

# 74LVC1G57-Q100

Low-power configurable multiple function gate

Rev. 3 — 4 June 2021

Product data sheet

## 1. General description

The 74LVC1G57-Q100 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.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Wide supply voltage range from 1.65 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- $\pm 24$  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:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V ( $C = 200$  pF,  $R = 0$   $\Omega$ )

## 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC1G57GW-Q100	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363
74LVC1G57GV-Q100	-40 °C to +125 °C	SC-74; TSOP6	plastic surface-mounted package; 6 leads	SOT457

## 4. Marking

Table 2. Marking

Type number	Marking code [1]
74LVC1G57GW-Q100	YC
74LVC1G57GV-Q100	V57

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

## 5. Functional diagram

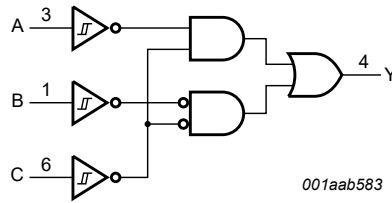


Fig. 1. Logic symbol

## 6. Pinning information

### 6.1. Pinning

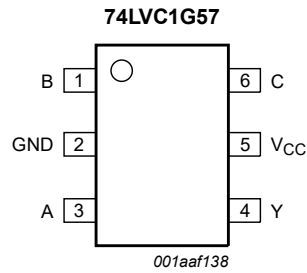


Fig. 2. Pin configuration SOT363 (SC-88) and SOT457 (SC-74; TSOP6)

### 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**

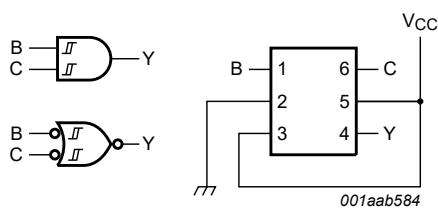
H = HIGH voltage level; L = LOW voltage level.

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

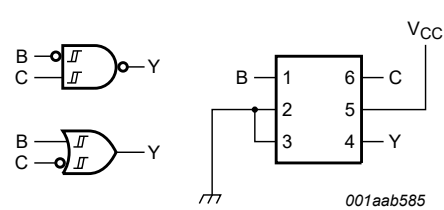
### 7.1. Logic configurations

**Table 5. Function selection table**

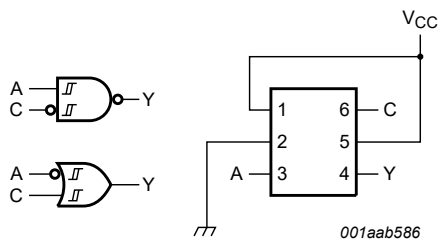
Logic function	Figure
2-input AND	see <a href="#">Fig. 3</a>
2-input AND with both inputs inverted	see <a href="#">Fig. 6</a>
2-input NAND with inverted input	see <a href="#">Fig. 4</a> and <a href="#">Fig. 5</a>
2-input OR with inverted input	see <a href="#">Fig. 4</a> and <a href="#">Fig. 5</a>
2-input NOR	see <a href="#">Fig. 6</a>
2-input NOR with both inputs inverted	see <a href="#">Fig. 3</a>
2-input XNOR	see <a href="#">Fig. 7</a>
Inverter	see <a href="#">Fig. 8</a>
Buffer	see <a href="#">Fig. 9</a>



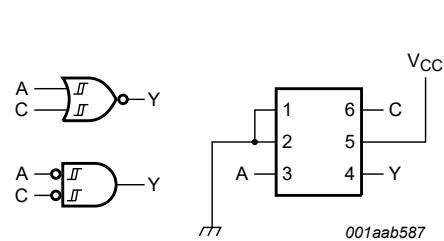
**Fig. 3. 2-input AND gate or 2-input NOR gate with both inputs inverted**



