



QPF4206

Wi-Fi Front End Module

Product Overview

The Qorvo® QPF4206 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 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. .

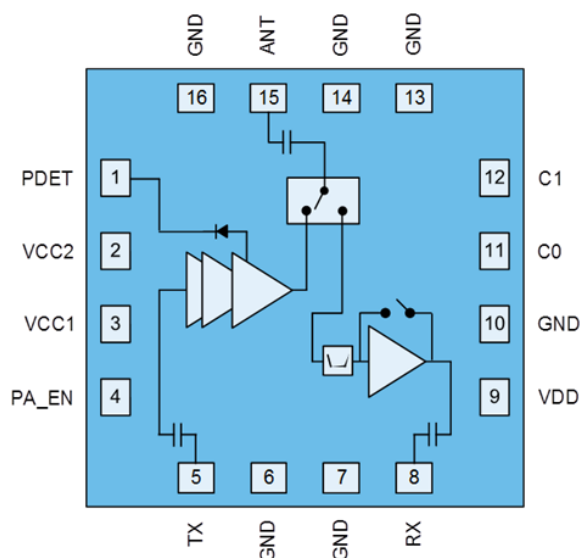
Another key feature is the integration of a logarithmic power detector which enables power accuracy at lower powers.

The QPF4206 integrates a 2GHz power amplifier (PA), regulator, single pole two throw switch (SP2T), and a bypassable low noise amplifier (LNA).



16 Pin 3x3 mm Laminate Package

Functional Block Diagram



Key Features

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

Applications

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

Ordering Information

Part Number	Description
QPF4206SB	Sample bag with 5 pieces
QPF4206SQ	Sample bag with 25 pieces
QPF4206SR	7" reel with 100 pieces
QPF4206TR13-5K	13" reel with 5000 pieces
QPF4206EVB01	Assembled Evaluation Board

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.
- 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

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Product Overview

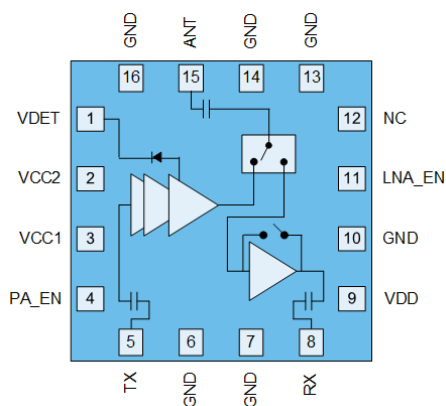
The Qorvo® QPF4211 is an integrated medium power front end module (FEM) designed for Wi-Fi 6 (802.11ax) systems. The small form factor and integrated matching minimizes layout area in the application.

Performance is focused on optimizing the PA for a 5V supply voltage, while providing optional operation over a wide range, 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. An DC power detector with a voltage output provides feedback.

The QPF4211 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



16 Pad 2.5 x 2.5 mm Laminate Package

Key Features

- 2412-2484 MHz
- $P_{OUT} = +19$ dBm MCS11 HE40 -43dB Dynamic EVM
- $P_{OUT} = +22.5$ dBm MCS9 HT40 -35dB Dynamic EVM
- $P_{OUT} = +23.5$ dBm MCS7 HT20/40 -30dB Dynamic EVM
- $P_{OUT} = +25.5$ dBm MCS0 HT20 Spectral Mask Compliance
- Optimized for +5 V Operation while maintaining a wider range of capability
- 33 dB Tx Gain
- 1.8 dB Noise Figure
- 15 dB Rx Gain & 7 dB Bypass Loss
- 12 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
QPF4211SB	Sample bag with 5 pieces
QPF4211SR	7" reel with 100 pieces
QPF4211TR13	13" reel with 10,000 pieces
QPF4211EVB	Assembled Evaluation Board

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 2 (2000V)	ANSI/ESD/JEDEC JS-001
ESD – Charged Device Model (CDM)	Class C3 (1000V)	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: Electroless Ni/Electroless Pd/Immersion Au (ENEPIG)

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.
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- SVHC Free
- PFOS Free

Contact Information

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PRELIMINARY

QPF4216

Wi-Fi Front End Module

Product Overview

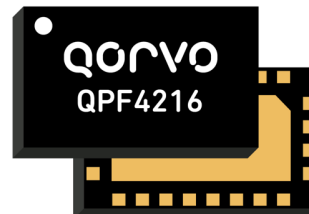
The Qorvo® QPF4216 is an integrated front end module (FEM) designed for Wi-Fi 802.11ax systems. The compact form factor and integrated matching minimizes layout area in the application.

Performance is focused on optimizing the PA for a 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.

A key feature is the integration of a logarithmic power detector which enables power control across the entire power spectrum for applications which use higher gain antennas or end users wanting to reduce device calibration time in production.

The QPF4216 integrates a 2.4 GHz power amplifier (PA), regulator, single pole two throw switch (SP2T), bypassable low noise amplifier (LNA) into a single device.

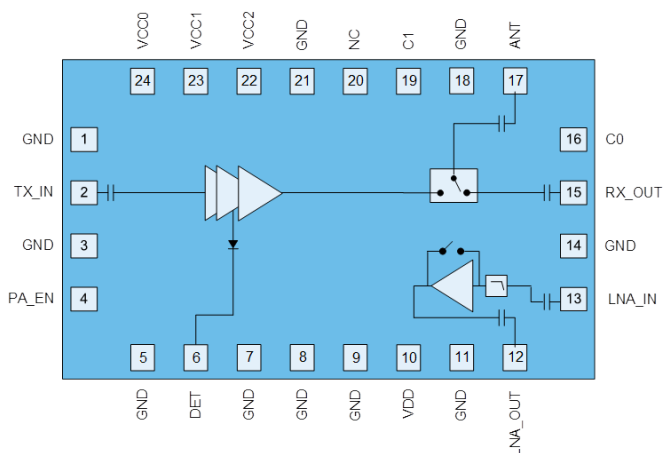


24 Pin 5x3 mm Laminate (LGA) Package

Key Features

- 2400-2500 MHz
- $P_{OUT} = +22$ dBm MCS11 HE40 -43 dB Dynamic EVM
- $P_{OUT} = +24$ dBm MCS8/9 VHT40 -35 dB Dynamic EVM
- $P_{OUT} = +25$ dBm MCS7 HT20/40 -30 dB Dynamic EVM
- $P_{OUT} = +26$ dBm MCS0 HT20 Spectral Mask Compliance
- Optimized for +5 V Operation
- 32 dB Tx Gain
- 1.8 dB Noise Figure
- 15.5 dB Rx Gain & 7 dB Bypass Loss
- 15 dB 5 GHz Rejection on Rx Path
- Integrated Quasi-Log Power Detector

Functional Block Diagram



Top View

Applications

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

Ordering Information

Part Number	Description
QPF4216SB	Sample bag with 5 pieces
QPF4216SQ	Sample bag with 25 pieces
QPF4216SR	7" reel with 100 pieces
QPF4216TR13-5K	13" reel with 5,000 pieces
QPF4216EVB-01	Assembled Evaluation Board

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 (C₁₅H₁₂Br₄O₂) Free
- SVHC Free



Contact Information

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QPF4219

Wi-Fi Front End Module

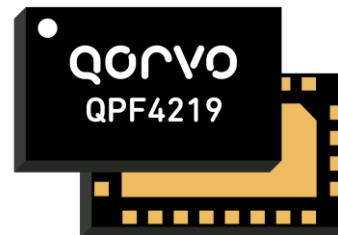
Product Overview

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.

