



QPF4200

Wi-Fi Front End Module

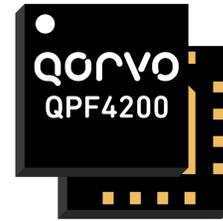
Product Overview

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.

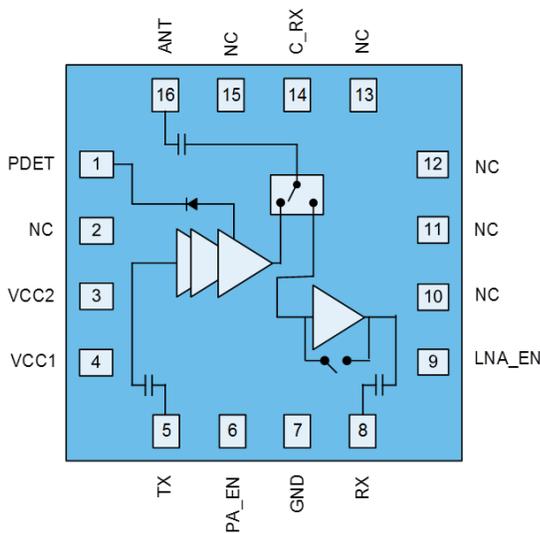
Integrated die level filtering for 2nd and 3rd harmonics as well as 5 GHz rejection for DBDC operation are included.

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

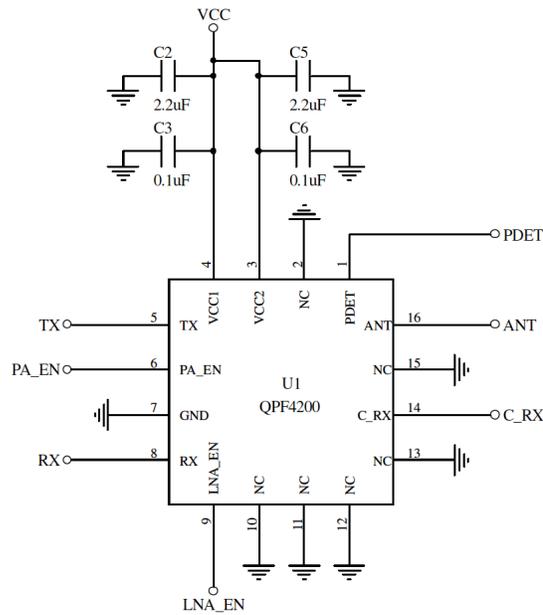
Parameter	Conditions	Min.	Typ.	Max.	Units
TRANSMIT (TX-ANT) MODE	Unless otherwise noted: V_{CC}=5V, T=+25°C, PA_EN=High, LNA_EN=Low, C_RX=Low				
Wi-Fi 6 HE40 Output Power	11ax MCS11 1024QAM		19		dBm
Dynamic EVM				-43	dB
Wi-Fi 5 VHT40 Output Power	11ac MCS8/9 256QAM	20	21		dBm
Dynamic EVM				-35	dB
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

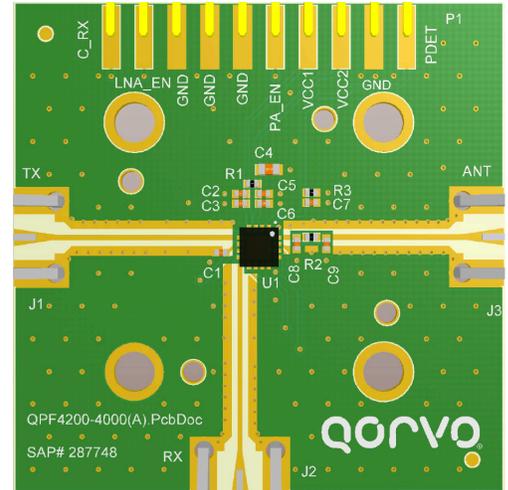
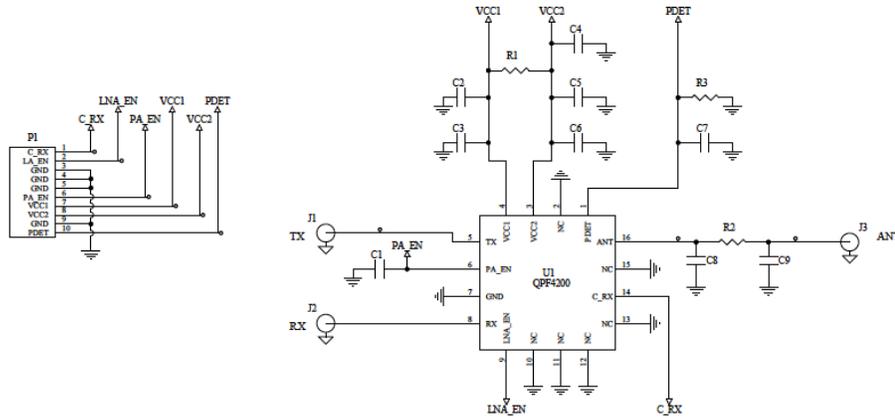
Logic Truth Table

