

74LVC1G57

Low-power configurable multiple function gate

Rev. 4 — 15 October 2010

Product data sheet

1. General description

The 74LVC1G57 provides configurable multiple functions. The output state is determined by eight patterns of 3-bit input. The user can choose the logic functions AND, OR, NAND, NOR, XNOR, inverter and buffer. All inputs can be connected to V_{CC} or GND.

Inputs 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.

All inputs (A, B and C) have Schmitt-trigger action. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- 5 V tolerant input/output for interfacing with 5 V logic
- 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
- Inputs accept voltages up to 5 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			
	Temperature range	Name	Description	Version
74LVC1G57GW	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363
74LVC1G57GV	-40 °C to +125 °C	SC-74	plastic surface-mounted package; 6 leads	SOT457
74LVC1G57GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74LVC1G57GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891
74LVC1G57GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74LVC1G57GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202

4. Marking

Table 2. Marking

Type number	Marking code ^[1]
74LVC1G57GW	YC
74LVC1G57GV	V57
74LVC1G57GM	YC
74LVC1G57GF	YC
74LVC1G57GN	YC
74LVC1G57GS	YC

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

5. Functional diagram

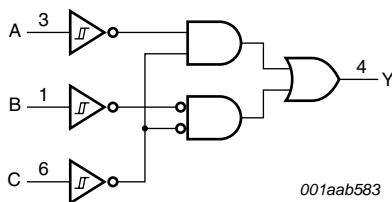
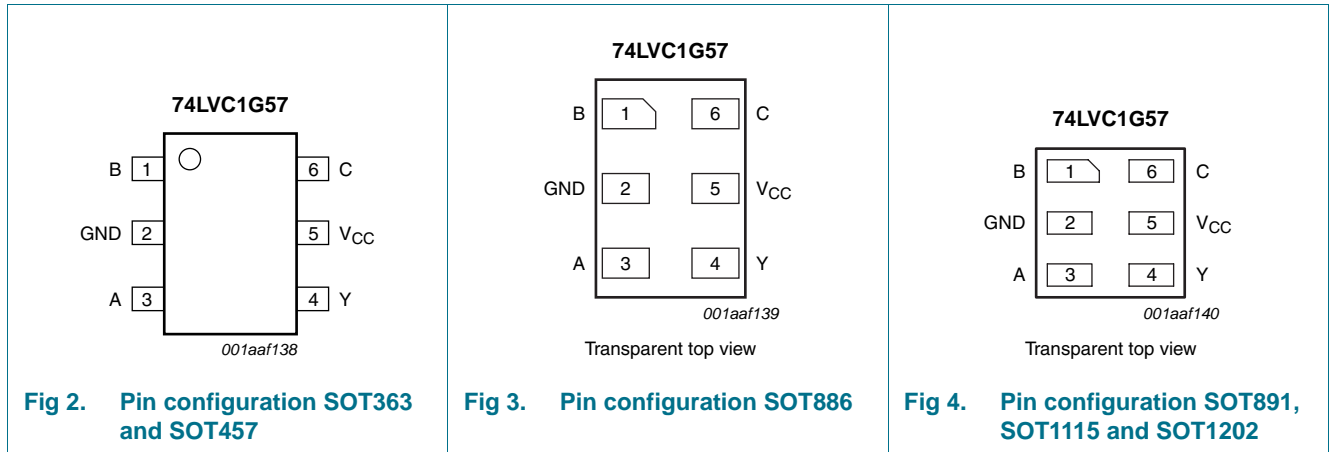


Fig 1. Logic symbol

6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

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

7. Functional description

Table 4. Function table^[1]

