

# 74LVT02

## 3.3 V Quad 2-input NOR gate

Rev. 3 — 7 April 2017

Product data sheet

### 1 General description

The 74LVT02 is a high-performance BiCMOS product designed for  $V_{CC}$  operation at 3.3 V.

The 74LVT02 is a quad 2-input NOR gate.

### 2 Features and benefits

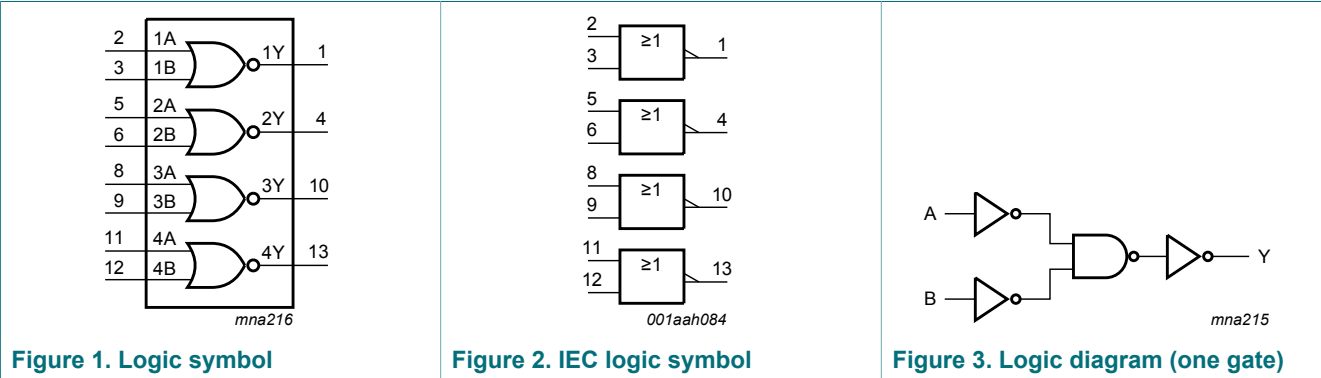
- Wide supply voltage range from 2.7 V to 3.6 V
- Output capability: +64 mA and -32 mA
- TTL input and output switching levels
- Latch-up protection
  - JESD78 Class II exceeds 500 mA
- Complies with JEDEC standards:
  - JESD8C (2.7 V to 3.6 V)
- ESD protection:
  - HBM JESD22-A114E exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to 85 °C

### 3 Ordering information

Table 1. Ordering information

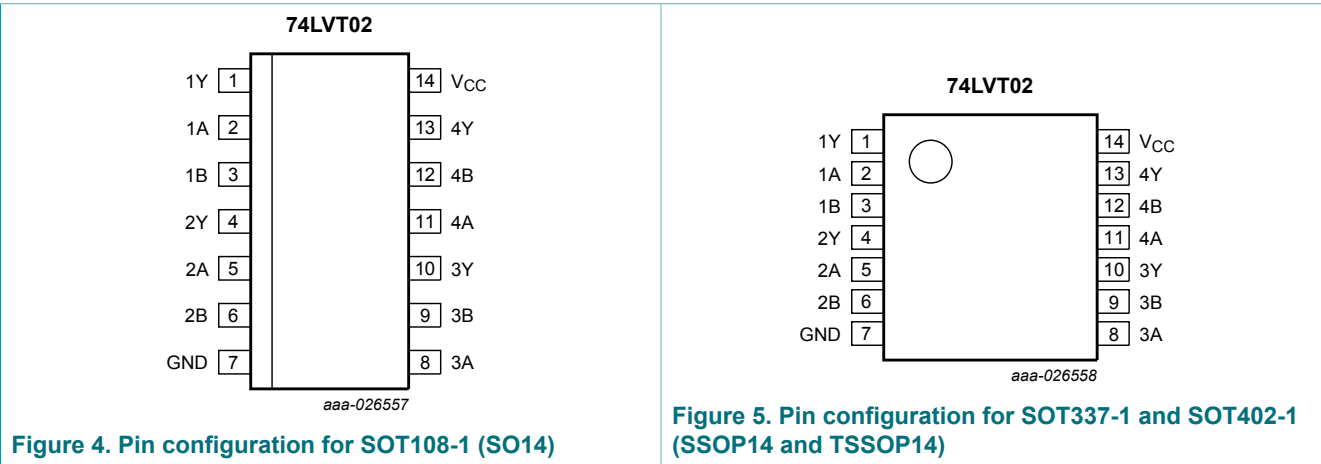
| Type number | Package           |         |                                                                        |          |
|-------------|-------------------|---------|------------------------------------------------------------------------|----------|
|             | Temperature range | Name    | Description                                                            | Version  |
| 74LVT02D    | -40 °C to +85 °C  | SO14    | plastic small outline package; 14 leads; body width 3.9 mm             | SOT108-1 |
| 74LVT02DB   | -40 °C to +85 °C  | SSOP14  | plastic shrink small outline package; 14 leads; body width 5.3 mm      | SOT337-1 |
| 74LVT02PW   | -40 °C to +85 °C  | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |

