

# 74AUP3G04

## Low-power triple inverter

Rev. 03 — 8 October 2009

Product data sheet

## 1. General description

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The 74AUP3G04 provides a low-power, low-voltage triple inverting buffer.

Schmitt trigger action at all inputs makes the circuit tolerant of slower input rise and fall times across the entire  $V_{CC}$  range from 0.8 V to 3.6 V.

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 a damaging backflow current through the device when it is powered down.

## 2. Features

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- Wide supply voltage range from 0.8 V to 3.6 V
- High noise immunity
- Complies with JEDEC standards:
  - ◆ JESD8-12 (0.8 V to 1.3 V)
  - ◆ JESD8-11 (0.9 V to 1.65 V)
  - ◆ JESD8-7 (1.2 V to 1.95 V)
  - ◆ JESD8-5 (1.8 V to 2.7 V)
  - ◆ JESD8-B (2.7 V to 3.6 V)
- ESD protection:
  - ◆ HBM JESD22-A114F Class 3A exceeds 5000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101D exceeds 1000 V
- Low static power consumption;  $I_{CC} = 0.9 \mu\text{A}$  (maximum)
- Latch-up performance exceeds 100 mA per JESD 78B 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  |          |
| 74AUP3G04DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm                           | SOT765-1 |
| 74AUP3G04GT | -40 °C to +125 °C | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm          | SOT833-1 |
| 74AUP3G04GD | -40 °C to +125 °C | XSON8U | plastic extremely thin small outline package; no leads; 8 terminals; UTLP based; body 3 × 2 × 0.5 mm | SOT996-2 |
| 74AUP3G04GM | -40 °C to +125 °C | XQFN8U | plastic extremely thin quad flat package; no leads; 8 terminals; UTLP based; body 1.6 × 1.6 × 0.5 mm | SOT902-1 |

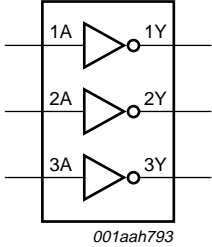
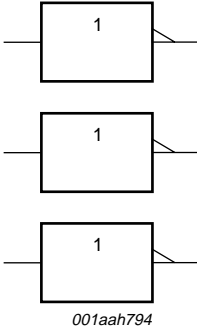
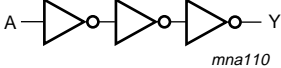
### 4. Marking

Table 2. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| 74AUP3G04DC | p04                         |
| 74AUP3G04GT | p04                         |
| 74AUP3G04GD | p04                         |
| 74AUP3G04GM | p04                         |

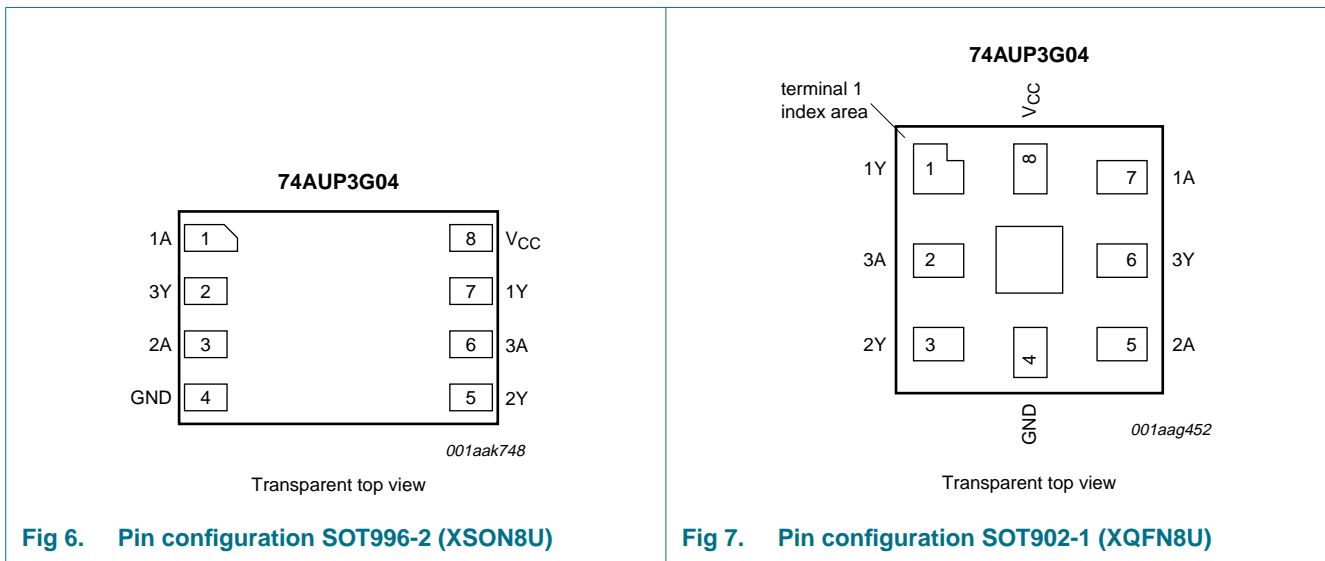
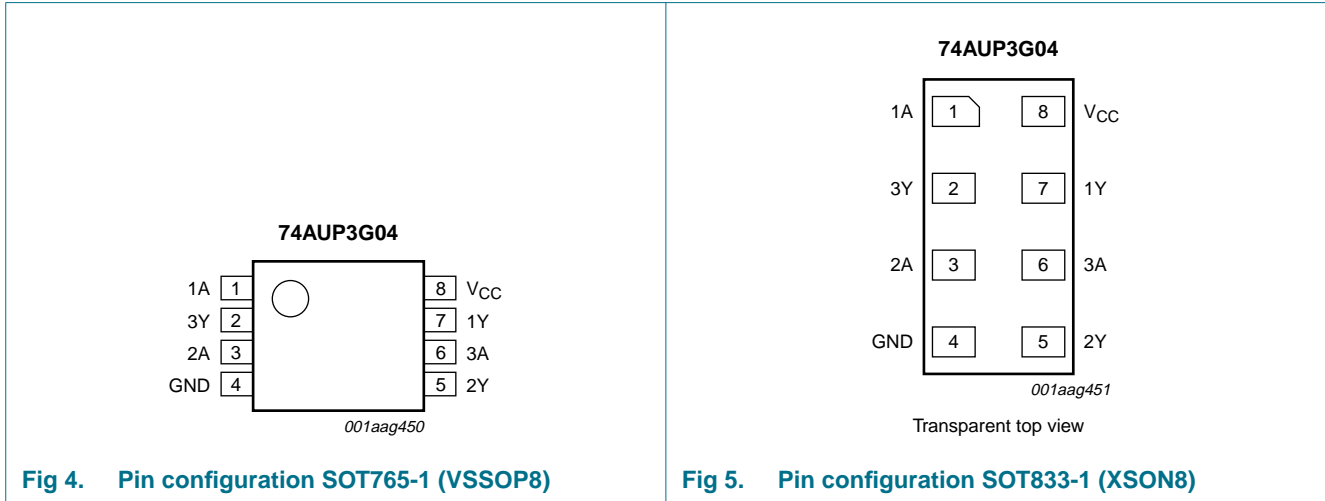
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

