RF5643

6.0V, 700MHz TO 3.8GHz LINEAR POWER AMPLIFIER

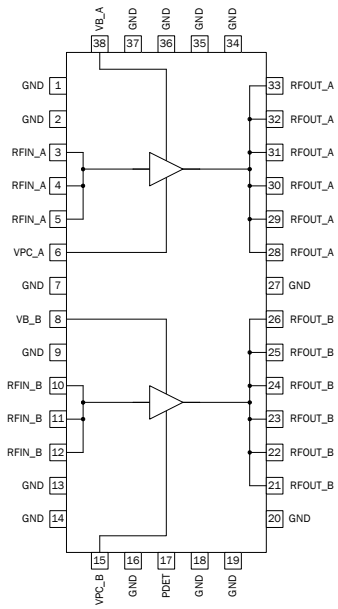
Package Style: QFN, 38-Pin, 3mm x 8mm

Features

- 11dB Small Signal Gain (Typ.)
- Supports Low Gain Mode
- 3% EVM WiMAX +30dBm, 6.0V
- Single Output Power Detectors
- Multiple Frequency Ranges
- High Efficiency

Applications

- WiMAX Customer Premises Equipment
- WiMAX Access Points



Functional Block Diagram

Product Description

The RF5643 is a linear power amplifier IC designed specifically for WiMAX final or driver stage applications. This product is an MCM Power Amplifier intently specified to address 700MHz to 3.8GHz WiMAX systems. The device is provided in a leadless chip carrier with a backside ground. The RF5643 is designed to maintain linearity over a wide range of temperatures and power outputs. The external match offers tunability for output power over multiple bands.

Optimum Technology Matching® Applied

☐ GaAs HBT	☐ SiGe BiCMOS	☐ GaAs pHEMT	☐ GaN HEMT
☐ GaAs MESFET	☐ Si BiCMOS	☐ Si CMOS	☐ BiFET HBT
☑ InGaP HBT	☐ SiGe HBT	☐ Si BJT	☐ LDMOS

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Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	-0.5 to +6.0	V_{DC}
DC Supply Current	1800	mA
Input RF Power	23	dBm
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C
Moisture Sensitivity	MSL 1	

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.

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RFMD Green: RoHS compliant per EU Directive 2002/95/EC, 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.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Typical Conditions					Temp = 25°C, Frequency = 2.3GHz to 3.8GHz depending on the evaluation board tune, V_{CC} = V_{PC} = 6.0V unless otherwise specified
Frequency	2.3		2.5	GHz	Tune A
	2.5		2.7	GHz	Tune B
	2.7		2.9	GHz	Tune C
	3.3		3.8	GHz	Tune D
Output Power		30			Tune A, B, C, D
EVM		3.0		%	802.16e 16QAM 3/4 modulation, P_{OUT} = +30dBm
Stability	0		33	dBm	PA should be stable when P_{OUT} is measured from 0dBm to 33dBm
Gain		11		dB	
Gain Flatness			3	dB	Peak-Peak over any 300MHz bandwidth
Power Detect	13		33	dBm	Useable power detection range
Noise Figure		5		dB	
Operating Current		1.3		Amp	RF P_{OUT} = +30dBm, V_{CC} = 6V
Quiescent Current		900		mA	
I_VPC Current		10		mA	No RF
Leakage Current		100		µA	
Turn-on Time from Setting of V_{BIAS}			400	ns	Output stable within 90% of final gain
Input Return Loss		-15	-10	dB	In tune band
Output Return Loss		-10	-7	dB	In tune band
Stable into Output VSWR			4:1		No spurs above -47dBm
No Damage into Output VSWR			10:1		Pin to achieve nominal operating power +3dB with 50Ω on output. Pulse modulated signal applied.
Max Pin		26		dBm	50Ω load, no damage

