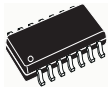
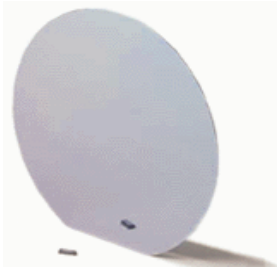
LM2901H

High Temperature Low Power Quad Voltage Comparators

- Wide single supply voltage range or dual supplies for all devices: +2V to +36V or ±1V to ±18V
- Very low supply current (1.1mA) independent of supply voltage (1.4mW/comparator at +5V)
- Low input bias current: 25nA typ.
- Low input offset current: ±5nA typ.
- Input common-mode voltage range includes ground
- Low output saturation voltage: 250mV typ. (I_O = 4mA)
- Differential input voltage range equal to the supply voltage
- TTL, DTL, ECL, MOS, CMOS compatible outputs

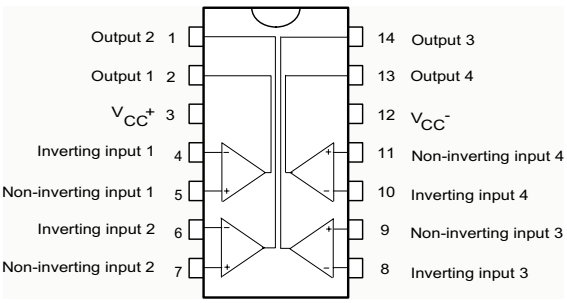


D
SO-14
(Plastic Micropackage)



Wafer form

Pin connections (top view)



Description

This device consists of four independent precision voltage comparators. All these comparators were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible.

These comparators also have a unique characteristic in that the input common-mode voltage range includes ground even though operated from a single power supply voltage.

Order Codes

Part Number	Temperature Range	Package	Packing	Marking
JLM2901H- I6D1	-40°C, +150°C	Wafer		
LM2901HD		SO-14	Tube or Tape & Reel	2901H
LM2901HYD/HYDT		SO-14 (automotive grade level)		2901HY

1 Absolute Maximum Ratings

Table 1. Key parameters and their absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	±18 or 36	V
V_{ID}	Differential Input Voltage	±36	V
V_I	Input Voltage	-0.3 to +36	V
	Output Short-circuit to Ground (1)	20	mA
p_{tot}	Power Dissipation at T_{amb}=+25°C (2)	830	mW
Toper	Operating Free-Air Temperature Range	-40 to +150	°C
T_{stg}	Storage Temperature Range	-65 to +150	°C

1. Short-circuit from the output to V_{CC}^+ can cause excessive heating and eventual destruction. The maximum output current is approximately 20mA, independent of the magnitude of V_{CC}^+
2. Maximum power dissipation has been calculated with $R_{thj\text{-}a}$= 150°C/W for SO-14 package, T_A=+25°C and T_J=+150°C

2 Typical Application Schematics

Figure 1. Schematic diagram (1/4 LM2901)

