74LVC2G125 Dual bus buffer/line driver; 3-state Rev. 14 – 29 March 2013

Product data sheet

1. General description

The 74LVC2G125 provides a dual non-inverting buffer/line driver with 3-state output. The 3-state output is controlled by the output enable input (pin $n\overline{OE}$). A HIGH-level at pin $n\overline{OE}$ causes the output to assume a high-impedance OFF-state. Schmitt trigger action at all inputs makes the circuit highly tolerant of slower input rise and fall times.

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 a 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)
 - ◆ JESD8-B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM 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
- Inputs accept voltages up to 5 V
- Multiple package options
- Specified from –40 °C to +85 °C and –40 °C to +125 °C



Dual bus buffer/line driver; 3-state

3. Ordering information

Table 1. Orderin	ng information			
Type number	Package			
	Temperature range	Name	Description	Version
74LVC2G125DP	–40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2
74LVC2G125DC	–40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74LVC2G125GT	–40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 \times 1.95 \times 0.5 mm	SOT833-1
74LVC2G125GF	–40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body $1.35 \times 1 \times 0.5$ mm	SOT1089
74LVC2G125GD	–40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body $3\times2\times0.5~\text{mm}$	SOT996-2
74LVC2G125GM	–40 °C to +125 °C	XQFN8	plastic, extremely thin quad flat package; no leads; 8 terminals; body $1.6 \times 1.6 \times 0.5$ mm	SOT902-2
74LVC2G125GN	–40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body $1.2 \times 1.0 \times 0.35$ mm	SOT1116
74LVC2G125GS	–40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body $1.35 \times 1.0 \times 0.35$ mm	SOT1203

4. Marking

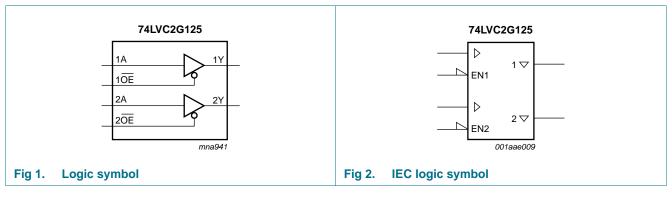
Table 2.Marking codes

Type number	Marking code ^[1]
74LVC2G125DP	V25
74LVC2G125DC	V25
74LVC2G125GT	V25
74LVC2G125GF	VM
74LVC2G125GD	V25
74LVC2G125GM	V25
74LVC2G125GN	VM
74LVC2G125GS	VM

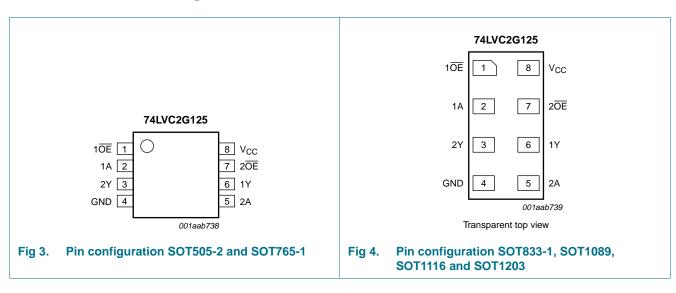
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

Dual bus buffer/line driver; 3-state

5. Functional diagram

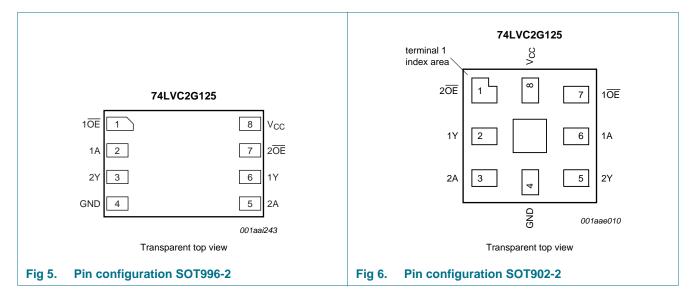


6. Pinning information



6.1 Pinning

Dual bus buffer/line driver; 3-state



6.2 Pin description

Symbol	Pin	Pin				
	SOT505-2, SOT765-1, SOT833-1, SOT1089, SOT996-2, SOT1116 and SOT1203	SOT902-2				
1 <u>0E</u> , 2 <u>0E</u>	1, 7	7, 1	output enable input (active LOW)			
1A, 2A	2, 5	6, 3	data input			
GND	4	4	ground (0 V)			
1Y, 2Y	6, 3	2, 5	data output			
V _{CC}	8	8	supply voltage			

