

# 74AUP1G98

Low-power configurable multiple function gate

Rev. 8 — 23 September 2015

Product data sheet

## 1. General description

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The 74AUP1G98 provides configurable multiple functions. The output state is determined by eight patterns of 3-bit input. The user can choose the logic functions MUX, AND, OR, NAND, NOR, inverter and buffer. All inputs can be connected to  $V_{CC}$  or GND.

This device ensures a very low static and dynamic power consumption across the entire  $V_{CC}$  range from 0.8 V to 3.6 V.

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 74AUP1G98 has Schmitt trigger inputs making it capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

The inputs switch at different points for positive and negative-going signals. The difference between the positive voltage  $V_{T+}$  and the negative voltage  $V_{T-}$  is defined as the input hysteresis voltage  $V_H$ .

## 2. Features and benefits

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- Wide supply voltage range from 0.8 V to 3.6 V
- High noise immunity
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 5000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101E exceeds 1000 V
- Low static power consumption;  $I_{CC} = 0.9 \mu\text{A}$  (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot < 10 % of  $V_{CC}$
- $I_{OFF}$  circuitry provides partial power-down mode operation
- Multiple package options
- Specified from  $-40 \text{ }^\circ\text{C}$  to  $+85 \text{ }^\circ\text{C}$  and  $-40 \text{ }^\circ\text{C}$  to  $+125 \text{ }^\circ\text{C}$

### 3. Ordering information

Table 1. Ordering information

| Type number | Package           |        |   | Version |
|-------------|-------------------|--------|---|---------|
|             | Temperature range | Name   | Description   |         |
| 74AUP1G98GW | -40 °C to +125 °C | SC-88  | plastic surface-mounted package; 6 leads  | SOT363  |
| 74AUP1G98GM | -40 °C to +125 °C | XSON6  | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm         | SOT886  |
| 74AUP1G98GF | -40 °C to +125 °C | XSON6  | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm            | SOT891  |
| 74AUP1G98GN | -40 °C to +125 °C | XSON6  | extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm               | SOT1115 |
| 74AUP1G98GS | -40 °C to +125 °C | XSON6  | extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm               | SOT1202 |
| 74AUP1G98GX | -40 °C to +125 °C | X2SON6 | plastic thermal extremely thin small outline package; no leads; 6 terminals; body 1 × 0.8 × 0.35 mm | SOT1255 |

### 4. Marking

Table 2. Marking

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| 74AUP1G98GW | a9                          |
| 74AUP1G98GM | a9                          |
| 74AUP1G98GF | a9                          |
| 74AUP1G98GN | a9                          |
| 74AUP1G98GS | a9                          |
| 74AUP1G98GX | a9                          |

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

### 5. Functional diagram

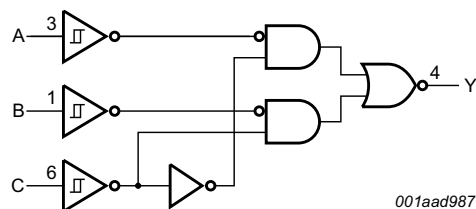


Fig 1. Logic diagram

## 6. Pinning information

### 6.1 Pinning



Fig 2. Pin configuration SOT363

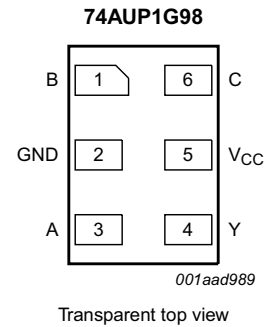


Fig 3. Pin configuration SOT886

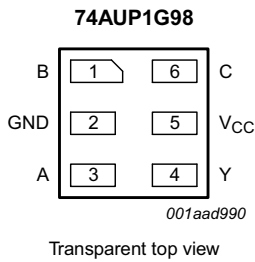


Fig 4. Pin configuration SOT891, SOT1115 and SOT1202



Fig 5. Pin configuration SOT1255 (X2SON6)

### 6.2 Pin description

Table 3. Pin description

| Symbol          | Pin | Description    |
|-----------------|-----|----------------|
| B               | 1   | data input     |
| GND             | 2   | ground (0 V)   |
| A               | 3   | data input     |
| Y               | 4   | data output    |
| V <sub>CC</sub> | 5   | supply voltage |
| C               | 6   | data input     |

## 7. Functional description

Table 4. Function table<sup>[1]</sup>

| Input |   |   | Output |
|-------|---|---|--------|
| C     | B | A | Y      |
| L     | L | L | H      |
| L     | L | H | H      |
| L     | H | L | L      |
| L     | H | H | L      |
| H     | L | L | H      |
| H     | L | H | L      |
| H     | H | L | H      |
| H     | H | H | L      |

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

### 7.1 Logic configurations

Table 5. Function selection table

| Logic function                       | Figure                        |
|--------------------------------------|-------------------------------|
| 2-input MUX with inverted output     | see <a href="#">Figure 6</a>  |
| 2-input NAND                         | see <a href="#">Figure 7</a>  |
| 2-input NOR with one input inverted  | see <a href="#">Figure 8</a>  |
| 2-input AND with one input inverted  | see <a href="#">Figure 8</a>  |
| 2-input NAND with one input inverted | see <a href="#">Figure 9</a>  |
| 2-input OR with one input inverted   | see <a href="#">Figure 9</a>  |
| 2-input NOR                          | see <a href="#">Figure 10</a> |
| Buffer                               | see <a href="#">Figure 11</a> |
| Inverter                             | see <a href="#">Figure 12</a> |



