

Distributed by:

**JAMECO**<sup>®</sup>  
ELECTRONICS

**www.Jameco.com ♦ 1-800-831-4242**

The content and copyrights of the attached  
material are the property of its owner.

Jameco Part Number 816173

# SN54LS31, SN74LS31 DELAY ELEMENTS

SDLS157 – DECEMBER 1983 – REVISED MARCH 1988

- Delay Elements for Generating Delay Lines
- Inverting and Non-inverting Elements
- Buffer NAND Elements Rated at  $I_{OL}$  of 12/24 mA
- PNP Inputs Reduce Fan-In ( $I_{IL} = -0.2$  mA MAX)
- Worst Case MIN/MAX Delays Guaranteed Across Temperature and  $V_{CC}$  Ranges

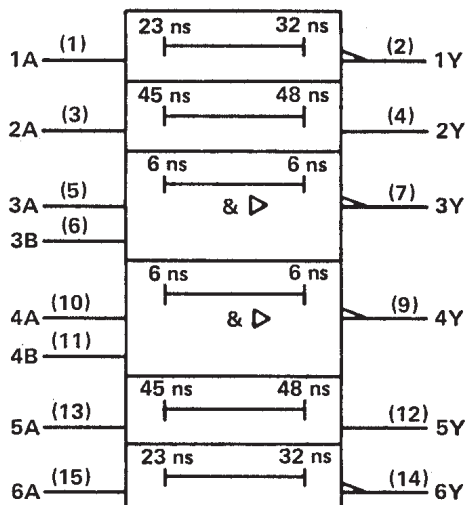
## description

These 'LS31 delay elements are intended to provide well-defined delays across both temperature and  $V_{CC}$  ranges. Used in cascade, a limitless range of delay gating is possible.

All inputs are PNP with  $I_{IL}$  MAX of  $-0.2$  mA. Gates 1, 2, 5, and 6 have standard Low-Power Schottky output sink current capability of 4 and 8 mA  $I_{OL}$ . Buffers 3 and 4 are rated at 12 and 24 mA.

The SN54LS31 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74LS31 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

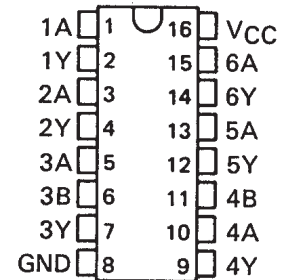
## logic symbol†



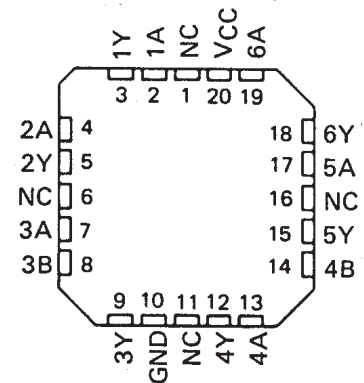
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, N, and W packages.

SN54LS31 . . . J OR W PACKAGE  
SN74LS31 . . . D OR N PACKAGE  
(TOP VIEW)



SN54LS31 . . . FK PACKAGE  
(TOP VIEW)

