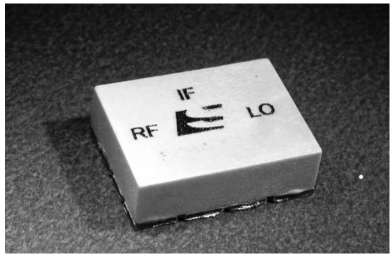
Preliminary Data Sheet

SPM-1045

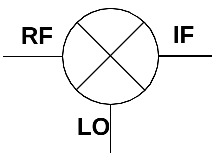
High Linearity Passive FET Mixer



Product Description

The Sirenza SPM-1045 is a passive mixer designed for systems that require high linearity up- and down-conversion. It employs proprietary silicon FETs with proven reliable core-and-wire baluns. It operates efficiently over a wide range of Local Oscillator powers, with input third order intercept remaining approximately 15-20 dB above LO power. This product is packaged in a standard surface mount module for excellent RF performance.

Functional Block Diagram



Product Features

- **Excellent linearity.**
- **Predictable conversion loss vs. LO power.**
- **Usable with a LO power from +10dBm to +17dBm.**

Applications

- **North American Cellular upconverters and downconverters**

Product Specifications: Down-converter

Test Conditions: FLO = 750MHz FIF = 100MHz Frf = 850MHz Plo = 17dBm

Parameters	Test Conditions	Unit	Min.	Typ.	Max.
RF Input Frequency Range		MHz	500		1000
LO Frequency		MHz	700		800
IF Output Frequency		MHz	50		500
RF Return Loss	Frf = 850 MHz	dB		7	
LO Return Loss	Flo = 750 MHz	dB		12	
IF Return Loss	Fif = 100 MHz	dB		10	
Conversion Loss	Frf = 850 MHz			7.5	10
SSB Noise Figure				7.5	10
TOI (Input)	Plo=10dBm	dBm		27	
	Plo=14dBm	dBm		32	
	Plo=17dBm	dBm		32	
P1dB (input)	Plo=17dBm	dBm		20	
LO-RF isolation	750MHz	dB		50	
LO-IF isolation	750MHz	dB		30	
RF-IF isolation	850MHz	dB		30	
LO Power	See graphs for performance vs. LO power	dBm			17

Product Specifications: Up-converter

Test Conditions: FLO = 750MHz FIF = 100MHz Frf = 850MHz Plo = 17dBm

Parameters	Test Conditions	Unit	Min.	Typ.	Max.
RF Output Frequency Range		MHz	500		1000
LO Frequency		MHz	700		800
IF Input Frequency		MHz	50		300
RF Return Loss	Frf = 850 MHz	dB		7	
LO Return Loss	Flo = 750 MHz	dB		12	
IF Return Loss	Fif = 100 MHz	dB		10	
Conversion Loss				7.5	10
TOI (Input)	Plo=10dBm	dBm		25	
	Plo=13dBm	dBm		32	
	Plo=17dBm	dBm		32	
P1dB (input)	Plo=17dBm	dBm		20	
LO Power	See graphs for performance vs. LO power	dBm			17

Absolute Maximum Ratings

Parameters	Value	Unit
RF Input	+15	dBm
LO Input	+20	dBm
IF Input	+15	dBm
Operating Temperature	-40 to +85	ºC
Storage Temperature	-65 to +150	ºC

Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation the device voltage and current must not exceed the maximum operating values specified in the table on page one.

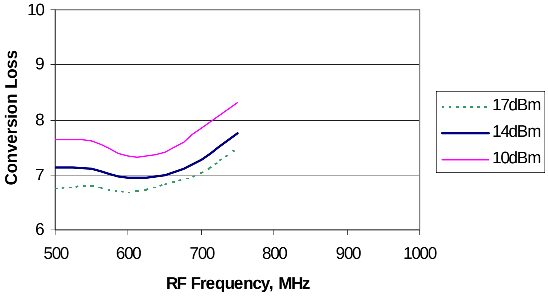
Caution: ESD Sensitive

Appropriate precaution in handling, packaging and testing devices must be observed.

