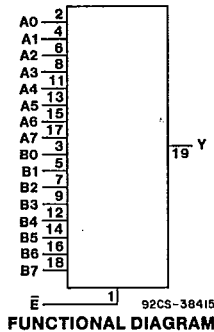


CD54/74HC688
CD54/74HCT688

File Number 1646

High-Speed CMOS Logic



8-Bit Magnitude Comparator

- Type Features:**
- Cascadable

The RCA-CD54/74HC688 and CD54/74HCT688 are 8-bit magnitude comparators designed for use in computer and logic applications that require the comparison of two 8-bit binary words. When the compared words are equal the output (Y) is low and can be used as the enabling input for the next device in a cascaded application.

The CD54HC688 and CD54HCT688 are supplied in 20-lead ceramic dual-in-line packages (F suffix). The CD74HC688 and CD74HCT688 are supplied in 20-lead dual-in-line plastic packages (E suffix) and in 20-lead dual-in-line surface-mount plastic packages (M suffix). Both types are also available in chip form (H suffix).

Family Features:

- Fanout (over temperature range):
Standard outputs - 10 LSTTL loads
Bus driver outputs - 15 LSTTL loads
- Wide operating temperature range:
CD74HC/HCT: -40 to +85° C
- Balanced propagation delay and transition times
- Significant power reduction compared to LSTTL logic ICs
- Alternate source is Philips/Signetics
- CD54HC/CD74HC types:
2 to 6 V operation
High noise immunity: $N_{IL}=30\%$, $N_{IH}=30\%$ of V_{CC} ; @ $V_{CC}=5$ V
- CD54HCT/CD74HCT types:
4.5 to 5.5 V operation
Direct LSTTL input logic compatibility
 $V_{IL}=0.8$ V max., $V_{IH}=2$ V min.
CMOS input compatibility
 $I_i \leq 1 \mu A$ @ V_{OL} , V_{OH}

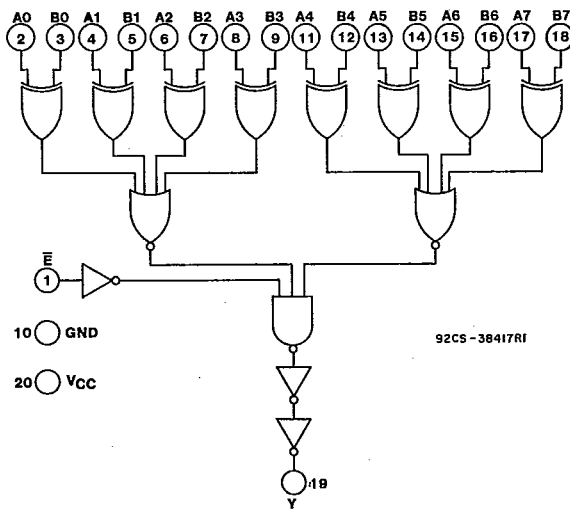


Fig. 1 - Logic diagram.

TRUTH TABLE

Inputs		Outputs
A, B	E	Y
A = B	L	L
A ≠ B	L	H
X	H	H

X = Don't care
L = Low level
H = High level

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MAXIMUM RATINGS, Absolute-Maximum Values:

DC SUPPLY-VOLTAGE, (V_{CC}):
(Voltages referenced to ground) -0.5 to +7 V

DC INPUT DIODE CURRENT, I_{IK} (FOR V_I < -0.5 V OR V_I > V_{CC} +0.5 V) ±20 mA

DC OUTPUT DIODE CURRENT, I_{OK} (FOR V_O < -0.5 V OR V_O > V_{CC} +0.5 V) ±20 mA

DC DRAIN CURRENT, PER OUTPUT (I_O) (FOR -0.5 V < V_O < V_{CC} +0.5 V) ±25 mA

DC V_{CC} OR GROUND CURRENT, (I_{CC}) ±50 mA

POWER DISSIPATION PER PACKAGE (P_D):

For T_A = -40 to +60° C (PACKAGE TYPE E) 500 mW

For T_A = +60 to +85° C (PACKAGE TYPE E) Derate Linearly at 8 mW/°C to 300 mW

For T_A = -55 to +100° C (PACKAGE TYPE F, H) 500 mW

For T_A = +100 to +125° C (PACKAGE TYPE F, H) Derate Linearly at 8 mW/°C to 300 mW

