



钜地半导体
Tudi Semiconductor

Product Specification

TUDI-AD8628/AD8629

Zero-Drift, Single-Supply, Rail-to-Rail Input/Output Operational Amplifier

网址 www.sztdbdt.com 🔍

用芯智造 · 卓越品质

**semiconductor device
manufacturer**

- Design
- research and development
- production
- and sales



FEATURES

- Lowest auto-zero amplifier noise
- Low offset voltage: $1\ \mu\text{V}$
- Input offset drift: $0.002\ \mu\text{V}/^\circ\text{C}$
- Rail-to-rail input and output swing
- 5 V single-supply operation
- High gain, CMRR, and PSRR: 120 dB
- Very low input bias current: 100 pA max Low supply current: 1.0 mA
- Overload recovery time: $10\ \mu\text{s}$
- No external components required

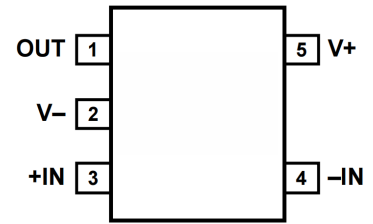
APPLICATIONS

- Automotive sensors
- Pressure and position sensors
- Strain gage amplifiers
- Medical instrumentation
- Thermocouple amplifiers
- Precision current sensing
- Photodiode amplifier

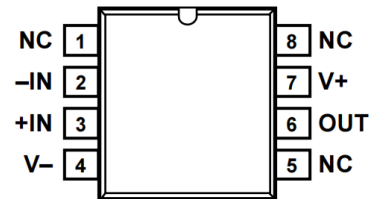
GENERAL DESCRIPTION

This amplifier has ultralow offset, drift, and bias current. The AD8628/AD8629/AD8630 are wide bandwidth auto-zero amplifiers featuring rail-to-rail input and output swings and low noise. Operation is fully specified from 2.7 V to 5 V single supply ($\pm 1.35\ \text{V}$ to $\pm 2.5\ \text{V}$ dual supply). The AD8628/AD8629/AD8630 provide benefits previously found only in expensive auto-zeroing or chopper-stabilized amplifiers. Using Analog Devices' topology, these zero-drift amplifiers combine low cost with high accuracy and low noise. No external capacitor is required. In addition, the AD8628/AD8629/AD8630 greatly reduce the digital switching noise found in most chopper-stabilized amplifiers.

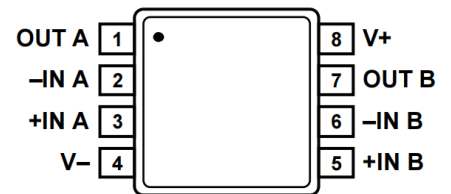
With an offset voltage of only $1\ \mu\text{V}$, drift of less than $0.005\ \mu\text{V}/^\circ\text{C}$, and noise of only $0.5\ \mu\text{V p-p}$ (0 Hz to 10 Hz), the AD8628/AD8629/AD8630 are perfectly suited for applications in which error sources cannot be tolerated. Position and pressure sensors, medical equipment, and strain gage amplifiers benefit greatly from nearly zero drift over their operating temperature range. Many systems can take advantage of the rail-to-rail input and output swings provided by the AD8628/AD8629/AD8630 to reduce input biasing complexity and maximize SNR.



5-Lead SOT-23 (RT-5)



8-Lead SOIC (R-8)



8-Lead MSOP (RM-8)



The AD8628/AD8629/AD8630 are specified for the extended industrial temperature range (-40°C to $+125^{\circ}\text{C}$). The AD8628 is available in tiny TSOT-23, SOT-23, and the 8-lead narrow SOIC plastic packages. The AD8629 is available in the standard 8-lead narrow SOIC and MSOP plastic packages. The AD8630 quad amplifier is available in standard 14-lead SOIC and TSSOP plastic packages.

ABSOLUTE MAXIMUM RATINGS

Table 3.

Parameters	Ratings
Supply Voltage	6 V
Input Voltage	GND – 0.3 V to $V_{S-} + 0.3$ V
Differential Input Voltage ¹	± 5.0 V
Output Short-Circuit Duration to GND	Indefinite
Storage Temperature Range	
R, RM, RU, RT, UJ Packages	-65°C to $+150^{\circ}\text{C}$
Operating Temperature Range	-40°C to $+125^{\circ}\text{C}$
Junction Temperature Range	
R, RM, RU, RT, UJ Packages	-65°C to $+150^{\circ}\text{C}$
Lead Temperature Range (Soldering, 60 sec)	300°C

¹ Differential input voltage is limited to ± 5 V or the supply voltage, whichever is less.

