Product data sheet

1 General description

The 74LVC2G00 provides a 2-input NAND gate function.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators 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
- · 5 V tolerant outputs for interfacing with 5 V logic
- · High noise immunity
- ±24 mA output drive (V_{CC} = 3.0 V)
- CMOS low power consumption
- · Complies with JEDEC standard:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8-B/JESD36 (2.7 V to 3.6 V)
- Latch-up performance exceeds 250 mA
- · Direct interface with TTL levels
- Inputs accept voltages up to 5 V
- ESD protection:
 - HBM JESD22-A114F exceeds 2 000 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 Ordering information

Table 1. Ordering information

Table 1. Ordering	momation						
Type number	Package Package						
	Temperature range	Name	Description	Version			
74LVC2G00DP	-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			
74LVC2G00DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1			



Type number	Package						
	Temperature range	Name	Description	Version			
74LVC2G00GT	-40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm	SOT833-1			
74LVC2G00GF	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1 x 0.5 mm	SOT1089			
74LVC2G00GM	-40 °C to +125 °C	XQFN8	plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 x 1.6 x 0.5 mm	SOT902-2			
74LVC2G00GN	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.2 x 1.0 x 0.35 mm	SOT1116			
74LVC2G00GS	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1.0 x 0.35 mm	SOT1203			
74LVC2G00GX	-40 °C to +125 °C	X2SON8	plastic thermal enhanced extremely thin small outline package; no leads; 8 terminals; body 1.35 x 0.8 x 0.35 mm	SOT1233			

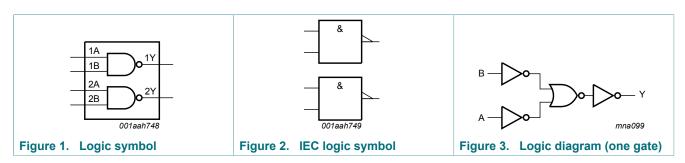
4 Marking

Table 2. Marking codes

Type number	Marking code ^[1]
74LVC2G00DP	V2G00
74LVC2G00DC	V00
74LVC2G00GT	V00
74LVC2G00GF	VA
74LVC2G00GM	V00
74LVC2G00GN	VA
74LVC2G00GS	VA
74LVC2G00GX	VA

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

5 Functional diagram

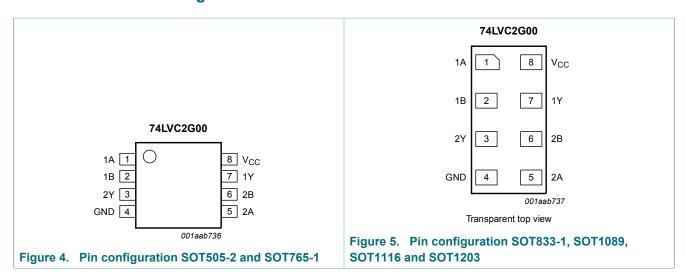


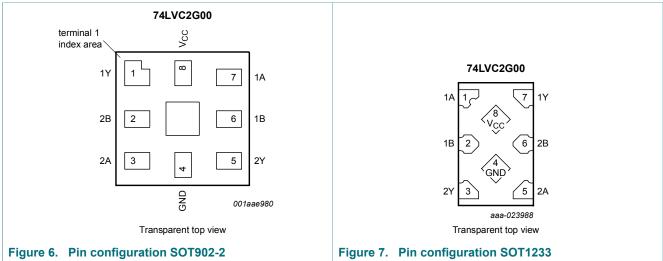
74LVC2G00

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6 Pinning information

6.1 Pinning





6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description		
	SOT505-2, SOT765-1, SOT833-1, SOT1089, SOT1116, SOT1203 and SOT1233	SOT902-2		
1A, 2A	1, 5	7, 3	data input	
1B, 2B	2, 6	6, 2	data input	
GND	4	4	ground (0 V)	
1Y, 2Y	7, 3	1, 5	data output	
V _{CC}	8	8	supply voltage	

