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# SN54HC688, SN74HC688 8-BIT IDENTITY COMPARATORS

SCLS010B – DECEMBER 1982 – REVISED MAY 1997

- Compare Two 8-Bit Words
- Package Options Include Plastic Small-Outline (DW) and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

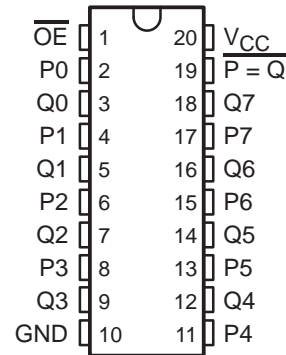
These identity comparators perform comparisons of two 8-bit binary or BCD words. An output-enable ( $\overline{OE}$ ) input may be used to force the output to the high level.

The SN54HC688 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HC688 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

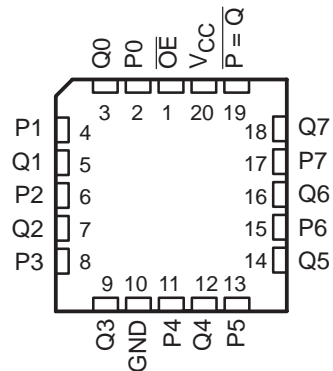
FUNCTION TABLE

INPUTS		OUTPUT $\overline{P = Q}$
DATA P, Q	$\overline{OE}$	
$P = Q$	L	L
$P > Q$	X	H
$P < Q$	X	H
X	H	H

SN54HC688 . . . J OR W PACKAGE  
SN74HC688 . . . DW OR N PACKAGE  
(TOP VIEW)



SN54HC688 . . . FK PACKAGE  
(TOP VIEW)



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**TEXAS  
INSTRUMENTS**

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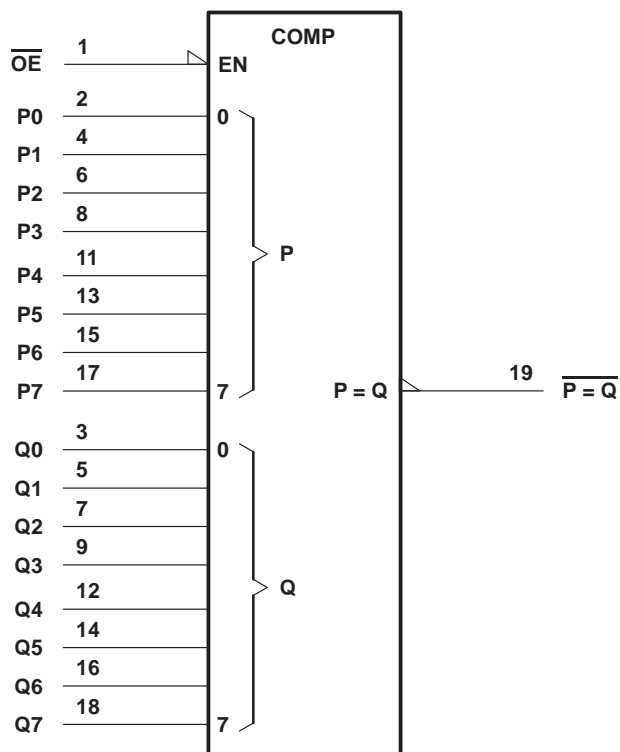
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# SN54HC688, SN74HC688

## 8-BIT IDENTITY COMPARATORS

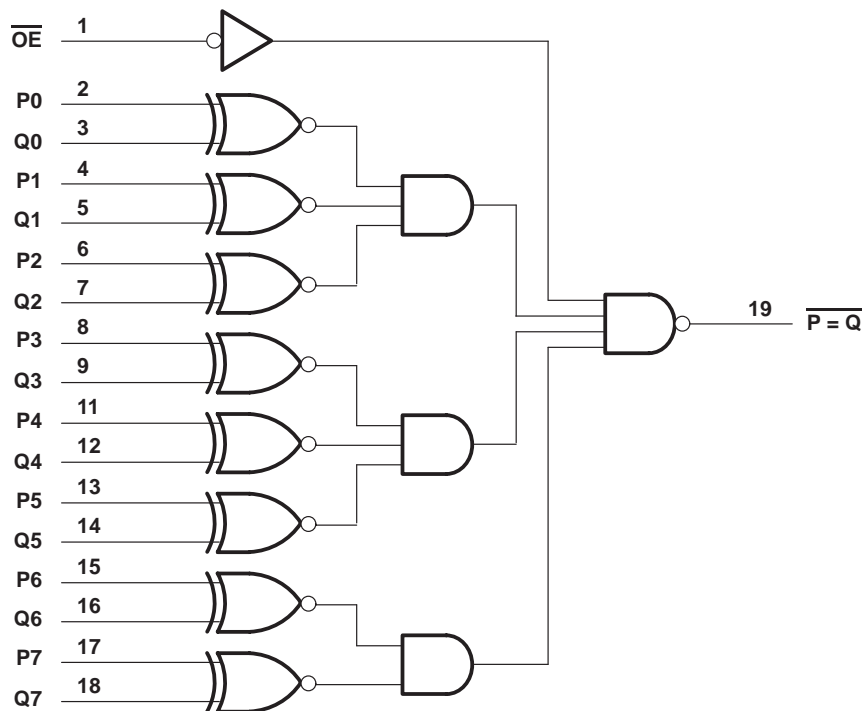
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### logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

### logic diagram (positive logic)



**absolute maximum ratings over operating free-air temperature range†**

Supply voltage range, $V_{CC}$	–0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see Note 1)	±20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1)	±20 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±25 mA
Continuous current through $V_{CC}$ or GND	±50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DW package	97°C/W
N package	67°C/W
Storage temperature range, $T_{stg}$	–65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The package thermal impedance is calculated in accordance with JEDEC 51, except for through-hole packages, which use a trace length of zero.

