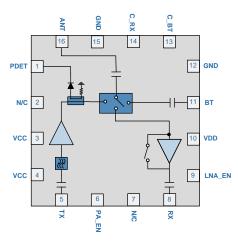


RFFM4203

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

RF Micro Devices Inc. 7628 Thorndike Road, Greensboro, NC 27409-9421

For sales or technical support, contact RFMD at +1.336.678.5570 or customerservice@rfmd.com.

DS140710



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} = 21.5dBm, 5V <3% Dynamic EVM
- P_{OUT} = 19dBm, 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

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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	



✓ rfmd 测 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.

Caution! ESD sensitive device.

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

Deservation	Specification			11-24	Operativities	
Parameter	Min	Тур	Max	Unit	Condition	
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 Pout	
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		

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Devemeter	Specification			11	Operativitar	
Parameter	Min	Тур	Max	Unit	Condition	
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	

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RFFM4203



MinTypMaxTemperature = -10°C to +70°C, V _{CC} = 5.0V, PA_EN = High, P _{QU} = 21.5dBm using a EEE802.11n MCS waveform unless otherwise noted.General Tx Performance-20-18dBm/MHzP _{QUT} = 21.5dBm using a EEE802.11n MCS waveform unless otherwise noted.Gain252729dB	Parameter	Specification			11-21	O an dittan	
I ypead Conduition 3.0V (continued) PA_EN = High, Pour = 21.5dBm using a IEEE802.11n MCS waveform unless otherwise noted. General Tx Performance -20 -18 dBm/MHz Second Harmonic -20 -18 dBm/MHz Gain and 25 27 29 dB Gain variation over Temp -2 -42 dB Power Detect Voltage 0.14 0.16 0.18 V Power Detect Voltage 0.91 1.20 V Pour = 21.5dBm Power Detect Voltage 0.95 1.05 1.20 V Pour = 21.5dBm Power Detect Voltage 0.95 1.05 1.20 V Pour = 21.5dBm Power Detect Voltage 0.95 1.05 1.20 V Pour = 21.5dBm Output Return Loss at ANT pin -15 -10 dB In specified frequency band Output Return Loss at ANT pin -15 -10 dB In specified frequency band Quiescent Current 280 290 mA At rated Pour 19dBm Quiescent Current 28 2.	Falameter	Min	Тур	Max	Unit	Condition	
Second Hamonic -20 -18 dBm/MHz Pour = 21.5dBm Third Hamonic -43 -38 dBm/MHz Four = 21.5dBm Gain 25 27 29 dB Gain variation over Temp -2 +2 dB Power Detect Voltage 0.14 0.16 0.18 V Pour = 0dBm and also when RF = off Power Detect Voltage 0.95 1.05 1.20 V Pour = 21.5dBm Power Detect Voltage 0.95 1.05 1.20 V Pour = 21.5dBm Input Rtur Loss Tx_in pin -13 1.0 dB In specified frequency band Output Retur Loss at ANT pin -16 -10 dB In specified frequency band Output Retur Loss at ANT pin 260 mA At rated 11n Pour 27 Quescent Current 190 mA Na trated 11n Pour 28 29 5.0 V VCONTROL Ligh (PA_EN, C_BT, C_AT, CA_BT, CA_BT, CA, CA, C_BT,	Typical Condition 5.0V (continued)					PA_EN = High, P _{OUT} = 21.5dBm using a IEEE802.11n MCS7	
Third Hamonic 4-3 -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 Pour = 0.450m and also when RF = off Power Detect Voltage 0.14 0.16 0.18 V Pour = 21.540m Power Detect Voltage 0.95 1.05 1.20 V Pour = 21.540m Input Return Loss af XNT pin -13 -10 dB In specified frequency band Output Return Loss af XNT pin -15 -10 dB In specified frequency band Quiescent Current 200 200 mA At rated 11n Pour Laskage Current 2 10 µA Vco = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C VCONTROL Lingh (PA_EN, C_BT, C_BT, C_BT, C_BT, C_RT, N_EN) 0 0.2 V Vco = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C VCPIROL Low (PA_EN, C_BT, C_BT, C_BT, C_RT, LNA_EN) 0 0.2 V Vco = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C	General Tx Performance						
