

# 74LVC2G74

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Single D-type flip-flop with set and reset; positive edge trigger

Rev. 06 — 23 December 2009

Product data sheet

## 1. General description

The 74LVC2G74 is a single positive-edge triggered D-type flip-flop with individual data (D) inputs, clock (CP) inputs, set ( $\overline{SD}$ ) and reset ( $\overline{RD}$ ) inputs, and complementary Q and  $\overline{Q}$  outputs.

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

The set and reset are asynchronous active LOW inputs and operate independently of the clock input. Information on the data input is transferred to the Q output on the LOW-to-HIGH transition of the clock pulse. The D inputs must be stable, one set-up time prior to the LOW-to-HIGH clock transition for predictable operation.

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

## 2. Features

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

3. Ordering information

Table 1. Ordering information

| Type number | Package           |        |                                                                                                      |          |
|-------------|-------------------|--------|------------------------------------------------------------------------------------------------------|----------|
|             | Temperature range | Name   | Description                                                                                          | Version  |
| 74LVC2G74DP | −40 °C to +125 °C | TSSOP8 | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm              | SOT505-2 |
| 74LVC2G74DC | −40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm                           | SOT765-1 |
| 74LVC2G74GT | −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 |
| 74LVC2G74GF | −40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm                  | SOT1089  |
| 74LVC2G74GD | −40 °C to +125 °C | XSON8U | plastic extremely thin small outline package; no leads; 8 terminals; UTLF based; body 3 × 2 × 0.5 mm | SOT996-2 |
| 74LVC2G74GM | −40 °C to +125 °C | XQFN8U | plastic extremely thin quad flat package; no leads; 8 terminals; UTLF based; body 1.6 × 1.6 × 0.5 mm | SOT902-1 |

4. Marking

Table 2. Marking codes

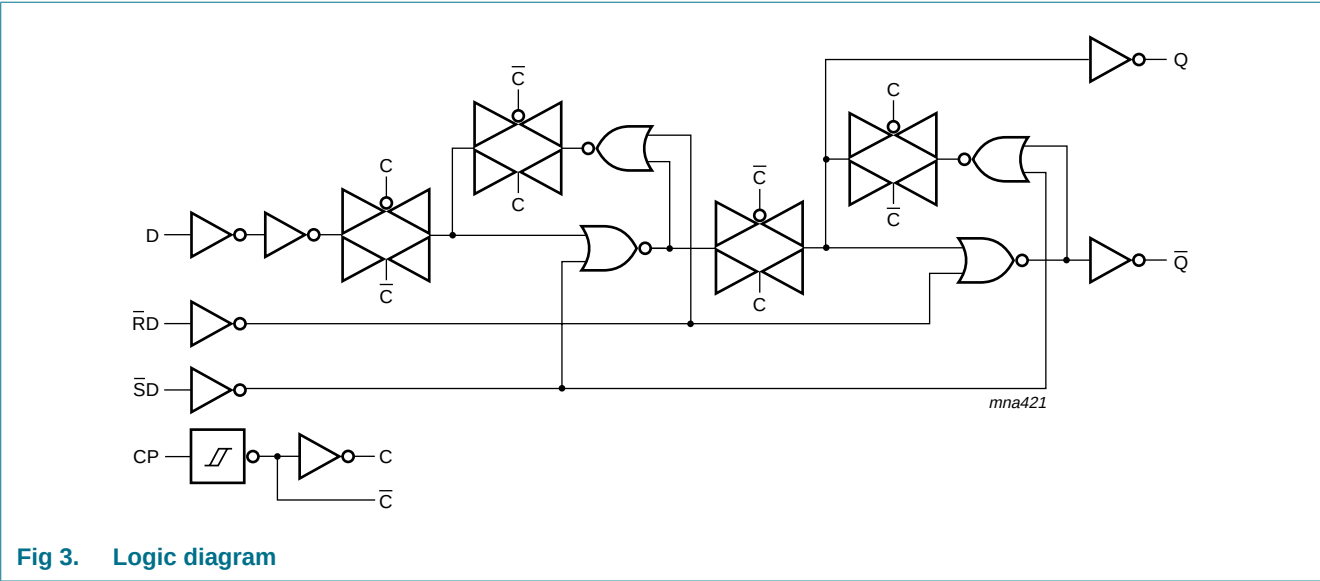
| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| 74LVC2G74DP | V74                         |
| 74LVC2G74DC | V74                         |
| 74LVC2G74GT | V74                         |
| 74LVC2G74GF | Y4                          |
| 74LVC2G74GD | V74                         |
| 74LVC2G74GM | V74                         |