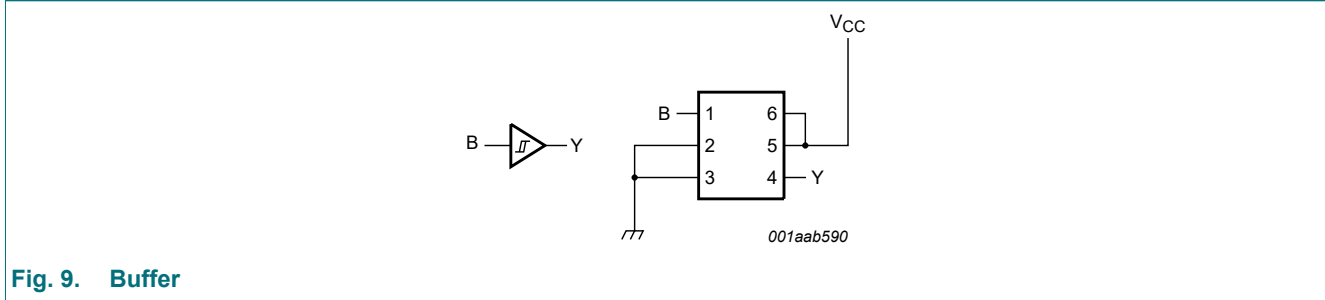
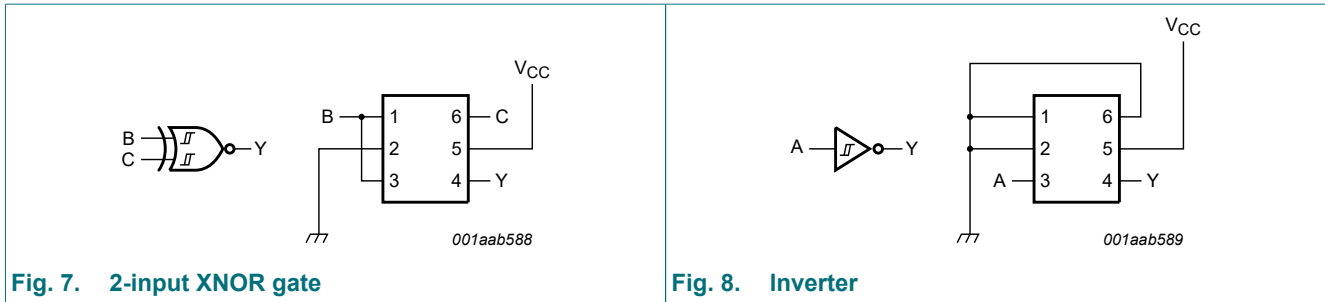
**Fig. 4. 2-input NAND gate with input B inverted or 2-input OR gate with inverted C input**



**Fig. 5. 2-input NAND gate with input C inverted or 2-input OR gate with inverted A input**



**Fig. 6. 2-input NOR gate or 2-input AND gate with both inputs inverted**



## 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	-	$\pm 50$	mA	
$V_O$	output voltage	Active mode	[1]	-0.5	+6.5	V
		Power-down mode; $V_{CC} = 0$ V	[1]	-0.5	+6.5	V
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	$\pm 50$	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.

[2] For SOT363 (SC-88) package:  $P_{tot}$  derates linearly with 3.7 mW/K above 83 °C.

For SOT457 (SC-74; TSOP6) package:  $P_{tot}$  derates linearly with 4.1 mW/K above 89 °C.

## 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
		Power-down mode; $V_{CC} = 0$ V	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 [1]	Max	Min	Max	
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>						
		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>T+</sub> or V <sub>T-</sub>						
		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	±1	-	±1	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	±2	-	±2	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	4	-	4	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	-	500	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 test circuit see Fig. 11.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
t <sub>pd</sub>	propagation delay	A, B, C to Y; see Fig. 10 [2]						
		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> [3]	-	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.

