

800-1000 MHz High Linearity SiGe Active Receive Mixer

Description

The T0780 is a high-linearity active mixer which is manufactured using Atmel Wireless & Microcontrollers' advanced Silicon-Germanium technology. This mixer features a frequency range of 800 to 1000 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 T0780 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.

Electrostatic sensitive device.
Observe precautions for handling.



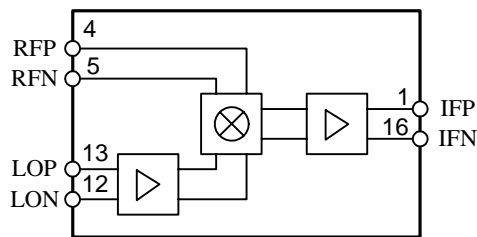
Features

- 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 SSOP16 package

Applications

- Digital communication systems
- 800-1000 MHz transceivers for base stations

Block Diagram



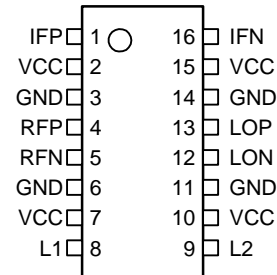
Ordering Information

Extended Type Number	Package	Remarks
T0780	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 osc., negative input
13	LOP	Local osc., positive input
14	GND	Ground
15	VCC	5 V power supply
16	IFN	IF negative output

Pinning



Absolute Maximum Ratings

All voltages are referred to GND.

Parameters	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}		5.0	6.0	V
LO input	LO_P, LO_N			10	dBm
IF input	RF_P, RF_N			15	dBm
Operating temperature	T_{OP}	-40		+85	°C
Storage temperature	T_{stg}	-40		+150	°C

Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient	R_{thJA}	t.b.d.	K/W

Electrical Characteristics

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

RF input: -20 dBm @ 900 MHz

LO input: 0.7 dBm @ 700 MHz

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
AC Performance						
Frequency range		f	800		1000	MHz
IF frequency range		F_{IF}	10	200	300	MHz
Input IP3	RF1 = RF2 = -17 dBm/ tone	IP3		20		dBm
Input P1dB				5		dBm
Conversion gain				10		dB
SSB noise figure				15		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)				-40		dBm
Leakage (LO-IF)				-26		dBm
Miscellaneous						
Supply voltage		V_{CC}	4.75	5	5.25	V
Supply current		I_{CC}		150		mA

Typical Device Performance

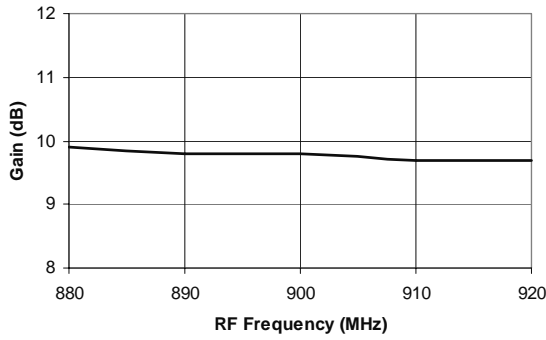


Figure 1. Conversion Gain
 $V_{CC} = 5.0\text{ V}$, LO = 0 dBm, $RF_{IN} = -20\text{ dBm}$, IF = 200 MHz

