74AVC1T8128

Single dual-supply translating 2-input NOR with enable

Rev. 1 — 10 October 2018 Product data sheet

1. General description

The 74AVC1T8128 is a single dual-supply translating 2-input NOR with enable input. It features two data input pins (A, B), one enable input pin (E), one data output pin (Y) and dual-supply pins ($V_{CC(A)}$ and $V_{CC(B)}$). Both $V_{CC(A)}$ and $V_{CC(B)}$ can be supplied at any voltage between 0.8 V and 3.6 V making the device suitable for translating between any of the low voltage nodes (0.8 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V and 3.3 V). Pins A, B and E are referenced to $V_{CC(A)}$ and pin Y is referenced to $V_{CC(B)}$.

The logic equation provided at the Y output is:

$$Y = E + A \bullet \overline{B}$$

The device is fully specified for partial power-down applications using I_{OFF}. The I_{OFF} circuitry disables the output, preventing any damaging backflow current through the device when it is powered down. In Suspend mode when either $V_{CC(A)}$ or $V_{CC(B)}$ are at GND level, the Y output is in the high-impedance OFF-state.

2. Features and benefits

- Wide supply voltage range:
  - $V_{CC(A)}$: 0.8 V to 3.6 V
  - $V_{CC(B)}$: 0.8 V to 3.6 V
- High noise immunity
- 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 exceeds 8000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 exceeds 1000 V
- Maximum data rates:
  - 500 Mbit/s (1.8 V to 3.3 V translation)
  - 320 Mbit/s (<1.8 V to 3.3 V translation)
  - 320 Mbit/s (translate to 2.5 V or 1.8 V)
  - 280 Mbit/s (translate to 1.5 V)
  - 240 Mbit/s (translate to 1.2 V)
- Suspend mode
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot < 10 % of V_{CC}
- I_{OFF} circuitry provides partial Power-down mode operation
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

nexperia

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AVC1T8128GS	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1.0 x 0.35 mm	SOT1203

4. Marking

Table 2. Marking

Type number	Marking code[1]
74AVC1T8128GS	Be

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram

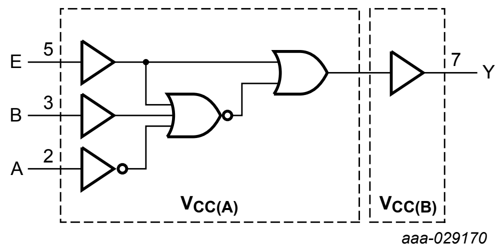


Fig. 1. Logic symbol

6. Pinning information

6.1. Pinning

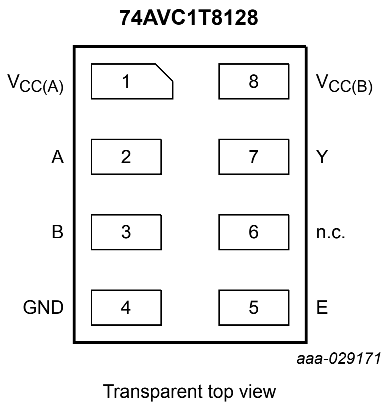


Fig. 2. Pin configuration SOT1203 (XSON8)

6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
$V_{CC(A)}$	1	supply voltage A (referenced to pins A, B and E)
A	2	data input
B	3	data input
GND	4	ground (0 V)
E	5	enable input
n.c.	6	not connected
Y	7	data output
$V_{CC(B)}$	8	supply voltage B (referenced to pin Y)

7. Functional description

Table 4. Function table

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

Supply voltage	Input[1]			Output[2]
$V_{CC(A)}$, $V_{CC(B)}$	E	B	A	Y
0.8 V to 3.6 V	L	L	L	L
0.8 V to 3.6 V	L	L	H	H
0.8 V to 3.6 V	L	H	L	L
0.8 V to 3.6 V	L	H	H	L
0.8 V to 3.6 V	H	L	L	H
0.8 V to 3.6 V	H	L	H	H
0.8 V to 3.6 V	H	H	L	H
0.8 V to 3.6 V	H	H	H	H
GND [3]	X	X	X	Z

[1] The A, B and E inputs are referenced to $V_{CC(A)}$.
[2] The Y output is referenced to $V_{CC(B)}$.
[3] If $V_{CC(A)}$ is at GND level, the device goes into Suspend mode.

