74LVC1G57

Low-power configurable multiple function gate

Rev. 10 — 1 February 2022

Product data sheet

1. General description

The 74LVC1G57 is a configurable multiple function gate with Schmitt-trigger inputs. The device can be configured as any of the following logic functions AND, OR, NAND, NOR, XNOR, inverter and buffer; using the 3-bit input. All inputs can be connected directly to V_{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 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
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- I_{OFF} circuitry provides partial Power-down mode operation
- 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).
- 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			
74LVC1G57GW	-40 °C to +125 °C	TSSOP6	plastic thin shrink small outline package; 6 leads; body width 1.25 mm	SOT363-2			
74LVC1G57GV	-40 °C to +125 °C	SC-74; TSOP6	plastic surface-mounted package; 6 leads	SOT457			
74LVC1G57GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886			
74LVC1G57GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115			
74LVC1G57GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202			

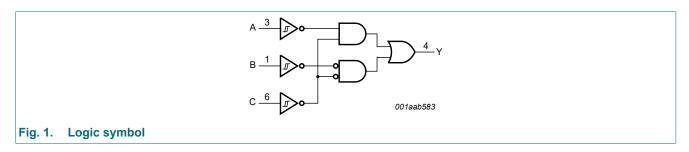
4. Marking

Table 2. Marking

Type number	Marking code [1]
74LVC1G57GW	YC
74LVC1G57GV	V57
74LVC1G57GM	YC
74LVC1G57GN	YC
74LVC1G57GS	YC

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

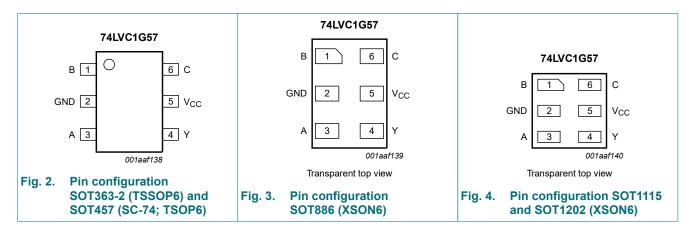
5. Functional diagram



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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

7. Functional description

Table 4. Function table

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

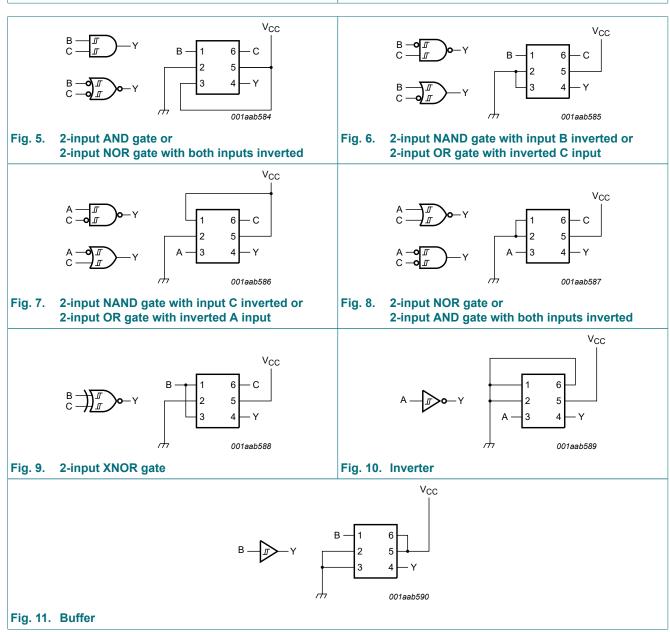
Input	Output		
С	В	A	Υ
L	L	L	Н
L	L	Н	L
L	Н	L	Н
L	Н	Н	L
Н	L	L	L
Н	L	Н	L
Н	Н	L	Н
Н	Н	Н	Н

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7.1. Logic configurations

Table 5. Function selection table

Logic function	Figure
2-input AND	see Fig. 5
2-input AND with both inputs inverted	see Fig. 8
2-input NAND with inverted input	see Fig. 6 and Fig. 7
2-input OR with inverted input	see Fig. 6 and Fig. 7
2-input NOR	see Fig. 8
2-input NOR with both inputs inverted	see Fig. 5
2-input XNOR	see Fig. 9
Inverter	see Fig. 10
Buffer	see Fig. 11



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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]	-0.5	+6.5	V
		Power-down mode; V _{CC} = 0 V	[1]	-0.5	+6.5	V
Io	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 °C to +125 °C	[2]	-	250	mW

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

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.

