

DATA SHEET

74LVC2G17

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

Product specification
Supersedes data of 2003 Aug 13

2004 Sep 08

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

74LVC2G17

FEATURES

- 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)
 - JESD8B/JESD36 (2.7 V to 3.6 V).
- ESD protection:
 - HBM EIA/JESD22-A114-B exceeds 2000 V
 - MM EIA/JESD22-A115-A exceeds 200 V.
- ± 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.

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 V or 5 V devices. These 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 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 Ω	5.6	ns
		$V_{CC} = 2.5$ V; $C_L = 30$ pF; $R_L = 500$ Ω	3.7	ns
		$V_{CC} = 2.7$ V; $C_L = 50$ pF; $R_L = 500$ Ω	3.8	ns
		$V_{CC} = 3.3$ V; $C_L = 50$ pF; $R_L = 500$ Ω	3.6	ns
		$V_{CC} = 5.0$ V; $C_L = 50$ pF; $R_L = 500$ Ω	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 μ 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 $V_I = \text{GND to } V_{CC}$.

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FUNCTION TABLE

See note 1.

INPUT		OUTPUT	
nA		nY	
L		L	
H		H	

Note

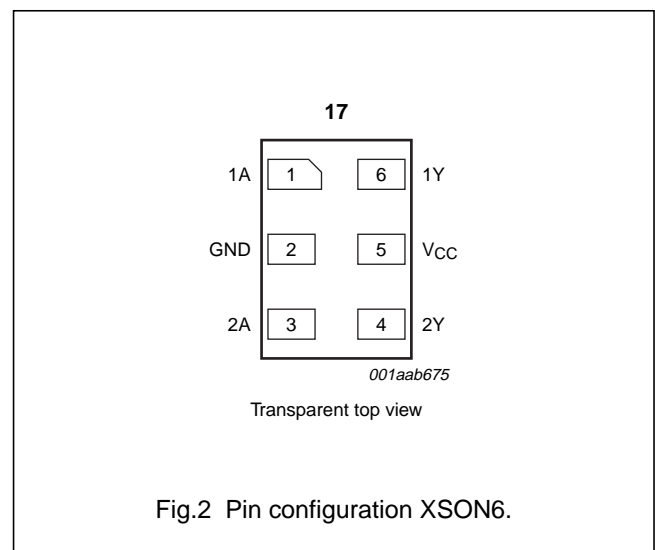
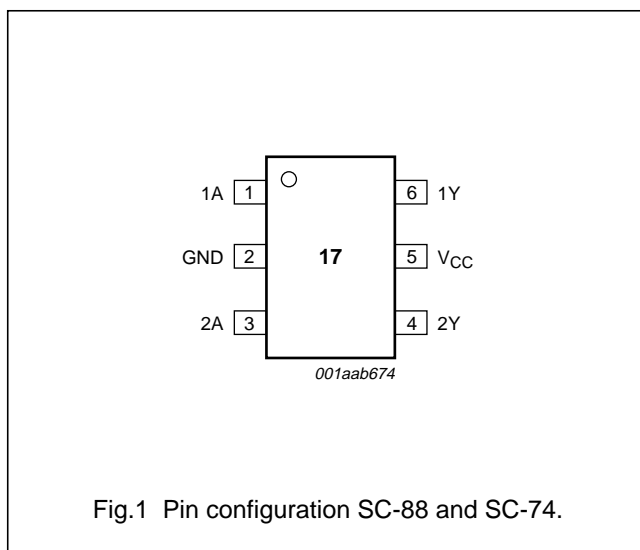
1. H = HIGH voltage level;
L = LOW voltage level.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE					
	TEMPERATURE RANGE	PINS	PACKAGE	MATERIAL	CODE	MARKING
74LVC2G17GW	-40 °C to +125 °C	6	SC-88	plastic	SOT363	VV
74LVC2G17GV	-40 °C to +125 °C	6	SC-74	plastic	SOT457	V17
74LVC2G17GM	-40 °C to +125 °C	6	XSON6	plastic	SOT886	VV

PINNING

PIN	SYMBOL	DESCRIPTION
1	1A	data input
2	GND	ground (0 V)
3	2A	data input
4	2Y	data output
5	V _{CC}	supply voltage
6	1Y	data output



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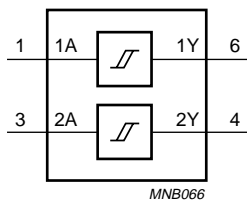


Fig.3 Logic symbol.

