Single 3-input AND gate Rev. 11 — 21 September 2021

1. General description

The 74LVC1G11 is a single 3-input AND 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
- ±24 mA output drive (V_{CC} = 3.0 V)
- CMOS low power dissipation
- Direct interface with TTL levels
- I_{OFF} circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA
- 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)
- · 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



3. Ordering information

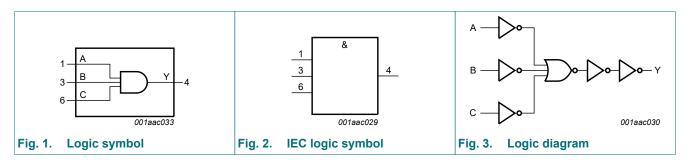
Type number	Package							
	Temperature range	Name	Description	Version				
74LVC1G11GW	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363				
74LVC1G11GV	-40 °C to +125 °C	SC-74; TSOP6	plastic surface-mounted package; 6 leads	SOT457				
74LVC1G11GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886				
74LVC1G11GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115				
74LVC1G11GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202				
74LVC1G11GX	-40 °C to +125 °C	X2SON6	plastic thermal extremely thin small outline package; no leads; 6 terminals; body 1 × 0.8 × 0.35 mm	SOT1255				

4. Marking

Table 2. Marking	
Type number	Marking code[1]
74LVC1G11GW	VU
74LVC1G11GV	V11
74LVC1G11GM	VU
74LVC1G11GN	VU
74LVC1G11GS	VU
74LVC1G11GX	VU

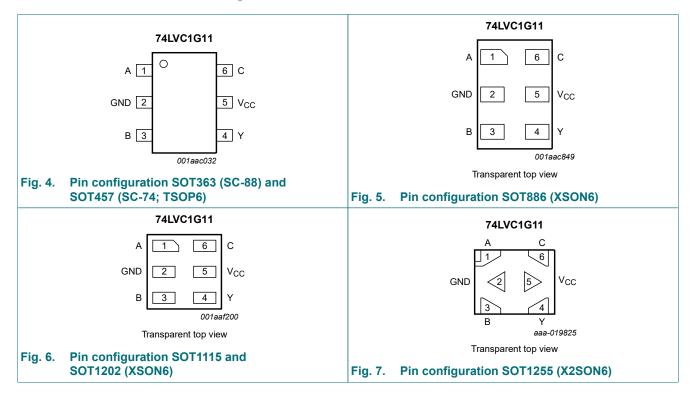
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



74LVC1G11

6. Pinning information



6.1. Pinning

6.2. Pin description

Table 3. Pin	description
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Symbol	Pin	Description
A	1	data input
GND	2	ground (0 V)
В	3	data input
Y	4	data output
V _{CC}	5	supply voltage
С	6	data input

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care.

Input			Output
Α	В	С	Y
Н	Н	Н	Н
L	Х	Х	L
X	L	Х	L
X	Х	L	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 ₁ < 0 V	-50	-	mA
VI	input voltage	[1]	-0.5	+6.5	V
I _{OK}	output clamping current	$V_{\rm O}$ > $V_{\rm CC}$ or $V_{\rm O}$ < 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
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
P _{tot}	total power dissipation	T _{amb} = -40 °C to +125 °C [2]	-	250	mW
T _{stg}	storage temperature		-65	+150	°C

The input and output voltage ratings may be exceeded if the input and output current ratings are observed. [1] [2]

For SOT363 (SC-88) package: Ptot derates linearly with 3.7 mW/K above 83 °C.

For SOT457 (SC-74; TSOP6) package: Ptot derates linearly with 4.1 mW/K above 89 °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: Ptot derates linearly with 3.3 mW/K above 74 °C.

