

74AHCV245A

Octal bus transceiver; 3-state

Rev. 2 — 8 November 2016

Product data sheet

1. General description

The 74AHCV245A is an 8-bit transceiver with 3-state outputs and Schmitt trigger inputs. The device features an output enable (\overline{OE}) and send/receive (DIR) for direction control. A HIGH on \overline{OE} causes the outputs to assume a high-impedance OFF-state.

Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

The data (An, Bn) and control (\overline{OE} and DIR) inputs include Schmitt trigger inputs. These inputs can transform slowly changing input signals into sharply defined, jitter-free output signals.

This device is ideal for driving bus lines or buffer memory address registers. It features inputs and outputs on opposite sides of the package to facilitate printed circuit board layout.

This device is fully specified for partial Power-down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

2. Features and benefits

- Wide supply voltage range from 1.8 V to 5.5 V
- Typical t_{pd} of 3.2 ns at 5 V
- Typical $V_{OL(p)} < 0.8$ V at $V_{CC} = 3.3$ V, $T_{amb} = 25$ °C
- Typical $V_{OH(v)} > 2.3$ V at $V_{CC} = 3.3$ V, $T_{amb} = 25$ °C
- Supports mixed-mode voltage operation on all ports
- I_{OFF} circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA per JESD 78 Class II
- ESD protection:
 - ◆ HBM ANSI/ESDA/JEDEC JS-001 Class 2 exceeds 3 kV
 - ◆ MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101E exceeds 2 kV
- Specified from -40 °C to $+85$ °C and from -40 °C to $+125$ °C

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3. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|--------------|-------------------|---------|--|----------|
| | Temperature range | Name | Description | |
| 74AHCV245APW | -40 °C to +125 °C | TSSOP20 | plastic thin shrink small outline package; 20 leads; body width 4.4 mm | SOT360-1 |

