

SN74LVC1G14-Q1 Single Schmitt-Trigger Inverter

1 Features

- Qualified for automotive applications
- AEC-Q100 qualified with the following results:
 - Device temperature grade 1: -40°C to +125°C ambient operating temperature range
 - Device human-body model (HBM) ESD classification level 2
 - Device charged-device model (CDM) ESD classification level C5
- Supports 5V V_{CC} operation
- Inputs accept voltages to 5.5V
- Maximum t_{pd} of 4.6ns at 3.3V
- Low power consumption, 10µA maximum I_{CC}
- ±24mA output drive at 3.3V
- I_{off} supports partial-power-down mode operation
- Latch-up performance exceeds 100mA per JESD 78, class II

2 Applications

- Body control modules
- Engine control modules
- Infotainment systems
- **Telematics**

3 Description

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

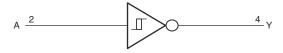
The SN74LVC1G14-Q1 device contains one inverter and performs the Boolean function $Y = \overline{A}$. The device functions as an independent inverter, but because of Schmitt action, it may have different input threshold levels for positive-going (V_{T+}) and negative-going $(V_{T_{-}})$ signals.

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

Package Information

PART NUMBER	PACKAGE ⁽¹⁾	PACKAGE SIZE(2)	BODY SIZE(3)
	DCK (SC70, 5)	2.0mm × 2.1mm	2.0mm × 1.25mm
SN74LVC1G14-Q1	DRY (SON, 6)	1.45mm × 1.0mm	1.45mm × 1.0mm
	DBV (SOT-23, 5)	2.9mm x 2.8mm	2.9mm x 1.6mm

- For more information, see Mechanical, Packaging, and Orderable Information.
- The package size (length × width) is a nominal value and includes pins, where applicable.
- The body size (length × width) is a nominal value and does not include pins.



Simplified Schematic



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4 Pin Configuration and Functions

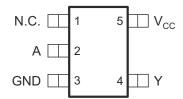
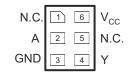


Figure 4-1. DCK (5-Pin SC70) and DBV (5-Pin SOT-23) Packages (Top View)



N.C. – No internal connection

See mechanical drawings for dimensions.

Figure 4-2. DRY Package 6-Pin SON Transparent Top View

Pin Functions

		PIN					
NAME	DCK (SC70)	DBV (SOT-23)	DRY (SON)	I/O	DESCRIPTION		
NAME	NO.	NO.	NO.				
Α	2	2	2	I	Input		
GND	3	3	3	_	Ground		
N.C.	1	1	1, 5	_	No internal connection.		
V _{CC}	5	5	6	_	Supply or power pin		
Υ	4	4	4	0	Output		



5 Specifications

5.1 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
VI	Input voltage ⁽²⁾		-0.53	6.5	V
Vo	Voltage range applied to any output in the high-imp	/oltage range applied to any output in the high-impedance or power-off state ⁽²⁾			V
Vo	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
Io	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, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

5.2 ESD Ratings

			VALUE	UNIT
V	Electrostatic discharge	Human-body model (HBM), per AEC Q100-002 ⁽¹⁾	±2000	V
V _(ESD)	Electrostatic discharge	Charged-device model (CDM), per AEC Q100-011	±750	V

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

5.3 Recommended Operating Conditions

See(1)

			MIN	MAX	UNIT		
.,	Cumply voltage	Operating	1.65	5.5	V		
V_{CC}	Supply voltage	Data retention only	1.5		V		
VI	Input voltage		0	5.5	V		
Vo	Output voltage		0	V _{CC}	V		
		V _{CC} = 1.65 V		-4			
	High-level output current $ V_{CC} = 2.3 \text{ V} $ $ V_{CC} = 3 \text{ V} $	V _{CC} = 2.3 V		-8	mA		
I _{OH}		\\\ -2\\		-16			
		V _{CC} – 3 V		-24			
		V _{CC} = 4.5 V		-32	2		
		V _{CC} = 1.65 V		4			
		V _{CC} = 2.3 V		8			
I_{OL}	Low-level output current	\\\ -2\\		16	mA		
		V _{CC} = 3 V		24			
		V _{CC} = 4.5 V		32			
T _A	Operating free-air temperature		-40	125	°C		

All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. See *Implications of Slow or Floating CMOS Inputs*, SCBA004.

