

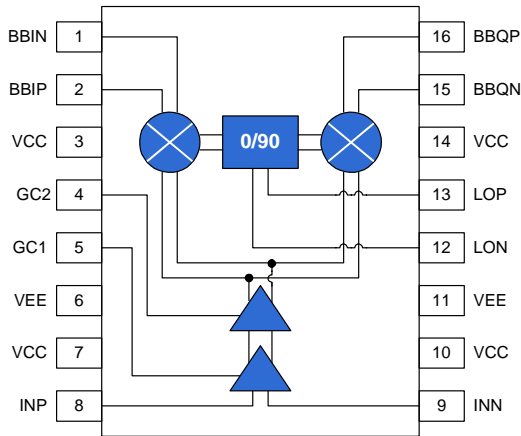


## Product Description

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 <sub>DC</sub>
LO Input	+10	dBm
IF Input	+10	dBm
Operating Temperature	-40 to +85	°C
Storage Temperature	-65 to +150	°C

**Test Conditions**

V <sub>S</sub> = +5V <sub>DC</sub>	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	gain set=medium GC1=1 GC2=0	dB		6	
Gain		dB		15	
Input P1dB		dBm		-10	
Input IP3	gain set=low GC1=GC2=0	dBm		0	
Noise Figure		dB		10	
Gain		dB		-5	
Input P1dB	gain set=low GC1=GC2=0	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	gain set=medium GC1=1 GC2=0	dB		6	
Gain		dB		20	
Input P1dB		dBm		-6	
Input IP3	gain set=low GC1=GC2=0	dBm		4	
Noise Figure		dB		9	
Gain		dB		0	
Input P1dB	gain set=low GC1=GC2=0	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	

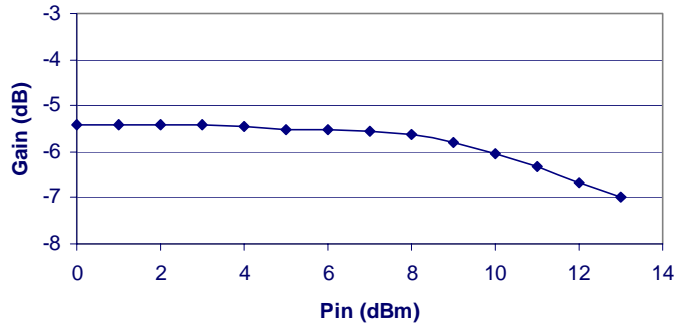
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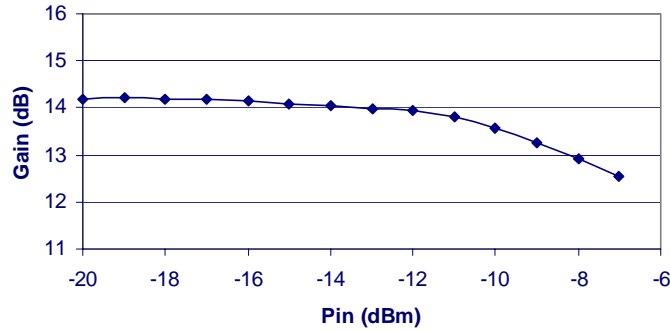
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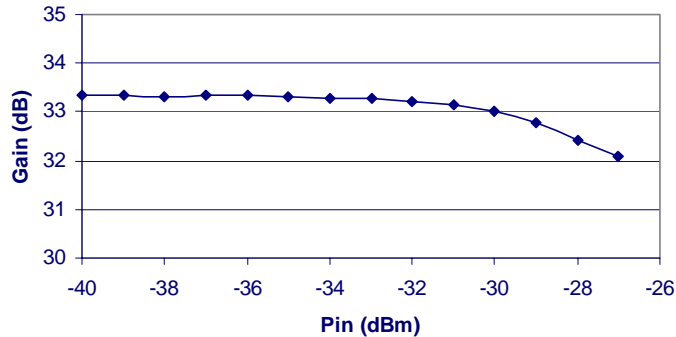
**Gain vs. Pin**  
**Low Gain State (00)**



**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

**Advanced Data Sheet**  
**SRF-2016 SiGe IF Receiver**



**Caution: ESD Sensitive**  
Appropriate precaution in handling, packaging and testing devices must be observed.

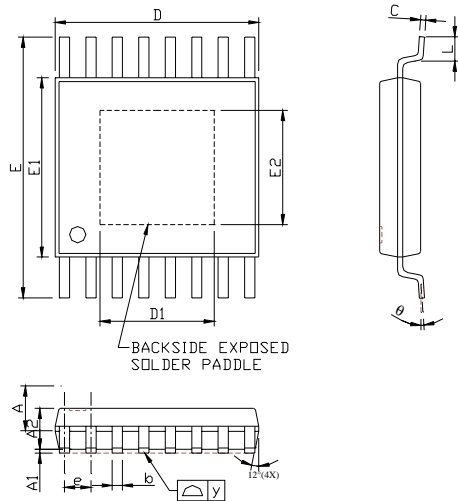
**Part Number Ordering Information**

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.

