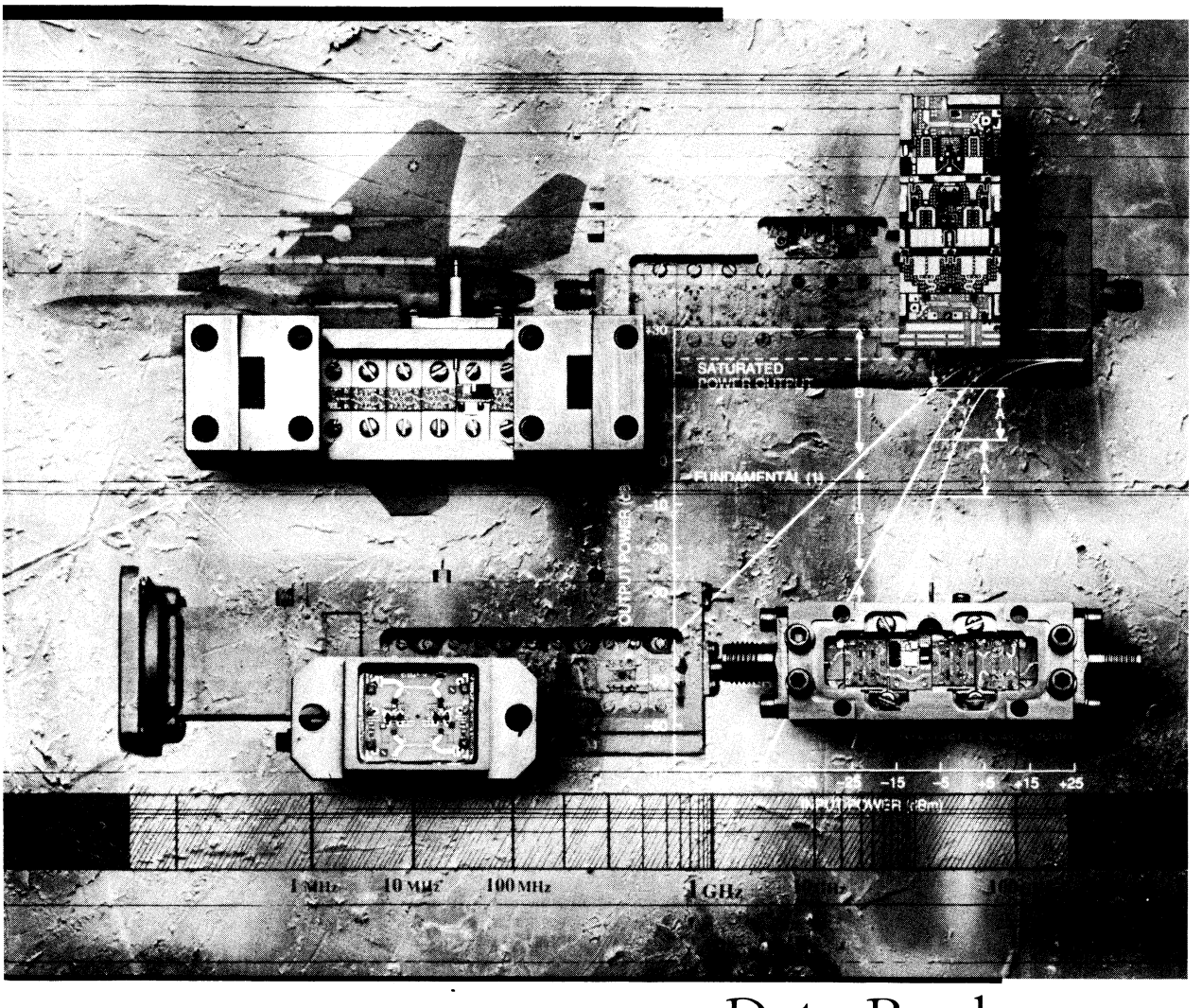
AVANTEK

Microwave and Millimeter Wave Amplifiers



Data Book

second edition

About The Cover

Vertical Integration: Avantek manufactures all critical components for all of its products beginning with its own silicon and GaAs microwave transistors and MMICs which are then used in Avantek amplifier component products which are then used in Avantek's integrated systems and sub-assemblies. Complete control at every step assures the highest quality, reliability and repeatability.

Avantek, Inc. reserves the right to make changes to the products described in this catalog to improve performance, reliability or manufacturability at any time without notice. Changes and additions made after the publication of this catalog will be reflected in updated product data sheets or other literature as soon as possible.

Avantek, Inc. recommends that before the products described herein are written into specifications or used in critical applications that the performance characteristics be verified by contacting Avantek Amplifier Sales.

Every effort has been made to insure accuracy of the information contained in this Data Book to factory specifications on February 1, 1989, however, Avantek, Inc. assumes no responsibility for errors, omissions or future specification changes as described above.

Unless otherwise indicated, all specifications indicated as minimun or maximum are guaranteed at the temperatures and under the conditions described. All specifications indicated as typical are tested on a periodic basis and are intended to provide a good indication of actual performance, but are not guaranteed. FOR MORE DETAILED INFORMATION ON ANY PRODUCT, CONTACT THE FACTORY OR ANY AVANTEK AUTHORIZED REPRESENTATIVE.

Some **Avantek** products are manufactured under the following U.S. patents:
3809817, 3931472, 3978282, Re. 29844, 4595881, 4649354, 4672023.

CONTENTS

TABLE OF CONTENTS

Millimeter Wave Amplifiers and Multipliers (con't)

ALPHANUMERIC INDEX

Note:
(N) - New product offering

ALPHANUMERIC INDEX

Note:
(N) - New product offering

ALPHANUMERIC INDEX

Note:
(N) - New product offering

ALPHANUMERIC INDEX

Note:
(N) - New product offering

ALPHANUMERIC INDEX

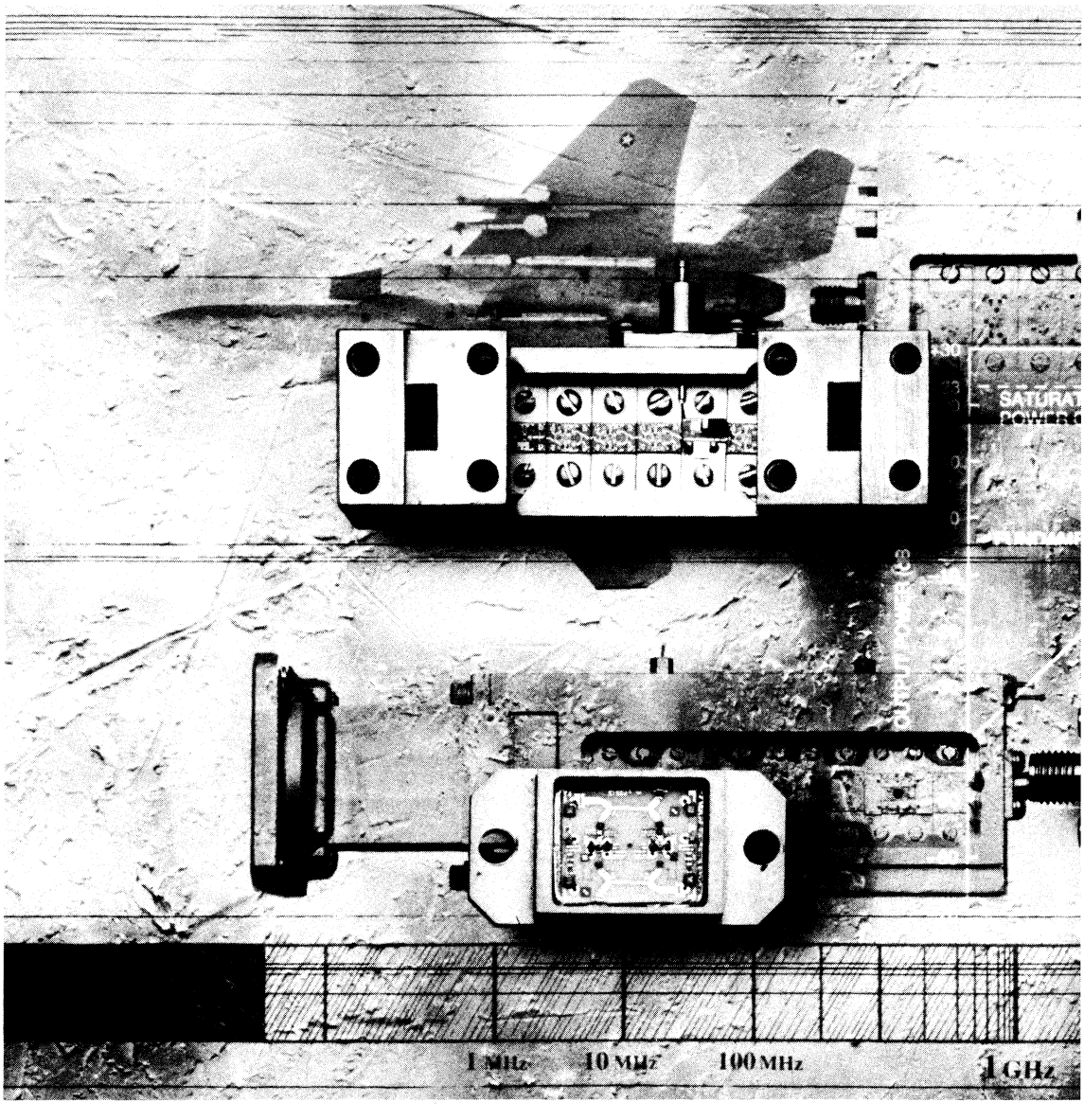
Note:
(N) - New product offering

ALPHANUMERIC INDEX

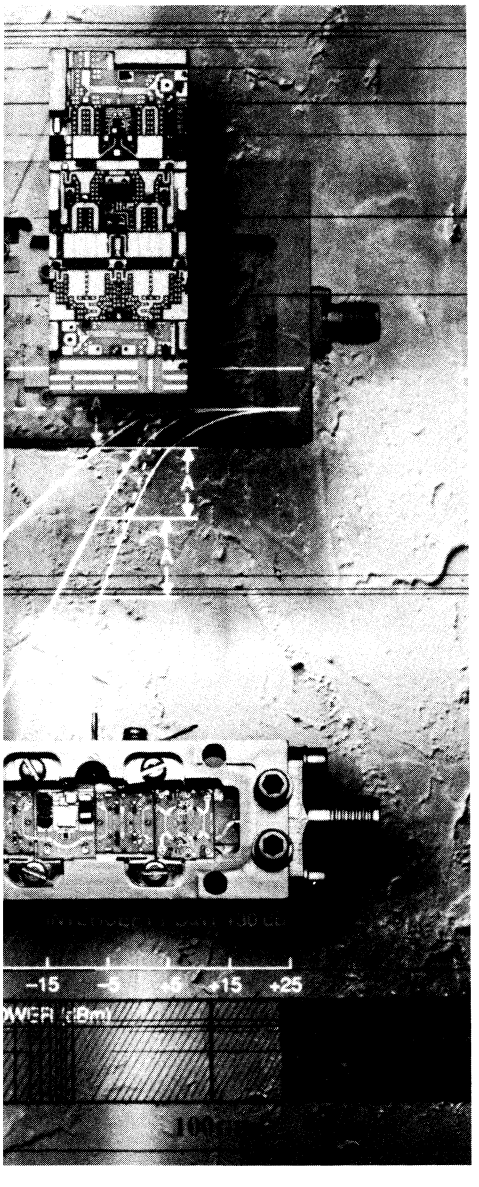
Note:
(N) - New product offering

Case Drawing Alphanumeric Listing

Note 1: With gain control


1 MHz
10 MHz
100 MHz
1 GHz

I. Introduction



Information About This Data Book
Avantek Vertical Integration
Solid State Leadership

AVANTEK

SOME INFORMATION ABOUT THIS DATA BOOK

Standard Microwave and Millimeter Amplifiers

Avantek's Amplifier Data Book contains detailed information on our full line of standard microwave and millimeter wave amplifier products. The comprehensive lines of amplifiers listed in this Data Book are divided into sections based on the following broad definitions:

1. **Gain Modules** – PGM series packaged gain modules, microstrip compatible μAVPAK, 2-20 GHz.
2. **Small Signal Amplifiers** – frequencies up to 20 GHz, and power levels up to +23 dBm at 1 dB gain compression. Wide band widths, octave and multi-octave.
3. **Millimeter Wave Amplifiers** – low end frequencies starting at 18 GHz. All bandwidths and power levels to 45.5 GHz.
4. **Wideband Power Amplifiers** – frequencies up to 20 GHz, and power output levels greater than +23 dBm at 1 dB gain compression. Wideband and narrowband.
5. **Communications Amplifier Products** – LNAs and Power Amplifiers for satellite, terrestrial, and cellular communications.
6. **Output Limiting Amplifiers** – power output minimum-maximum boxes of less than 7 dB (less than 6 dB for octave band) specified over wide input power ranges.
7. **Low Noise Amplifiers (LNA)** – Frequencies up to 20 GHz and bandwidths up to 33% with very low noise figure requirements.

These amplifiers are all built to Avantek standards, the highest in the industry. They are suitable for application in the most rugged of commercial, military, and aerospace systems. Avantek continues to develop new and upgraded microwave and millimeter wave amplifiers, and to introduce them as standard products. (This Data Book contains numerous "Industry Firsts").

Available Through Distribution

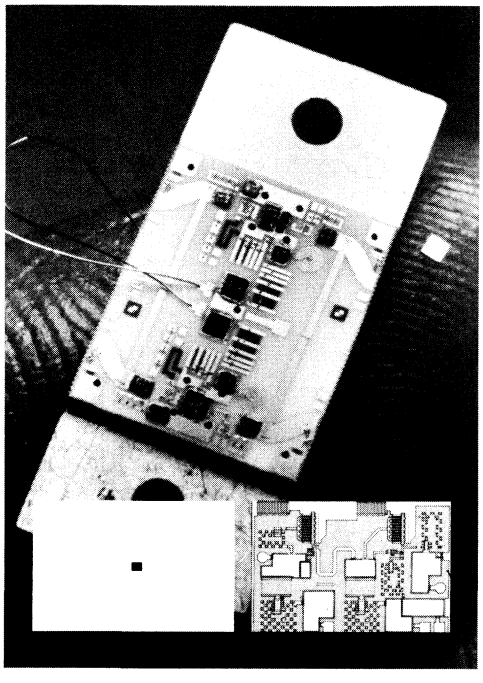
Many of the microwave amplifiers included in this Data Book are standard products which are readily available from Avantek distributors' stock. It is recommended that you first call your local distributor to determine availability and price of any of these items.

The products in the following sections are available through the Avantek Worldwide Distribution Network.

1. Gain Modules - μAVPAK PGM series
2. Wideband Small Signal Amplifiers - AFT, AMT, AWT, and AGT series
3. Millimeter Wave Products - up tp 26.5 GHz only
4. Wideband Power Amps - APT, APG series
5. Communications Amplifier Products - AM, AMG, APG, AW and AWC series
6. Output Limiting Amplifiers
7. Narrowband Low Noise Amplifers

II. Power Supplies (listed at the end of section II, Application Notes

AVANTEK VERTICAL INTEGRATION



The tiny GaAs monolithic microwave integrated circuit performs the same basic function as the similar hybrid circuit in 1/25th the area and eliminates most circuit adjustment.s Insets: The same MMIC shown actual size and enlarged 35 times.

From Transistors and MMICs to Advanced Integrated Subassemblies

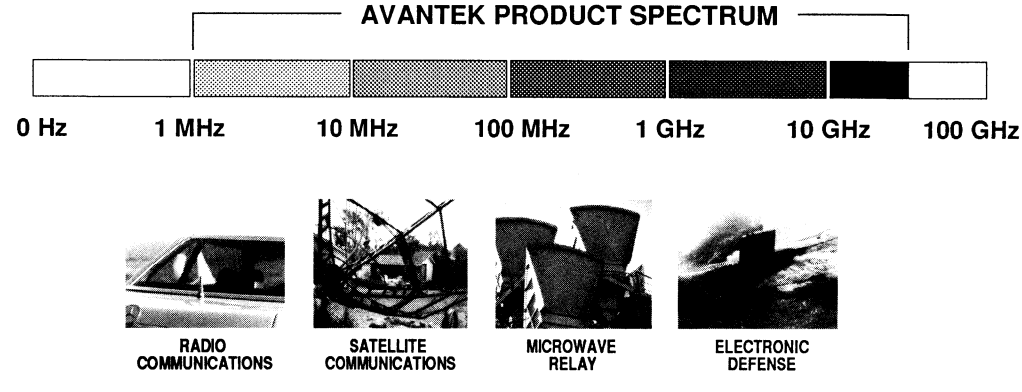
1. Space-Age Technology:

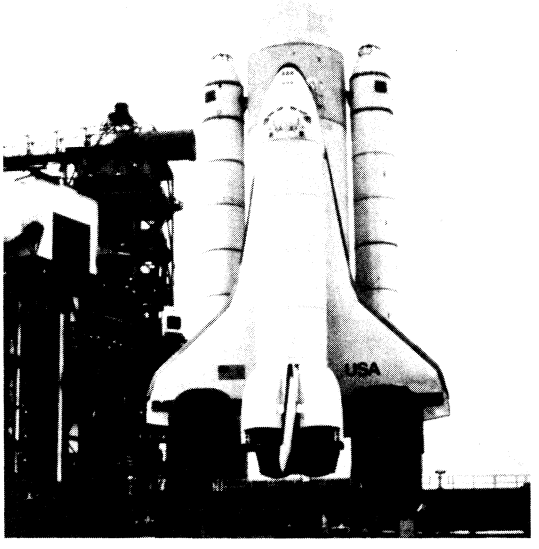
- Silicon and GaAs transistors
- Silicon and GaAs Monolithic Microwave Integrated Circuits (MMICs)
- Thin-film hybrid Microwave Integrated Circuits (MICs)
- Mixers and RF switches
- Advanced fabrication technology
- Proprietary packaging

2. Premium Product Performance:

- GaAs FETs operating beyond 60 GHz
- GaAs MMICs through 20 GHz
- Widest oscillator and amplifier bandwidths
  — Only available 2-18, 18-40 GHz transistor amplifiers
  — Only available 18-26, 26-40 and 33-50 GHz transistor YTOs
- Lowest amplifier noise figures

Frequency Spectrum Chart





3. High Quality/Reliability

- Supplier to virtually all airborne electronic warfare systems
- Space-qualified products
- Integrated QA/QC system
- High-reliability screening

4. Vertical Integration

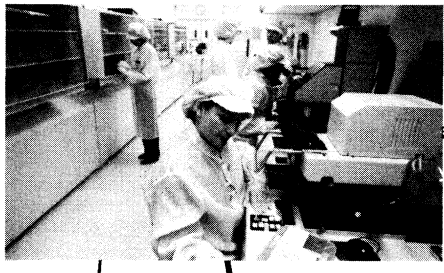
- Microwave transistors
- Silicon and GaAs MMICs
- Modular amplifiers and signal-processing components
- Modular signal control components
- Wideband and communications/radar-band amplifiers
- Variable- and fixed-frequency oscillators
- Digitally- and voltage-tuned oscillator and filter assemblies
- Downconverters, amplifier-downconverters and mixer-preamps
- Multifunction subassemblies
- Over 700 standard products

5. **Volume Manufacturing Capability**

- Four U.S. manufacturing facilities
- 600,000 sq. ft.
- Over 2600 employees
- Industry's most advanced microwave semiconductor facility
- Three million product units shipped in five years (excluding semiconductors)

6. **Over 20 Years of Experience•**
Manufacturing solid-state microwave components since 1965
  - Semiconductors and thin-film hybrids since 1968
  - Tunable microwave oscillators since 1969
  - Microwave mixers since 1980
  - Monolithic Microwave ICs since 1982
  - Thin-film mixers since 1986
  - HEMTs and MSI MMICs since 1987
  - 60 GHz amplifiers since 1988

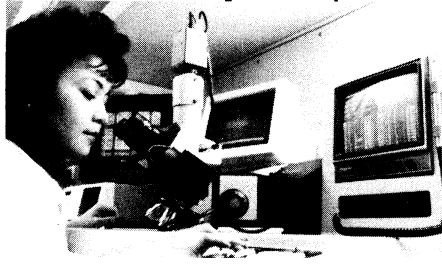
NEWARK



FOLSOM

MILPITAS

SANTA CLARA



TWENTY-FOUR YEARS OF SOLID STATE LEADERSHIP

Avantek, Inc. was founded in late 1965 to meet the electronic industry's need for high performance solid state VHF, UHF and microwave transistor amplifiers.

By December, 1965, the company had developed and introduced a family of low-noise solid state preamplifiers covering the 30 to 1000 MHz frequency range. Less than six months later, Avantek added solid state microwave amplifiers with octave band coverage through 2300 MHz as well as narrowband amplifiers for specific communications bands in that frequency range. This early family of highly reliable

Avantek transistor amplifiers played a significant part in the microwave industry's decision to replace tube-type amplifiers with solid state.

Advances in solid state amplifier technology were hampered in these early years by the limited and sporadic availability of microwave transistors. Device suppliers simply were not able to keep pace with the progress made by Avantek circuit designers.

Consequently, in the spring of 1968, Avantek added the staff and facilities to design, develop and manufacture its own gold-metalized planar epitaxial microwave transistors. The capability to design and produce high performance microwave transistors in-house is one of the important factors leading to Avantek's present success. Today, virtually every microwave transistor used in an Avantek product is an Avantek transistor. In 1968, Avantek also established a facility for the production of hybrid thin-film microwave integrated circuits (MICs).

In February, 1970, Avantek was granted a patent on the techniques of producing unconditionally-stable, cascadable wideband amplifier modules. This concept resulted in a wide variety of modular "gain blocks" in packages ranging from conventional cases with connectors to tiny thin-film modules in TO-8 and TO-12 transistor packages. To meet the needs of both the commercial and military user.

Avantek introduced thin-film fundamental YIG-tuned transistor oscillators in 1969. In 1973, varactor-tuned transistor oscillators were added to the growing component line. Some more-recent Avantek developments include:

1981

- 5-watt communications/radar-band GaAs FET amplifiers.
- Dielectrically-stabilized microwave oscillators.
- Avanpak flatpack amplifiers through 18 GHz.
- YIG filters.
- 1 Watt, 4–8 GHz GaAs FET amplifier.

1982

- Industry's first 40+ GHz GaAs FET.

1983

- Silicon monolithic microwave ICs into production
- Industry's first 26.5–40 GHz GaAs FET amplifier
- 10 watt 6 GHz amplifiers.
- 45 watt, 900 MHz amplifiers.
- Industry's first 26.5–40 GHz GaAs FET YIG-tuned oscillator.

1984

- GaAs monolithic amplifiers introduced
- Industry's first 18–40 GHz GaAs FET amplifiers
- PlanarPak package

1985

- Industry's first 2 watt, 20 GHz GaAs FET.
- Industry's first 55 watt bipolar transistor @ 900 MHz

1986

- Tunable dielectric-resonator oscillators
- Low-cost, plastic-packaged MMIC amplifiers
- Industry's first 33–50 GHz YIG-tuned GaAs FET oscillator
- Industry's first 45 GHz GaAs FET amplifier

1987

- Patented fast-switching multi-resonator DRO design
- 6–18 GHz, 1-watt power amplifier.
- 2–20 GHz, quarter-watt MMIC.

1988

- HEMT device with 0.5 dB noise figure at 12 GHz
- 35 GHz HEMT with 12 dB gain.
- Industry's first medium-scale integration (MSI) silicon MMICs.
- 60 GHz integrated amplifier/downconverter

Today, Avantek is the world's leading manufacturer of microwave products. During the past two decades Avantek has produced more Monolithic Microwave Integrated Circuits (MMICs), wideband solid state microwave and millimeter-wave amplifiers, YIG-tuned oscillators and low-noise communications/radar amplifiers than all other U.S. manufacturers combined. Over the past five years Avantek has shipped nearly three million product units (excluding all semiconductor devices) to over 3000 customers.

Today the Avantek microwave product line includes:

- Microwave Semiconductors
- Silicon Transistors
- Gallium Arsenide Field Effect Transistors
- GaAs and Silicon Monolithic Microwave Integrated Circuits
- Internally-Matched GaAs FETs
- Avanpak Miniature Flatpack Products
- PlanarPak Surface-Mount Products
- Control Components:
  - — Mixers
  - — Switches
  - — Limiters
  - — Attenuators
- YIG-tuned Oscillators and Filters
- Varactor-Tuned Oscillators
- Dielectric Resonator Oscillators
- Wideband Microwave Amplifiers
- Low-Noise Communications Amplifiers
- Power Amplifiers
- Modular Amplifiers
- Special-Purpose Amplifiers
- Multifunction Integrated Assemblies

Avantek products cover frequencies from DC to 60 GHz for use in electronic defense and radar; missiles and satellites; test equipment and instrumentation; and communications equipment for the military, commercial, industrial and consumer markets, both domestic and international.

Avantek Employees and Facilities: Today there are over 2600 employees in the Avantek family supported by some of the industry's most modern equipment and facilities. Manufacturing, engineering and administrative facilities, all located in California, include 255,000 sq. ft. in Santa Clara, 180,000 sq. ft. in Milpitas, 88,000 sq. ft. in Folsom and 90,000 sq. ft. in Newark. Avantek also has a facility in Farnborough, UK to support European requirements. This staff and floorspace supports Avantek's fundamental vertical integration strategy: to manufacture high-performance microwave semiconductors, to build these into amplifiers and other functional "building blocks," to integrate these functions into multifunction assemblies—and to support all products with research, engineering, quality control and customer support.

SEMICONDUCTORS

Avantek's line of advanced microwave semiconductors is fully described in the Avantek *Semiconductor Data Book*. Products include:

SILICON BIPOLAR TRANSISTORS

Avantek's line of silicon bipolar transistors offers high gain, low noise figure and moderate power output for amplifier applications up to 6 GHz and oscillator applications through 12 GHz. The devices are available in a variety of package styles suitable for commercial through military applications.

SILICON MONOLITHIC MICROWAVE INTEGRATED CIRCUITS

Avantek has over 55 different models in its steadily-increasing line of MODAMP MSA-series monolithic amplifiers and MSF-series frequency converters. These silicon MMICs are designed for use in narrow- and broad-bandwidth applications from DC to 6 GHz. They are offered in package styles for military, industrial and high-volume commercial designs. The same MMIC designs are also offered in unpackaged chip form for incorporation in thin- or thick-film hybrid MIC applications.

Avantek also offers a series of advanced silicon monolithic circuits using its ISOSAT process for high-performance and medium-scale integration devices. Products include active mixers operating through 8 GHz; low-noise amplifiers, AGC amplifiers and frequency dividers operating through 6 GHz, high-speed operational amplifiers for frequencies over 1 GHz, and a series of functional units designed for fiber-optic communications applications.

GALLIUM ARSENIDE FIELD EFFECT TRANSISTORS (GaAs FETs)

Avantek's range of GaAs FETs includes low-noise, high-gain devices operating through 18 GHz, and medium-power devices operating to 15 GHz. Suitable for use in military, industrial and commercial applications, all transistors are designed and tested to provide extremely uniform performance for the most severe and critical microwave applications.

GALLIUM ARSENIDE MONOLITHIC MICROWAVE INTEGRATED CIRCUITS

Avantek now offers an extremely versatile, cost-effective 2 to 6 GHz GaAs MMIC gain block suitable for commercial applications.

IMFET™ INTERNALLY-MATCHED GaAs FETs

Avantek's line of *IMFET* internally-matched GaAs FETs provides output power of up to 6 watts, optimized for specific frequency bands between 2.9 and 8.4 GHz. These power FET assemblies contain all the necessary matching circuitry to allow them to be used in 50-ohm applications without external tuning. Avantek modulator products are essentially miniature functional blocks designed to operate in standard 50-ohm environments, for incorporation in microwave systems. These products are packaged in TO-8, TO-39 and TO-12 metal cans, the unique *PlanarPak* surface-mount package, the *Avanpak* miniature flatpack and dual-inline packages.

Avantek also offers an extensive range of compact fixed and variable-frequency signal sources.

MODULAR PRODUCTS

- IF/RF amplifiers, TO-8 and PlanarPak packages: 10 MHz to 2 GHz
- Surface-mount amplifiers, *PlanarPak* package: 1 to 18 GHz
- AGC amplifiers, TO-3 and TO-8 packages: 5 to 1000 MHz
- Limiters, TO-8, DIP and *PlanarPak* packages: 5 to 1000 MHz
- Amplifiers, *Avanpak* miniature flatpack: 10 MHz to 4 GHz
- Low-cost TO-12 to TO-39 amplifiers: 0.1 MHz to 1500 MHz
- Voltage-controlled attenuators, TO-8 and *PlanarPak* packages: 5 MHz to 2 GHz
- Level and threshold detectors, TO-8 and *PlanarPak* packages: 10MHz to 2 GHz
- Power splitter, *Avanpak* package: 2 to 18 GHz
- Mixers, *Avanpak, Planarpak* and TO-8 package: 0.75 to 18 GHz
- Mixer-preamplifiers, *Avanpak* package: 0.5 to 18 GHz input
- PIN-diode switches, Avanpak package: SPST through SP5T, reflective and non-reflective: 2 to 18 GHz
- Limiters, Avanpak, TO-8, TO-12 package: 2 to 18 GHz

SIGNAL SOURCES

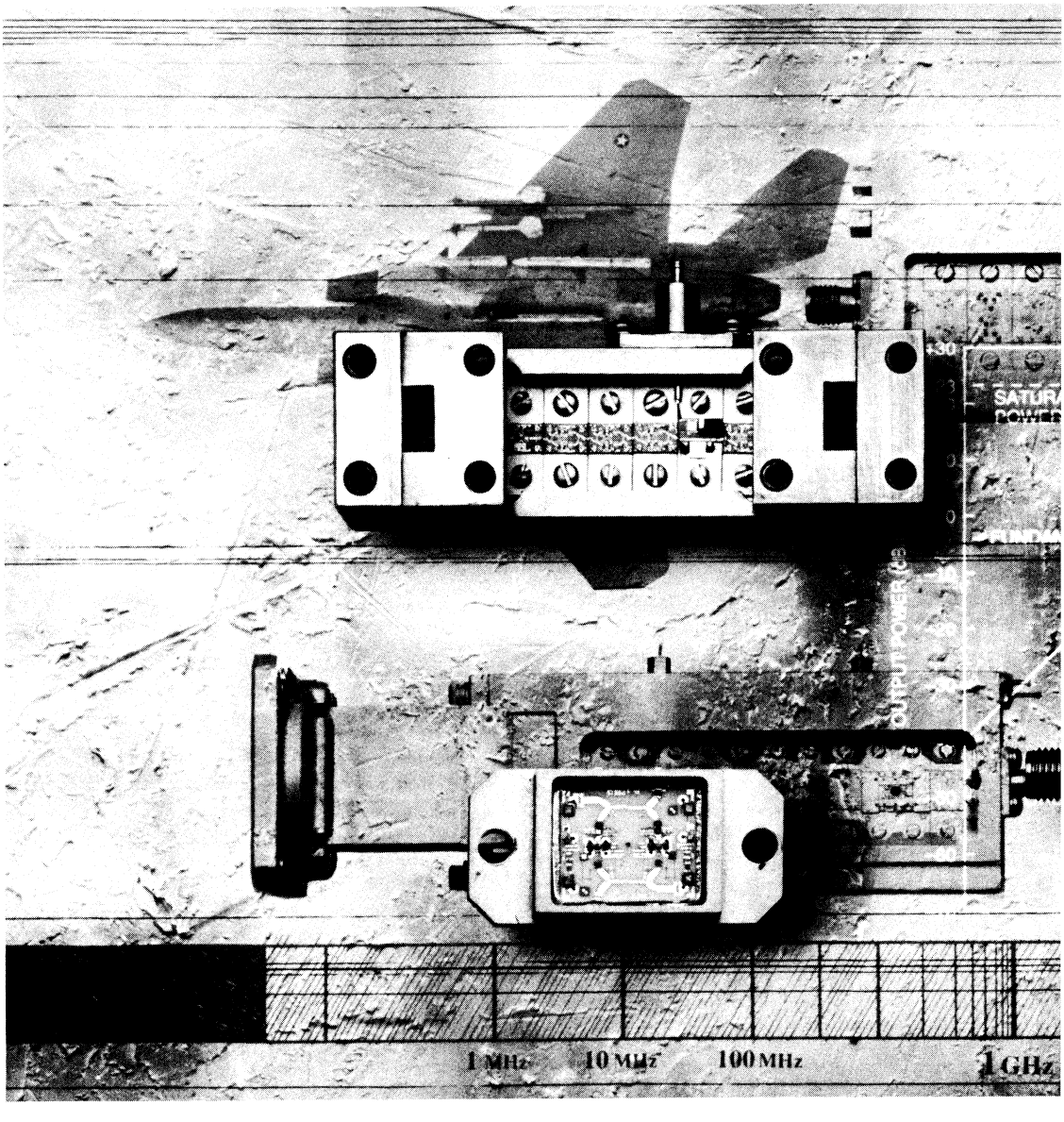
- Varactor-tuned oscillators: 300 MHz to 18 GHz
- Dielectric Resonator oscillators: fixed; mechanically-and electrically-tunable: 3 to 18 GHz
- YIG-tuned oscillators: 1 to 50 GHz
- YIG Filters: 0.5 to 26.5 GHz

HOW TO USE THE DATABOOK SERIES

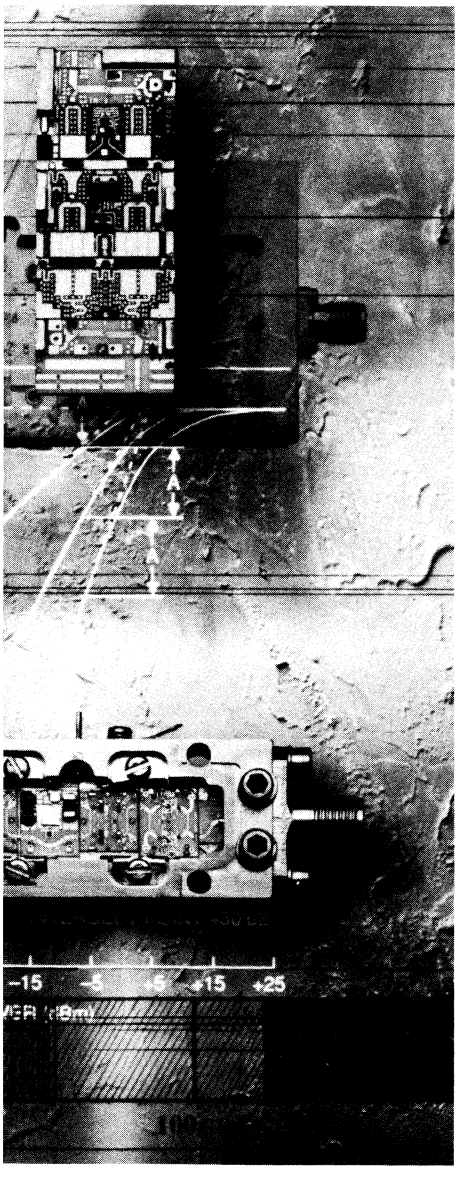
The Avantek Databook set consists of the following items:

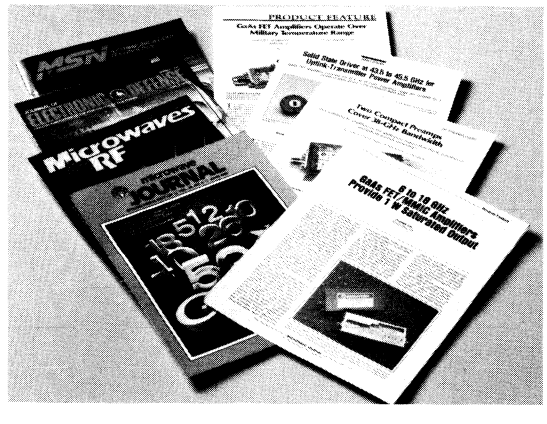
1. Product Guide
2. Modular and Oscillator Components Data Book
3. Semiconductor Data Book
4. Microwave and Millimeter Wave Amplifier Data Book

Item 1, the Product Guide, gives summary specifications for all of Avantek's standard products at time of publication. Custom and special products are described. It is suggested that this Product Guide be used as the first reference to locate products of possible use. When potentially useful products have been identified, the user should refer to items 2 through 4, the data books, which provide complete, detailed data sheets on all standard Avantek products in that category plus applications notes and other appropriate information. Some products, such as modular amplifiers, may appear in more than one databook for user convenience.


1 MHz
10 MHz
100 MHz
1 GHz

II. Application Notes





CARE AND HANDLING OF AMPLIFIERS

Power Supply

DC Power Supply Voltage

The specified input voltage is the minimum value required for proper operation. Contact Avantek Amplifier Applications Engineering for operation above the minimum value to prevent possible shutdown due to internal thermal safeguards.

Reverse polarity protection, overvoltage protection, and dual bias voltage sequencing (when required) are incorporated into the design of all products to prevent accidental damage by the application of incorrect DC supply voltage.

The guaranteed amplifier performance depends on operation at the specified DC supply voltage and where constant performance is a requirement, the supply voltage should be kept constant and well regulated.

AC Power Supplies

Avantek offers a series of "universal" AC power supplies to operate practically any current Avantek solid-state amplifier from standard 115 or 230 VAC, 50-450 Hz. These power supplies are compact, linear (non-switching) for RFI free operation and are designed to assure that the amplifier being powered will operate to its full performance capability. Each power supply is equipped with a six foot power cord with mating AC connector. On special order, Avantek can supply drilled baseplates to mount both the power supply and associated amplifier. The combination of amplifier with power supply may be qualified to the same military specification as the amplifier alone.

Detailed information on the Avantek power supply for your application can be found at the end of this section.

RF Input Power

Input Power Withstanding Capability of Transistor Amplifiers

Each GaAs FET or bipolar transistor has its own unique ability to withstand excessive input power levels. This capability is related to device geometry, metal thickness, fabrication techniques and materials. Since the input circuit of most transistor amplifiers is tuned for maximum power transfer, the power withstanding capacity of an amplifier is practically the same as that of the input transistor or transistors.

If excessive power is applied to a transistor amplifier, the first measureable affect is almost always an increase in noise figure. A somewhat higher power will further degrade noise figure and decrease the gain of the amplifier. If the input power level is even higher, the input transistor will ultimately fail.

Such failures are most often seen in radar applications. In most radar systems, the receiver and high power transmitter are always connected to the same antenna and isolated with a passive duplexer. The high power signal that appears at the receiver port during transmit periods is reflected to a large extent by a TR (transmit-receive) switch which uses a gas tube, solid state device or a combination of both. Since these switches are not perfect, some transmitter power invariably appears at the receiver input - usually in the form of a high power spike and a lower power flat leakage.

In discussing the ability of an amplifier to survive high power levels, the input signal is generally described using the following terms:

Peak Pulse Power:
The instantaneous maximum power occurring during each carrier-frequency cycle. Expressed as "X" power for "Y" time.

Rise Time:
The interval between the instants at which the instantaneous power first reaches 10% and 90% of the peak pulse power on the leading edge of the pulse.

Fall Time:
The interval between the instants at which the instantaneous power first reaches 90% and 10% of the peak pulse power on the trailing edge of the pulse.

Pulse Width:
The time interval between the points on the leading and trailing edges of the pulse at which the instantaneous power is 3dB less than the maximum instantaneous power of the pulse (half-power points).

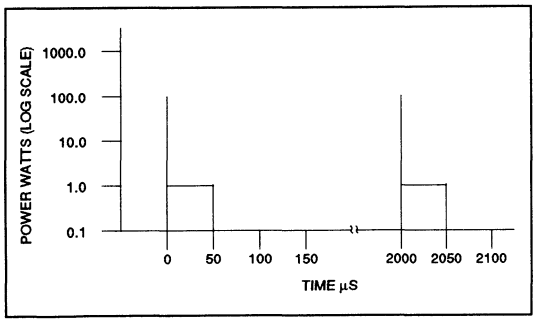
Pulse Duty Cycle:
The numerical ratio or percentage of the average pulse duration to the average pulse spacing. This is equivalent to the product of the average pulse duration and the pulse repetition rate.

Pulse Repetition Rate:
The number of pulses occuring per unit time.

To examine the relationship between these factors and the resulting energy, power and voltage appearing at an amplifier input, we can examine the following example taken from a typical radar system. Assume that the leakage signal from the TR switch consists of a 10 ns, +50 dBm (100W) spike followed by a 50μs, +30 dBm (1 W) flat. The duty cycle is 2.5 % (.025).

APPLICATION NOTES

The power waveform would look like this:



Since 50μs is 2.5% of one cycle, the cycle is 2×10^{-3} sec. (2ms)

ENERGY PER CYCLE:

$$W_{erg} = (1 \times 10^{7})\ (P_{watts})\ (T_{seconds})$$

TOTAL ENERGY PER CYCLE =

$$W_{tot} = (1 \times 10^{7})\ (200)\ (1 \times 10^{-8}) + (1 \times 10^{7})\ (1)\ (5 \times 10^{-5})$$

$$W_{tot} = 20 + 500$$

= 520 ergs each 2 ms cycle

TOTAL AVERAGE DISSIPATION

$$= \left(\frac{W_{erg}}{T_{sec}}\right)\left(1 \times 10^{-7}\right)$$

$$= \frac{520}{2 \times 10^{-3}} \times 10^{-7} = 26 \text{ mW (+14 dBm)}$$

DISSIPATION FROM 100W PULSE

$$= \frac{520}{2 \times 10^{-3}} \times 10^{-7} = 1 \times 10^{-3}$$

= 1 mW (0dBm)

PEAK VOLTAGE = $\sqrt{2PR}$
(50Ω SYSTEM)

$$E = \sqrt{2PR} = \sqrt{2 \times 100 \times 50} = \sqrt{1 \times 10^{4}} = 100V$$

W = energy, ergs
P = power, W
T = time, sec
R = resistance, ohms
E = voltage, volts

Both the +14 dBm average power and the +50 dBm, 10 ns peak pulse power should definitely call for caution if a transistor amplifier is used at the receiver input. However, the amplifier transistors could be properly protected through the use of an external diode limiter or integral input limiter.

RF Input Power Levels

Avantek guarantees the amplifiers to be unconditionally stable under any input/output condition. However, for extended operating life, it is recommended that the output be loaded during operation. This load is especially important when operating with high input drive levels.

Unless otherwise noted in the product specifications, the maximum safe RF input power level which may be applied to an amplifier is +20 dBm CW. Pulsed input power levels of up to +30 dBm may be applied to most amplifiers (unless otherwise noted) PROVIDED the pulse width and duty cycle average +20 dBm or less over one cycle. Please contact Avantek Amplifier Applications Engineering if your application involves input levels exceeding these limits.

Input Limiters for Amplifier Protection

Currently, Avantek can equip most solid state amplifiers in this catalog with internal or external input limiters that will provide protection from +50 dBm peak (up to 5 μs duration with low duty cycle) and up to +30 dBm continuous input power.

Avantek uses a number of basic PIN diode limiters for input protection. They range from simple single-diode self-biased circuits through multi-diode cascades.

To discuss your requirements for Avantek low noise amplifiers combined with input limiter protection contact Avantek Amplifier Applications Engineering.

Thermal Considerations

Thermal Considerations - Power Amplifiers

The lifetime or MTBF of a GaAs FET varies inversely with its channel temperature. Avantek design engineers make every effort to assure that the design of the amplifier does not allow the FET's operating channel temperature to exceed the specified maximum rating. GaAs Power FETs and MMICs built with Avantek's designs and fabrication technology offer the potential for useful lifetimes exceeding those of the systems in which they are used.

It is recommended that precautions be taken to protect the amplifier from the following conditions:

- Excessive RF input signals (see "RF Input Power Levels" on page 14)
- High-voltage power supply spikes (see "DC Power Supply Voltage" on page 13)
- Improper heat sinking (see "Heat Sinking" on this page)

Heat Sinking

All Avantek power amplifiers, i.e. APT and APG series, are designed to be cooled by conduction through the amplifier base plate to the external heat sink and/or mounting surface. Application of DC power without proper heat sinking may result in degraded performance and/or permanent damage to the amplifier. It is ultimately the system designer's responsibility to assure that adequate heat sinking is provided to maintain the amplifier baseplate temperature within the guaranteed temperature specification.

Proper heat sinking is dependent upon a number of system design factors (i.e. configuration/size constraints, air flow, ambient temperatures, power dissipation, thermal resistance, etc.). Power dissipation (in watts) may be determined by multiplying the applied DC voltage by the operating DC current. Thermal resistance, like electrical resistance, is a measure of the ability of a device or interface to enhance or impede the flow of heat. It is a function of heat sink design, surface area, convection coefficient, power dissipation, and generally is expressed in °C/watt. The only way thermal resistance can be reduced is either by increasing the physical size of the heat sink (i.e., changing surface area) or by moving more air across the sink (i.e., changing from natural convection to forced convection coefficients).

Due to these variables and without calculating for each specific application, the following recommendations are offered as a guide to proper heat sinking which will enhance the useful lifetime of the amplifier:

- Temperature should be monitored by means of a thermocouple connected to a temperature measuring device and attached as close as possible to the amplifier base plate on the mounting surface.
- A thermal compound should be applied between the amplifier baseplate and the heat sinking surface. These compounds reduce the high thermal impedance of the air gap between the case and the sink.
- Consider specific system variables when calculating power dissipation and thermal resistance to determine the size and heat dissipating characteristics of the heat sink material.
- When possible, forced air cooling should be utilized to reduce the operating temperature of the amplifier.
- When space is available, finned cooling plates should be employed to further enhance convective and forced air cooling.

The APG series power amplifiers are packaged in lightweight aluminum cases with heat-dissipating fins. If free air circulation is available, no additional cooling should be required in normal room temperature operation.

Stability

Avantek guarantees the amplifiers to be unconditionally stable under any input/output load condition. For prolonged operating life, it is recommended that the output always be loaded during operation, especially when operating with high input drive levels.

Bandwidth Limitation With External Filtering

The guaranteed frequency range of all Avantek amplifiers represents the range in which all guaranteed performance parameters are met and *not* the 3 dB down points on the amplifier gain curve. There is no way to determine the 3 dB points from the basic amplifier specifications, and the amplifier may continue to exhibit large amounts of gain over a considerably wider frequency range. If response to out-of-band signals is a problem in a system design, it may be necessary to provide external filtering to limit the overall system bandwidth to a known range.

Safety

Avantek does not use hazardous or toxic material in the final assembly of our amplifiers. In the majority of the amplifiers shown in this catalog, reasonable product safety features (overvoltage and reverse polarity protection) are a part of the final assembly.

APPLICATION NOTES

TESTING, SCREENING and TEST DATA

Certified Test Data

Certified test data is provided with each Avantek amplifier. Data is taken with equipment calibrated and maintained in accordance with MIL-C-45662.

All amplifiers are routinely tested for:

- Small signal gain
- Noise figure
- Power output at the 1 dB gain compression point, or saturated output power, as applicable
- Input VSWR
- Output VSWR

Test data is supplied with each unit for performance at +25°C. Specifications are guaranteed over the stated temperature ranges and are tested to ensure compliance.

All parameters indicated in this Avantek Amplifier Data Book as "minimum" or "maximum" are tested as an integral part of the production process. All specifications indicated as "typical" are sample tested on a regular basis and serve as an indication of the performance of the units. For specific information on test set-ups used to measure the performance of Avantek amplifiers and equipment recommendations, please contact Avantek Amplifier Applications Engineering.

Recommended Test Methods

On those occasions when the user needs to verify amplifier performance the following test setups are recommended. If the apparatus is sufficiently accurate, the results will correspond closely to the values measured in our production test facility.

For specific information on using these setups to measure the performance of Avantek amplifiers and equipment recommendations, please contact Avantek Amplifier Applications Engineering.

Reliability Screening: R-Series Screened Amplifiers

A standard reliability screening is available for many of the amplifiers listed in this Data Book. Table 1 lists those amplifiers for which screening is available.

This standard screening is called "R-series". Because it is a standardized process, the incremental cost for this screening can be kept low, even on small quantity lots.

R-series screening meets the intent of MIL-STD 883, Method 5008 Class B, which is modified to accomodate the large physical size typical of the cascaded amplifiers in this Data Book. Method 5008 was developed for single microcircuits of relatively low complexity, housed in small, light, connectorless packages, and contains some stress levels inappropriate for the larger, more complex and heavier amplifiers.

R-series processing has proven to be a cost-effective screen which increases the reliability of the end product, and reduces infant mortality.

The following amplifier series may be ordered with R-series screening:

PGM series - Packaged Gain Modules
AFT series - Avanpak amplifiers
AMT/AWT series - High performance amplifiers from section 2

Table1. Amplifiers Available with R-series Screening

How To Order R-series Screening

Avantek Distributors and field sales personnel can quote the costs for R-series screening based upon the specific model number, quantity, and delivery requirements.

PGM series gain modules:

R-series screening for PGMs can be specified at the time of ordering by adding an R suffix to the model number, e.g. model number PGM-8231-2 (unscreened version) becomes PGM-8231-2R for R-series screened version.

AFT series amplifiers:

R-series screening for AFTs can be specified at the time of ordering by replacing the 0 in the model number suffix with an R, e.g. model number AFT-2033-20F (unscreened version) becomes AFT-2033-2RF for R-series screened version.

AMT/AWT series amplifiers:

R-series screening for AMTs and AWTs can be specified at the time of ordering by adding an R suffix to the model number, e.g. model number AWT-2073 (unscreened version) becomes AWT-2073R for R-series screened version.

R-series Screening Tests

Test	Mil Std 883 Method	Condition
Internal Visual Inspection	Note 1	AWS-014355-800
Pre-Seal Bake	—	T_A=125°C, 3 hours
Stabilization Bake	1008	Condition B, T_A=125°C, 24 hours minimum
Temperature Cycle	1010	Condition B, 10 cycles, –55°C to +125°C
Constant Acceleration	2001	Condition A, Y_1 axis, 5000 g
Hermetic Seal, Fine	1014	Condition A2, $1x10^{-6}$ ATM cc/sec maximum
Hermetic Seal, Gross	1014	Condition C
Burn-in	1015 (Note 2)	Condition B, 168 hours, T_A=100°C
Final Electrical		T_A=25°C, Standard ATP
External Visual	2009	

Note 1. Internal visual written to meet the intent of Method 2017 Mil Std 883 for microwave devices. Actual document used is Avantek Workmanship Standard AWS-014355-800.

Note 2. See Data Book specifications for burn-in bias conditions.

APPLICATION NOTES

AMPLIFIER PARAMETERS and PERFORMANCE

Gain

The ratio between the output power and the input power of the amplifier (in dB) is a measure of the gain or amplification available from the amplifier. Small signal gain (normally called "gain") is specified as operating in the small signal or linear gain region and measured with a source and load impedance of 50 ohms. The small signal gain is normally measured a minimum of 10 dB below the 1 dB gain compression point.

Gain Flatness

The small signal gain variation is expressed within the frequency range specified as the amplifier bandpass and at a fixed baseplate temperature as ± some limit (in dB) from the nominal gain level. For example, an amplifier with a small signal gain flatness specification of ±1.0 dB would have a maximum of 2.0 dB peak-to- peak gain variation.

Gain Variation vs. Temperature in Microwave Transistor Amplifiers

The gain of both GaAs FET and bipolar transistors exhibits a change with changes in the device temperature. Although the actual gain variation in a practical amplifier stage depends on a number of design factors, a rule of thumb states that a GaAs FET stage will vary at a rate of approximately .015dB/°C. Thus a ten-stage GaAs FET amplifier with a nominal gain of 45 dB at +25°C will exhibit a gain of approximately 30 dB at +125°C and 60 dB at –75°C *if no temperature compensation is used.* Bipolar transistor stages have a nonlinear gain vs. temperature characteristic, with maximum gain occurring at approximately 0°C (refer to figure 1 below).

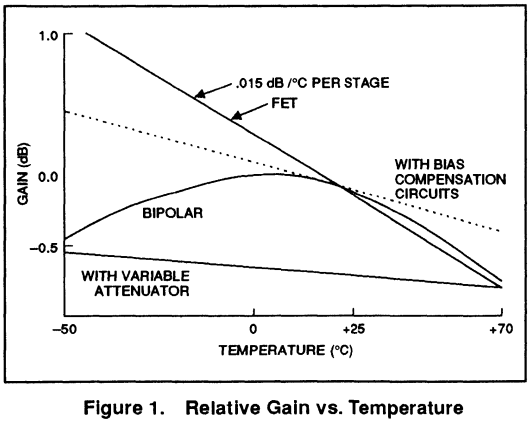


Figure 1. Relative Gain vs. Temperature

However, the gain variation with temperature can be minimized using several different design techniques. Three gain compensation methods used at Avantek are:

1. Temperature Variable Attenuator (See AMT amplifiers). If an attenuator incorporating temperature-dependent elements is carefully designed and optimized, and inserted in an amplifier cascade, it can be made to change in attenuation inversely with the temperature-induced gain changes of the amplification stages. This form of temperature compensation is particularly applicable to GaAs FET amplifiers because of the linear gain vs. temperature characteristics of GaAs FET devices.

In the Avantek AMT Series temperature-compensated GaAs FET amplifiers, the temperature-variable attenuator is synthesized by driving a voltage-variable attenuator with a bias voltage derived from a temperature detection circuit. This allows the complete amplifier with temperature compensation to be fine tuned to maintain the overall gain within a narrow "window" over a wide temperature range.

2. Bias compensation: A thermistor, diode junction or other temperature-variable element is incorporated in the bias net work of the amplifier stage. The bias system is adjusted so that the current through the device tends to increase with temperature, thus tending to increase the gain while the inherent gain of the active device is tending to decrease. This technique can be quite effective over a useful temperature range.

3. Heater Blanket Temperature Control: If the temperature of the transistor is not permitted to vary, the gain will remain constant regardless of changes in outside ambient temperature. In the heater blanket technique, the amplifier is thermally insulated and maintained at its maximum operating temperature using a proportionally-controlled heater. This is the most effective form of temperature compensation currently available, and is also the most expensive. It is used in a number of specially designed amplifiers for critical applications.

Noise Figure

All components in a given system generate their own internal noise ("white noise"). The comparison of this "white noise" to the noise level desired is the signal-to-noise ratio. This is measured in dB. Noise Figure is the measure of the signal-to-noise reduction by the component.

An automatic noise figure meter is the most common method of measurement. The test set-up including a mixer and IF preamplifier in figure 2 can make measurements beyond the capability of the noise figure meter alone. The solid-state noise

source can operate to 18 GHz and have a noise ratio of approximately 15 dB. Versatile and accurate measurement is achieved when the noise figure meter is "zeroed" and then properly driven (a system gain high enough). Some of the measurement errors can be mismatch (random phase), noise source variations (±0.2 dB), and the accuracy of the noise meter itself (normally ±0.1 dB over most of their range).

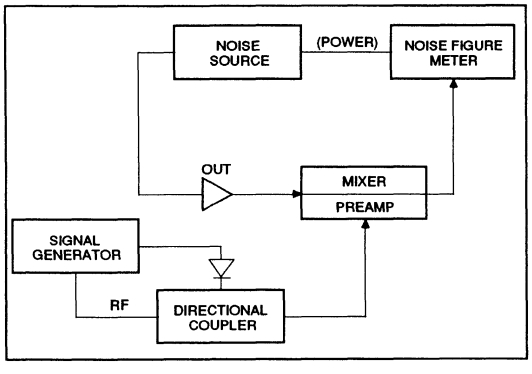


Figure 2. Noise Figure Test Set-Up

Precautions should be taken, if a gas tube noise source is used, to assure that large voltage "spikes" will not be applied to the amplifier input. This can result in damage or erroneous noise figure results. Avantek recommends the use of diode noise source such as the HP 346B.

Also, where necessary, the noise figure reading obtained should be corrected for noise source variances and for contributions by the receiver or post amplifier. When such precautions are adhered to, good correlation is obtained between various commercial noise figure measuring equipment. All Avantek automatic noise figure meter measurements can be referenced to a Hot-Cold noise source.

Output Power At A Specified Gain Compression Level

The setup of figure 3 is used to measure output power, with the signal generator delivering a single frequency (low harmonic) CW output. With the 10 dB attenuator "in", the output attenuator dial is adjusted to a convenient reference point on the power meter, with power output approximately 10 dB below minimum specified compression point. When the 10 dB of attenuation is taken out, the output power will increase. The 1 dB gain compression point is that point where the output power increase is 1 dB less than the increase in input power (i.e., if the input power is increased by 10 dB, the output power will rise only 9 dB). Through an interactive process of varying the input power and alternating the 10 dB step attenuator in and out, the 1 dB compression point can be determined.

The same technique may also be used when it is necessary to determine the power output at other compression points (e.g., 0.1 dB, threshold compression point), but requires very careful measurement when the degree of compression is small.

Intercept Point

The concept of Intercept Point as an indicator of the spurious-free dynamic range of an amplifier was first introduced by an Avantek engineer in 1964. A copy of an article appearing in the February 1, 1967 issue of Electronic Design along with an

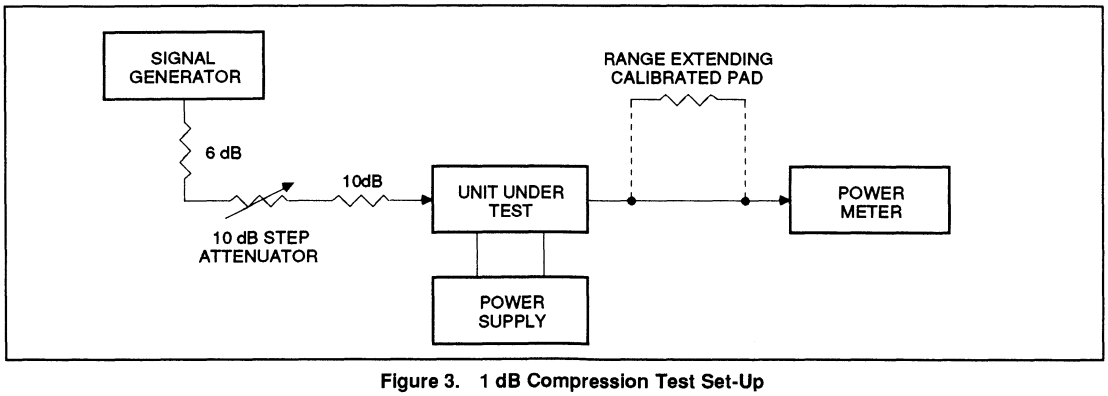


Figure 3. 1 dB Compression Test Set-Up

enlarged version of the Intercept Point nomograph is available from the Avantek factory or from local representatives.

If the fundamental input power (1) vs. output power response of an amplifier is plotted on a log-log scale, it will have 1:1 slope (see figure 4) in the linear operating region. A plot of the second-order intermodulation products (2) of most amplifiers, plotted on the same scale will have a slope of 2:1 and the third-order products (3) a slope of 3:1.

Since the third-order spurious products are the most troublesome, falling within the bandpass of even moderate bandwidth amplifiers, the intercept point is generally defined as the point where extensions of the first and third order responses intersect on the output power scale. Note that the second-order response plot will generally intersect near the same point as well, unless the amplifier design suppresses even order responses (for example, uses push-pull stages).

When the amplifier is operating in the linear amplification range (i.e., below the 1 dB gain compression point), the levels of the spurious responses can be estimated accurately with a simple calculation or by using the nomograph.

Referring to the typical amplifier response curve of figure 4, the output power at 1dB gain compression is +20 dBm and the intercept point is +30 dBm, a difference of 10 dB. Since the difference between the slope of the second order response curve and the fundamental curve is 1:1, the second order spurious products will be the same distance down from the fundamental as the fundamental is from the intercept point at any output power. Similarly, since the difference between the slope of the third order curve and the fundamental is 2:1, the third order products will be twice the distance down from the intercept point at any output power in the linear range.

If the amplifier in figure 4 is driven to an output power of 0 dBm (30 dB down from the intercept point), the second order spurious products will be at –30dBm, and the third order products at –60 dBm.

Notes:

1) The input signal consists of two components, f_1 and f_2 closely spaced in frequency, but not so closely spaced that difference frequencies are not well bypassed.

2) $f_1 \pm f_2$, $2f_1+2f_2$. The second order intercept point is normally only important for amplifiers with an octave or more of bandwidth, otherwise second order products will not fall within the amplifier passband.

The plot of amplifier responses is a set of straight lines on the log-log scale. The slope of the line depends on the order; the fundamental has a slope of 1, the second order has a slope of 2 and the third order has a slope of 3. The intersection of the fundamental and third order yields the intercept point.

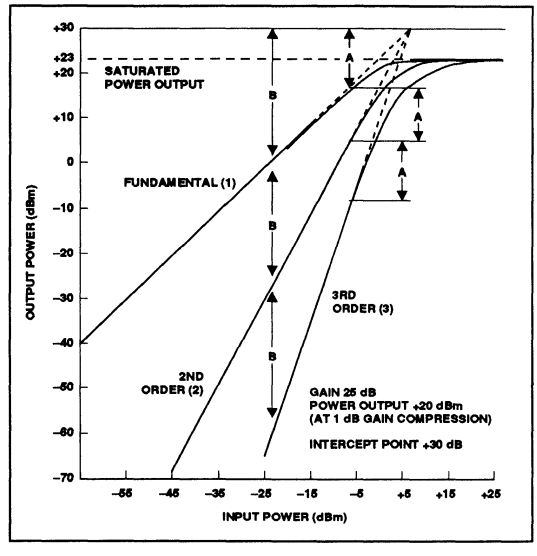


Figure 4. Intercept Point Responses for a Typical Amplifier

3) $3f_1$, $3f_2$, $2f_1 \pm f_2$, $2f_2 \pm f_1$. The third order intercept point is important, since third order difference products will fall within the passband of virtually any amplifier capable of amplifying both f_1 and f_2. Unless otherwise indicated, the intercept point given in any Avantek data sheet is for third order products.

Amplifier Dynamic Range

Once the intercept point of an amplifier is known, the spurious-free dynamic range can be calculated from the equation:

Spurious Free Dynamic Range (dB) =

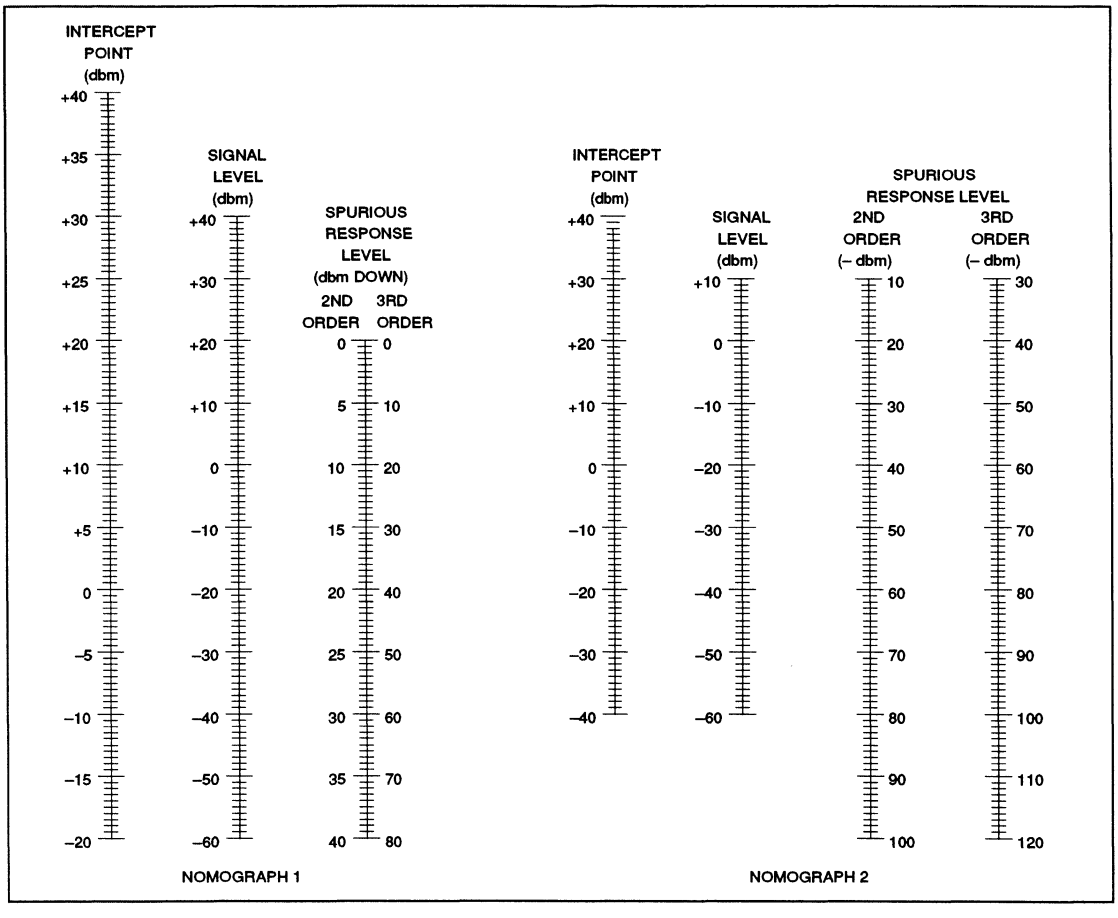
$$2/3\ (P_1 - P_0^{-10}\ \text{Log BW} - \text{NF})$$

Where: P_1 = Input intercept Point (obtained by subtracting the amplifier gain from the output intercept point given on data sheets).

P_0 = effective input noise power with no signal
= –114 dBm/MH

BW = System noise bandwidth in MHz (controlled by any filtering or other selectivity in the system, or by the amplifier bandwidth if no selectivity is provided).

NF = Amplifier Noise Figure in dB.



Avantek Dynamic Range Nomograph

Example 1

Given Intercept Point + 30 dBm
Output Signal Level –10 dBm

Find Third Order IM Level

Line up ruler on +30 on Intercept Point Scale and –10 dBm on Signal Level Scale. Read – 90 dBm on Nomograph 2 or 80 dB down on Nomograph 1. The spurious responses are at – 90 dBm, or 80 dB down from the signals at –10 dBm.

The Intercept Point is given for the output level. When input levels are being considered, the amplifier gain must be taken into consideration.

Example 2

Given Intercept Point +30 dBm
Input Signal –30 dBm
Amplifier Gain 30 dB

Find Third Order Spurious Level at the Output

At the output, the two signals will be at 0 dBm (–30 dBm +30 dB). Line up ruler on + 30 dBm on the Intercept Point Scale and 0 dBm on the Signal Level Scale. Read –60 dBm on Nomograph 2 or 60 dB down on Nomograph 1.

APPLICATION NOTES

Unequal Signals:

Unequal signals must be converted to equivalent equal signals by subtracting from the stronger signal one third of the difference between the two signals measured in dB.

Example 3

Given	Intercept Point + 30 dBm
	Output Signals at –3 dBm and at –18 dBm
Find	Third Order Spurious Response
Step 1	Find equivalent equal signal level

The difference between two signals at –3 dBm and –18 dBm is 15 dB. One third of 15 dB is 5 dB. Subtract 5 dB from –3 dBm. The resultant signal level, –8 dBm is the equivalent equal signal level.

Line up ruler with + 30 dBm on the Intercept Point Scale, –8 dBm on the Signal Level Scale and read 76 dB down on Nomograph 1, or –84 dBm on Nomograph 2.

Harmonic Distortion

Harmonic distortion results from non-linear amplifier gain and appears as output signals at integral multiples of the input signal frequency. Since harmonic distortion is a function of input power, it is usually specified in terms of the relative level of the harmonics with respect to the power of the fundamental signal.

The actual broadband characteristics of the amplifier (which may be wider than the required passband specified) may present significant gain at harmonic frequencies and thereby increase the harmonic output problem.

Second harmonic content is related to the device distortion and the frequency response of the circuit modules used to build the amplifier. The input and output networks are the major components in determining passband response. Second harmonics occurring within the passband of the amplifier will typically be –5 to –8 dBc at the amplifier's specified 1 dB gain compression point. Third harmonics are typically an additional 5 to 7 dB below this level. As the circuit's passband narrows, the resulting second and third harmonics attenuate rapidly. Typical second harmonics of narrowband amplifiers will be –12 to –15 dBc or better at the amplifier's specified 1 dB gain compression point.

AM-PM Conversion

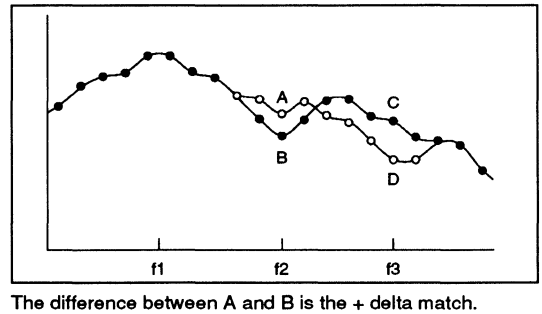
As the input signal level applied to a transistor amplifier is increased until some degree of gain compression is produced, further increases in signal amplitude will result in a slight shift of the amplifier phase delay. This phenomenon is known as AM-PM conversion and can be thought of as a result of the change of the transistor operating parameters from the small-signal to large-signal conditions. Many Avantek amplifiers include a guaranteed specification that AM-PM conversion will not exceed a certain value, on the order of a few tenths of a degree per dB increase in power output at a nominal power output level. If the input signal is further increased, the amount of AM-PM conversion will continue to increase reaching a maximum value when one of the amplifier stages is driven into full saturation. The maximum value will normally never exceed a few degrees/dB near amplifier saturation, and may generally be ignored.

Any limiters in a system are usually the major contributors to overall AM-PM conversion. Perhaps the worst case example is when a transistor amplifier is used in a receiving system in close proximity to a nearby transmitting system operating on a different frequency and the leakage power is sufficient to drive the limiters into their operating region. The result will usually be a noticable slope in the baseband frequency response which will take place only when the transmitter is operating.

Matching

A specification for matching (gain match, output power match, phase match, etc.) indicates how closely to identical the curve of the stated parameters vs. frequency of a given set of amplifiers will be over the specified passband. A specification for parameter matching between amplifiers implies that there is no means within the user's application to adjust the parameter vs. frequency curve (e.g. the system does not have the means to provide amplitude or phase offsets).

The figure below demonstrates a typical swept gain characteristic of a pair of amplifiers.

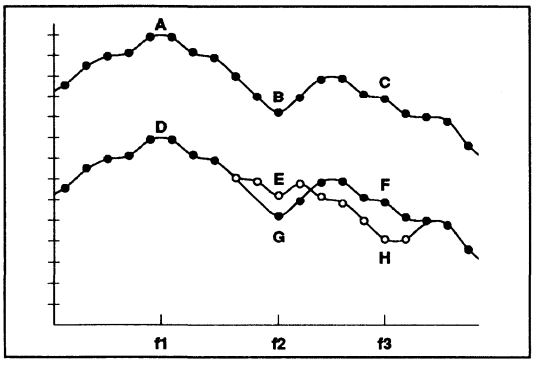


The difference between A and B is the + delta match.
The difference between C and D is the – delta match.
The difference between the maximum positive (A to B) and the maximum negative (C to D) difference between the two curves is the Matching Window and is expressed in either as ± dB or peak-to-peak dB.

