

# 74LVC2G241

Dual buffer/line driver; 3-state

Rev. 16 — 31 July 2019

Product data sheet

## 1. General description

The 74LVC2G241 is a dual non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs  $1\overline{OE}$  and  $2OE$ :

- A HIGH level at pin  $1\overline{OE}$  causes output 1Y to assume a high-impedance OFF-state.
- A LOW level at pin  $2OE$  causes output 2Y to assume a high-impedance OFF-state.

Schmitt trigger action at all inputs makes the circuit highly tolerant of slower input rise and fall times.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of the 74LVC2G241 as a translator in a mixed 3.3 V and 5 V environment.

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

## 2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- 5 V tolerant input/output 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  |
| 74LVC2G241DP | -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 |
| 74LVC2G241DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm                  | SOT765-1 |
| 74LVC2G241GT | -40 °C to +125 °C | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm | SOT833-1 |
| 74LVC2G241GF | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1 x 0.5 mm         | SOT1089  |
| 74LVC2G241GN | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.2 x 1.0 x 0.35 mm       | SOT1116  |
| 74LVC2G241GS | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1.0 x 0.35 mm      | SOT1203  |

4. Marking

Table 2. Marking codes

| Type number  | Marking code[1] |
|--------------|-----------------|
| 74LVC2G241DP | V241            |
| 74LVC2G241DC | V41             |
| 74LVC2G241GT | V41             |
| 74LVC2G241GF | V1              |
| 74LVC2G241GN | V1              |
| 74LVC2G241GS | V1              |

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

5. Functional diagram

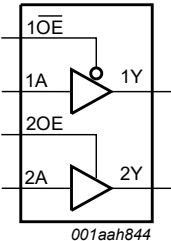


Fig. 1. Logic symbol

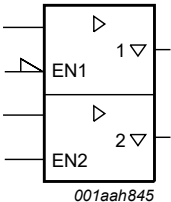


Fig. 2. IEC logic symbol

6. Pinning information

6.1. Pinning

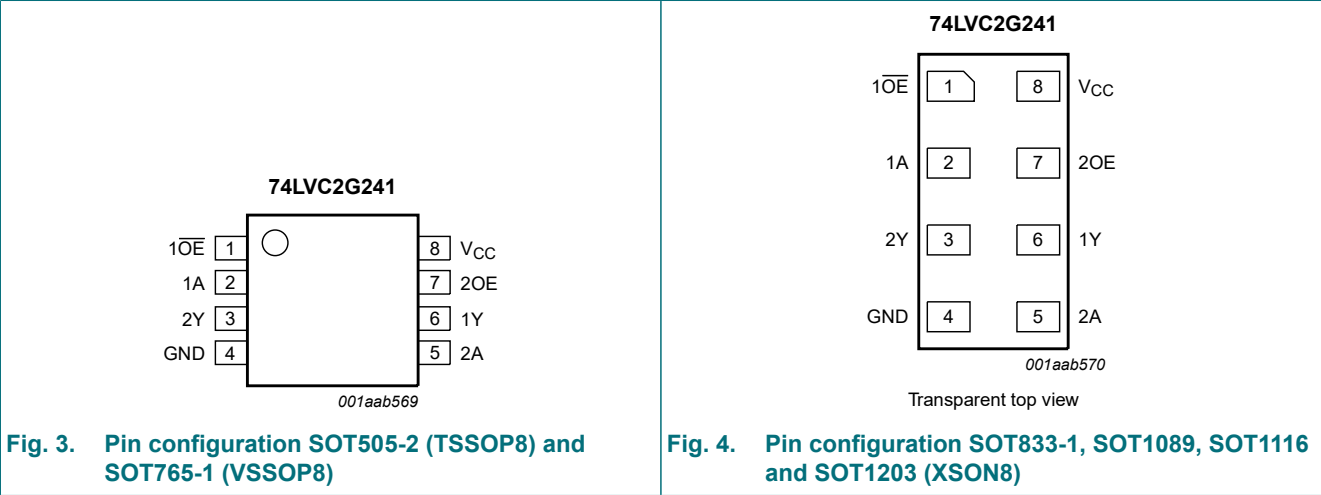


Fig. 3. Pin configuration SOT505-2 (TSSOP8) and SOT765-1 (VSSOP8)

Fig. 4. Pin configuration SOT833-1, SOT1089, SOT1116 and SOT1203 (XSON8)

6.2. Pin description

Table 3. Pin description

| Symbol | Pin  | Description                       |
|--------|------|-----------------------------------|
| 1OE    | 1    | output enable input (active LOW)  |
| 1A, 2A | 2, 5 | data input                        |
| GND    | 4    | ground (0 V)                      |
| 1Y, 2Y | 6, 3 | data output                       |
| 2OE    | 7    | output enable input (active HIGH) |
| VCC    | 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 |    |
|-------|----|-----|----|--------|----|
| 1OE   | 1A | 2OE | 2A | 1Y     | 2Y |
| L     | L  | H   | L  | L      | L  |
| L     | H  | H   | H  | H      | H  |
| H     | X  | L   | X  | Z      | Z  |

## 8. Limiting values

**Table 5. 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       | -    | $\pm 50$       | mA   |
| $V_O$     | output voltage          | enable mode [1]                     | -0.5 | $V_{CC} + 0.5$ | V    |
|           |                         | disable mode [1]                    | -0.5 | +6.5           | V    |
|           |                         | $V_{CC} = 0$ V; Power-down mode [1] | -0.5 | +6.5           | V    |
| $I_O$     | output current          | $V_O = 0$ V to $V_{CC}$             | -    | $\pm 50$       | mA   |
| $I_{CC}$  | supply current          |                                     | -    | 100            | mA   |
| $I_{GND}$ | ground current          |                                     | -100 | -              | mA   |
| $T_{stg}$ | storage temperature     |                                     | -65  | +150           | °C   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40$ °C to +125 °C [2]   | -    | 250            | mW   |

[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 SOT765-1 (VSSOP8) packages:  $P_{tot}$  derates linearly with 4.9 mW/K above 99 °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 6. 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                      | $V_{CC} = 1.65$ V to 5.5 V; enable mode  | 0    | $V_{CC}$ | V    |
|                     |                                     | $V_{CC} = 1.65$ V to 5.5 V; disable mode | 0    | 5.5      | V    |
|                     |                                     | $V_{CC} = 0$ V; Power-down mode          | 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 5.5 V                | -    | 10       | ns/V |