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
$V_{CC(A)}$	supply voltage A		-0.5	+4.6	V
$V_{CC(B)}$	supply voltage B		-0.5	+4.6	V
I_{IK}	input clamping current	$V_I < 0$ V	-50	-	mA
V_I	input voltage	[1]	-0.5	+4.6	V
I_{OK}	output clamping current	$V_O < 0$ V	-50	-	mA
V_O	output voltage	Active mode [1] [2]	-0.5	$V_{CC(B)}$ + 0.5	V
		Suspend mode [1]	-0.5	+4.6	V
I_O	output current	V_O = 0 V to $V_{CC(B)}$	-	±50	mA

Symbol	Parameter	Conditions	Min	Max	Unit
I_{CC}	supply current	$I_{CC(A)}$ or $I_{CC(B)}$	-	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 rating and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] $V_{CC(B)}$ + 0.5 V should not exceed 4.6 V.

[3] For SOT1203 package: above 81 °C the value of P_{tot} derates linearly with 3.6 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC(A)}$	supply voltage A		0.8	3.6	V
$V_{CC(B)}$	supply voltage B		0.8	3.6	V
V_I	input voltage		0	3.6	V
V_O	output voltage	Active mode	0	$V_{CC(B)}$	V
		Suspend mode	0	3.6	V
T_{amb}	ambient temperature		-40	+125	°C
Δt/ΔV	input transition rise and fall rate	$V_{CC(A)}$ = 0.8 V to 3.6 V	-	5	ns/V

10. Static characteristics

Table 7. Typical static characteristics at T_{amb} = 25 °C

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_O = -1.5 mA; $V_{CC(A)} = V_{CC(B)}$ = 0.8 V	-	0.69	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_O = 1.5 mA; $V_{CC(A)} = V_{CC(B)}$ = 0.8 V	-	0.07	-	V
I_I	input leakage current	inputs; V_I = 0 V or 3.6 V; $V_{CC(A)}$ = 0 V to 3.6 V	-	±0.025	±0.25	μA
I_{OZ}	OFF-state output current	Y output; V_O = 0 V or $V_{CC(B)}$; $V_{CC(A)}$ = 0 V; $V_{CC(B)}$ = 0.8 V to 3.6 V	-	±0.5	±2.5	μA
I_{OFF}	power-off leakage current	output; V_I or V_O = 0 V to 3.6 V; $V_{CC(B)}$ = 0 V; $V_{CC(A)}$ = 0.8 V to 3.6 V	-	±0.1	±1	μA
C_I	input capacitance	V_I = 0 V or 3.3 V; $V_{CC(A)} = V_{CC(B)}$ = 3.3 V	-	1.0	-	pF
C_O	output capacitance	Y output; Suspend mode; $V_O = V_{CC(B)}$ or GND; $V_{CC(A)} = V_{CC(B)}$ = 3.3 V	-	4.0	-	pF