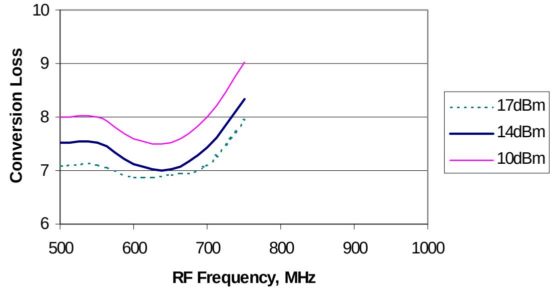
The SPM-1045 mixer is a MOSFET based high performance mixer designed for high linearity frequency conversion in the US cellular band. This mixer features a wide latitude in LO power requirements. Conversion loss remains virtually constant between 10dBm and 17dBm of LO power. Third Order Intercept is approximately proportional to the LO drive. This means that this mixer can be used to replace a wide variety of mixers requiring a variety of LO powers. The mixer uses baluns on all three ports, so each port presents a DC short.

The graphs on the following pages illustrate the performance of the SPM-1045 over a variety of operating conditions. In order to duplicate these performance tests, the following precautions should be observed:
-The mixer should be presented with good return losses at all ports by using isolators or attenuators. This is especially true of the LO port, because of the poor return loss of this port. If ripple is seen in a frequency sweep, it is likely due to reflections caused by poor VSWR in a cable leading up to the device.
-The presence of harmonics in the LO can cause changes in TOI.
-Be aware that signals of many different frequencies exist at the output of the mixer, and any one can potentially cause the spectrum analyzer to generate intermod.
-When measuring TOI, make sure the two generators supplying the RF signal are not interacting, causing intermod themselves.

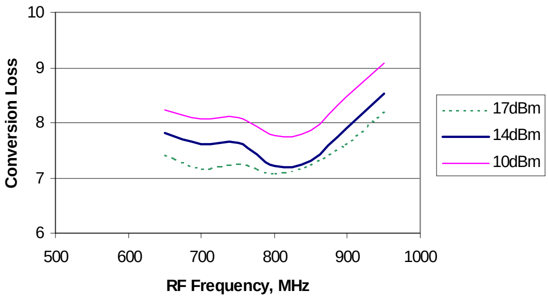
Conversion Loss vs. Frequency, High Side LO, Down-converter



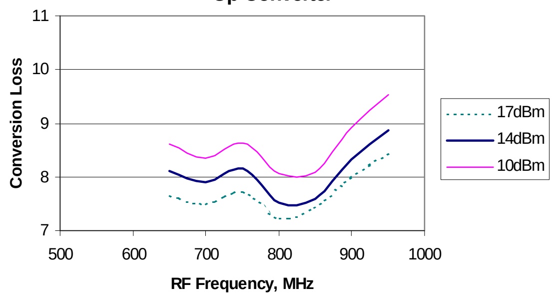
Conversion Loss. Vs Frequency, High Side LO Up-Converter



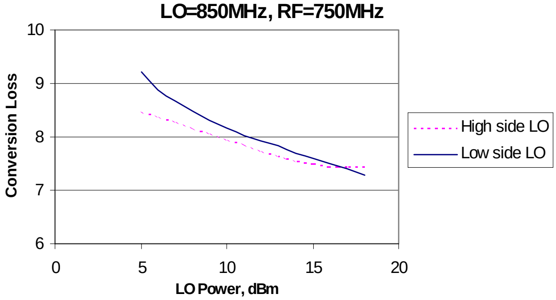
Conversion Loss vs. Frequency, Low Side LO Down-converter



