

74LVC1G17

Single Schmitt trigger buffer

Rev. 11 — 2 December 2016

Product data sheet

1. General description

The 74LVC1G17 provides a buffer function with Schmitt trigger input. It is capable of transforming slowly changing input signals into sharply defined outputs.

The input can be driven from either 3.3 V or 5 V devices. This feature allows the use of this device in a mixed 3.3 V and 5 V environment.

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.

2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- High noise immunity
- Complies with JEDEC standard
 - ◆ JESD8-7 (1.65 V to 1.95 V)
 - ◆ JESD8-5 (2.3 V to 2.7 V)
 - ◆ JESD8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- ± 24 mA output drive ($V_{CC} = 3.0$ V)
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Unlimited rise and fall times
- Inputs accept voltages up to 5 V
- Multiple package options
- Specified from -40 °C to $+85$ °C and from -40 °C to $+125$ °C

3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74LVC1G17GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74LVC1G17GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
74LVC1G17GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74LVC1G17GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891
74LVC1G17GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74LVC1G17GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202
74LVC1G17GX	-40 °C to +125 °C	X2SON5	X2SON5: plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body 0.8 × 0.8 × 0.35 mm	SOT1226

4. Marking

Table 2. Marking codes

Type number	Marking ^[1]
74LVC1G17GW	VJ
74LVC1G17GV	V17
74LVC1G17GM	VJ
74LVC1G17GF	VJ
74LVC1G17GN	VJ
74LVC1G17GS	VJ
74LVC1G17GX	VJ

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

5. Functional diagram

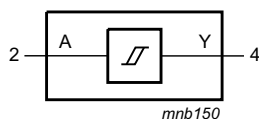


Fig 1. Logic symbol

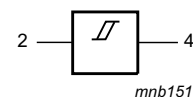


Fig 2. IEC logic symbol

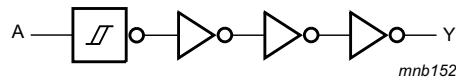


Fig 3. Logic diagram

6. Pinning information

6.1 Pinning

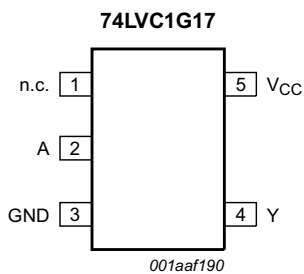


Fig 4. Pin configuration SOT353-1 and SOT753

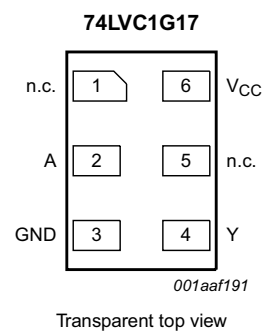


Fig 5. Pin configuration SOT886

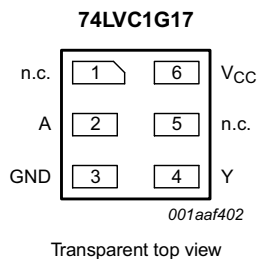


Fig 6. Pin configuration SOT891, SOT1115 and SOT1202

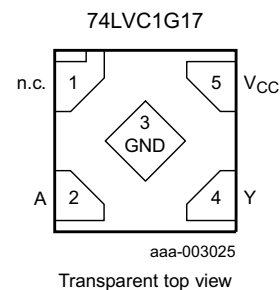


Fig 7. Pin configuration SOT1226 (X2SON5)

6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	TSSOP5 and X2SON5	XSON6	
n.c.	1	1, 5	not connected
A	2	2	data input
GND	3	3	ground (0 V)
Y	4	4	data output
V _{CC}	5	6	supply voltage

7. Functional description

Table 4. Function table^[1]

Input	Output
A	Y
L	L
H	H

[1] H = HIGH voltage level; L = LOW voltage level

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	+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	-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
P_{tot}	total power dissipation	$T_{amb} = -40$ °C to +125 °C	-	250	mW
T_{stg}	storage temperature		-65	+150	°C

[1] The 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 TSSOP5 and SC-74A packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.
For XSON6 and X2SON5 package: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		1.65	-	5.5	V
V_I	input voltage		0	-	5.5	V
V_O	output voltage	Active mode	0	-	V_{CC}	V
		$V_{CC} = 0$ V; Power-down mode	0	-	5.5	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	Min	Typ ^[1]	Max	Unit		
T_{amb} = -40 °C to +85 °C								
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		
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	-	-	V		
		I _O = -8 mA; V _{CC} = 2.3 V	1.9	-	-	V		
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	-	-	V		
		I _O = -24 mA; V _{CC} = 3.0 V	2.3	-	-	V		
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	V		
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	V		
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.3	V		
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.4	V		
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	V		
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±1	μA		
		I _{OFF}	power-off leakage current	V _I or V _O = 5.5 V; V _{CC} = 0 V	-	±0.1	±2	μA
		I _{CC}	supply current	V _I = 5.5 V or GND; V _{CC} = 1.65 V to 5.5 V; I _O = 0 A	-	0.1	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; per pin	-	5	500	μA
		C _I	input capacitance		-	5	-	pF
		T_{amb} = -40 °C to +125 °C						
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		
		I _O = -4 mA; V _{CC} = 1.65 V	0.95	-	-	V		
		I _O = -8 mA; V _{CC} = 2.3 V	1.7	-	-	V		
		I _O = -12 mA; V _{CC} = 2.7 V	1.9	-	-	V		
		I _O = -24 mA; V _{CC} = 3.0 V	2.0	-	-	V		
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	V		
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.7	V		
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.45	V		
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.6	V		
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.80	V		
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	±1	μA		