Product Folder Links: SN74LVC1G14-Q1

⁽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.



5.4 Thermal Information

			SN74LVC1G14-Q1					
	THERMAL METRIC(1)	DBV (SOT-23)	DCK (SC70)	DRY (SON)	UNIT			
		5 PINS	5 PINS	6 PINS				
R _{θJA}	Junction-to-ambient thermal resistance	357.1	371.0	264	°C/W			
R _θ JC(top)	Junction-to-case (top) thermal resistance	263.7	297.5	167	°C/W			
R _{0JB}	Junction-to-board thermal resistance	264.4	258.6	142	°C/W			
ΨЈТ	Junction-to-top characterization parameter	195.6	195.6	26	°C/W			
ΨЈВ	Junction-to-board characterization parameter	262.2	256.2	142	°C/W			

⁽¹⁾ For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application note

5.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V _{cc}	MIN	TYP ⁽¹⁾ MAX	UNIT			
		1.65 V	0.79	1.16				
V _{T+}		2.3 V	1.11	1.56				
Positive-going input threshold		3 V	1.5	1.87	V			
voltage		4.5 V	2.16	2.74				
		5.5 V	2.61	3.33				
		1.65 V	0.39	0.64				
V_{T-}		2.3 V	0.58	0.89				
Negative-going nput threshold		3 V	0.84	1.16	V			
voltage		4.5 V	1.41	1.79				
		5.5 V	1.87	2.29				
		1.65 V	0.37	0.62				
ΔV_{T}		2.3 V	0.48	0.77				
Hysteresis		3 V	0.56	0.87	V			
$(V_{T+} - V_{T-})$		4.5 V	0.71	1.04				
		5.5 V	0.71	1.11				
	I _{OL} = -100 μA	1.65 V to 4.5 V	V _{CC} - 0.1					
	$I_{OL} = -4 \text{ mA}$	1.65 V	1.2					
	$I_{OL} = -8 \text{ mA}$	2.3 V	1.9		.,			
V_{OH}	I _{OL} = -16 mA	3 V	2.4		V			
	I _{OL} = -24 mA	_	2.3					
	I _{OL} = -32 mA	4.5 V	3.8					
	I _{OL} = 100 μA	1.65 V to 4.5 V		0.1				
	I _{OL} = 4 mA	1.65 V		0.45				
\/	I _{OL} = 8 mA	2.3 V		0.3	V			
V_{OL}	I _{OL} = 16 mA	3 V		0.4	V			
	I _{OL} = 24 mA	_ 3 V		0.55				
	I _{OL} = 32 mA	4.5 V		0.70				
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}	$V_I = 5.5 \text{ V or GND}, \qquad I_O = 0$	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			

5.5 Electrical Characteristics (continued)

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

PARAMETER	TEST CONDITIONS	V _{cc}	MIN TYP(1) MAX	UNIT
C _i	$V_I = V_{CC}$ or GND	3.3 V	4.5	pF

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

5.6 Switching Characteristics, $C_L = 15 pF$

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 6-1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = ± 0.1		V _{CC} = ± 0.		V _{CC} = ± 0.3		V _{CC} = ± 0.9		UNIT
	(INPUT) (OUTPUT)	(001101)	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A	Y	2.8	9.9	1.6	5.5	1.5	4.6	0.9	4.4	ns

5.7 Switching Characteristics, C_L = 30 pF or 50 pF

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 6-2)

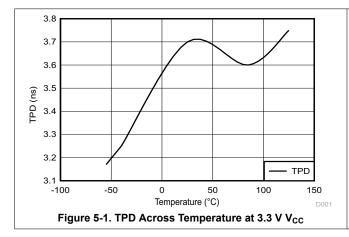
PARAMETER	FROM	TO (OUTPUT)	V _{CC} = ± 0.1		V _{CC} = ± 0.		V _{CC} = ± 0.3		V _{CC} = ± 0.5		UNIT
	(INPUT) (OUTPUT)	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
t _{pd}	A	Y	3.8	13	2	8	1.8	6.5	1.2	6	ns