### 5. Functional diagram

|  |  |   |
|--|--|---|
|  <p>001aah793</p> |  <p>001aah794</p> |  <p>mna110</p> |
| <b>Fig 1. Logic symbol</b>   | <b>Fig 2. IEC logic symbol</b>   | <b>Fig 3. Logic diagram (one gate)</b>  |

## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

**Table 3. Pin description**

| Symbol          | Pin                             |          | Description    |
|-----------------|---------------------------------|----------|----------------|
|                 | SOT765-1, SOT833-1 and SOT996-2 | SOT902-1 |                |
| 1A, 2A, 3A      | 1, 3, 6                         | 7, 5, 2  | data input     |
| 1Y, 2Y, 3Y      | 7, 5, 2                         | 1, 3, 6  | data output    |
| GND             | 4                               | 4        | ground (0 V)   |
| V <sub>CC</sub> | 8                               | 8        | supply voltage |

## 7. Functional description

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

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

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

## 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     | +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 $V_{CC}$         | -        | $\pm 20$ | mA   |
| $I_{CC}$  | supply current          |                                 | -        | 50       | mA   |
| $I_{GND}$ | ground current          |                                 | -50      | -        | 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 minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For VSSOP8 packages: above 110 °C the value of  $P_{tot}$  derates linearly with 8.0 mW/K.

For XSON8, XSON8U and XQFN8U packages: above 118 °C the value of  $P_{tot}$  derates linearly with 7.8 mW/K.

