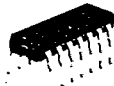


LC74HC393



3003A

CMOS High-Speed Standard Logic
LC74HC Series

T-45-23-13

Dual 4-Stage Binary Ripple Counter

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Features

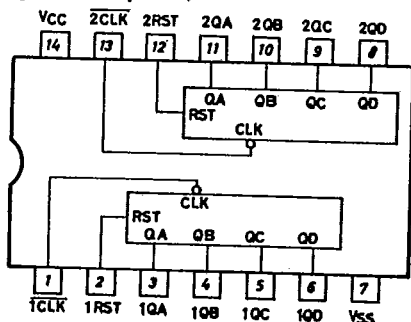
- The LC74HC393 consists of 2 identical 4-bit binary ripple counters. Counting is accomplished synchronously with the positive-to-negative transition of the clock input (CLK). The reset function is asynchronous to the clock. When the reset input (RST) is taken high, the counter is reset.
- Uses CMOS structure to provide such features as wide operating voltage range (2 to 6V), low power dissipation, and high noise margin.
- The LC74HC393 is functionally as well as pin-out compatible with LS.TTL (74LS393) and uses silicon gate process technology to achieve operating speeds similar to LS.TTL (74LS393).
- All inputs are protected from damage.
- Package: 14-pin DIP.

PENTATIVE

Absolute Maximum Ratings/ $T_a=25\pm 2^\circ\text{C}$, $V_{SS}=0\text{V}$

Parameter	Symbol	Unit	Value
Maximum Supply Voltage	V_{CC} max	V	$V_{SS}-0.5$ to $V_{SS}+7.0$
Input Voltage	V_{IN} max	V	$V_{SS}-0.5$ to $V_{CC}+0.5$
Output Voltage	V_{OUT} max	V	$V_{SS}-0.5$ to $V_{CC}+0.5$
Output Current	I_{OUT}	Per output pin	± 25 mA
Current Dissipation	I_{CC}/I_{Gnd}		± 50 mA
Clamp Diode Current	I_K	Per input pin (Input protector)	± 20 mA
Allowable Power Dissipation	P_d max	Per package, $T_a \leq 85^\circ\text{C}$	300 mW
Storage Temperature	T_{stg}		-65 to $+150$ $^\circ\text{C}$
Lead Temperature and Time	T_{sol}	$t=10\text{sec}$	300 $^\circ\text{C}$

Pin Assignment (Top view)

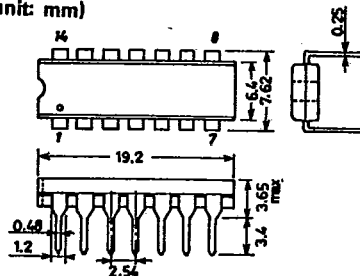


Input - Operation Table

Input		Operation
RST	CLK	
1	X	Reset (Counter output=0)
0	\uparrow	No change
0	\downarrow	Count (+1) operation

- 0 : 'L' level
- 1 : 'H' level
- X : Don't care
- \uparrow : Signal rise
- \downarrow : Signal fall

Case Outline 3003A-D14IC
(unit: mm)



SANYO: DIP14

LC74HC393

T-45-23-13

Allowable Operating Conditions/V_{SS}=0V

Supply Voltage	V _{CC}	2.0 to 6.0	V
Input Voltage	V _{IN}	0 to V _{CC}	V
Output Voltage	V _{OUT}	0 to V _{CC}	V
Operating Temperature	T _{opg}	-40 to +85	°C
Input Rise/Fall Time	t _r , t _f	0 to 500	ns

Electrical Characteristics/T_a=25±2°C, V_{SS}=0V

			min	typ	max	unit
'H'-Level Input Voltage	V _{IH}	V _{CC} = 2.0V	1.5			V
		V _{CC} = 4.5V	3.15			V
		V _{CC} = 5.0V	3.5			V
		V _{CC} = 5.5V	3.85			V
		V _{CC} = 6.0V	4.2			V
'L'-Level Input Voltage	V _{IL}	V _{CC} = 2.0V			0.6	V
		V _{CC} = 4.5V			1.35	V
		V _{CC} = 5.0V			1.5	V
		V _{CC} = 5.5V			1.65	V
		V _{CC} = 6.0V			1.8	V
'H'-Level Output Voltage	V _{OH}	V _{CC} = 4.5V, I _{OH} = -20μA	4.4	4.5		V
		V _{CC} = 5.0V, I _{OH} = -20μA	4.9	5.0		V
		V _{CC} = 5.5V, I _{OH} = -20μA	5.4	5.5		V
		V _{CC} = 4.5V, I _{OH} = -4mA	4.1	4.3		V
		V _{CC} = 5.0V, I _{OH} = -4mA	4.6	4.8		V
		V _{CC} = 5.5V, I _{OH} = -4mA	5.1	5.3		V
'L'-Level Output Voltage	V _{OL}	V _{CC} = 4.5V, I _{OL} = 20μA		0	0.1	V
		V _{CC} = 5.0V, I _{OL} = 20μA		0	0.1	V
		V _{CC} = 5.5V, I _{OL} = 20μA		0	0.1	V
		V _{CC} = 4.5V, I _{OL} = 4mA		0.2	0.4	V
		V _{CC} = 5.0V, I _{OL} = 4mA		0.2	0.4	V
		V _{CC} = 5.5V, I _{OL} = 4mA		0.2	0.4	V
Input Current	I _{IN}	V _{CC} = 6.0V			±0.3	μA
Quiescent Current	I _{CC}	V _{CC} = 6.0V			1.0	μA

