

74AUP3G17

Low-power triple Schmitt trigger

Rev. 4 — 31 July 2023

Product data sheet

1. General description

The 74AUP3G17 provides three Schmitt trigger buffers. It is capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

This device ensures a very low static and dynamic power consumption across the entire V_{CC} range from 0.8 V to 3.6 V.

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.

The inputs switch at different points for positive and negative-going signals. The difference between the positive voltage V_{T+} and the negative voltage V_{T-} is defined as the input hysteresis voltage V_H .

2. Features and benefits

- Wide supply voltage range from 0.8 V to 3.6 V
- High noise immunity
- Low static power consumption; $I_{CC} = 0.9 \mu\text{A}$ (maximum)
- 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
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 3A exceeds 5000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AUP3G17DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74AUP3G17GT	-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
74AUP3G17GN	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm	SOT1116
74AUP3G17GS	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm	SOT1203

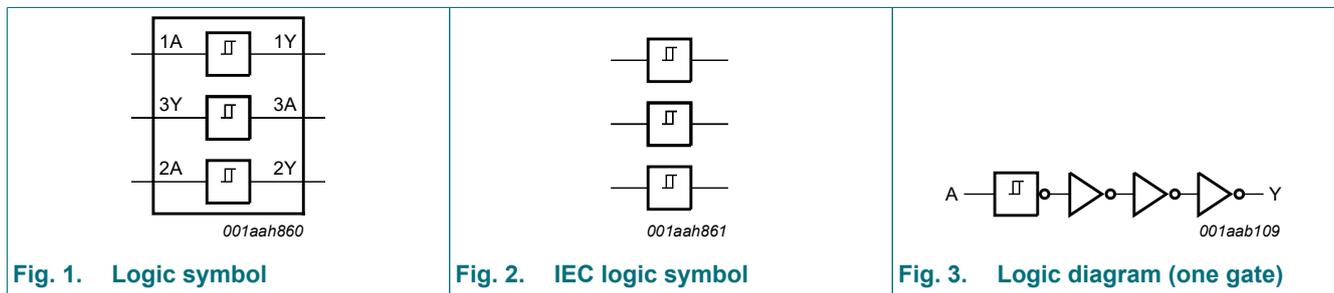
4. Marking

Table 2. Marking

Type number	Marking code [1]
74AUP3G17DC	pV
74AUP3G17GT	pV
74AUP3G17GN	pV
74AUP3G17GS	pV

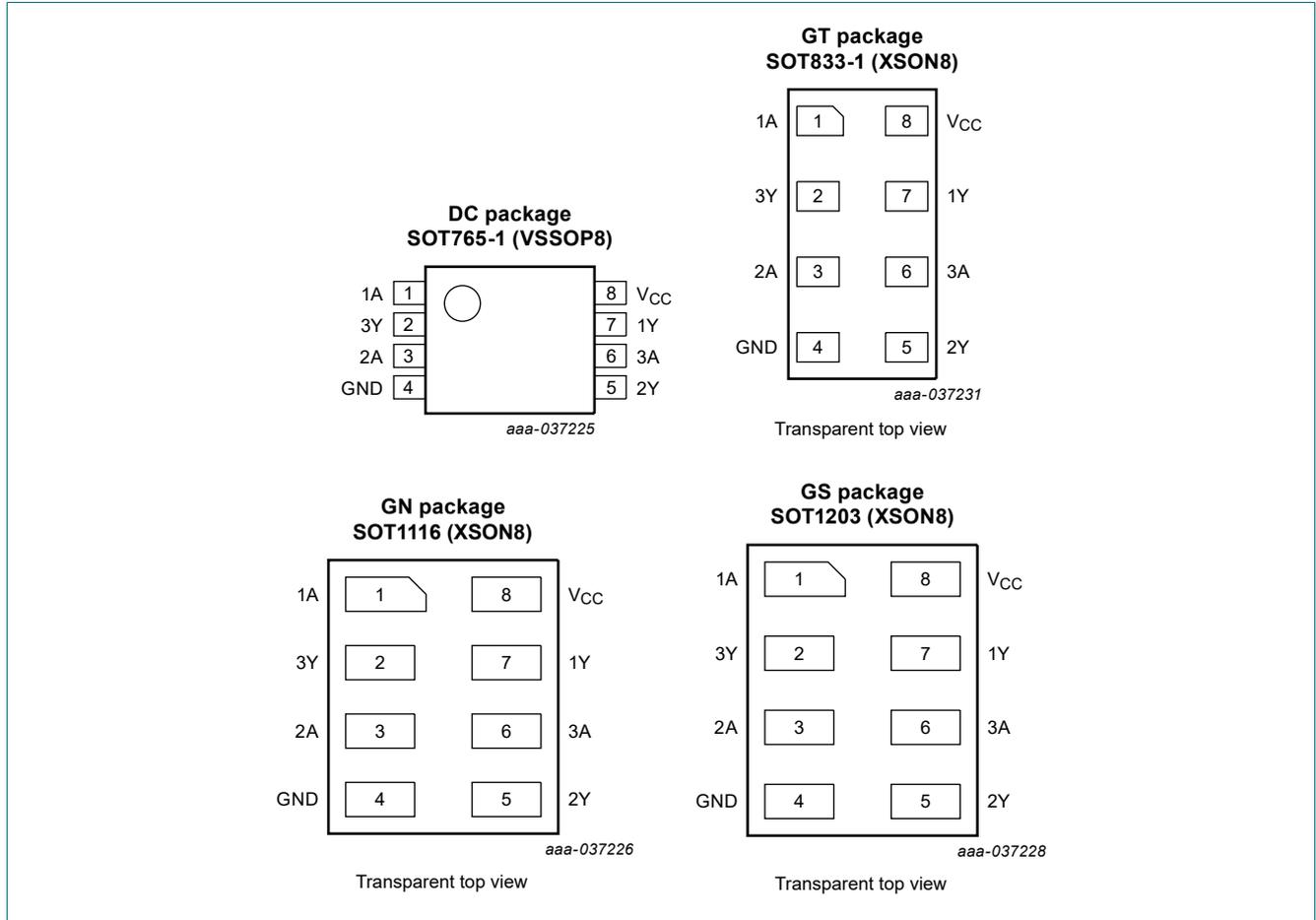
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1A, 2A, 3A	1, 3, 6	data input
GND	4	ground (0 V)
1Y, 2Y, 3Y	7, 5, 2	data output
V _{CC}	8	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level.

