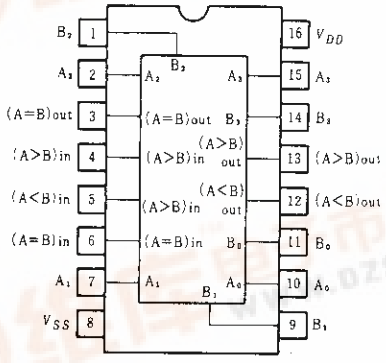
HD14585B

4-bit Magnitude Comparator

The HD14585B 4-bit Magnitude Comparator has eight comparing inputs (A3, B3, A2, B2, A1, B1, A0, B0), three cascading inputs (A < B, A = B and A > B), and three outputs (A < B, A = B, A > B). This device compares two 4-bit words (A and B) and determines whether they are "less than", "equal to", or "greater than" by a high level on the appropriate output. For words greater than 4-bits, units can be cascaded by connecting outputs (A < B), and (A = B) to the corresponding inputs of the next significant comparator (input A > B is connected to a high). Inputs (A < B), (A = B), and (A > B) on the least significant (first) comparator are connected to a low, a high, and a high, respectively. Applications include logic in CPU's, correction and/or detection of instrumentation conditions, comparator in testers, converters, and controls.

■ PIN ARRANGEMENT

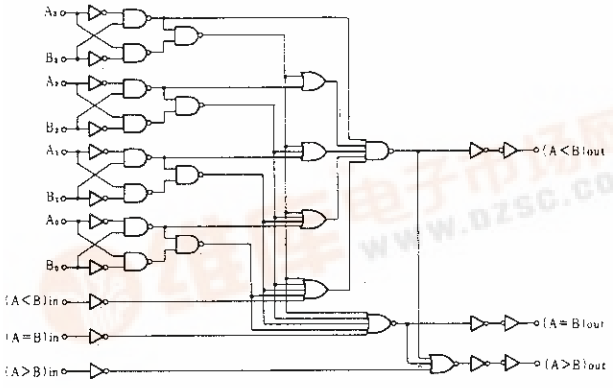


(Top View)

■ FEATURES

- Quiescent Current = 5nA/pkg typ. @5V
- Expandable
- Applicable to Binary or 8421-BCD Code
- Supply Voltage Range = 3 to 18V
- Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range

■ LOGIC DIAGRAM



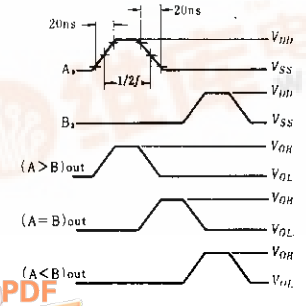
■ TRUTH TABLE

Inputs							Outputs		
Comparing				Cascading					
A_3, B_3	A_2, B_2	A_1, B_1	A_0, B_0	A<B	A=B	A>B	A<B	A=B	A>B
$A_3>B_3$	×	×	×	×	×	1	0	0	1
$A_3=B_3$	$A_2>B_2$	×	×	×	×	1	0	0	1
$A_3=B_3$	$A_2=B_2$	$A_1>B_1$	×	×	×	1	0	0	1
$A_3=B_3$	$A_2=B_2$	$A_1=B_1$	$A_0>B_0$	×	×	1	0	0	1
$A_3=B_3$	$A_2=B_2$	$A_1=B_1$	$A_0=B_0$	0	0	1	0	0	1
$A_3=B_3$	$A_2=B_2$	$A_1=B_1$	$A_0=B_0$	0	1	1	0	1	0
$A_3=B_3$	$A_2=B_2$	$A_1=B_1$	$A_0=B_0$	1	0	1	1	0	0
$A_3=B_3$	$A_2=B_2$	$A_1=B_1$	$A_0<B_0$	×	×	×	1	0	0
$A_3=B_3$	$A_2=B_2$	$A_1<B_1$	×	×	×	×	1	0	0
$A_3=B_3$	$A_2<B_2$	×	×	×	×	×	1	0	0
$A_3<B_3$	×	×	×	×	×	×	1	0	0

× : Don't Care

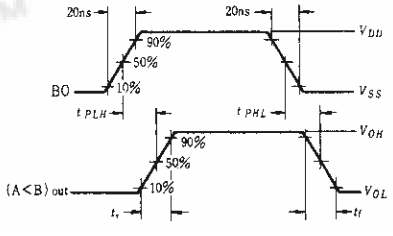
■ DYNAMIC SIGNAL WAVEFORMS

● Power Dissipation Signal Waveform



Notes) 1. Inputs (A>B) and (A=B) high, and inputs $B_2, A_2, B_1, A_1, B_0, A_0$ and (A<B) low.
2. f : in respect to a system clock.

