

# 74LV595

8-bit serial-in/serial-out or parallel-out shift register; 3-state

Rev. 4 — 18 March 2016

Product data sheet

## 1. General description

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The 74LV595 is an 8 stage serial shift register with a storage register and 3-state outputs. Both the shift and storage register have separate clocks. It is a low-voltage Si-gate CMOS device and is pin and functionally compatible with the 74HC595 and 74HCT595.

Data is shifted on the positive-going transitions of the SHCP input. The data in the shift register is transferred to the storage register on a positive-going transition of the STCP input. If both clocks are connected together, the shift register will always be one clock pulse ahead of the storage register.

The shift register has a serial input (DS) and a serial output ( $\overline{Q7S}$ ) for cascading the device. It is also provided with an asynchronous reset input MR (active LOW) for all 8 shift register stages. The storage register has 8 parallel 3-state bus driver outputs. Data in the storage register appears at the output whenever the output enable input ( $\overline{OE}$ ) is LOW.

## 2. Features and benefits

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- Optimized for low voltage applications: 1.0 V to 3.6 V
- Accepts TTL input levels between  $V_{CC} = 2.7$  V and  $V_{CC} = 3.6$  V
- Typical output ground bounce < 0.8 V at  $V_{CC} = 3.3$  V and  $T_{amb} = 25$  °C
- Typical HIGH-level output voltage ( $V_{OH}$ ) undershoot: > 2 V at  $V_{CC} = 3.3$  V and  $T_{amb} = 25$  °C
- Specified from  $-40$  °C to  $+85$  °C and from  $-40$  °C to  $+125$  °C
- Has a shift register with direct clear
- Multiple package options
- Output capability:
  - ◆ Parallel outputs; bus driver
  - ◆ serial output; standard
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V

## 3. Applications

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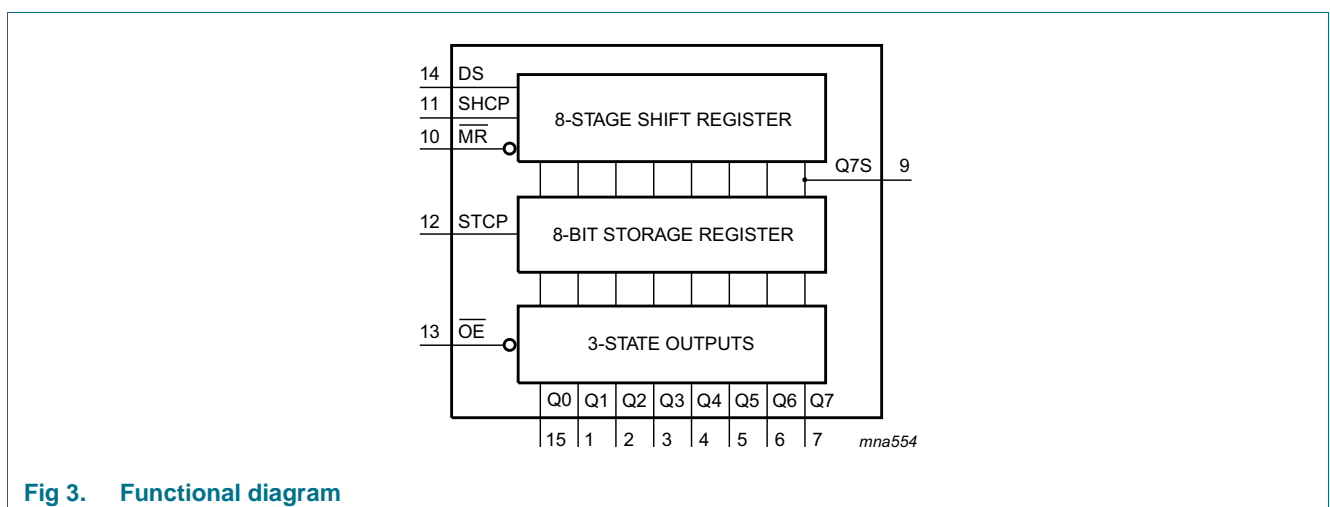
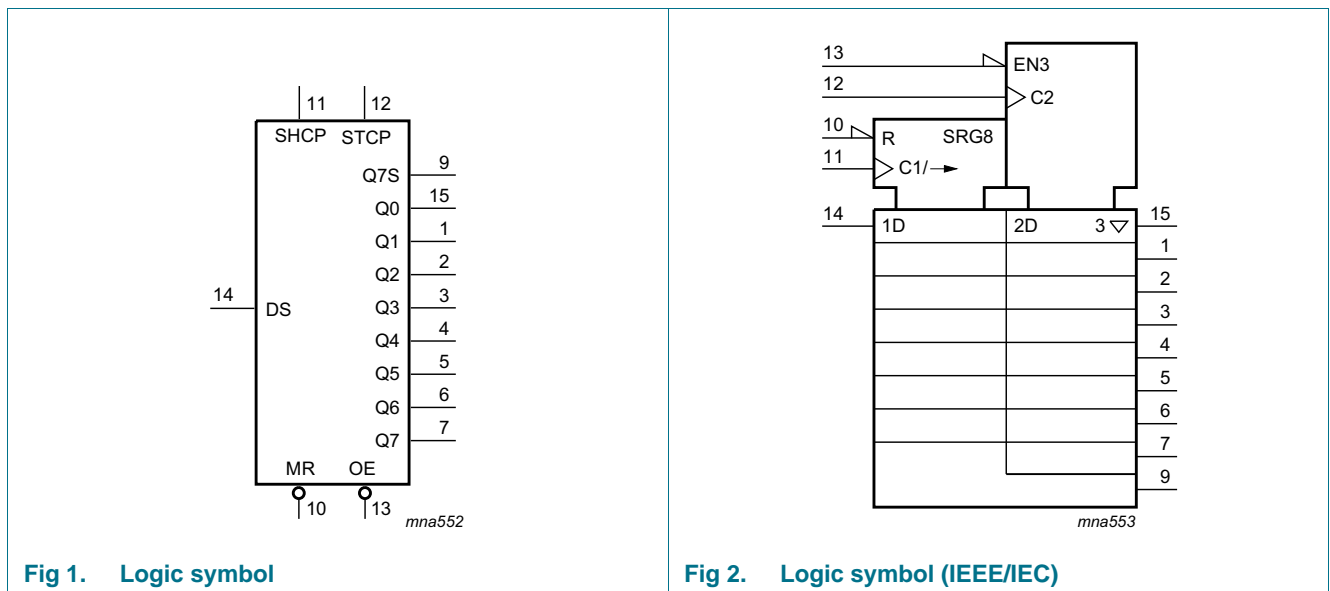
- Serial-to-parallel data conversion
- Remote control holding register

### 4. Ordering information

Table 1. Ordering information

| Type number | Package           |         |  | Version  |
|-------------|-------------------|---------|--|----------|
|             | Temperature range | Name    | Description  |          |
| 74LV595D    | -40 °C to +125 °C | SO16    | plastic small outline package; 16 leads; body width 3.9 mm             | SOT109-1 |
| 74LV595DB   | -40 °C to +125 °C | SSOP16  | plastic shrink small outline package; 16 leads; body width 5.3 mm      | SOT338-1 |
| 74LV595PW   | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |

