

DATA SHEET

Datasheet.Global

74HC14; 74HCT14 Hex inverting Schmitt trigger

Product specification
Supersedes data of 1997 Aug 26

2003 Oct 30

Hex inverting Schmitt trigger

74HC14; 74HCT14

FEATURES

- Applications:
 - Wave and pulse shapers
 - Astable multivibrators
 - Monostable multivibrators.
- Complies with JEDEC standard no. 7A
- ESD protection:
HBM EIA/JESD22-A114-A exceeds 2000 V
MM EIA/JESD22-A115-A exceeds 200 V.
- Specified from -40 to $+85$ °C and -40 to $+125$ °C.

DESCRIPTION

The 74HC14 and 74HCT14 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC14 and 74HCT14 provide six inverting buffers with Schmitt-trigger action. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

QUICK REFERENCE DATA

GND = 0 V; $T_{amb} = 25$ °C; $t_r = t_f = 6$ ns

| SYMBOL | PARAMETER | CONDITIONS | TYPICAL | | UNIT |
|-------------------|--|-------------------------------|---------|-----|------|
| | | | HC | HCT | |
| t_{PHL}/t_{PLH} | propagation delay nA to nY | $C_L = 15$ pF; $V_{CC} = 5$ V | 12 | 17 | ns |
| C_I | input capacitance | | 3.5 | 3.5 | pF |
| C_{PD} | power dissipation capacitance per gate | notes 1 and 2 | 7 | 8 | pF |

Notes

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μ W):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$$
 where:
 f_i = input frequency in MHz;
 f_o = output frequency in MHz;
 C_L = output load capacitance in pF;
 V_{CC} = supply voltage in Volts;
 N = total load switching outputs;
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.
2. For type 74HC14 the condition is $V_I = \text{GND to } V_{CC}$.
 For type 74HCT14 the condition is $V_I = \text{GND to } V_{CC} - 1.5$ V.

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FUNCTION TABLE

| INPUT | OUTPUT |
|-------|--------|
| nA | nY |
| L | H |
| H | L |

Note

1. H = HIGH voltage level;
L = LOW voltage level.

ORDERING INFORMATION

| TYPE NUMBER | PACKAGE | | | | |
|-------------|-------------------|------|----------|----------|----------|
| | TEMPERATURE RANGE | PINS | PACKAGE | MATERIAL | CODE |
| 74HC14D | -40 to +125 °C | 14 | SO14 | plastic | SOT108-1 |
| 74HCT14D | -40 to +125 °C | 14 | SO14 | plastic | SOT108-1 |
| 74HC14DB | -40 to +125 °C | 14 | SSOP14 | plastic | SOT337-1 |
| 74HCT14DB | -40 to +125 °C | 14 | SSOP14 | plastic | SOT337-1 |
| 74HC14N | -40 to +125 °C | 14 | DIP14 | plastic | SOT27-1 |
| 74HCT14N | -40 to +125 °C | 14 | DIP14 | plastic | SOT27-1 |
| 74HC14PW | -40 to +125 °C | 14 | TSSOP14 | plastic | SOT402-1 |
| 74HCT14PW | -40 to +125 °C | 14 | TSSOP14 | plastic | SOT402-1 |
| 74HC14BQ | -40 to +125 °C | 14 | DHVQFN14 | plastic | SOT762-1 |
| 74HCT14BQ | -40 to +125 °C | 14 | DHVQFN14 | plastic | SOT762-1 |

PINNING

| PIN | SYMBOL | DESCRIPTION |
|-----|-----------------|----------------|
| 1 | 1A | data input |
| 2 | 1Y | data output |
| 3 | 2A | data input |
| 4 | 2Y | data output |
| 5 | 3A | data input |
| 6 | 3Y | data output |
| 7 | GND | ground (0 V) |
| 8 | 4Y | data output |
| 9 | 4A | data input |
| 10 | 5Y | data output |
| 11 | 5A | data input |
| 12 | 6Y | data output |
| 13 | 6A | data input |
| 14 | V _{CC} | supply voltage |

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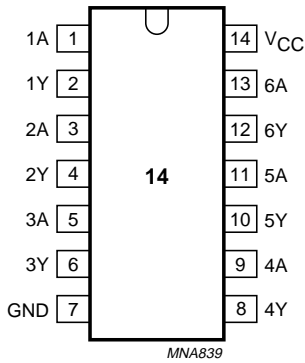
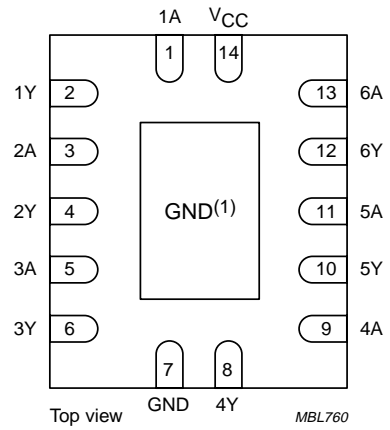


Fig.1 Pin configuration.



(1) The die substrate is attached to this pad using conductive die attach material. It can not be used as a supply pin or input.

Fig.2 Pin configuration DHVQFN14.

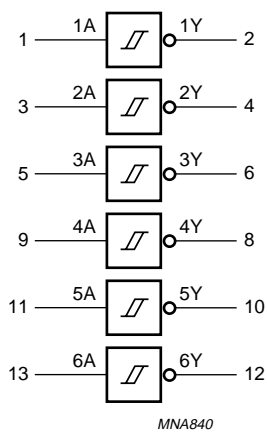


Fig.3 Logic symbol.

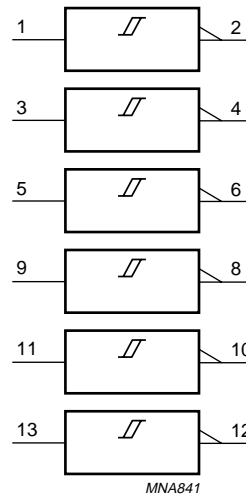
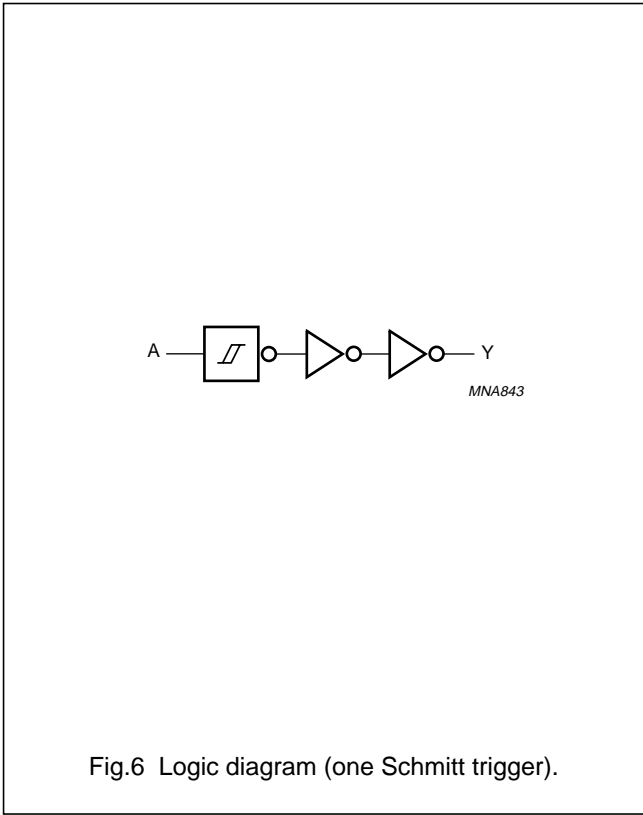
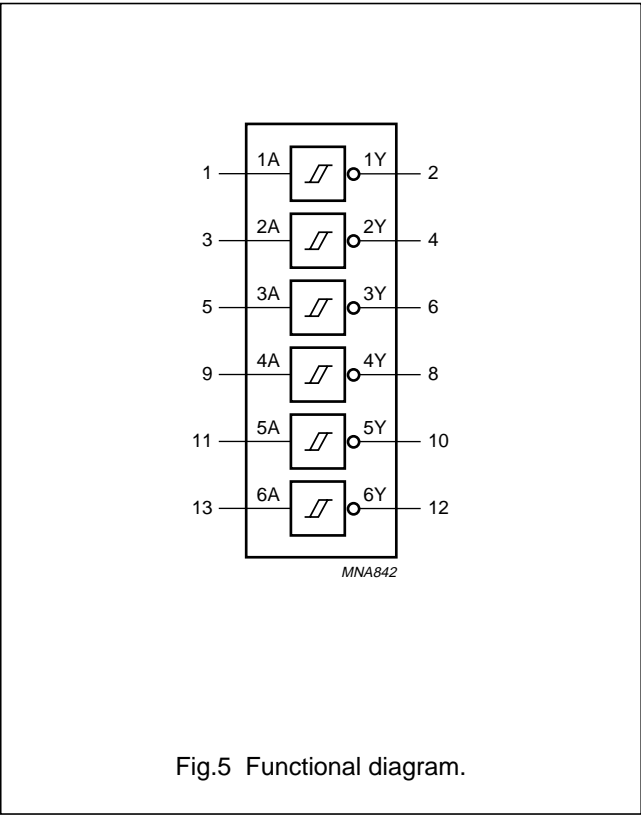


Fig.4 IEC logic symbol.

