RFMX0015

DIFFERENTIAL IF DOWN-CONVERTER 600MHZ TO 1050MHZ

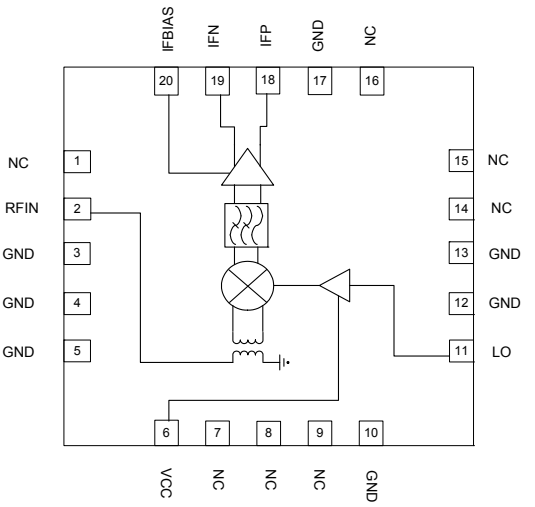
Package: MCM, 20-Pin, 5.2mmx5.2mm

Features

- RF: 600MHz to 1050MHz
- LO: 550MHz to 1100MHz
- IF: 50MHz to 300MHz
- Operates Both High and Low-Side LO
- Conversion Gain: 7.5dB (IF=50MHz)
- Input P1dB: 13.5dBm
- High Input IP3: 29dBm
- Adjustable IP3 and Current via IFBIAS
- LO Drive: -3dBm to +3dBm
- Single +5V Supply

Applications

- Cellular, 3G Infrastructure
- WiBro, WiMax LTE
- Wireless Backhaul
- High Performance Communications Systems
- GMSK, QPSK, DQPSK, QAM Modulation



Functional Block Diagram

Product Description

The RFMX0015 is a high linearity down-converter module designed for use in Cellular, 3G, LTE, and other high performance communications systems. The RFMX0015 contains an integrated LO buffer amp and a passive mixer core with an amplified differential IF output. The integrated LO buffer lowers the LO drive requirement to a friendly 0dBm typical. The RFMX0015 supports both low and high-side LO injection for IF frequencies up to 300MHz. The RFMX0015 also offers an adjustable IP3 range via the IFBIAS pin. Users can lower the IF amplifier DC current to save DC power when they don't require the device's peak linearity performance.

Ordering Information

RFMX0015SQ	Sample Bag with 25 pieces
RFMX0015SR	7” Reel with 100 pieces
RFMX0015TR7	7” Reel with 750 pieces
RFMX0015TR13	13” Reel with 2500 pieces
RFMX0015PCK-410	1500MHz to 2200MHz PCBA with 5-piece Sample Bag

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 (V_{CC})	5.5	V
Maximum RF Input Power	19	dBm
Maximum LO Input Power	10	dBm
Maximum Power Dissipation	1.5	W
Operating Temperature Range	-40 to +85	°C
Storage Temperature Range	-40 to +150	°C
Maximum Junction Temperature	+150	°C
ESD Rating - Human Body Model	Class 1A	
Moisture Sensitivity Level	MSL 3	

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.

RoHS status based on EUDirective2002/95/EC (at time of this document revision).

