

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

HEF4024B **MSI** 7-stage binary counter

Product specification
File under Integrated Circuits, IC04

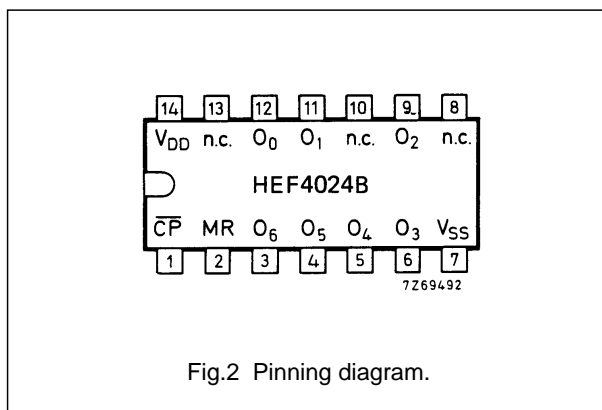
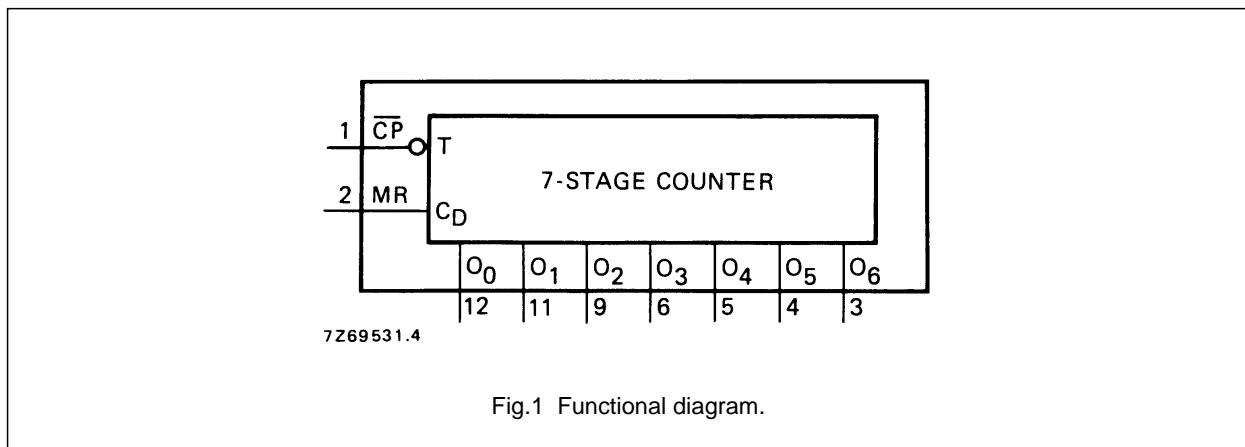
January 1995

7-stage binary counter

HEF4024B MSI

DESCRIPTION

The HEF4024B is a 7-stage binary ripple counter with a clock input (\overline{CP}), and overriding asynchronous master reset input (MR) and seven fully buffered parallel outputs (O_0 to O_6). The counter advances on the HIGH to LOW transition of \overline{CP} . A HIGH on MR clears all counter stages and forces all outputs LOW, independent of \overline{CP} . Each counter stage is a static toggle flip-flop.



PINNING

\overline{CP}	clock input (HIGH to LOW triggered)
MR	master reset input
O_0 to O_6	buffered parallel outputs

APPLICATION INFORMATION

Some examples of applications for the HEF4024B are:

- Frequency dividers
- Time delay circuits

FAMILY DATA, I_{DD} LIMITS category MSI

See Family Specifications

HEF4024BP(N):	14-lead DIL; plastic (SOT27-1)
HEF4024BD(F):	14-lead DIL; ceramic (cerdip) (SOT73)
HEF4024BT(D):	14-lead SO; plastic (SOT108-1)
():	Package Designator North America

