

74HC253; 74HCT253

Dual 4-input multiplexer; 3-state

Rev. 8 — 18 October 2021

Product data sheet

1. General description

The 74HC253; 74HCT253 is a dual 4-bit multiplexer, each with four binary inputs (nI0 to nI3), an output enable input (nOE) and shared select inputs (S0 and S1). One of the four binary inputs is selected by the select inputs and routed to the output nY. A HIGH on nOE causes the outputs to assume a high-impedance OFF-state. 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

- Non-inverting data path
- 3-state outputs interface directly with system bus
- Common select inputs
- Separate output enable inputs
- Wide supply voltage range from 2.0 V to 6.0 V
- Input levels:
 - For 74HC253: CMOS level
 - For 74HCT253: TTL level
- CMOS low power dissipation
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards
 - JESD8C (2.7 V to 3.6 V)
 - JESD7A (2.0 V to 6.0 V)
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Applications

- Data selectors
- Data multiplexers

4. Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|-------------|-------------------|---------|---|----------|
| | Temperature range | Name | Description | Version |
| 74HC253D | -40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74HCT253D | | | | |
| 74HC253PW | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |
| 74HCT253PW | | | | |

5. Functional diagram

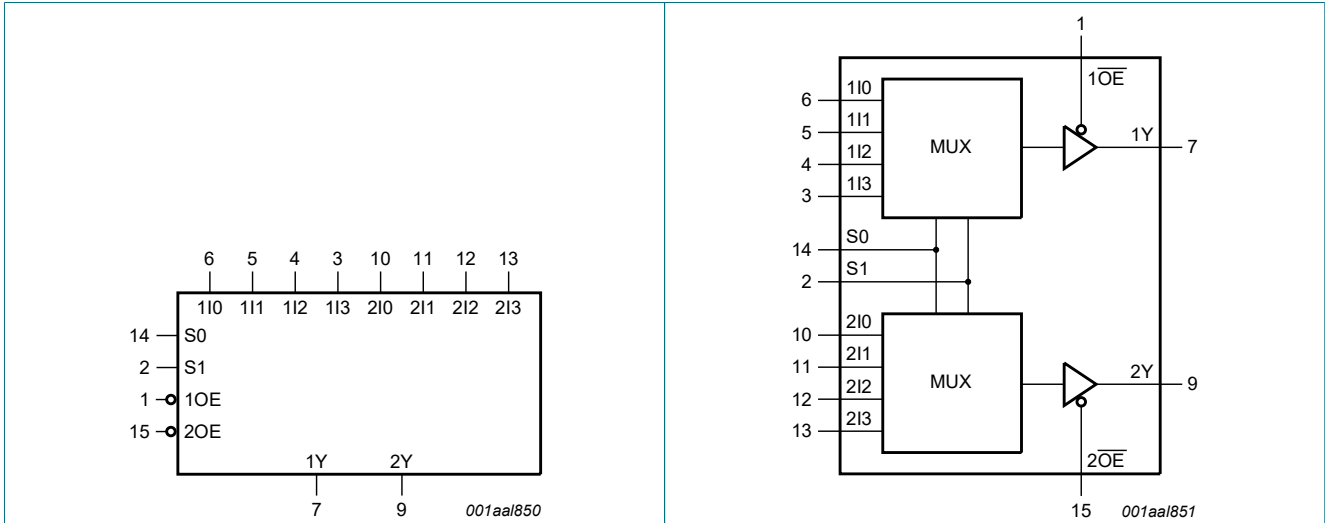


Fig. 1. Logic symbol

Fig. 2. Functional diagram

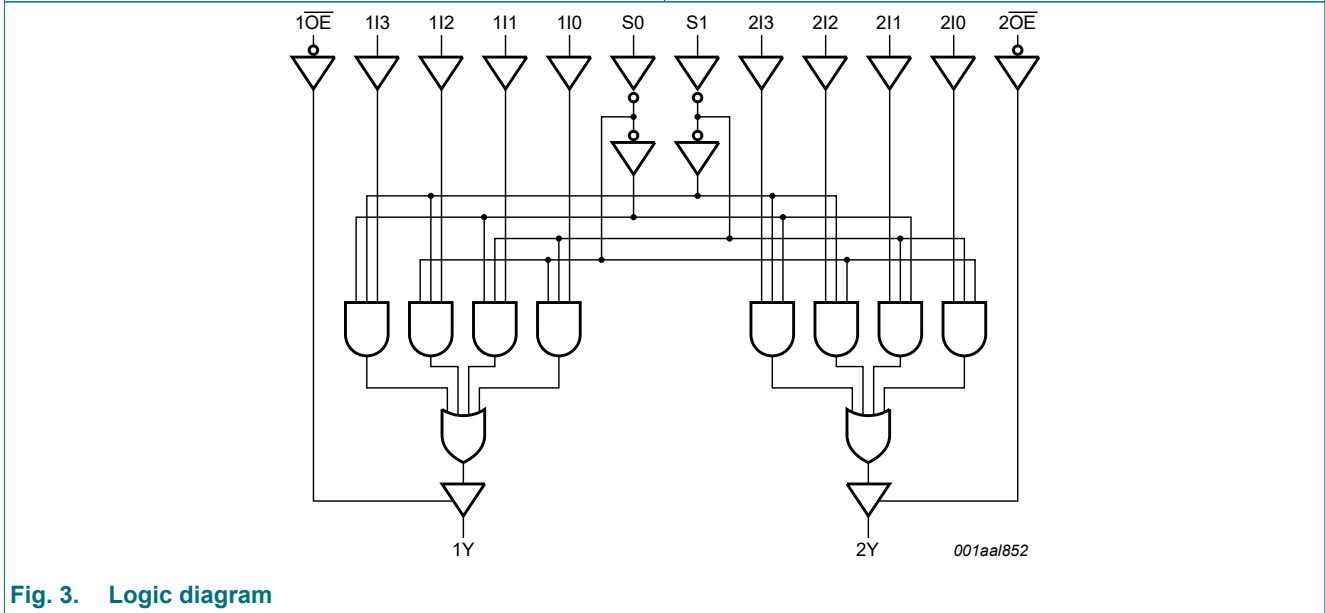


Fig. 3. Logic diagram

6. Pinning information

6.1. Pinning

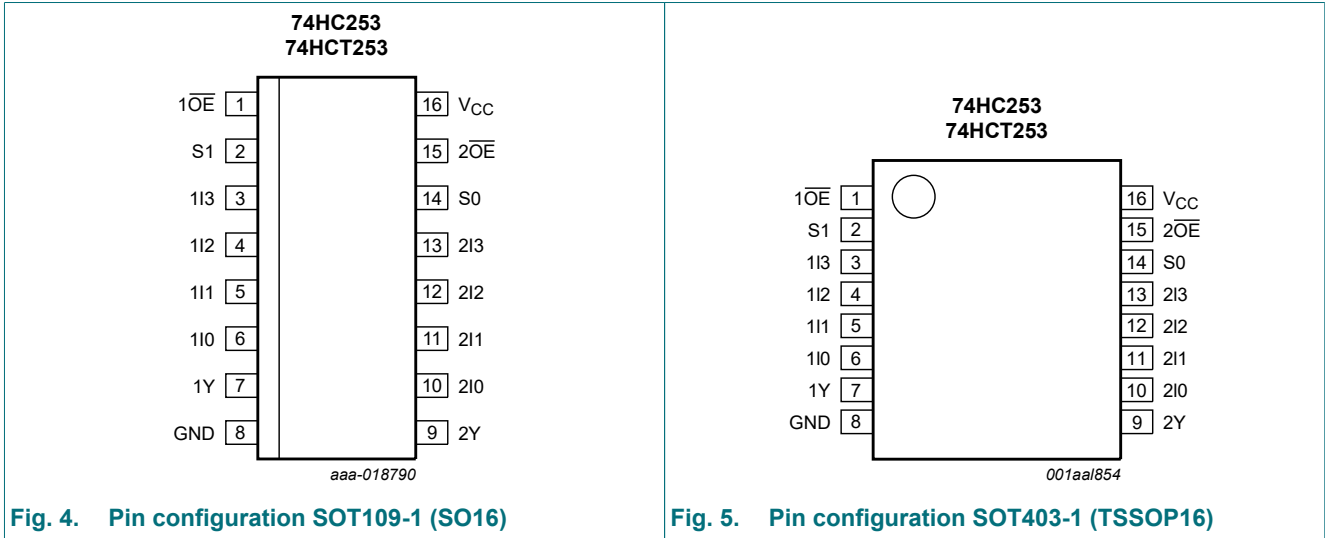


Fig. 4. Pin configuration SOT109-1 (SO16)

Fig. 5. Pin configuration SOT403-1 (TSSOP16)

