74LVC2G125-Q100

Dual bus buffer/line driver; 3-state

Rev. 4 — 26 July 2021

Product data sheet

1. General description

The 74LVC2G125-Q100 is a dual buffer/line driver with 3-state outputs controlled by the output enable inputs ($n\overline{OE}$). Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

This device is fully specified for partial power down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the potentially 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
- · High noise immunity
- I_{OFF} circuitry provides partial Power-down mode operation
- ±24 mA output drive (V_{CC} = 3.0 V)
- · CMOS low-power consumption
- · Latch-up performance exceeds 250 mA
- · Direct interface with TTL levels
- Overvoltage tolerant inputs to 5.5 V
- · Complies with JEDEC standard:
- JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8C (2.7 V to 3.6 V)
 - JESD36 (4.5 V to 5.5 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)

3. Ordering information

Table 1. Ordering information

Table	Table 1. Ordering information								
Type	number	Package							
		Temperature range	Name	Description	Version				
74LV0	C2G125DP-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				
74LV0	C2G125DC-Q100	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1				



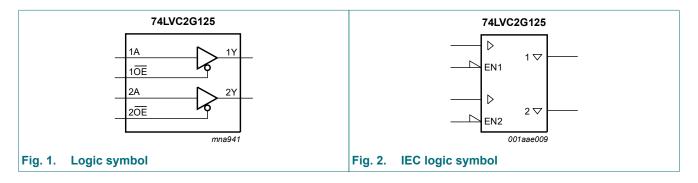
4. Marking

Table 2. Marking codes

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

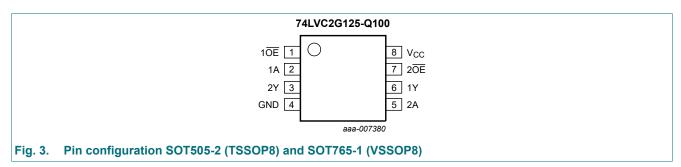
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

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	$T_{amb} = -40 ^{\circ}\text{C to } +125 ^{\circ}\text{C}$ [2]	-	250	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
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 SOT505-2 (TSSOP8) package: P_{tot} derates linearly with 4.6 mW/K above 96 °C. For SOT765-1 (VSSOP8) package: P_{tot} derates linearly with 4.9 mW/K above 99 °C.

10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			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_{I} or $V_{O} = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$	-	±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; $V_I = V_{CC} - 0.6 \text{ V}$; $I_O = 0 \text{ A}$; $V_{CC} = 2.3 \text{ V}$ 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	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			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.

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

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

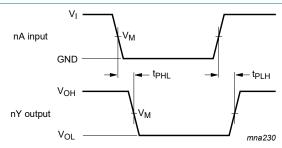
^[2] t_{pd} is the same as t_{PLH} and t_{PHL} .

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

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

^[5] C_{PD} is used to determine the dynamic power dissipation (P_D in μ W).

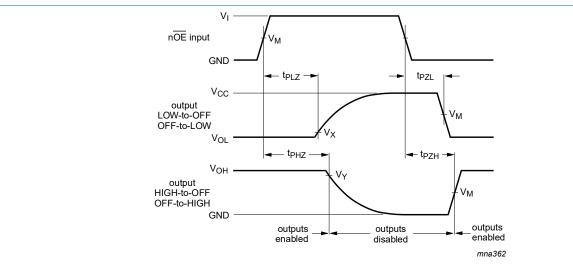
11.1. Waveforms and test circuit



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)



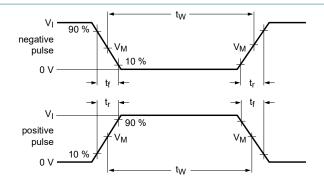
Measurement points are given in Table 9.

