

SN74LVC1G125 Single Bus Buffer Gate With 3-State Output

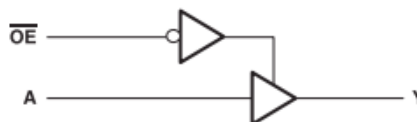
1 Features

- Available in the Ultra Small 0.64-mm² Package (DPW) With 0.5-mm Pitch
- Supports 5-V V_{CC} Operation
- Inputs Accept Voltages to 5.5 V
- Provides Down Translation to V_{CC}
- Max t_{pd} of 3.7 ns at 3.3 V
- Low Power Consumption, 10- μ A Max I_{CC}
- ± 24 -mA Output Drive at 3.3 V
- I_{off} Supports Live Insertion, Partial-Power-Down Mode, and Back-Drive Protection
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

2 Applications

- Cable Modem Termination System
- High-Speed Data Acquisition and Generation
- Military: Radar and Sonar
- Motor Control: High-Voltage
- Power Line Communication Modem
- SSD: Internal or External
- Video Broadcasting and Infrastructure: Scalable Platform
- Video Broadcasting: IP-Based Multi-Format Transcoder
- Video Communications System

4 Simplified Schematic



3 Description

This bus buffer gate is designed for 1.65-V to 5.5-V V_{CC} operation.

The SN74LVC1G125 device is a single line driver with a 3-state output. The output is disabled when the output-enable (OE) input is high.

The CMOS device has high output drive while maintaining low static power dissipation over a broad V_{CC} operating range.

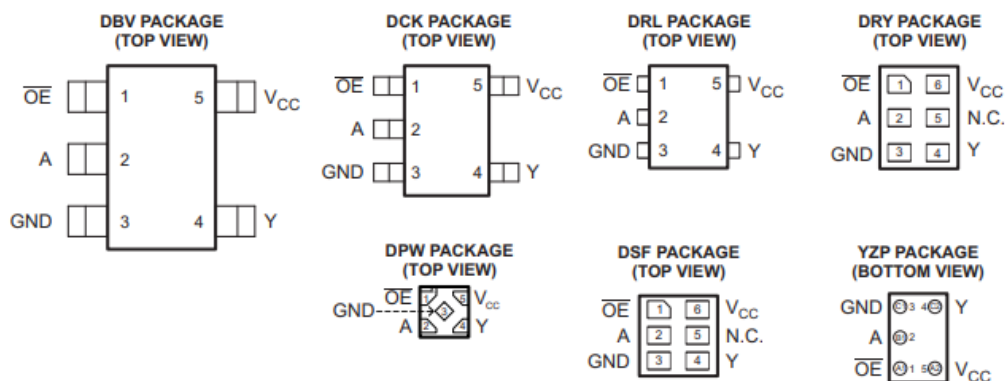
The SN74LVC1G125 device is available in a variety of packages including the ultra-small DPW package with a body size of 0.8 mm \times 0.8 mm.

Device Information⁽¹⁾

DEVICE NAME	PACKAGE	BODY SIZE (NOM)
SN74LVC1G125	SOT-23 (5)	2.90 mm \times 1.60 mm
	SC70 (5)	2.00 mm \times 1.25 mm
	SON (6)	1.45 mm \times 1.00 mm
	DSBGA (5)	1.40 mm \times 0.90 mm
	X2SON (4)	0.80 mm \times 0.80 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Pin Configuration and Functions



N.C. – No internal connection

See mechanical drawings for dimensions.

Pin Functions

NAME	PIN				DESCRIPTION
	DRL, DCK, DBV	DRY, DSF	DPW	YZP	
OE	1	1	1	A1	Input
A	2	2	2	B1	Input
GND	3	3	3	C1	Ground
Y	4	4	4	C2	Output
V_{CC}	5	6	5	A2	Power pin
NC	–	5	–	–	Not connected

Absolute Maximum Ratings⁽¹⁾

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
V _{CC}	Supply voltage range	-0.5	6.5	V
V _I	Input voltage range ⁽²⁾	-0.5	6.5	V
V _O	Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾	-0.5	6.5	V
V _O	Voltage range applied to any output in the high or low state ⁽²⁾⁽³⁾	-0.5	V _{CC} + 0.5	V
I _{IK}	Input clamp current	V _I < 0	-50	mA
I _{OK}	Output clamp current	V _O < 0	-50	mA
I _O	Continuous output current		±50	mA
	Continuous current through V _{CC} or GND		±100	mA

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value of V_{CC} is provided in the *Recommended Operating* table.

Handling Ratings

		MIN	MAX	UNIT	
T _{stg}	Storage temperature range	-65	150	°C	
V _(ESD)	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins ⁽¹⁾	0	2000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins ⁽²⁾	0	1000	

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Recommended Operating Conditions⁽¹⁾

