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Kind regards,

Team Nexperia

# XC7WH126

Dual buffer/line driver; 3-state

Rev. 2 — 8 May 2013

Product data sheet

## 1. General description

The XC7WH126 is a high-speed Si-gate CMOS devices. This device provides a dual non-inverting buffer/line driver with 3-state output. The 3-state output is controlled by the output enable input (nOE). A LOW at nOE causes the output to assume a high-impedance OFF-state.

## 2. Features and benefits

- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- Multiple package options
- ESD protection:
  - ◆ HBM JESD22-A114E: exceeds 2000 V
  - ◆ MM JESD22-A115-A: exceeds 200 V
  - ◆ CDM JESD22-C101C: exceeds 1000 V
- Specified from  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$

## 3. Ordering information

Table 1. Ordering information

| Type number | Package                                         |        |                                                                                                      |          |
|-------------|-------------------------------------------------|--------|------------------------------------------------------------------------------------------------------|----------|
|             | Temperature range                               | Name   | Description                                                                                          | Version  |
| XC7WH126DP  | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | TSSOP8 | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm              | SOT505-2 |
| XC7WH126DC  | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm                           | SOT765-1 |
| XC7WH126GD  | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body $3 \times 2 \times 0.5$ mm | SOT996-2 |



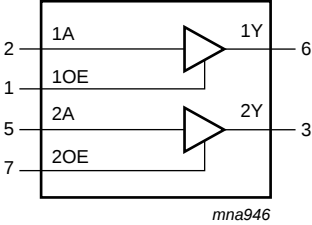
4. Marking

Table 2. Marking codes

| Type number | Marking <sup>[1]</sup> |
|-------------|------------------------|
| XC7WH126DP  | f26                    |
| XC7WH126DC  | f26                    |
| XC7WH126GD  | f26                    |

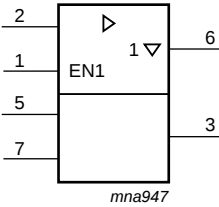
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



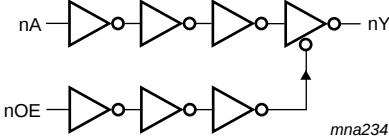
*mna946*

Fig 1. Logic symbol



*mna947*

Fig 2. IEC logic symbol

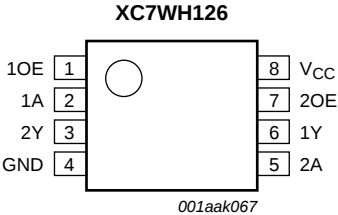


*mna234*

Fig 3. Logic diagram (one buffer)

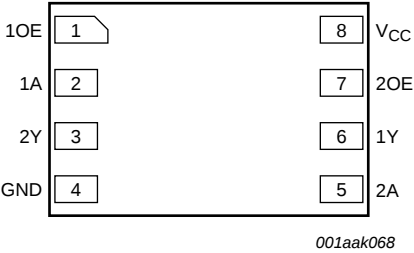
6. Pinning information

6.1 Pinning



*001aak067*

Fig 4. Pin configuration SOT505-2 (TSSOP8) and SOT765-1 (VSSOP8)



*001aak068*

Transparent top view

Fig 5. Pin configuration SOT996-2 (XSON8)

## 6.2 Pin description

**Table 3.** Pin description

| Symbol          | Pin  | Description                      |
|-----------------|------|----------------------------------|
| 1OE, 2OE        | 1, 7 | output enable input (active LOW) |
| 1A, 2A          | 2, 5 | data input                       |
| GND             | 4    | ground (0 V)                     |
| 1Y, 2Y          | 6, 3 | data output                      |
| V <sub>CC</sub> | 8    | supply voltage                   |

## 7. Functional description

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

| Control | Input | Output |
|---------|-------|--------|
| nOE     | nA    | nY     |
| H       | L     | L      |
| H       | H     | H      |
| L       | X     | Z      |

