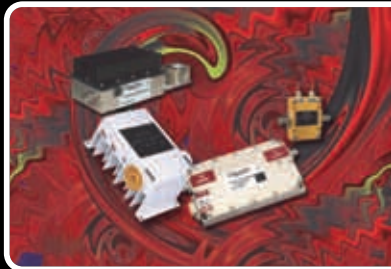


## POWER AMPLIFIER PRODUCTS



- Broadband
- Multioctave Wideband
- SATCOM and Radar
- Broadband GaN
- Instrumentation
- Microwave and Millimeter-Wave
- Pulsed



## Introduction



## Amplifier Models

- Broadband
- Multioctave Wideband
- SATCOM and Radar
- Broadband GaN Amplifiers
- Instrumentation and Rack-Mount
- Microwave and Millimeter-Wave
- Pulsed



## Outline Drawings

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### FEDERAL SUPPLY CODE

Our Federal Supply Code is: 33592

## INTRODUCTION

This catalog is intended to provide an overview of MITEQ's Power Amplifier standard products and custom capabilities. The products within this catalog are organized into ten major sections. An overall list by:

- Power Amplifiers
- Broadband PAs
- Multioctave Wideband PAs
- Narrowband SATCOM and Radar PAs
- Broadband GaN Amplifiers
- Instrumentation and Rack-Mount PAs
- Microwave and Millimeter-Wave PAs
- Pulsed PAs

In addition to the detailed product information, we have included typical test data from some of our amplifiers to give a feel for the performance listed in the specification tables. We have also included, for your reference, a section filled with application notes written by our engineers to help in understanding some system design parameters when using our amplifiers. Included in this section is a note on specification definitions. You may also find these especially informative in assuring that your requirements are in line with the catalog specifications.

In all, we think you will find this catalog informative and a useful tool to better understand MITEQ's Power Amplifier models, as well as a good general reference for any amplifier application.

# TECHNOLOGY OVERVIEW

## CIRCUIT DESCRIPTIONS

MITEQ's amplifiers incorporate many design techniques commonly used throughout the industry. Through extensive study and years of experience, our engineers have become more proficient in certain subtleties of amplifier design, most notably in the area of noise and broadband performance. With these factors, MITEQ cannot overlook our flexibility to utilize and combine all techniques to meet the customer's specific requirements. Each system requirement has an optimum approach, and MITEQ uses all of the available design and technology options plus a few proprietary techniques, to offer the best performance.



The disadvantages of this type of design are equally as clear. The cost and size are adversely affected because of the two FETs per stage. In addition, if used as the input stage of an amplifier, the loss of the 90° hybrid will degrade

the minimum achievable noise figure especially at higher frequencies. Finally, this design is bandwidth limited due to the problems in realizing multi-octave 90° hybrids. AMF series amplifiers that utilize the balanced approach are designated by our "B" series, for example; AMF-

## BALANCED AMPLIFIERS

During the early years at MITEQ, the balanced amplifier approach was most widely used. Each amplifier stage in a balanced design employs a 90° hybrid at the input and output to drive two discrete transistors. The advantage of using this topology is:

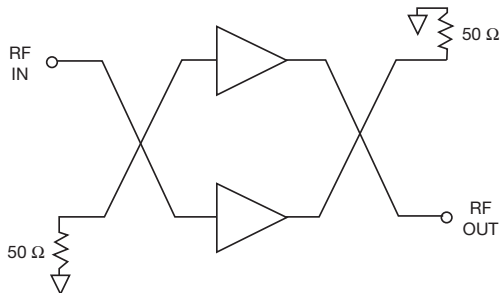
- Good VSWR characteristics
- Easily cascadable stages and stability
- Easy power matching and combining
- Good broadband performance

## ENVIRONMENTAL TESTING

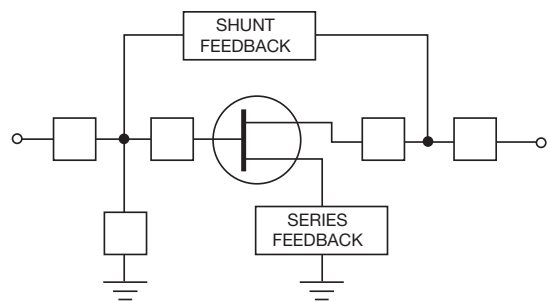
2B, AMF-3B, AMF-4B, etc., typically representing 2-, 3- and 4-stage balanced stage amplifier designs.

## FEEDBACK DESIGNS

MITEQ has established a technique to counter the deficiencies of the balanced approach and developed an amplifier series based upon a feedback design approach. Our "F" series amplifiers use this approach when its advantages fit the specific applications.



**BALANCED AMPLIFIER STAGE**



**FEEDBACK AMPLIFIER STAGE**

## TECHNOLOGY OVERVIEW (CONT.)

Feedback based designs use a single transistor in each stage. The impedance of the FET is matched to the input or output source and load impedance by means of feedback. Two basic types of feedback are applied, series or parallel. Series feedback is also known as "lossless" feedback because there is typically no additional lossy components used. Although difficult to optimize, and prone to instabilities, a lossless feedback design provides the lowest noise figures available today.

When implementing this type of design, the engineer must pay particular attention to impedance matching the input stages. The interaction of gain, gain flatness and noise match of the transistor must be optimized over the specified band. This optimization of a feedback amplifier design involves a tradeoff exercise between input VSWR and noise figure performance. The matching techniques utilized are best accomplished in "chip and wire" construction where subtle tuning can be realized. This is an area that requires extensive experience and a detailed knowledge of the bare-die transistor and impedance matching circuits in order to achieve the best possible performance.

It is also possible to make use of input and interstage isolators to provide good VSWR performance while maintaining the best noise match. Although isolators are sometimes used for special applications in our products, MITEQ has been able to achieve both a good gain and optimum noise match without isolators.

### DISTRIBUTED AMPLIFIERS

MITEQ also utilizes distributed amplifier approach to support broadband and ultra-broadband applications. While feedback and other single-ended topologies are limited in bandwidth by the cut-off frequencies of the devices used, distributed designs do not have such a limitation.

This technique uses multiple FETs per stage in a "traveling wave" approach to provide each stage with a balanced combination of gain flatness and power. The textbook design of a distributed amplifier uses 50 ohm termination resistors in each stage, which have a negative effect on noise figure. MITEQ's engineers have developed proprietary techniques to implement this approach and still achieve low noise performance.

Our JS, AFS, and "D" series amplifiers utilize the distributed amplifier design approach and achieve multi-octave to ultra-broadband designs beyond 40 GHz.

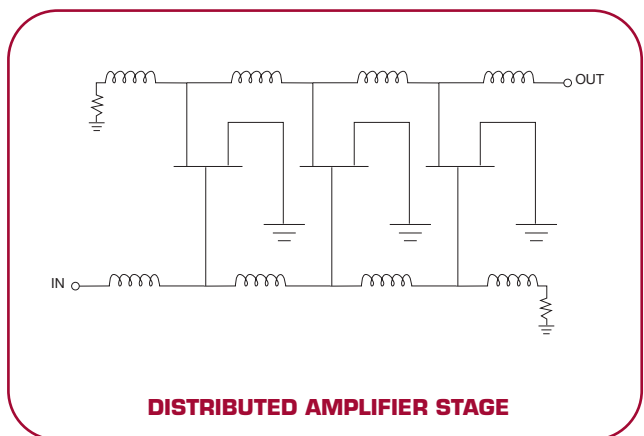
### SATCOM AMPLIFIERS

MITEQ's SATCOM LNAs are designed for the ultimate low noise performance in the common satellite bands and have the corresponding waveguide inputs. Typically, feedback is the technique used in the input stage to facilitate impedance matching for an optimum balance of gain, VSWR, and noise figure. Often waveguide isolators are used to meet strict input VSWR requirements.

### CUSTOM ENGINEERING

All these circuit approaches are combined to provide an endless array of amplifier designs. The positive and negative features of each design are weighed and combined to meet each customer's specific requirements. In addition to these approaches, MITEQ's Amplifiers integrates other features to meet custom design requirements, including:

- Gain control
- Input limiter protection
- Sloping amplifiers
- Limiting amplifiers
- Extended temperature range
- Switched or pulsed applications
- Detector outputs
- Fault alarms
- In-line filtering
- EMI shielding
- Weather-proofing
- Power supply options
- Heatsinking options



## TECHNOLOGY OVERVIEW (CONT.)

These various design possibilities are best discussed directly with our engineers. MITEQ's engineering personnel not only possess the detailed amplifier knowledge, but also have extensive overall systems background to help customers translate their true requirements into specifications. This direct contact on an "engineer-to-engineer" basis has allowed MITEQ to better support our customer base with information and suggestions to improve the use of our amplifiers in their systems.

### CONSTRUCTION

MITEQ's amplifiers are manufactured using our internal thin film hybrid manufacturing process. This type of Microwave Integrated Circuit (MIC) construction was introduced by MITEQ during the early 1970s and has been the main manufacturing technique for our amplifiers ever since. Our expertise in this form of micro-miniature integration has allowed MITEQ to achieve truly state-of-the-art performance, particularly in the areas of low-noise figure, high frequency and broadband amplifier design.

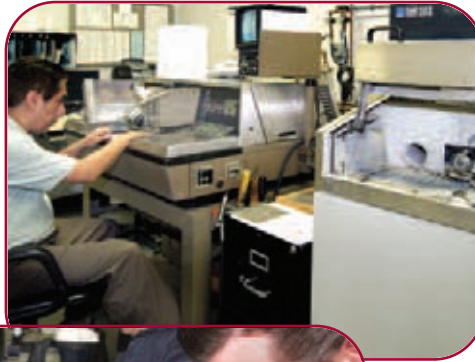
Most balanced amplifiers made by MITEQ are constructed using a carrier technique. Carriers are typically assembled by high speed automated equipment and stocked per model and band. These carriers are

then cascaded in the final chassis to achieve the total specified parameters of the amplifier. Final alignment and test is performed within the overall chassis to ensure compliance to these specifications.

The distributed amplifiers and the feedback designs use a technique where the FETs are mounted directly to the chassis. This technique allows MITEQ to achieve a physically smaller mechanical interface between the input stage and the coaxial transition, making lower noise figures possible. Also, the tighter inter-stage tolerances assist in achieving broader bandwidths, as required by both of these series.

To accomplish the manufacturing and testing of our cutting edge amplifiers, equally state-of-the-art equipment must be utilized. This includes machining equipment to manufacture tight tolerance chassis for our millimeter-wave amplifiers,

glass furnace equipment to control the process of glass sealing, latest microwave test equipment, seam-sealing equipment, thermal/humidity chambers, PIND, shock, and vibration stations for environmental screening.



THIN FILM LAB

## SPECIFICATION DEFINITIONS

### GENERAL SPECIFICATIONS

Most of the amplifiers listed in this catalog are classified by several specifications. They are based on operation at normal room ambient conditions of 23°C. For other parameters as amplifier requirements at other temperatures and environments, please consult the factory or your local representative.

- Operating frequency range
- Gain
- Gain flatness
- Noise figure or noise temperature
- Output power at 1 dB compression
- Input and output VSWR
- DC supply voltage and current consumption

We also can provide data upon request on other parameters such as phase linearity, intermodulation and harmonics, amplitude linearity or temperature variations.

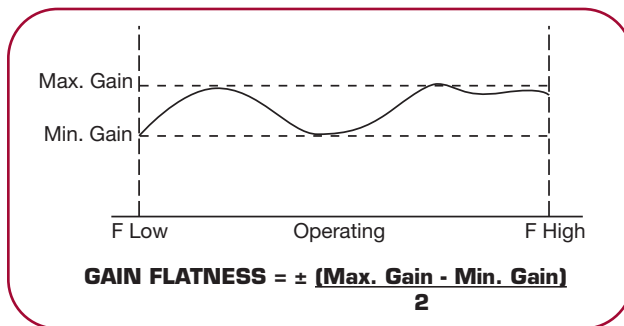
### OPERATING FREQUENCY RANGE

The operating frequency range is the range of frequencies over which the amplifier will meet or exceed the specification parameters. The amplifier may perform beyond this frequency range, and in cases where the amplifier is specified over less than an octave, the actual frequency response may be significantly greater than the specified operating frequency range.

PLEASE NOTE: If an engineer is interested in limiting the response beyond the specified operating frequency range, this should be defined as a separate specification item. In this case, MITEQ can usually incorporate band-limiting elements to meet the desired response.

### GAIN

Gain is defined as the ratio of the power measured at the output of an amplifier to the power provided to the input port. It is usually expressed in decibels and is typically measured in a swept fashion across the operating frequency range. Unless specified, 100% test data supplied by MITEQ will include gain data taken at several points within the band; however, in all cases, the amplifier gain has been measured in a swept fashion with performance verified over the entire frequency band. Gain stability over much larger bandwidths are also verified by measurement especially for new models and over temperature.



Test data supplied with our amplifiers will include swept gain plots taken at least 100 to 1600 points within the band. Tabular data can also be supplied if required.

### GAIN FLATNESS

Gain flatness describes the variation in an amplifier's gain over the operating frequency range at any fixed temperature within the operating temperature range. As such, it does not include the variation of gain as a function of temperature (see Gain Variation vs. Temperature).

The gain flatness of an amplifier is measured by viewing the swept gain and determining the difference between the minimum gain and the maximum gain recorded over the specified frequency range. Unless the amplifier is specified to operate over a defined temperature range, this measurement is performed at room ambient temperature (23°C). If a range of temperatures is specified, the measurement must also be verified at the temperature extremes.

### NOISE FIGURE

Noise figure is classically defined as the ratio of the signal to noise ratio at the input divided by the signal to noise ratio at the output with the input noise equivalent to that from a matched load at 290 degrees Kelvin. All physical bodies emit noise related to its physical temperature. This noise for a matched load is given by the formula  $kTB$ , where  $k$  is Boltzman's constant,  $T$  is the temperature in degrees Kelvin, and  $B$  is the Bandwidth. For example, a 1 MHz bandwidth, and  $T = 290$  degrees K, the noise power is  $-114$  dBm.

$$\text{Noise figure} = \frac{S_i/N_i}{S_o/N_o} = \frac{\text{Signal-to-noise ratio at the amplifier input}}{\text{Signal-to-noise ratio at the amplifier output}}$$

## SPECIFICATION DEFINITIONS (CONT.)

Since all amplifiers add thermal noise, the signal-to-noise ratio at the output will be degraded. Therefore, the noise figure will be a ratio greater than one, or when expressed in decibels, a positive number i.e. NF dB = 10 Log<sub>10</sub> (NF Ratio). The additive noise of an amplifier can also be expressed in a parameter referred to as noise temperature. In this approach, the noise temperature of the amplifier is equal to the temperature (in Kelvin) of a 50 ohm termination at the input of an ideal noiseless amplifier with the same gain and generating the same output noise power.

Note that in the case of low noise amplifiers that have lower frequency range extending to about 200 MHz or lower, one may expect an increase in the NF at the lowest frequencies. This happens as a result of the naturally occurring 1/f noise in semiconductor junctions, which usually has a corner frequency of 100-200 MHz, may show some variation with technology and device vendor and though it is only measurable for very low noise amplifiers, it is very difficult to control or predict. MITEQ has developed proprietary circuit techniques that reduce this effect considerably.

### NOISE TEMPERATURE

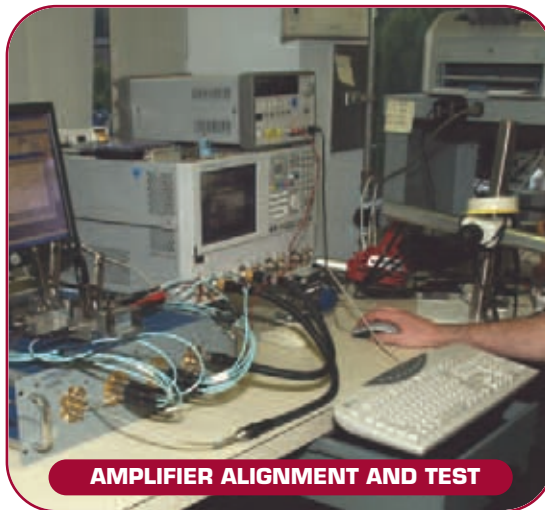
Noise figure was defined at a time when the background noise and system physical temperatures were close to 290 degrees K. With satellite applications, however, the space background temperature is near 4 degrees Kelvin and the noise sources in front of the amplifier are small. In this case, the relationship of the signal-to-noise ratio at the input vs. the signal-to-noise ratio at the output is not simply related to the noise figure definition. It is more intuitive to work with what is called noise temperature. By definition, all noise sources in an amplifier are referred to the input. The noise temperature of the amplifier is defined as the temperature (in Kelvin) of a matched termination at the input of an ideal noiseless amplifier with the

same gain and (the load) generating the same output noise power.

The relationship between noise figure and noise temperature is:

$$\text{Noise Figure} = 10 \text{ Log}_{10} \left\{ \frac{\text{Noise Temp. (K)}}{290 \text{ K}} \right\} + 1$$

Noise figure or noise temperature data is measured at discrete frequencies throughout the band. Test data is supplied at +23°C unless specified otherwise.



### OUTPUT POWER AT 1 dB COMPRESSION

The 1 dB output compression point of an amplifier, or P1dB is simply defined as the output power level at which the gain drops 1 dB below the small signal level.

All active components have a linear dynamic range. This is the range over which the output power varies linearly with respect to the input power. As the output power increases to near its maximum, the device will begin to saturate.

The point at which the saturation effects are 1 dB from linear is defined as the 1 dB compression point. Because of the nonlinear relation between the input and output power at this point, the following relationship holds:

$$P_{1dB} = P_{IN} \text{ 1 dB} + \text{Linear Gain} - 1 \text{ dB}$$

Note that for amplifiers that exhibit very soft compression or even gain expansion, the exact definition of P1dB can be ambiguous or misrepresent a power amplifiers capability.

### INPUT AND OUTPUT VSWR

Most RF and microwave systems are designed around a 50-ohm impedance system. An amplifier's impedance is always designed to be as close as possible to 50 ohms; however, this is not always possible, especially when attempting to simultaneously achieve a good noise figure. The Voltage Standing Wave Ratio (VSWR) of an amplifier is a measure of an amplifier's actual impedance (Z) with respect to the desired impedance (Zo), in most cases 50 ohms.

## SPECIFICATION DEFINITIONS (CONT.)

The VSWR is derived from the reflection coefficient  $\Gamma$ , which is a ratio of the normalized impedance:

$$\Gamma = \frac{Z - Z_0}{Z + Z_0}$$

and:

$$\text{VSWR} = 1 + \frac{|\Gamma|}{1 - |\Gamma|}$$

VSWR is measured with either a scalar or vector network analyzer. The reflection coefficients are determined by comparing the incident power and the reflected power at both ports of the device which in turn are converted and displayed as a VSWR. The ratio of the reflected power to the incident power is also known as the return loss usually expressed in dBs.



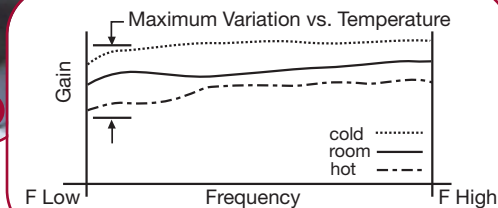
### DC SUPPLY VOLTAGE AND CURRENT CONSUMPTION

Amplifiers, being active devices, require DC power for their operation. MITEQ's amplifiers typically require +15 volts and include an internal voltage regulator. The use of a regulator allows for specification compliant operation even in the presence of power supply voltage variations, as long as minimum voltage supplied is greater than the specified drop-out voltage of the regulator. MITEQ also includes reverse voltage protection to prevent damage due to the accidental application of a negative DC voltage. Internal regulation is present in all MITEQ amplifiers which help eliminate most noise and ripple that may be present on the supply lines. Most power amplifiers are also protected against over-current and over-temperature conditions. With a few exceptions almost all MITEQ amplifiers require a single positive voltage, typically 15V, to operate. Other voltages and AC supply options are also available.

### ADDITIONAL SPECIFICATIONS

In addition to the electrical specifications for most of the models within this catalog, there are additional specifications that may be of concern to the engineer designing around stringent system requirements:

- Gain variation vs. temperature
- Overall gain window
- Group delay and flatness
- Output intercept point
- Dynamic range
- Amplifier de-sense
- Reverse isolation
- Phase linearity
- Phase and amplitude matching and tracking
- AM to PM conversion
- Phase noise
- Pulse conditions
- Maximum input power
- RFI immunity
- Environmental requirements



### GAIN VARIATION VS. TEMPERATURE

Gain variation versus temperature defines the maximum allowable variation of the linear gain due to temperature at any discrete frequency. As a result, this parameter does not account for drift over frequency. Gain variation versus temperature is measured by performing swept gain measurements at the specified temperature extremes and comparing the deviations between the two sweeps at a particular frequency to determine the greatest change. When a  $\pm$  value is used, then the delta is taken at both temperature extremes with respect to room temperature (23°C). (For typical gain variation values vs. temperature see Thermal Considerations section.)

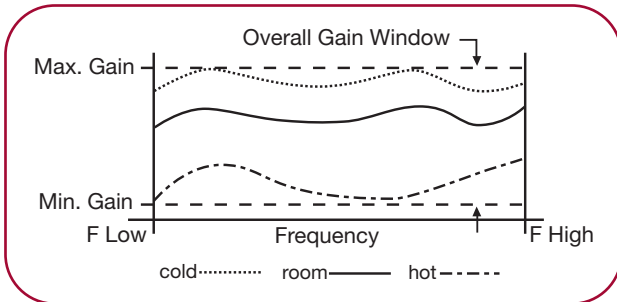


## SPECIFICATION DEFINITIONS (CONT.)

### OVERALL GAIN WINDOW

An overall gain window specification defines the absolute minimum and maximum gain values over both temperature and frequency.

In reality, it is the most complete way to specify an amplifier; however, it does impact the price due to the additional testing and alignment required by adding this constraining parameter.

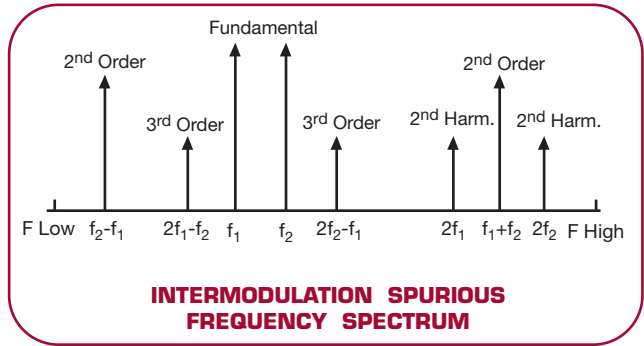


### GROUP DELAY AND FLATNESS

Group delay is a measure of the transit time of a signal through a device versus frequency. It is a useful measure of phase distortion and is calculated by differentiating the insertion phase of the device with respect to frequency. The linear portion of the phase response represents the average signal transmit time and deviations from this constant represent distortion. For many radar and communication applications, such distortions need to be kept below a threshold.

### OUTPUT INTERCEPT POINT

Solid state amplifiers use transistors and/or MMICs, to provide gain. Although these devices are generally used in a linear mode (except in the case of other than a Class A amplifier), they still exhibit nonlinear phenomenon, such as intermodulation effects and harmonic generation. These effects are evident in intermodulation products present at the output. In the case of the single-tone input condition, the nonlinear output signal components are the harmonics of the fundamental input signal. In the case of the two-tone input condition, the intermodulation products are generated as a result of mixing of two input tones at the frequencies  $f_1$  and  $f_2$ . The most common are the second order and the third order two-tone products.



Second order two-tone spurs are the sum and difference product of the fundamental input frequencies, i.e.,

$$f_{\text{SPUR}} = f_1 \pm f_2$$

These spurious signals are only of concern when the band is greater than one octave. If the frequency range is less than one octave, the two-tone second order spurs will be out of band.

These spurious signals are characterized with respect to the input signal by means of a theoretical tool called an intercept point. These points are defined as the point where the linear curve of input vs. output power of the fundamental would intersect with the linear curve of the spurious signal if saturation effects would not limit the output levels of these signals. Since it is known that the second order spurious products have a slope of 2:1 with respect to the fundamental input power, the value of the spurs can be estimated if the input signal power ( $P_{\text{IN}}$ ) and the output second order intercept point ( $\text{OIP}_2$ ) are known. The relationship is as follows:

$$\text{Two-tone second order spurious suppression} = \text{OIP}_2 - (P_{\text{IN}} + G)$$

$$\text{Two-tone second order spurious level} = 2(P_{\text{IN}} + G) - \text{OIP}_2$$

Third order spurious products result from combinations of the fundamental signal and the second harmonics.

$$f_{\text{SPUR}} = |2f_1 \pm f_2| \pm |f_1 \pm 2f_2|$$

## SPECIFICATION DEFINITIONS (CONT.)

The slope of third order spurious signal is 3:1 with respect to the fundamental input power, and again the value of the spurs can be estimated if the input signal power ( $P_{IN}$ ) and the output third order intercept point ( $OIP_3$ ) are known. The relationship is as follows:

$$\text{Two-tone third order spurious suppression} = 2 \{OIP_3 - (P_{IN} + G)\}$$

$$\text{Two-tone third order spurious level} = 3 (P_{IN} + G) - 2 OIP_3$$

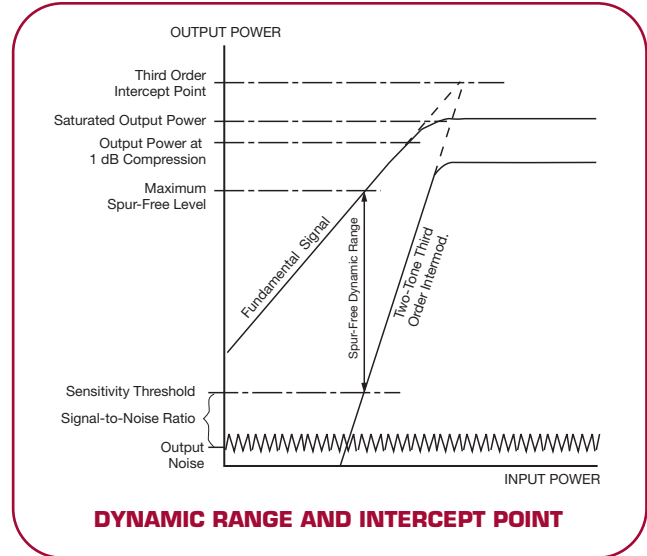
A rule of thumb is that the  $OIP_3$  is 10 dB above the 1 dB compression point, but this is often not the case. In many amplifiers, compression is not monotonic (such as with gain expansion) vs. input level. This depends upon the type of FET and to some degree its bias conditions. When this happens, the third order intercept is degraded. Degradation of the third order intercept can also occur when two or more stages are compressing at the same time as a result of improper design or biasing. Also, there can be significant measurement error. This is possible as more than one stage is contributing to the generation of spurs, and depending on the phase of the separately generated spur, the sum of the two sources may cancel or add at certain signal levels of temperature.

### DYNAMIC RANGE

Dynamic range can be defined in several ways. The two classical methods are to define the linear dynamic range and the spurious free dynamic range.

The linear dynamic range defines the difference between the Minimum Detectable Signal (MDS), referred to the input of the amplifier or receiver and the maximum signal level at which the amplifier remains linear. This is typically defined by the input 1 dB compression point ( $P1dB - G$ ). The minimum detectable signal is defined by system constraints, such as noise figure, bandwidth and minimum signal-to-noise ratio required for operation.

Spurious free dynamic range is defined as the difference between the minimum detectable signal at the input and the input level at which the intermodulation signals generated from two equal tones would either equal this MDS or some other acceptable level. The dynamic range can then be estimated by the following



relationship:

$$\text{Two-tone spurious free dynamic range} = (2/3) (IIP_3 - MDS)$$

$$MDS \text{ (dBm)} = -114 + 10 \log_{10} (BW \text{ in MHz}) + N.F. + SNR$$

Where SNR is the required signal to noise ratio of the system for proper operation. Note that spurious-free does not actually mean totally distortion free, but where the distortion that is present is below the detectable levels.

### AMPLIFIER DE-SENSE

It is a measure of the amplifiers ability to function properly in the presence of a strong interferer. It is typically defined as the level of signal present somewhere in the passband of the amplifier that will cause a gain degradation of a specific amount, say 0.1 dB, for the desired signal.

### REVERSE ISOLATION

Reverse isolation simply defines the isolation between the input and output of an amplifier. It is tested by injecting a signal into the output port and measuring its level at the input. Ideally, the isolation should be at least 10 dB greater and preferably 15 dB greater than the amplifiers gain. With low isolation, the load VSWR can affect the input VSWR and possibly affect the gain flatness and phase. Single stage amplifiers will often have lower isolation, and should be considered in a system's design.

### PHASE LINEARITY

The phase of a signal versus frequency will be distorted due to the nonlinear phase elements within the amplifier. This distortion is called phase linearity and is measured by means of a vector network analyzer across the operating frequency range.

The phase non-linearity of a device can be defined as the deviation in phase from that of a matched transmission line of the same average electrical length. This is equivalent to variations in the transit time through a device as a function of frequency. This variation causes the distortion of modulated signals.

Phase linearity in an amplifier is affected by the internal interaction of reactance's, some types of feedback, and impedance mismatches (reflections). Thus narrow bandwidth amplifiers will have worse phase linearity than broadband designs as narrow bandwidth amplifiers require more tuned (reactive) circuits.

In general, MITEQ amplifier designs are inherently broadband, which results in excellent phase linearity and low amplitude ripple.

### PHASE MATCHING

Phase matching, in the strict sense, is defined as the difference in insertion phase between any two or more units over a specific frequency range. This parameter is usually defined across the operating frequency band, however, in some cases it is defined over frequency segments ( $\Delta f$ ) within the overall operating band.

In the case of the definition over the entire band, the insertion phase is measured by means of a vector network analyzer, stepped across the band. The values at each frequency for two amplifiers are subtracted to provide a delta plot across frequency. Since each system has its own peculiarities, there are a wide variety of variations of this definition. Therefore, if your system requirements are such that this definition does not accurately meet your needs, or if this level of definition exceeds your real need and results in higher cost, you should contact MITEQ's engineering staff to discuss the most cost effective options.

### PHASE TRACKING

Phase tracking is very similar to phase matching. However, an arbitrary fixed offset exists between the amplifiers that can usually be compensated by the system software. The offset, sometimes referred to as the DC component (because all that remains is the phase versus frequency ripple and slope), is calculated at each temperature based upon an average over the band. As with phase matching, there are many variations on this theme that also should be discussed with MITEQ's engineering before committing to a final specification.

### AMPLITUDE MATCHING

Same as phase matching, except substitute gain for phase.

### AMPLITUDE TRACKING

Same as phase tracking, except substitute gain for phase.

### AM TO PM CONVERSION

This specification parameter defines the change in phase at any fixed frequency within the operating band relative to the input signal power. It is usually defined in terms of degrees per dB ( $^{\circ}/\text{dB}$ ) over a specified input dynamic range. Most GaAs FET amplifiers exhibit well-behaved AM/PM conversion (less than  $1^{\circ}/\text{dB}$ ) up to a few dB below the 1 dB compression point. Beyond the 1 dB compression point, the variation can be quite large, depending on the devices and biasing conditions used.

AM to PM is primarily due to the changes in the input and output VSWR of the various stages and their interaction. This can be visualized as phase shifts due to the changing reflections between stages. As a rough rule of thumb, the phase shift increases 1 or 2 degrees per 1 dB of compression.

### PHASE NOISE

Phase noise is the frequency domain representation of rapid, short-term, random fluctuations in the phase of a waveform. It is mostly a concern for sources and oscillators but it may be important in some applications to take into account the phase noise contribution of amplifiers also. Since any active component is capa-

## SPECIFICATION DEFINITIONS (CONT.)

ble of contributing to the phase noise of a signal, amplifiers will add a phase noise component, however small, to any signal passing through them. This noise is typically measured and characterized at a certain offset from the carrier and expressed in terms of dBc/Hz. A typical amplifier will have around  $-140$  dBc/Hz at 10 kHz for example. MITEQ offers a family of low-phase noise amplifiers up to 18 GHz.

### PULSE CONDITIONS

A variety of pulse conditions can be specified for an amplifier, including amplitude or phase overshoot and ringing, amplitude or phase settling time, droop, rise and fall times, recovery time, etc. In general, our broadband amplifiers have excellent pulse recovery characteristics. We build many special pulse amplifiers with rise times as low as in the tens of pico-seconds. We have amplifiers for high-data rates such as for 15 Gb/s applications with rise times near 30 pS.

Other than these high-data-rate applications, MITEQ has also developed a series of pulsed power amplifiers specifically for radar applications.

As with the matching and tracking specifications, pulse operation parameters are typically system dependent and rarely fall into a standard definition. Therefore, it is best to contact MITEQ's engineering staff when attempting to define the operation of an amplifier in the presence of pulsed signals. Pulsed power amplifiers are also a distinct category where not just the RF but the high currents associated can also be switched at high speeds.

### MAXIMUM INPUT POWER

Most low noise figure amplifiers will withstand an input level of 13 dBm CW. In the event that you require a higher input level, an input limiter can be added to the front end of the amplifier in order to protect it. The problem with the addition of the limiter is that its insertion loss is directly additive when calculating the overall noise figure. MITEQ can integrate input limiters up to 100W level into many of its amplifiers.

### RFI IMMUNITY

RFI can be a serious consideration in certain very low-noise, high gain or very high power applications. It is also important for applications that have the amplifier exposed outdoors, near high-power transmitters or mast-tops where lightning effects need to be taken into account.

The very fact that all MITEQ amplifiers are built in metal housings, with sealed covers and shielded connectors provides a level of immunity from most types of common radiated and conducted interference. Still, there are applications where this typically 60-75 dB range of isolation may not be sufficient. Type of connectors, the way they are assembled, cover thickness and DC feedthru have to be scrutinized for higher levels of isolation. In many telecom applications, there are standards that specify the type of immunity and methods of measurements. All such requirements should be discussed with MITEQ engineering.

### ENVIRONMENTAL REQUIREMENTS

While specifying environmental specifications for an amplifier, most important consideration is if a hermetic package is required. Customer needs to identify specifically all the extremes of the final environment. Most applications may require a hermetic seal. Standard environmental seal may be sufficient. If there is 100% condensation, altitude extremes or direct exposure to elements then a hermetic sealed packaging should be requested. In case the amplifier has to withstand direct exposure to elements, then a weatherproof housing is required which may entail special connectors, gasketing, windows for waveguide parts and special paint. Amplifiers can be made weatherproof without the need for hermetic sealing. There are numerous industry standards for environmental testing and screening and such issues should be discussed with MITEQ engineering ahead of time.

