

SN74LVC1G17-Q1 Single Schmitt-Trigger Buffer

1 Features

- Qualified for Automotive Applications
- Supports 5-V V_{CC} operation
- Inputs accept voltages to 5.5 V
- Max t_{pd} of 8 ns at 3.3 V
- Low power consumption, 20- 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
- ESD protection exceeds JEDEC JS-001
 - 2000-V Human-body model
 - 1000-V Charged-device model

2 Applications

- AV receiver
- Audio dock: portable
- Blu-ray player and home theater
- MP3 player/recorder
- Personal digital assistant (PDA)
- Power: Telecom/server AC/DC supply: single controller: analog and digital
- Solid state drive (SSD): client and enterprise
- TV: LCD/Digital and high-definition (HDTV)
- Tablet: Enterprise
- Video analytics: server
- Wireless headset, keyboard, and mouse

3 Description

This single Schmitt-trigger buffer is designed for 1.65-V to 5.5-V V_{CC} operation.

The SN74LVC1G17-Q1 device contains one buffer and performs the Boolean function $Y = A$.

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

The SN74LVC1G17-Q1 is available in a variety of packages.

Device Information⁽¹⁾

DEVICE NAME	PACKAGE	BODY SIZE (NOM)
SN74LVC1G17-Q1	SOT-23 (5)	2.9 mm × 1.6 mm
	SC-70 (5)	2.0 mm × 1.25 mm
	SON (6)	1.45 mm × 1.0 mm

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

Simplified Schematic



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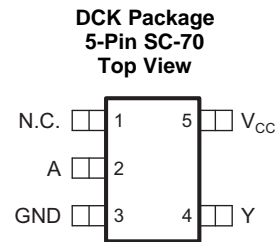
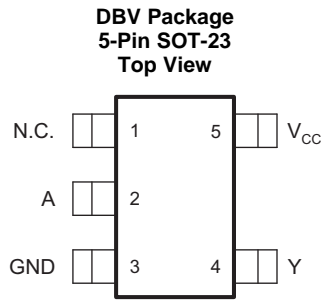
4 Revision History

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

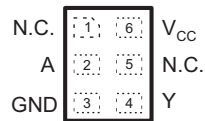
Changes from Revision B (October 2019) to Revision C	Page
• Corrected clerical errors introduced in Revision B: Features included incorrect values	1
• Changed to automotive ESD table format	4
• Corrected clerical errors introduced in Revision B: Electrical Characteristics values returned to Revision A values	6
• Corrected clerical errors introduced in Revision B: Switching Characteristics values returned to Revision A values	6
• Deleted inaccurate typical characteristics plot for operation across temperature	7
• Deleted unnecessary parameter measurement information for 15 pF load (unused)	8

Changes from Revision A (April 2008) to Revision B	Page
• Added <i>Applications</i>	1
• Added <i>Device Information</i> table	1
• Removed Ordering Information table	3
• Added DRY package to graphic figures and Pin Functions table	3
• Added Pin Functions table	3
• Added ESD Ratings table	4
• Added Thermal Information table	5
• Added Typical Characteristics	7
• Added Detailed Description section	9
• Added Application and Implementation section	10
• Revised Image for Typical Application	10
• Added Power Supply Recommendations section	11
• Added Layout section	11
• Added <i>Device and Documentation Support</i> section	12
• Added <i>Mechanical, Packaging, and Orderable Information</i> section	12

5 Pin Configuration and Functions



**DRY Package
6-Pin SON
Transparent Top View**



(1) N.C. - No internal connection

See mechanical drawings for at the end of the data sheet for dimensions

Pin Functions

PIN			DESCRIPTION
NAME	DBV, DCK	DRY	
NC	1	1, 5	Not connected
A	2	2	Input
GND	3	3	Ground
Y	4	4	Output
V_{CC}	5	6	Power terminal

6 Specifications

6.1 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
T_{stg}	Storage temperature	–65	150	°C

(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

(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 Conditions* table.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per AEC Q100-002 ⁽¹⁾ HBM ESD Classification Level 2	±2000	V
		Charged device model (CDM), per AEC Q100-011 CDM ESD Classification Level C6	±1000	

(1) AEC Q100-002 indicate that HBM stressing shall be in accordance with the ANSI/ESDA/JEDEC JS-001 specification.

