









SN54HC174, SN74HC174 SCLS119E - DECEMBER 1982 - REVISED FEBRUARY 2022

# SNx4HC174 Hex D-Type Flip-Flops with Clear

#### 1 Features

- Wide operating voltage range of 2 V to 6 V
- Outputs can drive up to 10 LSTTL loads
- Low power consumption, 80-µA max I<sub>CC</sub>
- Typical  $t_{pd}$  = 14 ns
- ±4-mA output drive at 5 V
- Low input current of 1 µA max
- Contain six flip-flops with single-rail

## 2 Applications

- Buffer/storage registers
- Shift registers
- Pattern generators

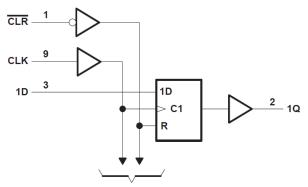
## 3 Description

The SNx4HC174 contains six positive-edge-triggered D-type flip-flops with shared clock (CLK) and clear (CLR) inputs.

#### **Device Information**

PART NUMBER	PACKAGE <sup>(1)</sup>	BODY SIZE (NOM)
SN74HC174D	SOIC (16)	9.90 mm × 3.90 mm
SN74HC174DB	SSOP (16)	6.20 mm × 5.30 mm
SN74HC174N	PDIP (16)	19.31 mm × 6.35 mm
SN74HC174NS	SO (16)	6.20 mm × 5.30 mm
SN74HC174PW	TSSOP (16)	5.00 mm × 4.40 mm
SN54HC174J	CDIP (16)	24.38 mm × 6.92 mm
SNJ54HC174FK	LCCC (20)	8.89 mm × 8.45 mm
SNJ54HC174W	CFP (16)	10.16 mm × 6.73 mm

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



To Five Other Channels

**Functional Block Diagram** 



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## **4 Revision History**

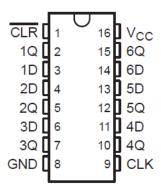
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

## Changes from Revision D (September 2003) to Revision E (February 2022)

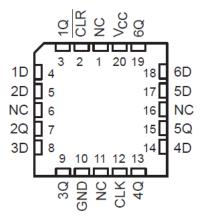
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## **5 Pin Configuration and Functions**



J, W, D, DB, N, NS, or PW Package 16-Pin CDIP, CFP, SOIC, SSOP, PDIP, SO, TSSOP Top View



NC - No internal connection

FK Package 20-Pln LCCC Top View



## **6 Specifications**

## **6.1 Absolute Maximum Ratings**

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

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range		-0.5	7	V
I <sub>IK</sub>	Input clamp current <sup>(2)</sup>	$V_I < 0$ or $V_I > V_{CC}$		±20	mA
I <sub>OK</sub>	Output clamp current <sup>(2)</sup>	$V_O < 0$ or $V_O > V_{CC}$		±20	mA
Io	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>J</sub>	Junction temperature			150	°C
T <sub>stg</sub>	Storage temperature		<b>–</b> 65	150	°C

<sup>(1)</sup> 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 Section 6.2 is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## **6.2 Recommended Operating Conditions**(1)

			SN	54HC174		SN	74HC174		LINUT	
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT	
V <sub>CC</sub>	Supply voltage		2	5	6	2	5	6	V	
		V <sub>CC</sub> = 2 V	1.5			1.5				
$V_{IH}$	High-level input voltage	V <sub>CC</sub> = 4.5 V	3.15			3.15			V	
		V <sub>CC</sub> = 6 V	4.2			4.2				
		V <sub>CC</sub> = 2 V			0.5			0.5		
$V_{IL}$	Low-level input voltage	V <sub>CC</sub> = 4.5 V			1.35			1.35	V	
		V <sub>CC</sub> = 6 V			1.8			1.8		
VI	Input voltage		0		V <sub>CC</sub>	0		V <sub>CC</sub>	V	
Vo	Output voltage		0		V <sub>CC</sub>	0		V <sub>CC</sub>	V	
		V <sub>CC</sub> = 2 V			1000			1000		
Δt/Δν	Input transition rise/fall time	V <sub>CC</sub> = 4.5 V			500			500	ns	
		V <sub>CC</sub> = 6 V			400			400		
T <sub>A</sub>	Operating free-air temperatu	re	-55		125	-40		85	°C	