Fig 6. 2-input MUX with inverted output

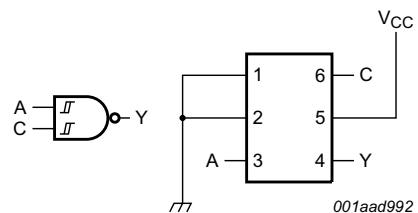
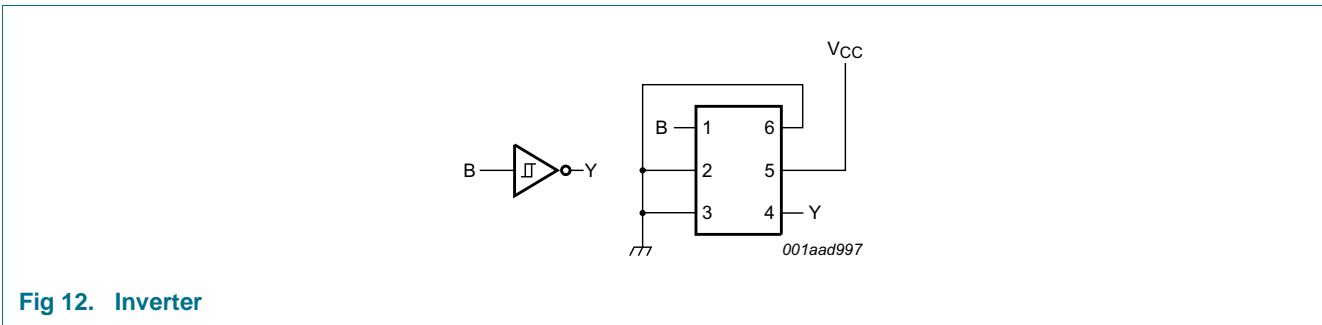
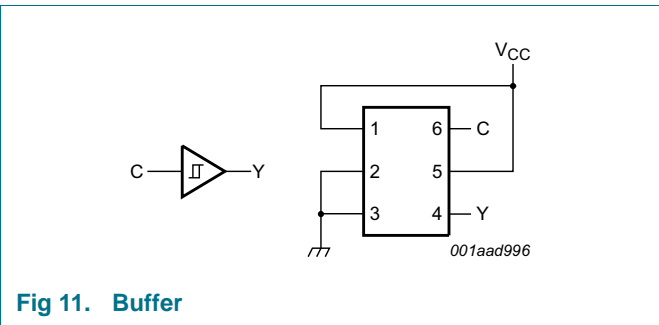
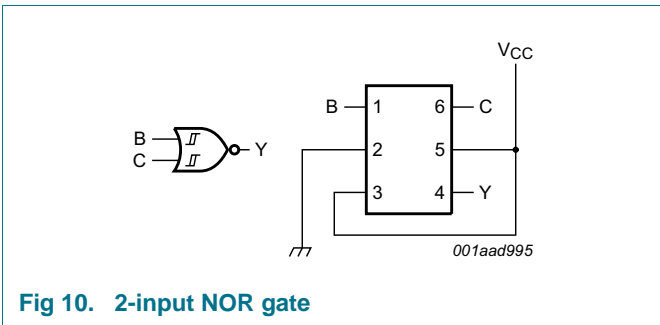
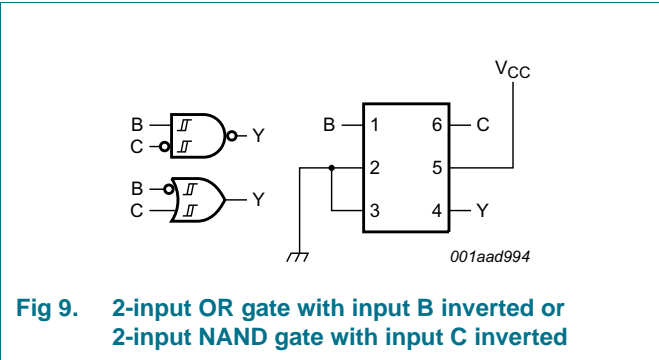
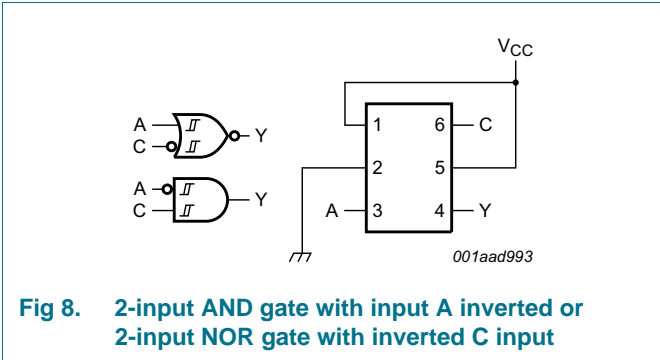


Fig 7. 2-input NAND gate



## 8. Limiting values

Table 6. 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 | +4.6 | V    |
| $I_{IK}$ | input clamping current  | $V_I < 0$ V                         | -50  | -    | mA   |
| $V_I$    | input voltage           | [1]                                 | -0.5 | +4.6 | V    |
| $I_{OK}$ | output clamping current | $V_O < 0$ V                         | -50  | -    | mA   |
| $V_O$    | output voltage          | Active mode and Power-down mode [1] | -0.5 | +4.6 | V    |
| $I_O$    | output current          | $V_O = 0$ V to $V_{CC}$             | -    | ±20  | mA   |
| $I_{CC}$ | supply current          |                                     | -    | 50   | mA   |

**Table 6.** Limiting values ...continued

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

| Symbol           | Parameter               | Conditions   | Min | Max  | Unit |
|------------------|-------------------------|--|-----|------|------|
| $I_{\text{GND}}$ | ground current          |  | -50 | -    | mA   |
| $T_{\text{stg}}$ | storage temperature     |  | -65 | +150 | °C   |
| $P_{\text{tot}}$ | total power dissipation | $T_{\text{amb}} = -40\text{ °C to }+125\text{ °C}$ [2] | -   | 250  | mW   |

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

[2] For SC-88 packages: above 87.5 °C the value of  $P_{\text{tot}}$  derates linearly with 4.0 mW/K.

For X2SON6 and XSON6 packages: above 118 °C the value of  $P_{\text{tot}}$  derates linearly with 7.8 mW/K.

## 9. Recommended operating conditions

**Table 7.** Recommended operating conditions

| Symbol           | Parameter           | Conditions                                    | Min | Max             | Unit |
|------------------|---------------------|---|-----|-----------------|------|
| $V_{\text{CC}}$  | supply voltage      |   | 0.8 | 3.6             | V    |
| $V_{\text{I}}$   | input voltage       |   | 0   | 3.6             | V    |
| $V_{\text{O}}$   | output voltage      | Active mode                                   | 0   | $V_{\text{CC}}$ | V    |
|                  |                     | Power-down mode; $V_{\text{CC}} = 0\text{ V}$ | 0   | 3.6             | V    |
| $T_{\text{amb}}$ | ambient temperature |   | -40 | +125            | °C   |

## 10. Static characteristics

**Table 8.** Static characteristics

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

| Symbol  | Parameter                 | Conditions   | Min                   | Typ | Max                | Unit |
|---|---------------------------|--|-----------------------|-----|--------------------|------|
| $T_{\text{amb}} = 25\text{ °C}$                                 |                           |  |                       |     |                    |      |
| $V_{\text{OH}}$   | HIGH-level output voltage | $V_{\text{I}} = V_{\text{T+}}$ or $V_{\text{T-}}$  |                       |     |                    |      |
|   |                           | $I_{\text{O}} = -20\text{ }\mu\text{A}$ ; $V_{\text{CC}} = 0.8\text{ V to }3.6\text{ V}$ | $V_{\text{CC}} - 0.1$ | -   | -                  | V    |
|   |                           | $I_{\text{O}} = -1.1\text{ mA}$ ; $V_{\text{CC}} = 1.1\text{ V}$                         | $0.75V_{\text{CC}}$   | -   | -                  | V    |
|   |                           | $I_{\text{O}} = -1.7\text{ mA}$ ; $V_{\text{CC}} = 1.4\text{ V}$                         | 1.11                  | -   | -                  | V    |
|   |                           | $I_{\text{O}} = -1.9\text{ mA}$ ; $V_{\text{CC}} = 1.65\text{ V}$                        | 1.32                  | -   | -                  | V    |
|   |                           | $I_{\text{O}} = -2.3\text{ mA}$ ; $V_{\text{CC}} = 2.3\text{ V}$                         | 2.05                  | -   | -                  | V    |
|   |                           | $I_{\text{O}} = -3.1\text{ mA}$ ; $V_{\text{CC}} = 2.3\text{ V}$                         | 1.9                   | -   | -                  | V    |
|   |                           | $I_{\text{O}} = -2.7\text{ mA}$ ; $V_{\text{CC}} = 3.0\text{ V}$                         | 2.72                  | -   | -                  | V    |
| $V_{\text{OL}}$   | LOW-level output voltage  | $V_{\text{I}} = V_{\text{T+}}$ or $V_{\text{T-}}$  |                       |     |                    |      |
|   |                           | $I_{\text{O}} = 20\text{ }\mu\text{A}$ ; $V_{\text{CC}} = 0.8\text{ V to }3.6\text{ V}$  | -                     | -   | 0.1                | V    |
|   |                           | $I_{\text{O}} = 1.1\text{ mA}$ ; $V_{\text{CC}} = 1.1\text{ V}$                          | -                     | -   | $0.3V_{\text{CC}}$ | V    |
|   |                           | $I_{\text{O}} = 1.7\text{ mA}$ ; $V_{\text{CC}} = 1.4\text{ V}$                          | -                     | -   | 0.31               | V    |
|   |                           | $I_{\text{O}} = 1.9\text{ mA}$ ; $V_{\text{CC}} = 1.65\text{ V}$                         | -                     | -   | 0.31               | V    |
|   |                           | $I_{\text{O}} = 2.3\text{ mA}$ ; $V_{\text{CC}} = 2.3\text{ V}$                          | -                     | -   | 0.31               | V    |
|   |                           | $I_{\text{O}} = 3.1\text{ mA}$ ; $V_{\text{CC}} = 2.3\text{ V}$                          | -                     | -   | 0.44               | V    |
|   |                           | $I_{\text{O}} = 2.7\text{ mA}$ ; $V_{\text{CC}} = 3.0\text{ V}$                          | -                     | -   | 0.31               | V    |
| $I_{\text{O}} = 4.0\text{ mA}$ ; $V_{\text{CC}} = 3.0\text{ V}$ | -                         | -  | 0.44                  | V   |                    |      |