Input	Output
nA	nY
L	L
H	H

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
I_{IK}	input clamping current	$V_I < 0$ V	-50	-	mA
V_I	input voltage		-0.5	+4.6	V
I_{OK}	output clamping current	$V_O < 0$ V	-50	-	mA
V_O	output voltage	Active mode and Power-down mode	-0.5	+4.6	V
I_O	output current	$V_O = 0$ V to V_{CC}	-	± 20	mA
I_{CC}	supply current		-	50	mA
I_{GND}	ground current		-50	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = -40$ °C to +125 °C	-	250	mW

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

[2] 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.
 For SOT1116 (XSON8) package: P_{tot} derates linearly with 4.2 mW/K above 90 °C.
 For SOT1203 (XSON8) package: P_{tot} derates linearly with 3.6 mW/K above 81 °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	Active mode	0	V_{CC}	V
		Power-down mode; $V_{CC} = 0$ V	0	3.6	V
T_{amb}	ambient temperature		-40	+125	°C

10. Static characteristics

Table 7. Static characteristics

At recommended operating conditions; 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 _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-}								
		I _O = -20 µA; V _{CC} = 0.8 V to 3.6 V	V _{CC} - 0.1	-	-	V _{CC} - 0.1	-	V _{CC} - 0.11	-	V
		I _O = -1.1 mA; V _{CC} = 1.1 V	0.75V _{CC}	-	-	0.7V _{CC}	-	0.6V _{CC}	-	V
		I _O = -1.7 mA; V _{CC} = 1.4 V	1.11	-	-	1.03	-	0.93	-	V
		I _O = -1.9 mA; V _{CC} = 1.65 V	1.32	-	-	1.30	-	1.17	-	V
		I _O = -2.3 mA; V _{CC} = 2.3 V	2.05	-	-	1.97	-	1.77	-	V
		I _O = -3.1 mA; V _{CC} = 2.3 V	1.9	-	-	1.85	-	1.67	-	V
		I _O = -2.7 mA; V _{CC} = 3.0 V	2.72	-	-	2.67	-	2.40	-	V
		I _O = -4.0 mA; V _{CC} = 3.0 V	2.6	-	-	2.55	-	2.30	-	V
V _{OL}	LOW-level output voltage	V _I = V _{T+} or V _{T-}								
		I _O = 20 µA; V _{CC} = 0.8 V to 3.6 V	-	-	0.1	-	0.1	-	0.11	V
		I _O = 1.1 mA; V _{CC} = 1.1 V	-	-	0.3V _{CC}	-	0.3V _{CC}	-	0.33V _{CC}	V
		I _O = 1.7 mA; V _{CC} = 1.4 V	-	-	0.31	-	0.37	-	0.41	V
		I _O = 1.9 mA; V _{CC} = 1.65 V	-	-	0.31	-	0.35	-	0.39	V
		I _O = 2.3 mA; V _{CC} = 2.3 V	-	-	0.31	-	0.33	-	0.36	V
		I _O = 3.1 mA; V _{CC} = 2.3 V	-	-	0.44	-	0.45	-	0.50	V
		I _O = 2.7 mA; V _{CC} = 3.0 V	-	-	0.31	-	0.33	-	0.36	V
		I _O = 4.0 mA; V _{CC} = 3.0 V	-	-	0.44	-	0.45	-	0.50	V
I _I	input leakage current	V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V	-	-	±0.1	-	±0.5	-	±0.75	µA
I _{OFF}	power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V	-	-	±0.2	-	±0.5	-	±0.75	µA
ΔI _{OFF}	additional power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V	-	-	±0.2	-	±0.6	-	±0.75	µA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V	-	-	0.5	-	0.9	-	1.4	µA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 3.3 V	-	-	40	-	50	-	75	µA
C _I	input capacitance	V _I = GND or V _{CC} ; V _{CC} = 0 V to 3.6 V	-	1.1	-	-	-	-	-	pF
C _O	output capacitance	V _O = GND; V _{CC} = 0 V	-	1.7	-	-	-	-	-	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 5