## 10. Static characteristics

**Table 7. Static characteristics**

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

| Symbol                                    | Parameter                 | Conditions                                                                                                      | Min                    | Typ[1] | Max                    | Unit |
|-------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------|--------|------------------------|------|
| <b>T<sub>amb</sub> = -40 °C to +85 °C</b> |                           |                                                                                                                 |                        |        |                        |      |
| V <sub>IH</sub>                           | HIGH-level input voltage  | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                              | 0.65 × V <sub>CC</sub> | -      | -                      | V    |
|                                           |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                | 1.7                    | -      | -                      | V    |
|                                           |                           | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                                | 2.0                    | -      | -                      | V    |
|                                           |                           | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                | 0.7 × V <sub>CC</sub>  | -      | -                      | V    |
| V <sub>IL</sub>                           | LOW-level input voltage   | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                              | -                      | -      | 0.35 × V <sub>CC</sub> | V    |
|                                           |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                | -                      | -      | 0.7                    | V    |
|                                           |                           | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                                | -                      | -      | 0.8                    | V    |
|                                           |                           | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                | -                      | -      | 0.3 × V <sub>CC</sub>  | V    |
| V <sub>OL</sub>                           | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                             |                        |        |                        |      |
|                                           |                           | I <sub>O</sub> = 100 µA; V <sub>CC</sub> = 1.65 V to 5.5 V                                                      | -                      | -      | 0.1                    | V    |
|                                           |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V                                                                 | -                      | -      | 0.45                   | V    |
|                                           |                           | I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V                                                                  | -                      | -      | 0.3                    | V    |
|                                           |                           | I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                                                                 | -                      | -      | 0.4                    | V    |
|                                           |                           | I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V                                                                 | -                      | -      | 0.55                   | V    |
|                                           |                           | I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V                                                                 | -                      | -      | 0.55                   | V    |
| V <sub>OH</sub>                           | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                             |                        |        |                        |      |
|                                           |                           | I <sub>O</sub> = -100 µA; V <sub>CC</sub> = 1.65 V to 5.5 V                                                     | V <sub>CC</sub> - 0.1  | -      | -                      | V    |
|                                           |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V                                                                | 1.2                    | -      | -                      | V    |
|                                           |                           | I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V                                                                 | 1.9                    | -      | -                      | V    |
|                                           |                           | I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V                                                                | 2.2                    | -      | -                      | V    |
|                                           |                           | I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V                                                                | 2.3                    | -      | -                      | V    |
|                                           |                           | I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V                                                                | 3.8                    | -      | -                      | V    |
| I <sub>I</sub>                            | input leakage current     | V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V                                                   | -                      | ±0.1   | ±1                     | µA   |
| I <sub>OZ</sub>                           | OFF-state output current  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 3.6 V | -                      | ±0.1   | ±2                     | µA   |
| I <sub>OFF</sub>                          | power-off leakage current | V <sub>I</sub> or V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 0 V                                                 | -                      | ±0.1   | ±2                     | µA   |
| I <sub>CC</sub>                           | supply current            | V <sub>I</sub> = 5.5 V or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 1.65 V to 5.5 V                       | -                      | 0.1    | 4                      | µA   |
| ΔI <sub>CC</sub>                          | additional supply current | per pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 2.3 V to 5.5 V    | -                      | 5      | 500                    | µA   |
| C <sub>I</sub>                            | input capacitance         |                                                                                                                 | -                      | 2      | -                      | pF   |

| Symbol                                     | Parameter                 | Conditions                                                                                                      | Min                    | Typ[1] | Max                    | Unit |
|--------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------|--------|------------------------|------|
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |                           |                                                                                                                 |                        |        |                        |      |
| V <sub>IH</sub>                            | HIGH-level input voltage  | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                              | 0.65 × V <sub>CC</sub> | -      | -                      | V    |
|                                            |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                | 1.7                    | -      | -                      | V    |
|                                            |                           | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                                | 2.0                    | -      | -                      | V    |
|                                            |                           | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                | 0.7 × V <sub>CC</sub>  | -      | -                      | V    |
| V <sub>IL</sub>                            | LOW-level input voltage   | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                              | -                      | -      | 0.35 × V <sub>CC</sub> | V    |
|                                            |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                | -                      | -      | 0.7                    | V    |
|                                            |                           | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                                | -                      | -      | 0.8                    | V    |
|                                            |                           | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                | -                      | -      | 0.3 × V <sub>CC</sub>  | V    |
| V <sub>OL</sub>                            | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                             |                        |        |                        |      |
|                                            |                           | I <sub>O</sub> = 100 µA; V <sub>CC</sub> = 1.65 V to 5.5 V                                                      | -                      | -      | 0.1                    | V    |
|                                            |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V                                                                 | -                      | -      | 0.70                   | V    |
|                                            |                           | I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V                                                                  | -                      | -      | 0.45                   | V    |
|                                            |                           | I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                                                                 | -                      | -      | 0.60                   | V    |
|                                            |                           | I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V                                                                 | -                      | -      | 0.80                   | V    |
|                                            |                           | I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V                                                                 | -                      | -      | 0.80                   | V    |
| V <sub>OH</sub>                            | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                             |                        |        |                        |      |
|                                            |                           | I <sub>O</sub> = -100 µA; V <sub>CC</sub> = 1.65 V to 5.5 V                                                     | V <sub>CC</sub> - 0.1  | -      | -                      | V    |
|                                            |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V                                                                | 0.95                   | -      | -                      | V    |
|                                            |                           | I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V                                                                 | 1.7                    | -      | -                      | V    |
|                                            |                           | I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V                                                                | 1.9                    | -      | -                      | V    |
|                                            |                           | I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V                                                                | 2.0                    | -      | -                      | V    |
|                                            |                           | I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V                                                                | 3.4                    | -      | -                      | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V                                                   | -                      | -      | ±1                     | µA   |
| I <sub>OZ</sub>                            | OFF-state output current  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 3.6 V | -                      | -      | ±2                     | µA   |
| I <sub>OFF</sub>                           | power-off leakage current | V <sub>I</sub> or V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 0 V                                                 | -                      | -      | ±2                     | µA   |
| I <sub>CC</sub>                            | supply current            | V <sub>I</sub> = 5.5 V or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 1.65 V to 5.5 V                       | -                      | -      | 4                      | µA   |
| ΔI <sub>CC</sub>                           | additional supply current | per pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 2.3 V to 5.5 V    | -                      | -      | 500                    | µA   |

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

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 8.

