QPF4219

Wi-Fi Front End Module

Product Overview

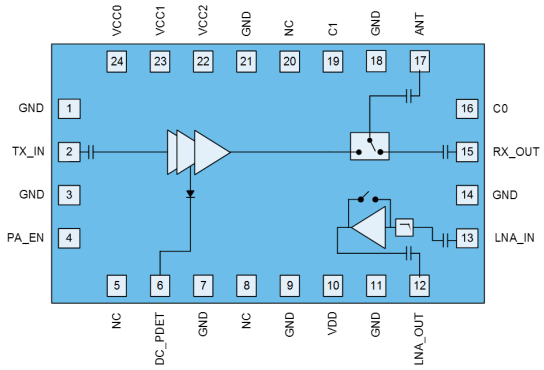
The Qorvo® QPF4219 is an integrated front end module (FEM) designed for Wi-Fi 5 (802.11ac) systems. The compact form factor and integrated matching minimizes layout area in the application.

Performance is focused on optimizing the PA for a 5V 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.

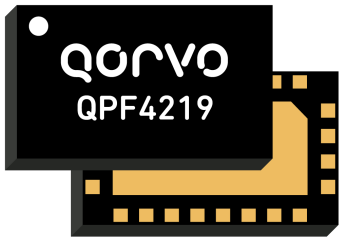
The receive path is pinned out so external filtering can be added in the optimal position. Integrated die level filtering for 2nd and 3rd harmonics as well as 5 GHz rejection for DBDC operation are included.

The QPF4219 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.

Functional Block Diagram



Top View



24 Pin 5x3 mm Laminate Package

Key Features

- 2400-2500 MHz
- P_{OUT} = +24.5 dBm MCS8/9 VHT40 -35 dB Dynamic EVM
- P_{OUT} = +25.5 dBm MCS7 HT20/40 -30 dB Dynamic EVM
- P_{OUT} = +26.5 dBm MCS0 HT20 Spectral Mask Compliance
- P_{OUT} = +28 dBm 802.11b Spectral Mask Compliance
- Optimized for +5 V Operation
- 33 dB Tx Gain
- 1.9 dB Noise Figure
- 15.5 dB Rx Gain & 7 dB Bypass Loss
- 15 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
QPF4219SB	Sample bag with 5 pieces
QPF4219SQ	Sample bag with 25 pieces
QPF4219SR	7” reel with 100 pieces
QPF4219TR13-5K	13” reel with 5,000 pieces
QPF4219EVB-01	Assembled Evaluation Board

Absolute Maximum Ratings

Parameter	Conditions	Rating
DC Supply Voltage		-0.5 to +6 V
Control Voltage		-0.5 to V_{CC}
Storage Temperature		-40 to 150 °C
Junction Temperature	MTTF > 30.30x10^6 hours	190 °C
	MTTF > 2.02x10^6 hours	210 °C
	MTTF > 1.03x10^6 hours	218 °C
RF Input Power at TX_IN	Into 50 Ω Load for 802.11b/g/n/ac (No Damage), Transmit Mode	+12 dBm
RF Input Power at ANT	(No Damage), Receive LNA On Mode	+10 dBm
RF Input Power at ANT	(No Damage), Receive Bypass Mode	+25 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} & V_{DD})	+4.75	+5	+5.25	V
Extended Device Voltage	+3.15		+5.25	V
Control Voltage – High (PA_EN, C0 & C1)	+1.6	+1.8	+3.6	V
Control Voltage – Low (PA_EN, C0 & C1)	0		+0.4	V
$T_{OPERATING}$*	-40		+85	°C

Electrical specifications are measured at specified test conditions. Extended Parameters have degraded performance but operational. Specifications are not guaranteed over all recommended operating conditions. $T_{OPERATING}$* is temperature at the package ground.