4. Functional diagram

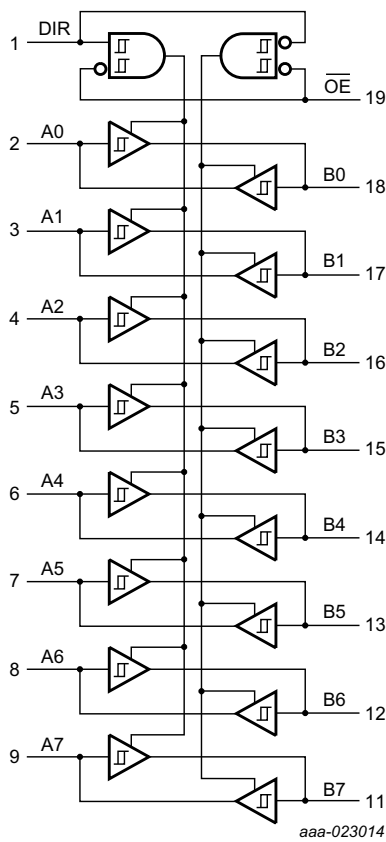


Fig 1. Logic symbol

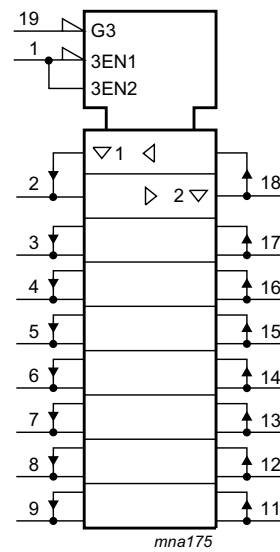
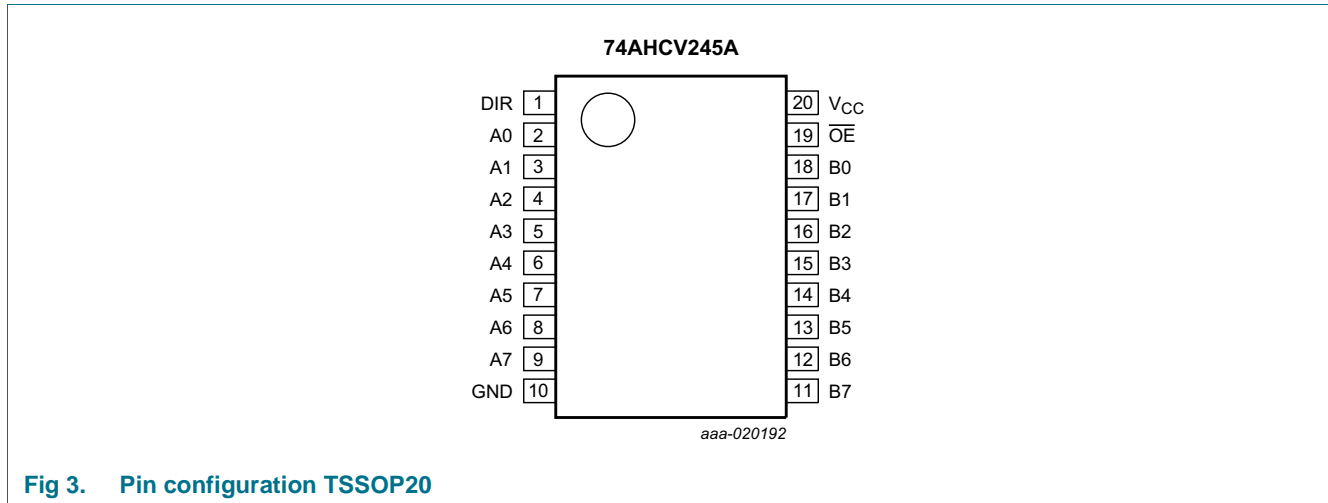


Fig 2. IEC logic symbol

5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|-----------------|--------------------------------|----------------------------------|
| DIR | 1 | direction control |
| A0 to A7 | 2, 3, 4, 5, 6, 7, 8, 9 | data input/output |
| GND | 10 | ground (0 V) |
| B0 to B7 | 18, 17, 16, 15, 14, 13, 12, 11 | data input/output |
| \overline{OE} | 19 | output enable input (active LOW) |
| V _{CC} | 20 | supply voltage |

6. Functional description

Table 3. Function table^[1]

| Input | | Input/output | | |
|-------|-----|--------------|-------|--|
| OE | DIR | An | Bn | |
| L | L | A = B | input | |
| L | H | input | B = A | |
| H | X | Z | 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 | +7.0 | V |
| V_I | input voltage | | -0.5 | +7.0 | V |
| V_O | output voltage | active mode | -0.5 | $V_{CC} + 0.5$ | V |
| | | power-down or 3-state mode | -0.5 | +7.0 | V |
| I_{IK} | input clamping current | $V_I < 0$ V | -50 | - | mA |
| I_{OK} | output clamping current | $V_O < 0$ 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 +125 °C | - | 500 | mW |

[1] If the input current ratings are observed, the minimum input voltage ratings may be exceeded.

[2] If the output current ratings are observed, the output voltage ratings may be exceeded.

[3] This value is limited to 7.0 V maximum.

[4] For TSSOP20 package: above 100 °C, the value of P_{tot} derates linearly with 10 mW/K.

8. Recommended operating conditions

Table 5. Recommended operating conditions

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---------------------|-------------------------------------|---|-----|----------|------|
| V_{CC} | supply voltage | | 1.8 | 5.5 | V |
| V_I | input voltage | | 0 | 5.5 | V |
| V_O | output voltage | active mode | 0 | V_{CC} | V |
| | | power-down or 3-state mode | 0 | 5.5 | V |
| T_{amb} | ambient temperature | | -40 | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | - | 50 | ms/V |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | - | 20 | ms/V |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | - | 1 | ms/V |

