

# 74LVC1G57

## Low-power configurable multiple function gate

Rev. 03 — 19 July 2007

Product data sheet

## 1. General description

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The 74LVC1G57 provides configurable multiple functions. The output state is determined by eight patterns of 3-bit input. The user can choose the logic functions AND, OR, NAND, NOR, XNOR, inverter and buffer. All inputs can be connected to  $V_{CC}$  or GND.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of this device in a mixed 3.3 V and 5 V environment.

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.

All inputs (A, B and C) have Schmitt trigger action. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

## 2. Features

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- 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)
- $\pm 24$  mA output drive ( $V_{CC} = 3.0$  V)
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 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

### 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC1G57GW	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363
74LVC1G57GV	-40 °C to +125 °C	SC-74	plastic surface-mounted package (TSOP6); 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
74LVC1G57GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891

### 4. Marking

Table 2. Marking

Type number	Marking code
74LVC1G57GW	YC
74LVC1G57GV	V57
74LVC1G57GM	YC
74LVC1G57GF	YC

### 5. Functional diagram

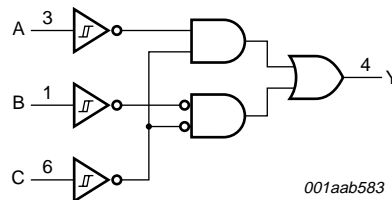
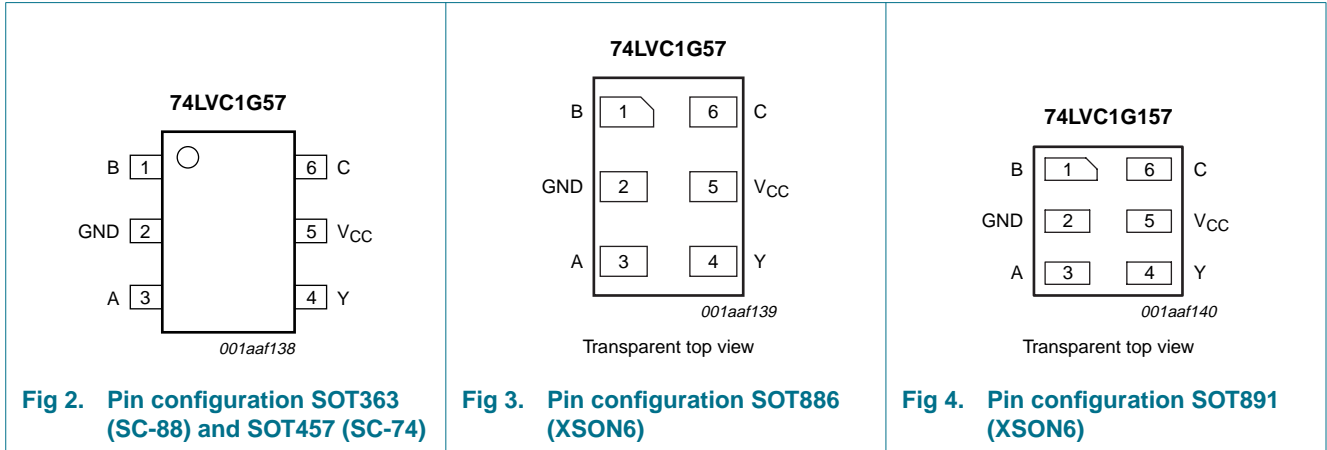


Fig 1. Logic symbol

## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
B	1	data input
GND	2	ground (0 V)
A	3	data input
Y	4	data output
V <sub>CC</sub>	5	supply voltage
C	6	data input

