

# DATA SHEET

## **74LVC2G17**

**Dual non-inverting Schmitt-trigger  
with 5 V tolerant input**

Product specification

2003 Aug 13

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

## 74LVC2G17

### FEATURES

- Wide supply voltage range from 1.65 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 to 1.95 V)
  - JESD8-5 (2.3 to 2.7 V)
  - JESD8B/JESD36 (2.7 to 3.6 V).
- ESD protection:
  - HBM EIA/JESD22-A114-A exceeds 2000 V
  - MM EIA/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
- SOT363 and SOT457 package
- Specified from  $-40$  to  $+125$  °C.

### APPLICATIONS

- Wave and pulse shapers for highly noisy environments.

### DESCRIPTION

The 74LVC2G17 is a high-performance, low-power, low-voltage, Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

Inputs can be driven from either 3.3 or 5 V devices. These feature allows the use of these devices as translators in a mixed 3.3 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 back flow current through the device when it is powered down.

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

### QUICK REFERENCE DATA

GND = 0 V;  $T_{amb} = 25$  °C.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
$t_{PHL}/t_{PLH}$	propagation delay inputs nA to output nY	$V_{CC} = 1.8$ V; $C_L = 30$ pF; $R_L = 1$ k $\Omega$	5.6	ns
		$V_{CC} = 2.5$ V; $C_L = 30$ pF; $R_L = 500$ $\Omega$	3.7	ns
		$V_{CC} = 2.7$ V; $C_L = 50$ pF; $R_L = 500$ $\Omega$	3.8	ns
		$V_{CC} = 3.3$ V; $C_L = 50$ pF; $R_L = 500$ $\Omega$	3.6	ns
		$V_{CC} = 5.0$ V; $C_L = 50$ pF; $R_L = 500$ $\Omega$	2.7	ns
$C_I$	input capacitance		3.5	pF
$C_{PD}$	power dissipation capacitance per buffer	$V_{CC} = 3.3$ V; notes 1 and 2	16.3	pF

### Notes

1.  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu$ W).

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in Volts;

$N$  = total load switching outputs;

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

2. The condition is  $V_I = \text{GND to } V_{CC}$ .

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

74LVC2G17

### FUNCTION TABLE

See note 1.

INPUT	OUTPUT
nA	nY
L	L
H	H

### Note

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

### ORDERING INFORMATION

TYPE NUMBER	PACKAGES					
	TEMPERATURE RANGE	PINS	PACKAGE	MATERIAL	CODE	MARKING
74LVC2G17GW	-40 to +125 °C	6	SC-88	plastic	SOT363	VV
74LVC2G17GV	-40 to +125 °C	6	SC-74	plastic	SOT457	V17

### PINNING

PIN	SYMBOL	DESCRIPTION
1	1A	data input
2	GND	ground (0 V)
3	2A	data input
4	2Y	data output
5	V <sub>CC</sub>	supply voltage
6	1Y	data output

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## 74LVC2G17

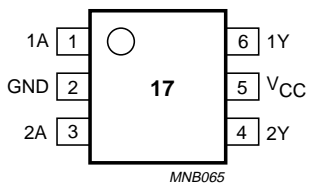


Fig.1 Pin configuration.

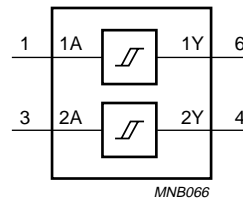


Fig.2 Logic symbol.

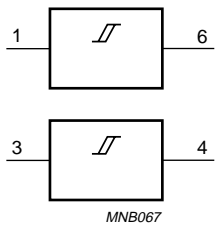


Fig.3 IEC logic symbol.

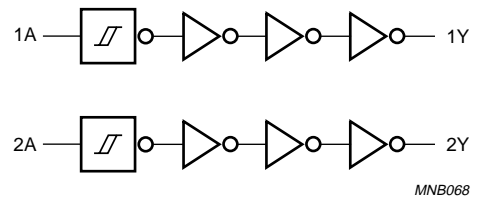


Fig.4 Logic diagram.