## SPECIFICATIONS DEFINITIONS (CONT.)

### OPTIONS

Options for a variety of special performance and testing requirements as well as connector types can be identified by adding a suffix to the part number. The table below lists the most commonly requested options. Option requests should be accompanied by a description of the required performance details as applicable. Note that not all options are available for all amplifiers and some options may conflict with each other.

| STANDARD OPTIONS                              | SUFFIX | STANDARD OPTIONS (CONT.)  | SUFFIX |
|---|--------|---------------------------|--------|
| Input Limiter                                 | -L     | DC On/Off Control         | -TTL   |
| Gain Window                                   | -GW    | Heatsink                  | -H     |
| Gain Flatness                                 | -GF    | DC Pulsed Amplifier       | -PLS   |
| Temperature Compensation                      | -TC    | Isolator at Output        | -ISO** |
| Phase Match                                   | -PM    | Detector Output           | -DET   |
| Amplitude Match                               | -AM    | Low Phase Noise           | -LPN   |
| Amplitude/Phase Match                         | -APM   | Amplitude Track           | -AT    |
| Gain Control                                  | -GC    | Phase Track               | -PT    |
| Hermetic                                      | -H     | Amplitude and Phase Track | -APT   |
| Bias Through Output                           | -BTO   |                           |        |
| Bias Through Input                            | -BTI   |                           |        |
| Specific Operating Voltage                    | -XXDC* |                           |        |
| Gain Slope                                    | -GS    |                           |        |
| Power Supply                                  | -PS    |                           |        |
| Fault Alarm                                   | -F     |                           |        |
| Combination of three or more standard options | -S     |                           |        |
| Waveguide Input                               | -WG    |                           |        |
| Weatherized                                   | -WP    |                           |        |

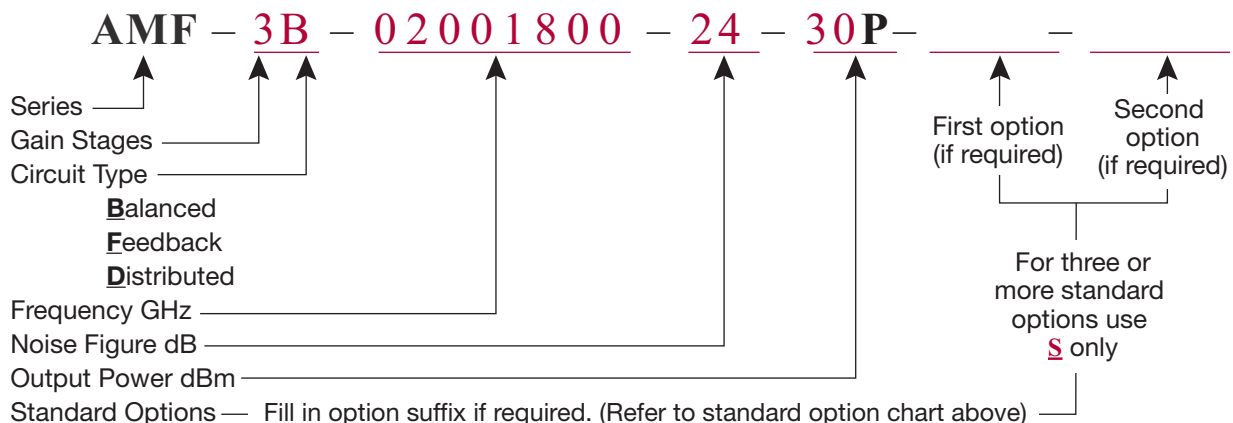
| STANDARD CONNECTOR OPTIONS | SUFFIX |
|----------------------------|--------|
| N Type Connector           | -N     |
| TNC Type Connector         | -T     |
| SMA Male Connector         | -M     |
| K Type Connector           | -K     |
| V Type Connector           | -V     |

\* XX is the DC operating voltage

\*\* Some power amplifiers have an isolator at output at output by default.

### ORDERING INFORMATION

General amplifier model naming rules:



## THERMAL CONSIDERATIONS

The following information can be used as a guide relative to the changes in performance of an amplifier as a function of temperature.

### GAIN

The gain of a typical amplifier, that is not temperature compensated, tends to decrease as the operating temperature of the device increases. Since most low-noise amplifiers have their specifications defined at 23°C, the difference in the gain caused by temperature is approximately 0.01 dB/°C/stage for driver stages and 0.015 dB/°C/stage for power stages.

By temperature compensating the amplifiers, improvements of 1/4 to 1/2 of the uncompensated gain change can be realized depending on the frequency bandwidth, gain, power, and temperature extremes. Out of band gain is typically 3-5 dB less than in-band gain.

### 1 dB COMPRESSION POINT

The 1 dB compression point, P1dB, of a low-noise amplifier varies inversely proportional to the operating temperature. As the temperature increases over room temperature (23°C), the P1dB will typically decrease up to 0.01 dB/°C, but this is not an absolute rule. Deviations from this characteristic may not hold at cold temperatures and with temperature compensation. For power amplifiers, output power and P1dB may drop by approximately 0.5 dB at the hot end of the operating range.

### THE SATURATED OUTPUT LEVEL RELATIVE TO THE 1 dB COMPRESSION POINT

The maximum output of an amplifier relative to the P1dB is not a fixed number. The PHEMT FETs used in many of our low noise products have a soft limited output, and the maximum output can be 1 or 2 dB above the P1dB. Other FETs may hard limit at 0.5 to 1 dB above the P1dB. On the other hand, GaN devices that are finding widespread use in power applications typically have very soft compression characteristics, which make P1dB definitions rather ambiguous.

### NOISE FIGURE VS TEMPERATURE

The noise figure variation as a function of temperature is dependent upon the noise figure at room temperature, the gain per input stage(s), and the type of FET used.

The noise figure of a typical amplifier will increase as the operating temperature of the device increases over room temperature (23°C). This rise in noise figure is typically 0.01 dB/°C. Thus, if the noise figure of an amplifier is defined by the manufacturer as 0.9 dB, and the unit has to operate at 85°C, the expected noise figure will be approximately:

$$[85^{\circ}\text{C} - 23^{\circ}\text{C}] [0.01 \text{ dB}/^{\circ}\text{C}] + 0.9 \text{ dB} = 1.52 \text{ dB}$$

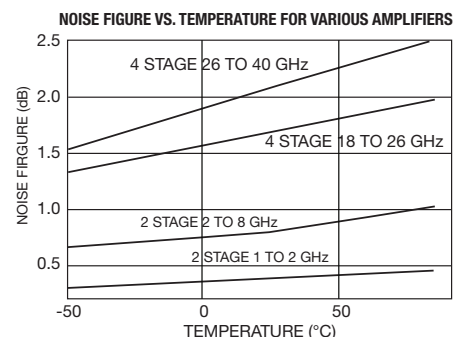
Similarly, for cold temperatures, the noise figure decreases at the same rate.

As you can see in the following graph, we can have a 0.001 dB per degree C slope for low noise figures, to 0.007 dB per degree C for the 26 to 40 GHz amplifier. The slope will be steeper for higher noise figure amplifiers, and for amplifiers with lower gain input stages. The variation of the first stage gain vs temperature for a low gain stage will cause a larger slope (due to the following second stage contribution to the noise figure) than just the change in temperature of the amplifier noise sources would explain.



**AUTOMATED EPOXY AND DIE PLACEMENT**

figure amplifiers, and for amplifiers with lower gain input stages. The variation of the first stage gain vs temperature for a low gain stage will cause a larger slope (due to the following second stage contribution to the noise figure) than just the change in temperature of the amplifier noise sources would explain.



## THERMAL CONSIDERATIONS (CONT.)

### HEATSINKING

All amplifiers utilize active components that dissipate heat when bias is applied. As such, proper mounting and heatsinking must be achieved in order to maintain the proper junction temperatures of the devices and ensure specification compliant operation. This is done via conduction cooling of the amplifier case to a baseplate or mounting surface. It is recommended that the mounting surface is smooth and clear of any foreign substances, so that there is a clear thermal path between the baseplate of the amplifier and that of the mounting surface. We also recommend that thermal grease be used wherever possible to enhance the conductivity of the thermal path.

Since the amplifiers are sealed housings, there is no way to remove the heat other than by conduction through the body of the amplifier, even when the ambient temperature is significantly below that of the baseplate. For higher power models, heatsinks are required. Please consult MITEQ for details.

In order to increase the efficiency and reduce the thermal stress on the components in our amplifiers, MITEQ has done extensive research on the thermal effects of the heat generating devices, various material combinations, and attachment schemes used. Most of our designs use either aluminum, copper/tungsten, or Kovar for the chassis, and aluminum for the mounting fixtures.

### TYPICAL POWER AMPLIFIER HEAT TRANSFER

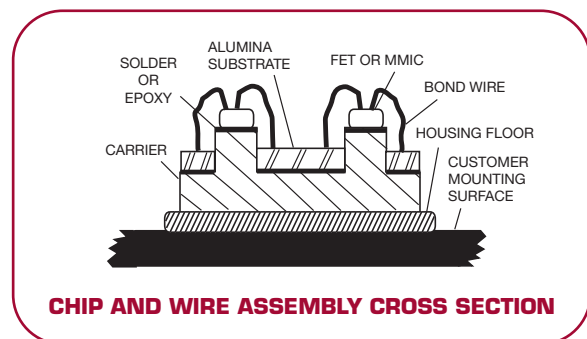
It is important for the user to understand that in addition to the thermal resistance of the chassis metal, every interface, starting with the mounting of the FET into the amplifier package, results in a thermal gradient. As such, one should try to minimize these various interfaces by direct attachment wherever possible.

In order to minimize the thermal resistance, MITEQ either eutectically bonds or epoxies the

FETs directly to the housing. Since most of the FETs are less than 20 x 20 x 5 mils and the mounting posts are large, there is a good thermal path between the FET and the chassis. Given typical power dissipation for a FET in a particular amplifier, the rise in junction temperature is calculated. The reference is always the bottom surface of the chassis or housing.

$$T_J = T_{case} + (V_{DS} I_{DS} - P_{out}) (R_{\theta})$$

Where  $(V_{DS} I_{DS} - P_{out})$  is the total power dissipated output and  $R_{\theta}$  is the thermal resistance of the device. To further guarantee a good thermal path, the base of both the amplifier and mounting fixture should be machined to very fine tolerance (i.e., 0.001"/inch).



## QUALITY ASSURANCE

### QUALITY ASSURANCE

MITEQ believes that quality must be built into all of the products that we manufacture. As such, we take extreme care in maintaining a complete and detailed product assurance program. Our product quality is structured to and operates within the precepts of ISO 9001:2008 and AS9100 Revision B and to MIL-I-45208. This, in turn, allows us to meet the rigorous requirements generated by our customers in the aerospace, military, and commercial sectors. Internal procedures are used to relate all functions affecting quality, from initial design through final acceptance. These procedures detail the responsibilities and functions necessary to maintain effective controls and to provide a means for evaluating quality disciplines during all phases of a job's performance.

Beginning with the audit of the customer's contract, our Quality Assurance Department will review and evaluate the contract and all of the specifications applicable to the job. Quality requirements and characteristics are highlighted and adequate plans are implemented to ensure the incorporation of all aspects pertaining to overall product quality. Quality assurance activities will be coordinated with engineering, manufacturing, and procurement during all phases of an order to ensure the transmittal of complete quality information to all manufacturing centers and inspection stations in a manner consistent with schedule requirements.

MITEQ, through our Quality Assurance and Purchasing Departments, is responsible for the quality of all purchased items. Procurement sources will be selected and approved, based upon the supplier's quality history records, facility and quality system surveys, or coordinated industry records. Approved sources will be required to maintain a quality program that is commensurate with the requirements of the items being purchased and in compliance with the contract.

Copies of MITEQ's Quality Manual and Workmanship Standard, that define the methods used for both quality and process control, are available upon request.

### TEST EQUIPMENT

MITEQ maintains a complete inventory of the latest state-of-the-art mechanical, electrical, and manufacturing test equipment. Equipment calibration and maintenance is performed and is traceable to the requirements of MIL-STD-45662A.



## MEAN TIME BETWEEN FAILURE (MTBF)

For the past 40 years, MITEQ has supplied thousands of different models of microwave hybrid amplifiers to the industry.

Reliability calculations have been performed in accordance with MIL-HDBK-217F for ground benign equipment at 23°C. From these calculations MITEQ has concluded that these amplifiers are extremely reliable.

### CASE I

A low-noise amplifier built to commercial standards using commercial parts.

### CASE II

The same amplifier built in a Kovar chassis, hermetically sealed, using commercial parts, but screened in accordance with a test flow similar to that of MIL-PRF-38534 Class H.

### CASE III

The same amplifier built in a Kovar chassis, hermetically sealed but, consisting of specially purchased high-reliability components and screened to a process similar to that of MIL-PRF-38534 Class K.

Our low-noise amplifiers are estimated to have a minimum MTBF per the following table:

| MTBF (HOURS) |                     |                     |                       |                      |
|--------------|---------------------|---------------------|-----------------------|----------------------|
| CASE         | ONE-STAGE AMPLIFIER | TWO-STAGE AMPLIFIER | THREE-STAGE AMPLIFIER | FOUR-STAGE AMPLIFIER |
| CASE I       | 300,000             | 200,000             | 120,000               | 115,000              |
| CASE II      | 3,000,000           | 2,000,000           | 1,200,000             | 1,100,000            |
| CASE III     | 12,000,000          | 8,200,000           | 4,900,000             | 4,400,000            |

The MTBF of low-noise amplifiers with more than four gain stages can be estimated by using the equations in the following table:

| MTBF (HOURS) |  |
|--------------|--|
| CASE         | EQUATION                                   |
| CASE I       | $MTBF = 100,000 \text{ HRS.} \times 3/N$   |
| CASE II      | $MTBF = 1,000,000 \text{ HRS.} \times 3/N$ |
| CASE III     | $MTBF = 4,000,000 \text{ HRS.} \times 3/N$ |

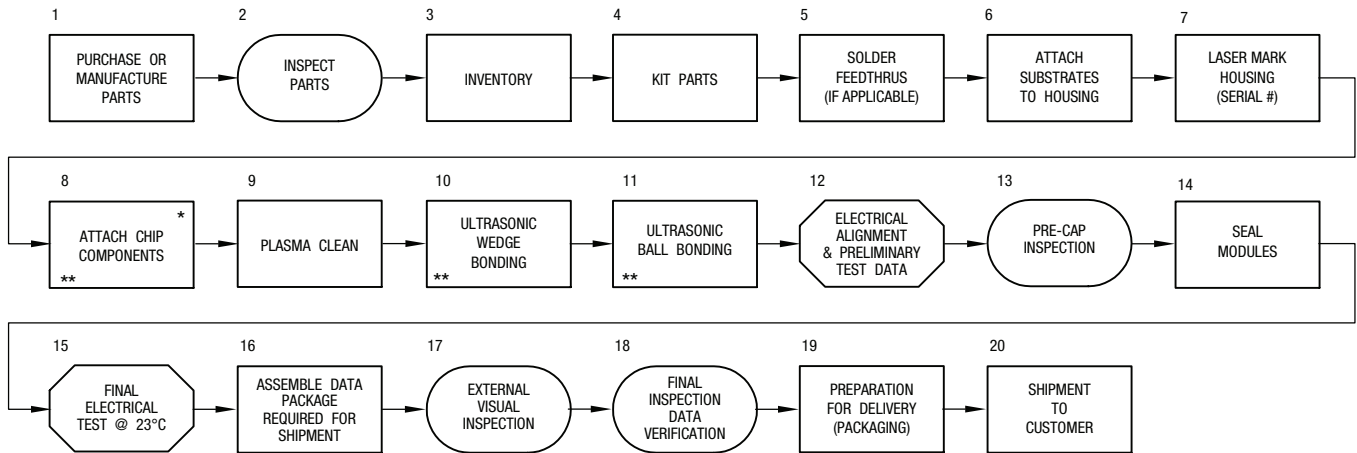
Where N is the number of stages in the amplifier.

The above analysis is only relevant for low-noise low-power amplifiers (amplifiers where the 1 dB compression point is 10 dBm or less). High-power amplifiers require individual calculations and usually result in significantly lower estimations for the MTBF.

# MANUFACTURING FLOW DIAGRAMS

The following diagrams depict the process flow for both our commercial and high-reliability amplifiers:

## COMMERCIAL GRADE AMPLIFIERS

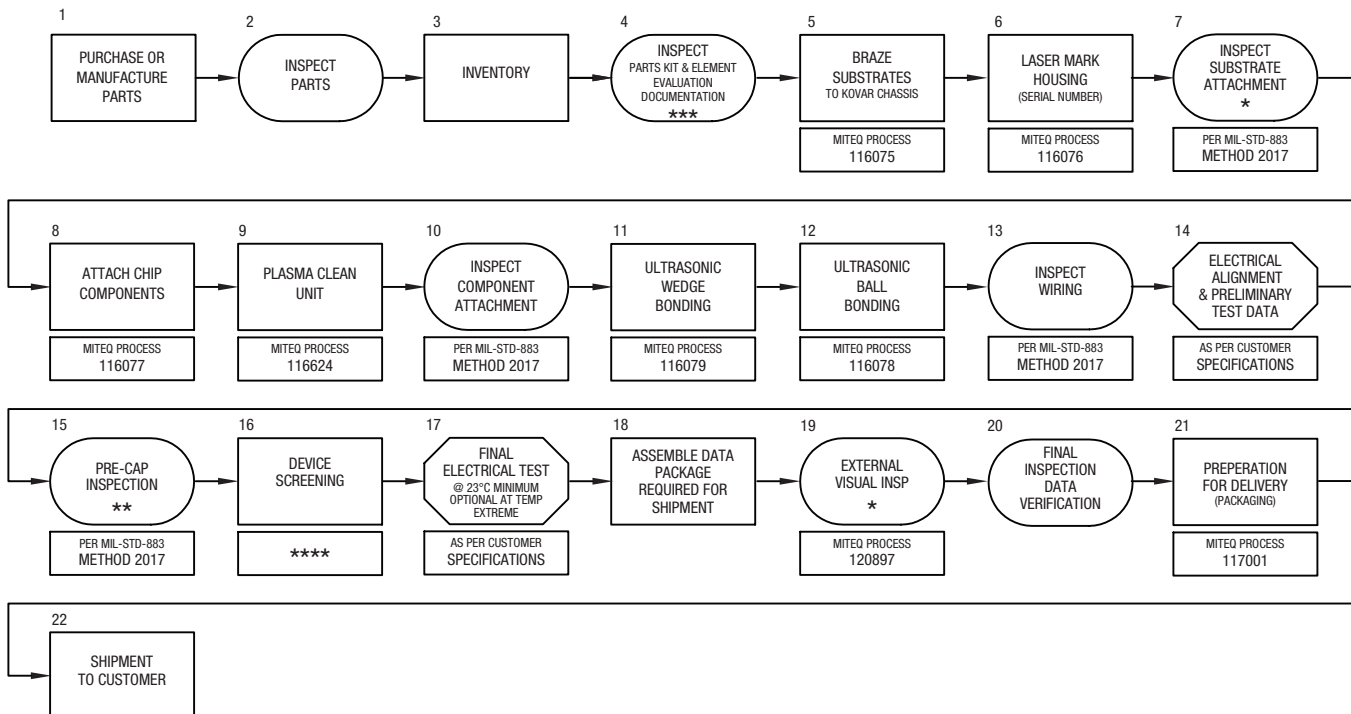


\* CURED IN CONTROLLED BELT FURNACE. MANUAL AND AUTOMATED CAPABILITIES  
 \*\* DAILY BOND SCHEDULE AND EPOXY CURING SCHEDULE VERIFICATION

### LEGEND



## HIGH RELIABILITY HERMETICALLY SEALED AMPLIFIERS



\* FOR MIL-PRF-38534 CLASS K EQUIVALENT RADIOGRAPHIC INSPECTION REQUIRED ALSO  
 \*\* FOR MIL-PRF-38534 CLASS K EQUIVALENT 100% WIRE BOND PULL REQUIRED  
 \*\*\* IF REQUIRED BY CONTRACT  
 \*\*\*\* PERFORMED PER MIL-PRF-38534 TABLE C-1X EQUIVALENT OR MODIFIED TO MEET CUSTOMER REQUIREMENTS

### LEGEND



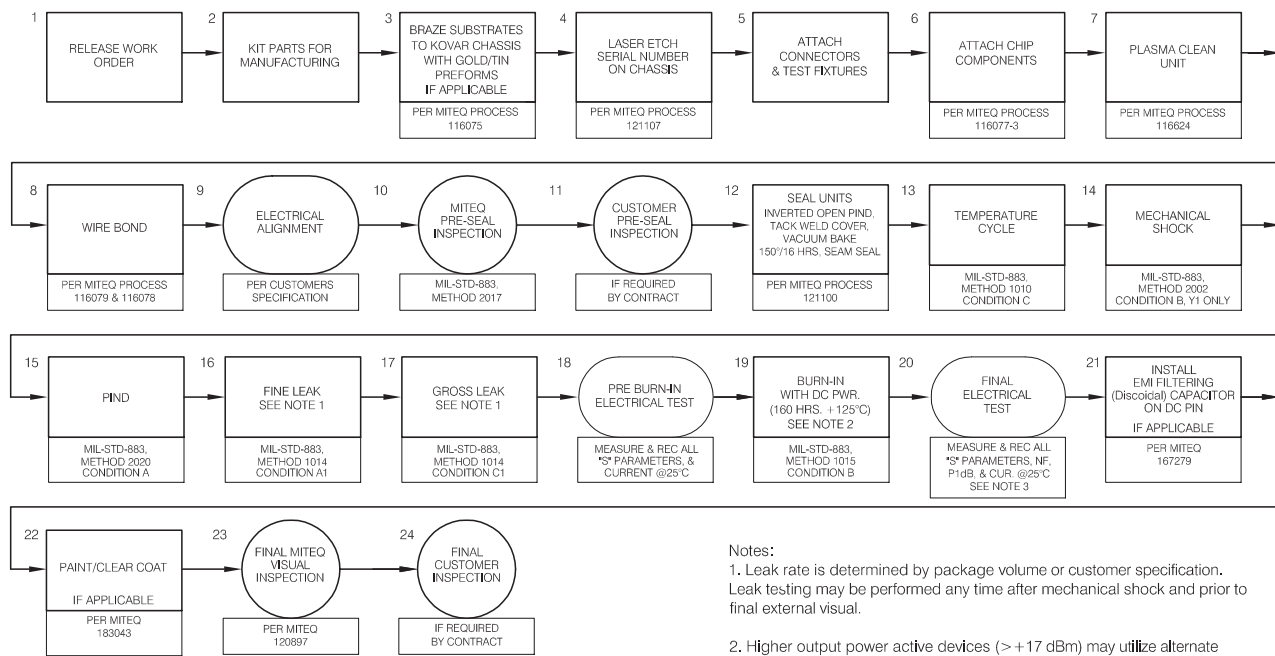
# TYPICAL MITEQ DEVICE SCREENING

MITEQ maintains an assortment of its own environmental testing equipment to further ensure product quality and facilitate the testing of our products. Our environmental lab is capable of testing the following:

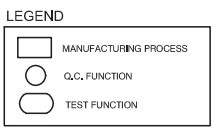
- Mechanical shock
- Vibration
- Burn-in
- Temperature cycling
- Thermal shock
- Gross leak
- Fine leak

The optional device screening shown here is as per MIL-PRF-38534E Table C-1X Class H and MITEQ Screening Flow 184004.

## ASSEMBLY, SCREENING FLOW CHART FOR HIGH RELIABILITY, MICROWAVE (Ref. MIL-PRF-38534 Table C-1X, Class H Equivalent Test Flow)



- Notes:
1. Leak rate is determined by package volume or customer specification. Leak testing may be performed any time after mechanical shock and prior to final external visual.
  2. Higher output power active devices (> +17 dBm) may utilize alternate burn-in profile as agreed by customer. Enter Duration, Temperature, and Voltage on Traveler.
  3. Test data provided at +23°C only. Test at temperature extremes only if required by P.O.



## GENERAL SPECIFICATIONS

Most low noise amplifiers are or can be offered hermetically sealed. Amplifiers with 30 dBm or more output power capability will have lower maximum baseplate temperatures allowed and it can vary from 65 to 75°C depending on the total dissipation and size. Specifications and data are for 23°C operation unless indicated otherwise.

MITEQ's standard low noise amplifiers have been designed to typically meet the following conditions:

Typical operating temperature ....-54 to +85°C for LNAs, -40 to +65°C for higher power

Storage temperature .....-65 to +125°C

Humidity .....95% relative humidity, Noncondensing

Vibration .....7 g's rms, 50-5000 CPS, per MIL-STD-810B, Method 514, Procedure 5

## SPACE-QUALIFIED AMPLIFIERS

MITEQ is a leading supplier of RF and microwave components, equipment, and systems for both commercial and defense applications, including; satellite, avionics, reconnaissance, surveillance, radar, and electronic countermeasure systems. Our continued advancements in the state-of-the-art and unique capability have led to wide acceptance of our company as a forerunner in the field of low-noise amplifier technology for space applications. We are confident that based on our experience we can offer you the following:

- Mature technology with heritage on space flight platforms.
- An organization dedicated to developing and manufacturing the very best low-noise amplifiers for space use.

- A staff of amplifier experts with state-of-the-art experience in both space and military type amplifiers.
- Cost competitive products.
- Low risk (both technical and schedule), through an extensive inventory of standard designs.
- Very high reliability.

MITEQ's Space-Qualified Quality Assurance Plan establishes the actions and controls necessary to provide confidence that the end-item will meet the quality, reliability, and electrical performance required for space qualified applications. This plan includes the use of parts, materials, process controls, product screening, traceability, configuration control, and destructive physical analysis. Please contact MITEQ for a copy of our Space-Qualified Quality Assurance Plan.

## CONFORMANCE TO CUSTOMER QUALITY REQUIREMENTS

MITEQ's involvement in various high-reliability space programs represents a spectrum of programmatic and quality requirements ranging from a process and test flow similar to that of **MIL-PRF-38534 Class H** or **K**.

All open-die, thin-film products are manufactured and tested within MITEQ's clean rooms (FED-STD-209, Class 100,000 and Class 10,000) according to program requirements.

In addition to compliance to stringent manufacturing controls, MITEQ possesses the capabilities to support the **program management** and extensive **documentation requirements** of your space contracts including:

- Configuration Control
- Design Reviews
- Traceability
- Thermal Analysis
- Parts Derating
- Design Analysis

- WCA
- FMECA
- MTBF
- Parts, Materials, and Processes
- Dynamic Stress
- Process Documentation
- EMI/EMC
- Radiation Susceptibility

All analysis and support provided is based upon individual custom requirements as set forth in the customer Statement of Work and/or Specifications. MITEQ has established controls, procedures and a philosophy with the customer in mind. **Conformance to customer requirements** has been paramount in all the programs we have supported throughout our history. It is this philosophy that had secured our successes in the past, and will guarantee our success in the future.



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# Power Amplifiers

All MITEQ amplifiers with a power output of 30 dBm and above.

## POWER AMPLIFIERS

### AMFG-3F-00230025-50-37P

#### POWER AMPLIFIER

This GaN amplifier has a gain of 40 dB in the 230-250 MHz band and delivers 37 dBm. Similar models cover 30 MHz to 4.0 GHz in power ranges from 33 to 40 dBm. For proper operation, 30V supply is needed for all AMFG line amplifiers.



| MODEL NUMBER            | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|-------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMFG-3F-00030300-60-33P | 0.03-3                    | 40              | 2                         | 6                       | 33                                   | 2:2.2              | 0.6*                       | 133171-3        |
| AMFG-3F-00030400-60-32P | 0.03-4                    | 40              | 2                         | 6                       | 32                                   | 2:2                | 0.6*                       | 133171-3        |
| AMFG-3F-00040250-60-33P | 0.04-2.5                  | 40              | 2                         | 6                       | 33                                   | 2:2.2              | 0.67*                      | 133171-3        |
| AMF-4D-00100100-30-30P  | 0.1-1                     | 44              | 1                         | 3                       | 30                                   | 2.2:2.2            | 0.85                       | 118406-4        |
| AMFG-3F-00700380-60-35P | 0.1-3.8                   | 40              | 2                         | 6                       | 35                                   | 2.5:2.5            | 1.5*                       | 133171-3        |
| AMFG-3F-00230025-30-37P | 0.23-0.25                 | 50              | 1                         | 3                       | 37                                   | 1.5:2              | 0.2*                       | 133171-3        |
| AMF-4D-00400600-50-30P  | 0.4-6                     | 34              | 2                         | 5                       | 30                                   | 2:2.3              | 0.65                       | 132513-2        |
| AMF-1B-00500100-60-30P  | 0.5-1                     | 12              | 1                         | 6                       | 30                                   | 2:2.2              | 0.5                        | 143477-1        |
| AMF-2B-00500100-45-33P  | 0.5-1                     | 25              | 1.5                       | 4.5                     | 33                                   | 2:2                | 1.3                        | 143477-2        |
| AMF-3B-00500100-13-33P  | 0.5-1                     | 43              | 1.5                       | 1.3                     | 33                                   | 2:2                | 1.7                        | 125420          |
| AMF-3B-00500100-25-33P  | 0.5-1                     | 43              | 1.5                       | 2.5                     | 33                                   | 2:2                | 1.7                        | 125420          |
| AMF-4B-00500100-13-33P  | 0.5-1                     | 55              | 1.5                       | 1.3                     | 33                                   | 2:2                | 1.8                        | 125420          |
| AMF-4B-00500100-25-33P  | 0.5-1                     | 55              | 1.5                       | 2.5                     | 33                                   | 2:2                | 1.8                        | 125420          |
| AMF-1D-00500200-70-30P  | 0.5-2                     | 8               | 1                         | 7                       | 30                                   | 2:2.3              | 0.4                        | 114293-1        |
| AMF-2F-00500200-60-30P  | 0.5-2                     | 18              | 1.5                       | 6                       | 30                                   | 2:2.3              | 0.65                       | 183016          |
| AMF-3D-00500200-50-31P  | 0.5-2                     | 36              | 1.5                       | 5                       | 31                                   | 2.2:2.2            | 0.9                        | 118406-3        |
| AMF-3F-00500200-45-30P  | 0.5-2                     | 29              | 1.5                       | 4.5                     | 30                                   | 2:2.3              | 0.8                        | 183016          |
| AMF-4D-00500200-25-33P  | 0.5-2                     | 40              | 2                         | 2.5                     | 33                                   | 2:2.3              | 1.4                        | 125420          |
| AMF-4D-00500200-35-30P  | 0.5-2                     | 41              | 2                         | 3                       | 30                                   | 2:2.3              | 0.9                        | 125420          |
| AMF-4F-00500200-17-32P  | 0.5-2                     | 55              | 2.5                       | 1.7                     | 32                                   | 2:2                | 1.4                        | 125420          |
| AMFG-3F-00700380-60-36P | 0.7-3.8                   | 40              | 2                         | 6                       | 36                                   | 2.5:2.5            | 1.5*                       | 133171-3        |
| AMFG-3F-00800220-60-35P | 0.8-2.2                   | 40              | 1.5                       | 6                       | 36                                   | 2:2                | 0.9*                       | 133171-3        |
| AMF-4B-00800250-50-34P  | 0.8-2.5                   | 40              | 3                         | 5                       | 34                                   | 2:2.3              | 2.7                        | 117558-4        |
| AMF-3B-01000110-20-36P  | 1-1.1                     | 25              | 1                         | 3                       | 36                                   | 2:2                | 3                          | 152398          |
| AMF-1B-01000200-60-30P  | 1-2                       | 11              | 1                         | 6                       | 30                                   | 2:2                | 0.5                        | 143477-1        |
| AMF-2B-01000200-70-33P  | 1-2                       | 13              | 1                         | 7                       | 33                                   | 2:2                | 1.3                        | 143477-2        |
| AMF-2F-01000200-55-30P  | 1-2                       | 18              | 1.5                       | 5.5                     | 30                                   | 2:2                | 0.55                       | 183016          |
| AMF-3B-01000200-20-33P  | 1-2                       | 35              | 1                         | 2                       | 33                                   | 1.5:1.5            | 1.2                        | 143477-4        |
| AMF-3B-01000200-45-33P  | 1-2                       | 23              | 1                         | 4.5                     | 33                                   | 2:2                | 1.6                        | 143477-3        |
| AMF-3B-01000200-50-40P  | 1-2                       | 35              | 3                         | 5                       | 40                                   | 2.2:3              | 4.1                        | 187662-1        |
| AMF-3F-01000200-25-30P  | 1-2                       | 32              | 1.5                       | 2.5                     | 30                                   | 2:2                | 0.65                       | 183016          |
| AMF-4B-01000200-20-33P  | 1-2                       | 33              | 1                         | 2                       | 33                                   | 2:2                | 1.7                        | 175425          |
| AMF-5D-01000200-15-33P  | 1-2                       | 50              | 1.5                       | 1.5                     | 33                                   | 2:2.3              | 1.5                        | 125420          |
| AMF-5D-01000200-30-33P  | 1-2                       | 50              | 1.5                       | 3                       | 33                                   | 2:2                | 1.5                        | 125420          |
| AMFG-2F-01000300-60-35P | 1-3                       | 40              | 2                         | 6                       | 35                                   | 2:2.2              | 1.5*                       | 133171-3        |
| AMF-2F-01000400-60-30P  | 1-4                       | 18              | 1.5                       | 6                       | 30                                   | 2:2.3              | 0.65                       | 183016          |
| AMF-3F-01000400-45-30P  | 1-4                       | 28              | 1.5                       | 4.5                     | 30                                   | 2:2.3              | 0.8                        | 183016          |

\* 30V supply, and peak current. IDQ usually much lower.