## 7. Functional description

Table 4. Function table<sup>[1]</sup>

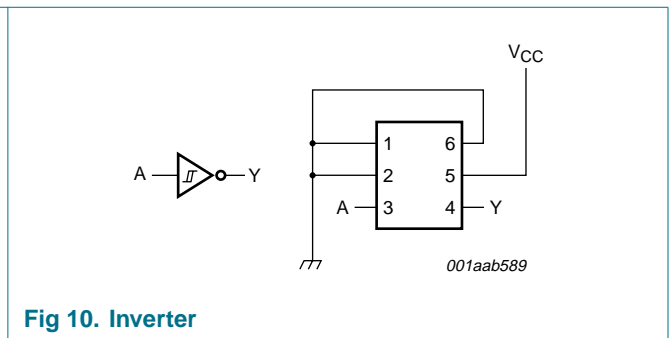
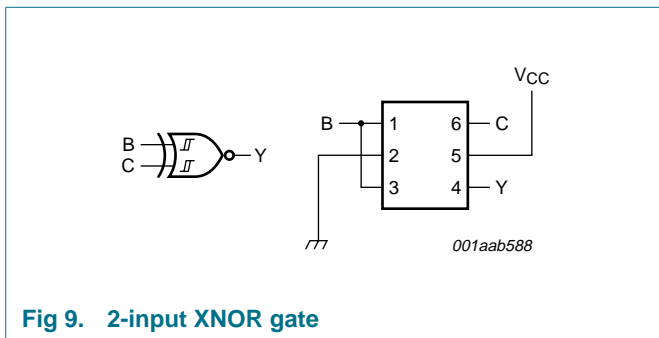
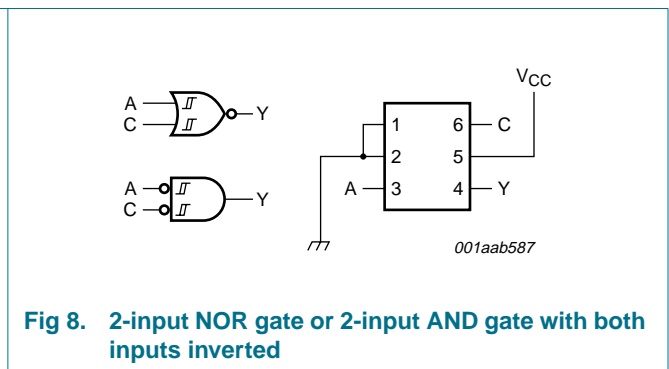
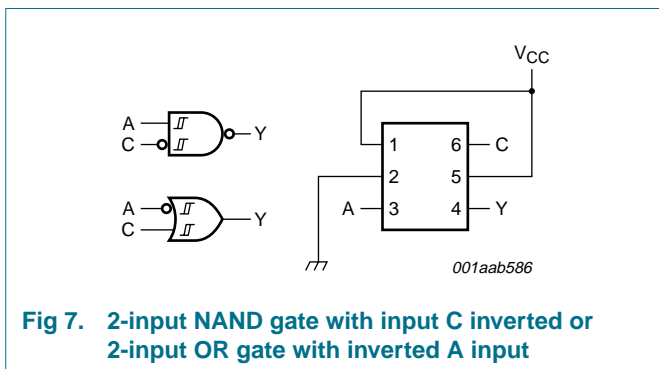
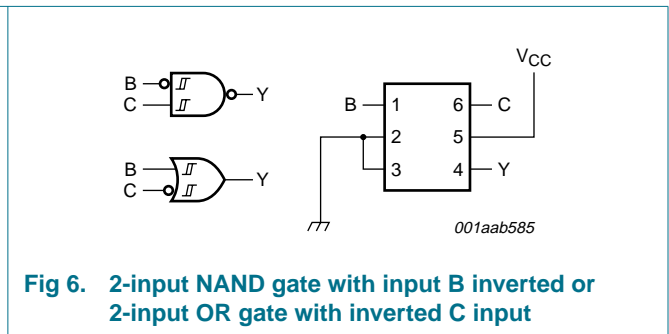
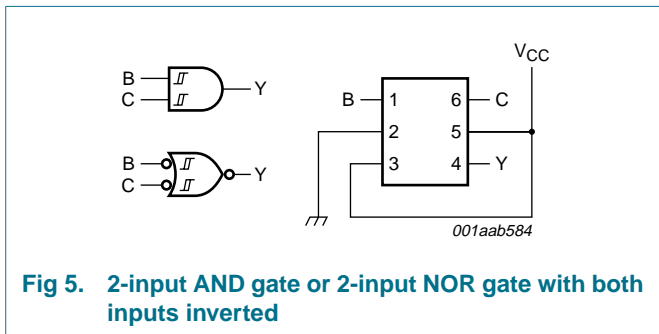
Input			Output
C	B	A	Y
L	L	L	H
L	L	H	L
L	H	L	H
L	H	H	L
H	L	L	L
H	L	H	L
H	H	L	H
H	H	H	H

