

SN54AC573, SN74AC573 OCTAL D-TYPE TRANSPARENT LATCHES WITH 3-STATE OUTPUTS

SCAS542D - OCTOBER 1995 - REVISED OCTOBER 2003

- 2-V to 6-V V_{CC} Operation
- Inputs Accept Voltages to 6 V
- Max t_{pd} of 9 ns at 5 V
- 3-State Outputs Drive Bus Lines Directly

description/ordering information

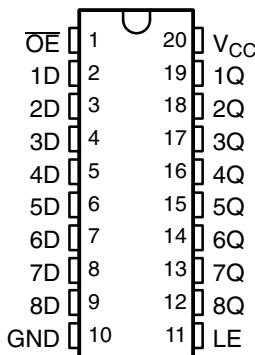
These 8-bit latches feature 3-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. The devices are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight latches are D-type transparent latches. When the latch-enable (LE) input is high, the Q outputs follow the data (D) inputs. When LE is taken low, the Q outputs are latched at the logic levels set up at the D Inputs.

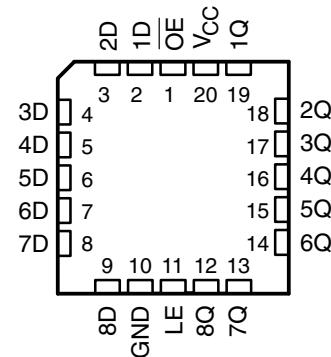
A buffered output-enable (\overline{OE}) input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines in a bus-organized system without need for interface or pullup components.

\overline{OE} does not affect the internal operations of the latches. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

SN54AC573 . . . J OR W PACKAGE
SN74AC573 . . . DB, DW, N, NS, OR PW PACKAGE
(TOP VIEW)



SN54AC573 . . . FK PACKAGE
(TOP VIEW)



ORDERING INFORMATION

T_A	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	PDIP - N	Tube	SN74AC573N	SN74AC573N
	SOIC - DW	Tube	SN74AC573DW	AC573
		Tape and reel	SN74AC573DWR	
	SOP - NS	Tape and reel	SN74AC573NSR	AC573
	SSOP - DB	Tape and reel	SN74AC573DBR	AC573
	TSSOP - PW	Tube	SN74AC573PW	AC573
		Tape and reel	SN74AC573PWR	
-55°C to 125°C	CDIP - J	Tube	SNJ54AC573J	SNJ54AC573J
	CFP - W	Tube	SNJ54AC573W	SNJ54AC573W
	LCCC - FK	Tube	SNJ54AC573FK	SNJ54AC573FK

[†] Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

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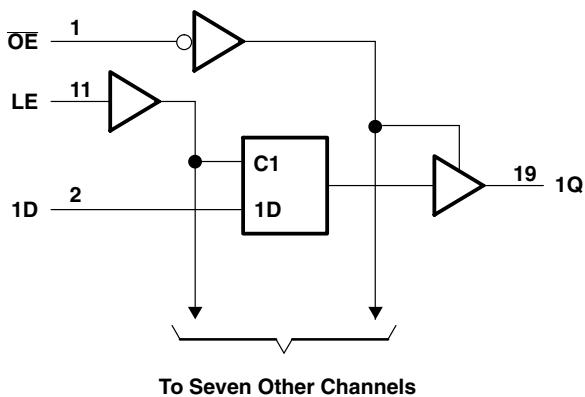
description/ordering information (continued)

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

FUNCTION TABLE (each latch)

INPUTS			OUTPUT
OE	LE	D	Q
L	H	H	H
L	H	L	L
L	L	X	Q_0
H	X	X	Z

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage range, V_{CC}	-0.5 V to + 7 V
Input voltage range, V_I (see Note 1)	-0.5 V to $V_{CC} + 0.5$ V
Output voltage range, V_O (see Note 1)	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$)	± 20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	± 20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	± 50 mA
Continuous current through, V_{CC} or GND	± 200 mA
Package thermal impedance, θ_{JA} (see Note 2):	
DB package	70°C/W
DW package	58°C/W
N package	69°C/W
NS package	60°C/W
PW package	83°C/W
Storage temperature range, T_{stg}	-65°C to 150°C