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RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | CONDITIONS | 74HC14 | | | 74HCT14 | | | UNIT |
|-----------|-------------------------------|--|--------|------|----------|---------|------|----------|------|
| | | | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. | |
| V_{CC} | supply voltage | | 2.0 | 5.0 | 6.0 | 4.5 | 5.0 | 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_{amb} | operating ambient temperature | see DC and AC characteristics per device | –40 | +25 | +85 | –40 | +25 | +85 | °C |
| | | | –40 | – | +125 | –40 | – | +125 | °C |

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 60134); voltages are referenced to GND (ground = 0 V).

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-------------------|-------------------------------|--|------|----------|------|
| V_{CC} | supply voltage | | –0.5 | +7 | V |
| I_{IK} | input diode current | $V_I < -0.5 \text{ V}$ or $V_I > V_{CC} + 0.5 \text{ V}$ | – | ± 20 | mA |
| I_{OK} | output diode current | $V_O < -0.5 \text{ V}$ or $V_O > V_{CC} + 0.5 \text{ V}$ | – | ± 20 | mA |
| I_O | output source or sink current | $-0.5 \text{ V} < V_O < V_{CC} + 0.5 \text{ V}$ | – | ± 25 | mA |
| $I_{CC}; I_{GND}$ | V_{CC} or GND current | | – | 50 | mA |
| T_{stg} | storage temperature | | –65 | +150 | °C |
| P_{tot} | power dissipation | $T_{amb} = -40 \text{ to } +125 \text{ °C}$ | | | |
| | | DIP14 packages; note 1 | – | 750 | mW |
| | | Other packages; note 2 | – | 500 | mW |

Notes

- For DIP14 packages: above 70 °C the value of P_D derates linearly with 12 mW/K.
- For SO14 packages: above 70 °C the value of P_D derates linearly with 8 mW/K.
For (T)SSOP14 packages: above 60 °C the value of P_D derates linearly with 5.5 mW/K.
For DHVQFN14 packages: above 60 °C the value of P_D derates linearly with 4.5 mW/K.

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DC CHARACTERISTICS

Type 74HC14

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| SYMBOL | PARAMETER | TEST CONDITIONS | | MIN. | TYP. ⁽¹⁾ | MAX. | UNIT |
|--|---------------------------|---|---------------------|------|---------------------|------|------|
| | | OTHER | V _{CC} (V) | | | | |
| T_{amb} = 25 °C | | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | |
| | | I _O = -20 μA | 2.0 | 1.9 | 2.0 | – | V |
| | | I _O = -20 μA | 4.5 | 4.4 | 4.5 | – | V |
| | | I _O = -20 μA | 6.0 | 5.9 | 6.0 | – | V |
| | | I _O = -4.0 mA | 4.5 | 3.98 | 4.32 | – | V |
| | | I _O = -5.2 mA | 6.0 | 5.48 | 5.81 | – | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | |
| | | I _O = 20 μA | 2.0 | – | 0 | 0.1 | V |
| | | I _O = 20 μA | 4.5 | – | 0 | 0.1 | V |
| | | I _O = 20 μA | 6.0 | – | 0 | 0.1 | V |
| | | I _O = 4.0 mA | 4.5 | – | 0.15 | 0.26 | V |
| | | I _O = 5.2 mA | 6.0 | – | 0.16 | 0.26 | V |
| I _{LI} | input leakage current | V _I = V _{CC} or GND | 6.0 | – | – | 0.1 | μA |
| I _{CC} | quiescent supply current | V _I = V _{CC} or GND; I _O = 0 | 6.0 | – | – | 2.0 | μA |
| T_{amb} = -40 to +85 °C | | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | |
| | | I _O = -20 μA | 2.0 | 1.9 | – | – | V |
| | | I _O = -20 μA | 4.5 | 4.4 | – | – | V |
| | | I _O = -20 μA | 6.0 | 5.9 | – | – | V |
| | | I _O = -4.0 mA | 4.5 | 3.84 | – | – | V |
| | | I _O = -5.2 mA | 6.0 | 5.34 | – | – | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | |
| | | I _O = 20 μA | 2.0 | – | – | 0.1 | V |
| | | I _O = 20 μA | 4.5 | – | – | 0.1 | V |
| | | I _O = 20 μA | 6.0 | – | – | 0.1 | V |
| | | I _O = 4.0 mA | 4.5 | – | – | 0.33 | V |
| | | I _O = 5.2 mA | 6.0 | – | – | 0.33 | V |
| I _{LI} | input leakage current | V _I = V _{CC} or GND | 6.0 | – | – | 1.0 | μA |
| I _{CC} | quiescent supply current | V _I = V _{CC} or GND; I _O = 0 | 6.0 | – | – | 20 | μA |

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| SYMBOL | PARAMETER | TEST CONDITIONS | | MIN. | TYP. ⁽¹⁾ | MAX. | UNIT |
|---|---------------------------|---|---------------------|------|---------------------|------|------|
| | | OTHER | V _{CC} (V) | | | | |
| T_{amb} = -40 to +125 °C | | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | |
| | | I _O = -20 μA | 2.0 | 1.9 | - | - | V |
| | | I _O = -20 μA | 4.5 | 4.4 | - | - | V |
| | | I _O = -20 μA | 6.0 | 5.9 | - | - | V |
| | | I _O = -4.0 mA | 4.5 | 3.7 | - | - | V |
| | | I _O = -5.2 mA | 6.0 | 5.2 | - | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | |
| | | I _O = 20 μA | 2.0 | - | - | 0.1 | V |
| | | I _O = 20 μA | 4.5 | - | - | 0.1 | V |
| | | I _O = 20 μA | 6.0 | - | - | 0.1 | V |
| | | I _O = 4.0 mA | 4.5 | - | - | 0.4 | V |
| | | I _O = 5.2 mA | 6.0 | - | - | 0.4 | V |
| I _{LI} | input leakage current | V _I = V _{CC} or GND | 6.0 | - | - | 1.0 | μA |
| I _{CC} | quiescent supply current | V _I = V _{CC} or GND; I _O = 0 | 6.0 | - | - | 40 | μA |

