

74ALVC244

Octal buffer/line driver; 3-state

Rev. 4 — 10 October 2017

Product data sheet

1 General description

The 74ALVC244 is a high-performance, low-power, low-voltage, Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

The 74ALVC244 is an octal non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs $1\overline{OE}$ and $2\overline{OE}$. A HIGH on $n\overline{OE}$ causes the outputs to assume a high-impedance OFF-state. Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times.

2 Features and benefits

- Wide supply voltage range from 1.65 V to 3.6 V
- 3.6 V tolerant inputs/outputs
- CMOS low power consumption
- Direct interface with TTL levels (2.7 V to 3.6 V)
- Power-down mode
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standards:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
 - HBM JESD22-A114E exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V

3 Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|-------------|-------------------|----------|--|----------|
| | Temperature range | Name | Description | Version |
| 74ALVC244D | -40 °C to +85 °C | SO20 | plastic small outline package; 20 leads; body width 7.5 mm | SOT163-1 |
| 74ALVC244PW | -40 °C to +85 °C | TSSOP20 | plastic thin shrink small outline package; 20 leads; body width 4.4 mm | SOT360-1 |
| 74ALVC244BQ | -40 °C to +85 °C | DHVQFN20 | plastic dual-in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm | SOT764-1 |

4 Functional diagram

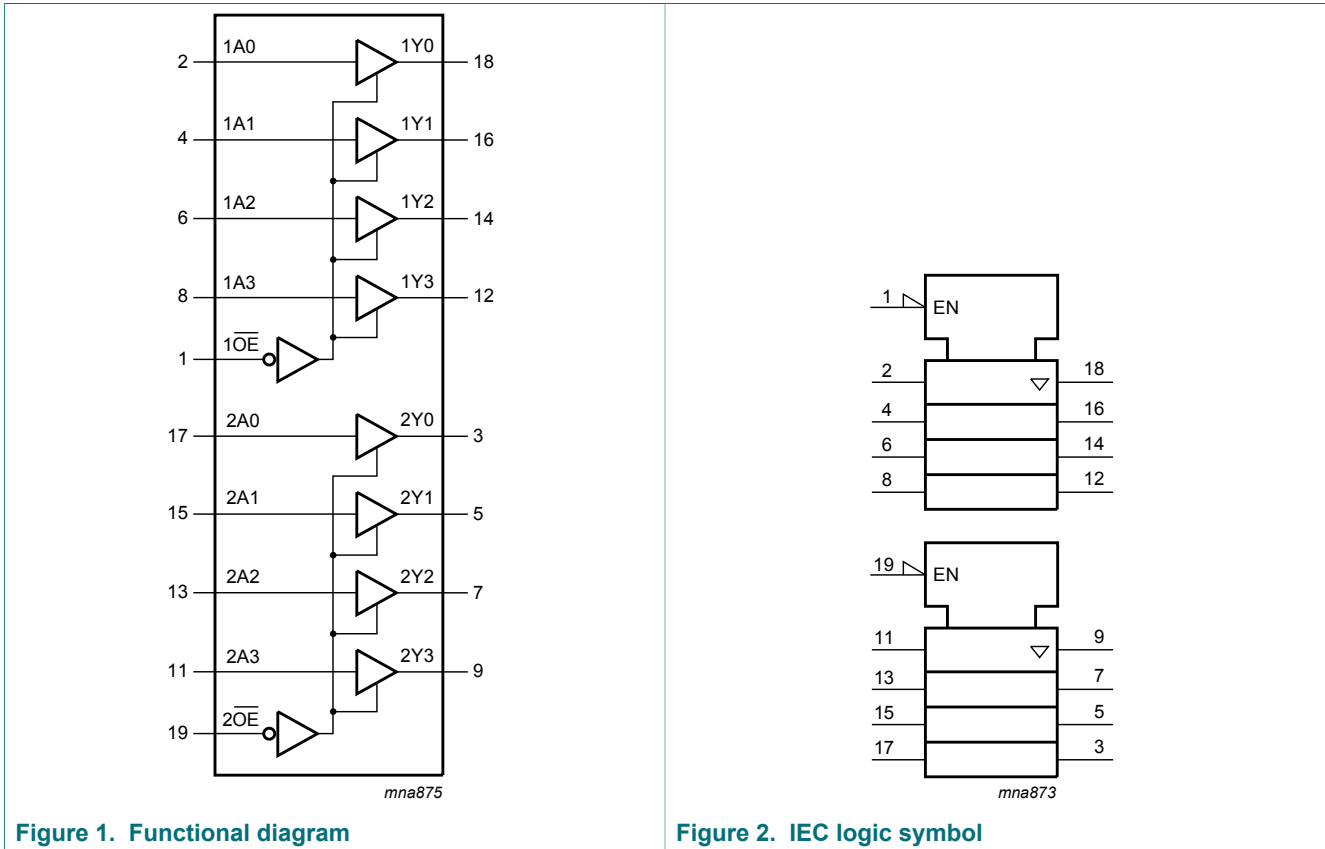


Figure 1. Functional diagram

Figure 2. IEC logic symbol

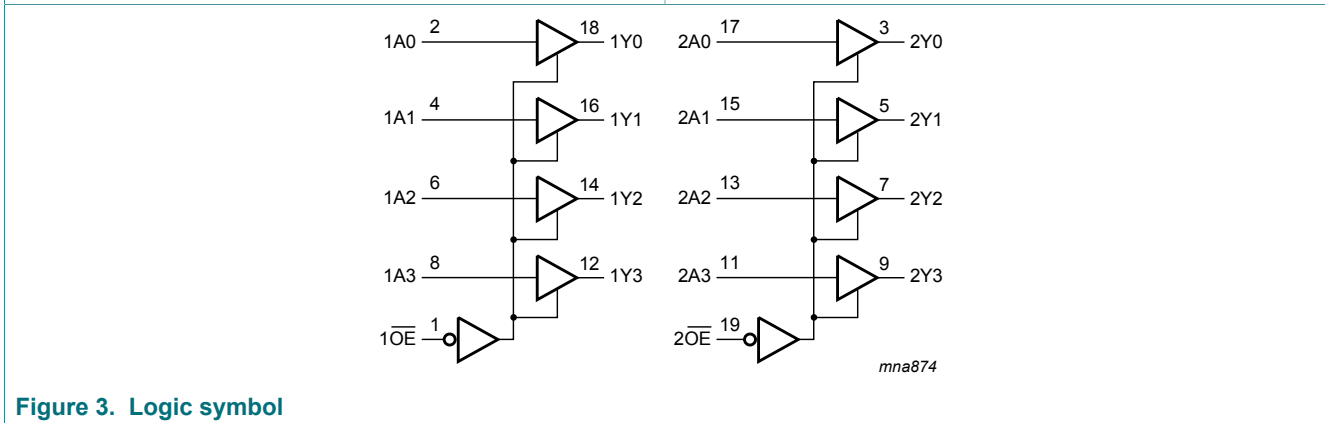
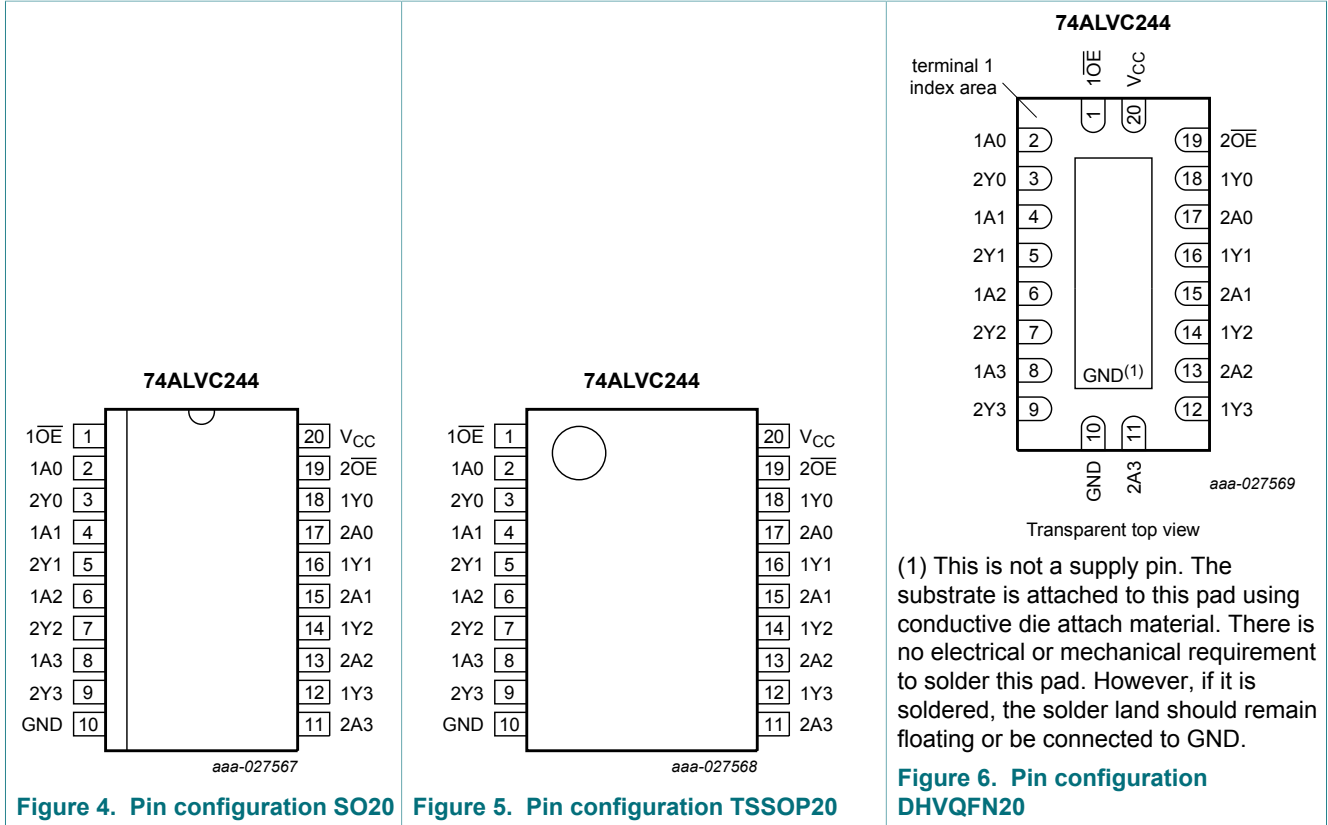


