

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 ($\pm 5V$) 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

Operating Temperature Range *		
-55°C to +125°C	0°C to +70°C	0°C to +70°C
8-Pin CERDIP Package	Q8-Pin Small Outline Package (SOIC)	8-Pin Plastic Dip Package
ALD2303A DA	ALD2303A SA	ALD2303A PA
ALD2303 DA	ALD2303 SA	ALD2303 PA

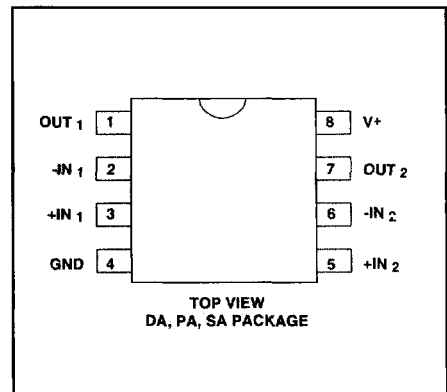
* Contact factory for industrial temperature range

FEATURES

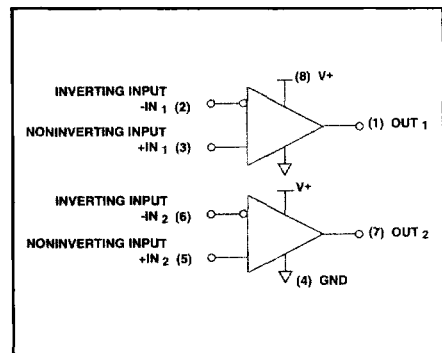
- 3V, 5V and 12V supply
- Guaranteed to drive 200Ω loads
- Fanout of 30LS TTL loads
- Guaranteed maximum supply current of 20µA for each comparator
- Pinout of LM193 type industry standard comparators
- Extremely low input bias currents -- 10pA
- Virtually eliminates source impedance effects
- Single (+5V) and dual supply ($\pm 5V$) operation
- CMOS, NMOS and TTL compatible
- Open drain wired-OR outputs
- High output sinking current -- 60mA
- Low supply current spikes
- High gain -- 100V/mV

7

PIN CONFIGURATION



BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Supply voltage, V^+	13.2V	
Differential input voltage range	-0.3V to $V^+ + 0.3V$	
Power dissipation	600 mW	
Operating temperature range	PA, SA package	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

$T_A = 25^\circ\text{C}$ $V^+ = +5V$ unless otherwise specified

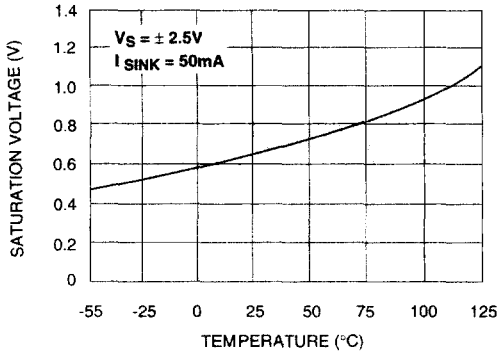
Parameter	Symbol	2303A			2303			Unit	Test Conditions
		Min	Typ	Max	Min	Typ	Max		
Voltage Supply	V_S	± 1.5		± 6	± 1.5		± 6	V	Dual Supply Single Supply
	V^+	3		12	3		12	V	
Supply Current	I_S		15	40		15	40	μA	$R_{LOAD} = \infty$
Voltage Gain	A_{VD}	10	100		10	100		V/mV	$R_{LOAD} \geq 15K\Omega$
Input Offset Voltage	V_{OS}		0.5	1.0 2.0		1.5	4.0 5.0	mV	$R_{LOAD} = 1.5K\Omega$ $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$
Input Offset Current ¹	I_{OS}		10	200 800		10	200 800	pA	$0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$
Input Bias Current ¹	I_B		10	200 1000		10	200 1000	pA	$0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$
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	$I_{SINK} = 12\text{mA}$ $V_{INPUT} = 1V$ 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	$R_L = 50K\Omega$ $C_L = 15\text{pF}$ 10mV Input Step/10mV Overdrive
			5			5		μs	$R_L = 50K\Omega$ $C_L = 15\text{pF}$ TTL-Level Input Step

