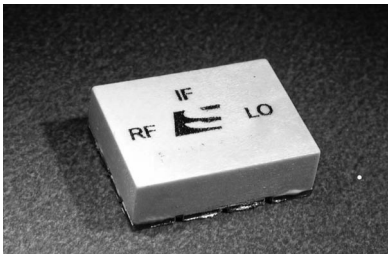
*Preliminary Data Sheet*

# SPM-1045

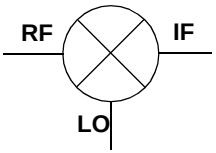
## High Linearity Passive FET Mixer




## 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

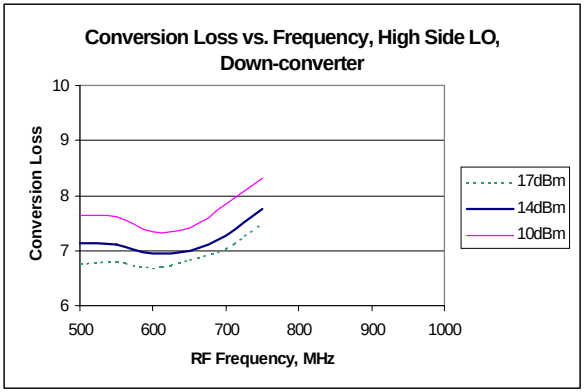
| Parameters | Value | Unit |
|---|---|---|
| RF Input | +15 | dBm |
| LO Input | +20 | dBm |
| IF Input | +15 | dBm |
| Operating Temperature | -40 to +85 | ºC |
| Storage Temperature | -65 to +150 | ºC |

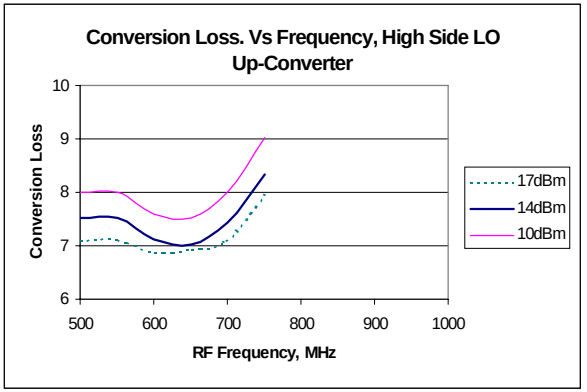
**Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation the device voltage and current must not exceed the maximum operating values specified in the table on page one.**

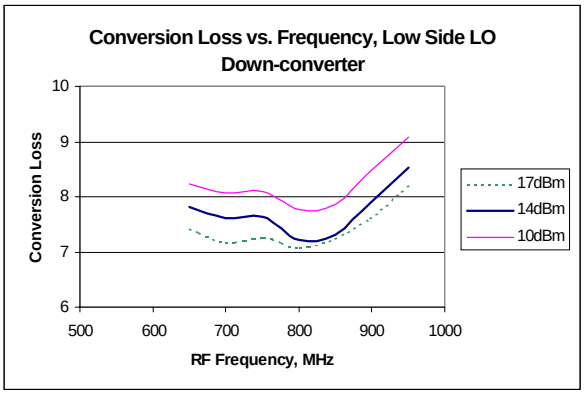
**Caution: ESD Sensitive**
Appropriate precaution in handling, packaging and testing devices must be observed.

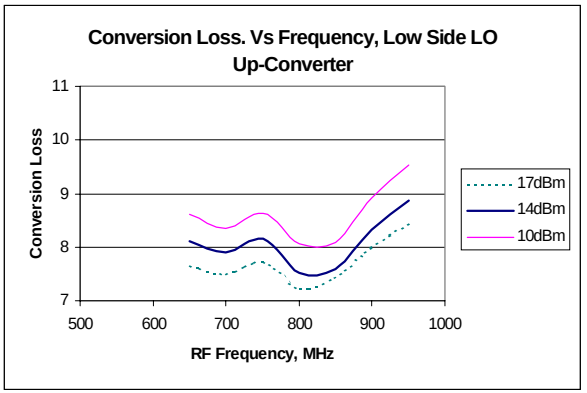
The SPM-1045 mixer is a MOSFET based high performance mixer designed for high linearity frequency conversion in the US cellular band. This mixer features a wide latitude in LO power requirements. Conversion loss remains virtually constant between 10dBm and 17dBm of LO power. Third Order Intercept is 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.

