

DATA SHEET

For a complete data sheet, please also download:

- The IC04 LOCMOS HE4000B Logic Family Specifications HEF, HEC
- The IC04 LOCMOS HE4000B Logic Package Outlines/Information HEF, HEC

HEF40175B

MSI

Quadruple D-type flip-flop

Product specification
File under Integrated Circuits, IC04

January 1995

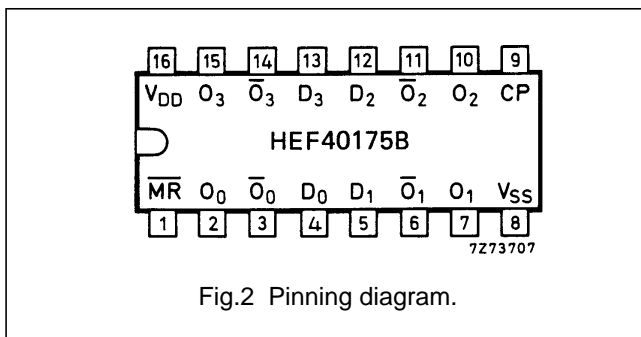
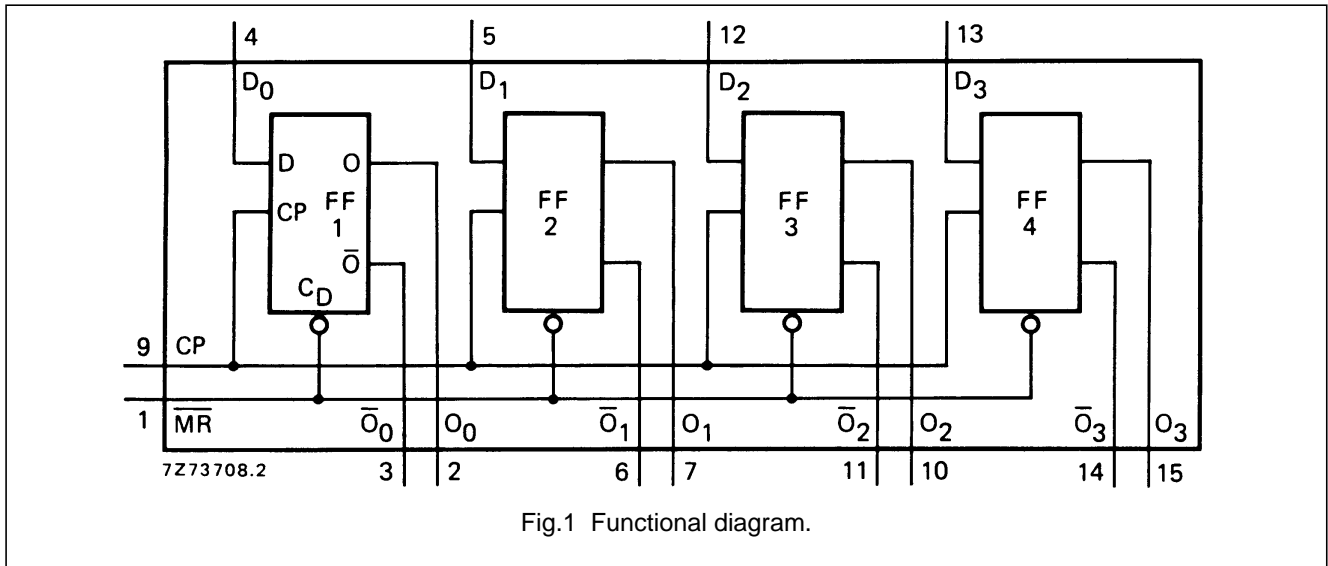
Quadruple D-type flip-flop

HEF40175B MSI

DESCRIPTION

The HEF40175B is a quadruple edge-triggered D-type flip-flop with four data inputs (D_0 to D_3), a clock input (CP), an overriding asynchronous master reset input (\overline{MR}), four buffered outputs (O_0 to O_3), and four complementary

buffered outputs (\overline{O}_0 to \overline{O}_3). Information on D_0 to D_3 is transferred to O_0 to O_3 on the LOW to HIGH transition of CP if \overline{MR} is HIGH. When LOW, \overline{MR} resets all flip-flops (O_0 to $O_3 = \text{LOW}$, \overline{O}_0 to $\overline{O}_3 = \text{HIGH}$), independent of CP and D_0 to D_3 .



