

HD74AC166/HD74ACT166

8-bit Shift Register

HITACHI

ADE-205-375 (Z)
1st. Edition
Sep. 2000

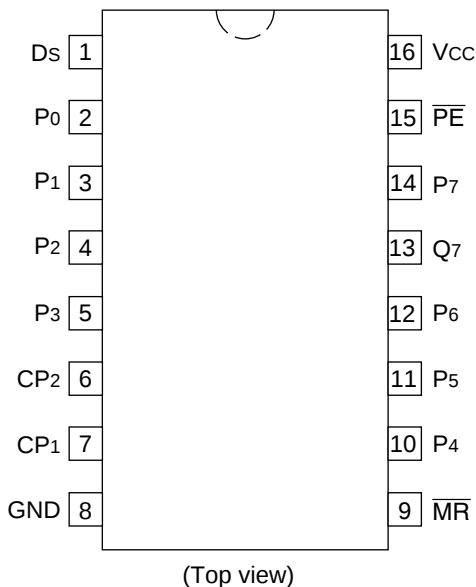
Description

The HD74AC166/HD74ACT166 is an 8-bit, serial or parallel-in, serial-out shift register using edge triggered D-type flip-flops. Serial and parallel entry are synchronous, with state changes initiated by the rising edge of the clock. An asynchronous Master Reset overrides other inputs and clears all flip-flops. The circuit can be clocked from two sources or one CP input can be used to trigger the other.

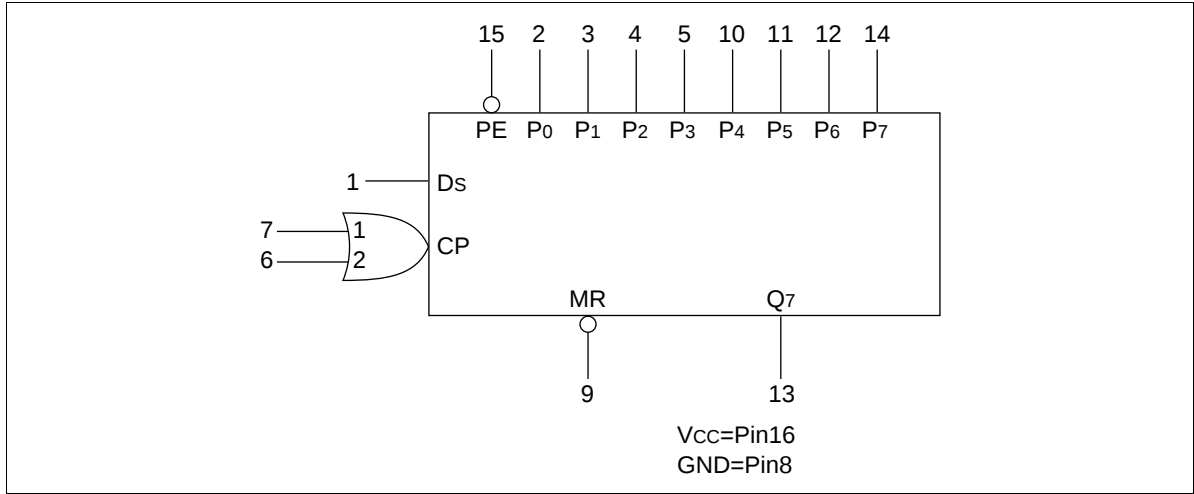
Features

- Outputs Source/Sink 24 mA
- HD74ACT166 has TTL-Compatible Inputs

Pin Arrangement



Logic Symbol



Pin Names

- CP₁, CP₂ Clock Pulse Inputs (Active Rising Edge)
- D_s Serial Data Input
- $\overline{PE}$ Parallel Enable Input (Active Low)
- P₀ to P₇ Parallel Data Inputs
- $\overline{MR}$ Asynchronous Master Reset Input (Active Low)
- Q₇ Last Stage Output

