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

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HD74AC165/HD74ACT165

Parallel-Load 8-bit Shift Register



ADE-205-374 (Z)
1st. Edition
Sep. 2000

Description

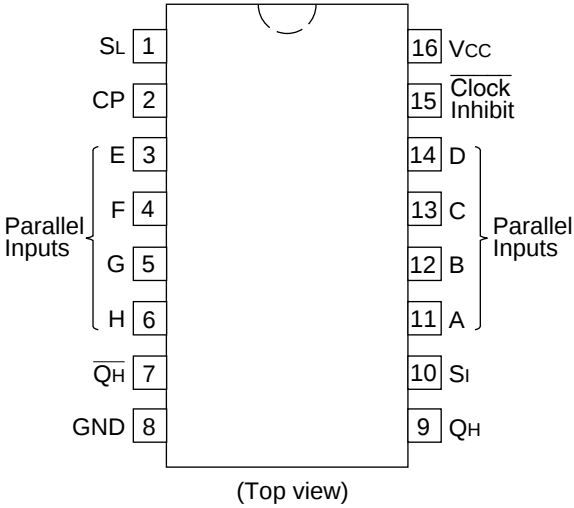
This 8-bit serial shift register shifts data from Q_A to Q_H when clocked, Parallel inputs to each stage are enabled by a low level at the Shift/Load Input. Also included is a gated clock input and a complementary output from the eighth bit.

Clocking is accomplished through a 2-input NOR gate permitting one input to be used as a clock inhibit function. Holding either of the clock inputs high inhibits clocking, and holding either clock input low with the Shift/Load input high enables the other clock input. Data transfer occurs on the positive going edge of the clock. Parallel loading is inhibited as long as the Shift/Load input is high. When taken low, data at the parallel inputs is loaded directly into the register independent of the state of the clock.

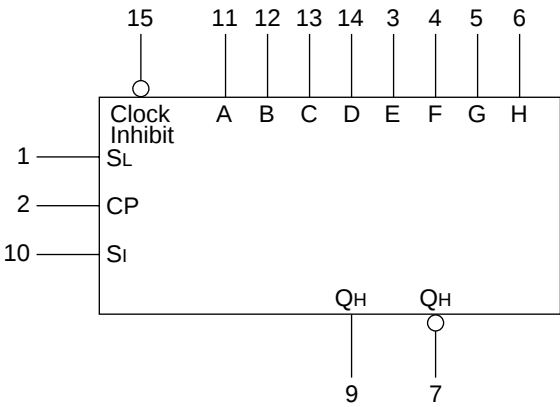
Features

- Outputs Source/Sink 24 mA
- HD74ACT165 has TTL-Compatible Inputs

Pin Arrangement



Logic Symbol



Pin Names

A to H	Parallel Inputs
S_I	Serial Input
CP	Clock Input
S_L	Shift Load
$\overline{Clock\ Inhibit}$	Clock Inhibit
$Q_H, \overline{Q_H}$	Outputs

Truth Table

Inputs

S_L	$\overline{\text{Clock}}$			Parallel	Internal Outputs		Outputs
	Inhibit	CP	S_i	A H	Q_A	Q_B	Q_H
L	X	X	X	a h	a	b	h
H	L	L	X	X	$Q_{A\overline{D}}$	$Q_{B\overline{O}}$	Q_{HO}
H	L		H	X	H	Q_{An}	Q_{Gn}
H	L		L	X	L	Q_{An}	Q_{Cn}
H	H	X	X	X	$Q_{A\overline{D}}$	$Q_{B\overline{O}}$	Q_{HO}

