WINSOURCE ELECTRONICS

# THE DATASHEET OF

# 74HC14PW,112

# 74AVC9112

## 1-to-4 fan-out buffer

Rev. 2 — 8 July 2024 Product data sheet

## 1. General description

The 74AVC9112 is a 1-to-4 fan-out buffer suitable for use in clock distribution. It has a data input (A), four data outputs (Yn) and an output enable input ($\overline{OE}$). $V_{CC}$ can be supplied at any voltage between 0.8 V and 3.6 V. A HIGH on $\overline{OE}$ causes all outputs to be pulled LOW via pull-down resistors, a LOW on $\overline{OE}$ disconnects the pull-down resistors and enables all outputs.

Schmitt trigger action at all inputs makes the circuit tolerant for slower input rise and fall time.

The $I_{OFF}$ circuitry disables the output, preventing any damaging backflow current through the device when it is powered down.

## 2. Features and benefits

- Wide supply voltage range:
  - $V_{CC}$: 0.8 V to 3.6 V
- Inputs accept voltages up to 3.6 V
- Maximum data rates:
  - 380 Mbit/s (3.3 V)
  - 200 Mbit/s (2.5 V)
  - 200 Mbit/s (1.8 V)
  - 150 Mbit/s (1.5 V)
  - 100 Mbit/s (1.2 V)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Complies with JEDEC standards:
  - JESD8-12 (0.8 V to 1.3 V)
  - JESD8-11 (0.9 V to 1.65 V)
  - JESD8-7 (1.2 V to 1.95 V)
  - JESD8-5 (1.8 V to 2.7 V)
  - JESD8-B (2.7 V to 3.6 V)
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 3B exceeds 8000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

## 3. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74AVC9112DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm | SOT765-1 |
| 74AVC9112GT | -40 °C to +125 °C | XSON8 | plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm | SOT833-1 |

## 4. Marking

**Table 2. Marking codes**

| Type number | Marking code |
|---|---|
| 74AVC9112DC | Bb |
| 74AVC9112GT | Bb |

## 5. Functional diagram

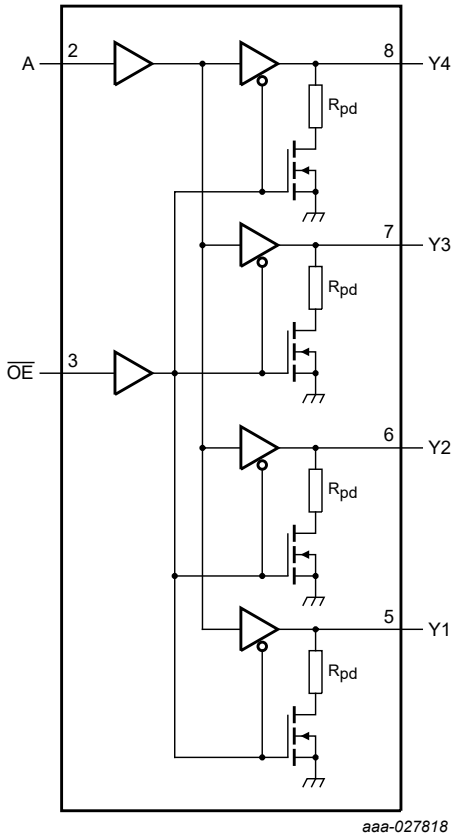



**Fig. 1. Logic symbol**

# 6. Pinning information

## 6.1. Pinning

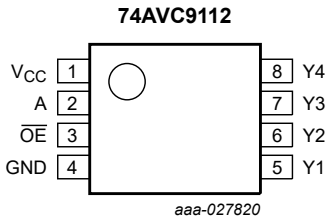
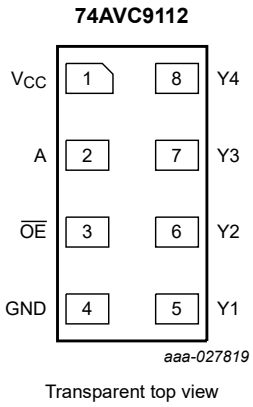



Fig. 2. Pin configuration SOT765-1 (VSSOP8)




Transparent top view

Fig. 3. Pin configuration SOT833-1 (XSON8)

