

- Cascading Circuitry Provided Internally
- Synchronous Operation
- Individual Preset to Each Flip-Flop
- Fully Independent Clear Input

TYPES	TYPICAL MAXIMUM COUNT FREQUENCY	TYPICAL POWER DISSIPATION
74LS192,74LS193	32 MHz	95 mW

**description**

These monolithic circuit, synchronous reversible (up/down) counters having a complexity of 55 equivalent gates. 74LS192 circuits are BCD counter\* 74LS193 are 4-bit binary counters. Synchronous operation is provided

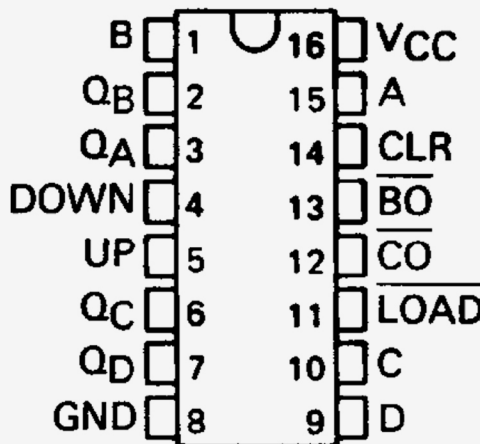
by having all flip-flops clocked simultaneously so that the outputs change coincidentally with each other when so instructed by the steering logic. This mode of operation eliminates the output counting spikes which are normally associated with asynchronous (ripple-clock) counters.

The outputs of the four master-slave flip-flops are triggered by a low-to-high-level transition of either count (clock) input. The direction of counting is determined by which count input is pulsed while the other count input is high.

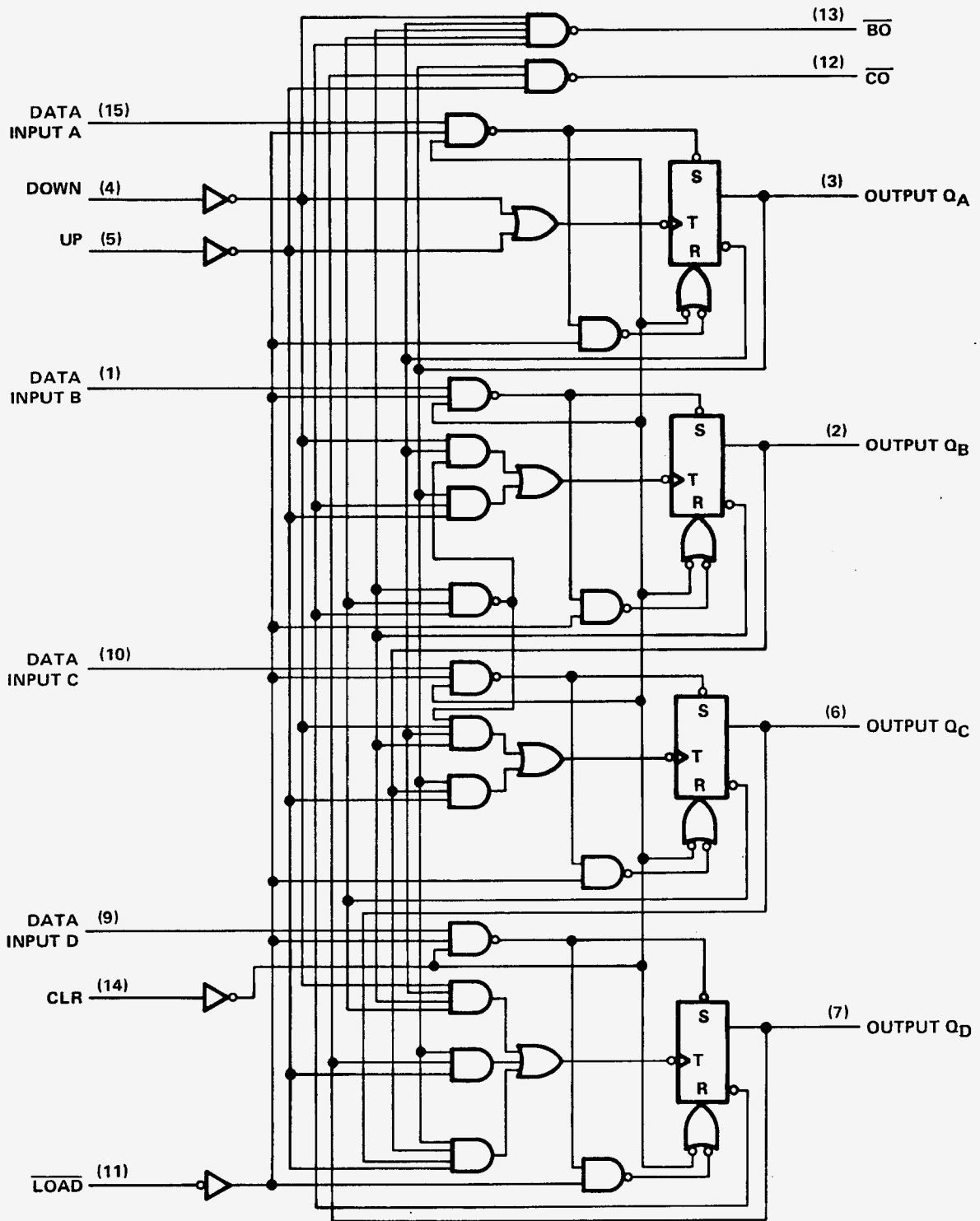
All four counters are fully programmable; that is, each output may be preset to either level by entering the desired data at the data inputs while the load input is low. The output will change to agree with the data inputs independently of the count pulse. This feature allows the counters to be used as modulo-N dividers by simply modifying the count length with the preset inputs. A clear input has been provided which forces all outputs to the low level when a high level is applied. The clear, count, and load inputs are buffered to lower the drive requirements. This reduces the number of clock drivers, etc., required for long words.

