DUAL PRECISION MICROPOWER CMOS VOLTAGE COMPARATOR WITH DRIVER

GENERAL DESCRIPTION

The ALD2303A/ALD2303 is a precision monolithic high performance dual voltage comparator built with advanced silicon gate CMOS technology. It features very high typical input impedance of $10^{12}\Omega$; low input bias current of 10pA; very low power dissipation of 7.5μA per comparator; and single (+5V) or dual (±5V) power supply operation.

The input voltage range includes ground, making this comparator ideal for single supply low level signal detection with high source impedance. The ALD2303A/ALD2303 can be used in connection with other voltage comparator circuits such as the ALD2301/ALD2302/ ALD4302 voltage comparators. The output can be connected to a higher external voltage than V^+.

The ALD2303A/ALD2303 is ideal for high precision micropower voltage comparator applications, especially low level signal detection circuits requiring low standby power, yet retaining high output current capability.

APPLICATIONS

- Sensor detection circuits
- PCMCIA instruments
- MOSFET driver
- High source impedance voltage comparison circuits
- Multiple limit window comparator
- Power supply voltage monitor
- Photodetector sensor circuit
- High speed LED driver
- Oscillators
- Battery operated instruments
- Remote signal detection
- Multiple relay drivers

BENEFITS

- Extremely low power and high precision combination
- Built-in high input impedance buffer
- Built-in output driver with up to 60mA sink current

ORDERING INFORMATION ("L" suffix for lead free version)

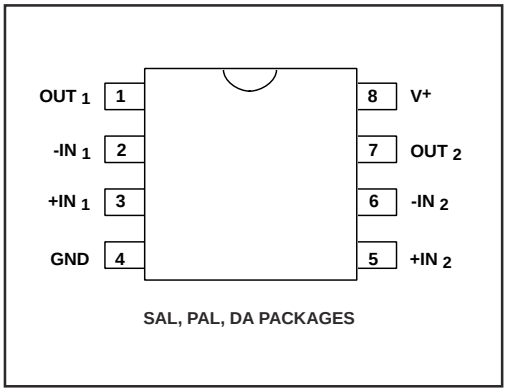
Operating Temperature Range *		
0°C to +70°C	0°C to +70°C	-55°C to +125°C
8-Pin Small Outline Package (SOIC)	8-Pin Plastic Dip Package	8-Pin CERDIP Package
ALD2303ASAL ALD2303SAL	ALD2303APAL ALD2303APAL	ALD2303ADA ALD2303DA

* Contact factory for leaded (non-RoHS) or high temperature versions.

FEATURES

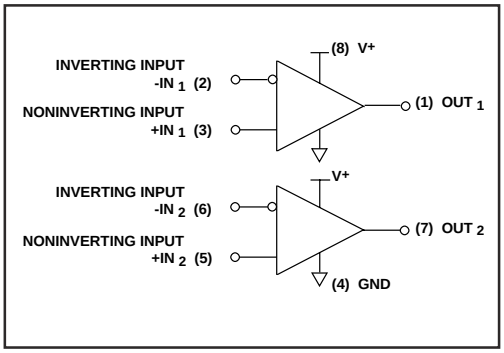
- 3V, 5V, and 10V supply
- Guaranteed to drive 200Ω loads
- Fanout of 30LS TTL loads
- Guaranteed maximum supply current of 20μA for each comparator
- Pinout of LM193 type industry standard comparators
- Extremely low input bias currents -- typically 10pA
- Virtually eliminates source impedance effects
- Single (+5V) and dual supply (±5V) operation
- CMOS, NMOS and TTL compatible
- Open drain wired-OR outputs
- High output sinking current -- typically 60mA
- Low supply current spikes
- High gain -- 100V/mV

PIN CONFIGURATION



SAL, PAL, DA PACKAGES

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Supply voltage, V^+		10.6V
Differential input voltage range		-0.3V to V^+ +0.3V
Power dissipation		600 mW
Operating temperature range	SAL, PAL packages	0°C to +70°C
	DA package	-55°C to +125°C
Storage temperature range		-65°C to +150°C
Lead temperature, 10 seconds		+260°C

