

# 74LVC1G58

Low-power configurable multiple function gate

Rev. 10 — 7 June 2021

Product data sheet

## 1. General description

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The 74LVC1G58 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, XOR, 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

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- Wide supply voltage range from 1.65 V to 5.5 V
- High noise immunity
- $\pm 24$  mA output drive ( $V_{CC} = 3.0$  V)
- CMOS low power dissipation
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Overvoltage tolerant inputs to 5.5 V
- 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 2 000 V
  - MM JESD22-A115-A exceeds 200 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
74LVC1G58GW	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363
74LVC1G58GV	-40 °C to +125 °C	SC-74; TSOP6	plastic surface-mounted package; 6 leads	SOT457
74LVC1G58GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74LVC1G58GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74LVC1G58GS	-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]
74LVC1G58GW	YK
74LVC1G58GV	V58
74LVC1G58GM	YK
74LVC1G58GN	YK
74LVC1G58GS	YK

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

### 5. Functional diagram

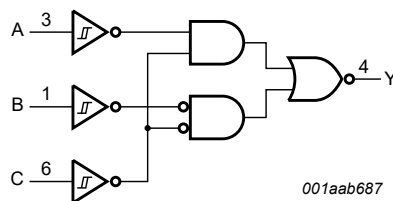
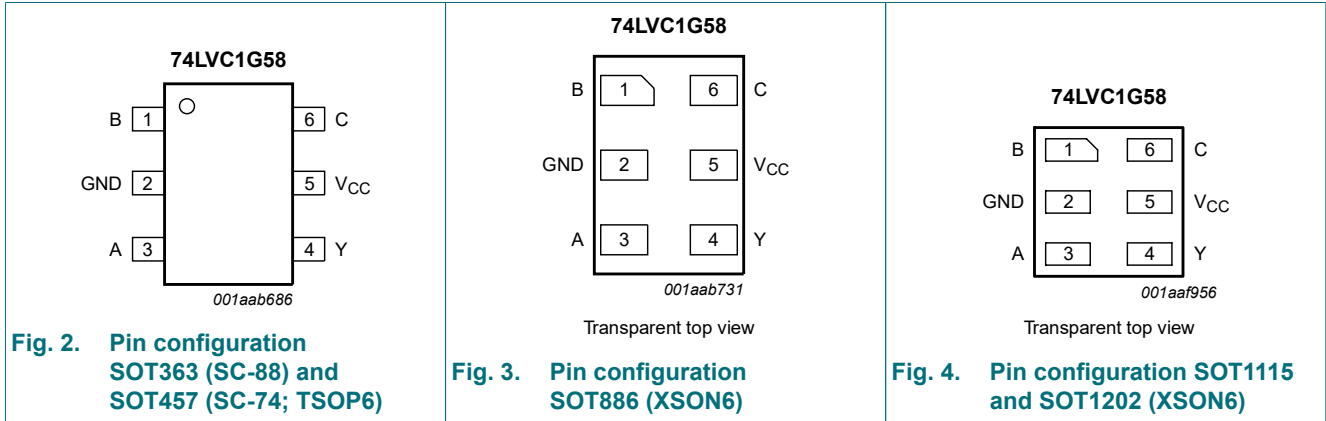


Fig. 1. Logic symbol

## 6. Pinning information

### 6.1. Pinning



### 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

Inputs			Output
C	B	A	Y
L	L	L	L
L	L	H	H
L	H	L	L
L	H	H	H
H	L	L	H
H	L	H	H
H	H	L	L
H	H	H	L