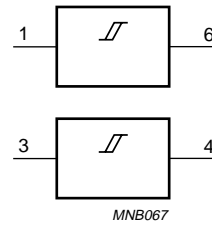


Fig.4 IEC logic symbol.

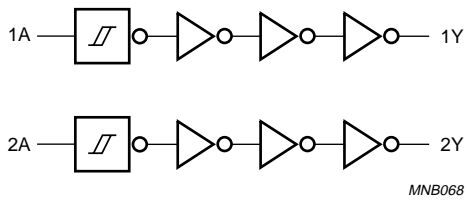


Fig.5 Logic diagram.

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

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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

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	$V_I < 0$ V	-	-50	mA
V_I	input voltage	note 1	-0.5	+6.5	V
I_{OK}	output diode current	$V_O > V_{CC}$ or $V_O < 0$ V	-	±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	$V_O = 0$ V 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	$T_{amb} = -40$ °C 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.

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DC CHARACTERISTICS

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

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. ⁽¹⁾	MAX.	UNIT
		OTHER	V _{CC} (V)				
T_{amb} = -40 °C to +85 °C							
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}	1.65 to 5.5	–	–	0.1	V
		I _O = 100 µA	1.65	–	–	0.45	V
		I _O = 4 mA	2.3	–	–	0.3	V
		I _O = 8 mA	2.7	–	–	0.4	V
		I _O = 12 mA	3.0	–	–	0.55	V
		I _O = 24 mA	4.5	–	–	0.55	V
		I _O = 32 mA					
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}	1.65 to 5.5	V _{CC} – 0.1	–	–	V
		I _O = -100 µA	1.65	1.2	–	–	V
		I _O = -4 mA	2.3	1.9	–	–	V
		I _O = -8 mA	2.7	2.2	–	–	V
		I _O = -12 mA	3.0	2.3	–	–	V
		I _O = -24 mA	4.5	3.8	–	–	V
		I _O = -32 mA					
I _{LI}	input leakage current	V _I = 5.5 V or GND	5.5	–	±0.1	±5	µA
I _{off}	power OFF leakage current	V _I or V _O = 5.5 V	0	–	±0.1	±10	µA
I _{CC}	quiescent supply current	V _I = V _{CC} or GND; I _O = 0 A	5.5	–	0.1	10	µA
ΔI _{CC}	additional quiescent supply current per pin	V _I = V _{CC} – 0.6 V; I _O = 0 A	2.3 to 5.5	–	5	500	µA

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

Note

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

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TRANSFER CHARACTERISTICS

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

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. ⁽¹⁾	MAX.	UNIT
		WAVEFORMS	V _{CC} (V)				
T_{amb} = -40 °C to +85 °C							
V _{T+}	positive-going threshold	see Figs 6 and 7	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 _{T-}	negative-going threshold	see Figs 6 and 7	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 _H	hysteresis (V _{T+} - V _{T-})	see Figs 6, 7 and 8	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
T_{amb} = -40 °C to +125 °C							
V _{T+}	positive-going threshold	see Figs 6 and 7	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 _{T-}	negative-going threshold	see Figs 6 and 7	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 _H	hysteresis (V _{T+} - V _{T-})	see Figs 6, 7 and 8	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

Note1. All typical values are measured at T_{amb} = 25 °C.

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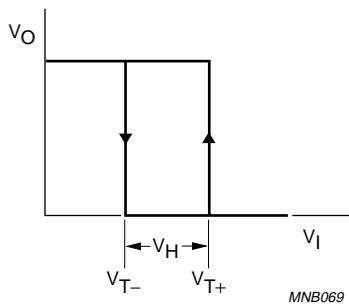
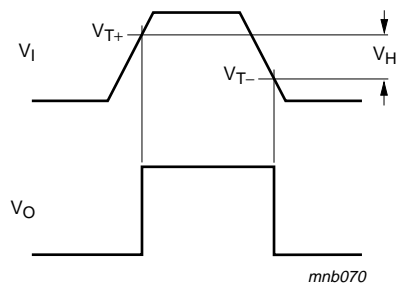
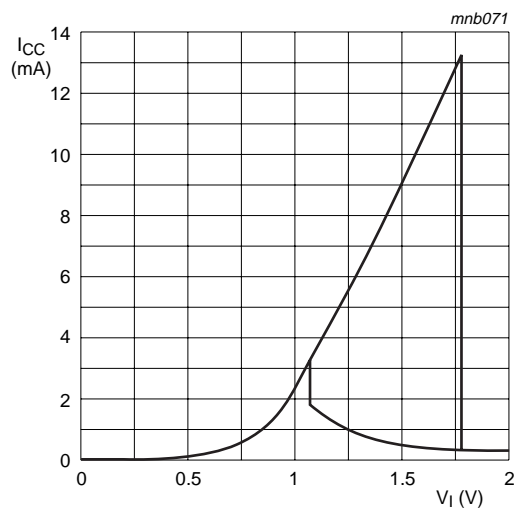


