

## SN74LV174A Hex D-Type Flip-Flops With Clear

### 1 Features

- $V_{CC}$  operation of 2 V to 5.5
- Maximum  $t_{pd}$  of 7.5 ns at 5 V
- Typical  $V_{OLP}$  (output ground bounce) < 0.8 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (output  $V_{OH}$  undershoot) > 2.3 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- $I_{off}$  supports partial-power-down mode operation
- Supports mixed-mode voltage operation on all ports
- Latch-up performance exceeds 250 mA per JESD 17

### 2 Applications

- [Output expansion](#)
- [LED matrix control](#)
- [7-segment display control](#)

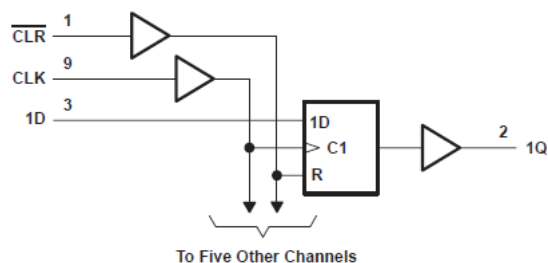
### 3 Description

The 'LV174A devices are hex D-type flip-flops designed for 2 V to 5.5 V  $V_{CC}$  operation.

#### Package Information<sup>(1)</sup>

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN74LV174A	DGV (TVSOP, 16)	4.00 mm × 3.50 mm
	PW (TSSOP, 16)	5.00 mm × 4.40 mm
	NS (SO, 16)	10.20 mm × 5.30 mm
	D (SOIC, 16)	9.00 mm × 3.90 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

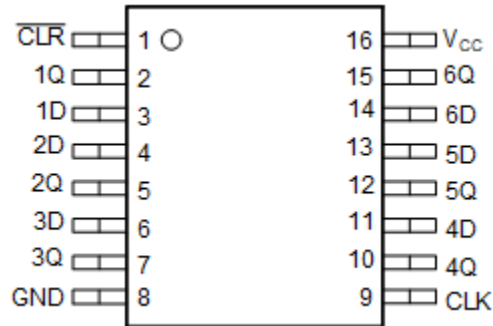
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

<b>Changes from Revision H (December 2022) to Revision I (March 2023)</b>	<b>Page</b>
• Removed references to DB package, removed pinout image of BQB or RGY package, and updated structural layout of document to current standard.....	1
• Updated thermal values for D package from R $\theta$ JA = 73 to 107.7, all values in °C/W.....	5

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<b>Changes from Revision G (April 1998) to Revision H (December 2022)</b>	<b>Page</b>
• Updated the format of tables, figures, and cross-references throughout the document.....	1

## 5 Pin Configuration and Functions



**Figure 5-1. D, DW, or PW Package,  
16-Pin SOIC, SOP or TSSOP  
(Top View)**

**Table 5-1. Pin Functions**

PIN		TYPE	DESCRIPTION
NAME	NO.		
CLR	1	I	Clear Pin
1Q	2	O	1Q Output
1D	3	I	1D Input
2D	4	I	2D Input
2Q	5	O	2Q Output
3D	6	I	3D Input
3Q	7	O	3Q Output
GND	8	—	Ground Pin
CLK	9	I	Clock Pin
4Q	10	O	4Q Output
4D	11	I	4D Input
5Q	12	O	5Q Output
5D	13	I	5D Input
6D	14	I	6D Input
6Q	15	O	6Q Output
V <sub>CC</sub>	16	P	Power Pin

## 6 Specifications

### 6.1 Absolute Maximum Ratings

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

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range		-0.5	7	V
V <sub>I</sub>	Input voltage range <sup>(2)</sup>		-0.5	7	V
V <sub>O</sub>	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>		-0.5	7	V
V <sub>O</sub>	Output voltage range applied in the high or low state <sup>(2) (3)</sup>		-0.5	V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Input clamp current	V <sub>I</sub> < 0		-20	mA
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0		-50	mA
I <sub>O</sub>	Continuous output current	V <sub>O</sub> = 0 to V <sub>CC</sub>		±25	mA
	Continuous current through V <sub>CC</sub> or GND			±50	mA
T <sub>stg</sub>	Storage temperature range		-65	150	°CW

- (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 *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output clamp current ratings are observed.
- (3) This value is limited to 5.5 V maximum.

