

## Hex inverting Schmitt-trigger

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74LV14

## FEATURES

- Wide operating voltage: 1.0 to 5.5 V
- Optimized for Low Voltage applications: 1.0 to 3.6 V
- Accepts TTL input levels between  $V_{CC} = 2.7$  V and  $V_{CC} = 3.6$  V
- Typical  $V_{OLP}$  (output ground bounce) < 0.8 V at  $V_{CC} = 3.3$  V,  $T_{amb} = 25^{\circ}\text{C}$ .
- Typical  $V_{OHV}$  (output  $V_{OH}$  undershoot) > 2 V at  $V_{CC} = 3.3$  V,  $T_{amb} = 25^{\circ}\text{C}$ .
- Output capability: standard
- $I_{CC}$  category: SSI

## APPLICATIONS

- Wave and pulse shapers for highly noisy environments

## DESCRIPTION

The 74LV14 is a low-voltage Si-gate CMOS device and is pin and function compatible with 74HC/HCT14.

The 74LV14 provides six inverting buffers with Schmitt-trigger action. It is capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

## QUICK REFERENCE DATA

$GND = 0$  V;  $T_{amb} = 25^{\circ}\text{C}$ ;  $t_r = t_f \leq 2.5$  ns

| SYMBOL            | PARAMETER                              | CONDITIONS                         | TYPICAL | UNIT |
|-------------------|----------------------------------------|------------------------------------|---------|------|
| $t_{PHL}/t_{PLH}$ | Propagation delay<br>nA to nY          | $C_L = 15$ pF;<br>$V_{CC} = 3.3$ V | 13      | ns   |
| $C_I$             | Input capacitance                      |                                    | 3.5     | pF   |
| $C_{PD}$          | Power dissipation capacitance per gate | See Notes 1 and 2                  | 15      | pF   |

## NOTES:

- $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ )  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$  where:  
 $f_i$  = input frequency in MHz;  $C_L$  = output load capacitance in pF;  
 $f_o$  = output frequency in MHz;  $V_{CC}$  = supply voltage in V;  
 $\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.
- The condition is  $V_i = GND$  to  $V_{CC}$ .

## ORDERING INFORMATION

| PACKAGES                    | TEMPERATURE RANGE                               | OUTSIDE NORTH AMERICA | NORTH AMERICA | PKG. DWG. # |
|-----------------------------|-------------------------------------------------|-----------------------|---------------|-------------|
| 14-Pin Plastic DIL          | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 74LV14 N              | 74LV14 N      | SOT27-1     |
| 14-Pin Plastic SO           | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 74LV14 D              | 74LV14 D      | SOT108-1    |
| 14-Pin Plastic SSOP Type II | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 74LV14 DB             | 74LV14 DB     | SOT337-1    |
| 14-Pin Plastic TSSOP Type I | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 74LV14 PW             | 74LV14PW DH   | SOT402-1    |

## PIN DESCRIPTION

| PIN NUMBER         | SYMBOL   | NAME AND FUNCTION       |
|--------------------|----------|-------------------------|
| 1, 3, 5, 9, 11, 13 | 1A – 6A  | Data inputs             |
| 2, 4, 6, 8, 10, 12 | 1Y – 6Y  | Data outputs            |
| 7                  | GND      | Ground (0 V)            |
| 14                 | $V_{CC}$ | Positive supply voltage |

## FUNCTION TABLE

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

## NOTES:

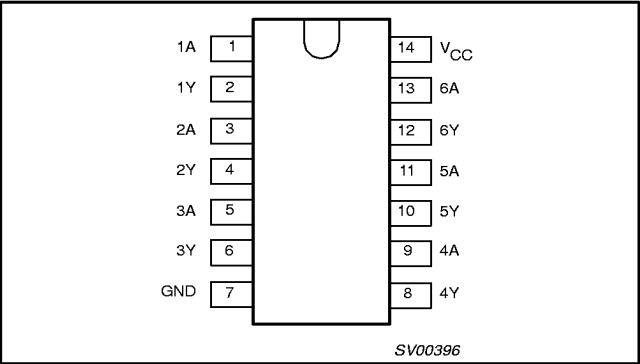
H = HIGH voltage level  
L = LOW voltage level

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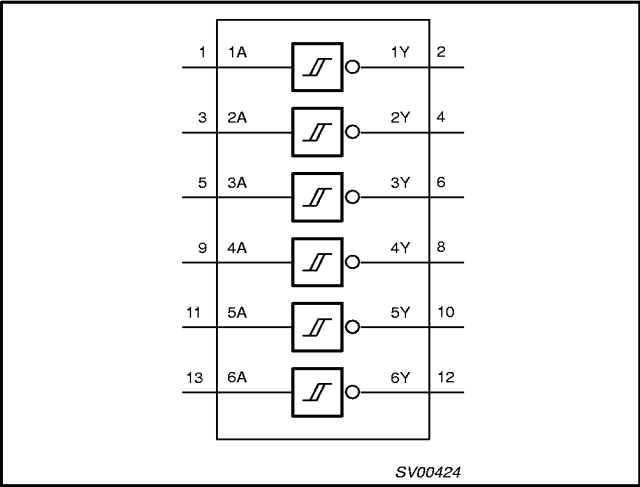
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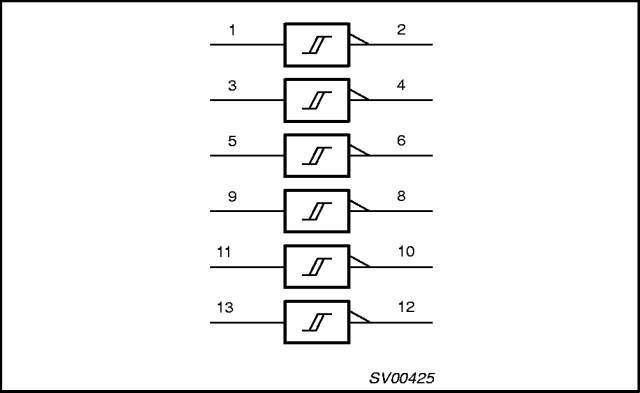
PIN CONFIGURATION



