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

HEF4015B
MSI
Dual 4-bit static shift register

Product specification
File under Integrated Circuits, IC04

January 1995

Philips Semiconductors

PHILIPS

Dual 4-bit static shift register

HEF4015B
MSI

DESCRIPTION

The HEF4015B is a dual edge-triggered 4-bit static shift register (serial-to-parallel converter). Each shift register has a serial data input (D), a clock input (CP), four fully buffered parallel outputs (O_0 to O_3) and an overriding asynchronous master reset input (MR). Information present on D is shifted to the first register position, and all the data in the register is shifted one position to the right on the LOW-to-HIGH transition of CP. A HIGH on MR clears the register and forces O_0 to O_3 to LOW, independent of CP and D. Schmitt-trigger action in the clock input makes the circuit highly tolerant to slower clock rise and fall times.

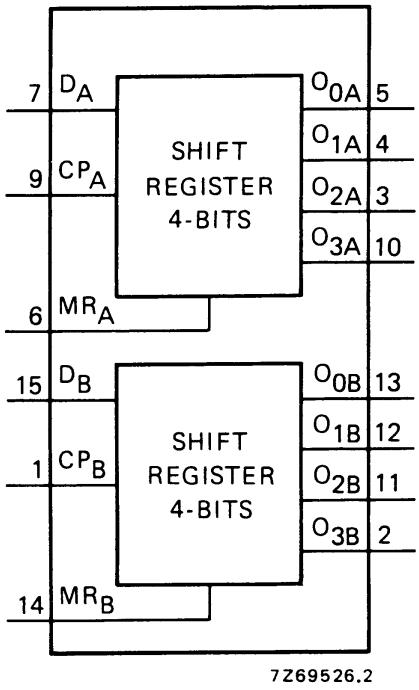

Fig.1 Functional diagram.

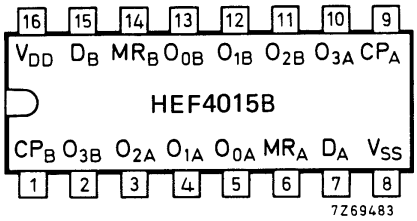

Fig.2 Pinning diagram.

HEF4015BP(N): 16-lead DIL; plastic (SOT38-1)
HEF4015BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
HEF4015BT(D): 16-lead SO; plastic (SOT109-1)
( ): Package Designator North America

PINNING

D_A, D_B	serial data input
MR_A, MR_B	master reset input (active HIGH)
CP_A, CP_B	clock input (LOW-to-HIGH edge-triggered)
O_{0A}, O_{1A}, O_{2A}, O_{3A}	parallel outputs
O_{0B}, O_{1B}, O_{2B}, O_{3B}	parallel outputs

FAMILY DATA, I_{DD} LIMITS category MSI

See Family Specifications

APPLICATION INFORMATION

Some examples of applications for the HEF4015B are:

- Serial-to-parallel converter
- Buffer stores
- General purpose register

LOGIC DIAGRAM (one register)

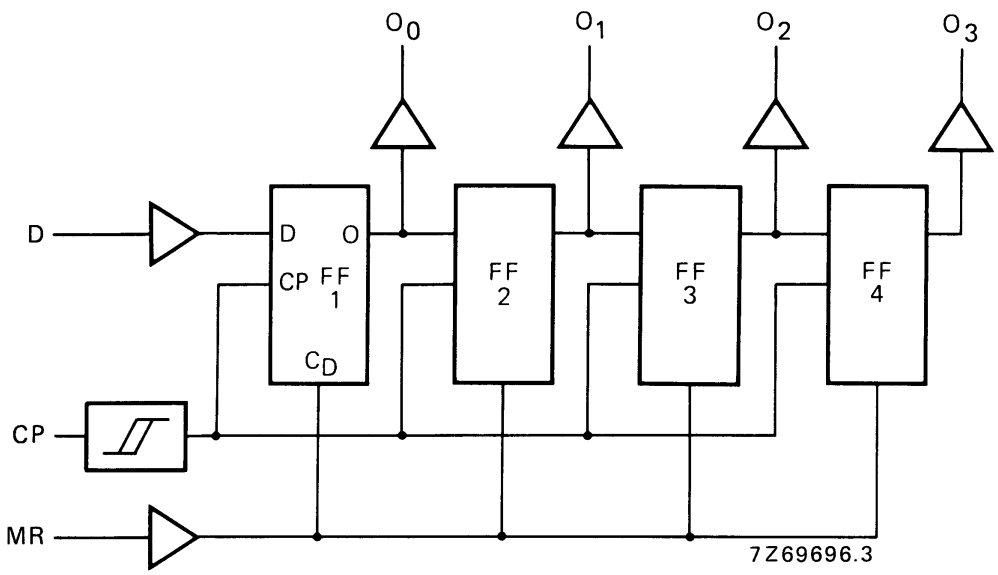

Fig.3 Logic diagram.

