



**THE DATASHEET OF  
74LVC3G04GS,115**



# 74LVC3G04

## Triple inverter

Rev. 15 — 24 August 2023

Product data sheet

## 1. General description

The 74LVC3G04 is a triple inverter. 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.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

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
- 5 V tolerant outputs 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)
- $\pm 24$  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
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 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	
<a href="#">74LVC3G04DP</a>	$-40$ °C to $+125$ °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	<a href="#">SOT505-2</a>
<a href="#">74LVC3G04DC</a>	$-40$ °C to $+125$ °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	<a href="#">SOT765-1</a>
<a href="#">74LVC3G04GT</a>	$-40$ °C to $+125$ °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body $1 \times 1.95 \times 0.5$ mm	<a href="#">SOT833-1</a>
<a href="#">74LVC3G04GN</a>	$-40$ °C to $+125$ °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body $1.2 \times 1.0 \times 0.35$ mm	<a href="#">SOT1116</a>
<a href="#">74LVC3G04GS</a>	$-40$ °C to $+125$ °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body $1.35 \times 1.0 \times 0.35$ mm	<a href="#">SOT1203</a>

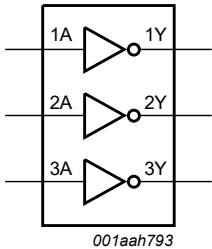
## 4. Marking

Table 2. Marking codes

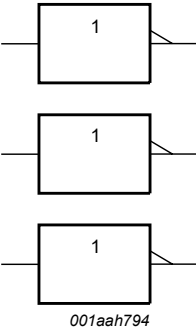
Type number	Marking code <sup>[1]</sup>
74LVC3G04DP	V04
74LVC3G04DC	V04
74LVC3G04GT	V04
74LVC3G04GN	V4
74LVC3G04GS	V4

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

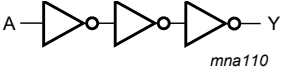
## 5. Functional diagram



**Fig. 1. Logic symbol**



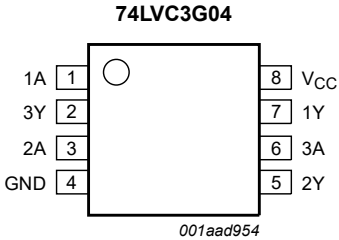
**Fig. 2. IEC logic symbol**



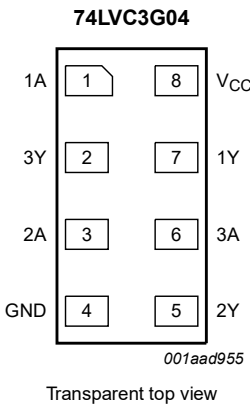
**Fig. 3. Logic diagram (one driver)**

## 6. Pinning information

### 6.1. Pinning



**Fig. 4. Pin configuration SOT505-2 (TSSOP8) and 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 nA	Output nY
L	H
H	L

## 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	+6.5	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	+6.5	V
I <sub>OK</sub>	output clamping current	V <sub>O</sub> > V <sub>CC</sub> or V <sub>O</sub> < 0 V	-	±50	mA
V <sub>O</sub>	output voltage	Active mode [1]	-0.5	V <sub>CC</sub> + 0.5	V
		Power-down mode; V <sub>CC</sub> = 0 V [1]	-0.5	+6.5	V
I <sub>O</sub>	output current	V <sub>O</sub> = 0 V to V <sub>CC</sub>	-	±50	mA
I <sub>CC</sub>	supply current		-	100	mA
I <sub>GND</sub>	ground current		-100	-	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C [2]	-	250	mW
T <sub>stg</sub>	storage temperature		-65	+150	°C

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

[2] For SOT505-2 (TSSOP8) package: P<sub>tot</sub> derates linearly with 4.6 mW/K above 96 °C.  
 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. 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	Active mode	0	$V_{CC}$	V
		Power-down mode; $V_{CC} = 0$ V	0	5.5	V
$T_{amb}$	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65$ V to 2.7 V	-	20	ns/V
		$V_{CC} = 2.7$ V to 5.5 V	-	10	ns/V