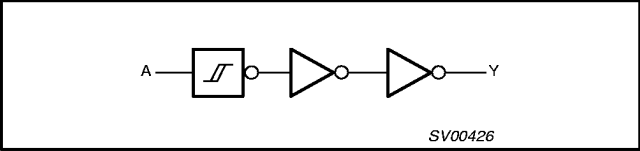
LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



LOGIC DIAGRAM



RECOMMENDED OPERATING CONDITIONS

| SYMBOL           | PARAMETER                                       | CONDITIONS                    | MIN | TYP | MAX             | UNIT |
|------------------|-------------------------------------------------|-------------------------------|-----|-----|-----------------|------|
| V <sub>CC</sub>  | DC supply voltage                               | See Note1                     | 1.0 | 3.3 | 5.5             | V    |
| V <sub>I</sub>   | Input voltage                                   |                               | 0   | –   | V <sub>CC</sub> | V    |
| V <sub>O</sub>   | Output voltage                                  |                               | 0   | –   | V <sub>CC</sub> | V    |
| T <sub>amb</sub> | Operating ambient temperature range in free air | See DC and AC characteristics | –40 |     | +85             | °C   |

**NOTE:**  
1. The LV is guaranteed to function down to V<sub>CC</sub> = 1.0V (input levels GND or V<sub>CC</sub>); DC characteristics are guaranteed from V<sub>CC</sub> = 1.2V to V<sub>CC</sub> = 5.5V.

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**ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>**

In accordance with the Absolute Maximum Rating System (IEC 134).

Voltages are referenced to GND (ground = 0V).

| SYMBOL                          | PARAMETER                                                                                                                 | CONDITIONS                                                                                                                                                               | RATING            | UNIT |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------|
| $V_{CC}$                        | DC supply voltage                                                                                                         |                                                                                                                                                                          | -0.5 to +7.0      | V    |
| $\pm I_{IK}$                    | DC input diode current                                                                                                    | $V_I < -0.5$ or $V_I > V_{CC} + 0.5V$                                                                                                                                    | 20                | mA   |
| $\pm I_{OK}$                    | DC output diode current                                                                                                   | $V_O < -0.5$ or $V_O > V_{CC} + 0.5V$                                                                                                                                    | 50                | mA   |
| $\pm I_O$                       | DC output source or sink current<br>– standard outputs                                                                    | $-0.5V < V_O < V_{CC} + 0.5V$                                                                                                                                            | 25                | mA   |
| $\pm I_{GND}$ ,<br>$\pm I_{CC}$ | DC $V_{CC}$ or GND current for types with<br>– standard outputs                                                           |                                                                                                                                                                          | 50                | mA   |
| $T_{stg}$                       | Storage temperature range                                                                                                 |                                                                                                                                                                          | -65 to +150       | °C   |
| $P_{TOT}$                       | Power dissipation per package<br>– plastic DIL<br>– plastic mini-pack (SO)<br>– plastic shrink mini-pack (SSOP and TSSOP) | for temperature range: -40 to +125°C<br>above +70°C derate linearly with 12 mW/K<br>above +70°C derate linearly with 8 mW/K<br>above +60°C derate linearly with 5.5 mW/K | 750<br>500<br>400 | mW   |

**NOTES:**

- Stresses beyond those listed 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.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

**DC ELECTRICAL CHARACTERISTICS**

Over recommended operating conditions. Voltages are referenced to GND (ground = 0V).