**Table 8. Static characteristics ...continued**

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

| Symbol   | Parameter                            | Conditions  | Min            | Typ | Max         | Unit          |
|--|--------------------------------------|---|----------------|-----|-------------|---------------|
| $I_I$  | input leakage current                | $V_I = \text{GND to } 3.6 \text{ V}; V_{CC} = 0 \text{ V to } 3.6 \text{ V}$                  | -              | -   | $\pm 0.1$   | $\mu\text{A}$ |
| $I_{\text{OFF}}$   | power-off leakage current            | $V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V}; V_{CC} = 0 \text{ V}$                   | -              | -   | $\pm 0.2$   | $\mu\text{A}$ |
| $\Delta I_{\text{OFF}}$  | additional power-off leakage current | $V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V}; V_{CC} = 0 \text{ V to } 0.2 \text{ V}$ | -              | -   | $\pm 0.2$   | $\mu\text{A}$ |
| $I_{CC}$   | supply current                       | $V_I = \text{GND or } V_{CC}; I_O = 0 \text{ A}; V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$    | -              | -   | 0.5         | $\mu\text{A}$ |
| $\Delta I_{CC}$  | additional supply current            | $V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V}$ <a href="#">[1]</a> | -              | -   | 40          | $\mu\text{A}$ |
| $C_I$  | input capacitance                    | $V_{CC} = 0 \text{ V to } 3.6 \text{ V}; V_I = \text{GND or } V_{CC}$                         | -              | 1.1 | -           | pF            |
| $C_O$  | output capacitance                   | $V_O = \text{GND}; V_{CC} = 0 \text{ V}$  | -              | 1.7 | -           | pF            |
| <b><math>T_{\text{amb}} = -40 \text{ }^\circ\text{C to } +85 \text{ }^\circ\text{C}</math></b> |                                      |   |                |     |             |               |
| $V_{OH}$   | HIGH-level output voltage            | $V_I = V_{T+} \text{ or } V_{T-}$   |                |     |             |               |
|  |                                      | $I_O = -20 \mu\text{A}; V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$                             | $V_{CC} - 0.1$ | -   | -           | V             |
|  |                                      | $I_O = -1.1 \text{ mA}; V_{CC} = 1.1 \text{ V}$   | $0.7V_{CC}$    | -   | -           | V             |
|  |                                      | $I_O = -1.7 \text{ mA}; V_{CC} = 1.4 \text{ V}$   | 1.03           | -   | -           | V             |
|  |                                      | $I_O = -1.9 \text{ mA}; V_{CC} = 1.65 \text{ V}$  | 1.30           | -   | -           | V             |
|  |                                      | $I_O = -2.3 \text{ mA}; V_{CC} = 2.3 \text{ V}$   | 1.97           | -   | -           | V             |
|  |                                      | $I_O = -3.1 \text{ mA}; V_{CC} = 2.3 \text{ V}$   | 1.85           | -   | -           | V             |
|  |                                      | $I_O = -2.7 \text{ mA}; V_{CC} = 3.0 \text{ V}$   | 2.67           | -   | -           | V             |
| $V_{OL}$   | LOW-level output voltage             | $V_I = V_{T+} \text{ or } V_{T-}$   |                |     |             |               |
|  |                                      | $I_O = 20 \mu\text{A}; V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$                              | -              | -   | 0.1         | V             |
|  |                                      | $I_O = 1.1 \text{ mA}; V_{CC} = 1.1 \text{ V}$  | -              | -   | $0.3V_{CC}$ | V             |
|  |                                      | $I_O = 1.7 \text{ mA}; V_{CC} = 1.4 \text{ V}$  | -              | -   | 0.37        | V             |
|  |                                      | $I_O = 1.9 \text{ mA}; V_{CC} = 1.65 \text{ V}$   | -              | -   | 0.35        | V             |
|  |                                      | $I_O = 2.3 \text{ mA}; V_{CC} = 2.3 \text{ V}$  | -              | -   | 0.33        | V             |
|  |                                      | $I_O = 3.1 \text{ mA}; V_{CC} = 2.3 \text{ V}$  | -              | -   | 0.45        | V             |
|  |                                      | $I_O = 2.7 \text{ mA}; V_{CC} = 3.0 \text{ V}$  | -              | -   | 0.33        | V             |
| $I_I$  | input leakage current                | $V_I = \text{GND to } 3.6 \text{ V}; V_{CC} = 0 \text{ V to } 3.6 \text{ V}$                  | -              | -   | $\pm 0.5$   | $\mu\text{A}$ |
|  |                                      | $V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V}; V_{CC} = 0 \text{ V}$                   | -              | -   | $\pm 0.5$   | $\mu\text{A}$ |
|  |                                      | $V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V}; V_{CC} = 0 \text{ V to } 0.2 \text{ V}$ | -              | -   | $\pm 0.6$   | $\mu\text{A}$ |
|  |                                      | $V_I = \text{GND or } V_{CC}; I_O = 0 \text{ A}; V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$    | -              | -   | 0.9         | $\mu\text{A}$ |
|  |                                      | $V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V}$ <a href="#">[1]</a> | -              | -   | 50          | $\mu\text{A}$ |
|  |                                      | $V_I = \text{GND to } 3.6 \text{ V}; V_{CC} = 0 \text{ V to } 3.6 \text{ V}$                  | -              | -   | $\pm 0.5$   | $\mu\text{A}$ |
|  |                                      | $V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V}; V_{CC} = 0 \text{ V}$                   | -              | -   | $\pm 0.5$   | $\mu\text{A}$ |
|  |                                      | $V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V}; V_{CC} = 0 \text{ V to } 0.2 \text{ V}$ | -              | -   | $\pm 0.6$   | $\mu\text{A}$ |