● Dynamic Signal Waveforms



Note) Inputs (A>B) and (A=B) high, and inputs $B_3, A_3, B_2, A_2, B_1, A_1, A_0$, and (A<B) low.

■ ELECTRICAL CHARACTERISTICS

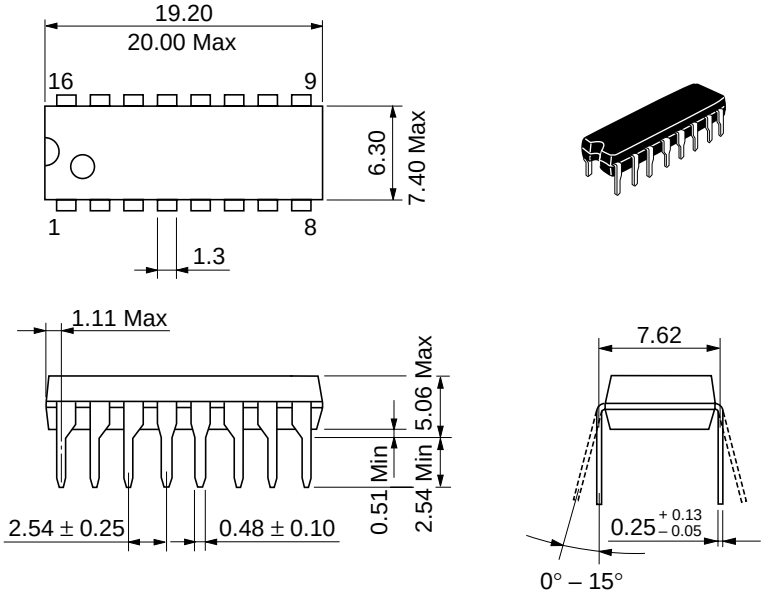
Characteristic	Symbol	V_{DD}(V)	Test Conditions	−40℃ min	−40℃ max	25℃ min	25℃ typ	25℃ max	85℃ min	85℃ max	Unit
Output Voltage	V_{OL}	5.0	$V_{in}=V_{DD}$ or 0	—	0.05	—	0	0.05	—	0.05	V
		10		—	0.05	—	0	0.05	—	0.05	
		15		—	0.05	—	0	0.05	—	0.05	
	V_{OH}	5.0	$V_{in}=0$ or V_{DD}	4.95	—	4.95	5.0	—	4.95	—	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	$V_{OH}=2.5$V	−1.0	—	−0.8	−1.7	—	−0.6	—	mA
		5.0	$V_{OH}=4.6$V	−0.2	—	−0.16	−0.36	—	−0.12	—	
		10	$V_{OH}=9.5$V	−0.5	—	−0.4	−0.9	—	−0.3	—	
		15	$V_{OH}=13.5$V	−1.4	—	−1.2	−3.5	—	−1.0	—	
	I_{OL}	5.0	$V_{OL}=0.4$V	0.52	—	0.44	0.88	—	0.36	—	mA
		10	$V_{OL}=0.5$V	1.3	—	1.1	2.25	—	0.9	—	
		15	$V_{OL}=1.5$V	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}, $C_L=50$pF, $f=1$ kHz, per Gate	—	—	—	0.6	—	—	—	μA
		10		—	—	—	1.2	—	—	—	
		15		—	—	—	1.8	—	—	—	

* To calculate total supply current at frequency other than 1kHz.
@ $V_{DD}=5.0$V $I_T=(0.6\mu A/kHz)f+I_{DD}$ @ $V_{DD}=10$V $I_T=(1.2\mu A/kHz)f+I_{DD}$ @ $V_{DD}=15$V $I_T=(1.8\mu A/kHz)f+I_{DD}$

■ SWITCHING CHARACTERISTICS ($C_L=50$pF, $Ta=25$℃)

Characteristic	Symbol	V_{DD}(V)	min	typ	max	Unit
Output Rise Time	t_r	5.0	—	180	400	ns
		10	—	90	200	
		15	—	65	160	
Output Fall Time	t_f	5.0	—	100	200	ns
		10	—	50	100	
		15	—	37	80	
Propagation Delay Time	t_{PLH}, t_{PHL}	5.0	—	430	1125	ns
		10	—	180	450	
		15	—	130	330	

Unit: mm


19.20
20.00 Max
16
9
6.30
7.40 Max
1
8
1.3
1.11 Max
5.06 Max
0.51 Min
2.54 Min
2.54 ± 0.25
0.48 ± 0.10
7.62
0.25 + 0.13 − 0.05
0° – 15°

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