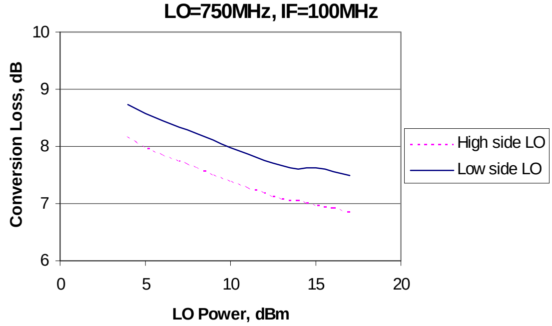
Conversion Loss. Vs Frequency, Low Side LO Up-Converter



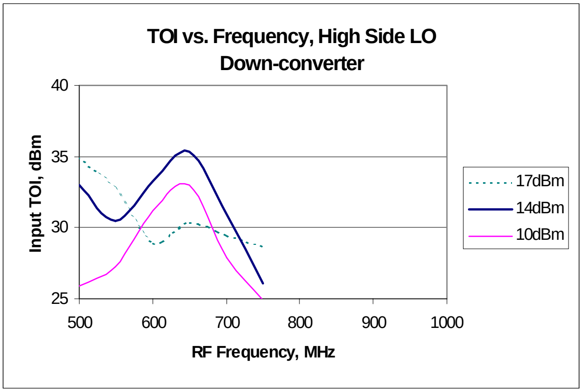
Conversion Loss vs. LO Power, Down-converter
LO=750MHz, RF=850MHz
LO=850MHz, RF=750MHz

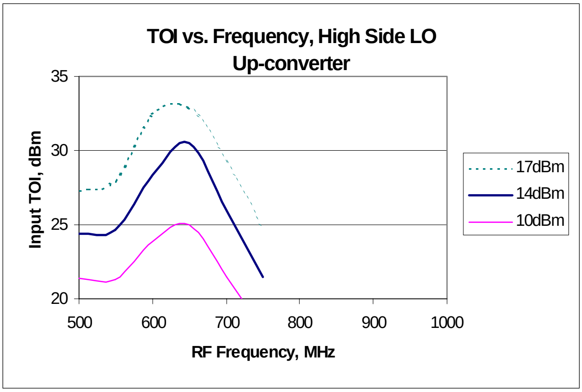


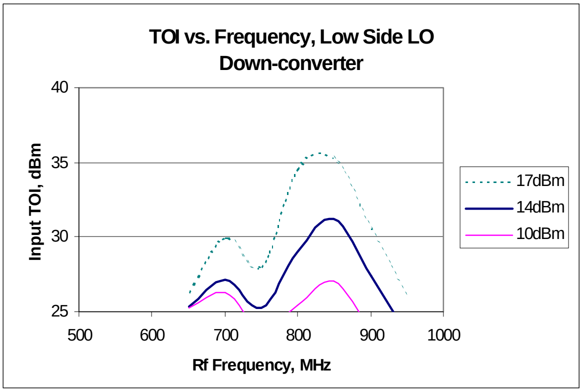
Conversion Loss vs. LO Power, Up-converter
LO=750MHz, IF=100MHz

