

# 74LVC1G57

Low-power configurable multiple function gate

Rev. 01 — 6 September 2004

Product data sheet

## 1. General description

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The 74LVC1G57 is a high-performance, low-power, low-voltage, Si-gate CMOS device, superior to most advanced CMOS compatible TTL families.

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.

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.

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 EIA/JESD22-A114-B exceeds 2000 V
  - ◆ MM EIA/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.

**PHILIPS**

### 3. Quick reference data

**Table 1: Quick reference data**

$GND = 0\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ;  $t_r = t_f \leq 2.5\text{ ns}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{PHL}$ , $t_{PLH}$	propagation delay input A, B and C to output Y	$C_L = 30\text{ pF}$ ; $R_L = 1\text{ k}\Omega$ ; $V_{CC} = 1.8\text{ V}$	-	6.0	-	ns
		$C_L = 30\text{ pF}$ ; $R_L = 500\text{ }\Omega$ ; $V_{CC} = 2.5\text{ V}$	-	3.5	-	ns
		$C_L = 50\text{ pF}$ ; $R_L = 500\text{ }\Omega$ ; $V_{CC} = 2.7\text{ V}$	-	4.2	-	ns
		$C_L = 50\text{ pF}$ ; $R_L = 500\text{ }\Omega$ ; $V_{CC} = 3.3\text{ V}$	-	3.8	-	ns
		$C_L = 50\text{ pF}$ ; $R_L = 500\text{ }\Omega$ ; $V_{CC} = 5.0\text{ V}$ ;	-	3.0	-	ns
$C_I$	input capacitance		-	2.5	-	pF
$C_{PD}$	power dissipation capacitance per buffer	$V_{CC} = 3.3\text{ V}$	[1][2]	22	-	pF

[1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = total load switching outputs;

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

[2] The condition is  $V_I = GND$  to  $V_{CC}$ .

### 4. Ordering information

**Table 2: Ordering information**

Type number	Package			
	Temperature range	Name	Description	Version
74LVC1G57GW	-40 °C to +125 °C	-	plastic surface mounted package; 6 leads	SOT363
74LVC1G57GV	-40 °C to +125 °C	-	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 $1 \times 1.45 \times 0.5\text{ mm}$	SOT886

### 5. Marking

**Table 3: Marking**

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

## 6. Functional diagram

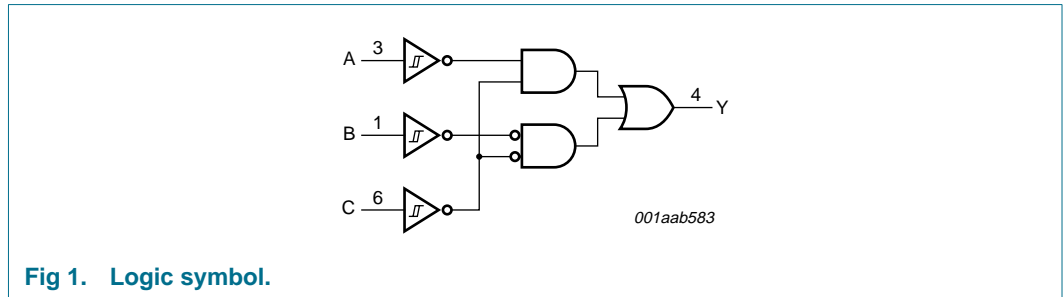


Fig 1. Logic symbol.

## 7. Pinning information

### 7.1 Pinning

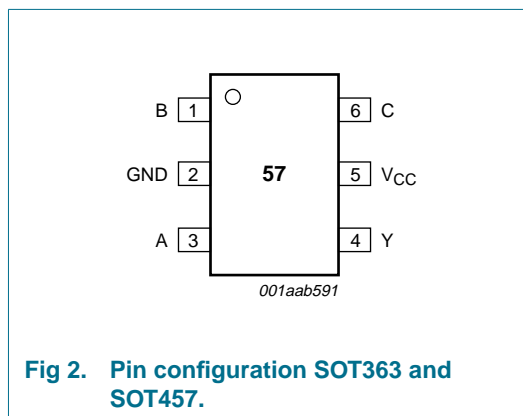


Fig 2. Pin configuration SOT363 and SOT457.

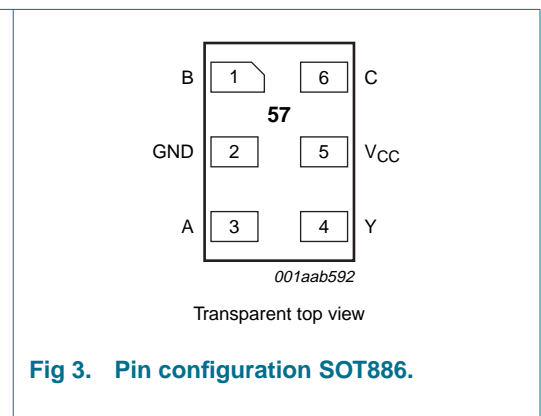


Fig 3. Pin configuration SOT886.