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
V_{I}	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

^[2] For SOT363-2 (TSSOP6) package: Ptot derates linearly with 3.7 mW/K above 83 °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	$V_I = V_{T+}$ or V_{T-}							
	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 mA; V _{CC} = 2.7 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	$V_I = V_{T+}$ or V_{T-}							
	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	-	-	0.95	-	V	
		$I_O = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.9	-	-	1.7	-	V	
		$I_O = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	2.2	-	-	1.9	-	V	
		$I_O = -24$ 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	
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	
l _{OFF}	power-off leakage current	V_{I} or $V_{O} = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$	-	±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	
ΔI _{CC}	additional supply current	V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 2.3 V to 5.5 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. 13.

Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to	Unit		
			Min	Typ [1]	Max	Min	Max	
t _{pd}	propagation delay	A, B, C to Y; see <u>Fig. 12</u> [2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	6.0	14.4	1.0	18	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 μ W). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:

f_i = input frequency in MHz;

 f_o = output frequency in MHz;

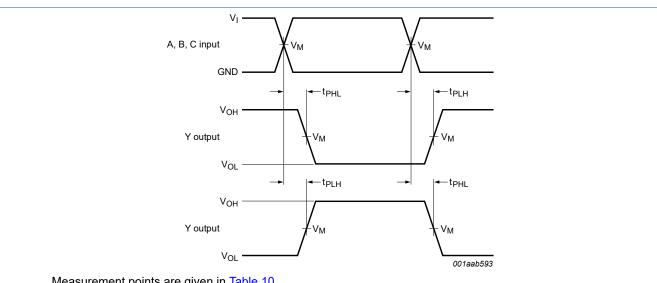
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

11.1. Waveforms and test circuit



Measurement points are given in Table 10.

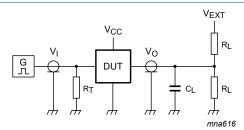
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 12. 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	0.5 × V _{CC}	V _{CC}	0.5 × V _{CC}	
2.3 V to 2.7 V	0.5 × V _{CC}	V _{CC}	0.5 × V _{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	0.5 × V _{CC}	V _{CC}	0.5 × V _{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_{o} of the pulse generator;

V_{EXT} = External voltage for measuring switching times.

Fig. 13. Test circuit for measuring switching times

Table 11. Test data

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 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. Transfer characteristics

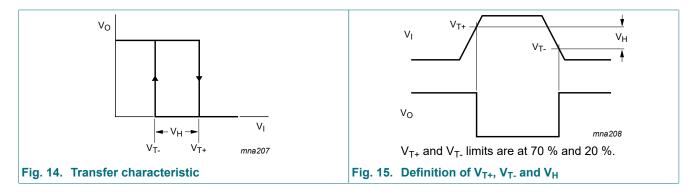
Table 12. Transfer characteristics

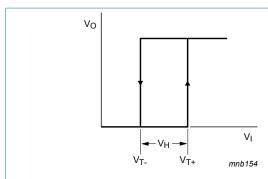
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40	°C to +85	°C	-40 °C to	+125 °C	Unit
			Min	Typ [1]	Max	Min	Max	
V _{T+}	positive-going threshold voltage	see Fig. 14, Fig. 15, Fig. 16 and Fig. 17						
		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	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. 14, Fig. 15, Fig. 16 and Fig. 17						
		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	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. 14</u> , <u>Fig. 15</u> , <u>Fig. 16</u> and <u>Fig. 17</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	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.

