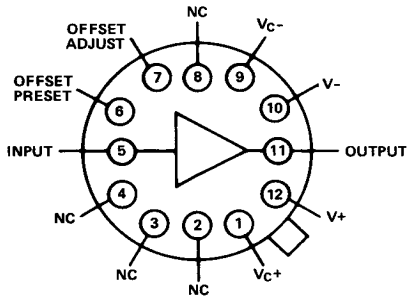
ADLH0033G/ADLH0033CG

FEATURES
- 2nd Source—Replaces All LH0033G Series
- Wide Bandwidth—dc to 100MHz
- High Slew Rate—1500V/μs
- Operates on Single or Dual Power Supplies
- Operation Guaranteed -55°C to +125°C (ADLH0033G)
- High 10^{11} Ω Input Impedance

APPLICATIONS
- High-Speed Line Drivers
- Video Impedance Transformation
- High-Speed A/D Input Buffers
- Nuclear Instrumentation Amplifiers
- Coaxial Cable Drive

ADLH0033G/ADLH0033CG
OUTLINE AND PIN DESIGNATIONS



GENERAL DESCRIPTION

The ADLH0033G and ADLH0033CG are superhigh speed (1500V/μs slew rate) and high input impedance (10^{11} Ω) buffer amplifiers, designed to replace all LH0033 series amplifiers in applications such as high-speed line drivers or as high impedance buffers for fast A/D converters and comparators.

The ADLH0033G is guaranteed over the temperature range of -55°C to +125°C, while the commercial grade ADLH0033CG is guaranteed over the range of -25°C to +85°C.

Guaranteed operation over temperature of the ADLH0033G is achieved by using specially selected junction FET's and the latest state-of-the-art laser trimming techniques. They are available in the industry standard 12 pin TO-8 metal can.

OPERATION WITHIN AN OP AMP LOOP

When using the ADLH0033G/ADLH0033CG as a current booster or isolation buffer with op amps such as LH0032, 118, 741, etc., an isolation resistor of at least 47Ω must be used between the op amp's output and the input of the ADLH0033G.

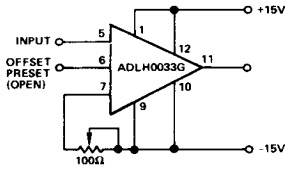


Figure 1. Offset Adjustment

HEAT SINKING

To assure maximum output drive capability of the ADLH0033G/ADLH0033CG over temperature, heat sinks should be used. The cases are electrically isolated from the circuit and thus may be connected to system grounds.

POWER SUPPLY BYPASSING

To prevent oscillation, power supply bypassing is recommended. Use low-inductance ceramic disc caps, keeping lead lengths as short as possible (1/4" to 1/2" max from device package), connected between ground plane and each supply lead. Use one or two 0.1μF caps in parallel with a 4.7μF tantalum for best results.

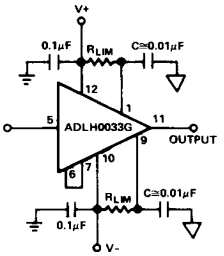


Figure 2. Short Circuit Protection Using Current Limiting Resistors (R_{LIM})

SPECIFICATIONS

	ADLH0033G	ADLH0033CG
ABSOLUTE MAXIMUM RATINGS		
Supply Voltage (V+ – V–)	40V	
Maximum Power Dissipation (see curves)	1.5W	
Maximum Junction Temperature	175°C	
Input Voltage	Equal to Supplies	
Continuous Output Current	±100mA	
Peak Output Current	±250mA	
Operating Temperature ADLH0033G	–55°C to +125°C	
ADLH0033CG	–25°C to +85°C	
Storage Temperature Range	–65°C to +150°C	
Lead Temperature (Soldering, 10 sec.)	300°C	

