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RFRX5933A
10 GHz TO 16 GHz DOWNCONVERTER
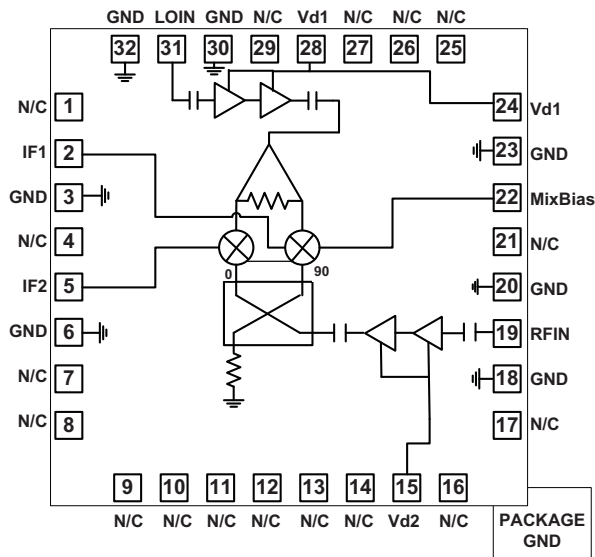
Package: QFN, 32-Pin, 5mm x 5mm

Features

- Integrated LNA, Image Rejection Mixer, LO Buffer Amplifier
- 2.0 dB NF
- 13 dB Conversion Gain
- 25 dBc Image Frequency Rejection
- +2 dBm to +5 dBm Third Order Intercept (IIP3)
- LO Input Drive 0 dBm
- DC to 4 GHz IF Frequency
- No Mixer Bias Required
- Low Cost 5mm x 5mm QFN Package
- 100% RF and DC Tested

Applications

- Point-to-Point
- VSAT

Functional Block Diagram

Product Description

The RFRX5933A is a 10 GHz to 16 GHz GaAs pHEMT downconverter, incorporating an integrated LNA, image rejection mixer, LO buffer amplifier, and DC decoupling capacitors. The device is packaged in a 5 mm x 5 mm QFN to simplify both system-level board design and volume assembly. The combination of high performance and low cost packaging makes the RFRX5933A a cost effective solution, ideally suited to both current and next generation Point-to-Point and VSAT applications.

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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1 of 10

RFRX5933A

Absolute Maximum Ratings

Parameter	Rating	Unit
LNA Drain Voltage (V_D)	5	V
LOA Drain Voltage (V_D)	5	V
RF Input Power	+10	dBm
LO Input Power	+15	dBm
ESD Human Body Model	250	V
ESD Machine Model	50	V
MSL	2	

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 EU Directive 2002/95/EC (at time of this document revision).

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Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
10.70 GHz to 11.70 GHz Output RF Frequency					
RF Electrical Characteristics					T = 25 °C
RF Frequency	10.7		11.7	GHz	
LO Frequency	6.7		15.7	GHz	
IF Frequency	DC		4	GHz	
Conversion Gain	9	13		dB	
Noise Figure		2.2	3	dB	
Input Third Order Intercept	2		4	dBm	
Image Rejection	20	23		dBc	
RF Input Return Loss		13		dB	
LO Input Return Loss		17		dB	
IF Input Return Loss		17		dB	
DC Electrical Characteristics					T = 25 °C
LNA Bias Voltage		4		V	
LOA Bias Voltage		3		V	
Supply Current		180	230	mA	
12.75 GHz to 13.25 GHz Output RF Frequency					
RF Electrical Characteristics					T = 25 °C
RF Frequency	12.75		13.25	GHz	
LO Frequency	8.75		17.25	GHz	
IF Frequency	DC		4	GHz	
Conversion Gain	10	13		dB	
Noise Figure		2.0	3	dB	
Input Third Order Intercept	3		6	dBm	
Image Rejection	10	27		dBc	
RF Input Return Loss		14		dB	
LO Input Return Loss		20		dB	
IF Input Return Loss		17		dB	
DC Electrical Characteristics					T = 25 °C
LNA Bias Voltage		4		V	
LOA Bias Voltage		3		V	
Supply Current		180	230	mA	