### 5. Functional diagram



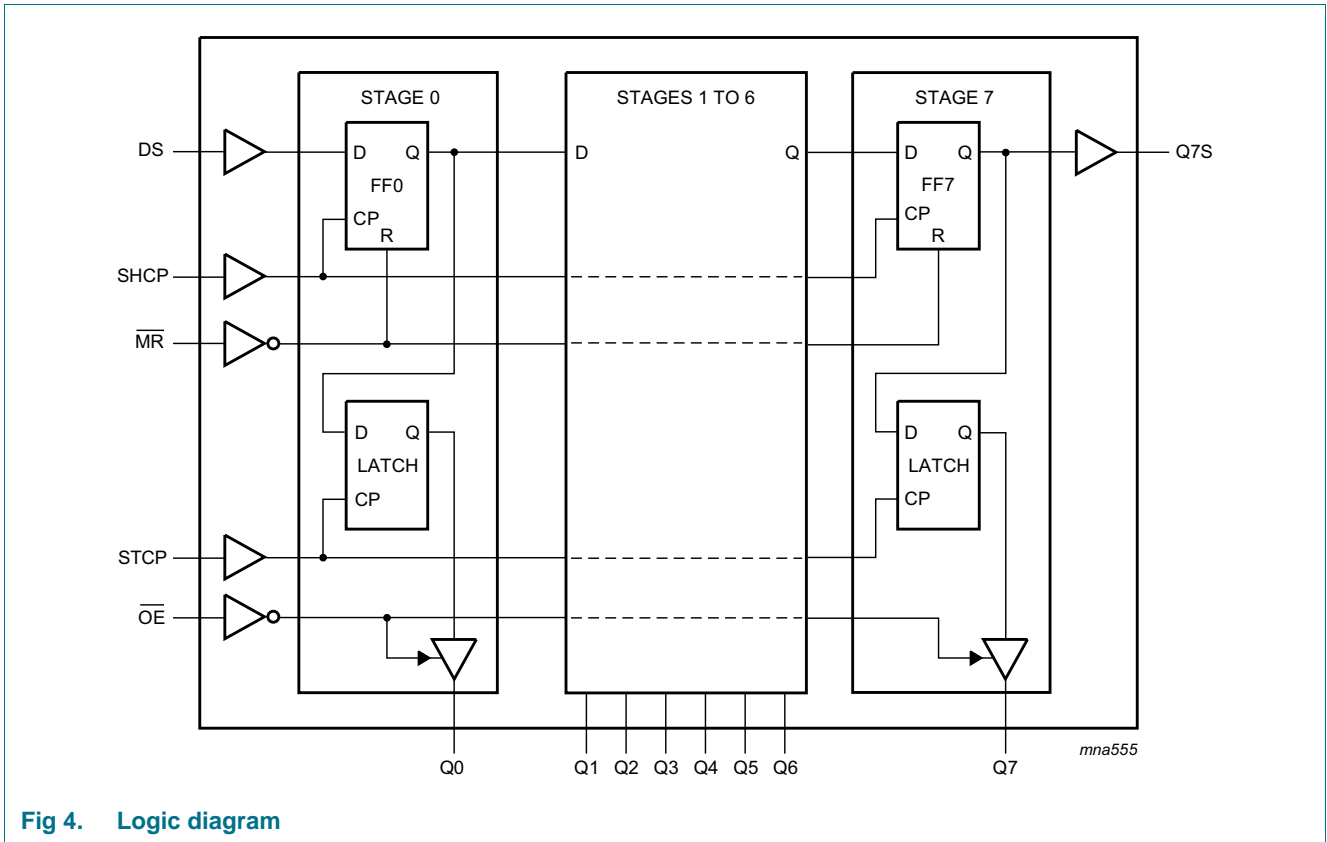


Fig 4. Logic diagram

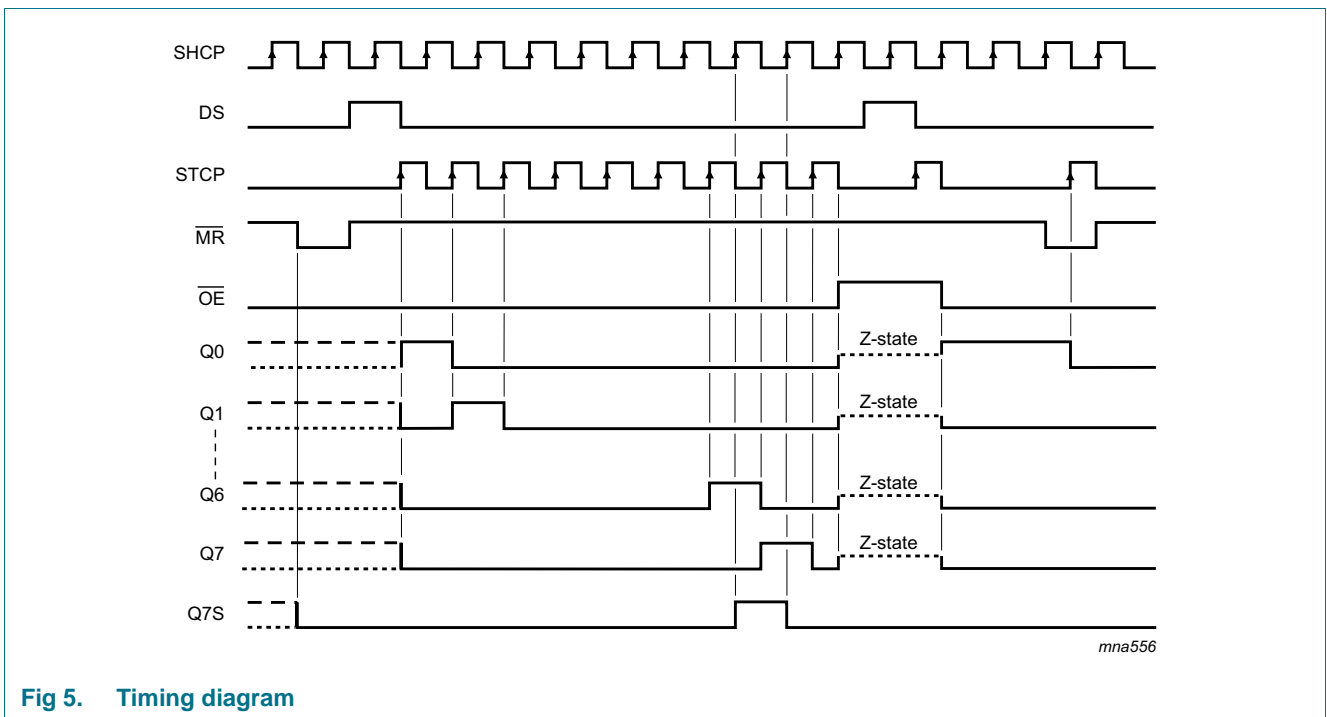


Fig 5. Timing diagram

## 6. Pinning information

### 6.1 Pinning

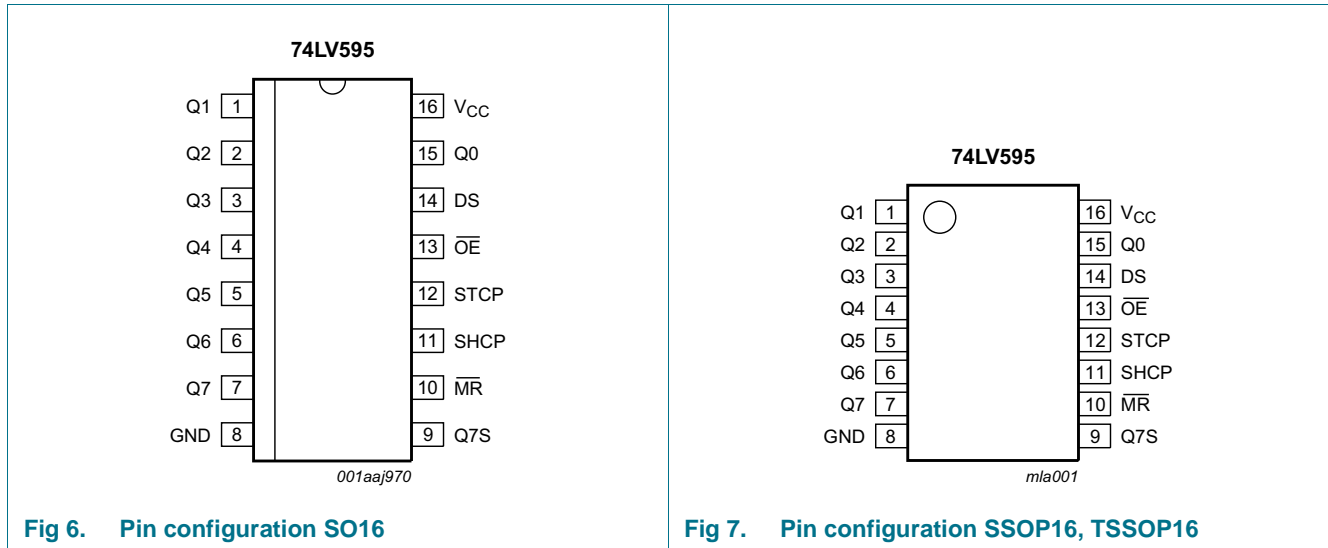


Fig 6. Pin configuration SO16

Fig 7. Pin configuration SSOP16, TSSOP16

### 6.2 Pin description

Table 2. Pin description

| Symbol                 | Pin                     | Description                      |
|------------------------|-------------------------|----------------------------------|
| Q0 to Q7               | 15, 1, 2, 3, 4, 5, 6, 7 | parallel data output             |
| GND                    | 8                       | ground (0 V)                     |
| Q7S                    | 9                       | serial data output               |
| $\overline{\text{MR}}$ | 10                      | master reset (active LOW)        |
| SHCP                   | 11                      | shift register clock input       |
| STCP                   | 12                      | storage register clock input     |
| $\overline{\text{OE}}$ | 13                      | output enable input (active LOW) |
| DS                     | 14                      | serial data input                |
| V <sub>CC</sub>        | 16                      | supply voltage                   |

## 7. Functional description

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

| Input |      |                 |                 |    | Output |     | Function   |
|-------|------|-----------------|-----------------|----|--------|-----|--|
| SHCP  | STCP | $\overline{OE}$ | $\overline{MR}$ | DS | Q7S    | Qn  |  |
| X     | X    | L               | L               | X  | L      | NC  | a LOW-state on $\overline{MR}$ only affects the shift register   |
| X     | ↑    | L               | L               | X  | L      | L   | empty shift register loaded into storage register  |
| X     | X    | H               | L               | X  | L      | Z   | shift register clear; parallel outputs in high-impedance OFF-state   |
| ↑     | X    | L               | H               | H  | Q6S    | NC  | logic HIGH-state shifted into shift register stage 0. Contents of all shift register stages shifted through, e.g. previous state of stage 6 (internal Q6S) appears on the serial output (Q7S). |
| X     | ↑    | L               | H               | X  | NC     | QnS | contents of shift register stages (internal QnS) are transferred to the storage register and parallel output stages  |
| ↑     | ↑    | L               | H               | X  | Q6S    | QnS | contents of shift register shifted through; previous contents of the shift register is transferred to the storage register and the parallel output stages                                      |

