

FEATURES

- *Guaranteed* 1.0mV Max. Input Offset Voltage
- *Guaranteed* 100,000 Min. Gain
- *Guaranteed* 50V/ μ s Slew Rate
- *Guaranteed* 20nA Max. Input Offset Current
- 15MHz Bandwidth
- Unity Gain Stable

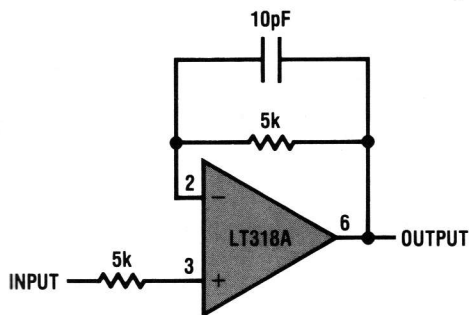
APPLICATIONS

- Wideband Amplifiers
- High Frequency Absolute Value Circuits
- D/A Converter Amplifiers
- Fast Integrators

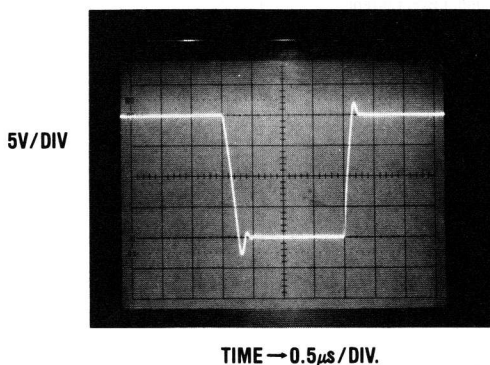
DESCRIPTION

The LT118A is an improved version of the industry standard LM118. The LT118A features lower input offset voltage, lower input offset currents, higher gain and higher common mode and power supply rejection. Because of these enhancements, the LT118A will improve the accuracy of most applications. Unlike many wideband amplifiers, the LT118A is unity gain stable and has a slew rate of 50V/ μ s. When used in inverting amplifier applications, feedforward compensation can be used to achieve slew rates in excess of 150V/ μ s. Linear Technology Corporation's advanced processing techniques make the LT118A an ideal choice for high speed applications.

Voltage Follower



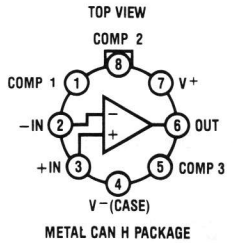
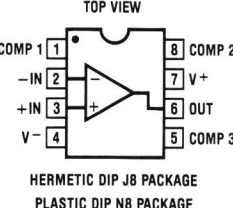
Voltage Follower Pulse Response



ABSOLUTE MAXIMUM RATINGS

Supply Voltage $\pm 20V$
 Differential Input Current (Note 1) $\pm 10mA$
 Input Voltage (Note 2) $\pm 20V$
 Output Short Circuit Duration Indefinite
 Operating Temperature Range
 LT118A/LM118 $-55^{\circ}C$ to $125^{\circ}C$
 LT318A/LM318 $0^{\circ}C$ to $70^{\circ}C$
 Storage Temperature Range
 All Devices $-65^{\circ}C$ to $150^{\circ}C$
 Lead Temperature (Soldering, 10 sec.) $300^{\circ}C$

PACKAGE/ORDER INFORMATION

 <p>TOP VIEW COMP 2 COMP 1 -IN +IN V- (CASE) V+ OUT COMP 3 METAL CAN H PACKAGE</p>	ORDER PART NUMBER
	LT118AH LM118H LT318AH LM318H
 <p>TOP VIEW COMP 1 -IN +IN V- COMP 3 OUT V+ COMP 2 HERMETIC DIP J8 PACKAGE PLASTIC DIP N8 PACKAGE</p>	LT118AJ8 LM118J8 LT318AJ8 LM318J8 LT318AN8 LM318N8

