Advanced Data Sheet

STM-1016

800 - 1000 MHz High Linearity Silicon Germanium Active Transmit Mixer

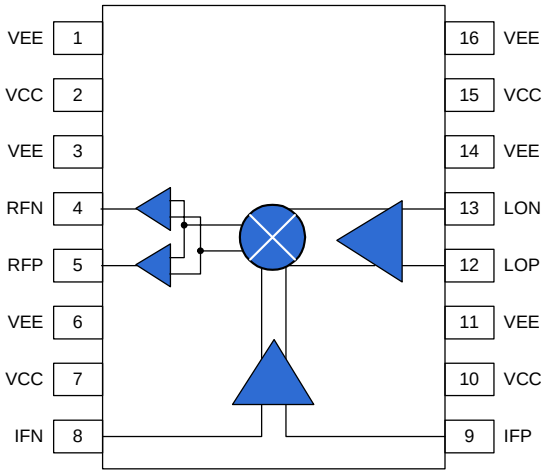
16 pin TSSOP with Exposed Pad
Package Body: 0.20 x 0.17 x 0.04 (inches)
5.0 x 4.4 x 1.0 (mm)

Product Description

The Stanford Microdevices' STM-1016 is a high linearity active mixer for use in a wide variety of communication systems covering the 800-1000 MHz frequency bands. This device operates from a single 5V supply and provides 7.5dB of conversion gain while requiring only 0dBm input to the integrated LO driver. The STM-1016 also includes an integrated on chip IF amplifier and is fabricated using silicon germanium device technology.

The STM-1016 incorporates internal matching on each RF, IF, and LO port to enhance ease of use and to reduce the number of external components required. The IF and LO ports can be driven differential or single ended. Each broadband port has been designed to minimize performance degradation while operating into highly reactive components such as SAW filters.

Functional Block Diagram



Product Features

- **Active mixer with conversion gain**
- **No need for separate external LO driver**
- **Low LO drive level required to drive mixer**
- **IF and LO ports may be driven single-ended**
- **Single supply operation (+5V)**
- **Broadband resistive 50Ω impedances on all three ports**

Applications

- **Digital and spread spectrum communication systems**
- **800-1000 MHz transceivers for base station infrastructure equipment**

Key Specifications

Parameters	Test Conditions (V_{CC}=5.0V, I=190mA, T=25ºC)	Unit	Min.	Typ.	Max.
RF Frequency Range		MHz	800		1000
IF Frequency Range		MHz	10	200	300
Output IP3	IF1 = IF2 = -20 dBm/tone	dBm		+17	
Output P1dB		dBm		+2	
Conversion Gain		dB		7.5	
SSB Noise Figure		dB		10	

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Absolute Maximum Ratings

Parameters	Value	Unit
Supply Voltage	+6.0	V_{DC}
LO Input	+10	dBm
RF Input	+15	dBm
Operating Temperature	-40 to +85	ºC
Storage Temperature	-65 to +150	ºC

Test Conditions

VCC	+5.0V
TA	+25ºC
IF Input	-20 dBm @ 200 MHz
LO Input	0 dBm @ 740 MHz

Product Specifications – AC Performance

Parameters	Additional Test Conditions	Unit	Min.	Typ.	Max.
RF Frequency Range		MHz	800		1000
IF Frequency Range		MHz	10	200	300
Output IP3	IF1 = IF2 = -20 dBm/tone	dBm		+17	
Output P1dB		dBm		+2	
Conversion Gain		dB		7.5	
SSB Noise figure		dB		10	
RF Return Loss		dB		14	
LO Return Loss		dB		14	
IF Return Loss		dB		14	
LO Drive		dBm	-3	0	+3

Product Specifications – Isolation Performance

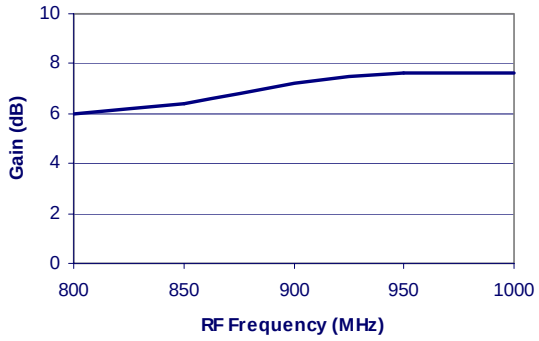
Parameters	Additional Test Conditions	Unit	Min.	Typ.	Max.
Leakage (LO-RF)		dBm		-35	
Leakage (LO-IF)		dBm		-30	