Table 8. Static characteristics

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

Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
V_{IH}	HIGH-level input voltage	inputs					
		$V_{CC(A)}$ = 0.8 V	$0.70V_{CC(A)}$	-	$0.70V_{CC(A)}$	-	V
		$V_{CC(A)}$ = 1.1 V to 1.95 V	$0.65V_{CC(A)}$	-	$0.65V_{CC(A)}$	-	V
		$V_{CC(A)}$ = 2.3 V to 2.7 V	1.6	-	1.6	-	V
		$V_{CC(A)}$ = 3.0 V to 3.6 V	2	-	2	-	V
V_{IL}	LOW-level input voltage	inputs					
		$V_{CC(A)}$ = 0.8 V	-	$0.30V_{CC(A)}$	-	$0.30V_{CC(A)}$	V
		$V_{CC(A)}$ = 1.1 V to 1.95 V	-	$0.35V_{CC(A)}$	-	$0.35V_{CC(A)}$	V
		$V_{CC(A)}$ = 2.3 V to 2.7 V	-	0.7	-	0.7	V
		$V_{CC(A)}$ = 3.0 V to 3.6 V	-	0.9	-	0.9	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}					
		I_O = -100 μA; $V_{CC(B)}$ = 0.8 V to 3.6 V	$V_{CC(B)}$ - 0.1	-	$V_{CC(B)}$ - 0.1	-	V
		I_O = -3 mA; $V_{CC(B)}$ = 1.1 V	0.85	-	0.85	-	V
		I_O = -6 mA; $V_{CC(B)}$ = 1.4 V	1.05	-	1.05	-	V
		I_O = -8 mA; $V_{CC(B)}$ = 1.65 V	1.2	-	1.2	-	V
		I_O = -9 mA; $V_{CC(B)}$ = 2.3 V	1.75	-	1.75	-	V
		I_O = -12 mA; $V_{CC(B)}$ = 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; $V_{CC(B)}$ = 0.8 V to 3.6 V	-	0.1	-	0.1	V
		I_O = 3 mA; $V_{CC(B)}$ = 1.1 V	-	0.25	-	0.25	V
		I_O = 6 mA; $V_{CC(B)}$ = 1.4 V	-	0.35	-	0.35	V
		I_O = 8 mA; $V_{CC(B)}$ = 1.65 V	-	0.45	-	0.45	V
		I_O = 9 mA; $V_{CC(B)}$ = 2.3 V	-	0.55	-	0.55	V
		I_O = 12 mA; $V_{CC(B)}$ = 3.0 V	-	0.7	-	0.7	V
I_I	input leakage current	inputs; V_I = 0 V or 3.6 V; $V_{CC(A)}$ = 0 V to 3.6 V	-	±1	-	±1.5	μA
I_{OZ}	OFF-state output current	output; V_O = 0 V or $V_{CC(B)}$; $V_{CC(A)}$ = 0 V; $V_{CC(B)}$ = 3.6 V	-	±5	-	±7.5	μA
I_{OFF}	power-off leakage current	output; V_I or V_O = 0 V to 3.6 V; $V_{CC(B)}$ = 0 V; $V_{CC(A)}$ = 0.8 V to 3.6 V	-	±5	-	±35	μA
I_{CC}	supply current	$V_{CC(A)}$; V_I = 0 V or $V_{CC(A)}$; I_O = 0 A					
		$V_{CC(A)}$ = 0.8 V to 3.6 V; $V_{CC(B)}$ = 0.8 V to 3.6 V	-	8	-	11.5	μA
		$V_{CC(A)}$ = 3.6 V; $V_{CC(B)}$ = 0 V	-	8	-	11.5	μA
		$V_{CC(A)}$ = 0 V; $V_{CC(B)}$ = 3.6 V	-2	-	-8	-	μA
		$V_{CC(B)}$; V_I = 0 V or $V_{CC(A)}$; I_O = 0 A					
		$V_{CC(A)}$ = 0.8 V to 3.6 V; $V_{CC(B)}$ = 0.8 V to 3.6 V	-	8	-	11.5	μA
		$V_{CC(A)}$ = 3.6 V; $V_{CC(B)}$ = 0 V	-2	-	-8	-	μA
		$V_{CC(A)}$ = 0 V; $V_{CC(B)}$ = 3.6 V	-	8	-	11.5	μA

11. Dynamic characteristics

Table 9. Typical dynamic characteristics at T_{amb} = 25 °C [1]

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 4; for waveforms see Fig. 3.

Symbol	Parameter	Conditions	$V_{CC(B)}$			Unit
			1.8 V	2.5 V	3.3 V	
t_{pd}	propagation delay	A, B and E to Y				
		$V_{CC(A)}$ = 1.8 V	3.1	2.8	2.7	ns
		$V_{CC(A)}$ = 2.5 V	2.6	2.2	2.1	ns
		$V_{CC(A)}$ = 3.3 V	2.4	2.0	1.9	ns

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

Table 10. Typical power dissipation capacitance at $V_{CC(A)}$ = $V_{CC(B)}$ and T_{amb} = 25 °C [1] [2]

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

Symbol	Parameter	Conditions	$V_{CC(A)}$ and $V_{CC(B)}$						Unit
			0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
C_{PD}	power dissipation capacitance	inputs	0.6	0.7	0.8	0.9	1.2	1.5	pF
		output	11	11	11	11	14	18	pF

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

Table 11. Dynamic characteristics for temperature range -40 °C to +85 °C [1]

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 4; for waveforms see Fig. 3.

