

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

HEF4031B

MSI

64-stage static shift register

Product specification
File under Integrated Circuits, IC04

January 1995

64-stage static shift register

HEF4031B MSI

DESCRIPTION

The HEF4031B is an edge-triggered 64-stage static shift register with two serial data inputs (D_A , D_B), a data select input \bar{A}/B , a clock input (CP), a buffered clock output (\overline{CO}), and buffered outputs from the 64th bit position (O_{63} , \bar{O}_{63}). The output O_{63} is capable of driving one TTL load.

Data from D_A or D_B , as determined by the state of \bar{A}/B , is shifted into the first shift register position and all the data in

the register is shifted one position to the right on the LOW to HIGH transition of CP. D_A is selected by a LOW, and D_B by a HIGH on \bar{A}/B . Registers can be cascaded either by connecting all CP inputs together or by driving CP of the most right-hand register with the system clock and connecting CO to CP of the preceding register. When the second technique is used in the recirculating mode, a flip-flop must be used to store O_{63} of the most right-hand register until the most left-hand register is clocked.

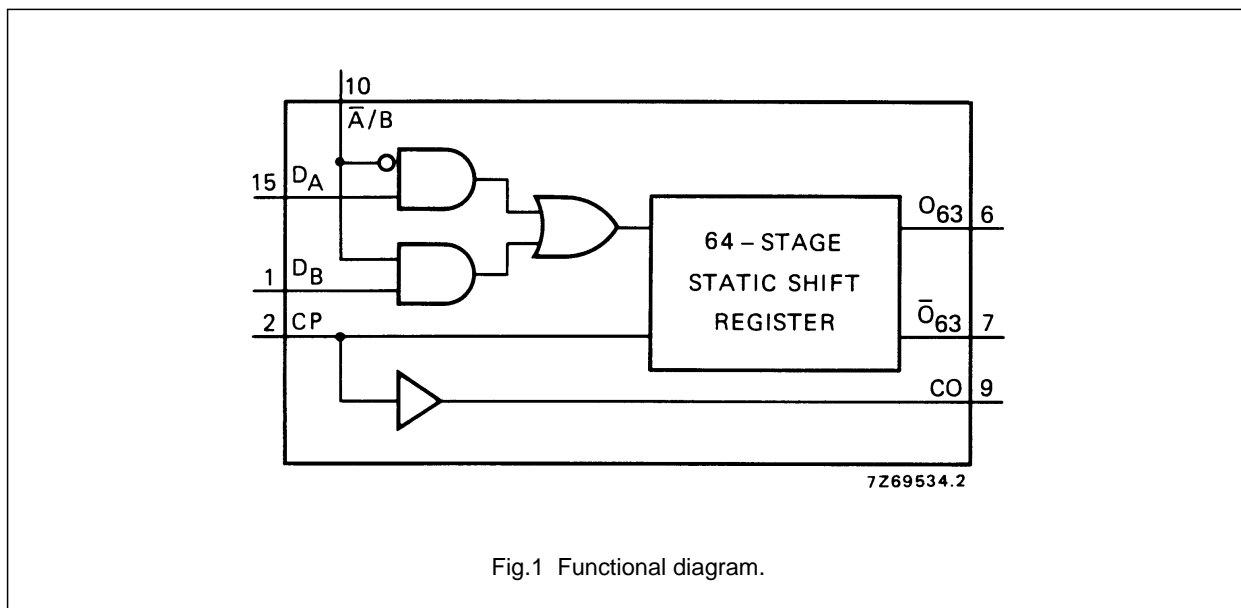


Fig.1 Functional diagram.

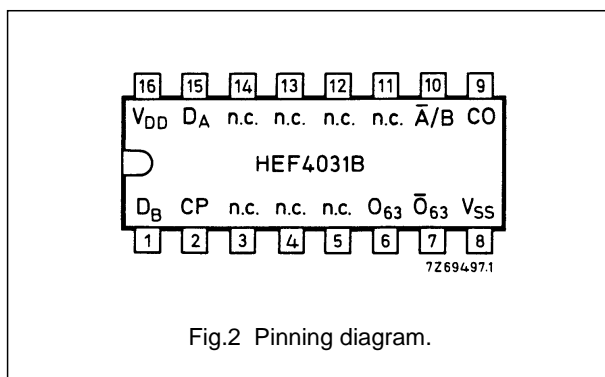


Fig.2 Pinning diagram.