### 11.1. Waveforms and test circuit

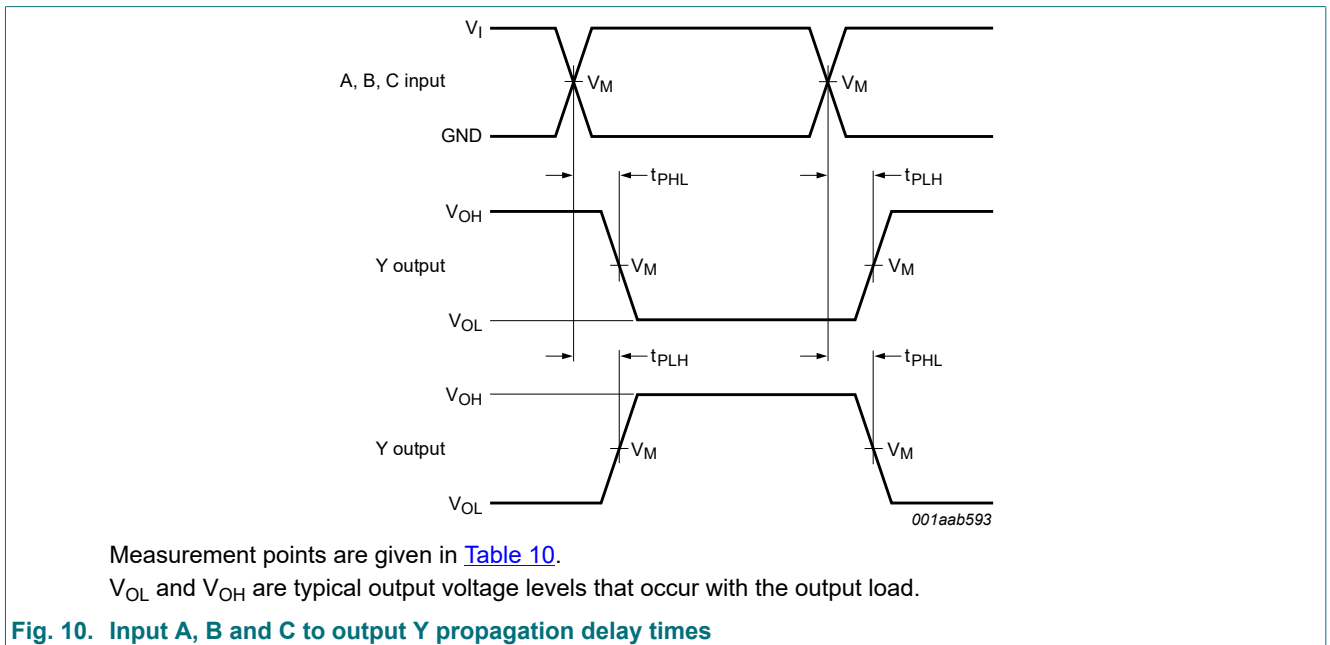
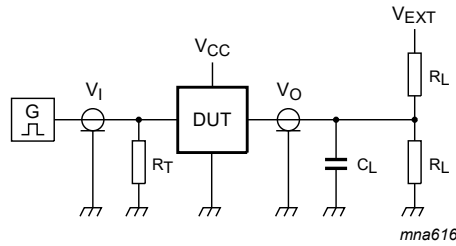


Table 10. Measurement points

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. 11. Test circuit for measuring switching times

Table 11. Test data

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

## 12. Transfer characteristics

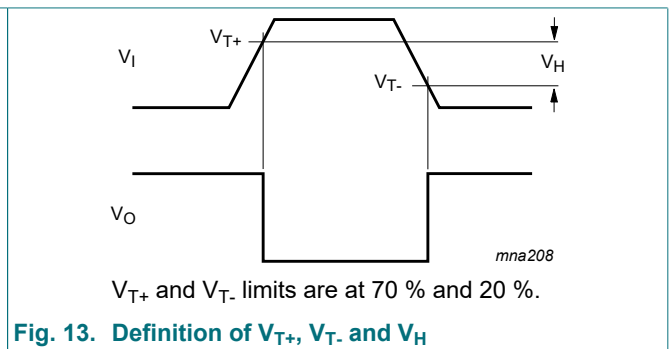
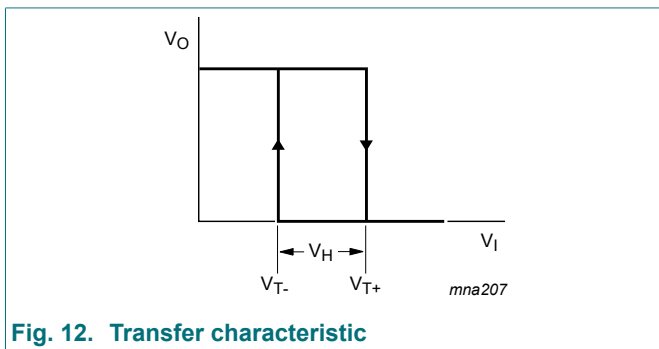
**Table 12. Transfer characteristics**