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

## 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 <sub>CC</sub>  | supply voltage          |                                                                     | -0.5               | +7.0 | V    |
| V <sub>I</sub>   | input voltage           |                                                                     | -0.5               | +7.0 | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < -0.5 V                                             | <sup>[1]</sup> -20 | -    | mA   |
| I <sub>OK</sub>  | output clamping current | V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V | <sup>[1]</sup> -   | ±20  | mA   |
| I <sub>O</sub>   | output current          | -0.5 V < V <sub>O</sub> < V <sub>CC</sub> + 0.5 V                   | -                  | ±25  | mA   |
| I <sub>CC</sub>  | supply current          |                                                                     | -                  | 75   | mA   |
| I <sub>GND</sub> | ground current          |                                                                     | -75                | -    | mA   |
| T <sub>stg</sub> | storage temperature     |                                                                     | -65                | +150 | °C   |
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 °C to +125 °C                                | <sup>[2]</sup> -   | 250  | mW   |

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

[2] For TSSOP8 package: above 55 °C the value of P<sub>tot</sub> derates linearly with 2.5 mW/K.

For VSSOP8 package: above 110 °C the value of P<sub>tot</sub> derates linearly with 8 mW/K.

For XSON8 package: above 118 °C the value of P<sub>tot</sub> derates linearly with 7.8 mW/K.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V).

| Symbol           | Parameter                           | Conditions                      | Min | Typ | Max             | Unit |
|------------------|-------------------------------------|---------------------------------|-----|-----|-----------------|------|
| V <sub>CC</sub>  | supply voltage                      |                                 | 2.0 | 5.0 | 5.5             | V    |
| V <sub>I</sub>   | input voltage                       |                                 | 0   | -   | 5.5             | V    |
| V <sub>O</sub>   | output voltage                      |                                 | 0   | -   | V <sub>CC</sub> | V    |
| T <sub>amb</sub> | ambient temperature                 |                                 | -40 | +25 | +125            | °C   |
| Δt/ΔV            | input transition rise and fall rate | V <sub>CC</sub> = 3.3 V ± 0.3 V | -   | -   | 100             | ns/V |
|                  |                                     | V <sub>CC</sub> = 5.0 V ± 0.5 V | -   | -   | 20              | ns/V |

## 10. Static characteristics

**Table 7. Static characteristics**

Voltages are referenced to GND (ground = 0 V).

| Symbol          | Parameter                 | Conditions                                                                                | 25 °C |     |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|-----------------|---------------------------|-------------------------------------------------------------------------------------------|-------|-----|------|------------------|------|-------------------|------|------|
|                 |                           |                                                                                           | Min   | Typ | Max  | Min              | Max  | Min               | Max  |      |
| V <sub>IH</sub> | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V                                                                   | 1.5   | -   | -    | 1.5              | -    | 1.5               | -    | V    |
|                 |                           | V <sub>CC</sub> = 3.0 V                                                                   | 2.1   | -   | -    | 2.1              | -    | 2.1               | -    | V    |
|                 |                           | V <sub>CC</sub> = 5.5 V                                                                   | 3.85  | -   | -    | 3.85             | -    | 3.85              | -    | V    |
| V <sub>IL</sub> | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V                                                                   | -     | -   | 0.5  | -                | 0.5  | -                 | 0.5  | V    |
|                 |                           | V <sub>CC</sub> = 3.0 V                                                                   | -     | -   | 0.9  | -                | 0.9  | -                 | 0.9  | V    |
|                 |                           | V <sub>CC</sub> = 5.5 V                                                                   | -     | -   | 1.65 | -                | 1.65 | -                 | 1.65 | 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> = -50 μA; V <sub>CC</sub> = 2.0 V                                          | 1.9   | 2.0 | -    | 1.9              | -    | 1.9               | -    | V    |
|                 |                           | I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 3.0 V                                          | 2.9   | 3.0 | -    | 2.9              | -    | 2.9               | -    | V    |
|                 |                           | I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 4.5 V                                          | 4.4   | 4.5 | -    | 4.4              | -    | 4.4               | -    | V    |
|                 |                           | I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V                                         | 2.58  | -   | -    | 2.48             | -    | 2.40              | -    | V    |
| V <sub>OL</sub> | LOW-level output voltage  | I <sub>O</sub> = -8.0 mA; V <sub>CC</sub> = 4.5 V                                         | 3.94  | -   | -    | 3.8              | -    | 3.70              | -    | V    |
|                 |                           | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                       |       |     |      |                  |      |                   |      |      |
|                 |                           | I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 2.0 V                                           | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 3.0 V                                           | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 4.5 V                                           | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
| I <sub>OZ</sub> | OFF-state output current  | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V                                          | -     | -   | 0.36 | -                | 0.44 | -                 | 0.55 | V    |
|                 |                           | I <sub>O</sub> = 8.0 mA; V <sub>CC</sub> = 4.5 V                                          | -     | -   | 0.36 | -                | 0.44 | -                 | 0.55 | V    |
| I <sub>I</sub>  | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>V <sub>CC</sub> = 5.5 V                       | -     | -   | 0.25 | -                | 2.5  | -                 | 10   | μA   |
| I <sub>I</sub>  | input leakage current     | V <sub>I</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 0 V to 5.5 V                          | -     | -   | 0.1  | -                | 1.0  | -                 | 2.0  | μA   |
| I <sub>CC</sub> | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 5.5 V | -     | -   | 1.0  | -                | 10   | -                 | 40   | μA   |
| C <sub>I</sub>  | input capacitance         |                                                                                           | -     | 1.5 | 10   | -                | 10   | -                 | 10   | pF   |