| SYMBOL           | PARAMETER                                   | TEST CONDITIONS                                                                                       | LIMITS         |                  |      |                 |      | UNIT |
|------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------|------------------|------|-----------------|------|------|
|                  |                                             |                                                                                                       | -40°C to +85°C |                  |      | -40°C to +125°C |      |      |
|                  |                                             |                                                                                                       | MIN            | TYP <sup>1</sup> | MAX  | MIN             | MAX  |      |
| V <sub>OH</sub>  | HIGH level output voltage; all outputs      | V <sub>CC</sub> = 1.2V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 100μA |                | 1.2              |      |                 |      | V    |
|                  |                                             | V <sub>CC</sub> = 2.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 100μA | 1.8            | 2.0              |      | 1.8             |      |      |
|                  |                                             | V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 100μA | 2.5            | 2.7              |      | 2.5             |      |      |
|                  |                                             | V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 100μA | 2.8            | 3.0              |      | 2.8             |      |      |
|                  |                                             | V <sub>CC</sub> = 4.5V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 100μA | 4.3            | 4.5              |      | 4.3             |      |      |
| V <sub>OH</sub>  | HIGH level output voltage; STANDARD outputs | V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 6mA   | 2.40           | 2.82             |      | 2.20            |      | V    |
|                  |                                             | V <sub>CC</sub> = 4.5V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; -I <sub>O</sub> = 12mA  | 3.60           | 4.20             |      | 3.50            |      |      |
| V <sub>OL</sub>  | LOW level output voltage; all outputs       | V <sub>CC</sub> = 1.2V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100μA  |                | 0                |      |                 |      | V    |
|                  |                                             | V <sub>CC</sub> = 2.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100μA  |                | 0                | 0.2  |                 | 0.2  |      |
|                  |                                             | V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100μA  |                | 0                | 0.2  |                 | 0.2  |      |
|                  |                                             | V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100μA  |                | 0                | 0.2  |                 | 0.2  |      |
|                  |                                             | V <sub>CC</sub> = 4.5V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100μA  |                | 0                | 0.2  |                 | 0.2  |      |
| V <sub>OL</sub>  | LOW level output voltage; STANDARD outputs  | V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 6mA    |                | 0.25             | 0.40 |                 | 0.50 | V    |
|                  |                                             | V <sub>CC</sub> = 4.5V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 12mA   |                | 0.35             | 0.55 |                 | 0.65 |      |
| I <sub>I</sub>   | Input leakage current                       | V <sub>CC</sub> = 5.5V; V <sub>I</sub> = V <sub>CC</sub> or GND                                       |                |                  | 1.0  |                 | 1.0  | μA   |
| I <sub>CC</sub>  | Quiescent supply current; SSI               | V <sub>CC</sub> = 5.5V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0                   |                |                  | 20.0 |                 | 40   | μA   |
| ΔI <sub>CC</sub> | Additional quiescent supply current         | V <sub>CC</sub> = 2.7V to 3.6V; V <sub>I</sub> = V <sub>CC</sub> - 0.6V                               |                |                  | 500  |                 | 850  | μA   |

**NOTE:**

- All typical values are measured at  $T_{amb} = 25^\circ C$ .

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TRANSFER CHARACTERISTICS

Voltages are referenced to GND (ground = 0 V)

| SYMBOL          | PARAMETER                                       | T <sub>amb</sub> (°C) |      |      |             |      | UNIT | TEST CONDITIONS     |                |
|-----------------|-------------------------------------------------|-----------------------|------|------|-------------|------|------|---------------------|----------------|
|                 |                                                 | −40 TO +85            |      |      | −40 TO +125 |      |      | V <sub>CC</sub> (V) | WAVEFORMS      |
|                 |                                                 | MIN.                  | TYP. | MAX. | MIN.        | MIN. |      |                     |                |
| V <sub>T+</sub> | Positive-going threshold                        | −                     | 0.70 | −    | −           | −    | V    | 1.2                 | Figure 1 and 2 |
|                 |                                                 | 0.8                   | 1.10 | 1.4  | 0.8         | 1.4  |      | 2.0                 |                |
|                 |                                                 | 1.0                   | 1.45 | 2.0  | 1.0         | 2.0  |      | 2.7                 |                |
|                 |                                                 | 1.2                   | 1.60 | 2.2  | 1.2         | 2.2  |      | 3.0                 |                |
|                 |                                                 | 1.5                   | 1.95 | 2.4  | 1.5         | 2.4  |      | 3.6                 |                |
|                 |                                                 | 1.7                   | 2.50 | 3.15 | 1.7         | 3.15 |      | 4.5                 |                |
|                 |                                                 | 2.1                   | 3.00 | 3.85 | 2.1         | 3.85 |      | 5.5                 |                |
| V <sub>T−</sub> | Negative-going threshold                        | −                     | 0.34 | −    | −           | −    | V    | 1.2                 | Figure 1 and 2 |
|                 |                                                 | 0.3                   | 0.65 | 0.9  | 0.3         | 0.9  |      | 2.0                 |                |
|                 |                                                 | 0.4                   | 0.90 | 1.4  | 0.4         | 1.4  |      | 2.7                 |                |
|                 |                                                 | 0.6                   | 1.05 | 1.5  | 0.6         | 1.5  |      | 3.0                 |                |
|                 |                                                 | 0.8                   | 1.30 | 1.8  | 0.8         | 1.8  |      | 3.6                 |                |
|                 |                                                 | 0.9                   | 1.60 | 2.0  | 0.9         | 2.0  |      | 4.5                 |                |
|                 |                                                 | 1.1                   | 2.00 | 2.6  | 1.1         | 2.6  |      | 5.5                 |                |
| V <sub>H</sub>  | Hysteresis (V <sub>T+</sub> − V <sub>T−</sub> ) | −                     | 0.30 | −    | −           | −    | V    | 1.2                 | Figure 1 and 2 |
|                 |                                                 | 0.2                   | 0.55 | 0.8  | 0.2         | 0.8  |      | 2.0                 |                |
|                 |                                                 | 0.3                   | 0.60 | 1.1  | 0.3         | 1.1  |      | 2.7                 |                |
|                 |                                                 | 0.4                   | 0.65 | 1.2  | 0.4         | 1.2  |      | 3.0                 |                |
|                 |                                                 | 0.4                   | 0.70 | 1.2  | 0.4         | 1.2  |      | 3.6                 |                |
|                 |                                                 | 0.4                   | 0.80 | 1.4  | 0.4         | 1.4  |      | 4.5                 |                |
|                 |                                                 | 0.6                   | 1.00 | 1.5  | 0.6         | 1.5  |      | 5.5                 |                |

- NOTES:
- 1. All typical values are measured at T<sub>amb</sub> = 25°C
  - 2. The V<sub>IH</sub> and V<sub>IL</sub> from the DC family characteristics are superseded by the V<sub>T+</sub> and V<sub>T−</sub>.

