

## Triple 3-input AND gate

74LV11

## FEATURES

- 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

## DESCRIPTION

The 74LV11 is a low-voltage Si-gate CMOS device and is pin and function compatible with 74HC/HCT11.

The 74LV11 provides the 3-input AND function.

## 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, nB, nC to nY  | $C_L = 15$ pF;<br>$V_{CC} = 3.3$ V | 10      | ns   |
| $C_I$             | Input capacitance                      |                                    | 3.5     | pF   |
| $C_{PD}$          | Power dissipation capacitance per gate | See Notes 1 and 2                  | 18      | 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  $V_I = \text{GND to } V_{CC}$ .

## ORDERING INFORMATION

| PACKAGES                    | TEMPERATURE RANGE                               | OUTSIDE NORTH AMERICA | NORTH AMERICA | PKG. DWG. # |
|-----------------------------|-------------------------------------------------|-----------------------|---------------|-------------|
| 14-Pin Plastic DIL          | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 74LV11 N              | 74LV11 N      | SOT27-1     |
| 14-Pin Plastic SO           | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 74LV11 D              | 74LV11 D      | SOT108-1    |
| 14-Pin Plastic SSOP Type II | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 74LV11 DB             | 74LV11 DB     | SOT337-1    |
| 14-Pin Plastic TSSOP Type I | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | 74LV11 PW             | 74LV11PW DH   | SOT402-1    |

## PIN DESCRIPTION

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

## FUNCTION TABLE

| INPUTS |    |    | OUTPUT |
|--------|----|----|--------|
| nA     | nB | nC | nY     |
| L      | L  | L  | L      |
| L      | L  | H  | L      |
| L      | H  | L  | L      |
| L      | H  | H  | L      |
| H      | L  | L  | L      |
| H      | L  | H  | L      |
| H      | H  | L  | L      |
| H      | H  | H  | H      |

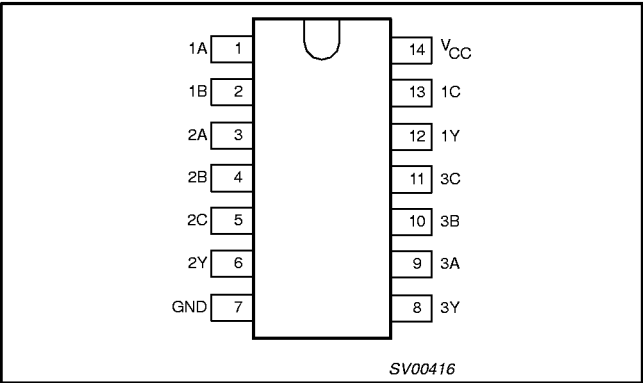
## NOTES:

H = HIGH voltage level  
L = LOW voltage level

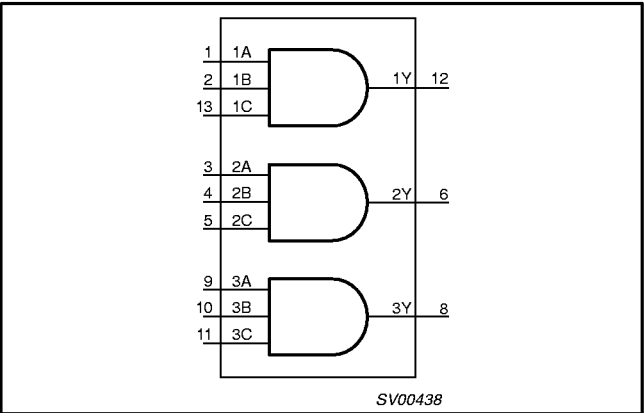
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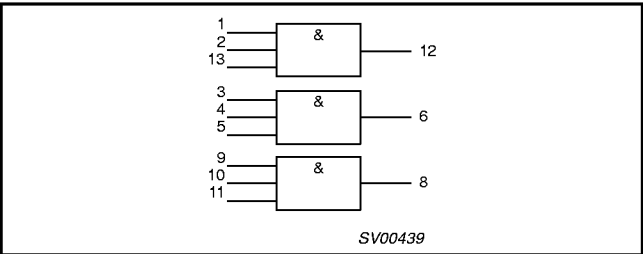
PIN CONFIGURATION



