Am118/218/318

High-Speed Operational Amplifier

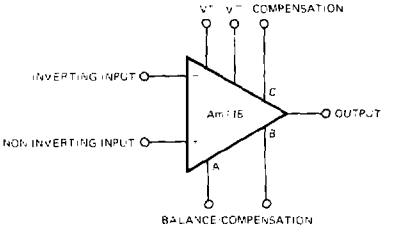
Distinctive Characteristics

- The Am118/218/318 are functionally, electrically, and pin-for-pin equivalent to the National LM118/218/318
- Slew rate: 70V/μs
- Small signal bandwidth: 15MHz
- Internal frequency compensation
- Supply voltage range: ±5V to ±20V
- 100% reliability assurance testing in compliance with MIL-STD-883.
- Electrically tested and optically inspected dice for hybrid manufacturers.
- Available in metal can, hermetic dual-in-line, hermetic flat package or plastic minidip.

FUNCTIONAL DESCRIPTION

The Am118/218/318 are internally compensated high-speed operational amplifiers featuring minimum slew rate of 50V/μs, low input bias currents, large input voltage range and excellent performance over a wide range of supply voltages and temperature. They have provision for increased speeds when operating in the inverting mode.

FUNCTIONAL DIAGRAM



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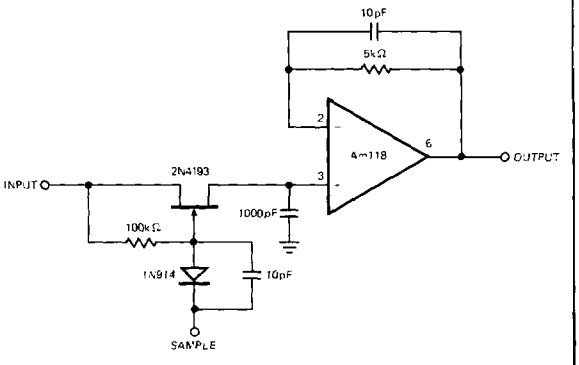
TYPICAL APPLICATIONS

Fast Sample and Hold



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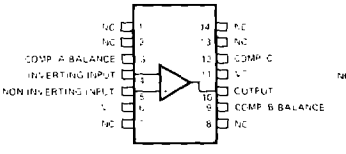
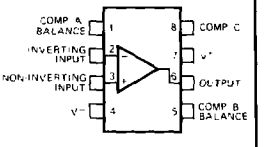
CONNECTION DIAGRAMS

Top Views

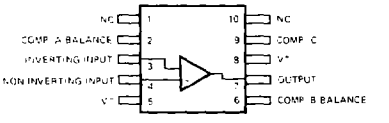
Dual-In-Line



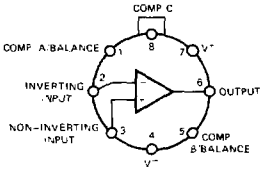
Dual-In-Line



Flat Package



Metal Can



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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.

ORDERING INFORMATION

Part Number	Package Type	Temperature Range	Order Number
Am318	Metal Can	0°C to +70°C	LM318H
	DIP	0°C to +70°C	LM318D
	Flat Package	0°C to +70°C	LM318F
	Molded DIP	0°C to +70°C	LM318N
	Dice	0°C to +70°C	LD318
Am218	Metal Can	−25°C to +85°C	LM218H
	DIP	−25°C to +85°C	LM218D
	Flat Pak	−25°C to +85°C	LM218F
Am118	Metal Can	−55°C to +125°C	LM118H
	DIP	−55°C to +125°C	LM118D
	Flat Package	−55°C to +125°C	LM118F
	Dice	−55°C to +125°C	LD118

MAXIMUM RATINGS

Supply Voltage	±20V
Internal Power Dissipation (Note 1)	500mW
Differential Input Voltage (Note 2)	±5V
Input Voltage (Note 3)	±15V
Output Short-Circuit Duration	Indefinite
Operating Temperature Range	
Am118	−55°C to +125°C
Am218	−25°C to +85°C
Am318	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 60 sec.)	300°C

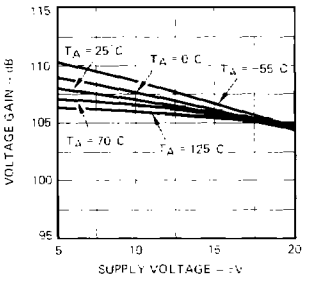
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise specified) (Note 4)