| Symbol    | Parameter                     | Conditions                                    | -40 °C to +85 °C |        |      | -40 °C to +125 °C |      | Unit |
|-----------|-------------------------------|-----------------------------------------------|------------------|--------|------|-------------------|------|------|
|           |                               |                                               | Min              | Typ[1] | Max  | Min               | Max  |      |
| $t_{pd}$  | propagation delay             | nA to nY; see Fig. 5 [2]                      |                  |        |      |                   |      |      |
|           |                               | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$  | 1.0              | 4.5    | 8.8  | 1.0               | 11.0 | ns   |
|           |                               | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$    | 0.5              | 2.8    | 4.9  | 0.5               | 6.3  | ns   |
|           |                               | $V_{CC} = 2.7 \text{ V}$                      | 1.0              | 2.8    | 4.7  | 1.0               | 5.9  | ns   |
|           |                               | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$    | 0.5              | 2.6    | 4.3  | 0.5               | 5.4  | ns   |
|           |                               | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$    | 0.5              | 2.1    | 3.7  | 0.5               | 4.6  | ns   |
| $t_{en}$  | enable time                   | 1OE to 1Y; see Fig. 6 [2]                     |                  |        |      |                   |      |      |
|           |                               | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$  | 1.5              | 5.2    | 9.9  | 1.5               | 12.4 | ns   |
|           |                               | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$    | 1.0              | 3.1    | 5.6  | 1.0               | 7.0  | ns   |
|           |                               | $V_{CC} = 2.7 \text{ V}$                      | 1.5              | 3.2    | 5.5  | 1.5               | 6.9  | ns   |
|           |                               | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$    | 0.5              | 2.7    | 4.7  | 0.5               | 5.9  | ns   |
|           |                               | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$    | 0.5              | 2.0    | 3.8  | 0.5               | 4.8  | ns   |
|           |                               | 2OE to 2Y; see Fig. 7 [2]                     |                  |        |      |                   |      |      |
|           |                               | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$  | 1.0              | 4.3    | 8.8  | 1.0               | 11.0 | ns   |
|           |                               | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$    | 1.0              | 2.7    | 4.7  | 1.0               | 5.9  | ns   |
|           |                               | $V_{CC} = 2.7 \text{ V}$                      | 1.0              | 2.7    | 4.6  | 1.0               | 5.8  | ns   |
|           |                               | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$    | 1.0              | 2.5    | 4.1  | 1.0               | 5.1  | ns   |
|           |                               | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$    | 0.5              | 1.9    | 3.3  | 0.5               | 4.1  | ns   |
| $t_{dis}$ | disable time                  | 1OE to 1Y; see Fig. 6 [2]                     |                  |        |      |                   |      |      |
|           |                               | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$  | 1.0              | 3.2    | 11.6 | 1.0               | 14.1 | ns   |
|           |                               | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$    | 0.5              | 2.2    | 5.8  | 0.5               | 7.6  | ns   |
|           |                               | $V_{CC} = 2.7 \text{ V}$                      | 1.0              | 2.8    | 4.6  | 1.0               | 5.9  | ns   |
|           |                               | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$    | 1.0              | 2.6    | 4.4  | 1.0               | 5.7  | ns   |
|           |                               | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$    | 0.5              | 2.0    | 3.4  | 0.5               | 4.6  | ns   |
|           |                               | 2OE to 2Y; see Fig. 7 [2]                     |                  |        |      |                   |      |      |
|           |                               | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$  | 1.0              | 3.6    | 12.5 | 1.0               | 15.2 | ns   |
|           |                               | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$    | 0.5              | 2.0    | 5.2  | 0.5               | 6.9  | ns   |
|           |                               | $V_{CC} = 2.7 \text{ V}$                      | 1.5              | 3.2    | 4.9  | 1.5               | 6.3  | ns   |
|           |                               | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$    | 1.0              | 2.8    | 4.2  | 1.0               | 5.4  | ns   |
|           |                               | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$    | 0.5              | 2.0    | 3.3  | 0.5               | 4.4  | ns   |
| $C_{PD}$  | power dissipation capacitance | per buffer; $V_I = \text{GND to } V_{CC}$ [3] |                  |        |      |                   |      |      |
|           |                               | output enabled                                | -                | 20     | -    | -                 | -    | pF   |
|           |                               | output disabled                               | -                | 5      | -    | -                 | -    | pF   |

[1] Typical values are measured at nominal  $V_{CC}$  and at  $T_{amb} = 25 \text{ °C}$ .

[2]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ ;  $t_{en}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ ;  $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ .

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

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

$f_i$  = input frequency in MHz;  $f_o$  = output frequency in MHz;  $C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;  $N$  = number of inputs switching;

