

74LVC3G17

Triple non-inverting Schmitt trigger with 5 V tolerant input

Rev. 14 — 26 August 2021

Product data sheet

1. General description

The 74LVC3G17 is a triple buffer with Schmitt-trigger inputs. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

This device is fully specified for partial power down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- ± 24 mA output drive ($V_{CC} = 3.0$ V)
- CMOS low-power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- I_{OFF} circuitry provides partial Power-down mode operation
- Complies with JEDEC standards
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8C (2.7 V to 3.6 V)
 - JESD36 (4.5 V to 5.5 V)
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to $+85$ °C and -40 °C to $+125$ °C

3. Applications

- Wave and pulse shapers for highly noisy environments

4. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC3G17DP	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2
74LVC3G17DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74LVC3G17GT	-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
74LVC3G17GF	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm	SOT1089
74LVC3G17GN	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm	SOT1116
74LVC3G17GS	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm	SOT1203

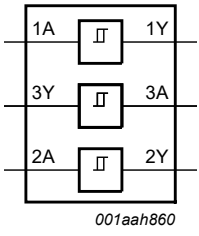
5. Marking

Table 2. Marking codes

Type number	Marking code [1]
74LVC3G17DP	V17
74LVC3G17DC	V17
74LVC3G17GT	V17
74LVC3G17GF	VV
74LVC3G17GN	VV
74LVC3G17GS	VV

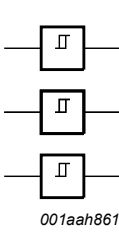
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

6. Functional diagram



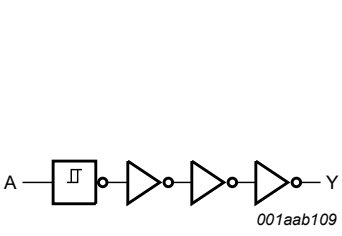
001aah860

Fig. 1. Logic symbol



001aah861

Fig. 2. IEC logic symbol



001aab109

Fig. 3. Logic diagram (one gate)

7. Pinning information

7.1. Pinning

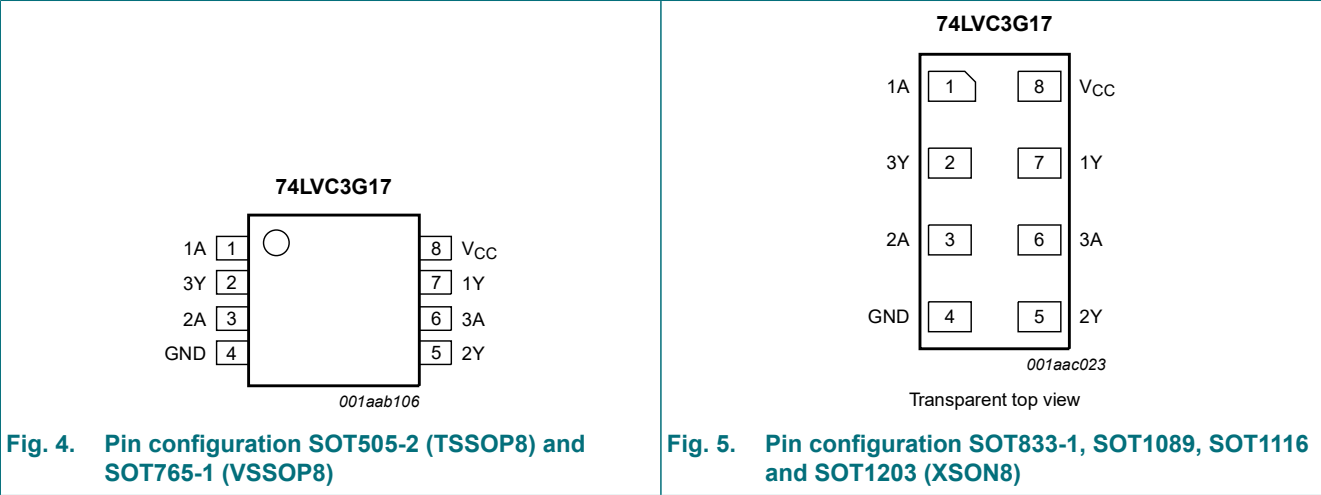


Fig. 4. Pin configuration SOT505-2 (TSSOP8) and SOT765-1 (VSSOP8)

Fig. 5. Pin configuration SOT833-1, SOT1089, SOT1116 and SOT1203 (XSON8)

7.2. 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

8. Functional description

Table 4. Function table

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

Input	Output
nA	nY
L	L
H	H

9. 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	+6.5	V
I_{IK}	input clamping current	$V_I < 0$ V	-50	-	mA
V_I	input voltage		-0.5	+6.5	V
I_{OK}	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	± 50	mA
V_O	output voltage	Active mode	-0.5	$V_{CC} + 0.5$	V
		Power-down mode; $V_{CC} = 0$ V	-0.5	+6.5	V
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	-	250	mW

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

[2] When $V_{CC} = 0$ V (Power-down mode), the output voltage can be 5.5 V in normal operation.

[3] For SOT505-2 (TSSOP8) package: P_{tot} derates linearly with 4.6 mW/K above 96 °C.

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 SOT1089 (XSON8) package: P_{tot} derates linearly with 4.0 mW/K above 88 °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.