AC CHARACTERISTICS

GND = 0V; t<sub>r</sub> ≤ t<sub>f</sub> = 2.5ns; C<sub>L</sub> = 50pF; R<sub>L</sub> = 1KΩ

| SYMBOL                | PARAMETER                     | WAVEFORM | CONDITION           | LIMITS        |                  |     |                |     | UNIT |
|-----------------------|-------------------------------|----------|---------------------|---------------|------------------|-----|----------------|-----|------|
|                       |                               |          |                     | −40 to +85 °C |                  |     | −40 to +125 °C |     |      |
|                       |                               |          | V <sub>CC</sub> (V) | MIN           | TYP <sup>1</sup> | MAX | MIN            | MAX |      |
| t <sub>PHL</sub> /PLH | Propagation delay<br>nA to nY | Figure 6 | 1.2                 |               | 80               |     |                |     | ns   |
|                       |                               |          | 2.0                 |               | 27               | 37  | 48             |     |      |
|                       |                               |          | 2.7                 |               | 20               | 28  | 35             |     |      |
|                       |                               |          | 3.0 to 3.6          |               | 15 <sup>2</sup>  | 22  | 28             |     |      |
|                       |                               |          | 4.5 to 5.5          |               |                  | 18  | 23             |     |      |

- NOTES:
- 1. Unless otherwise stated, all typical values are measured at T<sub>amb</sub> = 25°C
  - 2. Typical values are measured at V<sub>CC</sub> = 3.3 V.

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TRANSFER CHARACTERISTIC WAVEFORMS

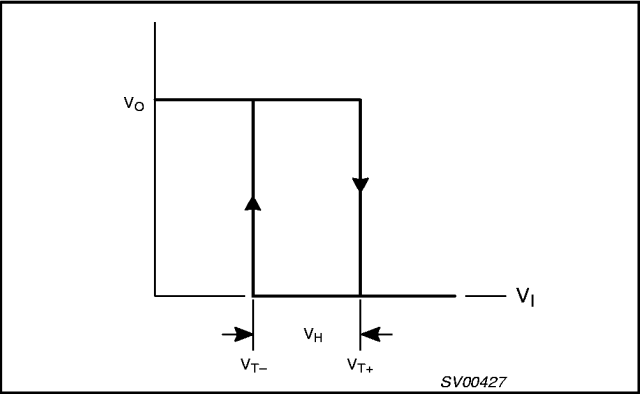


Figure 1. Transfer characteristic.

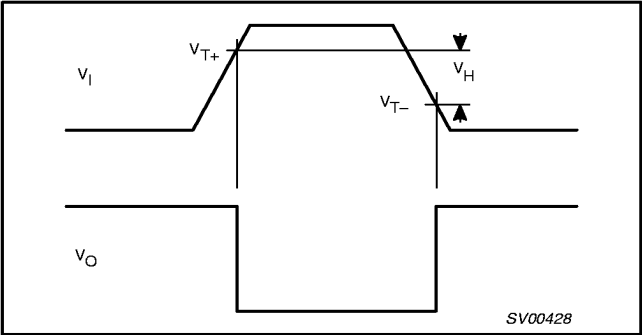


Figure 2. Definition of  $V_{T+}$ ,  $V_{T-}$  and  $V_H$ ; where  $V_{T+}$  and  $V_{T-}$  are between limits of 20% and 70%

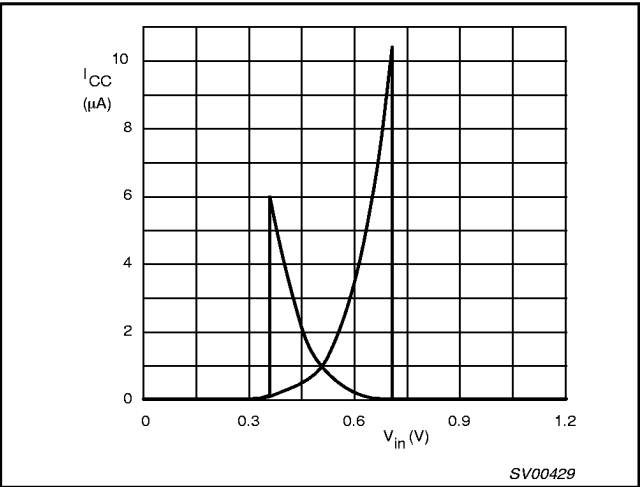


Figure 3. Typical 74LV14 transfer characteristics;  $V_{CC} = 1.2V$ .

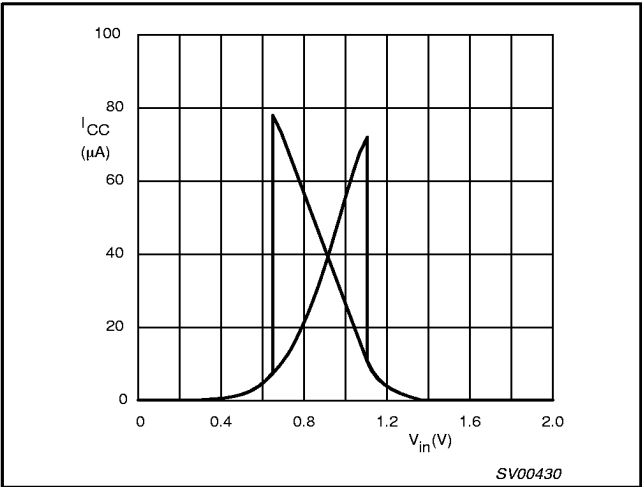


Figure 4. Typical 74LV14 transfer characteristics;  $V_{CC} = 2.0V$ .