For SOT1255 (X2SON6) package: Ptot derates linearly with 3.3 mW/K above 75 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions Symbol Conditions Parameter Min Typ Max V_{CC} supply voltage 1.65 _ VI input voltage 0 _ Vo output voltage Active mode 0 -0 Power-down mode; $V_{CC} = 0 V$ $\mathsf{T}_{\mathsf{amb}}$ ambient temperature -40 +125 _ Λt/ΛV input transition rise and fall rate V_{CC} = 1.65 V to 2.7 V _ -V_{CC} = 2.7 V to 5.5 V _ _

Unit

V

V

V

v

°C

ns/V

ns/V

5.5

5.5

 V_{CC}

5.5

20

10

10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	-40	°C to +85	S°C	-40 °C to	• +125 °C	Unit
			Min	Typ[1]	Max	Min	Max	1
VIH	HIGH-level	V _{CC} = 1.65 V to 1.95 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 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	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	$V_{I} = V_{IH}$ or V_{IL}						
	output 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	1.54	-	0.95	-	V
		I _O = -8 mA; V _{CC} = 2.3 V	1.9	2.15	-	1.7	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	2.50	-	1.9	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.3	2.62	-	2.0	-	V
		I _O = -32 mA; V _{CC} = 4.5 V	3.8	4.11	-	3.4	-	V
V _{OL}	L 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	-	-	0.10	-	0.10	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	0.07	0.45	-	0.70	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	0.12	0.30	-	0.45	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	0.17	0.40	-	0.60	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	0.33	0.55	-	0.80	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	0.39	0.55	-	0.80	V
I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±1	-	±1	μA
I _{OFF}	power-off leakage current	$V_{I} \text{ or } V_{O} = 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	±0.1	±2	-	±2	μA
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	μA
ΔI _{CC}	additional supply current	$V_{I} = V_{CC} - 0.6 \text{ V}; I_{O} = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V} \text{ to } 5.5 \text{ V}; \text{ per pin}$	-	5	500	-	500	μA
Cı	input capacitance	V_{CC} = 3.3 V; V_{I} = GND to V_{CC}	-	4	-	-	-	pF

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

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	5 °C	-40 °C to	+125 °C	Unit
			м	lin	Typ[1]	Max	Min	Мах	
t _{pd}	propagation delay	A, B and C to Y; see Fig. 8]						
		V _{CC} = 1.65 V to 1.95 V	1	.5	4.7	17.2	1.5	21.5	ns
		V _{CC} = 2.3 V to 2.7 V	1	.0	3.0	6.2	1.0	7.8	ns
		V _{CC} = 2.7 V	1	.0	3.0	6.0	1.0	7.5	ns
		V _{CC} = 3.0 V to 3.6 V	1	.0	2.6	4.9	1.0	6.2	ns
		V _{CC} = 4.5 V to 5.5 V	1	.0	1.9	3.5	1.0	4.4	ns
C _{PD}	power dissipation capacitance	$V_{I} = GND$ to V_{CC} ; $V_{CC} = 3.3 V$ [3	·]	-	13	-	-	-	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. [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 µW). [3]

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

 f_i = input frequency in MHz;

 $f_o = output$ frequency in MHz;

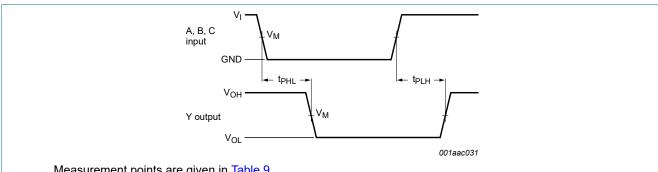
 C_{L} = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

11.1. Waveform and test circuit



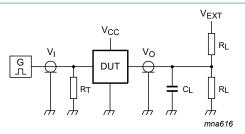
Measurement points are given in Table 9.

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

The input (A, B, C) to output (Y) propagation delays Fig. 8.