Symbol	Parameter	Conditions	$V_{CC(B)}$										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_{pd}	propagation delay	A, B and E to Y											
		$V_{CC(A)}$ = 1.1 V to 1.3 V	1.5	14.3	1.5	11.8	1.4	11.0	1.4	10.6	1.3	10.9	ns
		$V_{CC(A)}$ = 1.4 V to 1.6 V	1.1	11.3	1.2	8.5	1.2	7.6	1.1	6.8	1.1	6.8	ns
		$V_{CC(A)}$ = 1.65 V to 1.95 V	1.0	10.2	1.1	7.3	1.2	6.4	1.2	5.6	1.1	5.3	ns
		$V_{CC(A)}$ = 2.3 V to 2.7 V	0.9	8.9	1.0	6.1	1.0	5.2	0.9	4.2	0.8	3.9	ns
		$V_{CC(A)}$ = 3.0 V to 3.6 V	0.9	8.5	0.9	5.6	0.9	4.7	0.8	3.7	0.7	3.3	ns

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

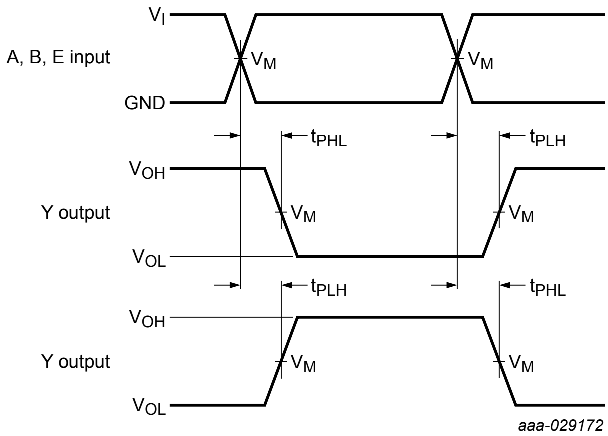
Table 12. Dynamic characteristics for temperature range -40 °C to +125 °C [1]

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 4; for waveforms see Fig. 3.

Symbol	Parameter	Conditions	$V_{CC(B)}$										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_{pd}	propagation delay	A, B and E to Y											
		$V_{CC(A)}$ = 1.1 V to 1.3 V	1.4	14.6	1.5	12.1	1.4	11.4	1.4	10.9	1.3	11.1	ns
		$V_{CC(A)}$ = 1.4 V to 1.6 V	1.1	11.8	1.2	9.0	1.2	8.1	1.1	7.3	1.1	7.1	ns
		$V_{CC(A)}$ = 1.65 V to 1.95 V	1.0	10.6	1.1	7.8	1.2	6.9	1.2	5.9	1.1	5.6	ns
		$V_{CC(A)}$ = 2.3 V to 2.7 V	0.9	9.3	1.0	6.5	1.0	5.5	0.9	4.5	0.8	4.1	ns
		$V_{CC(A)}$ = 3.0 V to 3.6 V	0.9	8.9	0.9	6.0	0.9	5.0	0.8	3.9	0.7	3.6	ns

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

11.1. Waveforms and test circuit



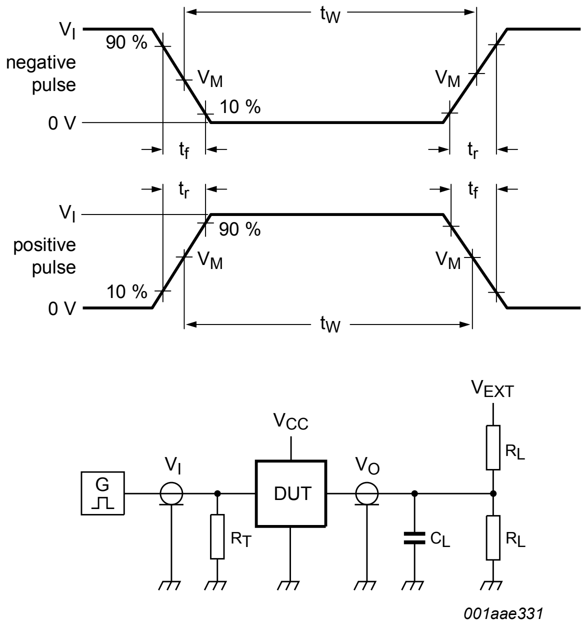
Measurement points are given in Table 13.

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

Fig. 3. Input A, B and E to output Y propagation delay times

Table 13. Measurement points

Supply voltage	Inputs	Output
$V_{CC(A)}$, $V_{CC(B)}$	V_M	V_M
0.8 V to 1.6 V	$0.5V_{CC(A)}$	$0.5V_{CC(B)}$
1.65 V to 2.7 V	$0.5V_{CC(A)}$	$0.5V_{CC(B)}$
3.0 V to 3.6 V	$0.5V_{CC(A)}$	$0.5V_{CC(B)}$



Test data is given in Table 14.

