Am107/207/307

Frequency Compensated Operational Amplifier

Description: The Am107/207/307 Operational Amplifiers are functionally, electrically, and pin-for-pin equivalent to the National LM107/207/307. They are available in the hermetic metal can, flat package, and dual-in-line packages.

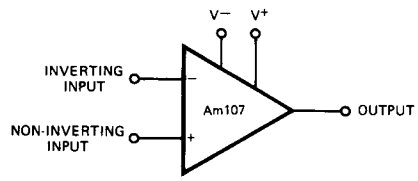
Distinctive Characteristics: 100% reliability assurance testing including high-temperature bake, temperature cycling, centrifuge and fine leak hermeticity testing in compliance with MIL STD 883.

Electrically tested and optically inspected dice for the assemblers of hybrid products.

FUNCTIONAL DESCRIPTION

The Am107/207/307 monolithic operational amplifiers are internally frequency compensated and input/output overload protected. These differential input, class AB output amplifiers are intended to provide high accuracy and lower noise in high impedance applications. The Am107/207/307 provide improved electrical parameters and are pin-for-pin replacements for the 709, 101, 101A and 741 in most applications.

FUNCTIONAL DIAGRAM



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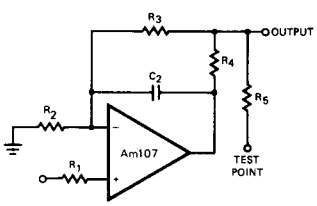
APPLICATIONS

Input/Output Protection



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If an input is driven from a low-impedance source, a series resistor, R_1 should be used to limit the peak instantaneous output current of the source to less than 100 mA. A large capacitor ($>0.1\mu F$) is equivalent to a low source impedance and should be protected against by an isolation resistor .

The amplifier output is protected against damage from shorts to ground or to the power supplies by device design. Protection of the output from voltages exceeding the specified operating power supplies can be obtained by isolating the output via limiting resistors R_4 or R_5.

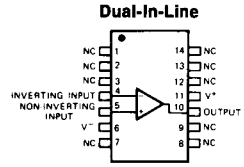
The power supplies must never become reversed, even under transient conditions. Reverse voltages as low as 1 volt can cause damage through excessive current. This hazard can be reduced by using clamp diodes of high-peak current rating connected to the device supply lines.

ORDERING INFORMATION

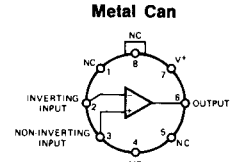
Part Number	Package Type	Temperature Range	Order Number
Am307	DIP	0°C to +70°C	LM307D
	Metal Can	0°C to +70°C	LM307H
	Dice	0°C to +70°C	LD307
Am207	DIP	−25°C to +85°C	LM207D
	Metal Can	−25°C to +85°C	LM207H
	Flat Package	−25°C to +85°C	LM207F
Am107	DIP	−55°C to +125°C	LM107D
	Metal Can	−55°C to +125°C	LM107H
	Flat Package	−55°C to +125°C	LM107F
	Dice	−55°C to +125°C	LD107

CONNECTION DIAGRAMS
Top View

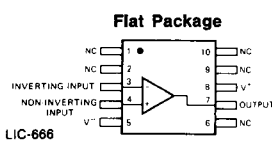
Dual-In-Line



Metal Can



Flat Package



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NOTES:
(1) On Metal Can, pin 4 is connected to case.
(2) On DIP, pin 6 is connected to bottom of package.
(3) On Flat Package, pin 5 is connected to bottom of package.

MAXIMUM RATINGS

Supply Voltage Am107, Am207, Am307	 ±22V ±18V
Internal Power Dissipation (Note 1)	500 mW
Differential Input Voltage	±30V
Input Voltage (Note 2)	±15V
Output Short-Circuit Duration	Indefinite
Operating Temperature Range Am107 Am207 Am307	 −55°C to +125°C −25°C to +85°C 0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 60 sec.)	300°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise specified) (Note 3)