These counters were designed to be cascaded without the need for external circuitry. Both borrow and carry outputs are available to cascade both the up and down-counting functions. The borrow output produces a pulse equal in width to the count-down input when the counter underflows. Similarly, the carry output produces a pulse equal in width to the count-up input when an overflow condition exists. The counters can then be easily cascaded by feeding the borrow and carry outputs to the count-down and count-up inputs respectively of the succeeding counter.

74LS192 74LS193  
(TOP VIEW)



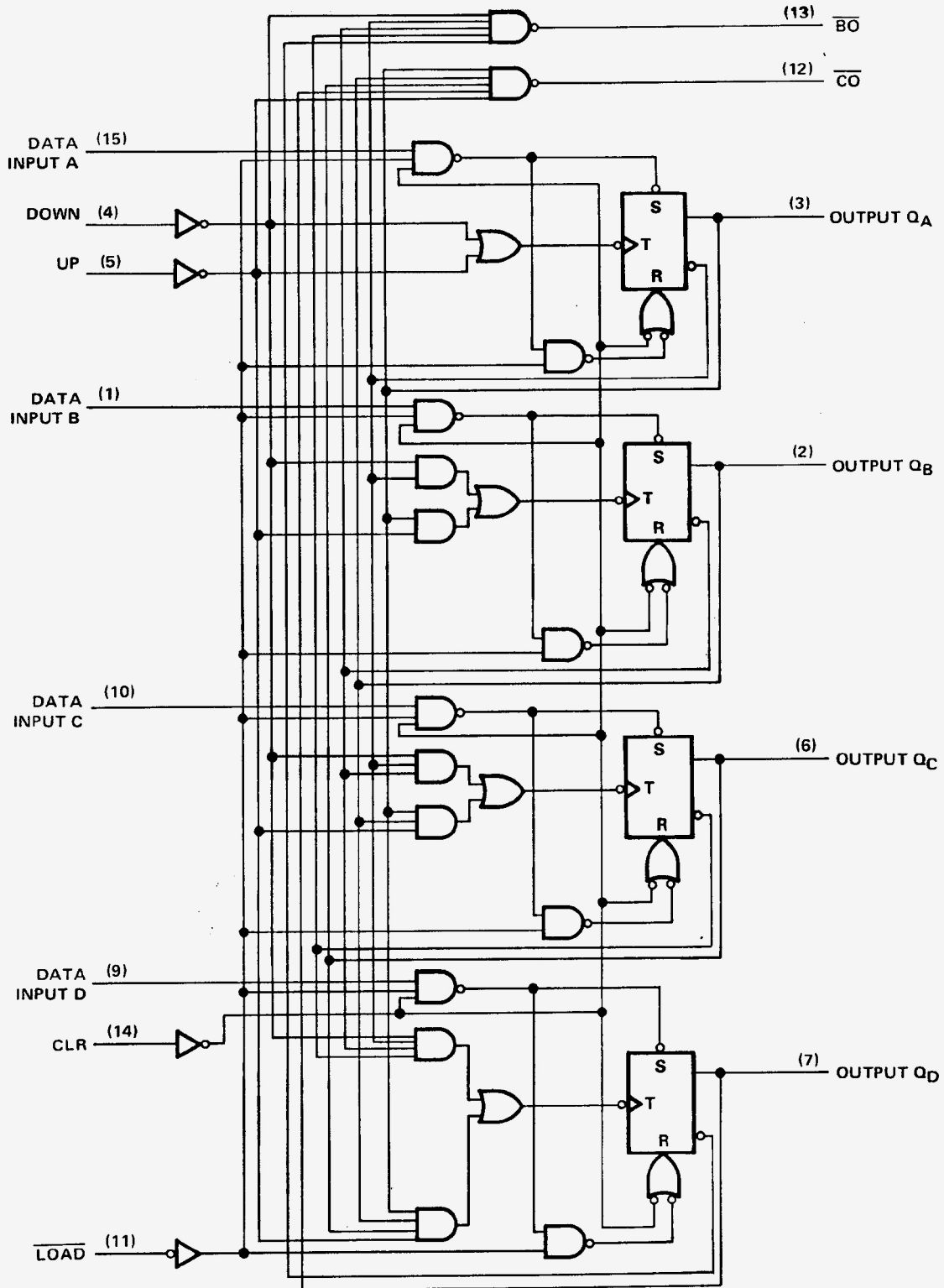
# XD74LS192 DIP-16 XD74LS193 DIP-16



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

