

# 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

## **HEF4018B**

## **MSI**

## **Presetable divide-by-N counter**

Product specification  
File under Integrated Circuits, IC04

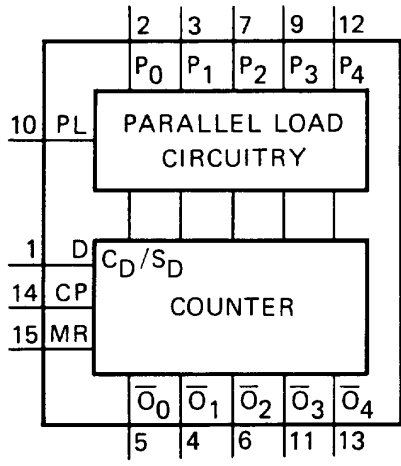
January 1995

Presettable divide-by-N counter

HEF4018B  
MSI

PRESETTABLE DIVIDE-BY-N COUNTER

The HEF4018B is a 5-stage Johnson counter with a clock input (CP), a data input (D), an asynchronous parallel load input (PL), five parallel inputs (P<sub>0</sub> to P<sub>4</sub>), five active LOW buffered outputs ( $\bar{O}_0$  to  $\bar{O}_4$ ), and an overriding asynchronous master reset input (MR). Information on P<sub>0</sub> to P<sub>4</sub> is asynchronously loaded into the counter while PL is HIGH, independent of CP and D inputs. When P<sub>L</sub> is LOW, the counter advances on the LOW to HIGH transition of CP. By connecting  $\bar{O}_0$  to  $\bar{O}_4$  to D, the counter operates as a divide-by-n counter (n = 2 to 10; see also function selection below). Each register stage is a D-type master-slave flip-flop with a set-direct/clear-direct input. An internal code correction circuit provides automatic code correction of the counter. From any illegal code the counter is in a proper counting mode within 11 clock pulses. A HIGH on MR resets the counter ( $\bar{O}_0$  to  $\bar{O}_4$  = HIGH) independent of all other inputs.



7Z69527.3  
Fig. 1 Functional diagram.

FUNCTION SELECTION

counter mode; divide by	connect D input to	remarks
10 8 6 4 2	$\bar{O}_4$ $\bar{O}_3$ $\bar{O}_2$ $\bar{O}_1$ $\bar{O}_0$	no external components needed
9 7 5 3	$\bar{O}_3 \cdot \bar{O}_4$ $\bar{O}_2 \cdot \bar{O}_3$ $\bar{O}_1 \cdot \bar{O}_2$ $\bar{O}_0 \cdot \bar{O}_1$	AND gate needed; counter skips all HIGH states

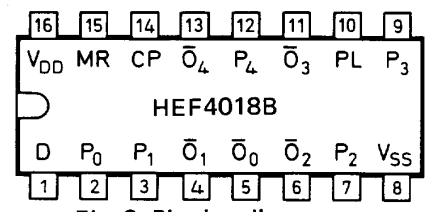


Fig. 2 Pinning diagram.

- HEF4018BP(N): 16-lead DIL; plastic (SOT38-1)
- HEF4018BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
- HEF4018BT(D): 16-lead SO; plastic (SOT109-1)
- ( ): Package Designator North America

PINNING

- PL parallel load input
- P<sub>0</sub> to P<sub>4</sub> parallel inputs
- D data input
- CP clock input (LOW to HIGH edge triggered)
- MR master reset input
- $\bar{O}_0$  to  $\bar{O}_4$  buffered output (active LOW)

APPLICATION INFORMATION

Some examples of applications for the HEF4018B are:

- Programmable divide-by-n counter
- Programmable frequency division
- Timers

FAMILY DATA

I<sub>DD</sub> LIMITS category MSI } see Family Specifications

Pre-settable divide-by-N counter

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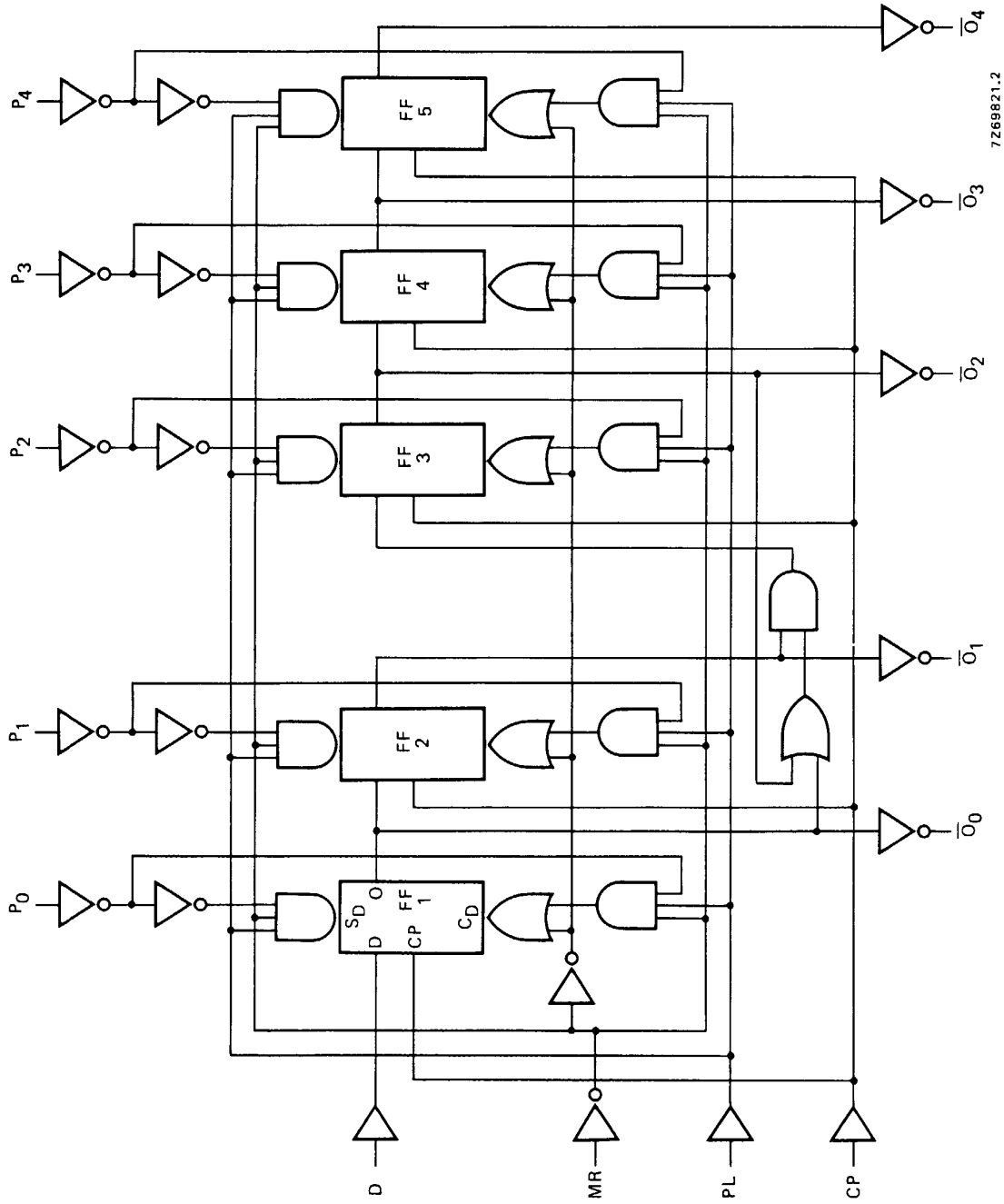


Fig. 3 Logic diagram.