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

74LVC2G17

### RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CC}$	supply voltage		1.65	5.5	V
$V_I$	input voltage		0	5.5	V
$V_O$	output voltage		0	$V_{CC}$	V
$T_{amb}$	operating ambient temperature		-40	+125	°C
$t_r, t_f$	input rise and fall times	$V_{CC} = 1.65$ to $2.7$ V	0	20	ns/V
		$V_{CC} = 2.7$ to $5.5$ V	0	10	ns/V

### 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 diode current	$V_I < 0$	-	-50	mA
$V_I$	input voltage	note 1	-0.5	+6.5	V
$I_{OK}$	output diode current	$V_O > V_{CC}$ or $V_O < 0$	-	±50	mA
$V_O$	output voltage	active mode; notes 1 and 2	-0.5	$V_{CC} + 0.5$	V
		Power-down mode; notes 1 and 2	-0.5	+6.5	V
$I_O$	output source or sink current	$V_O = 0$ to $V_{CC}$	-	±50	mA
$I_{CC}, I_{GND}$	$V_{CC}$ or GND current		-	±100	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_D$	power dissipation	$T_{amb} = -40$ to $+125$ °C	-	300	mW

### Notes

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.

Dual non-inverting Schmitt-trigger with  
5 V tolerant input

74LVC2G17

**DC CHARACTERISTICS**

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

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. <sup>(1)</sup>	MAX.	UNIT
		OTHER	V <sub>CC</sub> (V)				
<b>T<sub>amb</sub> = -40 to +85 °C</b>							
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	1.65 to 5.5	–	–	0.1	V
		I <sub>O</sub> = 100 μA	1.65	–	–	0.45	V
		I <sub>O</sub> = 4 mA	2.3	–	–	0.3	V
		I <sub>O</sub> = 8 mA	2.7	–	–	0.4	V
		I <sub>O</sub> = 12 mA	3.0	–	–	0.55	V
		I <sub>O</sub> = 24 mA	4.5	–	–	0.55	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	1.65 to 5.5	V <sub>CC</sub> – 0.1	–	–	V
		I <sub>O</sub> = –100 μA	1.65	1.2	–	–	V
		I <sub>O</sub> = –4 mA	2.3	1.9	–	–	V
		I <sub>O</sub> = –8 mA	2.7	2.2	–	–	V
		I <sub>O</sub> = –12 mA	3.0	2.3	–	–	V
		I <sub>O</sub> = –24 mA	4.5	3.8	–	–	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND	5.5	–	±0.1	±5	μA
I <sub>off</sub>	power OFF leakage current	V <sub>I</sub> or V <sub>O</sub> = 5.5 V	0	–	±0.1	±10	μA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0	5.5	–	0.1	10	μA
ΔI <sub>CC</sub>	additional quiescent supply current per pin	V <sub>I</sub> = V <sub>CC</sub> – 0.6 V; I <sub>O</sub> = 0	2.3 to 5.5	–	5	500	μA

Dual non-inverting Schmitt-trigger with  
5 V tolerant input

74LVC2G17

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. <sup>(1)</sup>	MAX.	UNIT
		OTHER	V <sub>CC</sub> (V)				
<b>T<sub>amb</sub> = -40 to +125 °C</b>							
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	1.65 to 5.5	–	–	0.1	V
		I <sub>O</sub> = 100 μA	1.65	–	–	0.70	V
		I <sub>O</sub> = 4 mA	2.3	–	–	0.45	V
		I <sub>O</sub> = 8 mA	2.7	–	–	0.60	V
		I <sub>O</sub> = 12 mA	3.0	–	–	0.80	V
		I <sub>O</sub> = 24 mA	4.5	–	–	0.80	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	1.65 to 5.5	V <sub>CC</sub> – 0.1	–	–	V
		I <sub>O</sub> = -100 μA	1.65	0.95	–	–	V
		I <sub>O</sub> = -4 mA	2.3	1.7	–	–	V
		I <sub>O</sub> = -8 mA	2.7	1.9	–	–	V
		I <sub>O</sub> = -12 mA	3.0	2.0	–	–	V
		I <sub>O</sub> = -24 mA	4.5	3.4	–	–	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND	5.5	–	±0.1	±20	μA
I <sub>off</sub>	power OFF leakage current	V <sub>I</sub> or V <sub>O</sub> = 5.5 V	0	–	–	±20	μA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0	5.5	–	–	40	μA
ΔI <sub>CC</sub>	additional quiescent supply current per pin	V <sub>I</sub> = V <sub>CC</sub> – 0.6 V; I <sub>O</sub> = 0	2.3 to 5.5	–	–	5000	μA