[1] H = HIGH voltage state; L = LOW voltage state; ↑ = LOW-to-HIGH transition; X = don't care; NC = no change; Z = high-impedance OFF-state.

## 8. 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 <sub>CC</sub>  | supply voltage          |   | -0.5 | +4.6 | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V | -    | ±20  | mA   |
| I <sub>OK</sub>  | output clamping current | V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V | -    | ±50  | mA   |
| I <sub>O</sub>   | output current          | -0.5 V < V <sub>O</sub> < V <sub>CC</sub> + 0.5 V                   | -    |      |      |
|                  |                         | standard driver outputs   |      | 25   | mA   |
|                  |                         | bus driver outputs  |      | 35   | mA   |
| I <sub>CC</sub>  | supply current          | standard driver outputs   |      | 50   | mA   |
|                  |                         | bus driver outputs  |      | 70   | mA   |
| I <sub>GND</sub> | ground current          | standard driver outputs   | -50  |      | mA   |
|                  |                         | bus driver outputs  | -70  |      | 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                                |      |      |      |
|                  |                         | SO16, SSOP16, TSSOP16 <sup>[2]</sup>                                | -    | 500  | mW   |

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

[2] For SO16 packages: above 70 °C the value of P<sub>tot</sub> derates linearly with 8 mW/K.  
For (T)SSOP16 packages: above 60 °C the value of P<sub>tot</sub> derates linearly with 5.5 mW/K.

## 9. Recommended operating conditions

**Table 5. Recommended operating conditions**

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

| Symbol              | Parameter                           | Conditions                                 | Min | Typ | Max      | Unit |
|---------------------|-------------------------------------|--|-----|-----|----------|------|
| $V_{CC}$            | supply voltage                      |  | 1.0 | 3.3 | 3.6      | 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 | $V_{CC} = 1.0 \text{ V to } 2.0 \text{ V}$ | -   | -   | 500      | ns/V |
|                     |                                     | $V_{CC} = 2.0 \text{ V to } 2.7 \text{ V}$ | -   | -   | 200      | ns/V |
|                     |                                     | $V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$ | -   | -   | 100      | ns/V |