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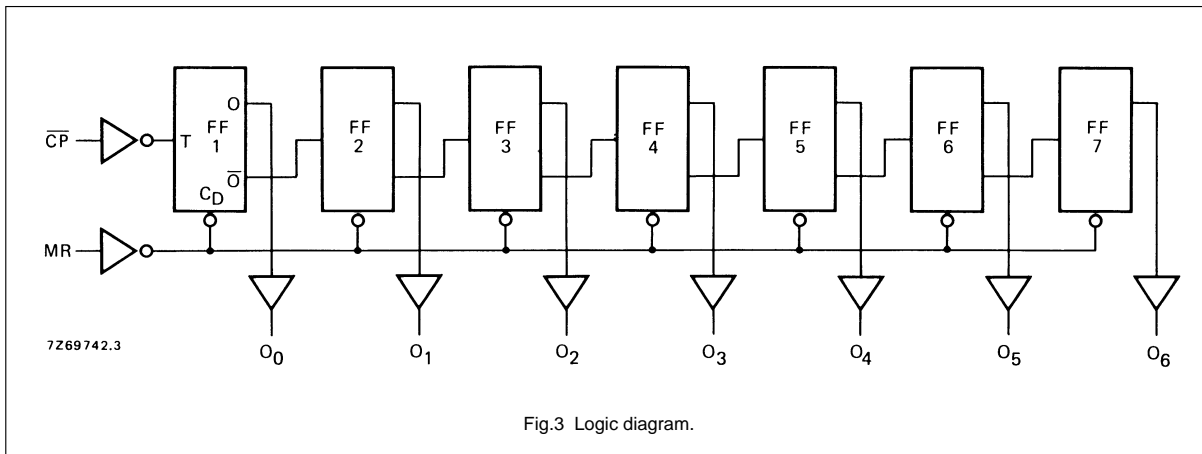


Fig.3 Logic diagram.

7-stage binary counter

HEF4024B
MSI**AC CHARACTERISTICS**

$V_{SS} = 0$ V; $T_{amb} = 25$ °C; $C_L = 50$ pF; input transition times ≤ 20 ns; see also waveforms Fig.4

	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA	
Propagation delays	$\overline{CP} \rightarrow O_0$ HIGH to LOW	t_{PHL}	5	100	200	ns	$73 \text{ ns} + (0,55 \text{ ns/pF}) C_L$
			10	40	75	ns	$29 \text{ ns} + (0,23 \text{ ns/pF}) C_L$
			15	25	50	ns	$17 \text{ ns} + (0,16 \text{ ns/pF}) C_L$
	LOW to HIGH	t_{PLH}	5	105	210	ns	$78 \text{ ns} + (0,55 \text{ ns/pF}) C_L$
			10	45	85	ns	$34 \text{ ns} + (0,23 \text{ ns/pF}) C_L$
			15	30	60	ns	$22 \text{ ns} + (0,16 \text{ ns/pF}) C_L$
	$O_n \rightarrow O_{n+1}$ HIGH to LOW	t_{PHL}	5	60	120	ns	$33 \text{ ns} + (0,55 \text{ ns/pF}) C_L$
			10	25	50	ns	$14 \text{ ns} + (0,23 \text{ ns/pF}) C_L$
			15	20	40	ns	$12 \text{ ns} + (0,16 \text{ ns/pF}) C_L$
	LOW to HIGH	t_{PLH}	5	50	100	ns	$23 \text{ ns} + (0,55 \text{ ns/pF}) C_L$
			10	20	40	ns	$9 \text{ ns} + (0,23 \text{ ns/pF}) C_L$
			15	15	30	ns	$7 \text{ ns} + (0,16 \text{ ns/pF}) C_L$
MR $\rightarrow O_n$ HIGH to LOW	t_{PHL}	5	120	240	ns	$93 \text{ ns} + (0,55 \text{ ns/pF}) C_L$	
		10	45	90	ns	$34 \text{ ns} + (0,23 \text{ ns/pF}) C_L$	
		15	30	60	ns	$22 \text{ ns} + (0,16 \text{ ns/pF}) C_L$	
Output transition times	HIGH to LOW	t_{THL}	5	60	120	ns	$10 \text{ ns} + (1,0 \text{ ns/pF}) C_L$
			10	30	60	ns	$9 \text{ ns} + (0,42 \text{ ns/pF}) C_L$
			15	20	40	ns	$6 \text{ ns} + (0,28 \text{ ns/pF}) C_L$
	LOW to HIGH	t_{TLH}	5	60	120	ns	$10 \text{ ns} + (1,0 \text{ ns/pF}) C_L$
			10	30	60	ns	$9 \text{ ns} + (0,42 \text{ ns/pF}) C_L$
			15	20	40	ns	$6 \text{ ns} + (0,28 \text{ ns/pF}) C_L$
Minimum clock pulse width; HIGH	t_{WCPH}	5	60	30	ns		
		10	30	15	ns		
		15	20	10	ns		
Minimum MR pulse width; HIGH	t_{WMRH}	5	80	40	ns		
		10	35	20	ns		
		15	25	15	ns		
Recovery time for MR	t_{RMR}	5	20	10	ns		
		10	15	5	ns		
		15	15	5	ns		
Maximum clock pulse frequency	f_{max}	5	5	10	MHz		
		10	13	25	MHz		
		15	18	35	MHz		