Note

1. All typical values are measured at T_{amb} = 25 °C.

Hex inverting Schmitt trigger

74HC14; 74HCT14

Type 74HCT14

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| SYMBOL | PARAMETER | TEST CONDITIONS | | MIN. | TYP. ⁽¹⁾ | MAX. | UNIT |
|---|-------------------------------------|--|---------------------|------|---------------------|------|------|
| | | OTHER | V _{CC} (V) | | | | |
| T_{amb} = 25 °C | | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | 4.5 | 4.4 | 4.5 | – | V |
| | | I _O = –20 µA I _O = –4.0 mA | 4.5 | 3.98 | 4.32 | – | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | 4.5 | – | 0 | 0.1 | V |
| | | I _O = 20 µA I _O = 4.0 mA | 4.5 | – | 0.15 | 0.26 | V |
| I _{LI} | input leakage current | V _I = V _{CC} or GND | 5.5 | – | – | 0.1 | µA |
| I _{CC} | quiescent supply current | V _I = V _{CC} or GND; I _O = 0 | 5.5 | – | – | 2.0 | µA |
| ΔI _{CC} | additional supply current per input | V _I = V _{CC} – 2.1 V; I _O = 0 | 4.5 to 5.5 | – | 30 | 108 | µA |
| T_{amb} = –40 to +85 °C | | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | 4.5 | 4.4 | – | – | V |
| | | I _O = –20 µA I _O = –4.0 mA | 4.5 | 3.84 | – | – | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | 4.5 | – | – | 0.1 | V |
| | | I _O = 20 µA I _O = 4.0 mA | 4.5 | – | – | 0.33 | V |
| I _{LI} | input leakage current | V _I = V _{CC} or GND | 5.5 | – | – | 1.0 | µA |
| I _{CC} | quiescent supply current | V _I = V _{CC} or GND; I _O = 0 | 5.5 | – | – | 20 | µA |
| ΔI _{CC} | additional supply current per input | V _I = V _{CC} – 2.1 V; I _O = 0 | 4.5 to 5.5 | – | – | 135 | µA |
| T_{amb} = –40 to +125 °C | | | | | | | |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | 4.5 | 4.4 | – | – | V |
| | | I _O = –20 µA I _O = –4.0 mA | 4.5 | 3.7 | – | – | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | 4.5 | – | – | 0.1 | V |
| | | I _O = 20 µA I _O = 4.0 mA | 4.5 | – | – | 0.4 | V |
| I _{LI} | input leakage current | V _I = V _{CC} or GND | 5.5 | – | – | 1.0 | µA |
| I _{CC} | quiescent supply current | V _I = V _{CC} or GND; I _O = 0 | 5.5 | – | – | 40 | µA |
| ΔI _{CC} | additional supply current per input | V _I = V _{CC} – 2.1 V; I _O = 0 | 4.5 to 5.5 | – | – | 147 | µA |

Note1. All typical values are measured at T_{amb} = 25 °C.

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TRANSFER CHARACTERISTICS

Type 74HC

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| SYMBOL | PARAMETER | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|---|-----------------|---------------------|------|------|------|------|
| | | WAVEFORMS | V _{CC} (V) | | | | |
| T_{amb} = 25 °C; note 1 | | | | | | | |
| V _{T+} | positive-going threshold | Figs 7 and 8 | 2.0 | 0.7 | 1.18 | 1.5 | V |
| | | | 4.5 | 1.7 | 2.38 | 3.15 | V |
| | | | 6.0 | 2.1 | 3.14 | 4.2 | V |
| V _{T-} | negative-going threshold | Figs 7 and 8 | 2.0 | 0.3 | 0.52 | 0.90 | V |
| | | | 4.5 | 0.9 | 1.40 | 2.00 | V |
| | | | 6.0 | 1.2 | 1.89 | 2.60 | V |
| V _H | hysteresis (V _{T+} – V _{T-}) | Figs 7 and 8 | 2.0 | 0.2 | 0.66 | 1.0 | V |
| | | | 4.5 | 0.4 | 0.98 | 1.4 | V |
| | | | 6.0 | 0.6 | 1.25 | 1.6 | V |
| T_{amb} = –40 to +85 °C | | | | | | | |
| V _{T+} | positive-going threshold | Figs 7 and 8 | 2.0 | 0.7 | – | 1.5 | V |
| | | | 4.5 | 1.7 | – | 3.15 | V |
| | | | 6.0 | 2.1 | – | 4.2 | V |
| V _{T-} | negative-going threshold | Figs 7 and 8 | 2.0 | 0.3 | – | 0.90 | V |
| | | | 4.5 | 0.90 | – | 2.00 | V |
| | | | 6.0 | 1.20 | – | 2.60 | V |
| V _H | hysteresis (V _{T+} – V _{T-}) | Figs 7 and 8 | 2.0 | 0.2 | – | 1.0 | V |
| | | | 4.5 | 0.4 | – | 1.4 | V |
| | | | 6.0 | 0.6 | – | 1.6 | V |
| T_{amb} = –40 to +125 °C | | | | | | | |
| V _{T+} | positive-going threshold | Figs 7 and 8 | 2.0 | 0.7 | – | 1.5 | V |
| | | | 4.5 | 1.7 | – | 3.15 | V |
| | | | 6.0 | 2.1 | – | 4.2 | V |
| V _{T-} | negative-going threshold | Figs 7 and 8 | 2.0 | 0.30 | – | 0.90 | V |
| | | | 4.5 | 0.90 | – | 2.00 | V |
| | | | 6.0 | 1.2 | – | 2.60 | V |
| V _H | hysteresis (V _{T+} – V _{T-}) | Figs 7 and 8 | 2.0 | 0.2 | – | 1.0 | V |
| | | | 4.5 | 0.4 | – | 1.4 | V |
| | | | 6.0 | 0.6 | – | 1.6 | V |

Note

1. All typical values are measured at T_{amb} = 25 °C.

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Family 74HCT

At recommended operating conditions: voltages are referenced to GND (ground = 0 V)

| SYMBOL | PARAMETER | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|---|-----------------|---------------------|------|------|------|------|
| | | WAVEFORMS | V _{CC} (V) | | | | |
| T_{amb} = 25 °C; note 1 | | | | | | | |
| V _{T+} | positive-going threshold | Figs 7 and 8 | 4.5 | 1.2 | 1.41 | 1.9 | V |
| | | | 5.5 | 1.4 | 1.59 | 2.1 | V |
| V _{T-} | negative-going threshold | Figs 7 and 8 | 4.5 | 0.5 | 0.85 | 1.2 | V |
| | | | 5.5 | 0.6 | 0.99 | 1.4 | V |
| V _H | hysteresis (V _{T+} – V _{T-}) | Figs 7 and 8 | 4.5 | 0.4 | 0.56 | – | V |
| | | | 5.5 | 0.4 | 0.60 | – | V |
| T_{amb} = –40 to +85 °C | | | | | | | |
| V _{T+} | positive-going threshold | Figs 7 and 8 | 4.5 | 1.2 | – | 1.9 | V |
| | | | 5.5 | 1.4 | – | 2.1 | V |
| V _{T-} | negative-going threshold | Figs 7 and 8 | 4.5 | 0.5 | – | 1.2 | V |
| | | | 5.5 | 0.6 | – | 1.4 | V |
| V _H | hysteresis (V _{T+} – V _{T-}) | Figs 7 and 8 | 4.5 | 0.4 | – | – | V |
| | | | 5.5 | 0.4 | – | – | V |
| T_{amb} = –40 to +125 °C | | | | | | | |
| V _{T+} | positive-going threshold | Figs 7 and 8 | 4.5 | 1.2 | – | 1.9 | V |
| | | | 5.5 | 1.4 | – | 2.1 | V |
| V _{T-} | negative-going threshold | Figs 7 and 8 | 4.5 | 0.5 | – | 1.2 | V |
| | | | 5.5 | 0.6 | – | 1.4 | V |
| V _H | hysteresis (V _{T+} – V _{T-}) | Figs 7 and 8 | 4.5 | 0.4 | – | – | V |
| | | | 5.5 | 0.4 | – | – | V |

Note

1. All typical values are measured at T_{amb} = 25 °C.

Hex inverting Schmitt trigger

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AC CHARACTERISTICS

Type 74HC

GND = 0 V; $t_f = t_r = 6$ ns; $C_L = 50$ pF

| SYMBOL | PARAMETER | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|----------------------------|-----------------|--------------|------|------|------|------|
| | | WAVEFORMS | V_{CC} (V) | | | | |
| $T_{amb} = 25$ °C; note 1 | | | | | | | |
| t_{PHL}/t_{PLH} | propagation delay nA to nY | see Fig.9 | 2.0 | – | 41 | 125 | ns |
| | | | 4.5 | – | 15 | 25 | ns |
| | | | 6.0 | – | 12 | 21 | ns |
| t_{THL}/t_{TLH} | output transition time | see Fig.9 | 2.0 | – | 19 | 75 | ns |
| | | | 4.5 | – | 7 | 15 | ns |
| | | | 6.0 | – | 6 | 13 | ns |
| $T_{amb} = -40$ to $+85$ °C | | | | | | | |
| t_{PHL}/t_{PLH} | propagation delay nA to nY | see Fig.9 | 2.0 | – | – | 155 | ns |
| | | | 4.5 | – | – | 31 | ns |
| | | | 6.0 | – | – | 26 | ns |
| t_{THL}/t_{TLH} | output transition time | see Fig.9 | 2.0 | – | – | 95 | ns |
| | | | 4.5 | – | – | 19 | ns |
| | | | 6.0 | – | – | 15 | ns |
| $T_{amb} = -40$ to $+125$ °C | | | | | | | |
| t_{PHL}/t_{PLH} | propagation delay nA to nY | see Fig.9 | 2.0 | – | – | 190 | ns |
| | | | 4.5 | – | – | 38 | ns |
| | | | 6.0 | – | – | 32 | ns |
| t_{THL}/t_{TLH} | output transition time | see Fig.9 | 2.0 | – | – | 110 | ns |
| | | | 4.5 | – | – | 22 | ns |
| | | | 6.0 | – | – | 19 | ns |

