

# 74AVC9112

## 1-to-4 fan-out buffer

Rev. 1 — 23 April 2018

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
- 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 8 kV
  - CDM JESD22-C101 exceeds 1000 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
- Inputs accept voltages up to 3.6 V
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

### 3 Ordering information

### Table 1. Ordering information

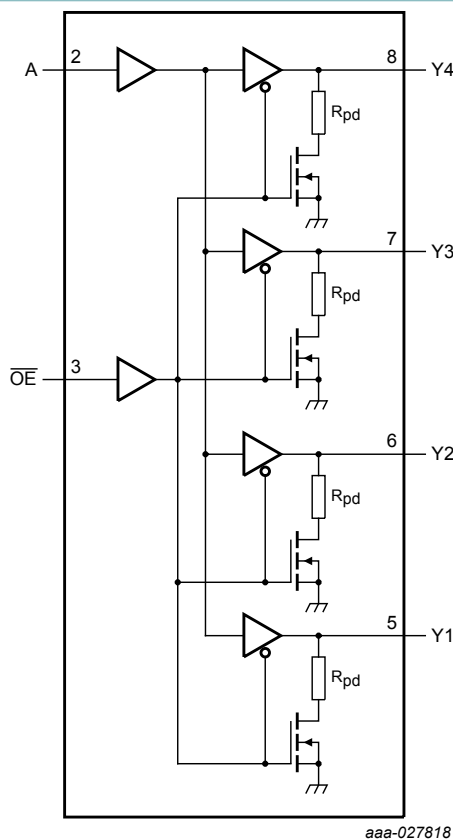
Type number	Package			
	Temperature range	Name	Description	Version
74AVC9112DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74AVC9112GT	-40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 x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

## 4 Marking

### Table 2. Marking codes

Type number	Marking code
74AVC9112DC	Bb
74AVC9112GT	Bb

## 5 Functional diagram



**Figure 1. Logic symbol**

6 Pinning information

6.1 Pinning

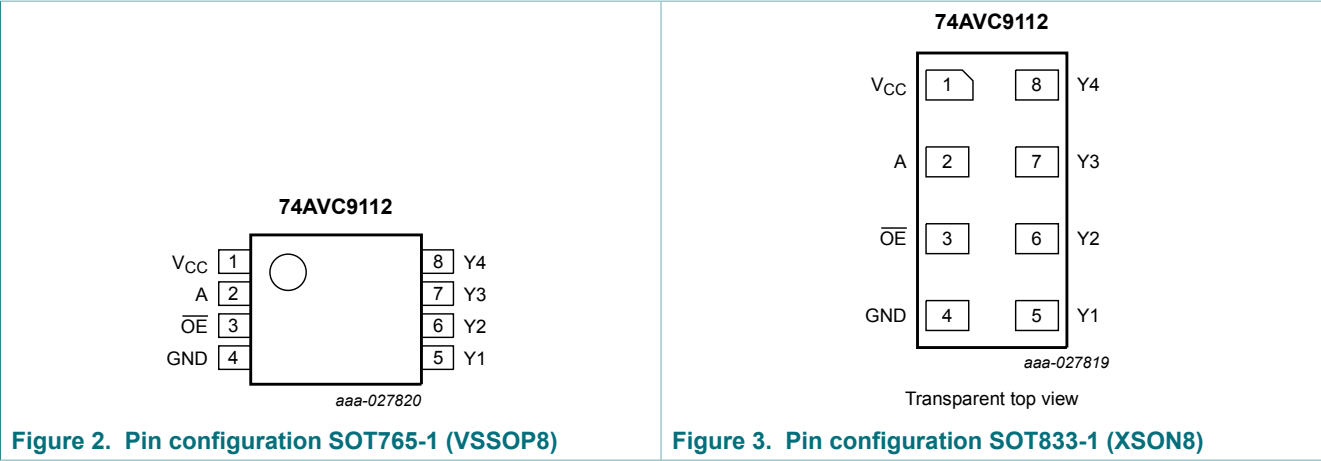


Figure 2. Pin configuration SOT765-1 (VSSOP8)

Figure 3. Pin configuration SOT833-1 (XSON8)

6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
V <sub>CC</sub>	1	supply voltage
A	2	data input
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 <sup>[1]</sup>

Inputs		Output
OE	A	Y <sub>n</sub>
L	L	L
L	H	H
H	X	L

[1] H = HIGH voltage level;  
L = LOW voltage level;  
X = don't care.