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_L = 5 pF										
t _{pd}	propagation delay	nA to nY; see Fig. 4 [2]								
		V _{CC} = 0.8 V	-	19.0	-	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	2.6	5.7	10.6	2.5	10.9	2.5	11.1	ns
		V _{CC} = 1.4 V to 1.6 V	2.4	4.2	6.5	2.3	7.1	2.3	7.4	ns
		V _{CC} = 1.65 V to 1.95 V	2.0	3.6	5.5	1.9	6.1	1.9	6.3	ns
		V _{CC} = 2.3 V to 2.7 V	1.9	3.0	4.2	1.8	4.6	1.8	4.8	ns
		V _{CC} = 3.0 V to 3.6 V	1.8	2.7	3.6	1.5	3.8	1.5	4.0	ns
C_L = 10 pF										
t _{pd}	propagation delay	nA to nY; see Fig. 4 [2]								
		V _{CC} = 0.8 V	-	22.5	-	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	2.9	6.6	12.4	2.7	12.9	2.7	13.0	ns
		V _{CC} = 1.4 V to 1.6 V	2.6	4.8	7.8	2.4	8.3	2.4	8.7	ns
		V _{CC} = 1.65 V to 1.95 V	2.5	4.2	6.3	2.4	6.8	2.4	7.1	ns
		V _{CC} = 2.3 V to 2.7 V	2.3	3.5	4.8	2.1	5.3	2.1	5.6	ns
		V _{CC} = 3.0 V to 3.6 V	2.1	3.3	4.4	2.0	4.6	2.0	4.8	ns
C_L = 15 pF										
t _{pd}	propagation delay	nA to nY; see Fig. 4 [2]								
		V _{CC} = 0.8 V	-	26.0	-	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	3.2	7.4	14.1	3.1	14.7	3.1	14.9	ns
		V _{CC} = 1.4 V to 1.6 V	3.1	5.4	8.7	2.8	9.5	2.8	9.9	ns
		V _{CC} = 1.65 V to 1.95 V	2.7	4.7	7.1	2.7	7.8	2.7	8.2	ns
		V _{CC} = 2.3 V to 2.7 V	2.6	4.0	5.6	2.5	6.0	2.5	6.3	ns
		V _{CC} = 3.0 V to 3.6 V	2.5	3.7	4.9	2.2	5.2	2.2	5.5	ns
C_L = 30 pF										
t _{pd}	propagation delay	nA to nY; see Fig. 4 [2]								
		V _{CC} = 0.8 V	-	36.3	-	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	3.9	9.7	19.0	3.7	19.8	3.7	20.1	ns
		V _{CC} = 1.4 V to 1.6 V	3.5	7.0	11.2	3.6	12.4	3.6	13.0	ns
		V _{CC} = 1.65 V to 1.95 V	3.5	6.0	9.2	3.4	10.1	3.4	10.7	ns
		V _{CC} = 2.3 V to 2.7 V	3.4	5.1	7.0	3.2	7.5	3.2	7.9	ns
		V _{CC} = 3.0 V to 3.6 V	3.3	4.8	6.2	3.1	7.1	3.1	7.5	ns

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_L = 5 pF, 10 pF, 15 pF and 30 pF										
C _{PD}	power dissipation capacitance	f _i = 1 MHz; V _I = GND to V _{CC} [3]								
		V _{CC} = 0.8 V	-	2.5	-	-	-	-	-	pF
		V _{CC} = 1.1 V to 1.3 V	-	2.7	-	-	-	-	-	pF
		V _{CC} = 1.4 V to 1.6 V	-	2.8	-	-	-	-	-	pF
		V _{CC} = 1.65 V to 1.95 V	-	3.0	-	-	-	-	-	pF
		V _{CC} = 2.3 V to 2.7 V	-	3.5	-	-	-	-	-	pF
		V _{CC} = 3.0 V to 3.6 V	-	4.0	-	-	-	-	-	pF

- [1] All typical values are measured at nominal V_{CC}.
- [2] t_{pd} is the same as t_{PLH} and t_{PHL}
- [3] 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 V;
 N = number of inputs switching;
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

11.1. Waveforms and test circuit

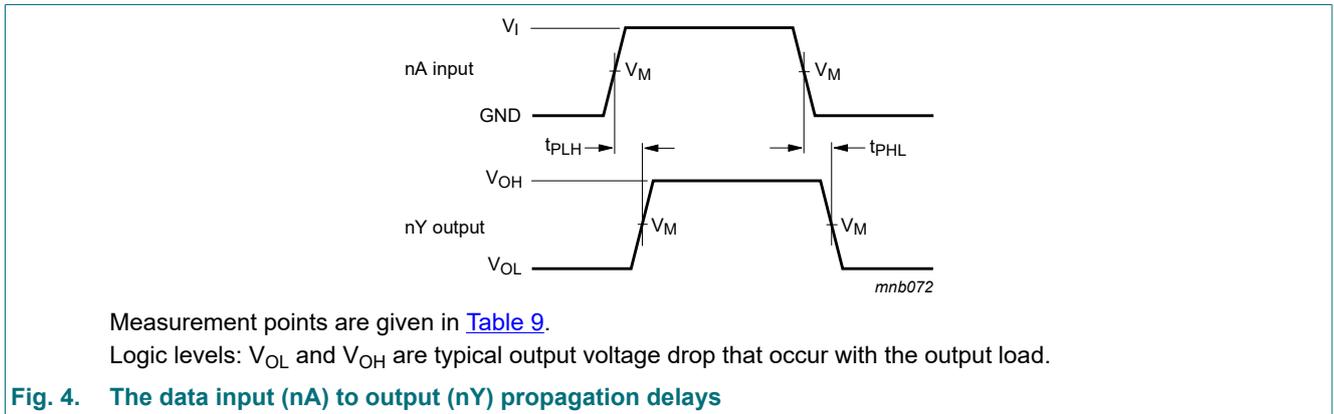
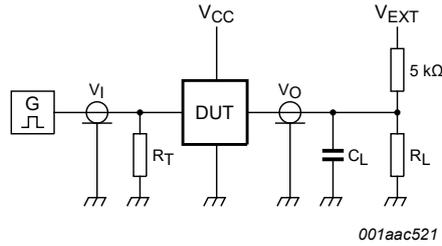


Table 9. Measurement points

Supply voltage	Output	Input		
V _{CC}	V _M	V _M	V _I	t _r = t _f
0.8 V to 3.6 V	0.5 × V _{CC}	0.5 × V _{CC}	V _{CC}	≤ 3.0 ns



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

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 the output impedance Z_o of the pulse generator.

