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

HEF4014B
MSI
8-bit static shift register

Product specification
File under Integrated Circuits, IC04

January 1995

Philips Semiconductors

8-bit static shift register

HEF4014B
MSI

DESCRIPTION

The HEF4014B is a fully synchronous edge-triggered 8-bit static shift register with eight synchronous parallel inputs (P_0 to P_7), a synchronous serial data input (D_S), a synchronous parallel enable input (PE), a LOW to HIGH edge-triggered clock input (CP) and buffered parallel outputs from the last three stages (O_5 to O_7).

Operation is synchronous and the device is edge-triggered on the LOW to HIGH transition of CP. Each register stage is of a D-type master-slave flip-flop. When PE is HIGH, data is loaded into the register from P_0 to P_7 on the LOW to HIGH transition of CP. When PE is LOW, data is shifted to the first position from D_S, and all the data in the register is shifted one position to the right on the LOW to HIGH transition of CP. Schmitt-trigger action in the clock input makes the circuit highly tolerant to slower clock rise and fall times

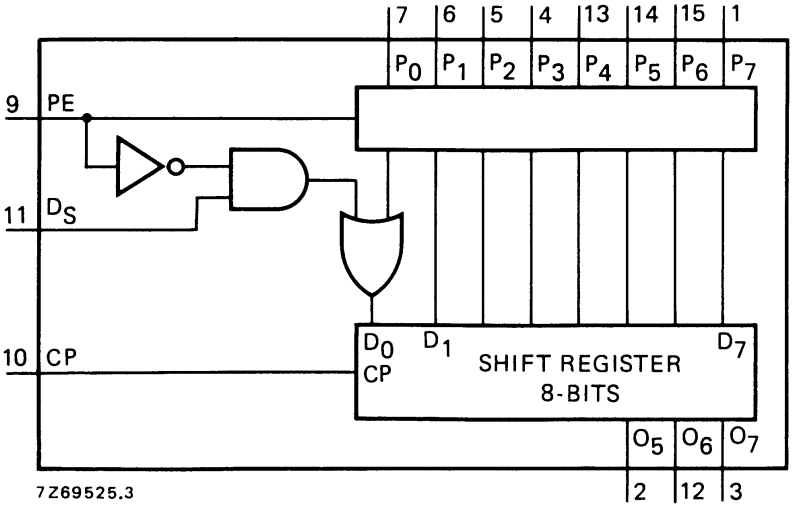

Fig.1 Functional diagram.

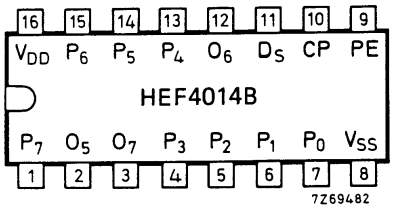

Fig.2 Pinning diagram.

HEF4014BP(N): 16-lead DIL; plastic (SOT38-1)
HEF4014BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
HEF4014BT(D): 16-lead SO; plastic (SOT109-1)
( ): Package Designator North America

