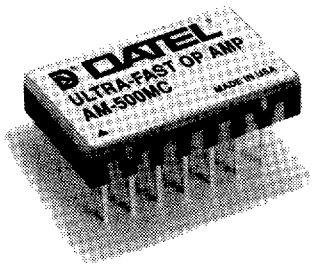
DATEL®
INNOVATION and EXCELLENCE

AM-500
High-Speed, Wideband Operational Amplifiers

FEATURES

- **200 nanosecond settling to ±0.01%**
- **±1000V/µsec slew rate**
- **100MHz minimum gain bandwidth product**
- **10^6 open loop gain**
- **±1µV/°C offset drift**
- **±50mA output current**



GENERAL DESCRIPTION

The AM-500 Series amplifiers are 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 6dB per octave to beyond 100MHz.

Output settling time is 200 nanoseconds maximum to ±0.01% for a 10V 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 16MHz. Gain bandwidth product is 100MHz 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 ±0.5mV, 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 can be applied to the positive input terminal.

Power supply requirements are ±15V at 22mA quiescent current. The amplifiers will operate over a supply range of ±10 to ±18V. Output current capability is ±50mA with output short-circuit protection. Four versions are available: AM-500GC and AM-500MC for 0 to +70°C operation; AM-500MM for –55 to +125°C operation; and AM-500MM-QL for high-reliability operation over the military temperature range.

INPUT/OUTPUT CONNECTIONS

PIN	FUNCTION
1	N.C.
2	N.C.
3	N.C.
4	–INPUT
5	+INPUT
6	–15V SUPPLY
7	N.C.
8	COMMON
9	DO NOT CONNECT
10	OUTPUT
11	+15V SUPPLY
12	N.C.
13	N.C.
14	N.C.

NOTE: Do not connect pin 9 to ground or any other pin.

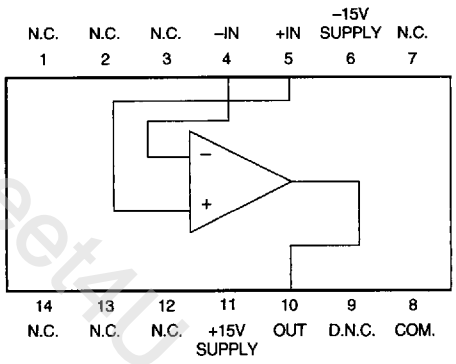


Figure 1. AM-500 Functional Block Diagram

ABSOLUTE MAXIMUM RATINGS

PARAMETERS	MIN.	TYP.	MAX.	UNITS
+15V Supply (Pin 11)	—	+18	—	Volts
–15V Supply (Pin 6)	—	–18	—	Volts
Analog Inputs (Pins 4, 5)	—	±18	—	Volts
Lead Temperature (soldering, 10 seconds)	—	300	—	°C
Short Circuit to Ground	Continuous			

FUNCTIONAL SPECIFICATIONS

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

INPUT	MIN.	TYP.	MAX.	UNITS
Input Common Mode Voltage Range ①	—	—	±5	Volts
Differential Input Impedance	1	30	—	megohms
Input Bias Current	—	±1	±4	nA
Input Offset Current	—	±0.5	±8	nA
Input Offset Voltage	—	±0.5	±3	mV
PERFORMANCE				
DC Open Loop Gain	10^5	10^6	—	V/V
Input Offset Voltage Drift				
0 to +70°C	—	±1	±5	µV/°C
–55 to +125°C	—	±5	±10	µV/°C
Input Bias Current Drift				
–55 to +70°C	—	–20	—	pA/°C
+70 to +125°C	Doubles every 10°C			
Input Voltage Noise ②				
0.01Hz to 1Hz	—	5	25	µVp-p
100Hz to 10kHz	—	1	5	µVrms
1Hz to 10MHz	—	20	100	µVrms
Power Supply Rejection Ratio (–55 to +125°C)	60	—	—	dB
DYNAMIC CHARACTERISTICS				
Gain Bandwidth Product	100	130	—	MHz
Slew Rate (positive going)	800	1000	—	V/µs
Slew Rate (negative going)	800	1800	—	V/µs
Full Power Bandwidth (20Vp-p)	—	16	—	MHz
Settling Time (±10V step) ③				
To ±0.01% (+25°C)	—	—	200	ns
To ±0.01% (–55 to +125°C)	—	—	600	ns
To ±0.1% (–55 to +125°C)	—	100	300	ns
To ±1.0% (–55 to +125°C)	—	70	200	ns
Overload Recovery Time	—	10	30	µs
OUTPUT				
Output Voltage	±10	—	—	Volts
Output Current (S.C. protected)	±25	±50	—	mA
Stable Capacitive Load	—	100	—	pF
Output Impedance	—	25	—	Ω
POWER REQUIREMENTS				
Voltage (rated performance)	—	±15	—	Volts
Voltage (operating)	±10	—	±18	Volts
Quiescent Current	—	±22	±37	mA

