74LV1T126

Single supply translating buffer/line driver; 3-state

Rev. 5 — 14 December 2023

Product data sheet

1. General description

The 74LV1T126 is a single, level translating buffer/line driver with 3-state output. The low threshold inputs support 1.8 V input logic at V_{CC} = 3.3 V and can be used in 1.8 V to 3.3 V level up translation. In addition, the 5 V tolerant input pins enable down translation (3.3 V to 2.5 V output at V_{CC} = 2.5 V). The 3-state output is controlled by the output enable input (OE). A LOW-level at OE causes the output to assume a high-impedance OFF-state. The output level is referenced to the supply voltage and supports 1.8 V, 2.5 V, 3.3 V and 5.0 V CMOS levels. The wide V_{CC} range permits the generation of output levels to connect to controllers or processors.

2. Features and benefits

- Single supply voltage translator at 1.8 V, 2.5 V, 3.3 V and 5.0 V
- Up translation
 - 1.2 V to 1.8 V at V_{CC} = 1.8 V
 - 1.5 V to 2.5 V at V_{CC} = 2.5 V
 - 1.8 V to 3.3 V at V_{CC} = 3.3 V
 - 3.3 V to 5.0 V at V_{CC} = 5.0 V
- Down translation
 - 3.3 V to 1.8 V at V_{CC} = 1.8 V
 - 3.3 V to 2.5 V at V_{CC} = 2.5 V
 - 5.0 V to 3.3 V at V_{CC} = 3.3 V
- 5 V tolerant inputs
- Latch-up performance exceeds 250 mA per JESD 78 Class II
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Applications

- Portable applications
- · PC and notebooks
- Industrial controller
- Telecom



Single supply translating buffer/line driver; 3-state

4. Ordering information

Table 1. Ordering information

Type number	Package	Package									
	Temperature range	Name	Description	Version							
74LV1T126GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1							
74LV1T126GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753							
74LV1T126GX	-40 °C to +125 °C	X2SON5	plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body 0.8 × 0.8 × 0.32 mm	SOT1226-3							

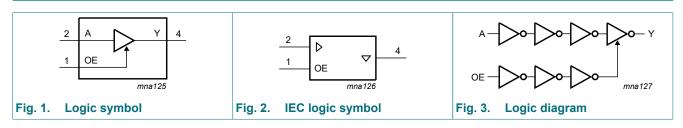
5. Marking

Table 2. Marking

Type number	Marking code[1]
74LV1T126GW	SP
74LV1T126GV	SP
74LV1T126GX	SP

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

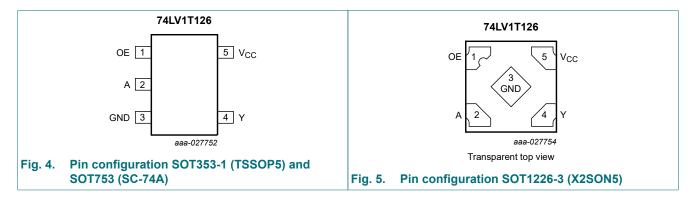
6. Functional diagram



Single supply translating buffer/line driver; 3-state

7. Pinning information

7.1. Pinning



7.2. Pin description

Table 3. Pin description

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

8. Functional description

Table 4. Function table

 $H = HIGH \ voltage \ level; \ L = LOW \ voltage \ level; \ X = don't \ care; \ Z = high-impedance \ OFF-state.$

Input	Output	
OE	A	Υ
Н	L	L
Н	Н	Н
L	X	Z

Single supply translating buffer/line driver; 3-state

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	+7.0	V
VI	input voltage	[1]	-0.5	+7.0	V
Vo	output voltage	output HIGH, LOW or 3-state [2][3]	-0.5	V _{CC} + 0.5	V
		output in power-off state [2]	-0.5	4.6	V
I _{IK}	input clamping current	V _I < 0 V	-20	-	mA
I _{OK}	output clamping current	$V_O < 0 \text{ V or } V_O > V_{CC}$	-	±20	mA
Io	output current	$V_O = 0 V \text{ to } V_{CC}$	-	±25	mA
I _{CC}	supply current		-	50	mA
I _{GND}	ground current		-50	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C to } +125 ^{\circ}\text{C}$ [4]	-	250	mW

^[1] If the input current ratings are observed, the minimum input voltage ratings may be exceeded.

10. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V _{CC}	supply voltage		1.6	5.0	5.5	V
V _I	input voltage		0	-	5.5	V
Vo	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 1.8 V to 5.0 V	-	-	20	ns/V

4/14

^[2] If the output current ratings are observed, the output voltage ratings may be exceeded.

^[3] This value is limited to 7 V maximum.

^[4] For SOT353-1 (TSSOP5) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C. For SOT753 (SC-74A) package: P_{tot} derates linearly with 3.8 mW/K above 85 °C. For SOT1226-3 (X2SON5) package: P_{tot} derates linearly with 3.0 mW/K above 67 °C.

Single supply translating buffer/line driver; 3-state

11. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	25 °	C	-40 °C to	+85 °C	-40 °C to +125 °C		Uni
			Min	Max	Min	Max	Min	Max	
V _{IH}	HIGH-level	V _{CC} = 1.65 V to 1.8 V	0.94	-	1.0	-	1.0	-	V
	input voltage	V _{CC} = 2.0 V	0.99	-	1.03	-	1.03	-	V
		V _{CC} = 2.25 V to 2.5 V	1.135	-	1.18	-	1.18	-	V
		V _{CC} = 2.75 V	1.21	-	1.23	-	1.23	-	V
		V _{CC} = 3.0 V to 3.3 V	1.35	-	1.37	-	1.37	-	V
		V _{CC} = 3.6 V	1.47	-	1.48	-	1.48	-	V
		V _{CC} = 4.5 V to 5.0 V	2.02	-	2.03	-	2.03	-	٧
		V _{CC} = 5.5 V	2.10	-	2.11	-	2.11	-	V
V _{IL}	LOW-level	V _{CC} = 1.65 V to 2.0 V	-	0.58	-	0.55	-	0.55	V
	input voltage	V _{CC} = 2.25 V to 2.75 V	-	0.75	-	0.71	-	0.71	٧
		V _{CC} = 3.0 V to 3.6 V	-	0.80	-	0.65	-	0.65	٧
		V _{CC} = 4.5 V to 5.5 V	-	0.80	-	0.80	-	0.80	٧
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL} ;							
	output voltage	V _{CC} = 1.65 V to 5.5 V; I _O = -20 μA	V _{CC} - 0.1	-	V _{CC} - 0.1	-	V _{CC} - 0.1	-	V
		V _{CC} = 1.65 V; I _O = -2 mA	1.28	-	1.21	-	1.21	-	٧
		V _{CC} = 1.8 V; I _O = -2 mA	1.5	-	1.45	-	1.45	-	V
		V _{CC} = 2.3 V; I _O = -2.3 mA	2.0	-	2.0	-	2.0	-	V
		$V_{CC} = 2.3 \text{ V}; I_{O} = -3 \text{ mA}$	2.0	-	1.93	-	1.93	-	V
		V _{CC} = 2.5 V; I _O = -3 mA	2.25	-	2.15	-	2.15	-	V
		$V_{CC} = 3.0 \text{ V}; I_{O} = -3 \text{ mA}$	2.78	-	2.7	-	2.7	-	V
		V _{CC} = 3.0 V; I _O = -5.5 mA	2.6	-	2.49	-	2.49	-	V
		V _{CC} = 3.3 V; I _O = -5.5 mA	2.9	-	2.8	-	2.8	-	V
		V _{CC} = 4.5 V; I _O = -4 mA	4.2	-	4.1	-	4.1	-	٧
		V _{CC} = 4.5 V; I _O = -8 mA	4.1	-	3.95	-	3.95	-	٧
		V _{CC} = 5.0 V; I _O = -8 mA	4.6	-	4.5	-	4.5	-	٧
V _{OL}	LOW-level	V _I = V _{IH} or V _{IL}							
	output voltage	V _{CC} = 1.65 V to 5.5 V; I _O = 20 μA	-	0.1	-	0.1	-	0.1	٧
		V _{CC} = 1.65 V; I _O = 2 mA	-	0.2	-	0.25	-	0.25	V
		V _{CC} = 2.3 V; I _O = 2.3 mA	-	0.1	-	0.15	-	0.15	٧
		V _{CC} = 2.3 V; I _O = 3 mA	-	0.15	-	0.2	-	0.2	V
		V _{CC} = 3.0 V; I _O = 3 mA	-	0.1	-	0.15	-	0.15	V
		V _{CC} = 3.0 V; I _O = 5.5 mA	-	0.2	-	0.252	-	0.252	V
		V _{CC} = 4.5 V; I _O = 4 mA	-	0.15	-	0.2	-	0.2	V
		V _{CC} = 4.5 V; I _O = 8 mA	-	0.3	-	0.35	-	0.35	V
lı	input leakage current	V _I = V _{CC} or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	-	±1	-	±1	μΑ
loz	OFF-state output current		-	±0.25	-	±2.5	-	±2.5	μΑ