4 Functional diagram



5 Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

| Symbol          | Pin          | Description    |
|-----------------|--------------|----------------|
| 1Y to 4Y        | 1, 4, 10, 13 | data output    |
| 1A to 4A        | 2, 5, 8, 11  | data input     |
| 1B to 4B        | 3, 6, 9, 12  | data input     |
| GND             | 7            | ground (0 V)   |
| V <sub>CC</sub> | 14           | supply voltage |

## 6 Functional description

Table 3. Function table <sup>[1]</sup>

| Input |    | Output |
|-------|----|--------|
| nA    | nB | nY     |
| L     | L  | H      |
| L     | H  | L      |
| H     | L  | L      |
| H     | H  | L      |

[1] H = HIGH voltage level; L = LOW voltage level

## 7 Limiting values

Table 4. Limiting values

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

| Symbol           | Parameter               | Conditions                        | Min  | Max  | Unit |
|------------------|-------------------------|-----------------------------------|------|------|------|
| V <sub>CC</sub>  | supply voltage          |                                   | -0.5 | +4.6 | V    |
| V <sub>I</sub>   | input voltage           |                                   | -0.5 | +7.0 | V    |
| V <sub>O</sub>   | output voltage          | output in OFF-state or HIGH-state | -0.5 | +7.0 | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < 0 V              | -50  | -    | mA   |
| I <sub>OK</sub>  | output clamping current | V <sub>O</sub> < 0 V              | -50  | -    | mA   |
| I <sub>O</sub>   | output current          | output in LOW-state               | -    | 64   | mA   |
|                  |                         | output in HIGH-state              | -32  | -    | mA   |
| T <sub>stg</sub> | storage temperature     |                                   | -65  | +150 | °C   |
| T <sub>j</sub>   | junction temperature    |                                   | -    | 150  | °C   |
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 to +85 °C  | -    | 500  | mW   |

[1] The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

[2] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

[3] For SO14 packages: above 70 °C derate linearly with 8 mW/K.  
For SSOP14 and TSSOP14 packages: above 60 °C derate linearly with 5.5 mW/K.

## 8 Recommended operating conditions

Table 5. Operating conditions

| Symbol           | Parameter                           | Conditions      | Min | Typ | Max | Unit |
|------------------|-------------------------------------|-----------------|-----|-----|-----|------|
| V <sub>CC</sub>  | supply voltage                      |                 | 2.7 | -   | 3.6 | V    |
| V <sub>I</sub>   | input voltage                       |                 | 0   | -   | 5.5 | V    |
| I <sub>OH</sub>  | HIGH-level output current           |                 | -20 | -   | -   | mA   |
| I <sub>OL</sub>  | LOW-level output current            |                 | -   | -   | 32  | mA   |
| T <sub>amb</sub> | ambient temperature                 | in free-air     | -40 | -   | +85 | °C   |
| Δt/ΔV            | input transition rise and fall rate | outputs enabled | -   | -   | 10  | ns/V |