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
General Performance					
Conversion Gain		6.8		dB	f_{RF}=880MHz, f_{LO}=730MHz
Input Third Order Intercept		29		dBm	f_{RF1}=880MHz, f_{RF2}=881MHz, f_{LO}=730MHz, -5dBm/tone
Input 1dB Compression Point		13.5		dBm	f_{RF}=880MHz, f_{LO}=730MHz
Noise Figure		14		dB	SSB NF, f_{RF}=880MHz, f_{LO}=730MHz
LO Leakage at RF Port		-33		dBm	f_{RF}=880MHz, f_{LO}=730MHz
LO Leakage at IF Port		-35		dBm	f_{RF}=880MHz, f_{LO}=730MHz
RF to IF Isolation		42		dB	f_{RF}=880MHz, f_{LO}=730MHz
2RF to 2LO Spurious Response		-55		dBc	f_{RF}=850MHz, f_{LO}=800MHz, P_{RF}=-10dBm
3RF to 3LO Spurious Response		-90		dBc	f_{RF}=850MHz, f_{LO}=800MHz, P_{RF}=-10dBm
RF Interface					
Frequency Range	600		1050	MHz	
Input Return Loss		18		dB	IF port terminated
Input Impedance		50		Ω	
LO Interface					
Frequency Range	550		1100	MHz	
LO Input Power	-3	0	3	dBm	
Return Loss		15		dB	IF port terminated
Impedance		50		Ω	
IF Interface					
Frequency Range	50		300	MHz	
Output Return Loss		15		dB	
Differential Output Impednace		200		Ω	
Power Supply					
Supply Voltage (V_{CC})	4.75	5	5.25	V	
Supply Current (I_{CC})	180	200	240	mA	Sum of all currents.
Thermal Resistance of LO Amp		93		C/W	Based on LO Amp current (pin 6)
Thermal Resistance of IF Amp		88		C/W	Based on IF Amp current (pins 18 and 19)

Notes:
1. Data shown for V_{CC}=5.0V, LO Power=0dBm, RF Power=0dBm, T=25°C (Unless otherwise noted)
2. All measurements performed with an RFMD IF BALUN (P/N RFXF2553) on the EVM.

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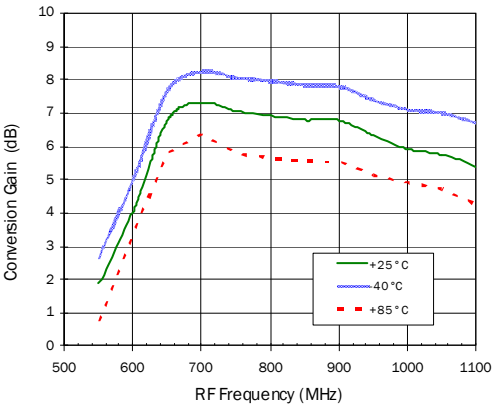
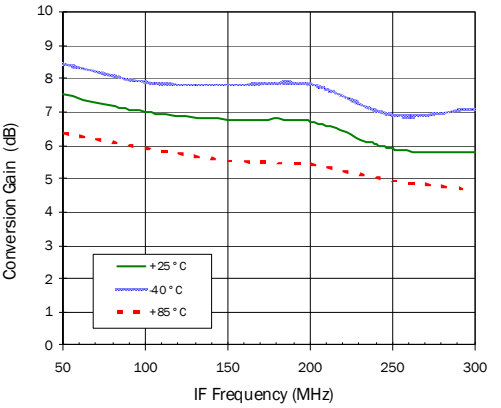
For all graphs: Typical Performance - Low Side LO ($f_{RF}>f_{LO}$), V_{CC}=5.0V, P_{LO}=0dBm, P_{RF}=0dBm, f_{IF}=150MHz, unless otherwise noted.

