74LVC2G17

Dual non-inverting Schmitt trigger with 5 V tolerant input

Rev. 9 — 15 December 2016

Product data sheet

1. General description

The 74LVC2G17 provides two non-inverting buffers with Schmitt trigger input. It is capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators 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.

2. Features and benefits

- 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)
 - ◆ JESD-8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- \pm 24 mA output drive (V_{CC} = 3.0 V)
- CMOS low-power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- 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



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4. Ordering information

Table 1. Ordering information

Type number	Package						
	Temperature range	Name	Description	Version			
74LVC2G17GW	−40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363			
74LVC2G17GV	−40 °C to +125 °C	TSOP6	plastic surface-mounted package (TSOP6); 6 leads	SOT457			
74LVC2G17GM	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body $1 \times 1.45 \times 0.5$ mm	SOT886			
74LVC2G17GF	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body $1 \times 1 \times 0.5$ mm	SOT891			
74LVC2G17GN	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $0.9 \times 1.0 \times 0.35$ mm	SOT1115			
74LVC2G17GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $1.0 \times 1.0 \times 0.35$ mm	SOT1202			

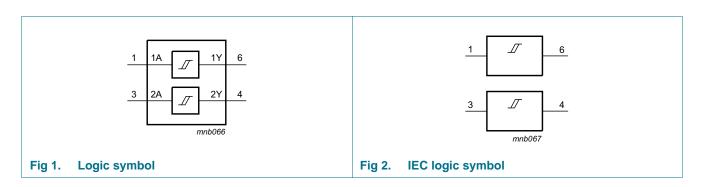
5. Marking

Table 2. Marking codes

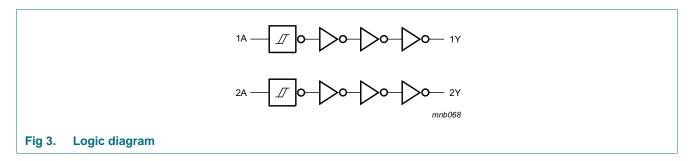
Type number	Marking code[1]
74LVC2G17GW	VV
74LVC2G17GV	VV
74LVC2G17GM	VV
74LVC2G17GF	VV
74LVC2G17GN	VV
74LVC2G17GS	VV

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

6. Functional diagram

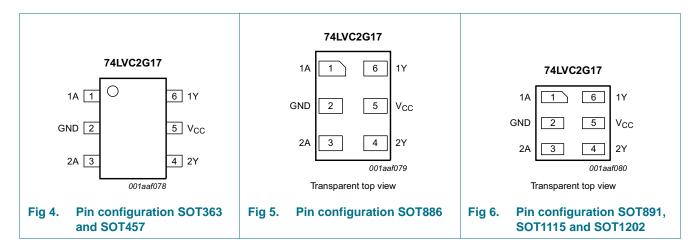


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7. Pinning information

7.1 Pinning



7.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
1A	1	data input
GND	2	ground (0 V)
2A	3	data input
2Y	4	data output
V _{CC}	5	supply voltage
1Y	6	data output

8. Functional description

Table 4. Function table[1]

Input	Output
nA	nY
L	L
Н	Н

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

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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 _{IK}	input clamping current	V _I < 0 V		-	-50	mA
VI	input voltage		[1]	-0.5	+6.5	V
I _{OK}	output clamping current	V _O < 0 V		-	-50	mA
Vo	output voltage	Active mode	[1][2]	-0.5	V _{CC} + 0.5	V
		Power-down mode	[1][2]	-0.5	+6.5	V
Io	output current	$V_O = 0 V \text{ to } V_{CC}$		-	±50	mA
Icc	supply current			-	100	mA
I _{GND}	ground current			-	-100	mA
T _{stg}	storage temperature			-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[3]	-	300	mW

^[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

10. 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		0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	-	+125	°C

11. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit		
$T_{amb} = -4$	$T_{amb} = -40 ^{\circ}\text{C to } +85 ^{\circ}\text{C}_{\frac{[1]}{2}}$							
V_{OL}	LOW-level output voltage	$V_I = V_{T+}$ or V_{T-}						
		$I_O = 100 \ \mu A; \ V_{CC} = 1.65 \ V \ to \ 5.5 \ V$	-	-	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		

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^[2] When $V_{CC} = 0 \text{ V}$ (Power-down mode), the output voltage can be 5.5 V in normal operation.

