74LVC2G125-Q100

Dual bus buffer/line driver; 3-state

Rev. 1 — 8 May 2013

Product data sheet

1. General description

The 74LVC2G125-Q100 provides a dual non-inverting buffer/line driver with 3-state output. The output enable input (pin nOE) controls the 3-state output. 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 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.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - ◆ Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- 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:
 - ◆ MIL-STD-883, method 3015 exceeds 2000 V
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ♦ MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)
- \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
- Inputs accept voltages up to 5 V
- Multiple package options



3. Ordering information

Table 1. Ordering information

Type number	Package									
	Temperature range	Name	Description	Version						
74LVC2G125DP-Q100	–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-Q100	–40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1						

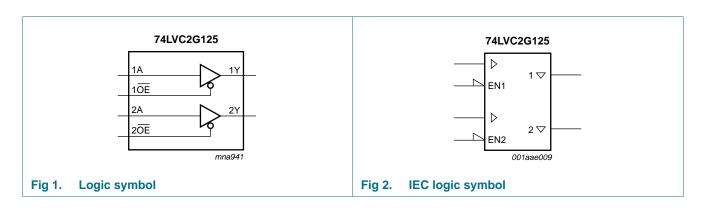
4. Marking

Table 2. Marking codes

Type number	Marking code[1]
74LVC2G125DP-Q100	V25
74LVC2G125DC-Q100	V25

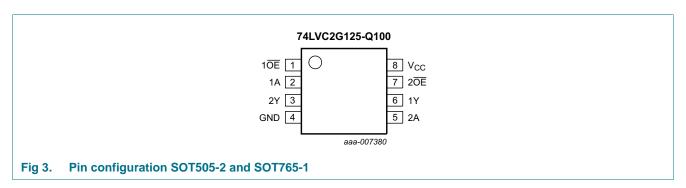
^[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
1 0E , 2 0E	1, 7	output enable input (active LOW)
1A, 2A	2, 5	data input
GND	4	ground (0 V)
1Y, 2Y	6, 3	data output
V _{CC}	8	supply voltage

7. Functional description

Table 4. Function table [1]

Control	Input	Output
nOE	nA	nY
L	L	L
L	Н	Н
Н	X	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
Io	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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[3] _	300	mW

^[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

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
Vo	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 5.5 V	V
T _{amb}	ambient temperature		-40	+125	°C
Δt/ΔV	input transition rise and	V _{CC} = 1.65 V to 2.7 V	-	20	ns/V
	fall rate	V _{CC} = 2.7 V to 5.5 V	-	10	ns/V

^[2] When $V_{CC} = 0 \text{ V}$ (Power-down mode), the output voltage can be 5.5 V in normal operation.

^[3] 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.

10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
$T_{amb} = -$	40 °C to +85 °C					
V _{IH}	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
V_{IL}	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 V to 3.6 V	-	-	8.0	V
		V _{CC} = 4.5 V to 5.5 V	-	-	$0.3V_{CC}$	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_{O} = 100 μ A; V_{CC} = 1.65 V to 5.5 V	-	-	0.1	V
		$I_{O} = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.45	V
		$I_{O} = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.3	V
		I_{O} = 12 mA; V_{CC} = 2.7 V	-	-	0.4	V
		$I_{O} = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.55	V
		$I_{O} = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.55	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = -100 \ \mu A; \ V_{CC} = 1.65 \ V \ to \ 5.5 \ V$	V _{CC} - 0.1	-	-	V
		$I_{O} = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	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
I	input leakage current	$V_I = 5.5 \text{ V or GND}$; $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	±0.1	±5	μΑ
l _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = 5.5$ V or GND; $V_{CC} = 3.6$ V	-	±0.1	±10	μΑ
I _{OFF}	power-off leakage current	V_{I} or $V_{O} = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$	-	±0.1	±10	μΑ
I _{CC}	supply current	$V_I = 5.5 \text{ V or GND};$ $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}; I_O = 0 \text{ A}$	-	0.1	10	μΑ
ΔI_{CC}	additional supply current	per pin; $V_I = V_{CC} - 0.6 \text{ V}$; $I_O = 0 \text{ A}$; $V_{CC} = 2.3 \text{ V}$ to 5.5 V	-	5	500	μΑ
C _I	input capacitance		-	2	-	pF