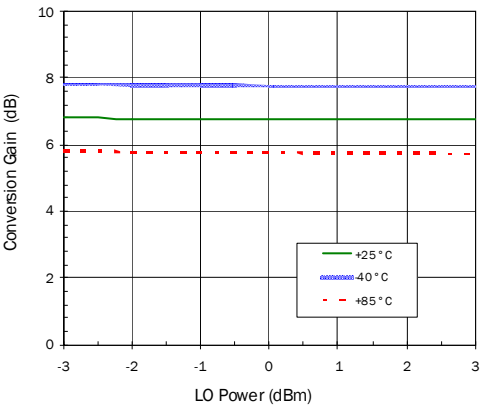
Conversion Gain vs. RF Frequency



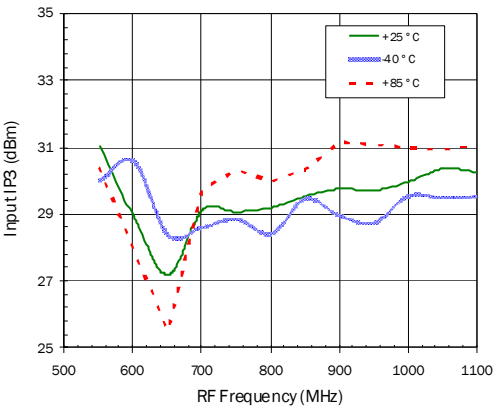
Conversion Gain vs. IF Frequency (RF=850MHz)



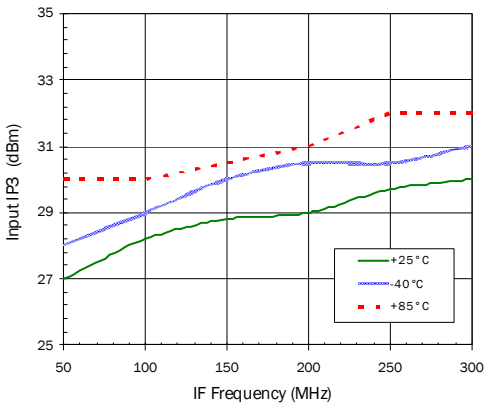
Gain vs. LO Power (RF=900MHz, LO=800MHz)



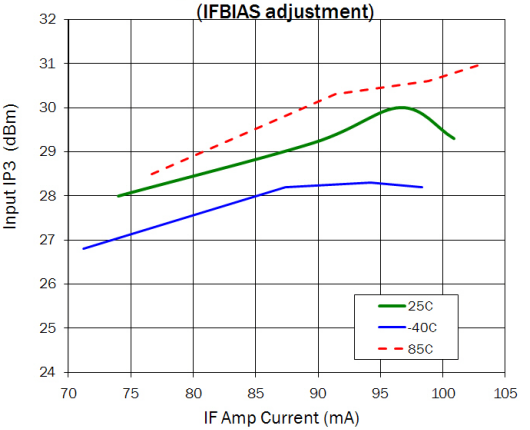
Input IP3 vs. RF Frequency



Input IP3 vs. IF Frequency (RF=850MHz)



Input IP3 vs. IF Amp Current (IFBIAS adjustment)



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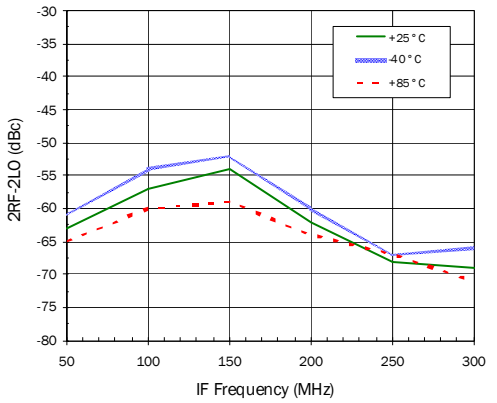
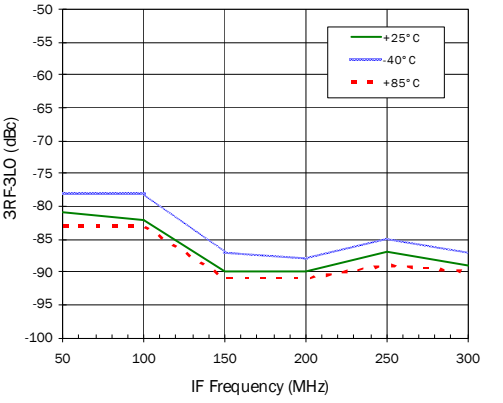
For all graphs: Typical Performance - Low Side LO ($f_{RF}>f_{LO}$), V_{CC}=5.0V, P_{LO}=0dBm, P_{RF}=0dBm, f_{IF}=150MHz, unless otherwise noted.