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

$GND = 0\text{ V}$ ; for test circuit see [Figure 8](#).

| Symbol    | Parameter                     | Conditions                                                                                                 | 25 °C |     |      | –40 °C to +85 °C |      | –40 °C to +125 °C |      | Unit |
|-----------|-------------------------------|------------------------------------------------------------------------------------------------------------|-------|-----|------|------------------|------|-------------------|------|------|
|           |                               |                                                                                                            | Min   | Typ | Max  | Min              | Max  | Min               | Max  |      |
| $t_{pd}$  | propagation delay             | nA to nY; see <a href="#">Figure 6</a> <a href="#">[1]</a>                                                 |       |     |      |                  |      |                   |      |      |
|           |                               | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ <a href="#">[2]</a>                                                |       |     |      |                  |      |                   |      |      |
|           |                               | $C_L = 15\text{ pF}$                                                                                       | -     | 4.7 | 8.0  | 1.0              | 9.5  | 1.0               | 11.5 | ns   |
|           |                               | $C_L = 50\text{ pF}$                                                                                       | -     | 6.6 | 11.5 | 1.0              | 13.0 | 1.0               | 14.5 | ns   |
|           |                               | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ <a href="#">[3]</a>                                                |       |     |      |                  |      |                   |      |      |
|           |                               | $C_L = 15\text{ pF}$                                                                                       | -     | 3.4 | 5.5  | 1.0              | 6.5  | 1.0               | 7.0  | ns   |
| $t_{en}$  | enable time                   | nOE to nY; see <a href="#">Figure 7</a> <a href="#">[1]</a>                                                |       |     |      |                  |      |                   |      |      |
|           |                               | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ <a href="#">[2]</a>                                                |       |     |      |                  |      |                   |      |      |
|           |                               | $C_L = 15\text{ pF}$                                                                                       | -     | 5.0 | 8.0  | 1.0              | 9.5  | 1.0               | 11.5 | ns   |
|           |                               | $C_L = 50\text{ pF}$                                                                                       | -     | 6.9 | 11.5 | 1.0              | 13.0 | 1.0               | 14.5 | ns   |
|           |                               | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ <a href="#">[3]</a>                                                |       |     |      |                  |      |                   |      |      |
|           |                               | $C_L = 15\text{ pF}$                                                                                       | -     | 3.6 | 5.1  | 1.0              | 6.0  | 1.0               | 6.5  | ns   |
| $t_{dis}$ | disable time                  | nOE to nY; see <a href="#">Figure 7</a> <a href="#">[1]</a>                                                |       |     |      |                  |      |                   |      |      |
|           |                               | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ <a href="#">[2]</a>                                                |       |     |      |                  |      |                   |      |      |
|           |                               | $C_L = 15\text{ pF}$                                                                                       | -     | 6.0 | 9.7  | 1.0              | 11.5 | 1.0               | 12.5 | ns   |
|           |                               | $C_L = 50\text{ pF}$                                                                                       | -     | 8.3 | 13.2 | 1.0              | 15.0 | 1.0               | 16.5 | ns   |
|           |                               | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ <a href="#">[3]</a>                                                |       |     |      |                  |      |                   |      |      |
|           |                               | $C_L = 15\text{ pF}$                                                                                       | -     | 4.1 | 6.8  | 1.0              | 8.0  | 1.0               | 8.5  | ns   |
| $C_{PD}$  | power dissipation capacitance | per buffer; $C_L = 50\text{ pF}$ ; $f_i = 1\text{ MHz}$ ; $V_i = GND\text{ to }V_{CC}$ <a href="#">[4]</a> | -     | 10  | -    | -                | -    | -                 | -    | pF   |