7 Functional description

Table 4. Function table

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

Input	Output	
nA	nB	nY
L	L	Н
L	н	н
Н	L	Н
Н	Н	L

Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Parameter	Conditions		Min	Max	Unit
supply voltage			-0.5	+6.5	V
input voltage		[1]	-0.5	+6.5	V
output voltage	Active mode	[1]	-0.5	V _{CC} + 0.5	V
	Power-down mode	[1] [2]	-0.5	+6.5	V
input clamping current	V _I < 0 V		-50	-	mA
output clamping current	$V_O < 0 V \text{ or } V_O > V_{CC}$		-	±50	mA
output current	$V_O = 0 V \text{ to } V_{CC}$		-	±50	mA
supply current			-	100	mA
ground current			-100	-	mA
storage temperature			-65	+150	°C
total power dissipation	T _{amb} = -40 °C to +125 °C	[3]	-	300	mW
	supply voltage input voltage output voltage input clamping current output clamping current output current supply current ground current storage temperature	$\begin{array}{c} \text{supply voltage} \\ \text{input voltage} \\ \text{output voltage} \\ \text{output voltage} \\ \text{Active mode} \\ \text{Power-down mode} \\ \text{input clamping current} \\ \text{output clamping current} \\ \text{V}_{\text{I}} < 0 \text{ V} \\ \text{output clamping current} \\ \text{V}_{\text{O}} < 0 \text{ V or V}_{\text{O}} > \text{V}_{\text{CC}} \\ \text{output current} \\ \text{supply current} \\ \text{ground current} \\ \text{storage temperature} \end{array}$	$\begin{array}{c} \text{supply voltage} \\ \text{input voltage} \\ \text{output voltage} \\ \text{Output voltage} \\ \text{Power-down mode} \\ \text{I1} \\ \text{Power-down mode} \\ \text{I2} \\ \text{input clamping current} \\ \text{V}_{\text{I}} < 0 \text{ V} \\ \text{output clamping current} \\ \text{V}_{\text{O}} < 0 \text{ V or V}_{\text{O}} > \text{V}_{\text{CC}} \\ \text{output current} \\ \text{Supply current} \\ \text{ground current} \\ \text{storage temperature} \\ \end{array}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$

The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

Recommended operating conditions

Table 6. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		1.65	5.5	V
VI	input voltage		0	5.5	V
Vo	output voltage	Active mode	0	V _{CC}	V
		Power-down mode	0	5.5	V
T _{amb}	ambient temperature		-40	+125	°C
Δt/ΔV	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

When $V_{\rm CC}$ = 0 V (Power-down mode), the output voltage can be 5.5 V in normal operation. For TSSOP8 package: above 55 °C the value of $P_{\rm tot}$ derates linearly with 2.5 mW/K. For VSSOP8 package: above 110 $^{\circ}\text{C}$ the value of Ptot derates linearly with 8 mW/K. For XSON8 and XQFN8 packages: above 118 $^{\circ}$ C the value of P_{tot} derates linearly with 7.8 mW/K. For X2SON8 package: above 118 °C the value of Ptot derates linearly with 7.7 mW/K.

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} = -4	0 °C to +85 °C			<u> </u>		,
V_{IH}	HIGH-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 x 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 x V _{CC}	-	-	V
V_{IL}	LOW-level input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	0.35 x 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 x V _{CC}	V
V _{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_{O} = -100 μ 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	1.53	-	V
		I_{O} = -8 mA; V_{CC} = 2.3 V	1.9	2.13	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	2.50	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.3	2.60	-	V
		I _O = -32 mA; V _{CC} = 4.5 V	3.8	4.10	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		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	-	0.08	0.45	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	0.14	0.3	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	0.19	0.4	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	0.37	0.55	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	0.43	0.55	V
l _l	input leakage current	V_I = 5.5 V or GND; V_{CC} = 0 V to 5.5 V	-	±0.1	±1	μΑ
I _{OFF}	power-off leakage current	V_{I} or V_{O} = 5.5 V; V_{CC} = 0 V	-	±0.1	±2	μΑ
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	μΑ
Δl _{CC}	additional supply current	per pin; V _I = V _{CC} - 0.6 V; V _{CC} = 2.3 V to 5.5 V; I _O = 0 A	-	5	500	μΑ
Cı	input capacitance		-	2.5	-	pF