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

11.1. Waveforms and test circuit

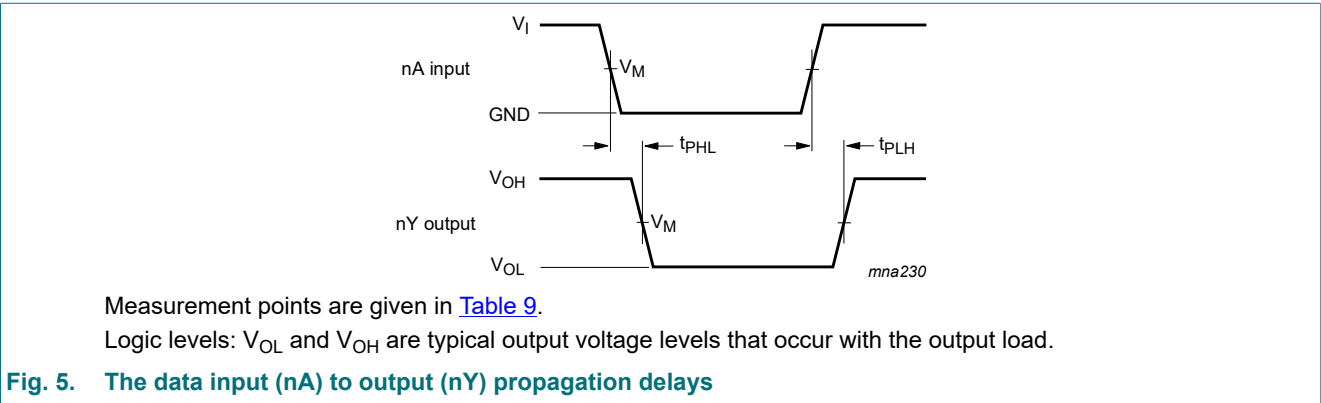
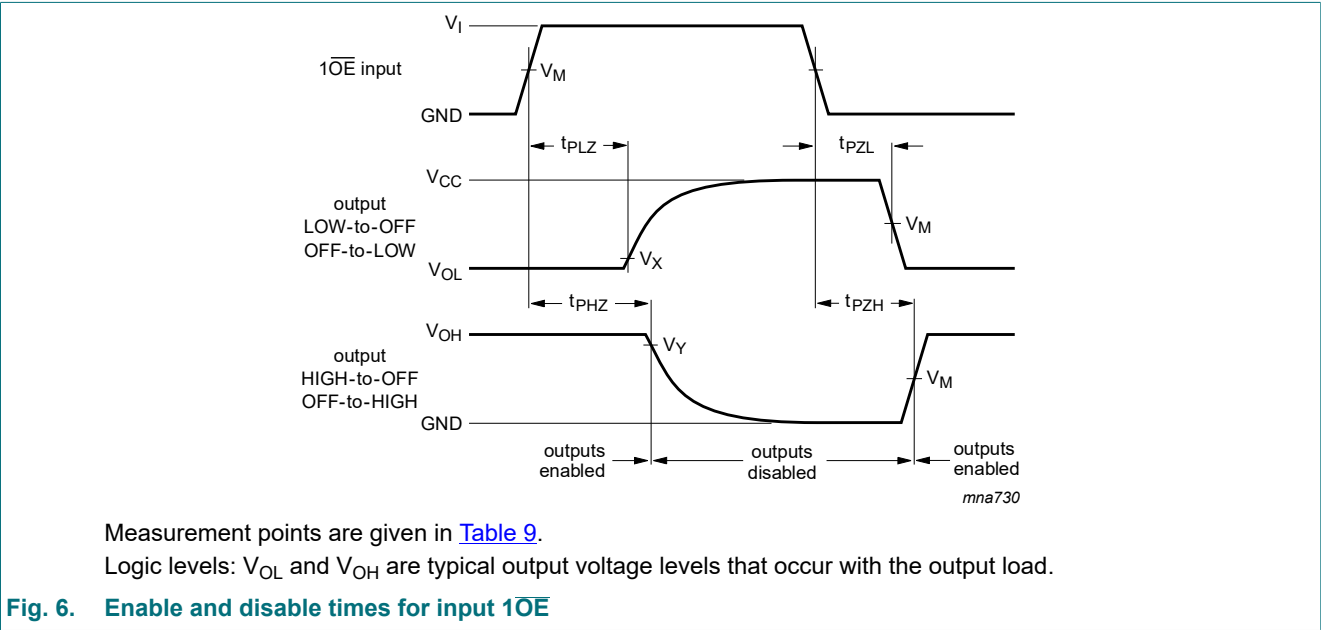
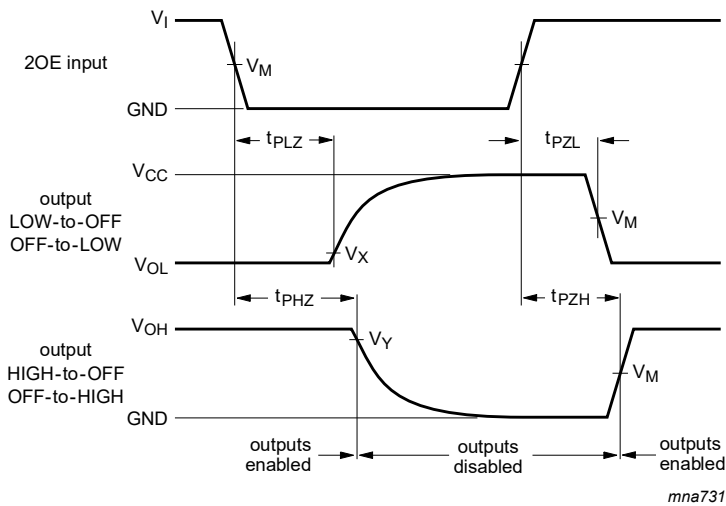


Table 9. Measurement points

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

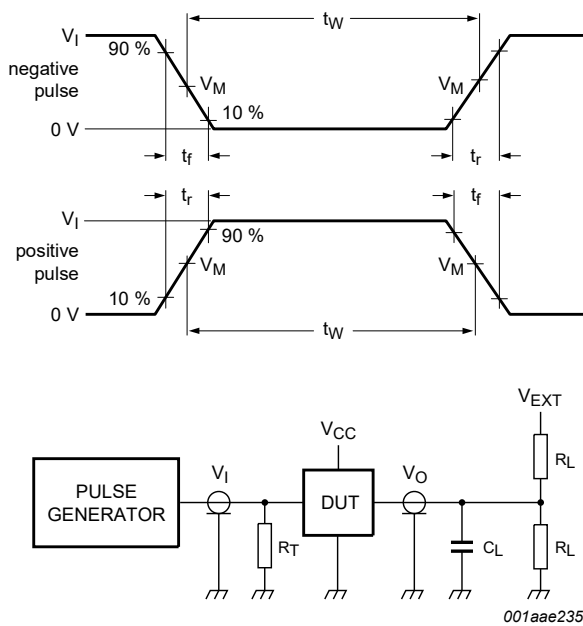






Measurement points are given in [Table 9](#).  
Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

Fig. 7. Enable and disable times for input 2OE



Test data is given in [Table 10](#).  
Definitions for 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.

