

MN74HC174/MN74HC174S

Hex D-Type Flip-Flops with Clear

Description

MN74HC174/MN74HC174S contain six hex D-type flip-flop circuits with clear in one chip, and this master/slave flip-flop has common clock and clear. D-input data to be met to set-up time is transferred to output Q at the rising edge of the clock pulse. When the clear input is "L", all outputs are set to "L".

Adoption of a silicon gate CMOS process makes possible low power consumption, a high noise allowance, and an operation speed equivalent to LS TTL; LS TTL 10-inputs can be directly driven. Resistors and diodes are used in the V_{DD} and V_{SS} to protect the input/output from damage by static electricity. Same pin configuration and function as standard 54LS/74LS Logic Family.

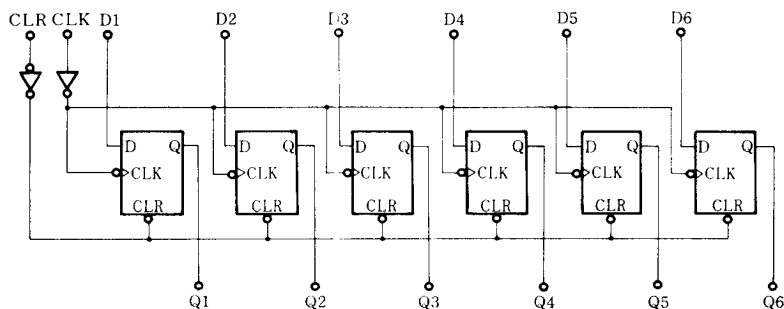
Truth table

Input			Output
CLR	CLK	D	Q
L	×	×	L
H	↗	H	H
H	↗	L	L
H	L	×	Q_0

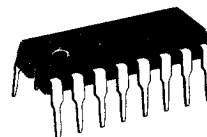
Notes:

1. ↗: Data input is transferred to output when the clock rises from LOW to HIGH
2. ×: Either HIGH or LOW; it doesn't matter
3. Q_0 : Q level prior to determination of input conditions shown in the table.

Logic diagram (1 gate)



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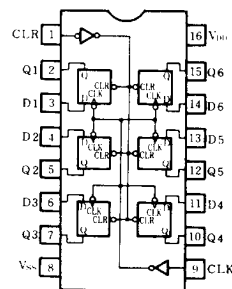
16-pin plastic DIL package

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16-pin Panaflat package (SO-16D)

Pin configuration (top view)



■ Absolute maximum ratings

Item			Sym.	Rating	Unit
Supply voltage			V_{DD}	$-0.5 \sim 7.0$	V
Input/output voltage			V_I, V_O	$-0.5 \sim V_{DD} + 0.5$	V
Input current			I_I	± 20	mA
Output current			I_O	± 25	mA
Power dissipation	MN74HC174	$T_a = -40 \sim +60^{\circ}\text{C}$	P_D	400	mW
		$T_a = +60 \sim +85^{\circ}\text{C}$		Decrease to 200mW at the rate of $8\text{mW}/^{\circ}\text{C}$	
	MN74HC174S	$T_a = -40 \sim +60^{\circ}\text{C}$	P_D	275	mW
		$T_a = +60 \sim +85^{\circ}\text{C}$		Decrease to 200mW at the rate of $3.8\text{mW}/^{\circ}\text{C}$	
Storage temperature range			T_{stg}	$-65 \sim +150$	$^{\circ}\text{C}$
Supply current			I_{DD}, I_{SS}	± 50	mA

■ Recommended operating conditions

Item	Sym.	Rating	Unit
Operating supply voltage	V_{DD}	$1.4 \sim 6.0$	V
Input voltage	V_I	$0 \sim V_{DD}$	V
Operating temperature range	T_{opr}	$-40 \sim +85$	$^\circ\text{C}$
Input rise and fall time	t_r, t_f	$0 \sim 500$	ns