Tracking

A specification for tracking (gain tracking, output power tracking, phase tracking, etc.) also indicates how closely to identical the stated parameters of a given set of amplifiers will be over the specified passband. However, a specification for parameter tracking implies that the average offset between the parameters of the amplifiers may be adjusted with the user's application (e.g. the system has the means to provide amplitude or phase offsets).

The following figure demonstrates a typical swept gain characteristic of a pair of amplifiers.



The Average difference between A and D is the TRACKING OFFSET.

The Absolute difference between E and G is the + delta track.

The Absolute difference between F and H is the – delta track.

The Absolute difference between maximum positive (E to G) and the maximum negative (F to H) is the Tracking Window and is expressed in ± dB.

Output Limiting

Specifying and Selecting Limiting Amplifiers

The function of a limiting amplifier is to accept input signals of widely varying power levels (wide input dynamic range) and provide an output in which the signal levels are highly compressed (limited output dynamic range). Such amplifiers are widely used in EW and radar system receiver front-end and IF applications to provide an optimum signal level to subsequent signal processing and detection circuitry. To perform properly in EW and radar systems, limiting amplifiers must combine extremely fast pulse response with the necessary input and output dynamic range characteristics.

Output dynamic range of a limiting amplifier depends on a combination of the limiting characteristics of the selected active devices and the specific design selected for the circuits. Typically, Avantek limiting amplifiers, using proven design and device technology, provide an output power window of less than 6 dB with output levels as low as +3 dBm to as high as +20 dBm.

The input characteristics of a limiting amplifier are usually specified by stating the minimum and maximum input signal power levels that will result in properly-limited output signals. Avantek limiting amplifiers can be specified to limit input signals ranging from ambient noise up to approximately +10 dBm.

Rise time characteristics of a limiting amplifier are determined by the ability of the amplification circuitry to make the transition from small signal to large signal conditions. Unlike ordinary linear amplifiers, Avantek limiting amplifiers are optimized to offer fast pulse response, even when the input signal drives the amplifier into hard compression. 90% rise times of 25 ns with a +10 dBm input pulse are typical.

Because of the inherent non-linearity of limiting amplifiers, they can generate in-band spurious products that may cause erroneous indications in the EW or radar system. Unless the system itself is capable of filtering out or recognizing thesespurious products, the limiting amplifier must also be specified in terms of minimum harmonic suppression (typically in dB below carrier).

Finally, it should be noted that in limiting amplifiers combining very high gain with a limited output dynamic range, normal noise figure measurements become unreliable and practically meaningless. When the calculated noise power of the amplifier is less than 20 dB below the saturated output power, the amplifier should be specified in terms of output noise power rather than noise figure.

Recovery Time

When the driving level of an amplifier exceeds the input limit for linear operation, the amplifier saturates. When the overload has been removed, Avantek's small signal gain amplifiers take some amount of time (measured in nanoseconds) to recover to within 1 dB (typically) of the pre-saturated condition (small signal gain). Recovery times can range from picoseconds to as long as 30 nanoseconds.

With the FET design and construction of Avantek limiting amplifiers *(the FET devices are majority carriers devices)*, the recovery time for GaAs FET small signal gain and GaAs limiting amplifiers is normally in the range of

picoseconds and in the range of the measurement error of the best test equipment.

Phase Linearity, Group Delay and Distortion

In an ideal transmission medium of "infinite" bandwidth such as free space or (in most cases) a well-terminated coaxial transmission line, the phase of a signal passing through the transmission path is directly related to the signal frequency and the propagation velocity. A plot of frequency vs. phase would result in a straight line with a slope dependent on the propagation velocity and effective electrical length of the path. In this ideal case, the phase delay term defined by equation 1 on the following page would remain constant regardless of the signal frequency.

When a single-frequency signal is applied to a filter, amplifier or other device with limited bandwidth, the phase delay becomes frequency-sensitive. The plot of phase vs. frequency is no longer a straight line and the phase delay (t_f) would vary as the frequency is changed. (See figure 5).

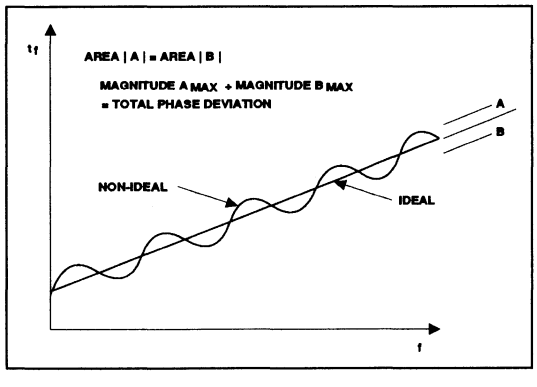


Figure 5. Phase Shift vs. Frequency

Phase linearity can be expressed as the maximum deviation from the ideal straight line phase vs. frequency plot which would be produced by an ideal transmission line of similar electrical length, or simply by reference to a tabular listing of phase deviation at a number of discrete frequencies.

In most cases, the value of knowing the phase deviation for the single-frequency signal passing through a device is limited, since amplifiers are generally called upon to process signals consisting of many frequency components such as modulated or keyed carriers. In a simple case, this signal consists of two original frequency components and the resulting modulation envelope (or beat). Each of the two original frequencies applied to an amplifier may propagate at a different velocity and the modulation envelope at a third velocity. The latter is known as the group velocity. The more linear the phase shift of the amplifier, the less difference will exist between the velocities of the two original frequencies.

Group delay is an expression of the rate of change of the phase shift of the modulation envelope vs. changes in carrier frequency and is expressed in units of time through equation 2.

The group delay of an amplifier may be measured in several different ways. The frequency of a single-frequency signal may vary in increments and the corresponding change in the phase of the output signal measured (equation 3), or the phase shift of the modulation envelope may be measured as the carrier is swept through that frequency range of interest (equation 4).

The actual phase shift affecting all frequency components of the signals passing through an amplifier (or system) is relatively unimportant (except when several signal paths must be combined in or out of phase), but phase distortion affecting different frequency components differently (as represented by dispersion) is vitally important. Phase distortion can result in intersymbol interference due to broadening of pulses in digitial transmission or co-channel interference in systems carrying a number of FM or television channels.

For many Avantek amplifiers, the group delay characteristics are specified by the terms of the quadratic equation $td=Lx+Px^2\pm R$ which describes a frequency vs. group delay curve similar to figure 6. In this equation L = the slope of the linear component of the curve (ns/MHz), P= the shape factor of the parabolic component of the curve (ns/MHz^2) and R is the residual (ripple) component of the curve after the linear and parabolic components have been removed (ns P-P).

It should be noted that usually the overall group delay characteristics of a system in which a transistor amplifier is used will be primarily determined by the characteristics of other components in the signal path. For example, when an Avantek amplifier is used as the preamplifier in a satellite downlink receiving system the bandpass filter, mixer and IF amplifier characteristics of the receiver will largely determine the group delay of the system.

The phase response of Avantek amplifiers can be measured by the factory and the results supplied to customers at extra cost. In addition, phase matching or tracking are available for critical applications.

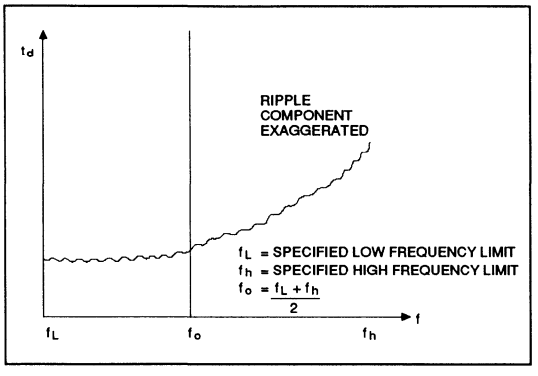


Figure 6. Combined Linear Parabolic and Ripple Components of Group Delay

EQUATION 1 — PHASE DELAY VS. FREQUENCY

$$t_f = \frac{\varphi}{\omega}$$

EQUATION 2 — GROUP DELAY VS. FREQUENCY

$$t_d = \frac{d\varphi}{d\omega}$$

EQUATION 3

$$t_d = \frac{\Delta\varphi}{\Delta\omega}$$

EQUATION 4

$$t_d = \frac{\varphi e}{360° fm}$$

t_f = phase delay (in seconds)
φ = carrier phase shift (in radians)
ω = carrier frequency (radians/second)
t_d = group delay (in seconds)
φe = modulation envelope phase shift (in degrees)
fm = modulation frequency (Hz)

Amplifier Types

Single-Ended vs. Balanced Amplification — Why Avantek Uses Both

Avantek engineers incorporate both single-ended and balanced amplification stages in their amplifier designs. In some products, both techniques are combined in the same amplifier, generally with a single-ended input and intermediate stages followed by a balanced output stage. Each design offers certain specific performance features as the following comparison will show.

In each Avantek amplifier family the choice of GaAs or silicon bipolar transistor or MMIC technology and the use of single-ended or balanced stages (or a combination of both), is based on providing the right performance specifications for the specific application while maintaining an optimum ratio of performance to cost.

Single-Ended Amplification

In a single-ended input stage, a single transistor provides the amplification. Since there is no input coupler to add loss, the noise figure of a single-ended stage may be lower than that of a balanced stage. Minimum-loss interstage coupling also means that a single-ended amplifier stage will generally produce a somewhat higher gain than the equivalent balanced stage.

Single-ended gain blocks using lossy feedback can also be used to provide gain with lower DC power consumption and reduced size.

Balanced Amplification

In a balanced microwave transistor stage, two identical amplification channels are used with quadrature (90°) couplers to equally divide the input signal and combine the output of the channels. The major advantage of the balanced amplifier stage is that, using the same transistors, a balanced stage can produce approximately twice the output power of a similar single-ended stage. In addition, the third-order intercept point is about 3 dB higher. Thus, with available microwave transistors, balanced amplification can provide significantly higher power output levels.

The quadrature couplers also have the inherent ability to cancel reflected energy at both their input and output ports and

tend to improve the VSWR of each stage in which they are used. This improved VSWR is obtained without the need for trading off gain or noise figure in stage tuning. The degree of VSWR improvement depends on how well the two amplifier channels are matched and on the degree of balance of the coupler.

PGM SERIES: GAIN MODULES IN THE μAVPAK PACKAGE

Description of Product

Amplifier

The PGM series of packaged amplifier gain modules covers 2-20 GHz in 17 models, providing eight different frequency bands with gain options that answer a wide variety of needs for the subassembly/subsystem designer.

All models in the series are housed in the μAVPAK package format. All circuit modules are of thin-film, hybrid MIC construction, with gold metallization on alumina substrates. Avantek GaAs FETs are used throughout. All internal interconnections are gold wire or ribbon using ball and wedge thermocompression bonding. The circuit module is attached to the case with a gold-tin eutectic.

These high quality circuits are identical to those used in the AMT/AWT/AFT series of amplifiers and are manufactured to the same quality and inspection standards.[1]

μAVPAK Package

μAVPAK is a small, rugged hermetically sealed package which allows microstrip interfacing of circuit functions. It is ideally suited for incorporating small blocks of gain into microstrip subassemblies where other functions are realized in microstrip form.

The package is fabricated from a copper-tungsten material, and is gold plated for good grounding and bonding. The lid seal is welded and, together with the alumina microstrip feedthru windows, provides an inert environment within the package.

Gold plated bonding pads on the microstrip feedthrus allow either hand wedge or gap weld interconnections to the user's microstrip circuit.

Product Applications

The μAVPAK package has a wide variety of applications, from breadboarding of assemblies at development stage to sustained high quantity production runs where product quality and consistency are of key importance.

The PGM series is a very cost-effective means of including high performance amplifier building blocks in such applications as RF preamplifiers, LO buffers/boosters, IF amplifiers and output amplifiers for instruments and sources.

PGM series amplifiers are particularly suited to system upgrades and modifications where line losses are excessive, or signal levels need to be raised, and where limited space is available.

The PGM series modules may also be used to provide the gain blocks required in many integrated subassemblies.

μAVPAK packaged amplifiers have significant size, weight, and cost advantages over conventionally packaged amplifiers with either coaxial connectors or pins for interconnect. The microstrip interface eliminates many of the difficulties experienced with the integration of packages using coaxial feedthrough, such as the critical fit and effects of proximity of ground planes.

Because the PGM series is constructed, tested and inspected to the same high standards as the Avantek AMT/AWT/AFT amplifiers, these packaged gain modules may be used with confidence in all commercial, industrial and defense systems applications.

Note 1: Avantek Workmanship Stds: 014355-800

Handling and Unpacking

Storage

Each μAVPAK amplifier is packaged for transportation in an individual ESD-proof plastic case and should be stored in the case until installed. See figure 7 below.

ESD Precautions

It is advisable to take normal ESD precautions such as wearing a grounded wrist strap for unpacking and subsequent handling operations.

Electrostatic discharge (ESD) can generate sufficient voltage to exceed breakdown limits and damage microwave devices. GaAs FETs are particularly susceptible to this kind of damage. Anything coming into contact with a static sensitive device should be at ground potential. This includes operators as well as equipment. Static sensitive devices should only be handled by operators wearing static wrist bands working at static free work stations. For more information on ESD protection, see Avantek application note AN-A004R *Electrostatic Discharge Damage and Control.*

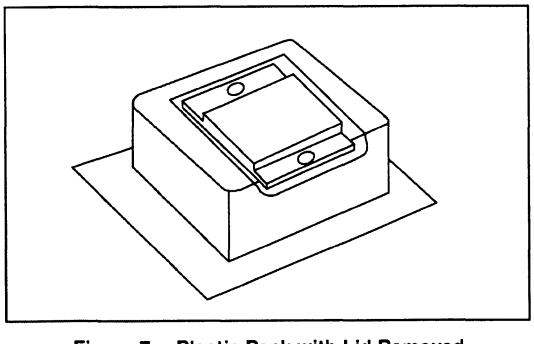


Figure 7. Plastic Pack with Lid Removed

Unpacking

The lid of the plastic case should be removed carefully to leave the module nested in the base of the plastic box. The module should be removed from the base using tweezers, avoiding contact with the alumina feedthru area to prevent any undue stress on the ceramic. It is advisable to wear fingercots or nylon gloves while handling to prevent soiling of the bonding surface with skin oils. Such soiling might lead to difficulties in subsequent bonding operations.

Mounting

The μAVPAK package has a gold-plated copper-tungsten carrier base. It can be either bolted down via carrier thru holes or soldered onto an assembly. For **bolt down** applications, two #0 pan head screws are recommended. Tighten each screw alternately to pull down evenly, and finally tighten with a torque of approximately 16 inch oz.

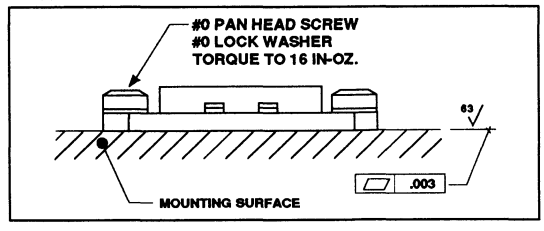


Figure 8. μAVPAK Mounted with Screws

For **solder applications,** a silver-bearing solder with a melting point of less than 250°C is recommended. A 60% Sn, 36% Pb, 4% Ag alloy (246°C liquidus), e.g. *Kester 604AG*, is appropriate. Maximum case temperature should not exceed 250°C during assembly (see cautions below). Ensure that the soldering iron is properly grounded.

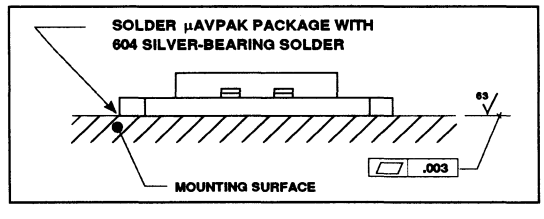


Figure 9. μAVPAK Mounted on Surface with Solder

Cautions to be Observed if Soldering

Thermal damage of various kinds can result if any of several critical temperatures are exceeded during the soldering process. These temperatures are used in the manufacture of the PGM:

GaAs FET die attach to substrate: 300°C **for 1 minute**
Substrate attach to case baseplate: 400°C

As case temperatures approach 300°C, the FET die can "float" and seriously degrade the bond to the substrate. Additionally, prolonged exposure (greater than 10 minutes) to these high temperatures can result in reduced reliability of the part. This degradation has both time and temperature factors. For these reasons, we recommend a maximum case temperature of 250°C during solder mounting.

APPLICATION NOTES

RF Interconnection

Recommended RF transitioning marked IN or OUT on unit)

- Operation to 20 GHz :
  Parallel gap weld .002" thick by .015" wide gold ribbon from the μAVPAK package window to the transmission line. For best performance, ensure that both bonding surfaces are of equal height. Appropriate stress relief is required.
- Operation to 8 GHz : (optional)
  Thermocompression bond three .001" diameter gold wires from the μAVPAK package window to the transmission line. Baseplate temperature for bonding should be +150° ±10°C. Appropriate stress relief is required.

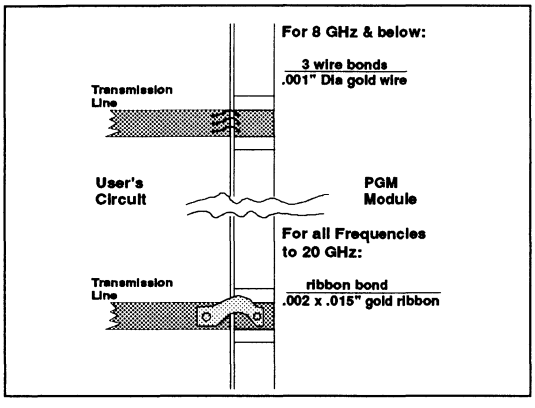


Figure 10. RF Interconnection

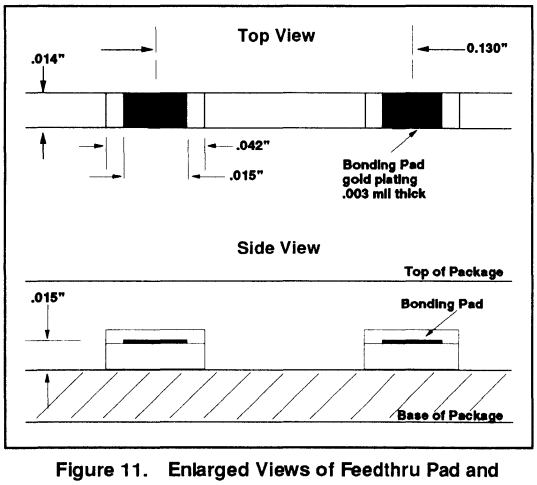


Figure 11. Enlarged Views of Feedthru Pad and Window Area

DC Interconnection

Recommended DC transitions (marked +V on unit): NOTE: **Both** DC terminals on the module must be connected to a positive 8V DC supply, regulated to ±0.3V.

- Thermocompression bond two .001" diameter gold wires from the μAVPAK package window to the DC supply lines (2 places).

Optional transitions (DC and/or RF):

- Spring contacts:
  Care must be taken not to exceed 750 grams pressure on the μAVPAK package window.
- Epoxy contact:
  Epoxy runout along transmission line on the μAVPAK package window will degrade performance.
- Solder contact:
  Not recommended.

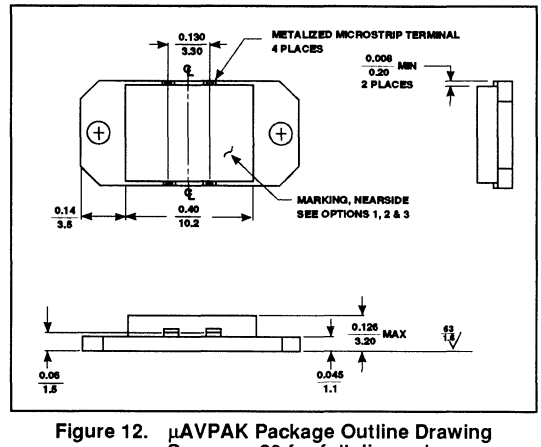


Figure 12. μAVPAK Package Outline Drawing
See page 39 for full dimensions.

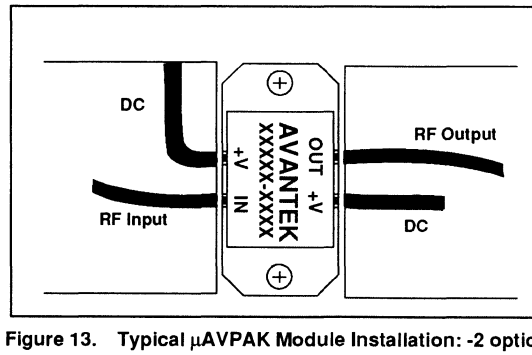


Figure 13. Typical μAVPAK Module Installation: -2 option

Selecting the Correct Module

Frequency:

Generally, frequency is the first performance parameter to be selected. In most cases, it is advisable to select the module that has the narrowest band coverage which includes your desired operating frequency range. For example, if your application requires operation from 8.5 to 10.0 GHz, a module covering 7.0 to 12.4 GHz would generally be a better choice than one covering 6-18 GHz. The 7-12.4 GHz module offers higher gain per module, and if required, lower noise figure and higher power output. Other considerations, such as the desirability of using a broadband module (e.g. 2-18 GHz) as a common part in a number of different frequency applications, and the effect of out-of-band performance might influence your selection of a narrowband module.

Noise Figure and Power Output:

Select the module that has the noise figure required, while recognizing that low noise modules generally have lower power output capability, which may not meet your dynamic range requirements. Sometimes, you may have to trade off a small noise figure increase to increase the output power to the desired level. For example, we offer a 'premium' 6-18 GHz module with 3.6 dB noise figure, with +6 dBm 1 dB compression power output, and a 4.5 dB noise figure module with +11 dBm 1 dB compression output. You will have to determine from your system requirements whether trading the 0.9 dB of noise figure for 5 dB of power output is appropriate.

Gain Level:

In some cases, you may have a requirement for a specific gain level that influences a module selection. For example, if a low gain (5-6 dB) is required for an LO buffer amp at 15 GHz, a 2-18 GHz, 5 dB gain module would be a better choice than a 6-18 GHz module with 9-10 dB of gain.

Package Options:

For all frequency bands except 2-18 GHz (PGM-18241-3 and 18242-3), the RF input and output are on a diagonal pattern, as shown below. Where a "straight through" configuration is required, such as cascading two modules or placing modules on either side of another RF component, both -1 and -2 package options are required. The -2 option is regarded as the standard package configuration, and the -1 version as its complement. The 2-18 GHz modules are supplied in a 'straight through' package version, denoted as the -3.

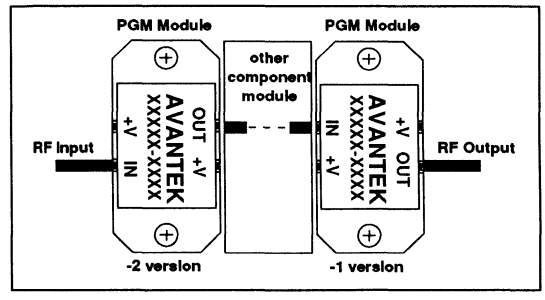


Figure 14. Typical Layout with -1, -2 Package Options

TESTING THE MODULE

All PGM modules are factory-tested for the 25°C guaranteed parameters.

Should you find it necessary to test the modules, for such purposes as selection of optimum performance, the testing can be performed as you would test any other microwave component, provided you have an appropriate test fixture.

Grounding of the module under test should be accomplished by bolting to an appropriate ground plane. (See the earlier section, Mounting)

A test fixture designed specifically for the μAVPAK microstrip package is available from a supplier. Please contact your local distributor, or the factory for details of this test fixture.

During testing and any subsequent operation of the module the following **maximum** RF and DC supply input levels must be observed.

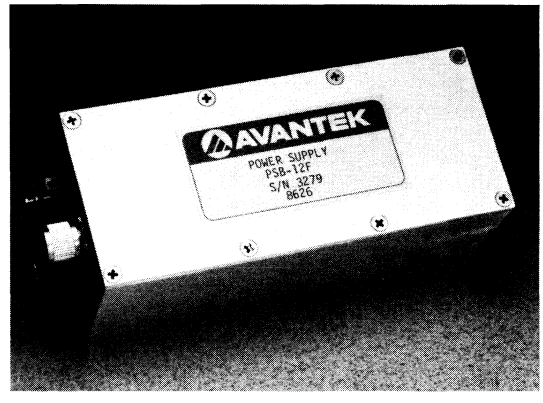
RF INPUT: +20 dBm CW
+30 dBm Pulsed, 1μs PW, 1% duty cycle

DC SUPPLY: +9.0 V Max

NOTE:

- **This provides a listing of all standard-product AC power supplies presently available from Avantek.**
- **Previously available custom power supplies are available on special order.**
- **Custom power supply/amplifier assemblies must be special ordered.**

PSA/PSB/PSC/PS-46 Series Power Supplies



Description

Avantek PSA/PSB/PSC Series power supplies will operate virtually any currently-manufactured Avantek solid-state amplifier directly from 115 or 230 VAC, 50 to 450 Hz AC line power. These power supplies are packaged in aluminum cases with threaded mounting holes (6-32 x 0.30 in. deep) for installation by the user on a baseplate or directly on equipment metalwork near the associated amplifier. Two wires are then used to connect the power supply to the amplifier.

Each power supply in this series will provide many different Avantek amplifiers with properly filtered and regulated DC at ample current to assure that the amplifiers operate with all their DC-powered performance potential.

These power supplies are linear (non-switching) for RFI-free operation. They feature integrated circuit voltage regulators, fully encapsulated circuitry and RFI-filtered DC connections. All PSA/PSB/PSC power supplies are shipped with a 6' AC power cord* with mating connectors. A fuse holder as shown in the outline drawings, pilot lights, and baseplates drilled for the power supply and Avantek amplifier are also optionally available.

All power supplies are purchased with amplifiers and can be qualified to MIL-E-5400 and MIL-E-16400 environmental specifications when required at additional cost.

* Other lengths are available.

Power supplies with unsuffixed type numbers are for operation from 115 VAC (±10%) and units with "A" suffix are for operation from 230 VAC (±10%), 50 to 450 Hz.

Power supplies with the fuse option are designated by an "F" (i.e. PSA-12AF).

PSA/PSB/PSC/PS-46 Series Applications

Power Supply	Application	Weight (appr)
PSA-12/12A	Any amplifier requiring +12 VDC, up to 250 mA	16 oz. (454g.)
PSA-15/15A	Any amplifier requiring +15 VDC, up to 250 mA	16 oz. (454g.)
PSB-12/12A	Any amplifier requiring +12 VDC, up to 500 mA	32 oz. (907 g.)
PSB-15/15A	Any amplifier requiring +15 VDC, up to 450 mA	32 oz. (907 g.)
PSC-12/12A	Any amplifier requiring +12 VDC, up to 1000 mA	32 oz. (907 g.)
PSC-15/15A	Any amplifier requiring +15 VDC, up to 900 mA	48 oz. (1.36 kg.)
PS-46/46A	AMT/AWT requiring +15 VDC, up to 500 mA	32 oz. (907 g.)

Contact Avantek Amplifier Applications Engineering for information on AC power supplies for amplifiers which operate from +24 or +28 VDC, require negative polarity or consume more current than the PSC power supply will provide.

PS-46/46A Power Supply Description

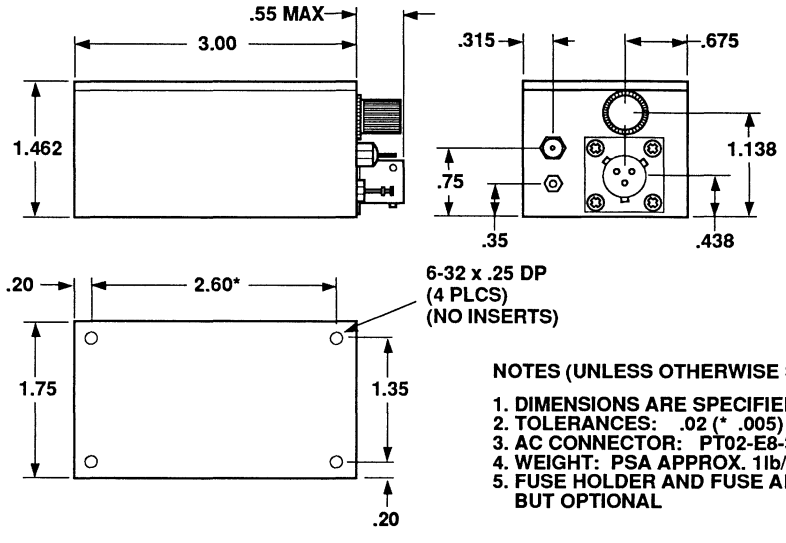
The PS-46/46A power supply is primarily used for military/airborne EW systems. It is available factory-mated, without external DC wiring, to any AMT/AWT Series thin-film hybrid amplifier requiring no more than 500mA of supply current. This integrated power supply/amplifier assembly provides an AC-powered amplifier that is ideal for replacing low noise TWTs in existing systems or for simplifying the power distribution requirements in AC-powered EW equipment.

The complete amplifier/power supply assembly is mechanically strong and as compact as possible within the limits of good engineering practice. The complete assembly may be qualified to the same military specifications as the AMT/AWT Series amplifier alone. A PS-46/46A assembly is shipped complete with a 6' * power cord with mating connectors.

The PS-46 is for use with 115 V (±10%) AC supplies. The PS-46A is for use with 230 V (±10%) AC supplies. In both cases, line frequency can be 50 to 450 Hz.

* Other lengths are available.

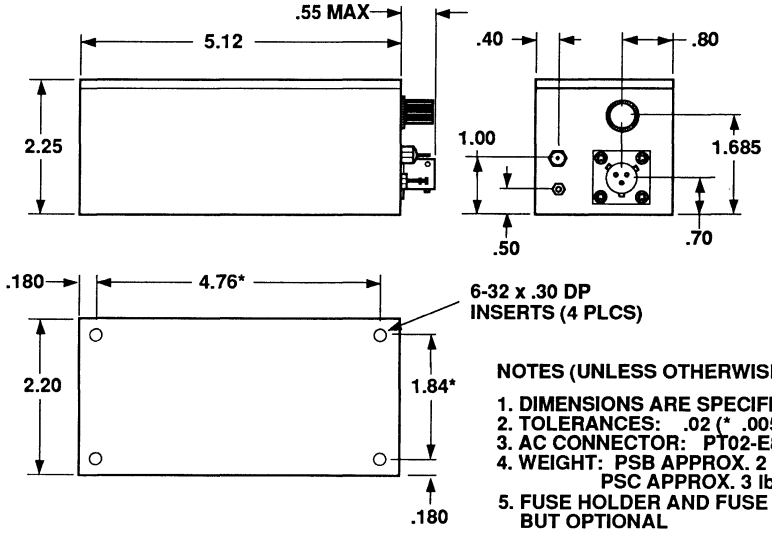
PSA



NOTES (UNLESS OTHERWISE SPECIFIED):

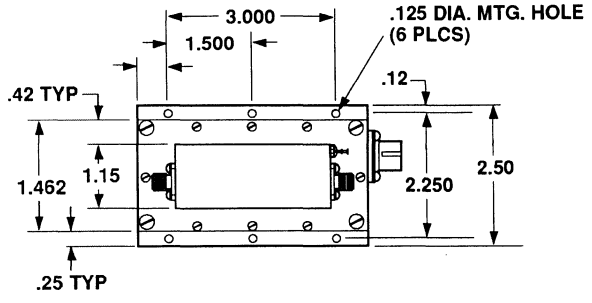
1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .02 (* .005)
3. AC CONNECTOR: PT02-E8-3P
4. WEIGHT: PSA APPROX. 1lb/454 g
5. FUSE HOLDER AND FUSE ARE SHOWN BUT OPTIONAL

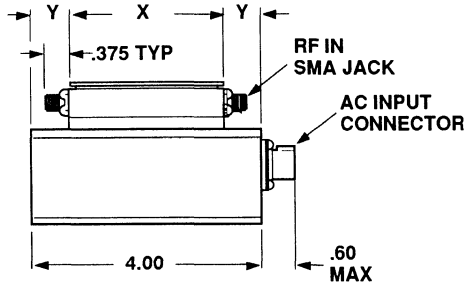
PSB/PSC

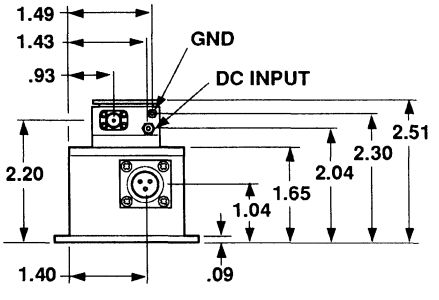


NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .02 (* .005)
3. AC CONNECTOR: PT02-E8-3P
4. WEIGHT: PSB APPROX. 2 lb/907 g
   PSC APPROX. 3 lb/1360 g
5. FUSE HOLDER AND FUSE ARE SHOWN BUT OPTIONAL







CASE	DIMENSION		
	X	Y	Z
IC2	1.417	1.29	0.89
IC4	2.083	0.96	0.89
IC6	2.750	0.62	0.89
IC8.	3.417	0.29	0.89

CASE	DIMENSION		
	X	Y	Z
IS2	1.417	1.29	0.80
IS4	2.083	0.96	0.80
IS6	2.750	0.62	0.80
IS8	3.417	0.29	0.80

CASE	DIMENSION		
	X	Y	Z
IX4	1.750	1.12	0.93
IX6	2.250	0.87	0.93
IX8	2.750	0.62	0.93
IX12	3.750	0.12	0.93

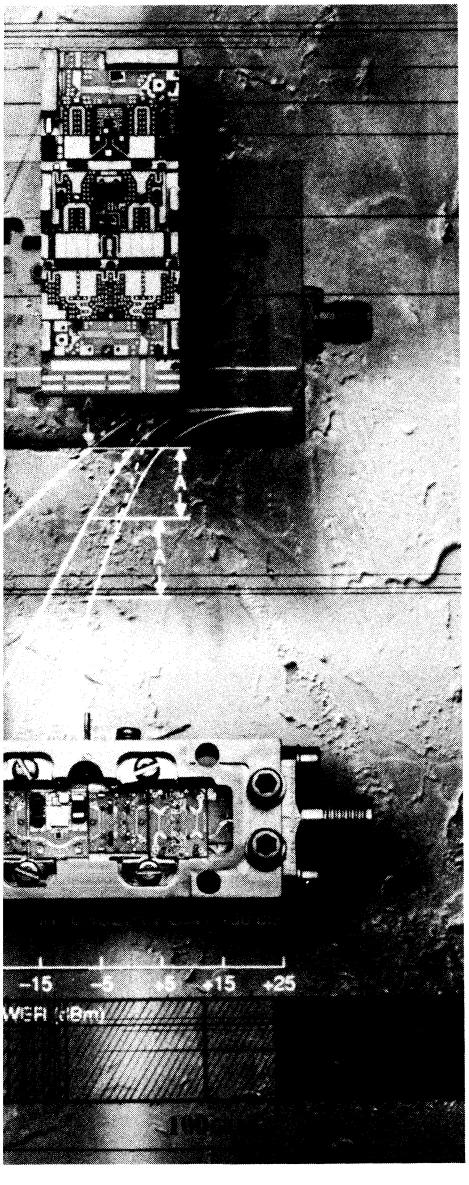
AC CONNECTOR				
CONNECTOR OPTION	PART NUMBER	PIN CONN. AC		DC
COMMERCIAL	DM9606-3	1	3	2
MIL-STD	MS-3112-E8-3P	A	C	B

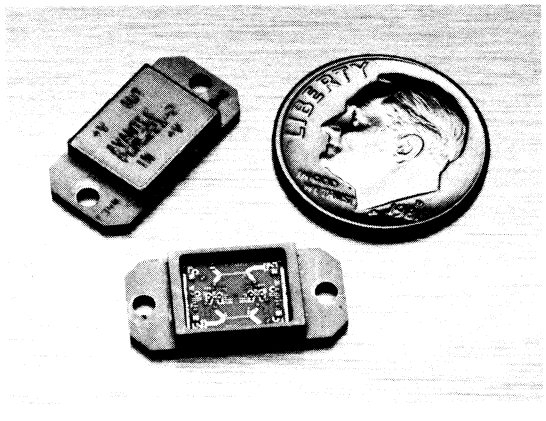
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES

SATURAT
OUTPUT POWER
10 MHz
100 MHz
1 GHz

1. Gain Modules: PGM Series μAVPAK

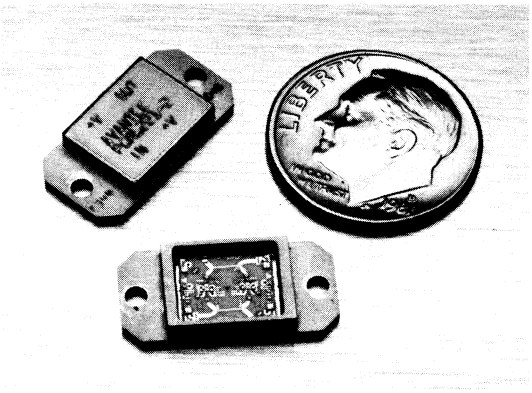




Features

- **Microstrip compatible**
- **Hermetic Case**
- **Small, versatile gain blocks**
- **Premium performance over 2-20 GHz**
- **Easy integration**
- **Low cost**

PGM Series: μAVPAK Package



Description

The μAVPAK package is a small, hermetically sealed package which allows microstrip interfacing of circuit functions. It is ideally suited for incorporating small blocks of gain into microstrip subassemblies where other components are realized in microstrip form. Hermetic microstrip feedthru windows provide an inert environment within the package and allow either hand wedge or gap weld microstrip connections to the outside.

Frequency coverage from 2-20 GHz is provided in greater than octave bandwidths from C to Ku Band with two versions available covering the entire 2-18 GHz band. Avantek will supply PGM series amplifiers in small quantities for breadboard/prototype systems and, with our strong manufacturing capabilities, can provide large production quantities with reliability and repeatability of performance unparalleled in the industry. This approach to integration with small blocks of gain into microstrip subassemblies gives a compact, low cost unit.

The ruggedness of the package is demonstrated by its ability to sustain environments to our R-series screening levels. These include:

• Stabilization Bake	Method 1008
• Temperature Cycle	Method 1010
• Constant Acceleration	Method 2001
• Hermetic Seal (Fine)	Method 1014 (Avantek process spec)
• Hermetic Seal (Gross)	Method 1014 (Avantek process spec)
• Burn-In	Method 1015

The reference document for the above methods is MIL-STD 883.

Application Notes

The μAVPAK package has a gold-plated copper-tungsten carrier base. It can be either bolted down via carrier thru holes or soldered onto an assembly. For bolt-down applications, a #0 pan head screw is recommended, while for solder applications a silver-bearing solder is recommended. Maximum case temperature should not exceed 250° C during assembly. The mounting surface should be flat to within .003" and with a $\sqrt{63}$ finish or better.

For DC connections to the +V terminals, use two .001" diameter gold wires and thermal compression bond to the microstrip windows (marked +V). Connect in two places. Specified operating voltage is 8.0 ± .3 volts. For RF connections, it is recommended to parallel gap weld .002" thick by .015" wide gold ribbons from the assembly transmission lines up to the microstrip windows (marked IN and OUT). For optimum performance both bonding surfaces should be of equal height. For operation at lower frequencies (up to 8 GHz) an alternate connection could be to thermal compression bond three .001" diameter gold wires to each RF transition. For all connections appropriate stress relief is required.

Other methods of transitioning to the package could include spring contacts to the microstrip feedthrus. Care must be taken not to exceed 750 grams pressure on the feedthrus. Epoxy contact can be used but runout along transmission line on the microstrip feedthrus will degrade performance. Solder contacts are not recommended.

For additional detail, refer to the Application Note section that appears earlier in this Data Book.

2.0 to 20.0 GHz FREQUENCY RANGE

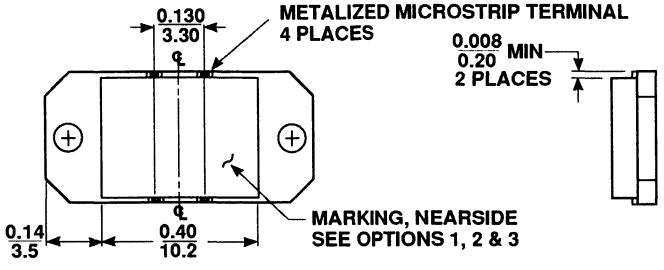
GAIN MODULE SERIES μAVPAK PACKAGE

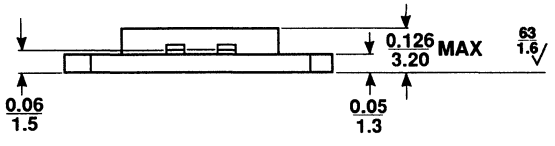
PGM Series

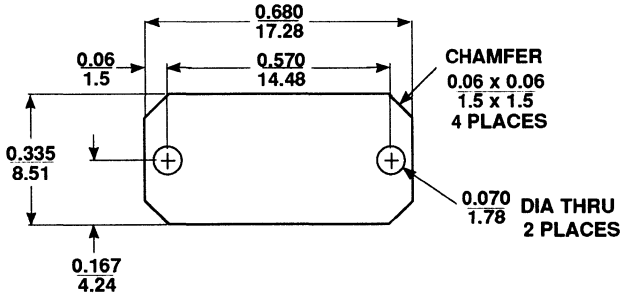
Guaranteed Specifications @ 25°C and -54°C to +100°C Case Temperature

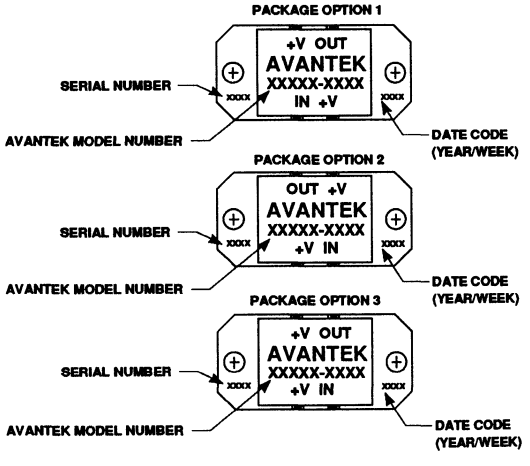
Model	Frequency Response (GHz) Minimum	Temp. Range °C	Gain (dB) Min.	Gain (dB) Max.	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage[1] (VDC)	Input Power Current (mA) Max.
PGM-6221-X[2]	2-6	25	10.0	13.0	2.5/2.7	+10	±0.5	+18	2.0	2.0	+8	50
		-54 to +100	8.8	14.2	3.4/3.6	+8	±0.8	+17	2.0	2.0	+8	50
PGM-8231-X[2]	2-8	25	9.5	12.5	4.0/4.5	+16	±0.5	+28	2.0	2.0	+8	80
		-54 to +100	8.3	13.7	4.9/5.4	+15	±0.8	+24	2.0	2.0	+8	80
PGM-11421-X[2]	4-11	25	8.0	11.0	2.3/2.5	+5	±0.8	+13	2.0	2.0	+8	60
		-54 to +100	6.9	12.2	3.3/3.5	+4	±1.1	+12	2.0	2.0	+8	60
PGM-11461-X[2]	4-11	25	8.0	11.0	3.6/4.0	+18	±0.5	+26	2.0	2.0	+8	70
		-54 to +100	6.9	12.2	4.6/5.0	+17	±0.8	+25	2.0	2.0	+8	70
PGM-12721-X[2]	7-12.4	25	9.5	12.5	2.0/2.5	+5	±0.5	+13	2.0	2.0	+8	70
		-54 to +100	8.4	13.7	3.0/3.5	+4	±0.8	+12	2.0	2.0	+8	70
PGM-12741-X[2]	7-12.4	25	8.0	11.0	4.8/5.5	+12	±0.4	+20	2.0	2.0	+8	60
		-54 to +100	6.9	12.2	5.8/6.5	+11	±0.7	+19	2.0	2.0	+8	60
PGM-12761-X[2]	7-12.4	25	8.0	11.0	5.3/6.0	+17	±0.4	+25	2.0	2.0	+8	70
		-54 to +100	6.9	12.2	6.3/7.0	+16	±0.7	+24	2.0	2.0	+8	70
PGM-12781-X[2]	7-12.4	25	6.0	9.0	6.5/7.5	+23	±0.5	+30	2.0	2.0	+8	180
		-54 to +100	4.9	10.2	7.5/8.5	+22	±0.8	+29	2.0	2.0	+8	180
PGM-13561-X[2]	5-13	25	8.5	11.5	3.5/4.0	+17	±0.5	+25	2.0	2.0	+8	65
		-54 to +100	7.3	12.7	4.5/5.0	+16	±0.8	+24	2.0	2.0	+8	65
PGM-18232-3	2-18	25	12.0	16.5	6.7/7.0	+10	±2.0	+18	2.0	2.0	+8	175
		-54 to +100	10.5	18.0	7.7/8.0	+9	±2.5	+17	2.0	2.0	+8	175
PGM-18241-3	2-18	25	5.0	7.5	7.8/8.5	+11	±0.9	+19	2.0	2.0	+8	100
		-54 to +100	3.8	9.0	10.0/11.0	+10	±1.2	+18	2.0	2.0	+8	100
PGM-18621-X[2]	6-18	25	7.5	10.5	3.4/3.6	+6	±0.8	+14	2.0	2.0	+8	60
		-54 to +100	6.3	11.7	4.4/4.6	+5	±1.1	+13	2.0	2.0	+8	60
PGM-18631-X[2]	6-18	25	9.0	12.0	3.8/4.5	+11	±0.6	+19	2.0	2.0	+8	70
		-54 to +100	7.8	13.2	4.9/5.6	+10	±0.9	+18	2.0	2.0	+8	70
PGM-18641-X[2]	6-18	25	6.5	9.5	6.5/7.0	+17	±0.5	+25	2.0	2.0	+8	60
		-54 to +100	5.3	10.7	7.5/8.0	+16	±0.8	+24	2.0	2.0	+8	60
PGM-18661-X[2]	6-18	25	5.5	8.5	6.8/8.0	+19	±0.5	+27	2.0	2.0	+8	70
		-54 to +100	4.3	9.7	7.8/9.0	+18	±0.8	+26	2.0	2.0	+8	70
PGM-18671-X[2]	6-18	25	4.5	7.5	7.5/8.5	+21	±0.7	+29	2.0	2.0	+8	180
		-54 to +100	3.3	8.7	8.5/9.5	+20	±1.0	+28	2.0	2.0	+8	180
PGM-20061-X[2]	12-20	25	5.0	8.0	4.8/5.2	+17	±0.5	+26	2.0	2.0	+8	70
		-54 to +100	3.8	9.2	5.8/6.2	+16	±0.8	+25	2.0	2.0	+8	70

(1) Voltage is 8.0 ± .3 Volts.
(2) X designates package option 1 or 2. Please specify option at time of order.



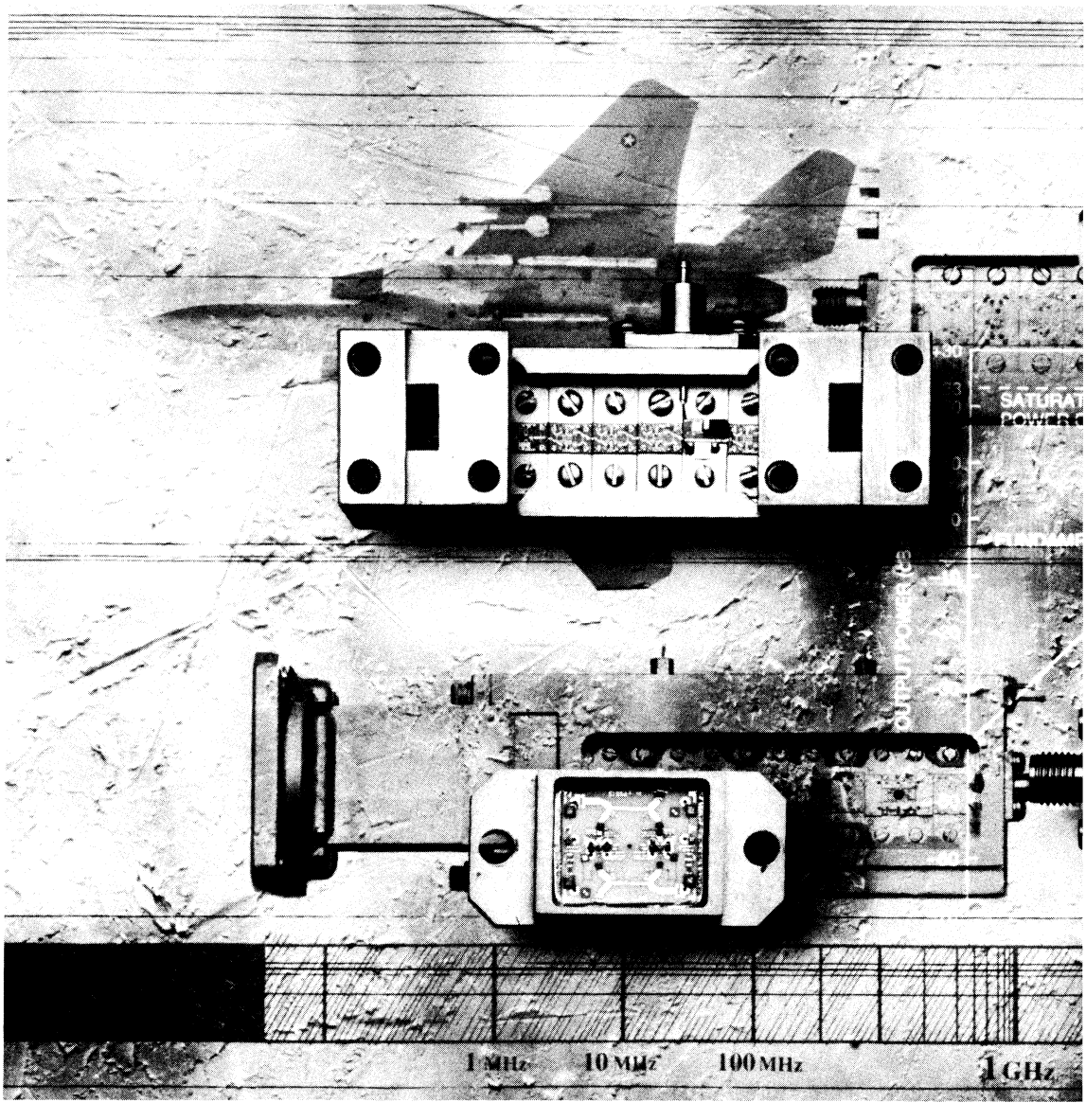




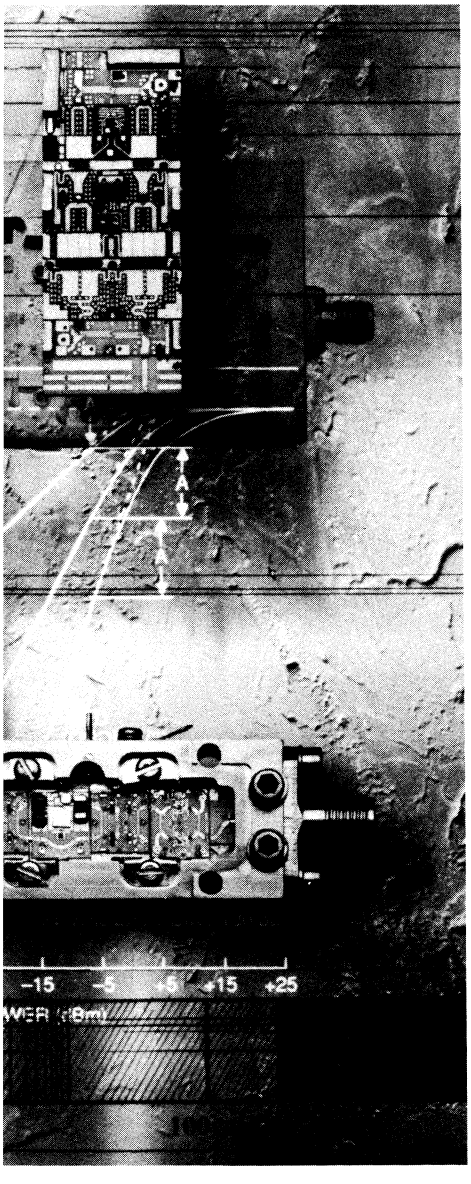


NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: INCHES .xx ± 0.01
   .xxx ± 0.005
   MILLIMETERS x.x ± 0.25
   x.xx ± 0.13
3. AMPLIFIER UNIT MARKINGS PER MIL-STD-130.
4. 63 MOUNTING SURFACE FINISH OR BETTER REQUIRED TO MOUNT AMPLIFIER.


1 MHz
10 MHz
100 MHz
1 GHz

2. Wideband Small Signal and Gain Control Amplifiers

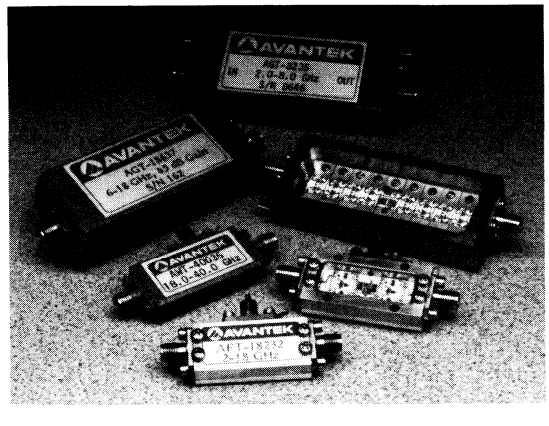


AFT series
0.1 to 18 GHz

AMT series
2 to 20 GHz

AWT series
0.5 to 20 GHz

AGT Gain Control series
2 to 18 GHz



AFT Series Miniature Amplifiers 0.5-18 GHZ.

Features
- **Avanpak™ Package**
- **Removable Connectors (Miniature Series)**
- **0.5 thru 18.0 GHz (Octave/Multioctave)**
- **Economically Priced (General Purpose)**

AFT Avanpak Series

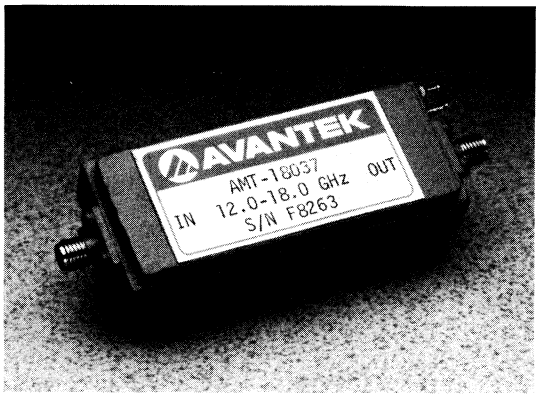
AFT amplifiers are general purpose amplifiers, suitable for a wide range of applications in commercial and military systems where low to medium gain "amplifier blocks" are required.

AFTs are compact and rugged and may be designed into commercial and military systems where stringent environments are encountered.

The Avanpak flatpak package is suitable for conventional chassis mounting using connectors and cables and, when the RF connectors are removed, is ideal for use in microstrip or stripline integration.

The AFT series is economically priced to facilitate its wide usage, and most models are readily available from stock from AVANTEK'S distributor network.

AMT/AWT Series 0.5-45.5 GHZ.



Features
- **High Performance, Wide Band**
- **0.5 thru 45.5 GHz**
- **Low Noise Figure**
- **Wide Dynamic Range**

AMT/AWT Series

The AMT/AWT series provides premium performance over octave (AMT) and multi-octave (AWT) bands at 25°C. Temperature compensated amplifiers are specified over full military temperature ranges up to +100°C.

AMT/AWT series amplifiers are ideal for specification in performance driven applications in commercial and military systems. These amplifiers have a wide range of gain options, typically up to 45-50 dB, and are optimized for noise figure and dynamic range, consistent with the best technology available. A complete range of performance specifications is standard on these series and they are guaranteed over the specified temperature range.

The rugged I-series case is designed for chassis mounting and conventional connector/cable system integration.

The MA-series case is equivalent to the Avanpak flatpak package outline and is designed to withstand the same rugged environments as the I-series cases. They are suitable for conventional chassis mounting, using connectors and cables and, when the RF connectors are removed, are ideal for use in microstrip or stripline integration.

0.1 to 4.5 GHz FREQUENCY RANGE

WIDEBAND SMALL SIGNAL AMPLIFIERS

AFT — Avanpak Series Amplifiers, Connectorized or Stripline Compatible
AMG — FET Amplifier Using Packaged GaAs FETs
AWT — High Performance and Temperature Compensated Connectorized Amplifier Series

AFT Series — Silicon MMICs – Ultrawideband, Low Cost

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Typical Gain (dB)	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Typical Current (mA)	Case Type[1]
AFT-4001	0.1-4.0	7	8.0 Typ.	7.0/8.0	+6	0.5	+17	2.0	2.0	+12	50 Typ.	AS2
AFT-4002	0.1-4.0	14	16.0 Typ.	7.0/8.0	+6	0.9	+17	2.0	2.0	+12	100 Typ.	AS2
AFT-4003	0.1-4.0	21	24.0 Typ.	7.0/8.0	+6	1.25	+17	2.0	2.0	+12	150 Typ.	AS4

AWT Series — GaAs FETs – Ultrawideband, High Performance

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AWT-4532	0.5-4.5	18	22	3.5/3.8	+12	0.75	+21	2.0	2.0	+12	110	IS2
AWT-4533	0.5-4.5	27	33	3.5/3.8	+12	1.0	+21	2.0	2.0	+12	150	IS4
AWT-4534	0.5-4.5	36	44	3.5/3.8	+12	1.0	+21	2.0	2.0	+12	200	IS4

AMG — Discrete Component, GaAs FET Ultrawideband Amplifier

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Intercept Point for IM Products (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Typical Current (mA)	Case Type
AMG-1020	0.05-1	34	2.7	+10	1.0	+22	2.5	2.2	+15	50	GC4

(N): New product offering

Note 1: See case drawing for connector options.

WIDEBAND SMALL SIGNAL AMPLIFIERS

0.5 to 2.0 GHz FREQUENCY RANGE

AFT—Avanpak Series Amplifiers, Connectorized or Stripline Compatible
AWT—High Performance and Temperature Compensated Connectorized Amplifier Series

AFT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Typical Gain (dB)	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Typical Current (mA)	Case Type[1]
AFT-2031	0.5-2.0	10	10.5 Typ.	3.3/3.5	+11	0.5	+21	2.0	2.0	+15	60 Typ.	AS2
AFT-2032	0.5-2.0	20	21.0 Typ.	3.5/3.7	+13	0.7	+23	2.0	2.0	+15	120 Typ.	AS2
AFT-2033	0.5-2.0	30	32.0 Typ.	3.5/3.7	+13	1.0	+23	2.0	2.0	+15	180 Typ.	AS4
AFT-2034	0.5-2.0	40	42.0 Typ.	3.5/3.7	+13	1.5	+23	2.0	2.0	+15	250 Typ.	AS4
AFT-2061	0.5-2.0	10	10.5 Typ.	4.5/5.0	+20	0.5	+29	2.0	2.0	+15	180 Typ.	AS2
AFT-2062	0.5-2.0	20	21.0 Typ.	3.5/3.7	+20	0.7	+29	2.0	2.0	+15	250 Typ.	AS2
AFT-2063	0.5-2.0	30	32.0 Typ.	3.5/3.7	+20	1.0	+29	2.0	2.0	+15	300 Typ.	AS4
AFT-2064	0.5-2.0	40	42.0 Typ.	3.5/3.7	+20	1.5	+29	2.0	2.0	+15	350 Typ.	AS4

AWT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AWT-2071	0.5-2.0	10	13	2.1/2.5	+11	0.50	+20	2.0	2.0	+12	75	IS2
AWT-2072	0.5-2.0	21	26	2.3/2.7	+11	0.75	+20	2.0	2.0	+12	150	IS2
AWT-2073	0.5-2.0	33	40	2.4/2.8	+20	1.00	+29	2.0	2.0	+12	260	IS4
AWT-2032	0.5-2.0	23	27	2.8/3.5	+13	1.25	+21	2.0	2.0	+12	100	IS2
AWT-2033	0.5-2.0	35	40	2.8/3.5	+13	1.25	+21	2.0	2.0	+12	160	IS4
AWT-2034	0.5-2.0	47	53	2.8/3.5	+13	1.25	+21	2.0	2.0	+12	200	IS4
AWT-2053	0.5-2.0	35	40	3.2/3.5	+20	1.25	+28	2.0	2.0	+12	210	IS4
AWT-2054	0.5-2.0	47	53	3.2/3.5	+20	1.25	+28	2.0	2.0	+12	250	IS4

AWT Series —Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

AWT-2082	0.5-2.0	19	23	3.6/4.0	+13	1.50	+21	2.0	2.0	+12	170	IS4
AWT-2083	0.5-2.0	30	34	3.4/3.8	+13	1.75	+21	2.0	2.0	+12	220	IS4
AWT-2084	0.5-2.0	41	46	3.4/3.8	+13	2.00	+21	2.0	2.0	+12	260	IS6
AWT-2042	0.5-2.0	19	23	4.5/4.7	+13	1.50	+21	2.0	2.0	+12	150	IS4
AWT-2043	0.5-2.0	30	34	4.2/4.5	+13	1.75	+21	2.0	2.0	+12	200	IS4
AWT-2044	0.5-2.0	41	46	4.2/4.5	+13	2.00	+21	2.0	2.0	+12	250	IS6
AWT-2063	0.5-2.0	30	34	4.2/4.5	+20	1.75	+28	2.0	2.0	+12	275	IS4
AWT-2064	0.5-2.0	41	46	4.2/4.5	+20	2.00	+28	2.0	2.0	+12	325	IS6

Note 1: See case drawing for connector options.

2.0 to 4.0 GHz FREQUENCY RANGE

WIDEBAND SMALL SIGNAL AMPLIFIERS

AFT—Avanpak Series Amplifiers, Connectorized or Stripline Compatible
AMT—High Performance and Temperature Compensated Connectorized Amplifier Series

AFT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Typical Gain (dB)	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Typical Current (mA)	Case Type[1]
AFT-4231	2-4	11.5	12.0 Typ.	3.6/4.0	+13	1.0	+23	2.0	2.0	+15	75 Typ.	AS2
AFT-4232	2-4	23.0	24.0 Typ.	3.6/4.0	+13	1.0	+23	2.0	2.0	+15	150 Typ.	AS2
AFT-4233	2-4	35.0	36.0 Typ.	3.6/4.0	+13	1.0	+23	2.0	2.0	+15	225 Typ.	AS4
AFT-4234	2-4	47.0	48.0 Typ.	3.6/4.0	+13	1.5	+23	2.0	2.0	+15	300 Typ.	AS4
AFT-4261	2-4	10.0	10.5 Typ.	4.7/5.0	+20	1.0	+29	2.0	2.0	+15	175 Typ.	AS2
AFT-4262	2-4	21.5	22.5 Typ.	3.6/4.0	+20	1.0	+29	2.0	2.0	+15	225 Typ.	AS2
AFT-4263	2-4	34.0	35.0 Typ.	3.6/4.0	+20	1.0	+29	2.0	2.0	+15	275 Typ.	AS4
AFT-4264	2-4	44.5	46.0 Typ.	3.6/4.0	+20	1.5	+29	2.0	2.0	+15	325 Typ.	AS4

AMT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AMT-4071	2-4	12.0	15.0	1.7/1.8	+9	0.5	+17	2.0	2.0	+12	65	IS2
AMT-4072	2-4	25.5	30.0	1.6/1.8	+9	1.0	+17	2.0	2.0	+12	125	IS2
AMT-4073	2-4	38.0	44.0	1.6/1.8	+18	1.0	+28	2.0	2.0	+12	225	IS4
AMT-4074	2-4	50.0	58.0	1.6/1.8	+20	1.0	+28	2.0	2.0	+12	280	IS4
AMT-4031	2-4	12.5	15.0	1.9/2.1	+12	0.5	+20	2.0	2.0	+12	65	IS2
AMT-4032	2-4	26.0	30.0	2.0/2.2	+12	1.0	+20	2.0	2.0	+12	125	IS2
AMT-4033	2-4	39.0	44.0	2.0/2.2	+20	1.0	+28	2.0	2.0	+12	225	IS4
AMT-4051	2-4	12.5	15.5	3.3/3.8	+20	1.0	+28	2.0	2.0	+12	120	IS2
AMT-4052	2-4	26.0	30.0	2.3/2.7	+20	1.0	+28	2.0	2.0	+12	175	IS2
AMT-4053	2-4	39.0	44.0	2.3/2.7	+20	1.0	+28	2.0	2.0	+12	225	IS4
AMT-4054	2-4	52.0	58.0	2.3/2.7	+20	1.0	+28	2.0	2.0	+12	280	IS4

AMT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

AMT-4082	2-4	22	26	3.2	+15	1.50	+23	2.0	2.0	+12	225	IS4
AMT-4083	2-4	34	38	2.9	+20	1.75	+28	2.0	2.0	+12	330	IS4
AMT-4084	2-4	46	51	2.9	+20	2.00	+28	2.0	2.0	+12	380	IS6
AMT-4062	2-4	22	26	5.0	+20	1.50	+28	2.0	2.0	+12	280	IS4
AMT-4063	2-4	34	38	3.8	+20	1.75	+28	2.0	2.0	+12	330	IS4
AMT-4064	2-4	46	51	3.8	+20	2.00	+28	2.0	2.0	+12	380	IS6

Note 1: See case drawing for connector options.

WIDEBAND SMALL SIGNAL AMPLIFIERS

2.0 to 6.0 GHz FREQUENCY RANGE

AFT— Avanpak Series Amplifiers, Connectorized or Stripline Compatible
AWT— High Performance and Temperature Compensated Connectorized Amplifier Series

AFT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Typical Gain (dB)	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Typical Current (mA)	Case Type[1]
AFT-6231	2-6	8.5	9.0 Typ.	3.3/3.7	+10	0.7	+20	2.0	2.0	+15	60 Typ.	AC2
AFT-6232	2-6	18.0	19.0 Typ.	3.6/4.0	+12	1.0	+22	2.0	2.0	+15	125 Typ.	AC2
AFT-6233	2-6	27.5	28.5 Typ.	3.6/4.0	+12	1.0	+22	2.0	2.0	+15	200 Typ.	AC4
AFT-6234	2-6	37.0	38.5 Typ.	3.6/4.0	+12	1.5	+22	2.0	2.0	+15	275 Typ.	AC4
AFT-6261	2-6	7.0	8.0 Typ.	5.5/6.0	+20	0.7	+29	2.0	2.0	+15	175 Typ.	AC2
AFT-6262	2-6	15.0	16.0 Typ.	6.0/6.5	+20	1.0	+29	2.0	2.0	+15	300 Typ.	AC2
AFT-6263	2-6	24.5	26.0 Typ.	5.0/5.5	+20	1.0	+29	2.0	2.0	+15	350 Typ.	AC4
AFT-6264	2-6	33.5	35.0 Typ.	4.5/5.0	+20	1.5	+29	2.0	2.0	+15	400 Typ.	AC4

AWT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AWT-6032	2-6	19	23	3.3/3.5	+15	1.00	+23	2.0	2.0	+12	130	IC2
AWT-6033	2-6	28	33	3.3/3.5	+15	1.00	+23	2.0	2.0	+12	190	IC4
AWT-6034	2-6	38	44	3.3/3.5	+15	1.25	+23	2.0	2.0	+12	250	IC4
AWT-6035	2-6	48	55	3.3/3.5	+15	1.50	+23	2.0	2.0	+12	310	IC6
AWT-6052	2-6	18	23	5.0/6.0	+23	1.25	+31	2.0	2.0	+12	300	IC2
AWT-6053	2-6	27	33	3.6/4.0	+23	1.25	+31	2.0	2.0	+12	350	IC4
AWT-6054	2-6	36	43	3.2/3.5	+23	1.50	+31	2.0	2.0	+12	400	IC4
AWT-6055	2-6	46	54	3.2/3.5	+23	2.00	+31	2.0	2.0	+12	460	IC6

AWT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

AWT-6043	2-6	24	28	4.8	+15	1.75	+23	2.0	2.0	+12	230	IC4
AWT-6044	2-6	31	36	4.5	+15	2.00	+23	2.0	2.0	+12	280	IC6
AWT-6045	2-6	40	45	4.5	+15	2.25	+23	2.0	2.0	+12	340	IC6
AWT-6063	2-6	23	28	6.5	+23	2.00	+31	2.0	2.0	+12	420	IC4
AWT-6064	2-6	31	37	5.0	+23	2.25	+31	2.0	2.0	+12	460	IC6
AWT-6065	2-6	38	45	4.5	+23	2.50	+31	2.0	2.0	+12	540	IC6

Note 1: See case drawing for connector options.

2.0 to 8.0 GHz FREQUENCY RANGE

WIDEBAND SMALL SIGNAL AMPLIFIERS

AFT—Avanpak Series Amplifiers, Connectorized or Stripline Compatible
AWT—High Performance and Temperature Compensated Connectorized Amplifier Series

AFT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Typical Gain (dB)	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Typical Current (mA)	Case Type[1]
AFT-8231	2-8	6.5	7.0 Typ.	4.3/4.8	+12	0.7	+22	2.0	2.0	+15	100 Typ.	AC2
AFT-8232	2-8	14.0	14.5 Typ.	4.5/5.0	+12	1.0	+22	2.0	2.0	+15	175 Typ.	AC2
AFT-8233	2-8	21.0	22.0 Typ.	4.5/5.0	+12	1.0	+22	2.0	2.0	+15	235 Typ.	AC4
AFT-8234	2-8	28.0	30.0 Typ.	4.5/5.0	+12	1.5	+22	2.0	2.0	+15	300 Typ.	AC4
AFT-8261	2-8	7.5	8.0 Typ.	5.5/6.0	+17	0.7	+26	2.0	2.0	+15	150 Typ.	AC2
AFT-8262	2-8	16.5	17.0 Typ.	5.5/6.0	+17	1.0	+26	2.0	2.0	+15	300 Typ.	AC2
AFT-8263	2-8	23.0	24.0 Typ.	4.7/5.2	+17	1.0	+26	2.0	2.0	+15	375 Typ.	AC4
AFT-8264	2-8	30.0	32.0 Typ.	4.7/5.2	+17	1.5	+26	2.0	2.0	+15	450 Typ.	AC4

AWT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AWT-8032	2-8	16	21	4.0/4.2	+15	1.00	+23	2.0	2.0	+12	165	IC2
AWT-8033	2-8	24	31	3.8/4.0	+15	1.25	+23	2.0	2.0	+12	235	IC4
AWT-8034	2-8	33	41	3.8/4.0	+15	1.50	+23	2.0	2.0	+12	320	IC4
AWT-8035	2-8	41	50	3.8/4.0	+15	1.75	+23	2.0	2.0	+12	400	IC6
AWT-8052	2-8	15	20	5.0/6.0	+20	1.00	+28	2.0	2.0	+12	275	IC2
AWT-8053	2-8	23	30	3.9/4.5	+20	1.25	+28	2.0	2.0	+12	350	IC4
AWT-8054	2-8	32	40	3.8/4.0	+20	1.50	+28	2.0	2.0	+12	425	IC4
AWT-8055	2-8	40	49	3.8/4.0	+20	1.75	+28	2.0	2.0	+12	510	IC6

AWT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

AWT-8043	2-8	18.5	24.5	5.8	+15	1.75	+23	2.0	2.0	+12	270	IC4
AWT-8044	2-8	26.5	32.5	5.5	+15	2.00	+23	2.0	2.0	+12	340	IC6
AWT-8045	2-8	34.0	41.0	5.3	+15	2.25	+23	2.0	2.0	+12	420	IC6
AWT-8063	2-8	18.0	24.0	7.5	+20	2.00	+28	2.0	2.0	+12	400	IC4
AWT-8064	2-8	25.0	32.0	5.7	+20	2.25	+28	2.0	2.0	+12	470	IC6
AWT-8065	2-8	32.5	41.5	5.5	+20	2.50	+28	2.0	2.0	+12	550	IC6

Note 1: See case drawing for connector options.