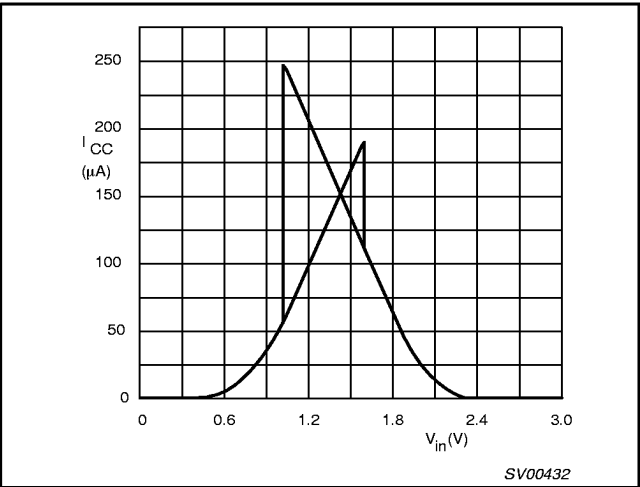


Figure 5. Typical 74LV14 transfer characteristics;  $V_{CC} = 3.0V$ .

AC WAVEFORMS

$V_M = 1.5 V$  at  $V_{CC} \geq 2.7 V$ ;  
 $V_M = 0.5 \times V_{CC}$  at  $V_{CC} < 2.7 V$   
 $V_{OL}$  and  $V_{OH}$  are the typical output voltage drop that occur with the output load.

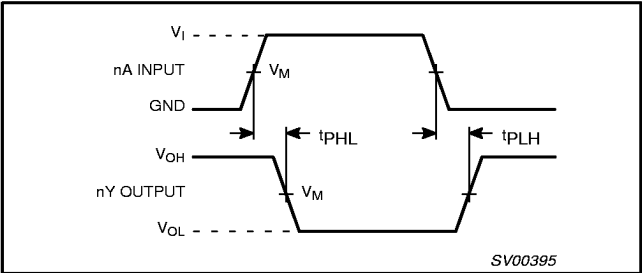


Figure 6. Input (nA) to output (nY) propagation delays.

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## APPLICATION INFORMATION

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

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

**Where:**

$P_{ad}$  = additional power dissipation ( $\mu W$ )

$f_i$  = input frequency (MHz)

$t_r$  = input rise time (ns); 10% – 90%

$t_f$  = input fall time (ns); 10% – 90%

$I_{CCa}$  = average additional supply current ( $\mu A$ )

Average  $I_{CCa}$  differs with positive or negative input transitions, as shown in Figure 7.

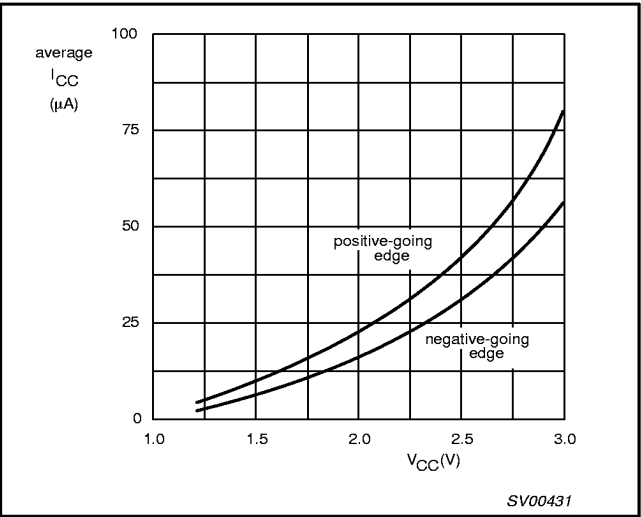


Figure 7. Average  $I_{CC}$  for LV Schmitt-trigger devices; linear change of  $V_I$  between  $0.1 V_{CC}$  to  $0.9 V_{CC}$ .

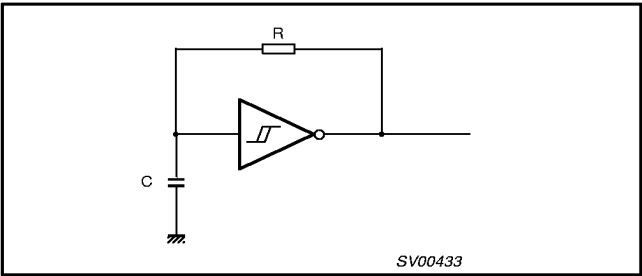


Figure 8. Relaxation oscillator using the LV14.

**Note to application information:**

All values given are typical unless otherwise specified.

