

74HC241; 74HCT241

Octal buffer/line driver; 3-state

Rev. 4 — 15 July 2021

Product data sheet

1. General description

The 74HC241; 74HCT241 is an 8-bit buffer/line driver with 3-state outputs. The device can be used as two 4-bit buffers or one 8-bit buffer. The device features two output enables (1OE and 2OE), each controlling four of the 3-state outputs. A HIGH on 1OE or LOW on 2OE causes the associated 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} .

The 74HCT241 device features reduced input threshold levels to allow interfacing to TTL logic levels.

2. Features and benefits

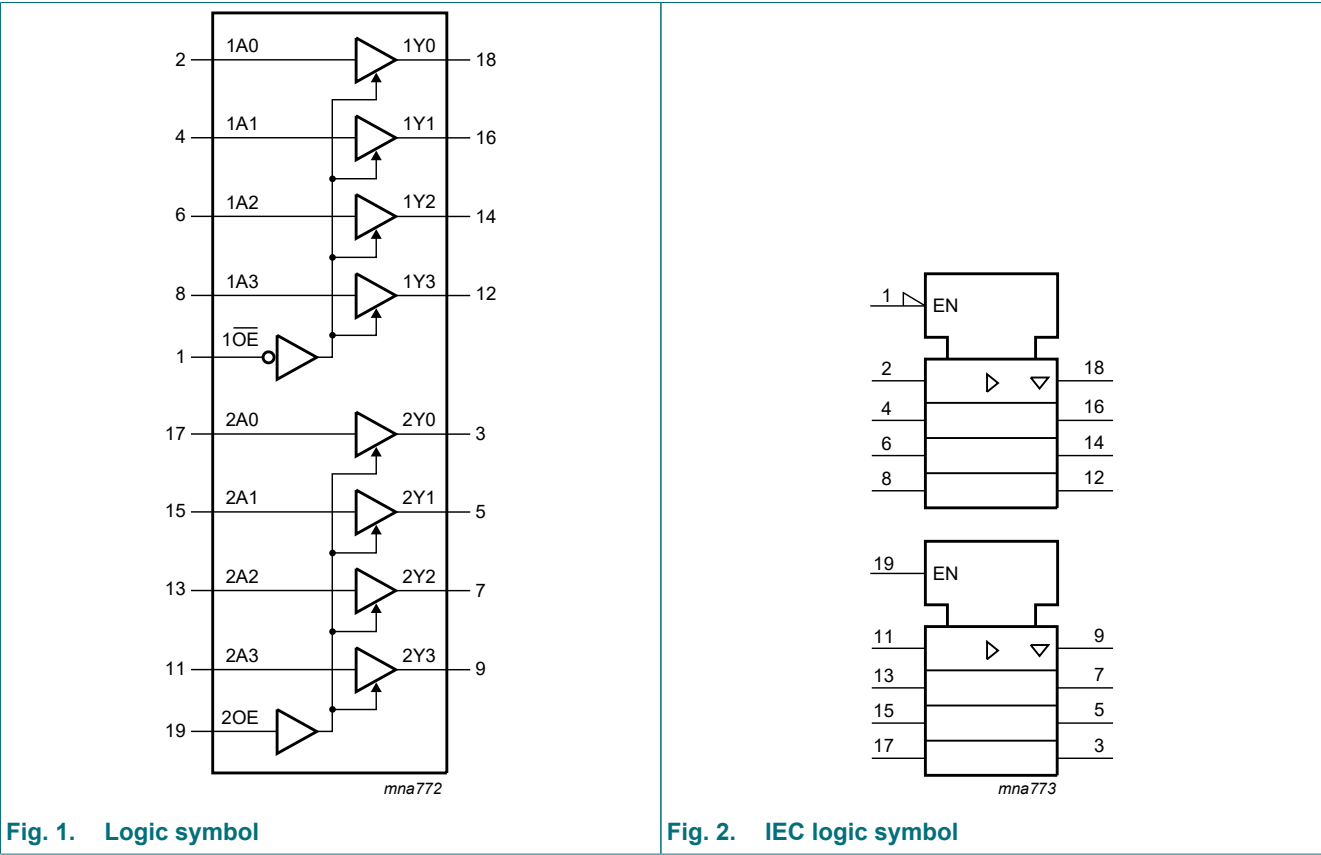
- Wide supply voltage range from 2.0 to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Input levels:
 - For 74HC241: CMOS level
 - For 74HCT241: TTL level
- Octal bus interface
- Non-inverting 3-state outputs
- Complies with 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 $+85^{\circ}\text{C}$ and -40°C to $+125^{\circ}\text{C}$

