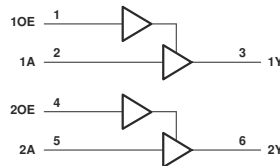


# SN74LVC126A-Q1 Automotive Quadruple Bus Buffer Gate With 3-State Outputs

## 1 Features

- Qualified for automotive applications
- Operates from 1.65V to 3.6V
- Inputs accept voltages to 5.5V
- Max  $t_{pd}$  of 4.7ns at 3.3V
- Typical  $V_{OLP}$  (output ground bounce)  $<0.8V$  at  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$
- Typical  $V_{OHV}$  (output  $V_{OH}$  undershoot)  $>2V$  at  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$
- Latch-up performance exceeds 250mA per JESD 17
- ESD protection exceeds JESD 22



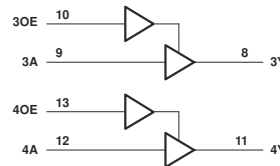
Logic Diagram (Positive Logic)

## 2 Description

This quadruple bus buffer gate is designed for 1.65V to 3.6V  $V_{CC}$  operation.

PART NUMBER	PACKAGE <sup>(1)</sup>	PACKAGE SIZE <sup>(2)</sup>	BODY SIZE <sup>(3)</sup>
SN74LVC126A-Q1	D (SOIC, 14)	8.65mm × 6mm	8.65mm × 3.9mm
	BQA (WQFN, 14)	3mm × 2.5mm	3mm × 2.5mm
	PW (TSSOP, 14)	5mm × 6.4mm	5mm × 4.4mm

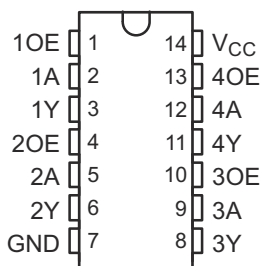
- (1) For more information, see [Section 10](#).
- (2) The package size (length × width) is a nominal value and includes pins, where applicable.
- (3) The body size (length × width) is a nominal value and does not include pins.



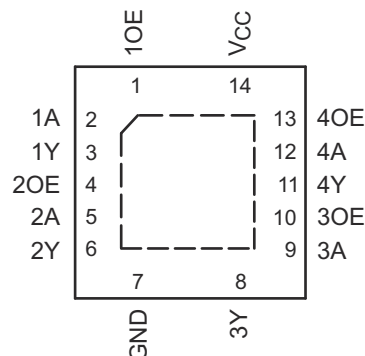
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### 3 Pin Configuration and Functions



**Figure 3-1. SN74LVC126A-Q1 D or PW Package;  
14-Pin SOIC or TSSOP (Top View)**



**Figure 3-2. SN74LVC126A-Q1 BQA Package; 14-Pin  
WQFN (Top View)**

**Table 3-1. Pin Functions**

PIN		I/O <sup>(1)</sup>	DESCRIPTION
NO.	NAME		
1	1OE	I	Output enable 1
2	1A	I	Gate 1 input
3	1Y	O	Gate 1 output
4	2OE	I	Output enable 2
5	2A	I	Gate 2 input
6	2Y	O	Gate 2 output
7	GND	—	Ground pin
8	3Y	O	Gate 3 output
9	3A	I	Gate 3 input
10	3OE	I	Output enable 3
11	4Y	O	Gate 4 output
12	4A	I	Gate 4 input
13	4OE	I	Output Enable 4
14	V <sub>CC</sub>	—	Power pin
Thermal pad		—	Connect the GND pin to the exposed thermal pad for correct operation. Connect the thermal pad to any internal PCB ground plane using multiple vias for good thermal performance.

(1) I = input, O = output, P = power, FB = feedback, GND = ground, N/A = not applicable

## 4 Specifications

### 4.1 Absolute Maximum Ratings

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 <sup>(1)</sup>	−0.5	6.5	V
$V_O$	Output voltage range <sup>(1) (2)</sup>	−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
$T_{stg}$	Storage temperature range	−65	150	°C

(1) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

(2) The value of  $V_{CC}$  is provided in the recommended operating conditions table.

### 4.2 ESD Ratings

	VALUE	UNIT
$V_{(ESD)}$ Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup>	±2000 V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. This rating was tested on the D (SOIC) package.