Symbol	Parameter	Conditions	Min	Typ ^[1]	Max	Unit
T _{amb} = -4	0 °C to +125 °C				1	
V _{IH}	HIGH-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 x 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 x V _{CC}	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	0.35 x 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 x V _{CC}	V
V _{OH}	HIGH-level output voltage	$V_{I} = V_{IH}$ or V_{IL}				
		I_{O} = -100 μ A; 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
		I _O = -32 mA; V _{CC} = 4.5 V	3.4	-	-	V
V _{OL}	LOW-level output voltage	$V_{I} = V_{IH}$ or V_{IL}				
		I_{O} = 100 μ A; V_{CC} = 1.65 V to 5.5 V	-	-	0.1	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.70	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.45	V
		I_{O} = 12 mA; V_{CC} = 2.7 V	-	-	0.60	V
		I_{O} = 24 mA; V_{CC} = 3.0 V	-	-	0.80	V
		I_{O} = 32 mA; V_{CC} = 4.5 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
I _{OFF}	power-off leakage current	V_{I} or V_{O} = 5.5 V; V_{CC} = 0 V	-	-	±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	-	-	4	μΑ
Δl _{CC}	additional supply current	per pin; $V_I = V_{CC} - 0.6 \text{ V}$; $V_{CC} = 2.3 \text{ V}$ to 5.5 V; $I_O = 0 \text{ A}$	-	-	500	μΑ

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

Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground 0 V); for test circuit see Figure 9.

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, nB to nY; see Figure 8	[2]						
		V _{CC} = 1.65 V to 1.95 V		1.2	3.5	8.6	1.2	10.8	ns
		V _{CC} = 2.3 V to 2.7 V		0.7	2.3	4.8	0.7	6.0	ns
		V _{CC} = 2.7 V		0.7	3.0	5.6	0.7	7.0	ns
		V _{CC} = 3.0 V to 3.6 V		0.7	2.2	4.3	0.7	5.4	ns
		V _{CC} = 4.5 V to 5.5 V		0.5	1.8	3.3	0.5	4.2	ns
C _{PD}	power dissipation capacitance	per gate; V_I = GND to V_{CC}	[3]	-	14	-	-	-	pF

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

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

f_i = input frequency in MHz;

 f_o = output frequency in MHz;

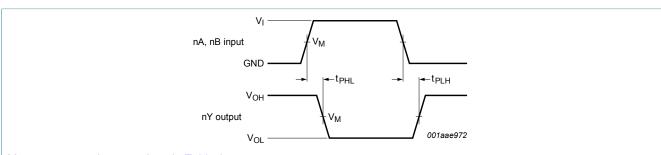
C_L = output load capacitance in pF;

 V_{CC} = supply voltage in V;

N = number of inputs switching;

 $\sum (C_L \times V_{CC}^2 \times f_0) = \text{sum of outputs.}$

11.1 Waveforms and test circuit



Measurement points are given in Table 9.

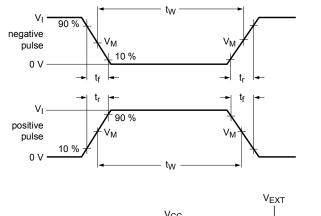
 V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

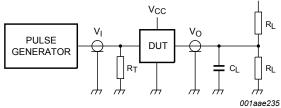
Figure 8. Input (nA, nB) to output (nY) propagation delays

 t_{pd} is the same as t_{PLH} and t_{PHL} C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

Table 9. Measurement points

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





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 output impedance Z_0 of the pulse generator.

V_{EXT} = Test voltage for switching times.