Single supply translating buffer/line driver; 3-state

Symbol	Parameter	Conditions	25 °	,C	-40 °C to	o +85 °C	-40 °C to +125 °C		Unit
			Min	Max	Min	Max	Min	Max	
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 1.8 V, 2.5 V, 3.3 V, 5.0 V	-	1	-	10	-	10	μΑ
ΔI _{CC}	additional supply current	per input pin; V_{CC} = 1.8 V; V_I = 0.3 V or 1.1 V; I_O = 0 A; other pins at V_{CC} or GND	-	10	-	10	-	10	μA
		per input pin; V_{CC} = 5.5 V; V_I = 0.3 V or 3.4 V; I_O = 0 A; other pins at V_{CC} or GND	-	1.35	-	1.5	-	1.5	mA

12. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V. For test circuit, see Fig. 8.

Symbol	Parameter	Conditions		25 °C		-40 °C to	o +85 °C	-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
t _{pd}	propagation	A to Y; see <u>Fig. 6</u> [1]								
	delay	V _{CC} = 1.8 V; C _L = 15 pF	-	6.5	9.6	-	10.8	-	11.6	ns
		V _{CC} = 1.8 V; C _L = 30 pF	-	7.6	10.8	-	12.2	-	13.2	ns
		V _{CC} = 2.5 V; C _L = 15 pF	-	4.6	6.6	-	7.5	-	8.0	ns
		V _{CC} = 2.5 V; C _L = 30 pF	-	5.3	7.4	-	8.4	-	9.1	ns
		V _{CC} = 3.3 V; C _L = 15 pF	-	3.8	5.4	-	6.0	-	6.4	ns
		V _{CC} = 3.3 V; C _L = 30 pF	-	4.4	6.0	-	6.8	-	7.3	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	3.2	4.1	-	4.4	-	4.7	ns
		V _{CC} = 5.0 V; C _L = 30 pF	-	3.6	4.6	-	5.1	-	5.4	ns
t _{en}	enable time	OE to Y; see Fig. 7 [1]								
		V _{CC} = 1.8 V; C _L = 15 pF	-	5.7	9.0	-	10.3	-	11.1	ns
		V _{CC} = 1.8 V; C _L = 30 pF	-	6.8	10.9	-	12.5	-	13.5	ns
		V _{CC} = 2.5 V; C _L = 15 pF	-	3.9	5.8	-	6.7	-	7.3	ns
		V _{CC} = 2.5 V; C _L = 30 pF	-	4.7	7.0	-	8.1	-	8.7	ns
		V _{CC} = 3.3 V; C _L = 15 pF	-	3.1	4.5	-	5.2	-	5.6	ns
		V _{CC} = 3.3 V; C _L = 30 pF	-	3.8	5.4	-	6.1	-	6.7	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	2.9	3.9	-	4.4	-	4.8	ns
		V _{CC} = 5.0 V; C _L = 30 pF	-	3.4	4.5	-	5.1	-	5.5	ns
t _{dis}	disable time	OE to Y; see Fig. 7 [1]								
		V _{CC} = 1.8 V; C _L = 15 pF	-	9.7	12.4	-	13.6	-	14.5	ns
		V _{CC} = 1.8 V; C _L = 30 pF	-	12.5	15.3	-	16.6	-	17.5	ns
		V _{CC} = 2.5 V; C _L = 15 pF	-	7.0	8.5	-	9.5	-	10.0	ns
		V _{CC} = 2.5 V; C _L = 30 pF	-	8.9	10.5	-	11.5	-	12.0	ns
		V _{CC} = 3.3 V; C _L = 15 pF	-	5.7	6.9	-	7.5	-	7.9	ns
	V _{CC} = 3.3 V; C _L = 30 pF	-	7.2	8.4	-	9.0	-	9.4	ns	
		V _{CC} = 5.0 V; C _L = 15 pF	-	4.3	5.3	-	5.6	-	5.8	ns
		V _{CC} = 5.0 V; C _L = 30 pF	-	5.2	6.2	-	6.5	-	6.8	ns
C _I	input capacitance	$V_I = V_{CC}$ or GND; $V_{CC} = 3.3 \text{ V}$	-	1.5	10	-	10	-	10	pF