### 7.2 Pin description

Table 4: Pin description

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

## 8. Functional description

### 8.1 Function table

Table 5: Function table <sup>[1]</sup>

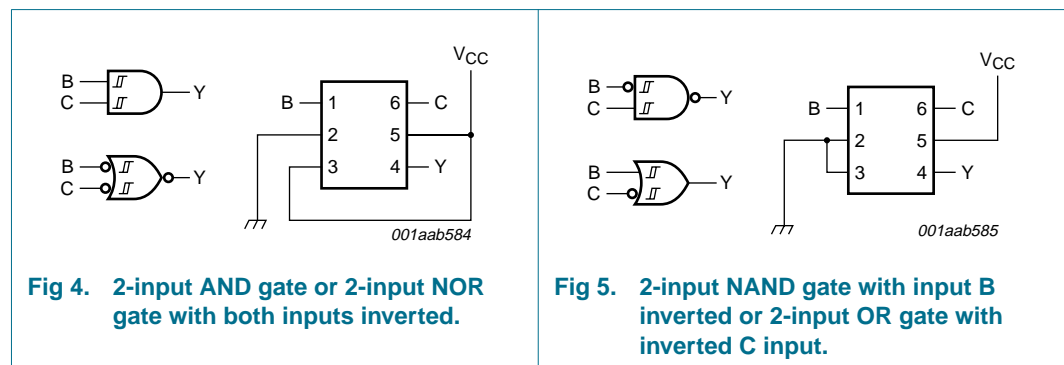
Input			Output
C	B	A	Y
L	L	L	H
L	L	H	L
L	H	L	H
L	H	H	L
H	L	L	L
H	L	H	L
H	H	L	H
H	H	H	H

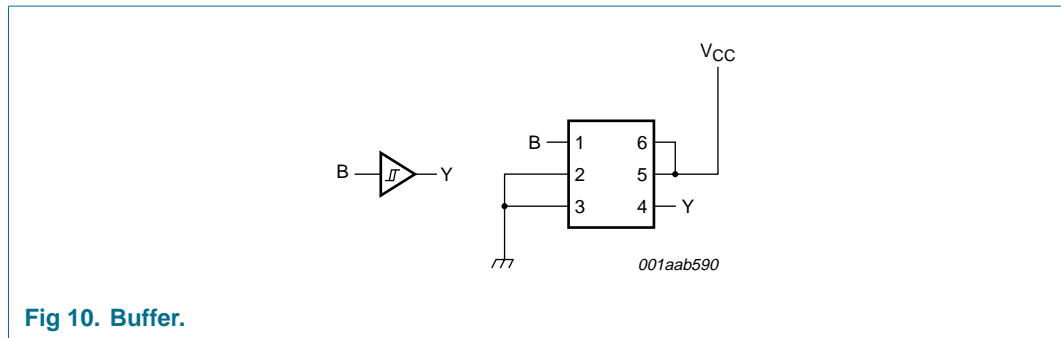
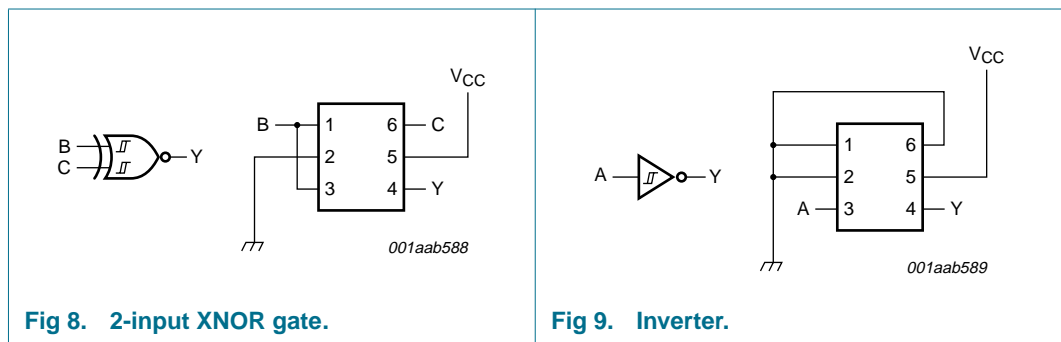
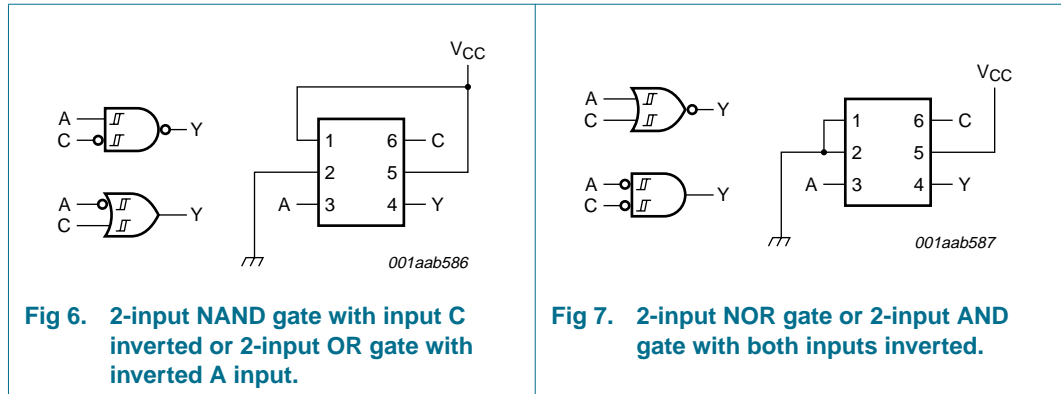
[1] H = HIGH voltage level;  
L = LOW voltage level.