## 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	$\overline{OE} = \text{LOW}$ [1] [2]	-0.5	$V_{CC} + 0.5$	V
		$\overline{OE} = \text{HIGH}$ [1]	-0.5	+4.6	V
$I_{IK}$	input clamping current	$V_I < 0 \text{ V}$	-50	-	mA
$I_{OK}$	output clamping current	$V_O < 0 \text{ V}$	-50	-	mA
$I_O$	output current	$V_O = 0 \text{ V to } V_{CC}$	-	$\pm 50$	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	$T_{amb} = -40 \text{ °C to } +125 \text{ °C}$			
		SOT765-1 package [3]	-	250	mW
		SOT833-1 package [4]	-	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]  $V_{CC} + 0.5 \text{ V}$  should not exceed 4.6 V.

[3] For SOT765-1 package: above 99 °C, the value of  $P_{tot}$  derates linearly with 4.9 mW/K.

[4] For SOT833-1 package: above 68 °C, the value of  $P_{tot}$  derates linearly with 3.1 mW/K.

## 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	$\overline{OE} = \text{LOW}$	0	$V_{CC}$	V
		$\overline{OE} = \text{HIGH}$	0	3.6	V
$T_{amb}$	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$	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 <sub>amb</sub> = 25 °C			Unit
			Min	Typ	Max	
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -1.5 mA; V <sub>CC</sub> = 0.8 V	-	0.69	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 1.5 mA; V <sub>CC</sub> = 0.8 V	-	0.07	-	V
I <sub>I</sub>	input leakage current	A, $\overline{\text{OE}}$ input; V <sub>I</sub> = 0 V or 3.6 V; V <sub>CC</sub> = 0.8 V to 3.6 V	-	±0.025	±0.25	µA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	±0.1	±1	µA
R <sub>pd</sub>	pull-down resistance		-	50	-	kΩ
C <sub>I</sub>	input capacitance	A, $\overline{\text{OE}}$ input; V <sub>I</sub> = 0 V or 3.3 V; V <sub>CC</sub> = 3.3 V	-	1.2	-	pF
C <sub>O</sub>	output capacitance	Yn; V <sub>O</sub> = 3.3 V or 0 V; V <sub>CC</sub> = 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 <sub>amb</sub> = -40 °C to +85 °C		T <sub>amb</sub> = -40 °C to +125 °C		Unit
			Min	Max	Min	Max	
V <sub>IH</sub>	HIGH-level input voltage	A, $\overline{\text{OE}}$ input					
		V <sub>CC</sub> = 0.8 V	0.70V <sub>CC</sub>	-	0.70V <sub>CC</sub>	-	V
		V <sub>CC</sub> = 1.1 V to 1.95 V	0.65V <sub>CC</sub>	-	0.65V <sub>CC</sub>	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	1.6	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2	-	2	-	V
V <sub>IL</sub>	LOW-level input voltage	A, $\overline{\text{OE}}$ input					
		V <sub>CC</sub> = 0.8 V	-	0.30V <sub>CC</sub>	-	0.30V <sub>CC</sub>	V
		V <sub>CC</sub> = 1.1 V to 1.95 V	-	0.35V <sub>CC</sub>	-	0.35V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.7	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>					
		I <sub>O</sub> = -100 µA; V <sub>CC</sub> = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.1	-	V <sub>CC</sub> - 0.1	-	V
		I <sub>O</sub> = -3 mA; V <sub>CC</sub> = 1.1 V	0.85	-	0.85	-	V
		I <sub>O</sub> = -6 mA; V <sub>CC</sub> = 1.4 V	1.05	-	1.05	-	V
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 1.65 V	1.2	-	1.2	-	V
		I <sub>O</sub> = -9 mA; V <sub>CC</sub> = 2.3 V	1.75	-	1.75	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 3.0 V	2.3	-	2.3	-	V

