

# 74HC75

## Quad bistable transparent latch

Rev. 4 — 24 February 2016

Product data sheet

### 1. General description

The 74HC75 is a quad bistable transparent latch with complementary outputs. Two latches are simultaneously controlled by one of two active HIGH enable inputs (LE12 and LE34). When LEnn is HIGH, the data enters the latches and appears at the nQ outputs. The nQ outputs follow the data inputs (nD) as long as LEnn is HIGH (transparent). The data on the nD inputs one set-up time prior to the HIGH-to-LOW transition of the LEnn will be stored in the latches. The latched outputs remain stable as long as the LEnn is LOW. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

### 2. Features and benefits

- Complementary Q and  $\bar{Q}$  outputs
- $V_{CC}$  and GND on the center pins
- Low-power dissipation
- Complies with JEDEC standard no. 7A
- Input levels:
  - ◆ For 74HC75: CMOS level
- ESD protection:
  - ◆ HBM EIA/JESD22-A114F exceeds 2000 V
  - ◆ MM EIA/JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+80\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$ .

### 3. Ordering information

Table 1. Ordering information

| Type number | Package   |         |  |          |
|-------------|---|---------|--|----------|
|             | Temperature range   | Name    | Description  | Version  |
| 74HC75D     | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SO16    | plastic small outline package; 16 leads; body width 3.9 mm             | SOT109-1 |
| 74HC75DB    | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SSOP16  | plastic shrink small outline package; 16 leads; body width 5.3 mm      | SOT338-1 |
| 74HC75PW    | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |

### 4. Functional diagram

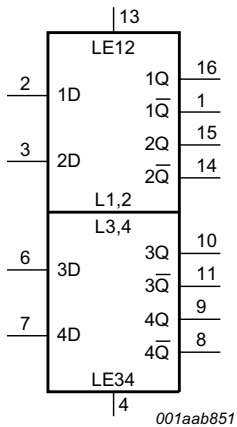


Fig 1. Logic symbol

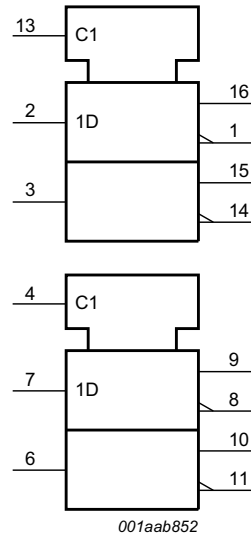


Fig 2. IEC logic symbol

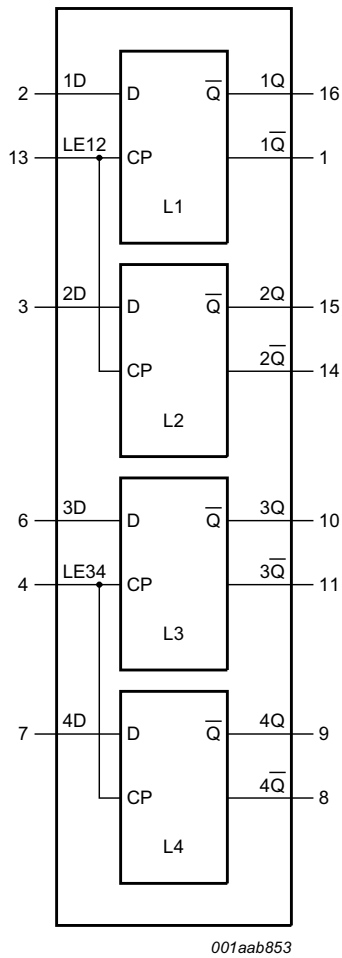


Fig 3. Functional diagram

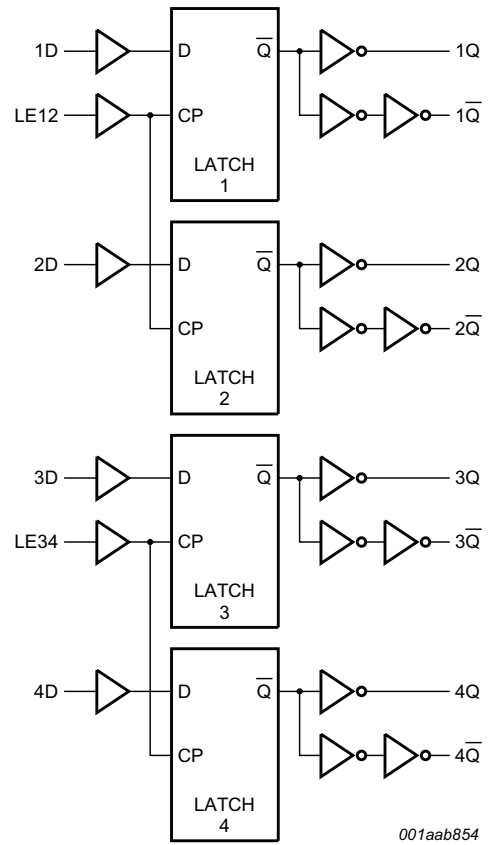


Fig 4. Logic diagram

## 5. Pinning information

### 5.1 Pinning

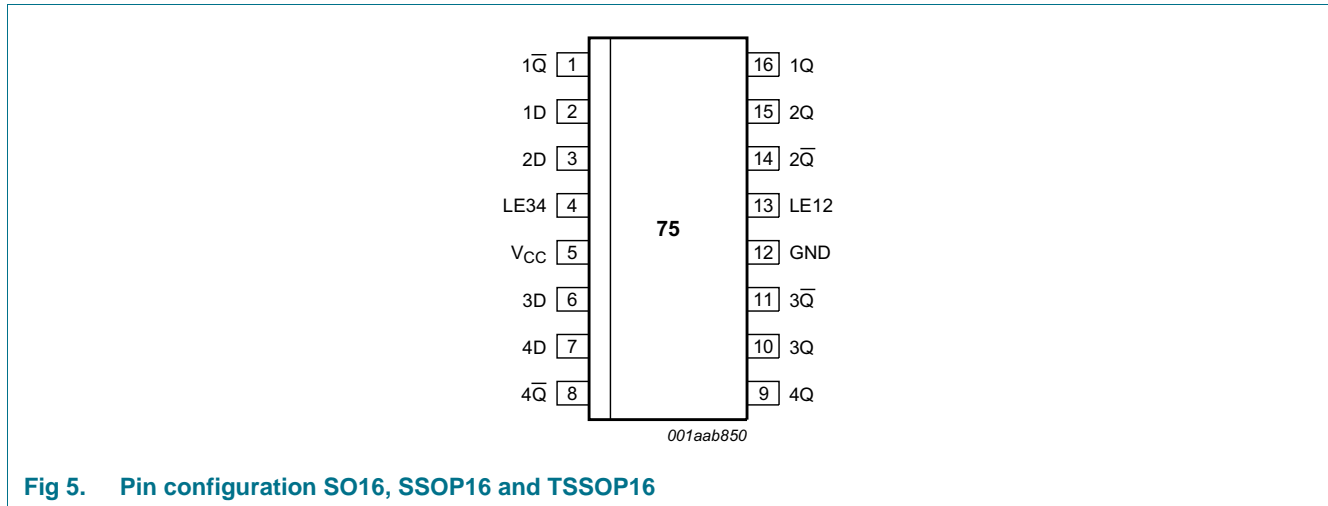


Fig 5. Pin configuration SO16, SSOP16 and TSSOP16

### 5.2 Pin description

Table 2. Pin description

| Symbol  | Pin           | Description  |
|---|---------------|--|
| 1 $\bar{Q}$ , 2 $\bar{Q}$ , 3 $\bar{Q}$ , 4 $\bar{Q}$ | 1, 14, 11, 8  | complementary latch output                           |
| 1D, 2D, 3D, 4D  | 2, 3, 6, 7    | data input   |
| LE34  | 4             | latch enable input for latches 3 and 4 (active HIGH) |
| V <sub>CC</sub>                                       | 5             | positive supply voltage                              |
| GND   | 12            | ground (0 V)   |
| LE12  | 13            | latch enable input for latches 1 and 2 (active HIGH) |
| 1Q, 2Q, 3Q, 4Q  | 16, 15, 10, 9 | latch output   |

## 6. Functional description

### 6.1 Function table

Table 3. Function table<sup>[1]</sup>

| Operating mode | Input            |    | Output |             |
|----------------|------------------|----|--------|-------------|
|                | LE <sub>nn</sub> | nD | nQ     | n $\bar{Q}$ |
| Data enabled   | H                | L  | L      | H           |
|                | H                | H  | H      | L           |
| Data latched   | L                | X  | q      | $\bar{q}$   |

- [1] H = HIGH voltage level;  
 L = LOW voltage level;  
 q = lower case letters indicate the state of the referenced output one set-up time prior to the HIGH-to-LOW LE<sub>nn</sub> transition;  
 X = don't care.

## 7. Limiting values

**Table 4. 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 | +7.0     | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ [1] | -    | $\pm 20$ | mA   |
| $I_{OK}$  | output clamping current | $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ [1] | -    | $\pm 20$ | mA   |
| $I_O$     | output current          | $V_O = -0.5\text{ V}$ to $V_{CC} + 0.5\text{ V}$           | -    | $\pm 25$ | 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 | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$              |      |          |      |
|           |                         | SO16 package [2]   | -    | 500      | mW   |
|           |                         | (T)SSOP16 package [3]                                      | -    | 500      | mW   |

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

[2]  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.

[3]  $P_{tot}$  derates linearly with 5.5 mW/K above 60 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol              | Parameter                           | Conditions              | Min | Typ  | Max      | Unit |
|---------------------|-------------------------------------|-------------------------|-----|------|----------|------|
| $V_{CC}$            | supply voltage                      |                         | 2.0 | 5.0  | 6.0      | V    |
| $V_I$               | input voltage                       |                         | 0   | -    | $V_{CC}$ | V    |
| $V_O$               | output voltage                      |                         | 0   | -    | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |                         | -40 | -    | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.0\text{ V}$ | -   | -    | 625      | ns/V |
|                     |                                     | $V_{CC} = 4.5\text{ V}$ | -   | 1.67 | 139      | ns/V |
|                     |                                     | $V_{CC} = 6.0\text{ V}$ | -   | -    | 83       | ns/V |

## 9. Static characteristics

**Table 6. Static characteristics**

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

| Symbol                                     | Parameter                | Conditions              | Min  | Typ | Max  | Unit |
|--|--------------------------|-------------------------|------|-----|------|------|
| <b><math>T_{amb} = 25\text{ °C}</math></b> |                          |                         |      |     |      |      |
| $V_{IH}$                                   | HIGH-level input voltage | $V_{CC} = 2.0\text{ V}$ | 1.5  | 1.2 | -    | V    |
|  |                          | $V_{CC} = 4.5\text{ V}$ | 3.15 | 2.4 | -    | V    |
|  |                          | $V_{CC} = 6.0\text{ V}$ | 4.2  | 3.2 | -    | V    |
| $V_{IL}$                                   | LOW-level input voltage  | $V_{CC} = 2.0\text{ V}$ | -    | 0.8 | 0.5  | V    |
|  |                          | $V_{CC} = 4.5\text{ V}$ | -    | 2.1 | 1.35 | V    |
|  |                          | $V_{CC} = 6.0\text{ V}$ | -    | 2.8 | 1.8  | V    |