### 8.2 Logic configurations

Table 6: Function selection table

Logic function	Figure
2-input AND	see <a href="#">Figure 4</a>
2-input AND with both inputs inverted	see <a href="#">Figure 7</a>
2-input NAND with inverted input	see <a href="#">Figure 5</a> and <a href="#">6</a>
2-input OR with inverted input	see <a href="#">Figure 5</a> and <a href="#">6</a>
2-input NOR	see <a href="#">Figure 7</a>
2-input NOR with both inputs inverted	see <a href="#">Figure 4</a>
2-input XNOR	see <a href="#">Figure 8</a>
Inverter	see <a href="#">Figure 9</a>
Buffer	see <a href="#">Figure 10</a>





## 9. Limiting values

**Table 7: 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 diode current	$V_I < 0\text{ V}$	-	-50	mA
$V_I$	input voltage		[1] -0.5	+6.5	V
$I_{OK}$	output diode current	$V_O > V_{CC}$ or $V_O < 0\text{ V}$	-	$\pm 50$	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 source or sink current	$V_O = 0\text{ V to }V_{CC}$	-	$\pm 50$	mA

**Table 7: Limiting values ...continued**

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
$I_{CC}, I_{GND}$	$V_{CC}$ or GND current		-	$\pm 100$	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	power dissipation	$T_{amb} = -40\text{ °C to }+125\text{ °C}$	-	300	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.

## 10. Recommended operating conditions

**Table 8: 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
		$V_{CC} = 0\text{ V}$ ; Power-down mode	0	-	5.5	V
$T_{amb}$	operating ambient temperature		-40	-	+125	°C

## 11. Static characteristics

**Table 9: Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = -40\text{ °C to }+85\text{ °C}$ [1]						
$V_{OL}$	LOW-level output voltage	$V_I = V_{CC}$ or GND				
		$I_O = 100\ \mu\text{A}$ ; $V_{CC} = 1.65\text{ V to }5.5\text{ V}$	-	-	0.1	V
		$I_O = 4\text{ mA}$ ; $V_{CC} = 1.65\text{ V}$	-	-	0.45	V
		$I_O = 8\text{ mA}$ ; $V_{CC} = 2.3\text{ V}$	-	-	0.3	V
		$I_O = 12\text{ mA}$ ; $V_{CC} = 2.7\text{ V}$	-	-	0.4	V
		$I_O = 24\text{ mA}$ ; $V_{CC} = 3.0\text{ V}$	-	-	0.55	V
		$I_O = 32\text{ mA}$ ; $V_{CC} = 4.5\text{ V}$	-	-	0.55	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{CC}$ or GND				
		$I_O = -100\ \mu\text{A}$ ; $V_{CC} = 1.65\text{ V to }5.5\text{ V}$	$V_{CC} - 0.1$	-	-	V
		$I_O = -4\text{ mA}$ ; $V_{CC} = 1.65\text{ V}$	1.2	-	-	V
		$I_O = -8\text{ mA}$ ; $V_{CC} = 2.3\text{ V}$	1.9	-	-	V
		$I_O = -12\text{ mA}$ ; $V_{CC} = 2.7\text{ V}$	2.2	-	-	V
		$I_O = -24\text{ mA}$ ; $V_{CC} = 3.0\text{ V}$	2.3	-	-	V
		$I_O = -32\text{ mA}$ ; $V_{CC} = 4.5\text{ V}$	3.8	-	-	V
$I_{LI}$	input leakage current	$V_I = 5.5\text{ V}$ or GND; $V_{CC} = 3.6\text{ V}$	-	$\pm 0.1$	$\pm 5$	$\mu\text{A}$

**Table 9: Static characteristics ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{off}$	power OFF leakage current	$V_I$ or $V_O = 5.5$ V; $V_{CC} = 0$ V	-	$\pm 0.1$	$\pm 10$	$\mu$ A
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	0.1	10	$\mu$ A
$\Delta I_{CC}$	additional quiescent supply current per pin	$V_I = V_{CC} - 0.6$ V; $I_O = 0$ A; $V_{CC} = 2.3$ V to 5.5 V	-	5	500	$\mu$ A
$C_I$	input capacitance		-	2.5	-	pF
<b><math>T_{amb} = -40</math> °C to <math>+125</math> °C</b>						
$V_{OL}$	LOW-level output voltage	$V_I = V_{CC}$ or GND				
		$I_O = 100$ $\mu$ A; $V_{CC} = 1.65$ V to 5.5 V	-	-	0.1	V
		$I_O = 4$ mA; $V_{CC} = 1.65$ V	-	-	0.7	V
		$I_O = 8$ mA; $V_{CC} = 2.3$ V	-	-	0.45	V
		$I_O = 12$ mA; $V_{CC} = 2.7$ V	-	-	0.6	V
		$I_O = 24$ mA; $V_{CC} = 3.0$ V	-	-	0.8	V
		$I_O = 32$ mA; $V_{CC} = 4.5$ V	-	-	0.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{CC}$ or GND				
		$I_O = -100$ $\mu$ A; $V_{CC} = 1.65$ V to 5.5 V	$V_{CC} - 0.1$	-	-	V
		$I_O = -4$ mA; $V_{CC} = 1.65$ V	0.95	-	-	V
		$I_O = -8$ mA; $V_{CC} = 2.3$ V	1.7	-	-	V
		$I_O = -12$ mA; $V_{CC} = 2.7$ V	1.9	-	-	V
		$I_O = -24$ mA; $V_{CC} = 3.0$ V	2.0	-	-	V
		$I_O = -32$ mA; $V_{CC} = 4.5$ V	3.4	-	-	V
$I_{LI}$	input leakage current	$V_I = 5.5$ V or GND; $V_{CC} = 3.6$ V	-	-	$\pm 100$	$\mu$ A
$I_{off}$	power OFF leakage current	$V_I$ or $V_O = 5.5$ V; $V_{CC} = 0$ V	-	-	$\pm 200$	$\mu$ A
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	200	$\mu$ A
$\Delta I_{CC}$	additional quiescent supply current per pin	$V_I = V_{CC} - 0.6$ V; $I_O = 0$ A; $V_{CC} = 2.3$ V to 5.5 V	-	-	5000	$\mu$ A