ELECTRICAL CHARACTERISTICS (Note 3)

SYMBOL	PARAMETER	CONDITIONS	LT118A			LM118			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage			0.5	1	2	4	mV	
			●	1	2				6
I_{OS}	Input Offset Current			6	20	6	50	nA	
			●	10	30				100
I_B	Input Bias Current			120	250	120	250	nA	
			●		500				500
R_{IN}	Input Resistance		1	3	1	3		M Ω	
A_V	Large Signal Voltage Gain	$V_S = \pm 15V, V_{OUT} = \pm 10V, R_L \geq 2k\Omega$		100	500	50	200	V/mV	
			●	100					25
SR	Slew Rate	$V_S = \pm 15V, A_V = 1$	50	70	50	70		V/ μs	
GBW	Gain Bandwidth Product	$V_S = \pm 15V$		15		15		MHz	
			●	± 12	± 13	± 12	± 13	V	
I_S	Supply Current	$T_A = 125^{\circ}C$		5	8	5	8	mA	
			●	4.5	7				4.5
CMRR	Common Mode Rejection Ratio		●	86	100	80	100	dB	
PSRR	Power Supply Rejection Ratio		●	86	100	70	80	dB	

ELECTRICAL CHARACTERISTICS (Note 3)

SYMBOL	PARAMETER	CONDITIONS	LT318A			LM318			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage		●	0.5	1	4	10	mV	
					2	15	15	mV	
I_{OS}	Input Offset Current		●	10	20	30	200	nA	
					30	750	750	nA	
I_B	Input Bias Current		●	150	250	150	500	nA	
					500	750	750	nA	
R_{IN}	Input Resistance			0.5	3	0.5	3	MΩ	
A_V	Large Signal Voltage Gain	$V_S = \pm 15V, V_{OUT} = \pm 10V, R_L \geq 2k\Omega$	●	100	500	25	200	V/mV	
				100		20		V/mV	
SR	Slew Rate	$V_S = \pm 15V, A_V = 1$		50	70	50	70	V/μs	
GBW	Gain Bandwidth Product	$V_S = \pm 15V$		15		15		MHz	
	Output Voltage Swing	$V_S = \pm 15V, R_L = 2k\Omega$	●	±12	±13	±12	±13	V	
	Input Voltage Range	$V_S = \pm 15V$	●	±11.5		±11.5		V	
I_S	Supply Current			5	10	5	10	mA	
CMRR	Common Mode Rejection Ratio		●	86	100	70	100	dB	
PSRR	Power Supply Rejection Ratio		●	86	100	65	80	dB	

The ● denotes those specifications which apply over the full operating temperature range.

The shaded electrical specifications indicate those parameters which have been improved or guaranteed test limits provided for the first time.

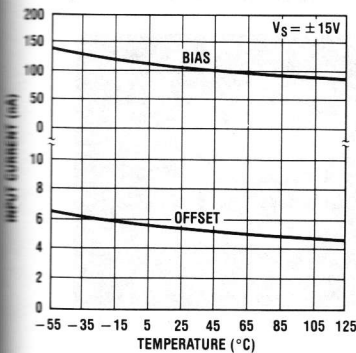
Note 1: The inputs are shunted with back-to-back zeners for overvoltage protection. Excessive current will flow if a differential voltage greater than 5V is applied to the inputs.

Note 2: For supply voltages less than ±15V, the maximum input voltage is equal to the supply voltage.

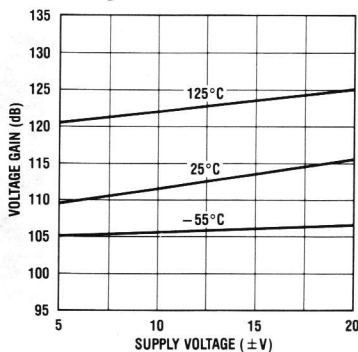
Note 3: These specifications apply for ±5V ≤ V_S ≤ ±20V. The power supplies must be bypassed with a 0.1μF or greater disc capacitor within 4 inches of the device.