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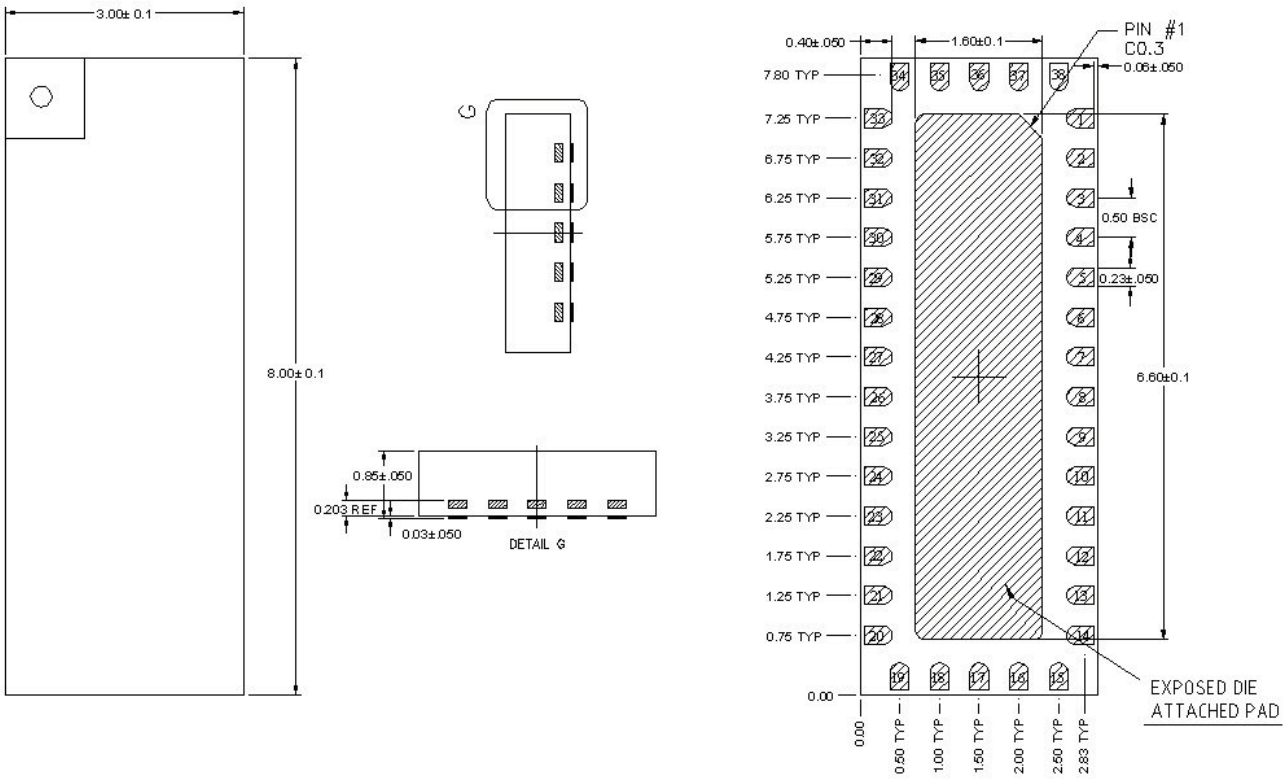
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
					Temp = 25°C, Frequency = 2.3GHz to 3.8GHz depending on the evaluation board tune, V_{CC} = V_{PC} = 6.0V unless otherwise specified
Frequency	2.3		2.5	GHz	Tune WDA
	2.5		2.7	GHz	Tune WDB
	2.7		2.9	GHz	Tune WDC
	3.3		3.8	GHz	Tune WDD
Output Power		30			Tune WDA, WDB, WDC, WDD
EVM		3.0		%	802.16e 16QAM 3/4 modulation, P_{OUT} = +30dBm
Stability	0		33	dBm	PA should be stable when P_{OUT} is measured from 0dBm to 33dBm
Gain		35		dB	Tune WDA, WDB, WDC
		30		dB	Tune WDD
Gain Flatness			3	dB	Peak-Peak over any 300MHz bandwidth
Power Detect	13		33	dBm	Useable power detection range
Noise Figure		5		dB	
Operating Current		1.5		Amp	RF P_{OUT} = +30dBm, V_{CC} = 6V
Quiescent Current		900		mA	
I_VPC Current		10		mA	No RF
Leakage Current		100		μA	
Turn-on Time from Setting of V_{BIAS}			400	ns	Output stable within 90% of final gain
Input Return Loss		-15	-10	dB	In tune band
Output Return Loss		-10	-7	dB	In tune band
Stable into Output VSWR			4:01		No spurs above -47dBm
No Damage into Output VSWR			10:1		Pin to achieve nominal operating power +3dB with 50Ω on output. Pulse modulated signal applied.
Max Pin		26		dBm	50Ω load, no damage

Note: RF5643 can be tuned to operate at other frequencies below 2.3GHz, as low as to 700MHz. For the tunes of other frequencies, please contact RFMD Sales and FAE.

Pin	Function	Description
1,2,7,9,13,14,16,18,19,20,27,34,35,36,37	GND	These pins are DC connected to the backside paddle. They provide good thermal connection to the backside.
3,4,5	RFIN_A	This is the RF input for Channel A, and has a DC voltage present. An external DC block is required.
6	VPC_A	Power up/down control pin for Channel A. The voltage on this pin should never exceed the voltage on pin 38 by more than 0.5V.
8	VB_B	This is the supply voltage for the active bias circuit for Channel B.
10,11,12	RFIN_B	This is the RF input pin for Channel B, and has a DC voltage present. An external DC block is required.
15	VPC_B	Power up/down control pin for Channel B. The voltage on this pin should never exceed the voltage on pin 8 by more than 0.5V.
17	PDET	This is the output port for the power detector. It samples the power at the input of Channel B of the amplifier.
21,22,23,24,25,26	RFOUT_B	This is the RF output pin and DC connection to the collector for Channel B.
28,29,30,31,32,33	RFOUT_A	This is the RF output pin and DC connection to the collector for Channel A.
38	VB_A	This is the supply voltage for the active bias circuit for Channel A.