Single supply translating buffer/line driver; 3-state

Symbol	Parameter	Conditions		25 °C		-40 °C to	+85 °C	-40 °C to	Unit	
			Min	Тур	Max	Min	Max	Min	Max	
Co	output capacitance	$V_O = V_{CC}$ or GND; $V_{CC} = 3.3 \text{ V}$	-	2.5	-	-	-	-	-	pF
C _{PD}	power dissipation	per buffer; V_I = GND to V_{CC} ; [2] C_L = 30 pF; f = 10 MHz								
	capacitance	V _{CC} = 1.8 V	-	4.4	-	-	-	-	-	pF
		V _{CC} = 2.5 V	-	5.6	-	-	-	-	-	pF
		V _{CC} = 3.3 V	-	7.4	-	-	-	-	-	pF
		V _{CC} = 5.0 V	-	11.6	-	-	-	-	-	pF

[1] t_{pd} is the same as t_{PLH} and t_{PHL} , t_{en} is the same as t_{PZL} and t_{PZH} , t_{dis} is the same as t_{PLZ} and t_{PHZ} . [2] C_{PD} is used to determine the dynamic power dissipation (P_D in μ W). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$ where:

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

 f_i = input frequency in MHz;

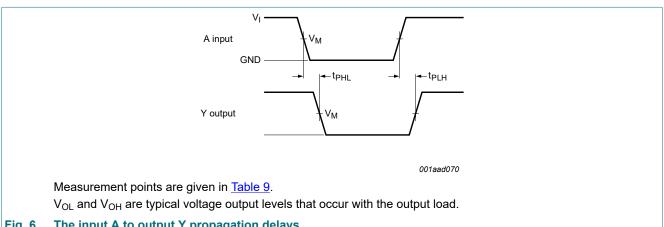
f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching; $\sum (C_L \times V_{CC}^2 \times f_o) = \text{sum of the outputs.}$

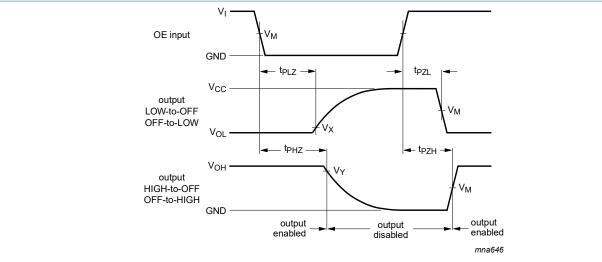
12.1. Waveforms and test circuit



The input A to output Y propagation delays Fig. 6.

7/14

Single supply translating buffer/line driver; 3-state



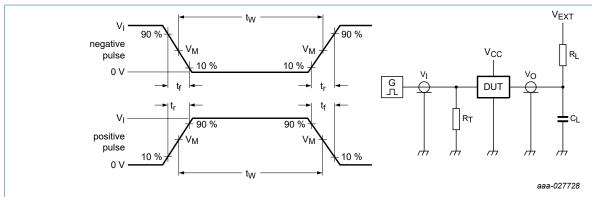
Measurement points are given in Table 9.

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

Fig. 7. 3-state enable and disable times

Table 9. Measurement points

Input	Output	utput						
V _M	V _M	V _X	V _Y					
0.5 × V _I	0.5 × V _{CC}	V _{OL} + 0.3 V	V _{OH} - 0.3 V					



Test data is given in Table 10.