## 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						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 1.65$ V to 1.95 V	$0.65 \times V_{CC}$	-	-	V
		$V_{CC} = 2.3$ V to 2.7 V	1.7	-	-	V
		$V_{CC} = 2.7$ V to 3.6 V	2.0	-	-	V
		$V_{CC} = 4.5$ V to 5.5 V	$0.7 \times V_{CC}$	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 1.65$ V to 1.95 V	-	-	$0.35 \times V_{CC}$	V
		$V_{CC} = 2.3$ V to 2.7 V	-	-	0.7	V
		$V_{CC} = 2.7$ V to 3.6 V	-	-	0.8	V
		$V_{CC} = 4.5$ V to 5.5 V	-	-	$0.3 \times V_{CC}$	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -100$ $\mu$ A; $V_{CC} = 1.65$ 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	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = 100$ $\mu$ A; $V_{CC} = 1.65$ V to 5.5 V	-	-	0.10	V
		$I_O = 4$ mA; $V_{CC} = 1.65$ V	-	-	0.45	V
		$I_O = 8$ mA; $V_{CC} = 2.3$ V	-	-	0.30	V
		$I_O = 12$ mA; $V_{CC} = 2.7$ V	-	-	0.40	V
		$I_O = 24$ mA; $V_{CC} = 3.0$ V	-	-	0.55	V
		$I_O = 32$ mA; $V_{CC} = 4.5$ V	-	-	0.55	V

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
$I_I$	input leakage current	$V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 0 \text{ V}$ to $5.5 \text{ V}$	-	$\pm 0.1$	$\pm 1$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_{CC} = 0 \text{ V}$ ; $V_I$ or $V_O = 5.5 \text{ V}$	-	$\pm 0.1$	$\pm 2$	$\mu\text{A}$
$I_{CC}$	supply current	$V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 1.65 \text{ V}$ to $5.5 \text{ V}$ ; $I_O = 0 \text{ A}$	-	0.1	4	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per pin; $V_{CC} = 2.3 \text{ V}$ to $5.5 \text{ V}$ ; $V_I = V_{CC} - 0.6 \text{ V}$ ; $I_O = 0 \text{ A}$	-	5	500	$\mu\text{A}$
$C_I$	input capacitance	$V_{CC} = 3.3 \text{ V}$ ; $V_I = \text{GND}$ to $V_{CC}$	-	2.5	-	pF
<b><math>T_{amb} = -40 \text{ }^\circ\text{C}</math> to <math>+125 \text{ }^\circ\text{C}</math></b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 1.65 \text{ V}$ to $1.95 \text{ V}$	$0.65 \times V_{CC}$	-	-	V
		$V_{CC} = 2.3 \text{ V}$ to $2.7 \text{ V}$	1.7	-	-	V
		$V_{CC} = 2.7 \text{ V}$ to $3.6 \text{ V}$	2.0	-	-	V
		$V_{CC} = 4.5 \text{ V}$ to $5.5 \text{ V}$	$0.7 \times V_{CC}$	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 1.65 \text{ V}$ to $1.95 \text{ V}$	-	-	$0.35 \times V_{CC}$	V
		$V_{CC} = 2.3 \text{ V}$ to $2.7 \text{ V}$	-	-	0.7	V
		$V_{CC} = 2.7 \text{ V}$ to $3.6 \text{ V}$	-	-	0.8	V
		$V_{CC} = 4.5 \text{ V}$ to $5.5 \text{ V}$	-	-	$0.3 \times V_{CC}$	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -100 \mu\text{A}$ ; $V_{CC} = 1.65 \text{ V}$ to $5.5 \text{ V}$	$V_{CC} - 0.1$	-	-	V
		$I_O = -4 \text{ mA}$ ; $V_{CC} = 1.65 \text{ V}$	0.95	-	-	V
		$I_O = -8 \text{ mA}$ ; $V_{CC} = 2.3 \text{ V}$	1.7	-	-	V
		$I_O = -12 \text{ mA}$ ; $V_{CC} = 2.7 \text{ V}$	1.9	-	-	V
		$I_O = -24 \text{ mA}$ ; $V_{CC} = 3.0 \text{ V}$	2.0	-	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = 100 \mu\text{A}$ ; $V_{CC} = 1.65 \text{ V}$ to $5.5 \text{ V}$	-	-	0.10	V
		$I_O = 4 \text{ mA}$ ; $V_{CC} = 1.65 \text{ V}$	-	-	0.70	V
		$I_O = 8 \text{ mA}$ ; $V_{CC} = 2.3 \text{ V}$	-	-	0.45	V
		$I_O = 12 \text{ mA}$ ; $V_{CC} = 2.7 \text{ V}$	-	-	0.60	V
		$I_O = 24 \text{ mA}$ ; $V_{CC} = 3.0 \text{ V}$	-	-	0.80	V
$I_I$	input leakage current	$V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 0 \text{ V}$ to $5.5 \text{ V}$	-	-	$\pm 1$	$\mu\text{A}$
		$V_{CC} = 0 \text{ V}$ ; $V_I$ or $V_O = 5.5 \text{ V}$	-	-	$\pm 2$	$\mu\text{A}$
		$V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 1.65 \text{ V}$ to $5.5 \text{ V}$ ; $I_O = 0 \text{ A}$	-	-	4	$\mu\text{A}$
		per pin; $V_{CC} = 2.3 \text{ V}$ to $5.5 \text{ V}$ ; $V_I = V_{CC} - 0.6 \text{ V}$ ; $I_O = 0 \text{ A}$	-	-	500	$\mu\text{A}$
		$V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 0 \text{ V}$ to $5.5 \text{ V}$	-	-	$\pm 1$	$\mu\text{A}$
		$V_{CC} = 0 \text{ V}$ ; $V_I$ or $V_O = 5.5 \text{ V}$	-	-	$\pm 2$	$\mu\text{A}$

