FREQUENCY MULTIPLIERS

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FEDERAL SUPPLY CODE

Our Federal Supply Code is: 33592

CORPORATE OVERVIEW

MITEQ, an acronym for (M)icrowave (I)nformation (T)ransmission (EQ)uipment, designs and manufactures a complete line of high-performance components and subsystems for the microwave electronics community. Located on Long Island, New York for more than thirty years, it has grown into a company which is dedicated to achieving technical excellence, producing quality products and satisfying our customer's specific needs.

STANDARD PRODUCT LINES

MITEQ's product lines are basically split between two market segments:

- **Microwave components and integrated assemblies**
- **Satellite communications & earth station equipment**

The Microwave Component Division offers designs up to and over 60 GHz, including:

- **Amplifiers**: Moderate to broadband, ultralow-noise to medium-power, bipolar, and GaAs FET designs
- **Mixers**: Single-, double-, and triple-balanced, MESFET and Schottky mixers and low-noise receiver front ends
- **Frequency multipliers**
- **Passive power components**
- **Microwave assemblies, systems and technologies:** Solid-state switches, attenuators, and power dividers
- **RF and IF signal processing components**
- **Oscillators**: Crystal, voltage, cavity tuned, free-running, and phase-locked
- **Frequency synthesizers**
- **Integrated multifunction assemblies**
- **Fiber Optic products**

MITEQ's Satellite Communication and Earth Station Equipment Groups manufacture the following:

- **Up/downconverters**
- **Test translators**
- **IF/video equalizers**
- **Redundancy switchover units**
- **Video modulators and modems**

Specific products include synthesized converters with 1.0 kHz and 125 kHz frequency step sizes, INMARSAT L- and C-band converters, pilot generators and receivers, crystal controlled converters, video exciters, and custom designed products.

CUSTOM DESIGN CAPABILITIES

Although MITEQ offers one of the broadest lines of standard catalog items, the bulk of MITEQ's business is in customized components, assemblies, and systems designed specifically around the customer's needs. MITEQ's heavy emphasis on internal R&D throughout its history has lead to the creation of a company with the ability to adapt quickly to the changing needs of the customer and market while at the same time offering competitive prices and fast turnaround times.

APPLICATIONS

MITEQ's components and systems are supplied to a wide variety of military and commercial markets including:

- Satellite and ground-based communication systems
- Missile guidance
- Military electronic countermeasures, radar warning and surveillance systems
- Land, sea, and airborne radar
- Air traffic control radar
- Radioastronomy
- Research and development efforts

MANUFACTURING AND DESIGN CAPABILITIES

MITEQ's state-of-the-art facilities presently consist of five adjacent buildings totaling 217,000 square feet. In addition to housing fifteen separate engineering and manufacturing groups, MITEQ prides itself on its support groups including: drafting, which uses the latest commercial CADD and proprietary software programs; and an extensive machine shop, which includes top-of-the-line numerically-controlled Okuma, Mitsui Seiki and Matsuura vertical machining centers capable of machining to the tightest of tolerances, guaranteeing repeated accuracy and reliability. MITEQ has three Class 100,000 and two Class 10,000 cleanrooms in support of high reliability space and military applications.

To accomplish the engineering, manufacturing and testing of MITEQ's components and assemblies, MITEQ invests heavily in capital equipment. This state-of-the-art equipment includes a wide array of vector network analyzers and synthesized sources, phase noise test sets, custom noise figure measuring equipment, glass furnace equipment to control the process of glass sealing, thermal/humidity chambers, and PIND and shock and vibration stations for environmental screening, to name a few.

QUALITY ASSURANCE

MITEQ is recognized as a world class supplier with an outstanding reputation for product quality. MITEQ has undergone the extensive **ISO-9001:2000** certification process to help secure its future as a primary source for advanced microwave products.

SPACE HERITAGE

MITEQ's continued advancements in this state-of-the-art and unique capability have led to a wide acceptance by the microwave community as a forerunner in spaceborne technology. Our space-qualified components include mixers, amplifiers, synthesizers, and super-components. MITEQ's Space-Qualified Quality Assurance Plan establishes the actions necessary to provide confidence that the end item will meet the quality, reliability, and electrical performance required for space-qualified applications. Recent space platforms include:

• AMSU-B • SSMIS • GEOSAT • SEAWINDS • P99
• SEASAT • SPINSAT • TOPEX

CUSTOMER SERVICE

MITEQ continually evaluates its service procedures to ensure that a close relationship is maintained between the company and its customers. The goal in every case is to deliver products of exceptional quality, backed by responsive technical and administrative support. MITEQ remains committed to offering comprehensive technical support to its customers through a direct customer-to-MITEQ engineering link. This enables a quick response to the customer's needs, and ensures receipt of exactly what the customer requires: Delivery of cost-effective solutions for the most demanding applications.

INTRODUCTION

This catalog is intended to provide an overview of MITEQ's passive and active multiplier capabilities. Within this catalog you will find a variety of standard designs which will meet typical applications. However, MITEQ maintains dedicated engineering resources to modify these standard designs in support of custom-generated specifications that are typically required in stringent system applications. These critical requirements often require high spectral purity. MITEQ can obtain high levels of fundamental and spurious signal suppression as required in many frequency source applications by employing special filter technologies.

In addition to custom-filter designs, MITEQ also has advanced amplifier technologies which, when combined with balanced multiplier designs, offer high performance active multipliers especially in the areas of shaped frequency response and desired output levels.

TECHNICAL OVERVIEW

Most of MITEQ's frequency multiplier designs perform to specific customer requirements and cannot easily be categorized into standard products. Parameters such as frequency range, bandwidth, spurious rejection and multiplication ratios are normally determined by specific system requirements. These requirements, in turn, translate into custom-designed filter and amplifier specifications at the multiplier design level.

In most frequency multiplier designs, the multiplier output contains, besides the desired harmonic output, unwanted signals. These unwanted signals consist of the fundamental input signal leakage, and lower-order and higher-order harmonics generated in the multiplier. Quite often with odd-order multipliers, the undesired signals are higher in level than the desired signal. In even-order multipliers, the undesired outputs are normally 10 to 20 dB below the desired output. Thus, the output signals can be amplified before the output is filtered. This is not possible with odd-order multipliers because the unwanted signals will cause the amplifier to saturate and suppress the desired output. The easiest to characterize as standard products are the frequency doublers because of their wide bandwidth and relatively high rejection to input harmonics.

For these reasons, the frequency doubler section of the product line offers more standard models than the higher-order frequency multipliers.

Definitions of key performance parameters vary from manufacturer to manufacturer. Some of the variations are minor, while others can lead to misinterpretations of specifications. In order to avoid that problem and facilitate the use of this catalog, we have supplied a technical discussion for our series of passive and active multipliers.

TECHNICAL DISCUSSION

MULTIPLIER LOSSES

MITEQ's multipliers are formed by cascading a passive multiplier with a bandpass filter and an active device, such as an amplifier.

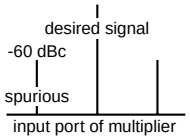
The basic multiplier losses of MITEQ's passive multipliers are listed below;

times two (X 2):	12 dB typical
times three (X 3):	15 dB typical
times four (X 4):	22 dB typical
times five (X 5):	23 dB typical

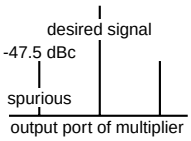
Multipliers of higher orders are formed by cascading these basic blocks. The most common higher-order multiplier used for MITEQ's systems applications is the times six, which is formed with the cascade of times two and times three. MITEQ manufactures C-band through Ku-band multipliers with built-in comb bandpass filters, MMIC amplifiers and higher-order assemblies that include various combinations of even- and odd-harmonic multipliers.

PHASE NOISE

MITEQ multipliers add phase noise to a lower frequency source by approximately 20 x log [N] + 3 dB, where N is the multiplication factor. If spurious products are present on an incoming signal, they increase in level by this factor. Below is a visual representation of this phenomenon:



The phase noise contribution of the tripler is 12.50 dB;



One method of measuring the phase noise contribution is referred to as a residual phase noise measurement and requires three multipliers (three measurements with two multipliers each), so that the source noise is cancelled. At present, all of our multipliers have not been thoroughly characterized for phase noise contribution.

SPURIOUS AND HARMONIC REJECTION

The concepts of harmonic rejection and spurious rejection are very important in the manufacture of multipliers. An important tool in the design process relates to the spurious-free bandwidth, which can be mathematically calculated from the relation:

[N + 1] / N < = [upper frequency limit/lower frequency limit]
where N is the multiplication factor.

For a tripler, this ratio becomes 4/3 = 1.333. A tripler whose output is 4 to 8 GHz wide has inband spurious outputs that are not filtered because 8/4 = 2, which exceeds the spurious-free bandwidth ratio.

With regard to spurious rejection, it makes a difference over what output region the rejection is required. Generally, MITEQ produces multipliers with -65 dBc minimum spurious rejection not only in the output passband, but also outside the desired passband from (1 to 18 GHz). Spurious outputs take three basic forms.

CASE 1. The spurs are not harmonically related to the input and are called nonharmonically-related spurs [not related to N at all].

CASE 2. The spurs are related somehow to the input, or multiples of it, and are called harmonically-related spurious. [N + 1, N - 1, N + 2, etc.].

CASE 3. The spurs are related to multiples of the output and are referred to as output harmonics [N, 3N, 4N, etc.].

At MITEQ, we refer to the first two cases under the general term spurious rejection and to case three by the term output harmonics. Rejection to output harmonics for the vast majority of MITEQ multipliers lies between -15 and -20 dBc. The reason for this is because those multipliers that require amplification usually employ an amplifier that is run in a saturated mode to minimize output power variations versus temperature.

This leads to a key design concept about properly assessing the choice of multiplication factor, and more importantly, how much rejection is required to meet your overall system requirements. The multiplier can be used as part of a synthesizer or source that feeds one port of a mixer. When the spurs of the multiplier enter the mixer, they mix with the RF and its harmonics to produce various unwanted signals that cannot be filtered in the IF passband.

DESIGN EXAMPLE

Your system requires a multiplier output from 8.6 to 10.5 GHz. Due to the available input frequencies, it is determined that the multiplication factor is six times. This is best accomplished by cascading a times three and a times two multiplier.

The input required for the tripler will be 1433 to 1750 MHz.
Multiples of the input, present at the output are:

X 2	2866 – 3500 MHz
X 3	4299 – 5250 MHz [desired]
X 4	5732 – 7000 MHz
X 5	7165 – 8750 MHz etc...

Suppose that the times five spectral component at the output is not suppressed properly. If your system specification is -70 dBc spurious, for example, and the N + 2 product is only suppressed by -58 dBc, the times six chain will not meet specification, because the next doubler will not provide any additional suppression. This product is an inband spurious because anything from 8600 to 10500 MHz is inband.

Suppose, next, that the N + 1 product of the tripler is not suppressed -70 dBc. The desired input to the doubler is 4299 to 5250 MHz, but we also have an input from 5732 to 7000 MHz that was not adequately suppressed. Therefore, we will observe an undesired output from the doubler at the following frequency:

N + 1	5732 – 7000 MHz
N	4299 – 5250 MHz, the difference product is 1433 – 1750 MHz

Since our desired output is 8600 to 10500 MHz, the difference product maps into the region (8600 to 10500 MHz) + (1433 to 1750 MHz) and the result is 10033 to 12250 MHz, which is an undesired product, from at least the 10033 to 10500 MHz region of the desired output passband.

The point of this example is to show that when a multiplier system is designed from cascaded multipliers, potential problems exist if you buy the individual multipliers separately from MITEQ and do not take into account all the multiples and their products formed at various stages. MITEQ provides custom-designed higher-order multipliers that will not suffer from these effects.

SPECIFICATION DEFINITIONS

PASSIVE MULTIPLIERS

CONVERSION LOSS (also known as multiplier loss)

This is the attenuation in dB between the input level and the output level.

HARMONIC REJECTION

The difference in dB between the desired harmonic and the unwanted harmonic as viewed at the multiplier output port. When the unwanted harmonic is the fundamental itself, then the difference is the fundamental rejection.

ACTIVE MULTIPLIERS

CONVERSION GAIN

The net increase in power between the fundamental input signal and the desired output. It is usually expressed as a positive ratio in dB.

SPURIOUS REJECTION

The difference in dB between the desired output harmonic and any other harmonic as viewed at the multiplier's output. The spurs can be multiples of the input frequency.

OUTPUT HARMONIC REJECTION

The difference in dB between the desired output and harmonics of the output frequency.

COMMON DEFINITIONS FOR BOTH PASSIVE AND ACTIVE MULTIPLIERS

OUTPUT POWER FLATNESS

The maximum power variation in dB over a specified frequency and at a specific temperature.

INPUT POWER

The level in dBm as measured at the multiplier's input port.

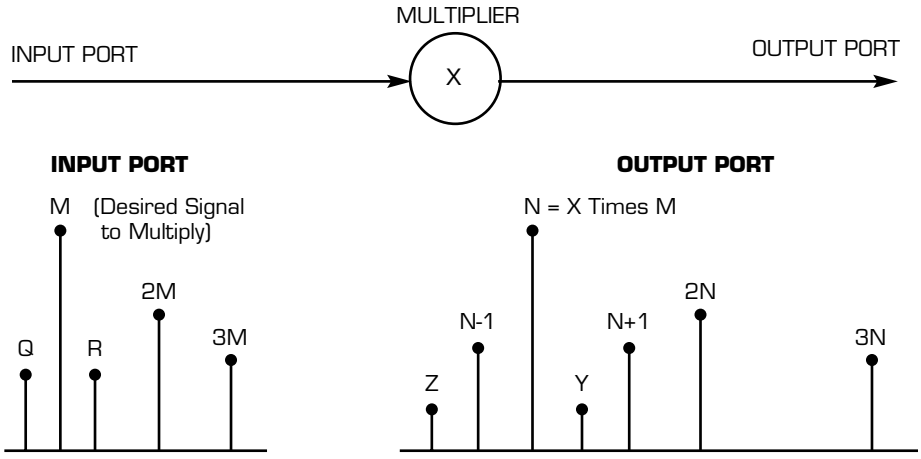
OUTPUT POWER

The level in dBm as measured at the output port of the multiplier.

OPERATING TEMPERATURE

The temperature range at which the device meets the specified electrical parameters. The temperature is defined as the base plate temperature of the device.

DEFINING MULTIPLIER TERMS



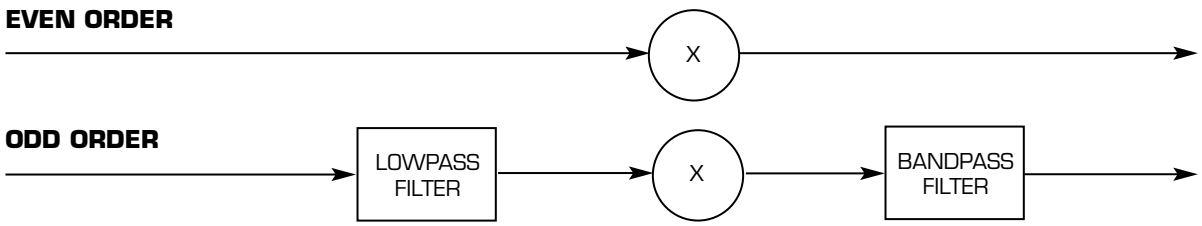
Input harmonics feeding multiplier = 2M, 3M
Spurious feeding multiplier = Q, R

Output harmonics from multiplier = 2N, 3N
Input harmonic rejection (products generated in the multiplier) = N + 1, N - 1 related to the input
Spurious rejection = Y, Z

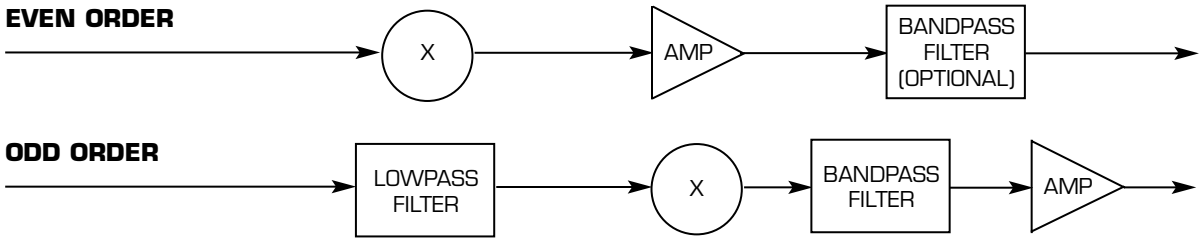
TYPICAL BLOCK DIAGRAMS

The basic use of frequency multipliers is to extend the output frequency range or bandwidth of a source by multiplying that frequency by a given multiplication factor, i.e., twice the fundamental of a 5 to 10 GHz source would yield a 10 to 20 GHz output. The following block diagrams represent but a small sampling of the uses for both passive and active multipliers.

PASSIVE MULTIPLIERS

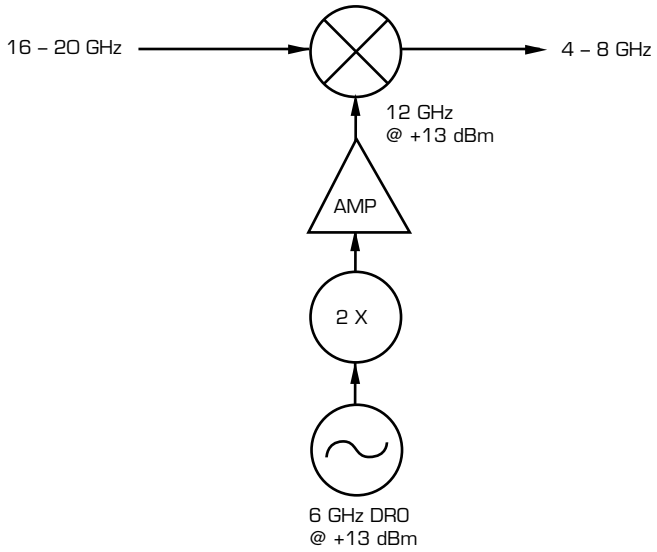


ACTIVE MULTIPLIERS

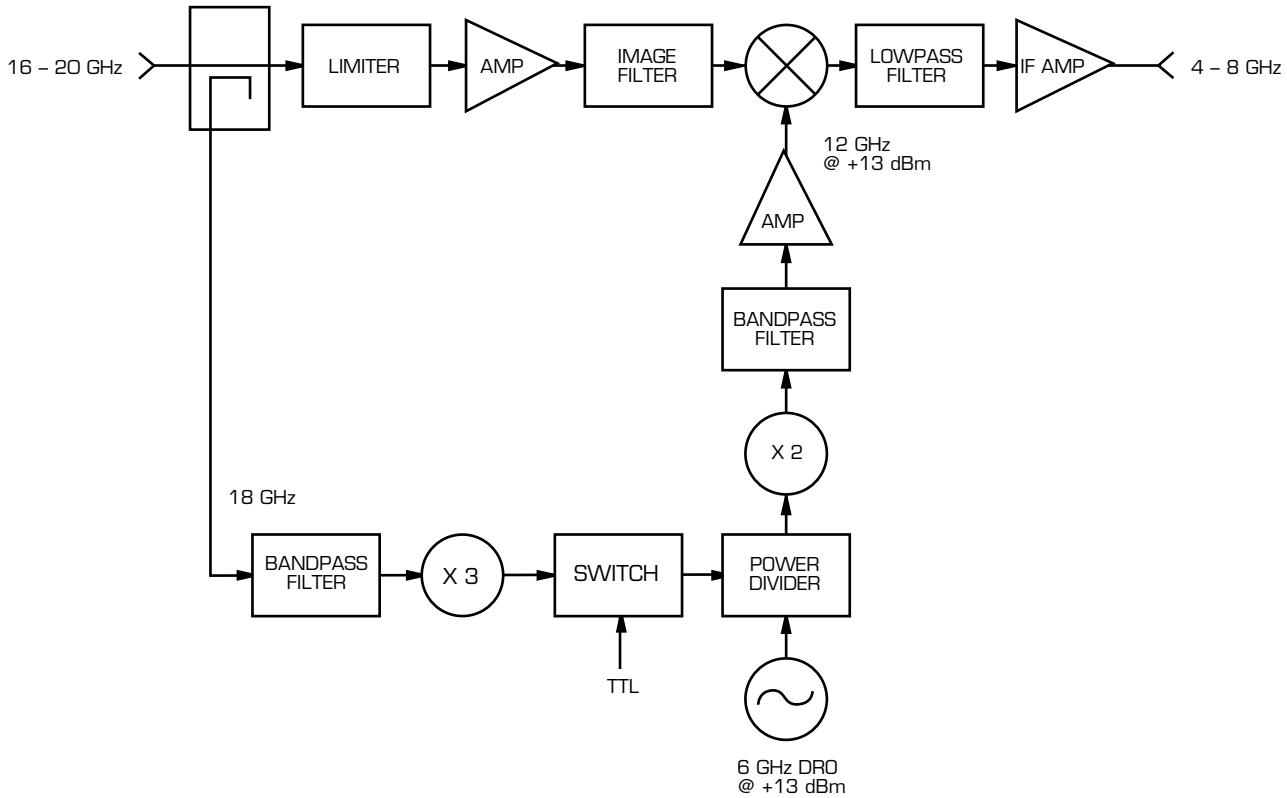


TYPICAL BLOCK DIAGRAMS (CONT.)

TIMES 2 MULTIPLIER WITH SOURCE



SUBSYSTEM WITH MULTIPLIERS



SPECIFICATIONS AND TYPICAL VALUES

One very common problem MITEQ's customers face when purchasing multipliers is not knowing what specifications are practically realizable, and also not appreciating that overspecification causes large, bulky and expensive products. This can be overcome by using some practical values established here as a reference:

SPECIFICATION	TYPICAL VALUE
Multiplication factor	Examine spurious-free bandwidth ratio
Phase noise contribution	20 log [N] + 3 dB
Output bandwidth	Examine spurious-free bandwidth ratio
Input power	+10 dBm
Output power	+10 dBm
Output power flatness	±1.50 dB
Spurious rejection	-65 dBc
Output harmonics	-15 dBc
Operating temperature	0 to 50°C
Size	Depends on required rejection

ENVIRONMENTAL CONDITIONS

MITEQ's standard frequency multipliers have been designed to meet the following environmental conditions:

Operating temperature ..... -30 to +75°C
Storage temperature ..... -40 to +85°C
Humidity ..... 95% relative humidity, noncondensing
Vibration ..... 7 g's rms, 50-5000 CPS, per MIL-STD-810B, Method 514, Procedure 5
Data curves are at 25°C ..... There will be some variation in the typical data shown as a function of temperature

PERCENTAGE BANDWIDTH, REJECTION AND SIZE

The last topic to address is perhaps the most complicated. It relates to having some feel for how large a multiplier will be in order to achieve proper spurious rejection. Two diagnostic tools used at MITEQ are presented here, which have played an important role in this regard:

Multiplier Percentage Bandwidth = [Output Bandwidth] / [Operating Frequency]
MITEQ produces designs with 10 to 15 percent bandwidths.

Bandwidth Ratio = [Reject Frequency - Center Frequency] / [Output Bandwidth]
Generally, the higher the number the better.

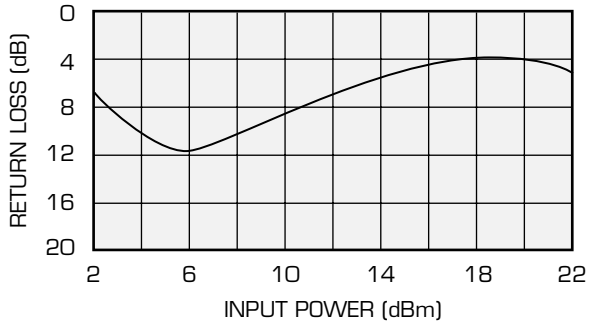
When the percentage bandwidth gets too large, and/or when the bandwidth ratio gets too small, the multiplier becomes difficult to produce and may become quite large because the filtering requirements are forcing the number of filtering elements to increase. It is also true that the size is related to the operating frequency.

Since the filter is often the largest component of the multiplier, it is useful to know how many resonators are needed and how large your multiplier might be. MITEQ has engineering support available to help you get a feel for how large your multiplier might be. **Contact MITEQ at (631) 439-9413** to discuss the details about specifying the spurious rejection and size of your multiplier requirement for a cost-effective design.

