

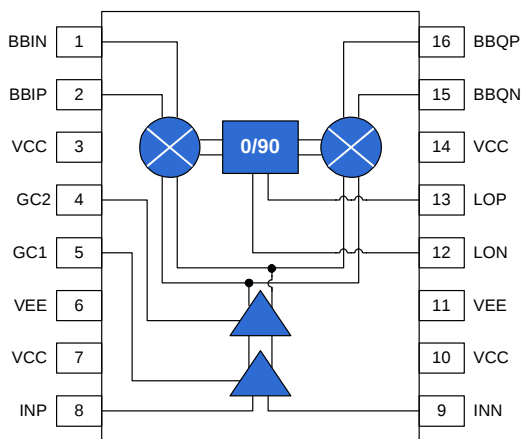


Product Description

The Stanford Microdevices' SRF-2016 is a multipurpose demodulator RFIC capable of both quadrature demodulation or direct IF output. This device features switchable gain control, high input P1dB, and excellent I/Q amplitude and phase balance.

The SRF-2016 uses silicon germanium device technology to yield a highly integrated RFIC for use in a variety of system applications. Use of this integrated device over standard discrete implementations can result in lower component count, less PCB space and higher transceiver card yields.

Functional Block Diagram



Advanced Data Sheet

SRF-2016

200 - 600 MHz

Silicon Germanium IF Receiver



16 pin TSSOP with Exposed Pad
Package Body: 0.20 x 0.17 x 0.04 (inches)
5.0 x 4.4 x 1.0 (mm)

Product Features

- Buffered IF OUT available through I axis
- Gain control in 20dB steps
- Excellent I/Q amplitude and phase balance
- High input P1dB

Applications

- Digital and spread spectrum communication systems
- Cellular, PCS, DCS, 3G transceivers
- ISM band transceivers
- FWA receiver IF sections

Key Specifications

Parameters	Test Conditions ($V_{CC}=5.0V$, $I=150mA$, $T=25^{\circ}C$)	Unit	Min.	Typ.	Max.
IF/LO Frequency Range		MHz	200	240 to 440	600
Conversion Gain		dB		-5/+15/+35	
Input P1dB		dBm		+10/-10/-30	
I/Q Output Frequency Range		MHz	DC		500
I/Q Output Amplitude Balance		dB	-0.2		0.2
I/Q Output Phase Balance		deg	-2		2

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Advanced Data Sheet

SRF-2016 SiGe IF Receiver

Absolute Maximum Ratings

Parameters	Value	Unit
Supply Voltage	6.0	V _{DC}
LO Input	+10	dBm
IF Input	+10	dBm
Operating Temperature	-40 to +85	°C
Storage Temperature	-65 to +150	°C

Test Conditions

V _S = +5V _{DC}	TA = +25°C	LO Input = 0dBm, 400MHz
IF Input F=400.1 MHz	GC1 = 0, GC2 = 0; 0dBm	
	GC1 = 1, GC2 = 0; -20dBm	
	GC1 = 1, GC2 = 1; -40dBm	

Product Specifications – IF Input (I/Q mixing to baseband)

Parameters	Test Conditions	Unit	Min.	Typ.	Max.
Frequency Range		MHz	200	240-440	600
Return Loss	50ohm reference	dB		20	
Gain	gain set=high GC1=GC2=1	dB		35	
Input P1dB		dBm		-30	
Input IP3		dBm		-20	
Noise Figure		dB		6	
Gain	gain set=medium GC1=1 GC2=0	dB		15	
Input P1dB		dBm		-10	
Input IP3		dBm		0	
Noise Figure		dB		10	
Gain	gain set=low GC1=GC2=0	dB		-5	
Input P1dB		dBm		10	
Input IP3		dBm		20	
Noise Figure		dB		30	

Product Specifications – Stuck Mixer (DC on LO Port – gain controlled amplifier)

Parameters	Test Conditions	Unit	Min.	Typ.	Max.
Frequency Range		MHz	200		600
Return Loss	50ohm reference	dB		20	
Gain	gain set=high GC1=GC2=1	dB		40	
Input P1dB		dBm		-26	
Input IP3		dBm		-16	
Noise Figure		dB		6	
Gain	gain set=medium GC1=1 GC2=0	dB		20	
Input P1dB		dBm		-6	
Input IP3		dBm		4	
Noise Figure		dB		9	
Gain	gain set=low GC1=GC2=0	dB		0	
Input P1dB		dBm		14	
Input IP3		dBm		24	
Noise Figure		dB		30	