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

## 12. Dynamic characteristics

**Table 10: Dynamic characteristics**

$GND = 0\text{ V}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b><math>T_{\text{amb}} = -40\text{ °C to }+85\text{ °C}</math> [1]</b>							
$t_{\text{PHL}}, t_{\text{PLH}}$	propagation delay A, B, C to Y	see <a href="#">Figure 11</a> and <a href="#">12</a>					
		$V_{\text{CC}} = 1.65\text{ V to }1.95\text{ V}$	1.0	6.0	14.4	ns	
		$V_{\text{CC}} = 2.3\text{ V to }2.7\text{ V}$	0.5	3.5	8.3	ns	
		$V_{\text{CC}} = 2.7\text{ V}$	0.5	4.2	8.5	ns	
		$V_{\text{CC}} = 3.0\text{ V to }3.6\text{ V}$	0.5	3.8	6.3	ns	
		$V_{\text{CC}} = 4.5\text{ V to }5.5\text{ V}$	0.5	3.0	5.1	ns	
$C_{\text{PD}}$	power dissipation capacitance per buffer	$V_{\text{CC}} = 3.3\text{ V}$	[2] [3]	-	22	-	pF
<b><math>T_{\text{amb}} = -40\text{ °C to }+125\text{ °C}</math></b>							
$t_{\text{PHL}}, t_{\text{PLH}}$	propagation delay A, B, C to Y	see <a href="#">Figure 11</a> and <a href="#">12</a>					
		$V_{\text{CC}} = 1.65\text{ V to }1.95\text{ V}$	1.0	-	18	ns	
		$V_{\text{CC}} = 2.3\text{ V to }2.7\text{ V}$	0.5	-	10.4	ns	
		$V_{\text{CC}} = 2.7\text{ V}$	0.5	-	10.6	ns	
		$V_{\text{CC}} = 3.0\text{ V to }3.6\text{ V}$	0.5	-	7.9	ns	
		$V_{\text{CC}} = 4.5\text{ V to }5.5\text{ V}$	0.5	-	6.4	ns	

[1] Typical values are measured at nominal  $V_{\text{CC}}$  and  $T_{\text{amb}} = 25\text{ °C}$ .

[2]  $C_{\text{PD}}$  is used to determine the dynamic power dissipation ( $P_{\text{D}}$  in  $\mu\text{W}$ ).

$P_{\text{D}} = C_{\text{PD}} \times V_{\text{CC}}^2 \times f_{\text{i}} \times N + \Sigma(C_{\text{L}} \times V_{\text{CC}}^2 \times f_{\text{o}})$  where:

$f_{\text{i}}$  = input frequency in MHz;

$f_{\text{o}}$  = output frequency in MHz;

$C_{\text{L}}$  = output load capacitance in pF;

$V_{\text{CC}}$  = supply voltage in V;

$N$  = total load switching outputs;

$\Sigma(C_{\text{L}} \times V_{\text{CC}}^2 \times f_{\text{o}})$  = sum of the outputs.

[3] The condition is  $V_{\text{I}} = GND$  to  $V_{\text{CC}}$ .



