

OPA2335AIDR-HX Zero_Drift, RRIO, CMOS, Op Amps

Description

The OPA2335AIDR-HX series of CMOS operational amplifiers employ auto-zeroing techniques to achieve simultaneously ultra-low input offset voltage (maximum 5 μV) and near-zero drift over time and temperature. This amplifier family delivers ultra-low noise, ultra-low offset, and ultra-low power consumption.

These miniature, high-precision operational amplifiers feature high input impedance and rail-to-rail input and output voltage swing. They offer a high gain–bandwidth product of 10 MHz and a slew rate of 5 V/ μs .

The devices operate from single or dual supplies ranging from +2.7 V (± 1.35 V) to +5.5 V (± 2.75 V).

The OPA2335AIDR-HX are specified for the extended industrial and automotive temperature range of -40°C to $+125^{\circ}\text{C}$. Encapsulated as SOP-8

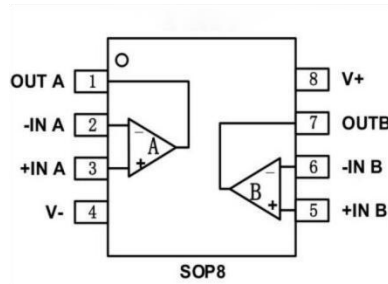
Features

- ★ Low Offset Voltage: 1 μV (TYP)
- ★ Input Offset Drift: 0.005 $\mu\text{V}/^{\circ}\text{C}$
- ★ Low Input Bias Current
- ★ Rail-to-Rail Input and Output
- ★ High Gain, CMRR, PSRR: 130dB(TYP)
- ★ High Gain Bandwidth Product: 10MHz
- ★ High Slew Rate: 5V/ μs
- ★ Low Supply Voltage: +2.7V to +5.5V
- ★ Operating Range: -40°C to $+125^{\circ}\text{C}$

Applications

- ★ Temperature Sensors
- ★ Battery-Powered Instrumentation
- ★ Active Filters
- ★ Weight Scale Sensor
- ★ Power Converter/Inverter

Pin Configuration



Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

PARAMETER	MIN	MAX	UNIT
Supply Voltage, $V_s=(V+) - (V-)$		6	V
Input Terminal Voltage ⁽²⁾	$(V-)-0.5$	$(V+)+0.5$	V
Input Terminal Current ⁽²⁾	-10	+10	mA
Signal Output Current	-35	+35	mA
Maximum Junction Temperature		+150	°C
Storage Temperature Range	-65	+150	°C

Note 1: Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

Note 2: Input terminals are diode-clamped to the power-supply rails. Input signals that can swing more than 0.5V beyond the supply rails should be current-limited to 10mA or less.

ESD Ratings

SYMBOL	PARAMETER		VALUE	UNIT
V(ESD)	Electrostatic discharge	Human-body model (HBM)	±2000	V

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

PARAMETER		MIN	TYP	MAX	UNIT
Supply Voltage, $V_s=(V+) - (V-)$	Signal-supply	2.7		5.5	V
	Dual-supply	±1.35		±2.75	V
Operating Temperature Range		-40	+25	+125	°C

Electrical characteristics

(At $T_A=+25^{\circ}\text{C}$, $V_S=5\text{V}$, $R_L=10\text{k}\Omega$ connected to $V_S/2$, and $V_{\text{OUT}}=V_S/2$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY						
Operating Voltage Range	V_S		2.7		5.5	V
Quiescent Current/Amplifier	I_Q			700		μA
Power-Supply Rejection Ratio	PSRR	$V_S=2.7\text{V}$ to 5.5V , $V_{\text{CM}}=0\text{V}$	110	130		dB
INPUT						
Input Offset Voltage	V_{OS}	$V_{\text{CM}}=V_S/2$		± 1	± 5	μV
Input Offset Voltage Average Drift	dV_{OS}/dT			0.005		$\mu\text{V}/^{\circ}\text{C}$
Input Bias Current	I_B	$V_{\text{CM}}=V_S/2$		± 50		pA
Input Offset Current	I_{OS}	$V_{\text{CM}}=V_S/2$		± 10		pA
Common-Mode Voltage Range	V_{CM}		(V-)-0.1		(V+)+0.1	V
Common-Mode Rejection Ratio	CMRR	$(V-)-0.1\text{V} < V_{\text{CM}} < (V+)+0.1\text{V}$	110	130		dB
Input Differential Capacitance				1		pF
Input Common Capacitance				5		pF
OUTPUT						
Open-Loop Voltage Gain	A_{OL}	$R_L=10\text{k}\Omega$, $V_O=0.3\text{V}$ to 4.7V	110	130		dB
Output Voltage High	V_{OH}	$R_L=100\text{k}\Omega$ to GND	4.99	4.998		V
		$R_L=10\text{k}\Omega$ to GND	4.95	4.98		V
Output Voltage Low	V_{OL}	$R_L=100\text{k}\Omega$ to V+		1	10	mV
		$R_L=10\text{k}\Omega$ to V+		10	30	mV
Short-Circuit Current	I_{OUT}			35		mA
FREQUENCY RESPONSE						
Slew Rate	SR	$G=+1$		5		V/ μs
Gain-Bandwidth Product	GBW			10		MHz
Overload Recovery Time				1		μs
NOISE						
Input Voltage Noise	$e_{\text{n-p}}$	$f=0.01\text{Hz}$ to 10Hz		0.75		μVpp
		$f=0.01\text{Hz}$ to 1Hz		0.22		μVpp
Input Voltage Noise Density	e_n	$f=1\text{kHz}$		35		$\text{nV}/\sqrt{\text{Hz}}$