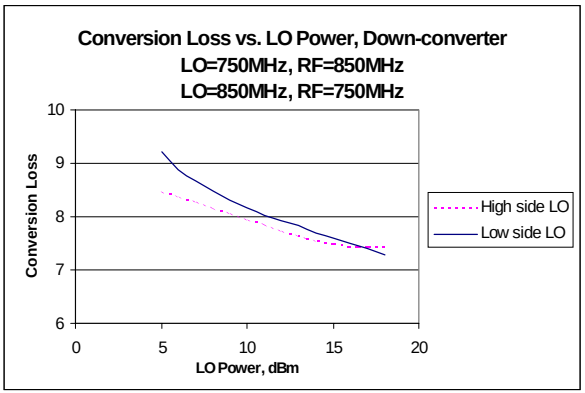
The graphs on the following pages illustrate the performance of the SPM-1045 over a variety of operating conditions. In order to duplicate these performance tests, the following precautions should be observed:
-The mixer should be presented with good return losses at all ports by using isolators or attenuators. 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.

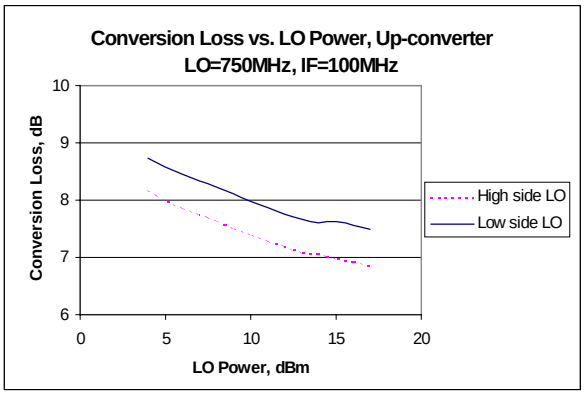


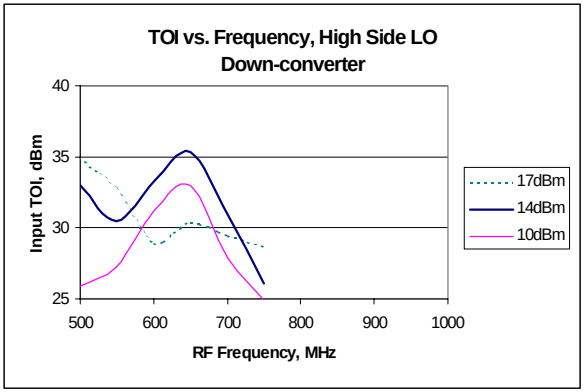