Gain 25 27 29 dB Gain variation over Temp -2 $+2$ dB Gain variation over Temp -2 $+2$ dB Power Detect Voltage 0.14 0.16 0.18 V $P_{Oxr} = 0dBm$ and also when RF = off Power Detect Voltage 0.95 1.05 1.20 V $P_{Oxr} = 21.5dBm$ Input Return Loss T.X. in pin -13 1.0 dB In specified frequency band Output Return Loss at ANT pin -15 -10 dB In specified frequency band Quiescent Current 280 mA At rated 11n P_{Oxr} Detain point Quiescent Current 2 10 μA Voc = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C VCONTROL Low (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-oft time from PA_EN edge 500 ns Output stable to within 90% of final gain Stability -25 24 dBm No sp	Second Harmonic		-20	-18	dBm/MHz	P _{OUT} = 21.5dBm	
Gain variation over Temp -2 +2 dB Power Detect Voltage 0.14 0.16 0.18 V $P_{Our} = 0dBm$ and also when RF = off Power Detect Voltage 0.14 0.16 0.18 V $P_{Our} = 21dBm$ Into 3:1 VSWR load at 25°C Power Detect Voltage 0.95 1.05 1.20 V $P_{Our} = 21.6Bm$ Input Return Loss - Tx, in pin -13 10 dB In specified frequency band Output Return Loss - Tx, in pin -15 -10 dB In specified frequency band Quiescent Current 280 280 mA At rated 11n Pour Lakage Current 2 10 µA V cor 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C VCONTROL Ligh (PA, EN, C_BT, C_BT, C_RX, LNA_EN) 2.8 2.9 5.0 V VCONTROL Low (PA_EN, C_BT, C_BT, C_RX, LNA_EN) 2.5 2.4 dBm No spurs above -47dBm into 4:1 VSWR CW P1dB 28.5 2.9.5 dB Tx mode in 50% duty cycle CW P1dB 28.5 2.9.5 dB Tx mode in 50	Third Harmonic		-43	-38	dBm/MHz		
Power Detect Voltage 0.14 0.16 0.18 V $P_{our} = 0dBm$ and also when RF = off Power Detect Accuracy 2 +2 dB Into 3:1 VSWR load at 25°C Power Detect Voltage 0.05 1.05 1.20 V $P_{our} = 21.5dBm$ Input Return Loss -Tx_in pin -13 -10 dB In specified frequency band Output Return Loss at ANT pin -15 -10 dB In specified frequency band Quiescent Current 280 290 mA At rated 11n Pour Guiescent Current 190 mA Nominal conditions; no RF applied Leakage Current 2 10 μA Vcc = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C VCONTROL Lingh (PA_EN, C_BT, C_RT, UN (PA_EN, C_BT, C_RT, LNA_EN) 0 0.2 V C_RX, LNA_EN) -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 -25 24 dBm In specified frequency band NF <t< td=""><td>Gain</td><td>25</td><td>27</td><td>29</td><td>dB</td><td></td></t<>	Gain	25	27	29	dB		
Power Detect Accuracy -2 +2 dB Into 3:1 VSWR load at 25°C Power Detect Voltage 0.95 1.05 1.20 V $P_{our} = 21.5dBm$ Input Return Loss at ANT pin -13 -10 dB Inspecified frequency band Output Return Loss at ANT pin -15 10 dB Inspecified frequency band Quescent Current 230 260 mA At rated 91n Pour Leakage Current 190 mA Mominal conditions; no RF applied Leakage Current 2 10 μ A Vccc = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C VCONTROL Low (PA_EN, C_BT, 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 V Stability -25 24 dBm No spurs above -47dBm into 4:1 VSWR CW P1dB 28.5 29.5 dBm Trode in 50% duty cycle CW P1dB 28.5 29.5 dBm Into 3:1 VSWR Gain 11.5 14 16 dBm	Gain variation over Temp	-2		+2	dB		
Power Detect Voltage 0.95 1.05 1.20 V $P_{outr} = 21.5dBm$ Input Return Loss at ANT pin -13 -10 dB In specified frequency band Output Return Loss at ANT pin -15 -10 dB In specified frequency band Output Return Loss at ANT pin -15 -10 dB In specified frequency band Quiescent Current 260 280 mA At rated 11n Pour Quiescent Current 190 mA Nominal conditions; no RF applied Leakage Current 2 10 μA Voc = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C VCONTROL Low (PA_EN, C_BT, C_RT, C_RT, C_RT, LNA_EN) 0 0.2 V Current time from PA_EN edge Turn-off time from PA_EN edge 500 ns Output stable to within 90% of final gain Turn-off time from PA_EN edge 28.5 29.5 dBm Nx mode in 50% duty cycle Rx Performance 23 3.0 dB In specified frequency band RX Port Return Loss -4 dB Input P14B -6 -2 dBm<	Power Detect Voltage	0.14	0.16	0.18	V	P _{OUT} = 0dBm and also when RF = off	
