

# 74LVC1G99

Ultra-configurable multiple function gate; 3-state

Rev. 11 — 25 July 2019

Product data sheet

## 1. General description

The 74LVC1G99 provides a low voltage, ultra-configurable, multiple function gate with 3-state output. The device can be configured as one of several logic functions including, AND, OR, NAND, NOR, XOR, XNOR, inverter, buffer and MUX. No external components are required to configure the device as all inputs can be connected directly to  $V_{CC}$  or GND. The 3-state output is controlled by the output enable input ( $\overline{OE}$ ). A HIGH level at  $\overline{OE}$  causes the output (Y) to assume a high-impedance OFF-state. When  $\overline{OE}$  is LOW, the output state is determined by the signals applied to the Schmitt trigger inputs (A, B, C and D).

Due to the use of Schmitt trigger inputs the device is tolerant of slowly changing input signals, transforming them into sharply defined, jitter free output signals. By eliminating leakage current paths to  $V_{CC}$  and GND, the inputs and disabled output are also over-voltage tolerant, making the device suitable for mixed-voltage applications.

This device is fully specified for partial power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

The 74LVC1G99 is fully specified over the supply range from 1.65 V to 5.5 V.

## 2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- 5 V tolerant inputs for interfacing with 5 V logic
- High noise immunity
- Complies with JEDEC standard:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8-B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- $\pm 24$  mA output drive ( $V_{CC} = 3.0$  V)
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5 V
- Multiple package options
- Specified from  $-40$  °C to  $+85$  °C and  $-40$  °C to  $+125$  °C.

### 3. Ordering information

### Table 1. Ordering information

| Type number | Package           |        |                                                                                             |          |
|-------------|-------------------|--------|---------------------------------------------------------------------------------------------|----------|
|             | Temperature range | Name   | Description                                                                                 | Version  |
| 74LVC1G99DP | -40 °C to +125 °C | TSSOP8 | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm     | SOT505-2 |
| 74LVC1G99GT | -40 °C to +125 °C | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm | SOT833-1 |
| 74LVC1G99GF | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm         | SOT1089  |
| 74LVC1G99GN | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm       | SOT1116  |
| 74LVC1G99GS | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm      | SOT1203  |

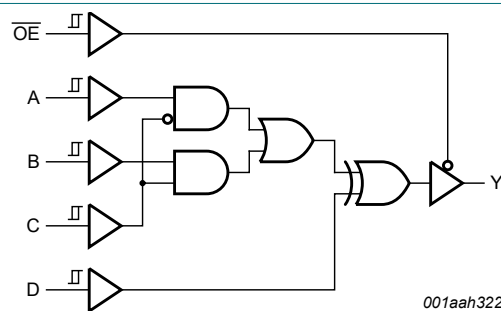
## 4. Marking

### Table 2. Marking codes

| Type number | Marking code [1] |
|-------------|------------------|
| 74LVC1G99DP | V99              |
| 74LVC1G99GT | V99              |
| 74LVC1G99GF | YF               |
| 74LVC1G99GN | YF               |
| 74LVC1G99GS | YF               |

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

## 5. Functional diagram



**Fig. 1. Logic symbol**

6. Pinning information

6.1. Pinning

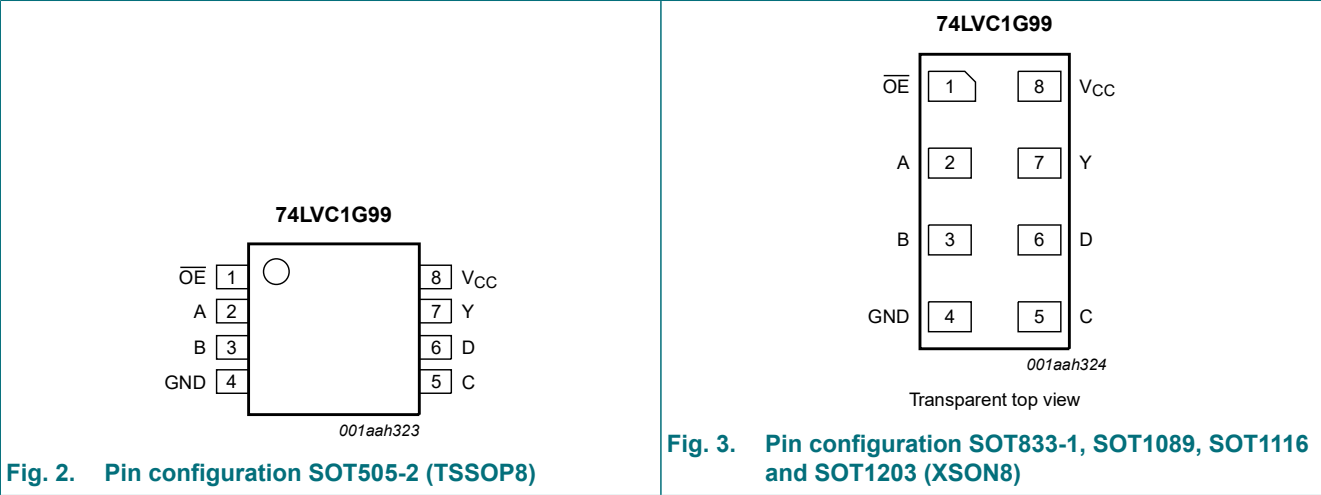


Fig. 2. Pin configuration SOT505-2 (TSSOP8)

Fig. 3. Pin configuration SOT833-1, SOT1089, SOT1116 and SOT1203 (XSON8)

6.2. Pin description

Table 3. Pin description

| Symbol          | Pin | Description                                      |
|-----------------|-----|--------------------------------------------------|
| OE              | 1   | output enable input $\overline{OE}$ (active LOW) |
| A               | 2   | data input                                       |
| B               | 3   | data input                                       |
| GND             | 4   | ground (0 V)                                     |
| C               | 5   | data input                                       |
| D               | 6   | data input                                       |
| Y               | 7   | data output                                      |
| V <sub>CC</sub> | 8   | supply voltage                                   |

## 7. Functional description

**Table 4. Function table**

*H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.*

| Input |   |   |   |   | Output |
|-------|---|---|---|---|--------|
| OE    | D | C | B | A | Y      |
| L     | L | L | L | L | L      |
| L     | L | L | L | H | H      |
| L     | L | L | H | L | L      |
| L     | L | L | H | H | H      |
| L     | L | H | L | L | L      |
| L     | L | H | L | H | L      |
| L     | L | H | H | L | H      |
| L     | L | H | H | H | H      |
| L     | H | L | L | L | H      |
| L     | H | L | L | H | L      |
| L     | H | L | H | L | H      |
| L     | H | L | H | H | L      |
| L     | H | H | L | L | H      |
| L     | H | H | L | H | H      |
| L     | H | H | H | L | L      |
| L     | H | H | H | H | L      |
| H     | X | X | X | X | Z      |

### 7.1. Logic configurations

**Table 5. Function selection table**

| Primary function                                  | Complementary function                        |
|---------------------------------------------------|-----------------------------------------------|
| 3-state buffer                                    |                                               |
| 3-state inverter                                  |                                               |
| 3-state 2-input multiplexer                       |                                               |
| 3-state 2-input multiplexer with inverting output |                                               |
| 3-state 2-input AND                               | 3-state 2-input NOR with two inverting inputs |
| 3-state 2-input AND with one inverting input      | 3-state 2-input NOR with one inverting input  |
| 3-state 2-input AND with two inverting inputs     | 3-state 2-input NOR                           |
| 3-state 2-input NAND                              | 3-state 2-input OR with two inverting inputs  |
| 3-state 2-input NAND with one inverting input     | 3-state 2-input OR with one inverting input   |
| 3-state 2-input NAND with two inverting inputs    | 3-state 2-input OR                            |
| 3-state 2-input XOR                               |                                               |
| 3-state 2-input XNOR                              | 3-state 2-input XOR with one inverting input  |

7.2. 3-state buffer functions available

Table 6. Function table

H = HIGH voltage level; L = LOW voltage level; See Fig. 4.

| Function       | Input |        |        |        |       |
|----------------|-------|--------|--------|--------|-------|
|                | OE    | A      | B      | C      | D     |
| 3-state buffer | L     | input  | H or L | L      | L     |
|                | L     | H or L | input  | H      | L     |
|                | L     | L      | H      | input  | L     |
|                | L     | H      | L      | input  | H     |
|                | L     | H      | H or L | L      | input |
|                | L     | H or L | L      | H      | input |
|                | L     | L      | L      | H or L | input |

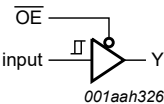


Fig. 4. 3-state buffer function

7.3. 3-state inverter functions available

Table 7. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care. See Fig. 5.

| Function         | Input |        |        |        |       |
|------------------|-------|--------|--------|--------|-------|
|                  | OE    | A      | B      | C      | D     |
| 3-state inverter | L     | input  | H or L | L      | H     |
|                  | L     | X      | input  | H      | H     |
|                  | L     | L      | H      | input  | H     |
|                  | L     | H      | L      | input  | L     |
|                  | L     | H      | H or L | L      | input |
|                  | L     | H or L | H      | H      | input |
|                  | L     | H      | H      | H or L | input |

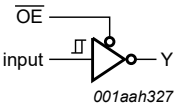


Fig. 5. 3-state inverter function

7.4. 3-state multiplexer functions available

Table 8. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 6.

| Function                    | Input |         |         |                    |   |
|-----------------------------|-------|---------|---------|--------------------|---|
|                             | OE    | A       | B       | C                  | D |
| 3-state 2-input multiplexer | L     | input 1 | input 2 | input 1 or input 2 | L |
|                             | L     | input 2 | input 1 | input 2 or input 1 | L |
|                             | L     | input 1 | input 2 | input 1 or input 2 | H |
|                             | L     | input 2 | input 1 | input 2 or input 1 | H |