Note to Figure 8

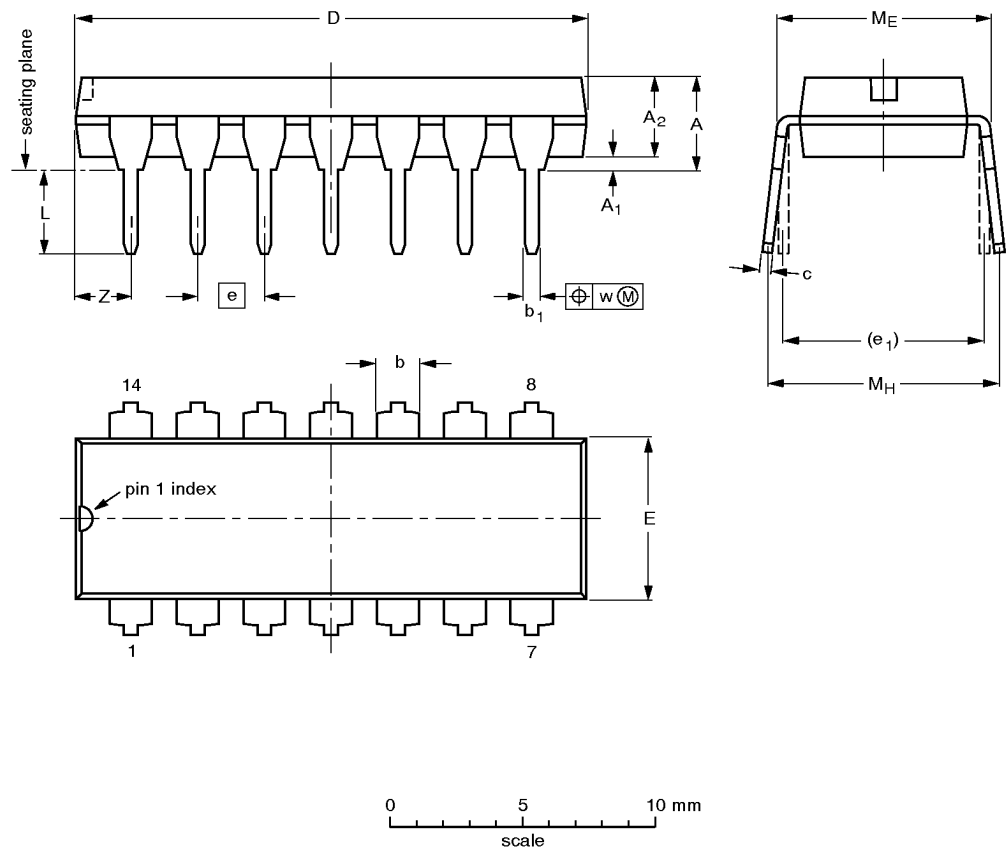
$$f = \frac{1}{T} \approx \frac{1}{0.8 \times RC}$$

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

SOT27-1



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

| UNIT   | A<br>max. | A <sub>1</sub><br>min. | A <sub>2</sub><br>max. | b              | b <sub>1</sub> | c              | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | e <sub>1</sub> | L            | M <sub>E</sub> | M <sub>H</sub> | w     | Z <sup>(1)</sup><br>max. |
|--------|-----------|------------------------|------------------------|----------------|----------------|----------------|------------------|------------------|------|----------------|--------------|----------------|----------------|-------|--------------------------|
| mm     | 4.2       | 0.51                   | 3.2                    | 1.73<br>1.13   | 0.53<br>0.38   | 0.36<br>0.23   | 19.50<br>18.55   | 6.48<br>6.20     | 2.54 | 7.62           | 3.60<br>3.05 | 8.25<br>7.80   | 10.0<br>8.3    | 0.254 | 2.2                      |
| inches | 0.17      | 0.020                  | 0.13                   | 0.068<br>0.044 | 0.021<br>0.015 | 0.014<br>0.009 | 0.77<br>0.73     | 0.26<br>0.24     | 0.10 | 0.30           | 0.14<br>0.12 | 0.32<br>0.31   | 0.39<br>0.33   | 0.01  | 0.087                    |

**Note**  
1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

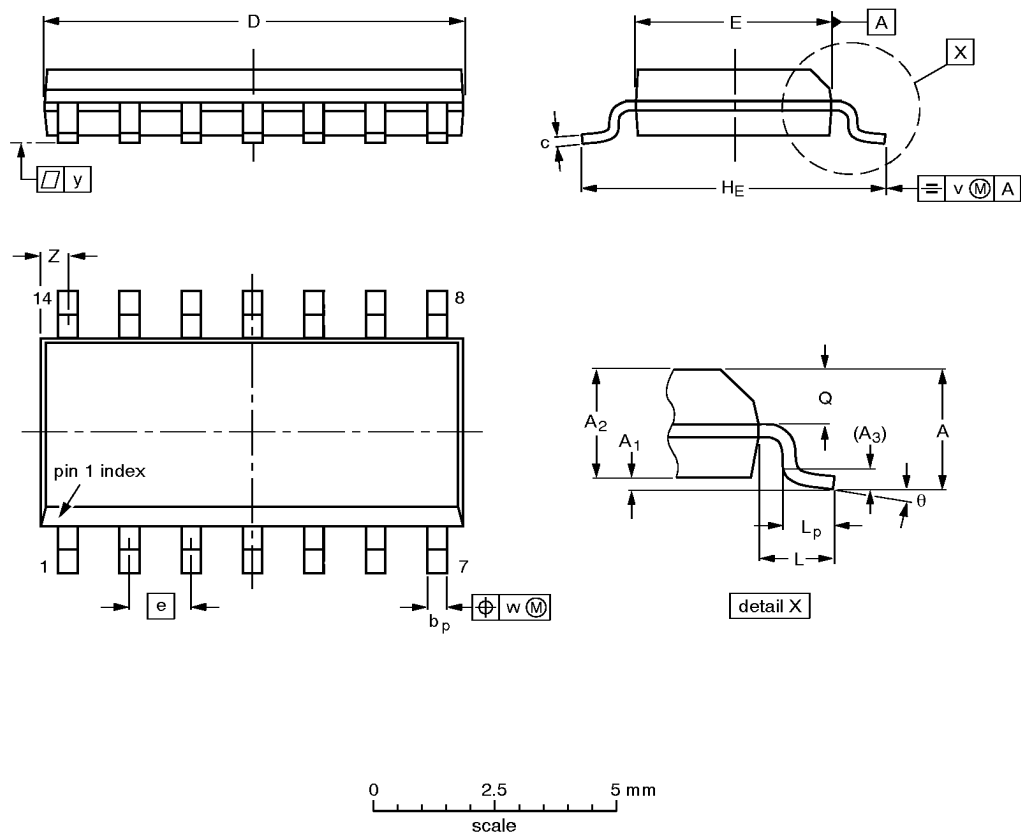
| OUTLINE<br>VERSION | REFERENCES |          |      |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|----------|------|--|------------------------|----------------------|
|                    | IEC        | JEDEC    | EIAJ |  |                        |                      |
| SOT27-1            | 050G04     | MO-001AA |      |  |                        | 92-11-17<br>95-03-11 |