 Table 7.
 Static characteristics ...continued

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

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
T _{amb} = -	-40 °C to +125 °C					
V _{IH}	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
V_{IL}	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 V to 3.6 V	-	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	$0.3V_{CC}$	V
V _{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_{O} = 100 μ A; V_{CC} = 1.65 V to 5.5 V	-	-	0.1	V
		$I_{O} = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.70	V
		$I_{O} = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.45	V
		$I_{O} = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.60	V
		$I_{O} = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.80	V
		$I_{O} = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.80	V
V _{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_{O} = -100 \ \mu A; \ V_{CC} = 1.65 \ V \ to \ 5.5 \ V$	$V_{CC}-0.1$	-	-	V
		$I_{O} = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	0.95	-	-	V
		$I_{O} = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.7	-	-	V
		$I_{O} = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	1.9	-	-	V
		$I_{O} = -24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.0	-	-	V
		$I_{O} = -32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.4	-	-	V
l _l	input leakage current	$V_I = 5.5 \text{ V or GND}$; $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	-	±20	μΑ
loz	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = 5.5$ V or GND; $V_{CC} = 3.6$ V	-	-	±20	μΑ
l _{OFF}	power-off leakage current	V_{I} or $V_{O} = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$	-	-	±20	μΑ
lcc	supply current	$V_I = 5.5 \text{ V or GND};$ $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}; I_O = 0 \text{ A}$	-	-	40	μΑ
Δl _{CC}	additional supply current	per pin; $V_I = V_{CC} - 0.6 \text{ V}$; $I_O = 0 \text{ A}$; $V_{CC} = 2.3 \text{ V}$ to 5.5 V	-	-	5	mA

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

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground 0 V); for test circuit see Figure 6.

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

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

[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;

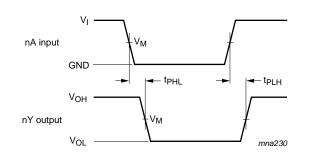
 $\Sigma(C_L \times V_{CC}^2 \times f_0)$ = sum of outputs.

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

^[3] t_{en} is the same as t_{PZH} and t_{PZL} .

^[4] t_{dis} is the same as t_{PLZ} and t_{PHZ} .

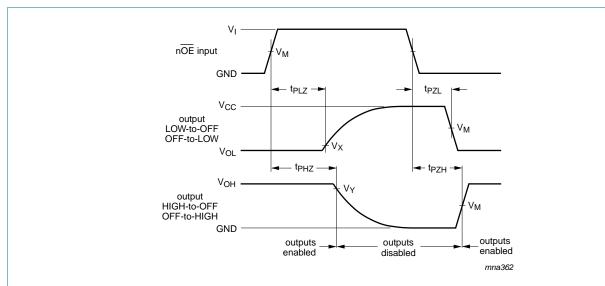
12. Waveforms



Measurement points are given in Table 9.

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

Fig 4. Propagation delay input (nA) to output (nY)



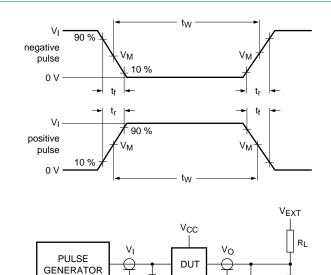
Measurement points are given in Table 9.

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

Fig 5. 3-state output enable and disable times

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	$V_{OH} - 0.3 V$						



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Test data is given in Table 10.

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 output impedance Z_o of the pulse generator.

 V_{EXT} = Test voltage for switching times.

Fig 6. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input		Load		V _{EXT}			
V _{CC}	VI	t _r , t _f	C _L	R _L	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	500Ω	open	GND	2V _{CC}	
2.7 V	2.7 V	\leq 2.5 ns	50 pF	500Ω	open	GND	6 V	
3.0 V to 3.6 V	2.7 V	\leq 2.5 ns	50 pF	500Ω	open	GND	6 V	
4.5 V to 5.5 V	V _{CC}		50 pF	500Ω	open	GND	2V _{CC}	