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}		

Single 3-input AND gate



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. 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

Single 3-input AND gate

12. Package outline

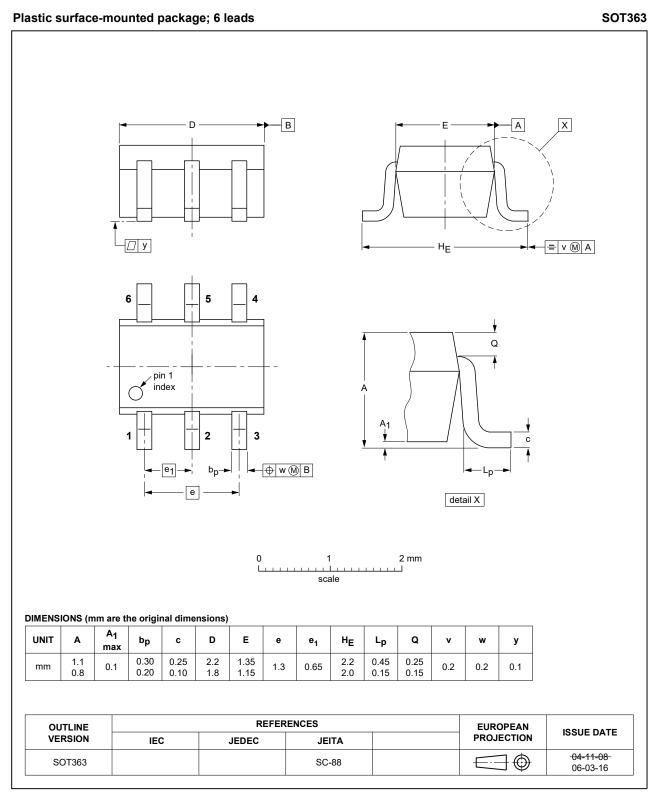


Fig. 10. Package outline SOT363 (SC-88)

SOT457

Single 3-input AND gate

Plastic, surface-mounted package (SC-74; TSOP6); 6 leads

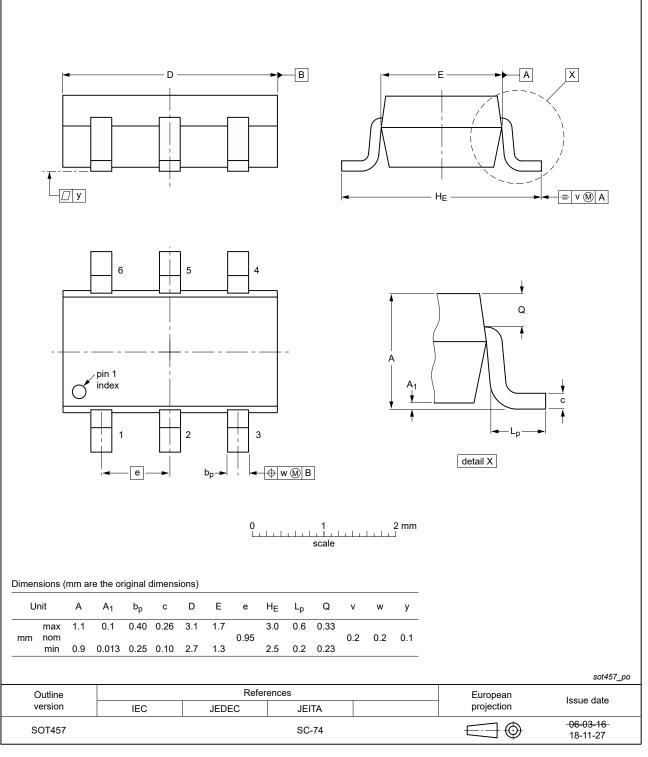


Fig. 11. Package outline SOT457 (SC-74; TSOP6)

