85 | °C |

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions. * T_{OPERATING} is temperature at the package ground.

Electrical Specifications

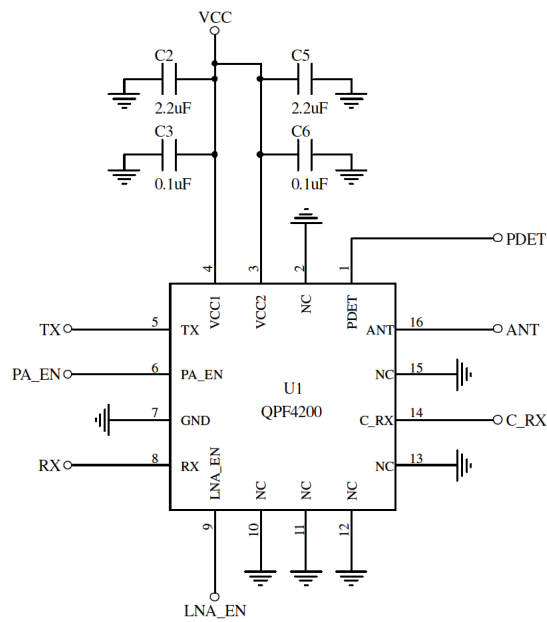
| Parameter | Conditions | Min. | Typ. | Max. | Units |
|-------------------------------|---|-------|------|-------|-------|
| TRANSMIT (TX-ANT) MODE | Unless otherwise noted: V_{CC}=5V, T=+25°C, PA_EN=High, LNA_EN=Low, C_RX=Low | | | | |
| Wi-Fi 6 HE40 Output Power | 11ax MCS11 1024QAM | | 19 | | dBm |
| Dynamic EVM | | | | -43 | dB |
| Wi-Fi 5 VHT40 Output Power | 11ac MCS8/9 256QAM | 20 | 21 | | dBm |
| Dynamic EVM | | | | -35 | dB |
| Wi-Fi 4 HT20/40 Output Power | 11n MCS7 64 QAM | 21.5 | 22.5 | | dBm |
| Dynamic EVM | | | | -30 | dB |
| Margin to 11n Spectral Mask | P _{OUT} = +25 dBm, 11n MCS0 HT20 | 0 | 3 | | dBc |
| Margin to 11b Spectral Mask | P _{OUT} = +26 dBm, 11b DSSS 1Mbps | 0 | 3 | | dBc |
| Gain | | 31 | 33 | | dB |
| Gain Flatness | Across any 40 MHz Channel | -0.25 | | +0.25 | dB |
| TX Port Return Loss | | 10 | 12 | | dB |
| ANT Port Return Loss | | 12 | 15 | | dB |