## 9. Recommended operating conditions

**Table 6.** Operating conditions

| Symbol              | Parameter                           | Conditions                      | Min | Max      | Unit |
|---------------------|-------------------------------------|---------------------------------|-----|----------|------|
| $V_{CC}$            | supply voltage                      |                                 | 0.8 | 3.6      | V    |
| $V_I$               | input voltage                       |                                 | 0   | 3.6      | V    |
| $V_O$               | output voltage                      | Active mode                     | 0   | $V_{CC}$ | V    |
|                     |                                     | Power-down mode; $V_{CC} = 0$ V | 0   | 3.6      | V    |
| $T_{amb}$           | ambient temperature                 |                                 | -40 | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 0.8$ V to 3.6 V       | -   | 200      | 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 | Max                 | Unit |
|--------------------------------|--------------------------------------|--|-----------------------|-----|---------------------|------|
| <b>T<sub>amb</sub> = 25 °C</b> |                                      |  |                       |     |                     |      |
| V <sub>IH</sub>                | HIGH-level input voltage             | V <sub>CC</sub> = 0.8 V  | 0.70V <sub>CC</sub>   | -   | -                   | V    |
|                                |                                      | V <sub>CC</sub> = 0.9 V to 1.95 V  | 0.65V <sub>CC</sub>   | -   | -                   | V    |
|                                |                                      | V <sub>CC</sub> = 2.3 V to 2.7 V   | 1.6                   | -   | -                   | V    |
|                                |                                      | V <sub>CC</sub> = 3.0 V to 3.6 V   | 2.0                   | -   | -                   | V    |
| V <sub>IL</sub>                | LOW-level input voltage              | V <sub>CC</sub> = 0.8 V  | -                     | -   | 0.30V <sub>CC</sub> | V    |
|                                |                                      | V <sub>CC</sub> = 0.9 V to 1.95 V  | -                     | -   | 0.35V <sub>CC</sub> | V    |
|                                |                                      | V <sub>CC</sub> = 2.3 V to 2.7 V   | -                     | -   | 0.7                 | V    |
|                                |                                      | V <sub>CC</sub> = 3.0 V to 3.6 V   | -                     | -   | 0.9                 | 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> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V  | V <sub>CC</sub> - 0.1 | -   | -                   | V    |
|                                |                                      | I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V  | 0.75V <sub>CC</sub>   | -   | -                   | V    |
|                                |                                      | I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V  | 1.11                  | -   | -                   | V    |
|                                |                                      | I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V   | 1.32                  | -   | -                   | V    |
|                                |                                      | I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V  | 2.05                  | -   | -                   | V    |
|                                |                                      | I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V  | 1.9                   | -   | -                   | V    |
|                                |                                      | I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V  | 2.72                  | -   | -                   | V    |
|                                |                                      | I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V  | 2.6                   | -   | -                   | 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> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V   | -                     | -   | 0.1                 | V    |
|                                |                                      | I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V   | -                     | -   | 0.3V <sub>CC</sub>  | V    |
|                                |                                      | I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V   | -                     | -   | 0.31                | V    |
|                                |                                      | I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V  | -                     | -   | 0.31                | V    |
|                                |                                      | I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V   | -                     | -   | 0.31                | V    |
|                                |                                      | I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V   | -                     | -   | 0.44                | V    |
|                                |                                      | I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V   | -                     | -   | 0.31                | V    |
|                                |                                      | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V   | -                     | -   | 0.44                | 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                                    | -                     | -   | ±0.1                | 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                           | -                     | -   | ±0.2                | 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; V <sub>CC</sub> = 0 V to 0.2 V                  | -                     | -   | ±0.2                | μA   |
| I <sub>CC</sub>                | supply current                       | V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V | -                     | -   | 0.5                 | 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; V <sub>CC</sub> = 3.3 V          | -                     | -   | 40                  | μA   |
| C <sub>I</sub>                 | input capacitance                    | V <sub>CC</sub> = 0 V to 3.6 V; V <sub>I</sub> = GND or V <sub>CC</sub>                          | -                     | 1.0 | -                   | pF   |
| C <sub>O</sub>                 | output capacitance                   | V <sub>O</sub> = GND; V <sub>CC</sub> = 0 V  | -                     | 1.8 | -                   | pF   |

**Table 7. 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 +85 °C</b> |                                      |  |                       |     |                     |      |
| V <sub>IH</sub>                           | HIGH-level input voltage             | V <sub>CC</sub> = 0.8 V  | 0.70V <sub>CC</sub>   | -   | -                   | V    |
|   |                                      | V <sub>CC</sub> = 0.9 V to 1.95 V  | 0.65V <sub>CC</sub>   | -   | -                   | V    |
|   |                                      | V <sub>CC</sub> = 2.3 V to 2.7 V   | 1.6                   | -   | -                   | V    |
|   |                                      | V <sub>CC</sub> = 3.0 V to 3.6 V   | 2.0                   | -   | -                   | V    |
| V <sub>IL</sub>                           | LOW-level input voltage              | V <sub>CC</sub> = 0.8 V  | -                     | -   | 0.30V <sub>CC</sub> | V    |
|   |                                      | V <sub>CC</sub> = 0.9 V to 1.95 V  | -                     | -   | 0.35V <sub>CC</sub> | V    |
|   |                                      | V <sub>CC</sub> = 2.3 V to 2.7 V   | -                     | -   | 0.7                 | V    |
|   |                                      | V <sub>CC</sub> = 3.0 V to 3.6 V   | -                     | -   | 0.9                 | 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> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V  | V <sub>CC</sub> - 0.1 | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V  | 0.7V <sub>CC</sub>    | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V  | 1.03                  | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V   | 1.30                  | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V  | 1.97                  | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V  | 1.85                  | -   | -                   | V    |
|   |                                      | I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V  | 2.67                  | -   | -                   | 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> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V   | -                     | -   | 0.1                 | V    |
|   |                                      | I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V   | -                     | -   | 0.3V <sub>CC</sub>  | V    |
|   |                                      | I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V   | -                     | -   | 0.37                | V    |
|   |                                      | I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V  | -                     | -   | 0.35                | V    |
|   |                                      | I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V   | -                     | -   | 0.33                | V    |
|   |                                      | I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V   | -                     | -   | 0.45                | V    |
|   |                                      | I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V   | -                     | -   | 0.33                | 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                                    | -                     | -   | ±0.5                | 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                           | -                     | -   | ±0.5                | 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; V <sub>CC</sub> = 0 V to 0.2 V                  | -                     | -   | ±0.6                | μA   |
| I <sub>CC</sub>                           | supply current                       | V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V | -                     | -   | 0.9                 | 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; V <sub>CC</sub> = 3.3 V          | -                     | -   | 50                  | μA   |