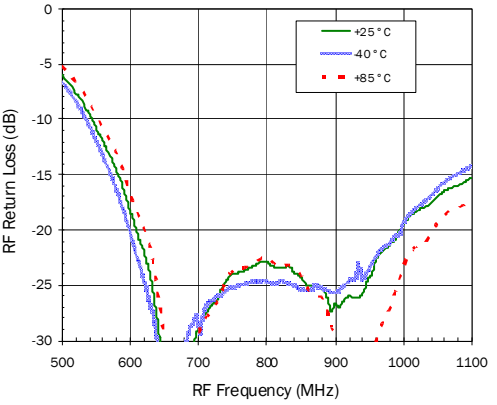
2RF-2LO Response vs. IF Freq (RF=850MHz)



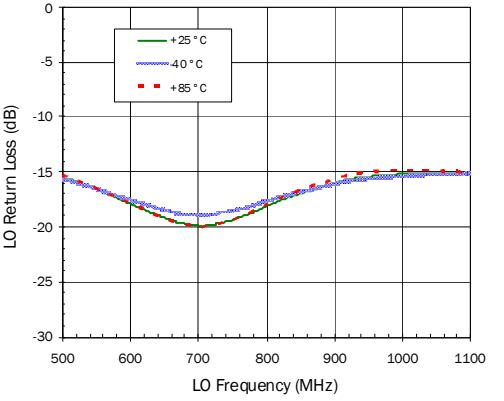
3RF-3LO Response vs. IF Freq (RF=850MHz)



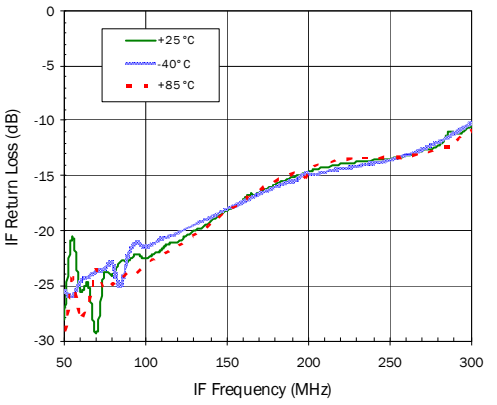
RF Return Loss vs. RF Frequency



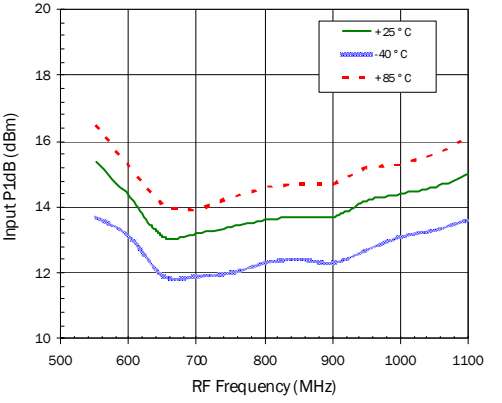
LO Return Loss vs. LO Frequency



IF Return Loss vs. IF Frequency



Input P1dB vs. RF Frequency



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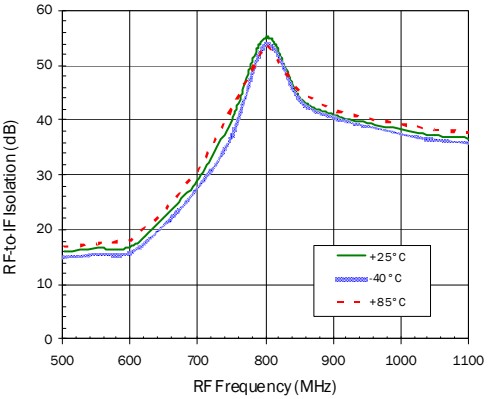
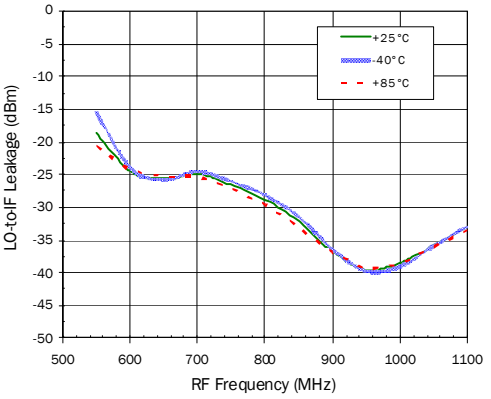
For all graphs: Typical Performance - Low Side LO ($f_{RF}>f_{LO}$), V_{CC}=5.0V, P_{LO}=0dBm, P_{RF}=0dBm, f_{IF}=150MHz, unless otherwise noted.

