1. General description

The 74LVC1G02 provides the single 2-input NOR function.

Input can be driven from either 3.3 V or 5 V devices. These features allow the use of these devices in a mixed 3.3 V and 5 V environment.

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

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
- 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)
 - ◆ JESD8-B/JESD36 (2.7 V to 3.6 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
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to +85 °C and -40 °C to +125 °C



3. Ordering information

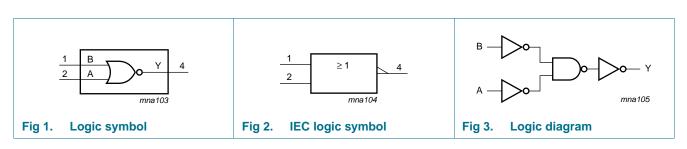
Table 1. Ordering	g information						
Type number	Package	ackage					
	Temperature range	Name	Description	Version			
74LVC1G02GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1			
74LVC1G02GV	–40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753			
74LVC1G02GM	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1.45 \times 0.5 mm	SOT886			
74LVC1G02GF	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1 \times 0.5 mm	SOT891			
74LVC1G02GN	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $0.9 \times 1.0 \times 0.35$ mm	SOT1115			
74LVC1G02GS	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $1.0 \times 1.0 \times 0.35$ mm	SOT1202			
74LVC1G02GX	–40 °C to +125 °C	X2SON5	X2SON5: plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body $0.8 \times 0.8 \times 0.35$ mm	SOT1226			

4. Marking

Table 2. Marking	
Type number	Marking code ^[1]
74LVC1G02GW	VB
74LVC1G02GV	V02
74LVC1G02GM	VB
74LVC1G02GF	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.

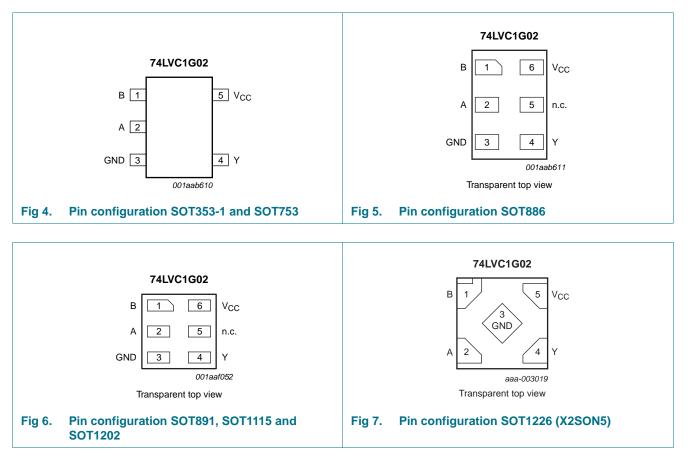
5. Functional diagram



74LVC1G02 Product data sheet

Pinning information 6.

6.1 Pinning



6.2 Pin description

SymbolPinDescriptionTSSOP5 and X2SON5XSON6B11A22GND33Y44A2A4	Table 3. Pin description						
B11data inputA22data inputGND33ground (0 V)Y44data output	Symbol	Pin		Description			
A22data inputGND33ground (0 V)Y44data output		TSSOP5 and X2SON5 XSON6					
GND 3 ground (0 V) Y 4 4 data output	В	1	1	data input			
Y 4 4 data output	А	2	2	data input			
	GND	3	3	ground (0 V)			
-	Y	4	4	data output			
n.c 5 not connected	n.c.	-	5	not connected			
V _{CC} 5 6 supply voltage	V _{CC}	5	6	supply voltage			

74LVC1G02 **Product data sheet**

7. Functional description

Table 4.	Function table ^[1]		
Inputs			Outputs
Α		В	Y
L		L	н
L		Н	L
Н		L	L
Н		Н	L

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

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		<u>[1]</u> –0.5	+6.5	V
Ι _{ΟΚ}	output clamping current	$V_{\rm O}$ > $V_{\rm CC}$ or $V_{\rm O}$ < 0 V	-	±50	mA
Vo	output voltage	Active mode	<u>[1][2]</u> –0.5	V _{CC} + 0.5	V
		Power-down mode	<u>[1][2]</u> –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
P _{tot}	total power dissipation	$T_{amb} = -40 \text{ °C to } +125 \text{ °C}$	<u>[3]</u> _	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.

