

SN54HCT14, SN74HCT14 HEX SCHMITT-TRIGGER INVERTERS

SCLS225C – JULY 1995 – REVISED FEBRUARY 2000

- Inputs Are TTL-Voltage Compatible
- Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), Thin Very Small-Outline (DGV), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) DIPs

description

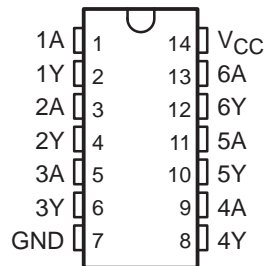
The 'HCT14 devices contain six independent inverters. The devices perform the Boolean function $Y = \bar{A}$ in positive logic.

The SN54HCT14 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HCT14 is characterized for operation from -40°C to 85°C .

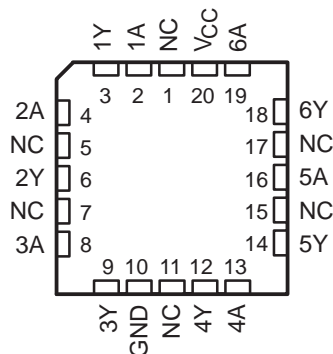
FUNCTION TABLE
(each inverter)

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

SN54HCT14 . . . J OR W PACKAGE
SN74HCT14 . . . D, DB, DGV, N, OR PW PACKAGE
(TOP VIEW)

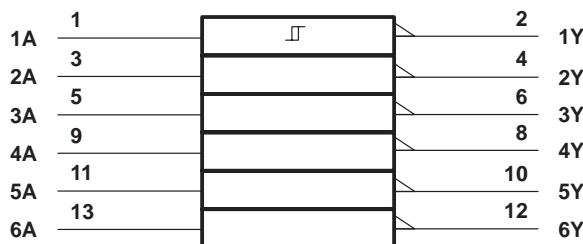


SN54HCT14 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

logic symbol†



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

logic diagram (positive logic)



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

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absolute maximum ratings over operating free-air temperature†

| | |
|--|----------------------------|
| Supply voltage range, V_{CC} | -0.5 V to 7 V |
| Input voltage range, V_I (see Note 1) | -0.5 V to $V_{CC} + 0.5$ V |
| Output voltage range, V_O (see Note 1) | -0.5 V to $V_{CC} + 0.5$ 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 | ± 50 mA |
| Package thermal impedance, θ_{JA} (see Note 2): | |
| D package | 86°C/W |
| DB package | 96°C/W |
| DGV package | 127°C/W |
| N package | 80°C/W |
| PW package | 113°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 JESD 51.

recommended operating conditions (see Note 3)

| | SN54HCT14 | | SN74HCT14 | | UNIT |
|--------------------------------------|-----------|----------|-----------|----------|------|
| | MIN | MAX | MIN | MAX | |
| V_{CC} Supply voltage | 4.5 | 5.5 | 4.5 | 5.5 | V |
| 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 |

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



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

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | SN54HCT14 | | SN74HCT14 | | UNIT |
|---|--|-----------------|-----------------------|-------|------|-----------|-----|-----------|------|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V _{T+} Positive-going threshold | | 4.5 V | 1.2 | 1.5 | 1.9 | 1.2 | 1.9 | 1.2 | 1.9 | V |
| | | 5.5 V | 1.4 | 1.7 | 2.1 | 1.4 | 2.1 | 1.4 | 2.1 | |
| V _{T-} Negative-going threshold | | 4.5 V | 0.5 | 0.9 | 1.2 | 0.5 | 1.2 | 0.5 | 1.2 | V |
| | | 5.5 V | 0.6 | 1 | 1.4 | 0.6 | 1.4 | 0.6 | 1.4 | |
| ΔV _T Hysteresis (V _{T+} – V _{T-}) | | 4.5 V | 0.4 | 0.6 | 1.4 | 0.4 | 1.4 | 0.4 | 1.4 | V |
| | | 5.5 V | 0.4 | 0.65 | 1.5 | 0.4 | 1.5 | 0.4 | 1.5 | |
| V _{OH} | I _{OH} = –20 μA | 4.5 V | 4.4 | 4.49 | | 4.4 | | 4.4 | | V |
| | I _{OH} = –4 mA | 4.5 V | 3.98 | 4.3 | | 3.7 | | 3.84 | | |
| V _{OL} | I _{OL} = 20 μA | 4.5 V | | 0.001 | 0.1 | | 0.1 | | 0.1 | V |
| | I _{OL} = 4 mA | 4.5 V | | 0.17 | 0.26 | | 0.4 | | 0.33 | |
| I _I | V _I = V _{CC} or GND | 5.5 V | | | ±0.1 | | ±1 | | ±1 | μA |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | | | 2 | | 40 | | 20 | μA |
| ΔI _{CC} [†] | One input at 0.5 V or 2.4 V, Other inputs at GND or V _{CC} | 5.5 V | | 0.2 | 2.4 | | 3 | | 2.9 | mA |
| C _i | V _I = V _{CC} or GND | 5 V | | 3 | 10 | | 10 | | 10 | pF |

