# 74LVC1G125-Q100

Bus buffer/line driver; 3-state Rev. 3 — 25 January 2019

**Product data sheet** 

## 1. General description

The 74LVC1G125-Q100 provides one non-inverting buffer/line driver with 3-state output. The 3-state output is controlled by the output enable input ( $\overline{OE}$ ). A HIGH-level at pin  $\overline{OE}$  causes the output to assume a high-impedance OFF-state.

The input 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.

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
- 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)
  - JESD8-B/JESD36 (2.7 V to 3.6 V)
- $\pm$  24 mA output drive (V<sub>CC</sub> = 3.0 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 Ω)
- CMOS low power consumption
- Inputs accept voltages up to 5 V
- · Latch-up performance exceeds 250 mA
- Direct interface with TTL levels

# 3. Ordering information

**Table 1. Ordering information** 

Type number	Package									
	Temperature range	Name	Description	Version						
74LVC1G125GW-Q100	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1						
74LVC1G125GV-Q100	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753						
74LVC1G125GM-Q100	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm	SOT886						



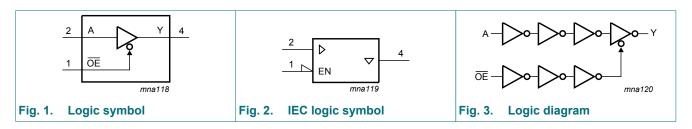
# 4. Marking

#### Table 2. Marking

Type number	Marking code[1]
74LVC1G125GW-Q100	VM
74LVC1G125GV-Q100	V25
74LVC1G125GM-Q100	VM

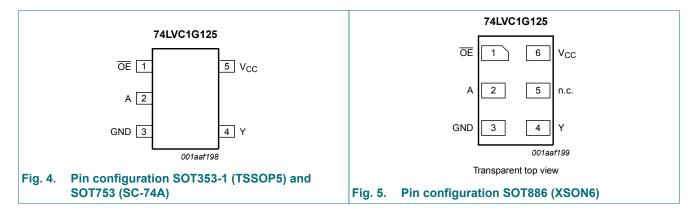
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

# 5. Functional diagram



# 6. Pinning information

## 6.1. Pinning



## 6.2. Pin description

Table 3. Pin description

Symbol	Pin	Pin						
	TSSOP5, SC-74A	XSON6						
ŌĒ	1	1	output enable input					
Α	2	2	data input					
GND	3	3	ground (0 V)					
Υ	4	4	data output					
n.c.	-	5	not connected					
V <sub>CC</sub>	5	6	supply voltage					

# 7. Functional description

#### **Table 4. Function table**

 $H = HIGH \text{ voltage level}; L = LOW \text{ voltage level}; X = don't care; Z = high-impedance OFF-state.}$ 

Input		Output
OE	A	Υ
L	L	L
L	Н	Н
Н	X	Z

# 8. Limiting values

#### Table 5. 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 <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-50	-	mA
VI	input voltage	[1]	-0.5	+6.5	V
I <sub>OK</sub>	output clamping current	$V_O > V_{CC}$ or $V_O < 0 V$	-	±50	mA
Vo	output voltage	Active mode [1]	-0.5	V <sub>CC</sub> + 0.5	V
V <sub>O</sub>		Power-down mode; V <sub>CC</sub> = 0 V [1]	-0.5	+6.5	V
Io	output current	$V_O = 0 V \text{ to } V_{CC}$	-	±50	mA
I <sub>CC</sub>	supply current		-	100	mA
$I_{GND}$	ground current		-100	-	mA
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40  ^{\circ}\text{C to } +125  ^{\circ}\text{C}$ [2]	-	250	mW
T <sub>stg</sub>	storage temperature		-65	+150	°C

<sup>[1]</sup> The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

# 9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$V_{CC}$	supply voltage		1.65	-	5.5	V
VI	input voltage		0	-	5.5	V
Vo	output voltage	Active mode	0	-	V <sub>CC</sub>	V
		Power-down mode; V <sub>CC</sub> = 0 V	0	-	5.5	V
T <sub>amb</sub>	ambient temperature		-40	-	+125	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 1.65 V to 2.7 V	-	-	20	ns/V
		V <sub>CC</sub> = 2.7 V to 5.5 V	-	-	10	ns/V

<sup>[2]</sup> For TSSOP5 and SC-74A packages: above 87.5 °C the value of P<sub>tot</sub> derates linearly with 4.0 mW/K. For XSON6 package: above 118 °C the value of P<sub>tot</sub> derates linearly with 7.8 mW/K.