Table 7. Static characteristics ...continued

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

Symbol	Parameter	Conditions	Min	Typ ^[1]	Max	Unit
I_{OFF}	power-off leakage current	V_I or $V_O = 5.5$ V; $V_{CC} = 0$ V	-	-	± 2	μ A
I_{CC}	supply current	$V_I = 5.5$ V or GND; $V_{CC} = 1.65$ V to 5.5 V; $I_O = 0$ A	-	-	4	μ A
ΔI_{CC}	additional supply current	per pin; $V_I = V_{CC} - 0.6$ V; $I_O = 0$ A; $V_{CC} = 2.3$ V to 5.5 V	-	-	500	μ A

[1] All typical values are measured at maximum V_{CC} and $T_{amb} = 25$ °C.**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 Figure 8 and Figure 9						
		$V_{CC} = 1.8$ V	0.82	1.0	1.14	0.79	1.14	V
		$V_{CC} = 2.3$ V	1.03	1.2	1.40	1.00	1.40	V
		$V_{CC} = 3.0$ V	1.29	1.5	1.71	1.26	1.71	V
		$V_{CC} = 4.5$ V	1.84	2.1	2.36	1.81	2.36	V
V_{T-}	negative-going threshold voltage	see Figure 8 and Figure 9						
		$V_{CC} = 1.8$ V	0.46	0.6	0.75	0.46	0.78	V
		$V_{CC} = 2.3$ V	0.65	0.8	0.96	0.65	0.99	V
		$V_{CC} = 3.0$ V	0.88	1.0	1.24	0.88	1.27	V
		$V_{CC} = 4.5$ V	1.32	1.5	1.84	1.32	1.87	V
V_H	hysteresis voltage	see Figure 8 , Figure 9 and Figure 10						
		$V_{CC} = 1.8$ V	0.26	0.4	0.51	0.19	0.51	V
		$V_{CC} = 2.3$ V	0.28	0.4	0.57	0.22	0.57	V
		$V_{CC} = 3.0$ V	0.31	0.5	0.64	0.25	0.64	V
		$V_{CC} = 4.5$ V	0.40	0.6	0.77	0.34	0.77	V
	$V_{CC} = 5.5$ V	0.47	0.6	0.88	0.41	0.88	V	

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

10.1 Transfer characteristic waveforms

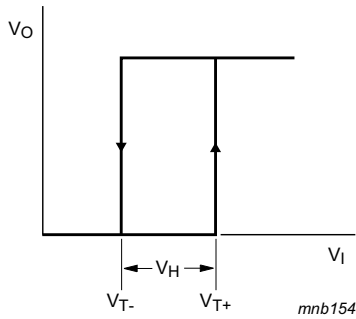


Fig 8. Transfer characteristic

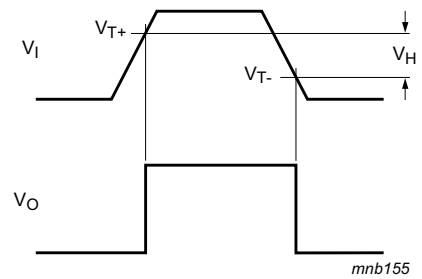
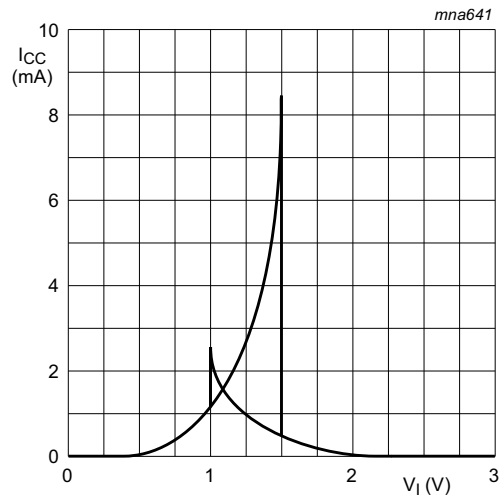


Fig 9. Definitions of V_{T+} , V_{T-} and V_H



$V_{CC} = 3.0$ V

Fig 10. Typical transfer characteristics

11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 12](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
t _{pd}	propagation delay	A to Y; see Figure 11 ^[2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	4.1	11.0	1.0	14.0	ns
		V _{CC} = 2.3 V to 2.7 V	0.7	2.8	6.5	0.7	8.5	ns
		V _{CC} = 2.7 V	0.7	3.2	6.5	0.7	8.5	ns
		V _{CC} = 3.0 V to 3.6 V	0.7	3.0	5.5	0.7	7.0	ns
		V _{CC} = 4.5 V to 5.5 V	0.7	2.2	5.0	0.7	6.5	ns
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC} ; V _{CC} = 3.3 V ^[3]	-	16.6	-	-	-	pF

[1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 1.8 V, 2.5 V, 2.7 V, 3.3 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).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

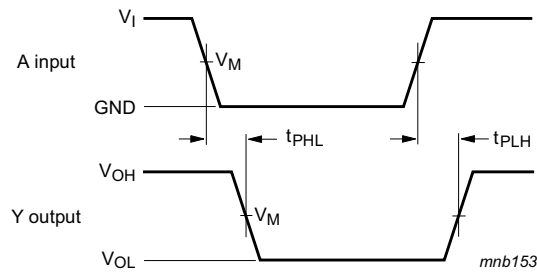
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

∑(C_L × V_{CC}² × f_o) = sum of outputs.