PINNING

- D_A , D_B data inputs
- \bar{A}/B data select input
- CP clock input (LOW to HIGH edge-triggered)
- CO buffered clock output
- O_{63} buffered output from the 64th stage
- \bar{O}_{63} complementary buffered output from the 64th stage

FAMILY DATA, I_{DD} LIMITS category MSI

See Family Specifications

- HEF4031BP(N): 16-lead DIL; plastic (SOT38-1)
- HEF4031BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)
- HEF4031BT(D): 16-lead SO; plastic (SOT109-1)
- (): Package Designator North America

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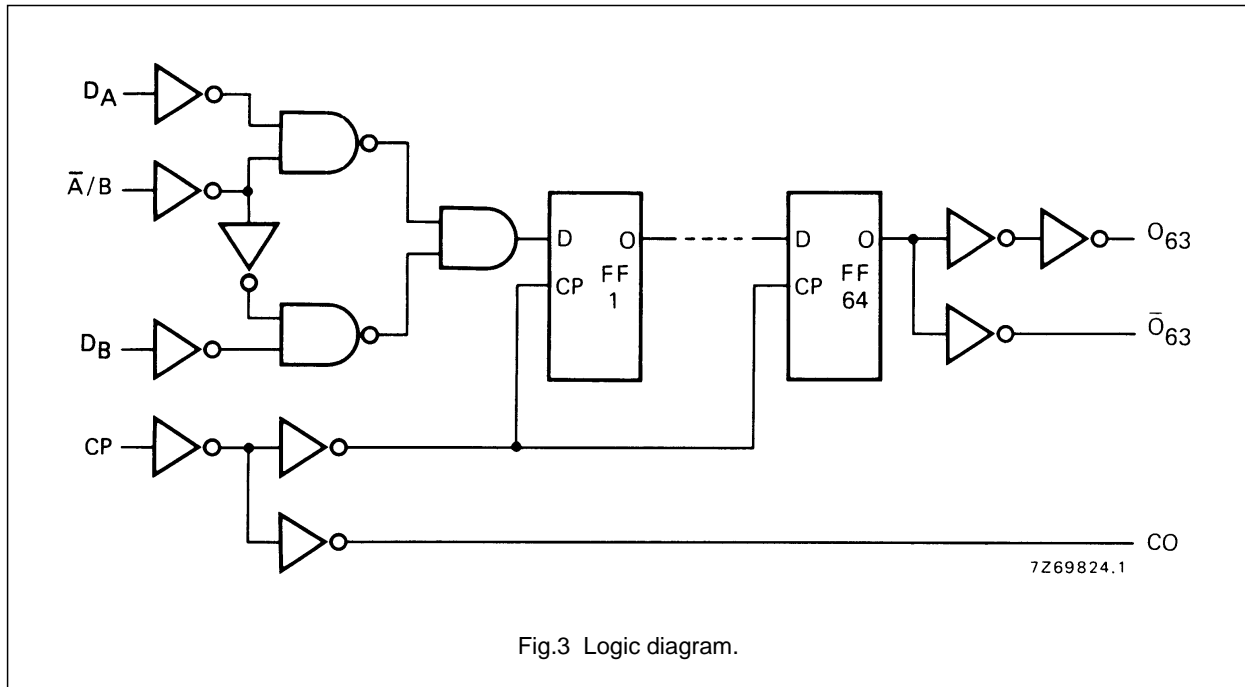
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Fig.3 Logic diagram.

DC CHARACTERISTICS $V_{SS} = 0\text{ V}$; $V_I = V_{SS}$ or V_{DD}

	V_{DD} V	V_{OH} V	V_{OL} V	SYMBOL	T_{amb} (°C)							
					-40		+ 25		+ 85			
					MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
Output (source)	5	4, 6			1,0	0,85	0,65					
current	10	9,5		$-I_{OH}$	3,0	2,5	2,0					
HIGH; O_{63}	15	13,5			10,0	8,5	6,5					
HIGH; \bar{O}_{63}	5	2,5		$-I_{OH}$	3,0	2,5	2,0					
Output (sink)	4,75		0,4		2,7	2,3	1,8					
current	10		0,5	I_{OL}	9,5	8,0	6,3					
LOW; O_{63}	15		1,5		24,0	20,0	16,0					

