



**THE DATASHEET OF  
VCHW1154LDSE-3C9L4-TR**



# SN74LVC157A-Q1 Automotive Quadruple 2-Line to 1-Line Data Selector/Multiplexer

## 1 Features

- Qualified for automotive applications
- ESD protection exceeds 2000V per MIL-STD-883, method 3015
- Operates from 2V to 3.6V
- Inputs accept voltages to 5.5V
- Max  $t_{pd}$  of 5.4ns 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  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$

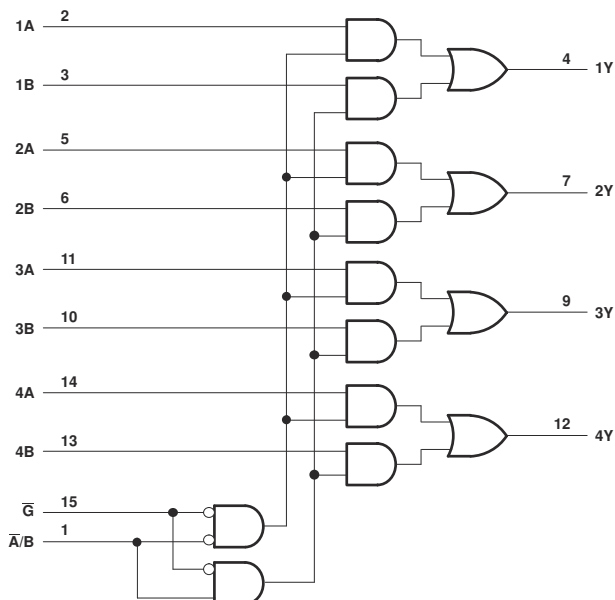
## 2 Description

The SN74LVC157A quadruple 2-line to 1-line data selector/multiplexer is designed for 2.7V to 3.6V  $V_{CC}$  operation.

### Package Information

PART NUMBER	PACKAGE <sup>(1)</sup>	PACKAGE SIZE <sup>(2)</sup>	BODY SIZE <sup>(3)</sup>
SN74LVC157A-Q1	BQB (WQFN, 16)	3.5mm × 2.5mm	3.5mm × 2.5mm
	D (SOIC, 16)	9.90 mm × 6mm	9.90 mm × 3.90 mm
	PW (TSSOP, 16)	5.00 mm × 6.4mm	5.00 mm × 4.40 mm

- (1) For more information, see [Mechanical, Packaging, and Orderable Information](#).
- (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.



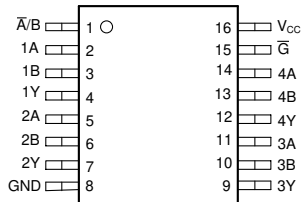
**Logic Diagram (Positive Logic)**



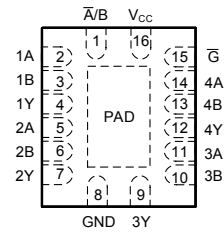
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### 3 Pin Configuration and Functions



**Figure 3-1. SN74LVC157A-Q1 D or PW Package, 16-Pin SOIC or TSSOP (Top View)**



**Figure 3-2. SN74LVC157A-Q1 BQB Package, 16-Pin WQFN (Top View)**

**Table 3-1. Pin Functions**

PIN		TYPE <sup>(1)</sup>	DESCRIPTION
NAME	NO.		
A/B	1	I	Address select
1A	2	I	Channel 1, data input A
1B	3	I	Channel 1, data input B
1Y	4	O	Channel 1, data output
2A	5	I	Channel 2, data input A
2B	6	I	Channel 2, data input B
2Y	7	O	Channel 2, data output
GND	8	G	Ground
3Y	9	O	Channel 3, data output
3B	10	I	Channel 3, data input B
3A	11	I	Channel 3, data input A
4Y	12	O	Channel 4, data output
4B	13	I	Channel 4, data input B
4A	14	I	Channel 4, data input A
G-bar	15	I	Output strobe, active low
V <sub>CC</sub>	16	P	Positive supply
Thermal pad <sup>(2)</sup>		—	The thermal pad can be connected to GND or left floating. Do not connect to any other signal or supply.

