

Features

- Active Mixer with Conversion Gain
- No External LO Driver Necessary
- Low LO Drive Level Required
- RF and LO Ports May Be Driven Single-ended
- Single 5-V Supply Voltage
- High LO-RF Isolation
- Broadband Resistive 50- Ω Impedances on All Three Ports
- Small SSO16 Package

Applications

- Digital Communication Systems
- 2200 MHz to 2700 MHz Transceivers for Base Stations

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Electrostatic sensitive device.
Observe precautions for handling.

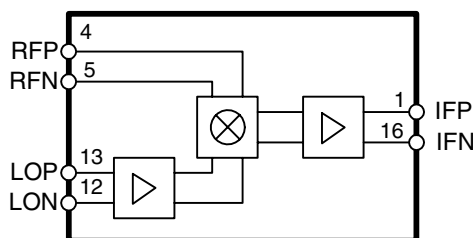


Description

The T0782 is a high-linearity active mixer which is manufactured using Atmel's advanced Silicon-Germanium technology. This mixer features a frequency range of 2200 MHz to 2700 MHz. It operates from a single 5-V supply and provides 10 dB of conversion gain while requiring only 0 dBm input to the integrated LO driver. An IF amplifier is also included.

The T0782 incorporates internal matching on each RF, IF and LO port to enhance ease of use and to reduce the external components required. The RF and LO inputs can be driven differentially or single-ended.

Figure 1. Block Diagram



2200-2700 MHz High Linearity SiGe Active Receive Mixer

T0782

Preliminary

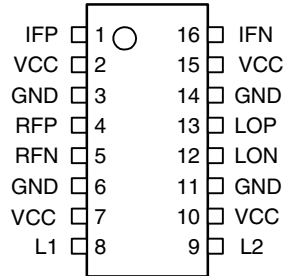
Rev. 4526A-SIGE-03/02



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Pin Configuration

Figure 2. Pinning SSOP16



Pin Description

| Pin | Symbol | Function |
|-----|--------|----------------------------------|
| 1 | IFP | IF positive output |
| 2 | VCC | 5-V power supply |
| 3 | GND | Ground |
| 4 | RFP | RF positive input |
| 5 | RFN | RF negative input |
| 6 | GND | Ground |
| 7 | VCC | 5-V power supply |
| 8 | L1 | External inductor terminal |
| 9 | L2 | External inductor terminal |
| 10 | VCC | 5-V power supply |
| 11 | GND | Ground |
| 12 | LON | Local oscillator, negative input |
| 13 | LOP | Local oscillator, positive input |
| 14 | GND | Ground |
| 15 | VCC | 5-V power supply |
| 16 | IFN | IF negative output |

Absolute Maximum Ratings

All voltages are referred to GND

| Parameters | Symbol | Value | Unit |
|-----------------------|--------------|-------------|------|
| Supply voltage | V_{CC} | 5 to 6.0 | V |
| LO input | LO_P, LO_N | 10 | dBm |
| IF input | RF_P, RF_N | 15 | dBm |
| Operating temperature | T_{OP} | -40 to +85 | °C |
| Storage temperature | T_{stg} | -40 to +150 | °C |

Thermal Resistance

| Parameter | Symbol | Value | Unit |
|------------------|------------|-------|------|
| Junction ambient | R_{thJA} | TBD | K/W |

Electrical Characteristics

Test conditions: $V_{CC} = +5\text{ V}$, $T_{amb} = +25^{\circ}\text{C}$

RF input: -20 dBm at 2450 MHz

LO output: 0 dBm at 2250 MHz

| No. | Parameters | Test Conditions / Pins | Pin | Symbol | Min. | Typ. | Max. | Unit | Type * |
|------------------------------|--------------------|------------------------------------|-----|----------|------|-------|------|------|--------|
| AC Performance | | | | | | | | | |
| | Frequency range | | | f | 2200 | | 2700 | MHz | |
| | IF frequency range | | | F_{IF} | 10 | 200 | 300 | MHz | |
| | Output IP3 | RF1 = RF2 = -17 dBm/ tone | | IP3 | | 15.5 | | dBm | |
| | Output P1dB | | | | | 4.5 | | dBm | |
| | Conversion gain | | | | | 10.5 | | dB | |
| | SSB noise figure | | | | | 15.5 | | dB | |
| | RF return loss | | | | | 14 | | dB | |
| | LO return loss | | | | | 14 | | dB | |
| | IF return loss | | | | | 14 | | dB | |
| | LO drive | | | | -3 | 0 | $+3$ | dBm | |
| Isolation Performance | | | | | | | | | |
| | Leakage (LO-RF) | | | | | -30 | | dBm | |
| | Leakage (LO-IF) | | | | | -30 | | dBm | |
| Miscellaneous | | | | | | | | | |
| | Supply voltage | | | V_{CC} | 4.75 | 5 | 5.25 | V | |
| | Supply current | | | I_{CC} | | 150 | | mA | |