# 10. Static characteristics

#### **Table 7. Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
T <sub>amb</sub> = -	40 °C to +85 °C					
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.7 × V <sub>CC</sub>	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.3 × V <sub>CC</sub>	V
V <sub>OL</sub>	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$V_{CC}$ = 1.65 V to 5.5 V; $I_{O}$ = 100 $\mu$ A	-	-	0.1	V
		V <sub>CC</sub> = 1.65 V; I <sub>O</sub> = 4 mA	-	-	0.45	V
		V <sub>CC</sub> = 2.3 V; I <sub>O</sub> = 8 mA	-	-	0.3	V
		V <sub>CC</sub> = 2.7 V; I <sub>O</sub> = 12 mA	-	-	0.4	V
		V <sub>CC</sub> = 3.0 V; I <sub>O</sub> = 24 mA	-	-	0.55	V
		V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 32 mA	-	-	0.55	V
V <sub>OH</sub>	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$V_{CC}$ = 1.65 V to 5.5 V; $I_{O}$ = -100 $\mu$ A	V <sub>CC</sub> - 0.1	-	-	V
		V <sub>CC</sub> = 1.65 V; I <sub>O</sub> = -4 mA	1.2	-	-	V
		V <sub>CC</sub> = 2.3 V; I <sub>O</sub> = -8 mA	1.9	-	-	V
		$V_{CC}$ = 2.7 V; $I_{O}$ = -12 mA	2.2	-	-	V
		V <sub>CC</sub> = 3.0 V; I <sub>O</sub> = -24 mA	2.3	-	-	V
		$V_{CC}$ = 4.5 V; $I_{O}$ = -32 mA	3.8	-	-	V
I <sub>I</sub>	input leakage current	V <sub>CC</sub> = 0 V to 5.5 V; V <sub>I</sub> = 5.5 V or GND	-	±0.1	±1	μΑ
l <sub>OZ</sub>	OFF-state output current	$V_{CC} = 3.6 \text{ V}; V_{I} = V_{IH} \text{ or } V_{IL};$ $V_{O} = 5.5 \text{ V or GND}$	-	±0.1	±2	μΑ
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 5.5 V	-	±0.1	±2	μΑ
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	μΑ
Δl <sub>CC</sub>	additional supply current	per pin; $V_{CC}$ = 2.3 V to 5.5 V; V <sub>I</sub> = $V_{CC}$ - 0.6 V; I <sub>O</sub> = 0 A	-	5	500	μΑ
Cı	input capacitance		-	5	-	pF

