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
Presettable divide-by-N counter

Product specification
File under Integrated Circuits, IC04

January 1995

Philips Semiconductors

PHILIPS

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_0 to P_4), five active LOW buffered outputs ($\overline{O}_0$ to $\overline{O}_4$), and an overriding asynchronous master reset input (MR).
Information on P_0 to P_4 is asynchronously loaded into the counter while PL is HIGH, independent of CP and D inputs. When P_L is LOW, the counter advances on the LOW to HIGH transition of CP. By connecting $\overline{O}_0$ to $\overline{O}_4$ 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 ($\overline{O}_0$ to $\overline{O}_4$ = HIGH) independent of all other inputs.

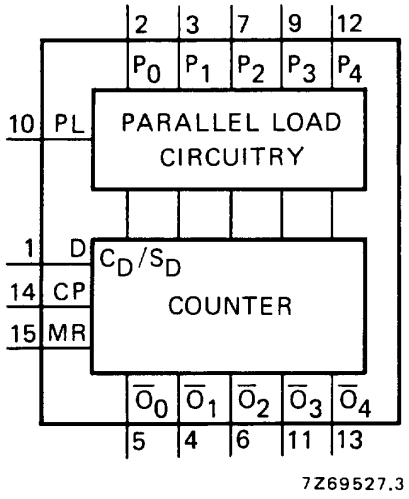

Fig. 1 Functional diagram.

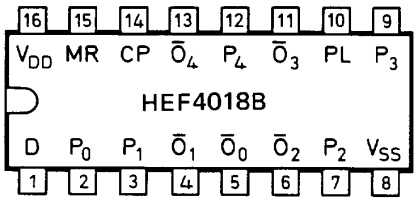

Fig. 2 Pinning diagram.

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

FUNCTION SELECTION

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

PINNING

PL	parallel load input
P_0 to P_4	parallel inputs
D	data input
CP	clock input (LOW to HIGH edge triggered)
MR	master reset input
$\overline{O}_0$ to $\overline{O}_4$	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_{DD} LIMITS category MSI } see Family Specifications

