National Semiconductor

January 1989

LH0032-200 Ultra Fast FET Operational Amplifier

General Description

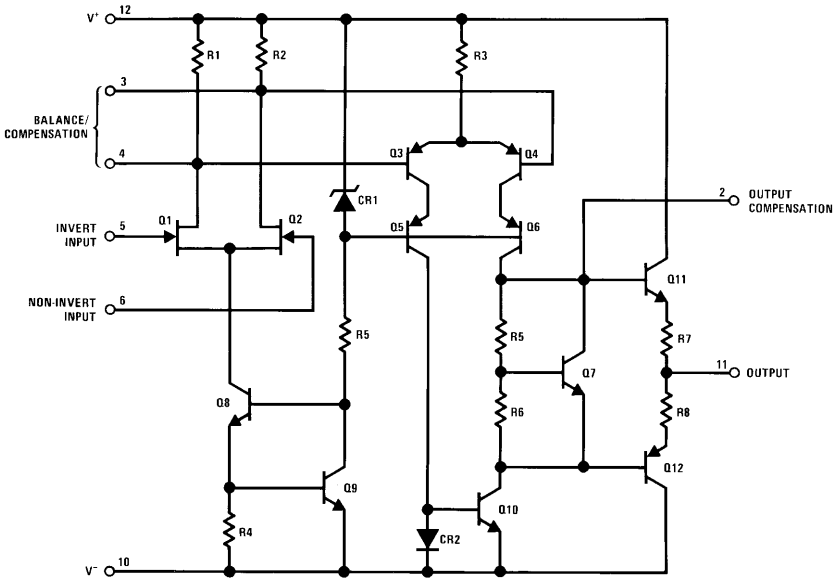
The LH0032-200 is a high slew rate, high input impedance differential operational amplifier suitable for diverse application in fast signal handling. The high allowable differential input voltage, ease of output clamping, and high output drive capability particularly suit it for comparator applications. It may be used in applications normally reserved for video amplifiers allowing the use of operational gain setting and frequency response shaping into the megahertz region.

The LH0032-200's wide bandwidth, high input impedance and high output capacity make it an ideal choice for applications such as summing amplifiers in high speed D to A's, buffers in data acquisition systems, and sample and hold circuits. Additional applications include high speed integrators and video amplifiers. The LH0032-200 is guaranteed over the temperature range −55°C to +200°C.

Features

- 200°C operation
- 500 V/μs slew rate
- 70 MHz bandwidth
- $10^{12}\Omega$ input impedance
- 5 mV max. input offset voltage
- FET input
- Offset null with single pot
- No compensation for gains above 50
- Peak output current to 100 mA
- Expected life in operation 160 hours

Schematic and Connection Diagrams



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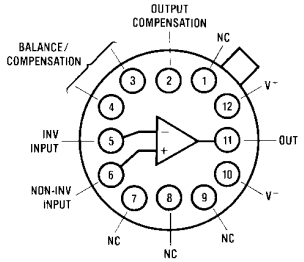

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Top View

Order Number LH0032G-200
See NS Package Number G12B

RRD-B30M115/Printed in U. S. A.

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage V_S	$\pm 18V$
Input Voltage	$\pm V_S$
Differential Input Voltage	$\pm 30V$ or $\pm 2V_S$

Power Dissipation	
$T_A = 25°C$	1.5W
$T_C = 25°C$	2.2W
Operating Temperature Range	$-55°C$ to $+200°C$
Operating Junction Temperature Range	225°C
Storage Temperature Range	$-65°C$ to $+225°C$
Lead Temperature (soldering, 10 sec.)	260°C

ESD rating is to be determined.