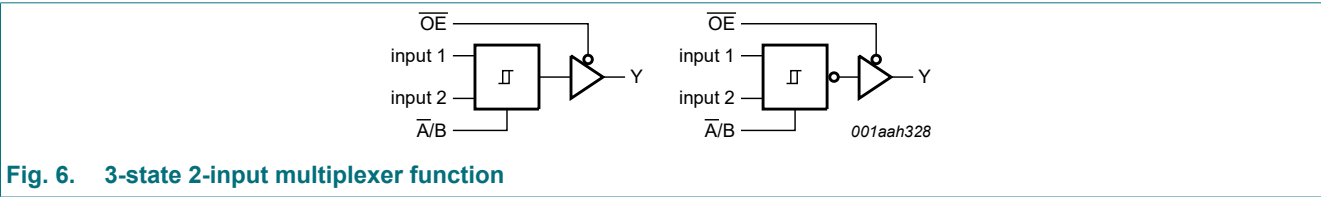


Fig. 6. 3-state 2-input multiplexer function

7.5. 3-state AND/NOR functions available

Table 9. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 7.

| Number of inputs | Function    |             | Input |   |         |         |   |
|------------------|-------------|-------------|-------|---|---------|---------|---|
|                  | AND/NAND    | OR/NOR      | OE    | A | B       | C       | D |
| 2                | 3-state AND | 3-state NOR | L     | L | input 1 | input 2 | L |
| 2                | 3-state AND | 3-state NOR | L     | L | input 2 | input 1 | L |

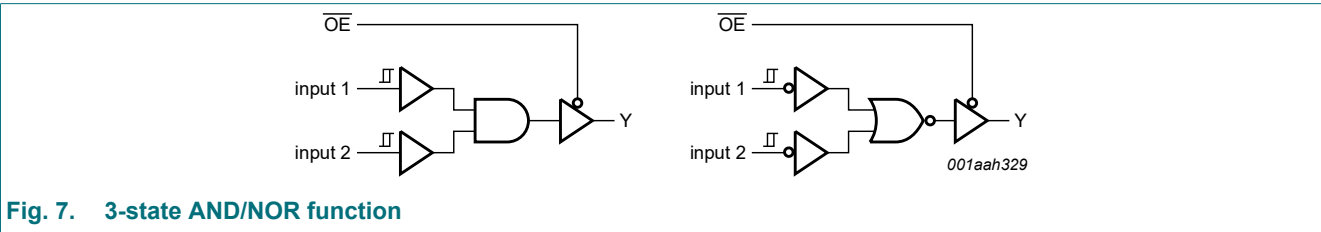


Fig. 7. 3-state AND/NOR function

Table 10. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 8.

| Number of inputs | Function    |             | Input |         |         |         |   |
|------------------|-------------|-------------|-------|---------|---------|---------|---|
|                  | AND/NAND    | OR/NOR      | OE    | A       | B       | C       | D |
| 2                | 3-state AND | 3-state NOR | L     | input 2 | L       | input 1 | L |
| 2                | 3-state AND | 3-state NOR | L     | H       | input 1 | input 2 | H |

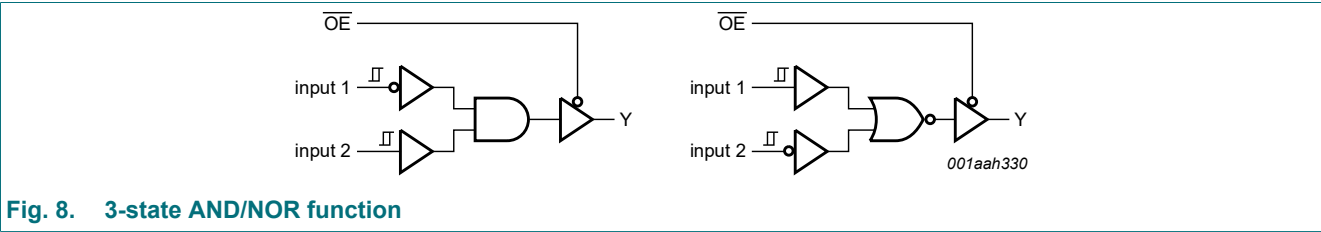


Fig. 8. 3-state AND/NOR function

Table 11. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 9.

| Number of inputs | Function    |             | Input |         |         |         |   |
|------------------|-------------|-------------|-------|---------|---------|---------|---|
|                  | AND/NAND    | OR/NOR      | OE    | A       | B       | C       | D |
| 2                | 3-state AND | 3-state NOR | L     | input 1 | L       | input 2 | L |
| 2                | 3-state AND | 3-state NOR | L     | H       | input 2 | input 1 | H |

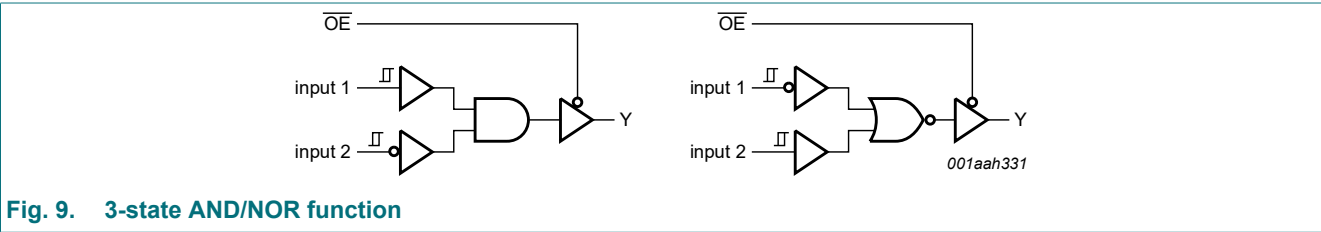
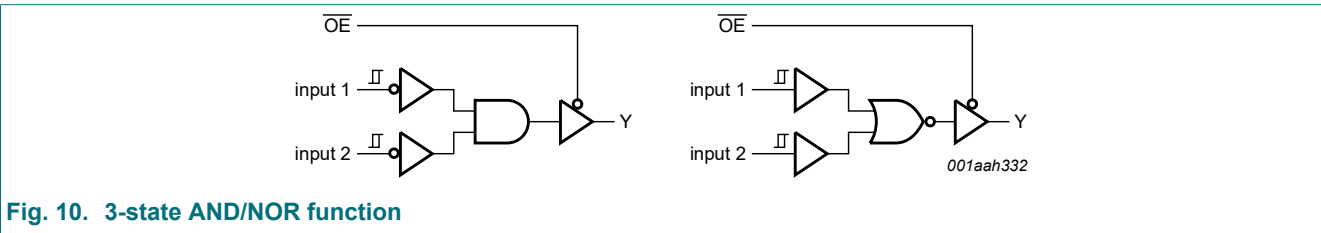


Table 12. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 10.

| Number of inputs | Function    |             | Input |         |   |         |   |
|------------------|-------------|-------------|-------|---------|---|---------|---|
|                  | AND/NAND    | OR/NOR      | OE    | A       | B | C       | D |
| 2                | 3-state AND | 3-state NOR | L     | input 1 | H | input 2 | H |
| 2                | 3-state AND | 3-state NOR | L     | input 2 | H | input 1 | H |



7.6. 3-state NAND/OR functions available

Table 13. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 11.

| Number of inputs | Function     |            | Input |   |         |         |   |
|------------------|--------------|------------|-------|---|---------|---------|---|
|                  | AND/NAND     | OR/NOR     | OE    | A | B       | C       | D |
| 2                | 3-state NAND | 3-state OR | L     | L | input 1 | input 2 | H |
| 2                | 3-state NAND | 3-state OR | L     | L | input 2 | input 1 | H |

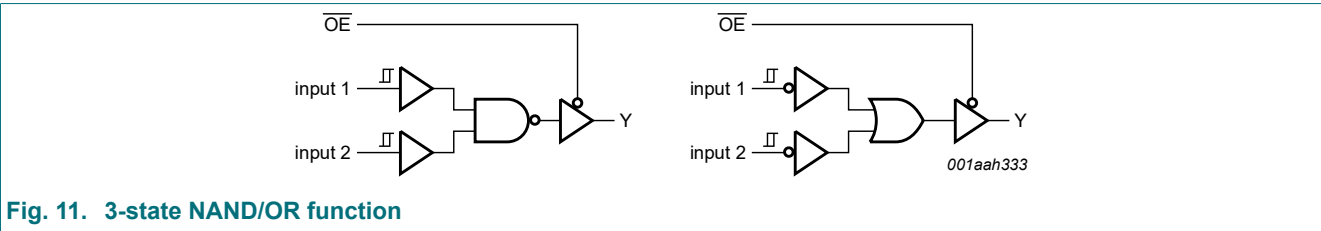


Table 14. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 12.

| Number of inputs | Function     |            | Input |         |         |         |   |
|------------------|--------------|------------|-------|---------|---------|---------|---|
|                  | AND/NAND     | OR/NOR     | OE    | A       | B       | C       | D |
| 2                | 3-state NAND | 3-state OR | L     | input 2 | L       | input 1 | H |
| 2                | 3-state NAND | 3-state OR | L     | H       | input 1 | input 2 | L |

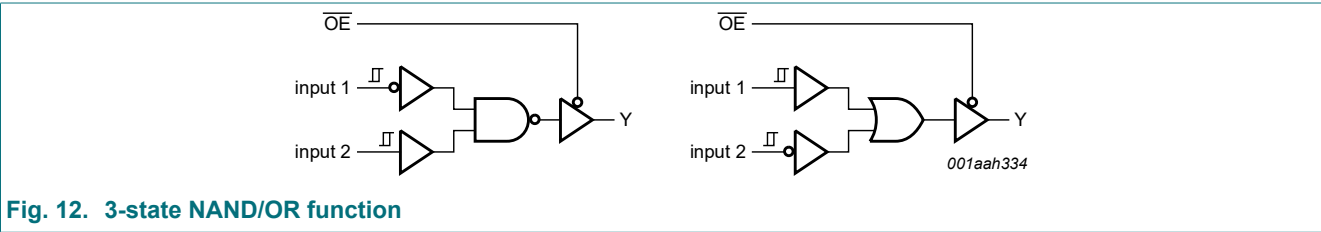


Fig. 12. 3-state NAND/OR function

Table 15. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 13.

| Number of inputs | Function     |            | Input |         |         |         |   |
|------------------|--------------|------------|-------|---------|---------|---------|---|
|                  | AND/NAND     | OR/NOR     | OE    | A       | B       | C       | D |
| 2                | 3-state NAND | 3-state OR | L     | input 1 | L       | input 2 | H |
| 2                | 3-state NAND | 3-state OR | L     | H       | input 2 | input 1 | L |

