

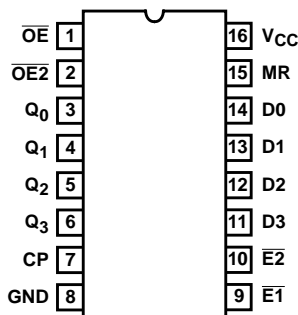
## High-Speed CMOS Logic Quad D-Type Flip-Flop, Three-State

### 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 Reduction Compared to LSTTL Logic ICs
- HC Types
  - 2V to 6V Operation
  - High Noise Immunity:  $N_{IL} = 30\%$ ,  $N_{IH} = 30\%$  of  $V_{CC}$  at  $V_{CC} = 5V$
- HCT Types
  - 4.5V to 5.5V Operation
  - Direct LSTTL Input Logic Compatibility,  $V_{IL} = 0.8V$  (Max),  $V_{IH} = 2V$  (Min)
  - CMOS Input Compatibility,  $I_I \leq 1\mu A$  at  $V_{OL}$ ,  $V_{OH}$

### Pinout

CD54HC173, CD54HCT173  
(CERDIP)  
CD74HC173  
(PDIP, SOIC, SOP, TSSOP)  
CD74HCT173  
(PDIP, SOIC)  
TOP VIEW



### Description

The 'HC173 and 'HCT173 high speed three-state quad D-type 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 MASTER RESET (MR) input to a logic "1" level. The data outputs change state on the positive going edge of the clock.

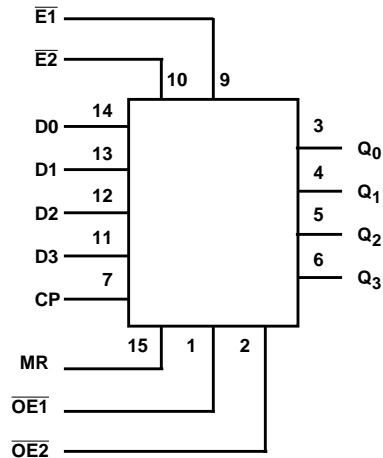
The 'HCT173 logic family is functionally, as well as pin compatible with the standard LS logic family.

### Ordering Information

PART NUMBER	TEMP. RANGE (°C)	PACKAGE
CD54HC173F3A	-55 to 125	16 Ld CERDIP
CD54HCT173F3A	-55 to 125	16 Ld CERDIP
CD74HC173E	-55 to 125	16 Ld PDIP
CD74HC173M	-55 to 125	16 Ld SOIC
CD74HC173MT	-55 to 125	16 Ld SOIC
CD74HC173M96	-55 to 125	16 Ld SOIC
CD74HC173NSR	-55 to 125	16 Ld SOP
CD74HC173PW	-55 to 125	16 Ld TSSOP
CD74HC173PWR	-55 to 125	16 Ld TSSOP
CD74HC173PWT	-55 to 125	16 Ld TSSOP
CD74HCT173E	-55 to 125	16 Ld PDIP
CD74HCT173M	-55 to 125	16 Ld SOIC
CD74HCT173MT	-55 to 125	16 Ld SOIC
CD74HCT173M96	-55 to 125	16 Ld SOIC

NOTE: When ordering, use the entire part number. The suffixes 96 and R denote tape and reel. The suffix T denotes a small-quantity reel of 250.

## Functional Diagram



TRUTH TABLE

INPUTS				DATA	OUTPUT
MR	CP	DATA ENABLE			
		$\overline{E1}$	$\overline{E2}$		
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