**recommended operating conditions**

			SN54HC688			SN74HC688			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage		2	5	6	2	5	6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V	1.5			1.5			V
		V <sub>CC</sub> = 4.5 V	3.15			3.15			
		V <sub>CC</sub> = 6 V	4.2			4.2			
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V	0			0			V
		V <sub>CC</sub> = 4.5 V	0			1.35			
		V <sub>CC</sub> = 6 V	0			1.8			
V <sub>I</sub>	Input voltage		0			V <sub>CC</sub>			V
V <sub>O</sub>	Output voltage		0			V <sub>CC</sub>			V
t <sub>t</sub>	Input transition (rise and fall) time	V <sub>CC</sub> = 2 V	0			1000			ns
		V <sub>CC</sub> = 4.5 V	0			500			
		V <sub>CC</sub> = 6 V	0			400			
T <sub>A</sub>	Operating free-air temperature		−55			125			°C

# SN54HC688, SN74HC688

## 8-BIT IDENTITY COMPARATORS

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**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

PARAMETER	TEST CONDITIONS		V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54HC688		SN74HC688		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 µA	2 V	1.9	1.998		1.9		1.9		V
			4.5 V	4.4	4.499		4.4		4.4		
			6 V	5.9	5.999		5.9		5.9		
		I <sub>OH</sub> = -4 mA	4.5 V	3.98	4.3		3.7		3.84		
		I <sub>OH</sub> = -5.2 mA	6 V	5.48	5.8		5.2		5.34		
V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20 µA	2 V		0.002	0.1		0.1		0.1	V
			4.5 V		0.001	0.1		0.1		0.1	
			6 V		0.001	0.1		0.1		0.1	
		I <sub>OL</sub> = 4 mA	4.5 V		0.17	0.26		0.4		0.33	
		I <sub>OL</sub> = 5.2 mA	6 V		0.15	0.26		0.4		0.33	
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0		6 V		±0.1	±100		±1000		±1000	nA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0		6 V			8		160		80	µA
C <sub>i</sub>			2 V to 6 V		3	10		10		10	pF

**switching characteristics over recommended operating free-air temperature range, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54HC688		SN74HC688		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>pd</sub>	P or Q	$\overline{P} = \overline{Q}$	2 V		113	210		313		265	ns
			4.5 V		30	42		63		53	
			6 V		24	36		53		45	
	$\overline{OE}$	$\overline{P} = \overline{Q}$	2 V		66	120		179		151	
			4.5 V		16	24		36		30	
			6 V		14	20		30		26	
t <sub>t</sub>		Any	2 V		38	75		110		95	ns
			4.5 V		8	15		22		19	
			6 V		6	13		19		16	

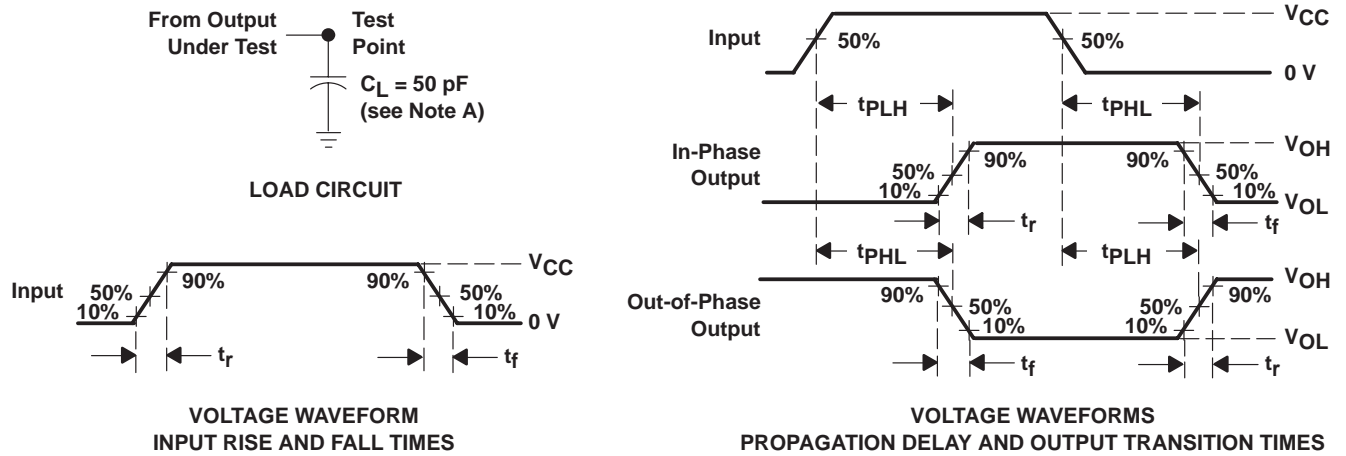
**operating characteristics, T<sub>A</sub> = 25°C**

PARAMETER		TEST CONDITIONS	TYP	UNIT
C <sub>pd</sub>	Power dissipation capacitance	No load	40	pF



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## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and test-fixture capacitance.  
 B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r = 6 \text{ ns}$ ,  $t_f = 6 \text{ ns}$ .  
 C. The outputs are measured one at a time with one input transition per measurement.  
 D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

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