# 74LVC3G17

# Triple non-inverting Schmitt trigger with 5 V tolerant input Rev. 15 — 24 August 2023 Product data sheet

# 1. General description

The 74LVC3G17 is a triple buffer with Schmitt-trigger inputs. 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

- Wide supply voltage range from 1.65 V to 5.5 V
- · Overvoltage tolerant inputs to 5.5 V
- · High noise immunity
- ±24 mA output drive (V<sub>CC</sub> = 3.0 V)
- · CMOS low-power consumption
- Latch-up performance exceeds 250 mA
- · Direct interface with TTL levels
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- Complies with JEDEC standards
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8C (2.7 V to 3.6 V)
  - JESD36 (4.5 V to 5.5 V)
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

# 3. Applications

· Wave and pulse shapers for highly noisy environments



# Triple non-inverting Schmitt trigger with 5 V tolerant input

# 4. Ordering information

**Table 1. Ordering information** 

Type number	Package			
	Temperature range	Name	Description	Version
74LVC3G17DP	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2
74LVC3G17DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74LVC3G17GT	-40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm	SOT833-1
74LVC3G17GF	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm	SOT1089
74LVC3G17GN	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm	SOT1116
74LVC3G17GS	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm	SOT1203

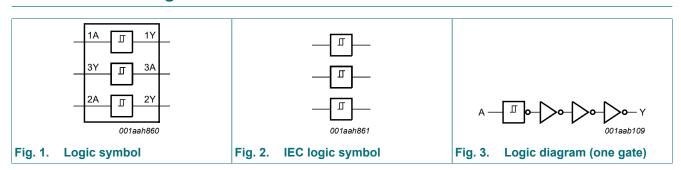
# 5. Marking

Table 2. Marking codes

Type number	Marking code [1]
74LVC3G17DP	V17
74LVC3G17DC	V17
74LVC3G17GT	V17
74LVC3G17GF	VV
74LVC3G17GN	VV
74LVC3G17GS	VV

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

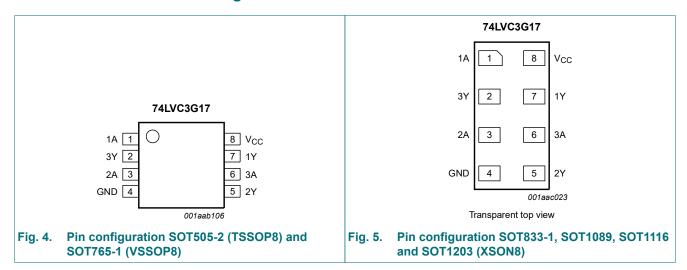
# 6. Functional diagram



## Triple non-inverting Schmitt trigger with 5 V tolerant input

# 7. Pinning information

# 7.1. Pinning



# 7.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1A, 2A, 3A	1, 3, 6	data input
GND	4	ground (0 V)
1Y, 2Y, 3Y	7, 5, 2	data output
V <sub>CC</sub>	8	supply voltage

# 8. Functional description

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

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

Input	Output
nA	nY
L	L
Н	Н

### Triple non-inverting Schmitt trigger with 5 V tolerant input

# 9. 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 <sub>O</sub> > V <sub>CC</sub> or V <sub>O</sub> < 0 V	-	±50	mA
Vo	output voltage	Active mode [1]	-0.5	V <sub>CC</sub> + 0.5	V
		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
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40  ^{\circ}\text{C} \text{ to } +125  ^{\circ}\text{C}$ [3]	-	250	mW

- [1] The minimum 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.
- [3] For SOT505-2 (TSSOP8) package:  $P_{tot}$  derates linearly with 4.6 mW/K above 96 °C.
  - For SOT765-1 (VSSOP8) package: Ptot derates linearly with 4.9 mW/K above 99 °C.
  - For SOT833-1 (XSON8) package:  $P_{tot}$  derates linearly with 3.1 mW/K above 68 °C.
  - For SOT1089 (XSON8) package:  $P_{tot}$  derates linearly with 4.0 mW/K above 88 °C.
  - For SOT1116 (XSON8) package: Ptot derates linearly with 4.2 mW/K above 90 °C.
  - For SOT1203 (XSON8) package:  $P_{tot}$  derates linearly with 3.6 mW/K above 81 °C.