## 6.2. Pin description

**Table 3. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| $V_{CC}$ | 1 | supply voltage |
| A | 2 | data input |
| $\overline{OE}$ | 3 | output enable input (active LOW) |
| GND | 4 | ground (0 V) |
| Y1, Y2, Y3, Y4 | 5, 6, 7, 8 | data outputs |

# 7. Functional description

**Table 4. Function table**

*H = HIGH voltage level; L = LOW voltage level; X = don't care.*

| Inputs | | Output |
|---|---|---|
| **$\overline{OE}$** | **A** | **Yn** |
| L | L | L |
| L | H | H |
| H | X | L |

# 8. Limiting values

**Table 5. 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 | $\overline{OE}$ = LOW [1] [2] | -0.5 | $V_{CC}$ + 0.5 | V |
| | | $\overline{OE}$ = HIGH [1] | -0.5 | +4.6 | 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 [3] | - | 250 | mW |

[1] The minimum input voltage ratings and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] $V_{CC}$ + 0.5 V should not exceed 4.6 V.
[3] For SOT765-1 (VSSOP8) package: $P_{tot}$ derates linearly with 4.9 mW/K above 99 °C.
For SOT833-1 (XSON8) package: $P_{tot}$ derates linearly with 3.1 mW/K above 68 °C.

# 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | 0.8 | 3.6 | V |
| $V_I$ | input voltage | | 0 | 3.6 | V |
| $V_O$ | output voltage | $\overline{OE}$ = LOW | 0 | $V_{CC}$ | V |
| | | $\overline{OE}$ = HIGH | 0 | 3.6 | V |
| $T_{amb}$ | ambient temperature | | -40 | +125 | °C |
| Δt/ΔV | input transition rise and fall rate | $V_{CC}$ = 0.8 V to 3.6 V | 0 | 200 | ns/V |

# 10. Static characteristics

**Table 7. Static characteristics**

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

| Symbol | Parameter | Conditions | $T_{amb}$ = 25 °C | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$; $I_O$ = -1.5 mA; $V_{CC}$ = 0.8 V | - | 0.69 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$; $I_O$ = 1.5 mA; $V_{CC}$ = 0.8 V | - | 0.07 | - | V |
| $I_I$ | input leakage current | A, $\overline{OE}$ input; $V_I$ = 0 V or 3.6 V; $V_{CC}$ = 0.8 V to 3.6 V | - | ±0.025 | ±0.25 | µA |
| $I_{OFF}$ | power-off leakage current | $V_I$ or $V_O$ = 0 V to 3.6 V; $V_{CC}$ = 0 V | - | ±0.1 | ±1 | µA |
| $R_{pd}$ | pull-down resistance | | - | 50 | - | kΩ |
| $C_I$ | input capacitance | A, $\overline{OE}$ input; $V_I$ = 0 V or 3.3 V; $V_{CC}$ = 3.3 V | - | 1.2 | - | pF |
| $C_O$ | output capacitance | Yn; $V_O$ = 3.3 V or 0 V; $V_{CC}$ = 3.3 V | - | 4.7 | - | pF |

**Table 8. Static characteristics**

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

| Symbol | Parameter | Conditions | $T_{amb}$ = -40 °C to +85 °C | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|
| | | | Min | Max | Min | Max | |
| $V_{IH}$ | HIGH-level input voltage | A, $\overline{OE}$ input | | | | | |
| | | $V_{CC}$ = 0.8 V | 0.70$V_{CC}$ | - | 0.70$V_{CC}$ | - | V |
| | | $V_{CC}$ = 1.1 V to 1.95 V | 0.65$V_{CC}$ | - | 0.65$V_{CC}$ | - | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.6 | - | 1.6 | - | V |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 2 | - | 2 | - | V |
| $V_{IL}$ | LOW-level input voltage | A, $\overline{OE}$ input | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 0.30$V_{CC}$ | - | 0.30$V_{CC}$ | V |
| | | $V_{CC}$ = 1.1 V to 1.95 V | - | 0.35$V_{CC}$ | - | 0.35$V_{CC}$ | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 0.7 | - | 0.7 | V |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 0.8 | - | 0.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | | |
| | | $I_O$ = -100 µA; $V_{CC}$ = 0.8 V to 3.6 V | $V_{CC}$ - 0.1 | - | $V_{CC}$ - 0.1 | - | V |
| | | $I_O$ = -3 mA; $V_{CC}$ = 1.1 V | 0.85 | - | 0.85 | - | V |
| | | $I_O$ = -6 mA; $V_{CC}$ = 1.4 V | 1.05 | - | 1.05 | - | V |
| | | $I_O$ = -8 mA; $V_{CC}$ = 1.65 V | 1.2 | - | 1.2 | - | V |
| | | $I_O$ = -9 mA; $V_{CC}$ = 2.3 V | 1.75 | - | 1.75 | - | V |
| | | $I_O$ = -12 mA; $V_{CC}$ = 3.0 V | 2.3 | - | 2.3 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | | |
| | | $I_O$ = 100 µA; $V_{CC}$ = 0.8 V to 3.6 V | - | 0.1 | - | 0.1 | V |
| | | $I_O$ = 3 mA; $V_{CC}$ = 1.1 V | - | 0.25 | - | 0.25 | V |
| | | $I_O$ = 6 mA; $V_{CC}$ = 1.4 V | - | 0.35 | - | 0.35 | V |
| | | $I_O$ = 8 mA; $V_{CC}$ = 1.65 V | - | 0.45 | - | 0.45 | V |
| | | $I_O$ = 9 mA; $V_{CC}$ = 2.3 V | - | 0.55 | - | 0.55 | V |
| | | $I_O$ = 12 mA; $V_{CC}$ = 3.0 V | - | 0.7 | - | 0.7 | V |