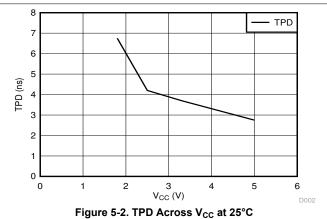
5.8 Operating Characteristics

 $T_A = 25^{\circ}C$

PARAMETER	TEST CONDITIONS	V _{CC} = 1.8 V TYP	V _{CC} = 2.5 V TYP	V _{CC} = 3.3 V TYP	V _{CC} = 5 V TYP	UNIT
C _{pd} Power dissipation capacitance	f = 10 MHz	20	21	22	25	pF

5.9 Typical Characteristics

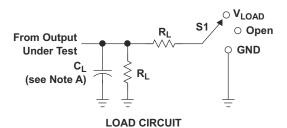




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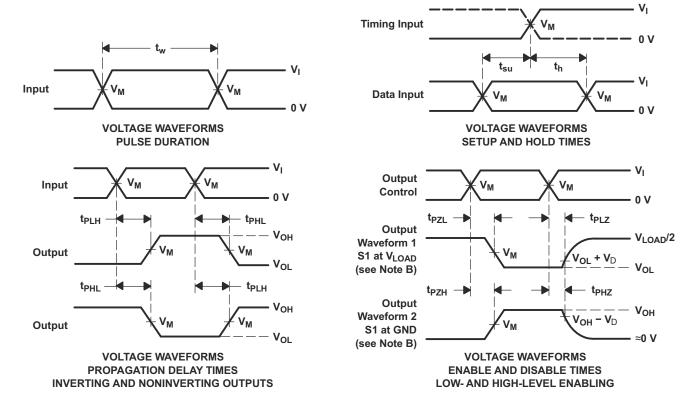
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6 Parameter Measurement Information



TEST	S1
t _{PLH} /t _{PHL}	Open
t _{PLZ} /t _{PZL}	V _{LOAD}
t _{PHZ} /t _{PZH}	GND

.,	INPUTS		.,	.,		_	.,
V _{CC}	VI	t _r /t _f	V _M	V _{LOAD}	CL	R _L	V _D
1.8 V ± 0.15 V	V _{CC}	≤2 ns	V _{CC} /2	2 × V _{CC}	15 pF	1 Μ Ω	0.15 V
2.5 V ± 0.2 V	v_{cc}	≤2 ns	V _{CC} /2	2 × V _{CC}	15 pF	1 M Ω	0.15 V
3.3 V ± 0.3 V	3 V	≤2.5 ns	1.5 V	6 V	15 pF	1 M Ω	0.3 V
5 V ± 0.5 V	V_{CC}	≤2.5 ns	V _{CC} /2	2 × V _{CC}	15 pF	1 M Ω	0.3 V



NOTES: A. C_L includes probe and jig capacitance.

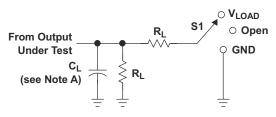
- B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics: PRR \leq 10 MHz, Z_O = 50 Ω .
- 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 6-1. Load Circuit and Voltage Waveforms

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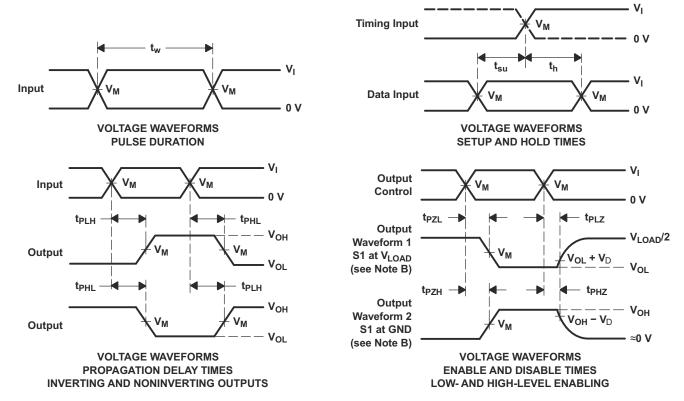




TEST	S 1
t _{PLH} /t _{PHL} t _{PLZ} /t _{PZL} t _{PHZ} /t _{PZH}	Open V _{LOAD} GND