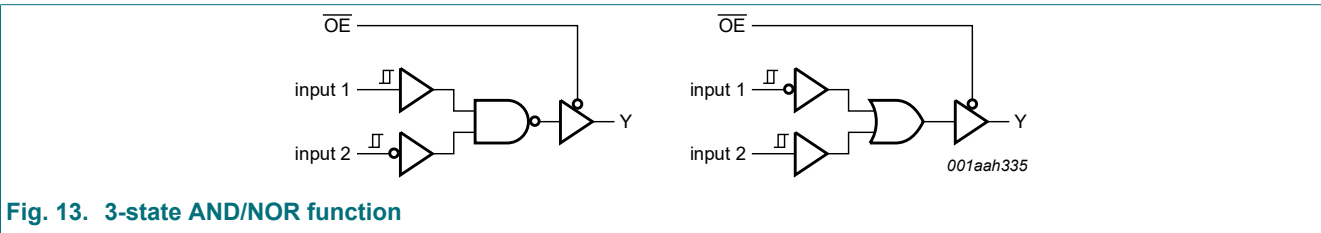


Fig. 13. 3-state AND/NOR function

Table 16. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 14.

| Number of inputs | Function     |            | Input |         |   |         |   |
|------------------|--------------|------------|-------|---------|---|---------|---|
|                  | AND/NAND     | OR/NOR     | OE    | A       | B | C       | D |
| 2                | 3-state NAND | 3-state OR | L     | input 1 | H | input 2 | L |
| 2                | 3-state NAND | 3-state OR | L     | input 2 | H | input 1 | L |

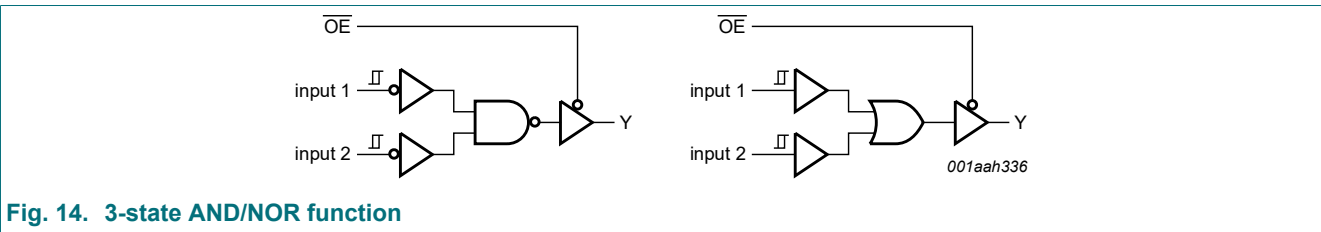


Fig. 14. 3-state AND/NOR function



7.7. 3-state XOR/XNOR functions available

Table 17. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 15.

| Function    | Input |         |         |         |         |
|-------------|-------|---------|---------|---------|---------|
|             | OE    | A       | B       | C       | D       |
| 3-state XOR | L     | input 1 | H or L  | L       | input 2 |
|             | L     | input 2 | H or L  | L       | input 1 |
|             | L     | H or L  | input 1 | H       | input 2 |
|             | L     | H or L  | input 2 | H       | input 1 |
|             | L     | L       | H       | input 1 | input 2 |
|             | L     | L       | H       | input 2 | input 1 |

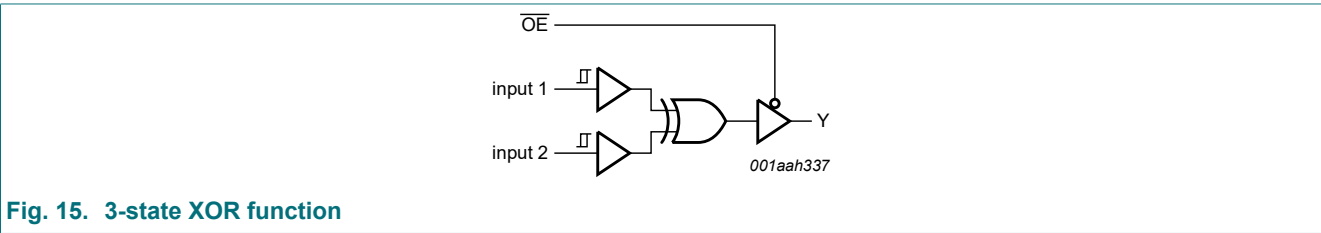


Table 18. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 16.

| Function    | Input |   |   |         |         |
|-------------|-------|---|---|---------|---------|
|             | OE    | A | B | C       | D       |
| 3-state XOR | L     | H | L | input 1 | input 2 |

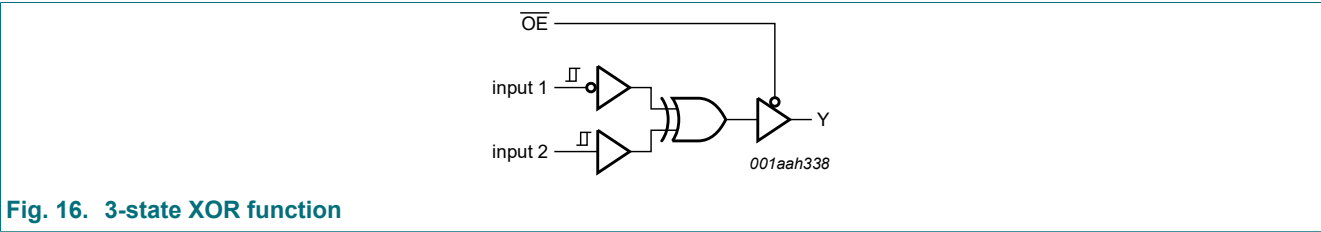


Table 19. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 17.

| Function    | Input |   |   |         |         |
|-------------|-------|---|---|---------|---------|
|             | OE    | A | B | C       | D       |
| 3-state XOR | L     | H | L | input 1 | input 2 |

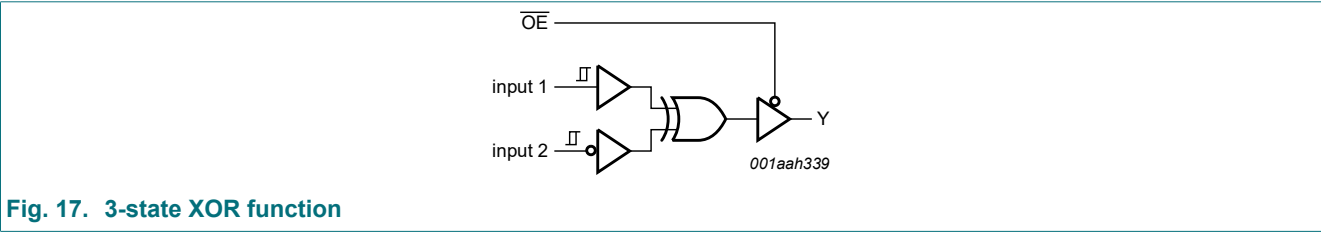


Table 20. Function table

H = HIGH voltage level; L = LOW voltage level. See Fig. 18.

| Function     | Input |   |   |         |         |
|--------------|-------|---|---|---------|---------|
|              | OE    | A | B | C       | D       |
| 3-state XNOR | L     | H | L | input 1 | input 2 |
|              | L     | H | L | input 2 | input 1 |

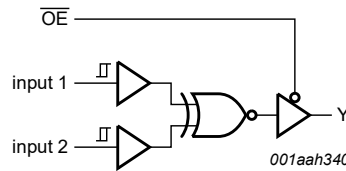


Fig. 18. 3-state XNOR function

## 8. Limiting values

Table 21. 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 |
|-----------|-------------------------|-------------------------------------|------|----------------|------|
| $V_{CC}$  | supply voltage          |                                     | -0.5 | +6.5           | V    |
| $I_{IK}$  | input clamping current  | $V_I < 0$ V                         | -50  | -              | mA   |
| $V_I$     | input voltage           | [1]                                 | -0.5 | +6.5           | V    |
| $I_{OK}$  | output clamping current | $V_O > V_{CC}$ or $V_O < 0$ V       | -    | ±50            | mA   |
| $V_O$     | output voltage          | Active mode [1]                     | -0.5 | $V_{CC} + 0.5$ | V    |
|           |                         | Power-down mode; $V_{CC} = 0$ V [1] | -0.5 | +6.5           | V    |
| $I_O$     | output current          | $V_O = 0$ V to $V_{CC}$             | -    | ±50            | mA   |
| $I_{CC}$  | supply current          |                                     | -    | 100            | mA   |
| $I_{GND}$ | ground current          |                                     | -100 | -              | mA   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40$ °C to $+125$ °C [2] | -    | 250            | mW   |
| $T_{stg}$ | storage temperature     |                                     | -65  | +150           | °C   |

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

[2] For SOT505-2 (TSSOP8) packages:  $P_{tot}$  derates linearly with 4.6 mW/K above 96 °C.

For SOT833-1 (XSON8) packages:  $P_{tot}$  derates linearly with 3.1 mW/K above 68 °C.

For SOT1089 (XSON8) packages:  $P_{tot}$  derates linearly with 4.0 mW/K above 88 °C.

For SOT1116 (XSON8) packages:  $P_{tot}$  derates linearly with 4.2 mW/K above 90 °C.

For SOT1203 (XSON8) packages:  $P_{tot}$  derates linearly with 3.6 mW/K above 81 °C.