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

Fig. 5. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Load		V_{EXT}		
V_{CC}	C_L	R_L [1]	t_{PLH} , t_{PHL}	t_{PZH} , t_{PHZ}	t_{PZL} , t_{PLZ}
0.8 V to 3.6 V	5 pF, 10 pF, 15 pF and 30 pF	5 kΩ or 1 MΩ	open	GND	$2 \times V_{CC}$

[1] For measuring enable and disable times $R_L = 5 \text{ k}\Omega$.

For measuring propagation delays, setup and hold times and pulse width $R_L = 1 \text{ M}\Omega$.

12. Transfer characteristics

Table 11. Transfer characteristics

Voltages are referenced to GND (ground = 0 V; for test circuit see Figure 8).

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	see Fig. 6 and Fig. 7								
		V _{CC} = 0.8 V	0.30	-	0.60	0.30	0.60	0.30	0.62	V
		V _{CC} = 1.1 V	0.53	-	0.90	0.53	0.90	0.53	0.92	V
		V _{CC} = 1.4 V	0.74	-	1.11	0.74	1.11	0.74	1.13	V
		V _{CC} = 1.65 V	0.91	-	1.29	0.91	1.29	0.91	1.31	V
		V _{CC} = 2.3 V	1.37	-	1.77	1.37	1.77	1.37	1.80	V
		V _{CC} = 3.0 V	1.88	-	2.29	1.88	2.29	1.88	2.32	V
V _{T-}	negative-going threshold voltage	see Fig. 6 and Fig. 7								
		V _{CC} = 0.8 V	0.10	-	0.60	0.10	0.60	0.10	0.60	V
		V _{CC} = 1.1 V	0.26	-	0.65	0.26	0.65	0.26	0.65	V
		V _{CC} = 1.4 V	0.39	-	0.75	0.39	0.75	0.39	0.75	V
		V _{CC} = 1.65 V	0.47	-	0.84	0.47	0.84	0.47	0.84	V
		V _{CC} = 2.3 V	0.69	-	1.04	0.69	1.04	0.69	1.04	V
		V _{CC} = 3.0 V	0.88	-	1.24	0.88	1.24	0.88	1.24	V
V _H	hysteresis voltage	(V _{T+} - V _{T-}); see Fig. 6 , Fig. 7 , Fig. 8 and Fig. 9								
		V _{CC} = 0.8 V	0.07	-	0.50	0.07	0.50	0.07	0.50	V
		V _{CC} = 1.1 V	0.08	-	0.46	0.08	0.46	0.08	0.46	V
		V _{CC} = 1.4 V	0.18	-	0.56	0.18	0.56	0.18	0.56	V
		V _{CC} = 1.65 V	0.27	-	0.66	0.27	0.66	0.27	0.66	V
		V _{CC} = 2.3 V	0.53	-	0.92	0.53	0.92	0.53	0.92	V
		V _{CC} = 3.0 V	0.79	-	1.31	0.79	1.31	0.79	1.31	V

12.1. Waveforms transfer characteristics

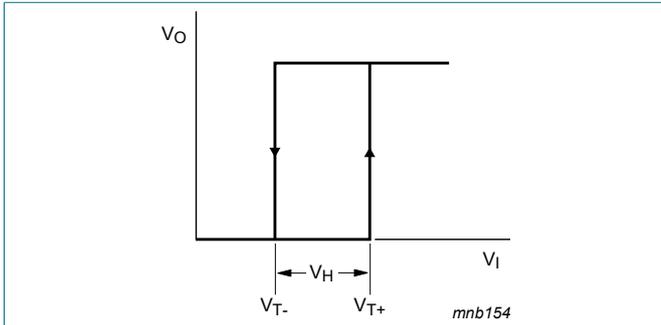


Fig. 6. Transfer characteristic

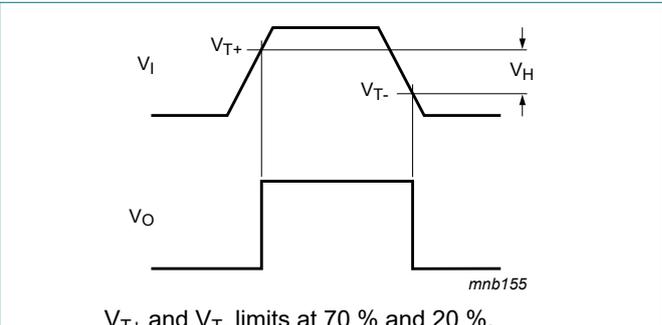


Fig. 7. Definition of V_{T+} , V_{T-} and V_H

V_{T+} and V_{T-} limits at 70 % and 20 %.