Notes: ¹ Consists of junction leakage currents

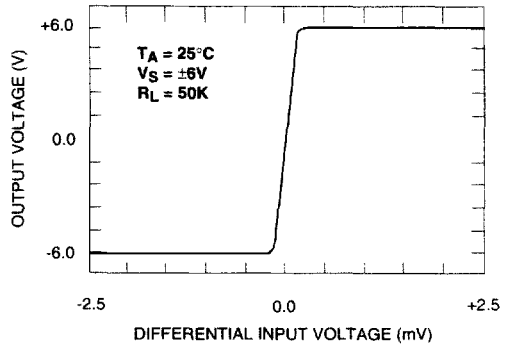
² Sample tested parameters

TYPICAL PERFORMANCE CHARACTERISTICS

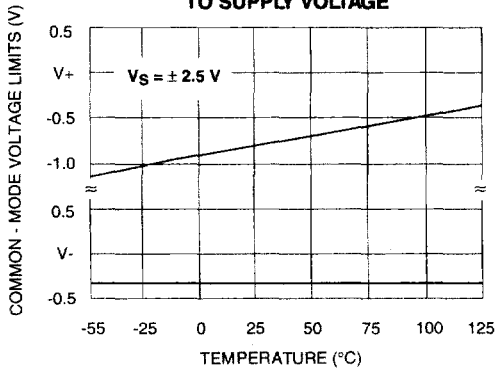
SATURATION VOLTAGE vs. TEMPERATURE



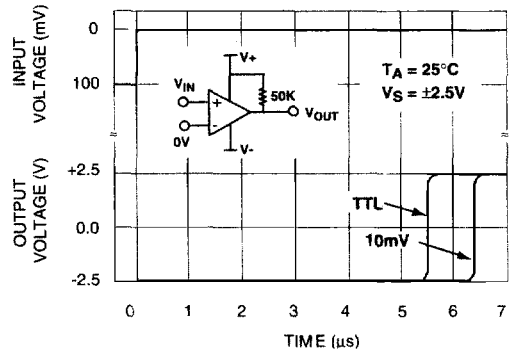
TRANSFER FUNCTION



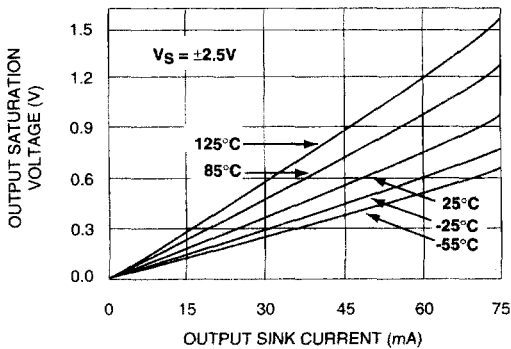
COMMON - MODE VOLTAGE REFERRED TO SUPPLY VOLTAGE



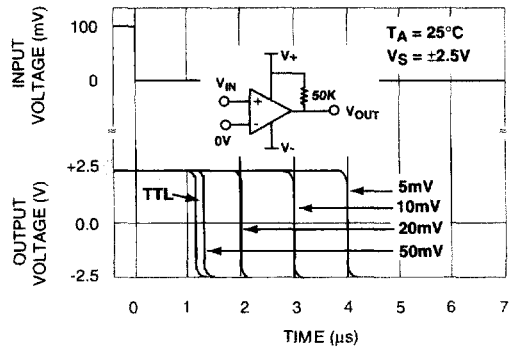
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



SATURATION VOLTAGE vs. SINK CURRENT



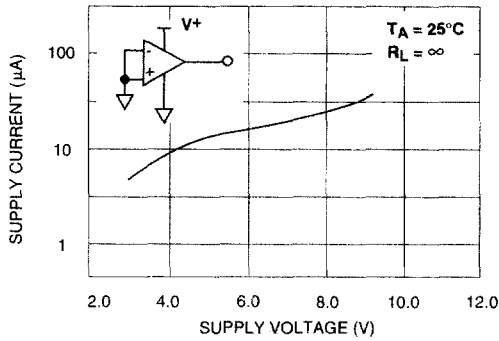
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