## 9 Static characteristics

**Table 6. Static characteristics**

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

| Symbol                                                                 | Parameter                 | Conditions                                                                                                                                                   | Min            | Typ <sup>[1]</sup> | Max       | Unit          |
|------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|-----------|---------------|
| $T_{amb} = -40\text{ }^{\circ}\text{C to }+85\text{ }^{\circ}\text{C}$ |                           |                                                                                                                                                              |                |                    |           |               |
| $V_{IK}$                                                               | input clamping voltage    | $V_{CC} = 2.7\text{ V}; I_{IK} = -18\text{ mA}$                                                                                                              | -1.2           |                    | -         | V             |
| $V_{IH}$                                                               | HIGH-level input voltage  |                                                                                                                                                              | 2.0            | -                  | -         | V             |
| $V_{IL}$                                                               | LOW-level input voltage   |                                                                                                                                                              | -              | -                  | 0.8       | V             |
| $V_{OH}$                                                               | HIGH-level output voltage | $V_{CC} = 2.7\text{ V to }3.6\text{ V}; I_{OH} = -100\text{ }\mu\text{A}$                                                                                    | $V_{CC} - 0.2$ |                    | -         | V             |
|                                                                        |                           | $V_{CC} = 2.7\text{ V}; I_{OH} = -6\text{ mA}$                                                                                                               | 2.4            | -                  | -         | V             |
|                                                                        |                           | $V_{CC} = 3.0\text{ V}; I_{OH} = -20\text{ mA}$                                                                                                              | 2.0            | -                  | -         | V             |
| $V_{OL}$                                                               | LOW-level output voltage  | $V_{CC} = 2.7\text{ V}; I_{OL} = 100\text{ }\mu\text{A}$                                                                                                     | -              |                    | 0.2       | V             |
|                                                                        |                           | $V_{CC} = 2.7\text{ V}; I_{OL} = 24\text{ mA}$                                                                                                               | -              |                    | 0.5       | V             |
|                                                                        |                           | $V_{CC} = 3.0\text{ V}; I_{OL} = 32\text{ mA}$                                                                                                               | -              |                    | 0.5       | V             |
| $I_I$                                                                  | input leakage current     | $V_{CC} = 0\text{ V or }3.6\text{ V}; V_I = 5.5\text{ V}$                                                                                                    | -              | -                  | 10        | $\mu\text{A}$ |
|                                                                        |                           | $V_{CC} = 3.6\text{ V}; V_I = V_{CC}\text{ or GND}$                                                                                                          |                | -                  | $\pm 1$   | $\mu\text{A}$ |
| $I_{OFF}$                                                              | power-off leakage current | $V_{CC} = 0\text{ V}; V_I\text{ or }V_O = 0\text{ V to }4.5\text{ V}$                                                                                        |                |                    | $\pm 100$ | $\mu\text{A}$ |
| $I_{CC}$                                                               | supply current            | $V_{CC} = 3.6\text{ V}; V_I = \text{GND or }V_{CC}; I_O = 0\text{ A}$                                                                                        |                |                    |           |               |
|                                                                        |                           | output HIGH                                                                                                                                                  | -              | -                  | 0.02      | mA            |
|                                                                        |                           | output LOW                                                                                                                                                   | -              | 1                  | 2         | mA            |
| $\Delta I_{CC}$                                                        | additional supply current | per input pin; $V_{CC} = 3.0\text{ V to }3.6\text{ V};$<br>one input at $V_{CC} - 0.6\text{ V}$<br>and other inputs at $V_{CC}\text{ or GND}$ <sup>[2]</sup> | -              |                    | 0.2       | $\mu\text{A}$ |
| $C_I$                                                                  | input capacitance         | $V_I = 0\text{ V or }3.0\text{ V}$                                                                                                                           | -              | 3                  | -         | pF            |

[1] Typical values are measured at  $T_{amb} = 25\text{ }^{\circ}\text{C}$  and  $V_{CC} = 3.3\text{ V}$ .

[2] This is the increase in supply current for each input at the specified voltage level other than  $V_{CC}$  or GND.