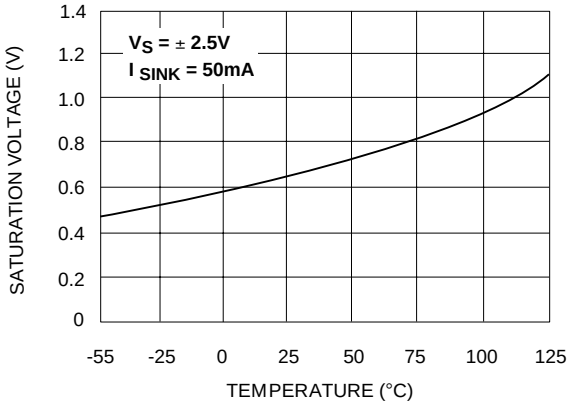
OPERATING ELECTRICAL CHARACTERISTICS
T_A = 25°C V+= +5V unless otherwise specified

		2303A			2303				Test
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Conditions**
Supply Voltage	V_S V^+	±1.5 3		±5 10	±1.5 3		±5 10	V V	Dual Supply Single Supply
Supply Current	I_S		15	40		15	40	μA	$R_{LOAD} = \infty$
Voltage Gain	A_{VD}	10	100		10	100		V/mV	$R_{LOAD} \geq 15K\Omega$
Input Offset Voltage	V_{OS}		0.5	1.0 2.0		1.5	4.0 5.0	mV	$R_{LOAD} = 1.5K\Omega$ $0°C \leq T_A \leq 70°C$
Input Offset Current [1]	I_{OS}		10	200 800		10	200 800	pA	$0°C \leq T_A \leq 70°C$
Input Bias Current [1]	I_B		10	200 1000		10	200 1000	pA	$0°C \leq T_A \leq 70°C$
Common Mode Input Voltage Range [2]	V_{ICR}	-0.3		V^+-1.5	-0.3		V^+ -1.5	V	
Low Level Output Voltage	V_{OL}		0.18	0.4		0.18	0.4	V	I_{SINK} =12mA V_{INPUT} =1V Differential
Low Level Output Current	I_{OL}	24	60		24	60		mA	V_{OL} =1.0V
High Level Leakage Current	I_{LH}		0.01	20		0.01	20	nA	V_{OH} = 5.0V
Response Time [2]	t_{RP}		6.5			6.5		μs	R_L =50KΩ C_L = 15pF 10mV Input Step/10mV Overdrive
			5			5		μs	RL = 50KΩ C_L = 15pF TTL- Level Input Step

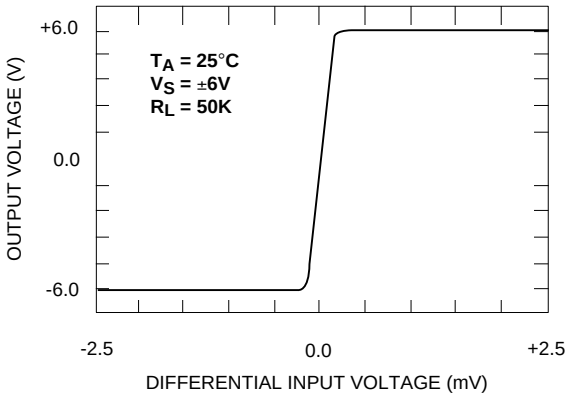
Notes: [1] Consists of junction leakage currents
[2] Sample tested parameters

