

SNx4HC175 具有清零功能的四路 D 型触发器

1 特性

- 2V 至 6V 的宽工作电压范围
- 输出可驱动多达 10 个 LSTTL 负载
- 低功耗， I_{CC} 最大值为 80 μ A
- 包含四个具有双轨输出的触发器
- t_{pd} 典型值 = 13ns
- ± 4 mA 输出驱动 (在 5 V 时)
- 低输出电流，最大值 1 μ A

2 应用

- 缓冲/存储寄存器
- 移位寄存器
- 图形发生器

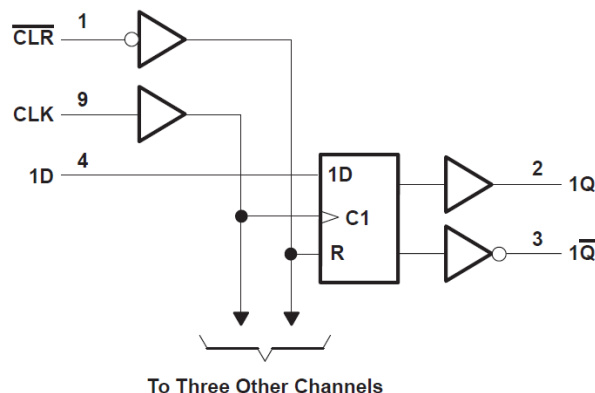
3 说明

这些正边沿触发式 D 型触发器具有直接清零 (\overline{CLR}) 输入。' HC175 器件具有来自每个触发器的互补输出。

器件信息

器件型号	封装 ⁽¹⁾	封装尺寸 (标称值)
SN54HC175J	CDIP (16)	24.38mm × 6.92mm
SN74HC175D	SOIC (16)	9.90mm × 3.90mm
SN74HC175DBR	SSOP (16)	6.20mm × 5.30mm
SN74HC175N	PDIP (16)	19.31mm × 6.35mm
SN74HC175NSR	SO (16)	6.20mm × 5.30mm
SN74HC175PW	TSSOP (16)	5.00mm × 4.40mm
SNJ54HC175FK	LCCC (20)	8.89mm × 8.45mm
SNJ54HC175W	CFP (16)	10.16mm × 6.73mm

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。



所示引脚编号用于 D、DB、J、N、NS、PW 和 W 封装。

功能方框图



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4 Revision History

注：以前版本的页码可能与当前版本的页码不同

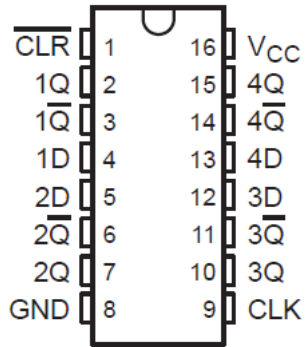
Changes from Revision E (February 2022) to Revision F (June 2022) Page

- Junction-to-ambient thermal resistance values increased. D was 73 is now 117.2, DB was 67 is now 102.7, N was 82 is now 60.5, NS was 64 is now 88.6, PW was 108 is now 137.5..... 4

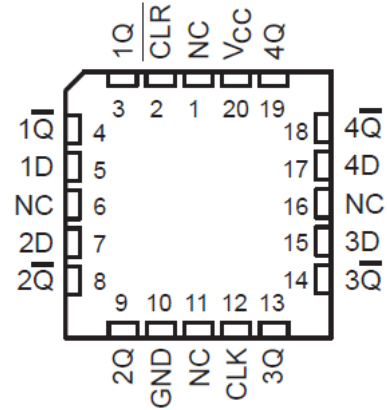
Changes from Revision D (September 2003) to Revision E (February 2022) Page

- 更新了整个文档中的编号、格式、表格、图和交叉参考，以反映现代数据表标准..... 1

5 Pin Configuration and Functions



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



NC - No internal connection

FK Package
20-Pin LCCC
Top View

6 Specifications

6.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V _{CC}	Supply voltage range	-0.5	7	V
I _{IK}	Input clamp current ⁽²⁾	V _I < 0 or V _I > V _{CC}		±20 mA
I _{OK}	Output clamp current ⁽²⁾	V _O < 0 or V _O > V _{CC}		±20 mA
I _O	Continuous output current	V _O = 0 to V _{CC}		±25 mA
	Continuous current through V _{CC} or GND			±50 mA
T _J	Junction temperature			150 °C
T _{stg}	Storage temperature range	-65	150	°C