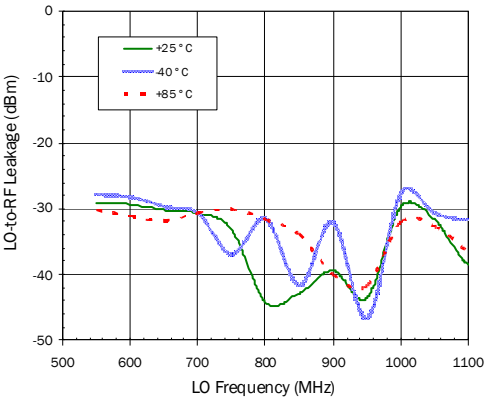
RF-to-IF Isolation vs. RF Frequency



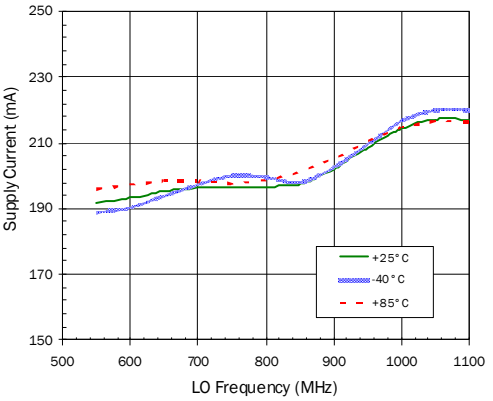
LO-to-IF Leakage vs. RF Frequency



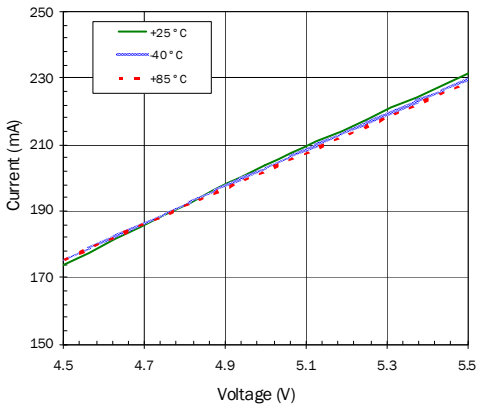
LO-to-RF Leakage vs. LO Frequency



Supply Current vs. LO Frequency



Current vs. Voltage



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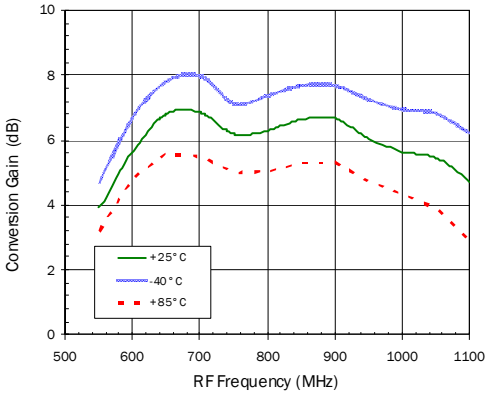
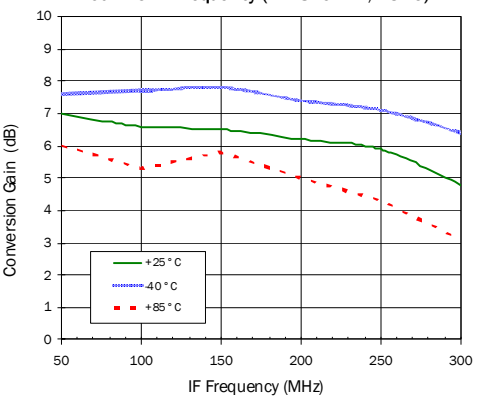
For all graphs: Typical Performance - High Side LO ($f_{RF}>f_{LO}$), V_{CC}=5.0V, P_{LO}=0dBm, P_{RF}=0dBm, f_{IF}=150MHz, unless otherwise noted.