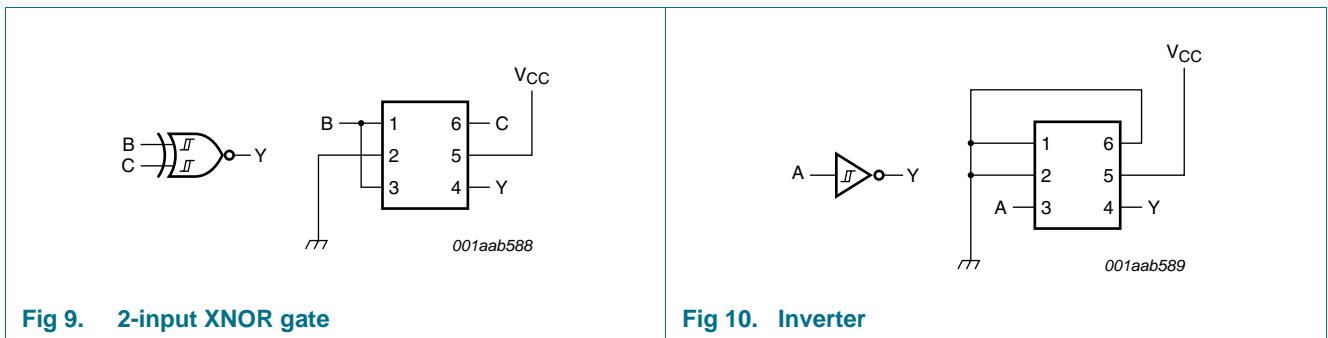
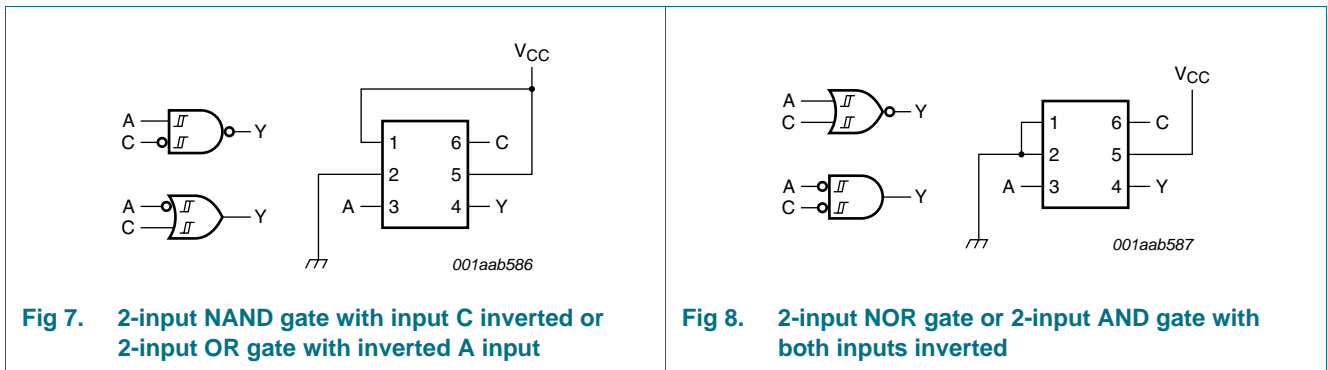
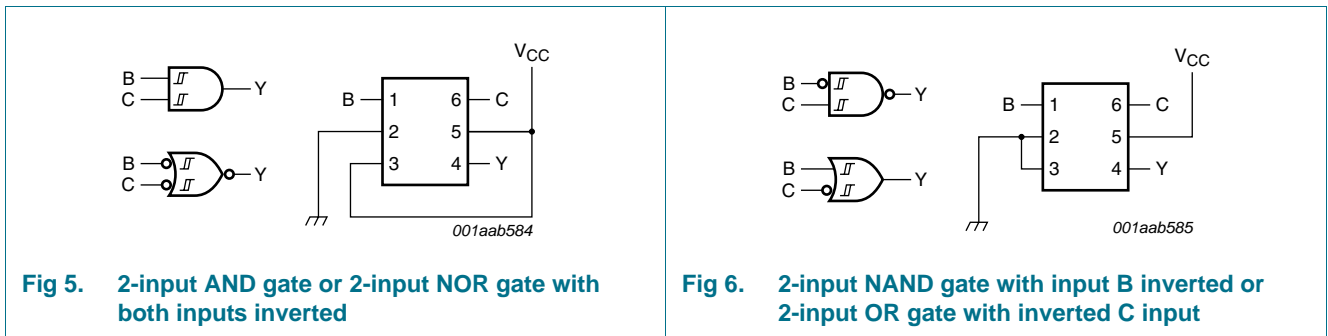
Input			Output
C	B	A	Y
L	L	L	H
L	L	H	L
L	H	L	H
L	H	H	L
H	L	L	L
H	L	H	L
H	H	L	H
H	H	H	H

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

7.1 Logic configurations

Table 5. Function selection table

Logic function	Figure
2-input AND	see Figure 5
2-input AND with both inputs inverted	see Figure 8
2-input NAND with inverted input	see Figure 6 and Figure 7
2-input OR with inverted input	see Figure 6 and Figure 7
2-input NOR	see Figure 8
2-input NOR with both inputs inverted	see Figure 5
2-input XNOR	see Figure 9
Inverter	see Figure 10
Buffer	see Figure 11



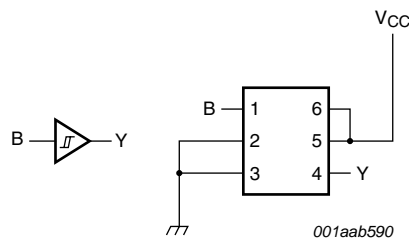


Fig 11. Buffer

8. Limiting values

Table 6. 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		[1]	-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	[1][2]	-0.5	+6.5	V
		Power-down mode	[1][2]	-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	[3]	-	250	mW

[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 SC-88 and SC-74 packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.
For XSON6 packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

9. Recommended operating conditions

Table 7. 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 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	Typ ^[1]	Max	Min	Max	
V _{OL}	LOW-level output voltage	V _I = V _{CC} or GND						
		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	-	0.7	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	-	0.6	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	-	0.8	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.55	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{CC} or GND						
		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	-	±0.1	±5	-	±100	μA
I _{OFF}	power-off leakage current	V _I or V _O = 5.5 V; V _{CC} = 0 V	-	±0.1	±10	-	±200	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	-	0.1	10	-	200	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	-	5	500	-	5000	μA
C _I	input capacitance		-	2.5	-	-	-	pF

[1] Typical values are measured at maximum V_{CC} and T_{amb} = 25 °C.

11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 13](#).

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, B, C to Y; see Figure 12 ^[2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	6.0	14.4	1.0	18	ns
		V _{CC} = 2.3 V to 2.7 V	0.5	3.5	8.3	0.5	10.4	ns
		V _{CC} = 2.7 V	0.5	4.2	8.5	0.5	10.6	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	3.8	6.3	0.5	7.9	ns
		V _{CC} = 4.5 V to 5.5 V	0.5	3.0	5.1	0.5	6.4	ns
C _{PD}	power dissipation capacitance	V _{CC} = 3.3 V; V _I = GND to V _{CC} ^[3]	-	22	-	-	-	pF

[1] Typical values are measured at nominal V_{CC} and at T_{amb} = 25 °C.