H= High Voltage Level

L = Low Voltage Level

X= Irrelevant

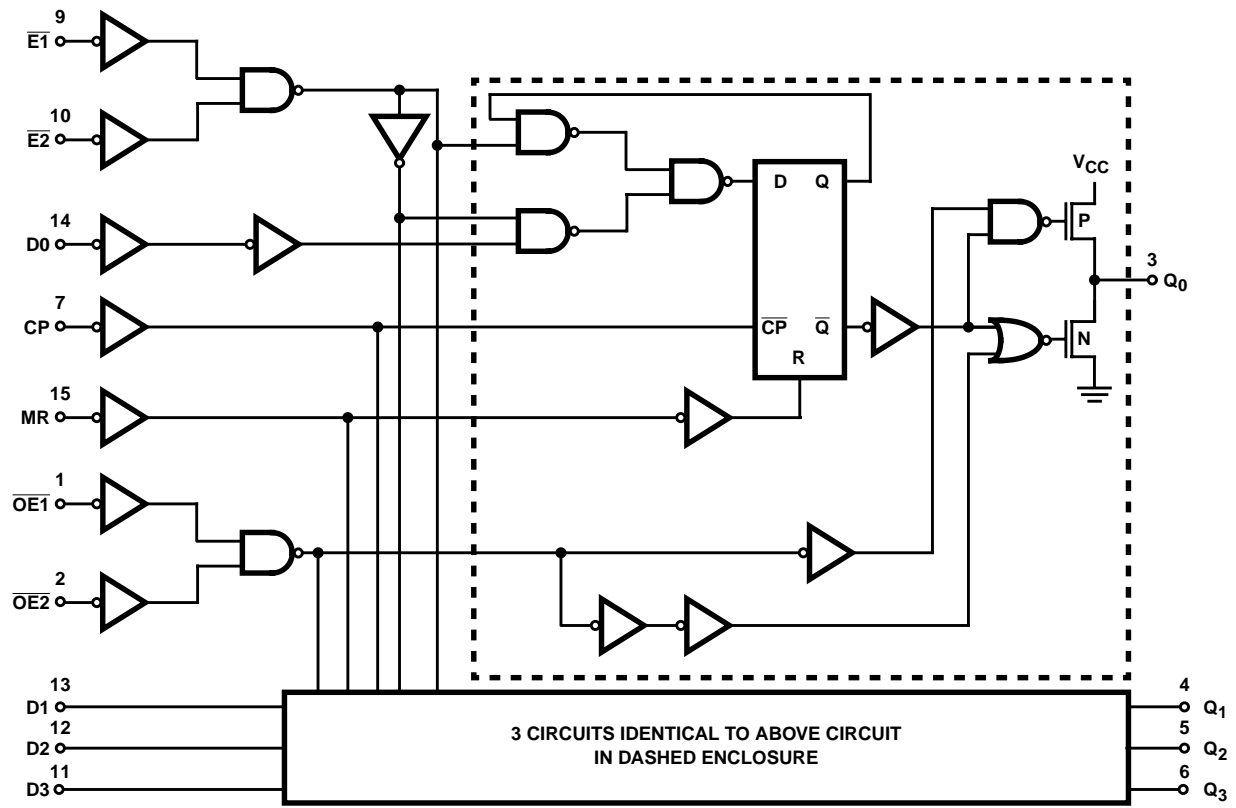
↑= Transition from Low to High Level

$Q_0$ = Level Before the Indicated Steady-State Input Conditions Were Established

NOTE:

1. When either OE1 or OE2 (or both) is (are) high, the output is disabled to the high-impedance state, however, sequential operation of the flip-flops is not affected.

**Logic Diagram**



# CD54HC173, CD74HC173, CD54HCT173, CD74HCT173

## Absolute Maximum Ratings

DC Supply Voltage,  $V_{CC}$  ..... -0.5V to 7V  
 DC Input Diode Current,  $I_{IK}$   
 For  $V_I < -0.5V$  or  $V_I > V_{CC} + 0.5V$  .....  $\pm 20mA$   
 DC Output Diode Current,  $I_{OK}$   
 For  $V_O < -0.5V$  or  $V_O > V_{CC} + 0.5V$  .....  $\pm 20mA$   
 DC Output Source or Sink Current per Output Pin,  $I_O$   
 For  $V_O > -0.5V$  or  $V_O < V_{CC} + 0.5V$  .....  $\pm 25mA$   
 DC  $V_{CC}$  or Ground Current,  $I_{CC}$  .....  $\pm 70mA$

## Thermal Information

Package Thermal Impedance,  $\theta_{JA}$  (see Note 2):  
 E (PDIP) Package .....  $67^{\circ}C/W$   
 M (SOIC) Package .....  $73^{\circ}C/W$   
 NS (SOP) Package .....  $64^{\circ}C/W$   
 PW (TSSOP) Package .....  $108^{\circ}C/W$   
 Maximum Junction Temperature .....  $150^{\circ}C$   
 Maximum Storage Temperature Range .....  $-65^{\circ}C$  to  $150^{\circ}C$   
 Maximum Lead Temperature (Soldering 10s) .....  $300^{\circ}C$   
 (SOIC - Lead Tips Only)

## Operating Conditions

Temperature Range ( $T_A$ ) .....  $-55^{\circ}C$  to  $125^{\circ}C$   
 Supply Voltage Range,  $V_{CC}$   
 HC Types ..... 2V to 6V  
 HCT Types ..... 4.5V to 5.5V  
 DC Input or Output Voltage,  $V_I, V_O$  ..... 0V to  $V_{CC}$   
 Input Rise and Fall Time  
 2V ..... 1000ns (Max)  
 4.5V ..... 500ns (Max)  
 6V ..... 400ns (Max)

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

## NOTE:

- The package thermal impedance is calculated in accordance with JESD 51-7.