6.3 Recommended Operating Conditions⁽¹⁾

			MIN	MAX	UNIT
V _{CC}	Supply voltage	Operating	1.65	5.5	V
		Data retention only	1.5		
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	
				−24	
		V _{CC} = 4.5 V		−32	
I _{OL}	Low-level output current	V _{CC} = 1.65 V		4	mA
		V _{CC} = 2.3 V		8	
		V _{CC} = 3 V		16	
				24	
		V _{CC} = 4.5 V		32	
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](#).

6.4 Thermal Information

THERMAL METRIC ⁽¹⁾		SN74LVC1G17-Q1			UNIT
		DBV	DCK	DRY	
		5 PINS	5 PINS	6 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	229	280	608	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	164	66	432	°C/W
R _{θJB}	Junction-to-board thermal resistance	62	67	446	°C/W
ψ _{JT}	Junction-to-top characterization parameter	44	2	191	°C/W
ψ _{JB}	Junction-to-board characterization parameter	62	66	442	°C/W
R _{θJC(bot)}	Junction-to-case (bottom) thermal resistance	–	–	198	°C/W

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

6.5 Electrical Characteristics—DC Limit Changes

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

PARAMETER		TEST CONDITIONS		V _{CC}	MIN	TYP	MAX	UNIT
V _{T+} (Positive-going input threshold voltage)				1.65 V	0.64		1.25	V
				2.3 V	1		1.68	
				3 V	1.36		2.04	
				4.5 V	2.07		2.86	
				5.5 V	2.53		3.43	
V _{T-} (Negative-going input threshold voltage)				1.65 V	0.23		0.71	V
				2.3 V	0.44		1.05	
				3 V	0.77		1.35	
				4.5 V	1.22		2.09	
				5.5 V	1.73		2.52	
ΔV _T Hysteresis (V _{T+} – V _{T-})				1.65 V	0.26		0.74	V
				2.3 V	0.33		0.92	
				3 V	0.4		0.99	
				4.5 V	0.45		1.28	
				5.5 V	0.56		1.32	
V _{OH}	I _{OH} = –100 μA		1.65 V to 5.5 V	V _{CC} – 0.1			V	
	I _{OH} = –4 mA		1.65 V	1.2				
	I _{OH} = –8 mA		2.3 V	1.9				
	I _{OH} = –16 mA		3 V	2.4				
	I _{OH} = –24 mA			2.3				
	I _{OH} = –32 mA		4.5 V	3.8				
V _{OL}	I _{OL} = 100 μA		1.65 V to 5.5 V			0.1	V	
	I _{OL} = 4 mA		1.65 V			0.45		
	I _{OL} = 8 mA		2.3 V			0.4		
	I _{OL} = 16 mA		3 V			0.5		
	I _{OL} = 24 mA					0.7		
	I _{OL} = 32 mA		4.5 V			0.7		
I _I	A input	V _I = 5.5 V or GND		0 to 5.5 V			±10	μA
I _{off}		V _I or V _O = 5.5 V		0			±25	μA
I _{CC}		V _I = 5.5 V or GND,	I _O = 0	1.65 V to 5.5 V			20	μA
ΔI _{CC}		One input at V _{CC} – 0.6 V, Other inputs at V _{CC} or GND		3 V to 5.5 V			500	μA
C _I		V _I = V _{CC} or GND		3.3 V	4.5			pF

6.6 Switching Characteristics AC Limit

 over recommended operating free-air temperature range, C_L = 30 pF or 50 pF (unless otherwise noted) (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	–40°C TO 125°C								UNIT
			V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 5 V ± 0.5 V		
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A	Y	2.8	14	1	9	1.5	8	0.7	7	ns

6.7 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	$f = 10\text{ MHz}$	20	21	22	26	pF

