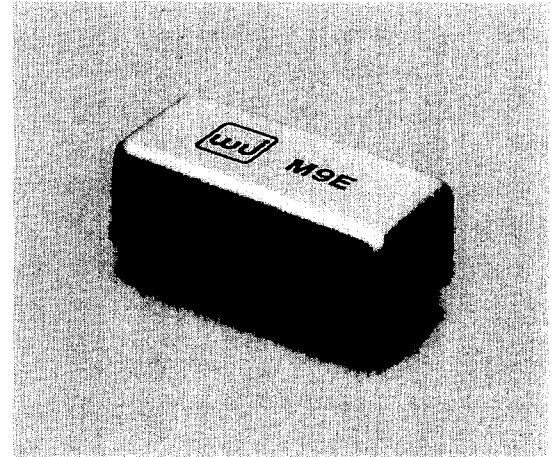
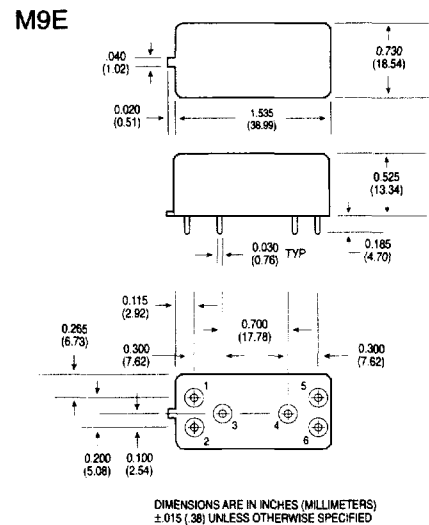


DOUBLE-BALANCED MIXER

- ◆ LO } 1 TO 400 MHz
- RF }
- ◆ IF DC TO 400 MHz
- ◆ LO DRIVE +27 dBm (NOMINAL)
- ◆ HIGH INTERCEPT POINT +32.5 dBm (TYP.)
- ◆ MIL-M-28837 EQUIVALENT LEVEL SCREENING AVAILABLE



Outline Drawing



Specifications^{1,2}

Characteristics	Typ.	+25°C	-54°C to 85°C	Test Conditions
SSB Conversion Loss and SSB Noise Figure (Max.)	5.5 dB 7.0 dB 8.0 dB	6.0 dB 7.5 dB 9.0 dB	6.3 dB 7.8 dB 9.3 dB	f_L & f_R 2 to 50 MHz f_I 2 to 100 MHz f_L & f_R 1 to 100 MHz f_I 0.4 to 400 MHz f_L & f_R 1 to 400 MHz f_I 0.4 to 200 MHz
Isolation (Min.)				
f_L at R	50 dB	45 dB	44 dB	f_L 1 to 30 MHz
f_L at I	55 dB	45 dB	44 dB	
f_I at R	40 dB	35 dB	34 dB	f_L 30 to 100 MHz
f_L at I	45 dB	40 dB	39 dB	
f_L at R	30 dB	25 dB	24 dB	f_L 100 to 400 MHz
f_L at I	35 dB	25 dB	24 dB	
f_R at I	25 dB			f_R 1 to 400 MHz
Conversion Compression	1.0 dB			$f_R = +20$ dBm $f_L = +27$ dBm
Desensitization Level	1.0 dB			$f_{R2} = +18$ dBm

Notes:

- Measured in a 50-ohm system with nominal LO drive and downconverter application only, unless otherwise specified. The I-Port frequency range extends to DC for phase detection, pulse modulation, or attenuator applications, I-Port VSWR degrades from a 50-ohm system at low IF frequencies.
- Typical values are measured at +25°C and are not guaranteed.

