

# 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

## HEF4008B

### MSI

## 4-bit binary full adder

Product specification  
File under Integrated Circuits, IC04

January 1995

# 4-bit binary full adder

HEF4008B  
MSI

## DESCRIPTION

The HEF4008B is a 4-bit binary full adder with two 4-bit data inputs ( $A_0$  to  $A_3$ ,  $B_0$  to  $B_3$ ), a carry input ( $C_{IN}$ ), four sum outputs ( $S_0$  to  $S_3$ ), and a carry

output ( $C_{OUT}$ ). The IC uses full look-ahead across 4-bits to generate  $C_{OUT}$ . This minimizes the necessity for extensive look-ahead and carry-cascading circuits.

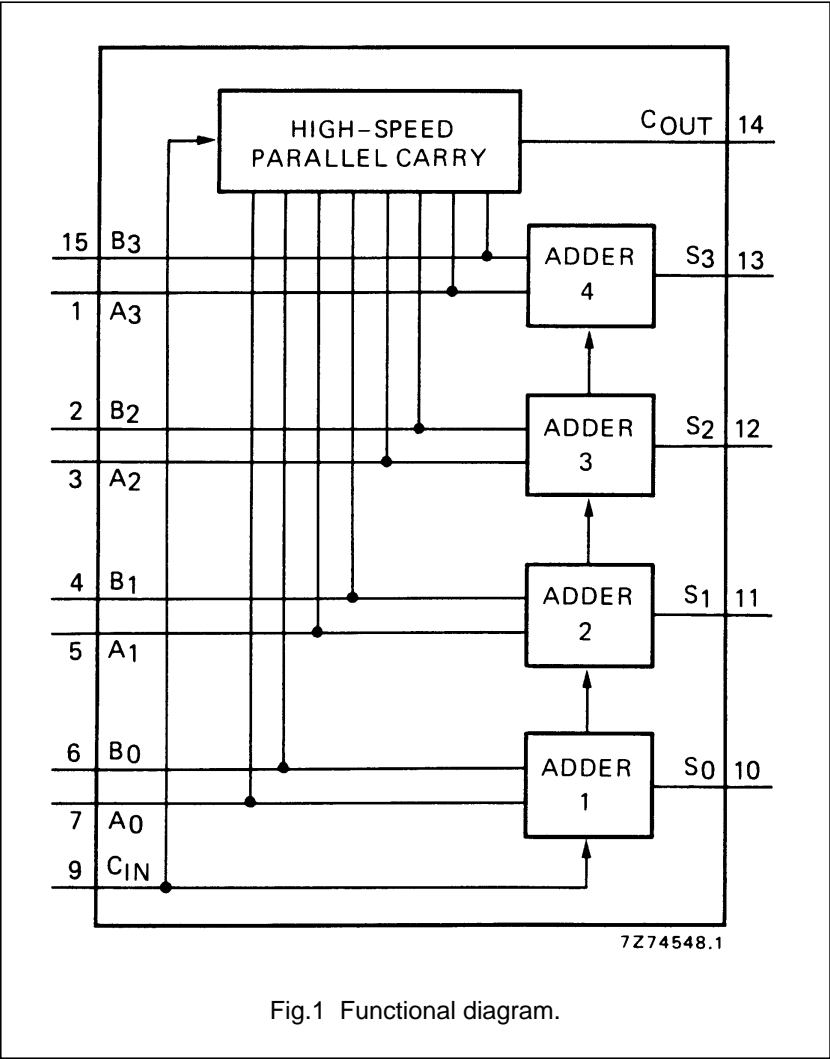


Fig.1 Functional diagram.