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Table 4. Thermal Characteristics

Package Type	θ_{JA} ¹	θ_{JC}	Unit
5-Lead TSOT-23 (UJ-5)	207	61	$^{\circ}\text{C}/\text{W}$
5-Lead SOT-23 (RT-5)	230	146	$^{\circ}\text{C}/\text{W}$
8-Lead SOIC (R-8)	158	43	$^{\circ}\text{C}/\text{W}$
8-Lead MSOP (RM-8)	190	44	$^{\circ}\text{C}/\text{W}$
14-Lead SOIC (R-14)	105	43	$^{\circ}\text{C}/\text{W}$
14-Lead TSSOP (RU-14)	148	23	$^{\circ}\text{C}/\text{W}$

¹ θ_{JA} is specified for worst-case conditions, that is, θ_{JA} is specified for the device soldered in a circuit board for surface-mount packages. This was measured using a standard 2-layer board.



SPECIFICATIONS

ELECTRICAL CHARACTERISTICS – $V_S = 5.0\text{ V}$

$V_S = 5.0\text{ V}$, $V_{CM} = 2.5\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Table 1.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		1	5	μV
Input Bias Current (AD8630)	I_B	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		30	100	μV pA
Input Offset Current	I_{OS}	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		100	300	pA nA
Input Voltage Range		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		50	200	pA pA
Common-Mode Rejection Ratio	CMRR	$V_{CM} = 0\text{ V to } 5\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	0	120	140	V dB
Large Signal Voltage Gain ¹	A_{VO}	$R_L = 10\text{ k}\Omega$, $V_O = 0.3\text{ V to } 4.7\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	115	130		dB dB
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	120	135		dB $\mu\text{V}/^\circ\text{C}$
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	$R_L = 100\text{ k}\Omega$ to ground $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	4.99	4.996		V V
Output Voltage Low	V_{OL}	$R_L = 10\text{ k}\Omega$ to ground $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	4.95	4.98		V V
Short-Circuit Limit	I_{SC}	$R_L = 100\text{ k}\Omega$ to V_+ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	4.95	4.97		V mV
Output Current	I_O	$R_L = 10\text{ k}\Omega$ to V_+ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		1	5	mV mV mV mV mA mA mA mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	$V_S = 2.7\text{ V to } 5.5\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	± 25	± 50		dB mA mA
Supply Current/Amplifier	I_{SY}	$V_O = 0\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		± 40		mA mA mA
INPUT CAPACITANCE						
Differential	C_{IN}			1.5		pF pF
Common-Mode				8.0		
DYNAMIC PERFORMANCE						
Slew Rate	SR	$R_L = 10\text{ k}\Omega$		1.0		$\text{V}/\mu\text{s}$ ms MHz
Overload Recovery Time				0.05		
Gain Bandwidth Product	GBP			2.5		
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		0.5		$\mu\text{V p-p}$ $\mu\text{V p-p}$ $\text{nV}/\sqrt{\text{Hz}}$ $\text{fA}/\sqrt{\text{Hz}}$
Voltage Noise Density	e_n p-p	0.1 Hz to 1.0 Hz		0.16		
Current Noise Density	i_n	$f = 1\text{ kHz}$ $f = 10\text{ Hz}$		22		

¹ Gain testing is highly dependent upon test bandwidth.



ELECTRICAL CHARACTERISTICS – $V_S = 2.7\text{ V}$

$V_S = 2.7\text{ V}$, $V_{CM} = 1.35\text{ V}$, $V_O = 1.4\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Table 2.