13. Waveforms

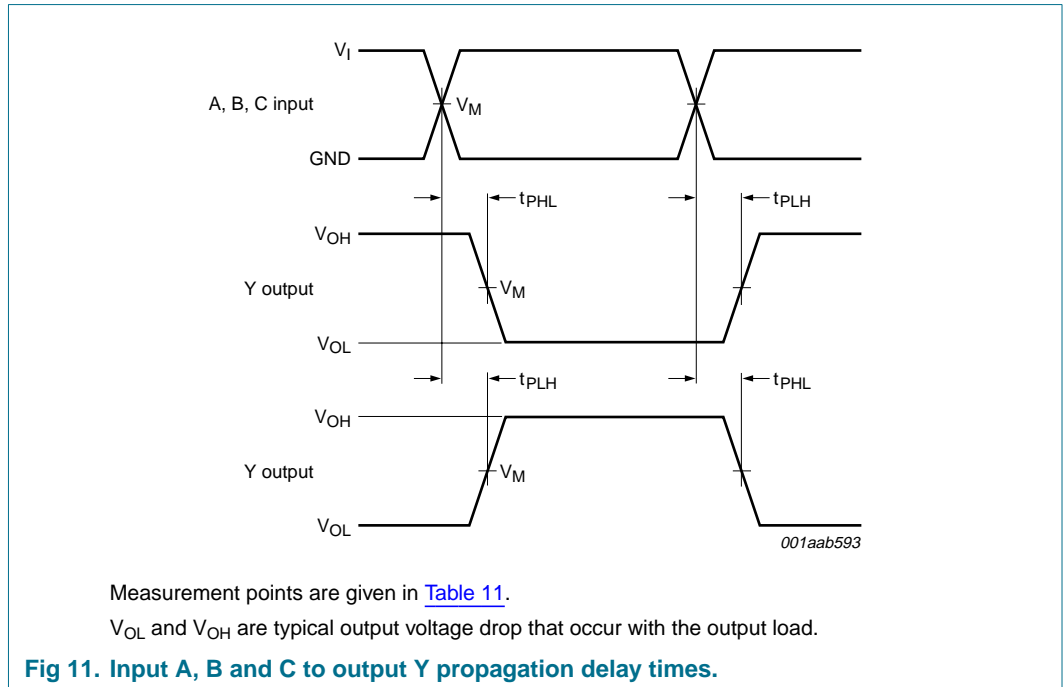
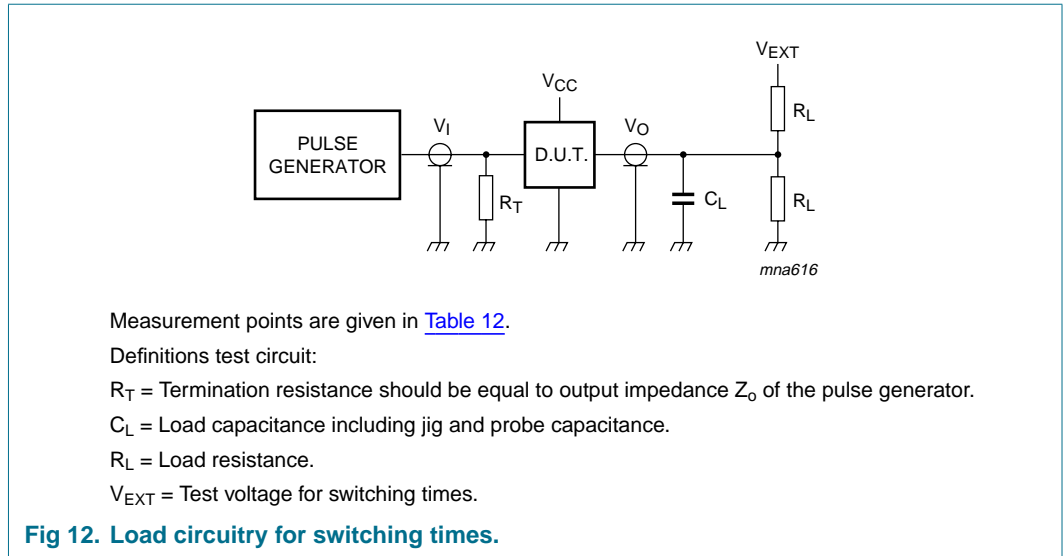


Table 11: Measurement points

Supply voltage	Input		Output
$V_{CC}$	$V_M$	$V_I$	$V_M$
1.65 V to 1.95 V	$0.5 \times V_{CC}$	$V_{CC}$	$0.5 \times V_{CC}$
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$V_{CC}$	$0.5 \times V_{CC}$
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	$0.5 \times V_{CC}$	$V_{CC}$	$0.5 \times V_{CC}$



**Table 12: Measurement points**

Supply voltage	Input		Load		$V_{EXT}$		
$V_{CC}$	$V_I$	$t_r = t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
1.65 V to 1.95 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	1 k $\Omega$	open	GND	$2 \times V_{CC}$
2.3 to 2.7 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	500 $\Omega$	open	GND	$2 \times V_{CC}$
2.7 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	GND	6 V
3.0 V to 3.6 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	GND	6 V
4.5 V to 5.5 V	$V_{CC}$	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	GND	$2 \times V_{CC}$

## 14. Transfer characteristics

**Table 13: Transfer characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = -40$ °C to $+85$ °C [1]						
$V_{T+}$	positive-going threshold voltage	see <a href="#">Figure 13</a> , <a href="#">14</a> , <a href="#">15</a> and <a href="#">16</a>				
		$V_{CC} = 1.8$ V	0.70	1.02	1.20	V
		$V_{CC} = 2.3$ V	1.11	1.42	1.60	V
		$V_{CC} = 3.0$ V	1.50	1.79	2.00	V
		$V_{CC} = 4.5$ V	2.16	2.52	2.74	V
		$V_{CC} = 5.5$ V	2.61	2.99	3.33	V
$V_{T-}$	negative-going threshold voltage	see <a href="#">Figure 13</a> , <a href="#">14</a> , <a href="#">15</a> and <a href="#">16</a>				
		$V_{CC} = 1.8$ V	0.30	0.53	0.72	V
		$V_{CC} = 2.3$ V	0.58	0.77	1.00	V
		$V_{CC} = 3.0$ V	0.80	1.04	1.30	V
		$V_{CC} = 4.5$ V	1.21	1.55	1.90	V
		$V_{CC} = 5.5$ V	1.45	1.86	2.29	V