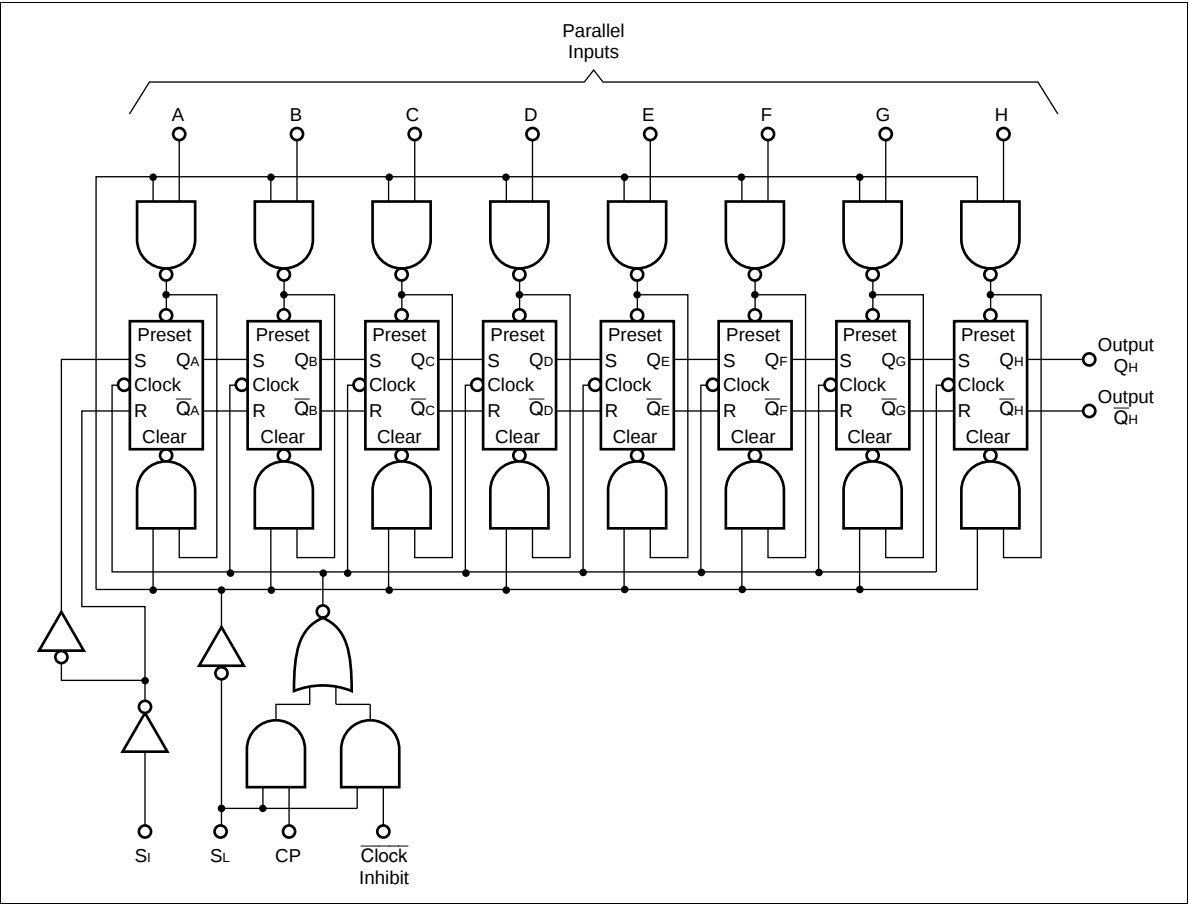
H : High Voltage Level

L : Low Voltage Level

X : Immaterial

: Low-to-High Clock Transition

Logic Diagram



DC Characteristics (unless otherwise specified)

Item	Symbol	Max	Unit	Condition
Maximum quiescent supply current	I_{CC}	80	μA	$V_{IN} = V_{CC}$ or ground, $V_{CC} = 5.5 V$, $T_a = \text{Worst case}$
Maximum quiescent supply current	I_{CC}	8.0	μA	$V_{IN} = V_{CC}$ or ground, $V_{CC} = 5.5 V$, $T_a = 25^{\circ}C$
Maximum additional I_{CC}/input (HD74ACT165)	I_{CCT}	1.5	mA	$V_{IN} = V_{CC} - 2.1 V$, $V_{CC} = 5.5 V$, $T_a = \text{Worst case}$

AC Characteristics: HD74AC165

Item	Symbol	V _{CC} (V)*1	Ta = +25°C C _L = 50 pF			Ta = -40°C to +85°C C _L = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Maximum count frequency	f _{max}	3.3	85	—	—	70	—	MHz
		5.0	100	—	—	90	—	
Propagation delay CP to Q _H or $\overline{Q}_H$	t _{PLH}	3.3	1.0	11.0	17.5	1.0	20.5	ns
		5.0	1.0	8.0	11.5	1.0	13.5	
Propagation delay CP to Q _H or $\overline{Q}_H$	t _{PHL}	3.3	1.0	12.0	18.0	1.0	21.5	ns
		5.0	1.0	8.5	12.5	1.0	14.5	
Propagation delay H to Q _H or $\overline{Q}_H$	t _{PLH}	3.3	1.0	13.5	19.5	1.0	22.5	ns
		5.0	1.0	9.5	13.5	1.0	15.5	
Propagation delay H to Q _H or $\overline{Q}_H$	t _{PHL}	3.3	1.0	9.0	14.0	1.0	16.5	ns
		5.0	1.0	6.5	9.5	1.0	11.0	
Propagation delay S _L to Q _H or $\overline{Q}_H$	t _{PLH}	3.3	1.0	11.5	20.5	1.0	23.5	ns
		5.0	1.0	8.5	14.0	1.0	16.0	
Propagation delay S _L to Q _H or $\overline{Q}_H$	t _{PHL}	3.3	1.0	10.0	16.5	1.0	19.5	ns
		5.0	1.0	7.5	11.0	1.0	12.5	