Functional Description

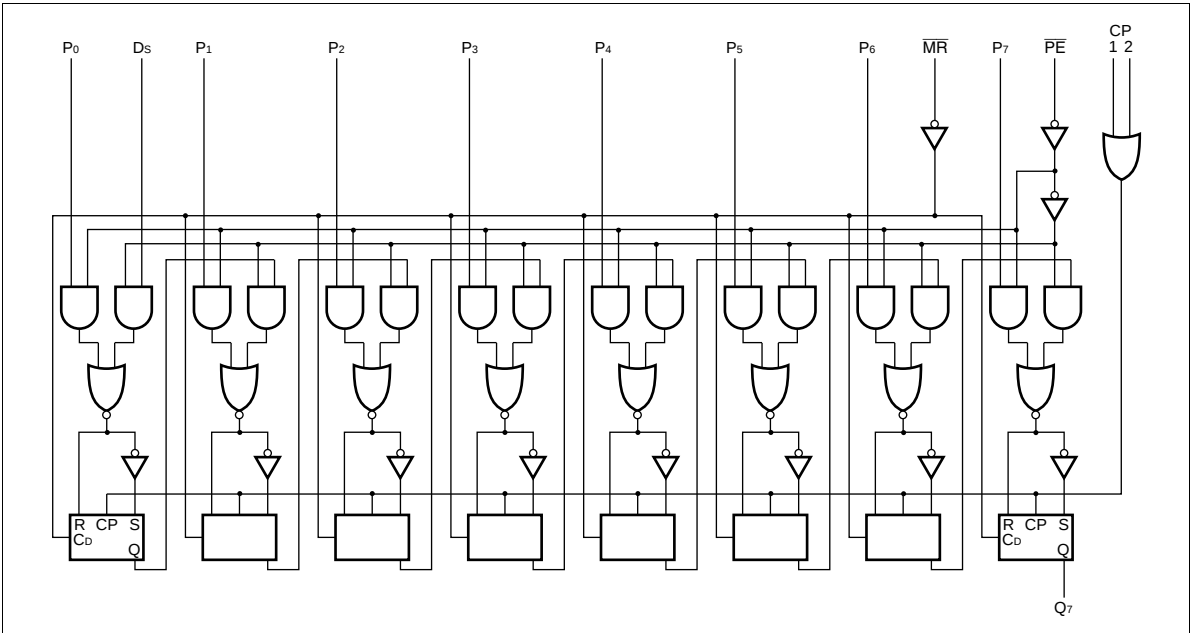
Operation is synchronous (except for Master Reset) and state changes are initiated by the rising edge of either clock input if the other clock input is Low. When one of the clock inputs is used as an active High clock inhibit, it should attain the High state while the other clock is still in the High state following the previous operation. When the Parallel Enable ($\overline{PE}$) input is Low, data is loaded into the register from the Parallel Data (P₀ to P₇) inputs on the next rising edge of the clock. When $\overline{PE}$ is High, information is shifted from the Serial Data (D_s) input to Q₀ and all data in the register is shifted one bit position (i.e., Q₀ → Q₁, Q₁ → Q₂, etc.) on the rising edge of the clock.

Truth Table

Inputs					Parallel	Internal Outputs		Output
$\overline{MR}$	$\overline{PE}$	CP_2	CP_1	D_S	P_0 to P_7	Q_0	Q_6	Q_7
L	X	X	X	X	X	L	L	L
H	X	L	L	X	X	Q_{A0}	Q_{B0}	Q_{H0}
H	L	L	$\lceil$	X	$a \cdots h$	a	b	h
H	H	L	$\lceil$	H	X	H	Q_{An}	Q_{Gn}
H	H	L	$\lceil$	L	X	L	Q_{An}	Q_{Gn}
H	X	H	$\lceil$	X	X	Q_{A0}	Q_{B0}	Q_{H0}

H : High Voltage Level
L : Low Voltage Level
X : Immaterial
 $\lceil$: Low-to-High Clock Transition

Logic Diagram



HD74AC166/HD74ACT166

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, Ta = Worst case
Maximum quiescent supply current	I _{CC}	8.0	μA	V _{IN} = V _{CC} or ground, V _{CC} = 5.5 V, Ta = 25°C
Maximum additional I _{CC} /input (HD74ACT166)	I _{CCT}	1.5	mA	V _{IN} = V _{CC} − 2.1 V, V _{CC} = 5.5 V, Ta = Worst case