WIDEBAND SMALL SIGNAL AMPLIFIERS

4.0 to 8.0 GHz FREQUENCY RANGE

AFT—Avanpak Series Amplifiers, Connectorized or Stripline Compatible
AMT—High Performance and Temperature Compensated Connectorized Amplifier Series

AFT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Typical Gain (dB)	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Typical Current (mA)	Case Type[1]
AFT-8431	4-8	8.5	9.0 Typ.	4.0/4.5	+10	1.0	+20	2.0	2.0	+15	75 Typ.	AC2
AFT-8432	4-8	17.0	18.0 Typ.	4.0/4.5	+10	1.0	+20	2.0	2.0	+15	125 Typ.	AC2
AFT-8433	4-8	28.0	29.0 Typ.	3.5/4.0	+12	1.0	+22	2.0	2.0	+15	200 Typ.	AX4
AFT-8434	4-8	37.5	39.0 Typ.	3.5/4.0	+12	1.5	+22	2.0	2.0	+15	250 Typ.	AC4
AFT-8461	4-8	6.5	7.0 Typ.	7.5/8.0	+20	0.7	+29	2.0	2.0	+15	125 Typ.	AC2
AFT-8462	4-8	13.0	14.0 Typ.	7.5/8.0	+20	1.0	+29	2.0	2.0	+15	250 Typ.	AC2
AFT-8463	4-8	24.0	25.0 Typ.	5.0/5.5	+20	1.0	+29	2.0	2.0	+15	300 Typ.	AC4
AFT-8464	4-8	32.0	34.0 Typ.	4.0/4.5	+20	1.5	+29	2.0	2.0	+15	350 Typ.	AC4

AMT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AMT-8071	4-8	10	12	2.1/2.5	+6	0.50	+15	2.0	2.0	+12	50	IC2
AMT-8072	4-8	20	24	2.3/2.7	+7	1.00	+15	2.0	2.0	+12	100	IC2
AMT-8073	4-8	30	35	2.3/2.7	+13	1.50	+21	2.0	2.0	+12	175	IC4
AMT-8074	4-8	39	45	2.3/2.7	+18	2.00	+26	2.0	2.0	+12	275	IC4
AMT-8032	4-8	19	23	3.3/3.7	+15	1.00	+23	2.0	2.0	+12	125	IC2
AMT-8033	4-8	29	34	3.0/3.5	+15	1.00	+23	2.0	2.0	+12	180	IC4
AMT-8034	4-8	38	45	3.0/3.5	+15	1.25	+23	2.0	2.0	+12	220	IC4
AMT-8035	4-8	48	56	3.0/3.5	+15	1.50	+23	2.0	2.0	+12	275	IC6
AMT-8052	4-8	18	22	4.0/5.2	+20	1.00	+28	2.0	2.0	+12	200	IC2
AMT-8053	4-8	27	32	3.2/3.8	+20	1.00	+28	2.0	2.0	+12	250	IC4
AMT-8054	4-8	37	44	3.0/3.5	+20	1.25	+28	2.0	2.0	+12	300	IC4
AMT-8055	4-8	46	54	3.0/3.5	+20	1.50	+28	2.0	2.0	+12	350	IC6

AMT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

AMT-8083	4-8	25.0	29	4.2	+15	1.25	+23	2.0	2.0	+12	230	IC4
AMT-8084	4-8	34.0	39.5	3.8	+15	1.50	+23	2.0	2.0	+12	275	IC6
AMT-8085	4-8	43.0	50	3.8	+15	1.75	+23	2.0	2.0	+12	325	IC6
AMT-8043	4-8	24.0	28	5.0	+15	1.25	+23	2.0	2.0	+12	225	IC4
AMT-8044	4-8	31.5	37	4.5	+15	1.50	+23	2.0	2.0	+12	250	IC6
AMT-8045	4-8	40.0	47	4.5	+15	1.75	+23	2.0	2.0	+12	300	IC6
AMT-8063	4-8	22.0	26	7.0	+20	1.50	+28	2.0	2.0	+12	350	IC4
AMT-8064	4-8	29.0	35	5.2	+20	1.75	+28	2.0	2.0	+12	400	IC6
AMT-8065	4-8	37.0	44	5.0	+20	2.00	+28	2.0	2.0	+12	450	IC6

Note 1: See case drawing for connector options.

4.0 to 11.0 GHz FREQUENCY RANGE

WIDEBAND SMALL SIGNAL AMPLIFIERS

AWT —High Performance and Temperature Compensated Connectorized Amplifier Series

AWT Series

Guaranteed Specifications @ 25°C Case Temperature

	Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
(U)	**AWT-11471**	4.0-11.0	8	11	2.1/2.5	+7	0.75	+18	2.0	2.0	+12	65	IX2
(U)	**AWT-11472**	4.0-11.0	17	21	2.3/2.7	+7	1.00	+18	2.0	2.0	+12	130	IX2
(U)	**AWT-11473**	4.0-11.0	26	31	2.3/2.7	+13	1.25	+23	2.0	2.0	+12	200	IX4
(U)	**AWT-11474**	4.0-11.0	34	41	2.3/2.7	+20	1.50	+28	2.0	2.0	+12	380	IX4
	AWT-10532	4.5-10.5	17	21	4.3/4.5	+15	1.00	+23	2.0	2.0	+12	120	IC2
	AWT-10533	4.5-10.5	26	31	4.2/4.5	+15	1.00	+23	2.0	2.0	+12	160	IC4
	AWT-10534	4.5-10.5	34	41	4.2/4.5	+15	1.25	+23	2.0	2.0	+12	210	IC4
	AWT-10535	4.5-10.5	43	51	4.2/4.5	+15	1.50	+23	2.0	2.0	+12	250	IC6
	AWT-10552	4.5-10.5	15	20	5.5/6.0	+20	1.00	+28	2.0	2.0	+12	275	IC2
	AWT-10553	4.5-10.5	24	30	4.8/5.0	+20	1.25	+28	2.0	2.0	+12	320	IC4
	AWT-10554	4.5-10.5	32	40	4.2/4.5	+20	1.50	+28	2.0	2.0	+12	360	IC4
	AWT-10555	4.5-10.5	41	50	4.2/4.5	+20	1.75	+28	2.0	2.0	+12	400	IC6

AWT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

(N)	**AWT-11484**	4.0-11.0	25.0	31	4.0	+7	2.00	+15	2.0	2.0	+12	300	IX6
(N)	**AWT-11485**	4.0-11.0	32.0	39	4.0	+13	2.25	+21	2.0	2.0	+12	365	IX6
	AWT-10543	4.5-10.5	21.0	26	6.0	+15	1.75	+23	2.0	2.0	+12	230	IC4
	AWT-10544	4.5-10.5	28.0	34	6.0	+15	2.00	+23	2.0	2.0	+12	250	IC6
	AWT-10545	4.5-10.5	35.5	42	6.0	+15	2.25	+23	2.0	2.0	+12	290	IC6
	AWT-10563	4.5-10.5	19.0	24	7.0	+20	1.75	+28	2.0	2.0	+12	375	IC4
	AWT-10564	4.5-10.5	27.0	34	6.5	+20	2.00	+28	2.0	2.0	+12	450	IC6
	AWT-10565	4.5-10.5	33.0	41	6.0	+20	2.25	+28	2.0	2.0	+12	475	IC6

(U)- Updated model number: was AWT-1057X series

(N)- New product offering

WIDEBAND SMALL SIGNAL AMPLIFIERS

6.0 to 12.0 GHz FREQUENCY RANGE

AFT—Avanpak Series Amplifiers, Connectorized or Stripline Compatible
AMT—High Performance and Temperature Compensated Connectorized Amplifier Series

AFT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Typical Gain (dB)	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Typical Current (mA)	Case Type[1]
AFT-12631	6-12	7.5	8.0 Typ.	6.0/6.5	+10	0.7	+20	2.0	2.0	+15	75 Typ.	AX2
AFT-12632	6-12	15.0	16.0 Typ.	5.7/6.0	+10	1.0	+20	2.0	2.0	+15	150 Typ.	AX2
AFT-12633	6-12	22.5	24.0 Typ.	4.2/4.5	+14	1.0	+24	2.0	2.0	+15	175 Typ.	AX4
AFT-12634	6-12	30.5	32.0 Typ.	4.2/4.5	+14	1.5	+24	2.0	2.0	+15	225 Typ.	AX4
AFT-12635	6-12	38.0	40.0 Typ.	4.2/4.5	+14	2.0	+24	2.0	2.0	+15	275 Typ.	AX6
AFT-12661	6-12	5.0	5.5 Typ.	7.5/8.0	+20	0.7	+29	2.0	2.0	+15	175 Typ.	AX2
AFT-12662	6-12	13.0	14.0 Typ.	6.0/6.5	+20	1.0	+29	2.0	2.0	+15	250 Typ.	AX2
AFT-12663	6-12	21.0	22.0 Typ.	5.0/5.5	+20	1.0	+29	2.0	2.0	+15	300 Typ.	AX4
AFT-12664	6-12	28.0	29.0 Typ.	4.5/5.0	+20	1.5	+29	2.0	2.0	+15	350 Typ.	AX4
AFT-12665	6-12	36.5	38.0 Typ.	4.5/5.0	+20	2.0	+29	2.0	2.0	+15	400 Typ.	AX6

AMT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AMT-12064	6-12	21	29	7.7	+20	1.5	+28	2.0	2.0	+12	520	IX6
AMT-12065	6-12	32	40	5.0	+20	1.5	+28	2.0	2.0	+12	460	IX6
AMT-12066	6-12	37	45	4.5	+20	2.0	+28	2.0	2.0	+12	520	IX8

Note 1: See case drawing for connector options.

7.0 to 12.4 GHz FREQUENCY RANGE

WIDEBAND SMALL SIGNAL AMPLIFIERS

AMT —High Performance and Temperature Compensated Connectorized Amplifier Series

AMT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AMT-12471	7-12.4	9	12	2.2/2.6	+7	0.75	+18	2.0	2.0	+12	75	IX2
AMT-12472	7-12.4	18	22	2.5/2.9	+7	1.00	+18	2.0	2.0	+12	140	IX2
AMT-12473	7-12.4	27	33	2.5/2.9	+15	1.25	+23	2.0	2.0	+12	210	IX4
AMT-12474	7-12.4	34	42	2.5/2.9	+20	1.50	+28	2.0	2.0	+12	390	IX4
AMT-12432	7-12.4	17	21	3.9/4.5	+15	1.0	+23	2.0	2.0	+12	140	IX2
AMT-12433	7-12.4	25	31	3.9/4.5	+15	1.0	+23	2.0	2.0	+12	210	IX4
AMT-12434	7-12.4	31	39	3.7/4.0	+15	1.0	+23	2.0	2.0	+12	230	IX4
AMT-12435	7-12.4	38	45	3.7/4.0	+15	1.5	+23	2.0	2.0	+12	290	IX6
AMT-12436	7-12.4	47	55	3.7/4.0	+15	1.5	+23	2.0	2.0	+12	350	IX6
AMT-12453	7-12.4	23	29	4.5/5.0	+20	1.0	+28	2.0	2.0	+12	330	IX4
AMT-12454	7-12.4	32	40	3.9/4.5	+20	1.0	+28	2.0	2.0	+12	390	IX4
AMT-12455	7-12.4	36	44	3.8/4.0	+20	1.5	+28	2.0	2.0	+12	400	IX6
AMT-12456	7-12.4	45	53	3.8/4.0	+20	1.5	+28	2.0	2.0	+12	450	IX6

AMT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

AMT-12483	7-12.4	18	24	—/4.9	+13	1.0	+21	2.0	2.0	+12	230	IX4
AMT-12484	7-12.4	25	33	—/5.2	+15	1.5	+23	2.0	2.0	+12	300	IX6
AMT-12485	7-12.4	32	41	—/4.7	+15	1.5	+23	2.0	2.0	+12	330	IX6
AMT-12486	7-12.4	38	47	—/4.4	+15	2.0	+23	2.0	2.0	+12	370	IX8
AMT-12487	7-12.4	45	55	—/4.2	+15	2.5	+23	2.0	2.0	+12	420	IX8
AMT-12443	7-12.4	20	26	—/5.7	+13	1.0	+21	2.0	2.0	+12	230	IX4
AMT-12444	7-12.4	27	35	—/6.0	+15	1.5	+23	2.0	2.0	+12	300	IX6
AMT-12445	7-12.4	31	40	—/5.5	+15	1.5	+23	2.0	2.0	+12	320	IX6
AMT-12446	7-12.4	36	45	—/5.2	+15	2.0	+23	2.0	2.0	+12	350	IX8
AMT-12447	7-12.4	44	54	—/5.0	+15	2.5	+23	2.0	2.0	+12	410	IX8
AMT-12464	7-12.4	21	29	—/7.7	+20	1.5	+28	2.0	2.0	+12	520	IX6
AMT-12465	7-12.4	30	38	—/6.0	+20	1.5	+28	2.0	2.0	+12	460	IX6
AMT-12466	7-12.4	36	45	—/5.6	+20	2.0	+28	2.0	2.0	+12	640	IX8

WIDEBAND SMALL SIGNAL AMPLIFIERS

5.0 to 13.0 GHz FREQUENCY RANGE

AWT —High Performance and Temperature Compensated Connectorized Amplifier Series

AWT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AWT-13531	5-13	6	9	2.6/3.2	+10	0.75	+18	2.0	2.0	+12	65	IX2
AWT-13532	5-13	13	17	3.1/3.5	+10	1.0	+18	2.0	2.0	+12	130	IX2
AWT-13533	5-13	20	26	3.1/3.5	+15	1.25	+23	2.0	2.0	+12	185	IX4
AWT-13534	5-13	28	36	3.1/3.5	+15	1.5	+23	2.0	2.0	+12	245	IX4
AWT-13032	5-13	17	21	4.3/4.5	+15	1.0	+23	2.0	2.0	+12	140	IX2
AWT-13033	5-13	25	30	4.3/4.5	+15	1.0	+23	2.0	2.0	+12	200	IX4
AWT-13034	5-13	33	40	4.3/4.5	+15	1.0	+23	2.0	2.0	+12	260	IX4
AWT-13035	5-13	41	49	4.3/4.5	+15	1.5	+23	2.0	2.0	+12	320	IX6
AWT-13036	5-13	49	57	4.3/4.5	+15	1.5	+23	2.0	2.0	+12	380	IX6

AWT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

AWT-13083	5-13	20	25	—/5.2	+13	1.5	+21	2.0	2.0	+12	220	IX4
AWT-13084	5-13	26	32	—/5.0	+13	1.5	+21	2.0	2.0	+12	280	IX6
AWT-13085	5-13	33	41	—/5.0	+15	2.0	+23	2.0	2.0	+12	340	IX6
AWT-13086	5-13	40	48	—/5.0	+15	2.5	+23	2.0	2.0	+12	400	IX8
AWT-13043	5-13	20	25	—/6.0	+13	1.5	+21	2.0	2.0	+12	220	IX4
AWT-13044	5-13	27	33	—/6.0	+15	1.5	+23	2.0	2.0	+12	280	IX6
AWT-13045	5-13	34	42	—/6.0	+15	2.0	+23	2.0	2.0	+12	340	IX6
AWT-13046	5-13	41	49	—/6.0	+15	2.5	+23	2.0	2.0	+12	400	IX8

6.0 to 18.0 GHz FREQUENCY RANGE

WIDEBAND SMALL SIGNAL AMPLIFIERS

AFT—Avanpak Series Amplifiers, Connectorized or Stripline Compatible

AFT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Typical Gain (dB)	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Typical Current (mA)	Case Type[1]
AFT-18631	6-18	7.0	7.5 Typ.	6.4/6.7	+10	1.0	+20	2.0	2.0	+15	75 Typ.	AX2
AFT-18632	6-18	13.0	14.0 Typ.	6.5/7.0	+10	1.0	+20	2.0	2.0	+15	125 Typ.	AX2
AFT-18633	6-18	18.5	20.0 Typ.	6.5/7.0	+10	1.0	+20	2.0	2.0	+15	175 Typ.	AX4
AFT-18634	6-18	24.5	26.0 Typ.	6.5/7.0	+10	1.5	+20	2.0	2.0	+15	250 Typ.	AX4
AFT-18635	6-18	30.0	32.0 Typ.	6.5/7.0	+10	2.0	+20	2.0	2.0	+15	300 Typ.	AX6
AFT-18651	6-18	5.0	6.0 Typ.	7.0/7.3	+15	1.0	+25	2.0	2.0	+15	100 Typ.	AX2
AFT-18652	6-18	11.0	12.0 Typ.	7.0/7.3	+15	1.0	+25	2.0	2.0	+15	165 Typ.	AX2
AFT-18653	6-18	18.5	20.0 Typ.	6.6/7.1	+15	1.0	+25	2.0	2.0	+15	225 Typ.	AX4
AFT-18654	6-18	24.5	26.0 Typ.	6.6/7.1	+15	1.5	+25	2.0	2.0	+15	275 Typ.	AX4
AFT-18655	6-18	32.0	34.0 Typ.	6.6/7.1	+15	2.0	+25	2.0	2.0	+15	325 Typ.	AX6
AFT-18662	6-18	9.5	10.5 Typ.	8.7/9.2	+20	1.0	+29	2.0	2.0	+15	325 Typ.	AX2
AFT-18663	6-18	15.0	16.5 Typ.	8.2/8.7	+20	1.0	+29	2.0	2.0	+15	360 Typ.	AX4
AFT-18664	6-18	23.0	24.5 Typ.	6.6/7.1	+20	1.5	+29	2.0	2.0	+15	425 Typ.	AX4
AFT-18665	6-18	30.5	32.5 Typ.	6.6/7.1	+20	2.0	+29	2.0	2.0	+15	475 Typ.	AX6

Note 1: See case drawing for connector options.

WIDEBAND SMALL SIGNAL AMPLIFIERS

6.0 to 18.0 GHz FREQUENCY RANGE

AWT — High Performance and Temperature Compensated Connectorized Amplifier Series

AWT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AWT-18673	6-18	20	26	3.6/4.0	+10	1.0	+18	2.0	2.0	+12	200	IX4
AWT-18674	6-18	26	32	3.6/4.0	+15	1.0	+23	2.0	2.0	+12	250	IX4
AWT-18675	6-18	32	38	3.6/4.0	+15	1.5	+23	2.0	2.0	+12	310	IX6
AWT-18676	6-18	38	44	3.6/4.0	+18	1.5	+26	2.0	2.0	+12	375	IX6
(I) **AWT-18632**	6-18	14	20	5.2/5.5	+13	1.0	+21	2.0	2.0	+12	140	IX2
(I) **AWT-18633**	6-18	20	26	5.1/5.5	+13	1.0	+21	2.0	2.0	+12	200	IX4
(I) **AWT-18634**	6-18	26	32	5.1/5.5	+15	1.0	+23	2.0	2.0	+12	260	IX4
(I) **AWT-18635**	6-18	32	38	5.1/5.5	+15	1.5	+23	2.0	2.0	+12	320	IX6
(I) **AWT-18636**	6-18	38	44	5.1/5.5	+15	1.5	+23	2.0	2.0	+12	380	IX6
(I) **AWT-18637**	6-18	44	50	5.1/5.5	+15	2.0	+23	2.0	2.0	+12	440	IX8
(I) **AWT-18654**	6-18	24	30	5.5/6.0	+20	1.0	+28	2.0	2.0	+12	370	IX4
(I) **AWT-18655**	6-18	30	36	5.2/5.5	+20	1.5	+28	2.0	2.0	+12	430	IX6
(I) **AWT-18656**	6-18	36	42	5.2/5.5	+20	1.5	+28	2.0	2.0	+12	490	IX6
(I) **AWT-18657**	6-18	42	50	5.2/5.5	+20	2.0	+28	2.0	2.0	+12	560	IX8

AWT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

AWT-18685	6-18	26	32	5.3/5.5	+10	2.5	+18	2.0	2.0	+12	350	IX6
AWT-18686	6-18	30	38	4.8/5.0	+10	2.5	+18	2.0	2.0	+12	410	IX8
AWT-18688	6-18	40	48	4.8/5.0	+15	3.0	+23	2.0	2.0	+12	520	IX10
AWT-18695	6-18	26	32	5.8/6.0	+15	2.5	+23	2.0	2.0	+12	350	IX6
AWT-18696	6-18	30	36	5.8/6.0	+18	2.5	+26	2.0	2.0	+12	510	IX8
AWT-18698	6-18	40	48	5.3/5.5	+20	3.0	+28	2.0	2.0	+12	630	IX10
(I) **AWT-18644**	6-18	20	25	6.7/7.0	+12	2.0	+20	2.0	2.0	+12	290	IX6
(I) **AWT-18645**	6-18	25	30	6.7/7.0	+15	2.5	+23	2.0	2.0	+12	350	IX6
(I) **AWT-18646**	6-18	30	36	6.3/6.5	+15	2.5	+23	2.0	2.0	+12	440	IX8
(I) **AWT-18647**	6-18	36	44	6.3/6.5	+18	3.0	+26	2.0	2.0	+12	510	IX8
(I) **AWT-18648**	6-18	42	50	6.3/6.5	+18	3.0	+26	2.0	2.0	+12	570	IX10
(I) **AWT-18666**	6-18	28	36	7.0/7.5	+20	2.5	+28	2.0	2.0	+12	520	IX8
(I) **AWT-18667**	6-18	36	44	6.3/6.5	+20	3.0	+28	2.0	2.0	+12	600	IX8

(I) - Improved specifications

8.0 to 18.0 GHz FREQUENCY RANGE

WIDEBAND SMALL SIGNAL AMPLIFIERS

AFT—Avanpak Series Amplifiers, Connectorized or Stripline Compatible

AFT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Typical Gain (dB)	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Typical Current (mA)	Case Type[1]
AFT-18831	8-18	7.0	7.5 Typ.	6.4/6.7	+10	1.0	+20	2.0	2.0	+15	75 Typ.	AX2
AFT-18832	8-18	13.0	14.0 Typ.	6.5/7.0	+10	1.0	+20	2.0	2.0	+15	125 Typ.	AX2
AFT-18833	8-18	18.5	20.0 Typ.	6.5/7.0	+10	1.0	+20	2.0	2.0	+15	175 Typ.	AX4
AFT-18834	8-18	24.5	26.0 Typ.	6.5/7.0	+10	1.5	+20	2.0	2.0	+15	250 Typ.	AX4
AFT-18835	8-18	30.0	32.0 Typ.	6.5/7.0	+10	2.0	+20	2.0	2.0	+15	300 Typ.	AX6
AFT-18851	8-18	5.0	5.5 Typ.	7.0/7.3	+15	1.0	+25	2.0	2.0	+15	100 Typ.	AX2
AFT-18852	8-18	11.0	12.0 Typ.	7.0/7.3	+15	1.0	+25	2.0	2.0	+15	165 Typ.	AX2
AFT-18853	8-18	18.5	20.0 Typ.	6.6/7.1	+15	1.0	+25	2.0	2.0	+15	225 Typ.	AX4
AFT-18854	8-18	24.5	26.0 Typ.	6.6/7.1	+15	1.5	+25	2.0	2.0	+15	275 Typ.	AX4
AFT-18855	8-18	32.0	34.0 Typ.	6.6/7.1	+15	2.0	+25	2.0	2.0	+15	325 Typ.	AX6
AFT-18862	8-18	9.5	10.5 Typ.	8.7/9.2	+20	1.0	+29	2.0	2.0	+15	325 Typ.	AX2
AFT-18863	8-18	15.0	16.5 Typ.	8.2/8.7	+20	1.0	+29	2.0	2.0	+15	360 Typ.	AX4
AFT-18864	8-18	23.0	24.5 Typ.	6.6/7.1	+20	1.5	+29	2.0	2.0	+15	425 Typ.	AX4
AFT-18865	8-18	30.5	32.5 Typ.	6.6/7.1	+20	2.0	+29	2.0	2.0	+15	475 Typ.	AX6

AWT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Current (mA) Maximum	Case Type
AWT-18032	8-18	14	20	5.5/6.5[2]	+13	1.0	+21	2.0	2.0	+12	140	IX2
AWT-18033	8-18	20	26	5.5/6.5[2]	+13	1.0	+21	2.0	2.0	+12	190	IX4
AWT-18034	8-18	26	32	5.5/6.5[2]	+15	1.0	+23	2.0	2.0	+12	260	IX4
AWT-18035	8-18	32	38	5.5/6.5[2]	+15	1.5	+23	2.0	2.0	+12	310	IX6
AWT-18036	8-18	38	44	5.5/6.5[2]	+15	1.5	+23	2.0	2.0	+12	370	IX6
AWT-18037	8-18	44	50	5.5/6.5[2]	+15	2.0	+23	2.0	2.0	+12	430	IX8
AWT-18054	8-18	24	30	5.5/7.0	+20	1.0	+28	2.0	2.0	+12	370	IX4
AWT-18055	8-18	30	36	5.5/7.0	+20	1.5	+28	2.0	2.0	+12	420	IX6
AWT-18056	8-18	36	42	5.5/7.0	+20	1.5	+28	2.0	2.0	+12	480	IX6
AWT-18057	8-18	42	50	5.5/7.0	+20	2.0	+28	2.0	2.0	+12	520	IX8

AWT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

AWT-18044	8-18	20	25	—/7.5	+12	2.0	+20	2.0	2.0	+12	290	IX6
AWT-18045	8-18	25	30	—/7.5	+15	2.5	+23	2.0	2.0	+12	350	IX6
AWT-18046	8-18	30	36	—/7.5	+15	2.5	+23	2.0	2.0	+12	430	IX8
AWT-18047	8-18	36	44	—/7.5	+18	3.0	+26	2.0	2.0	+12	500	IX8
AWT-18048	8-18	42	50	—/7.5	+18	3.0	+26	2.0	2.0	+12	575	IX10
AWT-18066	8-18	28	36	—/8.5	+20	2.5	+28	2.0	2.0	+12	520	IX8
AWT-18067	8-18	36	44	—/7.5	+20	3.0	+28	2.0	2.0	+12	600	IX8

Notes:

1. See case drawing for connector options.
2. 4.0 dB noise figure versions are available on special request.

WIDEBAND SMALL SIGNAL AMPLIFIERS

12.0 to 18.0 GHz FREQUENCY RANGE

AMT — High Performance Connectorized Amplifier Series

AMT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Typ./Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AMT-18032	12-18	14	20	5.5/6.5[1]	+13[2]	1.0	+21	2.0	2.0	+12	140	IX2
AMT-18033	12-18	20	26	5.0/6.5[1]	+13[2]	1.0	+21	2.0	2.0	+12	190	IX4
AMT-18034	12-18	26	32	5.0/6.5[1]	+15[2]	1.0	+23	2.0	2.0	+12	260	IX4
AMT-18035	12-18	32	38	5.0/6.5[1]	+15[2]	1.5	+23	2.0	2.0	+12	310	IX6
AMT-18036	12-18	38	44	5.0/6.5[1]	+15[2]	1.5	+23	2.0	2.0	+12	360	IX6
AMT-18037	12-18	44	50	5.0/6.5[1]	+15[2]	2.0	+23	2.0	2.0	+12	410	IX8

AMT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +100°C Case Temperature

AMT-18044	12-18	20	25	—/7.5	+12	2.0	+20	2.0	2.0	+12	290	IX6
AMT-18045	12-18	25	30	—/7.5	+15	2.5	+23	2.0	2.0	+12	350	IX6
AMT-18046	12-18	30	36	—/7.5	+15	2.5	+23	2.0	2.0	+12	440	IX8
AMT-18047	12-18	36	44	—/7.5	+18	3.0	+26	2.0	2.0	+12	410	IX8
AMT-18048	12-18	42	50	—/7.5	+18	3.0	+26	2.0	2.0	+12	570	IX10

Notes:

1. 4.0 dB noise figure versions are available on special request.
2. +20 dBm at 1 dB compression versions are available on special request.

1.0 to 20.0 GHz FREQUENCY RANGE

ULTRA - WIDEBAND SMALL SIGNAL AMPLIFIERS

AFT — Avanpak Series Amplifiers, Connectorized or Stripline Compatible
AWT—High Performance Connectorized Amplifier Series

AFT Series
Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type[1]
AFT-18232	2-18	9.0	17	10.0	+10	2.0	+18	2.2	2.2	+12	225	AX2
AFT-18234	2-18	18.0	28	10.0	+10	4.0	+18	2.2	2.2	+12	425	AX2

AWT Series
Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AWT-12133	1-12.4	14.5	19	8.5	+10	1.5	+18	2.2	2.2	+12	275	IX4
AWT-12134	1-12.4	20.0	27	8.5	+10	2.0	+18	2.2	2.2	+12	365	IX4
AWT-12135	1-12.4	25.0	34	8.5	+10	2.5	+18	2.2	2.2	+12	455	IX6
AWT-19133	1-19	14.5	19	10.5	+10	2.0	+18	2.2	2.2	+12	275	IX4
AWT-19134	1-19	20.0	27	10.5	+10	2.5	+18	2.2	2.2	+12	365	IX4
AWT-19135	1-19	25.0	34	10.5	+10	3.0	+18	2.2	2.2	+12	455	IX6
AWT-18233	2-18	14.5	19	10.0	+10	1.5	+18	2.2	2.2	+12	275	IX4
AWT-18234	2-18	20.0	27	10.0	+10	2.0	+18	2.2	2.2	+12	365	IX4
AWT-18235	2-18	25.0	34	10.0	+10	2.5	+18	2.2	2.2	+12	455	IX6
AWT-18236	2-18	30.0	40	10.0	+10	3.0	+18	2.2	2.2	+12	545	IX6
(N) **AWT-18273**	2-18	14.5	19	8.0	+10	1.5	+18	2.2	2.2	+12	275	IX2
(N) **AWT-18274**	2-18	20.0	27	8.0	+10	2.0	+18	2.2	2.2	+12	365	IX2
(N) **AWT-18275**	2-18	25.0	34	8.0	+10	2.5	+18	2.2	2.2	+12	455	IX4
(N) **AWT-18276**	2-18	30.0	40	8.0	+10	3.0	+18	2.2	2.2	+12	545	IX4
AWT-18252	2-18	10.0	15	10.0	+20	1.0	+28	2.2	2.2	+12	375	IX2
AWT-18253	2-18	15.0	22	10.0	+20	1.5	+28	2.2	2.2	+12	550	IX4
AWT-18254	2-18	20.0	28	10.0	+20	2.0	+28	2.2	2.2	+12	650	IX4
AWT-20233	2-20	14.5	19	11.0	+10	1.5	+18	2.2	2.2	+12	275	IX4
AWT-20234	2-20	20.0	27	11.0	+10	2.0	+18	2.2	2.2	+12	365	IX4
AWT-20235	2-20	25.0	34	11.0	+10	2.5	+18	2.2	2.2	+12	455	IX6
AWT-20236	2-20	30.0	40	11.0	+10	3.0	+18	2.2	2.2	+12	545	IX6

AWT Series — Temperature Compensated
Guaranteed Specifications @ -54°C to +100°C Case Temperature

AWT-18244	2-18	18	26	11.0	+9	3.0	+17	2.2	2.2	+12	425	IX4
AWT-18245	2-18	22	31	11.0	+9	3.5	+17	2.2	2.2	+12	510	IX6
AWT-18246	2-18	26	36	11.0	+9	4.0	+17	2.2	2.2	+12	600	IX6

(N)- New product offering

Note 1: See case drawing for connector options.

WIDEBAND SMALL SIGNAL AMPLIFIERS

8.0 to 20.0 GHz FREQUENCY RANGE

AMT — High Performance Connectorized Amplifier Series
AWT — High Performance Connectorized Amplifier Series

AMT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AMT-20032	12-20	10	14	7.0	+17.0	1.0	+25	2.0	2.0	+12	175	IX2
AMT-20033	12-20	15	20	7.0	+17.0	1.0	+25	2.0	2.0	+12	250	IX4
AMT-20034	12-20	21	27	7.0	+17.0	1.5	+25	2.0	2.0	+12	325	IX4
AMT-20035	12-20	26	33	7.0	+17.0	1.5	+25	2.0	2.0	+12	400	IX6
AMT-20036	12-20	32	40	7.0	+17.0	2.0	+25	2.0	2.0	+12	475	IX6

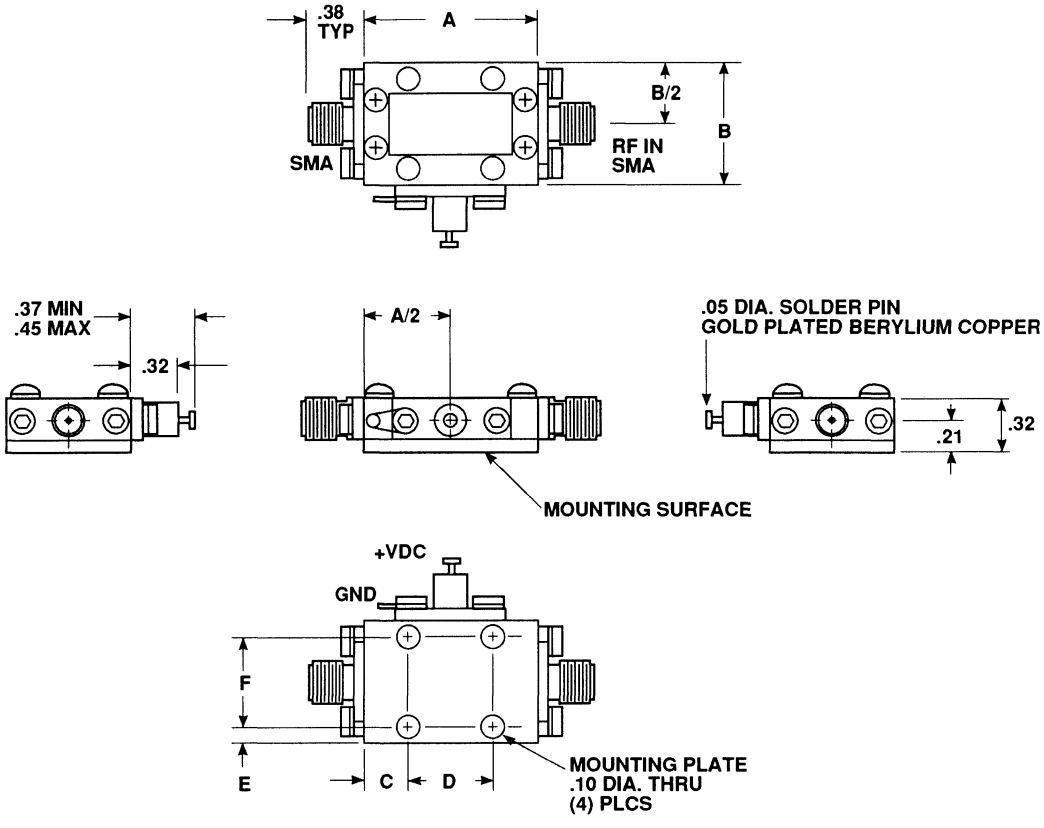
AWT Series

Guaranteed Specifications @ 25°C Case Temperature

AWT-20832	8-20	10	14	8.0	+16.0	1.0	+24	2.0	2.0	+12	175	IX2
AWT-20833	8-20	15	20	8.0	+16.0	1.0	+24	2.0	2.0	+12	250	IX4
AWT-20834	8-20	21	27	8.0	+16.0	1.5	+24	2.0	2.0	+12	325	IX4
AWT-20835	8-20	26	33	8.0	+16.0	1.5	+24	2.0	2.0	+12	400	IX6
AWT-20836	8-20	32	40	8.0	+16.0	2.0	+24	2.0	2.0	+12	485	IX6

AFT Series: Avanpak™ SMA Package

Female input and output connectors are the standard. If any other connectors are desired, please add the appropriate suffix, as shown in the table below, to the AFT model number.



CASE	DIMENSION						WEIGHT TYP GRAMS
	A	B	C	D	E	F	
AX2	1.364	.664	.31	.750	.07	.524	35
AC2	1.500	.764	.34	.826	.07	.624	35
AS2	1.500	.862	.34	.826	.07	.722	40
AX4	1.850	.664	.31	1.236	.07	.524	45
AC4	2.170	.764	.672	.826	.07	.624	55
AS4	2.170	.862	.672	.826	.07	.722	57
AX6	2.336	.664	.307	1.722	.07	.524	53

NOTES (UNLESS OTHERWISE SPECIFIED):

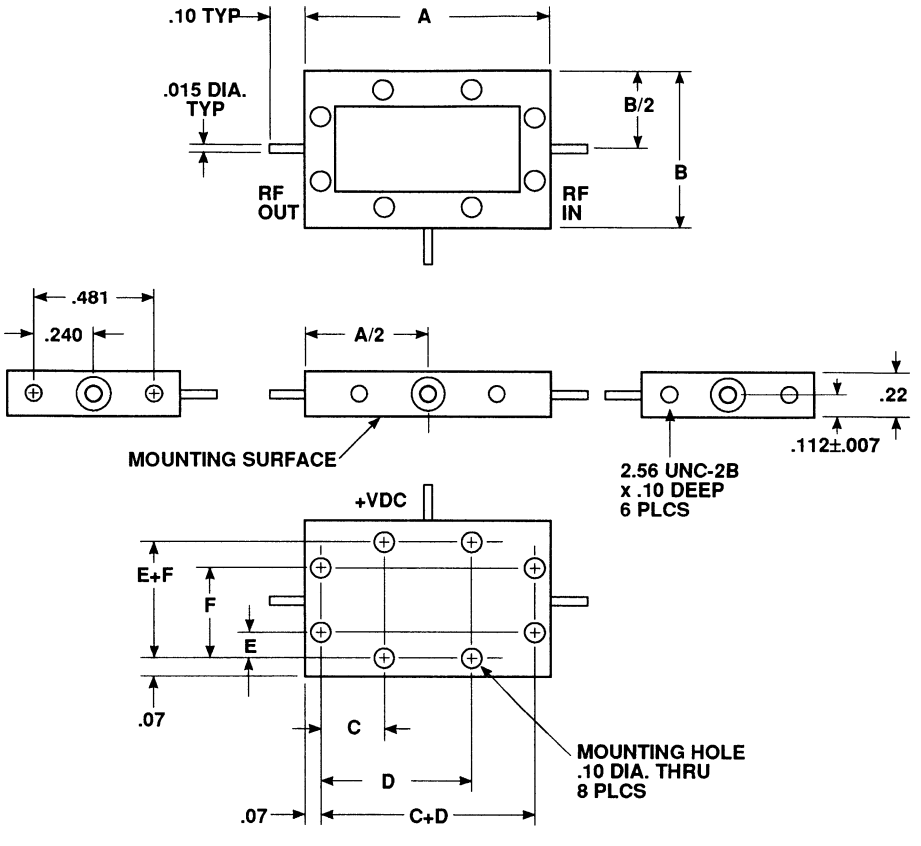
1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .02
   .XXX ± .010

CONNECTOR OPTION TABLE

SUFFIX	INPUT	OUTPUT
-10F	FEM	FEM
-30F	MALE	MALE
-40F	MALE	FEM
-50F	FEM	MALE

AFT Series: Avanpak™ PIN Package Dimensions - connectors and baseplate removed.

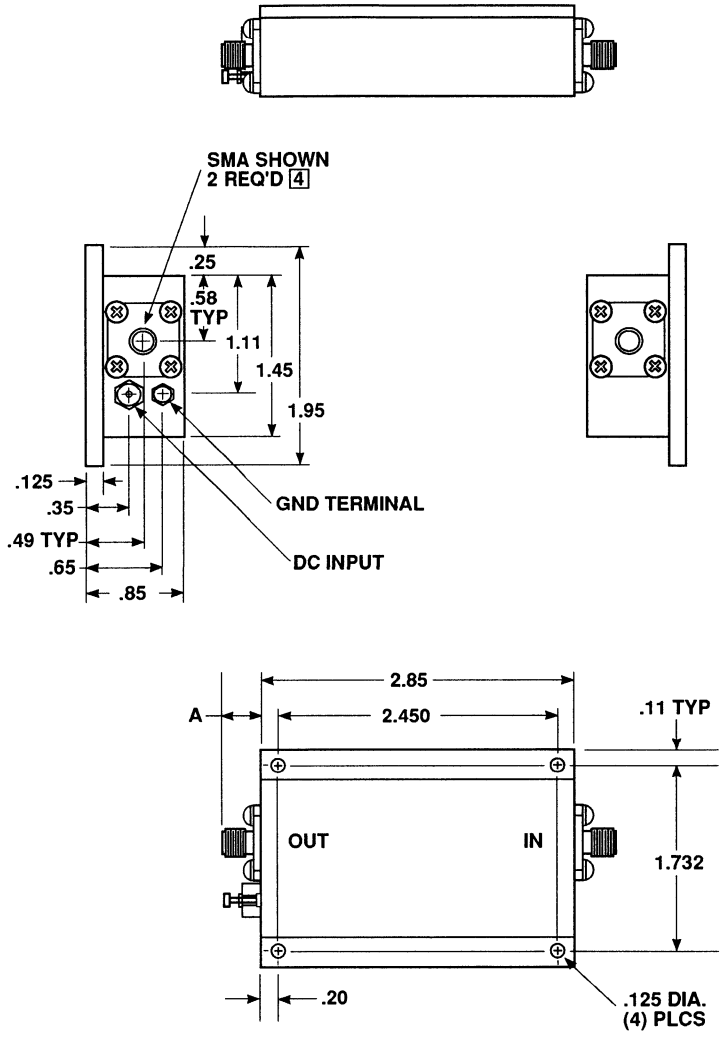
All Avanpaks are supplied with connectors installed; however, they may be removed by the user. If DC filtercon is removed, the user may need to provide external filtering.



CASE	DIMENSION						WEIGHT TYP GRAMS
	A	B	C	D	E	F	
AX2	1.364	.664	.237	.987	.137	.387	26
AC2	1.500	.764	.267	1.093	.187	.437	26
AS2	1.500	.862	.267	1.093	.236	.486	31
AX4	1.850	.664	.237	1.473	.137	.387	36
AC4	2.170	.764	.602	1.428	.187	.437	46
AS4	2.170	.862	.602	1.428	.236	.486	48
AX6	2.336	.664	.237	1.959	.137	.387	44

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
3. MATERIAL:
   BODY AND RF CONNECTORS — 30 STAINLESS STEEL
   MOUNTING SPACER — ALUMINUM ALLOY
   FILTER BODY — NICKEL PLATED BRASS



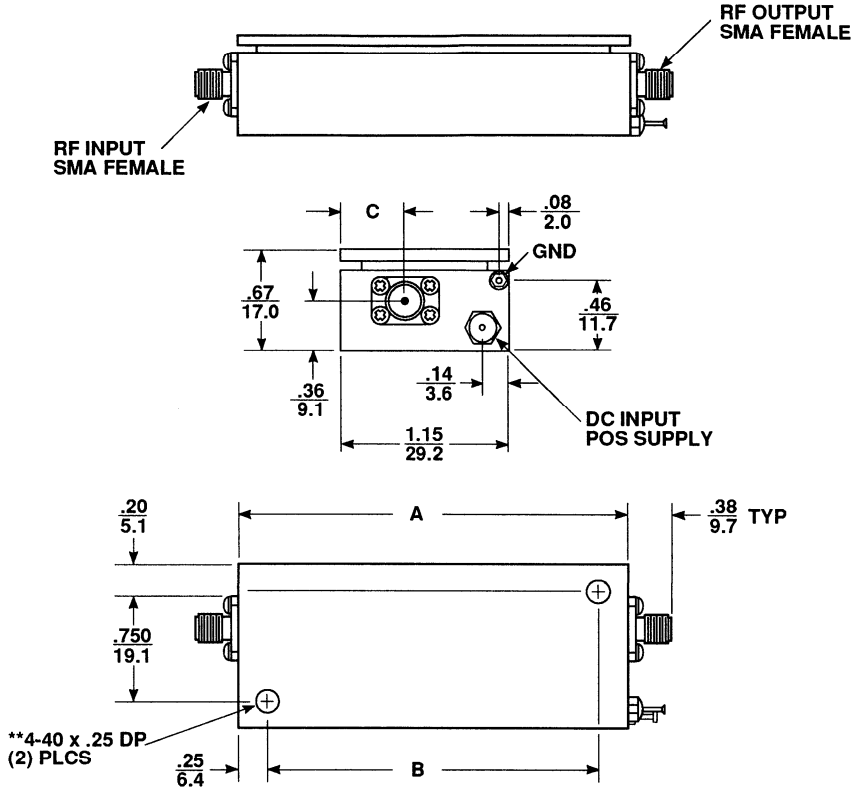
CONNECTOR	"A" DIMENSION
SMA	.40 MAX
TNC	.75 MAX
N	.75 MAX
BNC	.75 MAX

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .02
   .XXX ± .010
3. CASE MATERIAL: ALODINED ALUMINUM

4 CONNECTOR OPTIONS: SMA, N, TNC, BNC

AMT/AWT Series



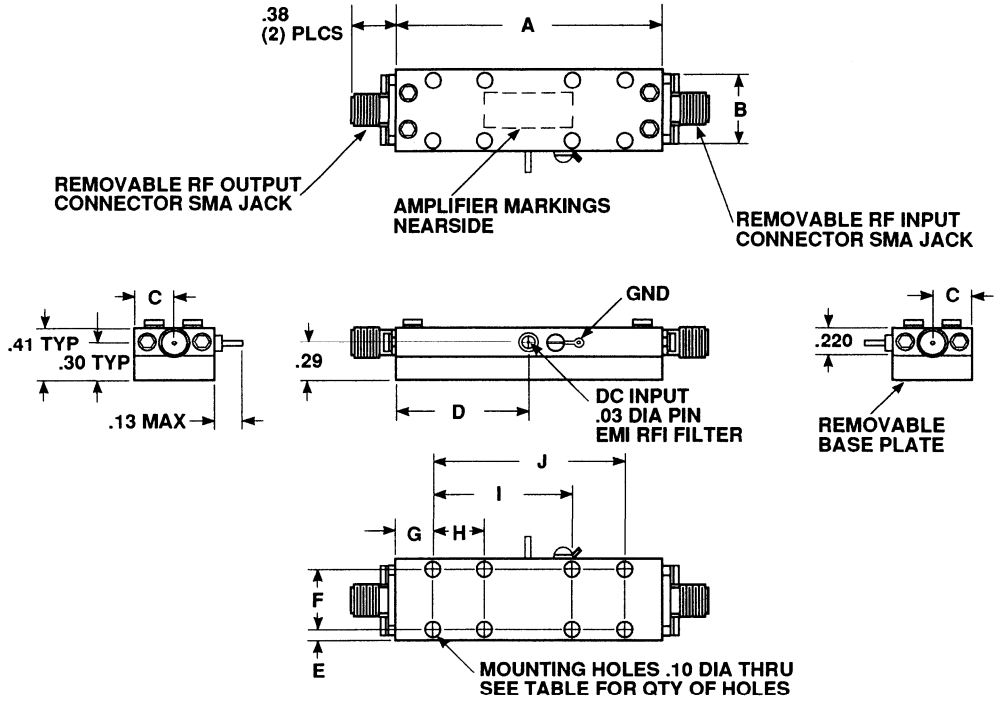
CASE	DIMENSION						WEIGHT	
	A		B		C			
	IN	MM	IN	MM	IN	MM	OZ	GMS
IS2	1.417	35.9	.917	23.2	.375	9.5	2	47
IS4	2.083	52.9	1.583	40.2	.375	9.5	3	68
IS6	2.750	69.8	2.250	57.1	.375	9.5	4	90
IC2	1.417	35.9	.917	23.2	.465	11.8	2	47
IC4	2.083	52.9	1.583	40.2	.465	11.8	3	68
IC6	2.750	69.8	2.250	57.1	.465	11.8	4	90
IX2	1.250	31.8	.750	19.1	.510	13.0	2	47
IX4	1.750	44.4	1.250	31.7	.510	13.0	2	58
IX6	2.250	57.1	1.750	44.4	.510	13.0	3	78
IX8	2.750	69.8	2.250	57.1	.510	13.0	4	92
IX10	3.250	82.5	2.750	69.8	.510	13.0	4	108

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN $\frac{\text{INCHES}}{\text{MM}}$
2. TOLERANCES: .XX ± .02
   .XXX ± .010
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING

**AVAILABLE WITH METRIC THREAD M3 ON REQUEST.
NO THREADS FIRST .062"

SELECTED AMPLIFIERS AVAILABLE IN THE I-SERIES CASE SHOWN ON THE PREVIOUS PAGE ARE ALSO AVAILABLE IN THIS MA-SERIES CASE. INTERNAL DC FILTERING IS PROVIDED ON THE DC TERMINAL. CONTACT AVANTEK APPLICATIONS ENGINEERING FOR FURTHER INFORMATION.



CASE	DIMENSION										QTY OF HOLES
	A	B	C	D	E	F	G	H	I	J	
MAX2	1.364	.664	.332	.68	.07	.524	.31	N/A	N/A	.750	4
MAC2	1.500	.764	.382	.75	.07	.624	.34	N/A	N/A	.826	4
MAS2	1.500	.862	.431	.75	.07	.722	.34	N/A	N/A	.826	4
MAX3	1.607	.664	.332	.80	.07	.524	.31	N/A	N/A	.992	4
MAC3	1.833	.764	.382	.75	.07	.624	.34	N/A	N/A	1.159	4
MAS3	1.833	.862	.431	.75	.07	.722	.34	N/A	N/A	1.159	4
MAX4	1.850	.664	.332	.92	.07	.524	.31	N/A	N/A	1.238	4
MAC4	2.170	.764	.382	1.08	.07	.624	.67	N/A	N/A	.826	4
MAS4	2.170	.862	.431	1.08	.07	.722	.67	N/A	N/A	.826	4
MAX5	2.093	.664	.332	1.04	.07	.524	.31	N/A	N/A	1.478	4
MAC5	2.503	.764	.382	1.08	.07	.624	.67	N/A	N/A	1.159	4
MAS5	2.503	.862	.431	1.08	.07	.722	.67	N/A	N/A	1.159	4
MAX6	2.336	.664	.332	1.17	.07	.524	.31	.483	1.239	1.722	8
MAC6	2.836	.764	.382	1.41	.07	.624	.67	N/A	N/A	1.491	4
MAS6	2.836	.862	.431	1.41	.07	.722	.67	N/A	N/A	1.491	4
MAX7	2.579	.664	.332	1.29	.07	.524	.31	.483	1.478	1.965	8
MAX8	2.822	.664	.332	1.41	.07	.524	.31	.483	1.722	2.207	8

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .02
   .XXX ± .010
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING

AGT Series 823x Amplifiers

Features
- 2-8 GHz
- 10 and 20 dB of Gain Control
- Small Signal Gain of 25 and 45 dB
- 0-10 Volts @ <10 mA typical

AGT Series 1863x Amplifiers

Features
- 6-18 GHz
- 10 and 20 dB of Gain Control
- Small Signal Gain of 25 and 45 dB
- 0-10 Volts @ <10 mA typical

Description

Both the AGT 823x series and the AGT 1863x series provide a continuously variable gain control over two key wideband frequency ranges, providing the system designer with increased dynamic range and the ability to set signal levels.

The AGT series uses dual-gate GaAs FET variable gain modules that respond rapidly (less than 10 µs) to 0 to +10 VDC control voltage inputs. Control current drain is low (typically less that 10 mA) simplifying control driver requirements. The variable gain control modules are combined with Avantek's high performance GaAs FET fixed-gain modules to provide both low noise figure and medium power output over the entire multi-octave frequency bands.

Temperature Compensation using the Gain Control

The gain control provided in both AGT series may be used to provide temperature compensation for gain variation within the amplifier. The user can determine the actual gain change over temperature exhibited by the amplifier and/or other system elements. The amplifier should then be set up to provide a zero gain reduction at the high temperature, and the gain control voltage then linearly increased to provide the appropriate gain.

2-8 GHz
6-18 GHz

WIDEBAND GAIN CONTROL AMPLIFIERS

AGT Series

Guaranteed Specifications @ 25°C Case Temperature

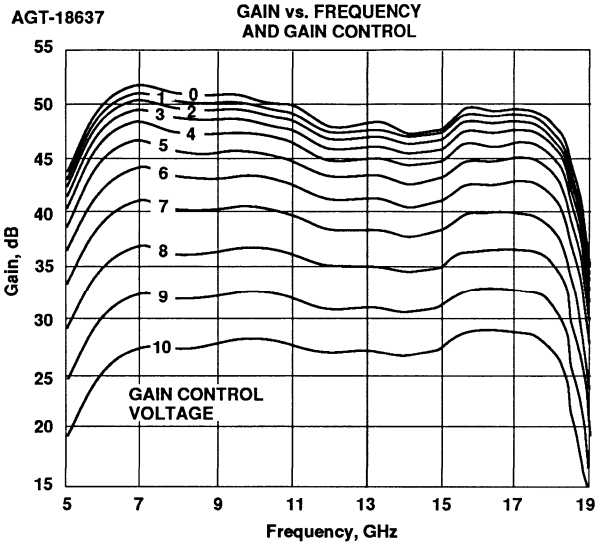
Model	Frequency Response Minimum (GHz)	Small Signal Gain Minimum with NO Gain Control (dB)	MAX Gain Control Range[1] (dB)	Noise Figure Maximum @ NO Gain Control (dB)	Noise Figure Maximum @ MAX Gain Control (dB)	Power Output for 1dB Gain Compression Minimum with NO Gain Control (dBm)	Power Output for 1dB Gain Compression Minimum @MAX Gain Control (dBm)	Gain Flatness Maximum (±dB)	Typical Third-Order Intercept Point ABOVE 1 dB Compression (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage[2] (VDC)	Input Power Typical Current (mA)	Case Type[3]
AGT-8233	2-8	25	10	5.5	7.0	+15	+12	2.0	8.0	2.0	2.0	+12	300	IC4
AGT-8235	2-8	45	20	5.5	7.0	+15	+12	3.0	8.0	2.0	2.0	+12	500	IC6
AGT-18634	6-18	25	10	6.0	7.0	+15	+10	2.0	8.0	2.0	2.0	+12	300	IX4
AGT-18637	6-18	45	20	6.0	8.0	+15	+12	3.5	8.0	2.0	2.0	+12	500	IX8

NOTES:

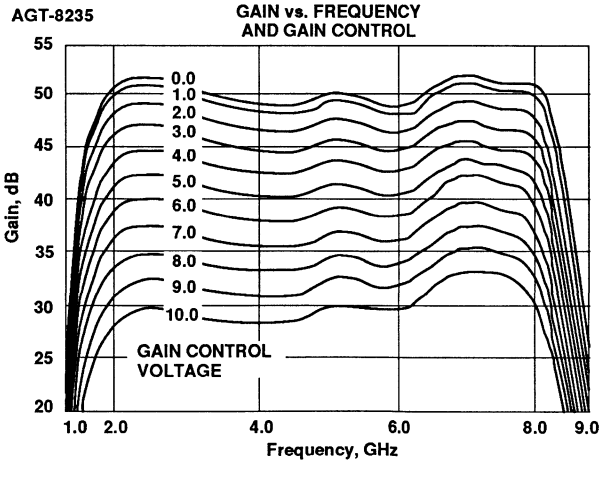
1. Gain control voltage:
   0 to +10 VDC maximum. No gain control for 0 VDC.
   Increasing gain control voltage decreases amplifier gain.
   Maximum gain control (minimum gain) at +10 VDC Maximum.
   Gain control current:
   10 dB control range <5 mA typical
   20 dB control range <10 mA typical
2. Contains integral voltage regulator permitting operation from unregulated +12 to +15 VDC power supply. Specified current is typical at +12 VDC.
3. Case is the standard type indicated except for the addition of the AGC control via a Selectro Nanohex connector.

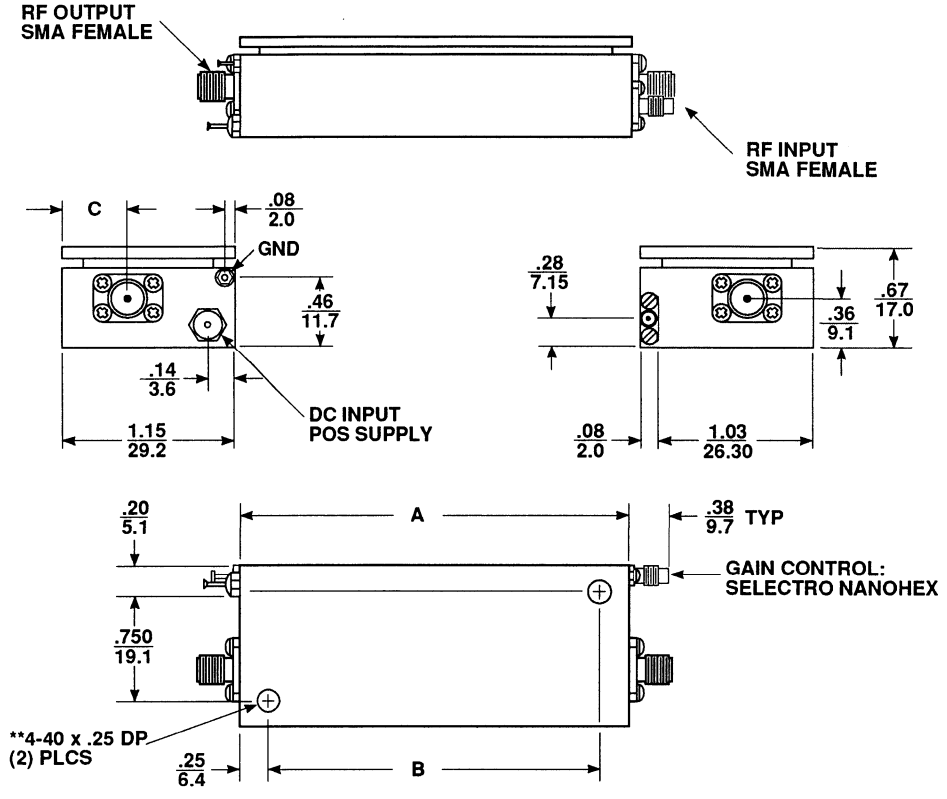
Typical Performance @ 25°C Case Temperature

AGT-18637



AGT-8235





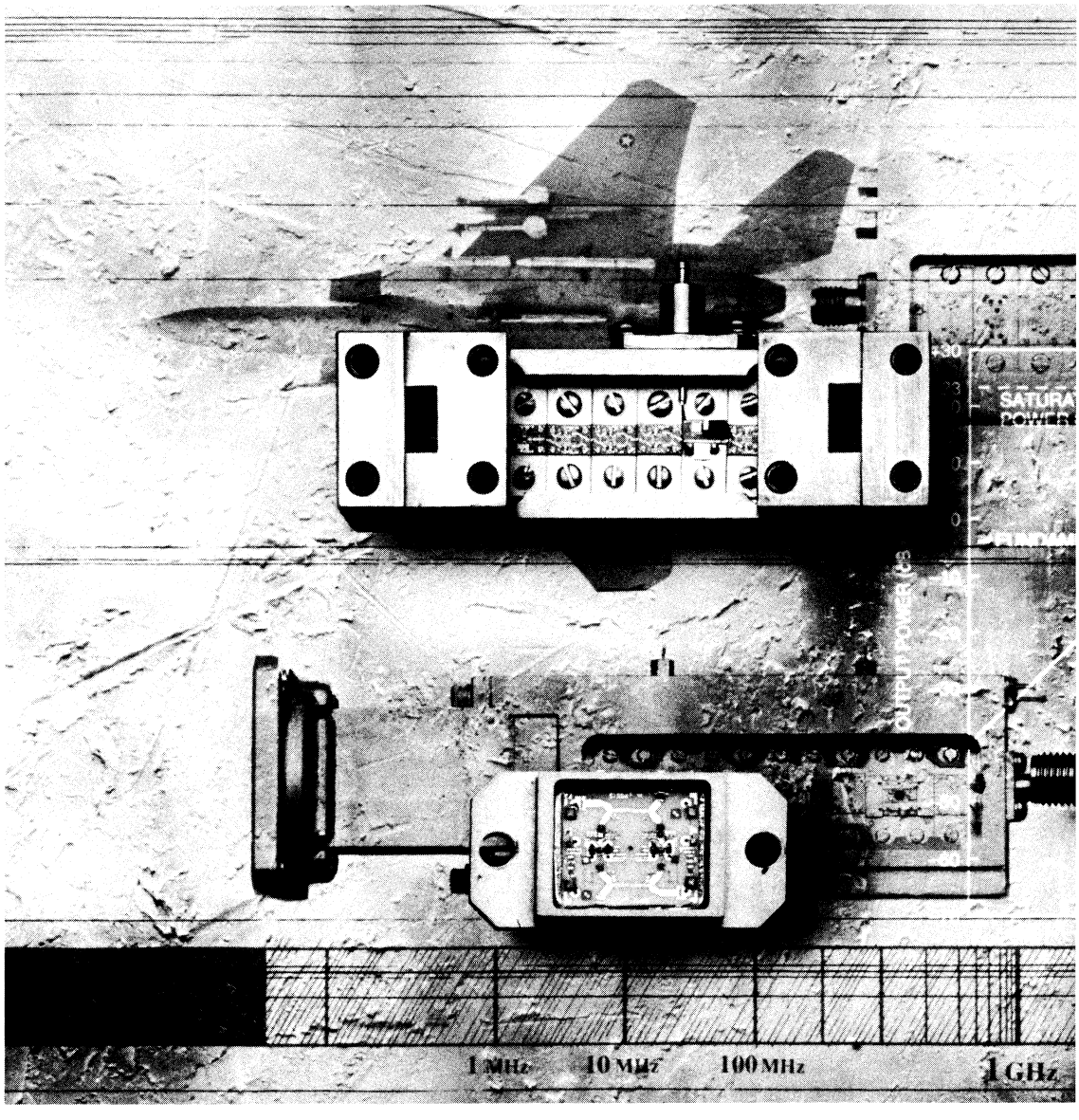
CASE	DIMENSION						WEIGHT	
	A		B		C		OZ	GMS
	IN	MM	IN	MM	IN	MM	TYP	TYP
IC4	2.083	52.9	1.583	40.2	.465	11.8	3	68
IC6	2.750	69.8	2.250	57.1	.465	11.8	4	90
IX4	1.750	44.4	1.250	31.7	.510	13.0	2	58
IX8	2.750	69.8	2.250	57.1	.510	13.0	4	92

NOTES (UNLESS OTHERWISE SPECIFIED):

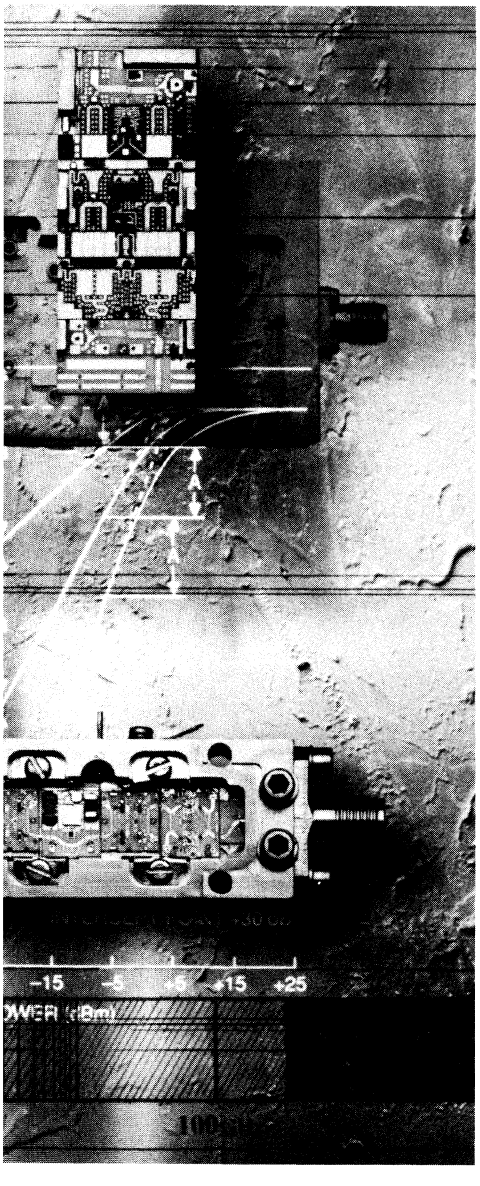
1. DIMENSIONS ARE SPECIFIED IN $\frac{\text{INCHES}}{\text{MM}}$
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010

ALL TOLERANCES BEFORE PAINT AND/OR LABELING

**AVAILABLE WITH METRIC THREAD M3 ON REQUEST.
NO THREADS FIRST .062"


1 MHz
10 MHz
100 MHz
1 GHz

3. Millimeter Wave Amplifiers and Multipliers



Wideband Millimeter Amplifiers

AMT Series 18-40 GHz

AWT Series 18-40 GHz

Narrowband Millimeter Amplifiers

AMT Low Noise Series 35, 44 and 60 GHz

AMT Series Power Amplifiers 35 and 44 GHz

Frequency Doublers and Quadruplers

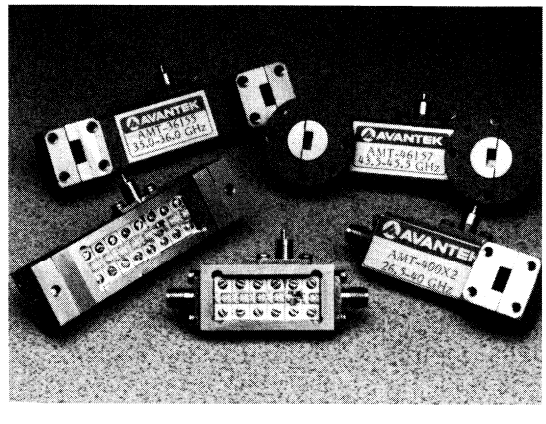
AMT Series 18-26.5, 26.5-40 and 44 GHz

TWT Replacement Amplifiers

ATR Series 18-26.5 and 26.5-40 GHz

Millimeter DownConverter Assemblies

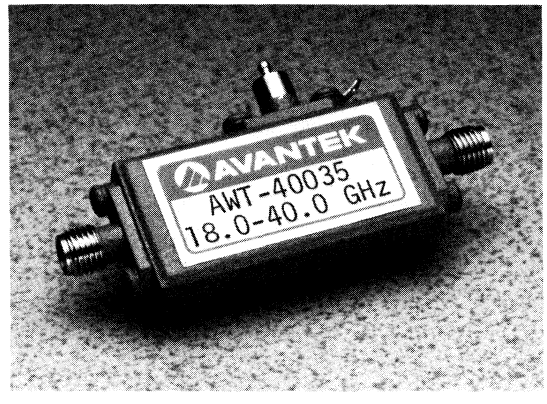
AFC Series



Features

- **High Performance, Wide Band**
- **18 through 40 GHz**
- **Low Noise Figure**
- **Wide Dynamic Range**

AMT/AWT Series 18–40 GHz.



Description

The AMT/AWT series provides premium performance over octave (AMT) and multi-octave (AWT) bands at 25°C. Temperature compensated amplifiers are specified over full military temperature ranges up to +71°C.

AMT/AWT series amplifiers are ideal for specification in performance driven applications in commercial and military systems. These amplifiers have a wide range of gain options, typically up to 45-50 dB, and are optimized for noise figure and dynamic range, consistent with the best technology available. A complete range of performance specifications is standard on these series and specifications are guaranteed over the specified temperature range.

The IK series packaging is a hermetically-sealed machined aluminum housing. Options are available for waveguide WR42, WR28, and WR22 as well as field-replaceable 3mm coaxial connectors. These options are available for either the input or output RF port and can be ordered in combinations, e.g. waveguide input and coax output. Case length varies depending on the amount of gain or number of functions needed.