[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;

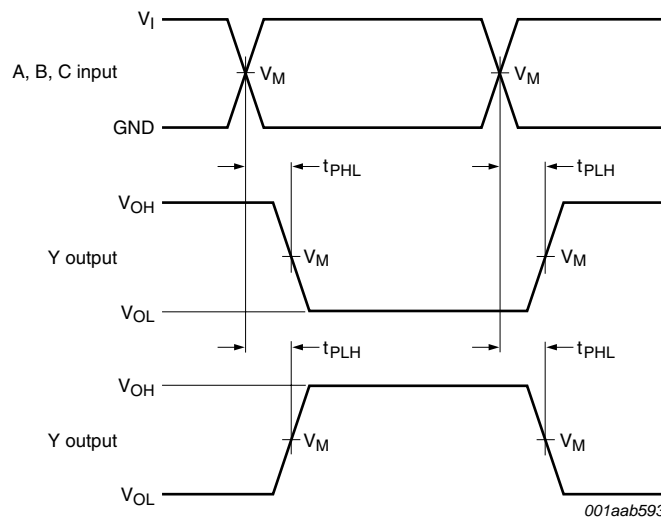
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

12. Waveforms



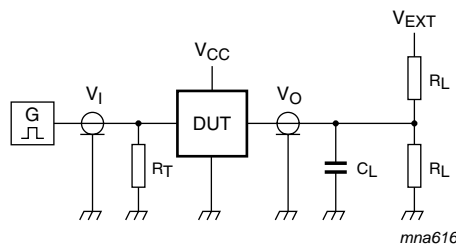
Measurement points are given in [Table 10](#).

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

Fig 12. Input A, B and C to output Y propagation delay times

Table 10. Measurement points

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



Measurement points are given in [Table 11](#).

Definitions test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

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

Fig 13. Test circuit for measuring switching times

Table 11. Measurement points

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. Transfer characteristics

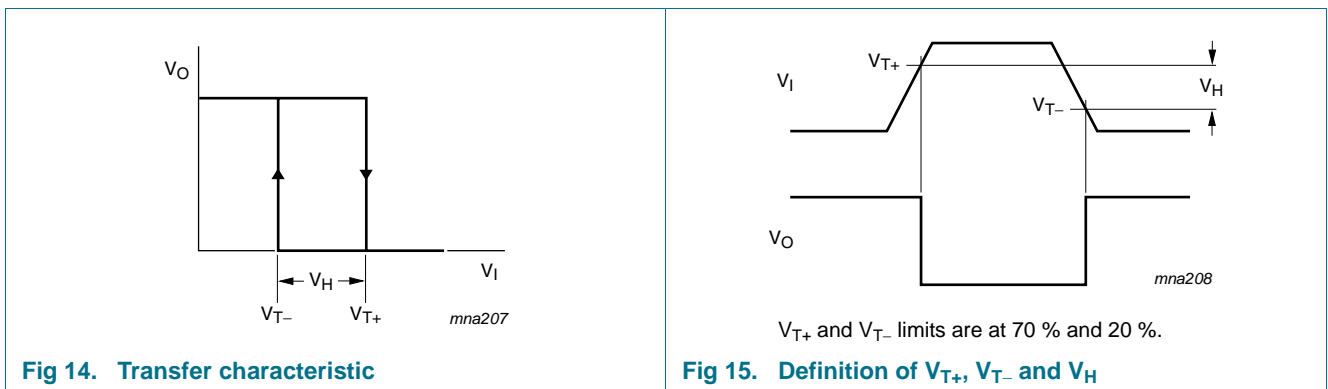
Table 12. Transfer characteristics

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 14 , Figure 15 , Figure 16 and Figure 17						
		V _{CC} = 1.8 V	0.70	1.02	1.20	0.67	1.20	V
		V _{CC} = 2.3 V	1.11	1.42	1.60	1.08	1.60	V
		V _{CC} = 3.0 V	1.50	1.79	2.00	1.47	2.00	V
		V _{CC} = 4.5 V	2.16	2.52	2.74	2.13	2.74	V
		V _{CC} = 5.5 V	2.61	2.99	3.33	2.58	3.33	V
V _{T-}	negative-going threshold voltage	see Figure 14 , Figure 15 , Figure 16 and Figure 17						
		V _{CC} = 1.8 V	0.30	0.53	0.72	0.30	0.75	V
		V _{CC} = 2.3 V	0.58	0.77	1.00	0.58	1.03	V
		V _{CC} = 3.0 V	0.80	1.04	1.30	0.80	1.33	V
		V _{CC} = 4.5 V	1.21	1.55	1.90	1.21	1.93	V
		V _{CC} = 5.5 V	1.45	1.86	2.29	1.45	2.32	V
V _H	hysteresis voltage (V _{T+} - V _{T-});	see Figure 14 , Figure 15 , Figure 16 and Figure 17						
		V _{CC} = 1.8 V	0.30	0.48	0.62	0.23	0.62	V
		V _{CC} = 2.3 V	0.40	0.64	0.80	0.34	0.80	V
		V _{CC} = 3.0 V	0.50	0.75	1.00	0.44	1.00	V
		V _{CC} = 4.5 V	0.71	0.97	1.20	0.65	1.20	V
		V _{CC} = 5.5 V	0.71	1.13	1.40	0.65	1.40	V