## 9. Recommended operating conditions

Table 22. Operating conditions

| Symbol              | Parameter                           | Conditions                      | Min  | Max      | Unit |
|---------------------|-------------------------------------|---------------------------------|------|----------|------|
| $V_{CC}$            | supply voltage                      |                                 | 1.65 | 5.5      | V    |
| $V_I$               | input voltage                       |                                 | 0    | 5.5      | V    |
| $V_O$               | output voltage                      | Active mode                     | 0    | $V_{CC}$ | V    |
|                     |                                     | Power-down mode; $V_{CC} = 0$ V | 0    | 5.5      | V    |
| $T_{amb}$           | ambient temperature                 |                                 | -40  | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 1.65$ V to 2.7 V      | -    | 20       | ns/V |
|                     |                                     | $V_{CC} = 2.7$ V to 4.5 V       | -    | 10       | ns/V |
|                     |                                     | $V_{CC} = 4.5$ V to 5.5 V       | -    | 5        | ns/V |

## 10. Static characteristics

Table 23. Static characteristics

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

| Symbol    | Parameter                 | Conditions                                                             | -40 °C to +85 °C |           |         | -40 °C to +125 °C |         | Unit    |
|-----------|---------------------------|------------------------------------------------------------------------|------------------|-----------|---------|-------------------|---------|---------|
|           |                           |                                                                        | Min              | Typ [1]   | Max     | Min               | Max     |         |
| $V_{OH}$  | HIGH-level output voltage | $V_I = V_{T+}$ or $V_{T-}$                                             |                  |           |         |                   |         |         |
|           |                           | $I_O = -100$ $\mu$ A;<br>$V_{CC} = 1.65$ V to 5.5 V                    | $V_{CC} - 0.1$   | -         | -       | $V_{CC} - 0.1$    | -       | V       |
|           |                           | $I_O = -4$ mA; $V_{CC} = 1.65$ V                                       | 1.2              | -         | -       | 0.95              | -       | V       |
|           |                           | $I_O = -8$ mA; $V_{CC} = 2.3$ V                                        | 1.9              | -         | -       | 1.7               | -       | V       |
|           |                           | $I_O = -12$ mA; $V_{CC} = 2.7$ V                                       | 2.2              | -         | -       | 1.9               | -       | V       |
|           |                           | $I_O = -24$ mA; $V_{CC} = 3.0$ V                                       | 2.3              | -         | -       | 2.0               | -       | V       |
|           |                           | $I_O = -32$ mA; $V_{CC} = 4.5$ V                                       | 3.8              | -         | -       | 3.4               | -       | V       |
| $V_{OL}$  | LOW-level output voltage  | $V_I = V_{T+}$ or $V_{T-}$                                             |                  |           |         |                   |         |         |
|           |                           | $I_O = 100$ $\mu$ A;<br>$V_{CC} = 1.65$ V to 5.5 V                     | -                | -         | 0.1     | -                 | 0.1     | V       |
|           |                           | $I_O = 4$ mA; $V_{CC} = 1.65$ V                                        | -                | -         | 0.45    | -                 | 0.70    | V       |
|           |                           | $I_O = 8$ mA; $V_{CC} = 2.3$ V                                         | -                | -         | 0.3     | -                 | 0.45    | V       |
|           |                           | $I_O = 12$ mA; $V_{CC} = 2.7$ V                                        | -                | -         | 0.4     | -                 | 0.60    | V       |
|           |                           | $I_O = 24$ mA; $V_{CC} = 3.0$ V                                        | -                | -         | 0.55    | -                 | 0.80    | V       |
|           |                           | $I_O = 32$ mA; $V_{CC} = 4.5$ V                                        | -                | -         | 0.55    | -                 | 0.80    | V       |
| $I_I$     | input leakage current     | $V_{CC} = 0$ V to 5.5 V;<br>$V_I = 5.5$ V or GND                       | -                | $\pm 0.1$ | $\pm 1$ | -                 | $\pm 1$ | $\mu$ A |
| $I_{OZ}$  | OFF-state output current  | $V_{CC} = 3.6$ V; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$V_O = 5.5$ V or GND | -                | $\pm 0.1$ | $\pm 2$ | -                 | $\pm 2$ | $\mu$ A |
| $I_{OFF}$ | power-off leakage current | $V_{CC} = 0$ V; $V_I$ or $V_O = 5.5$ V                                 | -                | $\pm 0.1$ | $\pm 2$ | -                 | $\pm 2$ | $\mu$ A |

| Symbol          | Parameter                 | Conditions                                                                                                | -40 °C to +85 °C |         |     | -40 °C to +125 °C |     | Unit          |
|-----------------|---------------------------|-----------------------------------------------------------------------------------------------------------|------------------|---------|-----|-------------------|-----|---------------|
|                 |                           |                                                                                                           | Min              | Typ [1] | Max | Min               | Max |               |
| $I_{CC}$        | supply current            | $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V};$<br>$V_I = 5.5 \text{ V or GND}; I_O = 0 \text{ A}$           | -                | 0.1     | 4   | -                 | 4   | $\mu\text{A}$ |
| $\Delta I_{CC}$ | additional supply current | per pin; $V_{CC} = 2.3 \text{ V to } 5.5 \text{ V};$<br>$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}$ | -                | 5       | 500 | -                 | 500 | $\mu\text{A}$ |
| $C_I$           | input capacitance         | $V_{CC} = 3.3 \text{ V}; V_I = \text{GND to } V_{CC}$                                                     | -                | 2.5     | -   | -                 | -   | pF            |

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

## 10.1. Transfer characteristics

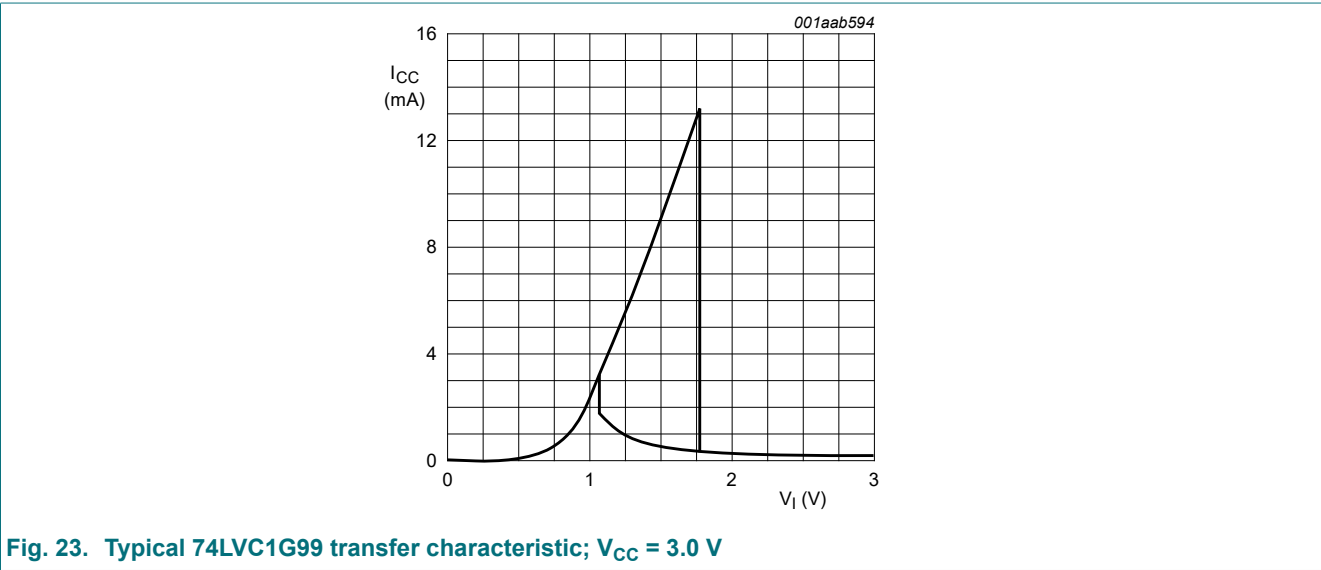
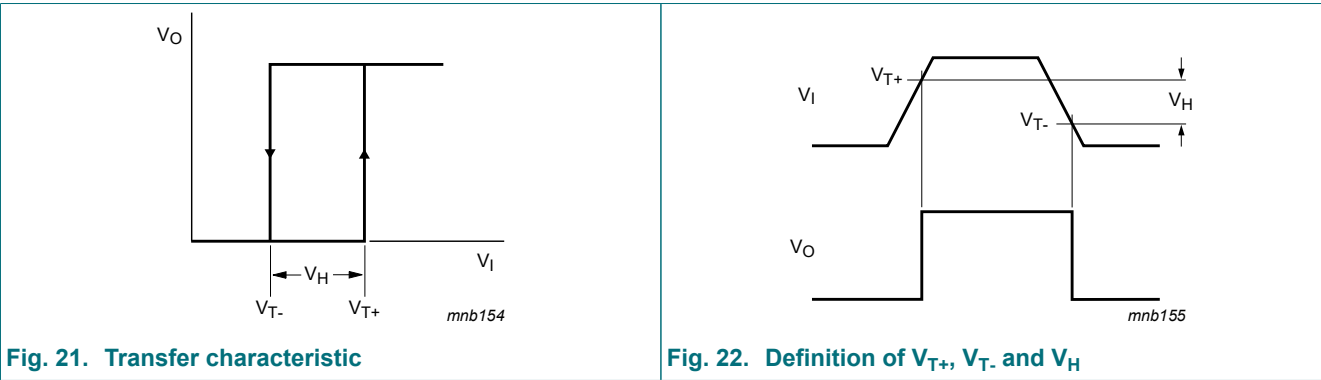
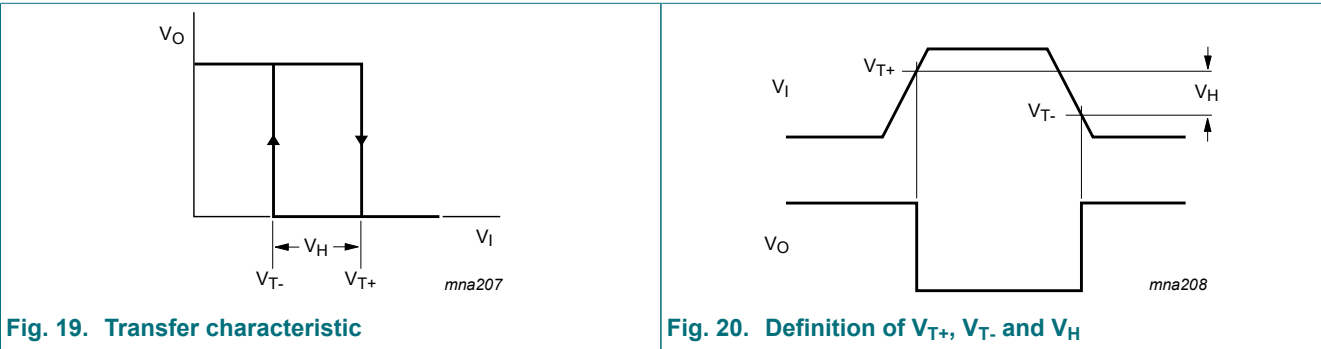
**Table 24. Transfer characteristics**