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
T <sub>amb</sub> = -	40 °C to +125 °C					
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.7 × V <sub>CC</sub>	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.3 × V <sub>CC</sub>	V
V <sub>OL</sub>	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$V_{CC}$ = 1.65 V to 5.5 V; $I_{O}$ = 100 $\mu$ A	-	-	0.1	V
		V <sub>CC</sub> = 1.65 V; I <sub>O</sub> = 4 mA	-	-	0.70	V
		V <sub>CC</sub> = 2.3 V; I <sub>O</sub> = 8 mA	-	-	0.45	V
		V <sub>CC</sub> = 2.7 V; I <sub>O</sub> = 12 mA	-	-	0.60	V
		V <sub>CC</sub> = 3.0 V; I <sub>O</sub> = 24 mA	-	-	0.80	V
		V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 32 mA	-	-	0.80	V
V <sub>OH</sub>	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$V_{CC}$ = 1.65 V to 5.5 V; $I_{O}$ = -100 $\mu$ A	V <sub>CC</sub> - 0.1	-	-	V
		V <sub>CC</sub> = 1.65 V; I <sub>O</sub> = -4 mA	0.95	-	-	V
		$V_{CC}$ = 2.3 V; $I_{O}$ = -8 mA	1.7	-	-	V
		V <sub>CC</sub> = 2.7 V; I <sub>O</sub> = -12 mA	1.9	-	-	V
		V <sub>CC</sub> = 3.0 V; I <sub>O</sub> = -24 mA	2.0	-	-	V
		$V_{CC}$ = 4.5 V; $I_{O}$ = -32 mA	3.4	-	-	V
lį	input leakage current	V <sub>CC</sub> = 0 V to 5.5 V; V <sub>I</sub> = 5.5 V or GND	-	-	±1	μΑ
I <sub>OZ</sub>	OFF-state output current	$V_{CC} = 3.6 \text{ V}; V_{I} = V_{IH} \text{ or } V_{IL};$ $V_{O} = 5.5 \text{ V or GND}$	-	-	±2	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 5.5 V	-	-	±2	μΑ
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	per pin; $V_{CC} = 2.3 \text{ V to } 5.5 \text{ V};$ $V_1 = V_{CC} - 0.6 \text{ V};$ $I_0 = 0 \text{ A}$	-	-	500	μA

<sup>[1]</sup> All typical values are measured at  $V_{CC}$  = 3.3 V and  $T_{amb}$  = 25 °C.

# 11. Dynamic characteristics

#### **Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 8.

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 to Y; see <u>Fig. 6</u> [2]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	3.3	8.0	1.0	10.5	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	2.2	5.5	0.5	7	ns
		V <sub>CC</sub> = 2.7 V	0.5	2.5	5.5	0.5	7	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.5	2.1	4.5	0.5	6	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.5	1.7	4.0	0.5	5.5	ns
t <sub>en</sub>	enable time	OE to Y; see Fig. 7 [3]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	4.1	9.4	1.0	12	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	2.8	6.6	0.5	8.5	ns
		V <sub>CC</sub> = 2.7 V	0.5	3.3	6.6	0.5	8.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.5	2.4	5.3	0.5	7	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.5	2.1	5.0	0.5	6.5	ns
t <sub>dis</sub>	disable time	OE to Y; see Fig. 7 [4]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	4.3	9.2	1.0	12	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	2.7	5.0	0.5	6.5	ns
		V <sub>CC</sub> = 2.7 V	0.5	3.0	5.0	0.5	6.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.5	3.1	5.0	0.5	6.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.5	2.2	4.2	0.5	5.5	ns
C <sub>PD</sub>	power dissipation	per buffer; $V_I = GND$ to $V_{CC}$ [5]						
	capacitance	output enabled	-	25	-	-	-	pF
		output disabled	-	6	-	-	-	pF

<sup>[1]</sup> Typical values are measured at  $T_{amb}$  = 25 °C and  $V_{CC}$  = 1.8 V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively.

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

 $f_i$  = input frequency in MHz;

 $f_o$  = 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;

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

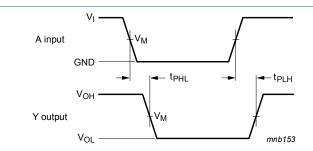
<sup>[2]</sup>  $\;\;t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ 

<sup>[3]</sup>  $t_{en}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ 

<sup>[4]</sup>  $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ 

<sup>[5]</sup>  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).

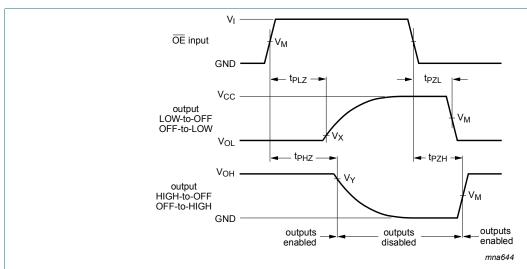
## 11.1. Waveforms and test circuit



Measurement points are given in Table 9.

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

Fig. 6. Input A to output Y propagation delay times



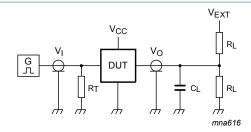
Measurement points are given in <u>Table 9</u>.