**Note**1. All typical values are measured at V<sub>CC</sub> = 3.3 V and T<sub>amb</sub> = 25 °C.

Dual non-inverting Schmitt-trigger with  
5 V tolerant input

74LVC2G17

**TRANSFER CHARACTERISTICS**

Voltages are referenced to GND (ground = 0 V).

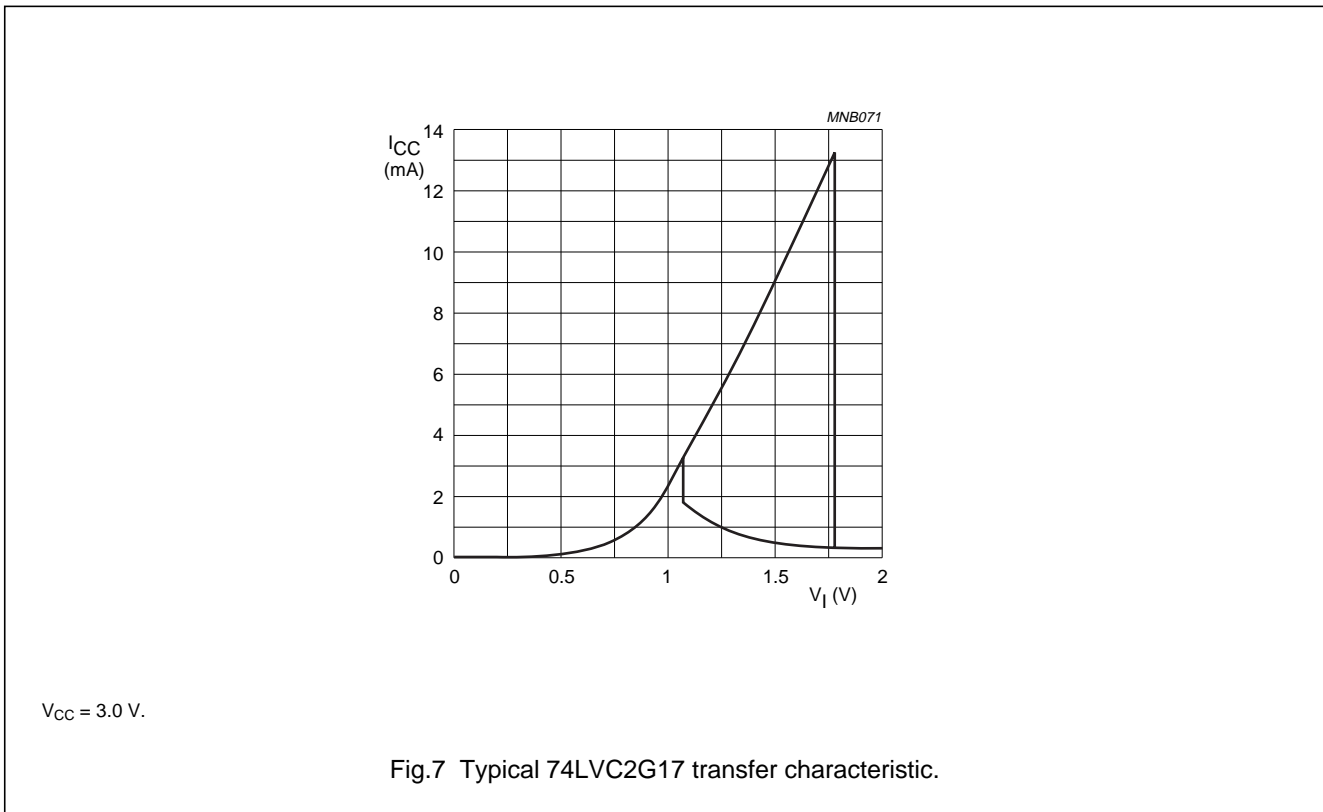
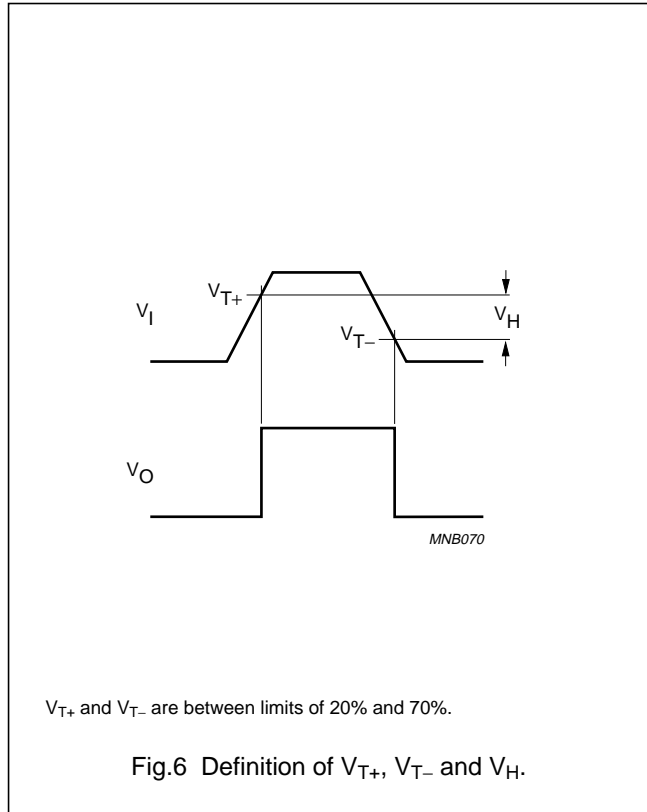
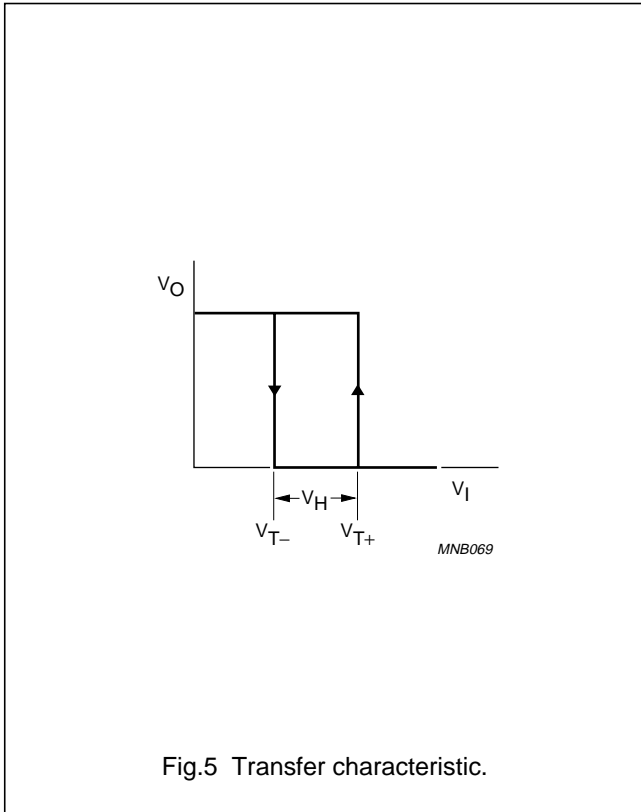
SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. <sup>(1)</sup>	MAX.	UNIT
		WAVEFORMS	V <sub>CC</sub> (V)				
<b>T<sub>amb</sub> = -40 to +85 °C</b>							
V <sub>T+</sub>	positive-going threshold	see Figs 5 and 6	1.8	0.70	1.10	1.50	V
			2.3	1.00	1.40	1.80	V
			3.0	1.30	1.76	2.20	V
			4.5	1.90	2.47	3.10	V
			5.5	2.20	2.91	3.60	V
V <sub>T-</sub>	negative-going threshold	see Figs 5 and 6	1.8	0.25	0.61	0.90	V
			2.3	0.40	0.80	1.15	V