7. Functional description

Table 4. Function table^[1]

Control	Input	Output
nOE	nA	nY
L	L	L
L	Н	Н
Н	Х	Z

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

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
VI	input voltage		<u>[1]</u> –0.5	+6.5	V
I _{OK}	output clamping current	$V_{O} > V_{CC}$ or $V_{O} < 0 V$	-	±50	mA
Vo	output voltage	Enable mode	<u>[1]</u> –0.5	V _{CC} + 0.5	V
		Disable mode	<u>[1]</u> –0.5	+6.5	V
		Power-down mode	<u>[1][2]</u> –0.5	+6.5	V
lo	output current	$V_{O} = 0 V \text{ to } V_{CC}$	-	±50	mA
I _{CC}	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 °C to +125 °C	[3] _	300	mW
-					

[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.

For TSSOP8 package: above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K.
 For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 mW/K.
 For XSON8, XQFN8 packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

9. Recommended operating conditions

Table 6.	Operating conditions				
Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		1.65	5.5	V
VI	input voltage		0	5.5	V
V _O output voltage	V_{CC} = 1.65 V to 5.5 V; Enable mode	0	V _{CC}	V	
	V_{CC} = 1.65 V to 5.5 V; Disable mode	0	5.5	V	
		V _{CC} = 0 V; Power-down mode	0	5.5	V
T _{amb}	ambient temperature		-40	+125	°C
$\Delta t / \Delta V$	input transition rise and fall rate	V_{CC} = 1.65 V to 2.7 V	-	20	ns/V
		V _{CC} = 2.7 V to 5.5 V	-	10	ns/V

10. Static characteristics

Table 7. Static characteristics

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

-	Parameter	Conditions	Min	Typ <mark>[1]</mark>	Max	Unit
T _{amb} = –	40 °C to +85 °C					
VIH	HIGH-level input voltage	V_{CC} = 1.65 V to 1.95 V	$0.65V_{CC}$	-	-	V
		V_{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V_{CC} = 2.7 V to 3.6 V	2.0	-	-	V
		V_{CC} = 4.5 V to 5.5 V	$0.7V_{CC}$	-	-	V
VIL	LOW-level input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	$0.35V_{CC}$	V
		V_{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		$V_{CC} = 2.7 \text{ V} \text{ to } 3.6 \text{ V}$	-	-	0.8	V
		V_{CC} = 4.5 V to 5.5 V	-	-	$0.3V_{CC}$	V
V _{OL}	LOW-level output voltage	$V_{I} = V_{IH} \text{ or } V_{IL}$				
		I_O = 100 μ A; V_{CC} = 1.65 V to 5.5 V	-	-	0.1	V
		$I_0 = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.45	V
		$I_0 = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.3	V
		$I_0 = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.4	V
		$I_0 = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.55	V
		$I_0 = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.55	V
V _{OH}	HIGH-level output voltage	$V_{I} = V_{IH} \text{ or } V_{IL}$				
		I_{O} = $-100~\mu\text{A};~V_{CC}$ = 1.65 V to 5.5 V	$V_{CC}-0.1$	-	-	V
		$I_0 = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	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
lı	input leakage current	V_{I} = 5.5 V or GND; V_{CC} = 0 V to 5.5 V	-	±0.1	±5	μA
l _{oz}	OFF-state output current	$\label{eq:VI} \begin{array}{l} V_{I} = V_{IH} \text{ or } V_{IL}; V_{O} = 5.5 \; V \text{ or } GND; \\ V_{CC} = 3.6 \; V \end{array}$	-	±0.1	±10	μΑ
OFF	power-off leakage current	$V_1 \text{ or } V_0 = 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	±0.1	±10	μΑ
cc	supply current	$V_{I} = 5.5 V \text{ or GND};$ $V_{CC} = 1.65 V \text{ to } 5.5 V; I_{O} = 0 \text{ A}$	-	0.1	10	μΑ
∆l _{CC}	additional supply current	per pin; V _I = V _{CC} – 0.6 V; I _O = 0 A; V _{CC} = 2.3 V to 5.5 V	-	5	500	μA
CI	input capacitance			2	-	pF

