

# 74LVC1G17

## Single Schmitt trigger buffer

Rev. 06 — 27 August 2007

Product data sheet

## 1. General description

---

The 74LVC1G17 provides a buffer function with Schmitt trigger action. It is capable of transforming slowly changing input signals into sharply defined outputs.

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.

## 2. Features

---

- 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)
  - ◆ JESD8B/JESD36 (2.7 V to 3.6 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
- Unlimited rise and fall times
- Inputs accept voltages up to 5 V
- Multiple package options
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Specified from  $-40$  °C to  $+125$  °C

### 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC1G17GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74LVC1G17GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
74LVC1G17GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74LVC1G17GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891

### 4. Marking

Table 2. Marking codes

Type number	Marking
74LVC1G17GW	VJ
74LVC1G17GV	V17
74LVC1G17GM	VJ
74LVC1G17GF	VJ

### 5. Functional diagram

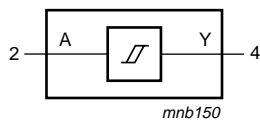


Fig 1. Logic symbol

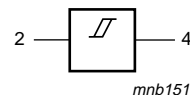


Fig 2. IEC logic symbol

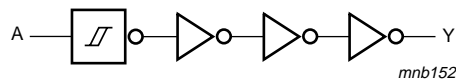
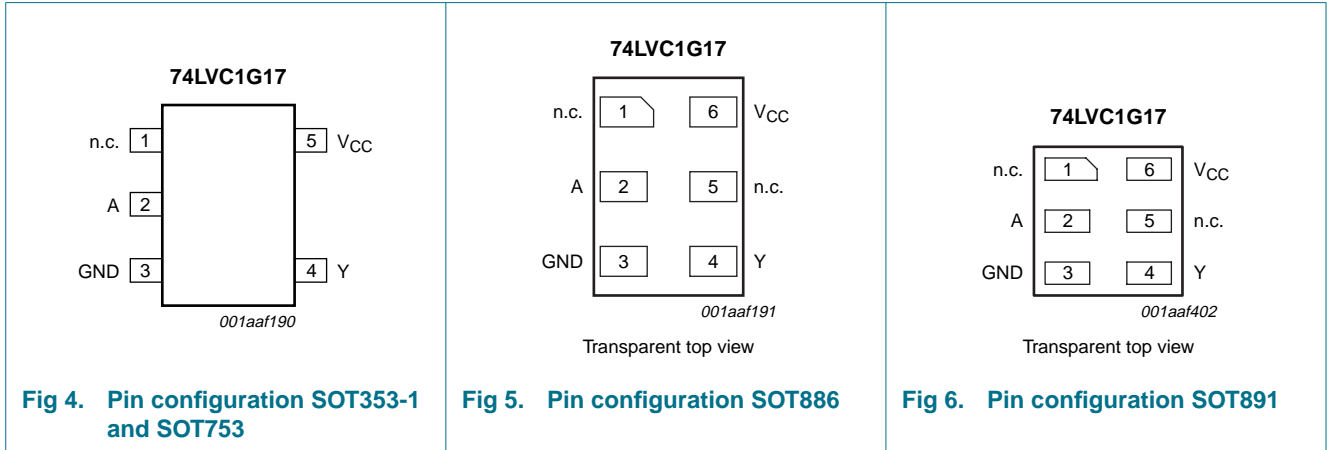


Fig 3. Logic diagram

## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

**Table 3. Pin description**

Symbol	Pin		Description
	SOT353-1/SOT753	SOT886/SOT891	
n.c.	1	1, 5	not connected
A	2	2	data input
GND	3	3	ground (0 V)
Y	4	4	data output
V <sub>CC</sub>	5	6	supply voltage

## 7. Functional description

**Table 4. Function table<sup>[1]</sup>**

Input	Output
A	Y
L	L
H	H

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

## 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
$I_{IK}$	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	-	$\pm 50$	mA
$V_O$	output voltage	Active mode	[1][2] -0.5	$V_{CC} + 0.5$	V
		Power-down mode	[1][2] -0.5	+6.5	V
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	$\pm 50$	mA
$I_{CC}$	supply current		-	100	mA
$I_{GND}$	ground current		-100	-	mA
$P_{tot}$	total power dissipation	$T_{amb} = -40$ °C to +125 °C	[3] -	250	mW
$T_{stg}$	storage temperature		-65	+150	°C

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

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

[3] For TSSOP5 and SC-74A packages: above 87.5 °C the value of  $P_{tot}$  derates linearly with 4.0 mW/K.  
For XSON6 packages: above 45 °C the value of  $P_{tot}$  derates linearly with 2.4 mW/K.