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 <sub>T+</sub>	positive-going threshold voltage	see <a href="#">Fig. 12</a> , <a href="#">Fig. 13</a> , <a href="#">Fig. 14</a> and <a href="#">Fig. 15</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="#">Fig. 12</a> , <a href="#">Fig. 13</a> , <a href="#">Fig. 14</a> and <a href="#">Fig. 15</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="#">Fig. 12</a> , <a href="#">Fig. 13</a> , <a href="#">Fig. 14</a> and <a href="#">Fig. 15</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.

### 12.1. Waveforms transfer characteristics





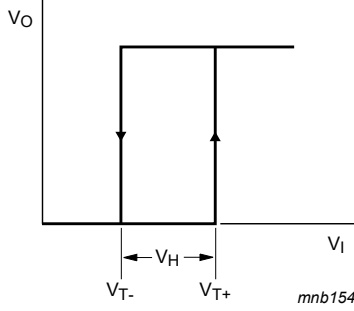
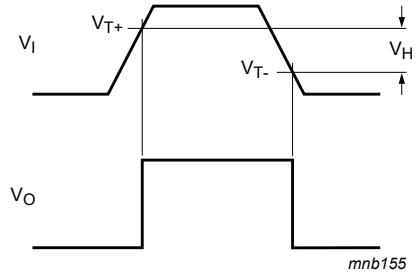