10. Recommended operating conditions

Table 6. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		1.65	5.5	V
V_I	input voltage		0	5.5	V
V_O	output voltage		0	V_{CC}	V
T_{amb}	ambient temperature		-40	+125	°C

11. Static characteristics

Table 7. 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	Typ [1]	Max	Min	Max	
V _{OL}	LOW-level output voltage	V _I = V _{T+} or V _{T-}						
		I _O = 100 µA; V _{CC} = 1.65 V to 5.5 V	-	-	0.1	-	0.1	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	-	0.70	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.3	-	0.45	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.4	-	0.60	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	-	0.80	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.55	-	0.80	V
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-}						
		I _O = -100 µA; V _{CC} = 1.65 V to 5.5 V	V _{CC} - 0.1	-	-	V _{CC} - 0.1	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	-	-	0.95	-	V
		I _O = -8 mA; V _{CC} = 2.3 V	1.9	-	-	1.7	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	-	-	1.9	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.3	-	-	2.0	-	V
		I _O = -32 mA; V _{CC} = 4.5 V	3.8	-	-	3.4	-	V
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V [2]	-	±0.1	±1	-	±1	µA
I _{OFF}	power-off leakage current	V _I or V _O = 5.5 V; V _{CC} = 0 V	-	±0.1	±2	-	±2	µA
I _{CC}	supply current	V _I = 5.5 V or GND; I _O = 0 A; V _{CC} = 1.65 V to 5.5 V [2]	-	0.1	4	-	4	µA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 2.3 V to 5.5 V [2]	-	5	500	-	500	µA
C _I	input capacitance		-	3.5	-	-	-	pF

[1] All typical values are measured at T_{amb} = 25 °C.

[2] These typical values are measured at V_{CC} = 3.3 V.

11.1. Transfer characteristics

Table 8. Transfer characteristics

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

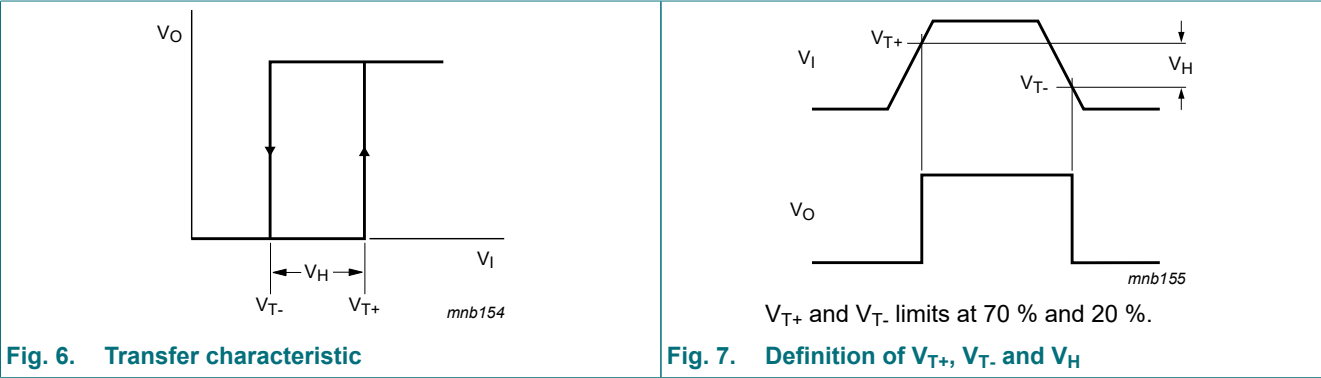
Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
V _{T+}	positive-going threshold voltage	see Fig. 6 and Fig. 7						
		V _{CC} = 1.8 V	0.70	1.10	1.50	0.70	1.70	V
		V _{CC} = 2.3 V	1.00	1.40	1.80	1.00	2.00	V
		V _{CC} = 3.0 V	1.30	1.76	2.20	1.30	2.40	V
		V _{CC} = 4.5 V	1.90	2.47	3.10	1.90	3.30	V
		V _{CC} = 5.5 V	2.20	2.91	3.60	2.20	3.80	V

Triple non-inverting Schmitt trigger with 5 V tolerant input

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
V _{T-}	negative-going threshold voltage	see Fig. 6 and Fig. 7						
		V _{CC} = 1.8 V	0.25	0.61	0.90	0.25	1.10	V
		V _{CC} = 2.3 V	0.40	0.80	1.15	0.40	1.35	V
		V _{CC} = 3.0 V	0.60	1.04	1.50	0.60	1.70	V
		V _{CC} = 4.5 V	1.00	1.55	2.00	1.00	2.20	V
		V _{CC} = 5.5 V	1.20	1.86	2.30	1.20	2.50	V
V _H	hysteresis voltage	(V _{T+} - V _{T-}); see Fig. 6, Fig. 7 and Fig. 8						
		V _{CC} = 1.8 V	0.15	0.49	1.00	0.15	1.20	V
		V _{CC} = 2.3 V	0.25	0.60	1.10	0.25	1.30	V
		V _{CC} = 3.0 V	0.40	0.73	1.20	0.40	1.40	V
		V _{CC} = 4.5 V	0.60	0.92	1.50	0.60	1.70	V
		V _{CC} = 5.5 V	0.70	1.02	1.70	0.70	1.90	V

[1] All typical values are measured at T_{amb} = 25 °C.

