

### PRODUCT OVERVIEW

The AM-500 series amplifiers are ultra-fast settling operational amplifiers for use in inverting applications. A unique feedforward amplifier design combines the characteristics of a low drift dc amplifier with those of a very fast AC amplifier. For optimum fast settling performance, this amplifier has an open loop gain roll-off of 6 dB per octave to beyond 100 MHz. Miniature thin-film hybrid construction permits an optimum combination of semiconductor devices and minimum lead lengths to realize the amplifier circuitry. Applications for the AM-500 Series include fast integrators, sample-holds, fast waveform drivers, and fast D/A converter output amplifiers.

Output settling time is 200 nanoseconds maximum to 0.01% for a 10 dc volt step change. Slew rate is 1000V/microsecond for positive output transitions and 1800V/microsecond for negative transitions. This high slew rate permits undistorted reproduction of a full load, 20V peak-to-peak sinewave out to 16 MHz. Gain bandwidth product is 100 MHz minimum.

AM-500 series dc characteristics include a dc open loop gain of  $10^6$ , 30 megohm input impedance, and 1 nanoampere bias current. Input offset voltage is  $\pm 0.5$  mV and input offset voltage drift is 1 microvolt/ $^{\circ}$ C. Although these amplifiers do not operate differentially, a dc offset voltage in

the range of  $\pm 5$ V dc can be applied to the positive input terminal.

Power supply requirement is  $\pm 15$ V dc at 22 mA quiescent current. The amplifiers will operate over a supply range of  $\pm 10$ V to  $\pm 18$ V dc. Output current capability is  $\pm 50$  mA with output short circuit protection. Three basic versions are available: AM-500GC and AM-500MC for  $0^{\circ}$ C to  $+10^{\circ}$ C, and the AM-500MM for  $-55^{\circ}$ C to  $+125^{\circ}$ C. The device package is a 14-pin ceramic DIP.

### FEATURES

- 200 Nanoseconds settling to 0.01%
- 100V/Microsecond slew rate
- 100 MHz Minimum gain-bandwidth
- $10^6$  Open loop gain
- 1 Microvolt/ $^{\circ}$ C drift
- $\pm 50$  mA Output current

PIN	FUNCTION
1	N.C.
2	N.C.
3	N.C.
4	-INPUT
5	+INPUT
6	-SUPPLY
7	N.C.
8	COMMON
9	N.C.
10	OUTPUT
11	+ SUPPLY
12	N.C.
13	N.C.
14	N.C.

### FUNCTIONAL BLOCK DIAGRAM

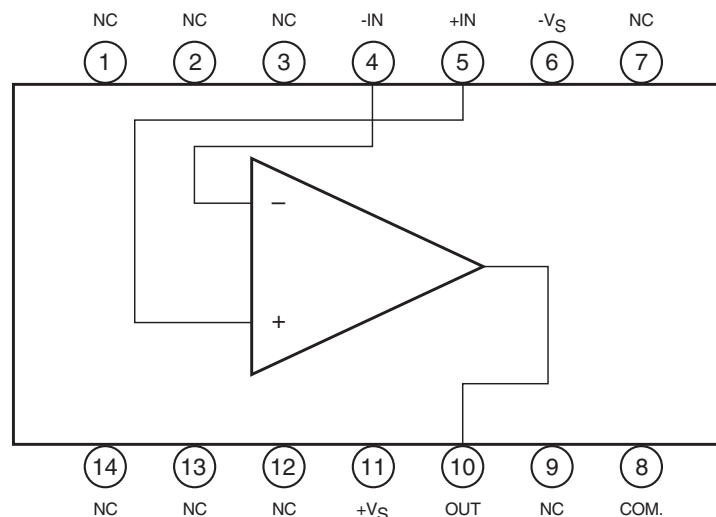


Figure 1. Functional Block Diagram

### FUNCTIONAL SPECIFICATIONS

(Typical at +25°C, ±15V dc supply, unless otherwise noted.)