- (1) Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

6.2 Recommended Operating Conditions⁽¹⁾

		SN54HC175			SN74HC175			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	2	5	6	2	5	6	V
V _{IH}	High-level input voltage	V _{CC} = 2 V	1.5		1.5		V	
		V _{CC} = 4.5 V	3.15		3.15			
		V _{CC} = 6 V	4.2		4.2			
V _{IL}	Low-level input voltage	V _{CC} = 2 V	0.5		0.5		V	
		V _{CC} = 4.5 V	1.35		1.35			
		V _{CC} = 6 V	1.8		1.8			
V _I	Input voltage	0	V _{CC}		0	V _{CC}		V
V _O	Output voltage	0	V _{CC}		0	V _{CC}		V
t _t	Input transition rise/fall time	V _{CC} = 2 V	1000		1000		ns	
		V _{CC} = 4.5 V	500		500			
		V _{CC} = 6 V	400		400			
T _A	Operating free-air temperature	-55	125		-40	85		°C

- (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number [SCBA004](#).

6.3 Thermal Information

THERMAL METRIC		D (SOIC)	DB (SSOP)	N (PDIP)	NS (SO)	PW (TSSOP)	UNIT
		16 PINS	16 PINS	16 PINS	16 PINS	16 PINS	
R _{θJA}	Junction-to-ambient thermal resistance ⁽¹⁾	117.2	102.7	60.5	88.6	137.5	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	77.2	48.6	48	46.2	75.3	°C/W
R _{θJB}	Junction-to-board thermal resistance	75.6	54.4	40.5	50.8	82.2	°C/W
ψ _{JT}	Junction-to-top characterization parameter	38.1	11.6	27.4	13.4	25.1	°C/W
ψ _{JB}	Junction-to-board characterization parameter	75.3	53.6	40.3	50.4	81.8	°C/W

6.3 Thermal Information (continued)

THERMAL METRIC		D (SOIC)	DB (SSOP)	N (PDIP)	NS (SO)	PW (TSSOP)	UNIT
		16 PINS	16 PINS	16 PINS	16 PINS	16 PINS	
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	N/A	N/A	°C/W

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

6.4 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS		V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC175		SN74HC175		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$V_I = V_{IH}$ or V_{IL}	$I_{OH} = -20 \mu\text{A}$	2 V	1.9	1.998		1.9		1.9	V	
			4.5 V	4.4	4.499		4.4		4.4		
			6 V	5.9	5.999		5.9		5.9		
		$I_{OH} = -4 \text{ mA}$	4.5 V	3.98	4.3		3.7		3.84		
			6 V	5.48	5.8		5.2		5.34		
V_{OL}	$V_I = V_{IH}$ or V_{IL}	$I_{OL} = 20 \mu\text{A}$	2 V		0.002	0.1		0.1		0.1	V
			4.5 V		0.001	0.1		0.1		0.1	
			6 V		0.001	0.1		0.1		0.1	
		$I_{OL} = 4 \text{ mA}$	4.5 V		0.17	0.26		0.4		0.33	
			6 V		0.15	0.26		0.4		0.33	
I_I	$V_I = V_{CC}$ or 0		6 V		± 0.1	± 100		± 1000		± 1000	nA
I_{CC}	$V_I = V_{CC}$ or 0, $I_O = 0$		6 V				8	160	80	μA	
C_i			2 V to 6 V		3	10		10	10	pF	