10 Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

| Symbol                              | Parameter                     | Conditions                                   | Min | Typ <sup>[1]</sup> | Max | Unit |
|-------------------------------------|-------------------------------|----------------------------------------------|-----|--------------------|-----|------|
| T <sub>amb</sub> = -40 °C to +85 °C |                               |                                              |     |                    |     |      |
| t <sub>PLH</sub>                    | LOW to HIGH propagation delay | nA or nB to nY; see <a href="#">Figure 6</a> |     |                    |     |      |
|                                     |                               | V <sub>CC</sub> = 2.7 V                      | -   | -                  | 5.2 | ns   |
|                                     |                               | V <sub>CC</sub> = 3.0 V to 3.6 V             | 1   | 2.8                | 4.4 | ns   |
| t <sub>PHL</sub>                    | HIGH to LOW propagation delay | nA or nB to nY; see <a href="#">Figure 6</a> |     |                    |     |      |
|                                     |                               | V <sub>CC</sub> = 2.7 V                      | -   | -                  | 3.4 | ns   |
|                                     |                               | V <sub>CC</sub> = 3.0 V to 3.6 V             | 1   | 2.6                | 3.6 | ns   |

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 3.3 V.

10.1 Waveforms and test circuit

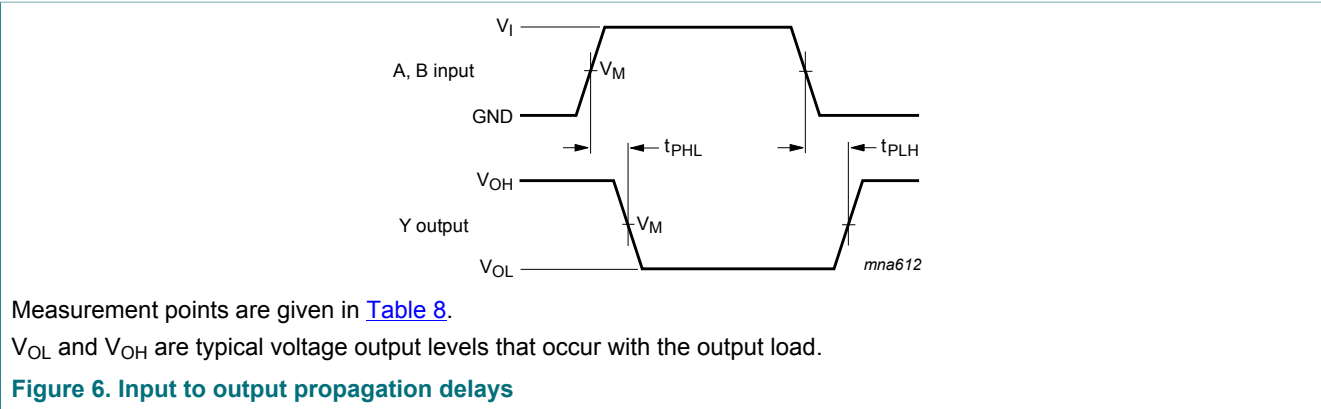
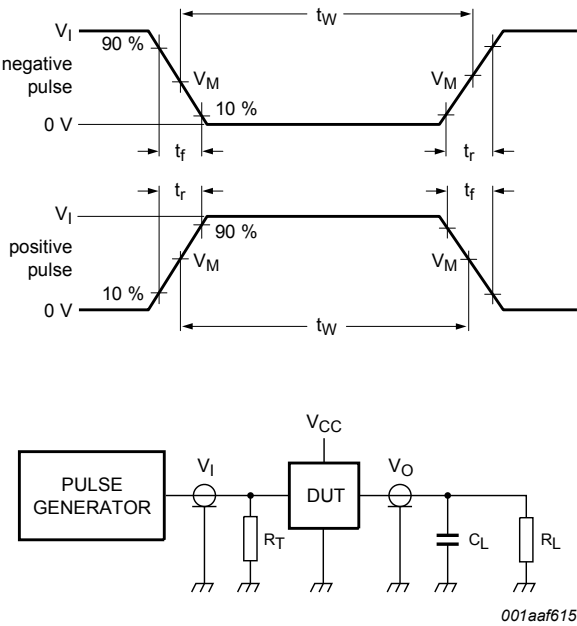


Table 8. Measurement points

| Input          |                | Output         |
|----------------|----------------|----------------|
| V <sub>M</sub> | V <sub>I</sub> | V <sub>M</sub> |
| 1.5 V          | 2.7 V          | 1.5 V          |



Test data is given in [Table 9](#).