TYPICAL PERFORMANCE CHARACTERISTICS

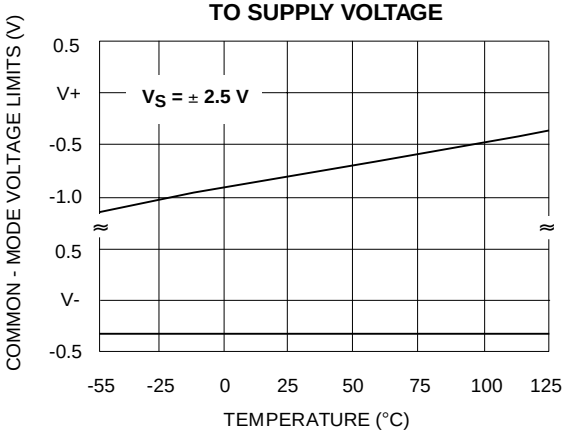
SATURATION VOLTAGE vs. TEMPERATURE



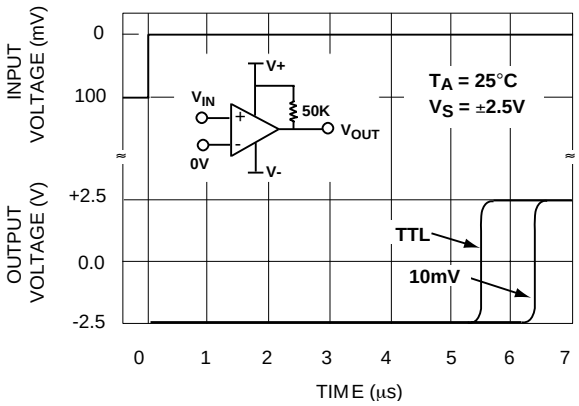
TRANSFER FUNCTION



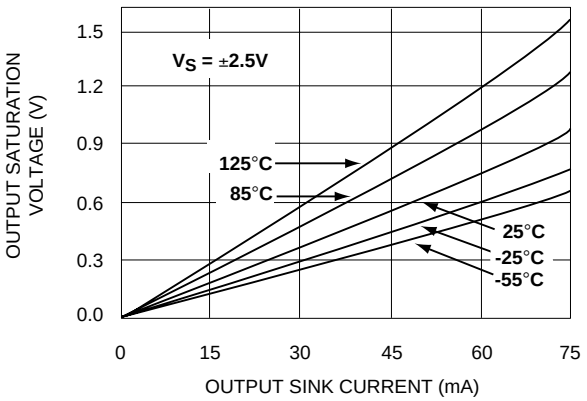
COMMON - MODE VOLTAGE REFERRED TO SUPPLY VOLTAGE



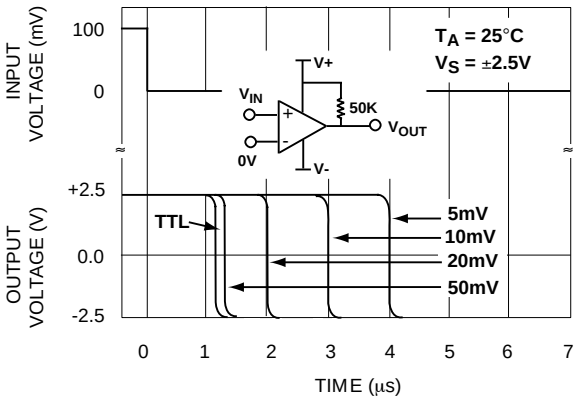
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



SATURATION VOLTAGE vs. SINK CURRENT

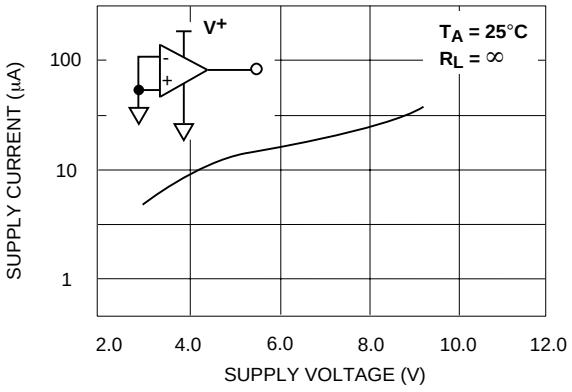


RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES

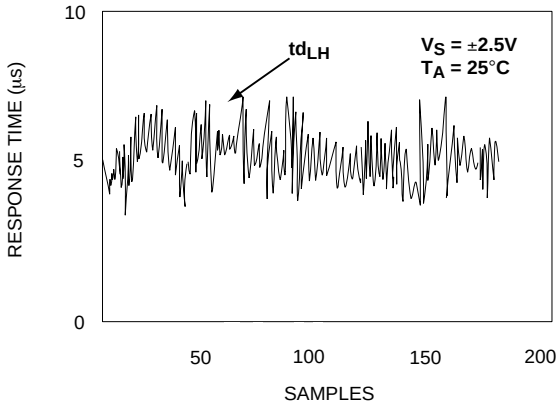


TYPICAL PERFORMANCE CHARACTERISTICS (cont'd)

