



SN74LVC1G07-Q1 Single Buffer/Driver With Open-Drain Output

1 Features

- Qualified for automotive applications
- AEC-Q100 Qualified with the following results:
 - Device temperature grade 1: -40°C to $+125^{\circ}\text{C}$ ambient operating temperature
 - 2000-V Device human-body model (HBM) ESD classification level 2
 - 1000-V Device charged-device model (CDM) ESD classification level C5
- Supports 5-V V_{CC} operation
- Input and open-drain output accept Voltages up to 5.5 V
- Max t_{pd} of 5.7 ns at 3.3 V
- Low power consumption, 10- μA max I_{CC}
- $\pm 24\text{-mA}$ Output drive at 3.3 V
- I_{off} Supports partial-power-down mode Operation

2 Applications

- Automotive infotainment
- Automotive ADAS camera and fusion
- Automotive body control module AV receiver
- Automotive HEV/powertrain
- Blu-ray player and home theater
- DVD recorder and player
- Desktop or notebook PC
- Digital radio or internet radio player
- Digital video camera (DVC)
- Embedded PC
- GPS: Personal navigation device
- Mobile internet device
- Network projector front end
- Portable media player
- Pro Audio Mixer
- Smoke detector
- Solid state drive (SSD): enterprise
- High-definition (HDTV)
- Tablet: enterprise
- Audio dock: portable
- DLP front projection system
- DVR and DVS
- Digital picture frame (DPF)
- Digital still camera

3 Description

The SN74LVC1G07-Q1 is a single channel open-drain buffer/driver qualified for automotive applications. This is designed for 1.65-V to 5.5-V V_{CC} operation.

The output of the SN74LVC1G07-Q1 device is open drain and can be connected to other open-drain outputs to implement active-low wired-OR or active-high wired-AND functions. The maximum sink current is 32 mA.

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.

Device Information⁽¹⁾

PART NUMBER	PACKAGE (PINS)	BODY SIZE (NOM)
SN74LVC1G07-Q1	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

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

Logic Diagram (Positive Logic)

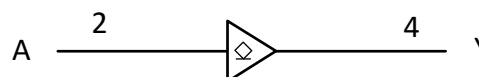


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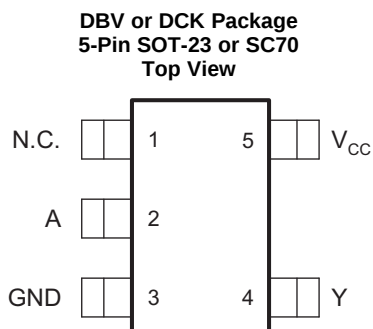
4 Revision History

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

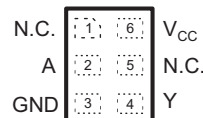
Changes from Revision A (February 2017) to Revision B	Page
• Added DRY package option to Device Information table	1
• Added DRY package as Product Preview device option to Pin Configuration and Functions	3
• Added DRY package to Thermal Information table	4

Changes from Original (March 2011) to Revision A	Page
• Added <i>Applications</i> , <i>Device Information</i> table, <i>ESD Ratings</i> table, <i>Typical Characteristics</i> , <i>Feature Description</i> section, <i>Device Functional Modes</i> , <i>Application and Implementation</i> section, <i>Power Supply Recommendations</i> section, <i>Layout</i> section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section.	1
• Changed $R_{\theta JA}$ value for DBV (SOT-23) package from: 206 to: 269.3	4

5 Pin Configuration and Functions



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



N.C. – No internal connection
See mechanical drawings for dimensions.

Pin Functions

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

6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

	MIN	MAX	UNIT
V_{CC} Supply voltage	–0.5	6.5	V
V_I Input voltage ⁽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	6.5	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_J Operating junction temperature		150	°C
T_{stg} Storage temperature	–65	150	°C

- 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 conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- 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⁾	±2000
	Charged-device model (CDM), per AEC Q100-011	±1000

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

6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V _{CC}	Supply voltage	Operating	1.65	5.5
		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	5.5	V
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	
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](#), SCBA004.