LOAD CIRCUIT

		INPUTS		V		Б	V
V _{CC}	VI	t _r /t _f	V _M	V _{LOAD}	CL	R _L	V _D
1.8 V ± 0.15 V	V _{CC}	≤2 ns	V _{CC} /2	2 × V _{CC}	30 pF	1 k Ω	0.15 V
2.5 V ± 0.2 V	V _{CC}	≤2 ns	V _{CC} /2	2 × V _{CC}	30 pF	500 Ω	0.15 V
3.3 V ± 0.3 V	3 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
5 V ± 0.5 V	V _{CC}	≤2.5 ns	V _{CC} /2	2 × V _{CC}	50 pF	500 Ω	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 Ω .
- 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}.
- $\mbox{\rm H.}\;\;\mbox{\rm All}\;\mbox{\rm parameters}\;\mbox{\rm and}\;\mbox{\rm waveforms}\;\mbox{\rm are}\;\mbox{\rm not}\;\mbox{\rm applicable}\;\mbox{\rm to}\;\mbox{\rm all}\;\mbox{\rm devices}.$

Figure 6-2. Load Circuit and Voltage Waveforms

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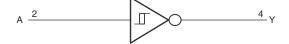
7 Detailed Description

7.1 Overview

The SN74LVC1G14-Q1 device contains one Schmitt Trigger Inverter and performs the Boolean function $Y = \overline{A}$. The device functions as an independent inverter, but because of Schmitt Trigger 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} circuit disables the output, preventing damaging current back-flow through the device when it is powered down.

7.2 Functional Block Diagram



7.3 Feature Description

7.3.1 Balanced CMOS Push-Pull Outputs

This device includes balanced CMOS push-pull outputs. The term balanced indicates that the device can sink and source similar currents. The drive capability of this device may create fast edges into light loads, so routing and load conditions should be considered to prevent ringing. Additionally, the outputs of this device are capable of driving larger currents than the device can sustain without being damaged. It is important to limit the output power of the device to avoid damage due to overcurrent. The electrical and thermal limits defined in the Absolute Maximum Ratings must be followed at all times.

Unused push-pull CMOS outputs must be left disconnected.

7.3.2 CMOS Schmitt-Trigger Inputs

This device includes inputs with the Schmitt-trigger architecture. These inputs are high impedance and are typically modeled as a resistor in parallel with the input capacitance given in the Electrical Characteristics table from the input to ground. The worst case resistance is calculated with the maximum input voltage, given in the Absolute Maximum Ratings table, and the maximum input leakage current, given in the Electrical Characteristics table, using Ohm's law $(R = V \div I)$.

The Schmitt-trigger input architecture provides hysteresis as defined by ΔV_T in the *Electrical Characteristics* table, which makes this device extremely tolerant to slow or noisy inputs. While the inputs can be driven much slower than standard CMOS inputs, it is still recommended to properly terminate unused inputs. Driving the inputs with slow transitioning signals will increase dynamic current consumption of the device. For additional information regarding Schmitt-trigger inputs, please see *Understanding Schmitt Triggers*.

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7.3.3 Clamp Diode Structure

Figure 7-1 shows the inputs and outputs to this device have negative clamping diodes only.

CAUTION

Voltages beyond the values specified in the *Absolute Maximum Ratings* table can cause damage to the device. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

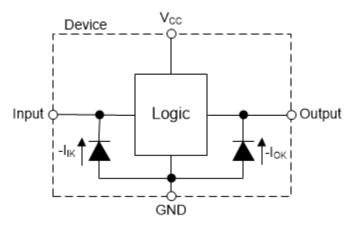


Figure 7-1. Electrical Placement of Clamping Diodes for Each Input and Output



7.4 Device Functional Modes

Table 7-1 shows the functional modes of the SN74LVC1G14-Q1 device.

Table 7-1. Function Table

INPUT A	OUTPUT Y
Н	L
L	Н

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8 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.

8.1 Application Information

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

8.2 Typical Application

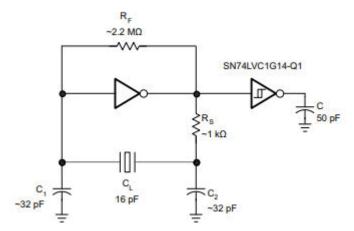


Figure 8-1. Typical Application Schematic

8.2.1 Design Requirements

8.2.1.1 Power Considerations

Ensure that the desired supply voltage is within the range specified in the *Electrical Characteristics*. The supply voltage sets the device electrical characteristics of the device, as described in the *Electrical Characteristics* section.