[2] When $V_{CC} = 0 V$ (Power-down mode), the output voltage can be 5.5 V in normal operation.

[3] For TSSOP5 and SC-74A packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K. For XSON6 and X2SON5 packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

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
Vo	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
$\Delta t / \Delta V$	input transition rise and fall rate	V_{CC} = 1.65 V to 2.7 V	-	-	20	ns/V
		$V_{CC} = 2.7 \text{ V to } 5.5 \text{ V}$	-	-	10	ns/V

10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	rameter Conditions		°C to +8	5 °C	-40 °C to	Unit	
				Typ <mark>[1]</mark>	Max	Min	Max	
VIH	HIGH-level	$V_{CC} = 1.65 \text{ V} \text{ to } 1.95 \text{ V}$	$0.65V_{CC}$	-	-	0.65V _{CC}	-	V
	input voltage	V_{CC} = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		$V_{CC} = 2.7 V \text{ to } 3.6 V$	2.0	-	-	2.0	-	V
		V_{CC} = 4.5 V to 5.5 V	$0.7V_{CC}$	-	-	$0.7V_{CC}$	-	V
VIL	LOW-level	V_{CC} = 1.65 V to 1.95 V	-	-	$0.35V_{CC}$	-	$0.35V_{CC}$	V
	input 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	$V_{I} = V_{IH} \text{ or } V_{IL}$						
	output voltage	$I_{O} = -100 \ \mu A;$ $V_{CC} = 1.65 \ V \text{ to } 5.5 \ V$	$V_{CC}-0.1$	-	-	$V_{CC}-0.1$	-	V
		$I_{O} = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	1.2	-	-	0.95	-	V
		$I_0 = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.9	-	-	1.7	-	V
		$I_{O} = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	2.2	-	-	1.9	-	V
		$I_{O} = -24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.3	-	-	2.0	-	V
		$I_{O} = -32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.8	-	-	3.4	-	V
V _{OL}	LOW-level	$V_{I} = V_{IH} \text{ or } V_{IL}$						
	output 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
		$I_0 = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.3	-	0.45	V
		I_{O} = 12 mA; V_{CC} = 2.7 V	-	-	0.4	-	0.60	V
		$I_{O} = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.55	-	0.80	V
		$I_{O} = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.55	-	0.80	V
I	input leakage current	$V_I = 5.5 V \text{ or GND};$ $V_{CC} = 0 V \text{ to } 5.5 V$	-	±0.1	±5	-	±100	μA

Symbol Parameter	Conditions	-40	°C to +85	°C	–40 °C to +125 °C		Unit	
			Min	Typ <mark>[1]</mark>	Max	Min	Max	
I _{OFF}	power-off leakage current	$V_{CC} = 0$ V; V_{I} or $V_{O} = 5.5$ V	-	±0.1	±10	-	±200	μA
I _{CC}	supply current	$V_{I} = 5.5 V \text{ or GND}; I_{O} = 0 A;$ $V_{CC} = 1.65 V \text{ to } 5.5 V$	-	0.1	10	-	200	μA
ΔI_{CC}	additional supply current		-	5	500	-	5000	μΑ
CI	input capacitance	V_{CC} = 3.3 V; V_{I} = GND to V_{CC}	-	5	-	-	-	pF

Table 7. Static characteristics ... continued

~ • •

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

11. Dynamic characteristics

Dynamic characteristics Table 8.

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

Symbol	Parameter	Conditions		–40 °C to +85 °C			–40 °C to	o +125 °C	Unit
				Min	Typ <mark>[1]</mark>	Max	Min	Мах	
t _{pd}	propagation delay	A, B to Y; see Figure 8	[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	$V_{I} = GND \text{ to } V_{CC};$ $V_{CC} = 3.3 \text{ V}$	<u>[3]</u>	-	14	-	-	-	pF

[1] 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.