## 10. Static characteristics

**Table 6. Static characteristics**

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

| Symbol   | Parameter                 | Conditions  | -40 °C to +85 °C |                    |     | -40 °C to +125 °C |     | Unit |
|--|---------------------------|---|------------------|--------------------|-----|-------------------|-----|------|
|  |                           |   | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |      |
| $V_{IH}$   | HIGH-level input voltage  | $V_{CC} = 1.2 \text{ V}$  | 0.9              | -                  | -   | 0.9               | -   | V    |
|  |                           | $V_{CC} = 2.0 \text{ V}$  | 1.4              | -                  | -   | 1.4               | -   | V    |
|  |                           | $V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$  | 2.0              | -                  | -   | 2.0               | -   | V    |
| $V_{IL}$   | LOW-level input voltage   | $V_{CC} = 1.2 \text{ V}$  | -                | -                  | 0.3 | -                 | 0.3 | V    |
|  |                           | $V_{CC} = 2.0 \text{ V}$  | -                | -                  | 0.6 | -                 | 0.6 | V    |
|  |                           | $V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$  | -                | -                  | 0.8 | -                 | 0.8 | V    |
| $V_{OH}$   | HIGH-level output voltage | all outputs; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$I_O = -100 \mu\text{A}$ ;                               |                  |                    |     |                   |     |      |
|  |                           | $V_{CC} = 1.2 \text{ V}$  | -                | 1.2                | -   | -                 | -   | V    |
|  |                           | $V_{CC} = 2.0 \text{ V}$  | 1.8              | 2.0                | -   | 1.8               | -   | V    |
|  |                           | $V_{CC} = 2.7 \text{ V}$  | 2.5              | 2.7                | -   | 2.5               | -   | V    |
|  |                           | $V_{CC} = 3.0 \text{ V}$  | 2.8              | 3.0                | -   | 2.8               | -   | V    |
|  |                           | standard outputs;<br>$V_I = V_{IH}$ or $V_{IL}$ ; $I_O = -6 \text{ mA}$ ;<br>$V_{CC} = 3.0 \text{ V}$ | 2.4              | 2.82               | -   | 2.2               | -   | V    |
| bus outputs; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$I_O = -8 \text{ mA}$ ;<br>$V_{CC} = 3.0 \text{ V}$ | 2.4                       | 2.82  | -                | 2.2                | -   | V                 |     |      |

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

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

| Symbol           | Parameter  | Conditions   | -40 °C to +85 °C |                    |     | -40 °C to +125 °C |     | Unit |
|------------------|--|--|------------------|--------------------|-----|-------------------|-----|------|
|                  |  |  | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |      |
| V <sub>OL</sub>  | LOW-level output voltage   | all outputs; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;<br>I <sub>O</sub> = 100 μA;                               |                  |                    |     |                   |     |      |
|                  |  | V <sub>CC</sub> = 1.2 V  | -                | 0                  | -   | -                 | -   | V    |
|                  |  | V <sub>CC</sub> = 2.0 V  | -                | 0                  | 0.2 | -                 | 0.2 | V    |
|                  |  | V <sub>CC</sub> = 2.7 V  | -                | 0                  | 0.2 | -                 | 0.2 | V    |
|                  |  | V <sub>CC</sub> = 3.0 V  | -                | 0                  | 0.2 | -                 | 0.2 | V    |
|                  |  | standard driver outputs<br>V <sub>CC</sub> = 3.0 V; I <sub>O</sub> = 6 mA  | -                | 0.25               | 0.4 | -                 | 0.5 | V    |
|                  | bus driver outputs<br>V <sub>CC</sub> = 3.0 V; I <sub>O</sub> = 8 mA | -  | 0.20             | 0.4                | -   | 0.5               | V   |      |
| I <sub>I</sub>   | input leakage current  | V <sub>CC</sub> = 3.6 V;<br>V <sub>I</sub> = 5.5 V or GND  | -                | -                  | 1.0 | -                 | 1.0 | μA   |
| I <sub>OZ</sub>  | OFF-state output current   | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;<br>V <sub>O</sub> = V <sub>CC</sub> or GND;<br>V <sub>CC</sub> = 3.6 V | -                | -                  | 5   | -                 | 10  | μA   |
| I <sub>CC</sub>  | supply current   | V <sub>CC</sub> = 3.6 V;<br>V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A                                    | -                | -                  | 20  | -                 | 160 | μA   |
| ΔI <sub>CC</sub> | additional supply current  | per input pin;<br>V <sub>CC</sub> = 2.7 V to 3.6 V;<br>V <sub>I</sub> = V <sub>CC</sub> - 0.6 V                              | -                | -                  | 500 | -                 | 850 | μA   |
| C <sub>I</sub>   | input capacitance  |  | -                | 3.5                | -   | -                 | -   | pF   |

[1] All typical values are measured at V<sub>CC</sub> = 3.3 V (unless stated otherwise) and T<sub>amb</sub> = 25 °C.

## 11. Dynamic characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 13](#).

| 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 | SHCP to Q7S; see <a href="#">Figure 8</a> <sup>[2]</sup>                   |                  |                    |     |                   |     |      |
|   |                   | V <sub>CC</sub> = 1.2 V  | -                | 95                 | -   | -                 | -   | ns   |
|   |                   | V <sub>CC</sub> = 2.0 V  | -                | 32                 | 61  | -                 | 75  | ns   |
|   |                   | V <sub>CC</sub> = 2.7 V  | -                | 24                 | 45  | -                 | 55  | ns   |
|   |                   | V <sub>CC</sub> = 3.3 V; C <sub>L</sub> = 15 pF                            | -                | 15                 | -   | -                 | -   | ns   |
|   |                   | V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>                            | -                | 18                 | 36  | -                 | 44  | ns   |
|   |                   | STCP to Qn; see <a href="#">Figure 9</a> <sup>[2]</sup>                    |                  |                    |     |                   |     |      |
|   |                   | V <sub>CC</sub> = 1.2 V  | -                | 100                | -   | -                 | -   | ns   |
|   |                   | V <sub>CC</sub> = 2.0 V  | -                | 34                 | 65  | -                 | 77  | ns   |
|   |                   | V <sub>CC</sub> = 2.7 V  | -                | 25                 | 48  | -                 | 56  | ns   |
|   |                   | V <sub>CC</sub> = 3.3 V; C <sub>L</sub> = 15 pF                            | -                | 16                 | -   | -                 | -   | ns   |
|   |                   | V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>                            | -                | 19                 | 38  | -                 | 45  | ns   |
|   |                   | MR to Q7S; see <a href="#">Figure 11</a>                                   |                  |                    |     |                   |     |      |
|   |                   | V <sub>CC</sub> = 1.2 V  | -                | 85                 | -   | -                 | -   | ns   |
|   |                   | V <sub>CC</sub> = 2.0 V  | -                | 29                 | 56  | -                 | 66  | ns   |
|   |                   | V <sub>CC</sub> = 2.7 V  | -                | 21                 | 41  | -                 | 49  | ns   |
| V <sub>CC</sub> = 3.3 V; C <sub>L</sub> = 15 pF | -                 | 14   | -                | -                  | -   | ns                |     |      |
| V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup> | -                 | 16   | 33               | -                  | 33  | ns                |     |      |
| t <sub>en</sub>                                 | enable time       | $\overline{\text{OE}}$ to Qn; see <a href="#">Figure 12</a> <sup>[4]</sup> |                  |                    |     |                   |     |      |
|   |                   | V <sub>CC</sub> = 1.2 V  | -                | 85                 | -   | -                 | -   | ns   |
|   |                   | V <sub>CC</sub> = 2.0 V  | -                | 29                 | 56  | -                 | 66  | ns   |
|   |                   | V <sub>CC</sub> = 2.7 V  | -                | 21                 | 41  | -                 | 49  | ns   |
|   |                   | V <sub>CC</sub> = 3.0 V to 3.6 V   | -                | 16                 | 33  | -                 | 39  | ns   |
| t <sub>dis</sub>                                | disable time      | $\overline{\text{OE}}$ to Qn; see <a href="#">Figure 12</a> <sup>[5]</sup> |                  |                    |     |                   |     |      |
|   |                   | V <sub>CC</sub> = 1.2 V  | -                | 65                 | -   | -                 | -   | ns   |
|   |                   | V <sub>CC</sub> = 2.0 V  | -                | 24                 | 40  | -                 | 49  | ns   |
|   |                   | V <sub>CC</sub> = 2.7 V  | -                | 18                 | 32  | -                 | 37  | ns   |
|   |                   | V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>                            | -                | 14                 | 26  | -                 | 30  | ns   |