6.2. Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|--------------------|----------------|-----------------------------------|
| 10E, 2OE | 1, 15 | output enable inputs (active LOW) |
| S0, S1 | 14, 2 | data select inputs |
| 1I0, 1I1, 1I2, 1I3 | 6, 5, 4, 3 | data inputs source 1 |
| 1Y | 7 | multiplexer output source 1 |
| GND | 8 | ground (0 V) |
| 2Y | 9 | multiplexer output source 2 |
| 2I0, 2I1, 2I2, 2I3 | 10, 11, 12, 13 | data inputs source 2 |
| VCC | 16 | supply voltage |

7. Functional description

Table 3. Function table

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

| select Inputs | | data inputs | | | | output enable | output |
|---------------|----|-------------|-----|-----|-----|---------------|--------|
| S0 | S1 | nI0 | nI1 | nI2 | nI3 | nOE | nY |
| X | X | X | X | X | X | H | Z |
| L | L | L | X | X | X | L | L |
| L | L | H | X | X | X | L | H |
| H | L | X | L | X | X | L | L |
| H | L | X | H | X | X | L | H |
| L | H | X | X | L | X | L | L |
| L | H | X | X | H | X | L | H |
| H | H | X | X | X | L | L | L |
| H | H | X | X | X | H | L | H |

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_{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] | - | ± 20 | mA |
| I_{OK} | output clamping current | $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ [1] | - | ± 50 | mA |
| I_O | output current | $-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$ | - | ± 35 | mA |
| I_{CC} | supply current | | - | 70 | mA |
| I_{GND} | ground current | | -70 | - | mA |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| P_{tot} | total power dissipation | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ [2] | - | 500 | mW |

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

[2] For SOT109-1 (SO16) package: P_{tot} derates linearly with 12.4 mW/K above 110 °C.
For SOT403-1 (TSSOP16) package: P_{tot} derates linearly with 8.5 mW/K above 91 °C.

9. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

| Symbol | Parameter | Conditions | 74HC253 | | | 74HCT253 | | | Unit |
|------------------|-------------------------------------|-------------------------|---------|------|-----------------|----------|------|-----------------|------|
| | | | Min | Typ | Max | Min | Typ | Max | |
| V _{CC} | supply voltage | | 2.0 | 5.0 | 6.0 | 4.5 | 5.0 | 5.5 | V |
| V _I | input voltage | | 0 | - | V _{CC} | 0 | - | V _{CC} | V |
| V _O | output voltage | | 0 | - | V _{CC} | 0 | - | V _{CC} | V |
| T _{amb} | ambient temperature | | -40 | - | +125 | -40 | - | +125 | °C |
| Δt/ΔV | input transition rise and fall rate | V _{CC} = 2.0 V | - | - | 625 | - | - | - | ns/V |
| | | V _{CC} = 4.5 V | - | 1.67 | 139 | - | 1.67 | 139 | ns/V |
| | | V _{CC} = 6.0 V | - | - | 83 | - | - | - | ns/V |

10. Static characteristics

Table 6. Static characteristics

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

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|---------------------------|--|-------|------|------|------------------|------|-------------------|-------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC253 | | | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 2.0 V | 1.5 | 1.2 | - | 1.5 | - | 1.5 | - | V |
| | | V _{CC} = 4.5 V | 3.15 | 2.4 | - | 3.15 | - | 3.15 | - | V |
| | | V _{CC} = 6.0 V | 4.2 | 3.2 | - | 4.2 | - | 4.2 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 2.0 V | - | 0.8 | 0.5 | - | 0.5 | - | 0.5 | V |
| | | V _{CC} = 4.5 V | - | 2.1 | 1.35 | - | 1.35 | - | 1.35 | V |
| | | V _{CC} = 6.0 V | - | 2.8 | 1.8 | - | 1.8 | - | 1.8 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = -20 μA; V _{CC} = 2.0 V | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | I _O = -20 μA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -20 μA; V _{CC} = 6.0 V | 5.9 | 6.0 | - | 5.9 | - | 5.9 | - | V |
| | | I _O = -6.0 mA; V _{CC} = 4.5 V | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | V |
| I _O = -7.8 mA; V _{CC} = 6.0 V | 5.48 | 5.81 | - | 5.34 | - | 5.2 | - | V | | |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = 20 μA; V _{CC} = 2.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 6.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 6.0 mA; V _{CC} = 4.5 V | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _O = 7.8 mA; V _{CC} = 6.0 V | - | 0.16 | 0.26 | - | 0.33 | - | 0.4 | V | | |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 6.0 V | - | - | ±0.1 | - | ±1.0 | - | ±1.0 | μA |
| I _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 6.0 V | - | - | ±0.5 | - | ±5.0 | - | ±10.0 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V | - | - | 8.0 | - | 80 | - | 160 | μA |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|------------------|---------------------------|--|-------|------|------|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |
| 74HCT253 | | | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 4.5 V to 5.5 V | 2.0 | 1.6 | - | 2.0 | - | 2.0 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 4.5 V to 5.5 V | - | 1.2 | 0.8 | - | 0.8 | - | 0.8 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = -20 µA | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -6 mA | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = 20 µA | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 6.0 mA | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 5.5 V | - | - | ±0.1 | - | ±1.0 | - | ±1.0 | µA |
| I _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 V | - | - | ±0.5 | - | ±5.0 | - | ±10 | µA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 8.0 | - | 80 | - | 160 | µA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 2.1 V; other inputs at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V; I _O = 0 A | | | | | | | | |
| | | per input pin; 1In, 2In inputs | - | 40 | 144 | - | 180 | - | 196 | µA |
| | | per input pin; $\overline{\text{nOE}}$ input | - | 110 | 396 | - | 495 | - | 539 | µA |
| | | per input pin; Sn input | - | 110 | 396 | - | 495 | - | 539 | µA |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |

11. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); For test circuit see Fig. 8.

| Symbol | Parameter | Conditions | 25 °C | | -40 °C to +85 °C | -40 °C to +125 °C | Unit |
|----------------|-------------------------------|--|-------|-----|------------------|-------------------|------|
| | | | Typ | Max | Max | Max | |
| 74HC253 | | | | | | | |
| t_{pd} | propagation delay | 1In to 1Y or 2In to 2Y; see Fig. 6 [1] | | | | | |
| | | $V_{CC} = 2.0\text{ V}$ | 55 | 175 | 220 | 265 | ns |
| | | $V_{CC} = 4.5\text{ V}$ | 20 | 35 | 44 | 53 | ns |
| | | $V_{CC} = 5.0\text{ V}; C_L = 15\text{ pF}$ | 17 | - | - | - | ns |
| | | $V_{CC} = 6.0\text{ V}$ | 16 | 30 | 37 | 45 | ns |
| | | Sn to nY; see Fig. 6 | | | | | |
| | | $V_{CC} = 2.0\text{ V}$ | 58 | 175 | 220 | 265 | ns |
| | | $V_{CC} = 4.5\text{ V}$ | 21 | 35 | 44 | 53 | ns |
| | | $V_{CC} = 5.0\text{ V}; C_L = 15\text{ pF}$ | 18 | - | - | - | ns |
| | $V_{CC} = 6.0\text{ V}$ | 17 | 30 | 37 | 45 | ns | |
| t_{en} | enable time | n \overline{OE} to nY; see Fig. 7 [2] | | | | | |
| | | $V_{CC} = 2.0\text{ V}$ | 30 | 100 | 125 | 150 | ns |
| | | $V_{CC} = 4.5\text{ V}$ | 11 | 20 | 25 | 30 | ns |
| | | $V_{CC} = 6.0\text{ V}$ | 9 | 17 | 21 | 26 | ns |
| t_{dis} | disable time | n \overline{OE} to nY; see Fig. 7 [3] | | | | | |
| | | $V_{CC} = 2.0\text{ V}$ | 41 | 150 | 190 | 225 | ns |
| | | $V_{CC} = 4.5\text{ V}$ | 15 | 30 | 38 | 45 | ns |
| | | $V_{CC} = 6.0\text{ V}$ | 12 | 26 | 33 | 38 | ns |
| t_t | transition time | see Fig. 6 [4] | | | | | |
| | | $V_{CC} = 2.0\text{ V}$ | 14 | 60 | 75 | 90 | ns |
| | | $V_{CC} = 4.5\text{ V}$ | 5 | 12 | 15 | 18 | ns |
| | | $V_{CC} = 6.0\text{ V}$ | 4 | 10 | 13 | 15 | ns |
| C_{PD} | power dissipation capacitance | per multiplexer; $V_I = \text{GND to } V_{CC}$ [5] | 55 | - | - | - | pF |