# Pre-settable divide-by-N counter

## HEF4018B MSI

### A.C. 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 ( $\mu\text{W}$ )	where $f_i$ = input freq. (MHz) $f_o$ = output freq. (MHz) $C_L$ = load capacitance (pF) $\Sigma(f_o C_L)$ = sum of outputs $V_{DD}$ = supply voltage (V)
Dynamic power dissipation per package (P)	5	$700 f_i + \Sigma(f_o C_L) \times V_{DD}^2$	
	10	$3450 f_i + \Sigma(f_o C_L) \times V_{DD}^2$	
	15	$10\,300 f_i + \Sigma(f_o C_L) \times V_{DD}^2$	

### A.C. 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 CP $\rightarrow$ $\bar{O}$ HIGH to LOW	5	$t_{PHL}$		185	370	ns	$158\text{ ns} + (0,55\text{ ns/pF}) C_L$	
	10		65	135	ns	$54\text{ ns} + (0,23\text{ ns/pF}) C_L$		
	15		50	95	ns	$42\text{ ns} + (0,16\text{ ns/pF}) C_L$		
	LOW to HIGH	5	$t_{PLH}$		145	295	ns	$118\text{ ns} + (0,55\text{ ns/pF}) C_L$
		10		55	110	ns	$44\text{ ns} + (0,23\text{ ns/pF}) C_L$	
		15		40	85	ns	$32\text{ ns} + (0,16\text{ ns/pF}) C_L$	
PL $\rightarrow$ $\bar{O}$ HIGH to LOW	5	$t_{PHL}$		205	415	ns	$178\text{ ns} + (0,55\text{ ns/pF}) C_L$	
	10		70	140	ns	$59\text{ ns} + (0,23\text{ ns/pF}) C_L$		
	15		50	105	ns	$42\text{ ns} + (0,16\text{ ns/pF}) C_L$		
	LOW to HIGH	5	$t_{PLH}$		175	350	ns	$148\text{ ns} + (0,55\text{ ns/pF}) C_L$
		10		65	125	ns	$54\text{ ns} + (0,23\text{ ns/pF}) C_L$	
		15		50	95	ns	$42\text{ ns} + (0,16\text{ ns/pF}) C_L$	
MR $\rightarrow$ $\bar{O}$ LOW to HIGH	5	$t_{PLH}$		140	280	ns	$113\text{ ns} + (0,55\text{ ns/pF}) C_L$	
	10		55	105	ns	$44\text{ ns} + (0,23\text{ ns/pF}) C_L$		
	15		40	80	ns	$32\text{ ns} + (0,16\text{ ns/pF}) C_L$		
	Output transition times HIGH to LOW	5	$t_{THL}$		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		5	$t_{TLH}$		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	$6\text{ ns} + (0,28\text{ ns/pF}) C_L$	

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A.C. 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
Set-up time D $\rightarrow$ CP	5	$t_{su}$	130	65	ns	see also waveforms Figs 4, 5 and 6
	10		40	20	ns	
	15		30	15	ns	
Hold time D $\rightarrow$ CP	5	$t_{hold}$	20	-45	ns	
	10		5	-15	ns	
	15		5	-10	ns	
Minimum clock pulse width; LOW	5	$t_{WCPL}$	140	70	ns	
	10		50	25	ns	
	15		40	20	ns	
Minimum MR pulse width; HIGH	5	$t_{WMRH}$	100	50	ns	
	10		35	20	ns	
	15		25	15	ns	
Minimum PL pulse width; HIGH	5	$t_{WPLH}$	145	75	ns	
	10		50	25	ns	
	15		35	20	ns	
Recovery time for MR	5	$t_{RMR}$	135	70	ns	
	10		40	20	ns	
	15		25	15	ns	
Recovery time for PL	5	$t_{RPL}$	170	85	ns	
	10		55	30	ns	
	15		40	20	ns	
Maximum clock pulse frequency	5	$f_{max}$	2	4	MHz	
	10		6	11	MHz	
	15		8	16	MHz	

