D2684, DECEMBER 1982—REVISED SEPTEMBER 1987

- **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

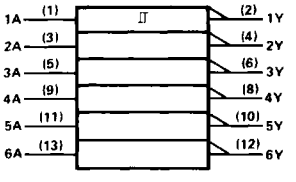
These Schmitt-trigger devices contain six independent inverters. They perform the Boolean function $Y = \overline{A}$.

The SN54HC14 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74HC14 is characterized for operation from −40°C to 85°C.

**FUNCTION TABLE**
**(each inverter)**

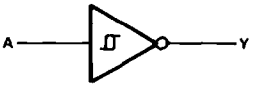
| INPUT A | OUTPUT Y |
|---|---|
| H | L |
| L | H |

## logic symbol†

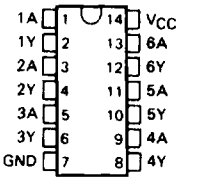



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for D, J, and N packages.

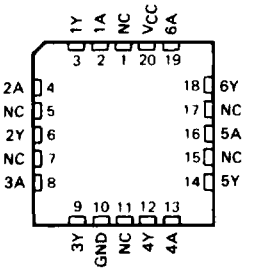
## logic diagram (positive logic)




**SN54HC14 . . . J PACKAGE**
**SN74HC14 . . . D OR N PACKAGE**
**(TOP VIEW)**




**SN54HC14 . . . FK PACKAGE**
**(TOP VIEW)**




NC—No internal connection

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

Supply voltage, $V_{CC}$ . . . . . −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: D 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

| | | SN54HC14 | | | SN74HC14 | | | 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 |
| $T_A$ 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 | | | SN54HC14 | | SN74HC14 | | 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 | |
| $V_{T+}$ | | 2 V | 0.70 | 1.2 | 1.50 | 0.70 | 1.50 | 0.70 | 1.50 | V |
| | | 4.5 V | 1.55 | 2.5 | 3.15 | 1.55 | 3.15 | 1.55 | 3.15 | |
| | | 6 V | 2.10 | 3.3 | 4.20 | 2.10 | 4.20 | 2.10 | 4.20 | |
| $V_{T-}$ | | 2 V | 0.30 | 0.6 | 1.00 | 0.30 | 1.00 | 0.30 | 1.00 | V |
| | | 4.5 V | 0.90 | 1.6 | 2.45 | 0.90 | 2.45 | 0.90 | 2.45 | |
| | | 6 V | 1.20 | 2.0 | 3.20 | 1.20 | 3.20 | 1.20 | 3.20 | |
| $V_{T+} - V_{T-}$ | | 2 V | 0.20 | 0.6 | 1.20 | 0.20 | 1.20 | 0.20 | 1.20 | V |
| | | 4.5 V | 0.40 | 0.9 | 2.10 | 0.40 | 2.10 | 0.40 | 2.10 | |
| | | 6 V | 0.50 | 1.3 | 2.50 | 0.50 | 2.50 | 0.50 | 2.50 | |
| $I_I$ | $V_I$ = $V_{CC}$ or 0 | 6 V | | | ±0.1 | ±100 | | ±1000 | | ±1000 | nA |
| $I_{CC}$ | $V_I$ = $V_{CC}$ or 0, $I_O$ = 0 | 6 V | | | 2 | | 40 | | 20 | 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 | | | SN54HC14 | | SN74HC14 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{pd}$ | A | Y | 2 V | | 55 | 125 | | 190 | | 155 | ns |
| | | | 4.5 V | | 12 | 25 | | 38 | | 31 | |
| | | | 6 V | | 11 | 21 | | 32 | | 26 | |
| $t_t$ | | Y | 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 per inverter | No load, $T_A$ = 25°C | 20 pF typ |

NOTE 1: Load circuit and voltage waveforms are shown in Section 1.