

# 74AUP3G17

Low-power triple Schmitt trigger

Rev. 3 — 9 February 2021

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
- ESD protection:
  - HBM JESD22-A114F Class 3A exceeds 5000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101E exceeds 1000 V
- 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
- 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

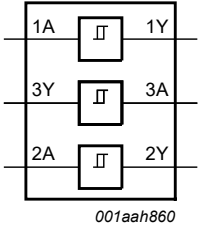
## 4. Marking

Table 2. Marking

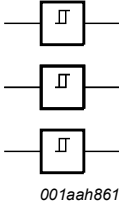
Type number	Marking code [1]
74AUP3G17DC	pV
74AUP3G17GT	pV
74AUP3G17GN	pV
74AUP3G17GS	pV

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

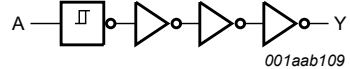
## 5. Functional diagram



**Fig. 1. Logic symbol**



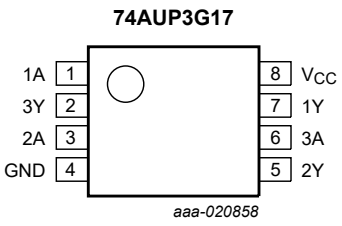
**Fig. 2. IEC logic symbol**



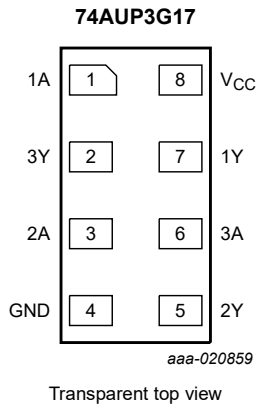
**Fig. 3. Logic diagram (one gate)**

## 6. Pinning information

### 6.1. Pinning



**Fig. 4. Pin configuration SOT765-1 (VSSOP8)**



**Fig. 5. Pin configuration SOT833-1, SOT1116 and SOT1203 (XSON8)**

## 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 <sub>CC</sub>	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 <sub>CC</sub>	supply voltage		-0.5	+4.6	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-50	-	mA
V <sub>I</sub>	input voltage	[1]	-0.5	+4.6	V
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < 0 V	-50	-	mA
V <sub>O</sub>	output voltage	Active mode and Power-down mode [1]	-0.5	+4.6	V
I <sub>O</sub>	output current	V <sub>O</sub> = 0 V to V <sub>CC</sub>	-	±20	mA
I <sub>CC</sub>	supply current		-	50	mA
I <sub>GND</sub>	ground current		-50	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C [2]	-	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<sub>tot</sub> derates linearly with 4.9 mW/K above 99 °C.  
 For SOT833-1 (XSON8) package: P<sub>tot</sub> derates linearly with 3.1 mW/K above 68 °C.  
 For SOT1116 (XSON8) package: P<sub>tot</sub> derates linearly with 4.2 mW/K above 90 °C.  
 For SOT1203 (XSON8) package: P<sub>tot</sub> 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 $V_{T-}$								
		$I_O = -20 \mu\text{A}$ ; $V_{CC} = 0.8$ 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 $V_{T-}$								
		$I_O = 20 \mu\text{A}$ ; $V_{CC} = 0.8$ 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	

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
$I_I$	input leakage current	$V_I = \text{GND to } 3.6 \text{ V};$ $V_{CC} = 0 \text{ V to } 3.6 \text{ V}$	-	-	$\pm 0.1$	-	$\pm 0.5$	-	$\pm 0.75$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V};$ $V_{CC} = 0 \text{ V}$	-	-	$\pm 0.2$	-	$\pm 0.5$	-	$\pm 0.75$	$\mu\text{A}$
$\Delta I_{OFF}$	additional power-off leakage current	$V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V};$ $V_{CC} = 0 \text{ V to } 0.2 \text{ V}$	-	-	$\pm 0.2$	-	$\pm 0.6$	-	$\pm 0.75$	$\mu\text{A}$
$I_{CC}$	supply current	$V_I = \text{GND or } V_{CC}; I_O = 0 \text{ A};$ $V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	0.5	-	0.9	-	1.4	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A};$ $V_{CC} = 3.3 \text{ V}$	-	-	40	-	50	-	75	$\mu\text{A}$
$C_I$	input capacitance	$V_I = \text{GND or } V_{CC};$ $V_{CC} = 0 \text{ V to } 3.6 \text{ V}$	-	1.1	-	-	-	-	-	pF
$C_O$	output capacitance	$V_O = \text{GND}; V_{CC} = 0 \text{ V}$	-	1.7	-	-	-	-	-	pF