**Table 6. Static characteristics ...continued**

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

| Symbol                                    | Parameter                 | Conditions  | Min  | Typ  | Max  | Unit |
|---|---------------------------|---|------|------|------|------|
| 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> = 2.0 V  | 1.9  | 2.0  | -    | V    |
|   |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V  | 4.4  | 4.5  | -    | V    |
|   |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V  | 5.9  | 6.0  | -    | V    |
|   |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 4.5 V   | 3.98 | 4.32 | -    | V    |
|   |                           | I <sub>O</sub> = -5.2 mA; V <sub>CC</sub> = 6.0 V   | 5.48 | 5.81 | -    | 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> = 2.0 V   | -    | 0    | 0.1  | V    |
|   |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V   | -    | 0    | 0.1  | V    |
|   |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V   | -    | 0    | 0.1  | V    |
|   |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 4.5 V  | -    | 0.15 | 0.26 | V    |
|   |                           | I <sub>O</sub> = 5.2 mA; V <sub>CC</sub> = 6.0 V  | -    | 0.16 | 0.26 | V    |
| I <sub>I</sub>                            | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V                          | -    | -    | ±0.1 | 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> = 6.0 V | -    | -    | 8.0  | μA   |
| C <sub>I</sub>                            | input capacitance         |   | -    | 3.5  | -    | pF   |
| <b>T<sub>amb</sub> = -40 °C to +85 °C</b> |                           |   |      |      |      |      |
| V <sub>IH</sub>                           | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V   | 1.5  | -    | -    | V    |
|   |                           | V <sub>CC</sub> = 4.5 V   | 3.15 | -    | -    | V    |
|   |                           | V <sub>CC</sub> = 6.0 V   | 4.2  | -    | -    | V    |
| V <sub>IL</sub>                           | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V   | -    | -    | 0.5  | V    |
|   |                           | V <sub>CC</sub> = 4.5 V   | -    | -    | 1.35 | V    |
|   |                           | V <sub>CC</sub> = 6.0 V   | -    | -    | 1.8  | 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> = 2.0 V  | 1.9  | -    | -    | V    |
|   |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V  | 4.4  | -    | -    | V    |
|   |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V  | 5.9  | -    | -    | V    |
|   |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 4.5 V   | 3.84 | -    | -    | V    |
|   |                           | I <sub>O</sub> = -5.2 mA; V <sub>CC</sub> = 6.0 V   | 5.34 | -    | -    | 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> = 2.0 V   | -    | -    | 0.1  | V    |
|   |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V   | -    | -    | 0.1  | V    |
|   |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V   | -    | -    | 0.1  | V    |
|   |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 4.5 V  | -    | -    | 0.33 | V    |
|   |                           | I <sub>O</sub> = 5.2 mA; V <sub>CC</sub> = 6.0 V  | -    | -    | 0.33 | V    |
| I <sub>I</sub>                            | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V                          | -    | -    | ±1.0 | 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> = 6.0 V | -    | -    | 80   | μA   |

**Table 6. 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> = 2.0 V  | 1.5  | -   | -    | V    |
|  |                           | V <sub>CC</sub> = 4.5 V  | 3.15 | -   | -    | V    |
|  |                           | V <sub>CC</sub> = 6.0 V  | 4.2  | -   | -    | V    |
| V <sub>IL</sub>                            | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V  | -    | -   | 0.5  | V    |
|  |                           | V <sub>CC</sub> = 4.5 V  | -    | -   | 1.35 | V    |
|  |                           | V <sub>CC</sub> = 6.0 V  | -    | -   | 1.8  | 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> = 2.0 V                                       | 1.9  | -   | -    | V    |
|  |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V                                       | 4.4  | -   | -    | V    |
|  |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V                                       | 5.9  | -   | -    | V    |
|  |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 4.5 V  | 3.7  | -   | -    | 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> = 2.0 V  | -    | -   | 0.1  | V    |
|  |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V  | -    | -   | 0.1  | V    |
|  |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V  | -    | -   | 0.1  | V    |
|  |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 4.5 V   | -    | -   | 0.4  | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V                       | -    | -   | ±1.0 | μA   |
|  |                           | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V | -    | -   | 160  | μA   |

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; unless otherwise specified, see [Figure 10](#).