		ADLH0033G			ADLH0033CG			
Parameter	**Conditions**	**min**	**typ**	**max**	**min**	**typ**	**max**	**Units**
DC ELECTRICAL CHARACTERISTICS[1,2]								
Input Bias Current	T_C = 25°C		0.1	0.15		0.15		nA
				10			5	nA
Input Impedance	R_L = 1kΩ	10^{10}	10^{11}		10^{10}	10^{11}		Ω
Voltage Gain	V_{IN} = 1V rms, f = 1kHz, R_L = 1kΩ, R_S = 100kΩ	0.96	0.98	1.0	0.96	0.98	1.0	V/V
Output Offset Voltage	R_S = 100kΩ, T_C = 25°C		5	10		12	20	mV
	R_S = 100kΩ			15			25	mV
Output Offset Voltage TC	R_S = 100kΩ		50	100		50	100	µV/°C
Output Impedance	V_{IN} = 1V rms, f = 1kHz		6	10		6	10	Ω
	R_S = 100kΩ, R_L = 1kΩ							
Output Voltage Swing	R_L = 1kΩ	±12	±13		±12	±13		V
	R_L = 100Ω, T_C = 25°C	±9			±9			V
Supply Current	V_{IN} = 0V, V_S = ±15V		20	25		21	25	mA
Power Consumption	V_{IN} = 0V, V_S = ±15V		600	660		630	720	mW
AC ELECTRICAL CHARACTERISTICS (T_C = 25°C, V_S = ±15V, R_S = 50Ω, R_L = 1kΩ)								
Slew Rate	V_{IN} = ±10V	1000	1500		1000	1400		V/µs
Bandwidth	V_{IN} = 1V rms		100			100		MHz
Phase Nonlinearity	BW = 1 to 20MHz		2			2		Degrees
Rise Time	ΔV_{IN} = 0.5V		2.9		5	3.2	5	ns
Propagation Delay	ΔV_{IN} = 0.5V		1.2			1.5		ns
Harmonic Distortion	f>1kHz		<0.1			<0.1		%
MTBF								
Meantime Between Failure	1.962×10^7							hours
PACKAGE OPTION[3]								
TO-8 (H-12A)			ADLH0033G			ADLH0033CG		

NOTES

[1] Unless otherwise specified, these specifications apply for +15V applied to pins 1 and 12, –15V applied to pins 9 and 10, and pin 6 connected to pin 7.

[2] Unless otherwise noted, specifications apply over a temperature range, $-55°C \leq T_C \leq +125°C$ for the ADLH0033G, and $-25°C \leq T_C \leq +85°C$ for the ADLH0033CG. Typical values shown are for T_C = 25°C.

[3] See Section 16 for package outline information.

Specifications subject to change without notice.

ORDERING INFORMATION

Model	Temperature Range
ADLH0033CG	–25°C to +85°C
ADLH0033G	–55°C to +125°C

LAYOUT CONSIDERATIONS

As is the case with any high-speed design, proper layout is critical to avoid the introduction of unnecessary errors due to high-frequency coupling, stray capacitance, and the like.

Large ground planes should be used whenever possible to provide a low resistance, low inductance circuit path, as well as shielding the effects of high-frequency coupling. Sockets should be avoided, as the increased inter-lead capacitance can degrade bandwidth. Input and output connections should be kept as short as practical.

OFFSET ADJUSTMENT

The ADLH0033G/ADLH0033CG are factory trimmed for output voltage offsets well within the guaranteed limits, thereby eliminating the need to calibrate each device individually. To use this feature, simply connect Pin 6 (OFFSET PRESET) to Pin 7 (OFFSET ADJUST).

When it is desirable to eliminate any errors due to output offsets, the circuit of Figure 1 may be used to adjust these errors to zero.

SHORT CIRCUIT PROTECTION

The circuit of Figure 2 is used to protect the ADLH0033G/ADLH0033CG from short circuits on the output. The value of R_{LIM} is determined by the following:

$$R_{LIM} \cong \frac{V+}{I_{sc}} = \frac{V-}{I_{sc}}$$

Where I_{sc} = Output Current under short circuit conditions ≤100mA.