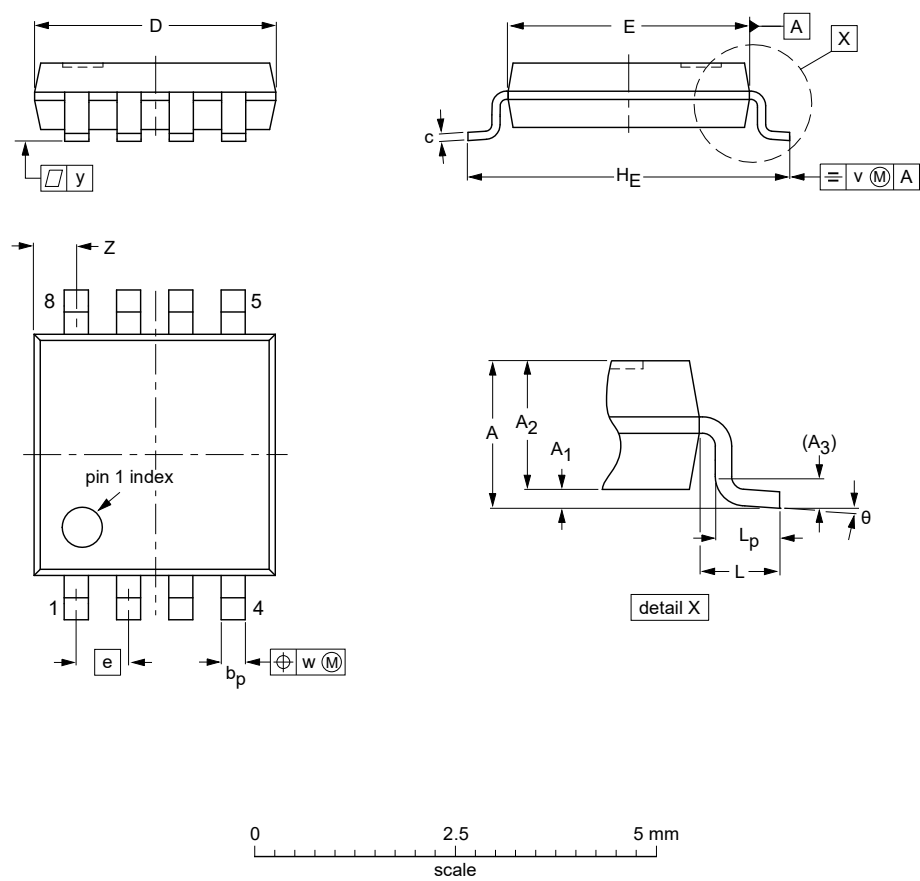
Fig. 8. Test circuit for measuring switching times

Table 10. Test data

| Supply voltage   | Input    | Load  |              | $V_{EXT}$             |                       |                       |
|------------------|----------|-------|--------------|-----------------------|-----------------------|-----------------------|
|                  | $V_I$    | $C_L$ | $R_L$        | $t_{PLH}$ , $t_{PHL}$ | $t_{PZH}$ , $t_{PHZ}$ | $t_{PZL}$ , $t_{PLZ}$ |
| 1.65 V to 1.95 V | $V_{CC}$ | 30 pF | 1 k $\Omega$ | open                  | GND                   | $2 \times V_{CC}$     |
| 2.3 V to 2.7 V   | $V_{CC}$ | 30 pF | 500 $\Omega$ | open                  | GND                   | $2 \times V_{CC}$     |
| 2.7 V            | 2.7 V    | 50 pF | 500 $\Omega$ | open                  | GND                   | 6 V                   |
| 3.0 V to 3.6 V   | 2.7 V    | 50 pF | 500 $\Omega$ | open                  | GND                   | 6 V                   |
| 4.5 V to 5.5 V   | $V_{CC}$ | 50 pF | 500 $\Omega$ | open                  | GND                   | $2 \times V_{CC}$     |

12. Package outline

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



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> | v   | w    | y   | Z <sup>(1)</sup> | θ        |
|------|-----------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|----------------|-----|----------------|-----|------|-----|------------------|----------|
| mm   | 1.1       | 0.15<br>0.00   | 0.95<br>0.75   | 0.25           | 0.38<br>0.22   | 0.18<br>0.08 | 3.1<br>2.9       | 3.1<br>2.9       | 0.65 | 4.1<br>3.9     | 0.5 | 0.47<br>0.33   | 0.2 | 0.13 | 0.1 | 0.70<br>0.35     | 8°<br>0° |

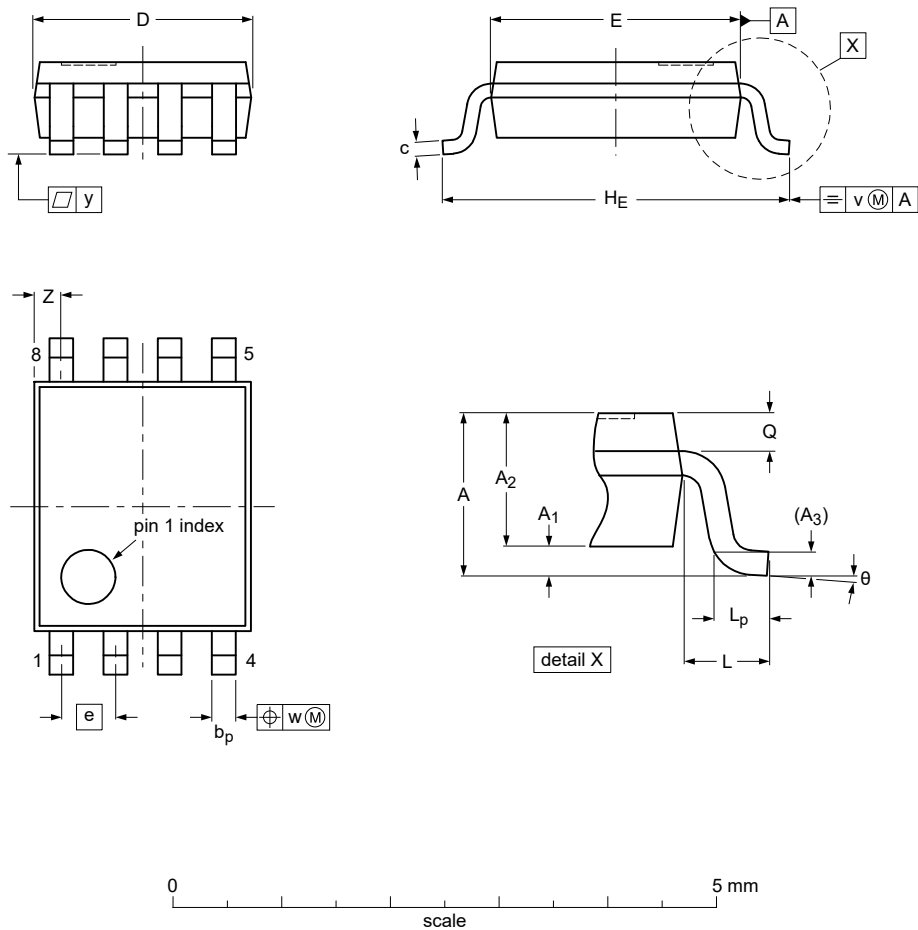
Note

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 | JEITA |  |                        |            |
| SOT505-2           |            | ---   |       |  |                        | 02-01-16   |

Fig. 9. Package outline SOT505-2 (TSSOP8)

