FAIRCHILD

A Schlumberger Company

μA318 High-Speed Operational Amplifier

Linear Products

Description

The μA318 is a Precision High-Speed Operational Amplifier designed for applications requiring wide bandwidth and high slew rate. It features a factor of ten increase in speed over general purpose devices without sacrificing dc performance.

The μA318 has internal unity gain frequency compensation. This simplifies its application since no external components are necessary for operation. However, unlike most internally compensated amplifiers, external frequency compensation may be added for optimum performance. For inverting applications, feedforward compensation will boost the slew rate to over 150 V/μs and almost double the bandwidth. Overcompensation can be used with the amplifier for greater stability when maximum bandwidth is not needed. Further, a single capacitor can be added to reduce the 0.1% settling time to under 1 μs.

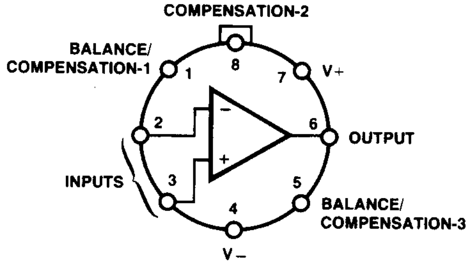
The high speed and fast settling time of this op amp makes it useful in a/d converters, oscillators, active filters, sample-and-hold circuits or general-purpose amplifiers. This device is easy to apply and offers a better ac performance than industry standards such as the μA709.

- **15 MHz SMALL SIGNAL BANDWIDTH**
- **GUARANTEED 50 V/μs SLEW RATE**
- **MAXIMUM BIAS CURRENT OF 500 nA**
- **OPERATES FROM SUPPLIES OF ±5 V TO ±20 V**
- **INTERNAL FREQUENCY COMPENSATION**
- **INPUT AND OUTPUT OVERLOAD PROTECTED**
- **PIN COMPATIBLE WITH GENERAL PURPOSE OP AMPS**

Absolute Maximum Ratings

Supply Voltage	±20 V
Power Dissipation (Note 1)	500 mW
Differential Input Current (Note 2)	±10 mA
Input Voltage (Note 3)	±15 V
Output Short Circuit Duration	Indefinite
Operating Temperature Range	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Pin Temperature (Soldering, 60 s)	300°C

Connection Diagram
8-Pin Metal Package



(Top View)

Order Information

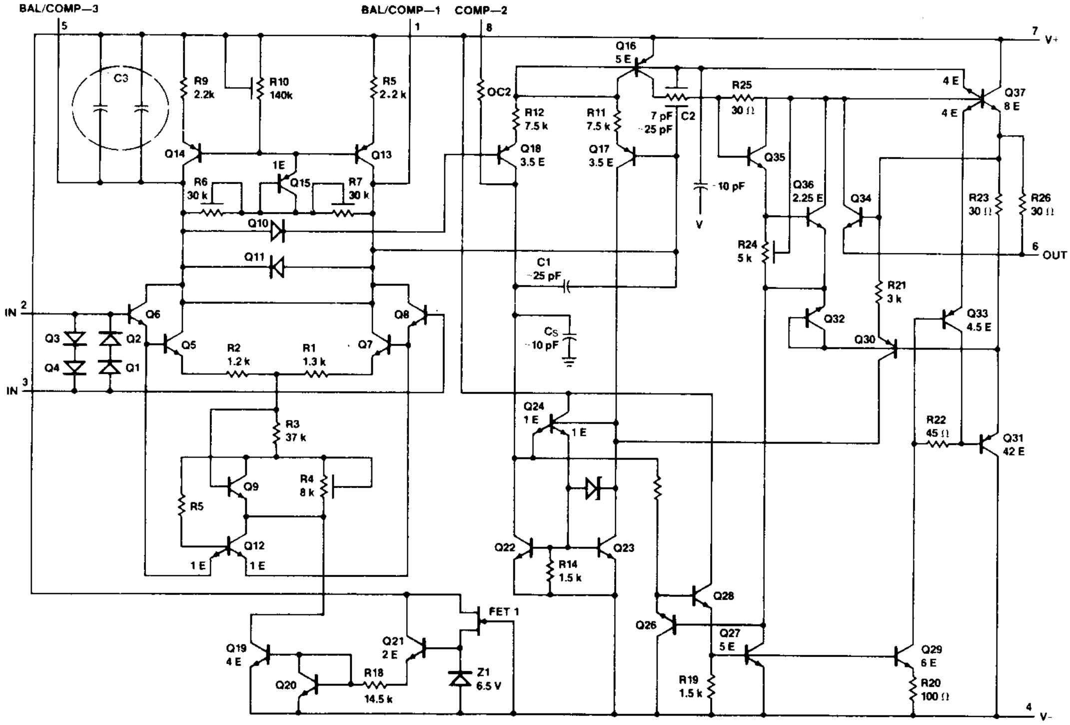
Type	Package	Code	Part No.
μA318	Metal	5W	μA318HC

