HD14008B

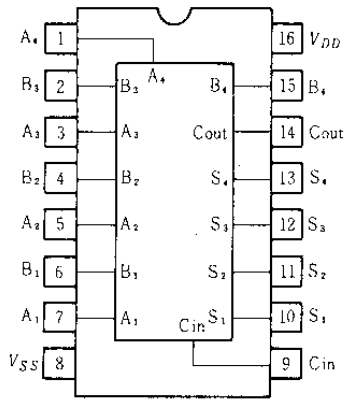
4-bit Full Adder

The HD14008B 4-bit full adder consists of four full adders with fast internal look-ahead carry output. It is useful in binary addition and other arithmetic applications. The fast parallel carry output bit allows high-speed operation when used with other adders in a system.

■ FEATURES

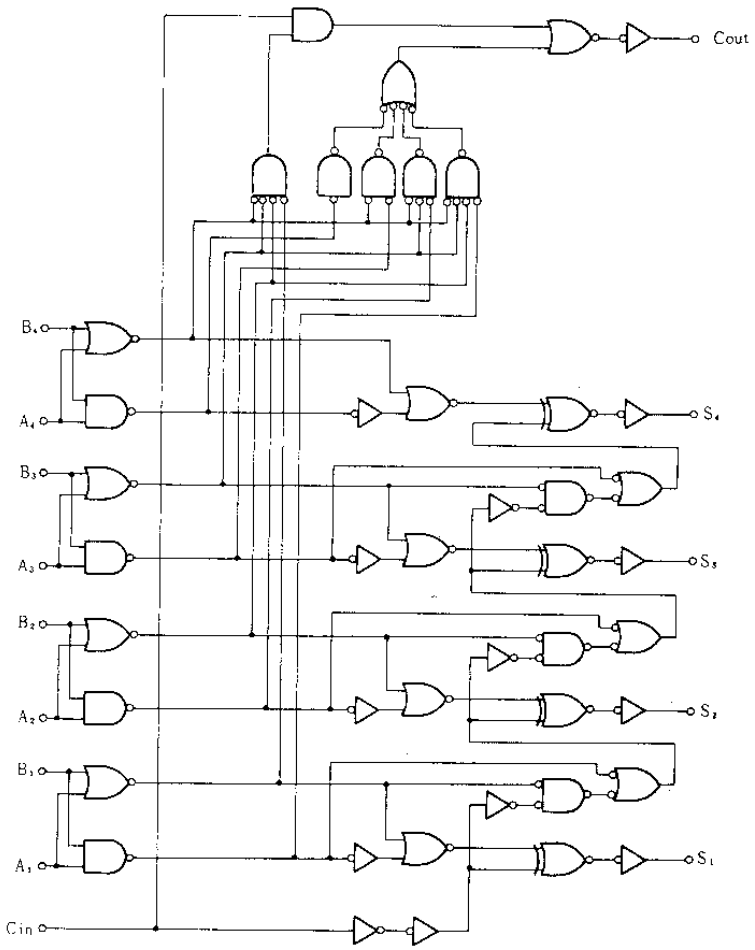
- Look-Ahead Carry Output
- High-Speed Operation; 160ns typ. from Sum_{in} to Sum_{out}
- Quiescent Current; 5nA/pkg typ @5V
- Supply Voltage Range = 3 to 18V
- Pin-for-Pin Replacement for CD4008B and MC14008B

■ PIN ARRANGEMENT



(Top View)

■ LOGIC DIAGRAM



■ TRUTH TABLE (1 Stage)