6.4 Thermal Information

THERMAL METRIC ⁽¹⁾		SN74LVC1G07-Q1			UNIT
		DBV (SOT-23)	DCK (SC70)	DRY (SON)	
		5 PINS	5 PINS	6 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	269.3	301.2	439	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	175.2	186.5	277	°C/W
R _{θJB}	Junction-to-board thermal resistance	104.9	111.8	271	°C/W
ψ _{JT}	Junction-to-top characterization parameter	73.4	78.3	84	°C/W
ψ _{JB}	Junction-to-board characterization parameter	104.5	110.6	271	°C/W
R _{θJC(bot)}	Junction-to-case (bottom) thermal resistance	–	–	–	°C/W

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

6.5 Electrical Characteristics

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

PARAMETER		TEST CONDITIONS	V _{CC}	MIN	TYP ⁽¹⁾	MAX	UNIT
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			0.3	
		I _{OL} = 16 mA	3 V			0.4	
		I _{OL} = 24 mA				0.55	
		I _{OL} = 32 mA	4.5 V			0.55	
I _I	A input	V _I = 5.5 V or GND	0 to 5.5 V			±5	µA
I _{off}		V _I or V _O = 5.5 V	0			±10	µA
I _{CC}		V _I = 5.5 V or GND, I _O = 0	1.65 V to 5.5 V			10	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	pF
C _o		V _O = V _{CC} or GND	3.3 V			5	pF

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

6.6 Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 3)

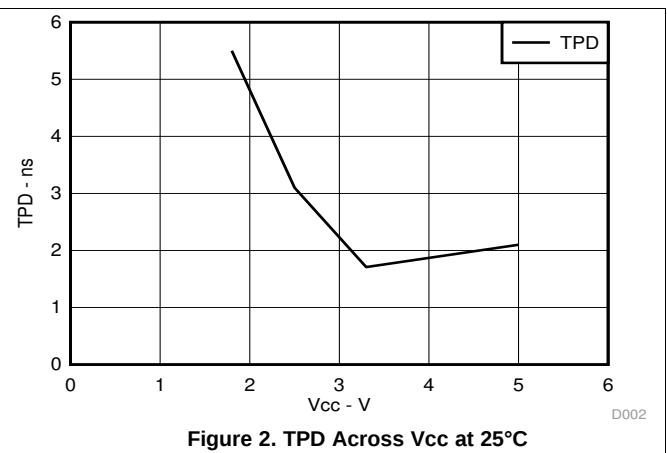
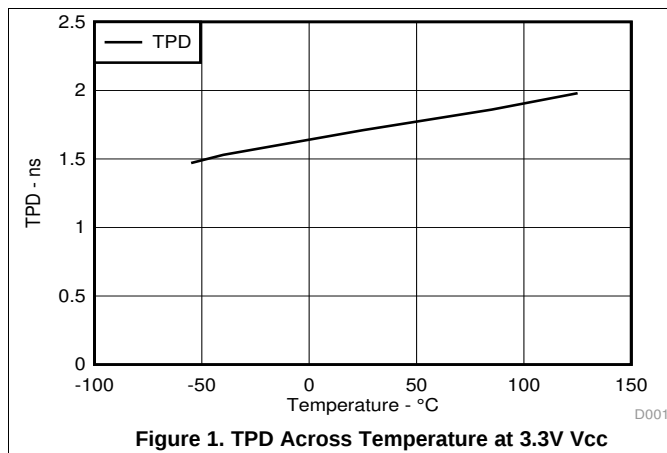
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 5 V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A	Y	2.4	9.8	1	7.0	1.5	5.7	1	4.9	ns

