CDx4HC173, CDx4HCT173 High-Speed CMOS Logic Quad D-Type Flip-Flop, Three-State

1 Features

- Three-state buffered outputs
- Gated input and output enables
- Fanout (over temperature range)
  - Standard outputs : 10 LSTTL loads
  - Bus driver outputs : 15 LSTTL loads
- Wide Operating Temperature Range : -55°C to 125°C
- Balanced propagation delay and transition times
- Significant power and reduction compared to LSTTL logic ICs
- HC types
  - 2 V to 6 V operation
  - High noise immunity: N_{IL} = 30%, N_{IH} = 30% of V_{CC} at V_{CC} = 5 V
- HCT types
  - 4.5 V to 5.5 V Operation
  - Direct LSTTL input logic compatibility, V_{IL}= 0.8 V (Max), V_{IH} = 2 V (Min)
  - CMOS input compatibility, $I_I \leq 1\mu A$ at V_{OL}, V_{OH}

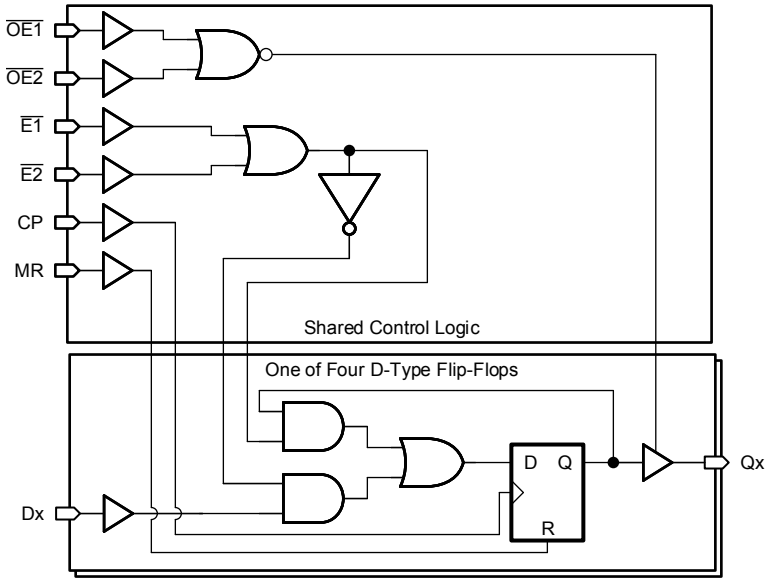
2 Description

The CDx4HC173 and CDx4HCT173 contains four independent D-type flip-flops with shared clock (CP), reset (MR), and data enable ($\overline{E1}$, $\overline{E2}$) pins.

Device Information

PART NUMBER	PACKAGE(1)	BODY SIZE (NOM)
CD54HC173F	CDIP (16)	21.34 mm × 6.92 mm
CD54HCT173F3A	CDIP (16)	21.34 mm × 6.92 mm
CD74HC173E	PDIP (16)	19.31mm × 6.35 mm
CD74HCT173E	PDIP (16)	19.31mm × 6.35 mm
CD74HC173M	SOIC (16)	9.90 mm × 3.90 mm
CD74HCT173M	SOIC (16)	9.90 mm × 3.90 mm
CD74HC173PW	TSSOP (16)	5.00 mm × 4.40 mm

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



Functional Block Diagram

An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.

Table of Contents

1 Features....1
2 Description....1
3 Revision History....2
4 Pin Configuration and Functions....3
5 Specifications....4
5.1 Absolute Maximum Ratings....4
5.2 Recommended Operating Conditions....4
5.3 Thermal Information....4
5.4 Electrical Characteristics....5
5.5 Switching Characteristics....6
5.6 Prerequisite For Switching Characteristics....7
6 Parameter Measurement Information....8
7 Detailed Description....10
7.1 Overview....10
7.2 Functional Block Diagram....10
7.3 Device Functional Modes....11
8 Power Supply Recommendations....12
9 Layout....12
9.1 Layout Guidelines....12
10 Device and Documentation Support....13
10.1 Documentation Support....13
10.2 Receiving Notification of Documentation Updates....13
10.3 Support Resources....13
10.4 Trademarks....13
10.5 Electrostatic Discharge Caution....13
10.6 Glossary....13
11 Mechanical, Packaging, and Orderable Information....13

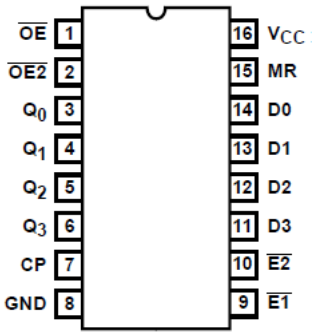
3 Revision History

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

Changes from Revision E (October 2003) to Revision F (March 2022)	Page
• Updated the numbering, formatting, tables, figures, and cross-references throughout the document to reflect modern data sheet standards	1

Copyright © 2022 Texas Instruments Incorporated

4 Pin Configuration and Functions



J, N, D, or PW Package
16-Pin CDIP, PDIP, SOIC, or TSSOP
Top View

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	7	V
I_{IK}	Input diode current(2)	$V_I < –0.5$ V or $V_I > V_{CC} + 0.5$ V		±20	mA
I_{OK}	Output diode current(2)	$V_O < –0.5$ V or $V_O > V_{CC} + 0.5$ V		±20	mA
I_O	Output source or sink current per output pin	$V_O > –0.5$ V or $V_O < V_{CC} + 0.5$ V		±25	mA
	Continuous current through V_{CC} or GND			±70	mA
T_J	Junction temperature			150	°C
	Lead temperature (soldering 10s) (SOIC - lead tips only)			300	°C
T_{stg}	Storage temperature		–65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Rating* 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 Condition*. 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.

5.2 Recommended Operating Conditions

			MIN	MAX	UNIT
V_{CC}	Supply voltage range	HC types	2	6	V
		HCT types	4.5	5.5	
V_I	Input voltage		0	V_{CC}	V
V_O	Output voltage		0	V_{CC}	V
t_t	Input rise and fall time	V_{CC} = 2V		1000	ns
		V_{CC} = 4.5V		500	
		V_{CC} = 6V		400	
T_A	Temperature range		-55	125	°C

5.3 Thermal Information

THERMAL METRIC		N (PDIP) 16 PINS	D (SOIC) 16 PINS	NS (SOP) 16 PINS	PW (TSSOP) 16 PINS	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance(1)	67	73	64	108	°C/W

