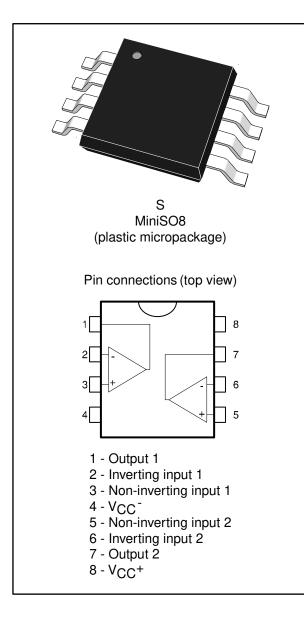


LM2903WH

Low-power, dual-voltage comparator

Datasheet - production data



Features

- Wide, single supply voltage range or dual supplies, 2 V to 36 V or ±1 V to ±18 V
- Very low supply current (0.4 mA) independent of supply voltage (1 mW/comparator at 5 V)
- Low input bias current: 25 nA typ.
- Low input offset current: ±5 nA typ.
- Input common-mode voltage range includes
 negative rail
- Low output saturation voltage: 250 mV typ. (I₀ = 4 mA)
- Differential input voltage range equal to the supply voltage
- TTL, DTL, ECL, MOS, CMOS compatible outputs
- ESD internal protection: 2 kV
- Wide operating temperature range: -40 to 150 °C

Description

This device consists of two independent low-power voltage comparators designed specifically to operate from a single supply over a wide range of voltages. Operation from split power supplies is also possible.

The input common-mode voltage range includes negative rail even though operated from a single power supply voltage.

All pins are protected against electrostatic discharge up to 2 kV. Consequently, the input voltages must not exceed the V_{CC}^+ or V_{CC}^- magnitudes.

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This is information on a product in full production.

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1 Schematic diagram

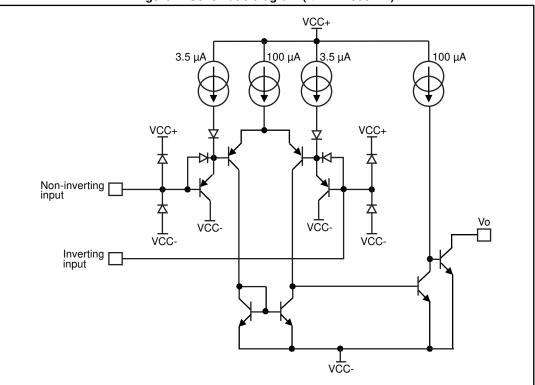


Figure 1: Schematic diagram (1/2 LM2903WH)



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Absolute maximum ratings and operating conditions

Table 1: Absolute maximum ratings

Symbol	Parameter	Value	Unit	
V _{CC}	Supply voltage	±18 or 36		
V_{id}	Differential input voltage	$(V_{cc}) - 0.3 \text{ to } (V_{cc}) + 0.3$	v	
V _{in}	Input voltage	$(v_{CC}) = 0.3 \ 10 \ (v_{CC}) = 0.3$	V	
V _{out}	Output voltage	36		
	Output short-circuit to ground ⁽¹⁾	Infinite		
R _{thja}	Thermal resistance junction to ambient ⁽²⁾	190	°C/W	
R _{thjc}	Thermal resistance junction to case ⁽²⁾	39	0/10	
Tj	Maximum junction temperature	160	°C	
T _{stg}	Storage temperature range	-65 to 160		
	Human body model (HBM) ⁽³⁾	2000		
ESD	Machine model (MM) (4)	200	V	
	CDM: charged device model ⁽⁵⁾	1500		

Notes:

⁽¹⁾Short-circuits from the output to V_{CC}^+ can cause excessive heating and possible destruction. The maximum output current is approximately 20 mA and is independent of the V_{CC}^+ magnitude.

⁽²⁾Short-circuits can cause excessive heating and destructive dissipation. Values are typical and for a four-layer PCB.

 $^{(3)}$ Human body model: a 100 pF capacitor is charged to the specified voltage, then discharged through a 1.5 k Ω resistor between two pins of the device. This is done for all couples of connected pin combinations while the other pins are floating.

⁽⁴⁾Machine model: a 200 pF capacitor is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5 Ω). This is done for all couples of connected pin combinations while the other pins are floating.

⁽⁵⁾Charged device model: all pins and the package are charged together to the specified voltage and then discharged directly to the ground through only one pin. This is done for all pins.

