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

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HD74HC173

4-bit D-type Register (with 3-state outputs)



ADE-205-459 (Z)

1st. Edition

Sep. 2000

Description

The four D type Flip-Flops operate synchronously from a common clock. The 3-state outputs allow the device to be used in bus organized systems. The outputs are placed in the 3-stage mode when either of the output disable pins are in the logic high level.

The input disable allows the flip-flops to remain in their present states without having to disrupt the clock. If either of the 2 input disables are taken to a logic high level, the Q outputs are fed back to the inputs, forcing the flip-flops to remain in the same state. Clearing is enabled by taking the clear input to a logic high level. The data outputs change state on the positive going edge of the clock.

Features

- High Speed Operation: t_{pd} (Clock to Q) = 14 ns typ ($C_L = 50$ pF)
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage: $V_{CC} = 2$ to 6 V
- Low Input Current: 1 μ A max
- Low Quiescent Supply Current: I_{CC} (static) = 4 μ A max ($T_a = 25^\circ\text{C}$)

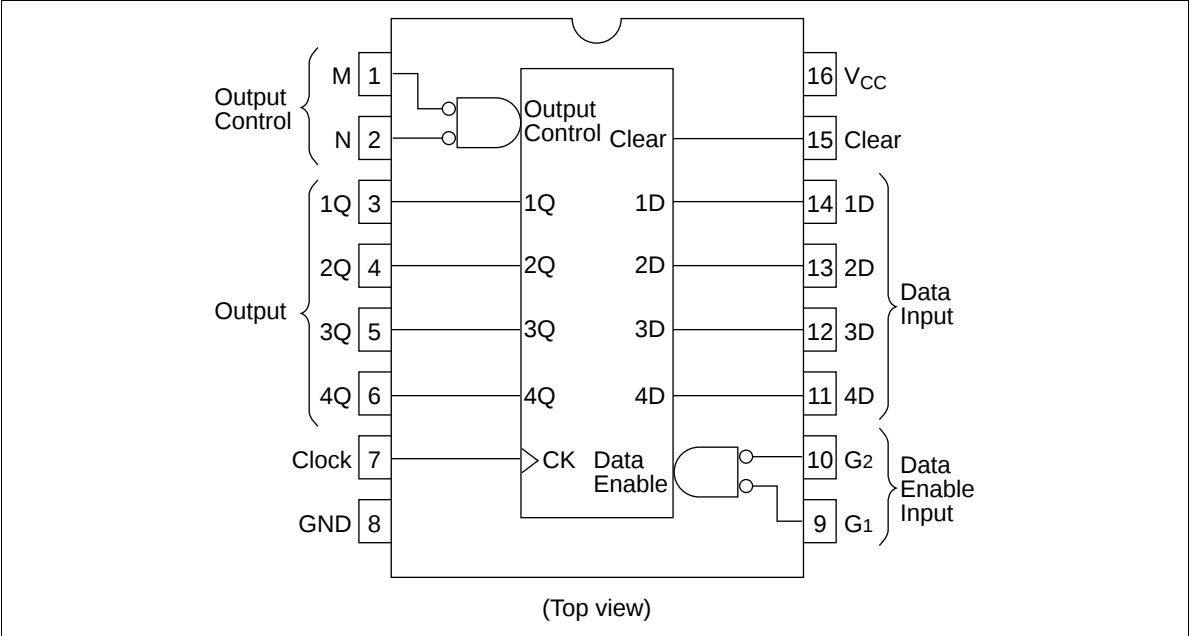
Function Table

Inputs

Clear	Clock	Data Enable		Data D	Output Q
		G ₁	G ₂		
H	X	X	X	X	L
L	L	X	X	X	Q ₀
L		H	X	X	Q ₀
L		X	H	X	Q ₀
L		L	L	L	L
L		L	L	H	H

Note: When either M or N (or both) is (are) high the output is disabled to the high-impedance state; however sequential operation of the flip-flops is not affected.

