

#### TC74HC688P 8-BIT EQUALITY COMPARATOR

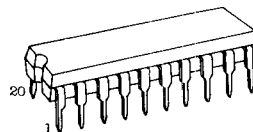
The TC74HC688 utilizes silicon gate C<sup>2</sup>MOS technology to achieve operating speeds equivalent to LSTTL parts. Along with the low power dissipation and high noise immunity of standard C<sup>2</sup>MOS integrated circuit, it possesses the driving capability of 10 LSTTL loads.

The TC74HC688 compares bit for bit two 8-bit words applied input P<sub>0</sub>~P<sub>7</sub> and input Q<sub>0</sub>~Q<sub>7</sub> and indicate whether or not they are equal.

A single active low enable is provided to facilitate cascading of several packages to enable comparison of words greater than 8 bits. All inputs are equipped with protection circuit against static discharge or transient excess voltage.

#### FEATURES:

- High Speed..... $t_{pd}=21ns(Typ.)$  at  $V_{CC}=5V$
- Low Power Dissipation..... $I_{CC}=4\mu A(Max.)$  at  $T_a=25^{\circ}C$
- High Noise Immunity..... $V_{NIH}=V_{NIL}=28\% V_{CC}(Min.)$
- Output Drive Capability.....10 LSTTL Loads
- Symmetrical Output Impedance... $|I_{OH}|=I_{OL}=4mA(Min.)$
- Balanced Propagation Delays... $t_{pLH}=t_{pHL}$
- Wide Operating Voltage Range.. $V_{CC(opr)}=2V\sim 6V$
- Pin and Function Compatible with 74LS688.



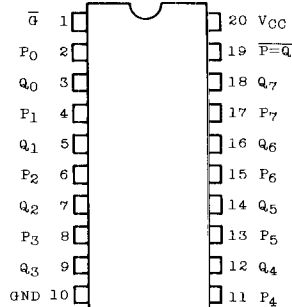
DIP (5-25A)

#### TRUTH TABLE

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

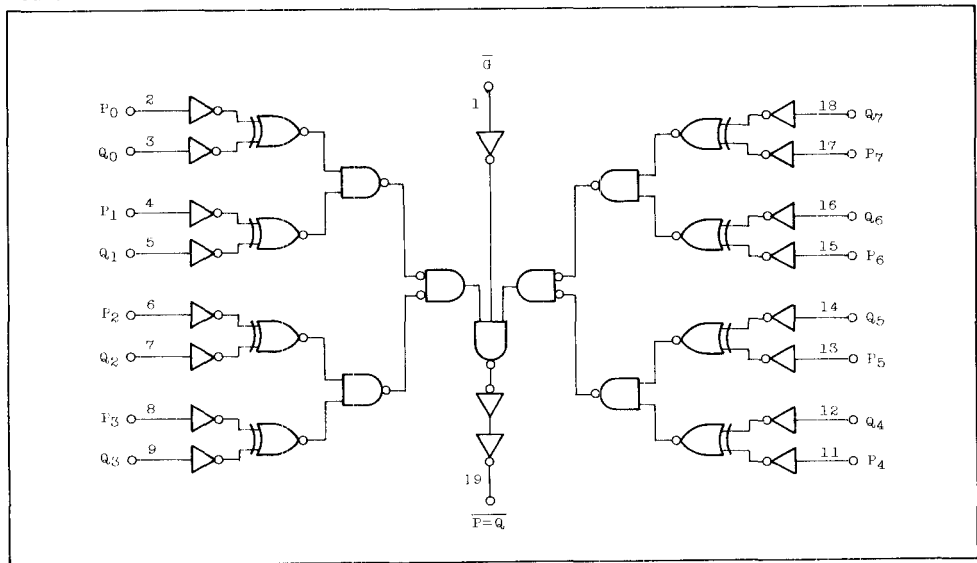
\* Don't care

#### PIN ASSIGNMENT



(TOP VIEW)