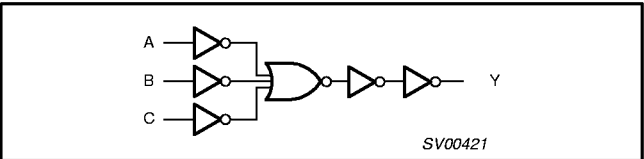
LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



LOGIC DIAGRAM (ONE GATE)



RECOMMENDED OPERATING CONDITIONS

| SYMBOL                          | PARAMETER                                       | CONDITIONS                                                                                         | MIN         | TYP         | MAX               | UNIT |
|---------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------|-------------|-------------------|------|
| V <sub>CC</sub>                 | DC supply voltage                               | See Note 1                                                                                         | 1.0         | 3.3         | 3.6               | 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<br>–40  |             | +85<br>+125       | °C   |
| t <sub>r</sub> , t <sub>f</sub> | Input rise and fall times                       | V <sub>CC</sub> = 1.0V to 2.0V<br>V <sub>CC</sub> = 2.0V to 2.7V<br>V <sub>CC</sub> = 2.7V to 3.6V | –<br>–<br>– | –<br>–<br>– | 500<br>200<br>100 | ns/V |

**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> = 3.6V.

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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 +4.6      | 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 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>IH</sub> | HIGH level Input voltage                    | V <sub>CC</sub> = 1.2V                                                                                | 0.9            |                  |      | 0.9             |      | V    |
|                 |                                             | V <sub>CC</sub> = 2.0V                                                                                | 1.4            |                  |      | 1.4             |      |      |
|                 |                                             | V <sub>CC</sub> = 2.7 to 3.6V                                                                         | 2.0            |                  |      | 2.0             |      |      |
| V <sub>IL</sub> | LOW level Input voltage                     | V <sub>CC</sub> = 1.2V                                                                                |                |                  | 0.3  |                 | 0.3  | V    |
|                 |                                             | V <sub>CC</sub> = 2.0V                                                                                |                |                  | 0.6  |                 | 0.6  |      |
|                 |                                             | V <sub>CC</sub> = 2.7 to 3.6V                                                                         |                |                  | 0.8  |                 | 0.8  |      |
| 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>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>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>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    |
| I <sub>I</sub>  | Input leakage current                       | V <sub>CC</sub> = 3.6V; V <sub>I</sub> = V <sub>CC</sub> or GND                                       |                |                  | 1.0  |                 | 1.0  | μA   |

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DC CHARACTERISTICS FOR THE LV FAMILY (Continued)

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 |     |      |
| I <sub>CC</sub>  | Quiescent supply current; SSI                 | V <sub>CC</sub> = 3.6V; 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 per input | V <sub>CC</sub> = 2.7V to 3.6V; V <sub>I</sub> = V <sub>CC</sub> - 0.6V             |                |  | 500  |                 | 850 | μA   |

NOTE:

1. All typical values are measured at T<sub>amb</sub> = 25°C.

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, nB, nC to nY | Figures 1, 2 | 1.2                 |               | 60               |     |                |     | ns   |
|                       |                                       |              | 2.0                 |               | 20               | 39  |                | 46  |      |
|                       |                                       |              | 2.7                 |               | 15               | 29  |                | 34  |      |
|                       |                                       |              | 3.0 to 3.6          |               | 11 <sup>2</sup>  | 23  |                | 27  |      |

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.

AC WAVEFORMS

V<sub>M</sub> = 1.5 V at V<sub>CC</sub> ≥ 2.7 V

V<sub>M</sub> = 0.5 × V<sub>CC</sub> at V<sub>CC</sub> < 2.7 V

V<sub>OL</sub> and V<sub>OH</sub> are the typical output voltage drop that occur with the output load.

