

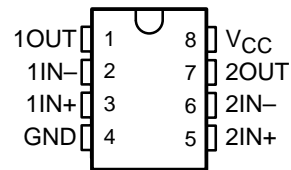
LM2903-Q1 DUAL DIFFERENTIAL COMPARATORS

SLCS141A – MAY 2003 – REVISED JUNE 2003

- Qualification in Accordance With AEC-Q100†
- Qualified for Automotive Applications
- Customer-Specific Configuration Control Can Be Supported Along With Major-Change Approval
- ESD Protection Exceeds 1000 V Per MIL-STD-883, Method 3015; Exceeds 100 V Using Machine Model (C = 200 pF, R = 0)
- Single Supply or Dual Supplies
- Wide Range of Supply Voltage . . . 2 V to 36 V
- Low Supply-Current Drain Independent of Supply Voltage . . . 0.4 mA Typ Per Comparator
- Low Input Bias Current . . . 25 nA Typ
- Low Input Offset Current . . . 5 nA Typ
- Low Input Offset Voltage . . . 2 mV Typ
- Common-Mode Input Voltage Range Includes Ground
- Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage . . . ± 36 V
- Low Output Saturation Voltage
- Output Compatible With TTL, MOS, and CMOS

† Contact factory for details. Q100 qualification data available on request.

D OR PW PACKAGE
(TOP VIEW)



description/ordering information

This device consists of two independent voltage comparators that are designed to operate from a single power supply over a wide range of voltages. Operation from dual supplies also is possible as long as the difference between the two supplies is 2 V to 36 V, and V_{CC} is at least 1.5 V more positive than the input common-mode voltage. Current drain is independent of the supply voltage. The outputs can be connected to other open-collector outputs to achieve wired-AND relationships.

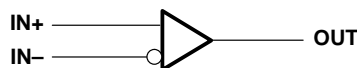
The LM2903Q is tested from -40°C to 125°C and is manufactured to demanding automotive requirements.

ORDERING INFORMATION

T_A	V_{IOmax} AT 25°C	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 125°C	7 mV	SOIC (D)	Tape and reel	LM2903QDRQ1	2903Q1
	7 mV	TSSOP (PW)	Tape and reel	LM2903QPWRQ1	2903Q1

‡ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

symbol (each comparator)



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

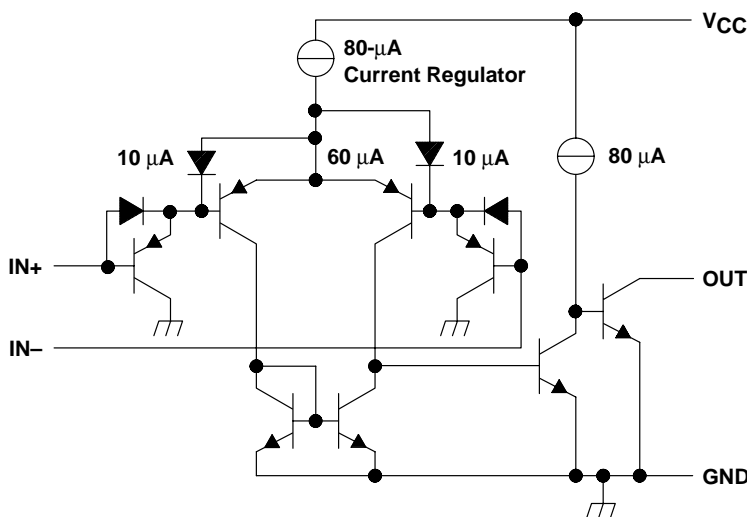
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schematic (each comparator)



COMPONENT COUNT	
Epi-FET	1
Diodes	2
Resistors	2
Transistors	30

Current values shown are nominal.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, V_{CC} (see Note 1)	36 V
Differential input voltage, V_{ID} (see Note 2)	± 36 V
Input voltage range, V_I (either input)	-0.3 V to 36 V
Output voltage, V_O	36 V
Output current, I_O	20 mA
Duration of output short-circuit to ground (see Note 3)	Unlimited
Package thermal impedance, θ_{JA} (see Note 4): D package	97°C/W
PW package	149°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or PW package	260°C
Storage temperature range, T_{stg}	-65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. All voltage values, except differential voltages, are with respect to GND.
 2. Differential voltages are at IN+ with respect to IN-.
 3. Short circuits from outputs to V_{CC} can cause excessive heating and eventual destruction.
 4. The package thermal impedance is calculated in accordance with JESD 51-7.

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electrical characteristics at specified free-air temperature, $V_{CC} = 5\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_A †	LM2903-Q1			UNIT	
			MIN	TYP	MAX		
V_{IO} Input offset voltage	$V_{CC} = 5\text{ V to }30\text{ V}$, $V_O = 1.4\text{ V}$, $V_{IC} = V_{IC(min)}$	25°C		2	7	mV	
		Full range			15		
I_{IO} Input offset current	$V_O = 1.4\text{ V}$	25°C		5	50	nA	
		Full range			200		
I_{IB} Input bias current	$V_O = 1.4\text{ V}$	25°C		-25	-250	nA	
		Full range			-500		
V_{ICR} Common-mode input voltage range‡		25°C		0 to $V_{CC}-1.5$		V	
		Full range		0 to $V_{CC}-2$			
A_{VD} Large-signal differential-voltage amplification	$V_{CC} = 15\text{ V}$, $V_O = 1.4\text{ V to }11.4\text{ V}$, $R_L \geq 15\text{ k}\Omega\text{ to }V_{CC}$	25°C		25	100	V/mV	
I_{OH} High-level output current	$V_{OH} = 5\text{ V}$, $V_{ID} = 1\text{ V}$	25°C		0.1	50	nA	
	$V_{OH} = 30\text{ V}$, $V_{ID} = 1\text{ V}$	Full range			1	μA	
V_{OL} Low-level output voltage	$I_{OL} = 4\text{ mA}$, $V_{ID} = -1\text{ V}$	25°C		150	400	mV	
		Full range			700		
I_{OL} Low-level output current	$V_{OL} = 1.5\text{ V}$, $V_{ID} = -1\text{ V}$	25°C		6		mA	
I_{CC} Supply current	$R_L = \infty$	$V_{CC} = 5\text{ V}$	25°C		0.8	1	mA
		$V_{CC} = 30\text{ V}$	Full range			2.5	

† Full range (MIN or MAX) for LM2903Q is -40°C to 125°C . All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

‡ The voltage at either input or common-mode should not be allowed to go negative by more than 0.3 V. The upper end of the common-mode voltage range is $V_{CC} + 1.5\text{ V}$, but either or both inputs can go to 30 V without damage.

switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS		LM2903-Q1	UNIT
			TYP	
Response time	R_L connected to 5 V through 5.1 k Ω , $C_L = 15\text{ pF}$ §, See Note 5	100-mV input step with 5-mV overdrive	1.3	μs
		TTL-level input step	0.3	

§ C_L includes probe and jig capacitance.

NOTE 5: The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

D (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

8 PINS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
 D. Falls within JEDEC MS-012

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