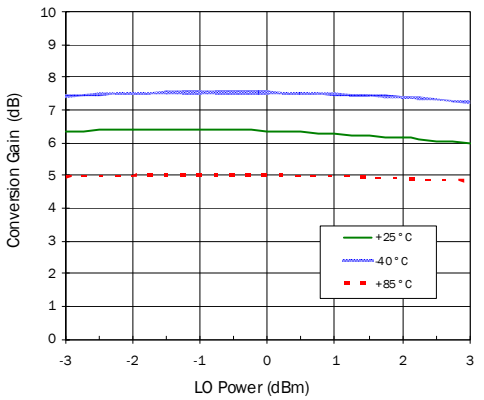
Conversion Gain vs. RF Frequency (HS LO)



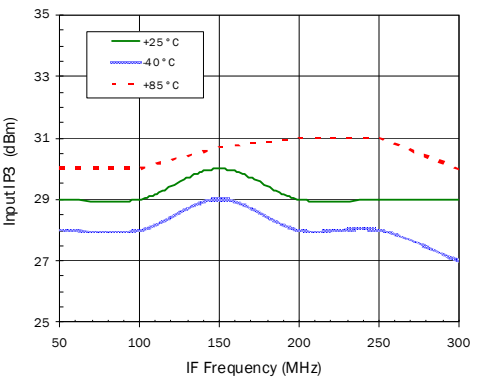
Gain vs. IF Frequency (RF=850MHz, HS LO)



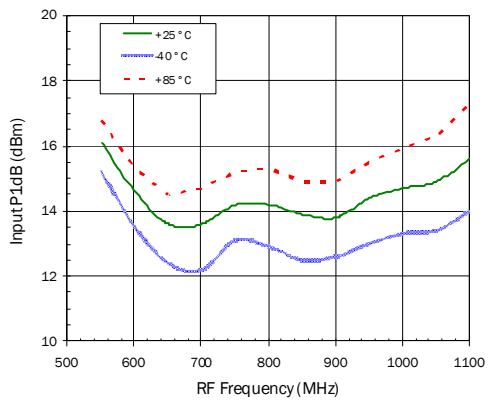
Gain vs. LO Power (RF=900MHz, IF=100MHz)



Input IP3 vs. IF Frequency (HS LO)



Input P1dB vs. RF Frequency (HS LO)