Figure 9. Test circuit for measuring switching times

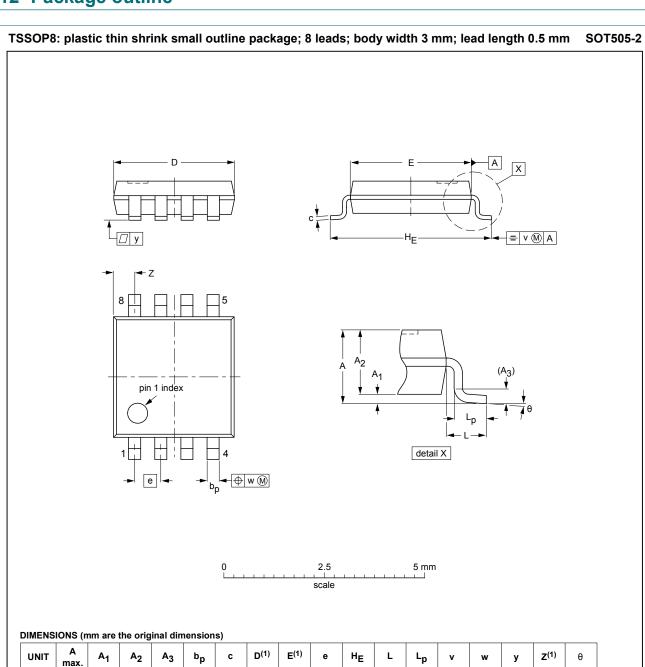
Table 10. Test data

Supply voltage	Input		Load		V _{EXT}
V _{CC}	VI	t _r , t _f	CL	R _L	t _{PLH} , t _{PHL}
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	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

74LVC2G00

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12 Package outline



UNIT	A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E ⁽¹⁾	е	HE	L	Lp	v	w	у	Z ⁽¹⁾	θ
mm	1.1	0.15 0.00	0.95 0.75	0.25	0.38 0.22	0.18 0.08	3.1 2.9	3.1 2.9	0.65	4.1 3.9	0.5	0.47 0.33	0.2	0.13	0.1	0.70 0.35	8° 0°

Note

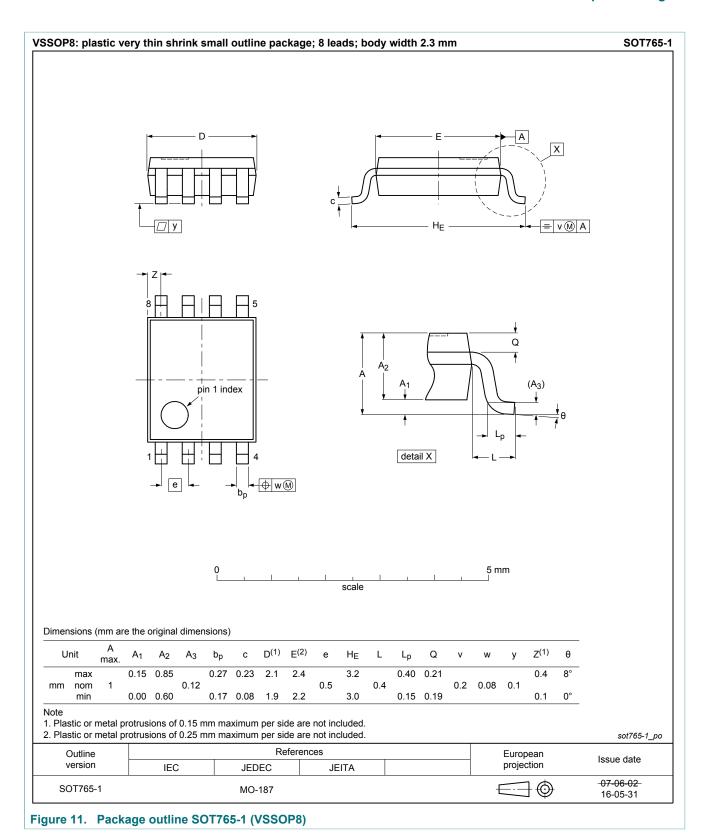
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE			
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE	
SOT505-2						02-01-16	

Figure 10. Package outline SOT505-2 (TSSOP8)

