

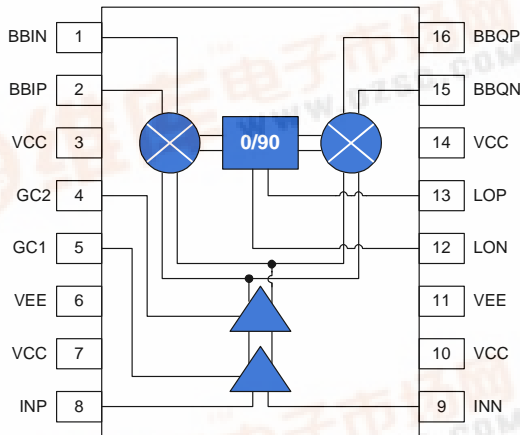


Product Description

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°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 | |

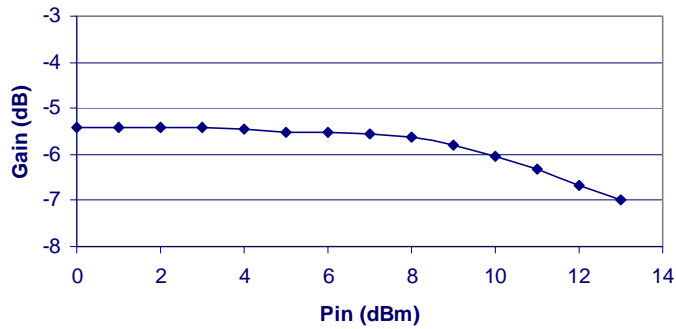
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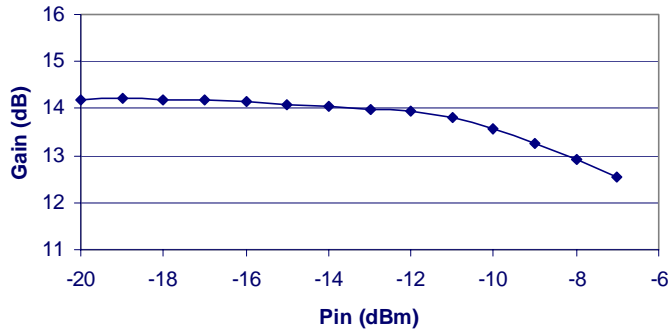
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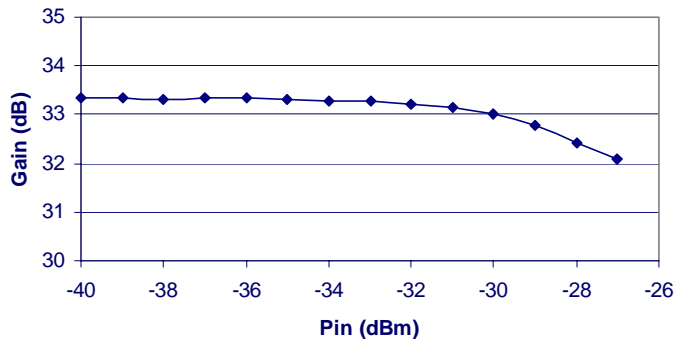
Gain vs. Pin
Low Gain State (00)



Gain vs. Pin
Medium Gain State (10)



Gain vs. Pin
High Gain State (11)



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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 |

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Advanced Data Sheet
SRF-2016 SiGe IF Receiver

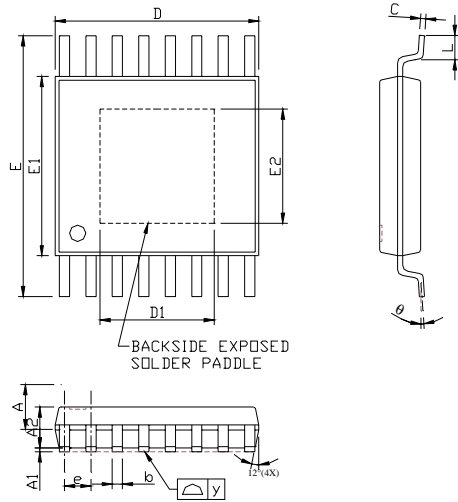


Caution: ESD Sensitive
Appropriate precaution in handling, packaging and testing devices must be observed.

| 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.