Dual bus buffer/line driver; 3-state

Symbol	Parameter	Conditions	Min	Typ[1]	Мах	Unit
-	-40 °C to +125 °C	Conditions		176	max	01110
∙amb – V _{IH}	HIGH-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65V _{CC}	-	-	V
чIП	r nor novor input voltago	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7	-	-	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	2.0	_	-	v
		$V_{CC} = 4.5 \text{ V} \text{ to } 5.5 \text{ V}$	0.7V _{CC}	-	-	v
/ _{IL}	LOW-level input voltage	$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	-	-	0.35V _{CC}	V
IL	2011 lotor inpat tokago	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	-	_	0.7	v
		$V_{\rm CC} = 2.7 \text{ V to } 3.6 \text{ V}$	-	-	0.8	V
		$V_{\rm CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	-	0.3V _{CC}	V
/ _{OL}	LOW-level output voltage	$V_{I} = V_{IH} \text{ or } V_{IL}$			0.0100	•
OL		$I_0 = 100 \ \mu\text{A}; \ V_{CC} = 1.65 \ \text{V to } 5.5 \ \text{V}$	-	-	0.1	V
		$I_{O} = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.70	V
		$I_0 = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.45	V
		$I_0 = 12 \text{ mA; } V_{CC} = 2.7 \text{ V}$	-	-	0.60	V
		$I_0 = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.80	V
		$I_0 = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.80	V
/ _{он}	HIGH-level output voltage	$V_{I} = V_{IH} \text{ or } V_{IL}$				
		$I_0 = -100 \ \mu\text{A}; \ V_{CC} = 1.65 \ \text{V} \text{ to } 5.5 \ \text{V}$	V _{CC} - 0.1	-	-	V
		$I_0 = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	0.95	-	-	V
		$I_0 = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.7	-	-	V
		$I_0 = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	1.9	-	-	V
		$I_0 = -24$ mA; $V_{CC} = 3.0$ V	2.0	-	-	V
		$I_{O} = -32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.4	-	-	V
1	input leakage current	$V_1 = 5.5$ V or GND; $V_{CC} = 0$ V to 5.5 V	-	-	±20	μA
OZ	OFF-state output current	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{O} = 5.5 \text{ V or GND};$ $V_{CC} = 3.6 \text{ V}$	-	-	±20	μΑ
OFF	power-off leakage current	V_{I} or V_{O} = 5.5 V; V_{CC} = 0 V	-	-	±20	μA
CC	supply current	$V_1 = 5.5 V \text{ or GND};$ $V_{CC} = 1.65 V \text{ to } 5.5 V; I_O = 0 A$	-	-	40	μA
Alcc	additional supply current	per pin; V _I = V _{CC} – 0.6 V; I _O = 0 A; V _{CC} = 2.3 V to 5.5 V	-	-	5	mA

Table 7. Static characteristics ... continued

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

Dual bus buffer/line driver; 3-state

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground 0 V); for test circuit see Figure 9.

Symbol	Parameter	Conditions		-40	°C to +85	°C	–40 °C to +125 °C		Unit
				Min	Typ <mark>[1]</mark>	Max	Min	Max	_
t _{pd}	propagation delay	nA to nY; see Figure 7	[2]						
		V_{CC} = 1.65 V to 1.95 V		1.0	3.7	9.1	1.0	11.4	ns
		V_{CC} = 2.3 V to 2.7 V		0.5	2.5	4.8	0.5	6.0	ns
		$V_{CC} = 2.7 V$		1.0	2.7	4.8	1.0	6.0	ns
		V_{CC} = 3.0 V to 3.6 V		0.5	2.3	4.3	0.5	5.5	ns
		V_{CC} = 4.5 V to 5.5 V		0.5	1.9	3.7	0.5	4.6	ns
t _{en}	enable time	nOE to nY; see Figure 8	[3]						
		V_{CC} = 1.65 V to 1.95 V		1.5	4.3	9.9	1.5	12.4	ns
		V_{CC} = 2.3 V to 2.7 V		1.0	2.8	5.6	1.0	7.0	ns
		$V_{CC} = 2.7 V$		1.5	3.3	5.7	1.5	7.1	ns
		V_{CC} = 3.0 V to 3.6 V		0.5	2.4	4.7	0.5	5.9	ns
		V_{CC} = 4.5 V to 5.5 V		0.5	2.0	3.8	0.5	4.8	ns
t _{dis}	disable time	nOE to nY; see Figure 8	[4]						
		V_{CC} = 1.65 V to 1.95 V		1.0	3.5	11.6	1.0	14.1	ns
		V_{CC} = 2.3 V to 2.7 V		0.5	1.8	5.8	0.5	7.6	ns
		$V_{CC} = 2.7 V$		1.0	2.7	4.8	1.0	6.2	ns
		$V_{CC} = 3.0 \text{ V} \text{ to } 3.6 \text{ V}$		1.0	2.7	4.6	1.0	5.9	ns
		V_{CC} = 4.5 V to 5.5 V		0.5	1.8	3.4	0.5	4.6	ns
C _{PD}	power dissipation	per buffer; V_I = GND to V_{CC}	[5]						
	capacitance	output enabled		-	18	-	-	-	pF
		output disabled		-	5	-	-	-	pF

[1] Typical values are measured at nominal V_{CC} and at $T_{amb} = 25$ °C.