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Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
14.40 GHz to 15.35 GHz Output RF Frequency					
RF Electrical Characteristics					T=25 °C
RF Frequency	14.4		15.35	GHz	
LO Frequency	10.4		19.35	GHz	
IF Frequency	DC		4	GHz	
Conversion Gain	9	13		dB	
Noise Figure		2.2	3	dB	
Input Third Order Intercept	2		3	dBm	
Image Rejection	10	25		dBc	
RF Input Return Loss		12		dB	
LO Input Return Loss		10		dB	
IF Input Return Loss		17		dB	
DC Electrical Characteristics					
LNA Bias Voltage		4		V	
LOA Bias Voltage		3		V	
Supply Current		180	230	mA	

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3 of 10

RFRX5933A

Typical Electrical Performance

Measurements performed with IF1 and IF2 ports connected to an external 90° Hybrid Combiner
LO Power 0/+5dBm, V(LNA)= +4V, V(LOA)=+3V
Temperature (case)=-40°C, +25°C, +85°C (unless otherwise specified)

Conversion Gain vs. Temperature
RF>LO
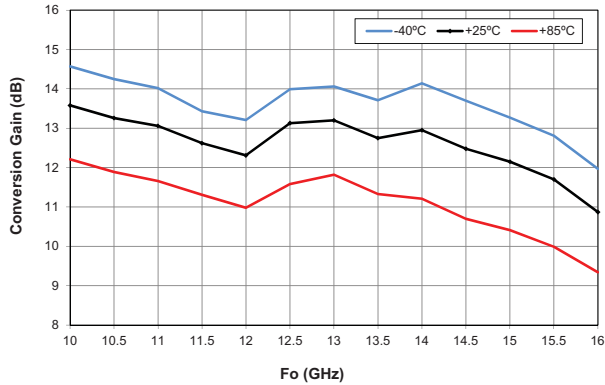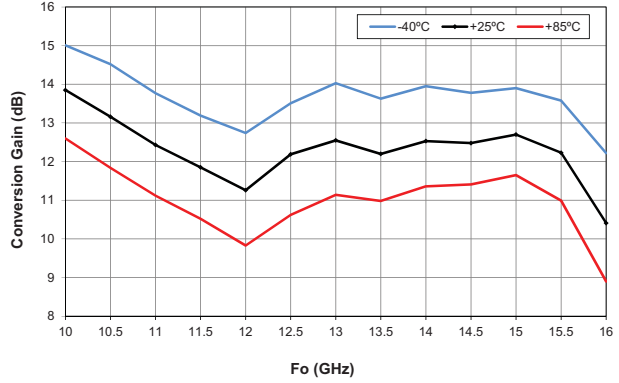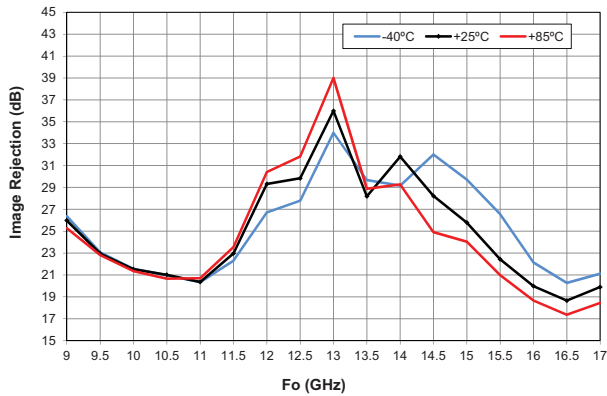

