

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

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 (P₀ to P₇), 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 (O₅ to O₇).

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 P₀ to P₇ 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

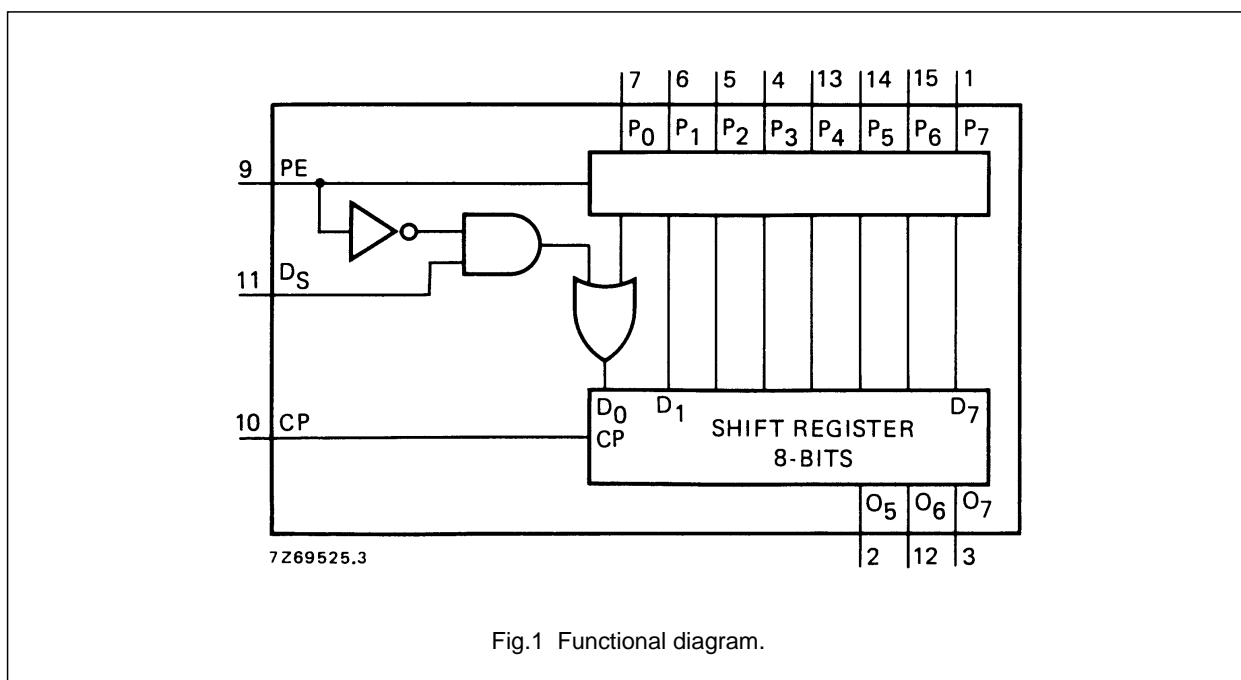


Fig.1 Functional diagram.

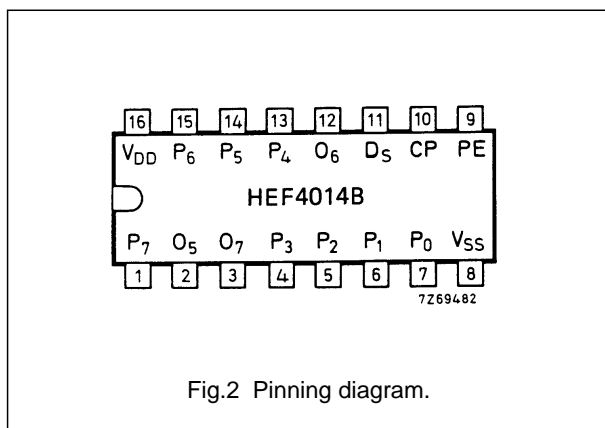


Fig.2 Pinning diagram.