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74LV14

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 <sub>max.</sub> | A <sub>1</sub>   | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c                | D <sup>(1)</sup> | E <sup>(1)</sup> | e     | H <sub>E</sub> | L     | L <sub>p</sub> | Q              | v    | w    | y     | Z <sup>(1)</sup> | θ        |
|--------|-------------------|------------------|----------------|----------------|----------------|------------------|------------------|------------------|-------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm     | 1.75              | 0.25<br>0.10     | 1.45<br>1.25   | 0.25           | 0.49<br>0.36   | 0.25<br>0.19     | 8.75<br>8.55     | 4.0<br>3.8       | 1.27  | 6.2<br>5.8     | 1.05  | 1.0<br>0.4     | 0.7<br>0.6     | 0.25 | 0.25 | 0.1   | 0.7<br>0.3       | 8°<br>0° |
| inches | 0.069             | 0.0098<br>0.0039 | 0.057<br>0.049 | 0.01           | 0.019<br>0.014 | 0.0098<br>0.0075 | 0.35<br>0.34     | 0.16<br>0.15     | 0.050 | 0.24<br>0.23   | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012   |          |

Note  
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE<br>VERSION | REFERENCES |          |      |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|----------|------|--|------------------------|----------------------|
|                    | IEC        | JEDEC    | EIAJ |  |                        |                      |
| SOT108-1           | 076E06S    | MS-012AB |      |  |                        | 91-08-13<br>95-01-23 |