TYPICAL PERFORMANCE CHARACTERISTICS

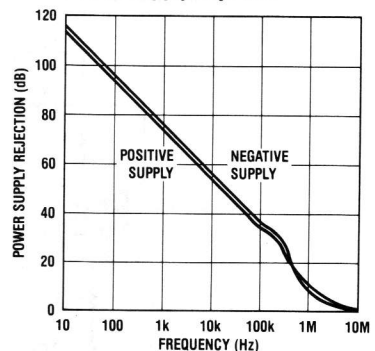
Input Current



Voltage Gain

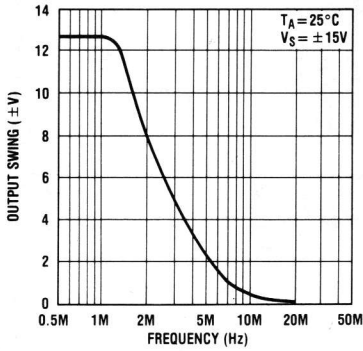


Power Supply Rejection

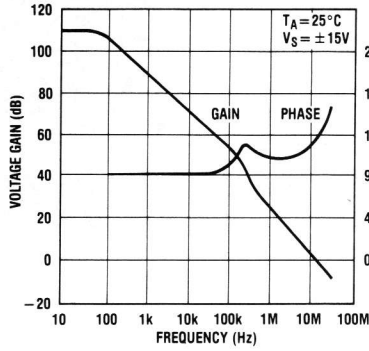


TYPICAL PERFORMANCE CHARACTERISTICS

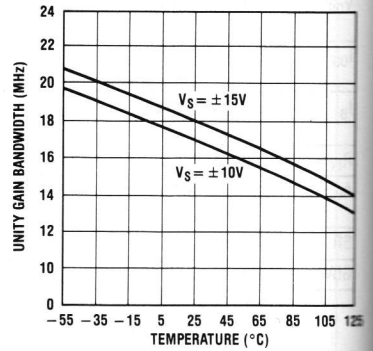
Large Signal Frequency Response



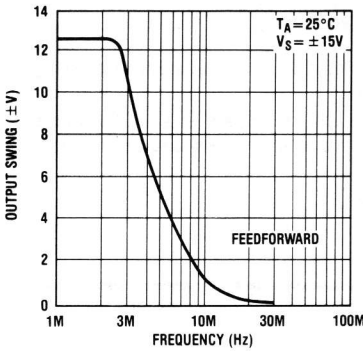
Open Loop Frequency Response



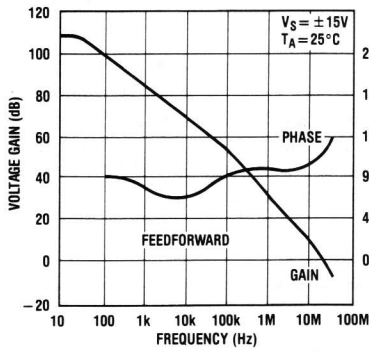
Unity Gain Bandwidth



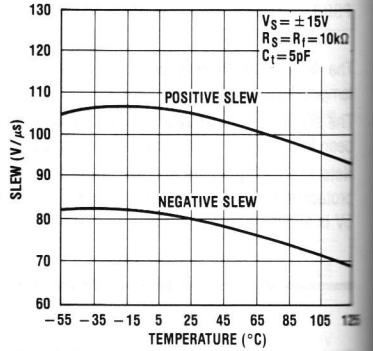
Large Signal Frequency Response



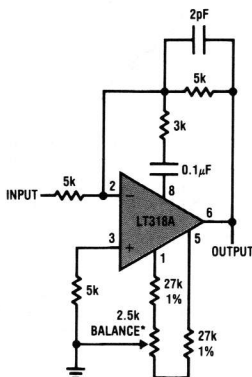
Open Loop Frequency Response



Voltage Follower Slew Rate

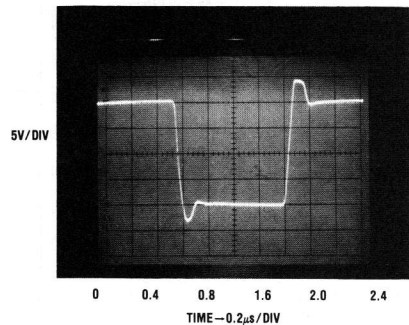


Feedforward Compensation for Slew Rates of $150V/\mu s$



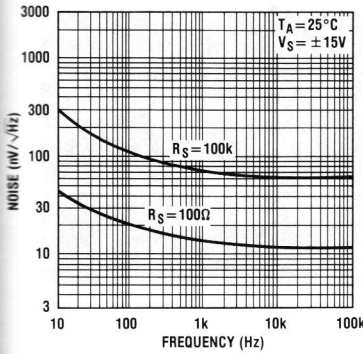
*BALANCE CIRCUIT NECESSARY FOR INCREASED SLEW RATE