## POWER AMPLIFIERS (CONT.)

| MODEL NUMBER           | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMF-4F-01000400-35-30P | 1-4                       | 39              | 1.5                       | 3.5                     | 30                                   | 2:2.3              | 0.9                        | 183016          |
| AMF-2B-01200140-70-32P | 1.2-1.4                   | 21              | 0.5                       | 7                       | 32                                   | 1.5:1.5            | 1.2                        | 137120          |
| AMF-3B-01200140-60-34P | 1.2-1.4                   | 30              | 1                         | 6                       | 34                                   | 2:1.5              | 2                          | 117558-4        |
| AMF-6B-02000230-60-43P | 2-2.3                     | 47              | 2                         | 6                       | 43                                   | 2:1.5              | 12                         | 172456          |
| AMF-1B-02000400-55-30P | 2-4                       | 10              | 1                         | 5.5                     | 30                                   | 1.5:1.5            | 0.5                        | 143477-1        |
| AMF-2B-02000400-40-30P | 2-4                       | 20              | 1                         | 4                       | 30                                   | 2:2                | 0.75                       | 143477-2        |
| AMF-2F-02000400-55-30P | 2-4                       | 18              | 1.5                       | 5.5                     | 30                                   | 2:2                | 0.65                       | 183016          |
| AMF-3B-02000400-20-30P | 2-4                       | 35              | 1                         | 2                       | 30                                   | 2:2                | 0.95                       | 143477          |
| AMF-3F-02000400-55-30P | 2-4                       | 32              | 1.5                       | 5.5                     | 30                                   | 2:2                | 0.65                       | 183016          |
| AMF-4B-02000400-15-33P | 2-4                       | 50              | 1.5                       | 1.5                     | 33                                   | 2:2                | 1.6                        | 117558-5        |
| AMF-4B-02000400-20-33P | 2-4                       | 40              | 1.5                       | 2                       | 33                                   | 2:2                | 1.6                        | 143477-4        |
| AMF-4B-02000400-30-30P | 2-4                       | 40              | 2                         | 3                       | 30                                   | 2:2                | 1                          | 143477          |
| AMF-2B-02000600-70-30P | 2-6                       | 13              | 1.5                       | 7                       | 30                                   | 2:2                | 0.72                       | 145393-2        |
| AMF-3B-02000600-80-33P | 2-6                       | 17              | 2                         | 8                       | 33                                   | 2:2                | 1.8                        | 145393-3        |
| AMF-4B-02000600-70-33P | 2-6                       | 20              | 1.75                      | 7                       | 33                                   | 2:2                | 2.1                        | 145393-3        |
| AMF-4B-02000600-70-37P | 2-6                       | 35              | 2                         | 7                       | 37                                   | 2:2.8              | 4.8                        | 116879-1        |
| AMF-4B-02000800-80-36P | 2-8                       | 40              | 2.5                       | 8                       | 36                                   | 2:2.8              | 4.8                        | 116879-1        |
| AMF-5B-02000600-50-33P | 2-6                       | 38              | 2                         | 5                       | 33                                   | 2:2                | 2                          | 117558-4        |
| AMF-5B-02000600-55-30P | 2-6                       | 32              | 1.75                      | 5.5                     | 30                                   | 2.1:2              | 1.3                        | 145393-5        |
| AMF-6B-02000600-80-33P | 2-6                       | 40              | 2.5                       | 8                       | 33                                   | 2:2                | 3.2                        | 145393-6        |
| AMF-5B-02000800-55-30P | 2-8                       | 32              | 2                         | 5.5                     | 30                                   | 2.1:2              | 1.3                        | 145393-5        |
| AMF-5B-02000800-55-32P | 2-8                       | 34              | 2                         | 5.5                     | 32                                   | 2.1:2              | 1.9                        | 145393-5        |
| AMF-3B-02001200-90-33P | 2-12                      | 35              | 2                         | 9                       | 33                                   | 2:2.3              | 4.5                        | 165230          |
| AMF-3B-02001800-30-30P | 2-18                      | 35              | 2                         | 3                       | 30                                   | 2.2:2.2            | 2                          | 163559          |
| AMF-3B-02001800-38-30P | 2-18                      | 35              | 2                         | 3.8                     | 30                                   | 2.2:2.2            | 2                          | 163559          |
| AMF-3B-02001800-60-30P | 2-18                      | 35              | 2                         | 6                       | 30                                   | 2.2:2.2            | 2                          | 163559          |
| AMF-3B-02001800-60-32P | 2-18                      | 33              | 2.5                       | 7                       | 32                                   | 2:2.3              | 4.5                        | 165230          |
| AMF-3B-02002000-60-30P | 2-20                      | 33              | 2.75                      | 6                       | 30                                   | 2:2.5              | 4.5                        | 165230          |
| AMF-6B-02200240-60-40P | 2.2-2.4                   | 40              | 1.25                      | 6                       | 40                                   | 2:1.5              | 4                          | 117251          |
| AMF-3B-02502000-60-32P | 2.5-20                    | 40              | 2.5                       | 6                       | 32                                   | 2:2.5              | 4.5                        | 165230          |
| AMF-6B-02500270-30-40P | 2.5-2.7                   | 40              | 1                         | 3                       | 40                                   | 1.5:1.5            | 5                          | 127402          |
| AMF-1B-02700380-40-30P | 2.7-3.8                   | 12              | 0.5                       | 4                       | 30                                   | 2:2                | 0.6                        | 178326          |
| AMF-1B-02700380-40-31P | 2.7-3.8                   | 13              | 0.6                       | 4                       | 31                                   | 2:2                | 0.65                       | 178326          |
| AMF-6B-02700290-40-37P | 2.7-2.9                   | 40              | 1                         | 4                       | 37                                   | 1.5:1.5            | 4                          | 127402          |
| AMF-6B-02700290-40-38P | 2.7-2.9                   | 40              | 1                         | 4                       | 38                                   | 1.5:1.5            | 2.85                       | 127402          |
| AMF-6B-02700290-50-39P | 2.7-2.9                   | 40              | 1                         | 5                       | 39                                   | 1.5:1.5            | 3.85                       | 127402          |
| AMF-6B-02700290-60-40P | 2.7-2.9                   | 40              | 1.25                      | 6                       | 40                                   | 1.5:1.5            | 4                          | 127402          |
| AMF-1B-02800340-40-30P | 2.8-3.4                   | 12              | 0.5                       | 4                       | 30                                   | 2:2                | 0.6                        | 178326          |
| AMF-4B-03000600-90-38P | 3-6                       | 36              | 1.5                       | 8                       | 38                                   | 2:2.8              | 3.3                        | 116879-1        |
| AMF-4B-03100350-50-36P | 3.1-3.5                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-03100350-50-39P | 3.1-3.5                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-4B-03100360-50-36P | 3.1-3.6                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.4                        | 177361          |
| AMF-4B-03400390-50-36P | 3.4-3.9                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-03400390-50-39P | 3.4-3.9                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-4B-03400420-20-30P | 3.4-4.2                   | 40              | 1                         | 2                       | 30                                   | 1.8:1.8            | 0.95                       | 145393-4        |
| AMF-4B-03400420-30-30P | 3.4-4.2                   | 40              | 1                         | 3                       | 30                                   | 2:2                | 0.95                       | 145393-4        |
| AMF-4B-03400480-30-30P | 3.4-4.8                   | 40              | 1                         | 3                       | 30                                   | 2:2                | 0.95                       | 145393-4        |
| AMF-4F-03400420-20-30P | 3.4-4.2                   | 40              | 1                         | 2                       | 30                                   | 2:2                | 0.75                       | 183016          |
| AMF-4F-03400480-20-30P | 3.4-4.8                   | 40              | 1                         | 2                       | 30                                   | 2:2                | 0.75                       | 183016          |
| AMF-5B-03700640-50-39P | 3.4-6.4                   | 40              | 2.5                       | 5                       | 39                                   | 2:2                | 8                          | 178301          |
| AMF-4B-03500580-60-30P | 3.5-5.8                   | 30              | 1.25                      | 4.5                     | 30                                   | 2:2                | 1.2                        | 145393-4        |
| AMF-4B-03700420-50-36P | 3.7-4.2                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-03700420-50-39P | 3.7-4.2                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |



## POWER AMPLIFIERS (CONT.)

| MODEL NUMBER            | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|-------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMF-5B-04000600-50-37P  | 4-6                       | 40              | 2.5                       | 5                       | 37                                   | 2.1:2.1            | 6                          | 178301          |
| AMF-5B-04000600-60-40P  | 4-6                       | 43              | 1.5                       | 6                       | 39                                   | 2:2                | 8                          | 178301          |
| AMF-3B-04000800-70-30P  | 4-8                       | 19              | 1.5                       | 7                       | 30                                   | 2:2                | 1.1                        | 145393-3        |
| AMF-4B-04000800-50-33P  | 4-8                       | 36              | 1                         | 5                       | 33                                   | 2:2                | 1.5                        | 145393-4        |
| AMF-4B-04000800-70-30P  | 4-8                       | 25              | 1.5                       | 7                       | 30                                   | 2:2                | 1.2                        | 145393-3        |
| AMF-5B-04000800-60-30P  | 4-8                       | 33              | 1.5                       | 6                       | 30                                   | 2:2                | 1.4                        | 145393-4        |
| AMF-5B-04000800-70-33P  | 4-8                       | 33              | 1.5                       | 7                       | 33                                   | 2:2                | 2.2                        | 145393-4        |
| AMF-6B-04000800-60-33P  | 4-8                       | 40              | 2                         | 6                       | 33                                   | 2:2                | 2.4                        | 145393-4        |
| AMF-4B-04400500-50-36P  | 4.4-5                     | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-04400500-50-39P  | 4.4-5                     | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-5B-04000450-50-33P  | 4.4-5                     | 30              | 1                         | 5                       | 33                                   | 2:1.5              | 1.5                        | 117558-4        |
| AMF-5B-04400640-50-39P  | 4.4-6.4                   | 40              | 1.7                       | 5                       | 39                                   | 2:2                | 8                          | 178301          |
| AMF-4B-05000530-50-36P  | 5-5.3                     | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-05000530-50-39P  | 5-5.3                     | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-5B-05000650-60-40P  | 5-6.5                     | 43              | 1.5                       | 6                       | 39*                                  | 2:2                | 8                          | 178301          |
| AMF-5B-05001300-65-33P  | 5-13                      | 25              | 2                         | 10                      | 33                                   | 2.1:2              | 2.85                       | 127465          |
| AMF-4B-05300590-50-36P  | 5.3-5.9                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-05300590-50-39P  | 5.3-5.9                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-4B-05400590-30-30P  | 5.4-5.9                   | 35              | 0.7                       | 3                       | 30                                   | 1.6:1.6            | 1.5                        | 145393-4        |
| AMF-5B-05400590-50-37P  | 5.4-5.9                   | 35              | 1                         | 5                       | 37                                   | 2:1.5              | 3.4                        | 117251          |
| AMF-4B-05900640-50-33P  | 5.9-6.4                   | 30              | 1                         | 5                       | 33                                   | 2:1.5              | 1.5                        | 116879-1        |
| AMF-4B-05900640-50-36P  | 5.9-6.4                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.1                        | 117251          |
| AMF-4B-05900640-50-38P  | 5.9-6.4                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 2.7                        | 117251          |
| AMF-4B-05900640-50-39P  | 5.9-6.4                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-4B-05900720-50-36P  | 5.9-7.2                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.1                        | 117251          |
| AMF-4B-05900720-50-38P  | 5.9-7.2                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 3.3                        | 127202          |
| AMF-5B-06001200-50-35P  | 6-12                      | 35              | 2                         | 5                       | 35                                   | 2:2                | 2.8                        | 127465          |
| AMF-5B-06001300-50-35P  | 6-13                      | 35              | 2                         | 5                       | 35                                   | 2:2                | 2.8                        | 127465          |
| AMF-2B-06001800-65-35P  | 6-18                      | 45              | 2.75                      | 6.5                     | 35                                   | 2.1:2.2            | 6.5                        | 163559          |
| AMF-6B-06001800-120-40P | 6-18                      | 43              | 5                         | 13                      | 39*                                  | 2.2:2.2            | 12.5                       | 165230          |
| AMF-6B-06001800-60-30P  | 6-18                      | 31              | 2                         | 6                       | 30                                   | 2:2                | 1.9                        | 146727          |
| AMF-6B-06001800-80-33P  | 6-18                      | 35              | 2.5                       | 8                       | 33                                   | 2.1:2.2            | 2.8                        | 127465          |
| AMF-8B-06001800-60-31P  | 6-18                      | 31              | 2                         | 6                       | 31                                   | 2:2                | 2                          | 127465          |
| AMF-8B-06001800-60-32P  | 6-18                      | 33              | 2                         | 6                       | 32                                   | 2:2                | 2.5                        | 127465          |
| AMF-4B-06400720-50-36P  | 6.4-7.2                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.1                        | 117251          |
| AMF-4B-06400720-50-38P  | 6.4-7.2                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 2.7                        | 127202          |
| AMF-4B-06400720-50-39P  | 6.4-7.2                   | 35              | 1                         | 5                       | 38.5                                 | 2:1.5              | 3.3                        | 127202          |
| AMF-2B-06500900-70-37P  | 6.5-9                     | 20              | 1.25                      | 7                       | 37                                   | 2:2                | 3.3                        | 146727          |
| AMF-4B-06500900-55-37P  | 6.5-9                     | 38              | 1.5                       | 5.5                     | 37                                   | 2:2                | 3.3                        | 146727          |
| AMF-4B-07000900-50-37P  | 7-9                       | 36              | 1.5                       | 5                       | 37                                   | 2:1.5              | 3.4                        | 146727          |
| AMF-5B-07001150-50-37P  | 7-11.5                    | 35              | 2                         | 5                       | 37                                   | 2:1.8              | 4.1                        | 127465          |
| AMF-5B-07100770-60-41P  | 7.1-7.7                   | 38              | 1.25                      | 6                       | 41                                   | 2:1.5              | 10.1                       | 176455          |
| AMF-5B-07100790-50-36P  | 7.1-7.9                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.1                        | 117251          |
| AMF-5B-07100790-50-38P  | 7.1-7.9                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 2.7                        | 127202          |
| AMF-5B-07100790-50-39P  | 7.1-7.9                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 127202          |
| AMF-5B-07100850-50-37P  | 7.1-8.5                   | 35              | 1                         | 5                       | 37                                   | 2:1.5              | 2.7                        | 127202          |
| AMFH-5B-07101010-80-33P | 7.1-10.1                  | 25              | 1                         | 8                       | 33                                   | 1.8:1.8            | 2.8                        | 135793          |
| AMF-4B-07600860-50-37P  | 7.7-8.6                   | 38              | 1.5                       | 5                       | 37                                   | 1.75:1.5           | 3.3                        | 146727          |
| AMF-4B-07700850-45-39P  | 7.7-8.5                   | 36              | 0.75                      | 4.5                     | 39                                   | 2:1.5              | 3.3                        | 146727          |
| AMF-5B-07700850-50-36P  | 7.7-8.5                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.1                        | 117251          |
| AMF-5B-07700850-50-37P  | 7.7-8.5                   | 35              | 1                         | 5                       | 37                                   | 2:1.5              | 2.7                        | 127202          |
| AMF-5B-07700850-50-38P  | 7.7-8.5                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 2.7                        | 146727          |

\* Typical 40 dBm or more.

## POWER AMPLIFIERS (CONT.)

### AMF-2B-08001800-65-35P

#### 8-18 GHz HIGH POWER AMPLIFIER

Model AMF-2B-08001800-65-35P is a connectorized high power amplifier, covering octave bandwidth from 8-18 GHz and delivering approximately 3W of power and 2.5W from 6-18 GHz. From 10-15 GHz, it delivers about 7W of P1dB. The SMA connectorized Aluminum alloy housing is 21 mm high, 95 mm long and 66 mm wide. It is intended for bolting to a flat cooling surface or fins. Housing is environmentally sealed, EMI shielded and hermetic sealing option is also available. The power amplifier includes reverse voltage protection, in addition to full internal regulation. A TTL on/off control pin is optional. Nominal small-signal gain is 50 dB while noise figure is close to 6 dB across the band. Current draw is nominally 6A at P1dB from +12 to +15 VDC of supply. Output IP<sup>3</sup> is a minimum of 44 dBm across the full band, closer to 47 dBm from 10-15 GHz.



| MODEL NUMBER            | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|-------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMF-5B-07700850-50-39P  | 7.7-8.5                   | 35              | 1                         | 5                       | 39                                   | 2.1:1.5            | 3.3                        | 127202          |
| AMF-4B-07800840-45-38P  | 7.8-8.4                   | 38              | 0.5                       | 4.5                     | 38                                   | 1.75:1.5           | 3.3                        | 146727          |
| AMF-6B-07900840-50-33P  | 7.9-8.4                   | 35              | 1                         | 5                       | 33                                   | 1.8:1.8            | 1.5                        | 117558-4        |
| AMF-5B-08001050-50-38P  | 8-10.5                    | 36              | 1.75                      | 5                       | 38                                   | 2:2                | 4.1                        | 127465          |
| AMF-5B-08001200-50-35P  | 8-12                      | 35              | 2                         | 5                       | 35                                   | 2:2                | 2.8                        | 127465          |
| AMF-5B-08001200-80-30P  | 8-12                      | 24              | 1.5                       | 8                       | 30                                   | 2:2                | 1.2                        | 116348-1        |
| AMF-6B-08001200-110-40P | 8-12                      | 40              | 3.5                       | 11                      | 40                                   | 2:2.3              | 12                         | 165230          |
| AMF-6B-08001200-35-30P  | 8-12                      | 35              | 1.5                       | 3.5                     | 30                                   | 2:2                | 1.8                        | 145393-4        |
| AMF-6B-08001200-50-33P  | 8-12                      | 33              | 1.5                       | 5                       | 33                                   | 2:2                | 2                          | 145393-5        |
| AMF-6B-08001200-55-31P  | 8-12                      | 37              | 1.25                      | 5.5                     | 31                                   | 2:2                | 1.4                        | 146727          |
| AMF-8B-08001200-60-34P  | 8-12                      | 35              | 2                         | 6                       | 34                                   | 2:2                | 2.8                        | 146727          |
| AMF-8B-08001300-60-34P  | 8-13                      | 35              | 2                         | 6                       | 34                                   | 2:2                | 2.8                        | 146727          |
| AMF-6B-08001300-50-35P  | 8-13                      | 35              | 2                         | 5                       | 35                                   | 2:2                | 2.8                        | 127465          |
| AMF-2B-08001600-65-37P  | 8-16                      | 47              | 2.5                       | 6.5                     | 37                                   | 2:2.1              | 4.5                        | 163559          |
| AMF-8B-08001600-60-32P  | 8-16                      | 35              | 2                         | 6                       | 32                                   | 2:2                | 2.8                        | 146727          |
| AMF-2B-08001800-65-35P  | 8-18                      | 43              | 2.5                       | 5.5                     | 35                                   | 2:2.1              | 6                          | 163559          |
| AMF-6B-08001800-100-40P | 8-18                      | 43              | 4.5                       | 10                      | 39*                                  | 2.2:2.2            | 12.5                       | 165230          |
| AMF-6B-08001800-60-34P  | 8-18                      | 37              | 2.5                       | 6                       | 34                                   | 2:2.1              | 3.7                        | 127465          |
| AMF-6B-08001800-70-34P  | 8-18                      | 37              | 2.5                       | 7                       | 34                                   | 2:2.2              | 3.7                        | 127465          |
| AMF-6B-08001800-80-33P  | 8-18                      | 35              | 2.5                       | 8                       | 33                                   | 2:2.2              | 2.8                        | 146727          |
| AMF-8B-08001800-60-31P  | 8-18                      | 31              | 2                         | 6                       | 31                                   | 2:2                | 2                          | 146727          |
| AMF-8B-08001800-60-30P  | 8-18                      | 40              | 2.75                      | 6                       | 30                                   | 2:2                | 1.9                        | 146727          |
| AMF-5B-08500960-50-38P  | 8.5-9.6                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 3.3                        | 127202          |
| AMF-5B-08500960-50-40P  | 8.5-9.6                   | 35              | 1                         | 5                       | 40                                   | 2:1.5              | 4.7                        | 178301          |
| AMF-5B-08500960-50-41P  | 8.5-9.6                   | 35              | 1                         | 5                       | 41                                   | 2:1.5              | 4.8                        | 135802          |
| AMF-6B-08500960-40-37P  | 8.5-9.6                   | 40              | 1                         | 4                       | 37                                   | 2:1.5              | 3.5                        | 127202          |
| AMF-6B-09000955-50-37P  | 9-9.5                     | 43              | 1                         | 5                       | 37                                   | 2:2                | 3.6                        | 127202          |
| AMF-2B-09001000-85-30P  | 9-10                      | 30              | 1.5                       | 6.5                     | 30                                   | 2:2                | 0.95                       | 145393          |
| AMF-3B-09001000-80-40P  | 9-10                      | 45              | 2                         | 8                       | 40                                   | 2:2.2              | 12                         | 165230          |
| AMF-5B-09001000-50-38P  | 9-10                      | 37              | 1                         | 5                       | 38                                   | 1.8:1.8            | 4.2                        | 127465          |
| AMF-5B-09001000-50-33P  | 9-10                      | 33              | 0.5                       | 5                       | 33                                   | 2:2                | 1.6                        | 117558-5        |

\* Typical 40 dBm or more.

## POWER AMPLIFIERS (CONT.)

### AMFH-7B-16751725-100-36P

#### POWER AMPLIFIER

This 4W module is capable of fully compliant 85°C baseplate temperature operation. It is suitable for pulsed and high-rel applications with a built in high speed RF switch.



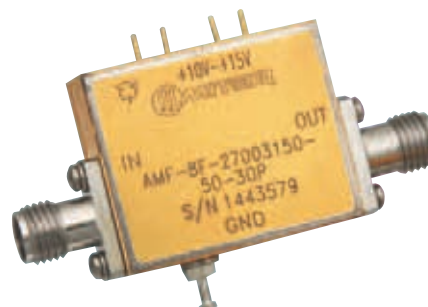
| MODEL NUMBER             | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|--------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMF-5B-0901000-45-36P    | 9-10                      | 37              | 1                         | 4.5                     | 36                                   | 2:2                | 3.1                        | 157681          |
| AMF-5B-0901000-45-37P    | 9-10                      | 38              | 1                         | 4.5                     | 37                                   | 2:2                | 3.2                        | 127465          |
| AMF-4B-09001000-50-33P   | 9-10                      | 33              | 0.5                       | 5                       | 33                                   | 2:2                | 1.5                        | 117558-5        |
| AMF-5B-09001050-40-39P   | 9-10.5                    | 37              | 1.35                      | 4                       | 39                                   | 2:2                | 4.1                        | 127465          |
| AMF-2B-09001550-50-37P   | 9-15.5                    | 45              | 1.75                      | 5                       | 37                                   | 2:2                | 6.6                        | 163559          |
| AMF-3B-09501150-100-41P  | 9.5-11.5                  | 45              | 3.5                       | 11                      | 41                                   | 2.1:2.3            | 12                         | 165230          |
| AMF-6B-09501050-50-38P   | 9.5-10.5                  | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 3.3                        | 127202          |
| AMF-6B-09501050-50-40P   | 9.5-10.5                  | 35              | 1                         | 5                       | 40                                   | 2:1.5              | 4.1                        | 178301          |
| AMF-5B-09701020-35-33P   | 9.7-10.2                  | 34              | 1                         | 3.5                     | 33                                   | 1.8:1.8            | 1.4                        | 117558-4        |
| AMF-5B-09701020-40-33P   | 9.7-10.2                  | 33              | 1                         | 4                       | 33                                   | 2:2                | 1.4                        | 117558-4        |
| AMF-6B-09901010-50-37P   | 9.9-10.1                  | 30              | 0.6                       | 3.5                     | 37                                   | 2:2                | 3.3                        | 127202          |
| AMF-2B-10001600-55-37P   | 10-16                     | 43              | 2.5                       | 5.5                     | 37                                   | 2:2.1              | 6.5                        | 163559          |
| AMF-2B-10001800-55-36P   | 10-18                     | 43              | 2.5                       | 5.5                     | 36                                   | 2:2.1              | 6.5                        | 163559          |
| AMF-6B-10701170-50-38P   | 10.7-11.7                 | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 3.3                        | 127202          |
| AMF-6B-10701170-50-40P   | 10.7-11.7                 | 35              | 1                         | 5                       | 40                                   | 2:1.5              | 4.7                        | 127202          |
| AMF-6B-10701170-50-41P   | 10.7-11.7                 | 35              | 1                         | 5                       | 41                                   | 2:1.5              | 4.8                        | 127202          |
| AMF-6B-12001800-70-33P   | 12-18                     | 35              | 2                         | 7                       | 33                                   | 2:2                | 2.8                        | 127465          |
| AMF-8B-12001800-60-31P   | 12-18                     | 33              | 2                         | 6                       | 31                                   | 2:2                | 2                          | 127465          |
| AMF-6B-12701320-50-40P   | 12.7-13.2                 | 35              | 1                         | 5                       | 40                                   | 2:1.5              | 4.7                        | 127202          |
| AMF-5B-13751450-50-37P   | 13.75-14.5                | 35              | 1.25                      | 5                       | 37                                   | 2:1.5              | 6                          | 127202          |
| AMF-6B-13751450-50-39P   | 13.75-14.5                | 35              | 1.25                      | 5                       | 39                                   | 2:1.5              | 7.1                        | 127202          |
| AMF-6B-13751450-50-40P   | 13.75-14.5                | 35              | 1.25                      | 5                       | 40                                   | 2:1.5              | 5.4                        | 127202          |
| AMF-6B-14001450-50-40P   | 14-14.5                   | 35              | 1                         | 5                       | 40                                   | 2:1.5              | 4.7                        | 127202          |
| AMF-6B-14001450-50-41P   | 14-14.5                   | 40              | 1.25                      | 5                       | 41                                   | 2:1.5              | 5.5                        | 178301-11       |
| AMF-7B-14001600-80-30P   | 14-16                     | 30              | 1.5                       | 8                       | 30                                   | 2:2                | 2.3                        | 117469-4        |
| AMF-6B-16001700-60-40P   | 16-17                     | 43              | 1.5                       | 6                       | 40                                   | 2:2.2              | 12                         | 165230          |
| AMFH-7B-16751725-100-36P | 16.75-17.25               | 50              | 1                         | 10                      | 36                                   | 2:2.3              | 9                          | 142571          |
| AMF-6F-17002200-70-30P   | 17-22                     | 25              | 1.5                       | 7                       | 30                                   | 2.1:2.1            | 2.2                        | 166644          |
| AMF-6B-17702200-60-30P   | 17-22                     | 40              | 2                         | 6                       | 30                                   | 2:2                | 1.8                        | 146727          |
| AMF-8B-18002650-70-37P   | 18-26.5                   | 52              | 4                         | 10                      | 36*                                  | 2:2                | 7                          | 178532          |

\* Psat is 37 dBm typical.

### AMF-8F-18002650-80-29P

#### POWER AMPLIFIER

This is a small, single-bias and a temperature compensated power amplifier covering 18-26.5 GHz in a rugged housing. It delivers typically 30 dBm in the full band.

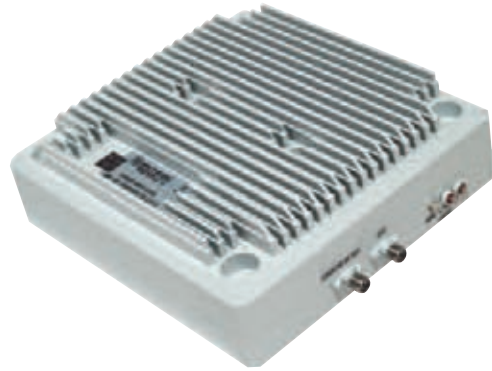


## POWER AMPLIFIERS (CONT.)

### AMF-6B-18002650-70-37P

#### 5W THROUGH 18-26.5 GHz HIGH POWER MODULE

Model AMF-6B-18002650-70-37P is a plate mounted high power amplifier, covering 18-26.5 GHz and delivering a minimum of 5W of saturated power. The SMA connectorized module has a base of 5" wide and 5.24" long and 2" high including fins on top. Housing is EMI and environmentally shielded, and can operate compliant in baseplate temperatures up to 60°C. The Power Amplifier includes over temperature protection in addition to full internal regulation. A 20 dB output coupled port is optional. Nominal small-signal gain is 52 dB and Psat is typically 38 dBm. Input/output port VSWRs are typically 2:1 or less. The unit runs from 12V to 15V (48V optional) and draws a typical of 7A at full power.



| MODEL NUMBER            | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|-------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMF-5B-19002400-60-33P  | 19-24                     | 36              | 1.5                       | 6                       | 33                                   | 2:2                | 3                          | 146727          |
| AMF-5B-20002300-60-34P  | 20-23                     | 36              | 1.5                       | 6                       | 33.5                                 | 2:2                | 3                          | 146727          |
| AMF-5B-20002400-60-30P  | 20-24                     | 36              | 1.5                       | 6                       | 30                                   | 2:2                | 2.2                        | 146727          |
| AMF-5B-22002400-60-33P  | 22-24                     | 38              | 1.5                       | 6                       | 33                                   | 2:2                | 3                          | 146727          |
| AMF-4B-26003100-100-36P | 26-31                     | 18              | 1.5                       | 9                       | 35*                                  | 2.3:2.3            | 7                          | 159648          |
| AMF-8F-27003100-90-30P  | 27-31                     | 30              | 2                         | 9                       | 30                                   | 2.5:2.5            | 1.05                       | 138002          |
| AMF-8F-27003150-55-30P  | 27-31.5                   | 35              | 2                         | 5.5                     | 30                                   | 2.5:2.5            | 1.5                        | 166644          |
| AMF-8F-27003150-50-30P  | 27-31.5                   | 38              | 1.75                      | 5                       | 30                                   | 2.4:2.4            | 1.5                        | 166644          |
| AMF-6F-27503100-90-30P  | 27.5-31                   | 16              | 2                         | 9                       | 30                                   | 2.5:2.5            | 0.95                       | 138002          |
| AMF-8F-27503150-55-31P  | 27.5-31.5                 | 40              | 1.5                       | 5.5                     | 31                                   | 2.3:2.3            | 1.7                        | 166644          |
| AMF-4B-29003100-90-36P  | 29-31                     | 20              | 1.25                      | 9                       | 36                                   | 2:2                | 7                          | 159648          |
| AMF-5B-33003500-80-32P  | 33-35                     | 50              | 2                         | 8                       | 32                                   | 2:2.3              | 2.2                        | 182509          |
| AMF-3B-33003500-80-32P  | 33-35                     | 30              | 2                         | 8                       | 32                                   | 2:2.3              | 2                          | 182509          |
| AMF-10F-37004100-90-30P | 37-41                     | 30              | 2.5                       | 9                       | 30                                   | 2.5:2.5            | 1.75                       | 165237          |
| AMF-8F-37004100-90-30P  | 37-41                     | 20              | 2.5                       | 9                       | 30                                   | 2.5:2.3            | 1.65                       | 165237          |

\* 36 dBm typical.

### AMF-4B-2600-3100-100-36P

#### 26-31 GHz 4W POWER AMPLIFIER

Model AMF-4B-26003100-100-36P is a connectorized high power amplifier/module, covering 26-31 GHz and delivering approximately 5W of power. The female K-type connectorized aluminum housing is 10 mm high, 25 mm long and 34 mm wide. It is intended for bolting to a flat cooling surface or fins. Housing is environmentally sealed and EMI shielded. Nominal small-signal gain is near 18 dB. Current draw is nominally 7A at P1dB from 6 to 6.5 VDC of supply and -1.25 VDC.



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# ***Broadband***

Power amplifiers with up to three octaves wide bandwidth.

## BROADBAND

### AMF-3B-02001800-60-30P

#### 2-18 GHz, 1W AMPLIFIER

These compact 2-18 GHz power amplifiers deliver minimum of 30 dBm with a typical small signal of 37 dB and  $\pm 1.5$  dB flat. Typical noise figure is 4 dB and even lower values are possible. Draws a maximum of 2A at P1dB.



| MODEL NUMBER            | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS ( $\pm$ dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|-------------------------|---------------------------|-----------------|---------------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMFG-3F-00030300-60-33P | 0.03-3                    | 40              | 2                               | 6                       | 33                                   | 2:2.2              | 0.6*                       | 133171-3        |
| AMFG-3F-00030400-60-32P | 0.03-4                    | 40              | 2                               | 6                       | 32                                   | 2:2                | 0.6*                       | 133171-3        |
| AMFG-3F-00040250-60-33P | 0.04-2.5                  | 40              | 2                               | 6                       | 33                                   | 2:2.2              | 0.67*                      | 133171-3        |
| AMF-1B-00500100-60-30P  | 0.5-1                     | 12              | 1                               | 6                       | 30                                   | 2:2.2              | 0.5                        | 143477-1        |
| AMF-2B-00500100-45-33P  | 0.5-1                     | 25              | 1.5                             | 4.5                     | 33                                   | 2:2                | 1.3                        | 143477-2        |
| AMF-3B-00500100-13-33P  | 0.5-1                     | 43              | 1.5                             | 1.3                     | 33                                   | 2:2                | 1.7                        | 125420          |
| AMF-3B-00500100-25-33P  | 0.5-1                     | 43              | 1.5                             | 2.5                     | 33                                   | 2:2                | 1.7                        | 125420          |
| AMF-4B-00500100-13-33P  | 0.5-1                     | 55              | 1.5                             | 1.3                     | 33                                   | 2:2                | 1.8                        | 125420          |
| AMF-4B-00500100-25-33P  | 0.5-1                     | 55              | 1.5                             | 2.5                     | 33                                   | 2:2                | 1.8                        | 125420          |
| AMFG-3F-00700380-60-35P | 0.7-3.8                   | 40              | 2                               | 6                       | 35                                   | 2.5:2.5            | 1.5*                       | 133171-3        |
| AMFG-3F-00800220-60-35P | 0.8-2.2                   | 40              | 1.5                             | 6                       | 35                                   | 2:2                | 0.9*                       | 133171-3        |
| AMF-4B-00800250-50-34P  | 0.8-2.5                   | 40              | 3                               | 5                       | 34                                   | 2:2.3              | 2.7                        | 117558-4        |
| AMF-1B-01000200-60-30P  | 1-2                       | 11              | 1                               | 6                       | 30                                   | 2:2                | 0.5                        | 143477-1        |
| AMF-2B-01000200-70-33P  | 1-2                       | 13              | 1                               | 7                       | 33                                   | 2:2                | 1.3                        | 143477-2        |
| AMF-2F-01000200-55-30P  | 1-2                       | 18              | 1.5                             | 5.5                     | 30                                   | 2:2                | 0.55                       | 183016          |
| AMF-3B-01000200-20-33P  | 1-2                       | 35              | 1                               | 2                       | 33                                   | 1.5:1.5            | 1.2                        | 143477-4        |
| AMF-3B-01000200-45-33P  | 1-2                       | 23              | 1                               | 4.5                     | 33                                   | 2:2                | 1.6                        | 143477-3        |
| AMF-3B-01000200-50-40P  | 1-2                       | 35              | 3                               | 5                       | 40                                   | 2.2:3              | 4.1                        | 187662-1        |
| AMF-3F-01000200-25-30P  | 1-2                       | 32              | 1.5                             | 2.5                     | 30                                   | 2:2                | 0.65                       | 183016          |
| AMF-4B-01000200-20-33P  | 1-2                       | 33              | 1                               | 2                       | 33                                   | 2:2                | 1.7                        | 175425          |
| AMF-5D-01000200-15-33P  | 1-2                       | 50              | 1.5                             | 1.5                     | 33                                   | 2:2.3              | 1.5                        | 125420          |
| AMF-5D-01000200-30-33P  | 1-2                       | 50              | 1.5                             | 3                       | 33                                   | 2:2                | 1.5                        | 125420          |
| AMFG-2F-01000300-60-36P | 1-3                       | 40              | 2                               | 6                       | 36                                   | 2:2.2              | 1.5*                       | 133171-3        |
| AMF-1B-02000400-55-30P  | 2-4                       | 10              | 1                               | 5.5                     | 30                                   | 1.5:1.5            | 0.5                        | 143477-1        |
| AMF-2B-02000400-40-30P  | 2-4                       | 20              | 1                               | 4                       | 30                                   | 2:2                | 0.75                       | 143477-2        |
| AMF-2F-02000400-55-30P  | 2-4                       | 18              | 1.5                             | 5.5                     | 30                                   | 2:2                | 0.65                       | 183016          |
| AMF-3B-02000400-20-30P  | 2-4                       | 35              | 1                               | 2                       | 30                                   | 2:2                | 0.95                       | 143477          |
| AMF-3F-02000400-55-30P  | 2-4                       | 32              | 1.5                             | 5.5                     | 30                                   | 2:2                | 0.65                       | 183016          |
| AMF-4B-02000400-15-33P  | 2-4                       | 50              | 1.5                             | 1.5                     | 33                                   | 2:2                | 1.6                        | 117558-5        |
| AMF-4B-02000400-20-33P  | 2-4                       | 40              | 1.5                             | 2                       | 33                                   | 2:2                | 1.6                        | 143477-4        |
| AMF-4B-02000400-30-30P  | 2-4                       | 40              | 2                               | 3                       | 30                                   | 2:2                | 1                          | 143477          |
| AMF-2B-02000600-70-30P  | 2-6                       | 13              | 1.5                             | 7                       | 30                                   | 2:2                | 2.1                        | 145393-2        |
| AMF-3B-02000600-80-33P  | 2-6                       | 17              | 2                               | 8                       | 33                                   | 2:2                | 1.8                        | 145393-3        |

\* 30V supply, and peak current. IDQ usually much lower.