3. Ordering information

Table 1. Ordering information

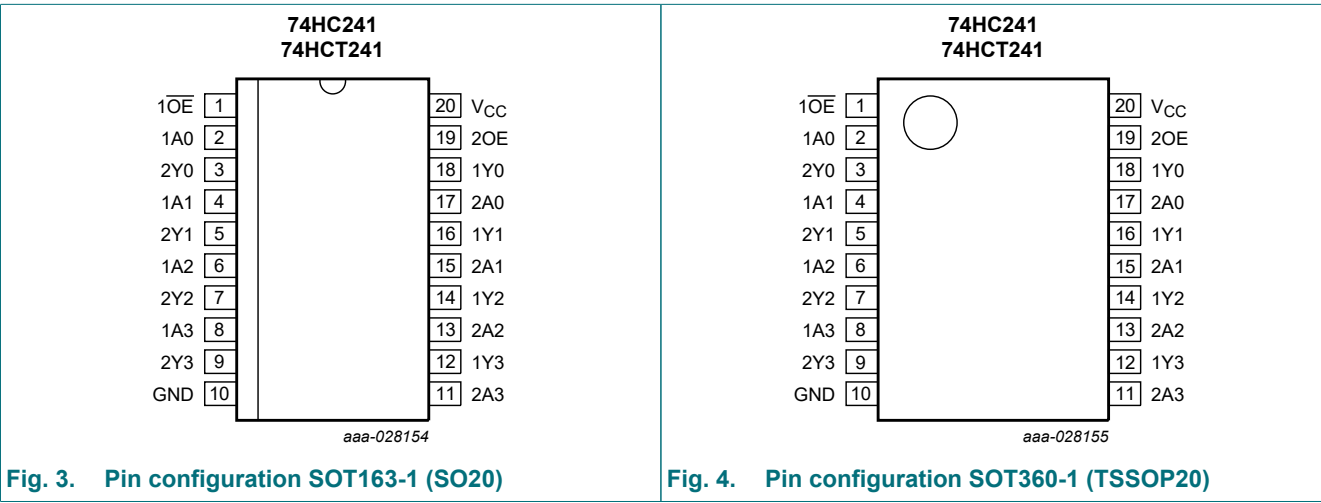
| Type number | Package | | | |
|-------------|---|---------|---|----------|
| | Temperature range | Name | Description | Version |
| 74HC241D | -40°C to $+125^{\circ}\text{C}$ | SO20 | plastic small outline package; 20 leads; body width 7.5 mm | SOT163-1 |
| 74HCT241D | | | | |
| 74HC241PW | -40°C to $+125^{\circ}\text{C}$ | TSSOP20 | plastic thin shrink small outline package; 20 leads; body width 4.4 mm | SOT360-1 |
| 74HCT241PW | | | | |

4. Functional diagram



5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|--------------------|----------------|-----------------------------------|
| 1OE | 1 | output enable input (active LOW) |
| 1A0, 1A1, 1A2, 1A3 | 2, 4, 6, 8 | data input |
| 2A0, 2A1, 2A2, 2A3 | 17, 15, 13, 11 | data input |
| GND | 10 | ground (0 V) |
| 1Y0, 1Y1, 1Y2, 1Y3 | 18, 16, 14, 12 | data output |
| 2Y0, 2Y1, 2Y2, 2Y3 | 3, 5, 7, 9 | data output |
| 2OE | 19 | output enable input (active HIGH) |
| V _{CC} | 20 | supply voltage |