[2] t_{pd} is the same as t_{PLH} and t_{PHL} .

 $[3] \quad t_{en} \mbox{ is the same as } t_{PZH} \mbox{ and } t_{PZL}.$

[5] C_{PD} is used to determine the dynamic power dissipation (P_D in µW). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:

 $f_i = input frequency in MHz;$

 $f_o = output frequency in MHz;$

 C_L = output load capacitance in pF;

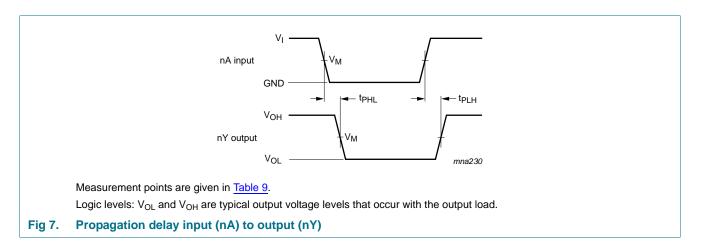
 V_{CC} = supply voltage in V;

N = number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_0)$ = sum of outputs.

Dual bus buffer/line driver; 3-state

12. Waveforms



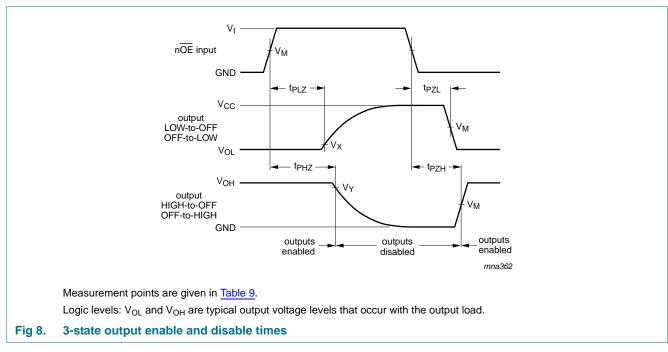


Table 9. Measurement points

Supply voltage	Input	Output		
V _{CC}	V _M	V _M	V _X	V _Y
1.65 V to 1.95 V	$0.5V_{CC}$	0.5V _{CC}	V _{OL} + 0.15 V	V _{OH} – 0.15 V
2.3 V to 2.7 V	$0.5V_{CC}$	0.5V _{CC}	V _{OL} + 0.15 V	V _{OH} – 0.15 V
2.7 V	1.5 V	1.5 V	V _{OL} + 0.3 V	V _{OH} – 0.3 V
3.0 V to 3.6 V	1.5 V	1.5 V	V _{OL} + 0.3 V	V _{OH} – 0.3 V
4.5 V to 5.5 V	0.5V _{CC}	0.5V _{CC}	V _{OL} + 0.3 V	V _{OH} – 0.3 V