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

Fig. 7. 3-state enable and disable times

**Table 9. Measurement points** 

Supply voltage	Input	Output								
V <sub>CC</sub>	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>						
1.65 V to 1.95 V	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.15 V	V <sub>OH</sub> - 0.15 V						
2.3 V to 2.7 V	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.15 V	V <sub>OH</sub> - 0.15 V						
2.7 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V						
3.0 V to 3.6 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V						
4.5 V to 5.5 V	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V						



Test data is given in Table 10.

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 the output impedance  $Z_0$  of the pulse generator.

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

## Fig. 8. Test circuit for measuring switching times

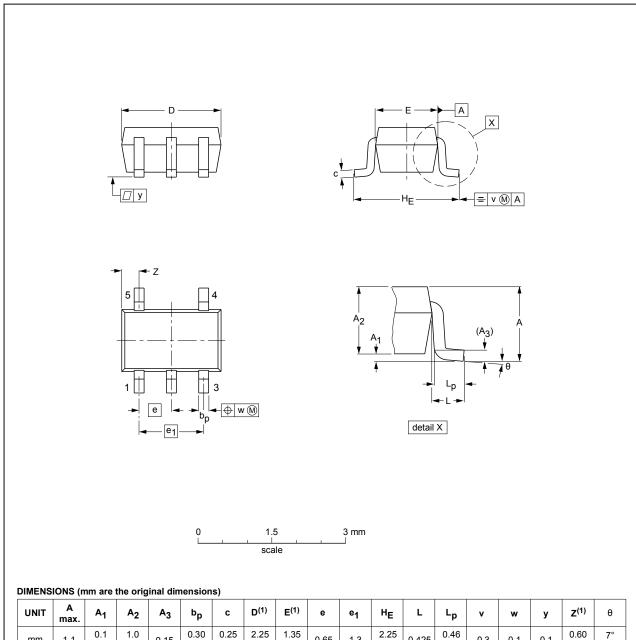
#### Table 10. Test data

Supply voltage	Input	Input			V <sub>EXT</sub>	V <sub>EXT</sub>			
V <sub>CC</sub>	V <sub>I</sub> t		CL	R <sub>L</sub>	t <sub>PLH</sub> , t <sub>PHL</sub>	t <sub>PZH</sub> , t <sub>PHZ</sub>	t <sub>PZL</sub> , t <sub>PLZ</sub>		
1.65 V to 1.95 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	1 kΩ	open	GND	2V <sub>CC</sub>		
2.3 V to 2.7 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	500 Ω	open	GND	2V <sub>CC</sub>		
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	GND	6 V		
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	GND	6 V		
4.5 V to 5.5 V	V <sub>CC</sub> ≤ 2.5 ns		50 pF	50 pF 500 Ω		GND	2V <sub>CC</sub>		

# 12. Package outline

## TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1



UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	А3	bp	С	D <sup>(1)</sup>	E <sup>(1)</sup>	е	e <sub>1</sub>	HE	L	Lp	٧	w	у	Z <sup>(1)</sup>	θ
mm	1.1	0.1 0	1.0 0.8	0.15	0.30 0.15	0.25 0.08	2.25 1.85	1.35 1.15	0.65	1.3	2.25 2.0	0.425	0.46 0.21	0.3	0.1	0.1	0.60 0.15	7° 0°

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN	ISSUE DATE
	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT353-1		MO-203	SC-88A			<del>-00-09-01</del> 03-02-19

Fig. 9. Package outline SOT353-1 (TSSOP5)