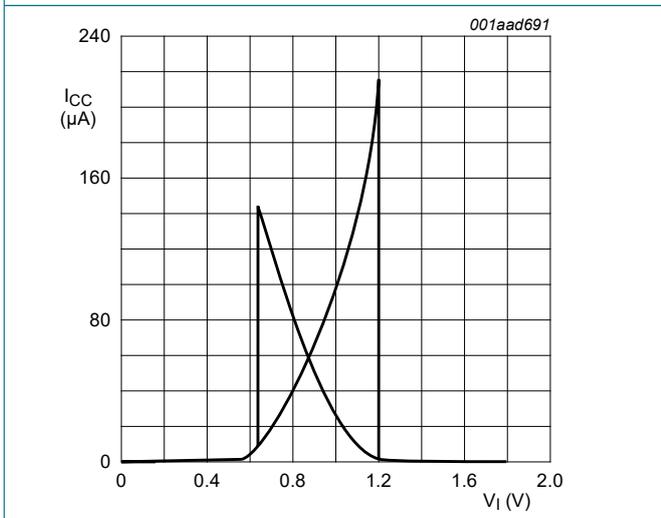


Fig. 8. Typical transfer characteristics; $V_{CC} = 1.8 \text{ V}$

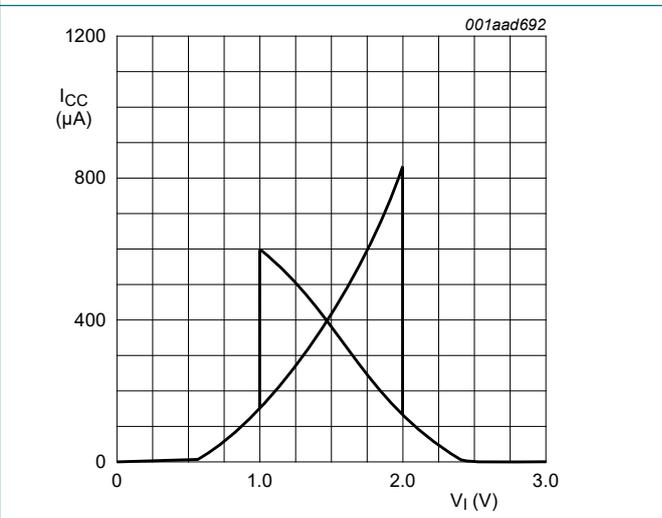


Fig. 9. Typical transfer characteristics; $V_{CC} = 3.0 \text{ V}$

13. Application information

The slow input rise and fall times cause additional power dissipation, this can be calculated using the following formula:

$$P_{\text{add}} = f_i \times (t_r \times \Delta I_{\text{CC(AV)}} + t_f \times \Delta I_{\text{CC(AV)}}) \times V_{\text{CC}} \text{ where:}$$

P_{add} = additional power dissipation (μW);

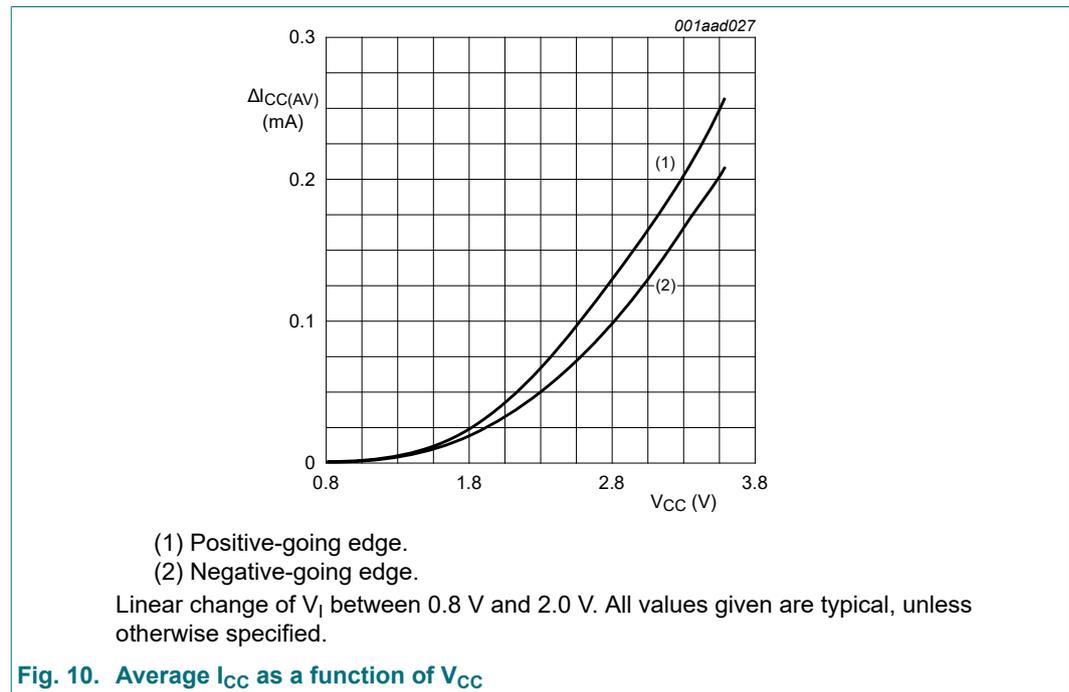
f_i = input frequency (MHz);

t_r = input rise time (ns); 10 % to 90 %;

t_f = input fall time (ns); 90 % to 10 %;

$\Delta I_{\text{CC(AV)}}$ = average additional supply current (μA).

Average $\Delta I_{\text{CC(AV)}}$ differs with positive or negative input transitions, as shown in [Fig. 10](#).



