

HD74LS221 • Dual Monostable Multivibrators

This multivibrator features a negative-transition-triggered input and a positive-transition-triggered input either of which can be used as an inhibit input. Pulse triggering occurs at a particular voltage level and is not directly related to the transition time of the input pulse. Schmitt-trigger input circuitry (TTL hysteresis) for B input allows jitter-free triggering from inputs with transition rates as slow as 1V/s, providing the circuit with excellent noise immunity of typically 1.2V. A high immunity to V_{CC} noise of typically 1.5V is also provided by internal latching circuitry. Once fired, the outputs are independent of further transitions of the A and B inputs and are a function of the timing components, or the output pulses can be terminated by the overriding clear. Input pulses may be of any duration relative to the output pulse. Output rise and fall times are TTL compatible and independent of pulse length.

Typical triggering and clearing sequence are illustrated as a part of the switching characteristics waveforms. Pulse width stability is achieved through internal compensation and is virtually independent of V_{CC} and temperature.

In most applications, pulse stability will only be limited by the accuracy of external timing components. Jitter-free operation is maintained over the full temperature and V_{CC} range for more than six decades of timing capacitance (10pF to 10μF) and more than one decade of timing resistance (2kΩ to 100kΩ).

Throughout these ranges, pulse width is defined by the relationship: $t_w(out) = C_{ext} \cdot R_{ext} \cdot \ln_2$.

■ FUNCTION TABLE

Inputs			Outputs	
Clear	A	B	Q	$\bar{Q}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑		
H	↓	H		
↑	L	H		

H; high level, L; low level, X; irrelevant.

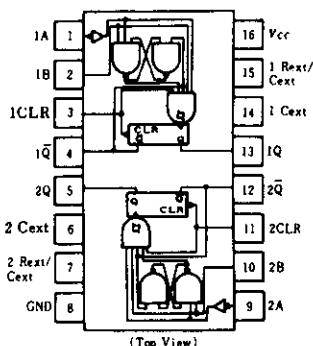
↑; Transition from high to low level.

↑; Transition from low to high level.

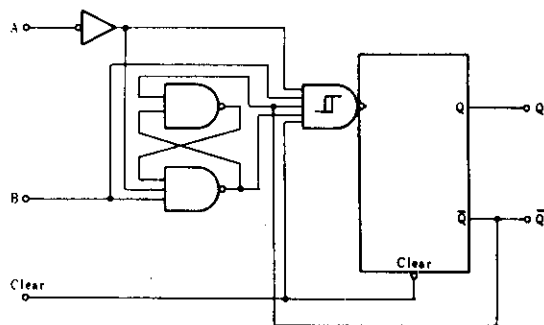
; one high-level pulse.

; one low-level pulse.

■ PIN ARRANGEMENT



■ BLOCK DIAGRAM (1/2)



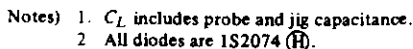
■ RECOMMENDED OPERATING CONDITIONS

Item	Symbol	min	typ	max	Unit
Rate of rise or fall of input pulse	Schmitt input, B	1	—	—	V/s
	logic input, A	1	—	—	V/μs
Input pulse width	A or B	40	—	—	ns
	Clear	40	—	—	ns
Setup time	t_{su}	15	—	—	ns
External timing resistance	R_{ext}	1.4	—	100	kΩ
External timing capacitance	C_{ext}	0	—	1,000	μF
Duty cycle	$R_T = 2k\Omega$	—	—	50	%
	$R_T = 100k\Omega$	—	—	90	%