Figure 3. Logic symbol

5 Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

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

6 Functional description

Table 3. Function table ^[1]

| Input | | Output |
|-------|-----|--------|
| nOE | nAn | nYn |
| L | L | L |
| L | H | H |
| H | X | Z |

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

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 | +4.6 | V |
| V _I | input voltage | | ^[1] -0.5 | +4.6 | V |
| V _O | output voltage | output HIGH or LOW state | ^[1] -0.5 | V _{CC} + 0.5 | V |
| | | output OFF-state | -0.5 | +4.6 | V |
| | | power-down mode, V _{CC} = 0 V | ^[2] -0.5 | +4.6 | V |
| I _{IK} | input clamping current | V _I < 0 V | - | -50 | mA |
| I _{OK} | output clamping current | V _O > V _{CC} or V _O < 0 V | - | ±50 | mA |
| I _O | output current | V _O = 0 V to V _{CC} | - | ±50 | mA |
| I _{CC} | supply current | | - | 100 | mA |
| I _{GND} | ground current | | -100 | - | mA |
| T _{stg} | storage temperature | | -65 | +150 | °C |
| P _{tot} | total power dissipation | T _{amb} = -40 °C to +85 °C | ^[3] - | 500 | mW |

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

[2] When V_{CC} = 0 V (power-down mode), the output voltage can be 3.6 V in normal operation.

[3] For SO20 packages: above 70 °C derate linearly with 8 mW/K.

For TSSOP20 packages: above 60 °C derate linearly with 5.5 mW/K.

For DHVQFN20 packages: above 60 °C derate linearly with 4.5 mW/K.

8 Recommended operating conditions

Table 5. Recommended operating conditions

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---------------------|-------------------------------------|--|------|----------|------|
| V_{CC} | supply voltage | | 1.65 | 3.6 | V |
| V_I | input voltage | | 0 | 3.6 | V |
| V_O | output voltage | $V_{CC} = 1.65$ to 3.6 V; output HIGH or LOW state | 0 | V_{CC} | V |
| | | $V_{CC} = 1.65$ to 3.6 V; output OFF-state | 0 | 3.6 | V |
| | | $V_{CC} = 0$ V; power-down mode | 0 | 3.6 | V |
| T_{amb} | ambient temperature | in free air | -40 | +85 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 1.65$ V to 2.7 V | 0 | 20 | ns/V |
| | | $V_{CC} = 2.7$ V to 3.6 V | 0 | 10 | ns/V |