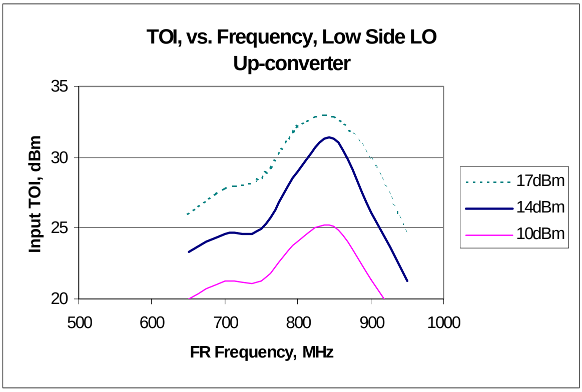


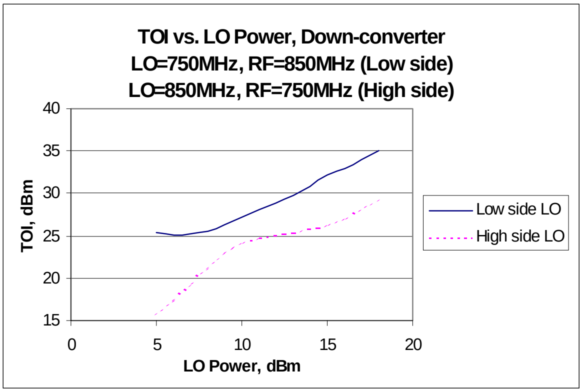
These graphs show mixer conversion loss vs. frequency, with both low-side LO excitation (LO frequency below the RF frequency) and high side excitation (LO frequency above the RF frequency). Operation both as a down-converter and an up-converter is shown, with LO powers of 10, 14, and 17dBm. In all cases, the IF frequency is 100MHz.