6.7 Operating Characteristics

T_A = 25°C

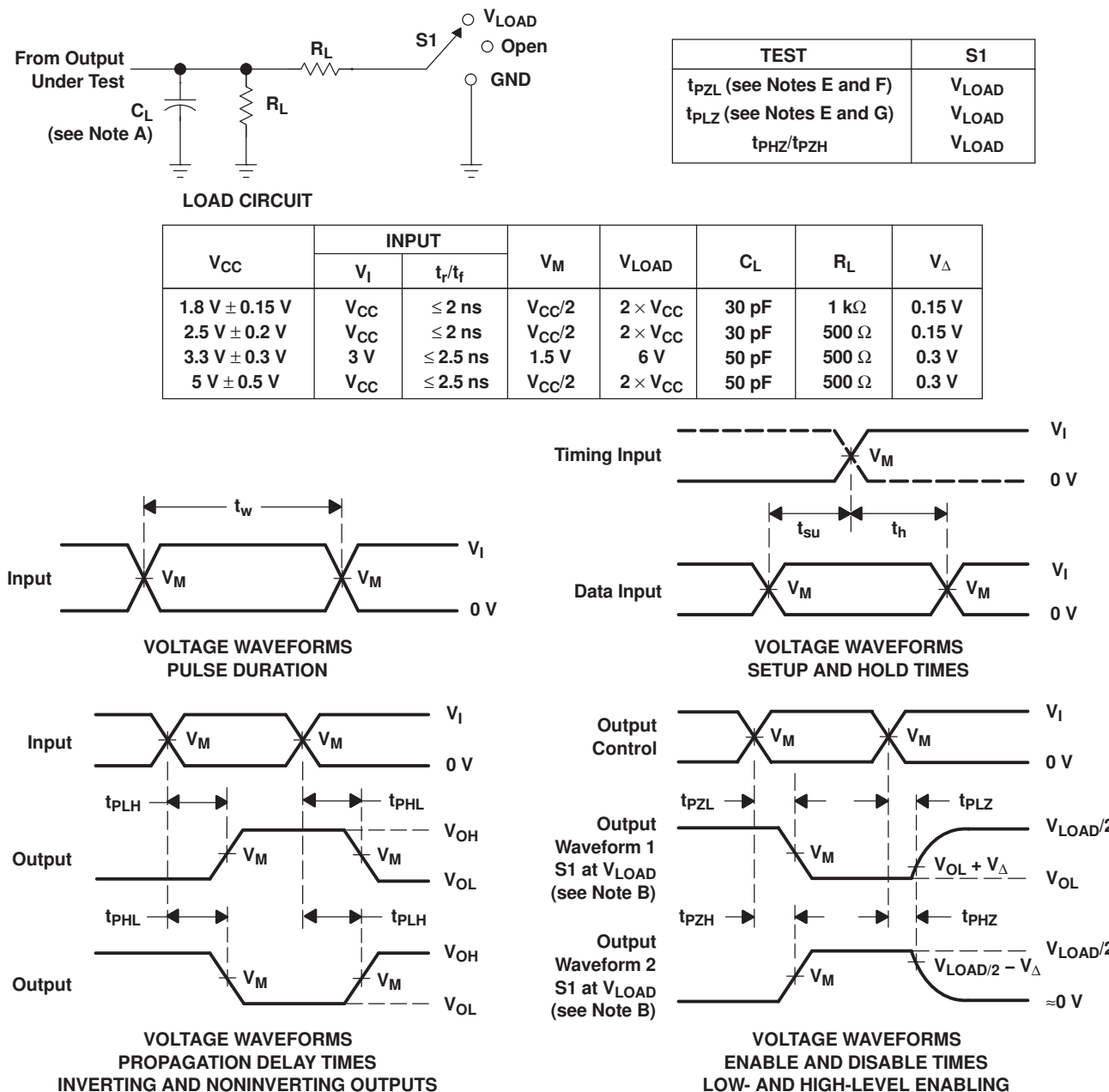
PARAMETER		TEST CONDITIONS	V _{CC} = 1.8 V	V _{CC} = 2.5 V	V _{CC} = 3.3 V	V _{CC} = 5 V	UNIT
			TYP	TYP	TYP	TYP	
C _{pd}	Power dissipation capacitance	f = 10 MHz	3	3	4	6	pF

6.8 Typical Characteristics



7 Parameter Measurement Information (Open Drain)

7.1 PMI



- NOTES:
- C_L includes probe and jig capacitance.
 - 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.
 - All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω.
 - The outputs are measured one at a time, with one transition per measurement.
 - Since this device has open-drain outputs, t_{PLZ} and t_{PZL} are the same as t_{pd}.
 - t_{PZL} is measured at V_M.
 - t_{PLZ} is measured at V_{OL} + V_Δ.
 - All parameters and waveforms are not applicable to all devices.