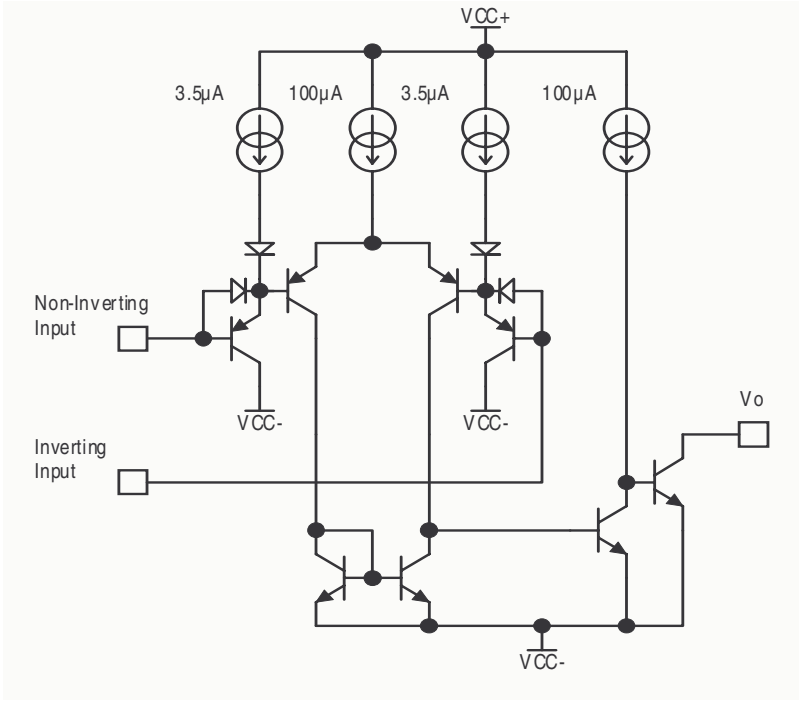
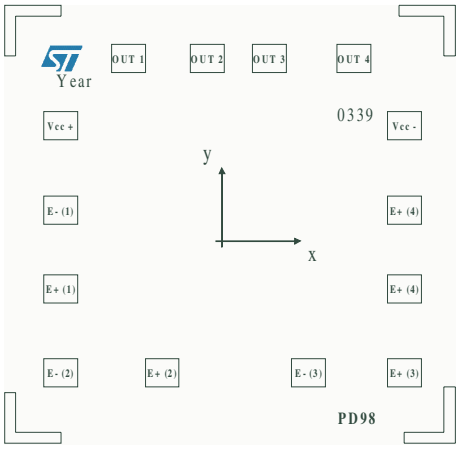


Figure 2. Pad locations



Name	Pad placement		Pad dimension	
	X	Y	X	Y
OUT2	-40	480	80	80
OUT1	-340	480	80	80
VCC+	-530	320	80	80
E-(1)	-530	150	80	80
E+(1)	-530	-150	80	80
E-(2)	-530	-480	80	80
E+(2)	-210	-480	80	80
E-(3)	210	-480	80	80
E+(3)	530	480	80	80
E-(4)	530	-150	80	80
E+(4)	530	150	80	80
VCC -	530	300	80	80
OUT4	430	480	80	80
OUT3	150	480	80	80

The coordinate "Origin" is at the center of the die

All dimensions are specified in micrometer (um)

3 Electrical Characteristics

Table 2. V_{CC}^+ = 5V, V_{CC}^- = GND, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{IO}	Input Offset Voltage (1)	T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$.		1	7 15	mV
I_{IO}	Input Offset Current	T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$.		5	50 150	nA
I_{IB}	Input Bias Current (I_I^+ or I_I^-)(2)	T_{amb} =+ 25°C $T_{min} \le T_{amb} \le T_{max}$.		25	250 400	nA
A_{VD}	Large Signal Voltage Gain	V_{CC} = 15V, R = 15kΩ, V_o = 1 to 11V	25	200		V/mV
I_{CC}	Supply Current (all comparators)	V_{CC} = +5V, no load V_{CC} = +30V, no load		1.1 1.3	2 2.5	mA
V_{ICM}	Input Common Mode Voltage Range (V_{cc}= 30V)(3)	T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$.	0 0		V_{CC}^+-1.5 V_{CC}^+- 2	V
V_{ID}	Differential Input Voltage(4)				V_{CC}^+	V
V_{OL}	Low Level Output Voltage	V_{id} = -1V, I_{sink} = 4mA T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$		250	400 700	mV
I_{OH}	High Level Output Current	$V_{CC} = V_o$ = 30V, V_{id} = 1V T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$		0.1	 1	nA µA
I_{SINK}	Output Sink Current	V_{id} = -1V, V_o = 1.5V T_{amb} = +25°C $T_{min} \le T_{amb} \le T_{max}$	6 2	16		mA
t_{RE}	Small Signal Response Time(5)	R_L = 5.1kΩ connected to V_{CC}^+		1.3		µs
t_{REL}	Large Signal Response Time(6)	TTL input, V_{ref} = +1.4V, R_L = 5.1kΩ to V_{CC}^+ – Output Signal at 50% of final value – Output Signal at 95% of final value			500 1	ns µs

1. At output switch point, VO ≈ 1.4V, RS = 0 with V_{CC}^+ from 5V to 30V, and over the full input common-mode range (0V to V_{CC}^+ –1.5V).
2. The direction of the input current is out of 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. The input common-mode voltage of either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V_{CC}^+ –1.5V, but either or both inputs can go to +30V without damage.
4. The response time specified is for a 100mV input step with 5mV overdrive.
5. 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 will provide a proper output state. The low input voltage state must not be less than –0.3V (or 0.3V bellow the negative power supply, if used)
6. Maximum values are guaranteed by design.

