74LVC1G97

Low-power configurable multiple function gate

Rev. 6 — 8 August 2018

Product data sheet

1. General description

The 74LVC1G97 is a configurable multiple function gate with Schmitt-trigger inputs. The device can be configured as any of the following logic functions MUX, AND, OR, NAND, NOR, inverter and buffer; using the 3-bit input. All inputs can be connected to $V_{\rm CC}$ or GND.

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.

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 input/output for interfacing with 5 V logic
- · 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)
 - JESD8B/JESD36 (2.7 V to 3.6 V).
- ±24 mA output drive (V_{CC} = 3.0 V)
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
 - CDM JESD22-C101E exceeds 1000 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
- 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	Package						
	Temperature range	Name	Description	Version				
74LVC1G97GW	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363				
74LVC1G97GV	-40 °C to +125 °C	SC-74	plastic surface mounted package; 6 leads	SOT457				
74LVC1G97GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886				
74LVC1G97GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891				
74LVC1G97GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115				
74LVC1G97GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202				
74LVC1G97GX	-40 °C to +125 °C	X2SON6	plastic thermal enhanced extremely thin small outline package; no leads; 6 terminals; body 1.0 × 0.8 × 0.35 mm	SOT1255				

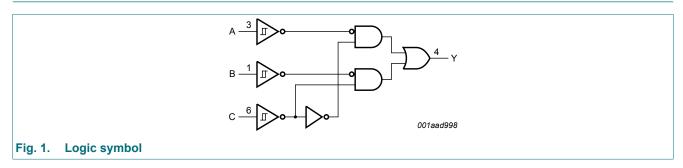
4. Marking

Table 2. Marking

Table 2. Walking					
Type number	Marking code [1]				
74LVC1G97GW	YV				
74LVC1G97GV	Y97				
74LVC1G97GM	YV				
74LVC1G97GF	YV				
74LVC1G97GN	YV				
74LVC1G97GS	YV				
74LVC1G97GX	YV				

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

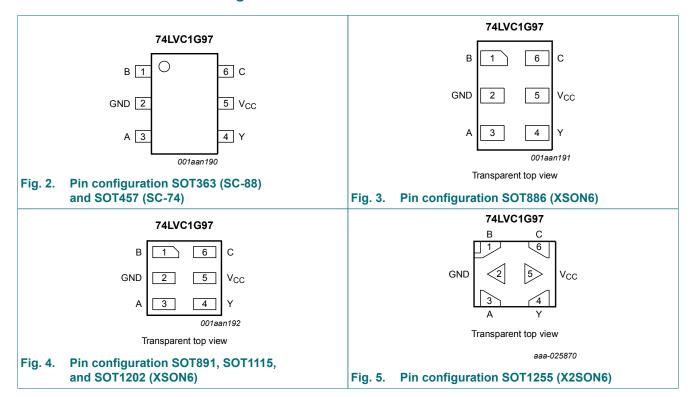
5. Functional diagram



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6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

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

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7. Functional description

Table 4. Function table

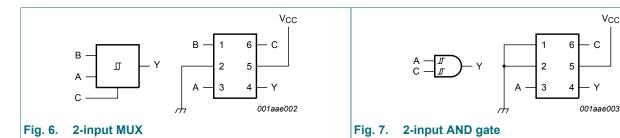
 $H = HIGH \ voltage \ level; \ L = LOW \ voltage \ level.$

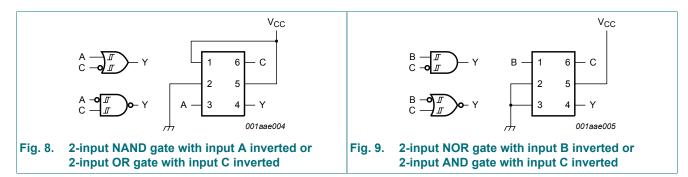
Input	Output		
С	В	A	Υ
L	L	L	L
L	L	Н	L
L	Н	L	Н
L	Н	Н	Н
Н	L	L	L
Н	L	Н	Н
Н	Н	L	L
Н	Н	Н	Н