[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 = $C_{PD} \times V_{CC}{}^2 \times f_i \times N$ + $\Sigma (C_L \times V_{CC}{}^2 \times f_o)$ 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;

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

12. Waveforms

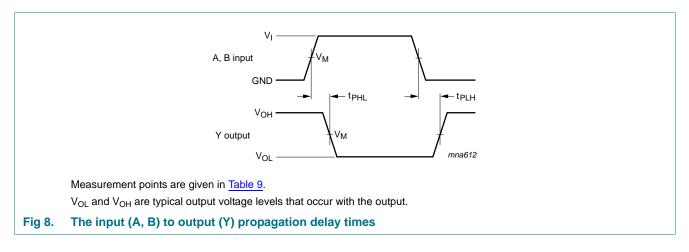
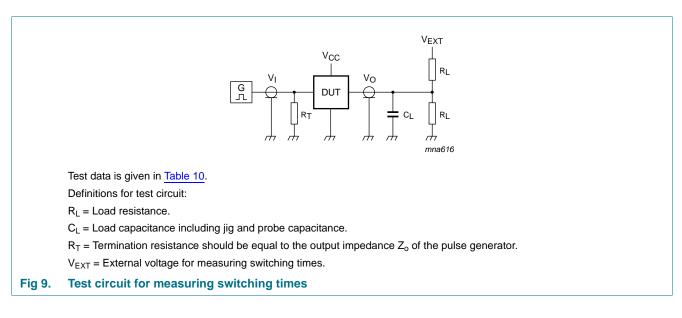


Table 9. Measurement points

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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74LVC1G02

Single 2-input NOR gate

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}	\leq 2.0 ns	30 pF	1 kΩ	open
2.3 V to 2.7 V	V _{CC}	\leq 2.0 ns	30 pF	500 Ω	open
2.7 V	2.7 V	\leq 2.5 ns	50 pF	500 Ω	open
3.0 V to 3.6 V	2.7 V	\leq 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

74LVC1G02

Single 2-input NOR gate

13. Package outline

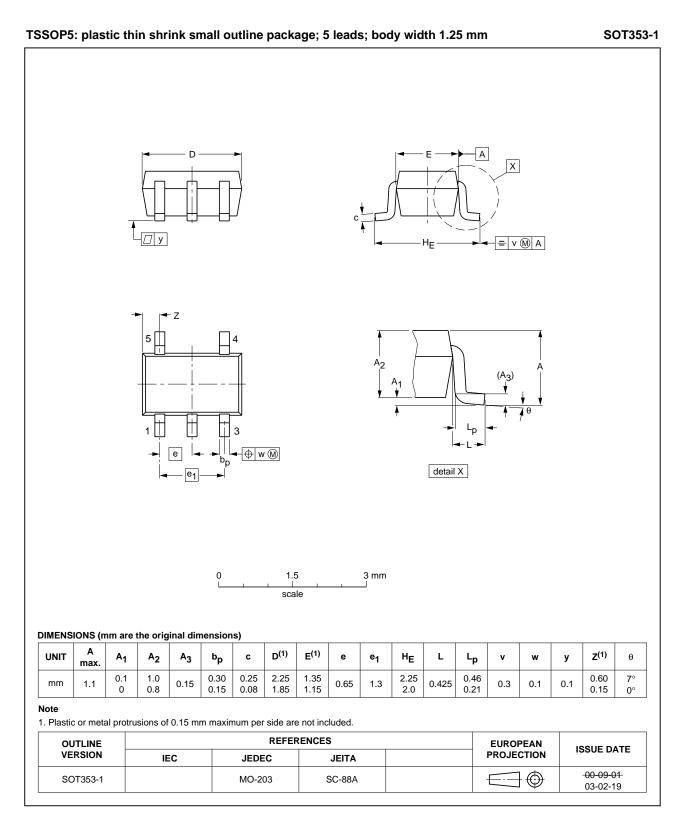
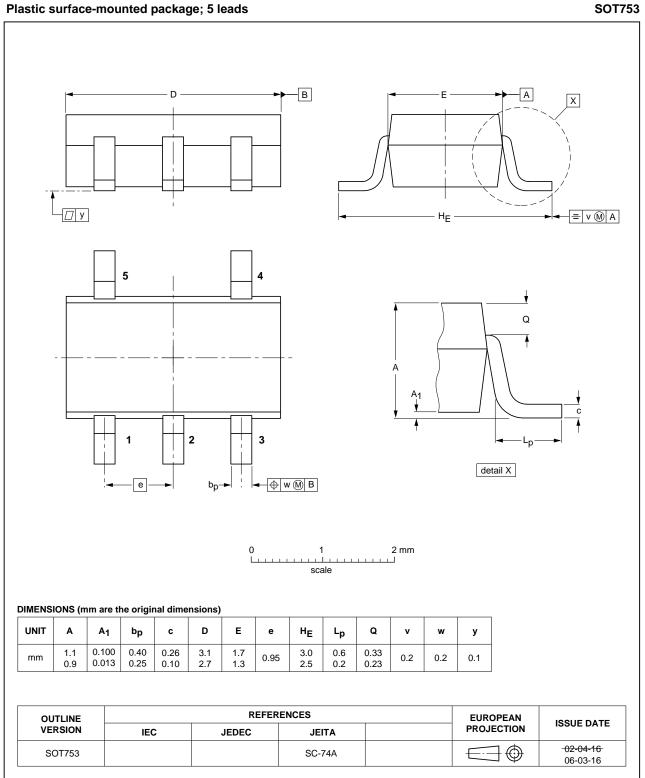