Package Drawing



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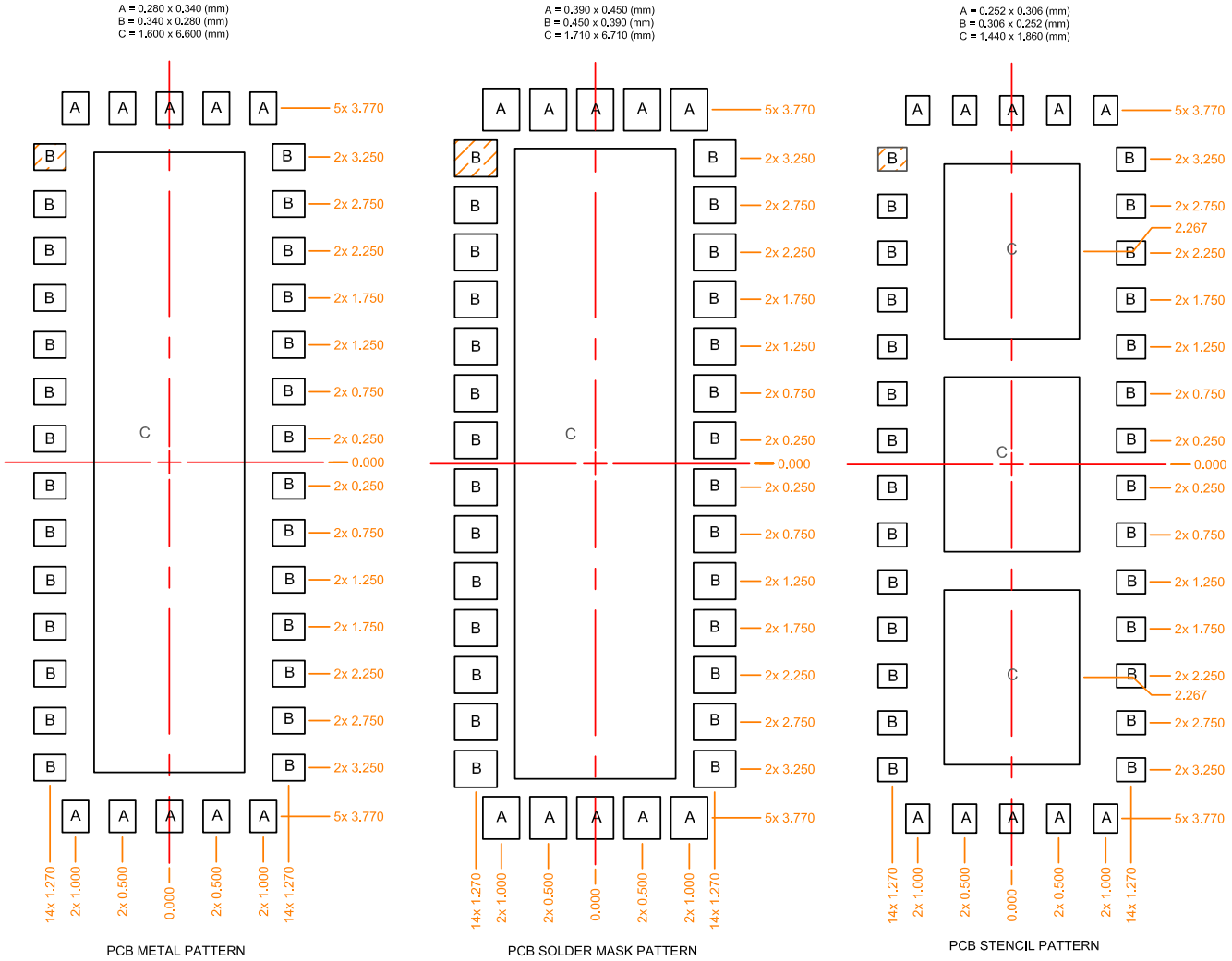
PCB Design Requirements



Shaded are represents Pin 1 location.

Note: Thermal vias for center slug "C" should be incorporated into the PCB design. The