Electrical Specifications

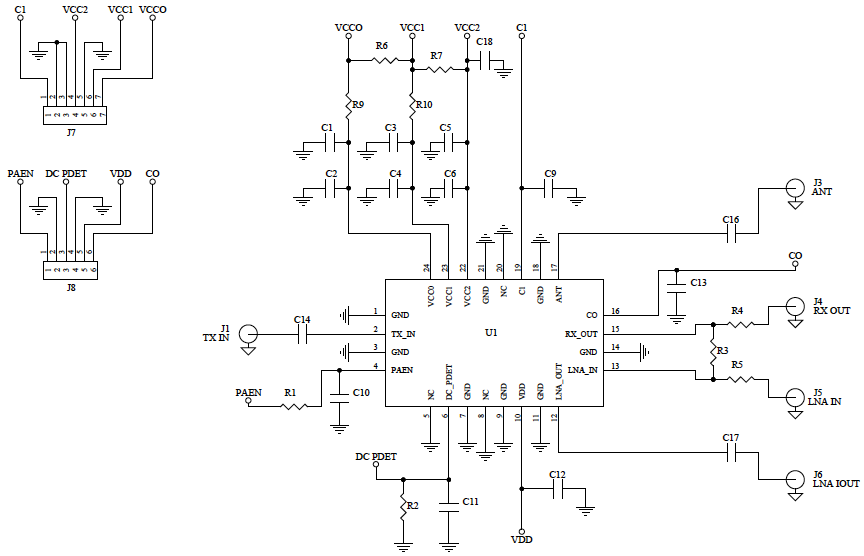
Parameter	Conditions	Min.	Typ.	Max.	Units
Transmit (TX_IN-ANT) Mode	**Unless otherwise noted: $V_{CC/DD}$=5V, T=+25ºC, PA_EN=High, C0=Low, C1=High**				
Wi-Fi 5 VHT40 Output Power	MCS8/9 1024QAM 11ac		22		dBm
Dynamic EVM				-40	dB
Wi-Fi 5 VHT20/40 Output Power	MCS8/9 256QAM 11ac	23	24.5		dBm
Dynamic EVM				-35	dB
Wi-Fi 4 HT20/40 Output Power	MCS7 64QAM 11n	24	25.5		dBm
Dynamic EVM				-30	dB
Margin to HT20 Spectral Mask	P_{OUT} = +26.5 dBm, 11n MCS0	0	3		dBc
Margin to 11b Spectral Mask	P_{OUT} = +28 dBm, 11b 1Mbps DSSS	0	3		dBc
Gain		31	33		dB
Gain Flatness	Across any 40 MHz Channel	-0.25		+0.25	dB

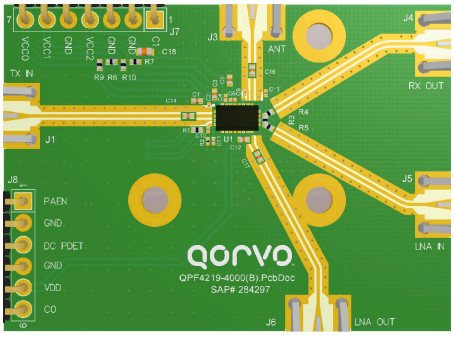
Parameter	Conditions	Min.	Typ.	Max.	Units
TX_IN Port Return Loss		10	14		dB
ANT Port Return Loss		10	12		dB
Quiescent Current	RF Off		220	255	mA
Operating Current	P_{OUT} = +24.5 dBm		360	390	mA
	P_{OUT} = +26.5 dBm		395	450	mA
	P_{OUT} = +28 dBm		510	550	mA
2nd Harmonics	P_{OUT} = +28 dBm 802.11b 1 MBps		-35	-30	dBm/MHz
3rd Harmonics	P_{OUT} = +28 dBm 802.11b 1 MBps		-55	-50	dBm/MHz
ANT-LNA_OUT Isolation			50		dB
DC Power Detect Voltage	RF Off		0.24		V
	P_{OUT} = +24.5 dBm		0.57		V
	P_{OUT} = +26.5 dBm		0.64		V
	P_{OUT} = +28 dBm		0.79		V
RECEIVE (ANT-LNA_OUT) LNA ON MODE	**Unless otherwise noted: $V_{CC/DD}$=5V, T=+25ºC, PA_EN=Low, C0=High, C1=Low Only through path between RX_OUT and LNA_IN**				
Gain			15.5		dB
Gain Flatness	Across any 40 MHz Channel	-0.25		+0.25	dB
Out of Band Gain	*f* = 5000-6000 MHz		-15		dB
Noise Figure			1.9	2.1	dB
LNA_OUT Port Return Loss		15	20		dB
ANT Port Return Loss		10	12		dB
Input P_{1dB}			-5		dBm
Input IP3			+10		dBm
Rx Operating Current			18	26	mA
RECEIVE (ANT-LNA_OUT) BYPASS MODE	**Unless otherwise noted: $V_{CC/DD}$=5V, T=+25ºC, PA_EN=Low, C0=High, C1=High, Only through path between RX_OUT and LNA_IN**				
Bypass Loss	Across any 40 MHz Channel		7		dB
Loss Flatness		-0.25		+0.25	dB
Out of Band Gain	*f* = 5000-6000 MHz		-22		dB
LNA_OUT Port Return Loss		9	12		dB
ANT Port Return Loss		9	12		dB
Input P_{1dB}			+27		dBm
Input IP3			+41		dBm
GENERAL SPECIFICATIONS	**Unless otherwise noted: $V_{CC/DD}$=5V, T=+25ºC, Switching Time Power Accuracy +/-1dB**				
Control Current - High				1	µA
Control Current - Low				100	nA
TX Output P_{1dB}	CW		+32.5		dBm
Switching Time	Transmit to LNA On or Bypass Mode			400	nS
	LNA On to Bypass Mode			200	nS
	Bypass to LNA On Mode			200	nS
	LNA On or Bypass to Transmit Mode			400	nS
PA Stability - Output VSWR	CW No Spurious above -41.25dBm/MHz		4:1		
Output Power Range		0		28	dBm
Thermal Resistance, θ_{jc}	Junction to case		31		°C/W