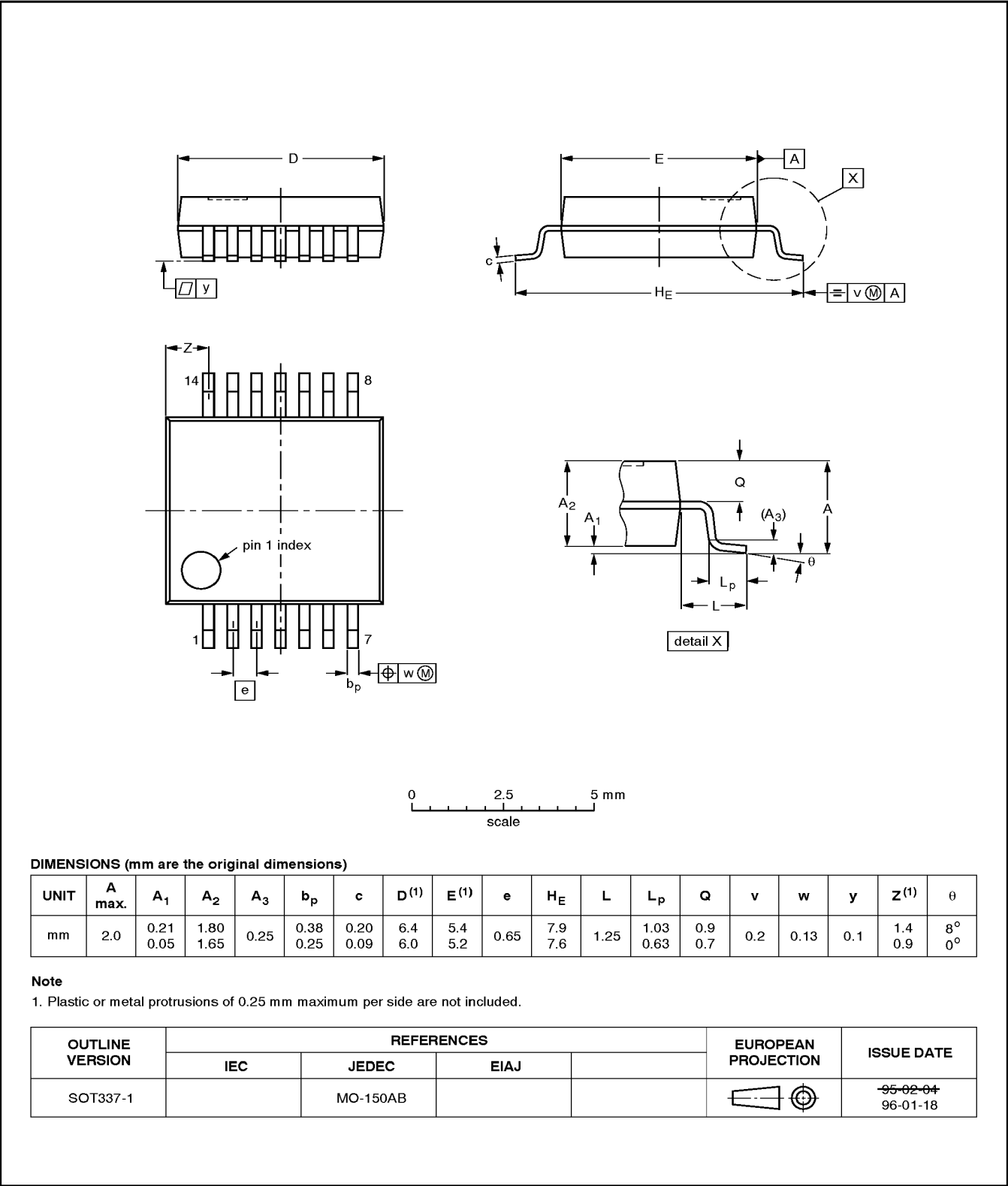
Hex inverting Schmitt-trigger

74LV14

[查询"74LV14DB-T"供应商](#)

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1



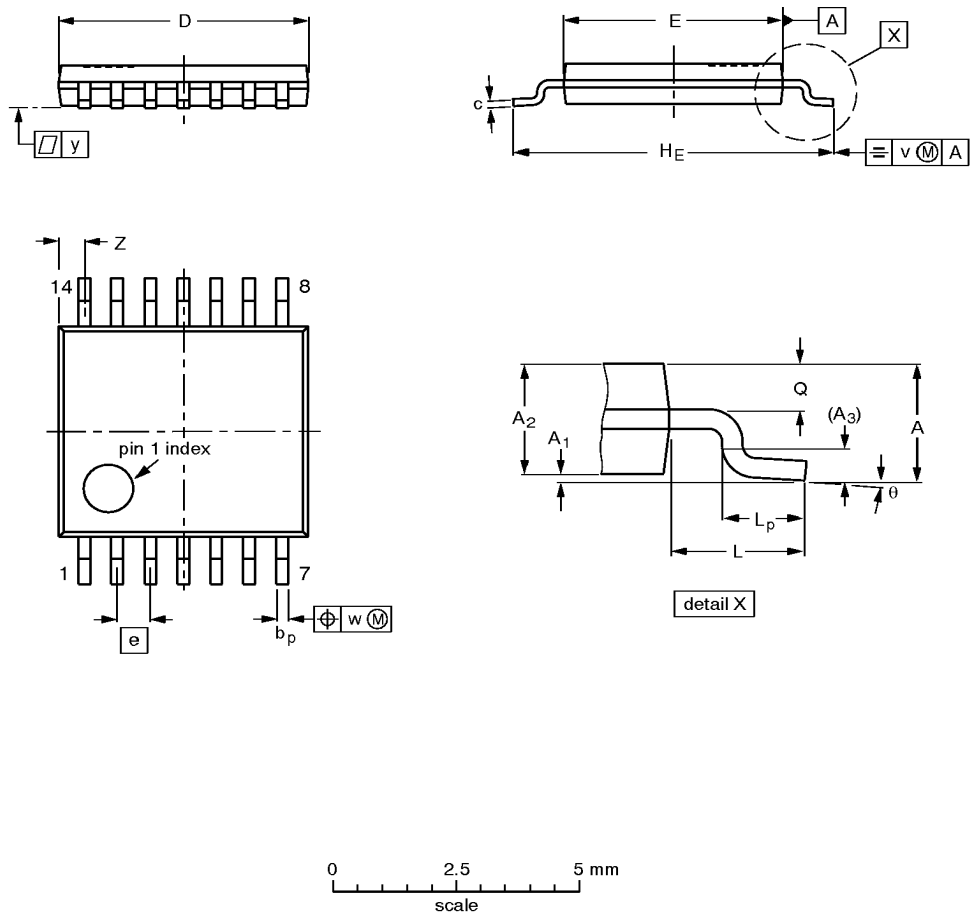
Hex inverting Schmitt-trigger

[查询"74LV14DB-T"供应商](#)

74LV14

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

SOT402-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A<br>max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c          | D <sup>(1)</sup> | E <sup>(2)</sup> | e    | H <sub>E</sub> | L   | L <sub>p</sub> | Q          | v   | w    | y   | Z <sup>(1)</sup> | θ        |
|------|-----------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|-----|----------------|------------|-----|------|-----|------------------|----------|
| mm   | 1.10      | 0.15<br>0.05   | 0.95<br>0.80   | 0.25           | 0.30<br>0.19   | 0.2<br>0.1 | 5.1<br>4.9       | 4.5<br>4.3       | 0.65 | 6.6<br>6.2     | 1.0 | 0.75<br>0.50   | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.72<br>0.38     | 8°<br>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<br>VERSION | REFERENCES |        |      |  | EUROPEAN<br>PROJECTION | ISSUE DATE            |
|--------------------|------------|--------|------|--|------------------------|-----------------------|
|                    | IEC        | JEDEC  | EIAJ |  |                        |                       |
| SOT402-1           |            | MO-153 |      |  |                        | 94-07-12-<br>95-04-04 |