11.2. Waveforms transfer characteristics



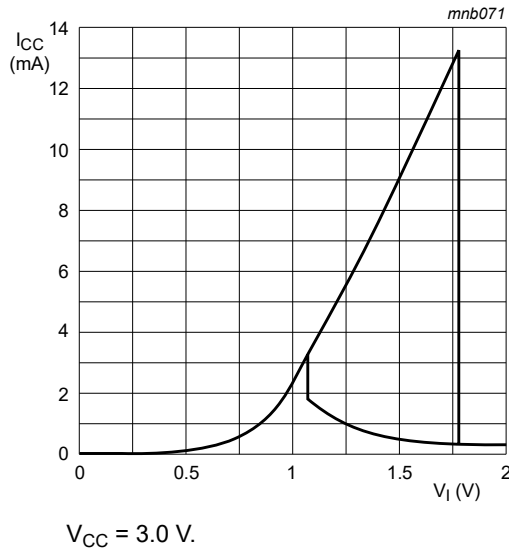
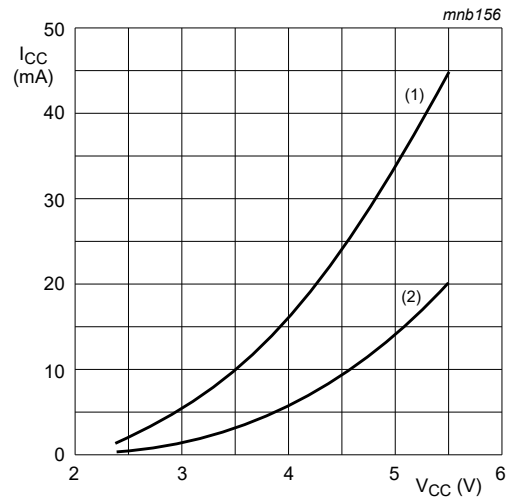


Fig. 8. Typical transfer characteristic



(1) Positive-going edge.

(2) Negative-going edge.

Linear change of V_I between 0.8 V to 2.0 V. All values given are typical unless otherwise specified.Fig. 9. Average I_{CC} as a function of V_{CC}

12. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 11.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
t_{pd}	propagation delay	nA to nY; see Fig. 10 [2]						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	1.5	5.6	10.5	1.5	13.1	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.0	3.7	6.5	1.0	8.5	ns
		$V_{CC} = 2.7 \text{ V}$	1.0	3.8	6.5	1.0	8.5	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.0	3.6	5.7	1.0	7.1	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	1.0	2.7	4.3	1.0	5.4	ns
C_{PD}	power dissipation capacitance	per buffer; $V_{CC} = 3.3 \text{ V}$; $V_I = \text{GND to } V_{CC}$ [3]	-	16.3	-	-	-	pF

[1] Typical values are measured at $T_{amb} = 25 \text{ °C}$ and $V_{CC} = 1.8 \text{ V}, 2.5 \text{ V}, 2.7 \text{ V}, 3.3 \text{ V}$ and 5.0 V respectively.[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 outputs.

12.1. Waveforms and test circuit

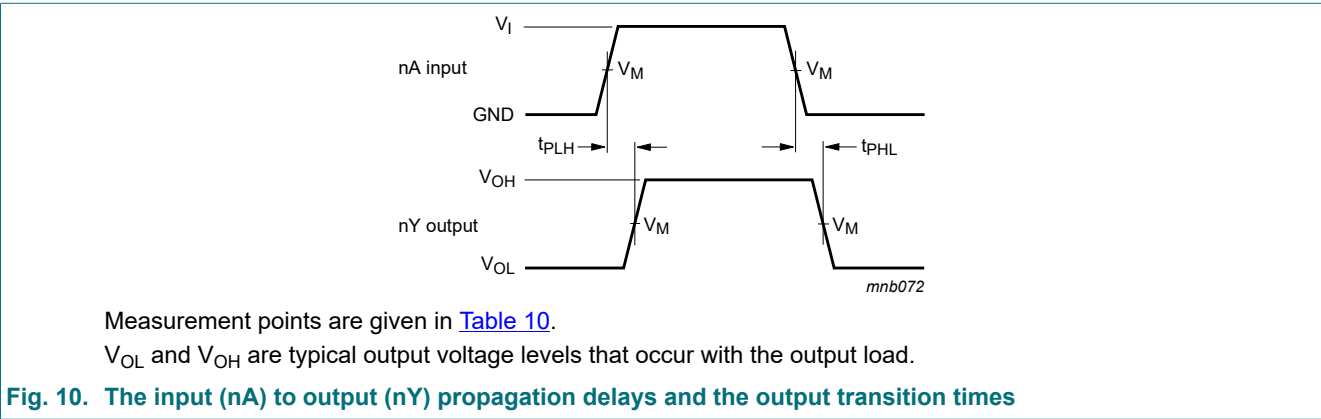


Table 10. Measurement points

Supply voltage	Input	Output
V_{CC}	V_M	V_M
1.65 V to 1.95 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.7 V	1.5 V	1.5 V
3.0 V to 3.6 V	1.5 V	1.5 V
4.5 V to 5.5 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

