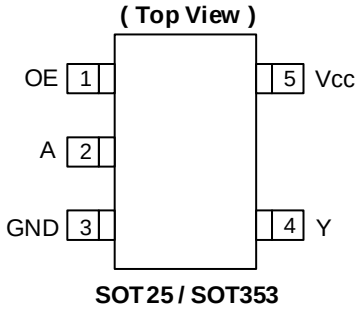
SINGLE BUFFER GATE WITH 3-STATE OUTPUT

Description

The 74LVC1G126Q is an automotive-compliant, single, non-inverting buffer/bus driver with a 3-state output. The output enters a high-impedance state when a LOW level is applied to the output enable (OE) pin. The device is designed for operation with a power supply range of 1.65V to 5.5V. The inputs are tolerant to 5.5V, allowing this device to be used in a mixed-voltage environment. The device is fully specified for partial power down applications using I_{OFF}. The I_{OFF} circuitry disables the output preventing damaging current backflow when the device is powered down.

Pin Assignments



SOT25 / SOT353

Features

- Grade 1 Ambient Temperature Operation: -40°C to +125°C
- Wide Supply Voltage Range from 1.65V to 5.5V
- ±24mA Output Drive at 3.3V
- CMOS Low Power Consumption
- I_{OFF} Supports Partial-Power-Down Mode Operation
- Inputs Accept up to 5.5V
- ESD Protection Tested per AEC-Q100
  - Exceeds 2000V Human Body Model (AEC-Q100-002)
  - Exceeds 1000V Charged Device Model (AEC-Q100-011)
- Latch-Up Exceeds 100mA (AEC-Q100-004)
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The 74LVC1G126Q is suitable for automotive applications requiring specific change control; this part is AEC-Q100 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**
  https://www.diodes.com/quality/product-definitions/

Applications

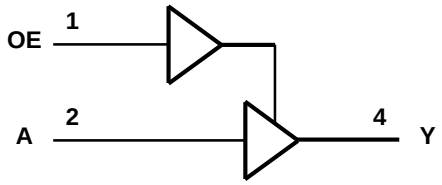
- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide Array of Products such as:
  - Automotive Applications within Grade 1 Temperature Range
  - Industrial Computing/Controls/Automation
  - High Reliability Networking/Communications
  - Industrial/Agricultural Equipment

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Descriptions

Pin Name	Description
OE	Output Enable Active HIGH
A	Data Input
GND	Ground
Y	Data Output
V_{CC}	Supply Voltage

Logic Diagram



Function Table

Inputs		Output
OE	**A**	**Y**
H	H	H
H	L	L
L	X	Z

Absolute Maximum Ratings (Notes 4 & 5)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
V_{CC}	Supply Voltage Range	-0.5 to 6.5	V
V_I	Input Voltage Range	-0.5 to 6.5	V
V_O	Voltage Applied to Output in High Impedance or I_{OFF} State	-0.5 to 6.5	V
V_O	Voltage Applied to Output in High or Low State	-0.5 to V_{CC} +0.5	V
I_{IK}	Input Clamp Current $V_I < 0$	-50	mA
I_{OK}	Output Clamp Current	-50	mA
I_O	Continuous Output Current	±50	mA
I_{CC}, I_{GN}	Continuous Current Through V_{CC} or GND	±100	mA
T_J	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature	-65 to +150	°C

Notes:
4. Stresses beyond the absolute maximum can result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.
5. Forcing the maximum allowed voltage could cause a condition exceeding the maximum current or conversely forcing the maximum current could cause a condition exceeding the maximum voltage. The ratings of both current and voltage must be maintained within the controlled range.

Recommended Operating Conditions (Note 6)

Symbol	Parameter		Min	Max	Unit
V_{CC}	Operating Voltage	Operating	1.65	5.5	V
		Data Retention Only	1.5	—	V
V_{IH}	High-Level Input Voltage	V_{CC} = 1.65V to 1.95V	0.65 × V_{CC}	—	V
		V_{CC} = 2.3V to 2.7V	1.7	—	
		V_{CC} = 3V to 3.6V	2	—	
		V_{CC} = 4.5V to 5.5V	0.7 × V_{CC}	—	
V_{IL}	Low-Level Input Voltage	V_{CC} = 1.65V to 1.95V	—	0.35 × V_{CC}	V
		V_{CC} = 2.3V to 2.7V	—	0.7	
		V_{CC} = 3V to 3.6V	—	0.8	
		V_{CC} = 4.5V to 5.5V	—	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} = 1.65V	—	-4	mA
		V_{CC} = 2.3V	—	-8	
		V_{CC} = 2.7V	—	-12	
		V_{CC} = 3V	—	-16	
			—	-24	
		V_{CC} = 4.5V	—	-32	
I_{OL}	Low-Level Output Current	V_{CC} = 1.65V	—	4	mA
		V_{CC} = 2.3V	—	8	
		V_{CC} = 2.7V	—	12	
		V_{CC} = 3V	—	16	
			—	24	
		V_{CC} = 4.5V	—	32	
Δt/ΔV	Input Transition Rise or Fall Rate	V_{CC} = 1.8V ± 0.15V, 2.5V ± 0.2V	—	20	ns/V
		V_{CC} = 3.3V ± 0.3V	—	10	
		V_{CC} = 5V ± 0.5V	—	5	
T_A	Operating Free-Air Temperature	—	-40	+125	°C