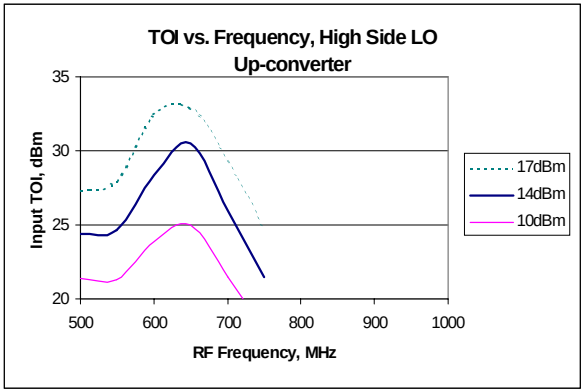



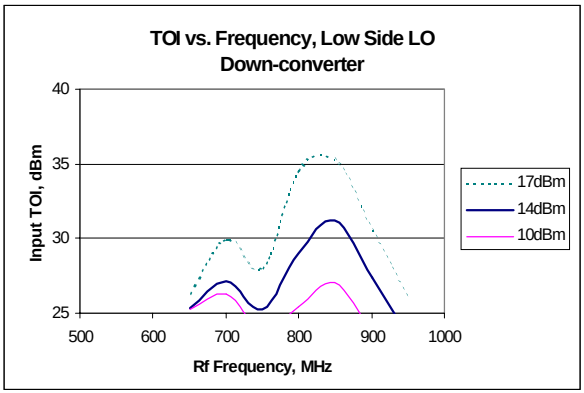



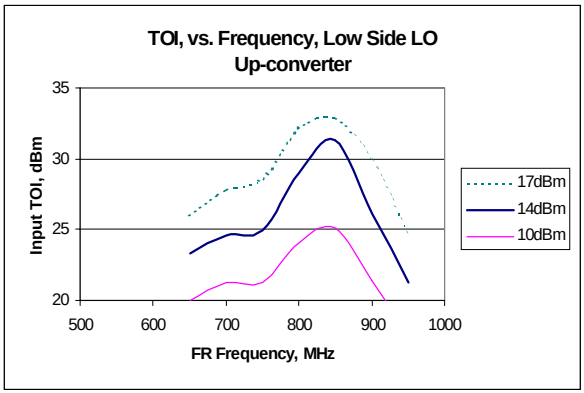



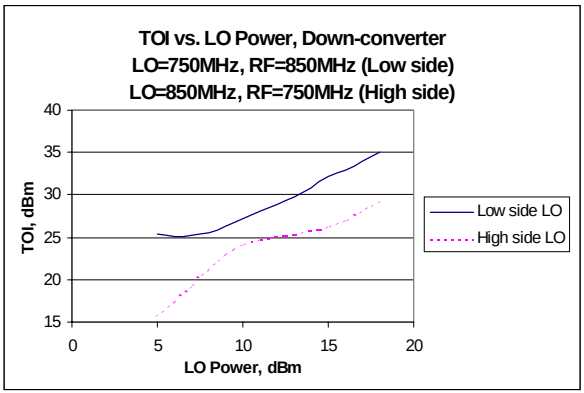

These graphs show mixer conversion loss vs. frequency, with both low-side LO excitation (LO frequency below the RF frequency) and high side excitation (LO frequency above the RF frequency). Operation both as a down-converter and an up-converter is shown, with LO powers of 10, 14, and 17dBm. In all cases,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