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

14. Waveforms transfer characteristics



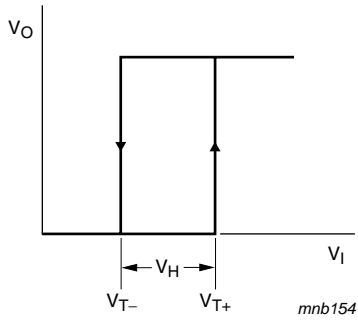
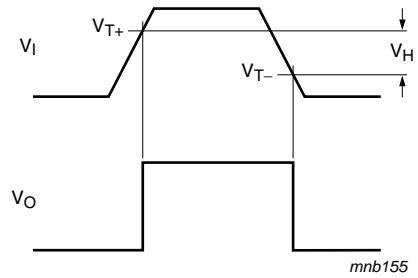


Fig 16. Transfer characteristic



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

Fig 17. Definition of V_{T+} , V_{T-} and V_H

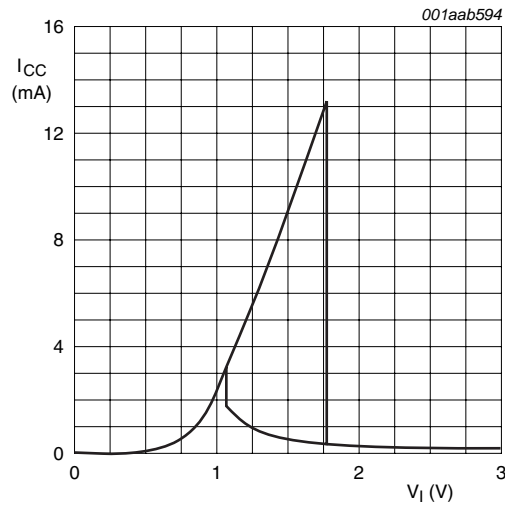