			3.0	0.60	1.04	1.50	V
			4.5	1.00	1.55	2.00	V
			5.5	1.20	1.86	2.30	V
V <sub>H</sub>	hysteresis (V <sub>T+</sub> - V <sub>T-</sub> )	see Figs 5, 6 and 7	1.8	0.15	0.49	1.00	V
			2.3	0.25	0.60	1.10	V
			3.0	0.40	0.73	1.20	V
			4.5	0.60	0.92	1.50	V
			5.5	0.70	1.02	1.70	V
<b>T<sub>amb</sub> = -40 to +125 °C</b>							
V <sub>T+</sub>	positive-going threshold	see Figs 5 and 6	1.8	0.70	–	1.70	V
			2.3	1.00	–	2.00	V
			3.0	1.30	–	2.40	V
			4.5	1.90	–	3.30	V
			5.5	2.20	–	3.80	V
V <sub>T-</sub>	negative-going threshold	see Figs 5 and 6	1.8	0.25	–	1.10	V
			2.3	0.40	–	1.35	V
			3.0	0.60	–	1.70	V
			4.5	1.00	–	2.20	V
			5.5	1.20	–	2.50	V
V <sub>H</sub>	hysteresis (V <sub>T+</sub> - V <sub>T-</sub> )	see Figs 5, 6 and 7	1.8	0.15	–	1.20	V
			2.3	0.25	–	1.30	V
			3.0	0.40	–	1.40	V
			4.5	0.60	–	1.70	V
			5.5	0.70	–	1.90	V