Definitions test circuit:

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

C_L = Load capacitance including jig and probe capacitance;

R_L = Load resistance;

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

Fig. 8. Test circuit for measuring switching times

Table 10. Test data

Supply voltage Input			Load		V _{EXT}			
V _{CC}	Vı	Δt/ΔV [1]	f _{max}	CL	R _L	t _{PLH} , t _{PHL}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}
1.8 V	V _{CC}	≤ 1.0 ns/V	15 MHz	15 pF, 30 pF	1 kΩ	open	GND	V _{CC}
2.5 V	V _{CC}	≤ 1.0 ns/V	25 MHz	15 pF, 30 pF	1 kΩ	open	GND	V _{CC}
3.3 V	3 V	≤ 1.0 ns/V	50 MHz	15 pF, 30 pF	1 kΩ	open	GND	V _{CC}
5.0 V	3 V	≤ 1.0 ns/V	50 MHz	15 pF, 30 pF	1 kΩ	open	GND	V _{CC}

[1] dV/dt ≥ 1.0 V/ns

Single supply translating buffer/line driver; 3-state

13. Package outline

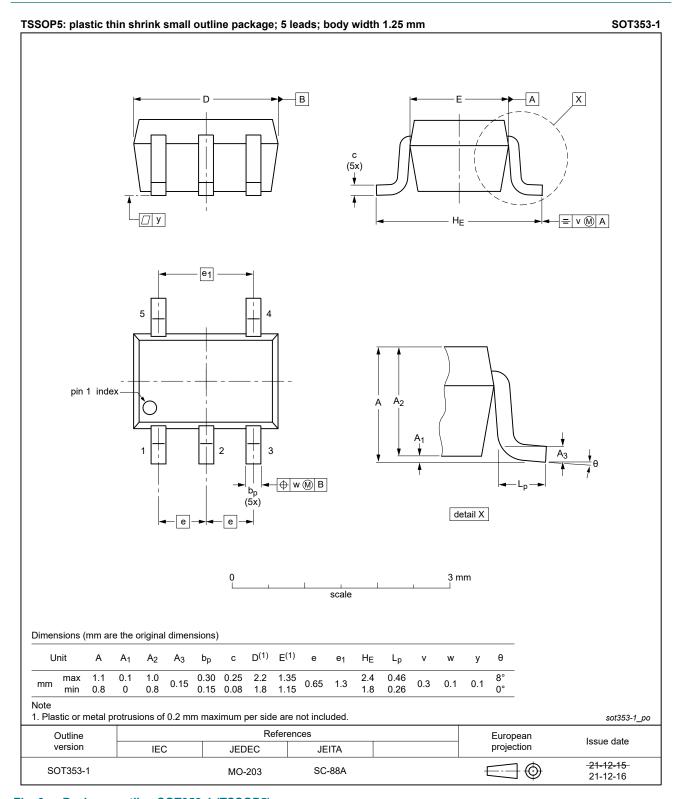


Fig. 9. Package outline SOT353-1 (TSSOP5)