Fig 18. Typical 74LVC1G57 transfer characteristic; $V_{CC} = 3.0$ V

15. Package outline

Plastic surface-mounted package; 6 leads

SOT363

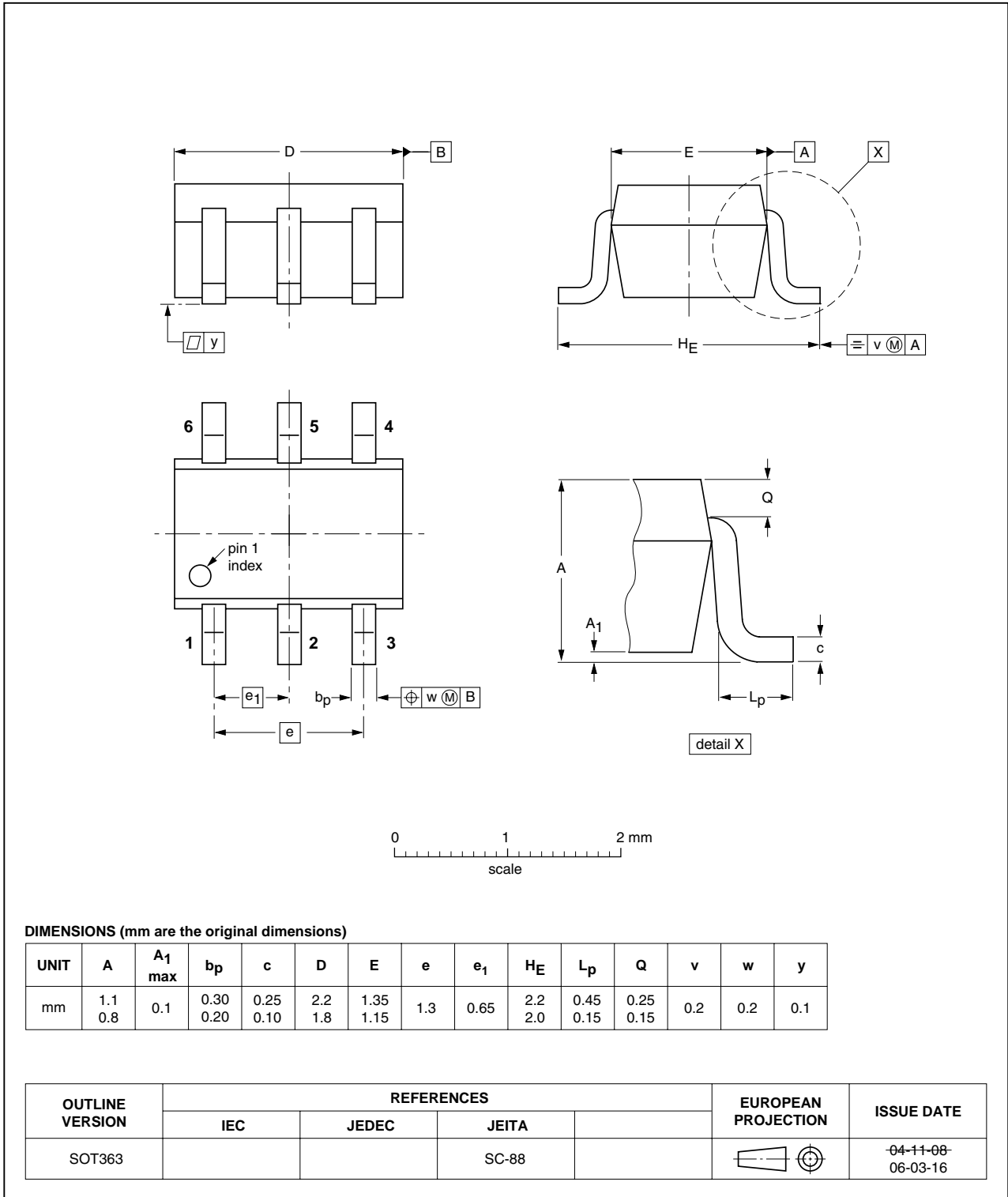


Fig 19. Package outline SOT363 (SC-88)

Plastic surface-mounted package (TSOP6); 6 leads

SOT457

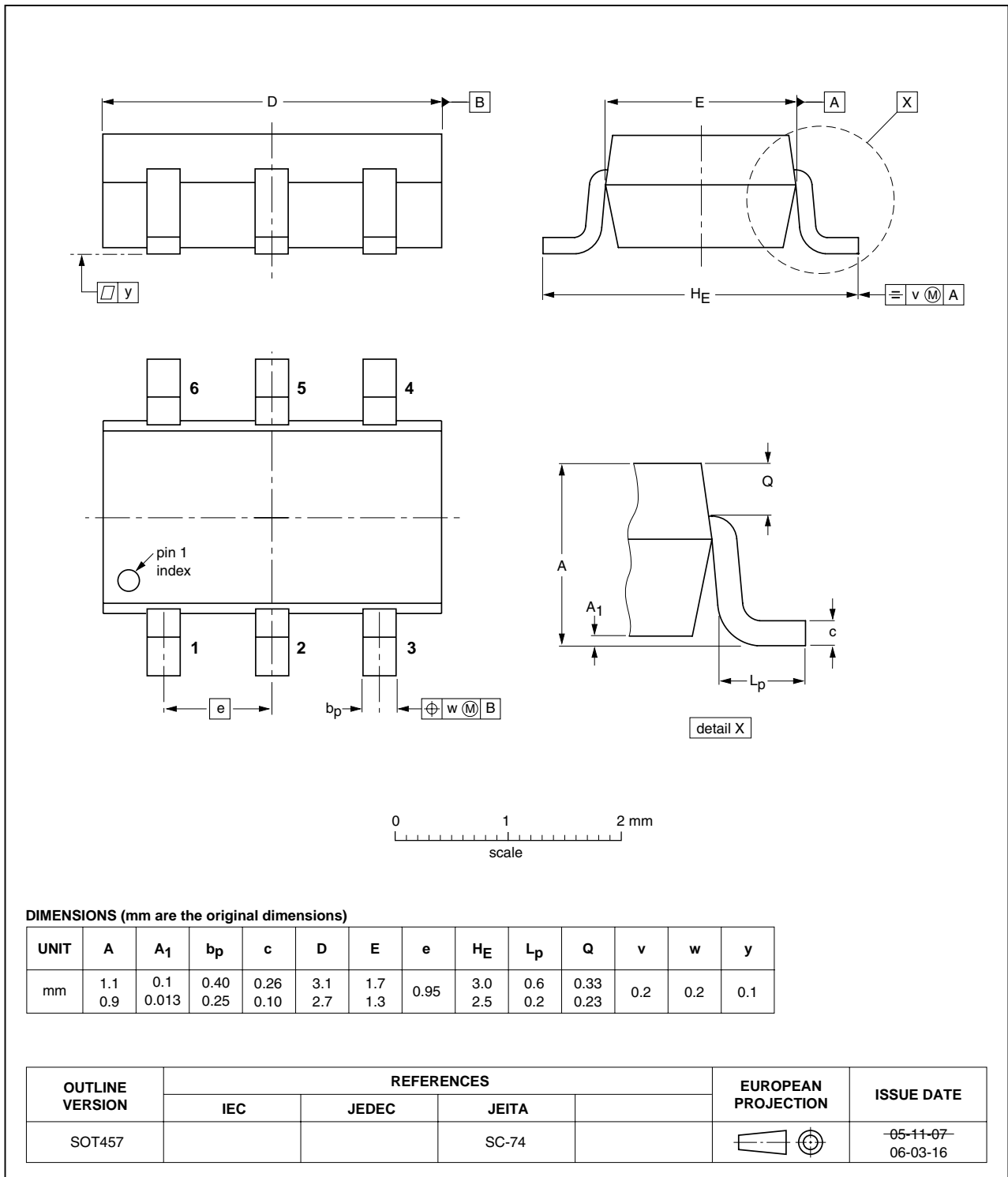


Fig 20. Package outline SOT457 (SC-74)