- 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

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HEF4014B
MSI

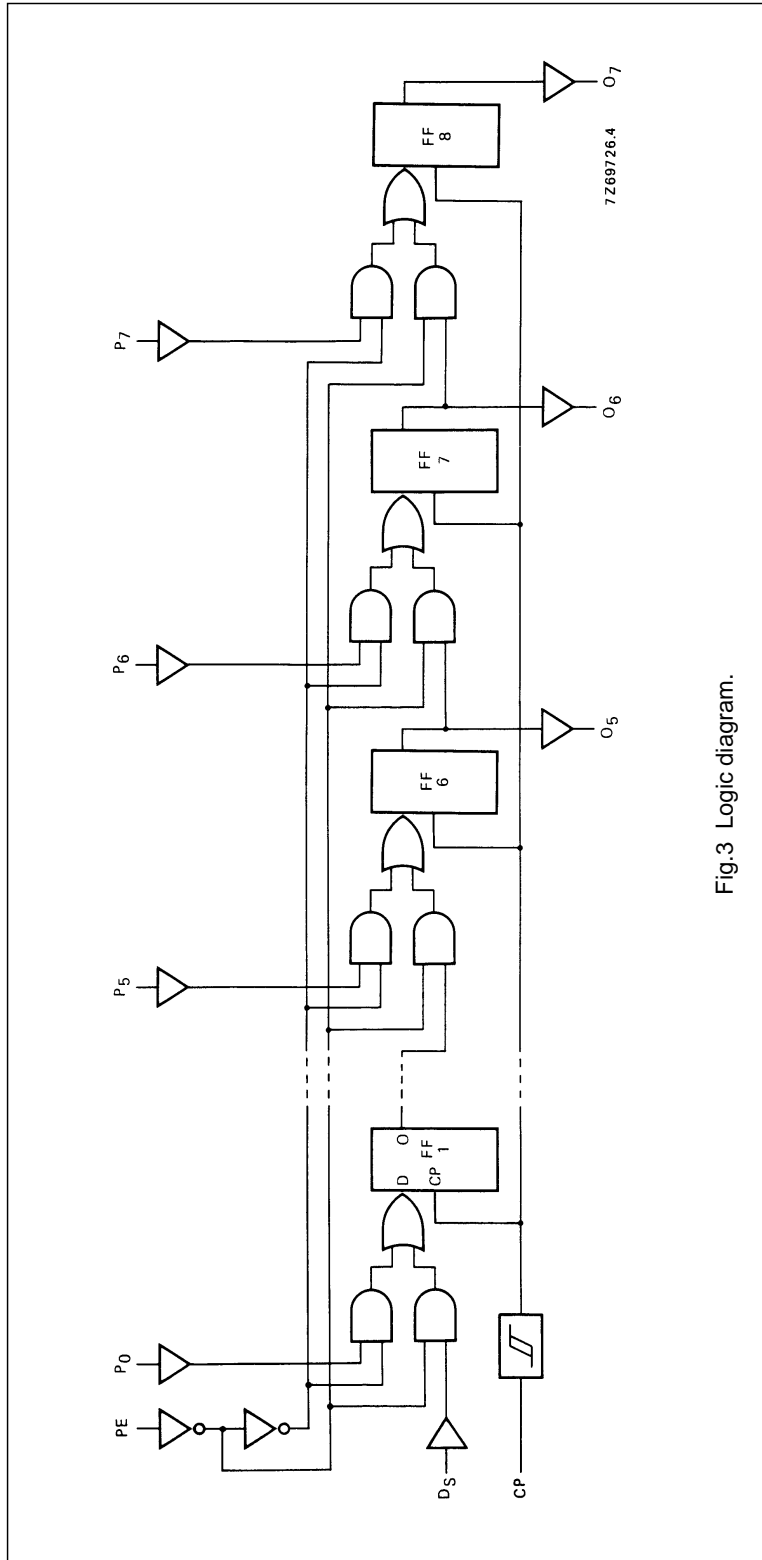


Fig.3 Logic diagram.