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

7.1 Logic configurations

Table 5. Function selection table

Logic function	Figure
2-input AND	see <a href="#">Figure 5</a>
2-input AND with both inputs inverted	see <a href="#">Figure 8</a>
2-input NAND with inverted input	see <a href="#">Figure 6</a> and <a href="#">Figure 7</a>
2-input OR with inverted input	see <a href="#">Figure 6</a> and <a href="#">Figure 7</a>
2-input NOR	see <a href="#">Figure 8</a>
2-input NOR with both inputs inverted	see <a href="#">Figure 5</a>
2-input XNOR	see <a href="#">Figure 9</a>
Inverter	see <a href="#">Figure 10</a>
Buffer	see <a href="#">Figure 11</a>



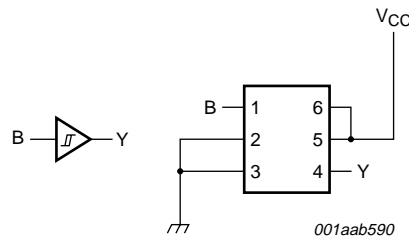


Fig 11. Buffer

## 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	
$V_I$	input voltage		[1]	-0.5	+6.5	V
$I_{OK}$	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	±50	mA	
$V_O$	output voltage	Active mode	[1][2]	-0.5	+6.5	V
		Power-down mode	[1][2]	-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	
$T_{stg}$	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  $V_{CC} = 0$  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 packages: above 45 °C the value of  $P_{tot}$  derates linearly with 2.4 mW/K.

## 9. Recommended operating conditions

Table 7. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	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
		$V_{CC} = 0$ V; Power-down mode	0	-	5.5	V
$T_{amb}$	ambient temperature		-40	-	+125	°C

## 10. Static characteristics

**Table 8. Static 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 <sup>[1]</sup>	Max	Min	Max	
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>CC</sub> or GND						
		I <sub>O</sub> = 100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V	-	-	0.1	-	0.1	V
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V	-	-	0.45	-	0.7	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V	-	-	0.3	-	0.45	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.4	-	0.6	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	-	0.55	-	0.8	V
		I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V	-	-	0.55	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>CC</sub> or GND						
		I <sub>O</sub> = -100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V	V <sub>CC</sub> - 0.1	-	-	V <sub>CC</sub> - 0.1	-	V
		I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V	1.2	-	-	0.95	-	V
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V	1.9	-	-	1.7	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	2.2	-	-	1.9	-	V
		I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V	2.3	-	-	2.0	-	V
		I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V	3.8	-	-	3.4	-	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	±0.1	±5	-	±100	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 0 V	-	±0.1	±10	-	±200	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = 5.5 V or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 1.65 V to 5.5 V	-	0.1	10	-	200	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 2.3 V to 5.5 V	-	5	500	-	5000	μA
C <sub>I</sub>	input capacitance		-	2.5	-	-	-	pF

[1] Typical values are measured at maximum V<sub>CC</sub> and T<sub>amb</sub> = 25 °C.

## 11. Dynamic characteristics

**Table 9. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for load circuit see [Figure 13](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
t <sub>pd</sub>	propagation delay	A, B, C to Y; see <a href="#">Figure 12</a> <sup>[2]</sup>						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	6.0	14.4	1.0	18	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	3.5	8.3	0.5	10.4	ns
		V <sub>CC</sub> = 2.7 V	0.5	4.2	8.5	0.5	10.6	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.5	3.8	6.3	0.5	7.9	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.5	3.0	5.1	0.5	6.4	ns
C <sub>PD</sub>	power dissipation capacitance	V <sub>CC</sub> = 3.3 V; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[3]</sup>	-	22	-	-	-	pF

[1] Typical values are measured at nominal V<sub>CC</sub> and at T<sub>amb</sub> = 25 °C.