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

SOT886

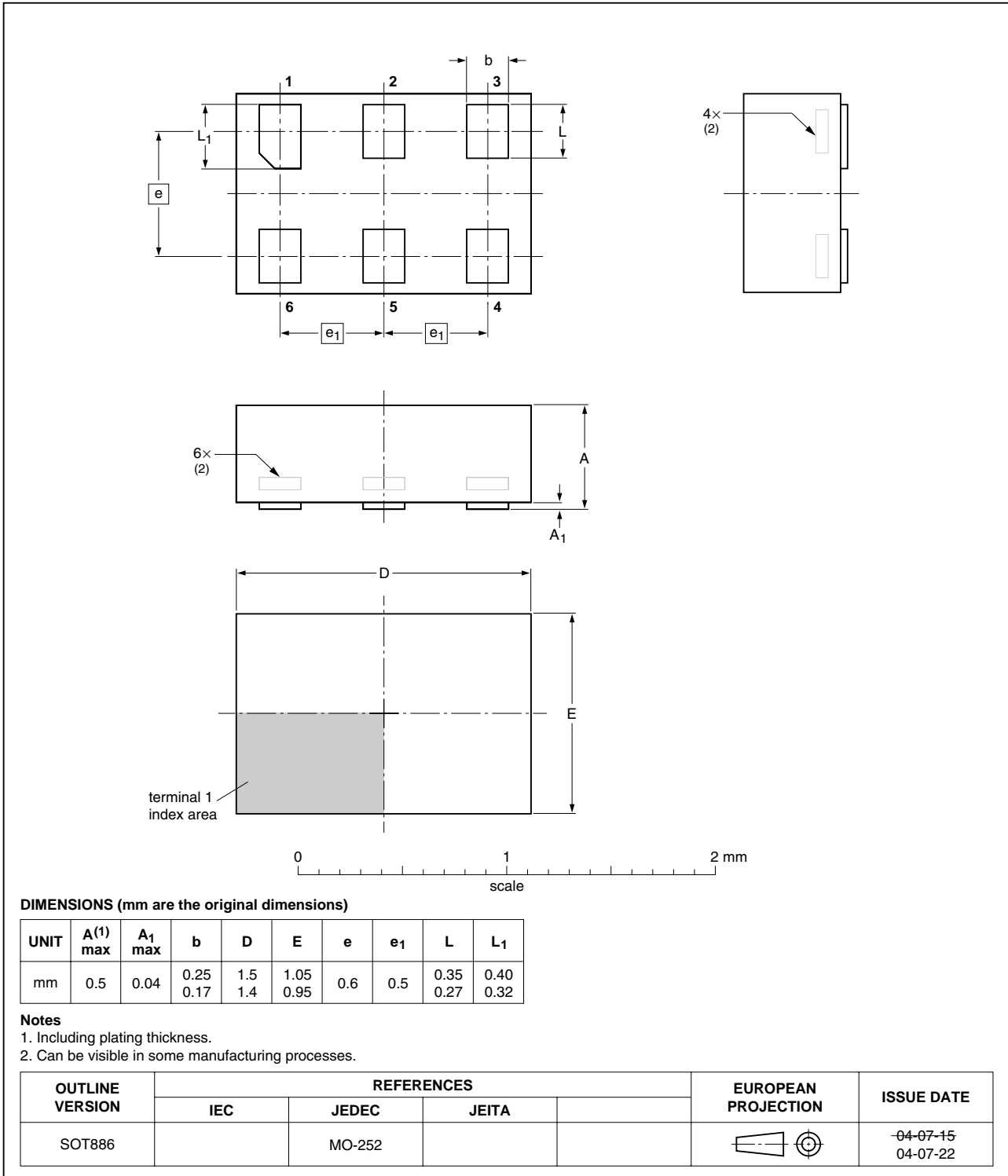


Fig 21. Package outline SOT886 (XSON6)