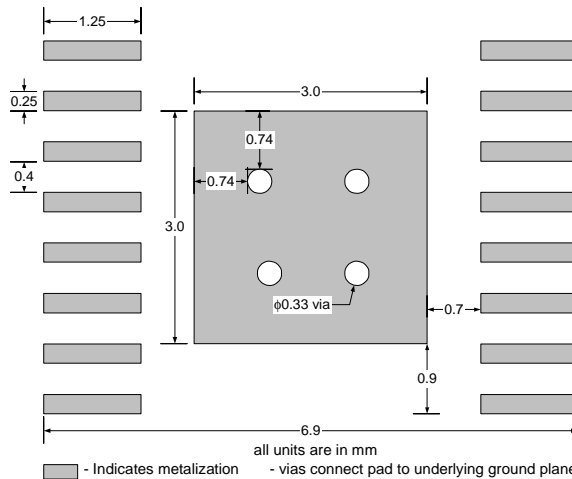
**Package Dimensions**



- 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°

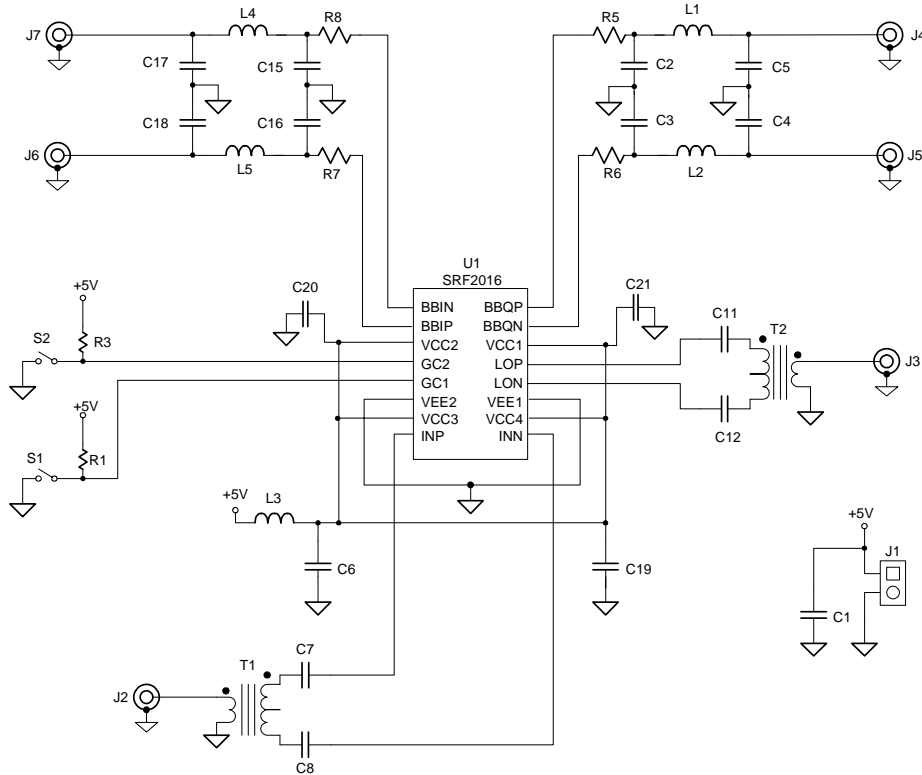
**Test PCB Pad Layout**



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Demo Test Board Schematic

SRF-2016 SiGe IF Receiver

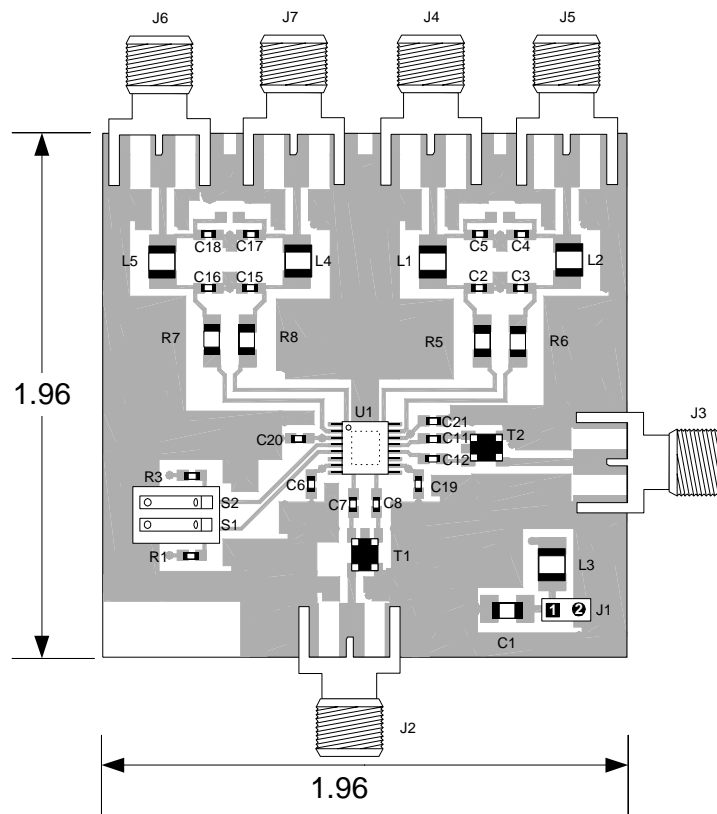


Bill of Materials

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



Note: Dimensions in inches