[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

$t_{en}$  is the same as  $t_{PZL}$  and  $t_{PZH}$ .

$t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ .

[2] Typical values are measured at  $V_{CC} = 3.3\text{ V}$ .

[3] Typical values are measured at  $V_{CC} = 5.0\text{ V}$ .

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

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

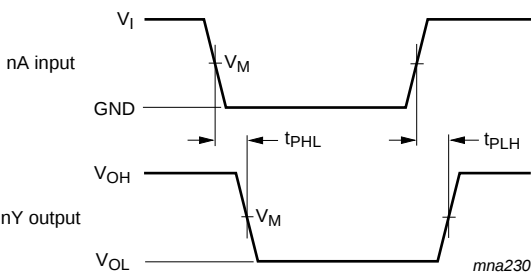
$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

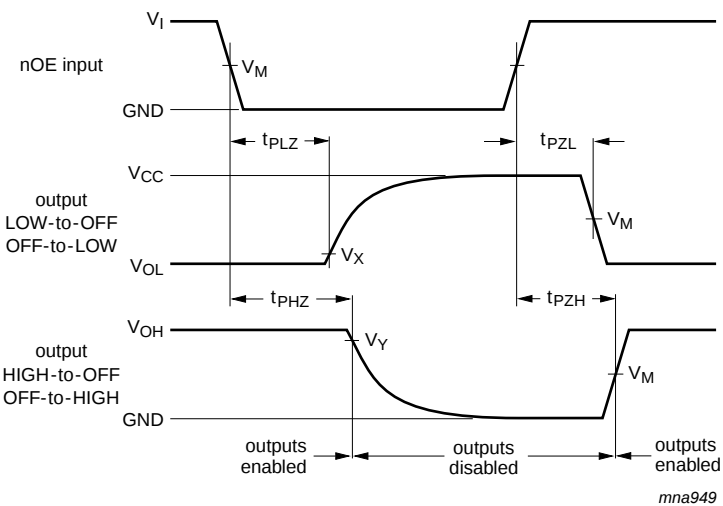
$V_{CC}$  = supply voltage in Volts.

12. Waveforms



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 6. Input (nA) to output (nY) propagation delays



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

Table 9. Measurement points

| Type     | Input       | Output      |                         |                         |
|----------|-------------|-------------|-------------------------|-------------------------|
|          | $V_M$       | $V_M$       | $V_X$                   | $V_Y$                   |
| XC7WH126 | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.3\text{ V}$ | $V_{OH} - 0.3\text{ V}$ |

