

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

Type number	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		

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74LVC2G00

Dual 2-input NAND gate

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			

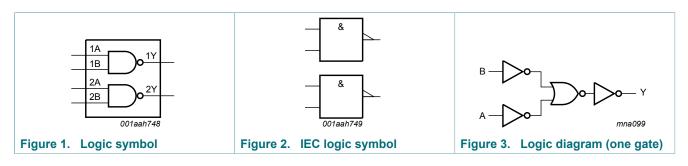
4 Marking

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.

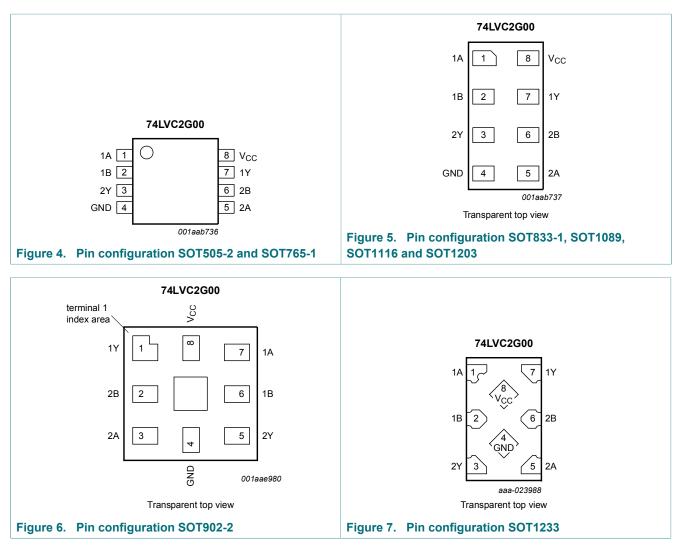
5 Functional diagram



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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

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	Мах	Unit
V _{CC}	supply voltage		-0.5	+6.5	V
VI	input voltage	[1]	-0.5	+6.5	V
Vo	output voltage	Active mode ^[1]	-0.5	V _{CC} + 0.5	V
		Power-down mode ^{[1] [2]}	-0.5	+6.5	V
I _{IK}	input clamping current	V _I < 0 V	-50	-	mA
I _{OK}	output clamping current	V_{O} < 0 V or V_{O} > V_{CC}	-	±50	mA
I _O	output current	$V_{O} = 0 V \text{ to } V_{CC}$	-	±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	$T_{amb} = -40 \ ^{\circ}C \ to +125 \ ^{\circ}C$ ^[3]	_	300	mW

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

[2] When $V_{CC} = 0 \vee$ (Power-down mode), the output voltage can be 5.5 V in normal operation. [3] For TSSOP8 package: above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K.

3] For TSSOP8 package: above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K. For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 mW/K. For XSON8 and XQFN8 packages: above 118 °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.

9 Recommended operating conditions

Table 6. Operating conditions

Symbol	Parameter	Conditions	Min	Мах	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

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]	Мах	Unit
T _{amb} = -4	0 °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 x 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 x V _{CC}	V
V _{OH}	HIGH-level output voltage	$V_{I} = V_{IH} \text{ or } V_{IL}$				
		$I_{\rm O}$ = -100 $\mu \text{A}; \text{V}_{\rm CC}$ = 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	$V_{I} = V_{IH} \text{ or } V_{IL}$				
		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	μA
I _{OFF}	power-off leakage current	V_1 or V_0 = 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	per pin; $V_I = V_{CC} - 0.6 V$; $V_{CC} = 2.3 V$ to 5.5 V; $I_O = 0 A$	-	5	500	μA
Cı	input capacitance		-	2.5	-	pF

74LVC2G00 Product data sheet

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74LVC2G00

Dual 2-input NAND gate

Symbol	Parameter	Conditions	Min	Typ ^[1]	Мах	Unit
$T_{amb} = -4$	0 °C to +125 °C				1	
VIH	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	$0.7 \mathrm{x} \mathrm{V}_{\mathrm{CC}}$	-	-	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 x V _{CC}	V
V _{OH}	HIGH-level output voltage	$V_{I} = V_{IH} \text{ or } V_{IL}$				
		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
		$I_{\rm O}$ = -8 mA; $V_{\rm CC}$ = 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	$V_{I} = V_{IH} \text{ or } V_{IL}$				
		I_{O} = 100 $\mu A;$ 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
l _l	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_1 or V_0 = 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	μA
ΔI _{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	-	-	500	μA