Input Return Loss - Tx_in pin -13 -10 dB In specified frequency band Output Return Loss at ANT pin -15 -10 dB Operating Current 280 290 mA At rated 11n Pour Quiescent Current 190 mA Nominal conditions; no RF applied Leakage Current 2 10 μ A Vcc = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C VCONTROL Low (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-oft time from PA_EN edge 500 ns Output stable to within 90% of final gain Turn-oft time from PA_EN edge 28.5 29.5 dBm No spurs above -47dBm into 4:1 VSWR CW P1dB 28.5 29.5 dBm Tx mode in 50% duty cycle Rx Performance - 2.3 3.0 dB In specified frequency band RX Port Return Loss - 4 6dBm - - Input P13 4 8 dBm -	Power Detect Accuracy	-2		+2	dB	Into 3:1 VSWR load at 25°C	
Output Return Loss at ANT pin -15 -10 dB Operating Current 280 280 mA At rated P_{OUT} 19dBm Quiescent Current 190 mA Natial conditions; no RF applied Leakage Current 2 10 μ A Vcc = 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 2.2 V V Turn-oft time from PA_EN edge 500 ns Output stable to within 90% of final gain Turn-oft time from PA_EN edge 500 ns Output stable to within 90% of final gain Turn-oft time from PA_EN edge 500 ns Output stable to within 90% of final gain Turn-oft time from PA_EN edge 28.5 29.5 dBm Tx mode in 50% duty cycle Rx Performance 23 3.0 dBm Tx mode in 50% duty cycle Rx Performance -4 dB Inspecified frequency band NF 2.3 3.0 dB In specified frequency band	Power Detect Voltage	0.95	1.05	1.20	V	P _{OUT} = 21.5dBm	
Operating Current260290mAAt rated 11n P_{OUT} Quiescent Current230260mAAt rated P_{OUT} 19dBmQuiescent Current190mANominal conditions; no RF appliedLeakage Current210 μ A $V_{CC} = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°CVCONTROL Lingh (PA_EN,C_BT, C_RX, LNA_EN)2.82.95.0VVCONTROL Low (PA_EN, C_BT,C_RX, LNA_EN)00.2VTurn-on time from PA_EN edge500nsOutput stable to within 90% of final gainTurn-oft time from PA_EN edge500nsOutput stable to within 90% of final gainTurn-oft time from PA_EN edge500nsOutput stable to within 90% of final gainStability-2524dBmNo spurs above -47dBm into 4:1 VSWRCW P1dB28.529.5dBmTx mode in 50% duty cycleRX Performance-2.33.0dBIn specified frequency bandRX Port Return Loss-4dBInspecified frequency bandATT Port Return Loss-4.4dBInspecified frequency bandInput IP348dBmInput IP3INA EN Control Current3050\muAInsertin Loss-8.5-7.5-6.5RX Port Return Loss-8.5-7.5-6.5RX Port Return Loss-9.6dBINAL EN Control Current3050\muAINAL EN Control Current3050\muAINAL EN Control Cu$	Input Return Loss - Tx_in pin		-13	-10	dB	In specified frequency band	
Quiescent Current230260mAAt rated Pour 19dBmQuiescent Current190mANominal conditions; no RF appliedLeakage Current210 μ A $V_{Cc} = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°CVCONTROL High (PA_EN,C_RT, CNA_EN)2.82.95.0VVCONTROL Solve (PA_EN, C_BT,C_RX, LNA_EN)00.2VVCONTROL Low (PA_EN, C_BT,C_RX, LNA_EN)00.2VTurn-on time from PA_EN edge500nsOutput stable to within 90% of final gainTurn-oft time from PA_EN edge500nsOutput stable to within 90% of final gainStability-2524dBmNo spurs above -47dBm into 4:1 VSWRCW P1dB28.529.5dBmTx mode in 50% duty cycleRx Performance23.0dBIn specified frequency bandMF2.33.0dBIn specified frequency bandNF2.33.0dBmInspecified frequency bandANT Port Return Loss-44BdBmInput IP348dBmIDD1020mALNA_EN Control Current3050\muAINSPerster Note-9.6dBRX Port Return Loss-8.5-7.5-6.5dB-RX Port Return Loss-8.5-7.5ANT Port Return Loss-9.6dBINACTION Current3050INACTION Current3050RX Port Return Los$	Output Return Loss at ANT pin		-15	-10	dB		