Figure 3. Supply current vs. supply voltage

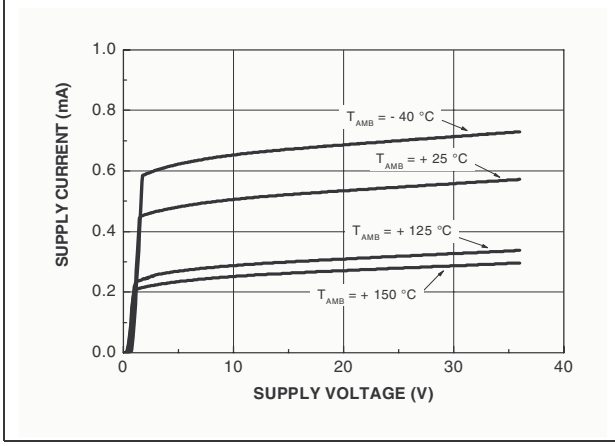


Figure 4. Input current vs. supply voltage

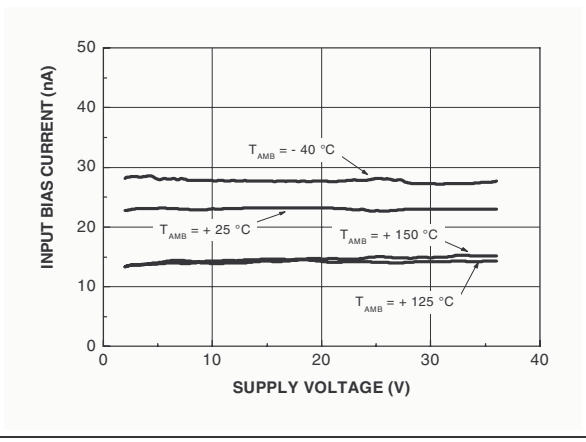


Figure 5. Output saturation voltage vs. output current (Vcc=5V)

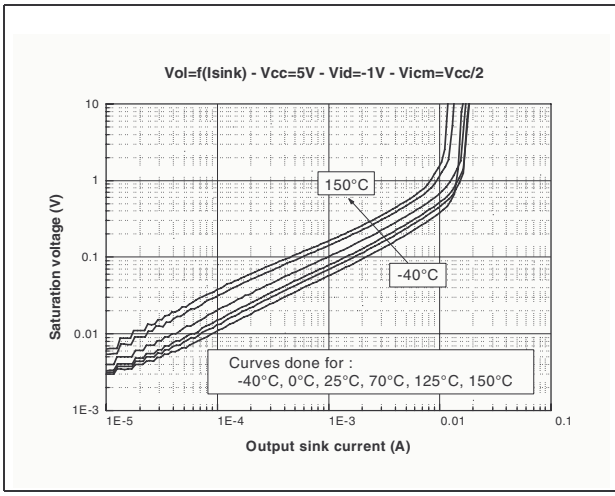


Figure 6. Output saturation voltage vs. output current (Vcc=30V)