### 4.3 Recommended Operating Conditions

over recommended operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	Operating	1.65	3.6
		Data retention only	1.5	V
$V_{IH}$	High-level input voltage	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	$0.65 \times V_{CC}$	V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7	
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	2	
$V_{IL}$	Low-level input voltage	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	$0.35 \times V_{CC}$	V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0.7	
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	0.8	
$V_I$	Input voltage	0	5.5	V
$V_O$	Output voltage	0	$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 1.65\text{ V}$	−4	mA
		$V_{CC} = 2.3\text{ V}$	−8	
		$V_{CC} = 2.7\text{ V}$	−12	
		$V_{CC} = 3\text{ V}$	−24	
$I_{OL}$	Low-level output current	$V_{CC} = 1.65\text{ V}$	4	mA
		$V_{CC} = 2.3\text{ V}$	8	
		$V_{CC} = 2.7\text{ V}$	12	
		$V_{CC} = 3\text{ V}$	24	
$\Delta t/\Delta v$	Input transition rise or fall rate		10	ns/V
$T_A$	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.

## 4.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>	SN74LVC126A-Q1			UNIT
	BQA (WQFN)	D (SOIC)	PW (TSSOP)	
	14 PINS	14 PINS	14 PINS	
$R_{\theta JA}$ Junction-to-ambient thermal resistance	102.3	86	150.8	°C/W

(1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

## 4.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	MIN	TYP <sup>(1)</sup>	MAX	UNIT
V <sub>OH</sub>	I <sub>OH</sub> = −100μA	1.65V to 3.6V	V <sub>CC</sub> − 0.2		V	
	I <sub>OH</sub> = −4mA	1.65V	1.1			
	I <sub>OH</sub> = −8mA	2.3V	1.5			
	I <sub>OH</sub> = −12mA	2.7V	2.1			
		3V	2.35			
	I <sub>OH</sub> = −24mA	3V	2.1			
V <sub>OL</sub>	I <sub>OL</sub> = 100μA	1.65V to 3.6V	0.2		V	
	I <sub>OL</sub> = 4mA	1.65V	0.45			
	I <sub>OL</sub> = 8mA	2.3V	0.7			
	I <sub>OL</sub> = 12mA	2.7V	0.5			
	I <sub>OL</sub> = 24mA	3V	0.7			
I <sub>I</sub>	V <sub>I</sub> = 5.5V or GND	3.6V	±10		μA	
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	3.6V	±10		μA	
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	3.6V	20		μA	
ΔI <sub>CC</sub>	One input at V <sub>CC</sub> − 0.6 V, Other inputs at V <sub>CC</sub> or GND	2.7V to 3.6V	500		μA	
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3V	4.5		pF	
C <sub>o</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	3.3V	7		pF	

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

## 4.6 Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 2.7V$		$V_{CC} = 3.3V \pm 0.3V$		UNIT
			MIN	MAX	MIN	MAX	
$t_{pd}$	A	Y	1	6.2	1	5.7	ns
$t_{en}$	OE	Y	1	6.3	1	5.7	ns
$t_{dis}$	OE	Y	1	6.7	1	6	ns
$t_{sk(o)}$						1	ns

## 4.7 Operating Characteristics

$T_A = 25^\circ C$

PARAMETER		TEST CONDITIONS	$V_{CC} = 3.3V$	UNIT
			TYP	
$C_{pd}$ Power dissipation capacitance per gate	Outputs enabled	$f = 10MHz$	22	pF
	Outputs disabled		4	

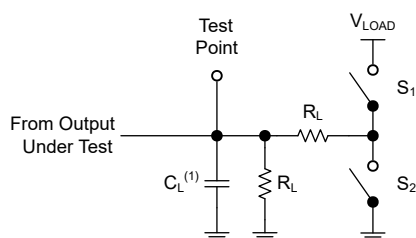
## 5 Parameter Measurement Information

Phase relationships between waveforms were chosen arbitrarily for the examples listed in the following table. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{MHz}$ ,  $Z_O = 50\Omega$ ,  $t_f \leq 2.5\text{ns}$ .

The outputs are measured individually with one input transition per measurement.