## 9. Recommended operating conditions

**Table 6. 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
		$V_{CC} = 0$ V; Power-down mode	0	-	5.5	V
$T_{amb}$	ambient temperature		-40	-	+125	°C

## 10. Static characteristics

**Table 7. Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
<b><math>T_{amb} = -40</math> °C to +85 °C</b>						
$V_{OH}$	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	1.2	-	-	V
		$I_O = -8$ mA; $V_{CC} = 2.3$ V	1.9	-	-	V
		$I_O = -12$ mA; $V_{CC} = 2.7$ V	2.2	-	-	V
		$I_O = -24$ mA; $V_{CC} = 3.0$ V	2.3	-	-	V
		$I_O = -32$ mA; $V_{CC} = 4.5$ V	3.8	-	-	V

**Table 7. Static characteristics ...continued**

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

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>CC</sub> or GND				
		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
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	±5	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	±10	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	10	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; per pin	-	5	500	μA
C <sub>I</sub>	input capacitance		-	5	-	pF
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>CC</sub> or GND				
		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>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V	3.4	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>CC</sub> or GND				
		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	-	-	0.80	V
		I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V	-	-	0.80	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	-	-	±100	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	-	-	±200	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	-	-	200	μA
ΔI <sub>CC</sub>	additional supply current	per pin; 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	-	-	5000	μA

[1] All typical values are measured at maximum V<sub>CC</sub> and T<sub>amb</sub> = 25 °C.

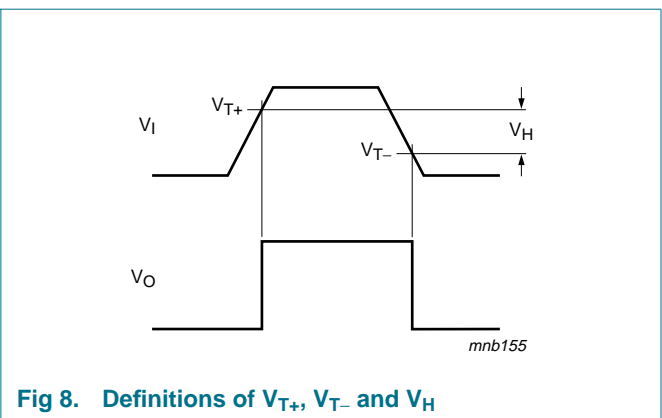
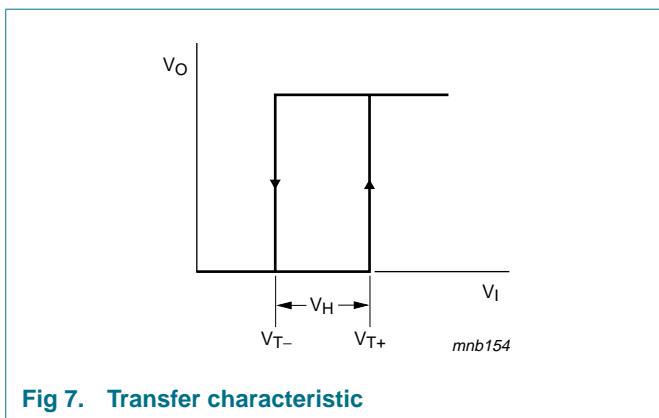
**Table 8. Transfer characteristics**