| Symbol | Parameter | Conditions | 25 °C | | -40 °C to +85 °C | -40 °C to +125 °C | Unit |
|------------------|-------------------------------|--|-------|-----|------------------|-------------------|------|
| | | | Typ | Max | Max | Max | |
| 74HCT253 | | | | | | | |
| t _{pd} | propagation delay | 1In to 1Y or 2In to 2Y; see Fig. 6 [1] | | | | | |
| | | V _{CC} = 4.5 V | 20 | 38 | 48 | 57 | ns |
| | | V _{CC} = 5.0 V; C _L = 15 pF | 17 | - | - | - | ns |
| | | Sn to nY; see Fig. 6 | | | | | |
| | | V _{CC} = 4.5 V | 22 | 40 | 50 | 60 | ns |
| | | V _{CC} = 5.0 V; C _L = 15 pF | 19 | - | - | - | ns |
| t _{en} | enable time | n \overline{OE} to nY; V _{CC} = 4.5 V; see Fig. 7 [2] | 14 | 30 | 38 | 45 | ns |
| t _{dis} | disable time | n \overline{OE} to nY; V _{CC} = 4.5 V; see Fig. 7 [3] | 13 | 30 | 38 | 45 | ns |
| t _t | transition time | V _{CC} = 4.5 V; see Fig. 6 | 5 | 12 | 15 | 18 | ns |
| C _{PD} | power dissipation capacitance | per multiplexer; V _I = GND to V _{CC} - 1.5 V [5] | 55 | - | - | - | pF |

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

[2] t_{en} is the same as t_{PZH}, t_{PZL}.

[3] t_{dis} is the same as t_{PHZ}, t_{PLZ}.

[4] t_t is the same as t_{THL}, t_{TLH}.

[5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

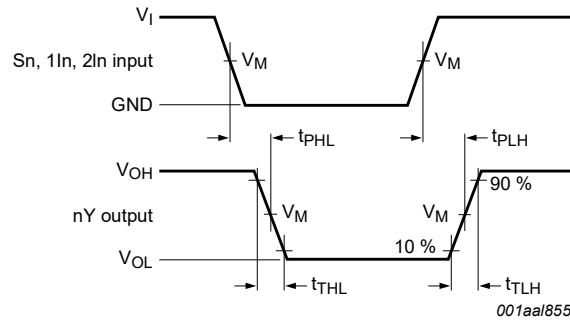
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

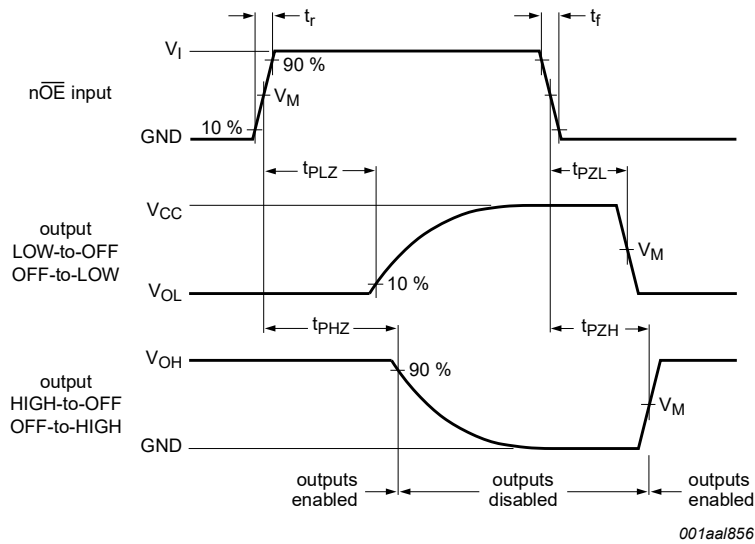
11.1. Waveforms and test circuit



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

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

Fig. 6. Propagation delays input (S_n , 1In, 2In) to output (nY) and output (nY) transition times



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

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

Fig. 7. 3-state output enable and disable times

Table 8. Measurement points

| Type | Input | Output |
|----------|-------------|-------------|
| | V_M | V_M |
| 74HC253 | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 74HCT253 | 1.3 V | 1.3 V |