# 10. Recommended operating conditions

### **Table 6. Operating conditions**

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		1.65	5.5	V
VI	input voltage		0	5.5	V
Vo	output voltage		0	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-40	+125	°C

## Triple non-inverting Schmitt trigger with 5 V tolerant input

# 11. Static characteristics

**Table 7. 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	Unit	
				Min	Typ [1]	Max	Min	Max	1
V <sub>OL</sub>	LOW-level output	$V_I = V_{T+}$ or $V_{T-}$							
	voltage	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	-	0.70	V
		$I_O = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$		-	-	0.3	-	0.45	V
		$I_O = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$		-	-	0.4	-	0.60	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V		-	-	0.55	-	0.80	V
		$I_O = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$		-	-	0.55	-	0.80	V
V <sub>OH</sub>	HIGH-level	$V_I = V_{T+}$ or $V_{T-}$							
	output voltage	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	[2]	-	±0.1	±1	-	±1	μΑ
l <sub>OFF</sub>	power-off leakage current	$V_{I}$ or $V_{O} = 5.5 \text{ V}$ ; $V_{CC} = 0 \text{ V}$		-	±0.1	±2	-	±2	μΑ
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	[2]	-	0.1	4	-	4	μΑ
Δl <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	[2]	-	5	500	-	500	μΑ
Cı	input capacitance			-	3.5	-	-	-	pF

All typical values are measured at  $T_{amb}$  = 25 °C. These typical values are measured at  $V_{CC}$  = 3.3 V.

### 11.1. Transfer characteristics

**Table 8. Transfer characteristics** 

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

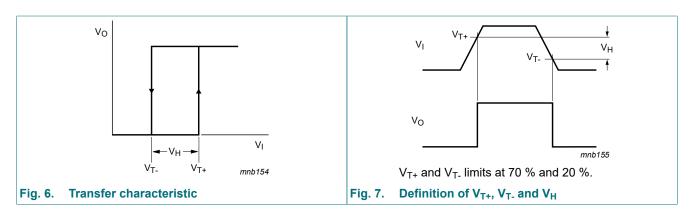
Symbol	Parameter	Conditions	-40	-40 °C to +85 °C			-40 °C to +125 °C	
			Min	Typ [1]	Max	Min	Max	
$V_{T+}$	positive-going	see Fig. 6 and Fig. 7						
	threshold voltage	V <sub>CC</sub> = 1.8 V	0.70	1.10	1.50	0.70	1.70	V
		V <sub>CC</sub> = 2.3 V	1.00	1.40	1.80	1.00	2.00	V
		V <sub>CC</sub> = 3.0 V	1.30	1.76	2.20	1.30	2.40	V
		V <sub>CC</sub> = 4.5 V	1.90	2.47	3.10	1.90	3.30	V
		V <sub>CC</sub> = 5.5 V	2.20	2.91	3.60	2.20	3.80	V

# Triple non-inverting Schmitt trigger with 5 V tolerant input

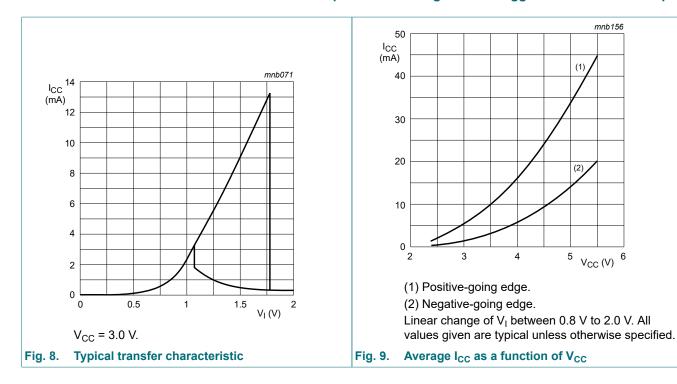
Symbol	Parameter	Conditions	-40	0 °C to +85	°C	-40 °C to	Unit	
			Min	Typ [1]	Max	Min	Max	
V <sub>T-</sub>	negative-going	see Fig. 6 and Fig. 7						
	threshold voltage	V <sub>CC</sub> = 1.8 V	0.25	0.61	0.90	0.25	1.10	V
		V <sub>CC</sub> = 2.3 V	0.40	0.80	1.15	0.40	1.35	V
		V <sub>CC</sub> = 3.0 V	0.60	1.04	1.50	0.60	1.70	V
		V <sub>CC</sub> = 4.5 V	1.00	1.55	2.00	1.00	2.20	V
		V <sub>CC</sub> = 5.5 V	1.20	1.86	2.30	1.20	2.50	V
V <sub>H</sub>	hysteresis voltage	$(V_{T+} - V_{T-})$ ; see <u>Fig. 6</u> , <u>Fig. 7</u> and <u>Fig. 8</u>						
		V <sub>CC</sub> = 1.8 V	0.15	0.49	1.00	0.15	1.20	V
		V <sub>CC</sub> = 2.3 V	0.25	0.60	1.10	0.25	1.30	V
		V <sub>CC</sub> = 3.0 V	0.40	0.73	1.20	0.40	1.40	V
		V <sub>CC</sub> = 4.5 V	0.60	0.92	1.50	0.60	1.70	V
		V <sub>CC</sub> = 5.5 V	0.70	1.02	1.70	0.70	1.90	V