## DC Electrical Specifications

PARAMETER	SYMBOL	TEST CONDITIONS		V <sub>CC</sub> (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		V <sub>I</sub> (V)	I <sub>O</sub> (mA)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HC TYPES												
High Level Input Voltage	V <sub>IH</sub>	-	-	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
Low Level Input Voltage	V <sub>IL</sub>	-	-	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
High Level Output Voltage CMOS Loads	V <sub>OH</sub>	V <sub>IH</sub> or V <sub>IL</sub>	-0.02	2	1.9	-	-	1.9	-	1.9	-	V
			-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V
			-0.02	6	5.9	-	-	5.9	-	5.9	-	V
High Level Output Voltage TTL Loads			-6	4.5	3.98	-	-	3.84	-	3.7	-	V
			-7.8	6	5.48	-	-	5.34	-	5.2	-	V
Low Level Output Voltage CMOS Loads	V <sub>OL</sub>	V <sub>IH</sub> or V <sub>IL</sub>	0.02	2	-	-	0.1	-	0.1	-	0.1	V
			0.02	4.5	-	-	0.1	-	0.1	-	0.1	V
			0.02	6	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads			6	4.5	-	-	0.26	-	0.33	-	0.4	V
			7.8	6	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	I <sub>I</sub>	V <sub>CC</sub> or GND	-	6	-	-	±0.1	-	±1	-	±1	μA
Quiescent Device Current	I <sub>CC</sub>	V <sub>CC</sub> or GND	0	6	-	-	8	-	80	-	160	μA

**CD54HC173, CD74HC173, CD54HCT173, CD74HCT173**

**DC Electrical Specifications (Continued)**

PARAMETER	SYMBOL	TEST CONDITIONS		$V_{CC}$ (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		$V_I$ (V)	$I_O$ (mA)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
Three-State Leakage Current	$I_{OZ}$	$V_{IL}$ or $V_{IH}$	-	6	-	-	±0.5	-	±0.5	-	±10	μA
<b>HCT TYPES</b>												
High Level Input Voltage	$V_{IH}$	-	-	4.5 to 5.5	2	-	-	2	-	2	-	V
Low Level Input Voltage	$V_{IL}$	-	-	4.5 to 5.5	-	-	0.8	-	0.8	-	0.8	V
High Level Output Voltage CMOS Loads	$V_{OH}$	$V_{IH}$ or $V_{IL}$	-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V
High Level Output Voltage TTL Loads			-6	4.5	3.98	-	-	3.84	-	3.7	-	V
Low Level Output Voltage CMOS Loads	$V_{OL}$	$V_{IH}$ or $V_{IL}$	0.02	4.5	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads			6	4.5	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	$I_I$	$V_{CC}$ to GND	0	5.5	-	-	±0.1	-	±1	-	±1	μA
Quiescent Device Current	$I_{CC}$	$V_{CC}$ or GND	0	5.5	-	-	8	-	80	-	160	μA
Additional Quiescent Device Current Per Input Pin: 1 Unit Load	$\Delta I_{CC}$ (Note 3)	$V_{CC}$ -2.1	-	4.5 to 5.5	-	100	360	-	450	-	490	μA
Three-State Leakage Current	$I_{OZ}$	$V_{IL}$ or $V_{IH}$	-	5.5	-	-	±0.5	-	±5.0	-	±10	μA

NOTE:

3. For dual-supply systems theoretical worst case ( $V_I = 2.4V$ ,  $V_{CC} = 5.5V$ ) specification is 1.8mA.

**HCT Input Loading Table**

INPUT	UNIT LOADS
D0-D3	0.15
$\overline{E}1$ and $\overline{E}2$	0.15
CP	0.25
MR	0.2
$\overline{OE}1$ and $\overline{OE}2$	0.5

NOTE: Unit Load is  $\Delta I_{CC}$  limit specified in DC Electrical Specifications table, e.g., 360μA max at 25°C.

