74LVC1G02

Single 2-input NOR gate

Rev. 14 — 3 August 2021

Product data sheet

1. General description

The 74LVC1G02 is a single 2-input NOR gate. 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
- Overvoltage tolerant inputs to 5.5 V
- · High noise immunity
- · CMOS low power dissipation
- I_{OFF} circuitry provides partial Power-down mode operation
- ±24 mA output drive (V_{CC} = 3.0 V)
- Latch-up performance exceeds 250 mA
- · Direct interface with TTL levels
- Complies with JEDEC standard:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8C (2.7 V to 3.6 V)
 - JESD36 (4.5 V to 5.5 V)
- · ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C



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3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC1G02GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74LVC1G02GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
74LVC1G02GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74LVC1G02GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74LVC1G02GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202
74LVC1G02GX	-40 °C to +125 °C	X2SON5	plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body 0.8 × 0.8 × 0.32 mm	SOT1226-3

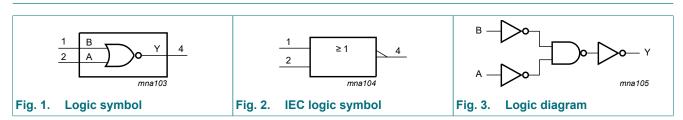
4. Marking

Table 2. Marking

Table 2. Warking			
Type number	Marking code[1]		
74LVC1G02GW	VB		
74LVC1G02GV	V02		
74LVC1G02GM	VB		
74LVC1G02GN	VB		
74LVC1G02GS	VB		
74LVC1G02GX	VB		

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

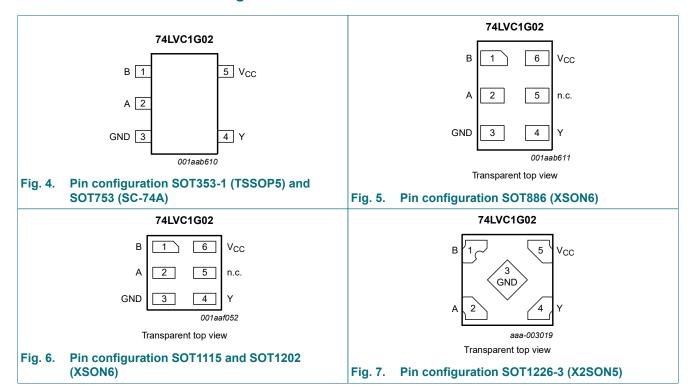
5. Functional diagram



Single 2-input NOR gate

6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

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

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7. Functional description

Table 4. Function table

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

Inputs		Outputs
Α	В	Υ
L	L	Н
L	Н	L
Н	L	L
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	Max	Unit
V _{CC}	supply voltage		-0.5	+6.5	V
I _{IK}	input clamping current	V _I < 0 V	-50	-	mA
VI	input voltage	[1]	-0.5	+6.5	V
I _{OK}	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	±50	mA
Vo	output voltage	Active mode [1]	-0.5	V _{CC} + 0.5	V
		Power-down mode; $V_{CC} = 0 V$ [1]	-0.5	+6.5	V
Io	output current	$V_O = 0 \text{ V to } V_{CC}$	-	±50	mA
I _{CC}	supply current		-	+100	mA
I _{GND}	ground current		-100	-	mA
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$ [2]	-	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.

For SOT753 (SC-74A) package: Ptot derates linearly with 3.8 mW/K above 85 °C.

For SOT886 (XSON6) package: Ptot derates linearly with 3.3 mW/K above 74 °C.

For SOT1115 (XSON6) package: Ptot derates linearly with 3.2 mW/K above 71 °C.

For SOT1202 (XSON6) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.

For SOT1226-3 (X2SON5) package: Ptot derates linearly with 3.0 mW/K above 67 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{CC}	supply voltage		1.65	-	5.5	V
VI	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
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

^[2] For SOT353-1 (TSSOP5) package: Ptot derates linearly with 3.3 mW/K above 74 °C.