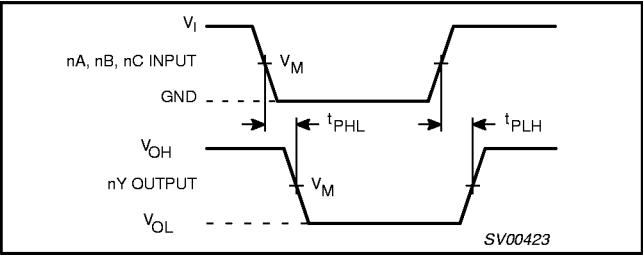


Figure 1. Input (nA, nB, nC) to output (nY) propagation delays.

TEST CIRCUIT

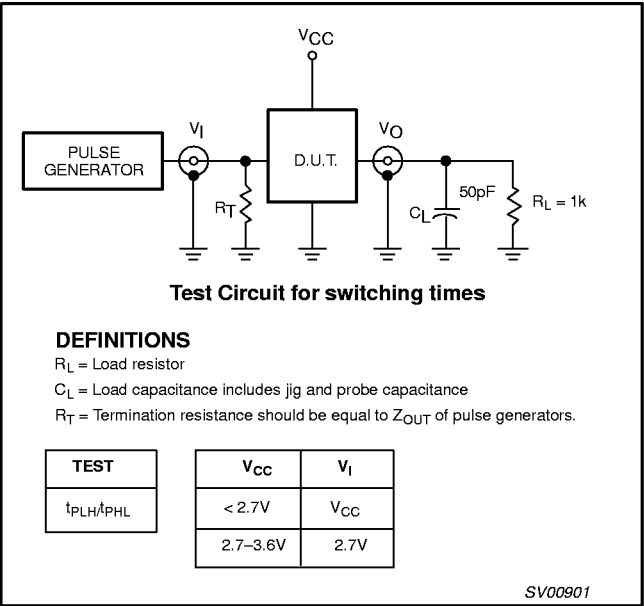


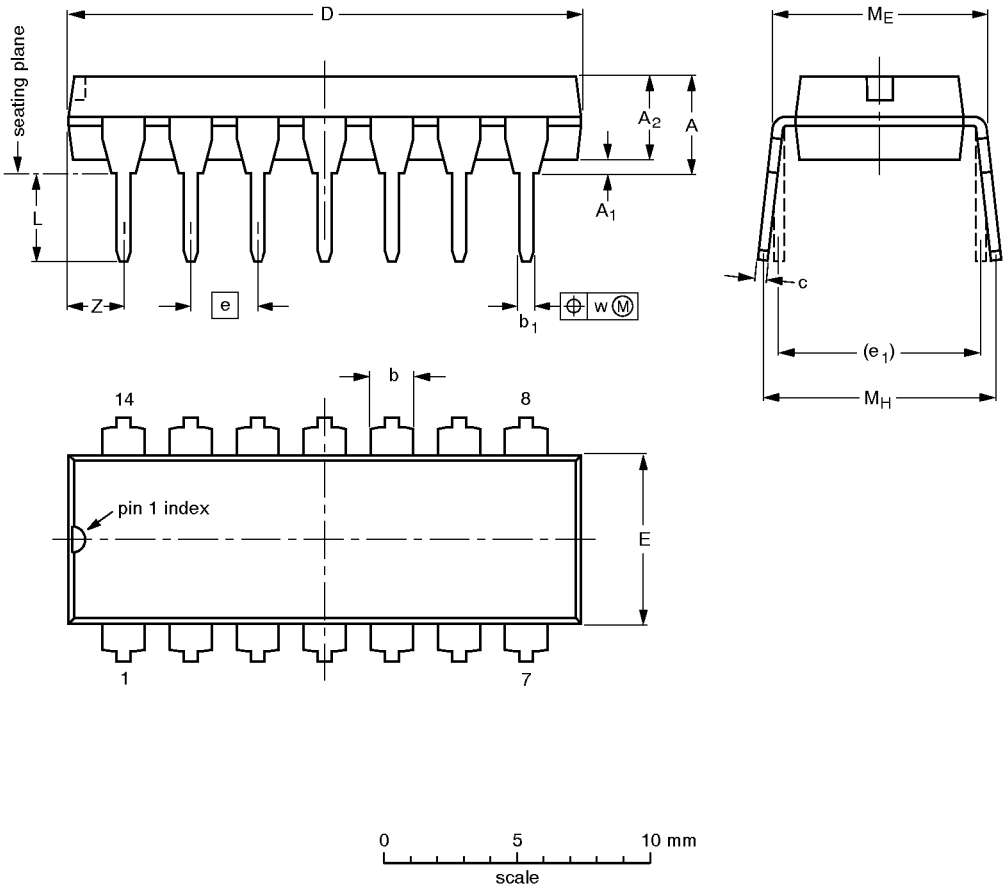
Figure 2. Load circuitry for switching times.