| Symbol | Parameter | Conditions | $T_{amb}$ = -40 °C to +85 °C | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|
| | | | Min | Max | Min | Max | |
| $I_I$ | input leakage current | A, $\overline{OE}$ input; $V_I$ = 0 V or 3.6 V; $V_{CC}$ = 0.8 V to 3.6 V | - | ±1 | - | ±5 | µA |
| $I_{OFF}$ | power-off leakage current | $V_I$ or $V_O$ = 0 V to 3.6 V; $V_{CC}$ = 0 V | - | ±5 | - | ±30 | µA |
| $I_{CC}$ | supply current | $V_I$ = 0 V or $V_{CC}$; $I_O$ = 0 A; $V_{CC}$ = 0.8 V to 3.6 V | - | 8 | - | 50 | µA |

# 11. Dynamic characteristics

### Table 9. Typical dynamic characteristics

*Voltages are referenced to GND (ground = 0 V); for test circuit, see Fig. 6; for waveforms, see Fig. 4 and Fig. 5.*

| Symbol | Parameter | Conditions | | $V_{CC}$ = 0.8 V | Unit |
|---|---|---|---|---|---|
| $t_{pd}$ | propagation delay | A to Yn; $T_{amb}$ = 25 °C | [1] | 31 | ns |
| $t_{dis}$ | disable time | $\overline{OE}$ to Yn; $T_{amb}$ = 25 °C | [2] | 25 | ns |
| $t_{en}$ | enable time | $\overline{OE}$ to Yn; $T_{amb}$ = 25 °C | [3] | 36 | ns |

[1] $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$;
[2] $t_{dis}$ is the same as $t_{PLZ}$ and $t_{PHZ}$;
[3] $t_{en}$ is the same as $t_{PZL}$ and $t_{PZH}$.

### Table 10. Dynamic characteristics

*Voltages are referenced to GND (ground = 0 V); for test circuit, see Fig. 6; for waveforms, see Fig. 4 and Fig. 5.*