Fig 10. Package outline SOT353-1 (TSSOP5)

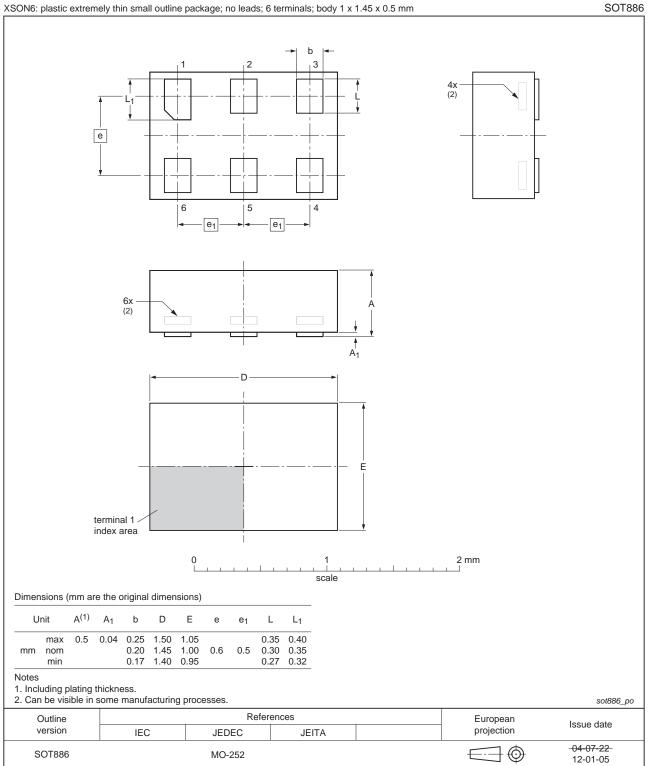
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Plastic surface-mounted package; 5 leads