| Symbol                   | Parameter                                      | Conditions   | Min | Typ | Max | Unit |  |
|--------------------------|--|--|-----|-----|-----|------|--|
| $T_{amb} = 25\text{ °C}$ |  |  |     |     |     |      |  |
| $t_{PHL}$ , $t_{PLH}$    | propagation delay<br>nD to nQ                  | see <a href="#">Figure 6</a>                       |     |     |     |      |  |
|                          |  | $V_{CC} = 2.0\text{ V}$                            | -   | 33  | 110 | ns   |  |
|                          |  | $V_{CC} = 4.5\text{ V}$                            | -   | 12  | 22  | ns   |  |
|                          |  | $V_{CC} = 6.0\text{ V}$                            | -   | 10  | 19  | ns   |  |
|                          |  | $V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$     | -   | 11  | -   | ns   |  |
|                          | propagation delay<br>nD to nQ̄                 | see <a href="#">Figure 7</a>                       |     |     |     |      |  |
|                          |  | $V_{CC} = 2.0\text{ V}$                            | -   | 39  | 120 | ns   |  |
|                          |  | $V_{CC} = 4.5\text{ V}$                            | -   | 14  | 24  | ns   |  |
|                          |  | $V_{CC} = 6.0\text{ V}$                            | -   | 11  | 20  | ns   |  |
|                          |  | $V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$     | -   | 11  | -   | ns   |  |
|                          | propagation delay<br>LEnn to nQ                | see <a href="#">Figure 9</a>                       |     |     |     |      |  |
|                          |  | $V_{CC} = 2.0\text{ V}$                            | -   | 33  | 120 | ns   |  |
|                          |  | $V_{CC} = 4.5\text{ V}$                            | -   | 12  | 24  | ns   |  |
|                          |  | $V_{CC} = 6.0\text{ V}$                            | -   | 10  | 20  | ns   |  |
|                          |  | $V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$     | -   | 11  | -   | ns   |  |
|                          | propagation delay<br>LEnn to nQ̄               | see <a href="#">Figure 9</a>                       |     |     |     |      |  |
| $V_{CC} = 2.0\text{ V}$  |  | -  | 39  | 125 | ns  |      |  |
| $V_{CC} = 4.5\text{ V}$  |  | -  | 14  | 25  | ns  |      |  |
| $V_{CC} = 6.0\text{ V}$  |  | -  | 11  | 21  | ns  |      |  |
|                          | $V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$ | -  | 11  | -   | ns  |      |  |
| $t_{THL}$ , $t_{TLH}$    | output transition time                         | see <a href="#">Figure 6</a> and <a href="#">7</a> |     |     |     |      |  |
|                          |  | $V_{CC} = 2.0\text{ V}$                            | -   | 19  | 75  | ns   |  |
|                          |  | $V_{CC} = 4.5\text{ V}$                            | -   | 7   | 15  | ns   |  |
|                          |  | $V_{CC} = 6.0\text{ V}$                            | -   | 6   | 13  | ns   |  |
| $t_w$                    | enable pulse width<br>HIGH                     | see <a href="#">Figure 9</a>                       |     |     |     |      |  |
|                          |  | $V_{CC} = 2.0\text{ V}$                            | 80  | 17  | -   | ns   |  |
|                          |  | $V_{CC} = 4.5\text{ V}$                            | 16  | 6   | -   | ns   |  |
|                          |  | $V_{CC} = 6.0\text{ V}$                            | 14  | 5   | -   | ns   |  |
| $t_{su}$                 | set-up time nD to<br>LEnn                      | see <a href="#">Figure 8</a>                       |     |     |     |      |  |
|                          |  | $V_{CC} = 2.0\text{ V}$                            | 60  | 14  | -   | ns   |  |
|                          |  | $V_{CC} = 4.5\text{ V}$                            | 12  | 5   | -   | ns   |  |
|                          |  | $V_{CC} = 6.0\text{ V}$                            | 10  | 4   | -   | ns   |  |
| $t_h$                    | hold time nD to LEnn                           | see <a href="#">Figure 8</a>                       |     |     |     |      |  |
|                          |  | $V_{CC} = 2.0\text{ V}$                            | 3   | -8  | -   | ns   |  |
|                          |  | $V_{CC} = 4.5\text{ V}$                            | 3   | -3  | -   | ns   |  |
|                          |  | $V_{CC} = 6.0\text{ V}$                            | 3   | -2  | -   | ns   |  |



**Table 7. Dynamic characteristics ...continued**GND = 0 V;  $t_r = t_f = 6$  ns;  $C_L = 50$  pF; unless otherwise specified, see [Figure 10](#).

| Symbol  | Parameter                               | Conditions   | Min | Typ | Max | Unit |  |
|---|---|--|-----|-----|-----|------|--|
| $C_{PD}$  | power dissipation capacitance per latch | $V_I = \text{GND to } V_{CC}$ <a href="#">[1]</a>  | -   | 42  | -   | pF   |  |
| <b><math>T_{amb} = -40</math> °C to <math>+85</math> °C</b> |   |  |     |     |     |      |  |
| $t_{PHL}, t_{PLH}$  | propagation delay nD to nQ              | see <a href="#">Figure 6</a>                       |     |     |     |      |  |
|   |   | $V_{CC} = 2.0$ V                                   | -   | -   | 140 | ns   |  |
|   |   | $V_{CC} = 4.5$ V                                   | -   | -   | 28  | ns   |  |
|   | propagation delay nD to nQ              | see <a href="#">Figure 7</a>                       |     |     |     |      |  |
|   |   | $V_{CC} = 2.0$ V                                   | -   | -   | 150 | ns   |  |
|   |   | $V_{CC} = 4.5$ V                                   | -   | -   | 30  | ns   |  |
|   | propagation delay LEnn to nQ            | see <a href="#">Figure 9</a>                       |     |     |     |      |  |
|   |   | $V_{CC} = 2.0$ V                                   | -   | -   | 150 | ns   |  |
|   |   | $V_{CC} = 4.5$ V                                   | -   | -   | 30  | ns   |  |
|   | propagation delay LEnn to nQ            | see <a href="#">Figure 9</a>                       |     |     |     |      |  |
|   |   | $V_{CC} = 2.0$ V                                   | -   | -   | 155 | ns   |  |
|   |   | $V_{CC} = 4.5$ V                                   | -   | -   | 31  | ns   |  |
| $t_{THL}, t_{TLH}$  | output transition time                  | see <a href="#">Figure 6</a> and <a href="#">7</a> |     |     |     |      |  |
|   |   | $V_{CC} = 2.0$ V                                   | -   | -   | 95  | ns   |  |
|   |   | $V_{CC} = 4.5$ V                                   | -   | -   | 19  | ns   |  |
|   |   | $V_{CC} = 6.0$ V                                   | -   | -   | 16  | ns   |  |
| $t_W$   | enable pulse width HIGH                 | see <a href="#">Figure 9</a>                       |     |     |     |      |  |
|   |   | $V_{CC} = 2.0$ V                                   | 100 | -   | -   | ns   |  |
|   |   | $V_{CC} = 4.5$ V                                   | 20  | -   | -   | ns   |  |
|   |   | $V_{CC} = 6.0$ V                                   | 17  | -   | -   | ns   |  |
| $t_{su}$  | set-up time nD to LEnn                  | see <a href="#">Figure 8</a>                       |     |     |     |      |  |
|   |   | $V_{CC} = 2.0$ V                                   | 75  | -   | -   | ns   |  |
|   |   | $V_{CC} = 4.5$ V                                   | 15  | -   | -   | ns   |  |
|   |   | $V_{CC} = 6.0$ V                                   | 13  | -   | -   | ns   |  |
| $t_h$   | hold time nD to LEnn                    | see <a href="#">Figure 8</a>                       |     |     |     |      |  |
|   |   | $V_{CC} = 2.0$ V                                   | 3   | -   | -   | ns   |  |
|   |   | $V_{CC} = 4.5$ V                                   | 3   | -   | -   | ns   |  |
|   |   | $V_{CC} = 6.0$ V                                   | 3   | -   | -   | ns   |  |