PINNING

- D_0 to D_3 data inputs
- CP clock input (LOW to HIGH; edge-triggered)
- \overline{MR} master reset input (active LOW)
- O_0 to O_3 buffered outputs
- \overline{O}_0 to \overline{O}_3 complementary buffered outputs

FUNCTION TABLE

INPUTS			OUTPUTS	
CP	D	\overline{MR}	O	\overline{O}
	H	H	H	L
	L	H	L	H
	X	H	no change	no change
X	X	L	L	H

Notes

1. H = HIGH state (the more positive voltage)
- L = LOW state (the less positive voltage)
- X = state is immaterial

= positive-going transition

= negative-going transition

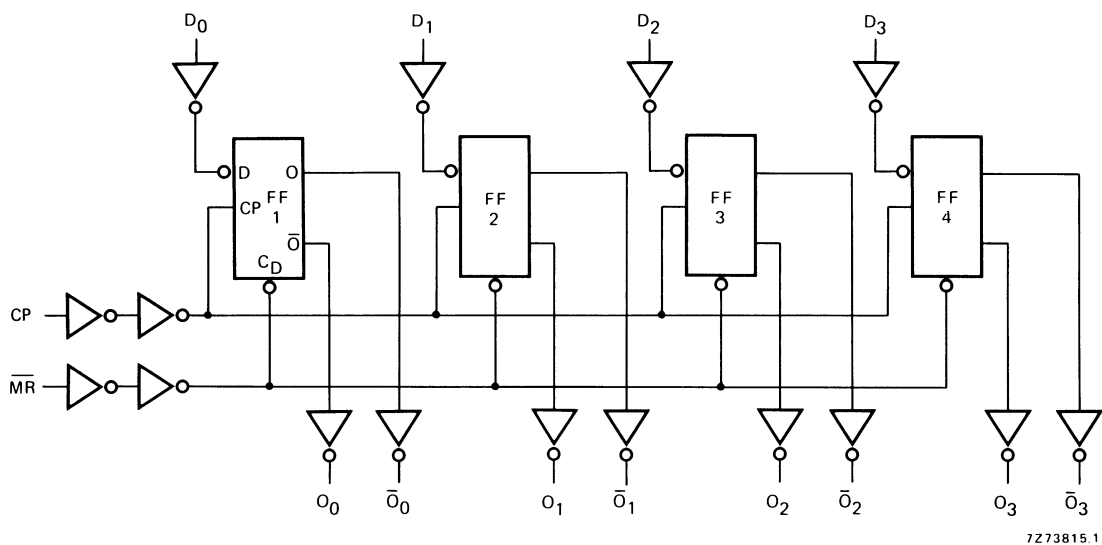
- HEF40175BP(N): 16-lead DIL; plastic (SOT38-1)
 - HEF40175BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
 - HEF40175BT(D): 16-lead SO; plastic (SOT109-1)
- (): Package Designator North America

FAMILY DATA, I_{DD} LIMITS category MSI

See Family Specifications

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7273815.1

Fig.3 Logic diagram.

Quadruple D-type flip-flop

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AC CHARACTERISTICS

 $V_{SS} = 0$ V; $T_{amb} = 25$ °C; $C_L = 50$ pF; input transition times ≤ 20 ns

	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA	
Propagation delays $CP \rightarrow O_n, \overline{O}_n$ HIGH to LOW	5	t_{PHL}		80	160	ns	53 ns + (0,55 ns/pF) C_L
	10			35	70	ns	24 ns + (0,23 ns/pF) C_L
	15			25	50	ns	17 ns + (0,16 ns/pF) C_L
LOW to HIGH	5	t_{PLH}		70	140	ns	43 ns + (0,55 ns/pF) C_L
	10			30	65	ns	19 ns + (0,23 ns/pF) C_L
	15			25	45	ns	17 ns + (0,16 ns/pF) C_L
$\overline{MR} \rightarrow O_n$ HIGH to LOW	5	t_{PHL}		75	155	ns	48 ns + (0,55 ns/pF) C_L
	10			30	65	ns	19 ns + (0,23 ns/pF) C_L
	15			25	50	ns	17 ns + (0,16 ns/pF) C_L
$\overline{MR} \rightarrow \overline{O}_n$ LOW to HIGH	5	t_{PLH}		70	140	ns	43 ns + (0,55 ns/pF) C_L
	10			30	65	ns	19 ns + (0,23 ns/pF) C_L
	15			25	50	ns	17 ns + (0,16 ns/pF) C_L
Output transition times HIGH to LOW	5	t_{THL}		60	120	ns	10 ns + (1,0 ns/pF) C_L
	10			30	60	ns	9 ns + (0,42 ns/pF) C_L
	15			20	40	ns	6 ns + (0,28 ns/pF) C_L
LOW to HIGH	5	t_{TLH}		60	120	ns	10 ns + (1,0 ns/pF) C_L
	10			30	60	ns	9 ns + (0,42 ns/pF) C_L
	15			20	40	ns	6 ns + (0,28 ns/pF) C_L
Set-up time $D_n \rightarrow CP$	5	t_{su}	60	30		ns	see also waveforms Fig.4
	10		20	10		ns	
	15		15	5		ns	
Hold time $D_n \rightarrow CP$	5	t_{hold}	25	-5		ns	
	10		10	0		ns	
	15		10	0		ns	
Minimum clock pulse width; LOW	5	t_{WCPL}	90	45		ns	
	10		35	15		ns	
	15		25	10		ns	
Minimum \overline{MR} pulse width; LOW	5	t_{WMRL}	80	40		ns	
	10		30	15		ns	
	15		20	10		ns	
Recovery time for \overline{MR}	5	t_{RMR}	0	-30		ns	
	10		0	-20		ns	
	15		0	-15		ns	
Maximum clock pulse frequency	5	f_{max}	5	11		MHz	
	10		15	30		MHz	
	15		20	45		MHz	