^[3] For SC-88 and SC-74 packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K. For XSON6 packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

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Table 7. Static characteristics ...continued
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V _{OH}	HIGH-level output voltage	$V_I = V_{T+}$ or V_{T-}				
		$I_O = -100 \mu A$; $V_{CC} = 1.65 \text{ V}$ to 5.5 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
l _l	input leakage current	$V_{I} = 5.5 \text{ V or GND}; V_{CC} = 5.5 \text{ V}$	-	±0.1	±1	μΑ
I _{OFF}	power-off leakage current	V_{I} or $V_{O} = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$	-	±0.1	±2	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	0.1	4	μΑ
Δl _{CC}	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V} \text{ to } 5.5 \text{ V}$	-	5	500	μА
Cı	input capacitance		-	3.5	-	pF
T _{amb} = -	40 °C to +125 °C					
V _{OL}	LOW-level output voltage	$V_I = V_{T+}$ or V_{T-}				
		$I_O = 100 \mu A$; $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$	-	-	0.1	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.70	V
		$I_O = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.45	V
		$I_O = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.60	V
		$I_O = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.80	V
		$I_O = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.80	V
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		$I_O = -100 \mu A$; $V_{CC} = 1.65 \text{ V}$ to 5.5 V	V _{CC} - 0.1	-	-	V
		$I_O = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	0.95	-	-	V
		$I_{O} = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.7	-	-	V
		$I_O = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	1.9	-	-	V
		$I_{O} = -24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.0	-	-	V
		$I_{O} = -32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.4	-	-	V
I	input leakage current	$V_{I} = 5.5 \text{ V or GND}; V_{CC} = 5.5 \text{ V}$	-	±0.1	±1	μΑ
OFF	power-off leakage current	V_{I} or $V_{O} = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$	-	-	±2	μΑ
cc	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	4	μΑ
Δl _{CC}	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V} \text{ to } 5.5 \text{ V}$	-	-	500	μА

^[1] All typical values are measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.

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12. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

Symbol	Parameter	Conditions	-40	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t _{pd}	propagation delay	nA to nY; see Figure 7 [2]						
		V _{CC} = 1.65 V to 1.95 V	1.5	5.6	10.5	1.5	13.1	ns
		V _{CC} = 2.3 V to 2.7 V	1.0	3.7	6.5	1.0	8.5	ns
		V _{CC} = 2.7 V	1.0	3.8	6.5	1.0	8.5	ns
		V _{CC} = 3.0 V to 3.6 V	1.0	3.6	5.7	1.0	7.1	ns
		V _{CC} = 4.5 V to 5.5 V	1.0	2.7	4.3	1.0	5.4	ns
C_{PD}	power dissipation capacitance	per buffer; $V_{CC} = 3.3 \text{ V}$; $V_I = \text{GND to } V_{CC}$	-	16.3	-	-	-	pF

- [1] 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.
- [2] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

 f_i = input frequency in MHz;

f_o = output frequency in MHz;

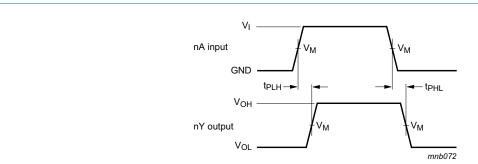
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

13. Waveforms



Measurement points are given in Table 9.

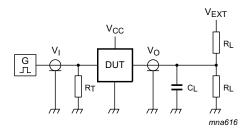
 V_{OL} and V_{OH} are typical output voltage drop that occur with the output load.

Fig 7. The input (nA) to output (nY) propagation delays and the output transition times

Dual non-inverting Schmitt trigger with 5 V tolerant input

Table 9. Measurement points

Supply voltage	Input	Output
Vcc	V _M	V _M
1.65 V to 1.95 V	0.5 × V _{CC}	0.5 × V _{CC}
2.3 V to 2.7 V	0.5 × V _{CC}	0.5 × 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 × V _{CC}	0.5 × V _{CC}



Measurement points are 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 output impedance Z_0 of the pulse generator.