### 7.1. Logic configurations

Table 5. Function selection table

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

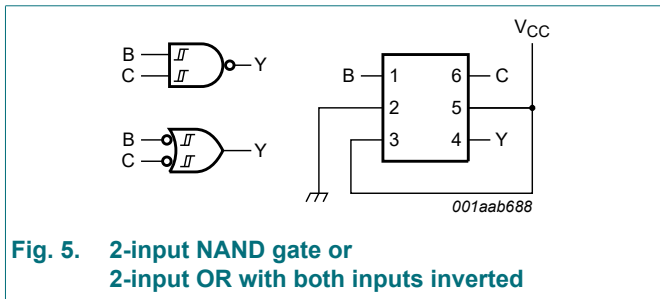


Fig. 5. 2-input NAND gate or 2-input OR with both inputs inverted

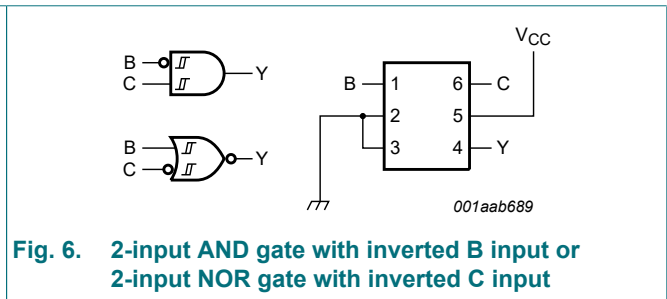


Fig. 6. 2-input AND gate with inverted B input or 2-input NOR gate with inverted C input

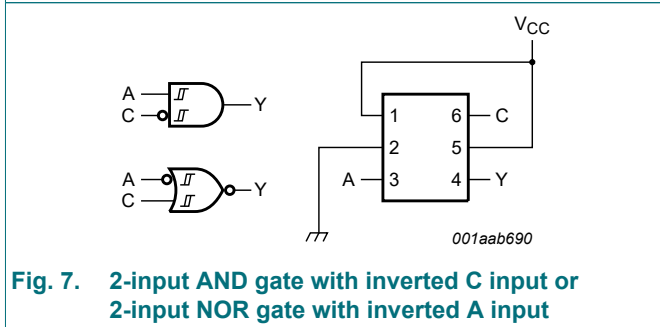


Fig. 7. 2-input AND gate with inverted C input or 2-input NOR gate with inverted A input