Symbol	Parameter	Value	Unit	
Common mode input voltage range		0 to (V _{CC} ⁺) - 1.5	V	
V _{icm}	-40 °C ≤ T _{amb} ≤ 150 °C	0 to (V _{CC} ⁺) - 2	v	
T _{oper}	Operating free-air temperature range	-40 to 150	°C	

Table 2: Operating conditions



3 Electrical characteristics

Table 3: VCC+ = 5 V, VCC- = GND, Tamb = 25 °C (unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit	
	Input offset voltage (1)			1	7	7 mV	
V _{io}		$-40 \text{ °C} \le T_{amb} \le 150 \text{ °C}$			15 ^{mv}		
	Input offect ourrent			5	50) nA	
l _{io}	Input offset current	-40 °C \leq T _{amb} \leq 150 °C			150		
	Input bias current ⁽²⁾			25	250		
l _{ib}		-40 °C \leq T _{amb} \leq 150 °C			400		
A _{vd}	Large signal voltage gain	V_{CC} = 15 V, R_L = 15 k Ω , V_o = 1 to 11 V	25	200		V/mV	
	Supply current (all comparators)	$V_{CC} = 5 V$, no load		0.4	1	mA	
lcc		$V_{CC} = 30 V$, no load		1	2.5		
V _{id}	Differential input voltage (3)				V_{CC^+}	V	
Max	Low level output voltage	$V_{id} = -1 \ V, \ I_{sink} = 4 \ mA$		250	400	mV	
V _{OL}		-40 °C \leq T _{amb} \leq 150 °C	700		700	111V	
L	High level output current	$V_{CC} \ = \ V_o = \ 30 \ V, \ V_{id} = \ 1 \ V$		0.1		nA	
I _{OH}		-40 °C \leq T _{amb} \leq 150 °C			1	μA	
I _{sink}	Output sink current	V_{id} = -1 V, V $_o$ = 1.5 V	6	16		mA	
t _{res}	Small signal response time ⁽⁴⁾	R_L = 5.1 k Ω to V _{CC+}		1.3		μs	
+	Large signal response time, TTL	$\label{eq:Vref} V_{ref} = 1.4 \ V, \ R_L = 5.1 \ k\Omega \ to \ V_{CC+}, \\ output \ signal \ at \ 50 \ \% \ of \ final \ value$			500	ns	
t _{rel}	input ⁽⁵⁾	$V_{ref} = 1.4 \text{ V}, \text{R}_{\text{L}} = 5.1 \text{k} \Omega \text{ to } \text{V}_{\text{CC+}},$ output signal at 95 % of final value		1		μs	

Notes:

⁽¹⁾At output switch point, $V_O \approx 1.4$ V, $R_S = 0$ Ω with V_{CC}^+ from 5 V to 30 V, and over the full input common-mode range (0 V to $V_{CC}^+ - 1.5$ V).

⁽²⁾The direction of the input current is from the IC due to the PNP input stage. This current is essentially constant, independent of the state of the output, so no loading charge exists on the reference of input lines.

 $^{(3)}$ Positive excursions of input voltage may exceed the power supply level. As long as the other voltage remains within the common-mode range, the comparator provides a proper output state. The low input voltage state must not be less than -0.3 V (or 0.3 V below the negative power supply, if used).

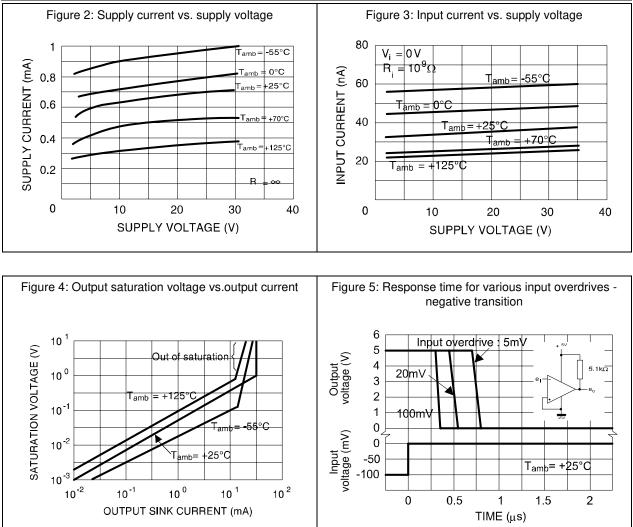
 $^{\rm (4)}$ The response time specified is for a 100 mV input step with 5 mV overdrive.