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

Copyright © 2022 Texas Instruments Incorporated

5.4 Electrical Characteristics

PARAMETER		TEST CONDITIONS[1]	V_{CC}	25°C			–40°C to 85°C		–55°C to 125°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HC TYPES											
V_{IH}	High-level input voltage		2	1.5			1.5		1.5		V
			4.5	3.15			3.15		3.15		V
			6	4.2			4.2		4.2		V
V_{IL}	Low-level input voltage		2			0.5		0.5		0.5	V
			4.5			1.35		1.35		1.35	V
			6			1.8		1.8		1.8	V
V_{OH}	High-level output voltage CMOS loads	I_{OH} = – 20µA	2	1.9			1.9		1.9		V
		I_{OH} = – 20µA	4.5	4.4			4.4		4.4		V
		I_{OH} = – 20µA	6	5.9			5.9		5.9		V
	High-level output voltage TTL loads	I_{OH} = – 6mA	4.5	3.98			3.84		3.7		V
		I_{OH} = – 7.8mA	6	5.48			5.34		5.2		V
V_{OL}	Low-level output voltage CMOS loads	I_{OL} = 20µA	2			0.1		0.1		0.1	V
		I_{OL} = 20µA	4.5			0.1		0.1		0.1	V
		I_{OL} = 20µA	6			0.1		0.1		0.1	V
	Low-level output voltage TTL loads	I_{OL} = 6mA	4.5			0.26		0.33		0.4	V
		I_{OL} = 7.8mA	6			0.26		0.33		0.4	V
I_I	Input leakage current	V_{CC} or GND	6			±0.1		±1		±1	µA
I_{CC}	Supply current	V_{CC} or GND	6			8		80		160	µA
I_{OZ}	Three-state leakage current		6			±0.5		±0.5		±10	µA
HCT TYPES											
V_{IH}	High-level input voltage		4.5 to 5.5	2			2		2		V
V_{IL}	Low-level input voltage		4.5 to 5.5			0.8		0.8		0.8	V
V_{OH}	High-level output voltage CMOS loads	I_{OH} = – 20µA	4.5	4.4			4.4		4.4		V
	High-level output voltage TTL loads	I_{OH} = – 6mA	4.5	3.98			3.84		3.7		V
V_{OL}	Low-level output voltage CMOS loads	I_{OL} = 20µA	4.5			0.1		0.1		0.1	V
	Low-level output voltage TTL loads	I_{OL} = 6mA	4.5			0.26		0.33		0.4	V
I_I	Input leakage current	V_{CC} and GND	5.5			±0.1		±1		±1	µA
I_{CC}	Supply Current	V_{CC} and GND	5.5			8		80		160	µA
ΔI_{CC} [2] [3]	Additional supply current per input pin	One of D0-D3	4.5 to 5.5		15	54		67.5		73.5	µA
		One of $\overline{E1}$ and $\overline{E2}$	4.5 to 5.5		15	54		67.5		73.5	µA
		CP	4.5 to 5.5		25	90		112.5		122.5	µA
		MR	4.5 to 5.5		20	72		90		98	µA
		One of $\overline{OE1}$ and $\overline{OE2}$	4.5 to 5.5		50	180		225		245	µA

Copyright © 2022 Texas Instruments Incorporated

PARAMETER		TEST CONDITIONS(1)	V_{CC}	25°C			–40°C to 85°C		–55°C to 125°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
I_{OZ}	Three-state leakage current		5.5			±0.5		±5.0		±10	µA

(1) $V_I = V_{IH}$ or V_{IL}, unless otherwise noted.
(2) For dual-supply systems theoretical worst case (V_I = 2.4 V, V_{CC} = 5.5 V) specification is 1.8 mA.
(3) Inputs held at V_{CC} – 2.1.

5.5 Switching Characteristics

Input t_t = 6ns. Unless otherwise specified, C_L = 50pF

PARAMETER		V_{CC}(V)	25°C		-40°C to 85°C	-55°C to 125°C	UNIT
			TYP	MAX	MAX	MAX	
HC TYPES							
t_{pd}	Propagation delay, clock to output	2		200	250	300	ns
		4.5	17(1)	40	50	60	
		6		34	43	51	
t_{pd}	Propagation delay, MR to output	2		175	220	265	ns
		4.5	12(1)	35	44	53	
		6		30	37	45	
t_{pd}	Propagation delay output enable to Q (Figure 6)	2		150	190	225	ns
		4.5	12(1)	30	38	45	
		6		26	33	38	
t_t	Output transition times	2		60	75	90	ns
		4.5		12	15	18	
		6		10	13	15	
f_{MAX}	Maximum clock frequency	5	60(1)				MHz
C_i	Input capacitance			10	10	10	pF
C_O	Three-state output capacitance			10	10	10	pF
C_{pd} (2) (3)	Power dissipation capacitance	5	29				pF
HCT TYPES							
t_{pd}	Propagation delay, clock to output	4.5	17(1)	40	50	60	ns
t_{pd}	Propagation delay, MR to output	4.5	18(1)	44	55	66	ns
t_{pd}	Propagation delay output enable to Q (Figure 6)	2		150	190	225	ns
		4.5	14(1)	30	38	45	
		6		26	33	38	
t_t	Output transition times	4.5		15	19	22	ns
f_{MAX}	Maximum clock frequency	5	60(1)				MHz
C_i	Input capacitance			10	10	10	pF
C_{pd} (2) (3)	Power dissipation capacitance	5	34				pF

(1) Typical value tested at 5V, C_L = 15pF.
(2) C_{PD} is used to determine th edynamic power consumption, per package.
(3) $P_D = V_{CC}{}^2 f_i + \Sigma (C_L V_{CC}{}^2 + f_O)$ where f_i = Input Frequency, C_L = Output Load Capacitance, V_{CC} = Supply Voltage.

Copyright © 2022 Texas Instruments Incorporated

5.6 Prerequisite For Switching Characteristics

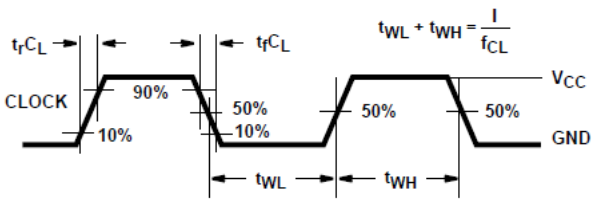
PARAMETER		V_{CC}(V)	25°C		-40°C to 85°C		-55°C to 125°C		UNITS
			MIN	MAX	MIN	MAX	MIN	MAX	
HC TYPES									
f_{MAX}	Maximum clock frequency	2	6		5		4		MHz
		4.5	30		24		20		
		6	35		28		24		
t_W	MR pulse width	2	80		100		120		ns
		4.5	16		20		24		
		6	14		17		20		
t_W	Clock pulse width	2	80		100		120		ns
		4.5	16		20		24		
		6	14		17		20		
t_{SU}	Set-up time, data to clock and $\overline{E}$ to clock	2	60		75		90		ns
		4.5	12		15		18		
		6	10		13		15		
t_H	Hold time, data to clock	2	3		3		3		ns
		4.5	3		3		3		
		6	3		3		3		
t_H	Hold time, $\overline{E}$ to clock	2	0		0		0		ns
		4.5	0		0		0		
		6	0		0		0		
t_{REM}	Removal time, MR to clock	2	60		75		90		ns
		4.5	12		15		18		
		6	10		13		15		
HCT TYPES									
f_{MAX}	Maximum clock frequency	4.5	20		16		13		MHz
$t_W t_W$	MR pulse width	4.5	15		19		22		ns
t_W	Clock pulse width	4.5	25		31		38		ns
t_{SU}	Set-up Time, $\overline{E}$ to clock	4.5	12		15		18		ns
t_{SU}	Set-up time, data to clock	4.5	18		23		27		ns
t_H	Hold time, data to clock	4.5	0		0		0		ns
t_H	Hold time, $\overline{E}$ to clock	4.5	0		0		0		ns
t_{REM}	Removal time, MR to clock	4.5	12		15		18		ns