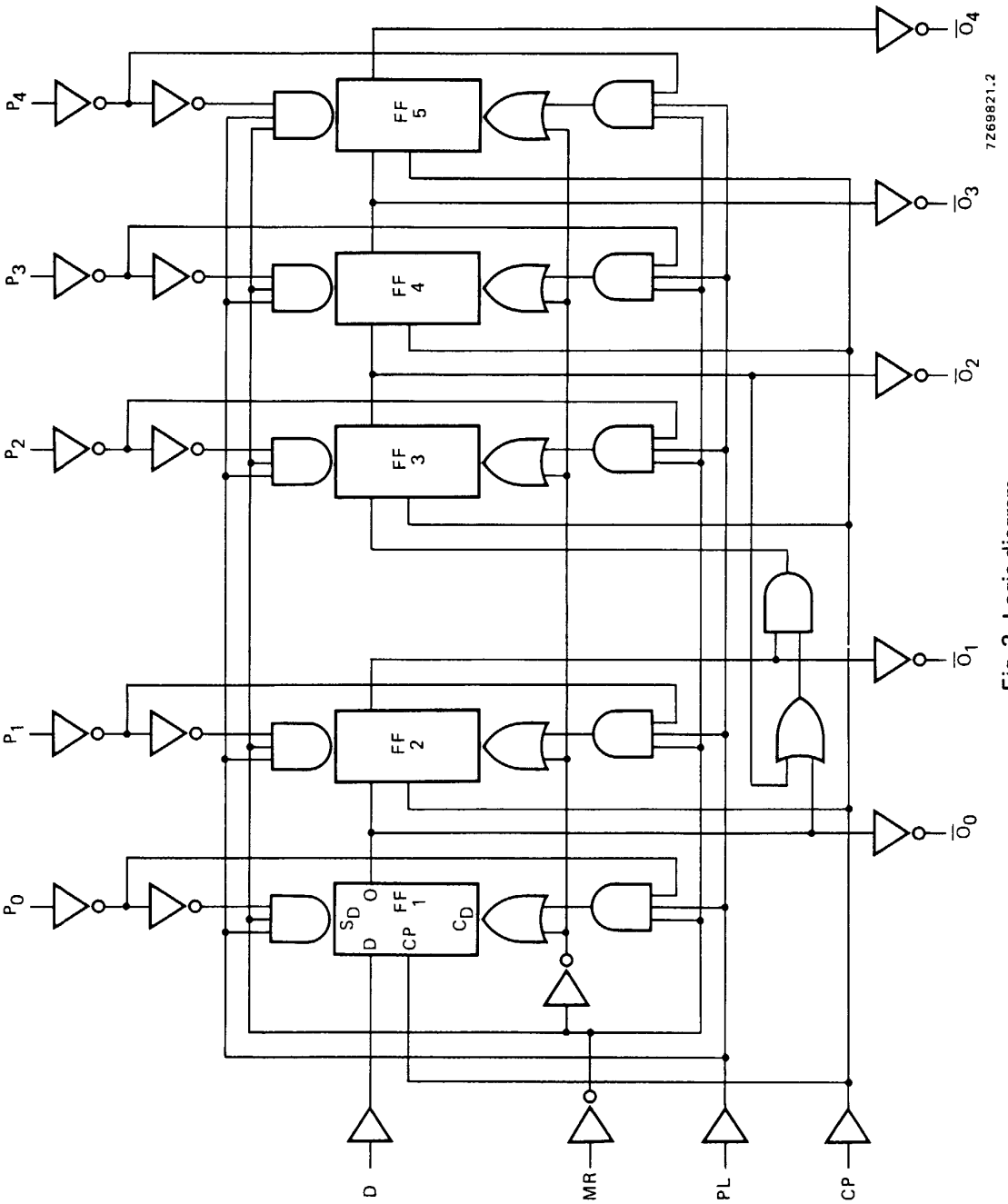

Fig. 3 Logic diagram.

A.C. CHARACTERISTICS

V_{SS} = 0 V; T_{amb} = 25 °C; input transition times ⩽ 20 ns

	V_{DD} V	typical formula for P (μW)	where
Dynamic power dissipation per package (P)	5	700 f_i + Σ($f_o C_L$) x V_{DD}^2	f_i = input freq. (MHz) f_o = output freq. (MHz) C_L = load capacitance (pF) Σ($f_o C_L$) = sum of outputs V_{DD} = supply voltage (V)
	10	3450 f_i + Σ($f_o C_L$) x V_{DD}^2	
	15	10 300 f_i + Σ($f_o C_L$) x V_{DD}^2	

A.C. 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 → $\overline{O}$	5			185	370	ns	158 ns + (0,55 ns/pF) C_L
HIGH to LOW	10	t_{PHL}		65	135	ns	54 ns + (0,23 ns/pF) C_L
	15			50	95	ns	42 ns + (0,16 ns/pF) C_L
	5			145	295	ns	118 ns + (0,55 ns/pF) C_L
LOW to HIGH	10	t_{PLH}		55	110	ns	44 ns + (0,23 ns/pF) C_L
	15			40	85	ns	32 ns + (0,16 ns/pF) C_L
PL → $\overline{O}$	5			205	415	ns	178 ns + (0,55 ns/pF) C_L
HIGH to LOW	10	t_{PHL}		70	140	ns	59 ns + (0,23 ns/pF) C_L
	15			50	105	ns	42 ns + (0,16 ns/pF) C_L
	5			175	350	ns	148 ns + (0,55 ns/pF) C_L
LOW to HIGH	10	t_{PLH}		65	125	ns	54 ns + (0,23 ns/pF) C_L
	15			50	95	ns	42 ns + (0,16 ns/pF) C_L
MR → $\overline{O}$	5			140	280	ns	113 ns + (0,55 ns/pF) C_L
LOW to HIGH	10	t_{PLH}		55	105	ns	44 ns + (0,23 ns/pF) C_L
	15			40	80	ns	32 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
	5			60	120	ns	10 ns + (1,0 ns/pF) C_L
LOW to HIGH	10	t_{TLH}		30	60	ns	9 ns + (0,42 ns/pF) C_L
	15			20	40	ns	6 ns + (0,28 ns/pF) C_L

A.C. 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
Set-up time D → 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 → 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	