**Table 7. 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>IH</sub>                            | HIGH-level input voltage  | V <sub>CC</sub> = 0.8 V                                   | 0.75V <sub>CC</sub>  | -   | -                   | V     |    |
|  |                           | V <sub>CC</sub> = 0.9 V to 1.95 V                         | 0.70V <sub>CC</sub>  | -   | -                   | V     |    |
|  |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                          | 1.6  | -   | -                   | V     |    |
|  |                           | V <sub>CC</sub> = 3.0 V to 3.6 V                          | 2.0  | -   | -                   | V     |    |
| V <sub>IL</sub>                            | LOW-level input voltage   | V <sub>CC</sub> = 0.8 V                                   | -  | -   | 0.25V <sub>CC</sub> | V     |    |
|  |                           | V <sub>CC</sub> = 0.9 V to 1.95 V                         | -  | -   | 0.30V <sub>CC</sub> | V     |    |
|  |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                          | -  | -   | 0.7                 | V     |    |
|  |                           | V <sub>CC</sub> = 3.0 V to 3.6 V                          | -  | -   | 0.9                 | 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> = -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     |    |
| 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> = 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>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; 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; 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; V <sub>CC</sub> = 3.3 V          | -   | -                   | 75    | μA |

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 9](#).

| Symbol                       | Parameter         | Conditions                             | 25 °C               |                    |      | –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 | nA to nY; see <a href="#">Figure 8</a> | <a href="#">[2]</a> |                    |      |                   |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                | -                   | 16.0               | -    | -                 | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V       | 2.4                 | 5.0                | 10.3 | 2.1               | 11.4        | 12.6         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V       | 1.8                 | 3.6                | 6.4  | 1.6               | 7.4         | 8.2          | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V     | 1.5                 | 2.9                | 5.0  | 1.4               | 5.9         | 6.5          | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V       | 1.2                 | 2.4                | 3.9  | 1.1               | 4.5         | 5.0          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V       | 1.1                 | 2.1                | 3.2  | 1.0               | 3.9         | 4.3          | ns   |
| <b>C<sub>L</sub> = 10 pF</b> |                   |  |                     |                    |      |                   |             |              |      |
| t <sub>pd</sub>              | propagation delay | nA to nY; see <a href="#">Figure 8</a> | <a href="#">[2]</a> |                    |      |                   |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                | -                   | 19.8               | -    | -                 | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V       | 2.8                 | 5.9                | 12.2 | 2.6               | 13.7        | 15.1         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V       | 2.3                 | 4.2                | 7.5  | 2.1               | 8.7         | 9.6          | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V     | 2.0                 | 3.5                | 5.9  | 1.8               | 7.0         | 7.7          | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V       | 1.7                 | 2.9                | 4.6  | 1.5               | 5.4         | 6.0          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V       | 1.6                 | 2.7                | 3.8  | 1.4               | 4.5         | 5.0          | ns   |
| <b>C<sub>L</sub> = 15 pF</b> |                   |  |                     |                    |      |                   |             |              |      |
| t <sub>pd</sub>              | propagation delay | nA to nY; see <a href="#">Figure 8</a> | <a href="#">[2]</a> |                    |      |                   |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                | -                   | 23.3               | -    | -                 | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V       | 3.2                 | 6.7                | 13.0 | 3.0               | 15.8        | 17.4         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V       | 2.6                 | 4.7                | 8.6  | 2.4               | 10.0        | 11.0         | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V     | 2.3                 | 4.0                | 6.7  | 2.1               | 8.0         | 8.8          | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V       | 2.1                 | 3.3                | 5.1  | 1.8               | 6.1         | 6.8          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V       | 2.0                 | 3.1                | 4.2  | 1.8               | 5.0         | 5.5          | ns   |
| <b>C<sub>L</sub> = 30 pF</b> |                   |  |                     |                    |      |                   |             |              |      |
| t <sub>pd</sub>              | propagation delay | nA to nY; see <a href="#">Figure 8</a> | <a href="#">[2]</a> |                    |      |                   |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                | -                   | 33.6               | -    | -                 | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V       | 4.4                 | 8.9                | 16.0 | 4.0               | 19.0        | 20.9         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V       | 3.6                 | 6.3                | 10.8 | 3.2               | 12.9        | 14.2         | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V     | 3.2                 | 5.3                | 9.0  | 2.9               | 10.5        | 11.6         | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V       | 2.9                 | 4.5                | 6.5  | 2.6               | 7.6         | 8.4          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V       | 2.9                 | 4.2                | 5.4  | 2.6               | 6.2         | 6.9          | ns   |

