

Avantek Products

Premium Performance Temperature Compensated GaAs FET Amplifier Series 6 to 18 GHz

Technical Data



AWT 186 X XX T Series

Features

- Excellent Noise Figure Performance
- Tightly Controlled Small Signal Gain
- Broad Range of Gain Options
- Excellent Gain Performance over Temperature
- Guaranteed P-1 dB and IP3 Performance
- Internal Voltage Regulation
- PHEMT Technology

Applications

The AWT 186 X XX T premium product series has been designed for applications in systems where amplifier noise figure is critical in establishing overall receiver sensitivity. Excellent noise figure and gain versus temperature performance, as well as a wide range of gain options, make these products ideal for broad band military electronic warfare and commercial communications systems. Repeatable unit-to-unit performance ensures consistent system performance from prototype through production.

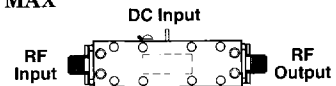
Description

The AWT 186 X XX T premium product series offers the system designer a broad range of high performance temperature-compensated amplifiers covering the full 6 to 18 GHz frequency band. HP PHEMT GaAs FET devices and rugged hybrid construction techniques, provide excellent low noise and medium power performance with proven reliability.

This series consists of twenty-two amplifiers with minimum gain options from 20 dB to 40 dB and power outputs up to +18 dBm at 1 dBm gain compression. Each unit consists of a cascade of balanced hybrid microcircuits specifically designed to provide an optimal combination of noise figure, small signal gain, and power performance.

Temperature compensation is achieved through the use of a balanced PIN diode attenuator driven by a temperature sensitive current source—ASIC. The ASIC, which contains over 100 transistors, is capable of providing a non-linear complex current function to compensate amplifier gain at all temperatures. The use of the ASIC provides a performance improvement over simple linear networks.

Pin Configuration MAX



Screening

A standard reliability screening (R-series) is available for these amplifiers. R-screening uses MIL-STD 883, Method 5008 Class B as a guide, which is modified to accommodate the physical attributes of this product line. Method 5008 was developed for single microcircuits of relatively low complexity, housed in small connectorless packages, and contains some stress levels inappropriate for larger more complex amplifiers. The Reliability Screening Table provides detail on the R-screening test plan.

Operation

The AWT 186 X XX T series of amplifiers operate from a +12V power supply at a maximum current specified in the Electrical Specifications Table. Internal voltage regulation facilitates operation at voltages other than +12 within the minimum and maximum levels listed in the Maximum Ratings Table. The units are designed to be secured to a thermally conductive mounting surface which will maintain case temperatures from -54°C to +100°C as indicated in the Electrical Specifications Table.

This amplifier series has been designed to operate reliably over temperature. At the maximum rated case temperature of 100°C, the maximum channel temperature of any device is less than 150°C. Calculations indicate device lifetimes of greater than 1×10^6 hours under these conditions.

RF input power must be controlled to prevent damage to the input PHEMT devices. See the Electrical Specifications Table for input power restrictions. The PHEMTs are sensitive to electrostatic discharge and should be handled with appropriate ESD processes and procedures.

The aluminum packages are laser welded and tested for hermeticity, which enables operation in environments with high humidity and in the presence of contaminants.

Maximum Ratings

Parameter	Min	Max	Units
DC Input	11	18	Volts
Reverse Voltage		-25	Volts
Power Supply Ripple			
Power Supply Noise			
CW RF Input Power		20	dBm
Pulsed RF Input Power		+30 (Note 1)	dBm
Operating Temperature	-54	+100	°C
Storage Temperature		150	°C
Humidity		100	%

Notes:

1. 1 µsec pulse width, 1% duty cycle max.

Reliability Screening

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

Notes:

1. Internal visual standard uses Method 2017 Mil-Std 883 as a guide for microwave devices. Actual document used is workmanship Standard AWS-014355-800.

Electrical Specifications

Guaranteed Specifications @ -54 to +100°C Case Temperature, Max Operating Temperature of 100°C