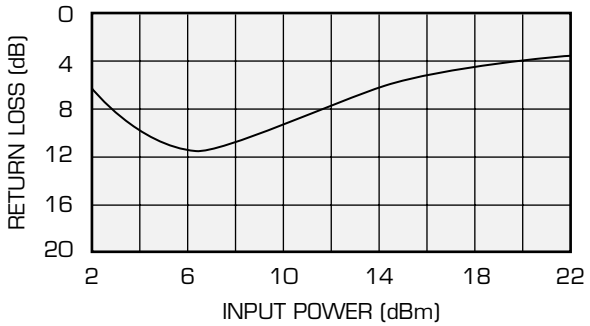
ACTIVE FREQUENCY MULTIPLIERS

TYPICAL PERFORMANCE VS. INPUT POWER

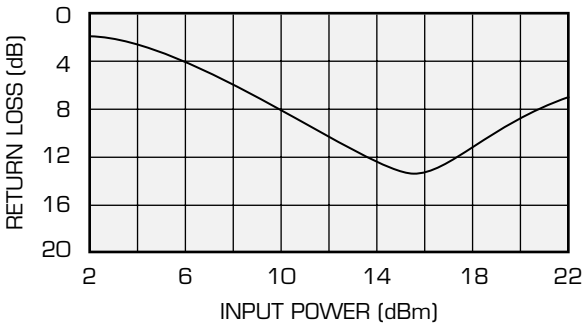
INPUT RETURN LOSS VS. INPUT POWER FOR J DRIVE LEVEL MULTIPLIERS



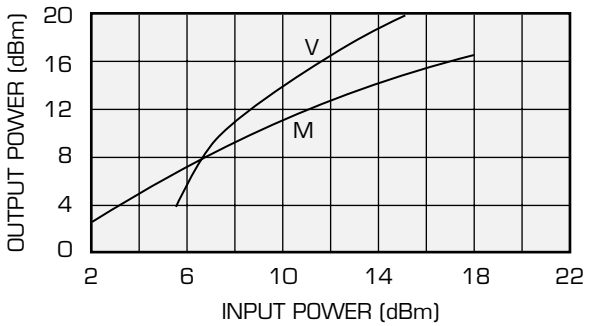
INPUT RETURN LOSS VS. INPUT POWER FOR M DRIVE LEVEL MULTIPLIERS



INPUT RETURN LOSS VS. INPUT POWER FOR V DRIVE LEVEL MULTIPLIERS



OUTPUT VS. INPUT POWER LEVEL FOR M AND V DRIVE LEVEL MULTIPLIERS



AVAILABLE INPUT POWER OPTIONS

DRIVE LEVEL	INPUT DRIVE (dBm)
J	3 – 8
M	8 – 12
H	12 – 16
V	16 – 20

COMMON APPLICATIONS

SATCOM PRODUCTS-COMMUNICATIONS RECEIVERS

Microwave front ends usually employ a phase-locked source, such as a frequency synthesizer which has extremely low phase-noise characteristics, especially for digital communications. The synthesizer uses a fundamental VCO which is locked to highly-stable crystal reference sources. The frequency limitation of many commercial VCOs and frequency dividers is 3500 MHz. A multiplier is employed to extend the synthesizer range.

RADAR RECEIVERS

Most high-quality radars employ frequency synthesizers which require frequency multipliers. The phase noise must be low to avoid clutter noise.

INSTRUMENTATION APPLICATIONS

Frequency synthesizers which require multipliers are found in the front end of many measuring instruments which require low phase-noise LOs. One example is a spectrum analyzer.

RADIO ASTRONOMY APPLICATIONS

Interferometers and radiometers require broadband frequency doublers for wideband receivers. Frequency synthesizers are used to generate millimeter-wave frequencies to make the measurements.

MILLIMETER-WAVE SOURCES

Millimeter-wave frequencies are used in research applications for atomic spectroscopy and for various communications and radars. A multiplier chain can be used to generate these frequencies from a lower frequency source.

FREQUENCY STANDARDS

Highly-stable frequency sources can be multiplied to produce microwave sources used to measure the effect of the atmosphere or rocket exhaust on microwave signals.

PASSIVE FREQUENCY DOUBLERS AND TRIPLERS

MODEL NUMBER	INPUT FREQUENCY (GHz)	INPUT POWER (dBm)	OUTPUT FREQUENCY (GHz)	CONVERSION LOSS (dB) (Typ./Max.)	HARMONIC REJECTION FUND./ODD (dBc, Typ.)	OUTLINE NUMBER	OPTIONAL OUTLINE
SUBOCTAVE BANDWIDTH							
MX2M260400 *	13–20	8–12	26–40	10/13	15	MX2E	MXF
MX2V260400	13–20	16–20	26–40	10/13	15	MX2E	MXF
OCTAVE BANDWIDTH							
MX2J020040	1–2	3–8	2–4	9.5/15	20	MX2A	
MX2M020040 *	1–2	8–12	2–4	9.5/13	20	MX2A	
MX2H020040	1–2	12–16	2–4	9.5/13	20	MX2A	
MX2V020040	1–2	16–20	2–4	9.5/13	20	MX2A	
MX2J040080	2–4	3–8	4–8	11/13**	20	MX2B	MX2C
MX2M040080 *	2–4	8–12	4–8	11/13**	20	MX2B	MX2C
MX2H040080	2–4	12–16	4–8	11/13**	20	MX2B	MX2C
MX2V040080	2–4	16–20	4–8	11/13**	20	MX2B	MX2C
MX2J080160	4–8	3–8	8–16	11/13**	20	MX2B	MX2C
MX2M080160 *	4–8	8–12	8–16	11/13**	20	MX2B	MX2C
MX2H080160	4–8	12–16	8–16	11/13**	20	MX2B	MX2C
MX2V080160	4–8	16–20	8–16	11/13**	20	MX2B	MX2C
MX2J130260	6.5–13	3–8	13–26	11/15	15	MX2D	
MX2M130260 *	6.5–13	8–12	13–26	11/13	15	MX2D	
MX2H130260	6.5–13	12–16	13–26	11/13	15	MX2D	
MX2V130260	6.5–13	16–20	13–26	11/13	15	MX2D	
MULTIOCTAVE BANDWIDTH							
MX2J004010	0.02–0.5	3–8	0.04–1	10.5/13	25	MX2A	
MX2M004010 *	0.02–0.5	8–12	0.04–1	10.5/13	25	MX2A	
MX2H004010	0.02–0.5	12–16	0.04–1	10.5/13	25	MX2A	
MX2V004010	0.02–0.5	16–20	0.04–1	10.5/13	25	MX2A	
MX2J010060	0.5–3	3–8	1–6	10.5/15	15/20	MX2A	
MX2M010060 *	0.5–3	8–12	1–6	10.5/15	15/20	MX2A	
MX2H010060	0.5–3	12–16	1–6	10.5/15	15/20	MX2A	
MX2V010060	0.5–3	16–20	1–6	10.5/15	15/ 20	MX2A	
MX2J030180	1.5–9	3–8	3–18	12/15	15/20	MX2B	MX2C
MX2M030180 *	1.5–9	8–12	3–18	12/15	15/20	MX2B	MX2C
MX2H030180	1.5–9	12–16	3–18	12/15	15/20	MX2B	MX2C
MX2V030180	1.5–9	16–20	3–18	12/15	15/20	MX2B	MX2C
MX2J060260	3–13	3–8	6–26	12/18	15/20	MX2D	
MX2M060260 *	3–13	8–12	6–26	12/18	15/20	MX2D	
MX2H060260	3–13	12–16	6–26	12/18	15/20	MX2D	
MX2V060260	3–13	16–20	6–26	12/18	15/20	MX2D	
PASSIVE TRIPLERS							
MX3M320400*	10.66–13.33	8–12	32–40	15/20	-55 (filtered)	MXF	

** 15 dB for MX2C outline.

* Complete data sheet available inside catalog.
Custom bandwidths/rejection specs available. Please contact factory.

NOTE: Consult MITEQ for higher-order passive multipliers.

ACTIVE FREQUENCY DOUBLERS

MODEL NUMBER	INPUT FREQUENCY (GHz)	INPUT POWER (dBm)	OUTPUT FREQUENCY (GHz)	OUTPUT POWER (dBm, Typ.)	CONVERSION GAIN (dB, Typ.)	HARMONIC REJECTION FUND./ODD (dBc, Typ.)	NOM. DC POWER (+15 V, mA)	OUTLINE NUMBER	NOTES
SUBOCTAVE BANDWIDTH									
MAX2M180260	9–13	8–12	18–26	12–15	0–7	20	175	MAX2K	1
MAX2P180260	9–13	-5–+5	18–26	12–15	10–20	20	250	MAX2M	1
MAX2M180260-20P	9–13	8–12	18–26	18–22	10–14	20	375	MAX2L	1, 4
MAX2P180260-20P	9–13	-5–+5	18–26	18–22	13–27	20	450	MAX2N	1, 4
MAX2M260400 *	13–20	8–12	26–40	12–15	0–7	20	175	MAX2K	2
MAX2M260400W *	13–20	8–12	26–40	12–15	0–7	20	175	MAX2G	2
MAX2M390440-20P *	19.5–22	8–12	39–44	18–22	10–14	20	375	MAX2L	3, 4
MAX2M360500 *	18–25	8–12	36–50	11–14	0–6	20	175	MAX2K	3
MAX2M300500 *	15–25	8–12	30–50	11–14	0–6	20	175	MAX2K	3
OCTAVE BANDWIDTH									
MAX2J020040	1–2	3–8	2–4	3–8	0	20	150	MAX2A2	
MAX2M020040 *	1–2	8–12	2–4	8–12	0	20	150	MAX2A2	
MAX2H020040	1–2	12–16	2–4	12–16	0	20	150	MAX2A	
MAX2V020040	1–2	16–20	2–4	16–20	0	20	150	MAX2A	
MAX2J040080	2–4	3–8	4–8	3–8	0	20	150	MAX2A2	
MAX2M040080 *	2–4	8–12	4–8	8–12	0	20	150	MAX2A2	
MAX2H040080	2–4	12–16	4–8	12–16	0	20	150	MAX2B	
MAX2V040080	2–4	16–20	4–8	16–20	0	20	150	MAX2B	
MAX2J080160	4–8	3–8	8–16	3–8	0	20	150	MAX2B	
MAX2M080160 *	4–8	8–12	8–16	8–12	0	20	150	MAX2B	
MAX2H080160	4–8	12–16	8–16	12–16	0	20	150	MAX2B	
MAX2V080160	4–8	16–20	8–16	16–20	0	20	150	MAX2B	
MAX2J130260	6.5–13	3–8	13–26	3–8	0	20	210	MAX2C	
MAX2M130260 *	6.5–13	8–12	13–26	8–12	0	20	210	MAX2C	
MAX2H130260	6.5–13	12–16	13–26	12–16	0	20	300	MAX2C	
MAX2V130260	6.5–13	16–20	13–26	16–20	0	20	350	MAX2C	
MAX2M180400	9–20	8–12	18–40	12–15	0–7	20	175	MAX2K	
MAX2P180400	9–20	-5–+5	18–40	12–15	7–20	20	275	MAX2M	
MAX2M200400 *	10–20	8–12	20–40	12–15	0–7	20	175	MAX2K	
MAX2P200400	10–20	-5–+5	20–40	12–15	7–20	20	175	MAX2M	
MAX2M200400-20P *	10–20	8–12	20–40	18–22	6–14	20	375	MAX2L	4
MAX2P200400-20P	10–20	-5–+5	20–40	18–22	13–27	20	475	MAX2N	4
MULTIOCTAVE BANDWIDTH									
MAX2J010060	0.5–3	3–8	1–6	3–8	0	20	150	MAX2A2	
MAX2M010060 *	0.5–3	8–12	1–6	8–12	0	20	150	MAX2A2	
MAX2H010060	0.5–3	12–16	1–6	12–16	0	20	150	MAX2A	
MAX2V010060	0.5–3	16–20	1–6	16–20	0	20	150	MAX2A	
MAX2J030180	1.5–9	3–8	3–18	3–8	0	15/20	150	MAX2B	
MAX2M030180 *	1.5–9	8–12	3–18	8–12	0	15/20	150	MAX2B	
MAX2H030180	1.5–9	12–16	3–18	12–16	0	15/20	150	MAX2B	
MAX2V030180	1.5–9	16–20	3–18	16–20	0	15/20	150	MAX2B	
MAX2J060260	3–13	3–8	6–26	3–8	0	12/15	210	MAX2C	
MAX2M060260 *	3–13	8–12	6–26	8–12	0	12/15	210	MAX2C	
MAX2H060260	3–13	12–16	6–26	12–16	0	12/15	300	MAX2C	
MAX2V060260	3–13	16–20	6–26	16–20	0	12/15	350	MAX2C2	

* Complete data sheet available inside catalog.

NOTES:
(1) Available with WR42 on output.
(2) Available with WR28 on output.
(3) Available with WR22/WR19 on output.
(4) Requires negative bias -15 V at 70 mA.

ACTIVE FREQUENCY DOUBLERS AND TRIPLERS

MODEL NUMBER	INPUT FREQUENCY (GHz)	INPUT POWER (dBm)	OUTPUT FREQUENCY (GHz)	OUTPUT POWER (dBm, Typ.)	CONVERSION GAIN (dB, Typ.)	HARMONIC REJECTION IN/OUT (dBc,Typ.)	NOM. DC POWER (+15 V, mA)	OUTLINE NUMBER
DOUBLERS WITH INTEGRATED FILTERS								
MAX2M097103	4.88–5.13	8–12	9.76–10.26	11–15	3	-60/-15	160	Consult factory
MAX2M132152	6.6–7.63	8–12	13.21–15.26	11–15	3	-60/-15	160	Consult factory

MODEL NUMBER	INPUT FREQUENCY (GHz)	INPUT POWER (dBm)	OUTPUT FREQUENCY (GHz)	OUTPUT POWER (dBm, Typ.)	CONVERSION GAIN (dB, Typ.)	HARMONIC REJECTION IN/OUT (dBc, Min.)	POWER FLATNESS (±dB, Typ.)	VSWR IN/OUT (Typ.)	NOM. DC POWER (+5 V, mA)	OUTLINE NUMBER
TRIPLERS										
MAX3J045050	1.5–1.67	3–8	4.5–5	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M045050	1.5–1.67	8–12	4.5–5	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H045050	1.5–1.67	12–16	4.5–5	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3J050055	1.67–1.83	3–8	5–5.5	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M050055	1.67–1.83	8–12	5–5.5	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H050055	1.67–1.83	12–16	5–5.5	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3J055060	1.83–2	3–8	5.5–6	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M055060	1.83–2	8–12	5.5–6	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H055060	1.83–2	12–16	5.5–6	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3J060065	2–2.16	3–8	6–6.5	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M060065	2–2.16	8–12	6–6.5	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H060065	2–2.16	12–16	6–6.5	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3J065070	2.16–2.33	3–8	6.5–7	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M065070	2.16–2.33	8–12	6.5–7	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H065070	2.16–2.33	12–16	6.5–7	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3J070075	2.33–2.5	3–8	7–7.5	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M070075	2.33–2.5	8–12	7–7.5	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H070075	2.33–2.5	12–16	7–7.5	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3J075080	2.5–2.66	3–8	7.5–8	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M075080	2.5–2.66	8–12	7.5–8	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H075080	2.5–2.66	12–16	7.5–8	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3J080085	2.66–2.83	3–8	8–8.5	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M080085	2.66–2.83	8–12	8–8.5	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H080085	2.66–2.83	12–16	8–8.5	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A

MITEQ's triplers, quadruplers and quintuplers can be adjusted for ranges not shown here, and in some cases slightly broader than the ranges shown in the tables.

ACTIVE FREQUENCY TRIPLERS (CONT.)

MODEL NUMBER	INPUT FREQUENCY (GHz)	INPUT POWER (dBm)	OUTPUT FREQUENCY (GHz)	OUTPUT POWER (dBm, Typ.)	CONVERSION GAIN (dB, Typ.)	HARMONIC REJECTION IN/OUT (dBc, Min.)	POWER FLATNESS (±dB, Typ.)	VSWR IN/OUT (Typ.)	NOM. DC POWER (+5 V, mA)	OUTLINE NUMBER
TRIPLERS (CONT.)										
MAX3J043052	1.43–1.73	3–8	4.3–5.2	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M043052	1.43–1.73	8–12	4.3–5.2	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H043052	1.43–1.73	12–16	4.3–5.2	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3J047056	1.56–1.86	3–8	4.7–5.6	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M047056	1.56–1.86	8–12	4.7–5.6	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H047056	1.56–1.86	12–16	4.7–5.6	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3J063074	2.1–2.46	3–8	6.3–7.4	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M063074	2.1–2.46	8–12	6.3–7.4	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H063074	2.1–2.46	12–16	6.3–7.4	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3J070083	2.3–2.76	3–8	7–8.3	6–11	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M070083	2.3–2.76	8–12	7–8.3	11–15	3	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3H070083	2.3–2.76	12–16	7–8.3	12–16	0	-60/-15	1	2:1/1.5:1	120	MAX3A
MAX3M154172	5150–5740	13	15450–17220	13	0	-60/-15	1	2:1/1.5:1	150*	**
MAX3M172190	5740–6330	13	17220–18990	13	0	-60/-15	1	2:1/1.5:1	150*	**
MAX3M300300	10	10–15	30	10 –13	0	18/18	–	3:1/2:1	160*	MAX2F

* Nominal current at +15 VDC.
** Consult factory for specific packaging information.

HIGHER ORDER ACTIVE MULTIPLIERS

MODEL NUMBER	INPUT FREQUENCY (GHz)	INPUT POWER (dBm)	OUTPUT FREQUENCY (GHz)	OUTPUT POWER (dBm, Typ.)	CONVERSION GAIN (dB, Typ.)	HARMONIC REJECTION IN/OUT (dBc, Min.)	POWER FLATNESS (±dB, Typ.)	VSWR IN/OUT (Typ.)	NOM. DC POWER (+15 V, mA)	OUTLINE NUMBER
QUADRUPLERS										
MAX4J050055	1.25–1.375	3–8	5–5.5	6–11	3	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4M050055 *	1.25–1.375	8–12	5–5.5	11–15	3	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4H050055	1.25–1.375	12–16	5–5.5	12–16	0	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4J055060	1.375–1.5	3–8	5.5–6	6–11	3	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4M055060	1.375–1.5	8–12	5.5–6	11–15	3	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4H055060	1.375–1.5	12–16	5.5–6	12–16	0	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4J060065	1.5–1.625	3–8	6–6.5	6–11	3	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4M060065	1.5–1.625	8–12	6–6.5	11–15	3	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4H060065	1.5–1.625	12–16	6–6.5	12–16	0	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4M062071 *	1.55–1.78	8–12	6.2–7.1	11–15	3	-50/-15	2	2:1/1.5:1	150	MAX4A
MAX4J065070	1.625–1.75	3–8	6.5–7	6–11	3	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4M065070	1.625–1.75	8–12	6.5–7	11–15	3	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4H065070	1.625–1.75	12–16	6.5–7	12–16	0	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4J070075	1.75–1.875	3–8	7–7.5	6–11	3	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4M070075	1.75–1.875	8–12	7–7.5	11–15	3	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4H070075	1.75–1.875	12–16	7–7.5	12–16	0	-50/-15	1	2:1/1.5:1	150	MAX4A
MAX4M400480 *	10–12	10–15	40–48	8–11	0	18/18	2	3:1/2.5:1	150	MAX2H
MAX4V168176-23P	4.2–4.4	17	16.8–17.6	23	6	-60/-15	1.5	2:1/1.5:1	400	**

* Complete data sheet available inside catalog.
** Consult factory for specific packaging information.

HIGHER ORDER ACTIVE MULTIPLIERS (CONT.)

MODEL NUMBER	INPUT FREQUENCY (GHz)	INPUT POWER (dBm)	OUTPUT FREQUENCY (GHz)	OUTPUT POWER (dBm, Typ.)	CONVERSION GAIN (dB, Typ.)	HARMONIC REJECTION IN/OUT (dBc, Min.)	POWER FLATNESS (±dB, Typ.)	VSWR IN/OUT (Typ.)	NOM. DC POWER (+15 V, mA)	OUTLINE NUMBER
QUINTUPLERS										
MAX5M065075-14P	1.3–1.5	8–12	6.5–7.5	11–15	3	-40/-15	1.5	2:1/1.5:1	150	MAX5A
MAX5J085090	1.7–1.8	3–8	8.5–9	6–11	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5M085090	1.7–1.8	8–12	8.5–9	11–15	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5H085090	1.7–1.8	12–16	8.5–9	12–16	0	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5J090095	1.8–1.9	3–8	9–9.5	6–11	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5M090095	1.8–1.9	8–12	9–9.5	11–15	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5H090095	1.8–1.9	12–16	9–9.5	12–16	0	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5J095105	1.9–2.1	3–8	9.5–10.5	6–11	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5M095105	1.9–2.1	8–12	9.5–10.5	11–15	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5H095105	1.9–2.1	12–16	9.5–10.5	12–16	0	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5J105115	2.1–2.3	3–8	10.5–11.5	6–11	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5M105115	2.1–2.3	8–12	10.5–11.5	11–15	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5H105115	2.1–2.3	12–16	10.5–11.5	12–16	0	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5J115125	2.3–2.5	3–8	11.5–12.5	6–11	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5M115125	2.3–2.5	8–12	11.5–12.5	11–15	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5H115125	2.3–2.5	12–16	11.5–12.5	12–16	0	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5J125135	2.5–2.7	3–8	12.5–13.5	6–11	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5M125135	2.5–2.7	8–12	12.5–13.5	11–15	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5H125135	2.5–2.7	12–16	12.5–13.5	12–16	0	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5J135145	2.7–2.9	3–8	13.5–14.5	6–11	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5M135145	2.7–2.9	8–12	13.5–14.5	11–15	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5H135145	2.7–2.9	12–16	13.5–14.5	12–16	0	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5J114127	2.28–2.56	3–8	11.4–12.8	6–11	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5M114127	2.28–2.56	8–12	11.4–12.8	11–15	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5H114127	2.28–2.56	12–16	11.4–12.8	12–16	0	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5J127142	2.54–2.84	3–8	12.7–14.2	6–11	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5M127142	2.54–2.84	8–12	12.7–14.2	11–15	3	-60/-15	1	2:1/1.5:1	150	MAX5A
MAX5H127142	2.54–2.84	12–16	12.7–14.2	12–16	0	-60/-15	1	2:1/1.5:1	150	MAX5A

* Complete data sheet available inside catalog.

HIGHER-ORDER ACTIVE MULTIPLIERS (CONT.)

MODEL NUMBER	INPUT FREQUENCY (GHz)	INPUT POWER (dBm)	OUTPUT FREQUENCY (GHz)	OUTPUT POWER (dBm, Typ.)	CONVERSION GAIN (dB, Typ.)	HARMONIC REJECTION IN/OUT (dBc, Min.)	POWER FLATNESS (±dB, Typ.)	VSWR IN/OUT (Typ.)	NOM. DC POWER (+15 V, mA)	OUTLINE NUMBER
FREQUENCY X 6										
MAX6M126132-20P *	2.1 – 2.2	10	12.6 – 13.2	20	10	-60/-15	1	2:1/1.5:1	450	**
FREQUENCY X 8										
MAX8S070070	0.875	10	7	-2	-12	-65/-50	N/A	2:1/1.5:1	450	**
MAX8M080085	1.0–1.06	10	8–8.5	14	4	-50/-15	1.5	2:1/1.5:1	450	**
FREQUENCY X 10										
MAX10M093098	0.93–0.98	10	9.3–9.8	10	0	-50/-15	1.5	2:1/1.5:1	450	**
FREQUENCY X 12										
MAX12M009009	0.081–0.082	8–12	0.972–0.984	8–12	0	-60/-15	1	2:1/1.5:1	450	**
FREQUENCY X 13										
MAX13M104104	0.8	10	10.4	15	5	-50/-50	N/A	2.5:1/2:1	450	**
FREQUENCY X 14										
MAX14M179179	1.28	10	17.92	10	0	-50/-15	N/A	2:1/1.5:1	500	**
FREQUENCY X 16										
MAX16S013015-20P *	0.085–0.097	-12	1.36–1.56	20	32	-60/-15	1	2:1/1.5:1	550	**
MAX16M029030-S	0.187–0.188	10	2.99–3.008	-10	-10	-40/-15	1	2:1/1.5:1	200	**
MAX16J064069-20P *	0.397–0.428	7	6.36–6.86	20	13	-60/-40	1	2:1	550	**
MAX16M160160	1	10	16	10	0	-50/-15	N/A	2:1/1.5:1	300	**
FREQUENCY X 32										
MAX32S027029 *	0.085–0.092	-10	2.7–2.94	10	20	-60/-50	1.5	2:1/1.5:1	550	**
FREQUENCY X 48										
MAX48S029031	0.062–0.063	10	2.976–3.024	-10	-20	-60/-15	1	2:1/1.5:1	550	**
MAX48M045053 *	94–111	10	4.510–5.330	10	0	-50/-15	1.5	2:1/1.5:1	110 500	*** **
FREQUENCY X 64										
MAX64M068068	0.106	10	6.784	15	5	-50/-15	N/A	2.5:1/1.5:1	550	**

* Complete data sheet available inside catalog.
** Consult factory for specific packaging information.
***Nominal current at +5 VDC.

Our higher order multiplier products can be modified for different frequency and power operation if the changes are not too extreme. MITEQ can also design products with multiplications not shown.

HIGHER-ORDER ACTIVE MULTIPLIERS (CONT.)

CFS STANDARD

MODEL NUMBER	INPUT FREQUENCY (GHz)	OUTPUT FREQUENCY (GHz)	INPUT/OUTPUT POWER (dBm)	CONVERSION GAIN (dB, Typ.)	VOLTAGE CURRENT (+5 V, -V, mA)	HARMONIC REJECTION IN/OUT (dBc, Min.)	POWER FLATNESS (±dB, Typ.)	VSWR IN/OUT (Typ.)	OUTLINE NUMBER
MAX2M045055	2.25–2.78	4.5–5.58	8–10	0	+5, 120	-65/-15	1.5	2:1	MAX2D
MAX2M055059	2.75–2.94	5.51–5.59	8–10	0	+5, 120	-65/-15	1.5	2:1	MAX2D
MAX4M088095	2.2–2.37	8.88–9.48	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4B
MAX4M109115	2.73–2.88	10.91–11.53	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4B
MAX4M114120	2.86–3.01	11.46–12.03	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4B
MAX4M114126	2.86–3.14	11.46–12.57	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4B
MAX4M124133	3.11–3.32	12.46–13.28	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4B
MAX4M127134*	3.17–3.32	12.71–13.3	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4B
MAX4M127148	3.18–3.85	12.72–14.84	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4C
MAX4M129138	3.24–3.45	12.97–13.79	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4B
MAX4M139144	3.48–3.61	13.95–14.46	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4C
MAX4M144146	3.61–3.65	14.4–14.66	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4C
MAX4M145154	3.62–4.22	14.5–15.4	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4C
MAX4M150162	3.75–4.05	15–16.17	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4C
MAX4M152163	3.8–4.08	15.21–16.31	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4C
MAX4M160169	4–4.22	16–16.9	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	MAX4C

* Complete data sheet available inside catalog. Data taken with +12 dBm drive.
NOTE: CFS products were designed to be lower cost than our standard products at the expense of size and the need for minus voltages.