9. Static characteristics

Table 6. Static characteristics

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 | |
| V_{T+} | positive-going threshold voltage | $V_{CC} = 1.8\text{ V}$ | - | - | 1.65 | - | 1.65 | - | 1.65 | V |
| | | $V_{CC} = 2.3\text{ V}$ | - | - | 1.85 | - | 1.85 | - | 1.85 | V |
| | | $V_{CC} = 3.0\text{ V}$ | - | - | 2.2 | - | 2.2 | - | 2.2 | V |
| | | $V_{CC} = 4.5\text{ V}$ | - | - | 3.15 | - | 3.15 | - | 3.15 | V |
| | | $V_{CC} = 5.5\text{ V}$ | - | - | 3.85 | - | 3.85 | - | 3.85 | V |
| V_{T-} | negative-going threshold voltage | $V_{CC} = 1.8\text{ V}$ | 0.15 | - | - | 0.15 | - | 0.15 | - | V |
| | | $V_{CC} = 2.3\text{ V}$ | 0.45 | - | - | 0.45 | - | 0.45 | - | V |
| | | $V_{CC} = 3.0\text{ V}$ | 0.9 | - | - | 0.9 | - | 0.9 | - | V |
| | | $V_{CC} = 4.5\text{ V}$ | 1.35 | - | - | 1.35 | - | 1.35 | - | V |
| | | $V_{CC} = 5.5\text{ V}$ | 1.65 | - | - | 1.65 | - | 1.65 | - | V |
| V_H | hysteresis voltage | $V_{CC} = 1.8\text{ V}$ | 0.15 | - | 1.05 | 0.15 | 1.05 | 0.15 | 1.05 | V |
| | | $V_{CC} = 2.3\text{ V}$ | 0.2 | - | 1.1 | 0.2 | 1.1 | 0.2 | 1.1 | V |
| | | $V_{CC} = 3.0\text{ V}$ | 0.3 | - | 1.2 | 0.3 | 1.2 | 0.3 | 1.2 | V |
| | | $V_{CC} = 4.5\text{ V}$ | 0.4 | - | 1.4 | 0.4 | 1.4 | 0.4 | 1.4 | V |
| | | $V_{CC} = 5.5\text{ V}$ | 0.5 | - | 1.6 | 0.5 | 1.6 | 0.5 | 1.6 | V |
| V_{OH} | HIGH-level output voltage | $V_I = V_{T+}$ or V_{T-} | | | | | | | | V |
| | | $I_O = -50\ \mu\text{A}; V_{CC} = 1.8\text{ V}$ | 1.7 | 1.8 | - | 1.7 | - | 1.7 | - | V |
| | | $I_O = -50\ \mu\text{A}; V_{CC} = 3.0\text{ V}$ | 2.9 | 3.0 | - | 2.9 | - | 2.9 | - | V |
| | | $I_O = -50\ \mu\text{A}; V_{CC} = 4.5\text{ V}$ | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | $I_O = -8\text{ mA}; V_{CC} = 3.0\text{ V}$ | 2.58 | - | - | 2.48 | - | 2.48 | - | V |
| | $I_O = -16\text{ mA}; V_{CC} = 4.5\text{ V}$ | 3.94 | - | - | 3.80 | - | 3.80 | - | | |

Table 6. Static characteristics ...continued
 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 | |
| V _{OL} | LOW-level output voltage | V _I = V _{T+} or V _{T-} | | | | | | | | |
| | | I _O = 50 μA; V _{CC} = 1.8 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 50 μA; V _{CC} = 3.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 50 μA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 8 mA; V _{CC} = 3.0 V | - | - | 0.36 | - | 0.44 | - | 0.44 | V |
| | | I _O = 16 mA; V _{CC} = 4.5 V | - | - | 0.44 | - | 0.55 | - | 0.55 | V |
| I _{OZ} | OFF-state output current | V _{CC} = 5.5 V; V _I = V _{IH} or V _{IL} ; V _O = GND to 5.5 V | - | - | ±0.25 | - | ±2.5 | - | ±2.5 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = GND to 5.5 V; V _{CC} = 0 V | - | - | 0.5 | - | 5 | - | 5 | μA |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 0 V to 5.5 V | - | - | ±0.1 | - | ±1 | - | ±1 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 2 | - | 20 | - | 20 | μA |