74LVC2G00

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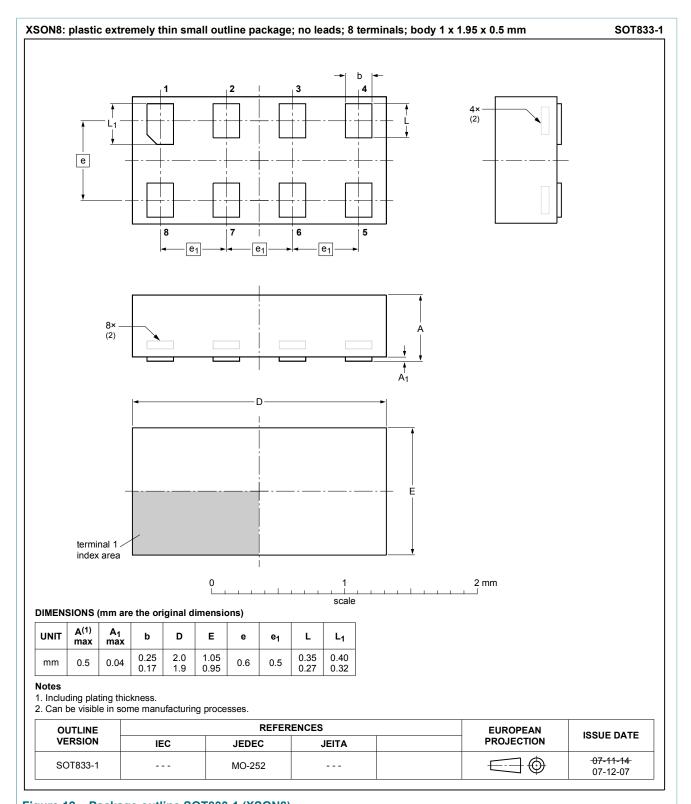