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

Fig 8. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input	put		Load		
V _{CC}	VI	t _r , t _f	CL	R _L	t _{PLH} , t _{PHL}	
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	open	
2.3 V to 2.7 V	V _{CC}	≤ 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 _{CC}	≤ 2.5 ns	50 pF	500 Ω	open	

Dual non-inverting Schmitt trigger with 5 V tolerant input

14. Transfer characteristics

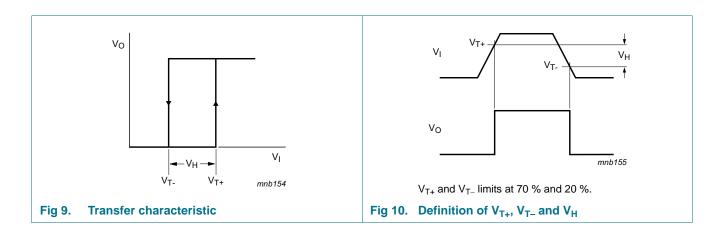
Table 11. Transfer characteristics

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

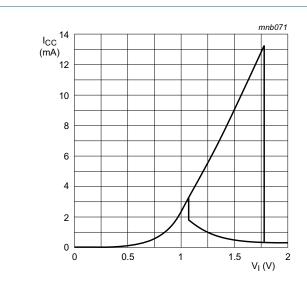
Symbol	Parameter	Conditions	-40	-40 °C to +85 °C			-40 °C to +125 °C	
			Min	Typ[1]	Max	Min	Max	1
V _{T+}	positive-going	see Figure 9 and Figure 10						
	threshold voltage	V _{CC} = 1.8 V	0.70	1.10	1.50	0.70	1.70	V
		V _{CC} = 2.3 V	1.00	1.40	1.80	1.00	2.00	V
		V _{CC} = 3.0 V	1.30	1.76	2.20	1.30	2.40	V
		V _{CC} = 4.5 V	1.90	2.47	3.10	1.90	3.30	V
		V _{CC} = 5.5 V	2.20	2.91	3.60	2.20	3.80	V
V_{T-}	negative-going	see Figure 9 and Figure 10						
	threshold voltage	V _{CC} = 1.8 V	0.25	0.61	0.90	0.25	1.10	V
		V _{CC} = 2.3 V	0.40	0.80	1.15	0.40	1.35	V
		V _{CC} = 3.0 V	0.60	1.04	1.50	0.60	1.70	V
		V _{CC} = 4.5 V	1.00	1.55	2.00	1.00	2.20	V
		V _{CC} = 5.5 V	1.20	1.86	2.30	1.20	2.50	V
V _H	hysteresis voltage	(V _{T+} – V _{T-}); see <u>Figure 9</u> , Figure 10 and <u>Figure 11</u>						
		V _{CC} = 1.8 V	0.15	0.49	1.00	0.15	1.20	V
		V _{CC} = 2.3 V	0.25	0.60	1.10	0.25	1.30	V
		V _{CC} = 3.0 V	0.40	0.73	1.20	0.40	1.40	V
		V _{CC} = 4.5 V	0.60	0.92	1.50	0.60	1.70	V
		V _{CC} = 5.5 V	0.70	1.02	1.70	0.70	1.90	V

^[1] All typical values are measured at T_{amb} = 25 °C.

15. Waveforms transfer characteristics

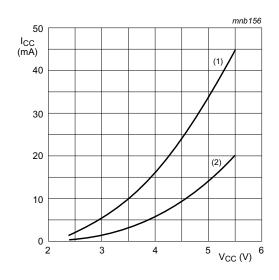


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 $V_{CC} = 3.0 \text{ V}.$

Fig 11. Typical transfer characteristic



- (1) Positive-going edge
- (2) Negative-going edge

Linear change of $V_{\rm I}$ between 0.8 V to 2.0 V. All values given are typical unless otherwise specified.