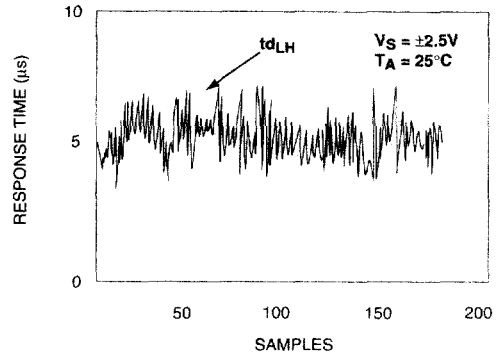
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TYPICAL PERFORMANCE CHARACTERISTICS

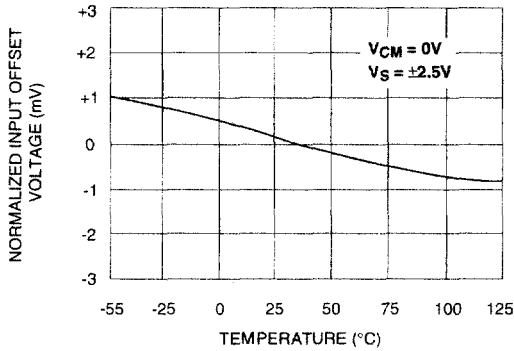
**TOTAL SUPPLY CURRENT vs.
TOTAL SUPPLY VOLTAGE**



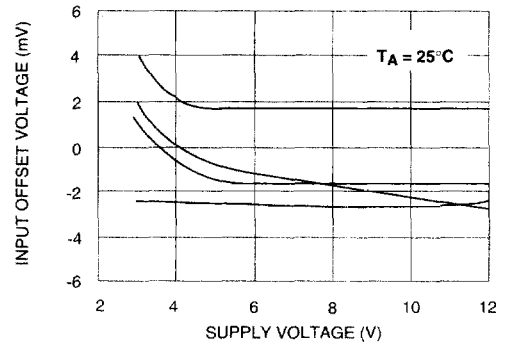
**RESPONSE TIME FOR
REPRESENTATIVE SAMPLES**



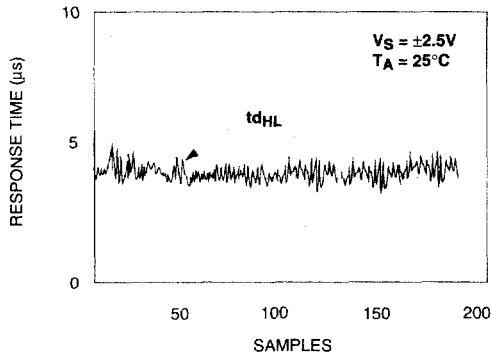
**NORMALIZED INPUT OFFSET VOLTAGE
vs. TEMPERATURE**



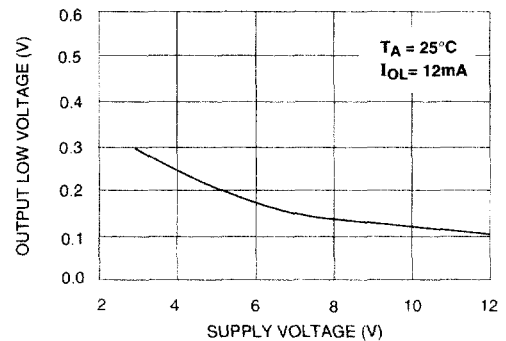
**INPUT OFFSET VOLTAGE vs. SUPPLY
VOLTAGE REPRESENTATIVE SAMPLES**