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>

[3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

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

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

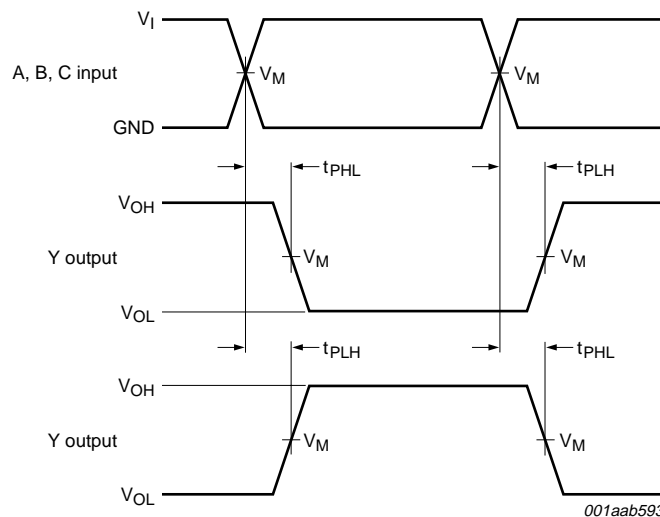
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs.

## 12. Waveforms



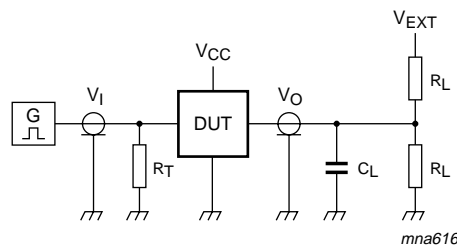
Measurement points are given in [Table 10](#).

V<sub>OL</sub> and V<sub>OH</sub> are typical output voltage levels that occur with the output load.

**Fig 12. Input A, B and C to output Y propagation delay times**

Table 10. Measurement points

Supply voltage	Input		Output
$V_{CC}$	$V_M$	$V_I$	$V_M$
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 [Table 11](#).

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. Load circuit for switching times

Table 11. Measurement points

Supply voltage	Input		Load		$V_{EXT}$
$V_{CC}$	$V_I$	$t_r = t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$
1.65 V to 1.95 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	1 k $\Omega$	open
2.3 V to 2.7 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	500 $\Omega$	open
2.7 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open
3.0 V to 3.6 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open
4.5 V to 5.5 V	$V_{CC}$	$\leq 2.5$ ns	50 pF	500 $\Omega$	open



