DESCRIPTION

The AO2903 is the dual comparator feature low offset voltage, high supply voltage capability, low supply current, low input bias current, low propagation delay and improved 2kV ED performance and input ruggedness through dedicated ESD clamps.

The AO2903 of outputs can be connected to other open-collector outputs to achieve wired-AND relationships. It can operate from 3.3V to 36V, and have low power consuming 55μA (TYP) per channel.

The AO2903 consist of two independent voltage comparators that are designed to operate from a single power supply over a wide range of voltages. Quiescent current is independent of the supply voltage.

The AO2903 is available in SOP8 and MSOP8 packages.

ORDERING INFORMATION

Package Type	Part Number	
SOP8 SPQ: 4,000pcs/Reel	M8	AO2903M8R
		AO2903M8VR
MSOP8 SPQ: 4,000pcs/Reel	MS8	AO2903MS8R
		AO2903MS8VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

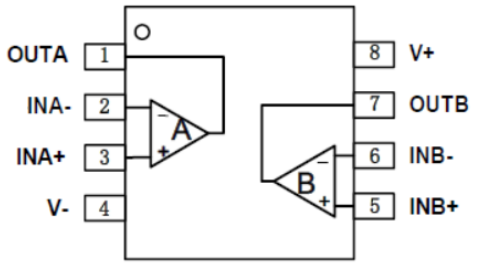
FEATURES

- Supply Range: +3.3V to +36V
- Low Supply Current
  55μA (TYP) per channel at V_S = 5V
- Common-Mode Input Voltage Range Includes Ground
- Low Output Saturation Voltage
- Open-Drain Output for Maximum Flexibility
- SPECIFIED UP TO +125°C
- Available in SOP8 and MSOP8 packages

APPLICATION

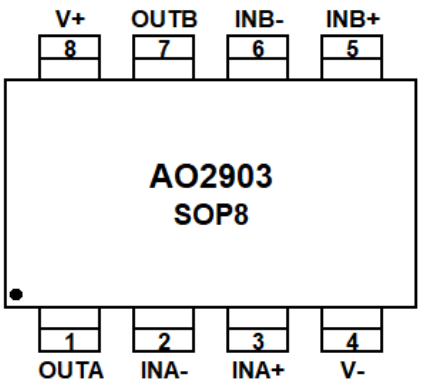
- Vacuum Robot
- Single Phase UPS
- Server PSU
- Cordless Power Tool
- Wireless Infrastructure
- Motor Drives
- Building Automation
- Factory Automation & Control
- Hysteresis Comparators
- Industrial Equipment
- Test and Measurement

TYPICAL APPLICATION

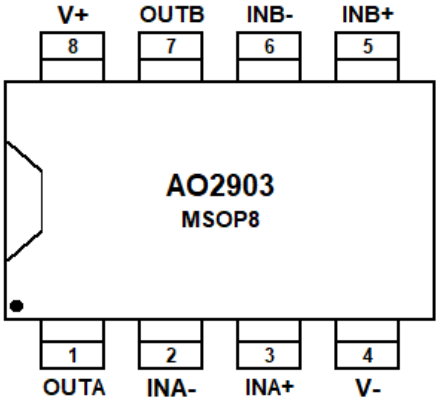


SOP8/MSO8

PIN DESCRIPTION



Top View



Top View

Pin #		Symbol	I/O NOTE1	Function
SOP8	PSOP8			
1	1	OUTA	O	Output, channel A
2	2	INA-	I	Inverting input, channel A
3	3	INA+	I	Noninverting input, channel A
4	4	V-	P	Negative (lowest) power supply
5	5	INB+	I	Noninverting input, channel B
6	6	INB-	I	Inverting input, channel B
7	7	OUTB	O	Output, channel B
8	8	V+	P	Positive (highest) power supply

NOTE1: I=Input, O=Output, P=Power

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range, unless otherwise noted

Supply Voltage, Vs=(V+) - (V-)		36V
Input Voltage Pin[NOTE1]		(V-)-0.3V ~ (V+)0.3V
Signal Output Voltage Pin[NOTE2]		(V-)-0.3V ~ (V+)0.3V
Signal input Current Pin (IN+, IN-)[NOTE1]		-10mA ~ 10mA
Signal Output Current Pin[NOTE2]		-55mA ~ 55mA
Output short-circuits Current[NOTE3]		Continuous
T_A, Operating Range Temperature		-40℃ ~ 125℃
T_J, Junction Temperature		150℃
T_{STG}, Storage Temperature		-55℃ ~ 150℃
ESD Ratings		
$V_{(ESD)}$, Electrostatic Discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS- 001	±2000V
	Charged device model (CDM), per JEDEC specification JESD22-C101	±1000V

Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

NOTE1: 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.