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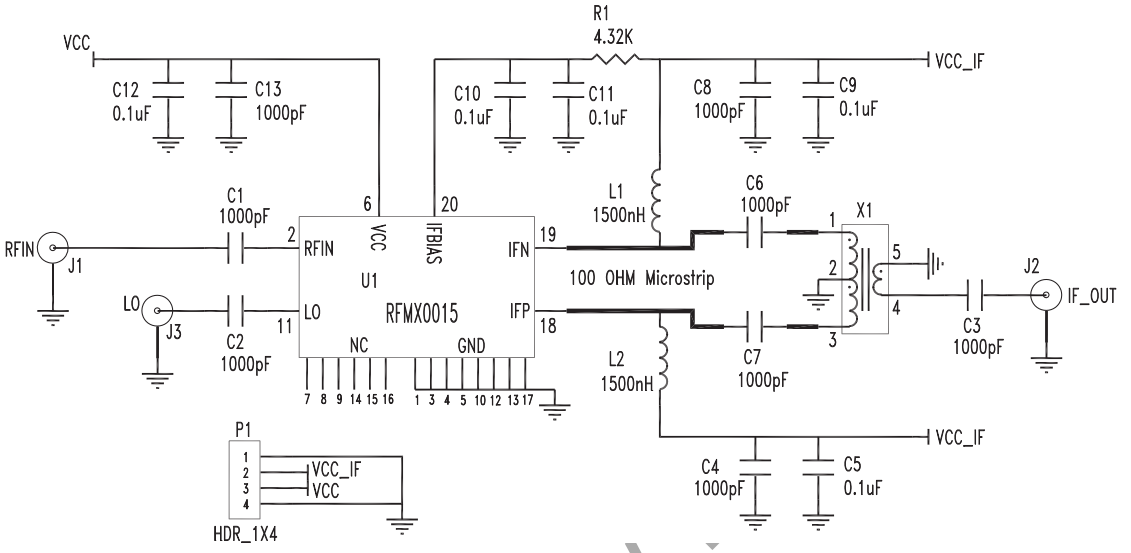
Evaluation Board Schematic



Evaluation Board Bill of Materials

RFMX0015 EVB BOM			
Description	**Reference Designator**	**Manufacturer**	**Manufacturer's P/N**
PCB			RFMXx015410(B)
RFMX0015SB - 1GHz Differential IF Down-Converter	U1	RFMD	RFMX0015
RFXF2553, 350MHz 1:4 Transformer	X1	RFMD	RFXF2553
CAP, 1000pF, 10%, 50V, X7R, 0402	C1-C4, C6-C8, C13	Murata	GRM155R71H102KA01E
CAP, 0.1uF, 10%, 16V, X7R, 0603	C5, C9, C11, C12	Murata	GRM188R71C104KA01D
CAP, 0.1uF, 10%, 16V, X7R, 0402	C10	Murata	GRM155R71C104KA88D
CONN, SMA, END LNCH, FLAT, 0.062"	J1, J2, J3	Johnson	142-0741-851
IND, 1500nH, 5%, W/W, 1008	L1, L2	Coilcraft	1008CS-152XJBC
RES, 4.32K, 1%, 1/16W, 0402	R1	Vishay	CRCW0402 4K32 1% 100 RT7
CONN, HDR, ST, PLRZD, 4-PIN, 0.100"	P1	ITW Pancon	MPSS100-4-C