number and size of thermal vias will depend on the application. Example of the number and size of vias can be found on the RFMD evaluation board layout.

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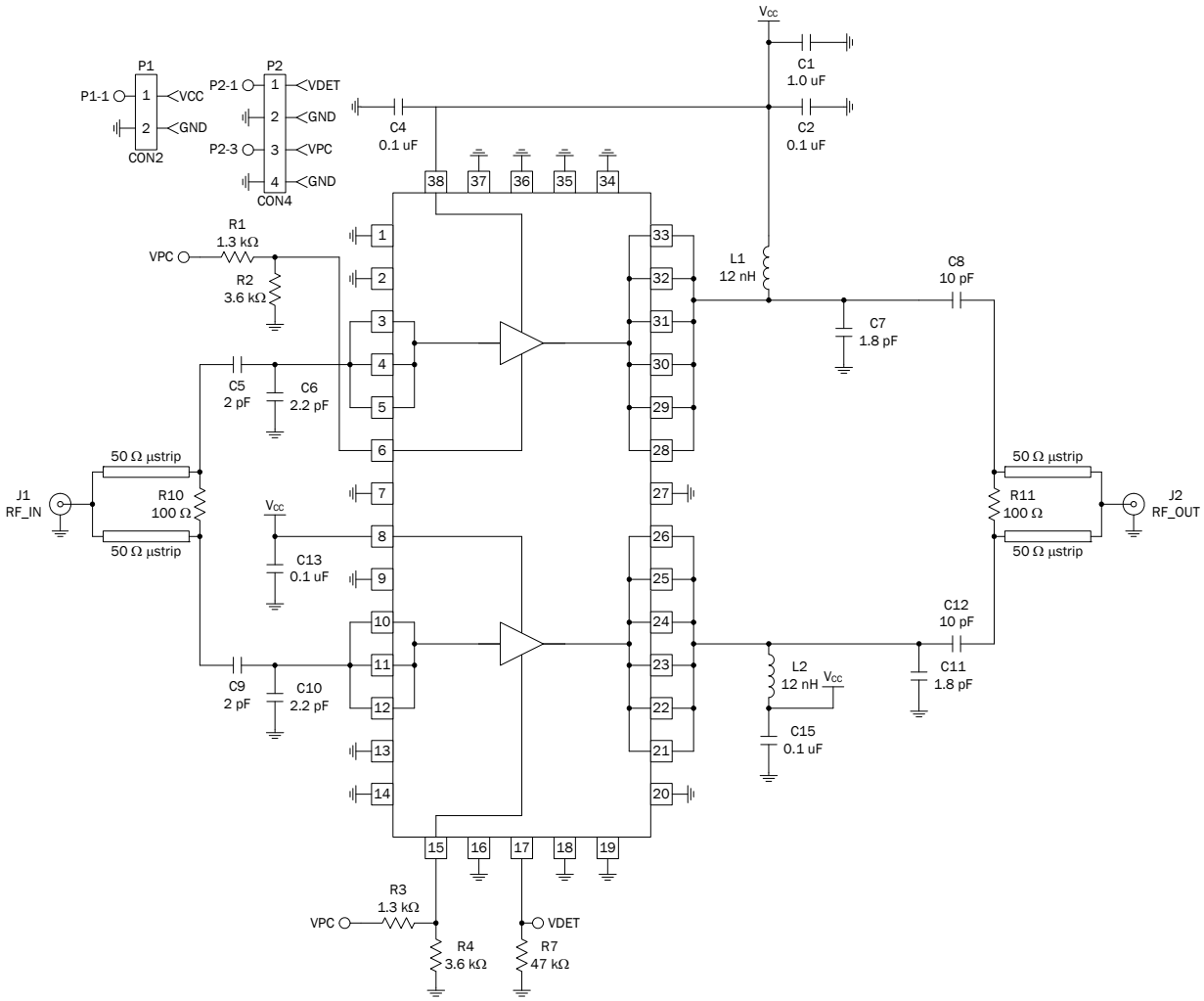
Application Schematic