Fig.6 Transfer characteristic.



V_{T+} and V_{T-} are between limits of 20 % and 70 %.

Fig.7 Definition of V_{T+} , V_{T-} and V_H .



$V_{CC} = 3.0$ V.

Fig.8 Typical 74LVC2G17 transfer characteristic.

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AC CHARACTERISTICS

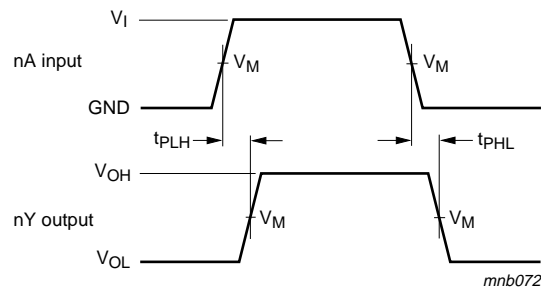
GND = 0 V.

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. ⁽¹⁾	MAX.	UNIT
		WAVEFORMS	V _{CC} (V)				
T_{amb} = -40 °C to +85 °C							
t _{PHL} /t _{PLH}	propagation delay nA to nY	see Figs 9 and 10	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
T_{amb} = -40 °C to +125 °C							
t _{PHL} /t _{PLH}	propagation delay nA to nY	see Figs 9 and 10	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_{amb} = 25 °C.

AC WAVEFORMS



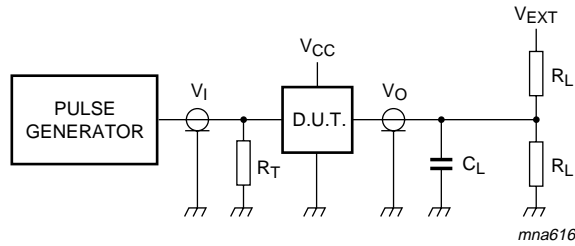
V _{CC}	V _M	INPUT	
		V _I	t _r = t _f
1.65 V to 1.95 V	0.5 × V _{CC}	V _{CC}	≤ 2.0 ns
2.3 V to 2.7 V	0.5 × V _{CC}	V _{CC}	≤ 2.0 ns
2.7 V	1.5 V	2.7 V	≤ 2.5 ns
3.0 V to 3.6 V	1.5 V	2.7 V	≤ 2.5 ns
4.5 V to 5.5 V	0.5 × V _{CC}	V _{CC}	≤ 2.5 ns

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

Fig.9 The input (nA) to output (nY) propagation delays and the output transition times.

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V _{CC}	V _I	C _L	R _L	V _{EXT}		
				t _{PLH} /t _{PHL}	t _{PZH} /t _{PHZ}	t _{PZL} /t _{PLZ}
1.65 V to 1.95 V	V _{CC}	30 pF	1 kΩ	open	GND	2 × V _{CC}
2.3 V to 2.7 V	V _{CC}	30 pF	500 Ω	open	GND	2 × V _{CC}
2.7 V	2.7 V	50 pF	500 Ω	open	GND	6 V
3.0 V to 3.6 V	2.7 V	50 pF	500 Ω	open	GND	6 V
4.5 V to 5.5 V	V _{CC}	50 pF	500 Ω	open	GND	2 × V _{CC}

Definitions for test circuit:

R_L = Load resistor.

C_L = Load capacitance including jig and probe capacitance.