Quiescent Current190mANominal conditions; no RF appliedLeakage Current210 μ A $V_{Cc} = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°CVCONTROL High (PA_EN,C_BT, C_RX, LNA_EN)2.82.95.0VVCONTROL Low (PA_EN, C_BT,C_RX, LNA_EN)00.2VVTm-oft time from PA_EN edge0.02VTurn-oft time from PA_EN edge500nsOutput stable to within 90% of final gain100Turn-oft time from PA_EN edge500nsStability-2524dBmVP 1dB28.529.5dBmTx mode in 50% duty cycleTemperature = -10°C to +70°C, V_{DD} = 5.0V,C_RX = High, LNA_EN = HighGain11.51416AF2.33.0dBInspecified frequency band-9.6dBmInput IP348dBmInput PdB-6-2dBmIDD1020mALNA_EN Control Current3050\muARx Bypass Mode-8.5-7.5-6.5RX Port Return Loss-8.5-7.5-6.5ANT Port Return Loss-8.5-7.5-6.5ANT Port Return Loss-8.5-7.5-6.5ANT Port Return Loss-8.6-7.6ANT Port Return Loss-8.6-7.6ANT Port Return Loss-8.6-7.6ANT Port Return Loss-8.6-7.5ANT Port Return Loss-8.6-7.5ANT Port $	Operating Current		260	290	mA	At rated 11n Pout	
Leakage Current210 μA $V_{Cc} = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°CVCONTROL High (PA_EN, C_BT, C_RX, LNA_EN)2.82.95.0VVCONTROL Low (PA_EN, C_BT, C_RX, LNA_EN)00.2VTurn-ont time from PA_EN edge500nsOutput stable to within 90% of final gainTurn-off time from PA_EN edge500nsOutput stable to within 90% of final gainTurn-off time from PA_EN edge500nsOutput stable to within 90% of final gainStability-2524dBmNo spurs above -47dBm into 4:1 VSWRCW P1dB28.529.5dBmTx mode in 50% duty cycleRx Performance23.0dBIn specified frequency bandRX Port Return Loss-9.6dBIn specified frequency bandNF2.33.0dBIn specified frequency bandInput IP348dBmInput P1dB-6-2dBmIDD1020mALNA_EN Control Current3050\mu AInsertion Loss-8.5-7.5-6.5dBRX Port Return Loss-9.6dBAInsertion Loss-9.6dBANT Port Return Loss-9.6dBInsertion Loss-8.5-7.5-6.5RX Port Return Loss-9.6dBInsertion Loss-9.6dBInput IP348M Port Return Loss-9.6ANT Port Return Loss-4.4$			230	260	mA	At rated P _{OUT} 19dBm	
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-on time from PA_EN edge 500 ns Output stable to within 90% of final gain Turn-of time from PA_EN edge 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 28.5 29.5 dBm Tx mode in 50% duty cycle Gain 11.5 14 16 dB Inspecified frequency band NF 2.3 3.0 dB In specified frequency band NT Port Return Loss - -9.6 dB Input P13 4 8 dBm IDD 10 20 mA INPERSTREAM -2.5 -4.6 B INPUT P13 4 8 MBm IND 10 20	Quiescent Current		190		mA	Nominal conditions; no RF applied	
C_BT, C_RX, LNA_EN)IIIIVCONTROL Low (PA_EN, C_BT, C_RX, LNA_EN)00.2VTurn-ontine from PA_EN edge500nsOutput stable to within 90% of final gainTurn-oft time from PA_EN edge500nsStabilityTurn-oft time from PA_EN edge28.529.54 dBmNo spurs above -47dBm into 4:1 VSWRCW P1dB28.529.54 dBmTx mode in 50% duty cycleRx PerformanceC2.33.0dBInspecified frequency bandGain11.51416dBNF2.33.0dBIn specified frequency bandRX Port Return Loss4dBmInput IP348dBmIDD-6-2dBmINA_EN Control Current3050 μA RX Bypass Mode-8.5-7.5-6.5RX Port Return Loss-8.5-7.5-6.5INA_EN Control Current-9.6dBInsertion Loss-8.5-7.5ANT Port Return Loss-9.6dBInsertion Loss-8.5-7.5ANT Port Return Loss-8.5-7.5Insertion Loss-8.5-7.5ANT Port Return Loss-9.6ANT Port Return Loss <td>Leakage Current</td> <td></td> <td>2</td> <td>10</td> <td>μA</td> <td>V_{CC} = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C</td>	Leakage Current		2	10	μA	V _{CC} = 5V, PA_EN = low, C_RX = low, LNA_EN = low at 25°C	