NOTE2: Output terminals are diode-clamped to the power-supply rails. Output signals that can swing more than 0.5V beyond the supply rails should be current-limited to ±55mA or less.

NOTE3: Short-circuit from output to VCC can cause excessive heating and eventual destruction.

RECOMMENDED OPERATING CONDITIONS

over operating free-air temperature range, unless otherwise noted

Parameter		Min.	Typ.	Max.	Unit
Supply Voltage Vs= (V+) - (V-)	Single-Supply	3.3	-	36	V
	Dual-Supply	±1.65	-	±18	

ELECTRICAL CHARACTERISTICS

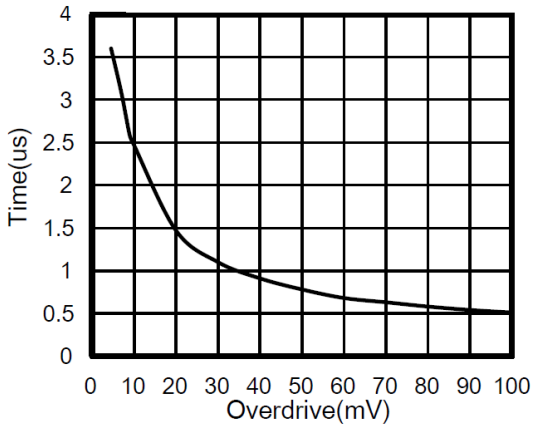
at T_A = +25°C, V_{CM}=(Vs/2), Vs=5V, unless otherwise noted.

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Operating Voltage Range	Vs			3.3	-	36	V
Quiescent Current	I_Q	V_S=5V, no load		-	110	180	uA
		V_S=36V, no load, T_A=-40°C to +125°C		-	150	-	
Input Offset Voltage	Vos	V_S=5V to 36V		-3.5	±0.8	3.5	mV
		V_S=5V to 36V, T_A=-40°C to +125°C		-4	-	4	
Input Bias Current	I_B	T_A=25°C		-	10	50	pA
		T_A=-40°C to +125°C		-	-	100	nA
Input Offset Current	I_{OS}	T_A=25°C		-	10	50	pA
		T_A=-40°C to +125°C		-	-	100	nA
Common-Mode Voltage Range	V_{CM}	V_S=3.3V to 36V		(V-)	-	(V+)-1.5	V
		V_S=3.3V to 36V T_A=-40°C to +125°C		(V-)	-	(V+)-2.0	
Large Signal Differential Voltage Amplification	A_{VD}	V_S=15V, Vo=1.4V to 11.4V R_L≥15k to (V+)		50	200	-	V/mV
Low-Level Output Voltage	V_{OL}	I_{sink}≤4mA, V_{ID}=-1V		-	200	300	mV
Output Current (Sinking)	I_{OL}	V_O=1.5V; V_{ID}=-1V; Vs=5V		6	23	-	mA
High-Level Output Leakage Current	I_{OH-LKG}	(V+)=Vo=5V; V_{ID}=1V		-	80	400	nA
		(V+)=Vo=36V; V_{ID}=1V		-	100	500	
Switching Characteristics							
Propagation Delay H to L	T_{PHL}	Vs=5V	RPU=5.1KΩ, Overdrive =10mV	-	25	-	us
			RPU=5.1KΩ, Overdrive =100mV	-	0.5	-	
		Vs=36V	RPU=5.1KΩ, Overdrive =10mV	-	1.8	-	
			RPU=5.1KΩ, Overdrive =100mV	-	0.7	-	
Propagation Delay L to H	T_{PLH}	Vs=5V	RPU=5.1KΩ, Overdrive =10mV	-	4.1	-	
			RPU=5.1KΩ, Overdrive =100mV	-	1.6	-	
		Vs=36V	RPU=5.1KΩ, Overdrive =10mV	-	3.1	-	
			RPU=5.1KΩ, Overdrive =100mV	-	1.4	-	