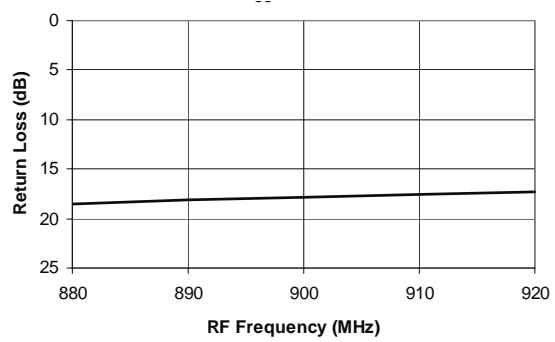


Figure 2. Return Loss vs. RF Frequency
 $V_{CC} = 5.0\text{ V}$

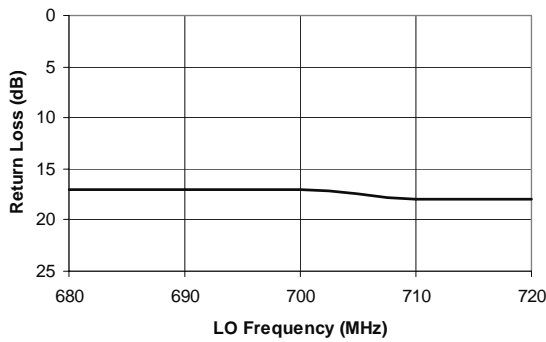


Figure 3. Return Loss at LO Input
 $V_{CC} = 5.0\text{ V}$

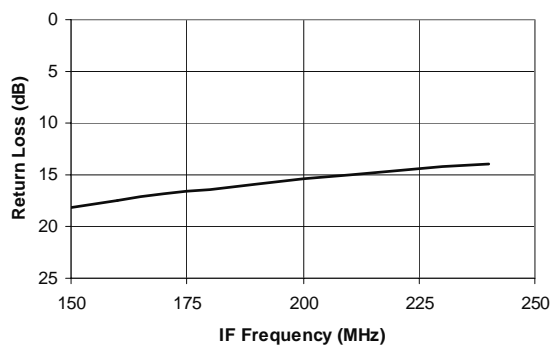
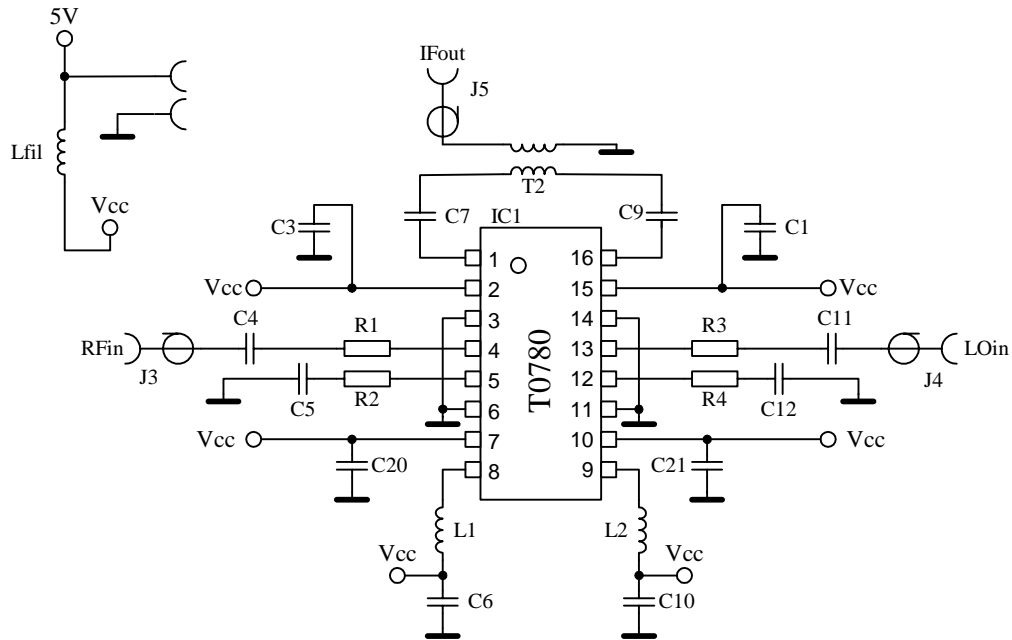