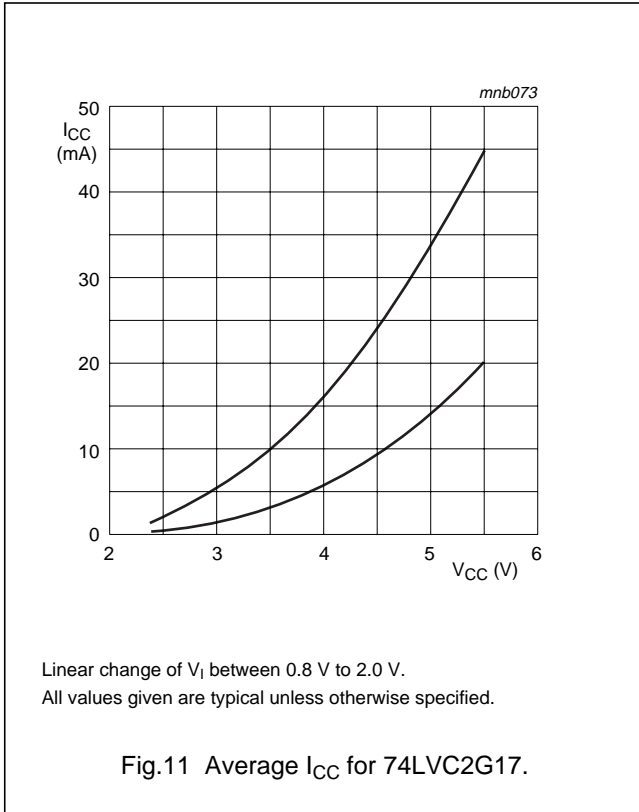
R_T = Termination resistance should be equal to the output impedance Z_o of the pulse generator.

Fig.10 Load circuitry for switching times.

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APPLICATION INFORMATION



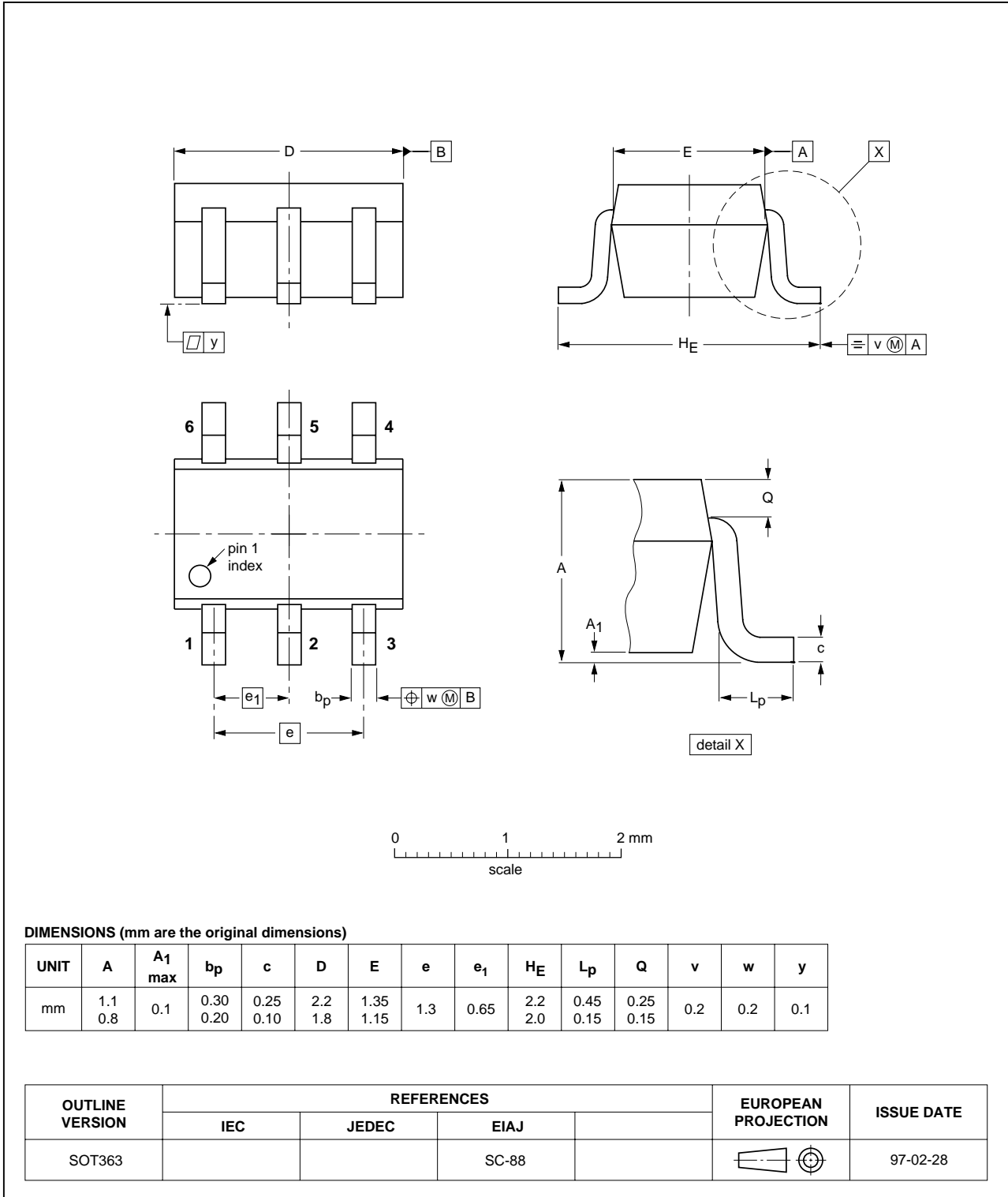
Dual non-inverting Schmitt-trigger with 5 V tolerant input