(1) Signal Types: I = Input, O = Output, I/O = Input or Output, P = Power, G = Ground.

(2) WBQB package only.

## 4 Specifications

### 4.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range	-0.5	6.5	V
V <sub>I</sub>	Input voltage range <sup>(1)</sup>	-0.5	6.5	V
V <sub>O</sub>	Output voltage range <sup>(1) (2)</sup>	-0.5	V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Input clamp current	V <sub>I</sub> < 0		-50 mA
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0		-50 mA
I <sub>O</sub>	Continuous output current			±50 mA
	Continuous current through V <sub>CC</sub> or GND			±100 mA
T <sub>stg</sub>	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<sub>CC</sub> is provided in the recommended operating conditions table.

### 4.2 ESD Ratings

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

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

### 4.3 Recommended Operating Conditions

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

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	Operating	2	3.6	V
		Data retention only	1.5		
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2.7V to 3.6V	2		V
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2.7V to 3.6V		0.8	V
V <sub>I</sub>	Input voltage		0	5.5	V
V <sub>O</sub>	Output voltage		0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 2.7V		-12	mA
		V <sub>CC</sub> = 3V		-24	
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2.7V		12	mA
		V <sub>CC</sub> = 3V		24	
Δt/Δv	Input transition rise or fall rate			10	ns/V
T <sub>A</sub>	Operating free-air temperature		-40	125	°C

(1) All unused inputs of the device must be held at V<sub>CC</sub> 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>		SN74LVC157A-Q1			UNIT
		BQB (WQFN)	D (SOIC)	PW (TSSOP)	
		16			
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	98.8	73	108	°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	MAX	UNIT
V <sub>OH</sub>		I <sub>OH</sub> = -100μA	2.7V to 3.6V	V <sub>CC</sub> - 0.2		V
		I <sub>OH</sub> = -12mA	2.7V	2.2		
		I <sub>OH</sub> = -24mA	3V	2.4		
V <sub>OL</sub>		I <sub>OL</sub> = 100μA	2.7V to 3.6V	0.2		V
		I <sub>OL</sub> = 12mA	2.7V	0.4		
		I <sub>OL</sub> = 24mA	3V	0.55		
I <sub>I</sub>	All inputs	V <sub>I</sub> = 5.5V or GND	3.6V	±5		μA
I <sub>CC</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	3.6V	10		μA
ΔI <sub>CC</sub>		One input at V <sub>CC</sub> - 0.6V, Other inputs at V <sub>CC</sub> or GND	2.7V to 3.6V	500		μA

## 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 <sub>CC</sub> = 2.7V		V <sub>CC</sub> = 3.3V ± 0.3V		UNIT
			MIN	MAX	MIN	MAX	
t <sub>pd</sub>	A or B	Y	6.2	0.8	5.4	ns	
	$\overline{A/B}$		8.2	0.8	7		
	$\overline{G}$		7.8	0.8	6.5		

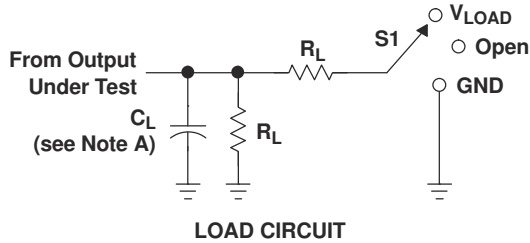
## 4.7 Operating Characteristics

T<sub>A</sub> = 25°C<sup>(1)</sup>

PARAMETER		TEST CONDITIONS	V <sub>CC</sub> = 2.5V	V <sub>CC</sub> = 3.3V	UNIT
			TYP	TYP	
C <sub>pd</sub>	Power dissipation capacitance	f = 10 MHz	15	16	pF