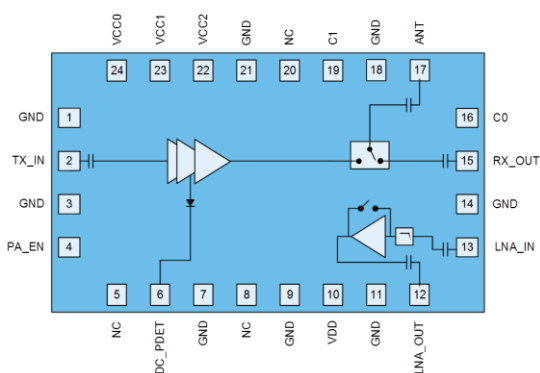


24 Pin 5x3 mm Laminate Package

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

Functional Block Diagram



Top View

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



Handling Precautions

QPF4219

Wi-Fi Front End Module

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 (C₁₅H₁₂Br₄O₂) Free
- SVHC Free



Contact Information

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QPF4230

Wi-Fi Front End Module

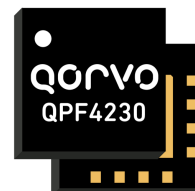
Product Overview

The Qorvo® QPF4230 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 3.3V 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. For power control feedback, a DC power detector which has voltage output has been integrated.

The QPF4230 integrates a 2.4GHz power amplifier (PA), regulator, single pole three throw switch (SP3T), low noise amplifier (LNA) and coupler into a single device.

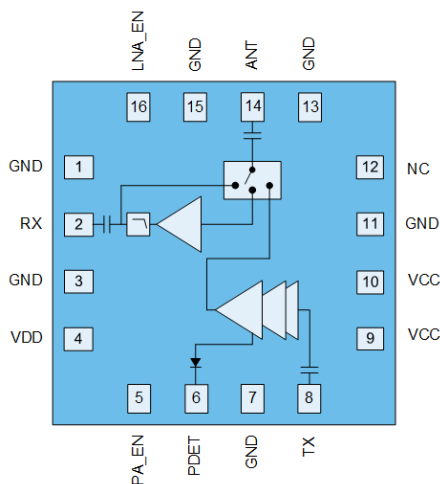


16 Pin 3x3 mm Laminate Package

Key Features

- 2412-2484MHz
- $P_{OUT} = +14\text{dBm}$ MCS11 HE40 -43dB Dynamic EVM
- $P_{OUT} = +17\text{dBm}$ MCS9 VHT40 -35dB Dynamic EVM
- $P_{OUT} = +18\text{dBm}$ MCS7 HT20/40 -30dB Dynamic EVM
- $P_{OUT} = +21\text{dBm}$ MCS0 HT20 Spectral Mask Compliance
- Optimized for +3.3V Operation
- 0.5W Power Consumption at $P_{OUT} = +18\text{dBm}$
- 33dB Tx Gain
- 2.1dB Noise Figure
- 15dB Rx Gain & 6dB Bypass Loss
- 15dB 5GHz Rejection on Rx Path
- Integrated DC Power Detector

Functional Block Diagram



Top View

Applications

- Access Points
- Wireless Routers
- Client Equipment
- Customer Premise Equipment
- Internet of Things

Ordering Information

Part Number	Description
QPF4230SB	Sample bag with 5 pieces
QPF4230SQ	Sample bag with 25 pieces
QPF4230SR	7" reel with 100 pieces
QPF4230TR13-5K	13" reel with 5,000 pieces
QPF4230EVB-01	Assembled Evaluation Board

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1B (750V)	ANSI/ESD/JEDEC JS-001
ESD – Charged Device Model (CDM)	Class C2b (750V)	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 (C₁₅H₁₂Br₄O₂) Free
- SVHC Free



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QPF4288

Wi-Fi Front End Module

Product Overview

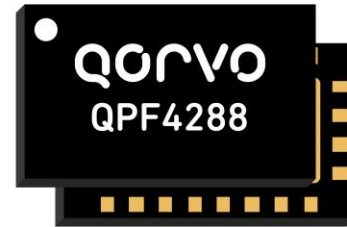
The Qorvo® QPF4288 is an integrated front end module (FEM) designed for Wi-Fi 6 (802.11ax) systems. The compact form factor and integrated matching minimizes layout area in the application.

Performance is focused on optimizing the PA for a 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.

There are two options for power detect, a DC power detector which has voltage output and an RF power detector with an RF output from a directional coupler.

The QPF4288 integrates a 2.4 GHz power amplifier (PA), regulator, single pole two throw switch (SP2T), bypassable low noise amplifier (LNA) and coupler into a single device

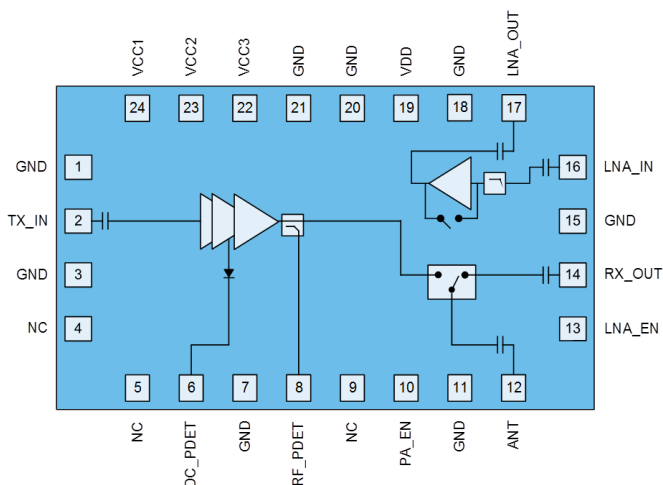


24 Pin 5x3 mm Laminate Package

Key Features

- 2400-2500 MHz
- $P_{OUT} = +17$ dBm HE40 -47dB Dynamic EVM
- $P_{OUT} = +22$ dBm HE40 -43dB Dynamic EVM
- $P_{OUT} = +24.5$ dBm MCS9 HT40 -35dB Dynamic EVM
- $P_{OUT} = +26$ dBm MCS7 HT20/40 -30dB Dynamic EVM
- $P_{OUT} = +28$ dBm MCS0 HT20 Spectral Mask Compliance
- Optimized for +5 V Operation
- 33 dB Tx Gain
- 1.7 dB Noise Figure
- 15.5 dB Rx Gain & 7 dB Bypass Loss
- >10dB 5 GHz Rejection on Rx Path
- Integrated RF Power Detector Coupler as well as DC Power Detector

Functional Block Diagram



Top View

Applications

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

Ordering Information

Part Number	Description
QPF4288SB	Sample bag with 5 pieces
QPF4288SQ	Sample bag with 25 pieces
QPF4288SR	7" reel with 100 pieces
QPF4288TR13-5K	13" reel with 5,000 pieces
QPF4288EVB-01	Assembled Evaluation Board

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1B (500V)	ANSI/ESD/JEDEC JS-001
ESD – Charged Device Model (CDM)	Class C2b (750V)	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.
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- SVHC Free

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QPF4288 Data sheet REV. A - 1. Subject to change without notice. 2 of 2

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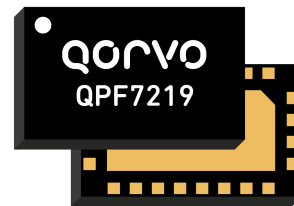
Product Overview

The Qorvo® QPF7219 is an integrated front end module (iFEM) designed for Wi-Fi 6 (802.11ax) systems which marries the advantages of active components with BAW filter technology. The compact form factor and integrated matching minimizes layout area in the application and greatly reduces the number of external components.

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 across all Wi-Fi channels 1 through 11 without need to reduce transmit power to meet the FCC regulatory limits. 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 QPF7219 integrates a 2.4 GHz power amplifier (PA) with power detector, FCC bandedge BAW filter, regulator, transmit-receive switch (SP2T) and bypassable low noise amplifier (LNA) into a single device.