14. Package outline

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

SOT765-1

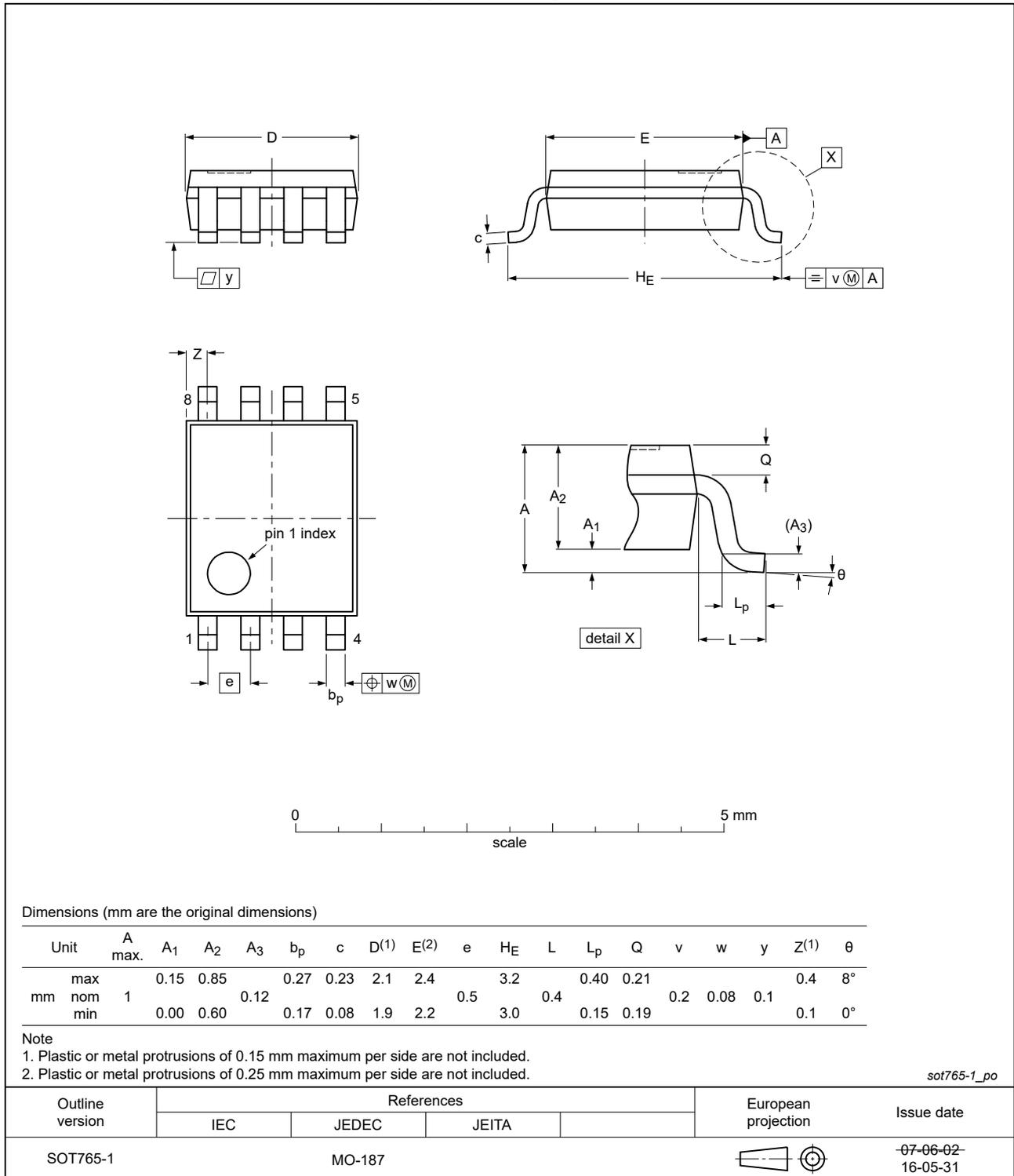


Fig. 11. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

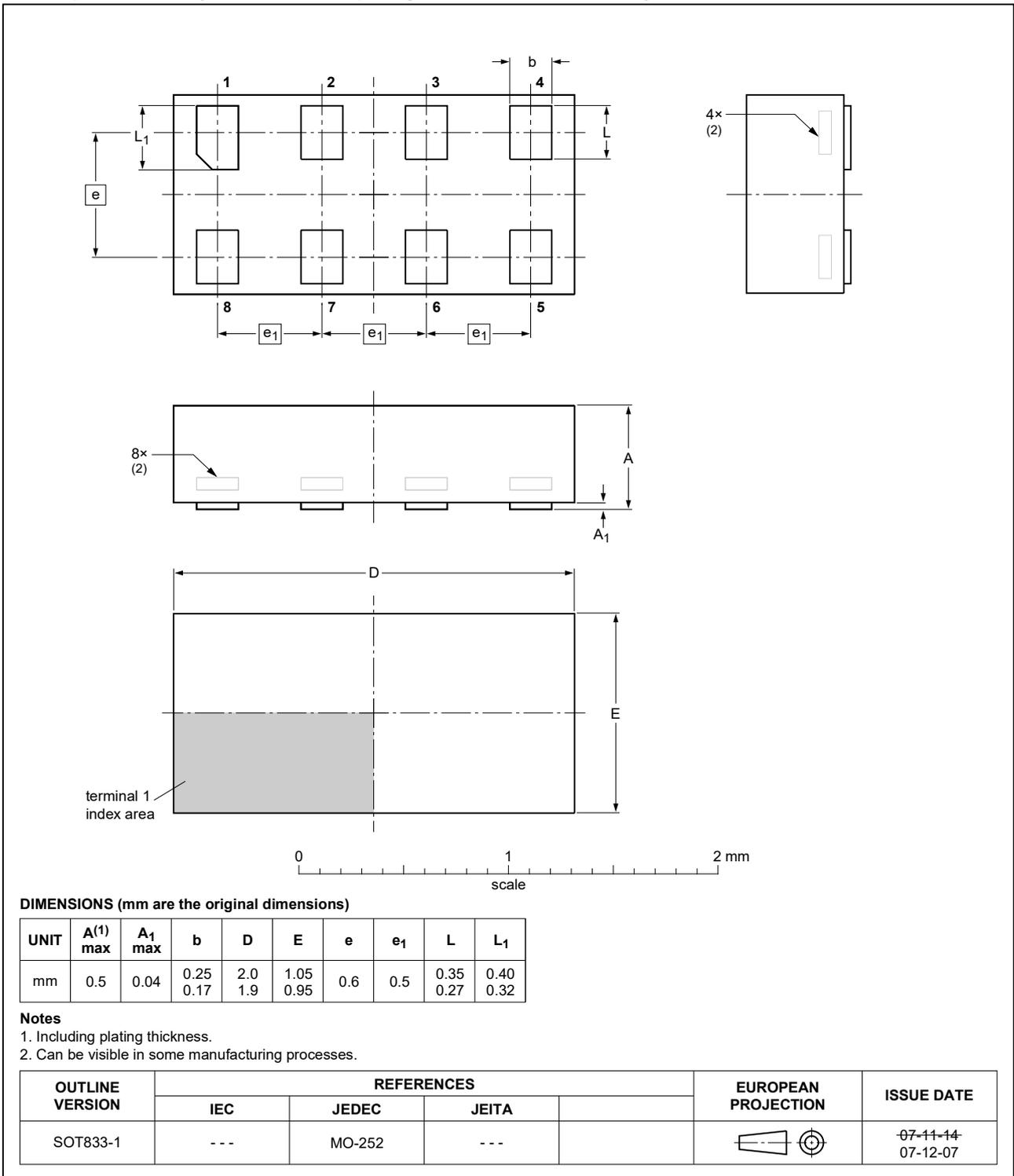