<sup>(1)</sup> All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

## **6.3 Thermal Information**

	THERMAL METRIC		DB (SSOP)	N (PDIP)	NS (SO)	PW (TSSOP)	
THERMAL I	METRIC	16 PINS	16 PINS	16 PINS	16 PINS	16 PINS	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance <sup>(1)</sup>	73	82	67	64	108	°C/W

<sup>(1)</sup> For more information about traditional and new thermal metrics, see the Semiconductor and IC package thermal metrics application report.

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<sup>(2)</sup> The input and output voltage ratings may be exceeded if the input and output current ratings are observed.



### **6.4 Electrical Characteristics**

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

PARAMETER	TEST	V AA	T	<sub>A</sub> = 25°C		SN54HC	174	SN74HC	174	UNIT
PARAMETER	CONDITIONS <sup>(1)</sup>	V <sub>CC</sub> (V)	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNII
		2	1.9	1.998		1.9		1.9		
	I <sub>OH</sub> = -20 μA	4.5	4.4	4.499		4.4		4.4		
$V_{OH}$		6 V	5.9	5.999		5.9		5.9		V
	I <sub>OH</sub> = -4 mA	4.5	3.98	4.3		3.7		3.84		
	I <sub>OH</sub> = −5.2 mA	6	5.48	5.8		5.2		5.34		
		2		0.002	0.1		0.1		0.1	
	I <sub>OL</sub> = 20 μA	4.5		0.001	0.1		0.1		0.1	
$V_{OL}$		6		0.001	0.1		0.1		0.1	V
	I <sub>OL</sub> = 4 mA	4.5		0.17	0.26		0.4		0.33	
	I <sub>OL</sub> = 5.2 mA	6		0.15	0.26		0.4		0.33	
I <sub>I</sub>	$V_I = V_{CC}$ or 0	6		±0.1	±100		±1000		±1000	nA
I <sub>CC</sub>	$V_I = V_{CC}$ or 0, $I_O$ = 0	6			8		160		80	μΑ
C <sub>i</sub>		2 to 6		3	10		10		10	pF

<sup>(1)</sup>  $V_I = V_{IH}$  or  $V_{IL}$ , unless otherwise noted.

## 6.5 Timing Requirements

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

	oonimended operating ne	·		T <sub>A</sub> = 25		SN54HC	174	SN74HC	174	
			V <sub>CC</sub> (V)	MIN	MAX	MIN	MAX	MIN	MAX	UNIT
			2		6		4.2		5	
f <sub>clock</sub>	Clock frequency		4.5		31		21		25	MHz
			6		36		25		29	
			2	80		120		100		
		CLR low	4.5	16		24		20		
	Pulse duration		6	14		20		17		no
t <sub>w</sub>	Puise duration	CLK high or low	2	80		120		100		ns
			4.5	16		24		20		
			6	14		20		17		
			2	100		150		125		
		Data	4.5	20		30		25		
	Setup time before CLK↑		6	17		25		21		ns
t <sub>su</sub>	Setup time before CLK		2	100		150		125		115
		CLR inactive	4.5	20		30		25		
				17		25		21		
		Hold time, data after CLK↑		0		0		0		
t <sub>h</sub>	Hold time, data after CLK			0		0		0		ns
		, - 1				0		0		



## **6.6 Switching Characteristics**

over recommended operating free-air temperature range, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Section 7)

PARAMETER	FROM	то	V 00	TA	= 25°C		SN54HC	174	SN74HC	174	UNIT				
PARAMETER	(INPUT)	(OUTPUT)	V <sub>CC</sub> (V)	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT				
			2	6	9		4.2		5						
f <sub>max</sub>			4.5	31	44		21		25		MHz				
			6	36	50		25		29						
			2		58	160		240		200					
	CLR	Any	4.5		17	32		48		40					
			6		14	27		41		34	no				
t <sub>pd</sub>							2		58	160		240		200	ns
	CLK	Any	4.5		17	32		48		40					
			6		14	27		41		34					
	t <sub>t</sub>		2		38	75		110		90					
t <sub>t</sub>						Any	4.5		8	15		22		19	ns
			6		6	13		19		16					