Fig 12. Average I_{CC} as a function of V_{CC}

Dual non-inverting Schmitt trigger with 5 V tolerant input

16. Package outline

Plastic surface-mounted package; 6 leads

SOT363

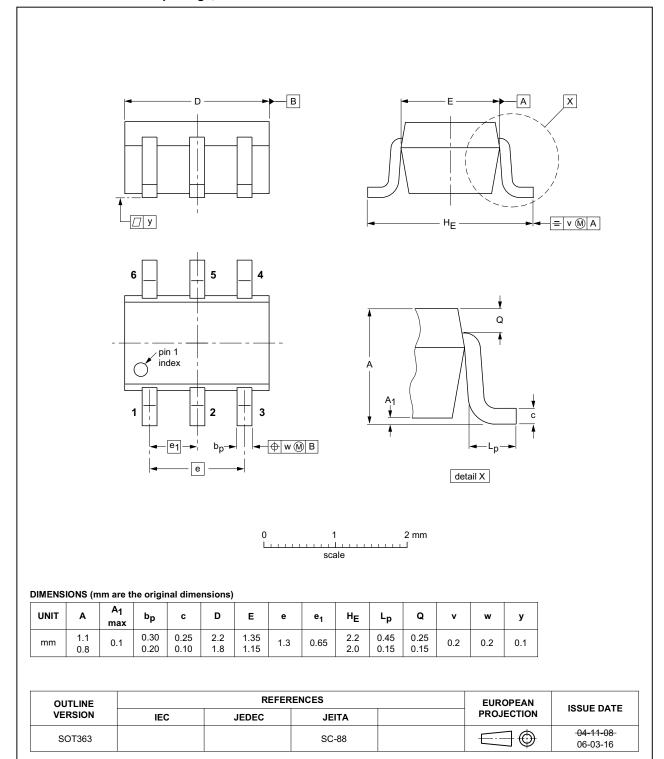


Fig 13. Package outline SOT363 (SC-88)

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Dual non-inverting Schmitt trigger with 5 V tolerant input

Plastic surface-mounted package (TSOP6); 6 leads

SOT457

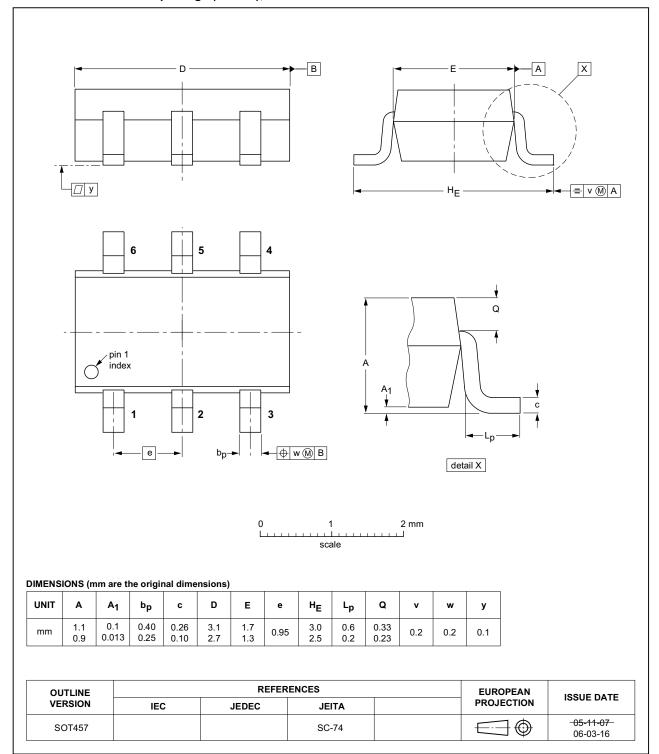


Fig 14. Package outline SOT457 (SC-74)