### 6.2 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
	Machine Model (MM), per JEDEC specification	±200	
Charged-device model (CDM), per ANSI/ESDA/JEDEC JS-002 <sup>(2)</sup>	±1000		

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

### 6.3 Recommended Operating Conditions

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

		MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage	2	5.5	V	
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V	1.5	V	
		V <sub>CC</sub> = 2.3 V to 2.7 V	V <sub>CC</sub> × 0.7		
		V <sub>CC</sub> = 3 V to 3.6 V	V <sub>CC</sub> × 0.7		
		V <sub>CC</sub> = 4.5 V to 5.5 V	V <sub>CC</sub> × 0.7		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V	0.5	V	
		V <sub>CC</sub> = 2.3 V to 2.7 V	V <sub>CC</sub> × 0.3		
		V <sub>CC</sub> = 3 V to 3.6 V	V <sub>CC</sub> × 0.3		
		V <sub>CC</sub> = 4.5 V to 5.5 V	V <sub>CC</sub> × 0.3		
V <sub>I</sub>	Input voltage	0	5.5	V	
V <sub>O</sub>	Output voltage	High or low state	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 2 V	-50	μA	
		V <sub>CC</sub> = 2.3 V to 2.7 V	-2	mA	
		V <sub>CC</sub> = 3 V to 3.6 V	-6		
		V <sub>CC</sub> = 4.5 V to 5.5 V	-12		
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2 V	50	μA	
		V <sub>CC</sub> = 2.3 V to 2.7 V	2	mA	
		V <sub>CC</sub> = 3 V to 3.6 V	6		
		V <sub>CC</sub> = 4.5 V to 5.5 V	12		
Δt/Δv	Input transition rise or fall rate	V <sub>CC</sub> = 2.3 V to 2.7 V	200	ns/V	
		V <sub>CC</sub> = 3 V to 3.6 V	100		
		V <sub>CC</sub> = 4.5 V to 5.5 V	20		
T <sub>A</sub>	Operating free-air temperature	-40	85	°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](#).

### 6.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		SN74LV174A				UNIT
		D	DGV	NS	PW	
		16 PINS				
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	107.7	120	64	108	°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

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	SN74LV174A			UNIT
			MIN	TYP	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = –50 μA	2 V to 5.5 V	V <sub>CC</sub> – 0.1			V
	I <sub>OH</sub> = –2 mA	2.3 V	2			
	I <sub>OH</sub> = –6 mA	3 V	2.48			
	I <sub>OH</sub> = –12 mA	3 V	3.8			
		4.5 V	0.1			
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	2 V to 5.5 V	0.1			V
	I <sub>OL</sub> = 2 mA	2.3 V	0.4			
	I <sub>OL</sub> = 6 mA	3 V	0.44			
	I <sub>OL</sub> = 12 mA	4.5	0.55			
I <sub>I</sub>	V <sub>I</sub> = 5.5 V or GND	0 V to 5.5 V	±1			μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V	20			μA
I <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V	0 V	5			μA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V	1.7			pF

## 6.6 Timing Requirements, V<sub>CC</sub> = 2.5 V ± 0.2 V

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

			T <sub>A</sub> = 25°C		SN74LV174A		UNIT
			MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse duration	CLR low	6		6.5		ns
		CLK high or low	7		7		
t <sub>su</sub>	Setup time before CLK↑	Data	8.5		9.5		ns
		CLR inactive	4		4		
t <sub>h</sub>	Hold time data after CLK↑	– 0.5		0		ns	

### 6.7 Timing Requirements, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$

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

			$T_A = 25^\circ\text{C}$		SN74LV174A		UNIT
			MIN	MAX	MIN	MAX	
$t_w$	Pulse duration	CLR low	5		5		ns
		CLK high or low	5		5		
$t_{su}$	Setup time before CLK $\uparrow$	Data	5		6		ns
		CLR inactive	3		3		
$t_h$	Hold time data after CLK $\uparrow$		0		0		ns

