

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

HEF4517B

LSI

Dual 64-bit static shift register

Product specification
File under Integrated Circuits, IC04

January 1995

Dual 64-bit static shift register

HEF4517B LSI

DESCRIPTION

The HEF4517B consists of two identical, independent 64-bit static shift registers. Each register has separate clock (CP), data input (D), parallel input-enable/output-enable (PE/\overline{EO}) and four 3-state outputs of the 16th, 32nd, 48th and 64th bit positions (O_{16} to O_{64}). Data at the D input is entered into the first bit on the LOW to HIGH transition of the clock, regardless of the state of PE/\overline{EO} .

When PE/\overline{EO} is LOW the outputs are enabled and the device is in the 64-bit serial mode.

When PE/\overline{EO} is HIGH the outputs are disabled (high impedance OFF-state), the 64-bit shift register is divided into four 16-bit shift registers with D, O_{16} , O_{32} and O_{48} as data inputs of the 1st, 17th, 33rd, and 49th bit respectively. Schmitt-trigger action in the clock input makes the circuit highly tolerant to slower clock rise and fall times.

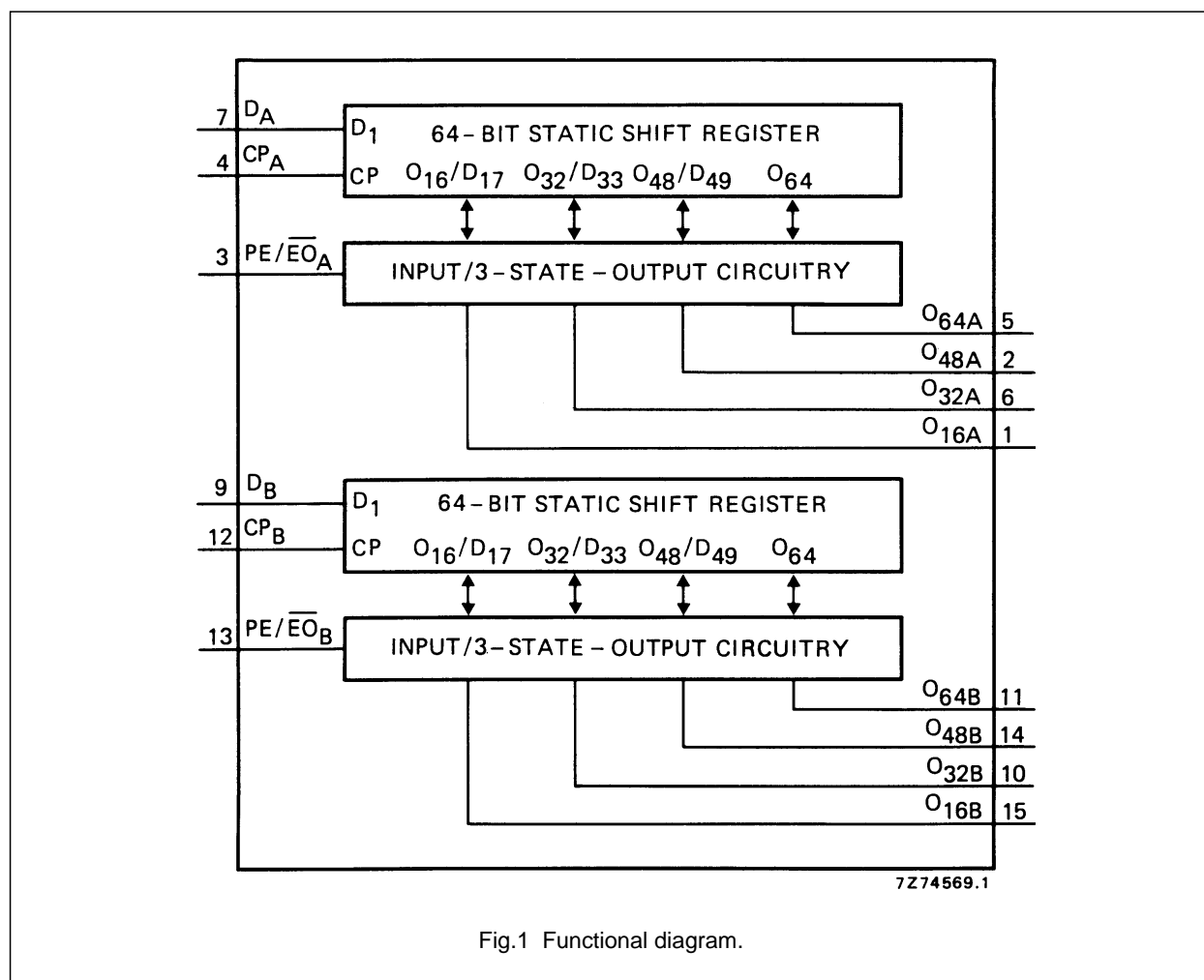
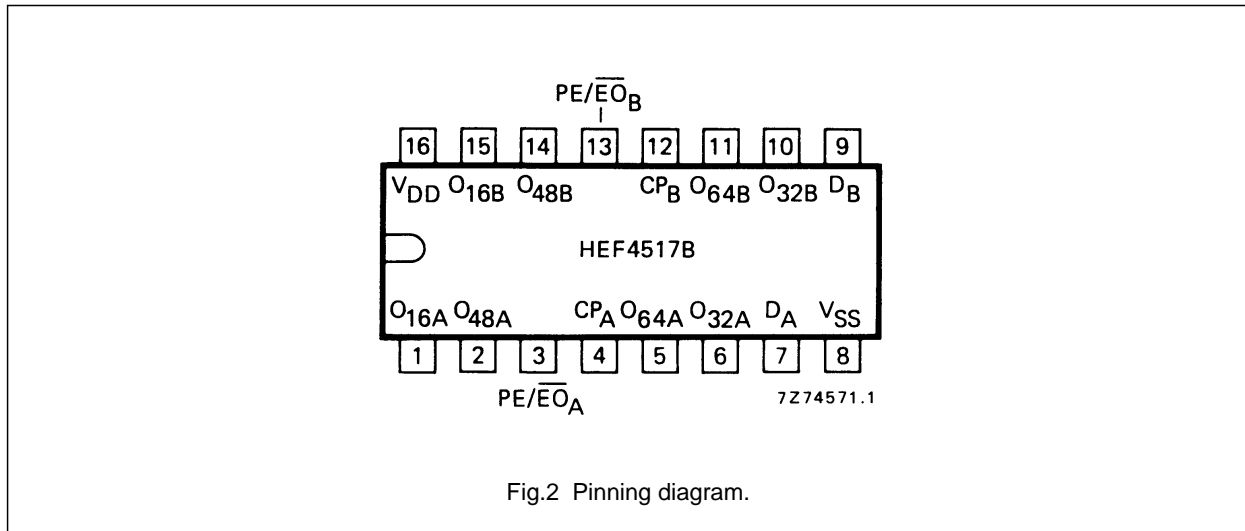