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PACKAGE OUTLINES

Plastic surface mounted package; 6 leads

SOT363

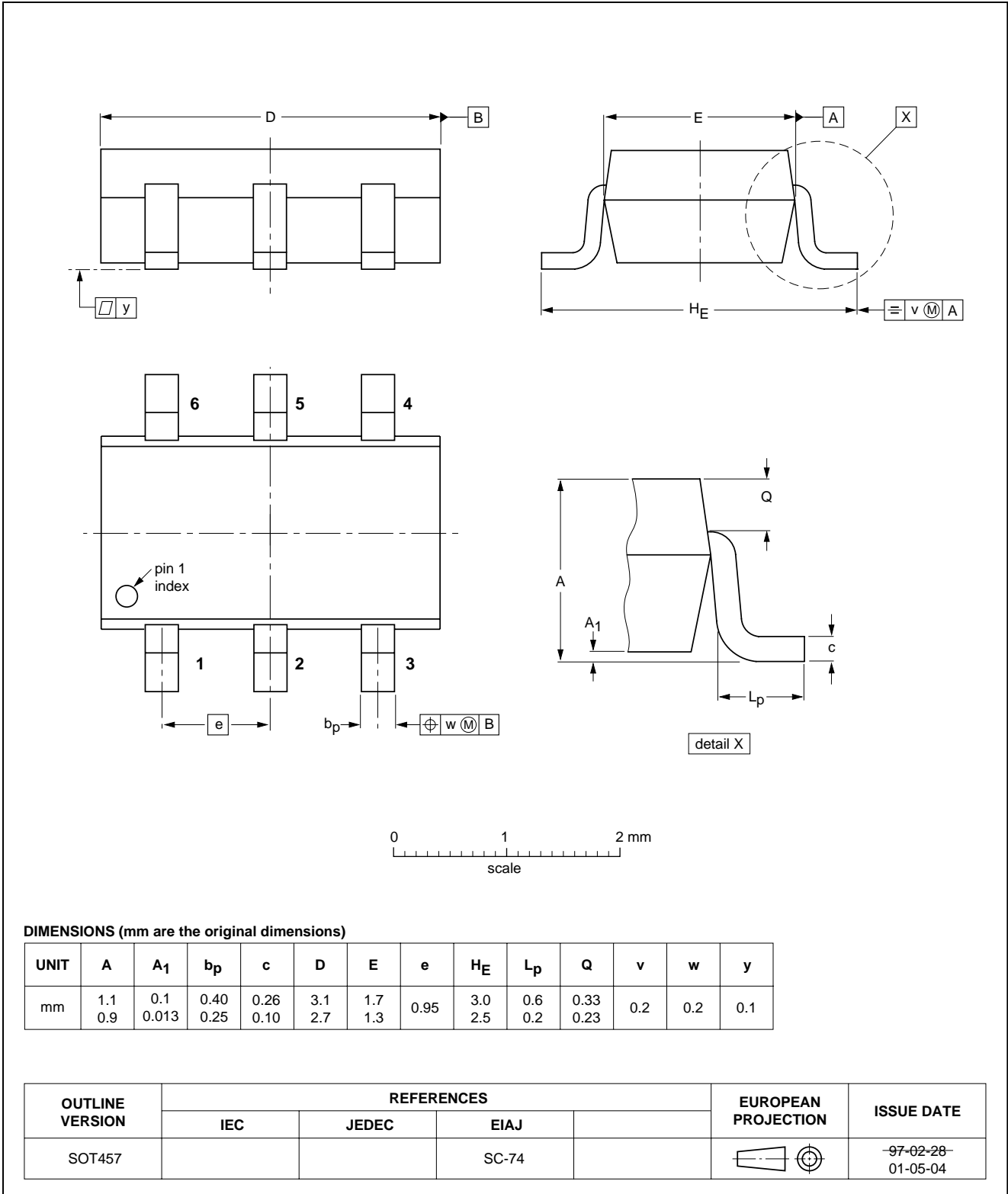


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Plastic surface mounted package; 6 leads