Electrical Characteristics/T_a=-40°C, V_{SS}=0V

			min	typ	max	unit
'H'-Level Input Voltage	V _{IH}	V _{CC} = 2.0V	1.5			V
		V _{CC} = 4.5V	3.15			V
		V _{CC} = 5.0V	3.5			V
		V _{CC} = 4.5V	3.85			V
		V _{CC} = 6.0V	4.2			V
'L'-Level Input Voltage	V _{IL}	V _{CC} = 2.0V			0.6	V
		V _{CC} = 4.5V			1.35	V
		V _{CC} = 5.0V			1.5	V
		V _{CC} = 5.5V			1.65	V
		V _{CC} = 6.0V			1.8	V
'H'-Level Output Voltage	V _{OH}	V _{CC} = 4.5V, I _{OH} = -20μA	4.4			V
		V _{CC} = 5.0V, I _{OH} = -20μA	4.9			V
		V _{CC} = 5.5V, I _{OH} = -20μA	5.4			V
		V _{CC} = 4.5V, I _{OH} = -4mA	4.1			V
		V _{CC} = 5.0V, I _{OH} = -4mA	4.6			V
		V _{CC} = 5.5V, I _{OH} = -4mA	5.1			V
'L'-Level Output Voltage	V _{OL}	V _{CC} = 4.5V, I _{OL} = 20μA			0.1	V
		V _{CC} = 5.0V, I _{OL} = 20μA			0.1	V
		V _{CC} = 5.5V, I _{OL} = 20μA			0.1	V
		V _{CC} = 4.5V, I _{OL} = 4mA			0.4	V
		V _{CC} = 5.0V, I _{OL} = 4mA			0.4	V
		V _{CC} = 5.5V, I _{OL} = 4mA			0.4	V
Input Current	I _{IN}	V _{CC} = 6.0V			±0.3	μA
Quiescent Current	I _{CC}	V _{CC} = 6.0V			1.0	μA

LC74HC393

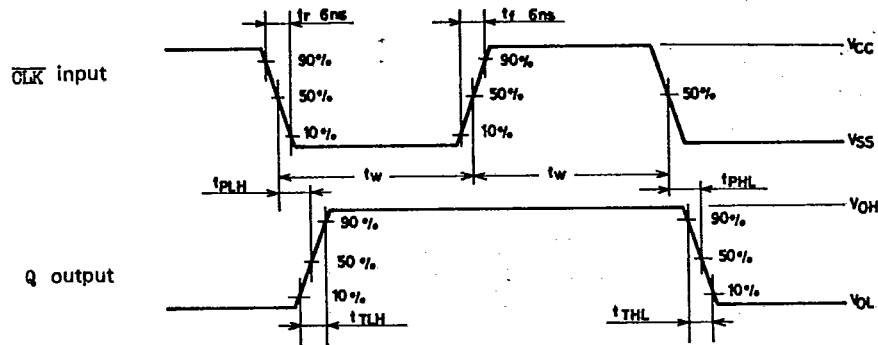
T-45-23-13

Electrical Characteristics/ $T_a = +85^\circ\text{C}$, $V_{SS} = 0\text{V}$			min	typ	max	unit
'H'-Level Input Voltage	V_{IH}	$V_{CC} = 2.0\text{V}$	1.5			V
		$V_{CC} = 4.5\text{V}$	3.15			V
		$V_{CC} = 5.0\text{V}$	3.5			V
		$V_{CC} = 5.5\text{V}$	3.85			V
		$V_{CC} = 6.0\text{V}$	4.2			V
'L'-Level Input Voltage	V_{IL}	$V_{CC} = 2.0\text{V}$			0.6	V
		$V_{CC} = 4.5\text{V}$			1.35	V
		$V_{CC} = 5.0\text{V}$			1.5	V
		$V_{CC} = 5.5\text{V}$			1.65	V
		$V_{CC} = 6.0\text{V}$			1.8	V
'H'-Level Output Voltage	V_{OH}	$V_{CC} = 4.5\text{V}$, $I_{OL} = -20\mu\text{A}$	4.4			V
		$V_{CC} = 5.0\text{V}$, $I_{OH} = -20\mu\text{A}$	4.9			V
		$V_{CC} = 5.5\text{V}$, $I_{OH} = -20\mu\text{A}$	5.4			V
		$V_{CC} = 4.5\text{V}$, $I_{OH} = -4\text{mA}$	4.0			V
		$V_{CC} = 5.0\text{V}$, $I_{OH} = -4\text{mA}$	4.5			V
'L'-Level Output Voltage	V_{OL}	$V_{CC} = 5.5\text{V}$, $I_{OH} = -4\text{mA}$	5.0			V
		$V_{CC} = 4.5\text{V}$, $I_{OL} = 20\mu\text{A}$			0.1	V
		$V_{CC} = 5.0\text{V}$, $I_{OL} = 20\mu\text{A}$			0.1	V
		$V_{CC} = 5.5\text{V}$, $I_{OL} = 20\mu\text{A}$			0.1	V
		$V_{CC} = 4.5\text{V}$, $I_{OL} = 4\text{mA}$			0.5	V
Input Current	I_{IN}	$V_{CC} = 5.0\text{V}$, $I_{OL} = 4\text{mA}$			0.5	V
		$V_{CC} = 5.5\text{V}$, $I_{OL} = 4\text{mA}$			0.5	V
Quiescent Current	I_{CC}	$V_{CC} = 6.0\text{V}$			± 1.0	μA
		$V_{CC} = 6.0\text{V}$			10.0	μA