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V
Voltage Range 5.0 is 5.0 V ± 0.5 V

AC Operating Requirements: HD74AC165

Item	Symbol	V _{CC} (V)*1	Ta = +25°C	Ta = –40°C		Unit
			C _L = 50 pF	to +85°C	C _L = 50 pF	
Setup time, HIGH or LOW	t _{su}	3.3	3.5	5.0	6.0	ns
H to S _L		5.0	2.5	4.0	4.5	
Hold time, HIGH or LOW	t _h	3.3	–1.0	0.5	0.5	ns
H to S _L		5.0	–0.5	0.5	0.5	
Setup time, HIGH or LOW	t _{su}	3.3	1.0	3.5	4.0	ns
S _{in} to CP		5.0	0.5	3.0	3.5	
Hold time, HIGH or LOW	t _h	3.3	1.5	2.0	2.0	ns
S _{in} to CP		5.0	1.0	2.0	2.0	
Setup time, HIGH or LOW	t _{su}	3.3	3.0	5.0	6.0	ns
S _L to CP		5.0	2.0	4.0	4.5	
Hold time, HIGH or LOW	t _h	3.3	–2.0	0.0	0.0	ns
S _L to CP		5.0	–1.0	0.0	0.0	
Recovery time clock inhibit	t _{rec}	3.3	2.5	3.5	3.5	ns
to CP		5.0	2.0	3.0	3.0	
Clock pulse width	t _w	3.3	3.0	5.5	7.0	ns
		5.0	3.0	4.5	5.0	

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V
Voltage Range 5.0 is 5.0 V ± 0.5 V

AC Characteristics: HD74ACT165

Item	Symbol	V_{CC} (V)*1	Ta = +25°C C _L = 50 pF			Ta = -40°C to +85°C C _L = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Maximum count frequency	f _{max}	5.0	70	—	—	60	—	MHz
Propagation delay CP to Q _H or $\overline{Q}_H$	t _{PLH}	5.0	1.0	8.5	13.5	1.0	15.5	ns
Propagation delay CP to Q _H or $\overline{Q}_H$	t _{PHL}	5.0	1.0	9.5	14.0	1.0	16.5	ns
Propagation delay H to Q _H or $\overline{Q}_H$	t _{PLH}	5.0	1.0	10.5	13.5	1.0	15.5	ns
Propagation delay H to Q _H or $\overline{Q}_H$	t _{PHL}	5.0	1.0	7.5	11.0	1.0	12.5	ns
Propagation delay S _L to Q _H or $\overline{Q}_H$	t _{PLH}	5.0	1.0	9.5	15.0	1.0	18.0	ns
Propagation delay S _L to Q _H or $\overline{Q}_H$	t _{PHL}	5.0	1.0	8.5	13.0	1.0	15.5	ns

Note: 1. Voltage Range 5.0 is 5.0 V ± 0.5 V

AC Operating Requirements: HD74ACT165

Item	Symbol	V _{CC} (V)*1	Ta = +25°C	Ta = −40°C		Unit
			C _L = 50 pF	to +85°C	C _L = 50 pF	
Setup time, HIGH or LOW H to S _L	t _{su}	5.0	3.0	4.0	4.5	ns
Hold time, HIGH or LOW H to S _L	t _h	5.0	−1.0	0.0	0.0	ns
Setup time, HIGH or LOW S _{in} to CP	t _{su}	5.0	0.5	3.0	3.5	ns
Hold time, HIGH or LOW S _{in} to CP	t _h	5.0	0.5	2.0	2.0	ns
Setup time, HIGH or LOW S _L to CP	t _{su}	5.0	2.0	4.0	4.5	ns
Hold time, HIGH or LOW S _L to CP	t _h	5.0	−1.5	0.0	0.0	ns
Recovery time clock inhibit to CP	t _{rec}	5.0	2.0	3.0	3.0	ns
Clock pulse width	t _w	5.0	3.5	7.0	8.0	ns