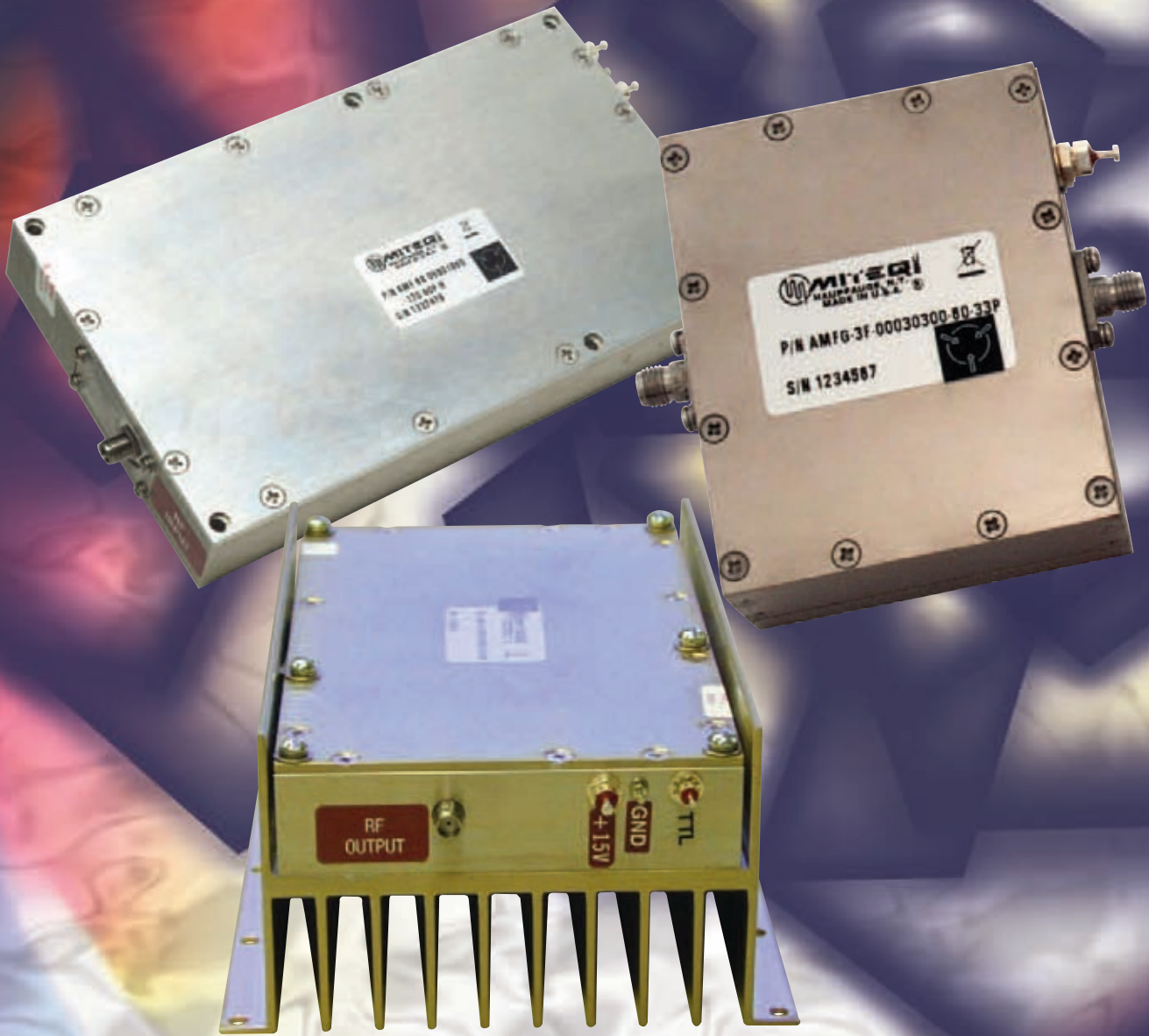
## BROADBAND (CONT.)

| MODEL NUMBER            | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|-------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMF-4B-02000600-70-33P  | 2-6                       | 20              | 1.75                      | 7                       | 33                                   | 2:2                | 2.1                        | 145393-3        |
| AMF-4B-02000600-70-37P  | 2-6                       | 35              | 2                         | 7                       | 37                                   | 2:2.8              | 4.8                        | 116879-1        |
| AMF-5B-02000600-50-33P  | 2-6                       | 38              | 2                         | 5                       | 33                                   | 2:2                | 2                          | 117558-4        |
| AMF-5B-02000600-55-30P  | 2-6                       | 32              | 1.75                      | 5.5                     | 30                                   | 2.1:2              | 1.3                        | 145393-5        |
| AMF-6B-02000600-80-33P  | 2-6                       | 40              | 2.5                       | 8                       | 33                                   | 2:2                | 3.2                        | 145393-6        |
| AMF-4B-03000600-90-38P  | 3-6                       | 36              | 1.5                       | 8                       | 38                                   | 2:2.8              | 3.3                        | 116879-1        |
| AMF-5B-03700640-50-39P  | 3.4-6.4                   | 40              | 2.5                       | 5                       | 39                                   | 2:2                | 8                          | 178301          |
| AMF-3B-04000800-70-30P  | 4-8                       | 19              | 1.5                       | 7                       | 30                                   | 2:2                | 1.1                        | 145393-3        |
| AMF-4B-04000800-50-33P  | 4-8                       | 36              | 1                         | 5                       | 33                                   | 2:2                | 1.5                        | 145393-4        |
| AMF-4B-04000800-70-30P  | 4-8                       | 25              | 1.5                       | 7                       | 30                                   | 2:2                | 1.2                        | 145393-3        |
| AMF-5B-04000800-60-30P  | 4-8                       | 33              | 1.5                       | 6                       | 30                                   | 2:2                | 1.4                        | 145393-4        |
| AMF-5B-04000800-70-33P  | 4-8                       | 33              | 1.5                       | 7                       | 33                                   | 2:2                | 2.2                        | 145393-4        |
| AMF-6B-04000800-60-33P  | 4-8                       | 40              | 2                         | 6                       | 33                                   | 2:2                | 2.4                        | 145393-4        |
| AMF-5B-05001300-65-33P  | 5-13                      | 25              | 2                         | 10                      | 33                                   | 2.1:2              | 2.85                       | 127465          |
| AMF-5B-06001200-50-35P  | 6-12                      | 35              | 2                         | 5                       | 35                                   | 2:2                | 2.8                        | 127465          |
| AMF-5B-06001300-50-35P  | 6-13                      | 35              | 2                         | 5                       | 35                                   | 2:2                | 2.8                        | 127465          |
| AMF-2B-06001800-65-35P  | 6-18                      | 45              | 2.75                      | 6.5                     | 35                                   | 2.1:2.2            | 6.5                        | 163559          |
| AMF-6B-06001800-120-40P | 6-18                      | 43              | 5                         | 13                      | 39*                                  | 2.2:2.2            | 12.5                       | 165230          |
| AMF-6B-06001800-60-30P  | 6-18                      | 31              | 2                         | 6                       | 30                                   | 2:2                | 1.9                        | 146727          |
| AMF-6B-06001800-80-33P  | 6-18                      | 35              | 2.5                       | 8                       | 33                                   | 2.1:2.2            | 2.8                        | 127465          |
| AMF-8B-06001800-60-31P  | 6-18                      | 31              | 2                         | 6                       | 31                                   | 2:2                | 2                          | 127465          |
| AMF-8B-06001800-60-32P  | 6-18                      | 33              | 2                         | 6                       | 32                                   | 2:2                | 2.5                        | 127465          |
| AMF-2B-08001600-65-37P  | 8-16                      | 47              | 2.5                       | 6.5                     | 37                                   | 2:2.1              | 4.5                        | 163559          |
| AMF-8B-08001600-60-32P  | 8-16                      | 35              | 2                         | 6                       | 32                                   | 2:2                | 2.8                        | 146727          |
| AMF-2B-08001800-65-35P  | 8-18                      | 43              | 2.5                       | 5.5                     | 35                                   | 2:2.1              | 6                          | 163559          |
| AMF-6B-08001800-100-40P | 8-18                      | 43              | 4.5                       | 10                      | 39*                                  | 2.2:2.2            | 12.5                       | 165230          |
| AMF-6B-08001800-60-34P  | 8-18                      | 37              | 2.5                       | 6                       | 34                                   | 2:2.1              | 3.7                        | 127465          |
| AMF-6B-08001800-70-34P  | 8-18                      | 37              | 2.5                       | 7                       | 34                                   | 2:2.2              | 3.7                        | 127465          |
| AMF-6B-08001800-80-33P  | 8-18                      | 35              | 2.5                       | 8                       | 33                                   | 2:2.2              | 2.8                        | 146727          |
| AMF-8B-08001800-60-31P  | 8-18                      | 31              | 2                         | 6                       | 31                                   | 2:2                | 2                          | 146727          |
| AMF-8B-08001800-60-30P  | 8-18                      | 40              | 2.75                      | 6                       | 30                                   | 2:2                | 1.9                        | 146727          |
| AMF-4F-20004000-90-22P  | 20-40                     | 15              | 3                         | 9                       | 22                                   | 3:3                | 0.5                        | 161196          |
| AMF-6F-20004000-90-22P  | 20-40                     | 25              | 3                         | 9                       | 22                                   | 3:3                | 0.6                        | 161196          |

\* Typical 40 dBm or more.



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# Wideband

Power amplifiers with bandwidths greater than three octaves.

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## WIDEBAND

### AMFG-3F-00030300-60-33P

#### MULTI-OCTAVE POWER AMPLIFIERS TO 20 GHz

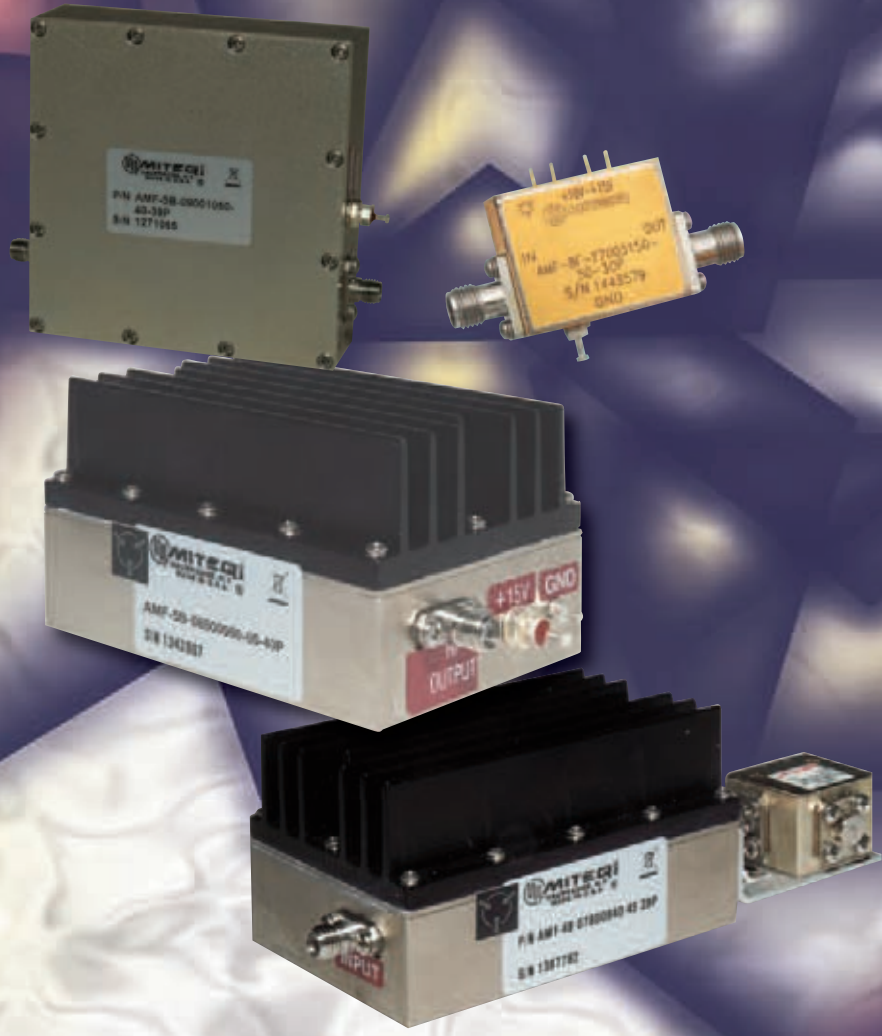
Power amplifier modules covering a frequency range of 2 to 20 GHz are available in a compact housing. These power amplifiers have power ranges from 0.8W to 10W depending on the specific frequency range. They are internally regulated, protected against reverse or over voltage, transients, and over temperature. A TTL control for internal DC supply is optional. They are also available in various mechanical configurations, with a custom heatsink or also with a fan pack.



| MODEL NUMBER            | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|-------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMFG-3F-00030300-60-33P | 0.03-3                    | 40              | 2                         | 6                       | 33*                                  | 2:2.2              | 0.6*                       | 133171-3        |
| AMFG-3F-00030400-60-32P | 0.03-4                    | 40              | 2                         | 6                       | 32*                                  | 2:2                | 0.6*                       | 133171-3        |
| AMFG-3F-00040250-60-33P | 0.04-2.5                  | 40              | 2                         | 6                       | 33*                                  | 2:2.2              | 0.67*                      | 133171-3        |
| AMF-4D-00100100-30-30P  | 0.1-1                     | 44              | 1                         | 3                       | 30                                   | 2.2:2.2            | 0.85                       | 118406-4        |
| AMF-4D-00400600-50-30P  | 0.4-6                     | 34              | 2                         | 5                       | 30                                   | 2:2.3              | 0.65                       | 132513-2        |
| AMF-1D-00500200-70-30P  | 0.5-2                     | 8               | 1                         | 7                       | 30                                   | 2:2.3              | 0.4                        | 114293-1        |
| AMF-2F-00500200-60-30P  | 0.5-2                     | 18              | 1.5                       | 6                       | 30                                   | 2:2.3              | 0.65                       | 183016          |
| AMF-3D-00500200-50-31P  | 0.5-2                     | 36              | 1.5                       | 5                       | 31                                   | 2.2:2.2            | 0.9                        | 118406-3        |
| AMF-3F-00500200-45-30P  | 0.5-2                     | 29              | 1.5                       | 4.5                     | 30                                   | 2:2.3              | 0.8                        | 183016          |
| AMF-4D-00500200-25-33P  | 0.5-2                     | 40              | 2                         | 2.5                     | 33                                   | 2:2.3              | 1.4                        | 125420          |
| AMF-4D-00500200-35-30P  | 0.5-2                     | 41              | 2                         | 3                       | 30                                   | 2:2.3              | 0.9                        | 125420          |
| AMF-4F-00500200-17-32P  | 0.5-2                     | 55              | 2.5                       | 1.7                     | 32                                   | 2:2                | 1.4                        | 125420          |
| AMFG-3F-00700380-60-35P | 0.7-3.8                   | 40              | 2                         | 6                       | 35*                                  | 2.5:2.5            | 1.5*                       | 133171-3        |
| AMFG-3F-00800220-60-35P | 0.8-2.2                   | 40              | 1.5                       | 6                       | 35*                                  | 2:2                | 0.9*                       | 133171-3        |
| AMF-2F-01000400-60-30P  | 1-4                       | 18              | 1.5                       | 6                       | 30                                   | 2:2.3              | 0.65                       | 183016          |
| AMF-3F-01000400-45-30P  | 1-4                       | 28              | 1.5                       | 4.5                     | 30                                   | 2:2.3              | 0.8                        | 183016          |
| AMF-4F-01000400-35-30P  | 1-4                       | 39              | 1.5                       | 3.5                     | 30                                   | 2:2.3              | 0.9                        | 183016          |
| AMF-4B-02000800-80-36P  | 2-8                       | 40              | 2.5                       | 8                       | 36                                   | 2:2.8              | 4.8                        | 116879-1        |
| AMF-5B-02000800-55-30P  | 2-8                       | 32              | 2                         | 5.5                     | 30                                   | 2:1.2              | 1.3                        | 145393-5        |
| AMF-5B-02000800-55-32P  | 2-8                       | 34              | 2                         | 5.5                     | 32                                   | 2:1.2              | 1.9                        | 145393-5        |
| AMF-3B-02001200-90-33P  | 2-12                      | 35              | 2                         | 9                       | 33                                   | 2:2.3              | 4.5                        | 165230          |
| AMF-3B-02001800-30-30P  | 2-18                      | 35              | 2                         | 3                       | 30                                   | 2.2:2.2            | 2                          | 163559          |
| AMF-3B-02001800-38-30P  | 2-18                      | 35              | 2                         | 3.8                     | 30                                   | 2.2:2.2            | 2                          | 163559          |
| AMF-3B-02001800-60-30P  | 2-18                      | 35              | 2                         | 6                       | 30                                   | 2.2:2.2            | 2                          | 163559          |
| AMF-3B-02001800-60-32P  | 2-18                      | 33              | 2.5                       | 7                       | 32                                   | 2:2.3              | 4.5                        | 165230          |
| AMF-3B-02002000-60-30P  | 2-20                      | 33              | 2.75                      | 6                       | 30                                   | 2:2.5              | 4.5                        | 165230          |
| AMF-3B-02502000-60-32P  | 2.5-20                    | 40              | 2.5                       | 6                       | 32                                   | 2:2.5              | 4.5                        | 165230          |

\* 30V supply, and peak current. IDQ usually much lower. Psat is typically 3-5 dB above P1dB.

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# ***SATCOM and Radar***

Narrowband power amplifiers in common radar and satellite bands.

## SATCOM AND RADAR

### AMF-4B-07800840-45-38P

A 6 W module in the 8 GHz band, with similar models available up to 12 W. Output is isolator protected, has fins on top and is suitable for all telecom applications in this band.



| MODEL NUMBER           | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMF-3B-01000110-20-36P | 1-1.1                     | 25              | 1                         | 3                       | 36                                   | 2:2                | 3                          | 152398          |
| AMF-2B-01200140-70-32P | 1.2-1.4                   | 21              | 0.5                       | 7                       | 32                                   | 1.5:1.5            | 1.2                        | 137120          |
| AMF-3B-01200140-60-34P | 1.2-1.4                   | 30              | 1                         | 6                       | 34                                   | 2:1.5              | 2                          | 117558-4        |
| AMF-6B-02000230-60-43P | 2-2.3                     | 47              | 2                         | 6                       | 43                                   | 2:1.5              | 12                         | 172456          |
| AMF-6B-02200240-60-40P | 2.2-2.4                   | 40              | 1.25                      | 6                       | 40                                   | 2:1.5              | 4                          | 117251          |
| AMF-6B-02500270-30-40P | 2.5-2.7                   | 40              | 1                         | 3                       | 40                                   | 1.5:1.5            | 5                          | 127402          |
| AMF-1B-02700380-40-30P | 2.7-3.8                   | 12              | 0.5                       | 4                       | 30                                   | 2:2                | 0.6                        | 178326          |
| AMF-1B-02700380-40-31P | 2.7-3.8                   | 13              | 0.6                       | 4                       | 31                                   | 2:2                | 0.65                       | 178326          |
| AMF-6B-02700290-40-37P | 2.7-2.9                   | 40              | 1                         | 4                       | 37                                   | 1.5:1.5            | 4                          | 127402          |
| AMF-6B-02700290-40-38P | 2.7-2.9                   | 40              | 1                         | 4                       | 38                                   | 1.5:1.5            | 2.85                       | 127402          |
| AMF-6B-02700290-50-39P | 2.7-2.9                   | 40              | 1                         | 5                       | 39                                   | 1.5:1.5            | 3.85                       | 127402          |
| AMF-6B-02700290-60-40P | 2.7-2.9                   | 40              | 1.25                      | 6                       | 40                                   | 1.5:1.5            | 4                          | 127402          |
| AMF-1B-02800340-40-30P | 2.8-3.4                   | 12              | 0.5                       | 4                       | 30                                   | 2:2                | 0.6                        | 178326          |
| AMF-4B-03100350-50-36P | 3.1-3.5                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-03100350-50-39P | 3.1-3.5                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-4B-03100360-50-36P | 3.1-3.6                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.4                        | 177361          |
| AMF-4B-03400390-50-36P | 3.4-3.9                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-03400390-50-39P | 3.4-3.9                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-4B-03400420-20-30P | 3.4-4.2                   | 40              | 1                         | 2                       | 30                                   | 1.8:1.8            | 0.95                       | 145393-4        |
| AMF-4B-03400420-30-30P | 3.4-4.2                   | 40              | 1                         | 3                       | 30                                   | 2:2                | 0.95                       | 145393-4        |
| AMF-4F-03400420-20-30P | 3.4-4.2                   | 40              | 1                         | 2                       | 30                                   | 2:2                | 0.75                       | 183016          |
| AMF-4B-03400480-30-30P | 3.4-4.8                   | 40              | 1                         | 3                       | 30                                   | 2:2                | 0.95                       | 145393-4        |
| AMF-4F-03400480-20-30P | 3.4-4.8                   | 40              | 1                         | 2                       | 30                                   | 2:2                | 0.75                       | 183016          |
| AMF-5B-03700640-50-39P | 3.4-6.4                   | 40              | 2.5                       | 5                       | 39                                   | 2:2                | 8                          | 178301          |
| AMF-4B-03500580-60-30P | 3.5-5.8                   | 30              | 1.25                      | 4.5                     | 30                                   | 2:2                | 1.2                        | 145393-4        |
| AMF-4B-03700420-50-36P | 3.7-4.2                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-03700420-50-39P | 3.7-4.2                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-5B-04000450-50-33P | 4.4-5                     | 30              | 1                         | 5                       | 33                                   | 2:1.5              | 1.5                        | 117558-4        |
| AMF-4B-04400500-50-36P | 4.4-5                     | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-04400500-50-39P | 4.4-5                     | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-5B-04400640-50-39P | 4.4-6.4                   | 40              | 1.7                       | 5                       | 39                                   | 2:2                | 8                          | 178301          |
| AMF-4B-05000530-50-36P | 5-5.3                     | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-05000530-50-39P | 5-5.3                     | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-5B-05000650-60-40P | 5-6.5                     | 43              | 1.5                       | 6                       | 39*                                  | 2:2                | 8                          | 178301          |

\* Typical 40 dBm or more.

## SATCOM AND RADAR (CONT.)

### AMF-5B-08500960-60-40P

A 10 W power amplifier module suitable for all linear and pulsed X-Band applications. It has a field removable isolator at the output.



| MODEL NUMBER            | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|-------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMF-4B-05300590-50-36P  | 5.3-5.9                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.2                        | 117251          |
| AMF-4B-05300590-50-39P  | 5.3-5.9                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-4B-05400590-30-30P  | 5.4-5.9                   | 35              | 0.7                       | 3                       | 30                                   | 1.6:1.6            | 1.5                        | 145393-4        |
| AMF-5B-05400590-50-37P  | 5.4-5.9                   | 35              | 1                         | 5                       | 37                                   | 2:1.5              | 3.4                        | 117251          |
| AMF-4B-05900640-50-33P  | 5.9-6.4                   | 30              | 1                         | 5                       | 33                                   | 2:1.5              | 1.5                        | 116879-1        |
| AMF-4B-05900640-50-36P  | 5.9-6.4                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.1                        | 117251          |
| AMF-4B-05900640-50-38P  | 5.9-6.4                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 2.7                        | 117251          |
| AMF-4B-05900640-50-39P  | 5.9-6.4                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 117251          |
| AMF-4B-05900720-50-36P  | 5.9-7.2                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.1                        | 117251          |
| AMF-4B-05900720-50-38P  | 5.9-7.2                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 3.3                        | 127202          |
| AMF-4B-06400720-50-36P  | 6.4-7.2                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.1                        | 117251          |
| AMF-4B-06400720-50-38P  | 6.4-7.2                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 2.7                        | 127202          |
| AMF-4B-06400720-50-39P  | 6.4-7.2                   | 35              | 1                         | 5                       | 38.5                                 | 2:1.5              | 3.3                        | 127202          |
| AMF-2B-06500900-70-37P  | 6.5-9                     | 20              | 1.25                      | 7                       | 37                                   | 2:2                | 3.3                        | 146727          |
| AMF-4B-06500900-55-37P  | 6.5-9                     | 38              | 1.5                       | 5.5                     | 37                                   | 2:2                | 3.3                        | 146727          |
| AMF-4B-07000900-50-37P  | 7-9                       | 36              | 1.5                       | 5                       | 37                                   | 2:1.5              | 3.4                        | 146727          |
| AMF-5B-07001150-50-37P  | 7-11.5                    | 35              | 2                         | 5                       | 37                                   | 2:1.8              | 4.1                        | 127465          |
| AMF-5B-07100770-60-41P  | 7.1-7.7                   | 38              | 1.25                      | 6                       | 41                                   | 2:1.5              | 10.1                       | 176455          |
| AMF-5B-07100790-50-36P  | 7.1-7.9                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.1                        | 117251          |
| AMF-5B-07100790-50-38P  | 7.1-7.9                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 2.7                        | 127202          |
| AMF-5B-07100790-50-39P  | 7.1-7.9                   | 35              | 1                         | 5                       | 39                                   | 2:1.5              | 3.3                        | 127202          |
| AMF-5B-07100850-50-37P  | 7.1-8.5                   | 35              | 1                         | 5                       | 37                                   | 2:1.5              | 2.7                        | 127202          |
| AMFH-5B-07101010-80-33P | 7.1-10.1                  | 25              | 1                         | 8                       | 33                                   | 1.8:1.8            | 2.8                        | 135793          |
| AMF-5B-07700850-50-36P  | 7.7-8.5                   | 35              | 1                         | 5                       | 36                                   | 2:1.5              | 2.1                        | 117251          |
| AMF-5B-07700850-50-37P  | 7.7-8.5                   | 35              | 1                         | 5                       | 37                                   | 2:1.5              | 2.7                        | 127202          |
| AMF-5B-07700850-50-38P  | 7.7-8.5                   | 35              | 1                         | 5                       | 38                                   | 2:1.5              | 2.7                        | 146727          |
| AMF-5B-07700850-50-39P  | 7.7-8.5                   | 35              | 1                         | 5                       | 39                                   | 2.1:1.5            | 3.3                        | 127202          |
| AMF-4B-07700850-45-39P  | 7.7-8.5                   | 36              | 0.75                      | 4.5                     | 39                                   | 2:1.5              | 3.3                        | 146727          |
| AMF-4B-07600860-50-37P  | 7.7-8.6                   | 38              | 1.5                       | 5                       | 37                                   | 1.75:1.5           | 3.3                        | 146727          |
| AMF-4B-07800840-45-38P  | 7.8-8.4                   | 38              | 0.5                       | 4.5                     | 38                                   | 1.75:1.5           | 3.3                        | 146727          |
| AMF-6B-07900840-50-33P  | 7.9-8.4                   | 35              | 1                         | 5                       | 33                                   | 1.8:1.8            | 1.5                        | 117558-4        |
| AMF-5B-08001050-50-38P  | 8-10.5                    | 36              | 1.75                      | 5                       | 38                                   | 2:2                | 4.1                        | 127465          |
| AMF-5B-08001200-80-30P  | 8-12                      | 24              | 1.5                       | 8                       | 30                                   | 2:2                | 1.2                        | 116348-1        |
| AMF-6B-08001200-35-30P  | 8-12                      | 35              | 1.5                       | 3.5                     | 30                                   | 2:2                | 1.8                        | 145393-4        |
| AMF-6B-08001200-55-31P  | 8-12                      | 37              | 1.25                      | 5.5                     | 31                                   | 2:2                | 1.4                        | 146727          |
| AMF-6B-08001200-50-33P  | 8-12                      | 33              | 1.5                       | 5                       | 33                                   | 2:2                | 2                          | 145393-5        |



## SATCOM AND RADAR (CONT.)

### AMF-5B-09001050-40-39P

#### X-BAND POWER AMPLIFIER

Model AMF-5B-09001050-40-39P has an output P1dB of about 39 dBm from 9 to 10.5 GHz and 38 dBm from 7.5 to 11 GHz. Gain is 36 dB minimum,  $\pm 1$  dB flat, and typical noise figure is 3.5 dB. This model operates from  $-10$  to  $+60^\circ\text{C}$  base temperature range and draws about 4A from 15V. It has internal regulation and protection, and a footprint of only 3.3" x 3.3".



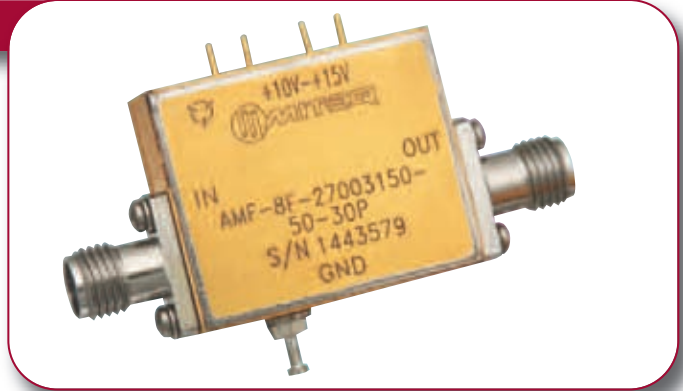
| MODEL NUMBER            | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS ( $\pm$ dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|-------------------------|---------------------------|-----------------|---------------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMF-8B-08001200-60-34P  | 8-12                      | 35              | 2                               | 6                       | 34                                   | 2:2                | 2.8                        | 146727          |
| AMF-5B-08001200-50-35P  | 8-12                      | 35              | 2                               | 5                       | 35                                   | 2:2                | 2.8                        | 127465          |
| AMF-6B-08001200-110-40P | 8-12                      | 40              | 3.5                             | 11                      | 40                                   | 2:2.3              | 12                         | 165230          |
| AMF-8B-08001300-60-34P  | 8-13                      | 35              | 2                               | 6                       | 34                                   | 2:2                | 2.8                        | 146727          |
| AMF-6B-08001300-50-35P  | 8-13                      | 35              | 2                               | 5                       | 35                                   | 2:2                | 2.8                        | 127465          |
| AMF-6B-08500960-40-37P  | 8.5-9.6                   | 40              | 1                               | 4                       | 37                                   | 2:1.5              | 3.5                        | 127202          |
| AMF-5B-08500960-50-38P  | 8.5-9.6                   | 35              | 1                               | 5                       | 38                                   | 2:1.5              | 3.3                        | 127202          |
| AMF-5B-08500960-50-40P  | 8.5-9.6                   | 35              | 1                               | 5                       | 40                                   | 2:1.5              | 4.7                        | 178301          |
| AMF-5B-08500960-50-41P  | 8.5-9.6                   | 35              | 1                               | 5                       | 41                                   | 2:1.5              | 4.8                        | 135802          |
| AMF-6B-09000955-50-37P  | 9-9.5                     | 43              | 1                               | 5                       | 37                                   | 2:2                | 3.6                        | 127202          |
| AMF-2B-09001000-85-30P  | 9-10                      | 30              | 1.5                             | 6.5                     | 30                                   | 2:2                | 0.95                       | 145393          |
| AMF-5B-09001000-50-33P  | 9-10                      | 33              | 0.5                             | 5                       | 33                                   | 2:2                | 1.6                        | 117558-5        |
| AMF-4B-09001000-50-33P  | 9-10                      | 33              | 0.5                             | 5                       | 33                                   | 2:2                | 1.5                        | 117558-5        |
| AMF-5B-0901000-45-36P   | 9-10                      | 37              | 1                               | 4.5                     | 36                                   | 2:2                | 3.1                        | 157681          |
| AMF-5B-0901000-45-37P   | 9-10                      | 38              | 1                               | 4.5                     | 37                                   | 2:2                | 3.2                        | 127465          |
| AMF-5B-0901000-50-38P   | 9-10                      | 37              | 1                               | 5                       | 38                                   | 1.8:1.8            | 4.2                        | 127465          |
| AMF-3B-09001000-80-40P  | 9-10                      | 45              | 2                               | 8                       | 40                                   | 2:2.2              | 12                         | 165230          |
| AMF-5B-09001050-40-39P  | 9-10.5                    | 37              | 1.35                            | 4                       | 39                                   | 2:2                | 4.1                        | 127465          |
| AMF-2B-09001550-50-37P  | 9-15.5                    | 45              | 1.75                            | 5                       | 37                                   | 2:2                | 6.6                        | 163559          |
| AMF-6B-09501050-50-38P  | 9.5-10.5                  | 35              | 1                               | 5                       | 38                                   | 2:1.5              | 3.3                        | 127202          |
| AMF-6B-09501050-50-40P  | 9.5-10.5                  | 35              | 1                               | 5                       | 40                                   | 2:1.5              | 4.1                        | 178301          |
| AMF-3B-09501150-100-41P | 9.5-11.5                  | 45              | 3.5                             | 11                      | 41                                   | 2.1:2.3            | 12                         | 165230          |
| AMF-5B-09701020-40-33P  | 9.7-10.2                  | 33              | 1                               | 4                       | 33                                   | 2:2                | 1.4                        | 117558-4        |
| AMF-5B-09701020-35-33P  | 9.7-10.2                  | 34              | 1                               | 3.5                     | 33                                   | 1.8:1.8            | 1.4                        | 117558-4        |
| AMF-6B-09901010-50-37P  | 9.9-10.1                  | 30              | 0.6                             | 3.5                     | 37                                   | 2:2                | 3.3                        | 127202          |
| AMF-6B-10701170-50-38P  | 10.7-11.7                 | 35              | 1                               | 5                       | 38                                   | 2:1.5              | 3.3                        | 127202          |
| AMF-6B-10701170-50-40P  | 10.7-11.7                 | 35              | 1                               | 5                       | 40                                   | 2:1.5              | 4.7                        | 127202          |
| AMF-6B-10701170-50-41P  | 10.7-11.7                 | 35              | 1                               | 5                       | 41                                   | 2:1.5              | 4.8                        | 127202          |
| AMF-6B-12001800-70-33P  | 12-18                     | 35              | 2                               | 7                       | 33                                   | 2:2                | 2.8                        | 127465          |
| AMF-6B-12701320-50-40P  | 12.7-13.2                 | 35              | 1                               | 5                       | 40                                   | 2:1.5              | 4.7                        | 127202          |
| AMF-5B-13751450-50-37P  | 13.75-14.5                | 35              | 1.25                            | 5                       | 37                                   | 2:1.5              | 6                          | 127202          |
| AMF-6B-13751450-50-39P  | 13.75-14.5                | 35              | 1.25                            | 5                       | 39                                   | 2:1.5              | 7.1                        | 127202          |
| AMF-6B-13751450-50-40P  | 13.75-14.5                | 35              | 1.25                            | 5                       | 40                                   | 2:1.5              | 5.4                        | 127202          |
| AMF-6B-14001450-50-40P  | 14-14.5                   | 35              | 1                               | 5                       | 40                                   | 2:1.5              | 4.7                        | 127202          |
| AMF-6B-14001450-50-41P  | 14-14.5                   | 40              | 1.25                            | 5                       | 41                                   | 2:1.5              | 5.5                        | 178301-11       |
| AMF-6B-14001535-50-40P  | 14-15.35                  | 35              | 1.5                             | 5                       | 40                                   | 2:2                | 8                          | 178301          |
| AMF-6B-14001535-50-40P  | 14-15.35                  | 35              | 1.5                             | 5                       | 40                                   | 2:2                | 8                          | 178301          |

## SATCOM AND RADAR (CONT.)

### AMF-8F-27003150-55-30P

#### K-BAND POWER AMPLIFIER MODULE

Model AMF-8F-27003150-55-30P is a compact and connectorized high power gain module, covering SAT-COM bands 27 to 31.5 GHz and delivering approximately 1W of power. High thermal performance housing is 0.37" (9.3 mm) high, 1" (25.5 mm) long (without connectors) and 0.83" (21 mm) wide (without the DC pins). Total length including the field-replaceable 2.92 mm K-connectors is 1.76".