CFS 9700

MODEL NUMBER	INPUT FREQUENCY (GHz)	OUTPUT FREQUENCY (GHz)	INPUT/ OUTPUT POWER (dBm)	CONVERSION GAIN (dBm, Typ.)	VOLTAGE CURRENT (+5 V, -V, mA)	HARMONIC REJECTION IN/OUT (dB)	POWER FLATNESS (±dB, Typ.)	VSWR IN/OUT (Typ.)	COUPLED PORT PWR RANGE (dB)*	OUTLINE NUMBER
MAX2M04055-C	2.25–2.78	4.5–5.58	8–10	0	+5, 120	-65/-15	1.5	2:1	-17 to -23	MAX2E
MAX2M055059-C	2.75–2.94	5.51–5.59	8–10	0	+5, 120	-65/-15	1.5	2:1	-17 to -23	MAX2E
MAX4M104110-C	2.6–2.75	10.4–11	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	-17 to -23	MAX4D
MAX4M114126-C	2.86–3.14	11.46–12.57	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	-17 to -23	MAX4D
MAX4M127148-C	3.18–3.85	12.72–14.84	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	-17 to -23	MAX4E
MAX4M150162-C	3.75–4.05	15–16.17	8–10	0	+5, -2.5, 120	-65/-15	1.5	2:1	-17 to -23	MAX4E

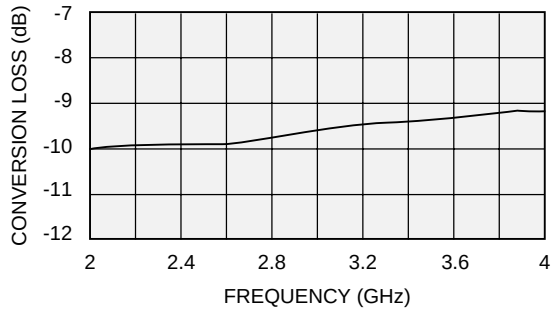
* Used to monitor main port.
NOTE: CFS 9700 products were designed for low cost and capability to monitor the minimum output while the unit is operating, without disconnecting the output and disrupting service.

PASSIVE FREQUENCY DOUBLERS

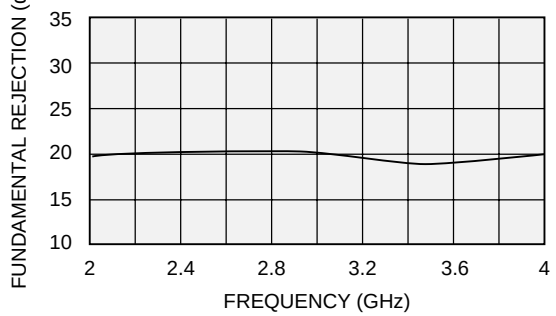
MODEL: MX2M020040

ELECTRICAL SPECIFICATIONS	
Input frequency range	1 – 2 GHz minimum
Output frequency range	2 – 4 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	9.5 dB typical 13 dB maximum
Harmonic rejection Fundamental Odd harmonic	 20 dB typical 20 dB typical

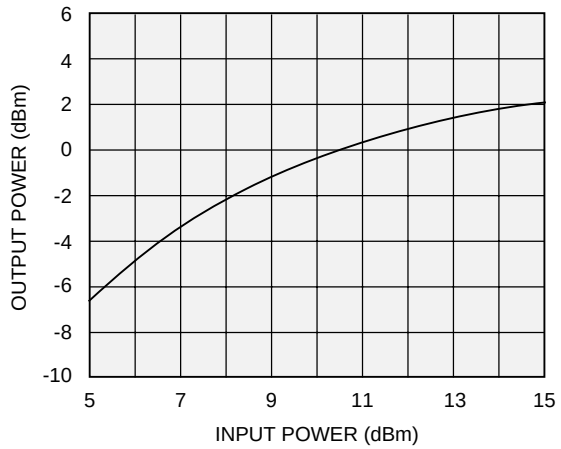
CONVERSION LOSS VS. FREQUENCY



FUNDAMENTAL REJECTION VS. FREQUENCY

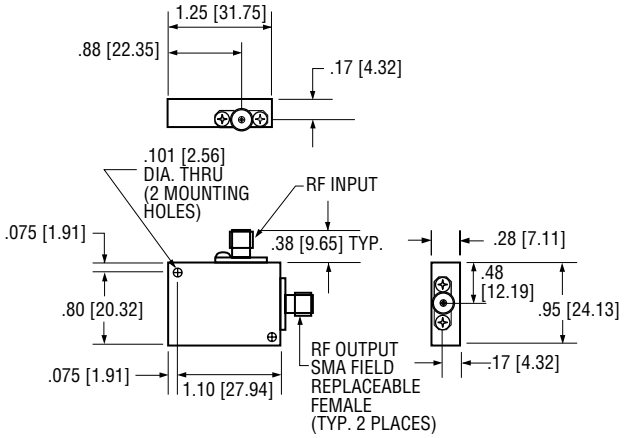


OUTPUT POWER VS. INPUT POWER



(P_{IN} = +10 dBm)

MX2A



Notes:

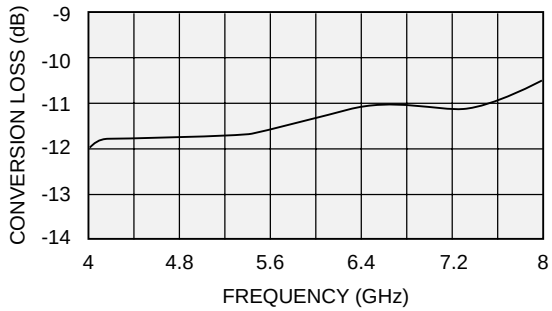
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

MODEL: MX2M040080

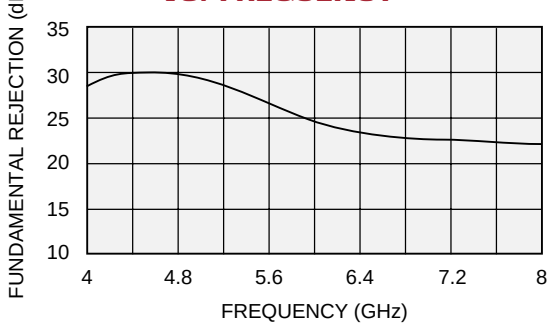
ELECTRICAL SPECIFICATIONS

Input frequency range	2 – 4 GHz minimum
Output frequency range	4 – 8 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	11 dB typical 13 dB maximum
Harmonic rejection Fundamental Odd harmonic	 20 dB typical 20 dB typical

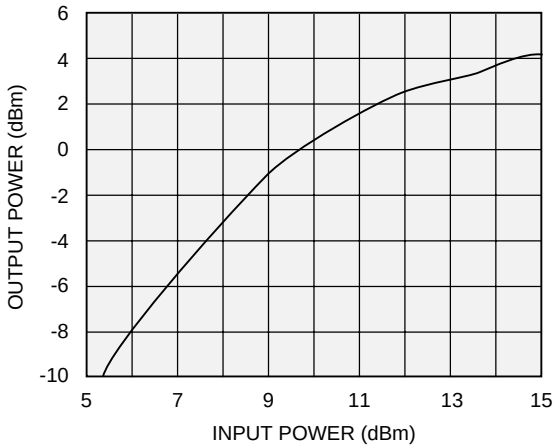
CONVERSION LOSS VS. FREQUENCY



FUNDAMENTAL REJECTION VS. FREQUENCY

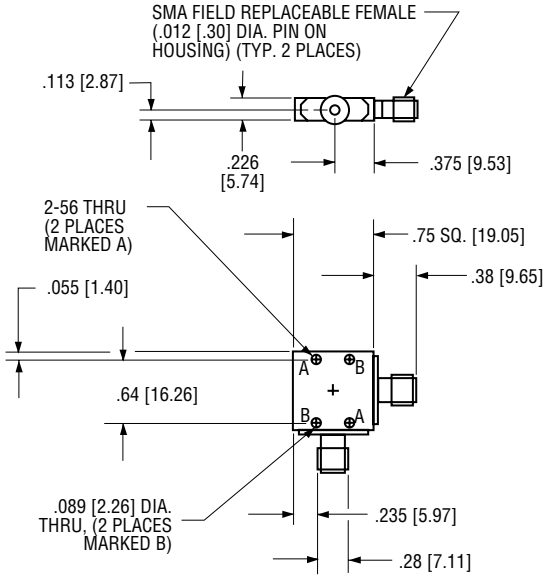


OUTPUT POWER VS. INPUT POWER



(P_{IN} = +10 dBm)

MX2B



Notes:

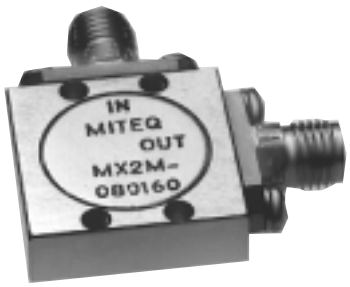
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

2. Optional MX2C package available, see outline section.

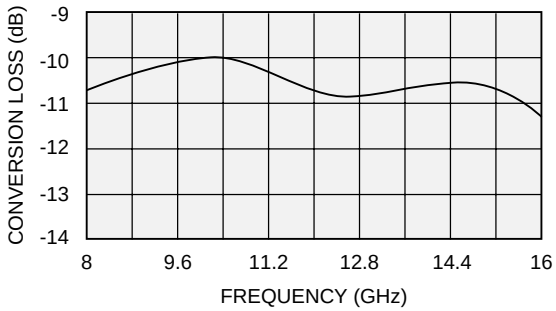
MODEL: MX2M080160

ELECTRICAL SPECIFICATIONS

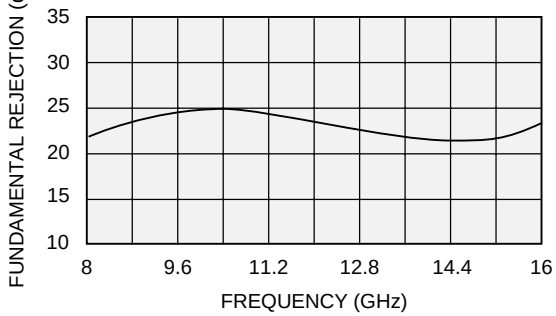
Input frequency range	4 – 8 GHz minimum
Output frequency range	8 – 16 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	11 dB typical 13 dB maximum
Harmonic rejection	
Fundamental	20 dB typical
Odd harmonic	20 dB typical



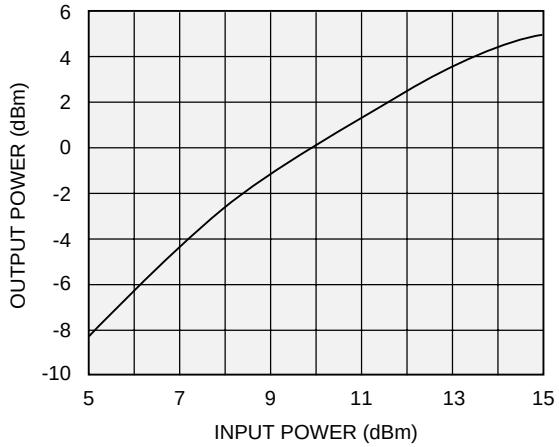
CONVERSION LOSS VS. FREQUENCY



FUNDAMENTAL REJECTION VS. FREQUENCY

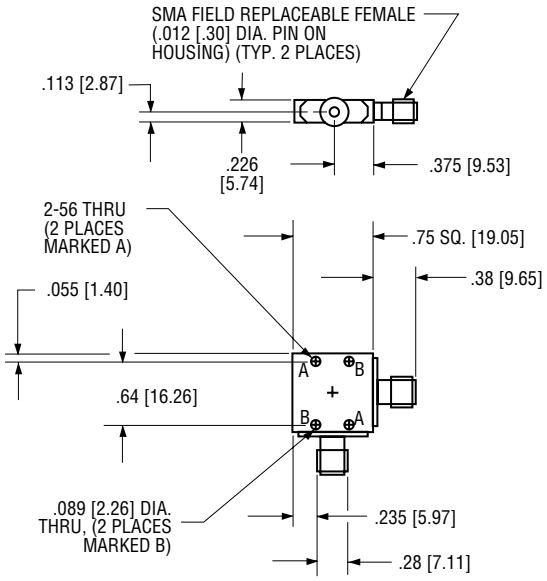


OUTPUT POWER VS. INPUT POWER



(P_{IN} = +10 dBm)

MX2B



Notes:

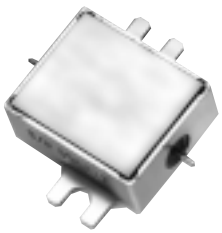
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

2. Optional MX2C package available, see outline section.

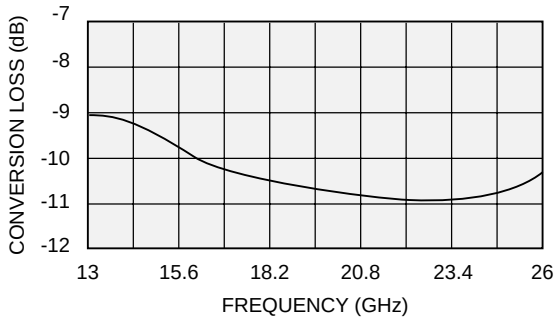
MODEL: MX2M130260

ELECTRICAL SPECIFICATIONS

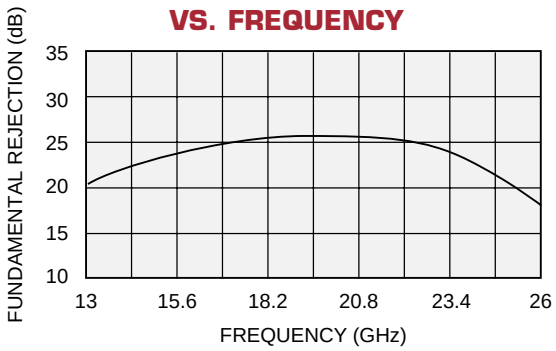
Input frequency range	6.5 – 13 GHz minimum
Output frequency range	13 – 26 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	11 dB typical 13 dB maximum
Harmonic rejection Fundamental Odd harmonic	 20 dB typical 20 dB typical



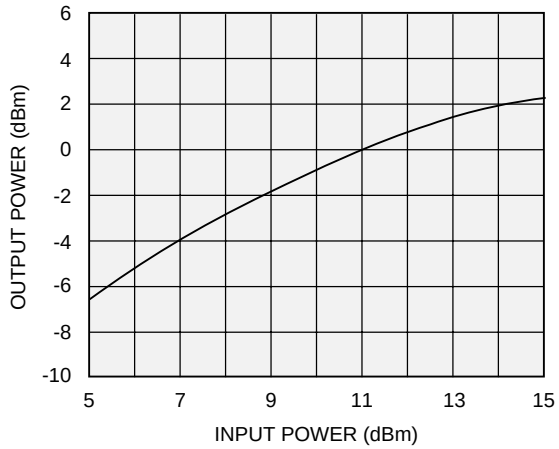
CONVERSION LOSS VS. FREQUENCY



FUNDAMENTAL REJECTION VS. FREQUENCY

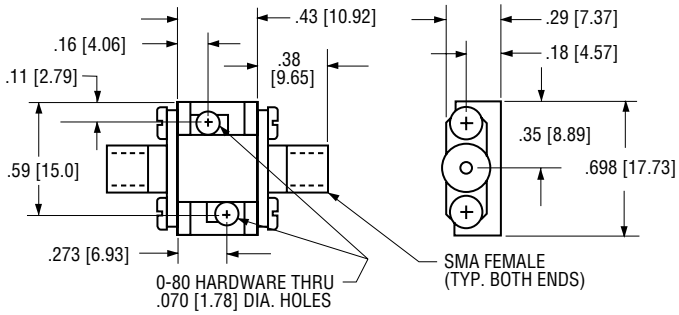


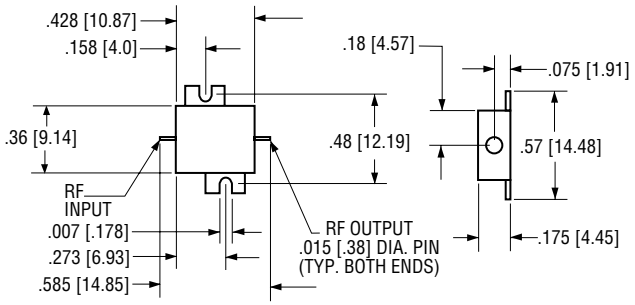
OUTPUT POWER VS. INPUT POWER



(P_{IN} = +10 dBm)

MX2D





Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

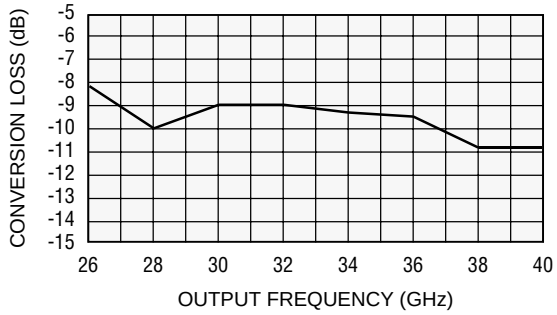
2. Doubler may be readily used as is, or as a drop-in by removing the SMA connectors and mounting hardware as shown.

MODEL: MX2M260400

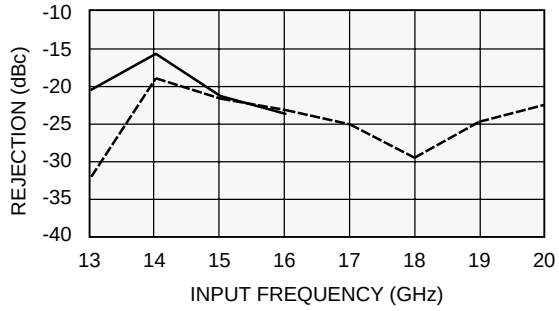
ELECTRICAL SPECIFICATIONS

Input frequency range	13 – 20 GHz
Output frequency range	26 – 40 GHz
Input power range	8 – 12 dBm nominal
Conversion loss	10 dB typical 13 dB maximum
Harmonic rejection Fundamental Odd harmonic	 15 dB typical 15 dB typical

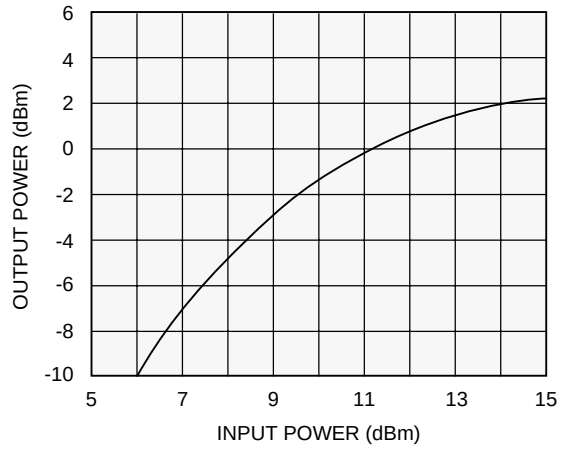
CONVERSION LOSS VS. FREQUENCY



FUNDAMENTAL HARMONIC REJECTION VS. FREQUENCY

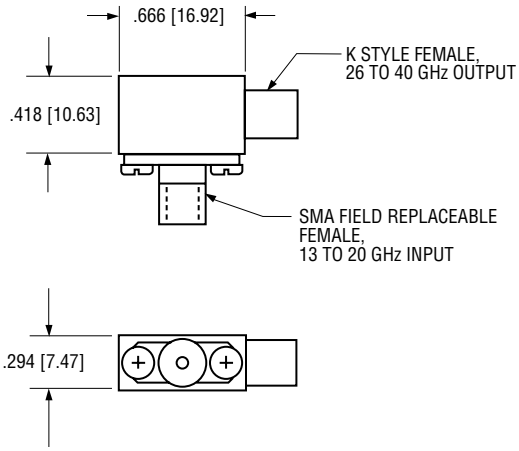


OUTPUT POWER VS. INPUT POWER



(P_{IN} = +10 dBm)

MX2E



Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

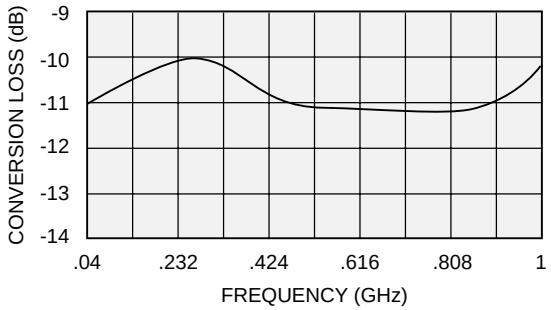
2. Optional SMA, K type male connectors in input, K or V type male connectors in output.

MODEL: MX2M004010

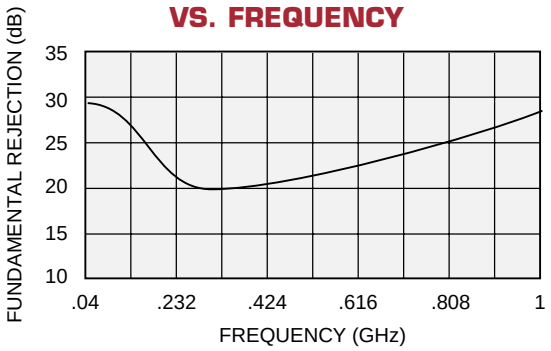
ELECTRICAL SPECIFICATIONS

Input frequency range	0.02 – 0.5 GHz minimum
Output frequency range	0.04 – 1 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	10.5 dB typical 13 dB maximum
Harmonic rejection Fundamental Odd harmonic	 25 dB typical 25 dB typical

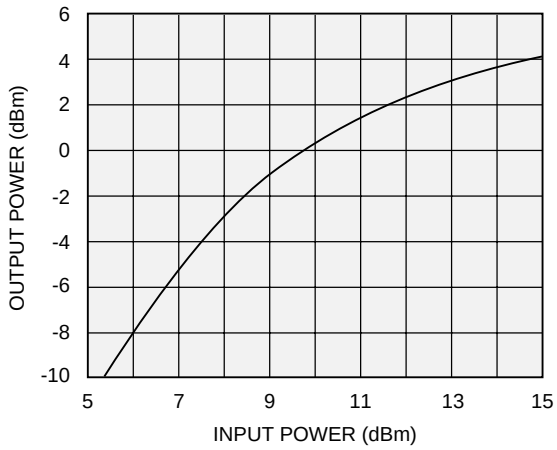
CONVERSION LOSS VS. FREQUENCY



FUNDAMENTAL REJECTION VS. FREQUENCY

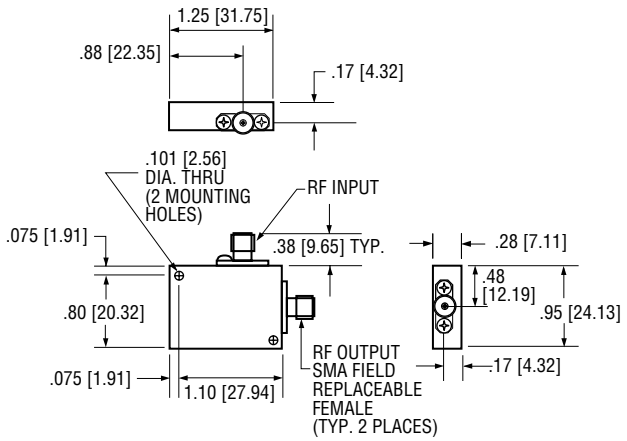


OUTPUT POWER VS. INPUT POWER



(P_{IN} = +10 dBm)

MX2A



Notes:

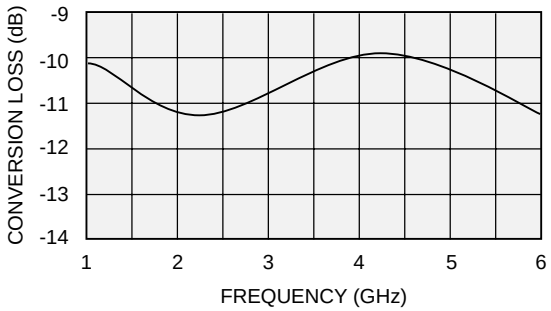
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

MODEL: MX2M010060

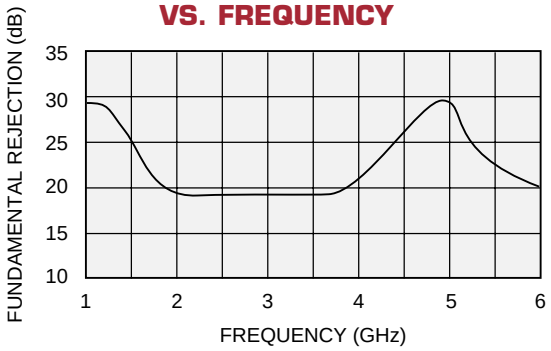
ELECTRICAL SPECIFICATIONS

Input frequency range	0.5 – 3 GHz minimum
Output frequency range	1 – 6 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	10.5 dB typical 15 dB maximum
Harmonic rejection Fundamental Odd harmonic	 15 dB typical 20 dB typical