AC Characteristics: HD74AC166

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 clock frequency	f _{max}	3.3	75	—	—	65	—	MHz
		5.0	100	—	—	80	—	
Propagation delay CP ₁ or CP ₂ to Q ₇	t _{PLH}	3.3	1.0	11.0	14.5	1.0	15.5	ns
		5.0	1.0	9.5	11.5	1.0	12.5	
Propagation delay CP ₁ or CP ₂ to Q ₇	t _{PHL}	3.3	1.0	10.5	14.0	1.0	15.0	
		5.0	1.0	9.0	11.0	1.0	12.0	
Propagation delay M $\overline{R}$ to Q ₇	t _{PHL}	3.3	1.0	9.5	12.0	1.0	13.0	
		5.0	1.0	6.5	9.0	1.0	10.0	

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 Operating Requirements: HD74AC166

Item	Symbol	V _{CC} (V)* ¹	Ta = +25°C C _L = 50 pF		Ta = −40°C to +85°C C _L = 50 pF		Unit
			Typ		Guaranteed Minimum		
Setup time	t _{su}	3.3	3.0		5.5	6.0	ns
$\overline{PE}$ or P _n or D _S to CP _n		5.0	2.0		4.0	4.5	
Hold time	t _h	3.3	−1.5		3.0	3.0	
CP _n to $\overline{PE}$ or P _n or D _S		5.0	−0.5		3.0	3.0	
Pulse width	t _w	3.3	2.0		5.5	7.0	
CP _n or $\overline{MR}$		5.0	2.0		4.5	5.0	
Recovery time	t _{rec}	3.3	−2.5		0.0	0.0	
$\overline{MR}$ to CP _n		5.0	−1.5		0.0	0.0	

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: HD74ACT166

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 clock frequency	f _{max}	5.0	100	—	—	80	—	MHz
Propagation delay CP _n to Q ₇	t _{PLH}	5.0	1.0	10.0	12.5	1.0	13.5	ns
Propagation delay CP _n to Q ₇	t _{PHL}	5.0	1.0	9.5	12.0	1.0	13.0	
Propagation delay $\overline{MR}$ to Q ₇	t _{PHL}	5.0	1.0	8.5	11.0	1.0	12.0	

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

AC Operating Requirements: HD74ACT166

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 PE or P _n or D _S to CP _n	t _{su}	5.0	2.5	7.0	8.0	ns
Hold time CP _n to PE or P _n or D _S	t _h	5.0	0.0	1.5	1.5	
Pulse width CP _n or MR	t _w	5.0	4.5	7.0	8.0	
Recovery time MR to CP _n	t _{rec}	5.0	−2.5	0.5	0.5	

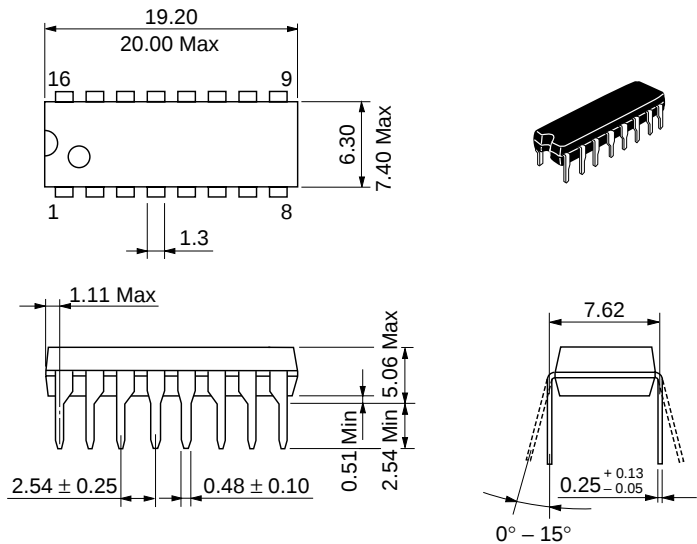
Note: 1. Voltage Range 5.0 is 5.0 V ± 0.5 V