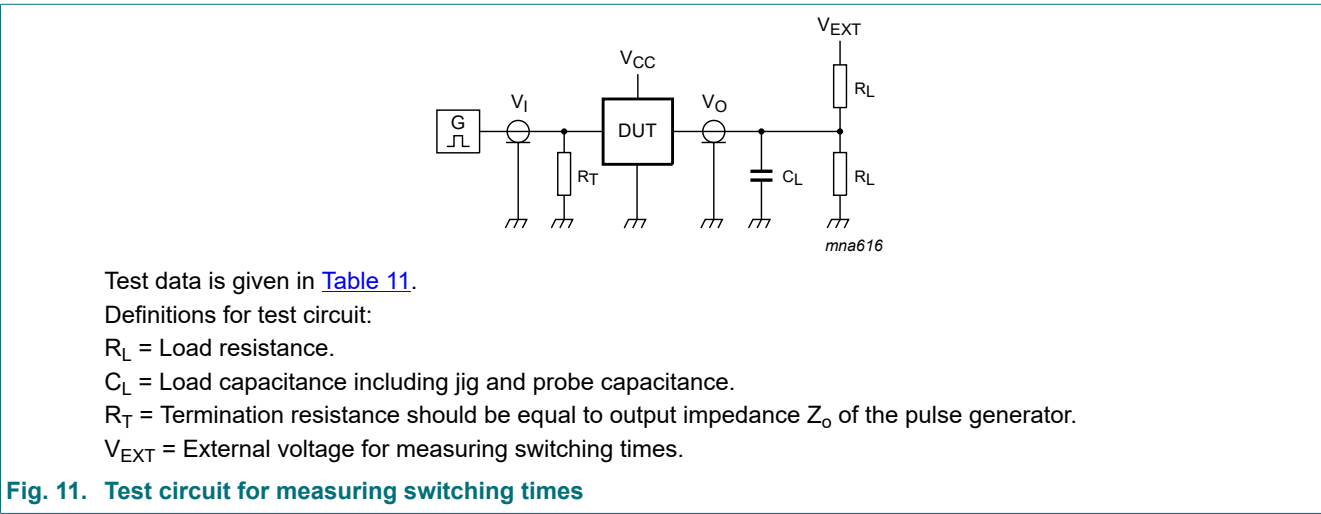


Table 11. Test data

Supply voltage	Input		Load		V _{EXT}		
V _{CC}	V _I	t _r , t _f	C _L	R _L	t _{PLH} , t _{PHL}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	open	GND	2 × V _{CC}
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	30 pF	500 Ω	open	GND	2 × V _{CC}
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	GND	6 V
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	GND	6 V
4.5 V to 5.5 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	open	GND	2 × V _{CC}

13. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

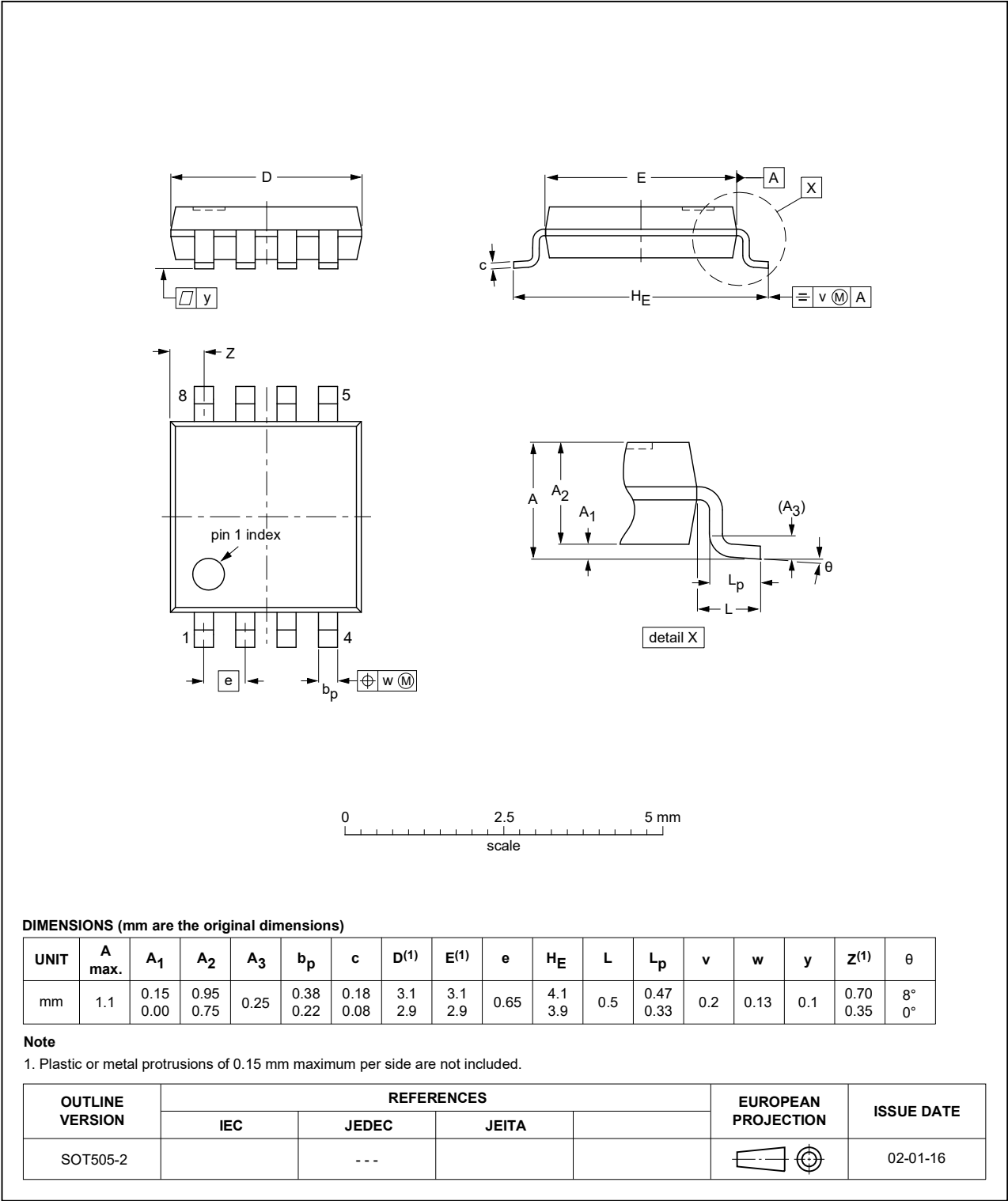


Fig. 12. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

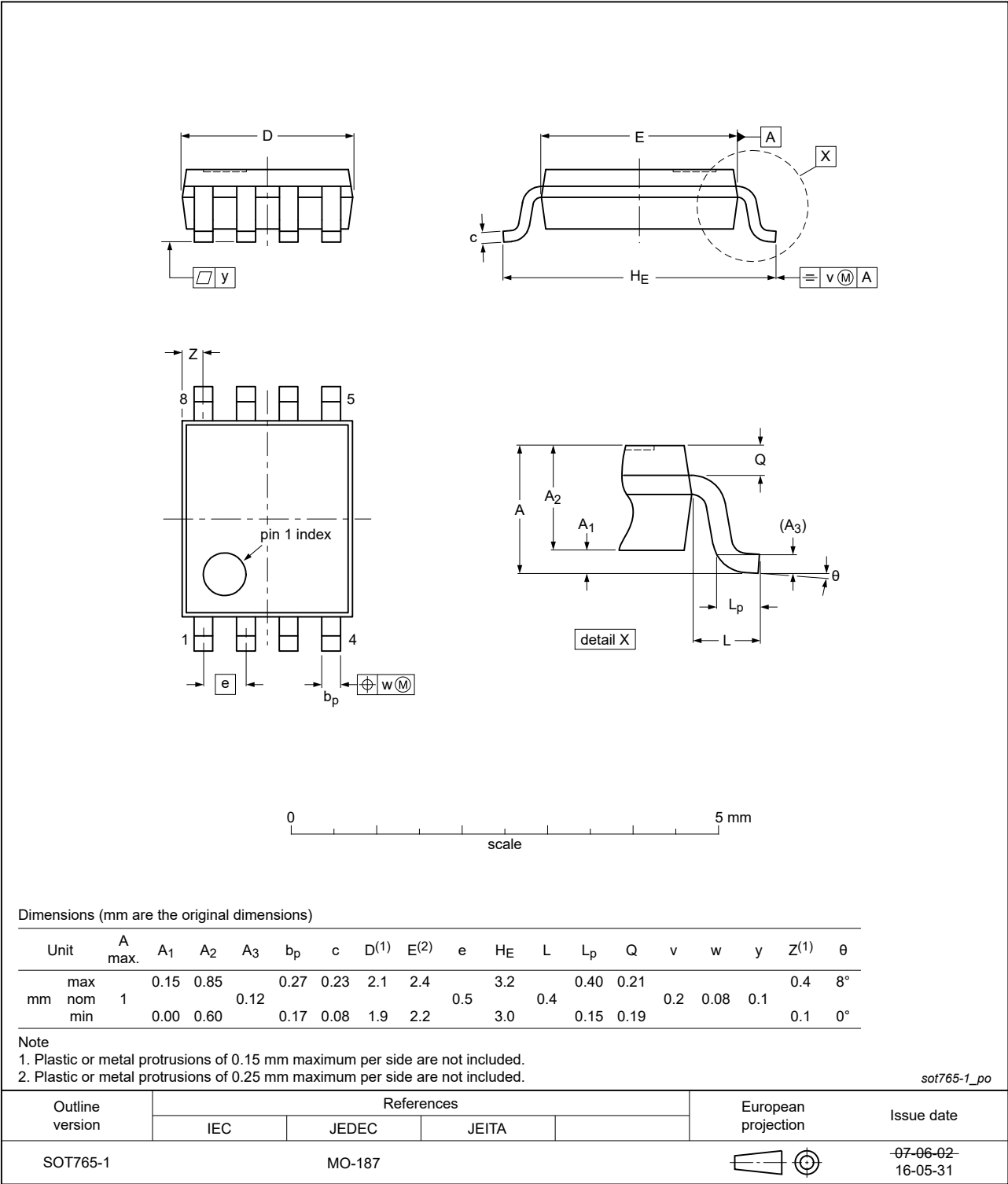