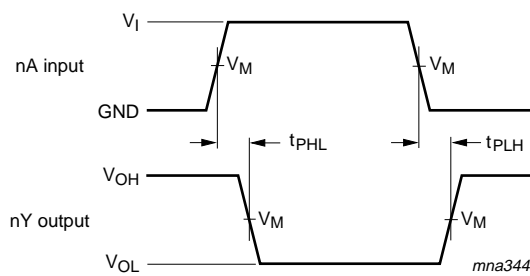


**Table 8. Dynamic characteristics ...continued**  
 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 9](#).

| Symbol  | Parameter                     | Conditions  | 25 °C |                    |     | -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, 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][4]</sup> |       |                    |     |                   |             |              |      |
|   |                               | V <sub>CC</sub> = 0.8 V   | -     | 2.5                | -   | -                 | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 1.1 V to 1.3 V  | -     | 2.7                | -   | -                 | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 1.4 V to 1.6 V  | -     | 2.8                | -   | -                 | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 1.65 V to 1.95 V  | -     | 3.0                | -   | -                 | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 2.3 V to 2.7 V  | -     | 3.5                | -   | -                 | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 3.0 V to 3.6 V  | -     | 4.0                | -   | -                 | -           | -            | 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] All specified values are the average typical values over all stated loads.
- [4] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:  
 f<sub>i</sub> = input frequency in MHz;  
 f<sub>o</sub> = output frequency in MHz;  
 C<sub>L</sub> = 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

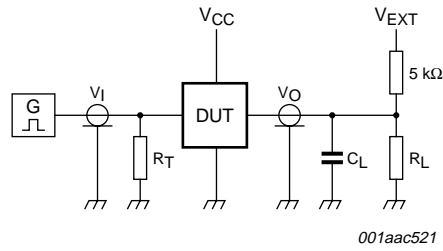


Measurement points are given in [Table 9](#).  
 Logic levels: V<sub>OL</sub> and V<sub>OH</sub> are typical output voltage levels that occur with the output load.

**Fig 8. The data input (nA) to output (nY) propagation delays**

**Table 9. Measurement points**

| Supply voltage  | Output             | Input              |                 |                                 |
|-----------------|--------------------|--------------------|-----------------|---------------------------------|
| V <sub>CC</sub> | V <sub>M</sub>     | V <sub>M</sub>     | V <sub>I</sub>  | t <sub>r</sub> = t <sub>f</sub> |
| 0.8 V to 3.6 V  | 0.5V <sub>CC</sub> | 0.5V <sub>CC</sub> | V <sub>CC</sub> | ≤ 3.0 ns                        |



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

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 9. Load circuitry for switching times**