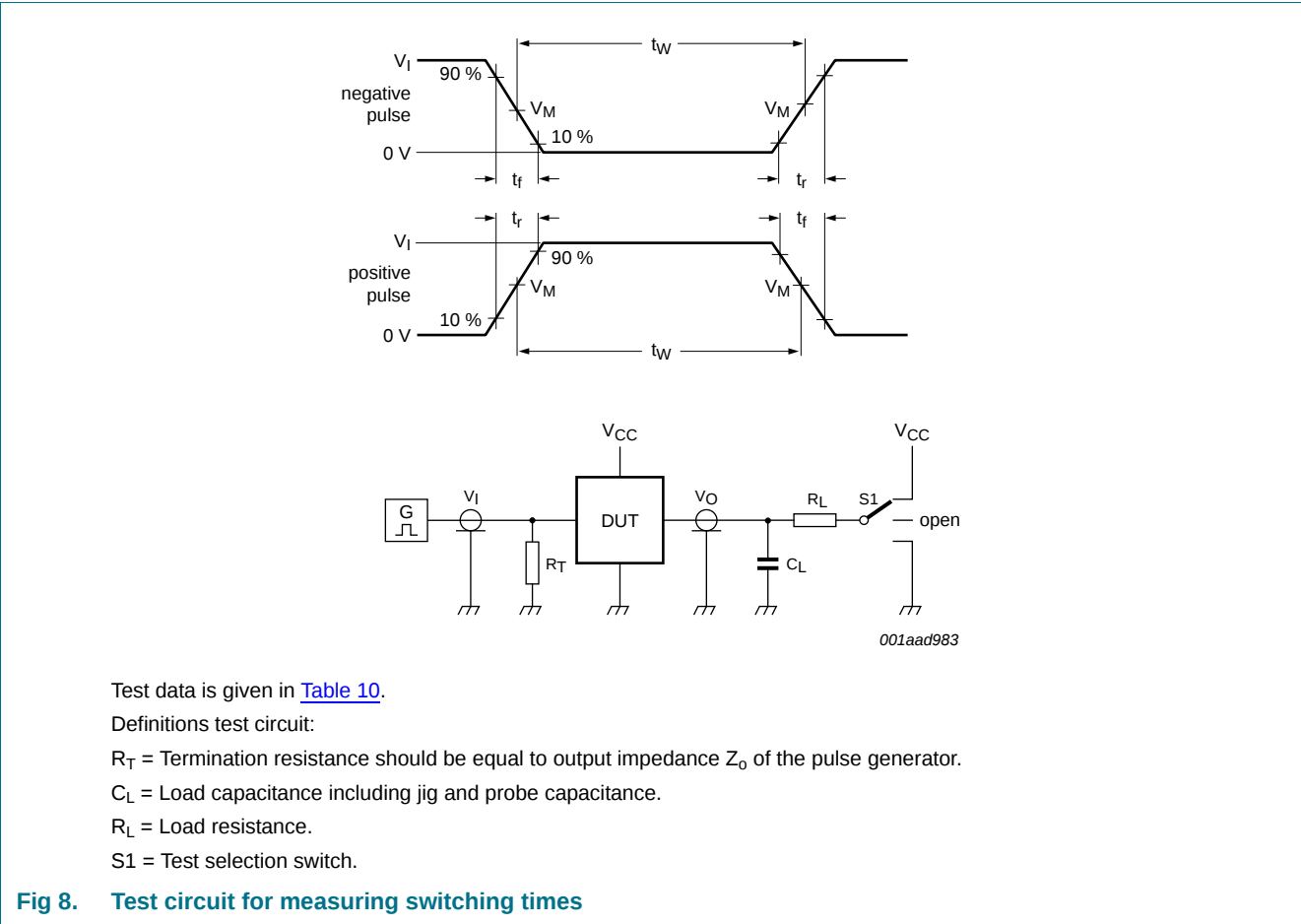


Table 10. Test data

| Type     | Input    |                     | Load         |              | S1 position        |                    |                    |
|----------|----------|---------------------|--------------|--------------|--------------------|--------------------|--------------------|
|          | $V_I$    | $t_r, t_f$          | $C_L$        | $R_L$        | $t_{PHL}, t_{PLH}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ |
| XC7WH126 | $V_{CC}$ | $\leq 3 \text{ ns}$ | 15 pF, 50 pF | 1 k $\Omega$ | open               | GND                | $V_{CC}$           |