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

5. Functional diagram

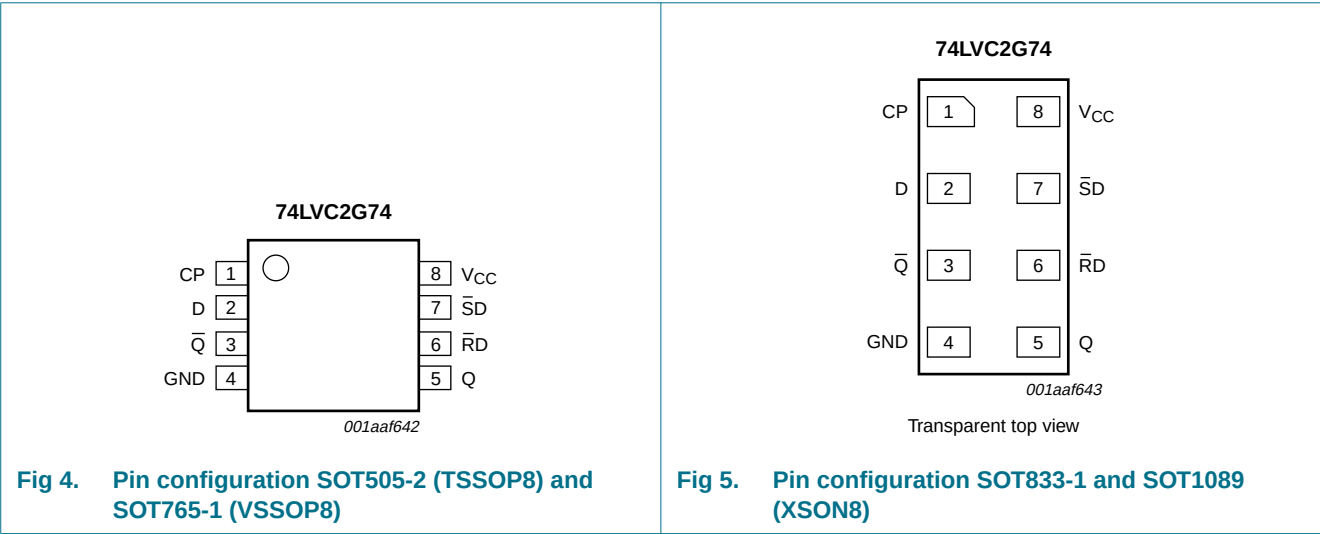
**Fig 1. Logic symbol**

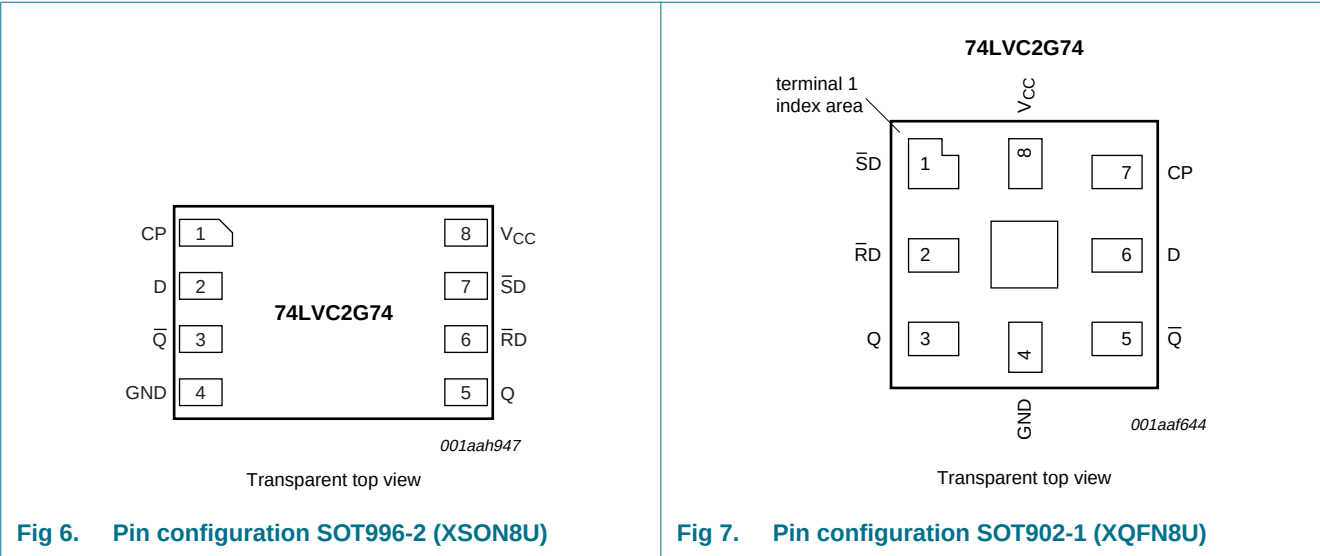
**Fig 2. IEC logic symbol**



## 6. Pinning information

### 6.1 Pinning





6.2 Pin description

Table 3. Pin description

| Symbol          | Pin                                                |          | Description                                  |
|-----------------|----------------------------------------------------|----------|----------------------------------------------|
|                 | SOT505-2, SOT765-1, SOT833-1, SOT996-2 and SOT1089 | SOT902-1 |                                              |
| CP              | 1                                                  | 7        | clock input (LOW-to-HIGH, edge-triggered)    |
| D               | 2                                                  | 6        | data input                                   |
| $\overline{Q}$  | 3                                                  | 5        | complement output                            |
| GND             | 4                                                  | 4        | ground (0 V)                                 |
| Q               | 5                                                  | 3        | true output                                  |
| $\overline{RD}$ | 6                                                  | 2        | asynchronous reset-direct input (active LOW) |
| $\overline{SD}$ | 7                                                  | 1        | asynchronous set-direct input (active LOW)   |
| V <sub>CC</sub> | 8                                                  | 8        | supply voltage                               |

7. Functional description

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

| Input           |                 |    |   | Output |                |
|-----------------|-----------------|----|---|--------|----------------|
| $\overline{SD}$ | $\overline{RD}$ | CP | D | Q      | $\overline{Q}$ |
| L               | H               | X  | X | H      | L              |
| H               | L               | X  | X | L      | H              |
| L               | L               | X  | X | H      | H              |

[1] H = HIGH voltage level;  
L = LOW voltage level;  
X = don't care.

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Table 5. Function table for synchronous operation<sup>[1]</sup>

| Input                  |                        |    |   | Output    |                      |
|------------------------|------------------------|----|---|-----------|----------------------|
| $\overline{\text{SD}}$ | $\overline{\text{RD}}$ | CP | D | $Q_{n+1}$ | $\overline{Q}_{n+1}$ |
| H                      | H                      | ↑  | L | L         | H                    |
| H                      | H                      | ↑  | H | H         | L                    |

- [1] H = HIGH voltage level;  
 L = LOW voltage level;  
 ↑ = LOW-to-HIGH CP transition;  
 $Q_{n+1}$  = state after the next LOW-to-HIGH CP transition.

## 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                   | +6.5           | V    |
| $I_{IK}$  | input clamping current  | $V_I < 0$ V                   | -50                    | -              | mA   |
| $V_I$     | input voltage           |                               | <sup>[1]</sup> -0.5    | +6.5           | V    |
| $I_{OK}$  | output clamping current | $V_O > V_{CC}$ or $V_O < 0$ V | -                      | ±50            | mA   |
| $V_O$     | output voltage          | Active mode                   | <sup>[1][2]</sup> -0.5 | $V_{CC} + 0.5$ | V    |
|           |                         | Power-down mode               | <sup>[1][2]</sup> -0.5 | +6.5           | V    |
| $I_O$     | output current          | $V_O = 0$ V to $V_{CC}$       | -                      | ±50            | mA   |
| $I_{CC}$  | supply current          |                               | -                      | 100            | mA   |
| $I_{GND}$ | ground current          |                               | -100                   | -              | mA   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40$ °C to +125 °C | <sup>[3]</sup> -       | 300            | mW   |
| $T_{stg}$ | storage temperature     |                               | -65                    | +150           | °C   |

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 [2] When  $V_{CC} = 0$  V (Power-down mode), the output voltage can be 5.5 V in normal operation.  
 [3] For TSSOP8 packages: above 55 °C the value of  $P_{tot}$  derates linearly with 2.5 mW/K.  
 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 7. Operating conditions

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

## 10. Static characteristics

**Table 8. Static characteristics**

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

| Symbol                                    | Parameter                 | Conditions                                                                                                   | Min                    | Typ <sup>[1]</sup> | Max                    | Unit |
|-------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------|------------------------|--------------------|------------------------|------|
| <b>T<sub>amb</sub> = -40 °C to +85 °C</b> |                           |                                                                                                              |                        |                    |                        |      |
| V <sub>IH</sub>                           | HIGH-level input voltage  | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                           | 0.65 × V <sub>CC</sub> | -                  | -                      | V    |
|                                           |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                             | 1.7                    | -                  | -                      | V    |
|                                           |                           | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                             | 2.0                    | -                  | -                      | V    |
|                                           |                           | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                             | 0.7 × V <sub>CC</sub>  | -                  | -                      | V    |
| V <sub>IL</sub>                           | LOW-level input voltage   | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                           | -                      | -                  | 0.35 × V <sub>CC</sub> | V    |
|                                           |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                             | -                      | -                  | 0.7                    | V    |
|                                           |                           | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                             | -                      | -                  | 0.8                    | V    |
|                                           |                           | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                             | -                      | -                  | 0.3 × V <sub>CC</sub>  | V    |
| V <sub>OH</sub>                           | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                          |                        |                    |                        |      |
|                                           |                           | I <sub>O</sub> = -100 µA; V <sub>CC</sub> = 1.65 V to 5.5 V                                                  | V <sub>CC</sub> - 0.1  | -                  | -                      | V    |
|                                           |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V                                                             | 1.2                    | 1.54               | -                      | V    |
|                                           |                           | I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V                                                              | 1.9                    | 2.15               | -                      | V    |
|                                           |                           | I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V                                                             | 2.2                    | 2.50               | -                      | V    |
|                                           |                           | I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V                                                             | 2.3                    | 2.62               | -                      | V    |
|                                           |                           | I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V                                                             | 3.8                    | 4.11               | -                      | V    |
| V <sub>OL</sub>                           | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                          |                        |                    |                        |      |
|                                           |                           | I <sub>O</sub> = 100 µA; V <sub>CC</sub> = 1.65 V to 5.5 V                                                   | -                      | -                  | 0.10                   | V    |
|                                           |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V                                                              | -                      | 0.07               | 0.45                   | V    |
|                                           |                           | I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V                                                               | -                      | 0.12               | 0.30                   | V    |
|                                           |                           | I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                                                              | -                      | 0.17               | 0.40                   | V    |
|                                           |                           | I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V                                                              | -                      | 0.33               | 0.55                   | V    |
|                                           |                           | I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V                                                              | -                      | 0.39               | 0.55                   | V    |
| 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               | ±5                     | µA   |
| I <sub>OFF</sub>                          | power-off leakage current | V <sub>I</sub> or V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 0 V                                              | -                      | ±0.1               | ±10                    | µA   |
| I <sub>CC</sub>                           | supply current            | V <sub>I</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 1.65 V to 5.5 V; I <sub>O</sub> = 0 A                    | -                      | 0.1                | 10                     | µA   |
| ΔI <sub>CC</sub>                          | additional supply current | per pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 2.3 V to 5.5 V | -                      | 5                  | 500                    | µA   |
| C <sub>I</sub>                            | input capacitance         |                                                                                                              | -                      | 4.0                | -                      | pF   |