For T_A = -40 to +70° C (PACKAGE TYPE M) 400 mW

For T_A = +70 to +125° C (PACKAGE TYPE M) Derate Linearly at 6 mW/°C to 70 mW

OPERATING-TEMPERATURE RANGE (T_A):

PACKAGE TYPE F, H -55 to +125° C

PACKAGE TYPE E, M -40 to +85° C

STORAGE TEMPERATURE (T_{stg}) -65 to +150° C

LEAD TEMPERATURE (DURING SOLDERING):

At distance 1/16 ± 1/32 in. (1.59 ± 0.79 mm) from case for 10 s max. +265° C

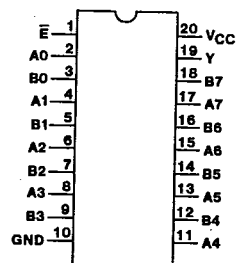
Unit inserted into a PC Board (min. thickness 1/16 in., 1.59 mm) with solder contacting lead tips only +300° C

RECOMMENDED OPERATING CONDITIONS

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range (For T _A =Full Package Temperature Range) V _{CC} .*			
CD54/74HC Types	2	6	V
CD54/74HCT Types	4.5	5.5	
DC Input or Output Voltage, V _I , V _O	0	V _{CC}	V
Operating Temperature, T _A :			
CD74 Types	-40	+85	°C
CD54 Types	-55	+125	
Input Rise and Fall Times, t _r , t _f :			
at 2 V	0	1000	ns
at 4.5 V	0	500	
at 6 V	0	400	

*Unless otherwise specified, all voltages are referenced to Ground.



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TERMINAL ASSIGNMENT

Technical Data

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CD54/74HC688
CD54/74HCT688

STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTICS	CD74HC688/CD54HC688										CD74HCT688/CD54HCT688								UNITS			
	TEST CONDITIONS			74HC/54HC TYPE			74HC TYPE		54HC TYPE			TEST CONDITIONS		74HCT/54HCT TYPE			74HCT TYPE			54HCT TYPE		
	V _i V	I _o mA	V _{cc} V	+25°C			-40/ +85°C		-55/ +125°C			V _i V	V _{cc} V	+25°C			-40/ +85°C			-55/ +125°C		
				Min	Typ	Max	Min	Max	Min	Max	Min			Max	Min	Typ	Max	Min		Max	Min	Max
High-Level Input Voltage V _{ih}			2	1.5	—	—	1.5	—	1.5	—	—	4.5	to	2	—	—	2	—	2	—	V	
			4.5	3.15	—	—	3.15	—	3.15	—	—	5.5										
			6	4.2	—	—	4.2	—	4.2	—	—											
Low-Level Input Voltage V _{il}			2	—	—	0.5	—	0.5	—	0.5	—	4.5	to	—	—	0.8	—	0.8	—	0.8	V	
			4.5	—	—	1.35	—	1.35	—	1.35	—	5.5										
			6	—	—	1.8	—	1.8	—	1.8	—											
High-Level Output Voltage V _{oh}	V _{ih}	-0.02	2	1.9	—	—	1.9	—	1.9	—	V _{ih}	4.5	4.4	—	—	4.4	—	4.4	—	4.4	V	
or			4.5	4.4	—	—	4.4	—	4.4	—	or											
CMOS Loads	V _{ih}		6	5.9	—	—	5.9	—	5.9	—	V _{ih}											
TTL Loads	V _{ih}	-4	4.5	3.98	—	—	3.84	—	3.7	—	V _{ih}	4.5	3.98	—	—	3.84	—	3.7	—	—	V	
	V _{ih}	-5.2	6	5.48	—	—	5.34	—	5.2	—	V _{ih}											
Low-Level Output Voltage V _{ol}	V _{ih}	0.02	2	—	—	0.1	—	0.1	—	0.1	V _{ih}	4.5	—	—	0.1	—	0.1	—	0.1	—	V	
or			4.5	—	—	0.1	—	0.1	—	0.1	or											
CMOS Loads	V _{ih}		6	—	—	0.1	—	0.1	—	0.1	V _{ih}											
TTL Loads	V _{ih}	4	4.5	—	—	0.26	—	0.33	—	0.4	V _{ih}	4.5	—	—	0.26	—	0.33	—	0.4	—	V	
	V _{ih}	5.2	6	—	—	0.26	—	0.33	—	0.4	V _{ih}											
Input Leakage Current I _i	V _{cc} or Gnd		6	—	—	±0.1	—	±1	—	±1	Any Voltage Between V _{cc} and Gnd	5.5	—	—	±0.1	—	±1	—	±1	—	μA	
Quiescent Device Current I _{cc}	V _{cc} or Gnd	0	6	—	—	8	—	80	—	160	V _{cc} or Gnd	5.5	—	—	8	—	80	—	160	—	μA	
Additional Quiescent Device Current per Input Pin: 1 Unit Load ΔI _{cc} *											V _{cc} -2.1	4.5 to 5.5	—	100	360	—	450	—	490	—	μA	