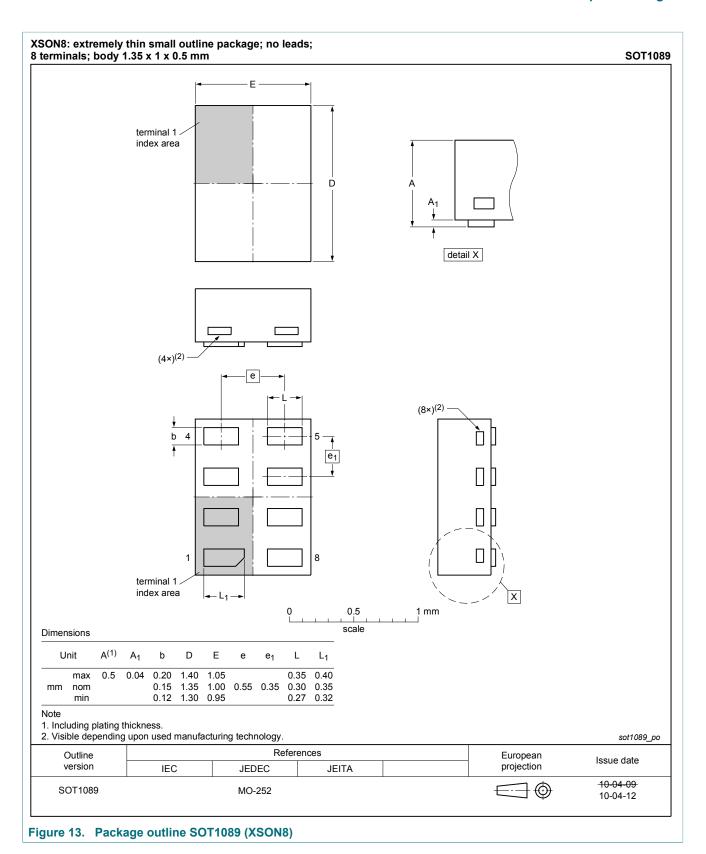
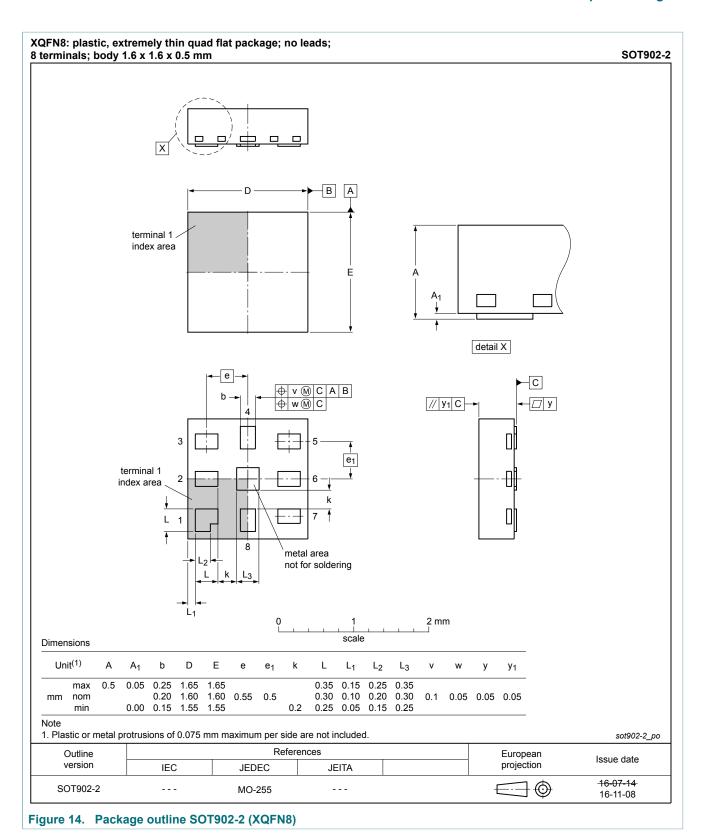
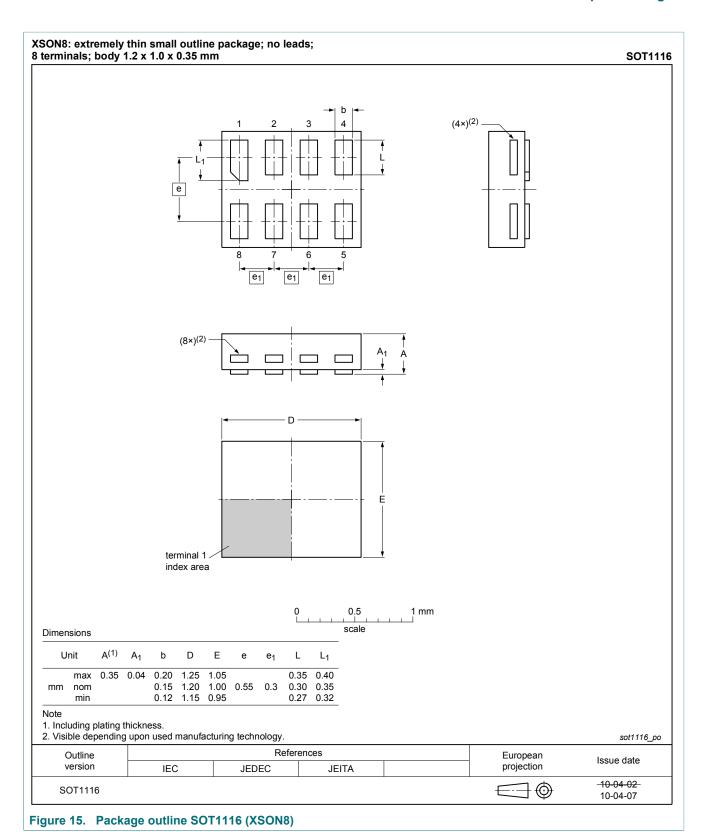