Single supply translating buffer/line driver; 3-state

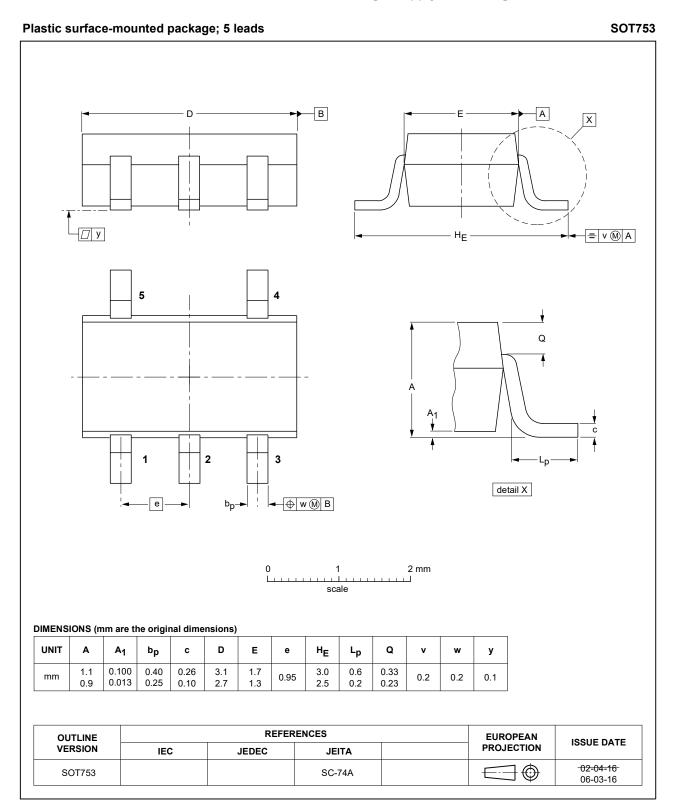


Fig. 10. Package outline SOT753 (SC-74A)

Single supply translating buffer/line driver; 3-state

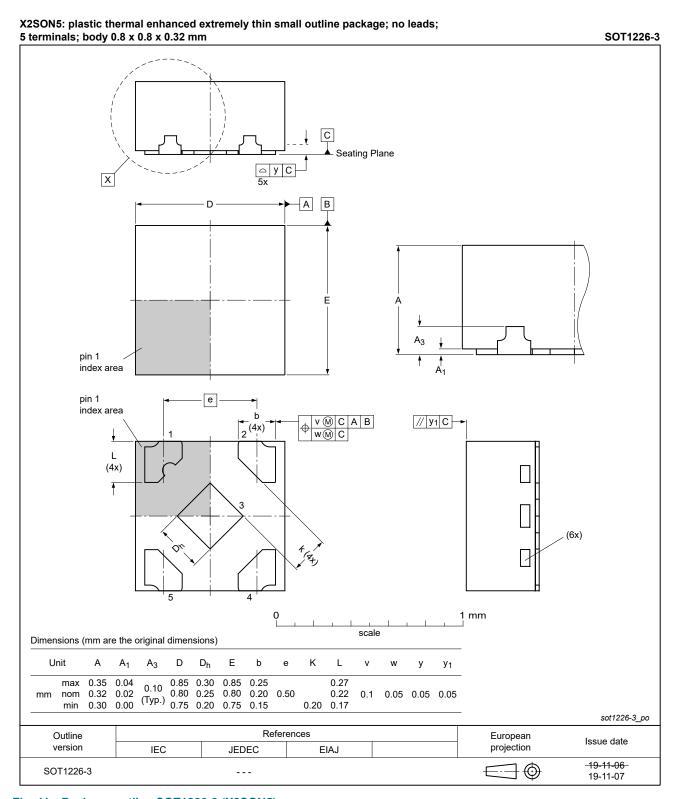


Fig. 11. Package outline SOT1226-3 (X2SON5)

11 / 14

Single supply translating buffer/line driver; 3-state

14. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charge Device Model
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model

15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LV1T126 v.5	20231214	Product data sheet	-	74LV1T126 v.4		
Modifications:	Section 2: I	<u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.				
74LV1T126 v.4	20220223	Product data sheet	-	74LV1T126 v.3		
Modifications:	Package S	Package SOT1226 (X2SON5) changed to SOT1226-3 (X2SON5).				
74LV1T126 v.3	20220210	Product data sheet	-	74LV1T126 v.2		
Modifications:	• <u>Fig. 9</u> : Pacl	Fig. 9: Package outline drawing for SOT353-1 (TSSOP5) has changed.				
74LV1T126 v.2	20191203	Product data sheet	-	74LV1T126 v.1		
Modifications:	• •	 Type number 74LV1T126GV (SOT753/SC-74A) added. Table 5: Derating values for P_{tot} total power dissipation updated. 				
74LV1T126 v.1	20171128	Product data sheet	-	-		

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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Single supply translating buffer/line driver; 3-state

Contents

1. General description	1
2. Features and benefits	1
3. Applications	1
4. Ordering information	2
5. Marking	2
6. Functional diagram	2
7. Pinning information	3
7.1. Pinning	3
7.2. Pin description	3
8. Functional description	3
9. Limiting values	4
10. Recommended operating conditions	4
11. Static characteristics	5
12. Dynamic characteristics	ε
12.1. Waveforms and test circuit	7
13. Package outline	9
14. Abbreviations	12
15. Revision history	12
16. Legal information	13

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