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|-------------------------------------|---|-------|------|-------|---------|
| Quiescent Current | RF Off | | 195 | | mA |
| Operating Current | P _{OUT} = +19 dBm | | 230 | 250 | mA |
| | P _{OUT} = +25 dBm | | 320 | 350 | mA |
| 2 nd Harmonics | P _{OUT} = +26 dBm 802.11b 1 Mbps | | -30 | -25 | dBm/MHz |
| 3 rd Harmonics | P _{OUT} = +26 dBm 802.11b 1 Mbps | | -35 | -30 | dBm/MHz |
| ANT-RX Isolation | | | 50 | | dB |
| DC Power Detect Voltage | RF Off | | 0.30 | | V |
| | P _{OUT} = +19 dBm | | 0.66 | | V |
| | P _{OUT} = +22.5 dBm | | 0.78 | | V |
| | P _{OUT} = +26 dBm | | 0.92 | | V |
| RECEIVE (ANT-RX) LNA ON MODE | Unless otherwise noted: V_{CC}=5V, T=+25°C, PA_EN=Low, LNA_EN=High, C_RX=High | | | | |
| Gain | | | 15.5 | | dB |
| Gain Flatness | Across any 40 MHz Channel | -0.25 | | +0.25 | dB |
| Out of Band Gain | f = 5000-6000 MHz | | -25 | | dB |
| Noise Figure | | | 2.1 | | dB |
| RX Port Return Loss | | 7 | 10 | | dB |
| ANT Port Return Loss | | 6 | 7 | | dB |
| Input P _{1dB} | | | 0 | | dBm |
| Input IP3 | | | +10 | | dBm |
| Rx Operating Current | | | 22 | | mA |
| RECEIVE (ANT-RX) BYPASS MODE | Unless otherwise noted: V_{CC}=5V, T=+25°C, PA_EN=Low, LNA_EN=Low, C_RX=High | | | | |
| Bypass Loss | | | 6 | | dB |
| Loss Flatness | Across any 40 MHz Channel | -0.1 | | +0.1 | dB |
| Out of Band Gain | f = 5000-6000 MHz | | -15 | | dB |
| RX Port Return Loss | | 20 | 25 | | dB |
| ANT Port Return Loss | | 15 | 17 | | dB |
| Input P _{1dB} | | | +28 | | dBm |
| Input IP3 | | | +44 | | dBm |
| GENERAL SPECIFICATIONS | Unless otherwise noted: V_{CC}=5V, T=+25°C, Switching Time Power Accuracy +/-1dB | | | | |
| Control Current - High | PA_EN, LNA_EN & C_RX | | | 0.1 | μA |
| Control Current - Low | PA_EN, LNA_EN & C_RX | | | 0.1 | μA |
| TX Output P _{1dB} | CW | | +29 | | dBm |
| Switching Time | Transmit to LNA On or Bypass Mode | | 400 | 500 | nS |
| | LNA On to Bypass Mode | | | 200 | nS |
| | Bypass to LNA On Mode | | | 300 | nS |
| | LNA On or Bypass to Transmit Mode | | | 400 | nS |
| PA Stability - Output VSWR | CW No Spurious above -41.25dBm/MHz | | 6:1 | | |
| Output Power Range | | 0 | | 26 | dBm |
| Thermal Resistance, θ _{jc} | Junction to case | | 37 | | °C/W |

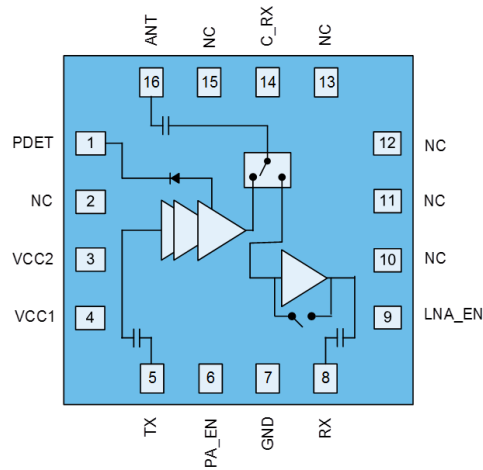
Logic Truth Table

| Mode | PA_EN | LNA_EN | C_RX |
|---------------|------------------|--------|------|
| Transmit | High | Low | Low |
| LNA On | Low | High | High |
| Bypass | Low | Low | High |
| All Off | Low | Low | Low |
| Not Supported | All Other States | | |