Parameter (see definitions)	Conditions	Am318 Min.	Am318 Typ.	Am318 Max.	Am118 Am218 Min.	Am118 Am218 Typ.	Am118 Am218 Max.	Units
Input Offset Voltage	$R_S \leq 5k\Omega$		4	10		2	4	mV
Input Offset Current			30	200		6	50	nA
Input Bias Current			150	500		120	250	nA
Input Resistance		0.5	3		1.0	3		MΩ
Supply Current	V_S = ±20V		5	10		5	8	mA
Large Signal Voltage Gain	V_S = ±15V, V_{OUT} = ±10V $R_L \geq 2k\Omega$	25	200		50	200		V/mV
Slew Rate	A_V = +1, V_S = ±15V (Fig.1) R_L = 2kΩ, C_L = 30pF	50	70		50	70		V/μs
Small Signal Bandwidth	V_S = ±15V		15			15		MHz
The Following Specifications Apply Over The Operating Temperature Ranges								
Input Offset Voltage	$R_S \leq 5k\Omega$			15			6	mV
Input Offset Current				300			100	nA
Input Bias Current				750			500	nA
Large Signal Voltage Gain	V_S = ±15V, V_{OUT} = ±10V $R_L \geq 2k\Omega$	20			25			V/mV
Input Voltage Range	V_S = ±15V	±11.5			±11.5			V
Common Mode Rejection Ratio	$R_S \leq 5k\Omega$	70			80			dB
Supply Voltage Rejection Ratio	$R_S \leq 5k\Omega$	65			70			dB
Output Voltage Swing	V_S = ±15V, R_L = 2kΩ	±12	±13		±12	±13		V
Supply Current	V_S = ±20V, T_A = 125°C						7	mA

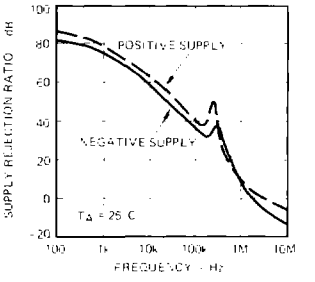
Notes:
1. Derate Metal Can package at 6.8 mW/°C for operation at ambient temperatures above 75°C, the Dual-In-Line package at 9 mW/°C for operation at ambient temperatures above 95°C, and the Flat Package at 5.4 mW/°C for operation at ambient temperatures above 57°C.
2. The inputs are shunted with diodes for overvoltage protection. To limit the current in the protection diodes, resistances of 2 kΩ or greater should be inserted in series with the input leads for differential input voltages greater than ±5 V.
3. For supply voltages less than ±15 V, the maximum input voltage is equal to the supply voltage.
4. Unless otherwise specified, these specifications apply for supply voltages from ±5 V to ±20 V.