7.1. Logic configurations

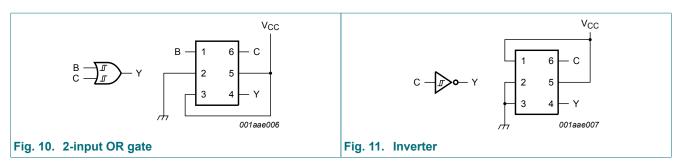
Table 5. Function selection table

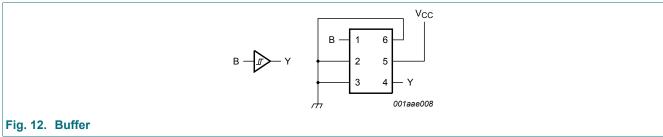
Logic function	Figure
2-input MUX	see Fig. 6
2-input AND	see Fig. 7
2-input OR with one input inverted	see Fig. 8
2-input NAND with one input inverted	see Fig. 8
2-input AND with one input inverted	see Fig. 9
2-input NOR with one input inverted	see Fig. 9
2-input OR	see Fig. 10
Inverter	see Fig. 11
Buffer	see Fig. 12





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8. Limiting values

Table 6. 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][2]	-0.5	+6.5	V
		Power-down mode	[1][2]	-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
T _{stg}	storage temperature			-65	+150	°C
P _{tot}	total power dissipation	T _{amb} = -40 °C to +125 °C	[3]	-	250	mW

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- [2] When $V_{CC} = 0 \text{ V}$ (Power-down mode), the output voltage can be 5.5 V in normal operation.
- [3] For SC-88 and SC-74 packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K. For XSON6 and X2SON6 packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

9. Recommended operating conditions

Table 7. 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	

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10. Static characteristics

Table 8. 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 _{OL}	LOW-level output	V _I = V _{CC} or GND						
	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	-	0.7	V
		$I_O = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.3	-	0.45	V
		$I_O = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.4	-	0.6	V
		$I_O = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.55	-	0.8	V
		$I_O = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.55	-	0.8	V
V_{OH}	HIGH-level output	V _I = V _{CC} or GND						
	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
		$I_O = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	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
		$I_O = -32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.8	-	-	3.4	-	V
l _l	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	$V_1 \text{ or } V_0 = 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	±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
Δl _{CC}	additional supply current	$V_1 = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V} \text{ to } 5.5 \text{ V}$	-	5	500	-	500	μΑ
Cı	input capacitance		-	2.5	-	-	-	pF

^[1] Typical values are measured at maximum V_{CC} and T_{amb} = 25 °C.

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11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 14.

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, C to Y; see <u>Fig. 13</u> [2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	6.0	14.4	1.0	18.0	ns
		V _{CC} = 2.3 V to 2.7 V	0.5	3.5	8.3	0.5	10.4	ns
		V _{CC} = 2.7 V	0.5	4.2	8.5	0.5	10.6	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	3.8	6.3	0.5	7.9	ns
		V _{CC} = 4.5 V to 5.5 V	0.5	3.0	5.1	0.5	6.4	ns
C _{PD}	power dissipation capacitance	$V_{CC} = 3.3 \text{ V}; V_I = \text{GND to } V_{CC}$ [3]	-	22	-	-	-	pF

- Typical values are measured at nominal V_{CC} and at T_{amb} = 25 °C.
- 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). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:

 f_i = input frequency in MHz;

 f_0 = output frequency in MHz;