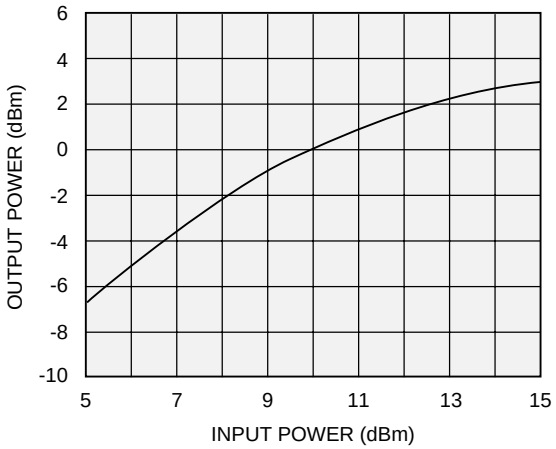
CONVERSION LOSS VS. FREQUENCY



FUNDAMENTAL REJECTION VS. FREQUENCY

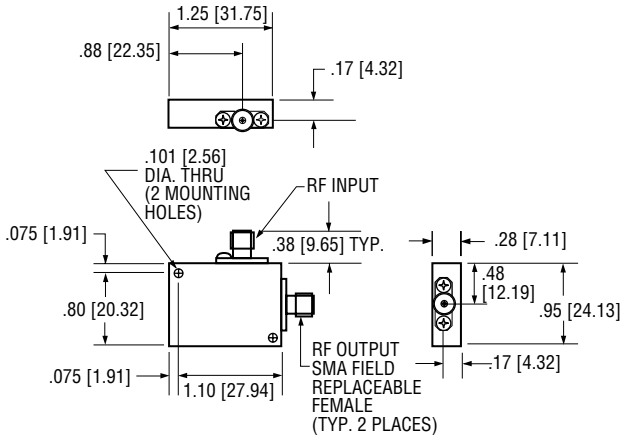


OUTPUT POWER VS. INPUT POWER



(P_{IN} = +10 dBm)

MX2A



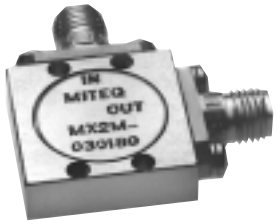
Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

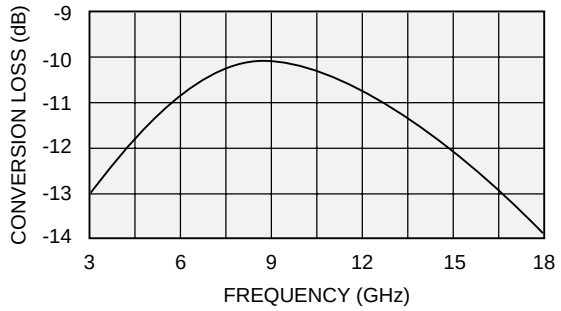
MODEL: MX2M030180

ELECTRICAL SPECIFICATIONS

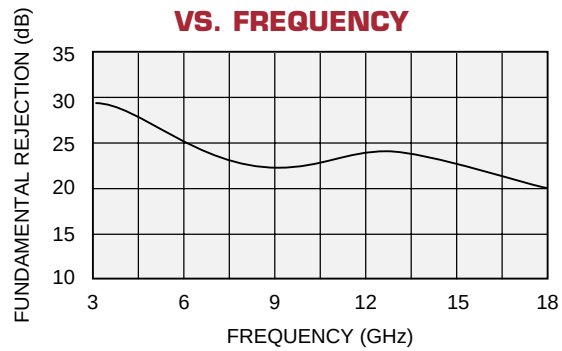
Input frequency range	1.5 – 9 GHz minimum
Output frequency range	3 – 18 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	12 dB typical 15 dB maximum
Harmonic rejection Fundamental Odd harmonic	 15 dB typical 20 dB typical



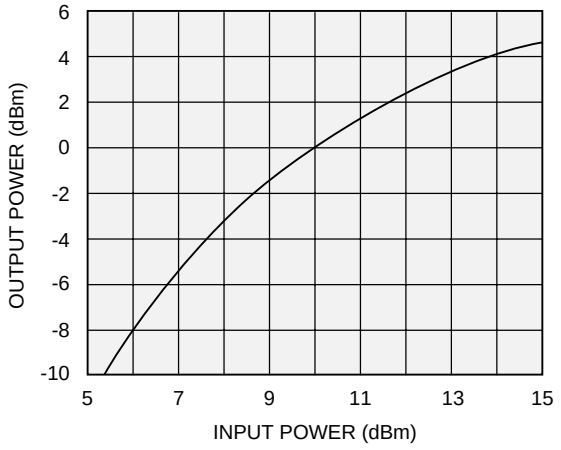
CONVERSION LOSS VS. FREQUENCY



FUNDAMENTAL REJECTION VS. FREQUENCY

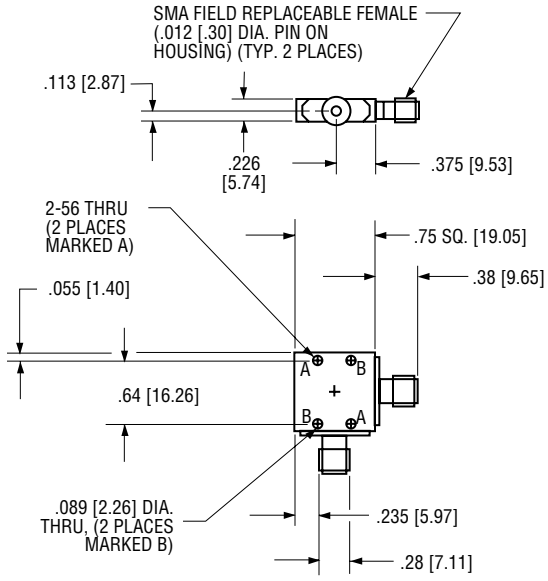


OUTPUT POWER VS. INPUT POWER



(P_{IN} = +10 dBm)

MX2B



Notes:

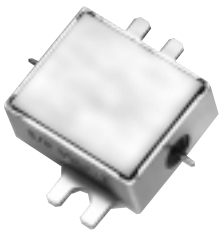
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

2. Optional MX2C package available, see outline section.

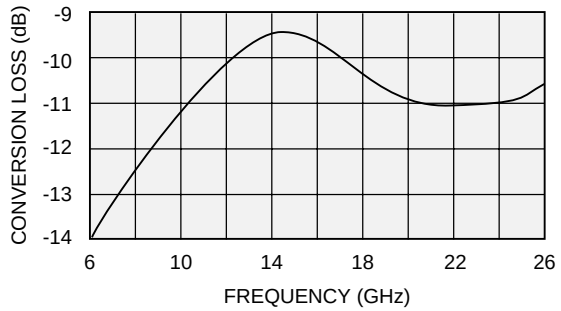
MODEL: MX2M060260

ELECTRICAL SPECIFICATIONS

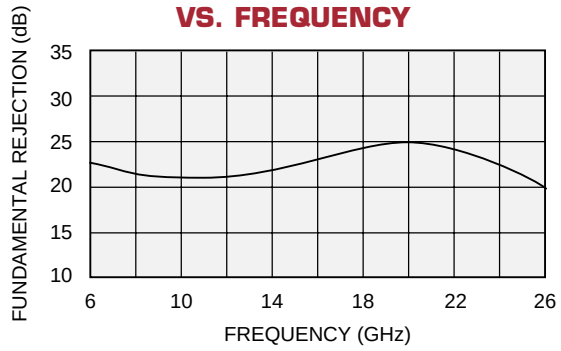
Input frequency range	3 – 13 GHz minimum
Output frequency range	6 – 26 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	12 dB typical 18 dB maximum
Harmonic rejection Fundamental Odd harmonic	 15 dB typical 20 dB typical



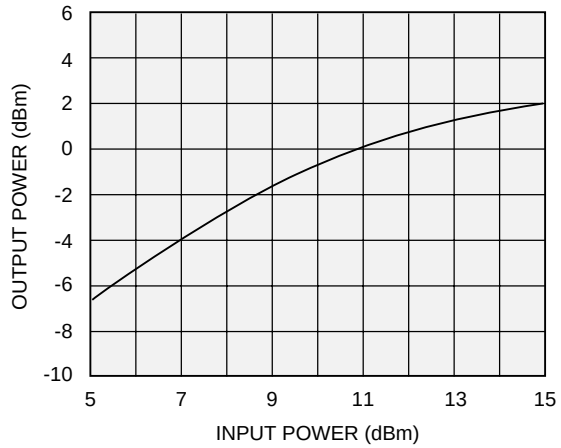
CONVERSION LOSS VS. FREQUENCY



FUNDAMENTAL REJECTION VS. FREQUENCY

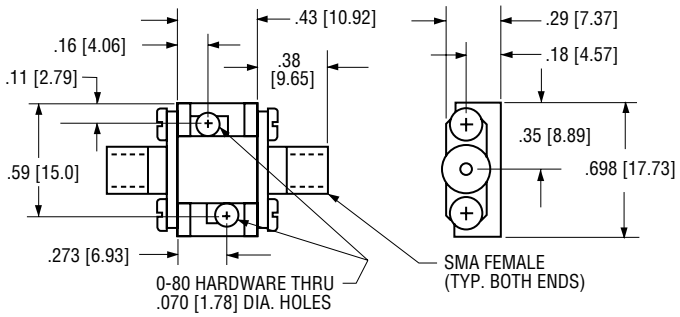


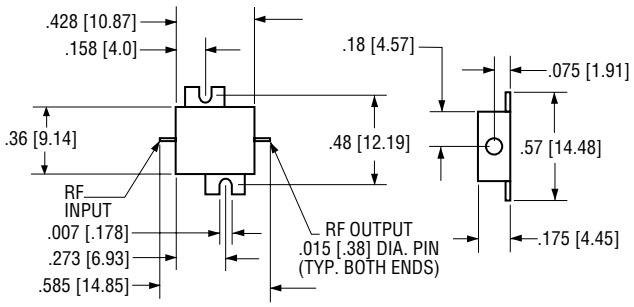
OUTPUT POWER VS. INPUT POWER



(P_{IN} = +10 dBm)

MX2D





Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

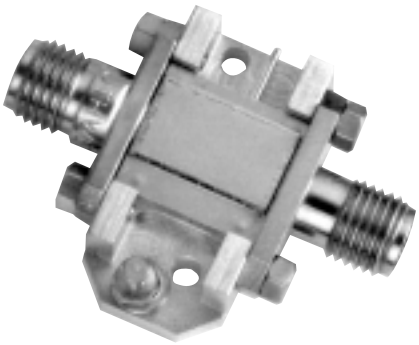
2. Doubler may be readily used as is, or as a drop-in by removing the SMA connectors and mounting hardware as shown.

PASSIVE FREQUENCY TRIPLERS

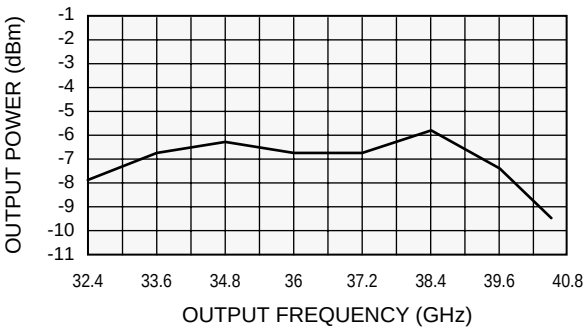
MODEL: MX3M320400

ELECTRICAL SPECIFICATIONS

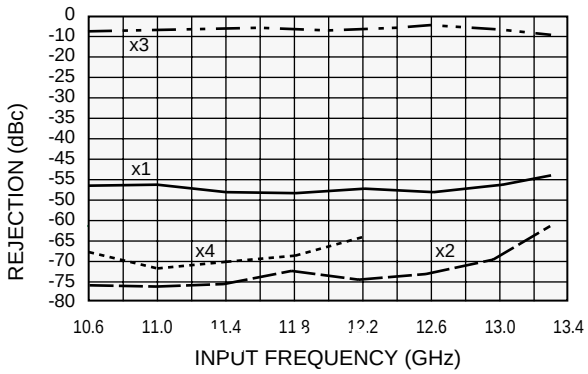
Input frequency range	10.66 – 13.33 GHz
Output frequency range	32 – 40 GHz
Input power range	8 – 12 dBm
Harmonic rejection	
Fundamental	-55 dBc typical
Odd harmonic	-55 dBc typical



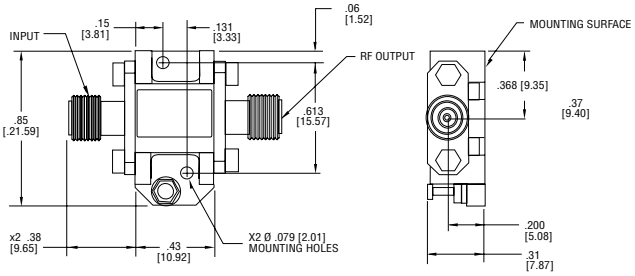
OUTPUT POWER VS. FREQUENCY



FUNDAMENTAL HARMONIC REJECTION VS. FREQUENCY



MXF



Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

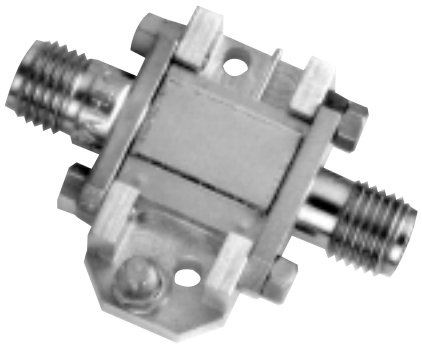
2. Optional input connectors SMA, K or output connectors K, V or GPO type male.

3. Optional waveguide output available, please contact factory.

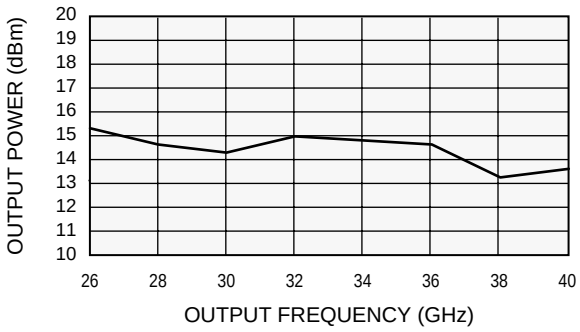
ACTIVE FREQUENCY DOUBLERS

MODEL: MAX2M260400

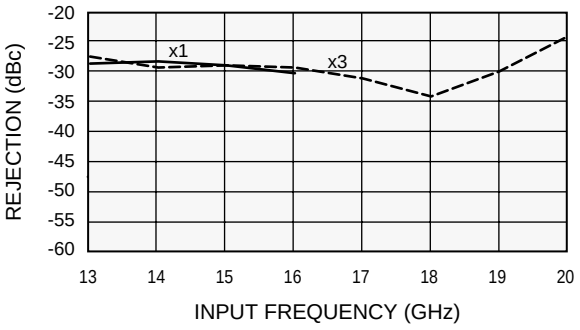
ELECTRICAL SPECIFICATIONS	
Input frequency range	13 – 20 GHz
Output frequency range	26 – 40 GHz
Input power range	10 – 15 dBm nominal
Harmonic rejection	
Fundamental	18 dB typical
Odd harmonic	18 dB typical



OUTPUT POWER VS. FREQUENCY

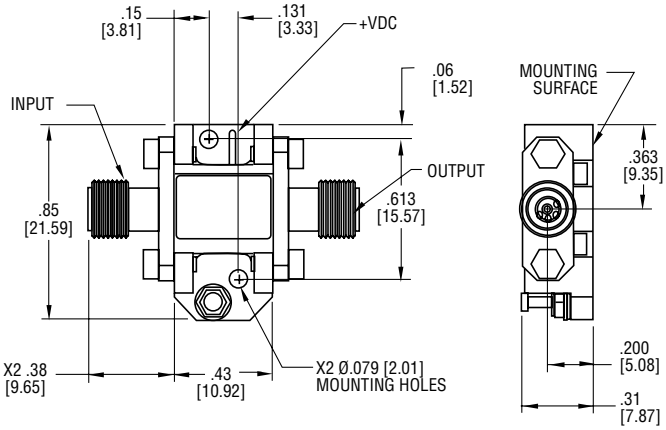


FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2K



Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

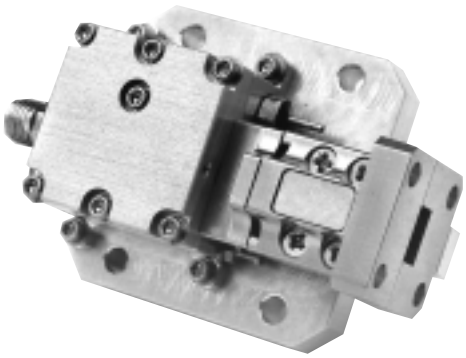
2. Optional input connectors SMA, K or output connectors K or V type male.

3. Optional waveguide output available, please contact factory.

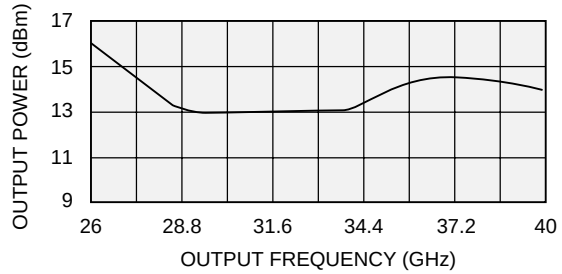
MODEL: MAX2M260400W (WAVEGUIDE WR28 OUTPUT)

ELECTRICAL SPECIFICATIONS

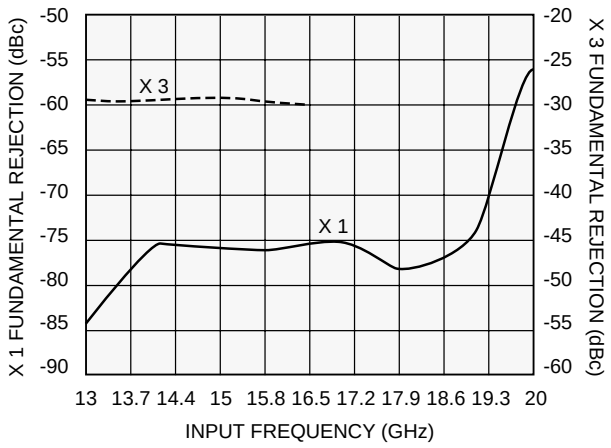
Input frequency range	13 – 20 GHz
Output frequency range	26 – 40 GHz
Input power range	8 – 12 dBm
Harmonic rejection	
Fundamental	> 20 dBc typical
Odd harmonic	> 20 dBc typical



OUTPUT POWER VS. FREQUENCY

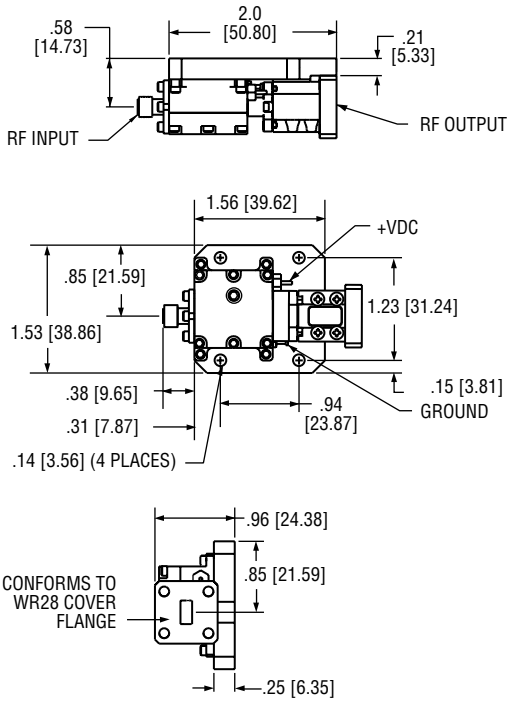


FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2G



Notes:

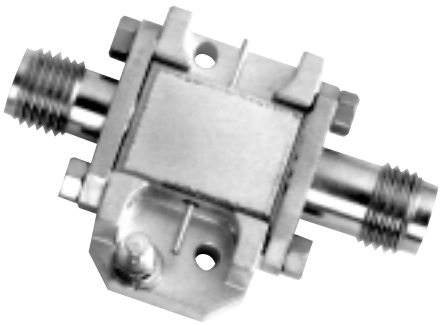
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

2. Optional SMA or K type male/female connectors in input.

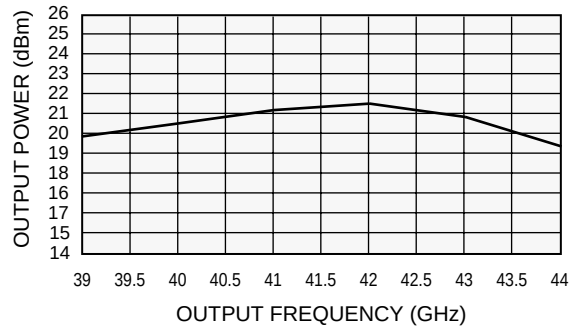
MODEL: MAX2M390440-20P

ELECTRICAL SPECIFICATIONS

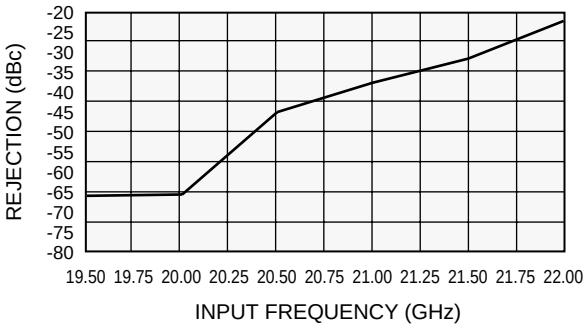
Input frequency range	19.5 – 22 GHz
Output frequency range	39 – 44 GHz minimum
Input power range	8 – 12 dBm nominal
Harmonic rejection	
Fundamental	20 dBc minimum
Odd harmonic	20 dBc minimum



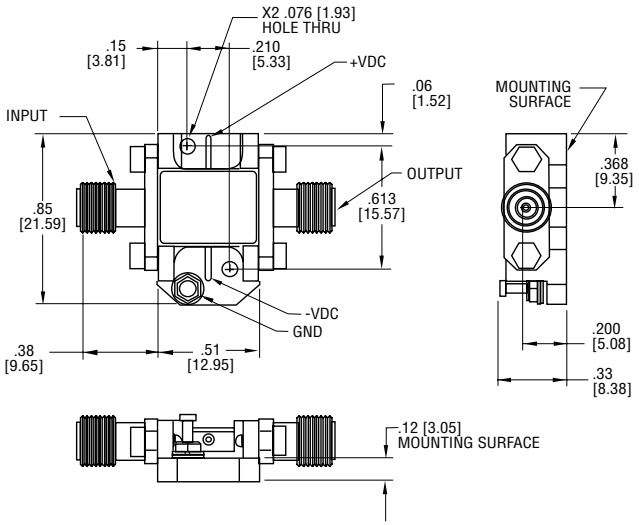
OUTPUT POWER VS. FREQUENCY



FUNDAMENTAL REJECTION VS. FREQUENCY



MAX2L



Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

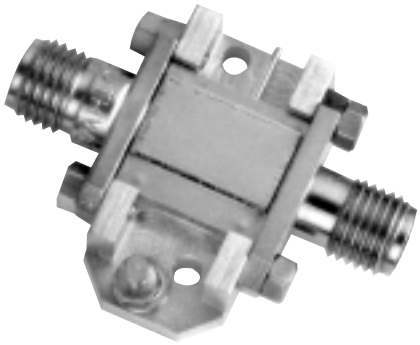
2. Optional input connectors SMA, K or output connectors K or V type male.