Figure 3. Load Circuit And Voltage Waveforms

8 Detailed Description

8.1 Overview

The SN74LVC1G07-Q1 device contains one open-drain buffer with a maximum sink current of 32 mA. 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

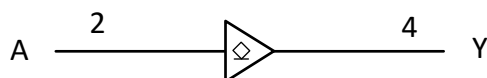


Figure 4. Logic Diagram (Positive Logic)

8.3 Feature Description

- Wide operating voltage range.
 - Operates from 1.65 V to 5.5 V.
- Allows down-voltage translation.
- Inputs and outputs 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](#) lists the functional modes of SN74LVC1G07-Q1.

Table 1. Function Table

INPUT A	OUTPUT Y
L	L
H	Z

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 SN74LVC1G07-Q1 is a high drive CMOS device that can be used to implement a high output drive buffer, such as an LED application. It can sink 32 mA of current at 4.5 V making it ideal for high drive and wired-OR/AND functions. It is good for high speed applications up to 100 MHz. The inputs are 5.5 V tolerant allowing it to translate up/down to V_{CC} .

9.2 Typical Application

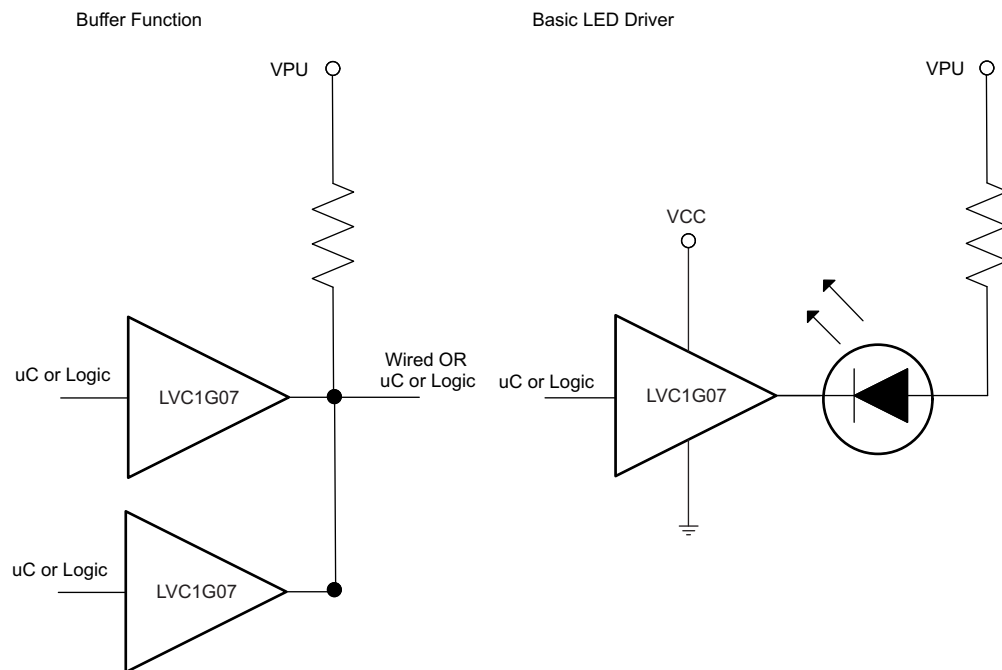


Figure 5. Typical Application-SN74LVC1G07-Q1

9.2.1 Design Requirements

This device uses CMOS technology and has high-output drive. Care should be taken to avoid bus contention because it may drive currents that would exceed maximum limits. The high drive also creates 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 over-voltage tolerant allowing them to go as high as (V_I max) in the [Recommended Operating Conditions](#) table at any valid V_{CC} .