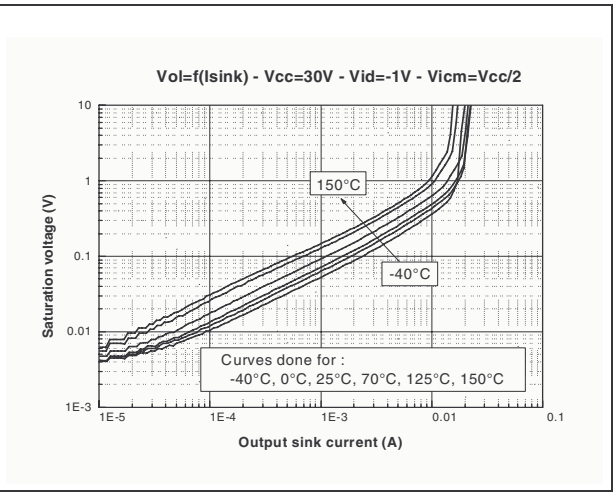


Figure 7. Response time for various input overdrives - positive transition

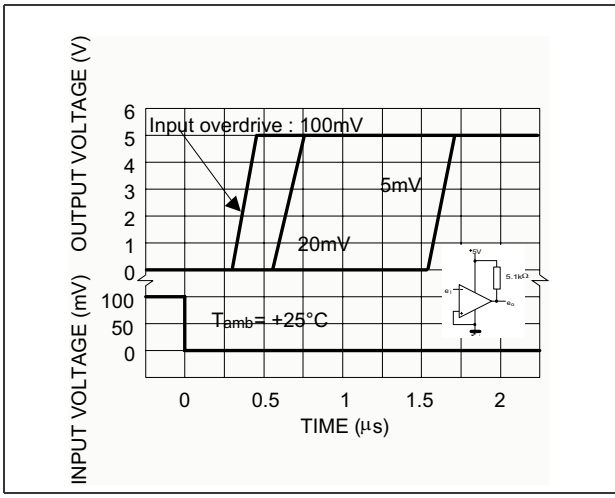
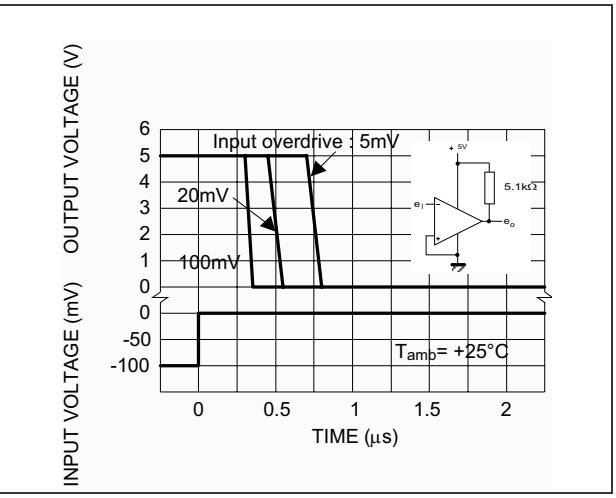


Figure 8. Response time for various input overdrives - negative transition



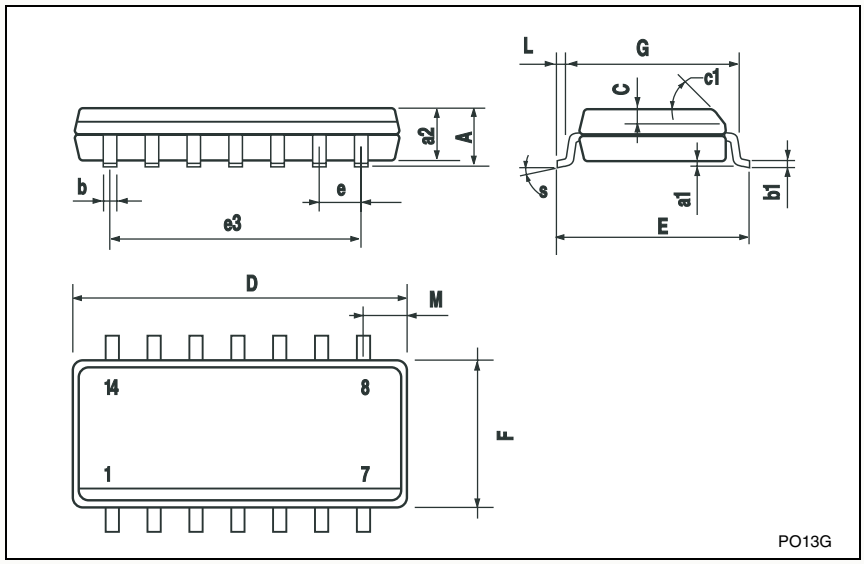
4 Package Mechanical Data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

SO-14 Package

SO-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8° (max.)					



5 Revision History

Date	Revision	Changes
Sept. 2003	1	Initial release.
July 2005	2	PPAP references inserted in the datasheet see *Table on page 1*.
Nov. 2005	3	– Table data reformatted for easier use in *Electrical Characteristics*. – Curves added in *Electrical Characteristics* section.