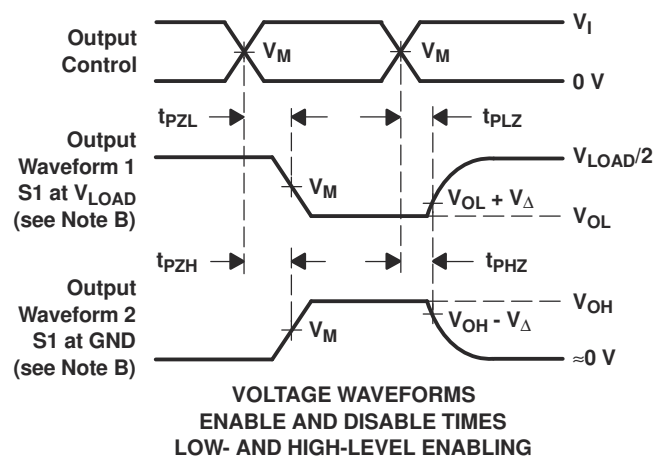
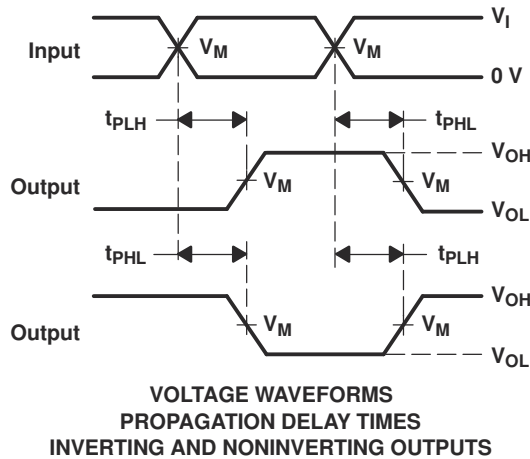
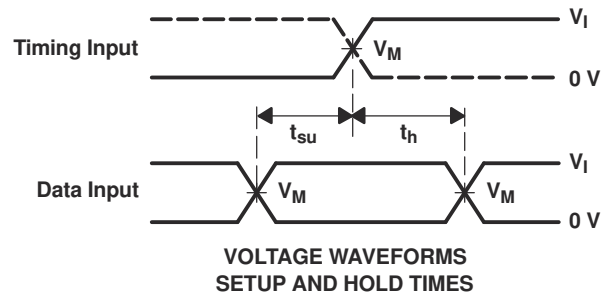
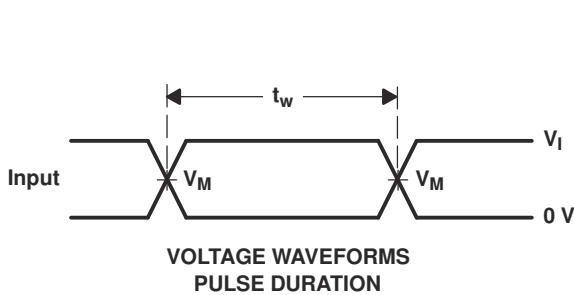
(1) On products compliant to MIL-PRF-38535, this parameter does not apply.

## 5 Parameter Measurement Information



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

$V_{CC}$	INPUTS		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_I$	$t_r/t_f$					
2.7 V	2.7 V	$\leq 2.5$ ns	1.5 V	6 V	50 pF	500 $\Omega$	0.3 V
3.3 V $\pm$ 0.3 V	2.7 V	$\leq 2.5$ ns	1.5 V	6 V	50 pF	500 $\Omega$	0.3 V



- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
  - B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz,  $Z_O = 50 \Omega$ .
  - D. The outputs are measured one at a time, with one transition per measurement.
  - E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - H. All parameters and waveforms are not applicable to all devices.

**Figure 5-1. Load Circuit and Voltage Waveforms**

## 6 Detailed Description

### 6.1 Overview

The device features a common strobe ( $\bar{G}$ ) input. When  $\bar{G}$  is high, all outputs are low. When  $\bar{G}$  is low, a 4-bit word is selected from one of two sources and is routed to the four outputs. The device provides true data.