PERFORMANCE CURVES

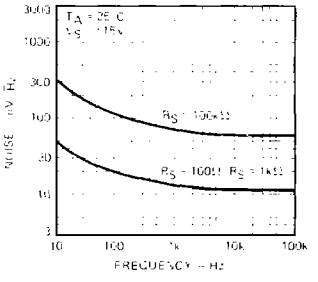
Voltage Gain



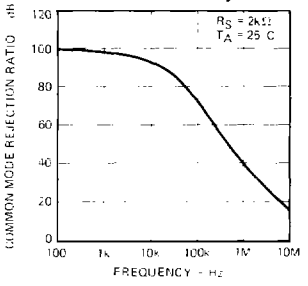
Power Supply Rejection



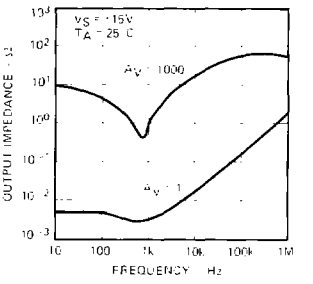
Input Noise Voltage



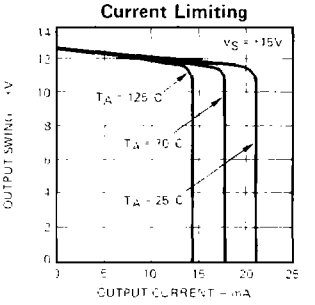
Common Mode Rejection



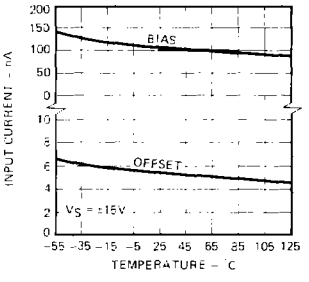
Closed Loop Output Impedance



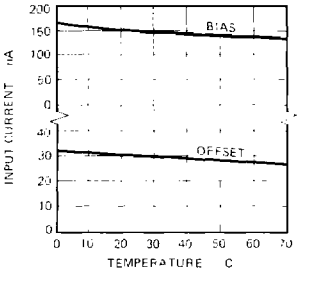
Current Limiting



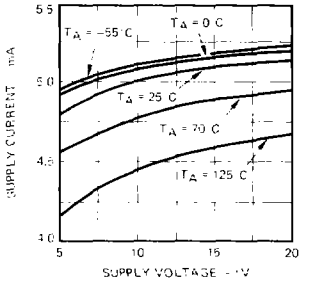
Input Current Am118, Am218



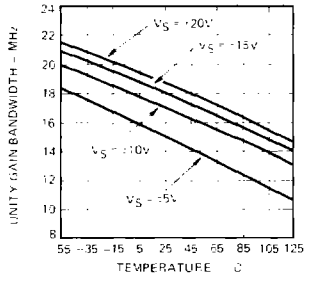
Input Current–Am318



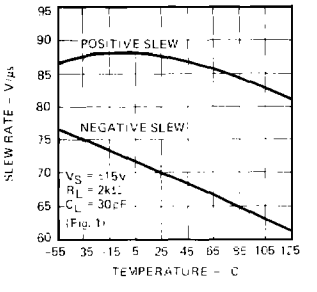
Supply Current



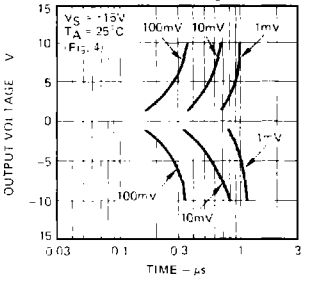
Unity Gain Bandwidth



Voltage Follower Slew Rate



Inverter Settling Time



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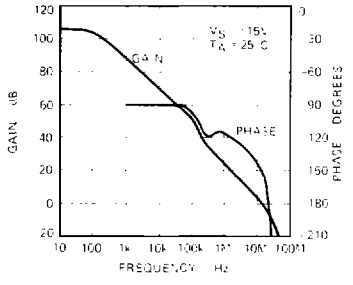
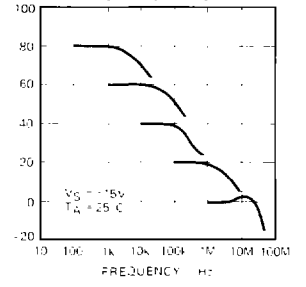
PERFORMANCE CURVES

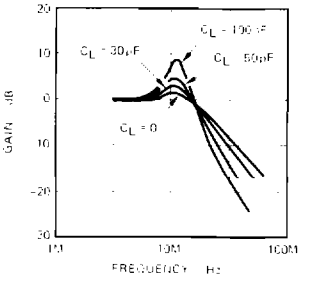
Open Loop Frequency Response



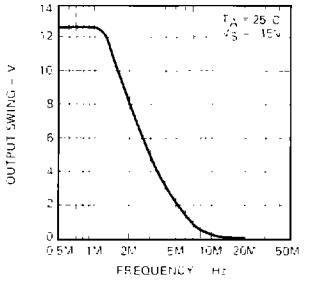
Closed Loop Frequency Response



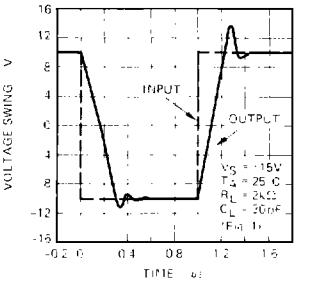
Effect of Capacitive Loading on Closed Loop Frequency Response



