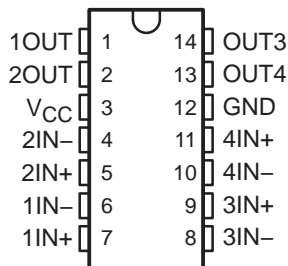


LM2901-Q1 QUADRUPLE DIFFERENTIAL COMPARATOR

SLCS142B – DECEMBER 2003 – REVISED JUNE 2004

- Qualification in Accordance With AEC-Q100†
- Qualified for Automotive Applications
- Customer-Specific Configuration Control Can Be Supported Along With Major-Change Approval
- Single Supply or Dual Supplies
- Low Supply-Current Drain Independent of Supply Voltage . . . 0.8 mA Typ
- Low Input Bias Current . . . 25 nA Typ
- Low Input Offset Current . . . 2 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
- For Single Version in SOT23-5, See TL331

D OR PW PACKAGE
(TOP VIEW)



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

description/ordering information

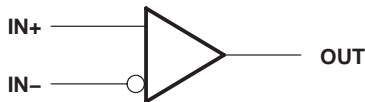
This device consists of four independent voltage comparators that are designed to operate from a single power supply over a wide range of voltages. Operation from dual supplies is possible, as long as the difference between the two supplies is 2 V to 36 V, and V_{CC} is at least 1.5 V more positive than 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.

ORDERING INFORMATION

T _A	V _{IO} max AT 25°C	MAX V _{CC}	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 125°C	7 mV	30 V	SOIC (D)	Reel of 2500	LM2901QDRQ1	2901Q1
			TSSOP (PW)	Reel of 2000	LM2901QPWRQ1	2901Q1
-40°C to 125°C	7 mV	32 V	SOIC (D)	Reel of 2500	LM2901VQDRQ1	2901VQ1
			TSSOP (PW)	Reel of 2000	LM2901VQPWRQ1	2901VQ1
-40°C to 125°C	2 mV	32 V	SOIC (D)	Reel of 2500	LM2901AVQDRQ1	2901AVQ
			TSSOP (PW)	Reel of 2000	LM2901AVQPWRQ1	2901AVQ

‡ 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**

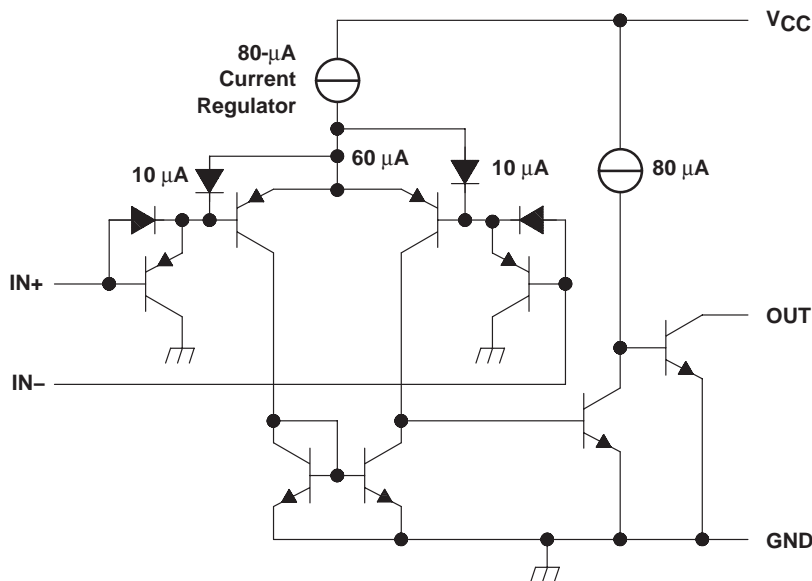
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LM2901-Q1 QUADRUPLE DIFFERENTIAL COMPARATOR

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schematic (each comparator)



All 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 Notes 4 and 5): D package	86°C/W
PW package	113°C/W
Operating virtual junction temperature, T_J	150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	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:
- All voltage values, except differential voltages, are with respect to network ground.
 - Differential voltages are at IN+ with respect to IN-.
 - Short circuits from outputs to V_{CC} can cause excessive heating and eventual destruction.
 - Maximum power dissipation is a function of $T_J(\max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\max) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 - The package thermal impedance is calculated in accordance with JESD 51-7.

LM2901-Q1 QUADRUPLE DIFFERENTIAL COMPARATOR

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

PARAMETER		TEST CONDITIONS†		T_A ‡	MIN	TYP	MAX	UNIT		
V_{IO}	Input offset voltage	$V_{IC} = V_{ICR}(\text{min})$, $V_O = 1.4\text{ V}$, $V_{CC} = 5\text{ V to MAX}\S$	Non-A devices	25°C		2	7	mV		
				Full range			15			
			A-suffix devices	25°C		1	2			
				Full range			4			
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	$V_{ID} = 1\text{ V}$		$V_{OH} = 5\text{ V}$	25°C		0.1	50	nA	
				$V_{OH} = V_{CC}\text{ MAX}\S$	Full range				1	μA
V_{OL}	Low-level output voltage	$V_{ID} = -1\text{ V}$,	$I_{OL} = 4\text{ mA}$	25°C		150	400	mV		
				Full range					700	
I_{OL}	Low-level output current	$V_{ID} = -1\text{ V}$,	$V_{OL} = 1.5\text{ V}$	25°C		6	16	mA		
I_{CC}	Supply current (four comparators)	$V_O = 2.5\text{ V}$, No load		25°C		$V_{CC} = 5\text{ V}$		0.8	2	mA
						$V_{CC} = \text{MAX}\S$			1	

† All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

‡ Full range (MIN to MAX) for LM2901 is -40°C to 125°C . All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

§ $V_{CC}\text{ MAX} = 30\text{ V}$ for non-V devices and 32 V for V-suffix devices.