Definitions test circuit:

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

$C_L$  = load capacitance including jig and probe capacitance.

$R_L$  = load resistance.

Figure 7. Test circuit for measuring switching times

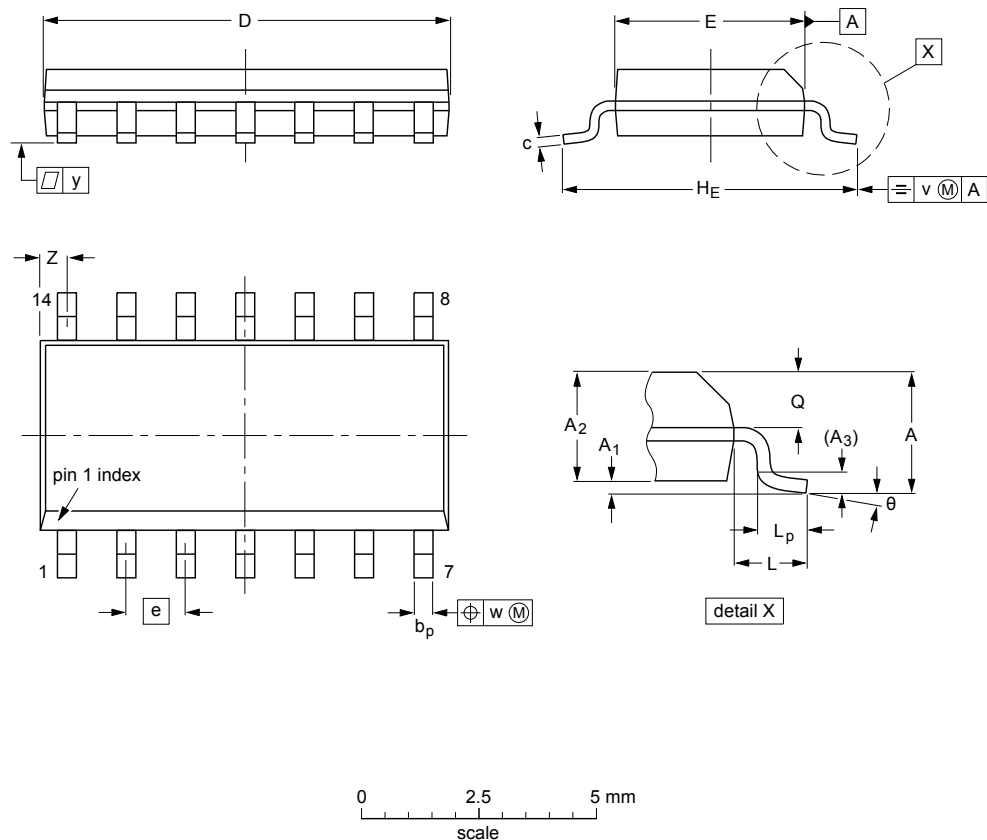
Table 9. Test data

| Input |               |        |               | Load  |              | Test               |
|-------|---------------|--------|---------------|-------|--------------|--------------------|
| $V_I$ | $f_i$         | $t_W$  | $t_r, t_f$    | $C_L$ | $R_L$        |                    |
| 2.7 V | $\leq 10$ MHz | 500 ns | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | $t_{PLH}, t_{PHL}$ |

11 Package outline

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     | 0.010<br>0.004 | 0.057<br>0.049 | 0.01           | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.35<br>0.34     | 0.16<br>0.15     | 0.05 | 0.244<br>0.228 | 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 (0.006 inch) maximum per side are not included.