**Table 8. Static characteristics ...continued**

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

| Symbol  | Parameter                            | Conditions  | Min                    | Typ | Max                 | Unit |
|---|--------------------------------------|---|------------------------|-----|---------------------|------|
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b>        |                                      |   |                        |     |                     |      |
| V <sub>OH</sub>                                   | HIGH-level output voltage            | V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>   |                        |     |                     |      |
|   |                                      | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V   | V <sub>CC</sub> - 0.11 | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V   | 0.6V <sub>CC</sub>     | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V   | 0.93                   | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V  | 1.17                   | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V   | 1.77                   | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V   | 1.67                   | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V   | 2.40                   | -   | -                   | V    |
| I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V | 2.30                                 | -   | -                      | V   |                     |      |
| V <sub>OL</sub>                                   | LOW-level output voltage             | V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>   |                        |     |                     |      |
|   |                                      | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V  | -                      | -   | 0.11                | V    |
|   |                                      | I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V  | -                      | -   | 0.33V <sub>CC</sub> | V    |
|   |                                      | I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V  | -                      | -   | 0.41                | V    |
|   |                                      | I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V   | -                      | -   | 0.39                | V    |
|   |                                      | I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V  | -                      | -   | 0.36                | V    |
|   |                                      | I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V  | -                      | -   | 0.50                | V    |
|   |                                      | I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V  | -                      | -   | 0.36                | V    |
| I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V  | -                                    | -   | 0.50                   | V   |                     |      |
| I <sub>I</sub>                                    | input leakage current                | V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V                                       | -                      | -   | ±0.75               | μA   |
| I <sub>OFF</sub>                                  | power-off leakage current            | V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V                              | -                      | -   | ±0.75               | μA   |
| ΔI <sub>OFF</sub>                                 | additional power-off leakage current | V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V;<br>V <sub>CC</sub> = 0 V to 0.2 V                  | -                      | -   | ±0.75               | μA   |
| I <sub>CC</sub>                                   | supply current                       | V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 0.8 V to 3.6 V | -                      | -   | 1.4                 | μA   |
| ΔI <sub>CC</sub>                                  | additional supply current            | V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 3.3 V          | [1]                    | -   | 75                  | μA   |

[1] One input at V<sub>CC</sub> - 0.6 V, other input at V<sub>CC</sub> or GND.



## 11. Dynamic characteristics

**Table 9. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 14](#).

| Symbol                       | Parameter         | Conditions   | T <sub>amb</sub> = 25 °C |                    |      | T <sub>amb</sub> = -40 °C to +125 °C |             |              | Unit |
|------------------------------|-------------------|--|--------------------------|--------------------|------|--------------------------------------|-------------|--------------|------|
|                              |                   |  | Min                      | Typ <sup>[1]</sup> | Max  | Min                                  | Max (85 °C) | Max (125 °C) |      |
| <b>C<sub>L</sub> = 5 pF</b>  |                   |  |                          |                    |      |                                      |             |              |      |
| t <sub>pd</sub>              | propagation delay | A, B, C to Y; see <a href="#">Figure 13</a> <sup>[2]</sup> |                          |                    |      |                                      |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                                    | -                        | 23.3               | -    | -                                    | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V                           | 2.9                      | 6.7                | 12.9 | 2.7                                  | 13.2        | 13.4         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V                           | 2.4                      | 4.8                | 7.7  | 2.4                                  | 8.3         | 8.7          | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                         | 2.2                      | 4.0                | 6.3  | 1.9                                  | 7.0         | 7.4          | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                           | 2.0                      | 3.2                | 4.6  | 1.8                                  | 5.2         | 5.4          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                           | 1.9                      | 2.9                | 4.0  | 1.6                                  | 4.2         | 4.4          | ns   |
| <b>C<sub>L</sub> = 10 pF</b> |                   |  |                          |                    |      |                                      |             |              |      |
| t <sub>pd</sub>              | propagation delay | A, B, C to Y; see <a href="#">Figure 13</a> <sup>[2]</sup> |                          |                    |      |                                      |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                                    | -                        | 27.1               | -    | -                                    | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V                           | 3.3                      | 7.6                | 14.5 | 3.0                                  | 15.1        | 15.3         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V                           | 2.7                      | 5.4                | 8.8  | 2.8                                  | 9.5         | 9.9          | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                         | 2.5                      | 4.6                | 7.2  | 2.3                                  | 8.0         | 8.4          | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                           | 2.4                      | 3.8                | 5.3  | 2.2                                  | 5.9         | 6.2          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                           | 2.3                      | 3.5                | 4.7  | 2.0                                  | 4.9         | 5.2          | ns   |
| <b>C<sub>L</sub> = 15 pF</b> |                   |  |                          |                    |      |                                      |             |              |      |
| t <sub>pd</sub>              | propagation delay | A, B, C to Y; see <a href="#">Figure 13</a> <sup>[2]</sup> |                          |                    |      |                                      |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                                    | -                        | 30.6               | -    | -                                    | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V                           | 3.6                      | 8.4                | 16.1 | 3.3                                  | 16.9        | 17.2         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V                           | 3.0                      | 6.0                | 9.7  | 3.1                                  | 10.5        | 11.0         | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                         | 2.8                      | 5.1                | 7.9  | 2.5                                  | 8.9         | 9.3          | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                           | 2.7                      | 4.2                | 5.9  | 2.5                                  | 6.6         | 7.0          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                           | 2.5                      | 3.9                | 5.2  | 2.2                                  | 5.5         | 5.8          | ns   |

**Table 9. Dynamic characteristics ...continued**Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 14](#).

| Symbol  | Parameter                     | Conditions   | T <sub>amb</sub> = 25 °C |                    |      | T <sub>amb</sub> = -40 °C to +125 °C |             |              | Unit |
|---|-------------------------------|--|--------------------------|--------------------|------|--------------------------------------|-------------|--------------|------|
|   |                               |  | Min                      | Typ <sup>[1]</sup> | Max  | Min                                  | Max (85 °C) | Max (125 °C) |      |
| <b>C<sub>L</sub> = 30 pF</b>                        |                               |  |                          |                    |      |                                      |             |              |      |
| t <sub>pd</sub>                                     | propagation delay             | A, B, C to Y; see <a href="#">Figure 13</a> <sup>[2]</sup>                     |                          |                    |      |                                      |             |              |      |
|   |                               | V <sub>CC</sub> = 0.8 V  | -                        | 38.7               | -    | -                                    | -           | -            | ns   |
|   |                               | V <sub>CC</sub> = 1.1 V to 1.3 V   | 4.5                      | 10.7               | 21.1 | 4.1                                  | 22.0        | 22.4         | ns   |
|   |                               | V <sub>CC</sub> = 1.4 V to 1.6 V   | 3.8                      | 7.6                | 12.3 | 3.8                                  | 13.5        | 14.2         | ns   |
|   |                               | V <sub>CC</sub> = 1.65 V to 1.95 V   | 3.5                      | 6.3                | 10.1 | 3.1                                  | 11.3        | 11.9         | ns   |
|   |                               | V <sub>CC</sub> = 2.3 V to 2.7 V   | 3.4                      | 5.3                | 7.5  | 3.2                                  | 8.4         | 8.9          | ns   |
|   |                               | V <sub>CC</sub> = 3.0 V to 3.6 V   | 3.2                      | 5.0                | 6.7  | 2.9                                  | 7.1         | 7.5          | ns   |
| <b>C<sub>L</sub> = 5 pF, 10 pF, 15 pF and 30 pF</b> |                               |  |                          |                    |      |                                      |             |              |      |
| C <sub>PD</sub>                                     | power dissipation capacitance | f <sub>i</sub> = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[3]</sup> |                          |                    |      |                                      |             |              |      |
|   |                               | V <sub>CC</sub> = 0.8 V  | -                        | 2.7                | -    | -                                    | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 1.1 V to 1.3 V   | -                        | 2.9                | -    | -                                    | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 1.4 V to 1.6 V   | -                        | 3.0                | -    | -                                    | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 1.65 V to 1.95 V   | -                        | 3.2                | -    | -                                    | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 2.3 V to 2.7 V   | -                        | 3.8                | -    | -                                    | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 3.0 V to 3.6 V   | -                        | 4.4                | -    | -                                    | -           | pF           |      |

[1] All typical values are measured at nominal V<sub>CC</sub>.