Notes

1. The maximum junction temperature of the μA318 is 150°C for operating at elevated temperatures. The package must be derated based on a thermal resistance of 150°C/W, junction to ambient or 45°C/W, junction to case.
2. The inputs are shunted with back-to-back diodes for overvoltage protection. Therefore, excessive current will flow if a differential input voltage in excess of 1 V is applied between the inputs unless some limiting resistance is used.
3. For supply voltages less than ± 15 V, the absolute maximum input voltage is equal to the supply voltage.

4

Equivalent Circuit

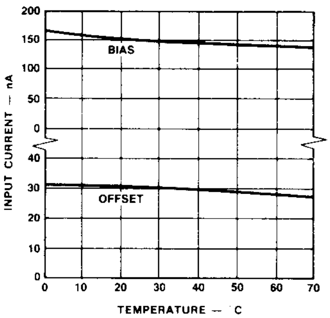


μA318
Electrical Characteristics $\pm 5\ V \leq V_S \leq \pm 20\ V$, $T_A = +25°C$

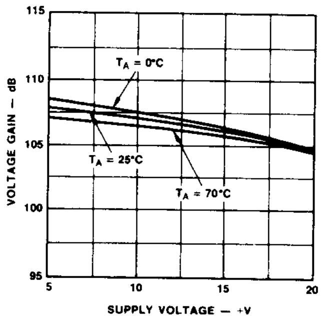
Characteristic	Condition	Min	Typ	Max	Unit
Input Offset Voltage			4	10	mV
Input Offset Current			30	200	nA
Input Bias Current			150	500	nA
Input Resistance		0.5	3		MΩ
Supply Current			5	10	mA
Large Signal Voltage Gain	$V_S = \pm 15\ V$, $V_{OUT} = \pm 10\ V$, $R_L \geq 2\ k\Omega$	25	200		V/mV
Slew Rate	$V_S = \pm 15\ V$, $A_V = 1$	50	70		V/μs
Small Signal Bandwidth	$V_S = \pm 15\ V$		15		MHz
The following specifications apply for $0°C < T_A < +70°C$					
Input Offset Voltage				15	mV
Input Offset Current				300	nA
Input Bias Current				750	nA
Large Signal Voltage Gain	$V_S = \pm 15\ V$, $V_{OUT} = \pm 10\ V$, $R_L \geq 2\ k\Omega$	20			V/mV
Output Voltage Swing	$V_S = \pm 15\ V$, $R_L = 2\ k\Omega$	±12	±13		V
Input Voltage Range	$V_S = \pm 15\ V$	±11.5			V
Common-Mode Rejection Ratio		70	100		dB
Supply Voltage Rejection Ratio		65	80		dB

Typical Performance Curves

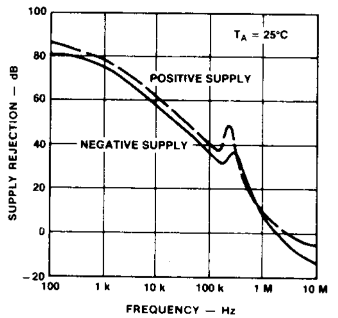
Input Current



Voltage Gain

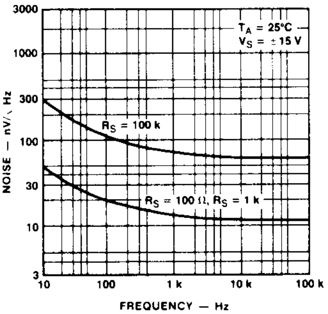


Power Supply Rejection

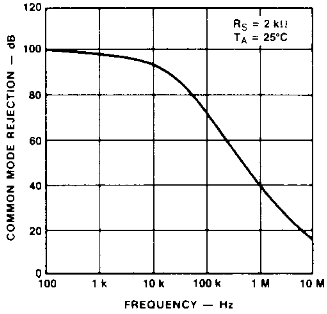


Typical Performance Curves (Cont.)