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

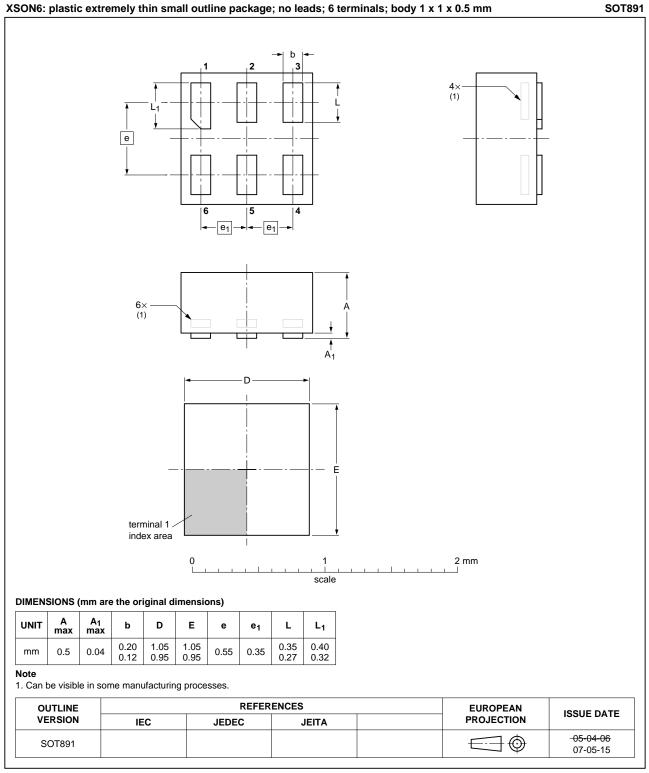
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XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

Fig 12. Package outline SOT886 (XSON6)

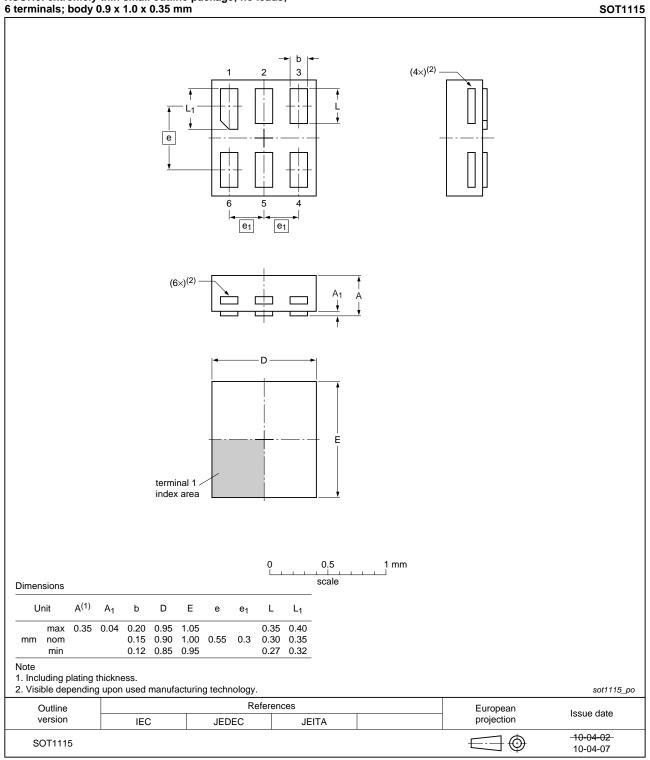
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XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1 x 0.5 mm

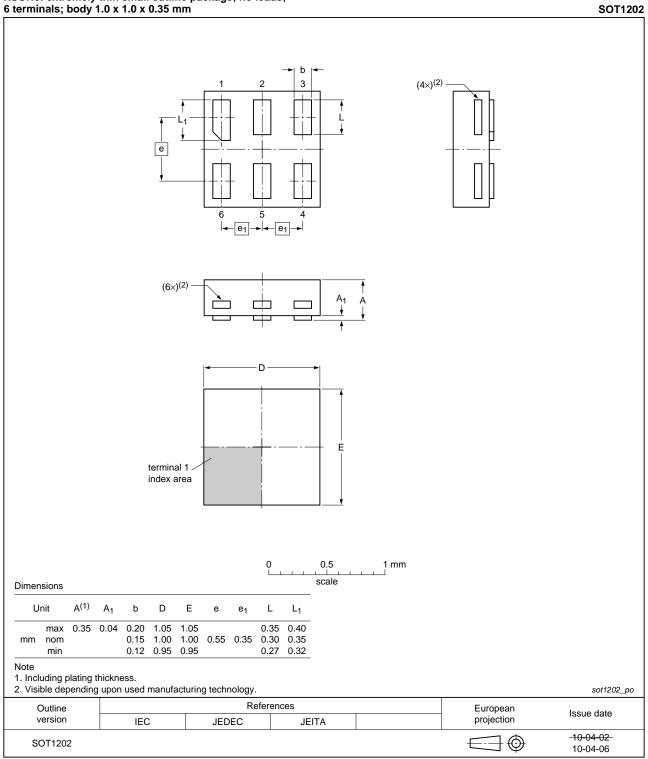
Fig 13. Package outline SOT891 (XSON6)