3. Optional waveguide output available, please contact factory.

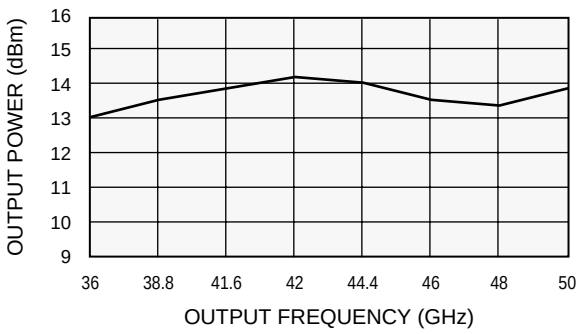
MODEL: MAX2M360500

ELECTRICAL SPECIFICATIONS

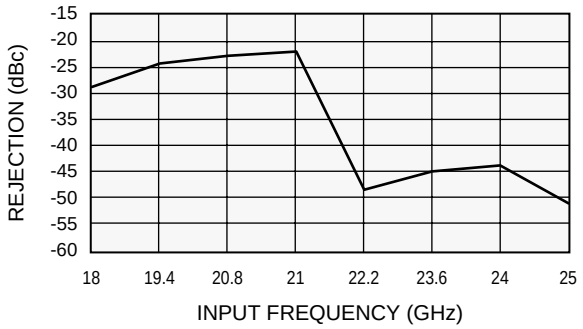
Input frequency range	18 – 25 GHz
Output frequency range	36 – 50 GHz
Input power range	10 – 15 dBm nominal
Harmonic rejection	
Fundamental	20 dBc typical
Odd harmonic	20 dBc typical



OUTPUT POWER VS. FREQUENCY

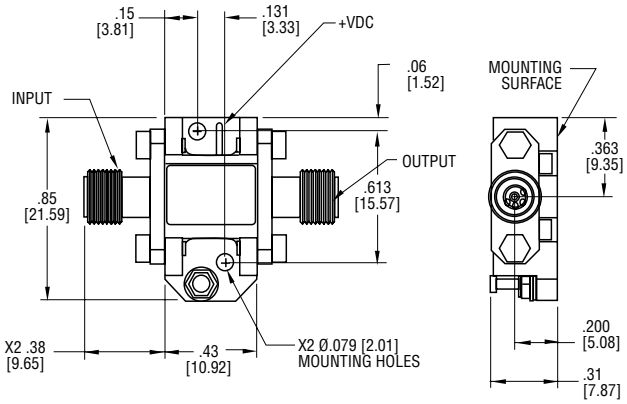


FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2K



Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

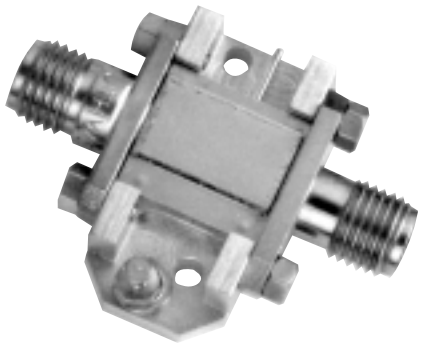
2. Optional input connectors SMA, K or output connectors V type male/female.

3. Optional waveguide output available, please contact factory.

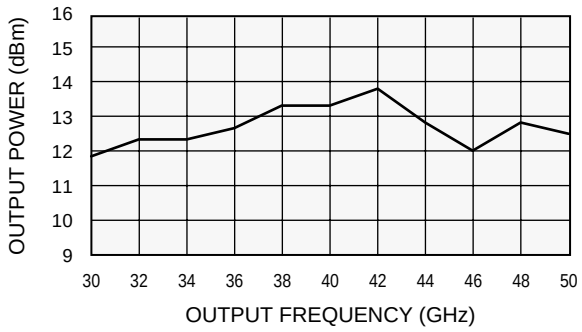
MODEL: MAX2M300500

ELECTRICAL SPECIFICATIONS

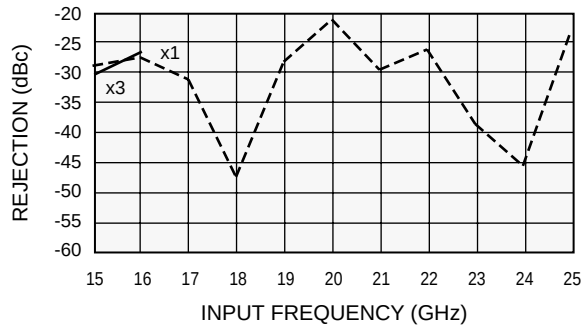
Input frequency range	15 – 25 GHz
Output frequency range	30 – 50 GHz
Input power range	8 – 12 dBm
Harmonic rejection	
Fundamental	20 dBc typical
Odd harmonic	20 dBc typical



OUTPUT POWER VS. FREQUENCY

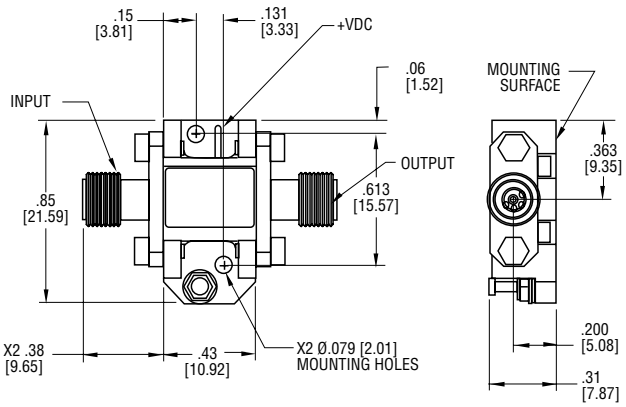


FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2K



Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

2. Optional input connectors SMA, K or output connectors V type male/female.

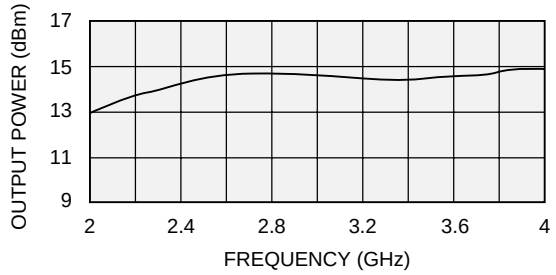
3. Optional waveguide output available, please contact factory.

MODEL: MAX2M020040

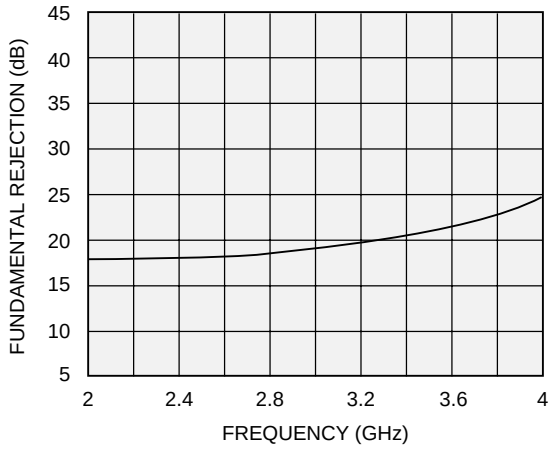
ELECTRICAL SPECIFICATIONS

Input frequency range	1 – 2 GHz minimum
Output frequency range	2 – 4 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	0 dB typical
Harmonic rejection	
Fundamental	20 dB typical
Odd harmonic	20 dB typical

OUTPUT POWER VS. FREQUENCY

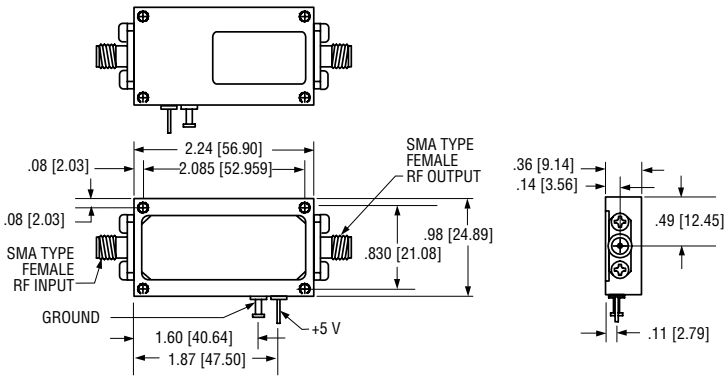


FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2A2



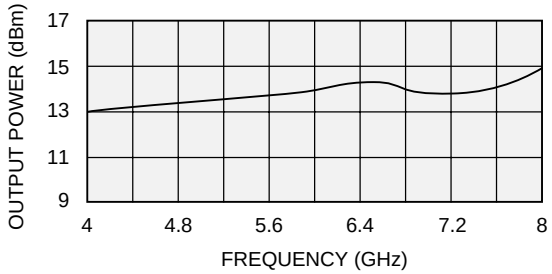
Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

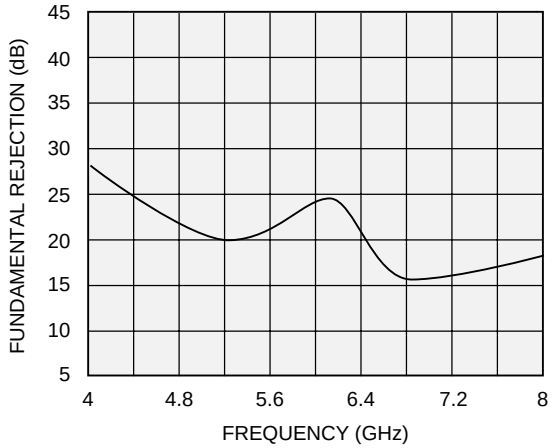
MODEL: MAX2M040080

ELECTRICAL SPECIFICATIONS	
Input frequency range	2 – 4 GHz minimum
Output frequency range	4 – 8 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	0 dB typical
Harmonic rejection	
Fundamental	20 dB typical
Odd harmonic	20 dB typical

OUTPUT POWER VS. FREQUENCY

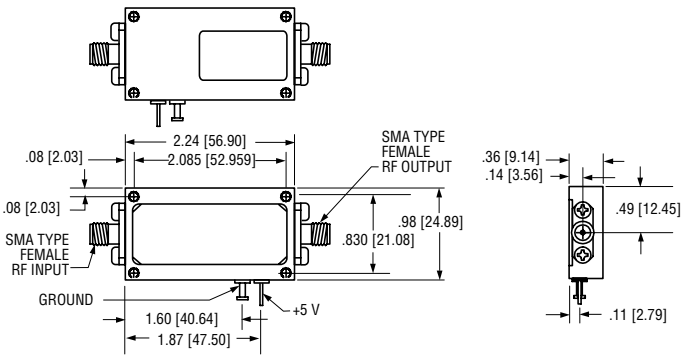


FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2A2



Notes:

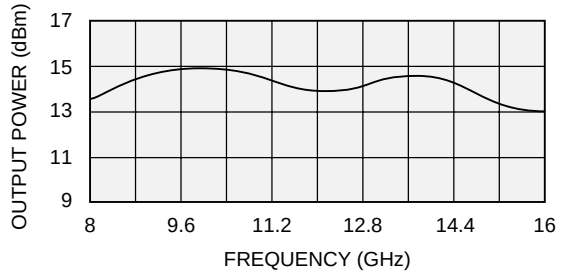
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

MODEL: MAX2M080160

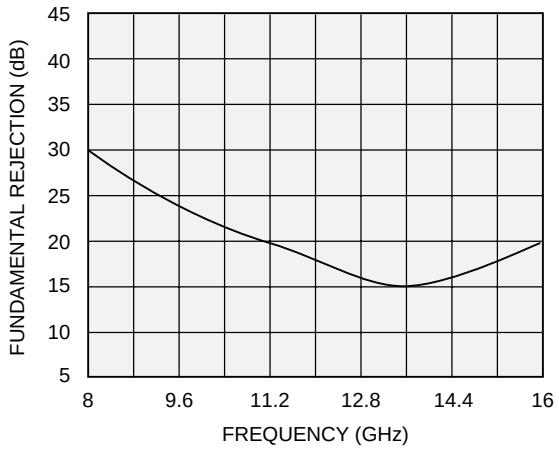
ELECTRICAL SPECIFICATIONS

Input frequency range	4 – 8 GHz minimum
Output frequency range	8 – 16 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	0 dB typical
Harmonic rejection	
Fundamental	20 dB typical
Odd harmonic	20 dB typical

OUTPUT POWER VS. FREQUENCY

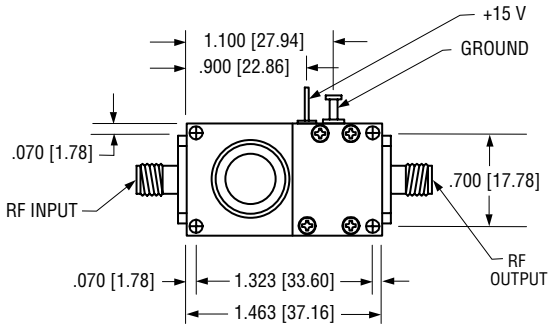


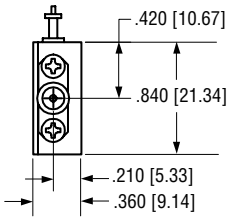
FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2B



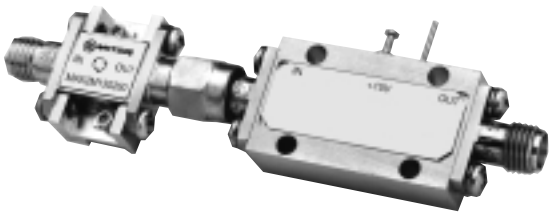


Notes:

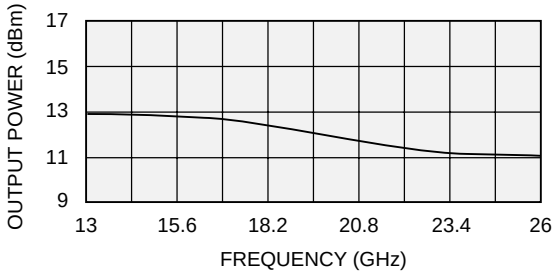
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

MODEL: MAX2M130260

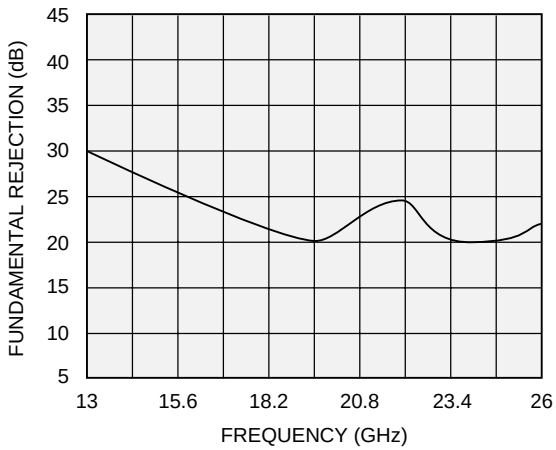
ELECTRICAL SPECIFICATIONS	
Input frequency range	6.5 – 13 GHz minimum
Output frequency range	13 – 26 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	0 dB typical
Harmonic rejection	
Fundamental	20 dB typical
Odd harmonic	20 dB typical



OUTPUT POWER VS. FREQUENCY

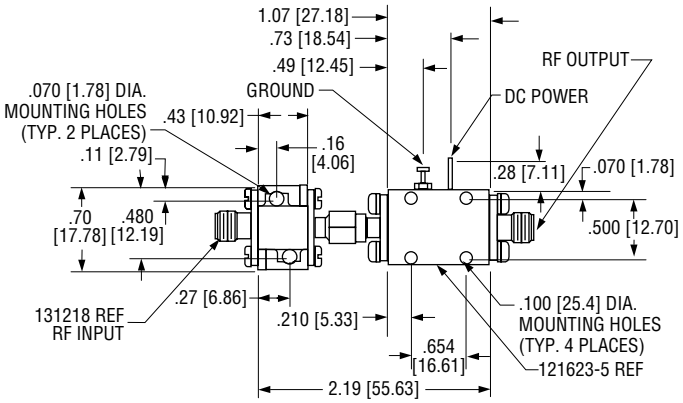


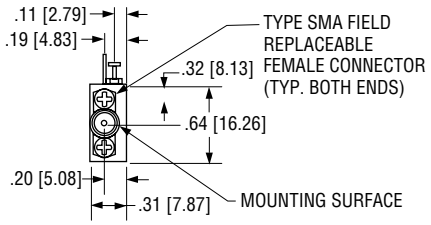
FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2C



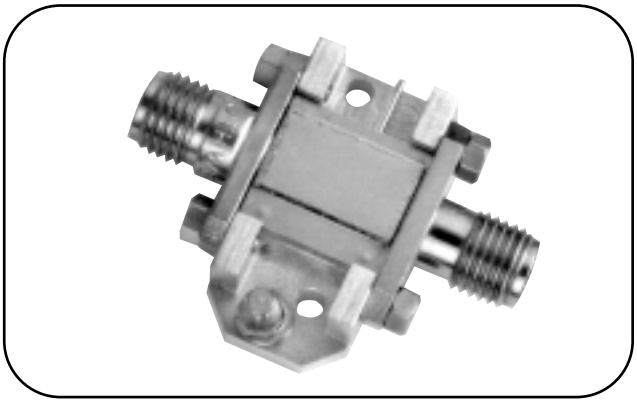


Notes:

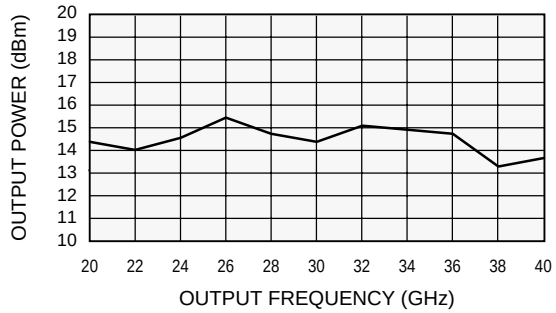
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

MODEL: MAX2M200400

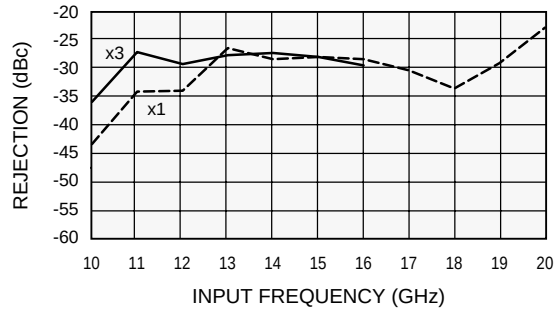
ELECTRICAL SPECIFICATIONS	
Input frequency range	10 – 20 GHz
Output frequency range	20 – 40 GHz
Input power range	8 – 12 dBm
Harmonic rejection	
Fundamental	20 dBc minimum
Odd harmonic	20 dBc minimum



OUTPUT POWER VS. FREQUENCY

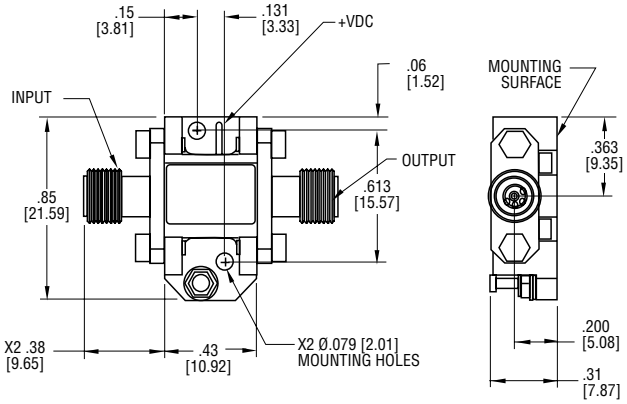


FUNDAMENTAL HARMONIC REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2K



Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

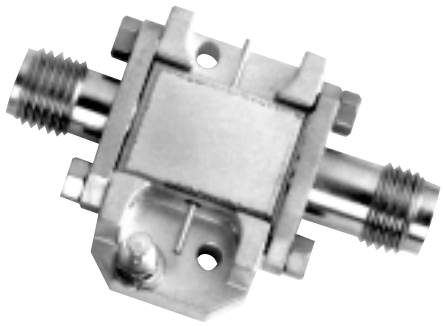
2. Optional input connectors SMA, K or output connectors K or V type male.

3. Optional waveguide output available, please contact factory.

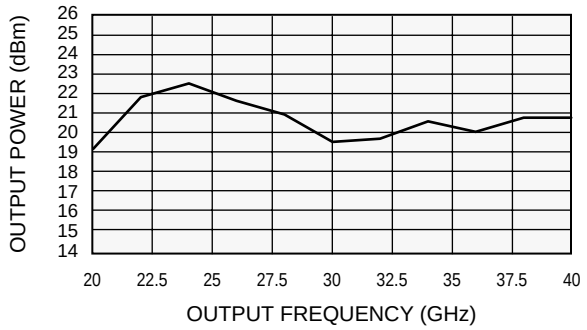
MODEL: MAX2M200400-20P

ELECTRICAL SPECIFICATIONS

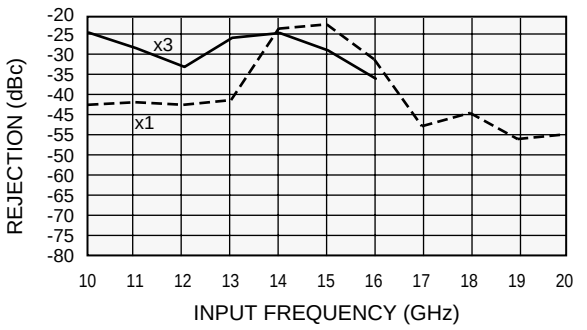
Input frequency range	10 – 20 GHz
Output frequency range	20 – 40 GHz
Input power range	8 – 12 dBm
Harmonic rejection	
Fundamental	20 dBc minimum
Odd harmonic	20 dBc minimum



OUTPUT POWER VS. FREQUENCY

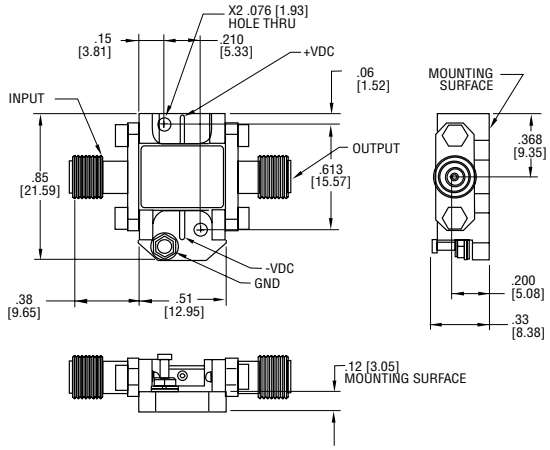


FUNDAMENTAL HARMONIC REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2L



Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

2. Optional input connectors SMA, K or output connectors K or V type male.

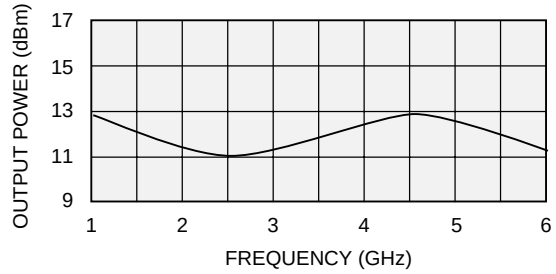
3. Optional waveguide output available, please contact factory.