Dual non-inverting Schmitt trigger with 5 V tolerant input

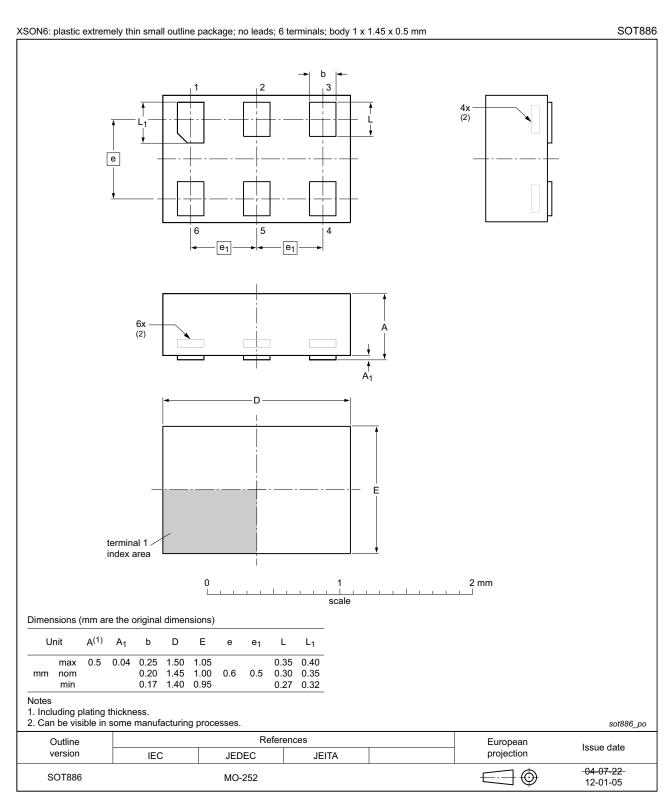


Fig 15. Package outline SOT886 (XSON6)

Dual non-inverting Schmitt trigger with 5 V tolerant input

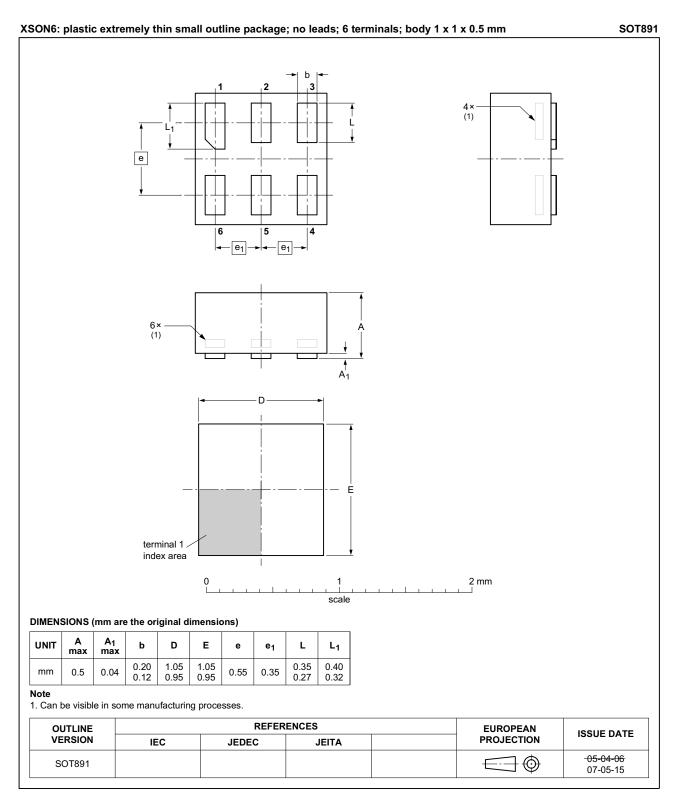


Fig 16. Package outline SOT891 (XSON6)

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Dual non-inverting Schmitt trigger with 5 V tolerant input