13. Package outline

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

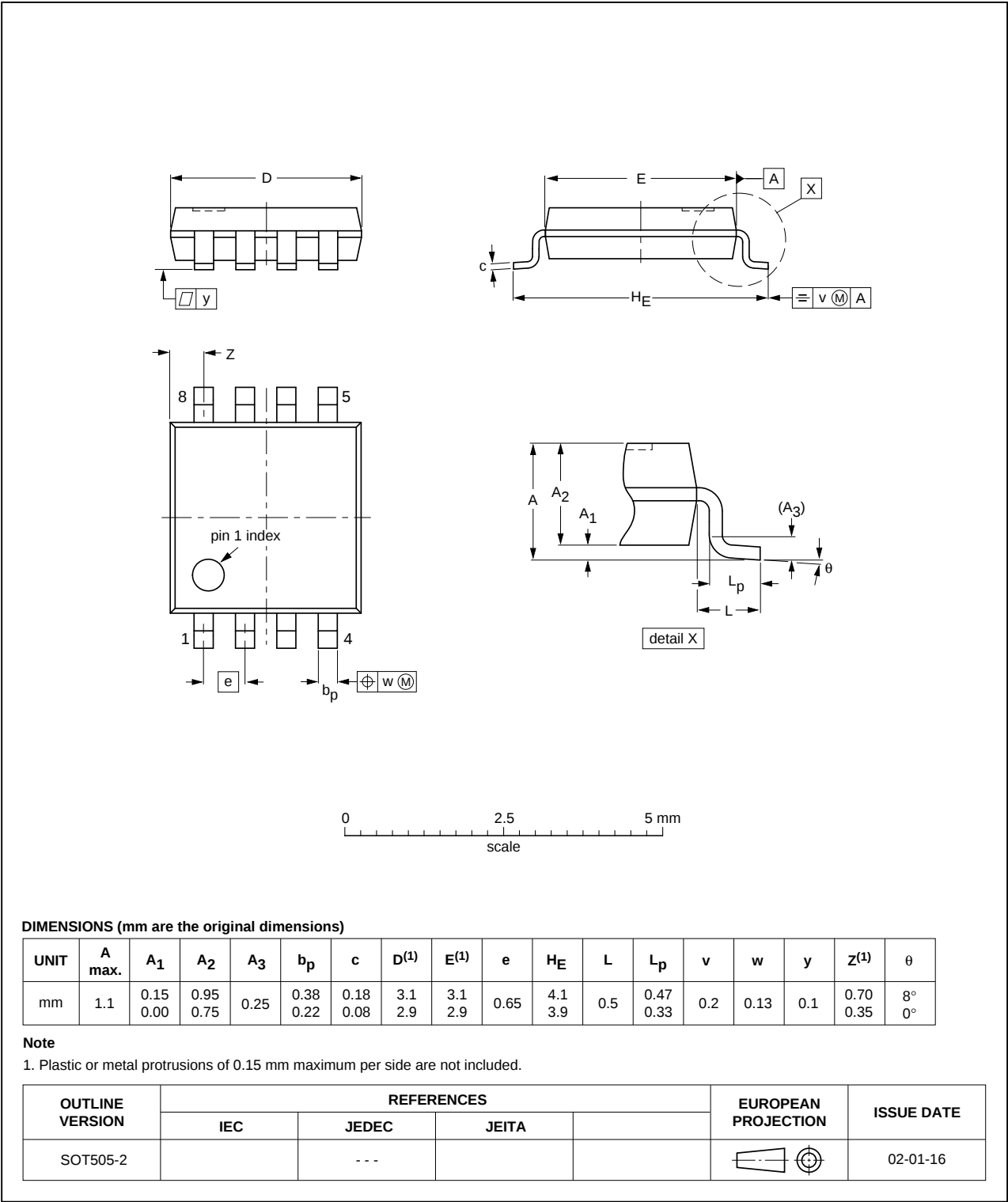


Fig 9. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