Fig. 14. Transfer characteristic



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

Fig. 15. Definition of  $V_{T+}$ ,  $V_{T-}$  and  $V_H$

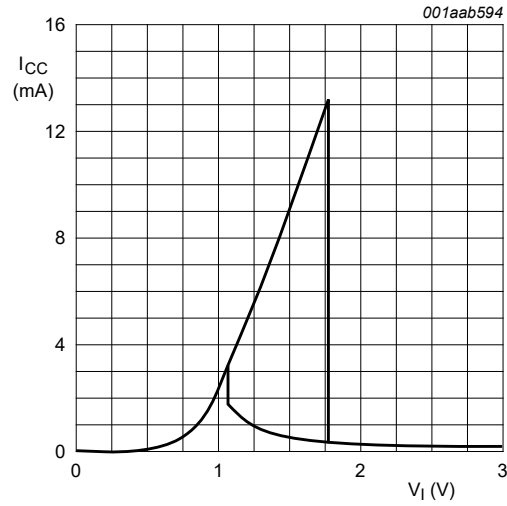


Fig. 16. Typical 74LVC1G57-Q100 transfer characteristic;  $V_{CC} = 3.0$  V

13. Package outline

Plastic surface-mounted package; 6 leads

SOT363

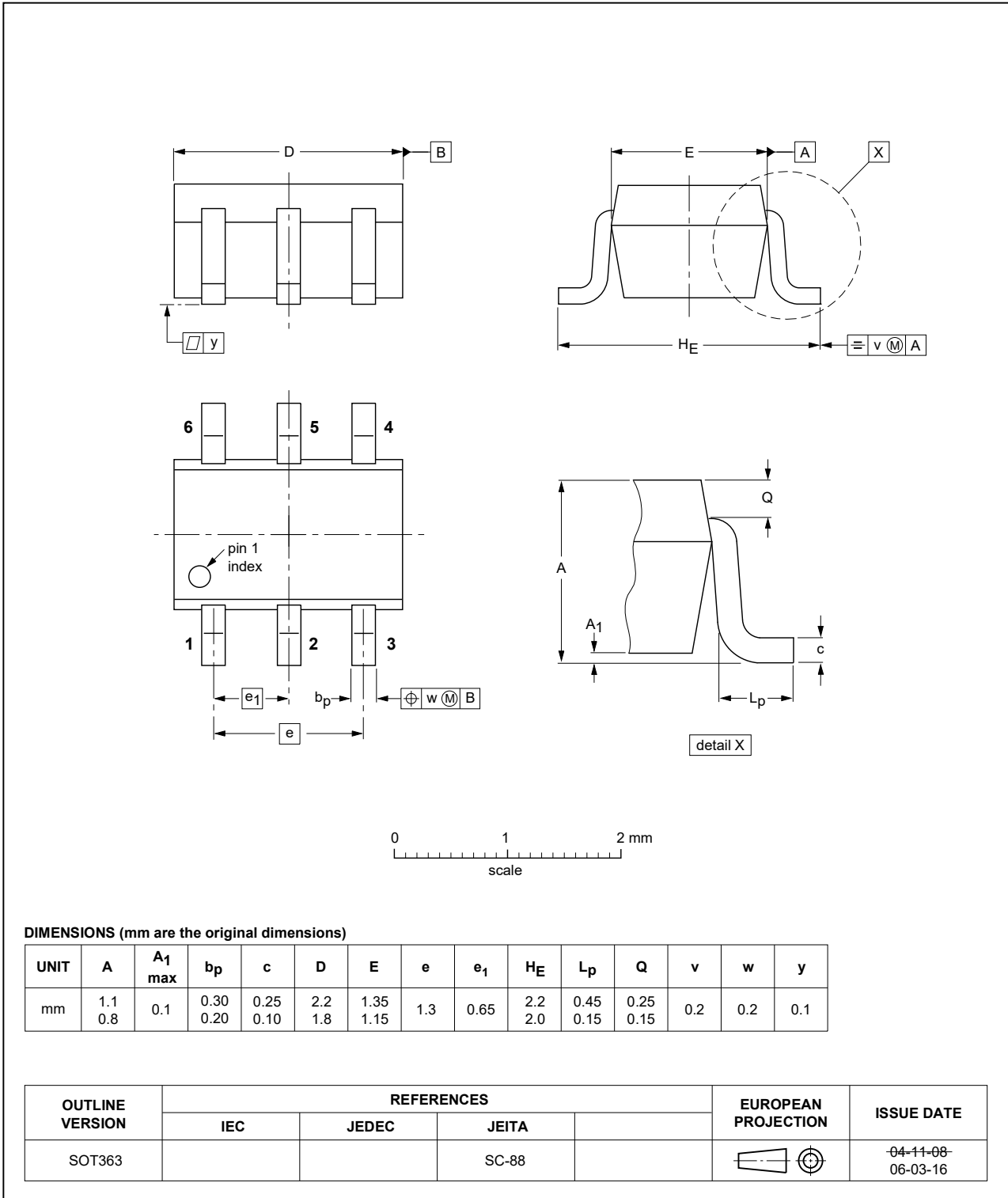


Fig. 17. Package outline SOT363 (SC-88)