9 Static characteristics

Table 6. Static characteristics

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

| Symbol | Parameter | Conditions | $T_{amb} = -40$ °C to $+85$ °C | | | Unit |
|----------------------------------|---------------------------|--|--------------------------------|--------------------|----------------------|------|
| | | | Min | Typ ^[1] | Max | |
| V_{IH} | HIGH-level input voltage | $V_{CC} = 1.65$ V to 1.95 V | $0.65 \times V_{CC}$ | - | - | V |
| | | $V_{CC} = 2.3$ V to 2.7 V | 1.7 | - | - | V |
| | | $V_{CC} = 2.7$ V to 3.6 V | 2.0 | - | - | V |
| V_{IL} | LOW-level input voltage | $V_{CC} = 1.65$ V to 1.95 V | - | - | $0.35 \times V_{CC}$ | V |
| | | $V_{CC} = 2.3$ V to 2.7 V | - | - | 0.7 | V |
| | | $V_{CC} = 2.7$ V to 3.6 V | - | - | 0.8 | V |
| V_{OH} | HIGH-level output voltage | $V_I = V_{IH}$ or V_{IL} | | | | |
| | | $I_O = -100$ μ A; $V_{CC} = 1.65$ V to 3.6 V | $V_{CC} - 0.2$ | - | - | V |
| | | $I_O = -6$ mA; $V_{CC} = 1.65$ V | 1.25 | - | - | V |
| | | $I_O = -12$ mA; $V_{CC} = 2.3$ V | 1.8 | - | - | V |
| | | $I_O = -18$ mA; $V_{CC} = 2.3$ V | 1.7 | - | - | V |
| | | $I_O = -12$ mA; $V_{CC} = 2.7$ V | 2.2 | - | - | V |
| | | $I_O = -18$ mA; $V_{CC} = 3.0$ V | 2.4 | - | - | V |
| $I_O = -24$ mA; $V_{CC} = 3.0$ V | 2.2 | - | - | V | | |

| Symbol | Parameter | Conditions | $T_{amb} = -40\text{ }^{\circ}\text{C to }+85\text{ }^{\circ}\text{C}$ | | | Unit |
|------------------|---------------------------|--|--|--------------------|------|------|
| | | | Min | Typ ^[1] | Max | |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = 100 μA; V _{CC} = 1.65 V to 3.6 V | - | - | 0.2 | V |
| | | I _O = 6 mA; V _{CC} = 1.65 V | - | - | 0.3 | V |
| | | I _O = 12 mA; V _{CC} = 2.3 V | - | - | 0.4 | V |
| | | I _O = 18 mA; V _{CC} = 2.3 V | - | - | 0.6 | V |
| | | I _O = 12 mA; V _{CC} = 2.7 V | - | - | 0.4 | V |
| | | I _O = 18 mA; V _{CC} = 3.0 V | - | - | 0.4 | V |
| | | I _O = 24 mA; V _{CC} = 3.0 V | - | - | 0.55 | V |
| I _I | input leakage current | V _{CC} = 3.6 V; V _I = 3.6 V or GND | - | ±0.1 | ±5 | μA |
| I _{OZ} | OFF-state output current | V _{CC} = 3.6 V; V _I = V _{IH} or V _{IL} ; V _O = 3.6 V or GND | - | 0.1 | ±10 | μA |
| I _{OFF} | power-off leakage current | V _{CC} = 0 V; V _I or V _O = 3.6 V | - | ±0.1 | ±10 | μA |
| I _{CC} | supply current | V _{CC} = 3.6 V; V _I = V _{CC} or GND; I _O = 0 A | - | 0.2 | 20 | μA |
| ΔI _{CC} | additional supply current | per input pin; V _{CC} = 3.0 V to 3.6 V; V _I = V _{CC} - 0.6 V; I _O = 0 A | - | 5 | 750 | μA |
| C _I | input capacitance | | - | 3.5 | - | pF |

[1] All typical values are measured at $T_{amb} = 25\text{ }^{\circ}\text{C}$.

