

DATA SHEET

74LVC2G125

Dual bus buffer/line driver; 3-state

Product specification
Supersedes data of 2003 Mar 10

2003 Sep 01

Dual bus buffer/line driver; 3-state

74LVC2G125

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.
- ± 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
- SOT505-2 and SOT765-1 package
- Specified from -40 to $+85$ °C and -40 to $+125$ °C.

DESCRIPTION

The 74LVC2G125 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 backflow current through the device when it is powered down.

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 nOE). A HIGH-level at pin nOE causes the output to assume a high-impedance OFF-state. Schmitt-trigger action at all inputs makes the circuit highly tolerant for slower input rise and fall times.

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	3.7	ns
		$V_{CC} = 2.5$ V; $C_L = 30$ pF; $R_L = 500$ Ω	2.5	ns
		$V_{CC} = 2.7$ V; $C_L = 50$ pF; $R_L = 500$ Ω	2.7	ns
		$V_{CC} = 3.3$ V; $C_L = 50$ pF; $R_L = 500$ Ω	2.3	ns
		$V_{CC} = 5.0$ V; $C_L = 50$ pF; $R_L = 500$ Ω	1.9	ns
C_I	input capacitance		2	pF
C_{PD}	power dissipation capacitance per buffer	output enabled; notes 1 and 2	18	pF
		output disabled; notes 1 and 2	5	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 $V_i = \text{GND to } V_{CC}$.

Dual bus buffer/line driver; 3-state

74LVC2G125

FUNCTION TABLE

See note 1.

INPUT		OUTPUT
$\overline{\text{nOE}}$	nA	nY
L	L	L
L	H	H
H	X	Z

Note

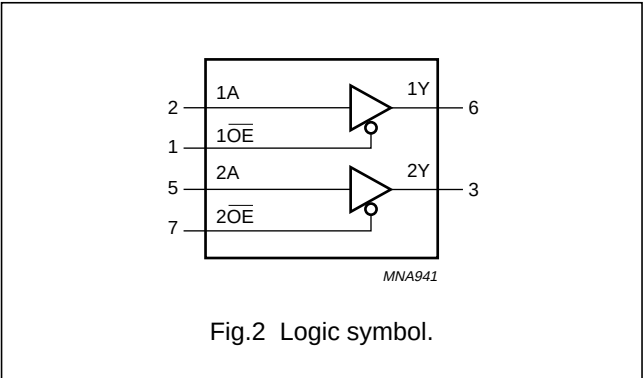
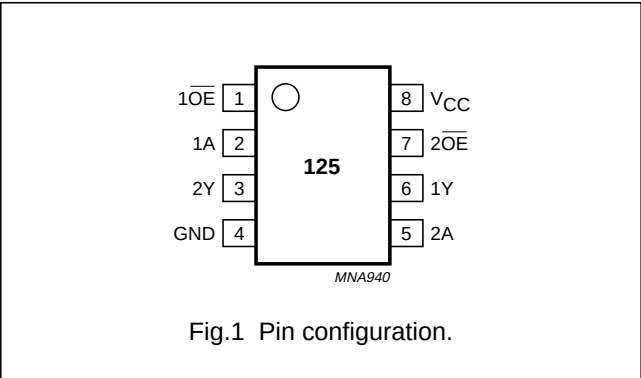
1. H = HIGH voltage level;
L = LOW voltage level;
X = don't care;
Z = high-impedance OFF-state.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE					
	TEMPERATURE RANGE	PINS	PACKAGE	MATERIAL	CODE	MARKING
74LVC2G125DP	−40 to +125 °C	8	TSSOP8	plastic	SOT505-2	V125
74LVC2G125DC	−40 to +125 °C	8	VSSOP8	plastic	SOT765-1	V25

PINNING

PIN	SYMBOL	DESCRIPTION
1	$1\overline{\text{OE}}$	output enable input (active LOW)
2	1A	data input
3	2Y	data output
4	GND	ground (0 V)
5	2A	data input
6	1Y	data output
7	$2\overline{\text{OE}}$	output enable input (active LOW)
8	V _{CC}	supply voltage



Dual bus buffer/line driver; 3-state

74LVC2G125

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	$V_{CC} = 1.65$ to 5.5 V; enable mode	0	V_{CC}	V
		$V_{CC} = 1.65$ to 5.5 V; disable mode	0	5.5	V
		$V_{CC} = 0$; Power-down mode	0	5.5	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	enable mode; notes 1 and 2	-0.5	$V_{CC} + 0.5$	V
		disable mode; notes 1 and 2	-0.5	+6.5	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 bus buffer/line driver; 3-state