12. Waveforms



Measurement points are given in [Table 10](#).

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

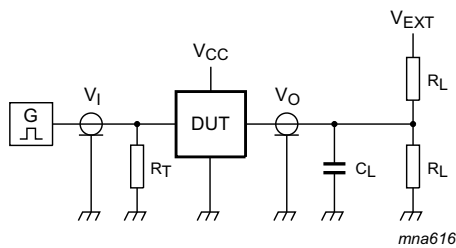
Fig 11. The input A to output Y propagation delay times

Table 10. Measurement points

Supply voltage	Input	Output
V _{CC}	V _M	V _M
1.65 V to 1.95 V	0.5 × V _{CC}	0.5 × V _{CC}
2.3 V to 2.7 V	0.5 × V _{CC}	0.5 × V _{CC}

Table 10. Measurement points ...continued

Supply voltage	Input	Output
V_{CC}	V_M	V_M
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	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$



Test data is given in [Table 11](#).

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.

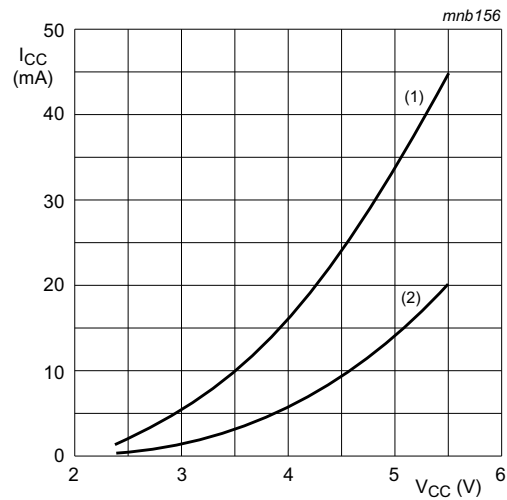
V_{EXT} = External voltage for measuring switching times.

Fig 12. Test circuit for measuring switching times

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}
1.65 V to 1.95 V	V_{CC}	≤ 2.0 ns	30 pF	1 k Ω	open
2.3 V to 2.7 V	V_{CC}	≤ 2.0 ns	30 pF	500 Ω	open
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open
4.5 V to 5.5 V	V_{CC}	≤ 2.5 ns	50 pF	500 Ω	open

13. Application information



Linear change of V_I between 0.8 V to 2.0 V.

- (1) Positive-going edge.
- (2) Negative-going edge.