DC Electrical Characteristics $V_S = \pm 15V$, $T_{MIN} \le T_A \le T_{MAX}$ unless otherwise noted

Symbol	Parameter	Test Conditions		Limits			Units
				Min	Typ	Max	
V_{OS}	Input Offset Voltage	$V_{IN} = 0$				25	mV
$\Delta V_{OS}/\Delta T$	Average Offset Voltage Drift				25		$\mu V/°C$
I_{OS}	Input Offset Current		$T_J = T_A = T_{MAX}$			150	nA
I_B	Input Bias Current		$T_J = T_A = T_{MAX}$			250	nA
V_{INCM}	Input Voltage Range			± 10	± 12		V
CMRR	Common Mode Rejection Ratio	$\Delta V_{IN} = 10V$		40	60		dB
A_{VOL}	Open-Loop Voltage Gain	$R_L = 1\ k\Omega$, $V_{OUT} = \pm 10V$		40	50		dB
V_O	Output Voltage Swing	$R_L = 1\ k\Omega$		± 9.0	± 13.5		V
I_S	Power Supply Current	$I_O = 0$ (Note 3)			18	26	mA
		Pulse			25		mA
PSRR	Power Supply Rejection Ratio	$\Delta V_S = 10V$		40	60		dB

AC Electrical Characteristics $V_S = \pm 15V$, $R_L = 1\ k\Omega$, $T_J = 25°C$

Symbol	Parameter	Conditions		Min	Typ	Max	Units
S_R	Slew Rate	$A_V = +1$	$\Delta V_{IN} = 20V$	350	500		$V/\mu s$

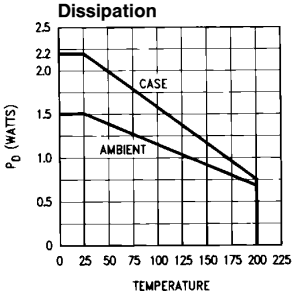
Note 1: In order to limit maximum junction temperature to $+225°C$ it may be necessary to operate with $V_S < \pm 15V$ when T_A or T_C exceeds specific values depending on the P_D within the device package. Total P_D is the sum of quiescent and load-related dissipation. See Applications Notes AN277, ''Applications of Wide-Band Buffer Amplifiers'' and AN253, ''High-Speed Operational-Amplifier Applications'' for a discussion of load-related power dissipation.

Note 2: Specification is at 25°C junction temperature due to requirements of high-speed automatic testing. Actual values at operating temperature will exceed the value at $T_J = 25°C$. When supply voltages are $\pm 15V$, no-load operating junction temperature may rise 40–60°C above ambient and more under load conditions. Accordingly, V_{OS} may change one to several mV, and I_B and I_{OS} will change significantly during warm-up. Refer to I_B and I_{OS} vs. temperature graph for expected values.

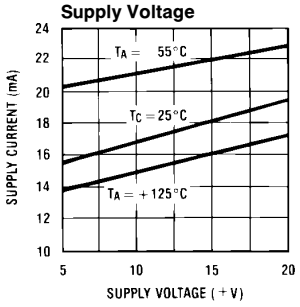
Note 3: Measured in still air 7 minutes after application of power.

Typical Performance Characteristics

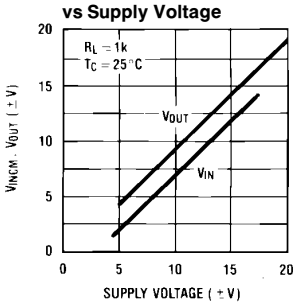
Maximum Power Dissipation



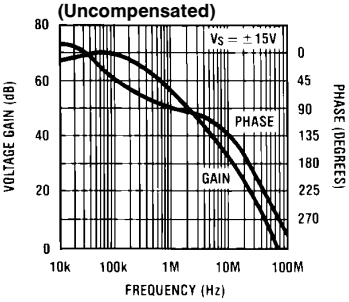
Supply Current vs Supply Voltage



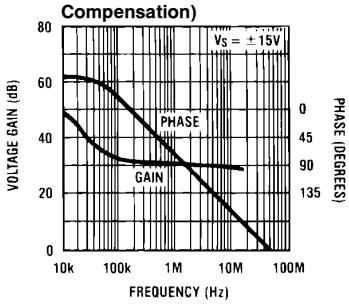
Input Voltage Range and Output Voltage vs Supply Voltage



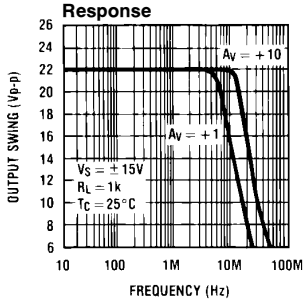
Bode Plot (Uncompensated)



