

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

HEF4040B

MSI

12-stage binary counter

Product specification
File under Integrated Circuits, IC04

January 1995

12-stage binary counter

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DESCRIPTION

The HEF4040B is a 12-stage binary ripple counter with a clock input ($\overline{CP}$), an overriding asynchronous master reset input (MR) and twelve fully buffered outputs (O_0 to O_{11}). 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. Schmitt-trigger action in the clock input makes the circuit highly tolerant to slower clock rise and fall times.

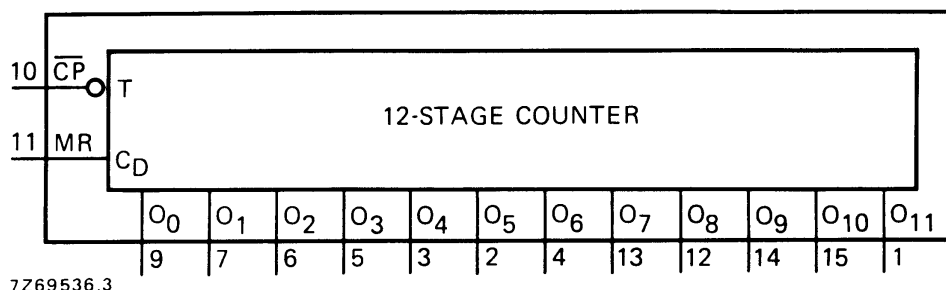


Fig.1 Functional diagram.

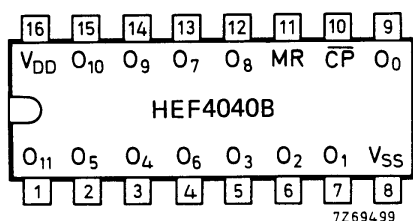


Fig.2 Pinning diagram.

PINNING

$\overline{CP}$	clock input (HIGH to LOW edge-triggered)
MR	master reset input (active HIGH)
O_0 to O_{11}	parallel outputs

APPLICATION INFORMATION

Some examples of applications for the HEF4040B are:

- Frequency dividing circuits
- Time delay circuits
- Control counters

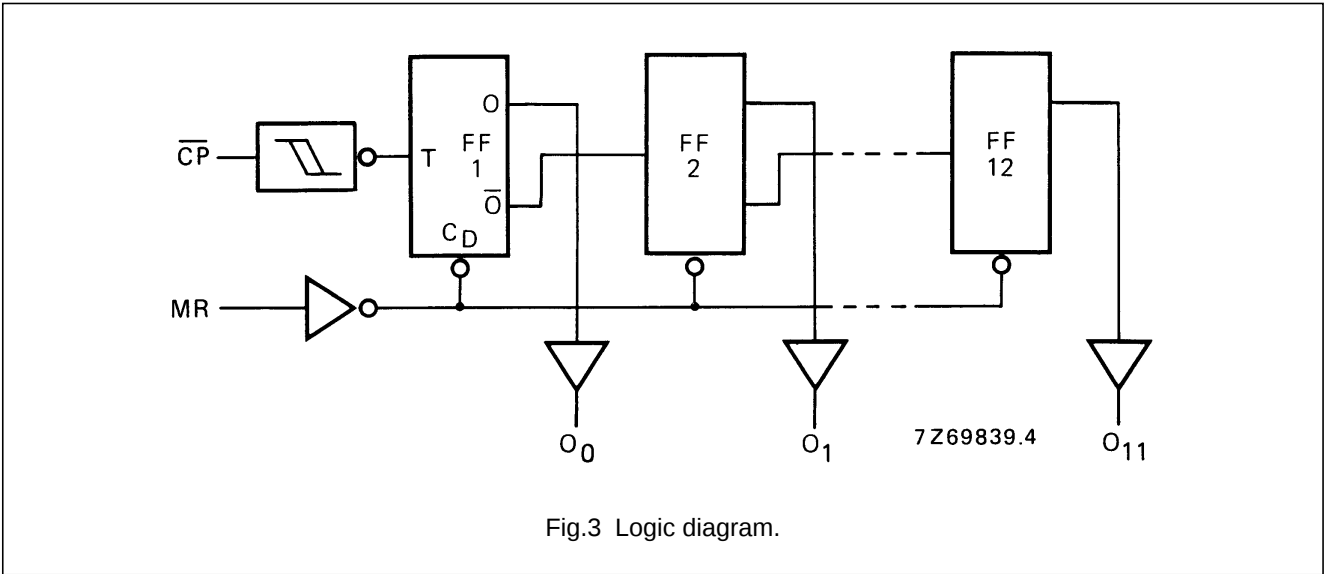
FAMILY DATA, I_{DD} LIMITS category MSI

See Family Specifications

HEF4040BP(N): 16-lead DIL; plastic
(SOT38-1)
HEF4040BD(F): 16-lead DIL; ceramic (cerdip)
(SOT74)
HEF4040BT(D): 16-lead SO; plastic
(SOT109-1)
(): Package Designator North America

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AC CHARACTERISTICS

$V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $C_L = 50\text{ pF}$; input transition times $\leq 20\text{ ns}$