### 13. Transfer characteristics

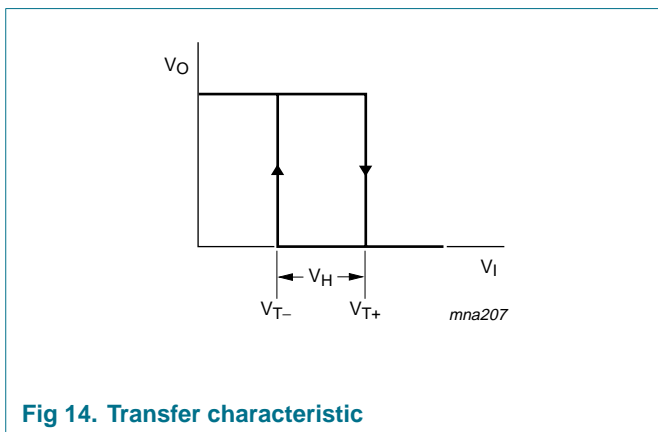
**Table 12. Transfer characteristics**

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

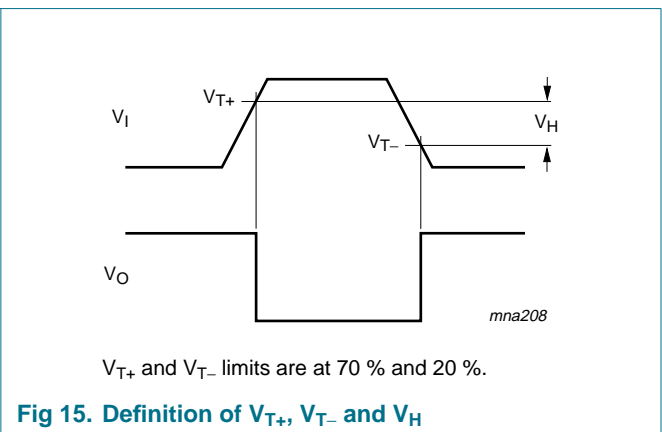
Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
V <sub>T+</sub>	positive-going threshold voltage	see <a href="#">Figure 14</a> , <a href="#">Figure 15</a> , <a href="#">Figure 16</a> and <a href="#">Figure 17</a>						
		V <sub>CC</sub> = 1.8 V	0.70	1.02	1.20	0.67	1.20	V
		V <sub>CC</sub> = 2.3 V	1.11	1.42	1.60	1.08	1.60	V
		V <sub>CC</sub> = 3.0 V	1.50	1.79	2.00	1.47	2.00	V
		V <sub>CC</sub> = 4.5 V	2.16	2.52	2.74	2.13	2.74	V
V <sub>T-</sub>	negative-going threshold voltage	see <a href="#">Figure 14</a> , <a href="#">Figure 15</a> , <a href="#">Figure 16</a> and <a href="#">Figure 17</a>						
		V <sub>CC</sub> = 1.8 V	0.30	0.53	0.72	0.30	0.75	V
		V <sub>CC</sub> = 2.3 V	0.58	0.77	1.00	0.58	1.03	V
		V <sub>CC</sub> = 3.0 V	0.80	1.04	1.30	0.80	1.33	V
		V <sub>CC</sub> = 4.5 V	1.21	1.55	1.90	1.21	1.93	V
V <sub>H</sub>	hysteresis voltage (V <sub>T+</sub> - V <sub>T-</sub> )	see <a href="#">Figure 14</a> , <a href="#">Figure 15</a> , <a href="#">Figure 16</a> and <a href="#">Figure 17</a>						
		V <sub>CC</sub> = 1.8 V	0.30	0.48	0.62	0.23	0.62	V
		V <sub>CC</sub> = 2.3 V	0.40	0.64	0.80	0.34	0.80	V
		V <sub>CC</sub> = 3.0 V	0.50	0.75	1.00	0.44	1.00	V
		V <sub>CC</sub> = 4.5 V	0.71	0.97	1.20	0.65	1.20	V
		V <sub>CC</sub> = 5.5 V	0.71	1.13	1.40	0.65	1.40	V

[1] Typical values are measured at T<sub>amb</sub> = 25 °C.

### 14. Waveforms transfer characteristics



**Fig 14. Transfer characteristic**



**Fig 15. Definition of V<sub>T+</sub>, V<sub>T-</sub> and V<sub>H</sub>**

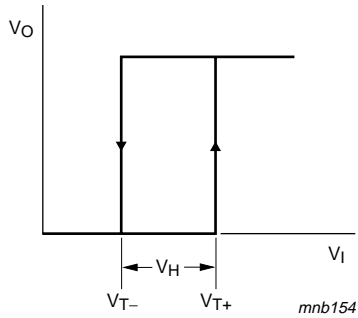
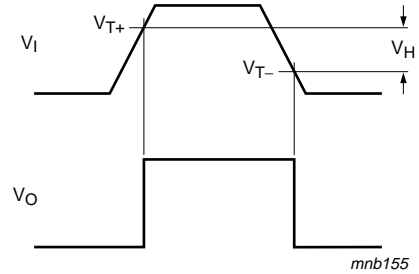


Fig 16. Transfer characteristic



$V_{T+}$  and  $V_{T-}$  limits are at 70 % and 20 %.