Note: 6. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (All typical values are at V_{CC} = 3.3V, T_A = +25°C)

Symbol	Parameter	Test Conditions		Vcc	-40°C to +125°C			Unit
					Min	Typ	Max	
V_{OH}	High Level Output Voltage	$V_I = V_{IH}$ or V_{IL}	I_{OH} = -100µA	1.65V to 5.5V	V_{CC} – 0.1	—	—	V
			I_{OH} = -4mA	1.65V	0.95	—	—	
			I_{OH} = -8mA	2.3V	1.7	—	—	
			I_{OH} = -12mA	2.7V	1.9	—	—	
			I_{OH} = -24mA	3V	2.0	—	—	
			I_{OH} = -32mA	4.5V	3.4	—	—	
V_{OL}	Low Level Output Voltage	$V_I = V_{IH}$ or V_{IL}	I_{OL} = 100µA	1.65V to 5.5V	—	—	0.10	V
			I_{OL} = 4mA	1.65V	—	—	0.70	
			I_{OL} = 8mA	2.3V	—	—	0.45	
			I_{OL} = 12mA	2.7V	—	—	0.60	
			I_{OL} = 24mA	3V	—	—	0.80	
			I_{OL} = 32mA	4.5V	—	—	0.80	
I_I	Input Current	V_I = 5.5V or GND		0 to 5.5V	—	±0.1	±1	µA
I_{OFF}	Power Down Leakage Current	V_I or V_O = 5.5V		0V	—	—	±2	µA
I_{CC}	Supply Current	V_I = 5.5V or GND I_O = 0		5.5V	—	0.1	4	µA
ΔI_{CC}	Additional Supply Current	One input at V_{CC} – 0.6V Other inputs at V_{CC} or GND		3V to 5.5V	—	—	500	µA
C_I	Input Capacitance	V_I = GND to V_{CC}		3.3V	—	5.0	—	pF

Package Characteristics

Symbol	Parameter	Package	Test Conditions	Min	Typ	Max	Unit
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOT25	Note 7	—	184	—	°C/W
		SOT353		—	385	—	
θ_{JC}	Thermal Resistance Junction-to-Case	SOT25	Note 7	—	62	—	°C/W
		SOT353		—	164	—	

Note: 7. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Switching Characteristics

Figure 1 Typical Values at T_A = +25°C and nominal voltages 1.8V, 2.5V, 2.7V, 3.3V, and 5.0V.

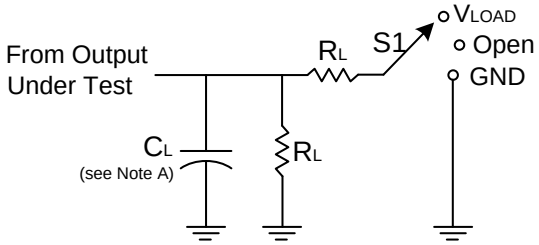
Parameter	From Input	To Output	V_{CC}	T_A = -40°C to +125°C			Unit
				Min	Typ	Max	
t_{PD}	A	Y	1.8V ± 0.15V	1.0	3.0	10.5	ns
			2.5V ± 0.2V	0.5	2.1	7.0	
			2.7V	0.5	2.3	7.0	
			3.3V ± 0.3V	0.5	2.0	6.0	
			5.0V ± 0.5V	0.5	1.7	5.5	
t_{EN}	OE	Y	1.8 V ± 0.15V	1.0	3.2	12.0	ns
			2.5V ± 0.2V	0.5	2.2	8.5	
			2.7V	0.5	2.4	8.5	
			3.3V ± 0.3V	0.5	2.1	7.0	
			5.0V ± 0.5V	0.5	1.6	6.5	
t_{DIS}	OE	Y	1.8V ± 0.15V	1.0	4.3	12.0	ns
			2.5V ± 0.2V	0.5	2.7	7.0	
			2.7V	0.5	3.4	7.0	
			3.3V ± 0.3V	0.5	3.0	7.0	
			5.0V ± 0.5V	0.5	2.2	5.5	