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 7

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	Min	Max	
<b><math>C_L = 5 \text{ pF}</math></b>										
$t_{pd}$	propagation delay	$n\text{A to } n\text{Y}; \text{ see Fig. 6 [2]}$								
		$V_{CC} = 0.8 \text{ V}$	-	19.0	-	-	-	-	-	ns
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	2.6	5.7	10.6	2.5	10.9	2.5	11.1	ns
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	2.4	4.2	6.5	2.3	7.1	2.3	7.4	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	2.0	3.6	5.5	1.9	6.1	1.9	6.3	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.9	3.0	4.2	1.8	4.6	1.8	4.8	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.8	2.7	3.6	1.5	3.8	1.5	4.0	ns
<b><math>C_L = 10 \text{ pF}</math></b>										
$t_{pd}$	propagation delay	$n\text{A to } n\text{Y}; \text{ see Fig. 6 [2]}$								
		$V_{CC} = 0.8 \text{ V}$	-	22.5	-	-	-	-	-	ns
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	2.9	6.6	12.4	2.7	12.9	2.7	13.0	ns
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	2.6	4.8	7.8	2.4	8.3	2.4	8.7	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	2.5	4.2	6.3	2.4	6.8	2.4	7.1	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	2.3	3.5	4.8	2.1	5.3	2.1	5.6	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.1	3.3	4.4	2.0	4.6	2.0	4.8	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	
<b>C<sub>L</sub> = 15 pF</b>										
t <sub>pd</sub>	propagation delay	nA to nY; see Fig. 6 [2]								
		V <sub>CC</sub> = 0.8 V	-	26.0	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.2	7.4	14.1	3.1	14.7	3.1	14.9	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.1	5.4	8.7	2.8	9.5	2.8	9.9	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.7	4.7	7.1	2.7	7.8	2.7	8.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.6	4.0	5.6	2.5	6.0	2.5	6.3	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.5	3.7	4.9	2.2	5.2	2.2	5.5	ns
<b>C<sub>L</sub> = 30 pF</b>										
t <sub>pd</sub>	propagation delay	nA to nY; see Fig. 6 [2]								
		V <sub>CC</sub> = 0.8 V	-	36.3	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.9	9.7	19.0	3.7	19.8	3.7	20.1	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.5	7.0	11.2	3.6	12.4	3.6	13.0	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	3.5	6.0	9.2	3.4	10.1	3.4	10.7	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.4	5.1	7.0	3.2	7.5	3.2	7.9	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	3.3	4.8	6.2	3.1	7.1	3.1	7.5	ns
<b>C<sub>L</sub> = 5 pF, 10 pF, 15 pF and 30 pF</b>										
C <sub>PD</sub>	power dissipation capacitance	f <sub>i</sub> = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> [3]								
		V <sub>CC</sub> = 0.8 V	-	2.5	-	-	-	-	-	pF
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	2.7	-	-	-	-	-	pF
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	2.8	-	-	-	-	-	pF
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	3.0	-	-	-	-	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	3.5	-	-	-	-	-	pF
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	4.0	-	-	-	-	pF	

[1] All typical values are measured at nominal V<sub>CC</sub>.

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

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

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

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

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

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

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

N = number of inputs switching;

$\sum(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

11.1. Waveforms and test circuit

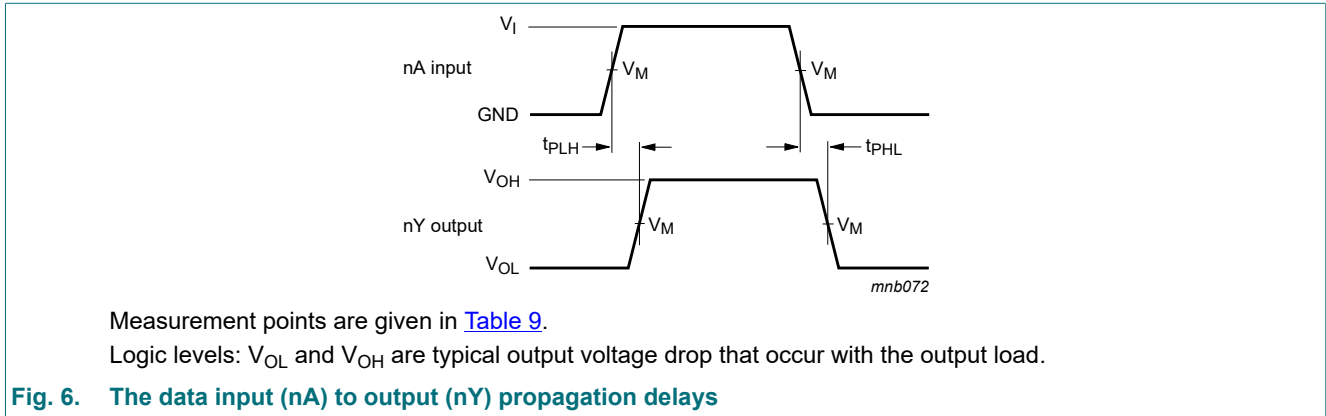


Table 9. Measurement points

Supply voltage	Output	Input		
$V_{CC}$	$V_M$	$V_M$	$V_I$	$t_r = t_f$
0.8 V to 3.6 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{CC}$	$\leq 3.0$ ns