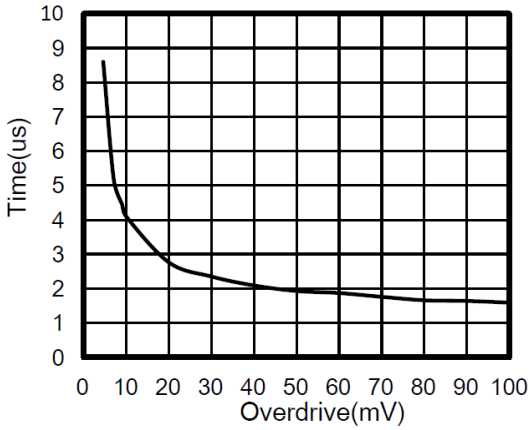
TYPICAL PERFORMANCE CHARACTERISTICS

at T_A = +25°C, Vs=5V, R_{PULLUP}=5.1k, V_{CM} = Vs/2, C_L=15pF, unless otherwise noted.

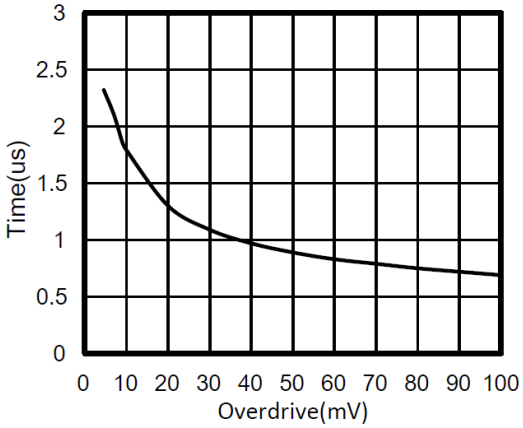
1. Response Time vs Input Overdrives Negative Transition (V_{CC}=5V)



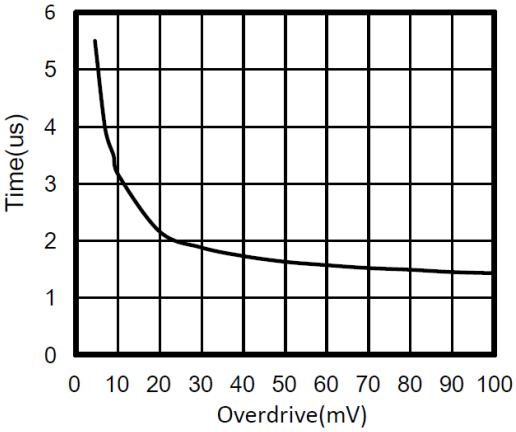
2. Response Time vs Input Overdrives Positive Transition (V_{CC}=5V)



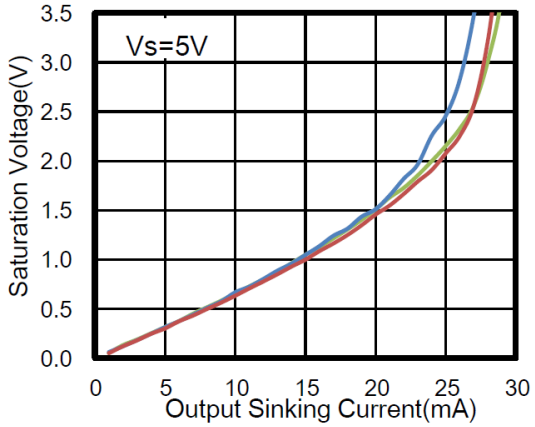
3. Response Time vs Input Overdrives Negative Transition (V_{CC}=36V)



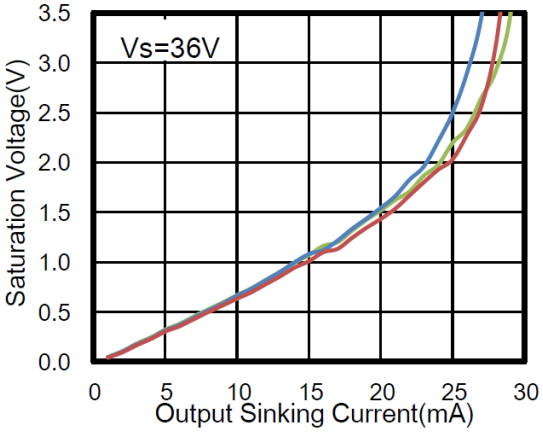
4. Response Time vs Input Overdrives Positive Transition (V_{CC}=36V)