| Symbol | Parameter | Conditions | | $V_{CC}$ | | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1.2 V ± 0.1 V | | 1.5 V ± 0.1 V | | 1.8 V ± 0.15 V | | 2.5 V ± 0.2 V | | 3.3 V ± 0.3 V | | |
| | | | | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | |
| **$T_{amb}$ = -40 °C to +85 °C** | | | | | | | | | | | | | | |
| $t_{pd}$ | propagation delay | A to Yn | [1] | 0.9 | 14.7 | 0.7 | 9.5 | 0.6 | 7.6 | 0.5 | 5.4 | 0.4 | 4.4 | ns |
| $t_{dis}$ | disable time | $\overline{OE}$ to Yn | [2] | 1.0 | 14.7 | 0.8 | 9.7 | 0.8 | 8.8 | 0.6 | 6.5 | 0.7 | 6.9 | ns |
| $t_{en}$ | enable time | $\overline{OE}$ to Yn | [3] | 1.0 | 15.8 | 0.7 | 9.9 | 0.6 | 7.9 | 0.5 | 5.5 | 0.5 | 4.5 | ns |
| $t_{sk(o)}$ | output skew time | between any output | | - | 0.7 | - | 0.4 | - | 0.3 | - | 0.2 | - | 0.2 | ns |
| **$T_{amb}$ = -40 °C to +125 °C** | | | | | | | | | | | | | | |
| $t_{pd}$ | propagation delay | A to Yn | [1] | 0.9 | 15.7 | 0.7 | 10.4 | 0.6 | 8.3 | 0.5 | 5.9 | 0.4 | 4.9 | ns |
| $t_{dis}$ | disable time | $\overline{OE}$ to Yn | [2] | 1.0 | 16.5 | 0.8 | 11.0 | 0.8 | 10.0 | 0.6 | 7.5 | 0.7 | 7.7 | ns |
| $t_{en}$ | enable time | $\overline{OE}$ to Yn | [3] | 1.0 | 16.9 | 0.7 | 10.9 | 0.6 | 8.7 | 0.6 | 6.1 | 0.5 | 4.9 | ns |
| $t_{sk(o)}$ | output skew time | between any output | | - | 0.9 | - | 0.5 | - | 0.4 | - | 0.3 | - | 0.2 | ns |

[1] $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$;
[2] $t_{dis}$ is the same as $t_{PLZ}$ and $t_{PHZ}$;
[3] $t_{en}$ is the same as $t_{PZL}$ and $t_{PZH}$.

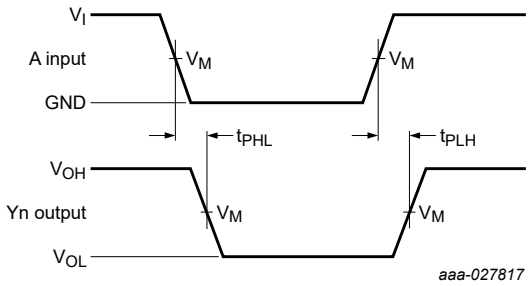
**Table 11. Typical power dissipation capacitance at $T_{amb}$ = 25 °C**

| Symbol | Parameter | Conditions | | $V_{CC}$ | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0.8 V | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V | |
| $C_{PD}$ | power dissipation capacitance | Yn; outputs enabled | [1] [2] | 35 | 35 | 36 | 37 | 40 | 45 | pF |
| | | Yn; outputs disabled | [1] [2] | 2.0 | 2.2 | 2.3 | 2.4 | 2.6 | 2.7 | pF |

[1] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
$f_i$ = input frequency in MHz;
$f_o$ = output frequency in MHz;
$C_L$ = load capacitance in pF;
$V_{CC}$ = supply voltage in V;
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

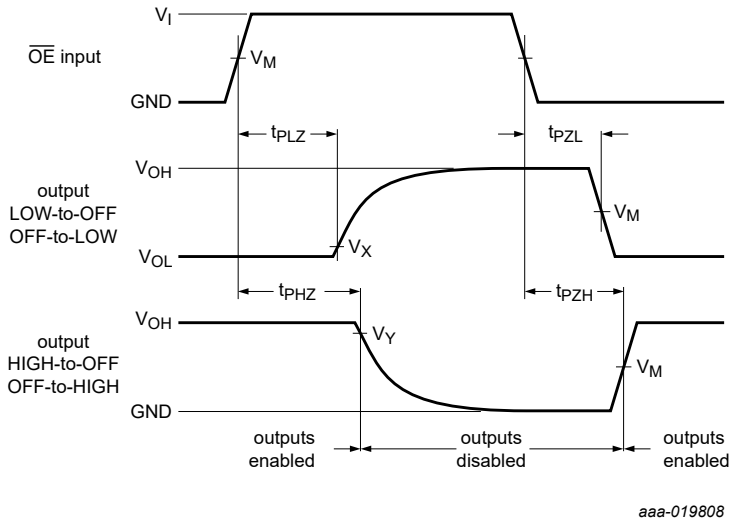
[2] $f_i$ = 10 MHz;
$V_I$ = GND to $V_{CC}$;
$t_r = t_f$ = 1 ns;
$C_L$ = 0 pF;
$R_L$ = ∞ Ω.

## 11.1. Waveforms and test circuit




Measurement points are given in Table 12.
$V_{OL}$ and $V_{OH}$ are typical output voltage levels that occur with the output load.