9.1 Transfer characteristics waveforms

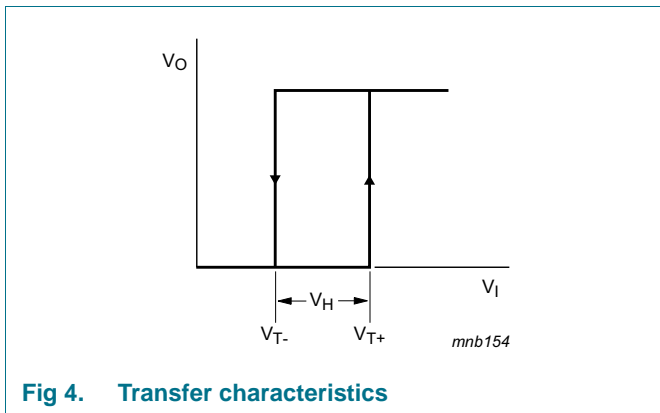


Fig 4. Transfer characteristics

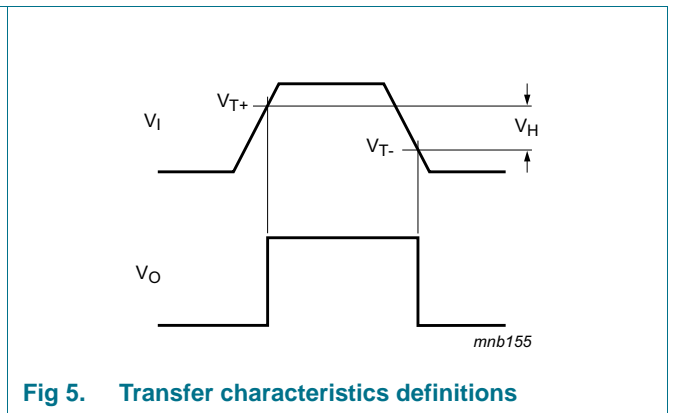
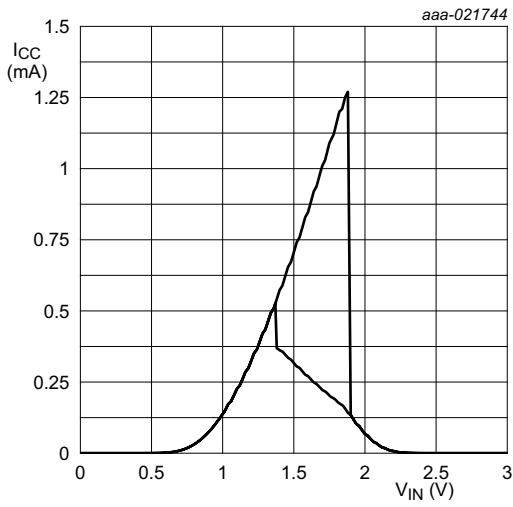
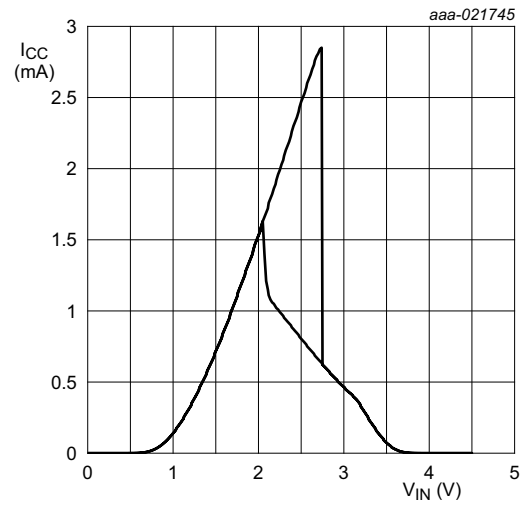