Product Specifications – I/Q Output

Parameters	Additional Test Conditions	Unit	Min.	Typ.	Max.
I/Q Output Frequency Range		MHz	DC		500
I/Q Output Amplitude Balance		dB	-0.2		0.2
I/Q Output Phase Balance		deg	-2		2
I/Q Output Common-mode Voltage		V		2.5	

Product Specifications – LO Input

Parameters	Additional Test Conditions	Unit	Min.	Typ.	Max.
LO Input Level		dBm	-3	0	+3
Return Loss		dB		20	

Product Specifications – Miscellaneous

Parameters	Additional Test Conditions	Unit	Min.	Typ.	Max.
Supply Voltage		V	+4.75	+5.0	+5.25
Supply Current		mA		180	
Thermal Resistance		°C		TBD	

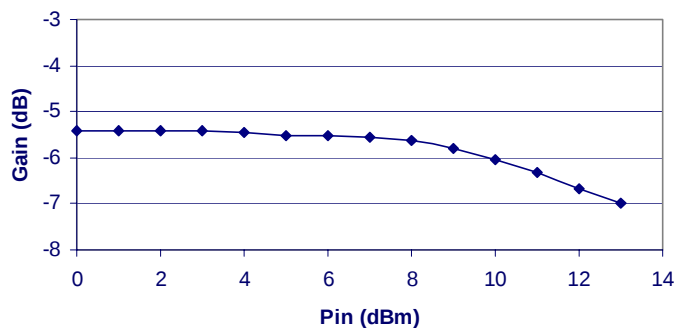
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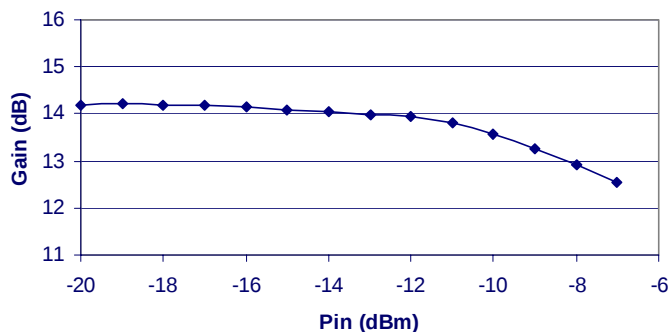
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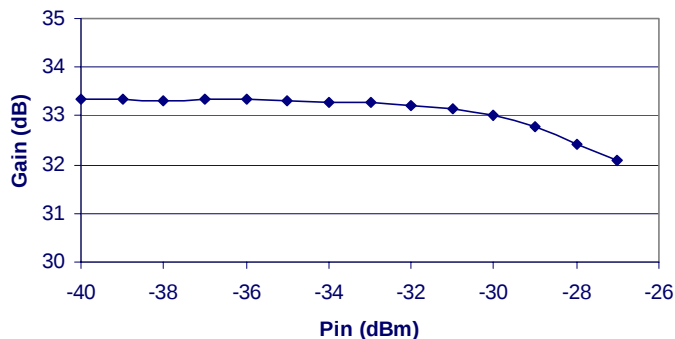
Gain vs. Pin
Low Gain State (00)



Gain vs. Pin
Medium Gain State (10)



Gain vs. Pin
High Gain State (11)



**Pin Out Description**

Pin #	Function	Description	Additional Comments
1	BBIN	Baseband I-axis output (-)	self-biasing
2	BBIP	Baseband I-axis output (+)	self-biasing
3	VCC	Positive power supply	
4	GC2	Gain control input, stage 2	5V CMOS levels
5	GC1	Gain control input, stage 1	5V CMOS levels
6	VEE	Ground	
7	VCC	Positive power supply	
8	INP	IF input (+)	self-biasing; AC-couple
9	INN	IF input (-)	self-biasing; AC-couple
10	VCC	Positive power supply	
11	VEE	Ground	
12	LON	LO input (-)	self-biasing; AC-couple
13	LOP	LO input (+)	self-biasing; AC-couple
14	VCC	Positive power supply	
15	BBQN	Baseband Q-axis output (-)	self-biasing
16	BBQP	Baseband Q-axis output (+)	self-biasing

SRF-2016 SiGe IF Receiver



Caution: ESD Sensitive

Appropriate precaution in handling, packaging and testing devices must be observed.