**Fig. 4. The data input (A) to output (Yn) propagation delay times**

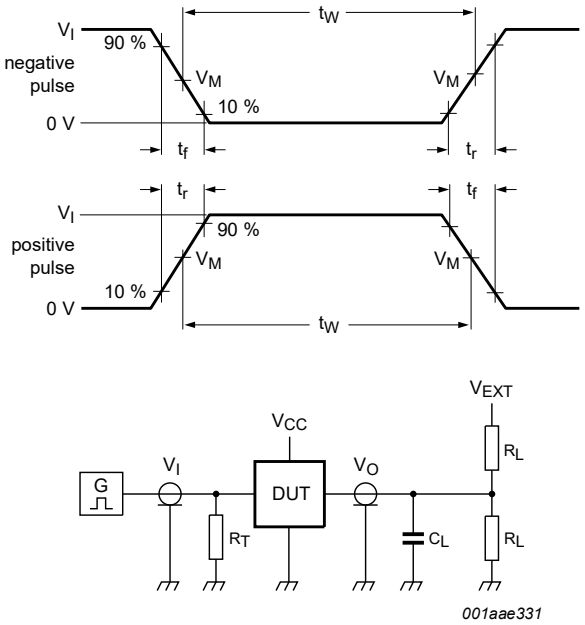



Measurement points are given in Table 12.
$V_{OL}$ and $V_{OH}$ are typical output voltage levels that occur with the output load.

**Fig. 5. Enable and disable times**

**Table 12. Measurement points**

| Supply voltage | Input | Output | | |
|---|---|---|---|---|
| $V_{CC}$ | $V_M$ | $V_M$ | $V_X$ | $V_Y$ |
| 0.8 V to 1.6 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL}$ + 0.1 V | $V_{OH}$ - 0.1 V |
| 1.65 V to 2.7 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL}$ + 0.15 V | $V_{OH}$ - 0.15 V |
| 3.0 V to 3.6 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL}$ + 0.3 V | $V_{OH}$ - 0.3 V |




Test data is given in Table 13

$R_L$ = Load resistance;

$C_L$ = Load capacitance including jig and probe capacitance;

$R_T$ = Termination resistance;

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

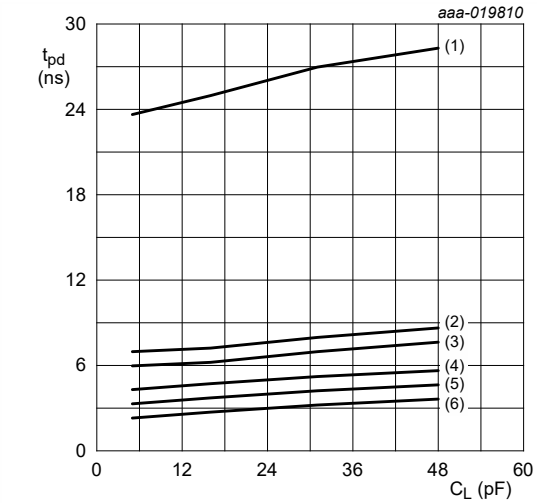
**Fig. 6. Test circuit for measuring switching times**

**Table 13. Test data**

| Supply voltage | Input | | Load | | $V_{EXT}$ | | |
|---|---|---|---|---|---|---|---|
| $V_{CC}$ | $V_I$ | $\Delta t/\Delta V$[1] | $C_L$ | $R_L$ | $t_{PLH}$, $t_{PHL}$ | $t_{PZH}$, $t_{PHZ}$ | $t_{PZL}$, $t_{PLZ}$ |
| 0.8 V to 1.6 V | $V_{CC}$ | ≤ 1.0 ns/V | 15 pF | 2 kΩ | open | GND | $2V_{CC}$ |
| 1.65 V to 2.7 V | $V_{CC}$ | ≤ 1.0 ns/V | 15 pF | 2 kΩ | open | GND | $2V_{CC}$ |
| 3.0 V to 3.6 V | $V_{CC}$ | ≤ 1.0 ns/V | 15 pF | 2 kΩ | open | GND | $2V_{CC}$ |