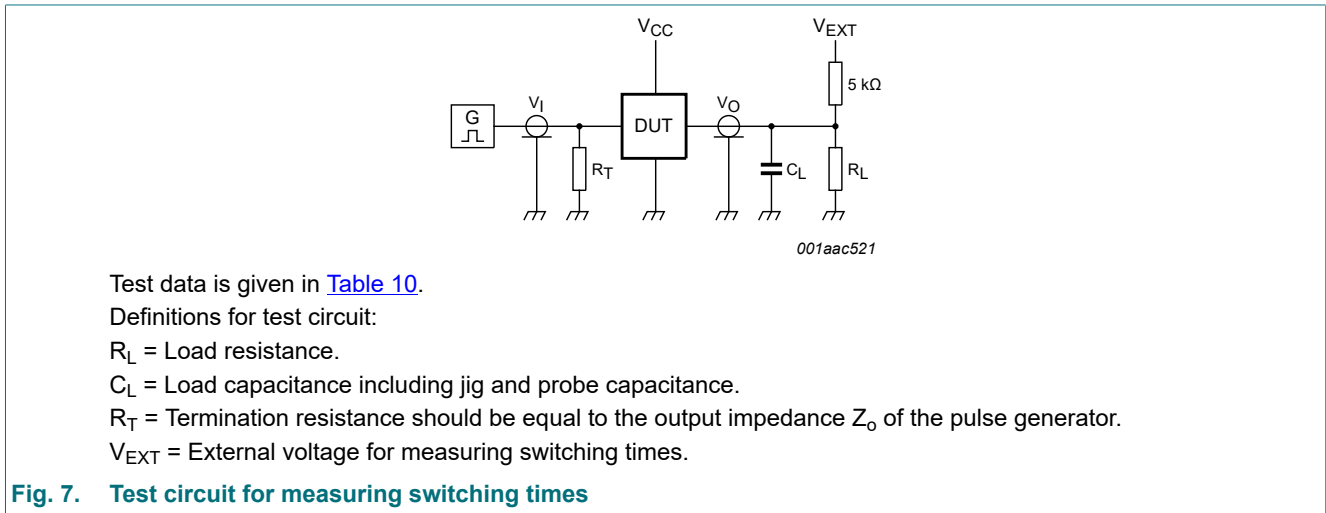


Table 10. Test data

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  $R_L = 5$  kΩ.  
 For measuring propagation delays, setup and hold times and pulse width  $R_L = 1$  MΩ.

## 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 <sub>T+</sub>	positive-going threshold voltage	see <a href="#">Fig. 8</a> and <a href="#">Fig. 9</a>								
		V <sub>CC</sub> = 0.8 V	0.30	-	0.60	0.30	0.60	0.30	0.62	V
		V <sub>CC</sub> = 1.1 V	0.53	-	0.90	0.53	0.90	0.53	0.92	V
		V <sub>CC</sub> = 1.4 V	0.74	-	1.11	0.74	1.11	0.74	1.13	V
		V <sub>CC</sub> = 1.65 V	0.91	-	1.29	0.91	1.29	0.91	1.31	V
		V <sub>CC</sub> = 2.3 V	1.37	-	1.77	1.37	1.77	1.37	1.80	V
V <sub>T-</sub>	negative-going threshold voltage	see <a href="#">Fig. 8</a> and <a href="#">Fig. 9</a>								
		V <sub>CC</sub> = 0.8 V	0.10	-	0.60	0.10	0.60	0.10	0.60	V
		V <sub>CC</sub> = 1.1 V	0.26	-	0.65	0.26	0.65	0.26	0.65	V
		V <sub>CC</sub> = 1.4 V	0.39	-	0.75	0.39	0.75	0.39	0.75	V
		V <sub>CC</sub> = 1.65 V	0.47	-	0.84	0.47	0.84	0.47	0.84	V
		V <sub>CC</sub> = 2.3 V	0.69	-	1.04	0.69	1.04	0.69	1.04	V
V <sub>H</sub>	hysteresis voltage	(V <sub>T+</sub> - V <sub>T-</sub> ); see <a href="#">Fig. 8</a> , <a href="#">Fig. 9</a> , <a href="#">Fig. 10</a> and <a href="#">Fig. 11</a>								
		V <sub>CC</sub> = 0.8 V	0.07	-	0.50	0.07	0.50	0.07	0.50	V
		V <sub>CC</sub> = 1.1 V	0.08	-	0.46	0.08	0.46	0.08	0.46	V
		V <sub>CC</sub> = 1.4 V	0.18	-	0.56	0.18	0.56	0.18	0.56	V
		V <sub>CC</sub> = 1.65 V	0.27	-	0.66	0.27	0.66	0.27	0.66	V
		V <sub>CC</sub> = 2.3 V	0.53	-	0.92	0.53	0.92	0.53	0.92	V
		V <sub>CC</sub> = 3.0 V	0.79	-	1.31	0.79	1.31	0.79	1.31	V