12.1. Waveforms transfer characteristics





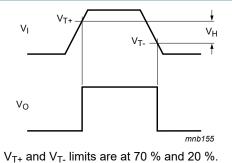


Fig. 16. Transfer characteristic

Fig. 17. Definition of V_{T+} , V_{T-} and V_H

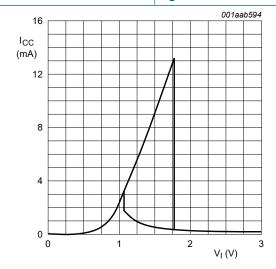


Fig. 18. Typical 74LVC1G57 transfer characteristic; $V_{CC} = 3.0 \text{ V}$

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13. Package outline

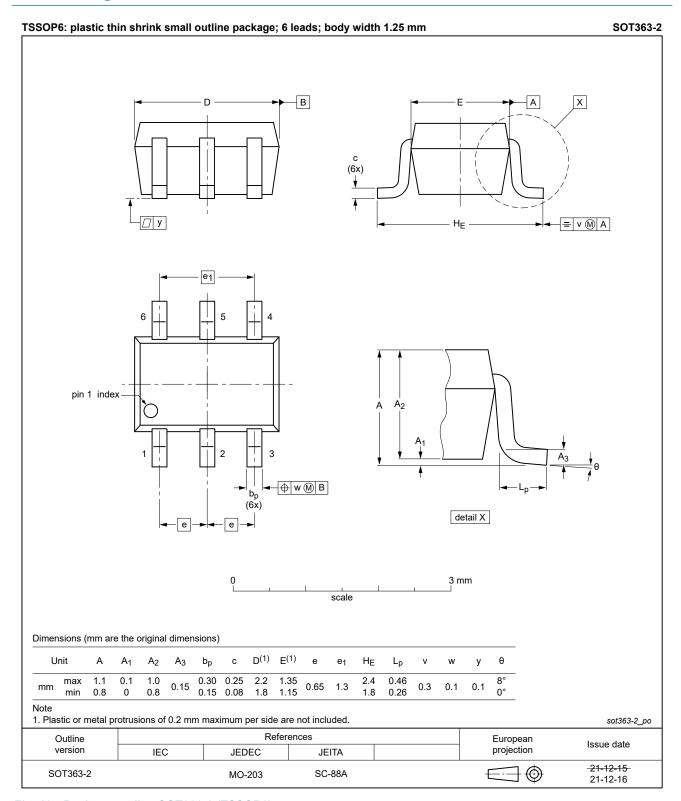


Fig. 19. Package outline SOT363-2 (TSSOP6)