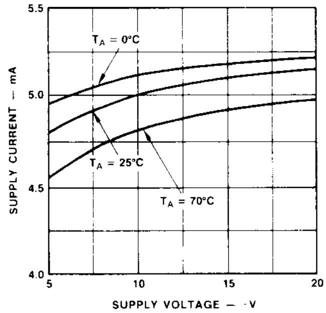
Input Noise Voltage



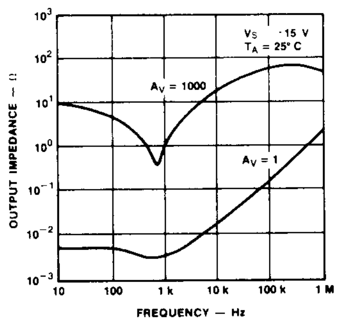
Common Mode Rejection



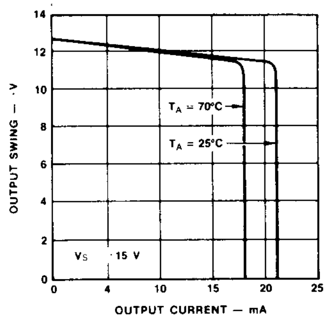
Supply Current



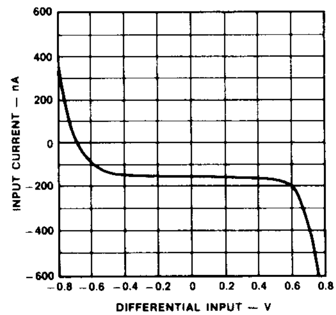
Closed Loop Output Impedance



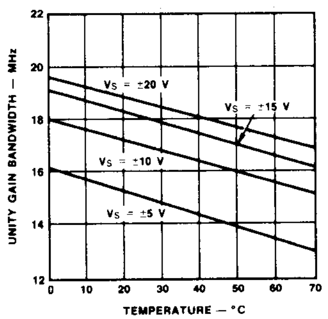
Current Limiting



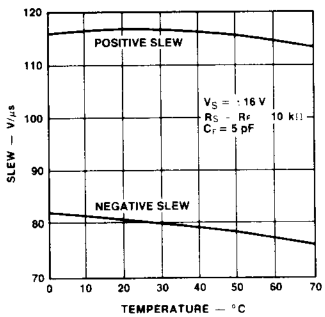
Input Current



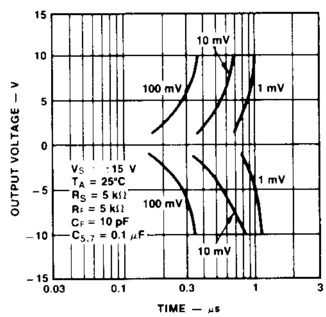
Unity Gain Bandwidth



Voltage Follower Slew Rate

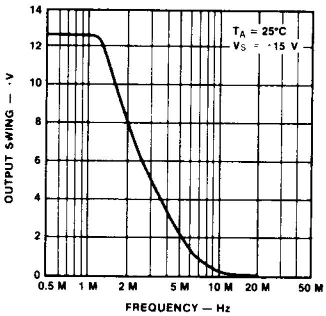


Inverter Settling Time

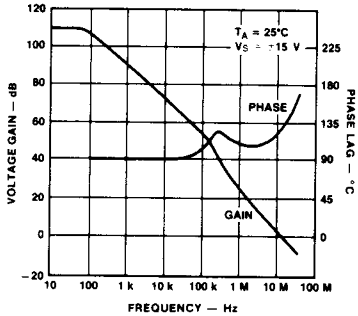


Typical Performance Curves (Cont.)