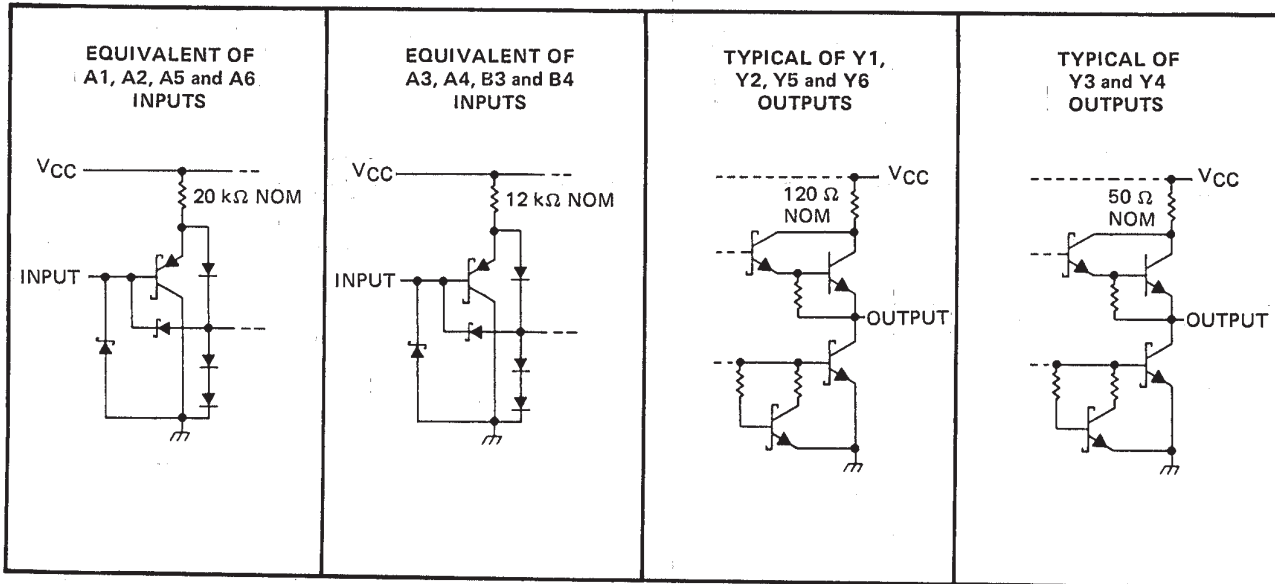


NC - No internal connection

# SN54LS31, SN74LS31 DELAY ELEMENTS

SDLS157 – DECEMBER 1983 – REVISED MARCH 1988

Delay Element	Logic	Typical Delays			Rated I <sub>OL</sub>
		t <sub>PLH</sub>	t <sub>PHL</sub>	AVG.	
Gates 1 and 6	Inverting	32 ns	23 ns	27.5 ns	4 and 8 mA
Gates 2 and 5	Non-Inverting	45 ns	48 ns	46.5 ns	4 and 8 mA
Buffers 3 and 4	2-Input NAND	6 ns	6 ns	6 ns	12 and 24 mA



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

Supply voltage, V <sub>CC</sub> (See Note 1)	7 V
Input voltage, V <sub>I</sub> : All inputs	7 V
Operating free-air temperature range: SN54LS31	– 55°C to 125°C
SN74LS31	0°C to 70°C
Storage temperature range	– 65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

### recommended operating conditions

	SN54LS31			SN74LS31			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub> High-level input voltage	2			2			V
V <sub>IL</sub> Low-level input voltage			0.7			0.8	V
I <sub>OH</sub> High-level output current	Y3, Y4 outputs		– 1.2	Y3, Y4 outputs		– 1.2	mA
	All other outputs		– 0.4	All other outputs		– 0.4	
I <sub>OL</sub> Low-level output current	Y3, Y4 outputs		12	Y3, Y4 outputs		24	mA
	All other outputs		4	All other outputs		8	
T <sub>A</sub> Operating free-air temperature	– 55	125		0	70		°C



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		SN54LS31			SN74LS31			UNIT	
			MIN	TYP‡	MAX	MIN	TYP‡	MAX		
V <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA		-1.5			-1.5			V	
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX	Y3, Y4	I <sub>OH</sub> = -1.2 mA			2.4 3.1			V	
		Others	I <sub>OH</sub> = -0.4 mA			2.5 3.1				
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX	Y3, Y4	I <sub>OL</sub> = 12 mA			0.25 0.4			V	
			I <sub>OL</sub> = 24 mA			0.35 0.5				
		Others	I <sub>OL</sub> = 4 mA			0.25 0.4				
			I <sub>OL</sub> = 8 mA			0.35 0.5				
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V		0.1			0.1			mA	
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V		20			20			μA	
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V		-0.2			-0.2			mA	
I <sub>OS</sub> §	V <sub>CC</sub> = MAX, A3, A4, B3, B4 = 0 V		Y3, Y4			-30 -130			mA	
	V <sub>CC</sub> = MAX, A1, A6 = 0 V, A2, A5 = 4.5 V		Y1, Y2, Y5, Y6			-20 -100				
I <sub>CC</sub>	I <sub>CC</sub> H	V <sub>CC</sub> = MAX, A2, A5 = 4.5 V, all other inputs 0 V		2.3 4			2.3 4			mA
	I <sub>CC</sub> L	V <sub>CC</sub> = MAX, A2, A5 = 0 V, all other inputs 4.5 V		13 20			13 20			

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

§ Not more than one output should be shorted at a time and the duration of the short-circuit should not exceed one second.

switching characteristics, (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54LS31			SN74LS31			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
t <sub>PLH</sub>	A1, A6	Y1, Y6	15			22			ns
t <sub>PHL</sub>			70			65			
t <sub>PLH</sub>	A2, A5	Y2, Y5	9			13			ns
t <sub>PHL</sub>			50			45			
t <sub>PLH</sub>	A3, B3, A4, Y4	Y3, Y4	22			31			ns
t <sub>PHL</sub>			90			80			
t <sub>PLH</sub>	Y4	Y3, Y4	20			30			ns
t <sub>PHL</sub>			105			95			
t <sub>PLH</sub>	Y4	Y3, Y4	2			2			ns
t <sub>PHL</sub>			20			15			
t <sub>PHL</sub>	Y4	Y3, Y4	2			2			ns
t <sub>PHL</sub>			20			15			

NOTE 2: V<sub>CC</sub> = MIN to MAX

R<sub>L</sub> = 667 Ω, C<sub>L</sub> = 45 pF for Y3 and Y4.

R<sub>L</sub> = 2 kΩ, C<sub>L</sub> = 15 pF for Y1, Y2, Y5 and Y6.

T<sub>A</sub> = MIN to MAX

Load circuits and voltage waveforms are shown in Section 1.

## IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.