74LVC2G125

DC CHARACTERISTICS

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

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
		OTHER	V _{CC} (V)				
T _{amb} = −40 to +85 °C; note 1							
V _{IH}	HIGH-level input voltage		1.65 to 1.95	0.65 × V _{CC}	−	−	V
			2.3 to 2.7	1.7	−	−	V
			2.7 to 3.6	2.0	−	−	V
			4.5 to 5.5	0.7 × V _{CC}	−	−	V
V _{IL}	LOW-level input voltage		1.65 to 1.95	−	−	0.35 × V _{CC}	V
			2.3 to 2.7	−	−	0.7	V
			2.7 to 3.6	−	−	0.8	V
			4.5 to 5.5	−	−	0.3 × V _{CC}	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}					
		I _O = 100 μA	1.65 to 5.5	−	−	0.1	V
		I _O = 4 mA	1.65	−	−	0.45	V
		I _O = 8 mA	2.3	−	−	0.3	V
		I _O = 12 mA	2.7	−	−	0.4	V
		I _O = 24 mA	3.0	−	−	0.55	V
		I _O = 32 mA	4.5	−	−	0.55	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}					
		I _O = −100 μA	1.65 to 5.5	V _{CC} − 0.1	−	−	V
		I _O = −4 mA	1.65	1.2	−	−	V
		I _O = −8 mA	2.3	1.9	−	−	V
		I _O = −12 mA	2.7	2.2	−	−	V
		I _O = −24 mA	3.0	2.3	−	−	V
		I _O = −32 mA	4.5	3.8	−	−	V
I _{LI}	input leakage current	V _I = 5.5 V or GND	5.5	−	±0.1	±5	μA
I _{OZ}	3-state output OFF-state current	V _I = V _{IH} or V _{IL} ; V _O = 5.5 V or GND	3.6	−	±0.1	±10	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	5.5	−	0.1	10	μA
ΔI _{CC}	additional quiescent supply current per pin	V _I = V _{CC} − 0.6 V; I _O = 0	2.3 to 5.5	−	5	500	μA

Dual bus buffer/line driver; 3-state

74LVC2G125

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
		OTHER	V _{CC} (V)				
T _{amb} = –40 to +125 °C							
V _{IH}	HIGH-level input voltage		1.65 to 1.95	0.65 × V _{CC}	–	–	V
			2.3 to 2.7	1.7	–	–	V
			2.7 to 3.6	2.0	–	–	V
			4.5 to 5.5	0.7 × V _{CC}	–	–	V
V _{IL}	LOW-level input voltage		1.65 to 1.95	–	–	0.35 × V _{CC}	V
			2.3 to 2.7	–	–	0.7	V
			2.7 to 3.6	–	–	0.8	V
			4.5 to 5.5	–	–	0.3 × V _{CC}	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}					
		I _O = 100 μA	1.65 to 5.5	–	–	0.1	V
		I _O = 4 mA	1.65	–	–	0.70	V
		I _O = 8 mA	2.3	–	–	0.45	V
		I _O = 12 mA	2.7	–	–	0.60	V
		I _O = 24 mA	3.0	–	–	0.80	V
		I _O = 32 mA	4.5	–	–	0.80	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}					
		I _O = –100 μA	1.65 to 5.5	V _{CC} – 0.1	–	–	V
		I _O = –4 mA	1.65	0.95	–	–	V
		I _O = –8 mA	2.3	1.7	–	–	V
		I _O = –12 mA	2.7	1.9	–	–	V
		I _O = –24 mA	3.0	2.0	–	–	V
		I _O = –32 mA	4.5	3.4	–	–	V
I _{LI}	input leakage current	V _I = 5.5 V or GND	5.5	–	–	±20	μA
I _{OZ}	3-state output OFF-state current	V _I = V _{IH} or V _{IL} ; V _O = 5.5 V or GND	3.6	–	–	±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	5.5	–	–	40	μA
ΔI _{CC}	additional quiescent supply current per pin	V _I = V _{CC} – 0.6 V; I _O = 0	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.

Dual bus buffer/line driver; 3-state

74LVC2G125

AC CHARACTERISTICS

GND = 0 V.