[1] All typical values are measured at  $V_{CC} = 3.3 \text{ V}$  and  $T_{amb} = 25 \text{ }^\circ\text{C}$ .

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
t <sub>pd</sub>	propagation delay	nA to nY; see Fig. 6 [2]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	3.5	8.0	1.0	9.5	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	2.2	4.4	0.5	5.4	ns
		V <sub>CC</sub> = 2.7 V	0.5	2.7	5.2	0.5	7.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.5	2.7	4.1	0.5	5.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.5	1.9	3.2	0.5	3.8	ns
C <sub>PD</sub>	power dissipation capacitance	V <sub>I</sub> = GND to V <sub>CC</sub> ; V <sub>CC</sub> = 3.3 V [3]	-	13.5	-	-	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.8 V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively.

[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;

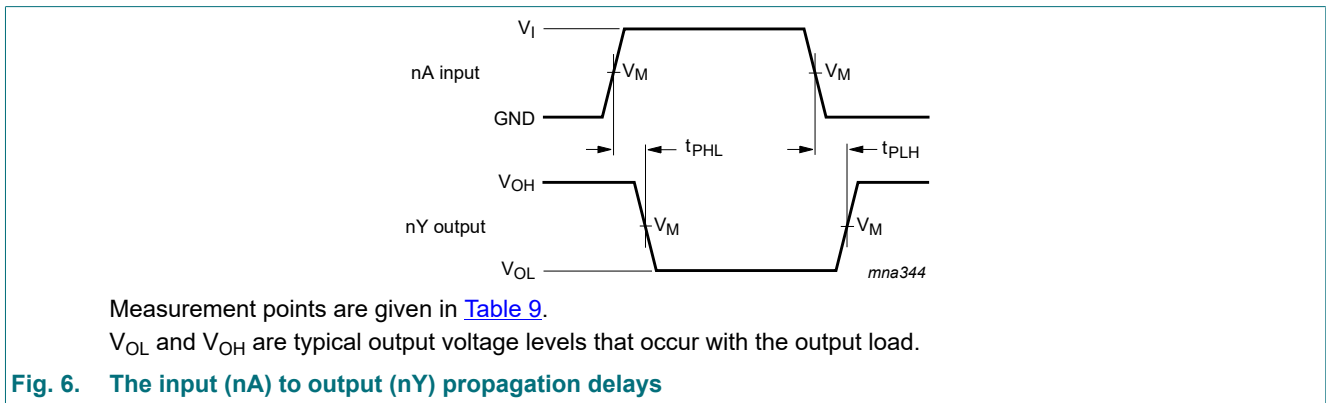
C<sub>L</sub> = output load capacitance in pF;

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

N = number of inputs switching;

∑(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs.

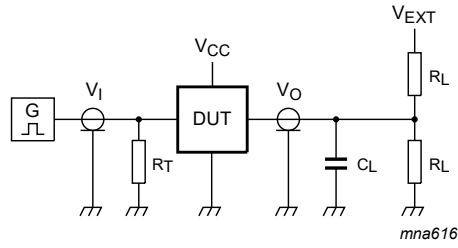
### 11.1. Waveform and test circuit



**Fig. 6. The input (nA) to output (nY) propagation delays**

**Table 9. Measurement points**

Supply voltage	Input	Output
V <sub>CC</sub>	V <sub>M</sub>	V <sub>M</sub>
1.65 V to 1.95 V	0.5 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>
2.3 V to 2.7 V	0.5 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>
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 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>