The positive voltage supply must be capable of sourcing current equal to the total current to be sourced by all outputs of the SN74LVC1G14-Q1 plus the maximum static supply current, I_{CC} , listed in the *Electrical Characteristics*, and any transient current required for switching. The logic device can only source as much current that is provided by the positive supply source. Ensure the maximum total current through V_{CC} listed in the *Absolute Maximum Ratings* is not exceeded.

The ground must be capable of sinking current equal to the total current to be sunk by all outputs of the SN74LVC1G14-Q1 plus the maximum supply current, I_{CC} , listed in the *Electrical Characteristics*, and any transient current required for switching. The logic device can only sink as much current that can be sunk into its ground connection. Ensure the maximum total current through GND listed in the *Absolute Maximum Ratings* is not exceeded.

The SN74LVC1G14-Q1 can drive a load with a total capacitance less than or equal to 50pF while still meeting all of the data sheet specifications. Larger capacitive loads can be applied; however, it is not recommended to exceed 50pF.

The SN74LVC1G14-Q1 can drive a load with total resistance described by $R_L \ge V_O / I_O$, with the output voltage and current defined in the *Electrical Characteristics* table with V_{OH} and V_{OL} . When outputting in the HIGH state, the output voltage in the equation is defined as the difference between the measured output voltage and the supply voltage at the V_{CC} pin.

Total power consumption can be calculated using the information provided in the *CMOS Power Consumption* and *Cpd Calculation* application note.

Thermal increase can be calculated using the information provided in the *Thermal Characteristics of Standard Linear and Logic (SLL) Packages and Devices* application note.

CAUTION

The maximum junction temperature, $T_{J(max)}$ listed in the *Absolute Maximum Ratings*, is an additional limitation to prevent damage to the device. Do not violate any values listed in the *Absolute Maximum Ratings*. These limits are provided to prevent damage to the device.

8.2.1.2 Input Considerations

Input signals must cross $V_{t-(min)}$ to be considered a logic LOW, and $V_{t+(max)}$ to be considered a logic HIGH. Do not exceed the maximum input voltage range found in the *Absolute Maximum Ratings*.

Unused inputs must be terminated to either V_{CC} or ground. The unused inputs can be directly terminated if the input is completely unused, or they can be connected with a pull-up or pull-down resistor if the input will be used sometimes, but not always. A pull-up resistor is used for a default state of HIGH, and a pull-down resistor is used for a default state of LOW. The drive current of the controller, leakage current into the SN74LVC1G14-Q1 (as specified in the *Electrical Characteristics*), and the desired input transition rate limits the resistor size. A $10k\Omega$ resistor value is often used due to these factors.

The SN74LVC1G14-Q1 has no input signal transition rate requirements because it has Schmitt-Trigger inputs.

Another benefit to having Schmitt-Trigger inputs is the ability to reject noise. Noise with a large enough amplitude can still cause issues. To know how much noise is too much, please refer to the $\Delta V_{T(min)}$ in the Electrical Characteristics . This hysteresis value will provide the peak-to-peak limit.

Unlike what happens with standard CMOS inputs, Schmitt-Trigger inputs can be held at any valid value without causing huge increases in power consumption. The typical additional current caused by holding an input at a value other than V_{CC} or ground is plotted in the Typical Characteristics.

Product Folder Links: SN74LVC1G14-Q1

Refer to the *Feature Description* for additional information regarding the inputs for this device.

8.2.1.3 Output Considerations

The positive supply voltage is used to produce the output HIGH voltage. Drawing current from the output will decrease the output voltage as specified by the V_{OH} specification in the *Electrical Characteristics*. The ground voltage is used to produce the output LOW voltage. Sinking current into the output will increase the output voltage as specified by the V_{OH} specification in the *Electrical Characteristics*.

Push-pull outputs that could be in opposite states, even for a very short time period, should never be connected directly together. This can cause excessive current and damage to the device.

Two channels within the same device with the same input signals can be connected in parallel for additional output drive strength.