Fig. 12. Package outline SOT833-1 (XSON8)

XSON8: extremely thin small outline package; no leads;
8 terminals; body 1.2 x 1.0 x 0.35 mm

SOT1116

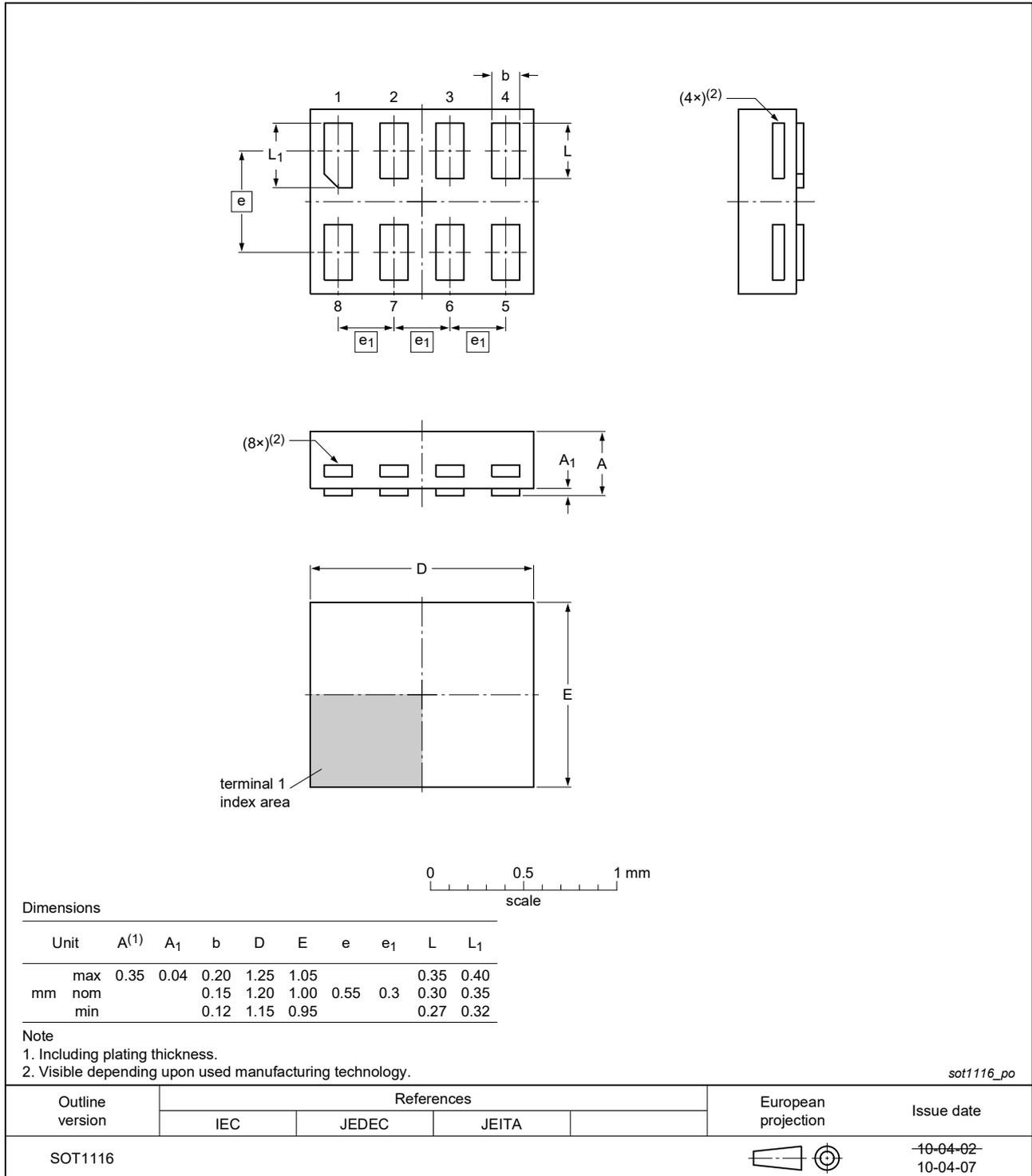


Fig. 13. Package outline SOT1116 (XSON8)