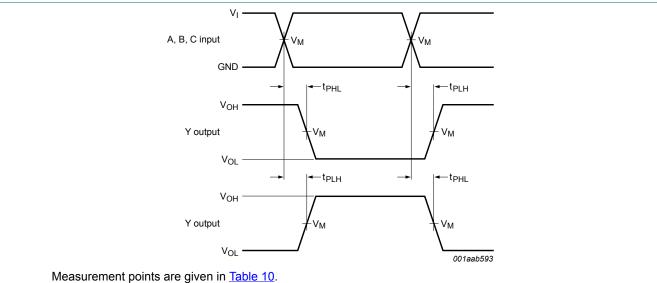
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

11.1. Waveforms and test circuit



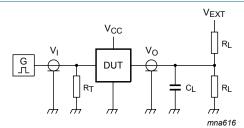
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 13. Input A, B and C to output Y propagation delay times

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Table 10. Measurement points

Supply voltage	Input	Input	
V _{CC}	V _M	V _I	V _M
1.65 V to 1.95 V	0.5V _{CC}	V _{CC}	0.5V _{CC}
2.3 V to 2.7 V	0.5V _{CC}	V _{CC}	0.5V _{CC}
2.7 V	1.5 V	2.7 V	1.5 V
3.0 V to 3.6 V	1.5 V	2.7 V	1.5 V
4.5 V to 5.5 V	0.5V _{CC}	V _{CC}	0.5V _{CC}



Measurement points are given in <u>Table 11</u>.

Definitions 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} = External voltage for measuring switching times.

Fig. 14. Test circuit for measuring switching times

Table 11. Measurement points

Supply voltage	Input		Load	V _{EXT}	
V _{CC}	V _I	$t_r = t_f$	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 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. Transfer characteristics

Table 12. Transfer characteristics

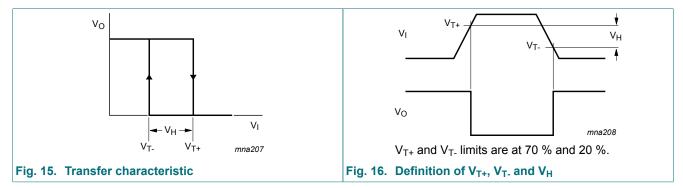
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

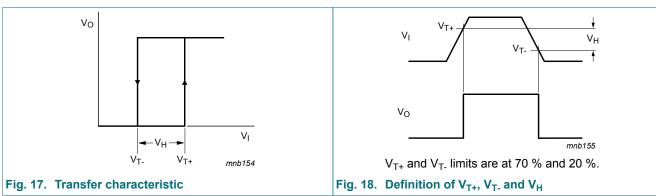
Symbol	Parameter	Conditions	-4	-40 °C to +85 °C			-40 °C to +125 °C		
			Min	Typ [1]	Max	Min	Max		
V _{T+}	positive-going threshold voltage	See Fig. 15, Fig. 16, Fig. 17 and Fig. 18							
		V _{CC} = 1.8 V	0.70	1.02	1.20	0.67	1.20	V	
		V _{CC} = 2.3 V	1.11	1.42	1.60	1.08	1.60	V	
		V _{CC} = 3.0 V, see <u>Fig. 19</u>	1.50	1.79	2.00	1.47	2.00	V	
		V _{CC} = 4.5 V	2.16	2.52	2.74	2.13	2.74	V	
		V _{CC} = 5.5 V	2.61	2.99	3.33	2.58	3.33	V	
V_{T-}	negative-going threshold voltage	See Fig. 15, Fig. 16, Fig. 17 and Fig. 18							
		V _{CC} = 1.8 V	0.30	0.53	0.72	0.30	0.75	V	
		V _{CC} = 2.3 V	0.58	0.77	1.00	0.58	1.03	V	
		V _{CC} = 3.0 V, see <u>Fig. 19</u>	0.80	1.04	1.30	0.80	1.33	V	
		V _{CC} = 4.5 V	1.21	1.55	1.90	1.21	1.93	V	
		V _{CC} = 5.5 V	1.45	1.86	2.29	1.45	2.32	V	
V _H	hysteresis voltage	(V _{T+} - V _{T-}). See <u>Fig. 15</u> , <u>Fig. 16</u> , <u>Fig. 17</u> and <u>Fig. 18</u>							
		V _{CC} = 1.8 V	0.30	0.48	0.62	0.23	0.62	V	
		V _{CC} = 2.3 V	0.40	0.64	0.80	0.34	0.80	V	
		V _{CC} = 3.0 V, see <u>Fig. 19</u>	0.50	0.75	1.00	0.44	1.00	V	
		V _{CC} = 4.5 V	0.71	0.97	1.20	0.65	1.20	V	
		V _{CC} = 5.5 V	0.71	1.13	1.40	0.65	1.40	V	