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm SOT765-1



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  |
|------|-------------------|----------------|----------------|----------------|----------------|------|------------------|------------------|-----|----------------|-----|----------------|------|-----|------|-----|------------------|----|
| max  |                   | 0.15           | 0.85           |                | 0.27           | 0.23 | 2.1              | 2.4              |     | 3.2            |     | 0.40           | 0.21 |     |      |     | 0.4              | 8° |
| mm   | nom               | 1              |                | 0.12           |                |      |                  |                  | 0.5 |                | 0.4 |                |      | 0.2 | 0.08 | 0.1 |                  |    |
| min  |                   |                | 0.60           |                | 0.17           | 0.08 | 1.9              | 2.2              |     | 3.0            |     | 0.15           | 0.19 |     |      |     | 0.1              | 0° |

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

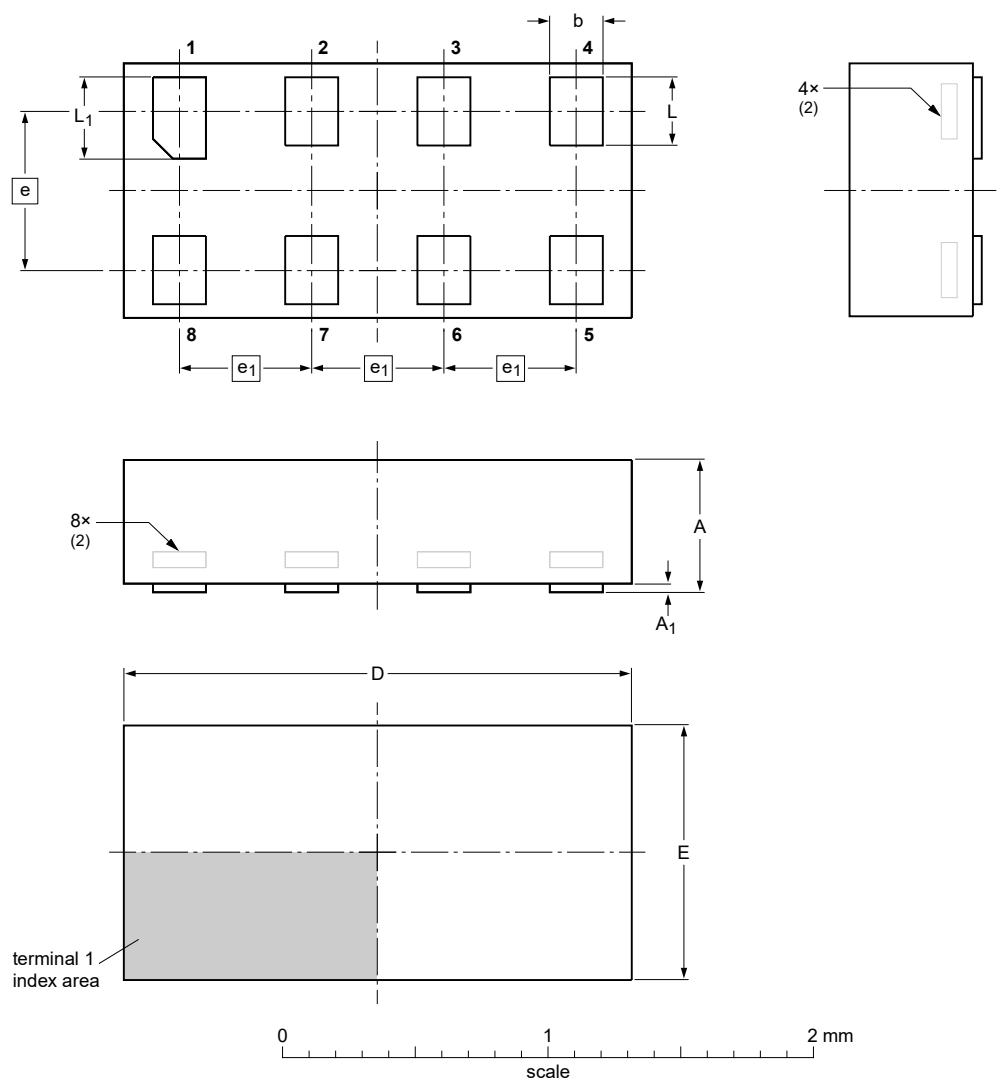
sot765-1\_po

| Outline version | References |        |       |  | European projection                                                                   | Issue date             |
|-----------------|------------|--------|-------|--|---------------------------------------------------------------------------------------|------------------------|
|                 | IEC        | JEDEC  | JEITA |  |                                                                                       |                        |
| SOT765-1        |            | MO-187 |       |  |  | -07-06-02-<br>16-05-31 |

Fig. 10. Package outline SOT765-1 (VSSOP8)

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

SOT833-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A <sup>(1)</sup><br>max | A <sub>1</sub><br>max | b            | D          | E            | e   | e <sub>1</sub> | L            | L <sub>1</sub> |
|------|-------------------------|-----------------------|--------------|------------|--------------|-----|----------------|--------------|----------------|
| mm   | 0.5                     | 0.04                  | 0.25<br>0.17 | 2.0<br>1.9 | 1.05<br>0.95 | 0.6 | 0.5            | 0.35<br>0.27 | 0.40<br>0.32   |

- Notes
- 1. Including plating thickness.
  - 2. Can be visible in some manufacturing processes.

| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE             |
|--------------------|------------|--------|-------|--|---------------------------------------------------------------------------------------|------------------------|
|                    | IEC        | JEDEC  | JEITA |  |                                                                                       |                        |
| SOT833-1           | ---        | MO-252 | ---   |  |  | -07-11-14-<br>07-12-07 |