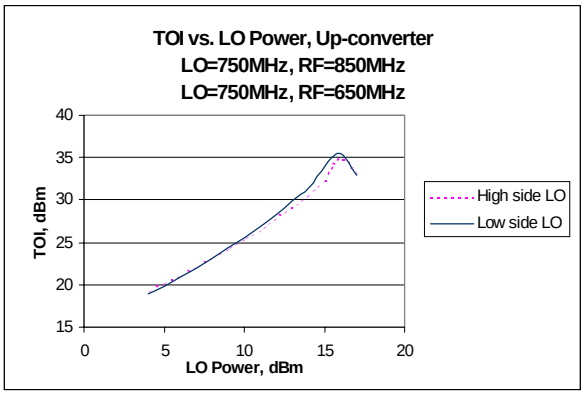


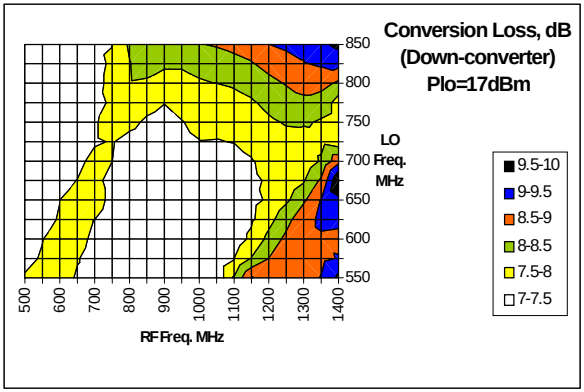



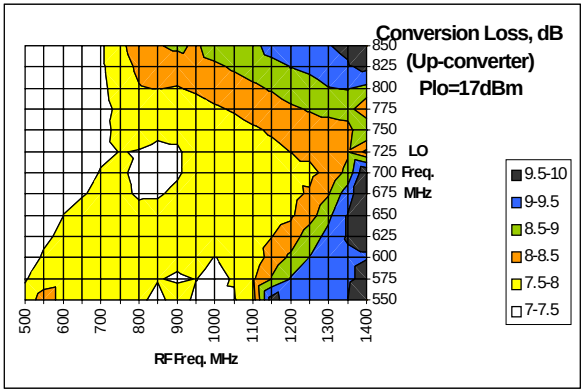



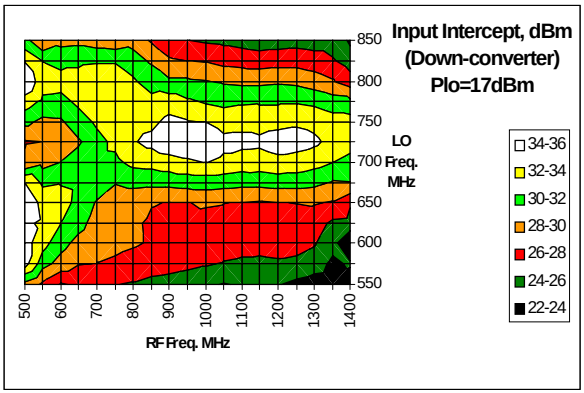



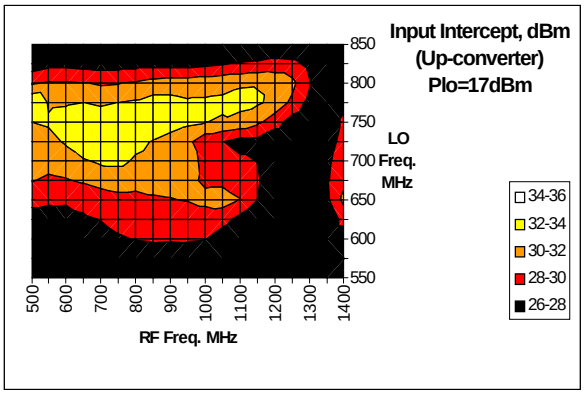



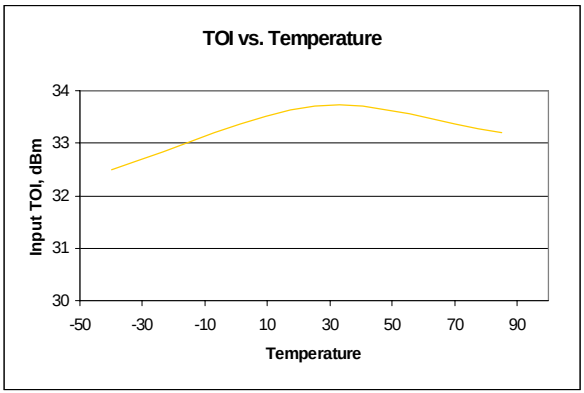

These graphs show mixer Third Order Intercept (TOI) vs. frequency referenced to the input of the mixer (that is, referenced to the RF port in the case off a down-converter, or the IF port in the case of an up-converter), with both low-side LO excitation (LO frequency below the RF frequency) and high 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.