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



Dual non-inverting Schmitt-trigger with 5 V tolerant input

74LVC2G17



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

74LVC2G17

### AC CHARACTERISTICS

GND = 0 V.

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. <sup>(1)</sup>	MAX.	UNIT
		WAVEFORMS	V <sub>CC</sub> (V)				
<b>T<sub>amb</sub> = -40 to +85 °C</b>							
t <sub>PHL</sub> /t <sub>PLH</sub>	propagation delay nA to nY	see Figs 8 and 9	1.65 to 1.95	1.5	5.6	10.5	ns
			2.3 to 2.7	1.0	3.7	6.5	ns
			2.7	1.0	3.8	6.5	ns
			3.0 to 3.6	1.0	3.6	5.7	ns
			4.5 to 5.5	1.0	2.7	4.3	ns
<b>T<sub>amb</sub> = -40 to +125 °C</b>							
t <sub>PHL</sub> /t <sub>PLH</sub>	propagation delay nA to nY	see Figs 8 and 9	1.65 to 1.95	1.5	–	13.1	ns
			2.3 to 2.7	1.0	–	8.5	ns
			2.7	1.0	–	8.5	ns
			3.0 to 3.6	1.0	–	7.1	ns
			4.5 to 5.5	1.0	–	5.4	ns

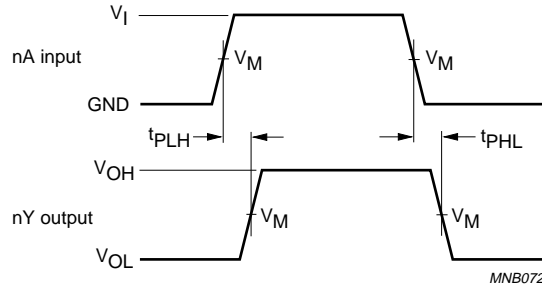
#### Note

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

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

74LVC2G17

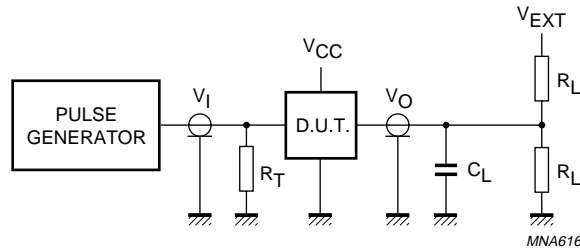
## AC WAVEFORMS



V <sub>CC</sub>	V <sub>M</sub>	INPUT	