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

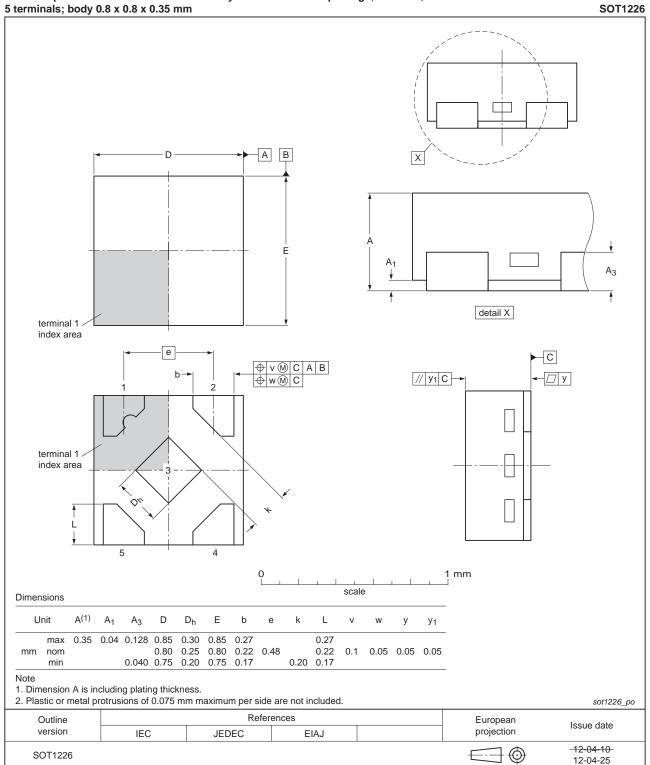
Fig 14. Package outline SOT1115 (XSON6)



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

Fig 15. Package outline SOT1202 (XSON6)

74LVC1G02 **Product data sheet**



X2SON5: plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body 0.8 x 0.8 x 0.35 mm

Fig 16. Package outline SOT1226 (X2SON5)

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14. Abbreviations

Table 11. Abb	previations
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

15. Revision history

Table 12. Revision	history			
Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC1G02 v.11	20120629	Product data sheet	-	74LVC1G02 v.10
Modifications:	 Added type 	number 74LVC1G02GX (S	OT1226)	
74LVC1G02 v.10	20120305	Product data sheet	-	74LVC1G02 v.9
Modifications:	 Package ou 	Itline drawing of SOT886 (F	igure 12) modified.	
74LVC1G02 v.9	20111209	Product data sheet	-	74LVC1G02 v.8
Modifications:	 Legal pages 	s 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	-	-

16. Legal information

16.1 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".

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74LVC1G02

Single 2-input NOR gate

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74LVC1G02

18. Contents

1	General description 1
2	Features and benefits 1
3	Ordering information 2
4	Marking 2
5	Functional diagram 2
6	Pinning information 3
6.1	Pinning 3
6.2	Pin description 3
7	Functional description 4
8	Limiting values 4
9	Recommended operating conditions 5
10	Static characteristics 5
11	Dynamic characteristics 6
12	Waveforms
13	Package outline 9
14	Abbreviations
15	Revision history 16
16	Legal information 17
16.1	Data sheet status 17
16.2	Definitions 17
16.3	Disclaimers
16.4	Trademarks 18
17	Contact information 18
18	Contents 19

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