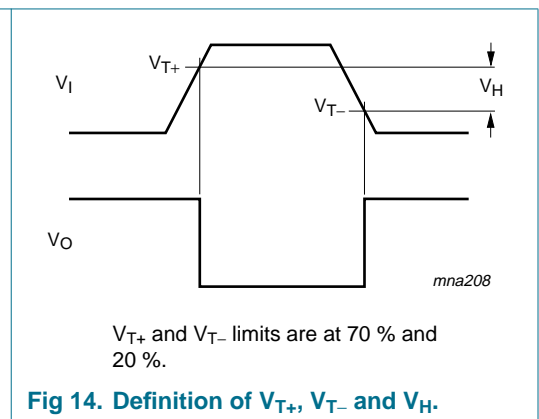
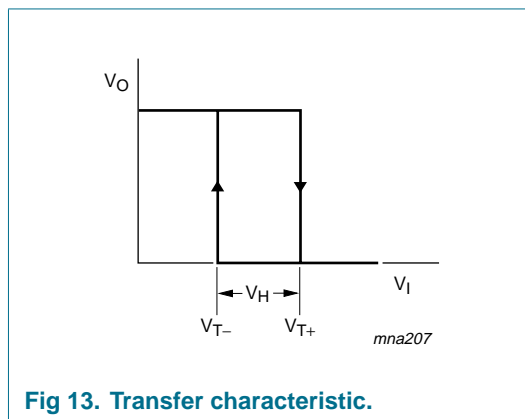
**Table 13: Transfer characteristics ...continued**

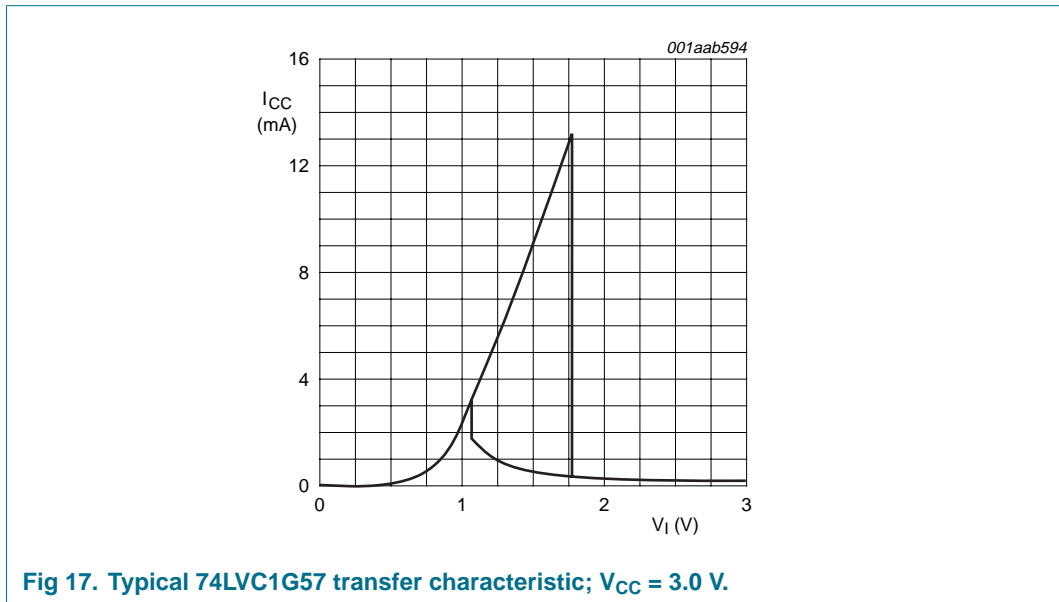
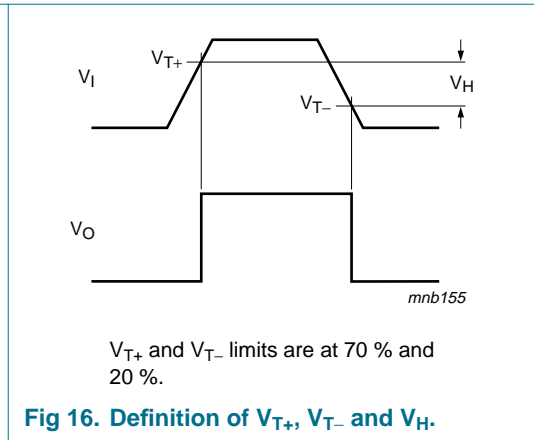
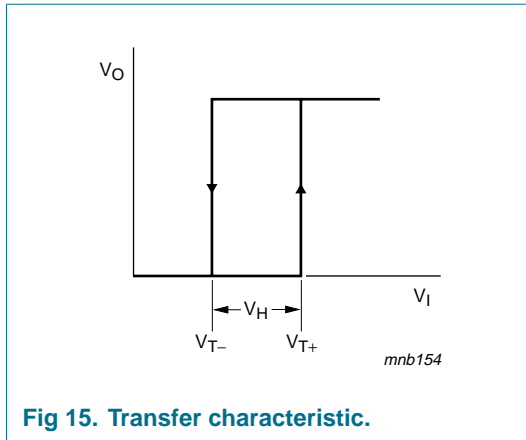
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_H$	hysteresis voltage ( $V_{T+} - V_{T-}$ )	see <a href="#">Figure 13</a> , <a href="#">14</a> , <a href="#">15</a> and <a href="#">16</a>				
		$V_{CC} = 1.8\text{ V}$	0.30	0.48	0.62	V
		$V_{CC} = 2.3\text{ V}$	0.40	0.64	0.80	V
		$V_{CC} = 3.0\text{ V}$	0.50	0.75	1.00	V
		$V_{CC} = 4.5\text{ V}$	0.71	0.97	1.20	V
		$V_{CC} = 5.5\text{ V}$	0.71	1.13	1.40	V
<b><math>T_{amb} = -40\text{ °C to }+125\text{ °C}</math></b>						
$V_{T+}$	positive-going threshold voltage	see <a href="#">Figure 13</a> , <a href="#">14</a> , <a href="#">15</a> and <a href="#">16</a>				
		$V_{CC} = 1.8\text{ V}$	0.67	-	1.20	V
		$V_{CC} = 2.3\text{ V}$	1.08	-	1.60	V
		$V_{CC} = 3.0\text{ V}$	1.47	-	2.00	V
		$V_{CC} = 4.5\text{ V}$	2.13	-	2.74	V
		$V_{CC} = 5.5\text{ V}$	2.58	-	3.33	V
$V_{T-}$	negative-going threshold voltage	see <a href="#">Figure 13</a> , <a href="#">14</a> , <a href="#">15</a> and <a href="#">16</a>				
		$V_{CC} = 1.8\text{ V}$	0.30	-	0.75	V
		$V_{CC} = 2.3\text{ V}$	0.58	-	1.03	V
		$V_{CC} = 3.0\text{ V}$	0.80	-	1.33	V
		$V_{CC} = 4.5\text{ V}$	1.21	-	1.93	V
		$V_{CC} = 5.5\text{ V}$	1.45	-	2.32	V
$V_H$	hysteresis voltage ( $V_{T+} - V_{T-}$ )	see <a href="#">Figure 13</a> , <a href="#">14</a> , <a href="#">15</a> and <a href="#">16</a>				
		$V_{CC} = 1.8\text{ V}$	0.23	-	0.62	V
		$V_{CC} = 2.3\text{ V}$	0.34	-	0.80	V
		$V_{CC} = 3.0\text{ V}$	0.44	-	1.00	V
		$V_{CC} = 4.5\text{ V}$	0.65	-	1.20	V
		$V_{CC} = 5.5\text{ V}$	0.65	-	1.40	V