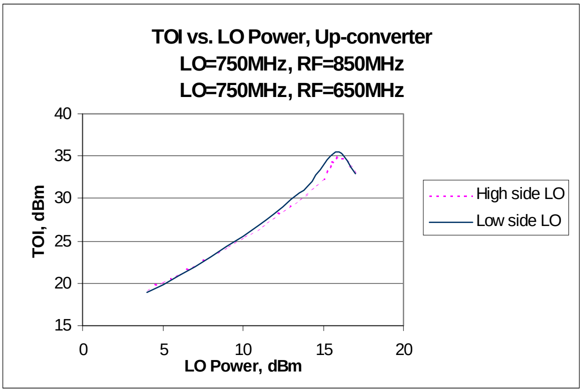




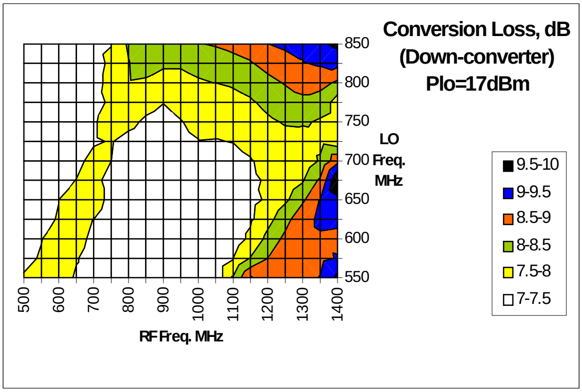


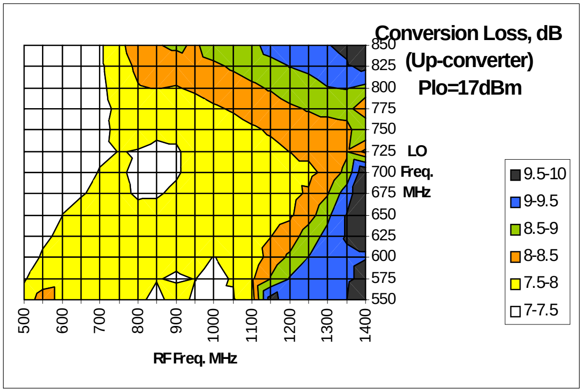


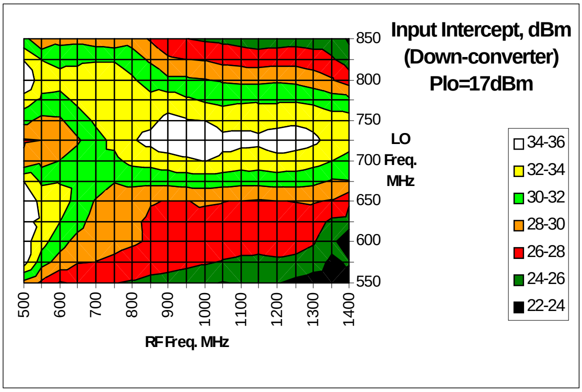


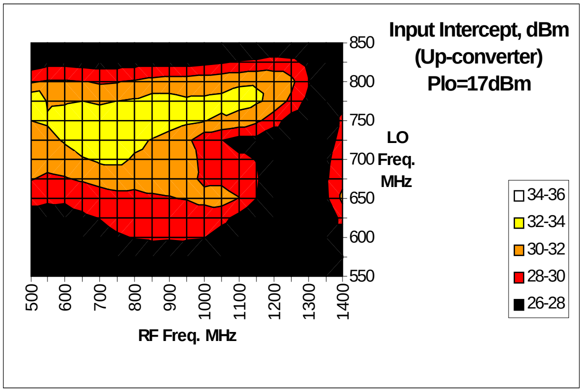


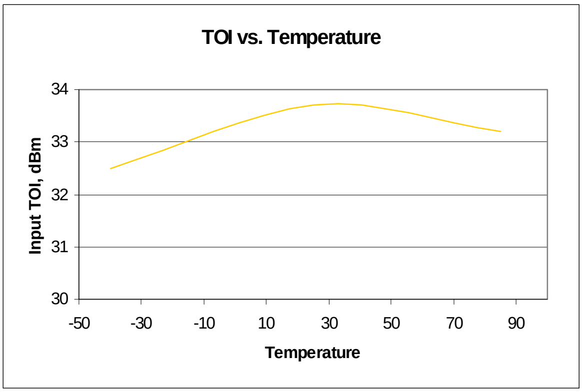
These graphs show mixer Third Order Intercept (TOI) vs. frequency referenced to the input of the mixer (that is, referenced to the RF port in the case off a down-converter, or the IF port in the case of an up-converter), with both low-side LO excitation (LO frequency below the RF frequency) and high side excitation (LO frequency above the RF frequency). Operation both as a down-converter and an up-converter is shown, with LO powers of 10, 14, and 17dBm. In all cases, the IF frequency is 100MHz. The RF power used in measuring third order intercept is +0dBm, except in cases where TOI exceeds 30dBm, in which case input power is increased to make the intermod tones visible above the noise floor.