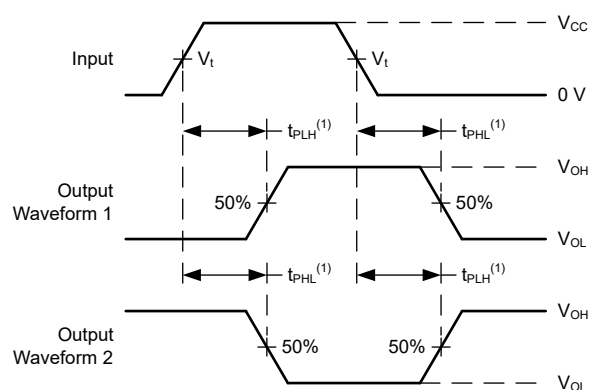
TEST	S1	S2	$R_L$	$C_L$	$\Delta V$	$V_{LOAD}$
$t_{PLH}$ , $t_{PHL}$	OPEN	OPEN	$500\Omega$	$50\text{pF}$	—	—
$t_{PLZ}$ , $t_{PZL}$	CLOSED	OPEN	$500\Omega$	$50\text{pF}$	$0.3\text{V}$	$2 \times V_{CC}$
$t_{PHZ}$ , $t_{PZH}$	OPEN	CLOSED	$500\Omega$	$50\text{pF}$	$0.3\text{V}$	—

$V_{CC}$	$V_t$	$R_L$	$C_L$	$\Delta V$	$V_{LOAD}$
$1.8\text{V} \pm 0.15\text{V}$	$V_{CC}/2$	$1\text{k}\Omega$	$30\text{pF}$	$0.15\text{V}$	$2 \times V_{CC}$
$2.5\text{V} \pm 0.2\text{V}$	$V_{CC}/2$	$500\Omega$	$30\text{pF}$	$0.15\text{V}$	$2 \times V_{CC}$
$2.7\text{V}$	$1.5\text{V}$	$500\Omega$	$50\text{pF}$	$0.3\text{V}$	$6\text{V}$
$3.3\text{V} \pm 0.3\text{V}$	$1.5\text{V}$	$500\Omega$	$50\text{pF}$	$0.3\text{V}$	$6\text{V}$



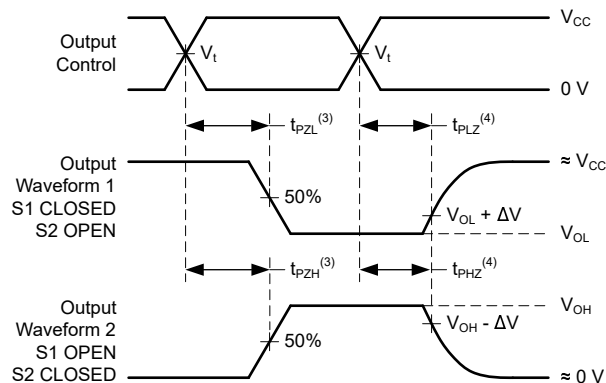
(1)  $C_L$  includes probe and test-fixture capacitance.

**Figure 5-1. Load Circuit for 3-State Outputs**



(1) The greater between  $t_{PLH}$  and  $t_{PHL}$  is the same as  $t_{pd}$ .

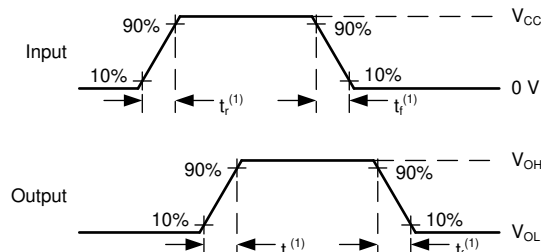
**Figure 5-2. Voltage Waveforms Propagation Delays**



(1) The greater between  $t_{PZL}$  and  $t_{PZH}$  is the same as  $t_{en}$ .

(2) The greater between  $t_{PLZ}$  and  $t_{PHZ}$  is the same as  $t_{dis}$ .

**Figure 5-3. Voltage Waveforms Propagation Delays**



(1) The greater between  $t_r$  and  $t_f$  is the same as  $t_t$ .

**Figure 5-4. Voltage Waveforms, Input and Output Transition Times**

## 6 Detailed Description

### 6.1 Overview

The SN74LVC126A features independent line drivers with 3-state outputs. Each output is disabled when the associated output-enable (OE) input is low.

To ensure the high-impedance state during power up or power down, OE should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of this device as a translator in a mixed 3.3V/5V system environment.