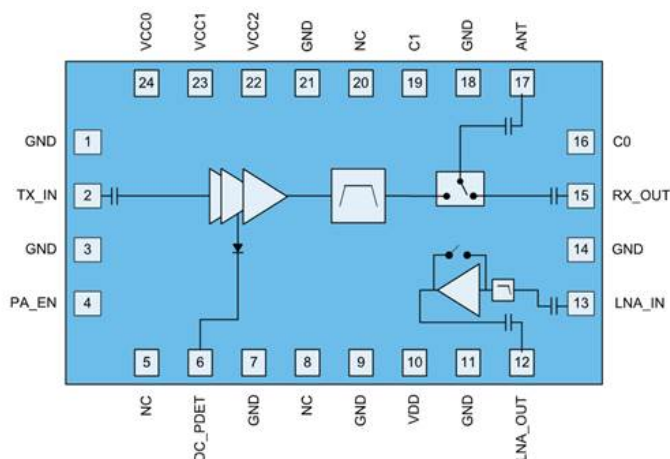


24 Pin 5x3 mm Laminate (LGA) Package

Key Features

- 2402-2472 MHz
- $P_{OUT} = +25$ dBm FCC Restricted Bandedge Compliance
- $P_{OUT} = +20$ dBm MCS11 HE40 -43 dB Dynamic EVM
- $P_{OUT} = +22.5$ dBm MCS9 VHT40 -35 dB Dynamic EVM
- $P_{OUT} = +23.5$ dBm MCS7 HT20/40 -30 dB Dynamic EVM
- $P_{OUT} = +25$ dBm MCS0 HT20 Spectral Mask Compliance
- Optimized for +5 V Operation
- 31 dB Tx Gain
- 2 dB Noise Figure
- 15.5 dB Rx Gain & 6.5 dB Bypass Loss

Functional Block Diagram



Top View

Applications

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

Ordering Information

Part Number	Description
QPF7219SB	Sample bag with 5 pieces
QPF7219SQ	Sample bag with 25 pieces
QPF7219SR	7" reel with 100 pieces
QPF7219TR13	13" reel with 2,500 pieces
QPF7219EVB-01	Assembled Evaluation Board

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:

- 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

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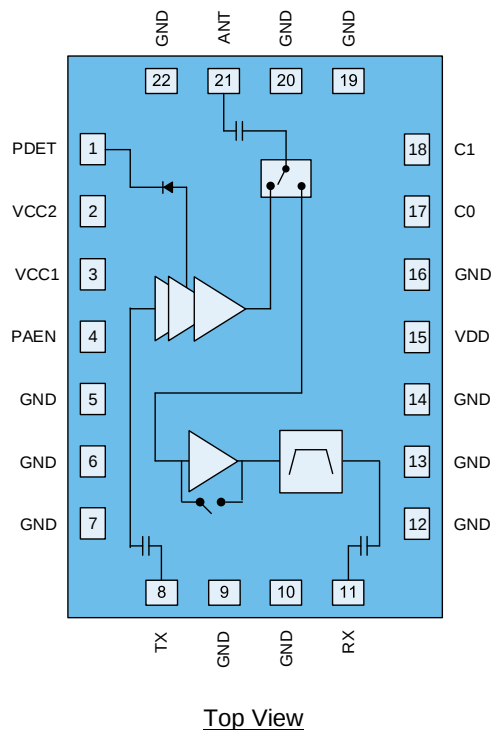
General Description

The QPF7221 provides a complete integrated solution in a single front end module (FEM) for Wi-Fi 802.11b/g/n/ac/ax systems. The small form factor and integrated matching minimizes layout area in the application and greatly reduces the number of external components.

The FEM allows true 5V supply without any modifications to the supply lines and performance is a balance of maximizing on highest linear output power and leading edge throughput. The FEM also provides state of the art LTE coexistence Rx immunity for maximum range and coverage by integrating high performance temperature stable BAW filtering on receive chain.

The QPF7221 integrates a 2GHz power amplifier (PA), single pole two throw switch (SP2T) and bypassable low noise amplifier (LNA) and an Rx BAW filter into a single device.

Functional Block Diagram



22 Pad 3 x 4.5 x 1 mm Laminate Package

Product Features

- 2.4GHz Wi-Fi Channel 1 through 13
- Integrated Rx coexistence BAW with 40 dB rejection in LTE bands & 5GHz
- $P_{OUT} = +22\text{dBm}$ MCS7 HT40 -30dB Dynamic EVM
- $P_{OUT} = +21\text{dBm}$ MCS8 HT40 -35dB Dynamic EVM
- $P_{OUT} = +18\text{dBm}$ MCS11 HE40 -43dB Dynamic EVM
- $P_{OUT} = +25\text{dBm}$ MCS0 Spectral Mask Compliance
- Optimized for +5 V supply (supports 3.3V operation)
- 34 dB Tx Gain
- 2.0 dB Noise Figure
- 15 dB Rx Gain & 10.5 dB Bypass Loss

Applications

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

Ordering Information

Part No.	Description
QPF7221SB	Sample bag with 5 pieces
QPF7221SQ	Sample bag with 25 pieces
QPF7221SR	7" reel with 100 pieces
QPF7221TR13	13" reel with 5000 pieces
QPF7221PCK-01	Assembled Evaluation Board

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1C	ANSI/ESDA/JEDEC JS-001
ESD – Charged Device Model (CDM)	Class C3	ANSI/ESDA/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 temp.) and tin/lead (245°C max. reflow temp.) soldering processes.
Solder profiles available upon request.

Contact plating: NiAu

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:

- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sa

Tel: 1-844-890-8163

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QPF8248

Wi-Fi Front End Module

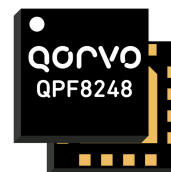
Product Overview

The Qorvo® QPF8248 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 a balance of efficiency versus linear power that increases the range and throughput of connections. Control lines are reduced to a two pin scheme.

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

The QPF8248 integrates a 2.4 GHz power amplifier (PA), single pole three throw switch (SP3T) and low noise amplifier (LNA) into a single device.

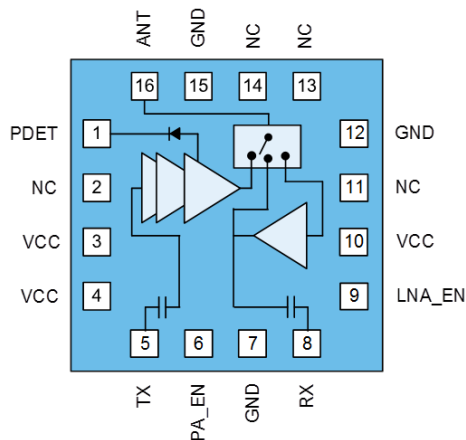


16 Pad 2.3x2.3 mm Laminate Package

Key Features

- 2412 – 2484 MHz
- $P_{OUT} = +17.5$ dBm MCS8/9 VHT40 -35 dB Dynamic EVM
- $P_{OUT} = +19$ dBm MCS7 HT20/40 -30 dB Dynamic EVM
- $P_{OUT} = +20$ dBm 802.11g -28 dB Dynamic EVM
- $P_{OUT} = +23$ dBm 802.11b Spectral Mask Compliance
- Optimized for +3.3 V Operation
- Low Power Mode Enabled
- 28.5 dB Tx Gain
- 2.5 dB Noise Figure
- 13.5 dB Rx Gain & 1.4 dB Bypass Loss
- Integrated DC Power Detector

Functional Block Diagram



Top View

Applications

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

Ordering Information

Part Number	Description
QPF8248SB	Sample bag with 5 pieces
QPF8248SQ	Sample bag with 25 pieces
QPF8248SR	7" reel with 100 pieces
QPF8248TR13	13" reel with 10,000 pieces
QPF8248PCK410	Assembled Evaluation Board + 5 pcs

Absolute Maximum Ratings

Parameter	Conditions	Rating
DC Supply Voltage		-0.5 to +6 V
Control Voltage	PA_EN & PNA_EN	-0.5 to +V _{CC} V
Storage Temperature		-40 to 150 °C
Junction Temperature	MTTF > 0.7 x10 ⁶ hours MTTF > 1.0 x10 ⁶ hours	160 °C 150 °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	+5 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
Device Voltage (V _{CC} & V _{DD})	+3	+3.3	+4.2	V
Extended Device Voltage (V _{CC})	+3		+5.25	V
Control Voltage – High (PA_EN & LNA_EN)	+2.8	+2.95	V _{CC}	V
Control Voltage – Low (PA_EN & LNA_EN)	0		+0.2	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 package ground.