Note that output voltage swing will also be somewhat limited in this configuration; however, decoupling of Pins 1 and 9 through disc type capacitors to ground as shown in Figure 2 will restore full output swing for transient pulses.

OPERATION WITH ASYMMETRICAL SUPPLIES

Since Symmetrical Power Supplies may not always be desirable or available, the ADLH0033G/ADLH0033CG is designed to operate on Asymmetrical Supplies. This causes an apparent output offset; however, this is because of the amplifier's gain of less than unity. To accurately predict the output voltage shift due to Asymmetrical Supplies, use the following formula:

$$A_{VO} \cong (1 - A_V)\frac{(V+ - V-)}{2} = 0.005\ (V+ - V-)$$

Where A_V = No Load Voltage Gain, typically 0.99
V+ = Positive Supply Voltage
V- = Negative Supply Voltage

Of course, these apparent offsets may be adjusted to zero by using the circuit shown in Figure 1, OFFSET ADJUSTMENT.

CAPACITIVE LOADING

The ADLH0033G/ADLH0033CG have been designed to drive capacitive loads of several thousand picofarads (such as coaxial cable) without oscillation. In these applications, peak current resulting from (C X dv/dt) should be limited below the absolute maximum peak current rating of ±250mA.

Also, power dissipation due to driving capacitive loads plus standby power should be kept below the total power rating of 1.5W.

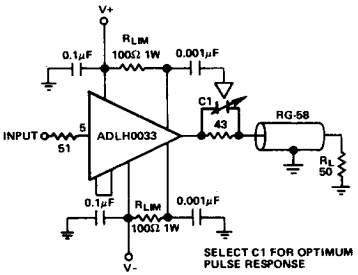


Figure 3. Coaxial Cable Drive

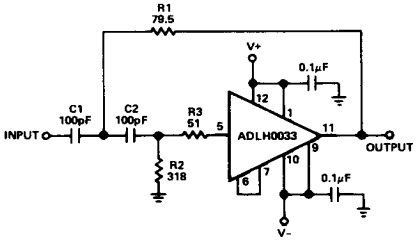


Figure 4. Wideband Two Pole High Pass Filter

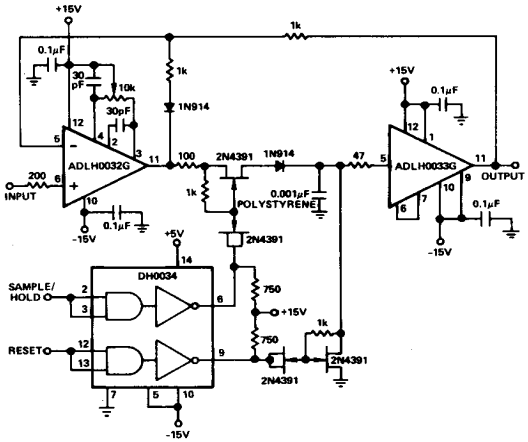


Figure 5. High Speed Peak Detector

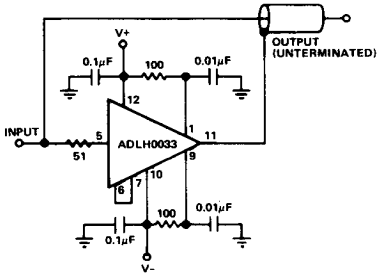
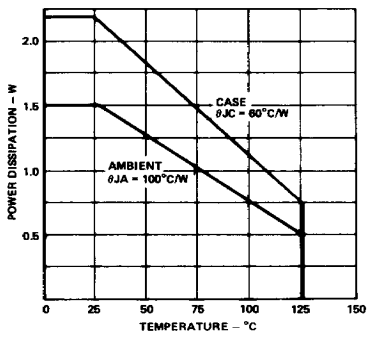
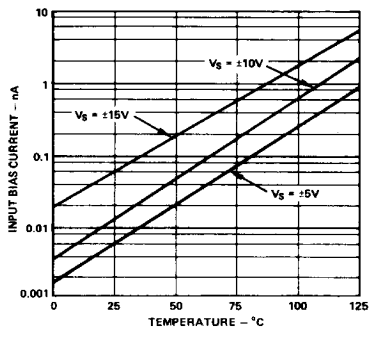