Note

1. All typical values are measured at $T_{amb} = 25$ °C.

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Type 74HCT

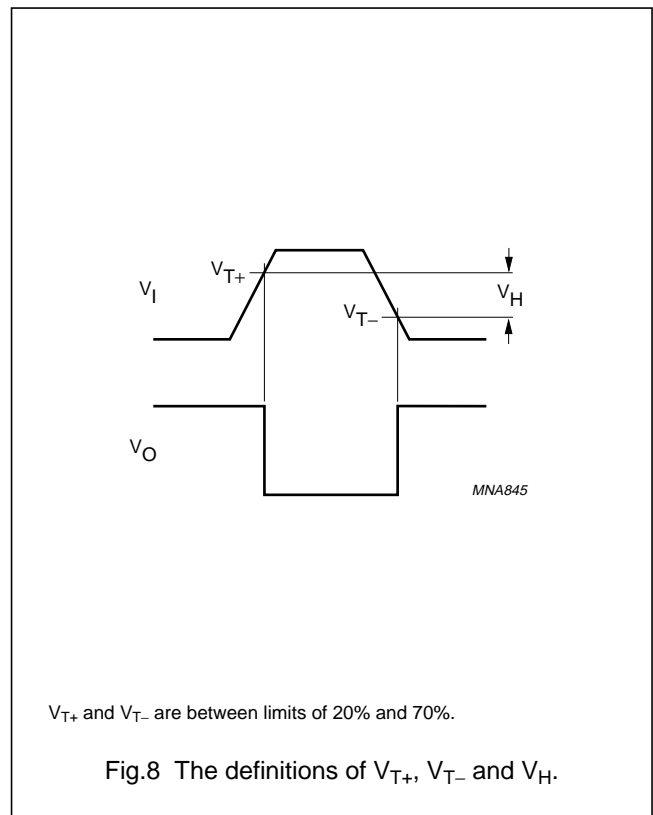
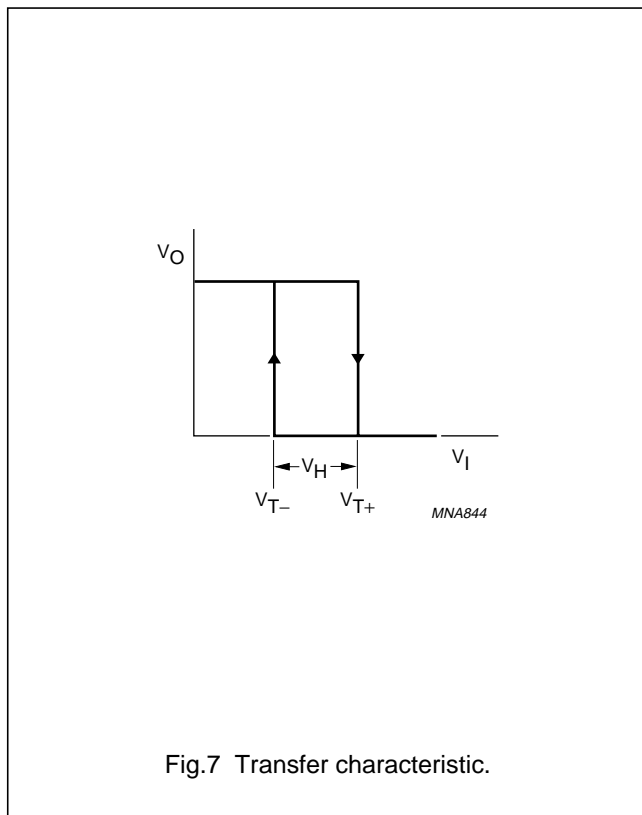
GND = 0 V; $t_r = t_f = 6 \text{ ns}$; $C_L = 50 \text{ pF}$

| SYMBOL | PARAMETER | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|----------------------------|-----------------|---------------------|------|------|------|------|
| | | WAVEFORMS | V _{CC} (V) | | | | |
| T_{amb} = 25 °C ; note 1 | | | | | | | |
| t _{PHL} /t _{PLH} | propagation delay nA to nY | see Fig.9 | 4.5 | – | 20 | 34 | ns |
| t _{THL} /t _{TLH} | output transition time | see Fig.9 | 4.5 | – | 7 | 15 | ns |
| T_{amb} = –40 to +85 °C | | | | | | | |
| t _{PHL} /t _{PLH} | propagation delay nA to nY | see Fig.9 | 4.5 | 43 | – | – | ns |
| t _{THL} /t _{TLH} | output transition time | see Fig.9 | 4.5 | 19 | – | – | ns |
| T_{amb} = –40 to +125 °C | | | | | | | |
| t _{PHL} /t _{PLH} | propagation delay nA to nY | see Fig.9 | 4.5 | – | – | 51 | ns |
| t _{THL} /t _{TLH} | output transition time | see Fig.9 | 4.5 | – | – | 22 | ns |