		V <sub>I</sub>	t <sub>r</sub> = t <sub>f</sub>
1.65 to 1.95 V	0.5 × V <sub>CC</sub>	V <sub>CC</sub>	≤ 2.0 ns
2.3 to 2.7 V	0.5 × V <sub>CC</sub>	V <sub>CC</sub>	≤ 2.0 ns
2.7 V	1.5 V	2.7 V	≤ 2.5 ns
3.0 to 3.6 V	1.5 V	2.7 V	≤ 2.5 ns
4.5 to 5.5 V	0.5 × V <sub>CC</sub>	V <sub>CC</sub>	≤ 2.5 ns

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

Fig.8 The input (nA) to output (nY) propagation delays and the output transition times.



V <sub>CC</sub>	V <sub>I</sub>	C <sub>L</sub>	R <sub>L</sub>	V <sub>EXT</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 to 1.95 V	V <sub>CC</sub>	30 pF	1 kΩ	open	GND	2 × V <sub>CC</sub>
2.3 to 2.7 V	V <sub>CC</sub>	30 pF	500 Ω	open	GND	2 × V <sub>CC</sub>
2.7 V	2.7 V	50 pF	500 Ω	open	GND	6 V
3.0 to 3.6 V	2.7 V	50 pF	500 Ω	open	GND	6 V
4.5 to 5.5 V	V <sub>CC</sub>	50 pF	500 Ω	open	GND	2 × V <sub>CC</sub>

Definitions for test circuit:

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

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

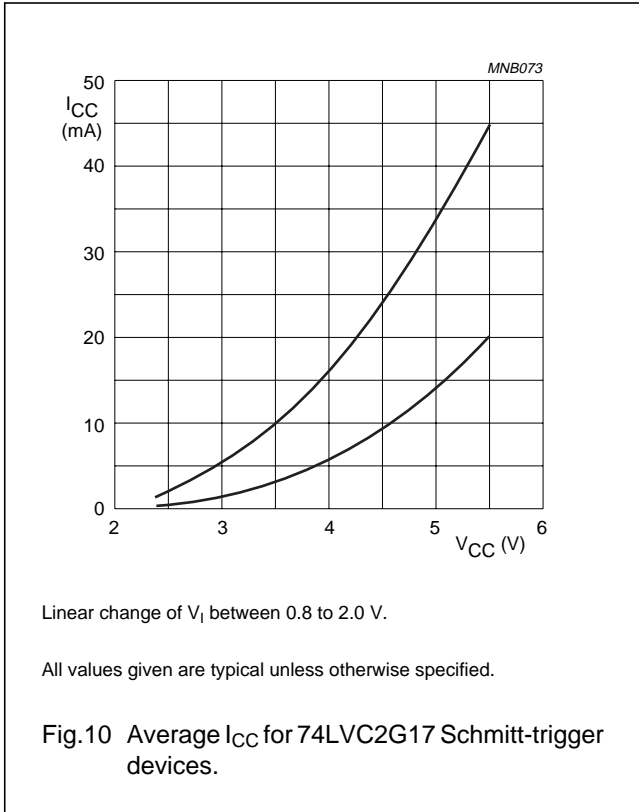
R<sub>T</sub> = Termination resistance should be equal to the output impedance Z<sub>o</sub> of the pulse generator.