FUNCTION TABLE

	INPUTS			OUTPUTS			
n	**CP**	**D**	**MR**	**O_0**	**O_1**	**O_2**	**O_3**
1	↗	D_1	L	D_1	X	X	X
2	↗	D_2	L	D_2	D_1	X	X
3	↗	D_3	L	D_3	D_2	D_1	X
4	↗	D_4	L	D_4	D_3	D_2	D_1
	↘	X	L	no change			
	X	X	H	L	L	L	L

Note

1. H = HIGH state (the more positive voltage)
2. L = LOW state (the less positive voltage)
3. X = state is immaterial
4. ↗ = positive-going transition
5. ↘ = negative-going transition
6. D_n = either HIGH or LOW
7. n = number of clock pulse transitions

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 → O_n	5			130	260	ns	103 ns + (0,55 ns/pF) C_L
HIGH to LOW	10	t_{PHL}		55	110	ns	44 ns + (0,23 ns/pF) C_L
	15			40	80	ns	32 ns + (0,16 ns/pF) C_L
	5			120	240	ns	93 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	80	ns	32 ns + (0,16 ns/pF) C_L
MR → O_n	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
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
Set-up time	5		25	–15		ns	see waveforms Figs 4 and 5
D → CP	10	t_{su}	25	–10		ns	
	15		20	–5		ns	
Hold time	5		40	20		ns	
D → CP	10	t_{hold}	20	10		ns	
	15		15	8		ns	
Minimum clock	5		60	30		ns	
pulse width; LOW	10	t_{WCPL}	30	15		ns	
	15		20	10		ns	
Minimum MR	5		80	40		ns	
pulse width; HIGH	10	t_{WMRH}	30	15		ns	
	15		24	12		ns	
Recovery time	5		50	20		ns	
for MR	10	t_{RMR}	30	10		ns	
	15		20	5		ns	
Maximum clock	5		7	15		MHz	
pulse frequency	10	f_{max}	15	30		MHz	
	15		22	44		MHz	

	V_{DD} V	TYPICAL FORMULA FOR P (μW)	
Dynamic power dissipation per package (P)	5	$1\,500\ f_i + \sum (f_o C_L) \times V_{DD}^2$	where
	10	$6\,300\ f_i + \sum (f_o C_L) \times V_{DD}^2$	f_i = input freq. (MHz)
	15	$17\,000\ f_i + \sum (f_o C_L) \times V_{DD}^2$	f_o = output freq. (MHz)
			C_L = load capacitance (pF)
			$\sum (f_o C_L)$ = sum of outputs
			V_{DD} = supply voltage (V)

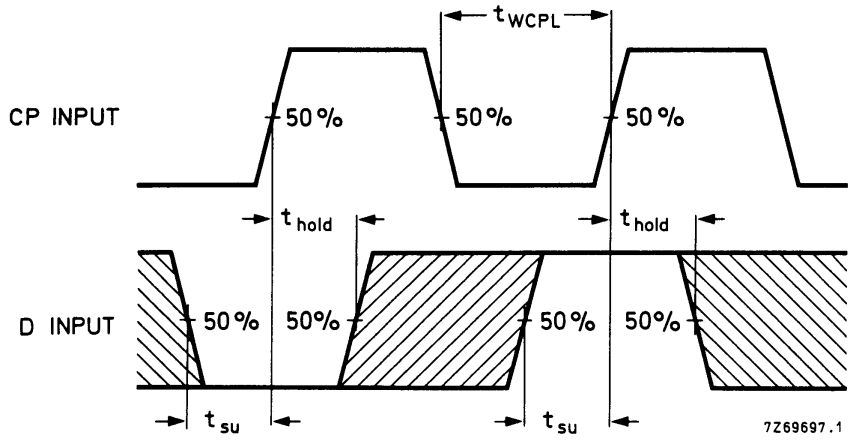

Fig.4 Waveforms showing set-up times, hold times and minimum clock pulse width. Set-up and hold times are shown as positive values but may be specified as negative values.

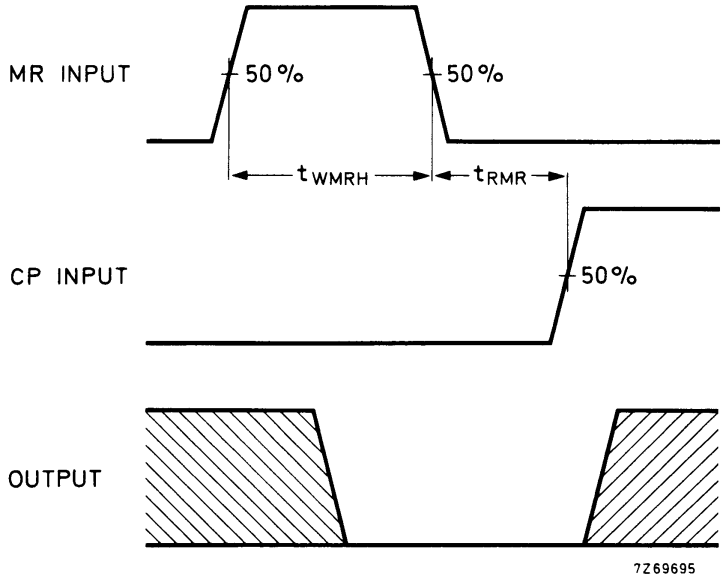

Fig.5 Waveforms showing recovery time for MR and minimum MR pulse width.