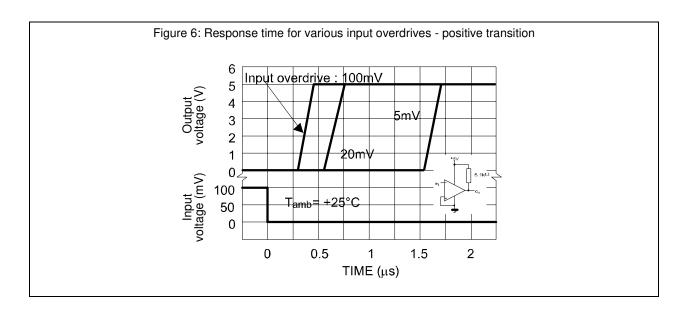
⁽⁵⁾Maximum values are guaranteed by design and evaluation.



Electrical characteristics

LM2903WH

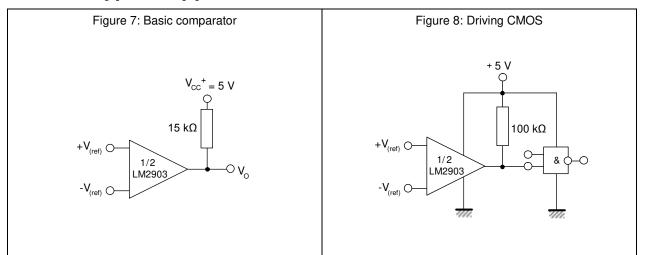


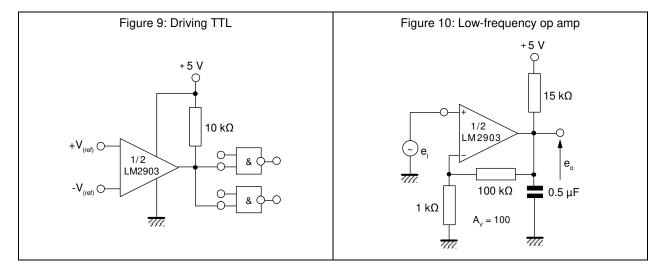


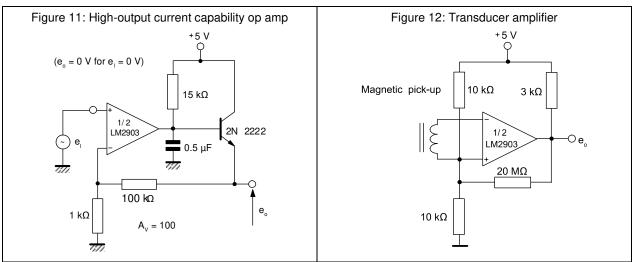
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4 **Typical application schematics**





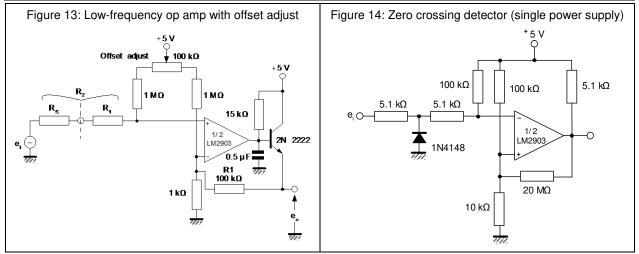


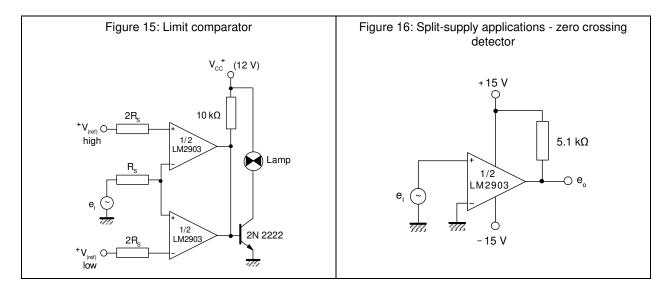
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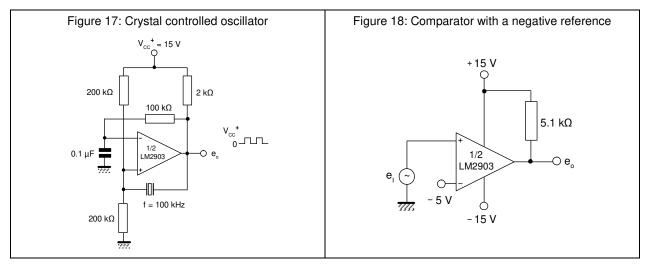
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Typical application schematics

