74LVC2G125-Q100

Dual bus buffer/line driver; 3-state
Rev. 3 — 10 September 2018

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 $n\overline{OE}$) controls the 3-state output. 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.

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)
- ±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

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			



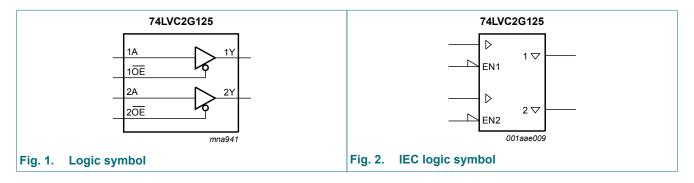
4. Marking

Table 2. Marking codes

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

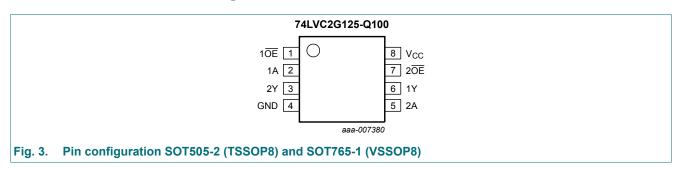
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1 OE , 2 OE	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

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

	Input	Output
nŌE	nA	nY
L	L	L
L	Н	Н
Н	X	Z

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	[1]	-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 [1]	-0.5	V _{CC} + 0.5	V
		Disable mode [1]	-0.5	+6.5	V
		Power-down mode; V _{CC} = 0 V [1]	-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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$ [2]	-	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
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
Δt/ΔV	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

^[2] 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 I	Parameter	Conditions	T _{amb} =	T _{amb} = -40 °C to +85 °C			T _{amb} = -40 °C to +125 °C	
			Min	Typ [1]	Max	Min	Max	
V _{IH}	HIGH-level	V _{CC} = 1.65 V to 1.95 V	0.65V _{CC}	-	-	0.65V _{CC}	-	V
	input voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
		V _{CC} = 4.5 V to 5.5 V	0.7V _{CC}	-	-	0.7V _{CC}	-	V
V _{IL}	LOW-level	V _{CC} = 1.65 V to 1.95 V	-	-	0.35V _{CC}	-	0.35V _{CC}	V
	input voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	0.3V _{CC}	-	0.3V _{CC}	V
V _{OL}	LOW-level	V _I = V _{IH} or V _{IL}						
	output voltage	I _O = 100 μA; V _{CC} = 1.65 V to 5.5 V	-	-	0.1	-	0.1	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	-	0.70	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.3	-	0.45	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.4	-	0.60	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	-	0.80	V
	I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.55	-	0.80	V	
V _{OH}	HIGH-level	V _I = V _{IH} or V _{IL}						
	output voltage	I _O = -100 μA; V _{CC} = 1.65 V to 5.5 V	V _{CC} - 0.1	-	-	V _{CC} - 0.1	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	-	-	0.95	-	V
		I_{O} = -8 mA; V_{CC} = 2.3 V	1.9	-	-	1.7	-	V
		I_{O} = -12 mA; V_{CC} = 2.7 V	2.2	-	-	1.9	-	V
		I_{O} = -24 mA; V_{CC} = 3.0 V	2.3	-	-	2.0	-	V
		I_{O} = -32 mA; V_{CC} = 4.5 V	3.8	-	-	3.4	-	V
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±1	-	±1	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	±2	-	±2	μΑ
I _{OFF}	power-off leakage current	$V_1 \text{ or } V_0 = 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	±0.1	±2	-	±2	μΑ
I _{CC}	supply current	V _I = 5.5 V or GND; V _{CC} = 1.65 V to 5.5 V; I _O = 0 A	-	0.1	4	-	4	μΑ
ΔI _{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	-	500	μΑ
Cı	input capacitance		-	2	-	-	-	pF

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

11. Dynamic characteristics

Table 8. Dynamic characteristics

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

Symbol	Parameter	ter Conditions		T _{amb} = -40 °C to +85 °C			T _{amb} = -40 °C to +125 °C	
			Min	Typ [1]	Max	Min	Max	
t _{pd}	propagation	nA to nY; see Fig. 4 [2]						
	delay	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 Fig. 5 [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 Fig. 5 [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 V to 3.6 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}	1:	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.

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma (C_L \times V_{CC}^2 \times f_0)$$
 where:

 f_i = input frequency in MHz;

fo = output frequency in MHz;

C_L = output load capacitance in pF;

 V_{CC} = supply voltage in V;

N = number of inputs switching;

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

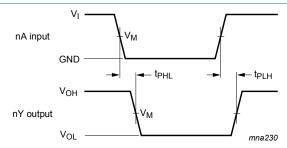
t_{pd} is the same as t_{PLH} and t_{PHL}.

t_{en} is the same as t_{PZH} and t_{PZL}.

 t_{dis} is the same as t_{PLZ} and t_{PHZ} .

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

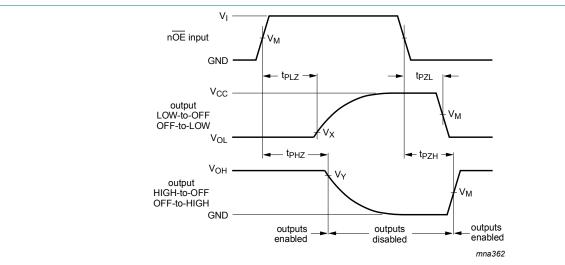
11.1. Waveforms and test circuit



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)



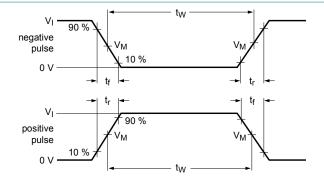
Measurement points are given in Table 9.