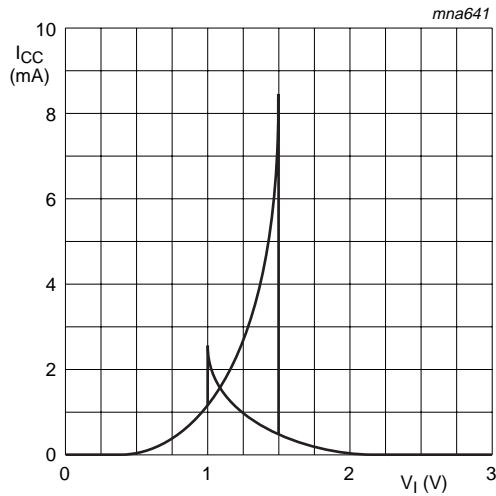
At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
V <sub>T+</sub>	positive-going threshold voltage	see <a href="#">Figure 7</a> and <a href="#">Figure 8</a>						
		V <sub>CC</sub> = 1.8 V	0.82	1.0	1.14	0.79	1.14	V
		V <sub>CC</sub> = 2.3 V	1.03	1.2	1.40	1.00	1.40	V
		V <sub>CC</sub> = 3.0 V	1.29	1.5	1.71	1.26	1.71	V
		V <sub>CC</sub> = 4.5 V	1.84	2.1	2.36	1.81	2.36	V
V <sub>T-</sub>	negative-going threshold voltage	see <a href="#">Figure 7</a> and <a href="#">Figure 8</a>						
		V <sub>CC</sub> = 1.8 V	0.46	0.6	0.75	0.46	0.78	V
		V <sub>CC</sub> = 2.3 V	0.65	0.8	0.96	0.65	0.99	V
		V <sub>CC</sub> = 3.0 V	0.88	1.0	1.24	0.88	1.27	V
		V <sub>CC</sub> = 4.5 V	1.32	1.5	1.84	1.32	1.87	V
V <sub>H</sub>	hysteresis voltage	see <a href="#">Figure 7</a> , <a href="#">Figure 8</a> and <a href="#">Figure 9</a>						
		V <sub>CC</sub> = 1.8 V	0.26	0.4	0.51	0.19	0.51	V
		V <sub>CC</sub> = 2.3 V	0.28	0.4	0.57	0.22	0.57	V
		V <sub>CC</sub> = 3.0 V	0.31	0.5	0.64	0.25	0.64	V
		V <sub>CC</sub> = 4.5 V	0.40	0.6	0.77	0.34	0.77	V
		V <sub>CC</sub> = 5.5 V	0.47	0.6	0.88	0.41	0.88	V

[1] All typical values are measured at T<sub>amb</sub> = 25 °C.

### 10.1 Transfer characteristic waveforms





V<sub>CC</sub> = 3.0 V

Fig 9. Typical transfer characteristics

## 11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see Figure 11.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
t <sub>pd</sub>	propagation delay	A to Y; see Figure 10 <sup>[2]</sup>						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	4.1	11.0	1.0	14.0	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.7	2.8	6.5	0.7	8.5	ns
		V <sub>CC</sub> = 2.7 V	0.7	3.2	6.5	0.7	8.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.7	3.0	5.5	0.7	7.0	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.7	2.2	5.0	0.7	6.5	ns
C <sub>PD</sub>	power dissipation capacitance	V <sub>I</sub> = GND to V <sub>CC</sub> ; V <sub>CC</sub> = 3.3 V <sup>[3]</sup>	-	16.6	-	-	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.8 V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively.

[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;

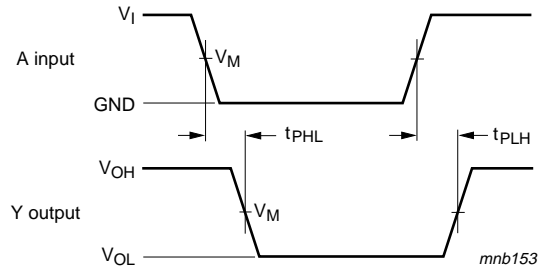
C<sub>L</sub> = output load capacitance in pF;

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.

12. Waveforms



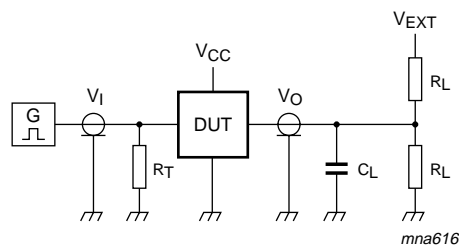
Measurement points are given in [Table 10](#).