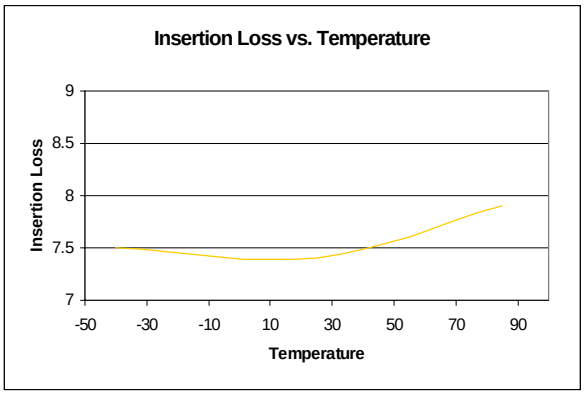


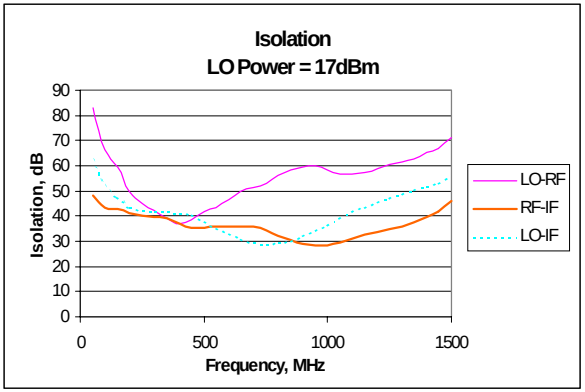



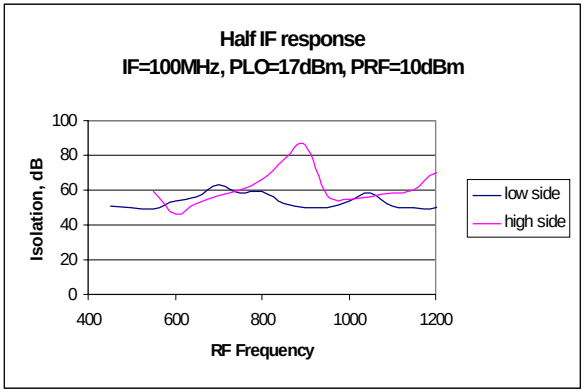



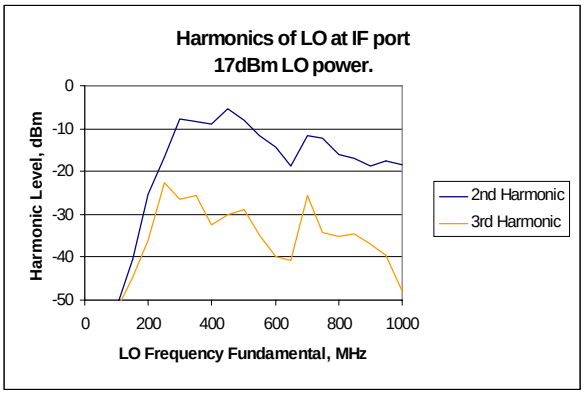



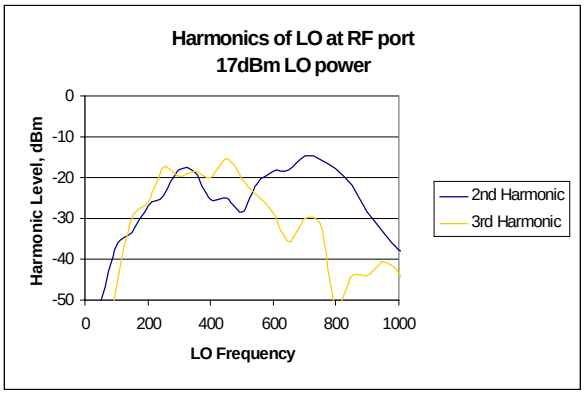



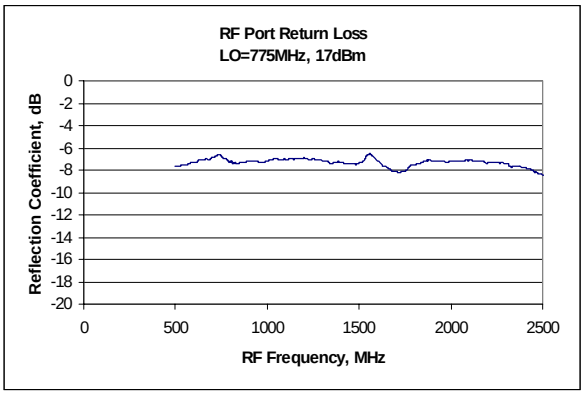

The contour graphs show mixer input TOI and conversion loss over a variety of RF and LO frequencies. These contour graphs can be used to assess the suitability of these mixers over a variety of frequencies of operation. Note that constant IF frequency curves can be overlaid as diagonal lines. Also shown 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.