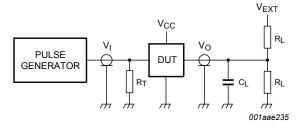
Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

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	





Test data is given in <u>Table 10</u>.

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	Input		Load V _{EXT}			Load V _{EXT}		
V _{CC}	VI	t _r , t _f	CL	R _L	t _{PLH} , t _{PHL}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}		
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	open	GND	2V _{CC}		
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	30 pF	500 Ω	open	GND	2V _{CC}		
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	GND	6 V		
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	GND	6 V		
4.5 V to 5.5 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	open	GND	2V _{CC}		

12. Package outline

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

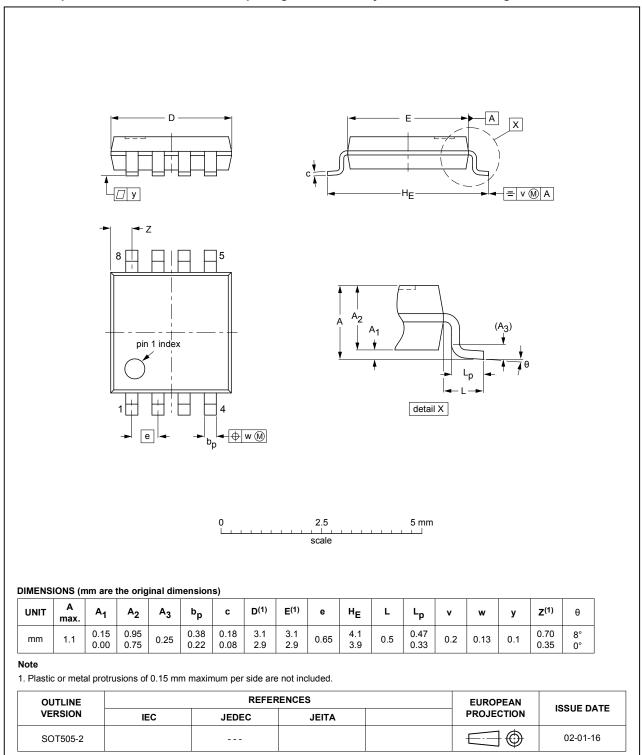


Fig. 7. Package outline SOT505-2 (TSSOP8)

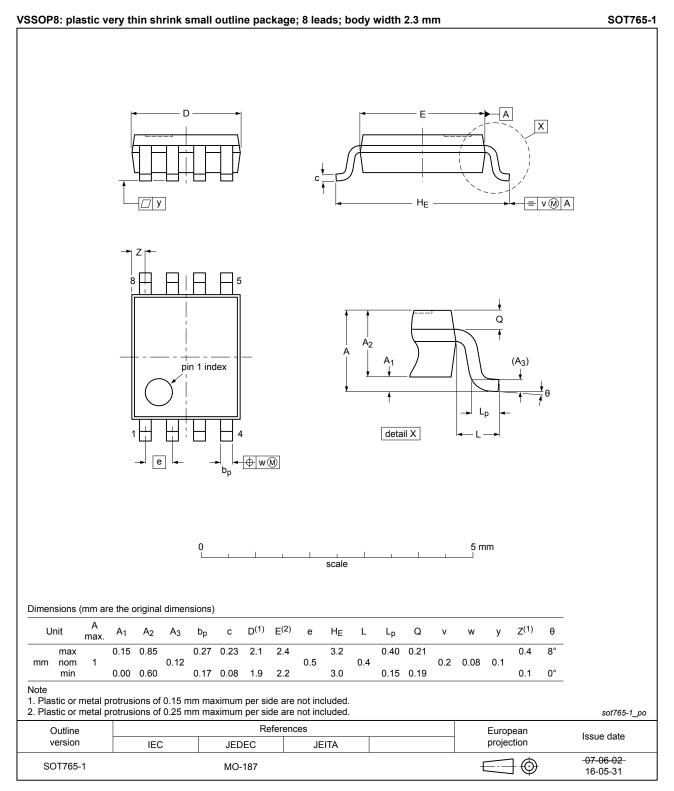


Fig. 8. Package outline SOT765-1 (VSSOP8)

13. 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

14. Revision history

Table 12. Revision history

Release date	Data sheet status	Change notice	Supersedes		
20180910	Product data sheet	-	74LVC2G125_Q100 v.2		
 The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. 					
20161214	Product data sheet	-	74LVC2G125_Q100 v.1		
<u>Table 7</u> : The maximum limits for leakage current and supply current have changed.					
20130508	Product data sheet	-	-		
	 20180910 The format or of Nexperia. Legal texts h. 20161214 Table 7: The 	 20180910 Product data sheet The format of this data sheet has been of Nexperia. Legal texts have been adapted to the next and the product data sheet Table 7: The maximum limits for leakage 	20180910 Product data sheet - The format of this data sheet has been redesigned to con of Nexperia. Legal texts have been adapted to the new company name 20161214 Product data sheet - Table 7: The maximum limits for leakage current and support the sheet of the new company name are company name at the sheet of the new company name are company name at the sheet of the new company name are company name at the sheet of the new company name are company name at the sheet of the new company name are company name at the sheet of the new company name at the		

15. 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.
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74LVC2G125_Q100

Product data sheet

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