[†] This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or V_{CC}.

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} | T _A = 25°C | | | SN54HCT14 | | SN74HCT14 | | UNIT |
|-----------------|--------------|-------------|-----------------|-----------------------|-----|-----|-----------|-----|-----------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t _{pd} | A | Y | 4.5 V | | 20 | 32 | | 48 | | 40 | ns |
| | | | 5.5 V | | 18 | 30 | | 45 | | 38 | |
| t _t | | Y | 4.5 V | | 7 | 15 | | 22 | | 19 | ns |
| | | | 5.5 V | | 6 | 14 | | 20 | | 17 | |

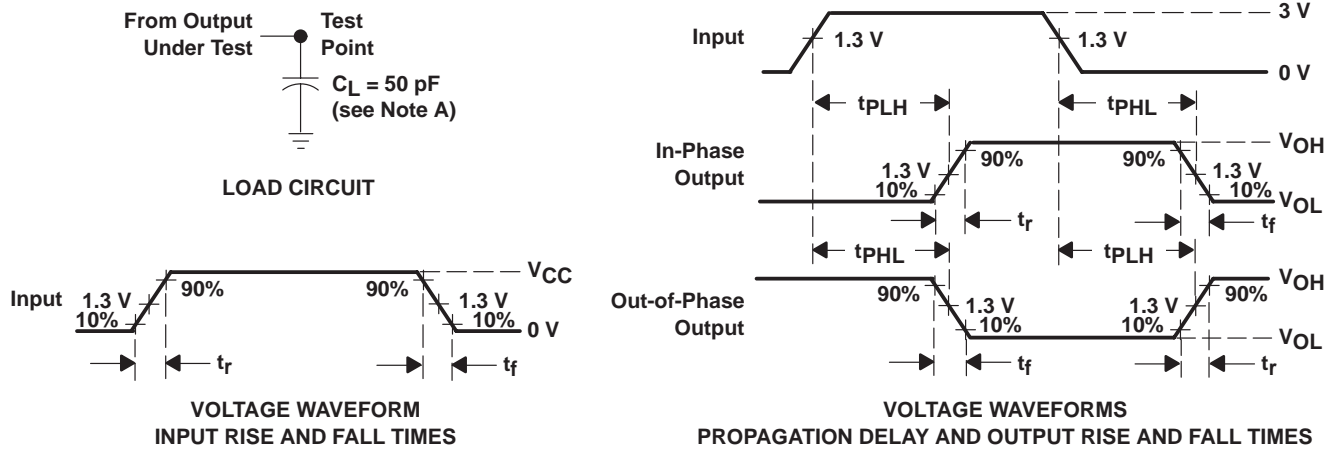
operating characteristics, T_A = 25°C

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|---|-----------------|-----|------|
| C _{pd} Power dissipation capacitance | No load | 10 | pF |

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PARAMETER MEASUREMENT INFORMATION

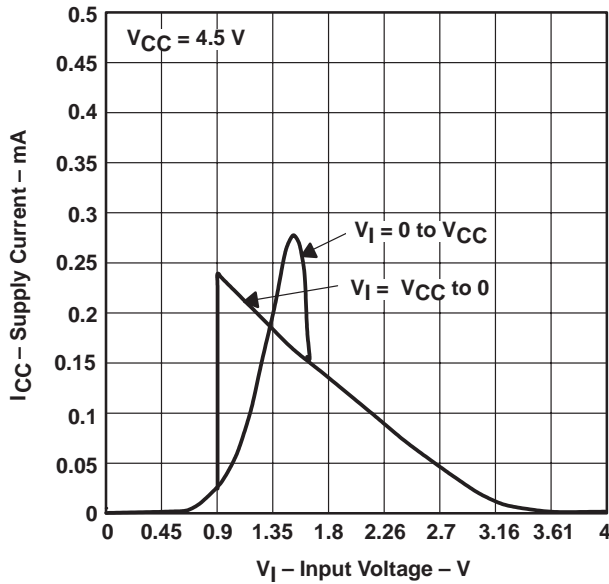


- NOTES:
- A. C_L includes probe and test-fixture capacitance.
 - B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
 - C. The outputs are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