Copyright © 2022 Texas Instruments Incorporated

6 Parameter Measurement Information

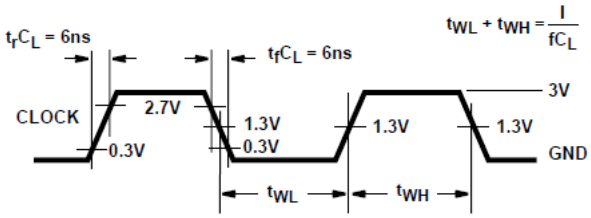
t_{PD} is the maximum between t_{PLH} and t_{PHL}

t_t is the maximum between t_{TLH} and t_{THL}



NOTE: Outputs should be switching from 10% V_{CC} to 90% V_{CC} in accordance with device truth table. For f_{MAX}, input duty cycle = 50%

Figure 6-1. HC clock pulse rise and fall times and pulse width



NOTE: Outputs should be switching from 10% V_{CC} to 90% V_{CC} in accordance with device truth table. FOr f_{MAX}, input duty cycle = 50%

Figure 6-2. HCT clock pulse rise and fall times and pulse width

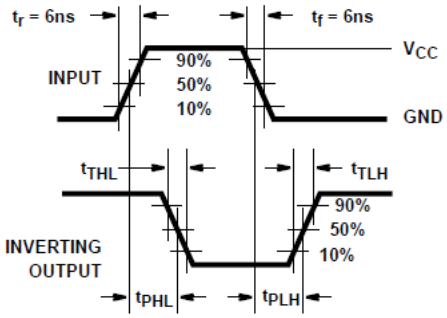


Figure 6-3. HC and HCU transition times and propagation delay times, combination logic

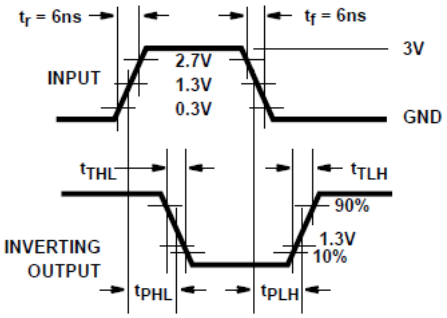


Figure 6-4. HCT transition times and propagation delay times, combination logic

Copyright © 2022 Texas Instruments Incorporated

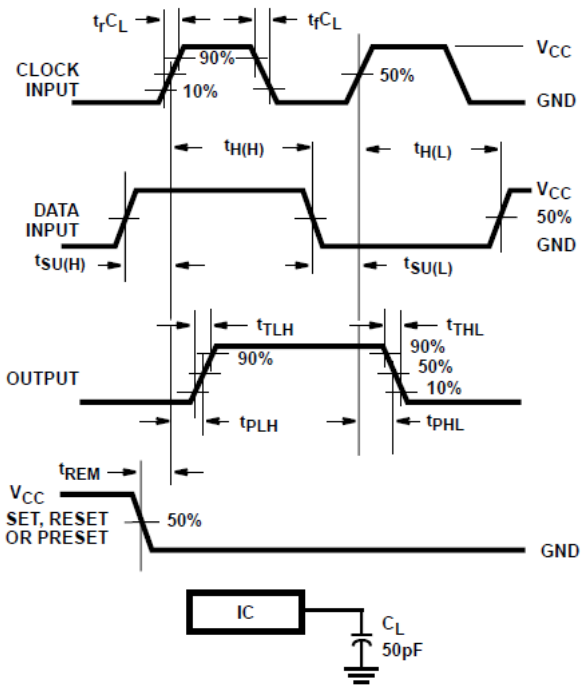


Figure 6-5. HC setup times, hold times, removal time, and propagation delay times for edge triggered sequential logic circuits

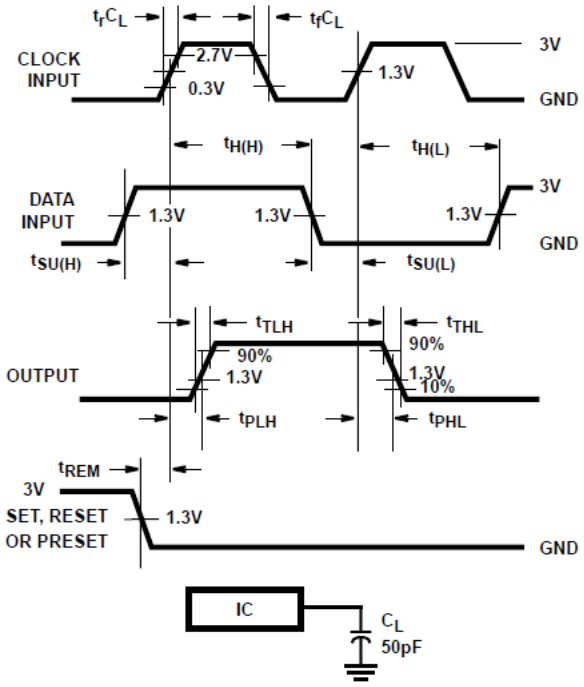


Figure 6-6. HCT setup times, hold times, removal time, and propagation delay times for edge triggered sequential logic circuits