Table 7. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 13](#).

| Symbol                           | Parameter     | Conditions   | -40 °C to +85 °C |   |     | -40 °C to +125 °C |     | Unit |   |    |
|----------------------------------|---------------|--|------------------|---|-----|-------------------|-----|------|---|----|
|                                  |               |  | Min              | Typ <sup>[1]</sup>                        | Max | Min               | Max |      |   |    |
| t <sub>w</sub>                   | pulse width   | SHCP, HIGH or LOW;<br>see <a href="#">Figure 8</a> |                  |   |     |                   |     |      |   |    |
|                                  |               | V <sub>CC</sub> = 2.0 V                            | 34               | 10  | -   | 41                | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 2.7 V                            | 25               | 8   | -   | 30                | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>    | 20               | 6   | -   | 24                | -   | ns   |   |    |
|                                  |               | STCP, HIGH or LOW;<br>see <a href="#">Figure 9</a> |                  |   |     |                   |     |      |   |    |
|                                  |               | V <sub>CC</sub> = 2.0 V                            | 34               | 7   | -   | 41                | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 2.7 V                            | 25               | 5   | -   | 30                | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>    | 20               | 4   | -   | 24                | -   | ns   |   |    |
|                                  |               | MR LOW; see <a href="#">Figure 11</a>              |                  |   |     |                   |     |      |   |    |
|                                  |               | V <sub>CC</sub> = 2.0 V                            | 34               | 10  | -   | 41                | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 2.7 V                            | 25               | 8   | -   | 30                | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>    | 20               | 6   | -   | 24                | -   | ns   |   |    |
| t <sub>su</sub>                  | set-up time   | DS to SHCP; see <a href="#">Figure 10</a>          |                  |   |     |                   |     |      |   |    |
|                                  |               | V <sub>CC</sub> = 1.2 V                            | -                | 40  | -   | -                 | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 2.0 V                            | 26               | 14  | -   | 31                | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 2.7 V                            | 19               | 10  | -   | 23                | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>    | 15               | 8   | -   | 18                | -   | ns   |   |    |
|                                  |               | SHCP to STCP; see <a href="#">Figure 9</a>         |                  |   |     |                   |     |      |   |    |
|                                  |               | V <sub>CC</sub> = 1.2 V                            | -                | 40  | -   | -                 | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 2.0 V                            | 26               | 14  | -   | 31                | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 2.7 V                            | 19               | 10  | -   | 23                | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>    | 15               | 8   | -   | 18                | -   | ns   |   |    |
|                                  |               | t <sub>h</sub>                                     | hold time        | DS to SHCP; see <a href="#">Figure 10</a> |     |                   |     |      |   |    |
|                                  |               |  |                  | V <sub>CC</sub> = 1.2 V                   | -   | -10.0             | -   | -    | - | ns |
| V <sub>CC</sub> = 2.0 V          | 5.0           |  |                  | -4.0                                      | -   | 5.0               | -   | ns   |   |    |
| V <sub>CC</sub> = 2.7 V          | 5.0           |  |                  | -3.0                                      | -   | 5.0               | -   | ns   |   |    |
| V <sub>CC</sub> = 3.0 V to 3.6 V | 5.0           |  |                  | -2.0                                      | -   | 5.0               | -   | ns   |   |    |
| t <sub>rec</sub>                 | recovery time | MR to SHCP; see <a href="#">Figure 11</a>          |                  |   |     |                   |     |      |   |    |
|                                  |               | V <sub>CC</sub> = 1.2 V                            | -                | -35                                       | -   | -                 | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 2.0 V                            | 5.0              | -12.0                                     | -   | 5.0               | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 2.7 V                            | 5.0              | -9.0                                      | -   | 5.0               | -   | ns   |   |    |
|                                  |               | V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>    | 5.0              | -7.0                                      | -   | 5.0               | -   | ns   |   |    |

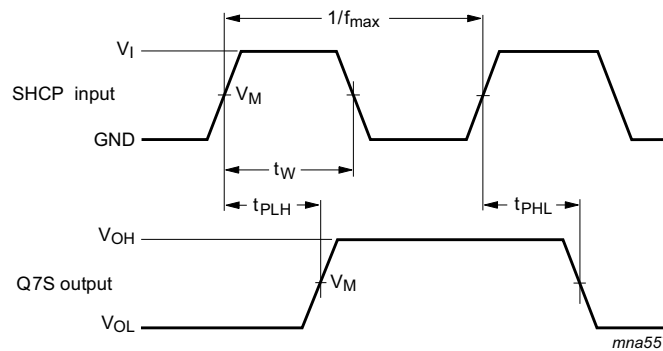
**Table 7. Dynamic characteristics ...continued**

Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 13](#).

| Symbol           | Parameter                     | Conditions   | -40 °C to +85 °C |                    |     | -40 °C to +125 °C |     | Unit |
|------------------|-------------------------------|--|------------------|--------------------|-----|-------------------|-----|------|
|                  |                               |  | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |      |
| f <sub>max</sub> | maximum frequency             | SHCP or STCP; see <a href="#">Figure 8</a> and <a href="#">Figure 9</a>          |                  |                    |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 2.0 V  | 14.0             | 40.0               | -   | 12                | -   | MHz  |
|                  |                               | V <sub>CC</sub> = 2.7 V  | 19.0             | 58.0               | -   | 16                | -   | MHz  |
|                  |                               | V <sub>CC</sub> = 3.3 V; C <sub>L</sub> = 15 pF                                  | -                | 77                 | -   | -                 | -   | MHz  |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>                                  | 24.0             | 70.0               | -   | 20                | -   | MHz  |
| C <sub>PD</sub>  | power dissipation capacitance | V <sub>I</sub> = GND to V <sub>CC</sub> ; V <sub>CC</sub> = 3.0 V <sup>[7]</sup> | -                | 115                | -   | -                 | -   | pF   |

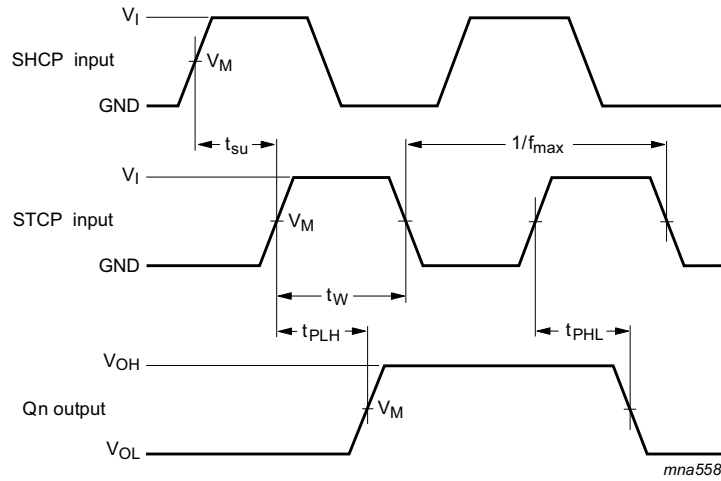
- [1] Typical values are measured at T<sub>amb</sub> = 25 °C.
- [2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- [3] Typical value measured at V<sub>CC</sub> = 3.3 V.
- [4] t<sub>en</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.
- [5] t<sub>dis</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.
- [6] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.
- [7] 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