74LVC1G125\_Q100

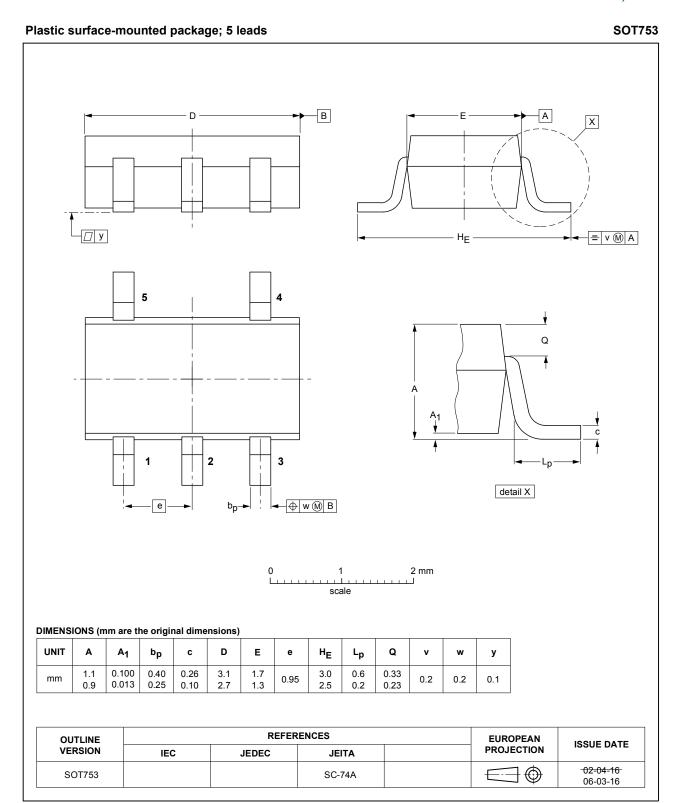


Fig. 10. Package outline SOT753 (SC-74A)

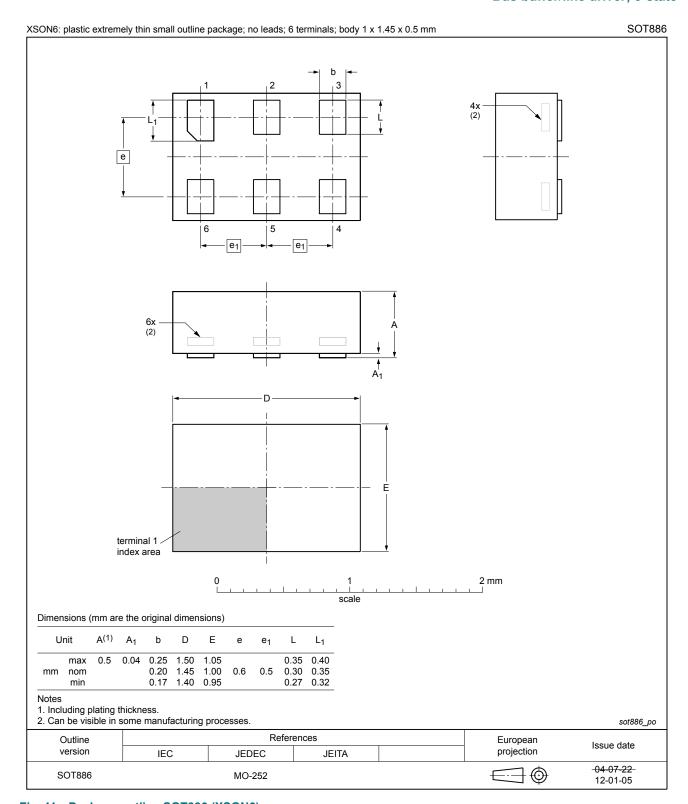


Fig. 11. Package outline SOT886 (XSON6)

# 13. Abbreviations

#### **Table 11. Abbreviations**

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

# 14. Revision history

### **Table 12. Revision history**

Table 12. Nevision history						
Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LVC1G125_Q100 v.3	20190125	Product data sheet	-	74LVC1G125_Q100 v.2		
Modifications:	of Nexperia. • Legal texts h	f this data sheet has been rave been adapted to the new 74LVC1G125GM-Q100 (S	ew company name	nply with the identity guidelines e where appropriate.		
74LVC1G125_Q100 v.2	20161208	Product data sheet	-	74LVC1G125_Q100 v.1		
Modifications:	<u>Table 7</u> : The maximum limits for leakage current and supply current have changed.					
74LVC1G125_Q100 v.1	20120709	Product data sheet	-	-		

## 15. 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".
- 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 <a href="https://www.nexperia.com">https://www.nexperia.com</a>.

#### **Definitions**

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