6.5 Timing Requirements

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

		V_{CC}	$T_A = 25^\circ\text{C}$		SN54HC175		SN74HC175		UNIT	
			MIN	MAX	MIN	MAX	MIN	MAX		
f_{clock}	Clock frequency	2 V		6		4.2		5	MHz	
		4.5 V		31		21		25		
		6 V		36		25		29		
t_w	Pulse duration	CLR low	2 V		80		120		100	ns
			4.5 V		16		24		20	
			6 V		14		20		17	
		CLK high or low	2 V		80		120		100	
			4.5 V		16		24		20	
			6 V		14		20		17	
t_{su}	Setup time before CLK ↑	Data	2 V		100		150		125	ns
			4.5 V		20		30		25	
			6 V		17		25		21	
		CLR inactive	2 V		100		150		125	
			4.5 V		20		30		25	
			6 V		17		25		21	

6.5 Timing Requirements (continued)

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

		V _{CC}	T _A = 25°C		SN54HC175		SN74HC175		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t _h	Hold time, data after CLK ↑	2 V	0		0		0		ns
		4.5 V	0		0		0		
		6 V	0		0		0		

6.6 Switching Characteristics

over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see [Parameter Measurement Information](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C			SN54HC175		SN74HC175		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{max}			2 V	6	12		4.2		5	MHz	
			4.5 V	31	50		21		25		
			6 V	36	60		25		29		
t _{pd}	CLR	Any	2 V		52	150		255		190	ns
			4.5 V		15	30		45		38	
			6 V		13	26		38		32	
	CLK	Any	2 V		58	150		255		190	
			4.5 V		16	30		45		38	
			6 V		13	26		38		32	
t _t		Any	2 V		38	75		110		90	ns
			4.5 V		8	15		22		19	
			6 V		6	13		19		16	

6.7 Operating Characteristics

T_A = 25°C

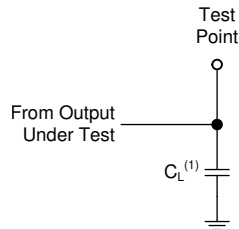
PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd}	Power dissipation capacitance per flip-flop	No load	30 pF

7 Parameter Measurement Information

Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_t < 6 \text{ ns}$.

For clock inputs, f_{max} is measured when the input duty cycle is 50%.

The outputs are measured one at a time with one input transition per measurement.



(1) C_L includes probe and test-fixture capacitance.

图 7-1. Load Circuit for Push-Pull Outputs

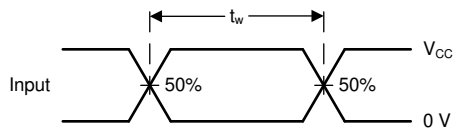


图 7-2. Voltage Waveforms, Standard CMOS Inputs Pulse Duration

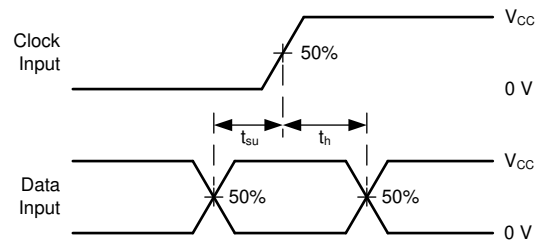
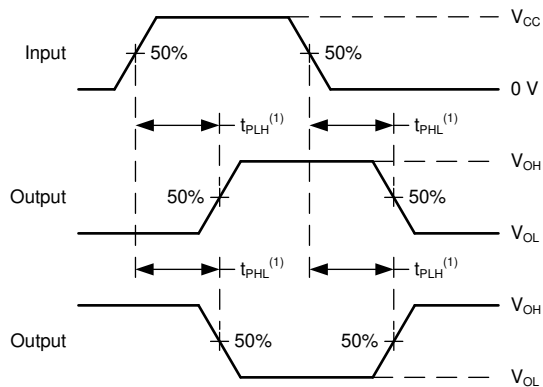
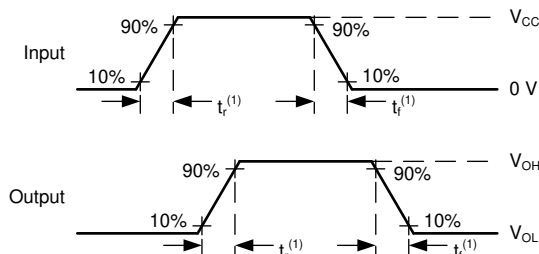


图 7-3. Voltage Waveforms, Standard CMOS Inputs Setup and Hold Times



(1) The greater between t_{PLH} and t_{PHL} is the same as t_{pd} .