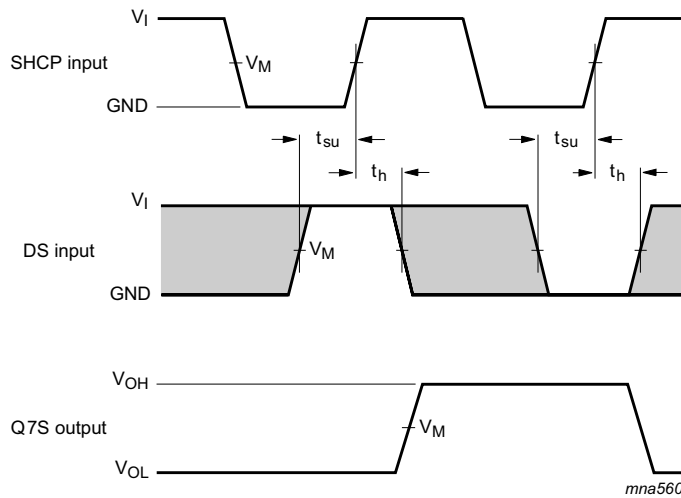
Measurement points are given in [Table 8](#).  
 V<sub>OL</sub> and V<sub>OH</sub> are typical output voltage drops that occur with the output load.

**Fig 8. The shift clock (SHCP) to serial data output (Q7S) propagation delays, the shift clock pulse width and maximum shift clock frequency**



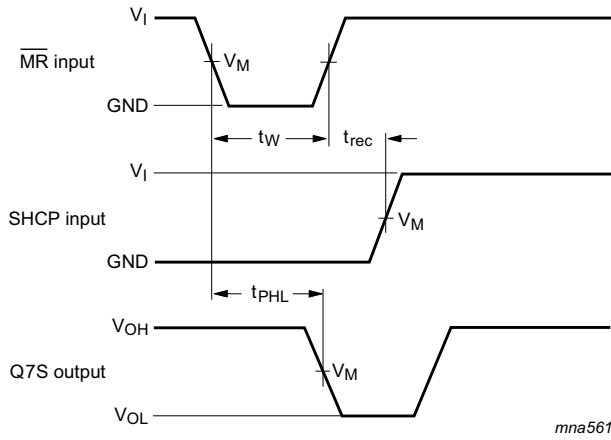
Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage drops that occur with the output load.

**Fig 9. The storage clock (STCP) to parallel data output (Qn) propagation delays, the storage clock pulse width and the shift clock to storage clock set-up time**



Measurement points are given in [Table 8](#).  
 The shaded areas indicate when the input is permitted to change for predictable output performance.  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage drops that occur with the output load.

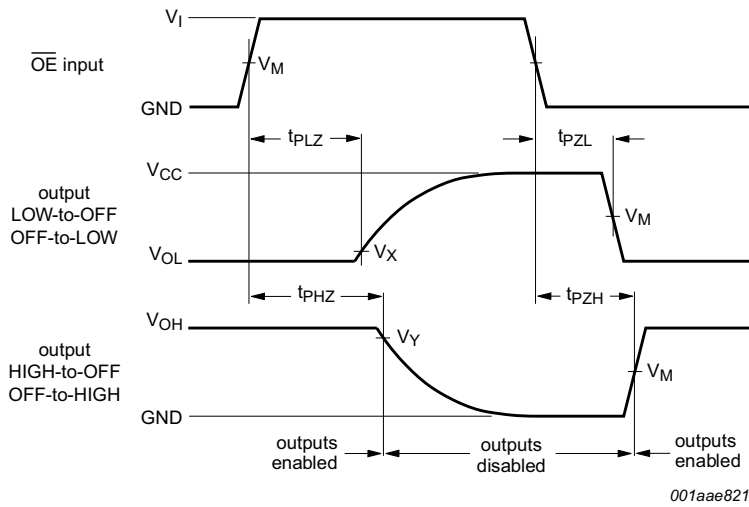
**Fig 10. The data set-up and hold times for the serial data input (DS)**



Measurement points are given in [Table 8](#).

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

**Fig 11.** The master reset (MR) pulse width, the master reset to serial data output (Q7S) propagation delays and the master reset to shift clock (SHCP) recovery time



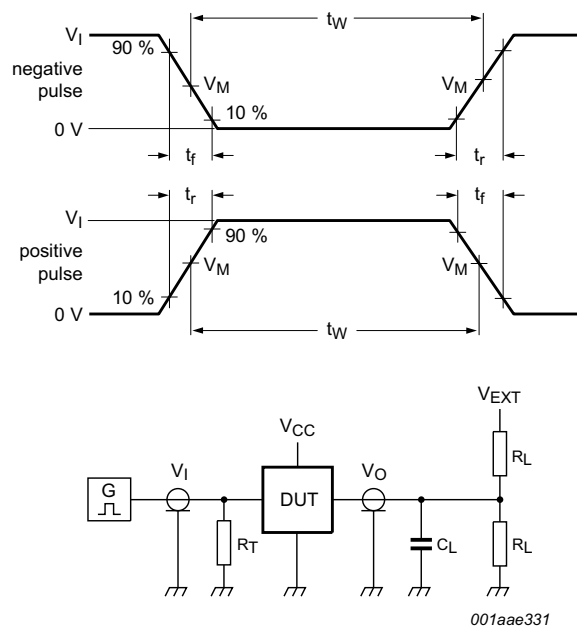
Measurement points are given in [Table 8](#).

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

**Fig 12.** Enable and disable times

**Table 8.** Measurement points

| Supply voltage      | Input       | Output      |                      |                      |
|---------------------|-------------|-------------|----------------------|----------------------|
| $V_{CC}$            | $V_M$       | $V_M$       | $V_X$                | $V_Y$                |
| $V_{CC} < 2.7 V$    | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.1V_{CC}$ | $V_{OH} - 0.1V_{CC}$ |
| $V_{CC} \geq 2.7 V$ | 1.5 V       | 1.5 V       | $V_{OL} + 0.3 V$     | $V_{OH} - 0.3 V$     |



Test data is given in [Table 9](#).

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 output impedance  $Z_o$  of the pulse generator.

$V_{EXT}$  = External voltage for measuring switching times.