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. 7. Test circuit for measuring switching times**

**Table 10. 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	$V_{CC}$	$\leq 2.0$ ns	30 pF	1 k $\Omega$	open
2.3 V to 2.7 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	500 $\Omega$	open
2.7 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open
3.0 V to 3.6 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open
4.5 V to 5.5 V	$V_{CC}$	$\leq 2.5$ ns	50 pF	500 $\Omega$	open

## 12. Package outline

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

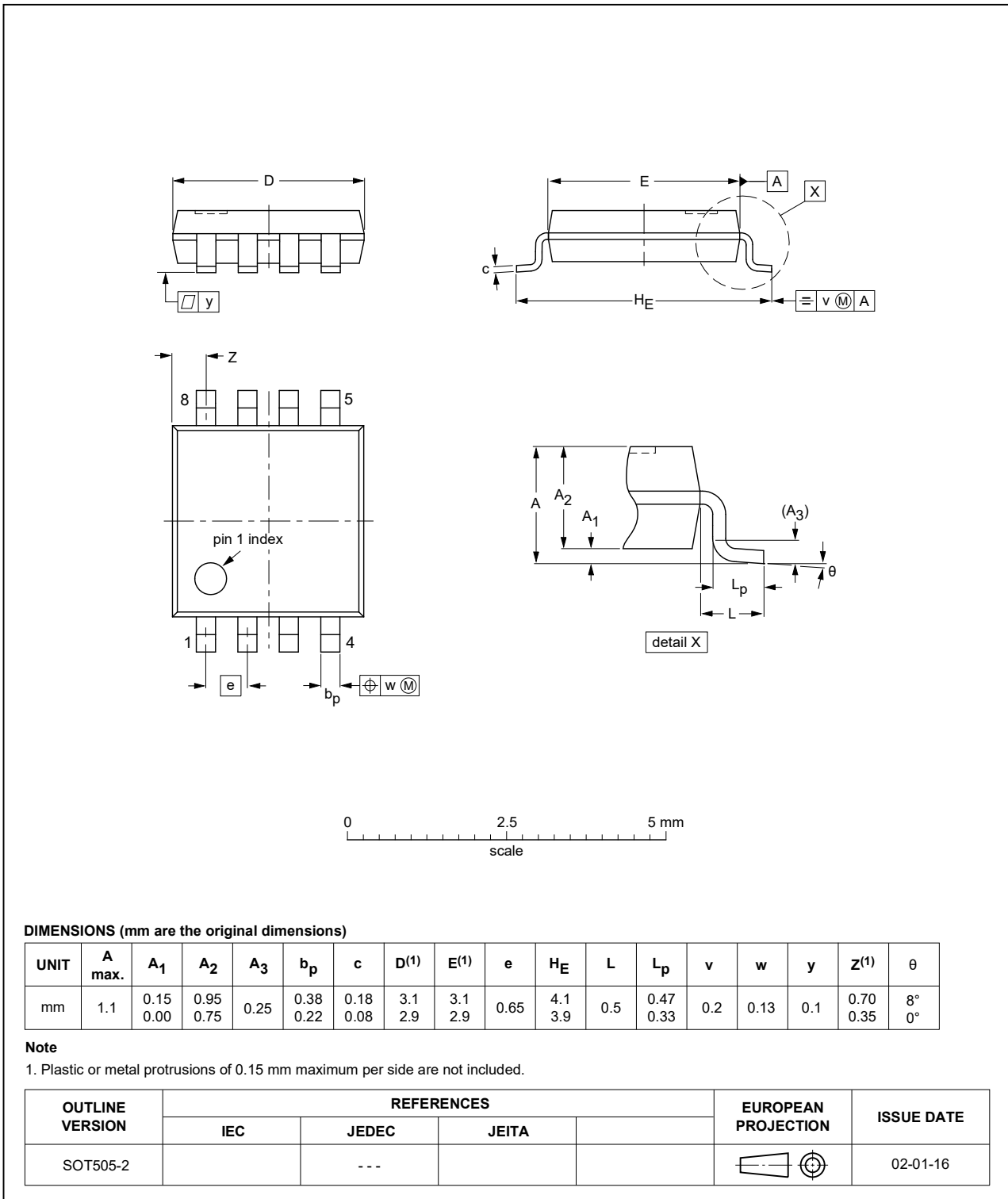


Fig. 8. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