12.1. Waveforms transfer characteristics

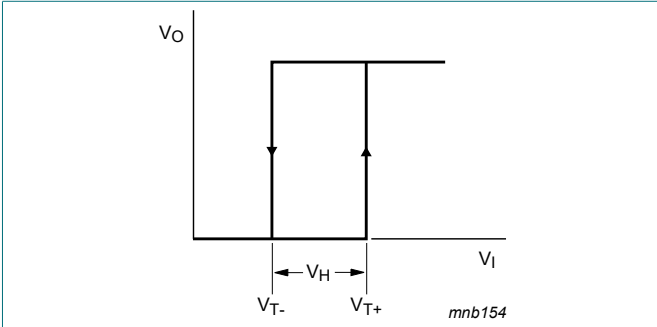


Fig. 8. Transfer characteristic

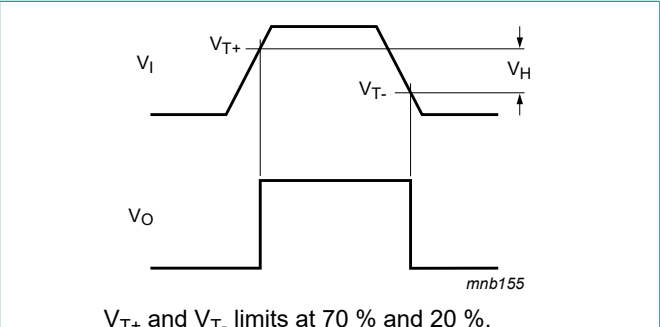


Fig. 9. Definition of  $V_{T+}$ ,  $V_{T-}$  and  $V_H$

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

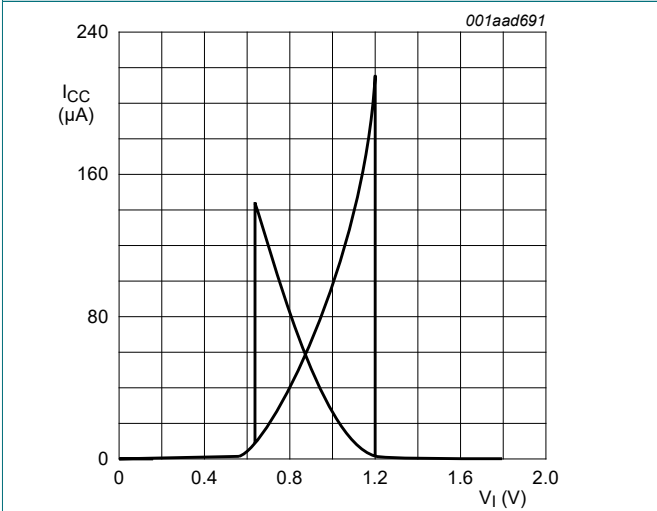


Fig. 10. Typical transfer characteristics;  $V_{CC} = 1.8 \text{ V}$

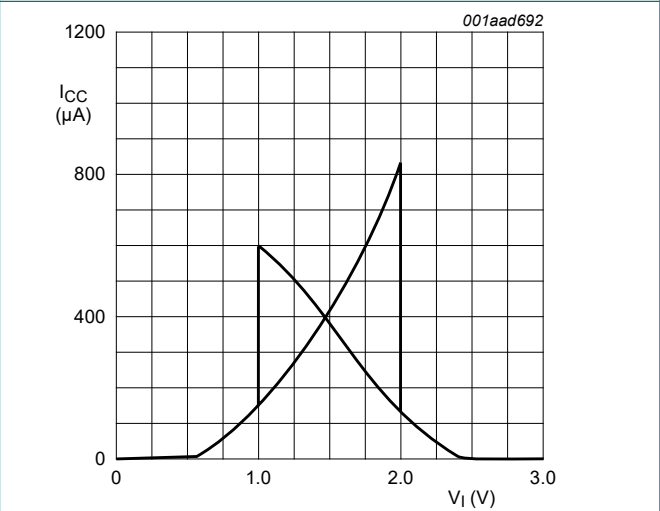


Fig. 11. Typical transfer characteristics;  $V_{CC} = 3.0 \text{ V}$

### 13. Application information

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

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

$P_{\text{add}}$  = additional power dissipation ( $\mu\text{W}$ );