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10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	-40	-40 °C to +85 °C			-40 °C to +125 °C	
			Min	Typ[1]	Max	Min	Max	
V _{IH}	HIGH-level input	V _{CC} = 1.65 V to 1.95 V	0.65V _{CC}	-	-	0.65V _{CC}	-	V
	voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
		V _{CC} = 4.5 V to 5.5 V	0.7V _{CC}	-	-	0.7V _{CC}	-	V
V _{IL}	LOW-level input	V _{CC} = 1.65 V to 1.95 V	-	-	0.35V _{CC}	-	0.35V _{CC}	V
	voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	0.3V _{CC}	-	0.3V _{CC}	V
V _{OH}	HIGH-level output	V _I = V _{IH} or V _{IL}						
	voltage	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
		$I_{\rm O}$ = -32 mA; $V_{\rm CC}$ = 4.5 V	3.8	-	-	3.4	-	V
V _{OL}	LOW-level output	V _I = V _{IH} or V _{IL}						
	voltage	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	-	0.70	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	-	0.60	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	-	0.80	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.55	-	0.80	V
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±1	-	±1	μΑ
I _{OFF}	power-off leakage current	$V_{CC} = 0 \text{ V}; V_{I} \text{ or } V_{O} = 5.5 \text{ V}$	-	±0.1	±2	-	±2	μΑ
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	4	-	4	μΑ
ΔI _{CC}	additional supply current	$V_{CC} = 2.3 \text{ V to } 5.5 \text{ V};$ $V_1 = V_{CC} - 0.6 \text{ V};$ $I_O = 0 \text{ A};$ per pin	-	5	500	-	500	μΑ
Cı	input capacitance	V_{CC} = 3.3 V; V_I = GND to V_{CC}	-	5	-	-	-	pF

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

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11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 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	A, B to Y; see <u>Fig. 8</u> [2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	3.2	8.0	1.0	10.5	ns
		V _{CC} = 2.3 V to 2.7 V	0.5	2.2	5.5	0.5	7.0	ns
		V _{CC} = 2.7 V	0.5	2.5	5.5	0.5	7.0	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	2.1	4.5	0.5	6.0	ns
		V _{CC} = 4.5 V to 5.5 V	0.5	1.7	4.0	0.5	5.5	ns
C _{PD}	power dissipation capacitance	$V_I = GND \text{ to } V_{CC}; V_{CC} = 3.3 \text{ V}$ [3]	-	14	-	-	-	pF

- 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.
- 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).

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

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

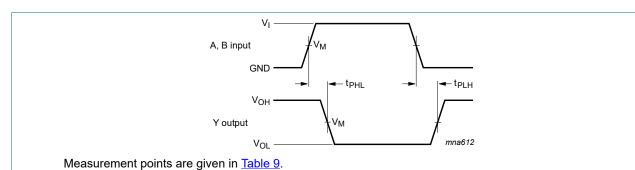
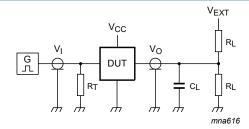


Fig. 8. The input (A, B) to output (Y) propagation delay times

Table 9. Measurement points

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

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Test data is given in Table 10.

Definitions for test circuit:

 R_L = Load resistance.

 $\ensuremath{C_L}$ = 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. 9. Test circuit for measuring switching times

Table 10. Test data

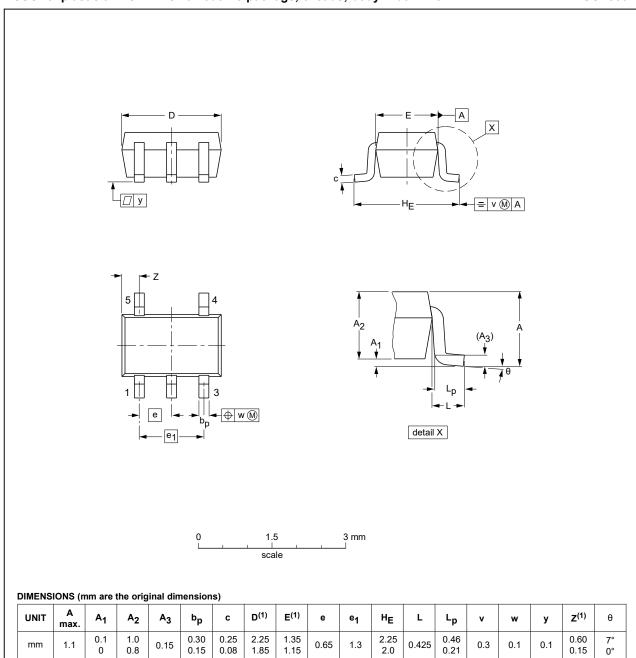
Supply voltage	Input		Load	V _{EXT}	
V _{CC}	VI	$t_r = t_f$	CL	R _L	t _{PLH} , t _{PHL}
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	open
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	30 pF	500 Ω	open
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open
4.5 V to 5.5 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	open