**Table 7. Dynamic characteristics ...continued**

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; unless otherwise specified, see [Figure 10](#).

| Symbol   | Parameter   | Conditions                         | Min | Typ | Max | Unit |  |
|--|---|------------------------------------|-----|-----|-----|------|--|
| <b><math>T_{\text{amb}} = -40\text{ °C to }+125\text{ °C}</math></b> |   |                                    |     |     |     |      |  |
| $t_{\text{PHL}}, t_{\text{PLH}}$                                     | propagation delay<br>nD to nQ                     | see <a href="#">Figure 6</a>       |     |     |     |      |  |
|  |   | $V_{\text{CC}} = 2.0\text{ V}$     | -   | -   | 165 | ns   |  |
|  |   | $V_{\text{CC}} = 4.5\text{ V}$     | -   | -   | 33  | ns   |  |
|  |   | $V_{\text{CC}} = 6.0\text{ V}$     | -   | -   | 28  | ns   |  |
|  | propagation delay<br>nD to $\overline{\text{nQ}}$ | see <a href="#">Figure 7</a>       |     |     |     |      |  |
|  |   | $V_{\text{CC}} = 2.0\text{ V}$     | -   | -   | 180 | ns   |  |
|  |   | $V_{\text{CC}} = 4.5\text{ V}$     | -   | -   | 36  | ns   |  |
|  |   | $V_{\text{CC}} = 6.0\text{ V}$     | -   | -   | 31  | ns   |  |
|  | propagation delay<br>LEnn to nQ                   | see <a href="#">Figure 9</a>       |     |     |     |      |  |
|  |   | $V_{\text{CC}} = 2.0\text{ V}$     | -   | -   | 180 | ns   |  |
|  |   | $V_{\text{CC}} = 4.5\text{ V}$     | -   | -   | 36  | ns   |  |
|  |   | $V_{\text{CC}} = 6.0\text{ V}$     | -   | -   | 31  | ns   |  |
| propagation delay<br>LEnn to $\overline{\text{nQ}}$                  | see <a href="#">Figure 9</a>                      |                                    |     |     |     |      |  |
|  | $V_{\text{CC}} = 2.0\text{ V}$                    | -                                  | -   | 190 | ns  |      |  |
|  | $V_{\text{CC}} = 4.5\text{ V}$                    | -                                  | -   | 38  | ns  |      |  |
|  | $V_{\text{CC}} = 6.0\text{ V}$                    | -                                  | -   | 32  | ns  |      |  |
| $t_{\text{THL}}, t_{\text{TLH}}$                                     | output transition time                            | see <a href="#">Figure 6 and 7</a> |     |     |     |      |  |
|  |   | $V_{\text{CC}} = 2.0\text{ V}$     | -   | -   | 110 | ns   |  |
|  |   | $V_{\text{CC}} = 4.5\text{ V}$     | -   | -   | 22  | ns   |  |
|  | $V_{\text{CC}} = 6.0\text{ V}$                    | -                                  | -   | 19  | ns  |      |  |
| $t_{\text{W}}$   | enable pulse width<br>HIGH                        | see <a href="#">Figure 9</a>       |     |     |     |      |  |
|  |   | $V_{\text{CC}} = 2.0\text{ V}$     | 120 | -   | -   | ns   |  |
|  |   | $V_{\text{CC}} = 4.5\text{ V}$     | 24  | -   | -   | ns   |  |
|  | $V_{\text{CC}} = 6.0\text{ V}$                    | 20                                 | -   | -   | ns  |      |  |
| $t_{\text{su}}$  | set-up time nD to<br>LEnn                         | see <a href="#">Figure 8</a>       |     |     |     |      |  |
|  |   | $V_{\text{CC}} = 2.0\text{ V}$     | 90  | -   | -   | ns   |  |
|  |   | $V_{\text{CC}} = 4.5\text{ V}$     | 18  | -   | -   | ns   |  |
|  | $V_{\text{CC}} = 6.0\text{ V}$                    | 15                                 | -   | -   | ns  |      |  |
| $t_{\text{h}}$   | hold time nD to LEnn                              | see <a href="#">Figure 8</a>       |     |     |     |      |  |
|  |   | $V_{\text{CC}} = 2.0\text{ V}$     | 3   | -   | -   | ns   |  |
|  |   | $V_{\text{CC}} = 4.5\text{ V}$     | 3   | -   | -   | ns   |  |
|  | $V_{\text{CC}} = 6.0\text{ V}$                    | 3                                  | -   | -   | ns  |      |  |