Note

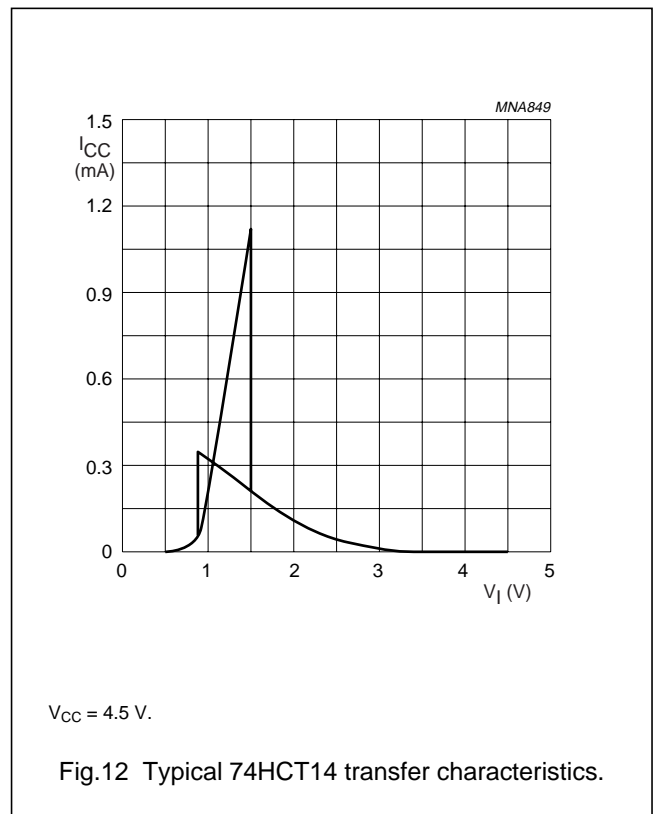
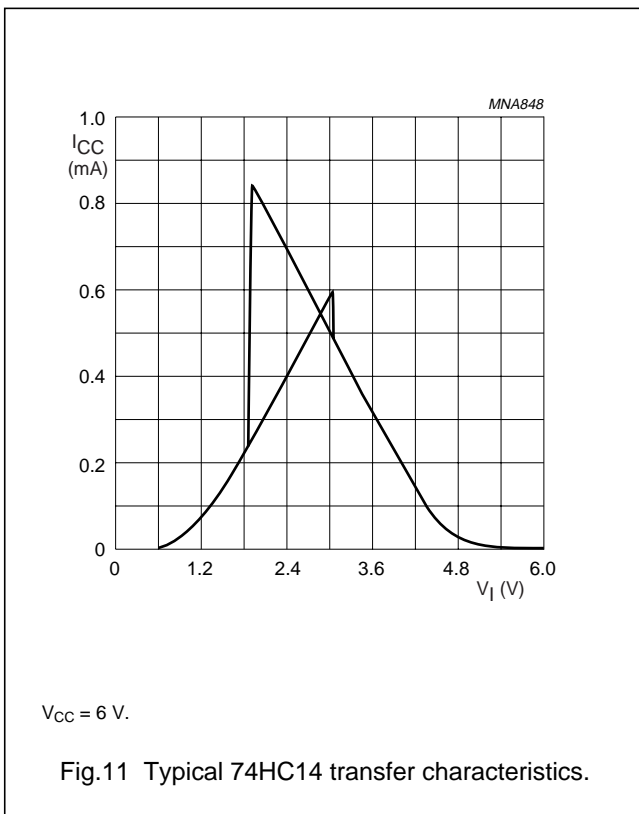
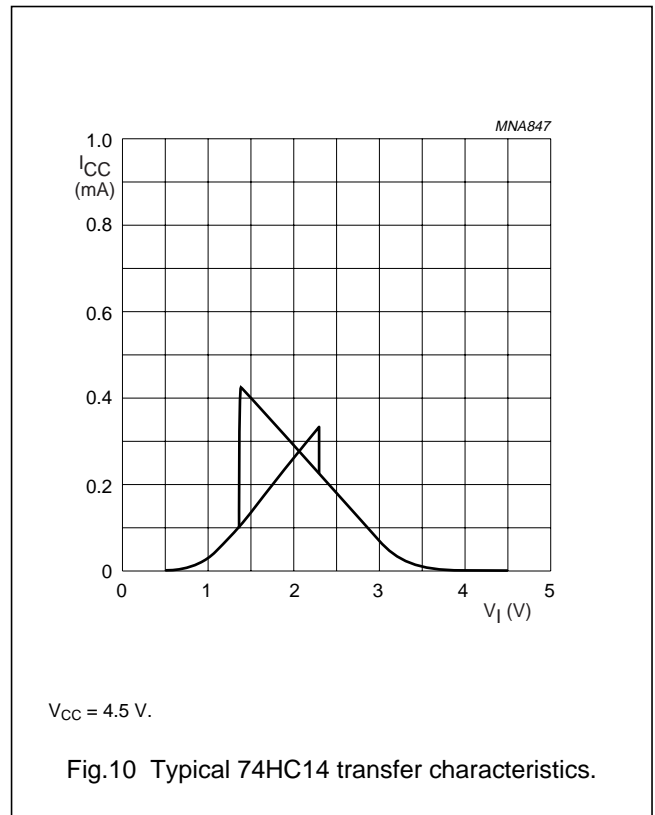
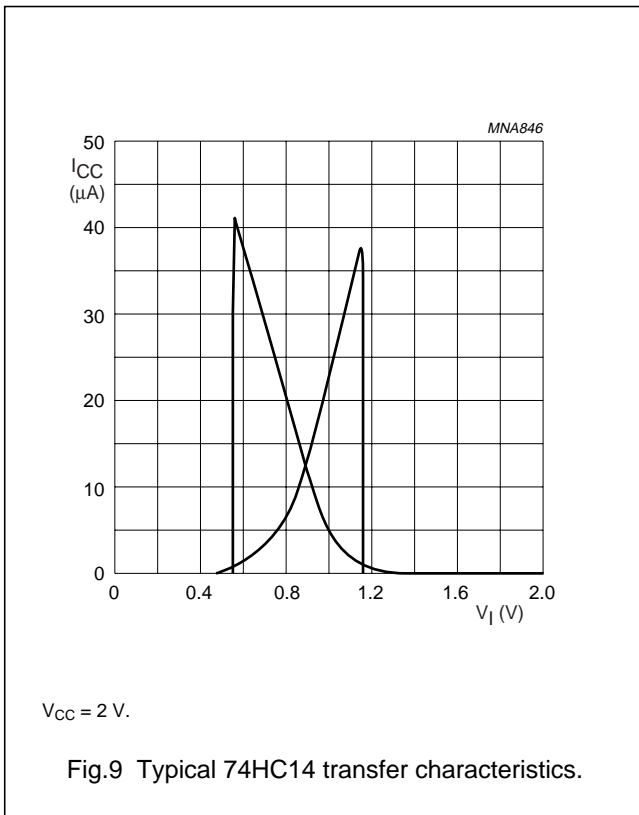
1. All typical values are measured at T_{amb} = 25 °C.