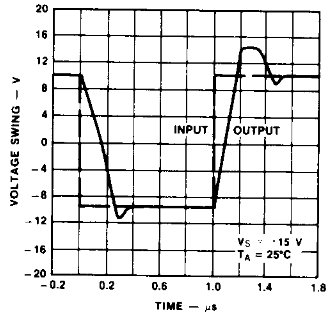
Large Signal Frequency Response



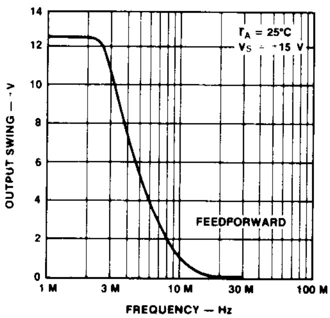
Open Loop Frequency Response



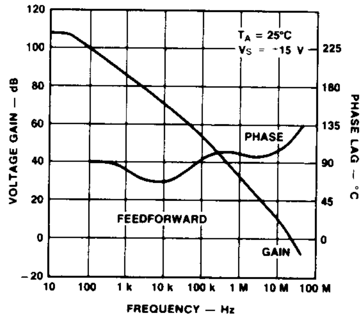
Voltage Follower Pulse Response



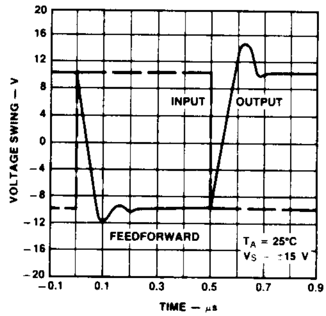
Large Signal Frequency Response



Open Loop Frequency Response

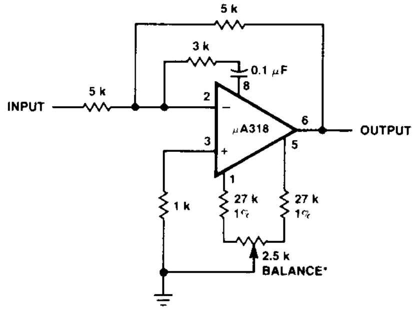


Inverter Pulse Response



Auxiliary Circuits

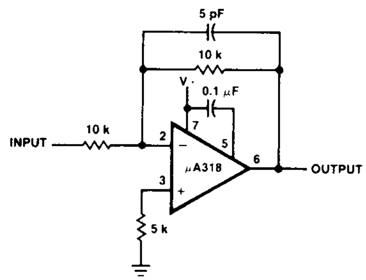
Feedforward Compensation For Greater Inverting Slew Rate



Slew rate typically 150 V/μs.

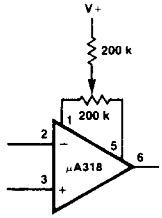
Balance circuit necessary for increased slew.

Compensation for Minimum Settling Time

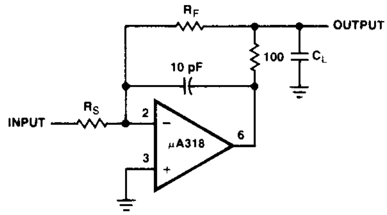


Slew and settling time to 0.1% for a 10 V step change is 800 ns.

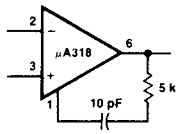
Offset Balancing



Isolating Large Capacitive Loads

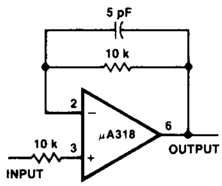


Overcompensation

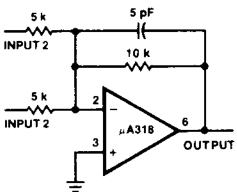


Typical Applications

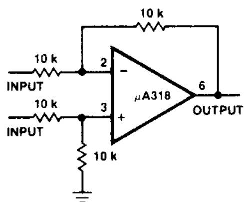
Fast Voltage Follower



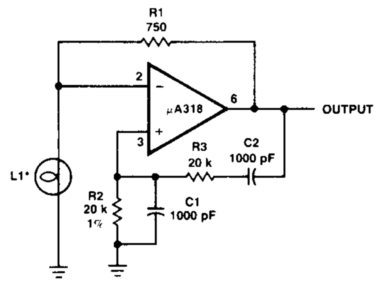
Fast Summing Amplifier



Differential Amplifier



Wein Bridge Sine Wave Oscillator



L1 = 10 V - 14 mA bulb ELDEMA 1869

R2 = R3

C1 = C2

$$f = \frac{1}{2\pi \, R2 \, C1}$$