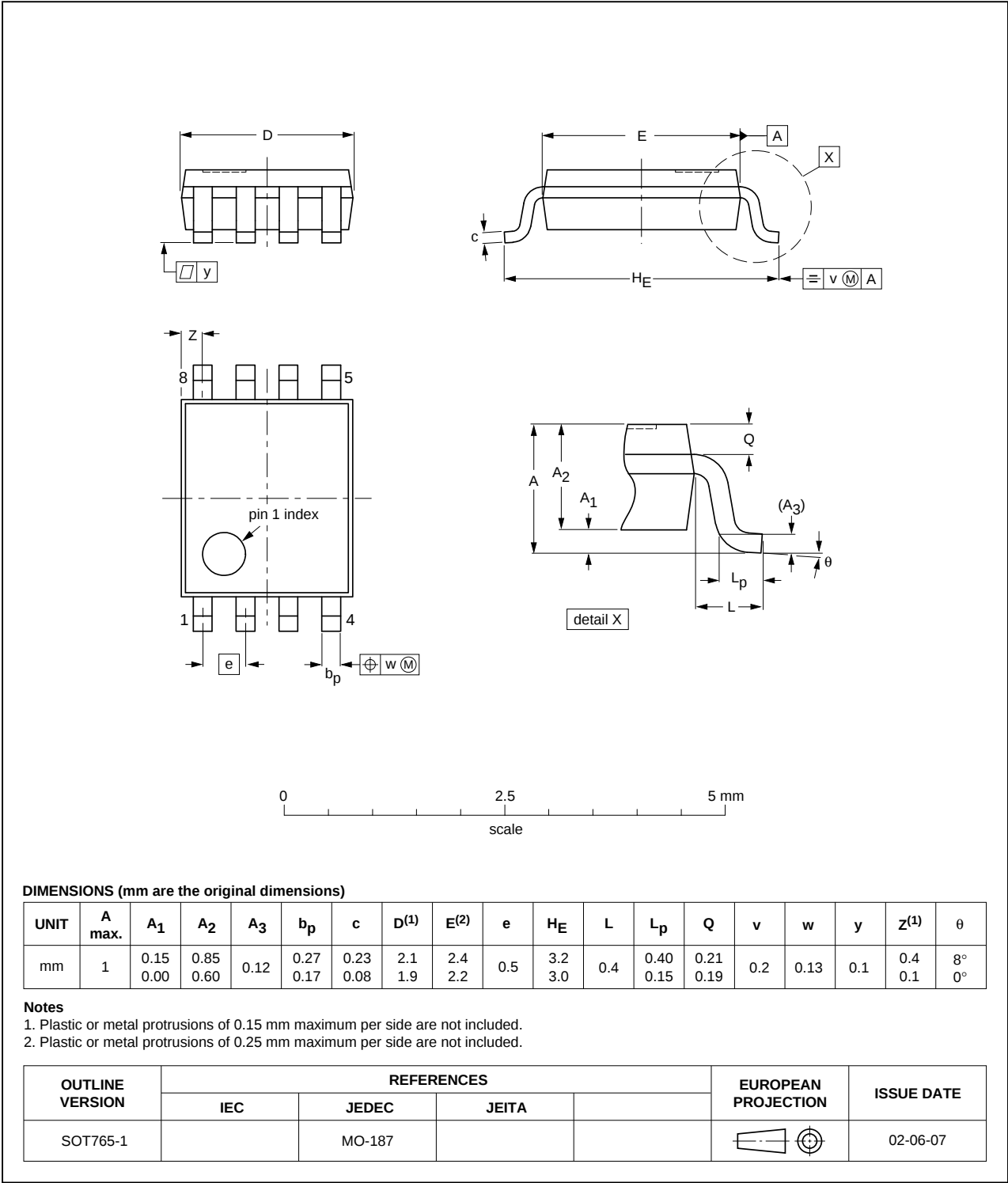


Fig 10. Package outline SOT765-1 (VSSOP8)

XSON8: plastic extremely thin small outline package; no leads;  
8 terminals; body 3 x 2 x 0.5 mm