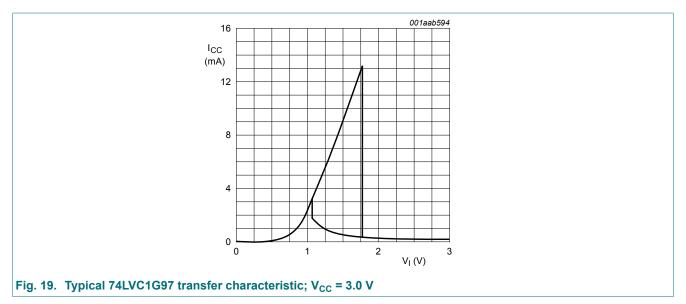
^[1] Typical values are measured at T_{amb} = 25 °C.

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12.1. Waveforms transfer characteristics







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13. Package outline

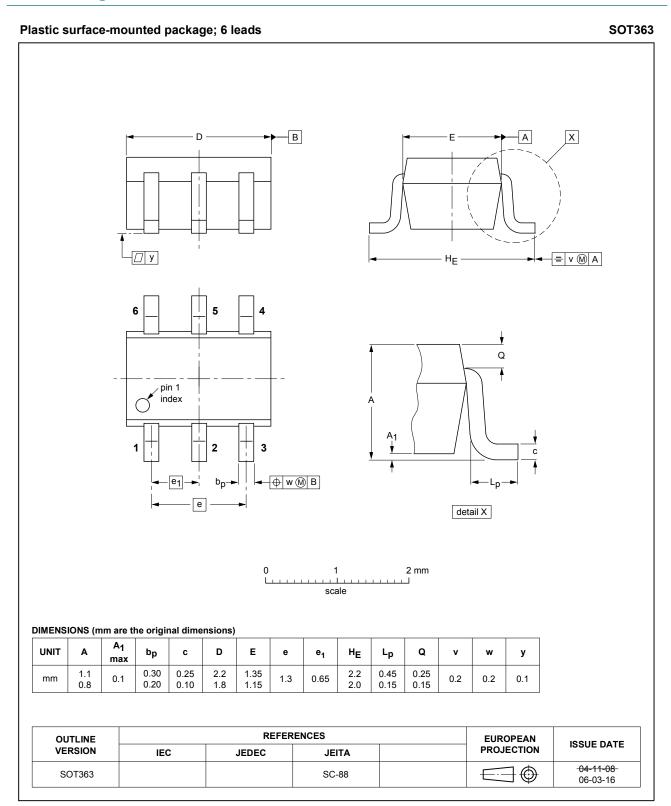


Fig. 20. Package outline SOT363 (SC-88)

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Plastic surface-mounted package (TSOP6); 6 leads