Single 2-input NOR gate

12. Package outline

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

SOT353-1



Note

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

OUTLINE		REFERENCES			EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT353-1		MO-203	SC-88A			-00-09-01 03-02-19

Fig. 10. Package outline SOT353-1 (TSSOP5)

Single 2-input NOR gate

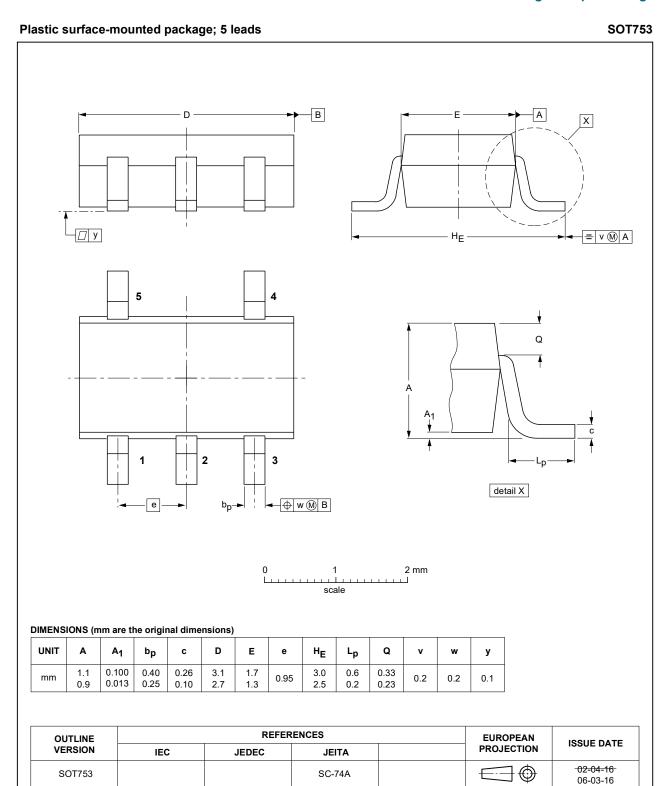


Fig. 11. Package outline SOT753 (SC-74A)

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Single 2-input NOR gate

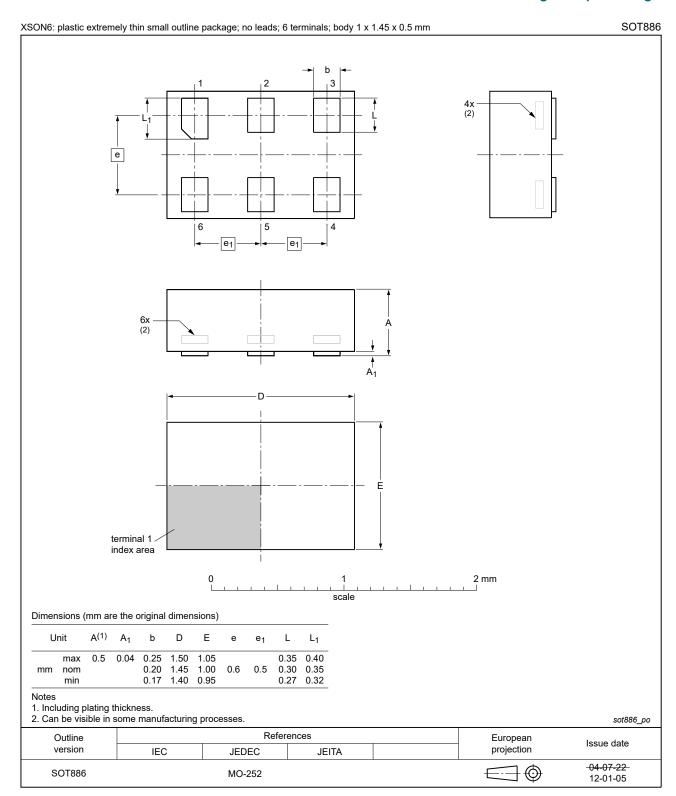


Fig. 12. Package outline SOT886 (XSON6)