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Typical Device Performance

Figure 3. Conversion Gain versus RF Frequency, $V_{CC} = 5.0\text{ V}$, LO = 0 dBm , $RF_{IN} = -20\text{ dBm}$, IF = 200 MHz

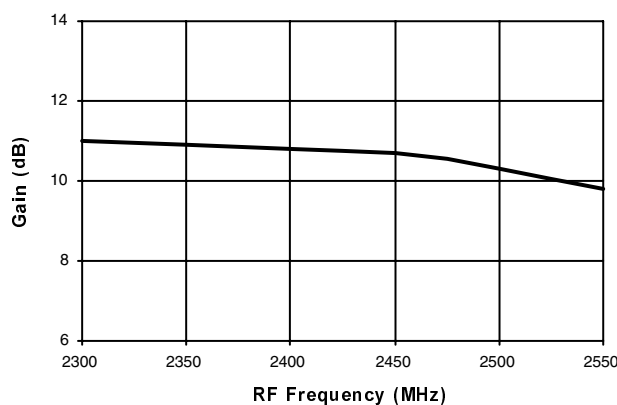


Figure 4. Return Loss versus RF Frequency, $V_{CC} = 5.0\text{ V}$

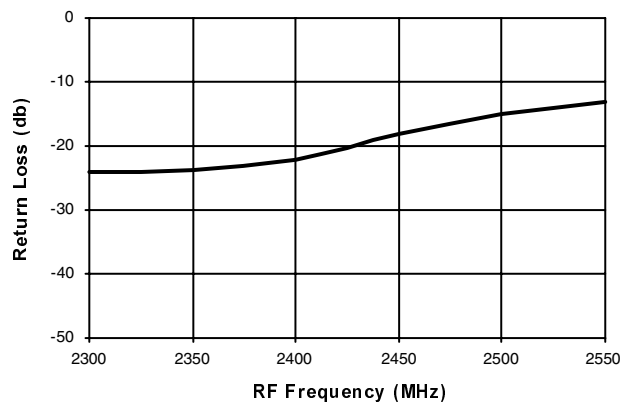


Figure 5. Return Loss at LO Input, $V_{CC} = 5.0\text{ V}$

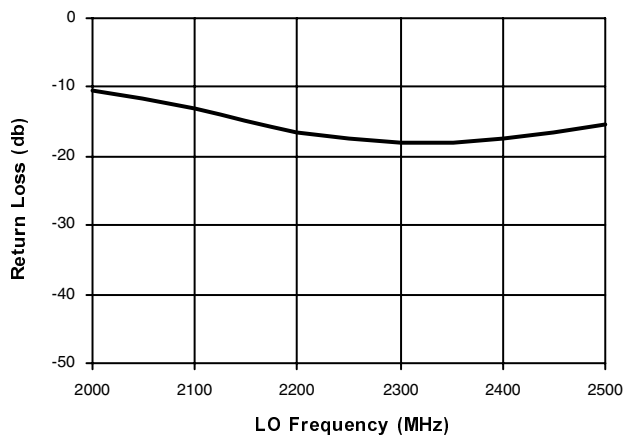


Figure 6. Return Loss versus IF Frequency, $V_{CC} = 5.0\text{ V}$

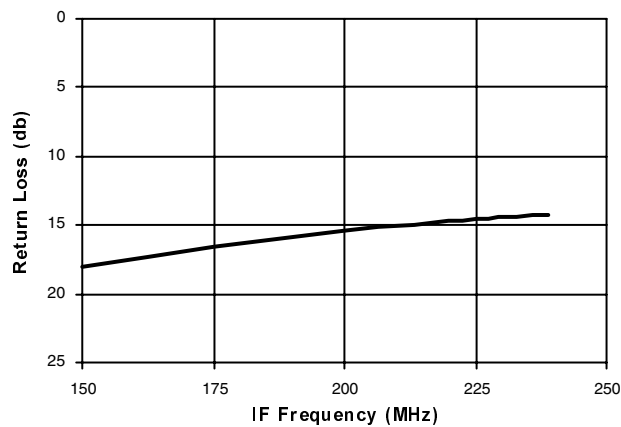
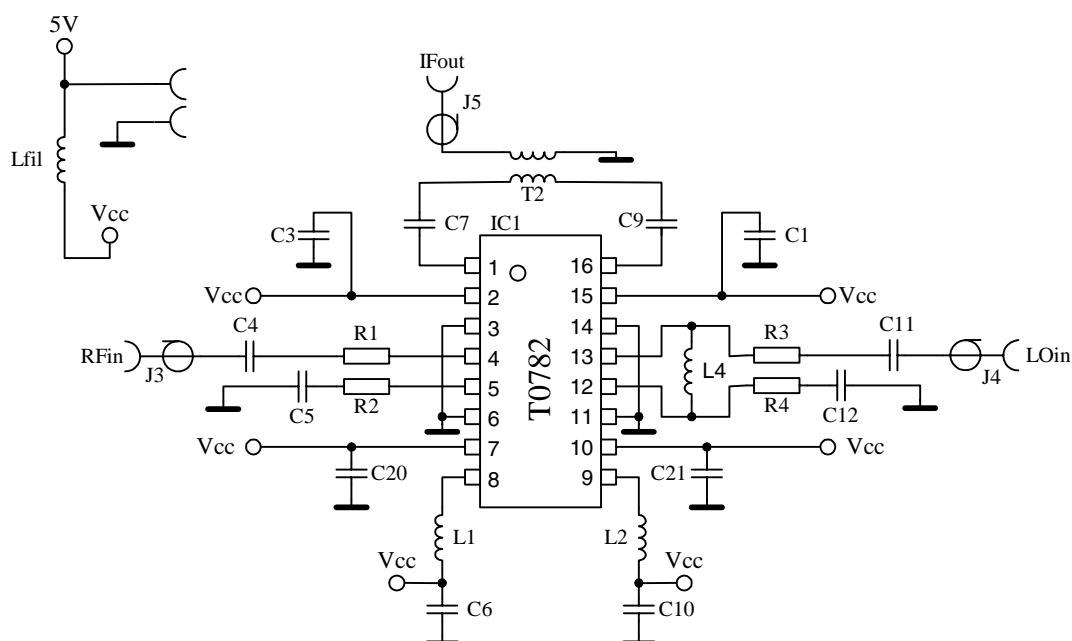