**CD54HC173, CD74HC173, CD54HCT173, CD74HCT173**

**Switching Specifications** Input  $t_r, t_f = 6\text{ns}$

PARAMETER	SYMBOL	TEST CONDITIONS	V <sub>CC</sub> (V)	25°C		-40°C TO 85°C	-55°C TO 125°C	UNITS
				TYP	MAX	MAX	MAX	
HC TYPES								
Propagation Delay, Clock to Output	t <sub>PLH</sub> , t <sub>PHL</sub>	C <sub>L</sub> = 50pF	2	-	200	250	300	ns
			4.5	-	40	50	60	ns
		C <sub>L</sub> = 15pF	5	17	-	-	-	ns
		CL = 50pF	6	-	34	43	51	ns
Propagation Delay, MR to Output	t <sub>PHL</sub>	C <sub>L</sub> = 50pF	2	-	175	220	265	ns
			4.5	-	35	44	53	ns
		C <sub>L</sub> = 15pF	5	12	-	-	-	ns
		CL = 50pF	6	-	30	37	45	ns
Propagation Delay Output Enable to Q (Figure 6)	t <sub>PLZ</sub> , t <sub>PHZ</sub> t <sub>PZL</sub> , t <sub>PZH</sub>	CL = 50pF	2		150	190	225	ns
		C <sub>L</sub> = 50pF	4.5		30	38	45	ns
		C <sub>L</sub> = 15pF	5	12	-	-	-	ns
		CL = 50pF	6		26	33	38	ns
Output Transition Times	t <sub>TLH</sub> , t <sub>THL</sub>	C <sub>L</sub> = 50pF	2	-	60	75	90	ns
			4.5	-	12	15	18	ns
			6	-	10	13	15	ns
Maximum Clock Frequency	f <sub>MAX</sub>	C <sub>L</sub> = 15pF	5	60	-	-	-	MHz
Input Capacitance	C <sub>IN</sub>	-	-	-	10	10	10	pF
Three-State Output Capacitance	C <sub>O</sub>	-	-	-	10	10	10	pF
Power Dissipation Capacitance (Notes 4, 5)	C <sub>PD</sub>	-	5	29	-	-	-	pF
HCT TYPES								
Propagation Delay, Clock to Output	t <sub>PLH</sub> , t <sub>PHL</sub>	C <sub>L</sub> = 50pF	4.5	-	40	50	60	ns
		C <sub>L</sub> = 15pF	5	17	-	-	-	ns
Propagation Delay, MR to Output	t <sub>PHL</sub>	C <sub>L</sub> = 50pF	4.5	-	44	55	66	ns
		C <sub>L</sub> = 15pF	5	18	-	-	-	ns
Propagation Delay Output Enable to Q (Figure 6)	t <sub>PZL</sub> , t <sub>PZH</sub>	CL = 50pF	2		150	190	225	ns
		C <sub>L</sub> = 50pF	4.5		30	38	45	ns
		C <sub>L</sub> = 15pF	5	14	-	-	-	ns
		CL = 50pF	6		26	33	38	ns
Output Transition Times	t <sub>TLH</sub> , t <sub>THL</sub>	C <sub>L</sub> = 50pF	4.5	-	15	19	22	ns
Maximum Clock Frequency	f <sub>MAX</sub>	C <sub>L</sub> = 15pF	5	60	-	-	-	MHz
Input Capacitance	C <sub>IN</sub>	-	-	-	10	10	10	pF
Power Dissipation Capacitance (Notes 4, 5)	C <sub>PD</sub>	-	5	34	-	-	-	pF

**NOTES:**

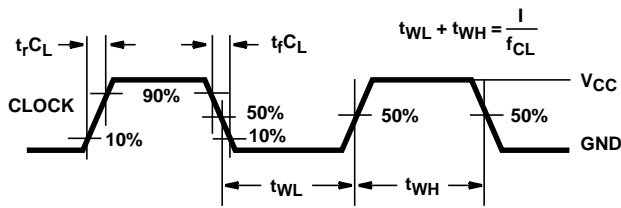
- $C_{PD}$  is used to determine the dynamic power consumption, per package.
- $P_D = V_{CC}^2 f_i + \sum (C_L V_{CC}^2 + f_O)$  where  $f_i$  = Input Frequency,  $f_O$  = Output Frequency,  $C_L$  = Output Load Capacitance,  $V_{CC}$  = Supply Voltage.