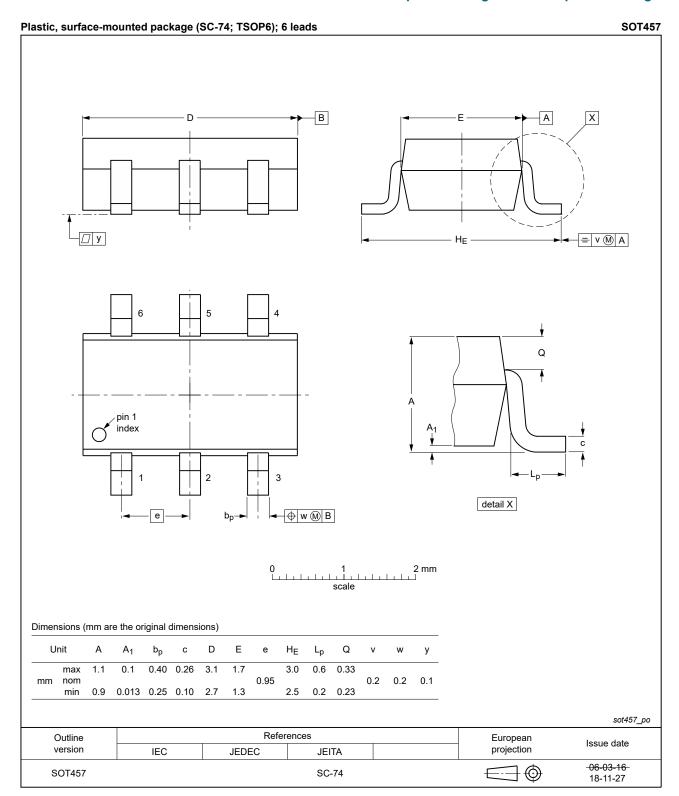


Fig. 20. Package outline SOT457 (SC-74; TSOP6)

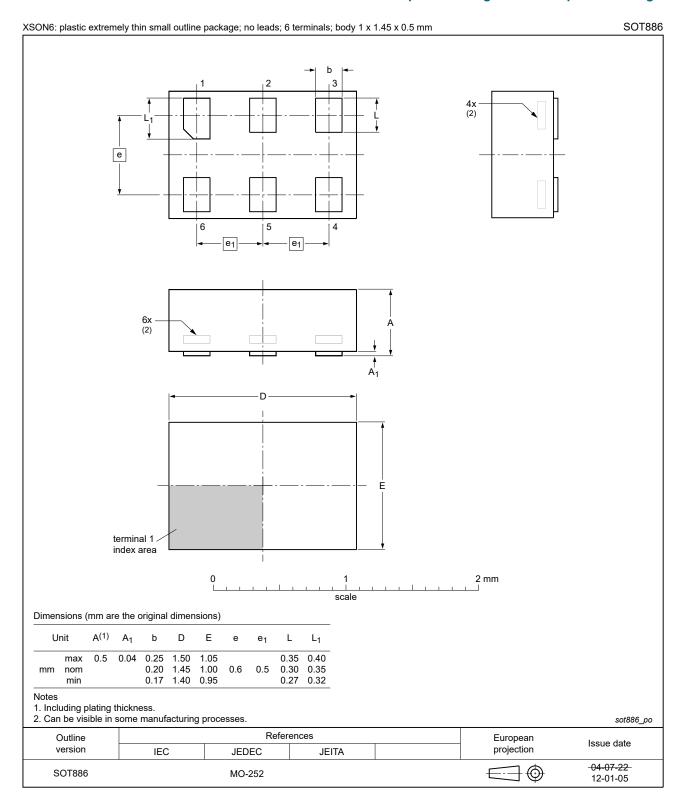


Fig. 21. Package outline SOT886 (XSON6)

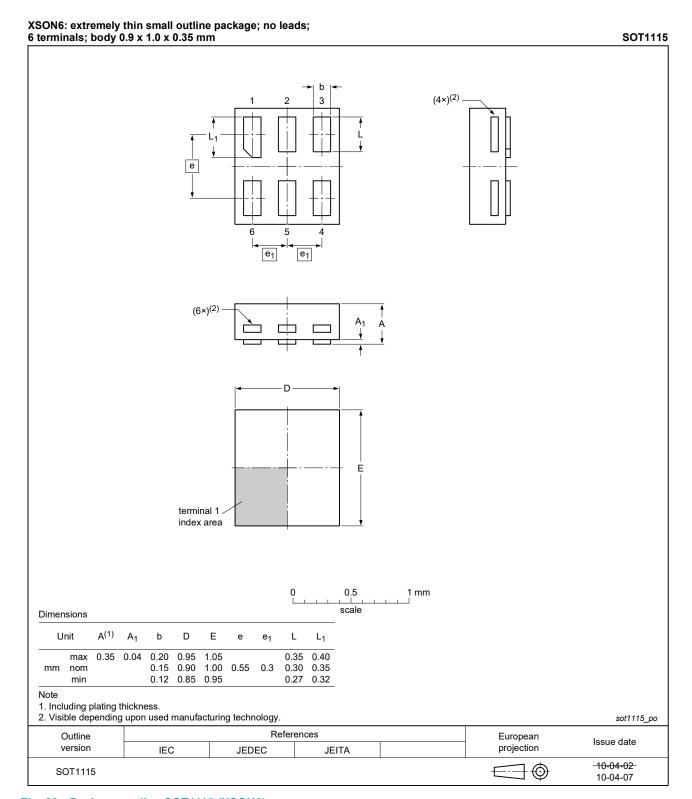


Fig. 22. Package outline SOT1115 (XSON6)