**Fig 13. Test circuit for measuring switching times**

**Table 9. Test data**

| Supply voltage | Input    |               | Load  |              | $V_{EXT}$          |                    |                    |
|----------------|----------|---------------|-------|--------------|--------------------|--------------------|--------------------|
| $V_{CC}$       | $V_I$    | $t_r, t_f$    | $C_L$ | $R_L$        | $t_{PLH}, t_{PHL}$ | $t_{PLZ}, t_{PZL}$ | $t_{PHZ}, t_{PZH}$ |
| < 2.7 V        | $V_{CC}$ | $\leq 2.5$ ns | 50 pF | 1 k $\Omega$ | open               | $2V_{CC}$          | GND                |
| 2.7 V to 3.6 V | 2.7 V    | $\leq 2.5$ ns | 50 pF | 1 k $\Omega$ | open               | $2V_{CC}$          | GND                |

13. Package outline

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

SOT109-1

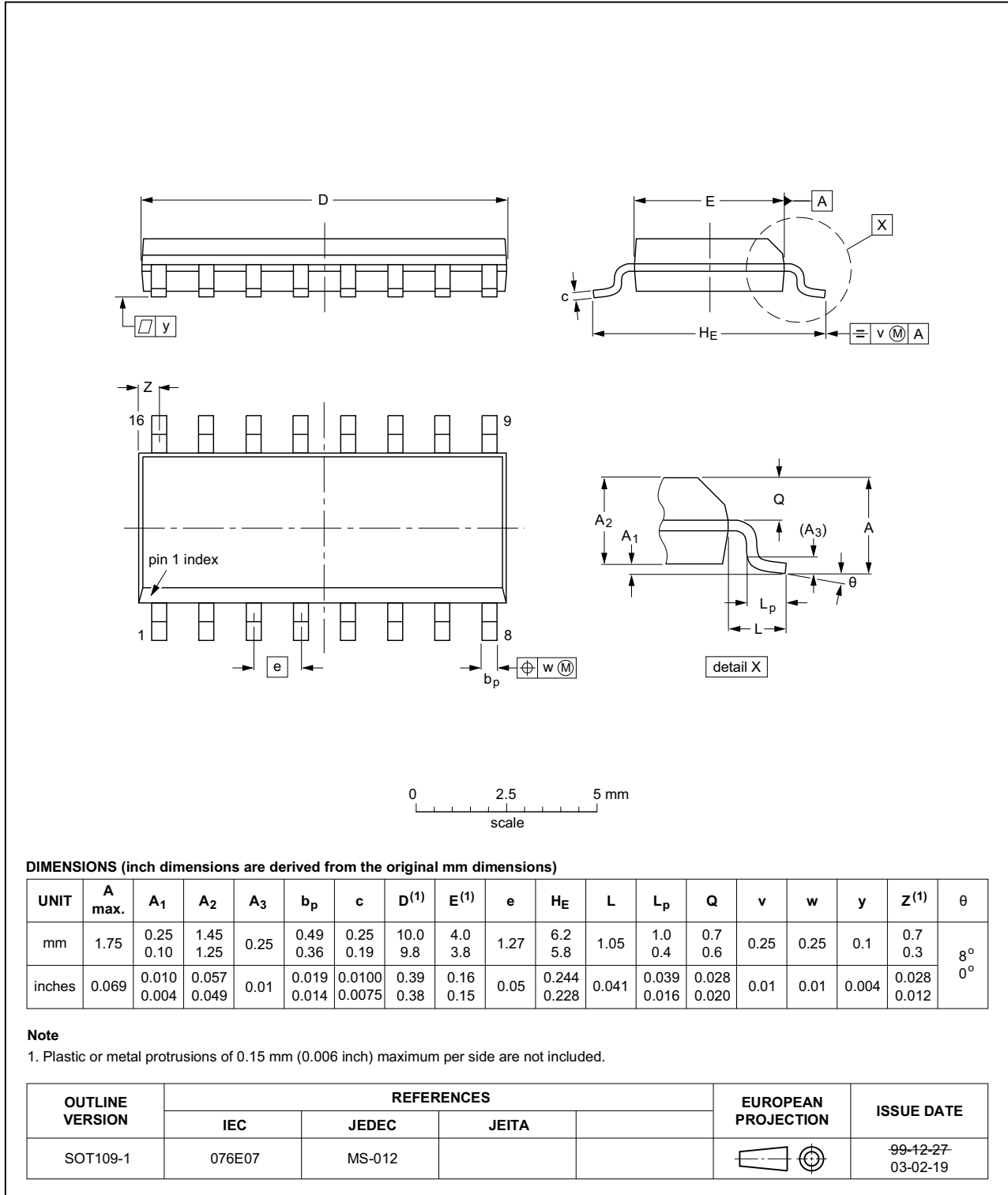


Fig 14. Package outline SOT109-1 (SO16)

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

SOT338-1

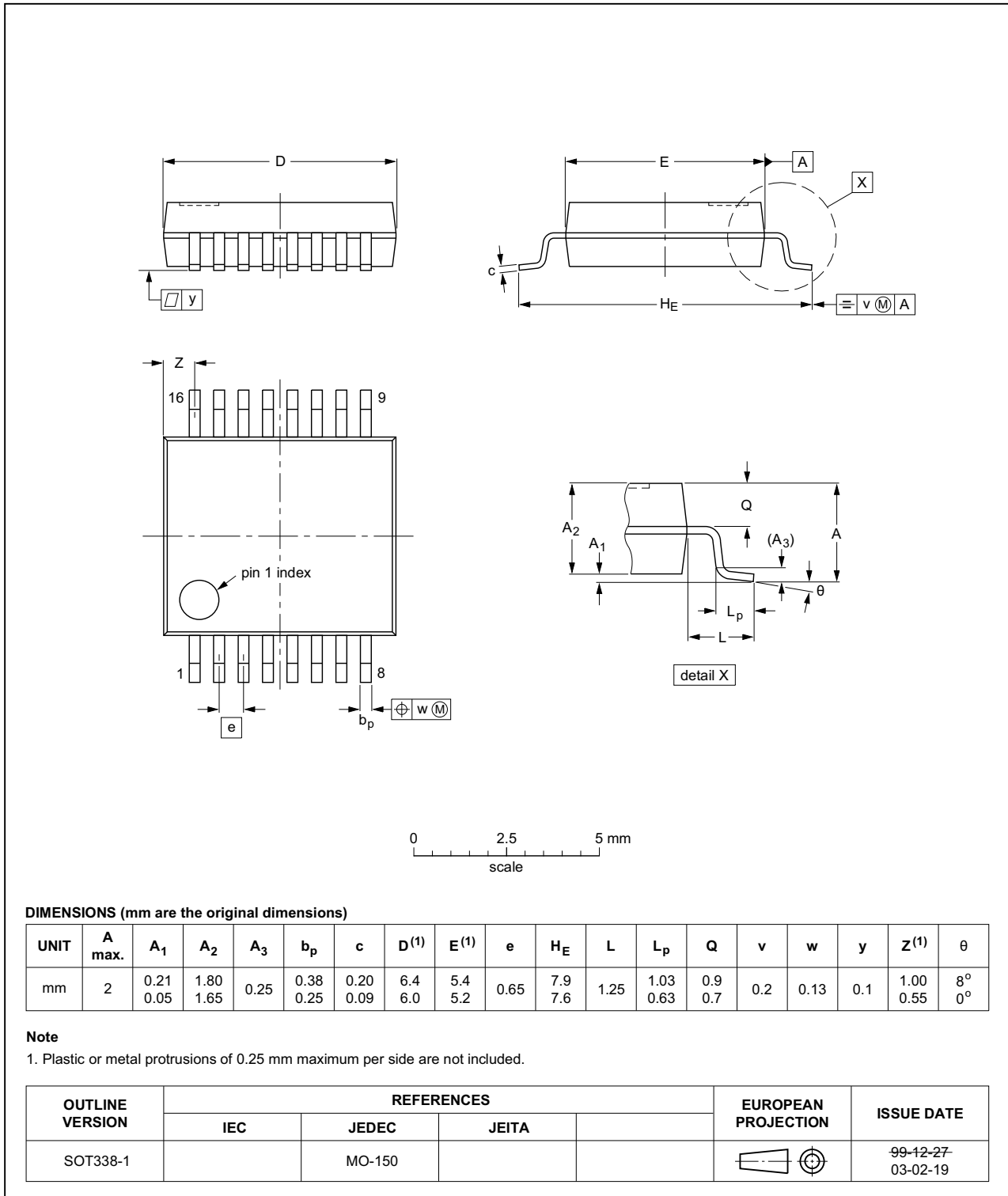


Fig 15. Package outline SOT338-1 (SSOP16)