### 6.8 Timing Requirements, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$

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

			$T_A = 25^\circ\text{C}$		SN74LV174A		UNIT
			MIN	MAX	MIN	MAX	
$t_w$	Pulse duration	CLR low	5		5		ns
		CLK high or low	5		5		ns
$t_{su}$	Setup time before CLK $\uparrow$	Data	4.5		4.5		ns
		CLR inactive	2.5		2.5		ns
$t_h$	Hold time data after CLK $\uparrow$		0.5		0.5		ns

## 6.9 Switching Characteristics, $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN74LV174A		UNIT
				MIN	TYP	MAX	MIN	MAX	
$f_{\text{max}}$			$C_L = 15\text{ pF}$	55	115		50		MHz
			$C_L = 50\text{ pF}$	45	90		40		
$t_{\text{pd}}$	$\overline{\text{CLR}}$	Q	$C_L = 15\text{ pF}$		6.3	17.3	1	19.5	ns
	CLK				8.4	17.1	1	19	
$t_{\text{pd}}$	$\overline{\text{CLR}}$	Q	$C_L = 50\text{ pF}$		8.2	21.9	1	23.5	ns
	CLK				10.8	20.6	1	23	
$t_{\text{sk(o)}}$						2		2	

## 6.10 Switching Characteristics, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN74LV174A		UNIT
				MIN	TYP	MAX	MIN	MAX	
$f_{\text{max}}$			$C_L = 15\text{ pF}$	95	170		80		MHz
			$C_L = 50\text{ pF}$	55	130		50		
$t_{\text{pd}}$	$\overline{\text{CLR}}$	Q	$C_L = 15\text{ pF}$		4.5	11.4	1	13.5	ns
	CLK				5.8	11	1	13	
$t_{\text{pd}}$	$\overline{\text{CLR}}$	Q	$C_L = 50\text{ pF}$		6	14.9	1	17	ns
	CLK				7.5	14.5	1	16.5	
$t_{\text{sk(o)}}$						1.5		1.5	

## 6.11 Switching Characteristics, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN74LV174A		UNIT
				MIN	TYP	MAX	MIN	MAX	
$f_{\text{max}}$			$C_L = 15\text{ pF}$	130	240		110	5	MHz
			$C_L = 50\text{ pF}$	90	180		80		
$t_{\text{pd}}$	$\overline{\text{CLR}}$	Q	$C_L = 15\text{ pF}$		3	7.6	1	9	ns
	CLK				4.1	7.2	1	8.5	
$t_{\text{pd}}$	$\overline{\text{CLR}}$	Q	$C_L = 50\text{ pF}$		4.2	9.6	1	11	ns
	CLK				5.5	9.2	1	10.5	
$t_{\text{sk(o)}}$						1		1	

## 6.12 Noise Characteristics

$V_{CC} = 3.3\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$ <sup>(1)</sup>

PARAMETER		SN74LV174A			UNIT
		MIN	TYP	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic $V_{OL}$		0.34	0.8	V
$V_{OL(V)}$	Quiet output, minimum dynamic $V_{OL}$		-0.3	-0.8	V
$V_{OH(V)}$	Quiet output, minimum dynamic $V_{OH}$		3.02		V
$V_{IH(D)}$	High-level dynamic input voltage		2.31		V
$V_{IL(D)}$	Low-level dynamic input voltage			0.99	V

(1) Characteristics are for surface-mount packages only.