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

# 11.2. Waveforms transfer characteristics



### Triple non-inverting Schmitt trigger with 5 V tolerant input



# 12. Dynamic characteristics

#### **Table 9. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 11.

Symbol	Parameter	-40	°C to +85	°C	-40 °C to	+125 °C	Unit	
			Min	Typ [1]	Max	Min	Max	
t <sub>pd</sub>	propagation	nA to nY; see Fig. 10 [2]						
	delay	V <sub>CC</sub> = 1.65 V to 1.95 V	1.5	5.6	10.5	1.5	13.1	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	3.7	6.5	1.0	8.5	ns
		V <sub>CC</sub> = 2.7 V	1.0	3.8	6.5	1.0	8.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	3.6	5.7	1.0	7.1	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	1.0	2.7	4.3	1.0	5.4	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $V_{CC} = 3.3 \text{ V}$ ; [3] $V_I = \text{GND to } V_{CC}$	-	16.3	-	-	-	pF

- 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.
- $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).

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

 $f_i$  = input frequency in MHz;

 $f_0$  = output frequency in MHz;

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

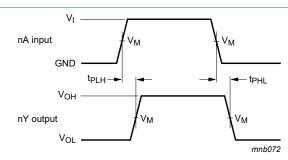
V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

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

## Triple non-inverting Schmitt trigger with 5 V tolerant input

### 12.1. Waveforms and test circuit



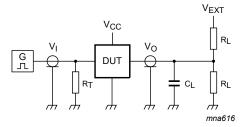
Measurement points are given in Table 10.

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

Fig. 10. The input (nA) to output (nY) propagation delays and the output transition times

**Table 10. Measurement points** 

Supply voltage	Input	Output
V <sub>CC</sub>	V <sub>M</sub>	V <sub>M</sub>
1.65 V to 1.95 V	0.5 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>
2.3 V to 2.7 V	0.5 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>
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 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>



Test data is given in Table 11.

Definitions for test circuit:

R<sub>L</sub> = Load resistance.

C<sub>L</sub> = Load capacitance including jig and probe capacitance.

 $R_{T}$  = Termination resistance should be equal to output impedance  $Z_{\text{o}}$  of the pulse generator.

V<sub>EXT</sub> = External voltage for measuring switching times.

Fig. 11. Test circuit for measuring switching times

Table 11. Test data

Supply voltage	e Input		Load	Load		V <sub>EXT</sub>		
V <sub>cc</sub>	V <sub>I</sub>	t <sub>r</sub> , t <sub>f</sub>	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	2 × V <sub>CC</sub>	
2.3 V to 2.7 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	500 Ω	open	GND	2 × V <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	500 Ω	open	GND	2 × V <sub>CC</sub>	