Tune: A 2.3GHz to 2.5GHz Tune



Note: Other tunes are available for frequencies between 1.8GHz to 2.3GHz.

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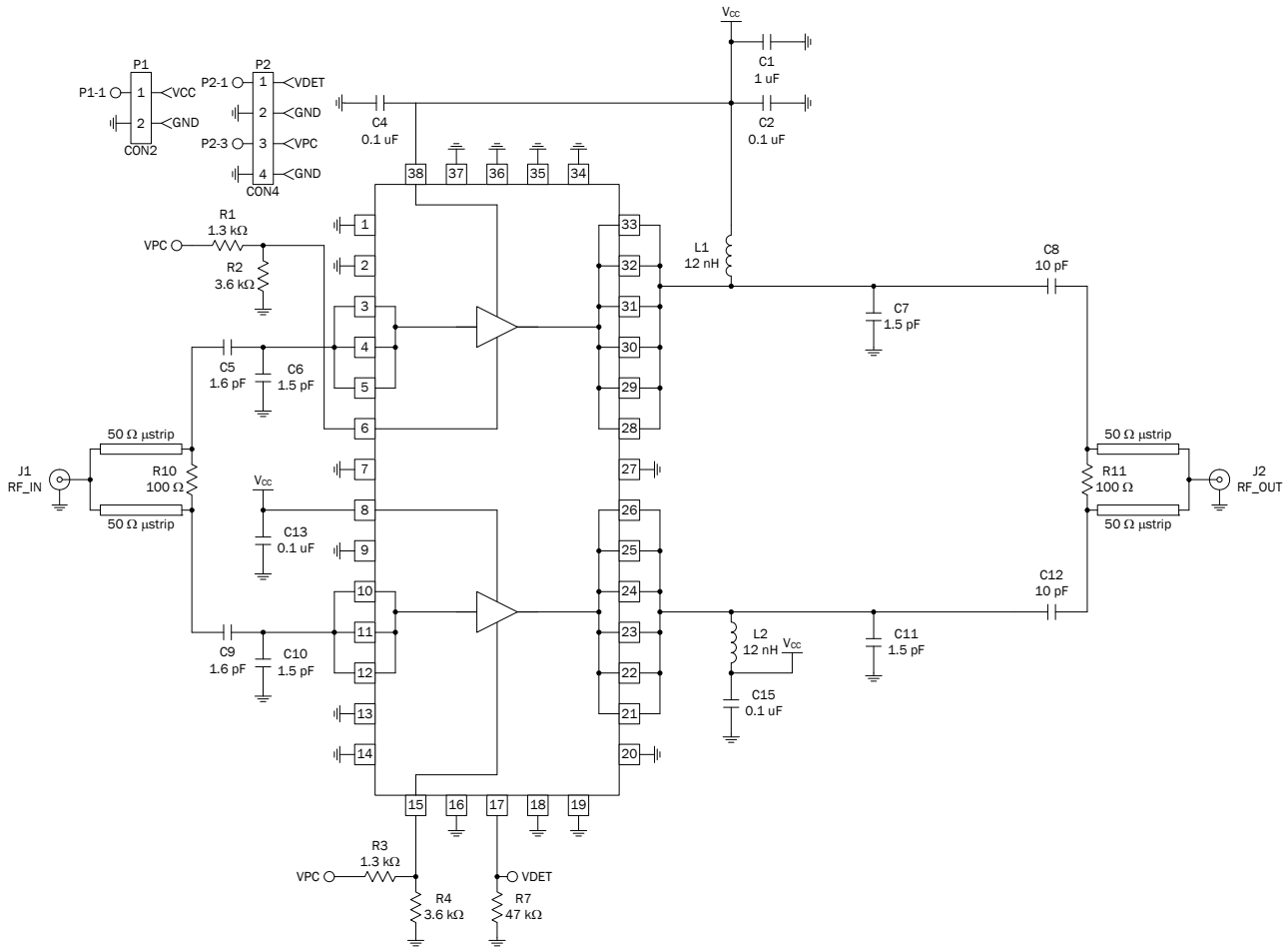
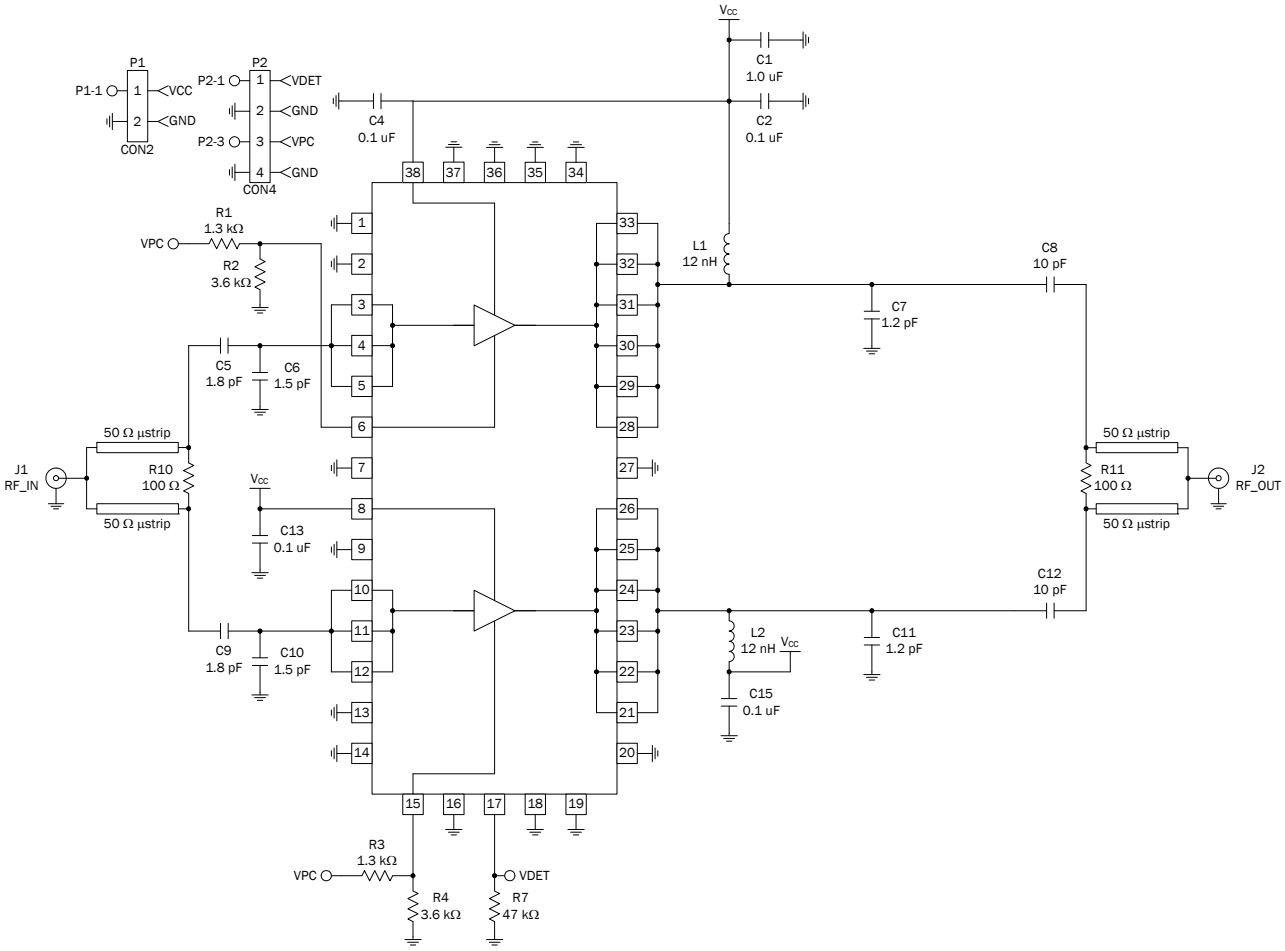
Application Schematic

