


FEI Microwave, Inc.

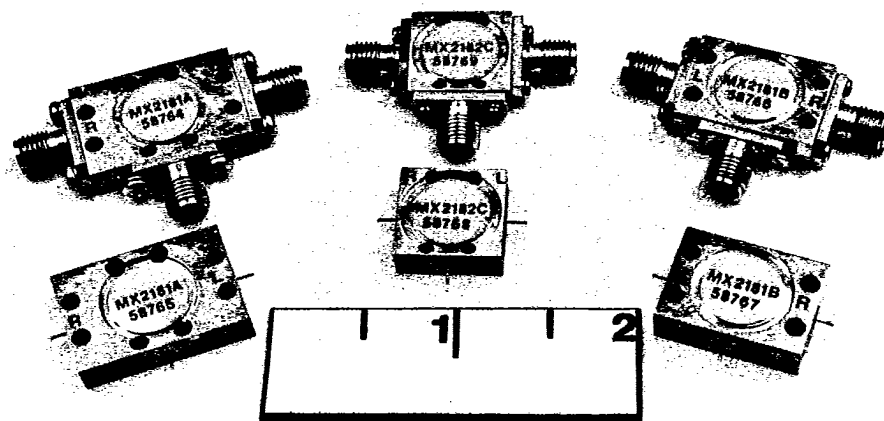
A SUBSIDIARY OF FREQUENCY ELECTRONICS, INC.

B-05-11

T-74-13-01

2-18 GHz Double Balanced Mixers

- Small size
- Low VSWR
- Broad IF bandwidth
- Flat IF response
- Hermetically sealed
- Field removable connectors



Description

FEI Microwave's MX2181 and MX2182 Series of Double Balanced Mixers are specified from 2–18 GHz on the LO and RF Ports with IF Port frequencies of 0.1–5 GHz and 0.5 to 10 GHz respectively. These mixers have excellent performance up to 20 GHz. They are designed for optimum conversion loss with an LO drive of +10 dBm. At +10 dBm LO drive, the mixers have a typical third order input intercept point of +15 dBm. Units can be special ordered for applications requiring a greater dynamic range and can be optimized for narrower bandwidths.

The MX2181, with an IF Port frequency range of 0.1–5 GHz, is de-

signed for 2–18 GHz swept frequency applications with low IF frequencies and for up converting low IF frequencies to the 2–18 GHz frequency range. The MX2182, with an IF Port frequency range of 0.5–10 GHz, is designed for 2–18 GHz band folding applications and up and down converting applications requiring a high IF frequency. For band folding applications with low side LO injection (Example: LO Freq: 8 GHz, RF Freq: 10.5–13GHz, IF Freq: 2.5–5 GHz), both models provide typically 30 dBc (below desired output) rejection to the 2LO–1RF spur.

These mixers are hermetically sealed and can be special ordered with a guaranteed leak rate of $< 1 \times 10^{-8}$ cc/sec.

All units are cleaned, baked, and then, without being exposed to the outside atmosphere, are placed in a dry box filled with an inert gas where the lids are welded to the housing.

Package Styles A, B and C have the same electrical performance, however, for new requirements, we recommend Package Style C. It is the smallest of the series and is priced less than Package Styles A and B. Package Styles A and B are offered as alternates to those manufactured by other mixer suppliers. All models have field removable SMA female connectors for "Drop-In" microstrip or strip-line applications.

Model	Frequency (GHz)			Maximum S.S.B. Conversion Loss (dB)	Minimum Isolation (dB)		
	LO	RF	IF		L-R	L-I	R-I
MX2181A, MX2181B, MX2181C	2-18	2-18	0.1-5	9.0 @ 0.1 GHz IF	15(2-5GHz) 18(5-18GHz)	17(2-4GHz) 20(4-18GHz)	18(2-18GHz)
MX2182A, MX2182B, MX2182C	2-18	2-18	0.5-10	9.0 @ 1GHz IF	15(2-5 GHz) 18(5-18GHz)	17(2-4GHz) 20(4-18GHz)	18(2-18GHz)

Note:

1. Specifications are guaranteed when mixers are tested as a down converter in a padded 50 Ohm System with a L.O. Power of +10 dBm.