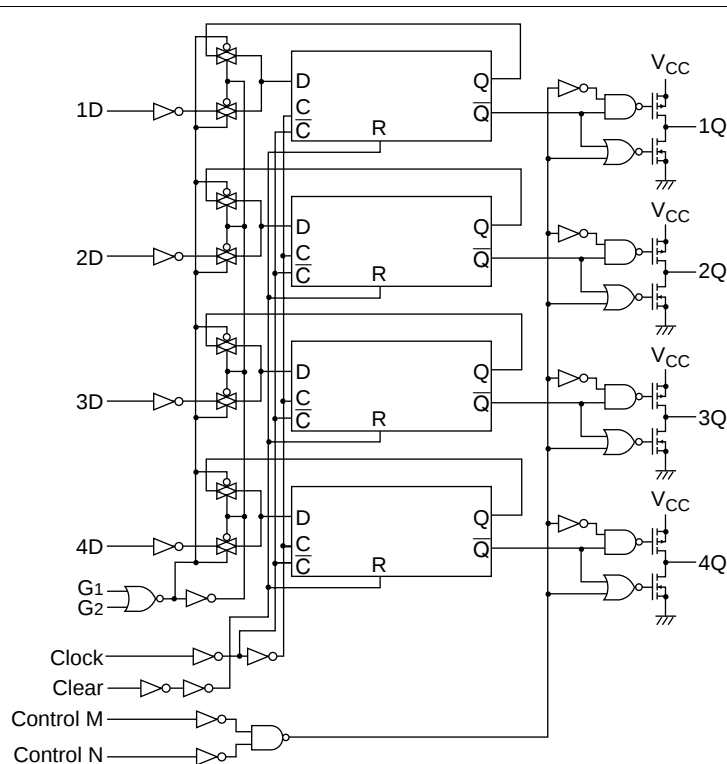
Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to +7.0	V
Input voltage	V_{IN}	-0.5 to $V_{CC} + 0.5$	V
Output voltage	V_{OUT}	-0.5 to $V_{CC} + 0.5$	V
DC current drain per pin	I_{OUT}	± 35	mA
DC current drain per VCC, GND	I_{CC}, I_{GND}	± 75	mA
DC input diode current	I_{IK}	± 20	mA
DC output diode current	I_{OK}	± 20	mA
Power dissipation per package	P_T	500	mW
Storage temperature	T_{stg}	-65 to +150	$^{\circ}C$

Block Diagram



DC Characteristics

Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Input voltage	V_{IH}	2.0	1.5	—	—	1.5	—	V	
		4.5	3.15	—	—	3.15	—		
		6.0	4.2	—	—	4.2	—		
	V_{IL}	2.0	—	—	0.5	—	0.5	V	
		4.5	—	—	1.35	—	1.35		
		6.0	—	—	1.8	—	1.8		
Output voltage	V_{OH}	2.0	1.9	2.0	—	1.9	—	V	$V_{in} = V_{IH}$ or V_{IL} $I_{OH} = -20 \mu A$
		4.5	4.4	4.5	—	4.4	—		
		6.0	5.9	6.0	—	5.9	—		
		4.5	4.18	—	—	4.13	—		
		6.0	5.68	—	—	5.63	—		
	V_{OL}	2.0	—	0.0	0.1	—	0.1	V	$V_{in} = V_{IH}$ or V_{IL} $I_{OL} = 20 \mu A$
		4.5	—	0.0	0.1	—	0.1		
		6.0	—	0.0	0.1	—	0.1		
		4.5	—	—	0.26	—	0.33		
		6.0	—	—	0.26	—	0.33		
Off-state output current	I_{OZ}	6.0	—	—	± 0.5	—	± 5.0	μA	$V_{in} = V_{IH}$ or V_{IL} , $V_{out} = V_{CC}$ or GND
Input current	I_{in}	6.0	—	—	± 0.1	—	± 1.0	μA	$V_{in} = V_{CC}$ or GND
Quiescent supply current	I_{CC}	6.0	—	—	4.0	—	40	μA	$V_{in} = V_{CC}$ or GND, $I_{out} = 0 \mu A$

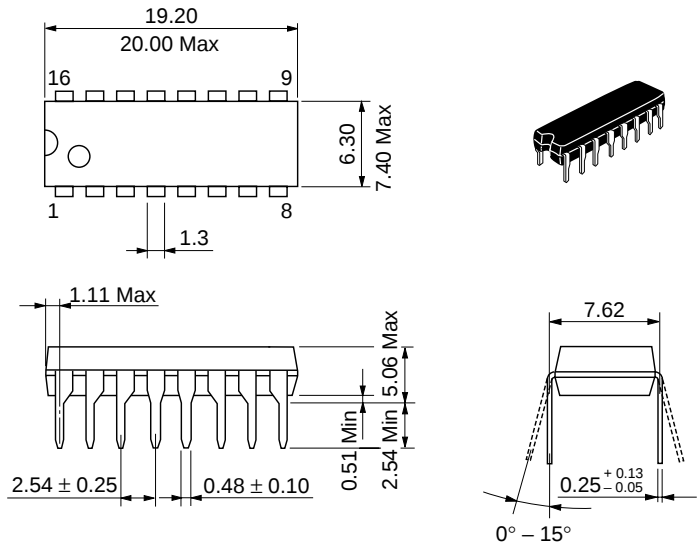
HD74HC173

AC Characteristics (C_L = 50 pF, Input t_r = t_f = 6 ns)