10 Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit, see [Figure 9](#).

| Symbol | Parameter | Conditions | T _{amb} = -40 °C to +85 °C | | | Unit |
|------------------|-------------------------------|--|-------------------------------------|--------------------|-----|------|
| | | | Min | Typ ^[1] | Max | |
| t _{pd} | propagation delay | nAn to nYn; see Figure 7 ^[2] | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.0 | 2.7 | 4.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.0 | 2.0 | 3.1 | ns |
| | | V _{CC} = 2.7 V | 1.0 | 2.3 | 3.1 | ns |
| t _{en} | enable time | n $\overline{O}E$ to nYn; see Figure 8 ^[3] | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.0 | 3.4 | 6.9 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.0 | 2.6 | 5.4 | ns |
| | | V _{CC} = 2.7 V | 1.0 | 3.2 | 5.3 | ns |
| t _{dis} | disable time | n $\overline{O}E$ to nYn; see Figure 8 ^[4] | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.0 | 3.8 | 5.9 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.0 | 2.2 | 4.1 | ns |
| | | V _{CC} = 2.7 V | 1.0 | 3.0 | 4.4 | ns |
| C _{PD} | power dissipation capacitance | per buffer; V _I = GND to V _{CC} ; V _{CC} = 3.3 V ^[5] | - | 20 | - | pF |
| | | V _{CC} = 3.0 V to 3.6 V | 1.0 | 2.9 | 4.2 | ns |
| | | V _{CC} = 2.7 V | 1.0 | 3.0 | 4.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.0 | 2.2 | 4.1 | ns |