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

SOT457

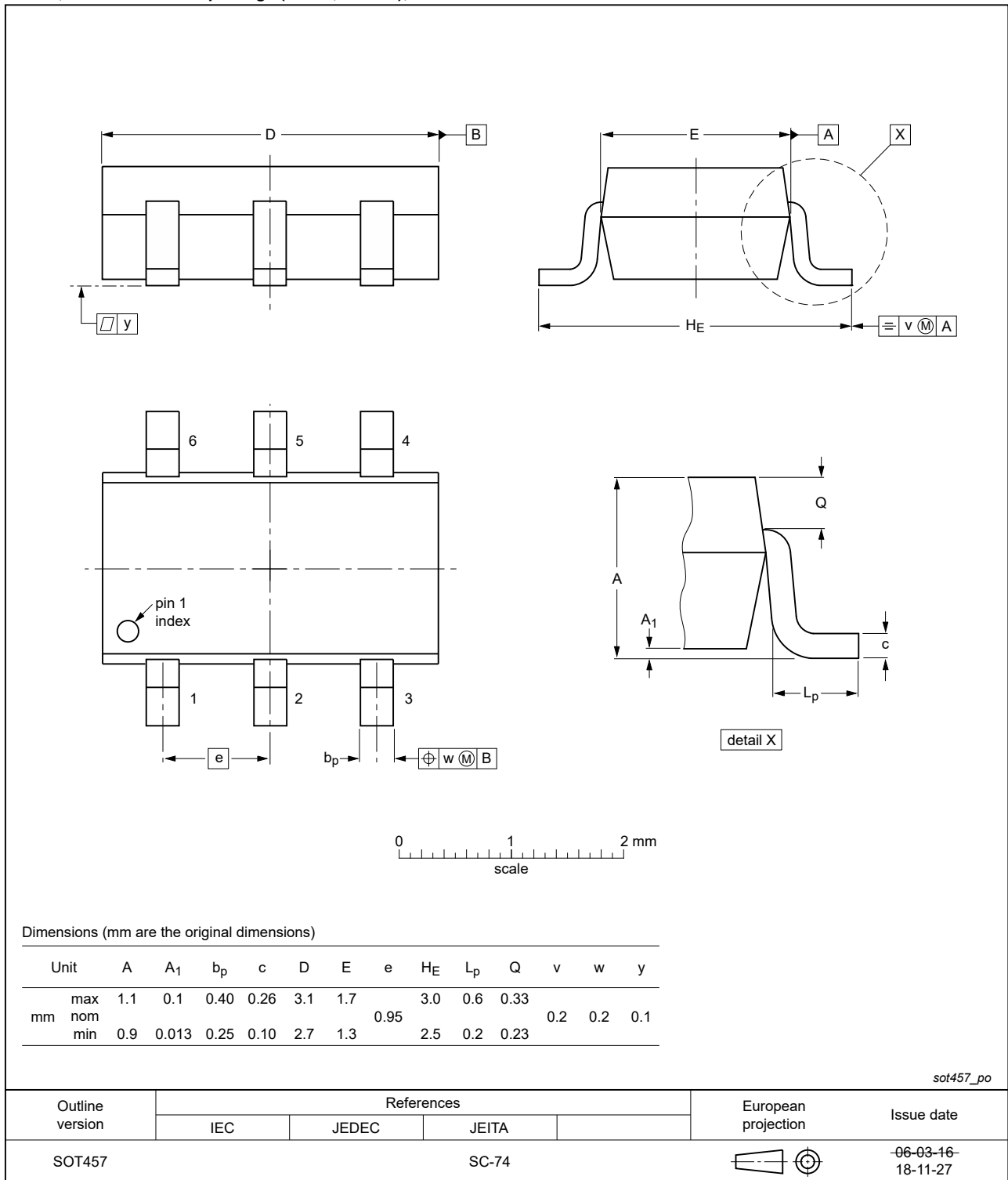


Fig. 18. Package outline SOT457 (SC-74; TSOP6)

## 14. Abbreviations

Table 13. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	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
74LVC1G57_Q100 v.3	20210604	Product data sheet	-	74LVC1G57_Q100 v.2
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Section 1</a> and <a href="#">Section 2</a> updated.</li> <li><a href="#">Section 8</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> <li><a href="#">Fig. 18</a>: Package outline drawing SOT457 (SC-74; TSOP6) updated.</li> </ul>			
74LVC1G57_Q100 v.2	20161209	Product data sheet	-	74LVC1G57_Q100 v.1
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Table 8</a>: The maximum limits for leakage current and supply current have changed.</li> </ul>			
74LVC1G57_Q100 v.1	20140415	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.

- [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 <https://www.nexperia.com>.

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