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

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

| Symbol                                     | Parameter                 | Conditions                                                                                                   | Min                    | Typ <sup>[1]</sup> | Max                    | Unit |
|--------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------|------------------------|--------------------|------------------------|------|
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |                           |                                                                                                              |                        |                    |                        |      |
| V <sub>IH</sub>                            | HIGH-level input voltage  | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                           | 0.65 × V <sub>CC</sub> | -                  | -                      | V    |
|                                            |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                             | 1.7                    | -                  | -                      | V    |
|                                            |                           | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                             | 2.0                    | -                  | -                      | V    |
|                                            |                           | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                             | 0.7 × V <sub>CC</sub>  | -                  | -                      | V    |
| V <sub>IL</sub>                            | LOW-level input voltage   | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                           | -                      | -                  | 0.35 × V <sub>CC</sub> | V    |
|                                            |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                             | -                      | -                  | 0.7                    | V    |
|                                            |                           | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                             | -                      | -                  | 0.8                    | V    |
|                                            |                           | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                             | -                      | -                  | 0.3 × V <sub>CC</sub>  | V    |
| V <sub>OH</sub>                            | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                          |                        |                    |                        |      |
|                                            |                           | I <sub>O</sub> = -100 µA; V <sub>CC</sub> = 1.65 V to 5.5 V                                                  | V <sub>CC</sub> - 0.1  | -                  | -                      | V    |
|                                            |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V                                                             | 0.95                   | -                  | -                      | V    |
|                                            |                           | I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V                                                              | 1.7                    | -                  | -                      | V    |
|                                            |                           | I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V                                                             | 1.9                    | -                  | -                      | V    |
|                                            |                           | I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V                                                             | 2.0                    | -                  | -                      | V    |
|                                            |                           | I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V                                                             | 3.4                    | -                  | -                      | V    |
| V <sub>OL</sub>                            | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                          |                        |                    |                        |      |
|                                            |                           | I <sub>O</sub> = 100 µA; V <sub>CC</sub> = 1.65 V to 5.5 V                                                   | -                      | -                  | 0.10                   | V    |
|                                            |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V                                                              | -                      | -                  | 0.70                   | V    |
|                                            |                           | I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V                                                               | -                      | -                  | 0.45                   | V    |
|                                            |                           | I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                                                              | -                      | -                  | 0.60                   | V    |
|                                            |                           | I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V                                                              | -                      | -                  | 0.80                   | V    |
|                                            |                           | I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V                                                              | -                      | -                  | 0.80                   | V    |
| 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                                             | -                      | -                  | ±20                    | µA   |
| I <sub>OFF</sub>                           | power-off leakage current | V <sub>I</sub> or V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 0 V                                              | -                      | -                  | ±20                    | µA   |
| I <sub>CC</sub>                            | supply current            | V <sub>I</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 1.65 V to 5.5 V; I <sub>O</sub> = 0 A                    | -                      | -                  | 40                     | µA   |
| ΔI <sub>CC</sub>                           | additional supply current | per pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 2.3 V to 5.5 V | -                      | -                  | 5000                   | µA   |

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

## 11. Dynamic characteristics

**Table 9. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 10](#).

| Symbol          | Parameter         | Conditions                                                               | –40 °C to +85 °C |                    |      | –40 °C to +125 °C |      | Unit |
|-----------------|-------------------|--------------------------------------------------------------------------|------------------|--------------------|------|-------------------|------|------|
|                 |                   |                                                                          | Min              | Typ <sup>[1]</sup> | Max  | Min               | Max  |      |
| t <sub>pd</sub> | propagation delay | CP to Q, $\bar{Q}$ ; see <a href="#">Figure 8</a> <sup>[2]</sup>         |                  |                    |      |                   |      |      |
|                 |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                                       | 1.5              | 6.0                | 13.4 | 1.5               | 13.4 | ns   |
|                 |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                                         | 1.0              | 3.5                | 7.1  | 1.0               | 7.1  | ns   |
|                 |                   | V <sub>CC</sub> = 2.7 V                                                  | 1.0              | 3.5                | 7.1  | 1.0               | 7.1  | ns   |
|                 |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                                         | 1.0              | 3.5                | 5.9  | 1.0               | 5.9  | ns   |
|                 |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                                         | 1.0              | 2.5                | 4.1  | 1.0               | 4.1  | ns   |
|                 |                   | $\bar{S}D$ to Q, $\bar{Q}$ ; see <a href="#">Figure 9</a> <sup>[2]</sup> |                  |                    |      |                   |      |      |
|                 |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                                       | 1.5              | 6.0                | 12.9 | 1.5               | 12.9 | ns   |
|                 |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                                         | 1.0              | 3.5                | 7.0  | 1.0               | 7.0  | ns   |
|                 |                   | V <sub>CC</sub> = 2.7 V                                                  | 1.0              | 3.5                | 7.0  | 1.0               | 7.0  | ns   |
|                 |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                                         | 1.0              | 3.0                | 5.9  | 1.0               | 5.9  | ns   |
|                 |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                                         | 1.0              | 2.5                | 4.1  | 1.0               | 4.1  | ns   |
|                 |                   | $\bar{R}D$ to Q, $\bar{Q}$ ; see <a href="#">Figure 9</a> <sup>[2]</sup> |                  |                    |      |                   |      |      |
|                 |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                                       | 1.5              | 5.0                | 12.9 | 1.5               | 12.9 | ns   |
|                 |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                                         | 1.0              | 3.5                | 7.0  | 1.0               | 7.0  | ns   |
|                 |                   | V <sub>CC</sub> = 2.7 V                                                  | 1.0              | 3.5                | 7.0  | 1.0               | 7.0  | ns   |
|                 |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                                         | 1.0              | 3.0                | 5.9  | 1.0               | 5.9  | ns   |
|                 |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                                         | 1.0              | 2.5                | 4.1  | 1.0               | 4.1  | ns   |
| t <sub>w</sub>  | pulse width       | CP HIGH or LOW;<br>see <a href="#">Figure 8</a>                          |                  |                    |      |                   |      |      |
|                 |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                                       | 6.2              | -                  | -    | 6.2               | -    | ns   |
|                 |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                                         | 2.7              | -                  | -    | 2.7               | -    | ns   |
|                 |                   | V <sub>CC</sub> = 2.7 V                                                  | 2.7              | -                  | -    | 2.7               | -    | ns   |
|                 |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                                         | 2.7              | 1.3                | -    | 2.7               | -    | ns   |
|                 |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                                         | 2.0              | -                  | -    | 2.0               | -    | ns   |
|                 |                   | $\bar{S}D$ and $\bar{R}D$ LOW;<br>see <a href="#">Figure 9</a>           |                  |                    |      |                   |      |      |
|                 |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                                       | 6.2              | -                  | -    | 6.2               | -    | ns   |
|                 |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                                         | 2.7              | -                  | -    | 2.7               | -    | ns   |
|                 |                   | V <sub>CC</sub> = 2.7 V                                                  | 2.7              | -                  | -    | 2.7               | -    | ns   |
|                 |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                                         | 2.7              | 1.6                | -    | 2.7               | -    | ns   |
|                 |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                                         | 2.0              | -                  | -    | 2.0               | -    | ns   |