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

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

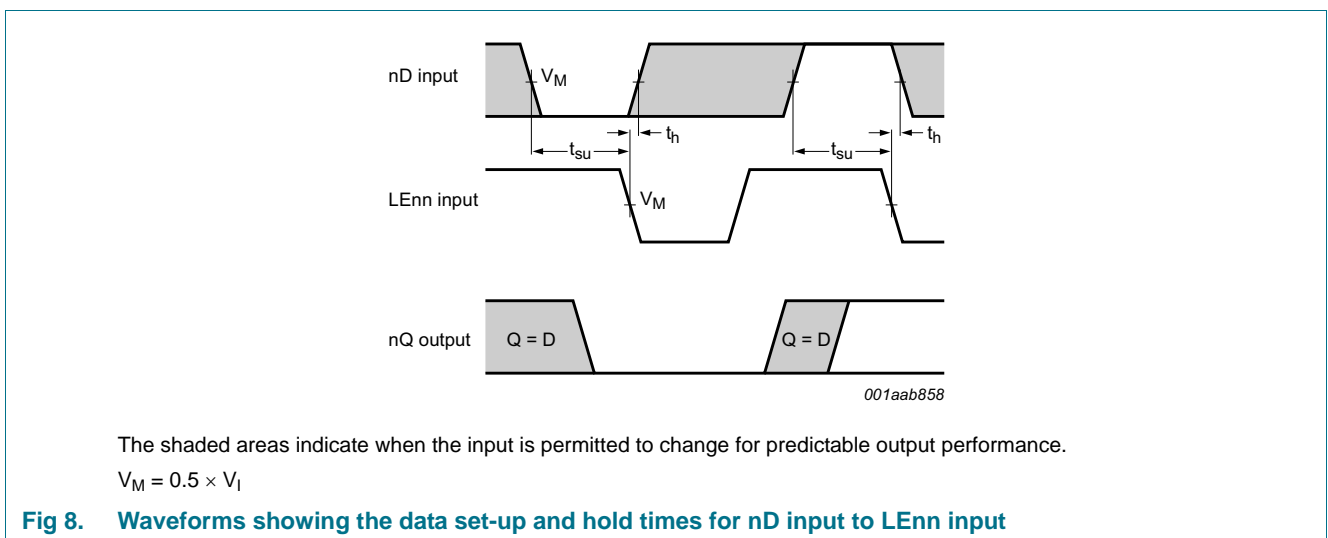
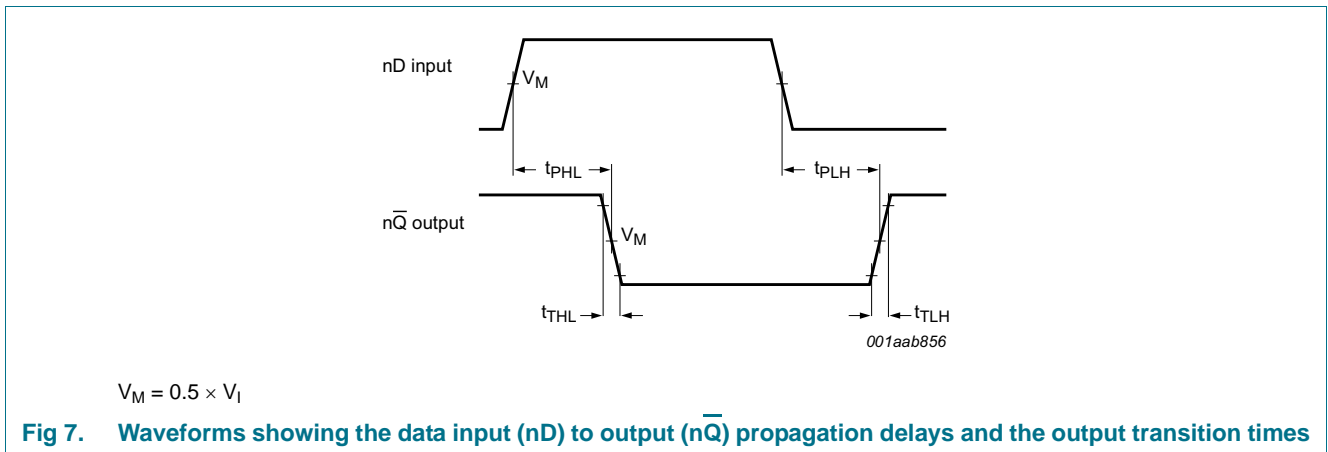
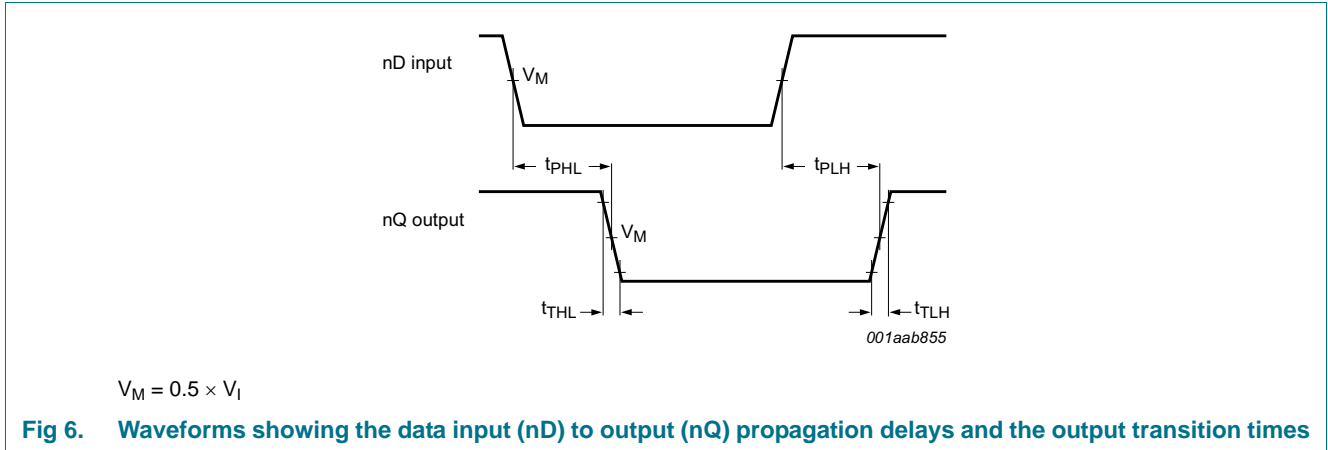
$C_L$  = output load capacitance in pF;