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

Dynamic characteristics 11

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	5 °C	-40 °C to +125 °C		Unit
			Min	Typ ^[1]	Мах	Min	Max	
t _{pd}	propagation delay	nA, nB to nY; see Figure 8]					
		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. [1]

- [2]
- t_{pd} is the same as t_{PLH} and t_{PHL} C_{PD} is used to determine the dynamic power dissipation (P_D in μ W). [3] $P_{D} = C_{PD} \times V_{CC}^{2} \times f_{i} \times N + \sum (C_{L} \times V_{CC}^{2} \times f_{o}) \text{ where:}$ f_i = input frequency in MHz; f_o = output frequency in MHz;

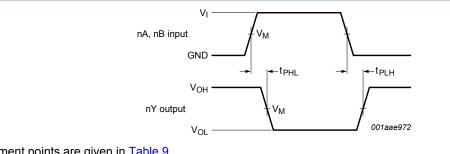
 C_{L} = output load capacitance in pF;

 V_{CC} = supply voltage in V;

N = number of inputs switching;

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

11.1 Waveforms and test circuit



Measurement points are given in Table 9.

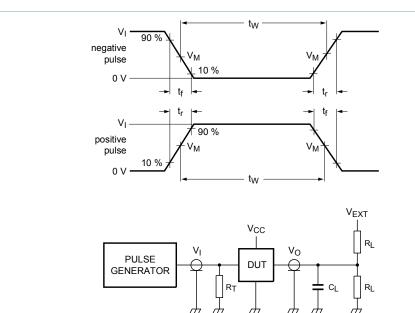
 V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

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

Dual 2-input NAND gate

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}	$0.5 \times V_{CC}$
2.3 V to 2.7 V	0.5 x 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 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_o 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	RL	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

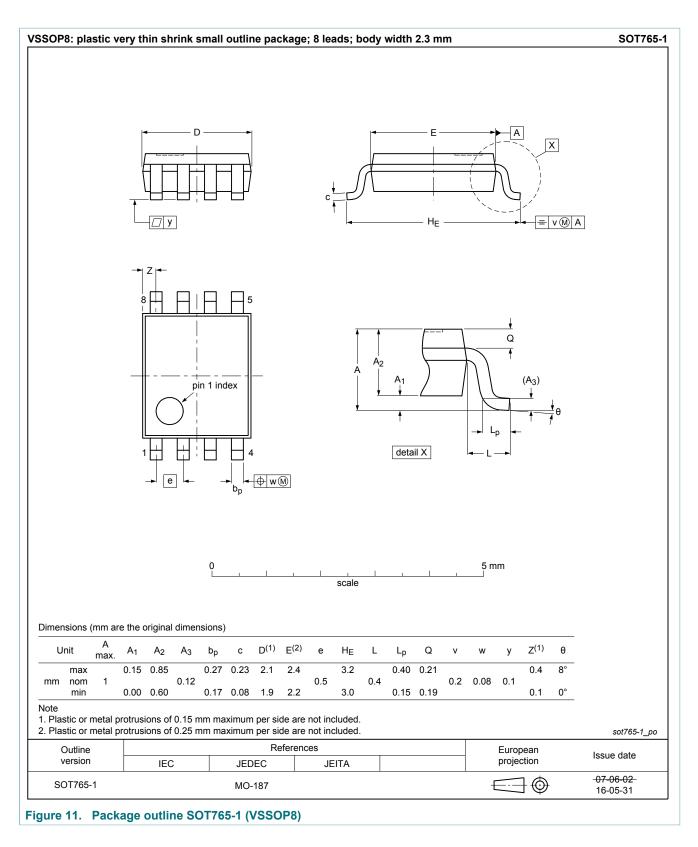
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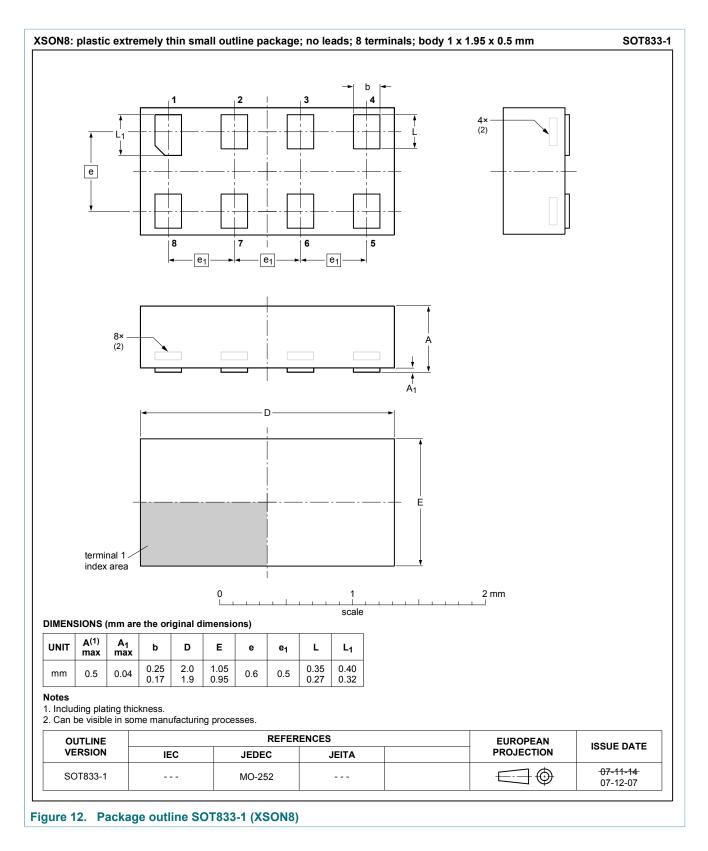
12 Package outline