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Single 2-input NOR gate

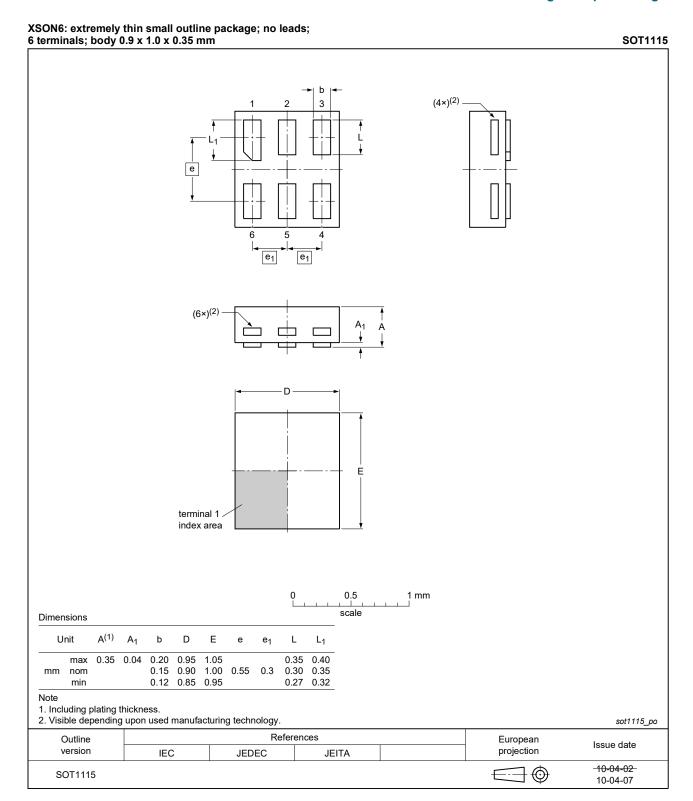


Fig. 13. Package outline SOT1115 (XSON6)

Single 2-input NOR gate

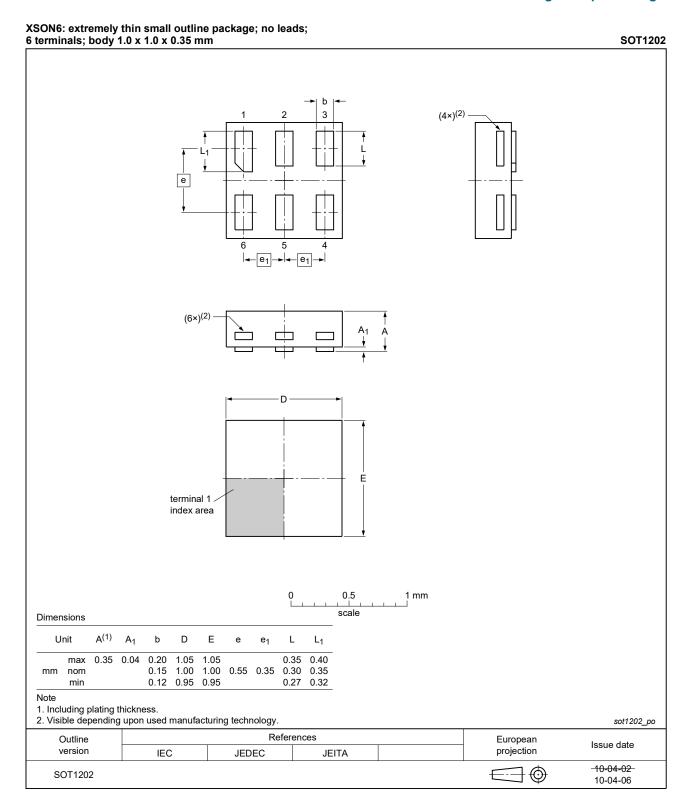


Fig. 14. Package outline SOT1202 (XSON6)