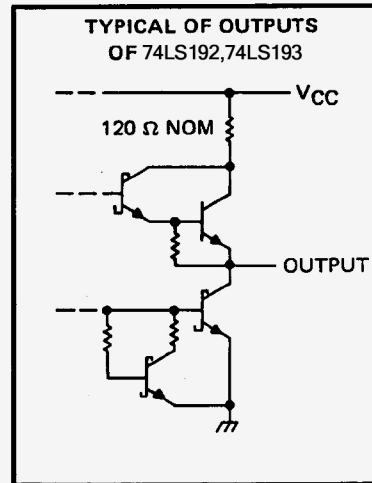
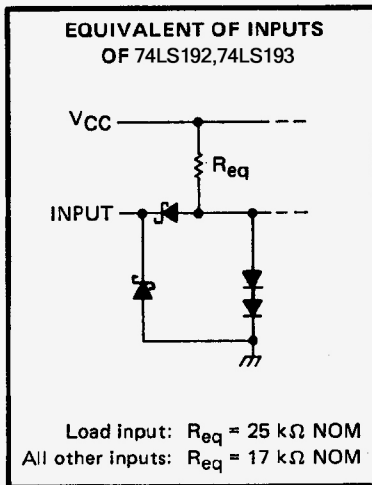
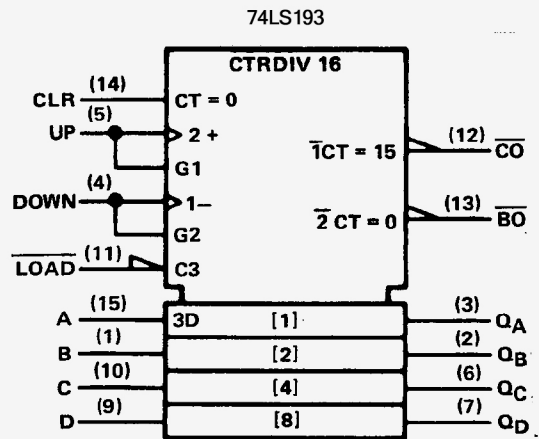
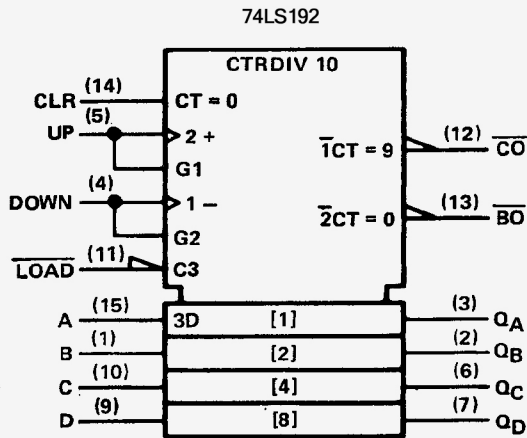
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logic diagram (positive logic)



# XD74LS192 DIP-16 XD74LS193 DIP-16

logic symbols†





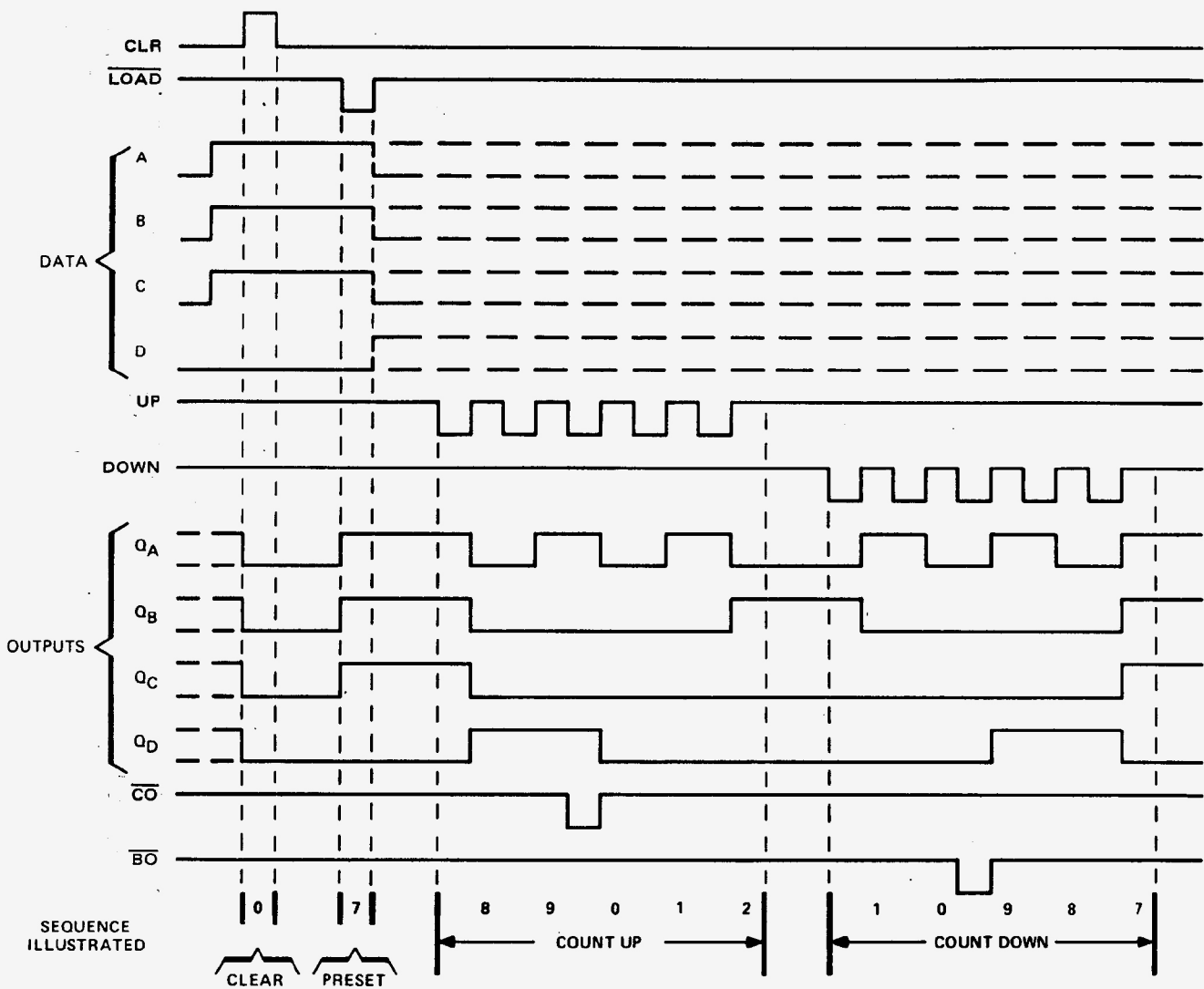
# XD74LS192 DIP-16 XD74LS193 DIP-16

## 74LS192 DECADE COUNTERS

### typical clear, load, and count sequences

Illustrated below is the following sequence:

1. Clear outputs to zero.
2. Load (preset) to BCD seven.
3. Count up to eight, nine, carry, zero, one, and two.
4. Count down to one, zero, borrow, nine, eight, and seven.