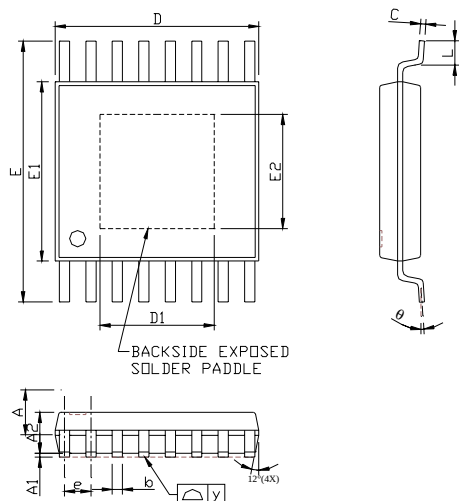
Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
SRF-2016	TBD	TBD

Part Symbolization

The part will be symbolized with a "TBD" marking designator on the top surface of the package.

Package Dimensions

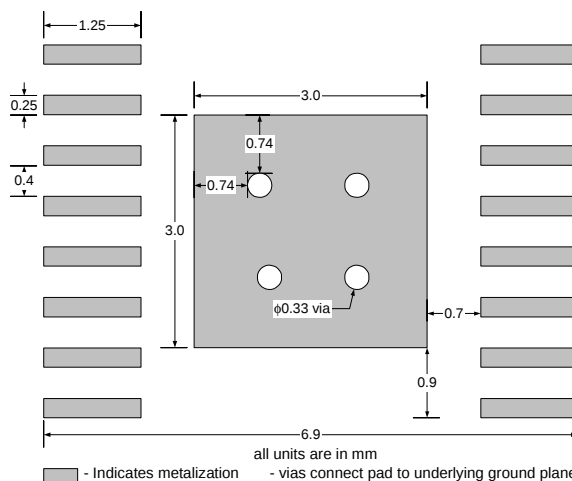


NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS
2. TOLERANCE ± 0.1 mm UNLESS OTHERWISE SPECIFIED
3. COPLANARITY : 0.1 mm
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. FOLLOWED FROM JEDEC MO-153

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	—	—	1.15	—	—	0.045
A1	0.00	—	0.10	0.000	—	0.004
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19	—	0.30	0.007	—	0.012
C	0.09	—	0.20	0.004	—	0.008
D	4.90	5.00	5.10	0.193	0.197	0.201
D1	—	2.80	—	—	0.110	—
E	—	6.40	—	—	0.252	—
E1	4.30	4.40	4.50	0.169	0.173	0.177
E2	—	2.80	—	—	0.110	—
e	—	0.65	—	—	0.026	—
L	0.45	0.60	0.75	0.018	0.024	0.030
y	—	—	0.10	—	—	0.004
θ	0°	—	8°	0°	—	8°