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. 4. Test circuit for measuring switching times

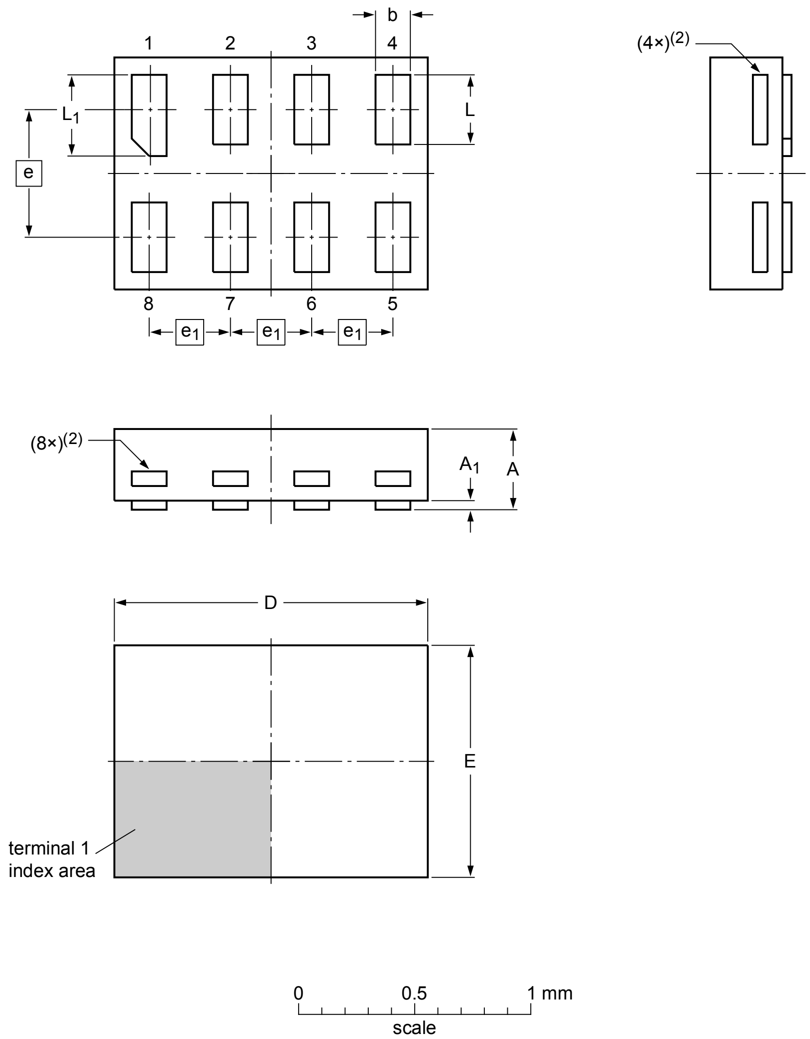
Table 14. Test data

Supply voltage	Input		Load		V_{EXT}
$V_{CC(A)}$, $V_{CC(B)}$	V_I	Δt/ΔV [1]	C_L	R_L	t_{PLH}, t_{PHL}
0.8 V to 1.6 V	$V_{CC(A)}$	≤ 1.0 ns/V	15 pF	2 kΩ	open
1.65 V to 2.7 V	$V_{CC(A)}$	≤ 1.0 ns/V	15 pF	2 kΩ	open
3.0 V to 3.6 V	$V_{CC(A)}$	≤ 1.0 ns/V	15 pF	2 kΩ	open

[1] dV/dt ≥ 1.0 V/ns

12. Package outline

XSON8: extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1.0 x 0.35 mm **SOT1203**



Dimensions

Unit		$A^{(1)}$	A_1	b	D	E	e	e_1	L	L_1
	max	0.35	0.04	0.20	1.40	1.05			0.35	0.40
mm	nom			0.15	1.35	1.00	0.55	0.35	0.30	0.35
	min			0.12	1.30	0.95			0.27	0.32

Note
1. Including plating thickness.
2. Visible depending upon used manufacturing technology.

sot1203_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1203						~~10-04-02~~ 10-04-06

Fig. 5. Package outline SOT1203 (XSON8)

13. Abbreviations

Table 15. Abbreviations

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

14. Revision history

Table 16. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AVC1T8128 v.1	20181010	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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