Absolute Maximum Ratings

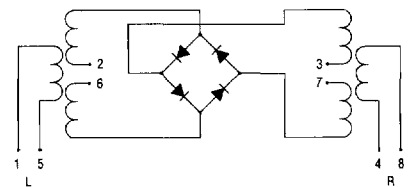
Operating Temperature

- with +27 dBm LO Power-54°C to +71°C
- with +24 dBm LO Power-54°C to +100°C
- Storage Temperature-65°C to +100°C
- Peak Input Power for Any Single Port+30 dBm RMS, +33 dBm Peak
- Total Input Power for All Ports+31.5 dBm RMS, +34.5 dBm Peak
- Peak Input Current at 25°C200 mA DC

The power rating is applicable over a -54°C to +71°C, temperature range. Derate linearly to one-half power at 100°C

Weight M9E: 21 grams (0.74 oz.) max.

Schematic Diagram

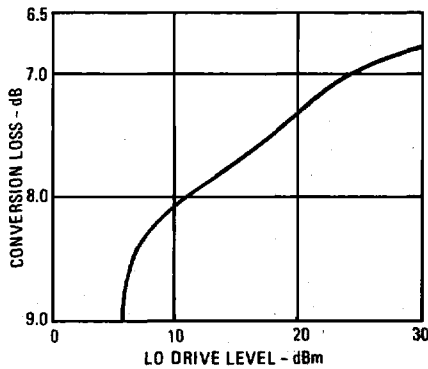


FOR BEST ISOLATION OF THE HIGH-LEVEL (f_L) SIGNAL GROUND PIN 3

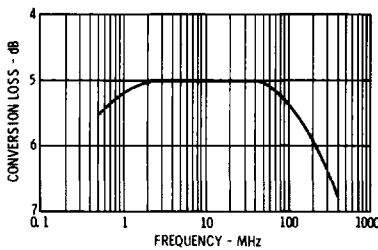
Typical Performance at 25°C

WJ-M9E

Conversion Loss



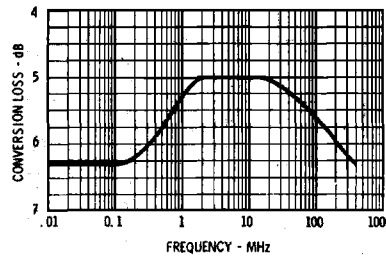
Conversion Loss vs. LO Drive Level: The minimum recommended drive level is +20 dBm. The maximum recommended drive level is +30 dBm.



Conversion Loss vs. Input Frequency: Conversion loss of the mixer when used in an SSB system. The frequency ordinate refers to the inputs f_L and f_R with f_I at 20 MHz for conversion loss measurements. Data plotted with an f_L level of +27 dBm.

A 1 dB improvement in conversion loss can be made at 400 MHz by reversing the I- and R-ports i.e., by feeding the input signal into the I-port and taking the output from the R-port. At lower frequencies this performance improvement is not as significant. At 100 MHz, there is a 0.2 dB improvement while at 50 MHz and below there is no improvement.

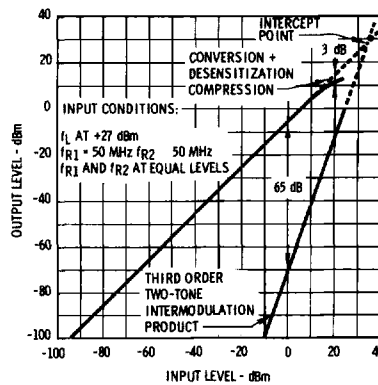
Conversion Loss



Conversion Loss vs. Output Frequency: The frequency ordinate refers to the output f_I with f_R at 50 MHz. Data plotted with an f_L level of +27 dBm.

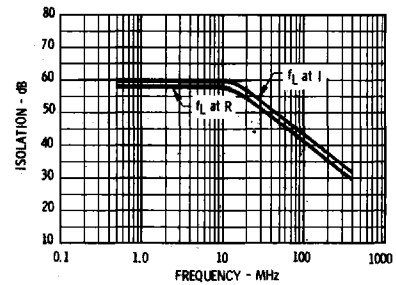
Typical Two-Tone Performance at 25°C

Definition: In a mixer application where the input must be wideband, two signals (f_{R1} and f_{R2}) may mix with the local oscillator signal (f_L) to produce in-band, two-tone third-order intermodulation products $[2f_{R2} - f_{R1}] \pm f_L$.