Fig 13. Average supply current as a function of supply voltage

14. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1

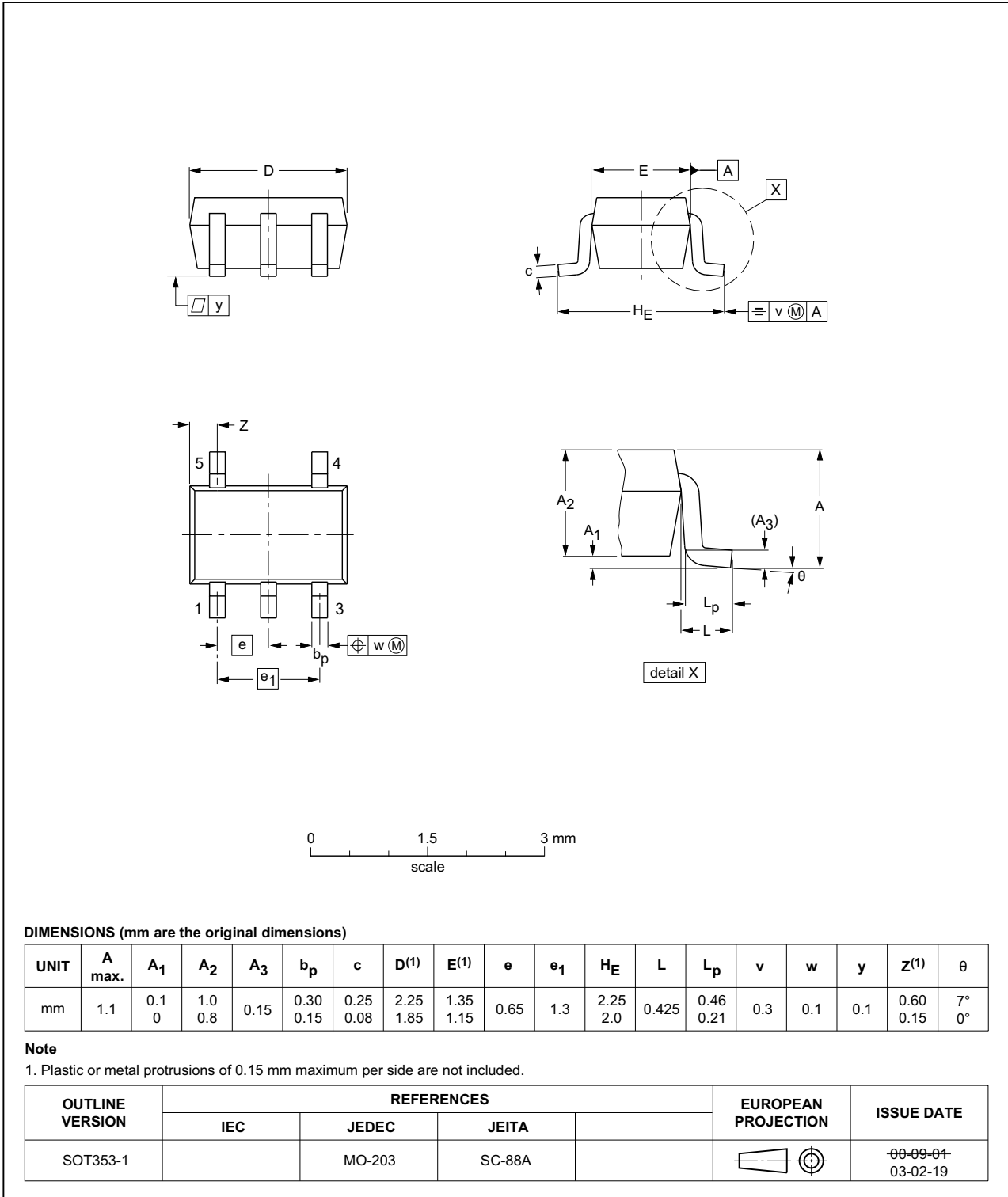


Fig 14. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

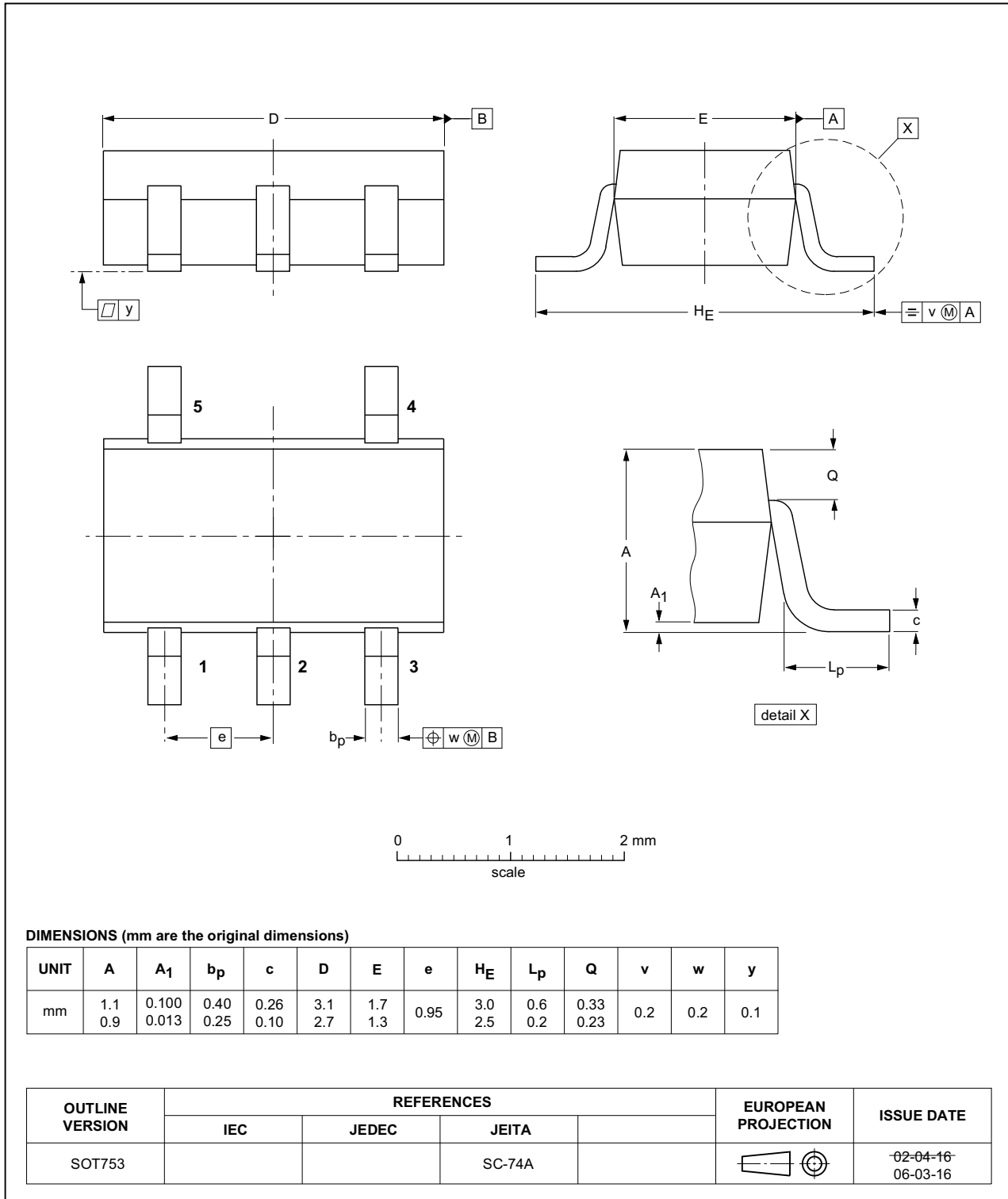


Fig 15. Package outline SOT753 (SC-74A)