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

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

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

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

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

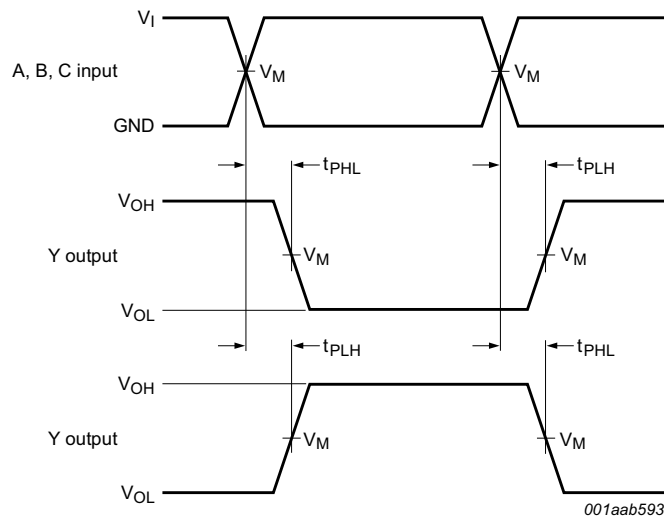
C<sub>L</sub> = output load capacitance in pF;

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

N = number of inputs switching;

Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

## 12. Waveforms



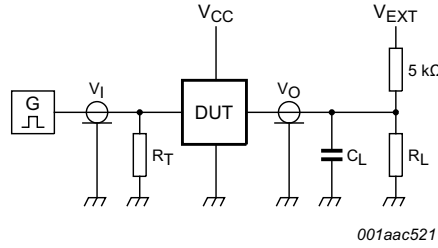
Measurement points are given in [Table 10](#).

$V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig 13. Input A, B and C to output Y propagation delay times.**

**Table 10. Measurement points**

| Supply voltage | Output      | Input       |          |               |
|----------------|-------------|-------------|----------|---------------|
| $V_{CC}$       | $V_M$       | $V_M$       | $V_I$    | $t_r = t_f$   |
| 0.8 V to 3.6 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{CC}$ | $\leq 3.0$ ns |



Test data is given in [Table 11](#).

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 14. Test circuit for measuring switching times**

**Table 11. Test data**

| Supply voltage | Load                         |              | $V_{EXT}$             |                       |                       |
|----------------|------------------------------|--------------|-----------------------|-----------------------|-----------------------|
| $V_{CC}$       | $C_L$                        | $R_L$ [1]    | $t_{PLH}$ , $t_{PHL}$ | $t_{PZH}$ , $t_{PHZ}$ | $t_{PZL}$ , $t_{PLZ}$ |
| 0.8 V to 3.6 V | 5 pF, 10 pF, 15 pF and 30 pF | 5 kΩ or 1 MΩ | open                  | GND                   | $2V_{CC}$             |

[1] For measuring enable and disable times  $R_L = 5\text{ k}\Omega$ , for measuring propagation delays, setup and hold times and pulse width  $R_L = 1\text{ M}\Omega$ .

### 13. Transfer characteristics

**Table 12. Transfer characteristics**

Voltages are referenced to GND (ground = 0 V; for test circuit see [Figure 14](#)).

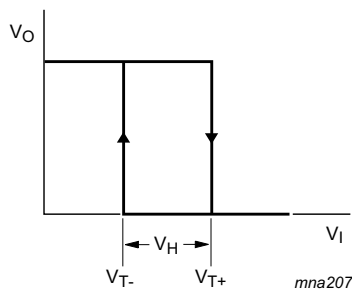
| Symbol   | Parameter                        | Conditions  | $T_{amb} = 25\text{ }^\circ\text{C}$ |      |      | $T_{amb} = -40\text{ }^\circ\text{C to } +125\text{ }^\circ\text{C}$ |             |              | Unit |
|----------|----------------------------------|---|--------------------------------------|------|------|--|-------------|--------------|------|
|          |                                  |   | Min                                  | Typ  | Max  | Min  | Max (85 °C) | Max (125 °C) |      |
| $V_{T+}$ | positive-going threshold voltage | see <a href="#">Figure 15</a> and <a href="#">Figure 16</a> |                                      |      |      |  |             |              |      |
|          |                                  | $V_{CC} = 0.8\text{ V}$                                     | 0.30                                 | -    | 0.60 | 0.30   | 0.60        | 0.62         | V    |
|          |                                  | $V_{CC} = 1.1\text{ V}$                                     | 0.53                                 | -    | 0.90 | 0.53   | 0.90        | 0.92         | V    |
|          |                                  | $V_{CC} = 1.4\text{ V}$                                     | 0.74                                 | -    | 1.11 | 0.74   | 1.11        | 1.13         | V    |
|          |                                  | $V_{CC} = 1.65\text{ V}$                                    | 0.91                                 | -    | 1.29 | 0.91   | 1.29        | 1.31         | V    |
|          |                                  | $V_{CC} = 2.3\text{ V}$                                     | 1.37                                 | -    | 1.77 | 1.37   | 1.77        | 1.80         | V    |
| $V_{T-}$ | negative-going threshold voltage | see <a href="#">Figure 15</a> and <a href="#">Figure 16</a> |                                      |      |      |  |             |              |      |
|          |                                  | $V_{CC} = 0.8\text{ V}$                                     | 0.10                                 | -    | 0.60 | 0.10   | 0.60        | 0.60         | V    |
|          |                                  | $V_{CC} = 1.1\text{ V}$                                     | 0.26                                 | -    | 0.65 | 0.26   | 0.65        | 0.65         | V    |
|          |                                  | $V_{CC} = 1.4\text{ V}$                                     | 0.39                                 | -    | 0.75 | 0.39   | 0.75        | 0.75         | V    |
|          |                                  | $V_{CC} = 1.65\text{ V}$                                    | 0.47                                 | -    | 0.84 | 0.47   | 0.84        | 0.84         | V    |
|          |                                  | $V_{CC} = 2.3\text{ V}$                                     | 0.69                                 | -    | 1.04 | 0.69   | 1.04        | 1.04         | V    |
|          | $V_{CC} = 3.0\text{ V}$          | 0.88  | -                                    | 1.24 | 0.88 | 1.24   | 1.24        | V            |      |

**Table 12. Transfer characteristics ...continued**

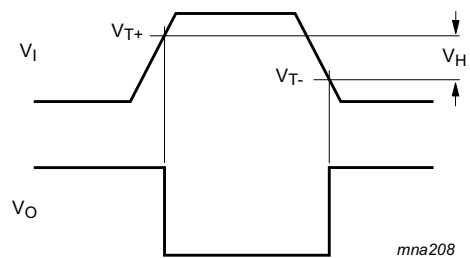
Voltages are referenced to GND (ground = 0 V; for test circuit see [Figure 14](#)).

| Symbol         | Parameter          | Conditions  | T <sub>amb</sub> = 25 °C |     |      | T <sub>amb</sub> = -40 °C to +125 °C |             |              | Unit |
|----------------|--------------------|---|--------------------------|-----|------|--------------------------------------|-------------|--------------|------|
|                |                    |   | Min                      | Typ | Max  | Min                                  | Max (85 °C) | Max (125 °C) |      |
| V <sub>H</sub> | hysteresis voltage | (V <sub>T+</sub> - V <sub>T-</sub> ); see <a href="#">Figure 15</a> , <a href="#">Figure 16</a> , <a href="#">Figure 17</a> and <a href="#">Figure 18</a> |                          |     |      |                                      |             |              |      |
|                |                    | V <sub>CC</sub> = 0.8 V   | 0.07                     | -   | 0.50 | 0.07                                 | 0.50        | 0.50         | V    |
|                |                    | V <sub>CC</sub> = 1.1 V   | 0.08                     | -   | 0.46 | 0.08                                 | 0.46        | 0.46         | V    |
|                |                    | V <sub>CC</sub> = 1.4 V   | 0.18                     | -   | 0.56 | 0.18                                 | 0.56        | 0.56         | V    |
|                |                    | V <sub>CC</sub> = 1.65 V  | 0.27                     | -   | 0.66 | 0.27                                 | 0.66        | 0.66         | V    |
|                |                    | V <sub>CC</sub> = 2.3 V   | 0.53                     | -   | 0.92 | 0.53                                 | 0.92        | 0.92         | V    |
|                |                    | V <sub>CC</sub> = 3.0 V   | 0.79                     | -   | 1.31 | 0.79                                 | 1.31        | 1.31         | V    |

## 14. Waveforms transfer characteristics



**Fig 15. Transfer characteristic**



V<sub>T+</sub> and V<sub>T-</sub> limits at 70 % and 20 %.