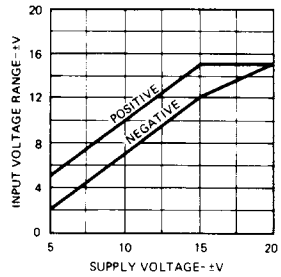
Parameter (see definitions)	Conditions	Am307 Min	Am307 Typ	Am307 Max	Am107 Am207 Min	Am107 Am207 Typ	Am107 Am207 Max	Units
Input Offset Voltage	$R_S \leq 50\ k\Omega$		2.0	7.5		0.7	2.0	mV
Input Offset Current			3	50		1.5	10	nA
Input Bias Current			70	250		30	75	nA
Input Resistance		0.5	2		1.5	4		MΩ
Supply Current	$V_S = \pm 20V$ $V_S = \pm 15V$		1.8	3.0		1.8	3.0	mA mA
Large Signal Voltage Gain	$V_S = \pm 15\ V$, $V_{OUT} = \pm 10\ V$, $R_L \geq 2\ k\Omega$	25	160		50	160		V/mV
Slew Rate	$R_L \geq 2\ k\Omega$		0.5			0.5		V/μs
The Following Specifications Apply Over The Operating Temperature Ranges								
Input Offset Voltage	$R_S \leq 50\ k\Omega$			10			3.0	mV
Input Offset Current				70			20	nA
Average Temperature Coefficient of Input Offset Voltage	$T_{A(min)} \leq T_A \leq T_{A(max)}$		6.0	30		3.0	15	μV/°C
Average Temperature Coefficient of Input Offset Current	$25°C \leq T_A \leq T_{A\ (max)}$ $T_{A\ (min)} \leq T_A \leq 25°C$		0.01 0.02	0.3 0.6		0.01 0.02	0.1 0.2	nA/°C nA/°C
Input Bias Current				300			100	nA
Large Signal Voltage Gain	$V_S = \pm 15\ V$, $V_{OUT} = \pm 10\ V$, $R_L > 2\ k\Omega$	25			25			V/mV
Input Voltage Range	$V_S = \pm 20\ V$ $V_S = \pm 15\ V$	+15, −12			±15			V V
Common Mode Rejection Ratio	$R_S \leq 50\ k\Omega$	70	90		80	96		dB
Supply Voltage Rejection Ratio	$R_S \leq 50\ k\Omega$	70	96		80	96		dB
Output Voltage Swing	$V_S = \pm 15V$, $R_L = 10\ k\Omega$, $R_L = 2\ k\Omega$,	±12 ±10	±14 ±13		±12 ±10	±14 ±13		V V
Supply Current	$T_A = +125°C$ $V_S = \pm 20\ V$					1.2	2.5	mA

Notes:
1. Derate Metal Can package at 6.8 mW/°C for operation at ambient temperatures above 75°C, the Dual In-Line package at 9 mW/°C for operation at ambient temperatures above 95°C, and the Flat Package at 5.4 mW/°C for operation at ambient temperatures above 75°C.
2. For supply voltages less than ±15 V, the maximum input voltage is equal to the supply voltage.
3. Unless otherwise specified, these specifications apply for supply voltages from ±5 V to ±20 V for the Am107 and Am207 and from ±5 V to ±15 V for the Am307.

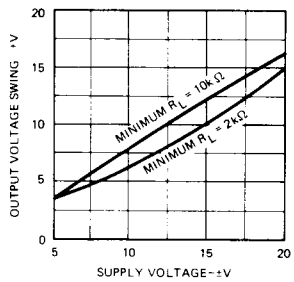
GUARANTEED PERFORMANCE CURVES (Note 3)

(Curves apply over the Operating Temperature Ranges)

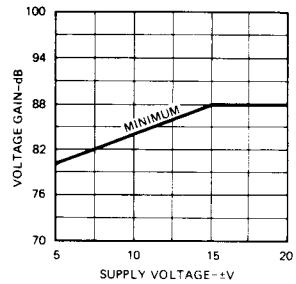
Input Voltage Range



Output Swing

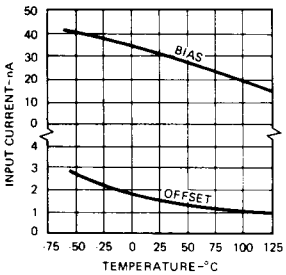


Voltage Gain

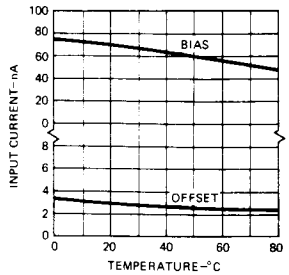


PERFORMANCE CURVES (Note 3)