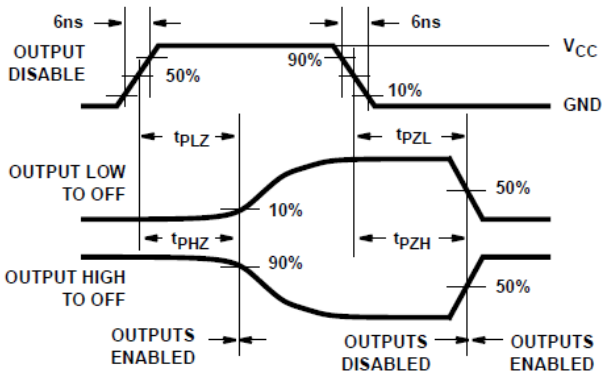


Figure 6-7. HC three-state propagation delay waveform

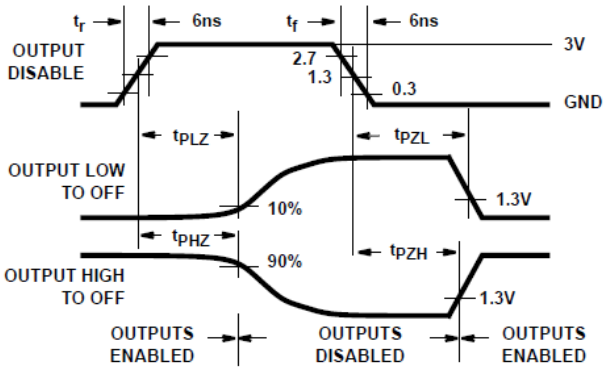
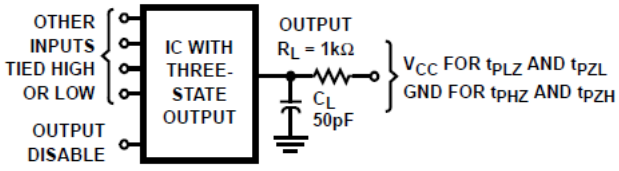


Figure 6-8. HCT three-state propagation delay waveform



NOTE: Opend drain waveforms t_{PLZ} and t_{PZL} are the same as those for three-state shown on the left. The test circuit is Output R_L = 1kΩ to V_{CC}, C_L = 50pF

Figure 6-9. HC and HCT three-state propagation delay test circuit

7 Detailed Description

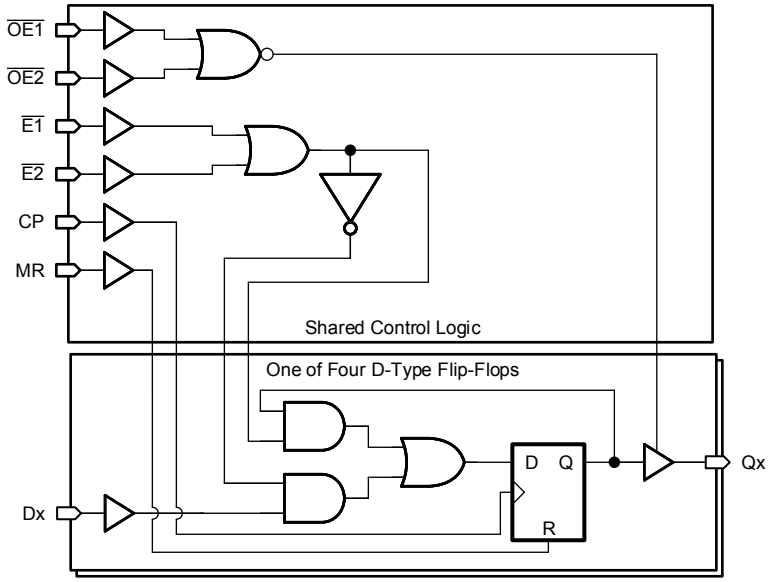
7.1 Overview

The CDx4HC173 or CDx4HCT173 high speed three-state quad Dtype flip-flops are fabricated with silicon gate CMOS technology. They possess the low power consumption of standard CMOS Integrated circuits, and can operate at speeds comparable to the equivalent low power Schottky devices. The buffered outputs can drive 15 LSTTL loads. The large output drive capability and three-state feature make these parts ideally suited for interfacing with bus lines in bus oriented systems

The four D-type flip-flops operate synchronously from a common clock. The outputs are in the three-state mode when either of the two output disable pins are at the logic “1” level. The input ENABLES allow the flip-flops to remain in their present states without having to disrupt the clock If either of the 2 input ENABLES are taken to a logic “1” level, the Q outputs are fed back to the inputs, forcing the flip-flops to remain in the same state. Reset is enabled by taking the RESET (MR) input to a logic “1” level. The data outputs change state on the positive going edge of the clock.

The ’HCT173 logic family is functionally, as well as pin compatible with the standard LS logic family.

7.2 Functional Block Diagram



Copyright © 2022 Texas Instruments Incorporated

7.3 Device Functional Modes

Table 7-1. Truth Table[1][2]

INPUTS				DATA	OUTPUT
MR	CP	DATA ENABLE			
		$\overline{E1}$	$\overline{E2}$	D	Q_n
H	X	X	X	X	L
L	L	X	X	X	Q_0
L	↑	H	X	X	Q_0
L	↑	X	H	X	Q_0
L	↑	L	L	L	L
L	↑	L	L	H	H

(1) H = High voltage level. L = Low voltage level. X = Irrelevant. ↑ = Transition from low to high level. Q_0 = Level before the indicated steady-state input conditions were established.
(2) When either OE1 or OE2 (or both) is (are) high, the output is disabled to the high-impedance stat, however, sequential operation of the flip-flops is not affected.

Copyright © 2022 Texas Instruments Incorporated

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

9 Layout

9.1 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.

Copyright © 2022 Texas Instruments Incorporated

10 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.

10.1 Documentation Support

10.1.1 Related Documentation

10.2 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.

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.

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.

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.

Copyright © 2022 Texas Instruments Incorporated

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
5962-8682501EA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8682501EA CD54HC173F3A	Samples
5962-8875901EA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8875901EA CD54HCT173F3A	Samples
CD54HC173F	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	CD54HC173F	Samples
CD54HC173F3A	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8682501EA CD54HC173F3A	Samples
CD54HCT173F3A	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8875901EA CD54HCT173F3A	Samples
CD74HC173E	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC173E	Samples
CD74HC173M	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC173M	Samples
CD74HC173M96	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC173M	Samples
CD74HC173PW	ACTIVE	TSSOP	PW	16	90	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HJ173	Samples
CD74HC173PWR	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU | SN	Level-1-260C-UNLIM	-55 to 125	HJ173	Samples
CD74HCT173E	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HCT173E	Samples
CD74HCT173M	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HCT173M	Samples
CD74HCT173M96	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HCT173M	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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

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 CD54HC173, CD54HCT173, CD74HC173, CD74HCT173 :

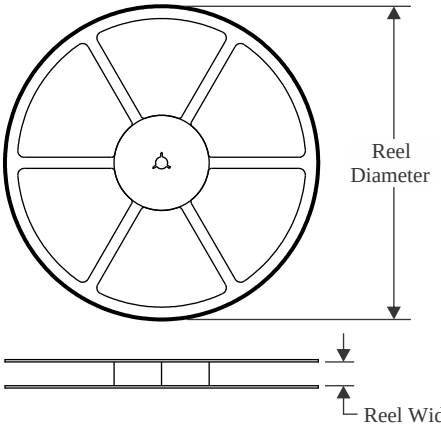
- Catalog : CD74HC173, CD74HCT173
- Military : CD54HC173, CD54HCT173

NOTE: Qualified Version Definitions:

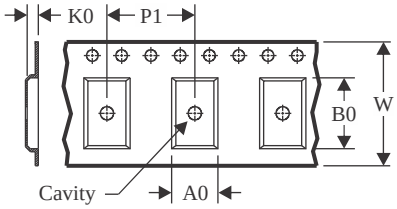
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