2. Recommended Output Conditions

- Load currents should not exceed (I_O 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 Maximum Ratings](#) table.

Typical Application (continued)

- Outputs should not be pulled above 5.5 V.

9.2.3 Application Curve

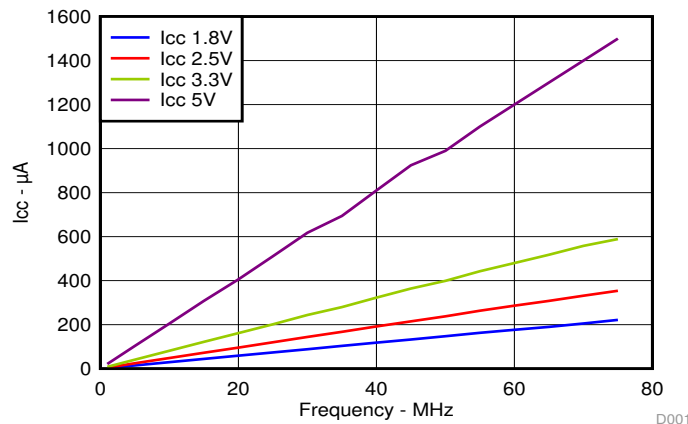


Figure 6. Icc vs Frequency

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 V_{CC} pin should have a good bypass capacitor to prevent power disturbance. A 0.1-µF capacitor is recommended for devices with a single supply. If there are multiple V_{CC} pins then a 0.01-µF or 0.022-µF capacitor is recommended for each power pin. It is acceptable 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 pins 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 are tied to GND or V_{CC} , whichever is more convenient.

11.2 Layout Example

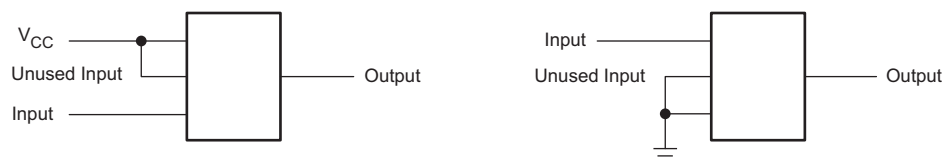


Figure 7. Layout Example

12 Device and Documentation Support

12.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* 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.

12.2 Community 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](#).

12.3 Trademarks

E2E is a trademark of Texas Instruments.

All other trademarks are the property of their respective owners.

12.4 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.

12.5 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 Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74LVC1G07QDBVRQ1	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CCQO	Samples
SN74LVC1G07QDCKRQ1	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	SN	Level-2-260C-1 YEAR	-40 to 125	16J	Samples
SN74LVC1G07QDCKTQ1	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	SN	Level-2-260C-1 YEAR	-40 to 125	16J	Samples
SN74LVC1G07QDRYRQ1	ACTIVE	SON	DRY	6	5000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HL	Samples

(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/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish 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

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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 SN74LVC1G07-Q1 :

- Catalog: [SN74LVC1G07](#)
- Enhanced Product: [SN74LVC1G07-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
SN74LVC1G07QDBVRQ1	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
SN74LVC1G07QDCKRQ1	SC70	DCK	5	3000	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
SN74LVC1G07QDCKTQ1	SC70	DCK	5	250	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
SN74LVC1G07QDRYRQ1	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