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AC CHARACTERISTICS

$V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; input transition times $\leq 20\text{ ns}$

	V_{DD} V	TYPICAL FORMULA FOR P (μW)	
Dynamic power dissipation per package (P)	5	$2000 f_i + \sum (f_o C_L) \times V_{DD}^2$	where f_i = input freq. (MHz) f_o = output freq. (MHz) C_L = load capacitance (pF) $\sum (f_o C_L)$ = sum of outputs V_{DD} = supply voltage (V)
	10	$8400 f_i + \sum (f_o C_L) \times V_{DD}^2$	
	15	$22\ 500 f_i + \sum (f_o C_L) \times V_{DD}^2$	

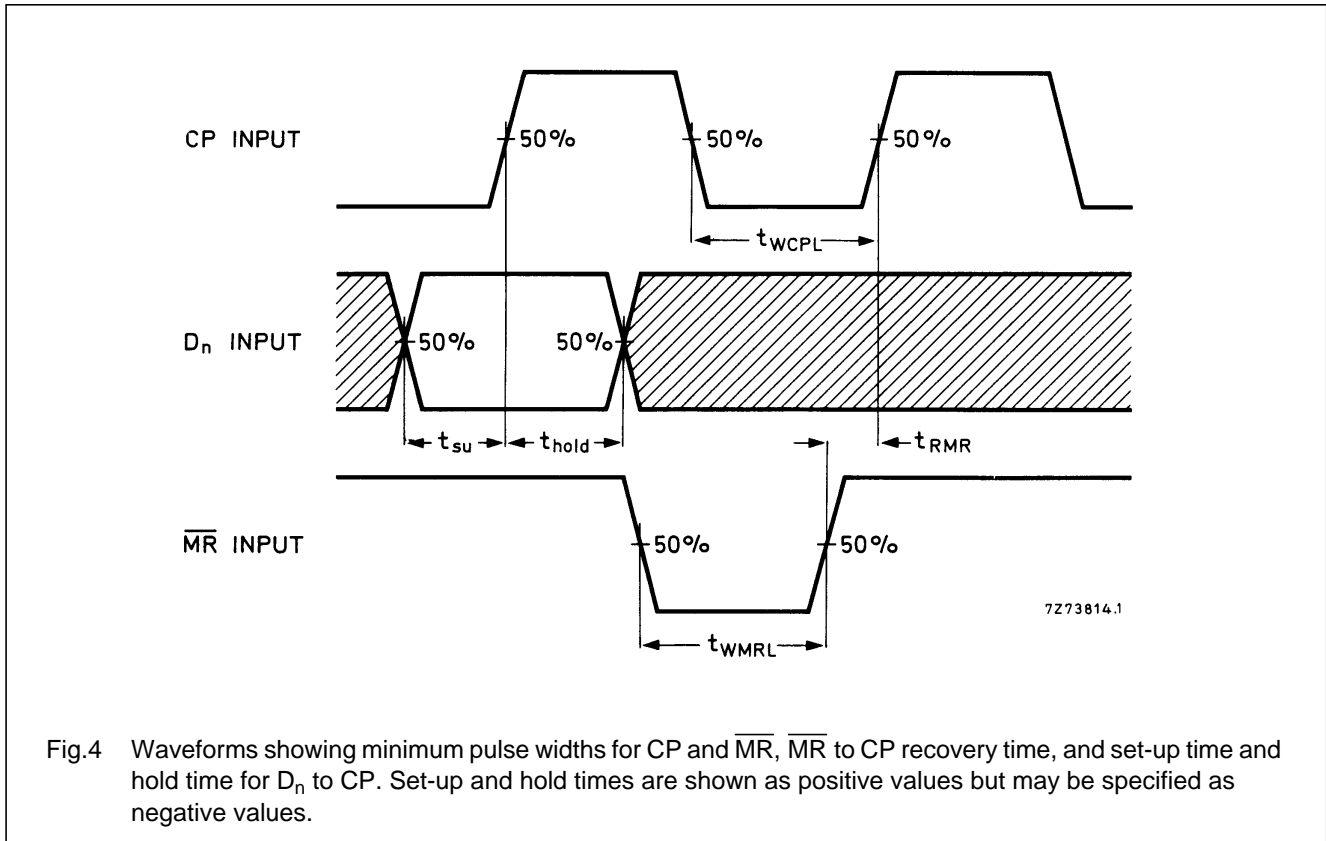


Fig.4 Waveforms showing minimum pulse widths for CP and $\overline{\text{MR}}$, $\overline{\text{MR}}$ to CP recovery time, and set-up time and hold time for D_n to CP. Set-up and hold times are shown as positive values but may be specified as negative values.

APPLICATION INFORMATION

Some examples of applications for the HEF40175B are:

- Shift registers
- Buffer/storage register
- Pattern generator