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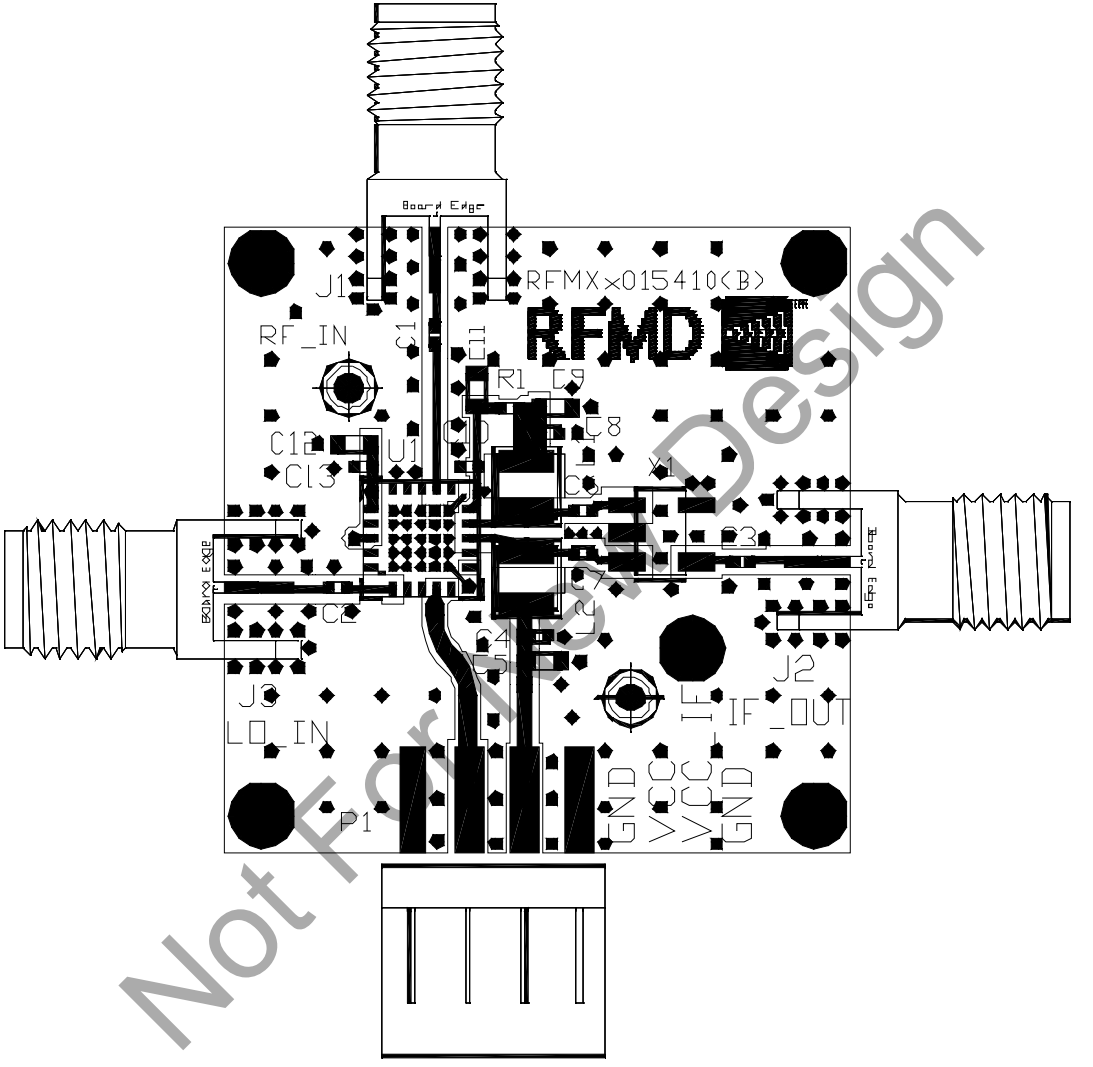
Evaluation Board Assembly Drawing



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Pin	Function	Description
1	NC	No internal connection. Can be NC or GND on the PCB.
2	RFIN	RF Single-ended input, external DC block required.
3	GND	Ground.
4	GND	Ground.
5	GND	Ground.
6	VCC	Supply voltage to LO buffer amplifiers.
7	NC	No internal connection. Can be NC or GND on the PCB.
8	NC	No internal connection. Can be NC or GND on the PCB.
9	NC	No internal connection. Can be NC or GND on the PCB.
10	GND	Ground.
11	LO	Local Oscillator Single-ended Input, external DC block required.
12	GND	Ground.
13	GND	Ground.
14	NC	No internal connection. Can be NC or GND on the PCB.
15	NC	No internal connection. Can be NC or GND on the PCB.
16	NC	No internal connection. Can be NC or GND on the PCB.
17	GND	Ground.
18	IFP	IF Differential Output and V_{CC} for IF Amplifier (collector voltage).
19	IFN	IF Differential Output and V_{CC} for IF Amplifier (collector voltage).
20	IFBIAS	IF Amplifier Current control (30mA range) Min Current: IFBIAS=0V (~75mA) Max Current: IFBIAS=5V (~105mA) Current between 75mA to 105mA: IFBIAS voltage between 0V to 5V.

Package Drawing

(Dimensions in millimeters)

Notes:
1. Shaded area represents Pin 1 location