Conversion Gain vs. Temperature
RF<LO

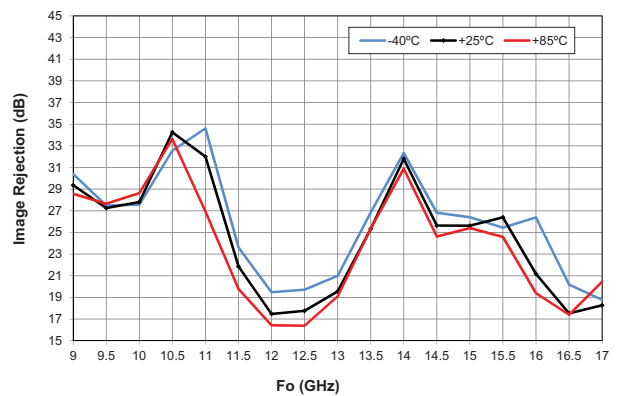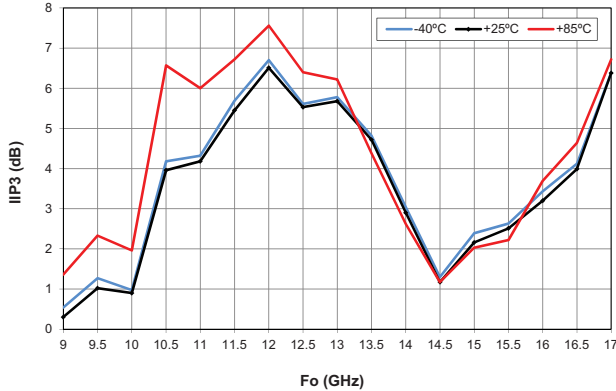**Image Rejection vs. Temperature**
RF>LO

Image Rejection vs. Temperature
RF<LO

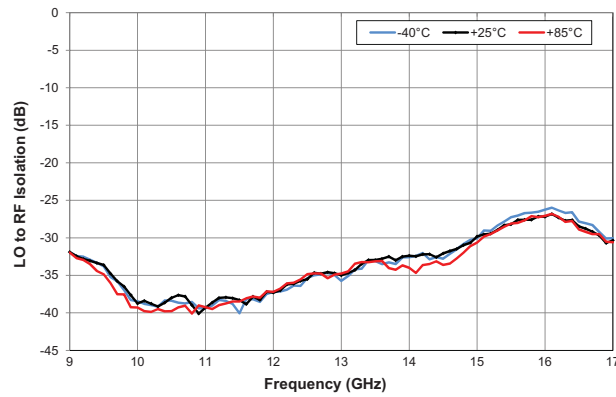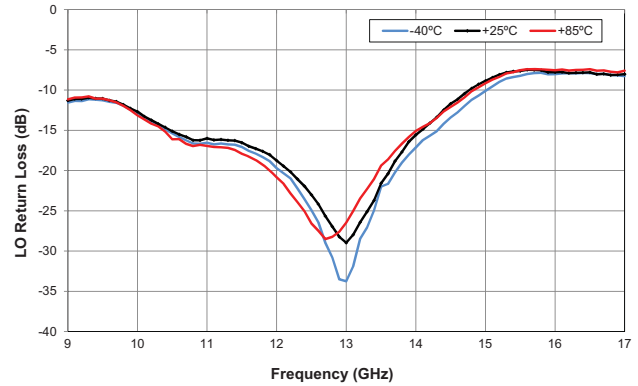**Input IP3 vs. Temperature**
RF>LO