18.0 to 26.5 GHz FREQUENCY RANGE

WIDEBAND MILLIMETER AMPLIFIERS

AMT Series—High Performance Connectorized Amplifiers

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AMT-21034	20.2-21.2	30	36	3.25	+12	1.00	+19	1.5	1.5	+12	325	IK4
AMT-26132	18-26.5	11	16	7.0	+12	1.00	+19	2.2	2.2	+12	160	IK2
AMT-26133	18-26.5	17	22	6.0	+12	1.25	+19	2.2	2.2	+12	200	IK4
AMT-26134	18-26.5	23	28	6.0	+12	1.50	+19	2.2	2.2	+12	280	IK4
AMT-26135	18-26.5	25	31	7.0	+21	2.50	+28	2.2	2.2	+12	1050	IK4
AMT-26136	18-26.5	30	36	7.0	+21	2.50	+28	2.2	2.2	+12	1100	IK6
(N) **AMT-26158**	18-26.5	30	36	7.0	+23	2.50	+30	2.2	2.2	+12	1200	IK6R[1]
AMT-26137	18-26.5	37	45	7.0	+21	3.00	+28	2.2	2.2	+12	1150	IK6
(N) **AMT-26175**	18-26.5	25	31	5.5	+12	2.50	+19	2.2	2.2	+12	380	IK4
(N) **AMT-26176**	18-26.5	30	36	5.5	+12	2.50	+19	2.2	2.2	+12	460	IK6
(N) **AMT-26177**	18-26.5	37	45	5.5	+12	3.00	+19	2.2	2.2	+12	540	IK6

AMT Series —Temperature Compensated Connectorized Amplifiers

Guaranteed Specifications @ -54° to +71°C Case Temperature

AMT-21044	20.2-21.2	30	36	3.5	+10	1.5	+17	1.5	1.5	+12	375	IK6
AMT-26145	18-26.5	20	27	9.5	+12	2.5	+19	2.2	2.2	+12	400	IK6
AMT-26146	18-26.5	26	34	9.0	+12	3.0	+19	2.2	2.2	+12	440	IK6
AMT-26147	18-26.5	31	39	9.0	+12	3.0	+19	2.2	2.2	+12	480	IK8
AMT-26148	18-26.5	38	46	9.0	+12	3.0	+19	2.2	2.2	+12	520	IK8
(N) **AMT-26185**	18-26.5	20	27	8.5	+12	2.5	+19	2.2	2.2	+12	400	IK6
(N) **AMT-26186**	18-26.5	26	34	8.0	+12	3.0	+19	2.2	2.2	+12	440	IK6
(N) **AMT-26187**	18-26.5	31	39	8.0	+12	3.0	+19	2.2	2.2	+12	480	IK8
(N) **AMT-26188**	18-26.5	38	46	8.0	+12	3.0	+19	2.2	2.2	+12	520	IK8

Note: Maximum safe input power: +10 dBm

AMT Series—Power Amplifiers

Preliminary Specifications @ 25°C Case Temperature

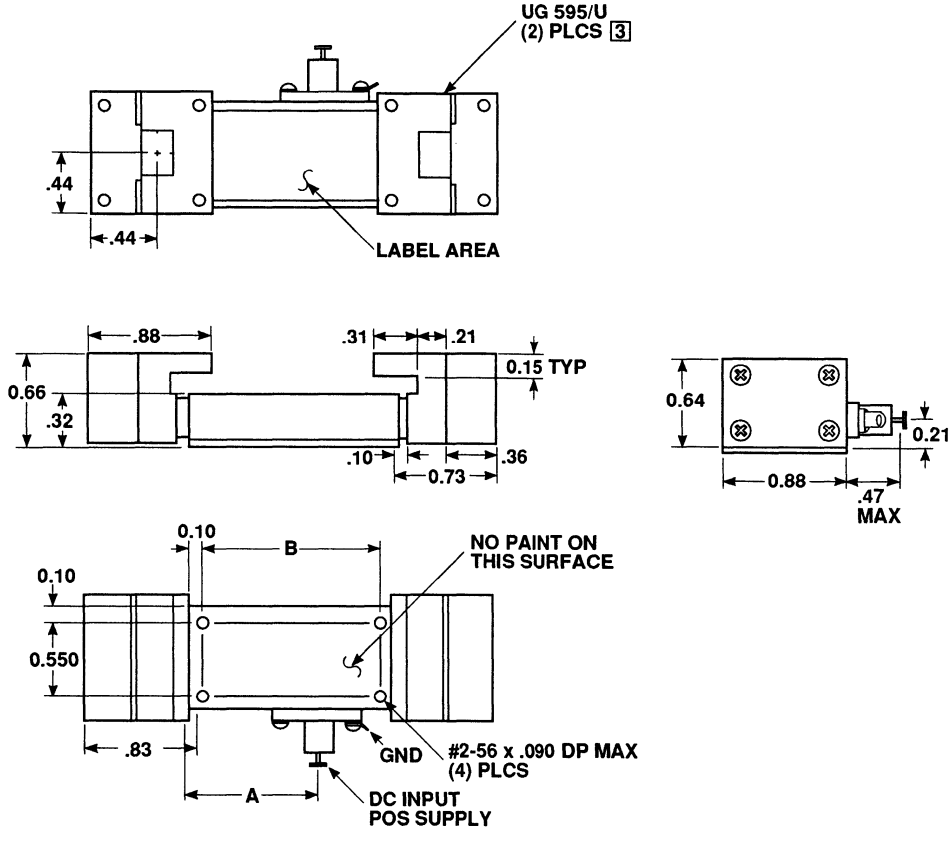
Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Saturated Output Power (dBm) Minimum	VSWR Maximum In	VSWR Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
(N) **AMT-24158**	20-24	29	26	2.2	2.2	+12	1070	IK6R[1]
(N) **AMT-27056**	24-27	25	22	2.2	2.5	+12	560	IK4

(N) - New product offering

Notes: Maximum safe input power: +10 dBm
1. Contact Applications Engineering for case drawing.

The following RF connector options are available for the amplifiers on this page. Please specify option suffix at the time of order.

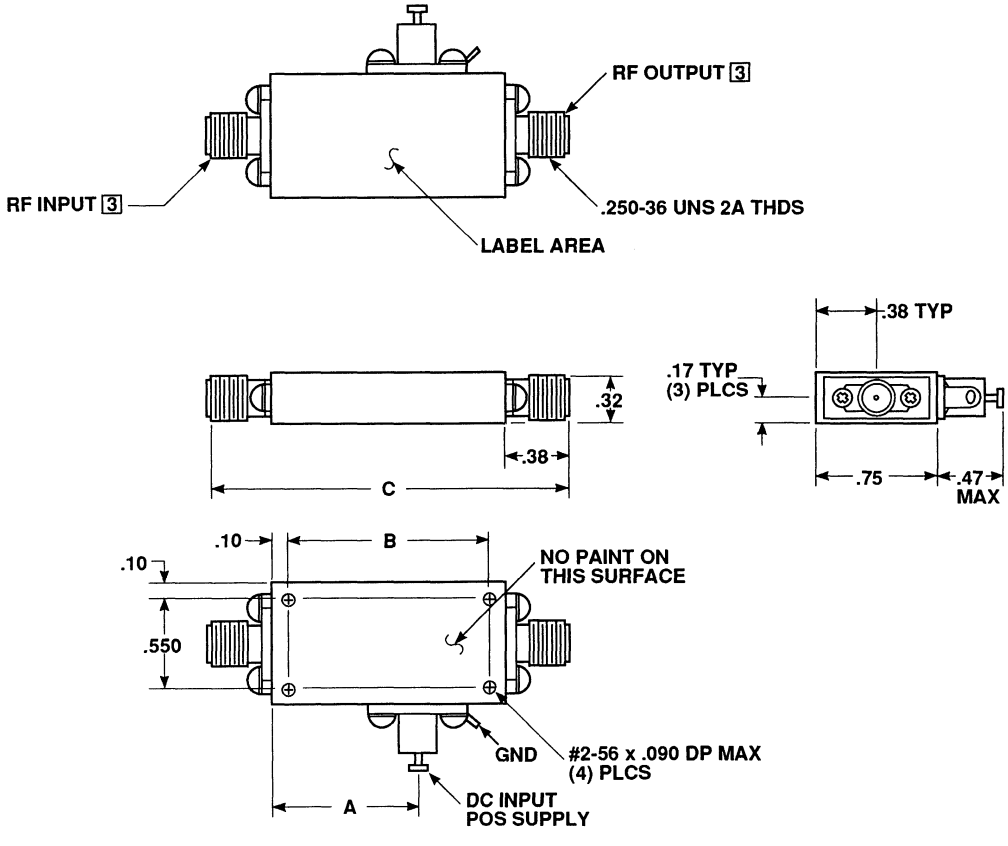
		INPUT	
		WG WR42	3 mm COAX
OUTPUT	WG WR42	-11	-31
	3 mm COAX	-13	-33



CASE	DIMENSION	
	A	B
IK2	0.36	0.708
IK4	0.95	1.303
IK6	1.15	1.697
IK8	1.35	2.095

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3 RF INPUT/OUTPUT CONNECTOR:
   WR-42,UG 595/U



CASE	DIMENSION		
	A	B	C
IK2	0.36	0.708	1.66
IK4	0.95	1.303	2.25
IK6	1.15	1.697	2.65
IK8	1.35	2.095	3.05

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3. RF INPUT/OUTPUT CONNECTOR:
   3 MM SMA COMPATIBLE

AWT — High Performance and Temperature Compensated Connectorized Amplifier Series

AWT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AWT-40032	18-40	8.0	14.0	9.0	+6	1.0	+13	3.0	3.0	+12	110	IK2
AWT-40034	18-40	15.0	21.0	9.0	+6	2.0	+13	3.0	3.0	+12	200	IK4
AWT-40035	18-40	21.0	28.0	8.0	+10	2.0	+16	3.0	3.0	+12	250	IK4
AWT-40036	18-40	24.0	32.0	8.0	+10	2.0	+16	3.0	3.0	+12	300	IK6
AWT-40038	18-40	33.5	42.5	8.0	+10	3.0	+16	3.0	3.0	+12	400	IK8
AWT-40039	18-40	39.5	49.5	8.0	+10	4.0	+16	3.0	3.0	+12	450	IK8

AWT Series — Temperature Compensated

Guaranteed Specifications @ -54° to +71°C Case Temperature

AWT-40046	18-40	17.0	25.0	10.0	+6	3.0	+13	3.0	3.0	+12	375	IK6
AWT-40048	18-40	24.5	34.5	10.0	+6	3.0	+13	3.0	3.0	+12	475	IK8
AWT-40410	18-40	32.5	43.5	10.0	+6	3.5	+13	3.0	3.0	+12	575	IK10

Note: Maximum safe input power: +10 dBm

AWT Series—Power Amplifiers

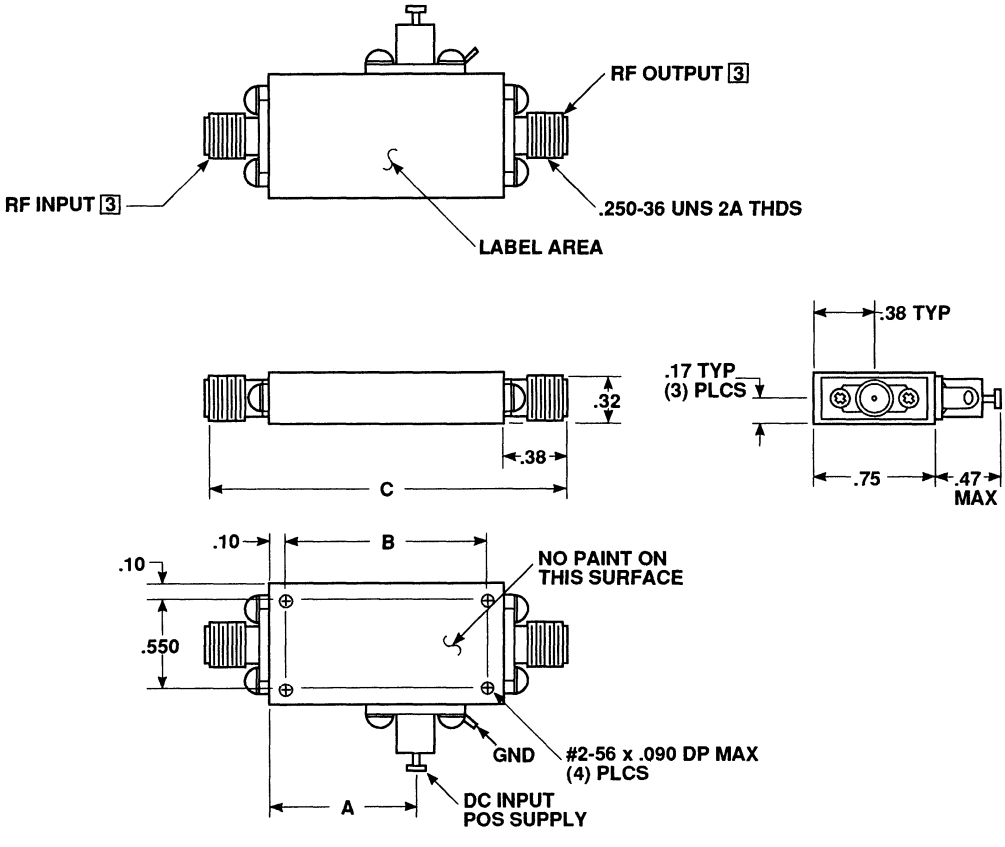
Preliminary Specifications @ 25°C Case Temperature

	Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Saturated Output Power (dBm) Minimum	VSWR Maximum In	VSWR Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
(N)	**AWT-40058**	18-40	27	15.5	3.0	3.0	+12	620	IK6

(N) - New product offering

Note: Maximum safe input power: +10 dBm

The amplifiers on this page are available only in a coax case style with 3 mm I/O. Please specify option suffix -33 at the time of order.



CASE	DIMENSION		
	A	B	C
IK2	0.36	0.708	1.66
IK4	0.95	1.303	2.25
IK6	1.15	1.697	2.65
IK8	1.35	2.095	3.05

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3 RF INPUT/OUTPUT CONNECTOR:
   3 MM SMA COMPATIBLE

AMT—High Performance and Temperature Compensated Connectorized Amplifier Series

AMT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flat-ness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AMT-40032	26.5-40	10	15	10.0	+6	1.0	+13	2.5	2.5	+12	100	IK2
AMT-40033	26.5-40	13	18	10.0	+6	1.25	+13	2.5	2.5	+12	130	IK4
AMT-40034	26.5-40	20	26	9.0	+10	1.5	+16	2.5	2.5	+12	170	IK4
AMT-40035	26.5-40	27	33	9.0	+10	2.0	+16	2.5	2.5	+12	210	IK4
AMT-40036	26.5-40	31	38	9.0	+10	2.5	+16	2.5	2.5	+12	250	IK6
AMT-40037	26.5-40	38	46	9.0	+10	3.0	+16	2.5	2.5	+12	300	IK6
(N) **AMT-40038**	26.5-40	38	46	9.0	+13	2.5	+19	2.5	2.5	+12	550	IK6
(N) **AMT-40072**	26.5-40	10	15	7.5	+6	1.0	+13	2.5	2.5	+12	100	IK2
(N) **AMT-40073**	26.5-40	13	18	7.5	+6	1.25	+13	2.5	2.5	+12	130	IK4
(N) **AMT-40074**	26.5-40	20	26	7.0	+10	1.5	+16	2.5	2.5	+12	170	IK4
(N) **AMT-40075**	26.5-40	27	33	7.0	+10	2.0	+16	2.5	2.5	+12	210	IK4
(N) **AMT-40076**	26.5-40	31	38	7.0	+10	2.5	+16	2.5	2.5	+12	250	IK6
(N) **AMT-40077**	26.5-40	38	46	7.0	+10	3.0	+16	2.5	2.5	+12	300	IK6

AMT Series —Temperature Compensated

Guaranteed Specifications @ -54° to +71°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flat-ness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
(N) **AMT-40086**	26.5-40	24	32	10.0	+6	2.5	+13	2.5	2.5	+12	325	IK6
(N) **AMT-40087**	26.5-40	27	35	9.0	+6	3.0	+13	2.5	2.5	+12	375	IK8
(N) **AMT-40088**	26.5-40	34	43	9.0	+6	3.5	+13	2.5	2.5	+12	425	IK8
AMT-40046	26.5-40	24	32	11.0	+6	3.0	+13	2.5	2.5	+12	325	IK6
AMT-40047	26.5-40	27	35	10.0	+6	3.5	+13	2.5	2.5	+12	375	IK8
AMT-40048	26.5-40	34	43	10.0	+6	4.0	+13	2.5	2.5	+12	425	IK8

AMT Series—Power Amplifiers

Preliminary Specifications @ 25°C Case Temperature

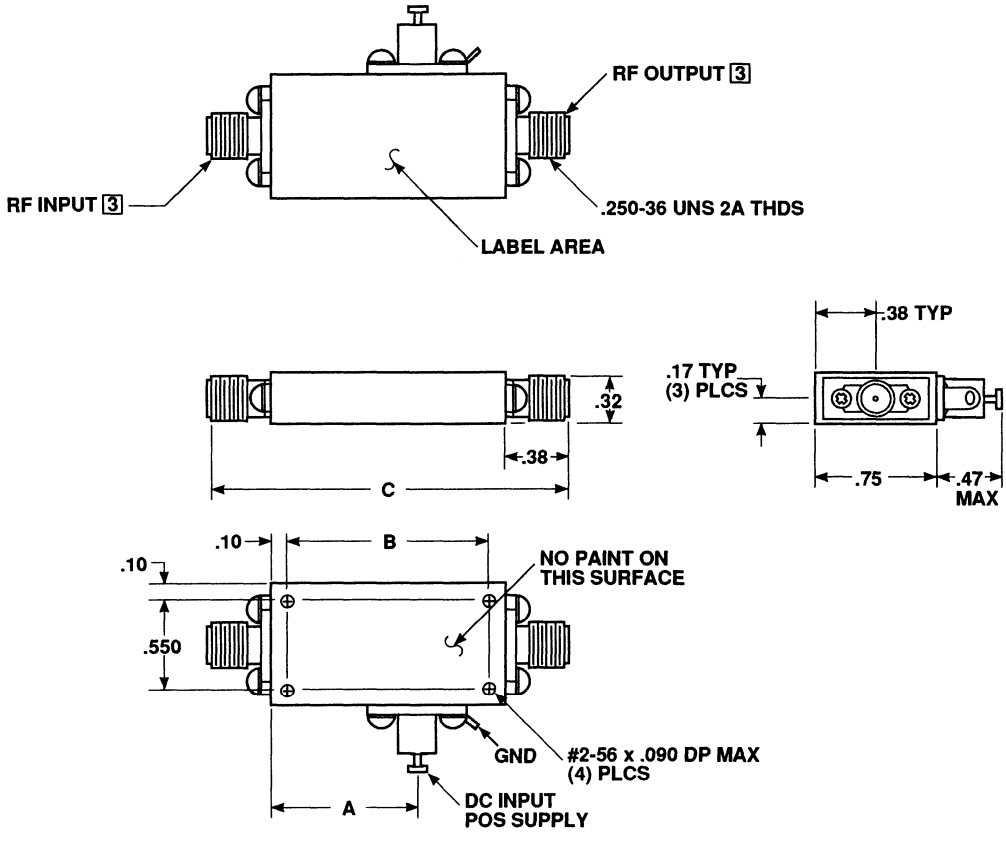
Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Saturated Output Power (dBm) Minimum	VSWR Maximum In	VSWR Maximum Out	Input Power Voltage (+VDC)	Input Power Current (mA) Maximum	Case Type
(N) **AMT-28156**	27-28	27	23	2.2	2.2	+12	760	IK4N[1]
(N) **AMT-40156**	27-30	22	21	2.2	2.2	+12	650	IK4
(N) **AMT-40055**	26.5-40	23	16	3.0	3.0	+12	510	IK4
(N) **AMT-40056**	26.5-40	20	19	2.2	2.2	+12	900	IK4

(N) - New product offering

Notes: Maximum safe input power: +10 dBm
1. Contact Applications Engineering for case drawing.

The following RF connector options are available for the amplifiers on this page. Please specify option suffix at the time of order.

		INPUT	
		WG WR28	3 mm COAX
OUTPUT	WG WR28	-11	-31
	3 mm COAX	-13	-33

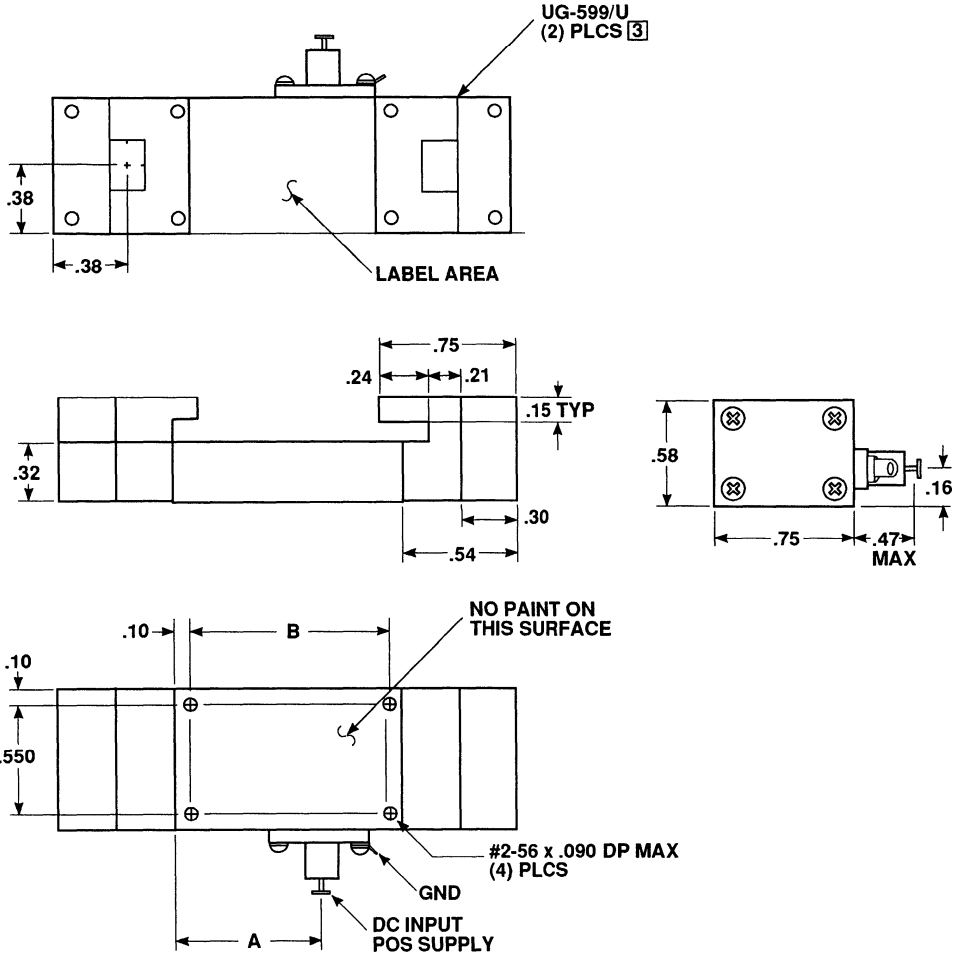


CASE	DIMENSION		
	A	B	C
IK2	0.36	0.708	1.66
IK4	0.95	1.303	2.25
IK6	1.15	1.697	2.65
IK8	1.35	2.095	3.05

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING

3 RF INPUT/OUTPUT CONNECTOR:
3 MM SMA COMPATIBLE



CASE	DIMENSION	
	A	B
IK2	0.36	0.708
IK4	0.95	1.303
IK6	1.15	1.697
IK8	1.35	2.095

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3. RF INPUT/OUTPUT CONNECTOR:
   WR-28,UG 599/U

AVANTEK

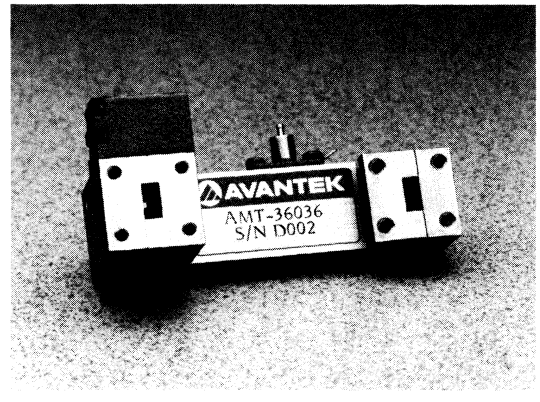
AMT Series

NARROWBAND LOW NOISE and POWER MILLIMETER AMPLIFIERS

Features

- 35, 44 and 60 GHz Frequency Bands
- Low Noise Figure
- Power Levels to +27 dBm
- Compact/Rugged Thin-Film Construction
- Temperature Compensation
- Optional Waveguide Input
- Optional ENR Bit Capability

AMT Series Amplifiers



Description

Avantek's family of small signal gain, low noise and power amplifiers offers coverage of the most needed bands in the electronics defense industry. Typical applications include airborne, shipboard, and ground electronic defense systems, IFF, radar and communications receivers, EHF satellite communications, TDRS uplink, and S-band telemetry.

Avantek's common small packaging offers extremely compact and lightweight amplifiers ideal for incorporation into the latest generation of ECM and radar systems as receiving preamplifiers, drivers, and phase/time delay loops.

Design Features

All the amplifiers in this series incorporate an integral monolithic IC voltage regulator to isolate the gain stages from variations in the DC input voltage. This voltage regulator also offers high rejection of noise and hum appearing on the power supply line and includes circuitry to protect both the regulator and the GaAs FET circuits. Over-voltage and reverse-voltage protection are also provided.

All of the amplifiers in the –25° to +71°C series are temperature compensated to minimize changes in the small signal gain over the wide military temperature ranges. Avantek's rugged and lightweight construction is particularly well-suited to military applications in environments such as MIL-E-5400 and MIL-E-16400.

AMT—High Performance and Temperature Compensated Connectorized Amplifier Series

AMT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (± dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type[1]
AMT-36032	34.5-35.5	12	16	4.5	+6	.75	+13	2.0	2.0	+12	110	IK2
AMT-36033	34.5-35.5	15	20	4.5	+10	.75	+17	2.0	2.0	+12	150	IK4
AMT-36034	34.5-35.5	23	29	4.5	+10	.75	+17	2.0	2.0	+12	200	IK4
AMT-36035	34.5-35.5	31	37	4.2	+10	1.5	+17	2.0	2.0	+12	250	IK4
AMT-36036	34.5-35.5	36	42	4.2	+10	1.5	+17	2.0	2.0	+12	300	IK6

AMT Series —Temperature Compensated

Guaranteed Specifications @ -25° to +71°C Case Temperature

AMT-36044	34.5-35.5	18	25	5.5	+6	1.0	+13	2.0	2.0	+12	275	IK4
AMT-36046	34.5-35.5	30	38	5.5	+10	1.5	+17	2.0	2.0	+12	350	IK6
AMT-36047	34.5-35.5	35	43	5.5	+10	1.5	+17	2.0	2.0	+12	400	IK8

Notes: Maximum safe input power: +10 dBm
1. Waveguide input only with external isolator.

3. MM WAVE

AMT Series—Power Amplifiers

Preliminary Specifications @ 25°C Case Temperature

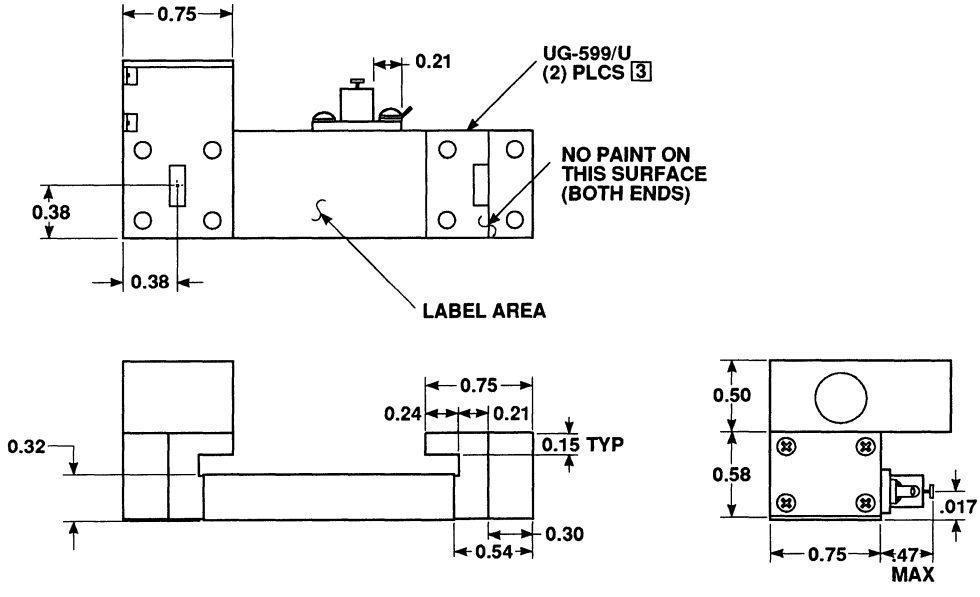
Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Saturated Output Power (dBm) Minimum	VSWR Maximum In	VSWR Maximum Out	Input Power Voltage (+VDC)	Input Power Voltage (–VDC)	Input Power Current (mA) Maximum	Case Type
(N) **AMT-36054**	34.5-35.5	10	27	2.0	2.0	+9	–8	2500	IK4W[1]
(N) **AMT-36057**	34.5-35.5	18	27	2.0	2.0	+9	–8	2750	IK6W[1]
(N) **AMT-36058**	34.5-35.5	23	27	2.0	2.0	+12	–8	3000	IK8W[1]
AMT-36056	34.5-35.5	33	24	2.0	2.0	+12	–8	1400	IK4N[1]
(N) **AMT-36156**	35-36	25	23	2.2	2.2	+12	–8	760	IK4N[1]

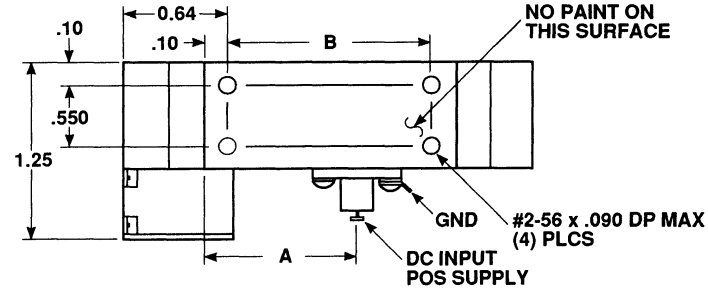
(N) - New product offering

Notes: Maximum safe input power: +10 dBm
1. Contact Applications Engineering for case drawing.

The following RF connector options are available for the amplifiers on this page. Please specify option suffix at the time of order.

		INPUT	
		WG WR28	3 mm COAX
OUTPUT	WG WR28	-11	-31
	3 mm COAX	-13	-33

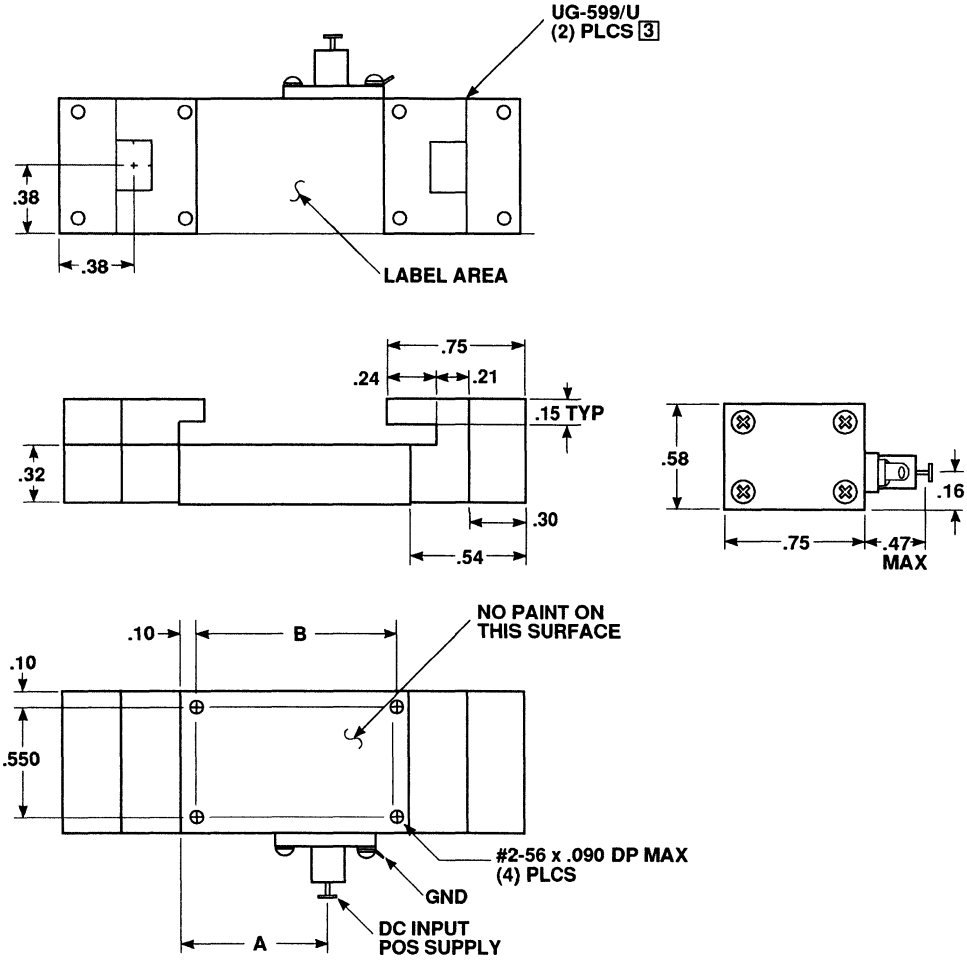




CASE	DIMENSION	
	A	B
IK2	0.36	0.708
IK4	0.95	1.303
IK6	1.15	1.697
IK8	1.35	2.095

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3 RF INPUT/OUTPUT CONNECTOR:
   WR-28,UG 599/U

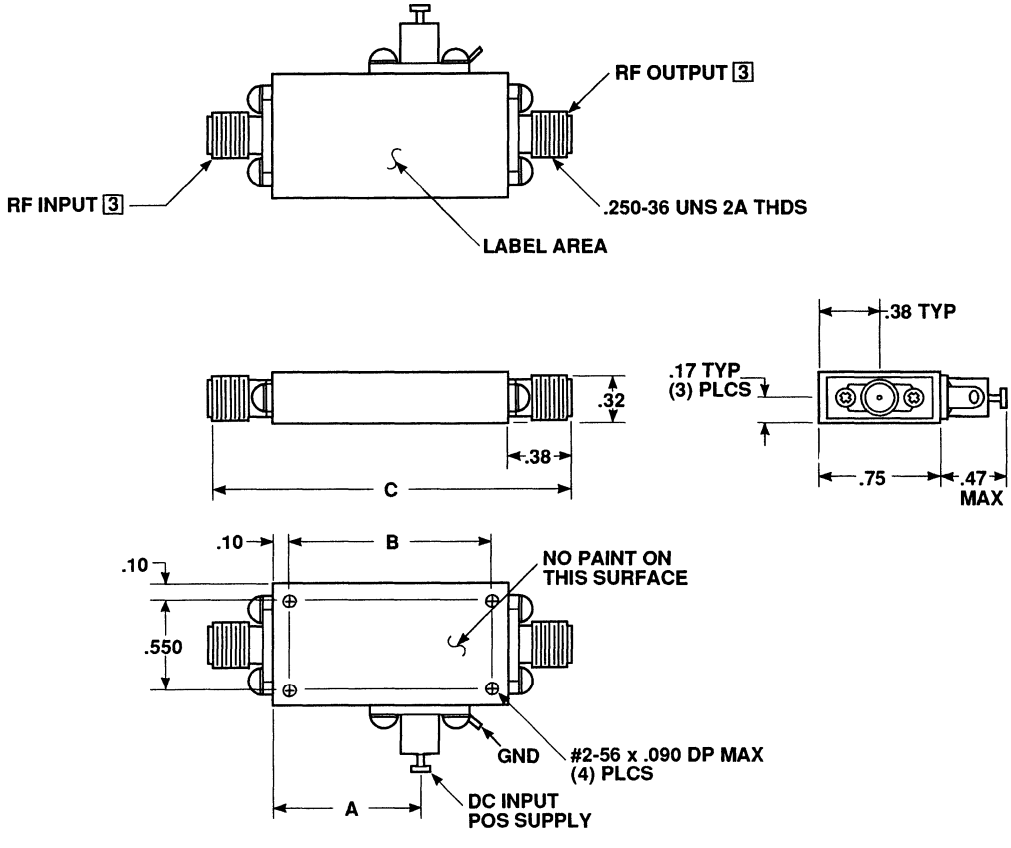


CASE	DIMENSION	
	A	B
IK2	0.36	0.708
IK4	0.95	1.303
IK6	1.15	1.697
IK8	1.35	2.095

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING

3 RF INPUT/OUTPUT CONNECTOR:
WR-28,UG 599/U



CASE	DIMENSION		
	A	B	C
IK2	0.36	0.708	1.66
IK4	0.95	1.303	2.25
IK6	1.15	1.697	2.65
IK8	1.35	2.095	3.05

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3 RF INPUT/OUTPUT CONNECTOR:
   3 MM SMA COMPATIBLE

AMT —High Performance and Temperature Compensated Connectorized Amplifier Series

AMT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AMT-46035	43.5-45.5	22	30	8.0	+6	1.5	+13	2.5	2.5	+12	300	IK4
AMT-46037	43.5-45.5	30	38	8.0	+6	1.5	+13	2.5	2.5	+12	400	IK6
AMT-46055	43.5-45.5	22	30	8.0	+15	1.5	+22	2.5	2.5	+12	350	IK4
AMT-46057	43.5-45.5	30	38	8.0	+15	1.5	+22	2.5	2.5	+12	450	IK6
AMT-46075	43.5-45.5	22	30	5.5	+6	1.5	+13	1.5	2.5	+12	300	IK4[1]
(N) **AMT-46077**	43.5-45.5	30	38	5.5	+10	1.5	+17	1.5	2.5	+12	400	IK6[1]

Guaranteed Specifications @ -25° to +71°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
(N) **AMT-46045**	43.5-45.5	22	30	6.0	+6	2.0	+13	2.5	2.5	+12	350	IK6[1]
(N) **AMT-46047**	43.5-45.5	30	38	6.0	+6	2.0	+13	2.5	2.5	+12	450	IK8[1]

Notes: Maximum safe input power: +10 dBm
1. Waveguide input only with external isolator.

AMT Series—Power Amplifiers

Preliminary Specifications @ 25°C Case Temperature

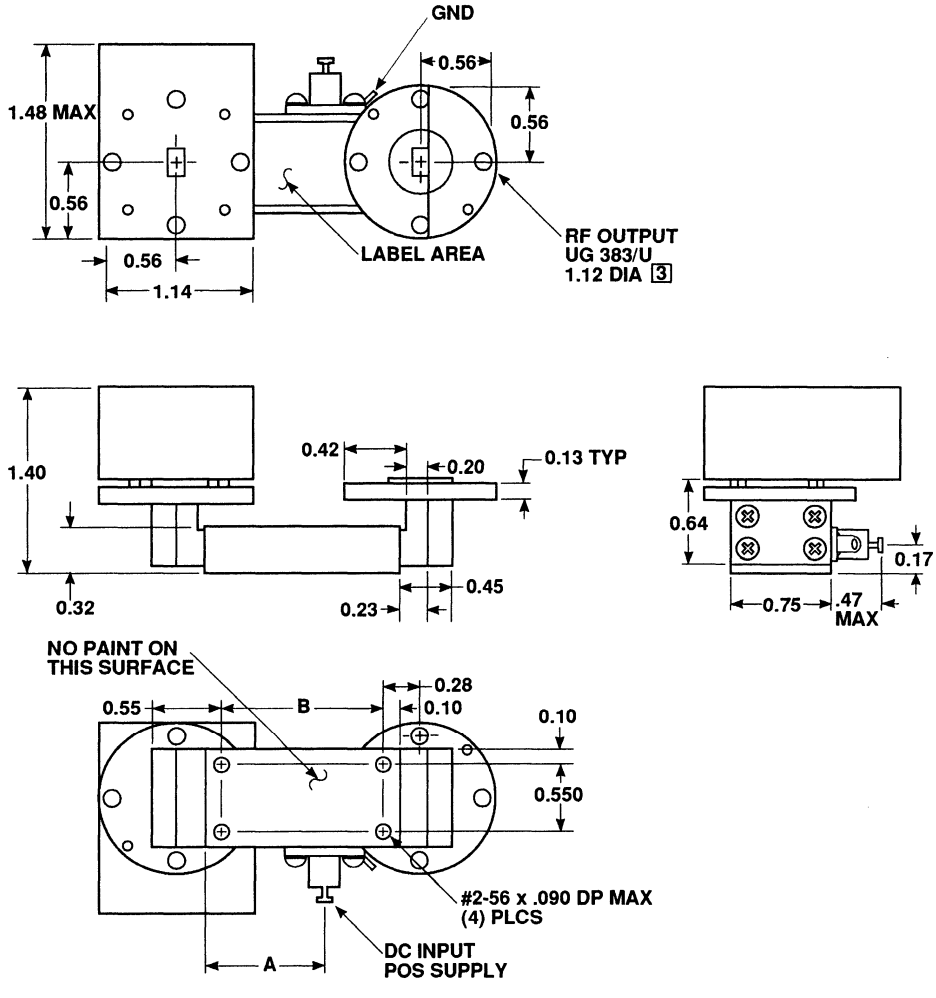
Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Saturated Output Power (dBm) Minimum	VSWR Maximum In	VSWR Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
(N) **AMT-46158**	43-45	26	+23	2.5	2.5	+12	650	IK6

(N) - New product offering

Note: Maximum safe input power: +10 dBm

The following RF connector options are available for the amplifiers on this page. Please specify option suffix at the time of order.

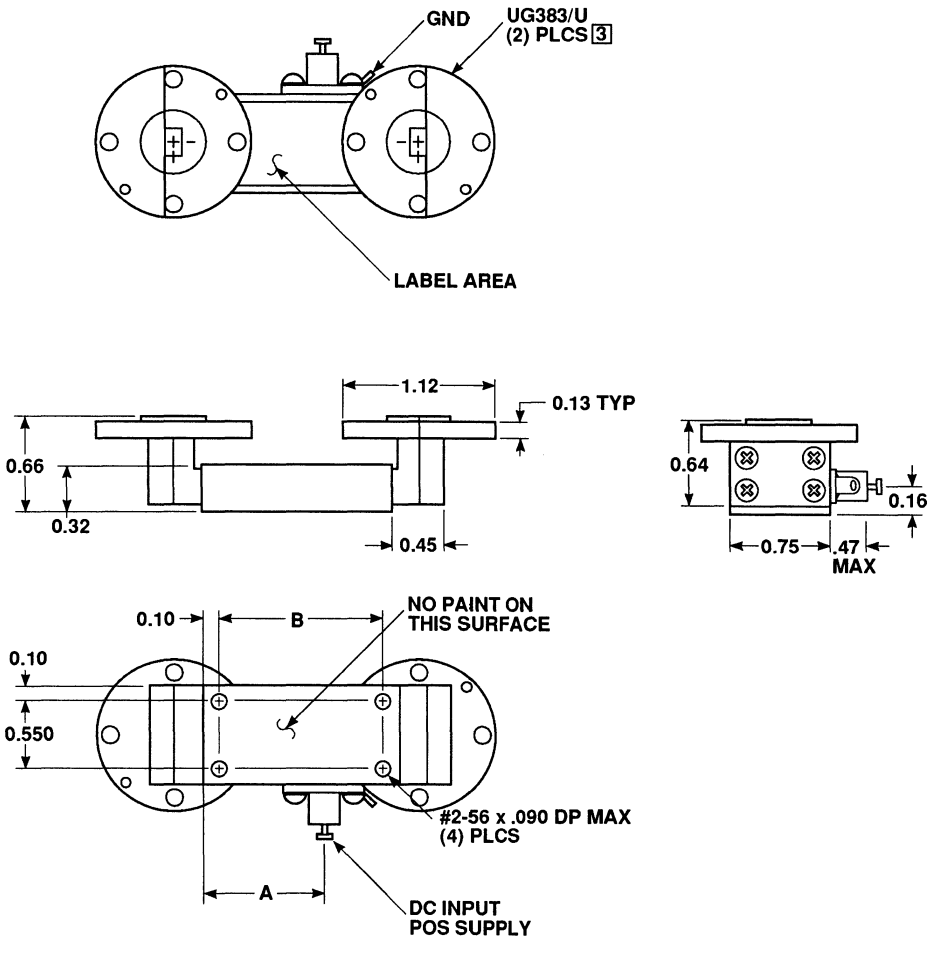
		INPUT
		WG WR22
OUTPUT	WG WR22	-11



CASE	DIMENSION	
	A	B
IK4	0.95	1.303
IK6	1.15	1.697
IK8	1.35	2.095

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3 RF INPUT/OUTPUT CONNECTOR:
   WR-22,UG 383/U



CASE	DIMENSION	
	A	B
IK4	0.95	1.303
IK6	1.15	1.697
IK8	1.35	2.095

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3 RF INPUT/OUTPUT CONNECTOR:
   WR-22,UG 383/U

AMT —High Performance Connectorized Amplifier Series

AMT Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Saturated Power Output (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
(N) **AMT-60032**	59-60	10	12	9.0	+3	1.0	+10	3.0	3.0	+12	120	IV3[1]
(N) **AMT-60033**	59-60	15	18	9.0	+3	1.5	+10	3.0	3.0	+12	185	IV3[1]
(N) **AMT-60034**	59-60	20	24	9.0	+3	1.5	+10	3.0	3.0	+12	245	IV4[1]
(N) **AMT-60035**	59-60	25	29	10.0	+5	2.0	+12	3.0	3.0	+12	305	IV5[1]
(N) **AMT-60036**	59-60	30	35	10.0	+5	2.0	+12	3.0	3.0	+12	365	IV6[1]

(N) - New product offering

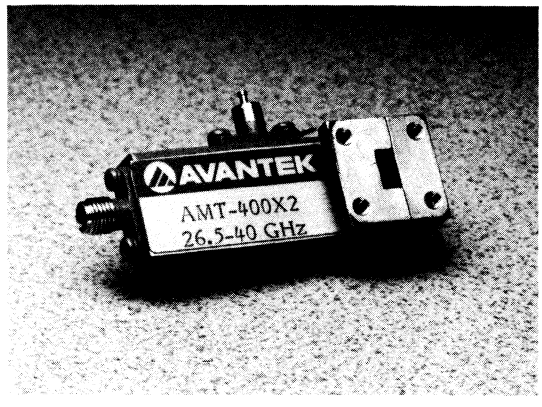
Notes: Maximum safe input power: +10 dBm

1. Contact Applications Engineering for case drawing. The amplifiers on this page are available only with WR 19 I/O.

Features

- Conversion Gain
- +21 dBm Output Power
- 20 dBc Signal Purity
- Low Current Consumption
- Waveguide/Coax Output Connector Option

AMT Series 18-45.5 GHz



Description

The AMT-260X2 and AMT-400X2 are active frequency doublers with outputs covering the full 18-26.5 GHz and 26.5-40 GHz bands respectively. The AMT-460X4 is an active frequency quadrupler covering the frequency band of 43.5-45.5 GHz. All models use post amplification for optimum size and power consumption and all have greater bandwidth capability if needed. Low input power levels, from 350 to 750 mA at +12 VDC, are sufficient to provide output levels from +15 to +21 dBm across the full bands.

These units are packaged in low profile, miniature aluminum packages which allows various output connector options including waveguide and 3mm coax. Signal purity* of 20-30 dBc across the full output bands allows these units to be used as signal sources for both test equipment and military systems. Updating a test bench to millimeter frequencies is as simple as just adding a doubler or quadrupler at an order of magnitude savings in cost over new equipment.

* Signal purity, the amount of rejection of all signals (fundamental, third harmonic, etc.) except for the desired output signal, is measured relative to the desired output signal in dBc.

3. MM WAVE

AMT Series

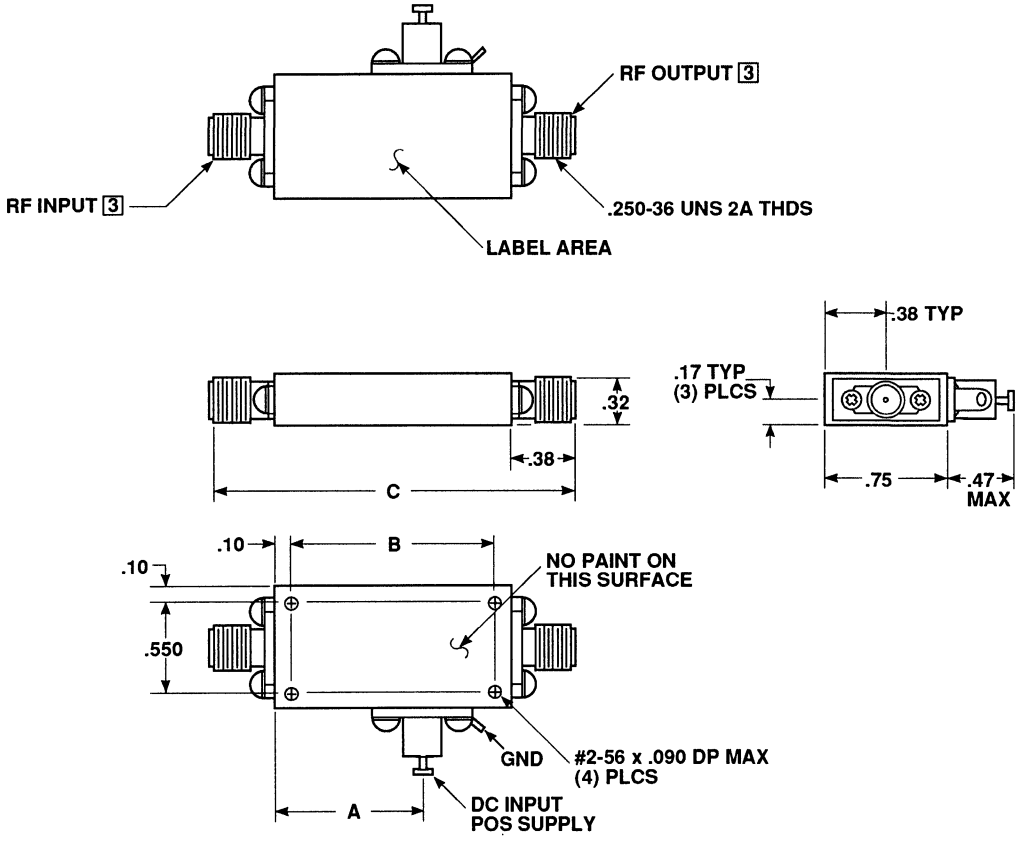
Guaranteed Specifications @ 25°C Case Temperature

Model	Input Frequency (GHz)	Output Frequency (GHz)	RF Power Input (dBm) Minimum[2]	RF Power Output (dBm) Minimum	Signal Purity (dBc) Maximum	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
AMT-260X2	9.0-13.25	18.0-26.5	+10	+15	-20	12	350	IK4
AMT-261X2	9.0-13.25	18.0-26.5	+10	+21	-20	12	750	IK6
AMT-400X2	13.25-20.0	26.5-40.0	+10	+11	-20	12	200	IK4
AMT-401X2	13.25-20.0	26.5-40.0	+10	+15	-20	12	350	IK6
AMT-460X4	10.87-11.37	43.5-45.5	+10	+10	-30	12	300	IK6[1]
AMT-461X4	10.87-11.37	43.5-45.5	+10	+20	-30	12	850	IK6[1]

Notes: Maximum safe input power: +20 dBm
1: Input coax isolator
2: Recommended minimum input to achieve listed minimum power output.

The following RF connector options are available for the amplifiers on this page. Please specify option suffix at the time of order.

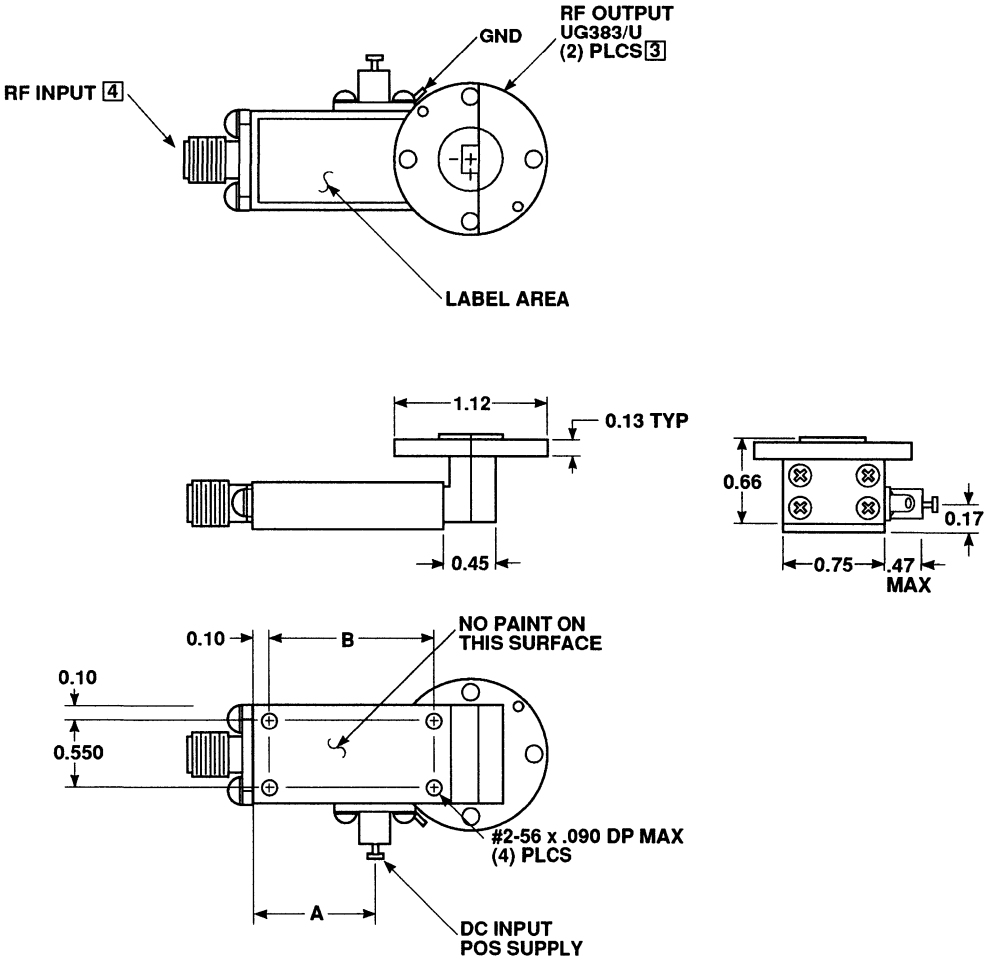
		INPUT
		3 mm COAX
OUTPUT	WG	-31
	3 mm COAX	-33



CASE	DIMENSION		
	A	B	C
IK2	0.36	0.708	1.66
IK4	0.95	1.303	2.25
IK6	1.15	1.697	2.65
IK8	1.35	2.095	3.05

NOTES (UNLESS OTHERWISE SPECIFIED):

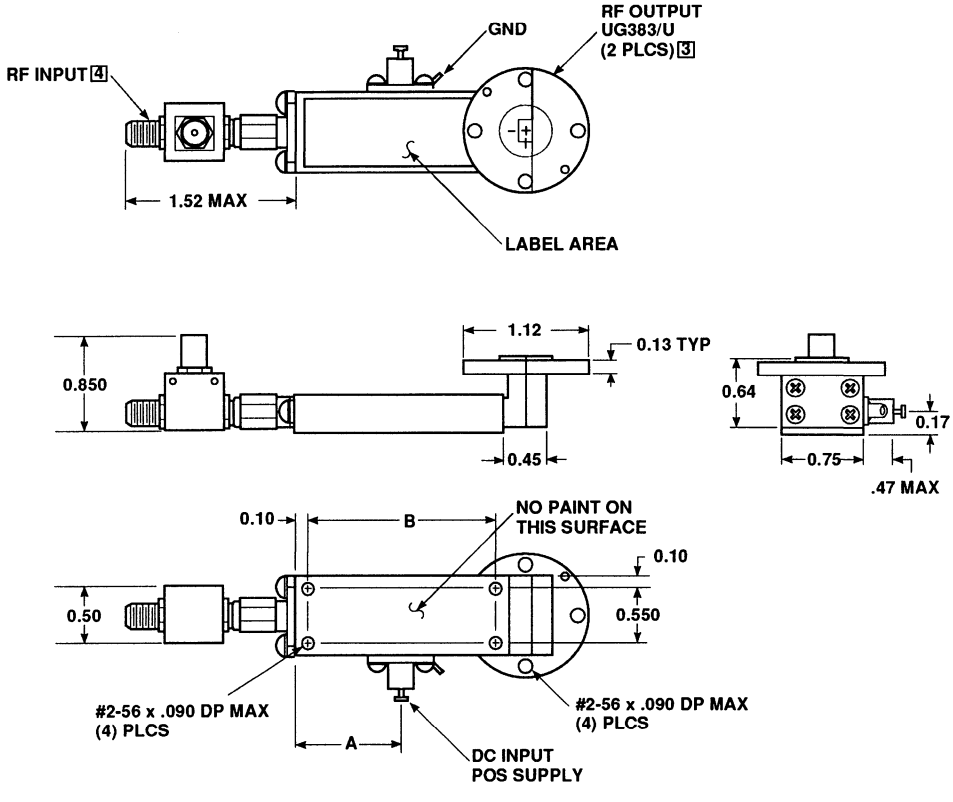
1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3 RF INPUT/OUTPUT CONNECTOR:
   3 MM SMA COMPATIBLE



CASE	DIMENSION	
	A	B
IK2	0.36	0.708
IK4	0.95	1.303
IK6	1.15	1.697
IK8	1.35	2.095

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3. RF INPUT/OUTPUT CONNECTOR:
   WR-22,UG 383/U
4. RF INPUT CONNECTOR: 3MM SMA COMPATIBLE



CASE	DIMENSION	
	A	B
IK2	0.36	0.708
IK4	0.95	1.303
IK6	1.15	1.697
IK8	1.35	2.095

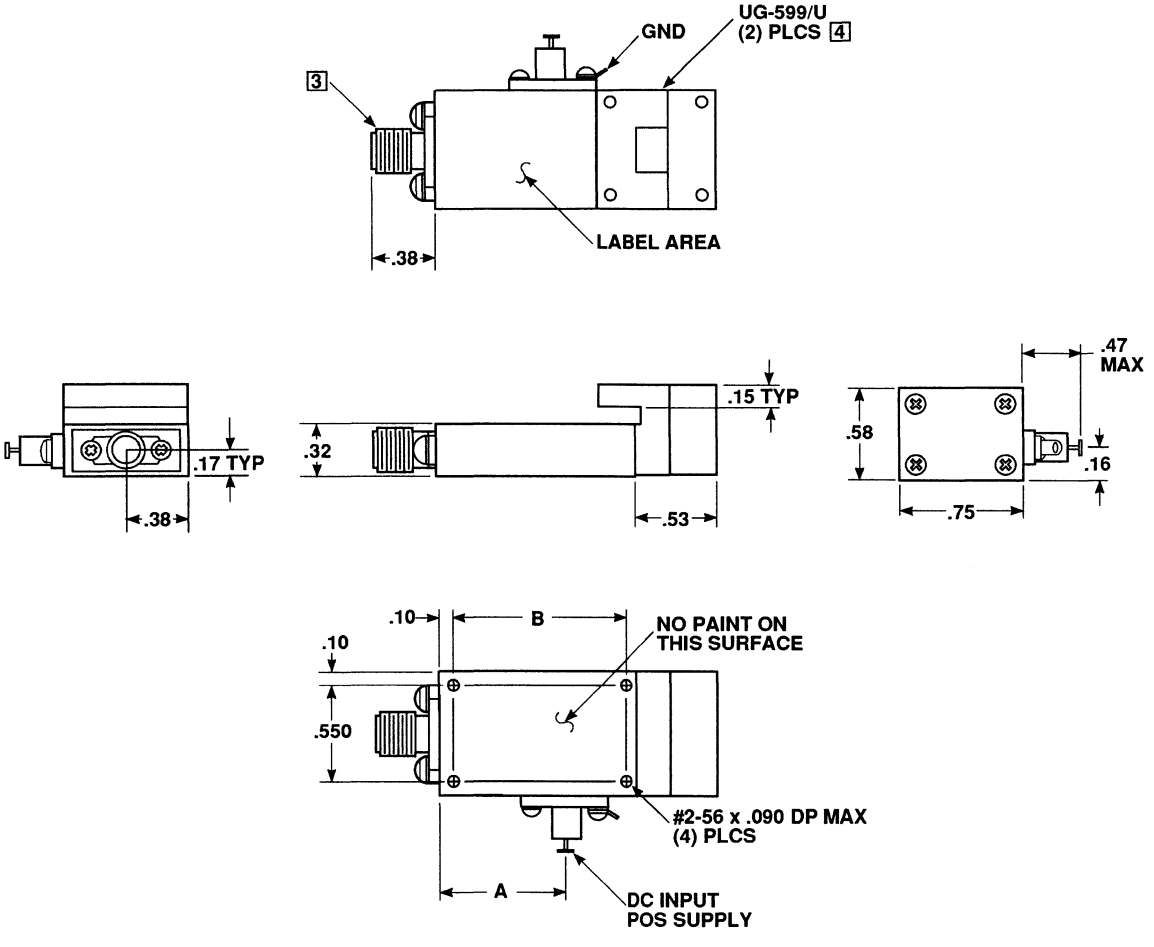
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING

[3] RF OUTPUT CONNECTOR:
WR-22,UG 383/U

[4] RF INPUT CONNECTOR: 3MM SMA COMPATIBLE

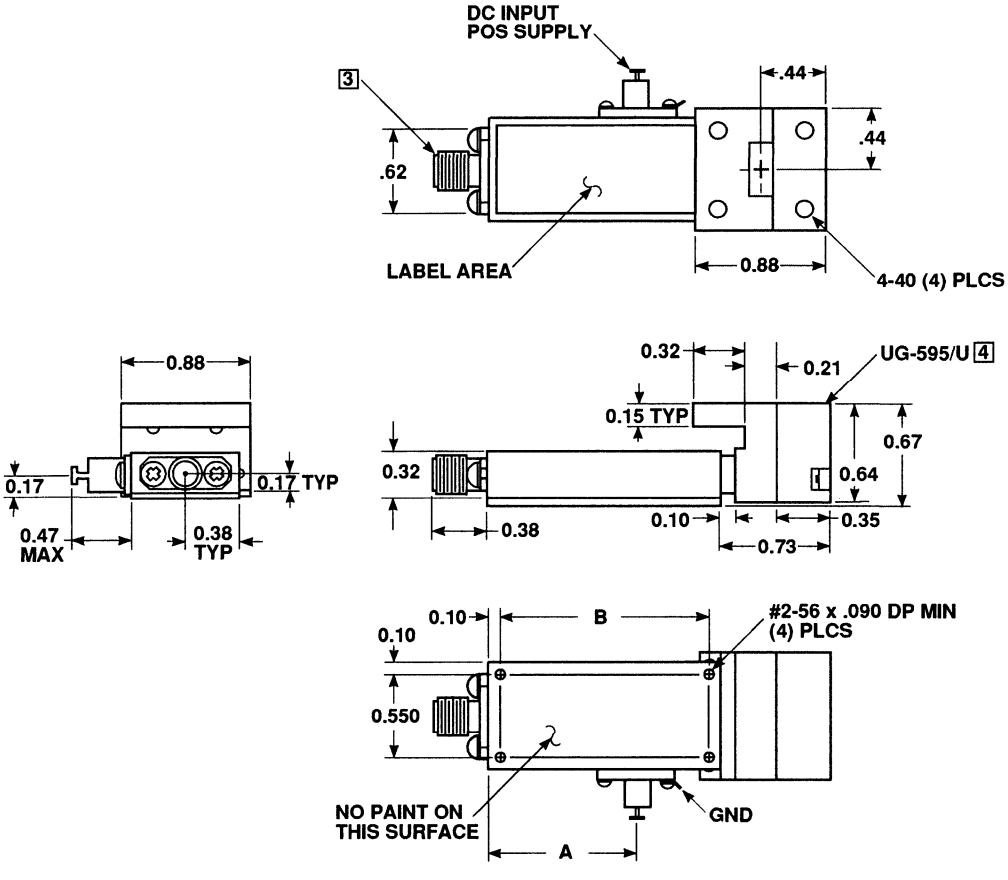
IK SERIES
COAX/WR-28
CASE DRAWING



CASE	DIMENSION	
	A	B
IK2	0.36	0.708
IK4	0.95	1.303
IK6	1.15	1.697
IK8	1.35	2.095

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3. RF INPUT CONNECTOR: 3 MM SMA COMPATIBLE
4. RF OUTPUT CONNECTOR: WR-28, UG-599/U



CASE	DIMENSION	
	A	B
IK2	0.36	0.708
IK4	0.95	1.303
IK6	1.15	1.697
IK8	1.35	2.095

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005

ALL TOLERANCES BEFORE PAINT AND/OR LABELING

3 RF INPUT CONNECTOR: 3 MM SMA COMPATIBLE

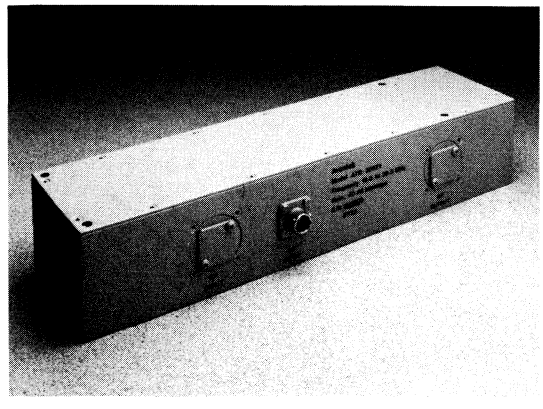
4 RF OUTPUT CONNECTOR: WR-42, UG-595/U

TWT REPLACEMENT SOLID STATE MILLIMETER AMPLIFIERS

Features

- **Form Fit And Functional Replacements For TWT Amplifiers**

ATR Series Militarized, Low-Noise TWT Replacement Amplifiers



Description

Avantek ATR Series amplifiers consist of state-of-the-art, thin-film GaAs FET amplifier circuits packaged as form, fit and functional replacements for the most common low-noise TWT amplifiers found in present airborne radar and ECM receiving systems. They will fit within the same volume and use the same mounting hardware and cabling as the tube amplifiers and are powered directly from available 115 or 230 VAC power sources.

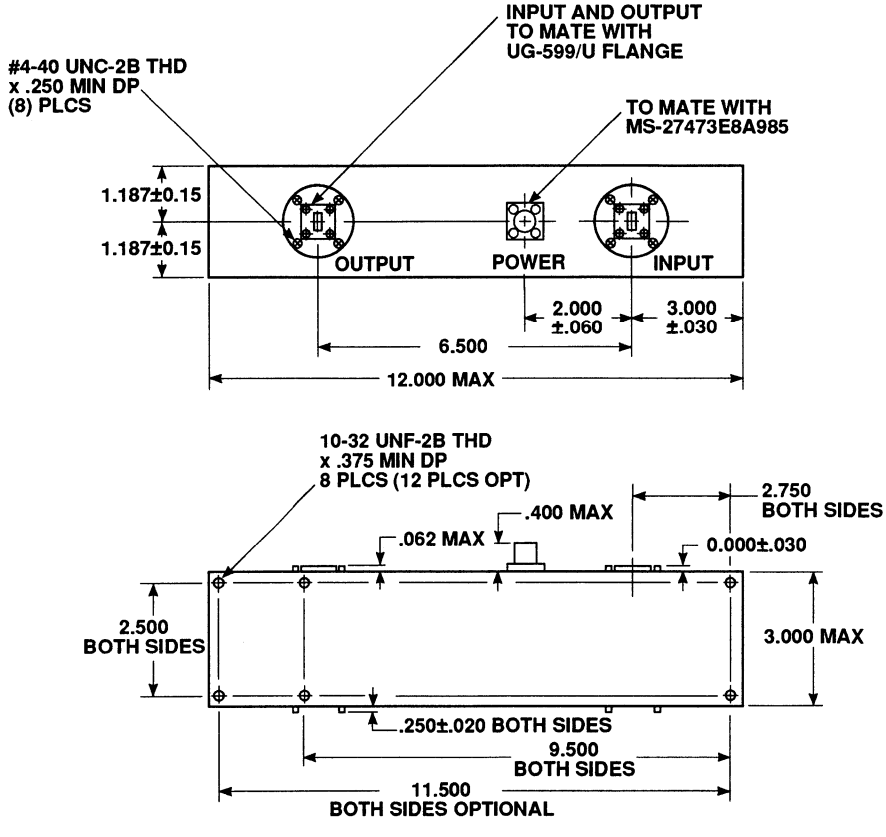
Top Access ATR "7 Series" U.S. Navy Qualified Units[1]

Guaranteed Specifications @ 0° to +50°C Case Temperature

Model[1]	Frequency Response (GHz) Minimum	Noise Figure (dB) Maximum	Small Signal Gain (dB) Minimum	Small Signal Gain (dB) Maximum	Gain Flatness (±dB) Maximum	Power Output for 1dB Gain Compression (dBm) Minimum	Intercept Point for IM Products (dBm) Typical	VSWR Maximum In	VSWR Maximum Out	Input Power (watts) Maximum	Case Type
ATR–26071	18-26.5	9.0	40	48.0	3.0	+12	+20	2.3	2.3	20	ATR-7/WG
ATR–40071	26.5-40	12.0	35	43.0	4.0	+6	+15	3.0	3.0	15	ATR-7/WG

Notes: Maximum safe input power: +10 dBm

1. These are U.S. Navy Qualified Units and may be ordered under the following National Stock Numbers:
   ATR-26071: NSN 7H 2040-LL-HHB-3719
   ATR-40071: NSN 7HS2040-01-162-2997



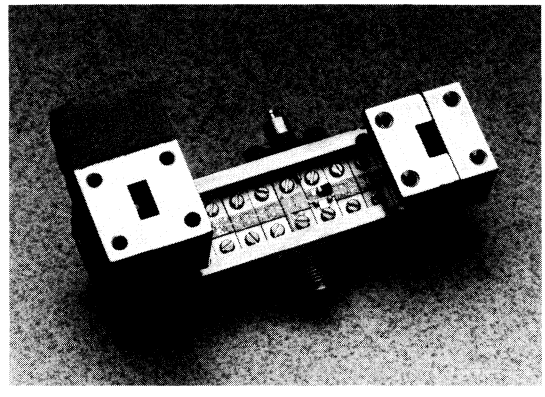
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .02
   .XXX ± .010
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3. WEIGHT: 54 OUNCES

Features

- SSB Downconversion (high-side LO)
- Conversion Gain
- Low Noise Figure
- Single Hermetic Packaging
- Input Isolator
- Thin Film Construction
- Internal Voltage Regulator
- Reverse Bias Protection

AFC Series



Description

The Avantek AFC series millimeter frequency downconverter assemblies are ideal for high reliability military applications where compact size and optimum performance is a requirement. The fully integrated downconverters consist of a low noise amplifier, single-balanced thin-film mixer, voltage regulator, and a LO buffer amplifier, contained within one hermetic package for maximum reliability. A miniature waveguide input isolator gives optimum input VSWR and assures unconditional stability. The assembly uses high-side LO injection for single sideband down conversion to a 2 GHz IF.

Options: Incorporation of a frequency doubler at the LO port is available for applications where operation of the LO port at KU band is desirable. Optional frequencies are available upon request.