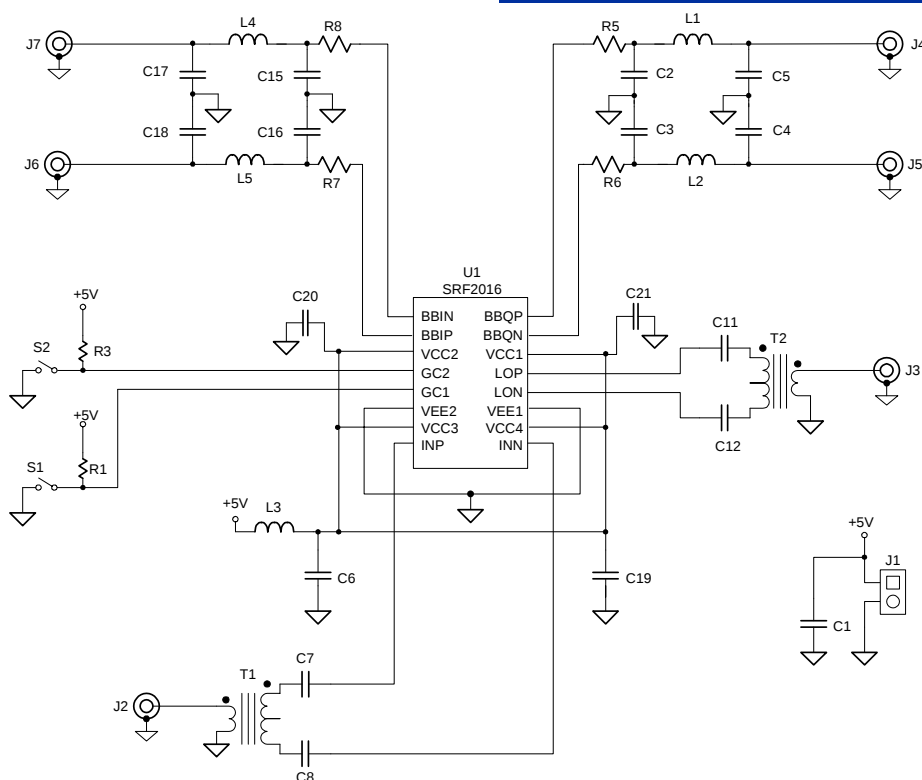
Test PCB Pad Layout



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Demo Test Board Schematic



Bill of Materials

Component Designator	Value	Qty	Vendor	Part Number	Description
U1		1	SMDI	SRF-2016	IF receiver
J1		1	Digikey-Sullins	S1312-02-ND	2 pin 0.1" power supply header
J2, J3, J4, J5, J6, J7		6	Johnson Components	142-0701-851	SMA end launch connector
T1, T2		2	Mini-Circuits	TC1-1	Transformer
C1	1uF	1	Venkel	C1206Y5V160-105ZNE	1206 size supply bypass capacitor
S1, S2		1	Grayhill	GH1102-ND	Dual DIP switch
R1, R3	1 kohm	2	Venkel	CR0603-16W-102JT	0603 size pull-up resistor
C6, C19, C20, C21	1nF	4	Venkel	C0603COG500-102JNE	0603 size bypass capacitor
L1, L2, L3, L4, L5	1uH	5	Panasonic	PCD1008TR-ND	1210 size inductor
C7, C8, C11, C12	18pF	4	Venkel	C0603COG500-180JNE	0603 size coupling capacitor
R5, R6, R7, R8	0 ohm	4	Venkel	CR1206-8W-000T	1206 size resistor
C2, C3, C4, C5, C15, C16, C17, C18	820pF	8	Venkel	C0603COG500-821JNE	0603 size filter capacitor

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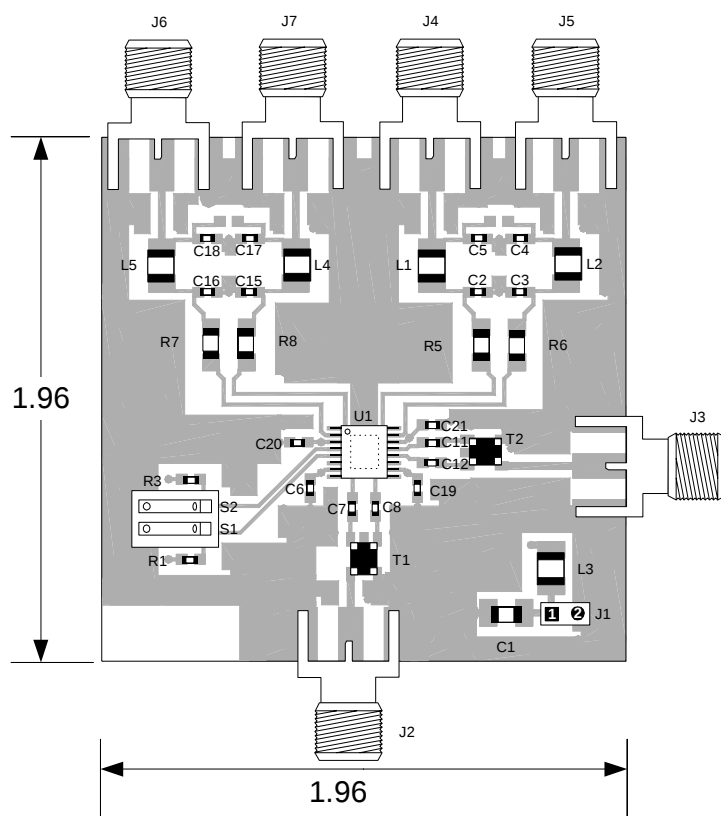
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Advanced Data Sheet

SRF-2016 SiGe IF Receiver

**Demo Test Board
(Fully Assembled PCB)**



Note: Dimensions in inches