Single 3-input AND gate

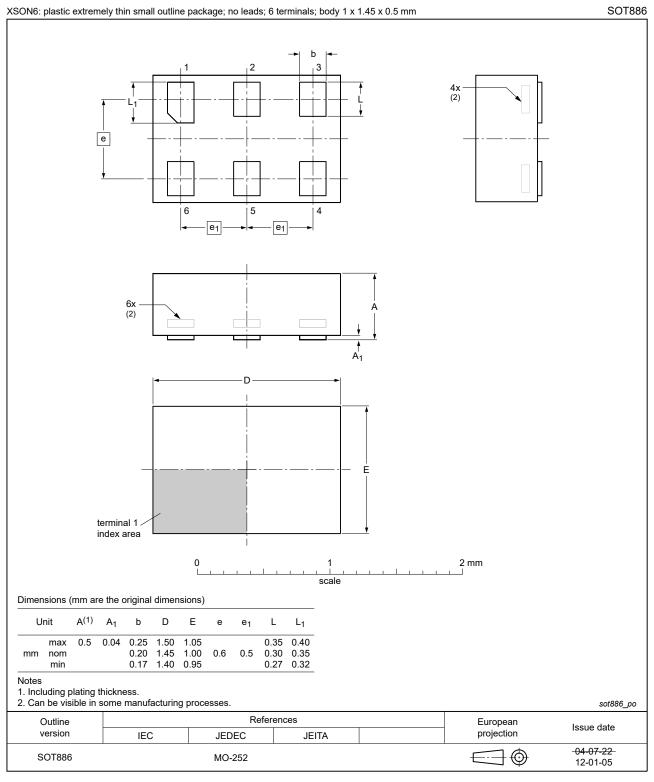
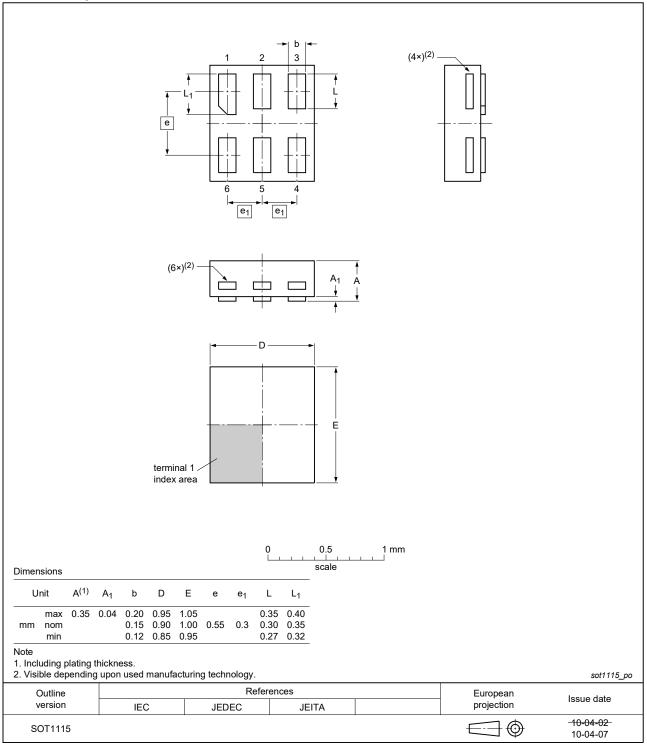


Fig. 12. Package outline SOT886 (XSON6)