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

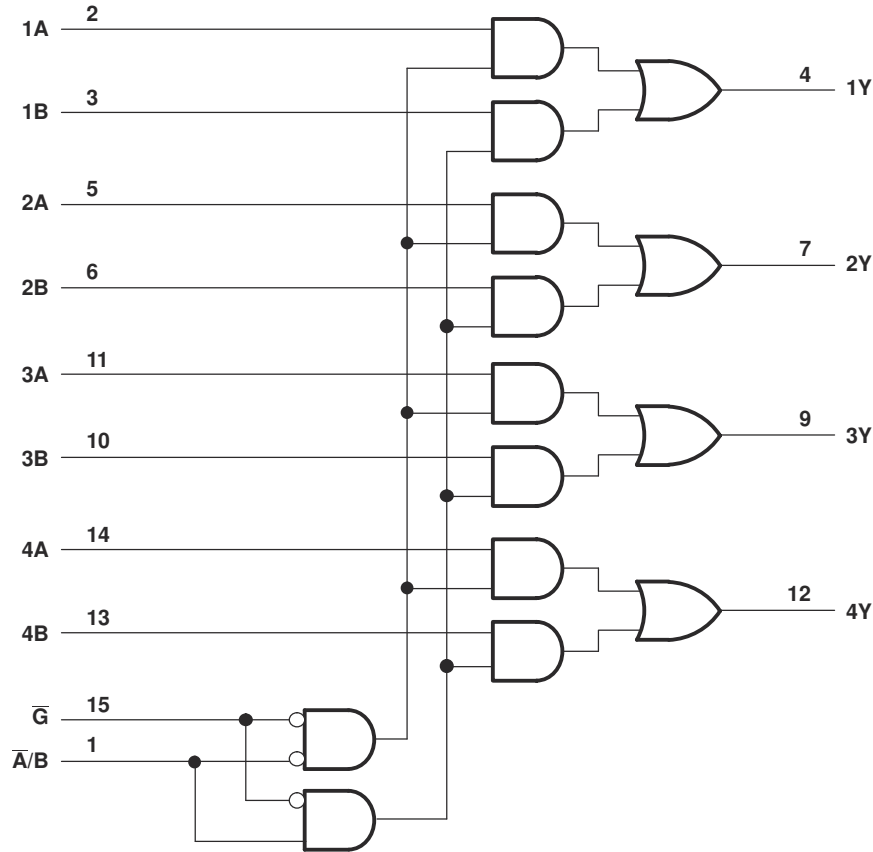


Figure 6-1. Logic Diagram (Positive Logic)

### 6.3 Device Functional Modes

Function Table

INPUTS				OUTPUT Y
$\bar{G}$	A/B	A	B	
H	X	X	X	L
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

## 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, as well as validating and testing their design implementation to confirm system functionality.

### 7.1 Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply voltage rating located in the [Section 4.3](#) table.

Each  $V_{CC}$  pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, 0.1 $\mu$ F is recommended; if there are multiple  $V_{CC}$  pins, then 0.01 $\mu$ F or 0.022  $\mu$ F is recommended for each power pin. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. A 0.1 $\mu$ F and a 1 $\mu$ F are commonly used in parallel. The bypass capacitor should 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 should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when only 3 of the 4-buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. Specified in Layout Diagram are 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 should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or  $V_{CC}$ , whichever makes more sense or is more convenient. It is acceptable to float outputs unless the part is a transceiver. If the transceiver has an output enable pin, it will disable the outputs section of the part when asserted. This will not disable the input section of the I/Os so they also cannot float when disabled.

#### 7.2.2 Layout Example

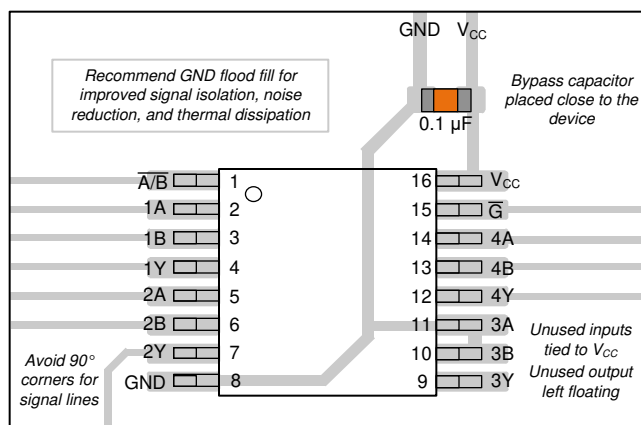


Figure 7-1. Example Layout for the SN74LVC157A-Q1

## 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
SN74LVC157A-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](#). 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.