Millimeter Single Sideband Frequency Downconverter Assemblies

AFC Series

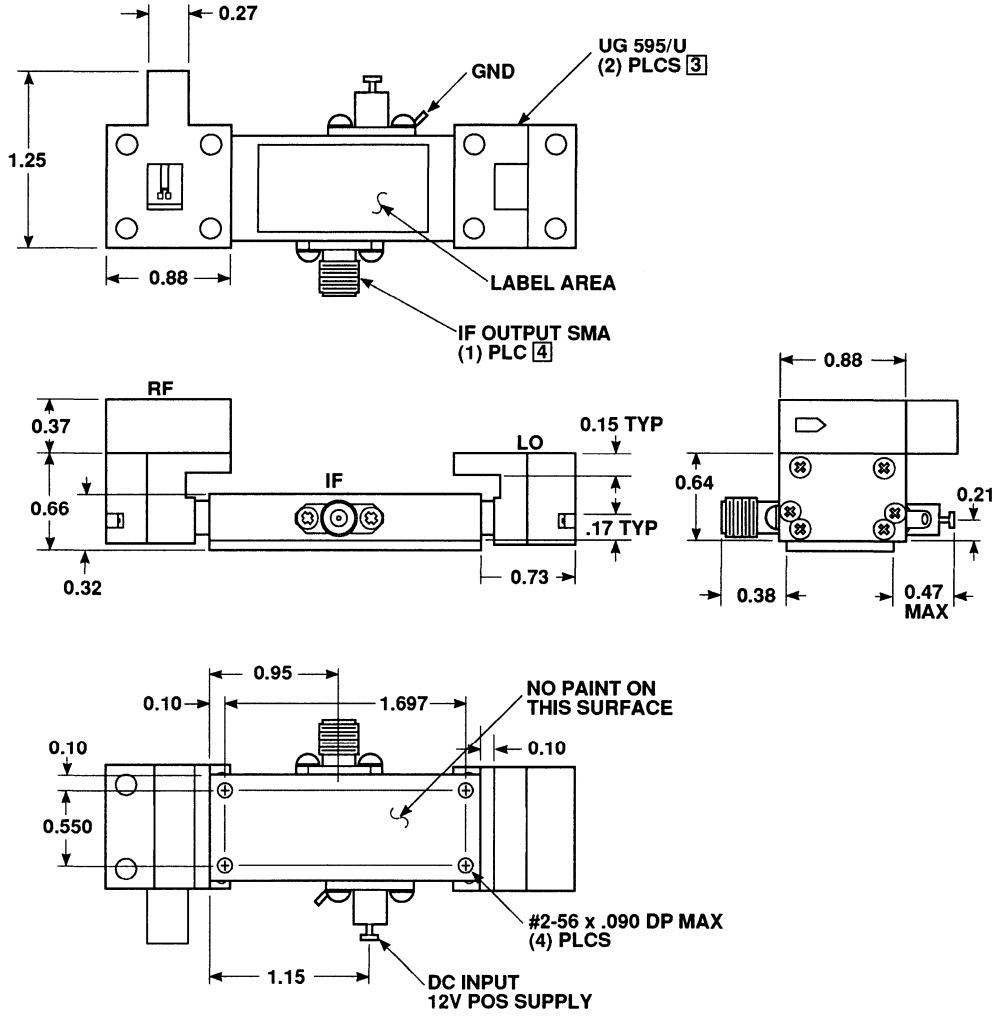
Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency GHz RF	LO	IF	Conversion Gain dB	SSB Noise Figure dB	LO Isolation dB @RF	@IF	VSWR RF	LO	LO Drive dBm	Bias @ 12V mA	Case Type
AFC-21035	20.7	22.7	2.0	15	4.0	60	30	1.2	2.2	0	250	IK6/E[1]
AFC-36035	35	37.0	2.0	15	5.0	60	30	1.2	2.2	0	250	IK6/E[1]
(N) **AFC-44035**	44	46.0	2.0	15	5.5	45	25	1.5	2.2	0	320	IK6/E[1]

(N) New model number

Notes: Bandwidth of RF is ±500 MHz
Maximum safe input power: +10 dBm
1: Standard IK6 with input waveguide isolator and SMA at IF port

CASE DRAWING FOR MODEL NUMBER AFC-21035



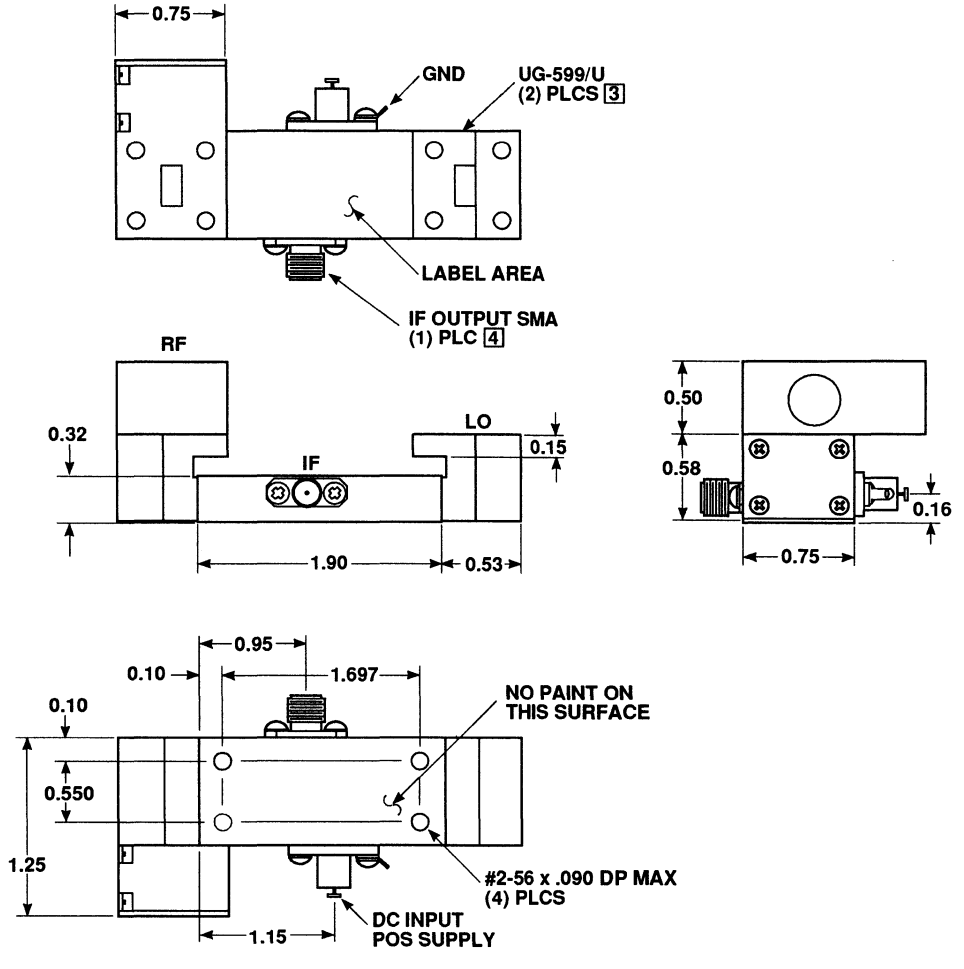
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING

3 RF INPUT/LO INPUT CONNECTOR:
WR-42,UG 595/U

4 IF OUTPUT CONNECTOR: SMA

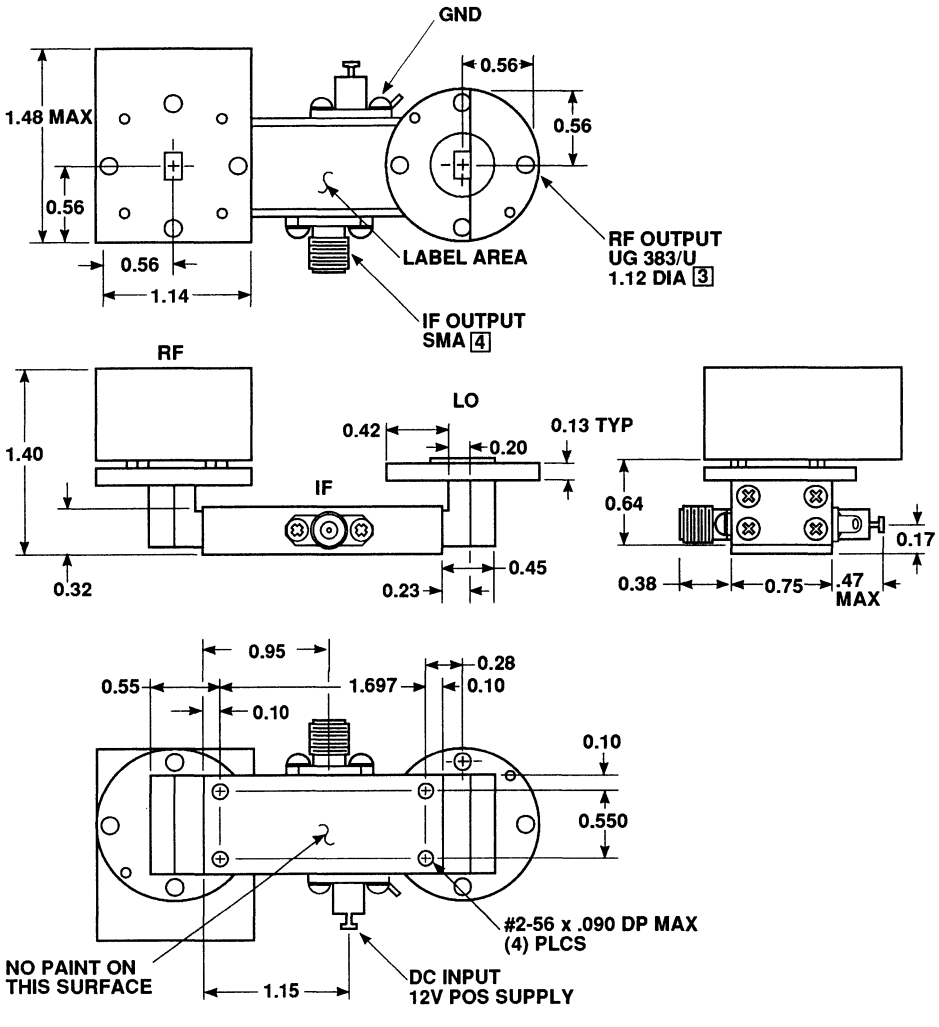
CASE DRAWING FOR MODEL NUMBER AFC-36035



NOTES (UNLESS OTHERWISE SPECIFIED):

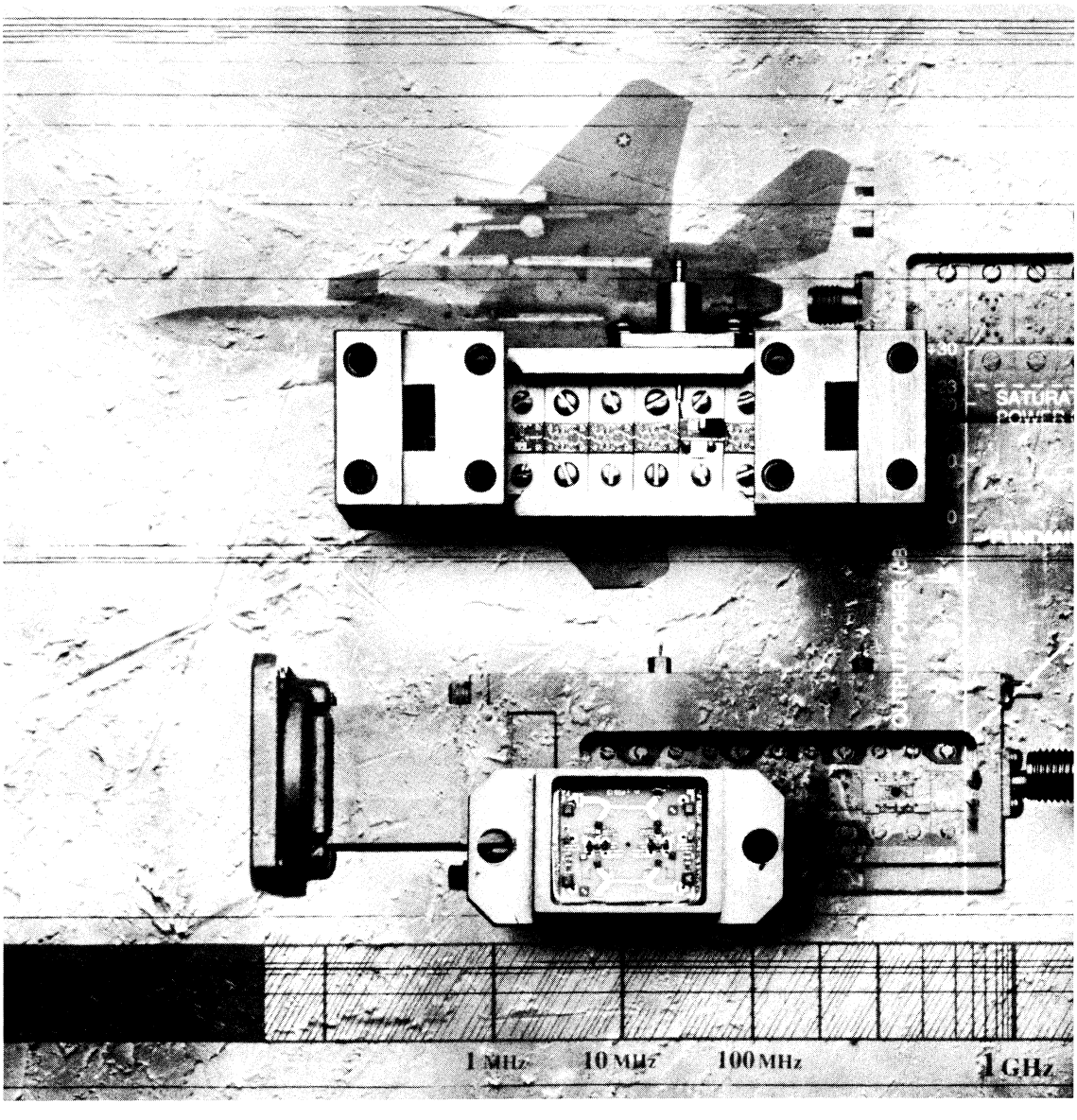
1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3. RF INPUT/OUTPUT CONNECTOR:
   WR-28,UG 599/U
4. IF OUTPUT CONNECTOR: SMA

CASE DRAWING FOR MODEL NUMBER AFC-44035

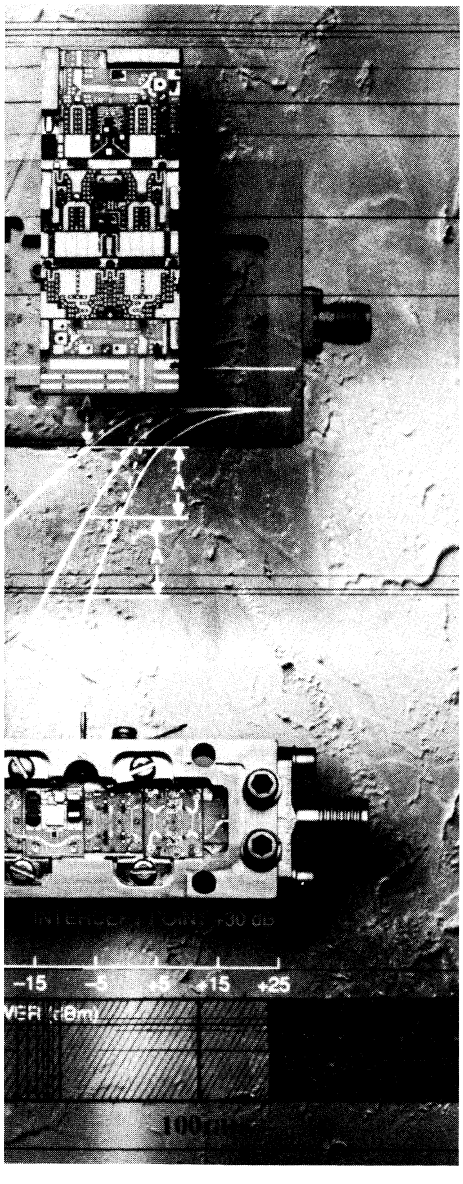


NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .01
   .XXX ± .005
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3. RF INPUT/LO INPUT CONNECTOR:
   WR-22,UG 383/U
4. IF OUTPUT CONNECTOR: SMA


1 MHz
10 MHz
100 MHz
1 GHz

4. Wideband Power Amplifiers



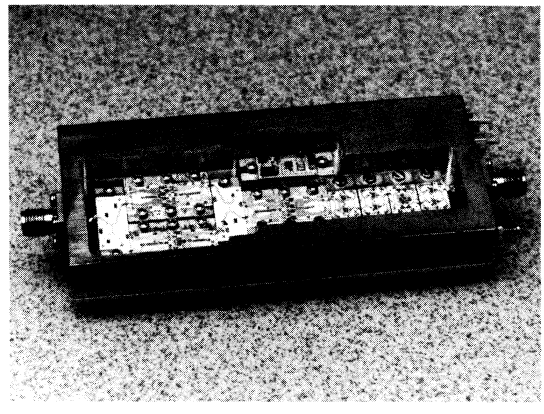
Thin-Film Power Amplifiers
APT Series 2-18 GHz

Discrete Component Amplifiers
APG Series 50 MHz- 4 GHz

Features

- **GaAs FET and MIC Reliability For Military Applications**
- **Compact Designs Replace Bulky TWTs**
- **2 Watts Of Power To 8 GHz**
- **1 Watt Of Power To 18 GHz**
- **Octave And Straddle Band Frequency Ranges**
- **Welded Aluminum Hermetic Cases**

APT Series – 2 to 18 GHz Wideband Thin Film Power Amplifiers



Description

The Avantek APT Series, GaAs FET amplifiers provides linear power output levels (at 1 dB gain compression) of up to 2 watts in a wide range of microwave frequency bands. The compact and rugged thin-film MIC construction makes these amplifiers particularly well suited for the most demanding environments. Avantek's own GaAs FETs and MMICs are used to provide the high performance and reliability demanded by military applications.

Stable operation, regardless of source or load conditions, is the result of balanced module design used throughout the amplifier. Thorough characterization of cascadable amplifier modules makes custom gain and power needs readily achieveable.

All APT amplifiers feature internal temperature compensation, voltage regulation, and protection for both reverse and dual bias.

Typical Applications Include:

- Driver Amplifiers In ECM Transmitters and Expendables
- Output Amplifiers In Decoy Transmitters
- Driver Amplifiers In RF Distribution Newworks
- Augmentor Amplifiers In Target Drones
- Output Amplifiers In Test Equipment (ATE & AGE)

2.0 to 18.0 GHz FREQUENCY RANGE

WIDEBAND THIN FILM POWER AMPLIFIERS

Military, Industrial And General Applications

APT Series — Temperature Compensated Connectorized Amplifier Series

Guaranteed Specifications at 0° to +50°C Case Temperature

Model	Frequency Response (GHz) Min.	Gain (dB) Min.	Gain (dB) Max.	Noise Figure (dB) Max.	Power Output for 1 dB Gain Comp. (dBm) Min.	Power Output (watts) Min.	Gain Flatness (±dB) Max	Typical Intercept Point for Third Order Intermod Products (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC±3%)	Input Power Typical Current (mA)	Case Type
APT-4063	2-4	28	38	5.5	+30	1.0	1.5	+37	2.0	2.0	+15[1]	1000	IS6P[2]
APT-4064	2-4	39	49	5.5	+30	1.0	1.5	+37	2.0	2.0	+15[1]	1050	IS6P[2]
APT-4074	2-4	33	43	6.0	+33	2.0	1.5	+40	2.0	2.0	+15[1]	1700	IS6P[2]
APT-6065	2-6	35	45	6.0	+30	1.0	1.5	+37	2.0	2.0	+15[1]	1200	IC6[2]
APT-6077	2-6	40	50	6.0	+33	2.0	1.5	+40	2.0	2.0	+15[1]	2300	IC8[2]
APT-8255	2-8	30	40	6.0	+27	0.5	2.0	+34	2.0	2.0	+15[1]	800	IC6[2]
APT-8266	2-8	35	45	7.0	+30	1.0	2.0	+37	2.0	2.0	+15[1]	1300	IC8[2]
APT-8056	4-8	35	45	7.0	+29	0.8	1.5	+36	2.0	2.0	+15[1]	1300	IC8[2]
APT-8066	4-8	35	45	7.0	+30	1.0	1.5	+37	2.0	2.0	+15[1]	1300	IC8[2]
APT-8076	4-8	30	40	10.0	+33	2.0	1.5	+40	2.0	2.0	+15[1]	2500	IC7P[2]
APT-10555	4.5-10.5	34	44	6.0	+26	0.4	1.5	+33	2.0	2.0	+12[1]	700	IC6[2]
(P) **APT-10566**	4.5-10.5	29	40	8.0	+30	1.0	2.0	+38	2.0	2.0	+15[1,3]	2200	ICD8[2]
APT-12057	6-12	35	45	7.0	+26	0.4	1.5	+33	2.0	2.0	+12[1]	1300	IX8[2]
APT-12066	6-12	28	39	8.0	+30	1.0	1.5	+37	2.0	2.0	+15	2500	IK7P[2]
APT-18646	6-18	20	30	10.0	+23	0.2	2.0	+30	2.0	2.0	+12[1]	1200	IX8[2]
APT-18649	6-18	35	45	10.0	+23	0.2	2.0	+30	2.0	2.0	+12[1]	1350	IX10[2]
APT-18656	6-18	18	28	12.0	+27	0.5	2.0	+33	2.0	2.0	+12[1]	2300	IK7P[2]
APT-18659	6-18	36	46	12.0	+27	0.5	2.0	+33	2.0	2.0	+12[1]	2500	IK11P[2]
APT-18667	6-18	26	34	13.0	+30[5]	1.0	3.0	+36	2.0	2.0	+15[1,4] +12	2200 2500	IKD12P[2]
APT-18668	6-18	34	42	10.0	+30[5]	1.0	3.0	+36	2.0	2.0	+15[1,4] +12	2200 2600	IKD12P[2]
APT-18660	6-18	42	50	9.0	+30[5]	1.0	3.0	+36	2.0	2.0	+15[1,4] +12	2200 2700	IKD14P[2]
(N) **APT-18615-001**[6]	6-18	26	37	14.0	+30	1.0	2.5	+33	2.0	2.0	+12[1] -12	2850 250	IKE6P
(N) **APT-18616-001**[6]	6-18	32	44	11.0	+30	1.0	3.0	+33	2.0	2.0	+12[1] -12	2900 250	IKE8P
(N) **APT-18617-001**[6]	6-18	38	51	10.0	+30	1.0	3.0	+33	2.0	2.0	+12[1] -12	2975 250	IKE8P

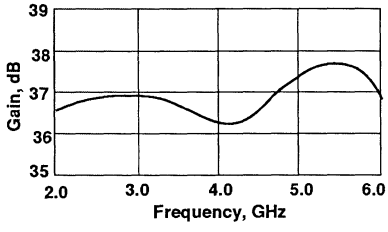
(P) Preliminary
(N) New product offering

Notes:
1: Integral voltage regulator
2 SMA connector only
3: Contains internal gate/drain bias sequencing
4: Single +15v supply can be used instead of +15v and +12v dual supply
5: Power output saturated (dBm)
6: -001 version for -0°C to +50°C
-003 version available for -54°C to +85°C. Contact Applications Engineering for specifications.

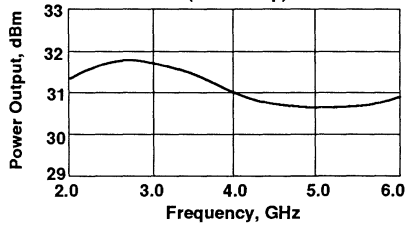
-003 version available for -54°C to +85°C. Contact Applications Engineering for specifications.

Typical Performance @ 25°C Case Temperature

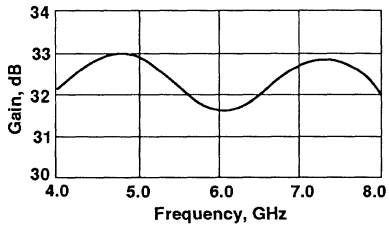
APT-6065 GAIN



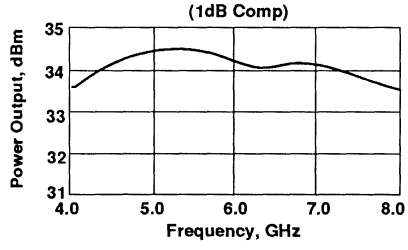
OUTPUT POWER
(1dB Comp)



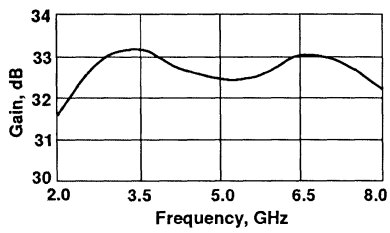
APT-8076 GAIN



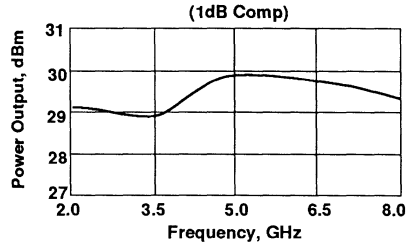
OUTPUT POWER
(1dB Comp)



APT-8255 GAIN

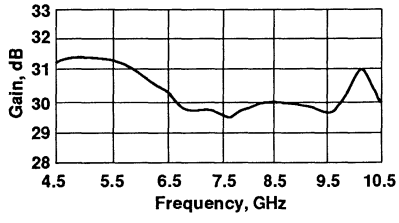


OUTPUT POWER
(1dB Comp)

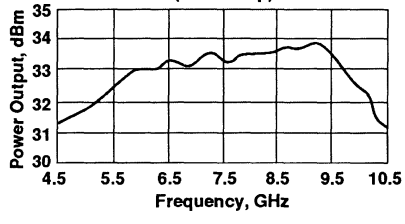


Typical Performance @ 25°C Case Temperature

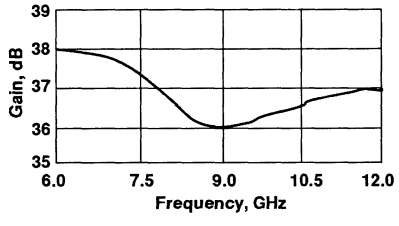
APT-10566 GAIN



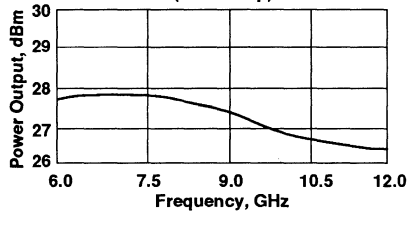
OUTPUT POWER
(1dB Comp)



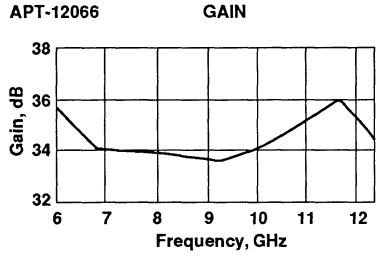
APT-12057 GAIN



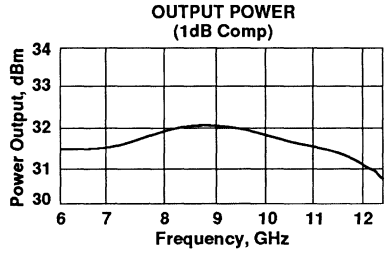
OUTPUT POWER
(1dB Comp)



APT-12066 GAIN

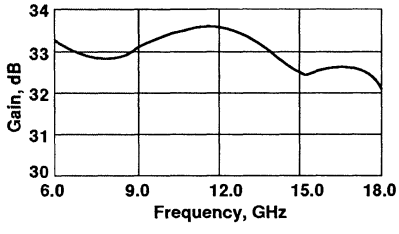


OUTPUT POWER
(1dB Comp)

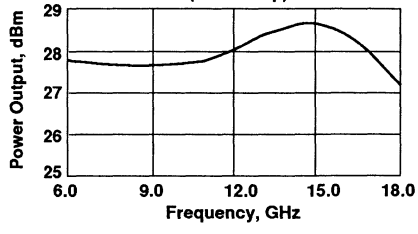


Typical Performance @ 25°C Case Temperature

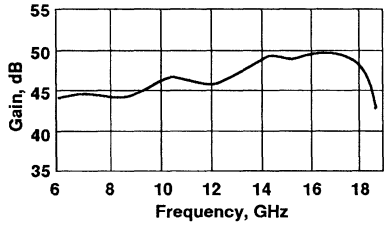
APT-18659 GAIN



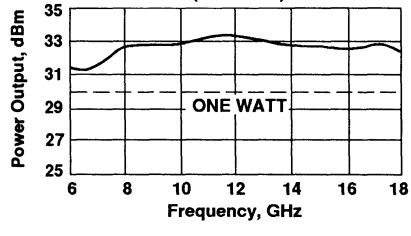
OUTPUT POWER
(1dB Comp)

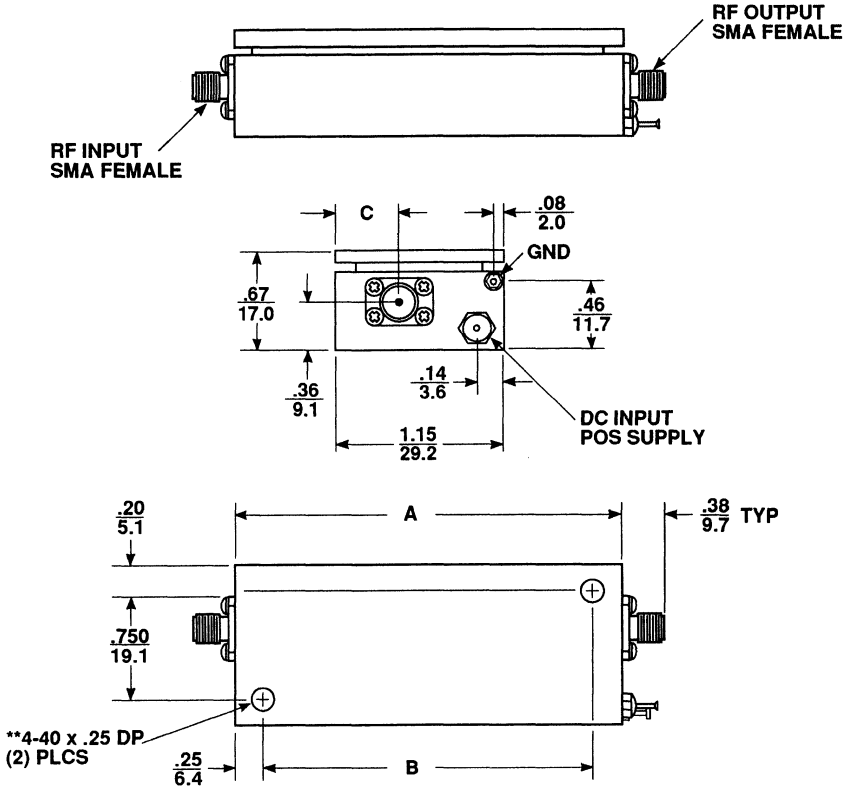


APT-18660 GAIN



OUTPUT POWER
(Saturated)





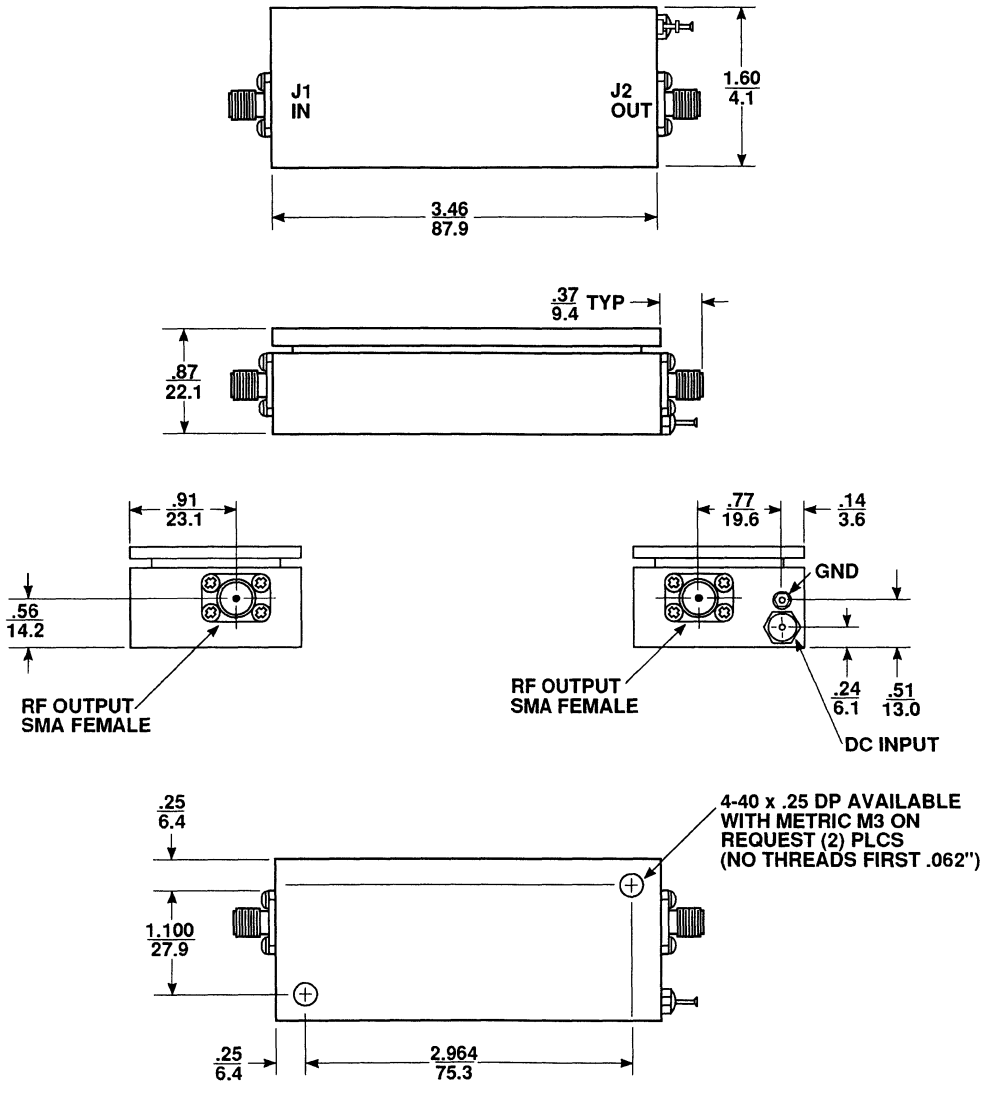
**AVAILABLE WITH METRIC THREAD M3 ON REQUEST.
NO THREADS FIRST .062"

CASE	DIMENSION						WEIGHT	
	A		B		C		OZ	GMS
	IN	MM	IN	MM	IN	MM	TYP	TYP
IC6	2.750	69.8	2.250	57.1	.465	11.8	4	114
IX8	2.750	69.8	2.250	57.1	.510	12.9	4	114
IX10	3.250	82.5	2.750	69.8	.510	12.9	4	114
IC8	3.417	86.8	2.917	74.1	.465	11.8	5	142

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN $\frac{\text{INCHES}}{\text{MM}}$
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010

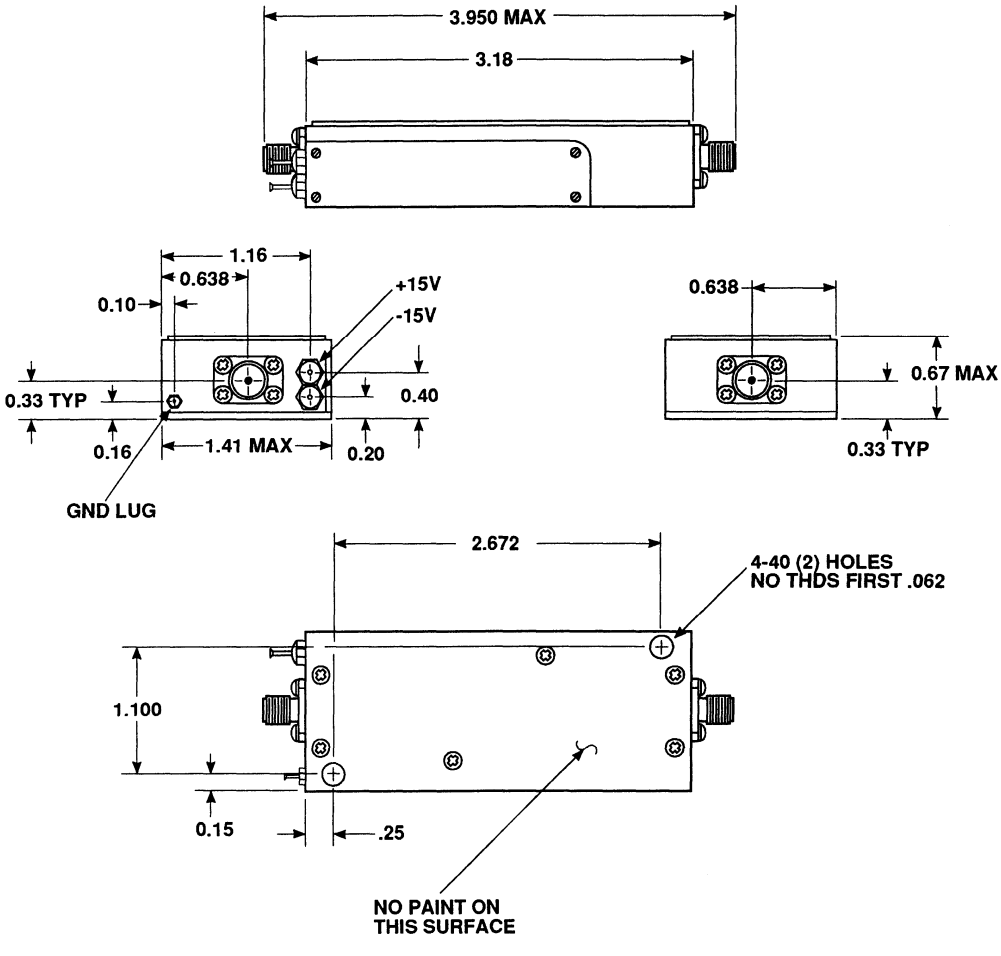
ALL TOLERANCES BEFORE PAINT AND/OR LABELING



NOTES (UNLESS OTHERWISE SPECIFIED):

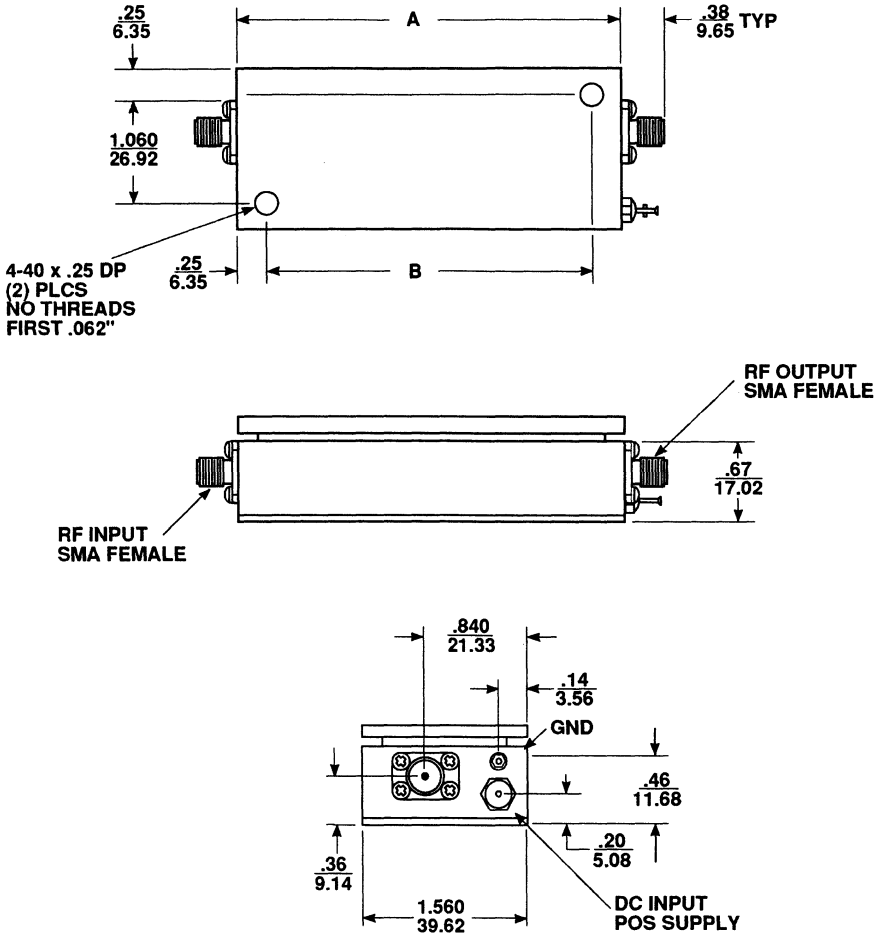
1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010

ALL TOLERANCES BEFORE PAINT AND/OR LABELING



NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .02
   .XXX ± .010
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING

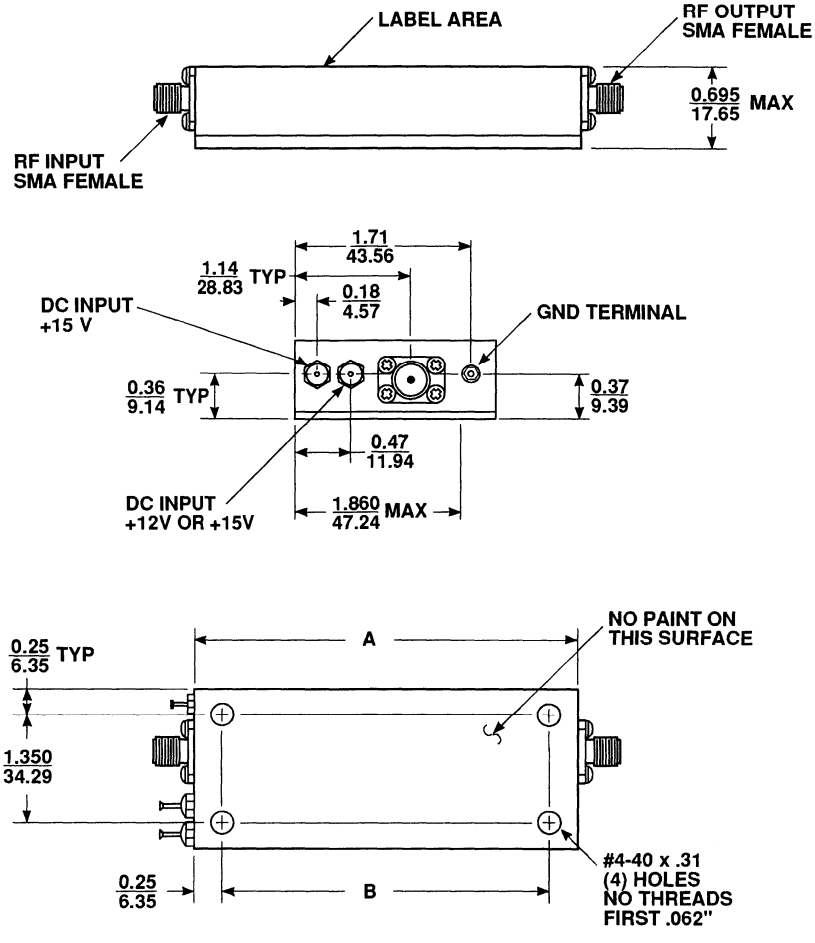


CASE	DIMENSION				WEIGHT	
	A		B		OZ	GMS
	IN	MM	IN	MM	TYP	TYP
IK7P	2.908	73.86	2.408	61.16	6	170
IK11P	3.908	99.26	3.408	86.56	7	199

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN $\frac{\text{INCHES}}{\text{MM}}$
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010

ALL TOLERANCES BEFORE PAINT AND/OR LABELING

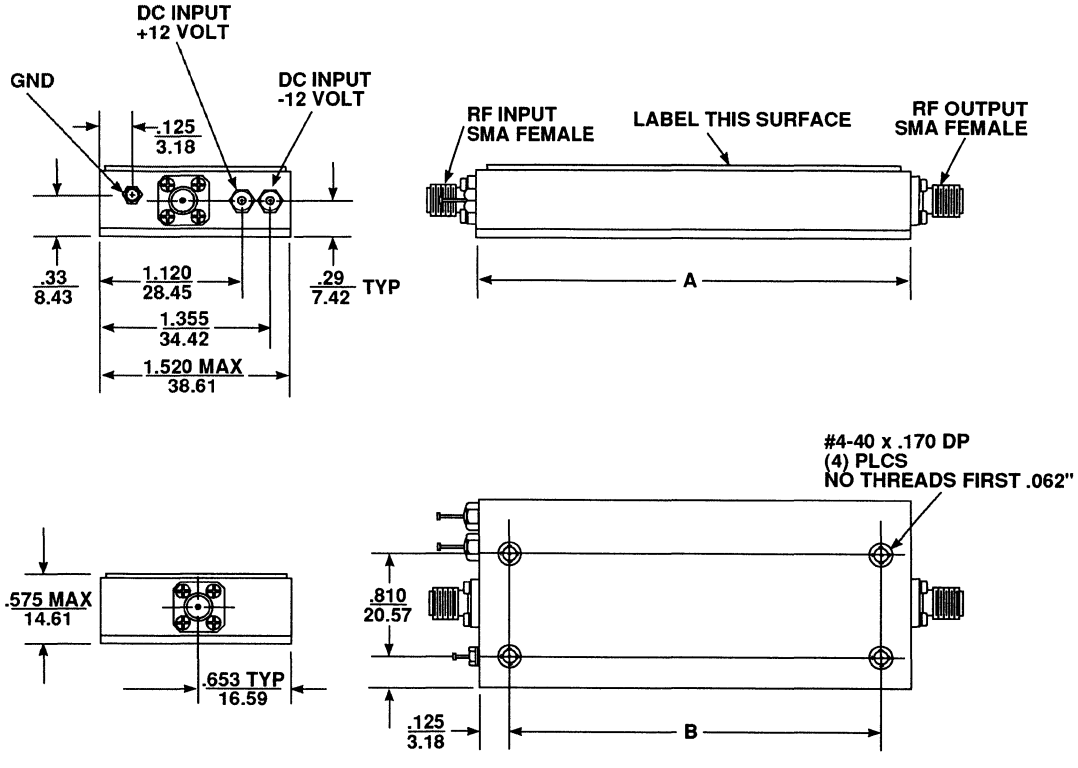


CASE	DIMENSION			
	A		B	
	IN	MM	IN	MM
IKD12P	3.920 MAX	99.57 MAX	3.408	86.56
IKD14P	4.420 MAX	112.27 MAX	3.908	99.26

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN $\frac{\text{INCHES}}{\text{MM}}$
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010

ALL TOLERANCES BEFORE PAINT AND/OR LABELING

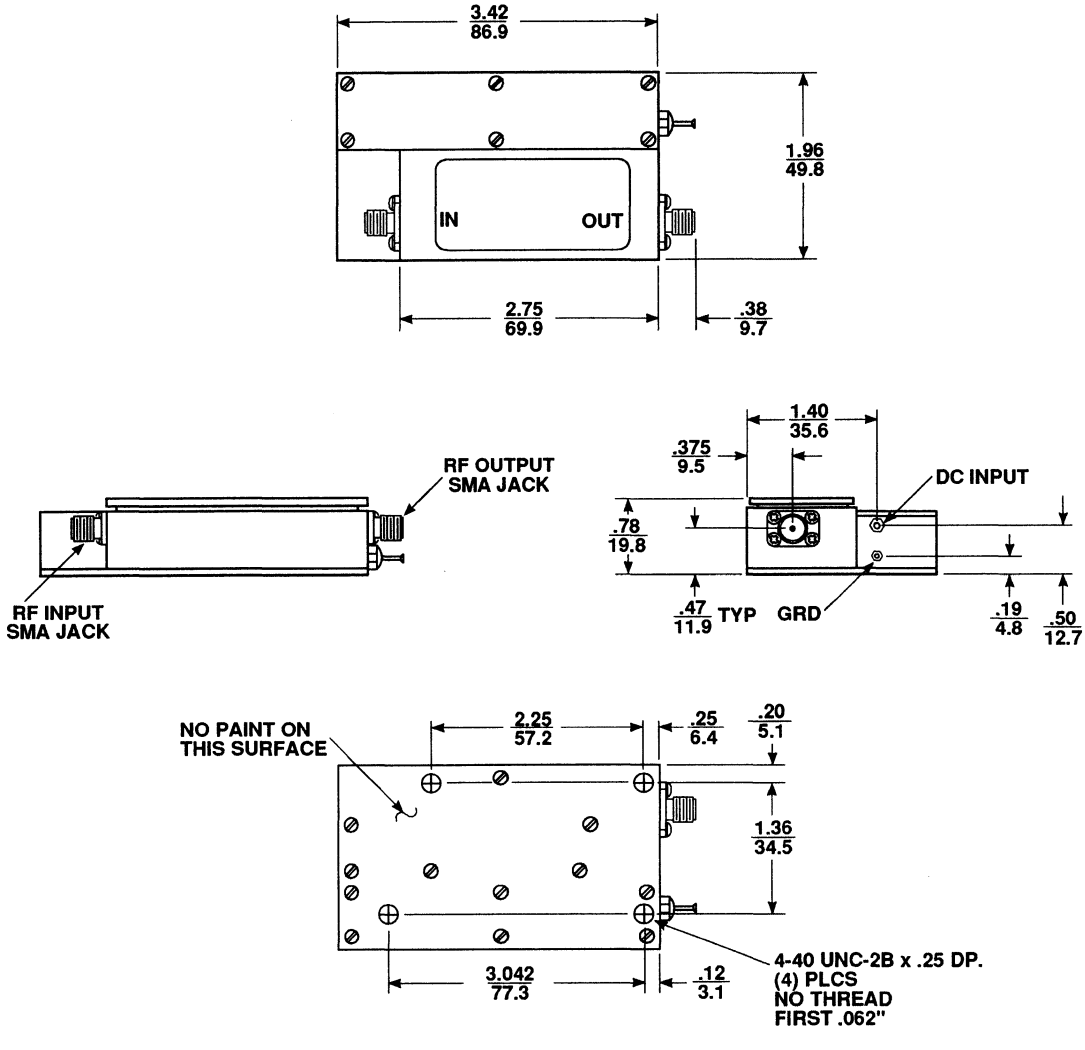


CASE	DIMENSION				WEIGHT	
	A		B		OZ	GMS
	IN (MAX)	MM	IN	MM	TYP	TYP
IKE6P	3.500	88.90	3.230	82.04	4.8	135
IKE8P	4.000	101.60	3.730	94.740	5.5	155

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN $\frac{\text{INCHES}}{\text{MM}}$
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010

ALL TOLERANCES BEFORE PAINT AND/OR LABELING



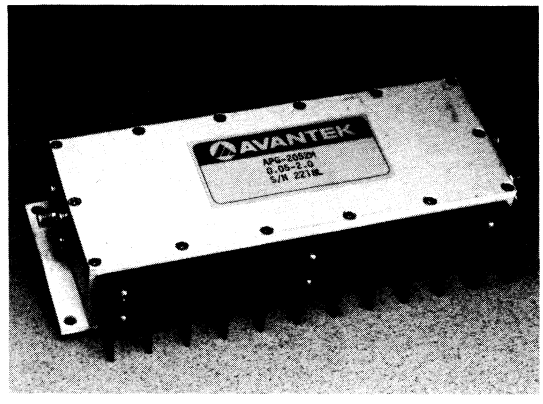
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3. WEIGHT: 6 OZ. (170 GMS.) TYP

Features

- **Wideband 1-2 Watt Power Output Levels**
- **Octave and Straddleband Ranges For General Purpose Applications**
- **Narrowband Ranges For S-Band And X-Band Radars**
- **Weatherproof Aluminum Cases**

APG Series Discrete FET Amplifiers



Description

These commercial GaAs FET amplifiers are designed for use in a wide range of general purpose applications such as laboratory test equipment, instrumentation and other applications requiring moderate power output.

Reliable operation is achieved by using rugged stripline circuit construction with selected and packaged Avantek GaAs FET devices actively biased with a current-controlling bipolar transistor. This design improves the dynamic range and ensures the temperature stability of these amplifiers.

Typical Applications Include:

- General High Power Laboratory RF Sources
- Output Amplifiers in Test Equipment (ATE & AGE)
- Driver Amplifiers in RF Distribution Networks
- Intermediate Power Amplifiers (IPA) in High Power Chains

.01 to 4.0 GHz FREQUENCY RANGE

WIDEBAND DISCRETE POWER AMPLIFIERS

General Applications

APG — Connectorized Amplifier Series

Guaranteed Specifications @ 0°C to +50°C Case Temperature

Model	Frequency Response (GHz) Min.	Gain (dB) Min.	Gain (dB) Max.	Noise Figure (dB) Max.	Power Output for 1 dB Gain Comp. (dB) Min.	Power Output (watts) Min.	Gain Flatness (±dB) Max.	Typical Intercept Point for Third Order Intermod Products (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC +3%)	Input Power Typical Current (mA)	Case Type
APG-1001	0.01-1	25	34	9.0	+30[1]	1.0	1.0	+39	2.0	2.5	+24	775	FM[2,3]
APG-1002	0.01-1	34	44	8.0	+30[1]	1.0	1.0	+39	2.0	2.5	+24	775	FM[2,3]
APG-1003	0.01-1	45	55	6.5	+30[1]	1.0	1.0	+39	2.0	2.5	+24	810	FM[2,3]
APG-1023	0.5-1	33	43	6.0	+33	2.0	1.0	+43	2.0	2.0	+15	1275	FS[2,4]
APG-2050	0.05-2	18.0	28.0	6.0	+23	0.2	1.0	+33	2.0	2.0	+15	275	FM[2,3]
APG-2052	0.05-2	28.0	38.0	6.0	+27[1]	0.5	1.0	+37	2.0	2.0	+15	525	FM[2,3]
APG-2053	0.5-2	30.0	40.0	6.0	+30	1.0	1.0	+40	2.0	2.0	+15	1200	FN[2,4]
APG-2001	1-2	10.0	20.0	5.0	+30	1.0	0.5	+40	2.0	2.0	+15	875	FN[2,4]
APG-2002	1-2	20.0	30.0	4.5	+30	1.0	0.75	+40	2.0	2.0	+15	950	FN[2,4]
APG-2003	1-2	30.0	40.0	4.5	+30	1.0	1.0	+40	2.0	2.0	+15	975	FN[2,4]
APG-2023	1-2	30.0	40.0	4.5	+33	2.0	1.0	+43	2.0	2.0	+15	1200	FN[2,4]
APG-4002	2-4	15.0	24.0	6.5	+30	1.0	1.0	+40	2.0	2.0	+15	1100	FO[2,5]
APG-4003	2-4	24.0	32.0	4.0	+30	1.0	1.0	+40	2.0	2.0	+15	1150	FO[2,5]
APG-4004	2-4	32.0	42.0	3.0	+30	1.0	1.0	+40	2.0	2.0	+15	1200	FO[2,5]

Notes:
1: Minimum power output for 2dB gain compression
2: Including cooling fins
3: SMA, N, TNC, or BNC connectors
4: SMA, N, or TNC connectors
5: SMA or N connectors

Special Applications - Narrowband Thin Film Power Amplifier

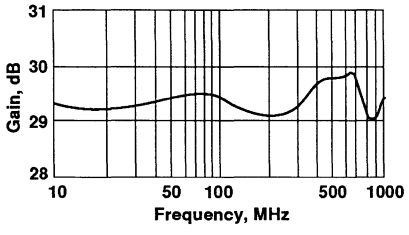
Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Min.	Gain (dB) Min.	Gain (dB) Max.	Noise Figure (dB) Max.	Power Output (watts) Min.	Power Output for 2 dB Gain Comp. (dBm) Min.	Gain Flatness (±dB) Max	Typical Intercept Point for Third Order Intermod Products (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC±3%)	Input Power Typical Current (mA)	Case Type
APT-8465	7.9-8.4	30.0	40.0	7.0	1.0	30	1.0	+37	2.0	2.0	+15[1]	1200	IC6[2]

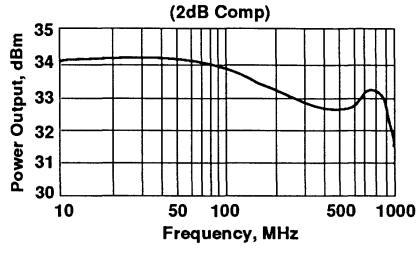
Notes:
1: Integral voltage regulator
2: SMA connector only

Typical Performance @ 25°C Case Temperature

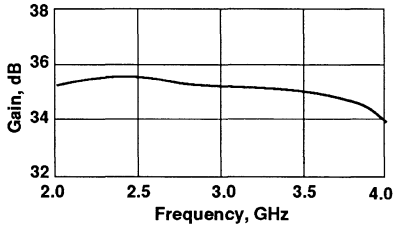
APG-1001 GAIN



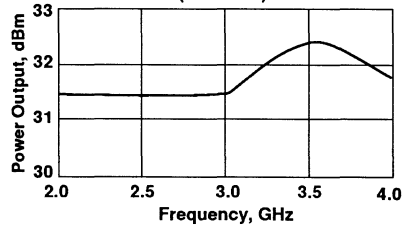
OUTPUT POWER
(2dB Comp)

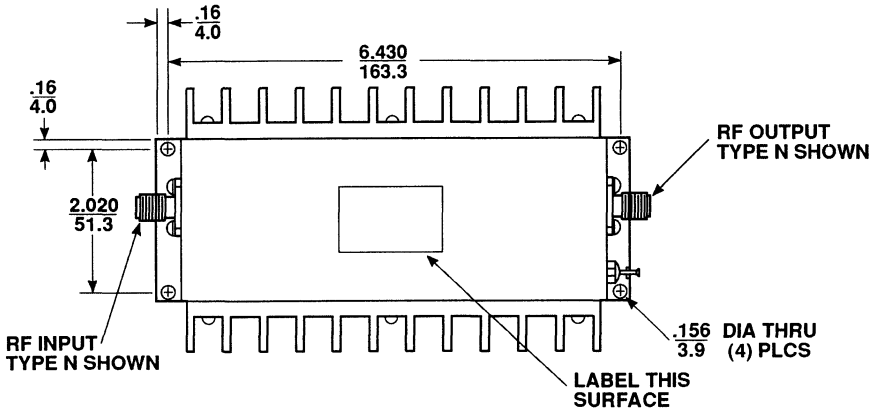


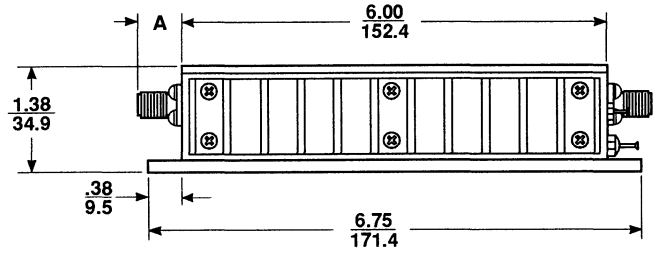
APG-4004 GAIN

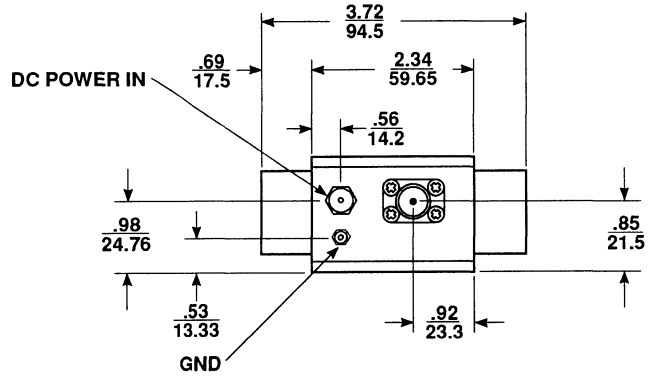


OUTPUT POWER
(1dB GCP)





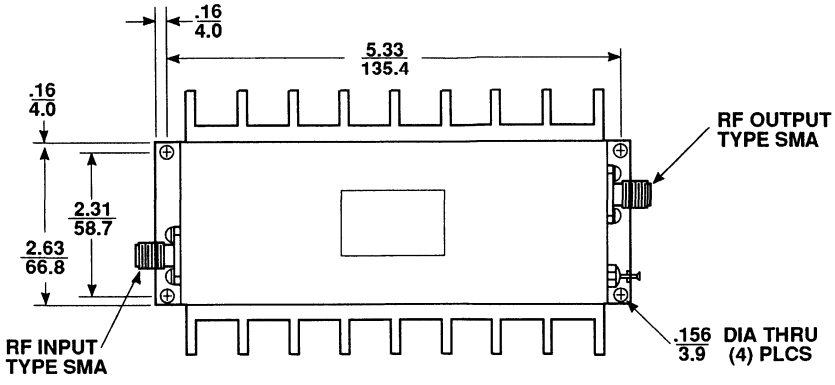


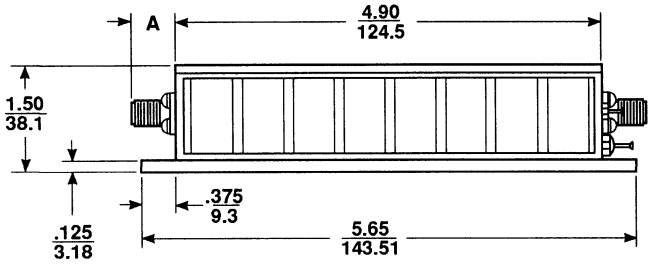


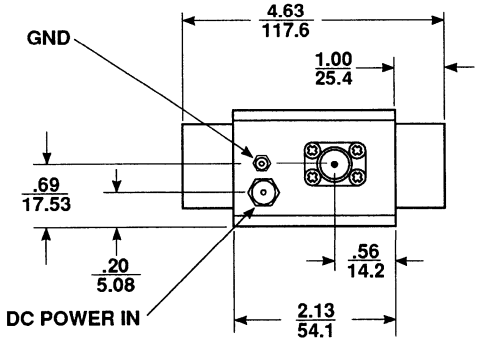
CONNECTOR	"A" DIMENSION
SMA	.40 / 10.16 MAX
TNC	.75 / 19.05 MAX
N	.75 / 19.05 MAX
BNC	.75 / 19.05 MAX

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010



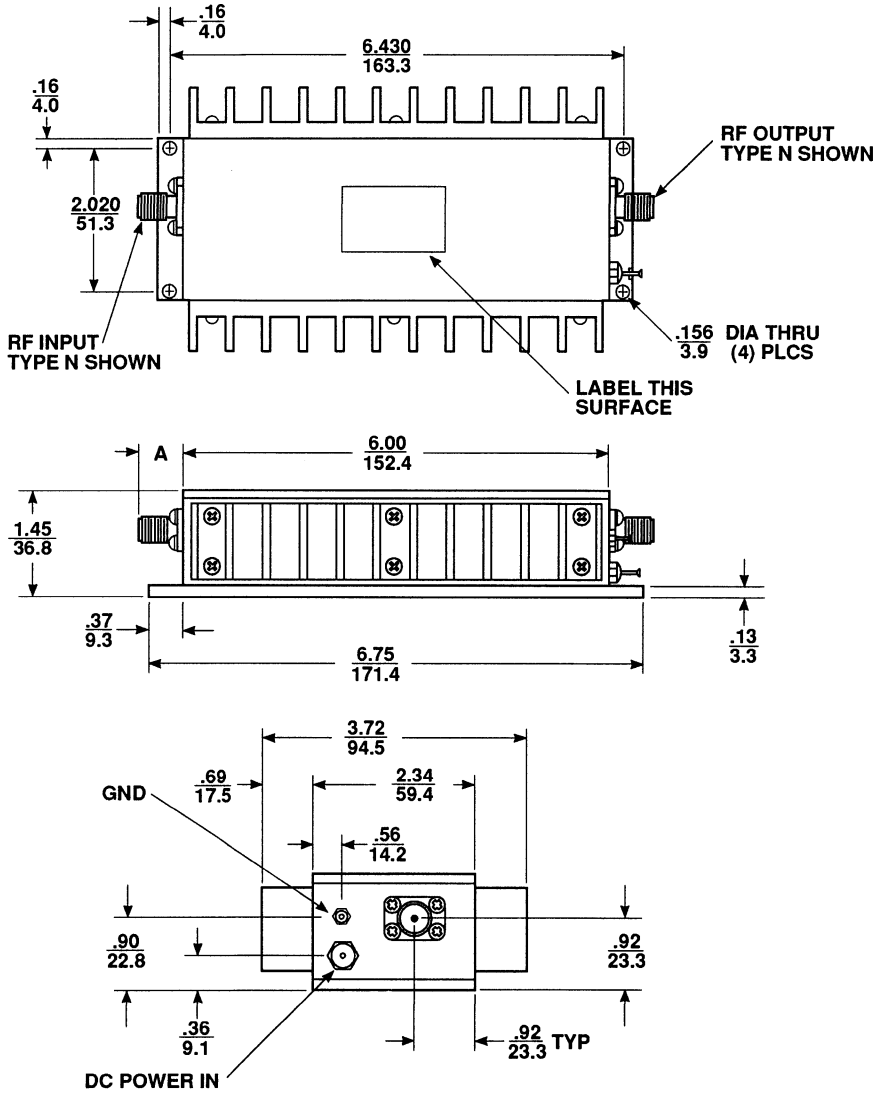




CONNECTOR	"A" DIMENSION
SMA	.40 / 10.16 MAX
TNC	.75 / 19.05 MAX
N	.75 / 19.05 MAX

NOTES (UNLESS OTHERWISE SPECIFIED):

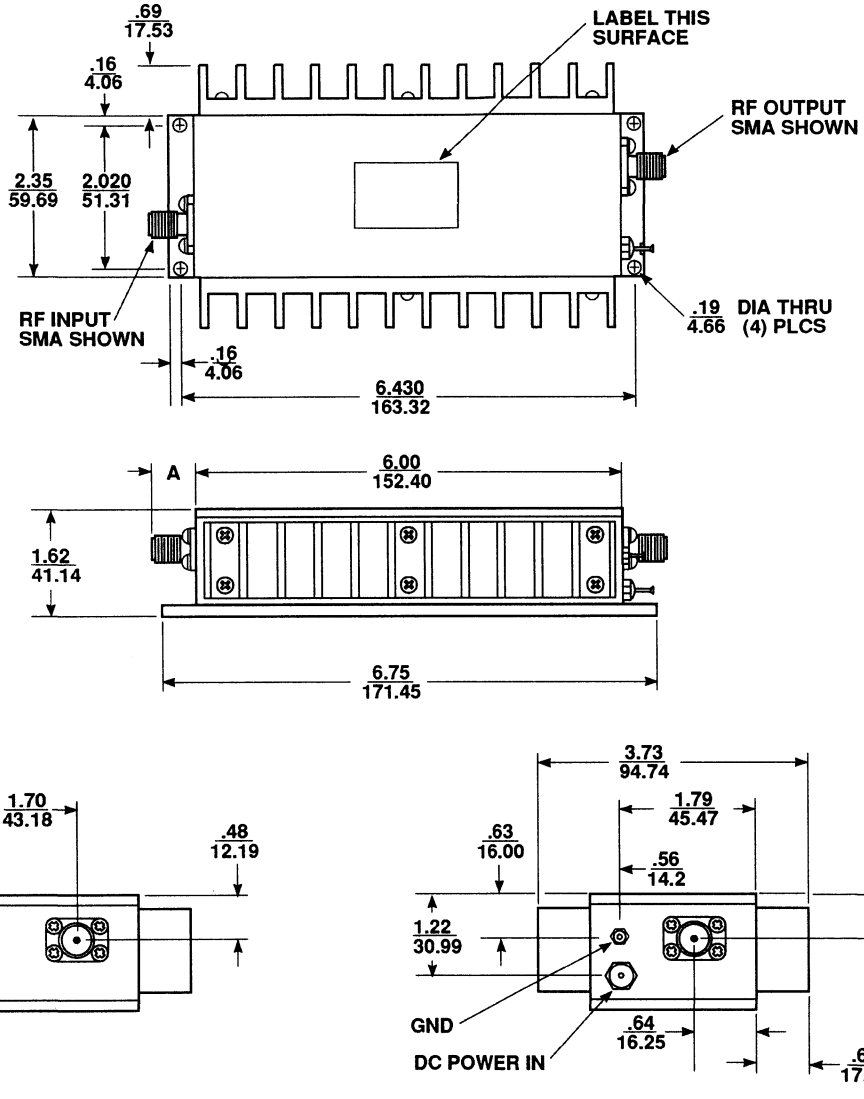
1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010



CONNECTOR	"A" DIMENSION
SMA	.40 / 10.16 MAX
TNC	.75 / 19.05 MAX
N	.75 / 19.05 MAX
BNC	.75 / 19.05 MAX

NOTES (UNLESS OTHERWISE SPECIFIED):

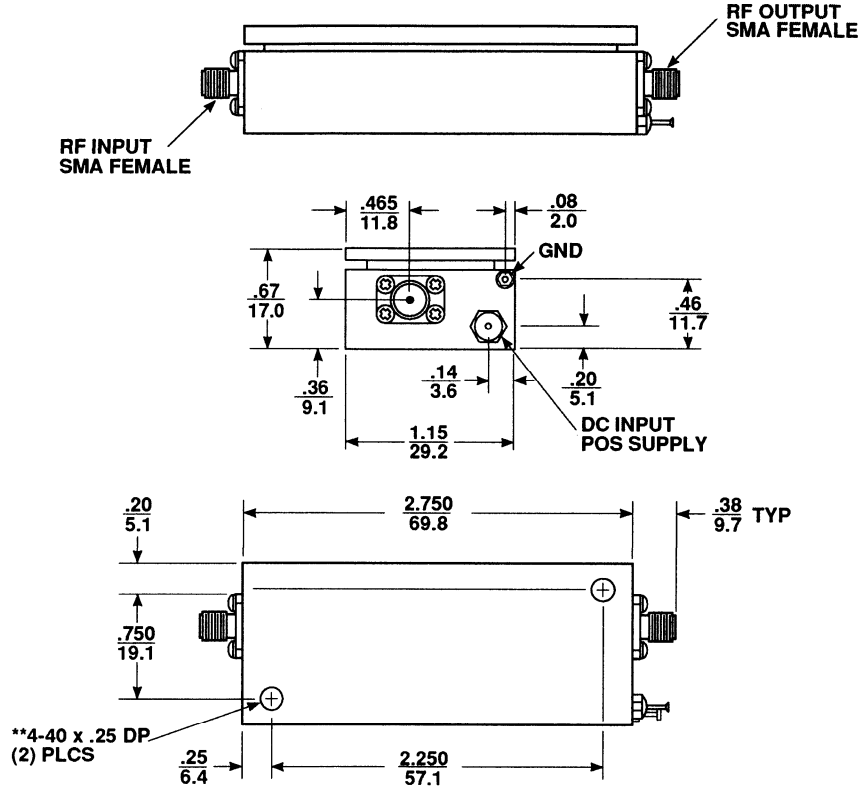
1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010



CONNECTOR	"A" DIMENSION
SMA FEMALE	.40 / 10.16 MAX
TNC FEMALE	.75 / 19.05 MAX
N FEMALE	.75 / 19.05 MAX

NOTES (UNLESS OTHERWISE SPECIFIED):

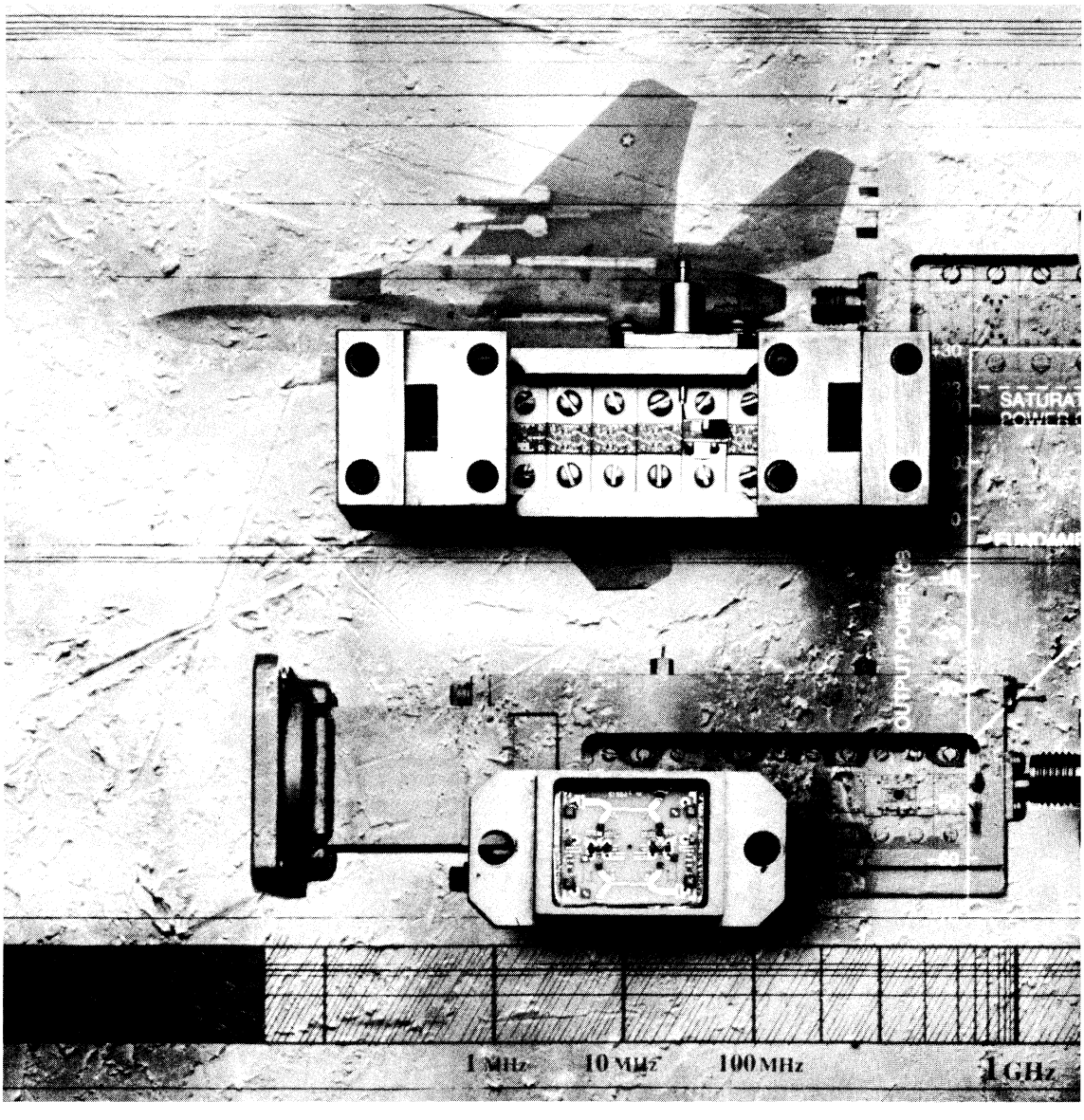
1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010



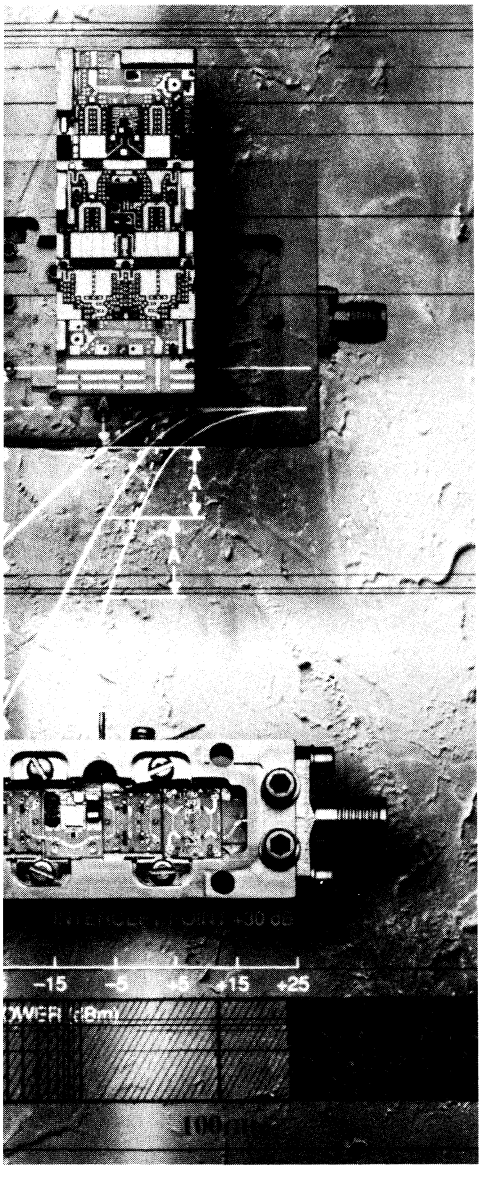
**AVAILABLE WITH METRIC THREAD M3 ON REQUEST.
NO THREADS FIRST .062"

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
3. WEIGHT: 4 OZ. (114 GMS.) TYP


1 MHz
10 MHz
100 MHz
1 GHz

5. Communications Amplifier Products



Satellite Communication Products

- Inmarsat Transceiver
- Uplink Power Amplifiers
  - Retrofit/OEM
- Low Noise Amplifiers
  - Downlink/Point-to-Point

TWT Retrofit Products

- Common Carrier Retrofit Amplifiers
- Radio Cross Reference Selection Guide

Cellular Radio Products

- Power
- Programmable
- Low Noise

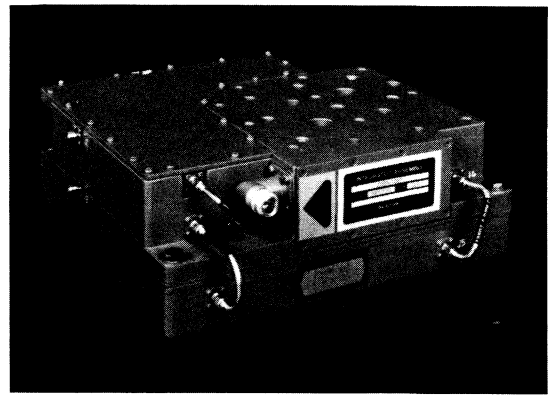
General Purpose Amplifiers

- Narrowband Power
- CARS Band
- Wideband Power

Features

- **150 dB Receiver Isolation**
- **50–70 dB Receiver Gain**
- **4 LO Frequency Options**
- **Noise Figures to 1.9 dB**
- **Transmit Powers to +46.0 dBm**
- **1.5:1 VSWR**
- **Reverse Polarity Voltage Protected**

Inmarsat RF Transceiver



Description

The Avantek Inmarsat RF Transceiver is an integrated uplink transmitter/upconverter with a power amplifier and downlink receiver front-end for use in shipboard and land-based earth stations for the worldwide Inmarsat telecommunications satellite system. This subsystem operates in the L-band, transmitting signals with +45.0 dBm power output in the 1636.5 to 1645.0 MHz frequency range while simultaneously receiving in the 1535.0 to 1543.5 MHz band. It interfaces with data and voice communications equipment using balanced-voltage digital interface circuitry compliant to EIA Standard RS-422. The assembly connects to the antenna via a single cable which carries both the transmit and receive signals.