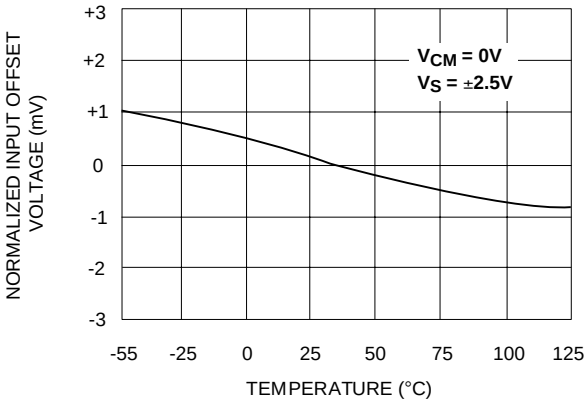
TOTAL SUPPLY CURRENT vs. TOTAL SUPPLY VOLTAGE



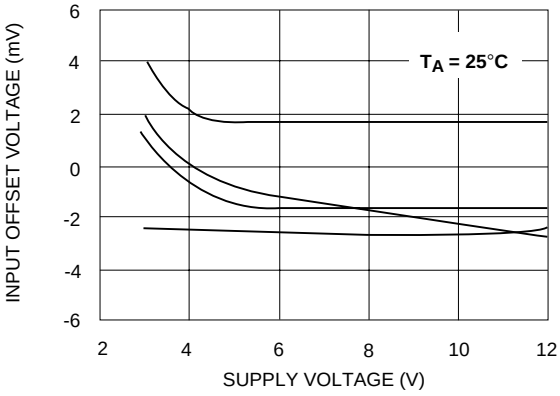
RESPONSE TIME FOR REPRESENTATIVE SAMPLES



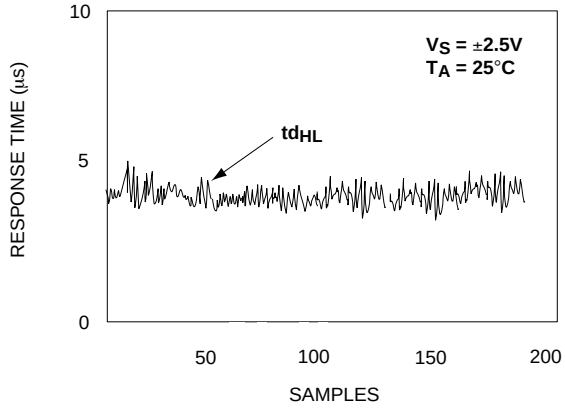
NORMALIZED INPUT OFFSET VOLTAGE vs. TEMPERATURE



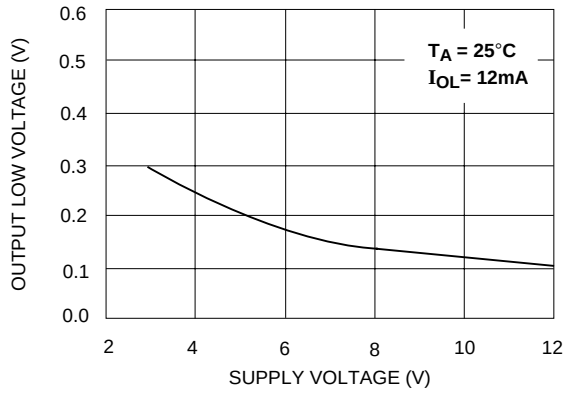
INPUT OFFSET VOLTAGE vs. SUPPLY VOLTAGE REPRESENTATIVE SAMPLES