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

SOT886

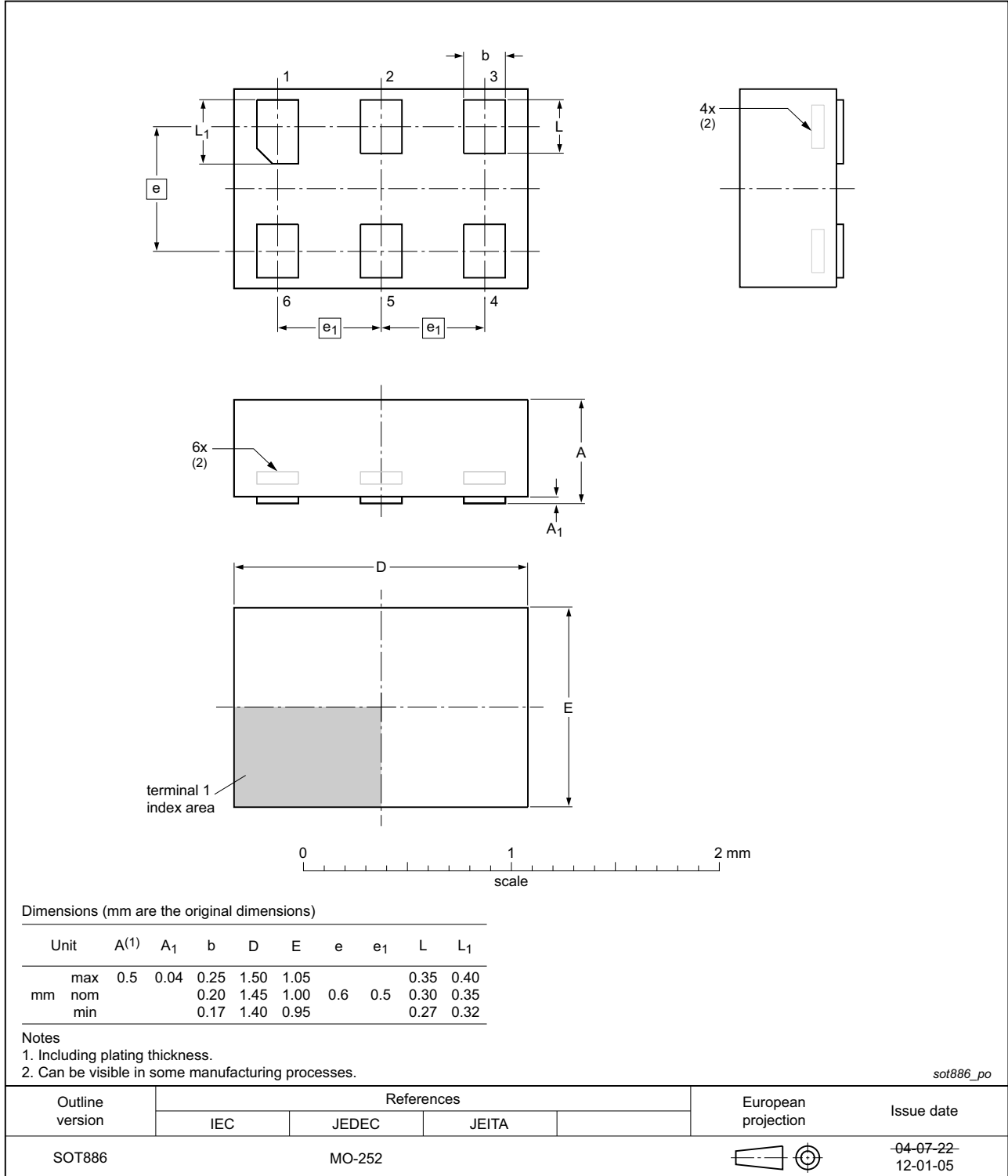


Fig 16. Package outline SOT886 (XSON6)