While units can be custom designed to operate on many combinations of TX-IF input, RX-IF output and UHF local oscillator frequencies, the standard unit can operate on any one of the four user supplied LO frequencies which predetermines any of three sets of IF input and output frequency bands as detailed in the specifications.

Four functional groups comprise the subassembly (Figure 1): a diplexer, a receiver preamplifier, a frequency translator and a transmitter power amplifier. The translator includes a local oscillator frequency multiplier, a receiver RF-IF downconverter and a transmitter IF-RF upconverter.

The diplexer provides in excess of 20 dB of isolation at each filter port and more than 60 dB of rejection at the band edge of the other filter. The receiver preamplifier consists of a balanced 1.0 dB noise figure, high gain GaAs FET preamplifier followed by a bandpass filter tuned to the receive band.

Frequency translation begins with LO frequency multiplication accomplished by taking the signal from the UHF phase locked local oscillator, multiplying it to the proper system LO frequency (1330, 1460 or 1680 MHz) and dividing it into two equal signals to be used in the upconversion and downconversion sections. The use of narrowband LO frequency bandpass filters assures high rejection of the oscillator input signal and its other multiplication products.

The downconverter is comprised of a double-balanced mixer, two low-pass filters, and two stages of gain. The low-pass filter at the IF port of the mixer rejects any residual external oscillator signals, undesirable multiplication products and any local oscillator signals that may appear there, while the low-pass filter at the output of the downconverter rejects any out of band mixing products.

The upconverter consists of a double balanced mixer, several gain stages, a filter and a limiter. The transmitter power amplifier RF section requires a constant input level which is provided by the limiting circuit. A narrow bandpass filter rejects undesired multiplication products leaking through the mixer and limits the noise power transmitted within the receiver RF band.

The transmitter power amplifier, housed in a separate aluminum case, consists of a class A input stage followed by two single-ended class C stages followed by a balanced class C stage and a high power isolator to provide +42.5 to +46.0 dBm (17.8 to 40.0 watts) of RF output power. The amplifier includes an EIA Standard RS-422 compatible control module which keys the RF power on and off, monitors the RF output power for failure annunciation, and monitors the internal case temperature for thermal shutdown annunciation.

Designed for Reliability

Most microwave transistors used in the Inmarsat transceiver are designed and built in Avantek's own facility in Santa Clara, CA in close cooperation with the designers and their particular needs. This assures the best possible performance and reliability by allowing the designers to take full advantage of optimally designed transistors, plus it assures a continuing flow of virtually identical transistors throughout the manufacturing stages of the unit.

All steps in the processing of the transistors are traceable down to the wafer level, and all manufacturing steps are documented for process control and to provide information for a comprehensive in-house failure analysis program. Components purchased from outside vendors are subjected to rigorous incoming inspection and only vendors with a proven record of consistent quality and reliability are selected.

Packaging

The Inmarsat transceiver is environmentally sealed in a cast aluminum housing, designed for maximum flexibility to enable it to be easily adapted to the customer's mounting requirements without expensive customizing costs. It is suitable for either antenna or base mounting, provided that it is adequately cooled by heat sinking and/or cooling fins. If the application requires, the transmitter power amplifier section (fig. 1) may be located remotely from the balance of the system. Slight additional cable losses may be encountered in this configuration.

Specifications

Receiver Section

RF Input

Frequency Range ..... 1535.0-1543.5 MHz
Gain ..... 53 dB
  Optional Gain Available ..... 50-70 dB
Gain Flatness ..... ±1 dB
Gain Variation (under all conditions) ..... ±5 dB
Noise Figure
  +25°C ..... 1.9 dB to 2.7 dB
  +70°C ..... 2.4 dB to 3.2 dB
Bandwidth
  3 dB ..... 20 MHz, Min.
  60 dB ..... 100 MHz, Max.
VSWR (50 ohms) ..... 1.5:1, Max.

IF Output

Frequency Range
  System LO=1330 MHz ..... 205.0–213.5 MHz
  System LO=1460 MHz ..... 75.0–83.5 MHz
  System LO=1680 MHz ..... 136.5–145.0 MHz
Power Output, Min.
  (1 dB Gain Compression) ..... +5 dBm
Third Order
  Intercept Point, Min. ..... +15 dBm
VSWR (50 ohms) ..... 2.0:1, Max.
  (Optional, 75 ohms) ..... 2.0:1, Max.
Spurious and Noise Density Outputs in a 4 kHz BW.
  Referenced to RF input
  (75.0-83.5 MHz, 136.5-145.0 MHz or
  205.0-213.5 MHz) ..... –150 dBm, Max.

Local Oscillator Section

LO Multiplication Factors and Input Power Range (standard)

Input LO, MHz	190	210	292	365
Multiplication Factor	7	8	5	4
System LO, MHz	1330	1680	1460	1460

Input Power Window ..... 10 dB
Extended power ranges are optionally available.
VSWR (50 ohms) ..... 2.0:1, Max.
  (Optional, 75 ohms) ..... 2.0:1, Max.

Transmitter Section

IF Input

Frequency Range
  System LO=1330 MHz ..... 306.5–315.0 MHz
  System LO=1460 MHz ..... 176.5–185.0 MHz
  System LO=1680 MHz ..... 35.0–43.5 MHz
VSWR (50 ohms) ..... 2.0:1, Max.
  (optional, 75 ohms) ..... 2.0:1, Max.
Input Power Window for Any
  IF Input Frequency Range ..... –5 to –15 dBm

RF Output

Frequency Range ..... 1636.5–1645.0 MHz
Power Output (100% duty cycle) ..... +42.5– +46.0 dBm[1]
Power Supply Voltage ..... 27.0–29.0 V[1]
  Tolerance ..... ±0.1 V[1]
Power Supply Current ..... 3.75–6.0 A[1]
VSWR (50 ohms) ..... 1.5:1, Max.
Harmonics ..... –60 dBc, Min.

Note 1: See the following page.

Spurious Signals and Noise Density shall fall below the spectrum envelope defined by the following points.

Frequency, MHz	Power in a 4 kHz Bandwidth, dBm
1535 and below	–55
1622.5	–47
1636.5–1645.0	–17
1660.0	–47
1750 and above	–55

Note 1: The customer may specify a ±0.75 dB power output window between +42.5 and +46.0 dBm which will then occur, under all operating conditions, at an Avantek specified supply voltage between 27.0 and 29.0 Volts (±0.1 V) which then determines the maximum current specification.

Transmitter Interface

Transmit Control (Input)
Logic signals control the RF power through the amplifier to suppress or activate (key) power output transmission.

Transmit Monitor (Output)
This signal indicates whether RF signal transmission is occurring.

Thermal Alarm (Output)
Automatically disables the power amplifier when the internal temperature exceeds +80° ±4°C and turns it on again when it cools to +70° ±4°C. The status from the temperature sensing circuit is available as an output signal.

Load Protection
The unit will not be damaged by sustained operation with any passive load.

Power Requirements

+16 VDC Power
Regulation ..... ±1.5%
Current ..... 1.1 amperes, Max.

+27 to +29 VDC Power
Regulation ..... ±0.35%
Current ..... 3.75 to 6.0 amperes, Max.

Protection
The unit will not be damaged by reverse polarity connection of either power supply.

Environmental

Case Temperature
Operating ..... –35° to +70°C
Non-operating ..... –55° to +125°C

Relative Humidity 95%

Interface

All interface to below decks equipment is defined by EIA Standard RS-422.

Weight ..... 16 lb., 6 oz., Typ.

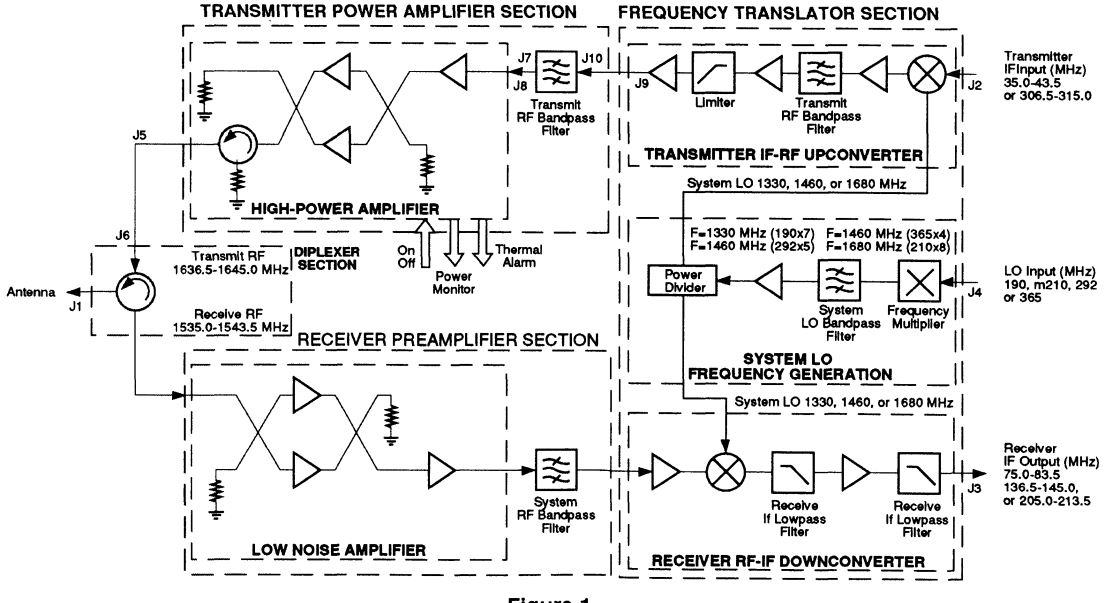
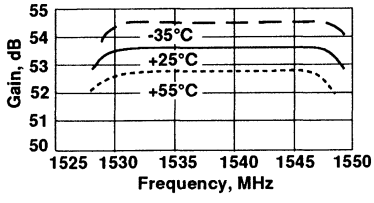


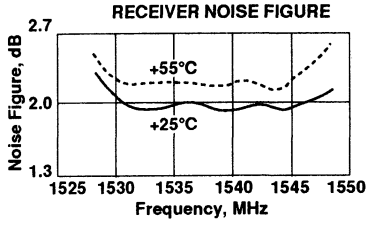
Figure 1

Typical Performance

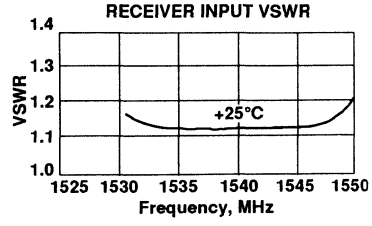
RECEIVER GAIN



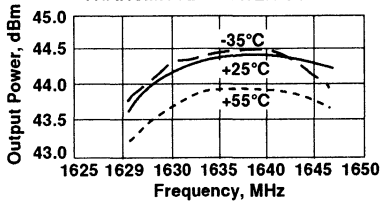
RECEIVER NOISE FIGURE



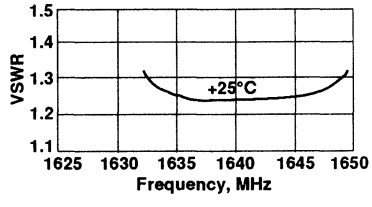
RECEIVER INPUT VSWR

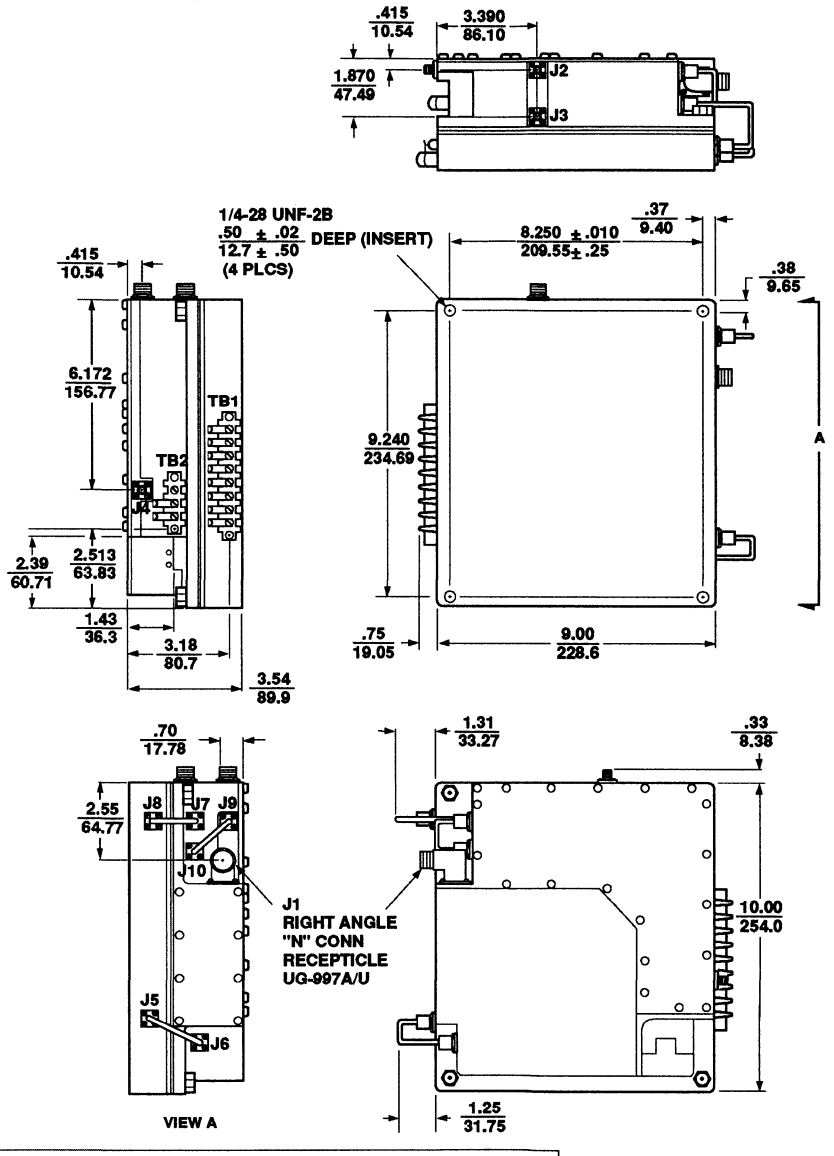


TRANSMITTER POWER OUTPUT



TRANSMITTER OUTPUT VSWR





J1 ANTENNA	J6 DIPLEXER TRANSMITTER INPUT
J2 TRANSMITTER IF INPUT	J7 TRANSMITTER INPUT-FILTER OUTPUT
J3 RECEIVER IF OUTPUT	J8 POWER AMP INPUT
J4 UHF LOCAL OSCILLATOR INPUT	J9 UPCONVERTER OUTPUT
J5 POWER AMP OUTPUT	J10 TRANSMITTER INPUT-FILTER INPUT

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN IN / MM
2. TOLERANCES: .XX ± .02
   .XXX ± 0.5
3. COAXIAL CONNECTORS ARE SMA-F

Features

- High Linearity
- High Gain
- Low/No Maintenance
- Long Life
- Fail Soft
- C Band
- Ku Band

ACU-64100 RM

Description

Avantek's C Band satellite uplink power amplifiers are designed to provide exceptionally high linearity. They may be used to retrofit SCPC, QPSK or other multiple carrier satellite uplinks now using TWTs with stringent third order requirements that normally preclude the use of a solid state amplifier.

The ACU-64100 is a 10 watt, 6 GHz amplifier with integral heatsink that may be conveniently mounted for use in a wide range of systems applications. The ACU-64100 RM (10 watt) and AWP-64200 (20 watt) amplifiers are installed in standard 19 inch rack-mountable cabinets with cooling fans that eliminate the need for an external thermal conduction path. Both versions are designed for retrofitting TWTs in existing applications, however they may also be used by equipment manufacturers whenever a high reliability, low maintenance unit is required.

The 2, 5 and 8 watt Ku Band satellite uplink power amplifiers provide the OEM system designer a variety of transmit output power levels with enhanced solid state performance and reliability at very favorable operating and maintenance costs when compared to other amplifier alternatives.

A system application may utilize any number of carriers as long as the maximum output power of each is calculated using the total frequency plan and resulting intermod figures.

The output stage of each of these amplifiers is designed to combine the power output of two internally matched GaAs FET devices. If one of these devices should fail, the unit's total power output will drop by only 6 dB and not cause a system outage.

ACU/AWP—HIGH POWER SATELLITE COMMUNICATIONS UPLINK

ACU Series — 5.925 to 6.425 GHz

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Range (GHz)	Gain (dB)	Output Power[1] (watts/dBm)	Noise Figure[2] (dB) Max.	AM/PM Conver (°/dB) @ Max. Output Typ./Max.	Output Gain Variation 0° to +50° C (dB) Max.	Output Power Flatness (dB) P-P	Third Order Intercept Point (3 Tone)	Harmonics (dBc) Max.	Spurious (dBc) Max.	Return Loss (dB) Min. Input	Return Loss (dB) Min. Output	DC Input Power[3] (watts) Typ.
ACU-64100	5.925-6.425	45-55[5]	10/+40	10	1.5/2	±3	±.25[6]	48	-53	-60	18	18	110[11]
ACU-64100RM[4]	5.925-6.425	43-53[5]	10/+40	10	1.5/2	±1	±.25[6]	48	-50	-60	18	14	125
AWP-64200RM[4]	5.925-6.425	45-55[5]	20/+43[15]	10	1.5/2	±1	±.25[6]	50	-53	-60	18	14	240

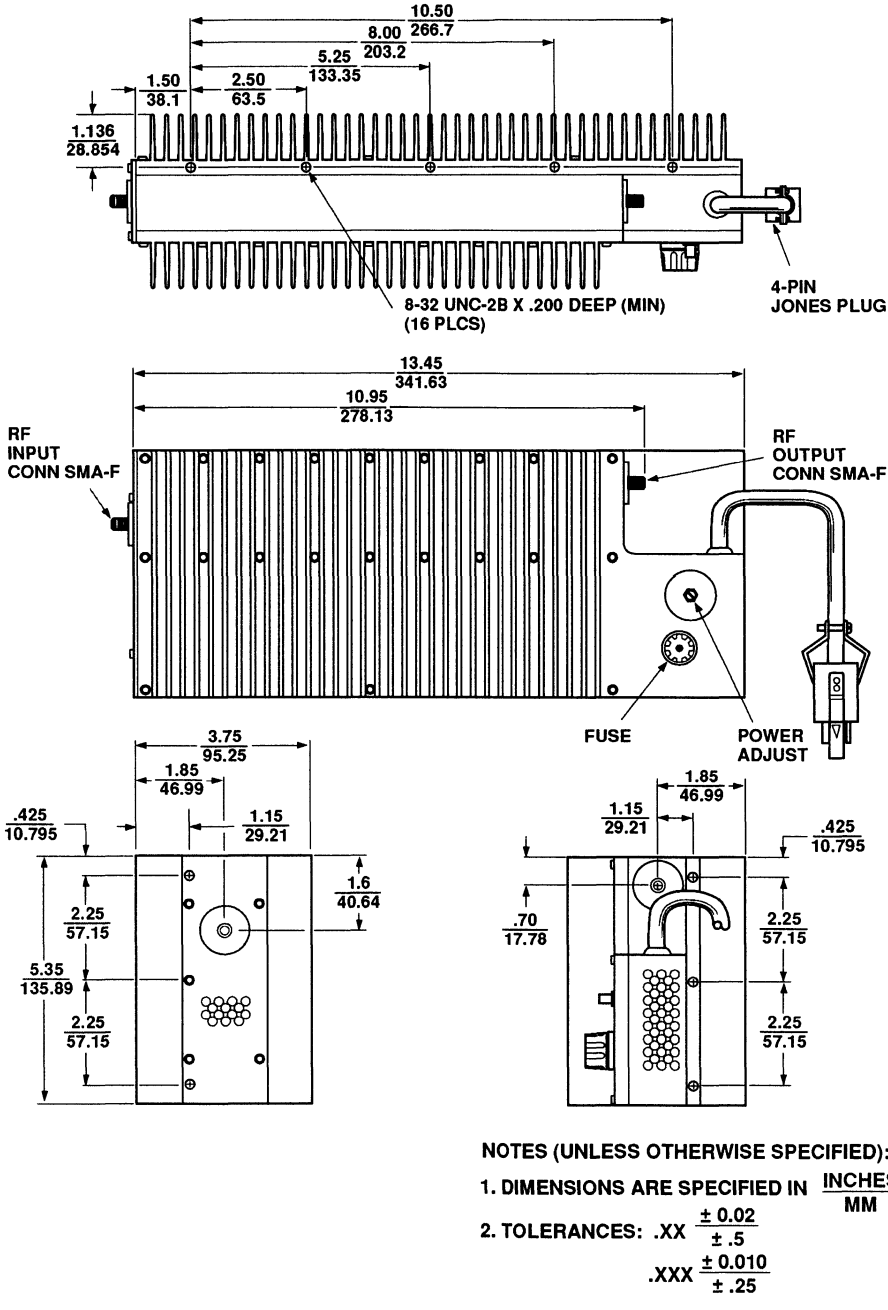
AWP Series — 14.0 to 14.5 GHz

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Range (GHz)	Gain (dB) Min.	Output Power[1] (watts/dBm) Min.	Noise Figure[2] (dB) Max.	AM/PM Conver (°/dB) @ Max. Output Typ./Max.	Output Gain Variation -40° to +50° C (dB) Max.	Output Power Flatness (dB) P-P	Third Order Intercept Point (3 Tone)	Harmonics (dBc) Max.	Spurious (dBc) Max.	Return Loss (dB) Min. Input	Return Loss (dB) Min. Output	DC Input Power[3] (watts) Typ.
AWP-145102	14.0-14.5	30	2/33	10	1.5/2	±2	±.25[6]	42[12]	-50	-60	14	18	40[10]
AWP-145505	14.0-14.5	45	5/37	10	1.5/2[8]	±2	±.25[7]	44[13]	-50[8]	-60[8]	14	18	100[11]
AWP-145508	14.0-14.5	45	8/39	10	1.5/2[9]	±2	±.25[7]	46[14]	-50[9]	-60[9]	14	18	165[11]

Notes:

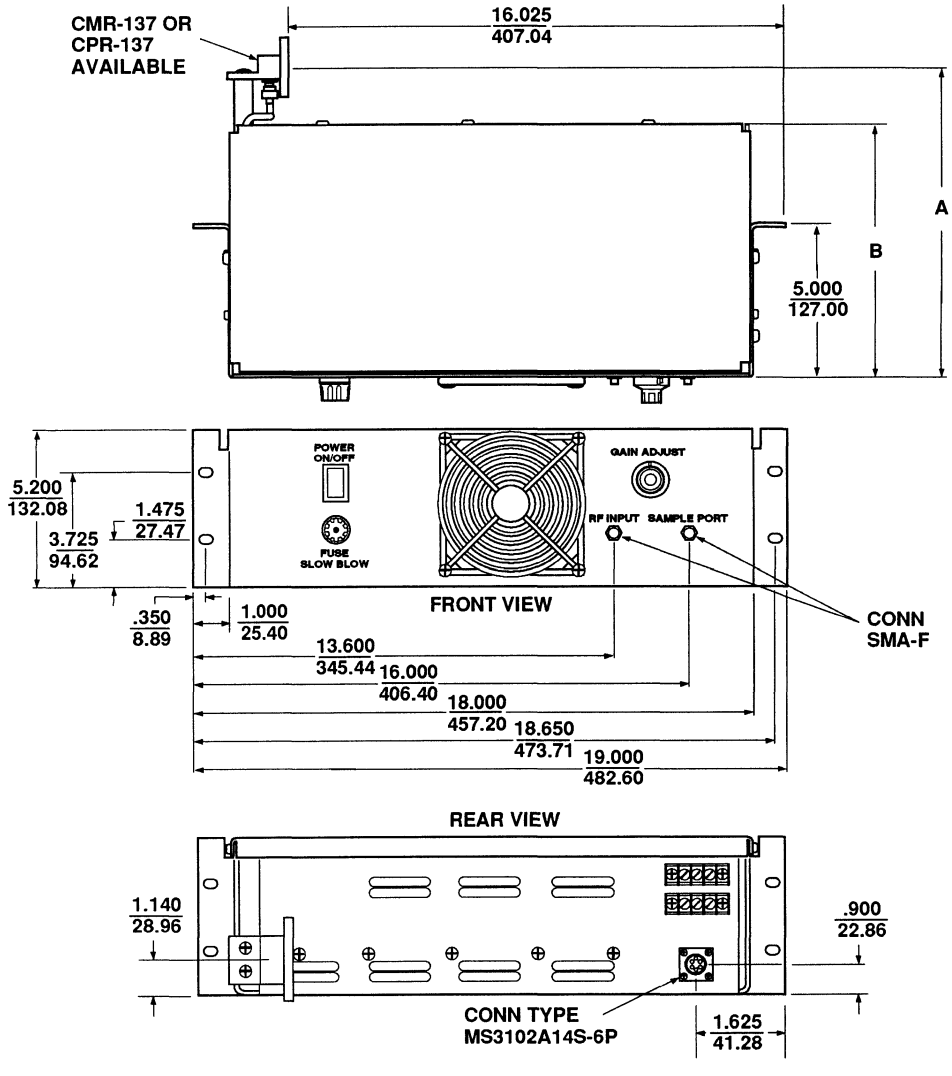
1. @ 1 dB gain compression
2. @ maximum gain
3. -24 or -48 VDC
4. Rack-mountable, 19-inch cabinet
5. 10 dB adjustable input attenuator
6. Peak-to-peak across any 40 MHz band at rated output power
7. Peak-to-peak across any 30 MHz band
8. @ +36 dBm P_o total
9. @ +37 dBm P_o total
10. +15 VDC
11. +15 V option available
12. @ +29 dBm total power
13. @ +33 dBm total power
14. @ +34 dBm total power
15. saturated power output



NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± 0.02 / ± .5
   .XXX ± 0.010 / ± .25

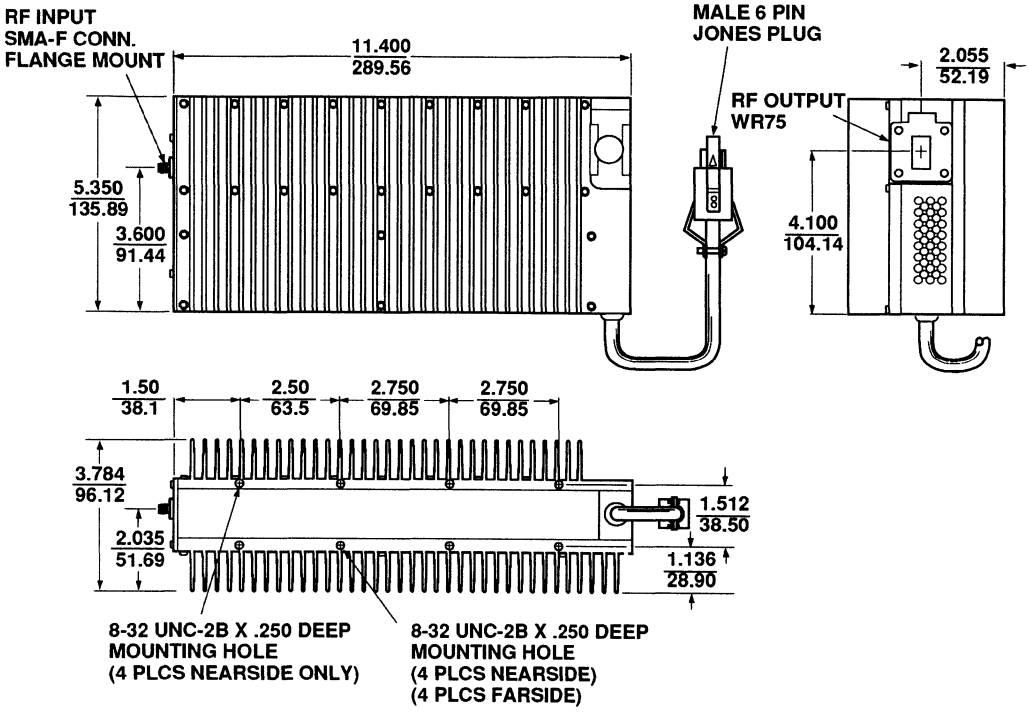
5. COMM AMP PRODS



CASE	DIMENSION				FUSE
	A		B		
	IN	MM	IN	MM	
ACU-64100RM	9.815	249.30	8.212	208.58	3A @ -48 VDC 7A @ -24 VDC
AWP-64200RM	17.430	442.72	15.475	393.06	7A @ -48 VDC 12A @ -24 VDC
AWP-64200RM	17.430	442.72	15.475	393.06	7A @ -48 VDC 12A @ -24 VDC

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN $\frac{\text{INCHES}}{\text{MM}}$
2. TOLERANCES: .XX $\frac{\pm 0.02}{\pm .5}$
   .XXX $\frac{\pm 0.010}{\pm .25}$



NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN $\frac{\text{INCHES}}{\text{MM}}$
2. TOLERANCES: .XX $\frac{\pm 0.02}{\pm .5}$
   .XXX $\frac{\pm 0.010}{\pm .25}$

AM-166x Series - INMARSAT Downlink 1535-1660 MHz

Features

- INMARSAT Downlink Band
- Ultra-flat Gain Response
- 1.2 dB Noise Figure (Typical)
- Internal Filtering (Factory Tunable in AM-1664)
- No Detectable Microphonics
- Integral Regulator Option Available (+18 to +24 VDC Operation)

Description

The AM-1664 series amplifiers are ultra-low noise, low VSWR, wide dynamic range, high gain solid state preamplifiers with an integral filter and are designed specifically for use in INMARSAT and GPS receivers. Quality construction techniques assure long life and high reliability under severe marine conditions.

AM-4281x Series - Point-to-Point and Satellite Downlink, 3.7-4.2 GHz

Features

- 1.5 dB Noise Figure
- Up to 50 dB Gain
- Wide Dynamic Range
- Optimized Phase and Gain Flatness
- Low AM/PM Conversion
- 1.25:1 Maximum VSWR
- Compact Aluminum Case

Description

Low noise amplifiers of this series make ideal post amplifiers for parametric LNAs used in heavy capacity satellite communications earth terminals and other receivers using small aperture antennas. They operate extremely well as stand-alone preamplifiers in point-to point microwave systems and in light capacity earth terminals because they exhibit excellent group delay, gain slope and AM/PM conversion characteristics vital to undistorted transmission of video and high-bit-rate digital information.

AWC-420xx Series - TVRO and CATV Satellite Downlink, 3.7-4.2 GHz

Features

- Noise Temperature as Low as 70°K
- Wide Dynamic Range (+15 dBm Intercept Point)
- 1.3:1 Maximum Input VSWR
- Excellent Group Delay/Gain Slope Performance
- Low AM/PM Conversion - 0.1 °/dB Maximum
- Cast Aluminum Weatherproof Case
- DC Powered Through RF Output Connector

Description

As stand-alone preamplifiers for receivers in 3.7 to 4.2 GHz earth terminals, this series of amplifiers displays the low noise figure, low input and output VSWR and gain/slope delay characteristics that are critical for reliable wideband communication. The wide dynamic range of these amplifiers allow systems to be optimized for the most reliable performance possible during periods of signal fading while minimizing overload and cross modulation during peak signal periods.

Low power DC voltage can be applied to the amplifier through the RF output coaxial feedline connector. This method simplifies antenna feedpoint mounting by using a single cable to carry both power and RF. For a receiver with no provision for powering the amplifier through the RF feedline, a specially designed DC block (the Avantek DCB-42) is available.

Because the AWC-420xx series amplifiers are packaged in cast aluminum cases with integral waveguide input flanges and coaxial cable output connectors, they are ideal for antenna feedpoint mounting when used as the sole preamplifier in light or medium capacity earth terminals. Feedpoint mounting has the distinct advantage of placing the amplifier ahead of all feedline losses which gives the best system noise performance.

LOW NOISE, COMMUNICATIONS BAND AMPLIFIERS

AM-166X — Inmarsat Downlink LNA

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Range (GHz) Minimum	Noise Figure (dB) Maximum	Gain (dB) Minimum	Gain Flatness (±dB) Maximum	Power Output at 1 dB Gain Compression (dBm) Minimum	Typical Intercept Point for Third Order Intermod Products (dBm) Minimum	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power[2] Voltage (VDC)	Input Power[2] Current (mA) Typical	Case Type[3]
AM-1664	1.535-1.660[1]	1.5	50	0.25	+12	+25	1.25	1.5	+15	150	FD
AM-1665	1.535-1.660	1.5	50	0.75	+12	+25	1.5	1.5	+15	150	FC
AM-1666	1.535-1.660	1.5	30	0.50	+6	+19	1.5	1.5	+15	90	FC

AM-4281X — Point-to-Point Communications and TV Satellite Downlink LNA

Guaranteed Specifications @ 25°C Case Temperature

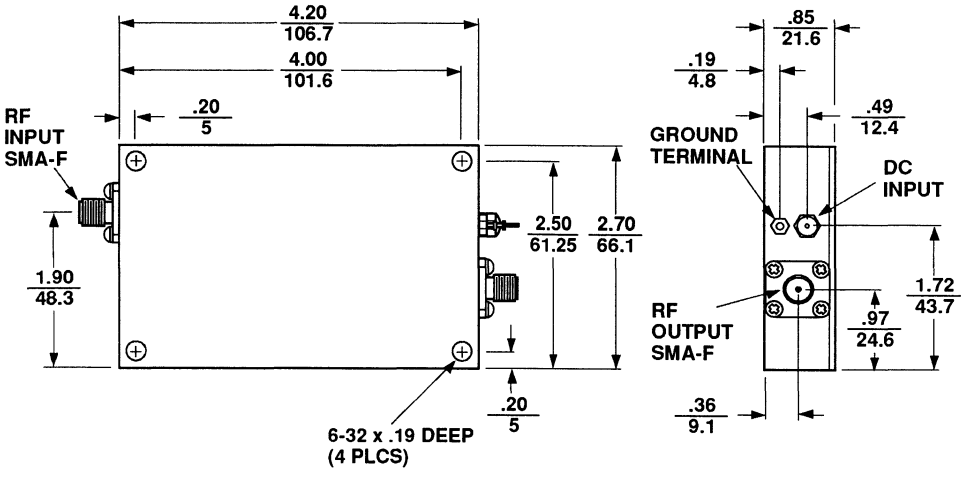
AM-42812	3.7-4.2	1.5	20	0.5	+12	+22	1.25	1.5	+15	70	AN
AM-42813	3.7-4.2	1.5	30	0.5	+15	+25	1.25	1.5	+15	90	AN
AM-42814	3.7-4.2	1.5	40	0.5	+15	+25	1.25	1.5	+15	120	AN
AM-42815	3.7-4.2	1.5	50	0.5	+15	+25	1.25	1.5	+15	150	AN

AWC-420XX — TVRO and CATV Satellite Downlink LNA

Guaranteed Specifications @ 25°C Case Temperature

AWC-42070	3.7-4.2	70[4]	48	2.0	—	+15	—	1.5	+15 to +24	150	Note 5
AWC-42075	3.7-4.2	75[4]	48	2.0	—	+15	—	1.5	+15 to +24	150	Note 5
AWC-42085	3.7-4.2	85[4]	48	2.0	—	+15	—	1.5	+15 to +24	150	Note 5

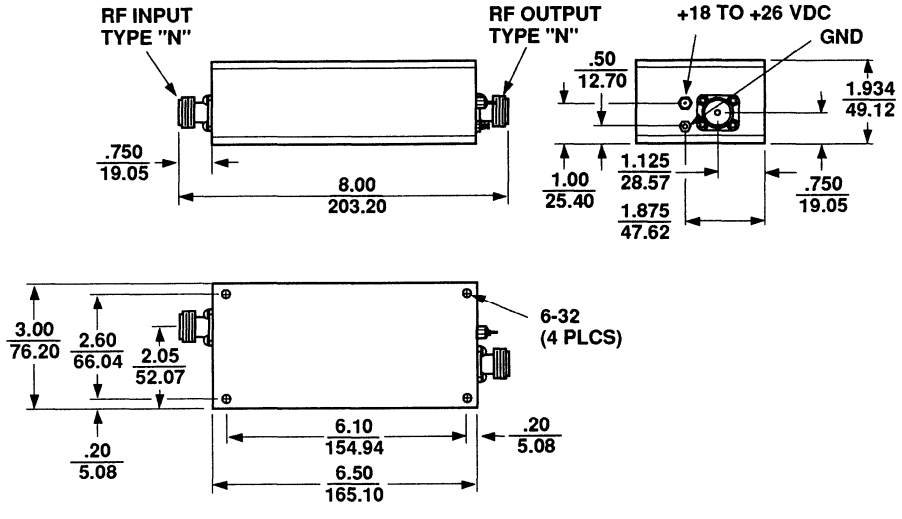
Notes:
1. Contains integral filter specifically tailored for any 10 MHz bandwidth. Applications include INMARSAT and GPS
2. Nominal. Contains integral voltage regulator for operation from +15 to +28 VDC
3. Type SMA connector only
4. Noise Temperature (°K) Maximum
5. Case Type IN-034694



NOTES (UNLESS OTHERWISE SPECIFIED):

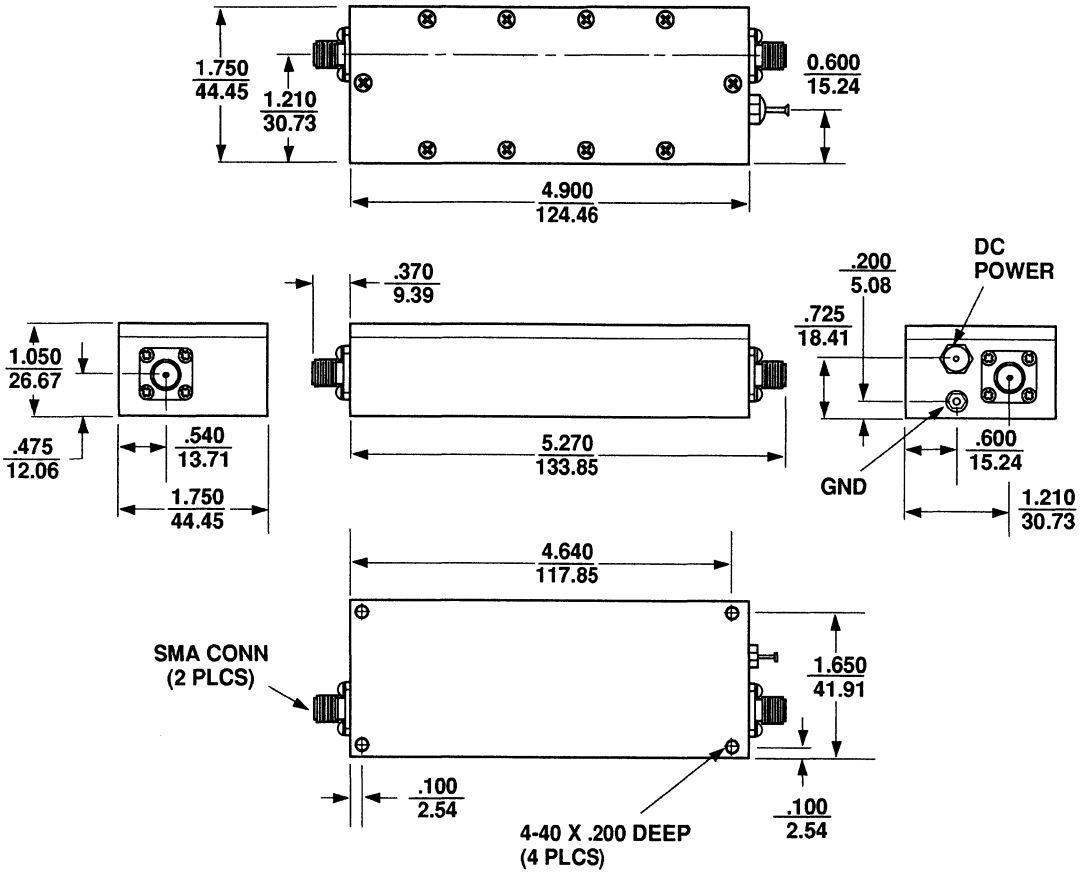
1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± 0.02 / ± .5
   .XXX ± 0.010 / ± .25

5. COMM AMP PRODS



NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± 0.02 / ± .5
   .XXX ± 0.010 / ± .25



NOTES (UNLESS OTHERWISE SPECIFIED):

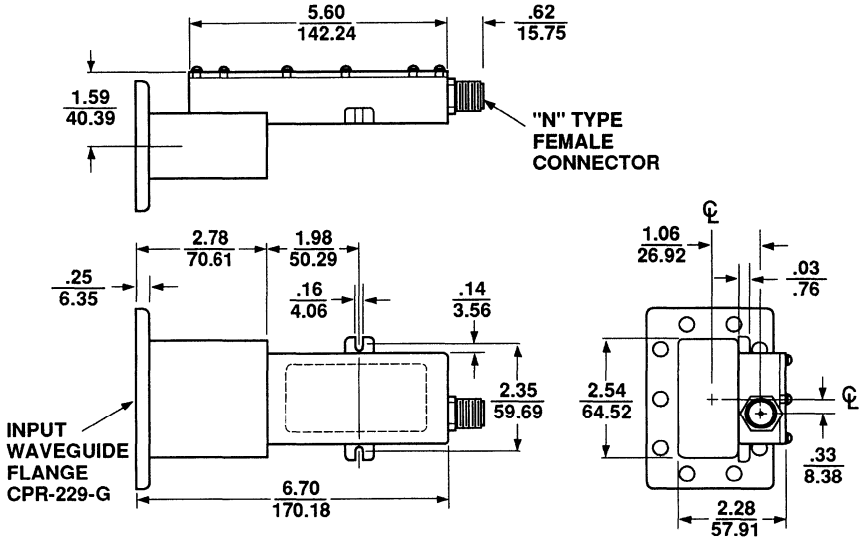
1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± 0.02 / ± .5
   .XXX ± 0.010 / ± .25

5. COMM AMP PRODS

IN-034694
CASE DRAWING

TVRO and CATV
LNA

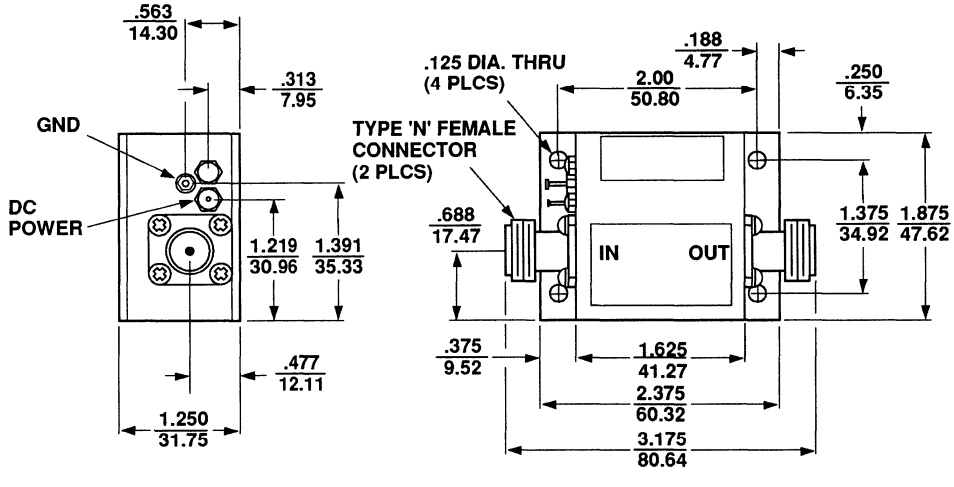
SATELLITE COMMUNICATIONS PRODUCTS



DCB-42
CASE DRAWING

DC BLOCK

SATELLITE COMMUNICATIONS PRODUCTS



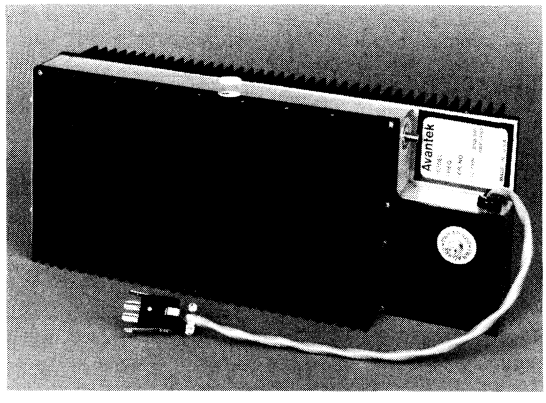
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± 0.02 / ± .5
   .XXX ± 0.010 / ± .25

Features

- High Reliability
- Energy Efficient
- FCC Type Accepted
- High Channel Loading Capacity
- Easy to Install
- No Maintenance Required
- Office Battery Powered
- Cost Competitive
- 4, 6, 7, 8 and 11 GHz Bands

Power Amplifier (Single Unit)



Description

Avantek manufactures a complete line of solid state power amplifiers and retrofit accessory kits to replace TWTs and their associated power supplies in terrestrial point-to-point microwave radio transmitters. These full-band amplifiers are available with 10 watts output power at 4, 6, 7, 8 and 11 GHz. The 6 and 11 GHz units are available in two physical styles. Performance characteristics of both styles are identical. The single unit has the RF and DC/DC converter combined into a single package that is ideal for replacing the older style TWTs. The split unit separates the RF and DC/DC converter into two packages with the RF section having the same footprint as the high-efficiency TWT it replaces.

Cost Effective TWT Replacement

Avantek's solid state power amplifiers are a cost effective solution to TWT replacement. Solid state GaAs FET RF power amplifiers typically require less current than a TWT amplifier. This reduction in DC power consumption can increase the battery plant reserve time or allow additional equipment to be added without increasing battery capacity. Reduced power consumption can eliminate the need for increased rectifier recharging capacity and larger emergency engine alternators. Less power dissipation means less heat is generated, thus the cost of air conditioning can be reduced. If obsolete power plants or air conditioning units are to replaced, the new ones can be smaller and less costly.

The Avantek amplifier is directly competitive in initial price if any part of the TWT amplifier needs to be changed. Retrofit accessory packages include all hardware, transitions and instructions needed to complete an amplifier retrofit installation in about one hour. Retrofit amplifiers are also equipped with an input attenuator capable of accepting any RF input power level between −1 and +10 dBm, thereby permitting installation of the TWT replacement amplifier without requiring adjustment to any of the previous stages. Additionally, these amplifiers can be used as spares for all of the various radio types that have been retrofitted.

Solid state amplifiers can dramatically reduce maintenance costs. All TWT amplifiers have to be realigned periodically to correct for aging. Older tubes need adjustment three to four times per year. When these tubes are replaced with the Avantek solid state amplifier, no periodic alignment is required. Once the power amplifier output is set by adjusting the attenuator and the unit is placed into service, only the required FCC checks must be made. Since the Avantek IMFET™ internally-matched GaAs field effect transistors, at ambient room temperature, operate at a 115°C channel temperature, the calculated device MTBF exceeds 30 years. With this reliability, significant cost savings through long life can be realized. However, in the unlikely event of failure of the IMFET™ device, the output stage is also designed to fail-soft, thus avoiding complete service outage.

Transmission Improvement

Many transmission improvements can result when traveling wave tube amplifiers are replaced with Avantek solid state power amplifiers. As mentioned above, the output of a TWT amplifier degrades between adjustments. On the day of

adjustment, it will put out its rated power and gradually drop until it needs to be readjusted or a low output alarm comes on at about 3 dB below rated power. Experience has shown that the average output of a tube-type amplifier is 2 dB below design value which corresponds to a 2 dB reduction in fade margin and 59% increase in outages. Since the output power of a solid state amplifier is not affected by the "sag" of cathode erosion as in a TWT, the transmitter is always putting out its rated power. This results in lower thermal noise in the receiver and a better fade margin, thus a quieter system with increased availability.

System Loading Maximization

Here is an example. The 6 GHz band can support 1800-2400 voice circuits in its 30 MHz channels. However, a number of users have found that routes designed and engineered to rigid noise budgets will not meet noise objectives when loaded beyond 600-1200 circuits. Testing short sections of facilities (6-10 hops) may show that each section is performing exactly as engineered. However, when four or five sections are tested in tandem, it may be found that the total picowatts of noise measured is two to three times the sum of the noise measured on each of the short sections.

Here's why. Picowatts are a measure of power; adding sections results in power addition, that is, 10 log addition. The same results can be obtained by combining the dBnc0 readings of the shorter sections on a power ratio (again 10 log) basis. It is very difficult to determine the amount of 20 log (voltage addition) noise in a per hop or short section test, since, in a short section, the 20 log noise may be completely masked by the sources of 10 log noise. On longer sections it can quickly become predominant.

The most common cause of this type of noise is AM/PM conversion in the traveling wave tube amplifier and in the upconverter. TWT amplifiers normally have AM/PM conversion of 4 to 8 degrees per dB. Avantek solid state retrofit amplifiers typically perform at 1.5°/dB across the 500 MHz band. Replacement of the TWT with an Avantek solid state low AM/PM amplifier will significantly reduce intermodulation noise due to reduced AM/PM conversion in the transmitting amplifier. With 2 dB reduction in thermal noise by eliminating TWT output sag and with four to five dB improvement in intermodulation noise due to AM/PM reduction, it is possible to fully utilize the 1800 to 2400 channels of system design capability.

Driver Amp Upconverter AM/PM Relief

Depending upon the system that you are retrofitting, you may also be able to remove the AM/PM problem in your upconverter. If your system normally drives the TWT at a level higher than 0 dBm, you could drop the level of IF signal into the driver amplifier section of the upconverter such as to give 0 dBm at the upconverter output. Then, by using the full gain of the Avantek solid state amplifier, you can maintain a +40 dBm output. Dropping the level into the driver amplifier 4-10 dB should significantly reduce the 20 log noise component.

AWP Series — High Power TWT Replacement Amplifiers

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Range (GHz)	RF Input Power (dBm)	Gain (dB)	Output Power[12] (watts/dBm)	Noise Figure (dB) Max.	AM/PM Conver (°/dB) @ Max. Output Typ./Max.	Output Power Variation 0° to +55°C (dB) Max.	Output Power Flatness (dB) P-P	Envelope Delay Distortion (nsec) P-P	Harmonics (dBc) Max.	Spurious (dBc) Max.	Return Loss (dB) Min. Input	Return Loss (dB) Min. Output	Input Power[13] DC watts[9]	Case Type
AWP-42100	3.7-4.2	Note 1	Note 2	10/+40	10[3]	1.5/3	±2.5	±.25[4]	±1[6]	-53	-60	20	20	76	RJA
AWP-64100	5.925-6.425	Note 1	Note 2	10/+40	10[3]	1.5/2	±2.5	±.25[5]	±1[7]	-53	-60	20	20	76	RJA
AWP-64105	5.925-6.425	Note 1	Note 2	10/+40	10[3]	1.5/2	±2.5	±.25[5]	±1[7]	-53	-60	20	20	76	PHL
AWP-71100	6.4-7.1	Note 1	Note 2	10/+40	10[3]	1.5/3	±2.5	±.25[10]	±1[11]	-53	-60	20	20	76	RJA
AWP-77100	7.1-7.7	Note 1	Note 2	10/+40	10[3]	1.5/3	±2.5	±.25[10]	±1[11]	-53	-60	20	20	76	RJA
AWP-83100	7.7-8.3	Note 1	Note 2	10/+40	10[3]	1.5/3	±2.5	±.25[10]	±1[11]	-53	-60	20	20	76	RJA
AWP-85100	7.7-8.5	Note 1	Note 2	10/+40	10[3]	1.5/3	±2.5	±.25[10]	±1[11]	-53	-60	20	20	76	RJA
AWP-117500	10.7-11.7	Note 1	Note 8	5/+37	10	1.5/3	±2[15]	±.25[10]	±1[11]	-53	-60	18	18	76	RJA
AWP-117505	10.7-11.7	Note 1	Note 8	5/+37	10	1.5/3	±2[15]	±.25[10]	±1[11]	-53	-60	18	18	76	PHL
AWP-1171405	10.7-11.7	Note 1	Note 8	5/+37	10	1.5/3	±2[15]	±.25[10]	±1[11]	-53	-60	18	18	76	PHL
AWP-117105	10.7-11.7	Note 1	Note 2	10/+40[14]	10	1.5/3	±2[15]	±.25[9]	±1[11]	-53	-60	18	18	125	RDA
AWP-1175405	10.7-11.7	Note 1	Note 2	10/+40[14]	10	1.5/3	±2[15]	±.25[9]	±1[11]	-53	-60	18	18	125	RDA

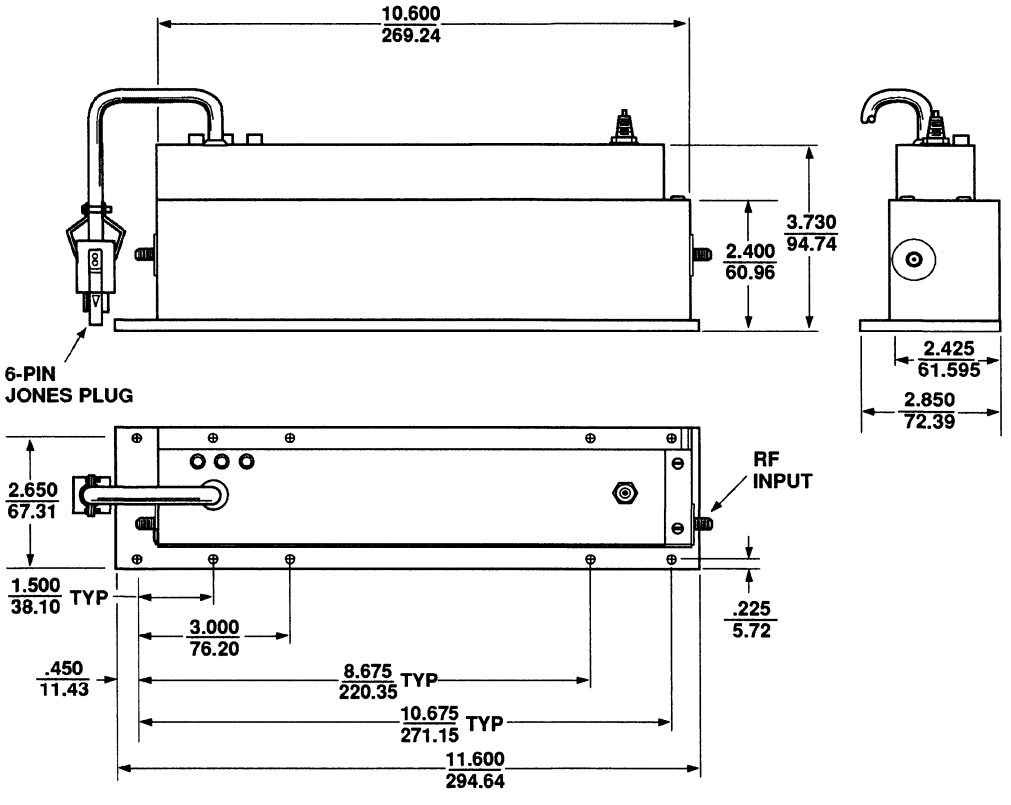
The above amplifiers are only representative of our complete Retrofit product line. Please contact the factory at (916) 985-1201 for additional information.

Notes:

1. Accepts any input level from -1 to +10 dBm for rated output power.
2. Gain adjustable from 30 to 41 dB for an output power level of +40 dBm.
3. At maximum gain.
4. Peak-to-peak across any 20 MHz band at +40 dBm output power.
5. Peak-to-peak across any 30 MHz band at +40 dBm output power.
6. Peak-to-peak across any 20 MHz band.
7. Peak-to-peak across any 30 MHz band.
8. Gain adjustable from 27 to 38 dB for an output power of +37 dBm.
9. At -24 or -48 VDC.
10. Peak-to-peak across any 40 MHz band at rated output power.
11. Peak-to-peak across any 40 MHz band.
12. At nominal input.
13. 1 dB compressed.
14. 3 dB compressed.
15. Maximum output power variation from 0° to +50°C.

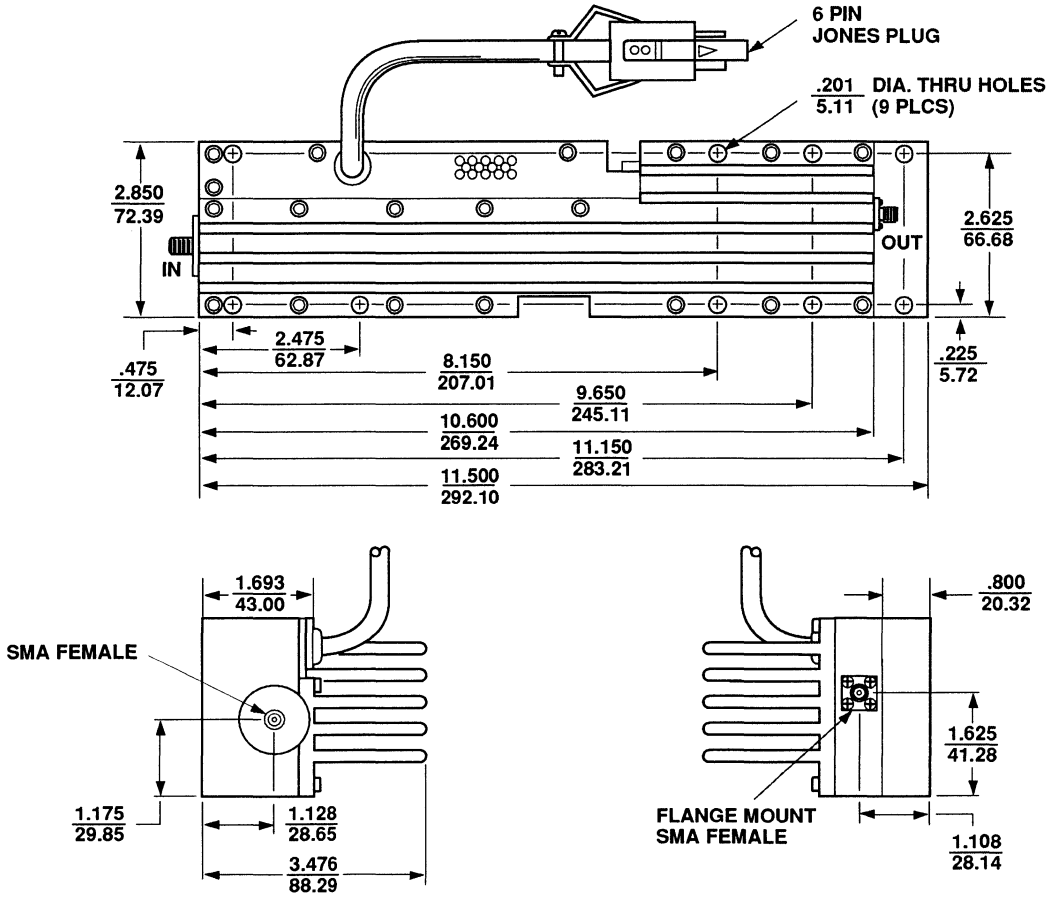
RETROFIT PRODUCT SELECTION GUIDE

	AWP-42100	AWP-64100	AWP-64105	AWP-640500	AWP-640604	AWP-640700	AWP-71100	AWP-77100	AWP-83100	AWP-117105	AWP-1175405	AWP-117500	AWP-117505	AWP-1171405
Collins														
MS109E	X													
MS109E1	X													
MS109ES	X													
MW109E		X												
MW109E1		X												
MDR6			X											
MW109A3		X												
MW109B3		X												
MW609E											X			
MW609E1/MW618											X			
MDR11									X			X		
Lenkurt														
CTR108	X													
775G	X													
775A		X				X								
775C							X							
775D											X			
NEC														
6G78MB		X												
Northern Telecom														
RA3T4	X													
RA3T6		X												
RD3								X						
Raytheon														
KTR3A/E		X												
KTR3TS		X												
RDS6200		X												
KTR3A/E11											X			
RCA														
MM600		X												
Western Electric														
FR-6					X									
TD-2	X													
TD-3D	X													
660	X													
TH-1		X		X										
TH-3		X												
TMA1		X												
TM2/2A					X									
TN1										X			X	
TL2									X			X		
TN1A									X			X		



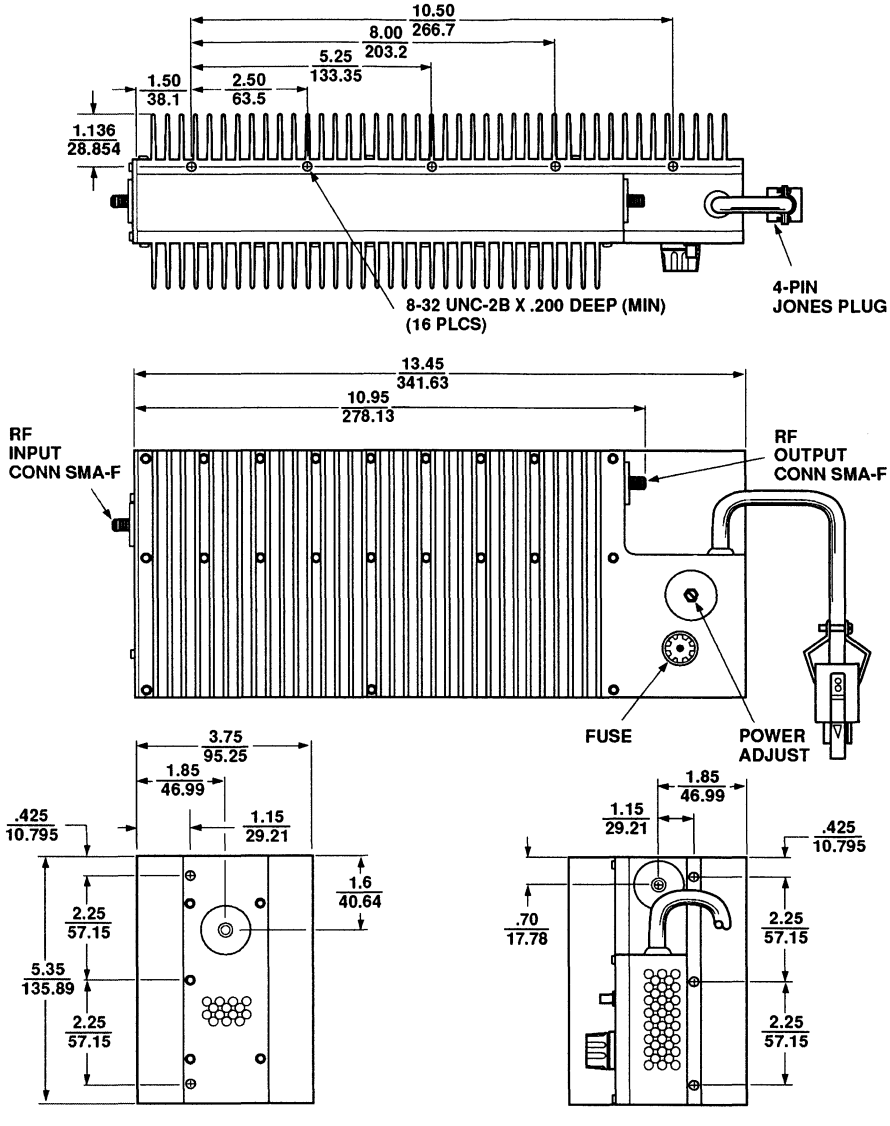
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± 0.02 / ± .5
   .XXX ± 0.010 / ± .25



NOTES (UNLESS OTHERWISE SPECIFIED):

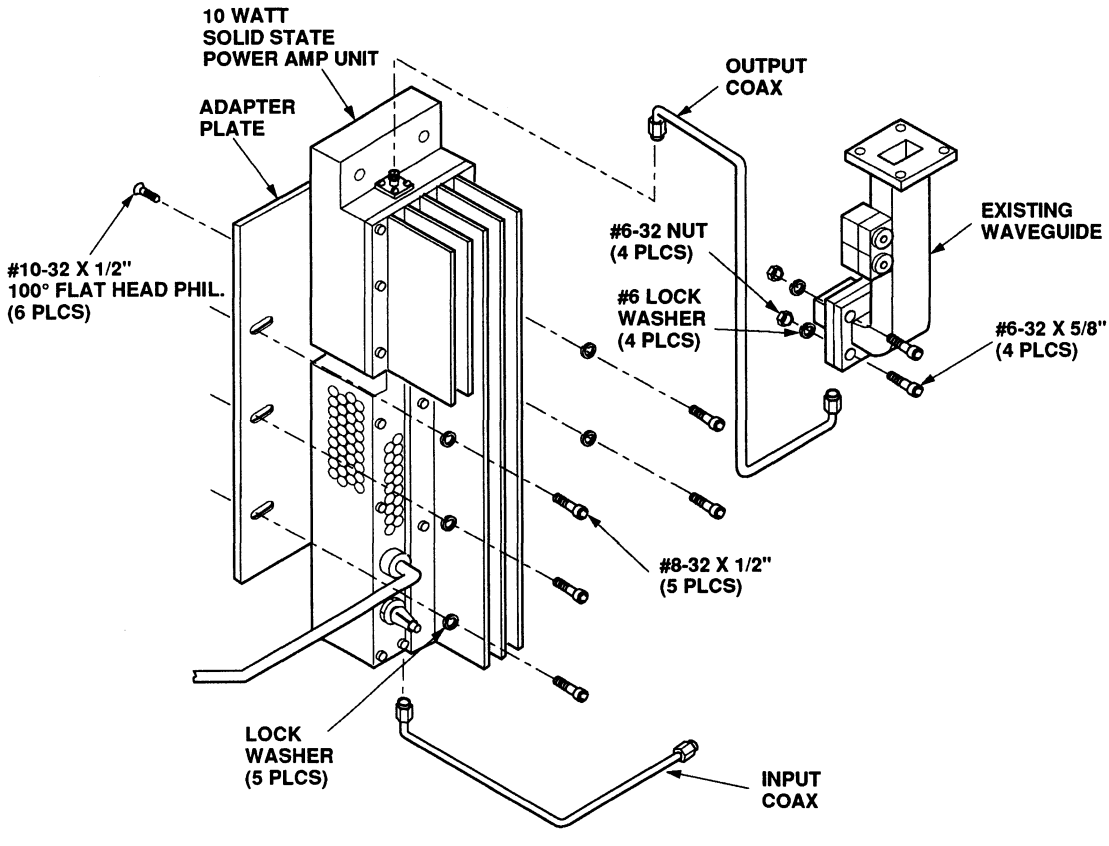
1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± 0.02 / ± .5
   .XXX ± 0.010 / ± .25



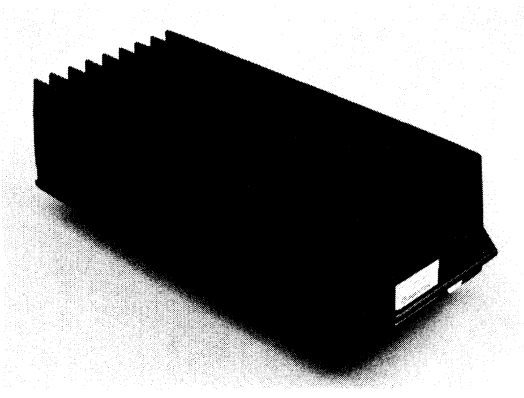
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± 0.02 / ± .5
   .XXX ± 0.010 / ± .25

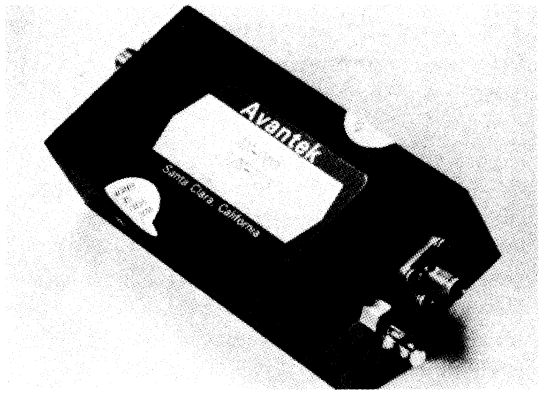
5. COMM AMP PRODS


10 WATT
SOLID STATE
POWER AMP UNIT
ADAPTER
PLATE
#10-32 X 1/2"
100° FLAT HEAD PHIL.
(6 PLCS)
OUTPUT
COAX
#6-32 NUT
(4 PLCS)
#6 LOCK
WASHER
(4 PLCS)
EXISTING
WAVEGUIDE
#6-32 X 5/8"
(4 PLCS)
#8-32 X 1/2"
(5 PLCS)
LOCK
WASHER
(5 PLCS)
INPUT
COAX

AWP-900: Base Station Power Amplifier



AM-900: Base Station Low Noise Amplifier



AWP-900 Features

- 860–900, 928–929 or 952–960 MHz
- Output power of 45 watts ±1 dB
- Output power may be reduced to 7 watts
- Input power range: .75–1.6 watts
- Internal ferrite isolator for RF output protection
- +26 V nominal, 5.3 amps typical
- TTL compatible on/off control
- Plug-in modular construction

AM-900 Features

- 821–851 MHz
- Low noise, 2.5 dB typical
- 44 dB gain nominal
- +32 dBm typical output intercept point
- +15 V nominal, 250 mA maximum
- Unconditionally stable
- Overvoltage and reverse voltage protection
- No external tuning required

Description

Avantek manufactures cellular radio cellsite power amplifiers in the 860 to 900 MHz range with output power of 45 watts ±1 dB. The output power is continuously variable down to 7 watts. In addition to the cellular frequency range, amplifiers can be furnished for 928–929 MHz paging use and the 952–960 MHz multiple address system range.