Electrical Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
TRANSMIT (TX-ANT) HIGH POWER	Unless otherwise noted: V_{CC}=3.3V, T=+25°C, PA_EN=High, LNA_EN=Low				
Wi-Fi 5 VHT20/40 Output Power	11ac MCS8/9 256QAM	16.5	17.5		dBm
Dynamic EVM				-35	dB
Wi-Fi 4 HT20/40 Output Power	11n MCS7 64QAM		19		dBm
Dynamic EVM				-30	dB
11g Output Power	OFDM 54Mbps	19	20		dBm
Dynamic EVM				-28	dB
Margin to HT20 Spectral Mask	P _{OUT} = +21 dBm, 11n MCS0		3	0	dBc
Margin to 802.11b Spectral Mask	P _{OUT} = +23 dBm, DSSS 1 Mbps		20	10	dBc
Gain		27	28.5		dB
Gain Flatness	Across any 40 MHz Channel	-0.25		+0.25	dB
TX Port Return Loss			6		dB
ANT Port Return Loss			15		dB
Quiescent Current	RF Off		140	160	mA
Operating Current	P _{OUT} = +17.5 dBm		190	225	mA

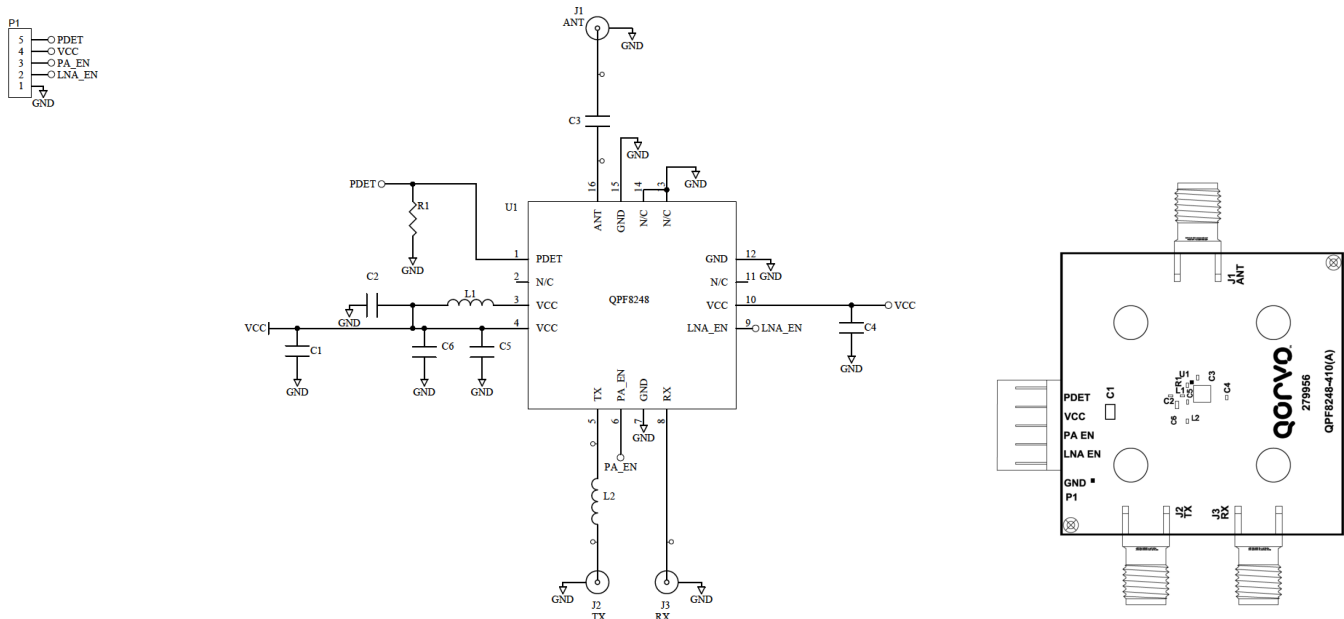
Parameter	Conditions	Min.	Typ.	Max.	Units
	P _{OUT} = +23 dBm		275	310	mA
2 nd Harmonics	P _{OUT} = +23 dBm 802.11b 1 Mbps		-25	-20	dBm/MHz
3 rd Harmonics	P _{OUT} = +23 dBm 802.11b 1 Mbps		-40	-35	dBm/MHz
ANT-RX Isolation			45		dB
DC Power Detect Voltage	RF Off		0.30		V
	P _{OUT} = +17.5 dBm		0.50		V
	P _{OUT} = +23dBm		0.68		V
TRANSMIT (ANT-RX) LOW POWER		Unless otherwise noted: V_{CC}=3.3V, T=+25°C, PA_EN=High, LNA_EN=High			
Wi-Fi 5 VHT20/40 Output Power	11ac MCS8/9 256QAM		12		dBm
Dynamic EVM				-35	dB
Gain			28		dB
Gain Flatness		-0.25		+0.25	dB
TX Port Return Loss			6		dB
ANT Port Return Loss			10		dB
Operating Current	P _{OUT} = +12 dBm		147		mA
	P _{OUT} = +17.5 dBm		175		mA
RECEIVE (ANT-RX) LNA ON MODE		Unless otherwise noted: V_{CC}=3.3V, T=+25°C, PA_EN=Low, LNA_EN=High			
Gain			13.5		dB
Gain Flatness Across any 40 MHz Channel		-0.2		+0.2	dB
Out of Band Gain	f = 5150-5925 MHz		-7.5		dB
Noise Figure			2.5	2.7	dB
RX Port Return Loss			9		dB
ANT Port Return Loss			4		dB
Input P _{1dB}			-5.5		dBm
Input IP3			+1		dBm
Rx Operating Current			9		mA
RECEIVE (ANT-RX) BYPASS MODE		Unless otherwise noted: V_{CC}=3.3V, T=+25°C, PA_EN=Low, LNA_EN=Low			
Bypass Loss			1.4		dB
Loss Flatness Across any 40 MHz Channel		-0.1		+0.1	dB
RX Port Return Loss			10		dB
ANT Port Return Loss			10		dB
Input P _{1dB}			+28		dBm
Input IP3			+40		dBm
GENERAL SPECIFICATIONS		Unless otherwise noted: V_{CC}=3.3V, T=+25°C			
FEM Leakage Current			11	20	μA
PA_EN Control Current - High			225	400	μA
LNA_EN Control Current - High			100	200	μA
TX Output P _{1dB}	CW		+27		dBm
Ramp ON/OFF Time	10<->90% Ref from Control Voltage to RF Power		200		nS
PA Stability - Output VSWR	CW No Spurious above -41.25dBm/MHz		4:1		

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Power Range		0		25	dBm
Thermal Resistance, θ_{jc}	Junction to case, MCS0 P _{OUT}		45		°C/W

Logic Truth Table

Mode	PA_EN	LNA_EN
Transmit – High Power	High	Low
Transmit – Low Power	High	High
LNA On	Low	High
Bypass	Low	Low

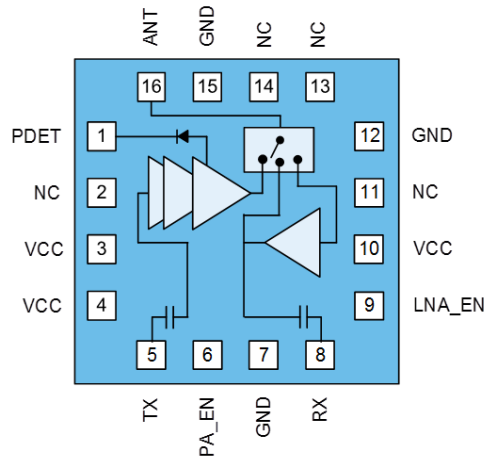
Evaluation Board Schematic and Layout



Bill of Material

Ref. Des.	Value	Description	Manuf.	Part number
-	-	Printed Circuit Board		
U1	-	2.4GHz Wi-Fi Front End Module	Qorvo	QPF8248
C6	1 μ F	Capacitor, Chip, 10%, 10V, X5R, 0402	AVX/Kyocera	0402ZD105KAT2A
C4	1000 pF	Capacitor, Chip, 10%, 25V, X7R, 0201	Samsung E-M	CL03B102KA3NNNC
C1	4.7 μ F	Capacitor, Chip, +80%/-20%, 10V, Y5V, 0805	Taiyo Yuden	CE LMK212 F475ZG-T
C3	10 pF	Capacitor, Chip, +/-0.5pF, 25V, C0G, 0201		
C2, C5	0.1 μ F	Capacitor, Chip, 10%, 6.3V, X5R, 0201		
R1	3.9K Ω	Resistor, Chip, 5%, 1/20W, 0201	Kamaya, Inc	RMC1/20-392JPA15
L2	1.8 nH	Inductor, Chip, +/- 0.3nH, M/L, 0201	Taiyo Yuden	LG HK 0603 1N8S-T
L1	3.3 nH	Inductor, Chip, +/- 0.1nH, T/F, 0201	Murata	LQP03TG3N3B02D