Footnotes:

① dc only

② –3dB single-pole bandwidth

③ 1kΩ input and feedback resistors, 2.4pF feedback capacitor

PHYSICAL/ENVIRONMENTAL

PARAMETERS	MIN.	TYP.	MAX.	UNITS
Operating Temp. Range, Case				
AM-500GC, MC	0	—	+70	°C
AM-500MM, MM-QL	–55	—	+125	°C
Storage Temp. Range	–65	—	+150	°C
Thermal Impedance				
θ_{JC}	—	48	—	°C/W
θ_{CA}	—	57	—	°C/W
Package Type	14-pin ceramic DIP			
Weight	0.09 ounces (2.5 grams)			

TECHNICAL NOTES

1. Figure 2 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 500Ω or less. For gains greater than –1, use an input resistor of 500Ω and pick a feedback resistor for the required closed loop gain (1kΩ for –2, 1.5kΩ for –3, etc.).

2. Use a small feedback capacitor across the feedback resistor. Determine C in nanofarads using the following formula:

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

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

3. Summing point leads must be kept as short as possible. Input and feedback resistors should be soldered close to the body of the amplifier 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 1µF tantalum bypassing capacitors at the amplifier supply terminals. The amplifier has internal 0.03µF ceramic bypass capacitors.

5. Although these amplifiers are designed for inverting mode only, a dc voltage in the range of ±5V may be applied to the positive input terminal to offset the amplifier.

6. For interrupted power applications, apply power to the AM-500 three (3) seconds before operating the device.

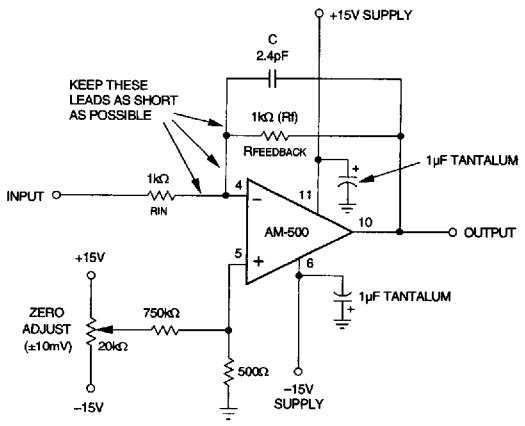


Figure 2. Connection for Fast Settling with Gain of –1

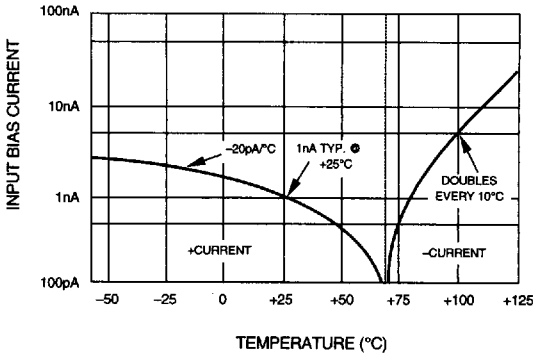
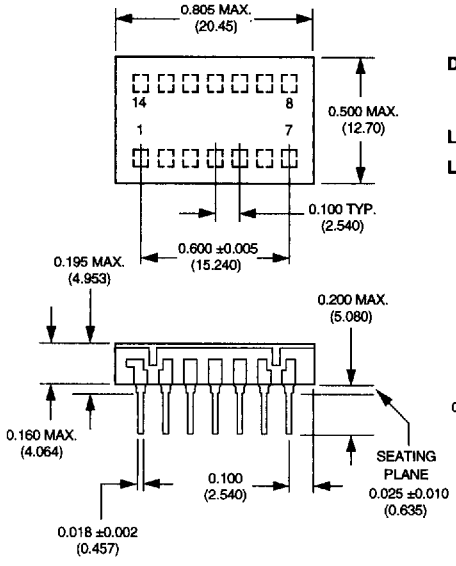


Figure 3. Input Bias Current vs. Temperature

MECHANICAL DIMENSIONS
INCHES (mm)

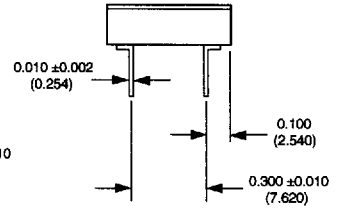


14-PIN DIP

Dimension Tolerances (unless otherwise indicated):
2 place decimal (.XX) ±0.010 (±0.254)
3 place decimal (.XXX) ±0.005 (±0.127)

Lead Material: Kovar alloy

Lead Finish: 50 microinches (minimum) gold plating over 100 microinches (nominal) nickel plating



ORDERING INFORMATION

MODEL	OPERATING TEMP. RANGE
AM-500GC	0 to +70°C
AM-500MC	0 to +70°C
AM-500MM	–55 to +125°C
AM-500MM-QL	–55 to +125°C