Product Specifications – Miscellaneous

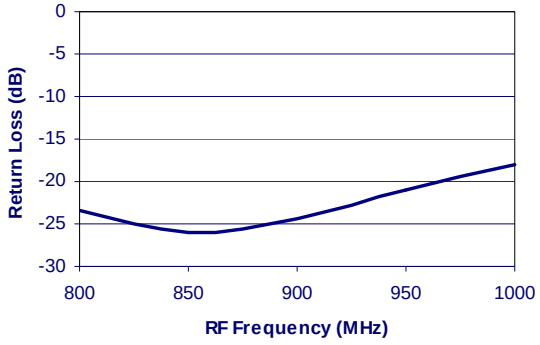
Parameters	Additional Test Conditions	Unit	Min.	Typ.	Max.
Supply Voltage		V	+4.75	+5.0	+5.25
Supply Current		mA		190	
Thermal Resistance		ºC/W		TBD	

Typical Device Performance

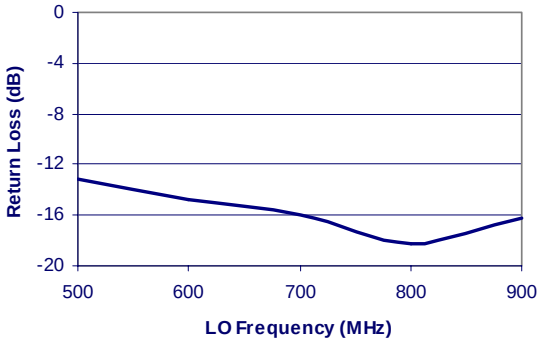
Conversion Gain
V_{CC} = 5.0V, RF = 940MHz, IF = 200MHz



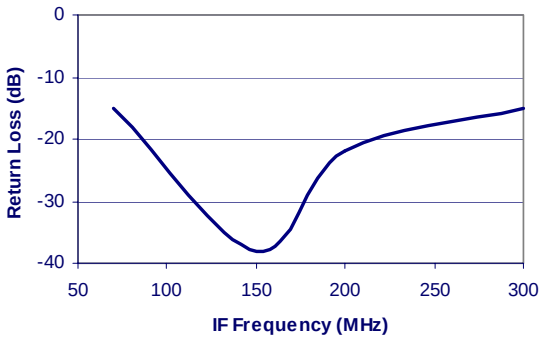
Return Loss at RF Input
V_{CC} = 5.0V



Return Loss at LO Input
V_{CC} = 5.0V



Return Loss at IF Input
V_{CC} = 5.0V



NOTE: The data shown in the graphs above demonstrates the STM-1016 performance tuned to the GSM band.

Pin Out Description

Pin #	Function	Description	Additional Comments
1	VEE	Ground	
2	VCC	Positive supply (+5V)	
3	VEE	Ground	
4	RFN	RF input, negative terminal	Nominal DC voltage is 2.3V. (Internally biased) Output should be AC-coupled.
5	RFP	RF input, positive terminal	Nominal DC voltage is 2.3V. (Internally biased) Output should be AC-coupled.
6	VEE	Ground	
7	VCC	Positive supply (+5V)	
8	IFN	IF output, negative terminal	Nominal DC voltage is 2.2V. (Internally biased) Input should be AC-coupled
9	IFP	IF output, positive terminal	Nominal DC voltage is 2.2V. (Internally biased) Input should be AC-coupled
10	VCC	Positive supply (+5V)	
11	VEE	Ground	
12	LOP	LO input, positive terminal	Nominal DC voltage is 2.3V. (Internally biased) Input should be AC-coupled.
13	LON	LO input, negative terminal	Nominal DC voltage is 2.3V. (Internally biased) Input should be AC-coupled.
14	VEE	Ground	
15	VCC	Positive supply (+5V)	
16	VEE	Ground	