Pin Configuration and Description

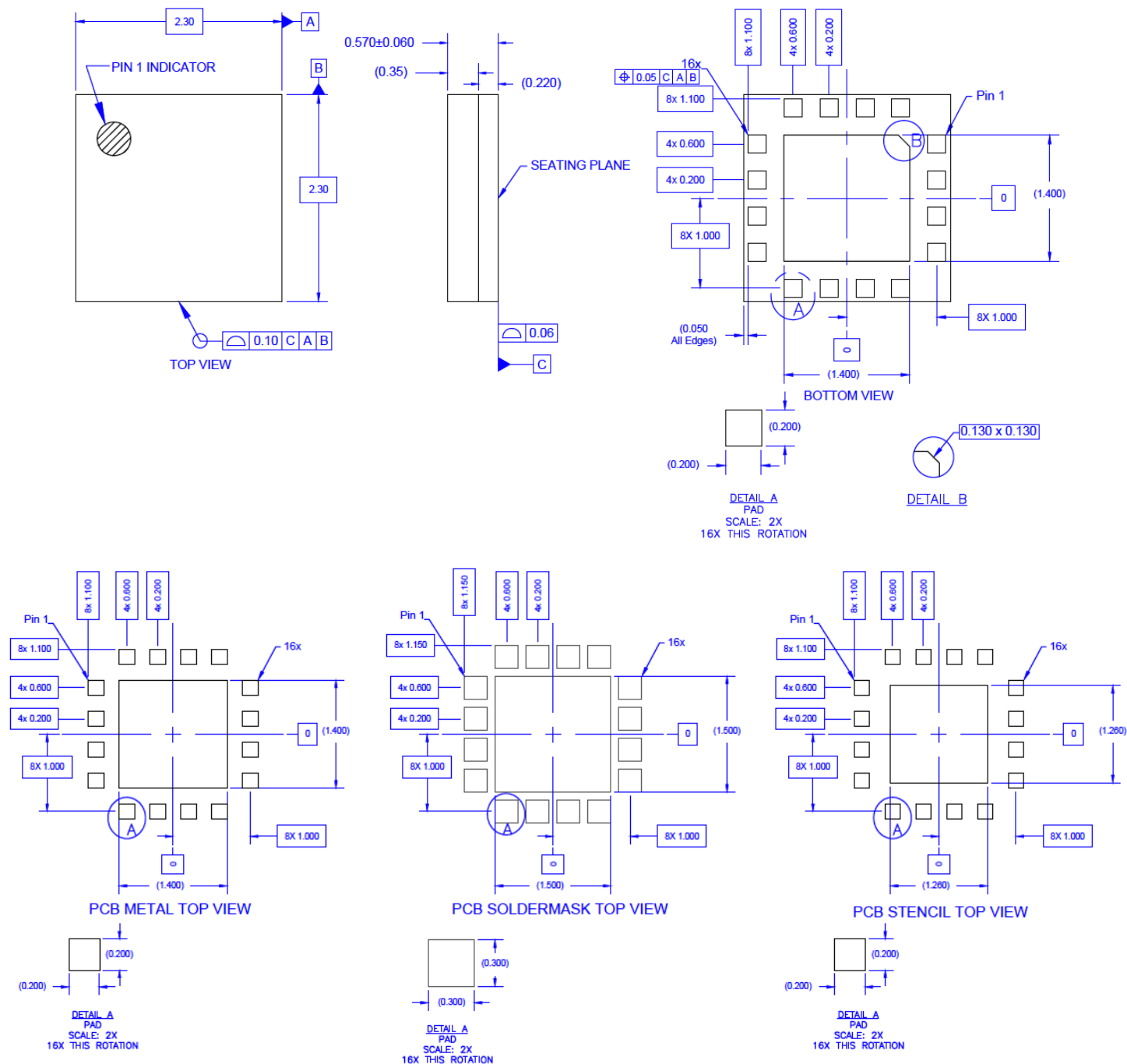


Top View

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. It may be left floating or connected to ground.
3	VCC	1 st and 2 nd stage supply voltage
4	VCC	3 rd stage supply voltage
5	TX	RF input. Internally matched to 50 Ω and DC Blocked.
6	PA_EN	Input enable bias voltage (Regulated internally)
7	GND	Ground connection.
8	RX	RF output from the low noise amplifier or bypass. Internally matched to 50 Ω and DC blocked.
9	LNA_EN	LNA enable bias voltage
10	VCC	LNA and regulator supply voltage
11	NC	No electrical connection. It may be left floating or connected to ground.
12	GND	Ground connection.
13	NC	No electrical connection. It may be left floating or connected to ground.
14	NC	No electrical connection. It may be left floating or connected to ground.
15	GND	Ground connection.
16	ANT	RF bi-directional antenna port. Internally matched to 50 Ω . An external DC block is required.
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:

1. All dimensions are in millimeters. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.5-2009.
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)	Class 1C	ANSI/ESD/JEDEC JS-001
ESD – Charged Device Model (CDM)	Class C3	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: Electroless Ni/Electroless Pd/Immersion Au (ENEPIG)

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

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Tel: 1-844-890-8163

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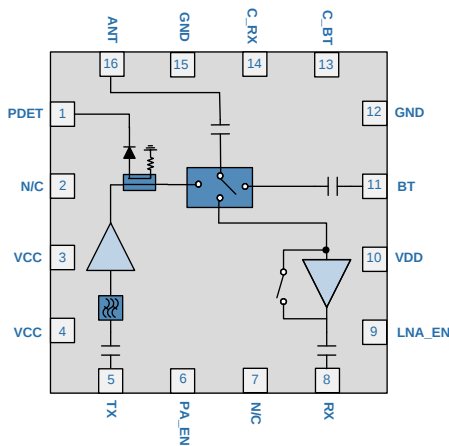
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RFFM4203

3.0V to 5.0V, 2.4GHz to 2.5GHz
802.11b/g/n/ac WiFi Front End Module

The RFFM4203 provides a complete integrated solution in a single front end module (FEM) for WiFi 802.11b/g/n/ac and Bluetooth® systems. The ultra-small form factor and integrated matching greatly reduces the number of external components and layout area in the customer application. This simplifies the total front end solution by reducing the bill of materials, system footprint, and manufacturability cost. The RFFM4203 integrates a 2.4GHz to 2.5GHz power amplifier (PA), low noise amplifier (LNA) with bypass mode, power detector coupler for improved accuracy, and some filtering for harmonic rejection. The device is provided in a 3mm x 3mm x 1.05mm, 16-pin package. This module meets or exceeds the RF front end needs of IEEE 802.11b/g/n/ac WiFi RF systems.



Functional Block Diagram

Ordering Information

RFFM4203SB	Standard 5 piece bag
RFFM4203SQ	Standard 25 piece bag
RFFM4203SR	Standard 100 piece reel
RFFM4203TR7	Standard 2500 piece reel
RFFM4203PCK-410	Fully assembled evaluation board w/ 5 piece bag



Package: Laminate, 16-pin,
3.0mm x 3.0mm x 1.05mm

Features

- Integrated 2.4GHz to 2.5GHz b/g/n/ac Amplifier, LNA with Bypass Mode, SP3T Switch, and Power Detector Coupler
- Single Supply Voltage 3.0V to 5V
- $P_{OUT} = 21.5\text{dBm}$, 5V <3% Dynamic EVM
- $P_{OUT} = 19\text{dBm}$, 3.3V <3% Dynamic EVM

Applications

- IEEE802.11b/g/n/ac WiFi Applications
- 2.4GHz to 2.5GHz ISM Band Solutions
- Portable Battery-Powered Equipment
- WiFi Access Points, Gateways, and Set Top Boxes

Absolute Maximum Ratings

Parameter	Rating	Unit
DC Supply Voltage (Continuous with No Damage)	5.4	V
DC Supply Current	500	mA
Operating Temperature Range	-40 to +85	°C
Storage Temperature	-40 to +150	°C
Maximum Tx Input Power into 50W Load	+10	dBm
Maximum Rx Input Power for both High Gain and Bypass Modes (No Damage)	+10	dBm
Moisture Sensitivity	MSL3	



Caution! ESD sensitive device.