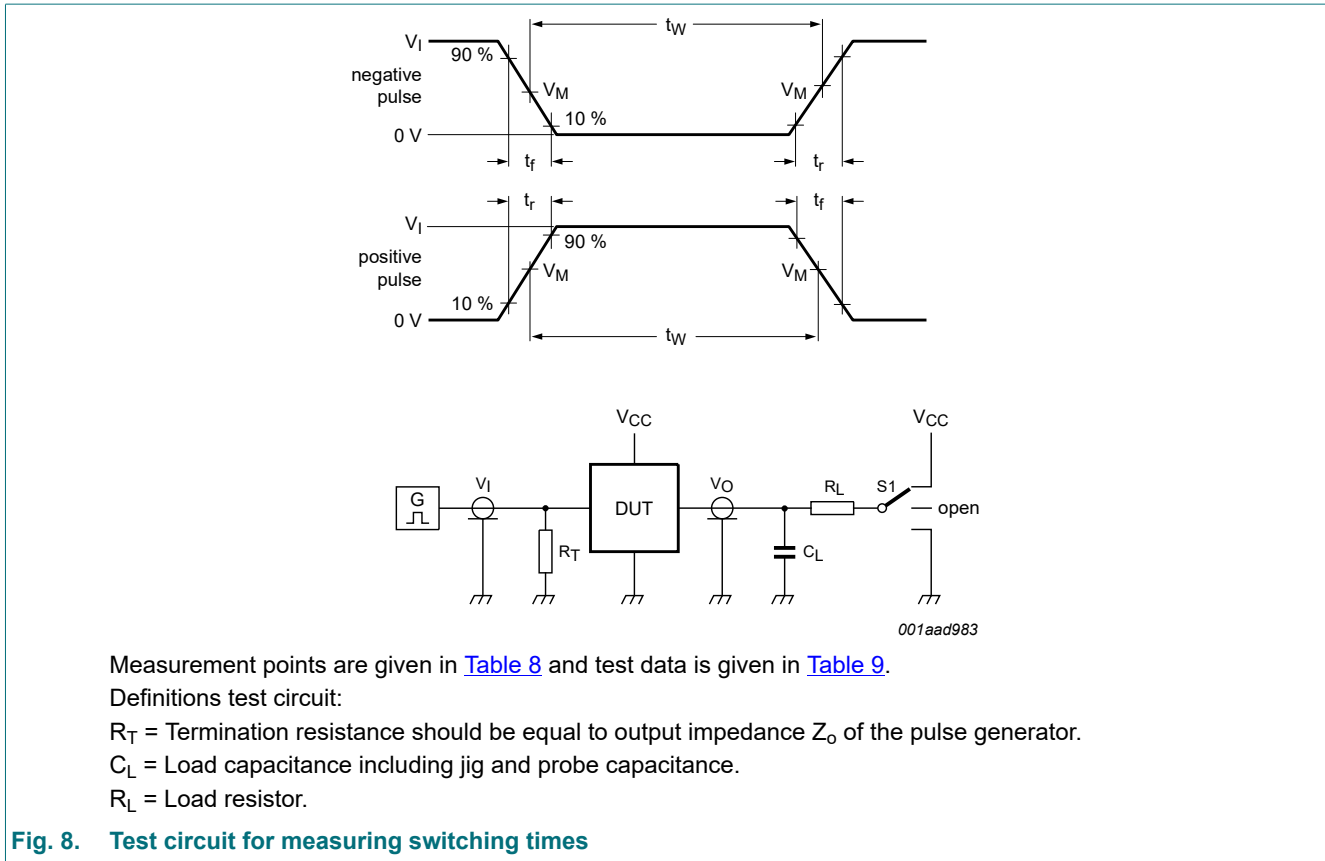


Table 9. Test data

| Type | Input | | Load | | Switch position | | |
|----------|----------|------------|-------|--------------|--------------------|--------------------|--------------------|
| | V_I | t_r, t_f | C_L | R_L | t_{PHL}, t_{PLH} | t_{PZH}, t_{PHZ} | t_{PZL}, t_{PLZ} |
| 74HC253 | V_{CC} | 6 ns | 50 pF | 1 k Ω | open | GND | V_{CC} |
| 74HCT253 | 3 V | 6 ns | 50 pF | 1 k Ω | open | GND | V_{CC} |