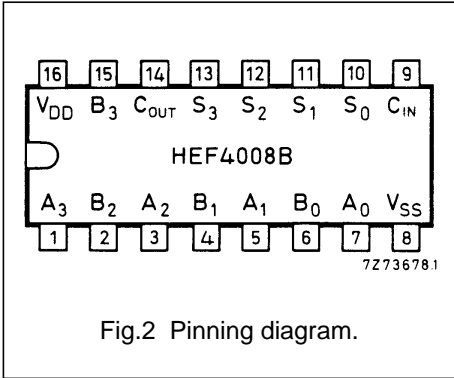


Fig.2 Pinning diagram.

## PINNING

$A_0$  to  $A_3$  data inputs  
 $B_0$  to  $B_3$  data inputs  
 $S_0$  to  $S_3$  sum outputs  
 $C_{IN}$  carry input  
 $C_{OUT}$  carry output

## TRUTH TABLE (one adder)

$C_{IN}$	A	B	$C_{OUT}$	S
L	L	L	L	L
L	L	H	L	H
L	H	L	L	H
L	H	H	H	L
H	L	L	L	H
H	L	H	H	L
H	H	L	H	L
H	H	H	H	H

HEF4008BP(N): 16-lead DIL; plastic (SOT38-1)  
HEF4008BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)  
HEF4008BT(D): 16-lead SO; plastic (SOT109-1)  
( ): Package Designator North America

**FAMILY DATA,  $I_{DD}$  LIMITS category MSI**  
See Family Specifications

## 4-bit binary full adder

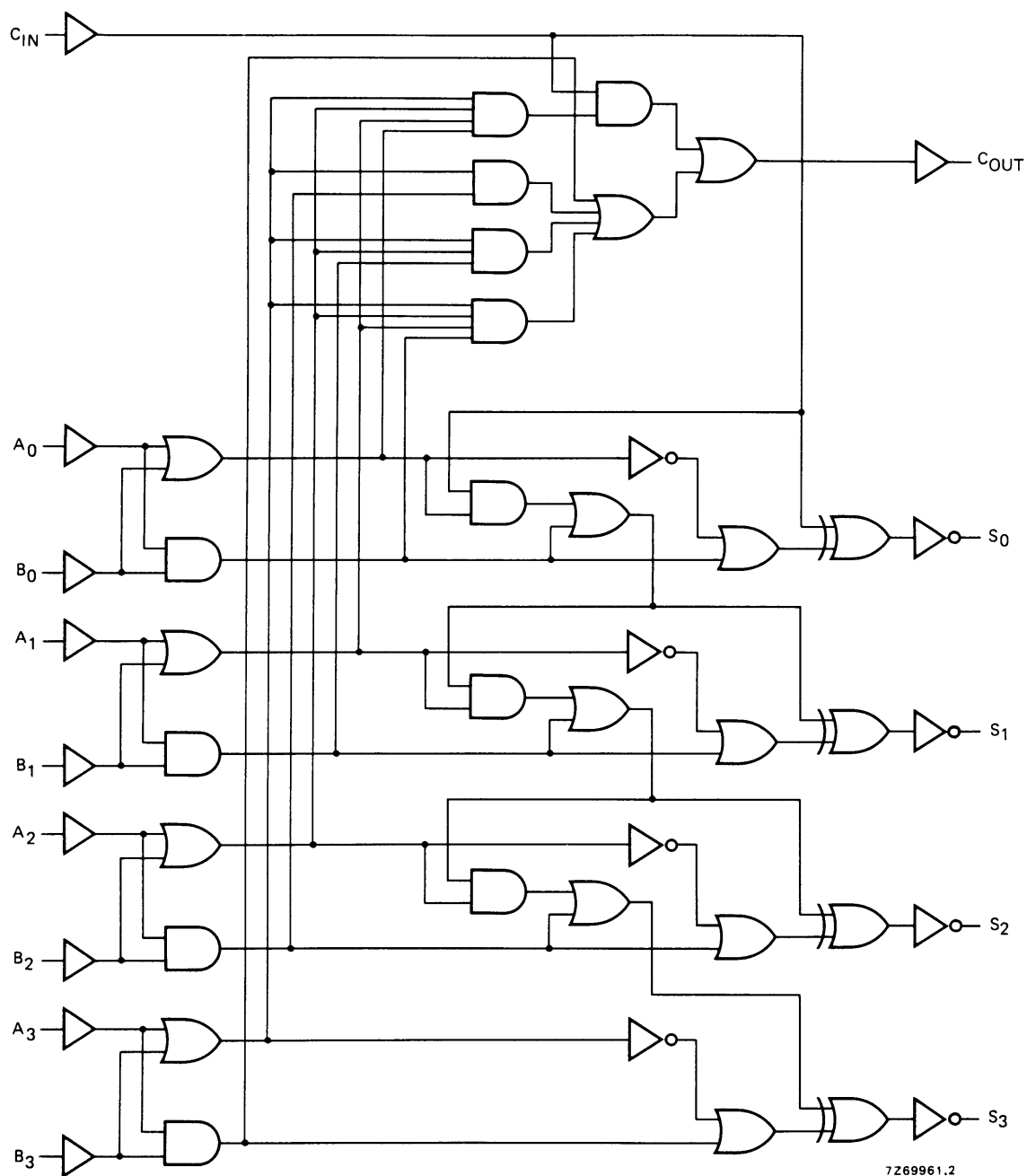
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Fig.3 Logic diagram.