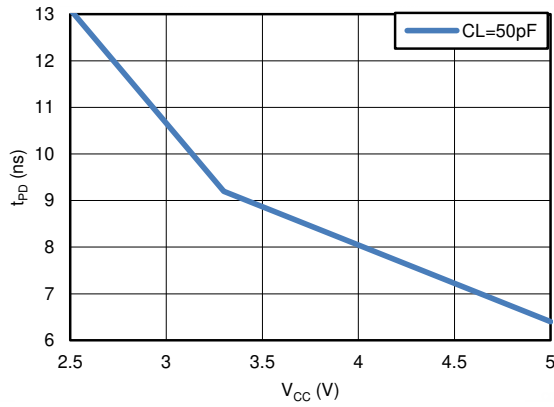


### 6.13 Operating Characteristics

$T_A = 25^\circ\text{C}$

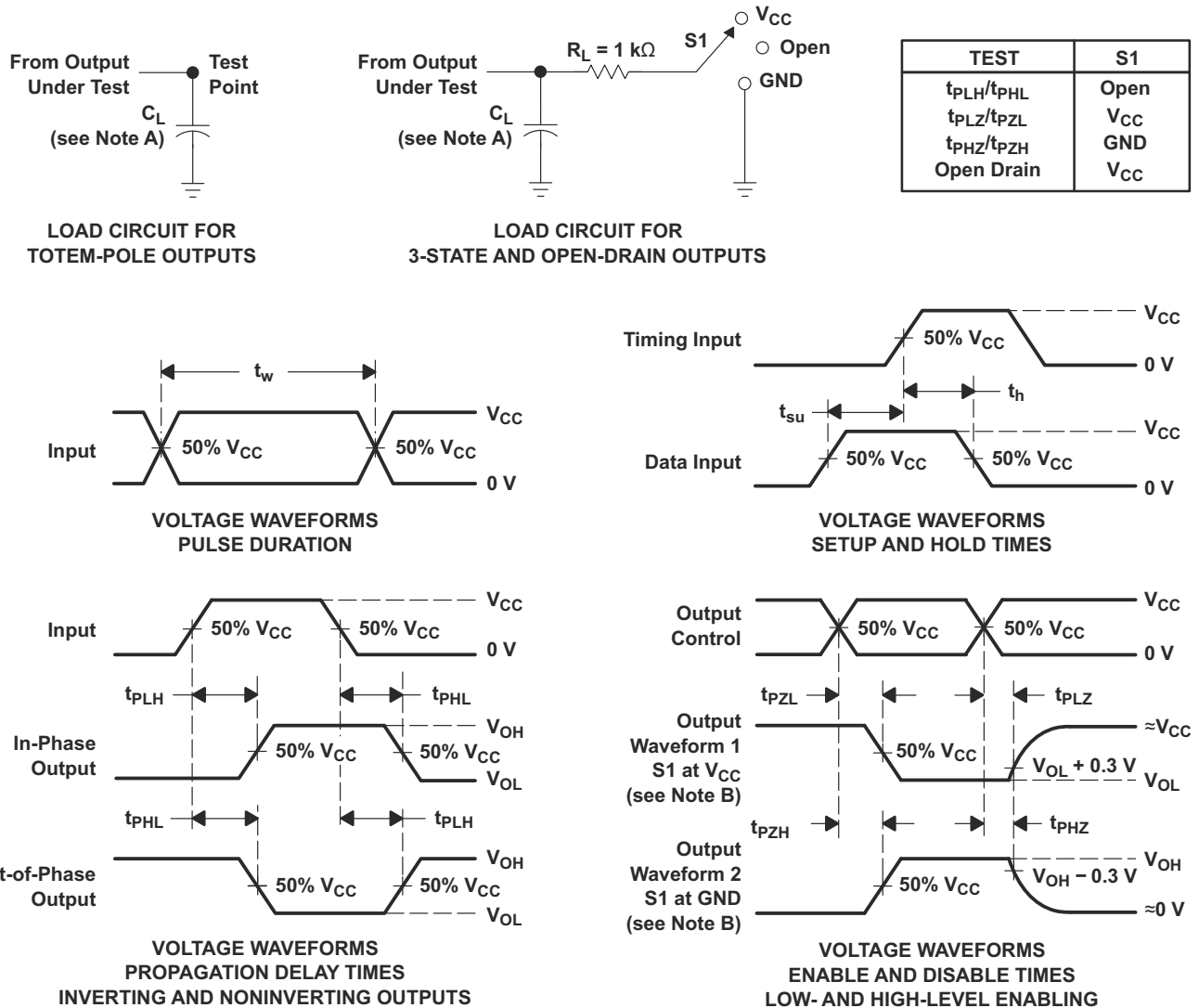
PARAMETER		TEST CONDITIONS		$V_{CC}$	TYP	UNIT
$C_{pd}$	Power dissipation capacitance	$C_L = 50\text{ pF}$	$f = 10\text{ MHz}$	3.3	14	pF
				5	15.1	

### 6.14 Typical Characteristics



**Figure 6-1. TPD vs V<sub>CC</sub>**

## 7 Parameter Measurement Information



- 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:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 3$  ns,  $t_f \leq 3$  ns.
- D. The outputs are measured one at a time, with one input transition per measurement.
- E.  $t_{P LZ}$  and  $t_{P H Z}$  are the same as  $t_{d is}$ .
- F.  $t_{P Z L}$  and  $t_{P Z H}$  are the same as  $t_{e n}$ .
- G.  $t_{P H L}$  and  $t_{P L H}$  are the same as  $t_{p d}$ .
- H. All parameters and waveforms are not applicable to all devices.