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



Evaluation Board Schematic



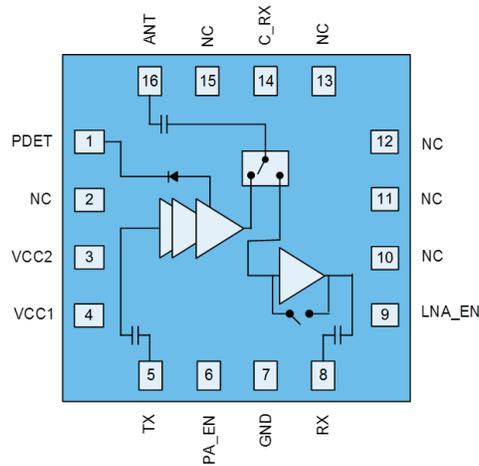
Bill of Material

Ref. Des.	Value	Description	Manuf.	Part number
-	-	Printed Circuit Board		
U1	-	2.4GHz Wi-Fi Front End Module	Qorvo	QPF4200
C3, C6	0.1 μ F	Capacitor, Chip, 10%, 10V, X5R, 0402	Taiyo Yuden	RM LMK105 BJ104KV-F
C2, C5	2.2 μ F	Capacitor, Chip, 20%, 6.3V, X5R, 0402	Murata	GRM155R60J225ME15D
C4	10 μ F	Capacitor, Chip, 20%, 25V, STD, 0603	TDK	C1608X5R1E106MT000E
R3	27.4 k Ω	Resistor, Chip, 1%, 1/10W, 0402	Panasonic	ERJ-2RKF2742X
R1, R2	0 Ω	Resistor, Chip, 5%, 1/10W, 0402	Kamaya	RMC1/16SJPTH
C1, C7, C8, C9	-	Do Not Install		

Notes:

1. R1 is populated on evaluation board. End user only needs to supply voltage to VCC1 or VCC2 on P1 and not both.

Pin Configuration and Description

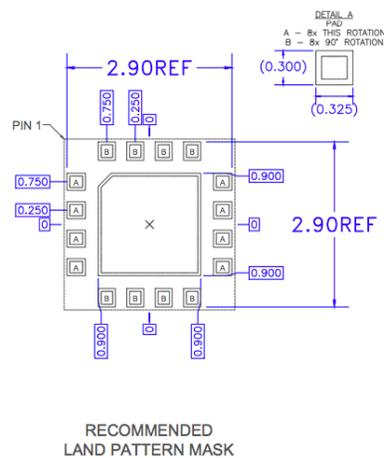
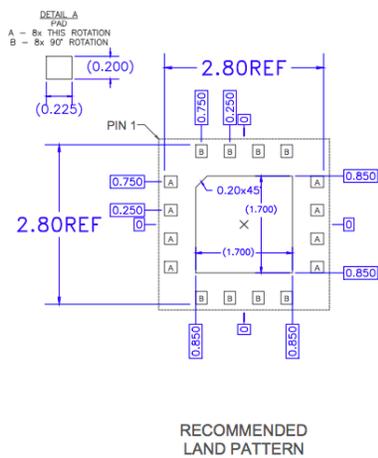
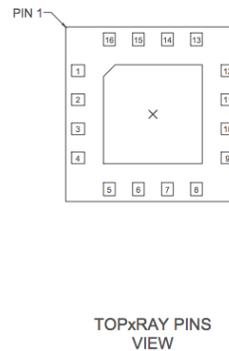
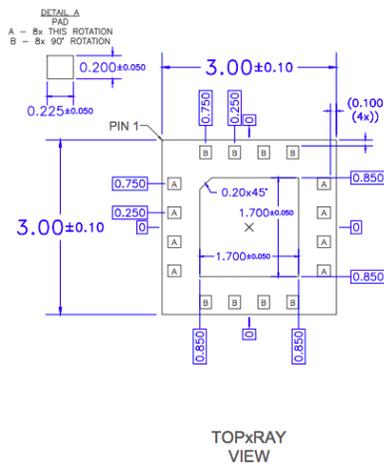
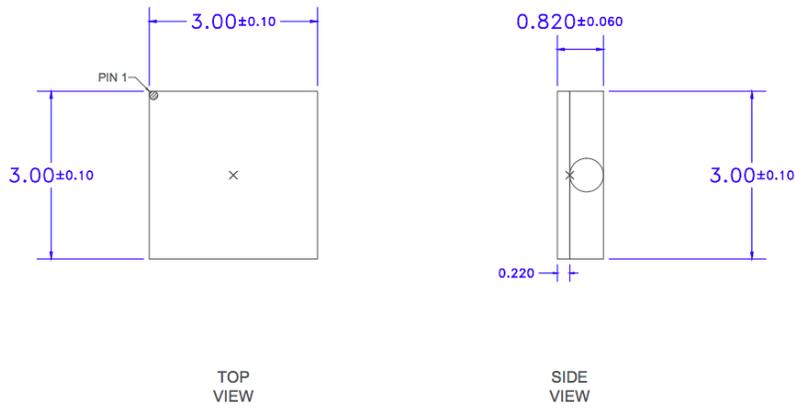


Top View

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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