[1] Typical values are measured at T_{amb} = 25 °C

Typical values for V_{CC} = 1.65 V to 1.95 V are measured at V_{CC} = 1.8 V

Typical values for V_{CC} = 2.3 V to 2.7 V are measured at V_{CC} = 2.5 V

Typical values for V_{CC} = 3.0 V to 3.6 V are measured at V_{CC} = 3.3 V

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

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

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

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

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

f_i = input frequency in MHz

f_o = output frequency in MHz

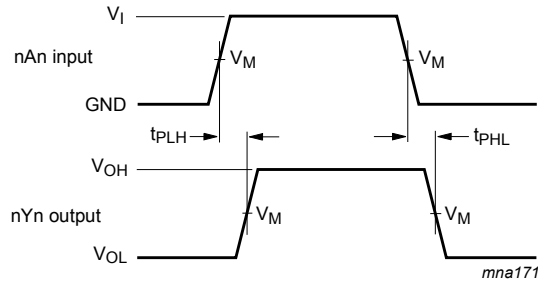
C_L = output load capacitance in pF

V_{CC} = supply voltage in Volt

N = number of inputs switching

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

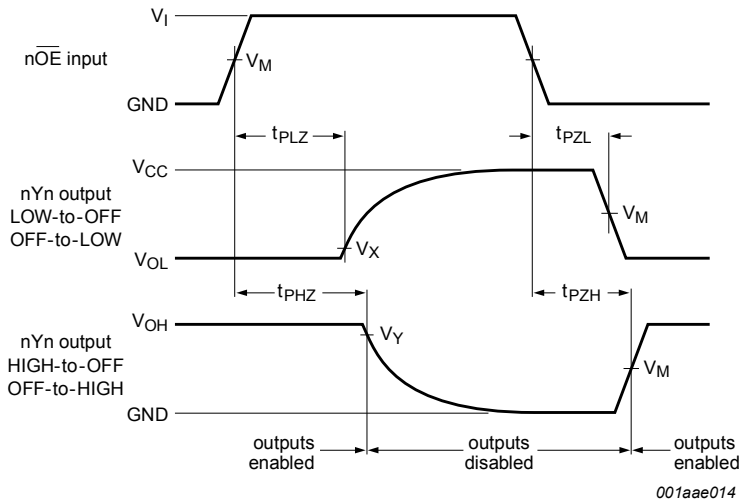
10.1 Waveforms and test circuit



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

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

Figure 7. Inputs nAn to output nYn propagation delays



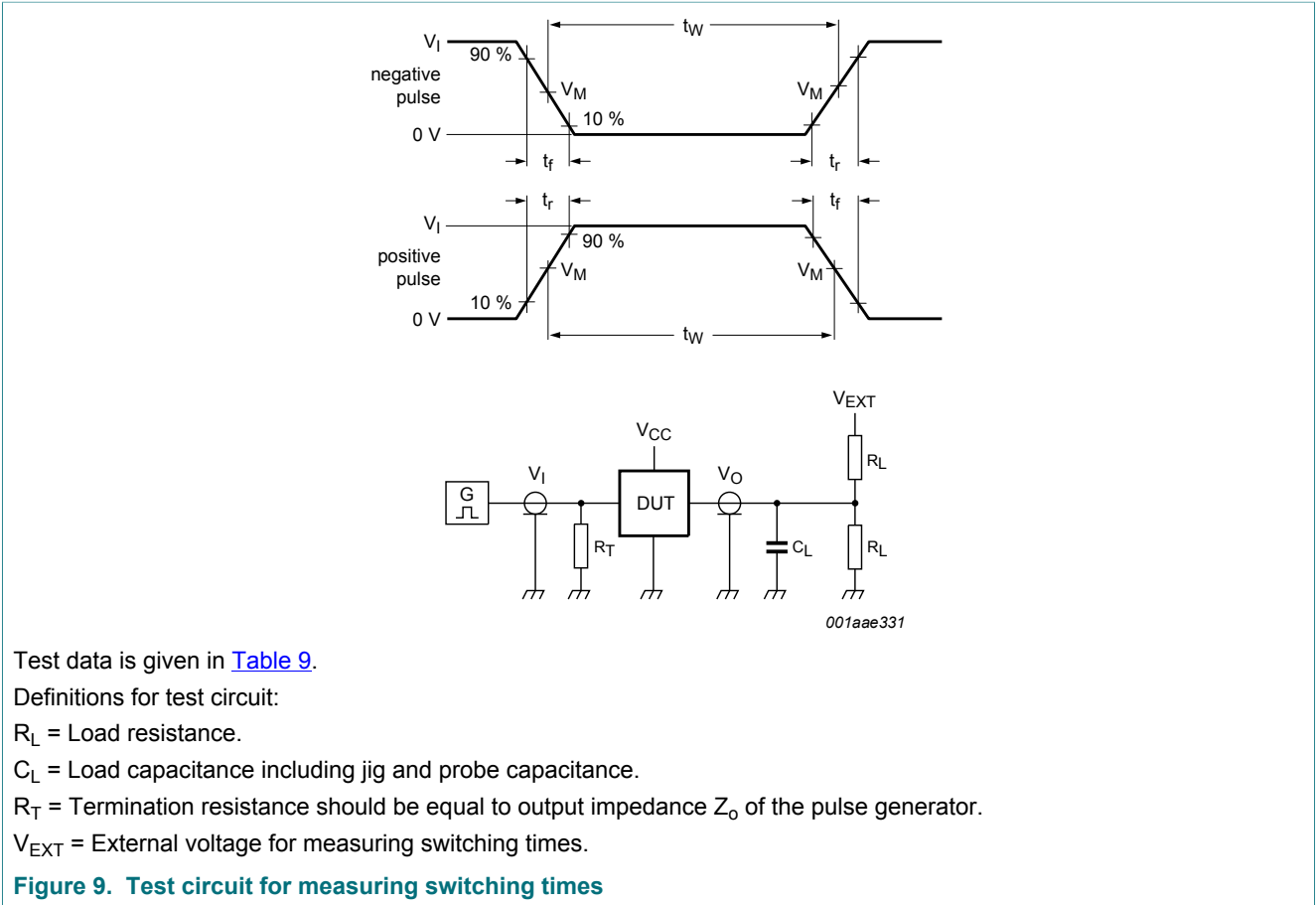
Measurement points are given in [Table 8](#).

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

Figure 8. 3-state enable and disable times

Table 8. Measurement points

| Supply voltage | Input | | Output | | |
|------------------|----------|---------------------|-------------|---------------------------|---------------------------|
| V_{CC} | V_I | V_M | V_M | V_x | V_y |
| 1.65 V to 1.95 V | V_{CC} | $0.5 \times V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15 \text{ V}$ | $V_{OH} - 0.15 \text{ V}$ |
| 2.3 V to 2.7 V | V_{CC} | $0.5 \times V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15 \text{ V}$ | $V_{OH} - 0.15 \text{ V}$ |
| 2.7 V | 2.7 V | 1.5 V | 1.5 V | $V_{OL} + 0.3 \text{ V}$ | $V_{OH} - 0.3 \text{ V}$ |
| 3.0 V to 3.6 V | 2.7 V | 1.5 V | 1.5 V | $V_{OL} + 0.3 \text{ V}$ | $V_{OH} - 0.3 \text{ V}$ |



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.