6. Functional description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level; X = Don't care; Z = High impedance "OFF" state

| Inputs | | Outputs | Inputs | | Outputs |
|--------|-----|---------|--------|-----|---------|
| 1OE | 1An | 1Yn | 2OE | 2An | 2Yn |
| L | L | L | H | L | L |
| L | H | H | H | H | H |
| H | X | Z | L | X | Z |

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 | V |
| I _{IK} | input clamping current | V _I < -0.5 V or V _I > V _{CC} + 0.5 V | - | ±20 | mA |
| I _{OK} | output clamping current | V _O < -0.5 V or V _O > V _{CC} + 0.5 V | - | ±20 | mA |
| I _O | output current | -0.5 V < V _O < V _{CC} + 0.5 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 | [1] | - | 500 | mW |

- [1] For SOT163-1 (SO20) package: P_{tot} derates linearly with 12.3 mW/K above 109 °C.
 For SOT360-1 (TSSOP20) package: P_{tot} derates linearly with 10.0 mW/K above 100 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

| Symbol | Parameter | Conditions | 74HC241 | | | 74HCT241 | | | 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 |
| $\Delta t/\Delta V$ | 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 |
| T _{amb} | ambient temperature | | -40 | - | +125 | -40 | - | +125 | °C |

9. 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 | |
| 74HC241 | | | | | | | | | | |
| 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 _{CC} = 6.0 V; V _O = V _{CC} or GND | - | - | ±0.5 | - | ±5.0 | - | ±10 | 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 |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |

| Symbol | Parameter | Conditions | 25 °C | | | −40 °C to +85 °C | | −40 °C to +125 °C | | Unit |
|------------------|---------------------------|---|-------|------|------|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HCT241 | | | | | | | | | | |
| 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 | - | 0.16 | 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 _{CC} = 5.5 V; V _O = V _{CC} or GND | - | - | ±0.5 | - | ±5.0 | - | ±10 | µA |
| I _{CC} | supply current | V _I = V _{CC} or GND; V _{CC} = 5.5 V; I _O = 0 A | - | - | 8.0 | - | 80 | - | 160 | µA |
| ΔI _{CC} | additional supply current | per input pin; V _{CC} = 4.5 V to 5.5 V; V _I = V _{CC} - 2.1 V; other inputs at V _{CC} or GND; I _O = 0 A | | | | | | | | |
| | | nAn; 1OE | - | 70 | 252 | - | 315 | - | 343 | µA |
| | | 2OE | - | 150 | 540 | - | 675 | - | 735 | µA |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |

10. 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 |
|-----------------|-------------------|---|--------|-----|-----|------------------|-----|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC241 | | | | | | | | | | |
| t _{pd} | propagation delay | nAn to nYn; see Fig. 5 [1] | | | | | | | | |
| | | V _{CC} = 2.0 V | - | 25 | 100 | - | 125 | - | 150 | ns |
| | | V _{CC} = 4.5 V | - | 9 | 20 | - | 25 | - | 30 | ns |
| | | V _{CC} = 5.0 V; C _L = 15 pF | - | 7 | - | - | - | - | - | ns |
| | | V _{CC} = 6.0 V | - | 7 | 17 | - | 21 | - | 26 | ns |
| t _{en} | enable time | 1OE to 1Yn; see Fig. 6 ; 2OE to 2Yn; see Fig. 7 [2] | | | | | | | | |
| | | V _{CC} = 2.0 V | - | 30 | 150 | - | 190 | - | 225 | ns |
| | | V _{CC} = 4.5 V | - | 11 | 30 | - | 38 | - | 45 | ns |
| | | V _{CC} = 6.0 V | - | 9 | 26 | - | 33 | - | 38 | ns |