[1] dV/dt ≥ 1.0 V/ns

## 11.2. Typical propagation delay characteristics

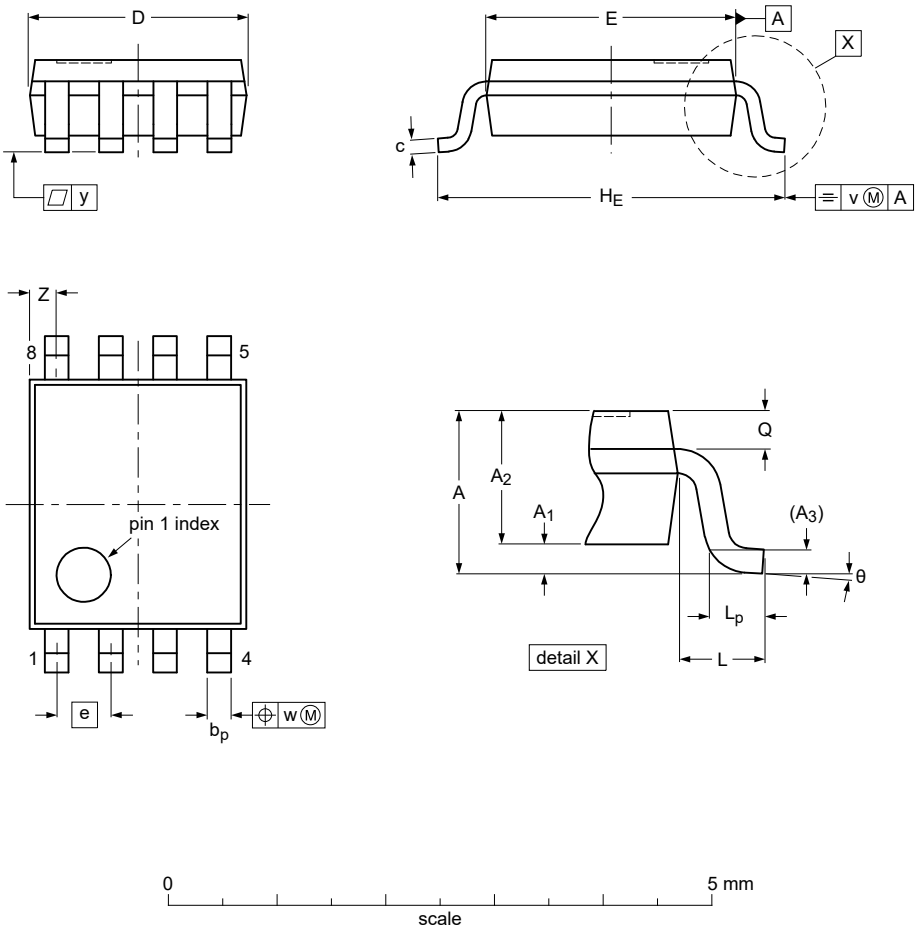



(1) $V_{CC}$ = 0.8 V
(2) $V_{CC}$ = 1.2 V
(3) $V_{CC}$ = 1.5 V
(4) $V_{CC}$ = 1.8 V
(5) $V_{CC}$ = 2.5 V
(6) $V_{CC}$ = 3.3 V

**Fig. 7. Typical propagation delay versus load capacitance; $T_{amb}$ = 25 °C**

## 12. Package outline

**VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm** **SOT765-1**




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 | max | 1 | 0.15 | 0.85 | 0.12 | 0.27 | 0.23 | 2.1 | 2.4 | 0.5 | 3.2 | 0.4 | 0.40 | 0.21 | 0.2 | 0.08 | 0.1 | 0.4 | 8° |
| | nom | | | | | | | | | | | | | | | | | | |
| | min | | 0.00 | 0.60 | | 0.17 | 0.08 | 1.9 | 2.2 | | 3.0 | | 0.15 | 0.19 | | | | 0.1 | 0° |