*For dual-supply systems theoretical worst case (V_i = 2.4 V, V_{cc} = 5.5 V) specification is 1.8 mA.

HCT Input Loading Table

Input	Unit Loads*
Enable	0.7
Data Inputs	0.35

*Unit Load is ΔI_{cc} limit specified in Static Characteristics Chart, e.g., 360 μA max. @25°C.

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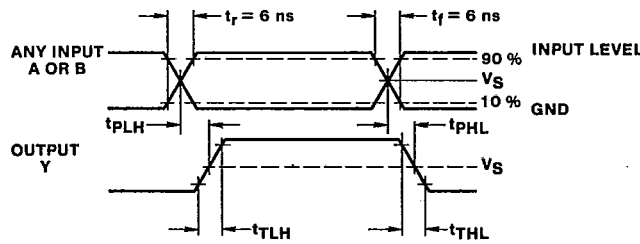
SWITCHING CHARACTERISTICS ($V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$, Input $t_r, t_f = 6\text{ ns}$)

CHARACTERISTIC	SYMBOL	C_L pF	TYPICAL VALUES		UNITS
			HC	HCT	
Propagation Delay A and B Data to Output	t_{PLH} t_{PHL}	15	14	14	ns
Propagation Delay Enable to Output	t_{PLH} t_{PHL}	15	9	9	
Power Dissipation Capacitance*	C_{PD}	—	22	22	pF

* C_{PD} is used to determine the power consumption, per device.
 $PD = V_{CC}^2 f_i (C_{PD} + C_L)$ where f_i = input frequency
 C_L = output load capacitance
 V_{CC} = supply voltage

SWITCHING CHARACTERISTICS ($C_L = 50\text{ pF}$, Input $t_r, t_f = 6\text{ ns}$)

CHARACTERISTIC	SYMBOL	V_{CC}	25°C				-40°C to +85°C				-55°C to +125°C				UNITS
			HC		HCT		74HC		74HCT		54HC		54HCT		
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Propagation Delay An to Output	t_{PLH}	2	—	170	—	—	—	210	—	—	—	—	255	—	ns
	t_{PHL}	4.5	—	34	—	34	—	42	—	42	—	51	—	51	
		6	—	29	—	—	—	36	—	—	—	43	—	—	
Bn to Output	t_{PLH}	2	—	170	—	—	—	210	—	—	—	255	—	ns	
	t_{PHL}	4.5	—	34	—	34	—	42	—	42	—	51	—		51
		6	—	29	—	—	—	36	—	—	—	43	—		—
\bar{E} to Output	t_{PLH}	2	—	120	—	—	—	150	—	—	—	180	—	ns	
	t_{PHL}	4.5	—	24	—	24	—	30	—	30	—	36	—		36
		6	—	20	—	—	—	26	—	—	—	30	—		—
Output Transition Time	t_{TLH}	2	—	75	—	—	—	95	—	—	—	110	—	ns	
	t_{THL}	4.5	—	15	—	15	—	19	—	19	—	22	—		22
		6	—	13	—	—	—	16	—	—	—	19	—		—
Input Capacitance	C_i		—	10	—	10	—	10	—	10	—	10	—	pF	



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	54/74HC	54/74HCT
Input Level	V_{CC}	3 V
Switching Voltage, V_S	50% V_{CC}	1.3 V

Fig. 2 - Propagation delay and transition times.