Voltages are referenced to GND (ground = 0 V; for test circuit see [Fig. 26](#))

| Symbol   | Parameter                        | Conditions                                                                                                                                                     | -40 °C to +85 °C |         |      | -40 °C to +125 °C |      | Unit |
|----------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------|------|-------------------|------|------|
|          |                                  |                                                                                                                                                                | Min              | Typ [1] | Max  | Min               | Max  |      |
| $V_{T+}$ | positive-going threshold voltage | see <a href="#">Fig. 19</a> , <a href="#">Fig. 20</a> , <a href="#">Fig. 21</a> ,<br><a href="#">Fig. 22</a> and <a href="#">Fig. 23</a>                       |                  |         |      |                   |      |      |
|          |                                  | $V_{CC} = 1.8 \text{ V}$                                                                                                                                       | 0.70             | 1.02    | 1.20 | 0.67              | 1.20 | V    |
|          |                                  | $V_{CC} = 2.3 \text{ V}$                                                                                                                                       | 1.11             | 1.42    | 1.60 | 1.08              | 1.60 | V    |
|          |                                  | $V_{CC} = 3.0 \text{ V}$                                                                                                                                       | 1.50             | 1.79    | 2.00 | 1.47              | 2.00 | V    |
|          |                                  | $V_{CC} = 4.5 \text{ V}$                                                                                                                                       | 2.16             | 2.52    | 2.74 | 2.13              | 2.74 | V    |
|          |                                  | $V_{CC} = 5.5 \text{ V}$                                                                                                                                       | 2.61             | 2.99    | 3.33 | 2.58              | 3.33 | V    |
| $V_{T-}$ | negative-going threshold voltage | see <a href="#">Fig. 19</a> , <a href="#">Fig. 20</a> , <a href="#">Fig. 21</a> ,<br><a href="#">Fig. 22</a> and <a href="#">Fig. 23</a>                       |                  |         |      |                   |      |      |
|          |                                  | $V_{CC} = 1.8 \text{ V}$                                                                                                                                       | 0.30             | 0.53    | 0.72 | 0.30              | 0.75 | V    |
|          |                                  | $V_{CC} = 2.3 \text{ V}$                                                                                                                                       | 0.58             | 0.77    | 1.00 | 0.58              | 1.03 | V    |
|          |                                  | $V_{CC} = 3.0 \text{ V}$                                                                                                                                       | 0.80             | 1.04    | 1.30 | 0.80              | 1.33 | V    |
|          |                                  | $V_{CC} = 4.5 \text{ V}$                                                                                                                                       | 1.21             | 1.55    | 1.90 | 1.21              | 1.93 | V    |
|          |                                  | $V_{CC} = 5.5 \text{ V}$                                                                                                                                       | 1.45             | 1.86    | 2.29 | 1.45              | 2.32 | V    |
| $V_H$    | hysteresis voltage               | $(V_{T+} - V_{T-})$ ; see <a href="#">Fig. 19</a> , <a href="#">Fig. 20</a> ,<br><a href="#">Fig. 21</a> , <a href="#">Fig. 22</a> and <a href="#">Fig. 23</a> |                  |         |      |                   |      |      |
|          |                                  | $V_{CC} = 1.8 \text{ V}$                                                                                                                                       | 0.30             | 0.48    | 0.62 | 0.23              | 0.62 | V    |
|          |                                  | $V_{CC} = 2.3 \text{ V}$                                                                                                                                       | 0.40             | 0.64    | 0.80 | 0.34              | 0.80 | V    |
|          |                                  | $V_{CC} = 3.0 \text{ V}$                                                                                                                                       | 0.50             | 0.75    | 1.00 | 0.44              | 1.00 | V    |
|          |                                  | $V_{CC} = 4.5 \text{ V}$                                                                                                                                       | 0.71             | 0.97    | 1.20 | 0.65              | 1.20 | V    |
|          |                                  | $V_{CC} = 5.5 \text{ V}$                                                                                                                                       | 0.71             | 1.13    | 1.40 | 0.65              | 1.40 | V    |

[1] All typical values are measured at  $T_{amb} = 25 \text{ }^\circ\text{C}$

10.2. Waveforms transfer characteristics



## 11. Dynamic characteristics

**Table 25. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V; for test circuit see [Fig. 26](#)).

| Symbol   | Parameter         | Conditions                                   | -40 °C to +85 °C |         |      | -40 °C to +125 °C |      | Unit |
|----------|-------------------|----------------------------------------------|------------------|---------|------|-------------------|------|------|
|          |                   |                                              | Min              | Typ [1] | Max  | Min               | Max  |      |
| $t_{pd}$ | propagation delay | A to Y; see <a href="#">Fig. 24</a> [2]      |                  |         |      |                   |      |      |
|          |                   | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | 2.8              | 7.5     | 30.8 | 2.8               | 38.5 | ns   |
|          |                   | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$   | 2.0              | 5.0     | 11.7 | 2.0               | 14.6 | ns   |
|          |                   | $V_{CC} = 2.7 \text{ V}$                     | 2.0              | 5.4     | 9.0  | 2.0               | 11.3 | ns   |
|          |                   | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$   | 1.8              | 4.5     | 8.4  | 1.8               | 10.5 | ns   |
|          |                   | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$   | 1.8              | 3.8     | 5.5  | 1.8               | 6.9  | ns   |
|          |                   | B to Y; see <a href="#">Fig. 24</a> [2]      |                  |         |      |                   |      |      |
|          |                   | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | 2.8              | 7.5     | 28.9 | 2.8               | 36.2 | ns   |
|          |                   | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$   | 2.0              | 5.0     | 11.3 | 2.0               | 14.2 | ns   |
|          |                   | $V_{CC} = 2.7 \text{ V}$                     | 2.0              | 5.4     | 9.0  | 2.0               | 11.3 | ns   |
|          |                   | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$   | 1.8              | 4.5     | 8.2  | 1.8               | 10.3 | ns   |
|          |                   | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$   | 1.8              | 3.8     | 5.4  | 1.8               | 6.8  | ns   |
|          |                   | C to Y; see <a href="#">Fig. 24</a> [2]      |                  |         |      |                   |      |      |
|          |                   | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | 3.2              | 7.8     | 29.8 | 3.2               | 37.3 | ns   |
|          |                   | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$   | 2.3              | 5.2     | 12.3 | 2.3               | 15.4 | ns   |
|          |                   | $V_{CC} = 2.7 \text{ V}$                     | 2.3              | 5.3     | 9.6  | 2.3               | 12.0 | ns   |
|          |                   | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$   | 2.3              | 4.6     | 8.6  | 2.3               | 10.8 | ns   |
|          |                   | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$   | 1.8              | 3.8     | 5.7  | 1.8               | 7.2  | ns   |
|          |                   | D to Y; see <a href="#">Fig. 24</a> [2]      |                  |         |      |                   |      |      |
|          |                   | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | 2.8              | 7.0     | 25.7 | 2.8               | 32.2 | ns   |
|          |                   | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$   | 2.0              | 4.6     | 10.7 | 2.0               | 13.4 | ns   |
|          |                   | $V_{CC} = 2.7 \text{ V}$                     | 2.0              | 4.8     | 9.2  | 2.0               | 11.5 | ns   |
|          |                   | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$   | 1.8              | 4.1     | 7.6  | 1.8               | 9.5  | ns   |
|          |                   | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$   | 1.6              | 3.4     | 5.2  | 1.6               | 6.5  | ns   |

| Symbol           | Parameter                     | Conditions                                                                                                                      | -40 °C to +85 °C |         |      | -40 °C to +125 °C |      | Unit |
|------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------|---------|------|-------------------|------|------|
|                  |                               |                                                                                                                                 | Min              | Typ [1] | Max  | Min               | Max  |      |
| t <sub>en</sub>  | enable time                   | OE to Y; see Fig. 25 [3]                                                                                                        |                  |         |      |                   |      |      |
|                  |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                              | 2.0              | 5.7     | 25.2 | 2.0               | 32.0 | ns   |
|                  |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                | 1.4              | 3.8     | 11.3 | 1.4               | 14.0 | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V                                                                                                         | 1.4              | 4.2     | 8.6  | 1.4               | 11.0 | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                                                                                                | 1.4              | 3.5     | 7.0  | 1.4               | 9.0  | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                | 1.4              | 2.7     | 4.7  | 1.4               | 6.0  | ns   |
| t <sub>dis</sub> | disable time                  | OE to Y; see Fig. 25 [4]                                                                                                        |                  |         |      |                   |      |      |
|                  |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                              | 3.0              | 5.7     | 15.0 | 3.0               | 19.0 | ns   |
|                  |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                | 2.0              | 3.6     | 5.8  | 2.0               | 7.3  | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V                                                                                                         | 2.0              | 4.5     | 6.6  | 2.0               | 8.2  | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                                                                                                | 2.1              | 4.5     | 5.9  | 2.1               | 7.4  | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                | 1.0              | 3.4     | 4.5  | 1.0               | 5.6  | ns   |
| C <sub>PD</sub>  | power dissipation capacitance | per buffer (output enabled);<br>f <sub>i</sub> = 10 MHz; C <sub>L</sub> = 50 pF;<br>V <sub>I</sub> = GND to V <sub>CC</sub> [5] |                  |         |      |                   |      |      |
|                  |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                              | -                | 14      | -    | -                 | -    | pF   |
|                  |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                | -                | 16      | -    | -                 | -    | pF   |
|                  |                               | V <sub>CC</sub> = 2.7 V                                                                                                         | -                | 18      | -    | -                 | -    | pF   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                                                                                                | -                | 25      | -    | -                 | -    | pF   |
|                  |                               | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                | -                | 30      | -    | -                 | -    | pF   |

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

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

[3] t<sub>en</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.

[4] t<sub>dis</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.