Item	Symbol	V _{CC} (V)	Ta = 25°C					Ta = -40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max				
Maximum clock frequency	f _{max}	2.0	—	—	5	—	4	MHz			
		4.5	—	—	27	—	21				
		6.0	—	—	32	—	25				
Propagation delay time	t _{PLH}	2.0	—	—	175	—	220	ns	Clock to Q		
		4.5	—	14	35	—	44				
		6.0	—	—	30	—	37				
	t _{PHL}	2.0	—	—	150	—	190	ns	Clear to Q		
		4.5	—	14	30	—	38				
		6.0	—	—	26	—	33				
Enable time	t _{ZH}	2.0	—	—	150	—	190	ns			
		4.5	—	12	30	—	38				
		6.0	—	—	26	—	33				
Disable time	t _{HZ}	2.0	—	—	150	—	190	ns			
		4.5	—	12	30	—	38				
		6.0	—	—	26	—	33				
Setup time	t _{su}	2.0	100	—	—	125	—	ns			
		4.5	20	4	—	25	—				
		6.0	17	—	—	21	—				
Removal time	t _{rem}	2.0	90	—	—	115	—	ns			
		4.5	18	0	—	23	—				
		6.0	15	—	—	20	—				
Hold time	t _h	2.0	5	—	—	5	—	ns			
		4.5	5	-2	—	5	—				
		6.0	5	—	—	5	—				
Pulse width	t _w	2.0	80	—	—	100	—	ns			
		4.5	16	4	—	20	—				
		6.0	14	—	—	17	—				
Output rise/fall time	t _{TLH}	2.0	—	—	60	—	75	ns			
		4.5	—	4	12	—	15				
		6.0	—	—	10	—	13				
Input capacitance	Cin	—	—	5	10	—	10	pF			

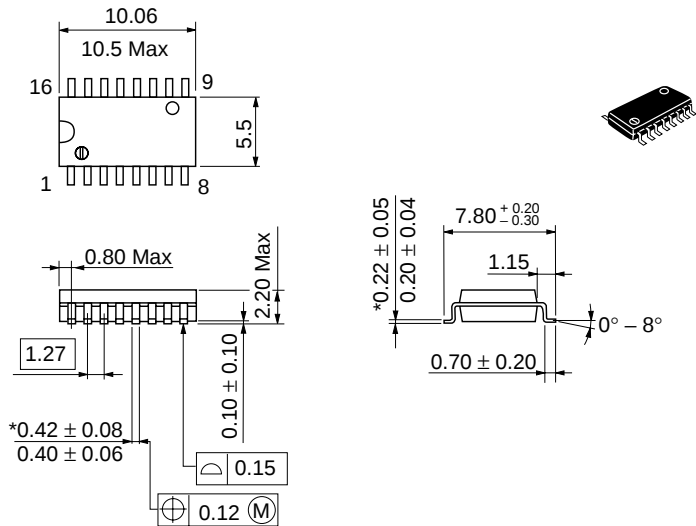
Package Dimensions

Unit: mm



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

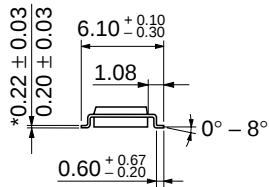
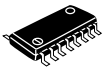
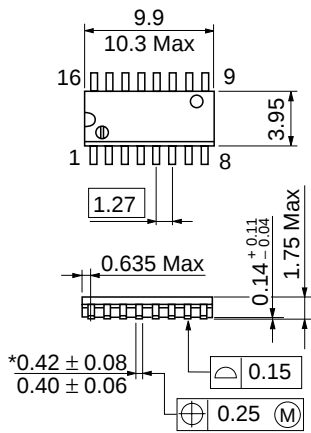
Unit: mm



*Dimension including the plating thickness
Base material dimension

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

Unit: mm



*Dimension including the plating thickness
Base material dimension

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

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