MODEL: MAX2M010060

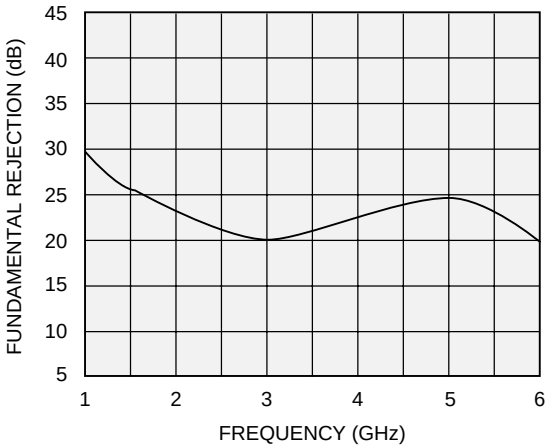
ELECTRICAL SPECIFICATIONS

Input frequency range	0.5 – 3 GHz minimum
Output frequency range	1 – 6 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	0 dB typical
Harmonic rejection	
Fundamental	20 dB typical
Odd harmonic	20 dB typical

OUTPUT POWER VS. FREQUENCY

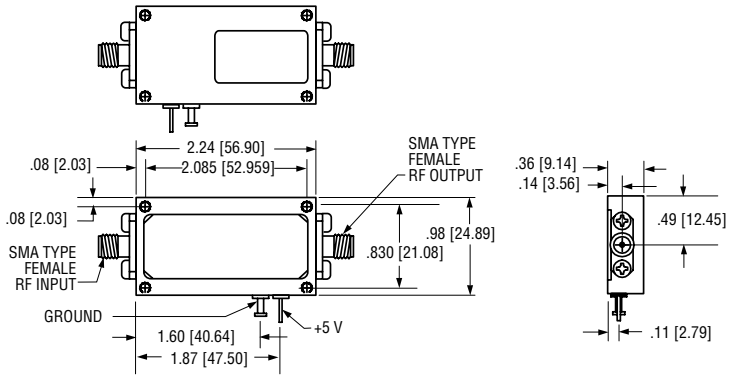


FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2A2



Notes:

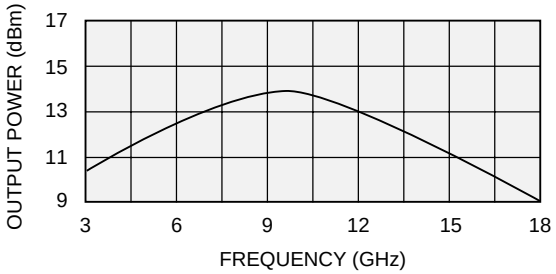
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

MODEL: MAX2M030180

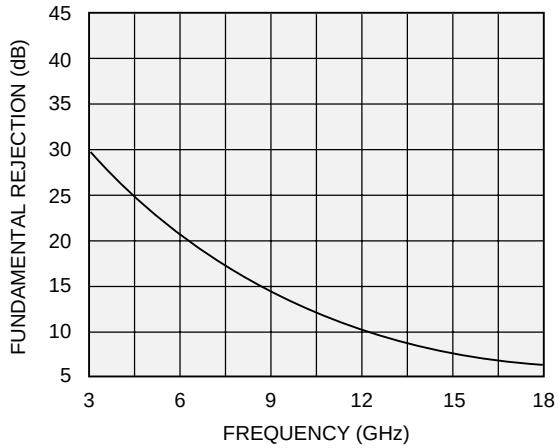
ELECTRICAL SPECIFICATIONS

Input frequency range	1.5 – 9 GHz minimum
Output frequency range	3 – 18 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	0 dB typical
Harmonic rejection	
Fundamental	15 dB typical
Odd harmonic	20 dB typical

OUTPUT POWER VS. FREQUENCY

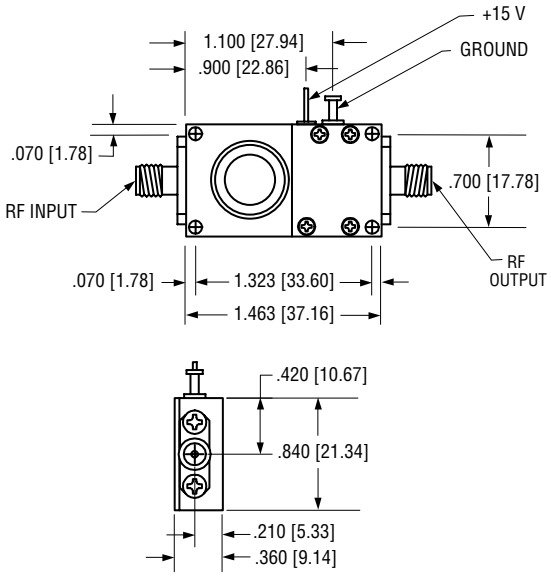


FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2B



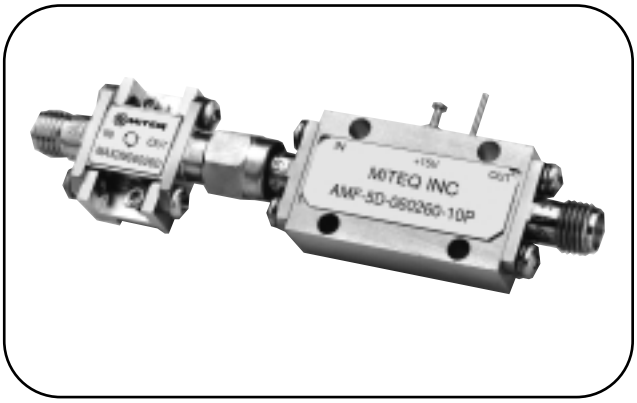
Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

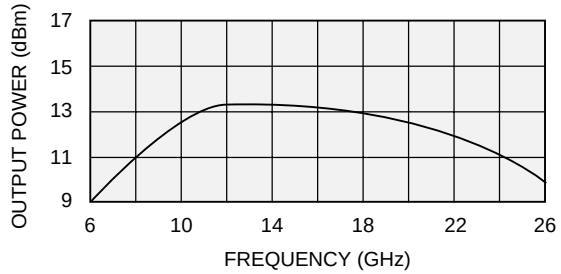
MODEL: MAX2M060260

ELECTRICAL SPECIFICATIONS

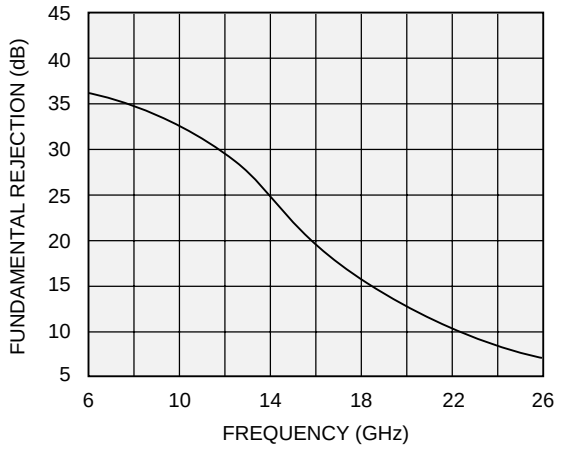
Input frequency range	3 – 13 GHz minimum
Output frequency range	6 – 26 GHz minimum
Input power range	8 – 12 dBm nominal
Conversion loss	0 dB typical
Harmonic rejection	
Fundamental	12 dB typical
Odd harmonic	15 dB typical



OUTPUT POWER VS. FREQUENCY

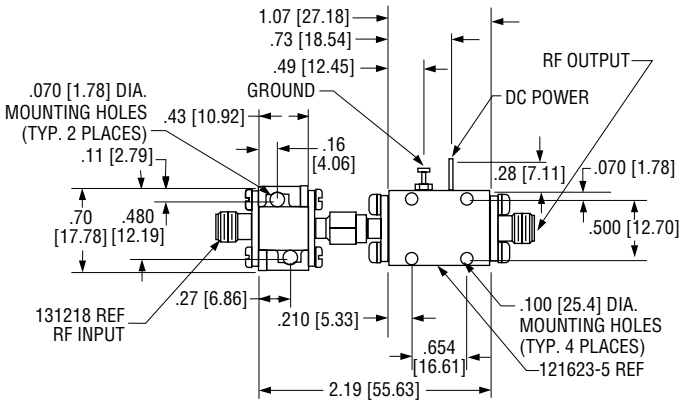


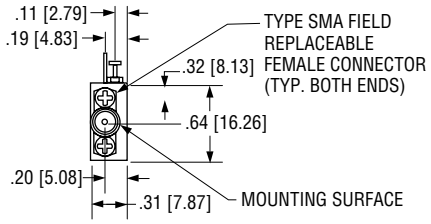
FUNDAMENTAL REJECTION VS. FREQUENCY



(P_{IN} = +10 dBm)

MAX2C





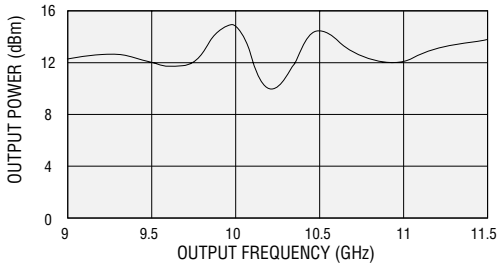
Notes:

1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

MAX3M094114-5P
9 TO 11.4 GHz, LOW OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	3 – 3.8 GHz minimum
Input power	+12 dBm minimum
Input VSWR	2:1 typical
Output frequency	9 – 11.4 GHz minimum
Output power	+5 dBm minimum
Output power flatness (at +25°C)	±2.5 dB maximum
Output spurious rejection	-50 dBc typical
Output harmonic rejection	-15 dBc typical
Rejection of input harmonics	-50 dBc typical
Output VSWR	1.5:1 typical
DC power	+15 VDC, 150 mA

SWEPT OUTPUT POWER
(with +12 dBm input)

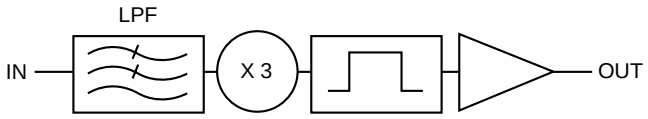


X 3 ACTIVE MULTIPLIER ASSEMBLIES

OPTIONS

- **Input Power +5 to +20 dBm**

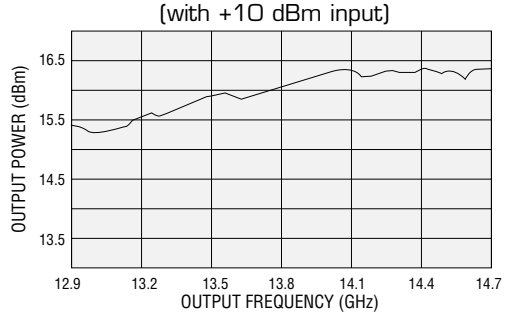
FUNCTIONAL BLOCK DIAGRAM



MAX3M129147-15P
12.9 TO 14.7 GHz, MID OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	4.3 – 4.9 GHz minimum
Input power	+10 dBm minimum
Input VSWR	2:1 typical
Output frequency	12.9 – 14.7 GHz minimum
Output power	+15 dBm minimum
Output power flatness (at +25°C)	±1 dB maximum
Output spurious rejection	-50 dBc typical
Output harmonic rejection	-15 dBc typical
Rejection of input harmonics	-50 dBc typical
Output VSWR	1.5:1 typical
DC power	+15 VDC, 150 mA

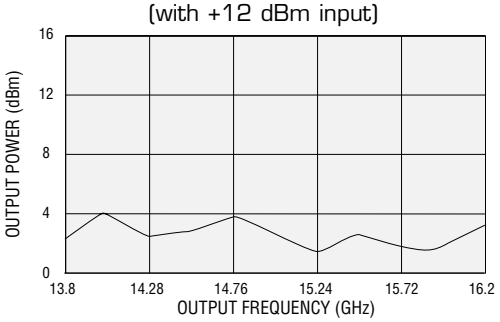
SWEPT OUTPUT POWER
(with +10 dBm input)



MAX3M138162-0P
13.8 TO 16.2 GHz, LOW OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	4.6 – 5.4 GHz minimum
Input power	+12 dBm minimum
Input VSWR	2:1 typical
Output frequency	13.8 – 16.2 GHz minimum
Output power	0 dBm minimum
Output power flatness (at +25°C)	±1.25 dB maximum
Output spurious rejection	-50 dBc typical
Output harmonic rejection	-15 dBc typical
Rejection of input harmonics	-50 dBc typical
Output VSWR	2:1 typical
DC power	+15 VDC, 150 mA

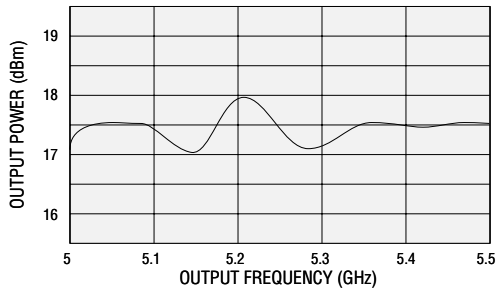
SWEPT OUTPUT POWER
(with +12 dBm input)



MAX4M050055-14P
5 TO 5.5 GHz, MID OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	1.25 – 1.375 GHz minimum
Input power	+10 dBm minimum
Input VSWR	2:1 typical
Output frequency	5 – 5.5 GHz minimum
Output power	+14 dBm minimum
Output power flatness (at +25°C)	±1.5 dB maximum
Output spurious rejection	-60 dBc typical
Output harmonic rejection	-15 dBc typical
Rejection of input harmonics	-50 dBc typical
Output VSWR	2:1 typical
DC power	+15 VDC, 250 mA

SWEPT OUTPUT POWER
(with +10 dBm input)

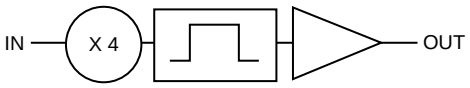


X 4 ACTIVE MULTIPLIER ASSEMBLIES

OPTIONS

- **Input Power +5 to +20 dBm**

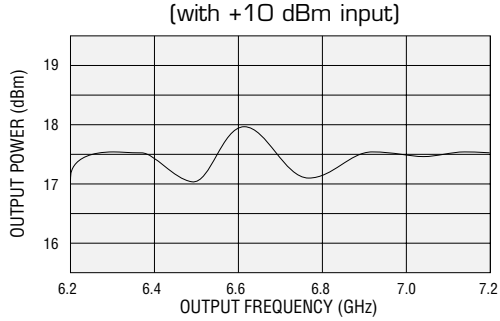
FUNCTIONAL BLOCK DIAGRAM
For units below 26 GHz



MAX4M062071
6.2 TO 7.1 GHz, MID OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	1.55 – 1.78 GHz minimum
Input power	+10 dBm typical
Input VSWR	2:1 typical
Output frequency	6.2 – 7.1 GHz minimum
Output power	+10 dBm minimum
Output power flatness (at +25°C)	±2 dB maximum
Output spurious rejection	-65 dBc typical
Output harmonic rejection	-15 dBc typical
Rejection of input harmonics	-65 dBc typical
Output VSWR	1.5:1 typical
DC power	+15 VDC, 250 mA

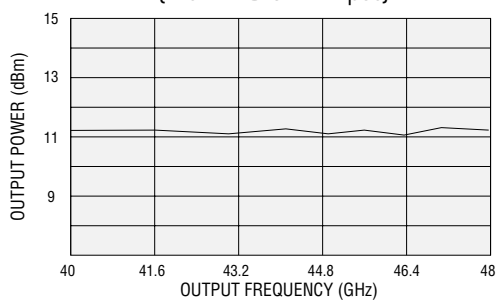
SWEPT OUTPUT POWER
(with +10 dBm input)



MAXM400480
40 TO 48 GHz, MID OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	10 – 12 GHz minimum
Input power	+10 dBm minimum
Output frequency	40 – 48 GHz minimum
Output power	+8 dBm minimum
Output power flatness (at +25°C)	±2 dB maximum
Output spurious rejection	-60 dBc typical
Rejection of input harmonics	-18 dBc typical
DC power	+15 VDC, 200 mA

SWEPT OUTPUT POWER
(with +10 dBm input)

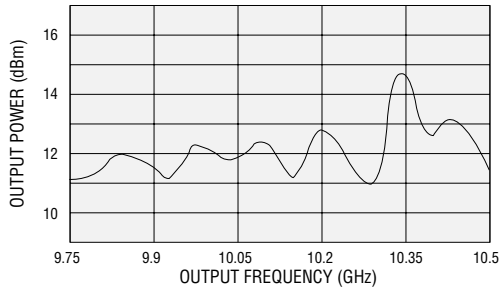


ACTIVE MULTIPLIER ASSEMBLIES (CONT.)

MAX4J097105
9.75 TO 10.5 GHz, MID OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	2.437 – 2.626 GHz minimum
Input power	+7 dBm minimum
Input VSWR	2.5:1 typical
Output frequency	9.75 – 10.5 GHz minimum
Output power	+10 dBm minimum
Output power flatness (at +25°C)	±2 dB maximum
Output spurious rejection	-65 dBc typical
Output harmonic rejection	-15 dBc typical
Rejection of input harmonics	-65 dBc typical
Output VSWR	1.5:1 typical
DC power	+15 VDC, 250 mA

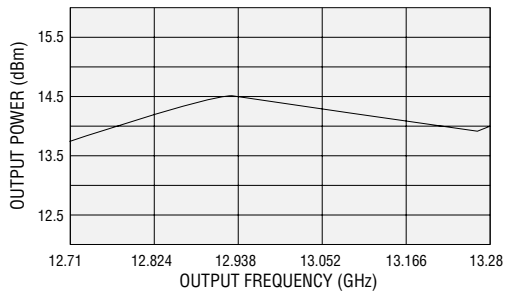
SWEPT OUTPUT POWER
(with +7 dBm input)



MAX4M127134
12.71 TO 13.28 GHz, MID OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	3.1775 – 3.32 GHz minimum
Input power	+12 dBm typical
Input VSWR	2.5:1 typical
Output frequency	12.71 – 13.28 GHz minimum
Output power	+13 dBm typical
Output power flatness (at +25°C)	±1 dB maximum
Output spurious rejection	-65 dBc typical
Output harmonic rejection	-15 dBc typical
Rejection of input harmonics	-65 dBc typical
Output VSWR	1.5:1 typical
DC power	+5 VDC, 110 mA

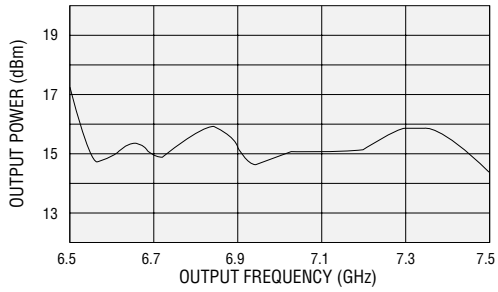
SWEPT OUTPUT POWER
(with +12 dBm input)



MAX5M065075-14P
6.5 TO 7.5 GHz, MID OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	1.3 – 1.5 GHz minimum
Input power	+10 dBm minimum
Input VSWR	2:1 typical
Output frequency	6.5 – 7.5 GHz minimum
Output power	+14 dBm minimum
Output power flatness (at +25°C)	±1.5 dB maximum
Output spurious rejection	-40 dBc typical
Output harmonic rejection	-15 dBc typical
Rejection of input harmonics	-40 dBc typical
Output VSWR	1.5:1 typical
DC power	+15 VDC, 250 mA

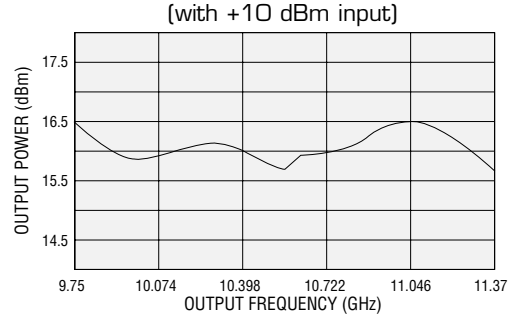
SWEPT OUTPUT POWER
(with +10 dBm input)



MAX5M097114
9.75 TO 11.375 GHz, MID OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	1.95 – 2.275 GHz minimum
Input power	+10 dBm minimum
Input VSWR	2:1 typical
Output frequency	9.75 – 11.375 GHz minimum
Output power	+10 dBm minimum
Output power flatness (at +25°C)	±1 dB maximum
Output spurious rejection	-65 dBc typical
Output harmonic rejection	-15 dBc typical
Rejection of input harmonics	-65 dBc typical
Output VSWR	1.5:1 typical
DC power	+15 VDC, 150 mA

SWEPT OUTPUT POWER
(with +10 dBm input)

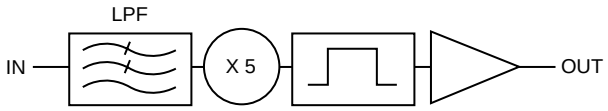


X 5 ACTIVE MULTIPLIER ASSEMBLIES

OPTIONS

- **Input Power +5 to +20 dBm**

FUNCTIONAL BLOCK DIAGRAM



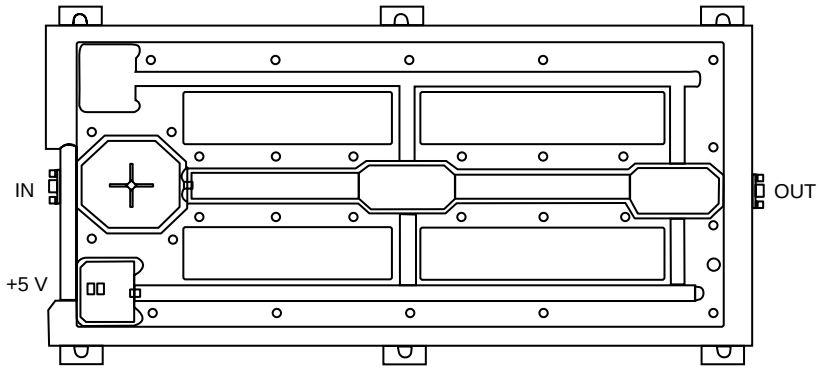
MAX5M064064 ELECTRICAL SPECIFICATIONS

Input	1280 MHz @ 10 dBm minimum
Output	6400 MHz @ 10 dBm minimum
Input harmonic rejection	-80 dBc
Output harmonic rejection	-20 dBc
DC power	+5 VDC @ 280 mA

This unit is hermetically sealed for flight applications. For outline refer to MAX5B.

X 5 ACTIVE MULTIPLIER ASSEMBLIES

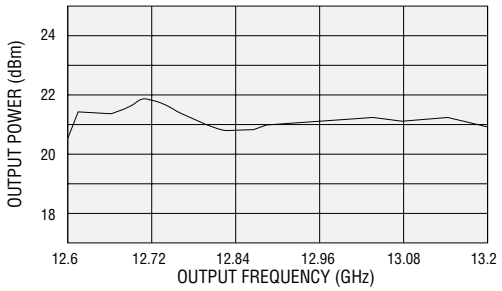
INSIDE VIEW SHOWING GENERAL LAYOUT CONCEPT



MAX6M126132-20P
12.6 TO 13.2 GHz, HIGH OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	2.1 – 2.2 GHz minimum
Input power	+10 dBm minimum
Input VSWR	2:1 typical
Output frequency	12.6 – 13.2 GHz minimum
Output power	+20 dBm minimum
Output power flatness (at +25°C)	±1 dB maximum
Output spurious rejection	-65 dBc typical
Output harmonic rejection	-15 dBc typical
Rejection of input harmonics	-65 dBc typical
Output VSWR	1.5:1 typical
DC power	+15 VDC

SWEPT OUTPUT POWER
(with +10 dBm input)

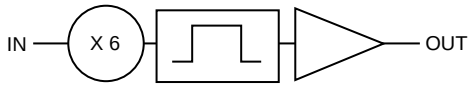


X 6 ACTIVE MULTIPLIER ASSEMBLIES

OPTIONS

- **Input Power +5 to +20 dBm**

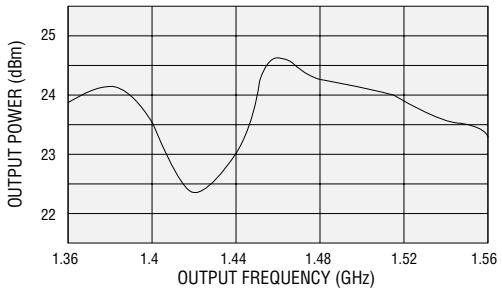
FUNCTIONAL BLOCK DIAGRAM



MAX16S013015-20P
1.36 TO 1.56 GHz, HIGH OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

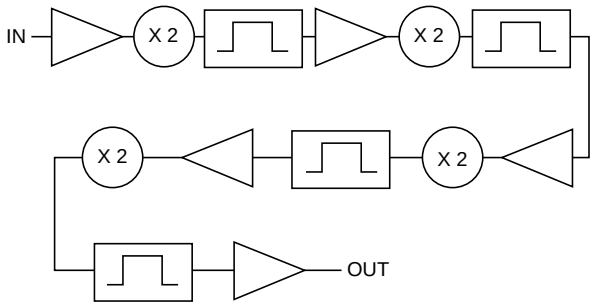
Input frequency	0.085 – 0.097 GHz minimum
Input power	-12 dBm minimum
Input VSWR	2:1 typical
Output frequency	1.36 – 1.56 GHz minimum
Output power	+20 dBm minimum
Output power flatness (at +25°C)	±2 dB maximum
Output spurious rejection	-65 dBc typical
Output harmonic rejection	-20 dBc typical
Rejection of input harmonics	-65 dBc typical
Output VSWR	1.5:1 typical
DC power	+15 VDC

SWEPT OUTPUT POWER
(with -12 dBm input)



X 16 ACTIVE MULTIPLIER ASSEMBLIES

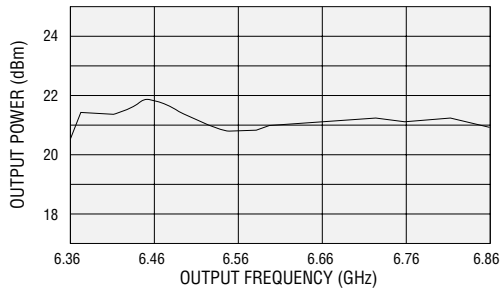
FUNCTIONAL BLOCK DIAGRAM



MAX16J064069-20P
6.36 TO 6.86 GHz, HIGH OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	0.397 – 0.428 GHz minimum
Input power	+7 dBm
Input VSWR	2:1 typical
Output frequency	6.36 – 6.86 GHz minimum
Output power	+20 dBm minimum
Output power flatness (at +25°C)	±0.5 dB maximum
Output spurious rejection	-70 dBc minimum
Output harmonic rejection	-40 dBc minimum
Rejection of input harmonics	-70 dBc typical
Output VSWR	2:1 typical
Detected video output into 1K ohm load	0.1 VDC
DC power	+15 VDC

SWEPT OUTPUT POWER
(with +7 dBm input)

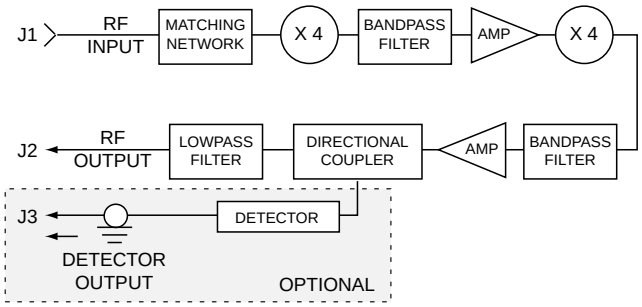


X 16 ACTIVE MULTIPLIER ASSEMBLIES

OPTIONS

- **Input Power +5 to +20 dBm**
- **Detector Output**

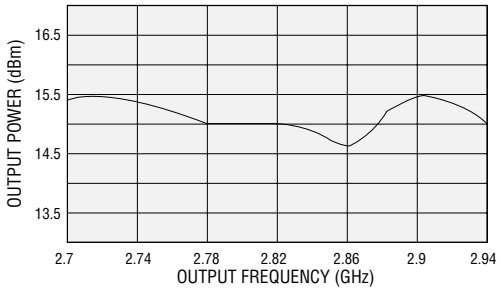
FUNCTIONAL BLOCK DIAGRAM



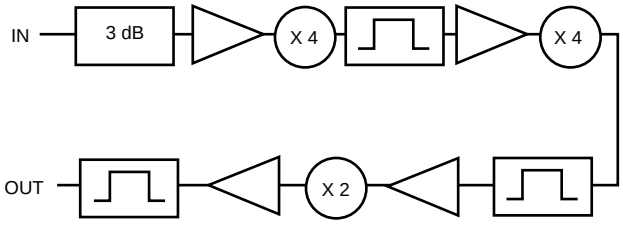
MAX32S027029
2.7 TO 2.945 GHz, MID OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