Operating Characteristics

T_A = +25°C

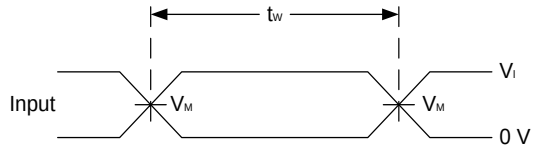
Parameter			Test Conditions	V_{CC} = 1.8V	V_{CC} = 2.5V	V_{CC} = 3.3V	V_{CC} = 5V	Unit
				Typ	Typ	Typ	Typ	
C_{PD}	Power Dissipation Capacitance	Outputs Enabled	f = 10MHz	19	19	19	21	pF
		Outputs Disabled		2	2	3	4	

Parameter Measurement Information

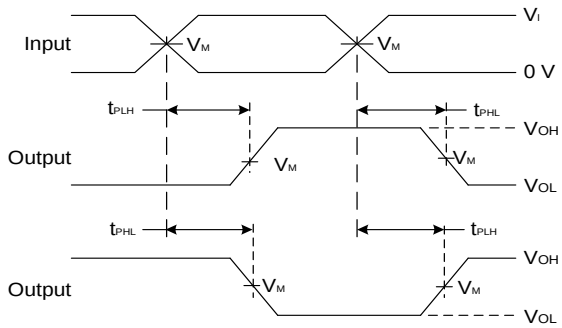


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

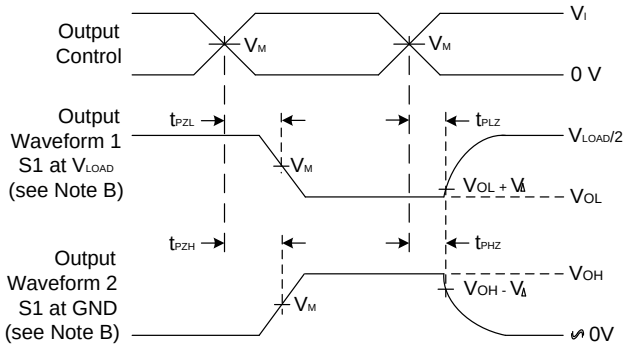
V_{CC}	Inputs		V_M	V_{LOAD}	C_L	R_L	$V\Delta$
	V_I	t_R/t_F					
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	2 × V_{CC}	30pF	1kΩ	0.15V
2.5V±0.2V	V_{CC}	≤2ns	$V_{CC}/2$	2 × V_{CC}	30pF	500Ω	0.15V
2.7V	2.7V	≤2.5ns	1.5V	6V	50pF	500Ω	0.3V
3.3V±0.3V	3V	≤2.5ns	1.5V	6V	50pF	500Ω	0.3V
5V±0.5V	V_{CC}	≤2.5ns	$V_{CC}/2$	2 × V_{CC}	50pF	500Ω	0.3V



Voltage Waveform Pulse Duration



Voltage Waveform Propagation Delay Times Inverting and Non Inverting Outputs

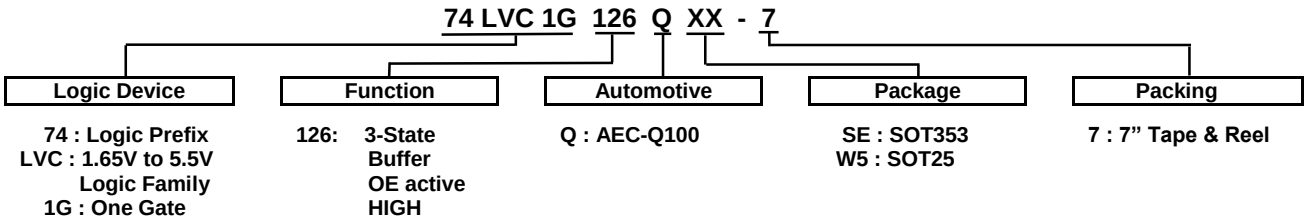


Voltage Waveform Enable and Disable Times Low and High Level Enabling

Figure 1. Load Circuit and Voltage Waveforms

Notes:
A. Includes test lead and test apparatus capacitance.
B. All pulses are supplied at pulse repetition rate ≤ 10MHz.
C. Inputs are measured separately one transition per measurement.
D. t_{PLZ} and t_{PHZ} are the same as t_{DIS}.
E. t_{PZL} and t_{PZH} are the same as t_{EN}.
F. t_{PLH} and t_{PHL} are the same as t_{PD}.