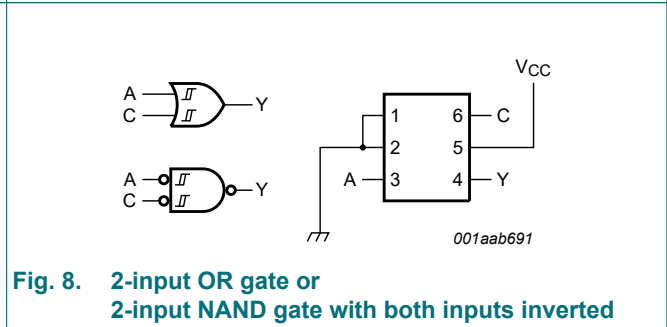


Fig. 8. 2-input OR gate or 2-input NAND gate with both inputs inverted

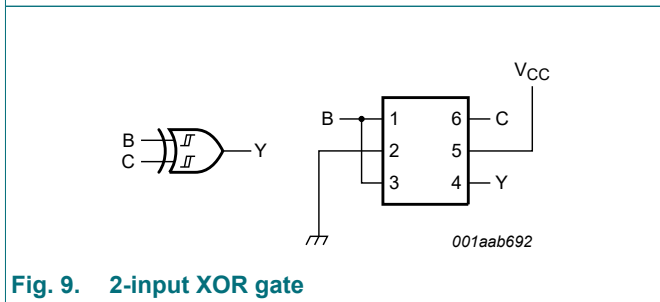


Fig. 9. 2-input XOR gate

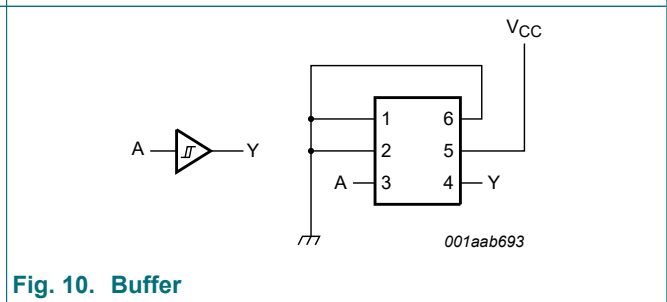


Fig. 10. Buffer

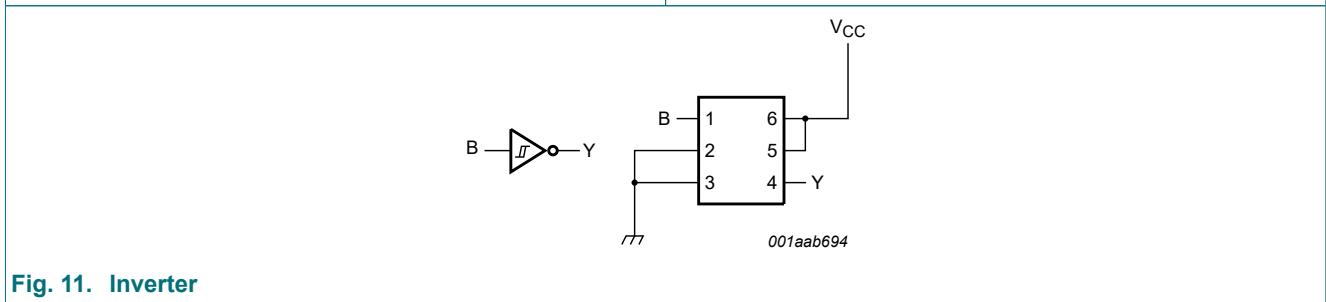


Fig. 11. Inverter

## 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] -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 $V_{CC}$	-	±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.  
 For SOT886 (XSON6) package:  $P_{tot}$  derates linearly with 3.3 mW/K above 74 °C.  
 For SOT1115 (XSON6) package:  $P_{tot}$  derates linearly with 3.2 mW/K above 71 °C.  
 For SOT1202 (XSON6) package:  $P_{tot}$  derates linearly with 3.3 mW/K above 74 °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	Min	Typ [1]	Max	Unit
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
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	V
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V	-	-	0.45	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V	-	-	0.3	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.4	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	-	0.55	V
		I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V	-	-	0.55	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
		I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V	1.2	-	-	V
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V	1.9	-	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	2.2	-	-	V
		I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V	2.3	-	-	V
		I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V	3.8	-	-	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	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	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 1.65 V to 5.5 V; I <sub>O</sub> = 0 A	-	0.1	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	μA
C <sub>I</sub>	input capacitance		-	2.5	-	pF

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
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	V
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V	-	-	0.7	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V	-	-	0.45	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.6	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	-	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
		I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V	0.95	-	-	V
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V	1.7	-	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	1.9	-	-	V
		I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V	2.0	-	-	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	-	-	±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	-	-
I <sub>CC</sub>	supply current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 1.65 V to 5.5 V; I <sub>O</sub> = 0 A	-	-	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	-	-	500	μA

[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. 13.

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. 12 [2]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	6.0	14.4	1.0	18.0	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
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]	-	20	-	-	-	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).

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

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

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

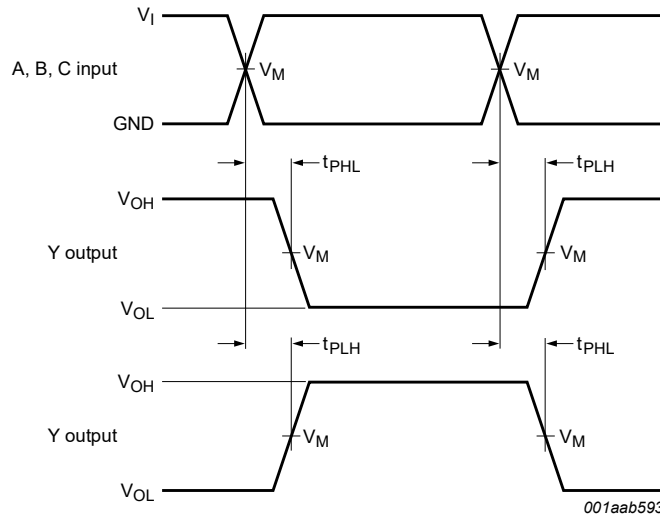
C<sub>L</sub> = output load capacitance in pF;

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

N = number of inputs switching;

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

11.1. Waveforms and test circuit



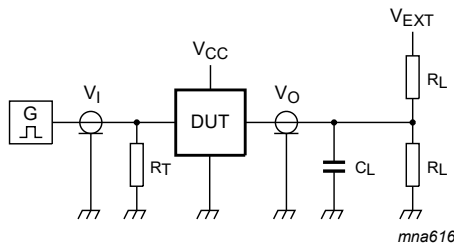
Measurement points are given in [Table 10](#).

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

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

Table 10. Measurement points

Supply voltage	Input	Output
$V_{CC}$	$V_M$	$V_M$
1.65 V to 1.95 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.7 V	1.5 V	1.5 V
3.0 V to 3.6 V	1.5 V	1.5 V
4.5 V to 5.5 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$



Test data is given in [Table 11](#).