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C		T <sub>amb</sub> = -40 °C to +125 °C		Unit
			Min	Max	Min	Max	
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>					
		I <sub>O</sub> = 100 µA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	0.1	-	0.1	V
		I <sub>O</sub> = 3 mA; V <sub>CC</sub> = 1.1 V	-	0.25	-	0.25	V
		I <sub>O</sub> = 6 mA; V <sub>CC</sub> = 1.4 V	-	0.35	-	0.35	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 1.65 V	-	0.45	-	0.45	V
		I <sub>O</sub> = 9 mA; V <sub>CC</sub> = 2.3 V	-	0.55	-	0.55	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 3.0 V	-	0.7	-	0.7	V
I <sub>I</sub>	input leakage current	A, $\overline{\text{OE}}$ input; V <sub>I</sub> = 0 V or 3.6 V; V <sub>CC</sub> = 0.8 V to 3.6 V	-	±1	-	±5	µA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	±5	-	±30	µA
I <sub>CC</sub>	supply current	V <sub>I</sub> = 0 V or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V	-	8	-	50	µA

## 11 Dynamic characteristics

**Table 9. Typical dynamic characteristics** <sup>[1]</sup>

Voltages are referenced to GND (ground = 0 V); for test circuit, see [Figure 6](#); for waveforms, see [Figure 4](#) and [Figure 5](#).

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C; V <sub>CC</sub> = 0.8 V	Unit
t <sub>pd</sub>	propagation delay	A to Y <sub>n</sub>	31	ns
t <sub>dis</sub>	disable time	$\overline{\text{OE}}$ to Y <sub>n</sub>	25	ns
t <sub>en</sub>	enable time	$\overline{\text{OE}}$ to Y <sub>n</sub>	36	ns

[1] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>;  
t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>;  
t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.

**Table 10. Dynamic characteristics** <sup>[1]</sup>

Voltages are referenced to GND (ground = 0 V); for test circuit, see [Figure 6](#); for waveforms, see [Figure 4](#) and [Figure 5](#).

Symbol	Parameter	Conditions	V <sub>CC</sub>										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 <sub>amb</sub> = -40 °C to +85 °C													
t <sub>pd</sub>	propagation delay	A to Yn	0.9	14.7	0.7	9.5	0.6	7.6	0.5	5.4	0.4	4.4	ns
t <sub>dis</sub>	disable time	$\overline{OE}$ to Yn	1.0	14.7	0.8	9.7	0.8	8.8	0.6	6.5	0.7	6.9	ns
t <sub>en</sub>	enable time	$\overline{OE}$ to Yn	1.0	15.8	0.7	9.9	0.6	7.9	0.5	5.5	0.5	4.5	ns
t <sub>sk(o)</sub>	output skew time	between any output	-	0.7	-	0.4	-	0.3	-	0.2	-	0.2	ns
T <sub>amb</sub> = -40 °C to +125 °C													
t <sub>pd</sub>	propagation delay	A to Yn	0.9	15.7	0.7	10.4	0.6	8.3	0.5	5.9	0.4	4.9	ns
t <sub>dis</sub>	disable time	$\overline{OE}$ to Yn	1.0	16.5	0.8	11.0	0.8	10.0	0.6	7.5	0.7	7.7	ns
t <sub>en</sub>	enable time	$\overline{OE}$ to Yn	1.0	16.9	0.7	10.9	0.6	8.7	0.6	6.1	0.5	4.9	ns
t <sub>sk(o)</sub>	output skew time	between any output	-	0.9	-	0.5	-	0.4	-	0.3	-	0.2	ns

- [1] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>;  
 t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>;  
 t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.

**Table 11. Typical power dissipation capacitance at T<sub>amb</sub> = 25 °C** <sup>[1] [2]</sup>

Symbol	Parameter	Conditions	V <sub>CC</sub>						Unit
			0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
C <sub>PD</sub>	power dissipation capacitance	Yn; outputs enabled	35	35	36	37	40	45	pF
		Yn; outputs disabled	2.0	2.2	2.3	2.4	2.6	2.7	pF

- [1] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

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

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

C<sub>L</sub> = load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

- [2] f<sub>i</sub> = 10 MHz;

V<sub>I</sub> = GND to V<sub>CC</sub>;

t<sub>r</sub> = t<sub>f</sub> = 1 ns;

C<sub>L</sub> = 0 pF;

R<sub>L</sub> = ∞ Ω.