Fig. 11. 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

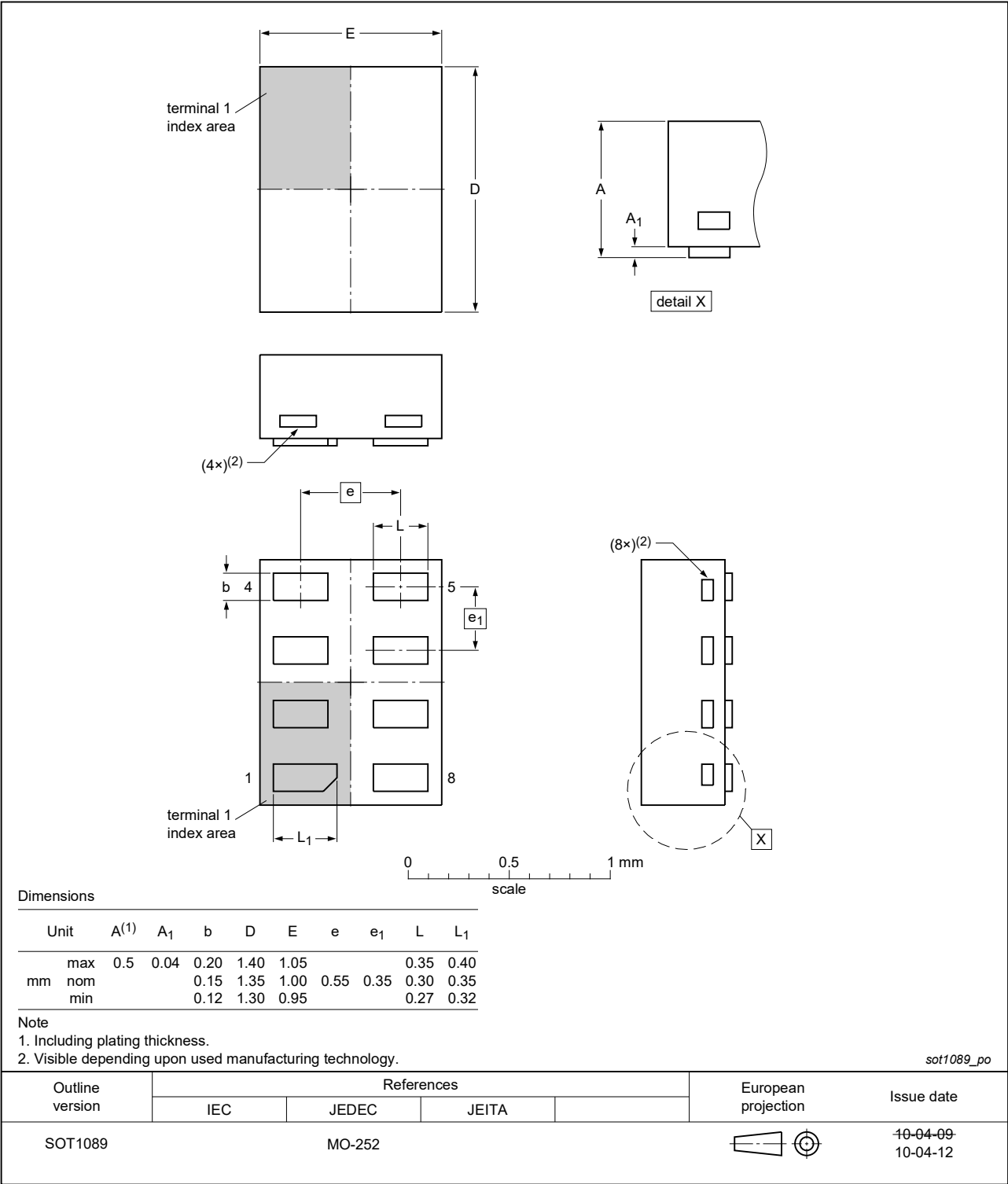
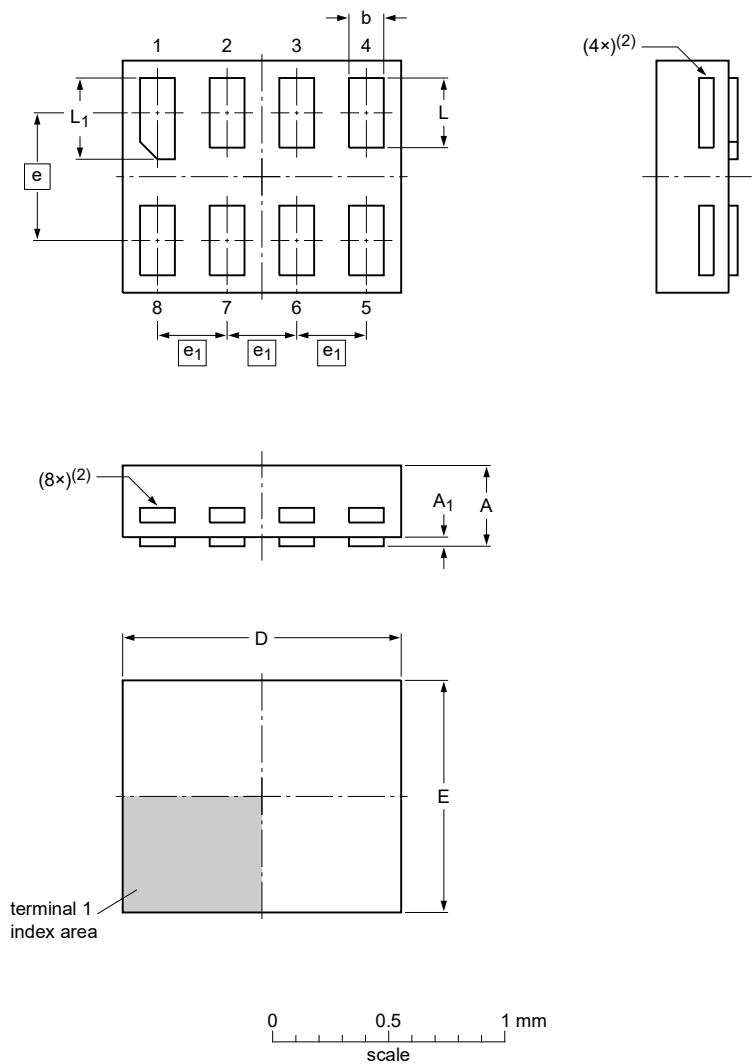


Fig. 12. Package outline SOT1089 (XSON8)

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

SOT1116



Dimensions

| Unit | A <sup>(1)</sup> | A <sub>1</sub> | b    | D    | E    | e    | e <sub>1</sub> | L    | L <sub>1</sub> |
|------|------------------|----------------|------|------|------|------|----------------|------|----------------|
| max  | 0.35             | 0.04           | 0.20 | 1.25 | 1.05 |      |                | 0.35 | 0.40           |
| mm   | nom              |                | 0.15 | 1.20 | 1.00 | 0.55 | 0.3            | 0.30 | 0.35           |
|      | min              |                | 0.12 | 1.15 | 0.95 |      |                | 0.27 | 0.32           |

Note

- 1. Including plating thickness.
- 2. Visible depending upon used manufacturing technology.