SOT457

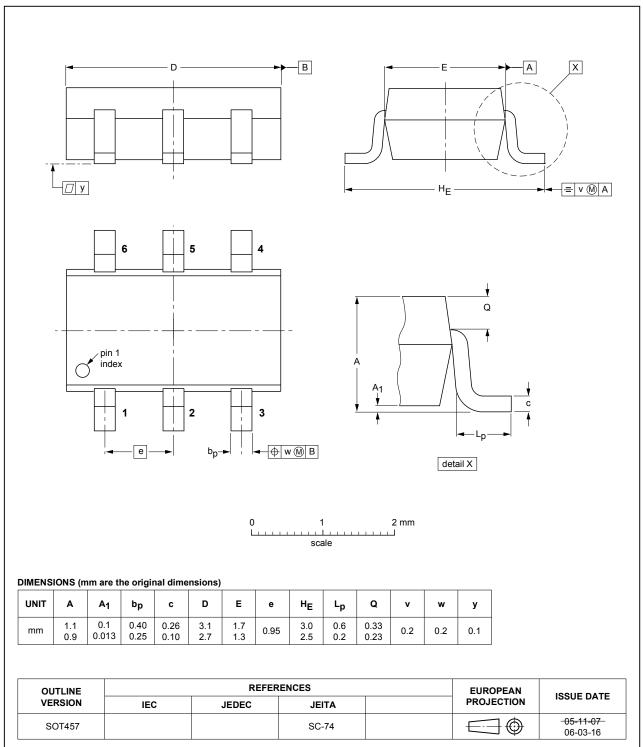


Fig. 21. Package outline SOT457 (SC-74)

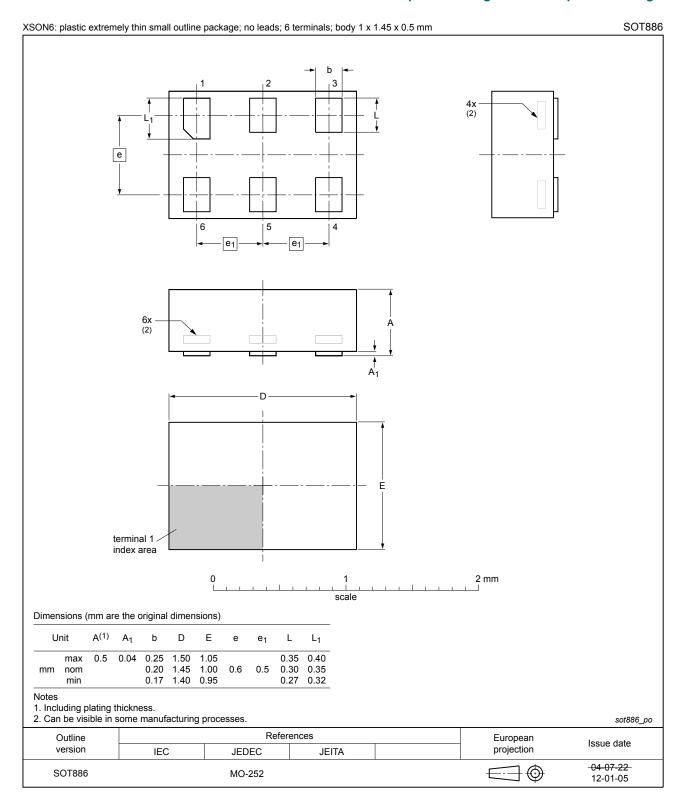


Fig. 22. Package outline SOT886 (XSON6)