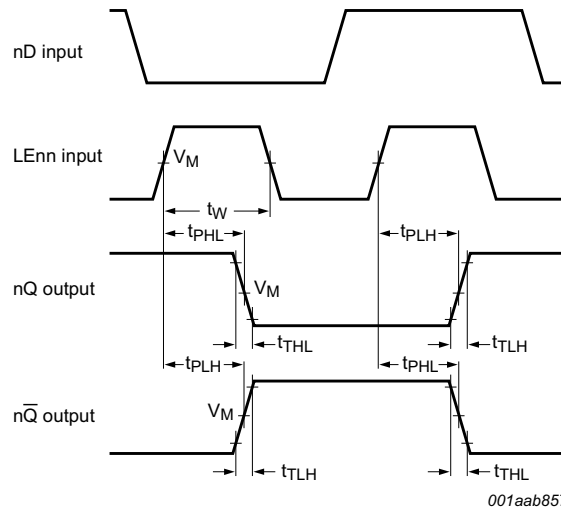
$V_{\text{CC}}$  = supply voltage in V;

$N$  = number of inputs switching;

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

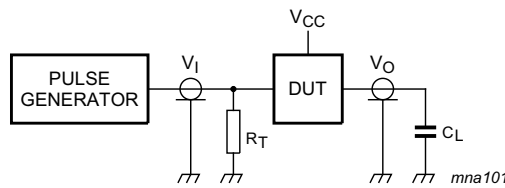
11. Waveforms





$V_M = 0.5 \times V_I$

**Fig 9.** Waveforms showing the latch enable input (LEnn) pulse width, the latch enable input to outputs (nQ, nQ̄) propagation delays and the output transition times



Test data is given in [Table 8](#)

Definitions for test circuit:

$R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator

$C_L$  = Load capacitance including jig and probe capacitance

**Fig 10.** Test circuit for measuring switching times

**Table 8.** Test data

| Supply   | Input    | Load  |
|----------|----------|-------|
| $V_{CC}$ | $V_I$    | $C_L$ |
| 2.0 V    | $V_{CC}$ | 50 pF |
| 4.5 V    | $V_{CC}$ | 50 pF |
| 6.0 V    | $V_{CC}$ | 50 pF |
| 5.0 V    | $V_{CC}$ | 15 pF |

12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



Fig 11. Package outline SOT109-1 (SO16)

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1

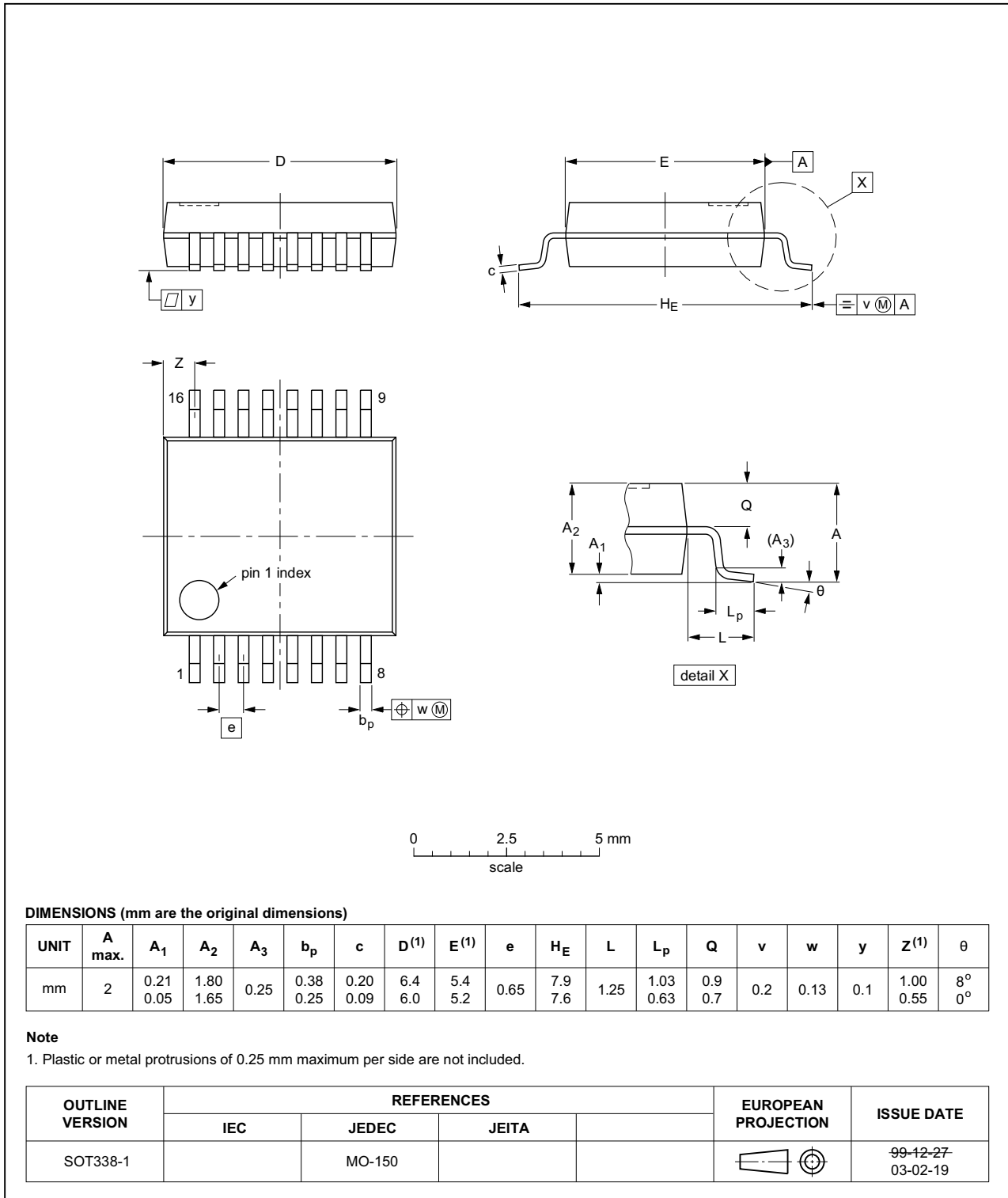


Fig 12. Package outline SOT338-1 (SSOP16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