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

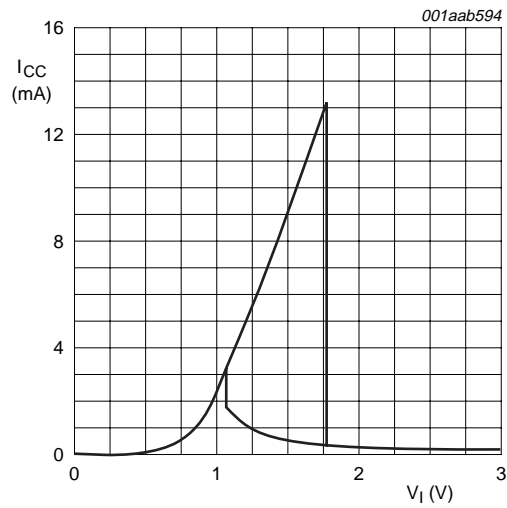


Fig 18. Typical 74LVC1G57 transfer characteristic;  $V_{CC} = 3.0$  V

15. Package outline

Plastic surface-mounted package; 6 leads

SOT363

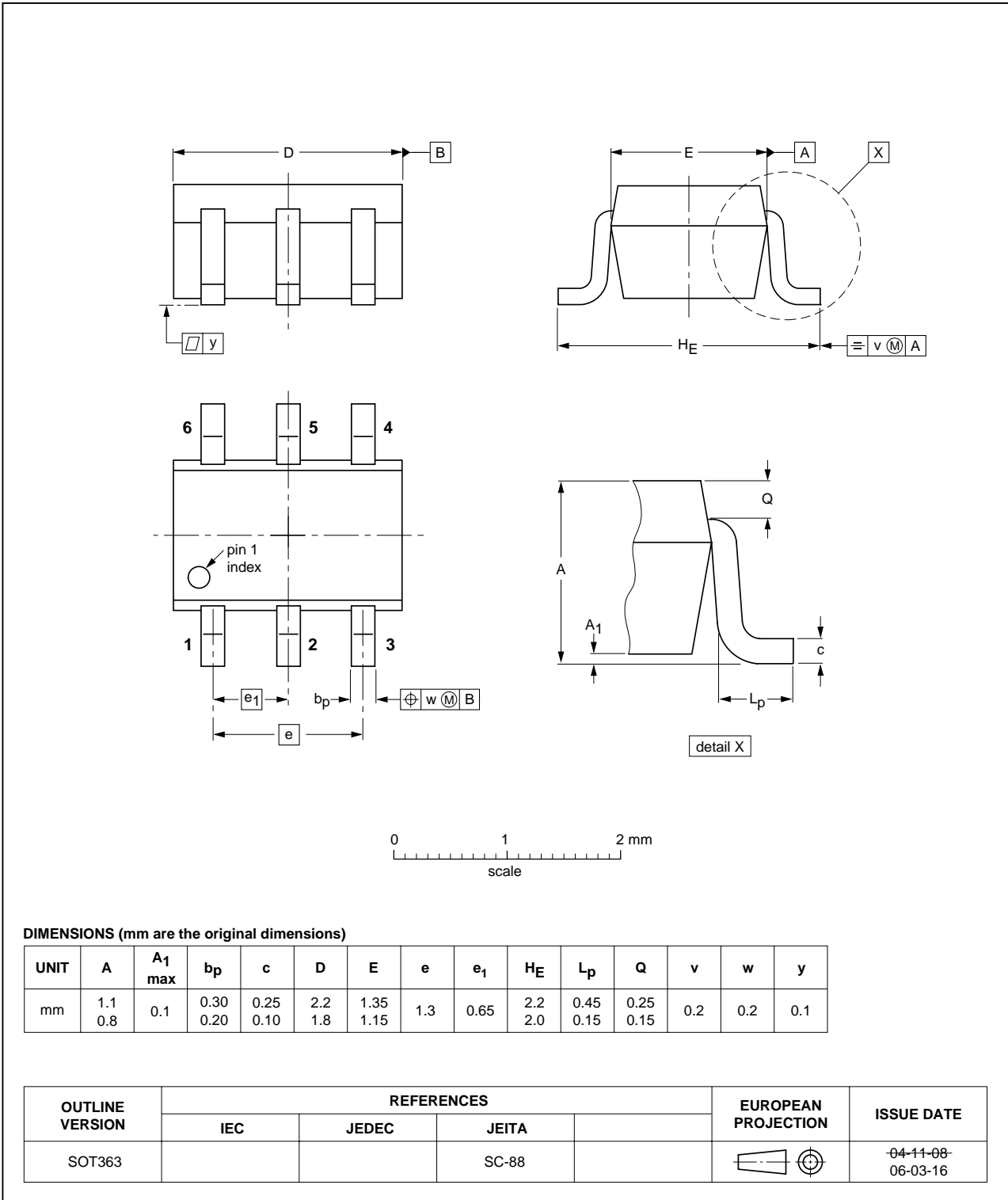


Fig 19. Package outline SOT363 (SC-88)