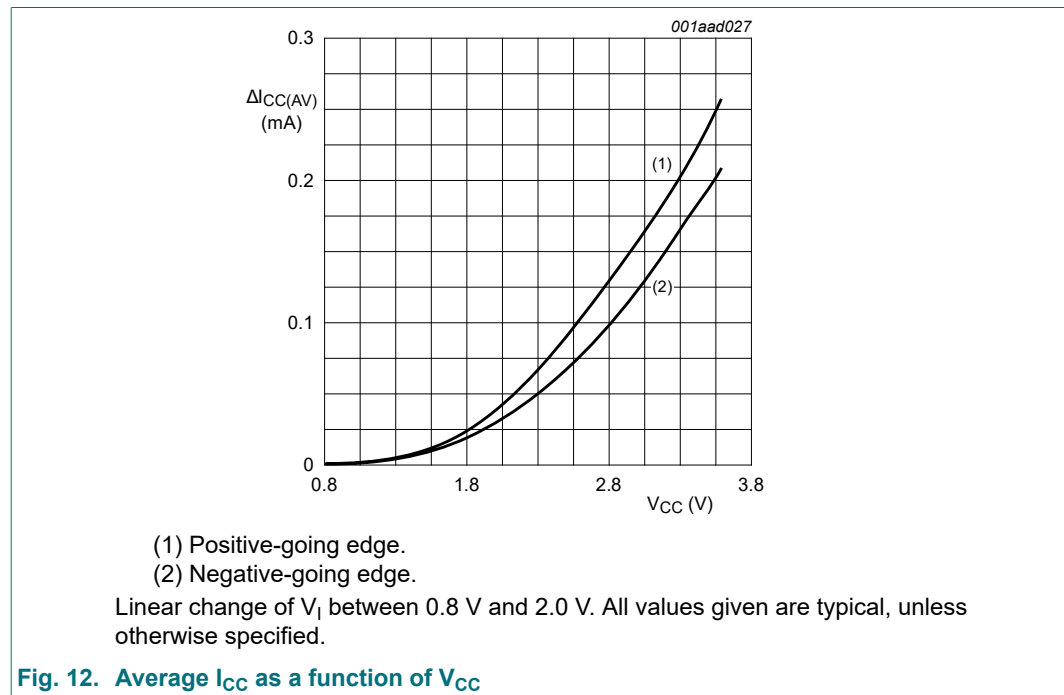
$f_i$  = input frequency (MHz);

$t_r$  = 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 ( $\mu\text{A}$ ).

Average  $\Delta I_{\text{CC(AV)}}$  differs with positive or negative input transitions, as shown in [Fig. 12](#).