RFMD Green: RoHS status based on EU Directive 2011/65/EU (at time of this document revision), halogen free per IEC 61249-2-21, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

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. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

Nominal Operating Parameters

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Typical Condition 3.3V					Temperature = -10°C to +70°C, V_{CC} = 3.3V, PA_EN = High, P_{OUT} = 19dBm using an IEEE802.11n MCS7 waveform unless otherwise noted.
Tx Performance - 11g/n/ac					Compliance with standard 802.11g/n/ac
Frequency	2412		2484	MHz	
802.11n Output Power	18.5	19		dBm	802.11n HT20 and HT40 MCS7 at 25°C
11n Dynamic EVM		2.5	3	%	
		-32	-30.5	dB	
802.11ac Output Power	16.5	17		dBm	802.11ac HT40 MCS9 at 25°C
11ac Dynamic EVM		1.5	1.8	%	
			-35	dB	
Tx Performance - Spectral Mask					
802.11n Output Power		21		dBm	802.11n HT20 and HT40 MCS7 at 25°C
802.11b Output Power		24		dBm	Meet 802.11b DSSS 1Mbps Spectral Mask
General Tx Performance					
Second Harmonic		-24	-20	dBm/MHz	At P _{OUT} = 19dBm
Third Harmonic		-50	-42	dBm/MHz	
Gain	25	27	29	dB	
Gain Variation Over Temp	-2		+2	dB	
Power Detect Voltage	0.11	0.125	.014	V	RF = off
	0.7	0.8	0.9	V	At rated P _{OUT}
Power Detect Accuracy	-2.0		+2.0	dB	Into 3:1 VSWR load at 25°C
Input Return Loss - Tx_in pin		-13	-10	dB	In specified frequency band
Output Return Loss at ANT pin		-15	-10	dB	
Operating Current		210	230	mA	At rated P _{OUT} 19dBm
		195	215	mA	At rated P _{OUT} 17dBm
Quiescent Current		170		mA	Nominal conditions; no RF applied
Leakage Current		2	10	μA	V _{CC} = 3.3V, PA_EN = Low, C_RX = Low, LNA_EN = Low
Power Added Efficiency		10.5		%	Nominal conditions
Power Supply - V _{CC}	3.0	3.3	3.6	V	

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Typical Condition 3.3V (continued)					Temperature = -10°C to +70°C, V_{CC} = 3.3V, PA_EN = High, P_{OUT} = 19dBm using an IEEE802.11n MCS7 waveform unless otherwise noted.
VCONTROL High (PA_EN, C_RX, C_BT, LNA_EN)	2.8	3	V _{CC}	V	
VCONTROL Low (PA_EN, C_RX, C_BT, LNA_EN)	0		0.2	V	
Turn-on time from PA_EN edge			500	ns	Output stable to within 90% of final gain
Turn-off time from PA_EN edge			500	ns	
Stability	-25		24	dBm	No spurs above -47dBm into 4:1 VSWR
CW P1dB	26	27		dBm	Tx mode in 50% Duty Cycle
Rx Performance					Temperature = -10°C to +70°C, V_{DD} = 3.3V, C_RX = High, LNA_EN = High
Gain	11	13	15	dB	
NF		2.3	3	dB	In specified frequency band
RX Port Return Loss			-9.6	dB	
ANT Port Return Loss			-4	dB	
Input IP3	4	8		dBm	
Input P1dB	-6	-2		dBm	
I _{DD}		10	15	mA	
LNA_EN Control Current		30	75	μA	
Rx Bypass Mode					Temperature = -10°C to +70°C, V_{DD} = 3.3V, C_RX = Low, LNA_EN = Low
Insertion Loss	-8.5	-7.5	-6.5	dB	
RX Port Return Loss			-9.6	dB	
ANT Port Return Loss			-4	dB	
Input IP3	4	8		dB	
Input P1dB	-6	-2		dBm	
Typical Condition 5.0V					Temperature = -10°C to +70°C, V_{CC} = 5.0V, PA_EN = High, P_{OUT} = 21.5dBm using a IEEE802.11n MCS7 waveform unless otherwise noted.
Tx Performance - 11g/n/ac					Compliance with standard 802.11g/n/ac
Frequency	2412		2484	MHz	
802.11n Output Power	21	21.5		dBm	802.11n HT20 and HT40 MCS7 at 25°C
11n Dynamic EVM		2.5	3	%	
		-32	-30.5	dB	
802.11ac Output Power	17	18		dBm	802.11ac HT40 MCS9 at 25°C
11ac Dynamic EVM		1.5	1.8	%	
			-35	dB	
Tx Performance - Spectral Mask					
802.11n output power		22		dBm	802.11n HT20 and HT40 MCS7 at 25°C
802.11b output power		26		dBm	Meet 802.11b DSSS 1Mbps spectral mask

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Typical Condition 5.0V (continued)					Temperature = -10°C to +70°C, V_{CC} = 5.0V, PA_EN = High, P_{OUT} = 21.5dBm using a IEEE802.11n MCS7 waveform unless otherwise noted.
General Tx Performance					
Second Harmonic		-20	-18	dBm/MHz	P _{OUT} = 21.5dBm
Third Harmonic		-43	-38	dBm/MHz	
Gain	25	27	29	dB	
Gain variation over Temp	-2		+2	dB	
Power Detect Voltage	0.14	0.16	0.18	V	P _{OUT} = 0dBm and also when RF = off
Power Detect Accuracy	-2		+2	dB	Into 3:1 VSWR load at 25°C
Power Detect Voltage	0.95	1.05	1.20	V	P _{OUT} = 21.5dBm
Input Return Loss - Tx_in pin		-13	-10	dB	In specified frequency band
Output Return Loss at ANT pin		-15	-10	dB	
Operating Current		260	290	mA	At rated 11n P _{OUT}
		230	260	mA	At rated P _{OUT} 19dBm
Quiescent Current		190		mA	Nominal conditions; no RF applied
Leakage Current		2	10	μA	V _{CC} = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C
VCONTROL High (PA_EN, C_BT, C_RX, LNA_EN)	2.8	2.9	5.0	V	
VCONTROL Low (PA_EN, C_BT, C_RX, LNA_EN)	0		0.2	V	
Turn-on time from PA_EN edge			500	ns	Output stable to within 90% of final gain
Turn-off time from PA_EN edge			500	ns	
Stability	-25		24	dBm	No spurs above -47dBm into 4:1 VSWR
CW P1dB	28.5	29.5		dBm	Tx mode in 50% duty cycle
Rx Performance					Temperature = -10°C to +70°C, V_{DD} = 5.0V, C_RX = High, LNA_EN = High
Gain	11.5	14	16	dB	
NF		2.3	3.0	dB	In specified frequency band
RX Port Return Loss			-9.6	dB	
ANT Port Return Loss			-4	dB	
Input IP3	4	8		dBm	
Input P1dB	-6	-2		dBm	
IDD		10	20	mA	
LNA_EN Control Current		30	50	μA	
Rx Bypass Mode					Temperature = -10°C to +70°C, V_{DD} = 5.0V, C_RX = High, LNA_EN = Low
Insertion Loss	-8.5	-7.5	-6.5	dB	
RX Port Return Loss			-9.6	dB	
ANT Port Return Loss			-4	dB	
Input IP3	4	8		dB	
Input P1dB	-6	-2		dBm	