Definitions for 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 <sub>EXT</sub>
V <sub>CC</sub>	V <sub>I</sub>	t <sub>r</sub> = t <sub>f</sub>	C <sub>L</sub>	R <sub>L</sub>	t <sub>PLH</sub> , t <sub>PHL</sub>
1.65 V to 1.95 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	1 kΩ	open
2.3 V to 2.7 V	V <sub>CC</sub>	≤ 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 <sub>CC</sub>	≤ 2.5 ns	50 pF	500 Ω	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. 14</a> , <a href="#">Fig. 15</a> , <a href="#">Fig. 16</a> and <a href="#">Fig. 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="#">Fig. 14</a> , <a href="#">Fig. 15</a> , <a href="#">Fig. 16</a> and <a href="#">Fig. 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="#">Fig. 14</a> , <a href="#">Fig. 15</a> , <a href="#">Fig. 16</a> and <a href="#">Fig. 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.

12.1. Waveforms transfer characteristics

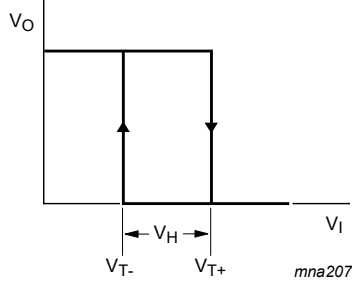
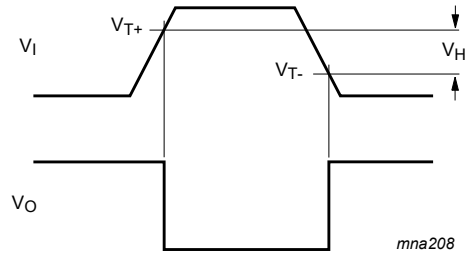


Fig. 14. Transfer characteristics



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

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

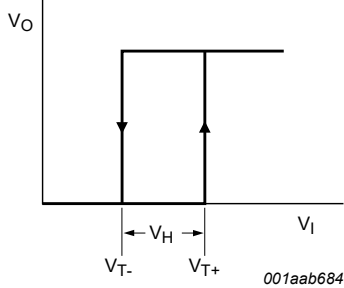
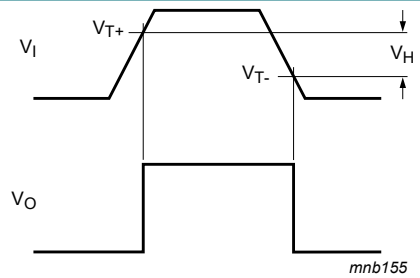