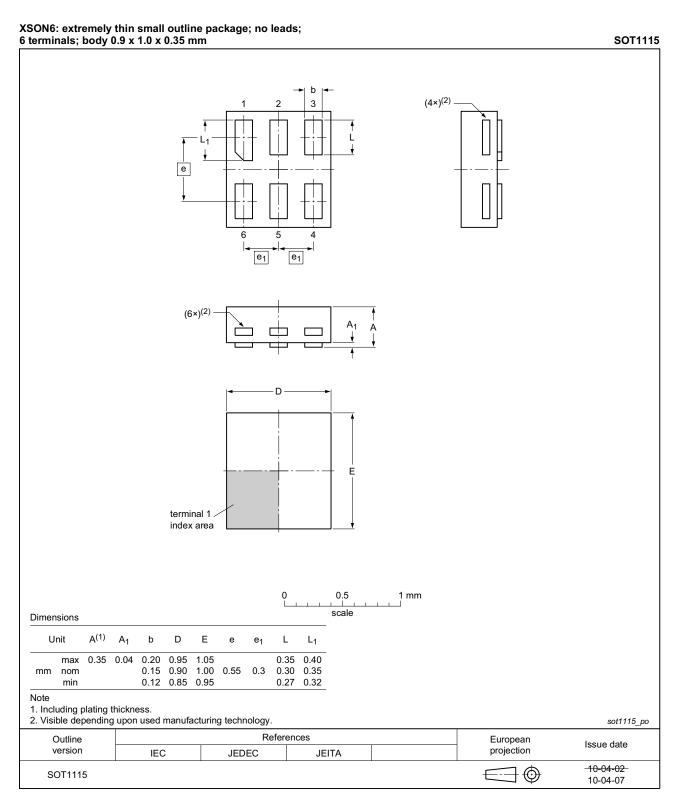


Fig 17. Package outline SOT1115 (XSON6)

Dual non-inverting Schmitt trigger with 5 V tolerant input

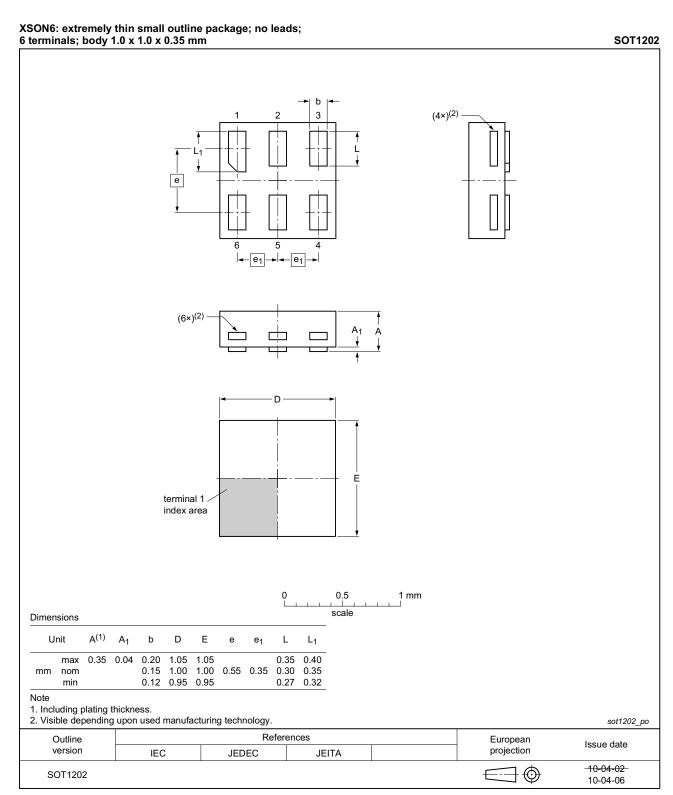


Fig 18. Package outline SOT1202 (XSON6)

Dual non-inverting Schmitt trigger with 5 V tolerant input

17. Abbreviations

Table 12. Abbreviations

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

18. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC2G17 v.9	20161215	Product data sheet	-	74LVC2G17 v.8
Modifications:	• Table 7: The	maximum limits for leakage cu	rrent and supply curre	nt have changed.
74LVC2G17 v.8	20130502	Product data sheet	-	74LVC2G17 v.7
Modifications:	• <u>Table 3</u> : the d	escription of pin 6 changed fro	m data input to data o	utput.
74LVC2G17 v.6	20110921	Product data sheet	-	74LVC2G17 v.5
74LVC2G17 v.5	20100806	Product data sheet	-	74LVC2G17 v.4
74LVC2G17 v.4	20061009	Product data sheet	-	74LVC2G17 v.3
74LVC2G17 v.3	20050926	Product data sheet	-	74LVC2G17 v.2
74LVC2G17 v.2	20040908	Product specification	-	74LVC2G17 v.1
74LVC2G17 v.1	20030813	Product specification	-	-

Dual non-inverting Schmitt trigger with 5 V tolerant input

19. Legal information

19.1 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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For more information, please visit: http://www.nexperia.com

For sales office addresses, please send an email to: salesaddresses@nexperia.com

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