**CD54HC173, CD74HC173, CD54HCT173, CD74HCT173**

**Prerequisite For Switching Specifications**

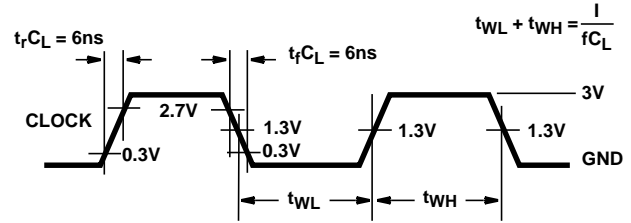
PARAMETER	SYMBOL	V <sub>CC</sub> (V)	25°C		-40°C TO 85°C		-55°C TO 125°C		UNITS
			MIN	MAX	MIN	MAX	MIN	MAX	
HC TYPES									
Maximum Clock Frequency	f <sub>MAX</sub>	2	6	-	5	-	4	-	MHz
		4.5	30	-	24	-	20	-	MHz
		6	35	-	28	-	24	-	MHz
MR Pulse Width	t <sub>w</sub>	2	80	-	100	-	120	-	ns
		4.5	16	-	20	-	24	-	ns
		6	14	-	17	-	20	-	ns
Clock Pulse Width	t <sub>w</sub>	2	80	-	100	-	120	-	ns
		4.5	16	-	20	-	24	-	ns
		6	14	-	17	-	20	-	ns
Set-up Time, Data to Clock and $\bar{E}$ to Clock	t <sub>SU</sub>	2	60	-	75	-	90	-	ns
		4.5	12	-	15	-	18	-	ns
		6	10	-	13	-	15	-	ns
Hold Time, Data to Clock	t <sub>H</sub>	2	3	-	3	-	3	-	ns
		4.5	3	-	3	-	3	-	ns
		6	3	-	3	-	3	-	ns
Hold Time, $\bar{E}$ to Clock	t <sub>H</sub>	2	0	-	0	-	0	-	ns
		4.5	0	-	0	-	0	-	ns
		6	0	-	0	-	0	-	ns
Removal Time, MR to Clock	t <sub>REM</sub>	2	60	-	75	-	90	-	ns
		4.5	12	-	15	-	18	-	ns
		6	10	-	13	-	15	-	ns
HCT TYPES									
Maximum Clock Frequency	f <sub>MAX</sub>	4.5	20	-	16	-	13	-	MHz
MR Pulse Width	t <sub>w</sub>	4.5	15	-	19	-	22	-	ns
Clock Pulse Width	t <sub>w</sub>	4.5	25	-	31	-	38	-	ns
Set-up Time, $\bar{E}$ to Clock	t <sub>SU</sub>	4.5	12	-	15	-	18	-	ns
Set-up Time, Data to Clock	t <sub>SU</sub>	4.5	18	-	23	-	27	-	ns
Hold Time, Data to Clock	t <sub>H</sub>	4.5	0	-	0	-	0	-	ns
Hold Time, $\bar{E}$ to Clock	t <sub>H</sub>	4.5	0	-	0	-	0	-	ns
Removal Time, MR to Clock	t <sub>REM</sub>	4.5	12	-	15	-	18	-	ns

## Test Circuits and Waveforms



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 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 2. HCT CLOCK PULSE RISE AND FALL TIMES AND PULSE WIDTH

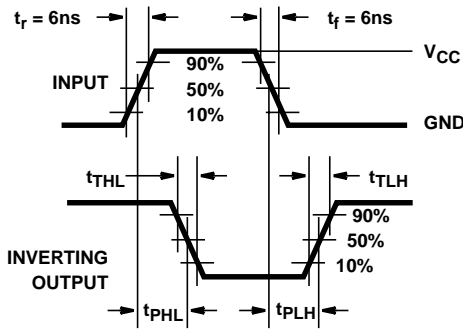


FIGURE 3. HC AND HCU TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC

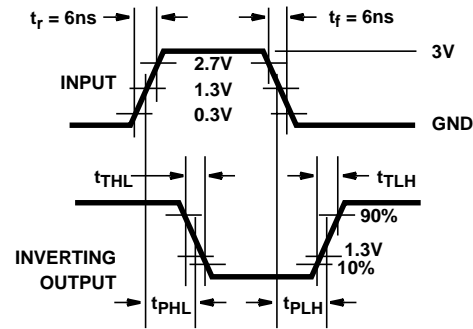


FIGURE 4. HCT TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC

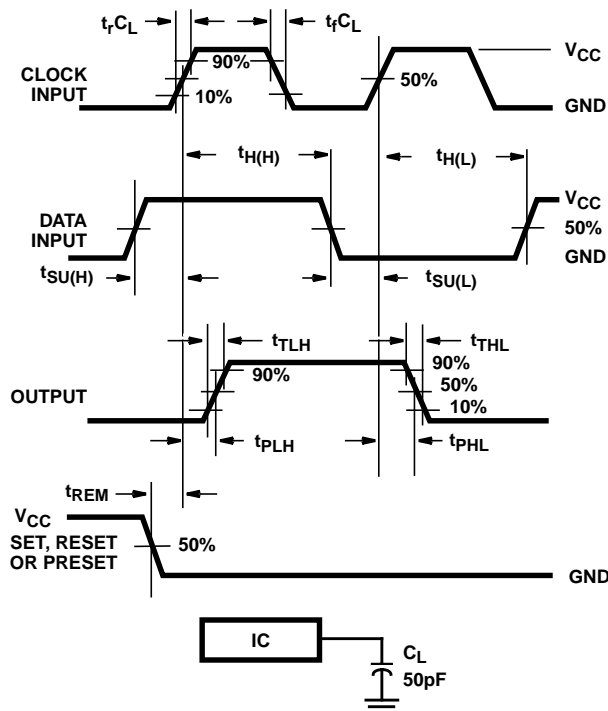


FIGURE 5. HC SETUP TIMES, HOLD TIMES, REMOVAL TIME, AND PROPAGATION DELAY TIMES FOR EDGE TRIGGERED SEQUENTIAL LOGIC CIRCUITS