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Dual 2-input NAND gate



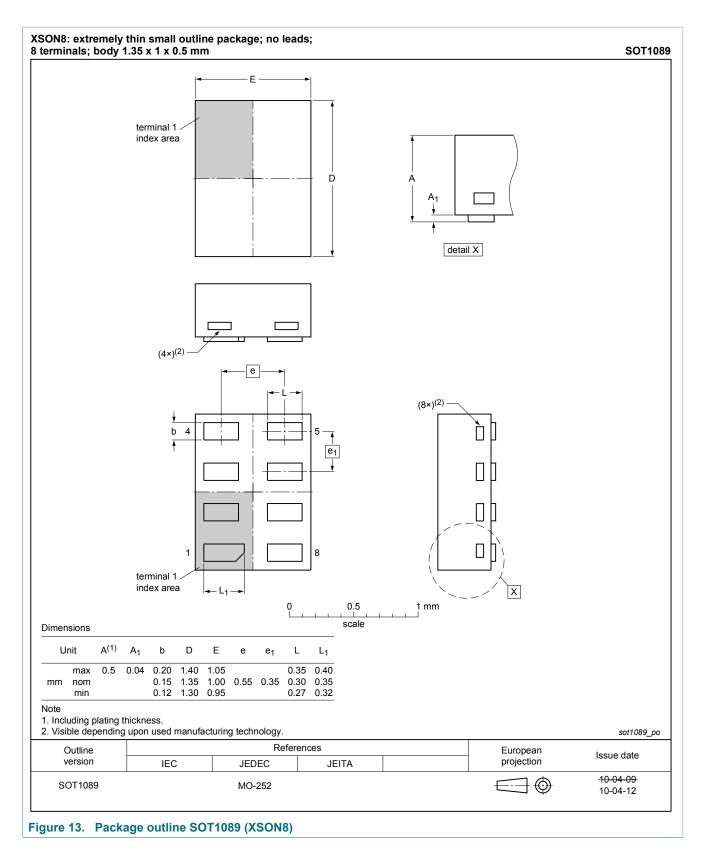
Dual 2-input NAND gate