**Fig 16. Definition of V<sub>T+</sub>, V<sub>T-</sub> and V<sub>H</sub>**



Fig 17. Typical transfer characteristics;  $V_{CC} = 1.8$  V



Fig 18. Typical transfer characteristics;  $V_{CC} = 3.0$  V

15. Package outline

Plastic surface-mounted package; 6 leads

SOT363

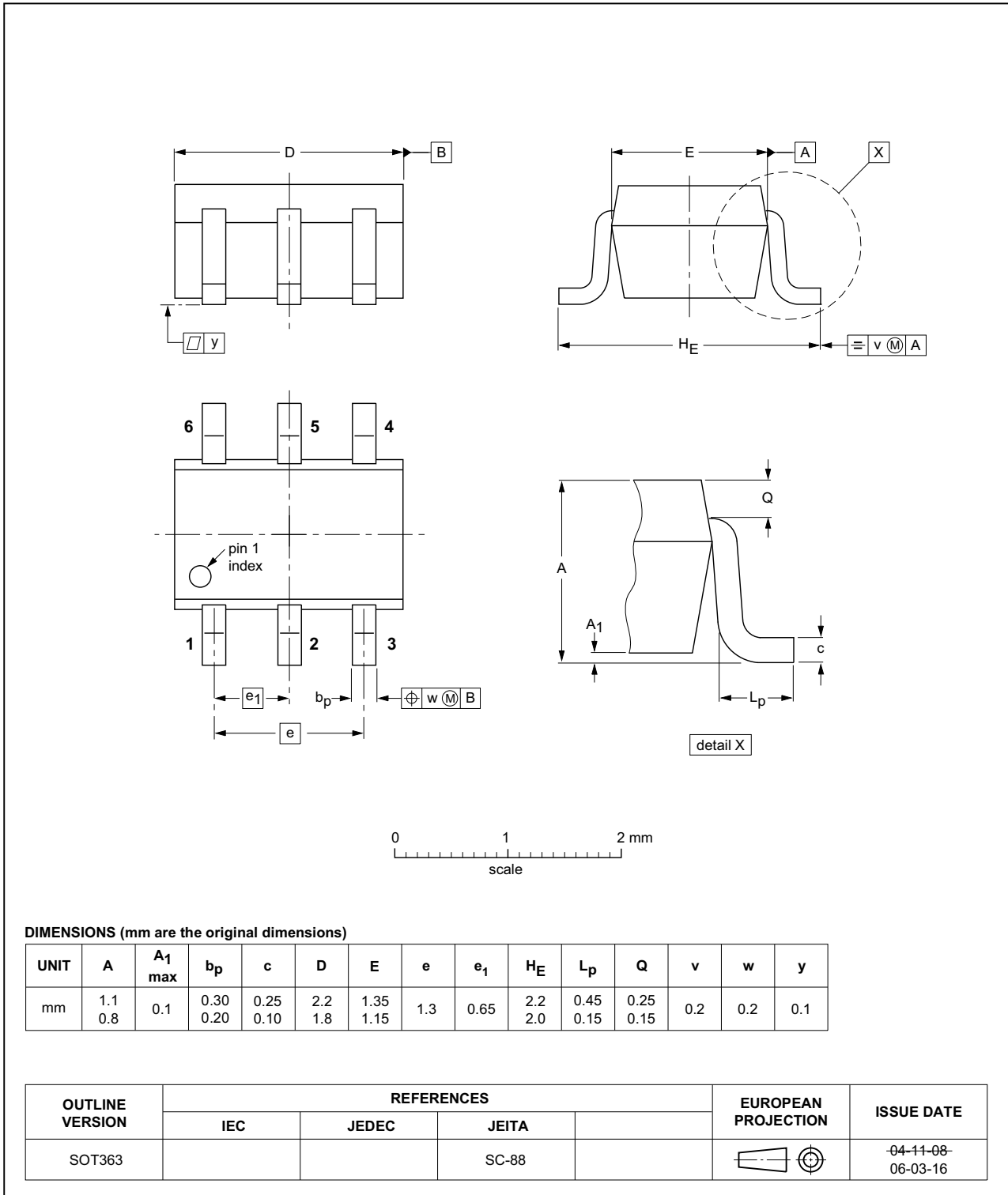


Fig 19. Package outline SOT363 (SC-88)

