D2804, MARCH 1984 – REVISED JUNE 1989

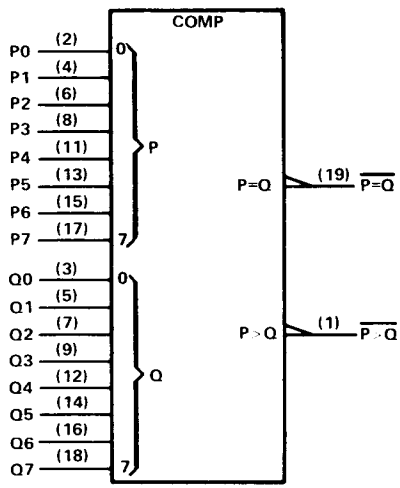
- **Compares Two 8-Bit Words**
- **100-kΩ Pullup Resistors are on the Q Inputs**
- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Dependable Texas Instruments Quality and Reliability**

## description

These magnitude comparators perform comparisons of two eight-bit binary or BCD words. The 'HC682 features 100-kΩ pullup termination resistors on the Q inputs for analog or switch data.

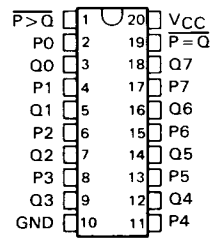
The SN54HC682 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74HC682 is characterized for operation from −40°C to 85°C.

## logic symbol†

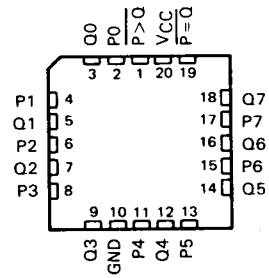



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

**SN54HC682 . . . J PACKAGE**
**SN74HC682 . . . DW OR N PACKAGE**
**(TOP VIEW)**




**SN54HC682 . . . FK PACKAGE**
**(TOP VIEW)**

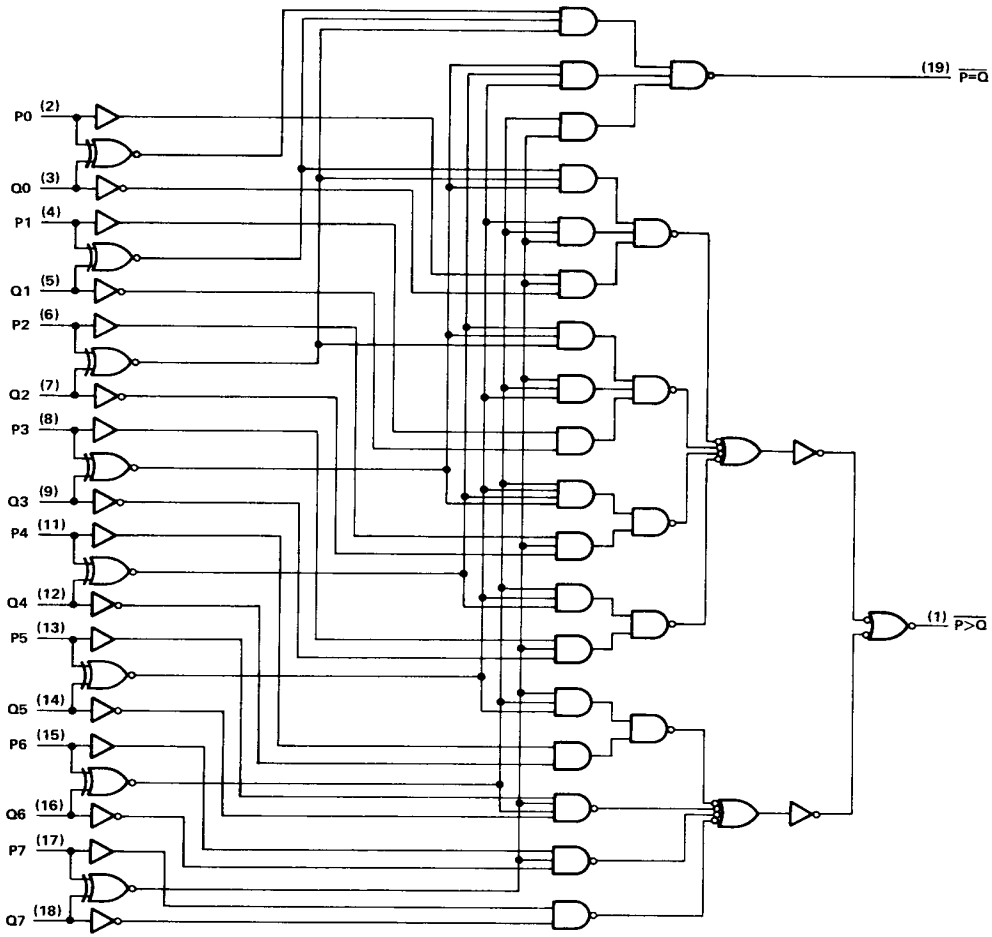



**FUNCTION TABLE**

| INPUTS DATA P, Q | OUTPUTS $\overline{P=Q}$ | OUTPUTS $\overline{P>Q}$ |
|---|---|---|
| P=Q | L | H |
| P>Q | H | L |
| P<Q | H | H |