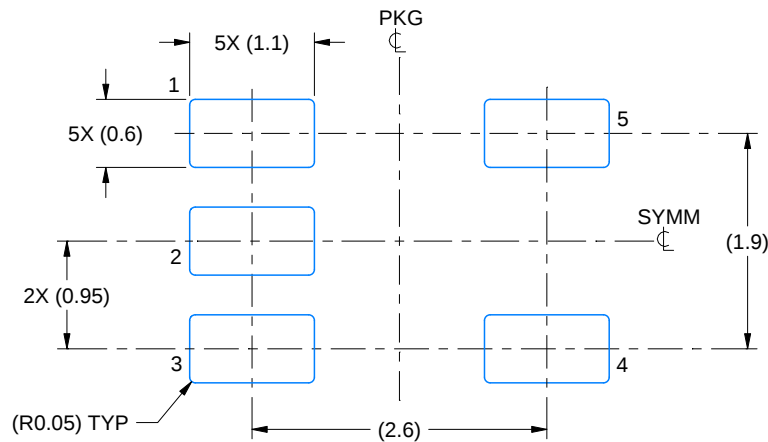
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVC1G07QDBVRQ1	SOT-23	DBV	5	3000	203.0	203.0	35.0
SN74LVC1G07QDCKRQ1	SC70	DCK	5	3000	180.0	180.0	18.0
SN74LVC1G07QDCKTQ1	SC70	DCK	5	250	180.0	180.0	18.0
SN74LVC1G07QDRYRQ1	SON	DRY	6	5000	189.0	185.0	36.0

EXAMPLE BOARD LAYOUT

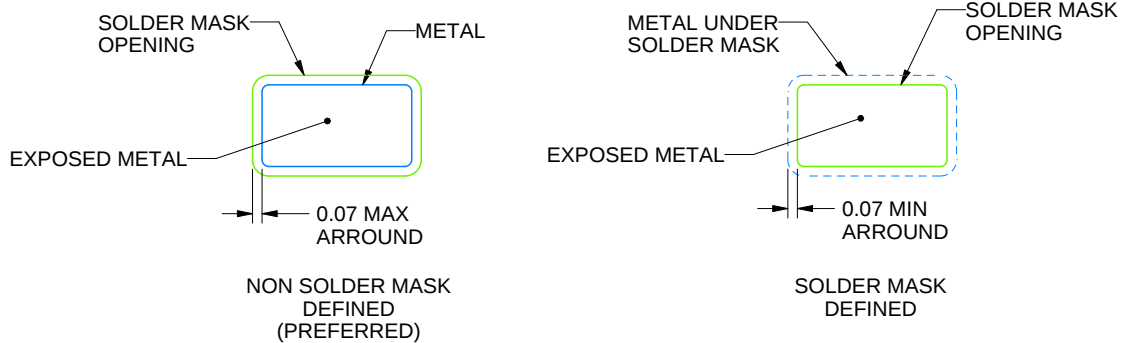
DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4214839/E 09/2019

NOTES: (continued)

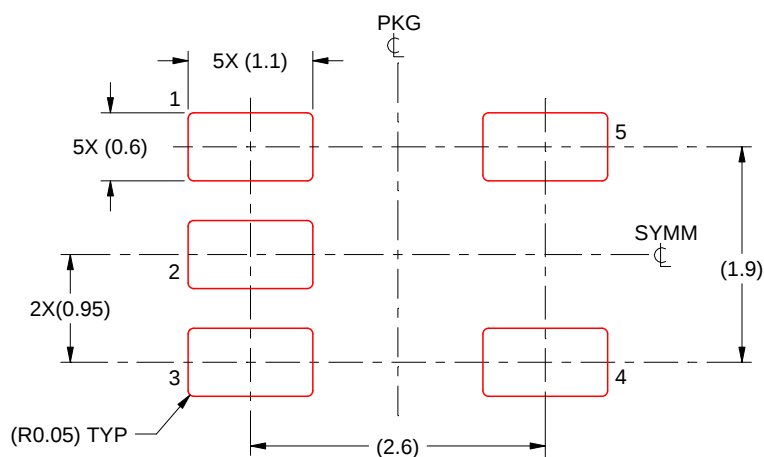
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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/E 09/2019

NOTES: (continued)

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

DCK (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



4093553-3/G 01/2007

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - Falls within JEDEC MO-203 variation AA.

DCK (R-PDSO-G5)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

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

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