The units operate with an input power range of .75–1.6 watts. The companion low noise receiving amplifier is available for operation in the Cellsite Receiving Band of 821–851 MHz. The unit has a typical noise figure of 2.5 dB and a nominal gain of 44 dB.

AVANTEK

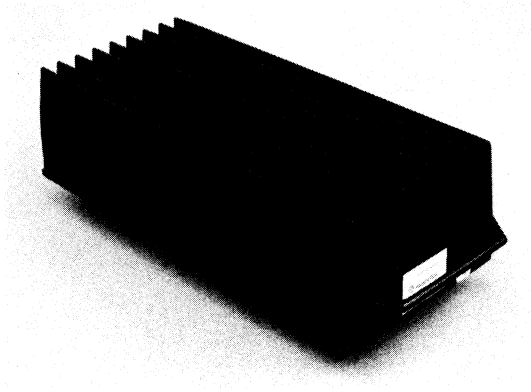
Programmable High Power Cell Site Amplifier

CELLULAR RADIO PRODUCTS

Features

- 860–900 MHz
- AT&T Autoplex™ compatible
- TTL controlled on/off and power adjust
- Static output power preset (manual/remote) continuously adjustable from 45 to 7 watts
- Programmable output power control (4 dB per step) from preset maximum down to 18.5 dBm
- Dynamic TX power control referenced to RX level of subscriber TX signal
- Over-temperature protection: automatic power step-down with front panel LED
- May be used as spare for conventional cell site power amplifier

AWP-905 Series: Base Station Power Amplifiers



Description

The AWP-905 is a programmable 45-watt cellular power amplifier which can be used to remotely vary the power output of the cell transmitter from +46.5 dBm to +18.5 dBm in 4 dB steps. In addition, an upper power limit can be set manually at any level between +46.5 dBm and +38.5 dBm. The amplifier can then be stepped down from that predetermined setting to a minimum of 18.5 dBm.

AWP-905 series amplifiers are configured for use in *AT&T Autoplex*™ or compatible cell site equipment. Programmable power amplifiers are used in two primary applications:

1. Remote power control
   This permits varying of the transmit power level on command from the MTSO to reduce intra-cell interference during unusual propagation conditions or to adjust cell coverage.
2. Dynamic power control
   Cells equipped with dynamic power control automatically vary the transmit output power to correspond with the signal level received from the subscriber's mobile set.

Avantek AWP-905 series power amplifiers are also equipped with built-in thermal protection. If cell site temperature conditions exceed the amplifier's specified ambient operating temperature, the power amplifier will detect this overheat condition, automatically reduce its output power by 4 dB, and an LED located on the front of the amplifier will be energized. When the overheat condition at the cell site is corrected, the amplifier will automatically return to its preset power output level and the LED will be de-energized.

These amplifiers are based on the same proven design as the Avantek AWP-900/KS-22090 power amplifier series first introduced in 1981. There are currently over 25,000 of these amplifiers in operation in cellular radio systems throughout the United States.

Existing Avantek power amplifiers may be upgraded.

Avantek also offers two retrofit options which economically convert existing AWP-900 or KS-22090L1 fixed power amplifiers to this programmable configuration. The AWP-905M1 retrofit maintains the original power output specification of the AWP-900 or KS-22090L1 amplifier. Maximum output power is rated at 45 W ± 1.0 dB. The otherwise-identical AWP-905M2 retrofit is rated for a guaranteed minimum 45 W output. Both retrofit options include the over-temperature protection feature.

Note:
Use of the dynamic power control feature is software and hardware controlled. Use of this feature may require system modification by the manufacturer. Static and dynamic power control amplifiers are interchangeable for use in a static Autoplex™ system. Use only programmable amplifiers such as the Avantek AWP-905 in programmable cell sites.

Autoplex is a trademark of AT&T.

Avantek, Inc • Telecom Microwave Assemblies • 180 Blue Ravine Road, Folsom, CA 95630 • For further information, Phone: (916) 985-1201 • Fax: (916) 985-0660

AWP-900—Base Station Power Amplifier

Guaranteed Specifications 0° to 50°C Case Temperature[7]

Model	Frequency Range[1] (MHz)	RF Input Power (watts)	RF Output Power (watts)[2,8]	DC Current	Second Harmonic Output (dBc)	Third Harmonic Output (dBc)	VSWR (50 ohms) In	VSWR (50 ohms) Out	ON-OFF Control	Carrier Leakage	Spurious Signals and Noise
AWP-900	860-900 928-929 952-960	.75-1.6	45±1dB @ +26 VDC 25 Min.@ +22 VDC 12 Min.@ +19 VDC	6A @ +26 VDC	>30	>60	1.5	1.5	Note 3	Note 4	Note 5

AWP-905—Base Station *Programmable Power Amplifier*

Guaranteed Specifications 0° to 50°C Case Temperature[7]

Model	Frequency Range (MHz)	RF Input Power (watts)	RF Output Power (watts)[2,8]	DC Current	Second Harmonic Output (dBc)	Third Harmonic Output (dBc)	VSWR (50 ohms) In	VSWR (50 ohms) Out	ON-OFF Control	Carrier Leakage	Spurious Signals and Noise
AWP-905	860-900	.75-1.6	45 Min[8]	6A @ +25.5 VDC	>30	>60	2.0	1.5	Note 3	Note 4	Note 5
AWP-905M1	860-900	.75-1.6	45±1dB[8]	6A @ +25.5 VDC	>30	>60	2.0	1.5	Note 3	Note 4	Note 5
AWP-905M2	860-900	.75-1.6	45 Min[8]	6A @ +25.5 VDC	>30	>60	2.0	1.5	Note 3	Note 4	Note 5

AM-900—Base Station Low Noise Amplifier

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Range (MHz)	Output Power at 1 dB Gain Compression	Gain	Noise Figure	VSWR (50 ohms) In	VSWR (50 ohms) Out	Third Order Intercept	DC Current	DC Voltage Range (VDC)
AM-900	821-851	+19 dBm	44 dB	3.0 dB	2.0	2.0	+30 dBm (min)	250 mA	+13.5 to +16.5

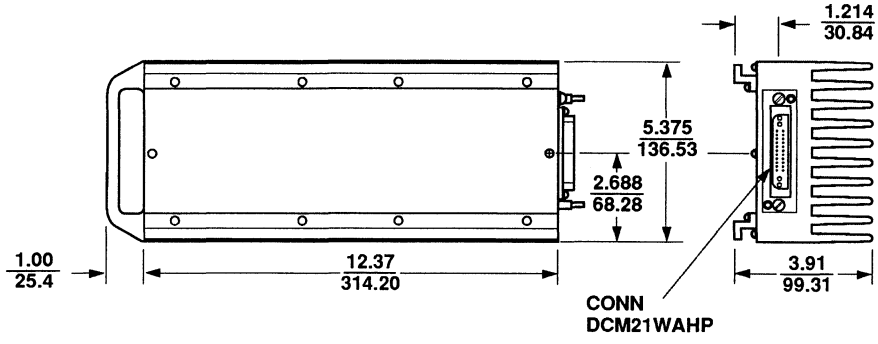
Notes:

1. Specify when ordering.
2. Adjustable to 7 watts output at input DC voltage shown.
3. TTL compatible logic: Logic 1, unit ON
   Logic 0, unit OFF
4. ≤+5 dBm with Logic 0 applied.
5. At 860-990 MHz >200 kHz from carrier ≤-15 dBm (30 kHz bandwidth).
6. RF output power applies to all frequency ranges.
7. Forced air cooling with 150 cfm required.
8. Output power is TTL control programmable in 4 dB steps from a preset maximum (continuously adjustable between 46.5 and 38.5 dBm) to an 18.5 dBm minimum.

AWP-900 and AWP-905 CASE DRAWINGS

High Power

CELLULAR RADIO PRODUCTS



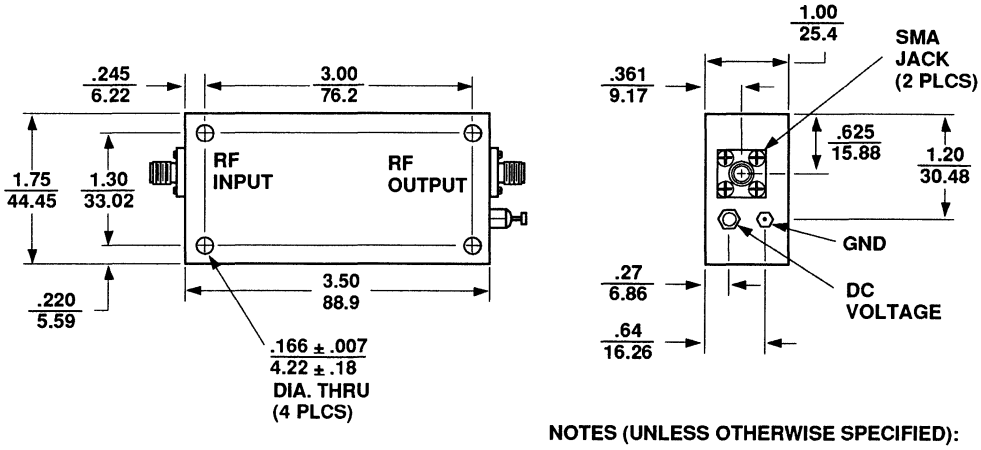
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± 0.02 / ± .5
   .XXX ± 0.010 / ± .25

AM-900 CASE DRAWING

Low Noise

CELLULAR RADIO PRODUCTS



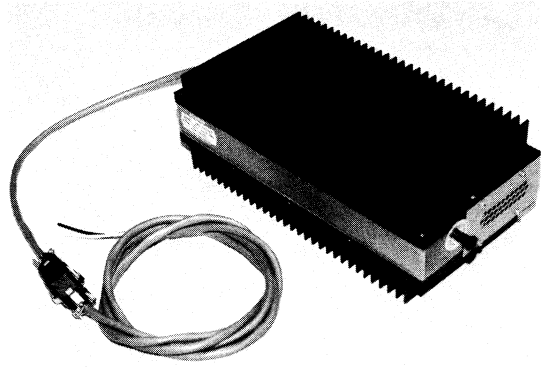
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± 0.02 / ± .5
   .XXX ± 0.010 / ± .25

Features

- High Reliability
- Energy Efficiency
- FCC Type Accepted
- High Channel Loading Capacity
- Easy to Install
- No Maintenance Required
- Cost Competitive

AWP Series 3.7 to 11.7 GHz.



Narrowband General Purpose Description

Avantek's 4, 6, 7, 8 and 11 GHz amplifiers are cost-effective TWTA replacements. Their performance and reliability has been proven by the more than 10,000 units now in use throughout the world. The AWP series uses substantially less input power than a TWT, has more gain thus reducing AM/PM problems due to the lower output needed from the upconverter, and maintains a constant output power over its calculated lifetime (MTBF) of 30 years. In digital systems, at lowered gain levels, AWP amplifiers offer less than 0.25 dB compression with AM/PM of less than 0.25°/dB over the entire band.

CARS Band Description

The Avantek AW-13251 is a compact, high-performance GaAs FET preamplifier designed specifically to improve the performance of receivers in the 12.7 to 13.25 GHz CARS (Cable Antenna Relay Service), STL (Studio-Transmitter Link) and Intercity Relay band. As an add-on to existing receivers or as an integral part of a system design, the 4.0 dB typical noise figure and 15 dB typical gain of this amplifier can substantially improve the fade margin and increase the path length capability of a microwave relay system.

AWP—MEDIUM POWER COMMERCIAL COMMUNICATIONS BAND AMPLIFIERS

AWP Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Power Output for 1 dB Gain Compression (dBm/watts) Minimum	Gain (dB) Min.	Gain Flatness (±dB) Max.	Typical Intercept Point for IM Products (dBm)	Noise Figure (dB) Max.	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC ±3%)	Input Power Current (mA) Typical	Case Type
AWP-42107	3.7-4.2	+25/.3	26	2	+35	10	1.2	1.2	+15	500	SPG
AWP-42108	3.7-4.2	+32/1.5	33	2	+40	10	1.2	1.2	+15	1200	SPG
AWP-42109	3.7-4.2	+40/10	41	2	+47	10	1.2	1.2	+15	6000	SPG
AWP-64107	5.925-6.425	+25/.3	26	2	+34	10	1.2	1.2	+15	500	SPG
AWP-64108	5.925-6.425	+32/1.5	33	2	+40	10	1.2	1.2	+15	1200	SPG
AWP-64109	5.925-6.425	+40/10	41	2	+46	10	1.2	1.2	+15	6000	SPG
AWP-71107	6.425-7.125	+25/.3	26	2	+34	10	1.2	1.2	+15	500	SPG
AWP-71108	6.425-7.125	+32/1.5	33	2	+40	10	1.2	1.2	+15	1200	SPG
AWP-71109	6.425-7.125	+40/10	41	2	+46	10	1.2	1.2	+15	6000	SPG
AWP-77107	7.125-7.725	+25/.3	26	2	+34	10	1.2	1.2	+15	500	SPG
AWP-77108	7.125-7.725	+32/1.5	33	2	+40	10	1.2	1.2	+15	1200	SPG
AWP-77109	7.125-7.725	+40/10	41	2	+46	10	1.2	1.2	+15	6000	SPG
AWP-83107	7.725-8.275	+25/.3	26	2	+34	10	1.2	1.2	+15	500	SPG
AWP-83108	7.725-8.275	+32/1.5	33	2	+40	10	1.2	1.2	+15	1200	SPG
AWP-83109	7.725-8.275	+40/10	41	2	+47	10	1.2	1.2	+15	6000	SPG
AWP-85107	7.725-8.500	+25/.3	26	2	+34	10	1.2	1.2	+15	500	SPG
AWP-85108	7.725-8.500	+32/1.5	33	2	+40	10	1.2	1.2	+15	1200	SPG
AWP-85109	7.725-8.500	+40/10	41	2	+47	10	1.2	1.2	+15	6000	SPG
AWP-117107	10.7-11.7	+25/.3	26	2	+32	10	1.2	1.2	+15	500	SPG
AWP-117108	10.7-11.7	+32/1.5	33	2	+39	10	1.2	1.2	+15	1200	SPG
AWP-117109	10.7-11.7	+40/10	41	2	+47	10	1.2	1.2	+15	6000	SPG

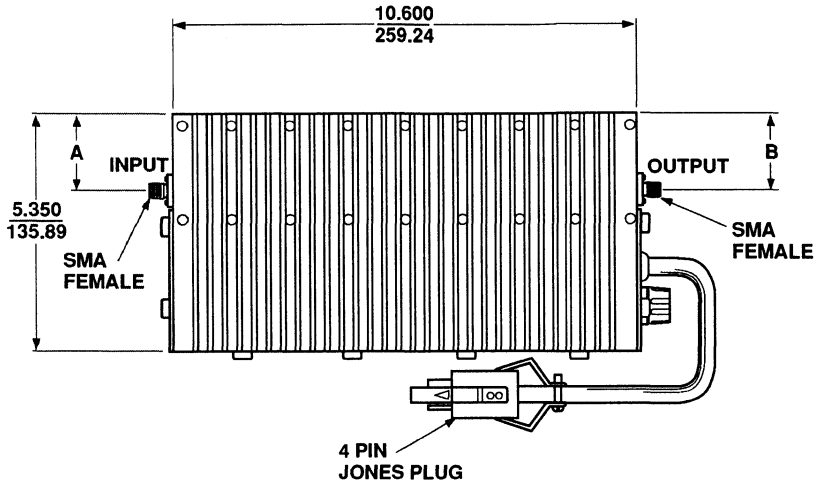
Note:
1. Units are available with or without top and/or bottom heatsinks.

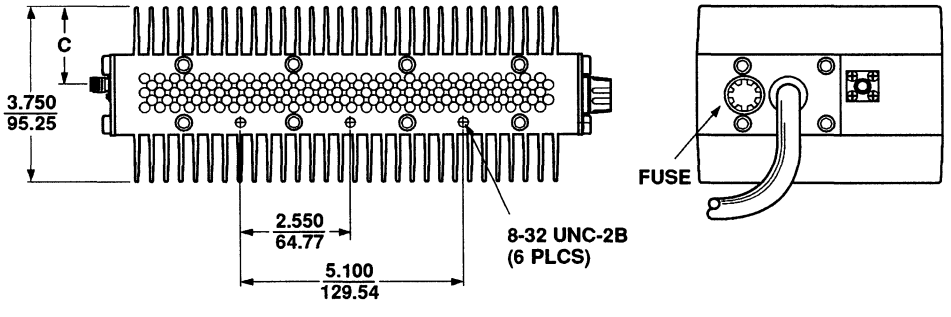
AW—CARS BAND RECEIVER PREAMPLIFIER

AW Series

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Range (GHz) Minimum	Noise Figure (dB) Maximum	Gain (dB) Min.	Gain Flatness (±dB) Max.	Power Output @ 1 dB Gain Compression (dBm) Minimum	Typ. Intercept Point for Third Order Intermod Products (dBm) Minimum	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Typical	Case Type
AW-13251	12.7-13.25	4.0	15	0.5	+10	+20	1.25	1.25	+15	50	AWJ



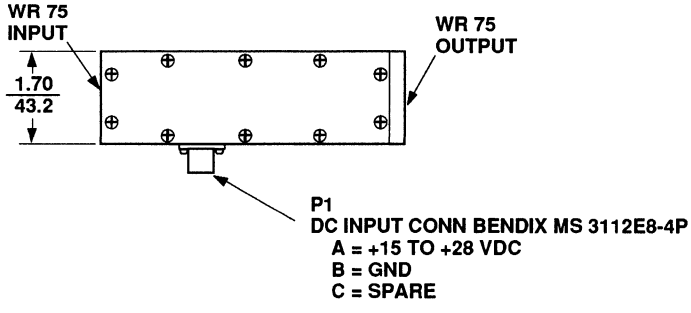


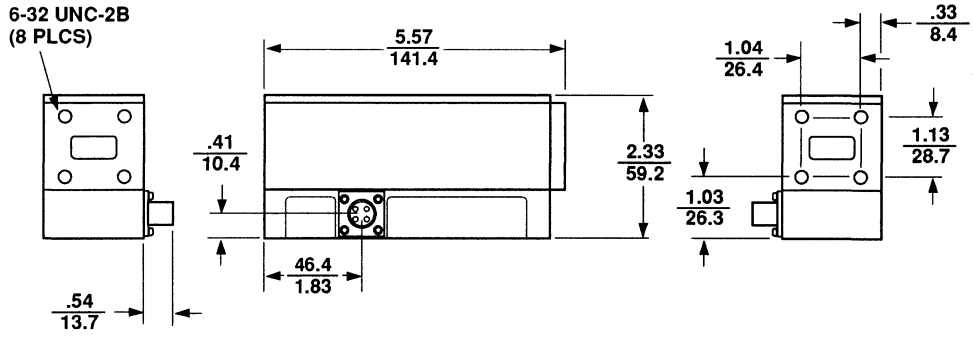
PART NUMBER	DIMENSION			CASE
	A	B	C	
AWP-42107,8,9	1.400	.665	1.907	SPG-1
AWP-64107,8,9	1.580	.674	1.891	SPG-2
AWP-71107,8,9	1.525	.975	1.891	SPG-3
AWP-77107,8,9	1.525	.975	1.891	SPG-3
AWP-83107,8,9	1.525	.975	1.891	SPG-3
AWP-85107,8,9	1.525	.975	1.891	SPG-3
AWP-117107,8	1.750	1.645	1.650	SPG-4
AWP-117109	1.475	1.065	1.650	SPG-5

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± .02 / ± 0.5
   .XXX ± .010 / ± 0.25

5. COMM AMP PRODS





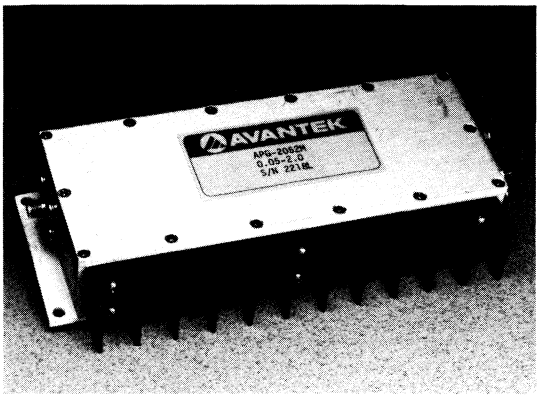
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCE: .XX ± .02 / ± .5

Features

- **Wideband 1-2 Watt Power Output Levels**
- **Octave and Straddleband Ranges For General Purpose Applications**
- **Narrowband Ranges For S-Band And X-Band Radars**
- **Weatherproof Aluminum Cases**

AMG and APG Series Wideband FET Amplifiers



Description

These commercial GaAs FET amplifiers are designed for use in a wide range of general purpose applications such as laboratory test equipment, instrumentation and other applications requiring moderate power output.

Reliable operation is achieved by using rugged stripline circuit construction with selected and packaged Avantek GaAs FET devices actively biased with a current-controlling bipolar transistor. This design improves the dynamic range and ensures the temperature stability of these amplifiers.

Typical Applications Include:

- General High Power Laboratory RF Sources
- Output Amplifiers in Test Equipment (ATE & AGE)
- Driver Amplifiers in RF Distribution Networks
- Intermediate Power Amplifiers (IPA) in High Power Chains

AMG — Commercial GaAs FET Ultrawideband Amplifier

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Intercept Point for IM Products (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Typical Current (mA)	Case Type
AMG-1020	0.05-1	34	2.7	+10	1.0	+22	2.5	2.2	+15	50	GC4

APG — Commercial, Connectorized Amplifier Series

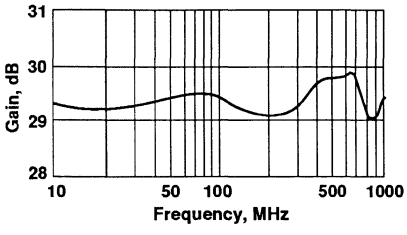
Guaranteed Specifications @ 0°C to +50°C Case Temperature

Model	Frequency Response (GHz) Min.	Gain (dB) Min.	Gain (dB) Max.	Noise Figure (dB) Max.	Power Output for 1 dB Gain Comp. (dBm) Min.	Power Output (watts) Min.	Gain Flatness (±dB) Max.	Typical Intercept Point for Third Order Intermod Products (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC ±3%)	Input Power Typical Current (mA)	Case Type
APG-1001	0.01-1	25	34	9.0	+30[1]	1.0	1.0	+39	2.0	2.5	+24	775	FM[2,3]
APG-1002	0.01-1	34	44	8.0	+30[1]	1.0	1.0	+39	2.0	2.5	+24	775	FM[2,3]
APG-1003	0.01-1	45	55	6.5	+30[1]	1.0	1.0	+39	2.0	2.5	+24	810	FM[2,3]
APG-1023	0.5-1	33	43	6.0	+33	2.0	1.0	+43	2.0	2.0	+15	1275	FS[2,4]
APG-2050	0.05-2	18	28	6.0	+23	0.2	1.0	+33	2.0	2.0	+15	275	FM[2,3]
APG-2052	0.05-2	28	38	6.0	+27[1]	0.5	1.0	+37	2.0	2.0	+15	525	FM[2,3]
APG-2053	0.5-2	30	40	6.0	+30	1.0	1.0	+40	2.0	2.0	+15	1200	FN[2,4]
APG-2001	1-2	10	20	5.0	+30	1.0	0.5	+40	2.0	2.0	+15	875	FN[2,4]
APG-2002	1-2	20	30	4.5	+30	1.0	0.75	+40	2.0	2.0	+15	950	FN[2,4]
APG-2003	1-2	30	40	4.5	+30	1.0	1.0	+40	2.0	2.0	+15	975	FN[2,4]
APG-2023	1-2	30	40	4.5	+33	2.0	1.0	+43	2.0	2.0	+15	1200	FN[2,4]
APG-4002	2-4	15	24	6.5	+30	1.0	1.0	+40	2.0	2.0	+15	1100	FO[2,5]
APG-4003	2-4	24	32	4.0	+30	1.0	1.0	+40	2.0	2.0	+15	1150	FO[2,5]
APG-4004	2-4	32	42	3.0	+30	1.0	1.0	+40	2.0	2.0	+15	1200	FO[2,5]

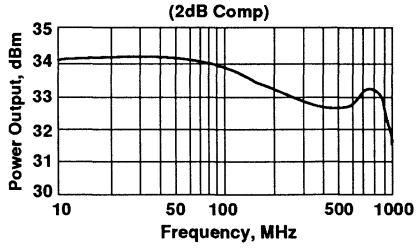
Notes:
1: Minimum power output at 2 dB gain compression
2: Including cooling fins
3: SMA, N, TNC, or BNC connectors
4: SMA, N, or TNC connectors
5: SMA or N connectors

Typical Performance @ 25°C Case Temperature

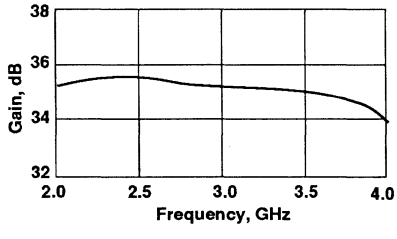
APG-1001 GAIN



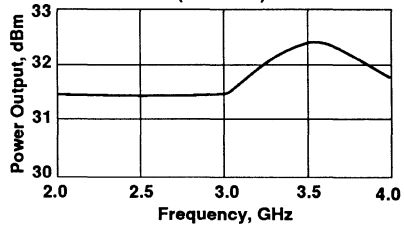
OUTPUT POWER (2dB Comp)



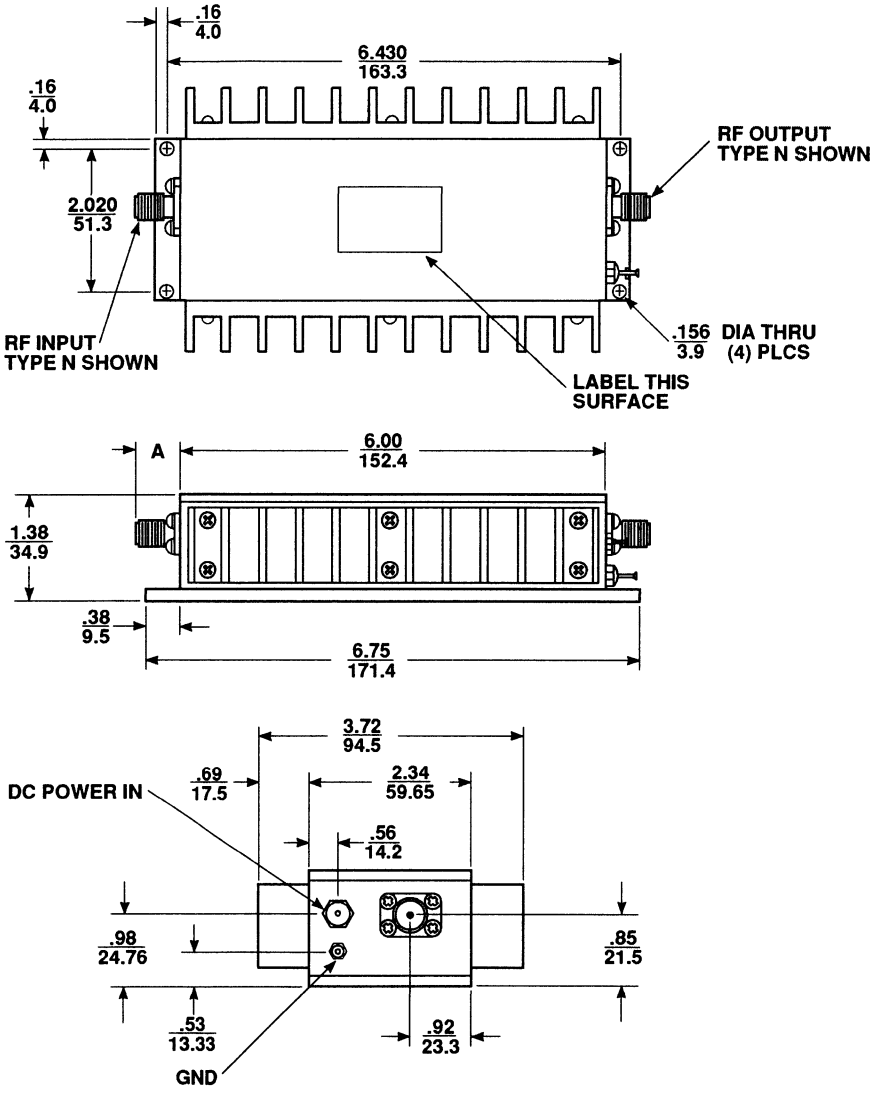
APG-4004 GAIN



OUTPUT POWER (1dB GCP)



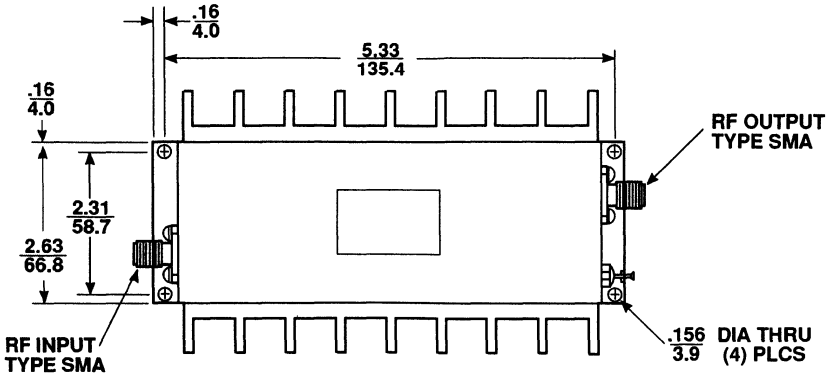
5. COMM AMP PRODS

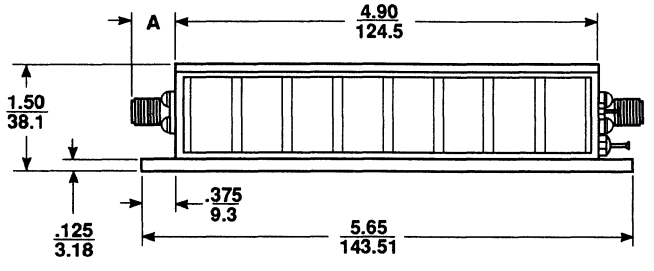


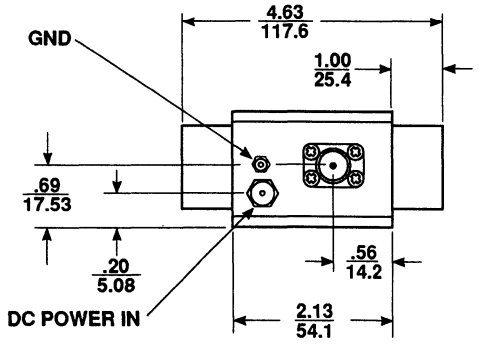
CONNECTOR	"A" DIMENSION
SMA	.40 / 10.16 MAX
TNC	.75 / 19.05 MAX
N	.75 / 19.05 MAX
BNC	.75 / 19.05 MAX

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010





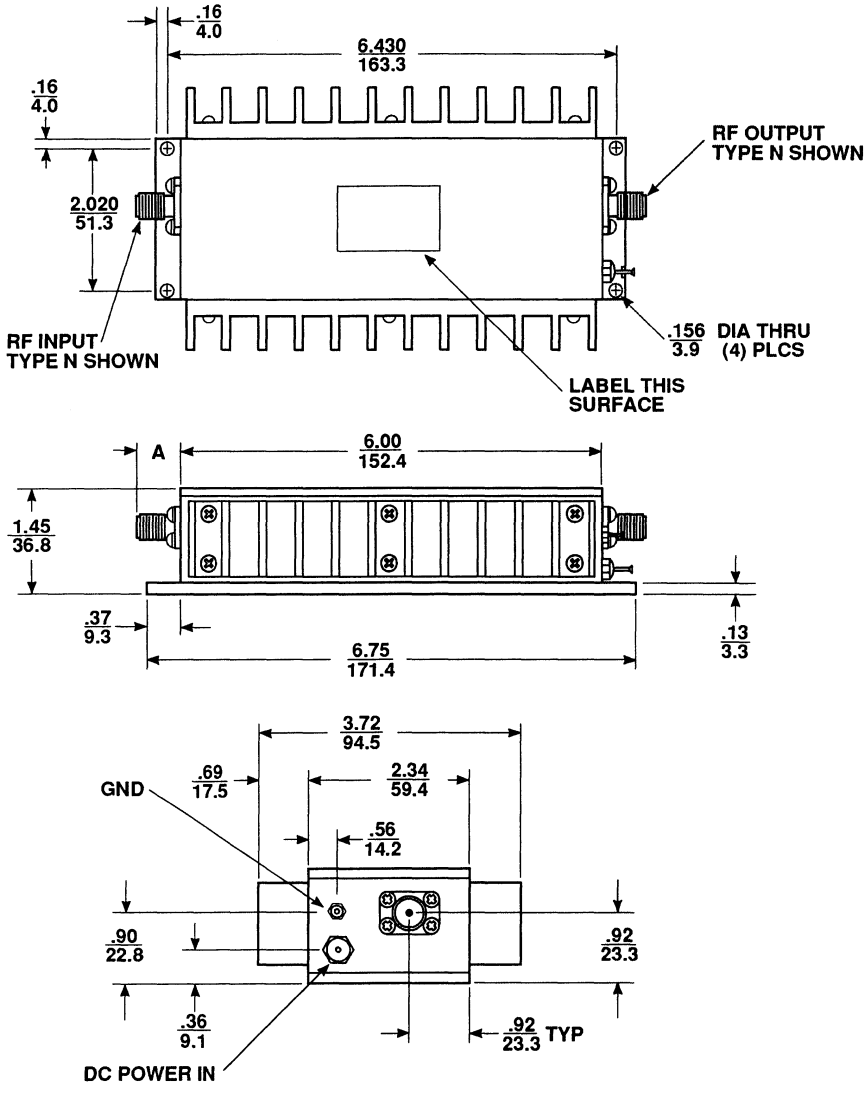


CONNECTOR	"A" DIMENSION
SMA	.40 / 10.16 MAX
TNC	.75 / 19.05 MAX
N	.75 / 19.05 MAX

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010

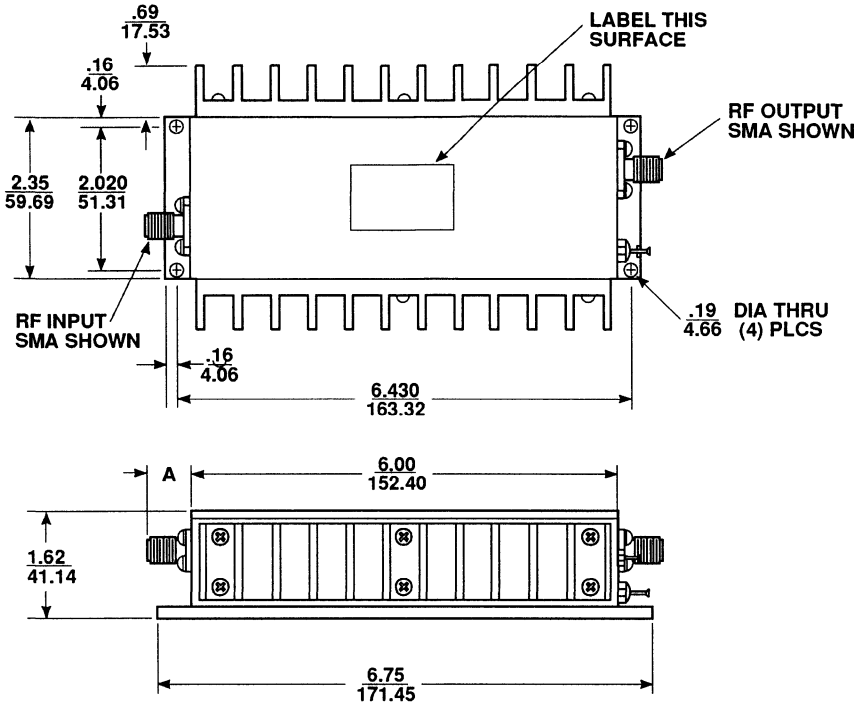
5. COMM AMP PRODS

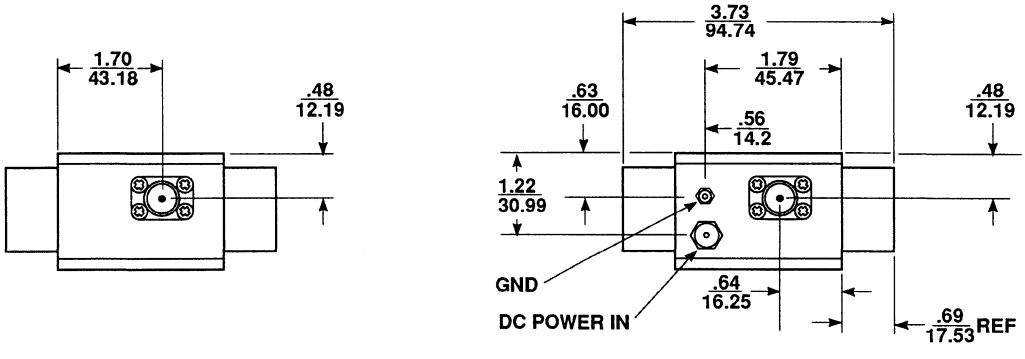


CONNECTOR	"A" DIMENSION
SMA	$\frac{.40}{10.16}$ MAX
TNC	$\frac{.75}{19.05}$ MAX
N	$\frac{.75}{19.05}$ MAX
BNC	$\frac{.75}{19.05}$ MAX

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN $\frac{\text{INCHES}}{\text{MM}}$
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010



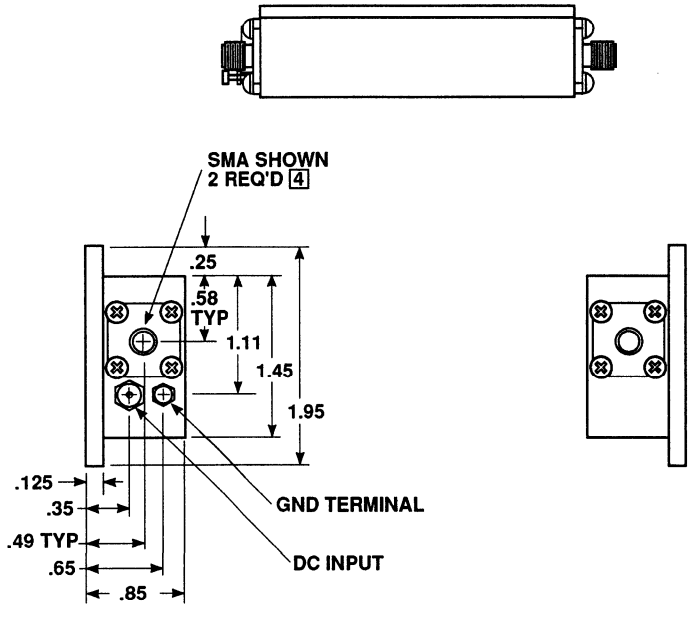


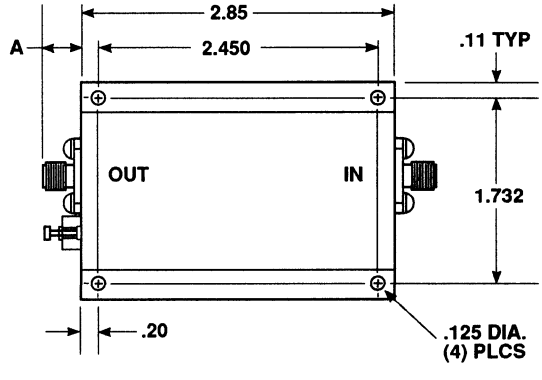
CONNECTOR	"A" DIMENSION
SMA FEMALE	.40 / 10.16 MAX
TNC FEMALE	.75 / 19.05 MAX
N FEMALE	.75 / 19.05 MAX

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010

5. COMM AMP PRODS

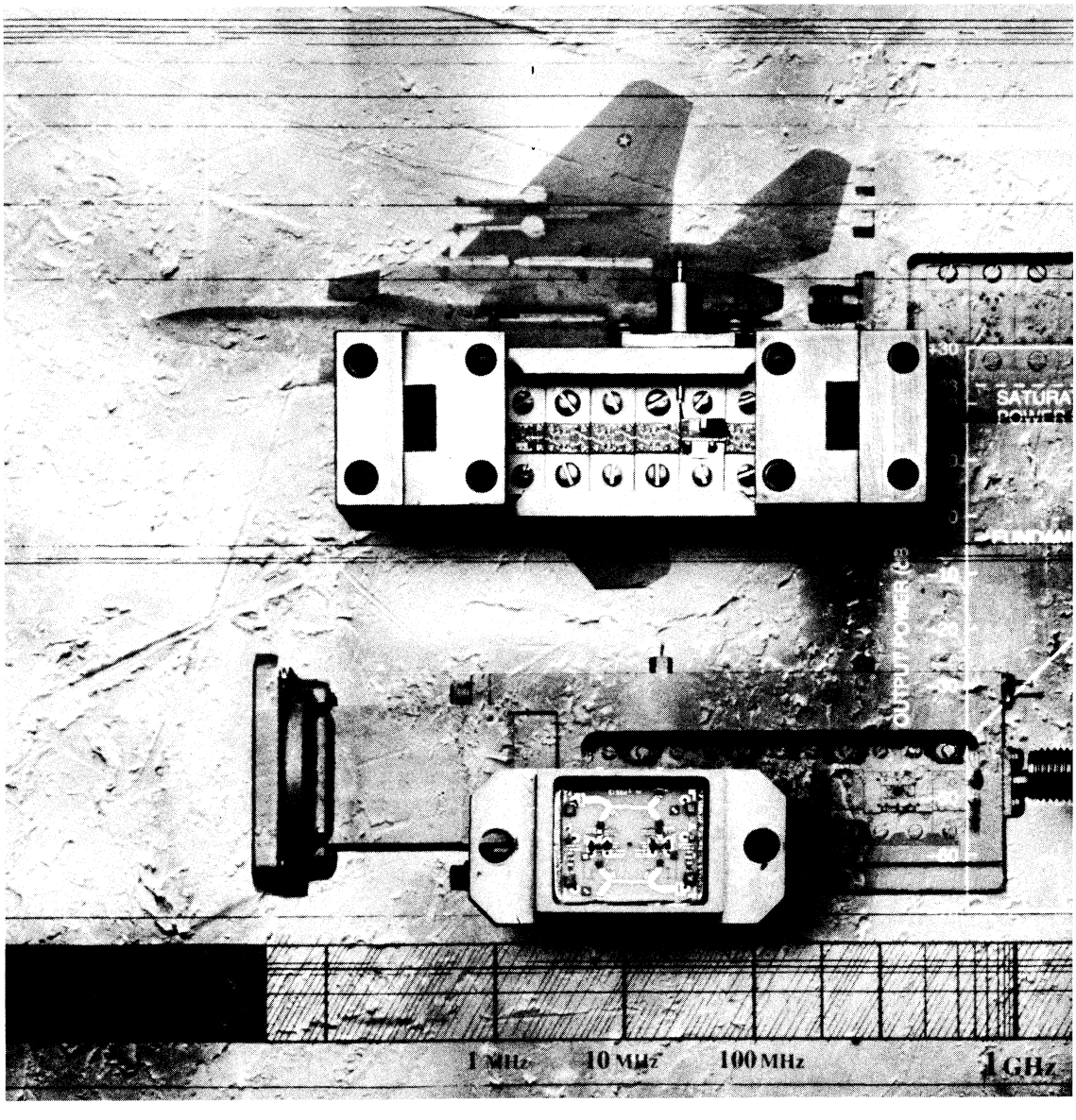




CONNECTOR	"A" DIMENSION
SMA	.40 MAX
TNC	.75 MAX
N	.75 MAX
BNC	.75 MAX

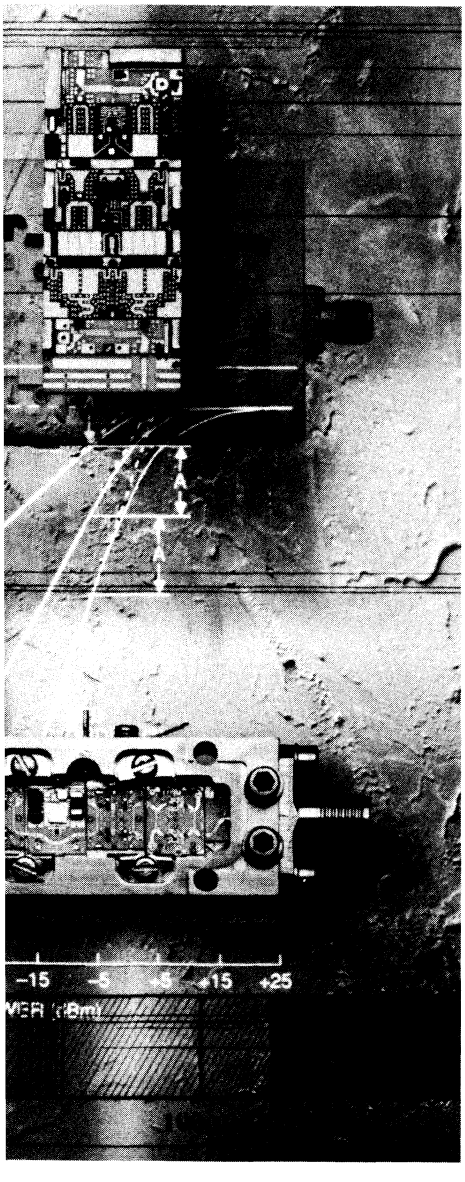
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .02
   .XXX ± .010
3. CASE MATERIAL: ALODINED ALUMINUM
4. CONNECTOR OPTIONS: SMA, N, TNC, BNC


1 MHz
10 MHz
100 MHz
1 GHz

6. Limiting Amplifiers

Wideband Output Limiting Amplifiers
LMT and LWT Series .5-18 GHz



Features

- GaAs FET Design
- Wide Input Dynamic Range
- Narrow Output Power Window
- Sharp Limiting "Knee"
- Low Harmonics
- Low Input/Output VSWR
- Thin-Film Hybrid Construction
- Hermetic Aluminum Case

LMT/LWT Series Amplifiers

Description

Avantek LMT/LWT series limiting wideband amplifiers combine the proven circuit design and thin-film gold construction of the Avantek AMT/AWT series of low noise amplifiers with a GaAs FET output limiting stage. Available in the 0.5-2.0 through 6-18 GHz frequency bands, LMT/LWT series amplifiers offer nominal 35 dB and 70 dB of small signal gain combined with saturated power outputs that remain within a very narrow window for an extremely wide range of input signal levels. Other important features include excellent full-band saturated power flatness, low small signal noise figure, VSWR, harmonics, and an integral voltage regulator for reliable operation from a +12 to +15 VDC unregulated power source.

To complement its performance features, the LMT/LWT series amplifier is packaged in a compact, hermetically welded aluminum case. This makes the LMT/LWT series amplifier the ideal choice for incorporation into the latest generation of compact, lightweight ECM/EW systems.

Amplifier Design Features

The amplifiers in the LMT/LWT series feature balanced cascadable amplification stages consisting of a pair of matched GaAs FET amplifier channels with quadrature hybrid couplers to equally divide the power between the two channels. This balanced design permits each GaAs FET to operate at a conservative power dissipation for improved reliability, and increases the dynamic range of each stage. It simultaneously minimizes the input and output VSWR of each stage and the complete amplifier due to the inherent cancellation of reflected energy at the couplers, assuring low mismatch ripple and unconditional stability.

The incorporation of temperature compensation into the "40" series of limiting amplifiers ensures a well-controlled small signal gain over a wide military temperature range, thereby maintaining dynamic range and limiting noise power variation. Temperature compensation is accomplished by means of thin-film variable RF attenuators.

High Performance GaAs FET Limiting Amplifier

The LMT/LWT output stages are balanced FET designs, the devices being specifically selected and qualified for the desired limiting characteristics. When the output stage transitions from linear to saturated operation, it produces a far sharper limiter "knee" than provided by conventional amplifier PIN diode limiter combinations. The saturated power output of the LMT/LWT output stage is very stable with temperature variations.

Avantek employs both single- and dual-gate GaAs FET devices in the LMT/LWT series Limiting Amplifiers for output stages, selecting the device type which provides the best limiting characteristic for the amplifier. In those cases where the dual-gate device is utilized, the signal input circuit, applied to the gate of the GaAs FETs, is optimized in a manner similar to that used in Avantek small signal amplifiers; the small signal characteristics are practically equivalent. The second gate is connected to a biasing circuit that controls saturated output power level.

Built And Tested For Reliability

All circuitry in the LMT/LWT series limiting amplifiers is thin-film gold and all resistors are thin-film tantalum nitride deposited on precision ceramic substrates. Components such as transistors and capacitors are in unpackaged chip form, bonded to gold pads on the substrate. This thin-film hybrid construction is noted for exacting reproducibility, excellent shock and vibration resistance and extremely consistent performance.

To fully protect the thin-film circuitry and unpackaged components from moisture and corrosive atmospheric gases, the interior of the case is filled with a dry, inert atmosphere, and the lid is subsequently laser welded. All RF connectors and the RFI-filtered DC feedthroughs are soldered directly into holes in the aluminum case and the finished amplifier is leak tested to assure hermeticity.

All GaAs FETs are selected from wafers designed and fabricated by Avantek's Microwave Semiconductor Division. This in-house capability provides absolute control over device performance and a further assurance of reliability.

Avantek's quality control and quality assurance procedures meet the requirements of MIL-Q-9858A. The LMT/LWT series amplifiers can be qualified to MIL-E-5400, MIL-E-16400 and MIL-E-4158, and are capable of meeting the EMI conditions of MIL-STD-461.

Other Capabilities

- Packaging
- Dynamic Range (Gain)
- Output Power Levels
- Detection (Logarithmic)
- Looping Amplifiers
- Environmental Design and Test

Avantek has the capability and experience necessary to meet specific amplifier needs in the areas of electrical performance, mechanical outline, and environmental testing/screening, as demanded by system requirements. Avantek has manufactured thousands of limiting amplifiers to customer requirements, with various input dynamic range, gain, and output power specifications, etc. Avantek limiting amplifiers can be qualified for MIL-STD-883 class B or class S environmental conditions. Avantek can offer packaging from form-fit-function TWT replacement to miniature 0.22-inch height connectorless "drop-in" designs.

Avantek also has many years of experience producing special categories of limiting amplifiers, such as time-delay loop amplifiers and RF logarithmic amplifiers.

Specifying and Selecting Limiting Amplifiers

The function of a limiting amplifier is to accept input signals of widely varying power levels (wide input dynamic range) and provide an output in which the signal levels are highly compressed (limited output dynamic range). Such amplifiers are widely used in EW and radar system receiver front-end and IF applications to provide an optimum signal level to subsequent signal processing and detection circuitry. To perform properly in EW and radar systems, limiting amplifiers must combine extremely fast pulse response with the necessary input and output dynamic range characteristics.

The output dynamic range of a limiting amplifier depends on a combination of the limiting characteristics of the selected active devices and the specific design selected for the circuits. Typically, Avantek limiting amplifiers, using proven design and device technology, provide an output power window of less than 5 dB with output levels as low as +3 dBm to as high as +20 dBm.

The input characteristics of a limiting amplifier are usually specified by stating the minimum and maximum input signal power levels that will result in properly-limited output signals. Avantek limiting amplifiers can be delivered with minimum input signals as small as ambient noise up to +10 dBm.

Rise time characteristics of a limiting amplifier are determined by the ability of the amplification circuitry to make the transition from small signal to large signal conditions. Unlike ordinary linear amplifiers, Avantek limiting amplifiers are optimized to offer fast pulse response, even when the input signal drives the amplifier into hard compression. 90% rise times of 25 ns with a +10 dBm input pulse are typical.

Because of the inherent non-linearity of limiting amplifiers, they can generate in-band spurious products that may cause erroneous indications in the EW or radar system. Unless the system itself is capable of filtering out or recognizing these spurious products, the limiting amplifier must also be specified in terms of minimum harmonic suppression (typically in dB below carrier).

Finally, it should be noted that in limiting amplifiers combining very high gain with a limited output dynamic range, normal noise figure measurements become unreliable and practically meaningless. When the calculated noise power of the amplifier is less than 20 dB below the saturated output power, the amplifier should be specified in terms of output noise power rather than noise figure.

Harmonic Distortion

Harmonic distortion results from non-linear amplifier gain and appears as output signals at integral multiples of the input signal frequency. Since harmonic distortion is a function of input power, it is usually specified in terms of the relative level of the harmonics with respect to the power of the fundamental signal.

The actual broadband characteristics of the amplifier (which may be wider than the specified passband) may present significant gain at harmonic frequencies and thereby increase the harmonic output problem.

Second harmonic content is related to the device distortion and the frequency response of the circuits used to build the amplifier. The hybrid coupler input network and output network are the major components in determining passband response. Second harmonics occurring within the passband of the amplifier will typically be −15 to −18 dBc at the amplifier's specified 1 dB Gain Compression Point. Third harmonics are typically an additional 5 to 7 dB below this level. As the circuit's passband narrows, the resulting second and third harmonics attenuate rapidly.

AM-PM Conversion

As the input signal level applied to a transistor amplifier is increased until some degree of gain compression is produced, further increases in signal amplitude will result in a slight shift of the amplifier phase delay. This phenomenon is known as AM-PM conversion and can be thought of as a result of the change of the transistor operating parameters from the small-signal to large-signal conditions. Many Avantek amplifiers include a guaranteed specification that AM-PM conversion will not exceed a certain value, on the order of a few tenths of a degree per dB increase in power output at a nominal power output level. If the input signal is further increased, the amount of AM-PM conversion will continue to increase, reaching a maximum value when one of the amplifier stages is driven into full saturation. The maximum value will normally never exceed a few degrees/dB near amplifier saturation, and may generally be ignored.

Any limiters in a system are usually the major contributors to overall AM-PM conversion. Perhaps the worst case example is when a transistor amplifier is used in a receiving system in close proximity to a nearby transmitting system operating on a different frequency, and the leakage power is sufficient to drive the limiters into their operating region. The result will usually be a noticable slope in the baseband frequency response which will take place only when the transmitter is operating.

0.5 TO 18.0 GHz FREQUENCY RANGE

LIMITING AMPLIFIERS

"30" Series; 35 dB Small Signal Gain

Guaranteed Specifications @ 25°C Case Temperature

Model	Frequency Response (GHz) Minimum	Small Signal Gain (dB) Minimum	Small Signal Gain (dB) Maximum	Gain Flatness (±dB) Maximum	Saturated Output Power (dBm) Min.	Saturated Output Power (dBm) Max.	Noise Figure (dB) Maximum	VSWR Maximum In	VSWR Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
LWT-2034	0.5-2	35	40	1.5	+3	+7	3.5	2.0	2.0	+12	250	IS4
LMT-4035	2-4	35	40	1.5	+7	+11	3.0	2.0	2.0	+12	300	IS6
LWT-6034	2-6	35	40	1.5	+14	+18	4.0	2.0	2.0	+12	300	IC4
LWT-8035	2-8	35	40	1.5	+16	+20	4.0	2.0	2.0	+12	450	IC6
LMT-8033	4-8	35	40	1.5	+14	+17	4.5	2.0	2.0	+12	300	IC4
LMT-12436	7-12.4	35	40	1.5	+14	+19	5.5	2.0	2.0	+12	400	IX6
LMT-18036	12-18	35	40	1.5	+14	+19	6.0	2.0	2.0	+12	400	IX6
LWT-18036	8-18	35	40	1.5	+14	+19	6.0	2.0	2.0	+12	400	IX6
LWT-18636	6-18	35	40	1.5	+14	+19	6.0	2.0	2.0	+12	400	IX6

"40" Series; Nominal 70 dB Small Signal Gain

Guaranteed Specifications -54°C to +100°C Case Temperature

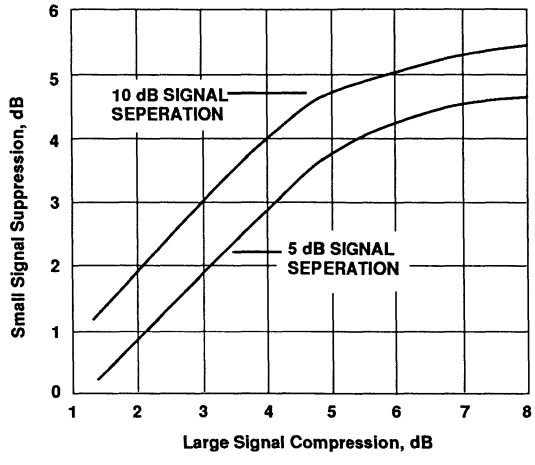
Model	Frequency Response (GHz) Maximum	Input Signal Range (dBm) Maximum	Saturated Output Power Range (dBm) Min.	Saturated Output Power Range (dBm) Max.	VSWR Maximum In	VSWR Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
LWT-2046	0.5-2	-61 to +20	+3	+7	2.0	2.0	+12	600	LS12
LMT-4046	2-4	-57 to +20	+7	+11	2.0	2.0	+12	700	LS12
LWT-6045	2-6	-50 to +20	+14	+18	2.0	2.0	+12	600	IC6
LWT-8046	2-8	-55 to +20	+16	+20	2.0	2.0	+12	900	LC12
LMT-8045	4-8	-50 to +20	+14	+17	2.0	2.0	+12	625	IC6
LMT-12448	7-12.4	-50 to +20	+14	+19	2.0	2.0	+12	900	LX16
LMT-18048	12-18	-50 to +20	+14	+19	2.0	2.0	+12	900	LX16
LWT-18048	8-18	-50 to +20	+14	+19	2.0	2.0	+12	900	LX16
LWT-18648	6-18	-50 to +20	+14	+19	2.0	2.0	+12	900	LX16

Other Specifications – Both "30" and "40" Series

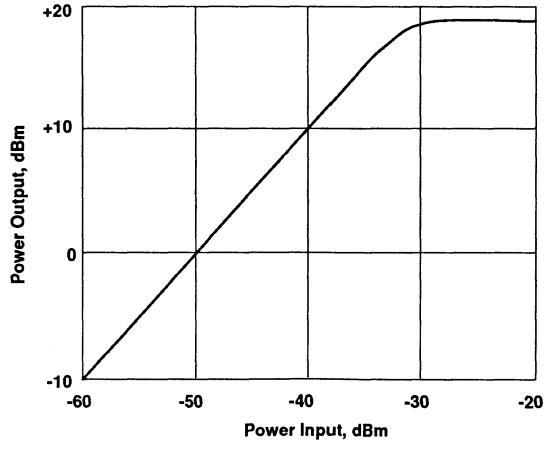
1. Power output for 1 dB gain compression is a maximum of 4 dB below saturated power output at any frequency.
2. Saturated power flatness is 2.0 dB p-p, maximum.
3. Saturated power variation over temperature is 1.5 dB p-p, maximum.
4. Maximum input power without damage: +20 dBm (CW).
5. Harmonics: -9 dBc maximum (-6 dBc 2nd Harmonic, -8 dBc 3rd Harmonic — LWT-2034, LWT-2046)
6. Pulse response: Overshoot, 0.25 dB maximum.
   Settling time, 25 ns maximum.
   Recovery time, 100 ns maximum.
7. Small signal suppression: 3 dB minimum.
8. AM/PM conversion: 5°/dB maximum.
9. Output noise power will be less than P_{SAT}(Min) -6 dB for the "40" series.
10. "30" and "40" series amplifiers contain an integral voltage regulator. The input voltage can be +12 to +15 VDC with 3% maximum ripple. All units also contain overvoltage and reverse polarity protection to ±25 VDC. Contact Avantek applications engineering for information on operation outside these parameters.

Typical Performance at 25°C Case Temperature

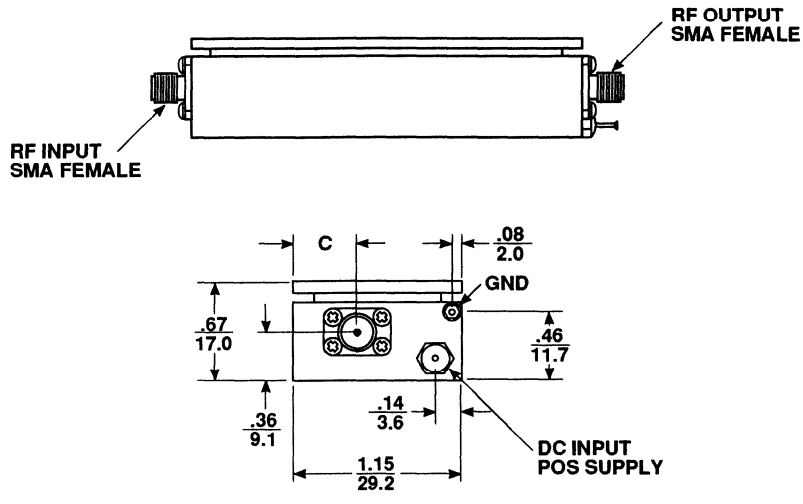
SMALL SIGNAL SUPPRESSION[1] VS.
LARGE SIGNAL COMPRESSION – TYP. ALL VERSIONS

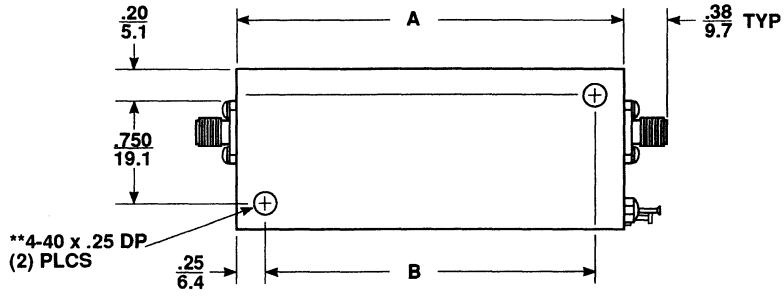


POWER OUTPUT VS. POWER INPUT
Typical "30" Series Versions [2]



NOTES:
1. SMALL SIGNAL SUPPRESSION IS DEFINED AS THE INCREASE IN THE POWER RATIO OF TWO SIGNALS AT THE OUTPUT OF THE LIMITING AMPLIFIER WITH RESPECT TO THE POWER RATIO AT THE INPUT.
2. THE SHAPE OF THE LIMITING CURVE IS TYPICAL OF ALL LMT/LWT SERIES AMPLIFIERS.