Single 2-input NOR gate

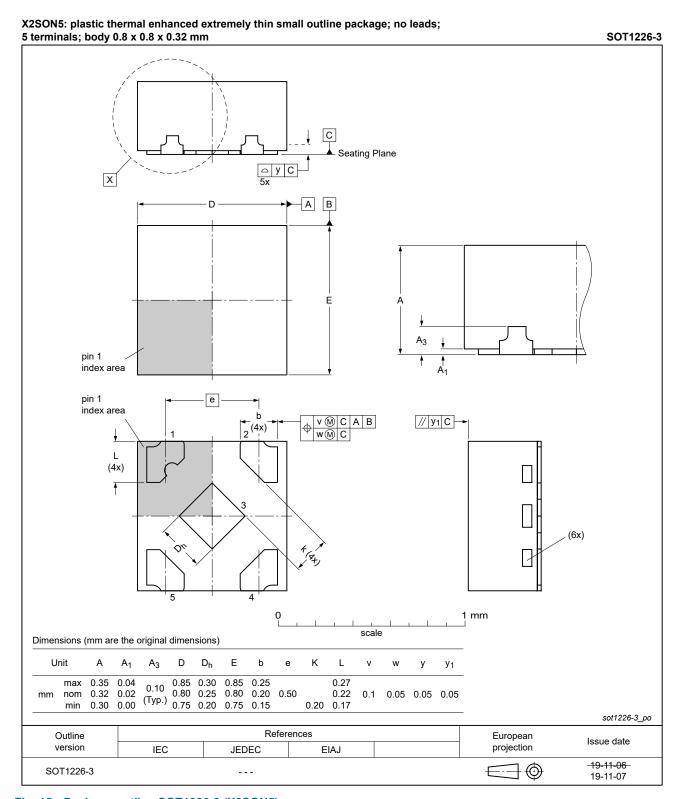


Fig. 15. Package outline SOT1226-3 (X2SON5)

Single 2-input NOR gate

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	
74LVC1G02 v.14	20210803	Product data sheet	-	74LVC1G02 v.13	
Modifications:	SOT1226 (3Section 1 a	Type number 74LVC1G02GF (SOT891/XSON6) removed. SOT1226 (X2SON5) package changed to SOT1226-3 (X2SON5) package. Section 1 and Section 2 updated. Table 5: Derating values for Ptot total power dissipation updated.			
74LVC1G02 v.13	20190208	Product data sheet	-	74LVC1G02 v.12	
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. 				
74LVC1G02 v.12	20161129	Product data sheet	-	74LVC1G02 v.11	
Modifications:	<u>Table 7</u> : The maximum limits for leakage current and supply current have changed.				
74LVC1G02 v.11	20120629	Product data sheet	-	74LVC1G02 v.10	
Modifications:	Added type number 74LVC1G02GX (SOT1226)				
74LVC1G02 v.10	20120305	Product data sheet	-	74LVC1G02 v.9	
Modifications:	Package outline drawing of SOT886 (Fig. 12) modified.				
74LVC1G02 v.9	20111209	Product data sheet	-	74LVC1G02 v.8	
Modifications:	Legal page	Legal pages updated.			
74LVC1G02 v.8	20101020	Product data sheet	-	74LVC1G02 v.7	
74LVC1G02 v.7	20070718	Product data sheet	-	74LVC1G02 v.6	
74LVC1G02 v.6	20060914	Product data sheet	-	74LVC1G02 v.5	
74LVC1G02 v.5	20040907	Product specification	-	74LVC1G02 v.4	
74LVC1G02 v.4	20021002	Product specification	-	74LVC1G02 v.3	
74LVC1G02 v.3	20020515	Product specification	-	74LVC1G02 v.2	
74LVC1G02 v.2	20010411	Product specification	-	74LVC1G02 v.1	
74LVC1G02 v.1	20001114	Product specification	-	-	

Product data sheet

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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.
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Product [short] data sheet	Production	This document contains the product specification.

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 NL17SG32P5T5G
 NL17SG86DFT2G
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 NLV74VHC04DTR2G
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