图 7-4. Voltage Waveforms, Propagation Delays for Standard CMOS Inputs



(1) The greater between t_r and t_f is the same as t_t .

图 7-5. Voltage Waveforms, Input and Output Transition Times for Standard CMOS Inputs

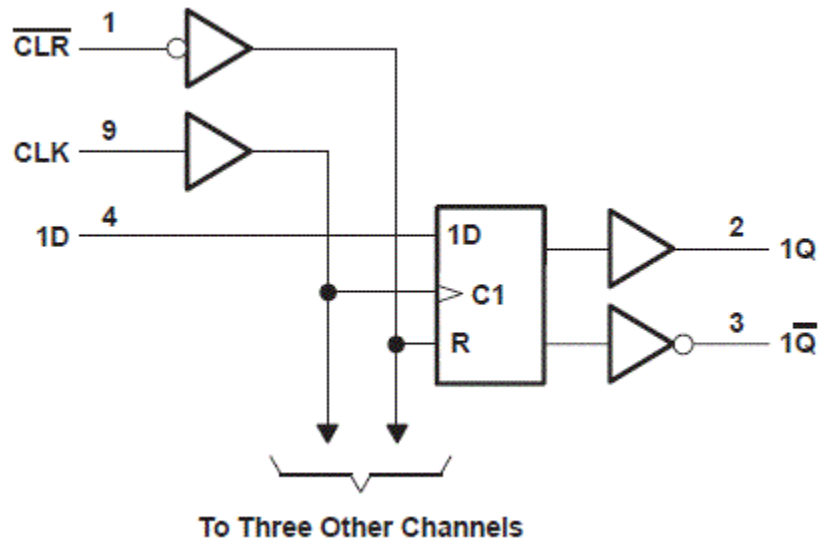
8 Detailed Description

8.1 Overview

These positive-edge-triggered D-type flip-flops have a direct clear ($\overline{\text{CLR}}$) input. The ' HC175 devices feature complementary outputs from each flip-flop.

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 related directly 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



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

8.3 Device Functional Modes

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

INPUTS			OUTPUTS	
$\overline{\text{CLR}}$	CLK	D	Q	$\overline{\text{Q}}$
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	L	X	Q_0	\overline{Q}_0

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- μ F capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1- μ F and 1- μ 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 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。点击 [订阅更新](#) 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

11.2 支持资源

TI E2E™ [支持论坛](#) 是工程师的重要参考资料，可直接从专家获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题可获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的 [《使用条款》](#)。

11.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

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 术语表

[TI 术语表](#) 本术语表列出并解释了术语、首字母缩略词和定义。

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.

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
84089012A	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	84089012A SNJ54HC 175FK	Samples
8408901EA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8408901EA SNJ54HC175J	Samples
8408901FA	ACTIVE	CFP	W	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8408901FA SNJ54HC175W	Samples
JM38510/65308BEA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65308BEA	Samples
M38510/65308BEA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 65308BEA	Samples
SN54HC175J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54HC175J	Samples
SN74HC175D	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC175	Samples
SN74HC175DBR	ACTIVE	SSOP	DB	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC175	Samples
SN74HC175DG4	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC175	Samples
SN74HC175DR	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 85	HC175	Samples
SN74HC175N	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC175N	Samples
SN74HC175NE4	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC175N	Samples
SN74HC175NSR	ACTIVE	SO	NS	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC175	Samples
SN74HC175PW	ACTIVE	TSSOP	PW	16	90	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC175	Samples
SN74HC175PWR	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC175	Samples
SNJ54HC175FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	84089012A SNJ54HC 175FK	Samples
SNJ54HC175J	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8408901EA SNJ54HC175J	Samples

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
SNJ54HC175W	ACTIVE	CFP	W	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	8408901FA SNJ54HC175W	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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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 SN54HC175, SN74HC175 :

- Catalog : [SN74HC175](#)
- Military : [SN54HC175](#)

NOTE: Qualified Version Definitions:

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

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
SN74HC175DBR	SSOP	DB	16	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74HC175DR	SOIC	D	16	2500	330.0	16.4	6.6	9.3	2.1	8.0	16.0	Q1
SN74HC175DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC175DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC175NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74HC175PWR	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)
SN74HC175DBR	SSOP	DB	16	2000	356.0	356.0	35.0
SN74HC175DR	SOIC	D	16	2500	366.0	364.0	50.0
SN74HC175DR	SOIC	D	16	2500	340.5	336.1	32.0
SN74HC175DR	SOIC	D	16	2500	356.0	356.0	35.0
SN74HC175NSR	SO	NS	16	2000	356.0	356.0	35.0
SN74HC175PWR	TSSOP	PW	16	2000	356.0	356.0	35.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
84089012A	FK	LCCC	20	1	506.98	12.06	2030	NA
8408901FA	W	CFP	16	1	506.98	26.16	6220	NA
SN74HC175D	D	SOIC	16	40	507	8	3940	4.32
SN74HC175DG4	D	SOIC	16	40	507	8	3940	4.32
SN74HC175N	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC175N	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC175NE4	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC175NE4	N	PDIP	16	25	506	13.97	11230	4.32
SN74HC175PW	PW	TSSOP	16	90	530	10.2	3600	3.5
SNJ54HC175FK	FK	LCCC	20	1	506.98	12.06	2030	NA
SNJ54HC175W	W	CFP	16	1	506.98	26.16	6220	NA

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK

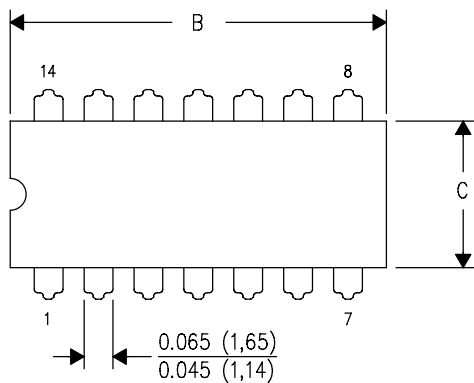


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within MIL STD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

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

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

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- 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.



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.

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a metal lid.
 - Falls within JEDEC MS-004

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4040047-6/M 06/11

- 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.