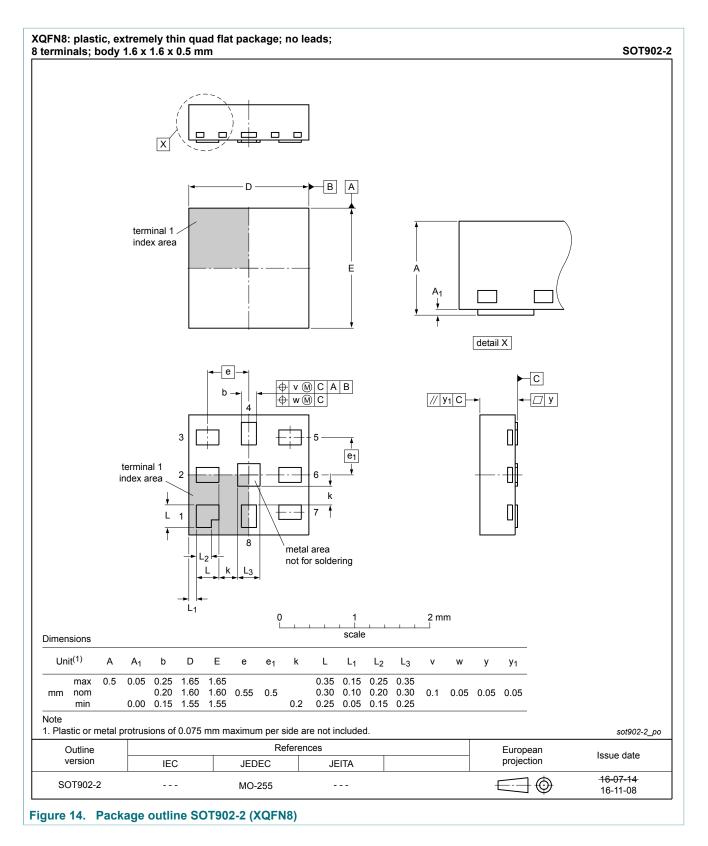
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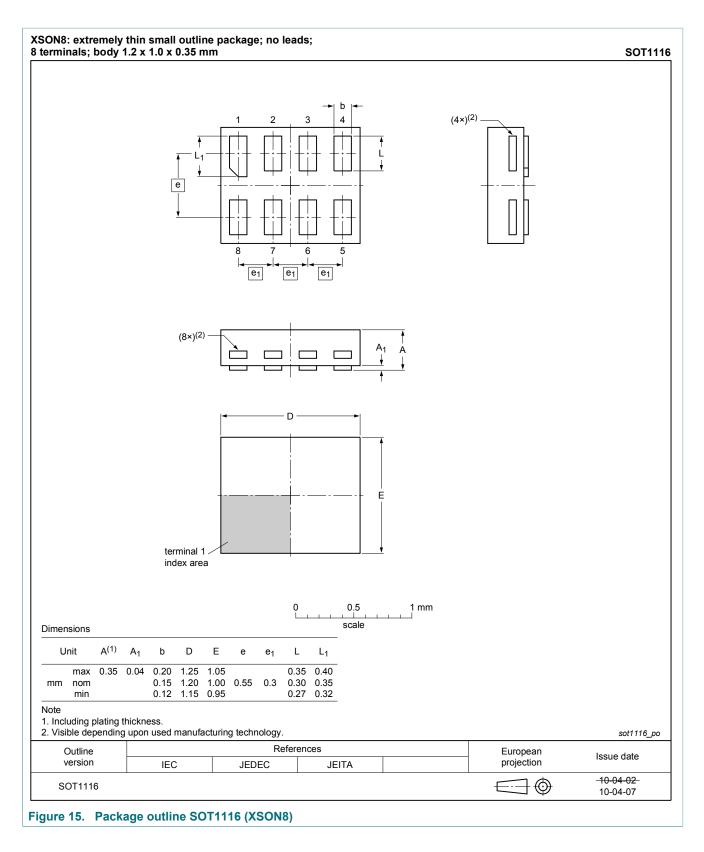
Dual 2-input NAND gate



