

HD74HC112

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

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Description

Each flip-flop has independent J, K, preset, clear and clock inputs and Q and \bar{Q} outputs. This device is edge sensitive to the clock input and change state on the negative going transition of the clock pulse. Clear and preset are independent of the clock and accomplished by a low logic level on the corresponding input.

Features

- High Speed Operation: t_{pd} (Clock to Q) = 17 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) = 2 μ A max ($T_a = 25^\circ\text{C}$)

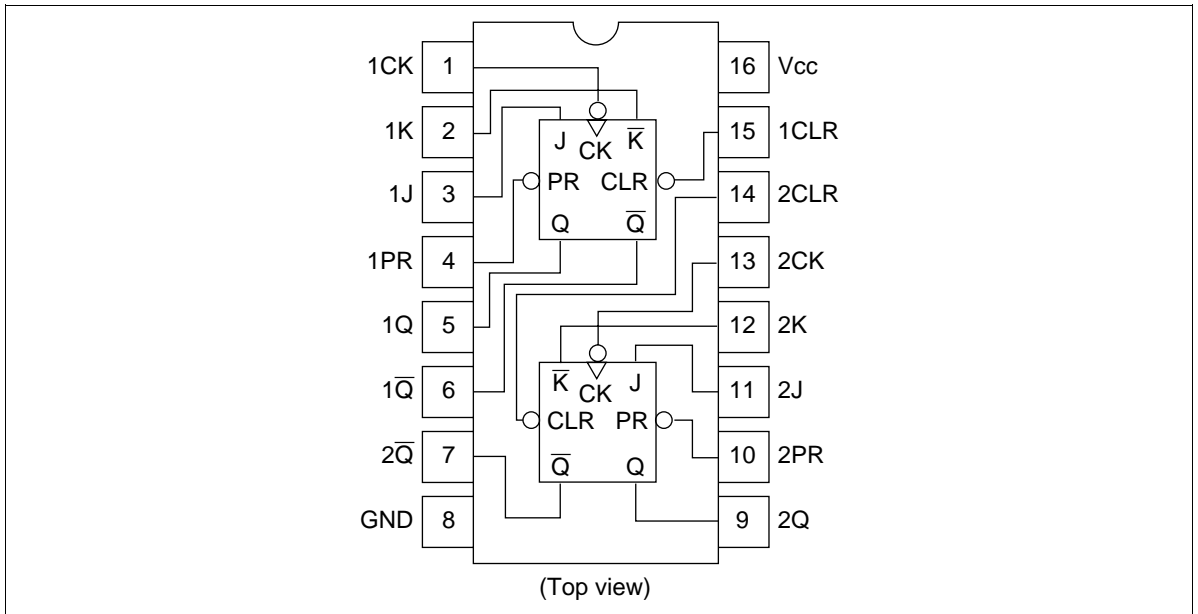
Function Table

Inputs					Output	
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* ¹	H* ¹
H	H		L	L	No Change	
H	H		L	H	L	H
H	H		H	L	H	L
H	H		H	H	Toggle	
H	H	L	X	X	No Change	
H	H	H	X	X	No Change	
H	H		X	X	No Change	

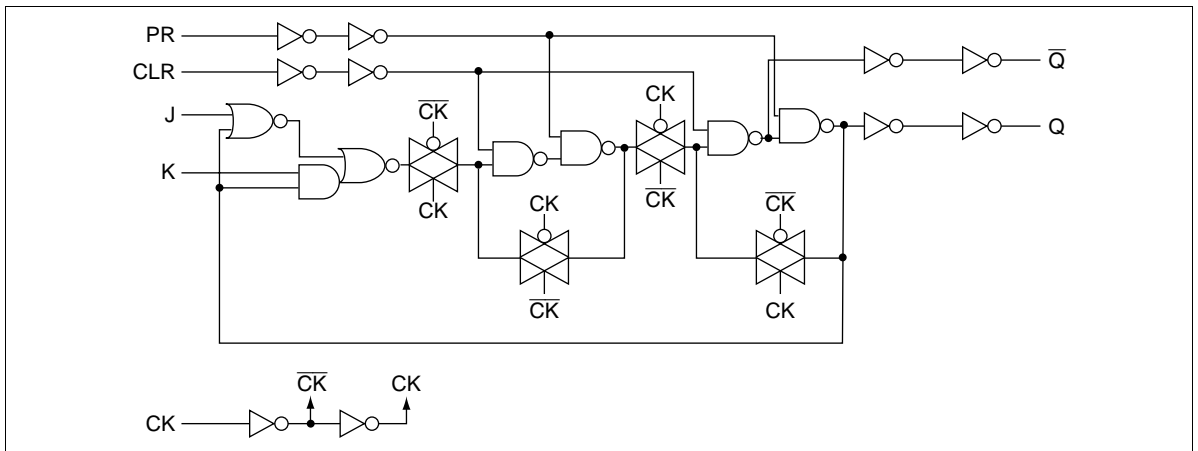
Note: 1. Q and \bar{Q} will remain HIGH as long as Preset and Clear are Low, but Q and \bar{Q} are unpredictable, if Preset and Clear go HIGH simultaneously.