Triple 3-input AND gate

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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 max. | A <sub>1</sub> min. | A <sub>2</sub> 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> 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.

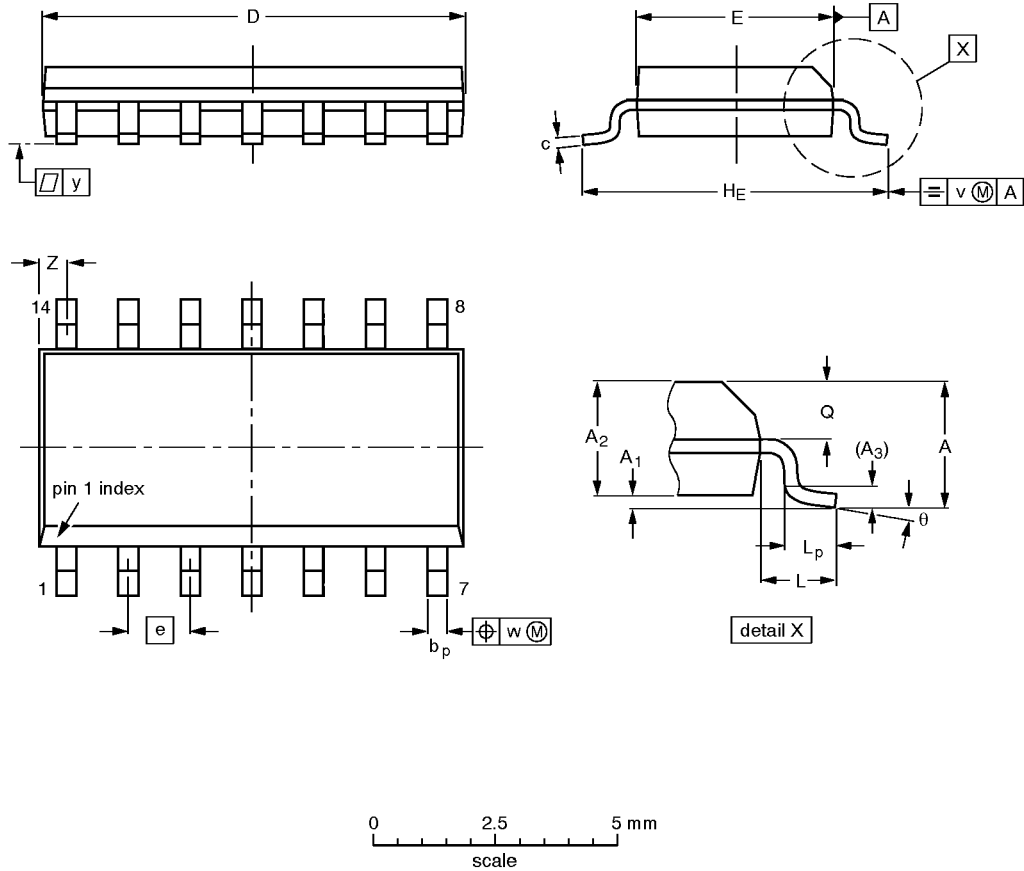
| OUTLINE<br>VERSION | REFERENCES |          |      |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE           |
|--------------------|------------|----------|------|--|---------------------------------------------------------------------------------------|----------------------|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

Triple 3-input AND gate

74LV11

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<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>(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.