SOT457

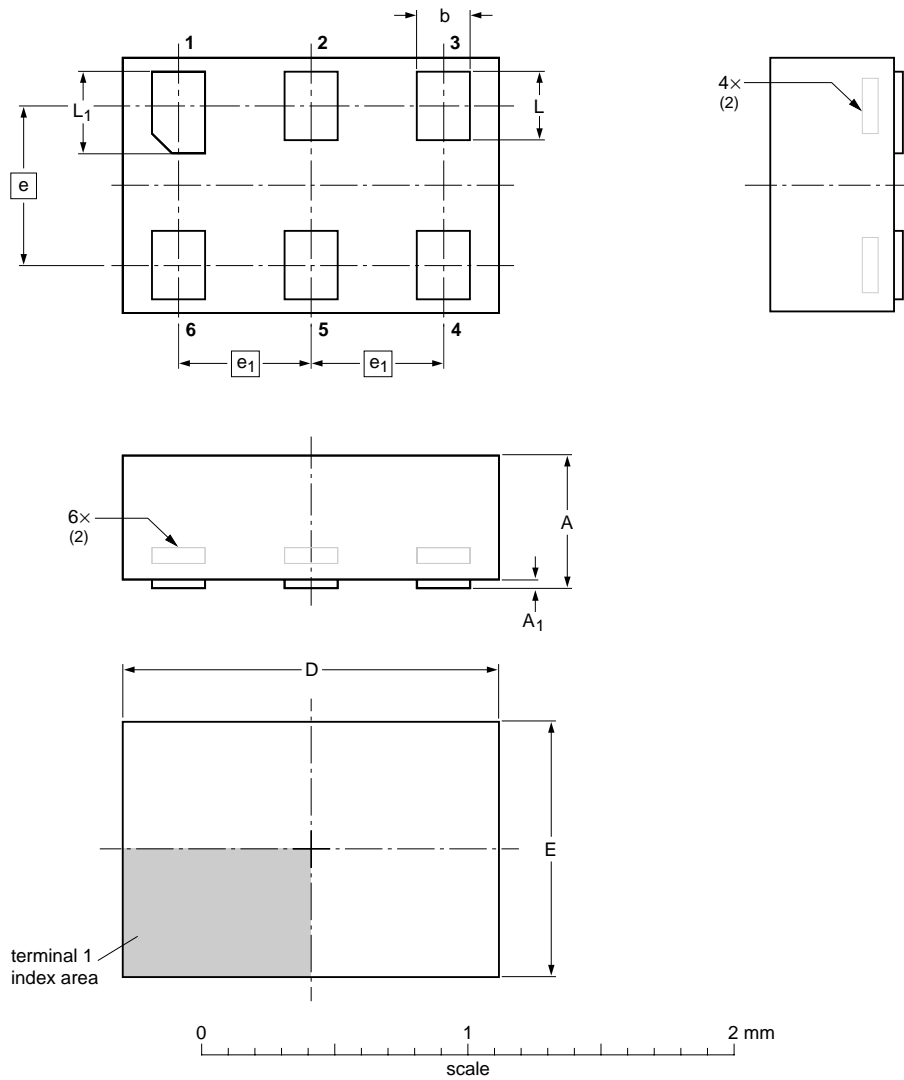


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XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

SOT886



DIMENSIONS (mm are the original dimensions)

UNIT	A ⁽¹⁾ max	A ₁ max	b	D	E	e	e ₁	L	L ₁
mm	0.5	0.04	0.25 0.17	1.5 1.4	1.05 0.95	0.6	0.5	0.35 0.27	0.40 0.32

Notes

1. Including plating thickness.
2. Can be visible in some manufacturing processes.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT886		MO-252			04-07-15 04-07-22

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DATA SHEET STATUS

LEVEL	DATA SHEET STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾⁽³⁾	DEFINITION
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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