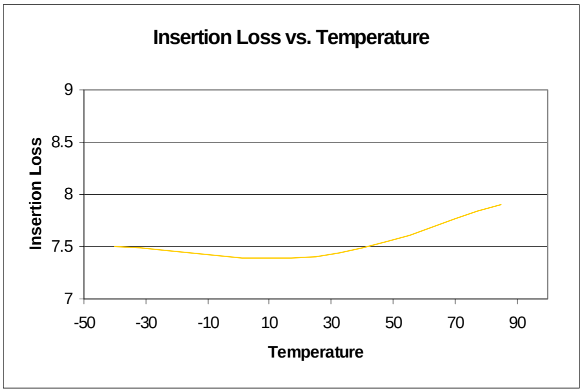




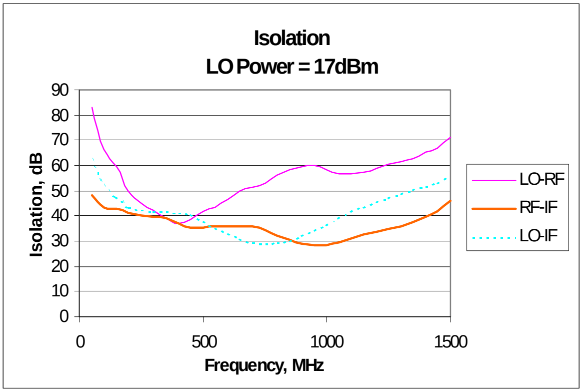


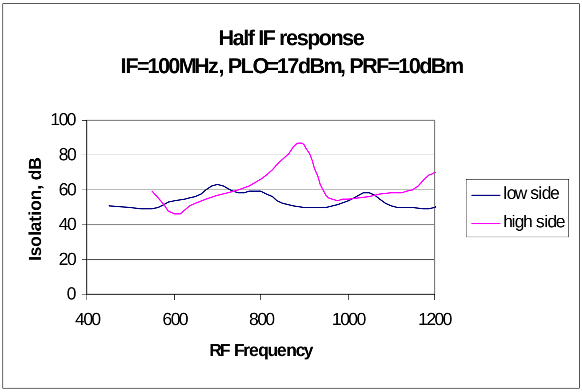


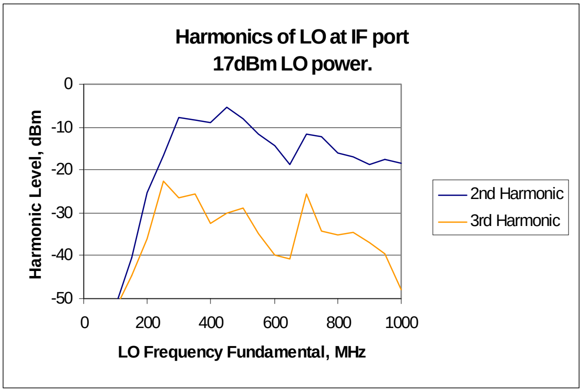


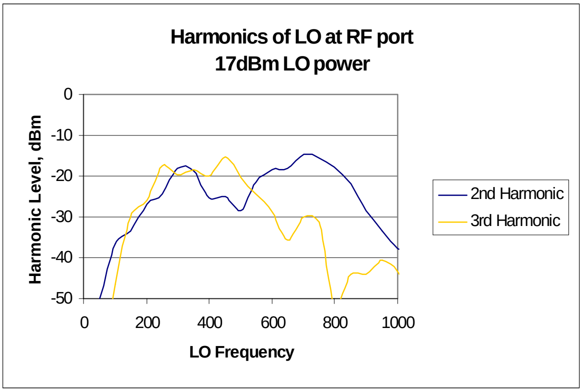


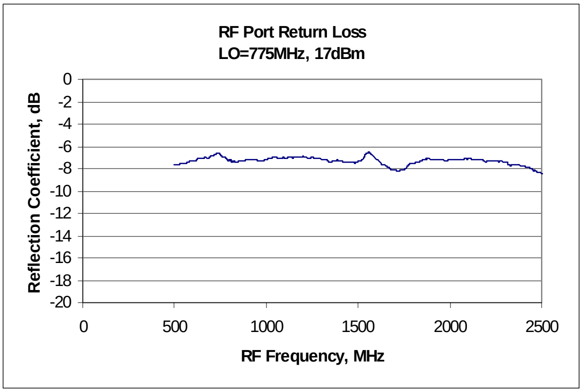
The contour graphs show mixer input TOI and conversion loss over a variety of RF and LO frequencies. These contour graphs can be used to assess the suitability of these mixers over a variety of frequencies of operation. Note that constant IF frequency curves can be overlaid as diagonal lines. Also shown are graphs of TOI and insertion loss vs. temperature. These curves were measured down-converter mode, with 750MHz LO, 850MHz RF and 14dBm LO power.