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

SOT886

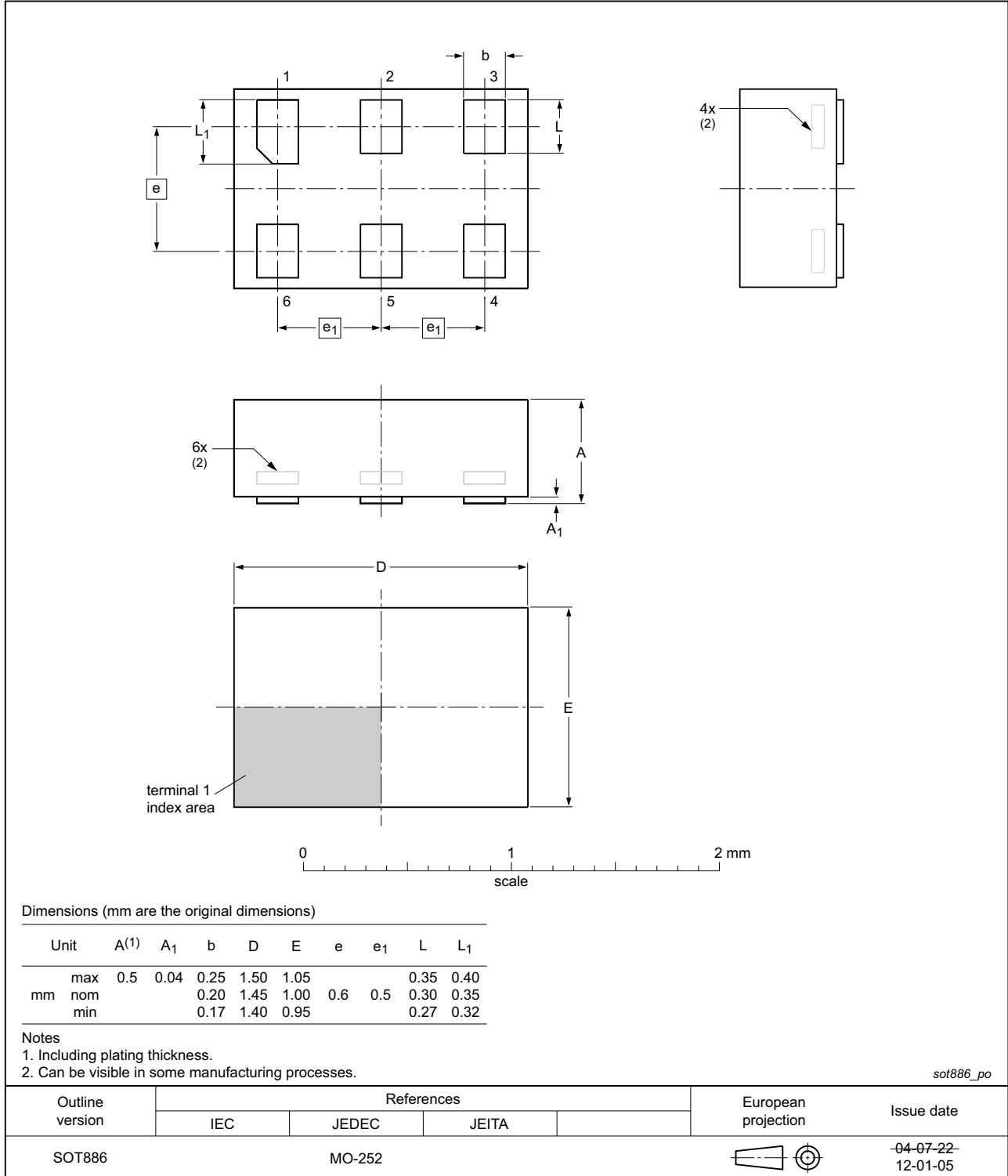


Fig 20. Package outline SOT886 (XSON6)



XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1 x 0.5 mm

SOT891

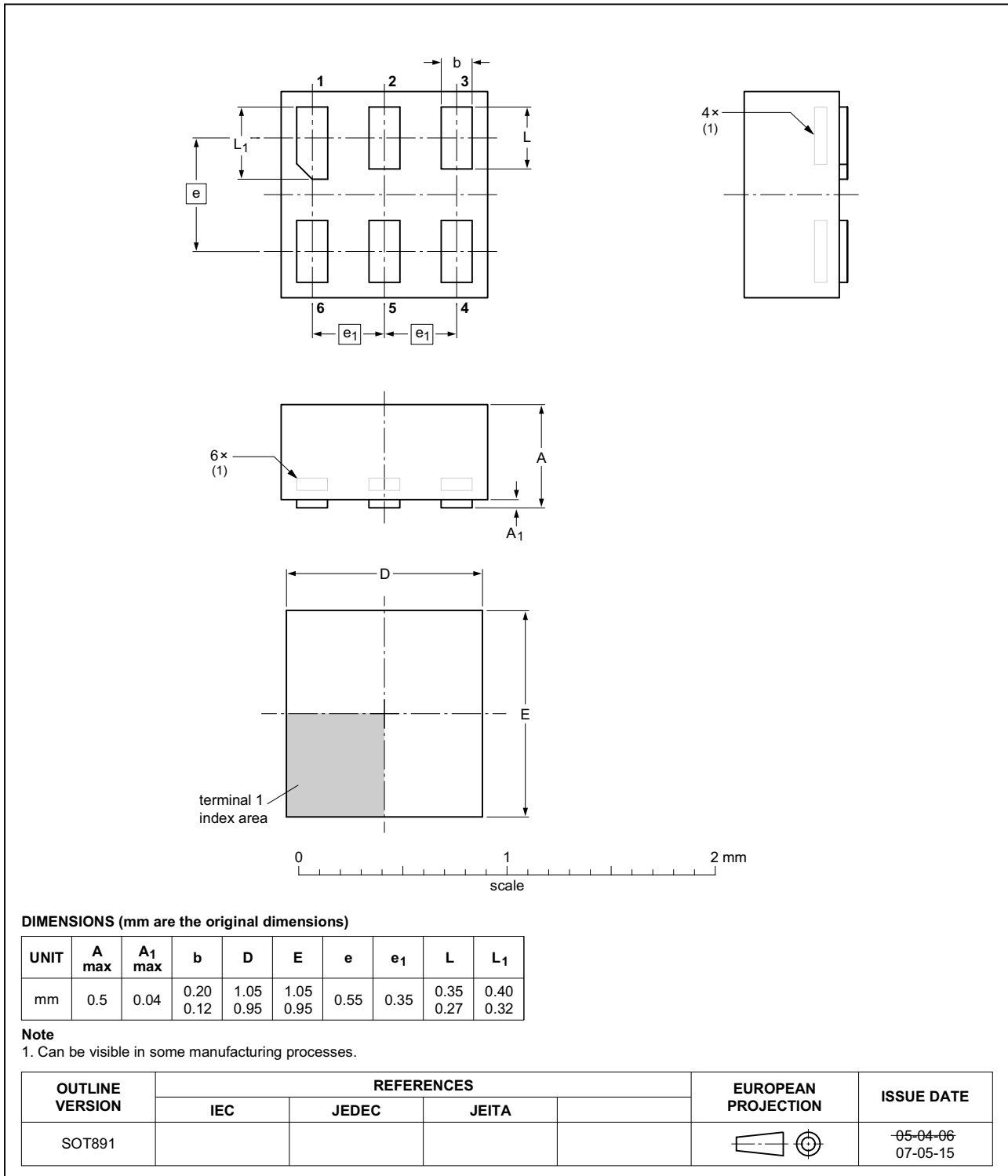


Fig 21. Package outline SOT891 (XSON6)