	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA
Propagation delays						
$\overline{CP} \rightarrow O_0$	5			105	210 ns	78 ns + (0,55 ns/pF) C_L
HIGH to LOW	10	t_{PHL}		45	90 ns	34 ns + (0,23 ns/pF) C_L
	15			35	70 ns	27 ns + (0,16 ns/pF) C_L
LOW to HIGH	5	t_{PLH}		85	170 ns	58 ns + (0,55 ns/pF) C_L
	10			40	80 ns	29 ns + (0,23 ns/pF) C_L
	15			30	60 ns	22 ns + (0,16 ns/pF) C_L
$O_n \rightarrow O_{n+1}$	5			35	70 ns	note 1 (0,55 ns/pF) C_L
HIGH to LOW	10	t_{PHL}		15	30 ns	note 1 (0,23 ns/pF) C_L
	15			10	20 ns	note 1 (0,16 ns/pF) C_L
LOW to HIGH	5	t_{PLH}		35	70 ns	note 1 (0,55 ns/pF) C_L
	10			15	30 ns	note 1 (0,23 ns/pF) C_L
	15			10	20 ns	note 1 (0,16 ns/pF) C_L
$MR \rightarrow O_n$	5			90	180 ns	63 ns + (0,55 ns/pF) C_L
HIGH to LOW	10	t_{PHL}		40	80 ns	29 ns + (0,23 ns/pF) C_L
	15			30	60 ns	22 ns + (0,16 ns/pF) C_L
Output transition times	5			60	120 ns	10 ns + (1,0 ns/pF) C_L
HIGH to LOW	10	t_{THL}		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

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	V _{DD} V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA
Minimum clock pulse width; HIGH	5	t _{WCPH}	50	25	ns	see also waveforms Fig.4
	10		30	15	ns	
	15		20	10	ns	
Minimum MR pulse width; HIGH	5	t _{WMRH}	40	20	ns	
	10		30	15	ns	
	15		20	10	ns	
Recovery time for MR	5	t _{RMR}	40	20	ns	
	10		30	15	ns	
	15		20	10	ns	
Maximum clock pulse frequency	5	f _{max}	10	20	MHz	
	10		15	30	MHz	
	15		25	50	MHz	

Note

- For other loads than 50 pF at the nth output, use the slope given.

	V _{DD} V	TYPICAL FORMULA FOR P (μW)	
Dynamic power dissipation per package (P)	5	$400 f_i + \sum (f_o C_L) \times V_{DD}^2$	where f _i = input freq. (MHz) f _o = output freq. (MHz) C _L = load cap. (pF) Σ (f _o C _L) = sum of outputs V _{DD} = supply voltage (V)
	10	$2\,000 f_i + \sum (f_o C_L) \times V_{DD}^2$	
	15	$5\,200 f_i + \sum (f_o C_L) \times V_{DD}^2$	

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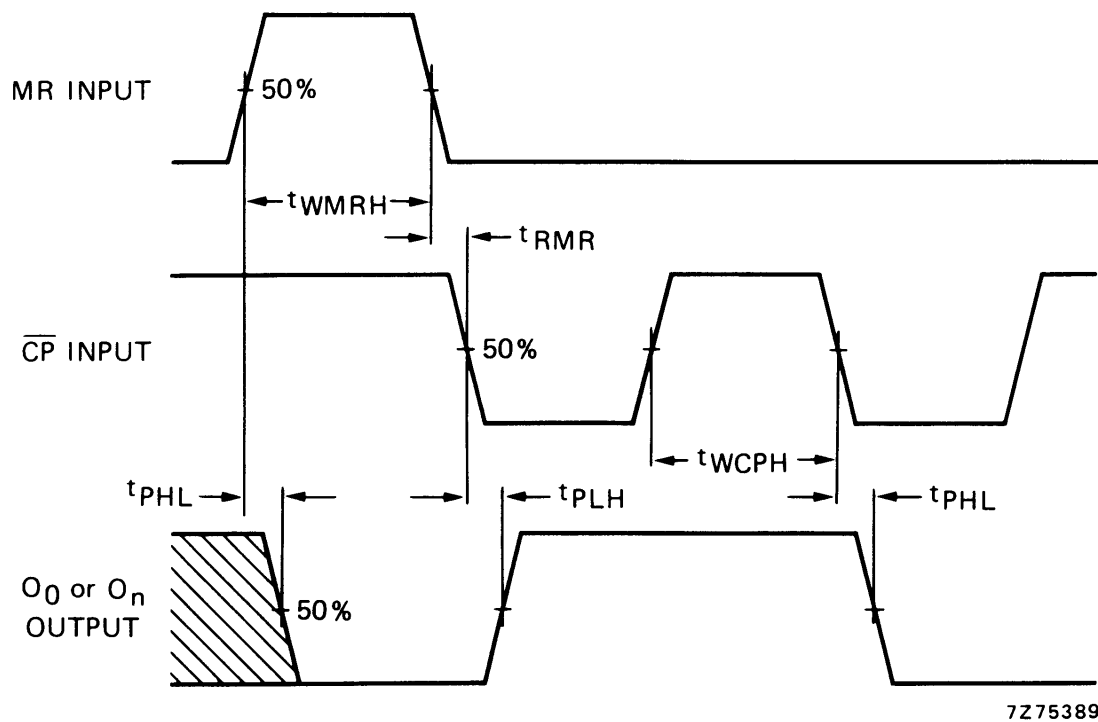
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Fig.4 Waveforms showing propagation delays for MR to O_n and $\overline{CP}$ to O_0 , minimum MR and $\overline{CP}$ pulse widths.