| Symbol | Parameter | Conditions | +25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|------------------|-------------------------------|---|--------|-----|-----|------------------|-----|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{dis} | disable time | 1OE to 1Yn; see Fig. 6; 2OE to 2Yn; see Fig. 7 [3] | | | | | | | | |
| | | V _{CC} = 2.0 V | - | 39 | 150 | - | 190 | - | 225 | ns |
| | | V _{CC} = 4.5 V | - | 14 | 30 | - | 38 | - | 45 | ns |
| | | V _{CC} = 6.0 V | - | 11 | 26 | - | 33 | - | 38 | ns |
| t _t | transition time | see Fig. 5 [4] | | | | | | | | |
| | | V _{CC} = 2.0 V | - | 14 | 60 | - | 75 | - | 90 | ns |
| | | V _{CC} = 4.5 V | - | 5 | 12 | - | 15 | - | 18 | ns |
| | | V _{CC} = 6.0 V | - | 4 | 10 | - | 13 | - | 15 | ns |
| C _{PD} | power dissipation capacitance | per buffer; V _I = GND to V _{CC} [5] | - | 30 | - | - | - | - | - | pF |
| 74HCT241 | | | | | | | | | | |
| t _{pd} | propagation delay | nAn to nYn; see Fig. 5 [1] | | | | | | | | |
| | | V _{CC} = 4.5 V | - | 13 | 22 | - | 28 | - | 33 | ns |
| | | V _{CC} = 5.0 V; C _L = 15 pF | - | 11 | - | - | - | - | - | ns |
| t _{en} | enable time | 1OE to 1Yn; see Fig. 6; 2OE to 2Yn; see Fig. 7; V _{CC} = 4.5 V [2] | - | 15 | 30 | - | 38 | - | 45 | ns |
| t _{dis} | disable time | 1OE to 1Yn; see Fig. 6; 2OE to 2Yn; see Fig. 7; V _{CC} = 4.5 V [3] | - | 18 | 30 | - | 38 | - | 45 | ns |
| t _t | transition time | V _{CC} = 4.5 V; see Fig. 5 [4] | - | 5 | 12 | - | 15 | - | 18 | ns |
| C _{PD} | power dissipation capacitance | per buffer; V _I = GND to V _{CC} - 1.5 V [5] | - | 30 | - | - | - | - | - | pF |

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

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

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

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

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

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

where:

f_i = input frequency in MHz;

f_o = output frequency in MHz;

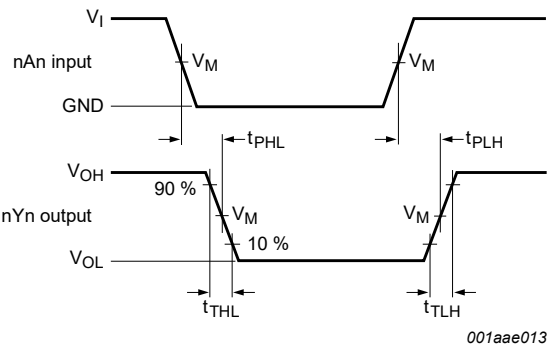
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

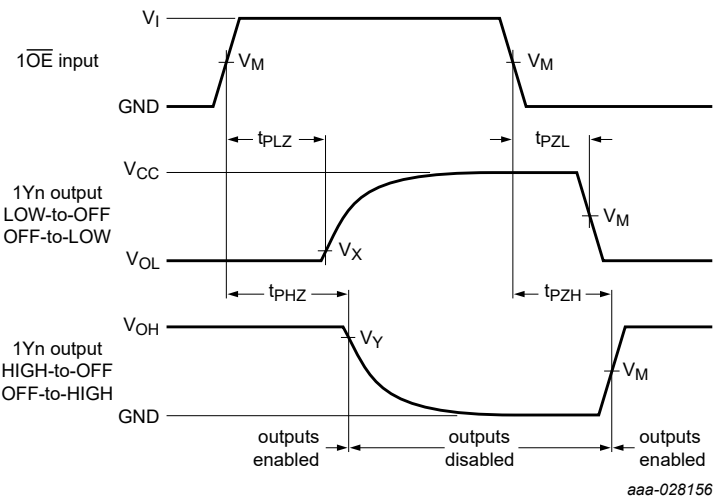
∑(C_L V_{CC}² f_o) = sum of outputs.