Maximum Ratings

Operating Temperature	-54°C to +100°C
Storage Temperature	-65°C to +125°C
Input Power	400 mW @ +25°C Derate linearly to 200 mW @ +100°C

Weight

MX2181A, MX2182A	17.5 grams (0.62 oz)
MX2181B, MX2182B	15.0 grams (0.53 oz)
MX2181C, MX2182C	12.0 grams (0.42 oz)

Note: Weight includes connectors

Environmental

These mixers have been qualified by FEI Microwave to the following MIL-STD-202 environmental tests.

Tests	Method	Condition
Thermal Shock	107	B
Altitude	105	G
H.F. Vibration	204	D
Random Vibration (15 min per axis)	214	IIF
Mechanical Shock	213	C
Salt Atmosphere ¹	101	A
Seal Test ¹	112	1x10 ⁻⁸ cc/sec
Solderability ¹	208	
Terminal Strength ¹	211	C
Resistance To Soldering Heat ¹	210	B

Note:

1. Connectors were removed for these tests.

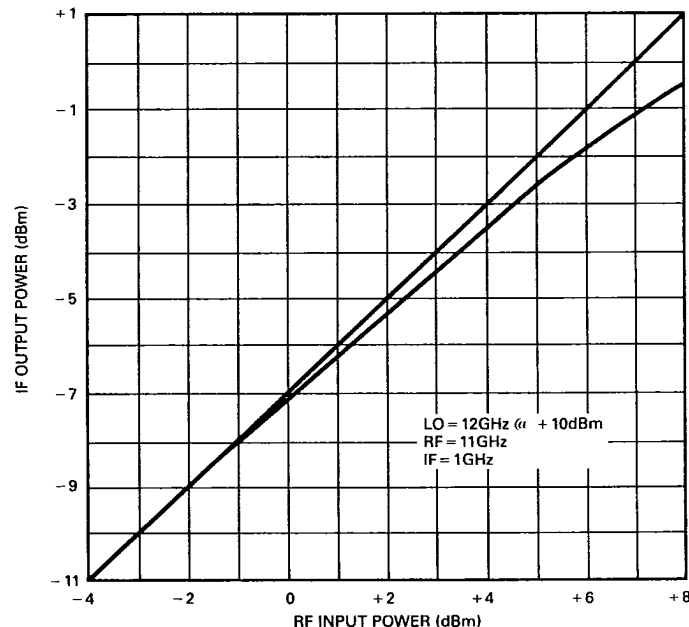
Materials

Housing	Passivated Stainless Steel
Lids	Passivated Stainless Steel
Feedthroughs	Glass to Metal Seals—Gold Plated Kovar
Connectors	Passivated Stainless Steel

**Typical Third Order Input Intercept Point
Down Conversion**

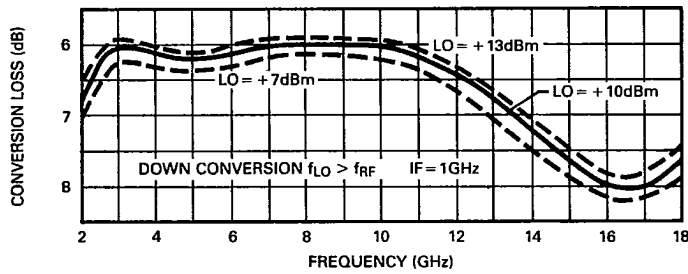
Test Conditions	Lo Power (+ dBm)	MX2181 (+ dBm)	MX2182 (+ dBm)
RF1 = 8.0GHz @ -10dBm	7	16	14
RF2 = 8.1GHz @ -10dBm	10	16	14
LO = 7GHz IF1 = 1.0GHz, IF2 = 1.1GHz	13	16	14
RF1 = 8.0GHz @ -10dBm	7	14	14
RF2 = 8.1GHz @ -10dBm	10	14	14
LO = 9GHz IF1 = 1.0GHz, IF2 = 1.1GHz	13	15	15
RF1 = 17.0GHz @ -10dBm	7	13	14
RF2 = 17.1GHz @ -10dBm	10	14	15
LO = 16GHz IF1 = 1.0GHz, IF2 = 1.1GHz	13	15	16

RF Input Power vs IF Output Power (MX2181, MX2182)