Fig. 13. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

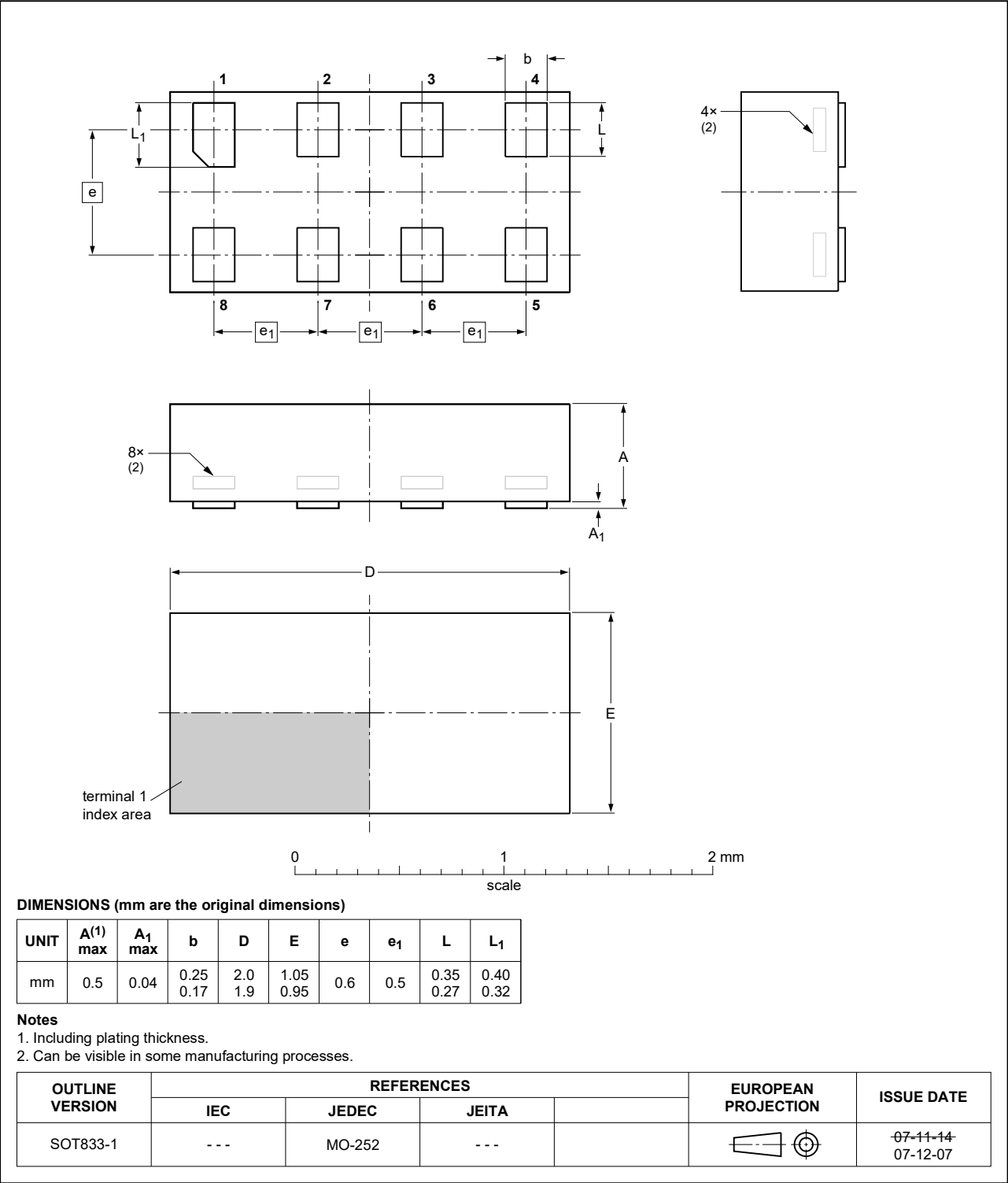


Fig. 14. Package outline SOT833-1 (XSON8)

XSON8: extremely thin small outline package; no leads;
8 terminals; body 1.35 x 1 x 0.5 mm