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

Figure 8. Package outline SOT108-1 (SO14)

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

SOT337-1

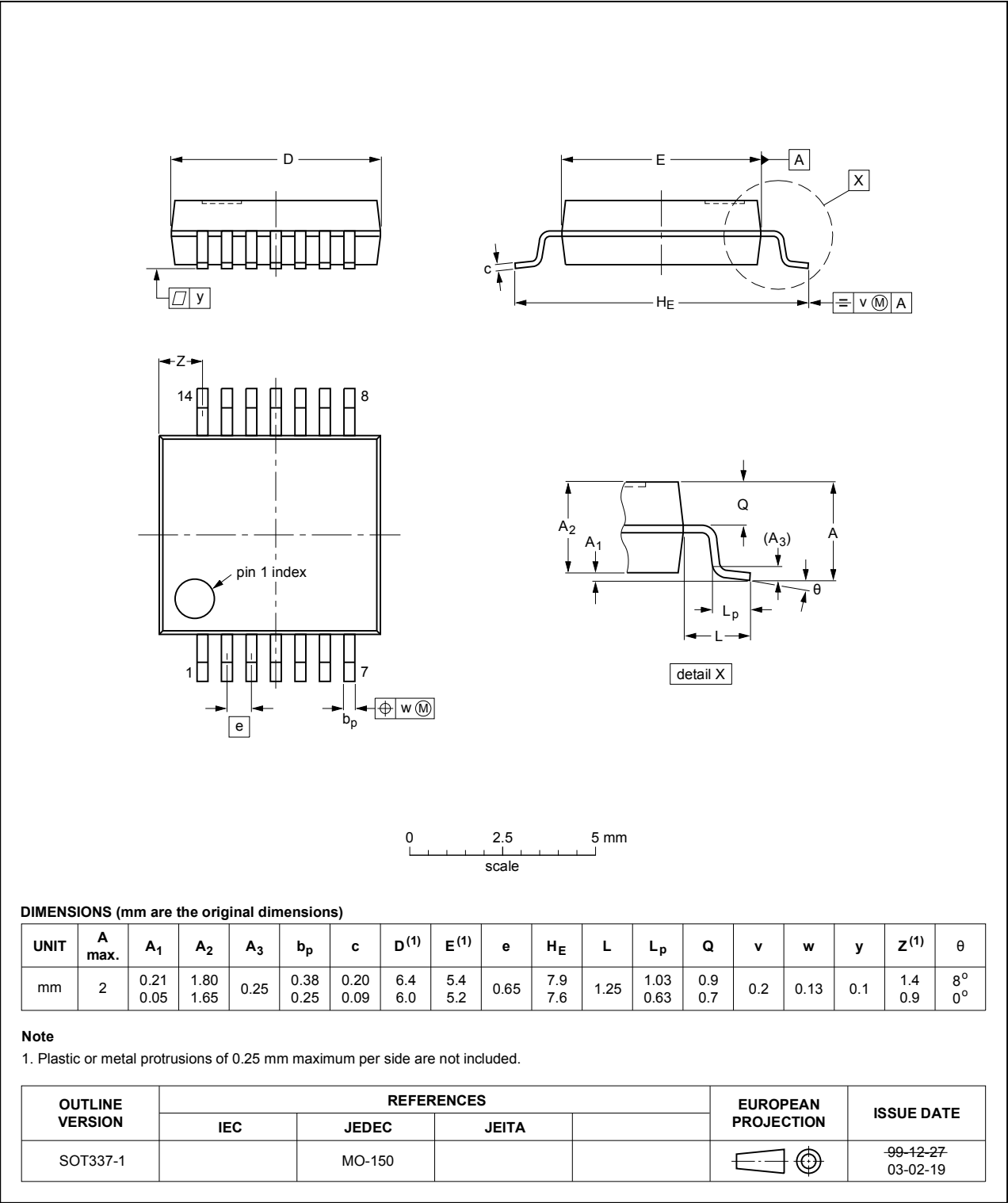
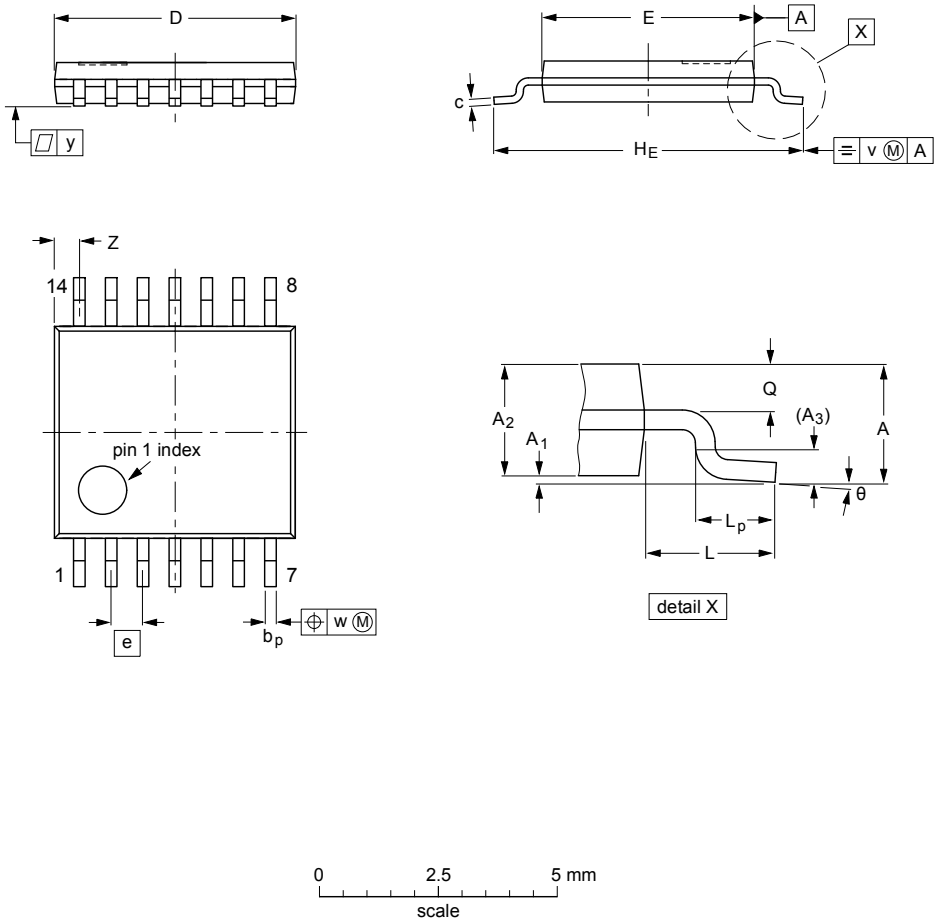