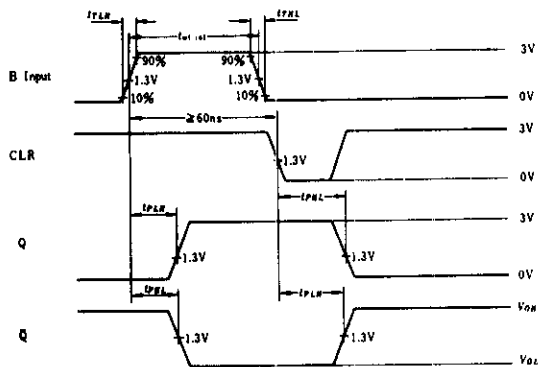
Item	Symbol	Test Conditions	min	typ*	max	Unit
Threshold voltage	A	V_{T^+} $V_{CC}=4.75V$	—	1.0	2.0	V
		V_{T^-} $V_{CC}=4.75V$	0.8	1.0	—	V
	B	V_{T^+} $V_{CC}=4.75V$	—	1.0	2.0	V
		V_{T^-} $V_{CC}=4.75V$	0.8	0.9	—	V
Output voltage		V_{OH} $V_{CC}=4.75V$, $I_{OH}=-400\mu A$	2.7	—	—	V
		V_{OL} $V_{CC}=4.75V$				
			$I_{OL}=4mA$	—	—	0.4
			$I_{OL}=8mA$	—	—	0.5
Input current		I_{IH} $V_{CC}=5.25V$, $V_I=2.7V$	—	—	20	μA
	A	I_{IL} $V_{CC}=5.25V$, $V_I=0.4V$	—	—	—0.4	mA
	B, Clear		—	—	—0.8	
		I_I $V_{CC}=5.25V$, $V_I=7V$	—	—	0.1	mA
Short-circuit output current		I_{OS} $V_{CC}=5.25V$	—20	—	—100	mA
Supply current		I_{CC} $V_{CC}=5.25V$				
			Quiescent	—	4.7	11
			Triggered	—	19	27
Input clamp voltage		V_{IK} $V_{CC}=4.75V$, $I_{IN}=-18mA$	—	—	—1.5	V

Item	Symbol	Inputs	Outputs	Test Conditions		min	typ	max	Unit
Propagation delay time	t_{PLH}	A	Q	$C_L = 15\text{pF}$ $R_L = 2\text{k}\Omega$	$C_{ext} = 80\text{pF}$ $R_{ext} = 2\text{k}\Omega$	—	45	70	ns
		B	Q			—	35	55	
	t_{PHL}	A	$\bar{Q}$			—	50	80	ns
		B	$\bar{Q}$			—	40	65	
	t_{PHL}	Clear	Q			—	35	55	ns
	t_{PLH}	Clear	$\bar{Q}$			—	44	65	ns
Output pulse width	t_{width}	A or B	Q or $\bar{Q}$		$C_{ext} = 80\text{pF}$, $R_{ext} = 2\text{k}\Omega$	70	120	150	ns
					$C_{ext} = 0$, $R_{ext} = 2\text{k}\Omega$	20	47	70	
					$C_{ext} = 100\text{pF}$, $R_{ext} = 10\text{k}\Omega$	600	670	750	
					$C_{ext} = 1\mu\text{F}$, $R_{ext} = 10\text{k}\Omega$	6	6.7	7.5	ms

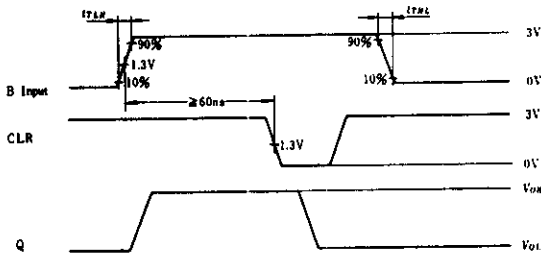
1) Test Circuit



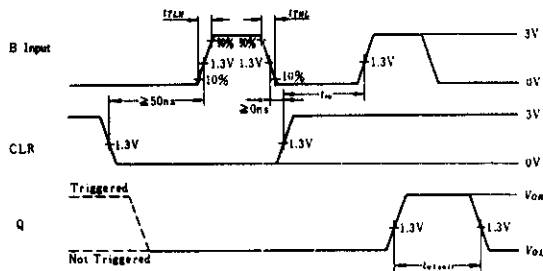
Waveform



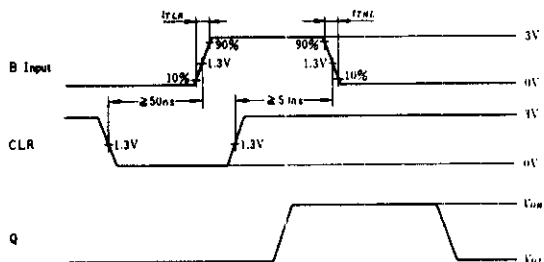
Trigger from B, then clear (A input is low).



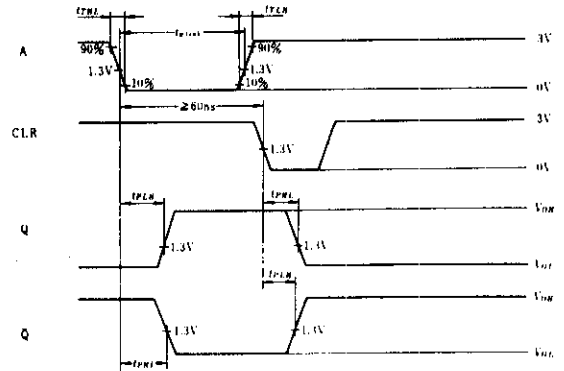
Trigger from B, then clear (A input is low).