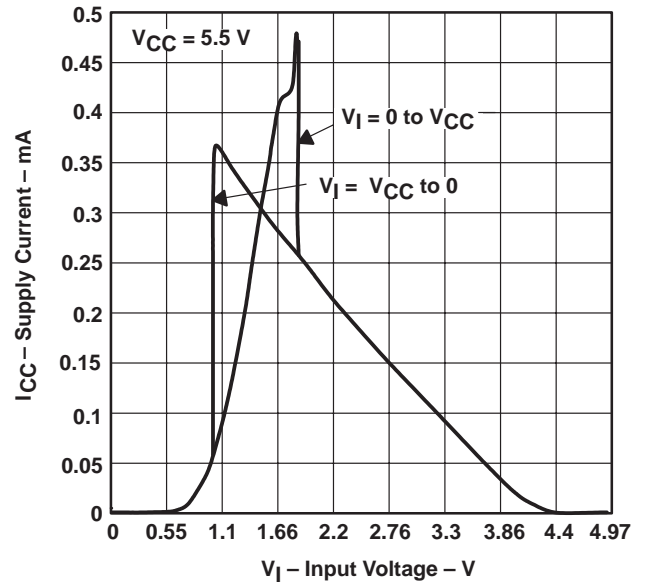
Figure 1. Load Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

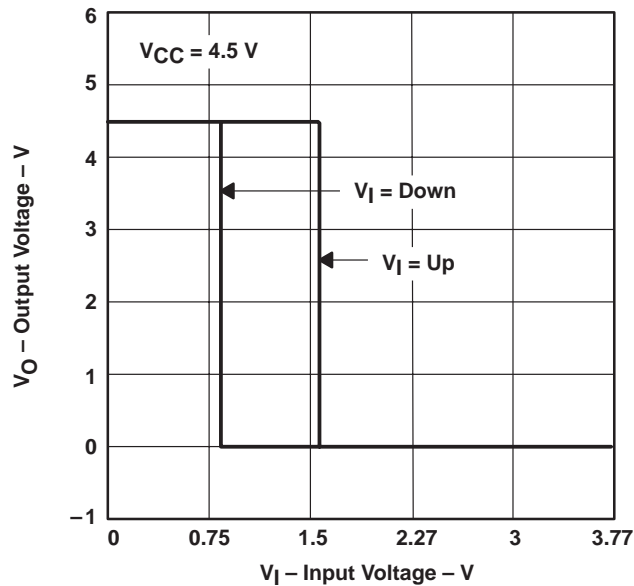
SUPPLY CURRENT
vs
INPUT VOLTAGE



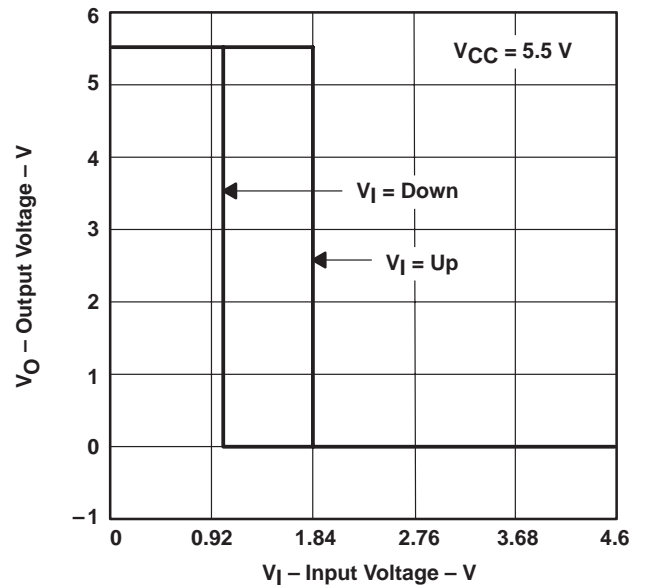
SUPPLY CURRENT
vs
INPUT VOLTAGE



OUTPUT VOLTAGE
vs
INPUT VOLTAGE



OUTPUT VOLTAGE
vs
INPUT VOLTAGE



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