6.8 Typical Characteristics

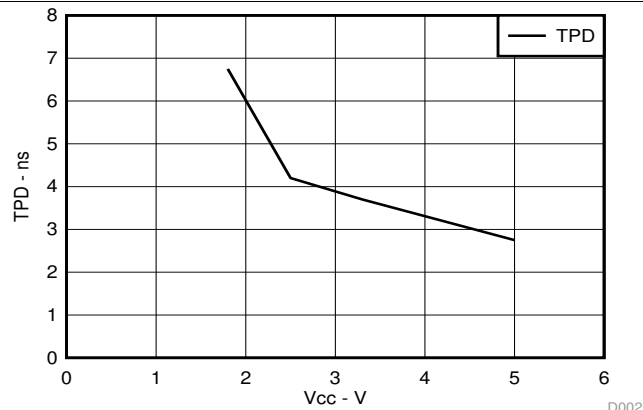
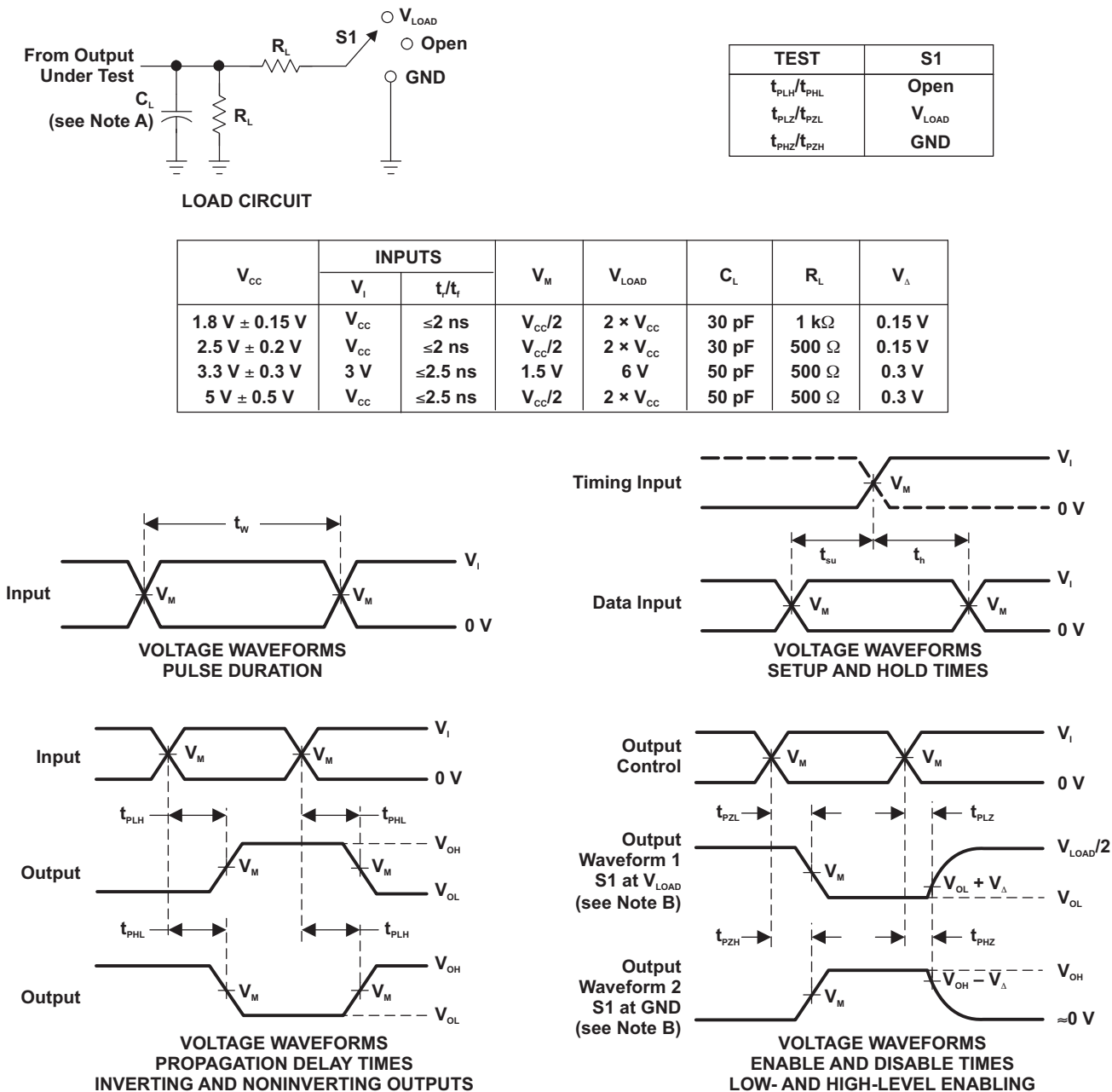


Figure 1. Across Vcc at 25°C

7 Parameter Measurement Information



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: $PRR \leq 10\text{ MHz}$, $Z_o = 50\text{ }\Omega$.

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 2. Load Circuit and Voltage Waveforms

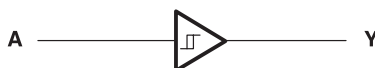
8 Detailed Description

8.1 Overview

The SN74LVC1G17-Q1 device contains one Schmitt trigger buffer and performs the Boolean function $Y = A$. The device functions as an independent buffer, but because of Schmitt action, it will have different input threshold levels for a positive-going (V_{T+}) and negative-going (V_{T-}) signals.