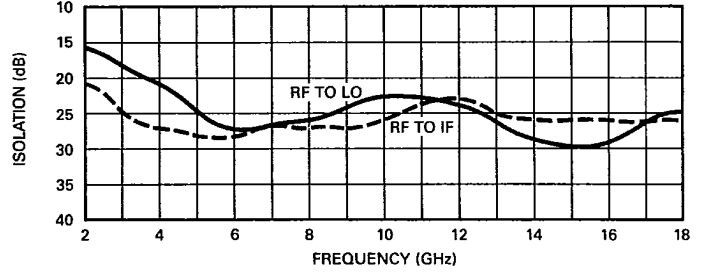


Typical Electrical Performance (MX2181)

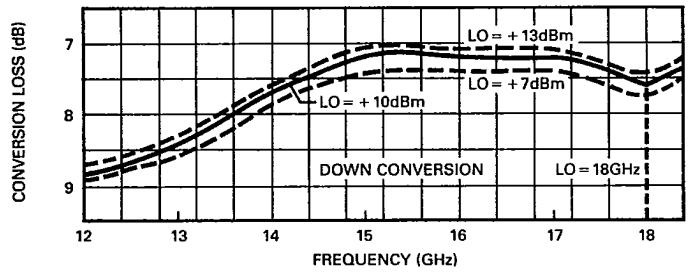
Conversion Loss vs Frequency and LO Power



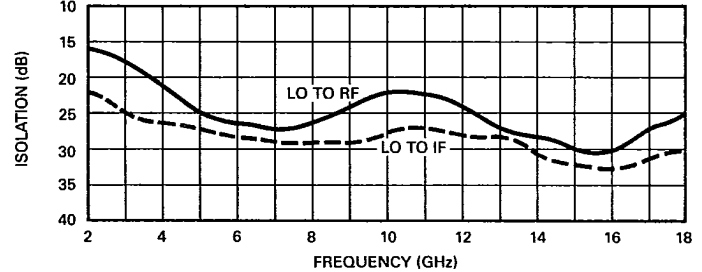
Isolation vs Frequency



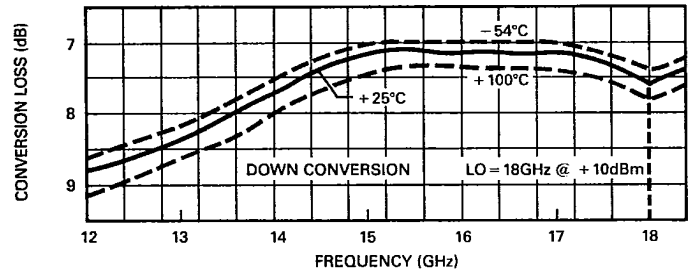
Conversion Loss vs Frequency and LO Power



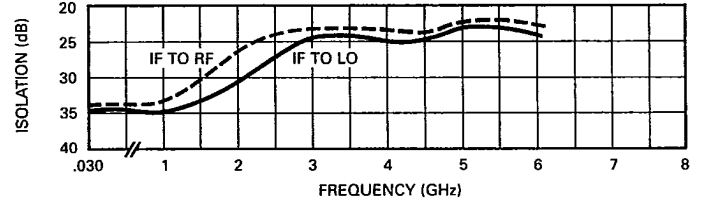
Isolation vs Frequency



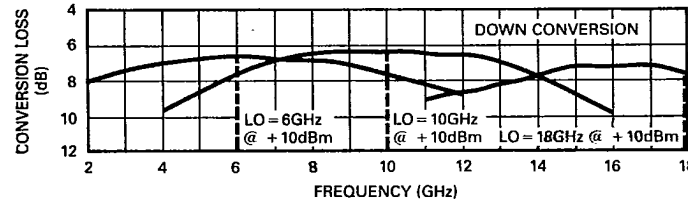
Conversion Loss vs Frequency and Temperature