**Table 9. Dynamic characteristics ...continued**Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 10](#).

| Symbol           | Parameter                     | Conditions                                                           | –40 °C to +85 °C |                    |     | –40 °C to +125 °C |     | Unit |
|------------------|-------------------------------|----------------------------------------------------------------------|------------------|--------------------|-----|-------------------|-----|------|
|                  |                               |                                                                      | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |      |
| t <sub>rec</sub> | recovery time                 | SD or RD; see <a href="#">Figure 9</a>                               |                  |                    |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                                   | 1.9              | -                  | -   | 1.9               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                                     | 1.4              | -                  | -   | 1.4               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V                                              | 1.3              | -                  | -   | 1.3               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                                     | +1.2             | –3.0               | -   | +1.2              | -   | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V to 5.5 V                                     | 1.0              | -                  | -   | 1.0               | -   | ns   |
| t <sub>su</sub>  | set-up time                   | D to CP; see <a href="#">Figure 8</a>                                |                  |                    |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                                   | 2.9              | -                  | -   | 2.9               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                                     | 1.7              | -                  | -   | 1.7               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V                                              | 1.7              | -                  | -   | 1.7               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                                     | 1.3              | 0.5                | -   | 1.3               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V to 5.5 V                                     | 1.1              | -                  | -   | 1.1               | -   | ns   |
| t <sub>h</sub>   | hold time                     | D to CP; see <a href="#">Figure 8</a>                                |                  |                    |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                                   | 1.5              | -                  | -   | 1.5               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                                     | 1.0              | -                  | -   | 1.0               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V                                              | 1.0              | -                  | -   | 1.0               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                                     | 1.0              | 0.6                | -   | 1.0               | -   | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V to 5.5 V                                     | 1.0              | -                  | -   | 1.0               | -   | ns   |
| f <sub>max</sub> | maximum frequency             | CP; see <a href="#">Figure 8</a>                                     |                  |                    |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 1.65 V to 1.95 V                                   | 80               | -                  | -   | 80                | -   | MHz  |
|                  |                               | V <sub>CC</sub> = 2.3 V to 2.7 V                                     | 175              | -                  | -   | 175               | -   | MHz  |
|                  |                               | V <sub>CC</sub> = 2.7 V                                              | 175              | -                  | -   | 175               | -   | MHz  |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V                                     | 175              | 280                | -   | 175               | -   | MHz  |
|                  |                               | V <sub>CC</sub> = 4.5 V to 5.5 V                                     | 200              | -                  | -   | 200               | -   | MHz  |
| C <sub>PD</sub>  | power dissipation capacitance | V <sub>I</sub> = GND to V <sub>CC</sub> ;<br>V <sub>CC</sub> = 3.3 V | <sup>[3]</sup>   | -                  | 15  | -                 | -   | pF   |

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.8 V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively.[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). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$  where:f<sub>i</sub> = input frequency in MHz;f<sub>o</sub> = output frequency in MHz;C<sub>L</sub> = output load capacitance in pF;V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

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

12. Waveforms

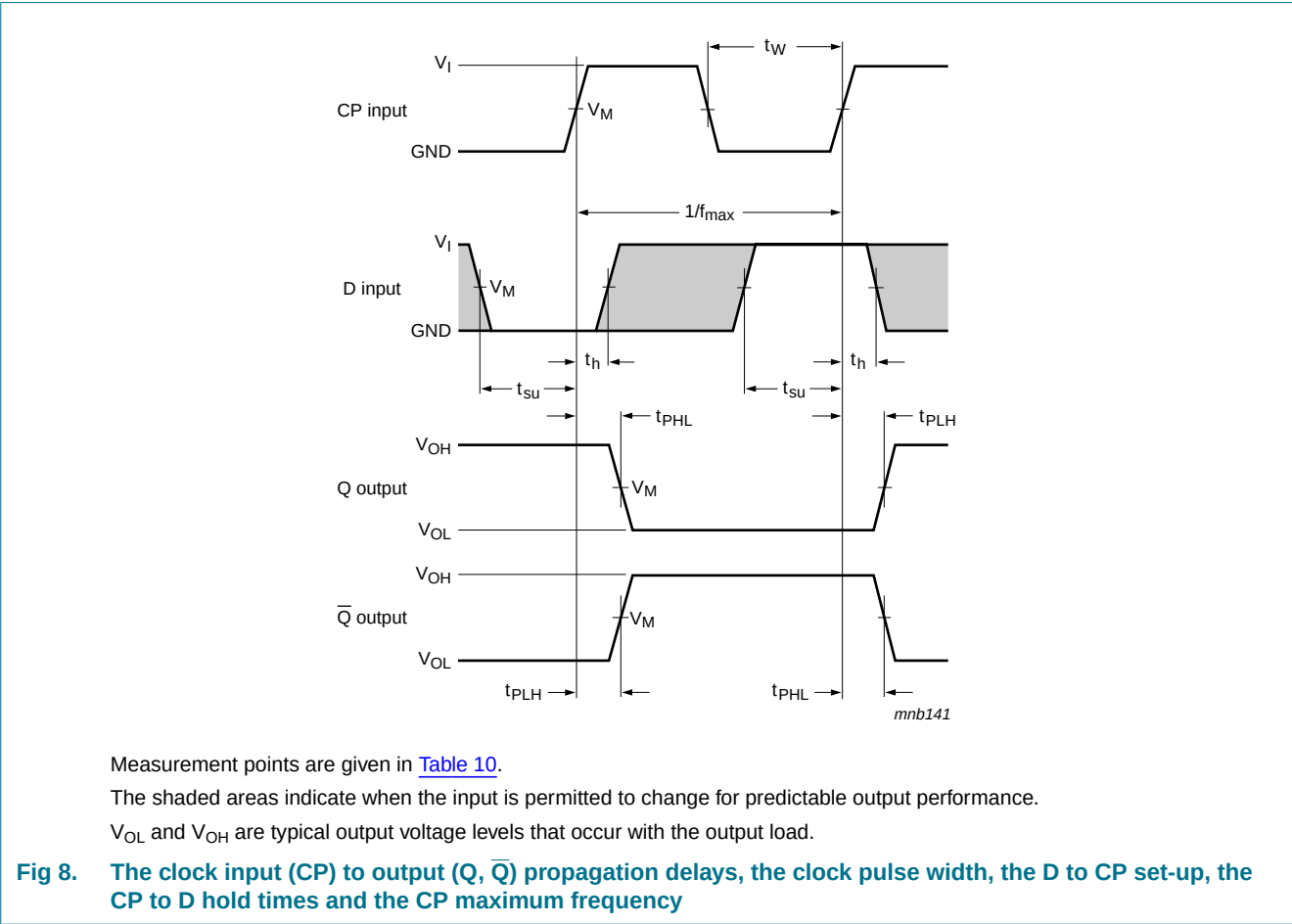
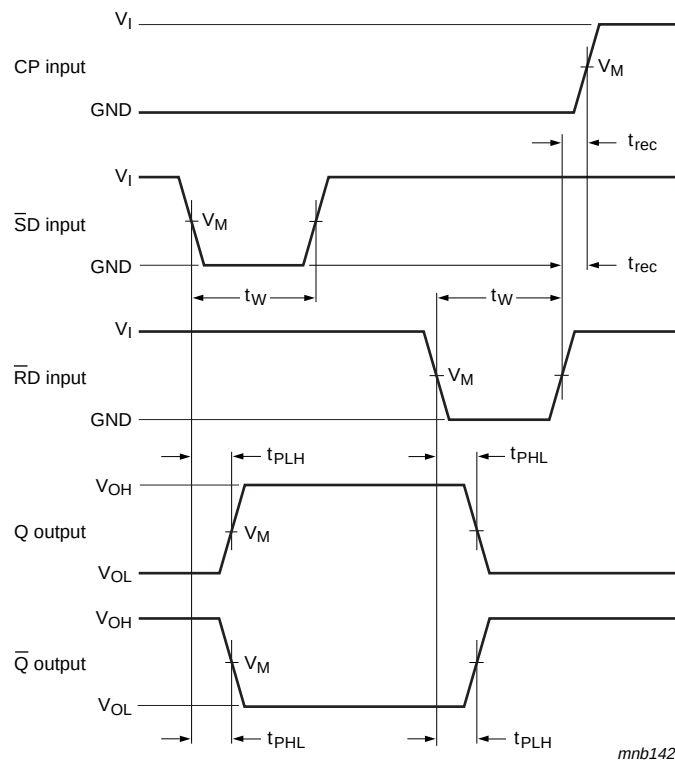