14. Package outline

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

SOT765-1

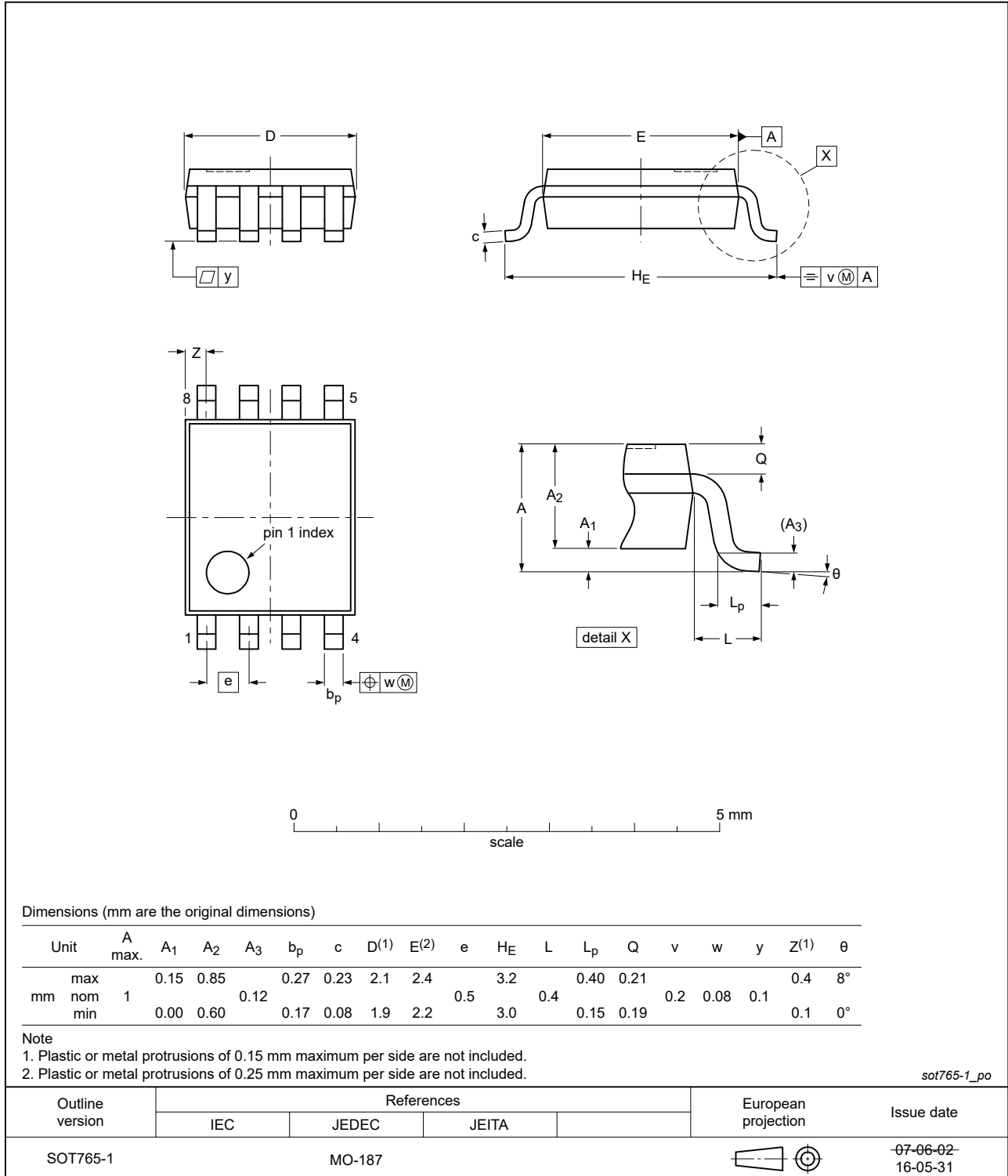


Fig. 13. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