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

SOT403-1

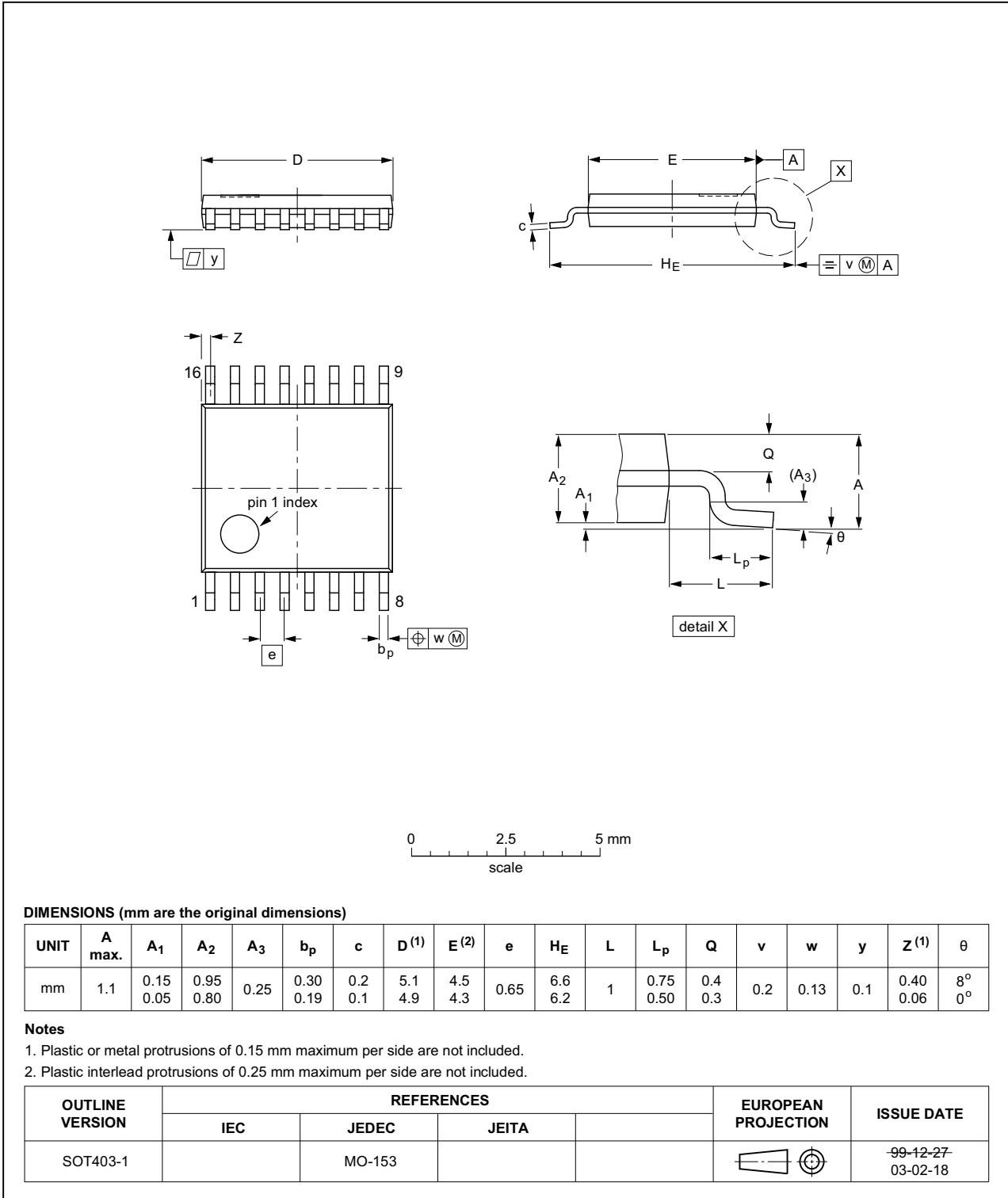


Fig 16. Package outline SOT403-1 (TSSOP16)



## 14. Abbreviations

Table 10. Abbreviations

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

## 15. Revision history

Table 11. Revision history

| Document ID    | Release date  | Data sheet status  | Change notice | Supersedes  |
|----------------|---|--------------------|---------------|-------------|
| 74LV595 v.4    | 20160318  | Product data sheet | -             | 74LV595 v.3 |
| Modifications: | <ul style="list-style-type: none"> <li>Type number 74LV595N (SOT38-4) removed.</li> </ul>   |                    |               |             |
| 74LV595 v.3    | 20090421  | Product data sheet | -             | 74LV595 v.2 |
| Modifications: | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul> |                    |               |             |
| 74LV595 v.2    | 980402  | Product data sheet | -             | 74LV595 v.1 |
| 74LV595 v.1    | 970606  | 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.nexperia.com>.

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## 18. Contents

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|           |   |           |
|-----------|---|-----------|
| <b>1</b>  | <b>General description</b> .....              | <b>1</b>  |
| <b>2</b>  | <b>Features and benefits</b> .....            | <b>1</b>  |
| <b>3</b>  | <b>Applications</b> .....                     | <b>1</b>  |
| <b>4</b>  | <b>Ordering information</b> .....             | <b>2</b>  |
| <b>5</b>  | <b>Functional diagram</b> .....               | <b>2</b>  |
| <b>6</b>  | <b>Pinning information</b> .....              | <b>4</b>  |
| 6.1       | Pinning .....                                 | 4         |
| 6.2       | Pin description .....                         | 4         |
| <b>7</b>  | <b>Functional description</b> .....           | <b>5</b>  |
| <b>8</b>  | <b>Limiting values</b> .....                  | <b>5</b>  |
| <b>9</b>  | <b>Recommended operating conditions</b> ..... | <b>6</b>  |
| <b>10</b> | <b>Static characteristics</b> .....           | <b>6</b>  |
| <b>11</b> | <b>Dynamic characteristics</b> .....          | <b>8</b>  |
| <b>12</b> | <b>Waveforms</b> .....                        | <b>10</b> |
| <b>13</b> | <b>Package outline</b> .....                  | <b>14</b> |
| <b>14</b> | <b>Abbreviations</b> .....                    | <b>17</b> |
| <b>15</b> | <b>Revision history</b> .....                 | <b>17</b> |
| <b>16</b> | <b>Legal information</b> .....                | <b>18</b> |
| 16.1      | Data sheet status .....                       | 18        |
| 16.2      | Definitions .....                             | 18        |
| 16.3      | Disclaimers .....                             | 18        |
| 16.4      | Trademarks .....                              | 19        |
| <b>17</b> | <b>Contact information</b> .....              | <b>19</b> |
| <b>18</b> | <b>Contents</b> .....                         | <b>20</b> |



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