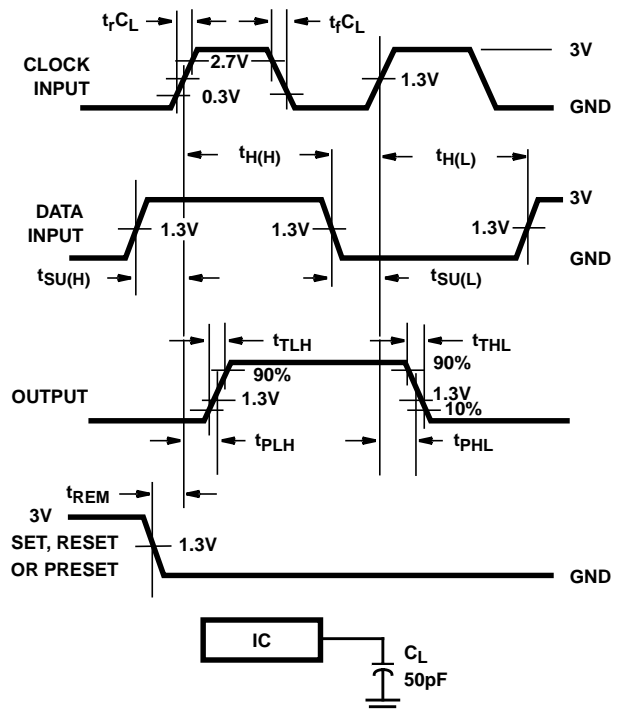
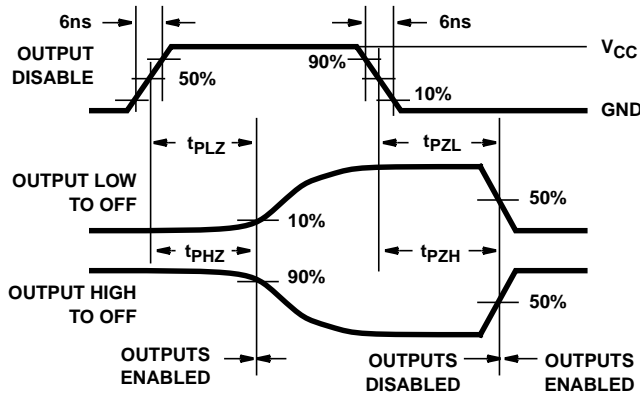


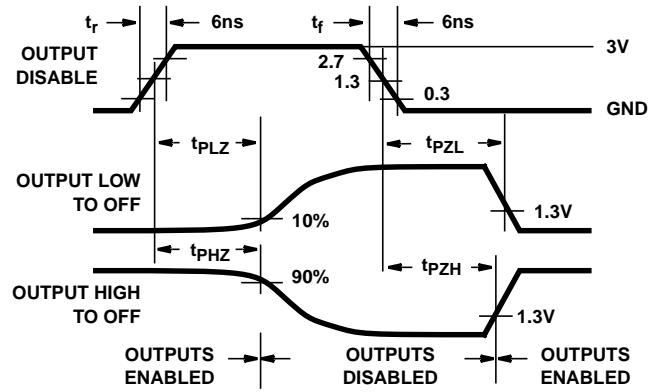
FIGURE 6. HCT SETUP TIMES, HOLD TIMES, REMOVAL TIME, AND PROPAGATION DELAY TIMES FOR EDGE TRIGGERED SEQUENTIAL LOGIC CIRCUITS



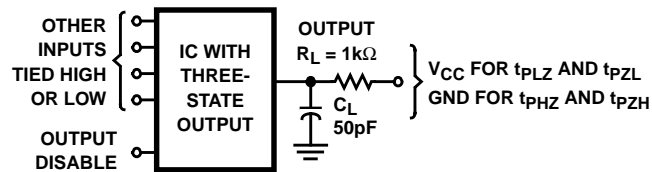
**Test Circuits and Waveforms (Continued)**