Table 10. Measurement points

| Supply voltage   | Input               | Output              |
|------------------|---------------------|---------------------|
| $V_{CC}$         | $V_M$               | $V_M$               |
| 1.65 V to 1.95 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 2.3 V to 2.7 V   | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 2.7 V            | 1.5 V               | 1.5 V               |
| 3.0 V to 3.6 V   | 1.5 V               | 1.5 V               |
| 4.5 V to 5.5 V   | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |

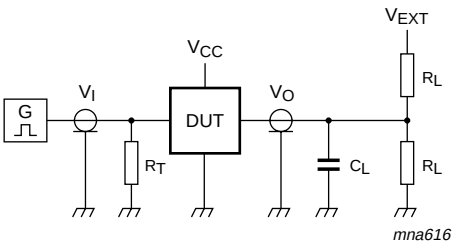
Single D-type flip-flop with set and reset; positive edge trigger



Measurement points are given in [Table 10](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig 9.** The set ( $\overline{SD}$ ) and reset ( $\overline{RD}$ ) input to output ( $Q$ ,  $\overline{Q}$ ) propagation delays, the set and reset pulse widths and the  $\overline{RD}$  to CP recovery time

Single D-type flip-flop with set and reset; positive edge trigger



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 10. Test circuit for measuring switching times

Table 11. Test data

| Supply voltage   | Input    |               | Load  |              | $V_{EXT}$          |                    |                    |
|------------------|----------|---------------|-------|--------------|--------------------|--------------------|--------------------|
| $V_{CC}$         | $V_i$    | $t_r, t_f$    | $C_L$ | $R_L$        | $t_{PLH}, t_{PHL}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ |
| 1.65 V to 1.95 V | $V_{CC}$ | $\leq 2.0$ ns | 30 pF | 1 k $\Omega$ | open               | GND                | $2V_{CC}$          |
| 2.3 V to 2.7 V   | $V_{CC}$ | $\leq 2.0$ ns | 30 pF | 500 $\Omega$ | open               | GND                | $2V_{CC}$          |
| 2.7 V            | 2.7 V    | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | GND                | 6 V                |
| 3.0 V to 3.6 V   | 2.7 V    | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | GND                | 6 V                |
| 4.5 V to 5.5 V   | $V_{CC}$ | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | GND                | $2V_{CC}$          |