<b>Changes from Revision C (April 2008) to Revision D (May 2024)</b>	<b>Page</b>
• 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 machine model from <i>Features</i> section.....	1

## 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
CLVC157AQPWRG4Q1	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	L157AQ1	<a href="#">Samples</a>
SN74LVC157AQDRG4Q1	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	L157AQ1	<a href="#">Samples</a>
SN74LVC157AQPWRQ1	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	L157AQ1	<a href="#">Samples</a>
SN74LVC157AWBQBRQ1	ACTIVE	WQFN	BQB	16	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LC157Q	<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.

**OBSELETE:** 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 SN74LVC157A-Q1 :**

- Catalog : [SN74LVC157A](#)
- Enhanced Product : [SN74LVC157A-EP](#)
- Military : [SN54LVC157A](#)

## NOTE: Qualified Version Definitions:

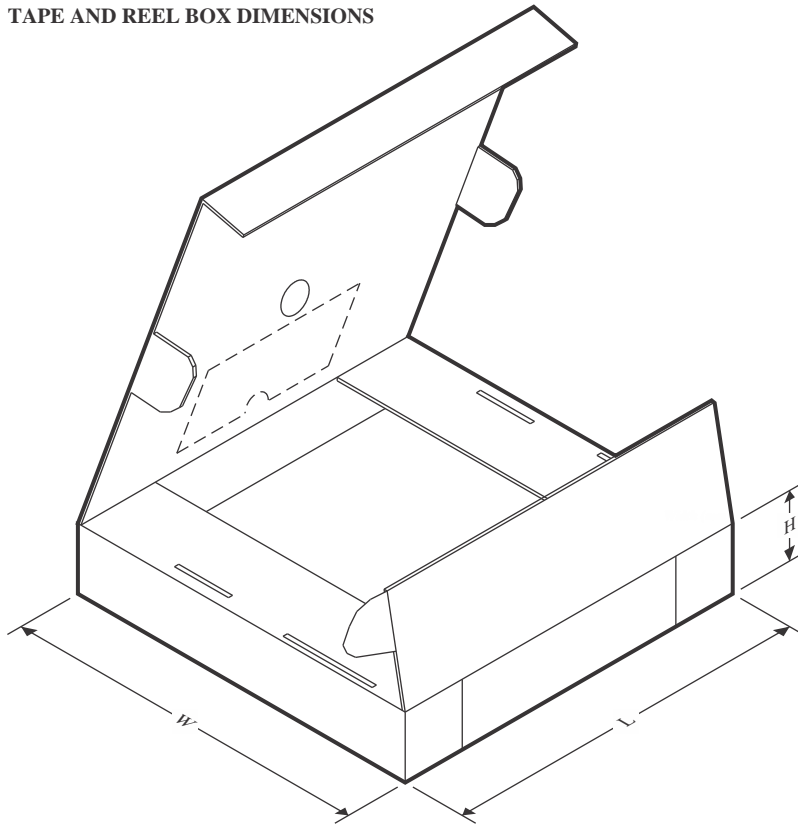
- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications

**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*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
CLVC157AQPWRG4Q1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC157AQPWRQ1	TSSOP	PW	16	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)
CLVC157AQPWRG4Q1	TSSOP	PW	16	2000	356.0	356.0	35.0
SN74LVC157AQPWRQ1	TSSOP	PW	16	2000	356.0	356.0	35.0

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- 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 AC.