Fig.9 Load circuitry for switching times.

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

74LVC2G17

## APPLICATION INFORMATION



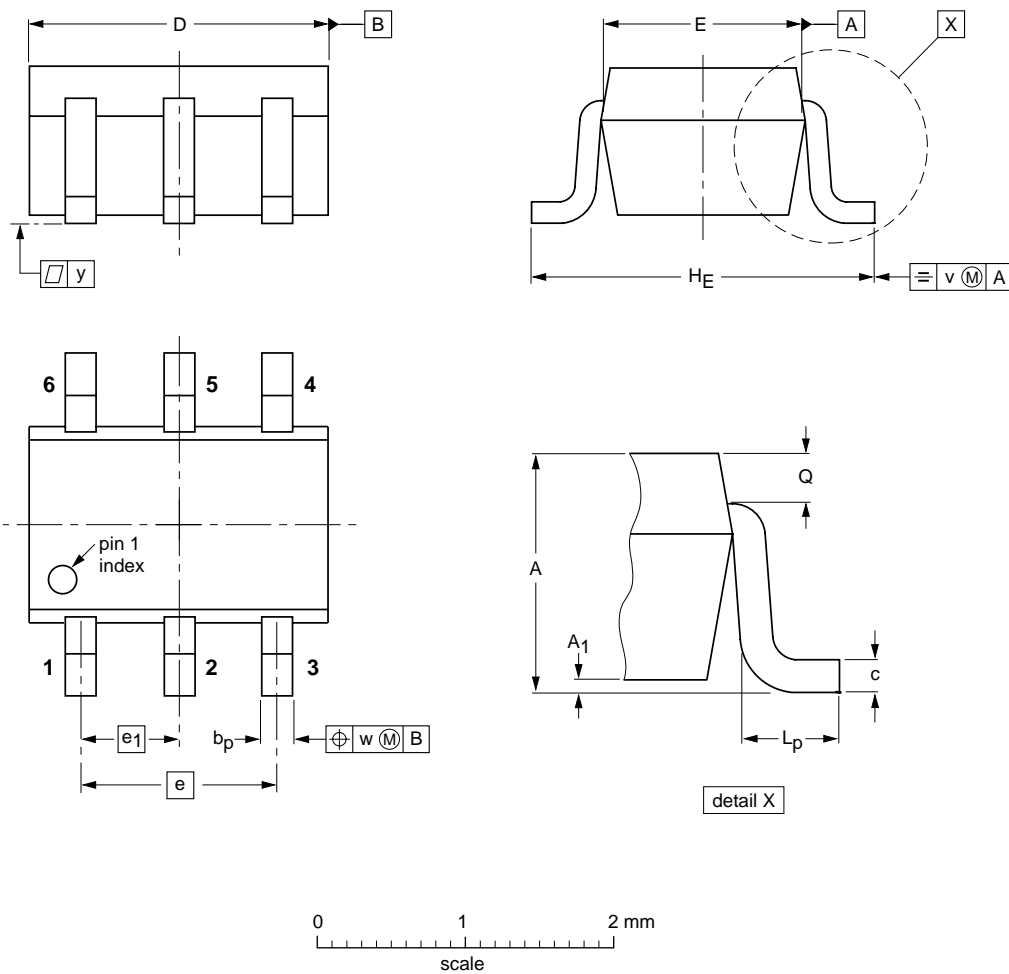
# Dual non-inverting Schmitt-trigger with 5 V tolerant input

74LVC2G17

## PACKAGE OUTLINES

Plastic surface mounted package; 6 leads

SOT363



**DIMENSIONS (mm are the original dimensions)**

UNIT	A	A <sub>1</sub> max	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w	y
mm	1.1 0.8	0.1	0.30 0.20	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.25 0.15	0.2	0.2	0.1