Cin	B	A	Cout	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

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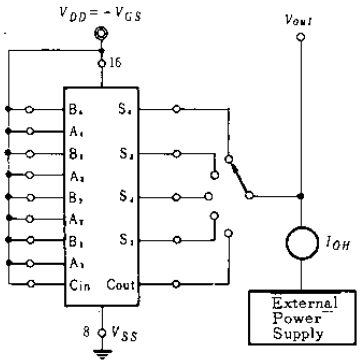
■ ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V_{DD}(V)	Test Conditions	−40°C min	−40°C max	25°C min	25°C typ	25°C max	85°C min	85°C max	Unit
Output Voltage	V_{OL}	5.0	$V_{in}=V_{DD}$ or 0	−	0.05	−	0	0.05	−	0.05	V
		10		−	0.05	−	0	0.05	−	0.05	
		15		−	0.05	−	0	0.05	−	0.05	
	V_{OH}	5.0	V_{in}= 0 or V_{DD}	4.95	−	4.95	5.0	−	4.95	−	V
		10		9.95	−	9.95	10	−	9.95	−	
		15		14.95	−	14.95	15	−	14.95	−	
Input Voltage	V_{IL}	5.0	V_{out}= 4.5 or 0.5V	−	1.5	−	2.25	1.5	−	1.5	V
		10	V_{out}= 9.0 or 1.0V	−	3.0	−	4.50	3.0	−	3.0	
		15	V_{out}=13.5 or 1.5V	−	4.0	−	6.75	4.0	−	4.0	
	V_{IH}	5.0	V_{out}= 0.5 or 4.5V	3.5	−	3.5	2.75	−	3.5	−	V
		10	V_{out}= 1.0 or 9.0V	7.0	−	7.0	5.50	−	7.0	−	
		15	V_{out}= 1.5 or 13.5V	11.0	−	11.0	8.25	−	11.0	−	
Output Drive Current	I_{OH}	5.0	V_{OH}= 2.5V	−1.0	−	−0.8	−1.7	−	−0.6	−	mA
		5.0	V_{OH}= 4.6V	−0.2	−	−0.16	−0.36	−	−0.12	−	
		10	V_{OH}= 9.5V	−0.5	−	−0.4	−0.9	−	−0.3	−	
		15	V_{OH}=13.5V	−1.4	−	−1.2	−3.5	−	−1.0	−	
	I_{OL}	5.0	V_{OL}= 0.4V	0.52	−	0.44	0.88	−	0.36	−	mA
		10	V_{OL}= 0.5V	1.3	−	1.1	2.25	−	0.9	−	
		15	V_{OL}= 1.5V	3.6	−	3.0	8.8	−	2.4	−	
Input Current	I_{in}	15		−	±0.3	−	±0.00001	±0.3	−	±1.0	μA
Input Capacitance	C_{in}	−	V_{in}= 0	−	−	−	5.0	7.5	−	−	pF
Quiescent Current	I_{DD}	5.0	Zero Signal, per Package	−	20	−	0.005	20	−	150	μA
		10		−	40	−	0.010	40	−	300	
		15		−	80	−	0.015	80	−	600	
Total Supply Current*	I_T	5.0	Dynamic+I_{DD}, C_L=50pF	−	−	−	1.7	−	−	−	μA
		10	f= 1kHz,	−	−	−	3.4	−	−	−	
		15	Per Gate	−	−	−	5.0	−	−	−	

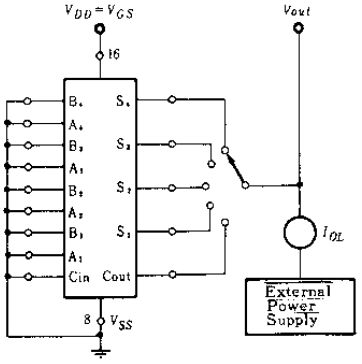
* To calculate total supply current at frequency other than 1kHz.
@ V_{DD}=5.0V $I_T=(1.7\mu A/kHz)f+I_{DD}$ @ V_{DD}=10V $I_T=(3.4\mu A/kHz)f+I_{DD}$ @ V_{DD}=15V $I_T=(5.0\mu A/kHz)f-I_{DD}$

■ DC CHARACTERISTIC TEST CIRCUIT

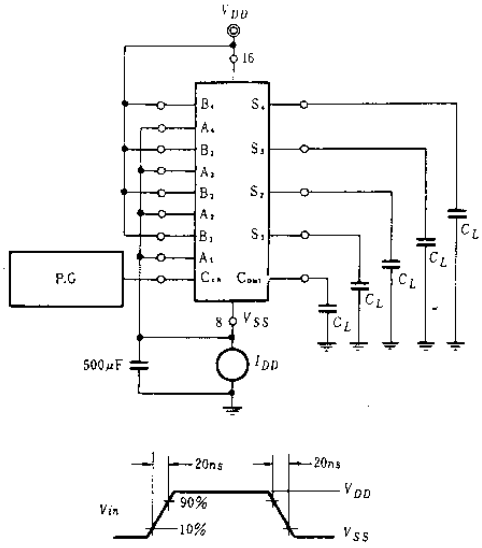
● I_{OH}



● I_{OL}



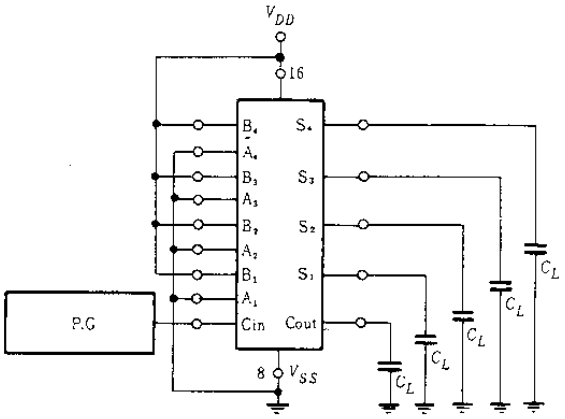
●POWER DISSIPATION TEST CIRCUIT AND WAVEFORM