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## AC CHARACTERISTICS

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

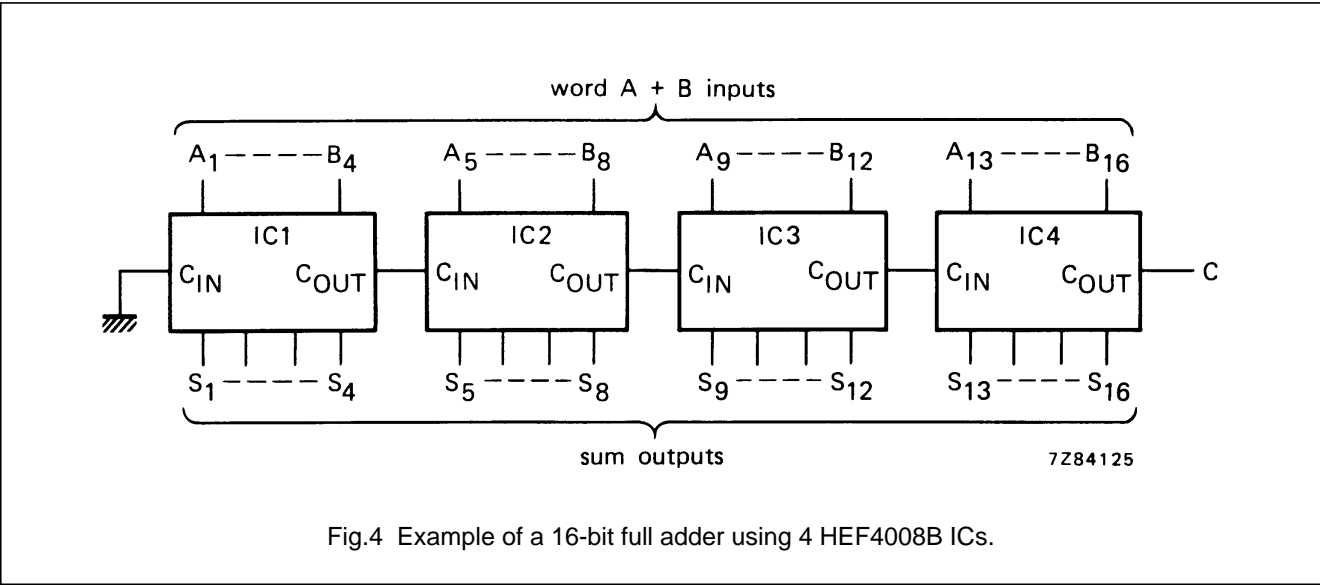
	$V_{DD}$ V	SYMBOL	MIN.	TYP.	MAX.	TYPICAL EXTRAPOLATION FORMULA
Propagation delays						
sum in $\rightarrow$ sum out	5	$t_{PHL}$		150	300 ns	123 ns + (0,55 ns/pF) $C_L$
HIGH to LOW	10			55	110 ns	44 ns + (0,23 ns/pF) $C_L$
	15			40	80 ns	32 ns + (0,16 ns/pF) $C_L$
LOW to HIGH	5	$t_{PLH}$		135	270 ns	108 ns + (0,55 ns/pF) $C_L$
	10			55	110 ns	44 ns + (0,23 ns/pF) $C_L$
	15			40	80 ns	32 ns + (0,16 ns/pF) $C_L$
sum in $\rightarrow C_{OUT}$	5	$t_{PHL}$		125	250 ns	98 ns + (0,55 ns/pF) $C_L$
HIGH to LOW	10			50	100 ns	39 ns + (0,23 ns/pF) $C_L$
	15			35	70 ns	27 ns + (0,16 ns/pF) $C_L$
LOW to HIGH	5	$t_{PLH}$		100	200 ns	73 ns + (0,55 ns/pF) $C_L$
	10			45	90 ns	34 ns + (0,23 ns/pF) $C_L$
	15			30	60 ns	22 ns + (0,16 ns/pF) $C_L$
$C_{IN} \rightarrow$ sum out	5	$t_{PHL}$		130	260 ns	103 ns + (0,55 ns/pF) $C_L$
HIGH to LOW	10			50	100 ns	39 ns + (0,23 ns/pF) $C_L$
	15			35	70 ns	27 ns + (0,16 ns/pF) $C_L$
LOW to HIGH	5	$t_{PLH}$		115	230 ns	88 ns + (0,55 ns/pF) $C_L$
	10			50	100 ns	39 ns + (0,23 ns/pF) $C_L$