# EXAMPLE BOARD LAYOUT

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220204/A 02/2017

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220204/A 02/2017

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

## GENERIC PACKAGE VIEW

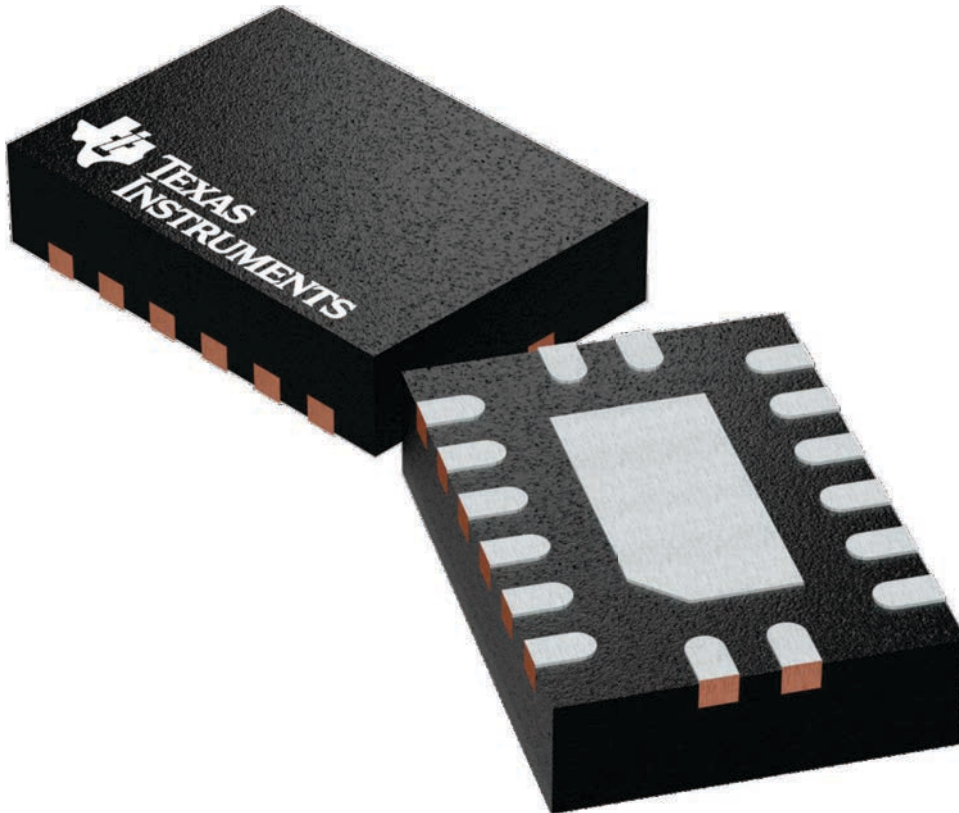
**BQB 16**

**WQFN - 0.8 mm max height**

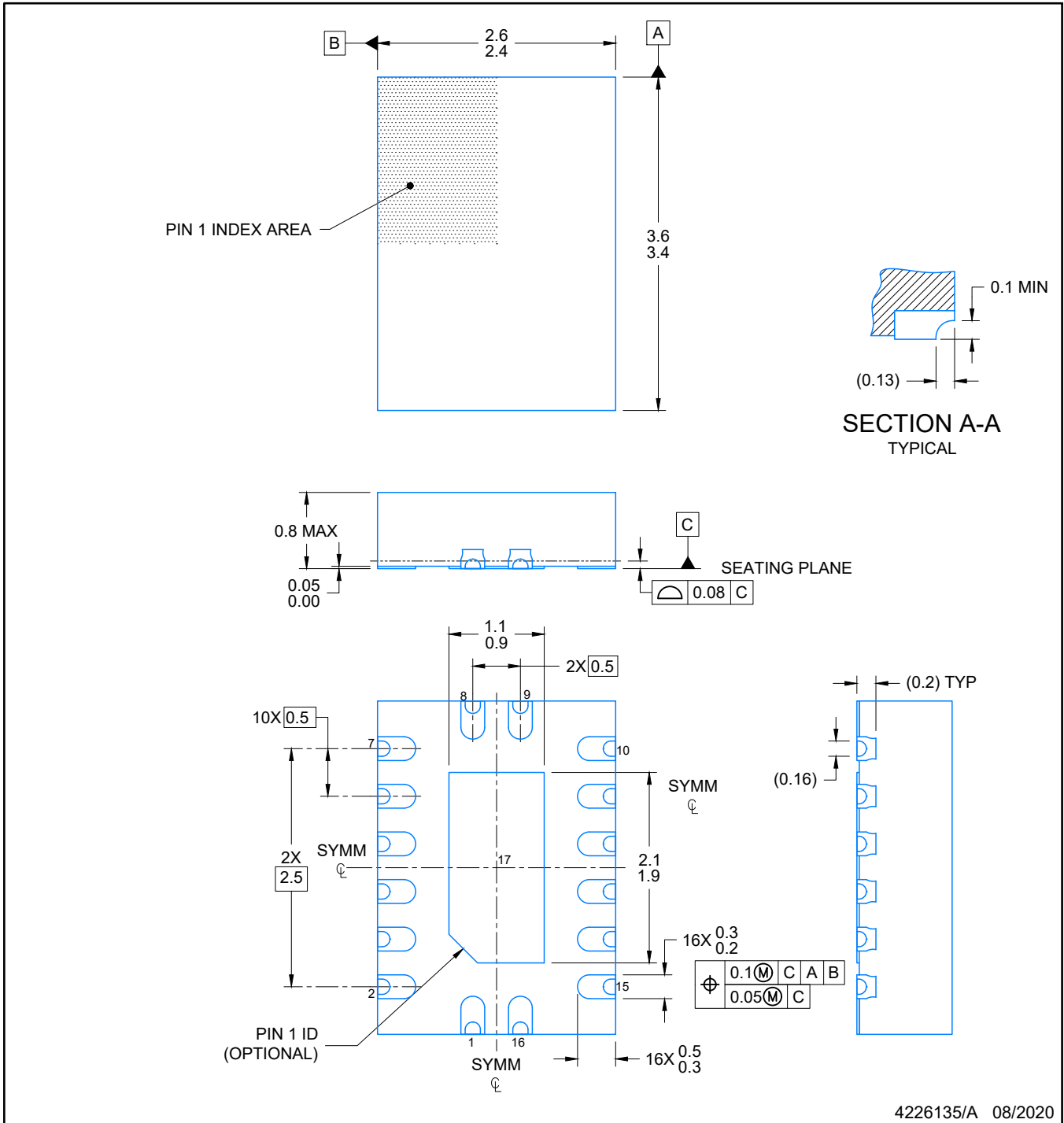
2.5 x 3.5, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