Figure 9. Test circuit for measuring switching times

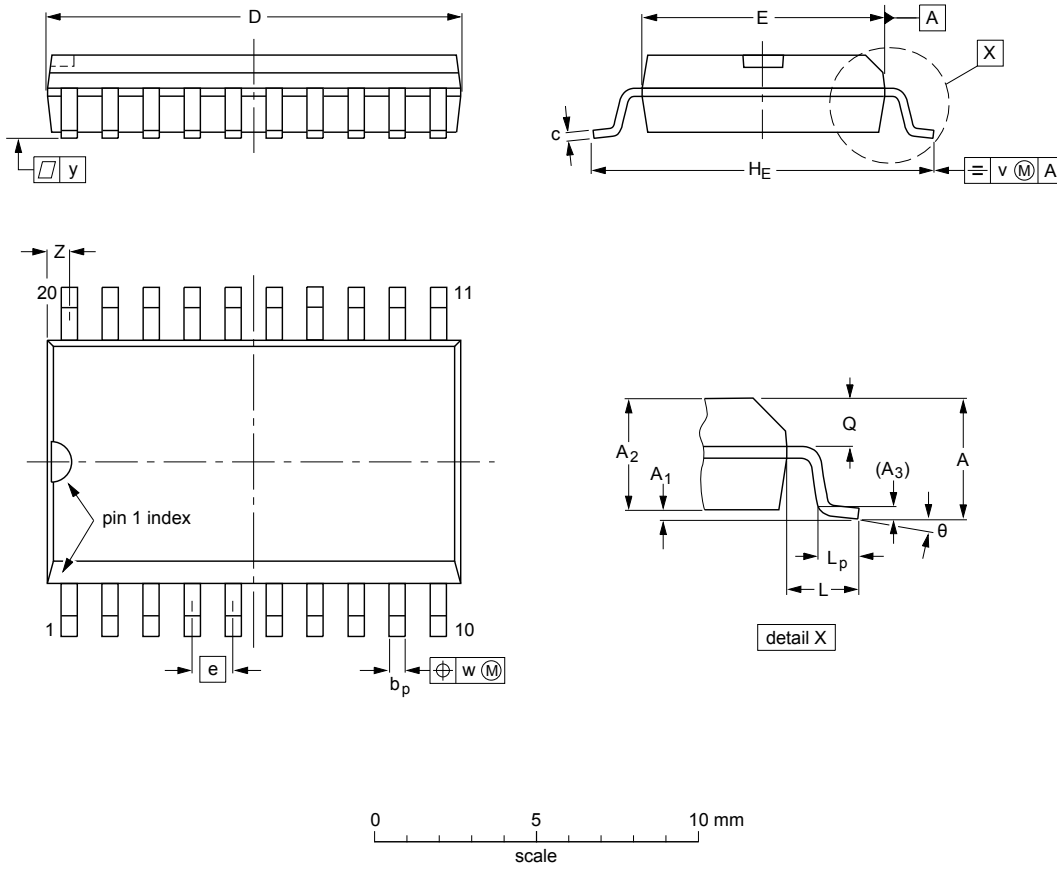
Table 9. Test data

| 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} |
| 1.65 V to 1.95 V | V_{CC} | ≤ 2.0 ns | 30 pF | 1 k Ω | open | $2 \times V_{CC}$ | GND |
| 2.3 V to 2.7 V | V_{CC} | ≤ 2.0 ns | 30 pF | 500 Ω | open | $2 \times V_{CC}$ | GND |
| 2.7 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω | open | 6 V | GND |
| 3.0 V to 3.6 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω | open | 6 V | GND |

11 Package outline

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

SOT163-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|--------|--------|----------------|----------------|----------------|----------------|----------------|------------------|------------------|------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm | 2.65 | 0.3 0.1 | 2.45 2.25 | 0.25 | 0.49 0.36 | 0.32 0.23 | 13.0 12.6 | 7.6 7.4 | 1.27 | 10.65 10.00 | 1.4 | 1.1 0.4 | 1.1 1.0 | 0.25 | 0.25 | 0.1 | 0.9 0.4 | 8° 0° |
| inches | 0.1 | 0.012 0.004 | 0.096 0.089 | 0.01 | 0.019 0.014 | 0.013 0.009 | 0.51 0.49 | 0.30 0.29 | 0.05 | 0.419 0.394 | 0.055 | 0.043 0.016 | 0.043 0.039 | 0.01 | 0.01 | 0.004 | 0.035 0.016 | |