Tune: B 2.5GHz to 2.7GHz Tune



Application Schematic

Tune: C 2.7GHz to 2.9GHz Tune



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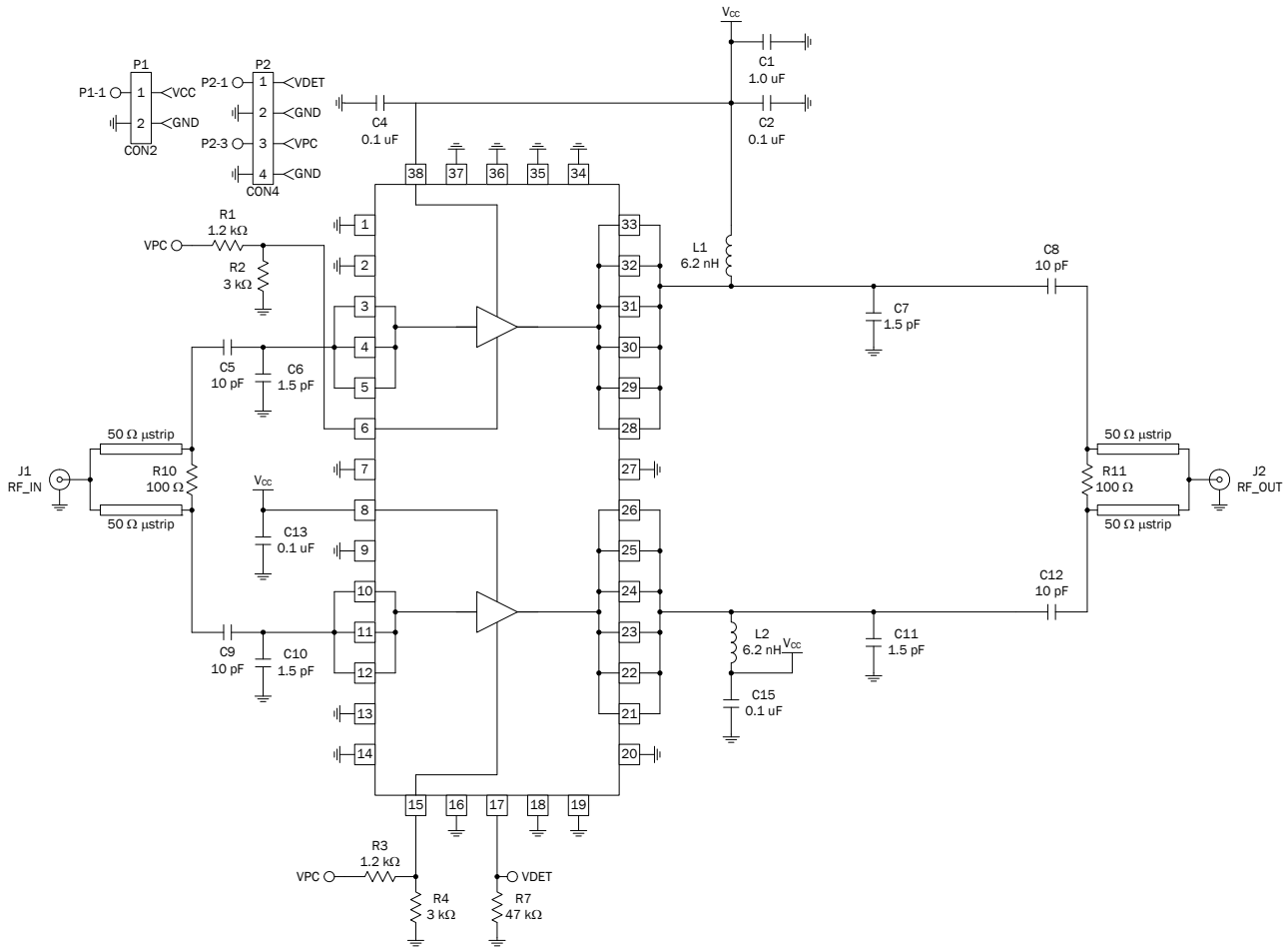
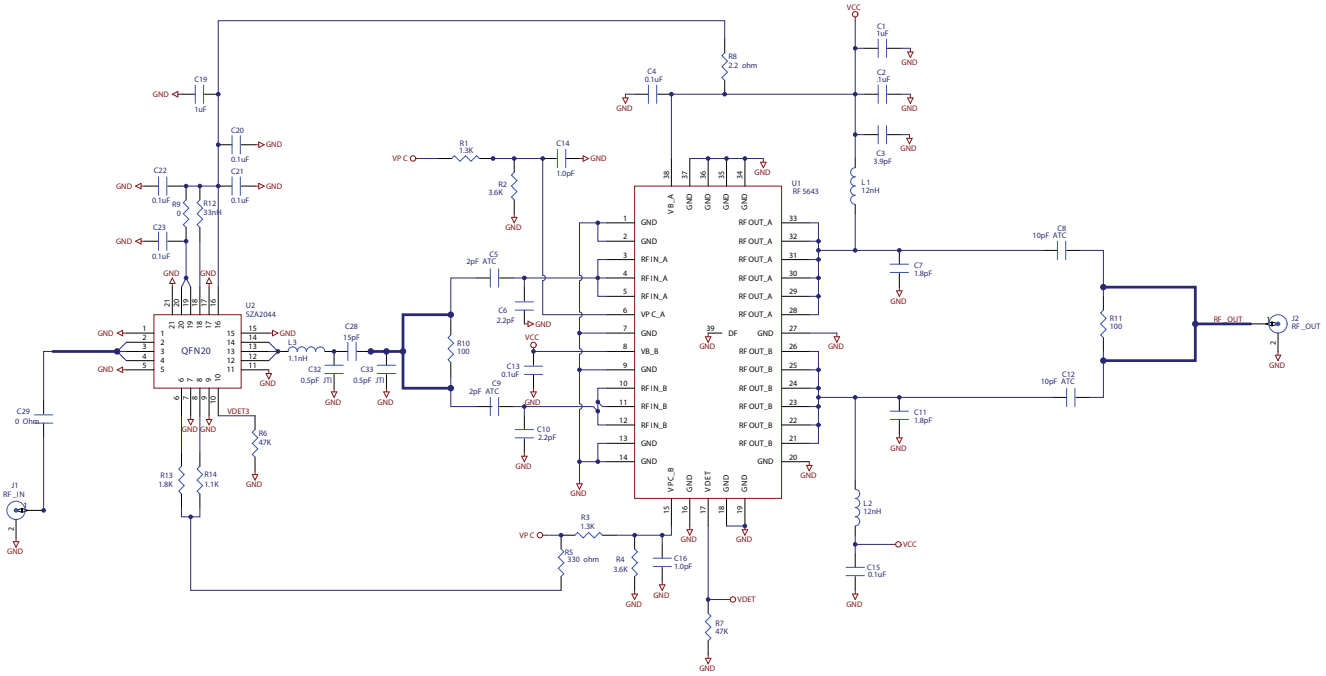
Application Schematic