**RESPONSE TIME FOR
REPRESENTATIVE SAMPLES**

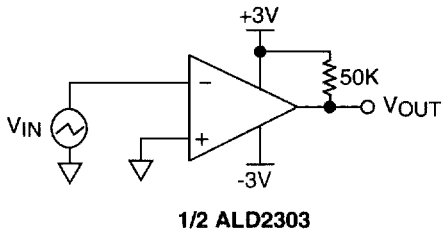


**OUTPUT LOW VOLTAGE
vs. SUPPLY VOLTAGE**

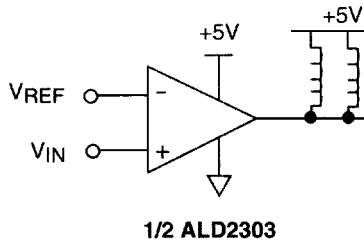


TYPICAL APPLICATIONS

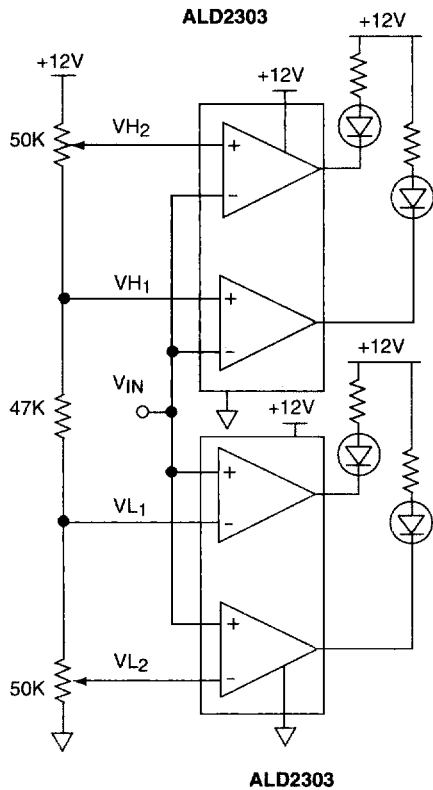
ZERO CROSSING DETECTOR



MULTIPLE RELAY DRIVE

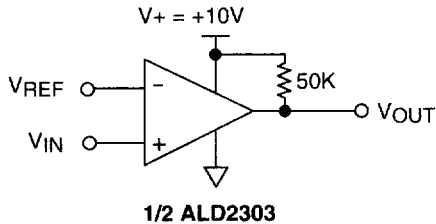


DOUBLE DUAL LIMIT WINDOW COMPARATOR



VL₁ and VH₁ first limit window send warning
 VL₂ and VH₂ second limit window execute system cutoff

VOLTAGE LEVEL TRANSLATOR



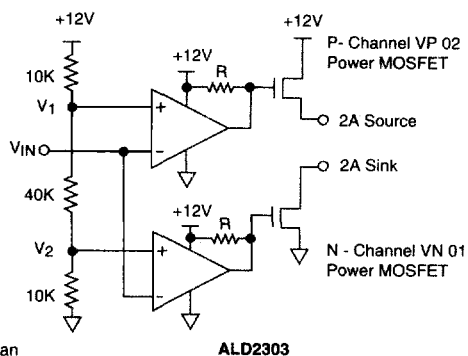
$V_{REF} = 1.4V$ for TTL input

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

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

TYPICAL APPLICATIONS

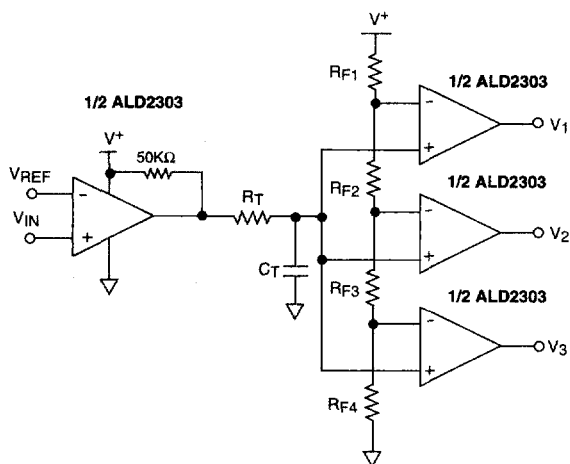
PUSH-PULL COMPLEMENTARY POWER MOSFET DRIVER



$R \geq 50 \text{ K}\Omega$

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 1 pA 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.