Plastic surface-mounted package (TSOP6); 6 leads

SOT457

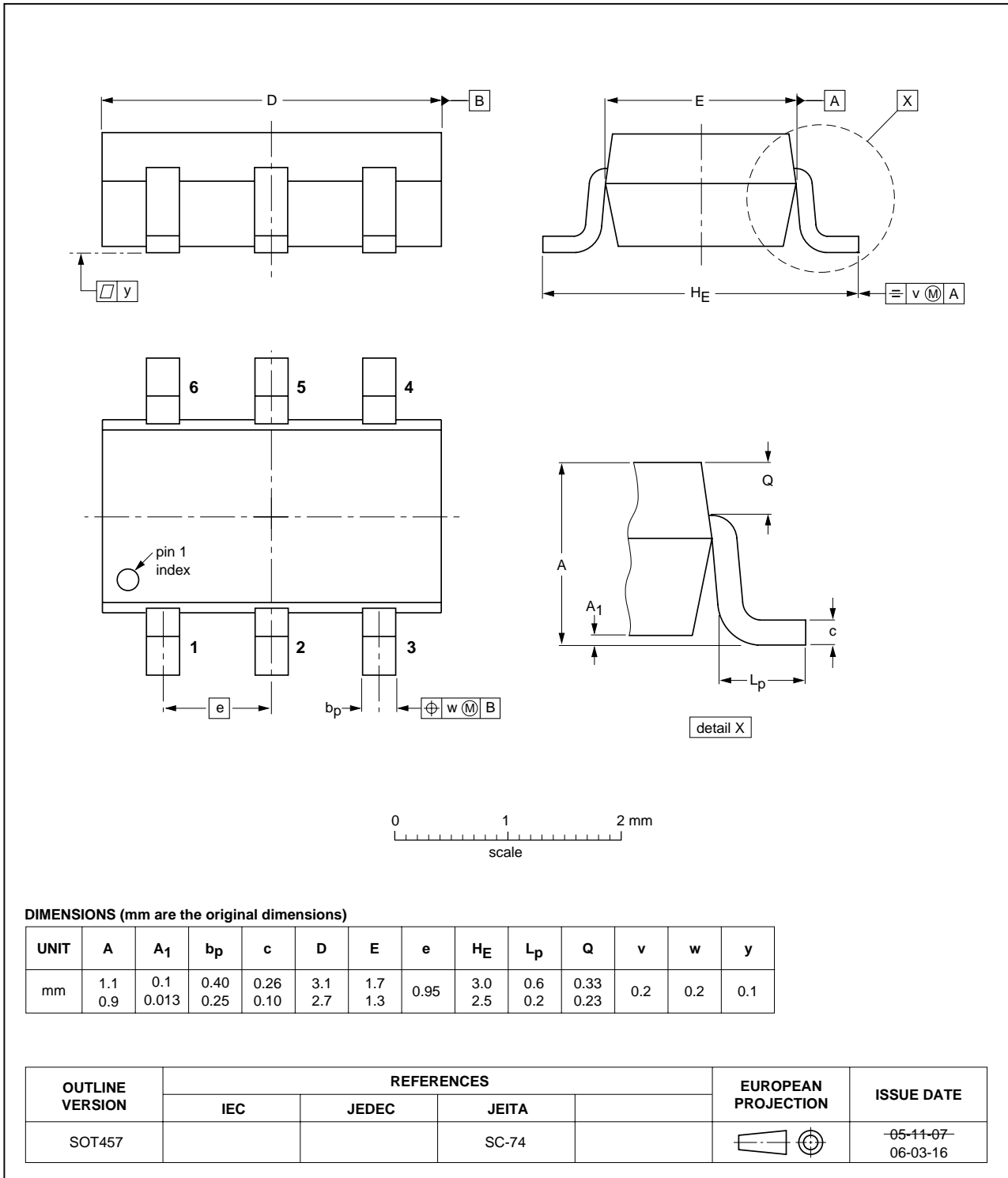


Fig 20. Package outline SOT457 (SC-74)

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

SOT886



Fig 21. Package outline SOT886 (XSON6)