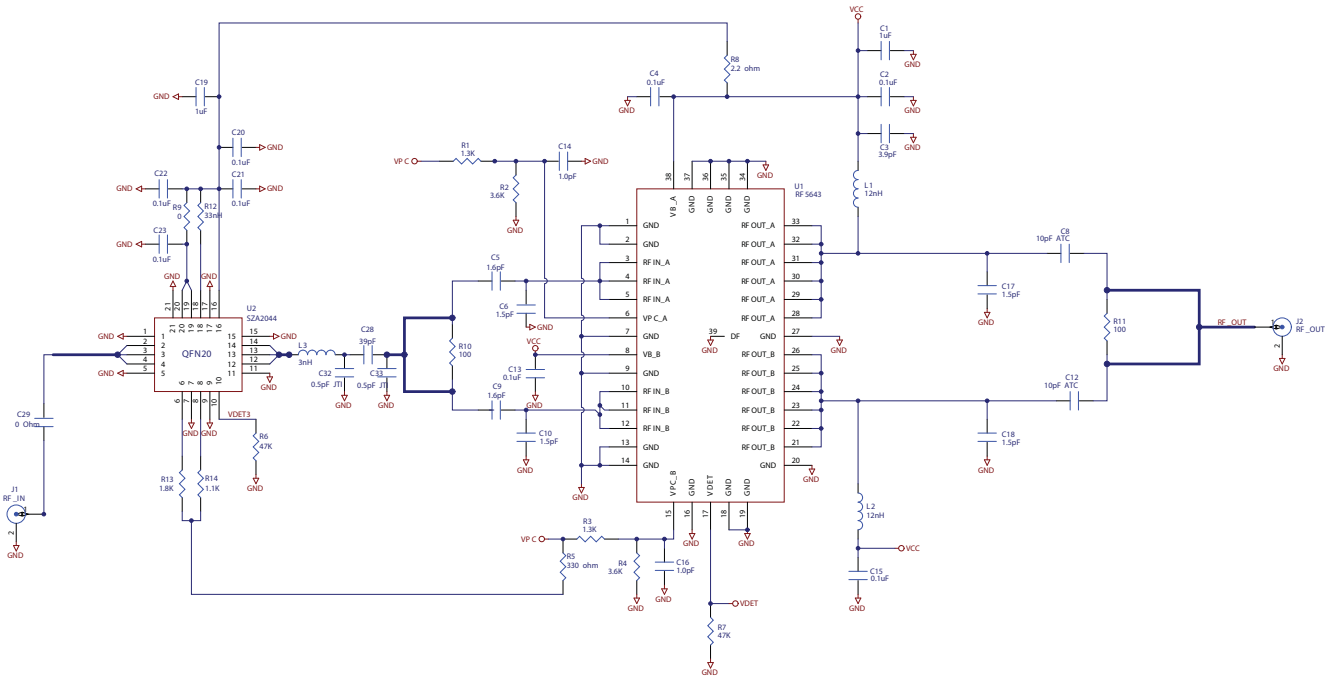
Tune: D 3.3GHz to 3.8GHz Tune



Evaluation Board Schematic Tune WDA: 2.3GHz to 2.5GHz



Evaluation Board Schematic Tune WDB: 2.5GHz to 2.7GHz



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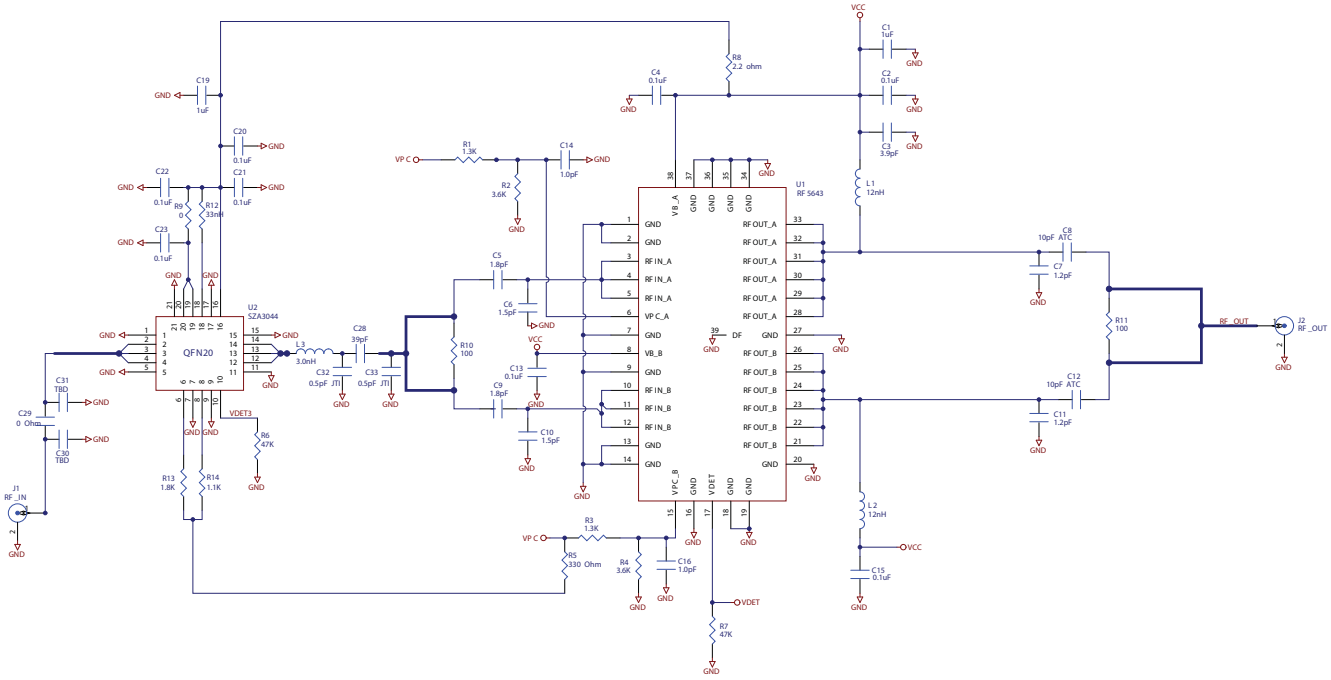
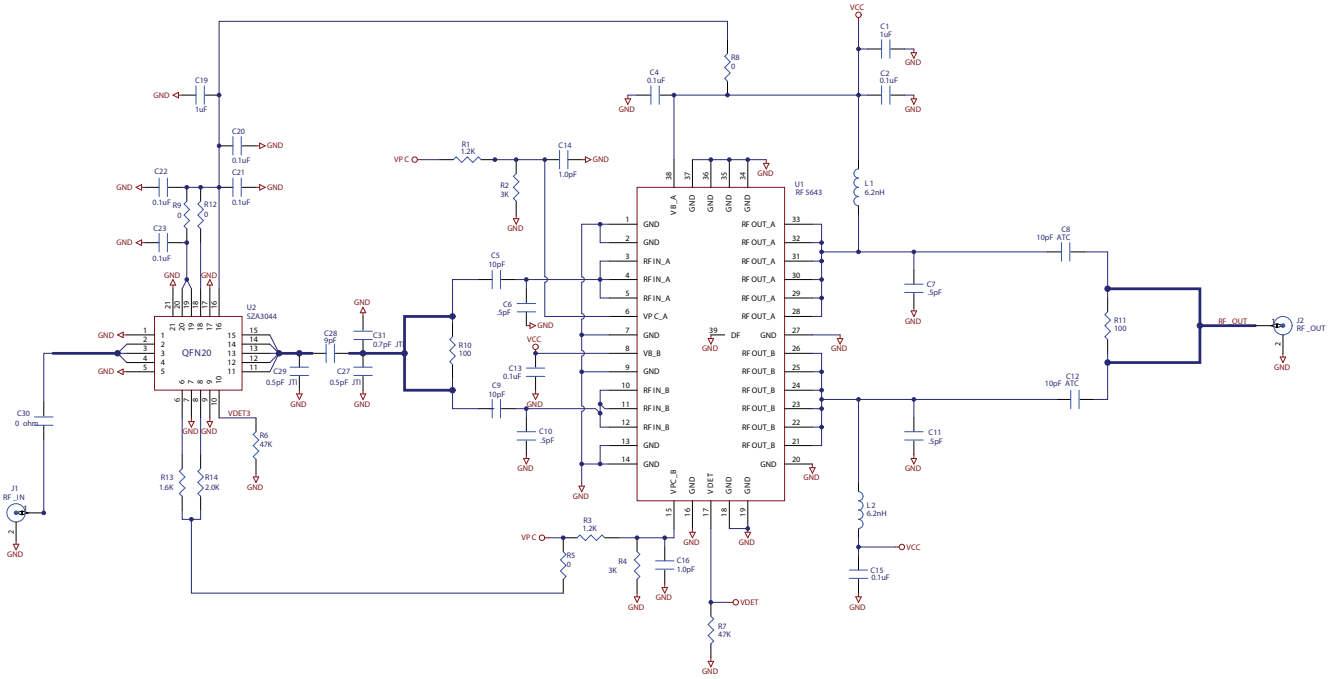
Evaluation Board Schematic Tune WDC: 2.7GHz to 2.9GHz



Evaluation Board Schematic Tune WDD: 3.3GHz to 3.8GHz



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Ordering Information

Ordering Code	Description
RF5643SQ	Standard 25 piece bag
RF5643SR	Standard 100 piece reel
RF5643TR13	Standard 2500 piece reel
RF5643APCBA-410	2.3GHz to 2.5GHz Tune Eval Board
RF5643BPCBA-410	2.5GHz to 2.7GHz Tune Eval Board
RF5643CPCBA-410	2.7GHz to 2.9GHz Tune Eval Board
RF5643DPCBA-410	3.3GHz to 3.8GHz Tune Eval Board
RF5643WDAPCBA-410	2.3GHz to 2.5GHz Tune Eval Board with Driver
RF5643WDBPCBA-410	2.5GHz to 2.7GHz Tune Eval Board with Driver
RF5643WDCPCBA-410	2.7GHz to 2.9GHz Tune Eval Board with Driver
RF5643WDDPCBA-410	3.3GHz to 3.8GHz Tune Eval Board with Driver

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