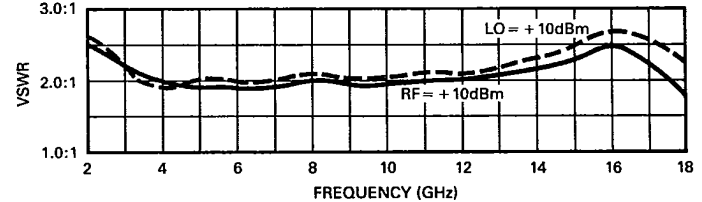
Isolation vs Frequency



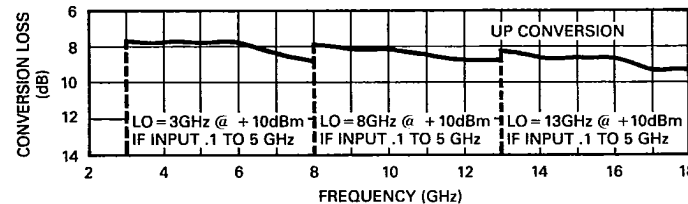
Conversion Loss vs Frequency



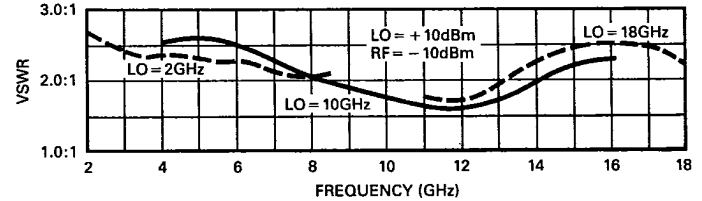
VSWR vs Frequency



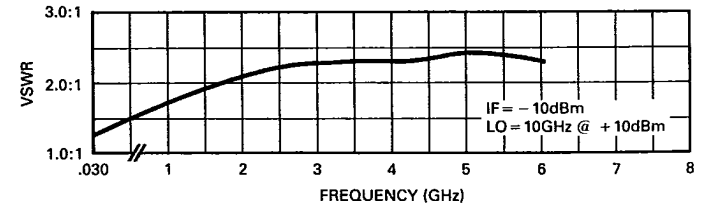
Conversion Loss vs Frequency



RF VSWR vs Frequency



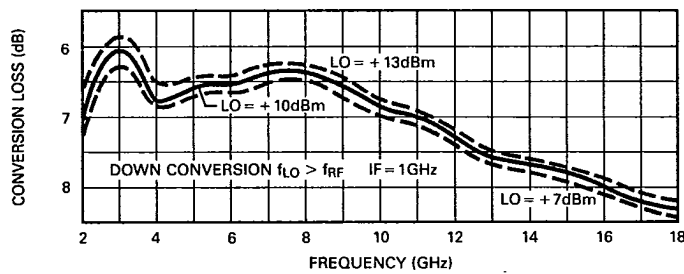
IF VSWR vs Frequency



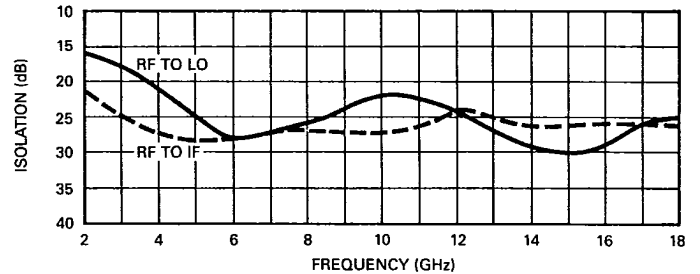
Typical Electrical Performance (MX2182)

T-74-13-01

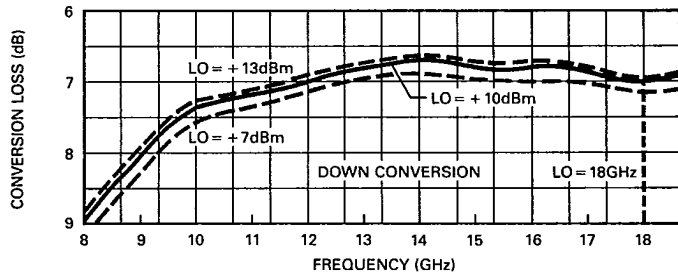
Conversion Loss vs Frequency and LO Power