[5] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

11.1. Waveforms and test circuit

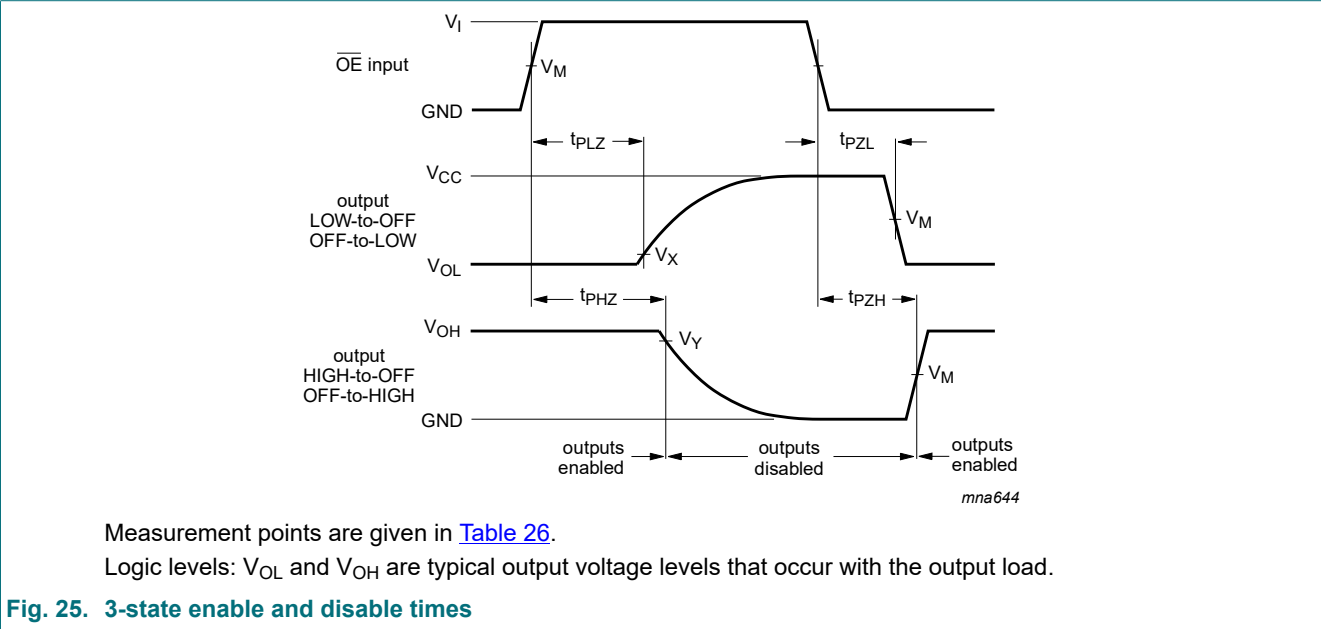
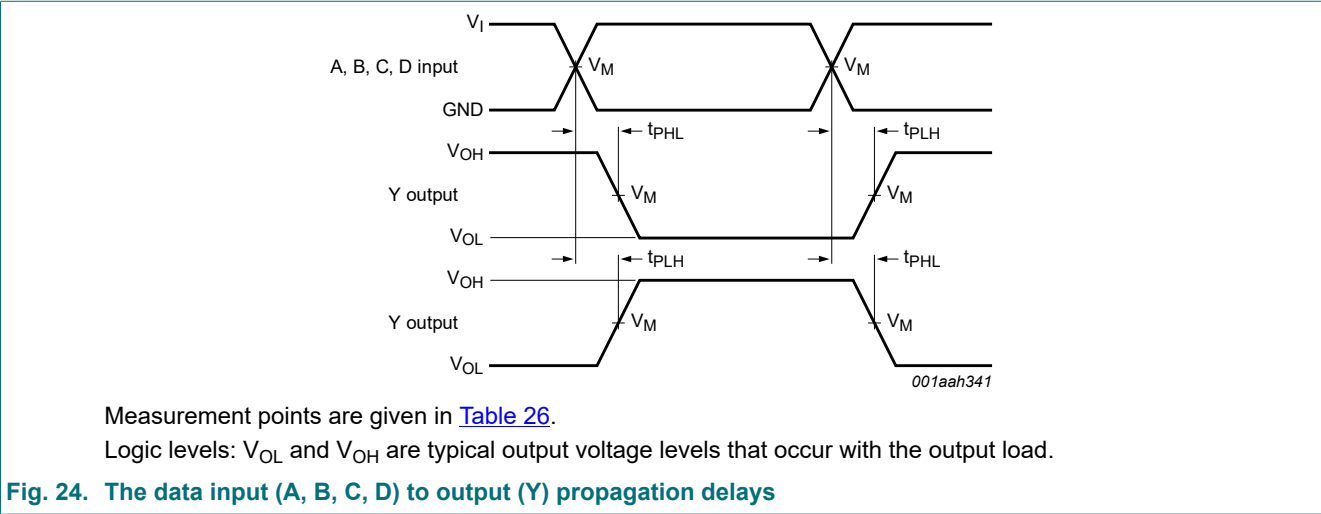
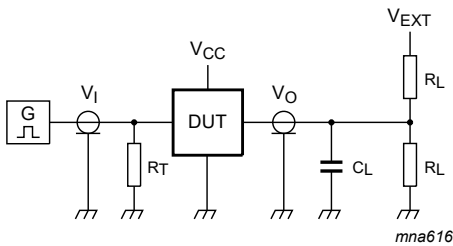


Table 26. Measurement points

| Supply voltage   | Input       | Output      |                          |                          |
|------------------|-------------|-------------|--------------------------|--------------------------|
| $V_{CC}$         | $V_M$       | $V_M$       | $V_X$                    | $V_Y$                    |
| 1.65 V to 1.95 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15\text{ V}$ | $V_{OH} - 0.15\text{ V}$ |
| 2.3 V to 2.7 V   | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15\text{ V}$ | $V_{OH} - 0.15\text{ V}$ |
| 2.7 V            | 1.5 V       | 1.5 V       | $V_{OL} + 0.3\text{ V}$  | $V_{OH} - 0.3\text{ V}$  |
| 3.0 V to 3.6 V   | 1.5 V       | 1.5 V       | $V_{OL} + 0.3\text{ V}$  | $V_{OH} - 0.3\text{ V}$  |
| 4.5 V to 5.5 V   | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.3\text{ V}$  | $V_{OH} - 0.3\text{ V}$  |





Test data is given in [Table 27](#).  
Definitions for test circuit:  
 $R_L$  = Load resistance.  
 $C_L$  = Load capacitance including jig and probe capacitance.  
 $R_T$  = Termination resistance should be equal to the output impedance  $Z_o$  of the pulse generator.  
 $V_{EXT}$  = External voltage for measuring switching times.

Fig. 26. Test circuit for measuring switching times

Table 27. Test data

| Supply voltage   | Input           |                                 | Load           |                | V <sub>EXT</sub>                    |                                     |                                     |
|------------------|-----------------|---------------------------------|----------------|----------------|-------------------------------------|-------------------------------------|-------------------------------------|
|                  | V <sub>I</sub>  | t <sub>r</sub> = t <sub>f</sub> | C <sub>L</sub> | R <sub>L</sub> | t <sub>PLH</sub> , t <sub>PHL</sub> | t <sub>PZH</sub> , t <sub>PHZ</sub> | t <sub>PZL</sub> , t <sub>PLZ</sub> |
| 1.65 V to 1.95 V | V <sub>CC</sub> | ≤ 2.0 ns                        | 30 pF          | 1 kΩ           | open                                | GND                                 | 2V <sub>CC</sub>                    |
| 2.3 V to 2.7 V   | V <sub>CC</sub> | ≤ 2.0 ns                        | 30 pF          | 500 Ω          | open                                | GND                                 | 2V <sub>CC</sub>                    |
| 2.7 V            | 2.7 V           | ≤ 2.5 ns                        | 50 pF          | 500 Ω          | open                                | GND                                 | 6 V                                 |
| 3.0 V to 3.6 V   | 2.7 V           | ≤ 2.5 ns                        | 50 pF          | 500 Ω          | open                                | GND                                 | 6 V                                 |
| 4.5 V to 5.5 V   | V <sub>CC</sub> | ≤ 2.5 ns                        | 50 pF          | 500 Ω          | open                                | GND                                 | 2V <sub>CC</sub>                    |

12. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm    SOT505-2

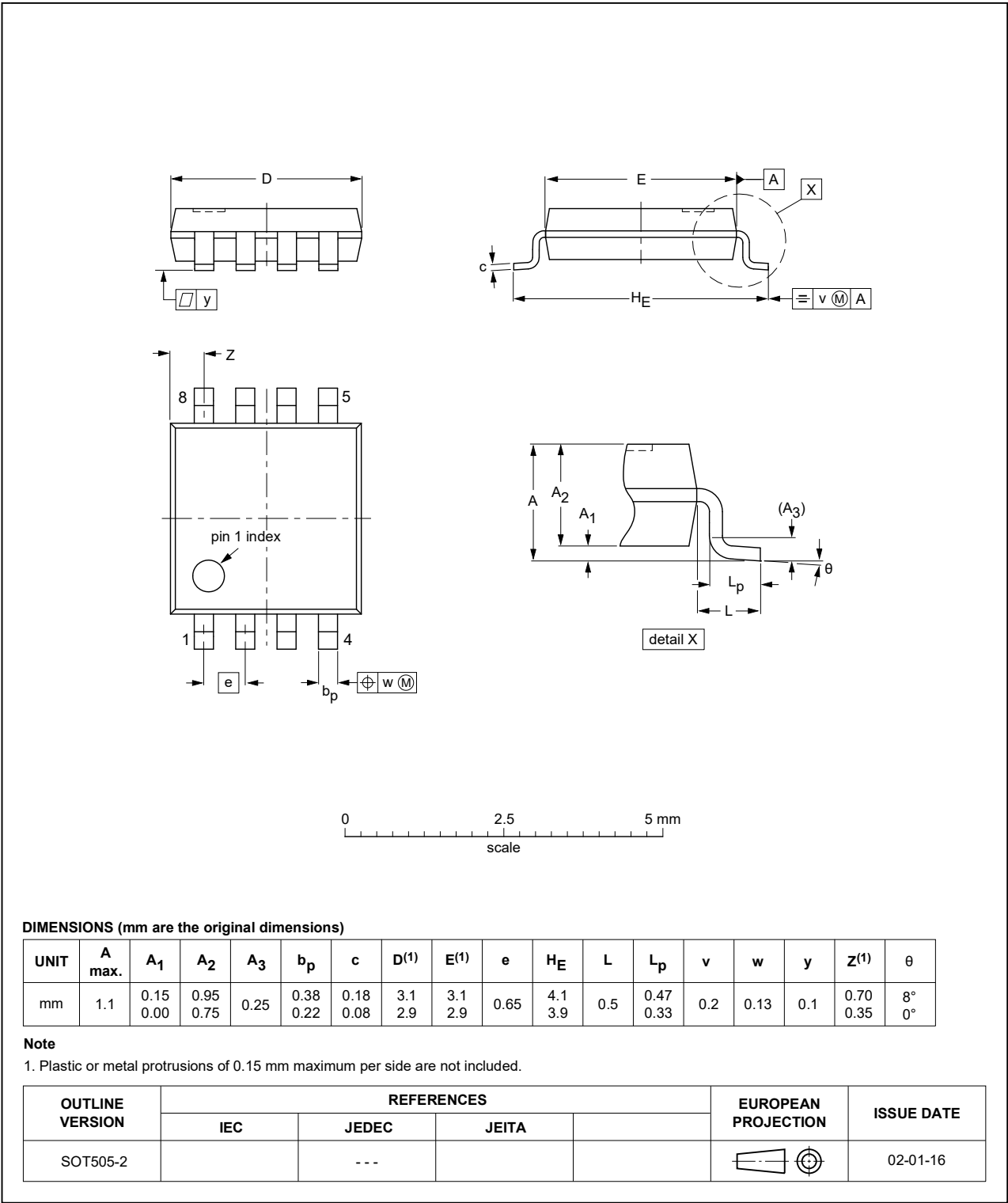


Fig. 27. Package outline SOT505-2 (TSSOP8)

XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm

SOT833-1

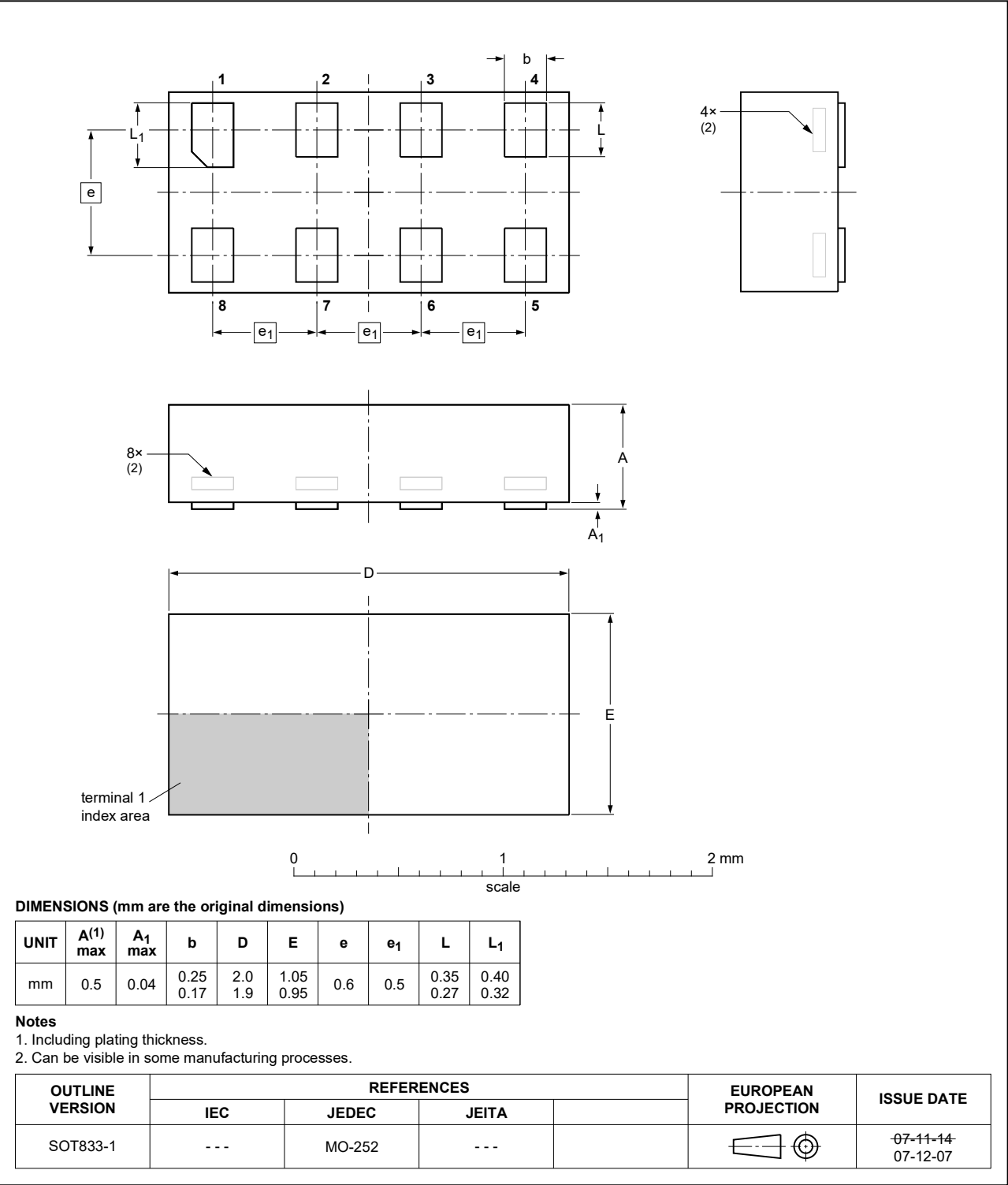


Fig. 28. Package outline SOT833-1 (XSON8)

XSON8: extremely thin small outline package; no leads;  
8 terminals; body 1.35 x 1 x 0.5 mm

SOT1089

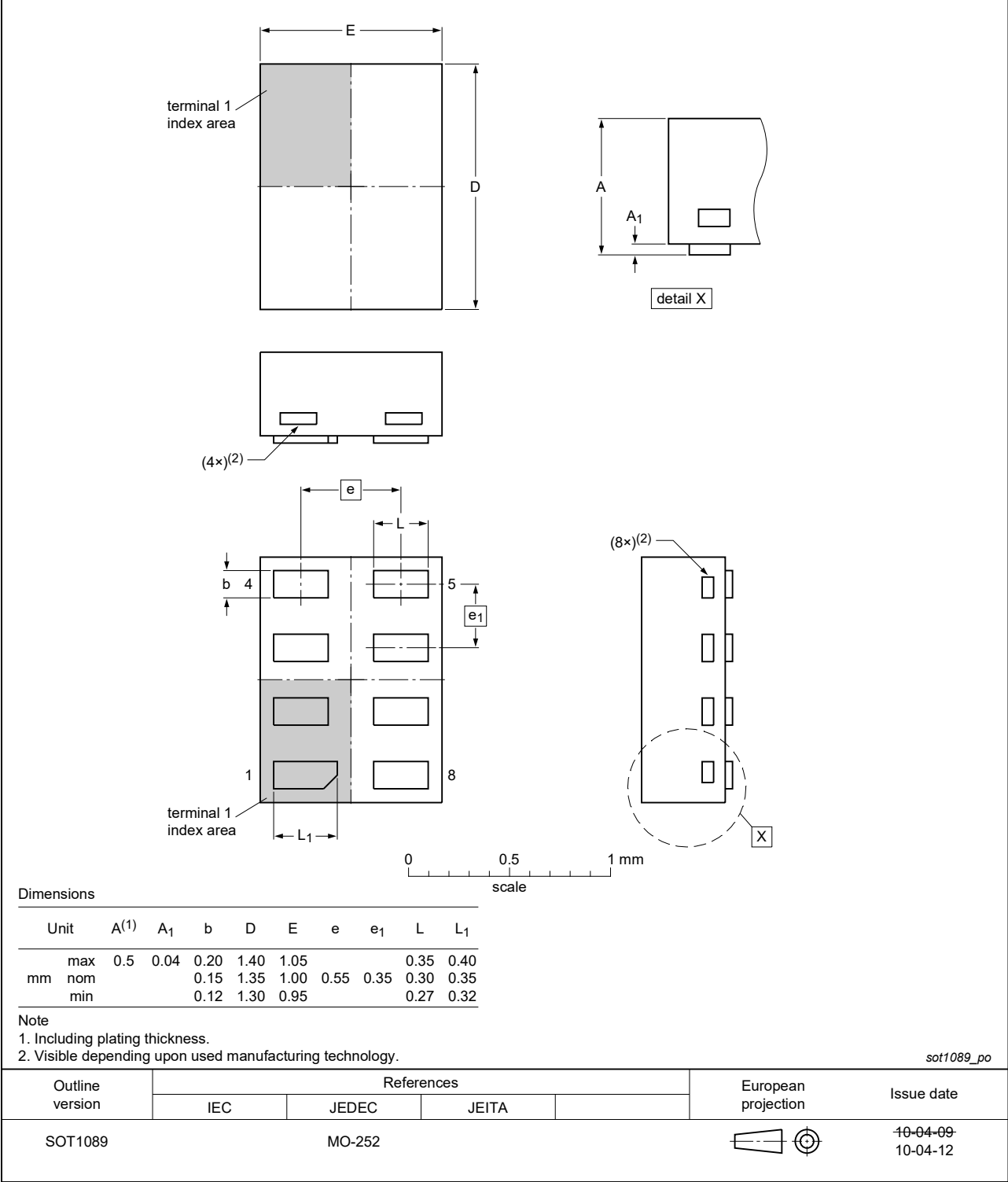


Fig. 29. Package outline SOT1089 (XSON8)

XSON8: extremely thin small outline package; no leads;  
8 terminals; body 1.2 x 1.0 x 0.35 mm