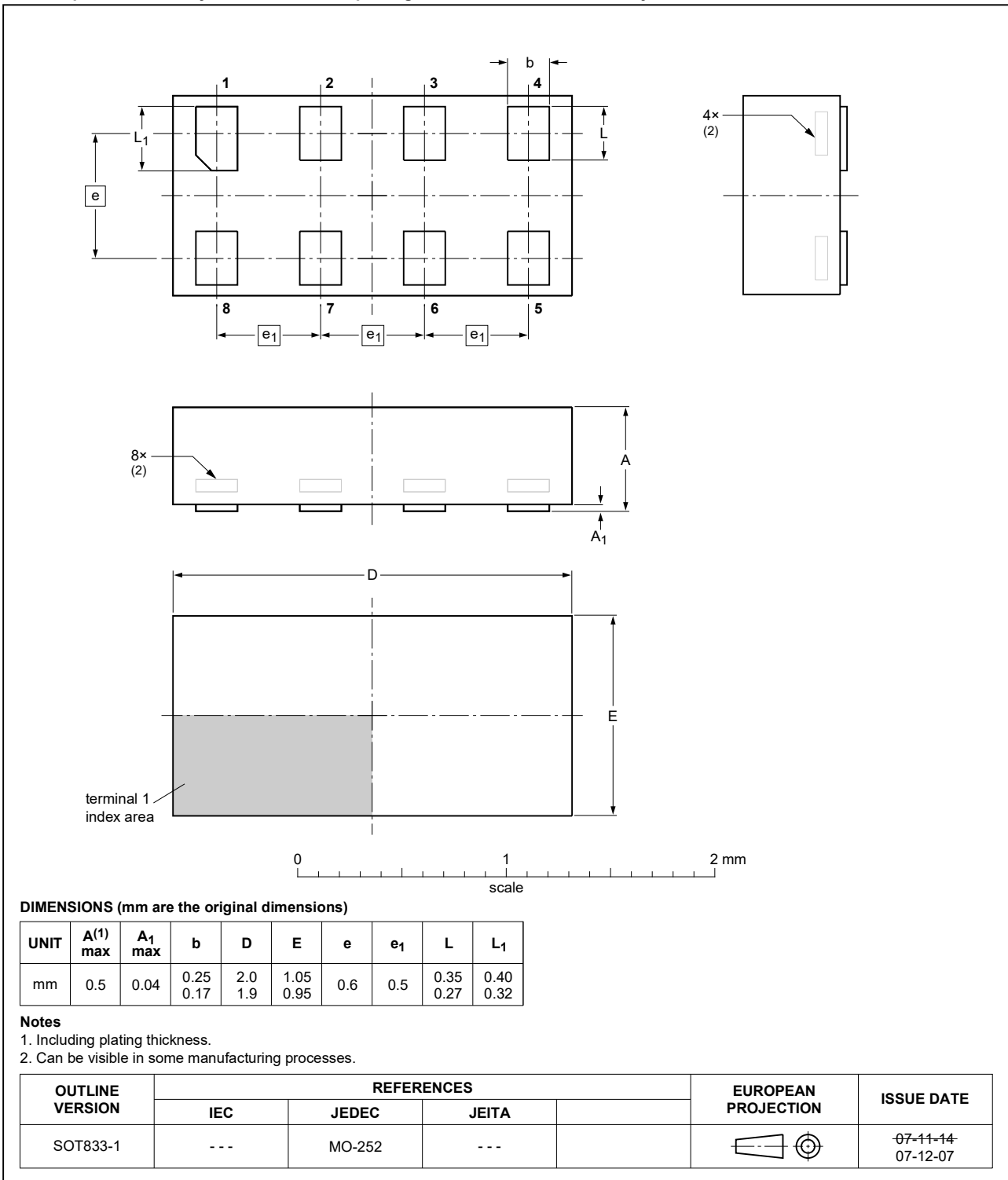


Fig. 14. Package outline SOT833-1 (XSON8)

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

SOT1116

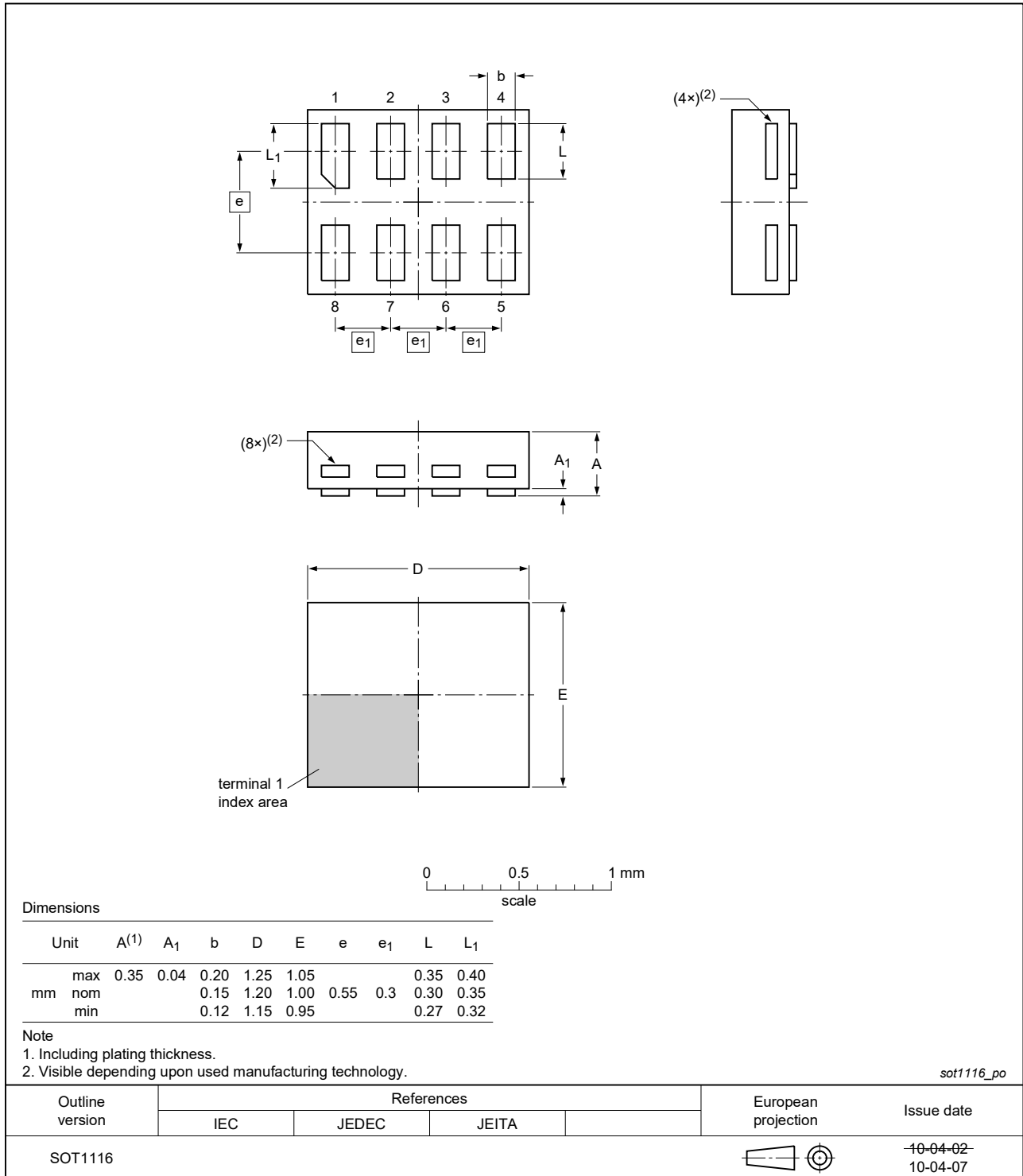


Fig. 15. Package outline SOT1116 (XSON8)