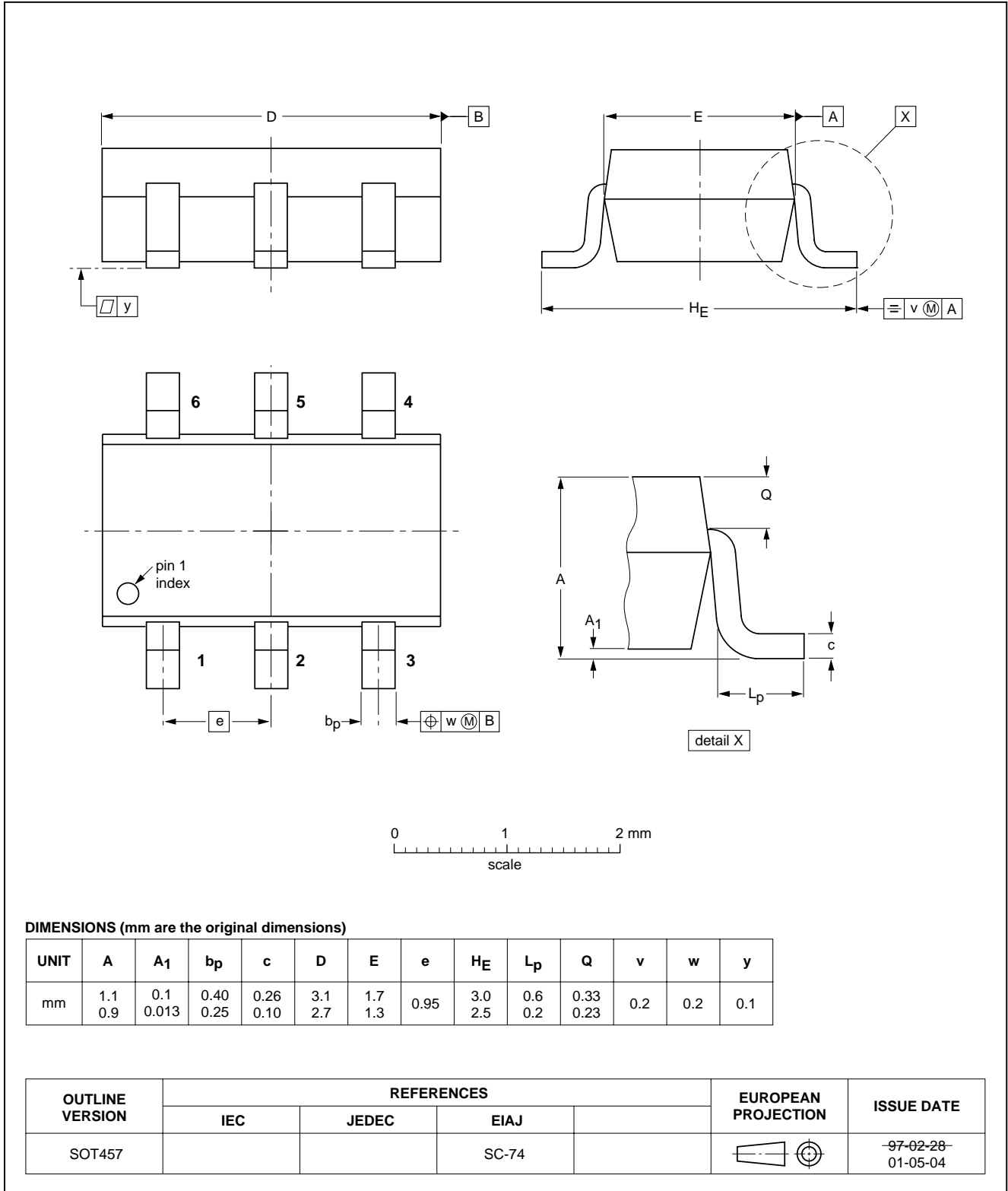
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	IEC	JEDEC	EIAJ			
SOT363			SC-88			97-02-28

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

74LVC2G17

Plastic surface mounted package; 6 leads

SOT457



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

74LVC2G17

### DATA SHEET STATUS

LEVEL	DATA SHEET STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)(3)</sup>	DEFINITION
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