INPUT CHARACTERISTICS	MIN.	TYP.	MAX.	UNITS
Common Mode Voltage Range ①	—	±5	—	Volts
Maximum Input Voltage, no damage	—	±18	—	Volts
Differential Input Impedance	3	30	—	Meg
Input Bias Current	—	1	4	nA
Input Offset Current	—	0.5	8	nA
Input Offset Voltage	—	0.5	3	mV
OUTPUT CHARACTERISTICS				
Output Voltage	±10	—	—	Volts
Output Current, S.C. protected	±25	±50	—	mA
Stable Capacitive Load	—	100	—	pF
Output Impedance	—	25	—	Ω
PERFORMANCE				
DC Open Loop Gain	—	10 <sup>6</sup>	—	V/V
Input Offset Voltage Drift				
0°C to +70°C	—	1	5	μV/°C
-55°C to +125°C	—	5	10	μV/°C
Input Bias Current Drift				
0°C to +70°C	—	-20	—	pA/°C
-55°C to +125°C	doubles every 10°C			
Input Voltage Noise ②				
0.01 Hz to 1 Hz	—	15	—	μVp-p
100 Hz to 10 kHz	—	1.6	—	μVrms
1 Hz to 10 MHz	—	5.2	—	μVrms
Input Current Noise ④				
0.01Hz to 10Hz	—	5	25	μVrms
100Hz to 10kHz	—	1	5	μVrms
10Hz to 1MHz	—	20	100	μVrms
Power Supply Rejection Ratio	80	—	—	dB
DYNAMIC CHARACTERISTICS				
Gain Bandwidth Product	100	130	—	MHz
Slew Rate, positive going	—	1000	—	V/μs
Slew Rate, negative going	—	1800	—	V/μs
Full Power Frequency (20V peak-to-peak)	—	16	—	MHz
Settling Time				
10V step to 1% <sup>3</sup>	—	70	—	ns
10Vstep to 0.1% <sup>3</sup>	—	100	—	ns
10Vstep to 0.01% <sup>3</sup>	—	—	200	ns
Overload Recovery Time	—	10	—	μs
POWER REQUIREMENTS				
Voltage, rated performance	—	±15	—	Vdc
Voltage, operating	± 10	—	± 18	Vdc
Quiescent Current	—	22	37	mA

PHYSICAL/ENVIRONMENTAL	MIN.	TYP.	MAX.	UNITS
Operating Temp. Range				
AM-500GC	0	—	+70	°C
AM-500MC	0	—	+70	°C
AM-500MM, MM-QL	-55	—	+125	°C
Storage Temp. Range	-55	—	+125	°C
Package Type	14-pin ceramic			
Pins	0.010x0.018 Kovar			
Weight	0.09 ounces (2.5 grams)			

### TECHNICAL NOTES

- The circuit design shows the connection of the AM-500 series for fast settling operation with a closed loop gain of -1. It can be used for fast settling at closed loop gains up to -10. The equivalent resistance seen by the summing junction should be 500 ohms or less. For gains larger than -1 use an input resistor of 500 ohms and pick a feedback resistor for the required closed loop gain (1k for -2, 1.5k for -3, etc.).
- A small feedback capacitor should be used across the feedback resistor. Determine C in nanofarads from the following formula:

where G is closed loop gain and Rf is in kilohms.

$$C = \frac{1 + |G|}{0.816Rf}$$

- Summing point leads must be kept as short as possible. Input and feedback resistors should be soldered close to the body of the resistor directly to the summing point (pin 4). Summing point capacitance to ground must be kept very low.
- Low output impedance power supplies should be used with 1 μF tantalum bypassing capacitors at the amplifier supply terminals. There are internal 0.03 μF ceramic capacitors in the amplifier.
- Although these amplifiers are inverting mode only, a dc voltage in the range of ± 5V may be applied to the positive input terminal for offsetting the amplifier.
- For interrupted power applications, apply power to the AM-500 three (3) seconds before operating the device.

#### Footnotes:

- ① dc only
- ② - 3 dB Single-pole bandwidth
- ③ 1k Input and feedback resistors, 2.4 pF feedback capacitor