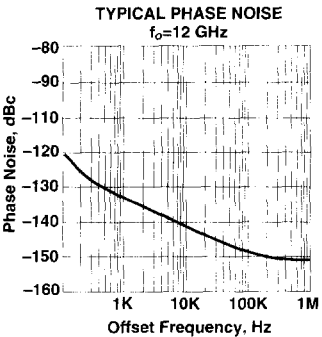
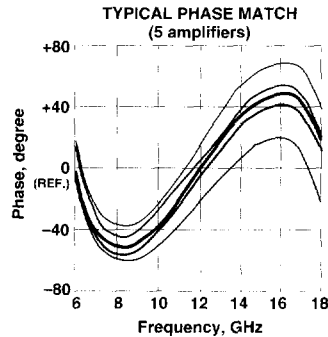
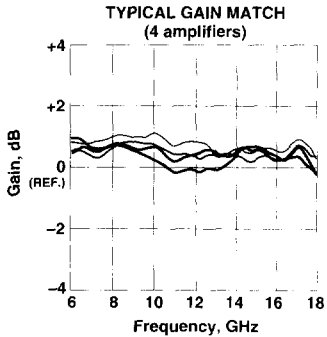
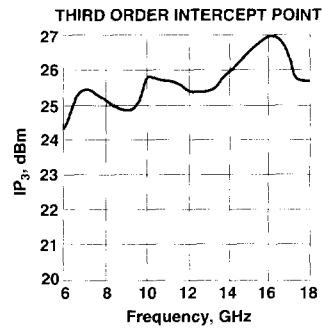
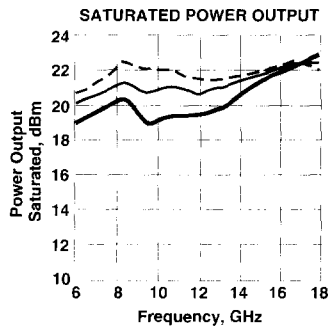
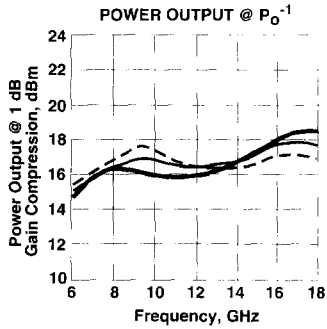
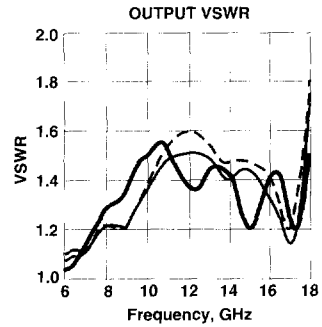
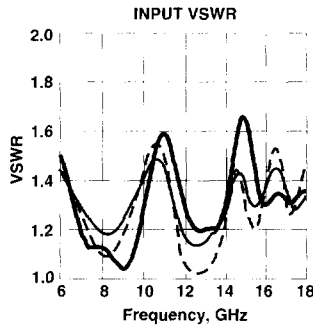
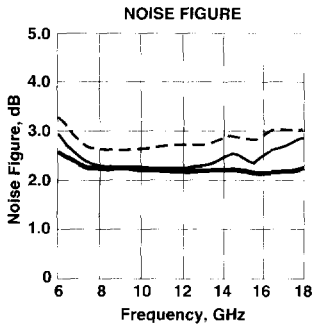
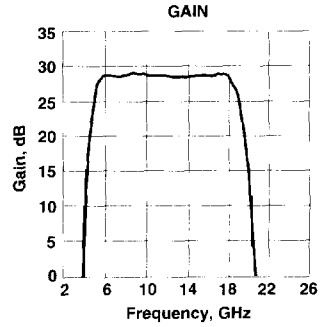
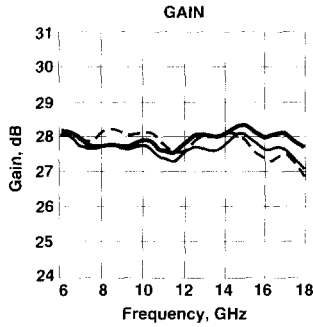
Model	Gain (dB)	Gain (dB)	Gain Variation (dB)	Noise Figure (dB)	Power Output for 1 dB Gain Compression (dBm)	Third Order Intercept Point (dBm)	PSAT (dBm)	VSWR (50 ohms)		Voltage (VDC)	Input Power Current @ +12 V ¹	Case Style
	Min.	Max.	Max. (P-P)	Max.	Minimum	Minimum	Min.	Maximum In	Maximum Out		Max. (mA)	
Low Noise Amplifiers												
AWT 186 N 30 T 21	21.0	24.0	2.0	3.0	5.0	13.0	7.0	1.8	1.8	+12	170	MAX4L
AWT 186 N 30 T 23	23.0	26.0	2.0	3.0	6.0	14.0	8.0	1.8	1.8	+12	180	MAX4L
AWT 186 N 30 T 26	26.0	29.0	2.5	3.0	7.5	15.5	9.5	1.8	1.8	+12	235	MAX6L
AWT 186 N 30 T 28	28.0	32.0	3.0	3.0	8.0	16.0	10.0	1.8	1.8	+12	235	MAX6L
AWT 186 N 30 T 31	31.0	35.0	3.0	3.0	8.5	16.5	10.5	1.8	1.8	+12	235	MAX6L
AWT 186 N 30 T 34	34.0	38.0	3.0	3.0	9.5	17.5	11.5	1.8	1.8	+12	290	MAX6L
AWT 186 N 30 T 38	38.0	43.0	4.0	3.0	11.5	19.5	13.5	1.8	1.8	+12	290	MAX6L
Low Noise Medium Power Amplifiers												
AWT 186 N 33 T 20	20.0	23.0	2.0	3.3	8.5	16.5	10.5	1.8	1.8	+12	300	MAX4L
AWT 186 N 33 T 22	22.0	25.0	2.0	3.3	13.0	21.0	15.0	1.8	1.8	+12	330	MAX4L
AWT 186 N 33 T 24	24.0	27.0	2.0	3.3	11.0	19.0	13.0	1.8	1.8	+12	480	MAX6L
AWT 186 N 33 T 26	26.0	29.0	2.5	3.3	14.0	22.0	16.0	1.8	1.8	+12	465	MAX6L
AWT 186 N 33 T 29	29.0	33.0	3.0	3.3	16.0	24.0	18.0	1.8	1.8	+12	470	MAX6L
AWT 186 N 33 T 33	33.0	37.0	3.0	3.3	17.0	25.0	19.0	1.8	1.8	+12	625	MAX6L
AWT 186 N 33 T 37	37.0	41.0	3.0	3.3	17.0	25.0	19.0	1.8	1.8	+12	530	MAX6L
AWT 186 N 33 T 40	40.0	45.0	4.0	3.3	17.0	25.0	19.0	1.8	1.8	+12	440	MAX6L
Medium Power Amplifiers												
AWT 186 P 18 T 20	20.0	23.0	2.0	5.5	18.0	26.0	20.0	1.8	1.8	+12	450	MAX4L
AWT 186 P 18 T 22	22.0	25.0	2.0	5.5	18.0	26.0	20.0	1.8	1.8	+12	450	MAX4L
AWT 186 P 18 T 25	25.0	28.0	2.5	5.5	18.0	26.0	20.0	1.8	1.8	+12	610	MAX6L
AWT 186 P 18 T 28	28.0	31.0	3.0	5.5	18.0	26.0	20.0	1.8	1.8	+12	610	MAX6L
AWT 186 P 18 T 30	30.0	34.0	3.0	4.5	18.0	26.0	20.0	1.8	1.8	+12	510	MAX6L
AWT 186 P 18 T 34	34.0	38.0	3.0	4.5	18.0	26.0	20.0	1.8	1.8	+12	670	MAX6L
AWT 186 P 18 T 38	38.0	43.0	4.0	4.5	18.0	26.0	20.0	1.8	1.8	+12	580	MAX6L