Figure 6. High Speed Shield/Line Driver

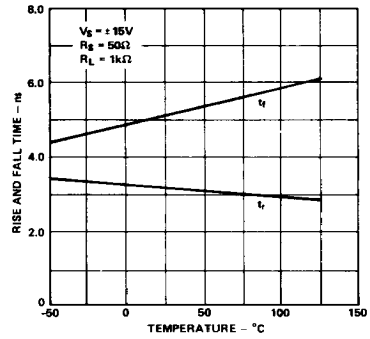
Typical Performance Curves



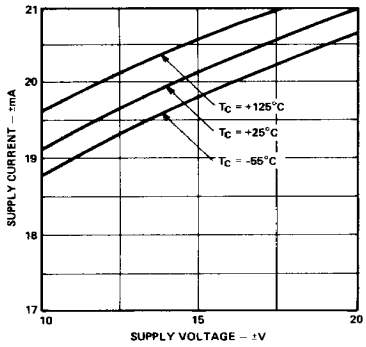
Power Dissipation vs Temperature



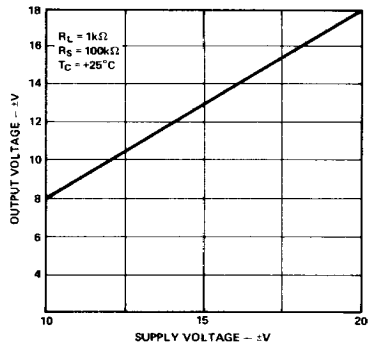
Input Bias Current vs Temperature



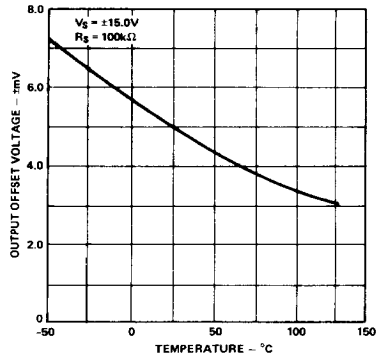
Rise and Fall Time vs Temperature



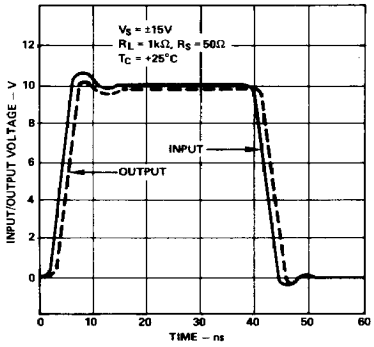
Supply Current vs Supply Voltage



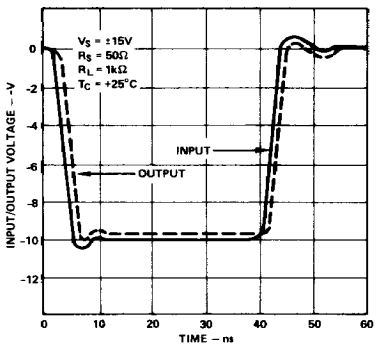
Output Voltage vs Supply Voltage



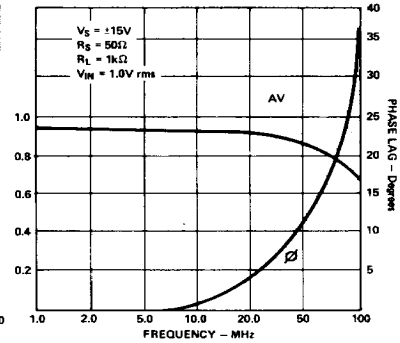
Output Offset Voltage vs Temperature



Positive Pulse Response



Negative Pulse Response



Frequency Response