TRANSFER CHARACTERISTIC WAVEFORMS



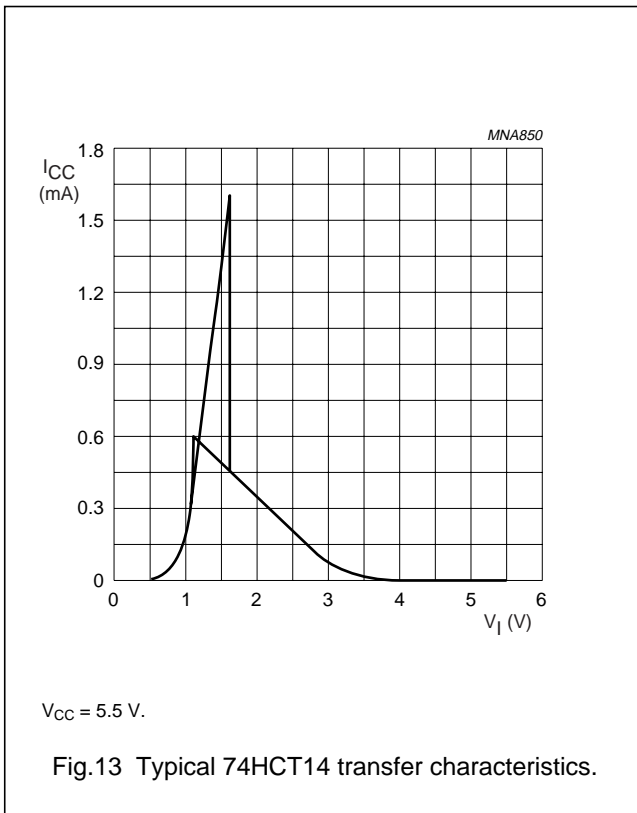
Hex inverting Schmitt trigger

74HC14; 74HCT14

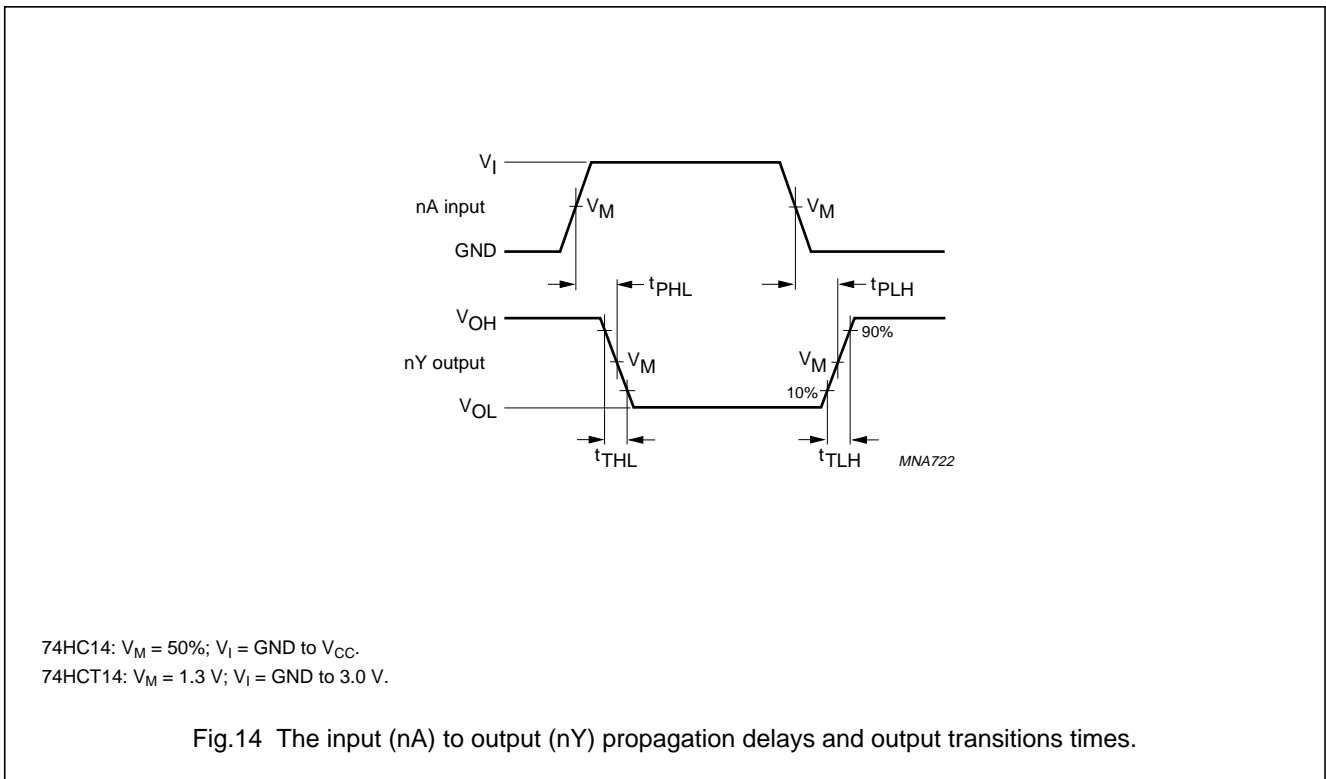


Hex inverting Schmitt trigger

74HC14; 74HCT14

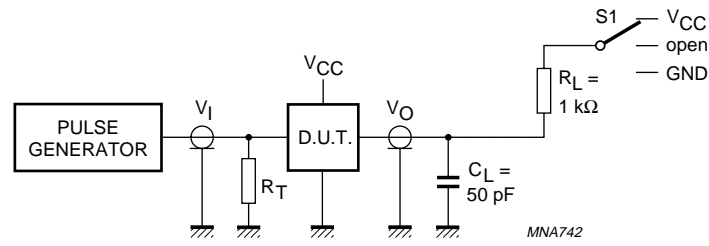


AC WAVEFORMS



Hex inverting Schmitt trigger

74HC14; 74HCT14



| TEST | S1 |
|-------------------|----------|
| t_{PLH}/t_{PHL} | open |
| t_{PLZ}/t_{PZL} | V_{CC} |
| t_{PHZ}/t_{PZH} | GND |

Definitions for test circuit:

R_L = Load resistor.

C_L = load capacitance including jig and probe capacitance.

R_T = termination resistance should be equal to the output impedance Z_o of the pulse generator.

Fig.15 Load circuitry for switching times.

Hex inverting Schmitt trigger

74HC14; 74HCT14

APPLICATION INFORMATION

The slow input rise and fall times cause additional power dissipation. This can be calculated using the following formula:

$$P_{ad} = f_i \times (t_r \times I_{CC(AV)} + t_f \times I_{CC(AV)}) \times V_{CC}$$

Where:

P_{ad} = additional power dissipation (μW);

f_i = input frequency (MHz);

t_r = input rise time (μs); 10% to 90%;

t_f = input fall time (μs); 10% to 90%;

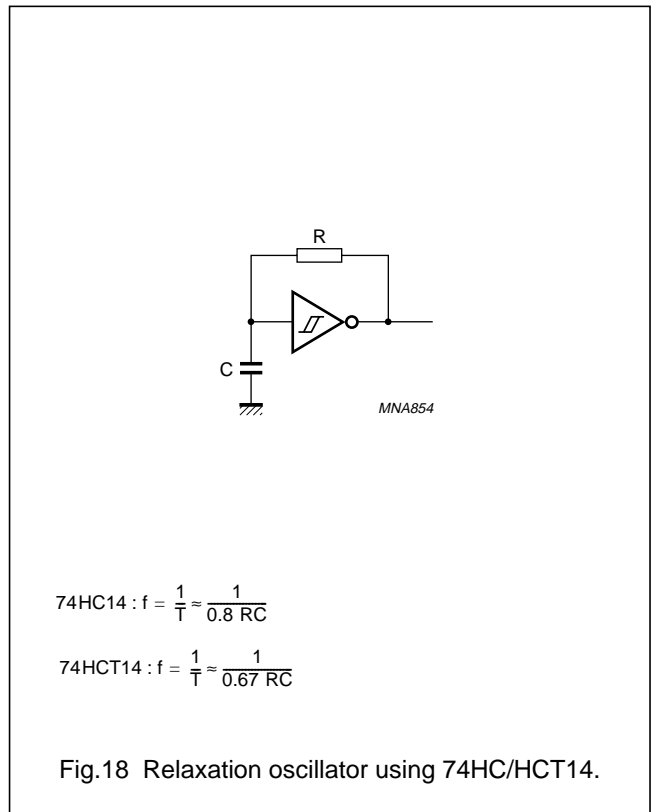
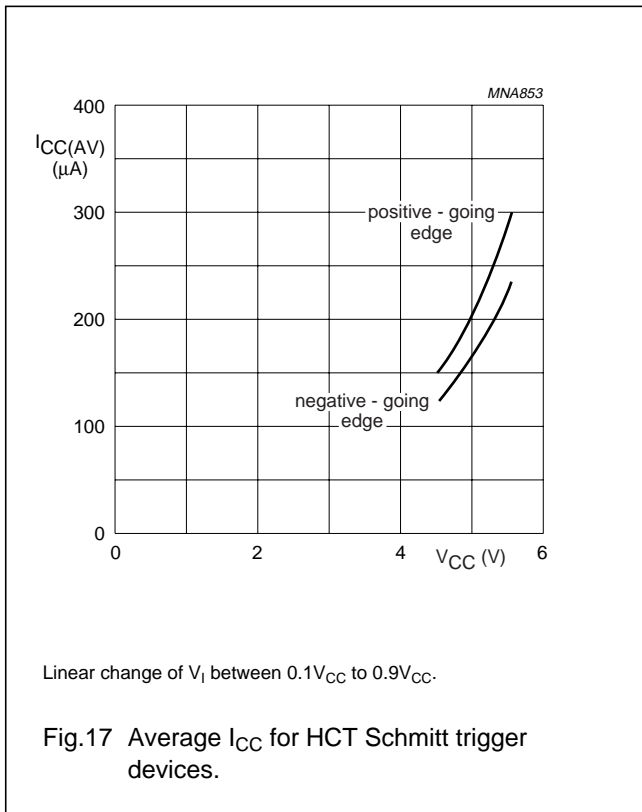
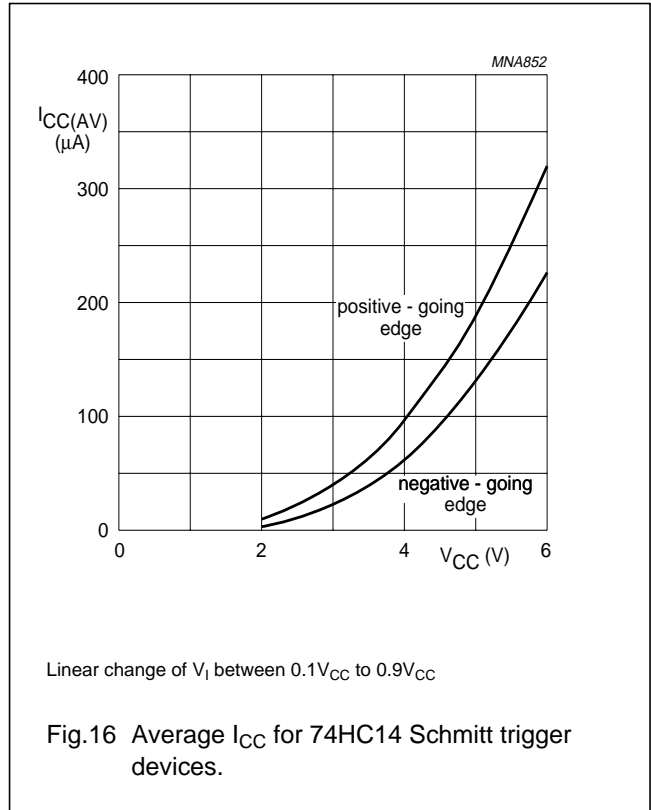
$I_{CC(AV)}$ = average additional supply current (μA).

$I_{CC(AV)}$ differs with positive or negative input transitions, as shown in Figs 16 and 17.

For 74HC/HCT14 used in a relaxation oscillator circuit, see Fig.18.

Note to application information

All values given are typical unless otherwise specified.