REEL DIMENSIONS

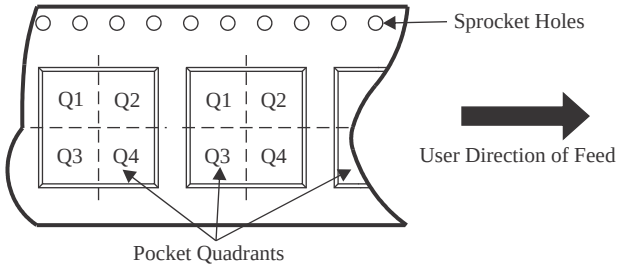


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	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

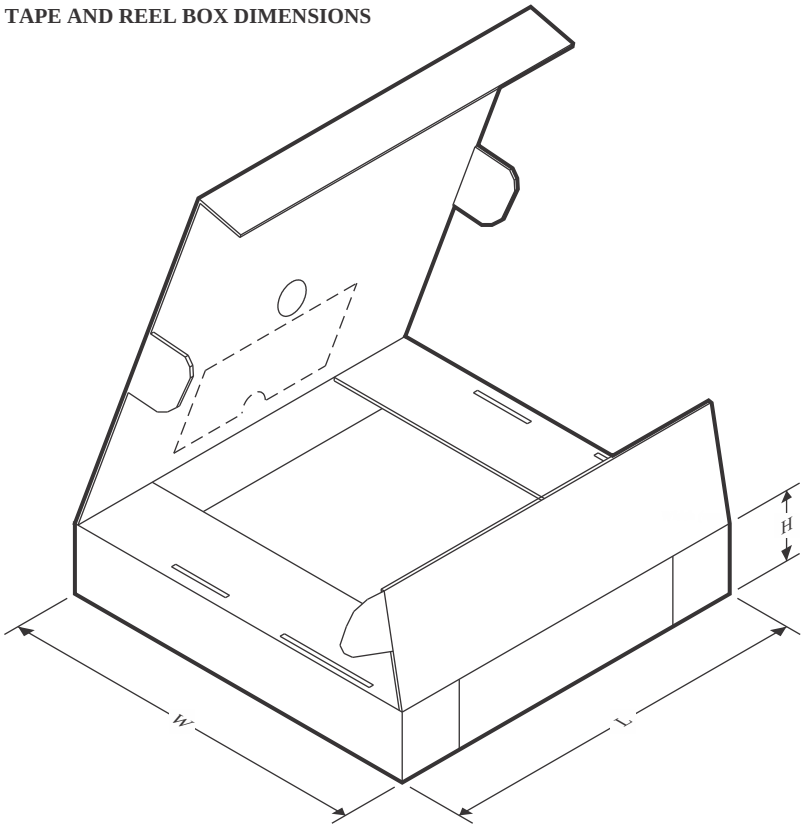
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CD74HC173M96	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
CD74HC173PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
CD74HC173PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
CD74HC173PWR	TSSOP	PW	16	2000	330.0	12.4	6.85	5.45	1.6	8.0	12.0	Q1
CD74HCT173M96	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1

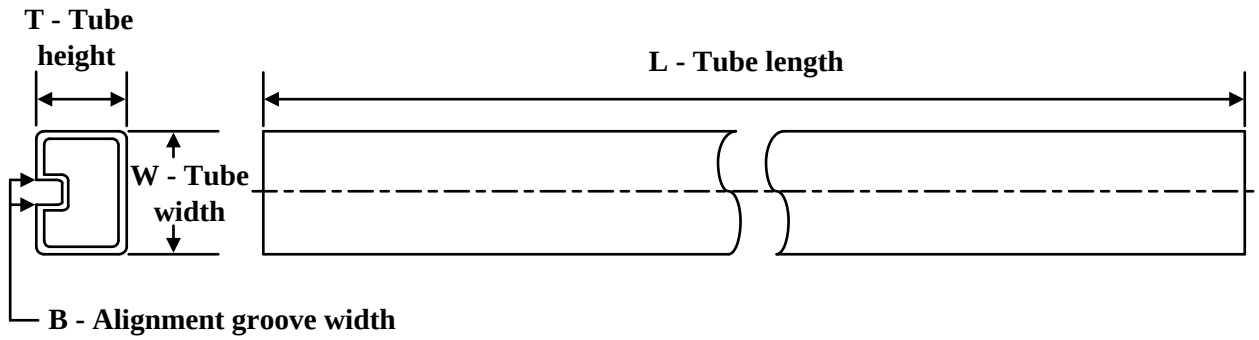
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CD74HC173M96	SOIC	D	16	2500	340.5	336.1	32.0
CD74HC173PWR	TSSOP	PW	16	2000	356.0	356.0	35.0
CD74HC173PWR	TSSOP	PW	16	2000	356.0	356.0	35.0
CD74HC173PWR	TSSOP	PW	16	2000	366.0	364.0	50.0
CD74HCT173M96	SOIC	D	16	2500	340.5	336.1	32.0