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	V_{DD} V	TYPICAL FORMULA FOR P (μ W)	
Dynamic power dissipation per package (P)	5	$500 f_i + \sum (f_o C_L) \times V_{DD}^2$	where f_i = input freq. (MHz) f_o = output freq. (MHz) C_L = load cap. (pF) $\sum (f_o C_L)$ = sum of outputs V_{DD} = supply voltage (V)
	10	$2100 f_i + \sum (f_o C_L) \times V_{DD}^2$	
	15	$5200 f_i + \sum (f_o C_L) \times V_{DD}^2$	

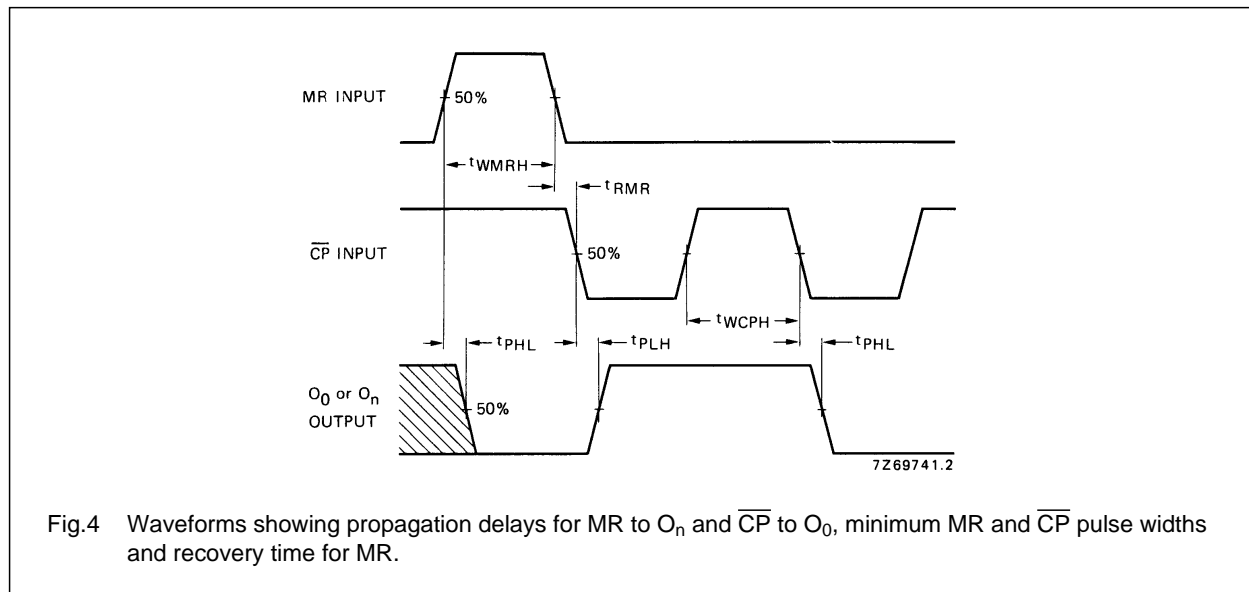


Fig.4 Waveforms showing propagation delays for MR to O_n and CP to O₀, minimum MR and CP pulse widths and recovery time for MR.