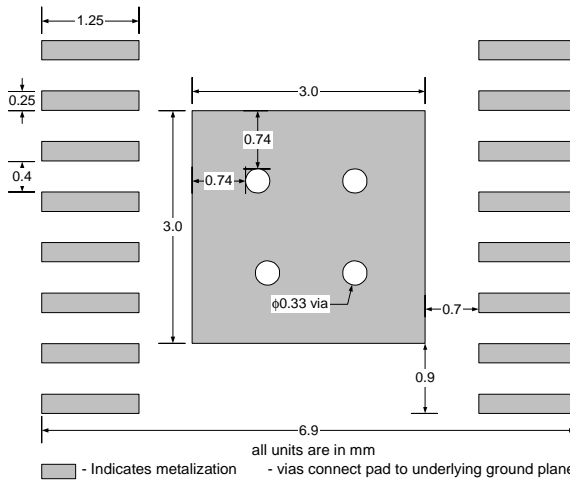
Package Dimensions



- 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

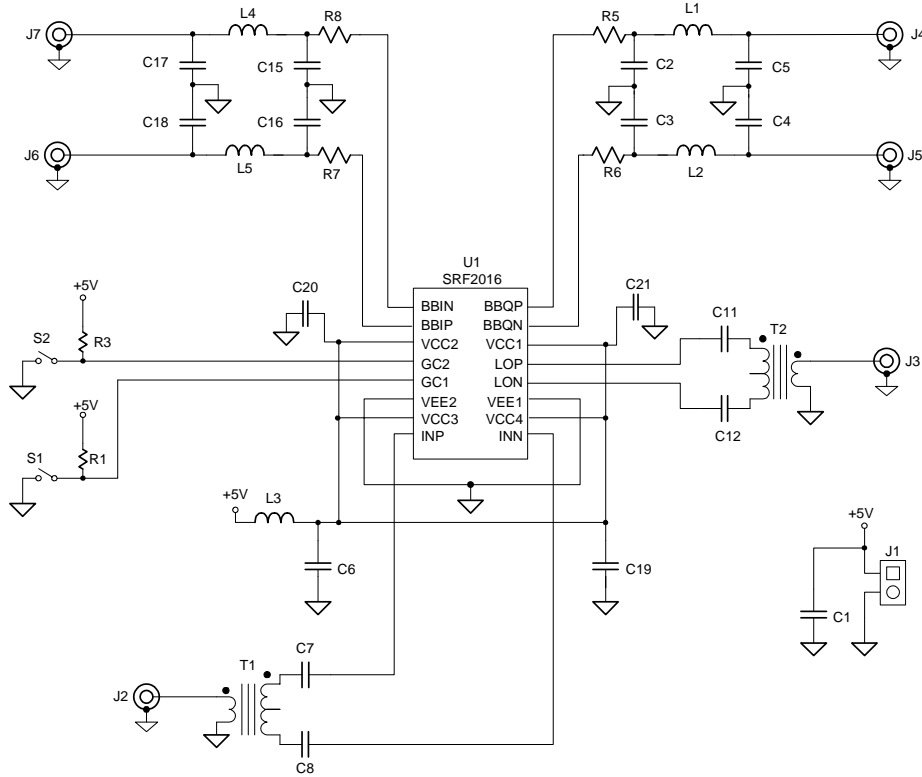
| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|----------|---------------------------|------|------|----------------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | — | — | 1.15 | — | — | 0.045 |
| A1 | 0.00 | — | 0.10 | 0.000 | — | 0.004 |
| A2 | 0.80 | 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

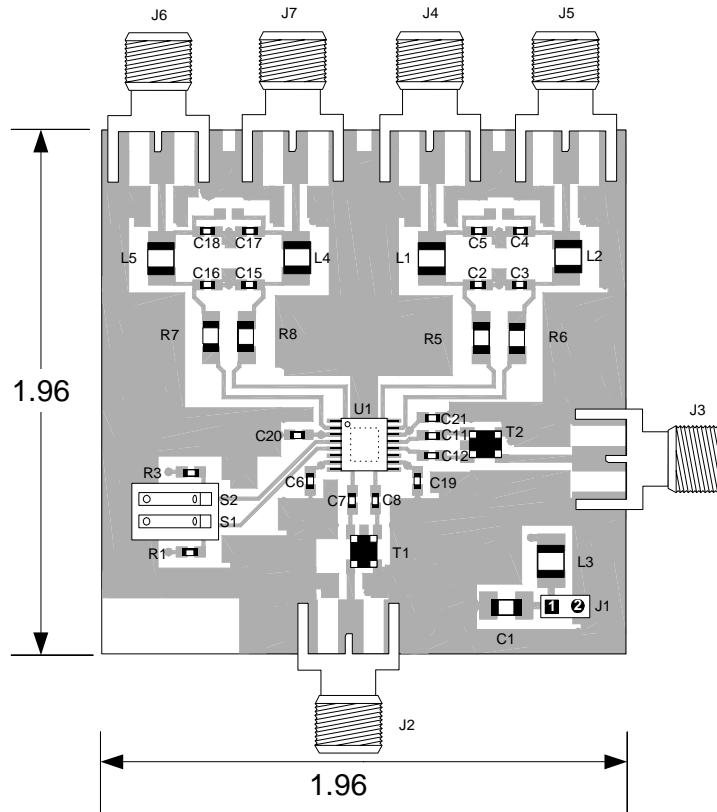


Bill of Materials

| 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

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