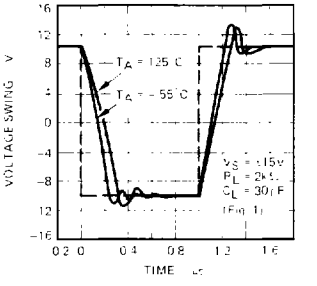
Large Signal Frequency Response



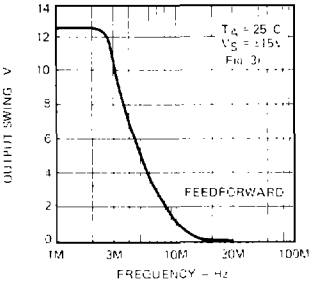
Voltage Follower Pulse Response



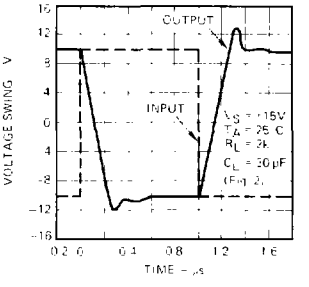
Voltage Follower Pulse Response Over Temperature



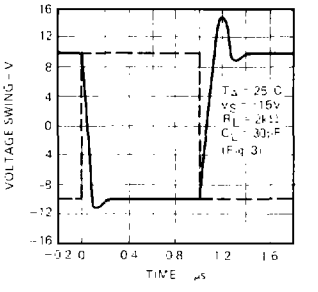
Large Signal Frequency Response with Feedforward



Inverter Pulse Response without Feedforward



Inverter Pulse Response with Feedforward



The high gain and large bandwidth of the Am118 make it mandatory to observe the following precautions in using the device, as is the case with any high-frequency amplifier. Circuit layout should be arranged to keep all lead lengths as short as possible and the output separated from the inputs. The values of the feedback and source impedances should be kept small to reduce the effect of stray capacitance at the inputs. The power supplies must be bypassed to ground at the supply leads of the amplifier with low inductance capacitors. Capacitive loading must be kept to minimum, or the amplifier must be isolated as shown in the applications.

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APPLICATIONS

Voltage Follower (Slew Rate Test Circuit)

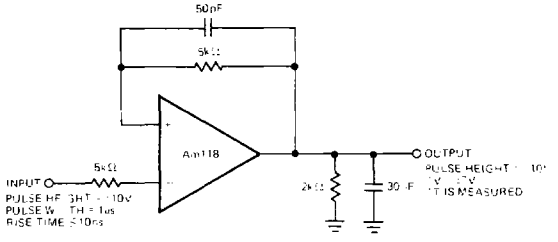

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Figure 1

Inverter

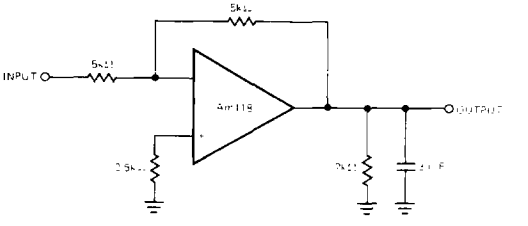

Figure 2

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Inverter with Feedforward Compensation for Higher Slew Rate