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Pin Arrangement



Logic Diagram (1/2)



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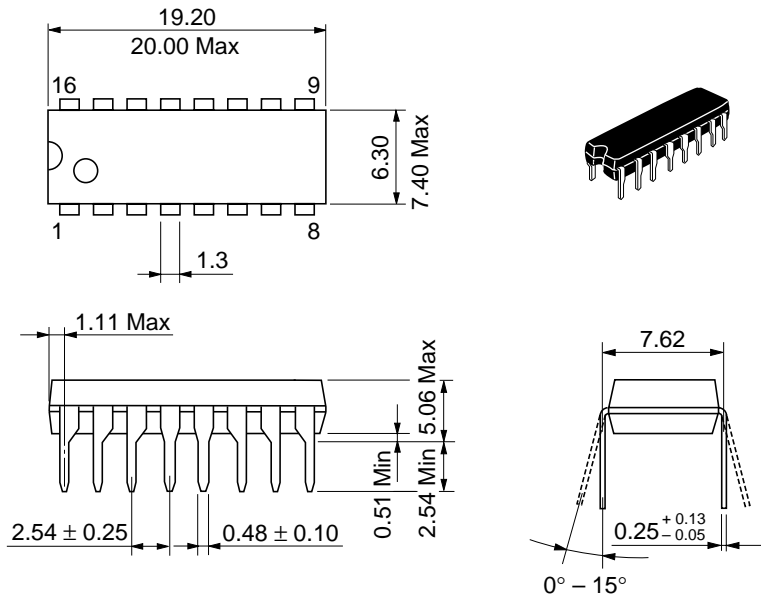
DC Characteristics

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	Vin = V _{IH} or V _{IL} I _{OH} = -20 μA	
		4.5	4.4	4.5	—	4.4	—			
		6.0	5.9	6.0	—	5.9	—			
		4.5	4.18	—	—	4.13	—			I _{OH} = -4 mA
		6.0	5.68	—	—	5.63	—			I _{OH} = -5.2 mA
		6.0	—	0.0	0.1	—	0.1			V
	4.5	—	0.0	0.1	—	0.1				
	6.0	—	0.0	0.1	—	0.1				
	4.5	—	—	0.26	—	0.33	I _{OL} = 4 mA			
	6.0	—	—	0.26	—	0.33	I _{OL} = 5.2 mA			
Input current	I _{in}	6.0	—	—	±0.1	—	±1.0	μA	Vin = V _{CC} or GND	
Quiescent supply current	I _{CC}	6.0	—	—	2.0	—	20	μA	Vin = V _{CC} or GND, I _{out} = 0 μA	

HD74HC112

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

Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $+85^\circ\text{C}$		Unit	Test Conditions		
			Min	Typ	Max	Min	Max				
Maximum clock frequency	f_{max}	2.0	—	—	6	—	5	MHz			
		4.5	—	—	30	—	24				
		6.0	—	—	35	—	28				
Propagation delay time	t_{PLH}	2.0	—	—	150	—	190	ns	Clock to Q or \bar{Q}		
		4.5	—	17	30	—	38				
		6.0	—	—	26	—	33				
	t_{PHL}	2.0	—	—	140	—	175	ns	Clear to Q or \bar{Q}		
		4.5	—	15	28	—	35				
		6.0	—	—	24	—	30				
		2.0	—	—	140	—	175			ns	Preset Q or \bar{Q}
		4.5	—	16	28	—	35				
		6.0	—	—	24	—	30				
	Pulse width	t_w	2.0	80	—	—	100	—	ns	Clock, Clear	
			4.5	16	9	—	20	—			
			6.0	14	—	—	17	—			
Setup time	t_{su}	2.0	100	—	—	125	—	ns	Data to Clock		
		4.5	20	3	—	25	—				
		6.0	17	—	—	21	—				
Hold time	t_h	2.0	5	—	—	5	—	ns	Clock to Data		
		4.5	5	-2	—	5	—				
		6.0	5	—	—	5	—				
Removal time	t_{rem}	2.0	100	—	—	125	—	ns	Clear to Clock		
		4.5	20	2	—	25	—				
		6.0	17	—	—	21	—				
Output rise/fall time	t_{TLH}	2.0	—	—	75	—	95	ns			
		4.5	—	5	15	—	19				
	t_{THL}	6.0	—	—	13	—	16				
Input capacitance	C_{in}	—	—	5	10	—	10	pF			



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



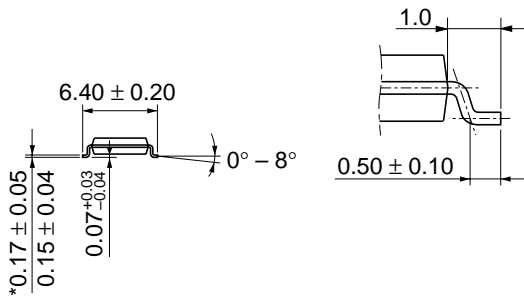
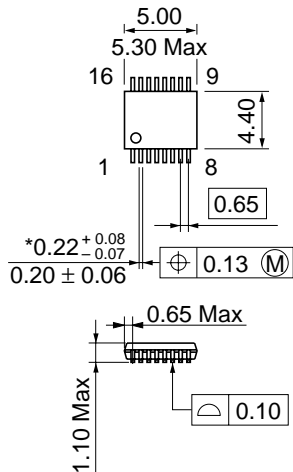
*Dimension including the plating thickness
Base material dimension

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
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 g



*Dimension including the plating thickness
 Base material dimension

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

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