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

8.2 Functional Block Diagram



8.3 Feature Description

- Wide operating voltage range.
 - Operates From 1.65 V to 5.5 V.
- Allows Down voltage translation.
- Inputs accept voltages to 5.5 V.
- I_{off} feature allows voltages on the inputs and outputs, when V_{CC} is 0 V.

8.4 Device Functional Modes

Table 1. Function Table

INPUT A	OUTPUT Y
H	H
L	L

9 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.

9.1 Application Information

The SN74LVC1G17-Q1 is a high-drive CMOS device that can be used for a multitude of buffer type functions where the input is slow or noisy. It can produce 24 mA of drive current at 3.3 V making it ideal for driving multiple outputs and good for high speed applications up to 100 MHz. The inputs are 5.5 V tolerant allowing it to translate down to V_{CC} .

9.2 Typical Application

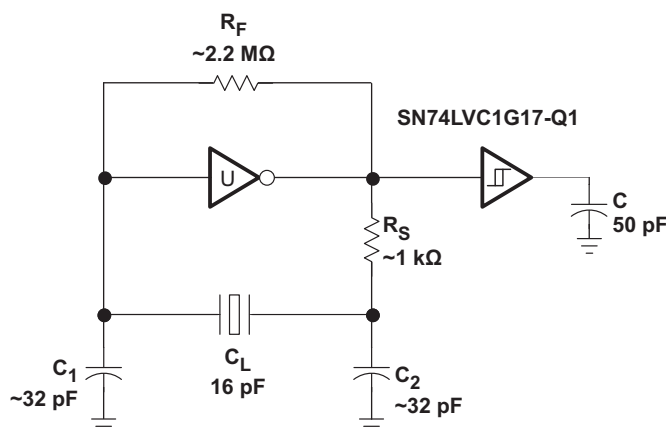


Figure 3. SN74LVC1G17-Q1 Typical Application

9.2.1 Design Requirements

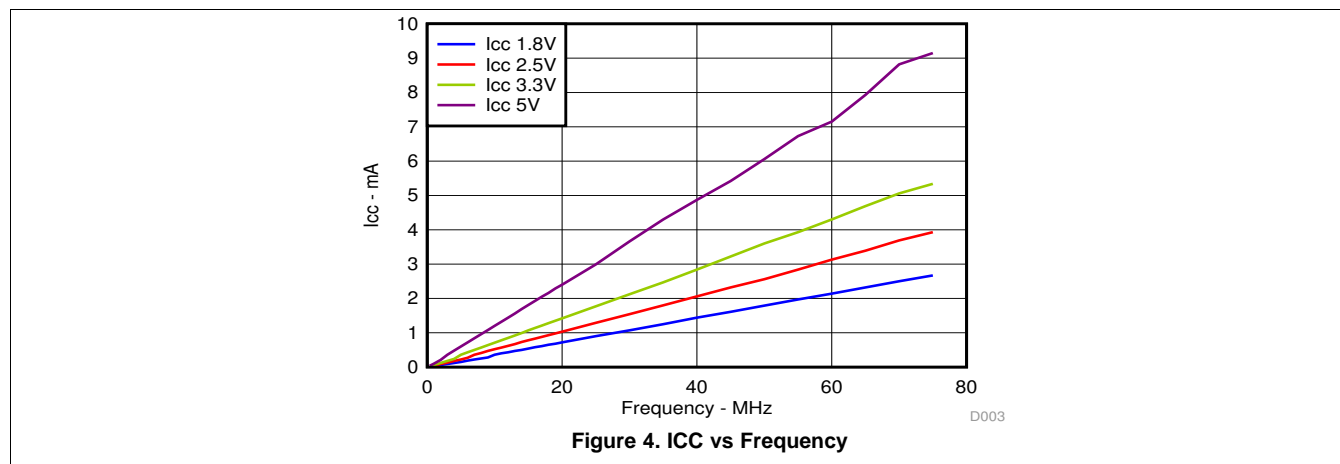
This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads so routing and load conditions should be considered to prevent ringing.