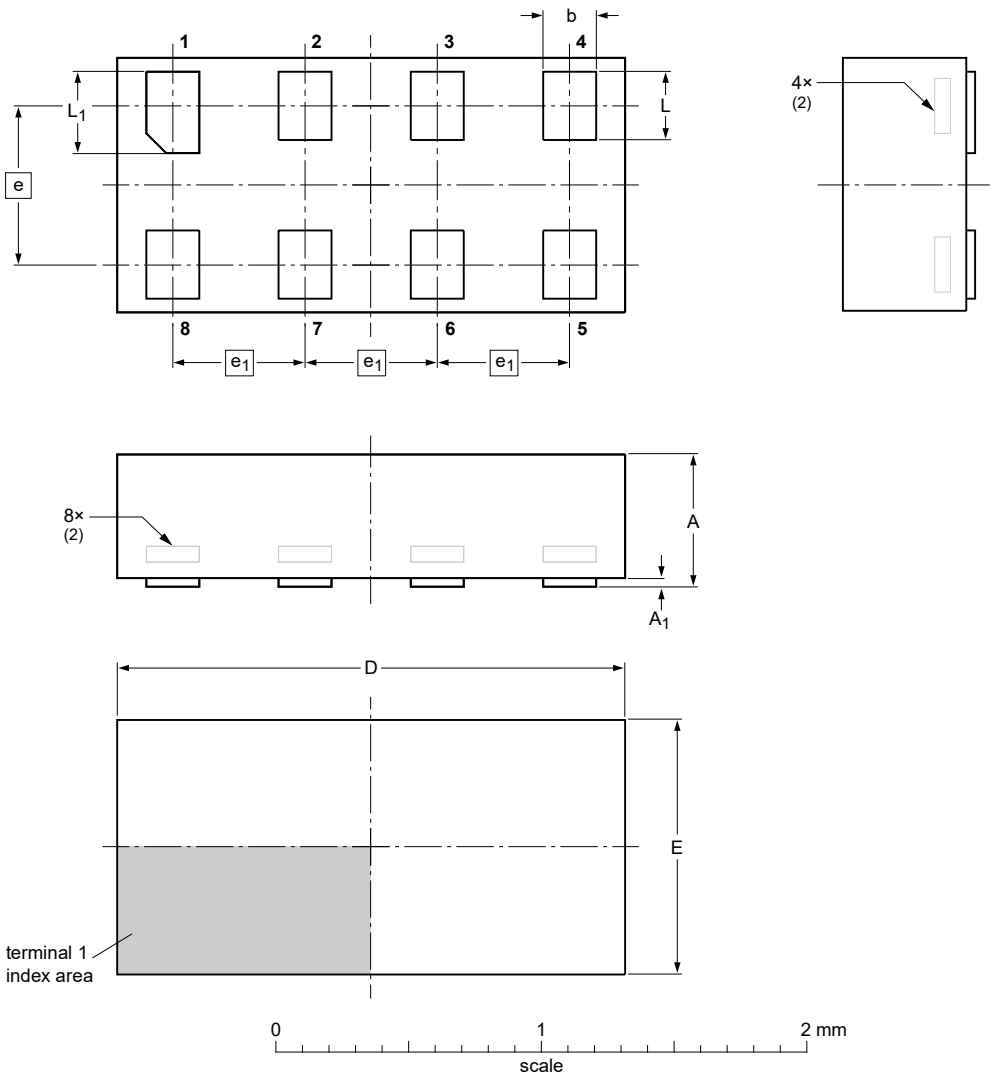
Note
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

*sot765-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT765-1 | | MO-187 | | | | ~~07-06-02~~ 16-05-31 |

**Fig. 8. Package outline SOT765-1 (VSSOP8)**

**XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm** **SOT833-1**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A(1) max | $A_1$ max | b | D | E | e | $e_1$ | L | $L_1$ |
|---|---|---|---|---|---|---|---|---|---|
| mm | 0.5 | 0.04 | 0.25<br>0.17 | 2.0<br>1.9 | 1.05<br>0.95 | 0.6 | 0.5 | 0.35<br>0.27 | 0.40<br>0.32 |

**Notes**

1. Including plating thickness.
2. Can be visible in some manufacturing processes.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT833-1 | - - - | MO-252 | - - - | | | ~~07-11-14~~<br>07-12-07 |

**Fig. 9. Package outline SOT833-1 (XSON8)**

# 13. Abbreviations

**Table 14. Abbreviations**

| Acronym | Description |
|---|---|
| ANSI | American National Standards Institute |
| CDM | Charged Device Model |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| ESDA | ElectroStatic Discharge Association |
| HBM | Human Body Model |
| JEDEC | Joint Electron Device Engineering Council |

# 14. Revision history

**Table 15. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74AVC9112 v.2 | 20240708 | Product data sheet | - | 74AVC9112 v.1 |
| Modifications: | • Section 2: ESD specification updated according to the latest JEDEC standard. | | | |
| 74AVC9112 v.1 | 20180423 | Product data sheet | - | - |

# 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. |

[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".
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