11.1 Waveforms and test circuit

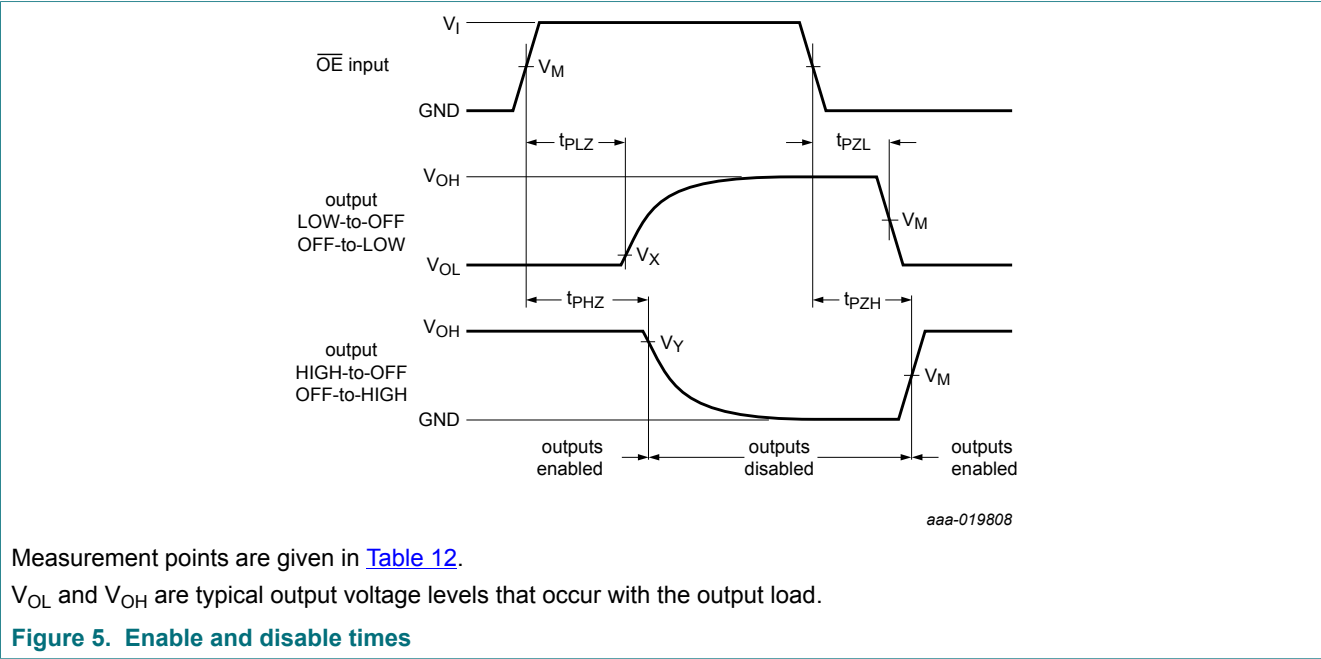
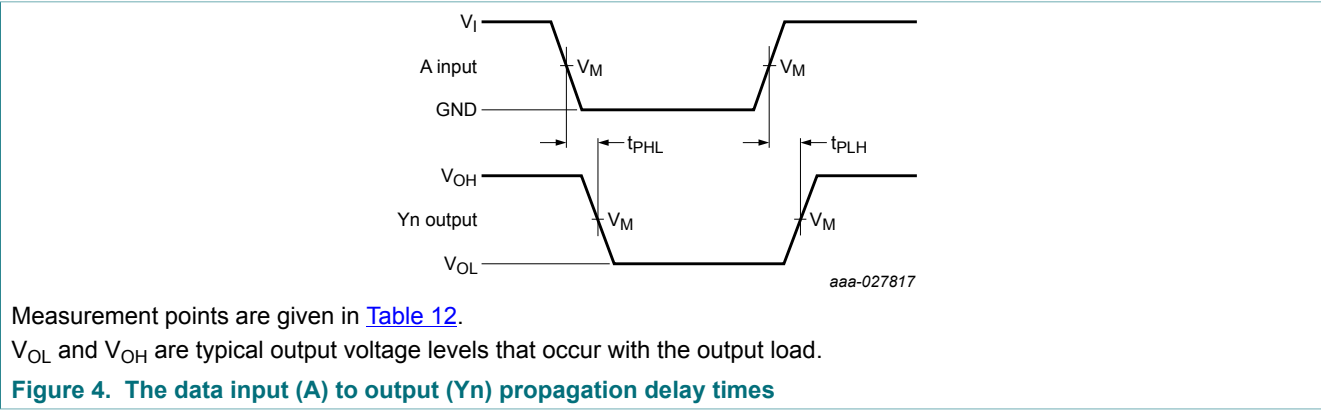
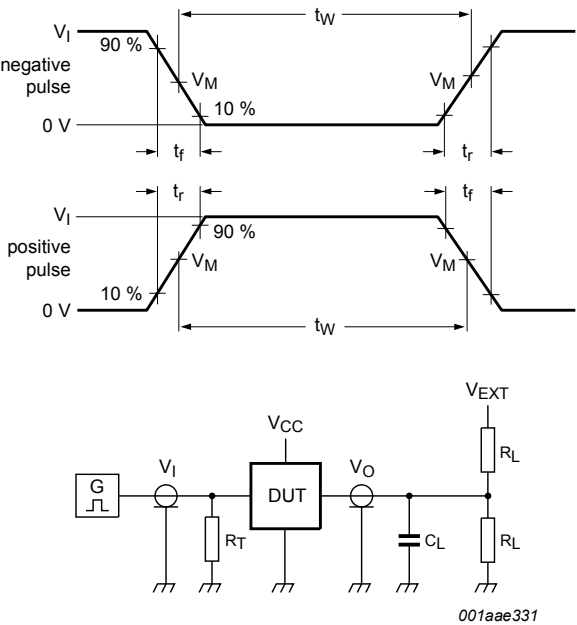