NOTE: The $\overline{P<Q}$ function can be generated by applying the $\overline{P=Q}$ and $\overline{P>Q}$ outputs to a 2-input NAND gate.

logic diagram (positive logic)



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### 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 $V_I > V_{CC}$) . . . . . ±20 mA
Output clamp current, $I_{OK}$ ($V_O < 0$ or $V_O > V_{CC}$) . . . . . ±20 mA
Continuous output current, $I_O$ ($V_O = 0$ to $V_{CC}$) . . . . . ±25 mA
Continuous current through $V_{CC}$ or GND pins . . . . . ±50 mA
Lead temperature 1,6 mm (1/16 in) from case for 60 s: FK or J package . . . . . 300°C
Lead temperature 1,6 mm (1/16 in) from case for 10 s: DW or N package . . . . . 260°C
Storage temperature range . . . . . −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.

### recommended operating conditions

| | | | SN54HC682 | | | SN74HC682 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | | 2 | 5 | 6 | 2 | 5 | 6 | V |
| $V_{IH}$ | High-level input voltage | $V_{CC}$ = 2 V | 1.5 | | | 1.5 | | | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | | | 3.15 | | | |
| | | $V_{CC}$ = 6 V | 4.2 | | | 4.2 | | | |
| $V_{IL}$ | Low-level input voltage | $V_{CC}$ = 2 V | 0 | | 0.3 | 0 | | 0.3 | V |
| | | $V_{CC}$ = 4.5 V | 0 | | 0.9 | 0 | | 0.9 | |
| | | $V_{CC}$ = 6 V | 0 | | 1.2 | 0 | | 1.2 | |
| $V_I$ | Input voltage | | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $V_O$ | Output voltage | | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $t_t$ | Input transition (rise and fall) times | $V_{CC}$ = 2 V | 0 | | 1000 | 0 | | 1000 | ns |
| | | $V_{CC}$ = 4.5 V | 0 | | 500 | 0 | | 500 | |
| | | $V_{CC}$ = 6 V | 0 | | 400 | 0 | | 400 | |
| $T_A$ | Operating free-air temperature | | −55 | | 125 | −40 | | 85 | °C |

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

| PARAMETER | TEST CONDITIONS | | $V_{CC}$ | $T_A$ = 25°C | | | SN54HC682 | | SN74HC682 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $V_{OH}$ | $V_I$ = $V_{IH}$ or $V_{IL}$, $I_{OH}$ = −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 | | |
| | $V_I$ = $V_{IH}$ or $V_{IL}$, $I_{OH}$ = −4 mA | | 4.5 V | 3.98 | 4.30 | | 3.7 | | 3.84 | | |
| | $V_I$ = $V_{IH}$ or $V_{IL}$, $I_{OH}$ = −5.2 mA | | 6 V | 5.48 | 5.80 | | 5.2 | | 5.34 | | |
| $V_{OL}$ | $V_I$ = $V_{IH}$ or $V_{IL}$, $I_{OL}$ = 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 | |
| | $V_I$ = $V_{IH}$ or $V_{IL}$, $I_{OL}$ = 4 mA | | 4.5 V | | 0.17 | 0.26 | | 0.4 | | 0.33 | |
| | $V_I$ = $V_{IH}$ or $V_{IL}$, $I_{OL}$ = 5.2 mA | | 6 V | | 0.15 | 0.26 | | 0.4 | | 0.33 | |
| $I_{IH}$ | $V_I$ = $V_{CC}$ | | 6 V | | 0.1 | 100 | | 1000 | | 1000 | nA |
| $I_{IL}$ | $V_I$ = 0 | Q Inputs, 'HC682 | 6 V | | −50 | −90 | | −160 | | −140 | μA |
| | | All other inputs | 6 V | | −0.1 | −100 | | −1000 | | −1000 | nA |
| $I_{CC}$ | $V_I$ = $V_{CC}$ or 0, $I_O$ = 0 | 'HC682 | 6 V | | 480 | 700 | | 1300 | | 1100 | μA |
| $C_i$ | | | 2 to 6 V | | 3 | 10 | | 10 | | 10 | pF |

**switching characteristics over recommended operating free-air temperature range (unless otherwise noted), $C_L$ = 50 pF (see Note 1)**

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | SN54HC682 | | SN74HC682 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{pd}$ | P or Q | Any | 2 V | | 130 | 275 | | 413 | | 344 | ns |
| | | | 4.5 V | | 26 | 55 | | 88 | | 69 | |
| | | | 6 V | | 22 | 47 | | 70 | | 58 | |
| $t_t$ | | Any | 2 V | | 38 | 75 | | 110 | | 95 | ns |
| | | | 4.5 V | | 8 | 15 | | 22 | | 19 | |
| | | | 6 V | | 6 | 13 | | 19 | | 16 | |

| | | | |
|---|---|---|---|
| $C_{pd}$ | Power dissipation capacitance | No load, $T_A$ = 25°C | 40 pF typ |

Note 1: Load circuits and voltage waveforms are shown in Section 1.



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