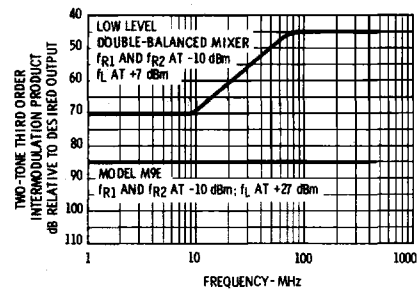


Two-Tone Suppression vs. Input Level: With each dB decrease in input level, the third-order products 65 dB with both input signals at 0 dBm and 85 dB with both input signals at -10 dBm. The input intercept point for the WJ-M9E is at +32.5 dBm. This is 19 dB higher than the intercept point for a low-level double-balanced mixer like the WJ-M1. The 3 dB compression shown on the graph is a combination of both conversion compression and desensitization.

Isolation

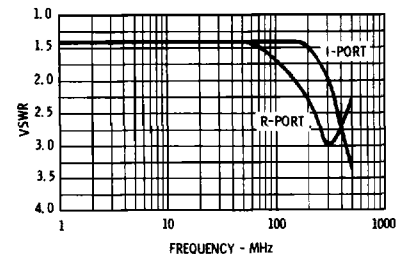


Isolation vs. Frequency: Level of the f_L signal fed through to the R- and I-ports with respect to the level of the f_L signal at the L-port. Maximum isolation can be obtained between the input signals by feeding the input signal (f_R) into the I-port with some sacrifice in two-tone performance.



Two-Tone Suppression vs. Input Frequency: The two-tone performance of the WJ-M9E is constant across its frequency range. Other mixers, even other high level mixers, have a degradation in performance about 10 MHz.

VSWR



VSWR vs. Frequency: VSWR of the R- and I-ports in a 50-ohm system with $f_L = 400$ MHz at +27 dBm. Some variation in the I- and R-port VSWR will occur as a function of the L-port frequency. The L-port VSWR is typically less than 2.0 to 1 across its 1 to 400 MHz frequency band.

Typical Intermodulation Performance at 25°C

WJ-M9E

Intermodulation Signal Levels: Intermodulation signals resulting from the mixing of harmonics of the input signals are shown in the table below for the WJ-M9E. Mixing products are indicated by the number of dB below the $f_L \pm f_R$ output. The typical performance in the shaded portion of the table was obtained with f_L and f_R at approximately 50 MHz, f_L at +27 dBm, f_R at 0 dBm, and all resistive terminations. The typical performance in the other portion of the table was obtained under the same conditions as the shaded portion, but with f_R at -10 dBm. Note the improvement in suppression, especially with the higher order products of f_R , when the f_R level is reduced. Improved performance can also be achieved at lower frequencies.

For best suppression of f_R harmonics ≥ 2 , an f_L level of +30 dBm is recommended. For best suppression of f_R harmonics < 2 , an f_L level less than +27 dBm but not less than +20 dB is recommended.

7	>99	>99	>99	>99	>99	>99	>99	>99	>99
	>90	>90	>90	>90	>90	>90	>90	>90	>90
6	>99	>99	>99	97	>99	>99	>99	>99	>99
	>90	>90	>90	>90	>90	>90	>90	>90	>90
5	>99	85	>99	95	>99	>99	>99	90	>99
	>90	>90	>90	>90	>90	>90	>90	>90	>90
4	88	91	>99	92	90	95	87	94	87
	>90	>90	>90	>90	>90	>90	>90	>90	>90
3	81	73	85	69	85	68	85	64	87
	>90	>90	>90	>90	>90	>90	>90	89	>90
2	64	71	62	70	63	70	61	62	64
	73	83	75	79	80	80	77	82	79
1	24	0	35	11	42	19	50	39	49
	24	0	34	11	42	18	49	37	49
0		29	20	32	24	29	27	30	29
		18	10	23	14	19	17	21	19
	0	1	2	3	4	5	6	7	8