10.1. Waveforms and test circuit



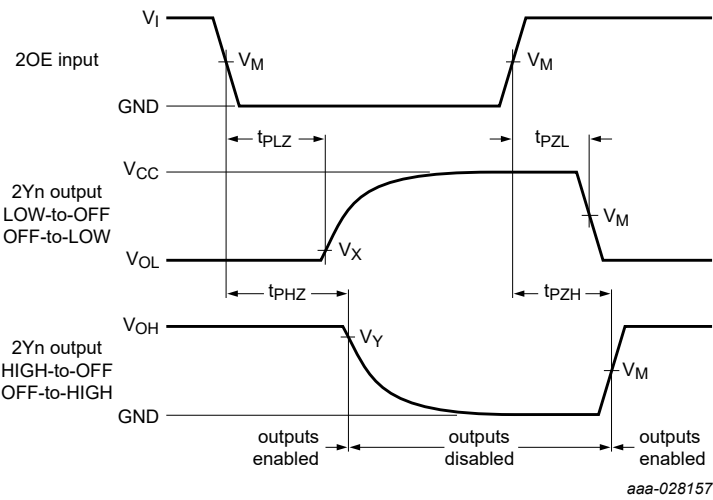
See Table 8 for measurement points.
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig. 5. Input (nAn) to output (nYn) propagation delays and output transition times



See Table 8 for measurement points.
 V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 6. 3-state output (1OE to 1Yn) enable and disable times



See Table 8 for measurement points.
 V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 7. 3-state output (2OE to 2Yn) enable and disable times

Table 8. Measurement points

| Type | Input | | Output | | |
|----------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | V _I | V _M | V _M | V _X | V _Y |
| 74HC241 | GND to V _{CC} | 0.5 x V _{CC} | 0.5 x V _{CC} | 0.1 x V _{CC} | 0.9 x V _{CC} |
| 74HCT241 | GND to 3 V | 1.3 V | 1.3 V | 0.1 x V _{CC} | 0.9 x V _{CC} |