[†] 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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

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recommended operating conditions (see Note 3)

		SN54AC573		SN74AC573		UNIT
		MIN	MAX	MIN	MAX	
V _{CC}	Supply voltage	2	6	2	6	V
V _{IH}	High-level input voltage	V _{CC} = 3 V	2.1	2.1	2.1	V
		V _{CC} = 4.5 V	3.15	3.15	3.15	
		V _{CC} = 5.5 V	3.85	3.85	3.85	
V _{IL}	Low-level input voltage	V _{CC} = 3 V	0.9	0.9	0.9	V
		V _{CC} = 4.5 V	1.35	1.35	1.35	
		V _{CC} = 5.5 V	1.65	1.65	1.65	
V _I	Input voltage	0	V _{CC}	0	V _{CC}	V
V _O	Output voltage	0	V _{CC}	0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 3 V	-12	-12	-12	mA
		V _{CC} = 4.5 V	-24	-24	-24	
		V _{CC} = 5.5 V	-24	-24	-24	
I _{OL}	Low-level output current	V _{CC} = 3 V	12	12	12	mA
		V _{CC} = 4.5 V	24	24	24	
		V _{CC} = 5.5 V	24	24	24	
Δt/Δv	Input transition rise or fall rate		8	8	ns/V	
T _A	Operating free-air temperature	-55	125	-40	85	°C

NOTE 3: 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.

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			SN54AC573	SN74AC573	UNIT
			MIN	TYP	MAX			
V _{OH}	I _{OH} = -50 μA	3 V	2.9		2.9	2.9	2.9	V
		4.5 V	4.4		4.4	4.4	4.4	
		5.5 V	5.4		5.4	5.4	5.4	
	I _{OH} = -12 mA	3 V	2.58		2.48	2.48	2.48	
		4.5 V	3.94		3.8	3.8	3.8	
	I _{OH} = -24 mA	5.5 V	4.94		4.8	4.8	4.8	
		5.5 V			3.85	3.85	3.85	
	I _{OH} = -75 mA [†]	3 V		0.1		0.1	0.1	
		4.5 V		0.1		0.1	0.1	
		5.5 V		0.1		0.1	0.1	
V _{OL}	I _{OL} = 50 μA	3 V		0.1		0.1	0.1	V
		4.5 V		0.1		0.1	0.1	
		5.5 V		0.1		0.1	0.1	
	I _{OL} = 12 mA	3 V		0.36		0.44	0.44	
		4.5 V		0.36		0.44	0.44	
I _{OL}	I _{OL} = 24 mA	5.5 V		0.36		0.44	0.44	V
		5.5 V		0.36		0.44	0.44	
	I _{OL} = 75 mA	5.5 V				1.65	1.65	
I _I	V _I = V _{CC} or GND	5.5 V		±0.1		±1	±1	μA
I _{OZ}	V _O = V _{CC} or GND	5.5 V		±0.25		±5	±2.5	μA
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V		4		80	40	μA
C _i	V _I = V _{CC} or GND	5 V		5				pF

[†] Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

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WITH 3-STATE OUTPUTS**

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timing requirements over recommended operating free-air temperature range, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see Figure 1)