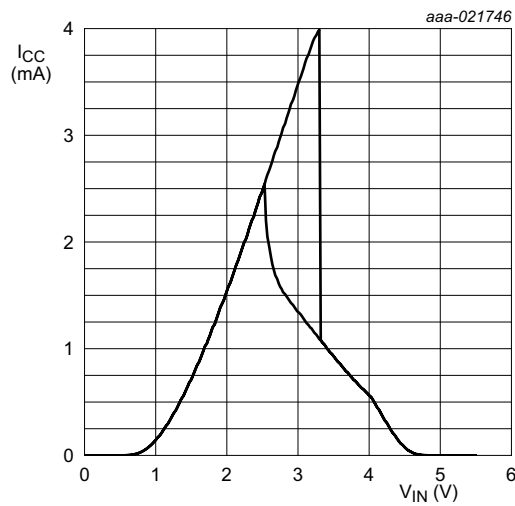
Fig 5. Transfer characteristics definitions



a. $V_{CC} = 3.0\text{ V}$



b. $V_{CC} = 4.5\text{ V}$



c. $V_{CC} = 5.5\text{ V}$

Fig 6. Typical transfer characteristics

10. Dynamic characteristics

Table 7. Dynamic characteristics
GND = 0 V. For test circuit, see Figure 9.

| Symbol | Parameter | Conditions | 25 °C | | | −40 °C to +85 °C | | −40 °C to +125 °C | | Unit |
|--------------------|-------------------|--|-------|--------------------|------|------------------|------|-------------------|------|------|
| | | | Min | Typ ^[1] | Max | Min | Max | Min | Max | |
| t _{pd} | propagation delay | An to Bn or Bn to An; see Figure 7 | | | | | | | | |
| | | V _{CC} = 2.3 V to 2.7 V | | | | | | | | |
| | | C _L = 15 pF | - | 5.3 | 13 | 1 | 15 | 1 | 16.3 | ns |
| | | C _L = 50 pF | - | 7.3 | 15.9 | 1 | 18 | 1 | 19.4 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | | | | | | | | |
| | | C _L = 15 pF | - | 4.1 | 8.4 | 1 | 10 | 1 | 10.9 | ns |
| | | C _L = 50 pF | - | 5.7 | 11.9 | 1 | 13.5 | 1 | 14.6 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 3.2 | 5.5 | 1 | 6.5 | 1 | 7 | ns |
| | | C _L = 50 pF | - | 4.5 | 7.5 | 1 | 8.5 | 1 | 9.3 | ns |
| t _{en} | enable time | $\overline{\text{OE}}$ to An or $\overline{\text{OE}}$ to Bn; see Figure 8 | | | | | | | | |
| | | V _{CC} = 2.3 V to 2.7 V | | | | | | | | |
| | | C _L = 15 pF | - | 6.5 | 19.9 | 1 | 22 | 1 | 23 | ns |
| | | C _L = 50 pF | - | 8.6 | 22.7 | 1 | 26 | 1 | 27 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | | | | | | | | |
| | | C _L = 15 pF | - | 4.9 | 13.2 | 1 | 15.5 | 1 | 16 | ns |
| | | C _L = 50 pF | - | 6.6 | 16.7 | 1 | 19 | 1 | 20 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 3.7 | 8.5 | 1 | 10 | 1 | 10.5 | ns |
| | | C _L = 50 pF | - | 5.1 | 10.6 | 1 | 12 | 1 | 12.5 | ns |
| t _{dis} | disable time | $\overline{\text{OE}}$ to An or $\overline{\text{OE}}$ to Bn; see Figure 8 | | | | | | | | |
| | | V _{CC} = 2.3 V to 2.7 V | | | | | | | | |
| | | C _L = 15 pF | - | 7 | 15.1 | 1 | 16.7 | 1 | 17.8 | ns |
| | | C _L = 50 pF | - | 11.6 | 23.1 | 1 | 25 | 1 | 26 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | | | | | | | | |
| | | C _L = 15 pF | - | 5.7 | 10.5 | 1 | 12.3 | 1 | 13.2 | ns |
| | | C _L = 50 pF | - | 9.1 | 15.8 | 1 | 18 | 1 | 19 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 4.5 | 6.9 | 1 | 8 | 1 | 8.5 | ns |
| | | C _L = 50 pF | - | 6.7 | 9.7 | 1 | 11 | 1 | 11.5 | ns |
| t _{sk(o)} | output skew time | C _L = 50 pF | | | | | | | | |
| | | V _{CC} = 2.3 V to 2.7 V | - | - | 2 | - | 2 | - | 2 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | - | 1.5 | - | 1.5 | - | 1.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | - | - | 1 | - | 1 | - | 1 | ns |