Note: Units contain internal voltage regulator and normally operate with input voltage of +12 to +15 Vdc. Currents listed are for small signal gain at 25°C. When driven into Psat and cold temperature, the maximum current may increase by 25%.

AWT186N33T26 Typical Performance Over Temperature

(@ +12 VDC unless otherwise noted)

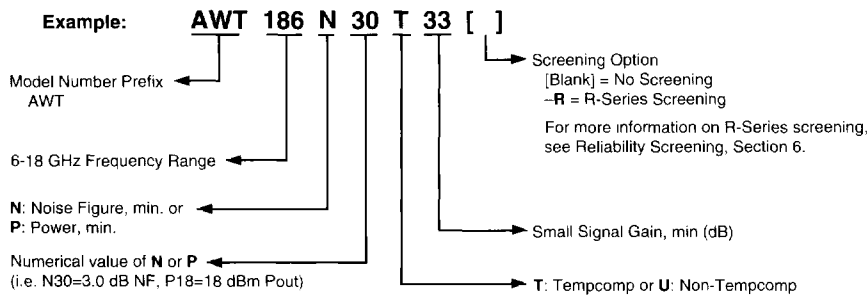
Key: +25°C ———
 +100°C - - - -
 -54°C ———



Ordering Information

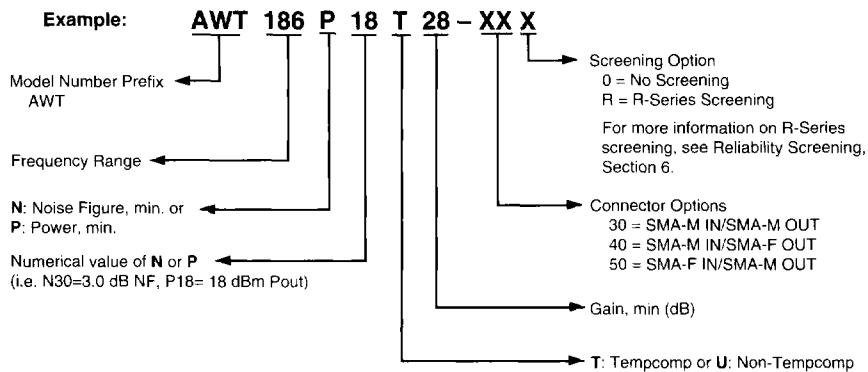
The AWT 186 X XX T series of amplifiers may be ordered with four connector options, with or without R-series screening. The Product Options part numbering scheme shown below is provided to facilitate ordering the correct amplifier.

Product Options with SMA-F IN/SMA-F OUT Connectors ONLY



This example would order a 6–18 GHz amplifier with a noise figure of 3.0 dB max, temp comp, a small signal gain of 33 dB minimum, and NO “R” Series Screening.

Product Options with Male-Female SMA Connectors



This example with a -40R suffix would order a 6–18 GHz amplifier with a Pout of 18 dBm minimum, temp comp, a small signal gain of 28 dB minimum, a SMA-male input connector and SMA-female output connector, and “R” Series Screening.