## Triple non-inverting Schmitt trigger with 5 V tolerant input

# 13. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

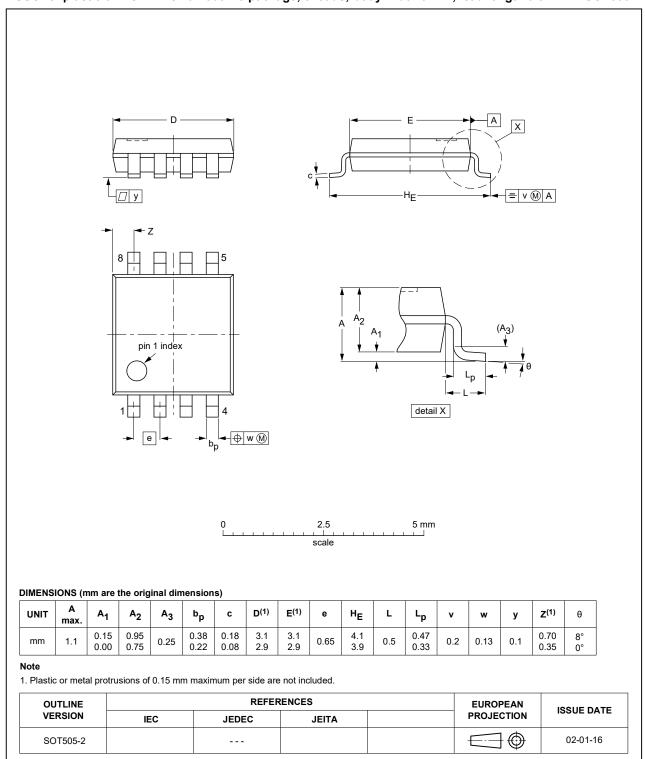


Fig. 12. Package outline SOT505-2 (TSSOP8)

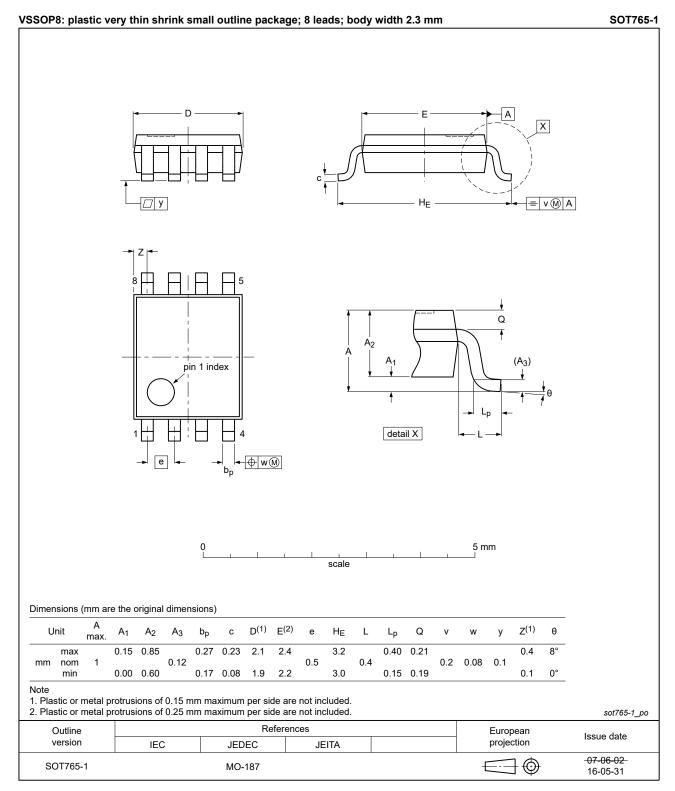


Fig. 13. Package outline SOT765-1 (VSSOP8)

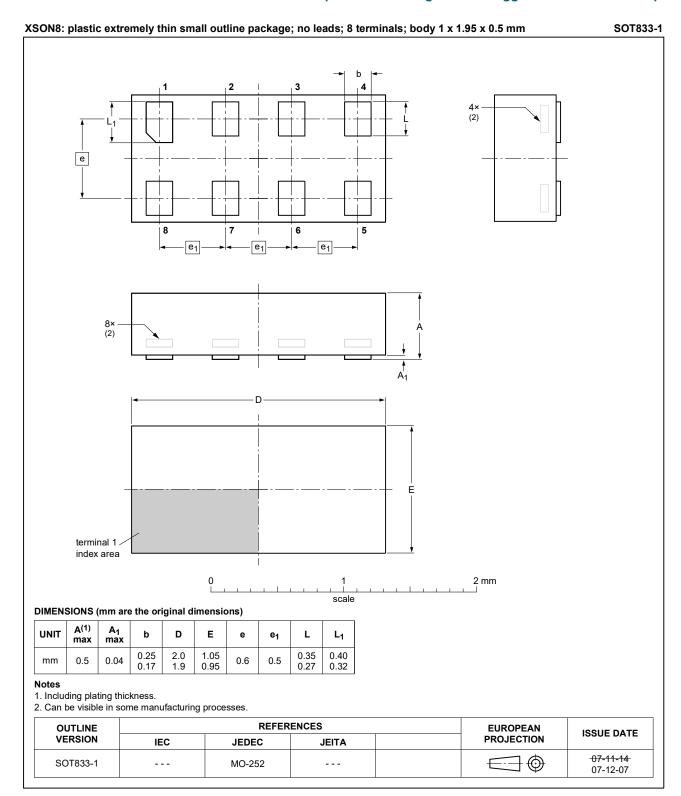


Fig. 14. Package outline SOT833-1 (XSON8)