C_RX, LNA_EN)Image: C_RX, LNA_EN edgeImage: C_RX, LNA_EN edge <td>VCONTROL High (PA_EN, C_BT, C_RX, LNA_EN)</td> <td>2.8</td> <td>2.9</td> <td>5.0</td> <td>V</td> <td></td>	VCONTROL High (PA_EN, C_BT, C_RX, LNA_EN)	2.8	2.9	5.0	V		
Turn-off time from PA_EN edgeImage: Stability-25500nsStability-2524dBmNo spurs above -47dBm into 4:1 VSWRCW P1dB28.529.529.5dBmTx mode in 50% duty cycleRx PerformanceImage: Constraint or the system of the system	VCONTROL Low (PA_EN, C_BT, C_RX, LNA_EN)	0		0.2	V		
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 28.5 29.5 dBm Tx mode in 50% duty cycle Gain 11.5 14 16 dB Temperature = -10°C to +70°C, V_{DD} = 5.0V, C_RX = High, LNA_EN = High Gain 11.5 14 16 dB Inspecified frequency band RX Port Return Loss 2.3 3.0 dB In specified frequency band ANT Port Return Loss - -4 dB - Input IP3 4 8 dBm - IDD -6 -2 dBm - INA_EN Control Current 30 50 μA - Rx Bypass Mode -8.5 -7.5 -6.5 dB - Insertion Loss -8.5 -7.5 -6.5 dB - ANT Port Return Loss -9.6 dB - - - - Inse	Turn-on time from PA_EN edge			500	ns	Output stable to within 90% of final gain	
CW P1dB 28.5 29.5 dBm Tx mode in 50% duty cycle Rx Performance C_{m}	Turn-off time from PA_EN edge			500	ns		
Rx PerformanceImage: Section of the sect	Stability	-25		24	dBm	No spurs above -47dBm into 4:1 VSWR	
RX Performance Image: 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 - -9.6 dB Input IP3 4 8 - dBm Input P1dB -6 -2 dBm - IDD 10 20 mA - RX Bypass Mode - 30 50 μA Insertion Loss -8.5 -7.5 -6.5 dB ANT Port Return Loss - -9.6 dB Insertion Loss -8.5 -7.5 -6.5 dB ANT Port Return Loss - -9.6 dB - ANT Port Return Loss - -4 dB - Input IP3 4 8 dB - -	CW P1dB	28.5	29.5		dBm	Tx mode in 50% duty cycle	
NFI2.33.0dBIn specified frequency bandRX Port Return Loss-9.6dBANT Port Return Loss-4dBInput IP348dBmInput P1dB-6-2dBmIDD1020mALNA_EN Control Current3050 μA Rx Bypass Mode-8.5-7.5-6.5dBInsertion Loss-8.5-7.5-6.5dBRX Port Return Loss-9.6dB	Rx Performance						
RX Port Return Loss Image: Marge Marg	Gain	11.5	14	16	dB		
ANT Port Return Loss-4dBInput IP348dBmInput P1dB-6-2dBmIDD1020mALNA_EN Control Current3050 μ A Rx Bypass Mode -8.5-7.5-6.5dBInsertion Loss-8.5-7.5-6.5dBRX Port Return Loss-9.6dBANT Port Return Loss48dB	NF		2.3	3.0	dB	In specified frequency band	
Input IP3 4 8 dBm Input P1dB -6 -2 dBm IDD -6 10 20 mA LNA_EN Control Current -30 50 μA Rx Bypass Mode -8.5 -7.5 -6.5 dB Insertion Loss -8.5 -7.5 -6.5 dB RX Port Return Loss -8 -9.6 dB	RX Port Return Loss			-9.6	dB		
Input P1dB-6-2dBmIDD1020mALNA_EN Control Current3050 μ A Rx Bypass Mode -8.5-7.5-6.5dBInsertion Loss-8.5-7.5-6.5dBRX Port Return Loss-8-9.6dBANT Port Return Loss48dB	ANT Port Return Loss			-4	dB		
IDD1020mAIDD3050 μ ALNA_EN Control Current3050 μ A Rx Bypass Mode Image: Constraint of the second se	Input IP3	4	8		dBm		
LNA_EN Control Current3050μARx Bypass Mode3050μAInsertion Loss-8.5-7.5-6.5dBRX Port Return Loss-8-7.5-6.5dBANT Port Return Loss-9.6dBInput IP348dB	Input P1dB	-6	-2		dBm		
Rx Bypass ModeImage: Second systemImage:	IDD		10	20	mA		
KX Bypass ModeImage: C_RX = High, LNA_EN = LowInsertion Loss-8.5-7.5-6.5dBRX Port Return LossImage: C_RX = High, LNA_EN = LowANT Port Return LossImage: C_RX = High, LNA_EN = LowANT Port Return LossImage: C_RX = High, LNA_EN = LowImage: Image: C_RX = High, LNA_EN = LowImage: Image: Image: Image: C_RX = High, LNA_EN = LowImage: Image:	LNA_EN Control Current		30	50	μA		
RX Port Return Loss-9.6dBANT Port Return Loss-4dBInput IP348dB	Rx Bypass Mode						
RX Port Return Loss-9.6dBANT Port Return Loss-4dBInput IP348dB	Insertion Loss	-8.5	-7.5	-6.5	dB		
ANT Port Return Loss 4 dB Input IP3 4 8 dB							
Input IP3 4 8 dB							
		4	8				
	Input P1dB	-6	-2		dBm		