Input frequency	0.085 – 0.092 GHz minimum
Input power	-10 dBm minimum
Input VSWR	2:1 typical
Output frequency	2.7 – 2.945 GHz minimum
Output power	+10 dBm minimum
Output power flatness (at +25°C)	±1.5 dB maximum
Output spurious rejection	-60 dBc to 8.8 GHz typical
Output harmonic rejection	-50 dBc to 8.8 GHz typical
Rejection of input harmonics	-65 dBc typical
Output VSWR	1.5:1 typical
DC power	+15 VDC

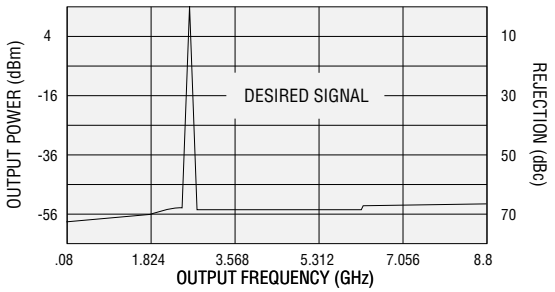
SWEPT OUTPUT POWER
(with -10 dBm input)



X 32 ACTIVE MULTIPLIER ASSEMBLIES



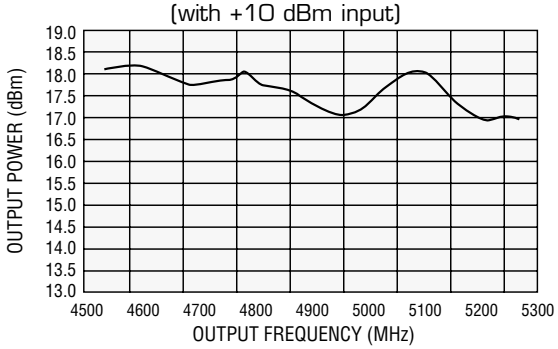
REJECTION OF INPUT HARMONICS
(with -10 dBm input)



OUTPUT LEVEL
ELECTRICAL SPECIFICATIONS

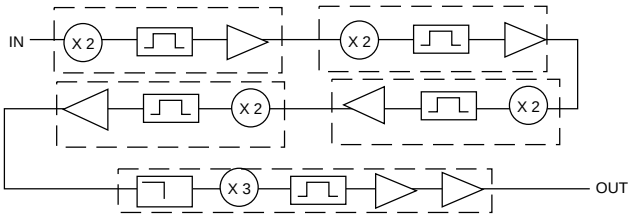
Input frequency	94 – 111 MHz
Input level	+10 dBm
Output frequency	4510 – 5330 MHz
Output level	+10 dBm minimum
Output flatness	±1 dB
Input harmonic rejection	-50 dBc typical
Output harmonic rejection	-15 dBc typical
Input/output match	2.5:1 typical
Voltage, current	+5 110 mA, +15 500 mA

SWEPT OUTPUT POWER
(with +10 dBm input)



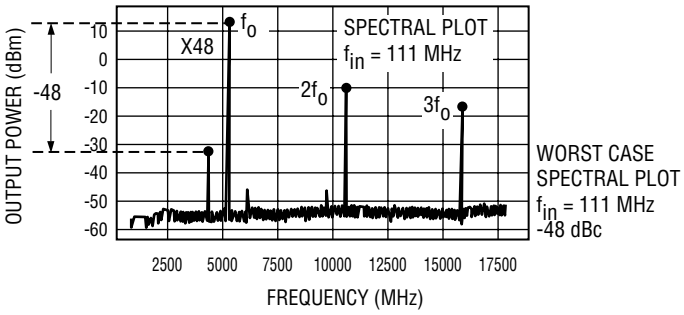
X 48 ACTIVE MULTIPLIER ASSEMBLIES

FUNCTIONAL BLOCK DIAGRAM



MAX48M045053

REJECTION OF INPUT HARMONICS
(with +10 dBm input)



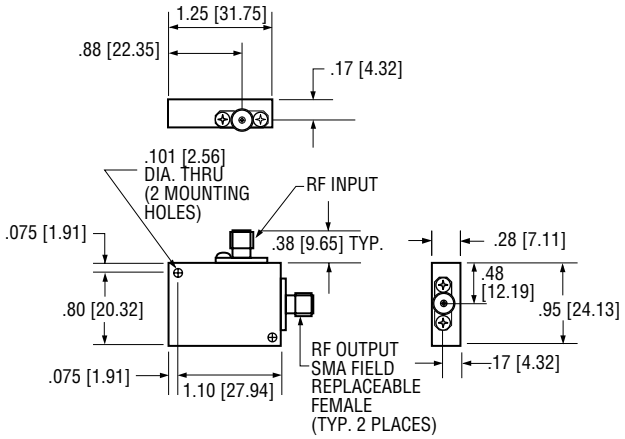
PASSIVE MULTIPLIERS – OUTLINE DRAWINGS

GENERAL NOTES

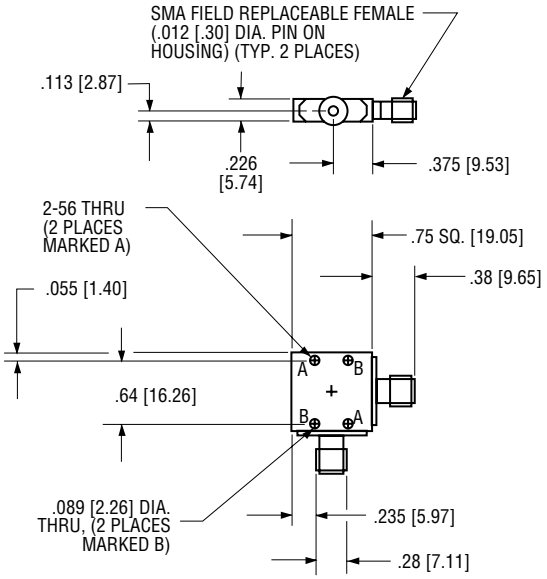
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

2. Optional SMA, K or V type male. SMA type only, on multipliers below 26 GHz.

MX2A



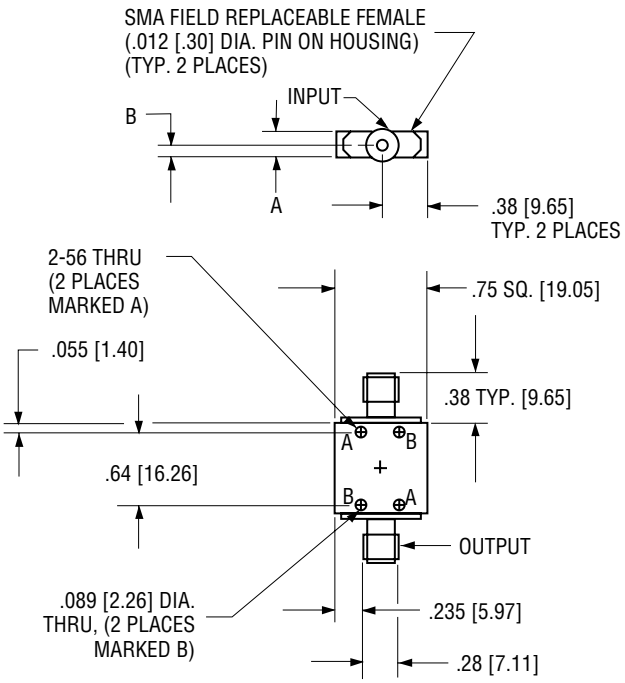
MX2B



Notes: Optional MX2C package available, see outline section.

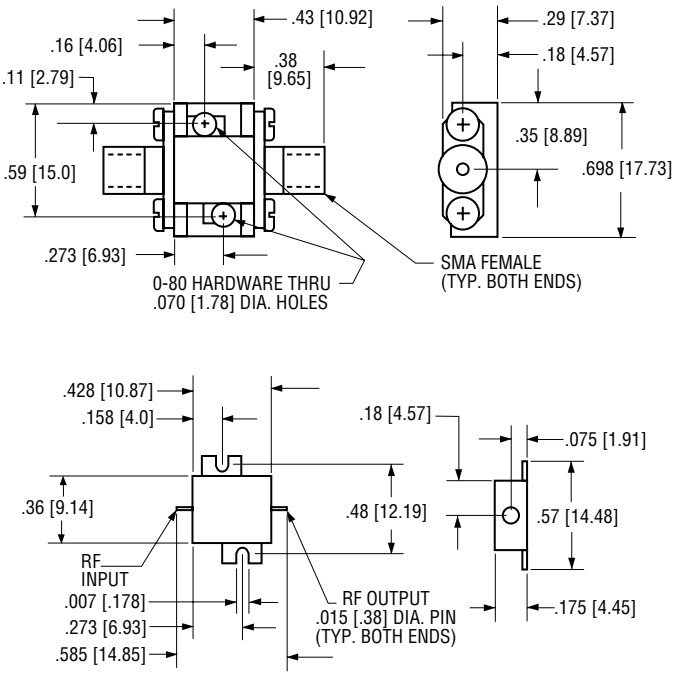
PASSIVE MULTIPLIERS – OUTLINE DRAWINGS (CONT.)

MX2C



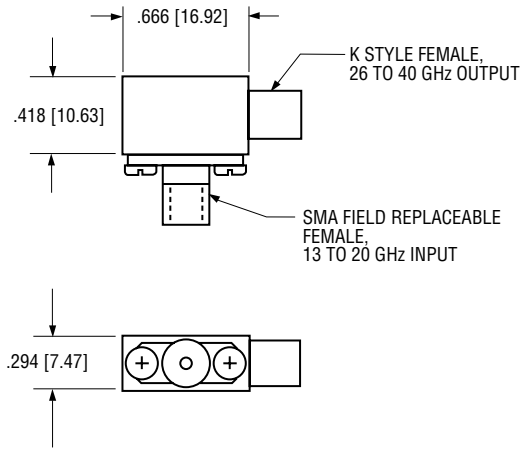
OUTLINE DASH NO.	DIM A	DIM B
-1	.226 [5.74]	.121 [3.07]

MX2D

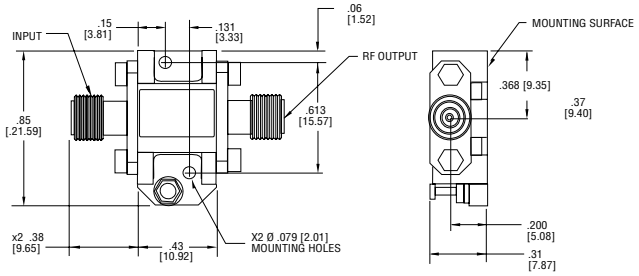


Notes: Doubler may be readily used as is, or as a drop-in by removing the SMA connectors and mounting hardware as shown.

MX2E



MXF



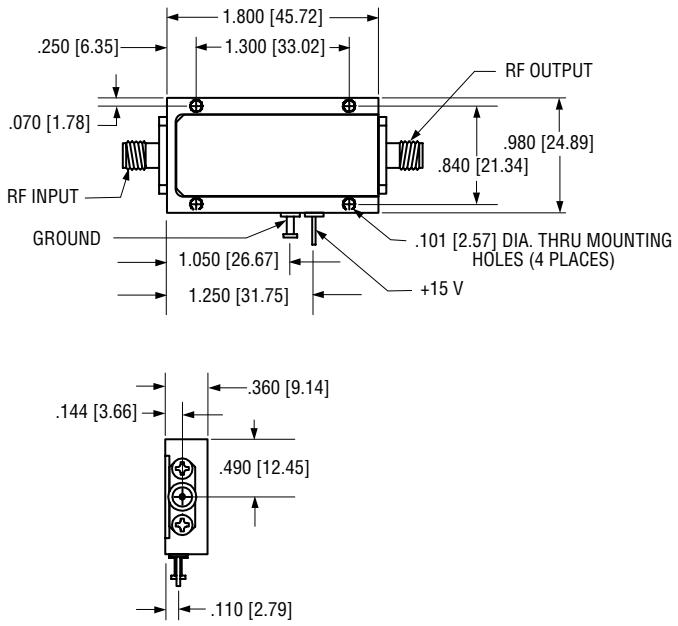
ACTIVE MULTIPLIERS – OUTLINE DRAWINGS

GENERAL NOTES

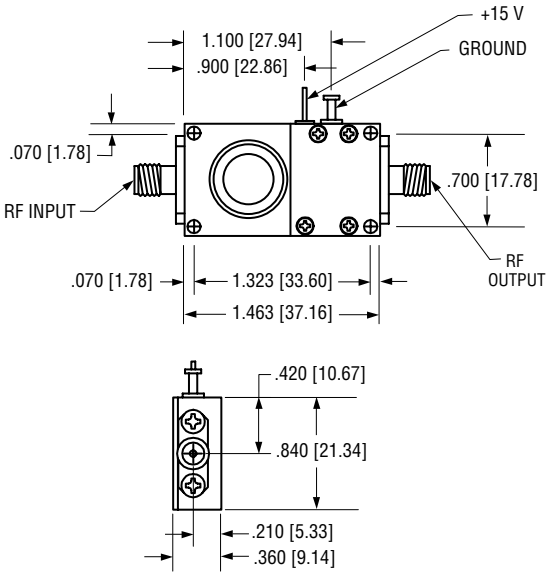
1. Dimensions are in inches [millimeters]
   Tolerance as follows:
   .xx = ±0.01 [.xx = ±0.25]
   .xxx = ±0.005 [.xxx = ±0.13]

2. Optional SMA, K or V type male. SMA type only, on multipliers below 26 GHz.

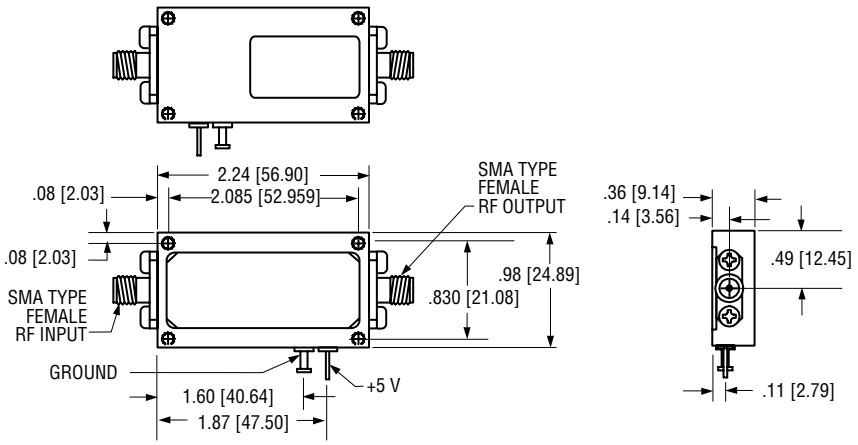
MAX2A



MAX2B

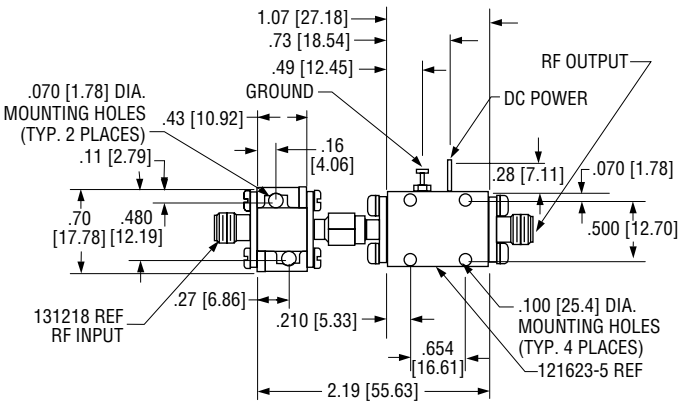


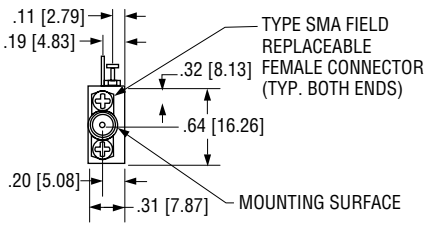
MAX2A2



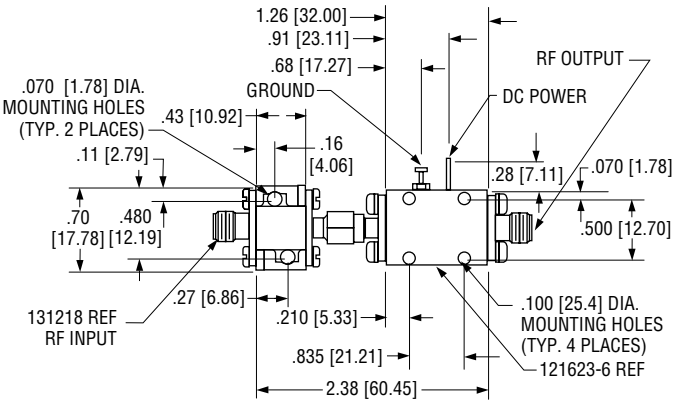
ACTIVE MULTIPLIERS – OUTLINE DRAWINGS (CONT.)

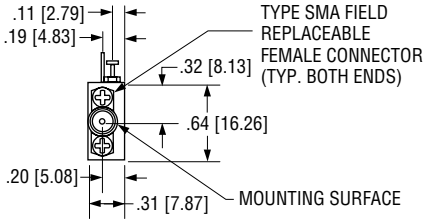
MAX2C



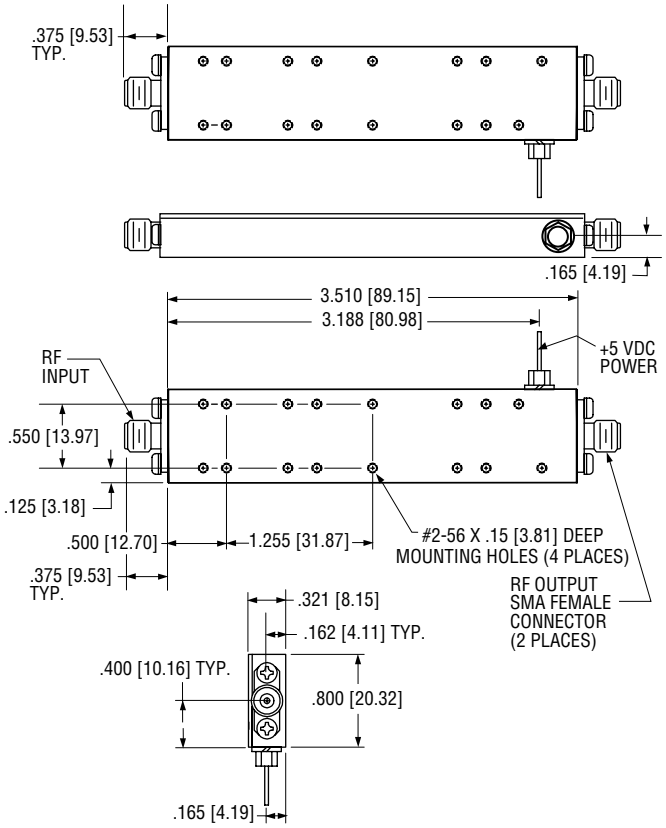


MAX2C2

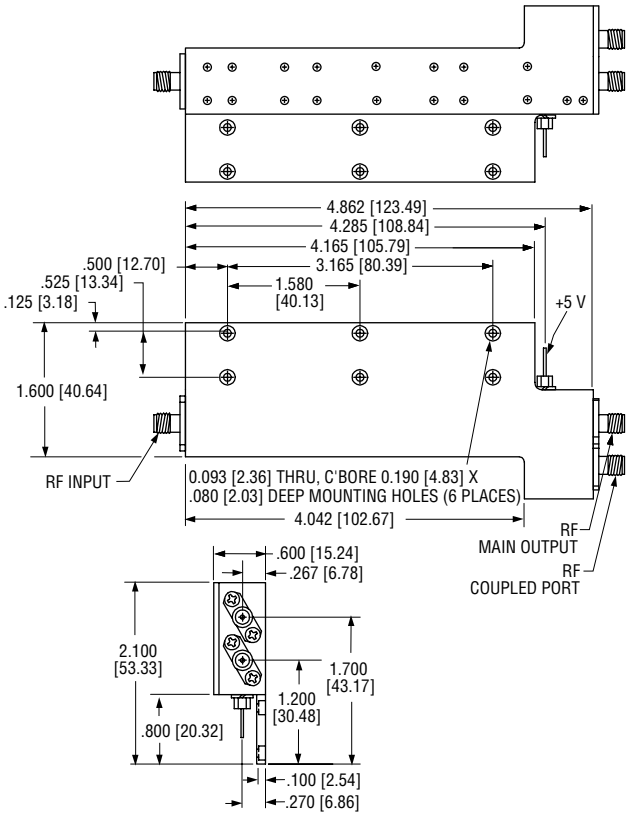




MAX2D

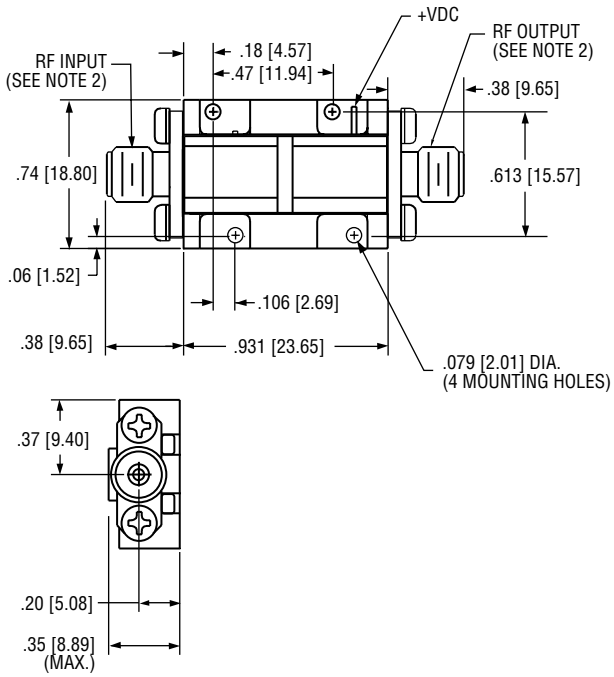


MAX2E



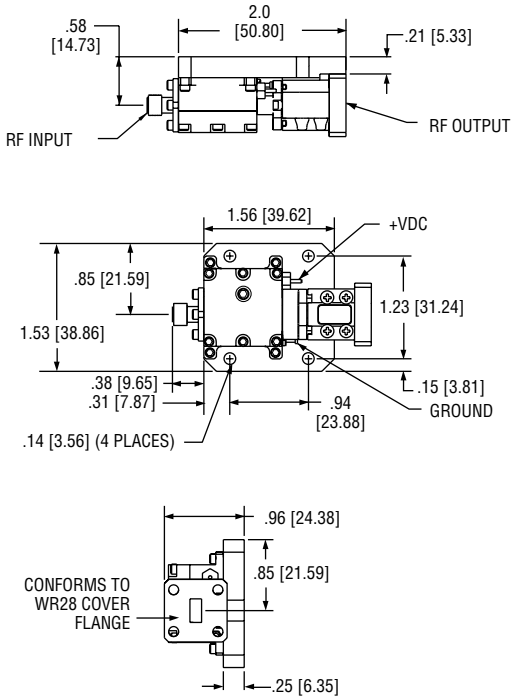
ACTIVE MULTIPLIERS – OUTLINE DRAWINGS (CONT.)

MAX2F

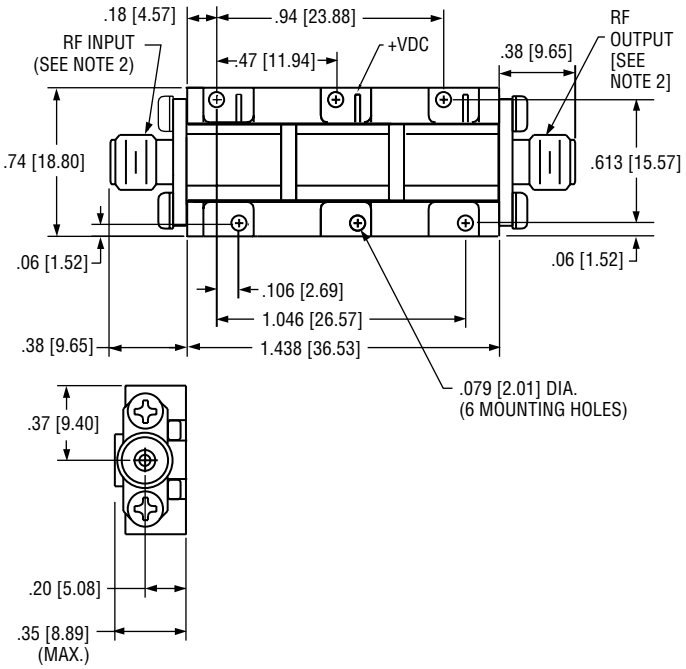


Note: Optional waveguide output available, please contact factory.