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

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Response time	R_L connected to 5 V through $5.1\text{ k}\Omega$, $C_L = 15\text{ pF}$ ¶, See Note 6	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 6: The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V .



PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
LM2901AVQDRQ1	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
LM2901AVQPWRQ1	ACTIVE	TSSOP	PW	14	2000	None	CU NIPDAU	Level-1-250C-UNLIM
LM2901QDRQ1	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
LM2901QPWRQ1	ACTIVE	TSSOP	PW	14	2000	None	CU NIPDAU	Level-1-250C-UNLIM
LM2901VQDRQ1	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
LM2901VQPWRQ1	ACTIVE	TSSOP	PW	14	2000	None	CU NIPDAU	Level-1-250C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

None: Not yet available Lead (Pb-Free).

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

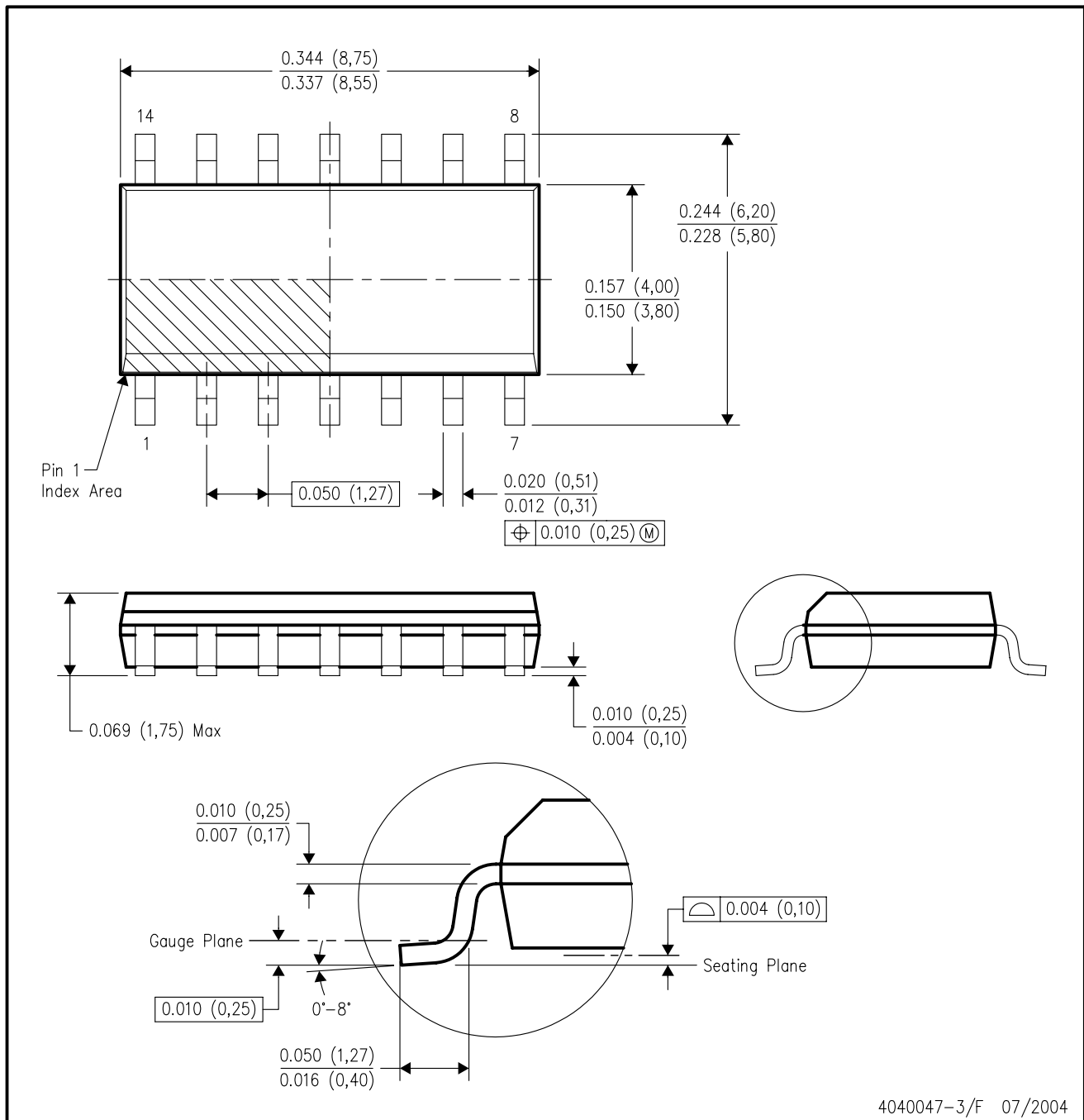
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



- 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 variation AB.

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

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Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265