12. Package outline

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

SOT109-1

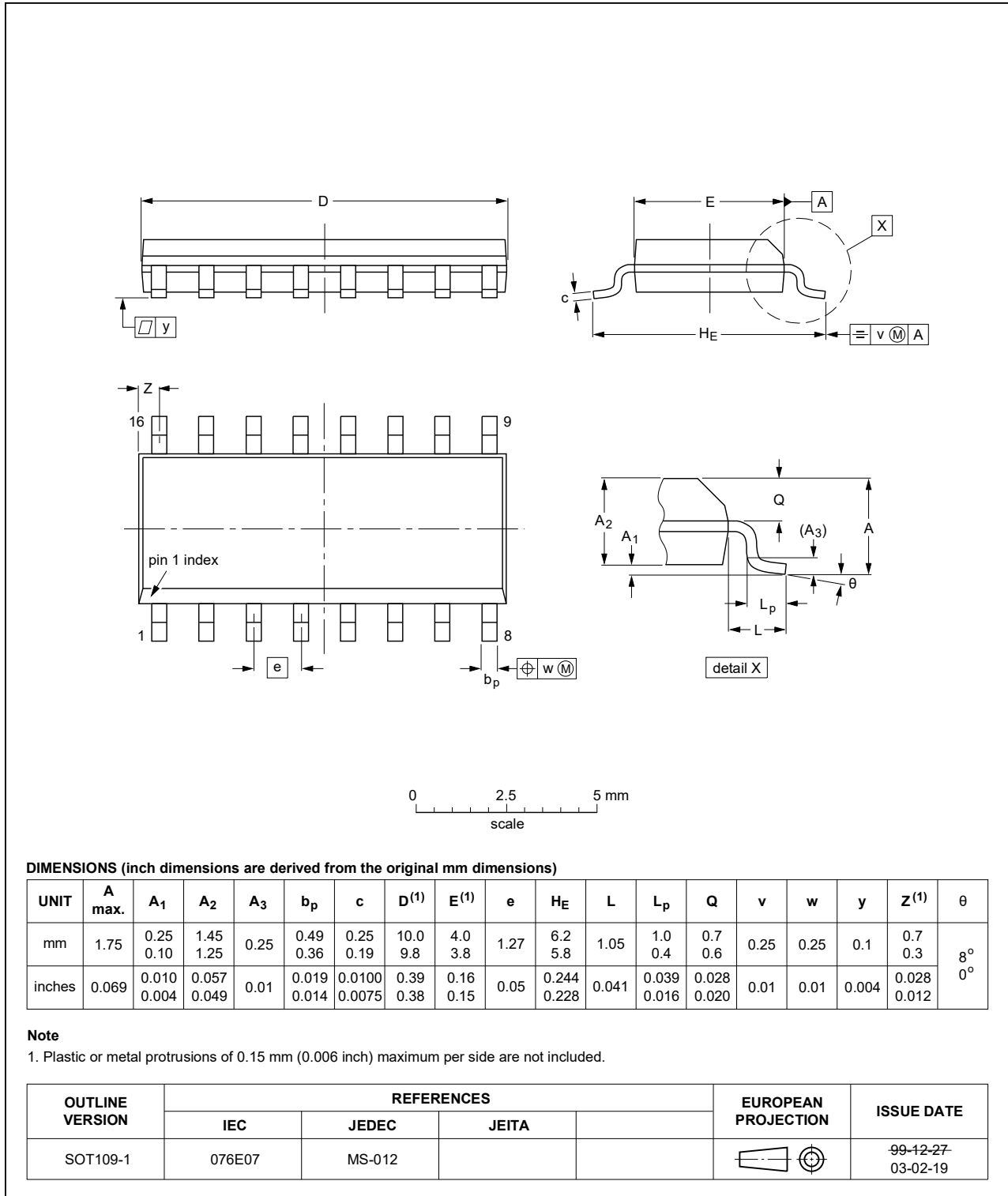


Fig. 9. Package outline SOT109-1 (SO16)