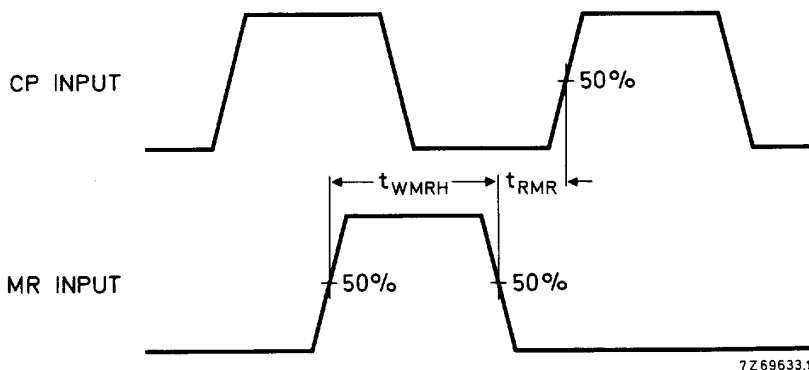


Fig. 4 Waveforms showing minimum MR pulse width and MR recovery time.

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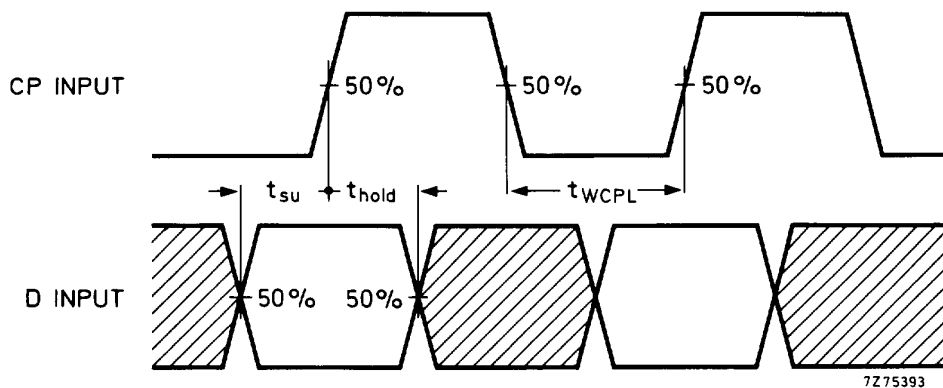


Fig. 5 Waveforms showing minimum clock pulse width, set-up time and hold time for CP and D.

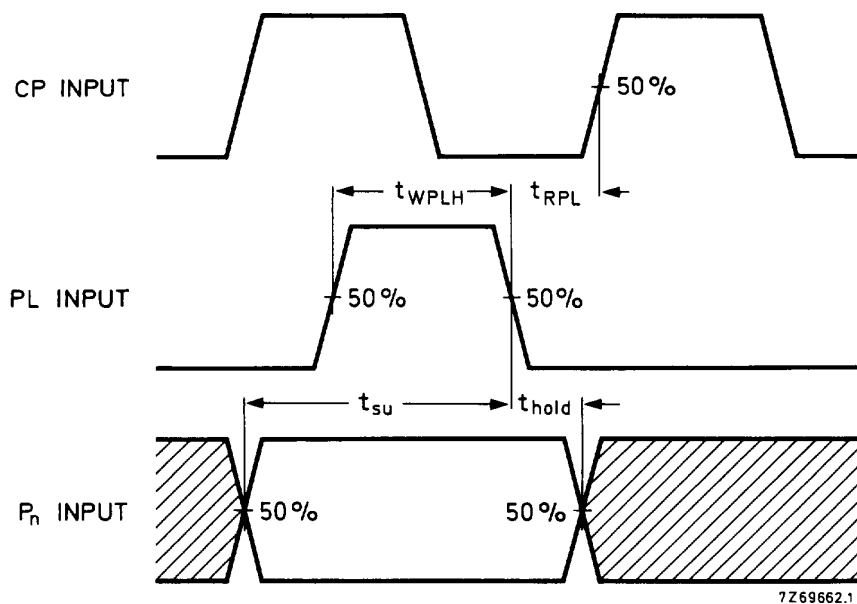


Fig. 6 Waveforms showing minimum PL pulse width, recovery time for PL, and set-up and hold times for P<sub>n</sub> to PL. Set-up and hold times are shown as positive values but may be specified as negative values.