Unused outputs can be left floating. Do not connect outputs directly to V_{CC} or ground.

Refer to the Feature Description section for additional information regarding the outputs for this device.

8.2.2 Detailed Design Procedure

- Add a decoupling capacitor from V_{CC} to GND. The capacitor needs to be placed physically close to the device and electrically close to both the V_{CC} and GND pins. An example layout is shown in the *Layout* section.
- 2. Verify that the capacitive load at the output is ≤ 50pF. This is not a hard limit; by design, however, it will optimize performance. This can be accomplished by providing short, appropriately sized traces from the SN74LVC1G14-Q1 to one or more of the receiving devices.
- 3. Verify that the resistive load at the output is larger than $(V_{CC} / I_{O(max)})\Omega$. Doing this prevents the maximum output current from the *Absolute Maximum Ratings* from being violated. Most CMOS inputs have a resistive load measured in M Ω ; much larger than the minimum calculated previously.
- 4. Thermal issues are rarely a concern for logic gates; the power consumption and thermal increase, however, can be calculated using the steps provided in the CMOS Power Consumption and Cpd Calculation application note.

8.2.3 Application Curve

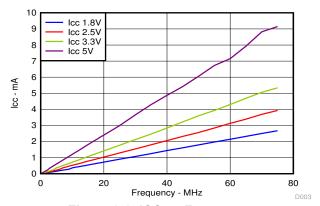


Figure 8-2. ICC vs Frequency

Product Folder Links: SN74LVC1G14-Q1

8.3 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance.

A $0.1\mu F$ capacitor is recommended for this device. It is acceptable to parallel multiple bypass capacitors to reject different frequencies of noise. The $0.1\mu F$ and $1\mu F$ capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

8.4 Layout

8.4.1 Layout Guidelines

- · Bypass capacitor placement
 - Place near the positive supply terminal of the device
 - Provide an electrically short ground return path
 - Use wide traces to minimize impedance
 - Keep the device, capacitors, and traces on the same side of the board whenever possible
- Signal trace geometry
 - 8mil to 12mil trace width
 - Lengths less than 12cm to minimize transmission line effects
 - Avoid 90° corners for signal traces
 - Use an unbroken ground plane below signal traces
 - Flood fill areas around signal traces with ground
 - Parallel traces must be separated by at least 3x dielectric thickness
 - For traces longer than 12cm
 - Use impedance controlled traces
 - Source-terminate using a series damping resistor near the output
 - Avoid branches; buffer each signal that must branch separately

8.4.2 Layout Example

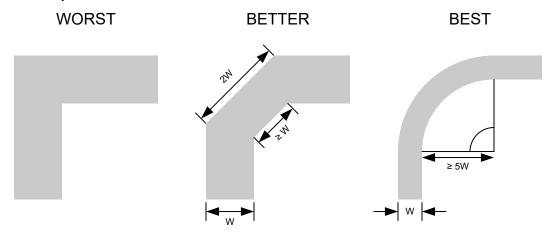


Figure 8-3. Example Trace Corners for Improved Signal Integrity



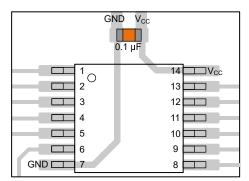


Figure 8-4. Example Bypass Capacitor Placement for TSSOP and Similar Packages

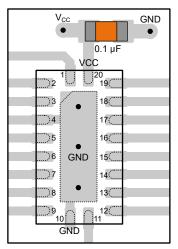


Figure 8-5. Example Bypass Capacitor Placement for WQFN and Similar Packages

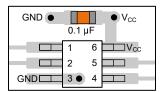


Figure 8-6. Example Bypass Capacitor Placement for SOT, SC70 and Similar Packages

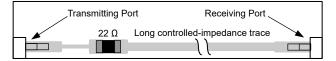


Figure 8-7. Example Damping Resistor Placement for Improved Signal Integrity

Submit Document Feedback

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9 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

9.1 Documentation Support

9.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, CMOS Power Consumption and Cpd Calculation application note
- Texas Instruments, Designing With Logic application note
- Texas Instruments, *Thermal Characteristics of Standard Linear and Logic (SLL) Packages and Devices* application note

9.2 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.

9.3 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.

9.4 Trademarks

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9.5 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.