9.2.2 Detailed Design Procedure

1. Recommended Input Conditions
 - Rise time and fall time specs. See $(\Delta t/\Delta V)$ in the [Recommended Operating Conditions](#) table.
 - Specified high and low levels. See $(V_{IH}$ and $V_{IL})$ in the [Recommended Operating Conditions](#) table.
 - Inputs are overvoltage tolerant allowing them to go as high as $(V_I \text{ max})$ in the [Recommended Operating Conditions](#) table at any valid V_{CC} .
2. Recommend Output Conditions
 - Load currents should not exceed $(I_O \text{ max})$ per output and should not exceed (continuous current through V_{CC} or GND) total current for the part. These limits are located in the [Absolute Max Ratings](#) table.
 - Outputs should not be pulled above V_{CC} .

Typical Application (continued)

9.2.3 Application Curves



10 Power Supply Recommendations

The power supply can be any voltage between the min and max supply voltage rating located in the [Recommended Operating Conditions](#) table.

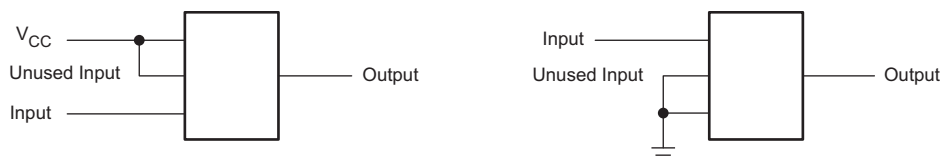
Each Vcc pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply a 0.1-μF capacitor is recommended and if there are multiple Vcc pins then a 0.01-μF or 0.022-μF capacitor is recommended for each power pin. It is ok to parallel multiple bypass caps to reject different frequencies of noise. 0.1-μF and 1-μF capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

11 Layout

11.1 Layout Guidelines

When using multiple bit logic devices inputs should not ever 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 terminals should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. Specified below are 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 should be applied to any particular unused input depends on the function of the device. Generally they will be tied to Gnd or Vcc whichever make more sense or is more convenient.

11.2 Layout Example



12 Device and Documentation Support

12.1 Trademarks

All trademarks are the property of their respective owners.

12.2 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

12.3 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

13 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 part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74LVC1G17QDBVRQ	Active	Production	SOT-23 (DBV) 5	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(34W5, C17O)
SN74LVC1G17QDCKRQ	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	(C7J, C7O)
SN74LVC1G17QDRYRQ	Active	Production	SON (DRY) 6	5000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HM

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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 SN74LVC1G17-Q1 :

- Catalog : [SN74LVC1G17](#)

- Enhanced Product : [SN74LVC1G17-EP](#)

NOTE: Qualified Version Definitions:

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

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
SN74LVC1G17QDBVRQ1	SOT-23	DBV	5	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
SN74LVC1G17QDCKRQ1	SC70	DCK	5	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
SN74LVC1G17QDCKRQ1	SC70	DCK	5	3000	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
SN74LVC1G17QDRYRQ1	SON	DRY	6	5000	180.0	9.5	1.2	1.65	0.7	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVC1G17QDBVRQ1	SOT-23	DBV	5	3000	180.0	180.0	18.0
SN74LVC1G17QDCKRQ1	SC70	DCK	5	3000	200.0	183.0	25.0
SN74LVC1G17QDCKRQ1	SC70	DCK	5	3000	190.0	190.0	30.0
SN74LVC1G17QDRYRQ1	SON	DRY	6	5000	189.0	185.0	36.0

DCK0005A**PACKAGE OUTLINE****SOT - 1.1 max height**

SMALL OUTLINE TRANSISTOR



4214834/G 11/2024

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. Reference JEDEC MO-203.
4. Support pin may differ or may not be present.
5. Lead width does not comply with JEDEC.
6. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:18X



SOLDER MASK DETAILS

4214834/G 11/2024

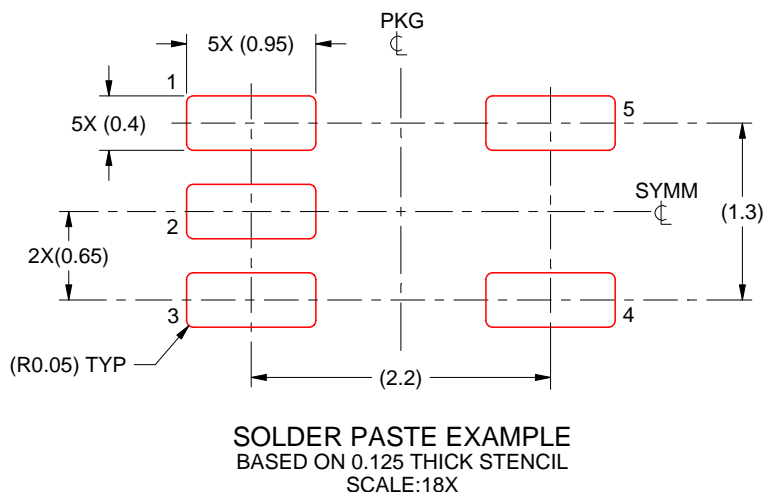
NOTES: (continued)

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

DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



4214834/G 11/2024

NOTES: (continued)

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

DBV0005A**PACKAGE OUTLINE****SOT-23 - 1.45 mm max height**

SMALL OUTLINE TRANSISTOR

**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. Reference JEDEC MO-178.
4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
5. Support pin may differ or may not be present.