RESPONSE TIME FOR REPRESENTATIVE SAMPLES

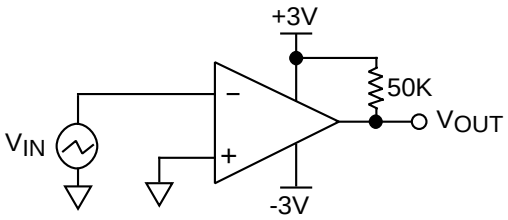


OUTPUT LOW VOLTAGE vs. SUPPLY VOLTAGE



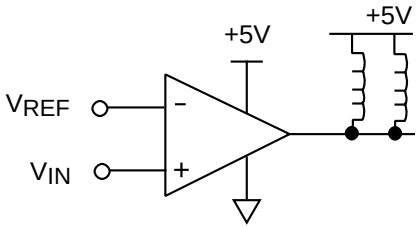
TYPICAL APPLICATIONS

ZERO CROSSING DETECTOR



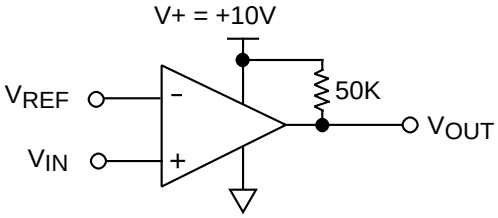
1/2 ALD2303

MULTIPLE RELAY DRIVE



1/2 ALD2303

VOLTAGE LEVEL TRANSLATOR



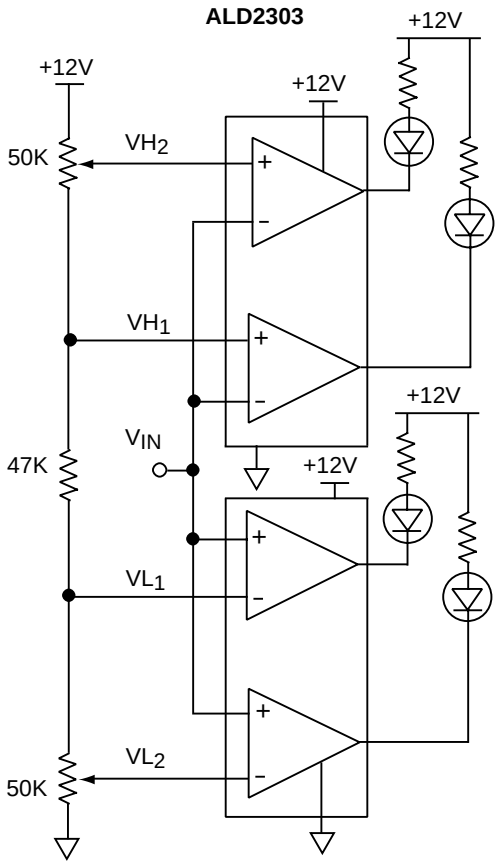
1/2 ALD2303

V_{REF} = 1.4V for TTL input

$V_{REF} = \frac{V^+}{2}$ for CMOS input

Output V_{OUT} swings from rail-to-rail

DOUBLE DUAL LIMIT WINDOW COMPARATOR

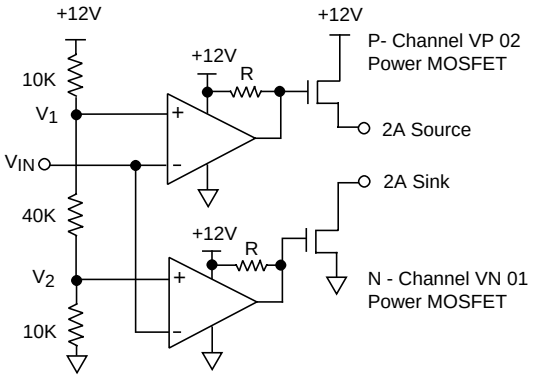


ALD2303

VL_1 and VH_1 first limit window send warning. VL_2 and VH_2 second limit window execute system cutoff.