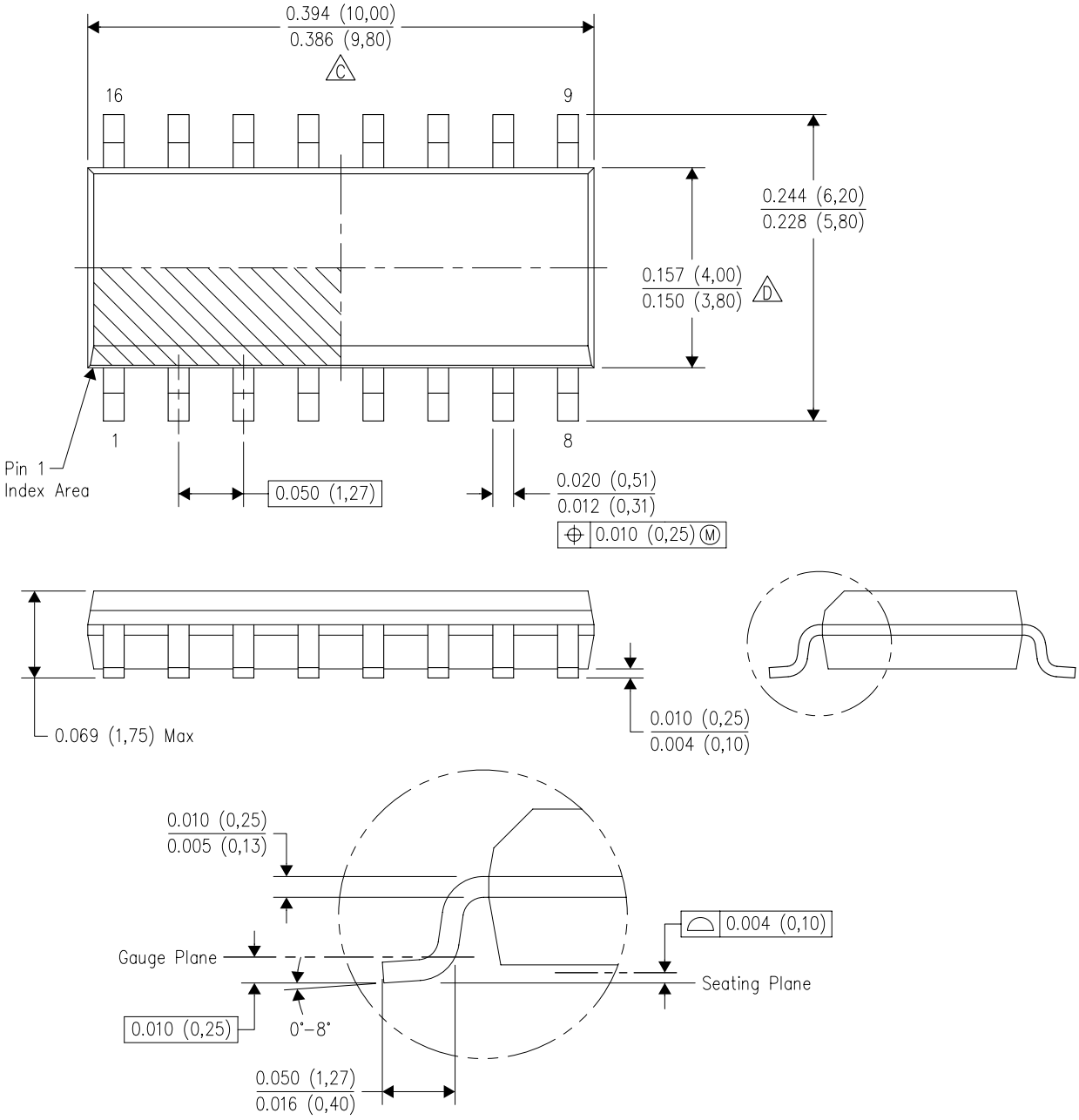
TUBE



*All dimensions are nominal

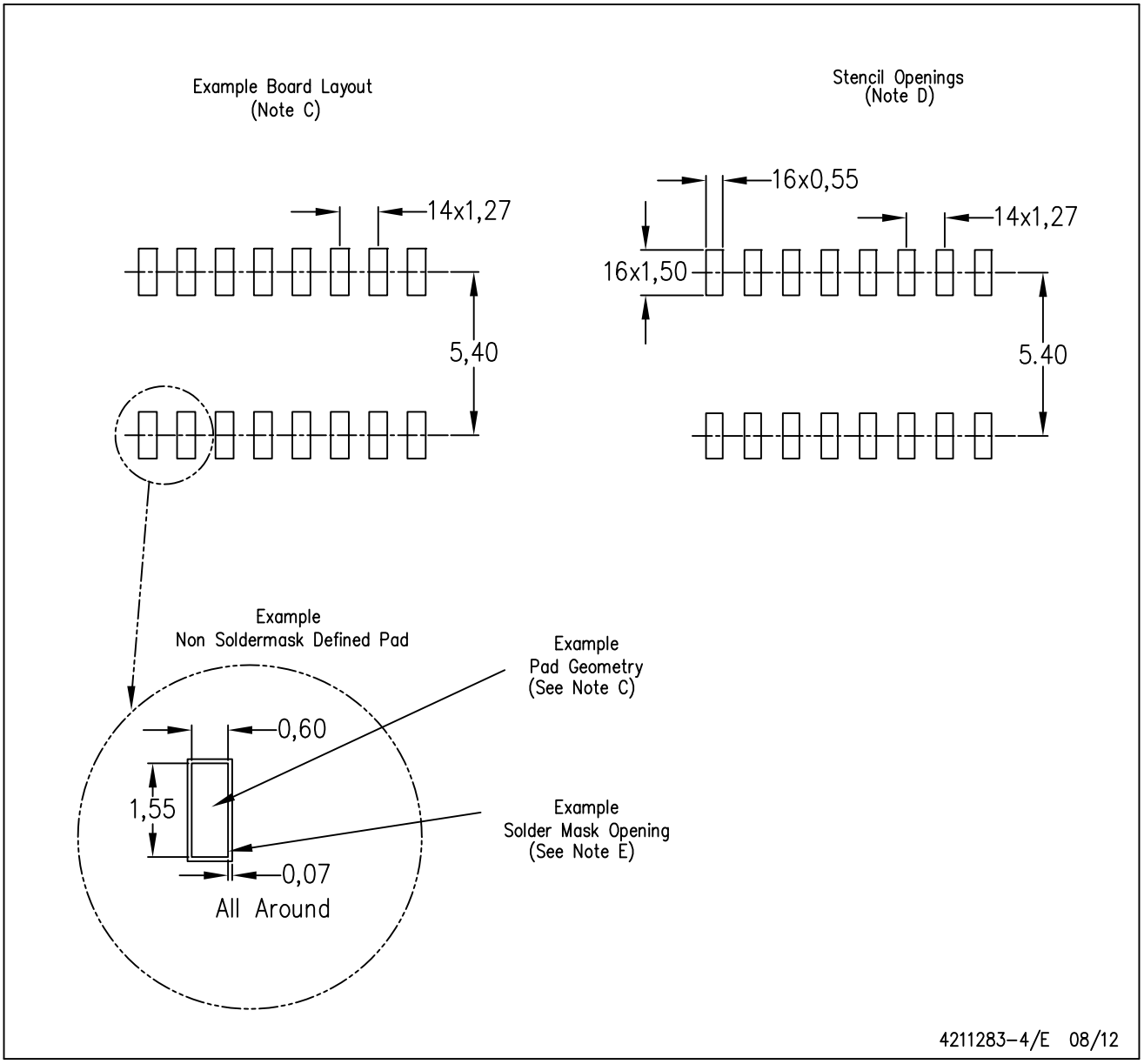
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
CD74HC173E	N	PDIP	16	25	506	13.97	11230	4.32
CD74HC173E	N	PDIP	16	25	506	13.97	11230	4.32
CD74HC173M	D	SOIC	16	40	507	8	3940	4.32
CD74HC173PW	PW	TSSOP	16	90	530	10.2	3600	3.5
CD74HCT173E	N	PDIP	16	25	506	13.97	11230	4.32
CD74HCT173E	N	PDIP	16	25	506	13.97	11230	4.32
CD74HCT173M	D	SOIC	16	40	507	8	3940	4.32

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.