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
		WAVEFORMS	V _{CC} (V)				
T _{amb} = –40 to +85 °C; note 1							
t _{PHL} /t _{PLH}	propagation delay nA to nY	see Figs 3 and 5	1.65 to 1.95	1.0	3.7	9.1	ns
			2.3 to 2.7	0.5	2.5	4.9	ns
			2.7	1.0	2.7	4.8	ns
			3.0 to 3.6	0.5	2.3	4.3	ns
			4.5 to 5.5	0.5	1.9	3.7	ns
t _{PZH} /t _{PZL}	3-state output enable time n $\overline{\text{OE}}$ to nY	see Figs 4 and 5	1.65 to 1.95	1.5	4.3	10.1	ns
			2.3 to 2.7	1.0	2.8	5.6	ns
			2.7	1.5	3.3	5.7	ns
			3.0 to 3.6	0.5	2.4	4.7	ns
			4.5 to 5.5	0.5	2.0	3.8	ns
t _{PHZ} /t _{PLZ}	3-state output disable time n $\overline{\text{OE}}$ to nY	see Figs 4 and 5	1.65 to 1.95	1.0	3.5	11.6	ns
			2.3 to 2.7	0.5	1.8	5.8	ns
			2.7	1.0	2.7	4.8	ns
			3.0 to 3.6	1.0	2.7	4.6	ns
			4.5 to 5.5	0.5	1.8	3.4	ns
T _{amb} = –40 to +125 °C							
t _{PHL} /t _{PLH}	propagation delay nA to nY	see Figs 3 and 5	1.65 to 1.95	1.0	–	11.4	ns
			2.3 to 2.7	0.5	–	6.3	ns
			2.7	1.0	–	6.0	ns
			3.0 to 3.6	0.5	–	5.5	ns
			4.5 to 5.5	0.5	–	4.6	ns
t _{PZH} /t _{PZL}	3-state output enable time n $\overline{\text{OE}}$ to nY	see Figs 4 and 5	1.65 to 1.95	1.5	–	12.6	ns
			2.3 to 2.7	1.0	–	7.0	ns
			2.7	1.5	–	7.1	ns
			3.0 to 3.6	0.5	–	5.9	ns
			4.5 to 5.5	0.5	–	4.8	ns
t _{PHZ} /t _{PLZ}	3-state output disable time n $\overline{\text{OE}}$ to nY	see Figs 4 and 5	1.65 to 1.95	1.0	–	14.1	ns
			2.3 to 2.7	0.5	–	7.6	ns
			2.7	1.0	–	6.2	ns
			3.0 to 3.6	1.0	–	5.9	ns
			4.5 to 5.5	0.5	–	4.6	ns

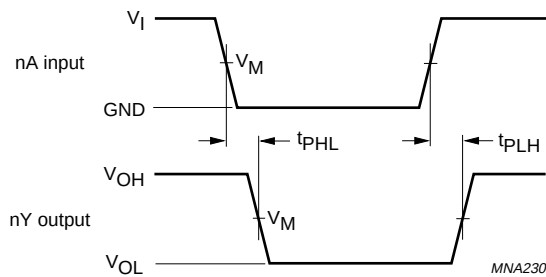
Note

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

Dual bus buffer/line driver; 3-state

74LVC2G125

AC WAVEFORMS



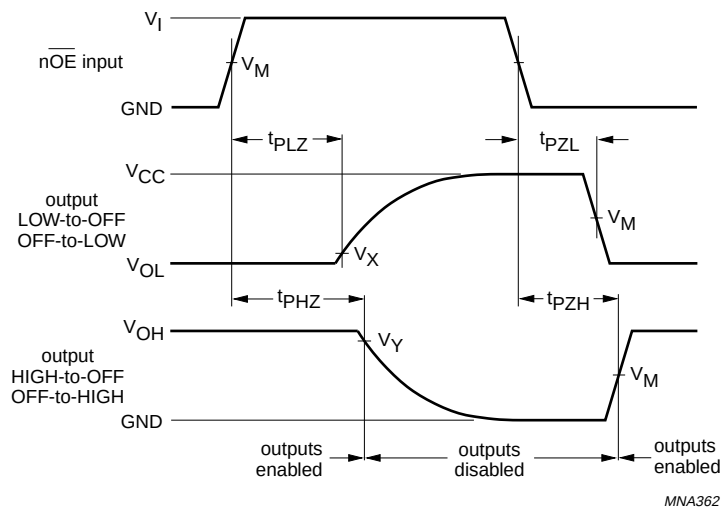
V_{CC}	V_M	INPUT	
		V_I	$t_r = t_f$
1.65 to 1.95 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2.0 ns
2.3 to 2.7 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2.0 ns
2.7 V	1.5 V	2.7 V	≤ 2.5 ns
3.0 to 3.6 V	1.5 V	2.7 V	≤ 2.5 ns
4.5 to 5.5 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2.5 ns

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

Fig.3 The input (nA) to output (nY) propagation delays and the output transition times.