Fig.1 Functional diagram.

FAMILY DATA, I_{DD} LIMITS category LSI

See Family Specifications

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HEF4517BP(N): 16-lead DIL; plastic (SOT38-1)

HEF4517BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)

HEF4517BT(D): 16-lead SO; plastic (SOT109-1)

(): Package Designator North America

PINNING

CP_A, CP_B	clock inputs
$PE/\overline{EO}_A, PE/\overline{EO}_B$	parallel input-enable/output-enable inputs
D_A, D_B	data inputs
$O_{16A}, O_{32A}, O_{48A}$	3-state outputs/inputs
$O_{16B}, O_{32B}, O_{48B}$	3-state outputs/inputs
O_{64A}, O_{64B}	3-state outputs

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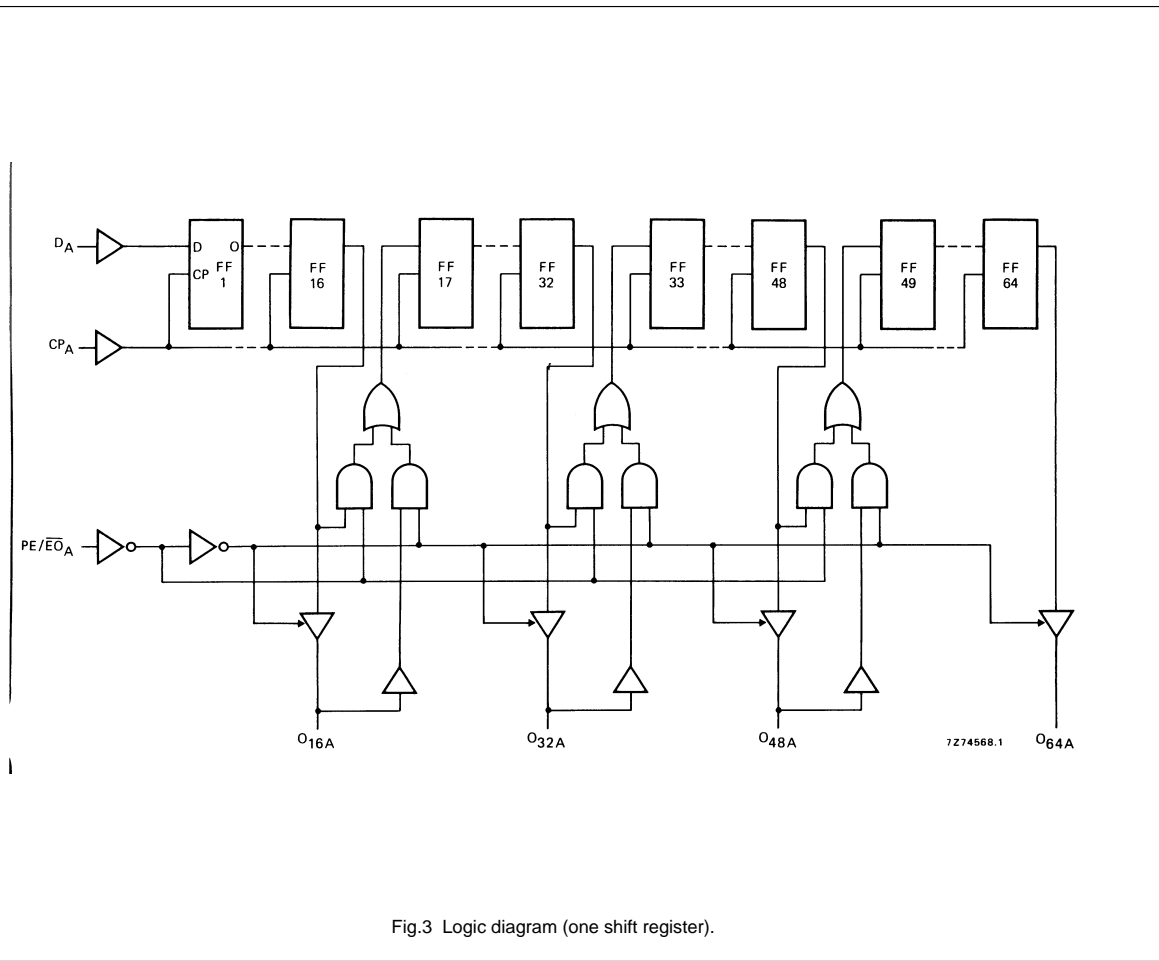


Fig.3 Logic diagram (one shift register).

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FUNCTION TABLE

INPUTS			INPUTS/OUTPUTS				MODE
CP	D	PE/ \overline{EO}	O ₁₆	O ₃₂	O ₄₈	O ₆₄	
↗	data entered into 1st bit	L	content of 16th bit displayed	content of 32nd bit displayed	content of 48th bit displayed	content of 64th bit displayed	One 64-bit shift register. The content of the shift register is shifted over one stage
↗	data entered into 1st bit	H	data at O ₁₆ entered into 17th bit	data at O ₃₂ entered into 33rd bit	data at O ₄₈ entered into 49th bit	remains in 'Z' state	Four 16-bit shift register. The content of the shift registers is shifted over one stage.
↘	X	L	no change	no change	no change	no change	no change
↘	X	H	Z	Z	Z	Z	no change

Notes

- H = HIGH state (the more positive voltage)
L = LOW state (the less positive voltage)
X = state is immaterial
Z = high impedance state
↗ = positive-going transition
↘ = negative-going transition

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LSI**AC CHARACTERISTICS** $V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ °C}$; input transition times $\leq 20\text{ ns}$

	V_{DD} V	TYPICAL FORMULA FOR P (μW)	
Dynamic power dissipation per package (P)	5 10 15	$7\,000 f_i + \sum (f_o C_L) \times V_{DD}^2$ $28\,000 f_i + \sum (f_o C_L) \times V_{DD}^2$ $70\,000 f_i + \sum (f_o C_L) \times V_{DD}^2$	where f_i = input freq. (MHz) f_o = output freq. (MHz) C_L = load capacitance (pF) $\sum (f_o C_L)$ = sum of outputs V_{DD} = supply voltage (V)