Table 7. Dynamic characteristics ...continued
GND = 0 V. For test circuit, see Figure 9.

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|------------------|-------------------------------|---|-------|--------------------|-----|------------------|-----|-------------------|-----|------|
| | | | Min | Typ ^[1] | Max | Min | Max | Min | Max | |
| C _I | input capacitance | V _I = V _{CC} or GND; V _{CC} = 3.3 V | - | 2 | 6 | - | 6 | - | 6 | pF |
| C _{I/O} | input/output capacitance | V _O = V _{CC} or GND; V _{CC} = 3.3 V | - | 5.5 | - | - | - | - | - | pF |
| C _{PD} | power dissipation capacitance | per buffer; ^[3] C _L = 0 pF; f = 10 MHz; V _{CC} = 5 V; V _I = GND to V _{CC} | - | 13.8 | - | - | - | - | - | pF |

[1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 2.5 V, 3.3 V, and 5 V respectively, unless otherwise specified.

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

t_{en} is the same as t_{pZL} and t_{pZH}.

t_{dis} is the same as t_{pLZ} and t_{pHZ}.

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

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = output load capacitance in pF;

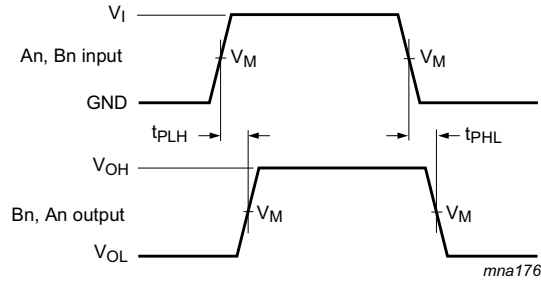
V_{CC} = supply voltage in Volts.

Table 8. Noise characteristics

GND = 0 V. For test circuit, see Figure 9.

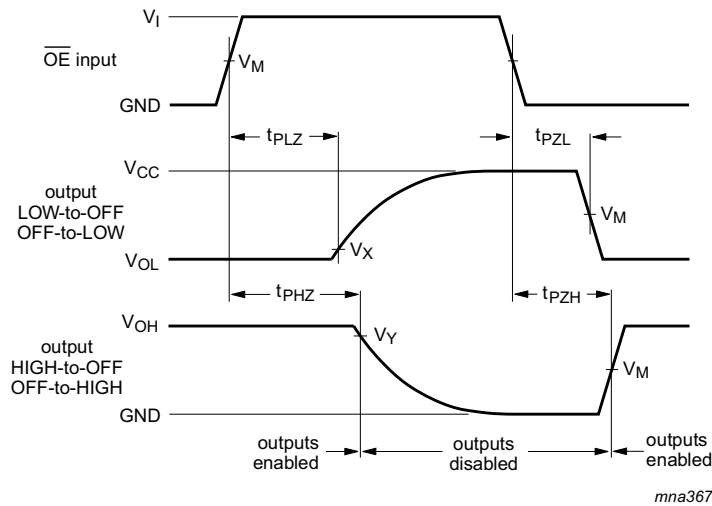
| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | Unit |
|--|------------------------------------|------------|--------------------------|------|------|------|
| | | | Min | Typ | Max | |
| V_{CC} = 3.3 V; C_L = 50 pF | | | | | | |
| V _{OL(p)} | LOW-level output voltage (peak) | | - | 0.3 | 0.8 | V |
| V _{OL(v)} | LOW-level output voltage (valley) | | -0.8 | -0.2 | - | V |
| V _{OH(v)} | HIGH-level output voltage (valley) | | - | 2.9 | - | V |
| V _{IH(AC)} | AC HIGH-level input voltage | dynamic | 2.31 | - | - | V |
| V _{IL(AC)} | AC LOW-level input voltage | dynamic | - | - | 0.99 | V |
| V_{CC} = 5.0 V; C_L = 50 pF | | | | | | |
| V _{OL(p)} | LOW-level output voltage (peak) | | - | 0.6 | 1.5 | V |
| V _{OL(v)} | LOW-level output voltage (valley) | | -1.5 | -0.6 | - | V |
| V _{OH(v)} | HIGH-level output voltage (valley) | | - | 4.0 | - | V |
| V _{IH(AC)} | AC HIGH-level input voltage | dynamic | 3.5 | - | - | V |
| V _{IL(AC)} | AC LOW-level input voltage | dynamic | - | - | 1.5 | V |