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MSI**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_{63}	5		180	360	ns	$167\text{ ns} + (0,26\text{ ns/pF}) C_L$
HIGH to LOW	10	t_{PHL}	65	130	ns	$57\text{ ns} + (0,16\text{ ns/pF}) C_L$
	15		45	90	ns	$40\text{ ns} + (0,11\text{ ns/pF}) C_L$
LOW to HIGH	5		170	340	ns	$148\text{ ns} + (0,45\text{ ns/pF}) C_L$
	10	t_{PLH}	65	130	ns	$56\text{ ns} + (0,19\text{ ns/pF}) C_L$
	15		45	90	ns	$39\text{ ns} + (0,13\text{ ns/pF}) C_L$
CP \rightarrow \overline{O}_{63}	5		190	380	ns	$163\text{ ns} + (0,55\text{ ns/pF}) C_L$
HIGH to LOW	10	t_{PHL}	75	150	ns	$64\text{ ns} + (0,23\text{ ns/pF}) C_L$
	15		50	100	ns	$42\text{ ns} + (0,16\text{ ns/pF}) C_L$
LOW to HIGH	5		190	380	ns	$163\text{ ns} + (0,55\text{ ns/pF}) C_L$
	10	t_{PLH}	75	150	ns	$64\text{ ns} + (0,23\text{ ns/pF}) C_L$
	15		50	100	ns	$42\text{ ns} + (0,16\text{ ns/pF}) C_L$
CP \rightarrow CO	5		70	140	ns	$43\text{ ns} + (0,55\text{ ns/pF}) C_L$
HIGH to LOW	10	t_{PHL}	35	70	ns	$24\text{ ns} + (0,23\text{ ns/pF}) C_L$
	15		25	50	ns	$17\text{ ns} + (0,16\text{ ns/pF}) C_L$
LOW to HIGH	5		55	110	ns	$28\text{ ns} + (0,55\text{ ns/pF}) C_L$
	10	t_{PLH}	30	60	ns	$19\text{ ns} + (0,23\text{ ns/pF}) C_L$
	15		25	50	ns	$17\text{ ns} + (0,16\text{ ns/pF}) C_L$
Output transition times; O_{63}	5		25	50	ns	$5\text{ ns} + (0,40\text{ ns/pF}) C_L$
HIGH to LOW	10	t_{THL}	12	24	ns	$3\text{ ns} + (0,18\text{ ns/pF}) C_L$
	15		8	16	ns	$2\text{ ns} + (0,13\text{ ns/pF}) C_L$
LOW to HIGH	5		40	80	ns	$8\text{ ns} + (0,65\text{ ns/pF}) C_L$
	10	t_{TLH}	20	40	ns	$5\text{ ns} + (0,30\text{ ns/pF}) C_L$
	15		13	26	ns	$3\text{ ns} + (0,20\text{ ns/pF}) C_L$
Output transition times; \overline{O}_{63} , CO	5		60	120	ns	$10\text{ ns} + (1,0\text{ ns/pF}) C_L$
HIGH to LOW	10	t_{THL}	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		60	120	ns	$10\text{ ns} + (1,0\text{ ns/pF}) C_L$
	10	t_{TLH}	30	60	ns	$9\text{ ns} + (0,42\text{ ns/pF}) C_L$
	15		20	40	ns	$6\text{ ns} + (0,28\text{ ns/pF}) C_L$

64-stage static shift register

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	V_{DD} V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA
Set-up times $D_A, D_B \rightarrow CP$	5	t_{su}	25	0	ns	see also waveforms Fig.4
	10		25	-5	ns	
	15		10	-10	ns	
$\bar{A}/B \rightarrow CP$	5	t_{su}	30	10	ns	
	10		15	0	ns	
	15		10	-5	ns	
Hold times $D_A, D_B \rightarrow CP$	5	t_{hold}	40	10	ns	
	10		40	10	ns	
	15		40	10	ns	
$\bar{A}/B \rightarrow CP$	5	t_{hold}	40	10	ns	
	10		40	10	ns	
	15		40	10	ns	
Minimum clock pulse width; LOW	5	t_{WCPL}	180	90	ns	
	10		70	35	ns	
	15		50	25	ns	
Maximum clock pulse frequency	5	f_{max}	2,5	5	MHz	
	10		7	14	MHz	
	15		10	20	MHz	

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	$4000 f_i + \sum (f_o C_L) \times V_{DD}^2$	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)
	10	$19\,000 f_i + \sum (f_o C_L) \times V_{DD}^2$	
	15	$54\,000 f_i + \sum (f_o C_L) \times V_{DD}^2$	

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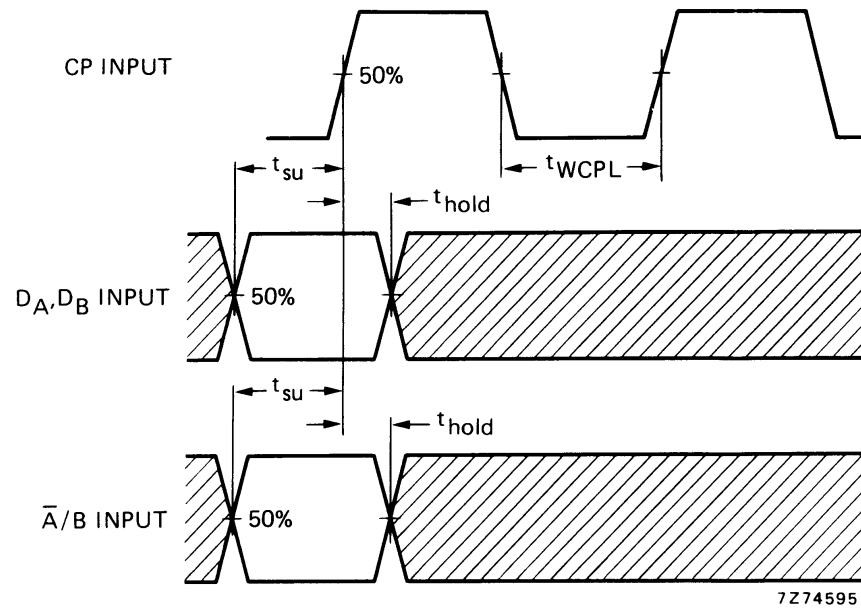
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Fig.4 Waveforms showing minimum clock pulse width, set-up and hold times for D_A , D_B to CP and \bar{A}/B to CP. Set-up and hold times are shown as positive values but may be specified as negative values.

APPLICATION INFORMATION

An example of an application for the HEF4031B is:

- Serial shift register.

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APPLICATION INFORMATION