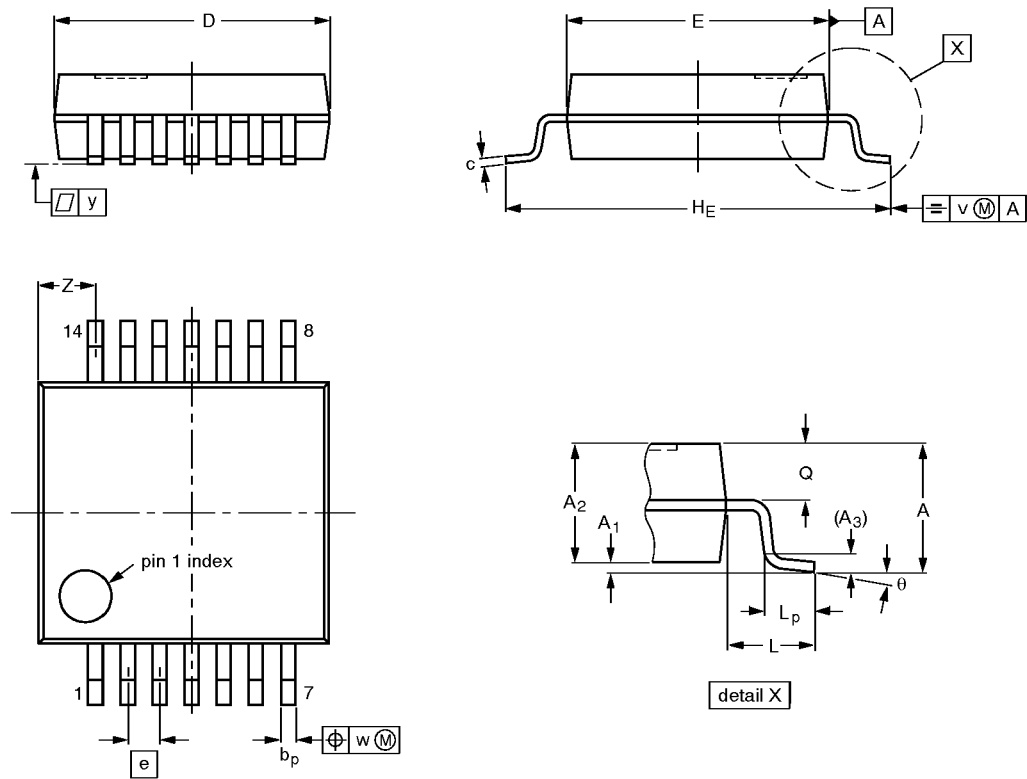
| OUTLINE<br>VERSION | REFERENCES |          |      |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|----------|------|--|------------------------|----------------------|
|                    | IEC        | JEDEC    | EIAJ |  |                        |         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

Triple 3-input AND gate

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

SOT337-1

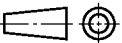


DIMENSIONS (mm are the original dimensions)

| 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>(1)</sup> | e    | H <sub>E</sub> | L    | L <sub>p</sub> | Q          | v   | w    | y   | Z <sup>(1)</sup> | θ        |
|------|-----------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|----------------|------|----------------|------------|-----|------|-----|------------------|----------|
| mm   | 2.0       | 0.21<br>0.05   | 1.80<br>1.65   | 0.25           | 0.38<br>0.25   | 0.20<br>0.09 | 6.4<br>6.0       | 5.4<br>5.2       | 0.65 | 7.9<br>7.6     | 1.25 | 1.03<br>0.63   | 0.9<br>0.7 | 0.2 | 0.13 | 0.1 | 1.4<br>0.9       | 8°<br>0° |

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 |  |                                                                                       |                                 |
| SOT337-1           |            | MO-150AB |      |  |  | <del>95-02-04</del><br>96-01-18 |

Triple 3-input AND gate

74LV11

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

SOT402-1