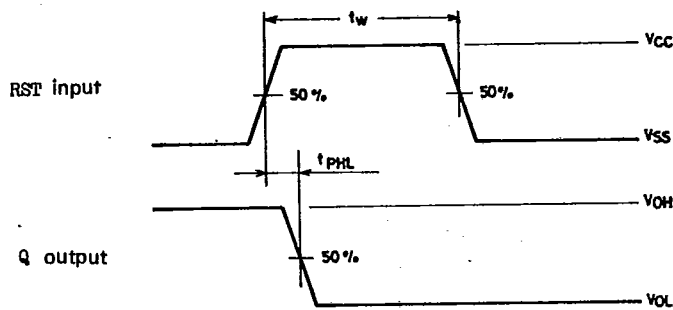
Switching Characteristics/ $T_a = 25 \pm 2^\circ\text{C}$, $V_{SS} = 0\text{V}$			min	typ	max	unit
Output Rise Time	t_{TLH}	$V_{CC} = 5\text{V}$, $C_L = 50\text{pF}$		8	15	ns
Output Fall Time	t_{THL}	$V_{CC} = 5\text{V}$, $C_L = 50\text{pF}$		8	15	ns
'H'-Level Propagation Delay Time (CLK-QA)	t_{PLH}	$V_{CC} = 5\text{V}$, $C_L = 50\text{pF}$		15	25	ns
'L'-Level Propagation Delay Time (CLK-QA)	t_{PHL}	$V_{CC} = 5\text{V}$, $C_L = 50\text{pF}$		15	25	ns
'H'-Level Propagation Delay Time (CLK-QD)	t_{PLH}	$V_{CC} = 5\text{V}$, $C_L = 50\text{pF}$		30	50	ns
'L'-Level Propagation Delay Time (CLK-QD)	t_{PHL}	$V_{CC} = 5\text{V}$, $C_L = 50\text{pF}$		30	50	ns
Minimum Pulse Width (CLK 'L')	t_w	$V_{CC} = 5\text{V}$		8	15	ns
Minimum Pulse Width (CLK 'H')	t_w	$V_{CC} = 5\text{V}$		8	15	ns
Maximum Clock Frequency	f_{max}	$V_{CC} = 5\text{V}$, $C_L = 50\text{pF}$	30	60		MHz
'L'-Level Propagation Delay Time (RST-Q)	t_{PHL}	$V_{CC} = 5\text{V}$, $C_L = 50\text{pF}$		15	25	ns
Minimum Pulse Width (RST 'H')	t_w	$V_{CC} = 5\text{V}$		15	25	ns
Minimum Removal Time	t_{rem}	$V_{CC} = 5\text{V}$		8	15	ns
Input Capacitance	C_{in}			5	10	pF

Switching Waveforms

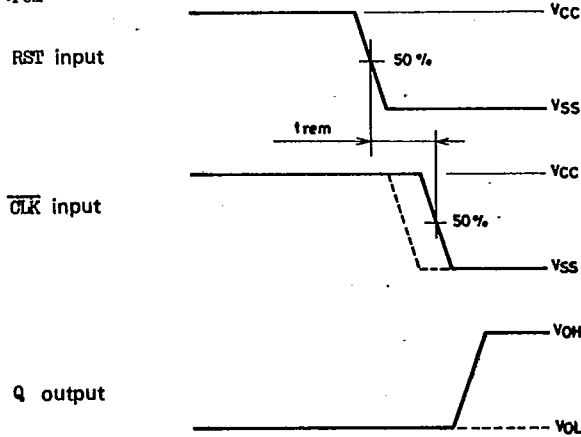
(1) CLK → Q



(2) RST → Q



(3) trem



Timing Chart