LOGIC DIAGRAM

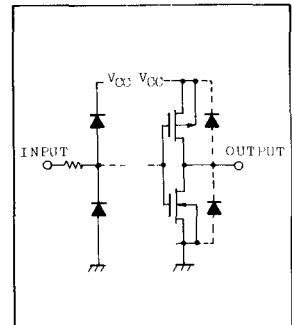


ABSOLUTE MAXIMUM RATINGS

| PARAMETER              | SYMBOL | VALUE          | UNIT |
|------------------------|--------|----------------|------|
| Supply Voltage Range   | VCC    | -0.5 ~ 7       | V    |
| DC Input Voltage       | VIN    | -0.5 ~ VCC+0.5 | V    |
| DC Output Voltage      | VOUT   | -0.5 ~ VCC+0.5 | V    |
| Input Diode Current    | IIK    | ±20            | mA   |
| Output Diode Current   | IOK    | ±20            | mA   |
| DC Output Current      | IOUT   | ±25            | mA   |
| DC VCC/Ground Current  | ICC    | ±50            | mA   |
| Power Dissipation      | PD     | 500*           | mW   |
| Storage Temperature    | Tstg   | -65 ~ 150      | °C   |
| Lead Temperature 10sec | Tl     | 300            | °C   |

\* 500mW in the range of Ta=-40°C ~ 65°C. and from Ta=65°C up to 85°C derating factor of -10mW/°C shall be applied until 300mW.

INPUT and OUTPUT EQUIVALENT CIRCUIT



# TC74HC688P

## RECOMMENDED OPERATING CONDITIONS

| PARAMETER                | SYMBOL                          | LIMIT               | UNIT |
|--------------------------|---------------------------------|---------------------|------|
| Supply Voltage           | V <sub>CC</sub>                 | 2 ~ 6               | V    |
| Input Voltage            | V <sub>IN</sub>                 | 0 ~ V <sub>CC</sub> | V    |
| Output Voltage           | V <sub>OUT</sub>                | 0 ~ V <sub>CC</sub> | V    |
| Operating Temperature    | T <sub>opr</sub>                | -40 ~ 85            | °C   |
| Input Rise and Fall Time | t <sub>r</sub> , t <sub>f</sub> | 0 ~ 500             | ns   |

## DC ELECTRICAL CHARACTERISTICS

| PARAMETER                 | SYMBOL          | TEST CONDITION                                          |                                                  | Ta=25°C         |      |      |      | Ta=-40~85°C |      | UNIT |
|---------------------------|-----------------|---------------------------------------------------------|--------------------------------------------------|-----------------|------|------|------|-------------|------|------|
|                           |                 |                                                         |                                                  | V <sub>CC</sub> | MIN. | TYP. | MAX. | MIN.        | MAX. |      |
| High-Level Input Voltage  | V <sub>IH</sub> |                                                         |                                                  | 2.0             | 1.5  | -    | -    | 1.5         | -    | V    |
|                           |                 |                                                         |                                                  | 4.5             | 3.15 | -    | -    | 3.15        | -    |      |
|                           |                 |                                                         |                                                  | 6.0             | 4.2  | -    | -    | 4.2         | -    |      |
| Low-Level Input Voltage   | V <sub>IL</sub> |                                                         |                                                  | 2.0             | -    | -    | 0.5  | -           | 0.5  | V    |
|                           |                 |                                                         |                                                  | 4.5             | -    | -    | 1.35 | -           | 1.35 |      |
|                           |                 |                                                         |                                                  | 6.0             | -    | -    | 1.8  | -           | 1.8  |      |
| High-Level Output Voltage | V <sub>OH</sub> | V <sub>IN</sub> =<br>V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OH</sub> =-20μA                           | 2.0             | 1.9  | 2.0  | -    | 1.9         | -    | V    |
|                           |                 |                                                         |                                                  | 4.5             | 4.4  | 4.5  | -    | 4.4         | -    |      |
|                           |                 |                                                         |                                                  | 6.0             | 5.9  | 6.0  | -    | 5.9         | -    |      |
|                           |                 |                                                         | I <sub>OH</sub> =-4mA<br>I <sub>OH</sub> =-5.2mA | 4.5             | 4.18 | 4.31 | -    | 4.13        | -    |      |
|                           |                 |                                                         |                                                  | 6.0             | 5.68 | 5.80 | -    | 5.63        | -    |      |
| Low-Level Output Voltage  | V <sub>OL</sub> | V <sub>IN</sub> =<br>V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OL</sub> =20μA                            | 2.0             | -    | 0.0  | 0.1  | -           | 0.1  | V    |
|                           |                 |                                                         |                                                  | 4.5             | -    | 0.0  | 0.1  | -           | 0.1  |      |
|                           |                 |                                                         |                                                  | 6.0             | -    | 0.0  | 0.1  | -           | 0.1  |      |
|                           |                 |                                                         | I <sub>OL</sub> =4mA<br>I <sub>OL</sub> =5.2mA   | 4.5             | -    | 0.17 | 0.32 | -           | 0.37 |      |
|                           |                 |                                                         |                                                  | 6.0             | -    | 0.18 | 0.32 | -           | 0.37 |      |
| Input Leakage Current     | I <sub>IN</sub> | V <sub>IN</sub> =V <sub>CC</sub> or GND                 |                                                  | 6.0             | -    | -    | ±0.1 | -           | ±1.0 | μA   |
| Quiescent Supply Current  | I <sub>CC</sub> | V <sub>IN</sub> =V <sub>CC</sub> or GND                 |                                                  | 6.0             | -    | -    | 4.0  | -           | 40.0 |      |

## AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub>=50pF, Input t<sub>r</sub>=t<sub>f</sub>=6ns)

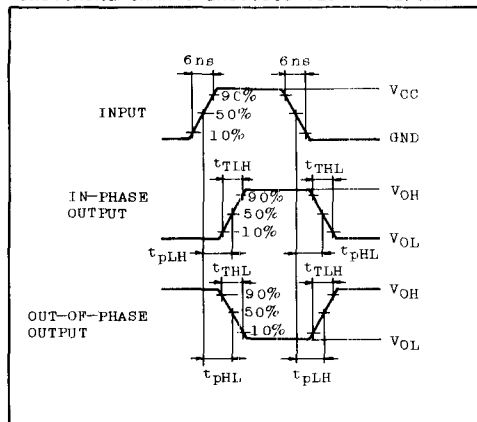
| PARAMETER                                                         | SYMBOL                               | TEST CONDITION | Ta=25°C         |      |      |      | Ta=-40~85°C |      | UNIT |
|-------------------------------------------------------------------|--------------------------------------|----------------|-----------------|------|------|------|-------------|------|------|
|                                                                   |                                      |                | V <sub>CC</sub> | MIN. | TYP. | MAX. | MIN.        | MAX. |      |
| Output Transition Time                                            | t <sub>TLH</sub><br>t <sub>THL</sub> |                | 2.0             | -    | 30   | 75   | -           | 90   | ns   |
|                                                                   |                                      |                | 4.5             | -    | 9    | 15   | -           | 18   |      |
|                                                                   |                                      |                | 6.0             | -    | 8    | 13   | -           | 16   |      |
| Propagation Delay Time<br>(P <sub>n</sub> , Q <sub>n</sub> - P=Q) | t <sub>pLH</sub><br>t <sub>pHL</sub> |                | 2.0             | -    | 100  | 195  | -           | 235  |      |
|                                                                   |                                      |                | 4.5             | -    | 26   | 39   | -           | 47   |      |
|                                                                   |                                      |                | 6.0             | -    | 22   | 33   | -           | 40   |      |
| Propagation Delay Time<br>(G - P=Q)                               | t <sub>pLH</sub><br>t <sub>pHL</sub> |                | 2.0             | -    | 50   | 120  | -           | 145  |      |
|                                                                   |                                      |                | 4.5             | -    | 15   | 24   | -           | 29   |      |
|                                                                   |                                      |                | 6.0             | -    | 13   | 21   | -           | 25   |      |
| Input Capacitance                                                 | C <sub>IN</sub>                      |                | -               | -    | 5    | 10   | -           | 10   | pF   |
| Power Dissipation Capacitance                                     | C <sub>PD</sub> (1)                  |                | -               | -    | 40   | -    | -           | -    |      |

Note (1) C<sub>PD</sub> is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit).