■ DC characteristics ($V_{DD} = 5\text{V} \pm 10\%$, $V_{SS} = 0\text{V}$)

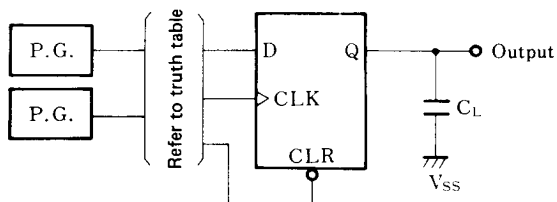
Item	Sym.	Test conditions	$T_a = -40^\circ\text{C}$		$T_a = +25^\circ\text{C}$		$T_a = +85^\circ\text{C}$		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	
Quiescent supply current	I_{DD}	$V_I = V_{DD}$ or V_{SS}		8		8		80	μA
High level input voltage	V_{IH}	$V_O = V_{DD} - 1.0\text{V}$	$V_{DD} = 4.5\text{V}$	3.15		3.15		3.15	V
		or 0.5V	$V_{DD} = 5.0\text{V}$	3.50		3.50		3.50	
		$ I_O \leq 1\mu\text{A}$	$V_{DD} = 5.5\text{V}$	3.85		3.85		3.85	
Low level input voltage	V_{IL}	$V_O = V_{DD} - 1.0\text{V}$	$V_{DD} = 4.5\text{V}$		0.9		0.9		V
		or 0.5V	$V_{DD} = 5.0\text{V}$		1.0		1.0		
		$ I_O \leq 1\mu\text{A}$	$V_{DD} = 5.5\text{V}$		1.1		1.1		
Input current	$\pm I_I$	$V_I = V_{DD}$ or V_{SS}		0.3		0.3		1	μA
High level output voltage	V_{OH}	$V_I = V_{DD}$ or V_{SS} , $ I_O \leq 1\mu\text{A}$	$V_{DD} - 0.05$		$V_{DD} - 0.05$		$V_{DD} - 0.05$		V
Low level output voltage	V_{OL}	$V_I = V_{DD}$ or V_{SS} , $ I_O \leq 1\mu\text{A}$		0.05		0.05		0.05	V
High level output current	I_{OH}	$V_I = V_{DD}$ or V_{SS} , $V_O = V_{DD} - 0.8\text{V}$	-6		-5		-4		mA
Low level output current	I_{OL}	$V_I = V_{DD}$ or V_{SS} , $V_O = 0.4\text{V}$	6		5		4		mA

■ AC characteristics ($V_{DD} = 5\text{V}$, $V_{SS} = 0\text{V}$, $T_a = 25^\circ\text{C}$, Input transition time $\leq 6\text{ns}$, $C_L = 50\text{pF}$)

Item	Sym.	Test conditions	Min.	Typ.	Max.	Unit
Output rise time	t_{rLH}			8	15	ns
Output fall time	t_{rHL}			6	15	ns
Minimum data set-up time	t_{su}				20	ns
Maximum clock frequency	f_{max}		30			MHz
Propagation time (L→H) CLK→Q	t_{PLH}				25	ns
Propagation time (H→L) CLK→Q	t_{PHL}				25	ns
Propagation time (L→H) PR,CLR→Q	t_{PLH}				25	ns
Propagation time (H→L) PR,CLR→Q	t_{PHL}				25	ns
Minimum clear pulse width	t_{wCD}				20	ns

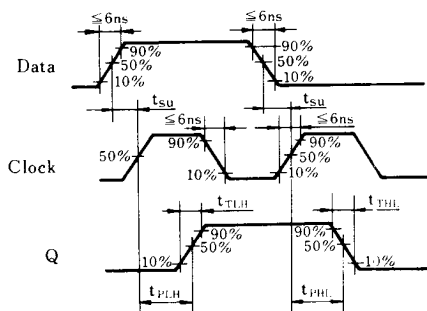
※ Switching time measurement circuit and waveform

1. Measurement circuit



2. Waveforms

Waveforms--1



Waveforms--2