Figure 4. Return Loss vs. IF Frequency
 $V_{CC} = 5.0\text{ V}$

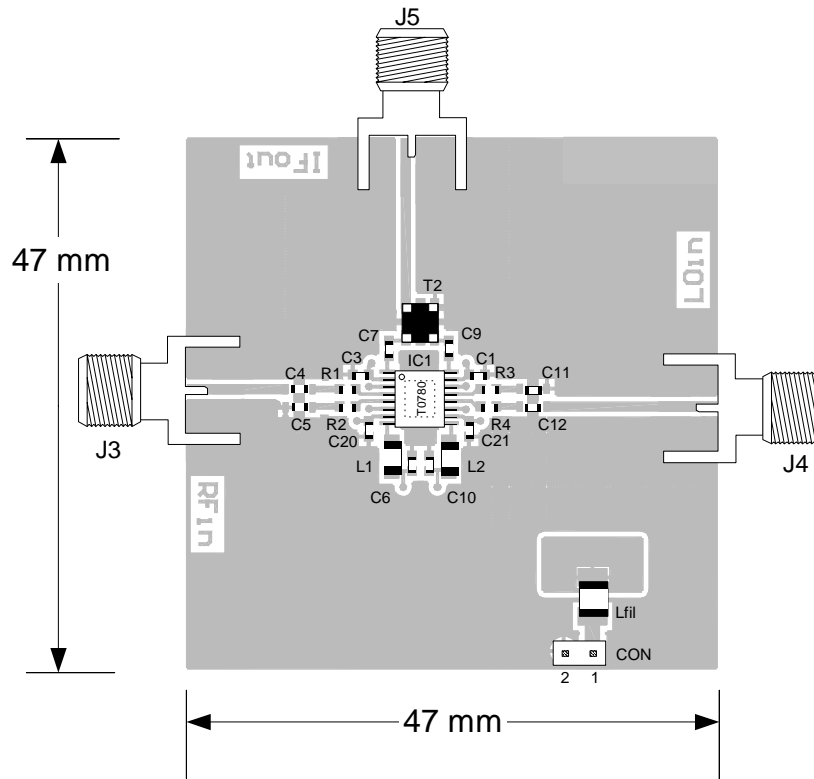
Demo Test Board Schematic



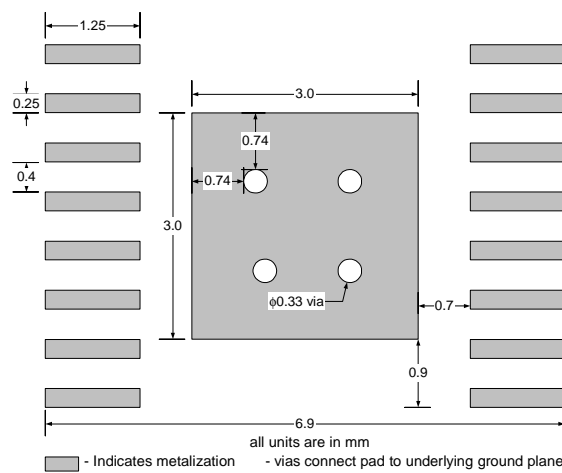
Bill of Material

Component Designator	Value	Vendor	Part Number	Description
IC1		Atmel Wireless & Microcontrollers	T0780	SiGe receiver mixer
J3, J4, J5		Johnson Components	142-0701-851	SMA connector, end launch with tab, for .062 inch thick board
T2	1:1	Mini-Circuits	TC1-1	IF transformer
Lfil	1 μ H			Inductor, 1210 footprint, min. 200 mA rating
L1, L2	100 nH	TOKO	LL1608-FSR10J	Inductor, 0603 footprint, high Q series
C1, C3, C20, C21	27 pF			Capacitor, 0603 footprint
C6, C10	100 pF			Capacitor, 0603 footprint
C7, C9	120 pF			Capacitor, 0603 footprint
C4, C5	33 pF			Capacitor, 0603 footprint
C11, C12	39 pF			Capacitor, 0603 footprint
R1, R2, R3, R4	0 Ohm			Resistor, 0603 footprint

Demo Test Board (Fully Assembled PCB)

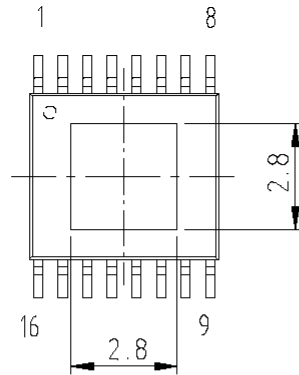


Recommended Package Footprint

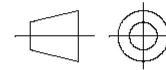


Remark: Heatslug must be soldered to GND

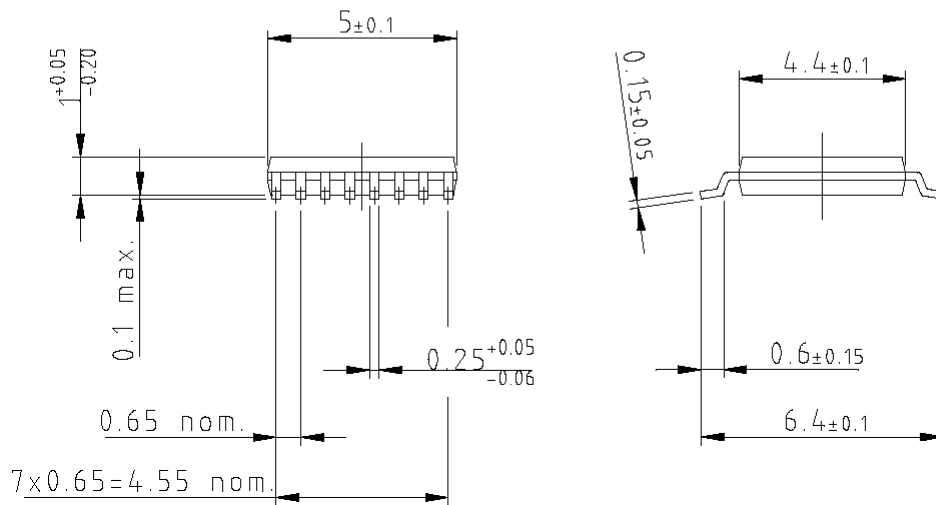
Package Information SSOP16



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



technical drawings
 according to DIN
 specifications



Ozone Depleting Substances Policy Statement

It is the policy of **Atmel Germany GmbH** to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Atmel Germany GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class 1 and 11 ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Atmel Germany GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

We reserve the right to make changes to improve technical design and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Atmel Wireless & Microcontrollers products for any unintended or unauthorized application, the buyer shall indemnify Atmel Wireless & Microcontrollers against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

Data sheets can also be retrieved from the Internet: <http://www.atmel-wm.com>

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