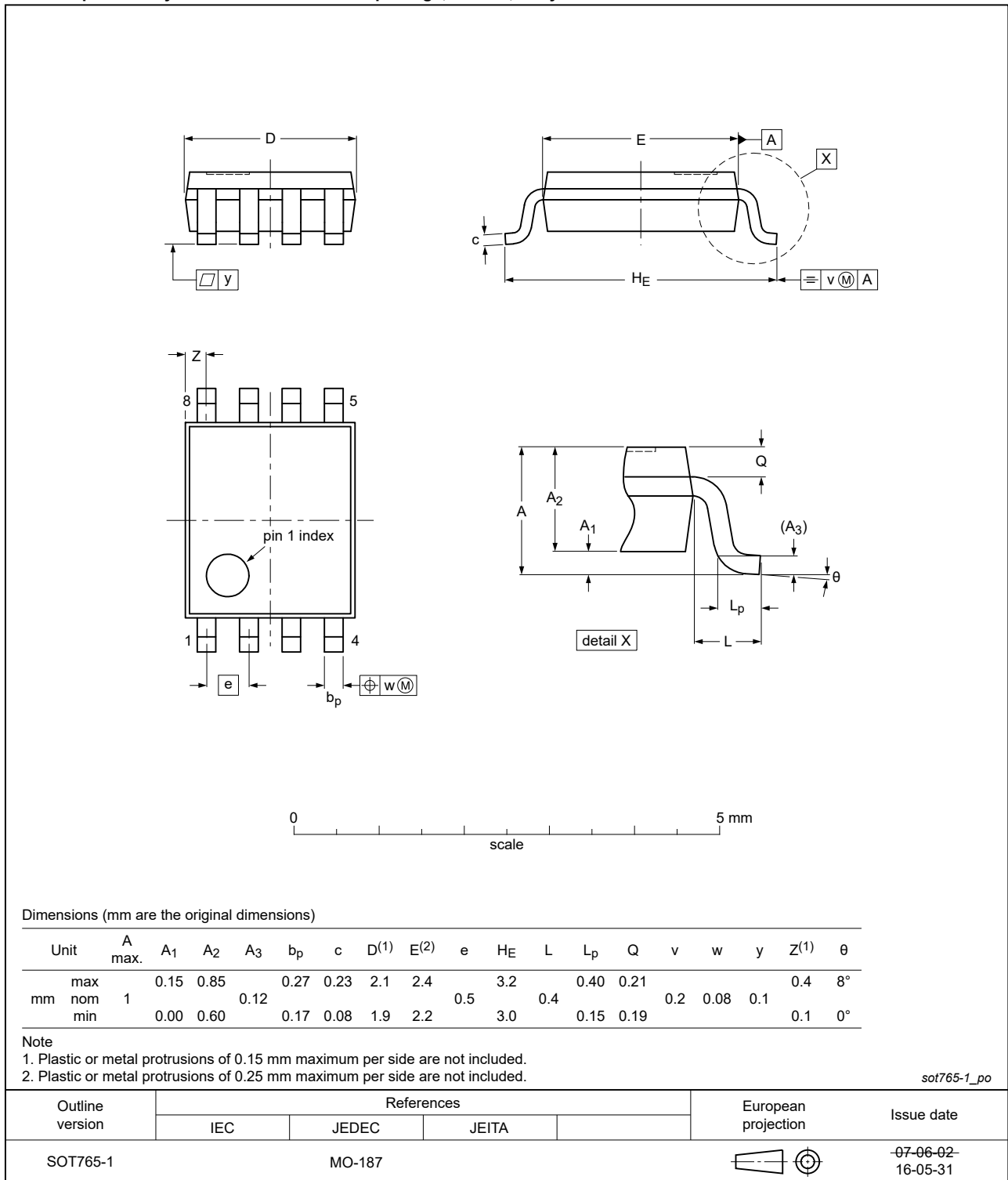


Fig. 9. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

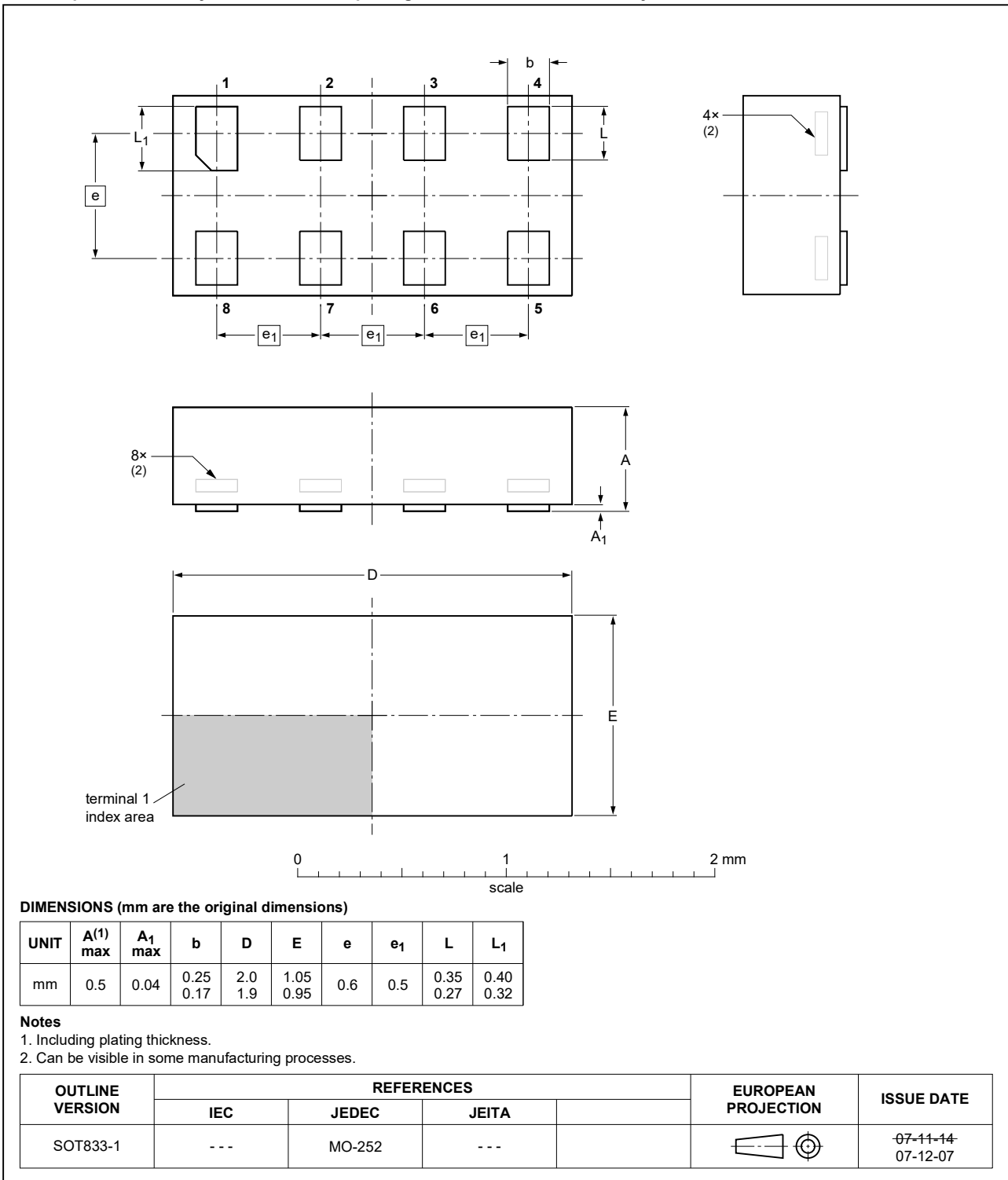
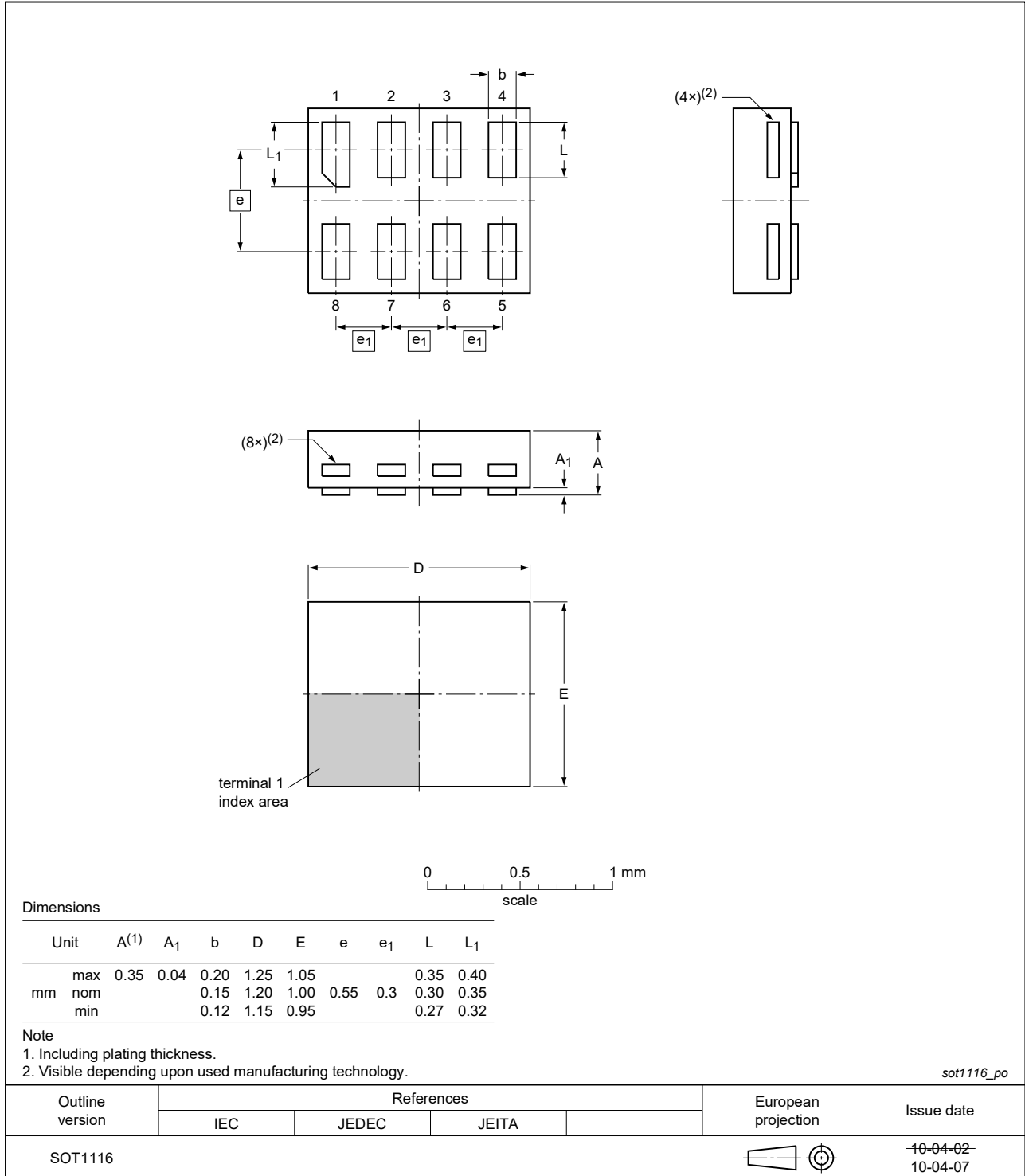