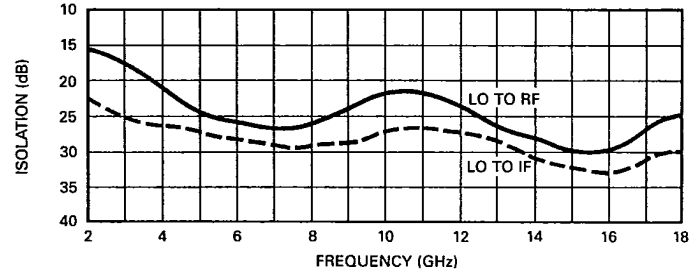
Isolation vs Frequency



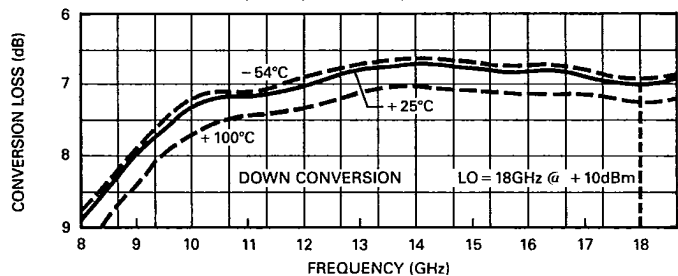
Conversion Loss vs Frequency and LO Power



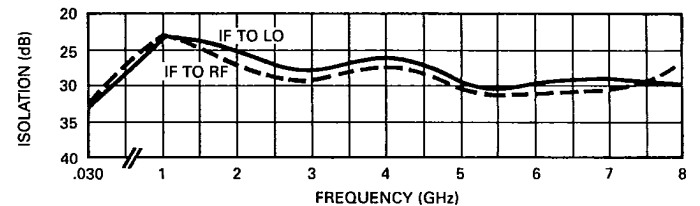
Isolation vs Frequency



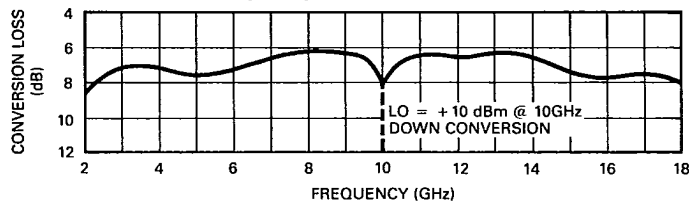
Conversion Loss vs Frequency and Temperature