STM-1016 800-1000 MHz Transmit Mixer

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

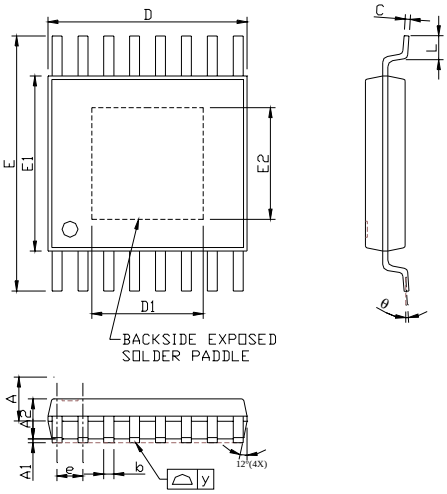
Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
STM-1016	TBD	TBD

Part Symbolization

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

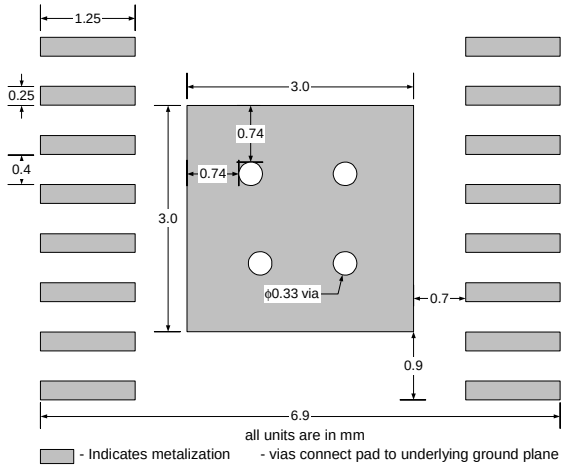
Package Dimensions (“16” Package)



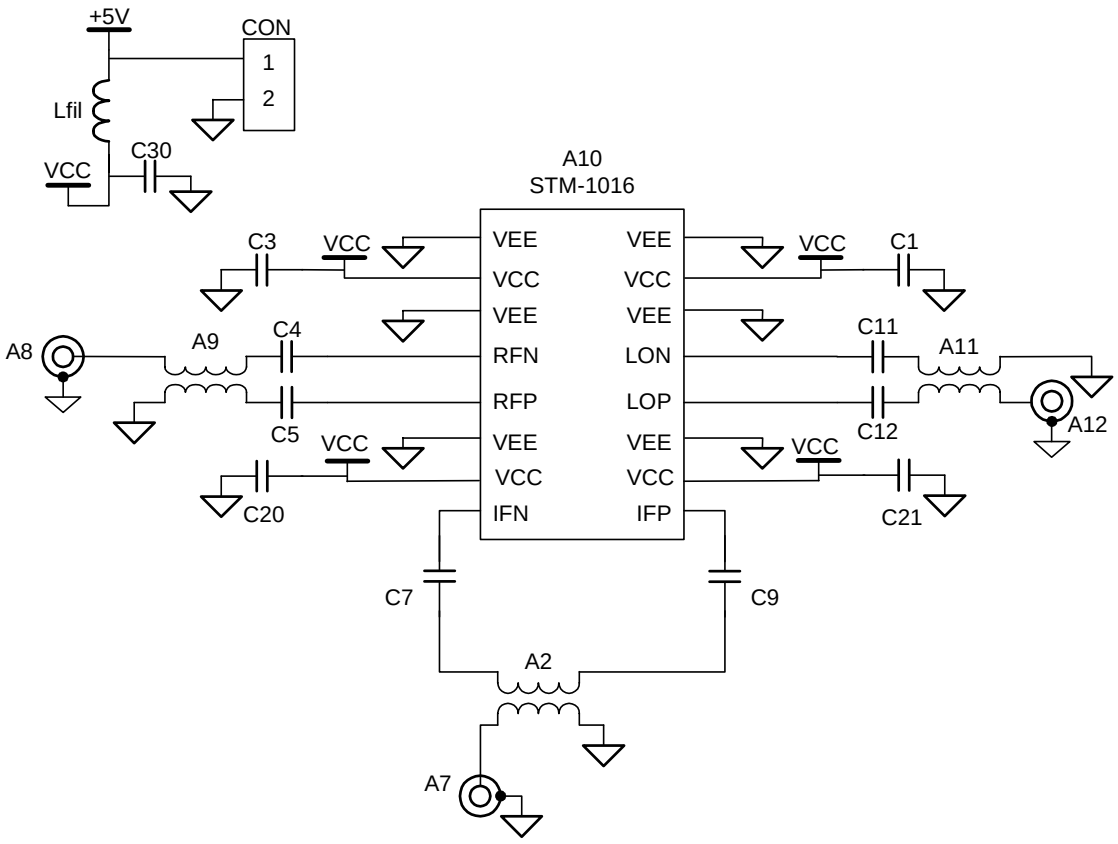
NOTE
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS
2. TOLERANCE ±0.1 mm UNLESS OTHERWISE SPECIFIED
3. COPLANARITY : 0.1 mm
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. FOLLOWED FROM JEDEC MO-153