13. Package outline

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

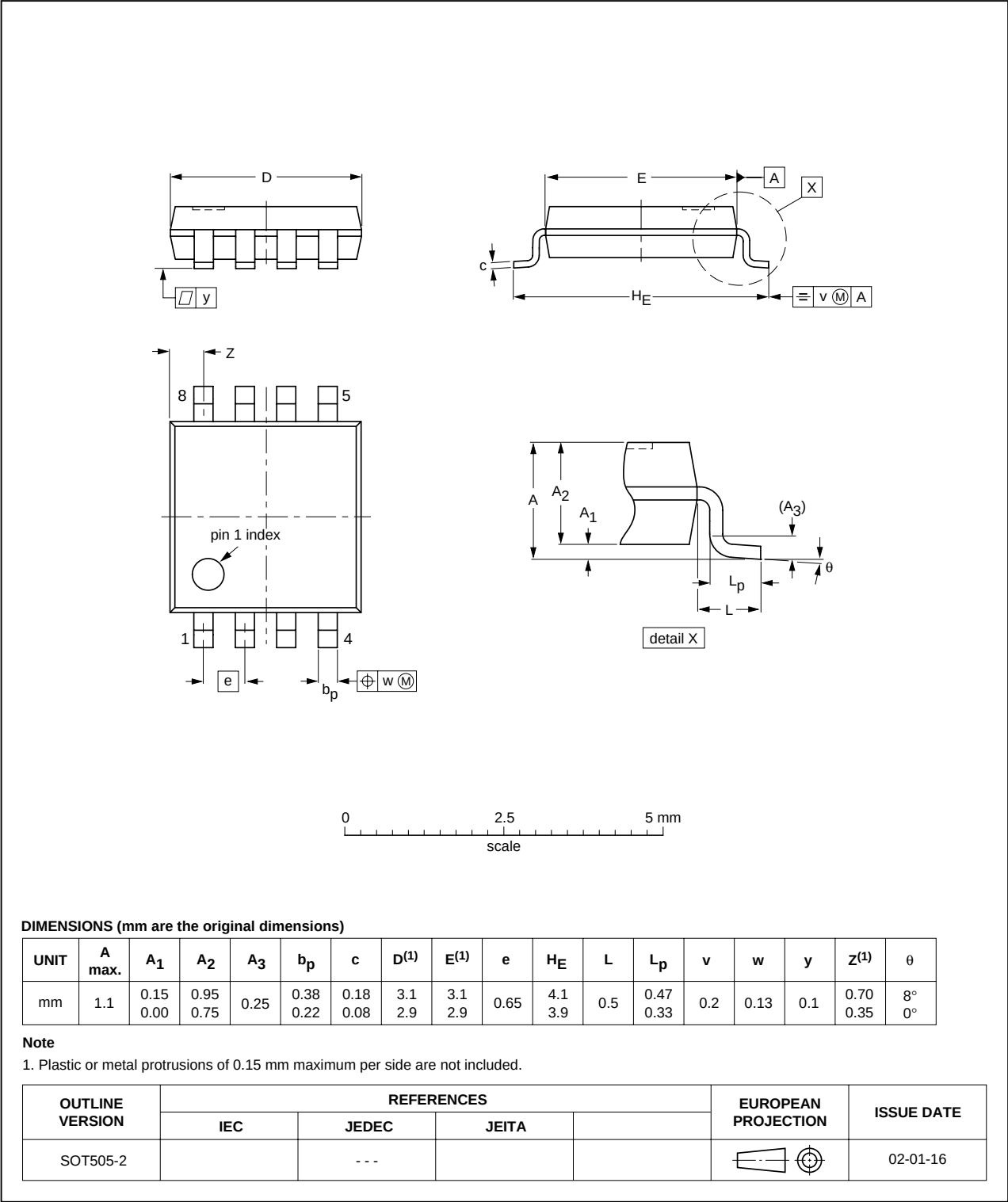


Fig 11. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

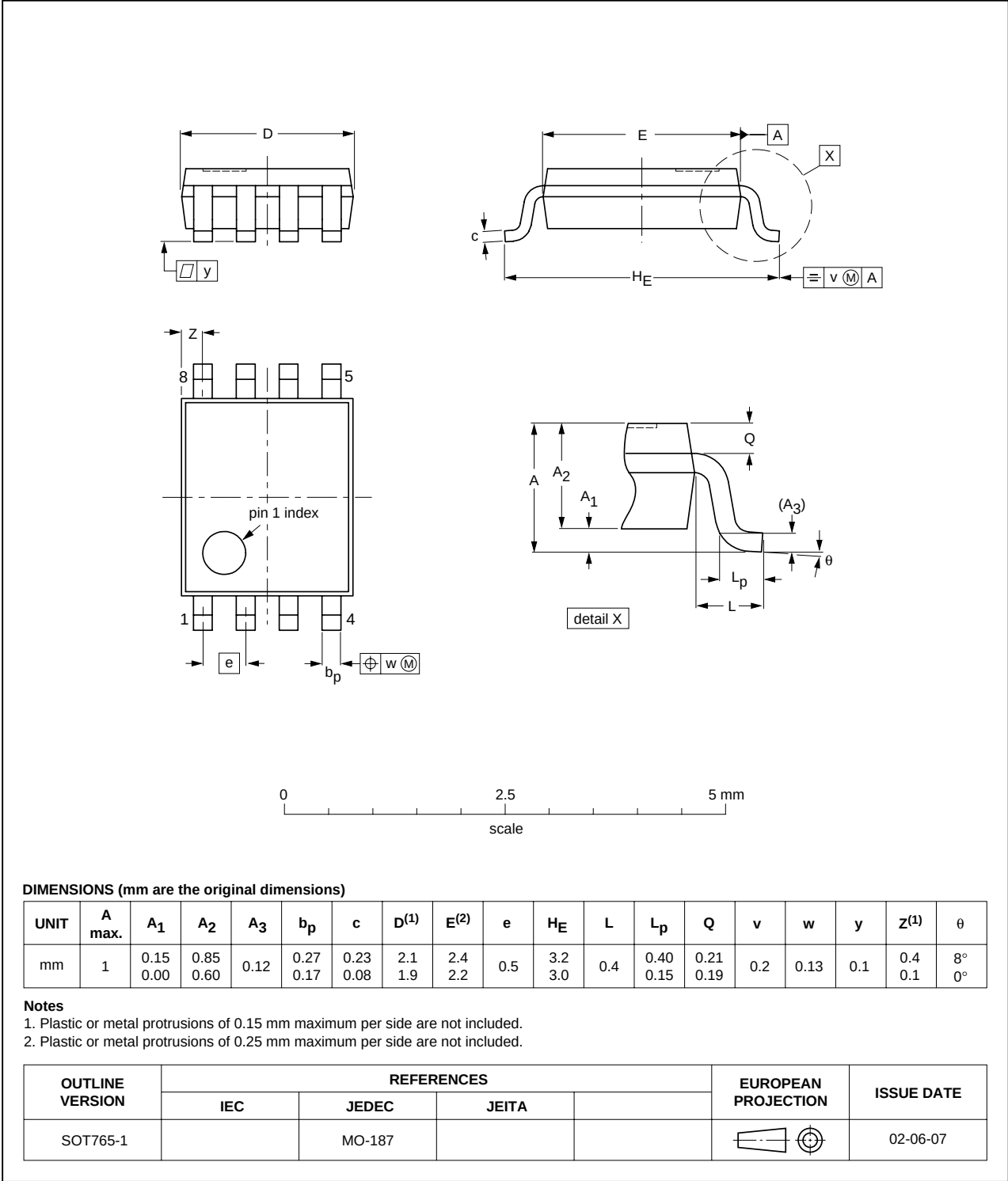


Fig 12. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