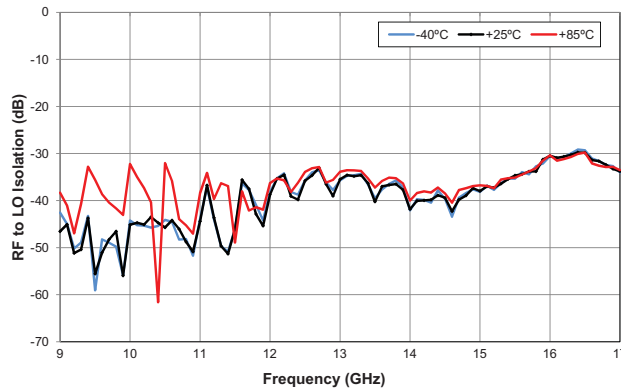**Input IP3 vs. Temperature**
RF<LO
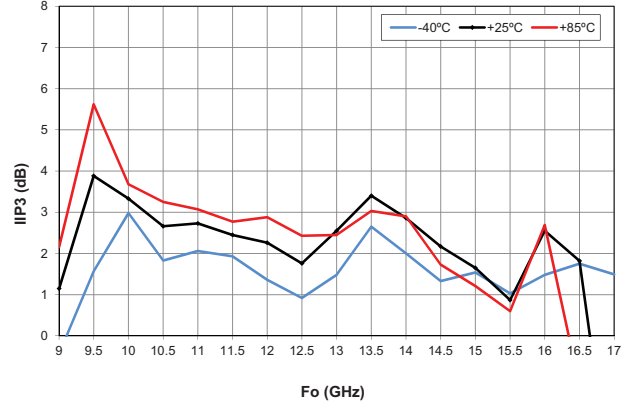
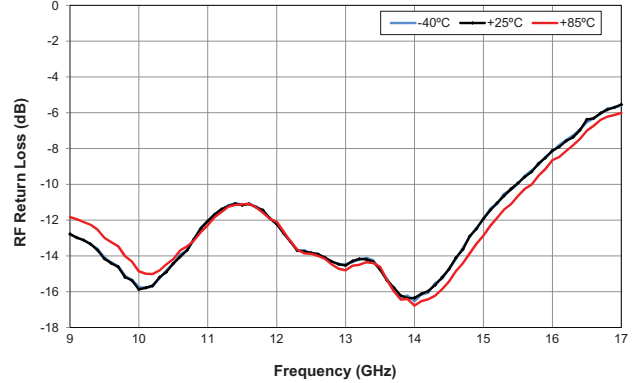### LO to RF Isolation Loss Over Temperature