EXAMPLE BOARD LAYOUT

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4214839/K 08/2024

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

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

4214839/K 08/2024

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

DRY 6

USON - 0.6 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4207181/G



PACKAGE OUTLINE

USON - 0.55 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



NOTES:

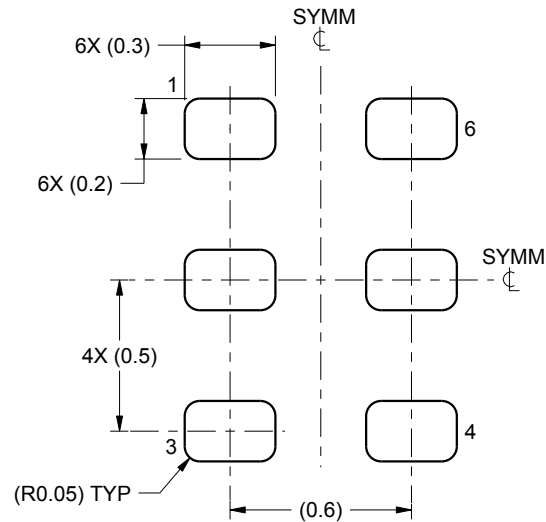
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

EXAMPLE BOARD LAYOUT

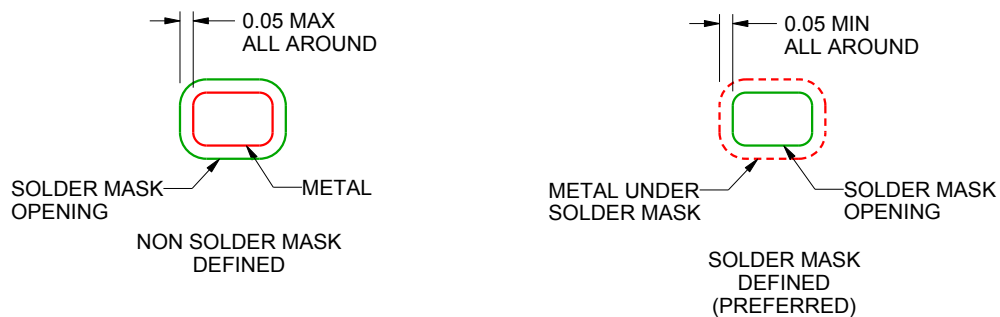
DRY0006B

USON - 0.55 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



LAND PATTERN EXAMPLE
1:1 RATIO WITH PKG SOLDER PADS
SCALE:40X



SOLDER MASK DETAILS

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NOTES: (continued)

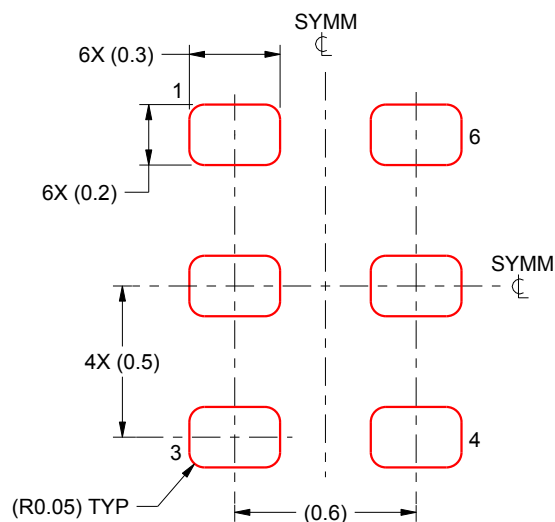
3. For more information, see QFN/SON PCB application report in literature No. SLUA271 (www.ti.com/lit/slue271).

EXAMPLE STENCIL DESIGN

DRY0006B

USON - 0.55 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.075 - 0.1 mm THICK STENCIL
SCALE:40X

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NOTES: (continued)

4. 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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