- NOTES: A. Clear overrides load, data, and count inputs.  
 B. When counting up, count-down input must be high; when counting down, count-up input must be high.

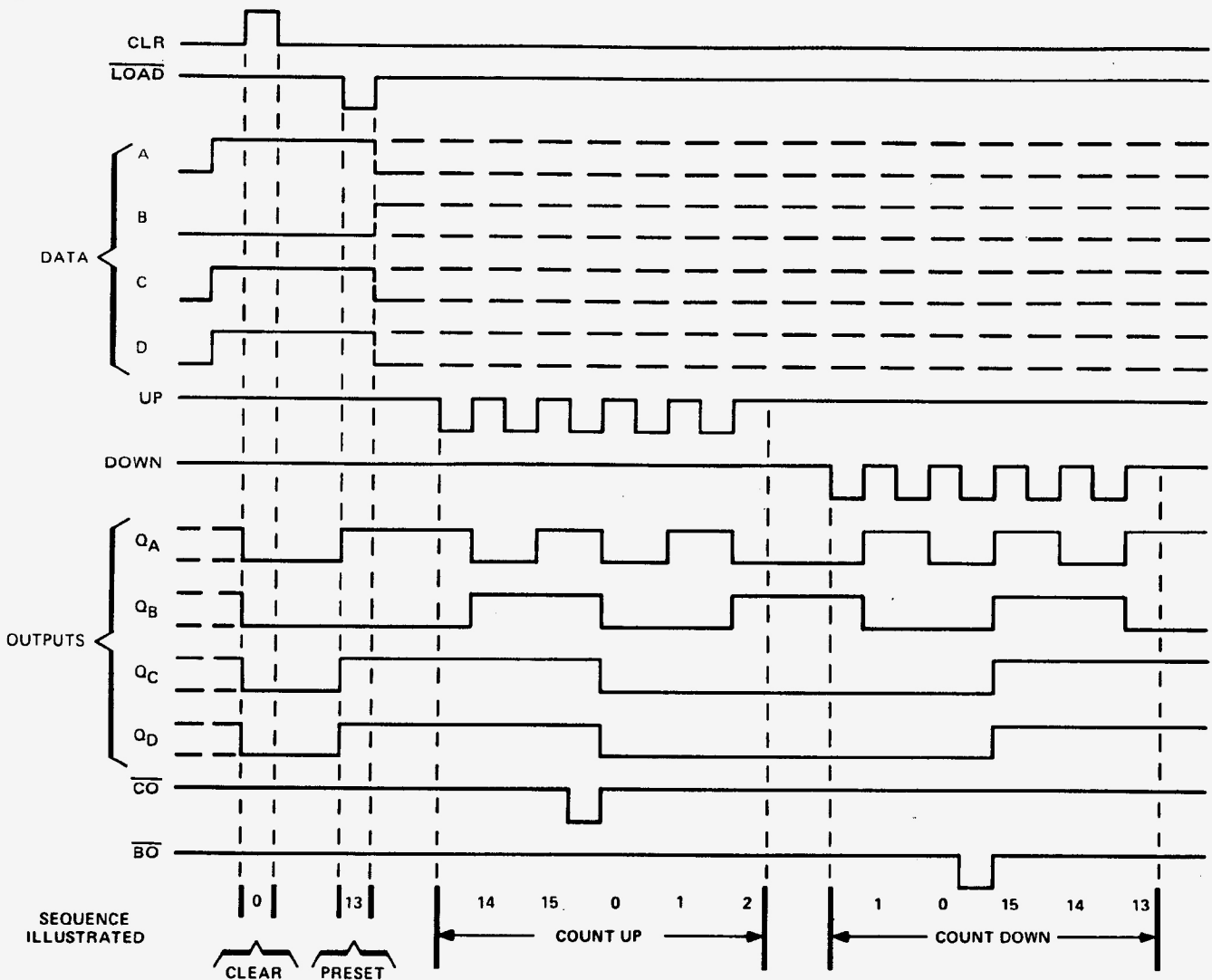
# XD74LS192 DIP-16 XD74LS193 DIP-16

## 74LS193 BINARY COUNTERS

### typical clear, load, and count sequences

Illustrated below is the following sequence:

1. Clear outputs to zero.
2. Load (preset) to binary thirteen.
3. Count up to fourteen, fifteen, carry, zero, one, and two.
4. Count down to one, zero, borrow, fifteen, fourteen, and thirteen.



NOTES: A. Clear overrides load, data, and count inputs.