Dual bus buffer/line driver; 3-state

74LVC2G125



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

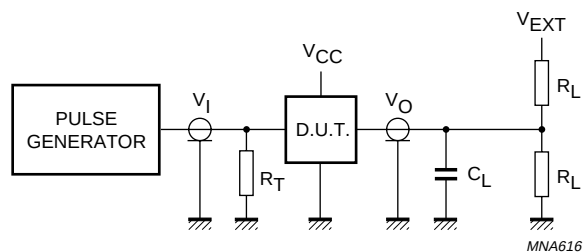
V_X = V_{OL} + 0.3 V at V_{CC} ≥ 2.7 V;
V_X = V_{OL} + 0.15 V at V_{CC} < 2.7 V;
V_Y = V_{OH} - 0.3 V at V_{CC} ≥ 2.7 V;
V_Y = V_{OH} - 0.15 V at V_{CC} < 2.7 V.

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

Fig.4 3-state enable and disable times.

Dual bus buffer/line driver; 3-state

74LVC2G125



V _{CC}	V _I	C _L	R _L	V _{EXT}		
				t _{PLH} /t _{PHL}	t _{PZH} /t _{PHZ}	t _{PZL} /t _{PLZ}
1.65 to 1.95 V	V _{CC}	30 pF	1 kΩ	open	GND	2 × V _{CC}
2.3 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 to 3.6 V	2.7 V	50 pF	500 Ω	open	GND	6 V
4.5 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_0 of the pulse generator.

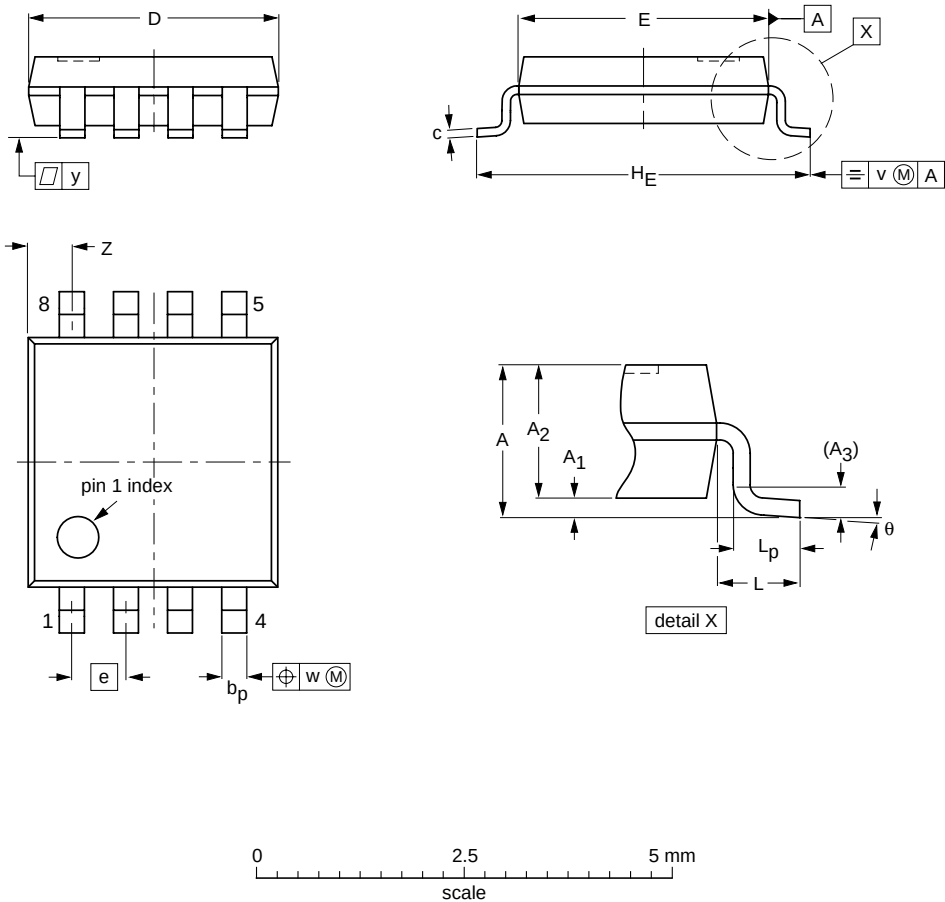
Fig.5 Load circuitry for switching times.