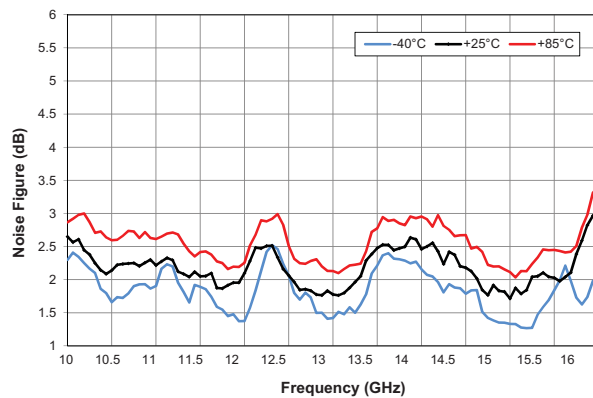### LO Return Loss Over Temperature

RF to LO Isolation Over Temperature
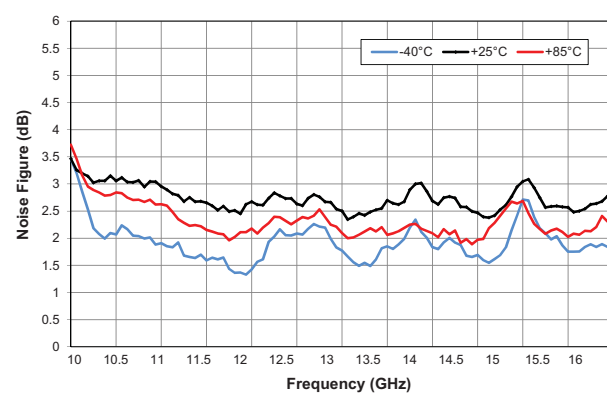

RF Return Loss Over Temperature

NOISE FIGURE LSB
LNA=4V, LOA=3V, LO POWER=0dBm

NOISE FIGURE USB
LNA=4V, LOA=3V, LO POWER=0dBm

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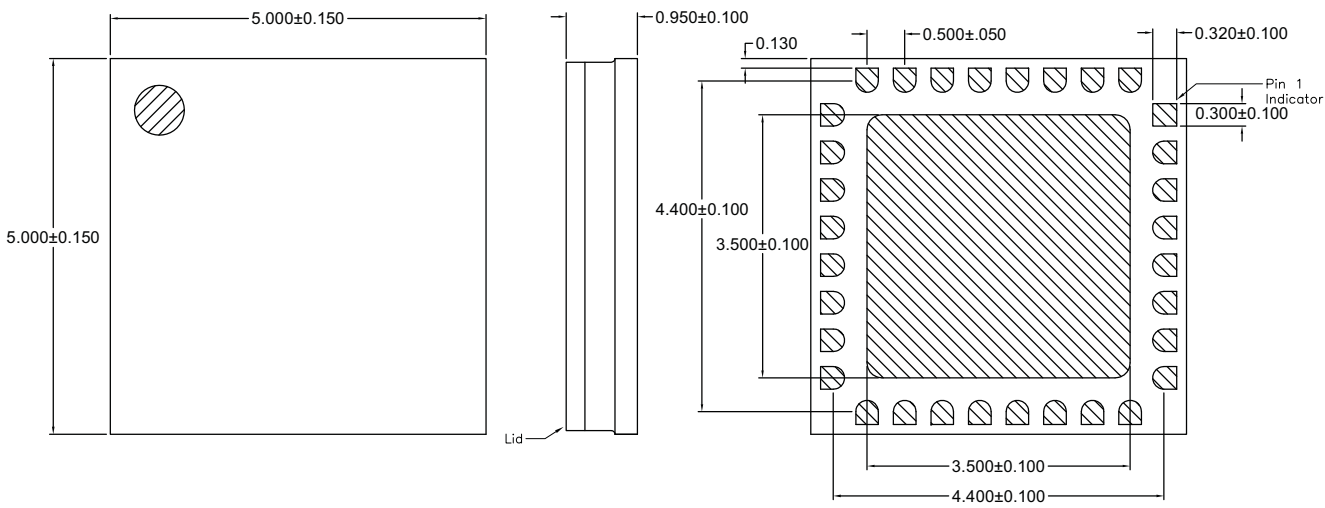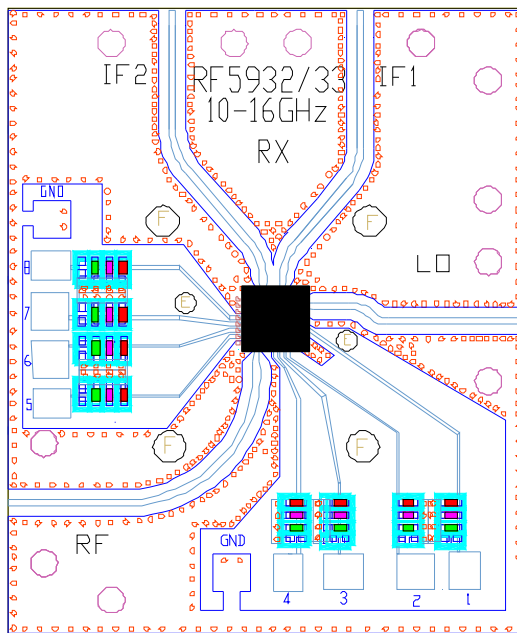7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at **(+1) 336-678-5570** or **sales-support@rfmd.com**.