Nominal small-signal gain of the amplifier is 35 dB minimum,  $\pm 1.5$  dB, while noise figure is close to 4.5 dB typical. Port VSWRs are less than 2.3:1. Minimum P1dB is 30 dBm. Output IP<sup>3</sup> is a minimum of 33 dBm and a typical of 37 dBm across the full band. It is intended for bolting to a flat cooling surface. Housing can be hermetically or environmentally sealed.

Regulation and bias sequencing is internal, so only a single +10 to +15V supply is required. Typical current draw is near 1.2A linear and about 1.7A at full power. Operational from  $-40$  to  $+85^{\circ}\text{C}$  baseplate temperature, with about 1 dB degradation in power and gain.

| MODEL NUMBER             | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS ( $\pm$ dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | DC POWER @ +15 V (A, Nom.) | OUTLINE DRAWING |
|--------------------------|---------------------------|-----------------|---------------------------------|-------------------------|--------------------------------------|--------------------|----------------------------|-----------------|
| AMF-7B-14001600-80-30P   | 14-16                     | 30              | 1.5                             | 8                       | 30                                   | 2:2                | 2.3                        | 117469-4        |
| AMF-6B-16001700-60-40P   | 16-17                     | 43              | 1.5                             | 6                       | 40                                   | 2:2.2              | 12                         | 165230          |
| AMFH-7B-16751725-100-36P | 16.75-17.25               | 50              | 1                               | 10                      | 36                                   | 2:2.3              | 9                          | 142571          |
| AMF-6F-17002200-70-30P   | 17-22                     | 25              | 1.5                             | 7                       | 30                                   | 2.1:2.1            | 2.2                        | 166644          |
| AMF-6B-17702200-60-30P   | 17.7-22                   | 40              | 2                               | 6                       | 30                                   | 2:2                | 1.8                        | 146727          |
| AMF-5B-19002400-60-33P   | 19-24                     | 36              | 1.5                             | 6                       | 33                                   | 2:2                | 3                          | 146727          |
| AMF-5B-20002300-60-34P   | 20-23                     | 36              | 1.5                             | 6                       | 33.5                                 | 2:2                | 3                          | 146727          |
| AMF-5B-20002400-60-30P   | 20-24                     | 36              | 1.5                             | 6                       | 30                                   | 2:2                | 2.2                        | 146727          |
| AMF-5B-22002400-60-33P   | 22-24                     | 38              | 1.5                             | 6                       | 33                                   | 2:2                | 3                          | 146727          |
| AMF-4B-26003100-100-36P  | 26-31                     | 18              | 1.5                             | 9                       | 35                                   | 2.3:2.3            | 7                          | 159648          |
| AMF-8F-27003100-90-30P   | 27-31                     | 30              | 2                               | 9                       | 30                                   | 2.5:2.5            | 1.05                       | 138002          |
| AMF-8F-27003150-55-30P   | 27-31.5                   | 35              | 2                               | 5.5                     | 30                                   | 2.5:2.5            | 1.5                        | 166644          |
| AMF-8F-27003150-50-30P   | 27-31.5                   | 38              | 1.75                            | 5                       | 30                                   | 2.4:2.4            | 1.5                        | 166644          |
| AMF-6F-27503100-90-30P   | 27.5-31                   | 16              | 2                               | 9                       | 30                                   | 2.5:2.5            | 0.95                       | 138002          |
| AMF-8F-27503150-55-31P   | 27.5-31.5                 | 40              | 1.5                             | 5.5                     | 31                                   | 2.3:2.3            | 1.7                        | 166644          |
| AMF-4B-29003100-90-36P   | 29-31                     | 20              | 1.25                            | 9                       | 36                                   | 2:2                | 7                          | 159648          |

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# Broadband GaN

Multi-octave GaN power amplifiers starting at 30 MHz up to 4 GHz.

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## BROADBAND GaN POWER AMPLIFIERS

### AMFG-3F-00030400-60-32P

#### MULTI-OCTAVE GaN RF POWER AMPLIFIERS

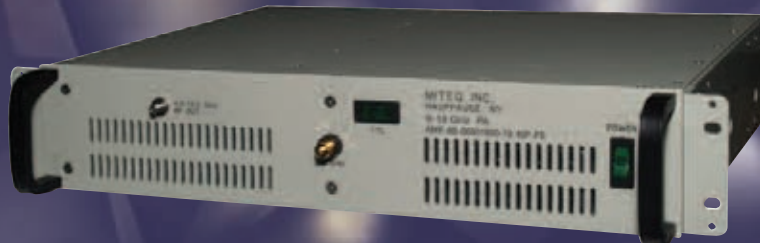
MITEQ's AMFG family of GaN power amplifiers covers frequency ranges more than ten octaves wide. High impedances of these devices allow for excellent port match and gain flatness over very wide bandwidths. Inherent robustness of the device technology enables these amplifiers to withstand very high base temperatures or surges in RF or DC power without compromising their reliability. The Model AMFG-3F-00030400-60-32P operates from 30 MHz to 4 GHz, has over 40 dB gain, typical  $\pm 1.5$  dB flatness, P1dB of over 32 dBm and a Psat of 34 dBm typical. IP3 is typically 40 dBm. It is available in a small connectorized aluminum alloy housing, 6 cm long, 7.3 cm wide and 2.5 cm high, requires a single 30V DC supply and draws about 600 mA. It has a built-in over/reverse voltage, temperature and current protection. Port VSWRs are less than 2:1 for the whole band, and able to withstand full reflection. The operational temperature range is  $-40$  to  $+65^{\circ}\text{C}$  at base. Noise figure is near 5 dB and flat. In the same footprint and outline, MITEQ offers other models covering 30 MHz to 3 GHz at 33 dBm, 0.7-3.8 GHz at 36 dBm, a radio band module at 230-250 MHz at 37 dBm and others.



| MODEL NUMBER            | FREQUENCY RANGE (GHz) | GAIN (dB, Min.) | GAIN FLATNESS ( $\pm$ dB, Max.) | NOISE FIGURE (dB, Max.) | VSWR IN/OUT | P1dB (dBm, Min.) | Psat (dBm, Min.) | NOMINAL PEAK CURRENT @30V (mA) | OUTLINE DRAWING |
|-------------------------|-----------------------|-----------------|---------------------------------|-------------------------|-------------|------------------|------------------|--------------------------------|-----------------|
| AMFG-3F-00030300-60-33P | 0.03-3                | 40              | 2                               | 6                       | 2:2.2       | 33               | 35.5             | 750                            | 133171-3        |
| AMFG-3F-00030400-60-32P | 0.03-4                | 40              | 2                               | 6                       | 2:2         | 32               | 35               | 750                            | 133171-3        |
| AMFG-3F-00040250-60-33P | 0.04-2.5              | 40              | 2                               | 6                       | 2:2.2       | 33               | 35.5             | 670                            | 133171-3        |
| AMFG-3F-00230025-30-37P | 0.23-0.25             | 50              | 1                               | 3                       | 1.5:2       | 37               | 40               | 250                            | 133171-3        |
| AMFG-3F-00700380-60-35P | 0.7-3.8               | 40              | 2                               | 6                       | 2.5:2.5     | 35               | 39               | 1500                           | 133171-3        |
| AMFG-3F-00800220-60-35P | 0.8-2.2               | 40              | 1.5                             | 6                       | 2:2         | 35               | 38               | 900                            | 133171-3        |
| AMFG-2F-01000300-60-35P | 1-3                   | 40              | 2                               | 6                       | 2:2.2       | 35               | 39               | 1500                           | 133171-3        |

Note: Psat is defined as the output power where a minimum of 3 dB gain compression takes place.

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# *Instrumentation*

Amplifiers available in 19" rack format, self-cooled and AC input.



## INSTRUMENTATION

### AMF-6B-06001800-70-40P-PS

#### 6-18 GHz 10W HIGH POWER AMPLIFIER

Model AMF-6B-06001800-70-40P-PS is a self-cooled 3RU rack-mount high power amplifier, covering 6-18 GHz and delivering approximately 10W of power. The SMA connectorized box is 3.47" high, 16.99" wide excluding brackets, and 12.12" deep including fans. This model can be horizontally or vertically mounted. Housing is EMI shielded, CE certified and can operate in ambient temperature up to 50°C. This power amplifier includes over temperature protection in addition to full internal regulation. DC on/off switch is optional so is input connector through the front panel.



Nominal small-signal gain is 47 dB,  $\pm 3.5$  dB flat, while noise figure is typically 6 dB across the full band. Output IP3 is a typical of 45 dBm. Input/output port VSWRs are typically 2:1. It runs from 90-240 VAC, 40-400 Hz. Typical power draw is 150W.

### AMF-8B-18002650-70-37P-PS

#### 5W THROUGH 18-26.5 GHz BROADBAND HIGH POWER AMPLIFIER

Model AMF-8B-18002650-70-37P-PS is a self-cooled 3RU rack-mount high power amplifier, covering 18-26.5 GHz and delivering a minimum of 5W of power. The SMA connectorized box is 3.47" high, 16.99" wide excluding brackets, and 12.12" deep including fans. This model can be horizontally or vertically mounted. Housing is EMI shielded, CE certified and can operate in ambient temperature up to 50°C. This power amplifier includes over temperature protection in addition to full internal regulation. A 20 dB output coupled port is optional.



Nominal small-signal gain is 50 dB and  $P_{sat}$  is typically  $38 \pm 1$  dBm. Input/output port VSWRs are typically 2:1 or less. This unit runs from 90-240 VAC, 40-400 Hz, with power draw less than 80W with separate RF power switch.

## INSTRUMENTATION (CONT.)

### AMF-8B-02002650-10-40P-PS

#### BROADBAND HIGH POWER AMPLIFIER

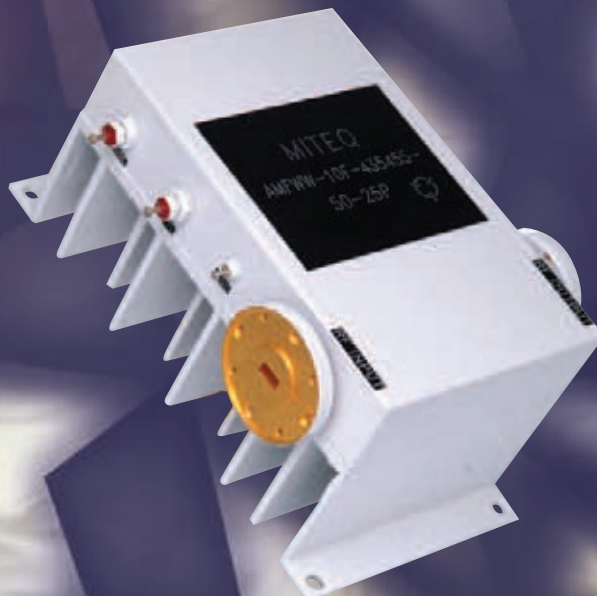
This 3U rack-mount Power Amplifier has three separate low channels covering 2 to 18 GHz, with separate controls. Self-cooled housing works if from 90-250 VAC.



| MODEL NUMBER              | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | OUTLINE DRAWING |
|---------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|-----------------|
| AMF-3B-02001800-60-30P-PS | 2-18                      | 35              | 2                         | 6                       | 30                                   | 2.2:2.2            | 170356          |
| AMF-5B-05000650-60-40P-PS | 5-6.5                     | 43              | 1.5                       | 6                       | 39*                                  | 2:2.1              | 170356          |
| AMF-6B-06001800-70-40P-PS | 6-18                      | 43              | 3.5                       | 7                       | 39*                                  | 2.2:2.2            | 170356          |
| AMF-6B-14001450-50-41P-PS | 14-14.5                   | 40              | 1.25                      | 5                       | 41                                   | 2:1.5              | 170356          |
| AMF-8B-18002650-70-37P-PS | 18-26.5                   | 52              | 4                         | 10                      | 36                                   | 2:2                | 170356          |
| AMF-8F-27003150-60-30P-PS | 27-31.5                   | 35              | 2                         | 6                       | 30                                   | 2.5:2.5            | 170356          |

\* Typical 40 dBm or more.  
 Note: All rack-mount models above are CE certified.

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# ***Microwave and Millimeter-Wave***

**Power amplifiers above 26 GHz.**

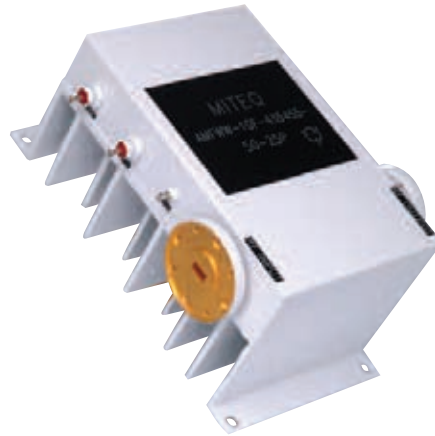
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## MICROWAVE AND MILLIMETER-WAVE

### AMFWW-10F-43504550-50-25P

#### Q-BAND WR-22 MEDIUM POWER MMW WAVEGUIDE AMPLIFIER

Model AMFWW-10F-43504550-50-25P is a 43.5 to 45.5 GHz waveguide amplifier. It has 35 dB minimum gain of over the full band, with a minimum P1dB of 25 dBm. Typical noise figure is 5 dB. UG383/U waveguide input and output ports have a low VSWR of 1.5:1. It typically draws 1A from a 15V supply. This amplifier has a custom heatsink that can be removed. Other models from 15 dBm to 30 dBm are also available.



| MODEL NUMBER              | OPERATING FREQUENCY (GHz) | GAIN (dB, Min.) | GAIN FLATNESS (±dB, Max.) | NOISE FIGURE (dB, Max.) | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | VSWR IN/OUT (Max.) | NOMINAL VOLTAGE (V) | DC POWER @ +15 V (mA, Nom.) | OUTLINE DRAWING |
|---------------------------|---------------------------|-----------------|---------------------------|-------------------------|--------------------------------------|--------------------|---------------------|-----------------------------|-----------------|
| AMF-6B-17002650-50-23P    | 17-26.5                   | 33              | 2                         | 5                       | 23                                   | 2.3:2.3            | 12                  | 650                         | 117469-5        |
| AMF-4F-18002650-90-23P    | 18-26.5                   | 20              | 2                         | 9                       | 23                                   | 2.5:2.5            | 15*                 | 400                         | 161196          |
| AMF-4F-20003000-90-22P    | 20-30                     | 15              | 2.5                       | 9                       | 22                                   | 2.5:2.5            | 15                  | 500                         | 161196          |
| AMF-6F-20003000-90-22P    | 20-30                     | 25              | 2.5                       | 9                       | 22                                   | 2.5:2.5            | 15*                 | 600                         | 161196          |
| AMF-4F-20004000-90-22P    | 20-40                     | 15              | 3                         | 9                       | 22                                   | 3:3                | 15*                 | 500                         | 161196          |
| AMF-6F-20004000-90-22P    | 20-40                     | 25              | 3                         | 9                       | 22                                   | 3:3                | 15*                 | 600                         | 161196          |
| AMF-4B-26003100-100-36P   | 26-31                     | 18              | 1.5                       | 9                       | 35                                   | 2.3:2.3            | 6*                  | 7000                        | 159648          |
| AMF-5B-33003500-80-32P    | 33-35                     | 50              | 2                         | 8                       | 32                                   | 2:2.3              | 15                  | 2200                        | 182509          |
| AMF-3B-33003500-80-32P    | 33-35                     | 30              | 2                         | 8                       | 32                                   | 2:2.3              | 15                  | 2000                        | 182509          |
| AMF-10F-37004100-90-30P   | 37-41                     | 30              | 2.5                       | 9                       | 30                                   | 2.5:2.5            | 15*                 | 1750                        | 165237          |
| AMF-8F-37004100-90-30P    | 37-41                     | 20              | 2.5                       | 9                       | 30                                   | 2.5:2.5            | 15                  | 1650                        | 165237          |
| AMFWW-10F-43504550-50-25P | 43.5-45.5                 | 35              | 1                         | 5                       | 25                                   | 1.5:1.5            | 15                  | 1000                        | 145239          |

\* Requires (-) bias also.

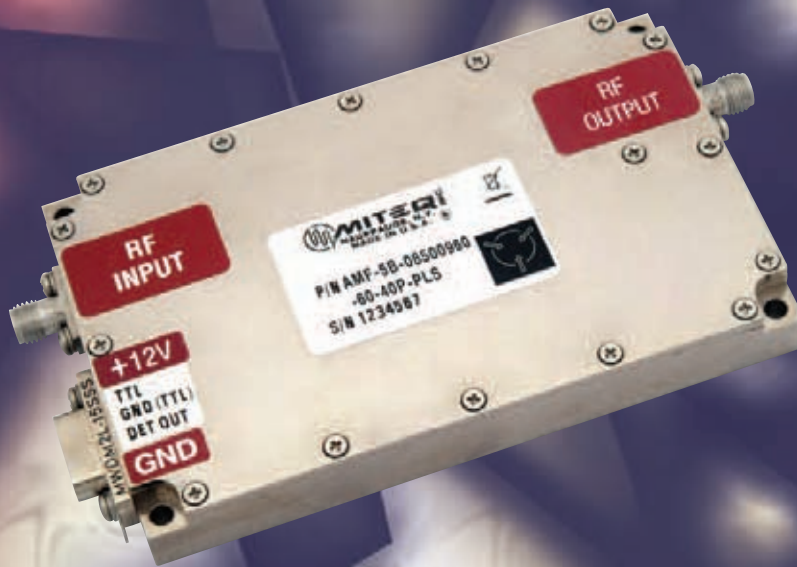
### AMF-5B-33003500-80-32P

#### 2W MILLIMETER-WAVE POWER AMPLIFIER

Model AMF-5B-33003500-80-32P is a connectorized high power amplifier/module, covering 33-35 GHz and delivering approximately 2.5W of saturated power and 2W of P1dB over a 2 GHz band. The connectorized aluminum alloy housing is 19 mm high, 76 mm long and 89 mm wide. It is intended for bolting to a flat cooling surface. Nominal small-signal gain is over 50 dB. Noise figure is nominally 6 dB. Output VSWR is a maximum of 2.3:1 and input is 2:1 maximum. Current draw is nominally 2.2A from 12V at P1dB. A TTL pin gives control over bias turn on/off. Operating temperature range is -40 to +55°C baseplate.



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# *Pulsed Power*

Power amplifiers for pulsed X-Band applications.



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## PULSED POWER AMPLIFIER

### AMF-5B-08500960-25-40P-PLS

#### HIGH SPEED PULSED POWER AMPLIFIER

This small outline power amplifier line offers a unique combination of features and performance in an extremely small footprint. High speed pulsed DC feature and 12V supply allows for very efficient operation suitable for high temperature, or battery operated or portable applications. Numerous models cover 8.5 GHz to 10.5 GHz, in various sub bands up to 1 GHz wide, (or custom) with power levels of 8W to 12W.



Model AMF-5B-08500960-25-40P-PLS for example is a 10W amplifier, delivering full peak power up to 50% duty cycle, with a maximum droop of typically 0.1 dB or less, for pulses over 100 usec long. With proper heatsinking, the power amplifier is capable of CW operation. Built-in output isolator protects against all output impedance conditions. A TTL input can control the DC current with rise and fall times of 200 nsec maximum with off state drawing less than 100 mA. The power amplifier has a gain of 40 dB minimum, with better than  $\pm 1.5$  dB flatness and a maximum noise figure of 2.5 dB. Input and output port VSWRs are 1.5:1 and 1.2:1 typical. RF rise and fall times are typically much less than 10 nsec, and phase settling occurs within less than 100 nsec. At peak power, the power amplifier may draw up to 6A or more from a 12V supply. A detector output is also available that directly samples the output power. The power amplifier also has warning and alarm features that monitor the internal average temperature and current peaks.

Input and output RF connectors are SMA(F), while all the DC, control and alarm signals are through a Micro-Sub connector. The power amplifier is approximately 10 cm long, 6 cm wide and 1.4 cm high and weighs only 175 grams. The AMF-5B-09701030-25-41P-PLS model delivers 12W for example from 9.7-10.3 GHz, while the AMF-5B-09501050-25-39P-PLS delivers 8W from 9.5-10.5 GHz, all in the same profile.

| MODEL NUMBER               | FREQUENCY   | GAIN (dB, Min.) | GAIN FLATNESS ( $\pm$ dB, Max.) | NOISE FIGURE (dB, Max.) | VSWR IN/OUT | OUTPUT PWR. @ 1 dB COMP. (dBm, Min.) | DC POWER @ +15 V (A, Nom. Pk.) | OUTLINE DRAWING |
|----------------------------|-------------|-----------------|---------------------------------|-------------------------|-------------|--------------------------------------|--------------------------------|-----------------|
|                            | RANGE (GHz) |                 |                                 |                         |             |                                      |                                |                 |
| AMF-5B-08500960-25-39P-PLS | 8.5-9.6     | 40              | 1.5                             | 2.5                     | 2:1.5       | 39                                   | 5.8                            | 185798          |
| AMF-5B-08500960-25-40P-PLS | 8.5-9.6     | 40              | 1.5                             | 2.5                     | 2:1.5       | 40                                   | 6                              | 185798          |
| AMF-5B-90009200-25-41P-PLS | 9-9.2       | 40              | 0.75                            | 2.5                     | 2:1.5       | 40.5*                                | 6.5                            | 185798          |
| AMF-5B-09100930-25-41P-PLS | 9.1-9.3     | 40              | 0.75                            | 2.5                     | 2:1.5       | 40.5*                                | 6.5                            | 185798          |
| AMF-5B-92009700-25-38P-PLS | 9.2-9.7     | 40              | 0.75                            | 2.5                     | 2:1.5       | 38                                   | 4.2                            | 185798          |
| AMF-5B-09300950-25-39P-PLS | 9.3-9.5     | 40              | 0.75                            | 2.5                     | 2:1.5       | 39                                   | 5.8                            | 185798          |
| AMF-5B-09300950-25-40P-PLS | 9.3-9.5     | 40              | 0.75                            | 2.5                     | 2:1.5       | 40                                   | 6.1                            | 185798          |
| AMF-5B-09300950-25-41P-PLS | 9.3-9.5     | 40              | 0.75                            | 2.5                     | 2:1.5       | 40.5*                                | 6.5                            | 185798          |
| AMF-5B-09501050-25-39P-PLS | 9.5-10.5    | 40              | 1.25                            | 2.5                     | 2:1.5       | 39                                   | 5.8                            | 185798          |
| AMF-5B-09601040-25-40P-PLS | 9.6-10.4    | 40              | 1.5                             | 2.5                     | 2:1.5       | 40                                   | 6.4                            | 185798          |
| AMF-5B-09701030-25-39P-PLS | 9.7-10.3    | 40              | 1                               | 2.5                     | 2:1.5       | 39                                   | 5.8                            | 185798          |
| AMF-5B-09701030-25-40P-PLS | 9.7-10.3    | 40              | 1                               | 2.5                     | 2:1.5       | 40                                   | 6.1                            | 185798          |
| AMF-5B-09701030-25-41P-PLS | 9.7-10.3    | 40              | 1                               | 2.5                     | 2:1.5       | 40.5*                                | 6.5                            | 185798          |

\* Typical 41 dBm or more.

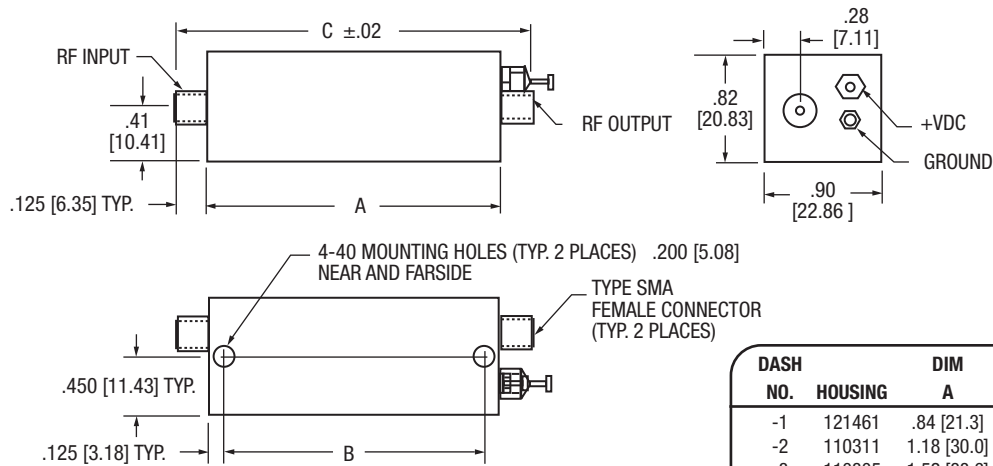
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***Outline  
Drawings***

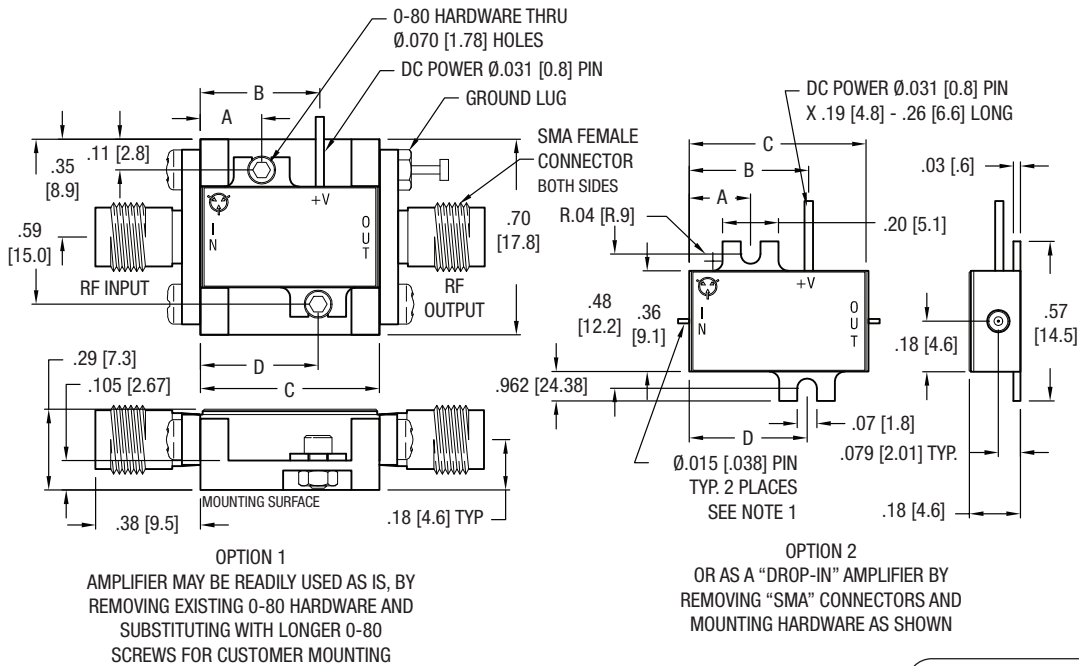
# OUTLINE DRAWINGS

## 110699



| DASH NO. | HOUSING | DIM A       | DIM B         | DIM C        |
|----------|---------|-------------|---------------|--------------|
| -1       | 121461  | .84 [21.3]  | .590 [23.62]  | 1.34 [34.0]  |
| -2       | 110311  | 1.18 [30.0] | .930 [23.62]  | 1.68 [42.67] |
| -3       | 110305  | 1.52 [38.6] | 1.270 [32.26] | 2.02 [51.31] |
| -4       | 110315  | 1.86 [47.2] | 1.610 [40.89] | 2.36 [59.94] |
| -5       | 110478  | 2.23 [56.6] | 1.980 [50.26] | 2.73 [69.3]  |
| -6       | 110480  | 2.57 [65.3] | 2.320 [58.93] | 3.07 [78.0]  |
| -7       | 110483  | 2.91 [73.9] | 2.660 [67.56] | 3.41 [86.6]  |
| -8       | 110775  | 3.25 [82.6] | 3.00 [76.20]  | 3.75 [95.3]  |
| -9       | 110738  | 2.20 [55.9] | 1.950 [49.53] | 2.70 [68.6]  |

## 113384

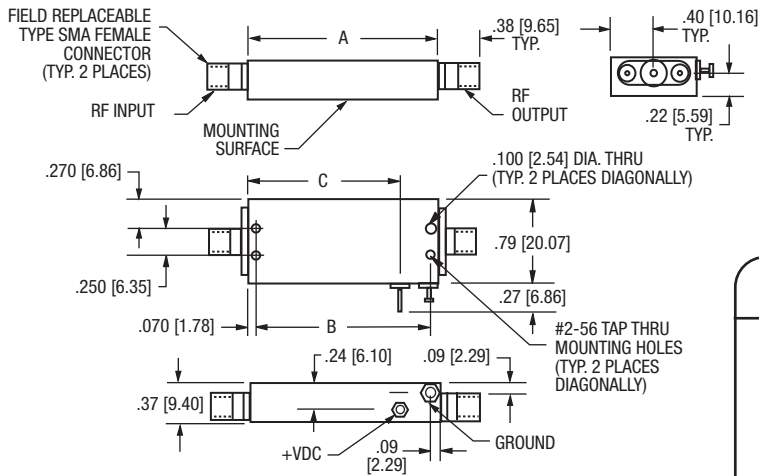


| DASH | DIM A     | DIM B      | DIM C       | DIM D      |
|------|-----------|------------|-------------|------------|
| 2    | .16 [4.1] | .28 [7.1]  | .43 [10.9]  | .27 [6.9]  |
| 3    | .16 [4.1] | .32 [8.1]  | .53 [13.5]  | .38 [9.7]  |
| 4    | .22 [5.6] | .43 [10.9] | .64 [16.3]  | .42 [10.7] |
| 5    | .22 [5.6] | .53 [13.5] | .75 [19.1]  | .53 [13.5] |
| 6    | .22 [5.6] | .64 [16.3] | .86 [21.8]  | .64 [16.3] |
| 7    | .22 [5.6] | .75 [19.1] | .97 [24.6]  | .75 [19.1] |
| 8    | .22 [5.6] | .86 [21.8] | 1.07 [27.2] | .86 [21.8] |

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

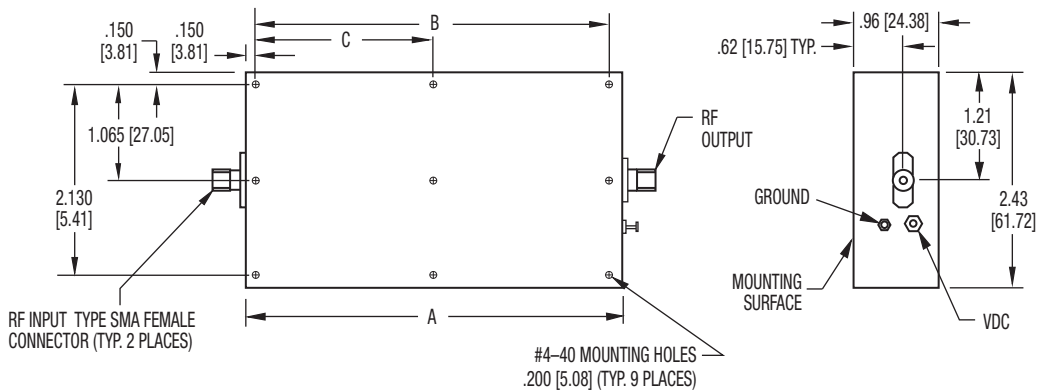
# OUTLINE DRAWINGS (CONT.)