B. When counting up, count-down input must be high; when counting down, count-up input must be high.

# XD74LS192 DIP-16 XD74LS193 DIP-16

## recommended operating conditions

		74LS192 74LS193			UNIT
		MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.75	5	5.25	V
I <sub>OH</sub>	High-level output current			-400	μA
I <sub>OL</sub>	Low-level output current			8	mA
f <sub>clock</sub>	Clock frequency	0		25	MHz
t <sub>w</sub>	Width of any input pulse	20			ns
t <sub>su</sub>	Clear inactive-state setup time	15			ns
	Load inactive-state setup time	15			ns
	Data setup time (see Figure 1)	20			ns
t <sub>h</sub>	Data hold time	5			ns
T <sub>A</sub>	Operating free-air temperature range	0		70	°C

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

PARAMETER	TEST CONDITIONS†	74LS192 74LS193		UNIT	
		MIN	TYP‡		MAX
V <sub>IH</sub>	High-level input voltage	2		V	
V <sub>IL</sub>	Low-level input voltage			0.8	V
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA		-1.5	V
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>IL</sub> max, I <sub>OH</sub> = -400 μA		2.7 3.4	V
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>IL</sub> max		0.15 0.4	V
		I <sub>OL</sub> = 4 mA	0.35 0.5		
I <sub>I</sub>	Input current at maximum input voltage	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V		0.1	mA
I <sub>IH</sub>	High-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V		20	μA
I <sub>IL</sub>	Low-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V		-0.4	mA
I <sub>OS</sub>	Short-circuit output current§	V <sub>CC</sub> = MAX		-20 -100	mA
I <sub>CC</sub>	Supply current	V <sub>CC</sub> = MAX, See Note 2		19 34	mA

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

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

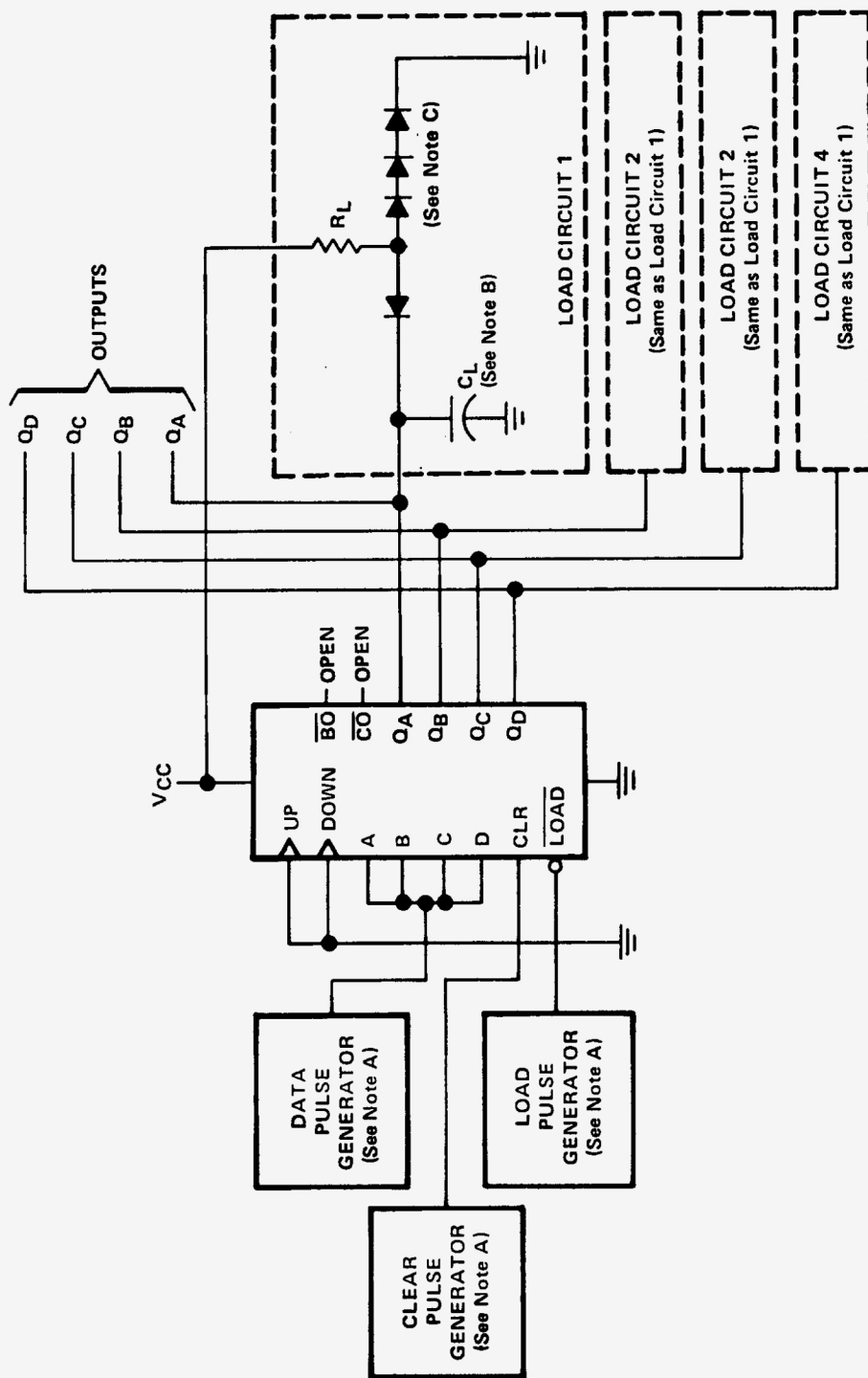
§ Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

NOTE 2: I<sub>CC</sub> is measured with all outputs open, clear and load inputs grounded, and all other inputs at 4.5 V.

## switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C

PARAMETER	FROM INPUT	TO OUTPUT	TEST CONDITIONS	MIN	TYP	MAX	UNIT
f <sub>max</sub>			C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ, See Figures 1 and 2	25	32		MHz
t <sub>PLH</sub>	UP	$\overline{CO}$			17	26	ns
t <sub>PHL</sub>					18	24	
t <sub>PLH</sub>	DOWN	$\overline{BO}$			16	24	ns
t <sub>PHL</sub>					15	24	
t <sub>PLH</sub>	UP OR DOWN	Q			27	38	ns
t <sub>PHL</sub>					30	47	
t <sub>PLH</sub>	$\overline{LOAD}$	Q			24	40	ns
t <sub>PHL</sub>					25	40	
t <sub>PHL</sub>	CLR	Q			23	35	ns

**PARAMETER MEASUREMENT INFORMATION**

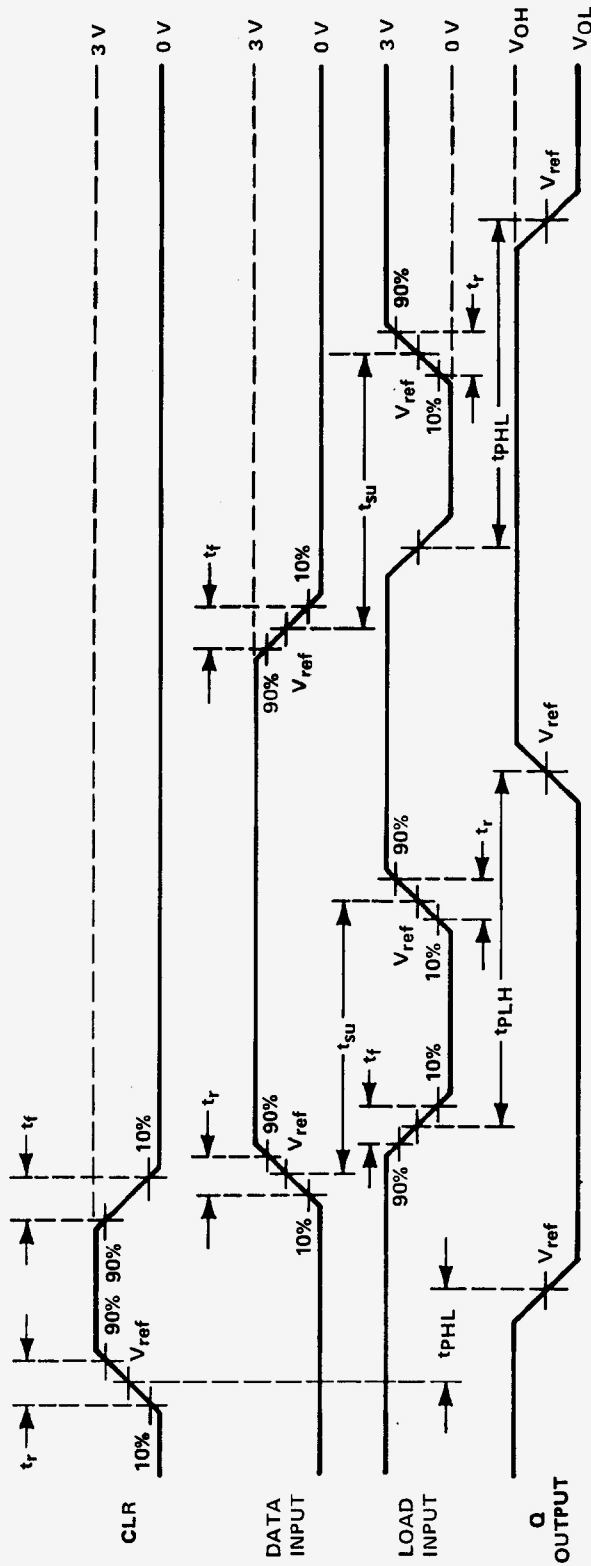


**TEST CIRCUIT**

- NOTES:**
- A. The pulse generators have the following characteristics:  $Z_{out} \approx 50 \Omega$  and for the data pulse generator PRR  $\leq 500$  kHz, duty cycle = 50%; for the load pulse generator PRR is two times data PRR, duty cycle = 50%
  - B.  $C_L$  includes probe and jig capacitance.
  - C. Diodes are 1N3064 or equivalent.
  - D.  $t_r$  and  $t_f \leq 7$  ns.
  - E.  $V_{ref}$  is 1.5 V for '192 and '193, 1.3 V for 74LS192,74LS193.

