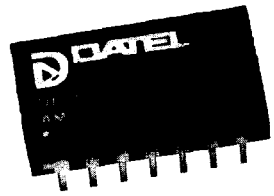
AM-500 Series
Ultra-Fast Operational Amplifier

FEATURES

- **200 Nanoseconds settling to 0.01%**
- **1000V/Microsecond slew rate**
- **100 MHz Minimum gain-bandwidth**
- **10^6 Open loop gain**
- **1 Microvolt/°C drift**
- **± 50 mA Output current**



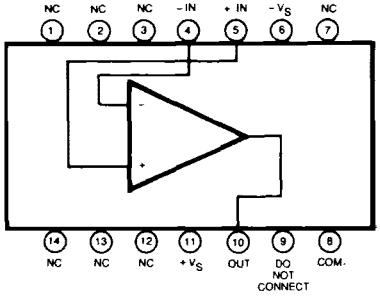
GENERAL DESCRIPTION

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.

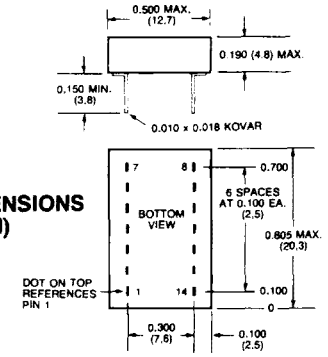
Output settling time is 200 nanoseconds maximum to 0.01% for a 10 dc volt step change. Slew rate is 1000V/microsecond for positive output transitions and 1800V/microsecond for negative transitions. This high slew rate permits undistorted reproduction of a full load, 20V peak-to-peak sinewave out to 16 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 ±0.5 mV and input offset voltage drift is 1 microvolt/°C. Although these amplifiers do not operate differentially, a dc offset voltage in the range of ±5V dc can be applied to the positive input terminal.

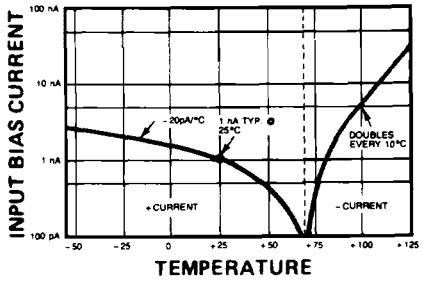
Power supply requirement is ±15V dc at 22 mA quiescent current. The amplifiers will operate over a supply range of ±10V to ±18V dc. Output current capability is ±50 mA with output short circuit protection.



MECHANICAL DIMENSIONS INCHES (MM)



NOTE: PINS HAVE ±0.01 INCH STANDOFF FROM CASE



INPUT/OUTPUT CONNECTIONS

PIN	FUNCTION
1	NO CONNECTION
2	NO CONNECTION
3	NO CONNECTION
4	-INPUT
5	+INPUT
6	-SUPPLY
7	NO CONNECTION
8	COMMON
9	DO NOT CONNECT
10	OUTPUT
11	+SUPPLY
12	NO CONNECTION
13	NO CONNECTION
14	NO CONNECTION

FUNCTIONAL SPECIFICATIONS, AM-500 SERIES

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

INPUT CHARACTERISTICS	
Input Common Mode Voltage Range[1]	±5V
Maximum Input Voltage, no damage	±18V
Differential Input Impedance	30 Meg. typical, 3 Meg. min.
Input Bias Current	1 nA typical, 4 nA max.
Input Offset Current	0.5 nA typ., 8 nA max.
Input Offset Voltage	0.5 mV typ., 3 mV max.
OUTPUT CHARACTERISTICS	
Output Voltage	±10V min.
Output Current, S.C. protected	±50 mA typ., ±25 mA min.
Stable Capacitive Load	100 pF
Output Impedance	25Ω
PERFORMANCE	
DC Open Loop Gain	10^6 volts/volt
Input Offset Voltage Drift,	
0°C to +70°C	1 μV/°C typ., 5 μV/°C max.
−55°C to +125°C	5 μV/°C typ., 10 μV/°C max.
Input Bias Current Drift,	
−55°C to +70°C	−20 pA/°C
+70°C to +125°C	doubles every 10°C
Input Voltage Noise,[2]	
0.01 Hz to 1 Hz	5 μV peak-to-peak typ., 25 μV peak-to-peak max.
100 Hz to 10 kHz	1 μV RMS typ., 5 μV max.
1 Hz to 10 MHz	20 μV RMS typ., 100 μV max.
Power Supply Rejection Ratio	80 dB min.
DYNAMIC CHARACTERISTICS	
Gain Bandwidth Product	130 MHz typ., 100 MHz min.
Slew Rate, positive going	1000V/μsec.
Slew Rate, negative going	1800V/μsec.
Full Power Frequency (20V peak-to-peak)	16 MHz
Settling Time,	
10V step to 1%[3]	70 nsec.
10V step to 0.1%[3]	100 nsec.
10V step to 0.01%[3]	200 nsec. max.
Overload Recovery Time	10 μsec.
POWER REQUIREMENTS	
Voltage, rated performance	±15V dc
Voltage, operating	±10V dc to ±18V dc
Quiescent Current	22 mA typ., 33 mA max.
PHYSICAL/ENVIRONMENTAL	
Operating Temperature Range	
AM-500GC	0°C to +70°C
AM-500MC	0°C to +70°C
AM-500MM/MM-QL	−55°C to +125°C
Storage Temperature Range	−55°C to +125°C
Package Type	14 pin ceramic
Pins	0.010x0.018" Kovar
Weight	0.09 ounces (2.5 grams)

FOOTNOTES:

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

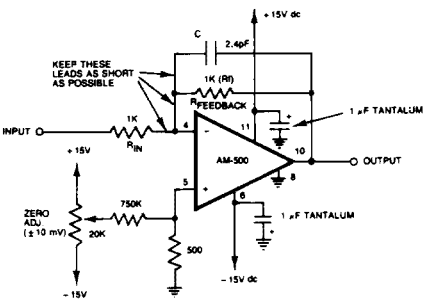
TECHNICAL NOTES

1. 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.).
2. A small feedback capacitor should be used across the feedback resistor. Determine C in nanofarads from the following formula:

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

   where G is closed loop gain and Rf is in kilohms.
3. 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.
4. 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.
5. 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.
6. For interrupted power applications, apply power to the AM-500 three (3) seconds before operating the device.

CONNECTION FOR FAST SETTLING WITH GAIN OF −1



ORDERING INFORMATION

MODEL NO.	OPERATING TEMP. RANGE	SEAL
AM-500GC	0 to +70 °C	Epoxy
AM-500MC	0 to +70 °C	Herm.
AM-500MM	-55 to +125 °C	Herm.
AM-500MM-QL	-55 to +125 °C	Herm.

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