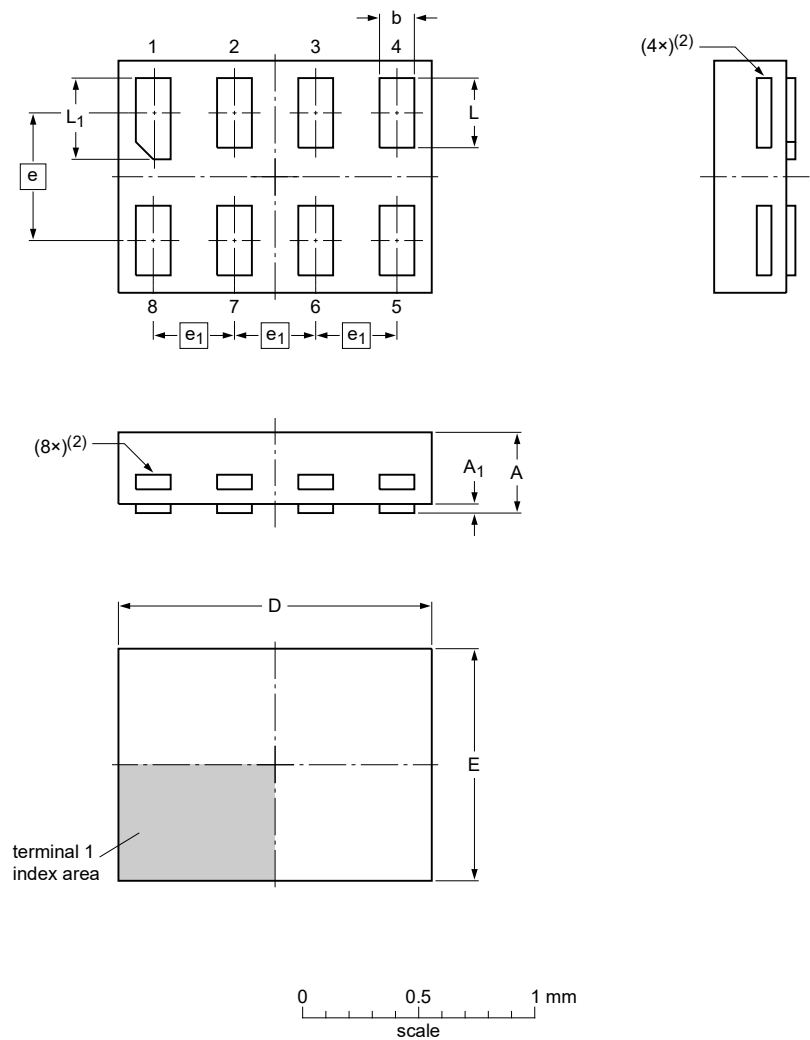
sot1116\_po

| Outline version | References |       |       |  | European projection                                                                   | Issue date                      |
|-----------------|------------|-------|-------|--|---------------------------------------------------------------------------------------|---------------------------------|
|                 | IEC        | JEDEC | JEITA |  |                                                                                       |                                 |
| SOT1116         |            |       |       |  |  | <del>10-04-02</del><br>10-04-07 |

Fig. 13. 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



Dimensions

| Unit | A <sup>(1)</sup> | A <sub>1</sub> | b    | D    | E    | e    | e <sub>1</sub> | L    | L <sub>1</sub> |
|------|------------------|----------------|------|------|------|------|----------------|------|----------------|
| mm   | max              | 0.35           | 0.04 | 0.20 | 1.40 | 1.05 |                | 0.35 | 0.40           |
|      | nom              |                |      | 0.15 | 1.35 | 1.00 | 0.55           | 0.30 | 0.35           |
|      | min              |                |      | 0.12 | 1.30 | 0.95 |                | 0.27 | 0.32           |

Note

- 1. Including plating thickness.
- 2. Visible depending upon used manufacturing technology.

sot1203\_po

| Outline version | References |       |       |  | European projection | Issue date                      |
|-----------------|------------|-------|-------|--|---------------------|---------------------------------|
|                 | IEC        | JEDEC | JEITA |  |                     |                                 |
| SOT1203         |            |       |       |  |                     | <del>10-04-02</del><br>10-04-06 |

Fig. 14. Package outline SOT1203 (XSON8)

## 13. Abbreviations

Table 11. 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 12. Revision history

| Document ID     | Release date                                                                                                                                                                                                                                                                                           | Data sheet status     | Change notice | Supersedes      |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-----------------|
| 74LVC2G241 v.16 | 20190731                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.15 |
| Modifications:  | <ul style="list-style-type: none"> <li>Type number 74LVC2G241GM (SOT902-2/XQFN8) removed.</li> <li><a href="#">Table 5</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul>                                                                                       |                       |               |                 |
| 74LVC2G241 v.15 | 20181122                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.14 |
| 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 numbers 74LVC2G241GD (SOT996-2/XSON8) removed.</li> </ul> |                       |               |                 |
| 74LVC2G241 v.14 | 20161215                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.13 |
| Modifications:  | <ul style="list-style-type: none"> <li><a href="#">Table 7</a>: The maximum limits for leakage current and supply current have changed.</li> </ul>                                                                                                                                                     |                       |               |                 |
| 74LVC2G241 v.13 | 20130408                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.12 |
| Modifications:  | <ul style="list-style-type: none"> <li>For type number 74LVC2G241GD XSON8U has changed to XSON8.</li> </ul>                                                                                                                                                                                            |                       |               |                 |
| 74LVC2G241 v.12 | 20120622                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.11 |
| Modifications:  | <ul style="list-style-type: none"> <li>For type number 74LVC2G241GM the SOT code has changed to SOT902-2.</li> </ul>                                                                                                                                                                                   |                       |               |                 |
| 74LVC2G241 v.11 | 20111129                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.10 |
| Modifications:  | <ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>                                                                                                                                                                                                                                 |                       |               |                 |
| 74LVC2G241 v.10 | 20100806                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.9  |
| 74LVC2G241 v.9  | 20080610                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.8  |
| 74LVC2G241 v.8  | 20080312                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.7  |
| 74LVC2G241 v.7  | 20071005                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.6  |
| 74LVC2G241 v.6  | 20060922                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | 74LVC2G241 v.5  |
| 74LVC2G241 v.5  | 20050202                                                                                                                                                                                                                                                                                               | Product specification | -             | 74LVC2G241 v.4  |
| 74LVC2G241 v.4  | 20040922                                                                                                                                                                                                                                                                                               | Product specification | -             | 74LVC2G241 v.3  |
| 74LVC2G241 v.3  | 20030311                                                                                                                                                                                                                                                                                               | Product specification | -             | 74LVC2G241 v.2  |
| 74LVC2G241 v.2  | 20030129                                                                                                                                                                                                                                                                                               | Product specification | -             | 74LVC2G241 v.1  |
| 74LVC2G241 v.1  | 20021030                                                                                                                                                                                                                                                                                               | Product specification | -             | -               |



## 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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