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

SOT403-1

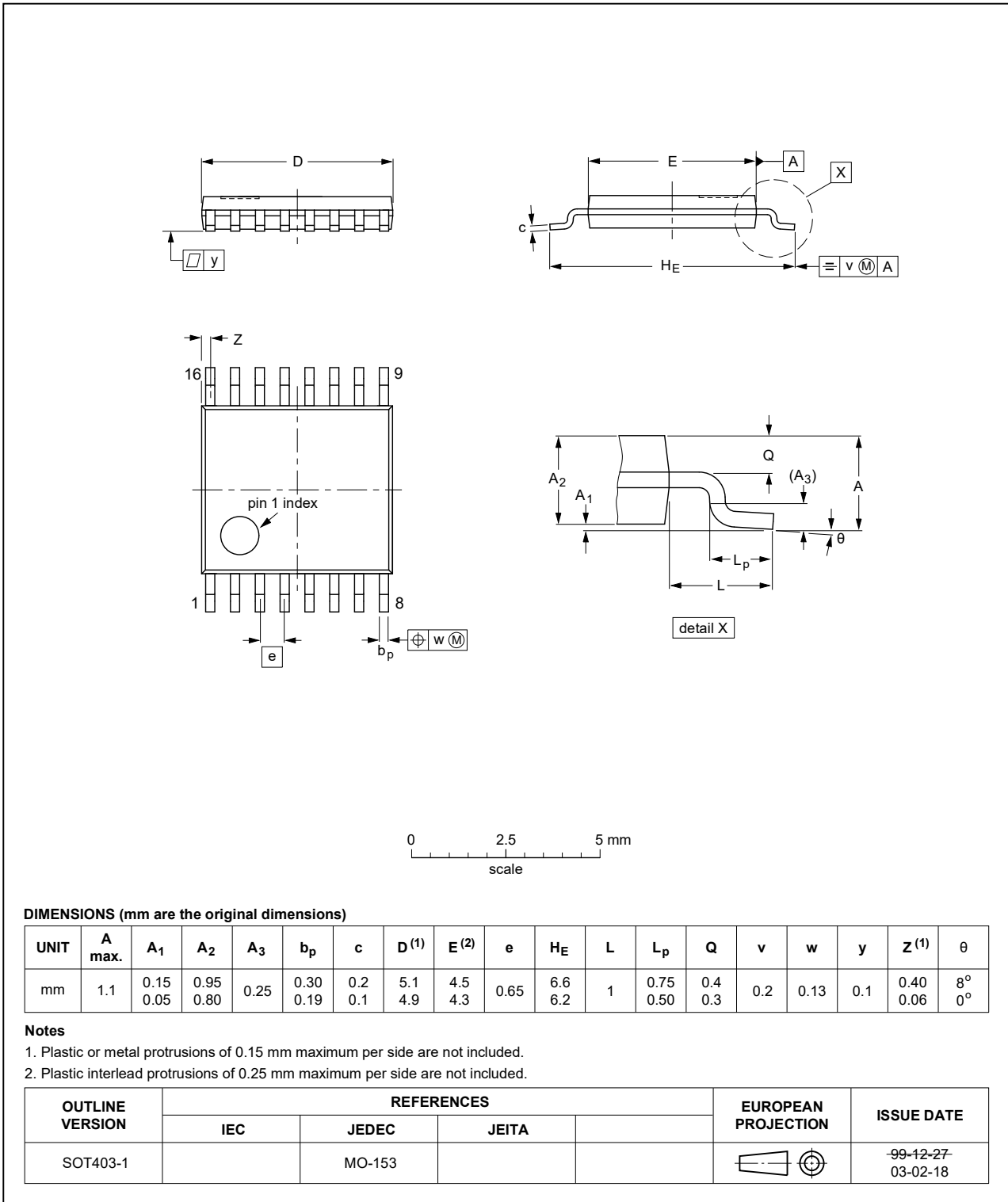


Fig. 10. Package outline SOT403-1 (TSSOP16)

13. 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 |

14. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------------|--|-----------------------|---------------|---------------------|
| 74HC_HCT253 v.8 | 20211018 | Product data sheet | - | 74HC_HCT253 v.7 |
| Modifications: | <ul style="list-style-type: none"> Type number 74HCT253PW (SOT403-1/TSSOP16) added. | | | |
| 74HC_HCT253 v.7 | 20210816 | Product data sheet | - | 74HC_HCT253 v.6 |
| Modifications: | <ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Type numbers 74HC253DB and 74HCT253DB (SOT338-1/SSOP16) removed. Type number 74HC253PW (SOT403-1/TSSOP16) added. Section 2 updated. Section 8: Derating values for P_{tot} total power dissipation updated. | | | |
| 74HC_HCT253 v.6 | 20160201 | Product data sheet | - | 74HC_HCT253 v.5 |
| Modifications: | <ul style="list-style-type: none"> Type numbers 74HC253N and 74HCT253N (SOT38-4) removed. | | | |
| 74HC_HCT253 v.5 | 20150121 | Product data sheet | - | 74HC_HCT253 v.4 |
| Modifications: | <ul style="list-style-type: none"> Table 7: Power dissipation capacitance condition for 74HCT253 is corrected. | | | |
| 74HC_HCT253 v.4 | 20111212 | Product data sheet | - | 74HC_HCT253 v.3 |
| Modifications: | <ul style="list-style-type: none"> Legal pages updated. | | | |
| 74HC_HCT253 v.3 | 20100422 | Product data sheet | - | 74HC_HCT253_CNV v.2 |
| 74HC_HCT253_CNV v.2 | 970828 | Product specification | - | - |

15. Legal information

Data sheet status

| Document status [1][2] | Product status [3] | 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. |

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

| | |
|--|-----------|
| 1. General description | 1 |
| 2. Features and benefits | 1 |
| 3. Applications | 1 |
| 4. Ordering information | 1 |
| 5. Functional diagram | 2 |
| 6. Pinning information | 3 |
| 6.1. Pinning..... | 3 |
| 6.2. Pin description..... | 3 |
| 7. Functional description | 4 |
| 8. Limiting values | 4 |
| 9. Recommended operating conditions | 5 |
| 10. Static characteristics | 5 |
| 11. Dynamic characteristics | 7 |
| 11.1. Waveforms and test circuit..... | 9 |
| 12. Package outline | 11 |
| 13. Abbreviations | 13 |
| 14. Revision history | 13 |
| 15. Legal information | 14 |

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For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: salesaddresses@nexperia.com

Date of release: 18 October 2021