TYPICAL APPLICATIONS (cont'd)

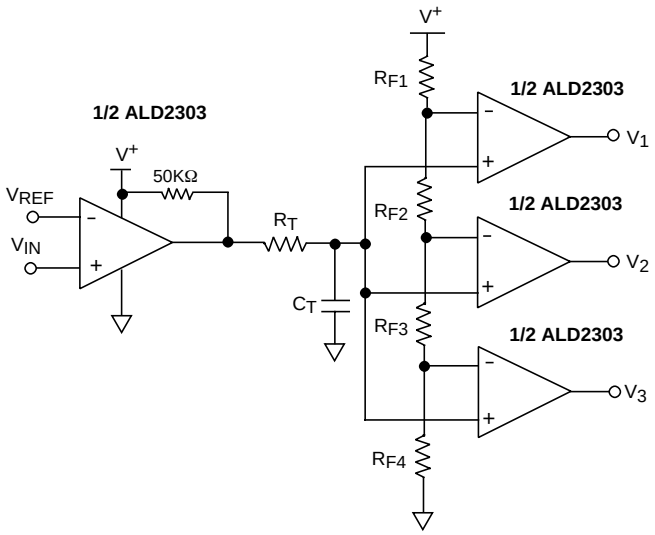
PUSH-PULL COMPLEMENTARY POWER MOSFET DRIVER



R ≥ 50 KΩ

This circuit eliminates crossover current in the complementary power transistors. The outputs can be used to source and sink different loads or tied together to provide push-pull drive of the same load.

TIME DELAY GENERATOR

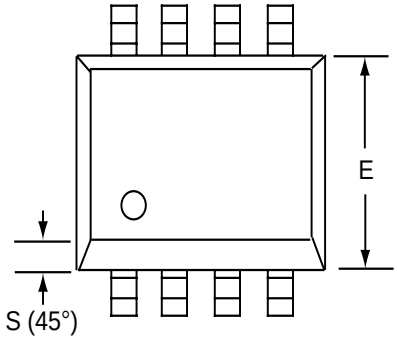


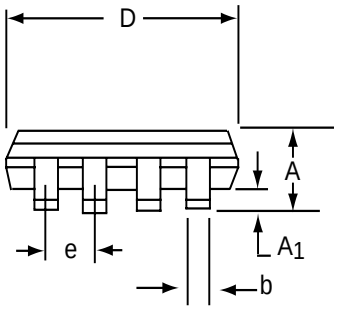
Design & Operating Notes:

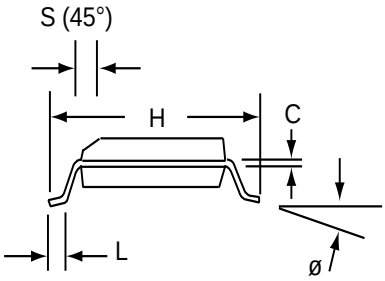
1. In order to minimize stray oscillation, all unused inputs must be tied to ground.
2. The input bias and offset currents are essentially input protection diode reverse bias leakage currents, and are typically less than 1pA at room temperature. These currents are a function of ambient temperature, and would have to be considered in applications where very high source impedance or high accuracy are involved.
3. The high output sinking current of 60mA for each output offers flexibility in many applications, as a separate buffer or driver would not be necessary to drive the intended load. However, as the circuit normally operates close to ambient temperature due to its very low power consumption, thermal effects caused by large output current transients must be considered in certain applications.