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Deremeter	Specification			11	O an Hitan	
Parameter	Min	Тур	Max	Unit	Condition	
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 50 Ω , V _{CC} = 3.3V, 25°C	
Maximum Input Power			12	dBm	6:1 VSWR, V _{CC} = 3.3V, 25°C	
Maximum Input Power			5	dBm	10:1 VSWR, V _{CC} = 3.3V, 25°C	
Bluetooth (Both 3.3V and 5.0V)					Temperature = -10°C to +70°C, V _{DD} = 3.3V, 5.0V, C_BT = High, unless otherwise noted	
Input/Output Power	25	30		dBm	<u> </u>	
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		

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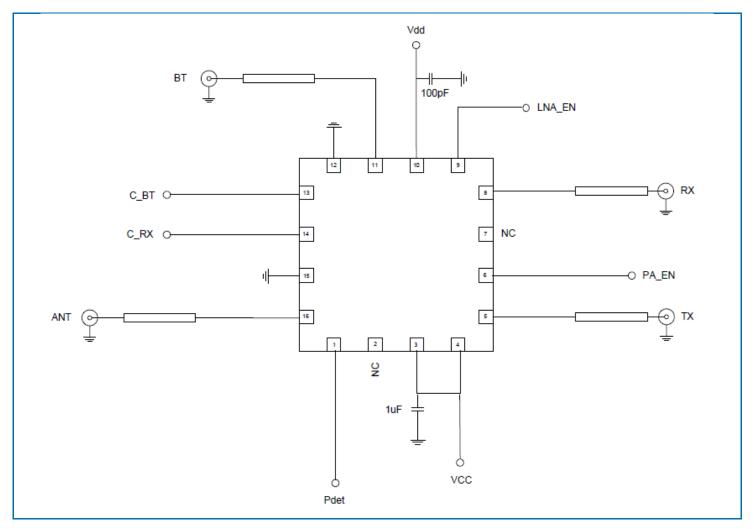