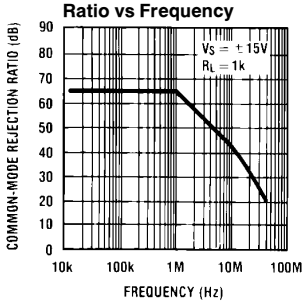
Bode Plot (Unity Gain Compensation)



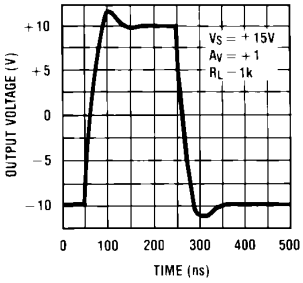
Large Signal Frequency Response



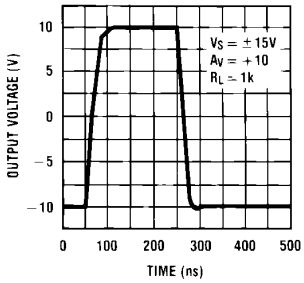
Common Mode Rejection Ratio vs Frequency



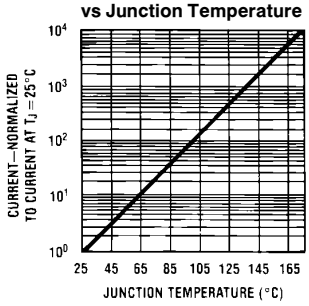
Large Signal Pulse Response



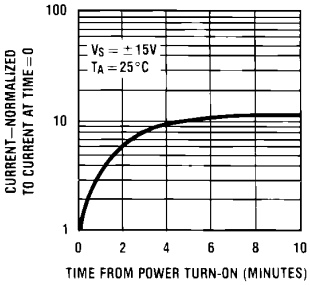
Large Signal Pulse Response



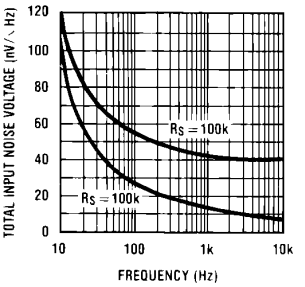
Normalized Input Bias and Offset Current vs Junction Temperature



Normalized Input Bias Current During Warm-Up



Input Bias Current vs Input Voltage



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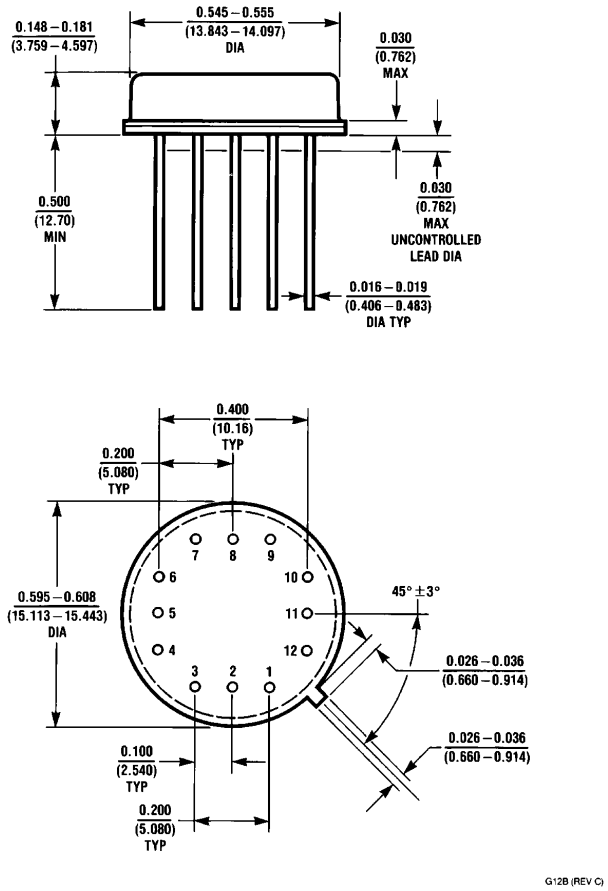
Physical Dimensions inches (millimeters)

Lit. # 106275



12-Lead Metal Can Package (G)
Order Number LH0032G-200
NS Package Number G12B

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