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1 x 0.5 mm

SOT891

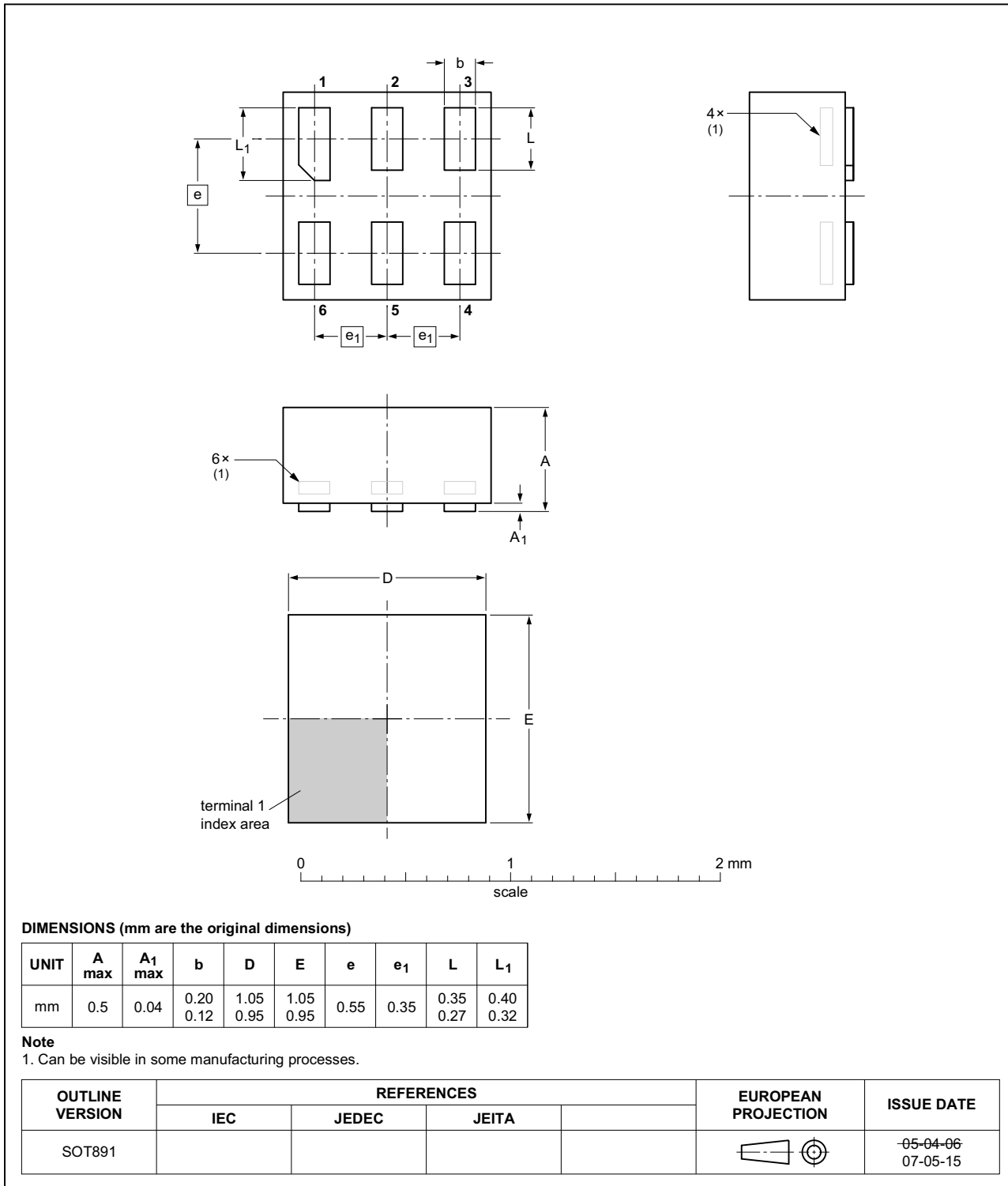


Fig 17. Package outline SOT891 (XSON6)