Capacitance

Item	Symbol	Typ	Unit	Condition
Input capacitance	C _{IN}	4.5	pF	V _{CC} = 5.5 V
Power dissipation capacitance	C _{PD}	35.0	pF	V _{CC} = 5.0 V

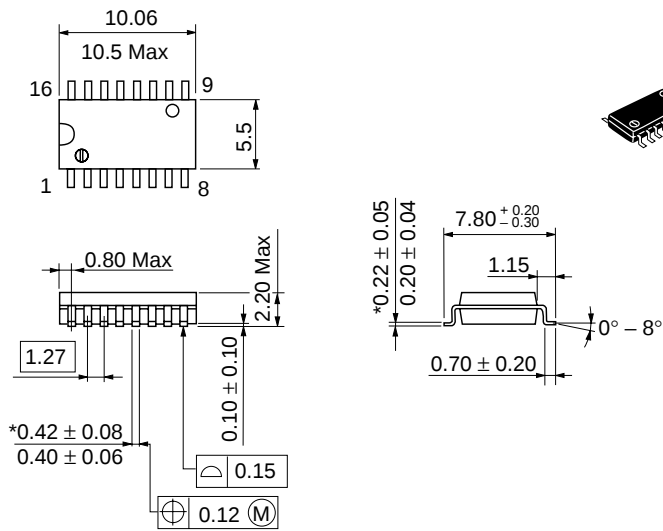
Package Dimensions

Unit: mm



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

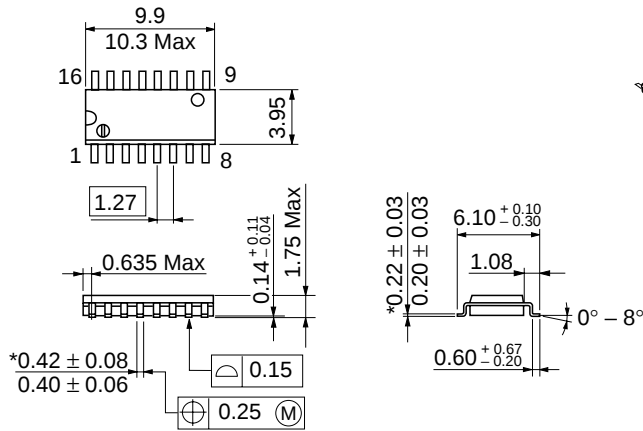
Unit: mm



*Dimension including the plating thickness
Base material dimension

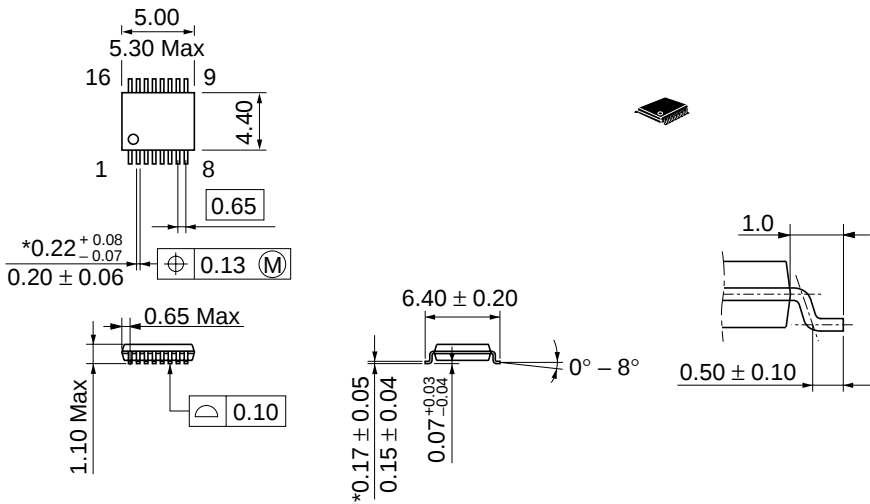
Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.24 g

Unit: mm



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

Unit: mm



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

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