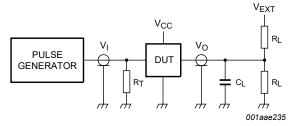
Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

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		Load		V _{EXT}		
V _{CC}	V _I	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}

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12. Package outline

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

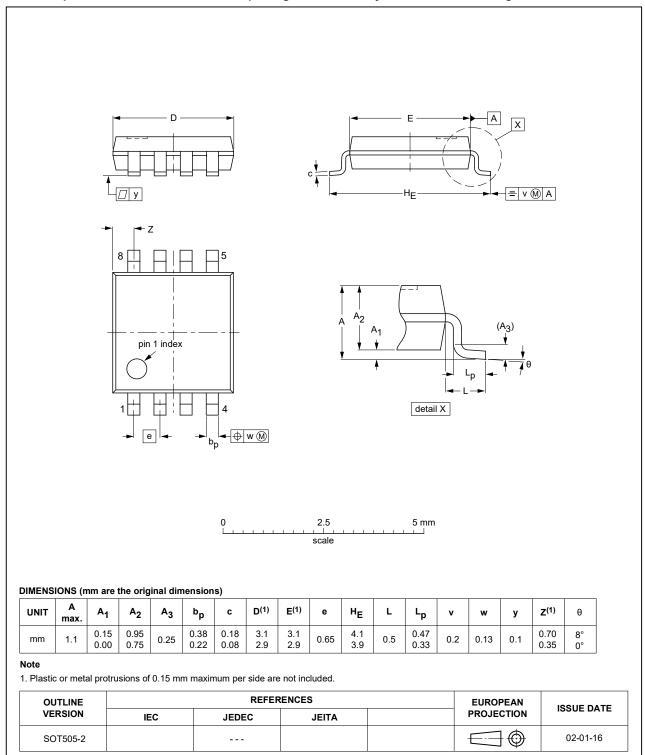


Fig. 7. Package outline SOT505-2 (TSSOP8)

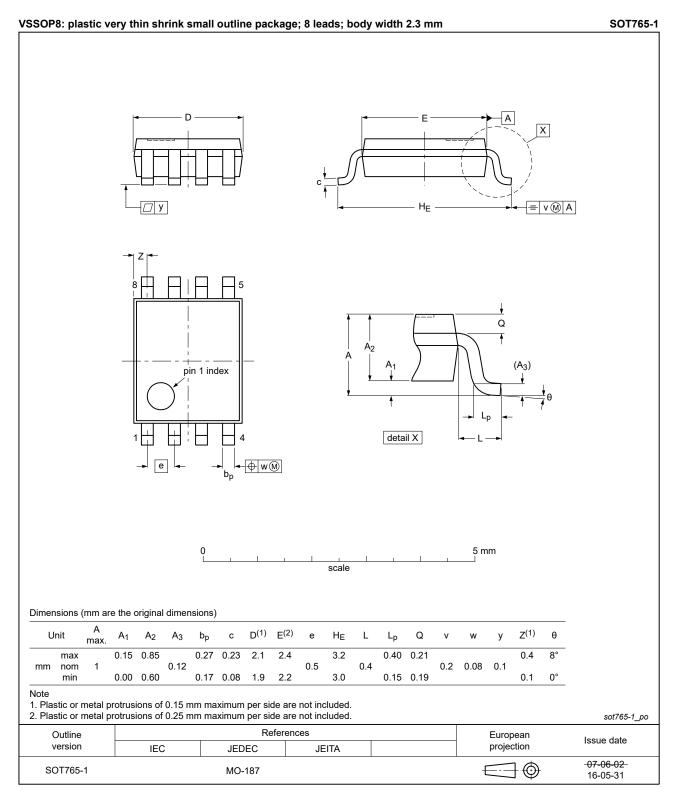


Fig. 8. Package outline SOT765-1 (VSSOP8)

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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

Table 12. Revision history	.	5	6 1 41				
Document ID	Release date	Data sheet status	Change notice	Supersedes			
74LVC2G125_Q100 v.4	20210726	Product data sheet	-	74LVC2G125_Q100 v.3			
Modifications:	 <u>Section 1</u> and <u>Section 2</u> updated. <u>Section 8</u>: Derating values for P_{tot} total power dissipation updated. 						
74LVC2G125_Q100 v.3	20180910	Product data sheet	-	74LVC2G125_Q100 v.2			
Modifications:	of Nexperia.		· ·	nply with the identity guidelines			
	Legal texts h	ave been adapted to the ne	ew company name	e where appropriate.			
74LVC2G125_Q100 v.2	20161214	Product data sheet	-	74LVC2G125_Q100 v.1			
Modifications:	<u>Table 7</u> : The maximum limits for leakage current and supply current have changed.						
74LVC2G125_Q100 v.1	20130508	Product data sheet	-	-			

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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