Dual bus buffer/line driver; 3-state

74LVC2G125

PACKAGE OUTLINES

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	v	w	y	Z ⁽¹⁾	θ
mm	1.1	0.15 0.00	0.95 0.75	0.25	0.38 0.22	0.18 0.08	3.1 2.9	3.1 2.9	0.65	4.1 3.9	0.5	0.47 0.33	0.2	0.13	0.1	0.70 0.35	8° 0°

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

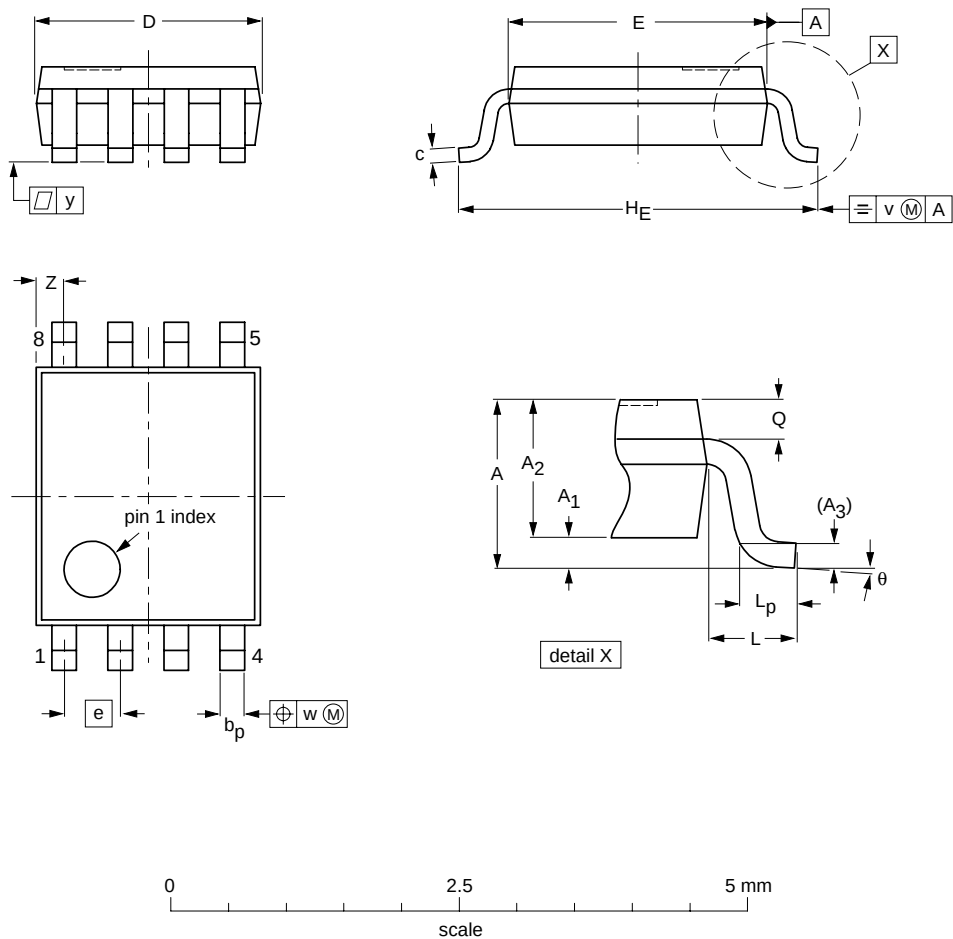
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT505-2		---				02-01-16

Dual bus buffer/line driver; 3-state

74LVC2G125

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽²⁾	e	H _E	L	L _p	Q	v	w	y	z ⁽¹⁾	θ
mm	1	0.15 0.00	0.85 0.60	0.12	0.27 0.17	0.23 0.08	2.1 1.9	2.4 2.2	0.5	3.2 3.0	0.4	0.40 0.15	0.21 0.19	0.2	0.13	0.1	0.4 0.1	8° 0°

- Notes
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
 2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT765-1		MO-187				02-06-07

Dual bus buffer/line driver; 3-state

74LVC2G125

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.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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Notes

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3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

DEFINITIONS

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

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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