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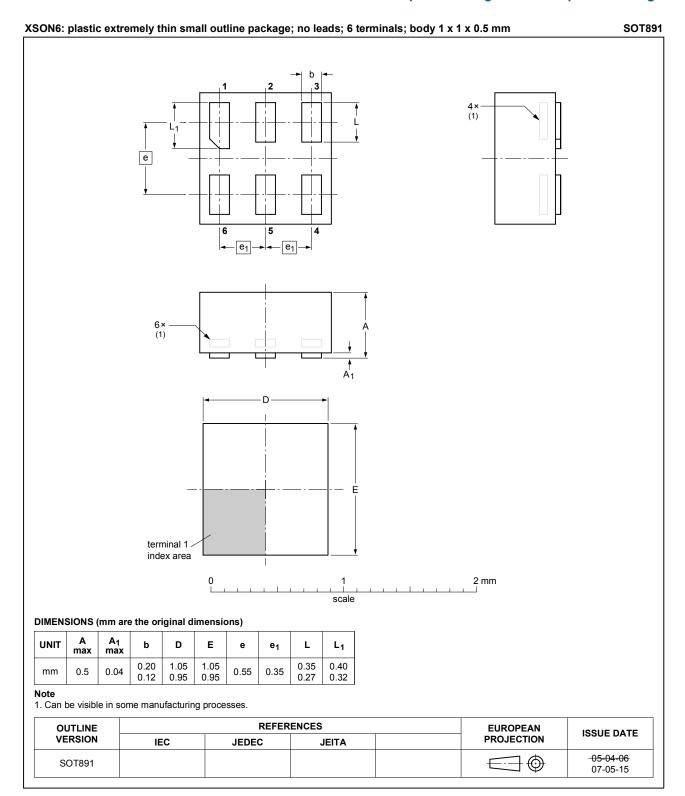


Fig. 23. Package outline SOT891 (XSON6)

14 / 20

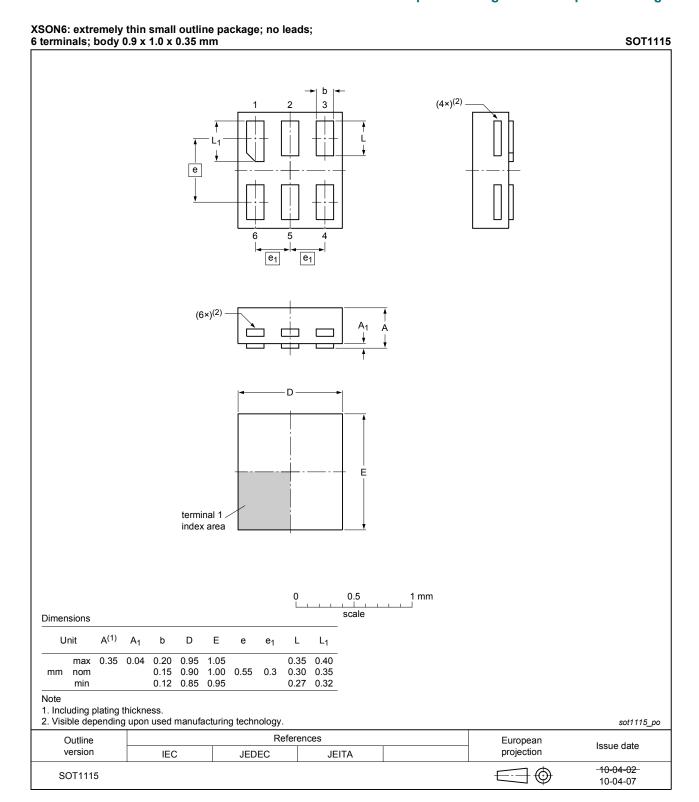


Fig. 24. Package outline SOT1115 (XSON6)