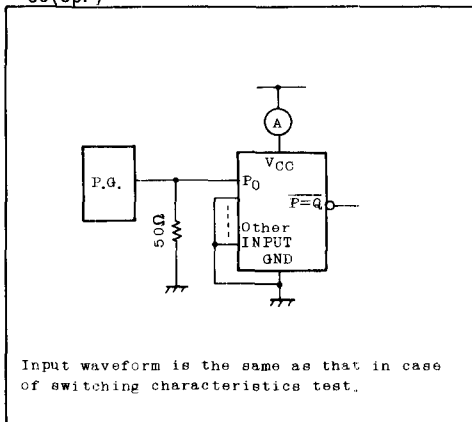
Average operating current can be obtained by the equation hereunder.

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

## SWITCHING CHARACTERISTICS TEST WAVEFORM

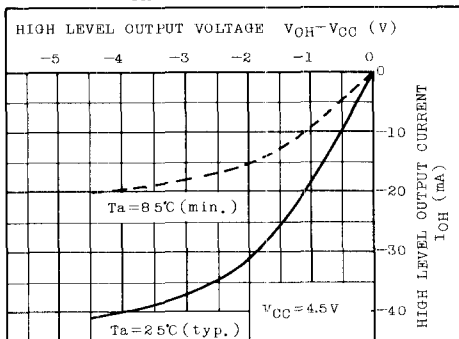


## I<sub>CC(opr)</sub> TEST CIRCUIT

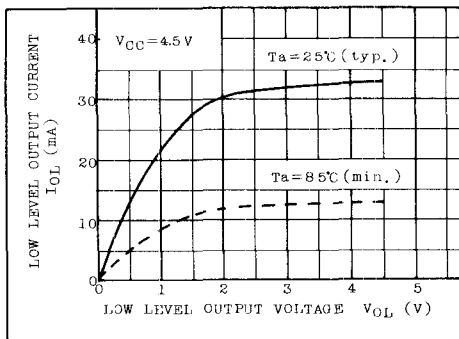


# TC74HC688P

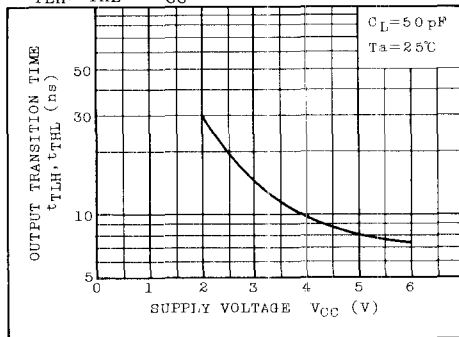
$I_{OH}$  CHARACTERISTICS



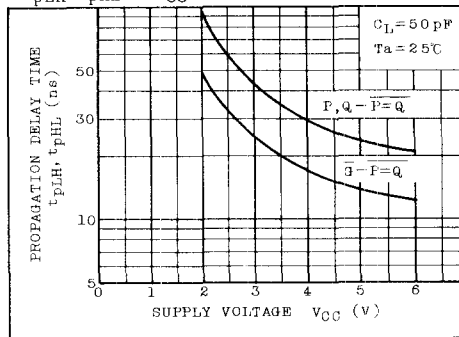
$I_{OL}$  CHARACTERISTICS



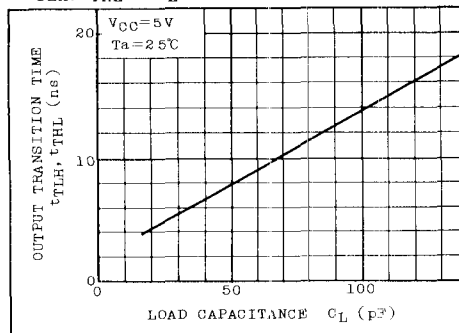
$t_{TLH}, t_{THL} - V_{CC}$  CHARACTERISTICS (TYP.)



$t_{PLH}, t_{PHL} - V_{CC}$  CHARACTERISTICS (TYP.)



$t_{TLH}, t_{THL} - C_L$  CHARACTERISTICS (TYP.)



$t_{PLH}, t_{PHL} - C_L$  CHARACTERISTICS (TYP.)