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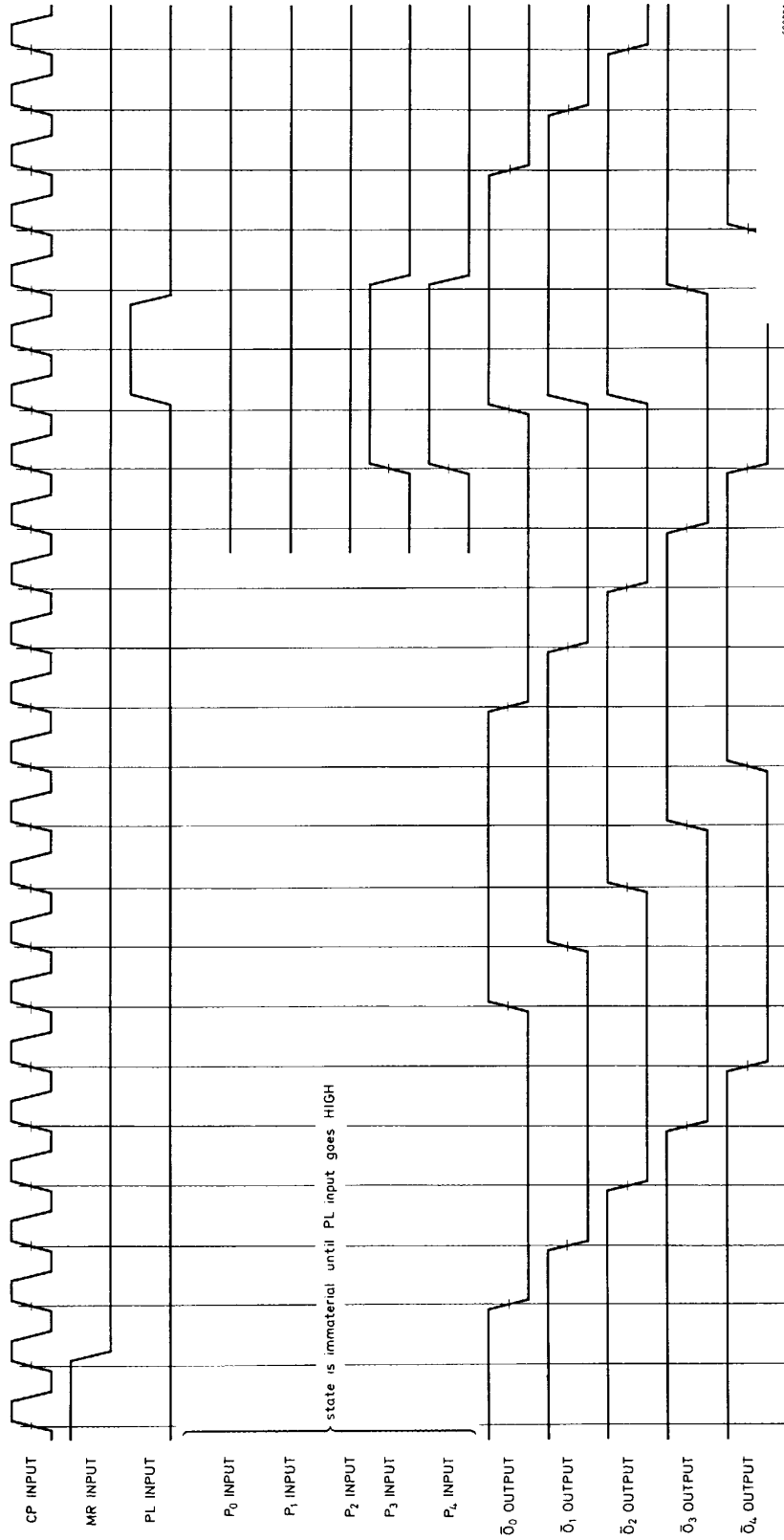


Fig. 7 Timing diagram.

**Note**

D input connected to  $\bar{Q}_4$  for decade counter configuration.