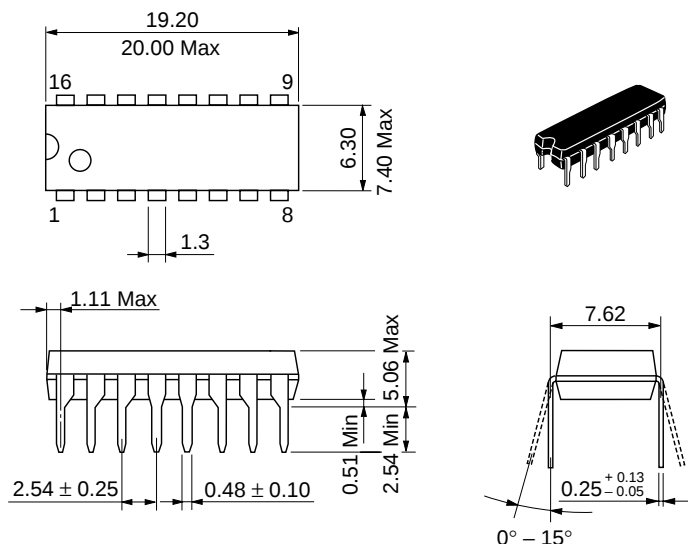
Note: 1. Voltage Range 5.0 is 5.0 V $\pm$ 0.5 V

Capacitance

Item	Symbol	Typ	Unit	Condition
Input capacitance	C_{IN}	4.5	pF	$V_{CC} = 5.5$ V
Power dissipation capacitance	C_{PD}	50	pF	$V_{CC} = 5.0$ V

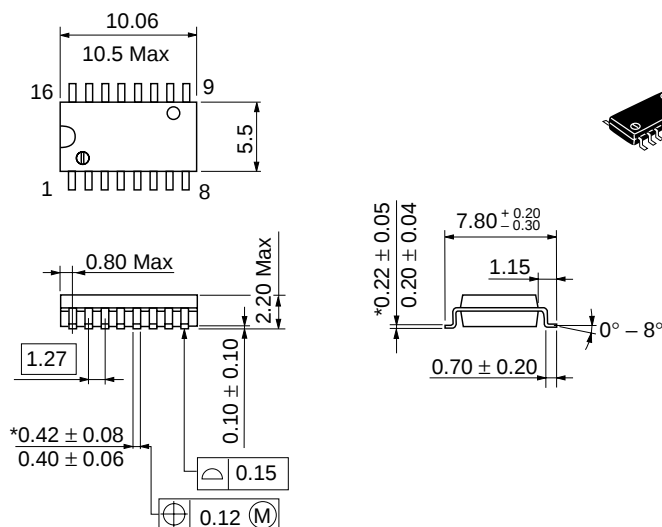
Package Dimensions

Unit: mm



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

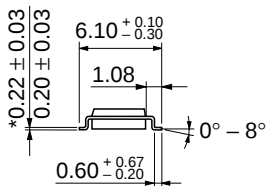
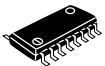
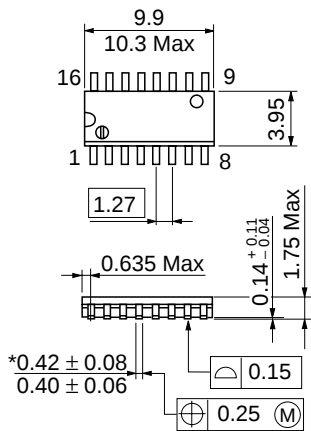
Unit: mm



*Dimension including the plating thickness
Base material dimension

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

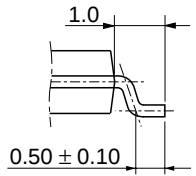
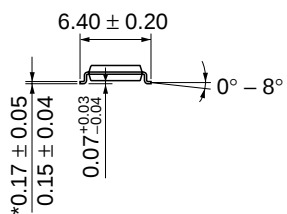
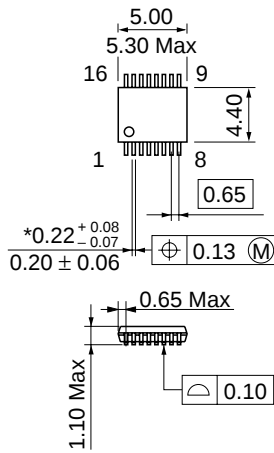
Unit: mm



*Dimension including the plating thickness
Base material dimension

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

Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	TTP-16DA
JEDEC	—
EIAJ	—
Mass (reference value)	0.05 g

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