## 114293



| DASH NO. | HOUSING | DIM A         | DIM B         | DIM C        |
|----------|---------|---------------|---------------|--------------|
| -1       | 113873  | .918 [23.32]  | .778 [19.76]  | .54 [13.72]  |
| -2       | 113140  | 1.158 [29.41] | 1.018 [25.86] | .78 [19.81]  |
| -3       | 113139  | 1.398 [35.51] | 1.258 [31.95] | 1.12 [28.45] |
| -4       | 112988  | 1.738 [44.15] | 1.598 [40.58] | 1.46 [37.08] |
| -5       | 113874  | 2.078 [52.78] | 1.938 [49.23] | 1.80 [45.72] |
| -6       | 113875  | 2.418 [61.41] | 2.278 [57.86] | 2.14 [54.36] |
| -7       | 113876  | 2.758 [70.05] | 2.618 [66.50] | 2.48 [62.99] |
| -8       |         | 3.098 [78.69] | 2.968 [75.39] | 2.82 [71.63] |
| -9       |         | 3.438 [87.33] | 3.298 [83.77] | 3.16 [80.26] |
| -10      |         | 3.778 [95.96] | 3.638 [92.41] | 3.50 [88.9]  |

## 116348

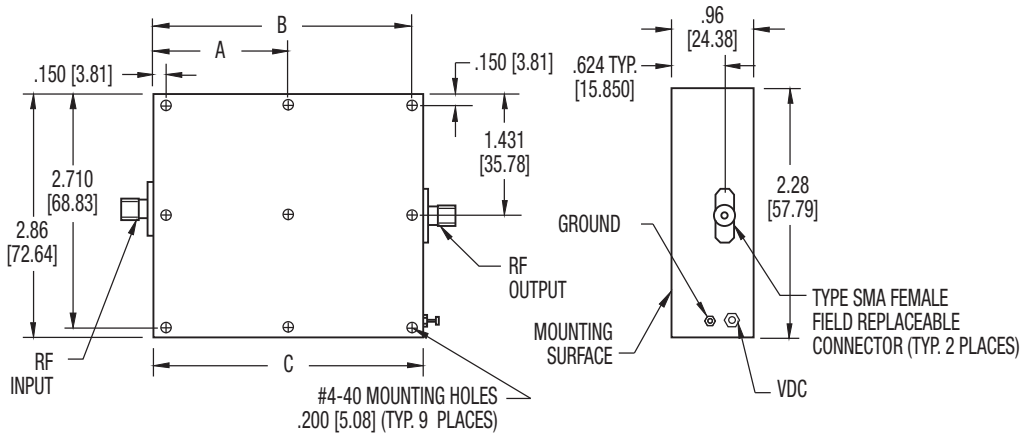


| DASH NO. | DIM A         | DIM B          | DIM C         |
|----------|---------------|----------------|---------------|
| -1       | 4.26 [108.20] | 3.956 [100.48] | 1.978 [50.24] |
| -2       | 2.98 [75.69]  | 1.338 [33.99]  | 2.676 [67.97] |

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

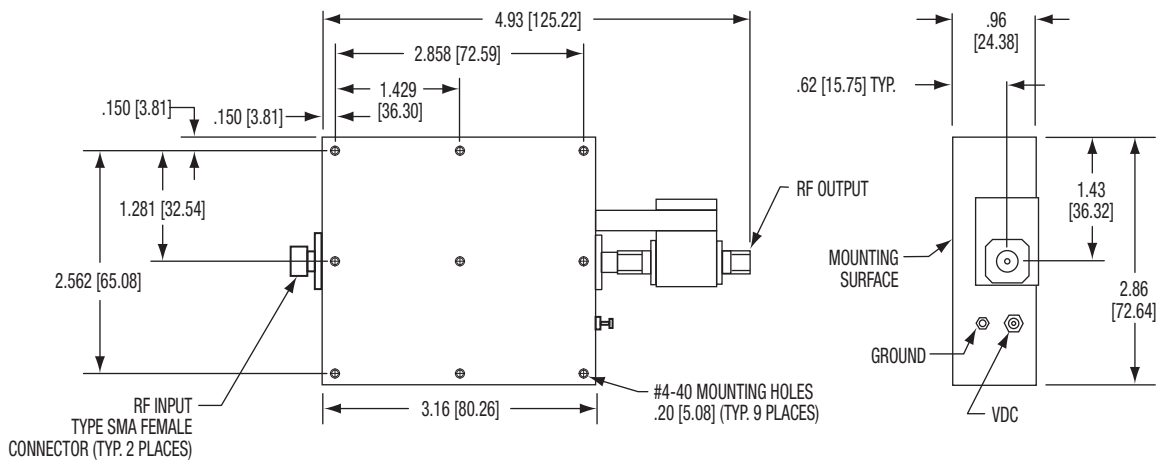
# OUTLINE DRAWINGS (CONT.)

## 116879



| DASH NO. | DIM A         | DIM B         | DIM C        |
|----------|---------------|---------------|--------------|
| -1       | 1.579 [40.11] | 3.008 [76.40] | 3.16 [80.26] |
| -2       | 1.899 [42.24] | 3.648 [92.66] | 3.80 [96.52] |

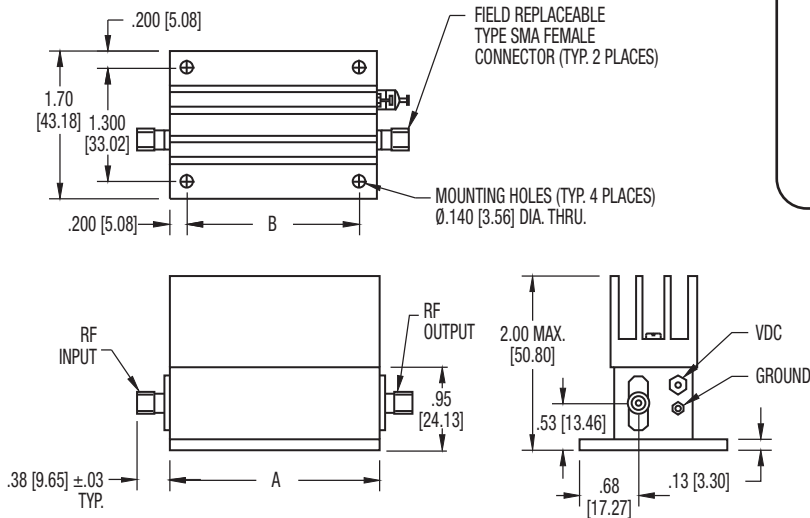
## 117251



NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

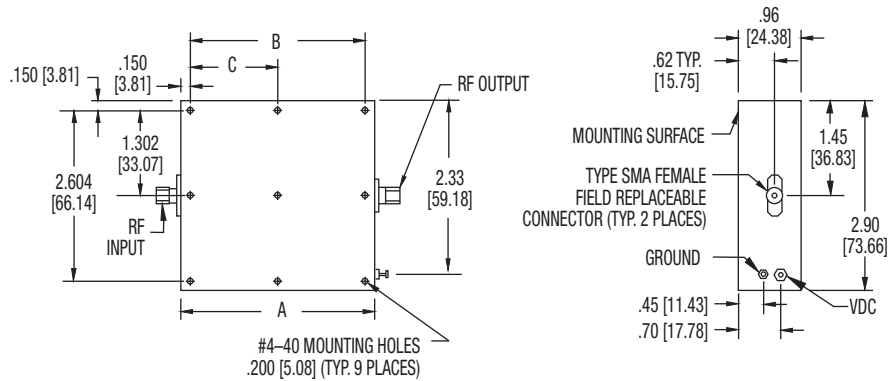
# OUTLINE DRAWINGS (CONT.)

## 117469



| DASH NO. | DIM A        | DIM B         |
|----------|--------------|---------------|
| -1       | 1.13 [28.70] | .729 [18.52]  |
| -2       | 1.36 [34.54] | .956 [24.28]  |
| -3       | 1.68 [42.67] | 1.283 [32.59] |
| -4       | 2.01 [51.05] | 1.610 [40.89] |
| -5       | 2.34 [59.44] | 1.937 [49.20] |
| -6       | 2.66 [67.56] | 2.264 [57.51] |
| -7       | 2.99 [75.95] | 2.591 [65.81] |
| -8       | 3.32 [84.33] | 2.918 [74.12] |
| -9       | 3.64 [92.46] | 3.245 [82.42] |

## 117558



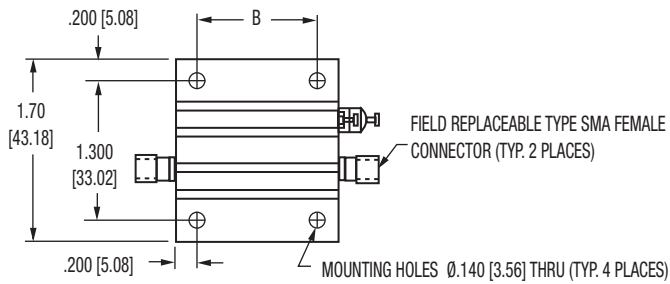
| DASH NO. | DIM A        | DIM B         | DIM C         |
|----------|--------------|---------------|---------------|
| -3       | 2.34 [59.44] | 2.036 [51.71] | 1.018 [25.86] |
| -4       | 2.98 [75.69] | 2.676 [67.97] | 1.338 [33.99] |
| -5       | 3.62 [91.95] | 3.316 [84.23] | 1.658 [42.11] |

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

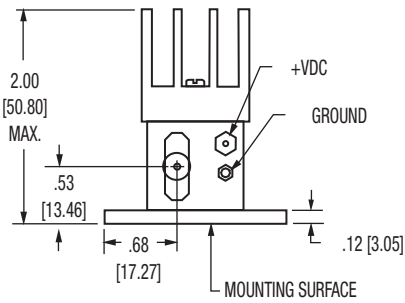
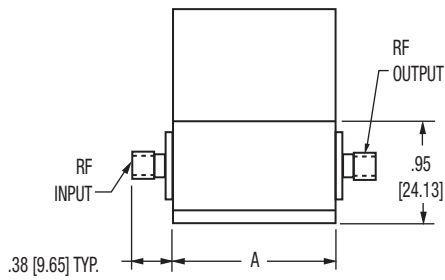


# OUTLINE DRAWINGS (CONT.)

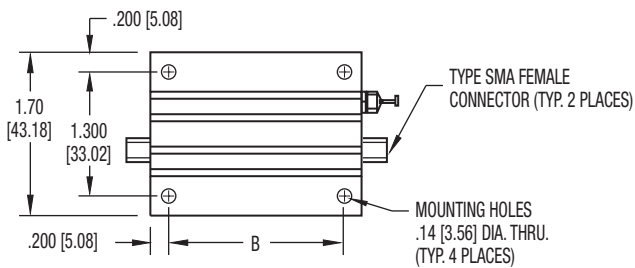
## 118406



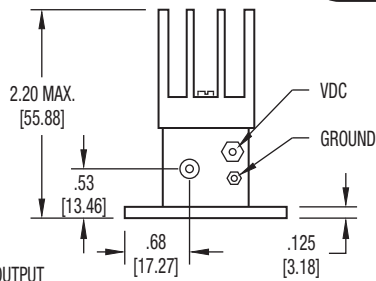
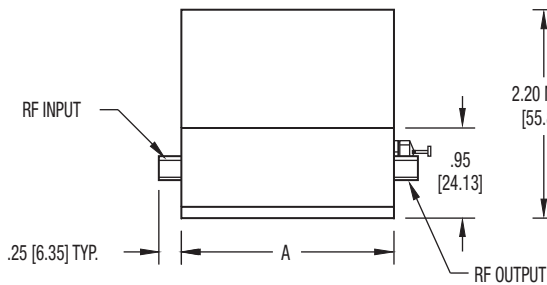
| DASH NO. | DIM A        | DIM B         |
|----------|--------------|---------------|
| -2       | 1.16 [29.46] | .762 [19.30]  |
| -3       | 1.40 [35.56] | 1.000 [25.40] |
| -4       | 1.74 [44.20] | 1.340 [34.04] |
| -5       | 2.11 [53.59] | 1.710 [43.43] |
| -6       | 2.45 [62.23] | 2.050 [52.07] |



## 118987



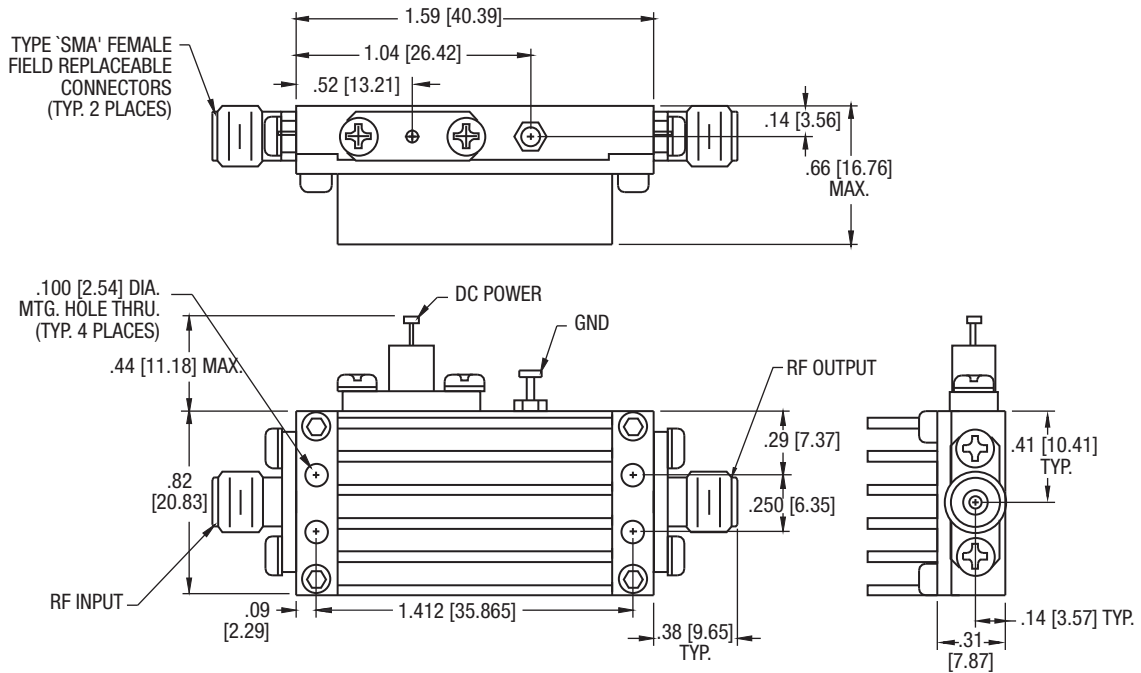
| DASH NO. | DIM A        | DIM B         |
|----------|--------------|---------------|
| -1       | .84 [26.34]  | .440 [11.18]  |
| -2       | 1.18 [29.97] | .780 [19.81]  |
| -3       | 1.52 [38.61] | 1.120 [28.45] |
| -4       | 1.86 [47.24] | 1.460 [37.08] |
| -5       | 2.23 [56.64] | 1.830 [46.48] |
| -6       | 2.57 [65.28] | 2.170 [55.12] |
| -7       | 2.91 [73.91] | 2.510 [63.75] |
| -8       | 3.25 [82.55] | 2.850 [72.39] |



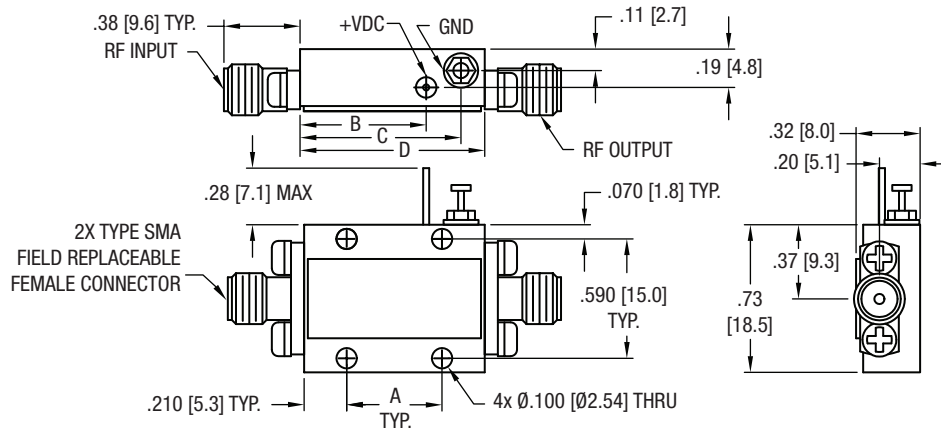
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 121045



## 123521

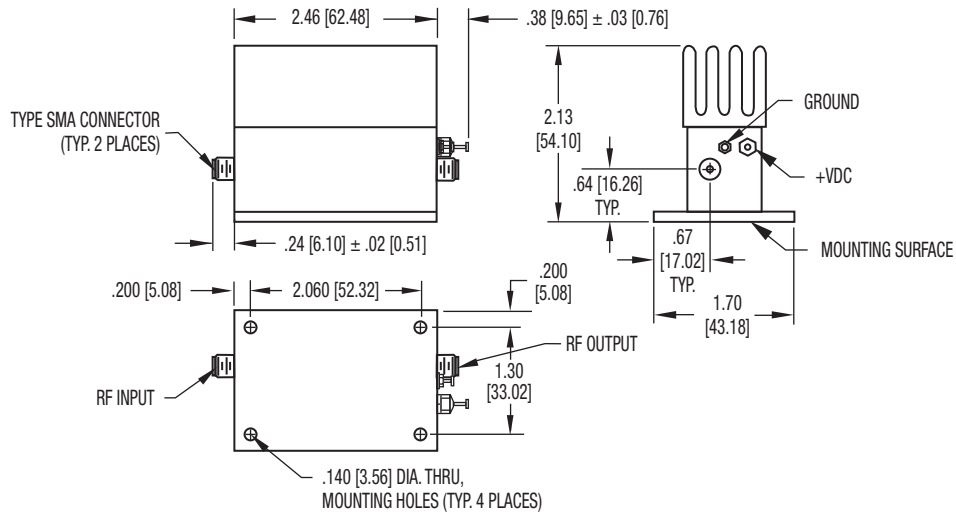


| HOUSING        | DASH | DIM A       | DIM B      | DIM C       | DIM D       |
|----------------|------|-------------|------------|-------------|-------------|
| 124250, 124419 | -3   | .292 [7.4]  | .34 [8.6]  | .63 [16.0]  | .71 [18.0]  |
| 126504 [STG]   | -3   | .292 [7.4]  | .34 [8.6]  | .63 [16.0]  | .71 [18.0]  |
| 124521, 124420 | -4   | .473 [12.0] | .52 [13.2] | .81 [20.6]  | .89 [22.6]  |
| 124252         | -5   | .654 [16.6] | .70 [17.8] | .99 [25.1]  | 1.07 [27.2] |
| 126505 [STG]   | -4   | .473 [12.0] | .52 [13.2] | .81 [20.6]  | .89 [22.6]  |
| 124253         | -6   | .831 [21.1] | .88 [22.3] | 1.17 [29.7] | 1.25 [31.7] |

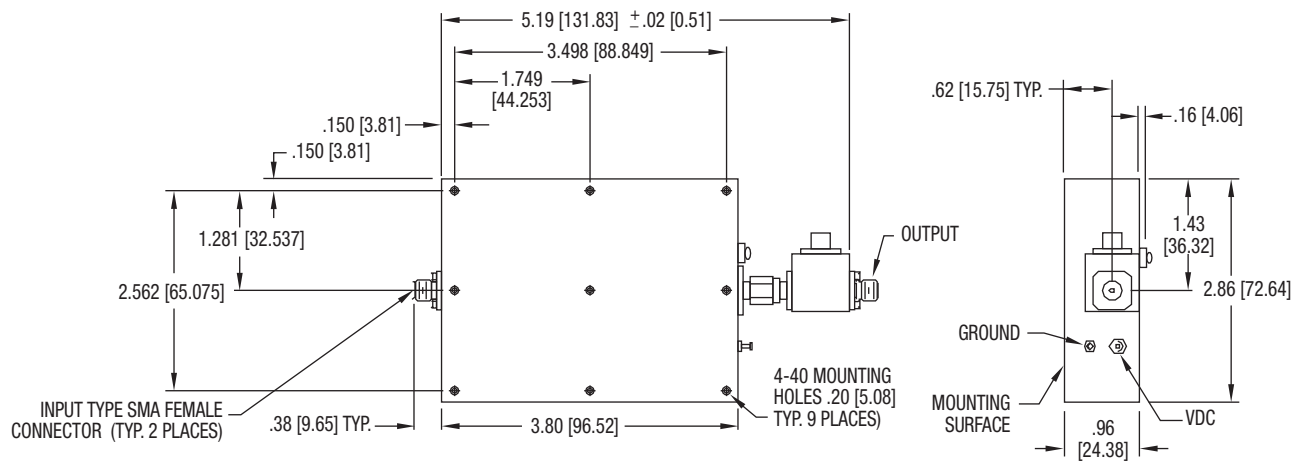
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 125420



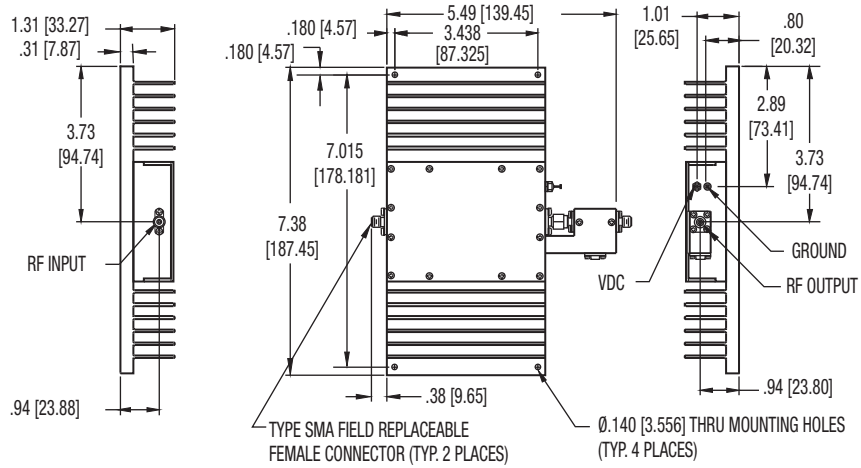
## 127202



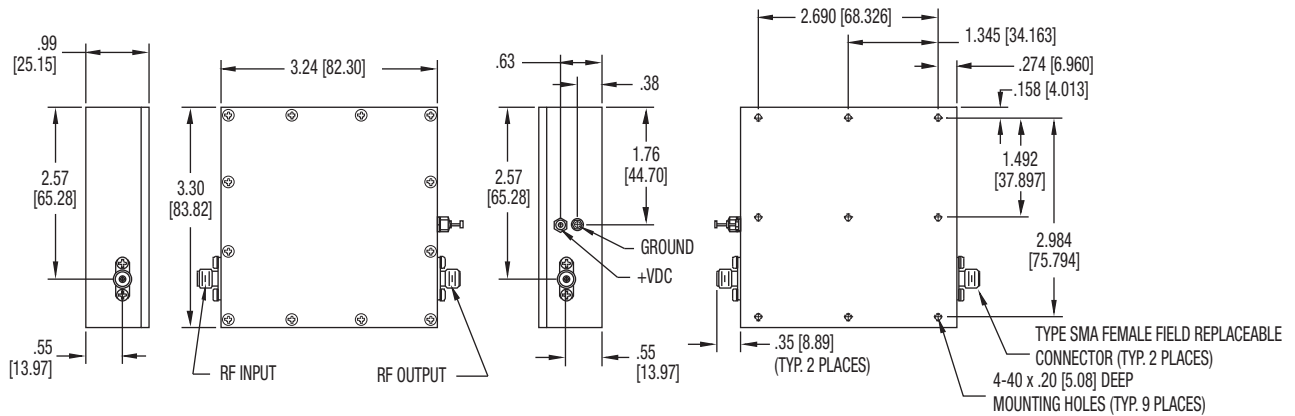
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 127402



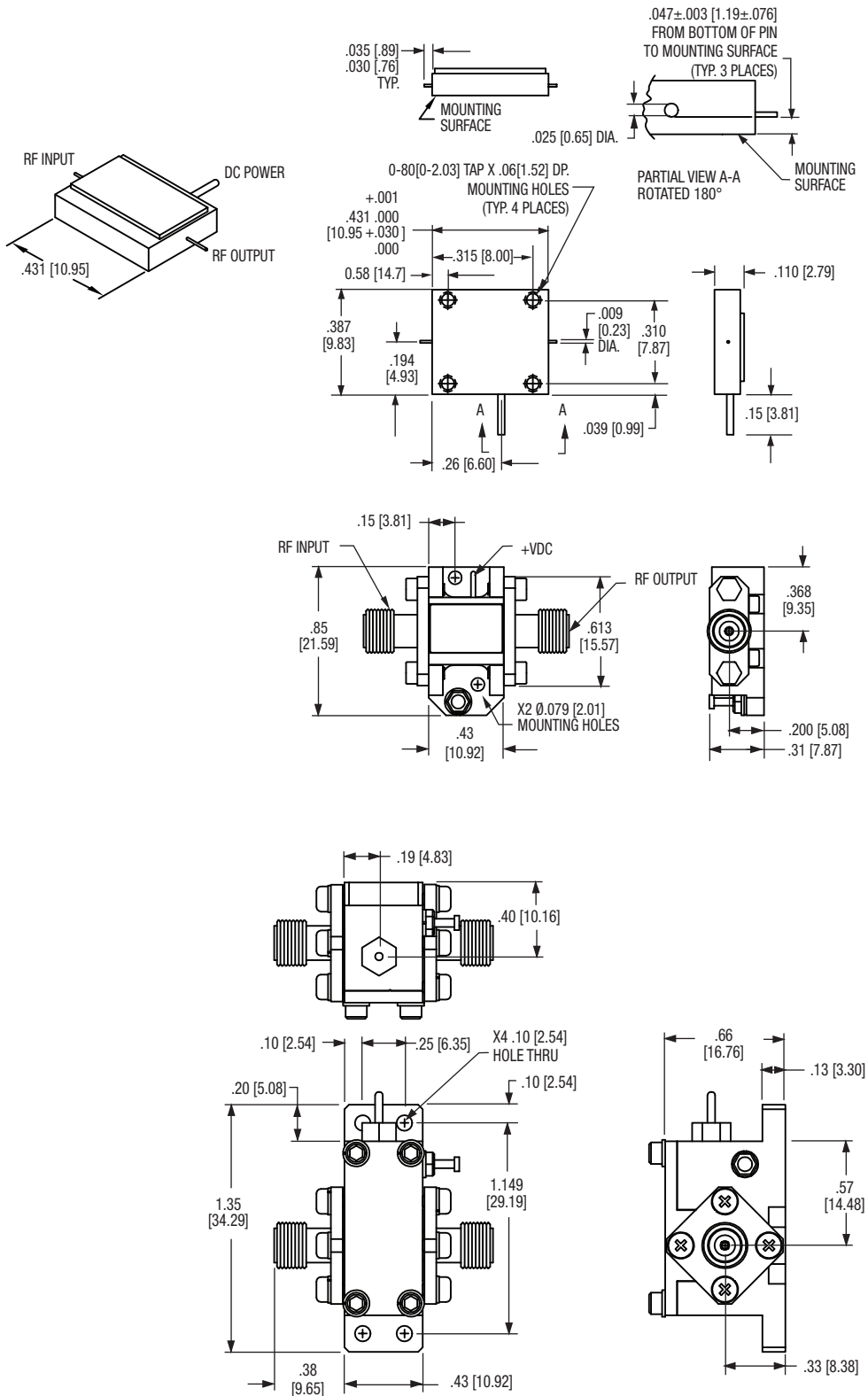
## 127465



NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

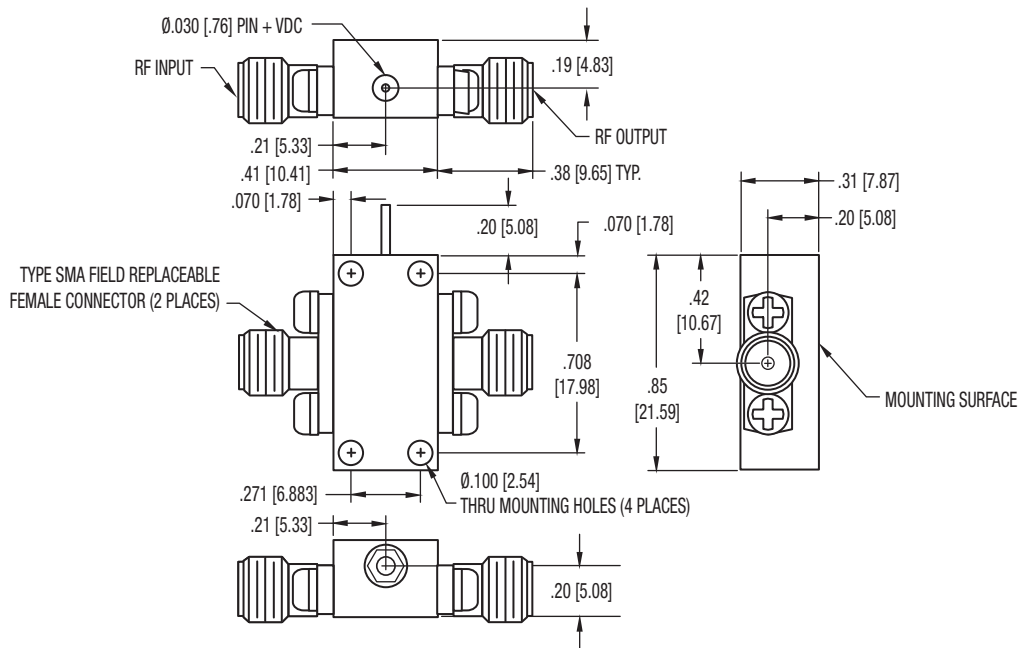
## 128749



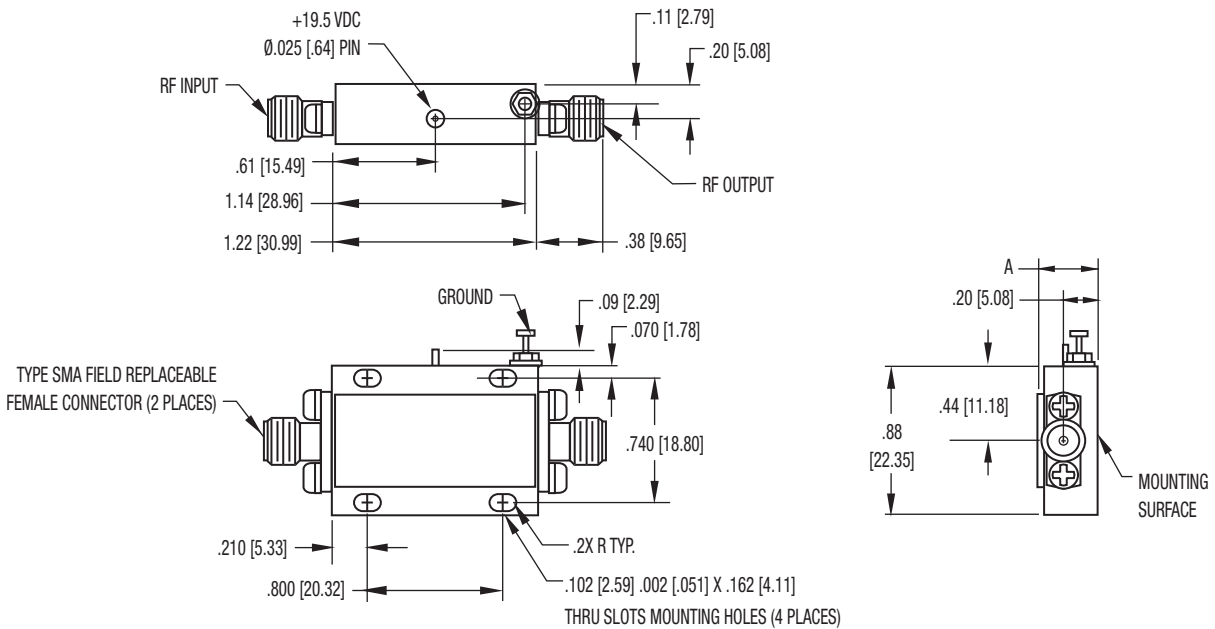
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 131580



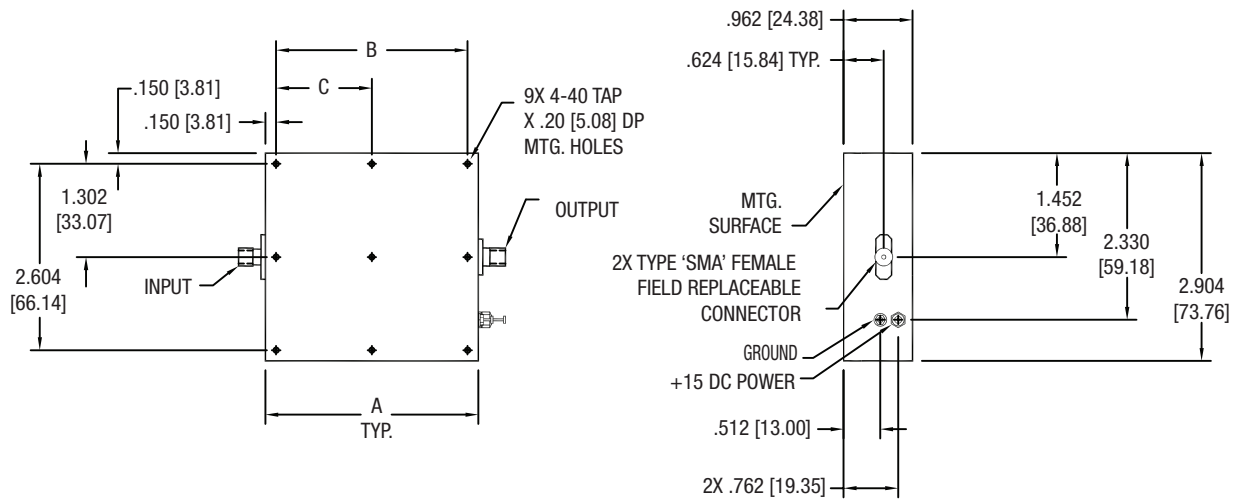
## 132513



NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

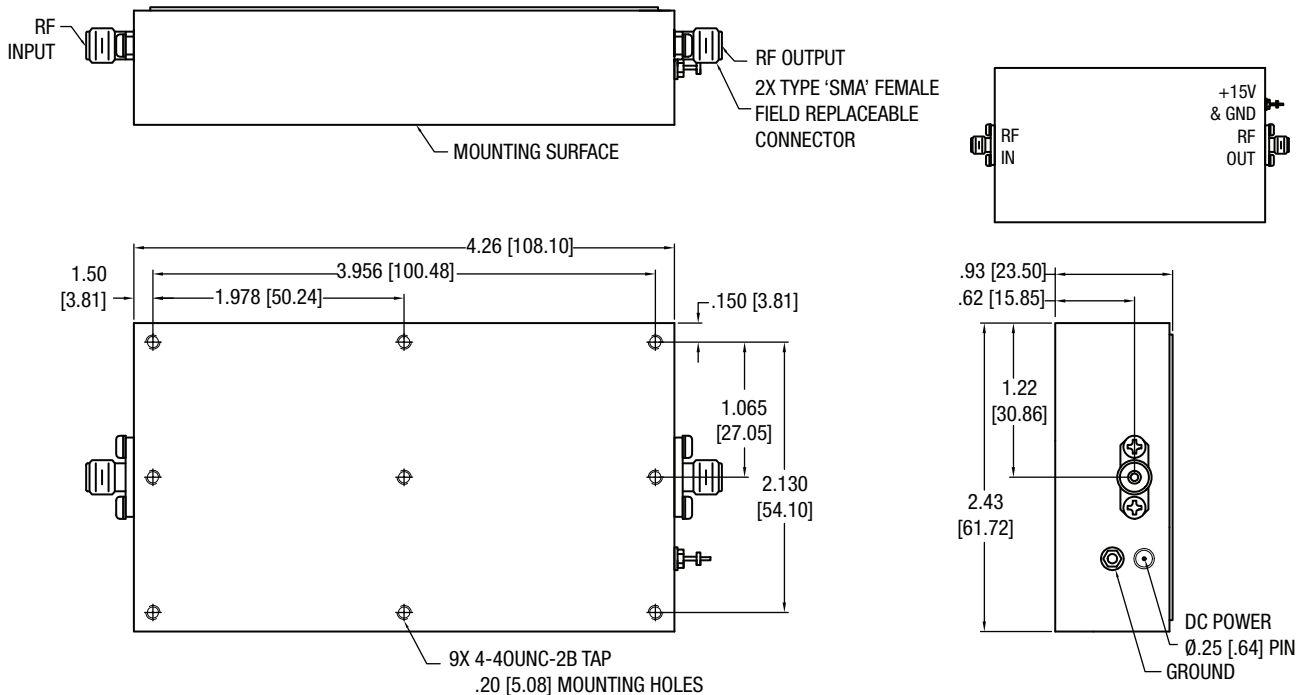
# OUTLINE DRAWINGS (CONT.)