Fig. 10. Package outline SOT833-1 (XSON8)

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

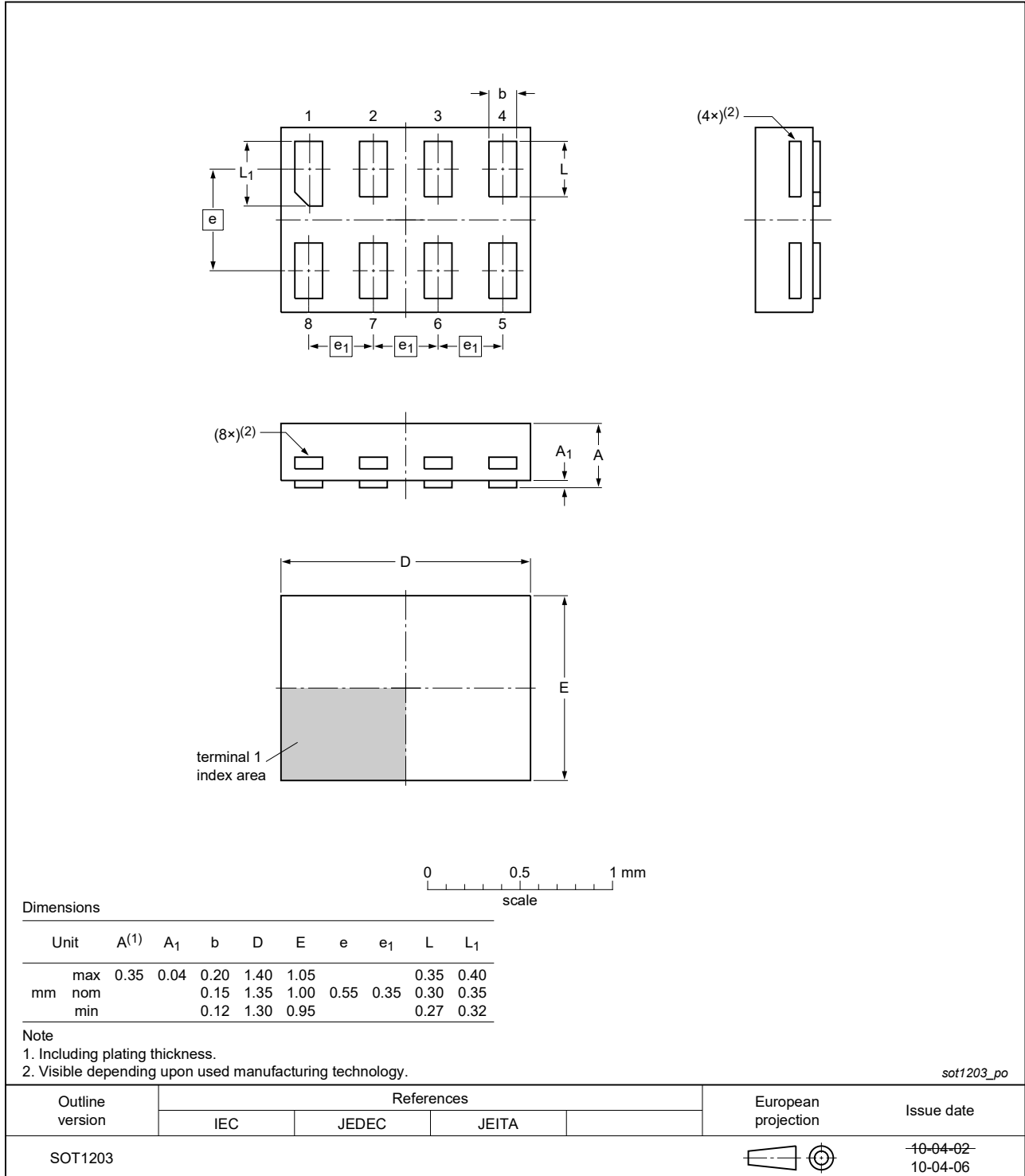
SOT1116



**Fig. 11. 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. 12. Package outline SOT1203 (XSON8)**

## 13. Abbreviations

Table 11. Abbreviations

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

## 14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC3G04 v.15	20230824	Product data sheet	-	74LVC3G04 v.14
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Section 2</a>: ESD specification updated according to the latest JEDEC standard.</li> </ul>			
74LVC3G04 v.14	20210416	Product data sheet	-	74LVC3G04 v.13
Modifications:	<ul style="list-style-type: none"> <li>• Type number 74LVC3G04GF (SOT1089 / XSON8) removed.</li> <li>• Type number 74LVC3G04GM (SOT902-2 / XQFN8) removed.</li> <li>• <a href="#">Section 1</a> updated.</li> <li>• <a href="#">Section 8</a>: Derating values for P<sub>tot</sub> total power dissipation updated.</li> </ul>			
74LVC3G04 v.13	20181102	Product data sheet	-	74LVC3G04 v.12
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 numbers 74LVC3G04GD (SOT996-2/XSON8) removed.</li> </ul>			
74LVC3G04 v.12	20161215	Product data sheet	-	74LVC3G04 v.11
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Table 7</a>: The maximum limits for leakage current and supply current have changed.</li> </ul>			
74LVC3G04 v.11	20130402	Product data sheet	-	74LVC3G04 v.10
Modifications:	<ul style="list-style-type: none"> <li>• For type number 74LVC3G04GD XSON8U has changed to XSON8.</li> </ul>			
74LVC3G04 v.10	20120614	Product data sheet	-	74LVC3G04 v.9
Modifications:	<ul style="list-style-type: none"> <li>• For type number 74LVC3G04GM the SOT code has changed to SOT902-2.</li> </ul>			
74LVC3G04 v.9	20111123	Product data sheet	-	74LVC3G04 v.8
Modifications:	<ul style="list-style-type: none"> <li>• Legal pages updated.</li> </ul>			
74LVC3G04 v.8	20101110	Product data sheet	-	74LVC3G04 v.7
74LVC3G04 v.7	20080616	Product data sheet	-	74LVC3G04 v.6
74LVC3G04 v.6	20080303	Product data sheet	-	74LVC3G04 v.5
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## 15. 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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