SOT996-2

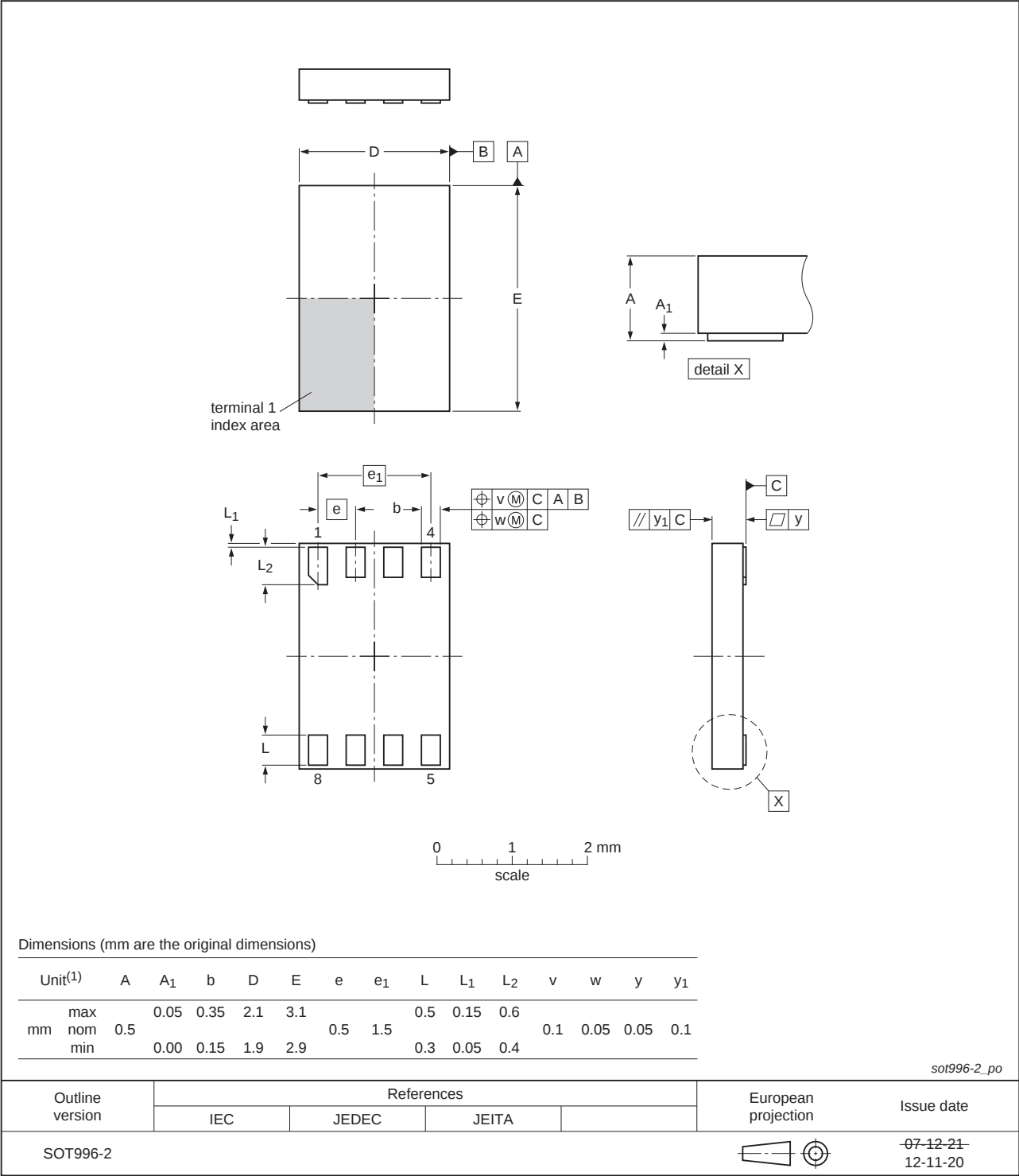


Fig 11. Package outline SOT996-2 (XSON8)

## 14. Abbreviations

Table 11. Abbreviations

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

## 15. Revision history

Table 12. Revision history

| Document ID    | Release date                                              | Data sheet status  | Change notice | Supersedes   |
|----------------|-----------------------------------------------------------|--------------------|---------------|--------------|
| XC7WH126 v.2   | 20130508                                                  | Product data sheet | -             | XC7WH126 v.1 |
| Modifications: | • For type number XC7WH126GD XSON8U has changed to XSON8. |                    |               |              |
| XC7WH126 v.1   | 20090902                                                  | 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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