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

**Fig 10. The input A 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 the output impedance  $Z_o$  of the pulse generator.

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

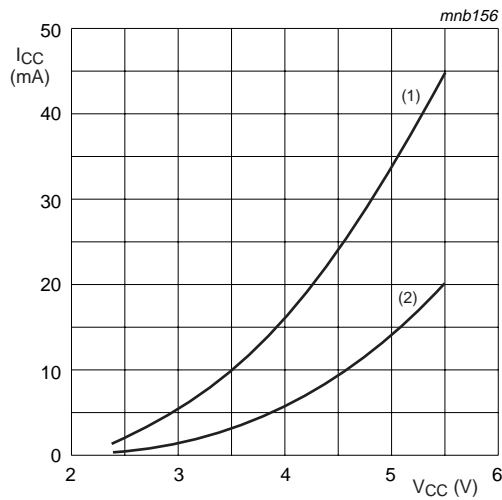
**Fig 11. Load circuitry for switching times**



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

### 13. Application information



Linear change of V<sub>I</sub> between 0.8 V to 2.0 V.

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

Fig 12. Average supply current as a function of supply voltage

14. Package outline

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

SOT353-1



Fig 13. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753



Fig 14. Package outline SOT753 (SC-74A)

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

SOT886



Fig 15. Package outline SOT886 (XSON6)

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

SOT891



Fig 16. Package outline SOT891 (XSON6)

## 15. Abbreviations

**Table 12. 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

## 16. Revision history

**Table 13. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC1G17_6	20070827	Product data sheet	-	74LVC1G17_5
Modifications:	<ul style="list-style-type: none"> <li>In <a href="#">Section 10 “Static characteristics”</a>, changed conditions for input leakage and supply current.</li> <li><a href="#">Figure 16 “Package outline SOT891 (XSON6)”</a> updated.</li> </ul>			
74LVC1G17_5	20061006	Product data sheet	-	74LVC1G17_4
74LVC1G17_4	20041130	Product specification	-	74LVC1G17_3
74LVC1G17_3	20041018	Product specification	-	74LVC1G17_2
74LVC1G17_2	20040407	Product specification	-	74LVC1G17_1
74LVC1G17_1	20040324	Product specification	-	-

## 17. Legal information

### 17.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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".

[3] 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 URL <http://www.nxp.com>.

### 17.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

### 17.3 Disclaimers

**General** — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

**Right to make changes** — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or

malfunction of a NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors accepts no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

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

**Terms and conditions of sale** — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, including those pertaining to warranty, intellectual property rights infringement and limitation of liability, unless explicitly otherwise agreed to in writing by NXP Semiconductors. In case of any inconsistency or conflict between information in this document and such terms and conditions, the latter will prevail.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

### 17.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 18. Contact information

For additional information, please visit: <http://www.nxp.com>

For sales office addresses, send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

**19. Contents**

1 **General description** . . . . . 1

2 **Features** . . . . . 1

3 **Ordering information** . . . . . 2

4 **Marking** . . . . . 2

5 **Functional diagram** . . . . . 2

6 **Pinning information** . . . . . 3

6.1 Pinning . . . . . 3

6.2 Pin description . . . . . 3

7 **Functional description** . . . . . 3

8 **Limiting values** . . . . . 4

9 **Recommended operating conditions** . . . . . 4

10 **Static characteristics** . . . . . 4

10.1 Transfer characteristic waveforms . . . . . 6

11 **Dynamic characteristics** . . . . . 7

12 **Waveforms** . . . . . 8

13 **Application information** . . . . . 9

14 **Package outline** . . . . . 10

15 **Abbreviations** . . . . . 14

16 **Revision history** . . . . . 14

17 **Legal information** . . . . . 15

17.1 Data sheet status . . . . . 15

17.2 Definitions . . . . . 15

17.3 Disclaimers . . . . . 15

17.4 Trademarks . . . . . 15

18 **Contact information** . . . . . 15

19 **Contents** . . . . . 16

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.



© NXP B.V. 2007.

All rights reserved.

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

Date of release: 27 August 2007

Document identifier: 74LVC1G17\_6