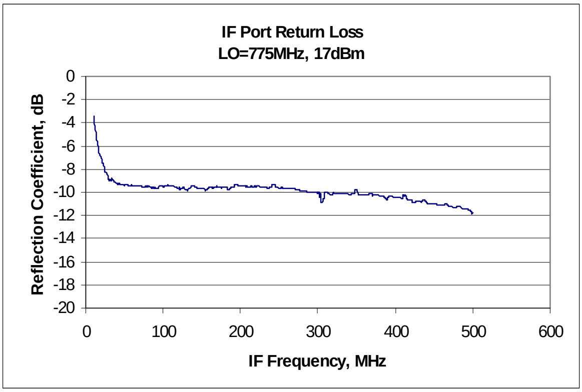




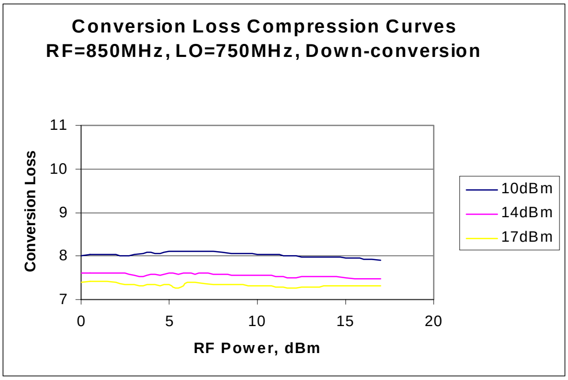


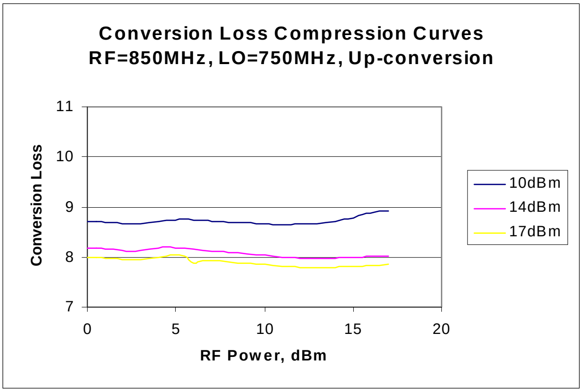


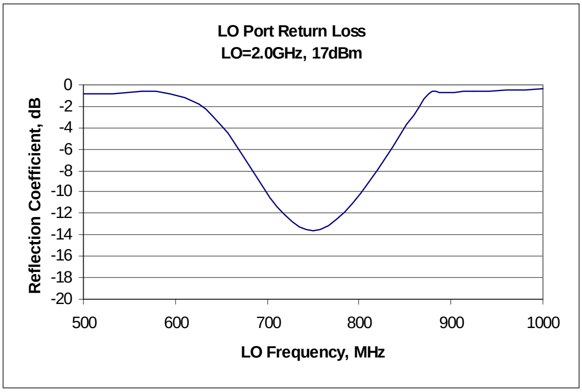




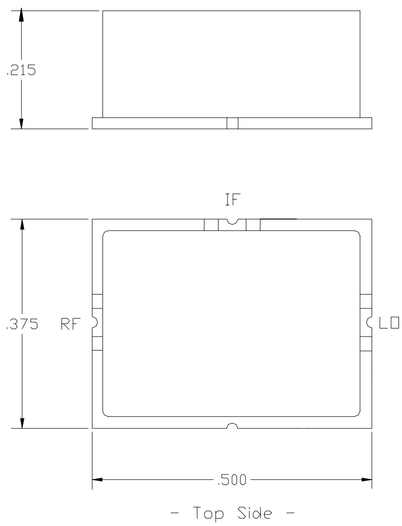
The isolation graph shows port isolation with a 750MHz LO at 17dB.
Half IF response is measured by applying RF signals (10dBm amplitude) 50MHz above or below the LO, and measuring the level of the undesired IF component at 100MHz.

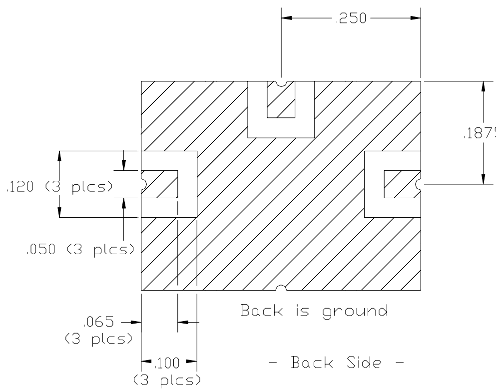






Package Dimensions



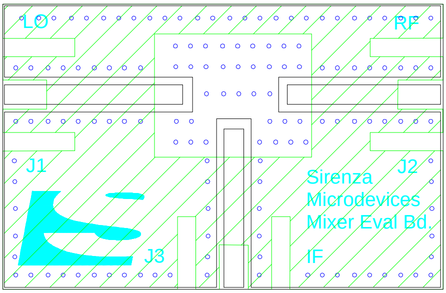


Part Number Ordering Information

Part Number	Reel Size	Parts per reel
SPM-1045	13”	1000

Demo Test Board Schematic

SPM Evaluation Board



Recommended connectors:
Johnson 142-0701-851 SMA end-launch connectors (or equivalent)