**FEATURES**

- Guaranteed 1.0mV Max. Input Offset Voltage
- Guaranteed 100,000 Min. Gain
- Guaranteed 50V/μs 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/μs. When used in inverting amplifier applications, feedforward compensation can be used to achieve slew rates in excess of 150V/μs. Linear Technology Corporation’s advanced processing techniques make the LT118A an ideal choice for high speed applications.

Voltage Follower

![Voltage Follower Circuit Diagram](image)

Voltage Follower Pulse Response

![Voltage Follower Pulse Response Graph](image)

TIME — 0.5μs/DIV.
LT118A/LT318A
LM118/LM318

ABSOLUTE MAXIMUM RATINGS

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

PACKAGE/ORDER INFORMATION

ORDER PART NUMBER

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>LT118AH</td>
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<tr>
<td>LM118H</td>
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<tr>
<td>LT318AH</td>
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ELECTRICAL CHARACTERISTICS (Note 3)

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<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>LT118A</th>
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<td>MAX</td>
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<td>Input Resistance</td>
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<td>AV</td>
<td>Large Signal Voltage Gain</td>
<td>V_S = ± 15V, V_OUT = ± 10V, R_L = 2kΩ</td>
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<td>500</td>
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<td></td>
<td></td>
<td>100</td>
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<tr>
<td>SR</td>
<td>Slew Rate</td>
<td>V_S = ± 15V, A_V = 1</td>
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<td>70</td>
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<td>GBW</td>
<td>Gain Bandwidth Product</td>
<td>V_S = ± 15V</td>
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<tr>
<td>Output Voltage Swing</td>
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<td>± 13</td>
<td>± 12</td>
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<td>Input Voltage Range</td>
<td>V_S = ± 15V</td>
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<td></td>
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<td>PSRR</td>
<td>Power Supply Rejection Ratio</td>
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UNITS

mV
nA
nA
nA
Ω
V/mV
V/mV
V/μs
MHz
V
V
mA
mA
dB
dB

2-312
### ELECTRICAL CHARACTERISTICS (Note 3)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
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<td>Input Offset Voltage</td>
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<td></td>
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<td></td>
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<td>$V_S = \pm 15\text{V}$, $V_{OUT} = \pm 10\text{V}$, $R_L \geq 2k\Omega$</td>
<td>100</td>
<td>500</td>
<td></td>
<td>25</td>
<td>200</td>
<td></td>
<td>V/mV</td>
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<tr>
<td>SR</td>
<td>Slew Rate</td>
<td>$V_S = \pm 15\text{V}$, $A_V = 1$</td>
<td>50</td>
<td>70</td>
<td></td>
<td>50</td>
<td>70</td>
<td></td>
<td>V/µs</td>
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<tr>
<td>GBW</td>
<td>Gain Bandwidth Product</td>
<td>$V_S = \pm 15\text{V}$</td>
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<td>15</td>
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<td>$I_S$</td>
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<td>V</td>
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<td>CMRR</td>
<td>Common Mode Rejection Ratio</td>
<td>$V_S = \pm 15\text{V}$</td>
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<td>±11.5</td>
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<td>V</td>
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<tr>
<td>PSRR</td>
<td>Power Supply Rejection Ratio</td>
<td>$V_S = \pm 15\text{V}$</td>
<td>86</td>
<td>100</td>
<td></td>
<td>70</td>
<td>100</td>
<td></td>
<td>dB</td>
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</table>

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 $\pm 15\text{V}$, the maximum input voltage is equal to the supply voltage.

**Note 3:** These specifications apply for $\pm 5\text{V} \leq V_S \leq \pm 20\text{V}$. 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

![Input Current Graph](image)

**Bias**

- $V_S = \pm 15\text{V}$

- OFFSET

- TEMPERATURE (°C)

#### Voltage Gain

![Voltage Gain Graph](image)

- **125°C**
- **25°C**
- **-55°C**

- SUPPLY VOLTAGE (±V)

#### Power Supply Rejection

![Power Supply Rejection Graph](image)

- **POSITIVE SUPPLY**
- **NEGATIVE SUPPLY**

- FREQUENCY (Hz)

- POWER SUPPLY REJECTION (dB)
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/μs

Pulse Response of Feedforward Inverter

*BALANCE CIRCUIT NECESSARY FOR INCREASED SLEW RATE
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

LT118A/LT318A
LM118/LM318
APPLICATONS 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.