D (R–PDSO–G16) PLASTIC SMALL OUTLINE



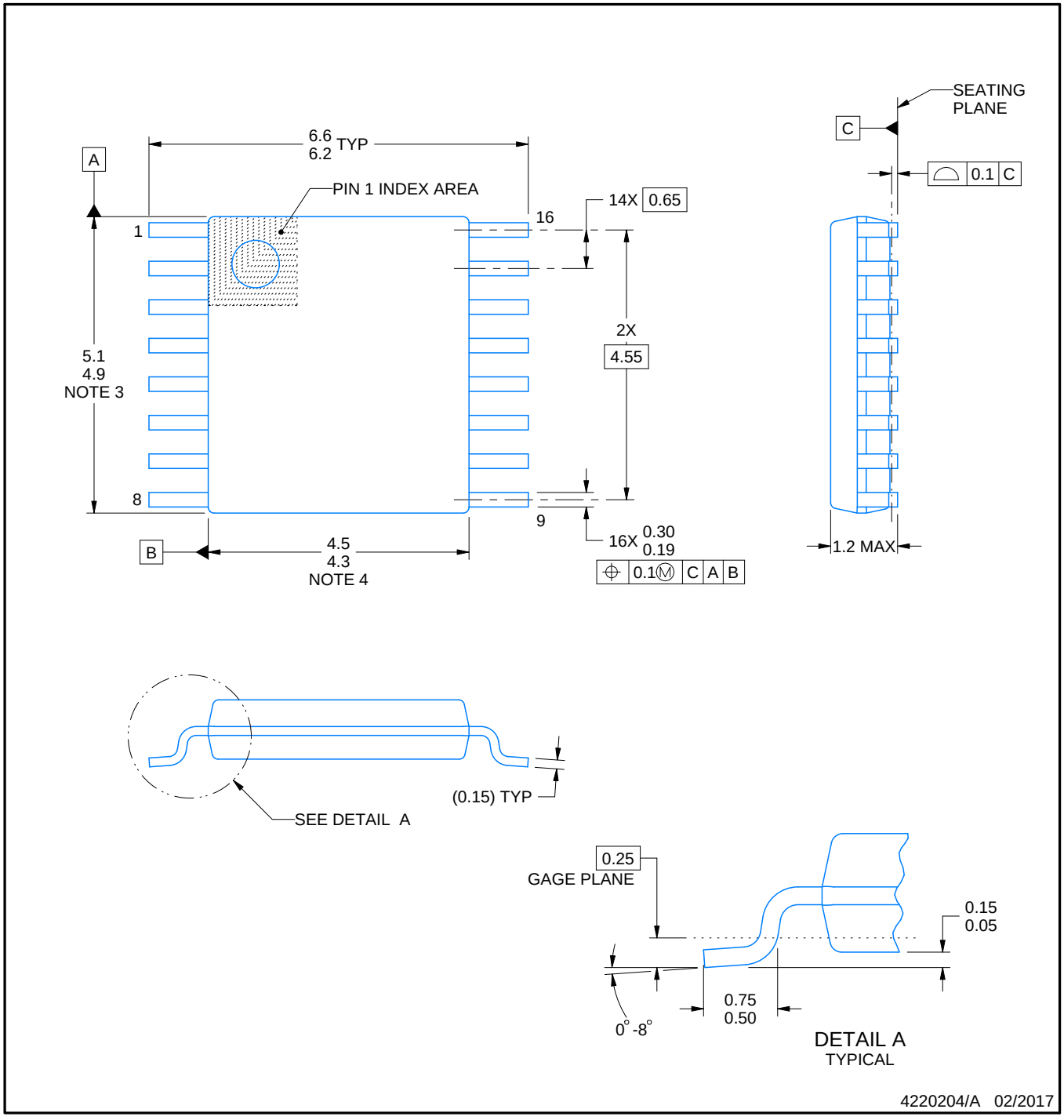
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact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

PACKAGE OUTLINE

PW0016A

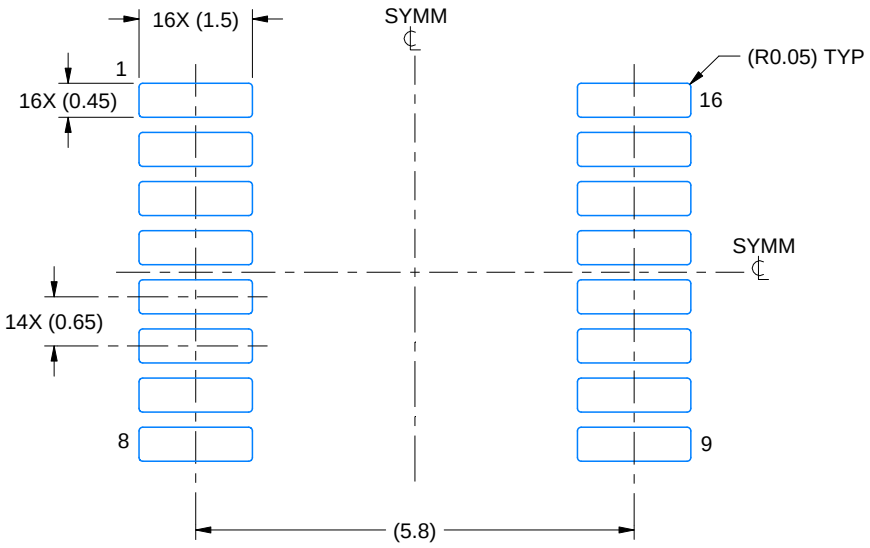
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE

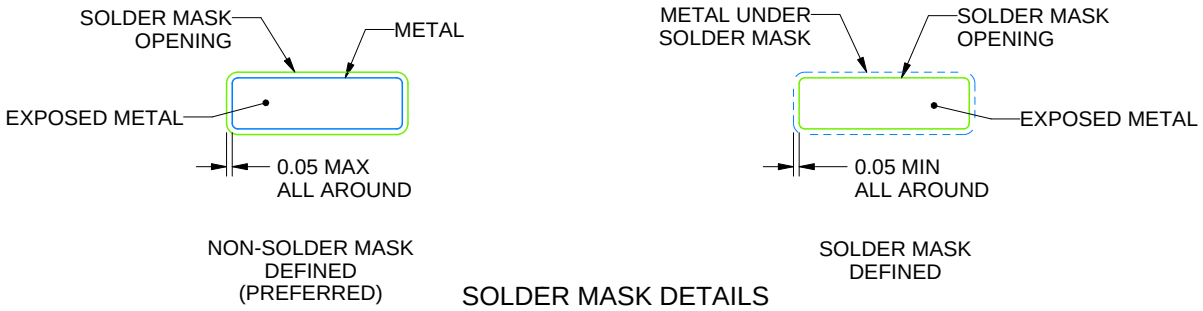


NOTES:

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.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