### 6.2 Functional Block Diagram

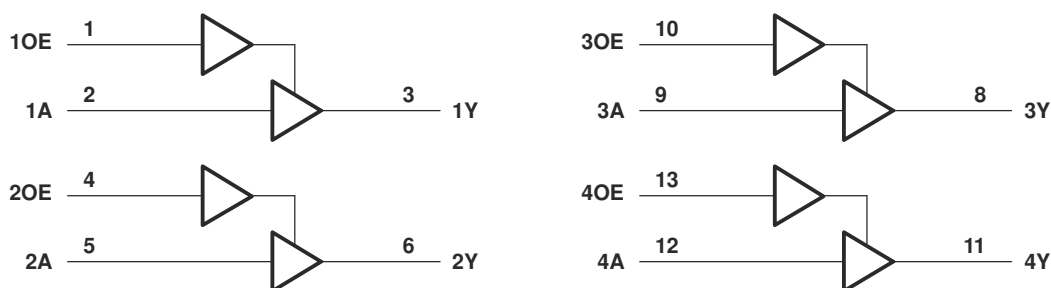


Figure 6-1. Logic Diagram (Positive Logic)

### 6.3 Device Functional Modes

Function Table  
(Each Buffer)

INPUTS		OUTPUT Y
OE	A	
H	H	H
H	L	L
L	X	Z

## 7 Application and Implementation

### Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

### 7.1 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating in the [Recommended Operating Conditions](#).

Each  $V_{CC}$  pin must have a good bypass capacitor to prevent power disturbance. For devices with a single supply, 0.1  $\mu\text{F}$  is recommended; if there are multiple  $V_{CC}$  pins, then 0.01  $\mu\text{F}$  or 0.022  $\mu\text{F}$  is recommended for each power pin. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. A 0.1  $\mu\text{F}$  and a 1  $\mu\text{F}$  are commonly used in parallel. The bypass capacitor must be installed as close to the power pin as possible for best results.

### 7.2 Layout

#### 7.2.1 Layout Guidelines

When using multiple bit logic devices, inputs must never float.

In many cases, functions or parts of functions of digital logic devices are unused, for example, when only two inputs of a triple-input and gate are used, or only 3 of the 4 buffer gates are used. Such input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. [Layout Diagram](#) specifies the rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally they are tied to GND or  $V_{CC}$ , whichever makes more sense or is more convenient. It is generally acceptable to float outputs, unless the part is a transceiver.

#### 7.2.2 Layout Example

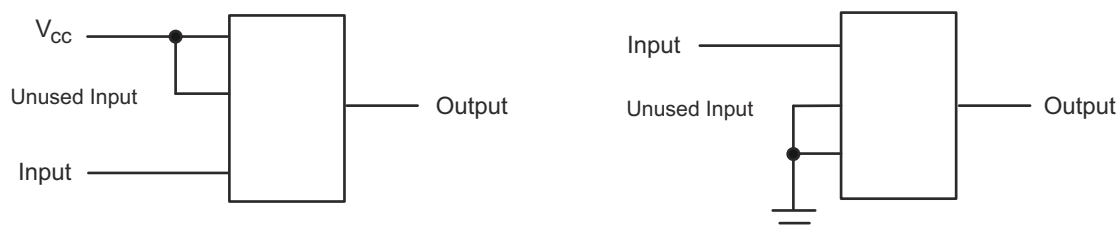


Figure 7-1. Layout Diagram



## 8 Device and Documentation Support

### 8.1 Documentation Support (Analog)

#### 8.1.1 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

**Table 8-1. Related Links**

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN74LVC126A-Q1	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>

### 8.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](https://www.ti.com). Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 8.3 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

### 8.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 8.5 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 8.6 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 9 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision B (April 2008) to Revision C (May 2024)	Page
• Added BQA package to <i>Package Information</i> table, <i>Pin Configuration and Functions</i> section, and <i>Thermal Information</i> table.....	1
• Added <i>Package Information</i> table, <i>Pin Functions</i> table, <i>ESD Ratings</i> table, <i>Thermal Information</i> table, <i>Device Functional Modes</i> , Application and Implementation section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section .....	1
• Deleted references to machine model throughout the data sheet.....	1
• Updated RθJA values: PW = 113 to 150.8, all values in °C/W .....	5

## 10 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

## PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CLVC126AQPWRG4Q1	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC126AQ	<a href="#">Samples</a>
SN74LVC126AQDRG4Q1	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC126AQ	<a href="#">Samples</a>
SN74LVC126AQDRQ1	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC126AQ	<a href="#">Samples</a>

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**OTHER QUALIFIED VERSIONS OF SN74LVC126A-Q1 :**

- Catalog : [SN74LVC126A](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

## TAPE AND REEL INFORMATION



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CLVC126AQPWRG4Q1	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CLVC126AQPWRG4Q1	TSSOP	PW	14	2000	356.0	356.0	35.0

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040047-5/M 06/11

NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AB.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040064-3/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153



PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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