**Figure 7-1. Load Circuit and Voltage Waveforms**

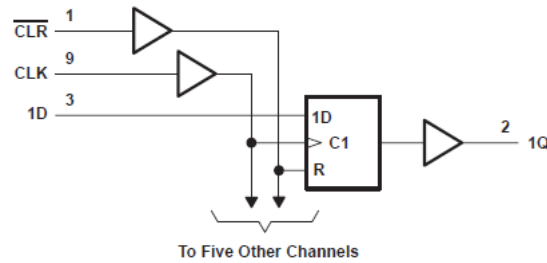
## 8 Detailed Description

### 8.1 Overview

The 'LV174A devices are positive-edge-triggered flip-flops with a direct clear (CLR) input. Information at the data (D) inputs meeting the setup time requirements is transferred to the outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going edge of the clock pulse. When the clock (CLK) input is at either the high or low level, the D-input signal has no effect at the output.

### 8.2 Functional Block Diagram

**Figure 8-1. Logic Diagram (Positive Logic)**



**Figure 8-2.**

## 8.3 Feature Description

### 8.3.1 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 for the output power of the device to be limited 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 should be left disconnected.

### 8.3.2 Latching Logic

This device includes latching logic circuitry. Latching circuits commonly include D-type latches and D-type flip-flops, but include all logic circuits that act as volatile memory.

When the device is powered on, the state of each latch is unknown. There is no default state for each latch at start-up.

The output state of each latching logic circuit only remains stable as long as power is applied to the device within the supply voltage range specified in the *Recommended Operating Conditions* table.

### 8.3.3 Partial Power Down ( $I_{off}$ )

This device includes circuitry to disable all outputs when the supply pin is held at 0 V. When disabled, the outputs will neither source nor sink current, regardless of the input voltages applied. The amount of leakage current at each output is defined by the  $I_{off}$  specification in the *Electrical Characteristics* table.

### 8.3.4 Clamp Diode Structure

Figure 8-3 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.

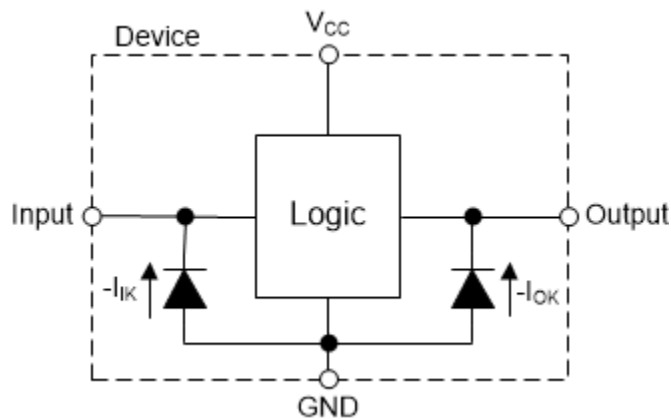


Figure 8-3. Electrical Placement of Clamping Diodes for Each Input and Output

## 8.4 Device Functional Modes

**Table 8-1. Function Table**

INPUTS <sup>(1)</sup>			OUTPUT
CLR	CLK	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Qo

(1) H = High Voltage Level, L = Low Voltage Level, X = Do not Care, Z = High Impedance