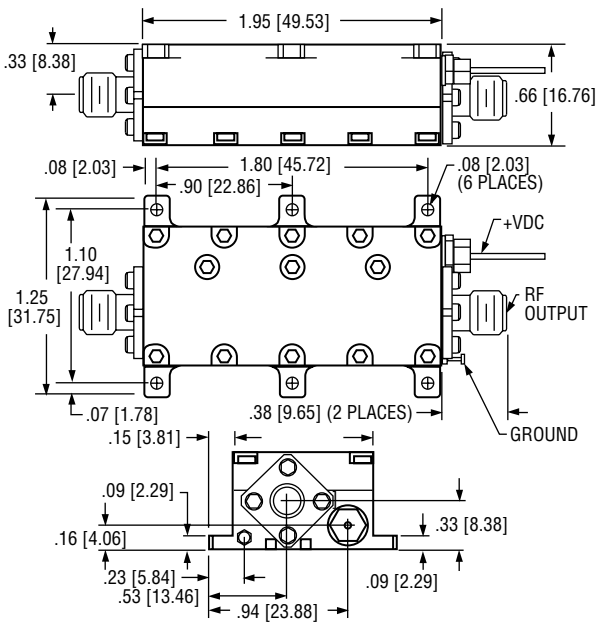
MAX2G



MAX2H

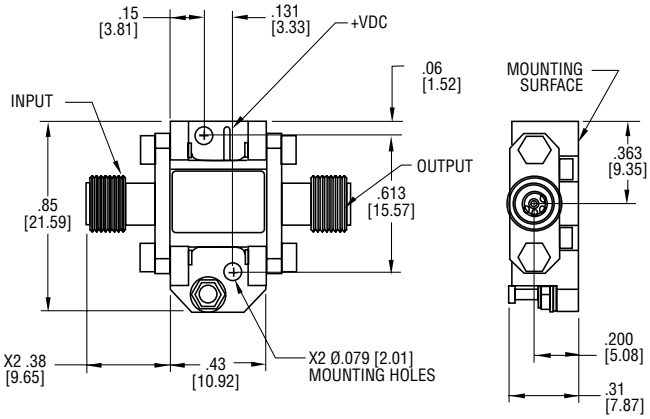


MAX2J

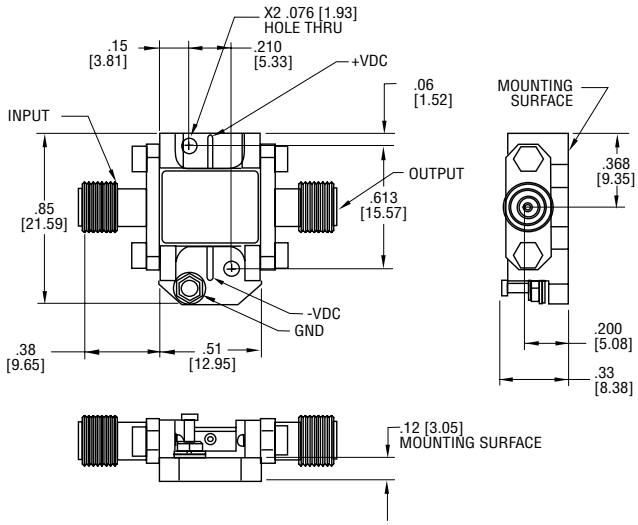


ACTIVE MULTIPLIERS – OUTLINE DRAWINGS (CONT.)

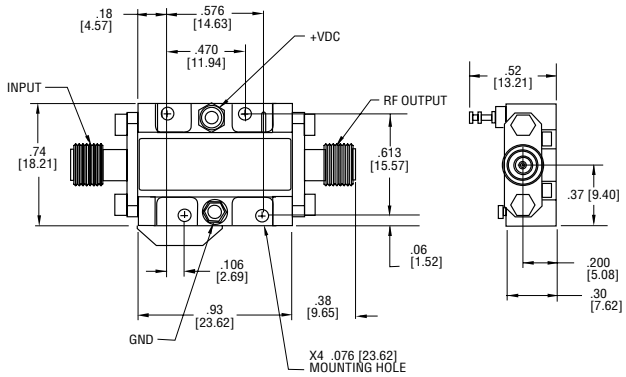
MAX2K



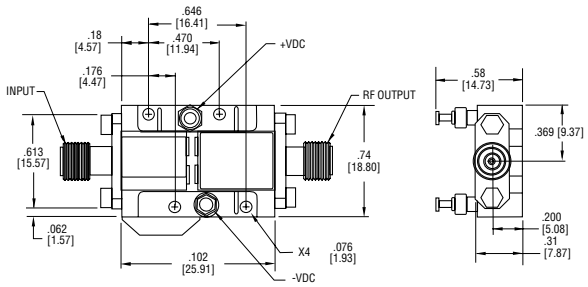
MAX2L



MAX2M

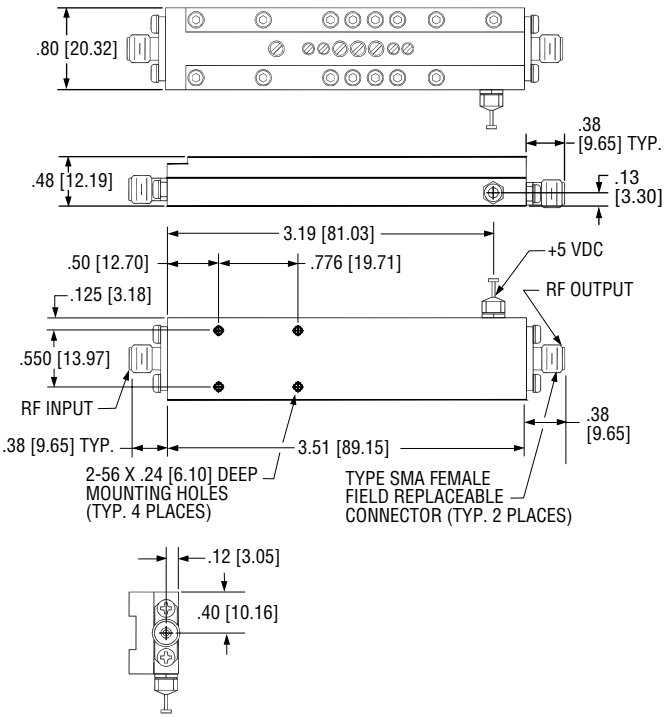


MAX2N

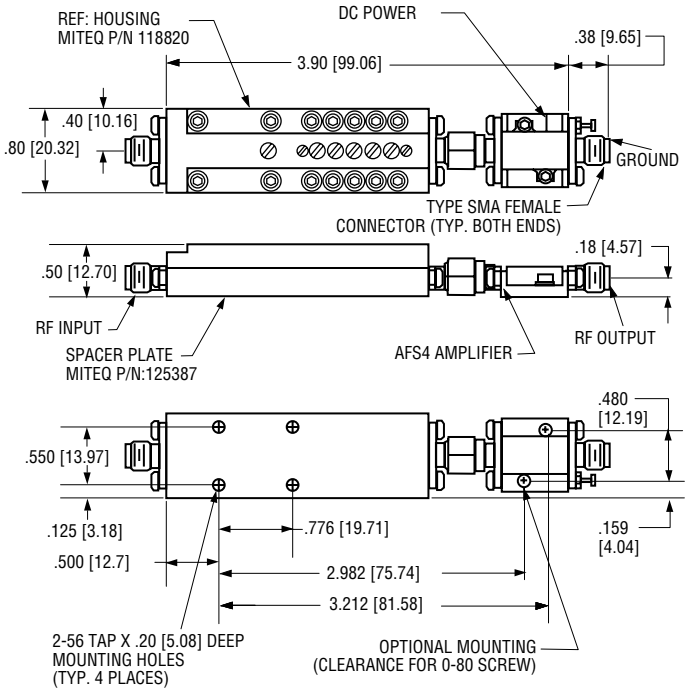


ACTIVE MULTIPLIERS – OUTLINE DRAWINGS (CONT.)

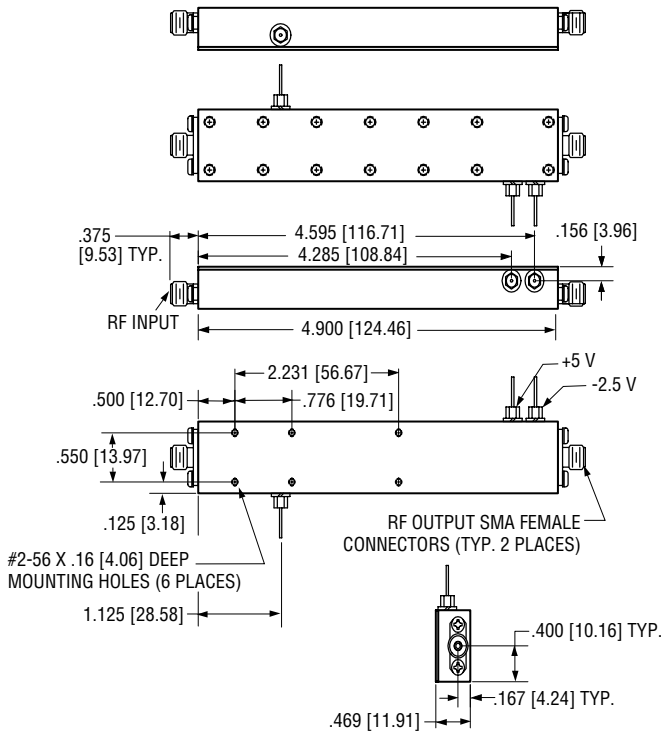
MAX3A



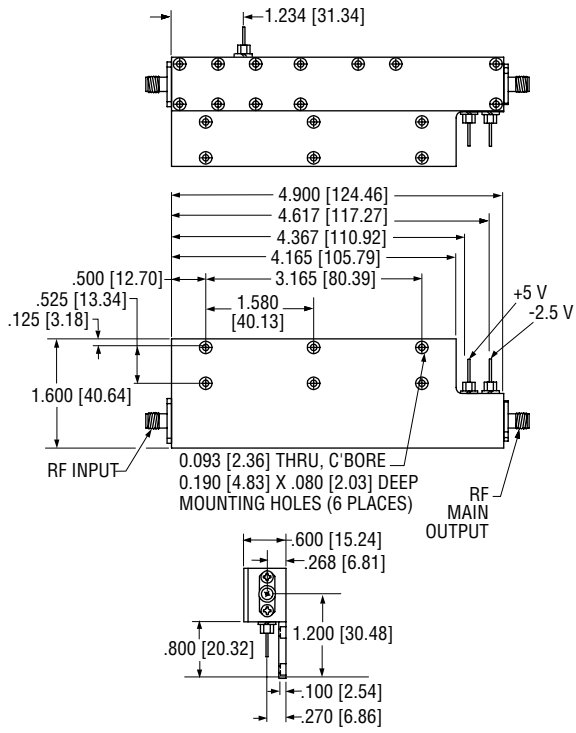
MAX4A



MAX4B

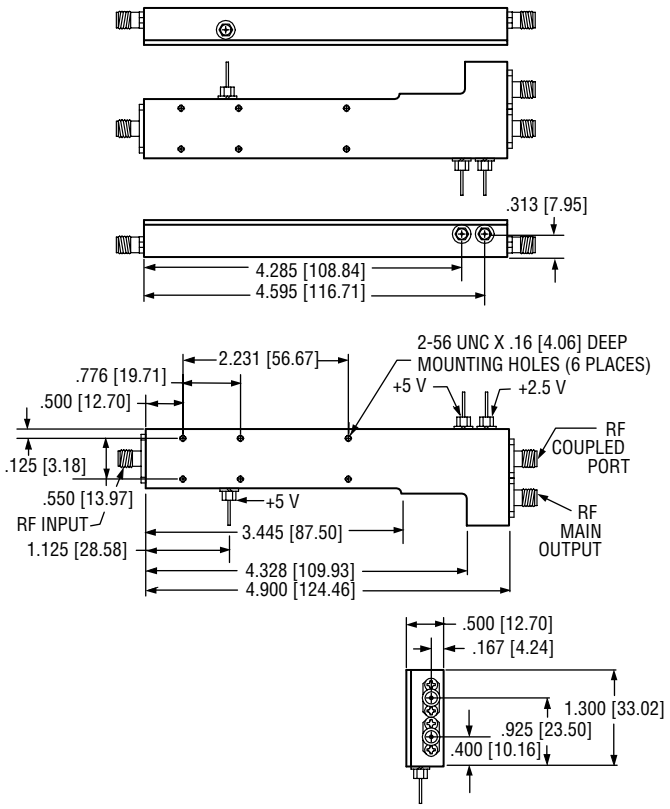


MAX4C

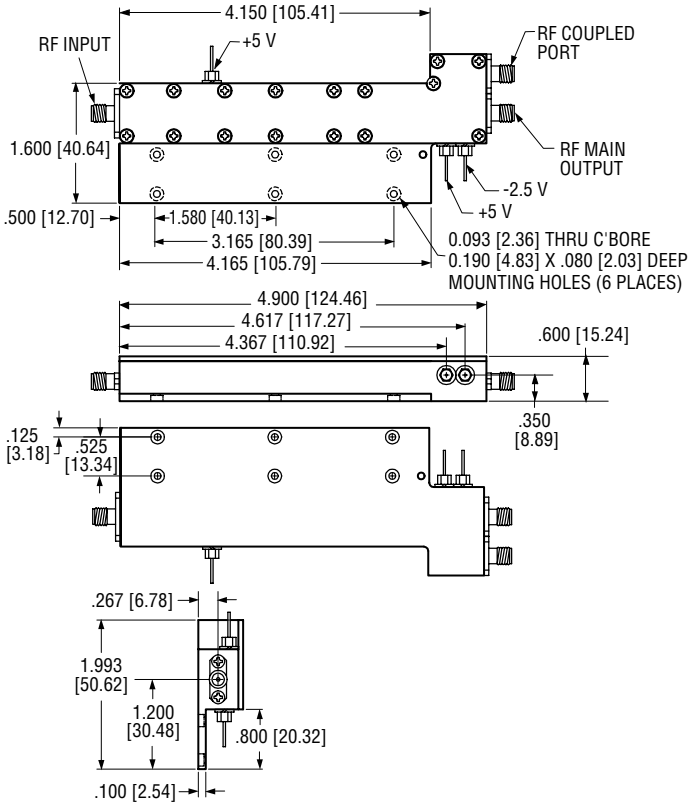


ACTIVE MULTIPLIERS – OUTLINE DRAWINGS (CONT.)

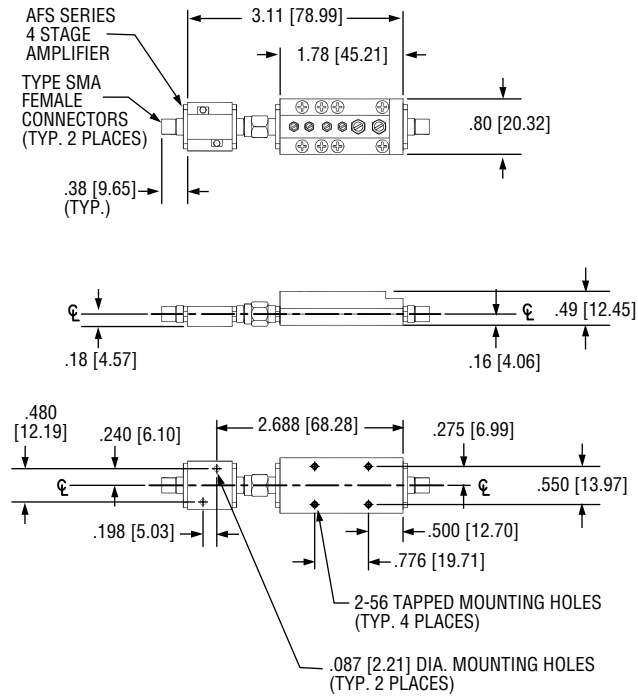
MAX4D



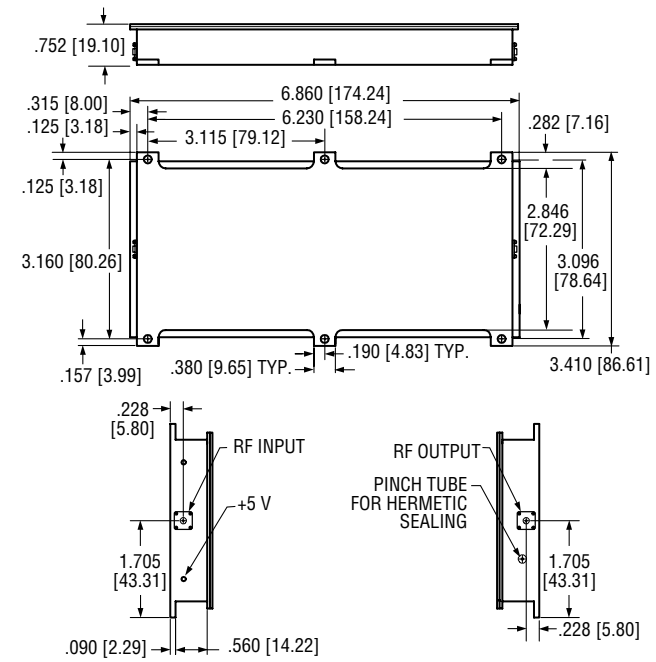
MAX4E



MAX5A



MAX5B



MULTIPLIER DEPARTMENT

TEL.: (631) 439-9413
FAX: (631) 436-7430
E-MAIL: dkrautheimer@miteq.com

DATE _____

COMPANY _____ **ADDRESS** _____

CONTACT _____ _____

TEL. _____ _____

FAX _____ _____

Please provide price, delivery and technical information for the following multipliers:

SPECIFICATION PARAMETER	REQUIREMENT 1	REQUIREMENT 2	TYPICAL VALUES PASSIVE	ACTIVE
Input frequency (GHz)				
Input power (dBm)			+10	+10
Input VSWR (maximum)			2.5:1	2.5:1
Input harmonics feeding multiplier (dBc)			-50	-50
Input harmonics rejection (gen. by multiplier) (dBc)			-15	-50 (with filter)
Output frequency (GHz)				
Output power (dBm, minimum)			-2	+10
Output power flatness at 25°C (dB)			±1 (octave)	±1.5
Output VSWR (maximum)			2.5:1	1.5:1
Output harmonics (dBc)			–	-15
Spurious rejection (nonharmonic related) (dB)			60	60
Conversion gain (dB)			–	0
Multiplier loss (dB)			12 (octave)	–
DC voltage, current			–	+15 VDC, 250 mA
Connectors (in/out)			SMA female/SMA female	
Operating temperature (°C)			0 to 50	0 to 50
Quantity				
Size (inches)				

Special requirements, such as output power variations over temperature and frequency, hermetic sealing, special testing/screening, or specific operating environment may be listed below:

_____

_____

PLEASE SEND ADDITIONAL INFORMATION ON THE FOLLOWING MITEQ PRODUCTS:

- ☐ Amplifiers
- ☐ Mixers
- ☐ Integrated Assemblies
- ☐ IF Signal Processing Components
- ☐ Frequency Generation Products
- ☐ Passive Power Components
- ☐ SATCOM Products
- ☐ Switches
- ☐ Fiber Optic Products

ISO 9001:2000 CERTIFIED

MITEQ attained its original ISO 9001 registration in June 1993, when fewer than 1500 companies were registered. ISO 9001 has since become a recognized standard for quality in over 90 countries. Nationally, it is accepted by an ever-increasing number of government agencies in place of longstanding military specifications covering quality and inspection criteria. Among those are MIL-Q-9858 and MIL-I-45208.

MITEQ's quality system is certified to ISO 9001 by **N**ational **Q**uality **A**ssurance USA (NQA), an accredited registrar of the **A**merican **N**ational **S**tandards **I**nstitute - **R**egistration **A**ccreditation **B**oard (ANSI-RAB). NQA performs a quality audit at MITEQ every six months to assure continued compliance to the standard. Additionally, MITEQ's internal auditing system, coupled with regular management reviews, assures that the quality system is effective, updated and constantly improved.

NQA NATIONAL QUALITY ASSURANCE, USA 9001:2000 REGISTERED COMPANY — ANSI-RAB QMS ACCREDITED

ORDERING INFORMATION

PRICING AND TERMS

A quotation on any item in the catalog is available by contacting the factory. All quotations, unless otherwise noted, are valid for 60 days from the date of issue, F.O.B. (FCA) Hauppauge, NY 11788. Pricing does not include customer or government source inspection unless otherwise noted. On international orders, an irrevocable letter of credit may be required. MITEQ accepts these credit cards:

VISA · MasterCard · American Express Cards Welcome · Carte Blanche · Diners Club International · JCB JCB CARDS

QUANTITY DISCOUNTS

A quantity discount is generally available on most catalog items. Due to the wide variety of devices in the catalog, it is not possible to provide a standard discount schedule. When quantities are involved, please contact the factory and the appropriate information will be provided.

SHIPPING INFORMATION

Unless instructed otherwise by the customer, we will ship UPS in the U.S. F.O.B. (FCA) Hauppauge. Air freight will be used as the primary international means of shipment. Please indicate at time of purchase what method of shipment you require.

DRAWINGS AND SPECIFICATIONS

Material presented in this catalog is current at the time of printing. Mechanical and electrical requirements are subject to change. If either of these parameters is critical, please contact the factory to verify that the information is current.

APPLICATION ENGINEERING

We maintain a large support staff of engineers who are experts in specific areas of microwave technology. Each has an engineering background that combines both a formal engineering education with training and experience in product design. As further technical support, we make available the services of our engineering and scientific staff, who may be consulted on more advanced circuit designs or application problems.

RETURNED MATERIAL

For all items requiring service, regardless of warranty status, MITEQ's Customer Service department should be contacted for a Return Material Authorization (RMA) number. This can be done by either visiting our website (www.miteq.com) and requesting an RMA number online or by calling (631) 439-9300. When requesting an RMA number either over the internet or by phone, you will need to provide the model number, serial number and as much information as possible about the nature of your difficulty. All returns must arrive freight, postage, duties and handling prepaid.

SOURCE INSPECTION

Government / customer source inspection is available on any item upon receipt of the complete written confirmation of purchase order items, including the prime government contract number. Source inspection with respect to some products increases the unit price and extends delivery because of duplicate standard final inspection and testing. It is recommended wherever possible that a Certificate of Compliance be substituted for source inspection to minimize price and delivery delays.

REPAIR COSTS

Warranty repairs will be made at no cost to the customer. Units out of warranty, or those which have been mishandled, will require approval by the customer for the charges involved before the repairs can be accomplished. We will provide an estimate for the cost of the repair, which can be applied to the repair, if approval is granted. For those items that are deemed beyond repair, or where the customer may decide not to repair the unit, a handling charge will be applicable.

WARRANTY

1. MITEQ, Inc. warrants to the purchaser that each of its products, when shipped will be free from defects in material and workmanship and will perform in full accordance with applicable specifications. The limit of liability under this warranty is at MITEQ, Inc.'s option to repair or replace any product or part thereof which shall within: (a) three years of delivery for indoor equipment, (b) two years of delivery for outdoor equipment and (c) one year of delivery for integrated assemblies or equipment having RF output powers equal to or greater than +24 dBm, be returned by the purchaser to MITEQ, Inc., at 100 Davids Drive, Hauppauge, New York, 11788, and shall, as determined by examination by MITEQ, Inc., prove defective in material and/or workmanship. Warranty returns must first be authorized in writing by MITEQ, Inc. Disassembly of any MITEQ, Inc. product by anyone other than an authorized representative of MITEQ, Inc. voids this warranty in its entirety. MITEQ, Inc. reserves the right to make changes in any of its products without incurring any obligation to make the same changes on previously delivered products.

2. Components and subsystems having been repaired by MITEQ, Inc. shall be warranted for that repair for ninety (90) days. For products that are still within the original warranty period as described above, the original warranty (if longer) will take precedence. For all SATCOM products, that portion of the system that is repaired, will be warrantied for one year.

3. As a condition to the warranties provided for herein, the Buyer will prepay the shipping charges for all products returned to MITEQ, Inc. for repair and MITEQ, Inc. will pay the return shipping with the exception of rack mountable hardware returned from outside the United States in which case the buyer will pay the shipping charges.

4. The buyer will pay the cost of inspecting and testing any goods returned under the warranty or otherwise which are found to meet the applicable specifications or which are not defective or not covered by the warranty.

5. Products sold by MITEQ, Inc. shall not be considered defective or non-conforming to the Buyers' order if they (a) satisfactorily fulfill the performance requirements that were (i) provided by the Buyer to MITEQ, Inc. or (ii) as published in the Sellers' product specification literature, or (b) or in accordance with any written or verbal agreement between the Buyer and MITEQ, Inc., or (c) are in accordance with samples approved by the Buyer. This warranty shall not apply to any products or parts thereof which have been subject to accident, negligence, alteration, abuse or misuse. MITEQ, Inc. makes no warranty whatsoever in respect to accessories or parts not supplied by it.

6. Limitations of Warranty, Damages and Liability

EXCEPT AS EXPRESSLY SET FORTH HEREIN, THERE ARE NO WARRANTIES, CONDITIONS, GUARANTEES OR REPRESENTATIONS AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHER WARRANTIES, CONDITIONS, GUARANTEES OR REPRESENTATIONS, WHETHER EXPRESSED OR IMPLIED, IN LAW OR IN FACT, ORAL OR IN WRITING.

MITEQ, INC.'S AGGREGATE LIABILITY IN DAMAGES OR OTHERWISE SHALL NOT EXCEED THE PAYMENT, IF ANY, RECEIVED BY MITEQ, INC. FOR THE UNIT OF PRODUCT OR SERVICE FURNISHED OR TO BE FURNISHED, AS THE CASE MAY BE, WHICH IS THE SUBJECT OF CLAIM OR DISPUTE. IN NO EVENT SHALL MITEQ, INC. BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES, HOWSOEVER CAUSED.

7. All matters regarding this warranty shall be interpreted in accordance with the laws of the State of New York and any controversy that cannot be settled directly shall be settled by arbitration in New York, New York in accordance with the rules then prevailing of the American Arbitration Association, and judgement upon the award rendered may be entered in any court having jurisdiction thereof.

Davids Drive • Hauppauge, NY

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MITEQ

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