Note

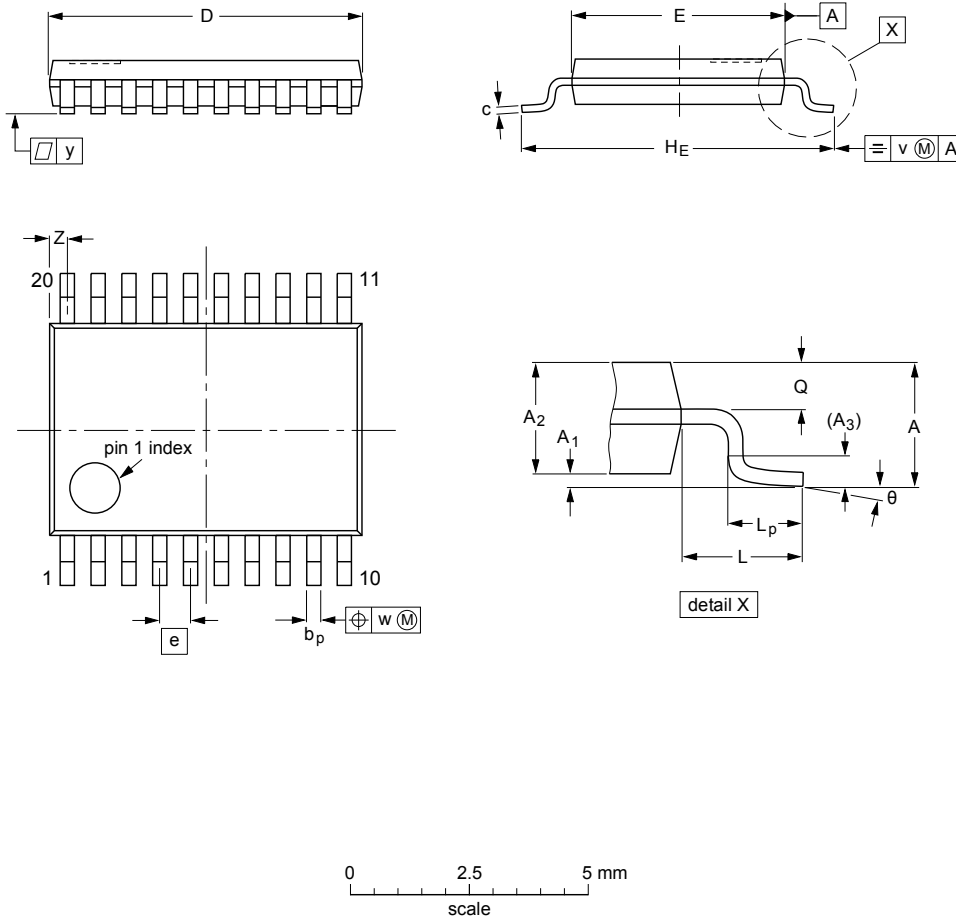
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | |
| SOT163-1 | 075E04 | MS-013 | | | 99-12-27 03-02-19 |

Figure 10. Package outline SOT163-1 (SO20)

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

SOT360-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽²⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|---|----------------|------------|-----|------|-----|------------------|----------|
| mm | 1.1 | 0.15 0.05 | 0.95 0.80 | 0.25 | 0.30 0.19 | 0.2 0.1 | 6.6 6.4 | 4.5 4.3 | 0.65 | 6.6 6.2 | 1 | 0.75 0.50 | 0.4 0.3 | 0.2 | 0.13 | 0.1 | 0.5 0.2 | 8° 0° |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|-----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT360-1 | | MO-153 | | | | -99-12-27 03-02-19 |

Figure 11. 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 |
|----------------|---|-----------------------|---------------|---------------|
| 74ALVC244 v.4 | 20171010 | Product data sheet | - | 74ALVC244 v.3 |
| 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. | | | |
| 74ALVC244 v.3 | 20030908 | Product specification | - | 74ALVC244 v.2 |
| 74ALVC244 v.2 | 20030811 | Product specification | - | 74ALVC244 v.1 |
| 74ALVC244 v.1 | 20011030 | Product specification | - | - |

14 Legal information

14.1 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. |

[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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