Logic Truth Table

Mode	PA_EN	C0	C1
Transmit	High	Low	High
LNA On	Low	High	Low
Bypass	Low	High	High
All Off	Low	Low	Low
Not Supported	All Other States		

Evaluation Board Schematic and Layout



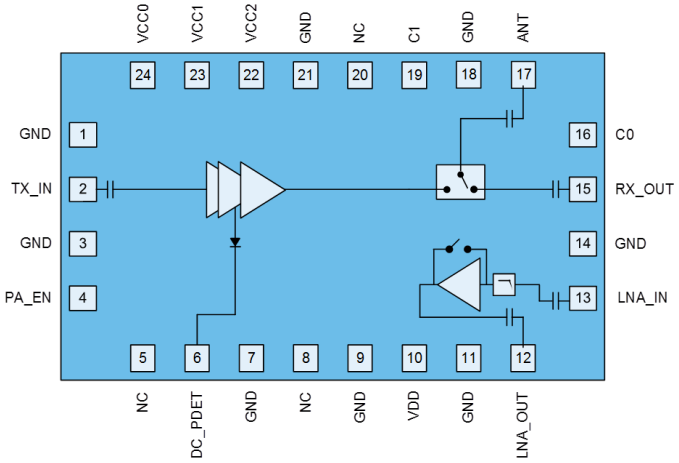


Bill of Material

Ref. Des.	Value	Description	Manuf.	Part number
-	-	Printed Circuit Board		
U1	-	2.4GHz Wi-Fi Front End Module	Qorvo	QPF4219
C12	0.1 µF	Capacitor, Chip, 10%, 10V, X5R, 0402	Taiyo Yuden	RM LMK105 BJ104KV-F
C14, C16, C17	100 pF	Capacitor, Chip, 5%, 50V, C0G, 0402	Murata	GRM1555C1H101JA01D
C1, C3, C5	2.2 µF	Capacitor, Chip, 20%, 6.3V, X5R, 0402	Murata	GRM155R60J225ME15D
C9, C10, C13	100 pF	Capacitor, Chip, 5%, 25V, C0G, 0201		
C2, C4, C6	0.1 µF	Capacitor, Chip, 10%, 16V, X5R, 0201		
R1, R3, R9, R10	0 Ω	Resistor, Chip, 5%, 1/10W, 0402	Kamaya	RMC1/16SJPTH
R2	27K Ω	Resistor, Chip, 5%, 1/16W, 0201	Kamaya	RMC1/20-273JPA15
C11, C18, R4, R5, R6, R7	-	Do Not Install		

Notes:
1. R6 and R7 are not installed on EVB so VCC0, VCC1 & VCC2 should be tied to a single supply.