		$T_A = 25^\circ\text{C}$		SN54AC573		SN74AC573		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration, LE high	6		8		7		ns
t_{su}	Setup time, data before LE \downarrow	3.5		5		4		ns
t_h	Hold time, data after LE \downarrow	2		3		2		ns

timing requirements over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

		$T_A = 25^\circ\text{C}$		SN54AC573		SN74AC573		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration, LE high	4		6		5		ns
t_{su}	Setup time, data before LE \downarrow	3		4.5		3.5		ns
t_h	Hold time, data after LE \downarrow	2		3		2		ns

switching characteristics over recommended operating free-air temperature range, $V_{CC} = 3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$		SN54AC573		SN74AC573		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	D	Q	2.5	13	1.5	16.5	2	15	ns
t_{PHL}			2.5	12	1.5	15.5	2	14	
t_{PLH}	LE	Q	2.5	13	1.5	16.5	2	15	ns
t_{PHL}			2.5	12	1.5	15.5	2	14	
t_{PZH}	OE	Q	2.5	11	1.5	13.5	2	12	ns
t_{PZL}			2.5	11	1.5	14	2	12.5	
t_{PHZ}	OE	Q	2.5	12.5	1.5	15	2	13.5	ns
t_{PLZ}			2.5	9.5	1.5	12	2	10.5	

switching characteristics over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$		SN54AC573		SN74AC573		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	D	Q	2.5	10	1.5	13	2	11.5	ns
t_{PHL}			2.5	9.5	1.5	12.5	2	11	
t_{PLH}	LE	Q	2.5	9.5	1.5	12.5	2	11	ns
t_{PHL}			2.5	8.5	1.5	11.5	2	10	
t_{PZH}	OE	Q	2.5	9	1.5	11.5	2	10	ns
t_{PZL}			2.5	8.5	1.5	11	2	9.5	
t_{PHZ}	OE	Q	2.5	11	1.5	13.5	2	12	ns
t_{PLZ}			2.5	8	1.5	10.5	2	9	

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

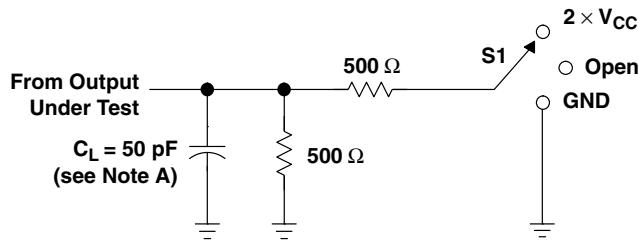
PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{pd} Power dissipation capacitance	$C_L = 50\text{ pF}$, $f = 1\text{ MHz}$	25	pF

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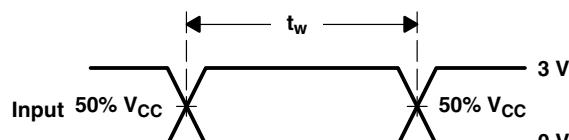
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PARAMETER MEASUREMENT INFORMATION

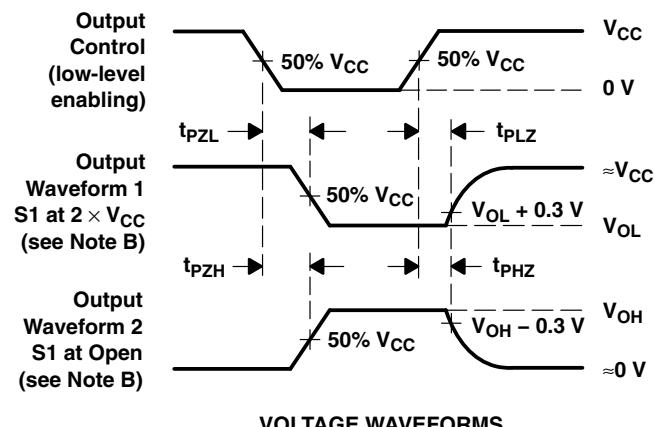
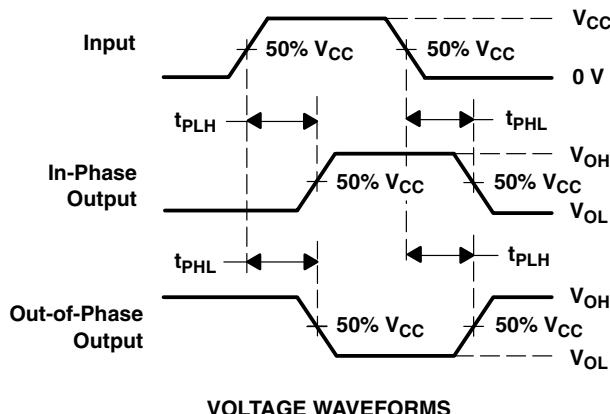
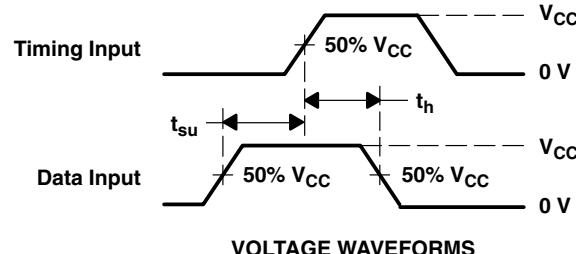