74LVC2G125

9 of 22

NXP Semiconductors

74LVC2G125

Dual bus buffer/line driver; 3-state

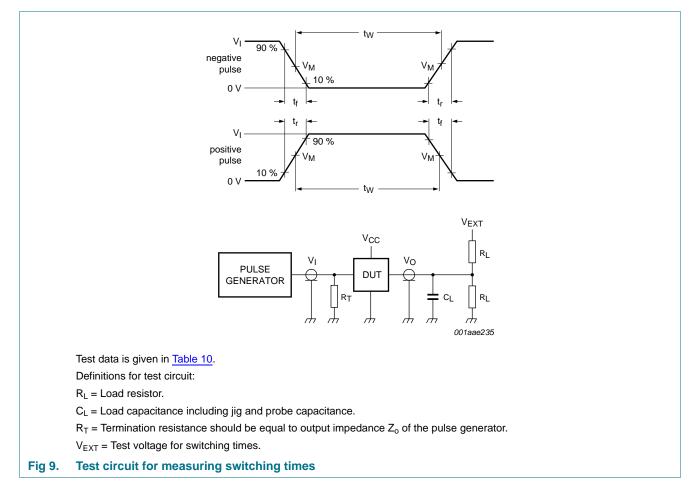


Table 10. Test data

Supply voltage	Input		Load	Load		V _{EXT}		
V _{cc}	VI	t _r , t _f	CL	RL	t _{PLH} , t _{PHL}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}	
1.65 V to 1.95 V	V _{CC}	\leq 2.0 ns	30 pF	1 kΩ	open	GND	$2V_{CC}$	
2.3 V to 2.7 V	V _{CC}	\leq 2.0 ns	30 pF	500 Ω	open	GND	$2V_{CC}$	
2.7 V	2.7 V	\leq 2.5 ns	50 pF	500 Ω	open	GND	6 V	
3.0 V to 3.6 V	2.7 V	\leq 2.5 ns	50 pF	500 Ω	open	GND	6 V	
4.5 V to 5.5 V	V _{CC}	\leq 2.5 ns	50 pF	500 Ω	open	GND	$2V_{CC}$	

Dual bus buffer/line driver; 3-state

13. Package outline

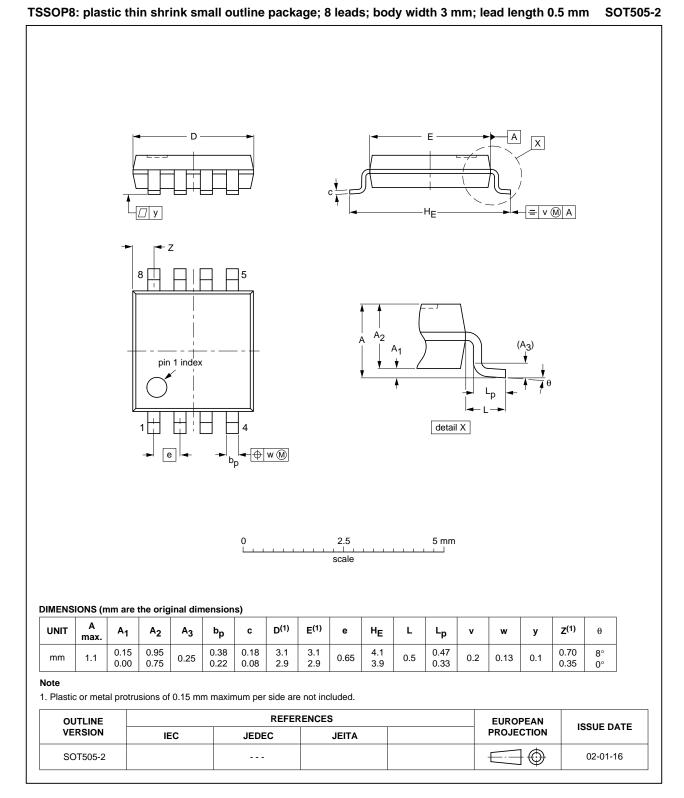


Fig 10. Package outline SOT505-2 (TSSOP8)

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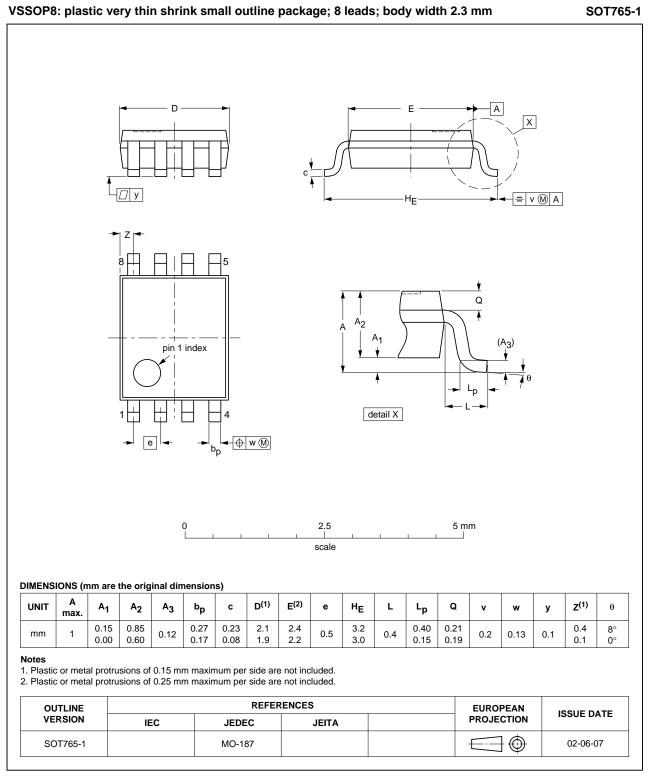