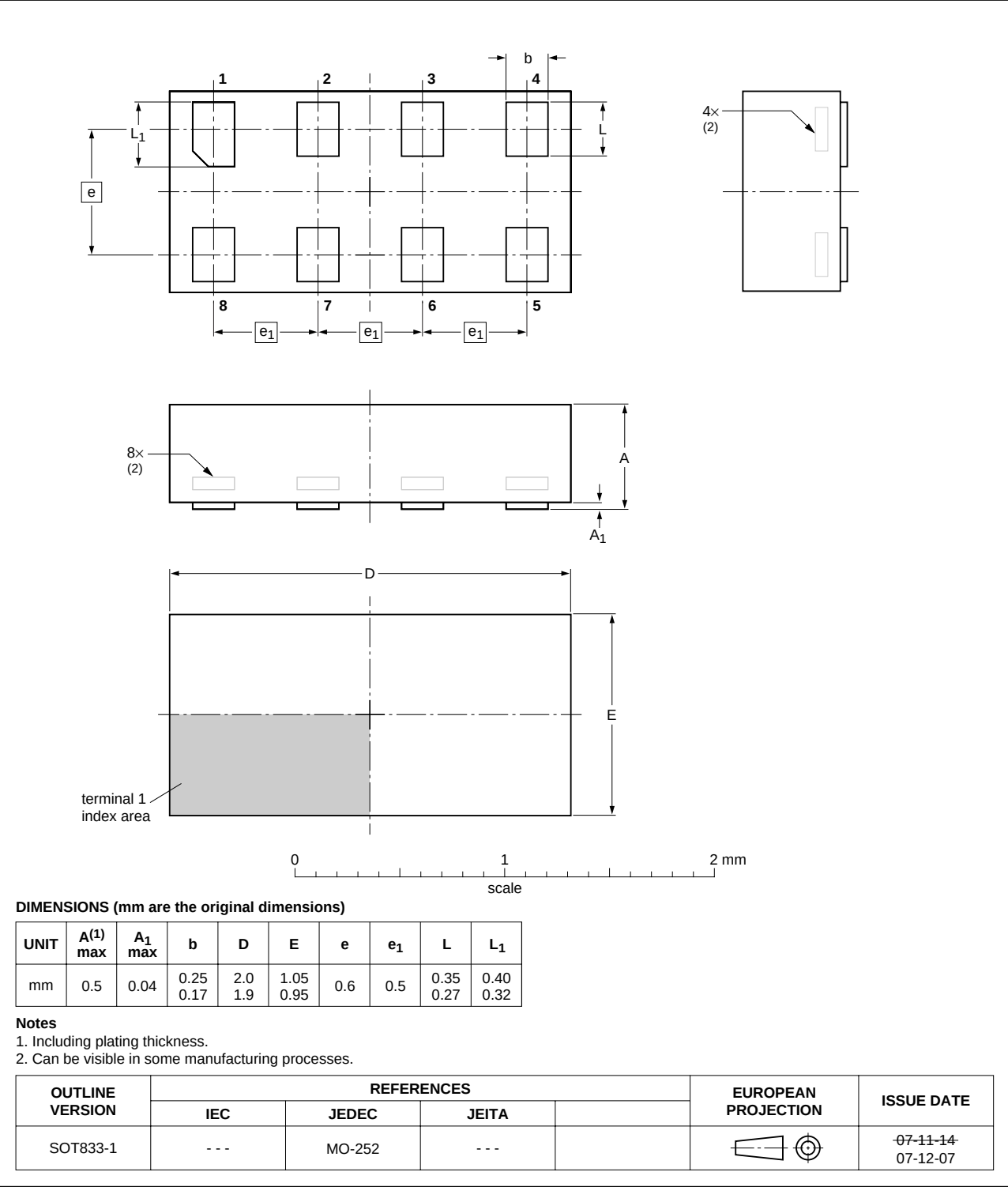


Fig 13. Package outline SOT833-1 (XSON8)

Single D-type flip-flop with set and reset; positive edge trigger

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

SOT1089

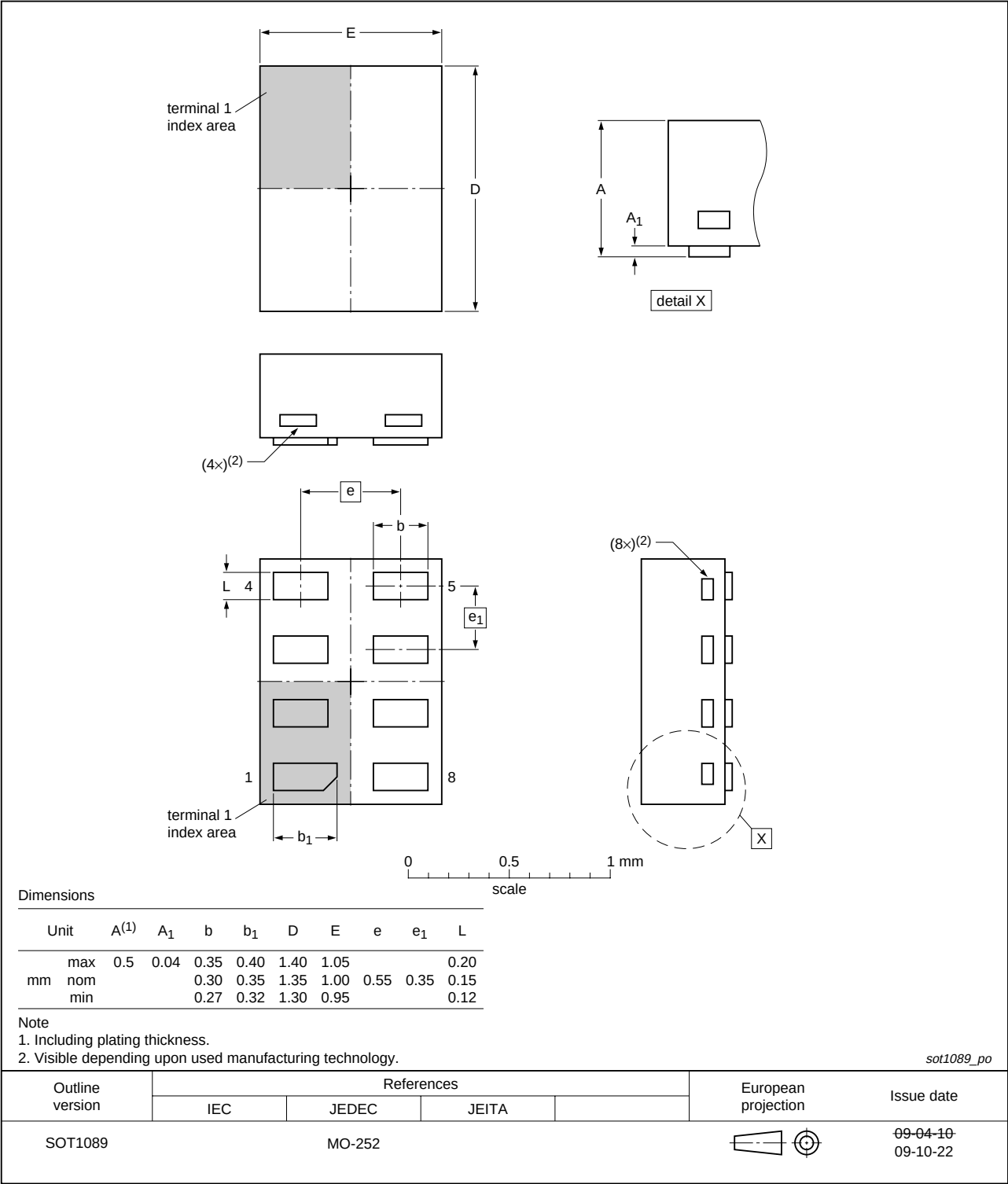


Fig 14. Package outline SOT1089 (XSON8)