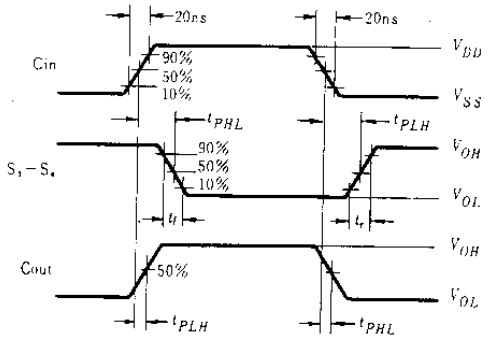


■ SWITCHING CHARACTERISTICS (C_L=50pF, Ta=25°C)

Characteristic		Symbol	V_{DD}(V)	min	typ	max	Unit
Output Rise Time		t_r	5.0	—	180	360	ns
			10	—	90	180	
			15	—	65	130	
Output Fall Time		t_f	5.0	—	100	200	ns
			10	—	50	100	
			15	—	40	80	
Propagation Delay Time	Sum In-to-Sum Out	t_{PLH}, t_{PHL}	5.0	—	400	800	ns
			10	—	160	320	
			15	—	115	230	
	Sum In-to-Carry Out		5.0	—	305	610	
			10	—	145	290	
			15	—	110	220	
	Carry In-to-Sum Out		5.0	—	375	750	
			10	—	155	310	
			15	—	115	230	
	Carry In-to-Carry Out		5.0	—	170	340	
			10	—	75	150	
			15	—	55	110	

■ SWITCHING TIME TEST CIRCUIT





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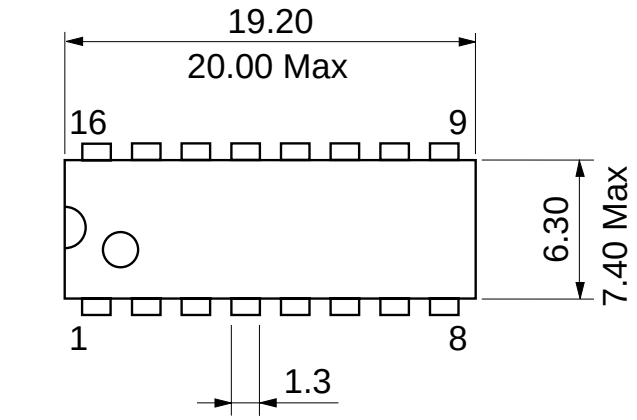
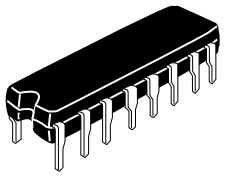
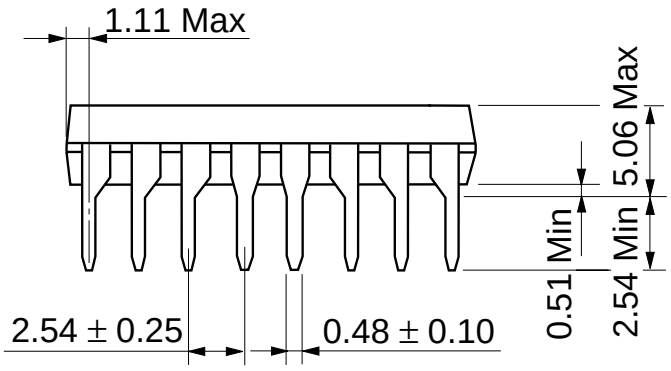
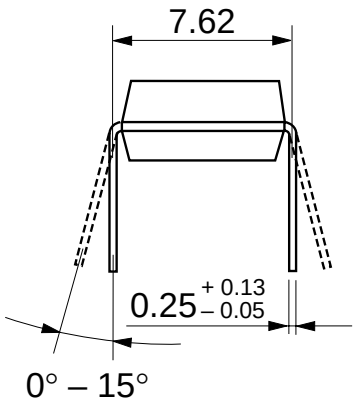
Unit: mm









Hitachi Code	DP-16
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Weight (reference value)	1.07 g

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