9.6 Glossary

TI Glossary

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

10 Revision History

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



Changes from Revision C (August 2021) to Revision D (April 2025)

Page

11 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.

Product Folder Links: SN74LVC1G14-Q1

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PACKAGING INFORMATION

Orderable part number	Status	Material type	Package Pins	Package qty Carrier	RoHS	Lead finish/	MSL rating/	Op temp (°C)	Part marking
	(1)	(2)			(3)	Ball material	Peak reflow		(6)
						(4)	(5)		
SN74LVC1G14DBVRQ1	Active	Production	SOT-23 (DBV) 5	3000 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	(3L4U, 3RXF)
SN74LVC1G14QDCKRQ1	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	(SJJ, SJM)
SN74LVC1G14QDCKRQ1.A	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	(SJJ, SJM)
SN74LVC1G14QDCKRQ1.B	Active	Production	SC70 (DCK) 5	3000 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	(SJJ, SJM)
SN74LVC1G14QDRYRQ1	Active	Production	SON (DRY) 6	5000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	FE
SN74LVC1G14QDRYRQ1.B	Active	Production	SON (DRY) 6	5000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	FE

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

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.

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⁽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.

PACKAGE OPTION ADDENDUM

www.ti.com 14-Oct-2025

OTHER QUALIFIED VERSIONS OF SN74LVC1G14-Q1:

● Catalog : SN74LVC1G14

● Enhanced Product : SN74LVC1G14-EP

NOTE: Qualified Version Definitions:

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

PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





A0	Dimension designed to accommodate the component width
В0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

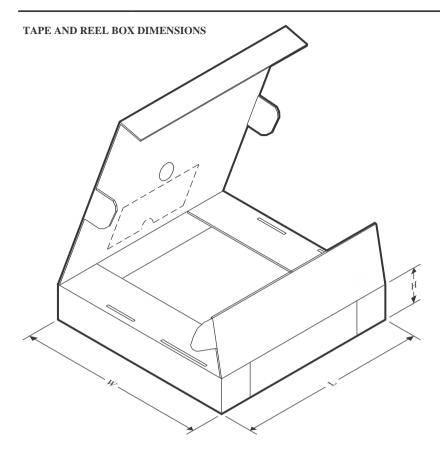


*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LVC1G14DBVRQ1	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
SN74LVC1G14QDCKRQ1	SC70	DCK	5	3000	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
SN74LVC1G14QDRYRQ1	SON	DRY	6	5000	180.0	9.5	1.2	1.65	0.7	4.0	8.0	Q1



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*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVC1G14DBVRQ1	SOT-23	DBV	5	3000	210.0	185.0	35.0
SN74LVC1G14QDCKRQ1	SC70	DCK	5	3000	190.0	190.0	30.0
SN74LVC1G14QDRYRQ1	SON	DRY	6	5000	189.0	185.0	36.0





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.





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.





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.





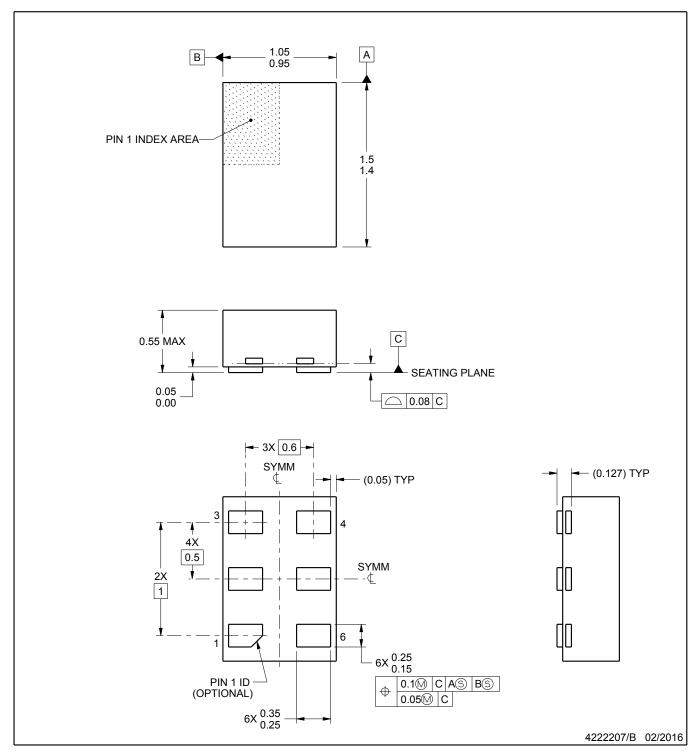
Images above are just a representation of the package family, actual package may vary. Refer to the product data sheet for package details.