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

## 15. Waveforms transfer characteristics





16. Package outline

Plastic surface mounted package; 6 leads

SOT363

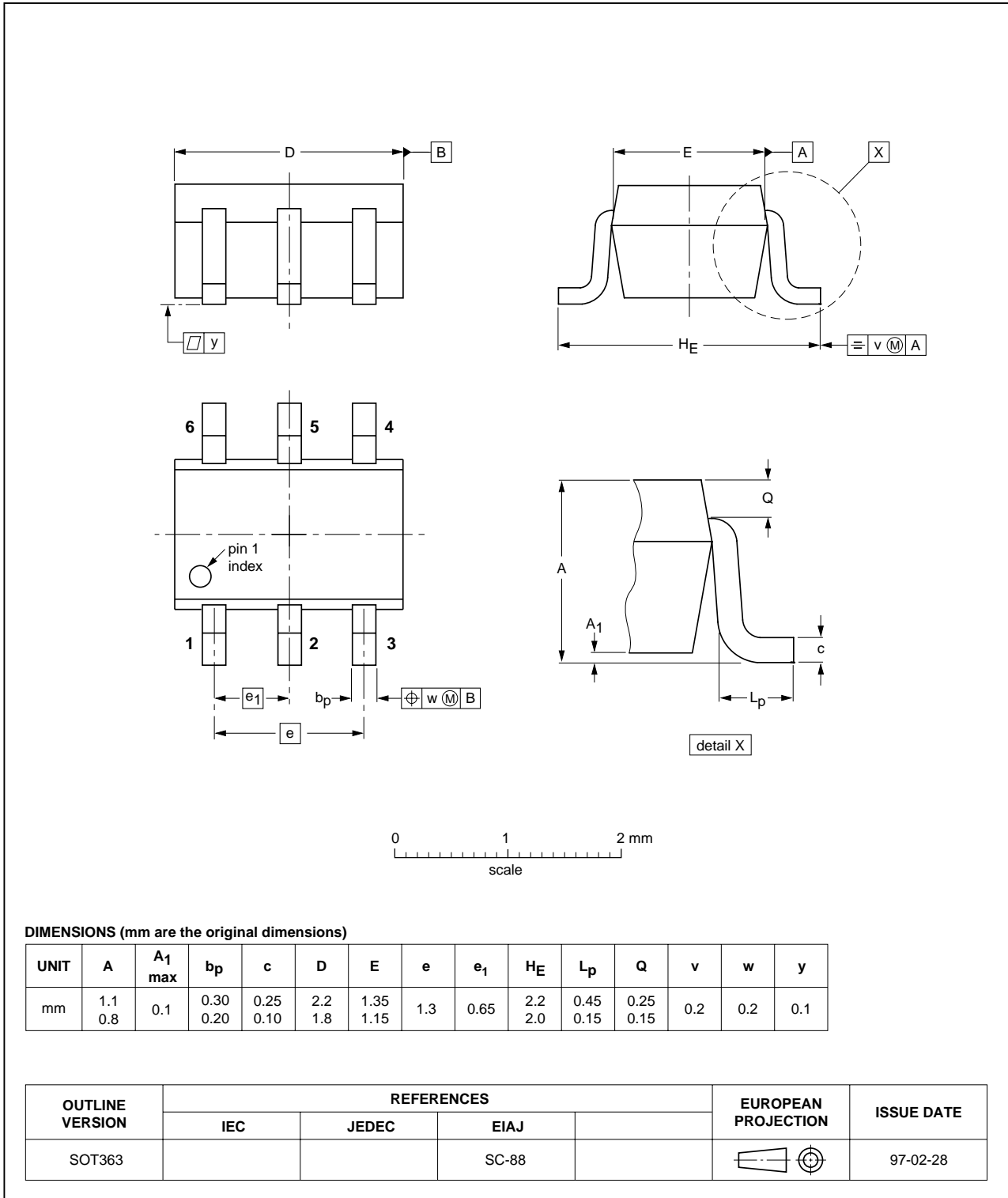


Fig 18. Package outline SOT363.

Plastic surface mounted package; 6 leads

SOT457

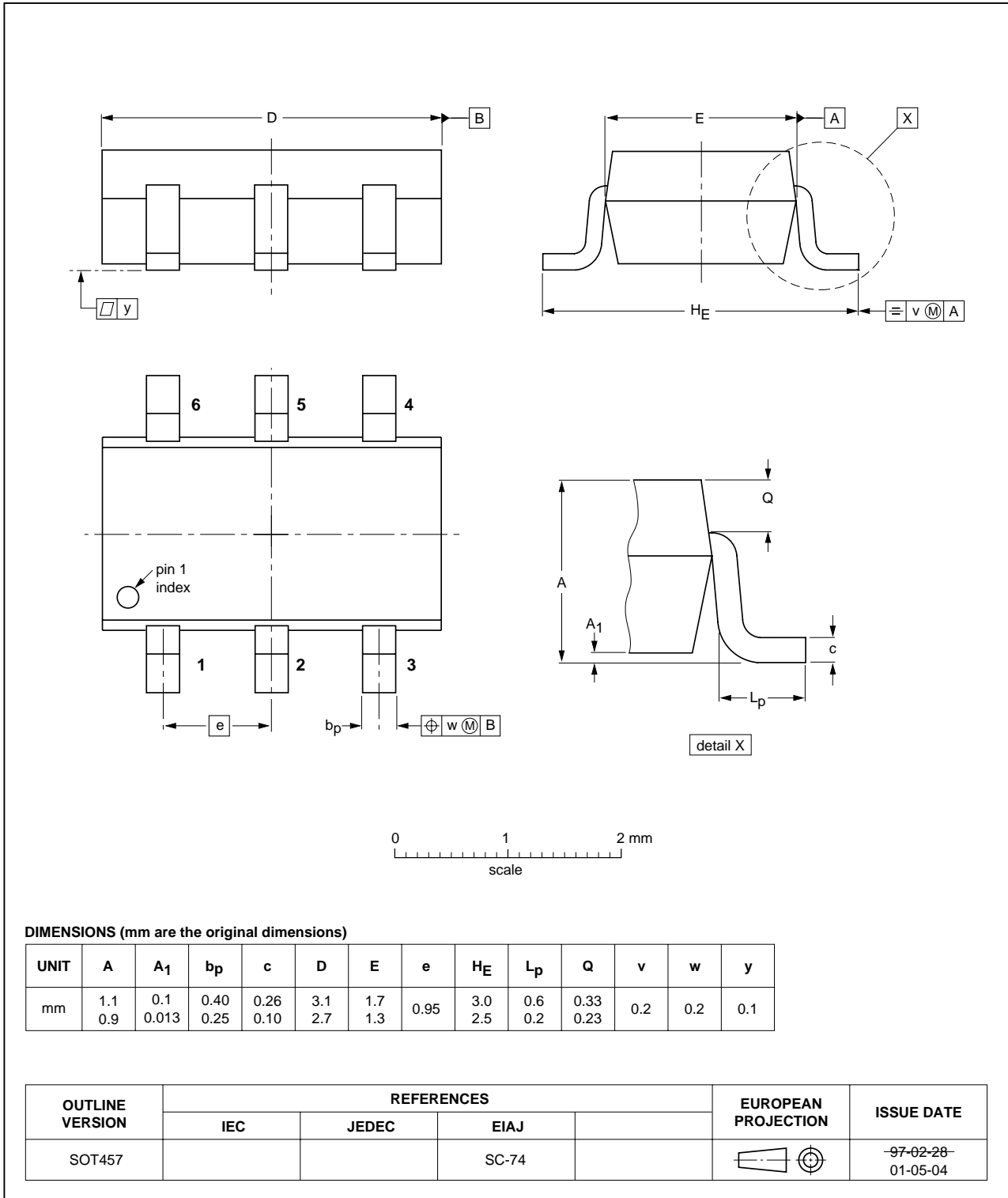


Fig 19. Package outline SOT457.

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

SOT886



Fig 20. Package outline SOT886 (XSON6).

## 17. Revision history

Table 14: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
74LVC1G57_1	20040906	Product data sheet	-	9397 750 13722	-



## 18. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup> <sup>[3]</sup>	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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## 21. Contact information

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