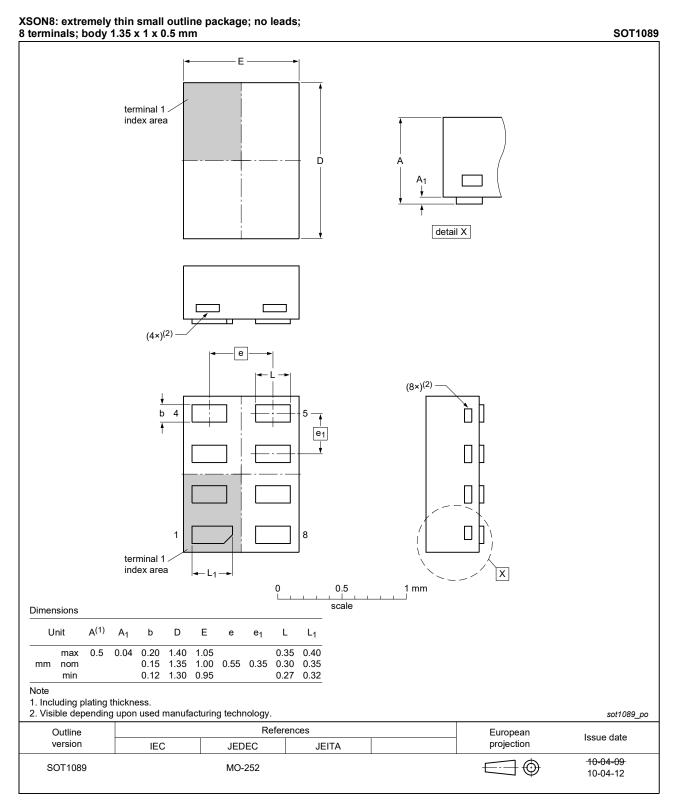


Fig. 15. Package outline SOT1089 (XSON8)

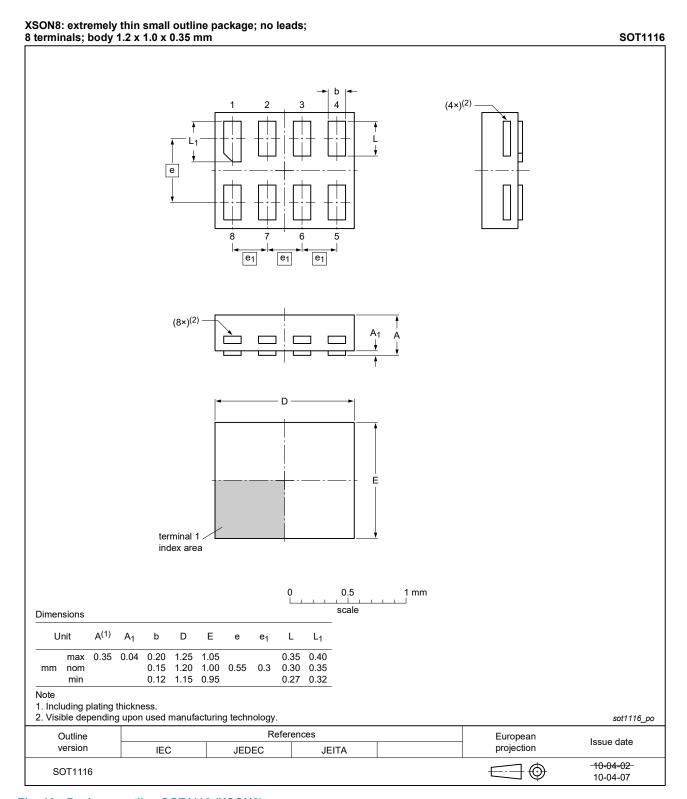


Fig. 16. Package outline SOT1116 (XSON8)