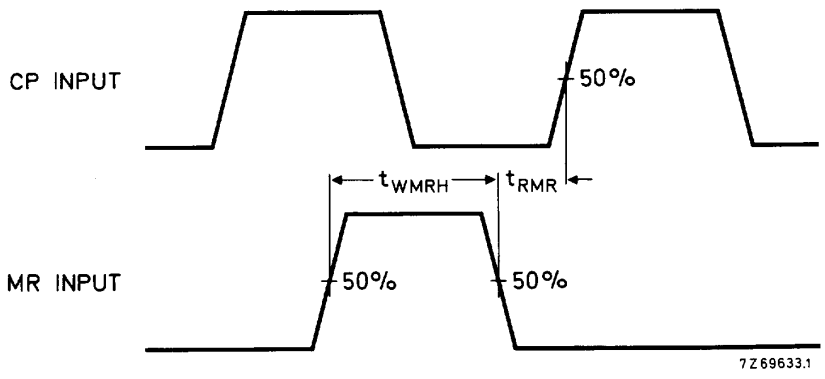

Fig. 4 Waveforms showing minimum MR pulse width and MR recovery time.

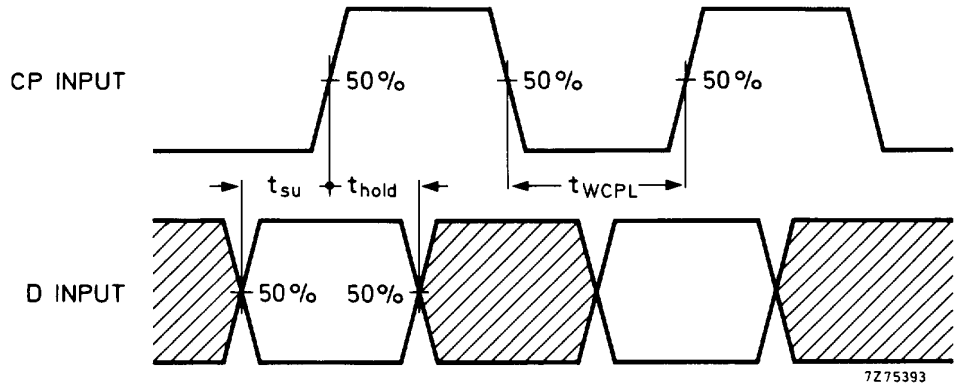

Fig. 5 Waveforms showing minimum clock pulse width, set-up time and hold time for CP and D.

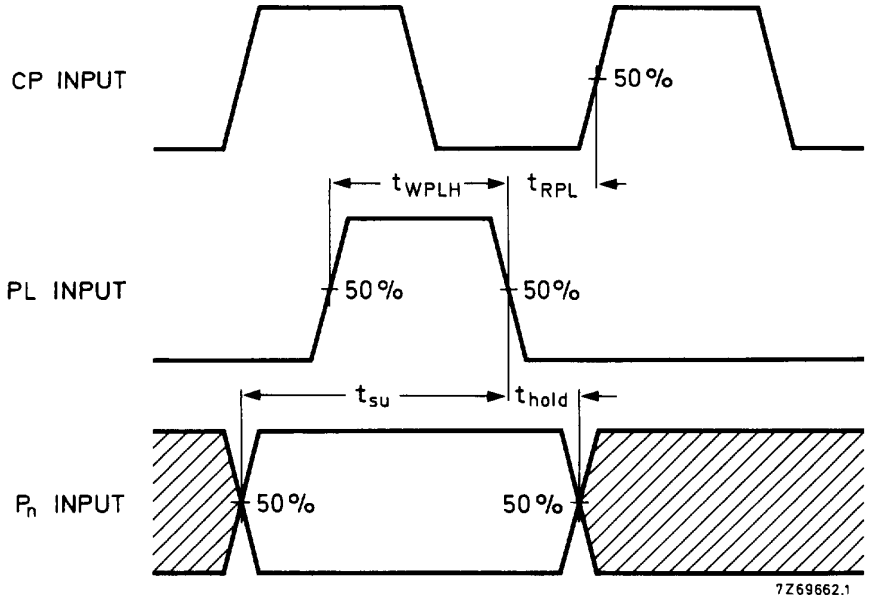

Fig. 6 Waveforms showing minimum PL pulse width, recovery time for PL, and set-up and hold times for P_n to PL. Set-up and hold times are shown as positive values but may be specified as negative values.