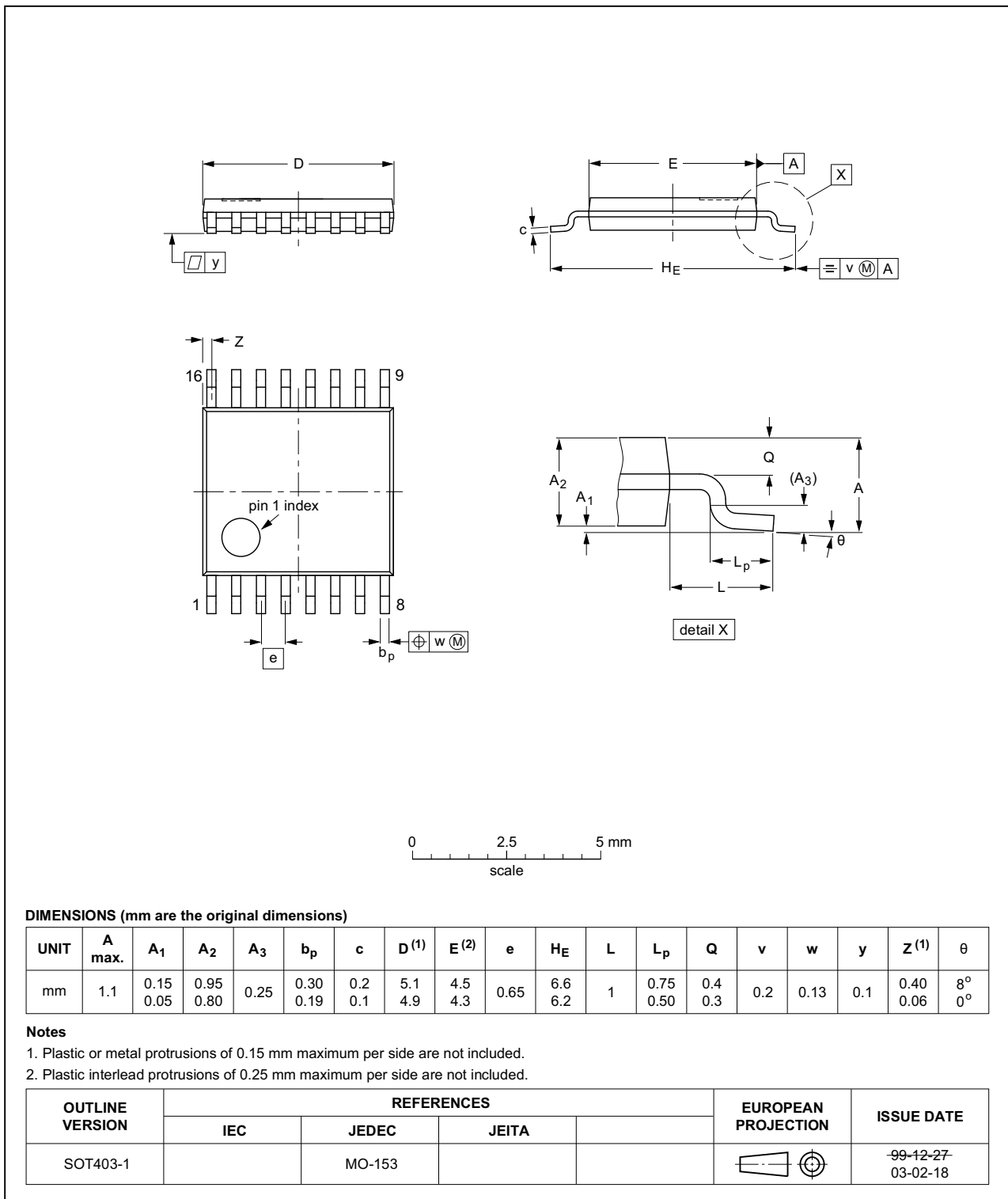


Fig 13. Package outline SOT403-1 (TSSOP16)

## 13. Abbreviations

Table 9. Abbreviations

| Acronym | Abbreviation                                   |
|---------|--|
| CMOS    | Complementary Metal Oxide Semiconductor        |
| DUT     | Device Under Test                              |
| ESD     | ElectroStatic Discharge                        |
| HBM     | Human Body Model                               |
| LSTTL   | Low-power Schottky Transistor-Transistor Logic |
| MM      | Machine Model                                  |

## 14. Revision history

Table 10. Revision history

| Document ID        | Release date  | Data sheet status     | Change notice | Supersedes         |
|--------------------|---|-----------------------|---------------|--------------------|
| 74HC75 v.4         | 20160224  | Product data sheet    | -             | 74HC75 v.3         |
| Modifications:     | <ul style="list-style-type: none"> <li>Type number 74HC75N (SOT38-4) removed.</li> </ul>  |                       |               |                    |
| 74HC75 v.3         | 20041112  | Product data sheet    | -             | 74HC_HCT75_CNV v.2 |
| Modifications:     | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the current presentation and information standard of Philips Semiconductors.</li> <li>Removed type number 74HCT75.</li> <li>Inserted family specification.</li> </ul> |                       |               |                    |
| 74HC_HCT75_CNV v.2 | 19970918  | Product specification | -             | 74HC_HCT75 v.1     |
| 74HC_HCT75 v.1     | 19901201  | Product specification | -             | -                  |



## 15. Legal information

### 15.1 Data sheet status

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

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

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

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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Тел: +7 (812) 336 43 04 (многоканальный)

Email: [org@lifeelectronics.ru](mailto:org@lifeelectronics.ru)