## 133171



| DASH | DIM A        | DIM B         | DIM C         |
|------|--------------|---------------|---------------|
| 3    | 2.34 [59.43] | 2.036 [51.71] | 1.018 [25.85] |
| 4    | 2.98 [75.69] | 2.676 [67.97] | 1.338 [33.98] |
| 5    | 3.62 [91.94] | 3.316 [84.22] | 1.658 [42.11] |

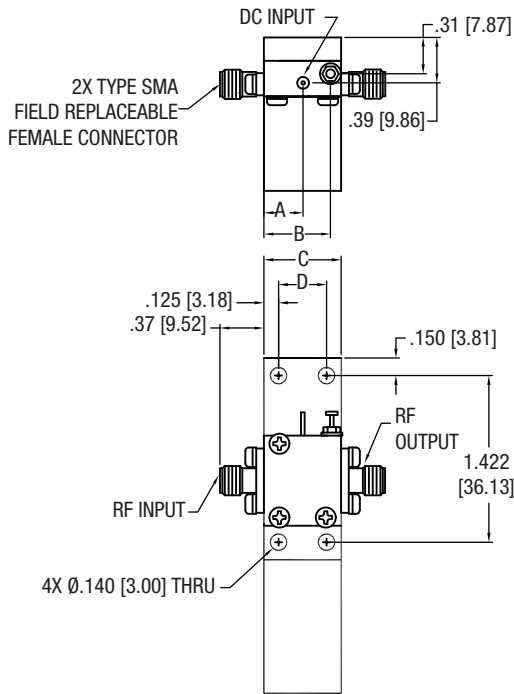
## 135793



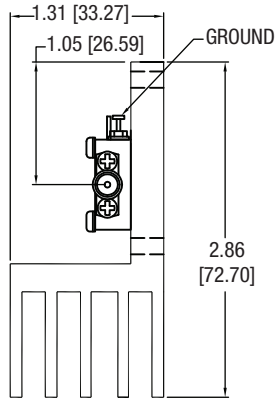
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

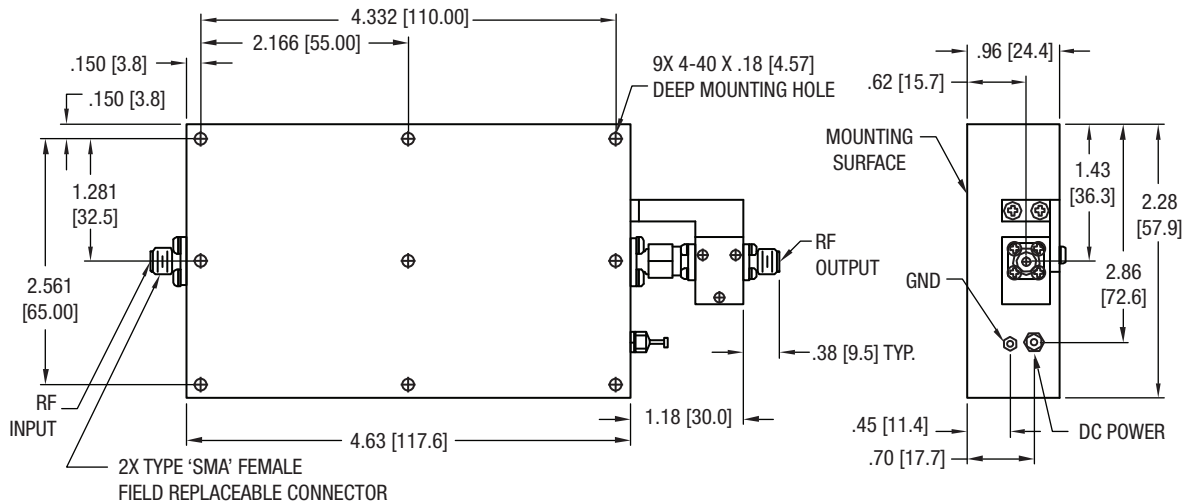
## 135798



| HOUSING | DASH | DIM A       | DIM B       | DIM C       | DIM D       |
|---------|------|-------------|-------------|-------------|-------------|
| 131579  | 5    | .44 [11.18] | .70 [17.8]  | .79 [20.07] | .55 [13.97] |
| 131578  | 4    | .34 [8.64]  | .58 [14.73] | .66 [16.76] | .42 [10.69] |
| 131577  | 3    | .27 [6.86]  | .45 [11.43] | .54 [13.72] | .30 [7.62]  |



## 135802



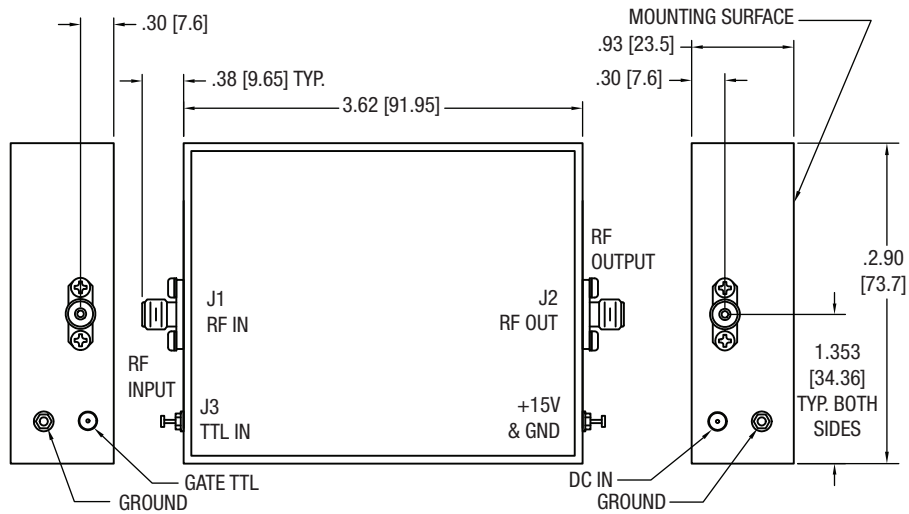
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.



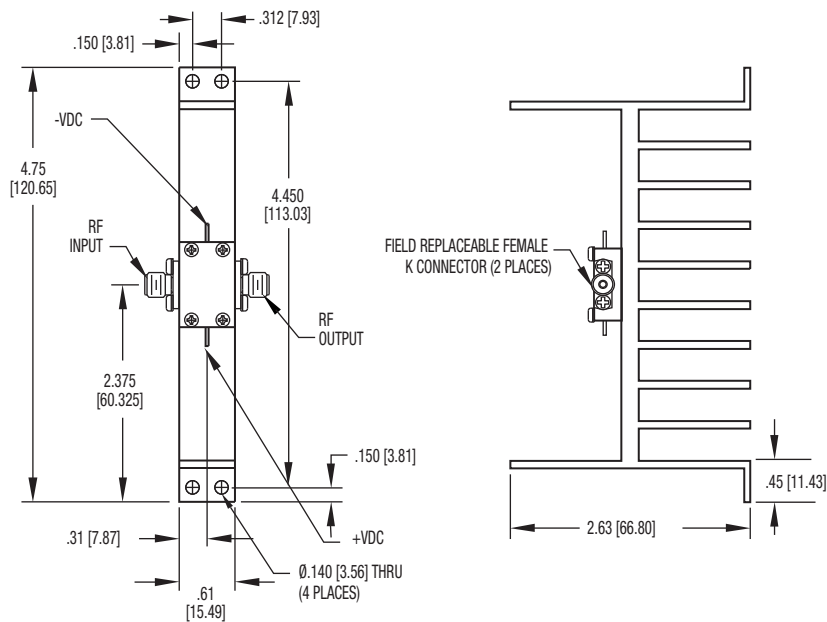


# OUTLINE DRAWINGS (CONT.)

## 137120



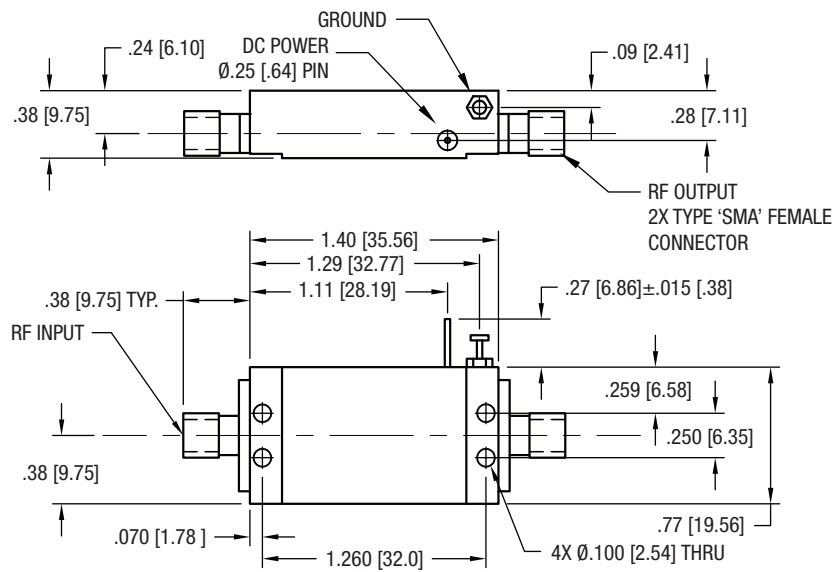
## 138002



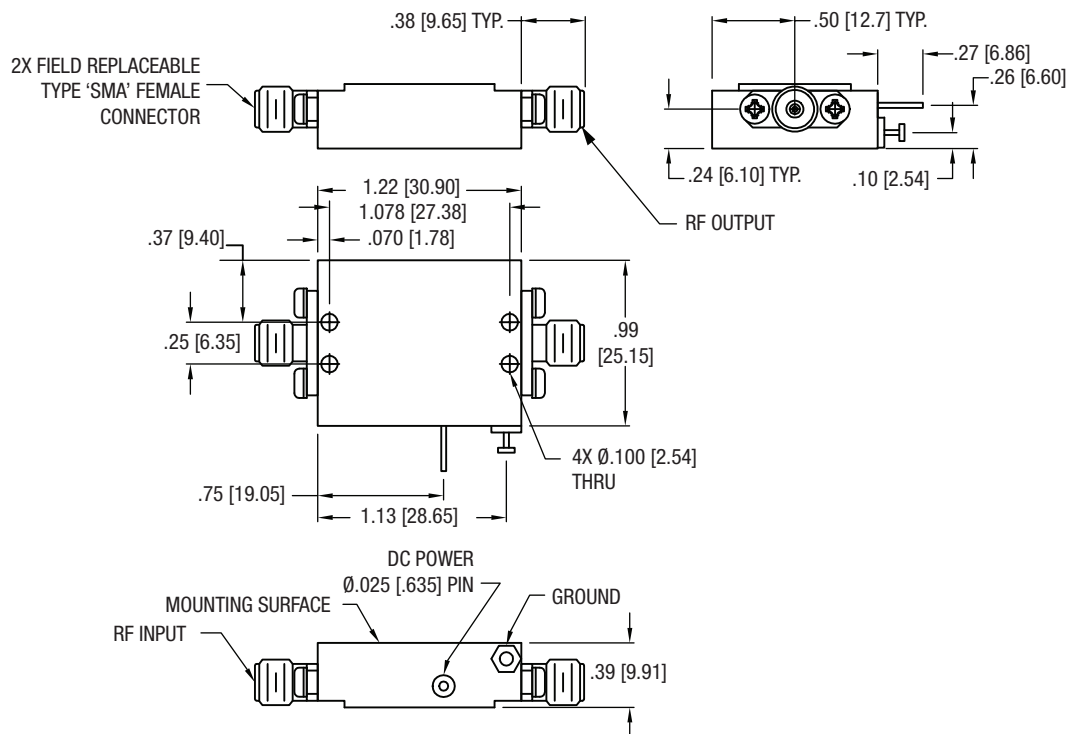
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 138178



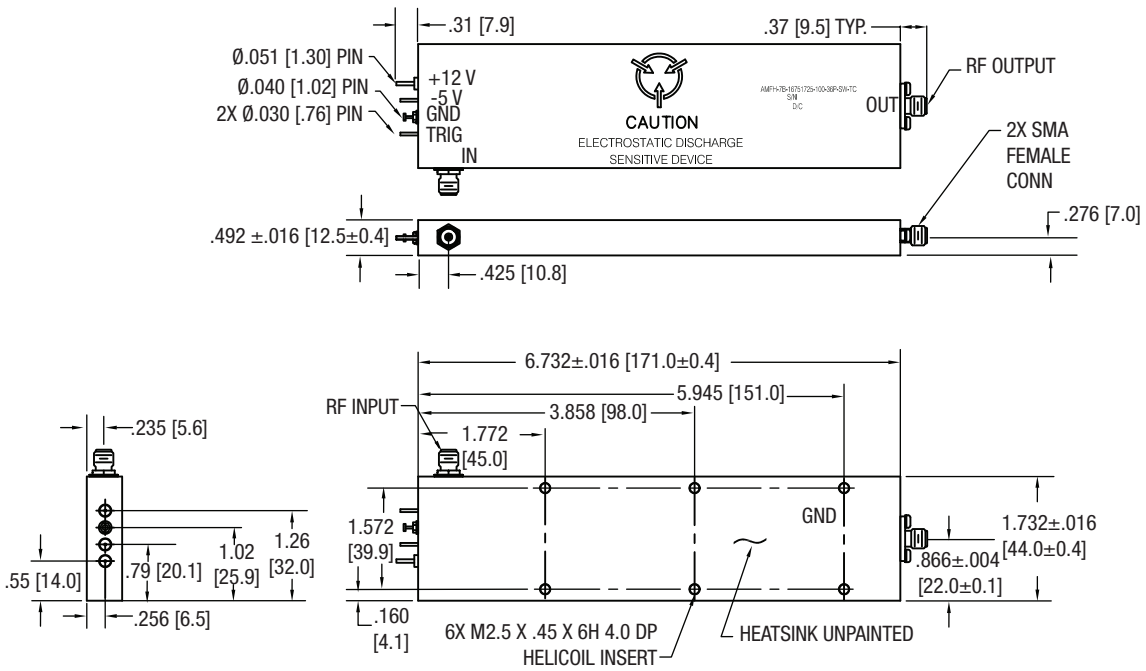
## 138212



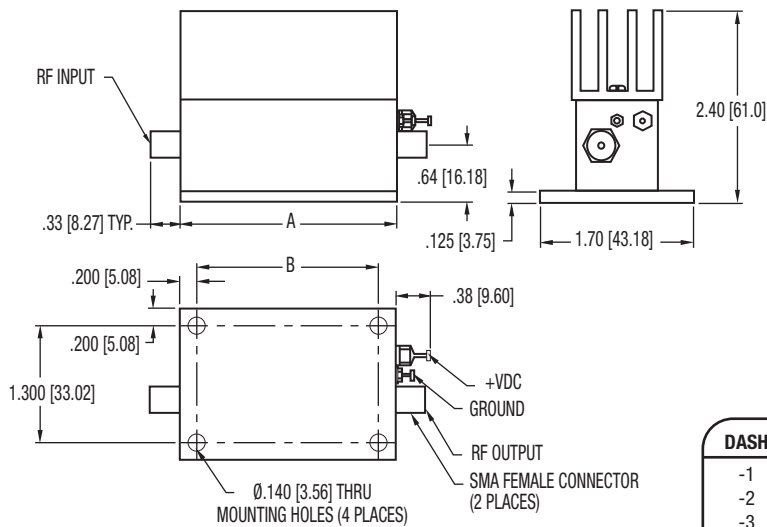
NOTE: DC POWER PIN MAY BE TRIMMED TO MEET CUSTOMER REQUIREMENTS.  
DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 142571



## 143477

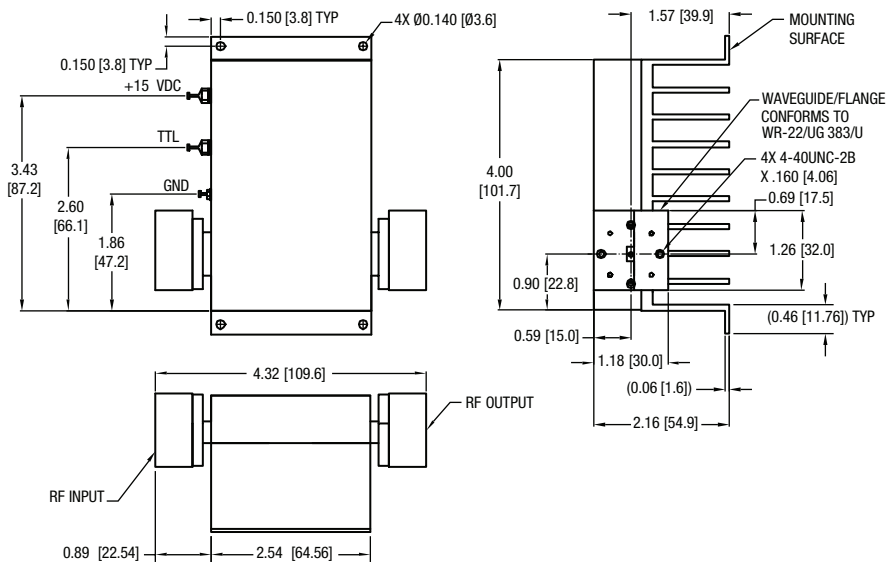


| DASH | HOUSING  | DIM A        | DIM B         | OLD NO. |
|------|----------|--------------|---------------|---------|
| -1   | 109951-1 | 1.14 [28.9]  | .736 [18.69]  | 96      |
| -2   | 109954-1 | 1.78 [45.11] | 1.376 [34.95] | 97      |
| -3   | 109959-1 | 2.42 [61.37] | 2.016 [51.21] | 98      |
| -4   | 109983-1 | 3.06 [77.62] | 2.656 [67.46] | 99      |

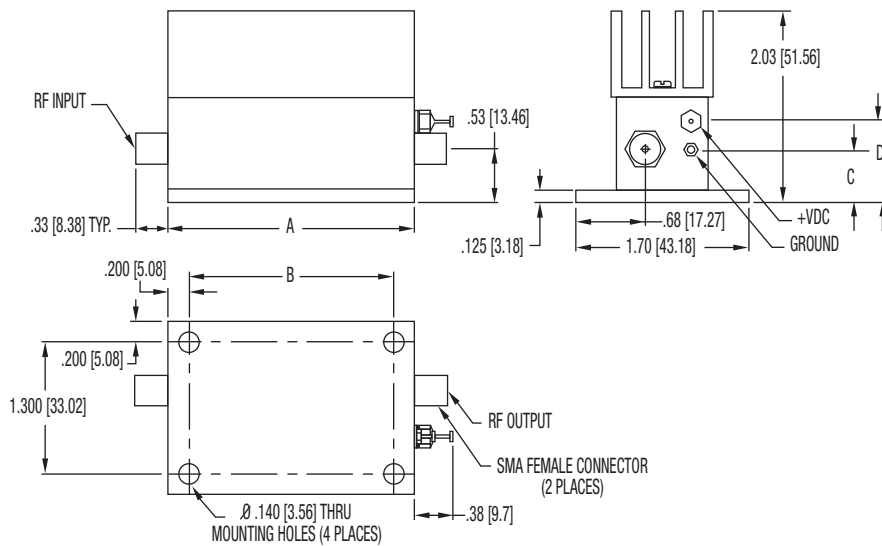
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 145239



## 145393



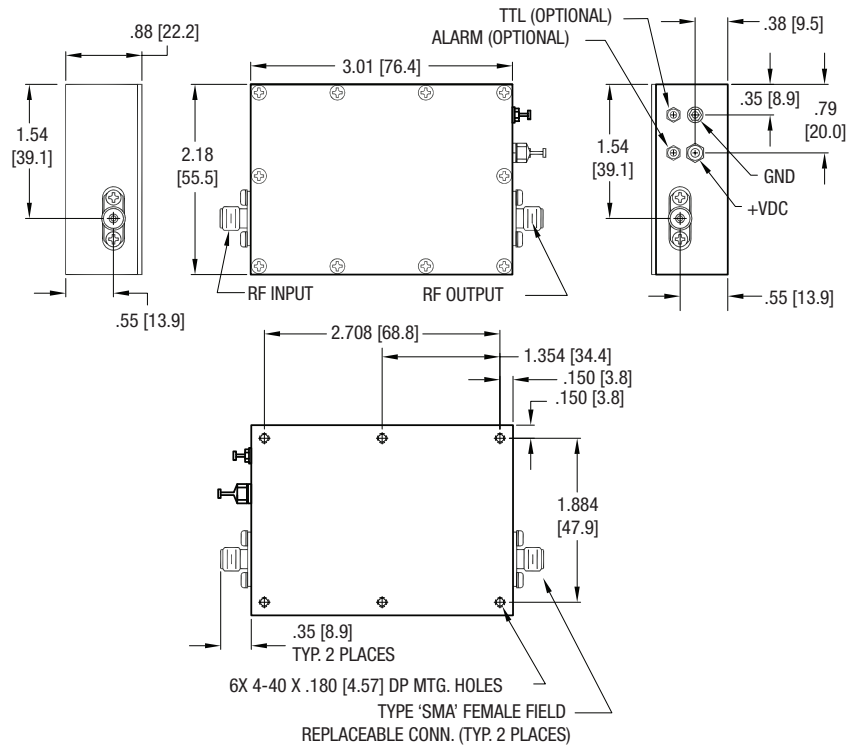
| DASH | HOUSING | DIM A        | DIM B         | DIM C      | DIM D      | OLD NO. | W/TTL |
|------|---------|--------------|---------------|------------|------------|---------|-------|
| -2   | 104194  | 1.78 [45.11] | 1.376 [34.95] | .46 [11.6] | .71 [17.9] | 100     | NO    |
| -3   | 104193  | 2.42 [61.37] | 2.016 [51.21] | .46 [11.6] | .71 [17.9] | 101     | NO    |
| -4   | 104242  | 3.06 [77.6]  | 2.656 [67.46] | .46 [11.6] | .71 [17.9] | 102     | NO    |
| -5   | 104245  | 3.70 [93.9]  | 3.296 [83.72] | .48 [11.6] | .75 [19]   | 103     | NO    |
| -6   | 105481  | 4.34 [110.1] | 3.936 [100.0] | .48 [11.6] | .75 [19]   | 104     | NO    |
| -7   | 104242  | 3.06 [77.6]  | 3.656 [67.46] | .46 [11.6] | .71 [17.9] | N/A     | YES   |

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

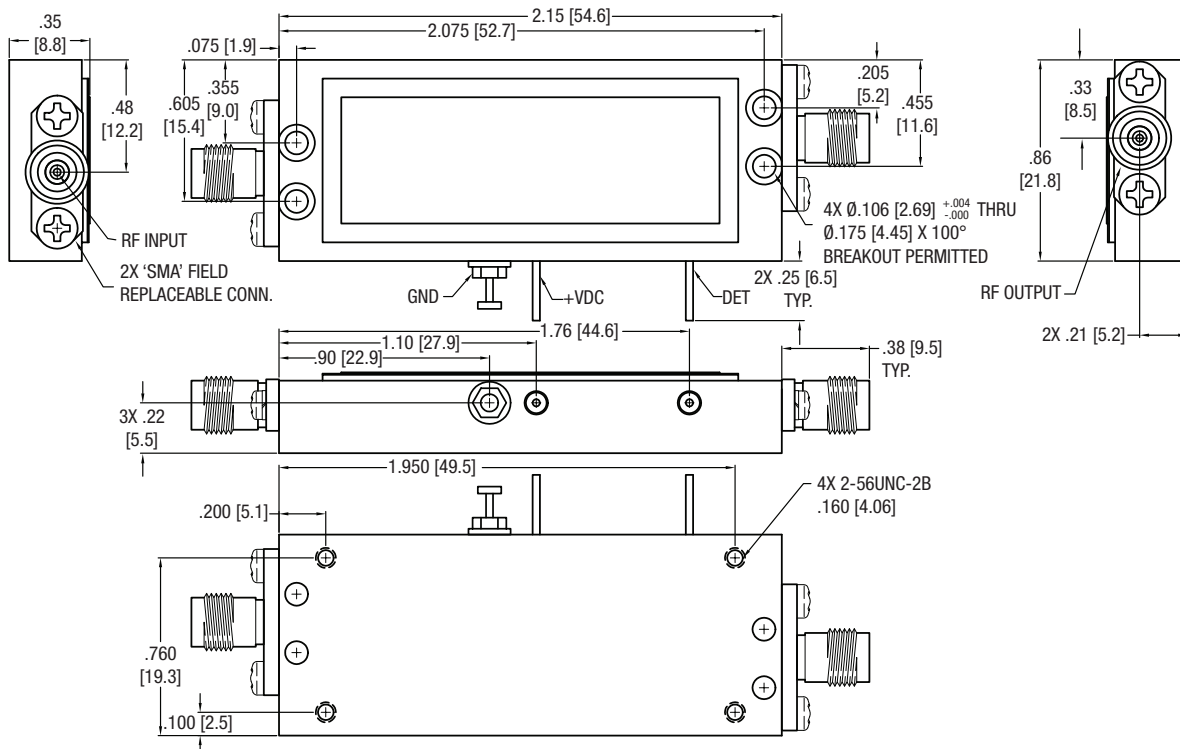


# OUTLINE DRAWINGS (CONT.)

## 146727



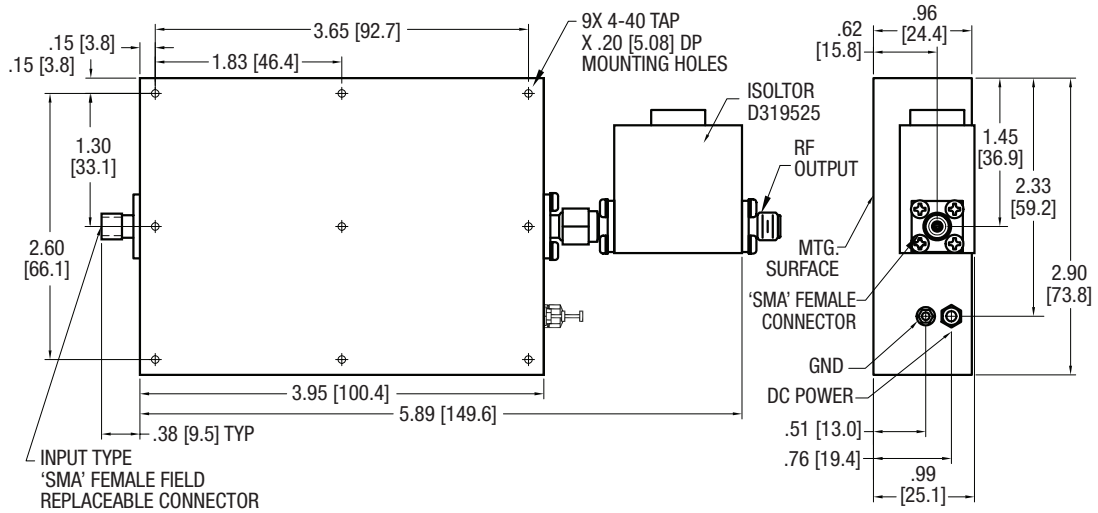
## 152079



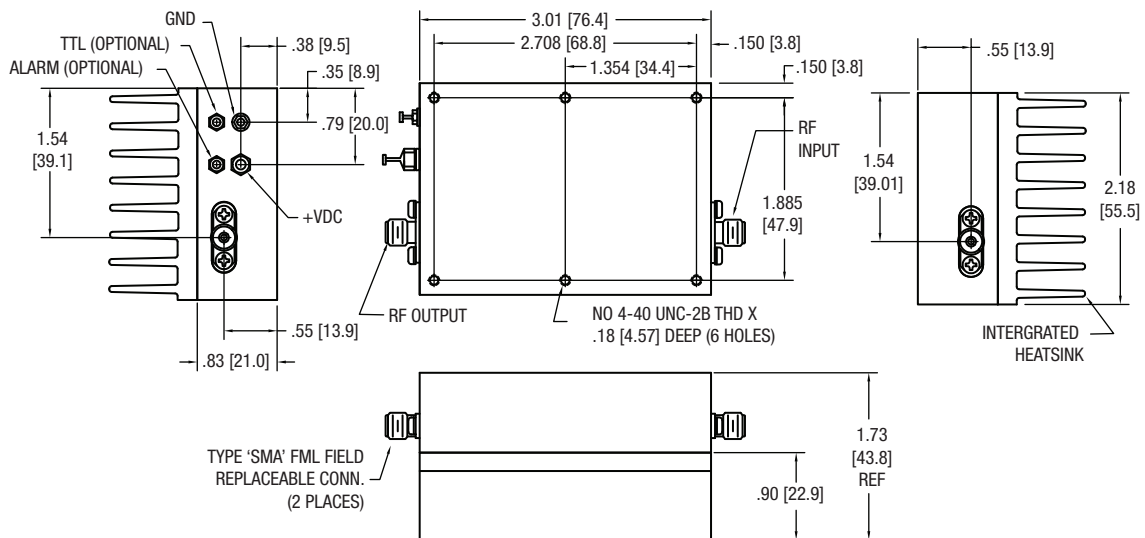
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 152398



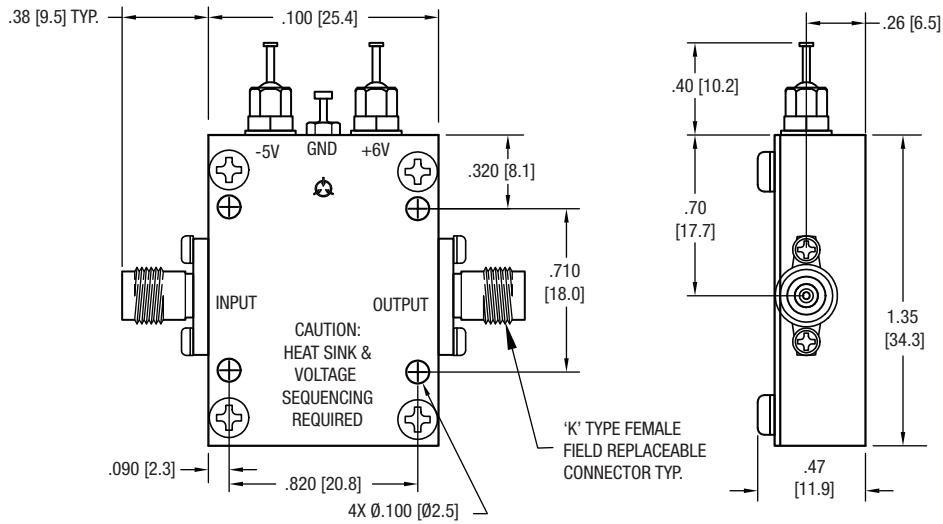
## 157681



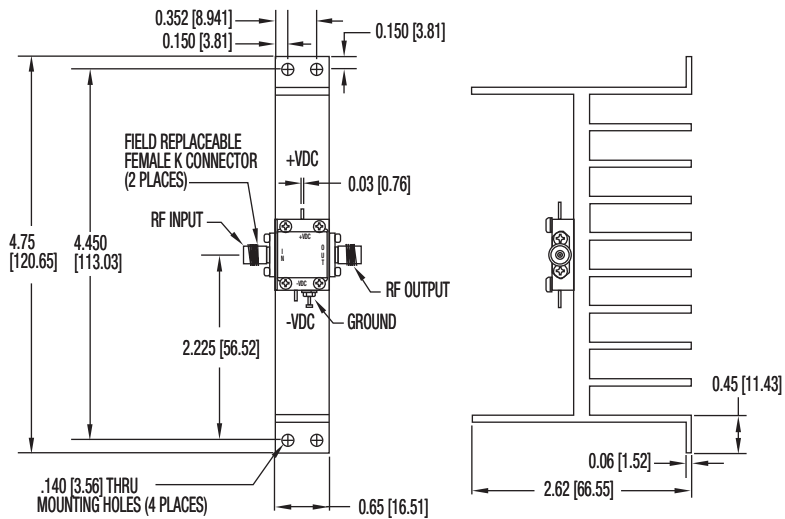
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 159648