SOT1089

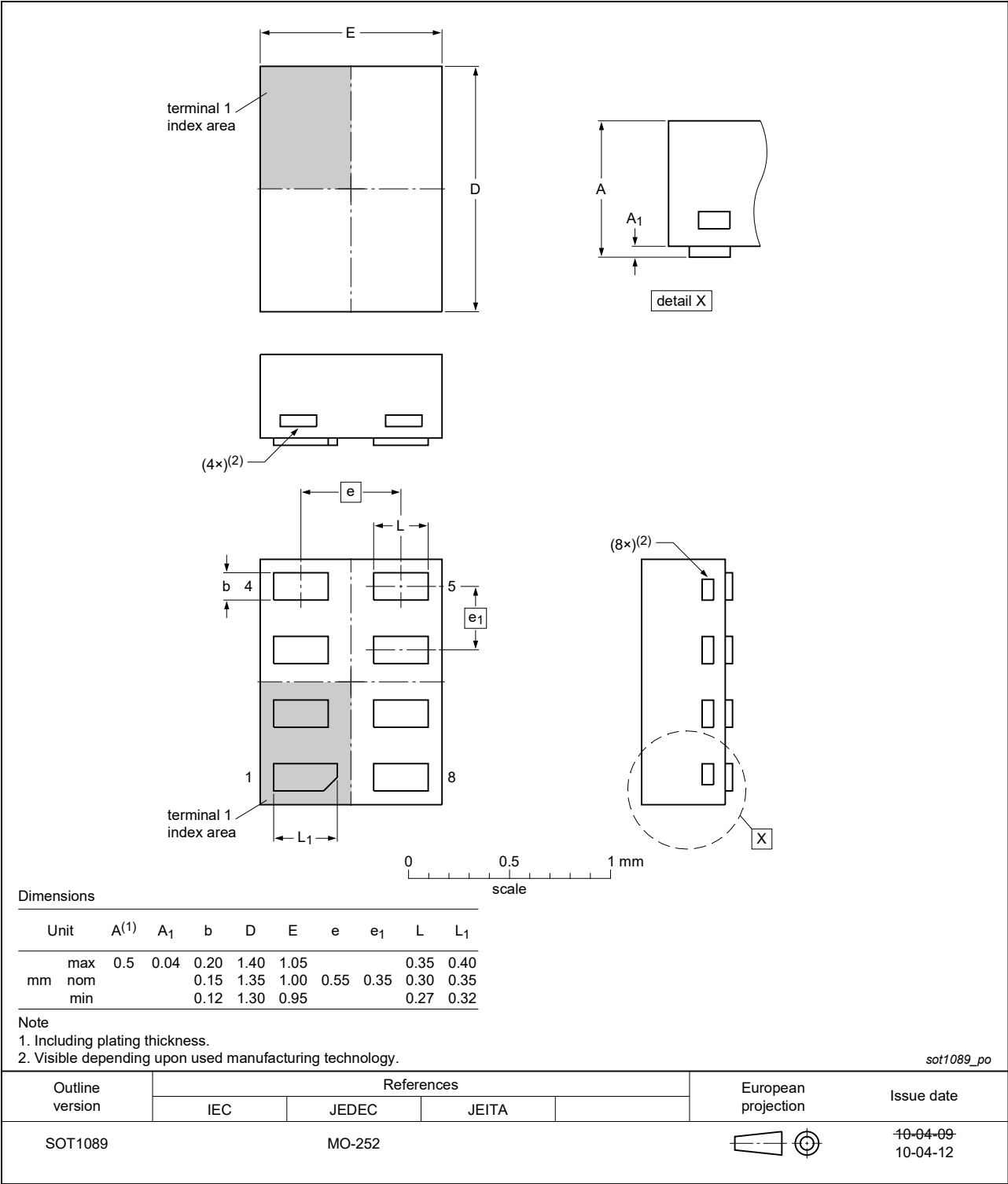


Fig. 15. Package outline SOT1089 (XSON8)

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

SOT1116

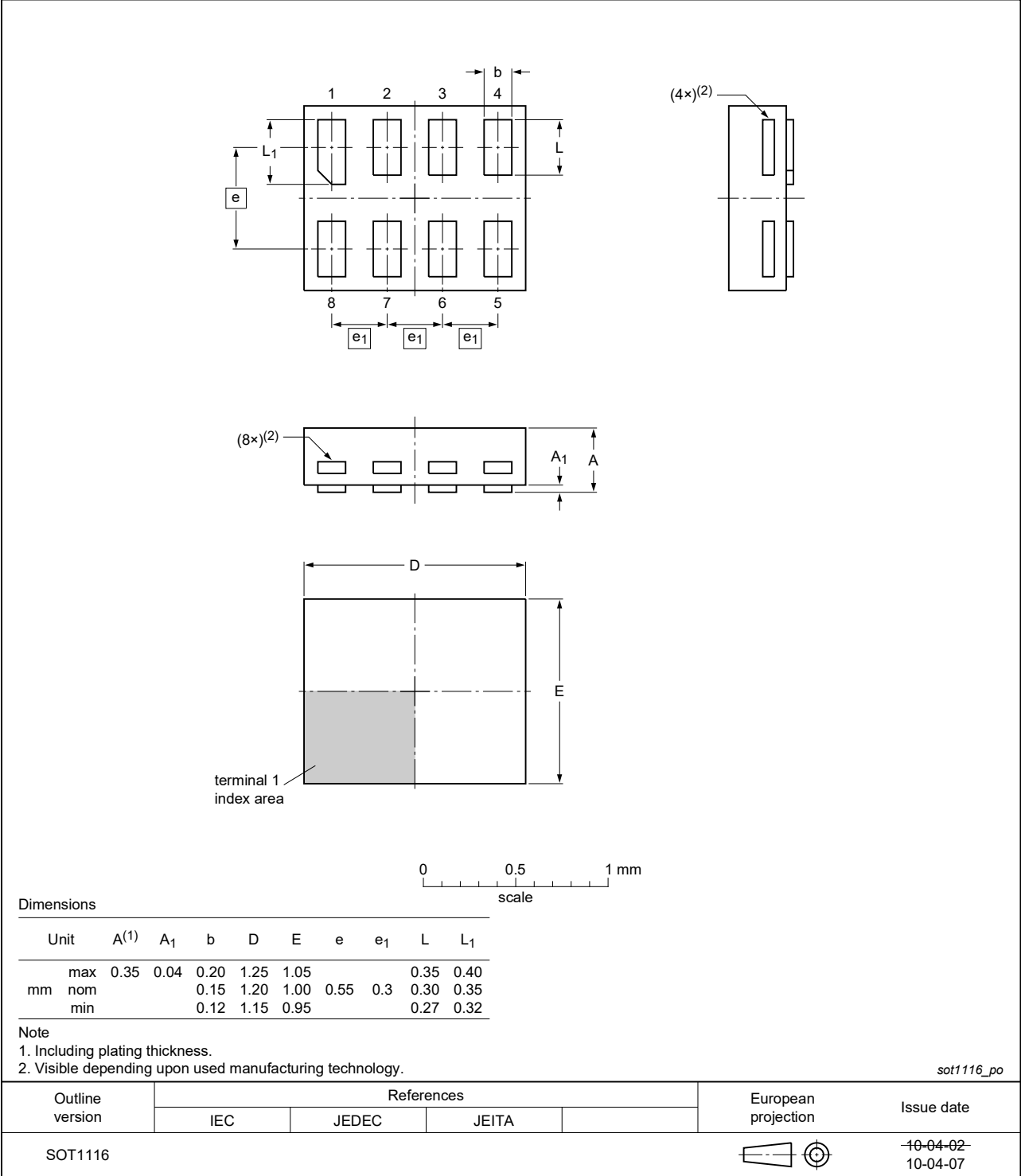


Fig. 16. Package outline SOT1116 (XSON8)