Typical characteristics

At $T_A=+25^{\circ}\text{C}$, $V_S=5\text{V}$, $R_L = 10\text{k}\Omega$ connected to $V_S/2$, $V_{OUT}=V_S/2$, unless otherwise noted.

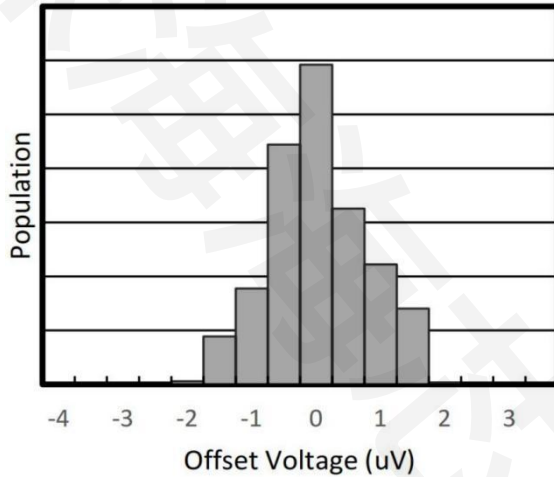


Figure 1. Offset Voltage Production Distribution

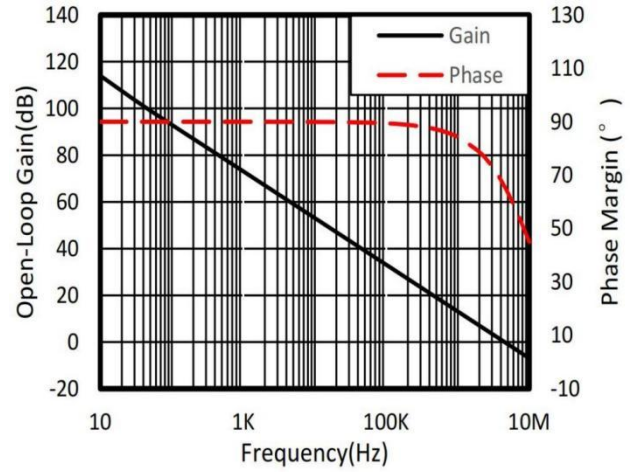


Figure 2. Open-Loop Gain And Phase vs Frequency

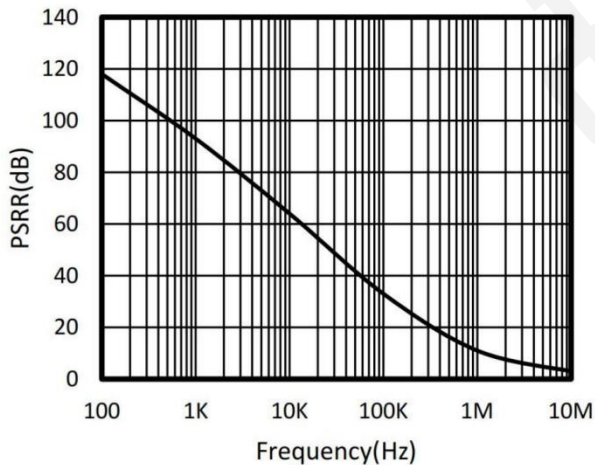