SOT1116

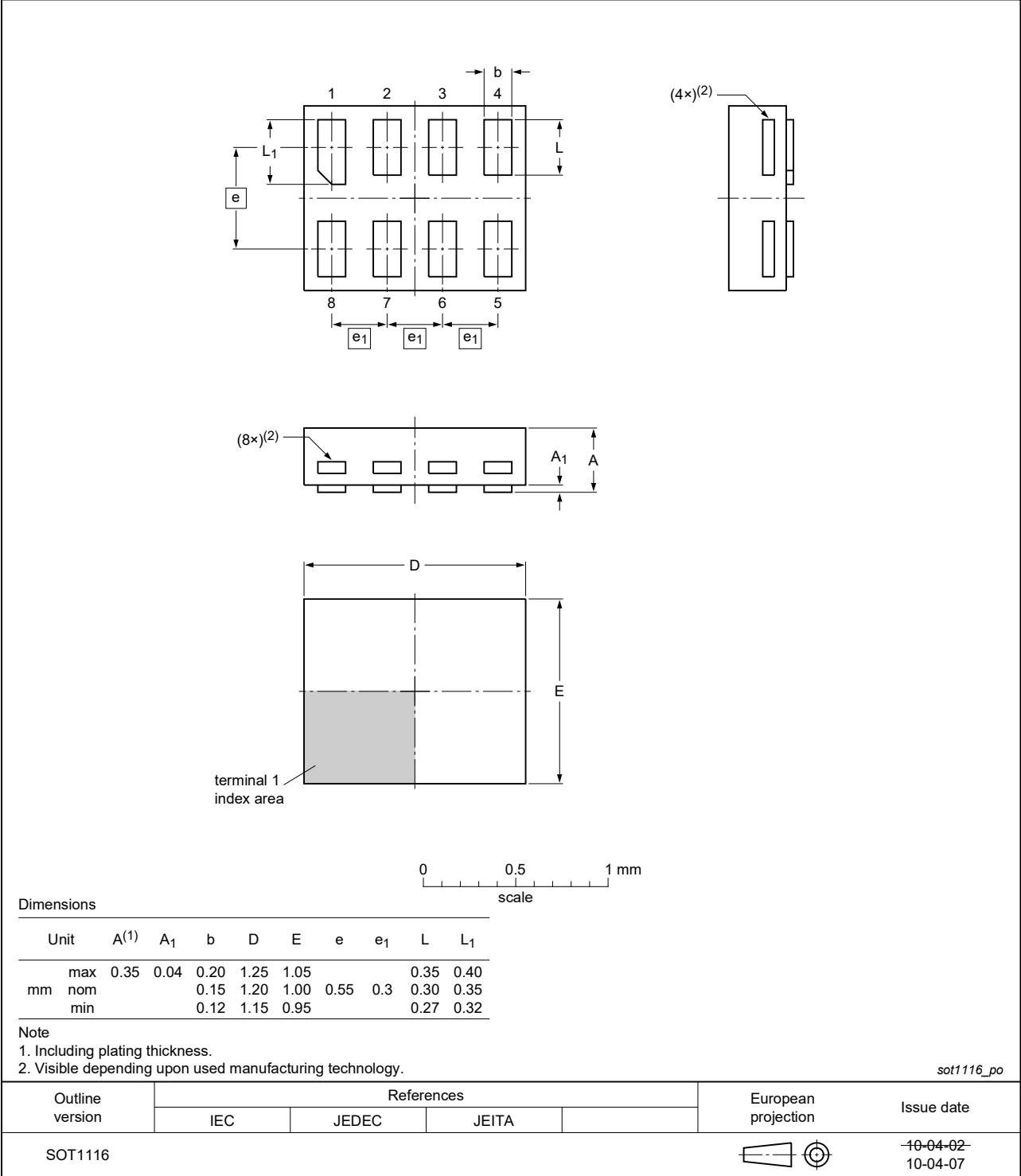


Fig. 30. Package outline SOT1116 (XSON8)

XSON8: extremely thin small outline package; no leads;  
8 terminals; body 1.35 x 1.0 x 0.35 mm

SOT1203

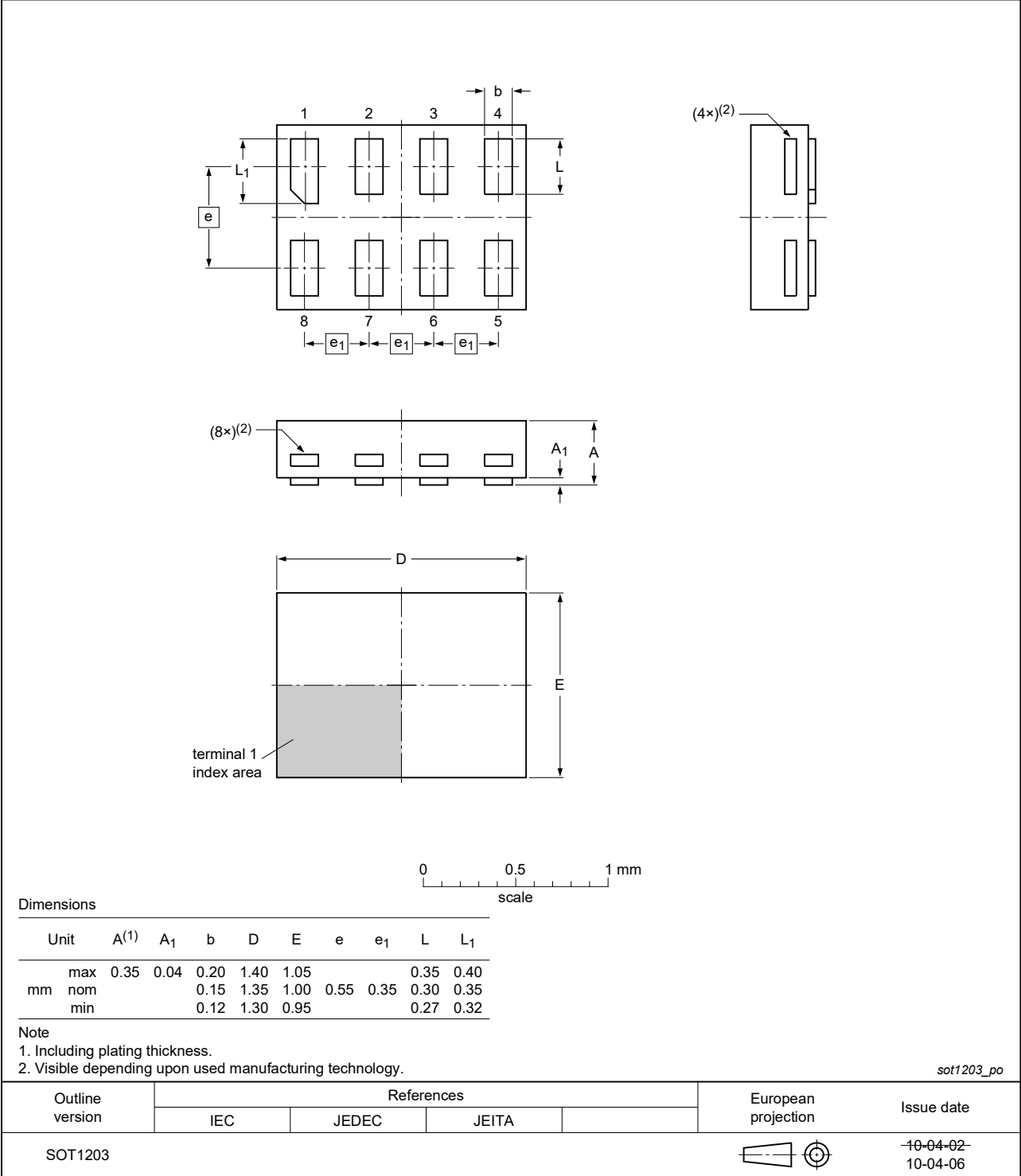


Fig. 31. Package outline SOT1203 (XSON8)

## 13. Abbreviations

Table 28. Abbreviations

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

## 14. Revision history

Table 29. Revision history

| Document ID      | Release date                                                                                                                                                                                                                                                                                   | Data sheet status  | Change notice | Supersedes       |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|------------------|
| 74LVC1G99 v.11   | 20190725                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.10.1 |
| Modifications:   | <ul style="list-style-type: none"> <li>Type number 74LVC1G99GM (SOT902-2) removed.</li> <li><a href="#">Table 21</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul>                                                                                     |                    |               |                  |
| 74LVC1G99 v.10.1 | 20181022                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.10   |
| Modifications:   | <ul style="list-style-type: none"> <li><a href="#">Table 12</a>: input D logic level changed to HIGH.</li> </ul>                                                                                                                                                                               |                    |               |                  |
| 74LVC1G99 v.10   | 20180927                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.9    |
| 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> <li>Type number 74LVC1G99GD (SOT996-2) removed.</li> </ul> |                    |               |                  |
| 74LVC1G99 v.9    | 20161212                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.8    |
| Modifications:   | <ul style="list-style-type: none"> <li><a href="#">Table 23</a>: The maximum limits for leakage current and supply current have changed.</li> </ul>                                                                                                                                            |                    |               |                  |
| 74LVC1G99 v.8    | 20130405                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.7    |
| Modifications:   | <ul style="list-style-type: none"> <li>For type number 74LVC1G99GD XSON8U has changed to XSON8.</li> </ul>                                                                                                                                                                                     |                    |               |                  |
| 74LVC1G99 v.7    | 20120622                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.6    |
| Modifications:   | <ul style="list-style-type: none"> <li>For type number 74LVC1G99GM the SOT code has changed to SOT902-2.</li> </ul>                                                                                                                                                                            |                    |               |                  |
| 74LVC1G99 v.6    | 20111201                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.5    |
| Modifications:   | <ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>                                                                                                                                                                                                                         |                    |               |                  |
| 74LVC1G99 v.5    | 20101021                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.4    |
| 74LVC1G99 v.4    | 20100416                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.3    |
| 74LVC1G99 v.3    | 20091203                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.2    |
| 74LVC1G99 v.2    | 20080208                                                                                                                                                                                                                                                                                       | Product data sheet | -             | 74LVC1G99 v.1    |
| 74LVC1G99 v.1    | 20080103                                                                                                                                                                                                                                                                                       | Product data sheet | -             | -                |

## 15. Legal information

### Data sheet status

| Document status<br>[1][2]      | Product status [3] | 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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