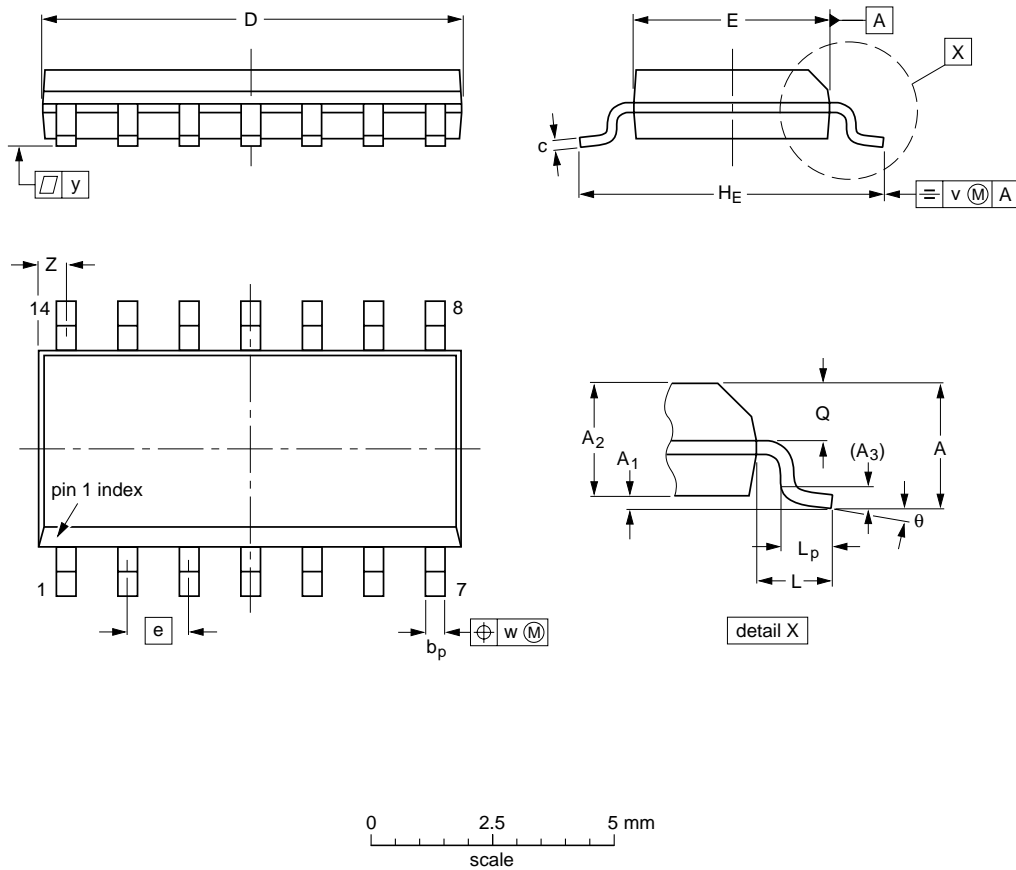
Hex inverting Schmitt trigger

74HC14; 74HCT14

PACKAGE OUTLINES

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | z ⁽¹⁾ | θ |
|--------|--------|----------------|----------------|----------------|----------------|------------------|------------------|------------------|------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm | 1.75 | 0.25 0.10 | 1.45 1.25 | 0.25 | 0.49 0.36 | 0.25 0.19 | 8.75 8.55 | 4.0 3.8 | 1.27 | 6.2 5.8 | 1.05 | 1.0 0.4 | 0.7 0.6 | 0.25 | 0.25 | 0.1 | 0.7 0.3 | 8° 0° |
| inches | 0.069 | 0.010 0.004 | 0.057 0.049 | 0.01 | 0.019 0.014 | 0.0100 0.0075 | 0.35 0.34 | 0.16 0.15 | 0.05 | 0.244 0.228 | 0.041 | 0.039 0.016 | 0.028 0.024 | 0.01 | 0.01 | 0.004 | 0.028 0.012 | |

Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

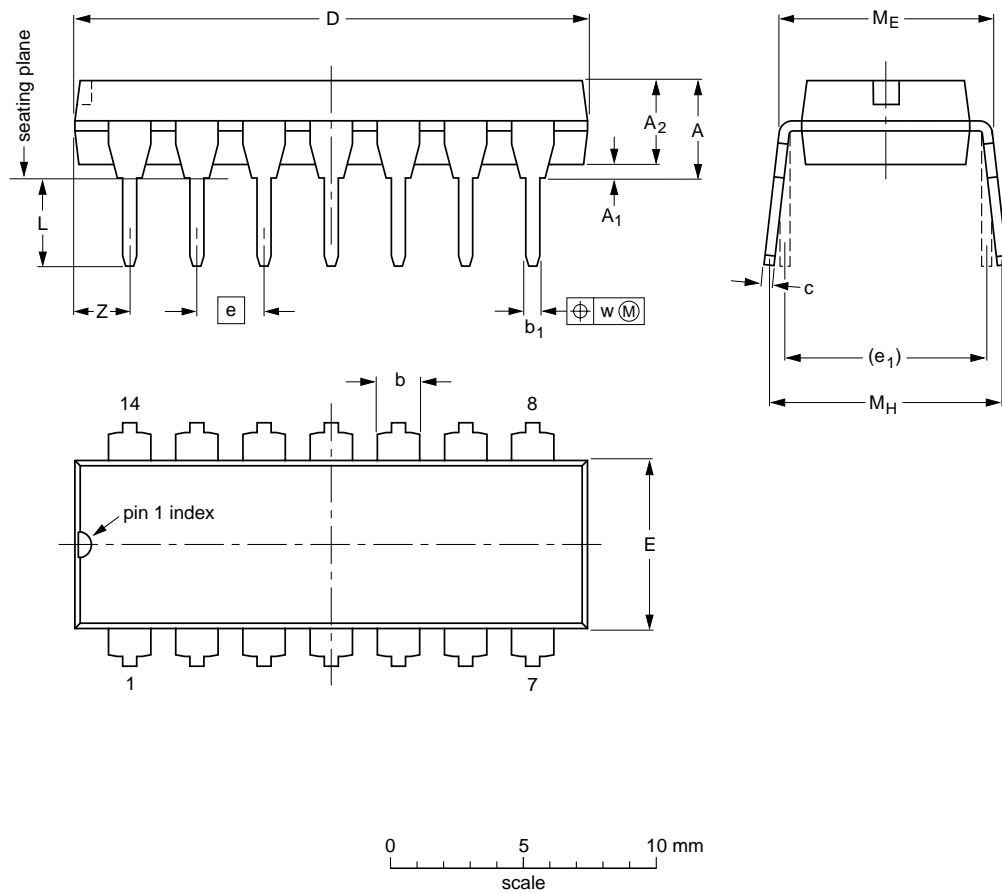
| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | |
| SOT108-1 | 076E06 | MS-012 | | | 99-12-27 03-02-19 |

Hex inverting Schmitt trigger

74HC14; 74HCT14

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT | A max. | A ₁ min. | A ₂ max. | b | b ₁ | c | D ⁽¹⁾ | E ⁽¹⁾ | e | e ₁ | L | M _E | M _H | w | Z ⁽¹⁾ max. |
|--------|--------|---------------------|---------------------|----------------|----------------|----------------|------------------|------------------|------|----------------|--------------|----------------|----------------|-------|-----------------------|
| mm | 4.2 | 0.51 | 3.2 | 1.73 1.13 | 0.53 0.38 | 0.36 0.23 | 19.50 18.55 | 6.48 6.20 | 2.54 | 7.62 | 3.60 3.05 | 8.25 7.80 | 10.0 8.3 | 0.254 | 2.2 |
| inches | 0.17 | 0.02 | 0.13 | 0.068 0.044 | 0.021 0.015 | 0.014 0.009 | 0.77 0.73 | 0.26 0.24 | 0.1 | 0.3 | 0.14 0.12 | 0.32 0.31 | 0.39 0.33 | 0.01 | 0.087 |

