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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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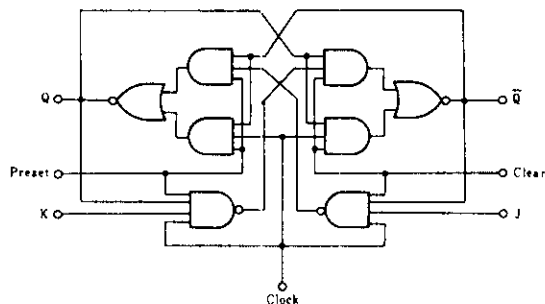
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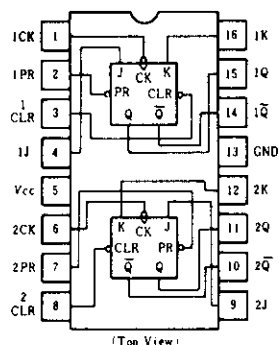
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HD74LS76A • Dual J-K Flip-Flops (with Preset and Clear)

■ BLOCK DIAGRAM (1/2)



■ PIN ARRANGEMENT

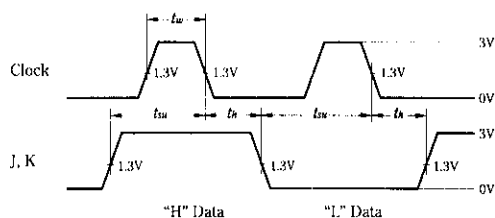


■ RECOMMENDED OPERATING CONDITIONS

Item	Symbol	min	typ	max	Unit
Clock frequency	f_{clock}	0	—	30	MHz
Pulse width	Clock High	20	—	—	ns
	Clear Preset Low	25	—	—	ns
Setup time	"H" Data	20↓	—	—	ns
	"L" Data	20↓	—	—	ns
Hold time	t_h	0↓	—	—	ns

Note) ↓; The arrow indicates the falling edge.

■ TIMING DEFINITION



■ ELECTRICAL CHARACTERISTICS ($T_a = -20 \sim +75^\circ\text{C}$)

Item	Symbol	Test Conditions	min	typ*	max	Unit
Input voltage	V_{IH}		2.0	—	—	V
	V_{IL}		—	—	0.8	V
Output voltage	V_{OH}	$V_{CC} = 4.75\text{V}, V_{IH} = 2\text{V}, V_{IL} = 0.8\text{V}, I_{OH} = -400\mu\text{A}$	2.7	—	—	V
	V_{OL}	$V_{CC} = 4.75\text{V}, V_{IH} = 2\text{V}, V_{IL} = 0.8\text{V}, I_{OL} = 8\text{mA}$	—	—	0.5	V
		$I_{OL} = 4\text{mA}$	—	—	0.4	V
Input current	J, K	I_{IH} $V_{CC} = 5.25\text{V}, V_I = 2.7\text{V}$	—	—	20	μA
	Clear		—	—	60	
	Preset		—	—	60	
	Clock		—	—	80	
	J, K	I_{IL}^{**} $V_{CC} = 5.25\text{V}, V_I = 0.4\text{V}$	—	—	-0.4	mA
	Clear		—	—	-0.8	
	Preset		—	—	-0.8	
	Clock		—	—	-0.8	
	J, K	I_I $V_{CC} = 5.25\text{V}, V_I = 7\text{V}$	—	—	0.1	mA
	Clear		—	—	0.3	
	Preset		—	—	0.3	
	Clock		—	—	0.4	
Short-circuit output current	I_{OS}	$V_{CC} = 5.25\text{V}$	-20	—	-100	mA
Supply current ***	I_{CC}	$V_{CC} = 5.25\text{V}$	—	4	6	mA
Input clamp voltage	V_{IK}	$V_{CC} = 4.75\text{V}, I_{IN} = -18\text{mA}$	—	—	-1.5	V

* $V_{CC} = 5\text{V}, T_a = 25^\circ\text{C}$

** I_{IL} should not be measured when preset and clear inputs are low at same time.

*** With all outputs open, I_{CC} is measured with the Q and $\bar{Q}$ outputs high in turn.

At the time of measurement, the clock input is grounded.

HD74LS76A

FUNCTION TABLE

Inputs					Outputs	
Preset	Clear	Clock	J	K	Q	$\bar{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	↓	L	L	Q ₀	$\bar{Q}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	Toggle	
H	H	H	X	X	Q ₀	$\bar{Q}_0$

Notes) H: high level, L: low level, X: irrelevant

↓: transition from high to low level

Q₀: level of Q before the indicated steady-state input conditions were established.

$\bar{Q}_0$: complement of Q₀ or level of $\bar{Q}$ before the indicated steady-state input conditions were established.

Toggle: each output changes to the complement of its previous level on each active transition indicated by ↓.

*: This configuration is nonstable; that is, it will not persist when preset and clear inputs return to their inactive (high) level.