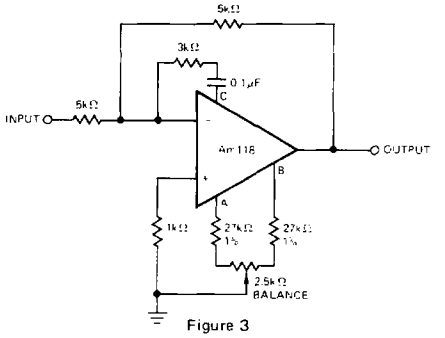

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Figure 3

Compensation for Minimum Settling Time

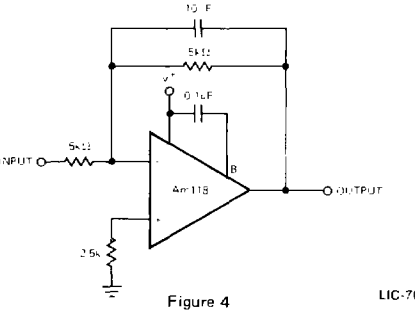

Figure 4

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Offset Nulling

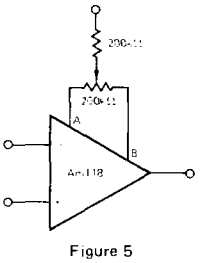

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Figure 5

Isolating Large Capacitive Loads

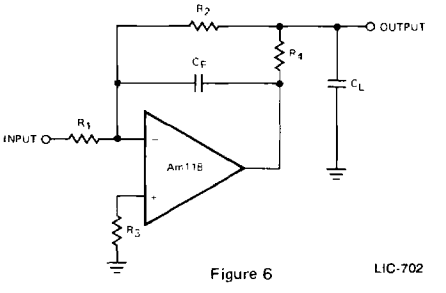

Figure 6

LIC-702

Over Compensation

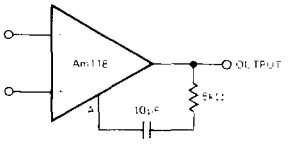

Figure 7

LIC-703

D/A Converter with Ladder Network

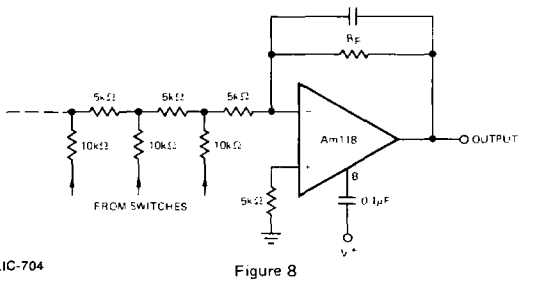

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Figure 8

D/A Converter with Binary Network

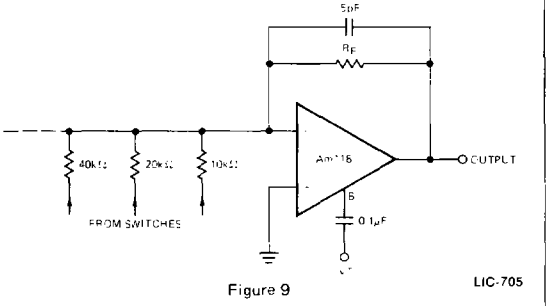

Figure 9

LIC-705

ADDITIONAL APPLICATIONS

High Speed Summing Amplifier with Low Input Bias Currents

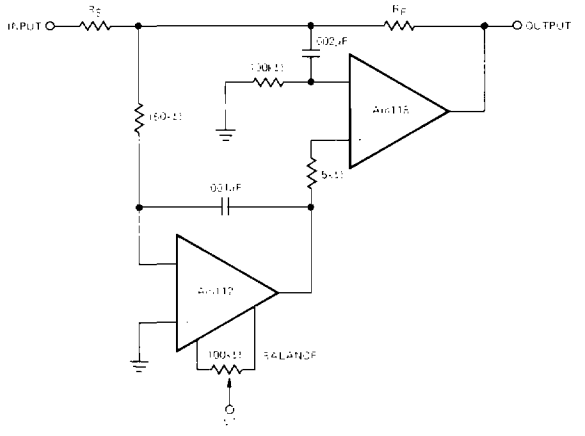

Figure 10

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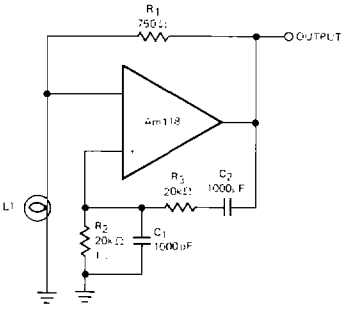
Wien Bridge Oscillator



L1–10V–14mA
bulb ELDEMA 1869
$R1 = R_2$
$C_1 = C_2$

$$f = \frac{1}{2\pi R1C1}$$

Figure 11

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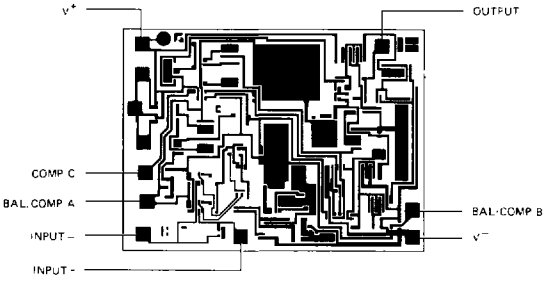
Metallization and Pad Layout



64 X 86 Mils