Application Schematic



Pin Configuration and Description

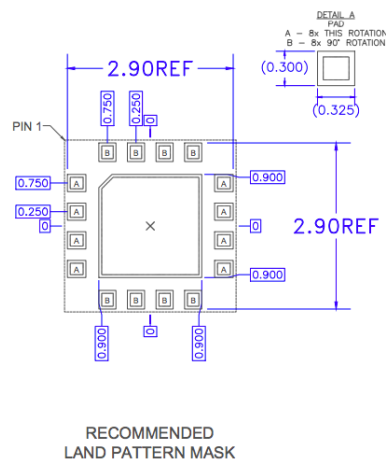
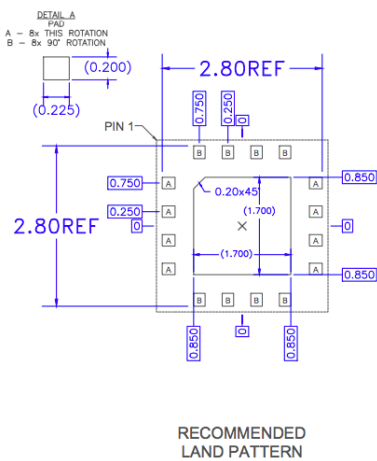
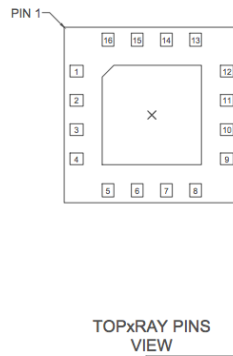
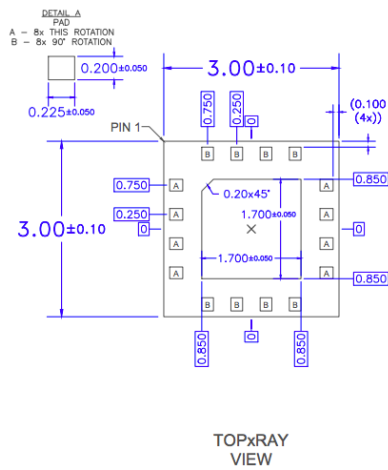
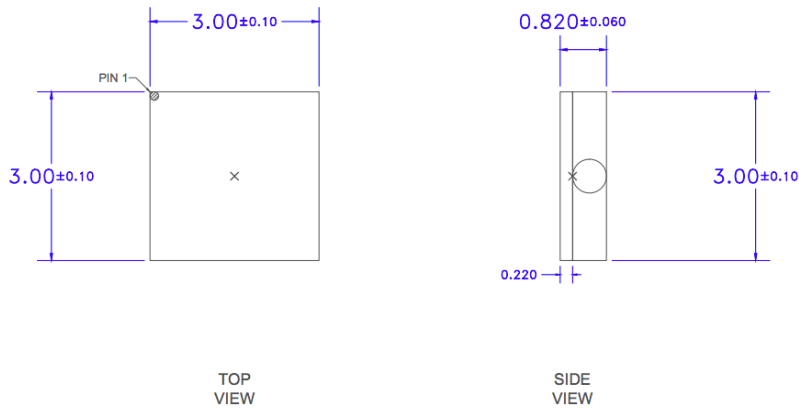


Top View

| Pin Number | Label | Description |
|-----------------|--------|--|
| 1 | PDET | DC power detector. Provides an output voltage proportional to the RF output power level |
| 2 | NC | No electrical connection. |
| 3 | VCC2 | 2 nd stage supply voltage |
| 4 | VCC1 | 1 st stage supply voltage |
| 5 | TX | RF input. Internally matched to 50 Ω and DC blocked. |
| 6 | PA_EN | Control pin. |
| 7 | GND | Ground connection. |
| 8 | RX | RF output from the low noise amplifier. Internally matched to 50 Ω and DC blocked. |
| 9 | LNA_EN | Control pin. |
| 10 | NC | No electrical connection. |
| 11 | NC | No electrical connection. |
| 12 | NC | No electrical connection. |
| 13 | NC | No electrical connection. |
| 14 | C_RX | Control pin. |
| 15 | NC | No electrical connection. |
| 16 | ANT | RF bi-directional antenna port. Internally matched to 50 Ω and DC blocked. |
| Backside Paddle | 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:
2. All dimensions are in millimeters. Angles are in degrees.
 3. Dimension and tolerance formats conform to ASME Y14.4M-1994.
 4. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

Handling Precautions

| Parameter | Rating | Standard |
|----------------------------------|----------------|-----------------------|
| ESD – Human Body Model (HBM) | Class 1C (1kV) | ANSI/ESD/JEDEC JS-001 |
| ESD – Charged Device Model (CDM) | Class C3 (1kV) | ANSI/ESD/JEDEC JS-002 |
| 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:

- Product uses RoHS Exemption 7c-I to meet RoHS Compliance requirements.
- PFOS 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:

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Email: customer.support@qorvo.com

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