8-bit static shift register

HEF4014B
MSI

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

n	INPUTS			OUTPUTS		
	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

n	INPUTS			OUTPUTS		
	CP	D _S	PE	O ₅	O ₆	O ₇
1		X	H	P ₅	P ₆	P ₇
		X	X	no change		

Notes

- 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	5	$900 f_i + \sum (f_o C_L) \times V_{DD}^2$	where f _i = input freq. (MHz) f _o = output freq. (MHz) C _L = load cap. (pF) ∑ (f _o C _L) = sum of outputs V _{DD} = supply voltage (V)
dissipation per	10	$4\,300 f_i + \sum (f_o C_L) \times V_{DD}^2$	
package (P)	15	$12\,000 f_i + \sum (f_o C_L) \times V_{DD}^2$	

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HEF4014B
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	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA	
Propagation delays $C_P \rightarrow O_n$ HIGH to LOW	5	t_{PHL}		130	260	ns	$103\text{ ns} + (0,55\text{ ns/pF}) C_L$
	10		55	110	ns	$44\text{ ns} + (0,23\text{ ns/pF}) C_L$	
	15		40	80	ns	$32\text{ ns} + (0,16\text{ ns/pF}) C_L$	
LOW to HIGH	5	t_{PLH}		115	230	ns	$88\text{ ns} + (0,55\text{ ns/pF}) C_L$
	10		50	100	ns	$39\text{ ns} + (0,23\text{ ns/pF}) C_L$	
	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	$6\text{ ns} + (0,28\text{ ns/pF}) C_L$	
Set-up times PE \rightarrow CP	5	t_{su}	40	10		ns	see also waveforms Fig.4
	10		25	5		ns	
	15		15	0		ns	
$D_S \rightarrow CP$	5	t_{su}	35	-5		ns	
	10		25	-5		ns	
	15		25	0		ns	
$P_n \rightarrow CP$	5	t_{su}	35	-5		ns	
	10		25	-5		ns	
	15		25	0		ns	
Hold times PE \rightarrow CP	5	t_{hold}	25	-5		ns	
	10		20	0		ns	
	15		15	0		ns	
$D_S \rightarrow CP$	5	t_{hold}	30	15		ns	
	10		20	10		ns	
	15		15	7		ns	
$P_n \rightarrow CP$	5	t_{hold}	30	15		ns	
	10		20	10		ns	
	15		15	7		ns	
Minimum clock pulse width; LOW	5	t_{WCPL}	70	35		ns	
	10		30	15		ns	
	15		24	12		ns	
Maximum clock pulse frequency	5	f_{max}	6	13		MHz	
	10		15	30		MHz	
	15		20	40		MHz	

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January 1995

6

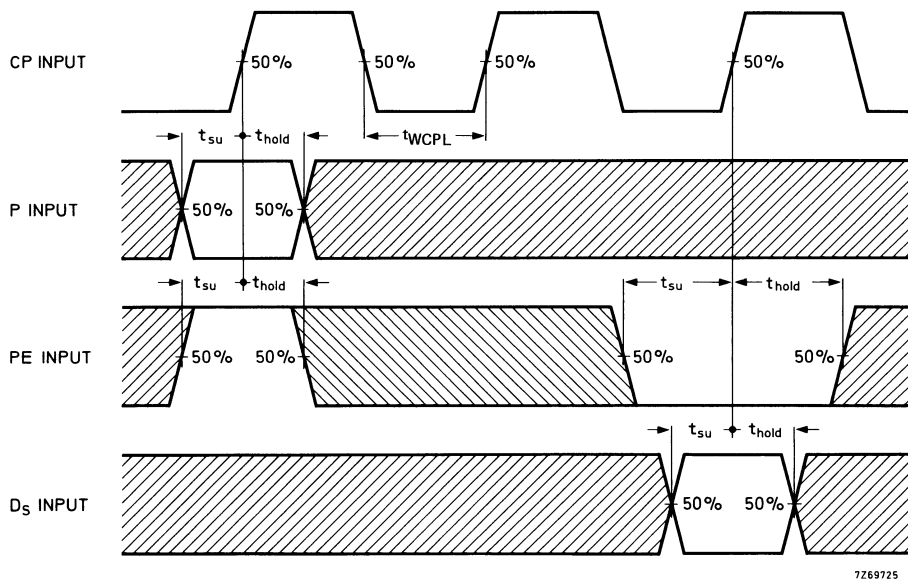


Fig.4 Waveforms showing minimum clock pulse width, and set-up and hold times for PE to CP, D_S to CP, and P to CP. Set-up and hold times are shown as positive values but may be specified as negative values.

APPLICATION INFORMATION

Some examples of applications for the HEF4014B are:

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