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

SOT891

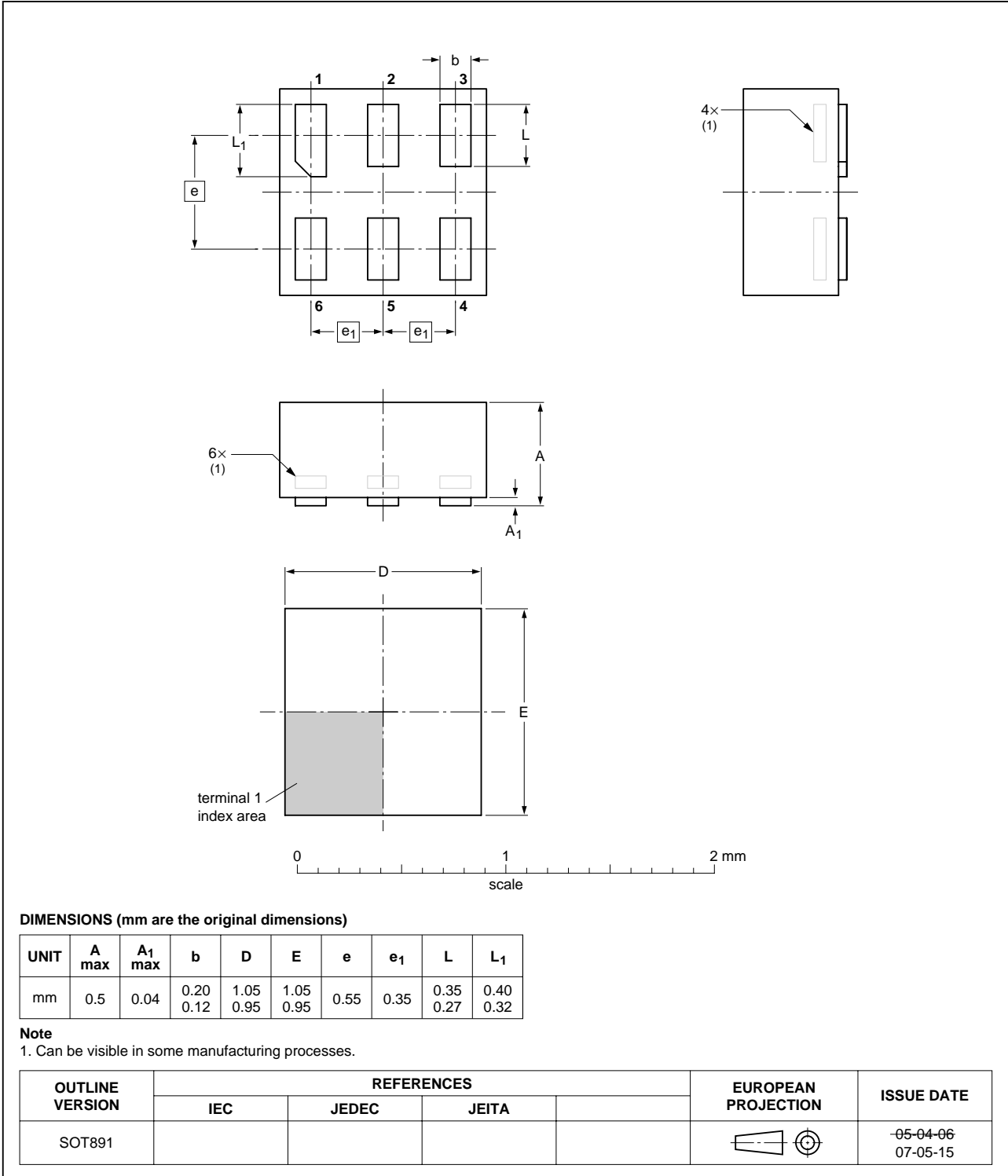


Fig 22. Package outline SOT891 (XSON6)

## 16. Abbreviations

**Table 13. Abbreviations**

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

## 17. Revision history

**Table 14. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC1G57_3	20070719	Product data sheet	-	74LVC1G57_2
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Section 10 "Static characteristics"</a>: Changed: Conditions for input leakage current and supply current.</li> <li>New package outline drawing for XSON6/SOT891.</li> </ul>			
74LVC1G57_2	20060911	Product data sheet	-	74LVC1G57_1
74LVC1G57_1	20040906	Product data sheet	-	-

## 18. Legal information

### 18.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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