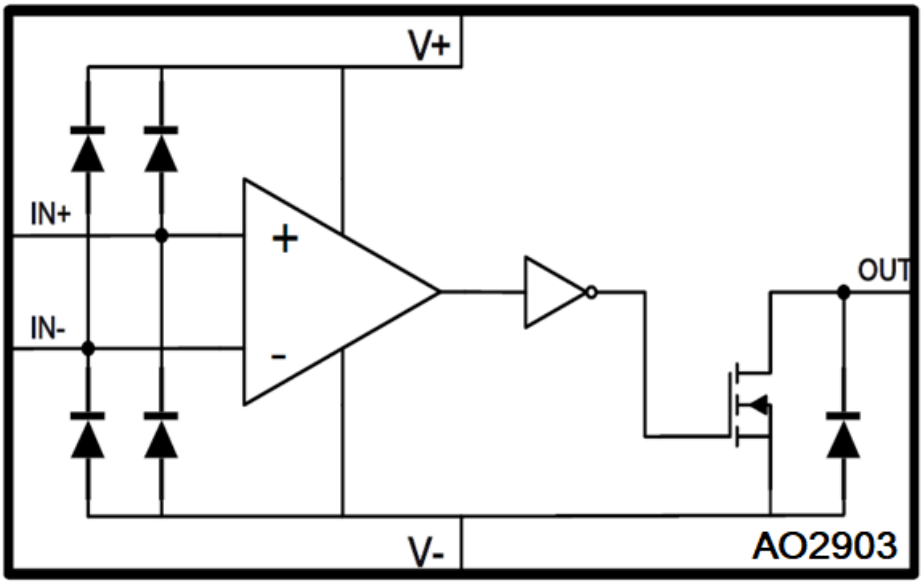
5. Saturation Voltage vs Output Sink Current



6. Saturation Voltage vs Output Sink Current



BLOCK DIAGRAM



Detailed Description

Overview

The AO2903 family of comparators can operate up to 36V on the supply pin. This standard device has proven ubiquity and versatility across a wide range of applications. This is due to its low power and high speed. The open-drain output allows the user to configure the output's logic low voltage (V_{OL}) and can be utilized to enable the comparator to be used in AND functionality.

DETAILED INFORMATION

Application and Implementation

Application Information

AO2903 is typically used to compare a single signal to a reference or two signals against each other. Many users take advantage of the open drain output (logic high with pull-up) to drive the comparison logic output to a logic voltage level to an MCU or logic device. The wide supply range and high voltage capability makes this comparator optimal for level shifting to a higher or lower voltage.

Typical Application

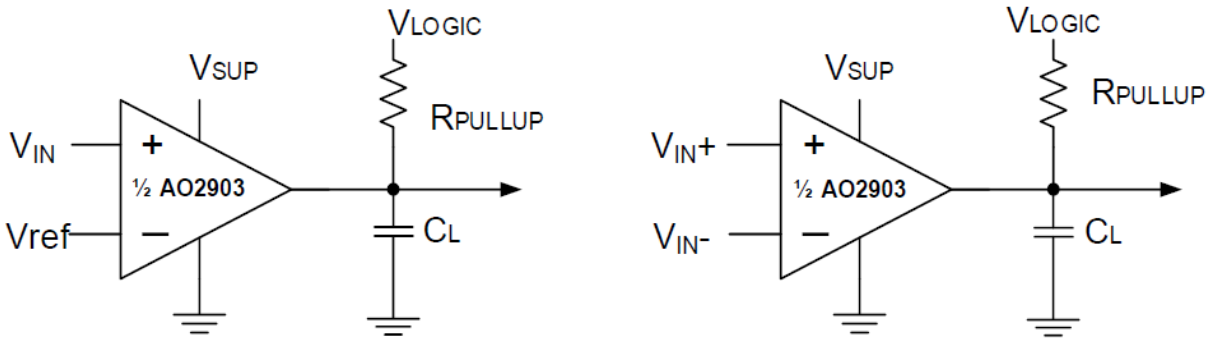


Figure 1. Single-Ended and Differential Comparator Configurations

Detailed Design Procedure

When using the device in a general comparator application, determine the following:

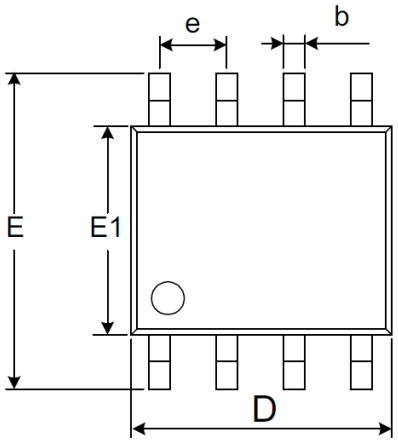
- Input Voltage Range
- Minimum Overdrive Voltage
- Output and Drive Current
- Response Time

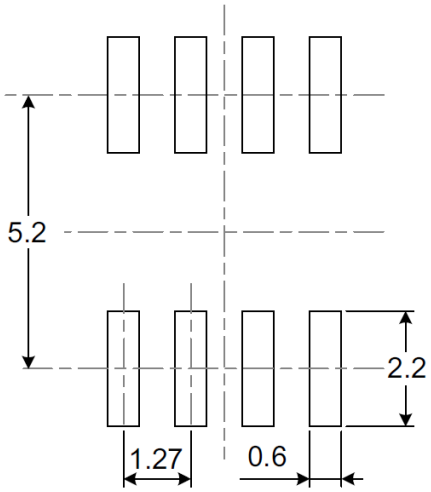
Input Voltage Range

When choosing the input voltage range, the input common mode voltage range (V_{ICR}) must be taken in to account. If temperature operation is below 25°C the V_{ICR} can range from 0V to V_{CC}– 2.0V. This limits the input voltage range to as high as V_{CC}– 2.0V and as low as 0V. Operation outside of this range can yield incorrect comparisons.

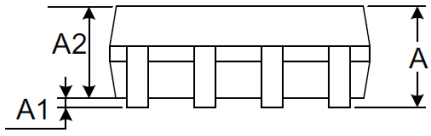
PACKAGE INFORMATION

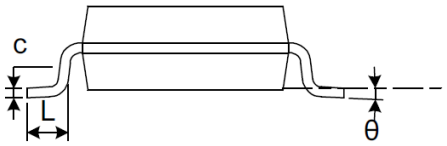
Dimension in SOP8 (Unit: mm)





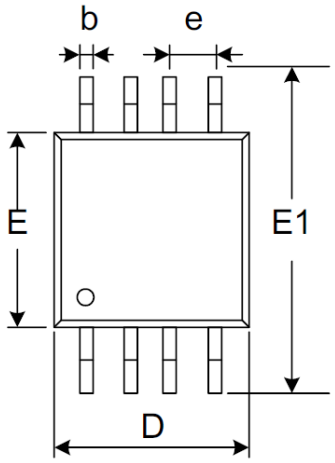
RECOMMENDED LAND PATTERN (Unit: mm)

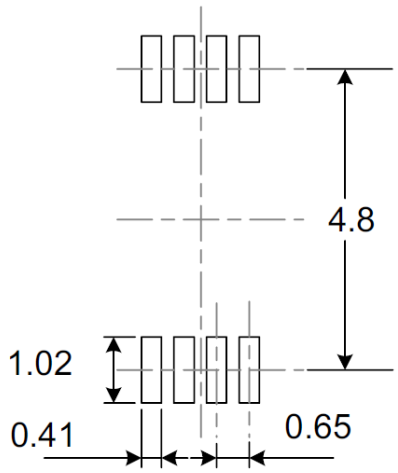




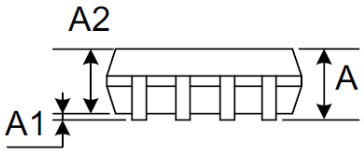
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.187	0.197
e	1.270 BSC		0.050 BSC	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Dimension in MSOP8 (Unit: mm)





RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650 BSC		0.026 BSC	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

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