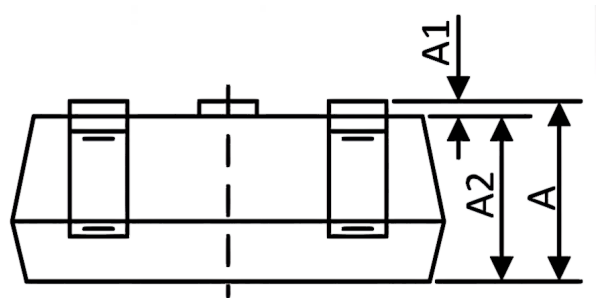
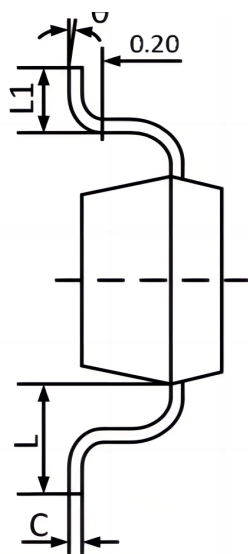
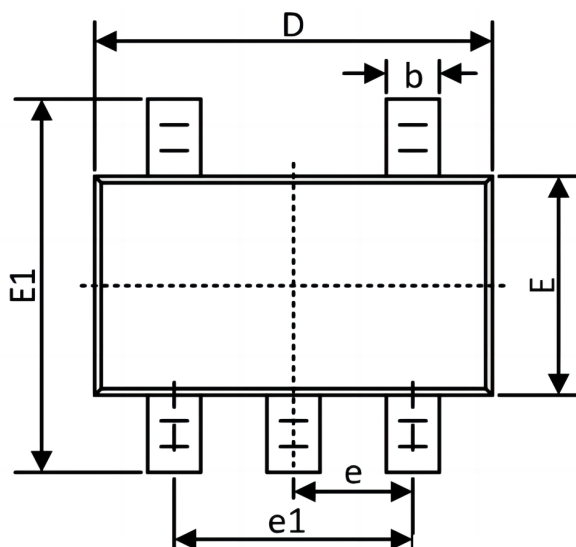
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		1	5	μV
Input Bias Current (AD8630)	I_B	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		30	100	μV pA
Input Offset Current	I_{OS}	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		100	300	pA
Input Voltage Range		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		1.0	1.5	nA
Common-Mode Rejection Ratio	CMRR	$V_{CM} = 0\text{ V to } 2.7\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	0		250	pA V dB
Large Signal Voltage Gain	A_{VO}	$R_L = 10\text{ k}\Omega$, $V_O = 0.3\text{ V to } 2.4\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	115	130		dB
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	110	120		dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	$R_L = 100\text{ k}\Omega$ to ground $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	2.68	2.695		$\mu\text{V}/^\circ\text{C}$
Output Voltage Low	V_{OL}	$R_L = 10\text{ k}\Omega$ to ground $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	2.67	2.68		V
Short-Circuit Limit	I_{SC}	$R_L = 100\text{ k}\Omega$ to V_+ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	2.67	2.675		V
Output Current	I_O	$R_L = 10\text{ k}\Omega$ to V_+ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		1	5	mV
		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		2	5	mV
		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		10	20	mV
		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		15	20	mV
		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	± 10	± 15		mA
		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		± 10		mA
		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		± 10		mA
		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		± 5		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	$V_S = 2.7\text{ V to } 5.5\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	115	130		dB
Supply Current/Amplifier	I_{SY}	$V_O = 0\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		0.75	1.0	mA
		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		0.9	1.2	mA
INPUT CAPACITANCE						
Differential	C_{IN}			1.5		pF
Common-Mode				8.0		pF
DYNAMIC PERFORMANCE						
Slew Rate	SR	$R_L = 10\text{ k}\Omega$		1		V/ μs
Overload Recovery Time				0.05		ms
Gain Bandwidth Product	GBP			2		MHz
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		0.5		$\mu\text{V p-p}$
Voltage Noise Density	e_n	$f = 1\text{ kHz}$		22		nV/ $\sqrt{\text{Hz}}$
Current Noise Density	i_n	$f = 10\text{ Hz}$		5		fA/ $\sqrt{\text{Hz}}$



Order information

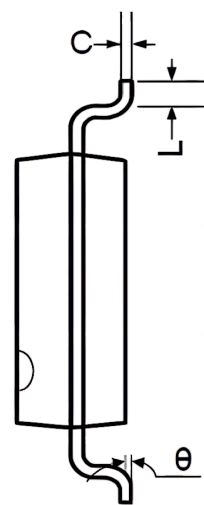
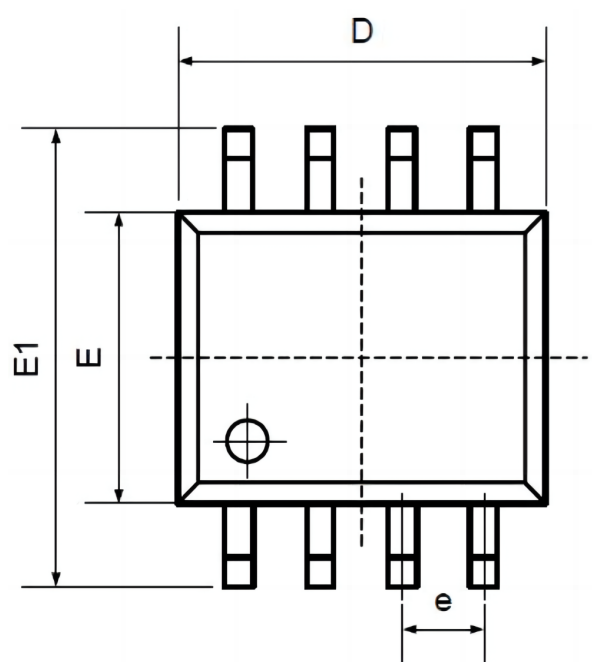
Order Number	Package	Package Quantity	Marking On The park
AD8628ARTZ-REEL-TUDI	SOT23	Tape,Reel,3000	AD8628ARTZ-REEL
AD8628ARZ-REEL-TUDI	SOP8	Tape,Reel,2500	AD8628ARZ-REEL
AD8629ARMZ-REEL-TUDI	MSOP8	Tape,Reel,2500	AD8629ARMZ-REEL
AD8629ARZ-REEL-TUDI	SOP8	Tape,Reel,2500	AD8629ARZ-REEL