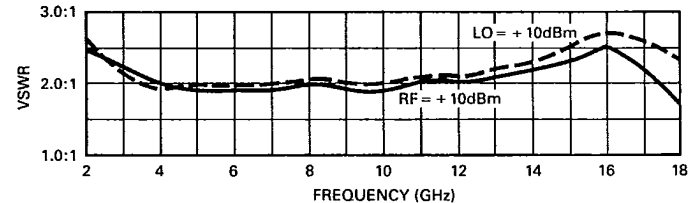
Isolation vs Frequency



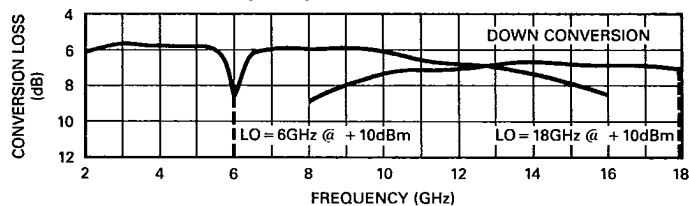
Conversion Loss vs Frequency



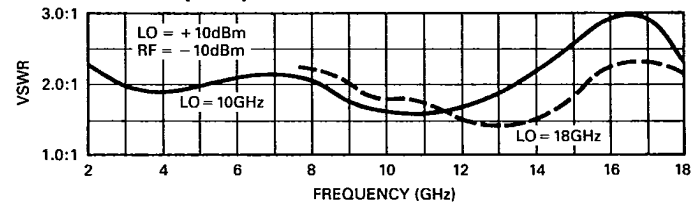
VSWR vs Frequency



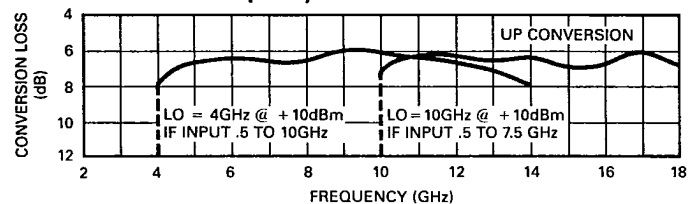
Conversion Loss vs Frequency



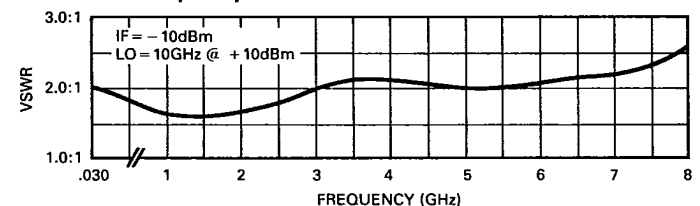
RF VSWR vs Frequency



Conversion Loss vs Frequency



IF VSWR vs Frequency



4

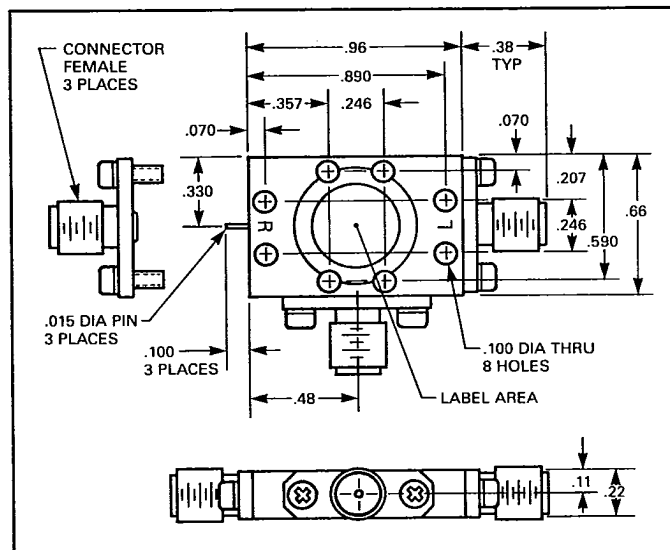
Reliability

The calculated mean time between failure (MTBF) for these mixers is shown below. These calculations are based on using Group VII Diode Data per MIL-STD-217D.

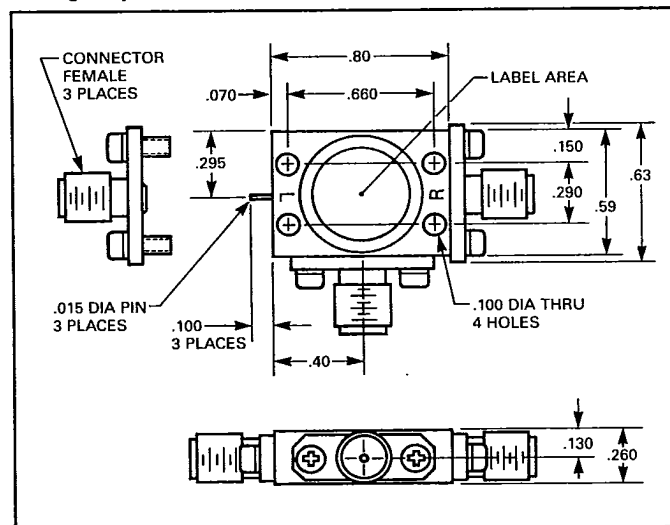
Environment	Temperature (°C)	Diodes	MTBF (Hrs)
Ground Benign	+ 25	Standard	3,595,800
	+ 25	TX Screened	4,090,000
Airborne Inhabited Fighter	+ 25	Standard	330,900
	+ 25	TX Screened	745,100
Airborne Uninhabited Fighter	+ 25	Standard	212,700
	+ 25	TX Screened	496,500
	+ 85	Standard	158,700
	+ 85	TX Screened	376,800

Outline Drawings

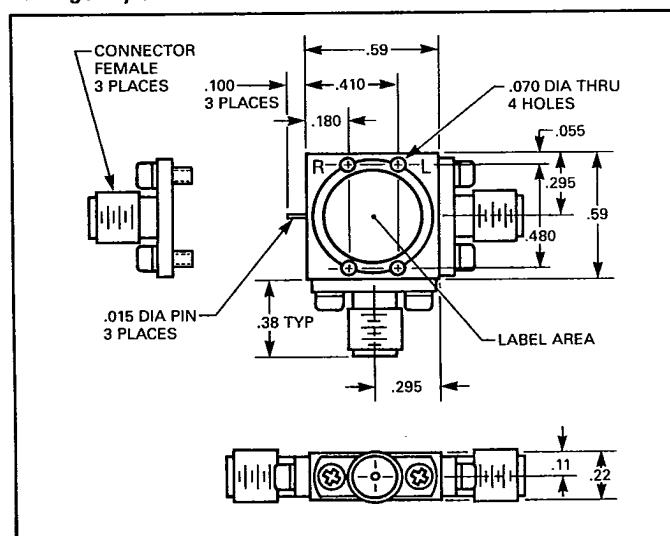
Package Style "A" MX2181A & MX2182A



Package Style "B" MX2181B & MX2182B



Package Style "C" MX2181C & MX2182C



Notes:

1. All units are shipped with SMA Female Connectors installed.
2. Tolerances—.xx ± .02; .xxx ± .010
3. All dimensions are in inches.