Figure 9. Package outline SOT337-1 (SSOP14)

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

SOT402-1



DIMENSIONS (mm are the original 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>(2)</sup> | e    | H <sub>E</sub> | L | L <sub>p</sub> | Q          | v   | w    | y   | Z <sup>(1)</sup> | θ        |
|------|-------------------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|---|----------------|------------|-----|------|-----|------------------|----------|
| mm   | 1.1               | 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 | 0.75<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  | JEITA |  |                        |                        |
| SOT402-1           |            | MO-153 |       |  |                        | -99-12-27-<br>03-02-18 |

Figure 10. Package outline SOT402-1 (TSSOP14)

## 12 Abbreviations

Table 10. Abbreviations

| Acronym | Description                                     |
|---------|-------------------------------------------------|
| BiCMOS  | Bipolar Complementary Metal Oxide Semiconductor |
| DUT     | Device Under Test                               |
| ESD     | ElectroStatic Discharge                         |
| HBM     | Human Body Model                                |
| MM      | Machine Model                                   |
| TTL     | Transistor-Transistor Logic                     |

## 13 Revision history

Table 11. Revision history

| Document ID    | Release date                                                                                                                                                                                                                           | Data sheet status     | Change notice | Supersedes  |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-------------|
| 74LVT02 v.3    | 20170324                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVT02 v.2 |
| Modifications: | <ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li><li>Legal texts have been adapted to the new company name where appropriate.</li></ul> |                       |               |             |
| 74LVT02 v.2    | 19960815                                                                                                                                                                                                                               | Product specification | -             | 74LVT02 v.1 |

## 14 Legal information

### 14.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition                                                                            |
|-----------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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