**XSON6: extremely thin small outline package; no leads;  
6 terminals; body 0.9 x 1.0 x 0.35 mm**

SOT1115

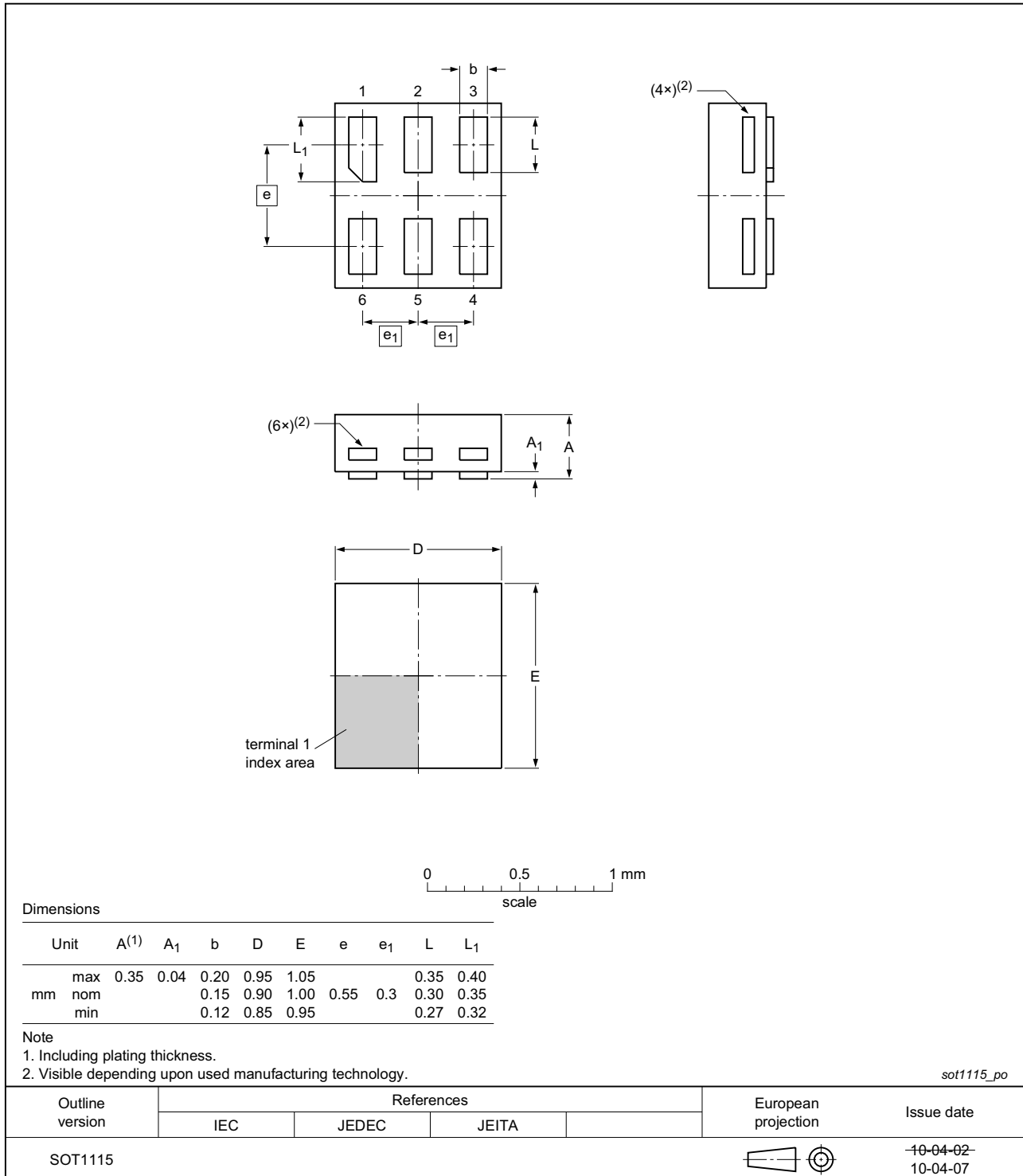


Fig 22. Package outline SOT1115 (XSON6)

**XSON6: extremely thin small outline package; no leads;**  
**6 terminals; body 1.0 x 1.0 x 0.35 mm**

SOT1202



Fig 23. Package outline SOT1202 (XSON6)

**X2SON6: plastic thermal enhanced extremely thin small outline package; no leads;  
6 terminals; body 1.0 x 0.8 x 0.35 mm**

SOT1255

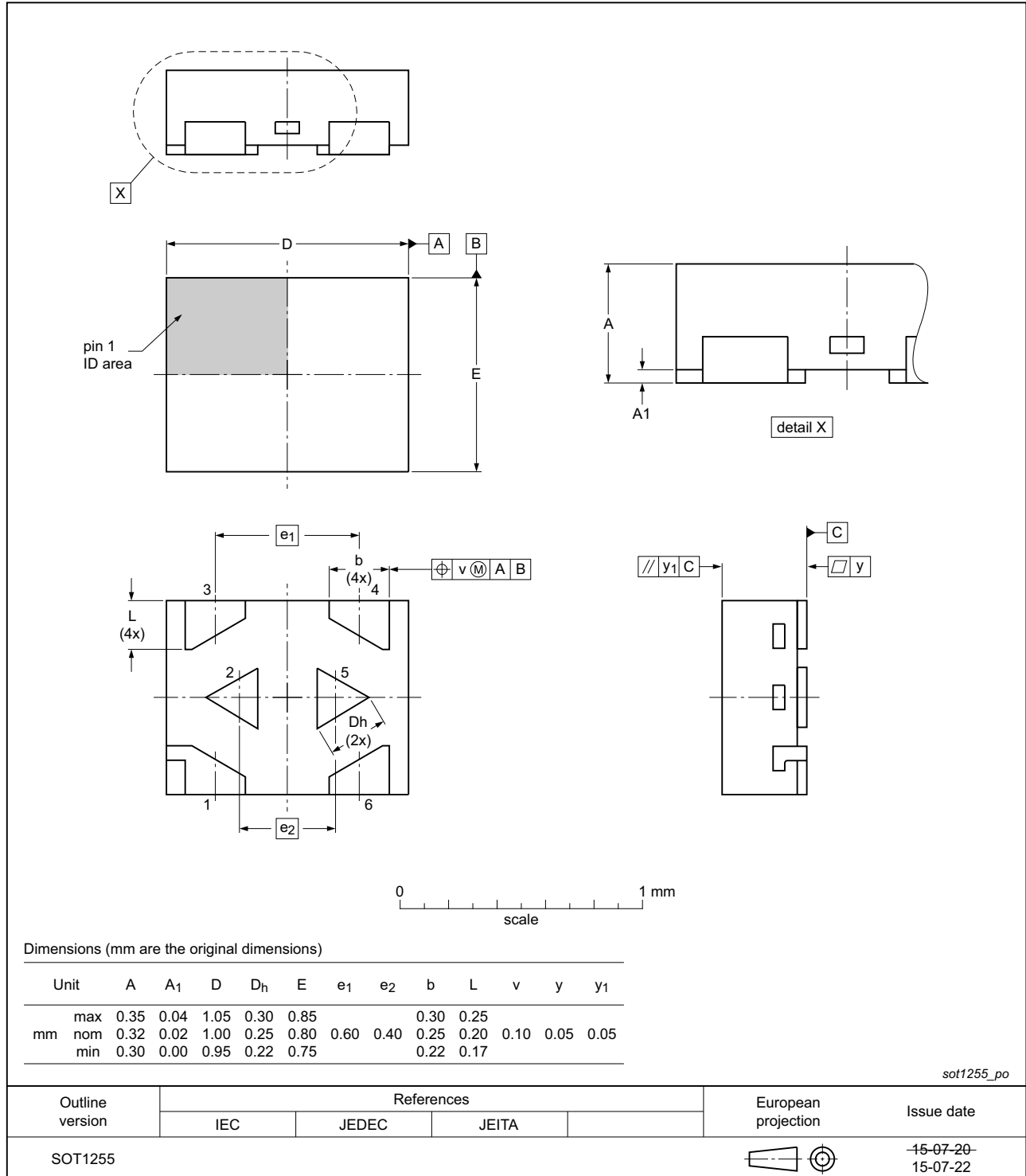


Fig 24. Package outline SOT1255 (X2SON6)

## 16. Abbreviations

Table 13. Abbreviations

| Acronym | Description             |
|---------|-------------------------|
| CDM     | Charged Device Model    |
| DUT     | Device Under Test       |
| ESD     | ElectroStatic Discharge |
| HBM     | Human Body Model        |
| MM      | Machine Model           |

## 17. Revision history

Table 14. Revision history

| Document ID    | Release date  | Data sheet status  | Change notice | Supersedes    |
|----------------|---|--------------------|---------------|---------------|
| 74AUP1G98 v.8  | 20150923  | Product data sheet | -             | 74AUP1G98 v.7 |
| Modifications: | <ul style="list-style-type: none"> <li>Added type number 74AUP1G98GX (SOT1255/X2SON6).</li> </ul>                         |                    |               |               |
| 74AUP1G98 v.7  | 20120815  | Product data sheet | -             | 74AUP1G98 v.6 |
| Modifications: | <ul style="list-style-type: none"> <li>Package outline drawing of SOT886 (<a href="#">Figure 20</a>) modified.</li> </ul> |                    |               |               |
| 74AUP1G98 v.6  | 20111128  | Product data sheet | -             | 74AUP1G98 v.5 |
| 74AUP1G98 v.5  | 20110105  | Product data sheet | -             | 74AUP1G98 v.4 |
| 74AUP1G98 v.4  | 20101012  | Product data sheet | -             | 74AUP1G98 v.3 |
| 74AUP1G98 v.3  | 20090629  | Product data sheet | -             | 74AUP1G98 v.2 |
| 74AUP1G98 v.2  | 20090402  | Product data sheet | -             | 74AUP1G98 v.1 |
| 74AUP1G98 v.1  | 20061108  | Product data sheet | -             | -             |

## 18. Legal information

### 18.1 Data sheet status

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

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

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

[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 URL <http://www.nexperia.com>.

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## 19. Contact information

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