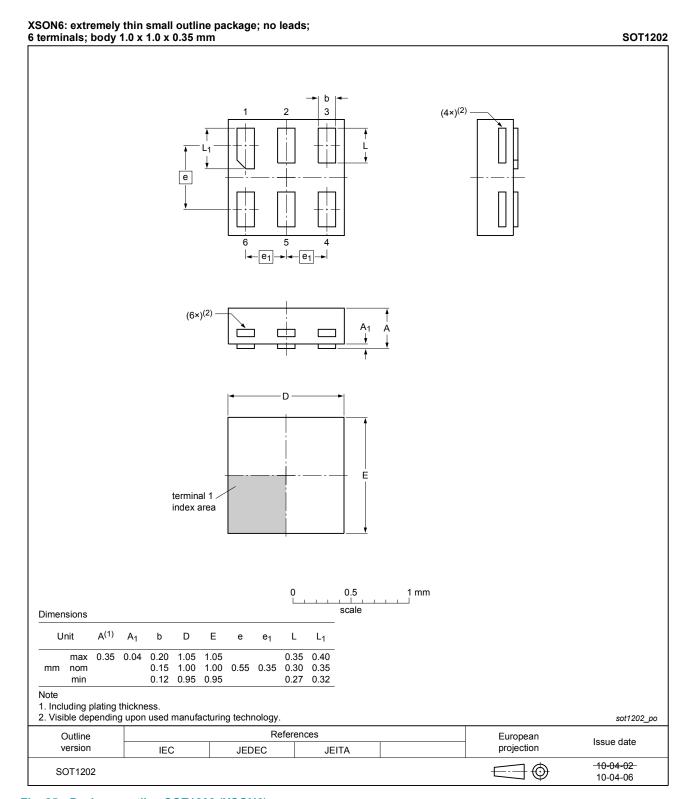


Fig. 25. Package outline SOT1202 (XSON6)

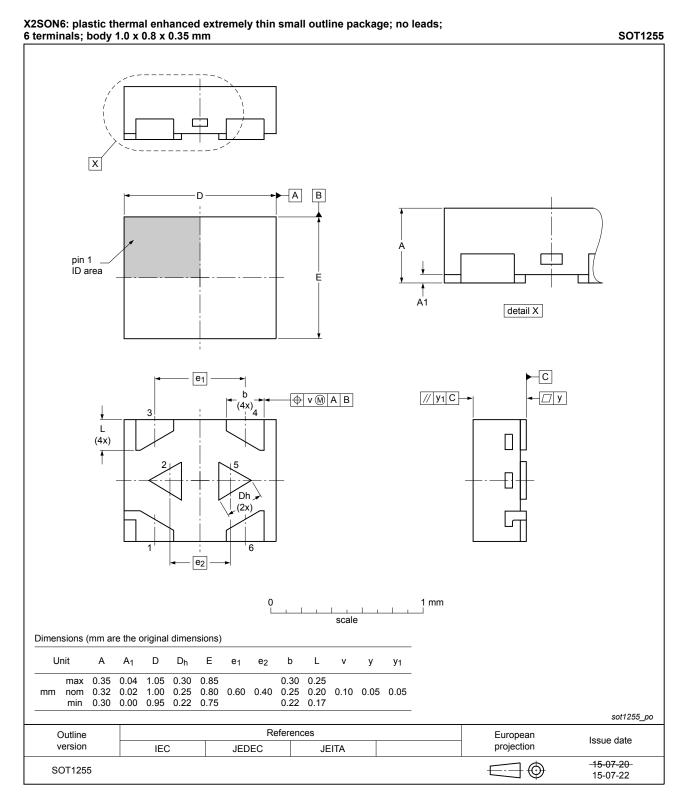


Fig. 26. Package outline SOT1255 (X2SON6)

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14. Abbreviations

Table 13. Abbreviations

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

15. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LVC1G97 v.6	20180808	Product data sheet	-	74LVC1G97 v.5		
Modifications:	of Nexperia.	 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. 				
74LVC1G97 v.5	20161212	Product data sheet	-	74LVC1G97 v.4		
Modifications:		 Table 8: The maximum limits for leakage current and supply current have changed. Type number 74LVC1G97GX (X2SON6/SOT1255) added. 				
74LVC1G97 v.4	20140910	Product data sheet	-	74LVC1G97 v.3		
Modifications:	Package outline drawing of SOT886 (Fig. 22) modified.					
74LVC1G97 v.3	20111207	Product data sheet	-	74LVC1G97 v.2		
74LVC1G97 v.2	20110309	Product data sheet	-	74LVC1G97 v.1		
74LVC1G97 v.1	20101221	Product data sheet	-	-		

16. 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.
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.
- [2] The term 'short data sheet' is explained in section "Definitions".
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Low-power configurable multiple function gate

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