Package SOT23-5

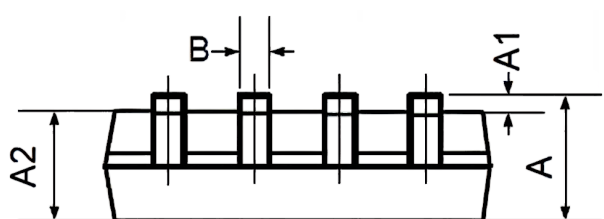


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
C	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

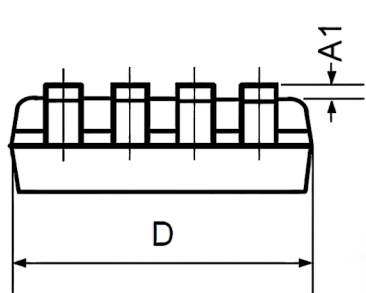
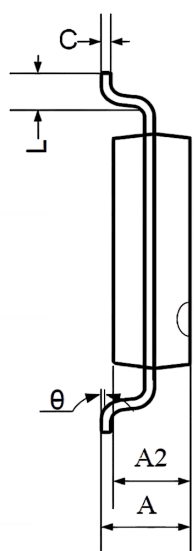
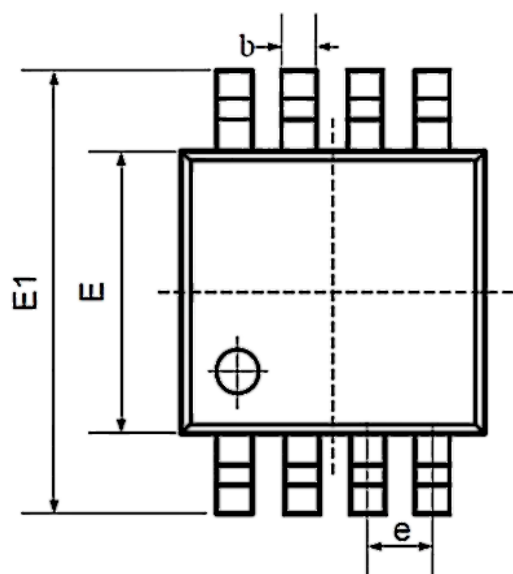
Package SOP8



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°



Package MSOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026 TYP	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
L	0.410	0.650	0.016	0.026
θ	0°	6°	0°	6°



Important statement:

- TUDI Semiconductor reserves the right to modify the product manual without prior notice! Before placing an order, customers need to confirm whether the obtained information is the latest version and verify the completeness of the relevant information.
- Any semi-guide product is subject to failure or malfunction under specified conditions. It is the buyer's responsibility to comply with safety standards when using TUDI Semiconductor products for system design and whole machine manufacturing. And take the appropriate safety measures to avoid the potential in the risk of loss of personal injury or loss of property situation!
- TUDI Semiconductor products have not been licensed for life support, military, and aerospace applications, and therefore TUDI Semiconductor is not responsible for any consequences arising from the use of this product in these areas.
- If any or all TUDI Semiconductor products (including technical data, services) described or contained in this document are subject to any applicable local export control laws and regulations, they may not be exported without an export license from the relevant authorities in accordance with such laws.
- The specifications of any and all TUDI Semiconductor products described or contained in this document specify the performance, characteristics, and functionality of said products in their standalone state, but do not guarantee the performance, characteristics, and functionality of said products installed in Customer's products or equipment. In order to verify symptoms and conditions that cannot be evaluated in a standalone device, the Customer should ultimately evaluate and test the device installed in the Customer's product device.
- TUDI Semiconductor documentation is only allowed to be copied without any alteration of the content and with the relevant authorization. TUDI Semiconductor assumes no responsibility or liability for altered documents.
- TUDI Semiconductor is committed to becoming the preferred semiconductor brand for customers, and TUDI Semiconductor will strive to provide customers with better performance and better quality products.