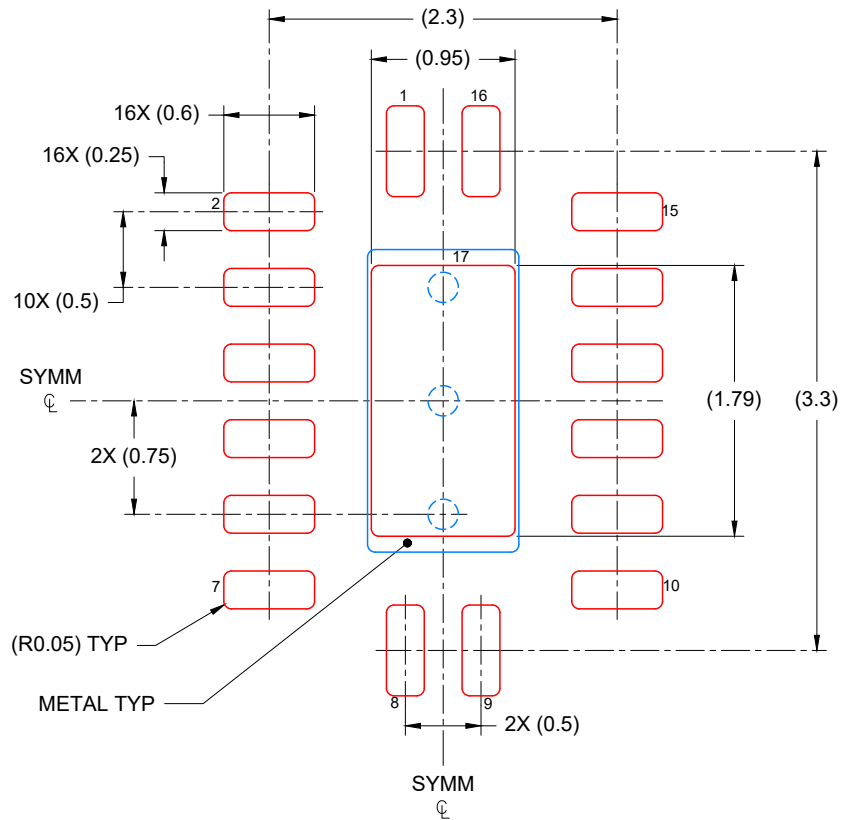
4226161/A



**NOTES:**

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for optimal thermal and mechanical performance.





SOLDER PASTE EXAMPLE  
 BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD  
 85% PRINTED COVERAGE BY AREA  
 SCALE: 20X

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NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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