Fig. 16. Transfer characteristics



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

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

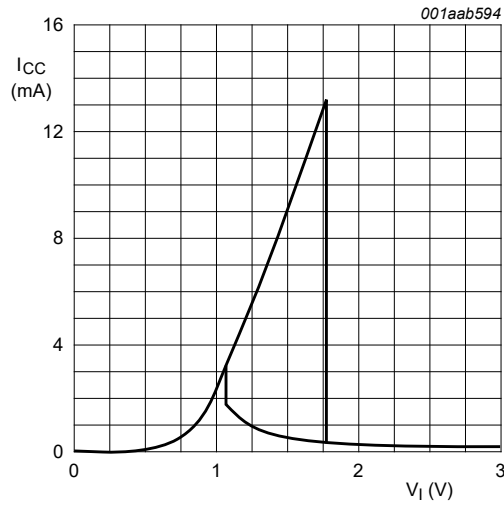


Fig. 18. Typical 74LVC1G58 transfer characteristics;  $V_{CC} = 3.0 \text{ V}$

### 13. Package outline

Plastic surface-mounted package; 6 leads

SOT363

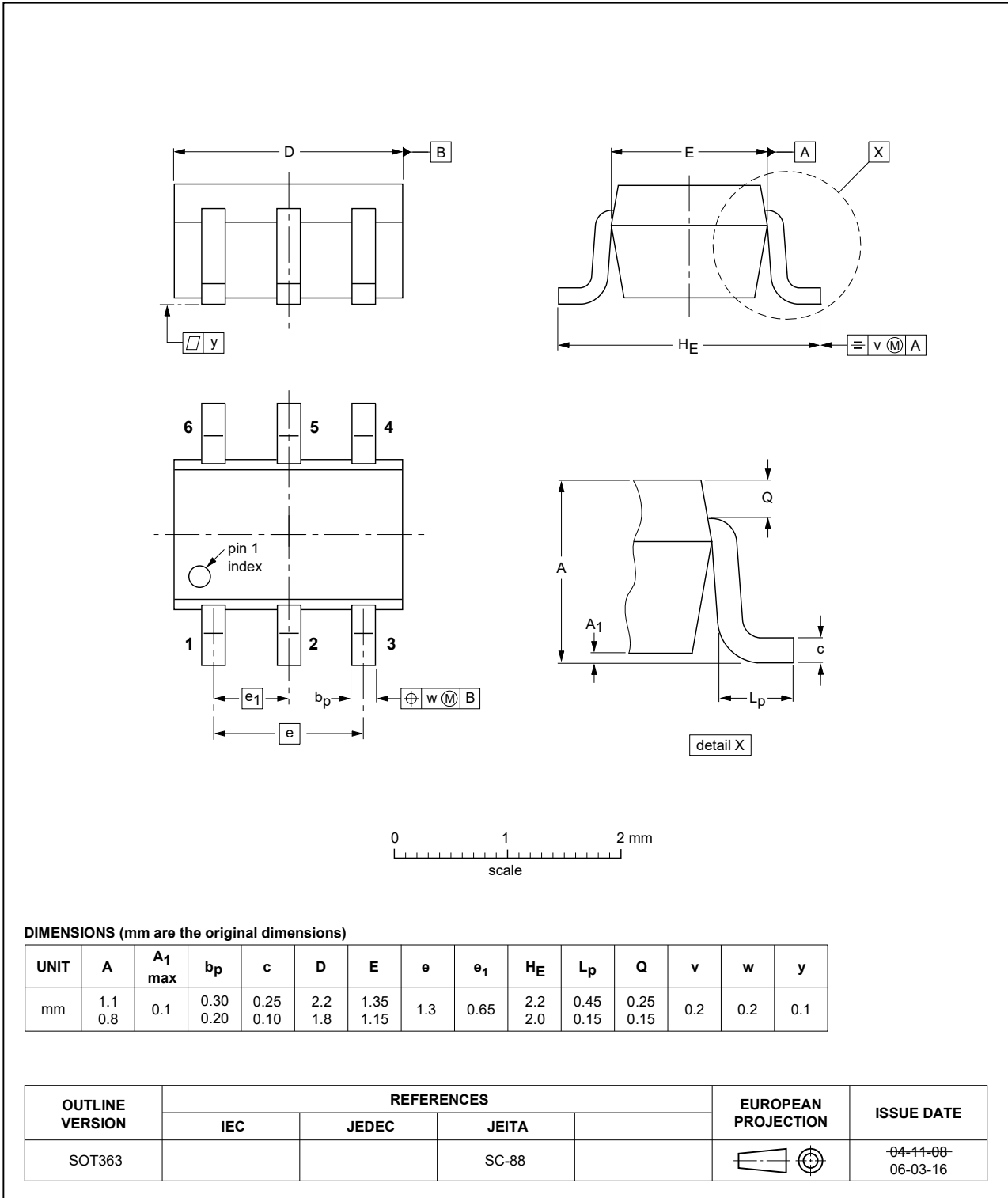


Fig. 19. Package outline SOT363 (SC-88)