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

SOT891

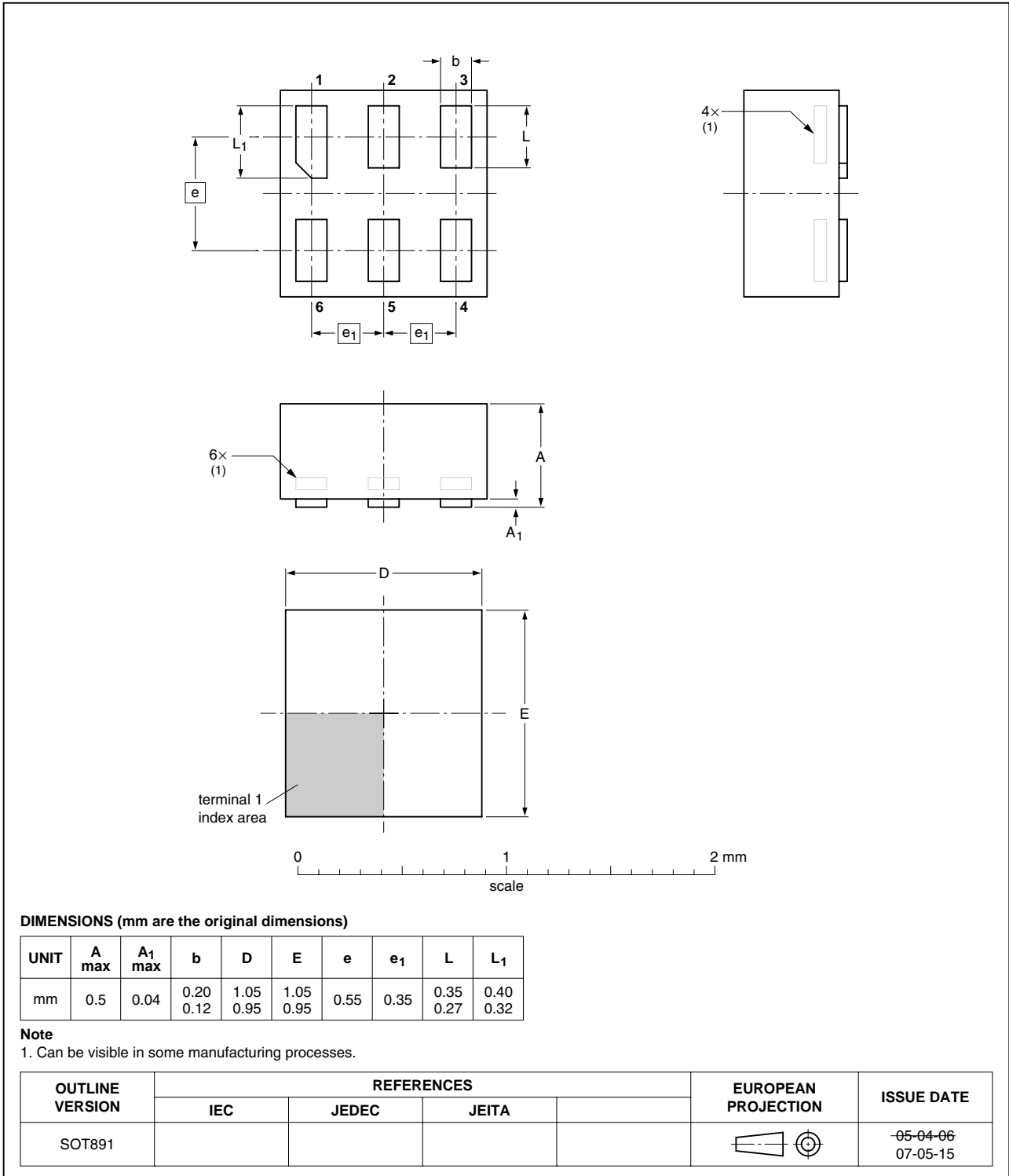


Fig 22. Package outline SOT891 (XSON6)

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

SOT1115

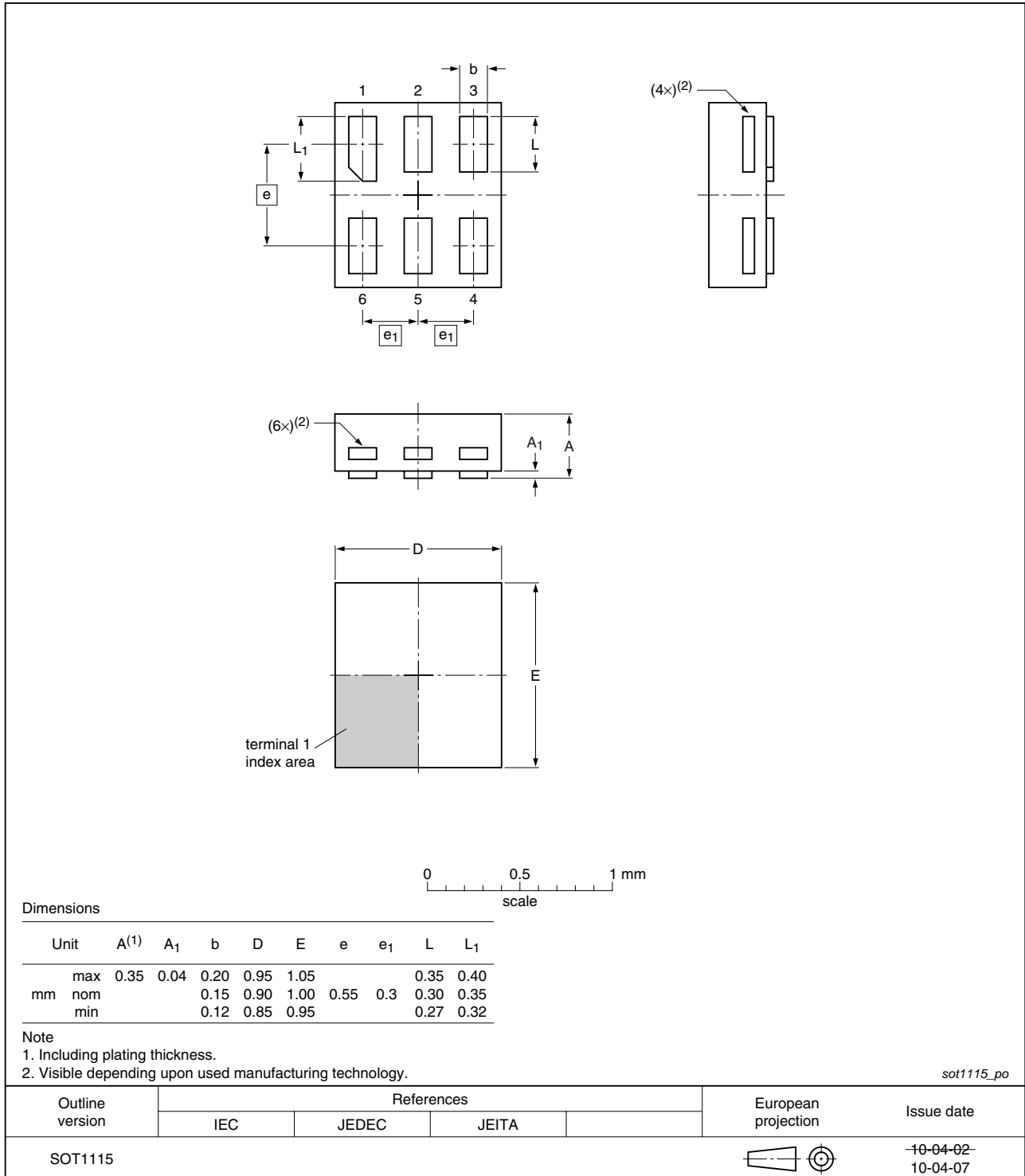


Fig 23. Package outline SOT1115 (XSON6)