Fig 11. Package outline SOT765-1 (VSSOP8)

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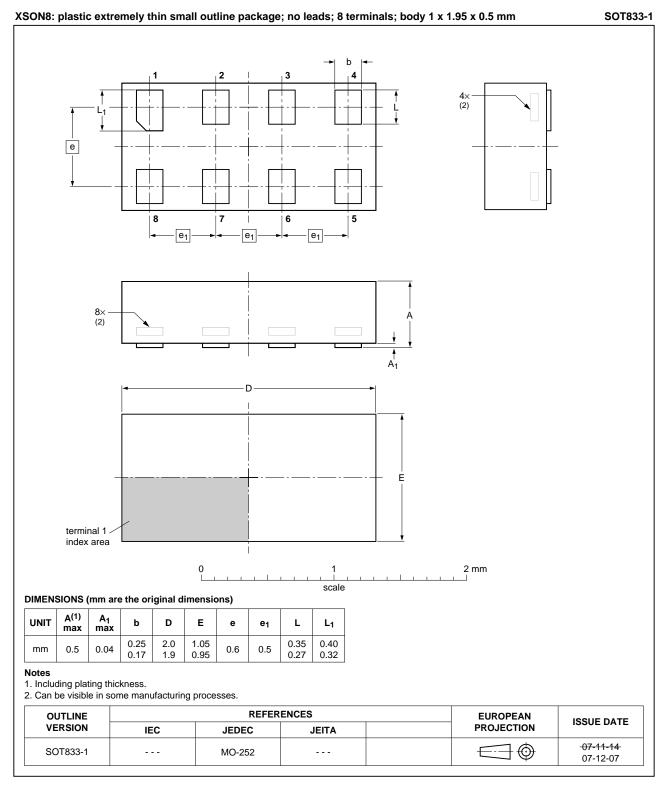
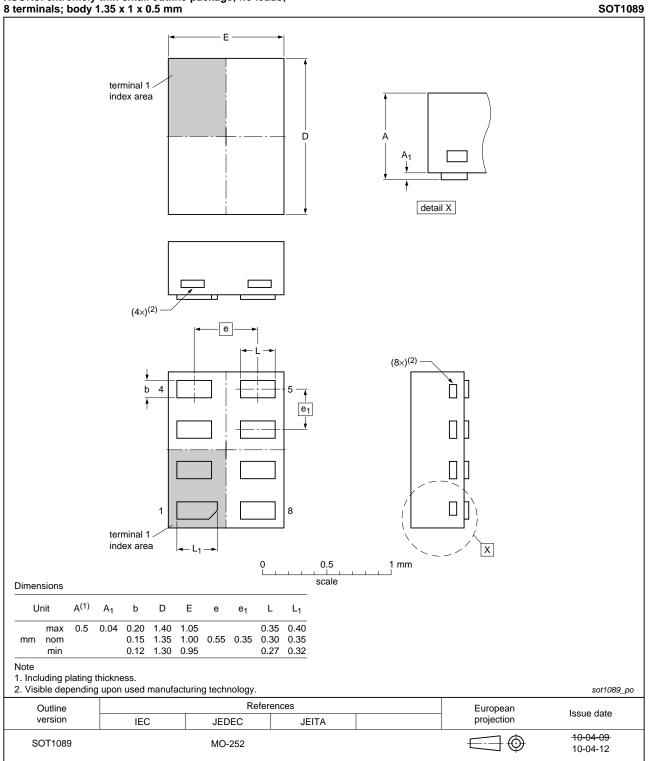


Fig 12. Package outline SOT833-1 (XSON8)

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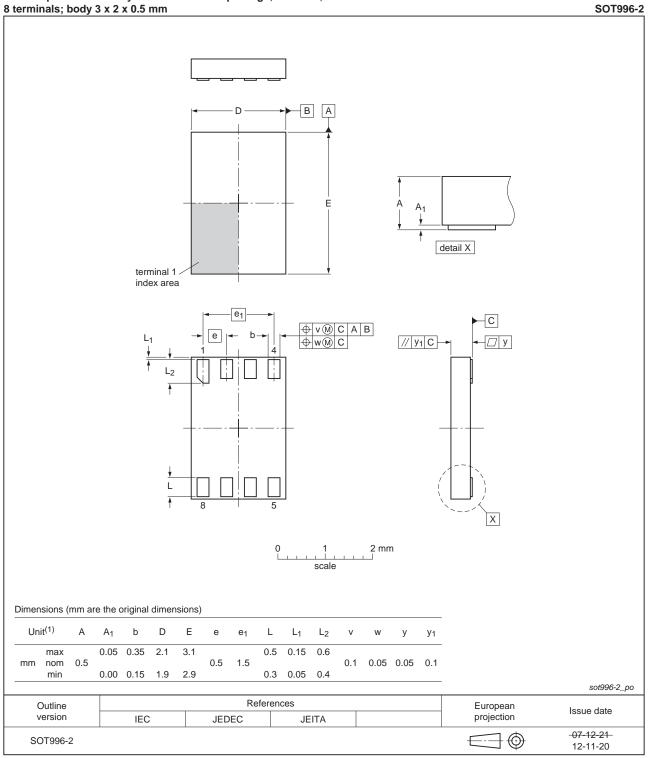