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

SOT457

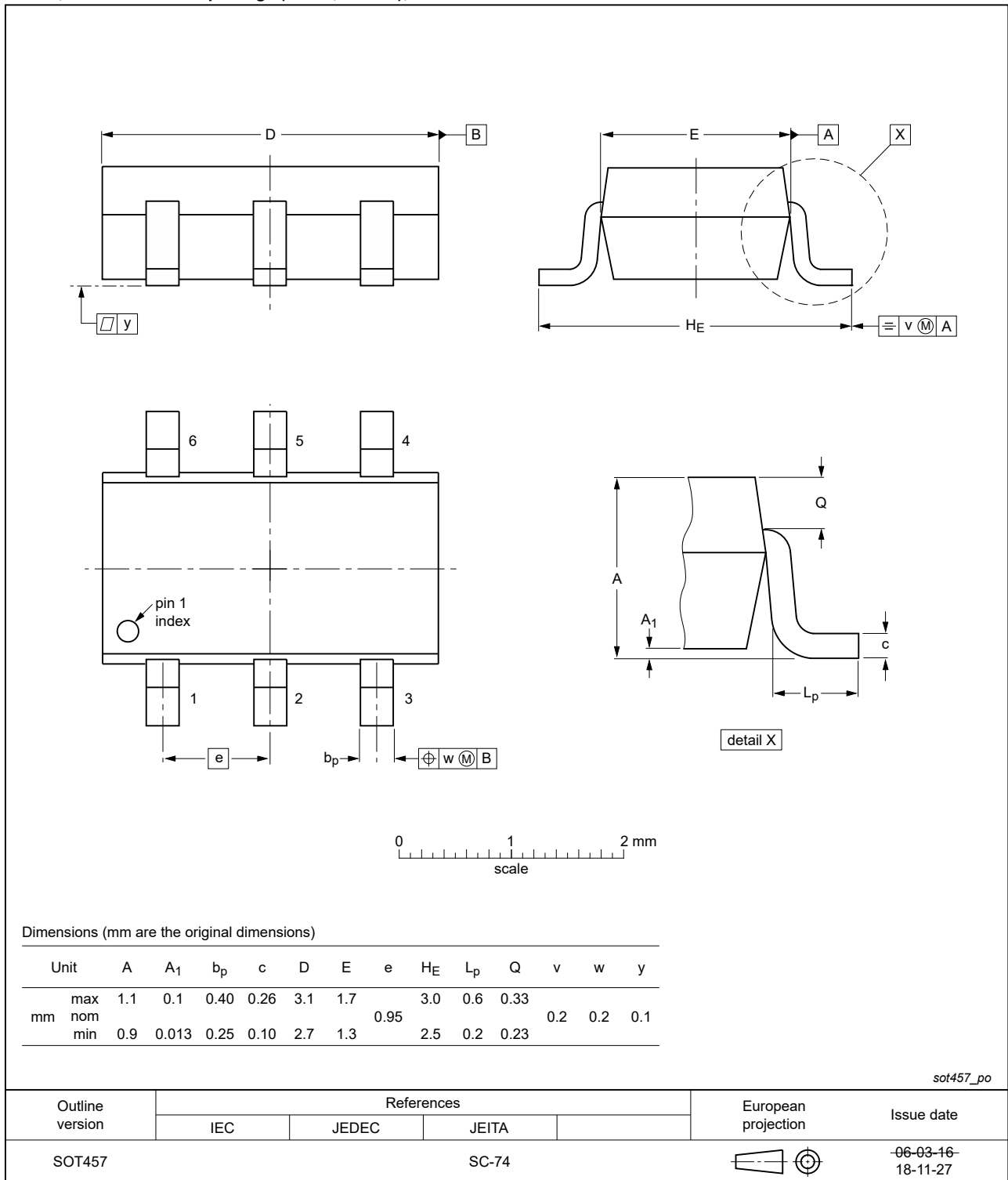


Fig. 20. Package outline SOT457 (SC-74; TSOP6)