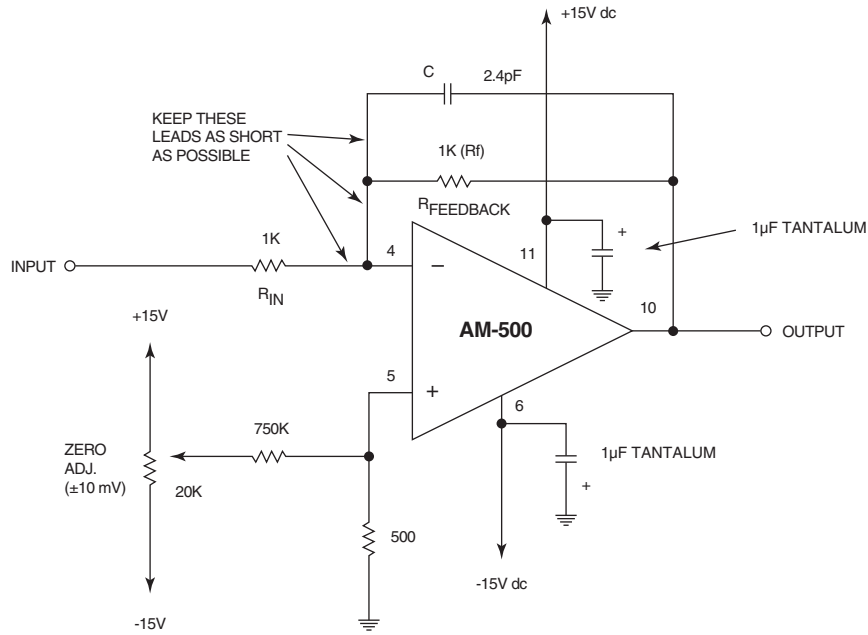


Figure 2. Connection for Fast Settling with Gain of -1

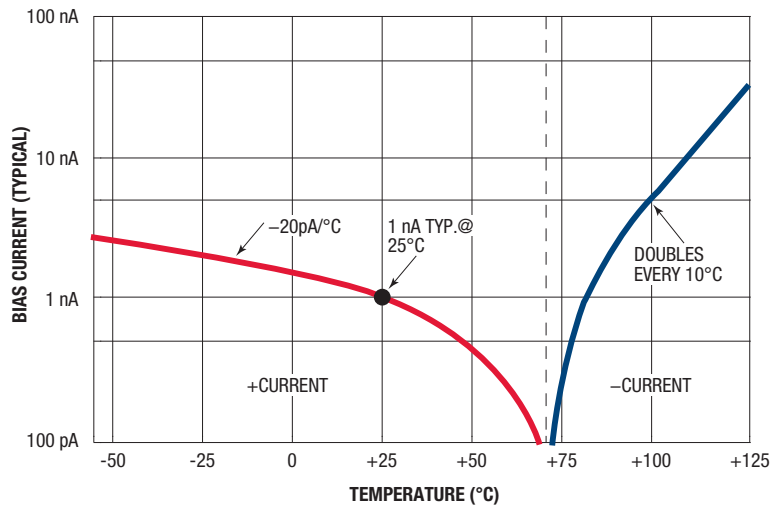
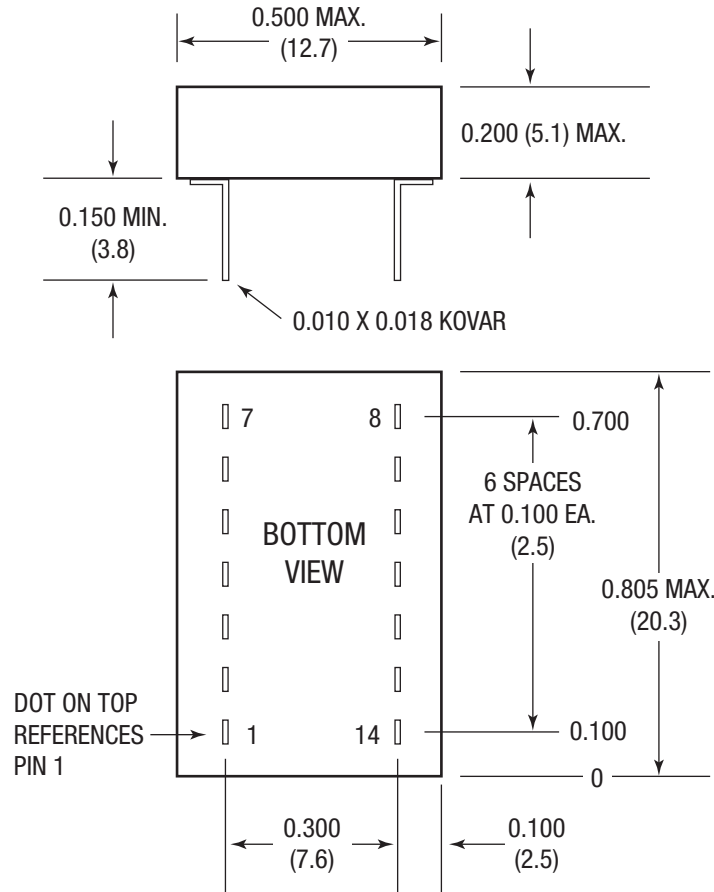


Figure 3. Input Bias Current vs. Temperature

MECHANICAL DIMENSIONS - INCHES (mm)



NOTE: PINS HAVE 0.025 INCH STANDOFF FROM CASE

ORDERING INFORMATION			
MODEL NUMBER	OPERATING TEMP. RANGE	PACKAGE SEAL	ROHS
AM-500GC	0 TO +70°C	Epoxy	No
AM-500MC	0 TO +70°C	Hermetic	No
AM-500MM	-55 TO +125°C	Hermetic	No
AM-500MM-QL	-55 TO +125°C	Hermetic	No
AM-500MC-C	0 TO +70°C	Hermetic	Yes
AM-500MM-C	-55 TO +125°C	Hermetic	Yes
AM-500MM-QL-C	-55 TO +125°C	Hermetic	Yes

For devices compliant to MIL-STD-883, consult the factory.