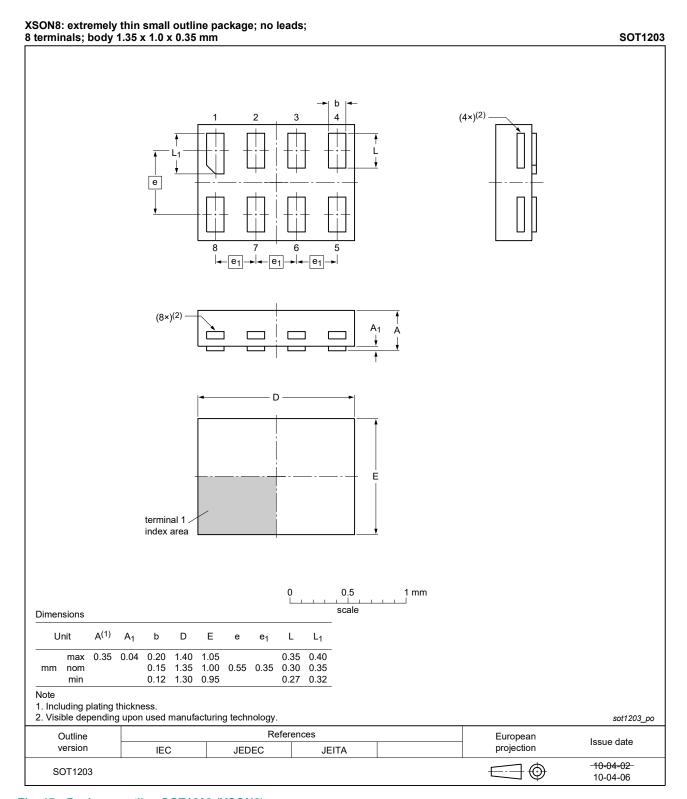


Fig. 17. Package outline SOT1203 (XSON8)

# Triple non-inverting Schmitt trigger with 5 V tolerant input

# 14. Abbreviations

#### **Table 12. Abbreviations**

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

# 15. Revision history

## Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LVC3G17 v.15	20230824	Product data sheet	-	74LVC3G17 v.14		
Modifications:	Section 2: I	<u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.				
74LVC3G17 v.14	20210826	Product data sheet	-	74LVC3G17 v.13		
Modifications:	Type numb	<ul> <li><u>Section 1</u> and <u>Section 2</u> updated.</li> <li>Type number 74LVC3G17GM (SOT902-2/XQFN8) removed.</li> <li><u>Section 9</u>: Derating values for P<sub>tot</sub> total power dissipation updated.</li> </ul>				
74LVC3G17 v.13	20181127	Product data sheet	-	74LVC3G17 v.12		
Modifications:	guidelines o Legal texts	<ul> <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 numbers 74LVC3G17GD (SOT996-2) removed.</li> </ul>				
74LVC3G17 v.12	20161215	Product data sheet	-	74LVC3G17 v.11		
Modifications:	• <u>Table 7</u> : Th	• <u>Table 7</u> : The maximum limits for leakage current and supply current have changed.				
74LVC3G17 v.11	20130409	Product data sheet	-	74LVC3G17 v.10		
Modifications:	For type nu	For type number 74LVC3G17GD XSON8U has changed to XSON8.				
74LVC3G17 v.10	20120706	Product data sheet	-	74LVC3G17 v.9		
Modifications:	For type nu	For type number 74LVC3G17GM the SOT code has changed to SOT902-2.				
74LVC3G17 v.9	20111123	Product data sheet	-	74LVC3G17 v.8		
Modifications:	Legal page	Legal pages updated.				
74LVC3G17 v.8	20110921	Product data sheet	-	74LVC3G17 v.7		
74LVC3G17 v.7	20101104	Product data sheet	-	74LVC3G17 v.6		
74LVC3G17 v.6	20080606	Product data sheet	-	74LVC3G17 v.5		
74LVC3G17 v.5	20080313	Product data sheet	-	74LVC3G17 v.4		
74LVC3G17 v.4	20070521	Product data sheet	-	74LVC3G17 v.3		
74LVC3G17 v.3	20050131	Product data sheet	-	74LVC3G17 v.2		
74LVC3G17 v.2	20041103	Product specification	-	74LVC3G17 v.1		
74LVC3G17 v.1	20040624	Product specification	-	-		

### Triple non-inverting Schmitt trigger with 5 V tolerant input

# 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.

- 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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# Triple non-inverting Schmitt trigger with 5 V tolerant input

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For more information, please visit: http://www.nexperia.com For sales office addresses, please send an email to: salesaddresses@nexperia.com Date of release: 24 August 2023

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