	15			35	70 ns	27 ns + (0,16 ns/pF) $C_L$
$C_{IN} \rightarrow C_{OUT}$	5	$t_{PHL}$		90	180 ns	63 ns + (0,55 ns/pF) $C_L$
HIGH to LOW	10			35	70 ns	24 ns + (0,23 ns/pF) $C_L$
	15			25	50 ns	17 ns + (0,16 ns/pF) $C_L$
LOW to HIGH	5	$t_{PLH}$		75	150 ns	48 ns + (0,55 ns/pF) $C_L$
	10			35	70 ns	24 ns + (0,23 ns/pF) $C_L$
	15			25	50 ns	17 ns + (0,16 ns/pF) $C_L$
Output transition times						
HIGH to LOW	5	$t_{THL}$		60	120 ns	10 ns + (1,0 ns/pF) $C_L$
	10			30	60 ns	9 ns + (0,42 ns/pF) $C_L$
	15			20	40 ns	6 ns + (0,28 ns/pF) $C_L$
LOW to HIGH	5	$t_{TLH}$		60	120 ns	10 ns + (1,0 ns/pF) $C_L$
	10			30	60 ns	9 ns + (0,42 ns/pF) $C_L$
	15			20	40 ns	6 ns + (0,28 ns/pF) $C_L$

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	V <sub>DD</sub> 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 f <sub>i</sub> = input freq. (MHz) f <sub>o</sub> = output freq. (MHz) C <sub>L</sub> = load capacitance (pF) Σ (f <sub>o</sub> C <sub>L</sub> ) = sum of outputs V <sub>DD</sub> = supply voltage (V)
	10	$6\,000\,f_i + \sum (f_o C_L) \times V_{DD}^2$	
	15	$13\,500\,f_i + \sum (f_o C_L) \times V_{DD}^2$	

APPLICATION INFORMATION



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