Pulse Response of Feedforward Inverter

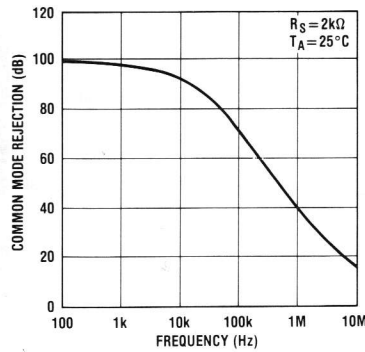


TYPICAL PERFORMANCE CHARACTERISTICS

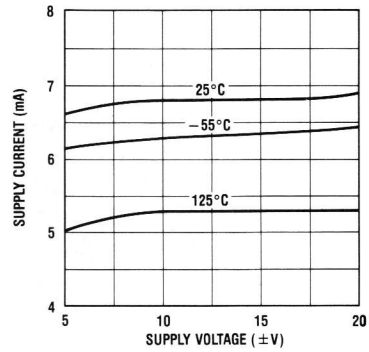
Input Noise Voltage



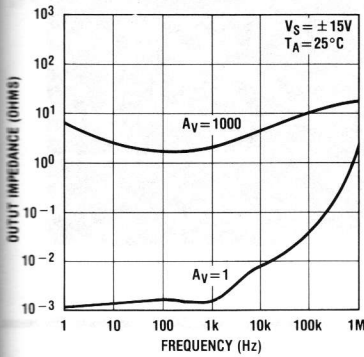
Common Mode Rejection



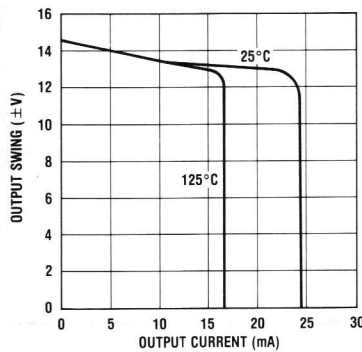
Supply Current



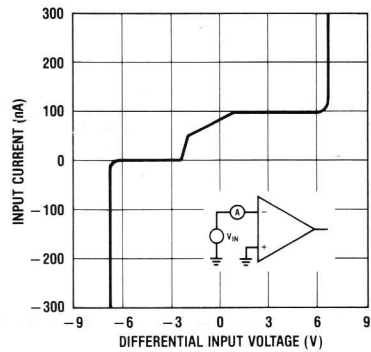
Closed Loop Output Impedance



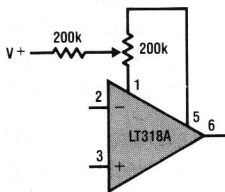
Current Limiting



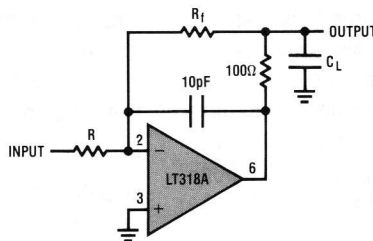
LT118A Input Current



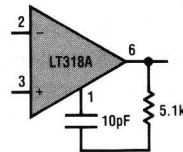
Offset Balancing



Isolating Large Capacitive Loads

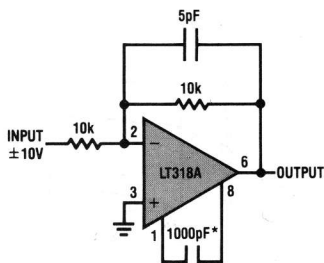


Overcompensation for Increased Stability



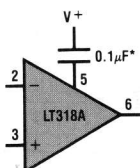
SETTLING TIME CIRCUITS

Settling Time Test Circuit



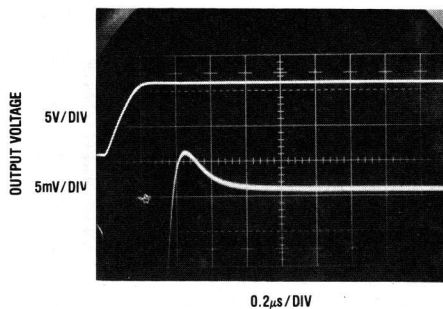
*IMPROVES SETTLING TIME

Alternate Compensation for Improved Settling Time

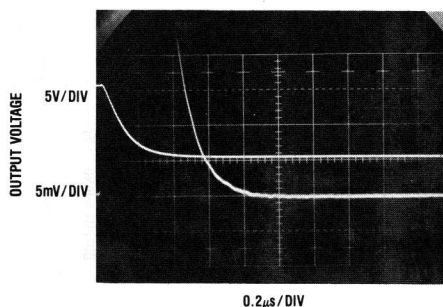


*IMPROVES SETTLING TIME

Settling Time



Settling Time



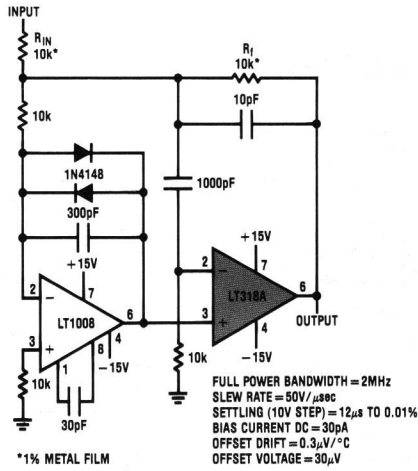
APPLICATIONS INFORMATION

Because of their wider bandwidth, the LT118A and LM118 operational amplifiers require more application care than most general purpose low frequency amplifiers. One of the most critical requirements is that power supplies should be bypassed with a 0.1µF (or larger) disc ceramic capacitor within an inch of the device. Also, stray capacitance at either the input or output can cause oscillation. While input capacitance can be compensated by placing a capacitor across the feedback resistor, load capacitance must be minimized or isolated as shown. Even the 50pF input capacitance of a 1X scope probe can alter the response of the device.

Settling time, an important parameter in many high speed amplifier applications, is difficult to measure and optimize. Settling time is very "application dependent" and is influenced by external components, layout and the amplifier. In general, the settling time to 0.01% can be minimized by using a circuit similar to that shown. In addition to the compensation network shown, a capacitor is needed across the feedback resistor to minimize ringing.

Power supply bypassing can also affect settling time. The amplifier has low power supply rejection ratio at high frequencies, so transients and ringing on the supply leads can appear at the output. Large (22µF) solid tantalum capacitors are preferred to minimize supply aberrations.

Precision Inverting Amplifier



SCHEMATIC DIAGRAM