XSON8: extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1 x 0.5 mm

Fig 13. Package outline SOT1089 (XSON8)

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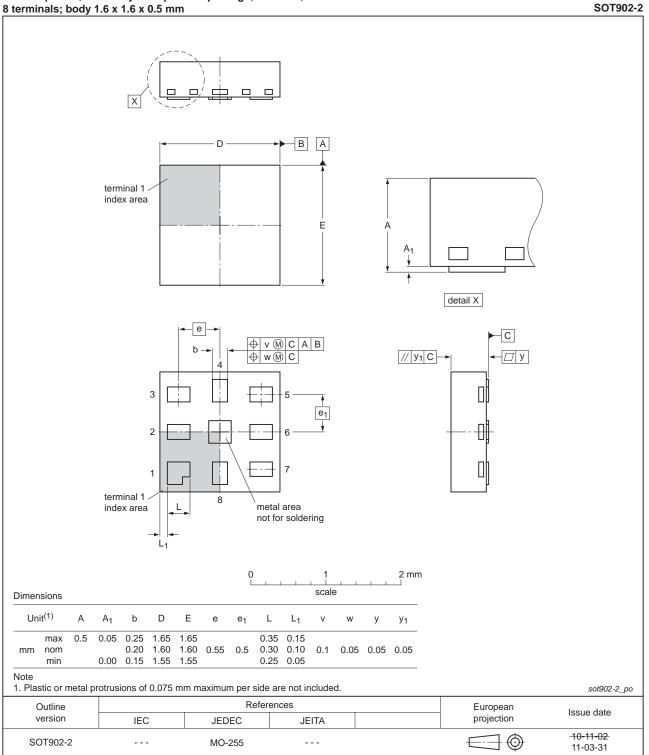


XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 3 x 2 x 0.5 mm

Fig 14. Package outline SOT996-2 (XSON8)

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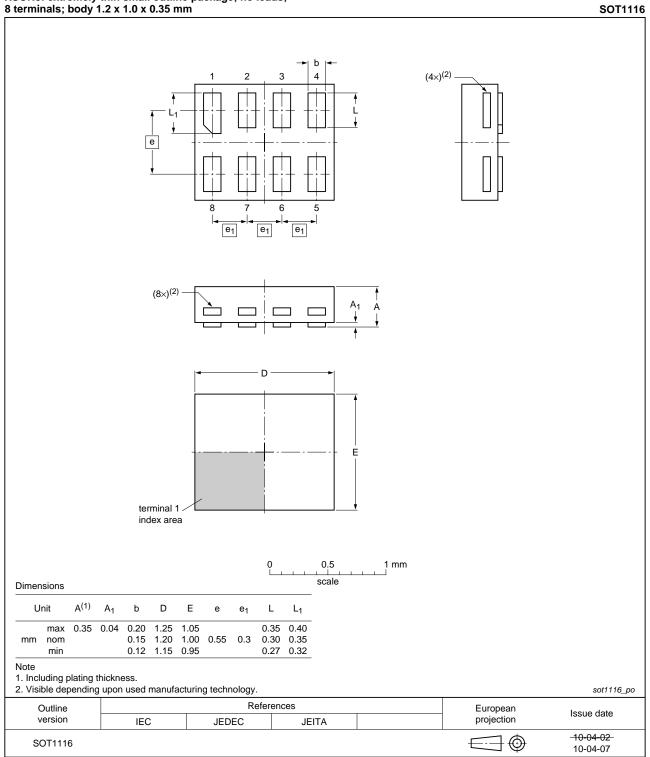


XQFN8: plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 x 1.6 x 0.5 mm

Fig 15. Package outline SOT902-2 (XQFN8)