Figure 12. Package outline SOT833-1 (XSON8)







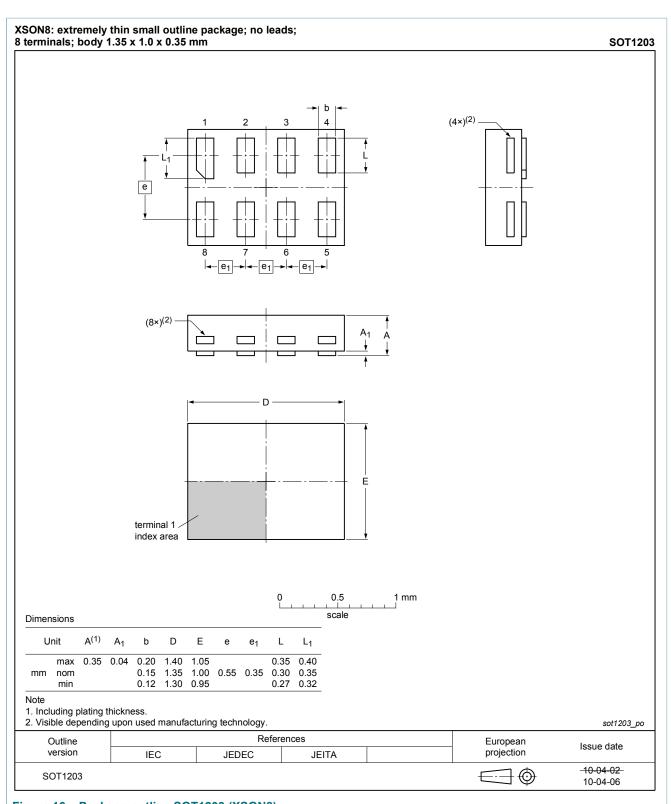
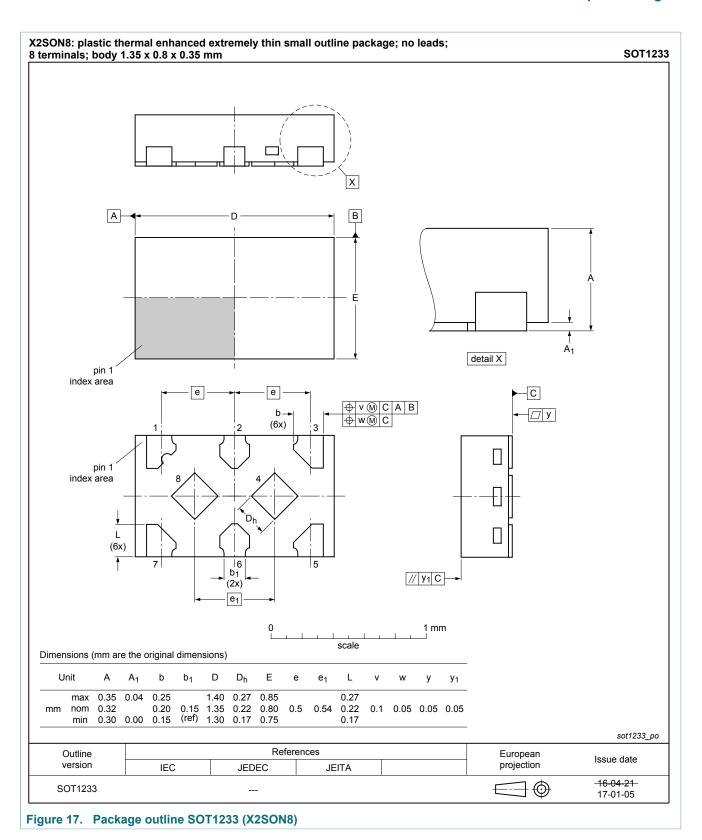


Figure 16. Package outline SOT1203 (XSON8)



13 Abbreviations

Table 11. Abbreviations

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

14 Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes				
74LVC2G00 v.15	20170703	Product data sheet	-	74LVC2G00 v.14				
Modifications:	Nexperia. • Legal texts hav • <u>Figure 17</u> : Pacl	nis data sheet has been redesine been adapted to the new corkage outline drawing for SOT124LVC2G00GD removed.	mpany name where					
74LVC2G00 v.14	20161212	Product data sheet	-	74LVC2G00 v.13				
Modifications:	• Table 7: The m	aximum limits for leakage curre	ent and supply curre	nt have changed.				
74LVC2G00 v.13	20161028	Product data sheet	-	74LVC2G00 v.12				
Modifications:	Added type nur	mber 74LVC2G00GX (SOT123	3/X2SON8)					
74LVC2G00 v.12	20130408	Product data sheet	-	74LVC2G00 v.11				
Modifications:	For type number 74LVC2G00GD XSON8U has changed to XSON8.							
74LVC2G00 v.11	20120622	Product data sheet	-	74LVC2G00 v.10				
Modifications:	For type number	er 74LVC2G00GM the SOT co	de has changed to S	OT902-2.				
74LVC2G00 v.10	20111130	Product data sheet	-	74LVC2G00 v.9				
Modifications:	 Legal pages up 	dated.						
74LVC2G00 v.9	20100608	Product data sheet	-	74LVC2G00 v.8				
74LVC2G00 v.8	20091026	Product data sheet	-	74LVC2G00 v.7				
74LVC2G00 v.7	20080610	Product data sheet	-	74LVC2G00 v.6				
74LVC2G00 v.6	20080220	Product data sheet	-	74LVC2G00 v.5				
74LVC2G00 v.5	20070904	Product data sheet	-	74LVC2G00 v.4				
74LVC2G00 v.4	20060515	Product data sheet	-	74LVC2G00 v.3				
74LVC2G00 v.3	20050201	Product specification	-	74LVC2G00 v.2				
74LVC2G00 v.2	20040923	Product specification	-	74LVC2G00 v.1				
74LVC2G00 v.1	20031117	Product specification	-	-				

15 Legal information

15.1 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.

- Please consult the most recently issued document before initiating or completing a design.
- The term 'short data sheet' is explained in section "Definitions". [2] [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.

15.2 Definitions

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