13. Package outline

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

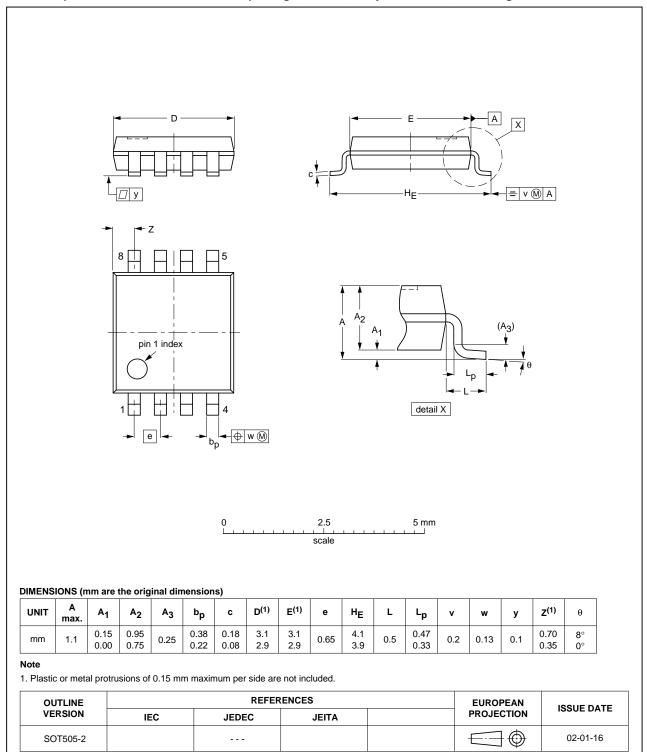


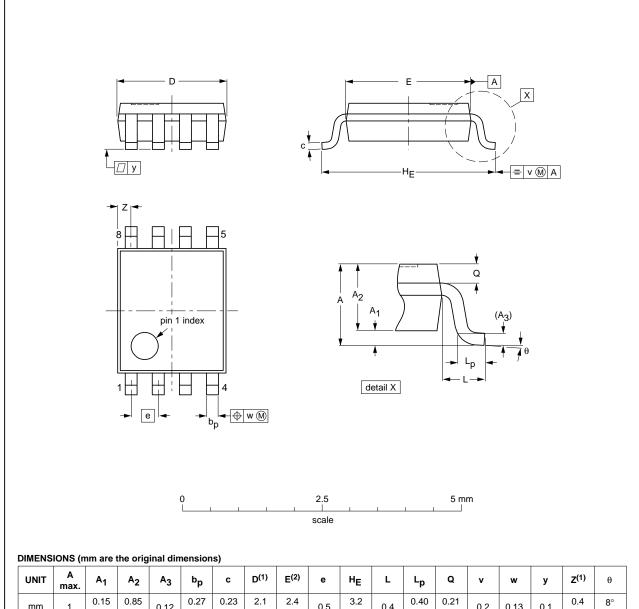
Fig 7. Package outline SOT505-2 (TSSOP8)

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

SOT765-1



UNIT	A max.	A ₁	A ₂	А3	bp	С	D ⁽¹⁾	E ⁽²⁾	е	HE	L	Lp	Q	v	w	у	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	REFERENCES			EUROPEAN	ISSUE DATE	
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT765-1		MO-187				02-06-07

Fig 8. Package outline SOT765-1 (VSSOP8)

74LVC2G125_Q100

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14. Abbreviations

Table 11. Abbreviations

Acronym	Description	
CMOS	Complementary Metal-Oxide Semiconductor	
DUT	Device Under Test	
ESD	ElectroStatic Discharge	
НВМ	Human Body Model	
MIL	Military	
MM	Machine Model	
TTL	Transistor-Transistor Logic	

15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC2G125_Q100 v.1	20130508	Product data sheet	-	-

12 of 15

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"
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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74LVC2G125-Q100

Dual bus buffer/line driver; 3-state

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18. Contents

1	General description
2	Features and benefits
3	Ordering information 2
4	Marking 2
5	Functional diagram 2
6	Pinning information 3
6.1	Pinning
6.2	Pin description
7	Functional description 3
8	Limiting values 4
9	Recommended operating conditions 4
10	Static characteristics 5
11	Dynamic characteristics 7
12	Waveforms
13	Package outline
14	Abbreviations12
15	Revision history
16	Legal information
16.1	Data sheet status
16.2	Definitions
16.3	Disclaimers
16.4	Trademarks14
17	Contact information 14
18	Contents

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