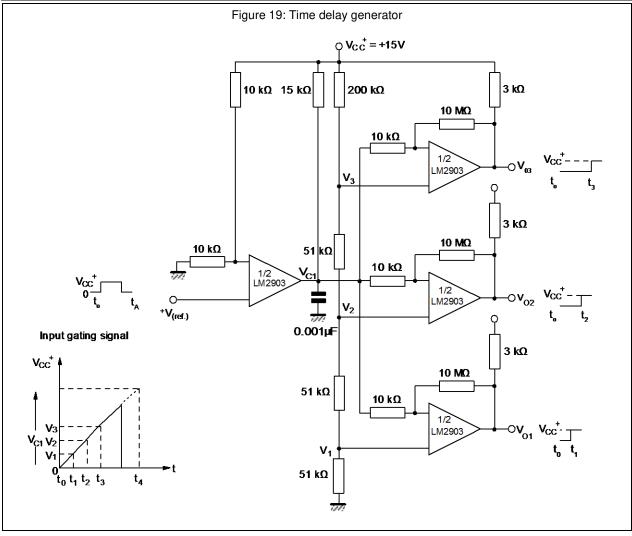
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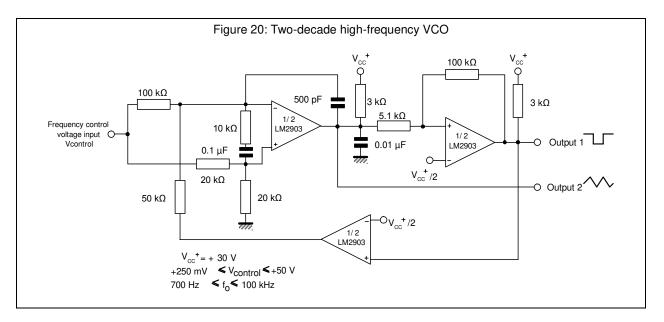












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5 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK[®] is an ST trademark.



5.1 MiniSO8 package information

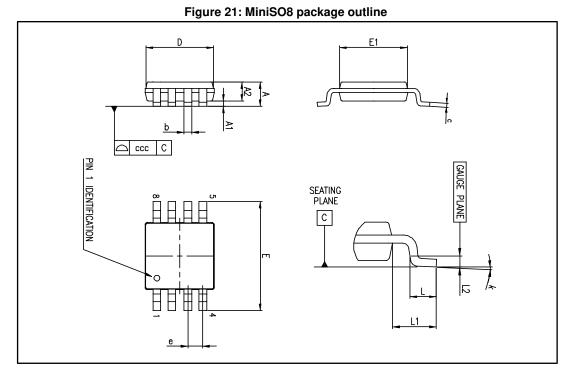


Table 4: MiniSO8 mechanical data

			Dimer	nsions			
Ref.	Millimeters			Inches			
	Min.	Тур.	Max.	Min.	Тур.	Max.	
А			1.1			0.043	
A1	0		0.15	0		0.006	
A2	0.75	0.85	0.95	0.030	0.033	0.037	
b	0.22		0.40	0.009		0.016	
С	0.08		0.23	0.003		0.009	
D	2.80	3.00	3.20	0.11	0.118	0.126	
E	4.65	4.90	5.15	0.183	0.193	0.203	
E1	2.80	3.00	3.10	0.11	0.118	0.122	
е		0.65			0.026		
L	0.40	0.60	0.80	0.016	0.024	0.031	
L1		0.95			0.037		
L2		0.25			0.010		
k	0°		8°	0°		8°	
CCC			0.10			0.004	



6 Ordering information

Table 5: Order codes						
Order code	Temperature range	Package	Packing	Marking		
LM2903WHYST (1)	-40 °C to +150 °C	MiniSO8 (automotive grade)	Tape and reel	K421		

Notes:

 $^{(1)}$ Qualification and characterization according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and Q 002 or equivalent.



7 Revision history

Table 6: Document revision history

Date	Version	Changes
07-Oct-2015	1	Initial release



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