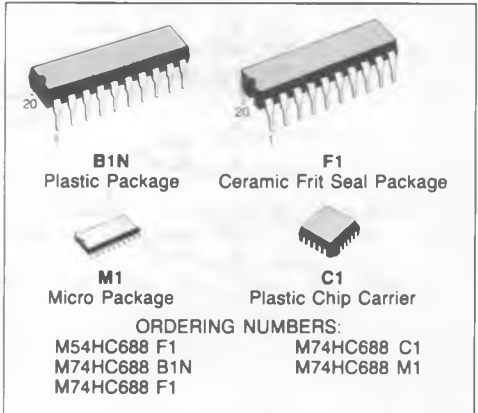


8-BIT EQUALITY COMPARATOR

- **HIGH SPEED**
 $t_{PD} = 21 \text{ ns (TYP.) at } V_{CC} = 5V$
- **LOW POWER DISSIPATION**
 $I_{CC} = 4 \mu A \text{ (MAX.) at } T_A = 25^\circ C$
- **HIGH NOISE IMMUNITY**
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (MIN.)}$
- **OUTPUT DRIVE CAPABILITY**
 10 LSTTL LOADS
- **SYMMETRICAL OUTPUT IMPEDANCE**
 $|I_{OH}| = I_{OL} = 4 \text{ mA (MIN.)}$
- **BALANCED PROPAGATION DELAYS**
 $t_{PLH} = t_{PHL}$
- **WIDE OPERATING VOLTAGE RANGE**
 $V_{CC} \text{ (OPR)} = 2V \text{ to } 6V$
- **PIN AND FUNCTION COMPATIBLE**
 WITH 54/74LS688



DESCRIPTION

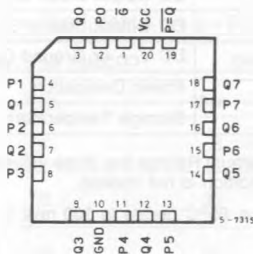
The M54/74HC688 utilizes silicon gate C²MOS technology to achieve operating speeds equivalent to LSTTL devices. Along with the low power dissipation and high noise immunity of standard C²MOS integrated circuit, it possesses the driving capability of 10 LSTTL load. The M54/74HC688 compares bit for bit two 8-bit words applied on inputs P0 - P7 and inputs Q0 - Q7 and indicates whether or not they are equal. A single active low enable is provided to facilitate cascading several packages to enable comparison of words greater than 8 bits. All inputs are equipped with protection circuit against static discharge and transient excess voltage.

TRUTH TABLE

INPUT		OUTPUT
P, Q	\bar{G}	$\overline{P = Q}$
P = Q	L	L
P \neq Q	L	H
X	H	H

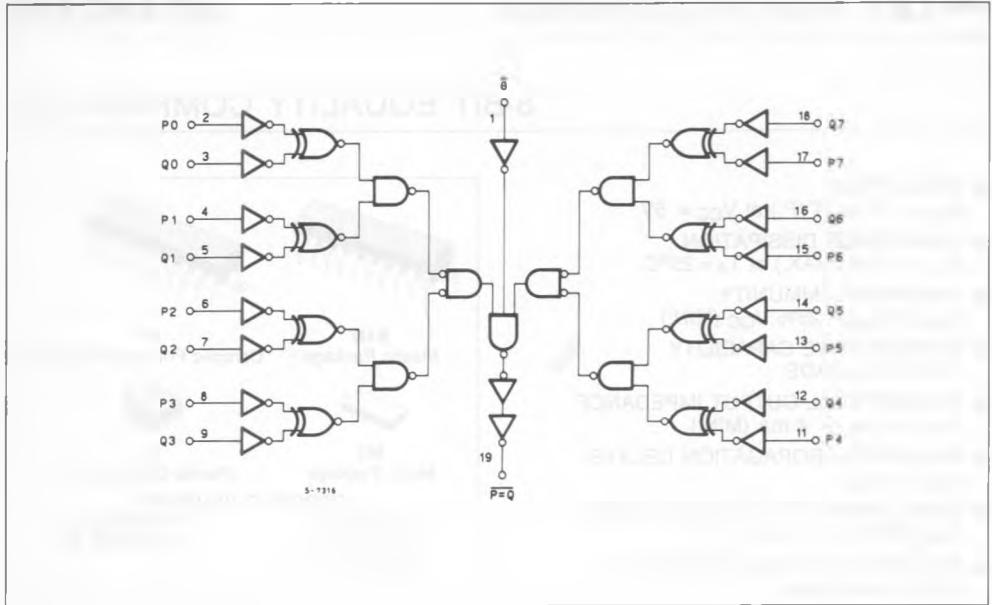
X: DON'T CARE

PIN CONNECTIONS (top view)



NC =
No Internal
Connection

LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to 7	V
V_I	DC Input Voltage	-0.5 to $V_{CC} + 0.5$	V
V_O	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	V
I_{IK}	DC Input Diode Current	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Source Sink Current Per Output Pin	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 50	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	-65 to 150	$^{\circ}C$

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(*) 500 mW: $\cong 65^{\circ}C$ derate to 300 mW by 10 mW/ $^{\circ}C$: $65^{\circ}C$ to $85^{\circ}C$.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2 to 6	V
V_I	Input Voltage	0 to V_{CC}	V
V_O	Output Voltage	0 to V_{CC}	V
T_A	Operating Temperature 74HC Series 54HC Series	-40 to 85 -55 to 125	°C
t_r, t_f	Input Rise and Fall Time	$V_{CC} \begin{cases} 2 \text{ V} & 0 \text{ to } 1000 \\ 4.5 \text{ V} & 0 \text{ to } 500 \\ 6 \text{ V} & 0 \text{ to } 400 \end{cases}$	ns