# **6.7 Operating Characteristics**

T<sub>a</sub> = 25°C

	PARAMETER	TEST CONDITIONS	TYP	UNIT
C <sub>pd</sub>	Power dissipation capacitance per flip-flop	No load	27	pF

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### 7 Parameter Measurement Information

 $t_{\text{pd}}$  is the maximum between  $t_{\text{PLH}}$  and  $t_{\text{PHL}}$ 

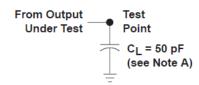


Figure 7-1. Load Circuit

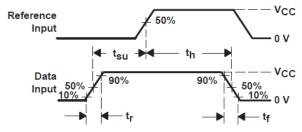


Figure 7-3. Voltage Waveforms
Setup and Hold and Input Rise and Fall Times

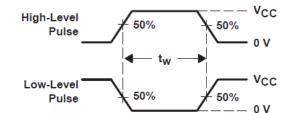


Figure 7-2. Voltage Waveforms
Pulse Durations

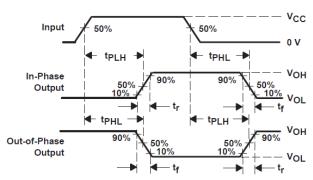


Figure 7-4. Voltage Waveforms
Propagation Delay and Output Transition Times

- A. C<sub>1</sub> includes probe and jig capacitance.
- B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following charactersitics: PRR  $\leq$  1 MHz,  $Z_O$  = 50  $\Omega$ ,  $t_r$  = 6 ns,  $t_f$  = 6 ns.
- C. For clock inputs,  $f_{\text{max}}$  is measured when the input duty cycle is 50%
- D. The outputs are measured one at a time with one input transition per measurement.

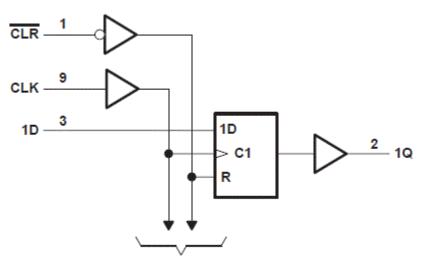
## **8 Detailed Description**

## 8.1 Overview

These positive-edge-triggered D-type flip-flops have 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 (CLK) pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going edge of CLK. When CLK is at either the high or low level, the D input has no effect at the output.

### 8.2 Functional Block Diagram



To Five Other Channels

Pin numbers shown are for the D, DB, J, N, NS, PW, and W packages.

### 8.3 Device Functional Modes

Table 8-1. Function Table (each flip-flop)

	INPUTS		OUTPUT Q
CLR	CLK	D	OUTFUT
L	Х	Х	L
Н	1	Н	Н
Н	1	L	L
Н	L	Х	Q <sub>0</sub>



## 9 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 caps 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.

## 10 Layout

### 10.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices inputs must not ever be left floating. 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 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  $V_{CC}$ , whichever makes more sense for the logic function or is more convenient.



## 11 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.

### 11.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on 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.

#### 11.2 Support Resources

TI E2E<sup>™</sup> 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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#### 11.3 Trademarks

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### 11.4 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.

### 11.5 Glossary

TI Glossary

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

## 12 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.

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## **PACKAGING INFORMATION**