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

SOT1203

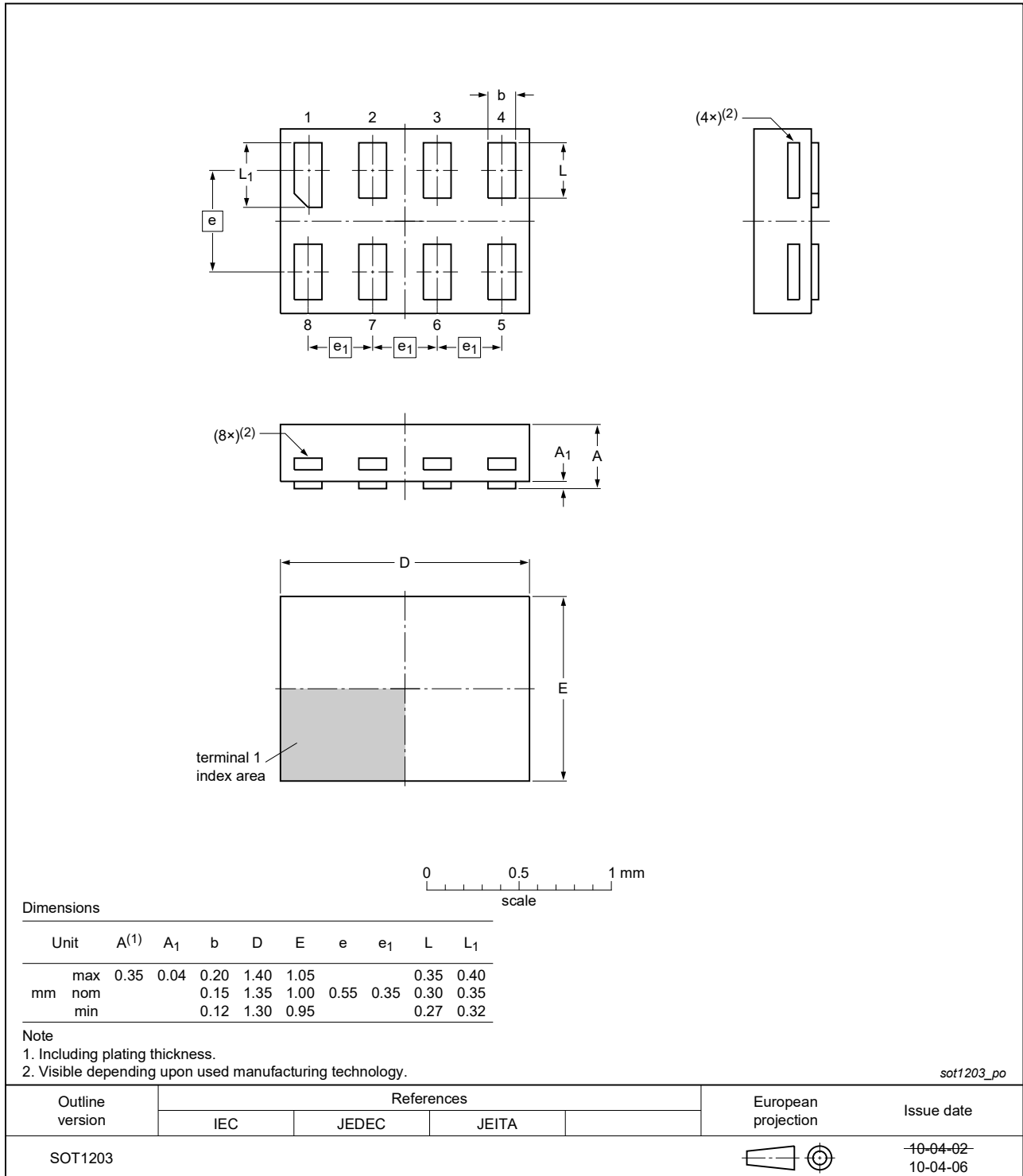


Fig. 16. Package outline SOT1203 (XSON8)

## 15. Abbreviations

Table 12. Abbreviations

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

## 16. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP3G17 v.3	20210209	Product data sheet	-	74AUP3G17 v.2
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Type number 74AUP3G17GM (SOT902-2 / XQFN8) removed.</li> <li><a href="#">Table 5</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul>			
74AUP3G17 v.2	20161012	Product data sheet	-	74AUP3G17 v.1
Modifications:	<ul style="list-style-type: none"> <li>Type numbers 74AUP3G17GD, and 74AUP3G17GF removed.</li> </ul>			
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".
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