11. Waveforms



Measurement points are given in [Table 9](#).
 VOL and VOH are typical voltage output levels that occur with the output load.

Fig 7. Propagation delay input (An, Bn) to output (Bn, An)

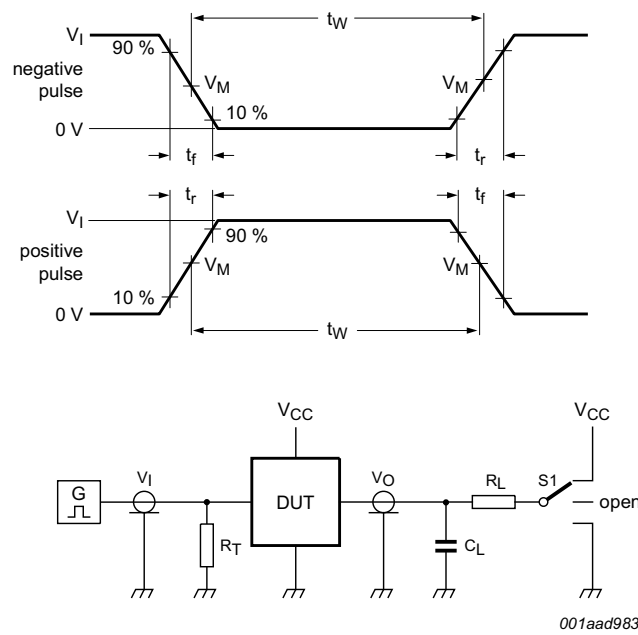


Measurement points are given in [Table 9](#).
 VOL and VOH are typical voltage output levels that occur with the output load.

Fig 8. Enable and disable times

Table 9. Measurement points

| Input | Output | | |
|-------------|-------------|------------------|------------------|
| V_M | V_M | V_X | V_Y |
| $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.3 V$ | $V_{OH} - 0.3 V$ |



Test data is given in [Table 10](#).

Definitions test circuit:

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

C_L = Load capacitance including jig and probe capacitance

R_L = Load resistor

S1 = Test selection switch

Fig 9. Test circuit for measuring switching times

Table 10. Test data

| 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} |
| GND to V_{CC} | 3.0 ns | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |

12. Package outline

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

SOT360-1

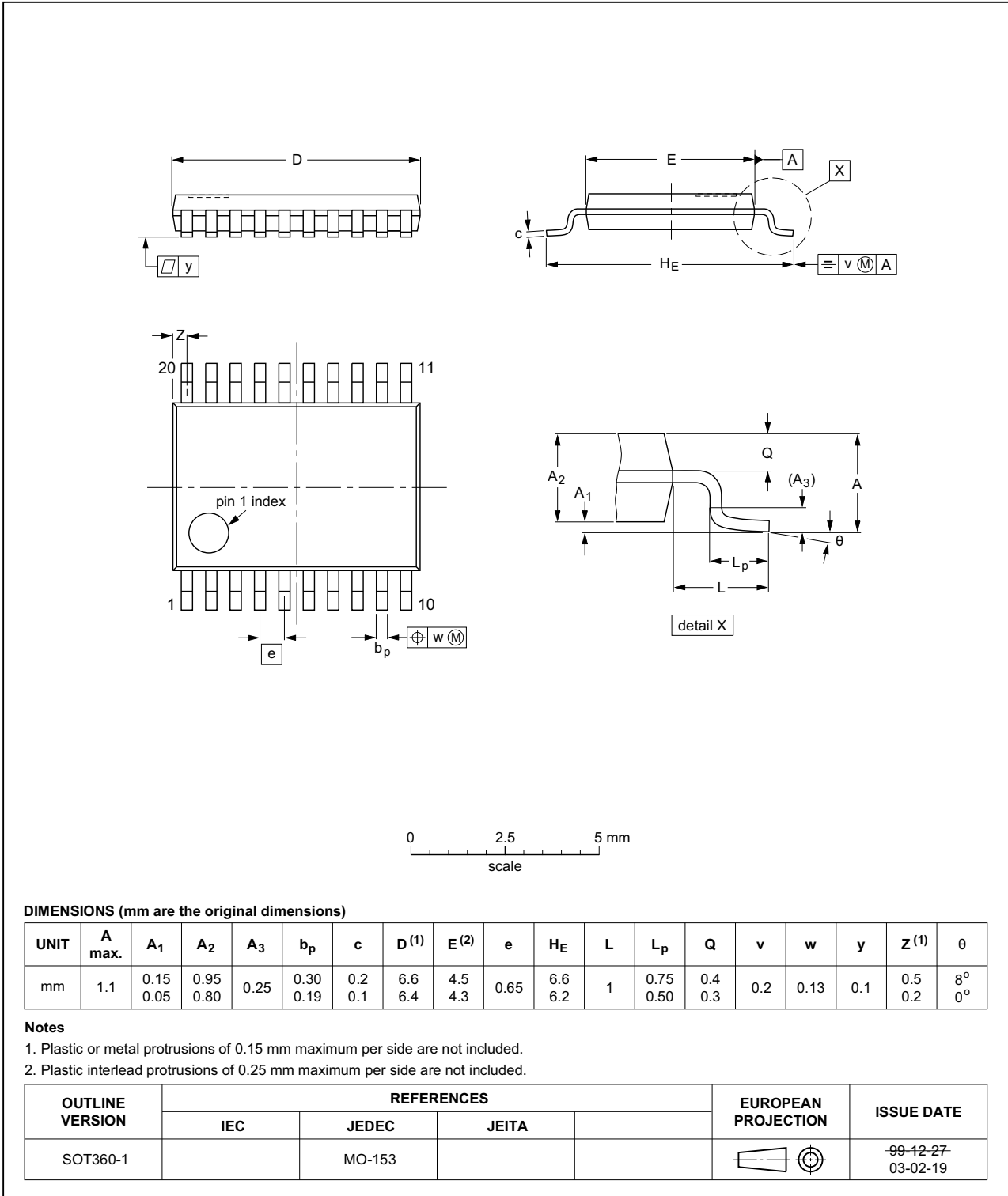


Fig 10. Package outline SOT360-1 (TSSOP20)

13. Abbreviations

Table 11. Abbreviations

| Acronym | Description |
|---------|-----------------------------|
| CDM | Charge Device Model |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MM | Machine Model |
| TTL | Transistor-Transistor Logic |

14. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|-------------------------------------|--------------------|---------------|----------------|
| 74AHCV245A v.2 | 20161108 | Product data sheet | - | 74AHCV245A v.1 |
| Modifications: | • Type number 74AHCV245ABQ removed. | | | |
| 74AHCV245A v.1 | 20160610 | Product data sheet | - | - |

15. Legal information

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

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

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