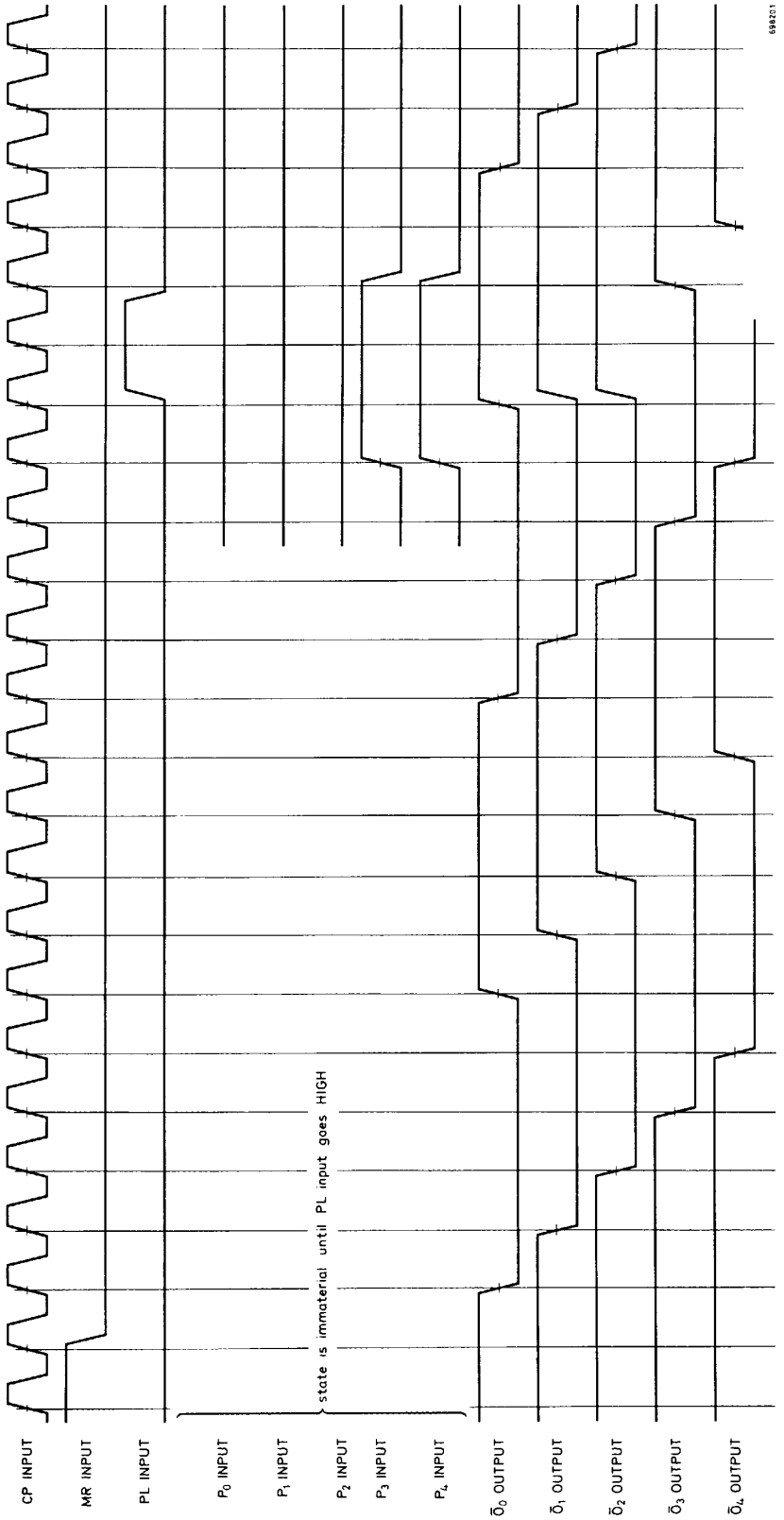

Fig. 7 Timing diagram.

Note

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