**FIGURE 7. HC THREE-STATE PROPAGATION DELAY WAVEFORM**



**FIGURE 8. HCT THREE-STATE PROPAGATION DELAY WAVEFORM**



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

**FIGURE 9. HC AND HCT THREE-STATE PROPAGATION DELAY TEST CIRCUIT**

## 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	<a href="#">Samples</a>
5962-8875901EA	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8875901EA CD54HCT173F3A	<a href="#">Samples</a>
CD54HC173F	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	CD54HC173F	<a href="#">Samples</a>
CD54HC173F3A	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8682501EA CD54HC173F3A	<a href="#">Samples</a>
CD54HCT173F3A	ACTIVE	CDIP	J	16	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-8875901EA CD54HCT173F3A	<a href="#">Samples</a>
CD74HC173E	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HC173E	<a href="#">Samples</a>
CD74HC173M	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC173M	<a href="#">Samples</a>
CD74HC173M96	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC173M	<a href="#">Samples</a>
CD74HC173M96G4	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC173M	<a href="#">Samples</a>
CD74HC173MG4	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HC173M	<a href="#">Samples</a>
CD74HC173PW	ACTIVE	TSSOP	PW	16	90	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HJ173	<a href="#">Samples</a>
CD74HC173PWR	ACTIVE	TSSOP	PW	16	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HJ173	<a href="#">Samples</a>
CD74HCT173E	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-55 to 125	CD74HCT173E	<a href="#">Samples</a>
CD74HCT173M	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HCT173M	<a href="#">Samples</a>
CD74HCT173M96	ACTIVE	SOIC	D	16	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HCT173M	<a href="#">Samples</a>
CD74HCT173MG4	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	HCT173M	<a href="#">Samples</a>

(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.

<sup>(2)</sup> **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  $\leq 1000$ ppm threshold. Antimony trioxide based flame retardants must also meet the  $\leq 1000$ ppm threshold requirement.

<sup>(3)</sup> MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

<sup>(4)</sup> There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

<sup>(5)</sup> 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.

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

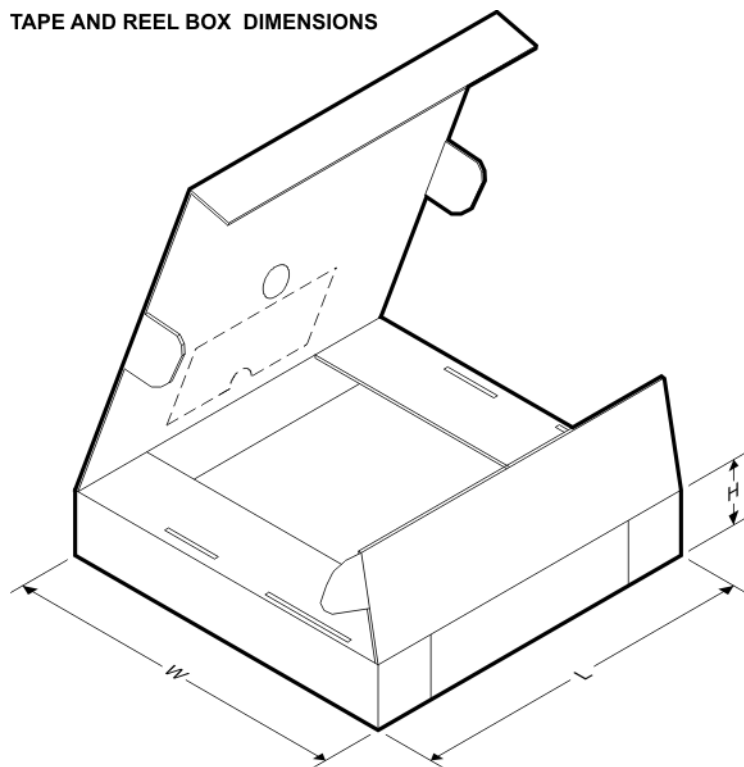
## TAPE AND REEL INFORMATION



\*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
CD74HCT173M96	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1

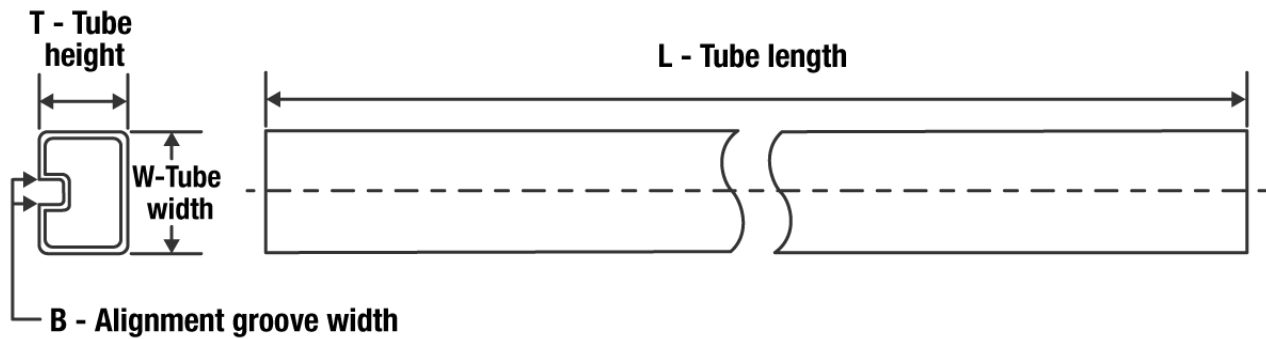
## TAPE AND REEL BOX DIMENSIONS



\*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	853.0	449.0	35.0
CD74HCT173M96	SOIC	D	16	2500	340.5	336.1	32.0