Figure 3. Power-Supply Rejection Ratio vs Frequency

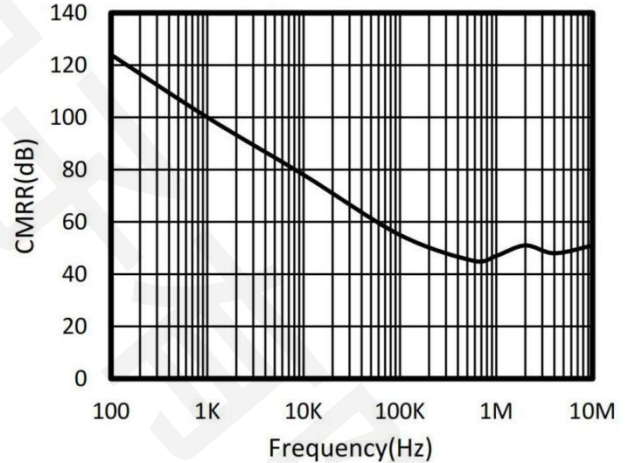


Figure 4. Common-Mode Rejection Ratio vs Frequency

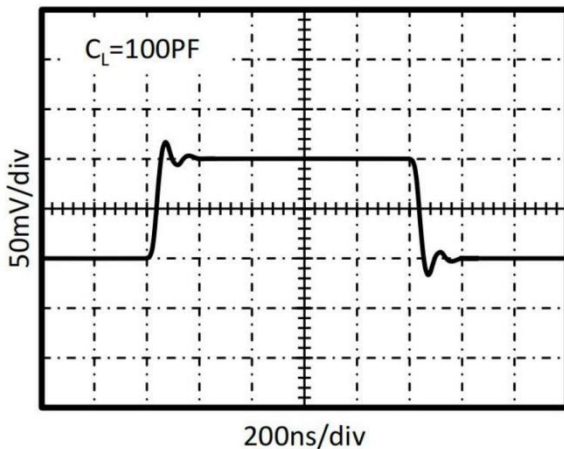


Figure 5. Small-Signal Step Response

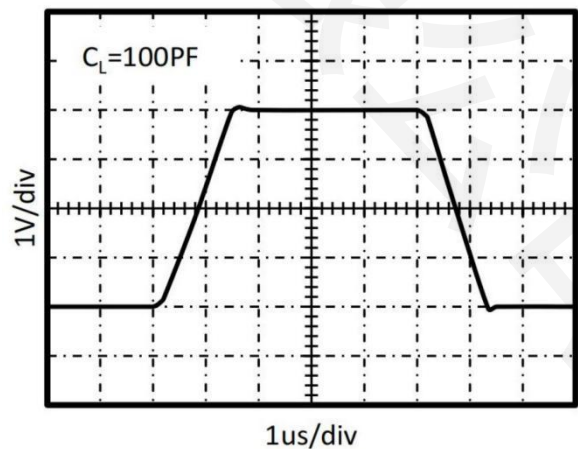
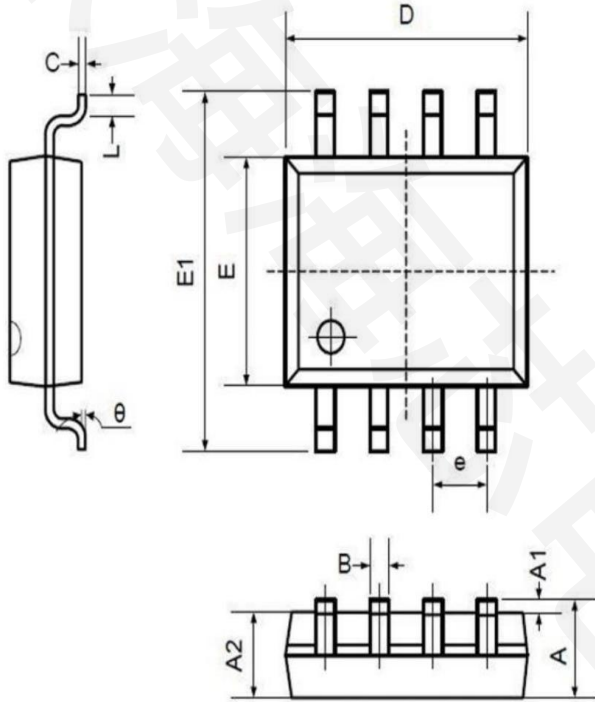


Figure 6. Large-Signal Step Response

Package outline dimensions

SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°