Ordering Information (Note 8)

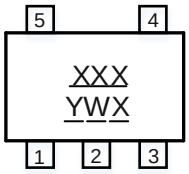


Part Number	Package Code	Package (Notes 9 & 10)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74LVC1G126QSE-7	SE	SOT353	2.15mm × 2.1mm × 1.1mm 0.65mm lead pitch	3000/Tape & Reel	-7
74LVC1G126QW5-7	W5	SOT25	3.0mm × 2.8mm × 1.2mm 0.95mm lead pitch	3000/Tape & Reel	-7

Notes: 8. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.
9. Pad layout as shown in Diodes Incorporated's package outline PDFs, which can be found on our website at http://www.diodes.com/package-outlines.html.
10. The taping orientation is located on our website at https://www.diodes.com/assets/Packaging-Support-Docs/ap02007.pdf.

Marking Information

(Top View)



SOT25 / SOT353

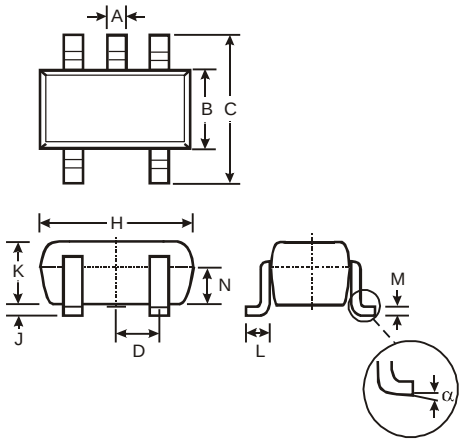
XXX : Identification Code
Y : Year 0~9
W : Week: A~Z 1~26 week
a~z 27~52 week
z represents week 52 and 53
X : A~Z : Internal Code

Part Number	Package	Identification Code
74LVC1G126QW5-7	SOT25	UZQ
74LVC1G126QSE-7	SOT353	UZQ

Package Outline Dimensions

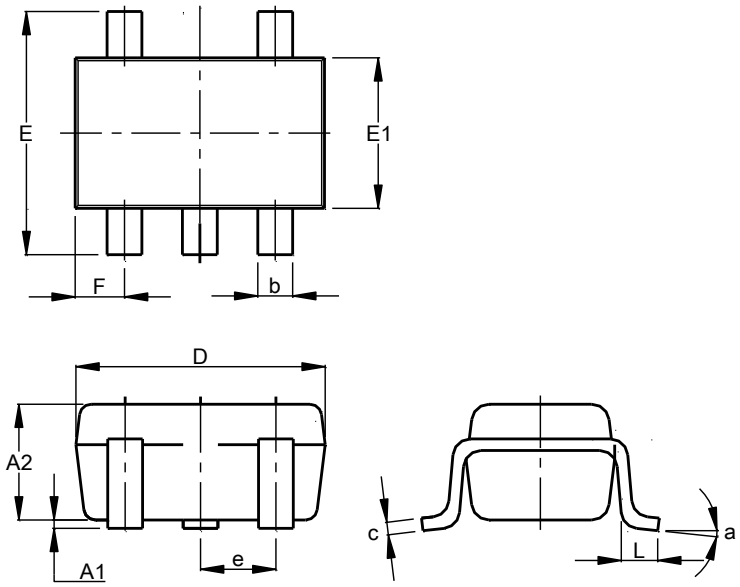
Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: SOT25



SOT25			
Dim	**Min**	**Max**	**Typ**
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

(2) Package Type: SOT353

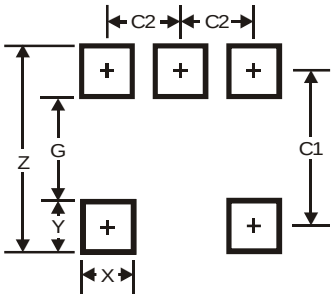


SOT353			
Dim	**Min**	**Max**	**Typ**
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

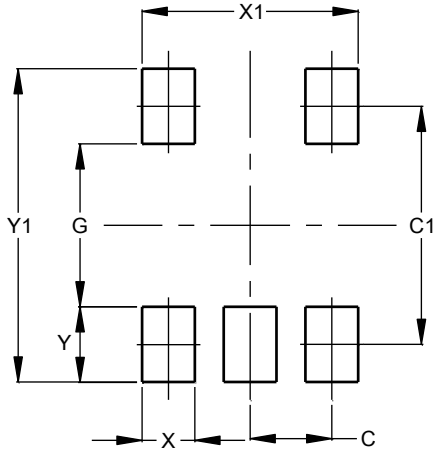
Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: SOT25



Dimensions	Value
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

(2) Package Type: SOT353



Dimensions	Value (in mm)
C	0.650
C1	1.900
G	1.300
X	0.420
X1	1.720
Y	0.600
Y1	2.500

Mechanical Data

SOT25

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.0158 grams (Approximate)

SOT353

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.0064 grams (Approximate)

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

www.diodes.com