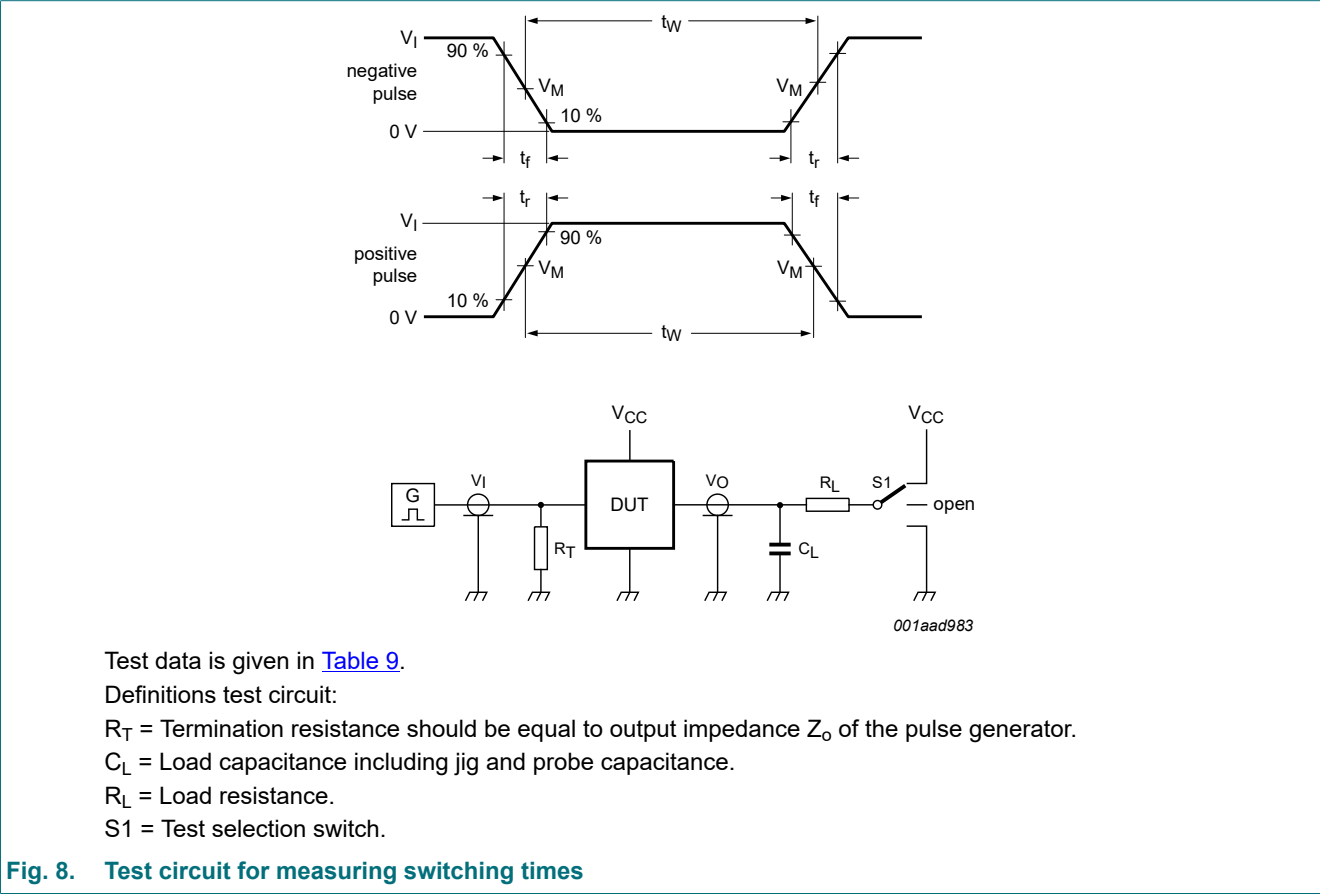


Fig. 8. Test circuit for measuring switching times

Table 9. Test data

| Type | Input | | Load | | S1 position | | |
|----------|------------------------|---------------------------------|----------------|----------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | V _I | t _r , t _f | C _L | R _L | t _{PHL} , t _{PLH} | t _{PZH} , t _{PHZ} | t _{PZL} , t _{PLZ} |
| 74HC241 | GND to V _{CC} | 6 ns | 50 pF | 1 kΩ | open | GND | V _{CC} |
| 74HCT241 | GND to 3 V | 6 ns | 50 pF | 1 kΩ | open | GND | V _{CC} |

11. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1

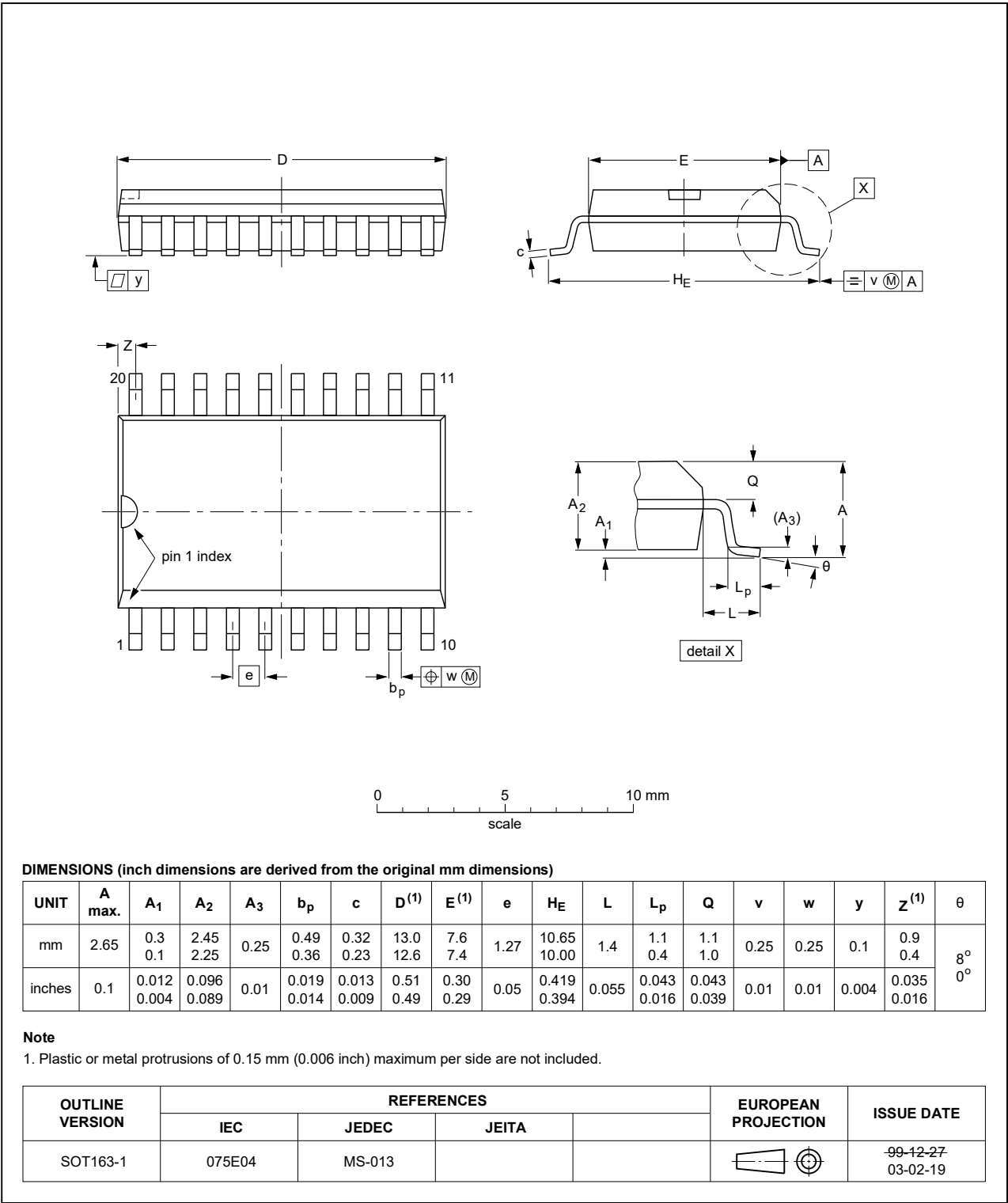


Fig. 9. Package outline SOT163-1 (SO20)