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



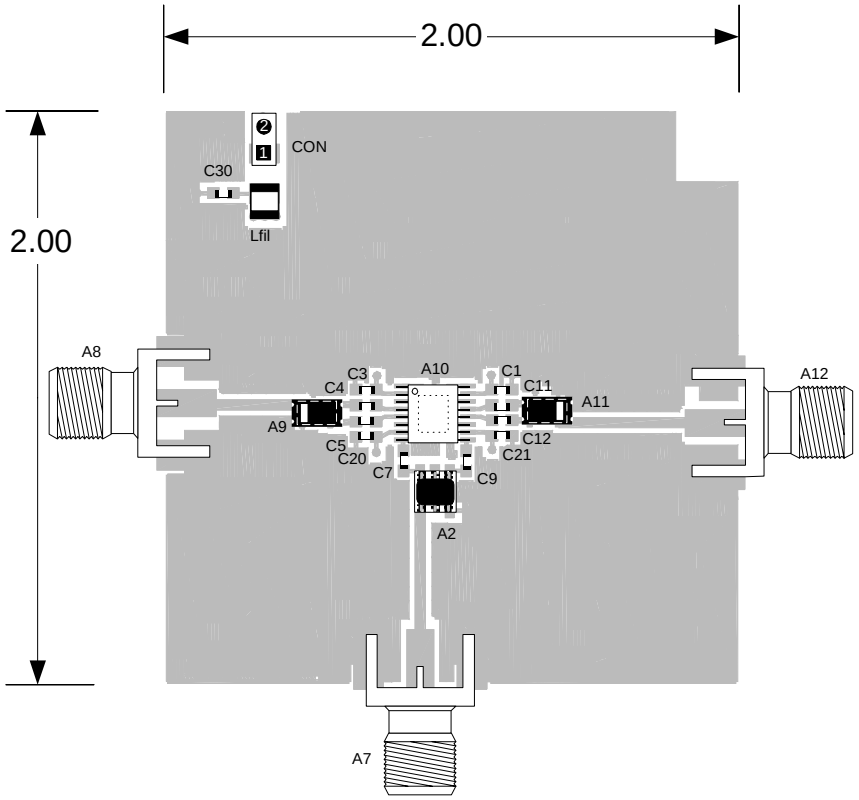
Demo Test Board Schematic



Bill of Materials

Component Designator	Value	Qty	Vendor	Part Number	Description
A10		1	SMDI	STM-1016	SiGe Transmit Mixer
A7, A8, A12		3	Johnson Components	142-0701-851	SMA connector, end launch with tab, for 62 mil pitch thick board
CON		1	Digikey	S1212-36-ND	2-pin header
A9, A11	1:1	2	Panasonic	EHF-FD1618	RF transformer
A2	1:1	1	Mini-Circuits	TC1-1	IF transformer
Lfil	1uH	1	Digikey	PCD1008CT-ND	Inductor, 1210 footprint, min. 200mA rating
C1, C3, C20, C21, C30	27pF	5	Venkel	C0603COG500-270JNE	Capacitor, 0603 footprint
C7, C9	100pF	2	Venkel	C0603COG500-101JNE	Capacitor, 0603 footprint
C4, C5	12pF	2	Venkel	C0603COG500-120JNE	Capacitor, 0603 footprint
C11, C12	18pF	2	Venkel	C0603COG500-180JNE	Capacitor, 0603 footprint

Demo Test Board
(Fully Assembled PCB)



Note: Dimensions in inches