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

SOT886

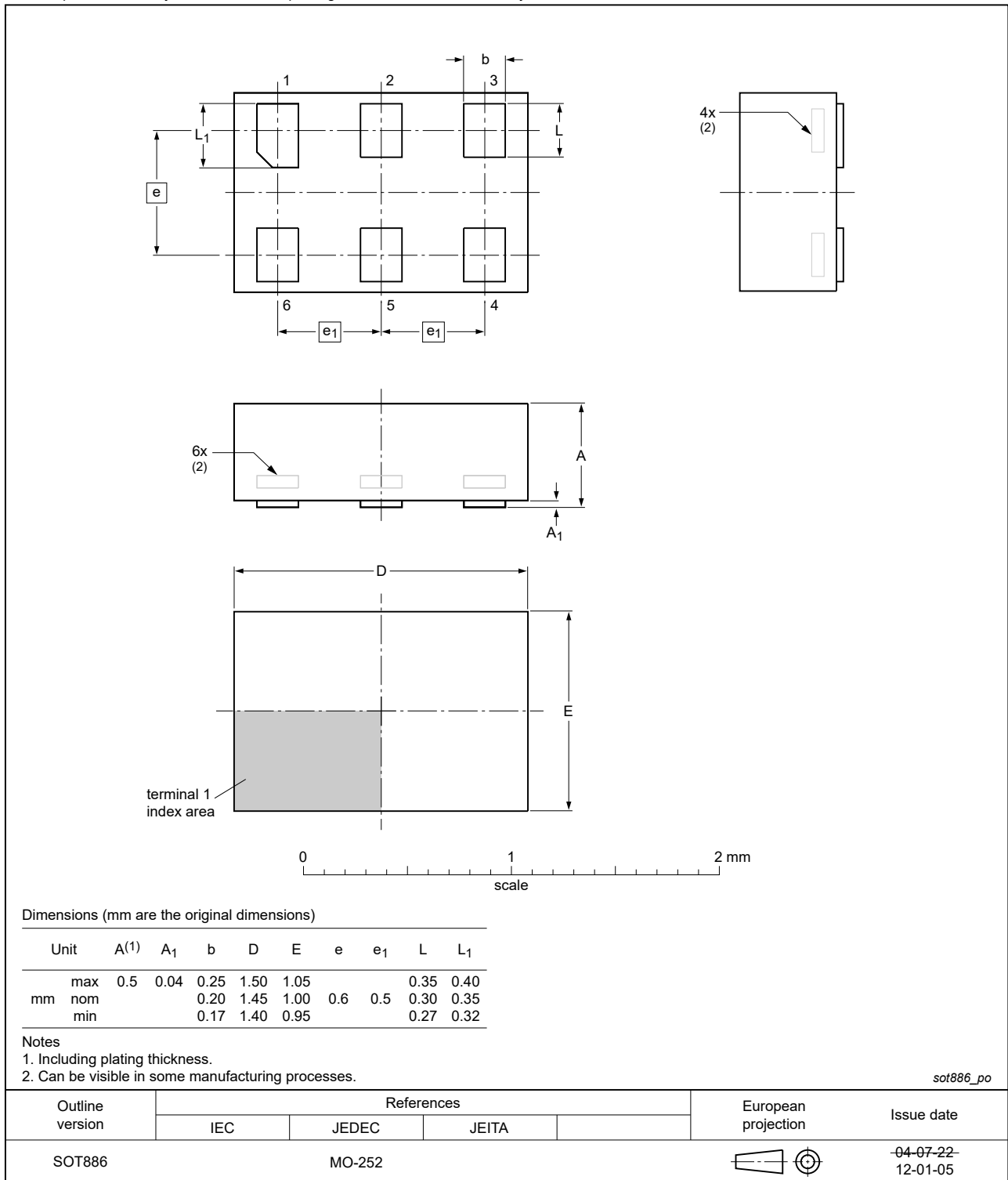


Fig. 21. Package outline SOT886 (XSON6)

**XSON6: extremely thin small outline package; no leads;**  
**6 terminals; body 0.9 x 1.0 x 0.35 mm**

SOT1115



**Fig. 22. Package outline SOT1115 (XSON6)**

XSON6: extremely thin small outline package; no leads;  
6 terminals; body 1.0 x 1.0 x 0.35 mm

SOT1202



Fig. 23. Package outline SOT1202 (XSON6)

## 14. Abbreviations

Table 13. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	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
74LVC1G58 v.10	20210607	Product data sheet	-	74LVC1G58 v.9
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>Type number 74LVC1G58GF (SOT891 / XSON6) removed.</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. 20</a>: Package outline drawing SOT457 (SC-74; TSOP6) updated.</li> </ul>			
74LVC1G58 v.9	20161207	Product data sheet	-	74LVC1G58 v.8
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>			
74LVC1G58 v.8	20140422	Product data sheet	-	74LVC1G58 v.7
Modifications:	<ul style="list-style-type: none"> <li>Package outline drawing of SOT886 (<a href="#">Fig. 21</a>) modified.</li> </ul>			
74LVC1G58 v.7	20111206	Product data sheet	-	74LVC1G58 v.6
Modifications:	<ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>			
74LVC1G58 v.6	20110923	Product data sheet	-	74LVC1G58 v.5
74LVC1G58 v.5	20101015	Product data sheet	-	74LVC1G58 v.4
74LVC1G58 v.4	20090427	Product data sheet	-	74LVC1G58 v.3
74LVC1G58 v.3	20070827	Product data sheet	-	74LVC1G58 v.2
74LVC1G58 v.2	20070222	Product data sheet	-	74LVC1G58 v.1
74LVC1G58 v.1	20040915	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".
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**Date of release: 7 June 2021**

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