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1

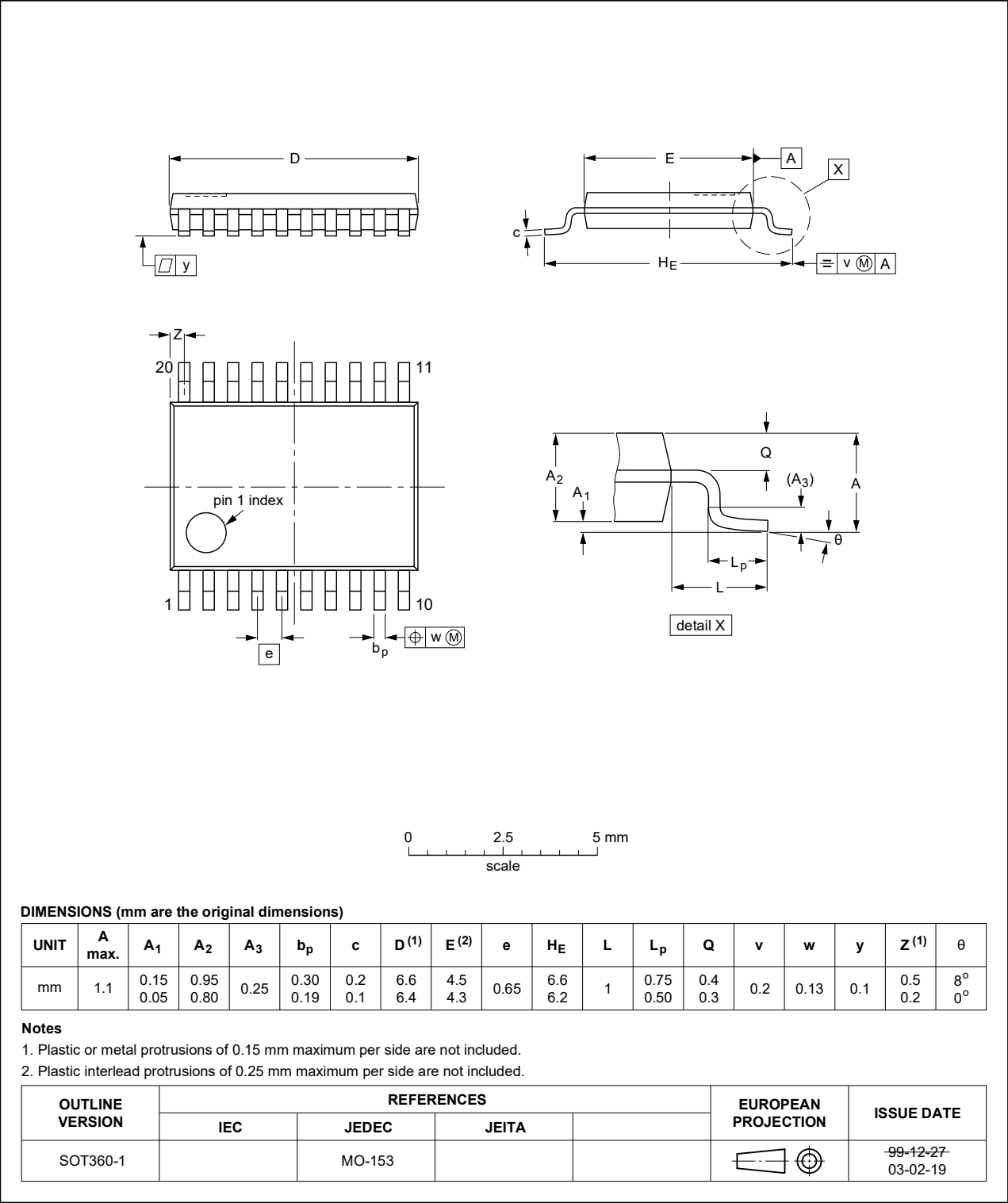


Fig. 10. Package outline SOT360-1 (TSSOP20)

12. 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 |

13. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------|--|--------------------|---------------|-----------------|
| 74HC_HCT241 v.4 | 20210715 | Product data sheet | - | 74HC_HCT241 v.3 |
| Modifications: | <ul style="list-style-type: none">Type numbers 74HC241DB and 74HCT241DB (SOT339-1/SSOP20) removed.Section 2 updated.Section 7: Derating values for P_{tot} total power dissipation updated. | | | |
| 74HC_HCT241 v.3 | 20180220 | Product data sheet | - | 74HC_HCT241 v.2 |
| 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. | | | |
| 74HC_HCT241 v.2 | 19930801 | Product data sheet | - | 74HC_HCT241 v.1 |

14. 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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