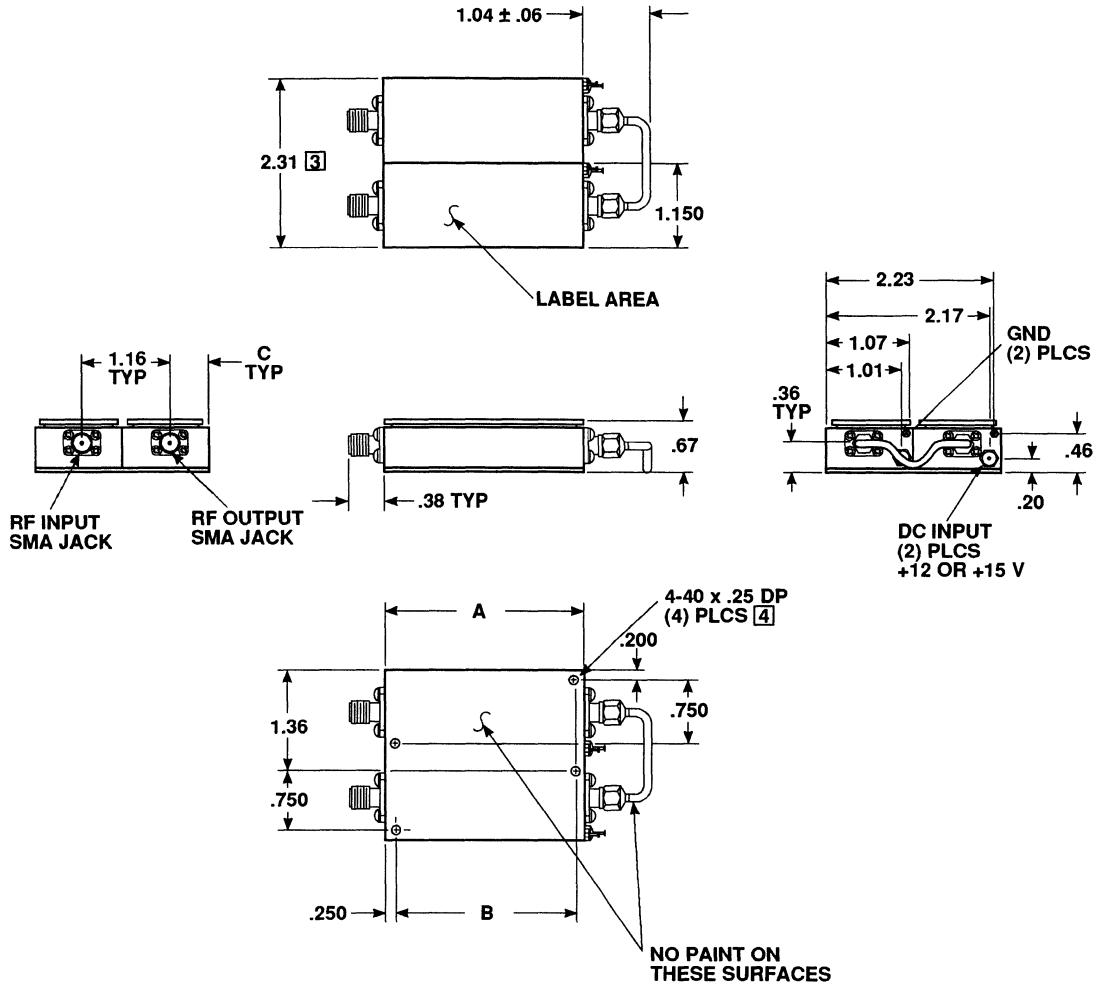
CASE	DIMENSION						WEIGHT	
	A		B		C			
	IN	MM	IN	MM	IN	MM	OZ	GMS
IS4	2.083	52.9	1.583	40.2	.375	9.5	3	68
IC4	2.083	52.9	1.583	4.02	.465	11.8	3	68
IC6	2.750	69.8	2.250	57.1	.465	11.8	4	90
IX6	2.250	57.1	1.750	44.4	.510	13.0	3	78

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN $\frac{\text{INCHES}}{\text{MM}}$
2. TOLERANCES: .XX ± .02
   .XXX ± .010
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING

**AVAILABLE WITH METRIC THREAD M3 ON REQUEST.
NO THREADS FIRST .062"

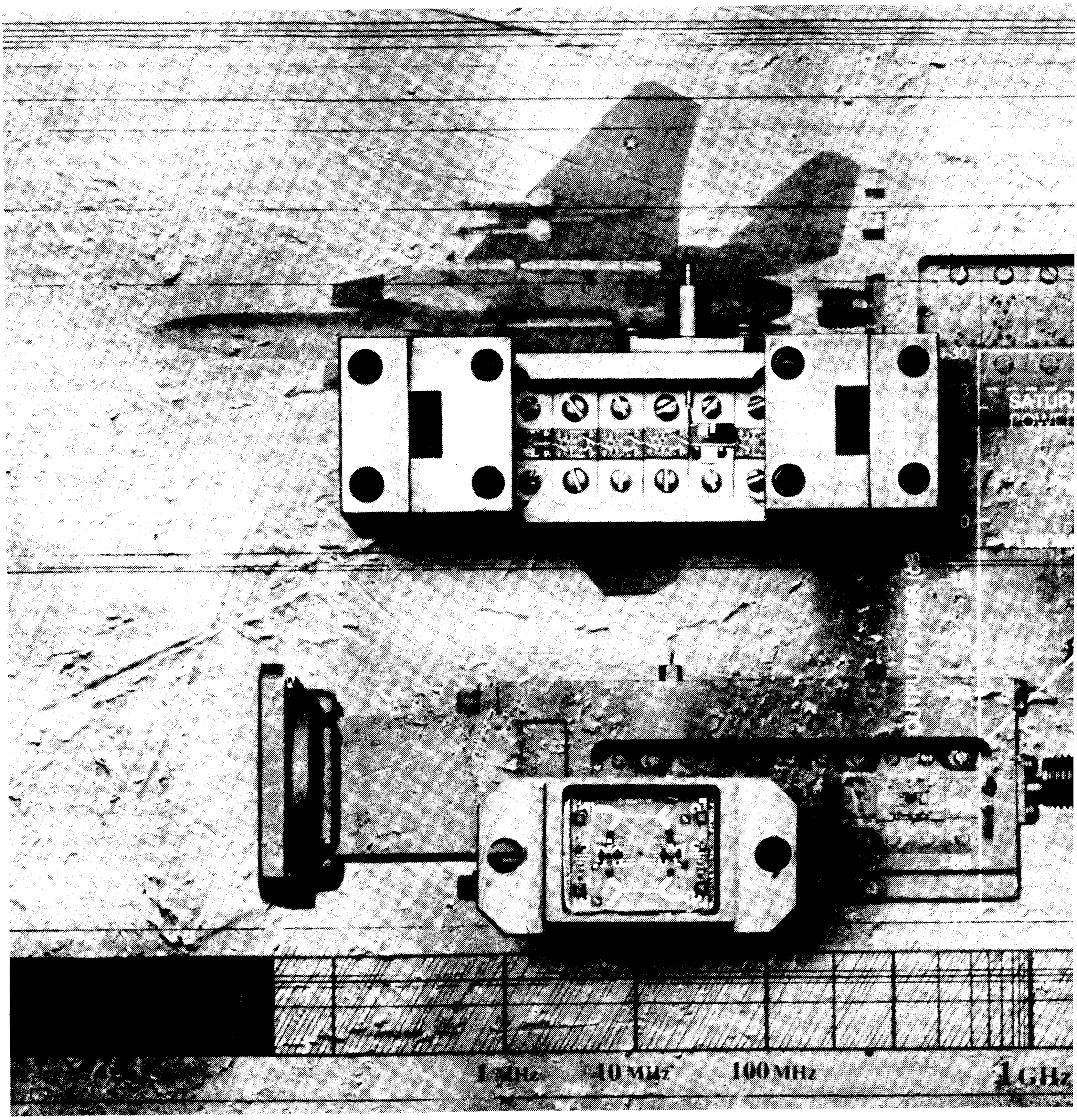
LC12, LS12, and LX16
CASE DRAWINGS



BAND	CASE	DIMENSION			WEIGHT GRAMS (APPROX)
		A	B	C	
S	LS12	2.75	2.250	.38	220
C	LC12	2.75	2.250	.47	220
X/KU	LX16	2.75	2.250	.51	260

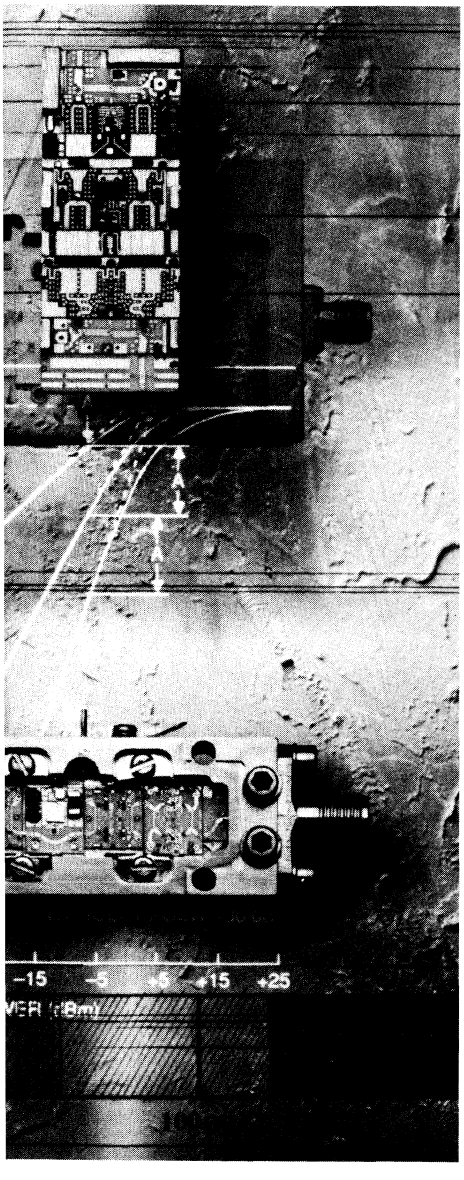
NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX± 0.02
   .XXX± .010
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING
[3] WIDTH DIMENSION DOES NOT INCLUDE ANY CUSTOMER REQUIRED LABELS.
[4] NO THREADS FIRST .062"



SATURA
OUTPUT POWER (dB
1 MHz
10 MHz
100 MHz
1 GHz

7. Narrowband Low Noise Amplifiers



Narrowband Low Noise Amplifiers

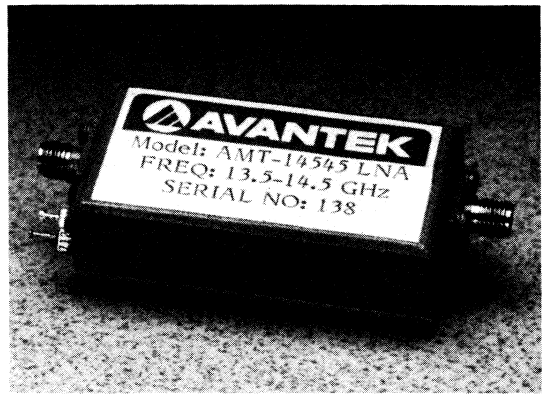
AMT Series

- 2.2-2.4 GHz
- 2.7-3.1 GHz
- 3.1-3.5 GHz
- 5.4-6.0 GHz
- 8.5-10.5 GHz
- 13.5-14.5 GHz

Features

- Low Noise Figure
- Compact/Rugged Thin-Film Construction
- Temperature Compensation
- Optional Waveguide Input
- Optional ENR Bit Capability

AMT Series Amplifiers



Description

Avantek's family of small signal gain, low noise amplifiers offers coverage of most needed bands. Typical applications include airborne, shipboard, and ground electronic defense systems, IFF, radar and communications receivers, EHF satellite communications, TDRS uplink, and S-band telemetry.

Avantek's small packaging offers extremely compact and light-weight amplifiers ideal for incorporation into the latest generation of defense systems.

Low noise performance combined with a wide selection of gain and output power provide some of the industry's most versatile amplifiers. The MILSTAR LNA covering 20.2 to 21.2 GHz has a maximum noise figure of 3.5 dB @ 25°C while maintaining a 1 dB gain compression point of +10 dBm minimum and 30 dB of gain. The AMT-10545 offers a waveguide input with a noise figure of 2.3 dB and a 1 dB gain compression point of +15 dBm. This amplifier-based subassembly includes up to 40 dB of gain control and an integral 14 dB ENR BIT capability to facilitate checking system noise.

Design Features

All thin-film amplifiers in this series operating above 2.0 GHz feature balanced amplification. Each stage consists of a pair of identical GaAs FET amplifier channels with quadrature hybrid couplers serving to equally divide the input power between the two channels and combine the output powers.

This balanced design permits each stage to produce an undistorted output power about twice that of an equivalent single-ended stage, while allowing the transistors to operate at a conservative power dissipation for high reliability. Balanced amplification also reduces the input and output VSWR of each stage, and of the overall amplifier, due to the inherent cancellation of reflected energy at each coupler.

The short term stability of all the amplifiers in this series is assured by the incorporation of an integral monolithic IC voltage regulator to isolate the gain stages from variations in the DC input voltage. This voltage regulator also offers high rejection of noise and hum appearing on the power supply line and includes circuitry to protect both the regulator and the GaAs FET circuits. Over-voltage and reverse-voltage protection are also provided.

All of the amplifiers in the -54° to +100°C series are temperature compensated to minimize changes in the small signal gain over the wide military temperature ranges. Avantek's rugged and light-weight construction are particularly well-suited to military applications in environments such as MIL-E-5400 and MIL-E-16400.

2.2 to 14.5 GHz FREQUENCY RANGE

NARROWBAND LOW NOISE AMPLIFIERS

AMT—High Performance and Temperature Compensated Connectorized Amplifier Series

AMT Series

Guaranteed Specifications @ 25°C Case Temperature

	Model	Frequency Response (GHz) Minimum	Gain (dB) Minimum	Gain (dB) Maximum	Noise Figure (dB) Maximum	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Maximum	Case Type
(N)	**AMT-2431**	2.2-2.4	15	20	1.5	10	0.5	18	1.50	1.50	12	60	MAS2
(N)	**AMT-2432**	2.2-2.4	28	33	1.5	10	0.5	18	1.50	1.50	12	110	MAS2
(N)	**AMT-3132**	2.7-3.1	25	30	1.2	10	0.5	18	1.50	1.50	12	130	IC2
(N)	**AMT-3532**	3.1-3.5	25	30	1.2	10	0.5	18	1.50	1.50	12	130	IC2
(N)	**AMT-6032**	5.4-6.0	24	29	1.5	10	0.5	18	1.50	1.50	12	120	IC2
(N)	**AMT-6033**	5.4-6.0	35	40	1.5	15	0.5	23	1.50	1.50	12	190	IC4
(P)	**AMT-10552**	8.5-10.5	20	22	1.8	10	0.5	18	1.50	1.50	12	100	IX2

(P) - Preliminary specifications

(N) - New product offering

AMT Series — Temperature Compensated

Guaranteed Specifications @ 25°C and -54° to +100°C Case Temperature

Model	Frequency Response (GHz) Minimum	Temp. Range °C	Gain (dB) Min.	Gain (dB) Max.	Noise Figure (dB) Max.	Power Output for 1 dB Gain Compression (dBm) Minimum	Gain Flatness (±dB) Maximum	Typical Third Order Intercept Point (dBm)	VSWR (50 ohms) Maximum In	VSWR (50 ohms) Maximum Out	Input Power Voltage (VDC)	Input Power Current (mA) Max.	Case Type
AMT-9544	8.5-9.5	25	29	33	2.0	12	0.5	20	1.50	1.50	12	275	IX8
		-54 to +100	29	33	2.8	10	1.5	18	1.50	1.50	12	275	IX8
AMT-10044	9.0-10.0	25	29	33	2.0	12	0.5	20	1.50	1.50	12	275	IX8
		-54 to +100	29	33	2.8	10	1.5	18	1.50	1.50	12	275	IX8
AMT-10545	8.5-10.5	25	33	40	2.3	15	0.5	23	1.25	1.50	12	325	IX10/WG[1]
		-54 to +100	33	40	3.1	12	1.5	20	1.25	1.50	12	325	IX10/WG[1]
AMT-10544	9.5-10.5	25	29	33	2.0	12	0.5	20	1.50	1.50	12	275	IX8
		-54 to +100	29	33	2.8	10	1.5	18	1.50	1.50	12	275	IX8
AMT-14545	13.5-14.5	25	29	33	3.0	15	0.5	23	1.50	1.50	12	290	IX6
		-54 to +100	29	33	3.8	10	1.5	18	1.50	1.50	12	290	IX6

Notes:

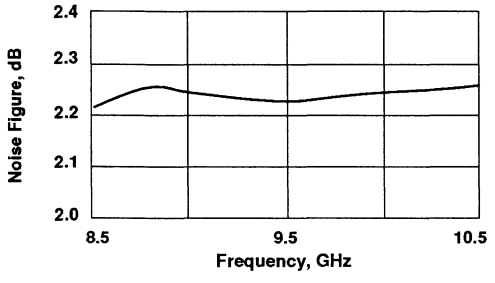
The nominal noise figure change over temperature is 0.01 dB/°C.

1. IX10 case with UG-135/U waveguide flange input, female SMA output.

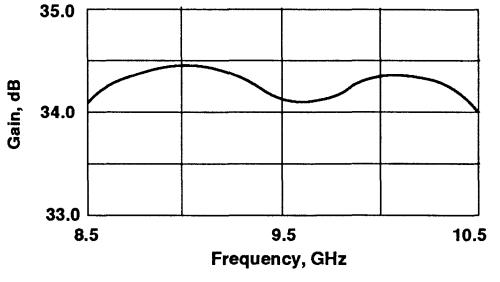
Typical Performance at 25°C Case Temperature

AMT-10545

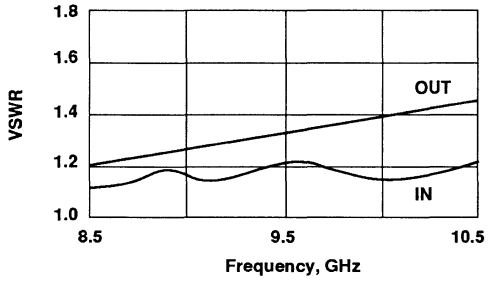
NOISE FIGURE



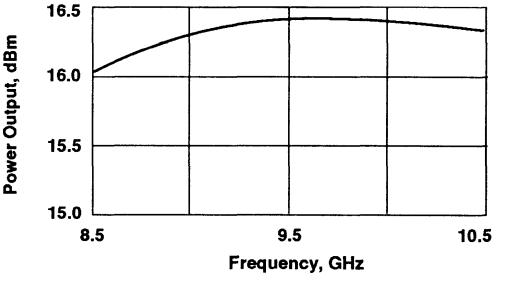
SMALL SIGNAL GAIN



VSWR



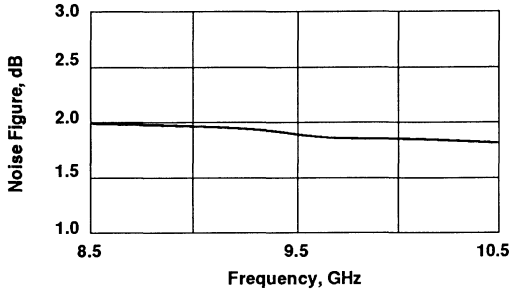
OUTPUT POWER
(1 dB Comp)



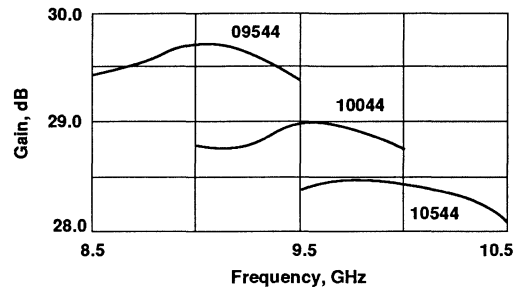
Typical Performance at 25°C Case Temperature

AMT-9544, -10044 and -10544

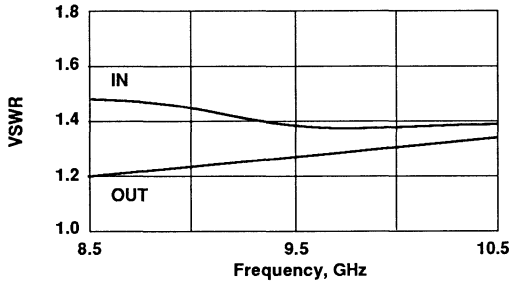
NOISE FIGURE



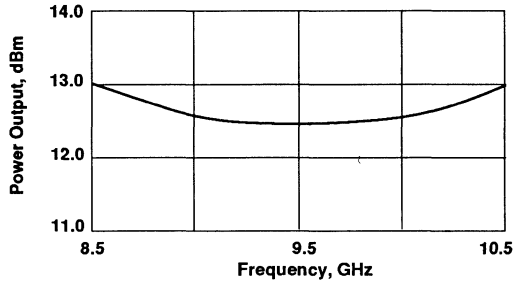
SMALL SIGNAL GAIN



VSWR



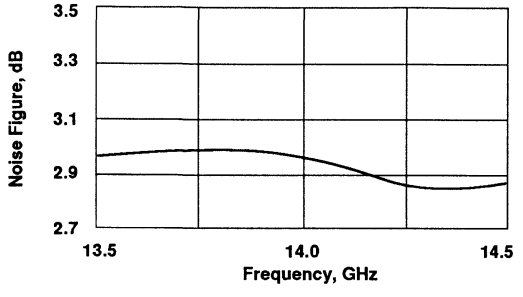
OUTPUT POWER
(1 dB Comp)



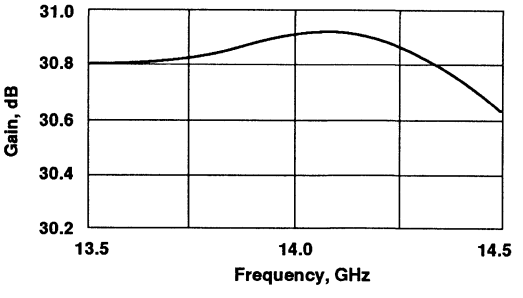
Typical Performance at 25°C Case Temperature

AMT-14545

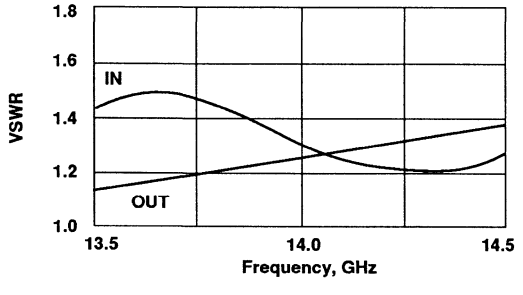
NOISE FIGURE



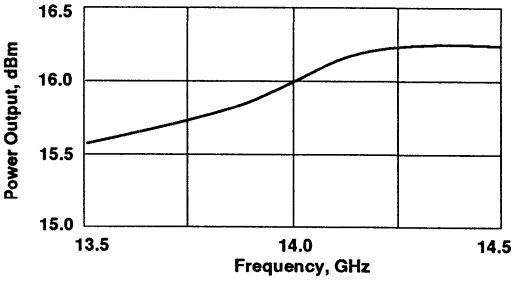
SMALL SIGNAL GAIN

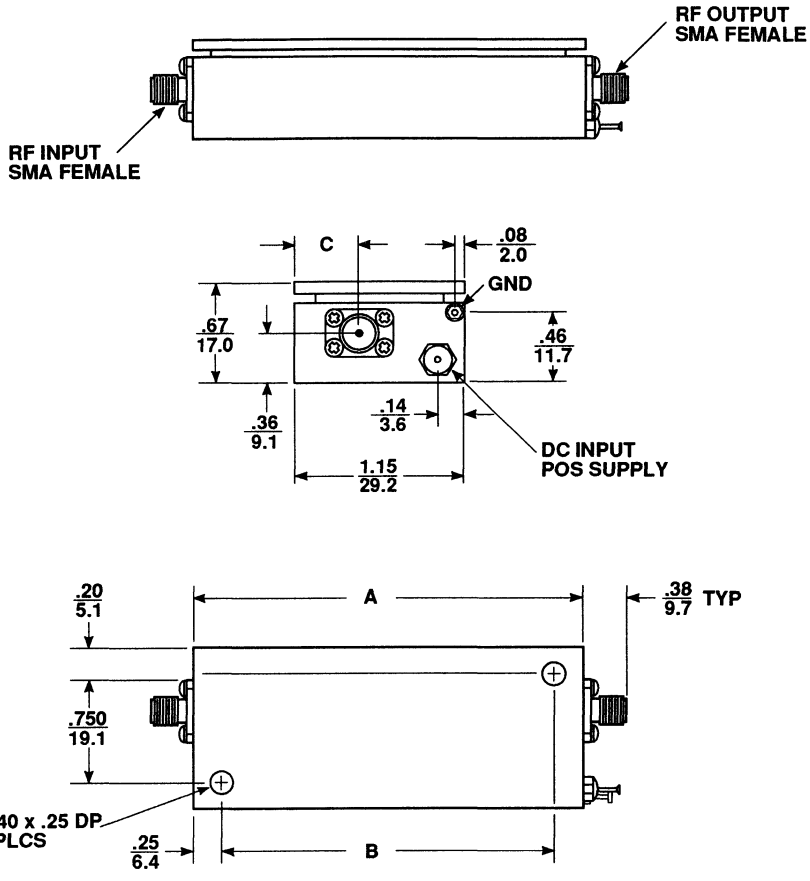


VSWR



OUTPUT POWER
(1 dB Comp)





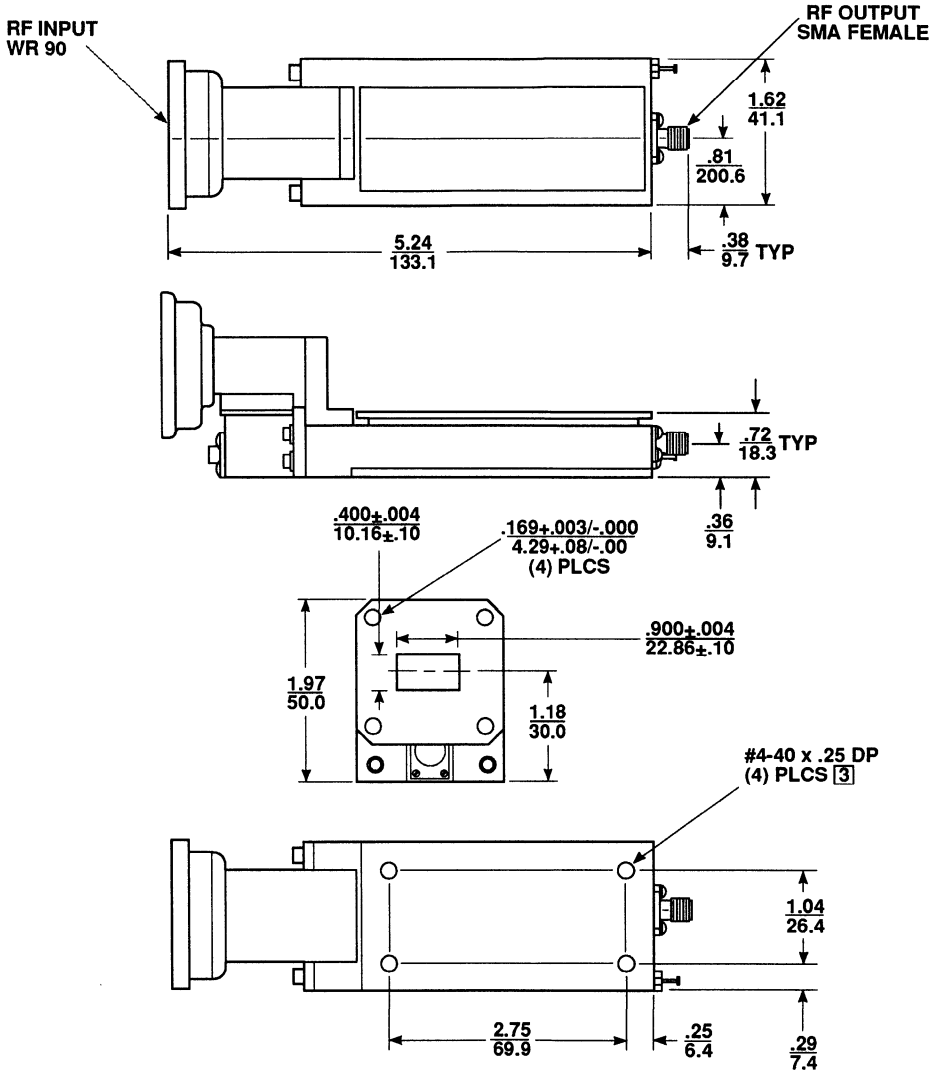
CASE	DIMENSION						WEIGHT	
	A		B		C			
	IN	MM	IN	MM	IN	MM	OZ	GMS
IS2	1.417	35.9	.917	23.2	.375	9.5	2	47
IC2	1.417	35.9	.917	23.2	.465	11.8	2	47
IC4	2.083	52.9	1.583	40.2	.465	11.8	3	68
IX2	1.250	31.8	.750	19.1	.510	13.0	2	47
IX6	2.250	57.1	1.750	44.4	.510	13.0	3	78
IX8	2.750	69.8	2.250	57.1	.510	13.0	4	92

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES: .XX ± .02
   .XXX ± .010
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING

**AVAILABLE WITH METRIC THREAD M3 ON REQUEST.
NO THREADS FIRST .062"

IX10/WG
CASE DRAWING

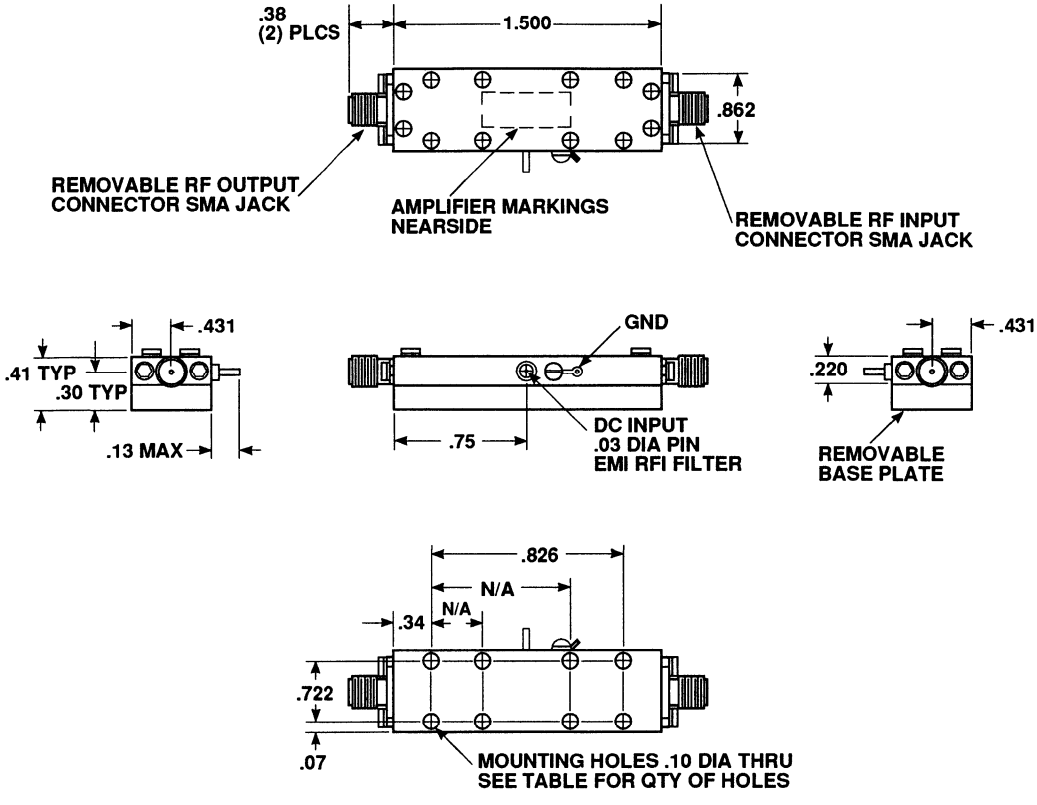


NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES / MM
2. TOLERANCES (INCHES): .XX ± .02
   .XXX ± .010

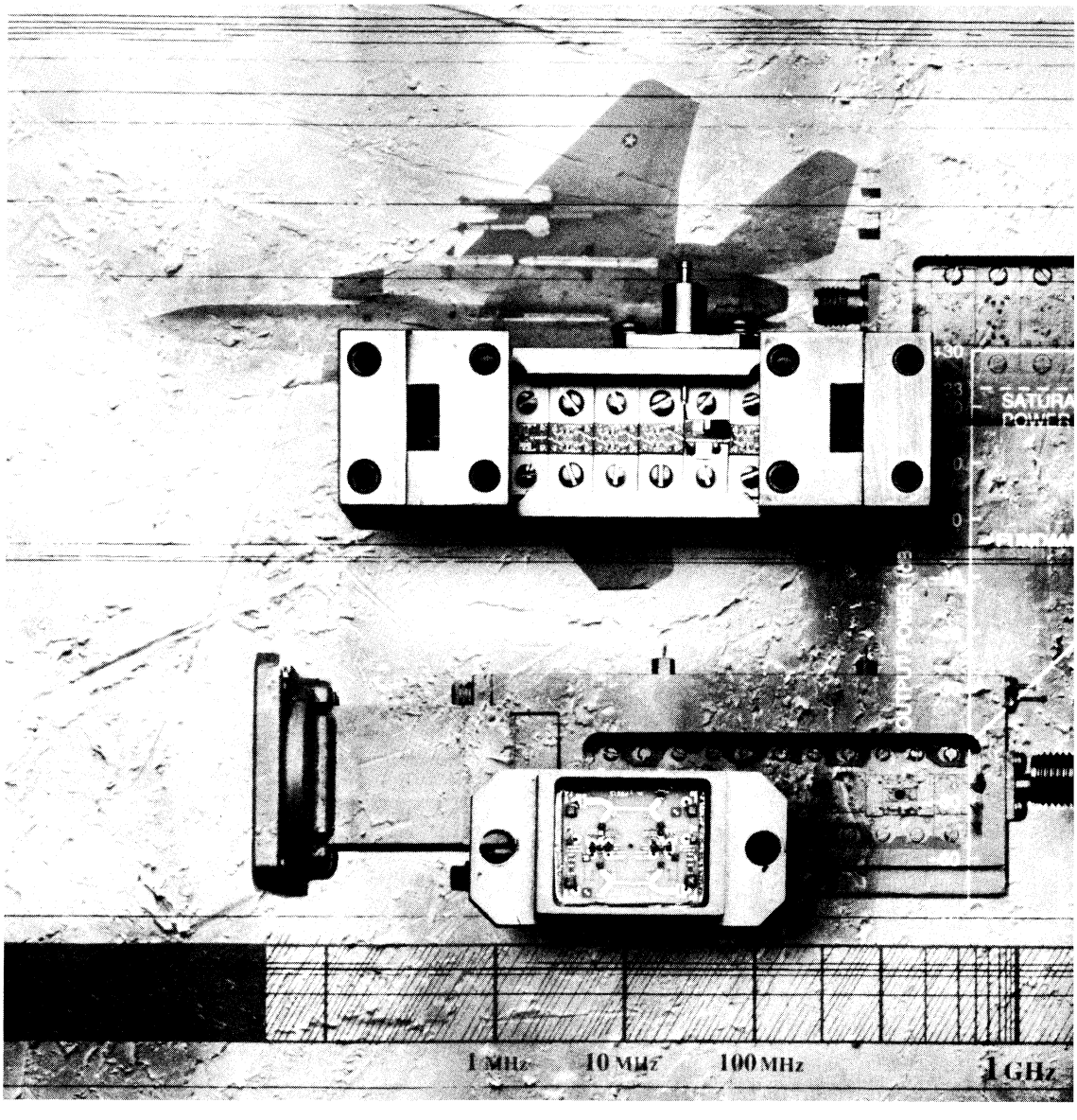
ALL TOLERANCES BEFORE PAINT AND/OR LABELING

3 AVAILABLE WITH METRIC THREAD M3 ON REQUEST. NO THREADS FIRST .062".

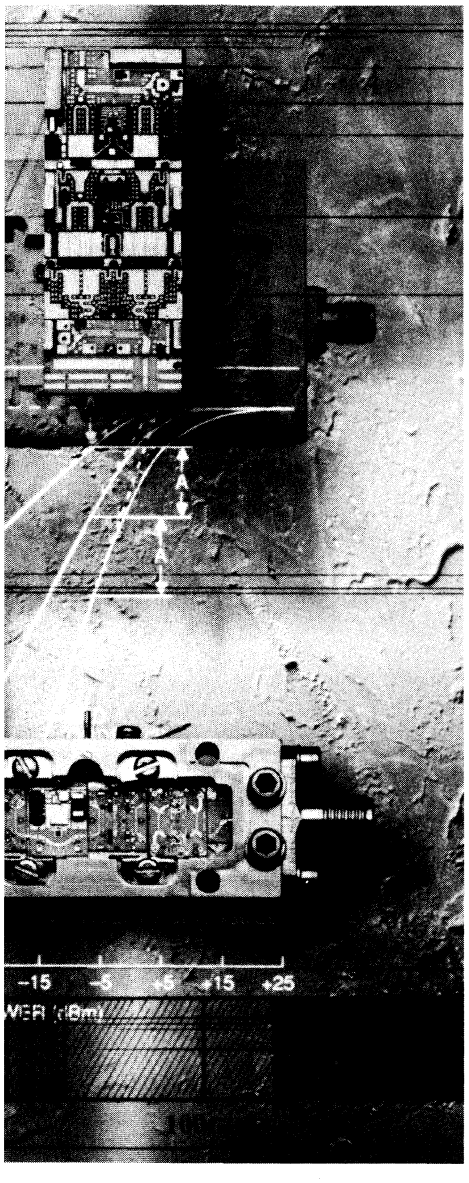


NOTES (UNLESS OTHERWISE SPECIFIED):

1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: .XX ± .02
   .XXX ± .010
   ALL TOLERANCES BEFORE PAINT AND/OR LABELING

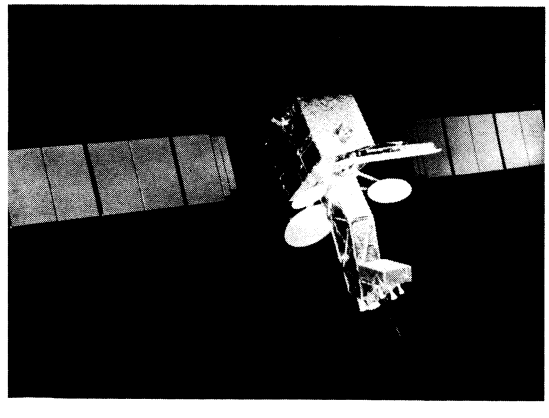

1 MHz
10 MHz
100 MHz
1 GHz

8. High Rel and Space Level Capabilities



"R-series" Level B Screening

Space Level (Level S) Screening



Optional Screening

Avantek's amplifiers are not only world leaders in their microwave performance but are also the standard in their environmental and mechanical capabilities. Exhaustive analysis has been done and many hours have been spent to ensure that all of our amplifiers can reliably perform in most any environment from shipboard to airborne to outer space. Avantek's amplifiers are routinely tested and qualified to a wide range of military environmental and mechanical standards.

High reliability is inherent in all of Avantek's amplifiers since all Avantek semiconductor wafers are processed to the same exacting standards regardless of whether the end use is for commercial, industrial, military, or space applications. Avantek's successful involvement in high reliability programs in both military and space applications is a result of testing these "standard" wafers to more stringent standards, thus allowing them to satisfy the most demanding customer requirements. Material traceability to individual wafer and lot is fully maintained through documentation at each step of the screening process.

Avantek can provide a standard screening for most of the standard amplifiers listed in this Data Book. This standard screening is referred to as "R-series", and is described in detail on page 17 in the screening section of the Application Notes. Where R-series screening is not sufficient for your needs, Avantek offers the full range of Mil-Spec screening on a special quotation and order basis. Inquiries for such screening can be made through your local sales office or Avantek applications engineering.

A partial list of the amplifier assembly screening that is available is shown on the following page.

Test	STD	Method	Condition or Procedure
Quality Visual	Avantek Workmanship Standards-014533-800		
Pre-Seal Bake	883	1030	C
Stabilization Bake	883	1008	A, B, C
	MIL-A-28875	4.8.2.1	3.6.1
Thermal Shock	202	107	A, B, C, D, F
	MIL-A-28875	4.8.25	3.11
Temperature Shock	810	503	Proc. I
Temperature Cycle	883	1010	B, C, D
Constant Acceleration	883	2001	
Mechanical Shock	202	213	A*
Moisture Resistance	202	106	E
	883	1004	
Conducted Emissions	461 + 462	CE01 - 7	
		(CE05 not commonly performed)	
Conducted Susceptibility	461 + 462	CS01 - 6	
Radiated Emissions	461 + 462	RE01	
		RE02	
		RE04	
Radiated Susceptibility	461 + 462	RS01	
		RS02	
		RS03	
Vibration, High Frequency	202	204	D
Vibration, Var. Frequency	883	2007	B
Temperature/Altitude	810	518	I
Explosive Atmosphere	810	511	I
Humidity	202	103	A, B, C
Sand and Dust	202	110	A
Salt Spray	202	101	D
Fungus	810	508	I
High Temperature	810	501	Proc. I & II
Low Temperature	810	502	Proc. I
Steady State Life	883	1005	A, B
Intermittent Life	883	1006	A, B
Life	202	108	A, B, C, D
Burn-in	883	1015	B
	MIL-A-28875	4.8.3	3.6.2
Seal	883	1014	C
	202	112	D, E
Final Electrical	Standardized Avantek Procedures		
External Visual	Avantek Quality Procedures		

* Contact factory for other conditions

Because the list of optional screening is so extensive, Avantek will work with you to meet your screening needs on a case-by-case basis. Please contact your representative for further information for these or other screening requirements you may have.

SPACE LEVEL CAPABILITIES

"WORLD CLASS" TECHNOLOGY FOR SPACE

Avantek Space Level Microwave Amplifiers

In 1972 the first Avantek thin-film microwave amplifiers were successfully used in space. Since 1972, Avantek microwave amplifiers have been flown in numerous space programs. Our unparalleled technologies in silicon and GaAs transistors and MMICs, and thin-film hybrid circuits provide the basis for our success in space. Our commitment to space level microwave amplifiers includes:

- Vertical integration of superior technologies
- Dedicated resources – engineering, program management
- Configuration management
- Material, process and production lot traceability and control
- Element screening and 100% product screening

Technologies

All Avantek microwave amplifiers use Avantek-designed and produced transistors or MMICs (or both), thin-film circuits, and MOS capacitors in all amplifier stages.

Avantek transistors are designed and tested to provide extremely uniform DC and microwave performance for the most severe and critical microwave space applications. All Avantek transistors are fabricated utilizing a gold and refractory metal system with proven excellence in junction and channel/contact performance, bond strength, and freedom from current-induced metal migration under high current and temperature conditions. The Avantek gold-based metal system that is used for all transistors produces uniform submicron geometries and assures complete coverage of even abrupt contours on the surface of devices. Our highly optimized fabrication processes allow for the production of precise half-micron silicon bipolar geometries and sub-quarter-micron GaAs FET geometries.

Avantek, from its beginning, chose thin-film construction for its microwave hybrid amplifiers because of the performance capability and the inherent reliability of this construction technique. Avantek now has over twenty years of experience producing thin-film hybrid modules using the most reliable metal systems available and state-of-the-art processing equipment.

Avantek produces all of its products with long-term reliability in mind. All new designs, from transistors through complex, multi-function subassemblies, are thoroughly analyzed and tested before being released to production.

Avantek's thin-film hybrid modules start out as select-grade ceramic substrates chosen for both electrical uniformity and surface finish. Thin-film circuitry is deposited using RF sputtering technology in a high-vacuum system. Multilayer metallization is used throughout to achieve excellent adhesion to the ceramic substrate as well as optimal electrical performance. All circuit conductors are fabricated with a top layer of electroplated, high-purity gold for excellent conductivity and corrosion resistance, and to assure reliable eutectic die attach and wire bonding. All resistors are thin-film tantalum nitride, heat treated for stability, and automatically laser-trimmed to low tolerances when necessary.

Circuit patterns are defined by high-resolution photolithography capable of producing consistent 1-mil line widths and 0.5-mil line spacing, thus making circuit performance repeatable and consistent.

All interconnections on circuits are made using either thermocompression or thermosonically bonded gold wires or ribbons by highly skilled, well trained operators

Dedicated Resources

Avantek's philosophy is to provide customers with an entire family of microwave amplifiers (currently through 45 GHz). We provide dedicated design engineering resources for each of our amplifier types which include:

- Small Signal Amplifiers
- Low Noise Amplifiers
- Medium Power Amplifiers
- Limiting Amplifiers
- Other Special Function Amplifiers such as Loop and Log Amps
- Multi-Function, Amplifier-Based Subassemblies

At Avantek every Space Level program is assigned to a program manager who provides leadership and control over an Avantek team consisting of engineering, product assurance, and manufacturing personnel. The specific responsibilities of program management include:

- Providing customer contact for all factory interfacing for the total duration of the program.
- Generating all product documentation that accurately reflects all of our customer's hardware, screening, qualification, and data requirements.
- Establishing an initial program plan and continually monitoring and reporting progress against it.

All Space Level Avantek amplifiers are manufactured in dedicated facilities featuring a Class 100,000 clean room with Class 100 workstations at critical operations with full electrostatic discharge (ESD) protection used throughout. These

facilities contain both assembly and test operations with complete microwave test capabilities through 40 GHz.

Avantek Space Level amplifiers, which are manufactured to very detailed process flow documents, are subjected to numerous in-process controls such as bond pull, die shear, and weld schedule calibration to guarantee end product performance to Space Level requirements.

Screening

All active and passive elements are screened to "S Level" requirements of MIL-STD-883, Method 5008 (see figure 1) prior to being used in flight hardware. All elements are submitted to 100% "S Level" visual and electrical testing.

Following the screening and testing of all elements, product assembly begins and progresses through the typical Space Level process flow displayed in figure 2. All methods and conditions employed are in accordance with MIL-STD-883.

Configuration Management

Avantek has a formal, documented policy for configuration management. For space programs its highest level is invoked. The product baseline is established at final design review with thorough process and product-specific documentation that is maintained and controlled by Avantek's computer system. Any subsequent change to the product baseline requires customer approval.

Traceability and Control

Avantek Space Level materials are procured to source control drawings which invoke "S Level" element screening per MIL-STD-883, Method 5008 as well as 100% "S-Level" visual and 100% electrical testing. All semiconductor wafers are subjected to very rigorous functional testing (electrical and mechanical) using actual production builds prior to "S Level" element screening. All lot number information, certifications, and material data packages are maintained at our Incoming Inspection area. Process and product traceability is maintained by Avantek manufacturing process flow documentation for subassemblies as well as top level parts. This documentation records all material usage and allowed rework plus providing production operation traceability to process specification revision level. A modern system of material control, using computer tracking and bonded stores for "S Level" components insures rigid control for all levels of inventory.

Additional Information

For further information on a space application, or on any of our amplifier products, please contact the Avantek sales office nearest you or contact Space Rel Marketing in Santa Clara, California at (408) 970-2173.

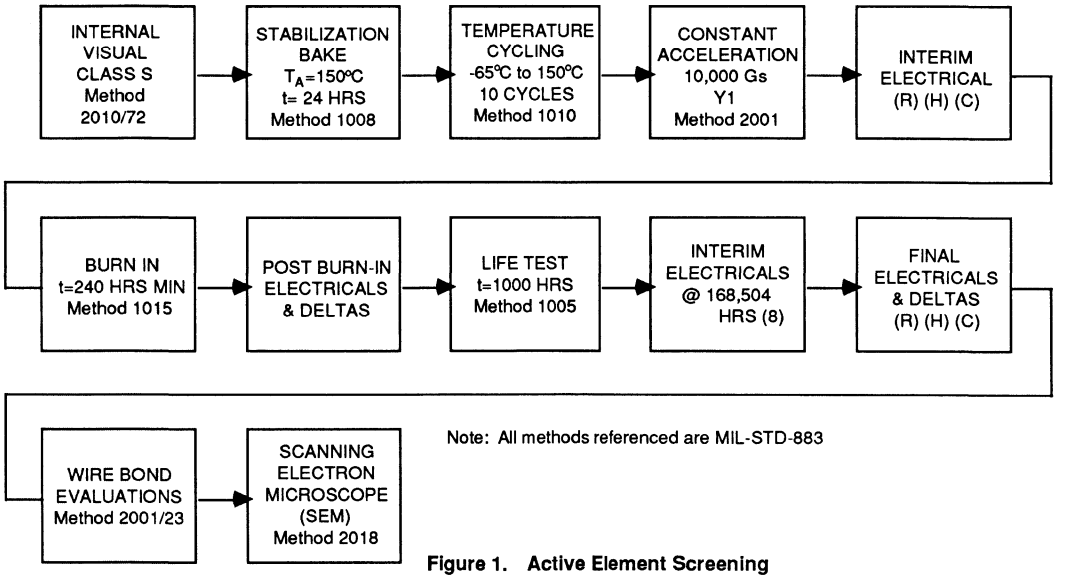
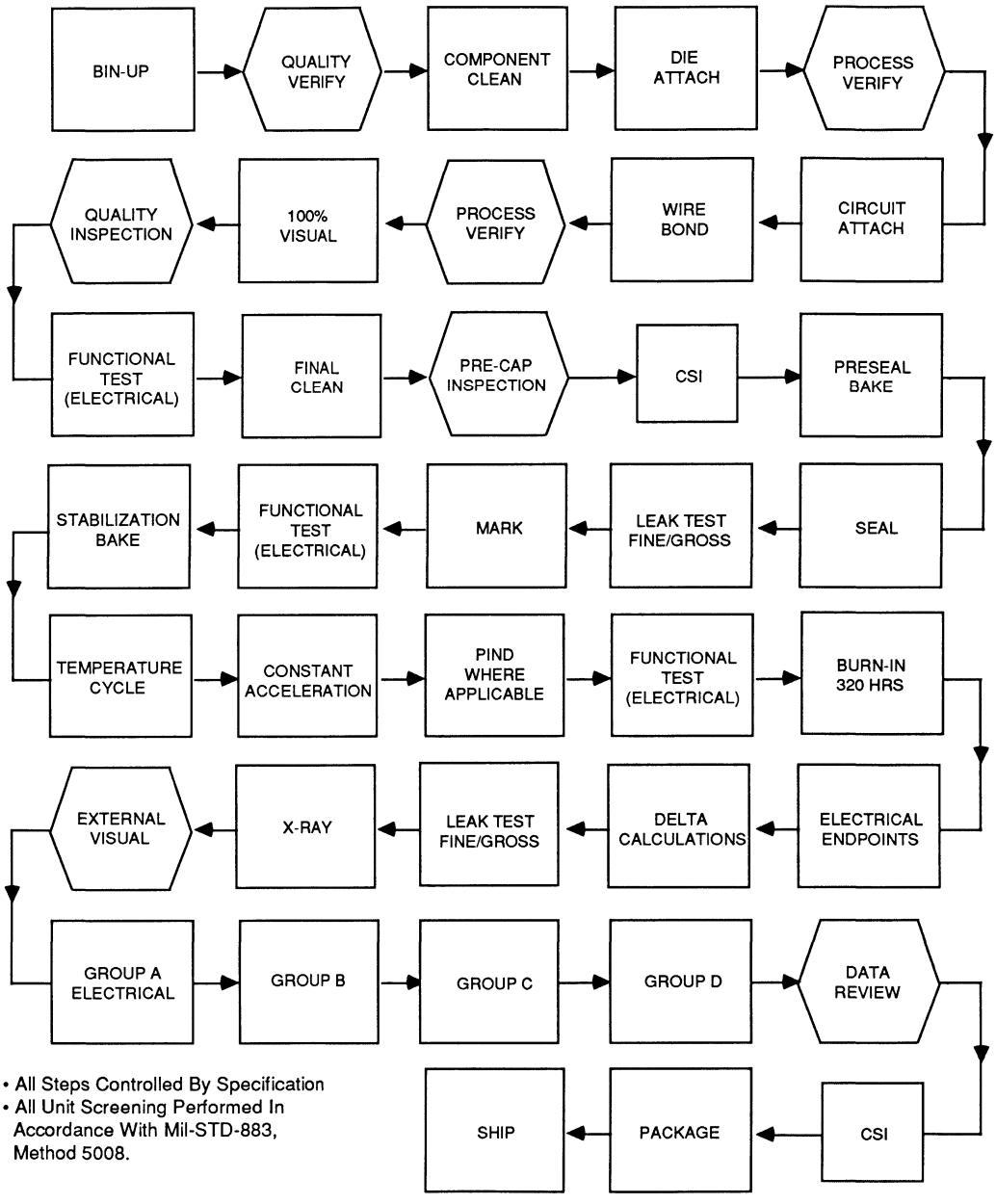
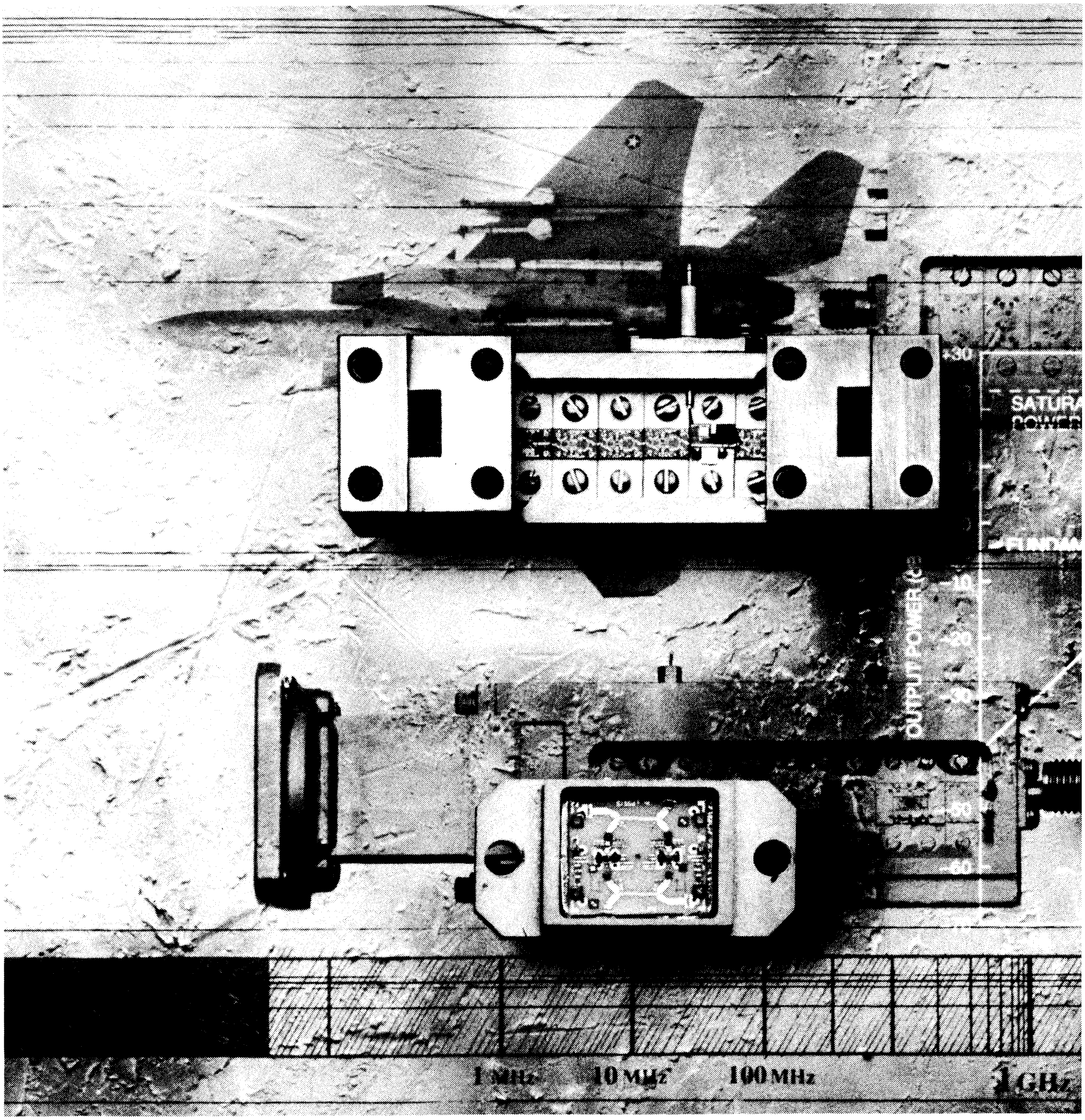


Figure 1. Active Element Screening

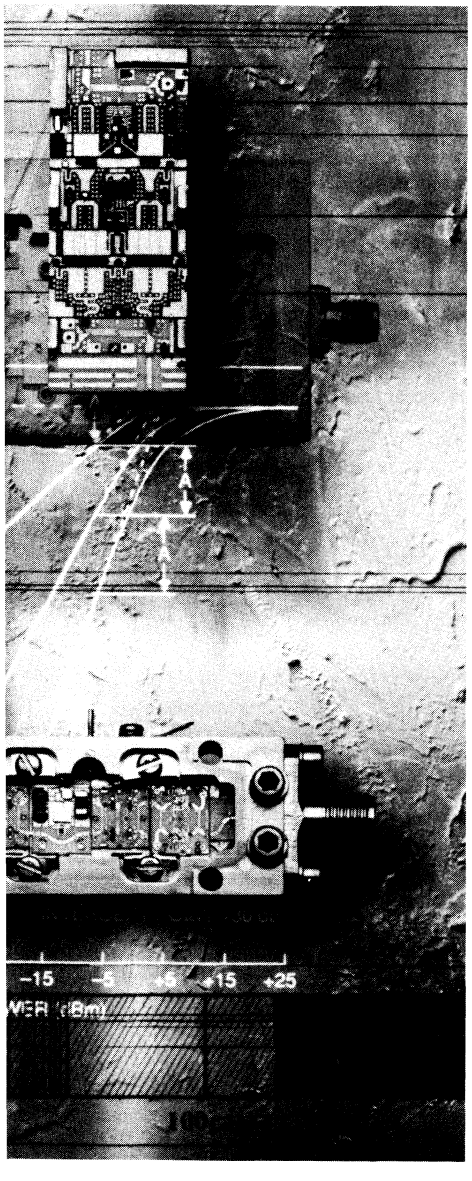


- All Steps Controlled By Specification
- All Unit Screening Performed In Accordance With Mil-STD-883, Method 5008.

Figure 2. Space Level Process Flow


+30
-10
-20
-30
-50
-60
1 MHz
10 MHz
100 MHz
1 GHz

9. Quality Assurance and Ordering/Applications Support



Quality Program

Ordering Information

- Field Sales Offices
- Avantek Representatives
- Avantek Stocking Distributors

Applications Support

Quality Program

Avantek's Quality program is a single standard system which utilizes MIL-Q-9858A as the controlling document. The Quality Department maintains independence by utilizing a matrix organization which reports to a separate division from that which they oversee. The crucial communication link is provided via dotted line reporting to the functional division.

A Quality Engineer (QE) is assigned to either a product line or specific customer depending on the size or complexity of the function. The QE is then responsible for approval of all activities within that function. These responsibilities include, but are not limited to: review of customer request for quotations; review of customer documentation; participation in design reviews; approval of internal manufacturing-related documentation, including changes thereto; participation in material review board and failure analysis board; internal quality audits; configuration management.

Vendor performance is monitored at all Avantek locations by the Incoming Inspection Department. Their responsibilities include the maintenance of the vendor performance report, vendor surveys, corrective action, and incoming inspection with related objective verifications.

Inprocess and final inspection verification gates are established to provide timely information to manufacturing for performance measurements with associated graphic charts.

Reliability engineering provides design review and analysis as well as expertise for purposes of failure analysis and participates in corrective action responses.

In-house environmental capabilities include: vibration, shock, temperature shock/cycle, burn-in, acceleration, seal (gross and fine), and PIND. Additionally, the Semiconductor Division has capabilities for detail die evaluation.

The corporate internal calibration facility is equipped to provide full repair and calibration to MIL-STD-45662. Approved suppliers provide additional (back-up) calibration support beyond our capabilities.

Avantek Sales and Distribution Network

Avantek has a worldwide Sales and Distribution Network to facilitate the servicing of your microwave product needs. See address and telephone listings on the following pages.

Avantek Sales Offices

Regional and district sales offices are located in the U.S. and in Europe. These offices are staffed with Avantek Sales and Administrative personnel to handle all your inquiries regarding microwave products.

Avantek Representatives

Sales representatives, located throughout the U.S. and the rest of the world, provide local coverage for sales inquiries.

Avantek Distributors

Worldwide availability of locally stocked microwave products is provided by the Avantek Distribution Network. This organization is committed to immediate response to our customers' needs for rapid shipment and delivery of product.

The products in the following sections are available through the Avantek Worldwide Distribution Network.

1. Gain Modules - μAVPAK PGM series
2. Wideband Small Signal Amplifiers - AFT, AMT, AWT, and AGT series
3. Millimeter Wave Products - up to 26.5 GHz only
4. Wideband Power Amps - APT, APG series
5. Communications Amplifier Products - AM, AMG, APG, AW and AWC series
6. Output Limiting Amplifiers
7. Narrowband Low Noise Amplifers

II. Power Supplies (listed at the end of section II, Application Notes

It is recommended that inquiries for these items be directed to your local distributor, as listed on the following pages.

Applications Support

If you require technical support beyond the resources of your local Distributor or Sales Office, applications engineers are available at the factory to answer technical questions related to the performance and use of Avantek amplifiers.

Applications engineering may be contacted toll-free during normal business hours at 800-543-7727.

Avantek Corporate Sales Offices

Regional Sales Offices

EASTERN

Avantek, Inc.
Suite N-165
10005 Old Columbia Road
Columbia, MD 21046
(301) 381-2600

CENTRAL

Avantek, Inc.
Countryside Executive Center
1226 W. Northwest Highway
Palatine, IL 60067
(312) 358-8963

WESTERN

Avantek, Inc.
Suite 325
4165 Thousand Oaks Blvd.
Westlake Village, CA 91362
(805) 373-3870

EUROPE

Avantek, Ltd.
Frimley Business Park, Unit 6
Frimley, Camberley
Surrey GU16 SSG
United Kingdom
(44) 276-685753

Direct Sales Offices

NORTHERN CALIFORNIA

Avantek, Inc.
481 Cottonwood Drive
Milpitas, CA 95035-7492
(408) 943-3026

COLORADO

5690 DTC Blvd.
Suite 130
Englewood, CO 80111
(303) 741-5757

FLORIDA

Avantek, Inc.
1645 Honey Bear Lane
Dunedin, FL 34698
(813) 787-3218

GEORGIA

Avantek, Inc.
3581 West Hampton Drive
Marietta, GA 30064
(404) 421-9007

Avantek Inc.
102 Shenan Court
Warner Robins, GA 31088
(912) 923-9989

INDIANA

Avantek, Inc.
6227 Constitution Drive
Fort Wayne, IN 46804
(219) 432-4965

KANSAS

Avantek, Inc
Suite 122
10,000 W. 75th Street
Shawnee Mission, KS 66204
(913) 677-3716

MASSACHUSETTS

Avantek, Inc.
Suite 11
4 Court House Lane
Chelmsford, MA 01824
(508) 453-8846

NEW YORK

Avantek, Inc.
Suite 102
200 Parkway Drive South
Hauppauge, NY 11788
(516) 864-1054

PENNSYLVANIA

Avantek, Inc.
Suite 200
997 Old Eagle School Road
Wayne, PA 19087
(215) 254-9440

TEXAS

Avantek, Inc.
Woodcreek Plaza, Suite 180
101 W. Renner Road
Richardson, TX 75080
(214) 437-5694

AVANTEK

Avantek Worldwide Distributors

Domestic Distributors

NORTHWEST

CALIFORNIA (Northern), IDAHO MONTANA, NEVADA (Northern), OREGON, WASHINGTON, WYOMING

Penstock, Inc.
520 Mercury Drive
Sunnyvale, CA 94086-4018
(408) 730-0300

Penstock, Inc.
10800 NE 8th Street, Suite 800
Bellevue, WA 98004
(206) 454-2371

SOUTHWEST

ARIZONA, CALIFORNIA (Southern), NEW MEXICO, NEVADA (Southern), TEXAS (El Paso area)

Sertek, Inc
5356 Sterling Center Drive
Westlake Village, CA 91361
(818) 707-2872

Sertek, Inc
1046 N. Tustin, Suite "I"
Orange, CA 92667
(714) 997-7311 or 7314
(619) 224-6911 (San Diego)

Sertek, Inc
2111 East Broadway Road., Suite 5
Tempe, AZ 85282
(602) 894-9405

COLORADO, UTAH

Sertek, Inc.
5356 Sterling Center Drive
Westlake Village, CA 91361
(800) 334-7127

MIDWEST

ILLINOIS, INDIANA, IOWA, KANSAS, KENTUCKY, MICHIGAN, MISSOURI, MINNESOTA, NEBRASKA, NORTH DAKOTA, OHIO, SOUTH DAKOTA, WISCONSIN

Penstock Midwest
Countryside Executive Ctr, Suite 504
1250 W. Northwest Highway
Palatine, IL 60067
(312) 934-3700
(317) 784-3870 (Indiana)

CENTRAL

ARKANSAS, LOUISIANA (West of the Mississippi River), OKLAHOMA, TEXAS, (Except El Paso area)

Thorson Distributing Company
4445 Alpha Road
Dallas, TX 75244
(214) 233-5744 (Dallas)
(512) 345-1985 (Austin)
(713) 558-8205 (Houston)

NORTHEAST

NEW ENGLAND STATES NEW YORK (Upstate)

Sickles Distribution Sales
175 Bedford St., Suite 12
Lexington, MA 02173
(617) 862-5100

EAST CENTRAL NEW JERSEY, NEW YORK (Metropolitan), PENNSYLVANIA

Penstock East
124B Little Falls Road
Fairfield, NJ 07006
(201) 808-1414

DISTRICT OF COLUMBIA, MARYLAND, VIRGINIA, WEST VIRGINIA, SOUTH NEW JERSEY, PENNSYLVANIA

Applied Specialties, Inc.
10101 G. Bacon Drive
Beltsville, MD 20705
(301) 595-5393 (Metro D.C.)
(301) 792-2211 (Maryland)
(800) 638-8555

SOUTHEAST

ALABAMA, FLORIDA, GEORGIA, LOUISIANA (East of the Mississippi River), MISSISSIPPI, NORTH & SOUTH CAROLINA, TENNESSEE

Applied Specialties of Florida
8420 Ulmerton Road, Suite 406
Largo, FL 34641
(813) 530-7309
(800) 722-4599

Component Distributors, Inc.
312 So. Harbor City Boulevard, Suite 3
Melbourne, FL 32901
(407) 724-9910
(800) 558-2351

Component Distributors, Inc.
11309 S. Memorial Parkway, Suite F
Huntsville, AL 35803
(205) 883-7501

Component Distributors, Inc.
5505 Creedmoor Road, Suite 206
Raleigh, NC 27612
(919) 787-7311

Component Distributors, Inc.
6264 Crooked Creek Road, Suite 2
Norcross, GA 30092
(404) 441-3320

CANADA

Sertek, Inc.
5356 Sterling Center Drive
Westlake Village, CA 91361
(818) 707-2872

International Distributors

ENGLAND, SCOTLAND, IRELAND, WALES

Wave Distribution LTD
Laser House
132/140 Goswell Road
London EC1V 7LE
England
(44) 1-251-5181

FRANCE, BELGIUM, THE NETHERLANDS

Scie Dimes
1, rue Lavoisier Z.I. B.P. 25
91430 Igny, France
(33) 1-69-41-8282

FINLAND

Visitron OY
PO Box 5
SF-01651 Vantaa, Finland
(358) 90-848-788

ITALY

BFI Ibexsa SpA
18 Via Massena
20145 Milano, Italy
(39) 2-33100535

BFI Ibexsa SpA
Viale Parioli, 63
00197 Roma, Italy
(39) 6-804472

JAPAN

Yamada Corporation
Shin-Aoyama Building East
1-1, 1-Chome Minamiaoyama
Minato-Ku, Tokyo 107 Japan
(81) 03-475-1121

Yamada Corporation
Higobashi Shimizu Building, 14F
3-7, 1-Chome Tosabori
Nishi-Ku, Osaka-Shi 550 Japan
(81) 6 449-1101

NORWAY

Visitron AS
PO Box 126-Alnabru
N-0614, Oslo 6 Norway
(47) 2-64-6870

SWEDEN, DENMARK

Visitron AB
P.O. Box 6063
Sorterargatan 2
S-16206 Vallingby, Sweden
(46) 8-38-01-30

WEST GERMANY, WEST BERLIN, AUSTRIA

Kontron Phystech GmbH
Oskar-von-Miller Str 1
8057 Eching Bei Munchen
West Germany
(49) 8165-77-376

Avantek Domestic Sales Representatives

ARIZONA, NEVADA, NEW MEXICO, TEXAS (EL PASO Area)

Cain Technology
2111 E. Broadway Road, Suite 5
Tempe, AZ 85282
(602) 966-4322

ALASKA, CALIFORNIA (Northern), OREGON, WASHINGTON, IDAHO (Northwestern to Boise)

Cain-White & Company
105 Fremont Avenue, Suite D
Los Altos, CA 94022
(415) 948-6533

Cain-White/Northwest
10800 N.E. 8th St., Suite 800
Bellevue, WA 98004
(206) 462-2118

CALIFORNIA (Southern), HAWAII

Cain Technology
16525 Sherman Way, Unit C-4
Van Nuys, CA 91406
(818) 904-9392

Cain Technology
1046 N. Tustin, Suite I
Orange, CA 92667
(714) 997-7311

MARYLAND, VIRGINIA, WEST VIRGINIA DISTRICT of COLUMBIA

Applied Engineering Consultants
10101 G. Bacon Drive
Beltsville, MD 20705
(301) 595-5393 (Metro D.C.)
(301) 792-2211 (Maryland)
(800) 638-8555 (All other)

MINNESOTA, NORTH & SOUTH DAKOTA IOWA (Northern), WISCONSIN (Except Southeastern)

Electronic Sales Agency, Inc.
8120 Penn Avenue South,
Suite160
Bloomington, MN 55431
(612) 884-8291

NEW ENGLAND STATES

R. J. Sickles Associates
175 Bedford Street, Suite 12
Lexington, MA 02173
(617) 862-5100

NEW JERSEY (Northern) NEW YORK (Metropolitan)

Technical Marketing Associates
87 Lackawanna Avenue, Suite 1R
Totowa, NJ 07512-2309
(201) 812-0356

NEW YORK (Upstate)

Robtron
53 1/2 Jordan Street
Skaneateles, NY 13152
(315) 685-5731

CANADA

Allan Crawford Associates
5835 Coopers Avenue
Mississauga, ON L4Z 1Y2
(416) 890-2010

Allan Crawford Associates
6815 8th Street, N.E., Suite 135
Calgary, AB T2E 7H7
(403) 295-0822

Allan Crawford Associates
2625 Queensview Drive
Ottawa, ON K2B 8K2
(613) 596-9300

Allan Crawford Associates
6505 Trans Canada Hwy, Suite 300
St. Laurent, PQ H4T 1S3
(514) 747-7878

Allan Crawford Associates
410-212 Brooksbank Avenue
N. Vancouver, BC V7J 2C1
(604) 988-2195
(opening Apri1989)

International Sales Representatives

FRANCE, BELGIUM, THE NETHERLANDS

Scie Dimes
1, rue Lavoisier Z.I. B.P. 25
91430 Igny, France
(33) 1-69-41-8282

GERMANY

Kontron Phystech GmbH
Oskar-von-Miller Str 1
8057 Eching Bei Munchen
West Germany
(49) 8165-77-376

Kontron Phystech GmbH
Maybachstr. 39 a
7000 Stuttgart 30
West Germany
(49) 711-8917-137

Kontron Phystech GmbH
Markt 71
5205 St. Augustin 1
West Germany
(49) 2241-29046

Kontron Phystech GmbH
Konigsreihe 2
2000 Hamburg 70
West Germany
(49) 40-68295-126

INDIA

Hinditron Services Pvt. Ltd.
Eros Bldg., 5th Floor
42 Maharshi Karve Road
Churchgate
Bombay, India – 400 020
(91) 22-09-20/22-39-89

Hinditron Services Pvt. Ltd.
33/44A, Rajmahal Vilas Extn.
8th Main Road
Bangalore, India – 560 080
(91) 363139/365734

Hinditron Services Pvt. Ltd.
Emarald House, 5th Floor
114, Sarojini Devi Road
Secunderabad, India – 500 003
(91) 82-11-17/82-37-51

ISRAEL

Gallium Electronics, Ltd.
P.O. Box 1379
5 Ussishkin Street
Ramat Hasharon, 47100 Israel
(972) 03-540-2242

ITALY

BFI Ibexsa SpA
18 Via Massena
20145 Milano, Italy
(39)2-33100535

BFI Ibexsa SpA
Viale Parioli, 63
00197 Roma, Italy
(39) 6-804472

JAPAN

Yamada Corporation
Shin-Aoyama Building East
1-1, 1-Chome Minamiaoyama
Minato-Ku, Tokyo 107, Japan
(81) 03-475-1121

Yamada Corporation
Higobashi Shimizu Building 14F
3-7, 1-Chome Tosabori
Nishi-Ku, Osaka-Shi550Japan
(81)6449-1101

KOREA

Sangsoo Electronics Company
Kyungho Bldg., Suite 303
25-2, Yoido-Dong,
Yungdeungpo-Ku
Seoul, Korea
(82) 2-780-5360~2

PEOPLE'S REPUBLIC OF CHINA, SINGAPORE, HONG KONG, INDONESIA, PAKISTAN, BANGLADESH, THAILAND, MALAYSIA

Esoon Enterprises, Inc.
6916 Stella Link Road
Houston, TX 77025
(713) 666-2538 or (713) 666-9135

REPUBLIC OF SOUTH AFRICA

South Continental Devices (Pty.) Ltd.
P.O. Box 56420, Pinegowrie, 2123
5th Floor, Randover House
Dover Street
Randburg, Republic of South Africa
(27) 11-789-2400

SPAIN

BFI Electronica S.A.
Paseo Marques de Zafra, 38. Bis
28028 Madrid, Spain
(34) 91-255 95 03

SWEDEN, DENMARK

Visitron AB
P.O. Box 6063
Sorterargatan 2
S-16206 Vallingby, Sweden
(46) 8-38-01-30

NORWAY

Visitron AS
PO Box 126-Alnabru
N-0614, Oslo 6 Norway
(47) 2-64-6870

FINLAND

Visitron OY
PO Box 5
SF-01651 Vantaa, Finland
(358) 90-848-788

SWITZERLAND

Walter Electronics AG
Frauenfelderstrasse 49
8370 Sirnach
Switzerland
(41) 073-26-40-40

TAIWAN

Sertek, International, Inc.
3rd Floor, Section 2
135 Chien Kuo North Road
Taipei 10479, Taiwan R.O.C.
(886) 2-501-0055

YUGOSLAVIA

Belram S.A.
83 Avenue des Mimosas
1150 Brussels, Belgium
(32) 2-734-33-32