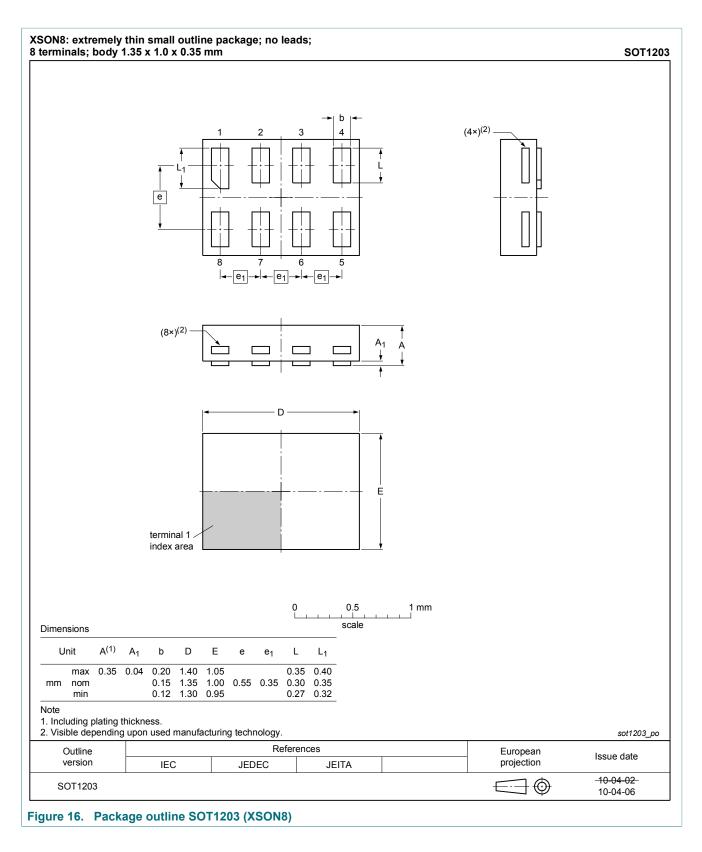
Dual 2-input NAND gate



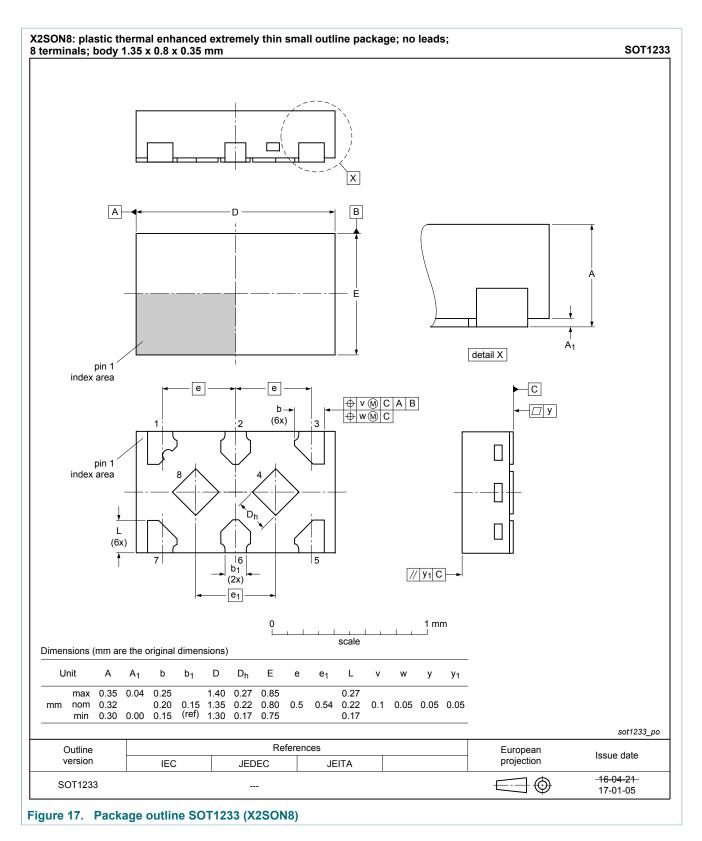
Dual 2-input NAND gate



Dual 2-input NAND gate



Dual 2-input NAND gate



13 Abbreviations

Table 11. 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					

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:	 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. Figure 17: Package outline drawing for SOT1233 has changed. Type number 74LVC2G00GD removed. 							
74LVC2G00 v.14	20161212	Product data sheet	-	74LVC2G00 v.13				
Modifications:	• <u>Table 7</u> : The ma	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 nun 	nber 74LVC2G00GX (SOT123	3/X2SON8)					
74LVC2G00 v.12	20130408	Product data sheet	-	74LVC2G00 v.11				
Modifications:	For type numbe	r 74LVC2G00GD XSON8U ha	s changed to XSON	8.				
74LVC2G00 v.11	20120622	Product data sheet	-	74LVC2G00 v.10				
Modifications:	 For type number 	r 74LVC2G00GM the SOT cod	le has changed to S	ОТ902-2.				
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. [1]

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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Contents

1	General description	1
2	Features and benefits	1
3	Ordering information	1
4	Marking	
5	Functional diagram	
6	Pinning information	
6.1	Pinning	
6.2	Pin description	4
7	Functional description	4
8	Limiting values	5
9	Recommended operating conditions	5
10	Static characteristics	6
11	Dynamic characteristics	8
11.1	Waveforms and test circuit	8
12	Package outline	10
13	Abbreviations	18
14	Revision history	18
15	Legal information	

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