Table 12. Measurement points

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





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.

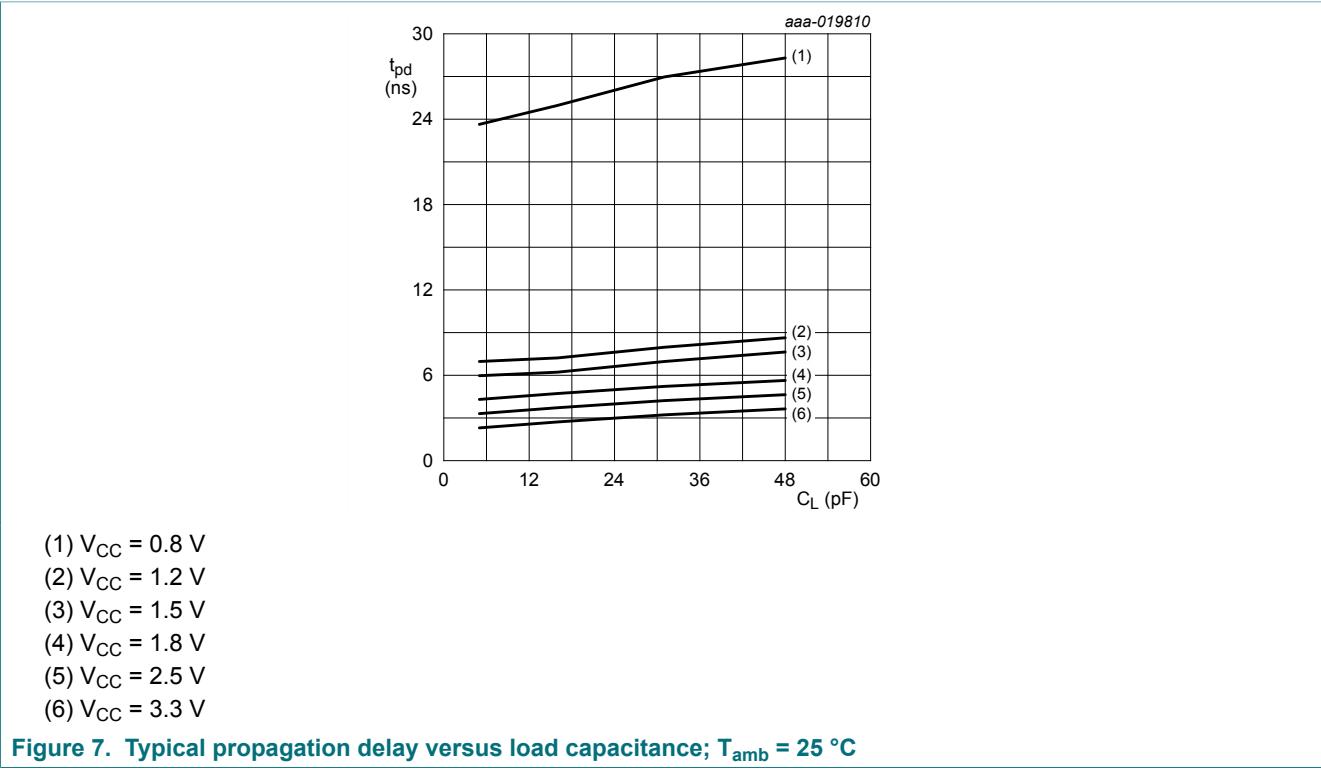
Figure 6. Test circuit for measuring switching times