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

SOT1203

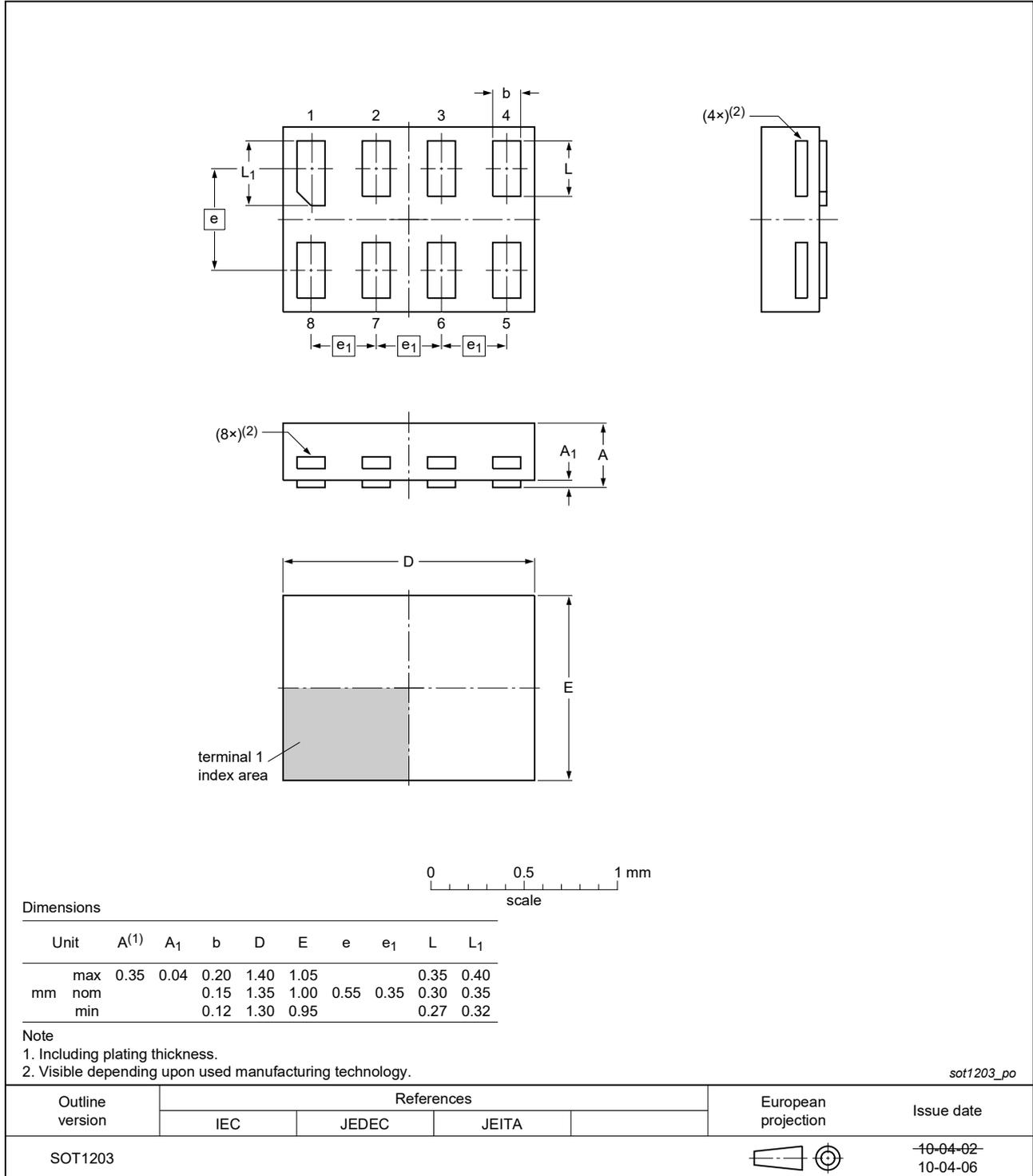


Fig. 14. Package outline SOT1203 (XSON8)

15. Abbreviations

Table 12. Abbreviations

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

16. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP3G17 v.4	20230731	Product data sheet	-	74AUP3G17 v.3
Modifications:	<ul style="list-style-type: none"> • Section 2: ESD specification updated according to the latest JEDEC standard. 			
74AUP3G17 v.3	20210209	Product data sheet	-	74AUP3G17 v.2
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. • Type number 74AUP3G17GM (SOT902-2 / XQFN8) removed. • Table 5: Derating values for P_{tot} total power dissipation updated. 			
74AUP3G17 v.2	20161012	Product data sheet	-	74AUP3G17 v.1
Modifications:	<ul style="list-style-type: none"> • Type numbers 74AUP3G17GD, and 74AUP3G17GF removed. 			
74AUP3G17 v.1	20151222	Product data sheet	-	-

17. 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".
- [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 <https://www.nexperia.com>.

Definitions

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