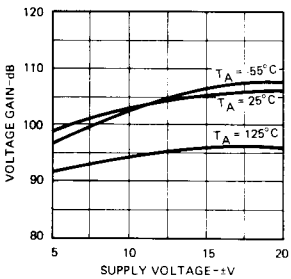
Input Current—Am107, Am207



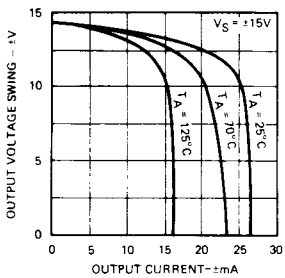
Input Current—Am307



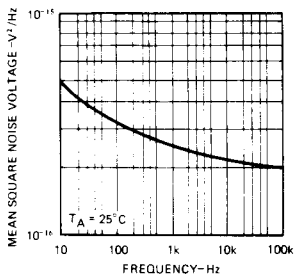
Voltage Gain



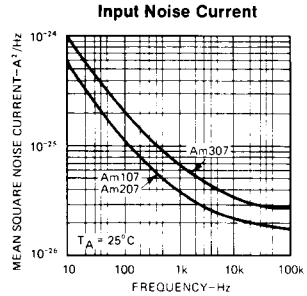
Current Limiting



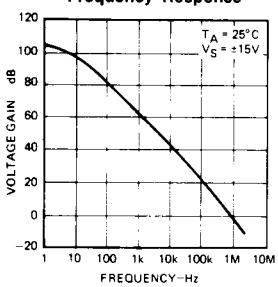
Input Noise Voltage



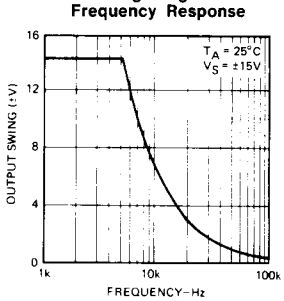
Input Noise Current



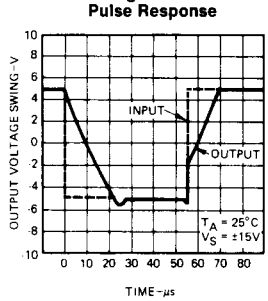
Open Loop Frequency Response



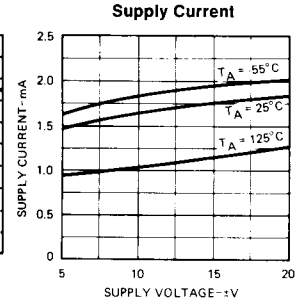
Large Signal Frequency Response



Voltage Follower Pulse Response



Supply Current



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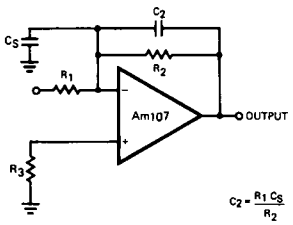
ADDITIONAL APPLICATION INFORMATION

Stray Input Capacitance/Large Feedback Resistance



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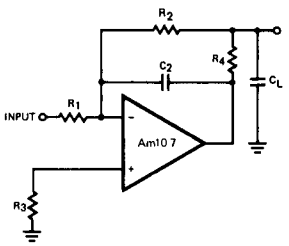
Large Capacitive Loads



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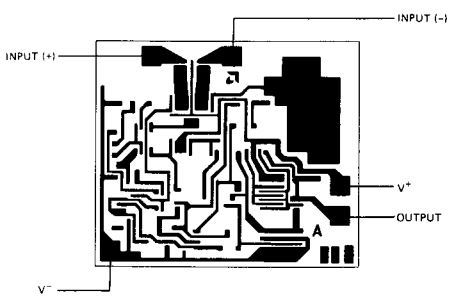
Stability is guaranteed for source resistances less than 10 kΩ, stray capacitances on the summing junction less than 5 pF, and capacitive loads smaller than 100 pF. If any of these conditions is not met, lead capacitors may be used in the feedback network to negate the effect of stray capacitance and large feedback resistors, or an RC network can be added to isolate capacitive loads. Power supplies should be bypassed to ground at one point, minimum, on each card. More bypass points should be considered for five or more amplifiers on a single card.

4

Metallization and Pad Layout



49 x 56 Mils