SOIC-8 PACKAGE DRAWING

8 Pin Plastic SOIC Package



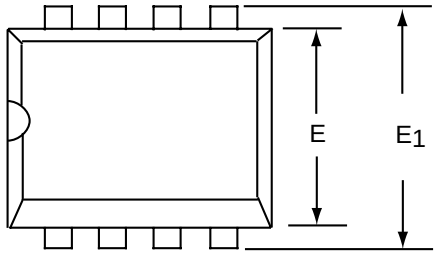


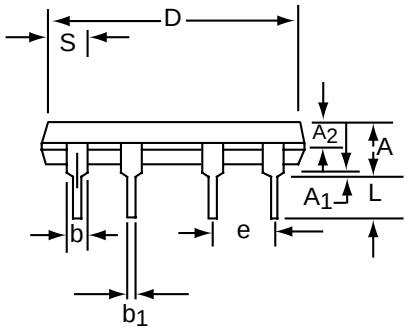


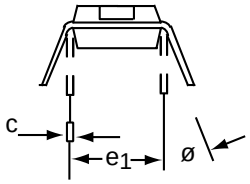
Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A_1	0.10	0.25	0.004	0.010
b	0.35	0.45	0.014	0.018
C	0.18	0.25	0.007	0.010
D-8	4.69	5.00	0.185	0.196
E	3.50	4.05	0.140	0.160
e	1.27 BSC		0.050 BSC	
H	5.70	6.30	0.224	0.248
L	0.60	0.937	0.024	0.037
Ø	0°	8°	0°	8°
S	0.25	0.50	0.010	0.020

PDIP-8 PACKAGE DRAWING

8 Pin Plastic DIP Package



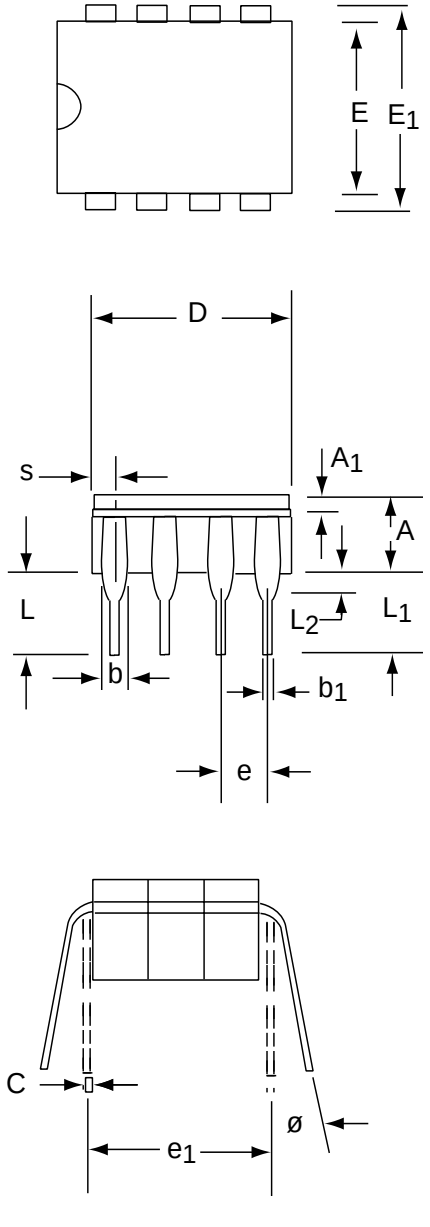




Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	3.81	5.08	0.105	0.200
A_1	0.38	1.27	0.015	0.050
A_2	1.27	2.03	0.050	0.080
b	0.89	1.65	0.035	0.065
b_1	0.38	0.51	0.015	0.020
c	0.20	0.30	0.008	0.012
D-8	9.40	11.68	0.370	0.460
E	5.59	7.11	0.220	0.280
E_1	7.62	8.26	0.300	0.325
e	2.29	2.79	0.090	0.110
e_1	7.37	7.87	0.290	0.310
L	2.79	3.81	0.110	0.150
S-8	1.02	2.03	0.040	0.080
ø	0°	15°	0°	15°

CERDIP-8 PACKAGE DRAWING

8 Pin CERDIP Package



Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	3.55	5.08	0.140	0.200
A_1	1.27	2.16	0.050	0.085
b	0.97	1.65	0.038	0.065
b_1	0.36	0.58	0.014	0.023
C	0.20	0.38	0.008	0.015
D-8	--	10.29	--	0.405
E	5.59	7.87	0.220	0.310
E_1	7.73	8.26	0.290	0.325
e	2.54 BSC		0.100 BSC	
e_1	7.62 BSC		0.300 BSC	
L	3.81	5.08	0.150	0.200
L_1	3.18	--	0.125	--
L_2	0.38	1.78	0.015	0.070
S	--	2.49	--	0.098
Ø	0°	15°	0°	15°