DC SPECIFICATIONS

Symbol	Parameter	V_{CC}	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			-40 to 85°C 74HC		-55 to 125°C 54HC		Unit	
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V_{IH}	High Level Input Voltage	2.0		1.5	—	—	1.5	—	1.5	—	V	
		4.5		3.15	—	—	3.15	—	3.15	—		
		6.0		4.2	—	—	4.2	—	4.2	—		
V_{IL}	Low Level Input Voltage	2.0		—	—	0.5	—	0.5	—	0.5	V	
		4.5		—	—	1.35	—	1.35	—	1.35		
		6.0		—	—	1.8	—	1.8	—	1.8		
V_{OH}	High Level Output Voltage	2.0	V_I	I_O	1.9	2.0	—	1.9	—	1.9	—	V
		4.5			V_{IH} or V_{IL}	-20 μA	4.4	4.5	—	4.4	—	
		6.0	V_{IL}	-4.0 mA -5.2 mA	5.9	6.0	—	5.9	—	5.9	—	
		4.5			4.18	4.31	—	4.13	—	4.10	—	
6.0	5.68	5.8	—	5.63	—	5.60	—					
V_{OL}	Low Level Output Voltage	2.0	V_{IH} or V_{IL}	20 μA	—	0.0	0.1	—	0.1	—	0.1	V
		4.5			—	0.0	0.1	—	0.1	—	0.1	
		6.0	V_{IL}	4.0 mA 5.2 mA	—	0.0	0.1	—	0.1	—	0.1	
		4.5			—	0.17	0.26	—	0.33	—	0.40	
6.0	—	0.18	0.26	—	0.33	—	0.40					
I_I	Input Leakage Current	6.0	$V_I = V_{CC}$ or GND	—	—	± 0.1	—	± 1.0	—	± 1.0	μA	
I_{CC}	Quiescent Supply Current	6.0	$V_I = V_{CC}$ or GND	—	—	4	—	40	—	80	μA	

AC ELECTRICAL CHARACTERISTICS ($V_{CC} = 5\text{V}$, $T_A = 25^\circ\text{C}$, $C_L = 15\text{pF}$, Input $t_r = t_f = 6\text{ns}$)

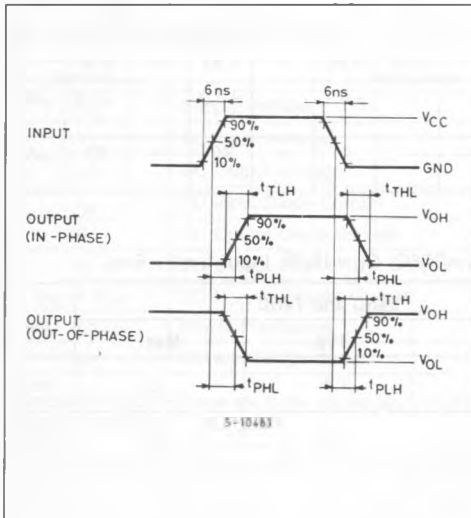
Symbol	Parameter	54HC and 74HC			Unit
		Min.	Typ.	Max.	
t_{TLH} t_{THL}	Output Transition Time		4	8	ns
t_{PLH} t_{PHL}	Propagation Delay Time ($P_n Q_n - P = Q$)		22	35	ns
t_{PLH} t_{PHL}	Propagation Delay Time ($\bar{G} - \bar{P} = \bar{Q}$)		12	20	ns

AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, Input t_r = t_f = 6ns)

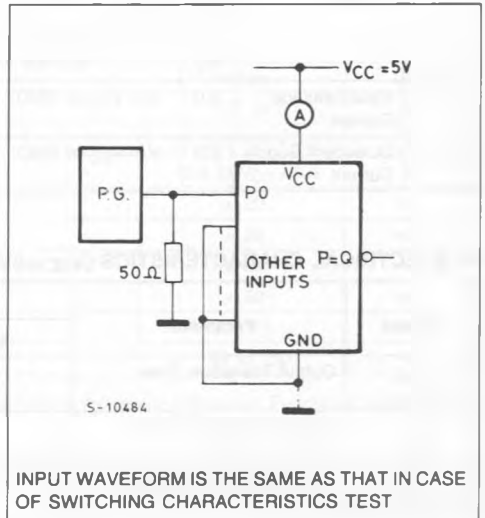
Symbol	Parameter	V _{CC}	Test Condition	T _A = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t _{TLH} t _{THL}	Output Transition Time	2.0 4.5 6.0		— — —	30 8 7	75 15 13	— — —	95 19 16	— — —	110 22 19	ns
t _{PLH} t _{PHL}	Propagation Delay Time (P _n , Q _n -P = Q)	2.0 4.5 6.0		— — —	104 26 22	190 39 33	— — —	245 49 42	— — —	295 59 50	ns
t _{PLH} t _{PHL}	Propagation Delay Time	2.0 4.5 6.0		— — —	60 15 13	120 24 20	— — —	150 30 26	— — —	180 36 31	ns
C _{IN}	Input Capacitance			—	5	10	—	10	—	10	pF
C _{PD} (*)	Power Dissipation Capacitance			—	40	—	—	—	—	—	pF

Note (*) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit)
Average operating current can be obtained by the following equation.
 $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

SWITCHING CHARACTERISTICS TEST WAVEFORM



TEST CIRCUIT I_{CC} (Opr.)



INPUT WAVEFORM IS THE SAME AS THAT IN CASE OF SWITCHING CHARACTERISTICS TEST