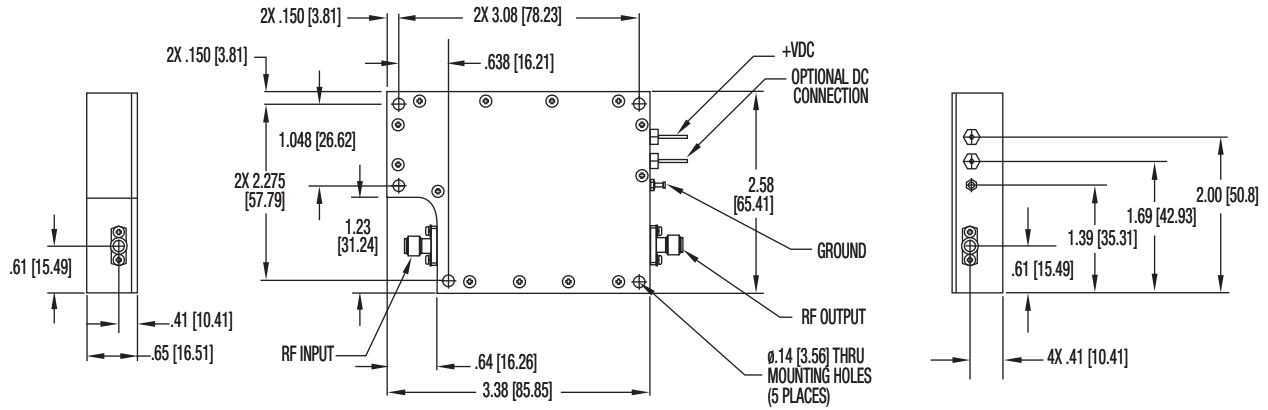
## 161196



NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

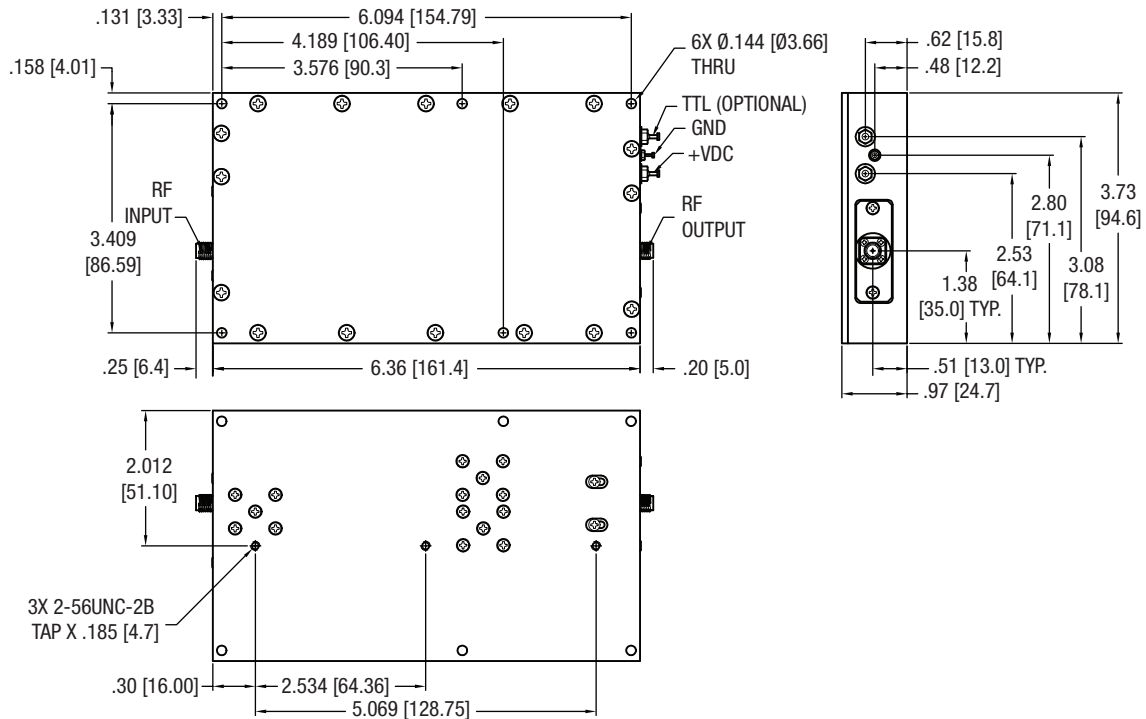
## 163559



DASH TABLE

|        |                  |
|--------|------------------|
| DASH 1 | WITHOUT HEATSINK |
| DASH 2 | WITH HEATSINK    |

## 165230

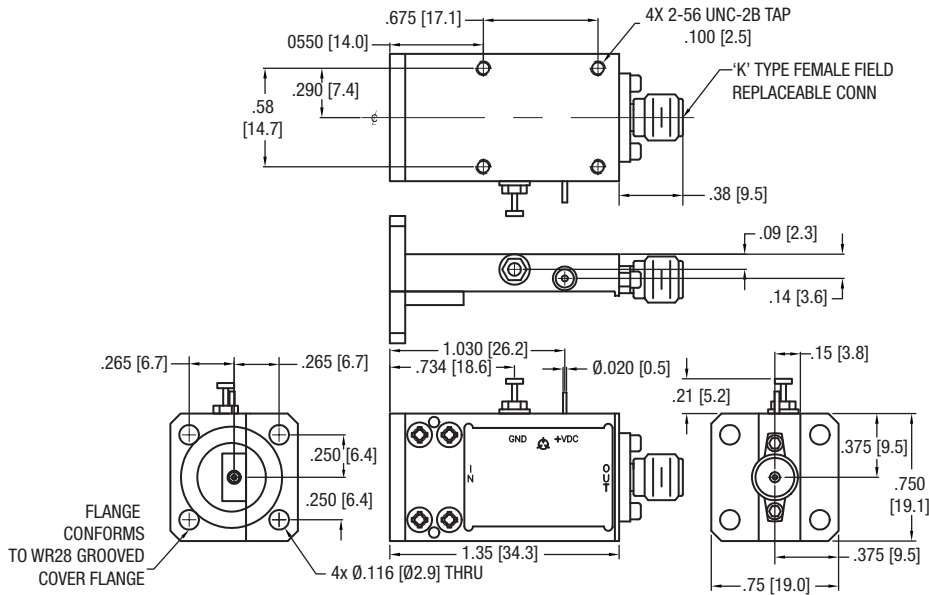


NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

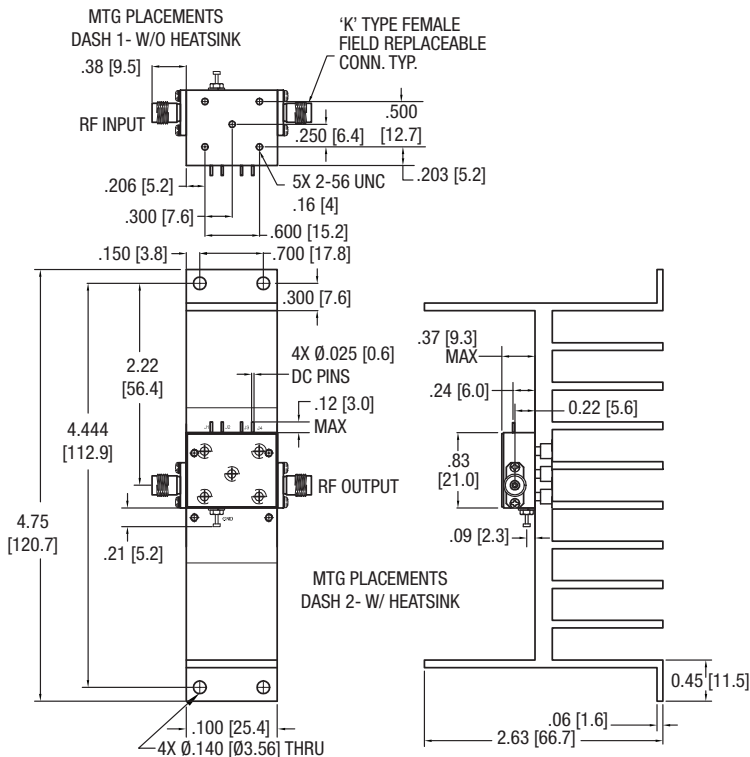


# OUTLINE DRAWINGS (CONT.)

## 165237



## 166644



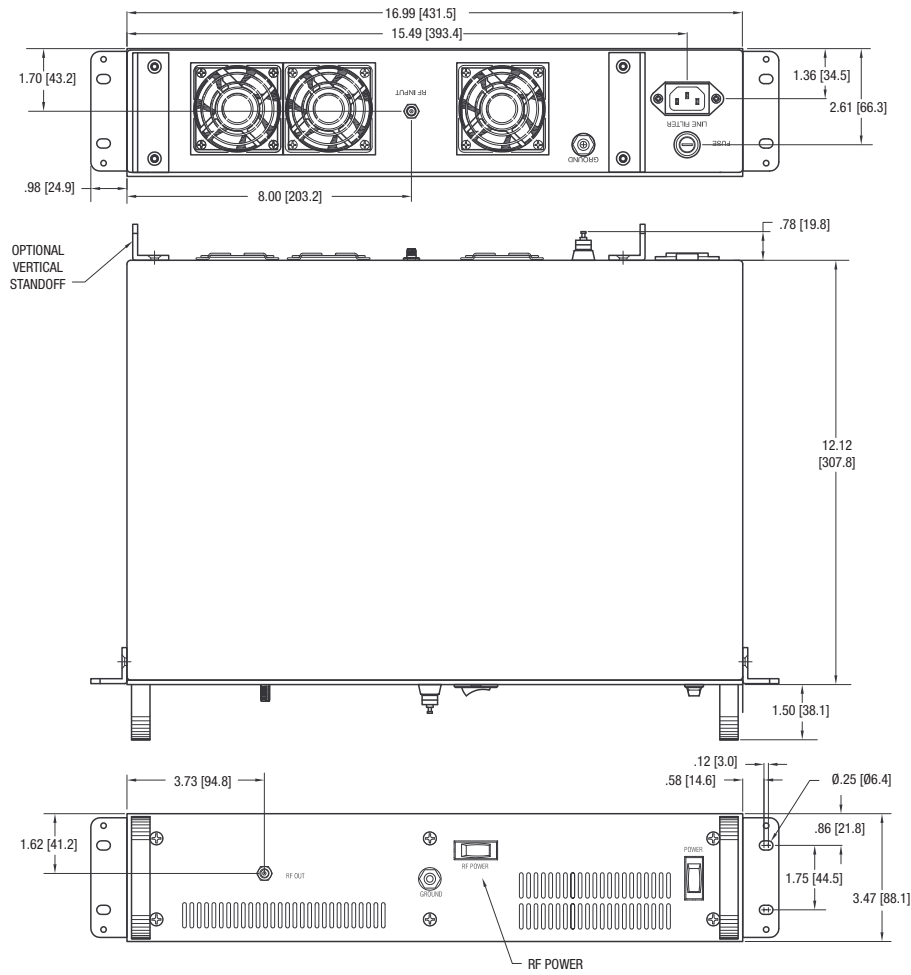
| D PIN | VOLTAGE |
|-------|---------|
| J1    | N/C     |
| J2    | +V      |
| J3    | +V      |
| J4    | N/C     |

| DASH TABLE |                  |
|------------|------------------|
| NO DASH    | WITHOUT HEATSINK |
| DASH 2     | WITH HEATSINK    |

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

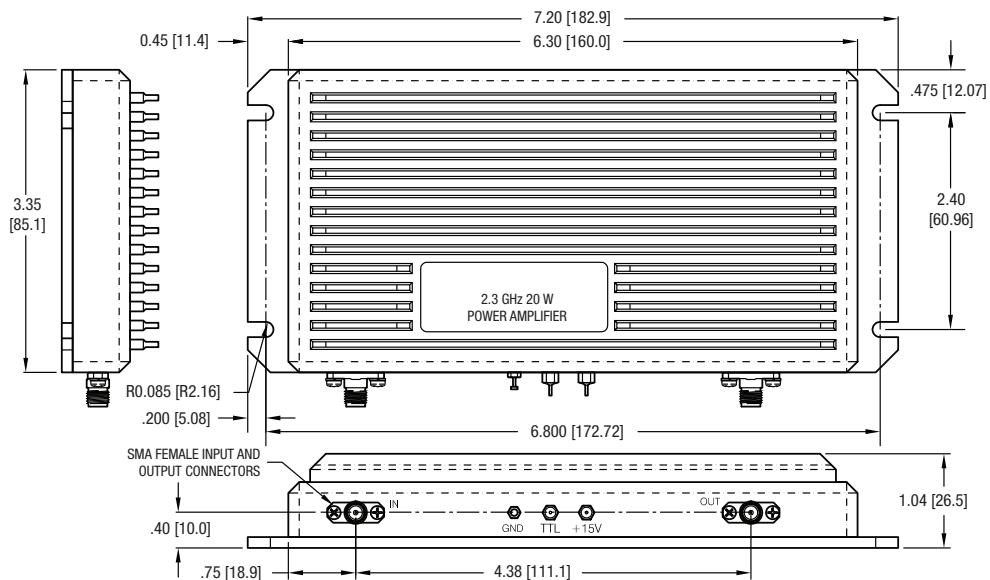
# OUTLINE DRAWINGS (CONT.)

## 170356



| RF CONNECTOR DASH NO. TABLE |                |
|-----------------------------|----------------|
| DASH                        | DESCRIPTION    |
| 1                           | SMA TYPE SHOWN |
| 2                           | "N" TYPE       |
| 3                           | "K" TYPE       |

## 172456

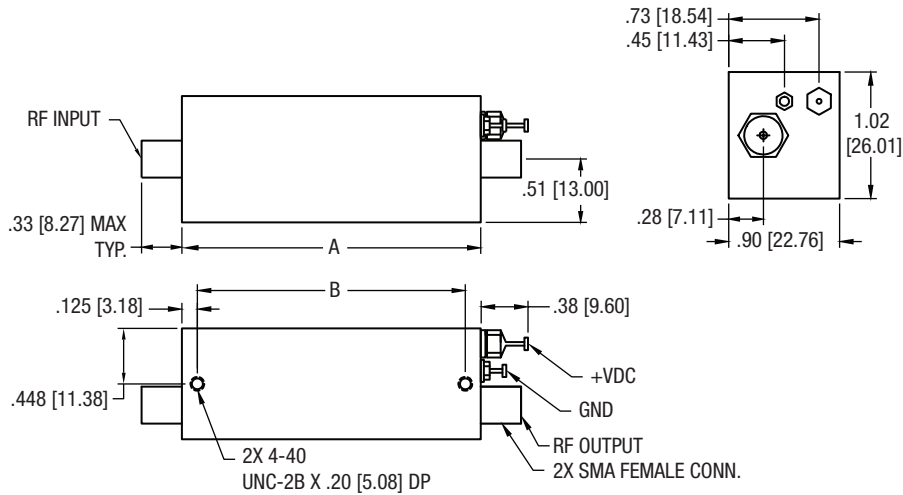


NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.



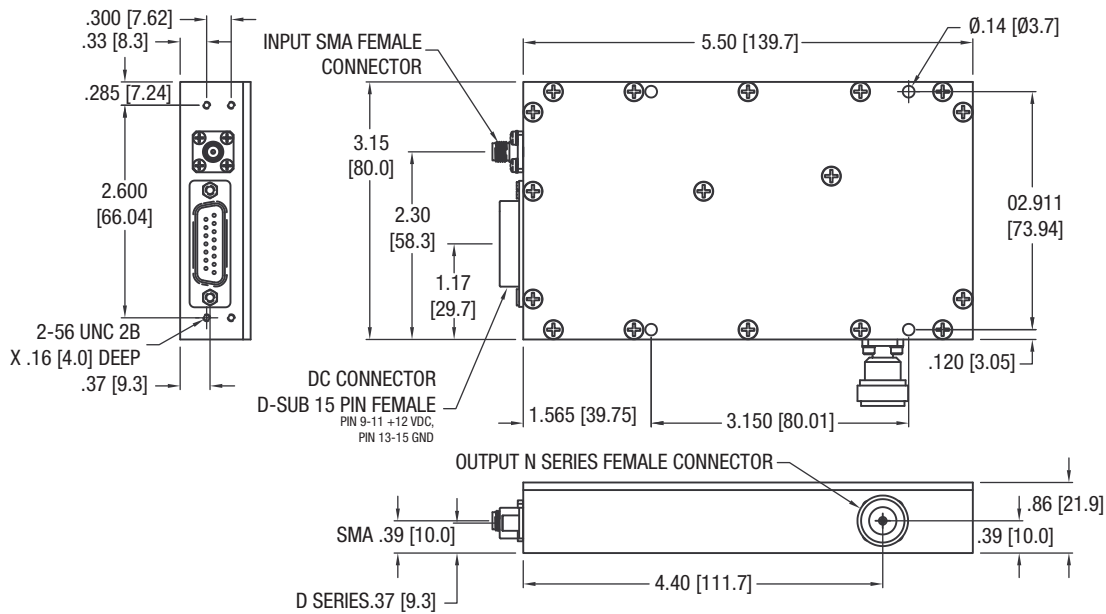
# OUTLINE DRAWINGS (CONT.)

## 175425



| DASH NO. | HSG NO. | DIM A         | DIM B         | OLD NO. |
|----------|---------|---------------|---------------|---------|
| -1       | 109951  | 1.136 [28.85] | .886 [15.65]  | 8       |
| -2       | 109954  | 1.776 [45.11] | 1.526 [19.05] | 9       |
| -3       | 109959  | 2.416 [61.37] | 2.166 [55.02] | 10      |
| -4       | 109983  | 3.056 [77.62] | 2.806 [71.27] | 11      |
| -5       |         | 3.696 [93.88] | 3.446 [87.53] | 12      |

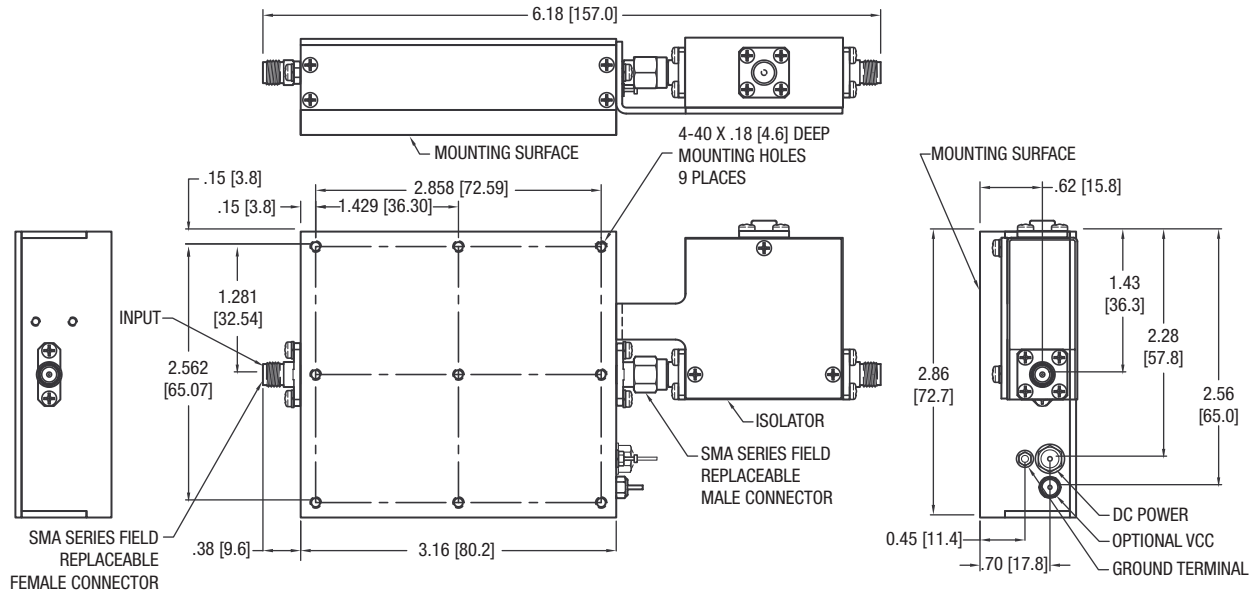
## 176455



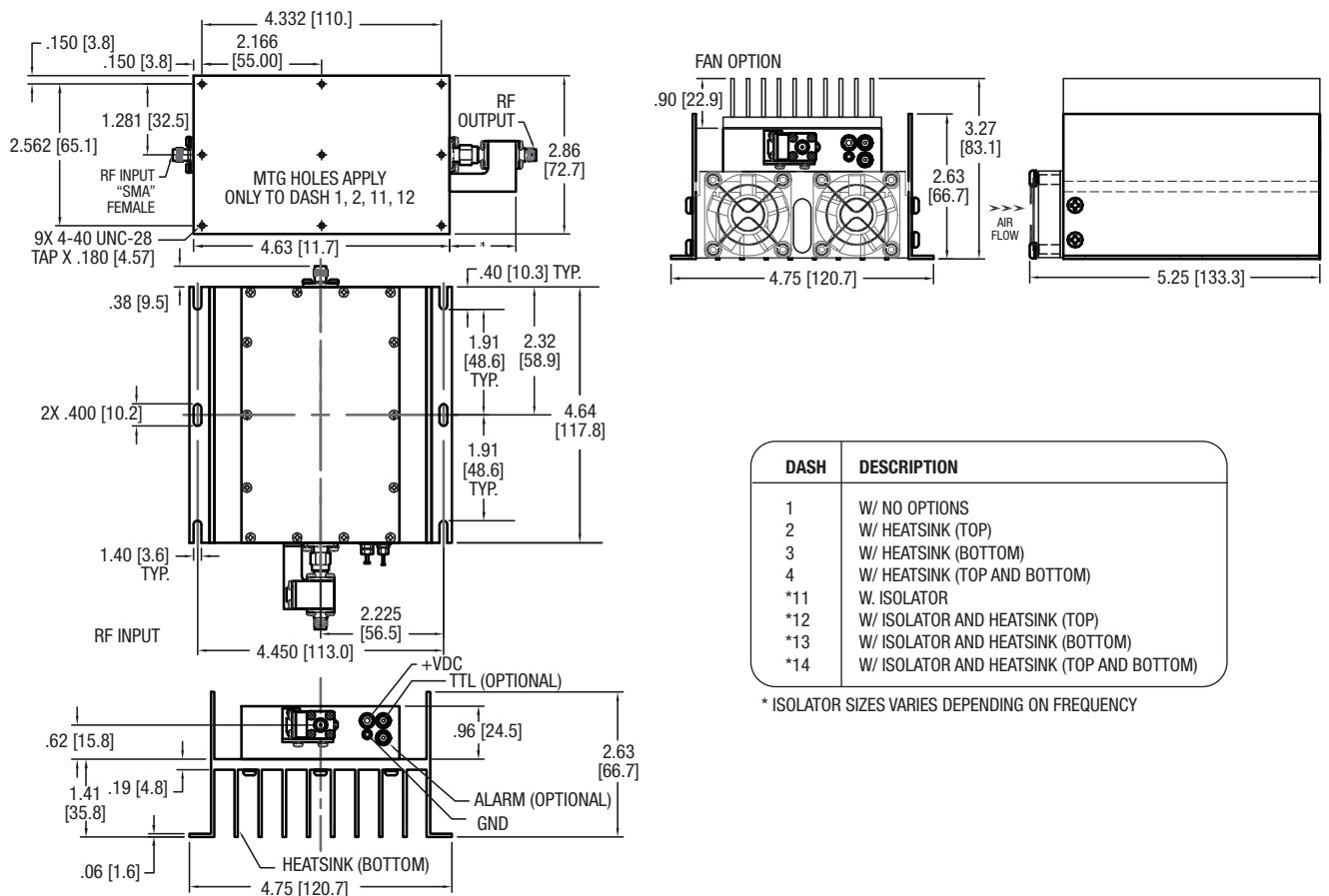
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 177361



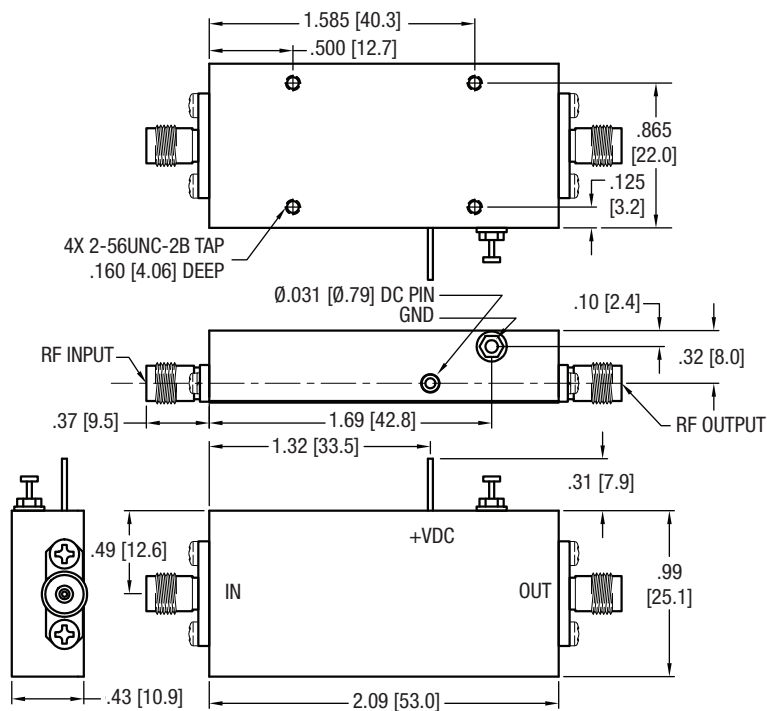
## 178301



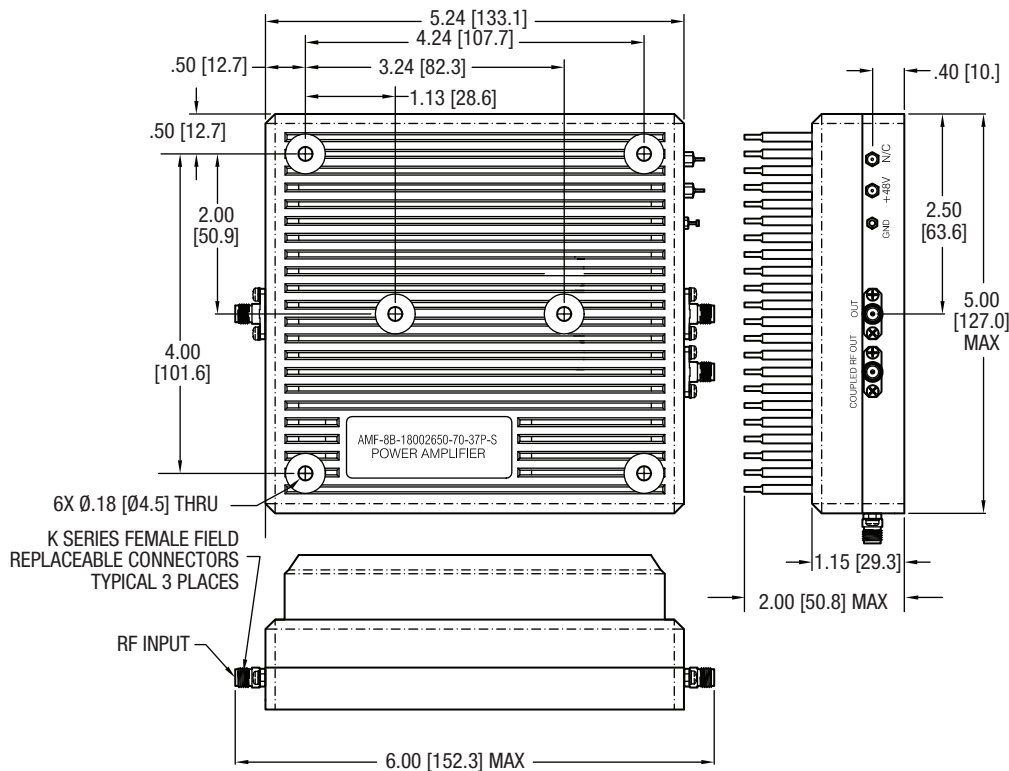
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

## 178326



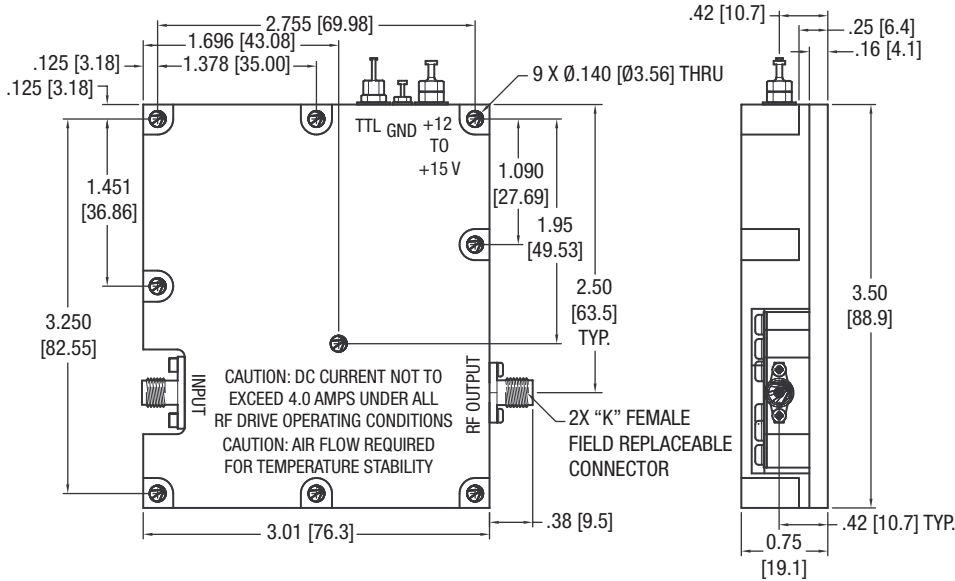
## 178532



NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

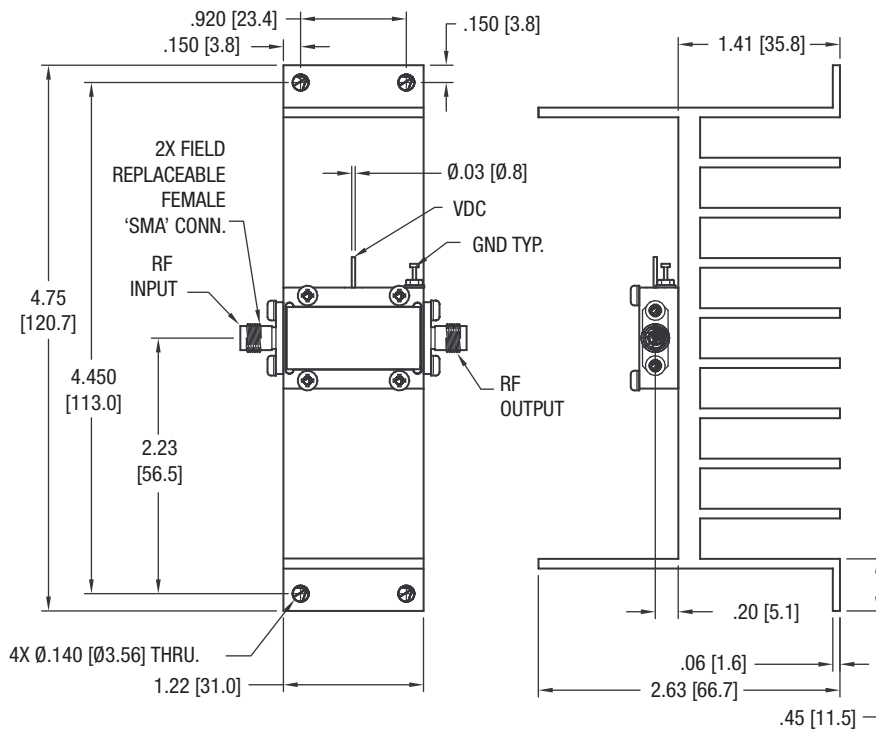
# OUTLINE DRAWINGS (CONT.)

## 182509



NOTES:  
Heatsink may be attached per customer request.

## 183016

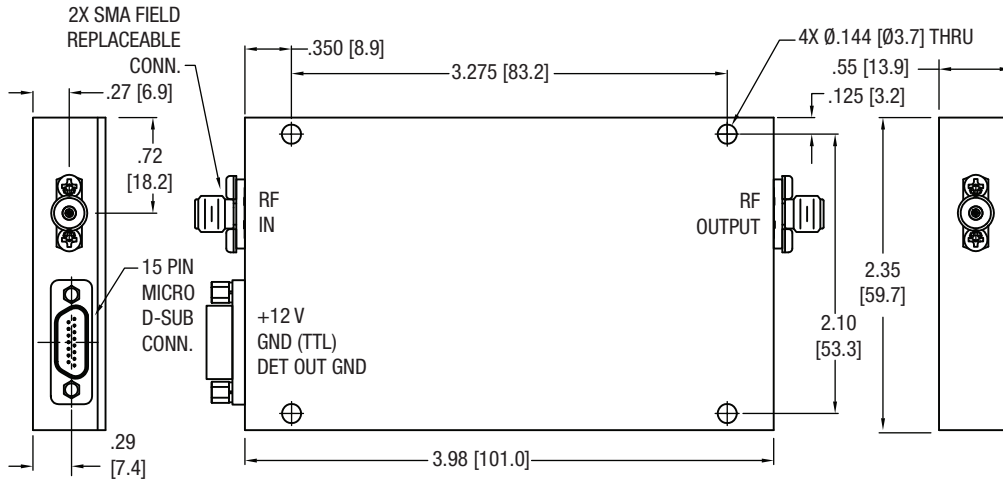


NOTES:  
Optional male or female connector can be specified per customer requirements.

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS (CONT.)

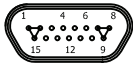
## 185798



**NOTES:**

Max. Peak Power IN = +5 dBm

Max. Duty Cycle at Rated Power = 30%



| DESIGNATION | PIN NUMBERS |
|-------------|-------------|
| 12V IN      | 1, 2 AND 15 |
| GND         | 7, 8 AND 9  |
| GND (TTL)   | 12          |
| TTL         | 4           |
| DET. OUT    | 6           |
| ALARM OUT   | N/A         |
| ANX OUT     | N/A         |

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

## ISO 9001:2008/AS9100 CERTIFIED

MITEQ attained its original ISO 9001 registration in June 1993, when fewer than 1500 companies were registered. ISO 9001 has since become a globally recognized standard for quality for commercial products. Nationally, it was accepted by an ever-increasing number of government agencies in place of long standing military quality and inspection criteria such as MIL-Q-9858 and MIL-I-45208. However, this is no longer true. AS9100 is now the Quality Management Standard being required for Aircraft, Space and Defense.



In May 2010 MITEQ achieved AS9100 registration, expanding our scope and commitment to include the Aircraft, Space and Defense Industry. MITEQ is now registered to AS9100 Rev B as well as ISO9001:2008 by National Quality Assurance USA (NQA), an accredited registrar of the ANSI-ASQ National Accreditation Board (ANAB). NQA performs Quality System audits at MITEQ every six months assuring continued compliance. Additionally, internal audits, management reviews and monthly quality reports assure the Quality Management System is continually improving at MITEQ.

## GENERAL 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:



### 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 MITEQ and the appropriate information will be provided.

### 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.

### 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.

### RETURNED MATERIAL

When returning material for repair or replacement, please ensure that there is complete information included with the shipment, giving a detailed description of the reason for its return, the date and purchase order on which it was obtained, and the exact address to which the material is to be reshipped. All returns must arrive freight, postage, duties and handling prepaid.

### 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, an evaluation fee and handling charge will be applicable.

### 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.

### DRAWINGS AND SPECIFICATIONS

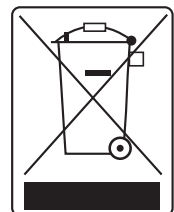
The material presented in this catalog was current at the time of publication. MITEQ Inc.'s continuing product improvement program makes it necessary to reserve the right to change our mechanical and electrical specifications without notice. If either of these parameters is critical, please contact the factory to verify that the information is current.





## 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 warranted 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.
8. As required by Article 10(3) and Article 11(2) of Directive 2002/96/EC (WEEE Directive) of the European Parliament and the Council of the European Union, and in accordance with European Standard EN 50419, MITEQ Inc. labels its products with the following symbol:



This symbol indicates that the product cannot be thrown into the trash, and must be collected and treated in accordance with Directive 2002/96/EC and local regulations.



100 Davids Drive • Hauppauge, NY



320 Oser Avenue • Hauppauge, NY



380 Oser Avenue • Hauppauge, NY



330 Oser Avenue • Hauppauge, NY