PLASTIC SMALL OUTLINE - NO LEAD



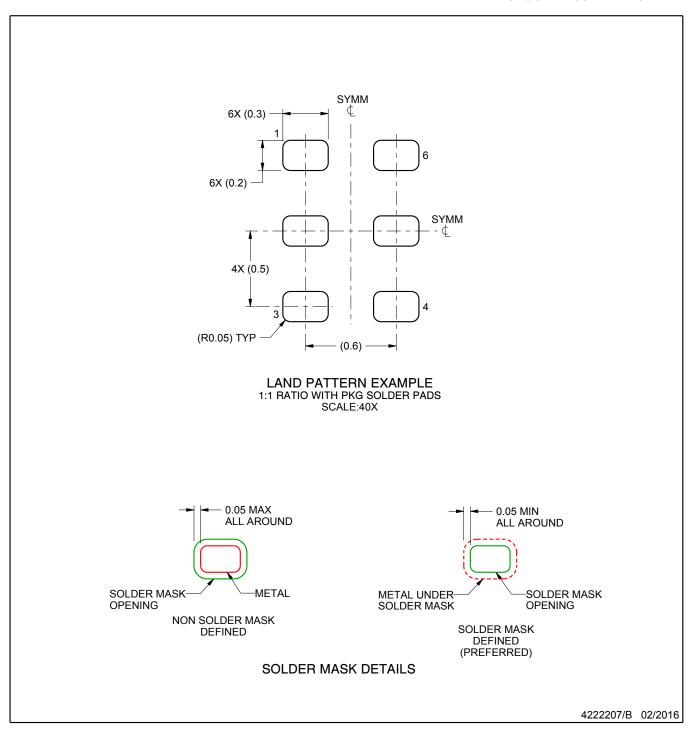
NOTES:

- 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.



PLASTIC SMALL OUTLINE - NO LEAD

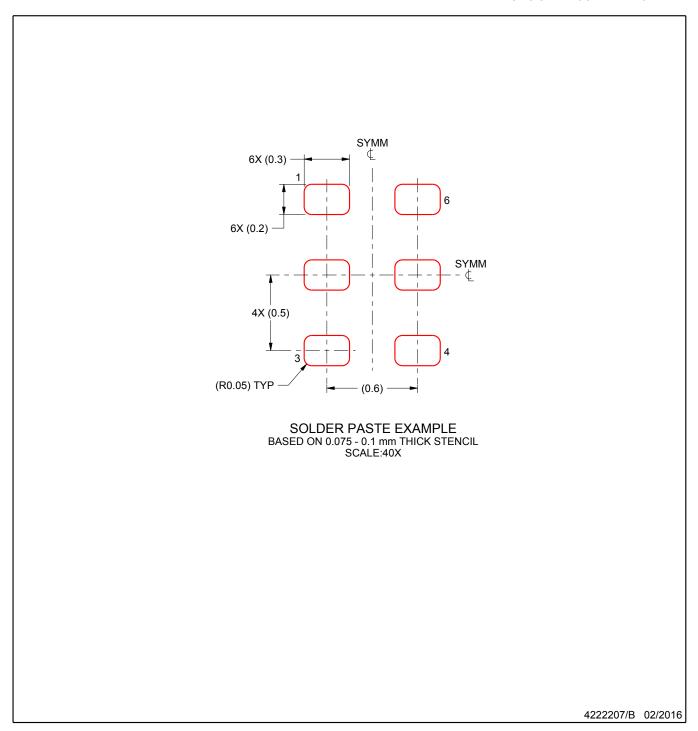


NOTES: (continued)

3. For more information, see QFN/SON PCB application report in literature No. SLUA271 (www.ti.com/lit/slua271).



PLASTIC SMALL OUTLINE - NO LEAD



NOTES: (continued)

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







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





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.





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.



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