## TUBE



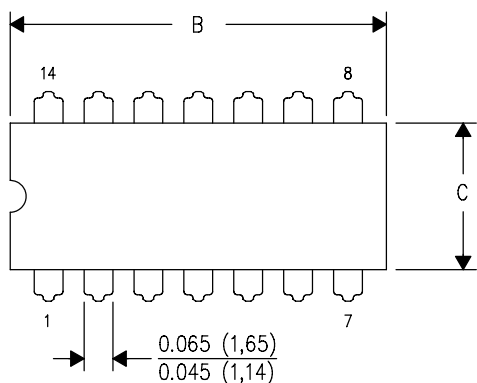
\*All dimensions are nominal

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
CD74HC173MG4	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
CD74HCT173MG4	D	SOIC	16	40	507	8	3940	4.32

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	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\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	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	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.
-  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.



D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



## NOTES:

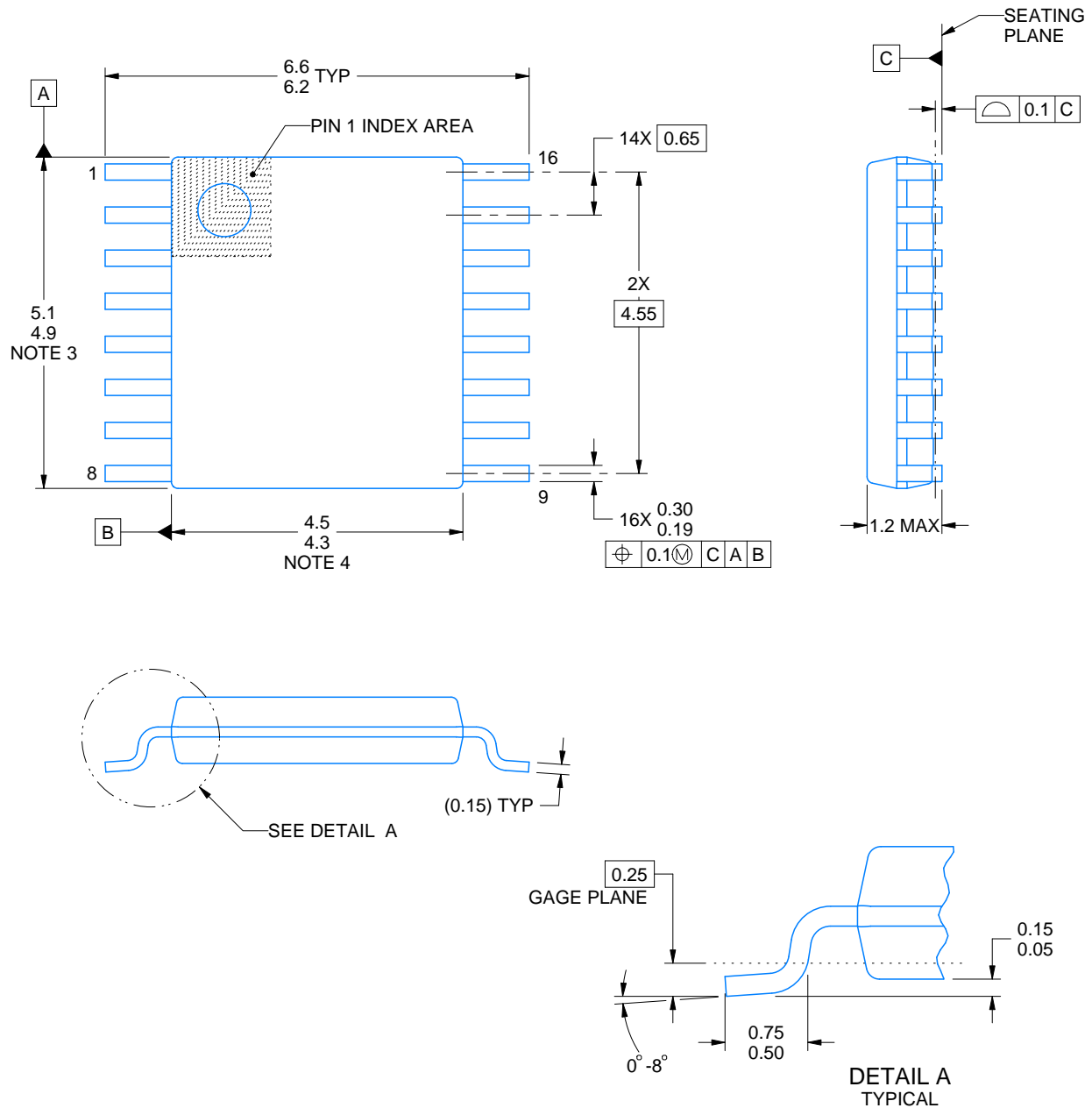
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- $\triangle D$  Body width 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.



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.

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