**XSON6: extremely thin small outline package; no leads;
6 terminals; body 0.9 x 1.0 x 0.35 mm**

SOT1115

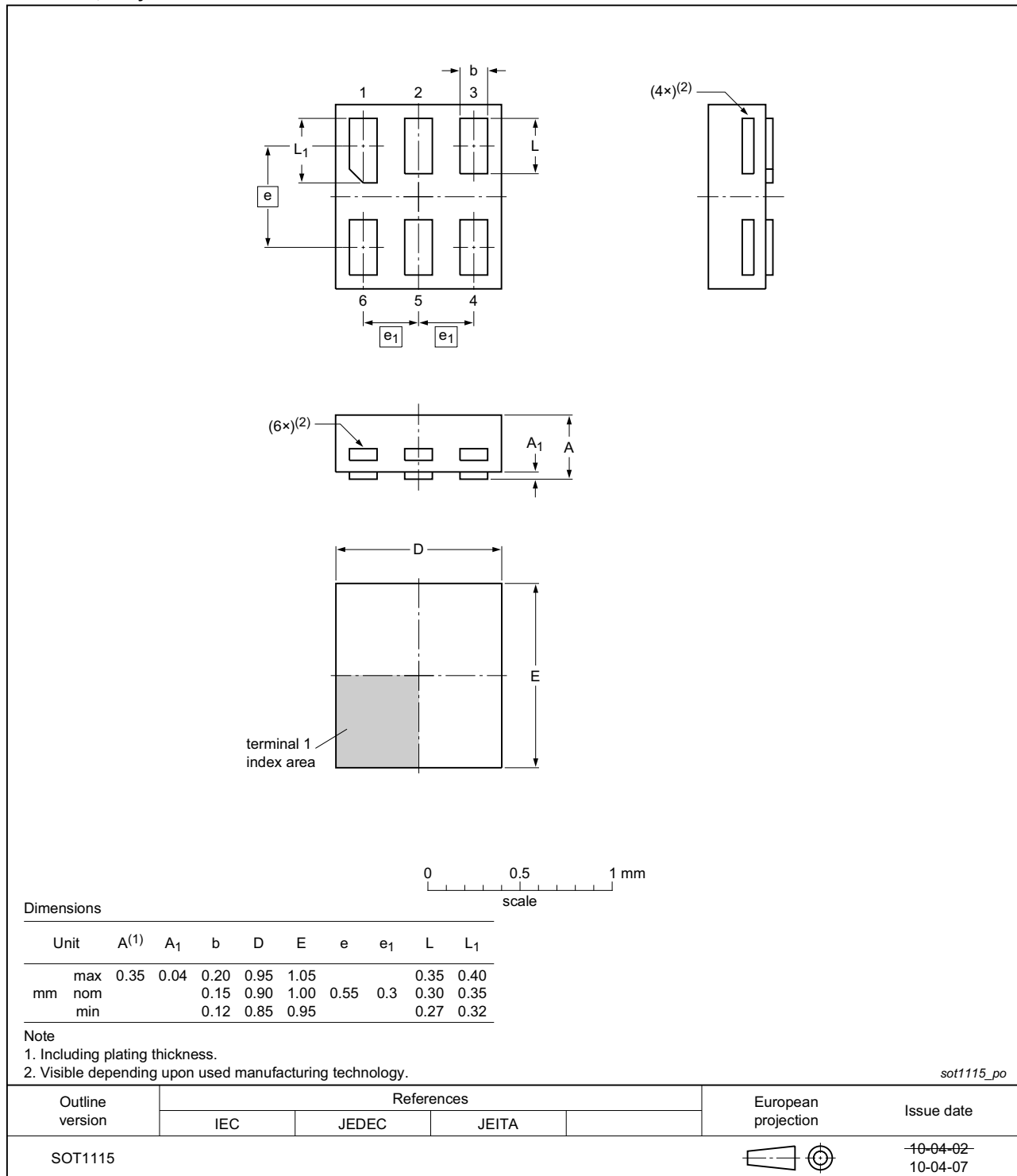


Fig 18. Package outline SOT1115 (XSON6)

XSON6: extremely thin small outline package; no leads;
6 terminals; body 1.0 x 1.0 x 0.35 mm

SOT1202

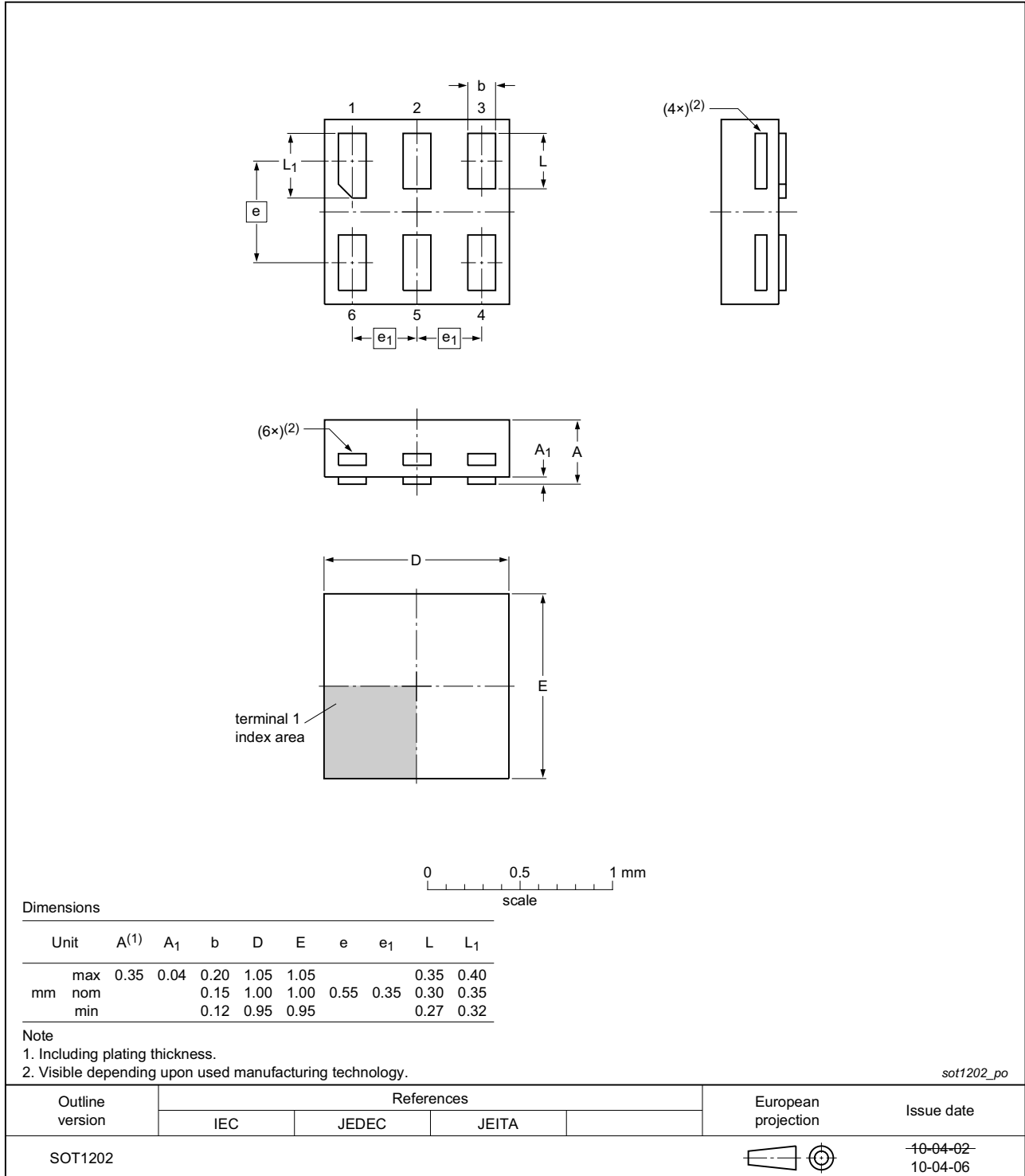


Fig 19. Package outline SOT1202 (XSON6)

X2SON5: plastic thermal enhanced extremely thin small outline package; no leads;
5 terminals; body 0.8 x 0.8 x 0.35 mm