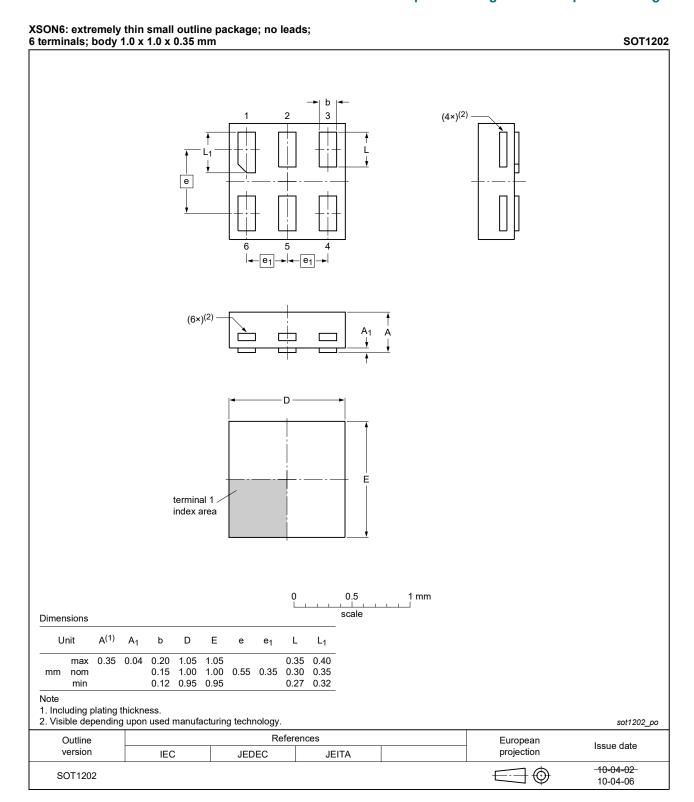


Fig. 23. Package outline SOT1202 (XSON6)

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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
MM	Machine Model
TTL	Transistor-Transistor Logic

15. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74LVC1G57 v.10	20220201	Product data sheet	-	74LVC1G57 v.9	
Modifications:	Package SOT363 (SC-88) changed to SOT363-2 (TSSOP6).				
74LVC1G57 v.9	20210604	Product data sheet	-	74LVC1G57 v.8	
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. Type number 74LVC1G57GF (SOT891 / XSON6) removed. Section 1 and Section 2 updated. Section 8: Derating values for P_{tot} total power dissipation updated. Fig. 20: Package outline drawing SOT457 (SC-74; TSOP6) updated. 				
74LVC1G57 v.8	20161207	Product data sheet	-	74LVC1G57 v.7	
Modifications:	<u>Table 8</u> : The maximum limits for leakage current and supply current have changed.				
74LVC1G57 v.7	20140910	Product data sheet	-	74LVC1G57 v.6	
Modifications:	Package outline drawing of SOT886 (Fig. 21) modified.				
74LVC1G57 v.6	20111206	Product data sheet	-	74LVC1G57 v.5	
74LVC1G57 v.5	20110922	Product data sheet	-	74LVC1G57 v.4	
74LVC1G57 v.4	20101015	Product data sheet	-	74LVC1G57 v.3	
74LVC1G57 v.3	20070719	Product data sheet	-	74LVC1G57 v.2	
74LVC1G57 v.2	20060911	Product data sheet	-	74LVC1G57 v.1	
74LVC1G57 v.1	20040906	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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