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

SOT1202

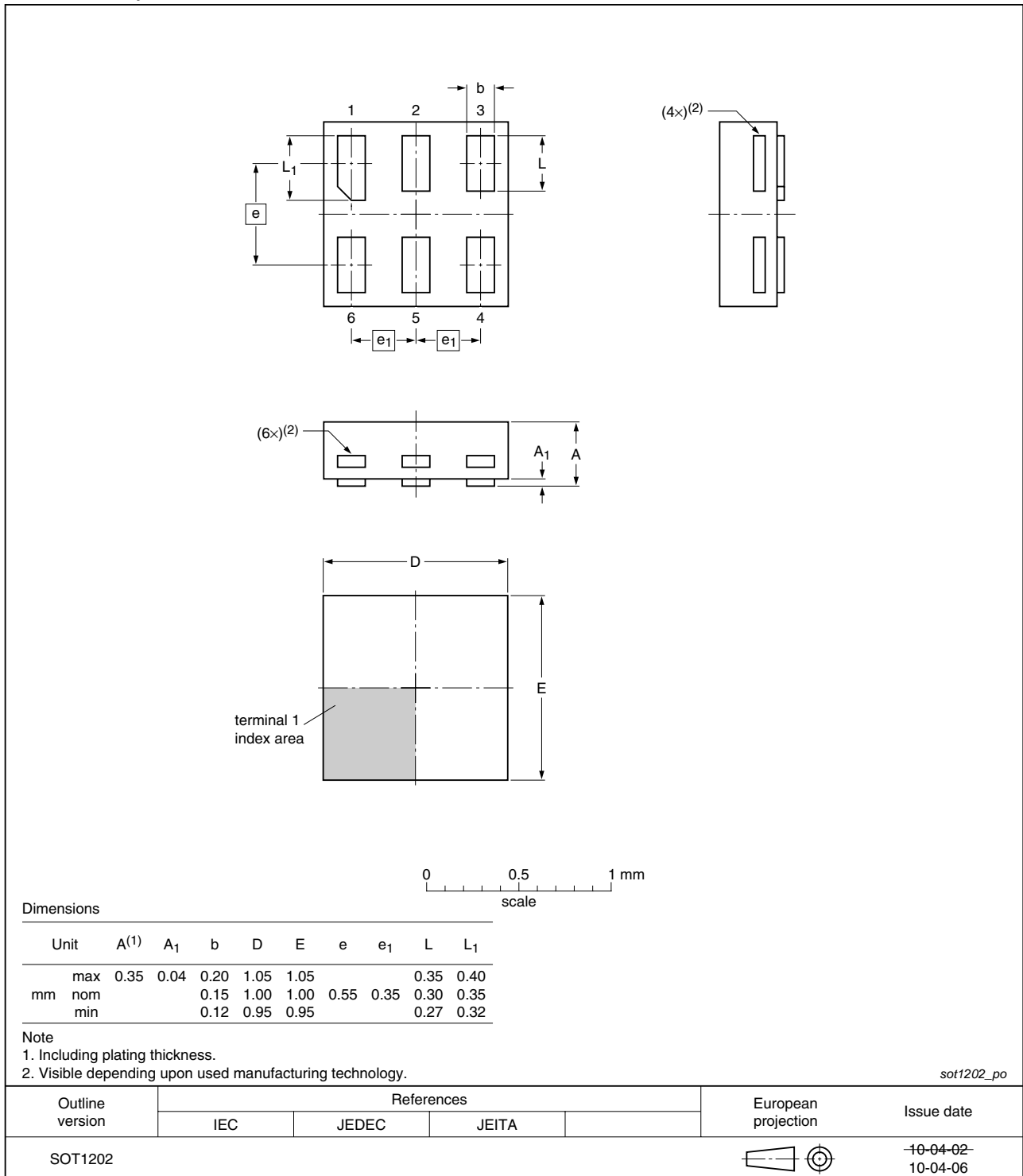


Fig 24. Package outline SOT1202 (XSON6)

16. Abbreviations

Table 13. Abbreviations

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

17. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC1G57 v.4	20101015	Product data sheet	-	74LVC1G57 v.3
Modifications:	<ul style="list-style-type: none"> Added type number 74LVC1G57GN (SOT1115/XSON6 package). Added type number 74LVC1G57GS (SOT1202/XSON6 package). 			
74LVC1G57 v.3	20070719	Product data sheet	-	74LVC1G57 v.2
74LVC1G57 v.2	20060911	Product data sheet	-	74LVC1G57 v.1
74LVC1G57 v.1	20040906	Product data sheet	-	-

18. Legal information

18.1 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.nxp.com>.

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Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

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