SOT1226

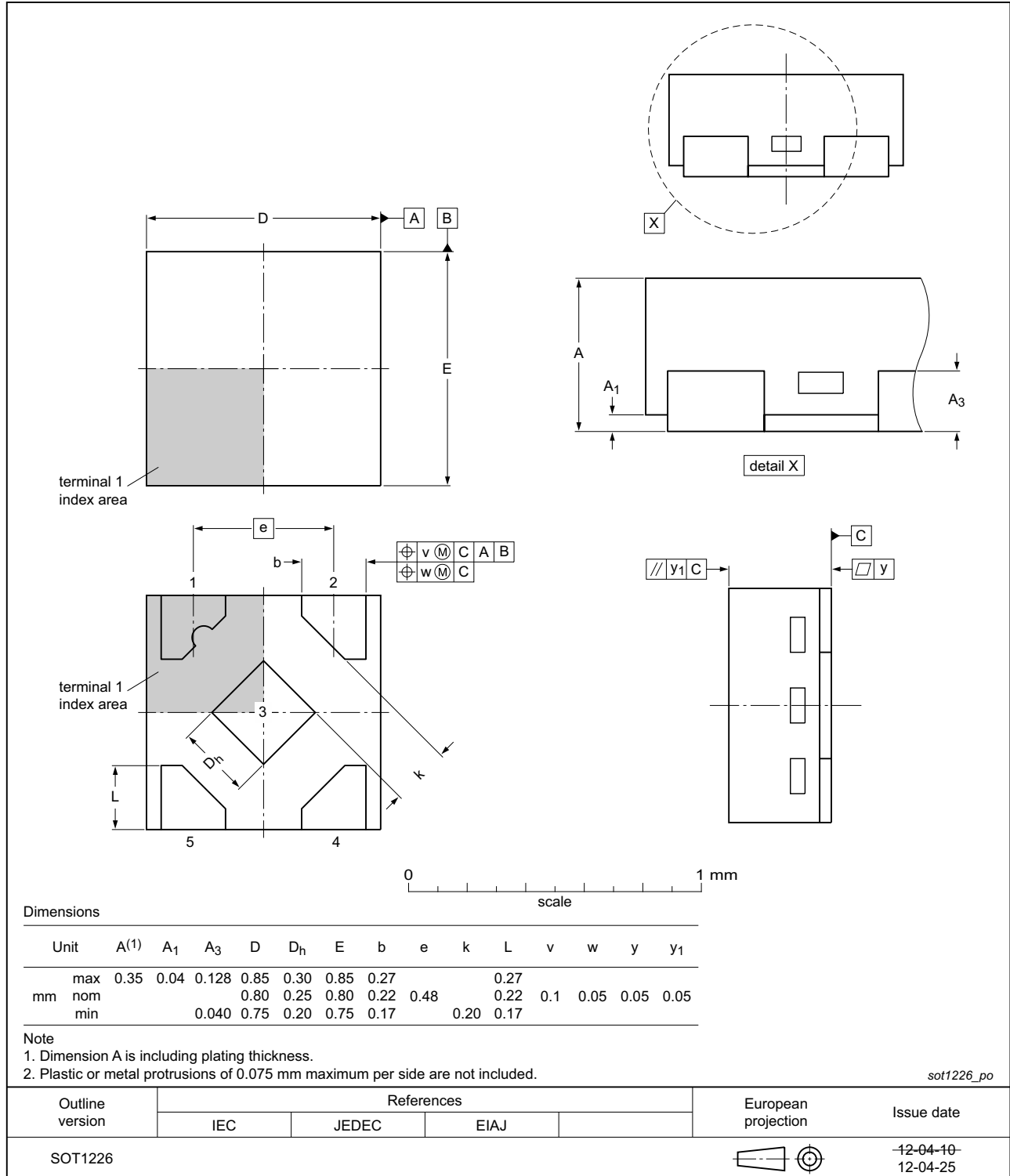


Fig 20. Package outline SOT1226 (X2SON5)

15. 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

16. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC1G17 v.11	20161202	Product data sheet	-	74LVC1G17 v.10
Modifications:	<ul style="list-style-type: none"> • Table 7: The maximum limits for leakage current and supply current have changed. 			
74LVC1G17 v.10	20120629	Product data sheet	-	74LVC1G17 v.9
Modifications:	<ul style="list-style-type: none"> • Added type number 74LVC1G17GX (SOT1226) • Package outline drawing of SOT886 (Figure 16) modified. 			
74LVC1G17 v.9	20111206	Product data sheet	-	74LVC1G17 v.8
Modifications:	<ul style="list-style-type: none"> • Legal pages updated. 			
74LVC1G17 v.8	20110920	Product data sheet	-	74LVC1G17 v.7
74LVC1G17 v.7	20101110	Product data sheet	-	74LVC1G17 v.6
74LVC1G17 v.6	20070827	Product data sheet	-	74LVC1G17 v.5
74LVC1G17 v.5	20061006	Product data sheet	-	74LVC1G17 v.4
74LVC1G17 v.4	20041130	Product specification	-	74LVC1G17 v.3
74LVC1G17 v.3	20041018	Product specification	-	74LVC1G17 v.2
74LVC1G17 v.2	20040407	Product specification	-	74LVC1G17 v.1
74LVC1G17 v.1	20040324	Product specification	-	-

17. Legal information

17.1 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 URL <http://www.nexperia.com>.

17.2 Definitions

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18. Contact information

For more information, please visit: <http://www.nexperia.com>

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