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	$V_{CC}$	$\leq 1.0 \text{ ns/V}$	15 pF	2 k $\Omega$	open	GND	2 $V_{CC}$
1.65 V to 2.7 V	$V_{CC}$	$\leq 1.0 \text{ ns/V}$	15 pF	2 k $\Omega$	open	GND	2 $V_{CC}$
3.0 V to 3.6 V	$V_{CC}$	$\leq 1.0 \text{ ns/V}$	15 pF	2 k $\Omega$	open	GND	2 $V_{CC}$

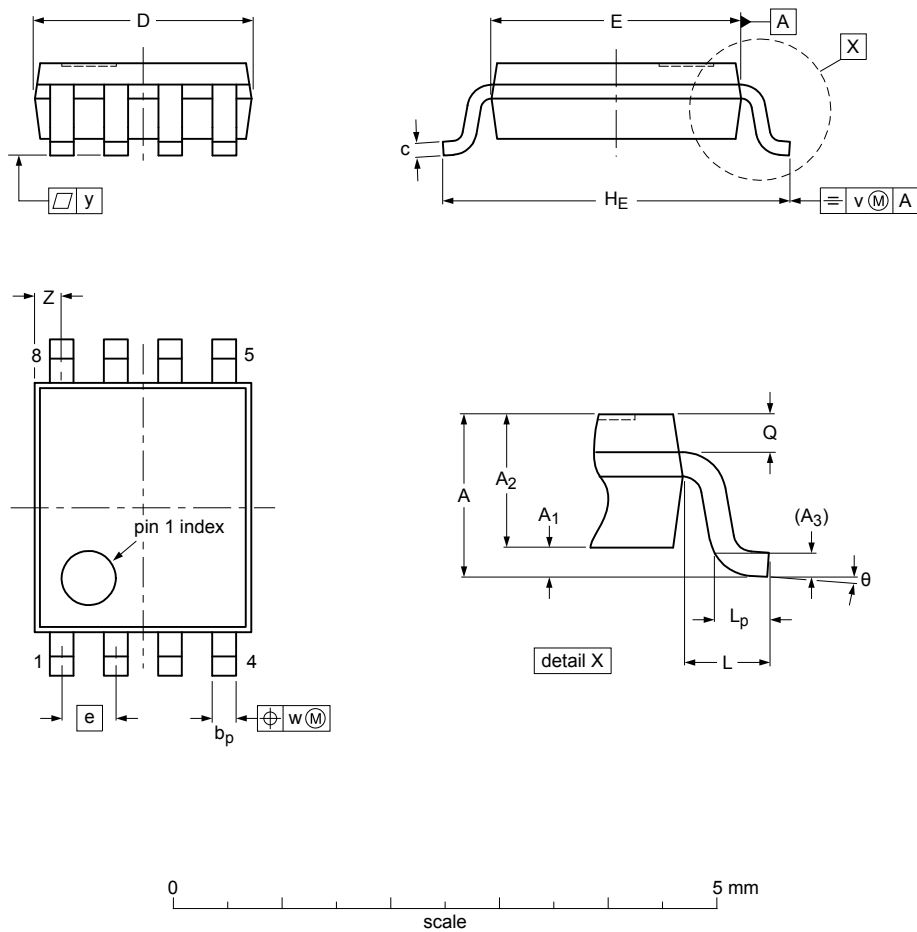
[1]  $dV/dt \geq 1.0 \text{ V/ns}$

11.2 Typical propagation delay characteristics



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 <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
max		0.15	0.85		0.27	0.23	2.1	2.4		3.2		0.40	0.21				0.4	8°
nom	1			0.12					0.5		0.4			0.2	0.08	0.1		
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.