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

SOT996-2

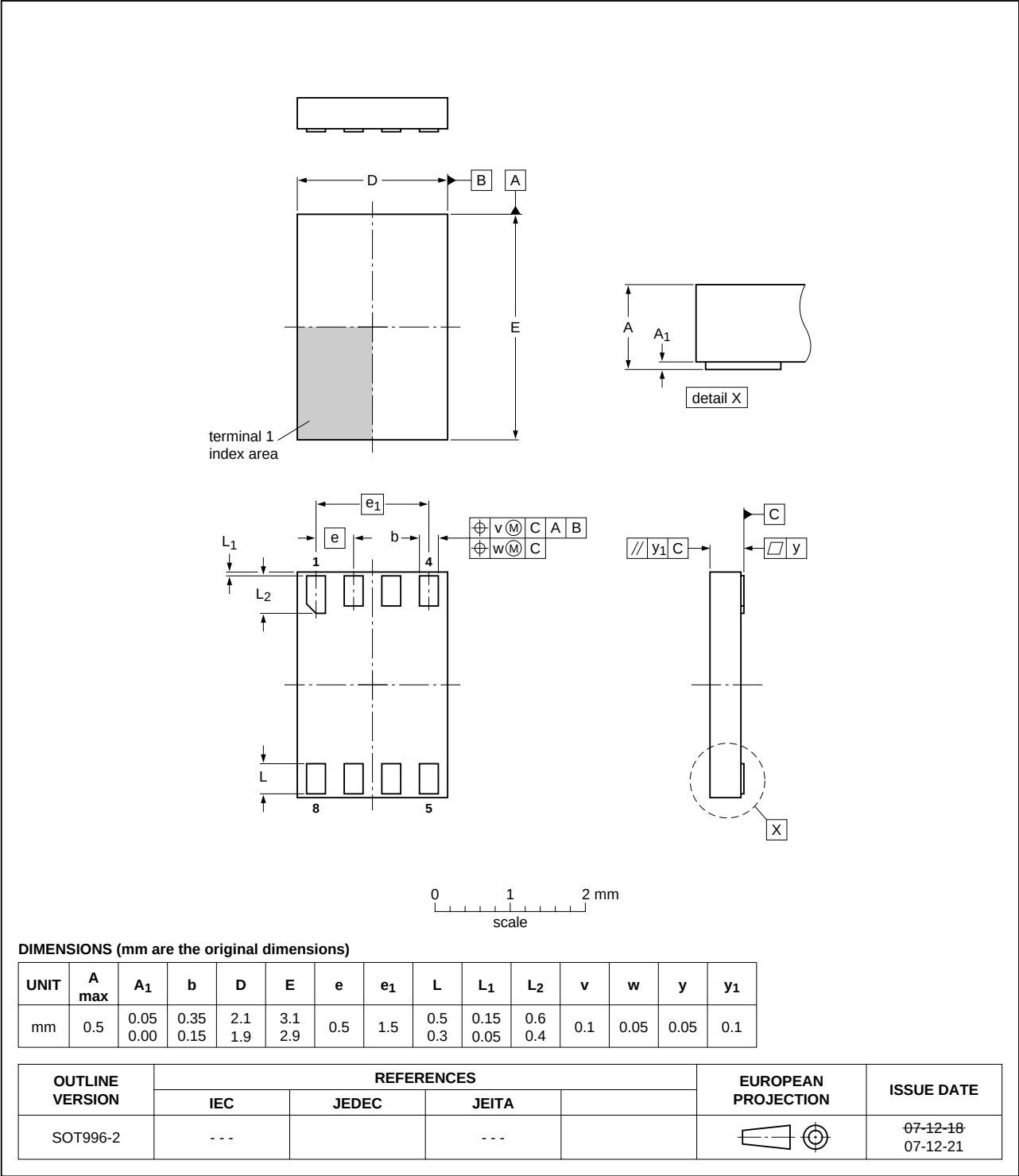


Fig 15. Package outline SOT996-2 (XSON8U)

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

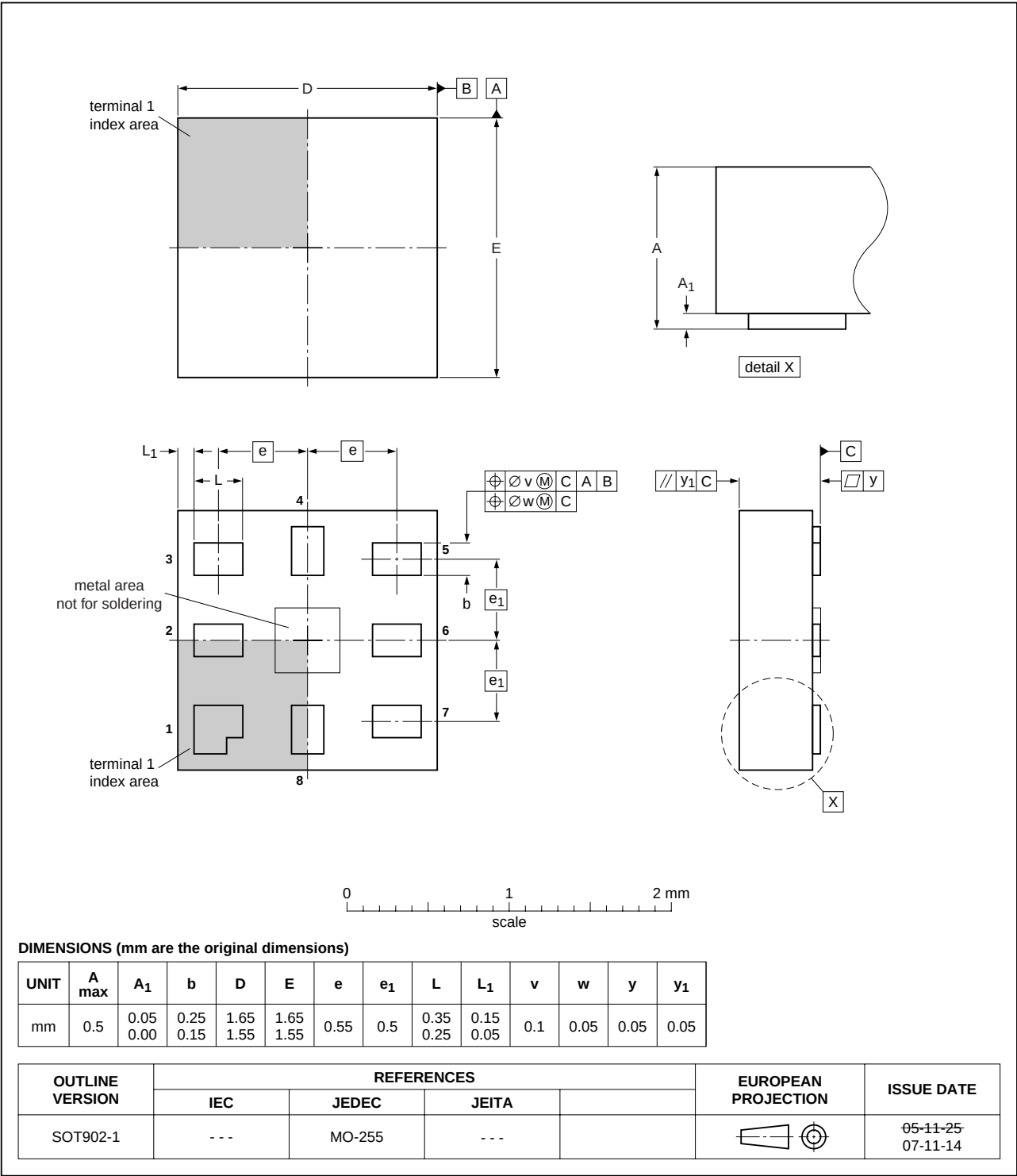


Fig 16. Package outline SOT902-1 (XQFN8U)

## 14. Abbreviations

Table 12. Abbreviations

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

## 15. Revision history

Table 13. Revision history

| Document ID    | Release date                                    | Data sheet status  | Change notice | Supersedes  |
|----------------|-------------------------------------------------|--------------------|---------------|-------------|
| 74LVC2G74_6    | 20091223                                        | Product data sheet | -             | 74LVC2G74_5 |
| Modifications: | • Added type number 74LVC2G74GF (XSON8 package) |                    |               |             |
| 74LVC2G74_5    | 20080630                                        | Product data sheet | -             | 74LVC2G74_4 |
| 74LVC2G74_4    | 20080207                                        | Product data sheet | -             | 74LVC2G74_3 |
| 74LVC2G74_3    | 20070809                                        | Product data sheet | -             | 74LVC2G74_2 |
| 74LVC2G74_2    | 20061214                                        | Product data sheet | -             | 74LVC2G74_1 |
| 74LVC2G74_1    | 20051103                                        | Product data sheet | -             | -           |

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### 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".

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