Note

1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

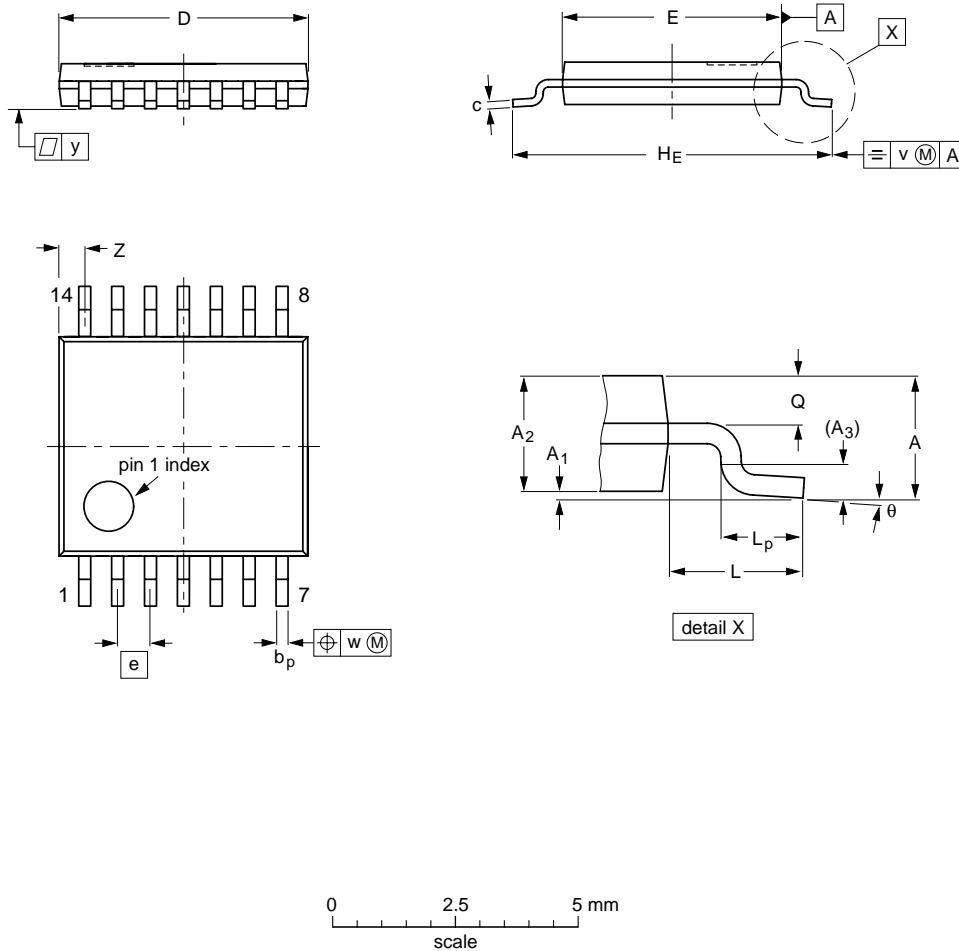
| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-----------|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | |
| SOT27-1 | 050G04 | MO-001 | SC-501-14 | | 99-12-27 03-02-13 |

Hex inverting Schmitt trigger

74HC14; 74HCT14

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽²⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|---|----------------|------------|-----|------|-----|------------------|----------|
| mm | 1.1 | 0.15 0.05 | 0.95 0.80 | 0.25 | 0.30 0.19 | 0.2 0.1 | 5.1 4.9 | 4.5 4.3 | 0.65 | 6.6 6.2 | 1 | 0.75 0.50 | 0.4 0.3 | 0.2 | 0.13 | 0.1 | 0.72 0.38 | 8° 0° |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

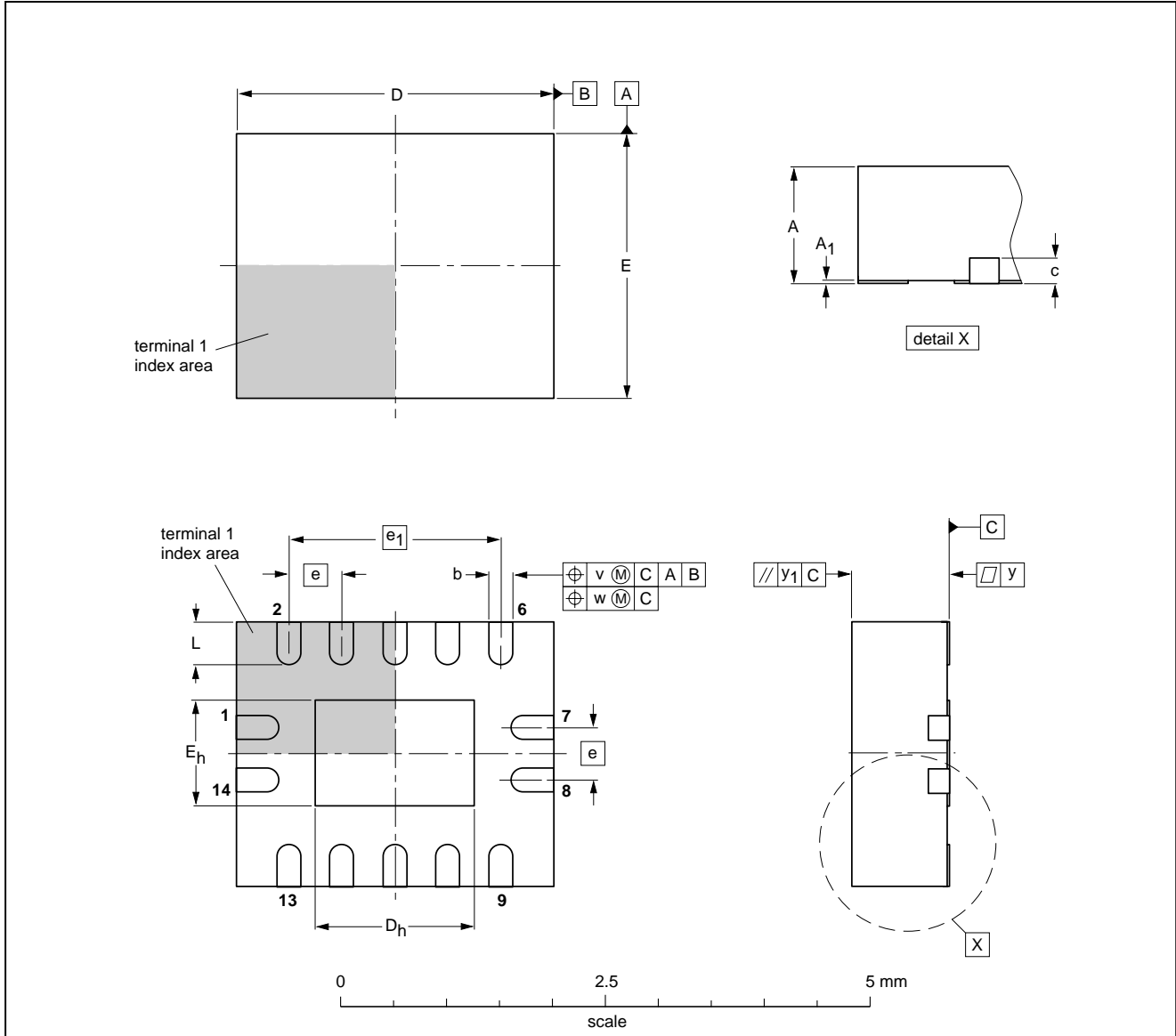
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT402-1 | | MO-153 | | | | 99-12-27 03-02-18 |

Hex inverting Schmitt trigger

74HC14; 74HCT14

DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm

SOT762-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A ⁽¹⁾ max. | A ₁ | b | c | D ⁽¹⁾ | D _h | E ⁽¹⁾ | E _h | e | e ₁ | L | v | w | y | y ₁ |
|------|-----------------------|----------------|--------------|-----|------------------|----------------|------------------|----------------|-----|----------------|------------|-----|------|------|----------------|
| mm | 1 | 0.05 0.00 | 0.30 0.18 | 0.2 | 3.1 2.9 | 1.65 1.35 | 2.6 2.4 | 1.15 0.85 | 0.5 | 2 | 0.5 0.3 | 0.1 | 0.05 | 0.05 | 0.1 |

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | |
| SOT762-1 | --- | MO-241 | --- | | 02-10-17 03-01-27 |

Hex inverting Schmitt trigger

74HC14; 74HCT14

DATA SHEET STATUS

| LEVEL | DATA SHEET STATUS ⁽¹⁾ | PRODUCT STATUS ⁽²⁾⁽³⁾ | DEFINITION |
|-------|----------------------------------|----------------------------------|--|
| I | Objective data | Development | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice. |
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