**FIGURE 1A – CLEAR, SETUP AND LOAD TIMES**

**PARAMETER MEASUREMENT INFORMATION**



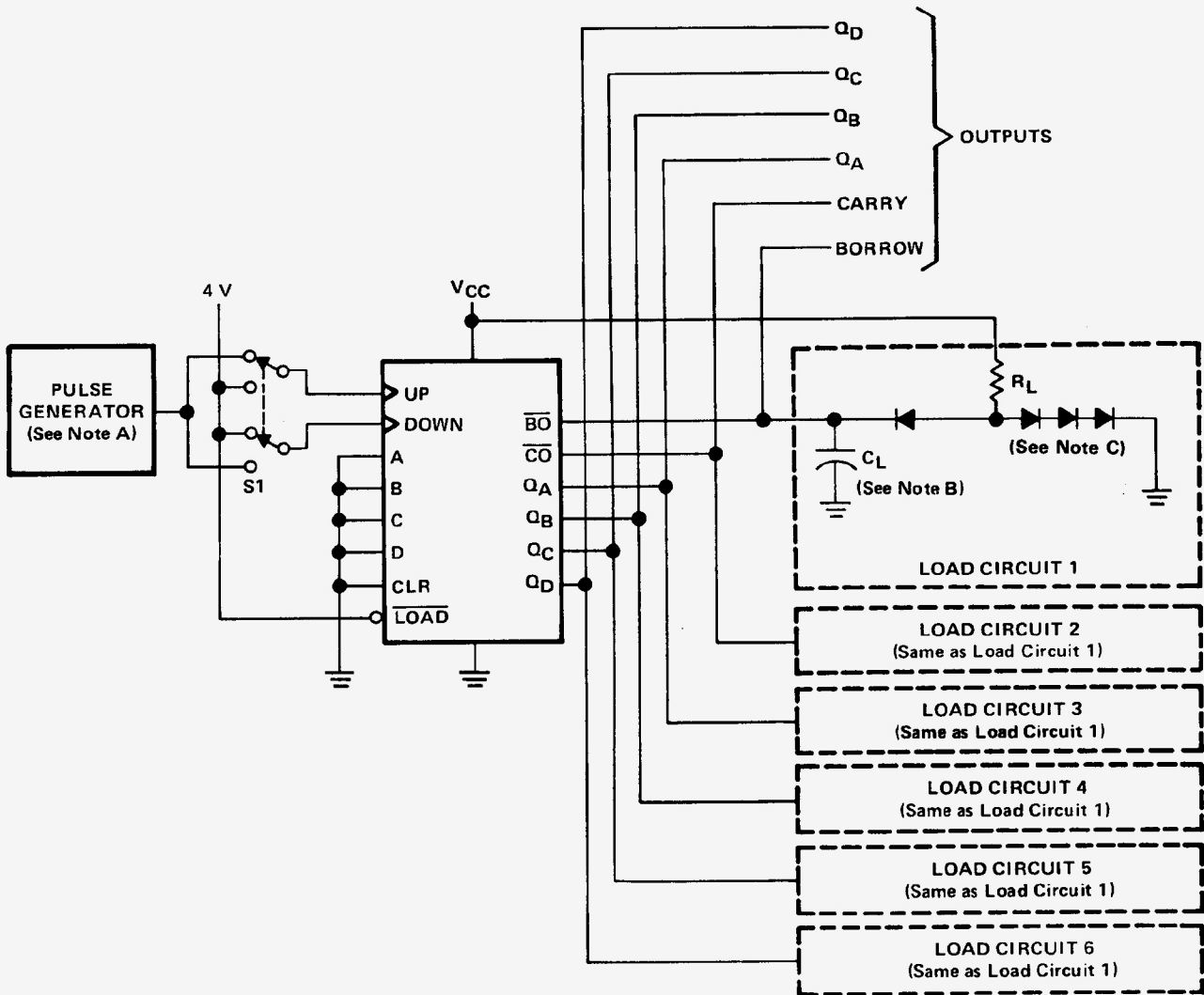
**VOLTAGE WAVEFORMS**

- NOTES:**
- A. The pulse generators have the following characteristics:  $Z_{out} \approx 50 \Omega$  and for the data pulse generator PRR  $\leq 500$  kHz, duty cycle = 50%; for the load pulse generator PRR is two times data PRR, duty cycle = 50%
  - B.  $C_L$  includes probe and jig capacitance.
  - C. Diodes are 1N3064 or equivalent.
  - D.  $t_r$  and  $t_f \leq 7$  ns.
  - E.  $V_{ref}$  is 1.5 V for '192 and '193, 1.3 V for 74LS192,74LS193.