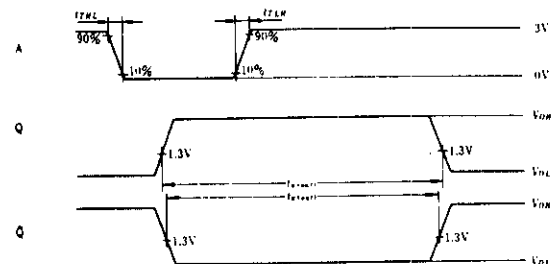
Clear overriding B, then trigger from B.



Triggering from positive transition of Clear.



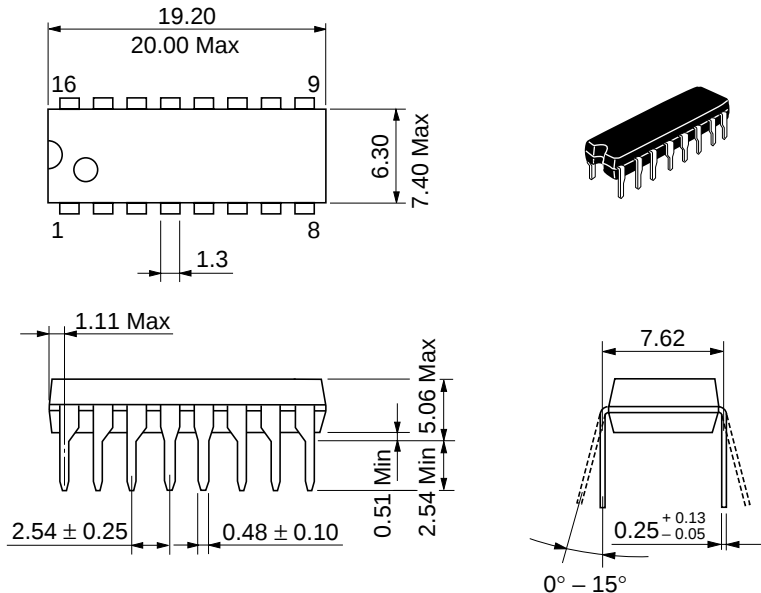
Trigger from A, then clear (B input is high).



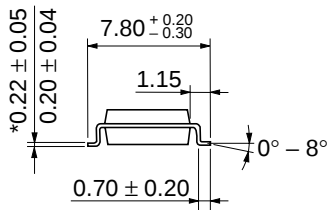
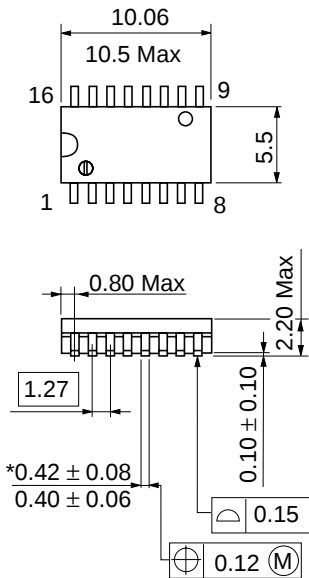
Trigger from A (B and clear inputs are high).

Note) Input pulse: $t_{TLH} \leq 15\text{ns}$, $t_{THL} \leq 6\text{ns}$, $PRR = 1\text{MHz}$

Unit: mm

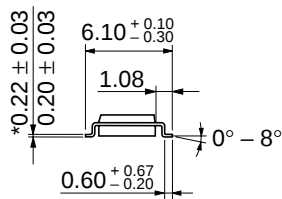
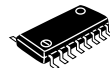


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



*Dimension including the plating thickness
Base material dimension

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JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 g

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HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

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For further information write to:

Hitachi Semiconductor (America) Inc. 179 East Tasman Drive, San Jose, CA 95134 Tel: <1> (408) 433-1990 Fax: <1> (408) 433-0223	Hitachi Europe GmbH Electronic components Group Dornacher Straße 3 D-85622 Feldkirchen, Munich Germany Tel: <49> (89) 9 9180-0 Fax: <49> (89) 9 29 30 00 Hitachi Europe Ltd. Electronic Components Group. Whitebrook Park Lower Cookham Road Maidenhead Berkshire SL6 8YA, United Kingdom Tel: <44> (1628) 585000 Fax: <44> (1628) 778322
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Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building, No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX

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