**Table 10. 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. Package outline

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

SOT765-1

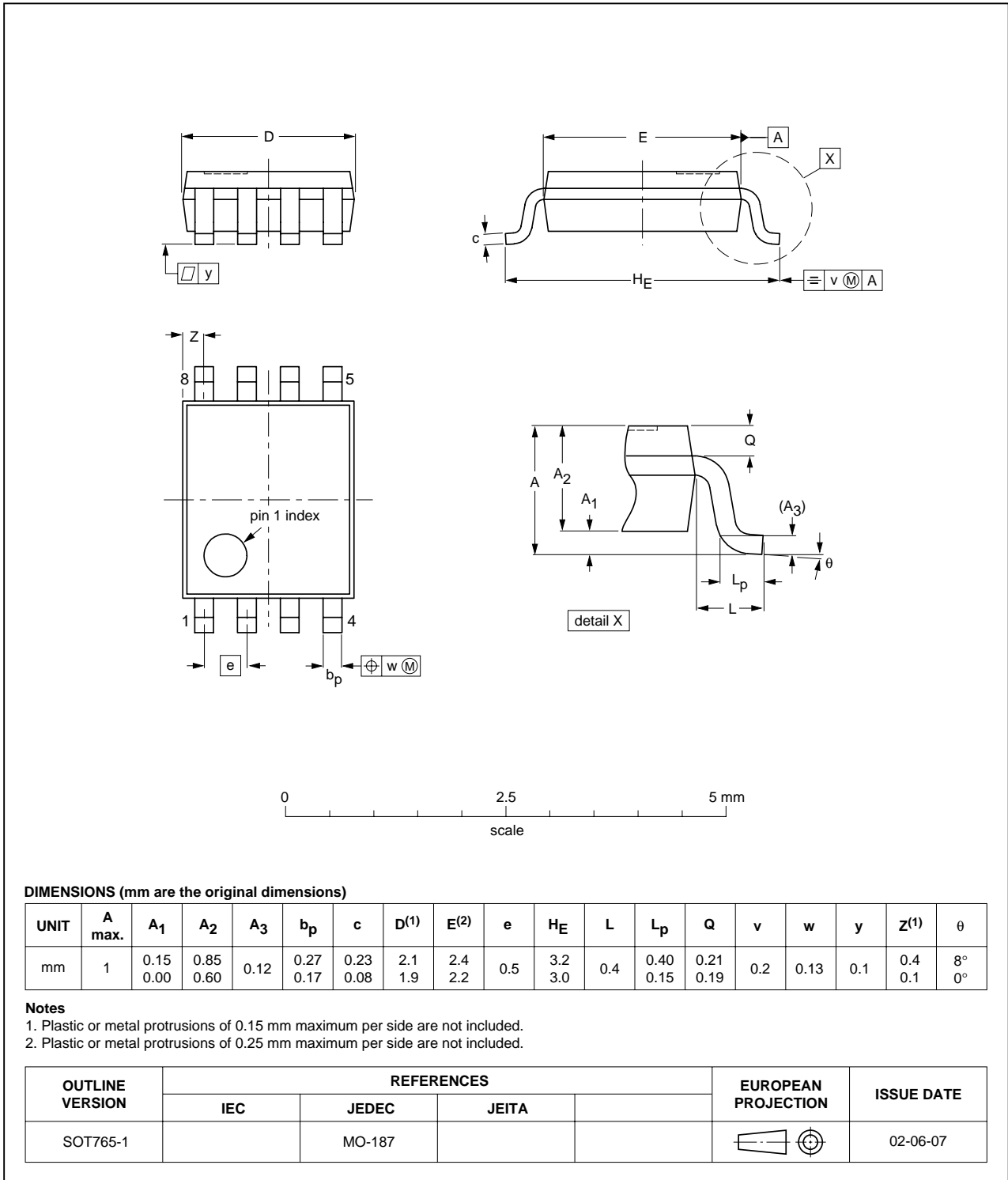


Fig 10. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

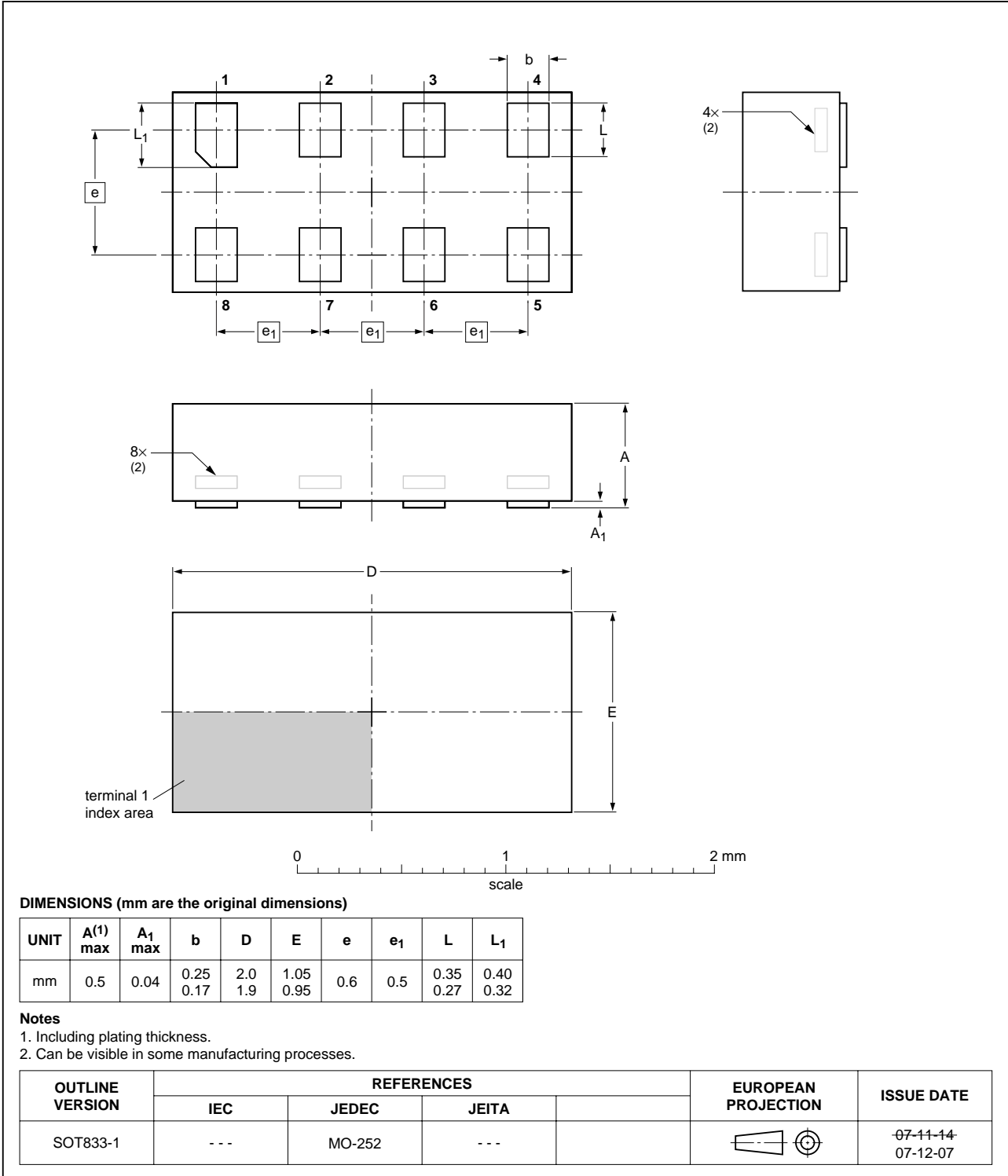


Fig 11. Package outline SOT833-1 (XSON8)

XSON8U: plastic extremely thin small outline package; no leads;  
8 terminals; UTLP based; body 3 x 2 x 0.5 mm

SOT996-2

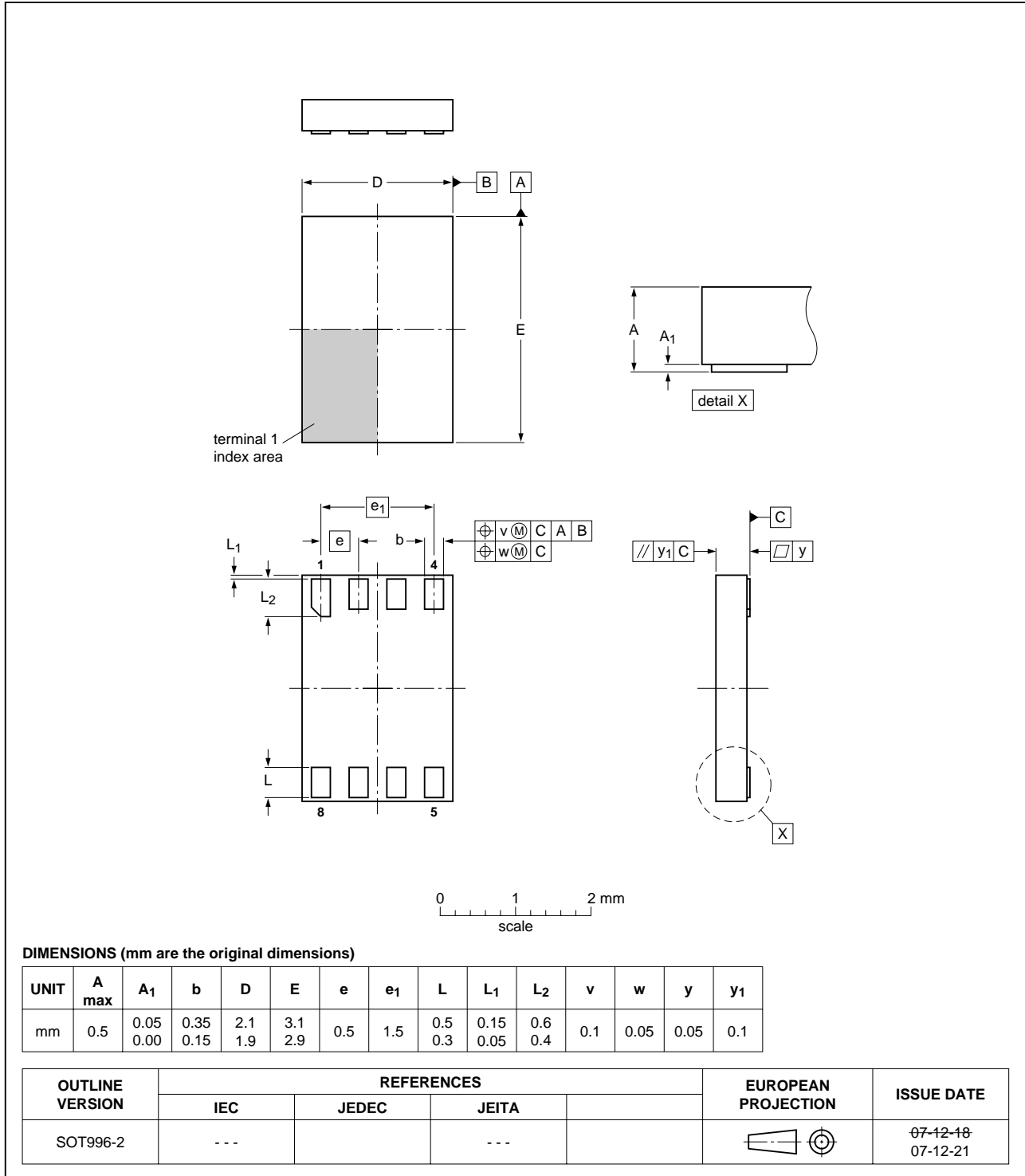
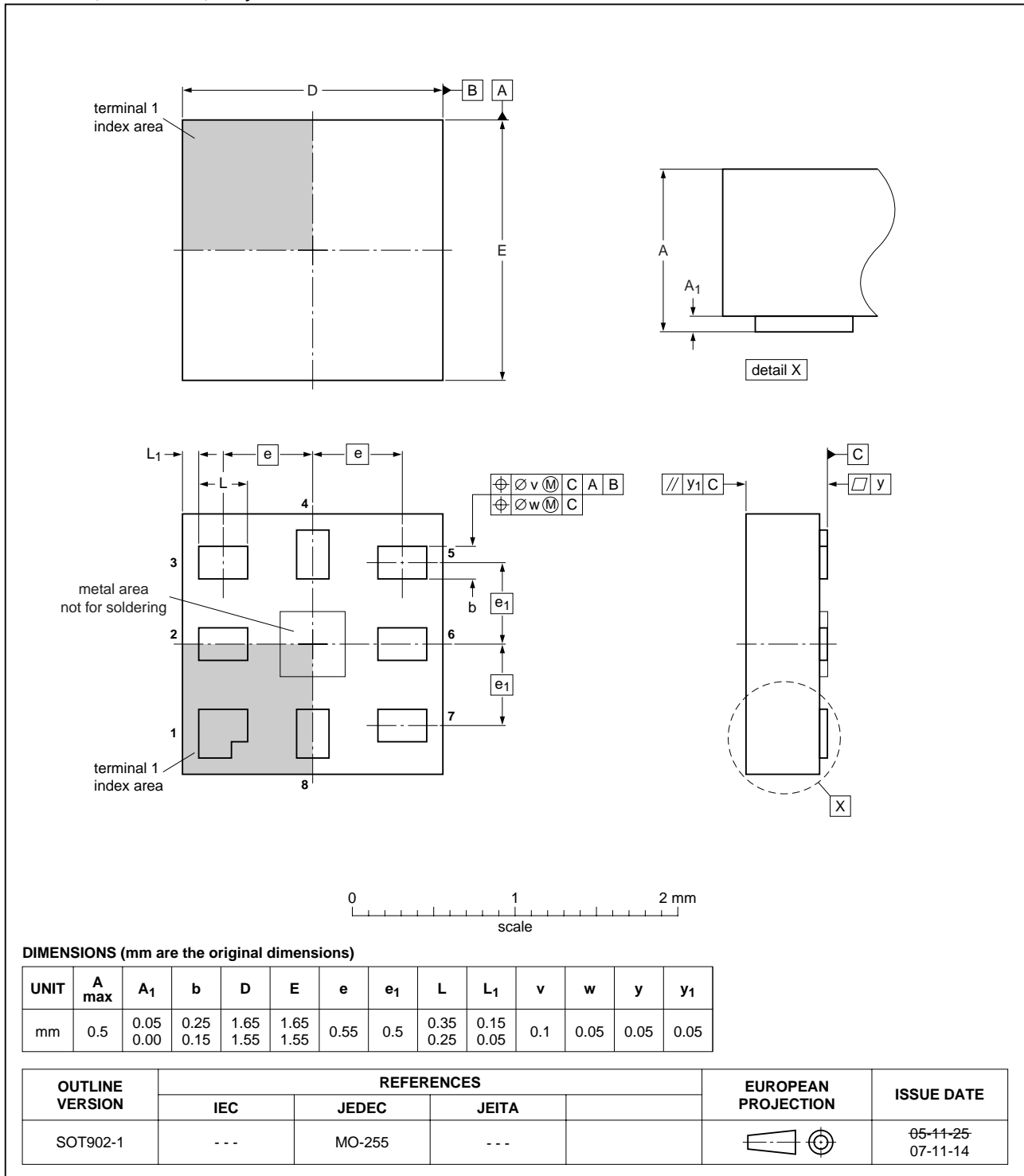


Fig 12. Package outline SOT996-2 (XSON8U)

**XQFN8U: plastic extremely thin quad flat package; no leads; 8 terminals; UTLP based; body 1.6 x 1.6 x 0.5 mm**

**SOT902-1**



**Fig 13. Package outline SOT902-1 (XQFN8U)**

## 14. Abbreviations

Table 11. Abbreviations

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

## 15. Revision history

Table 12. Revision history

| Document ID    | Release date | Data sheet status  | Change notice | Supersedes   |
|----------------|--------------|--------------------|---------------|--|
| 74AUP3G04_3    | 20091008     | Product data sheet | -             | 74AUP3G04_2  |
| Modifications: |              |                    |               |  |
|                |              |                    |               | <ul style="list-style-type: none"><li>Added type number 74AUP3G04GD (XSON8U / SOT996-2) package.</li><li><a href="#">Table 5</a>: Derating factor of XSON8, XSON8U and XQFN8U packages has been changed.</li></ul> |
| 74AUP3G04_2    | 20080313     | Product data sheet | -             | 74AUP3G04_1  |
| 74AUP3G04_1    | 20070524     | Product data sheet | -             | -  |

## 16. Legal information

### 16.1 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.nxp.com>.

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