FEI Microwave, Inc.
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Typical Electrical Performance**Single Tone Intermodulation Products (dB Below Desired Signal)****Down Conversion**

Test Conditions	Product	Freq. (GHz)	MX2181 (dBc)	MX2182 (dBc)
LO = 4GHz @ +10dBm RF = 3GHz @ -10dBm IF = 1GHz	2RF - 1LO	2	51	53
	2LO - 1RF	5	36	24
	2LO - 2RF	2	36	43
	3RF - 2LO	1	>65	64
	3LO - 1RF	9	29	17
	3LO - 2RF	6	53	53
	3LO - 3RF	3	52	62
	4LO - 3RF	7	>65	62
	4LO - 4RF	4	>65	>65
	5RF - 4LO	1	>65	>65
	5LO - 4RF	8	>65	>65
	5LO - 5RF	5	55	55
	2RF	6	41	47
LO = 11GHz @ +10dBm RF = 10GHz @ -10dBm IF = 1GHz	2LO	8	7	7
	3LO	12	24	20
	2LO - 2RF	2	52	47
	3LO - 3RF	3	57	58
LO = 18GHz @ +10dBm RF = 17GHz @ -10dBm IF = 1GHz	4LO - 4RF	4	>65	>65
	5LO - 5RF	5	>65	>65
	2LO - 2RF	2	54	50
	3LO - 3RF	3	60	54
LO = 8GHz @ +10dBm RF = 10.5 - 13GHz @ -10dBm IF = 2.5 - 5GHz	4LO - 4RF	4	>65	>65
	5LO - 5RF	5	>65	>65
	2LO - 1RF	3-5.5	30	30
	2RF - 2LO	5	44	44
	3LO - 2RF	2.5-3	48	43
	2RF - 3LO	2	62	54
	4LO - 2RF	6	47	46
	5LO - 3RF	2.5-5	53	55

Up Conversion

Test Conditions	Product	Freq. (GHz)	MX2181 (dBc)	MX2182 (dBc)
LO = 3GHz @ +10dBm IF = 2GHz @ -10dBm RF = 5GHz	1LO - 1IF	1	8	8
	2LO - 1IF	4	41	27
	2LO - 2IF	2	57	54
	2IF - 1LO	1	49	54
	3LO - 1IF	7	7	12
	3LO - 2IF	5	44	45
	3LO - 3IF	3	54	57
	3IF - 1LO	3	51	56
	4LO - 2IF	8	53	49
	4LO - 3IF	6	62	63
	4IF - 1LO	5	63	>65
	4IF - 2LO	2	>65	>65
	5IF - 1LO	7	45	50
LO = 10GHz @ +10dBm IF = 1GHz @ -10dBm RF = 11GHz	5IF - 2LO	4	>65	>65
	2IF	4	>65	>65
	3IF	6	>65	>65
	4IF	8	>65	>65
	2LO	6	7	5
	3LO	9	22	12
	1LO + 2IF	12	>45	>45
LO = 18GHz @ +10dBm IF = 1GHz @ -10dBm RF = 17GHz	1LO + 3IF	13	>45	>45
	1LO + 4IF	14	>45	>45
	1LO + 5IF	15	>45	>45
	2LO	20	22	14
LO = 8GHz @ +10dBm IF = 1GHz @ -10dBm RF = 17GHz	1LO - 2IF	16	>43	>43
	1LO - 3IF	15	>43	>43
	1LO - 4IF	14	>43	>43
	1LO - 5IF	13	>43	>43
LO = 8GHz @ +10dBm IF = 2.5 - 5GHz @ -10dBm RF = 10.5 - 13GHz	2LO - 1IF	11-13.5	30	30
	2IF	10	>43	>43
	3IF	10.5-13	>43	>43
	4IF	10.5-13	>43	>43



FEI Microwave, Inc.
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825 Stewart Drive
Sunnyvale, CA 94086-4514
408 732 0880
TWX 910 339 9207

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