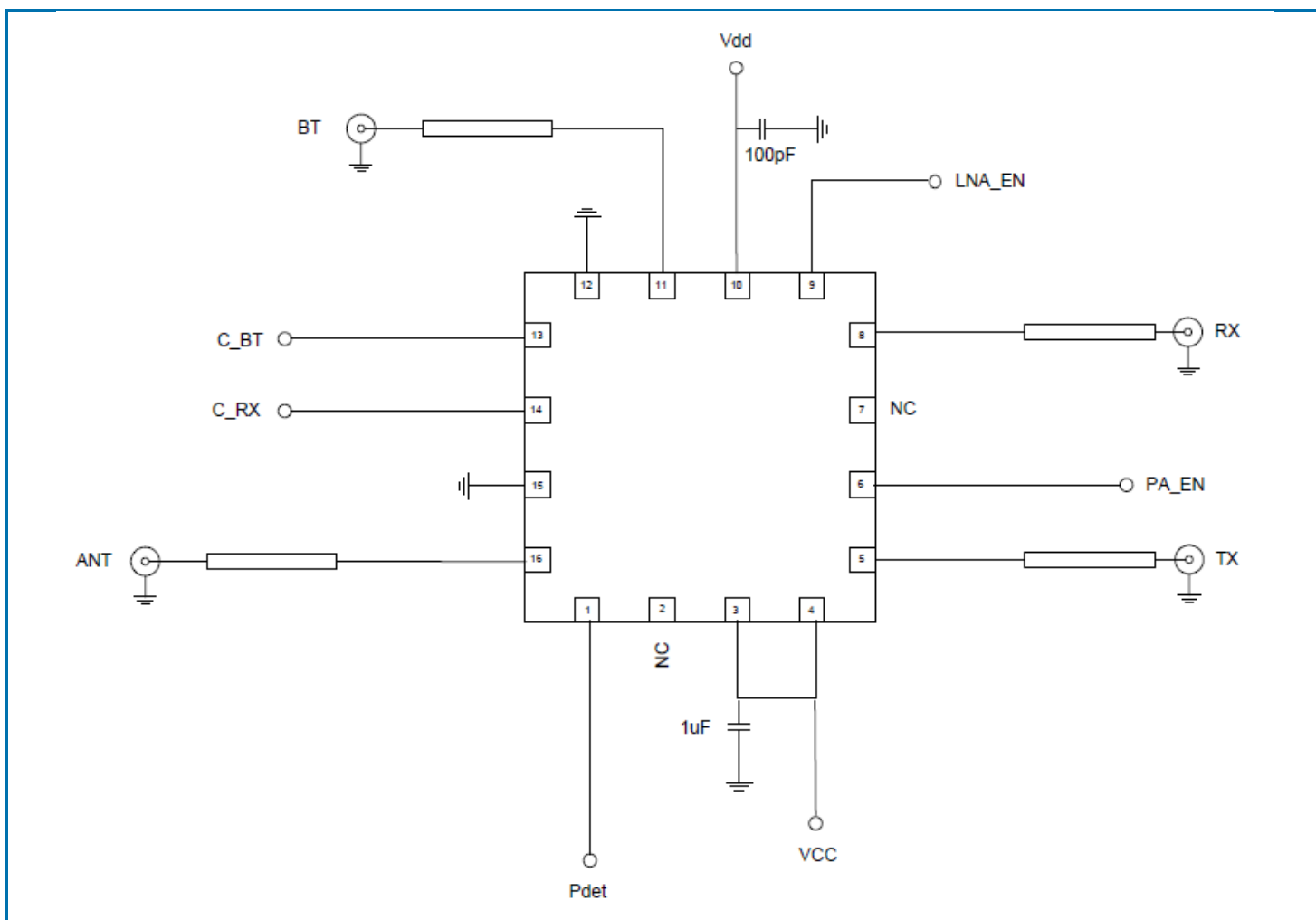
Parameter	Specification			Unit	Condition
	Min	Typ	Max		
General Performance 3.3V and 5.0V					
Control Current					
C_RX and C_BT Current		0.5	1	μA	
PA_EN Current		30	50	μA	
Switch Control Speed			200	ns	
PA_EN Control Impedance		5.2		MΩ	
LNA_EN Control Impedance		7.4		MΩ	
C_RX Control Impedance		27		MΩ	
C_BT Control Impedance		27		MΩ	
ESD					
Human Body Model	500			V	EIA/JESD22-114A RF pins
	1000			V	EIA/JESD22-114A DC pins
Charge Device Model	250			V	JESD22-C101C all pins
Thermal Resistance (Th-j)		46		°C/W	Vcc=3.3V; Pout=20dBm; 100% duty cycle
		56		°C/W	Vcc=5V; Pout=22dBm; 100% duty cycle
Junction Temperature (TJ)		118		°C	Vcc=3.3V; Pout=20dBm; 100% duty cycle
		59		°C	Vcc=5V; Pout=22dBm; 100% duty cycle
Maximum Input Power			12	dBm	Into 50Ω, VCC = 3.3V, 25°C
Maximum Input Power			12	dBm	6:1 VSWR, VCC = 3.3V, 25°C
Maximum Input Power			5	dBm	10:1 VSWR, VCC = 3.3V, 25°C
Bluetooth (Both 3.3V and 5.0V)					Temperature = -10°C to +70°C, VDD = 3.3V, 5.0V, C_BT = High, unless otherwise noted
Input/Output Power	25	30		dBm	
Insertion Loss		0.7	0.9	dB	
BT Port Return Loss			-9.6	dB	
ANT Port Return Loss			-9.6	dB	
Isolation					
ANT-BT; Tx Mode		18		dB	PA_EN = High, C_BT = Low, C_RX = Low, LNA_EN = Low
ANT-BT; Rx Gain Mode		25		dB	PA_EN = Low, C_BT = Low, C_RX = High, LNA_EN = High
ANT-BT; Rx Bypass Mode		20		dB	PA_EN = Low, C_BT = Low, C_RX = High, LNA_EN = Low
ANT-RX; Tx Mode		35		dB	PA_EN = High, C_BT = Low, C_RX = Low, LNA_EN = Low
ANT-RX; BT Mode		25		dB	PA_EN = Low, C_BT = High, C_RX = Low, LNA_EN = Low
ANT Port Return Loss			-9.6	dB	

Switch Logic Control

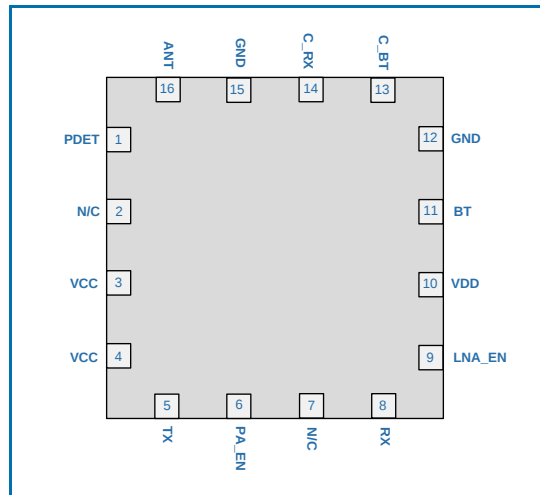
Operating Mode	PA_EN	LNA_EN	C_RX	C_BT
Standby	Low	Low	Low	Low
802.11b/g/n/ Tx	High	Low	Low	Low
802.11b/g/n/ Rx Gain	Low	High	High	Low
802.11b/g/n/ Rx Bypass	Low	Low	High	Low
BT Rx/ Tx	Low	Low	Low	High