5 of 10

RFRX5933A

Functional Schematic
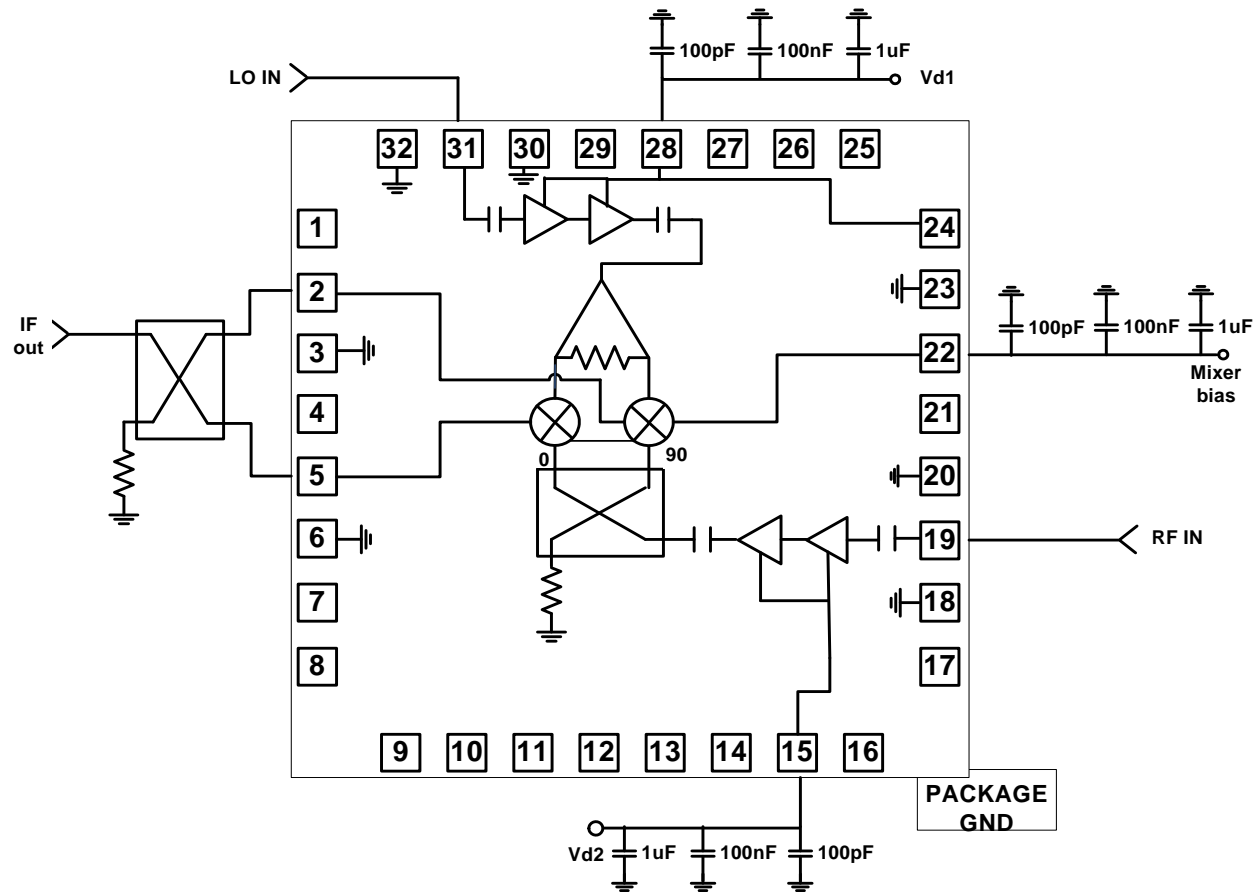
Pin Out
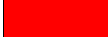
Pin	Function	Description
1	N/C	
2	IF1	
3	IF1 GND	
4	N/C	
5	IF2	
6	IF2 GND	
7	N/C	
8	N/C	
9	N/C	
10	N/C	
11	N/C	
12	GND	
13	VD2	LNA 2nd stage drain bias 4V
14	N/C	
15	VD1	LNA 1st stage drain bias 4V
16	N/C	
17	N/C	
18	RF GND	RF ground
19	RF IN	RF input
20	RF GND	RF ground
21	N/C	
22	GND	
23	GND	
24	VD3	LO amplifier drain bias (also connected to pin 28) 3V
25	N/C	
26	N/C	
27	N/C	
28	OPTIONAL	Connected to Pin 24 (LO amplifier drain bias) 3V
29	N/C	
30	LO GND	LO ground
31	LO IN	LO input
32	LO GND	LO ground

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7 of 10

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Package Drawing
(All dimensions in mm)

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Evaluation Board Layout

Color	0402 Capacitors
🟩	1 μF Capacitor
🟪	100 nF Capacitor
🟥	10000 pF Capacitor

PCB pad numbers 3, 6, and 8 are tied to grounds (GND)

PCB pad number 4 is the Mixer Bias and is set to -1V

PCB pad numbers 1 and 2 are tied together at +3V (LO amplifier)

PCB pad numbers 5 and 7 are tied together at +4V (RF amplifiers stage 1 and 2)

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9 of 10

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Ordering Information

Ordering Code	Description
RFRX5933AS2	2 piece sample bag
RFRX5933ASB	5 piece bag
RFRX5933ASQ	25 piece bag
RFRX5933ASR	100 pieces on a 7" reel
RFRX5933ATR7	750 pieces on a 7" reel
RFRX5933ATR13	2500 pieces on a 13" reel
RFRX5933APCK410	Evaluation board with 2 piece sample bag