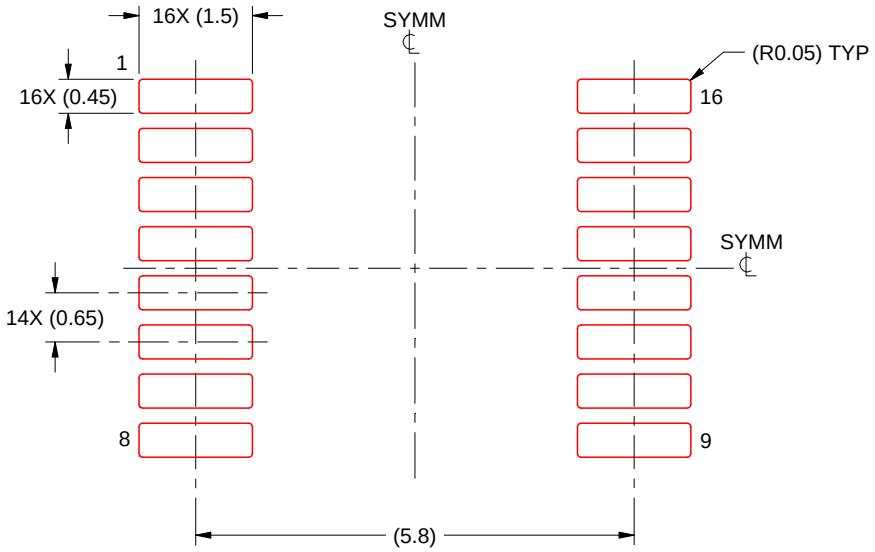


SOLDER MASK DETAILS

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.



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

4220204/A 02/2017

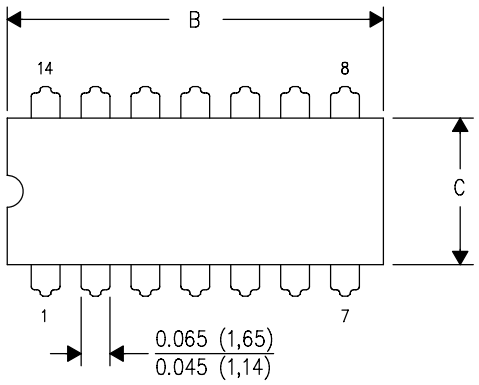
NOTES: (continued)

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.

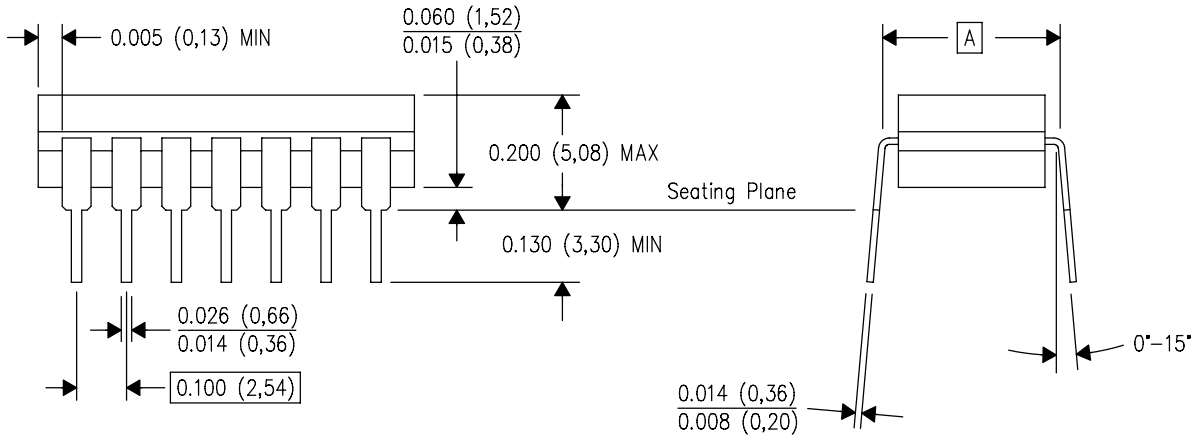
J (R–GDIP–T**)

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)



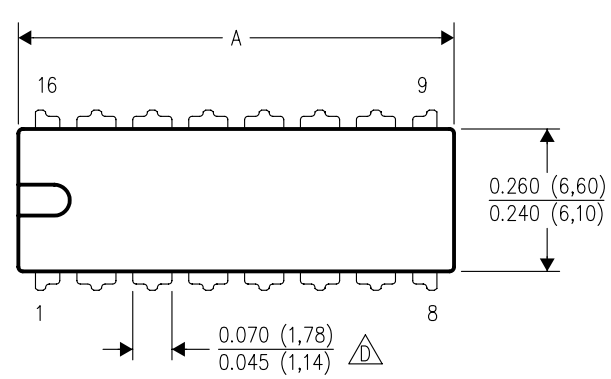
4040083/F 03/03

NOTES:
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.

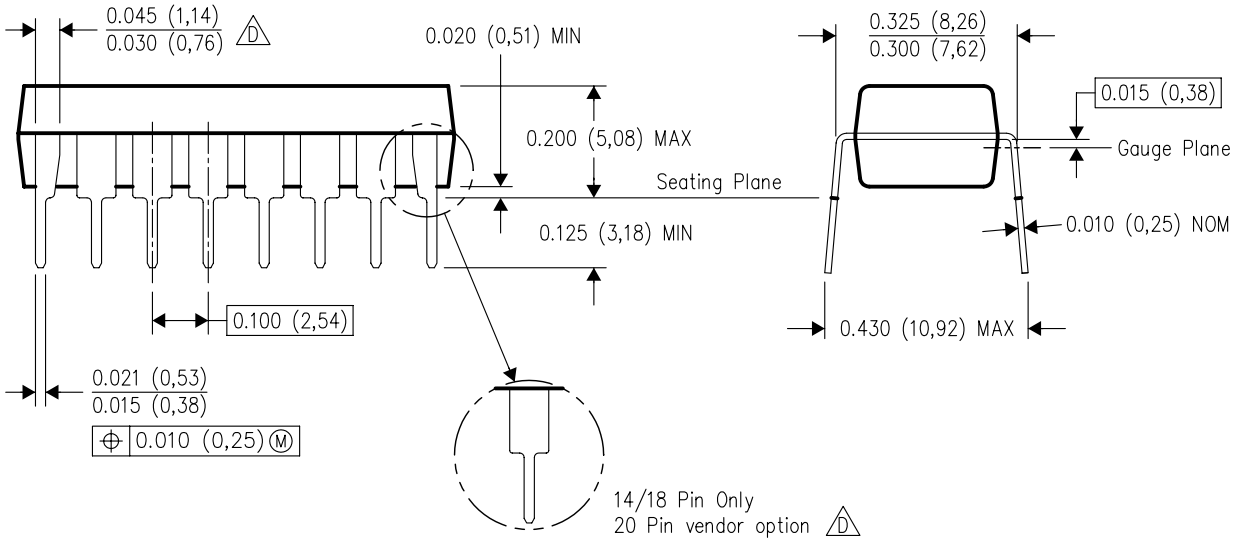
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

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

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2023, Texas Instruments Incorporated