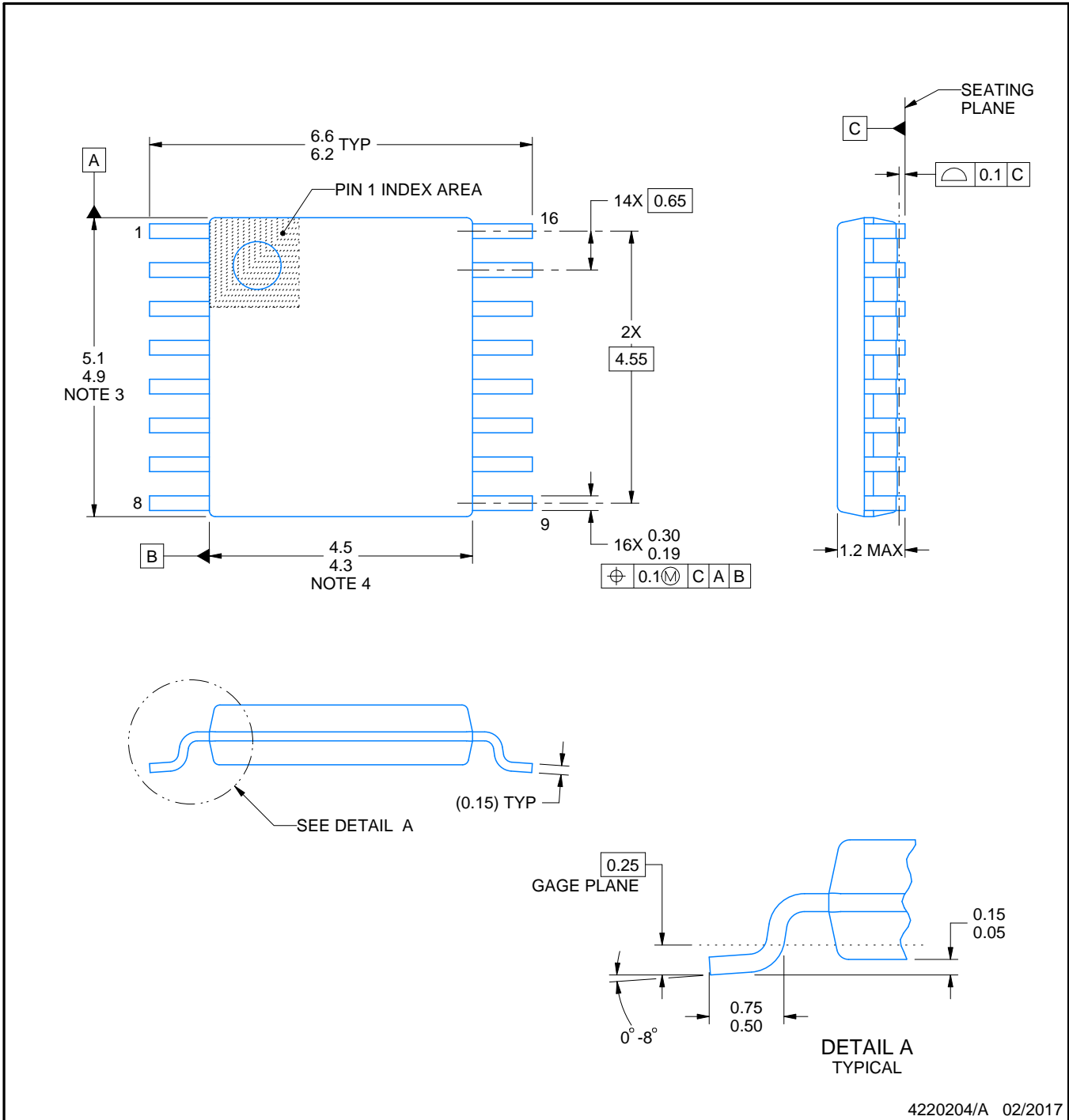
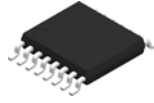
D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4211283-4/E 08/12

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



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)

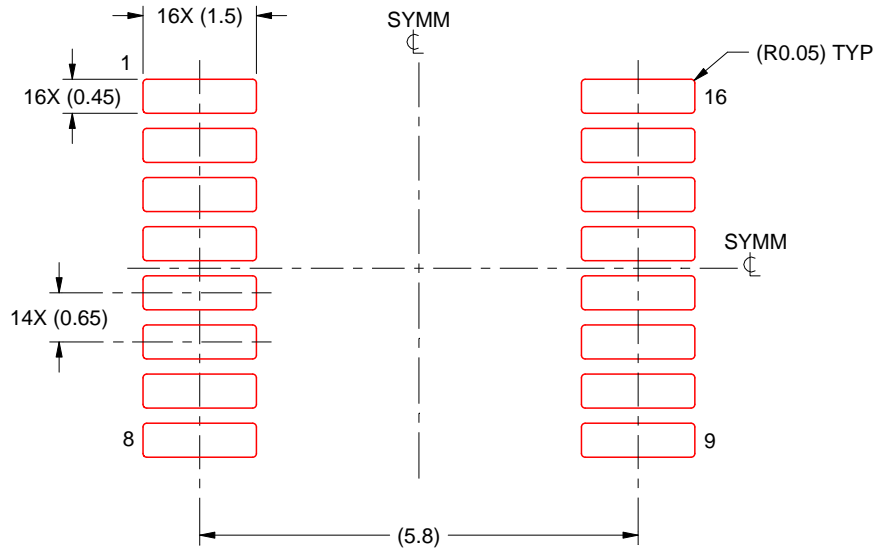
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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.

DB0016A



PACKAGE OUTLINE

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



4220763/A 05/2022

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. Reference JEDEC registration MO-150.

EXAMPLE BOARD LAYOUT

DB0016A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220763/A 05/2022

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

DB0016A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220763/A 05/2022

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.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-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.

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