SOT1115

Single 3-input AND gate

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

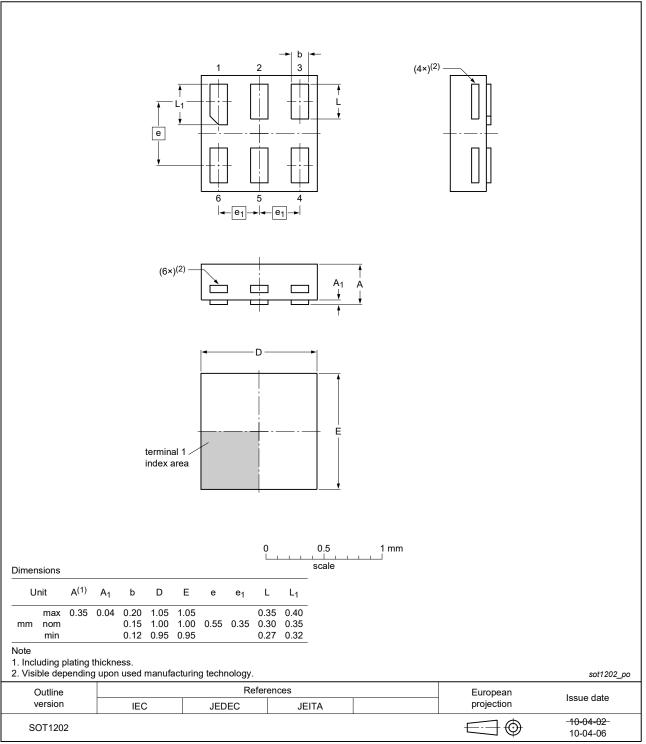




SOT1202

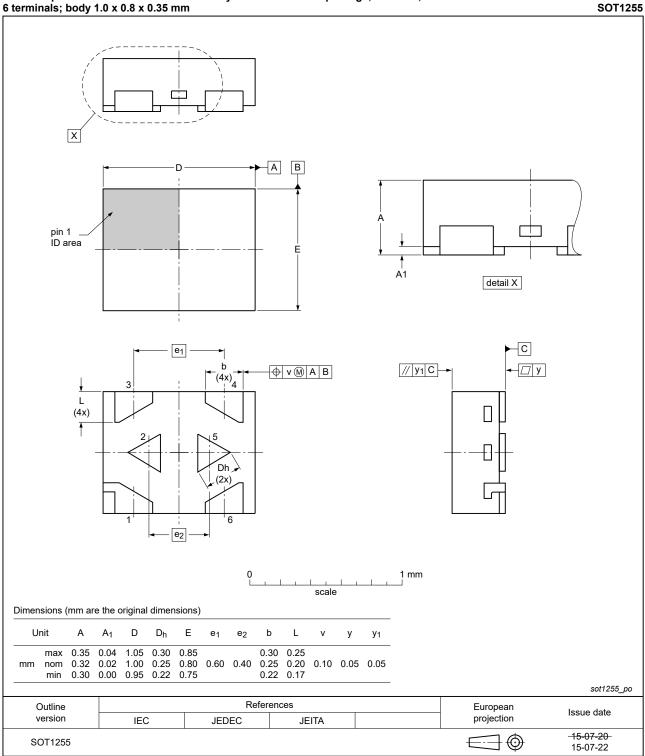
Single 3-input AND gate

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





Single 3-input AND gate



X2SON6: plastic thermal enhanced extremely thin small outline package; no leads; 6 terminals; body 1.0 x 0.8 x 0.35 mm

Fig. 15. Package outline SOT1255 (X2SON6)

13. Abbreviations

Table 11. Abbrev	Table 11. Abbreviations			
Acronym	Description			
CMOS	Complementary Metal Oxide Semiconductor			
DUT	Device Under Test			
ESD	ElectroStatic Discharge			
НВМ	Human Body Model			
ММ	Machine Model			
TTL	Transistor-Transistor Logic			

14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LVC1G11 v.11	20210921	Product data sheet	-	74LVC1G11 v.10		
Modifications:	 Type numb <u>Table 5</u>: De 	 Type number 74LVC1G11GF (SOT891/XSON6) removed. <u>Table 5</u>: Derating values for P_{tot} total power dissipation updated. 				
74LVC1G11 v.10	20170719	Product data sheet	-	74LVC1G11 v.9		
Modifications:	guidelines o	 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. 				
74LVC1G11 v.9	20161128	Product data sheet	-	74LVC1G11 v.8		
Modifications:	• <u>Table 7</u> : Th	• <u>Table 7</u> : The maximum limits for leakage current and supply current have changed.				
74LVC1G11 v.8	20150917	Product data sheet	-	74LVC1G11 v.7		
Modifications:	Added type	Added type number 74LVC1G11GX (SOT1255/X2SON6).				
74LVC1G11 v.7	20120704	Product data sheet	-	74LVC1G11 v.6		
Modifications:	Package outline drawing of SOT886 (Fig. 12) modified.					
74LVC1G11 v.6	20111209	Product data sheet	-	74LVC1G11 v.5		
Modifications:	Legal page	Legal pages updated.				
74LVC1G11 v.5	20100730	Product data sheet	-	74LVC1G11 v.4		
74LVC1G11 v.4	20070801	Product data sheet	-	74LVC1G11 v.3		
74LVC1G11 v.3	20060906	Product data sheet	-	74LVC1G11 v.2		
74LVC1G11 v.2	20050503	Product data sheet	-	74LVC1G11 v.1		
74LVC1G11 v.1	20041130	Product data sheet	-	-		

Single 3-input AND gate

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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- [2] The term 'short data sheet' is explained in section "Definitions".
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