Note: High = 2.8V to VCC, Low = 0V to 0.2V

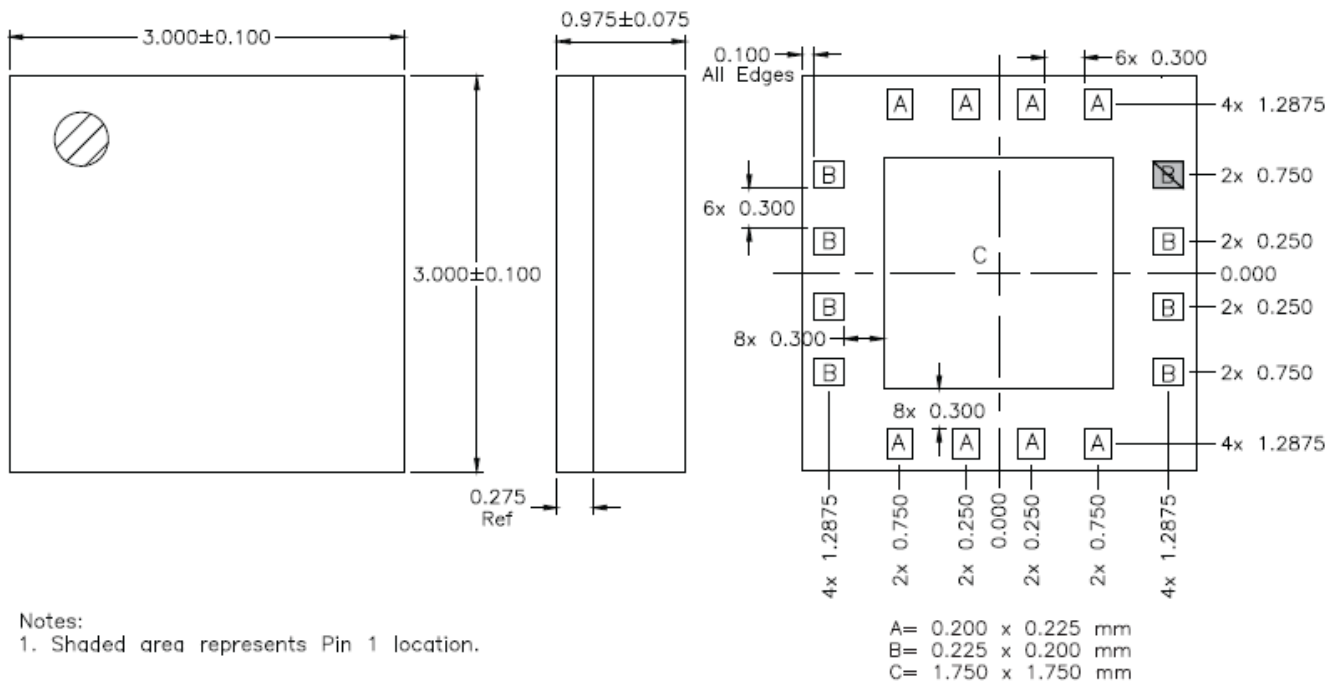
Applications Schematic



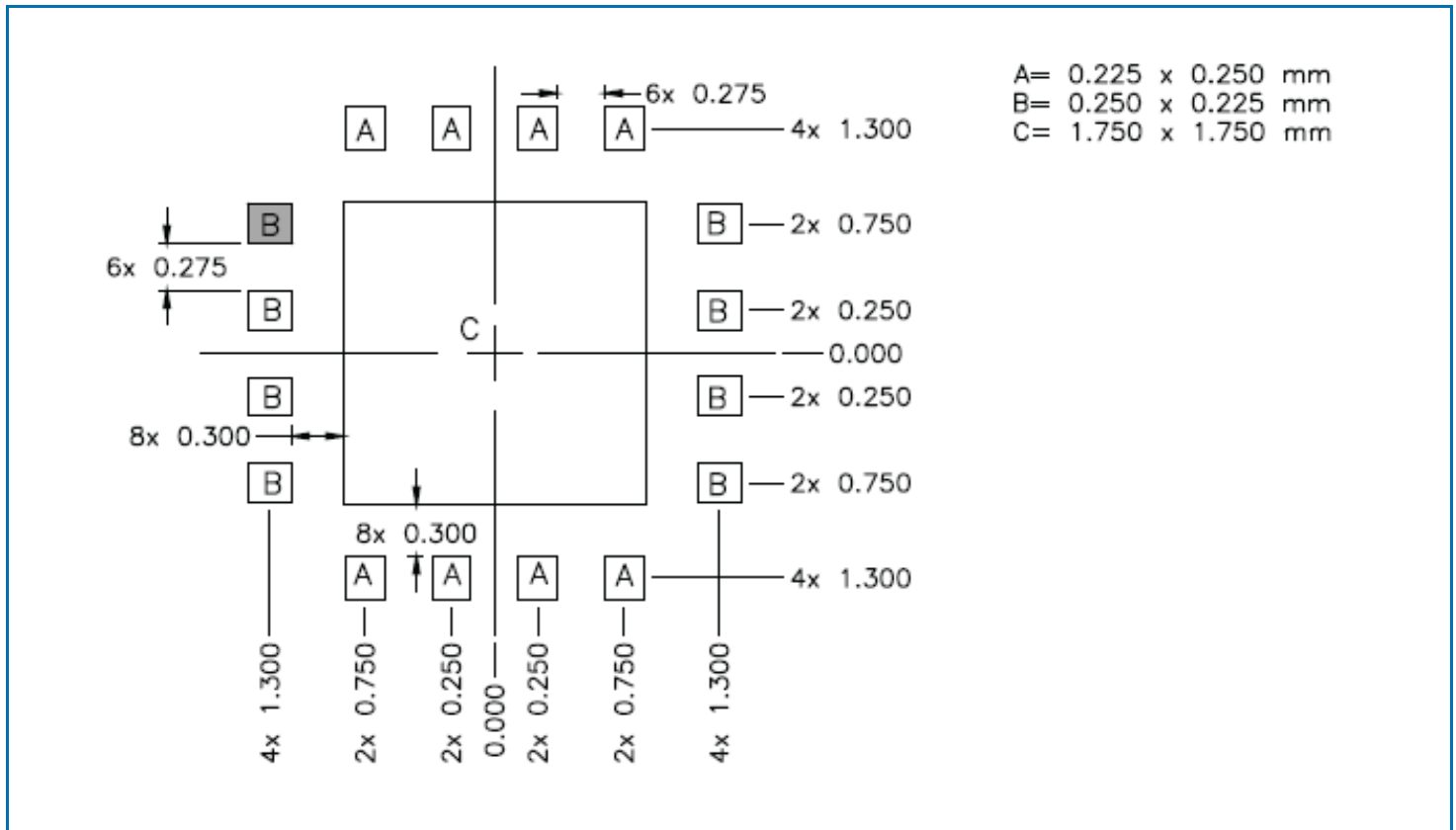
Pin Out



Package Drawing



PCB Pattern



Note:

1. Shaded area represents Pin 1 location
2. Example of the number and size of vias can be found on the RFMD evaluation board layout.

Pin Names and Descriptions

Pin	Name	Description
1	PDET	Power detector voltage for Tx section. PDET voltage varies with output power. May need external decoupling for noise decoupling.
2	NC	No Connect. This pin is not connected internally. It can be left floating or connected to ground.
3	VCC	Supply voltage for the PA. See applications schematic for biasing and bypassing components.
4	VCC	Supply voltage for the PA. See applications schematic for biasing and bypassing components.
5	TX	RF input port for the 802.11b/g/n PA. Input is matched to 50Ω and DC block is provided internally.
6	PA_EN	Control voltage for the PA and Tx switch. See truth table for proper settings.
7	NC	No Connect. This pin is not connected internally. It can be left floating or connected to ground.
8	RX	RF output port for the 802.11b/g/n LNA. Input is matched to 50Ω and DC block is provided internally.
9	LNA_EN	Control voltage for the LNA. When this pin is set to a LOW logic state, the bypass mode is enabled.
10	VDD	Supply voltage for the LNA. See applications schematic for biasing and bypassing components.
11	BT	RF Bidirectional port for Bluetooth®. Input is matched to 50Ω and DC block is provided internally.
12	GND	Ground connection. This pin is not connected internally and can be left floating or connected to ground.
13	C_BT	Bluetooth® switch control pin. See Truth Table for proper level.
14	C_RX	Receive switch control pin. See Switch Truth Table for proper level.
15	GND	Ground connection. This pin is not connected internally and can be left floating or connected to ground.
16	ANT	RF bidirectional antenna port matched to 50Ω and DC block is provided internally.
Pkg Base	GND	Ground connection. The backside of the package should be connected to the ground plane through a short path, i.e., PCB vias under the device are recommended.