## 9 Application and Implementation

### Note

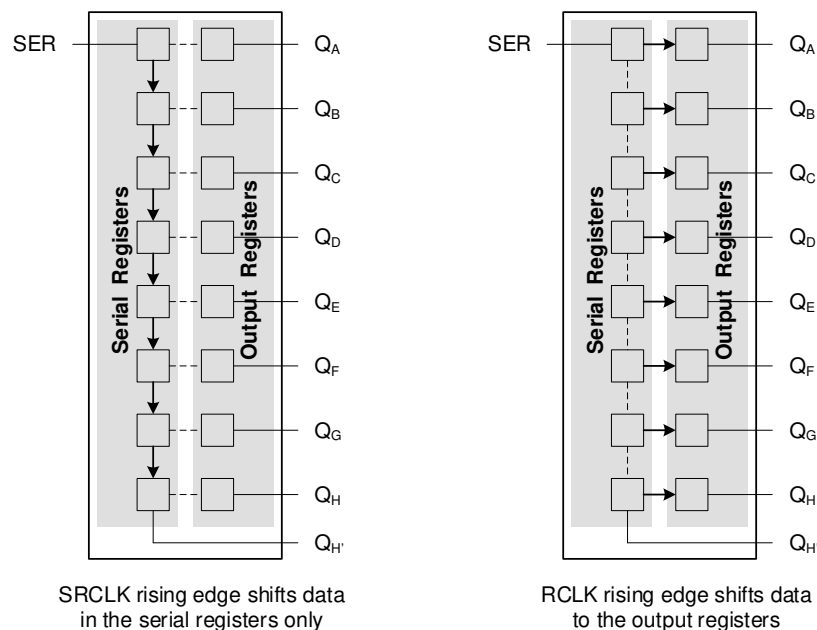
Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation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

### 9.1 Application Information

The SN74LV174A is a low-drive CMOS device that can be used for a multitude of bus interface type applications where output ringing is a concern. The low drive and slow edge rates will minimize overshoot and undershoot on the outputs. The inputs are 5-V tolerant allowing for down translation to  $V_{CC}$ .

### 9.2 Typical Application

#### 9.2.1 Application Curves



**Figure 9-1. Simplified Functional Diagram Showing Clock Operation**

### 9.3 Power Supply Recommendations

The power supply can be any voltage between the min and max supply voltage rating located in [Section 6.3](#).

Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1  $\mu\text{F}$  capacitor is recommended. If there are multiple  $V_{CC}$  terminals then 0.01  $\mu\text{F}$  or 0.022  $\mu\text{F}$  capacitors are recommended for each power terminal. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. 0.1  $\mu\text{F}$  and 1.0  $\mu\text{F}$  capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for the best results.

### 9.4 Layout

#### 9.4.1 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 unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of

digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or VCC, whichever makes more sense for the logic function or is more convenient.

## 10 Device and Documentation Support

### 10.1 Documentation Support

#### 10.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, [CMOS Power Consumption and Cpd Calculation application report](#)
- Texas Instruments, [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices application report](#)

### 10.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](http://ti.com). Click on *Subscribe to updates* 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.

### 10.3 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.

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### 10.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 10.5 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.

### 10.6 Glossary

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

## 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.



**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
SN74LV174AD	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	-40 to 85	LV174A	
SN74LV174ADGVR	ACTIVE	TVSOP	DGV	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LV174A	Samples
SN74LV174ADR	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	LV174A	Samples
SN74LV174ANSR	ACTIVE	SOP	NS	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	74LV174A	Samples
SN74LV174APW	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI	-40 to 85	LV174A	
SN74LV174APWR	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 85	LV174A	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 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.

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**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
SN74LV174ADGVR	TVSOP	DGV	16	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74LV174ADR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74LV174ANSR	SOP	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74LV174APWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LV174APWR	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)
SN74LV174ADGVR	TVSOP	DGV	16	2000	356.0	356.0	35.0
SN74LV174ADR	SOIC	D	16	2500	353.0	353.0	32.0
SN74LV174ANSR	SOP	NS	16	2000	356.0	356.0	35.0
SN74LV174APWR	TSSOP	PW	16	2000	356.0	356.0	35.0
SN74LV174APWR	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.



4220204/A 02/2017

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. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

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.





DGV (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194



# PACKAGE OUTLINE

## NS0016A

### SOP - 2.00 mm max height

SOP



4220735/A 12/2021

#### NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.

# EXAMPLE BOARD LAYOUT

NS0016A

SOP - 2.00 mm max height

SOP



4220735/A 12/2021

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

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:7X

4220735/A 12/2021

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.

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