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

SOT1203

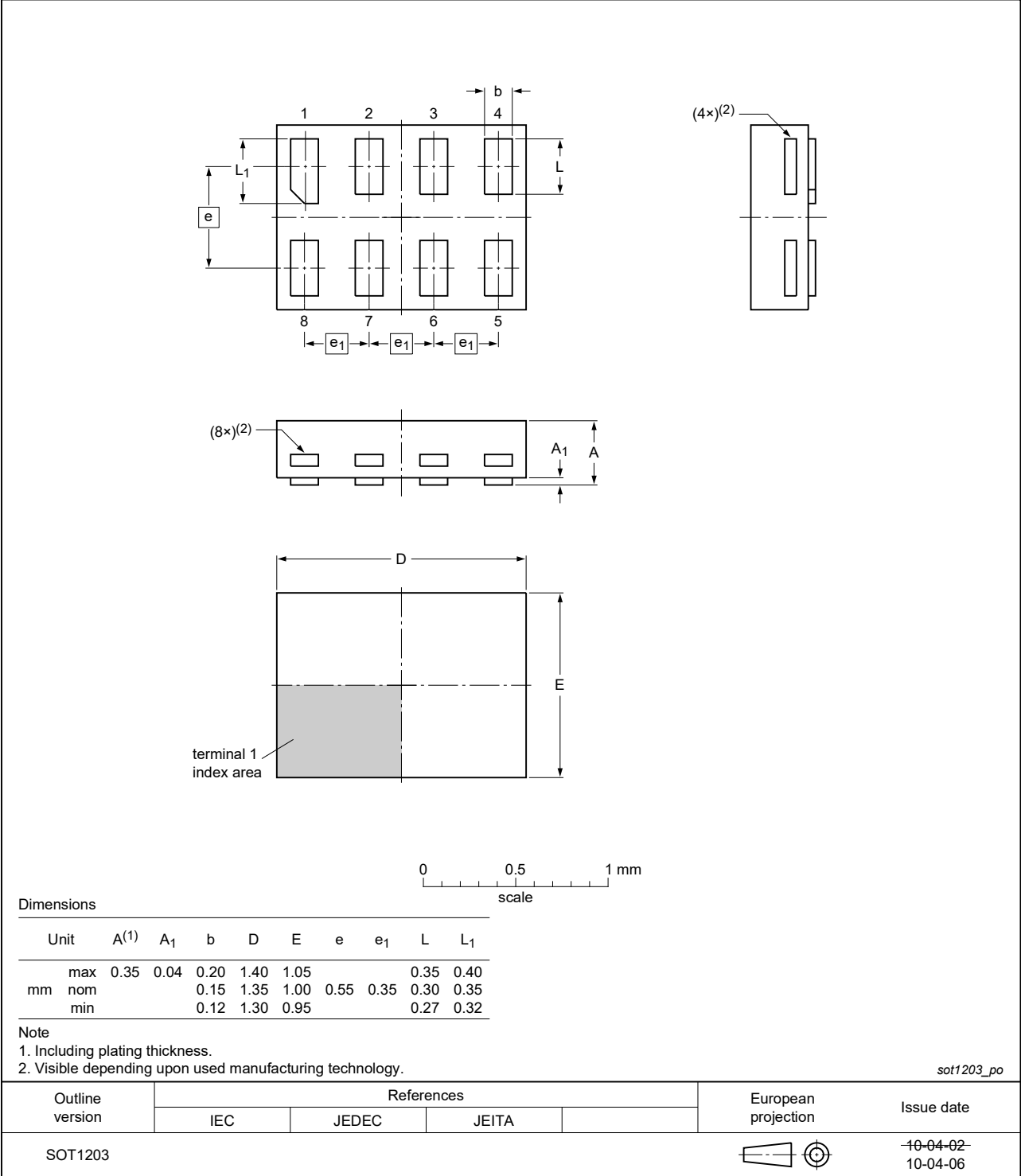


Fig. 17. Package outline SOT1203 (XSON8)

14. Abbreviations

Table 12. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

15. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC3G17 v.14	20210826	Product data sheet	-	74LVC3G17 v.13
Modifications:	<ul style="list-style-type: none"> • Section 1 and Section 2 updated. • Type number 74LVC3G17GM (SOT902-2/XQFN8) removed. • Section 9: Derating values for P_{tot} total power dissipation updated. 			
74LVC3G17 v.13	20181127	Product data sheet	-	74LVC3G17 v.12
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 numbers 74LVC3G17GD (SOT996-2) removed. 			
74LVC3G17 v.12	20161215	Product data sheet	-	74LVC3G17 v.11
Modifications:	<ul style="list-style-type: none"> • Table 7: The maximum limits for leakage current and supply current have changed. 			
74LVC3G17 v.11	20130409	Product data sheet	-	74LVC3G17 v.10
Modifications:	<ul style="list-style-type: none"> • For type number 74LVC3G17GD XSON8U has changed to XSON8. 			
74LVC3G17 v.10	20120706	Product data sheet	-	74LVC3G17 v.9
Modifications:	<ul style="list-style-type: none"> • For type number 74LVC3G17GM the SOT code has changed to SOT902-2. 			
74LVC3G17 v.9	20111123	Product data sheet	-	74LVC3G17 v.8
Modifications:	<ul style="list-style-type: none"> • Legal pages updated. 			
74LVC3G17 v.8	20110921	Product data sheet	-	74LVC3G17 v.7
74LVC3G17 v.7	20101104	Product data sheet	-	74LVC3G17 v.6
74LVC3G17 v.6	20080606	Product data sheet	-	74LVC3G17 v.5
74LVC3G17 v.5	20080313	Product data sheet	-	74LVC3G17 v.4
74LVC3G17 v.4	20070521	Product data sheet	-	74LVC3G17 v.3
74LVC3G17 v.3	20050131	Product data sheet	-	74LVC3G17 v.2
74LVC3G17 v.2	20041103	Product specification	-	74LVC3G17 v.1
74LVC3G17 v.1	20040624	Product specification	-	-

16. 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>.

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