AC CHARACTERISTICS $V_{SS} = 0\text{ V}$; $T_{amb} = 25\text{ °C}$; $C_L = 50\text{ pF}$; input transition times $\leq 20\text{ ns}$

	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA		
Propagation delays CP \rightarrow O _n HIGH to LOW	5	t_{PHL}		220	440	ns	$193\text{ ns} + (0,55\text{ ns/pF}) C_L$	
	10		85	170	ns	$74\text{ ns} + (0,23\text{ ns/pF}) C_L$		
	15		60	120	ns	$52\text{ ns} + (0,16\text{ ns/pF}) C_L$		
	LOW to HIGH	5	t_{PLH}		190	380	ns	$163\text{ ns} + (0,55\text{ ns/pF}) C_L$
		10		75	150	ns	$64\text{ ns} + (0,23\text{ ns/pF}) C_L$	
		15		50	100	ns	$42\text{ ns} + (0,16\text{ ns/pF}) C_L$	
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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	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.		
Minimum clock pulse width; LOW	5	t_{WCPL}		95	190	ns	see also waveforms Fig.4.
	10			40	80	ns	
	15			30	60	ns	
Set-up times $O_n, D \rightarrow CP$	5	t_{su}	30	10		ns	
	10		25	5		ns	
	15		20	5		ns	
Hold time $O_n, D \rightarrow CP$	5	t_{hold}	45	15		ns	
	10		30	10		ns	
	15		25	10		ns	
3-state propagation delays							
Output disable times $PE/\overline{EO} \rightarrow O_n$ HIGH	5	t_{PHZ}		40	80	ns	
	10			30	60	ns	
	15			25	50	ns	
LOW	5	t_{PLZ}		50	100	ns	
	10			30	60	ns	
	15			25	50	ns	
Output enable times $PE/\overline{EO} \rightarrow O_n$ HIGH	5	t_{PZH}		45	90	ns	
	10			25	50	ns	
	15			20	40	ns	
LOW	5	t_{PZL}		60	120	ns	
	10			30	60	ns	
	15			25	50	ns	
Maximum clock pulse frequency	5	f_{max}	2	5		MHz	
	10		6	12		MHz	
	15		8	16		MHz	

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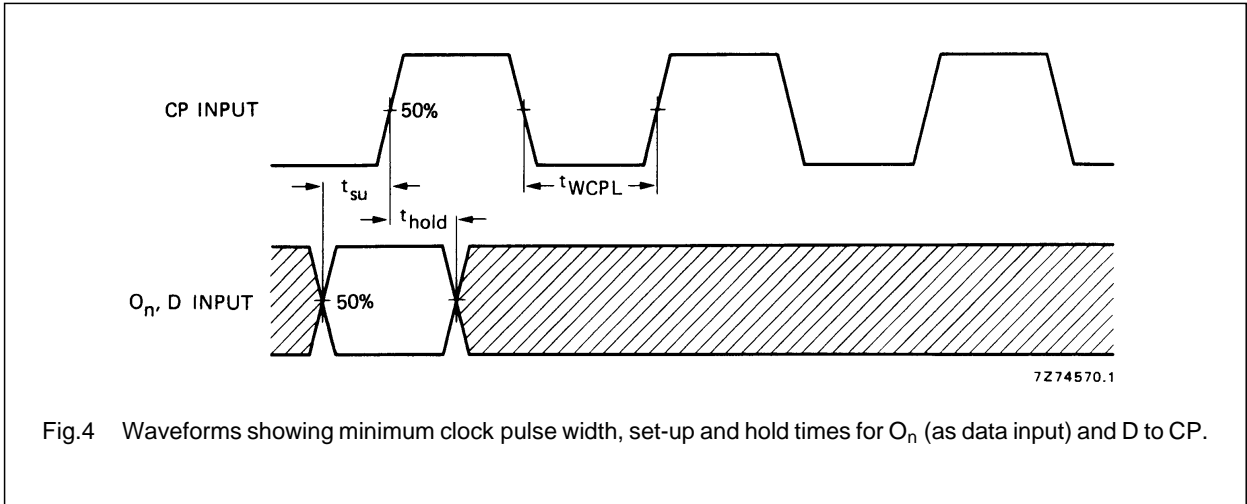


Fig.4 Waveforms showing minimum clock pulse width, set-up and hold times for O_n (as data input) and D to CP.