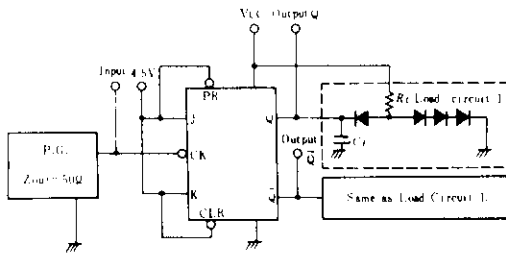
SWITCHING CHARACTERISTICS (V_{CC}=5V, T_a=25°C)

Item	Symbol	Inputs	Outputs	Test Conditions	min	typ	max	Unit
Maximum clock frequency	f _{max}			C _L = 15pF, R _L = 2kΩ	30	45	—	MHz
Propagation delay time	t _{PLH}	Clear Preset	Q, $\bar{Q}$		—	15	20	ns
	t _{PHL}	Clock			—	15	20	ns

TESTING METHOD

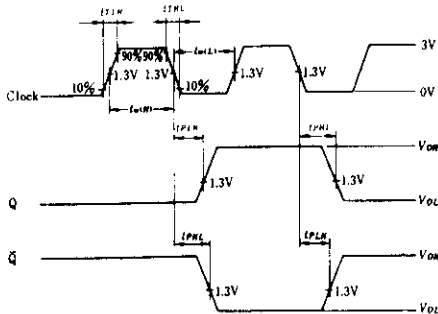
1) Test Circuit

1.1) f_{max}, t_{PLH}, t_{PHL} (Clock → Q, $\bar{Q}$)



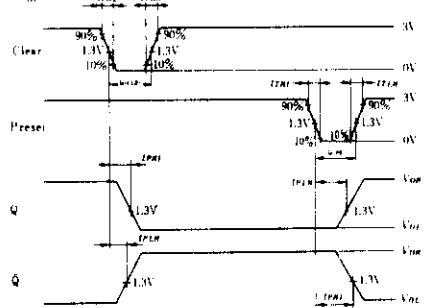
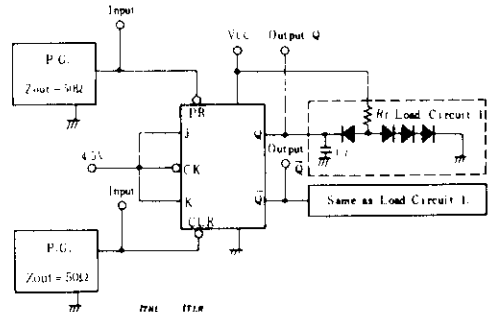
- Notes) 1. Test is put into the each flip-flop
2. All diodes are 1S2074 ①.
3. C_L includes probe and jig capacitance.

Waveform

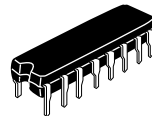
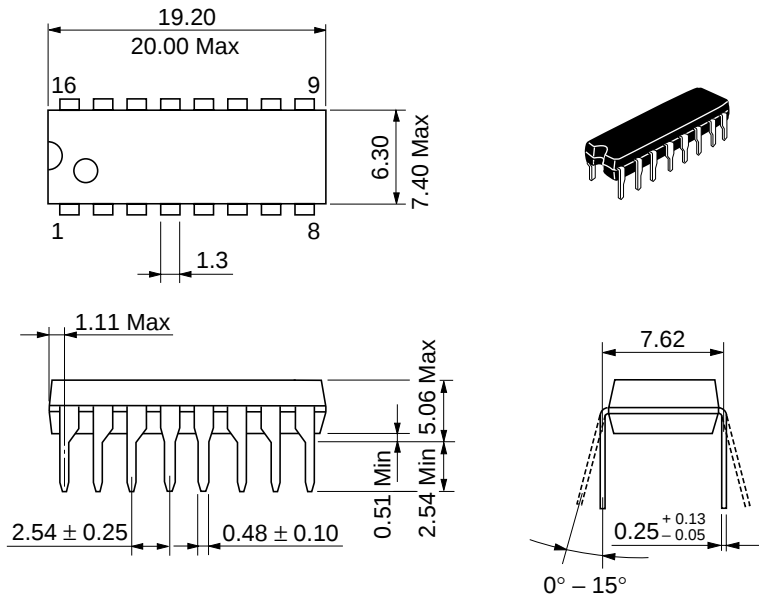


Note) Clock input pulse; t_{TLH} ≤ 15ns, t_{THL} ≤ 6ns, PRR = 1MHz, duty cycle = 50% and: for f_{max}, t_{TLH} = t_{THL} ≤ 2.5ns.

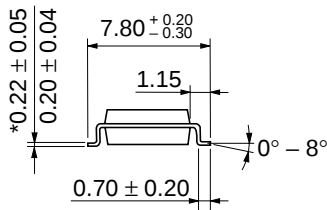
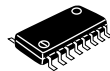
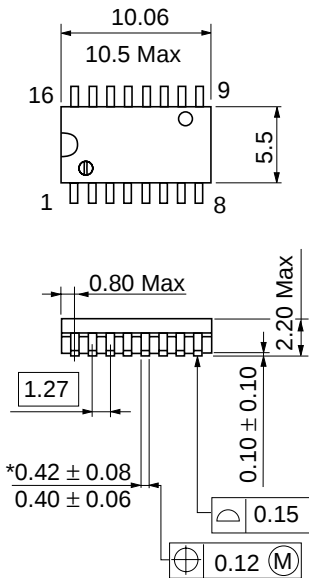
1.2) t_{PHL}, t_{PLH} (Clear, Preset → Q, $\bar{Q}$)



Note) Clear and preset input pulse; t_{TLH} ≤ 15ns, t_{THL} ≤ 6ns, PRR = 1MHz

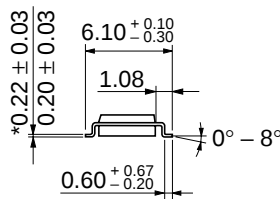
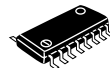
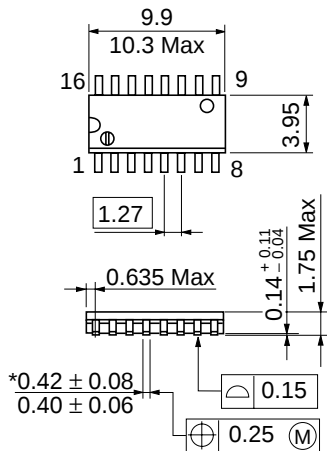


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g



*Dimension including the plating thickness
Base material dimension

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

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