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Dual bus buffer/line driver; 3-state

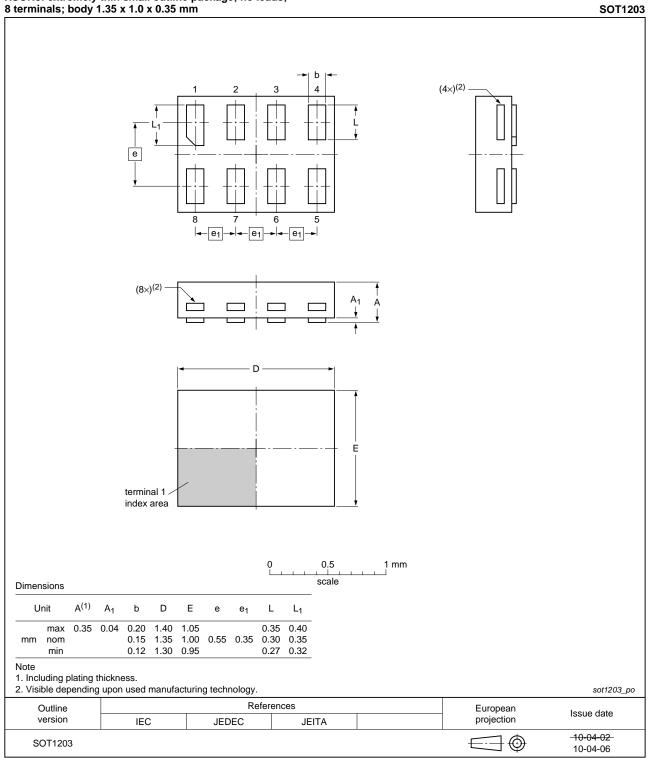


XSON8: extremely thin small outline package; no leads; 8 terminals; body 1.2 x 1.0 x 0.35 mm

Fig 16. Package outline SOT1116 (XSON8)

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Dual bus buffer/line driver; 3-state



XSON8: extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1.0 x 0.35 mm

Fig 17. Package outline SOT1203 (XSON8)

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Dual bus buffer/line driver; 3-state

14. Abbreviations

Description
Complementary Metal-Oxide Semiconductor
Device Under Test
ElectroStatic Discharge
Human Body Model
Machine Model
Transistor-Transistor Logic

15. Revision history

Table 12. **Revision history Document ID Release date** Data sheet status **Change notice Supersedes** 74LVC2G125 v.14 20130329 Product data sheet 74LVC2G125 v.13 _ Modifications: For type number 74LVC2G125GD XSON8U has changed to XSON8. 74LVC2G125 v.13 74LVC2G125 v.12 20120622 Product data sheet Modifications: For type number 74LVC2G125GM the SOT code has changed to SOT902-2. 74LVC2G125 v.12 20111201 Product data sheet 74LVC2G125 v.11 -Modifications: Legal pages updated. 74LVC2G125 v.11 20100909 Product data sheet 74LVC2G125 v.10 _ 74LVC2G125 v.10 20080611 Product data sheet 74LVC2G125 v.9 -74LVC2G125 v.9 20080226 Product data sheet 74LVC2G125 v.8 _ 74LVC2G125 v.8 20070907 Product data sheet 74LVC2G125 v.7 -74LVC2G125 v.7 20060523 Product data sheet 74LVC2G125 v.6 -74LVC2G125 v.6 20051223 Product data sheet 74LVC2G125 v.5 _ 74LVC2G125 v.5 20050201 Product specification 74LVC2G125 v.4 -74LVC2G125 v.4 20040922 Product specification 74LVC2G125 v.3 -74LVC2G125 v.3 Product specification 74LVC2G125 v.2 20040109 _ 74LVC2G125 v.2 Product specification 74LVC2G125 v.1 20030901 -74LVC2G125 v.1 20030310 Product specification _ -

16. Legal information

16.1 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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18. Contents

1	General description 1
2	Features and benefits 1
3	Ordering information 2
4	Marking 2
5	Functional diagram 3
6	Pinning information 3
6.1	Pinning
6.2	Pin description 4
7	Functional description 4
8	Limiting values 5
9	Recommended operating conditions 5
10	Static characteristics 6
11	Dynamic characteristics 8
12	Waveforms
13	Package outline 11
14	Abbreviations
15	Revision history 19
16	Legal information
16.1	Data sheet status 20
16.2	Definitions
16.3	Disclaimers
16.4	Trademarks
17	Contact information 21
18	Contents

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