Figure 7. Demo Test Board Schematic



Bill of Material

| Component Designator | Value | Vendor | Part Number | Description |
|----------------------|------------|--------------------|---------------|--|
| IC1 | | Atmel | T0782 | SiGe receiver mixer |
| J3, J4, J5 | | Johnson Components | 142-0701-851 | SMA connector, end launch with tab, for 0.062 inch thick board |
| T2 | 1:1 | Mini-circuits | TC1-1 | IF transformer |
| Lfil | 1 μ H | | | Inductor, 1210 footprint, minimum 200 mA rating |
| L1, L2 | 100 nH | TOKO | LL1608-FSR10J | Inductor, 0603 footprint, high Q series |
| C1, C3, C20, C21 | 5.6 pF | | | Capacitor, 0603 footprint |
| C6, C10 | 100 pF | | | Capacitor, 0603 footprint |
| C7, C9 | 120 pF | | | Capacitor, 0603 footprint |
| C4, C5 | 1.2 pF | | | Capacitor, 0603 footprint |
| C11, C12 | 1.5 pF | | | Capacitor, 0603 footprint |
| R1, R2, R3, R4 | 0 Ω | | | Resistor, 0603 footprint |
| L4 | 27 nH | | | Inductor, 0603 footprint |

 - Indicates metalization - vias connect pad to underlying ground plane

Remark: heatslug must be soldered to GND.



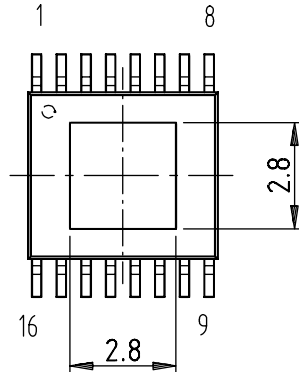
Remark: heatslug must be soldered to GND.

Ordering Information

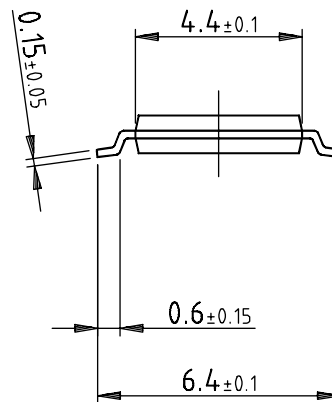
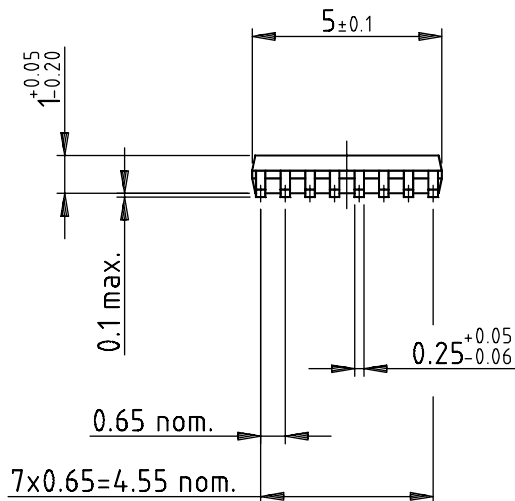
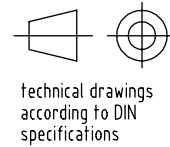
| Extended Type Number | Package | Remarks |
|----------------------|---------|---------|
| T0782 | SSOP16 | |

Package Information

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Package: SSOP16
(acc. JEDEC SMALL OUTLINE No. MO-153)
Dimensions in mm



Drawing-No.: 6.543-5079.01-4
Issue: 1; 10.07.01



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