Switch Logic Control

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

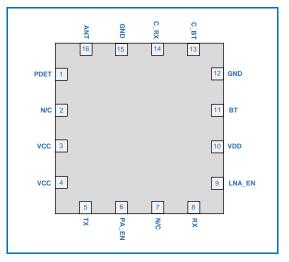


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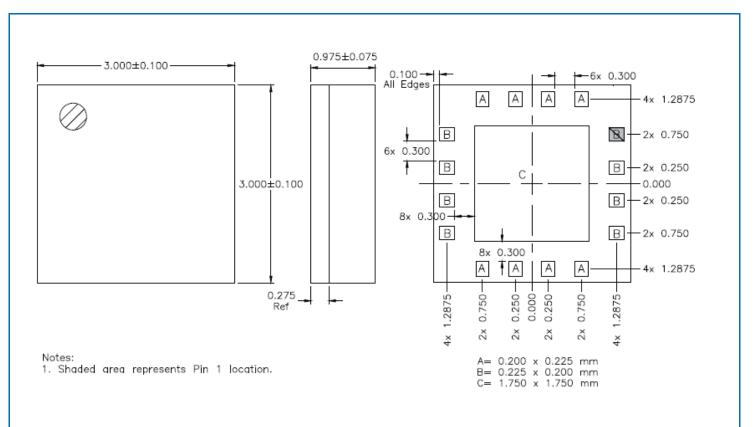
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Pin Out



Package Drawing



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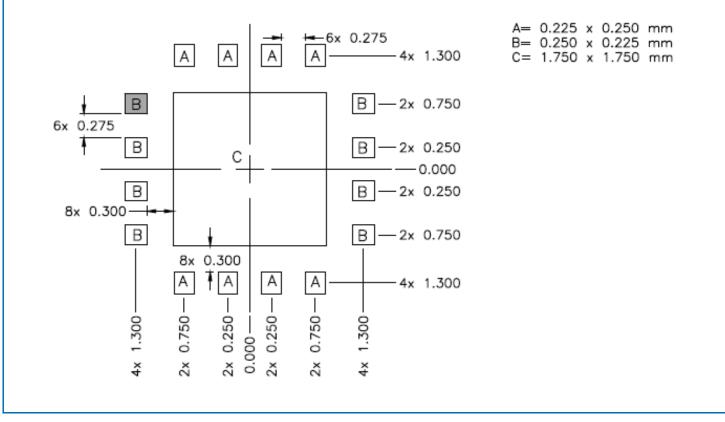
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RFFM4203



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	тх	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.