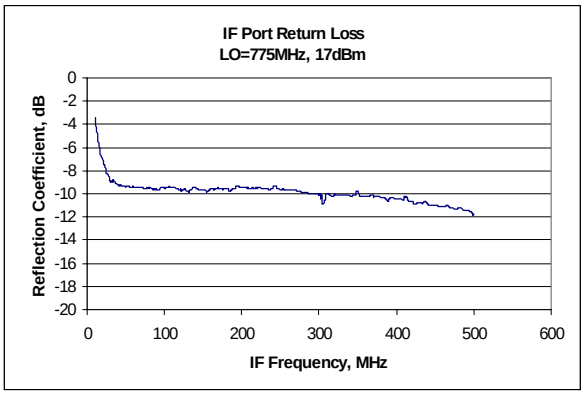


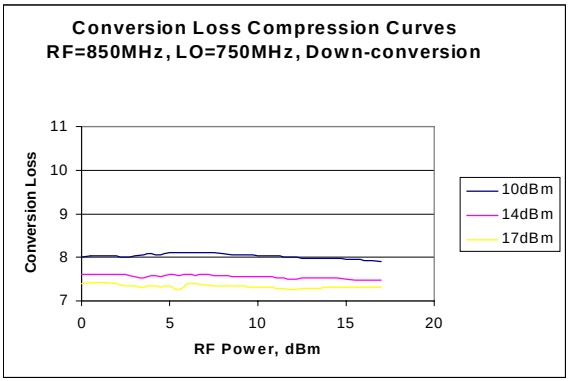



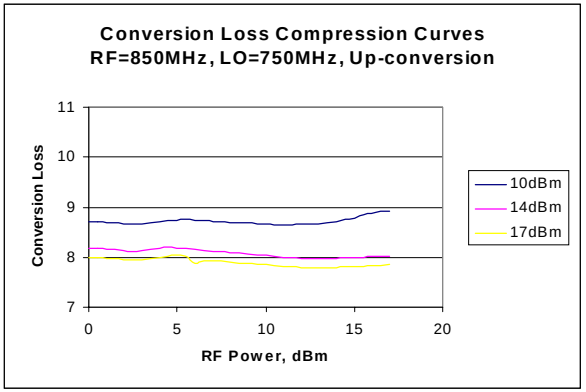



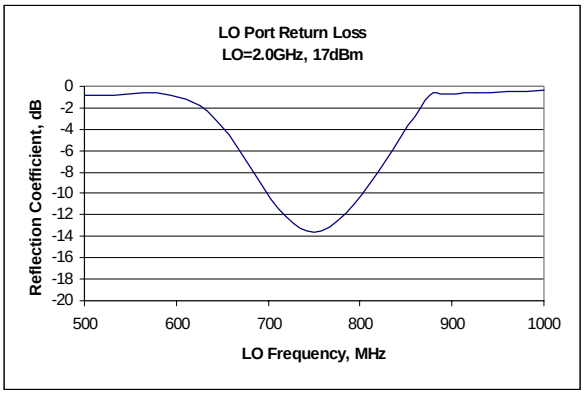



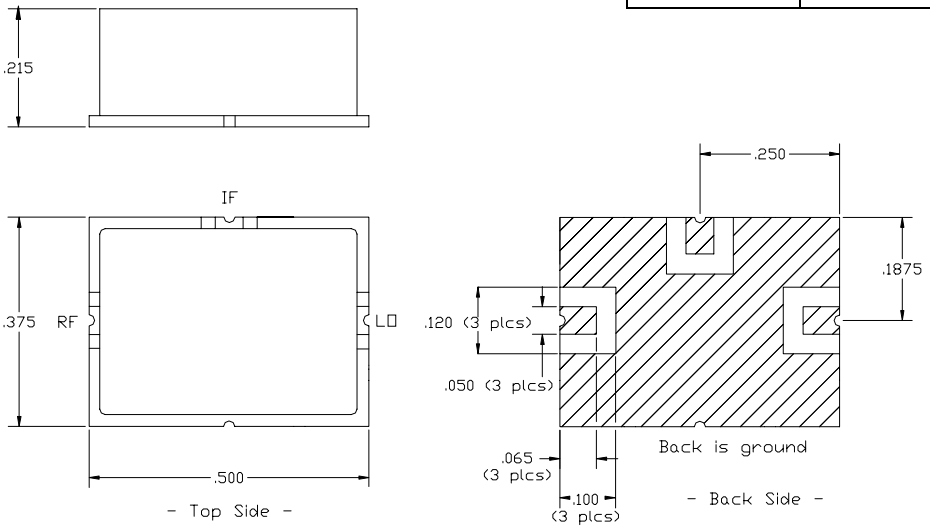

The isolation graph shows port isolation with a 750MHz LO at 17dB.
Half IF response is measured by applying RF signals (10dBm amplitude) 50MHz above or below the LO, and measuring the level of the undesired IF component at 100MHz.




## Package Dimensions

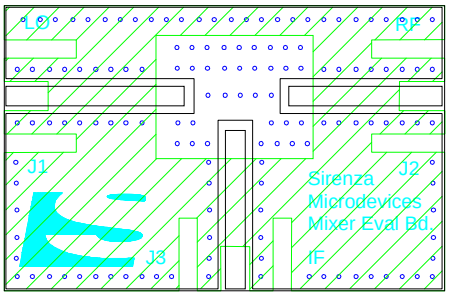



## Part Number Ordering Information

| 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)