		MIN	MAX	UNIT	
V _{CC}	Supply voltage	Operating	1.65	5.5	V
		Data retention only	1.5		
V _{IH}	High-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V	1.7		
		V _{CC} = 3 V to 3.6 V	2		
		V _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}		
V _{IL}	Low-level input voltage	V _{CC} = 1.65 V to 1.95 V		0.35 × V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V		0.7	
		V _{CC} = 3 V to 3.6 V		0.8	
		V _{CC} = 4.5 V to 5.5 V		0.3 × V _{CC}	
V _I	Input voltage	0	5.5	V	
V _O	Output voltage	0	V _{CC}	V	
I _{OH}	High-level output current	V _{CC} = 1.65 V		-4	mA
		V _{CC} = 2.3 V		-8	
		V _{CC} = 3 V		-16	
		V _{CC} = 4.5 V		-24	
I _{OL}	Low-level output current	V _{CC} = 1.65 V		4	mA
		V _{CC} = 2.3 V		8	
		V _{CC} = 3 V		16	
		V _{CC} = 4.5 V		24	
Δt/Δv	Input transition rise or fall rate	V _{CC} = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V		20	ns/V
		V _{CC} = 3.3 V ± 0.3 V		10	
		V _{CC} = 5 V ± 0.5 V		5	
T _A	Operating free-air temperature	-40	125	°C	

- (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

Thermal Information

THERMAL METRIC ⁽¹⁾		SN74LVC1G125						UNIT
		DBV	DCK	DRL	DRY	YZP	DPW	
		5 PINS	5 PINS	5 PINS	6 PINS	5 PINS	4 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	229	278	243	439	130	340	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	164	93	78	277	54	215	
$R_{\theta JB}$	Junction-to-board thermal resistance	62	65	78	271	51	294	
Ψ_{JT}	Junction-to-top characterization parameter	44	2	10	84	1	41	
Ψ_{JB}	Junction-to-board characterization parameter	62	64	77	271	50	294	
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	–	–	–	–	–	250	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, SPRA953.

Electrical Characteristics

over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V_{CC}	–40 C to 85 °C		–40 C to 125 °C		UNIT
			MIN	TYP ⁽¹⁾ MAX	MIN	TYP ⁽¹⁾ MAX	
V_{OH}	$I_{OH} = -100 \mu A$	1.65 V to 5.5 V	$V_{CC} - 0.1$		$V_{CC} - 0.1$		V
	$I_{OH} = -4 \text{ mA}$	1.65 V	1.2		1.2		
	$I_{OH} = -8 \text{ mA}$	2.3 V	1.9		1.9		
	$I_{OH} = -16 \text{ mA}$	3 V	2.4		2.4		
	$I_{OH} = -24 \text{ mA}$		2.3		2.3		
	$I_{OH} = -32 \text{ mA}$	4.5 V	3.8		3.8		
V_{OL}	$I_{OL} = 100 \mu A$	1.65 V to 5.5 V	0.1		0.1		V
	$I_{OL} = 4 \text{ mA}$	1.65 V	0.45		0.45		
	$I_{OL} = 8 \text{ mA}$	2.3 V	0.3		0.3		
	$I_{OL} = 16 \text{ mA}$	3 V	0.4		0.4		
	$I_{OL} = 24 \text{ mA}$		0.55		0.55		
	$I_{OL} = 32 \text{ mA}$	4.5 V	0.55		0.55		
I_i	A or \overline{OE} inputs	$V_i = 5.5 \text{ V}$ or GND	0 to 5.5 V		± 5	± 5	μA
I_{off}		V_i or $V_o = 5.5 \text{ V}$	0		± 10	± 10	μA
I_{OZ}		$V_o = 0$ to 5.5 V	3.6 V		10	10	μA
I_{CC}		$V_i = 5.5 \text{ V}$ or GND, $I_o = 0$	1.65 V to 5.5 V		10	10	μA
ΔI_{CC}		One input at $V_{CC} - 0.6 \text{ V}$, Other inputs at V_{CC} or GND	3 V to 5.5 V		500	500	μA
C_i		$V_i = V_{CC}$ or GND	3.3 V		4	4	pF

(1) All typical values are at $V_{CC} = 3.3 \text{ V}$, $T_A = 25^\circ\text{C}$.

Switching Characteristics, $C_L = 15 \text{ pF}$

over recommended operating free-air temperature range of -40°C to 85°C , $C_L = 15 \text{ pF}$ (unless otherwise noted)
(see Figure 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$		$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$		$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	1.9	6.9	0.7	4.6	0.6	3.7	0.5	3.4	ns

Switching Characteristics, -40°C to 85°C

over recommended operating free-air temperature range -40°C to 85°C , $C_L = 30 \text{ pF}$ or 50 pF (unless otherwise noted)
(see Figure 4)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$		$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$		$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	2.8	9	1.2	5.5	1	4.5	1	4	ns
t_{en}	\overline{OE}	Y	3.3	10.1	1.5	6.6	1	5.3	1	5	ns
t_{dis}	\overline{OE}	Y	1.3	9.2	1	5	1	5	1	4.2	ns

Switching Characteristics, -40°C to 125°C

over recommended operating free-air temperature range -40°C to 125°C, $C_L = 30$ pF or 50 pF (unless otherwise noted) (see Figure 4)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CC} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	2.8	9.3	1.2	5.8	1	4.7	1	4.2	ns
t_{en}	\overline{OE}	Y	3.3	10.4	1.5	6.9	1	5.6	1	5.2	ns
t_{dis}	\overline{OE}	Y	1.3	9.3	1	5.2	1	5.2	1	4.4	ns

Operating Characteristics

$T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	$V_{CC} = 1.8\text{ V}$	$V_{CC} = 2.5\text{ V}$	$V_{CC} = 3.3\text{ V}$	$V_{CC} = 5\text{ V}$	UNIT
			TYP	TYP	TYP	TYP	
C_{pd}	Power dissipation capacitance	Outputs enabled	18	18	19	21	pF
		Outputs disabled	2	2	2	4	

Typical Characteristics