**FIGURE 1B – CLEAR, SETUP, AND LOAD TIMES**

# XD74LS192 DIP-16 XD74LS193 DIP-16

## PARAMETER MEASUREMENT INFORMATION



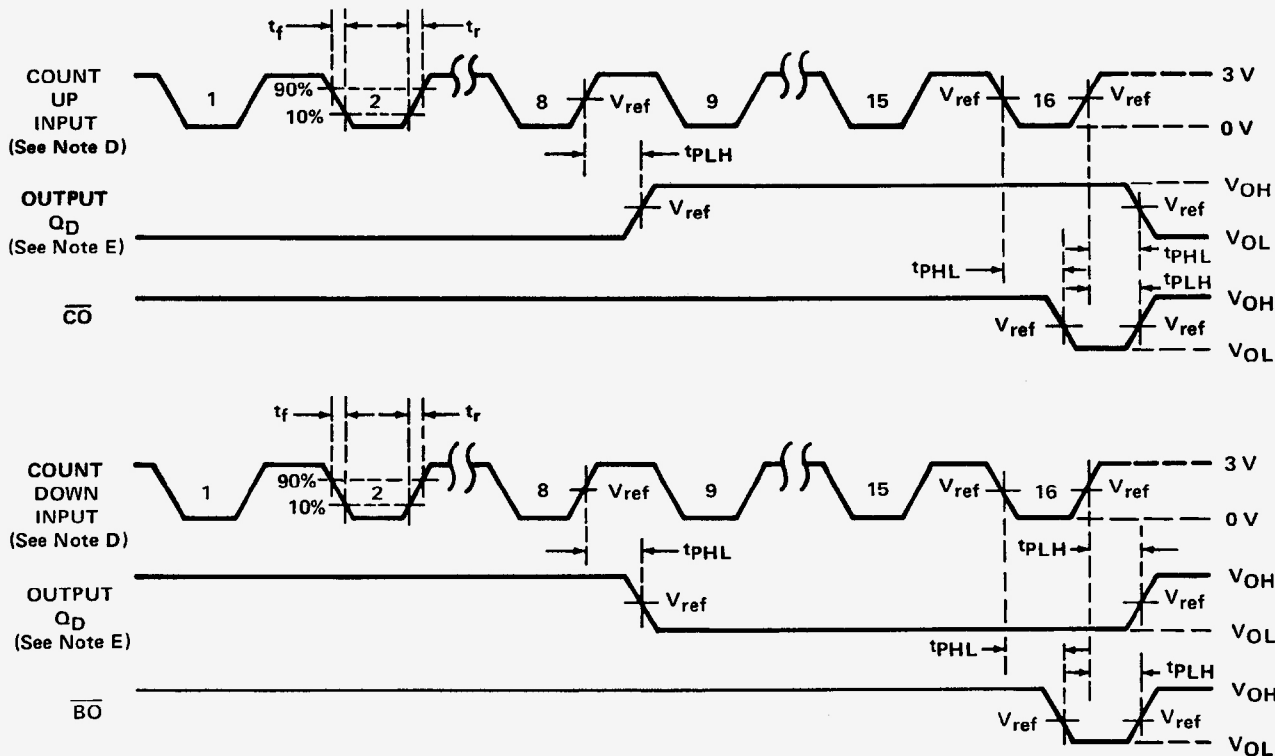
### TEST CIRCUIT

- NOTES:
- A. TM pulse generators have the following characteristics: PRR = 1 MHz,  $Z_g = 50 \Omega$ , duty cycle = 50%.
  - B. CL includes probe and jig capacitance.
  - C. Diodes are 1N3064 or equivalent.
  - D. Count-up and count-down pulse widths are for 74LS193 binary counters. Count cycle for 74LS192 decade counters is 1 through 10.
  - E. Waveforms for outputs QA, QB, and QC are omitted to simplify the drawing.
  - F.  $t_{f}$  and  $t_{r}$  = 7 ns.
  - G. 3 V for 74LS192 and 74LS193.

FIGURE 2A – PROPAGATION DELAY TIMES

# XD74LS192 DIP-16 XD74LS193 DIP-16

## PARAMETER MEASUREMENT INFORMATION



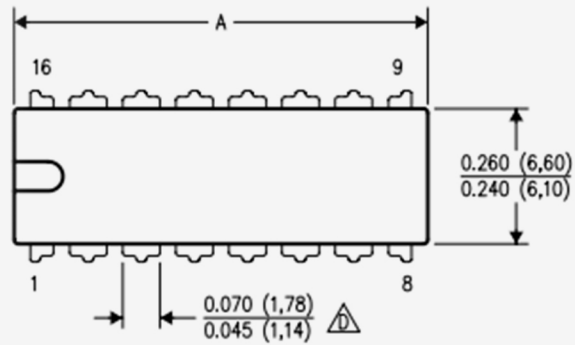
### VOLTAGE WAVEFORMS

- NOTES:
- A. The pulse generators have the following characteristics: PRR ■ 1 MHz,  $Z_g$  ■ 50  $\Omega$  duty cycle - 50%.
  - B.  $C_l$  includes probe and jig capacitance.
  - C. Diodes are 1N3064 or equivalent.
  - D. Count-up and count-down pulse shown as\* for the 74LS193 binary counters. Count cycle for 74LS192 decade counters is 1 through 10.
  - E. Waveforms for outputs  $Q_a$ ,  $Q_b$ , and  $Q_c$  9t9 omitted to simplify the drawing.
  - F.  $t_r$  and  $t_f$  s 7 ns.
  - G. 1.3 V for 74LS192 and 74LS193.

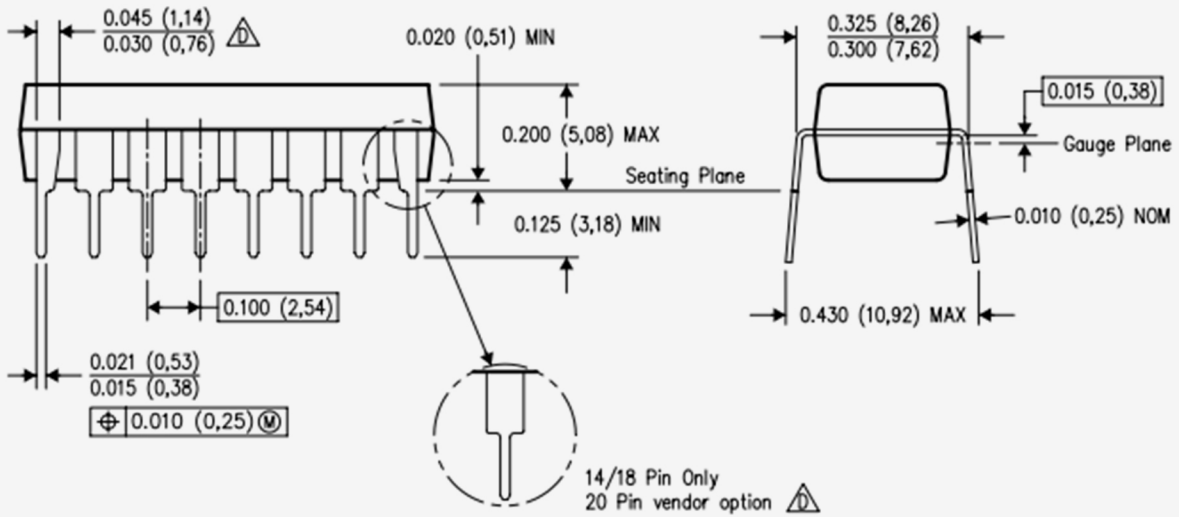
FIGURE 2B – PROPAGATION DELAY TIMES

# XD74LS192 DIP-16 XD74LS193 DIP-16

DIP



DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



以上信息仅供参考. 如需帮助联系客服人员。谢谢 XINLUDA



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