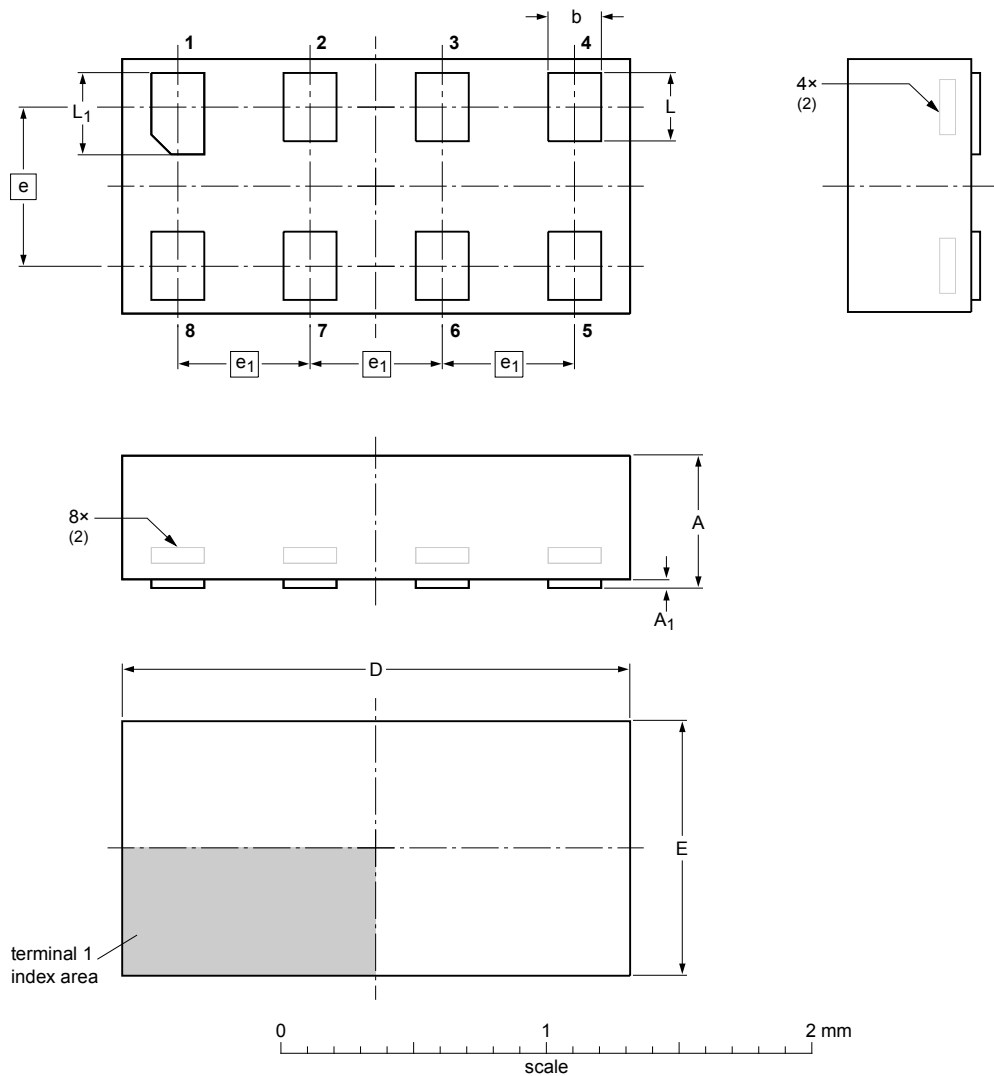
sot765-1\_po

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

Figure 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 <sup>(1)</sup> max	A <sub>1</sub> max	b	D	E	e	e <sub>1</sub>	L	L <sub>1</sub>
mm	0.5	0.04	0.25 0.17	2.0 1.9	1.05 0.95	0.6	0.5	0.35 0.27	0.40 0.32

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

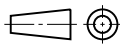
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT833-1	---	MO-252	---			07-11-14 07-12-07

Figure 9. Package outline SOT833-1 (XSON8)

## 13 Abbreviations

Table 14. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model

## 14 Revision history

Table 15. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AVC9112 v.1	20180423	Product data sheet	-	-

## 15 Legal information

### 15.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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Contents

1 General description ..... 1

2 Features and benefits .....1

3 Ordering information ..... 2

4 Marking .....2

5 Functional diagram .....2

6 Pinning information ..... 3

6.1 Pinning .....3

6.2 Pin description ..... 3

7 Functional description .....3

8 Limiting values .....4

9 Recommended operating conditions .....4

10 Static characteristics .....5

11 Dynamic characteristics .....6

11.1 Waveforms and test circuit ..... 8

11.2 Typical propagation delay characteristics ..... 10

12 Package outline .....11

13 Abbreviations ..... 13

14 Revision history ..... 13

15 Legal information ..... 14

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