FAMILY DATA, I_{DD} LIMITS category MSI

See Family Specifications

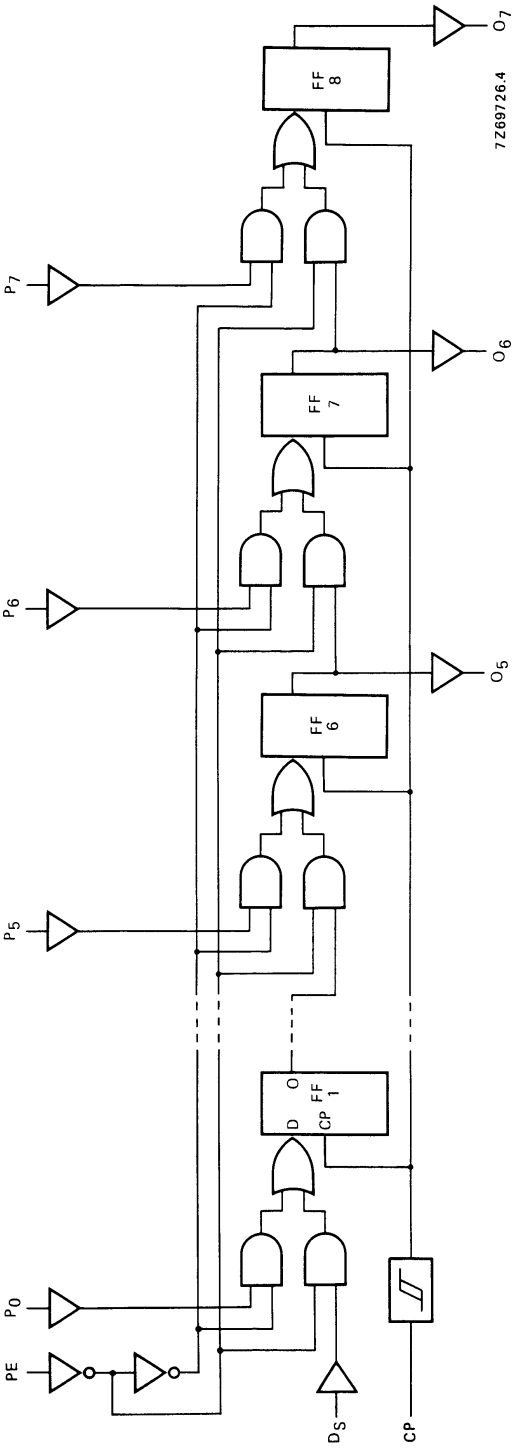

Fig.3 Logic diagram.

PINNING

PE	parallel enable input
P_0 to P_7	parallel data inputs
D_S	serial data input
CP	clock input (LOW to HIGH edge-triggered)
O_5 to O_7	buffered parallel outputs from the last three stages

FUNCTION TABLES

Serial operation

	INPUTS			OUTPUTS		
n	CP	D_S	PE	O_5	O_6	O_7
1	↑	D_1	L	X	X	X
2	↑	D_2	L	X	X	X
3	↑	D_3	L	X	X	X
6	↑	X	L	D_1	X	X
7	↑	X	L	D_2	D_1	X
8	↑	X	L	D_3	D_2	D_1
	↓	X	X	no change		

Parallel operation

	INPUTS			OUTPUTS		
n	CP	D_S	PE	O_5	O_6	O_7
1	↑	X	H	P_5	P_6	P_7
	↓	X	X	no change		

Notes

1. H = HIGH state (the more positive voltage)
   L = LOW state (the less positive voltage)
   X = state is immaterial
   ↑ = positive-going transition
   ↓ = negative-going transition
   D_n = either HIGH or LOW
   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	TYPICAL FORMULA FOR P (μW)	
Dynamic power dissipation per package (P)	5	$900\ f_i + \sum (f_o C_L) \times V_{DD}^2$	where
	10	$4\,300\ f_i + \sum (f_o C_L) \times V_{DD}^2$	f_i = input freq. (MHz)
	15	$12\,000\ f_i + \sum (f_o C_L) \times V_{DD}^2$	f_o = output freq. (MHz)
			C_L = load cap. (pF)
			$\sum (f_o C_L)$ = sum of outputs
			V_{DD} = supply voltage (V)

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							
$C_P \rightarrow O_n$	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			115	230	ns	88 ns + (0,55 ns/pF) C_L
LOW to HIGH	10	t_{PLH}		50	100	ns	39 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
Set-up times	5		40	10		ns	see also waveforms Fig.4
PE → CP	10	t_{su}	25	5		ns	
	15		15	0		ns	
	5		35	– 5		ns	
$D_S \rightarrow$ CP	10	t_{su}	25	–5		ns	
	15		25	0		ns	
	5		35	–5		ns	
$P_n \rightarrow$ CP	10	t_{su}	25	–5		ns	
	15		25	0		ns	
Hold times	5		25	–5		ns	
PE → CP	10	t_{hold}	20	0		ns	
	15		15	0		ns	
	5		30	15		ns	
$D_S \rightarrow$ CP	10	t_{hold}	20	10		ns	
	15		15	7		ns	
	5		30	15		ns	
$P_n \rightarrow$ CP	10	t_{hold}	20	10		ns	
	15		15	7		ns	
Minimum clock	5		70	35		ns	
pulse width; LOW	10	t_{WCPL}	30	15		ns	
	15		24	12		ns	
Maximum clock	5		6	13		MHz	
pulse frequency	10	f_{max}	15	30		MHz	
	15		20	40		MHz	

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

APPLICATION INFORMATION

Some examples of applications for the HEF4014B are:

- Parallel-to-serial converter
- Serial data queueing
- General purpose register