Orderable part number	Status (1)	Material type	Package   Pins	Package qty   Carrier	<b>RoHS</b> (3)	Lead finish/ Ball material	MSL rating/ Peak reflow	Op temp (°C)	Part marking (6)
84073012A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	84073012A SNJ54HC 174FK
8407301EA	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8407301EA SNJ54HC174J
8407301FA	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8407301FA SNJ54HC174W
JM38510/65307BEA	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 65307BEA
JM38510/65307BEA.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 65307BEA
M38510/65307BEA	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	JM38510/ 65307BEA
SN54HC174J	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54HC174J
SN54HC174J.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	SN54HC174J
SN74HC174D	Obsolete	Production	SOIC (D)   16	-	=	Call TI	Call TI	-40 to 85	HC174
SN74HC174DBR	Active	Production	SSOP (DB)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC174
SN74HC174DBR.A	Active	Production	SSOP (DB)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC174
SN74HC174DR	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 85	HC174
SN74HC174DR.A	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC174
SN74HC174DRG4	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC174
SN74HC174DRG4.A	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC174
SN74HC174N	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HC174N
SN74HC174N.A	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HC174N
SN74HC174NE4	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HC174N
SN74HC174NSR	Active	Production	SOP (NS)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC174
SN74HC174NSR.A	Active	Production	SOP (NS)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC174
SN74HC174PW	Obsolete	Production	TSSOP (PW)   16	-	-	Call TI	Call TI	-40 to 85	HC174
SN74HC174PWR	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 85	HC174
SN74HC174PWR.A	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC174
SN74HC174PWRG4	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC174



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Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	(3)	Lead finish/ Ball material	MSL rating/ Peak reflow	Op temp (°C)	Part marking (6)
SN74HC174PWRG4.A	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	(4) NIPDAU	(5) Level-1-260C-UNLIM	-40 to 85	HC174
SNJ54HC174FK	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	84073012A SNJ54HC 174FK
SNJ54HC174FK.A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	84073012A SNJ54HC 174FK
SNJ54HC174J	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8407301EA SNJ54HC174J
SNJ54HC174J.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8407301EA SNJ54HC174J
SNJ54HC174W	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8407301FA SNJ54HC174W
SNJ54HC174W.A	Active	Production	CFP (W)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	8407301FA SNJ54HC174W

<sup>(1)</sup> 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.

<sup>(2)</sup> 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.

<sup>(3)</sup> RoHS values: Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

<sup>(4)</sup> 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.

<sup>(5)</sup> 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.

<sup>(6)</sup> 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**

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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 SN54HC174, SN74HC174:

Catalog: SN74HC174

Military: SN54HC174

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Military QML certified for Military and Defense Applications





## TAPE AND REEL INFORMATION

**INSTRUMENTS** 





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
SN74HC174DBR	SSOP	DB	16	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74HC174DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC174DRG4	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC174NSR	SOP	NS	16	2000	330.0	16.4	8.1	10.4	2.5	12.0	16.0	Q1
SN74HC174PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HC174PWRG4	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1



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\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC174DBR	SSOP	DB	16	2000	353.0	353.0	32.0
SN74HC174DR	SOIC	D	16	2500	353.0	353.0	32.0
SN74HC174DRG4	SOIC	D	16	2500	353.0	353.0	32.0
SN74HC174NSR	SOP	NS	16	2000	353.0	353.0	32.0
SN74HC174PWR	TSSOP	PW	16	2000	356.0	356.0	35.0
SN74HC174PWRG4	TSSOP	PW	16	2000	353.0	353.0	32.0



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## **TUBE**



\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
84073012A	FK	LCCC	20	55	506.98	12.06	2030	NA
8407301FA	W	CFP	16	25	506.98	26.16	6220	NA
SN74HC174N	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC174N	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC174N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC174N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC174NE4	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC174NE4	N	PDIP	16	25	506	13.97	11230	4.32
SNJ54HC174FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54HC174FK.A	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54HC174W	W	CFP	16	25	506.98	26.16	6220	NA
SNJ54HC174W.A	W	CFP	16	25	506.98	26.16	6220	NA



SOP



- 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.



SOF



## 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.



SOF



#### 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.



# D (R-PDS0-G16)

## PLASTIC SMALL OUTLINE



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- 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.
- 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.







- 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. Reference JEDEC registration MO-150.





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.





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.



# W (R-GDFP-F16)

## CERAMIC DUAL FLATPACK



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only.
- E. Falls within MIL STD 1835 GDFP2-F16



8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

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



**INSTRUMENTS** www.ti.com

### 14 LEADS SHOWN



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package is hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.





- 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.





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.



# N (R-PDIP-T\*\*)

## PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
- The 20 pin end lead shoulder width is a vendor option, either half or full width.



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