Pin Configuration and Description

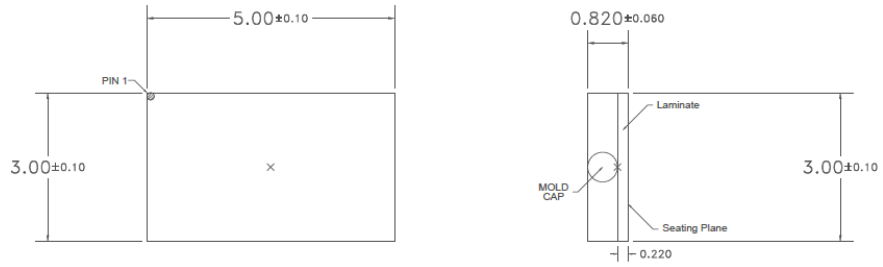


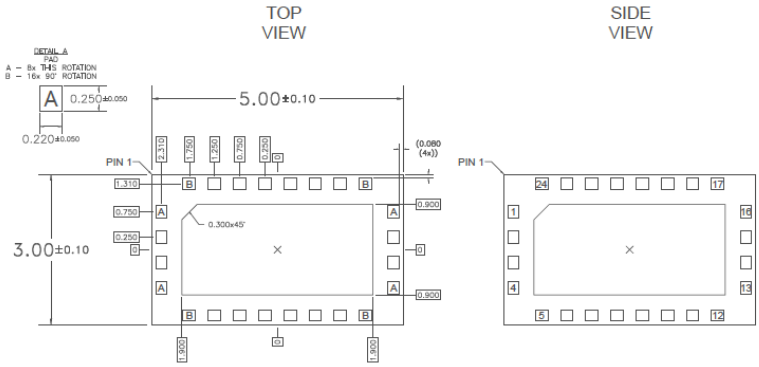
Top View

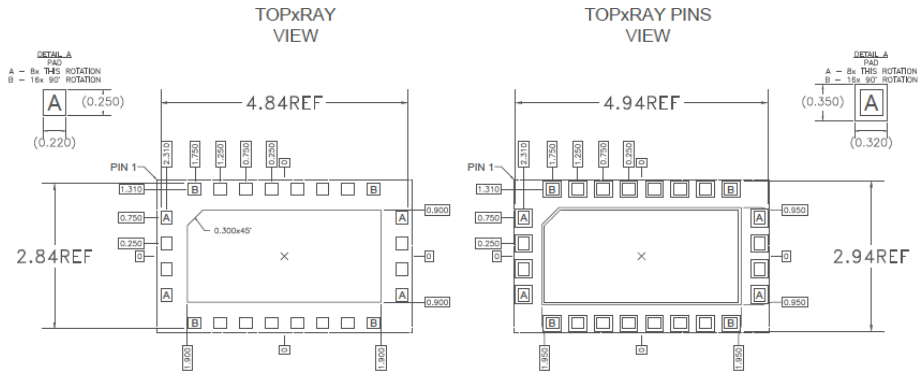
Pin Number	Label	Description
1	GND	No electrical connection. Recommend connect to ground.
2	TX_IN	RF input. Internally matched to 50 Ω and DC blocked.
3	GND	No electrical connection. Recommend connect to ground.
4	PA_EN	Control pin.
5	NC	No electrical connection.
6	DC_PDET	DC power detector. Provides an output voltage proportional to the RF output power level
7	GND	Ground connection.
8	NC	No electrical connection. Recommend connect to ground.
9	GND	No electrical connection. Recommend connect to ground.
10	VDD	Supply voltage.
11	GND	Ground connection.
12	LNA_OUT	RF output from the low noise amplifier. Internally matched to 50 Ω and DC blocked.
13	LNA_IN	RF input to the low noise amplifier. Internally matched to 50 Ω and DC blocked.
14	GND	No electrical connection. Recommended connect to Ground.
15	RX_OUT	RF output from the RX branch of the T/R switch. Internally matched to 50 Ω and DC blocked.
16	C0	Control pin.
17	ANT	RF bi-directional antenna port. Internally matched to 50 Ω and DC blocked.
18	GND	No electrical connection. Recommended connect to Ground.
19	C1	Control pin.
20	NC	No electrical connection. Recommend connect to ground.
21	GND	Ground connection.
22	VCC2	Supply voltage
23	VCC1	Supply voltage
24	VCC0	Supply voltage
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







RECOMMENDED LAND PATTERN

RECOMMENDED LAND PATTERN MASK

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 1B (500V)	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:

- Lead free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) 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.

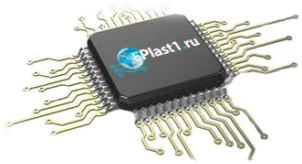
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.