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	2 $\times V_{CC}$
t_{PHZ}/t_{PZH}	Open

LOAD CIRCUIT



VOLTAGE WAVEFORMS



NOTES: A. C_L includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_f \leq 2.5 \text{ ns}$, $t_r \leq 2.5 \text{ ns}$.

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

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74AC573DBLE	OBsolete	SSOP	DB	20		TBD	Call TI	Call TI
SN74AC573DBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573DBRE4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573DBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573DWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74AC573NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74AC573NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573NSRE4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573NSRG4	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573PW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573PWE4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573PWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573PWLE	OBsolete	TSSOP	PW	20		TBD	Call TI	Call TI
SN74AC573PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573PWRE4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC573PWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

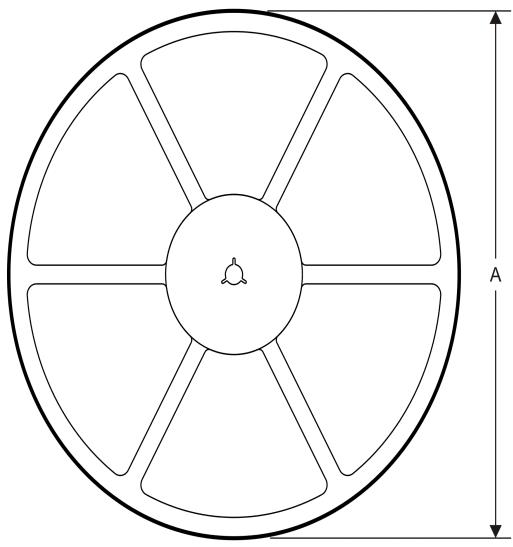
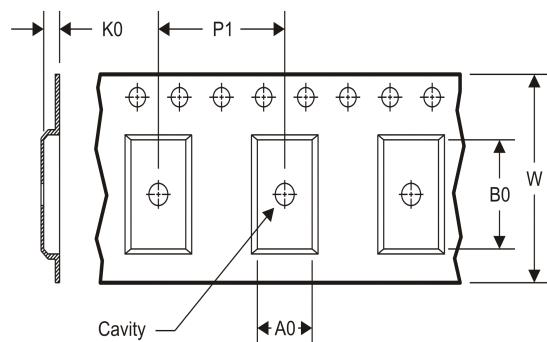
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

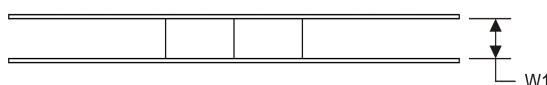
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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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


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
SN74AC573DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74AC573DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN74AC573NSR	SO	NS	20	2000	330.0	24.4	8.2	13.0	2.5	12.0	24.0	Q1
SN74AC573PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	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)
SN74AC573DBR	SSOP	DB	20	2000	367.0	367.0	38.0
SN74AC573DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74AC573NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74AC573PWR	TSSOP	PW	20	2000	367.0	367.0	38.0

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



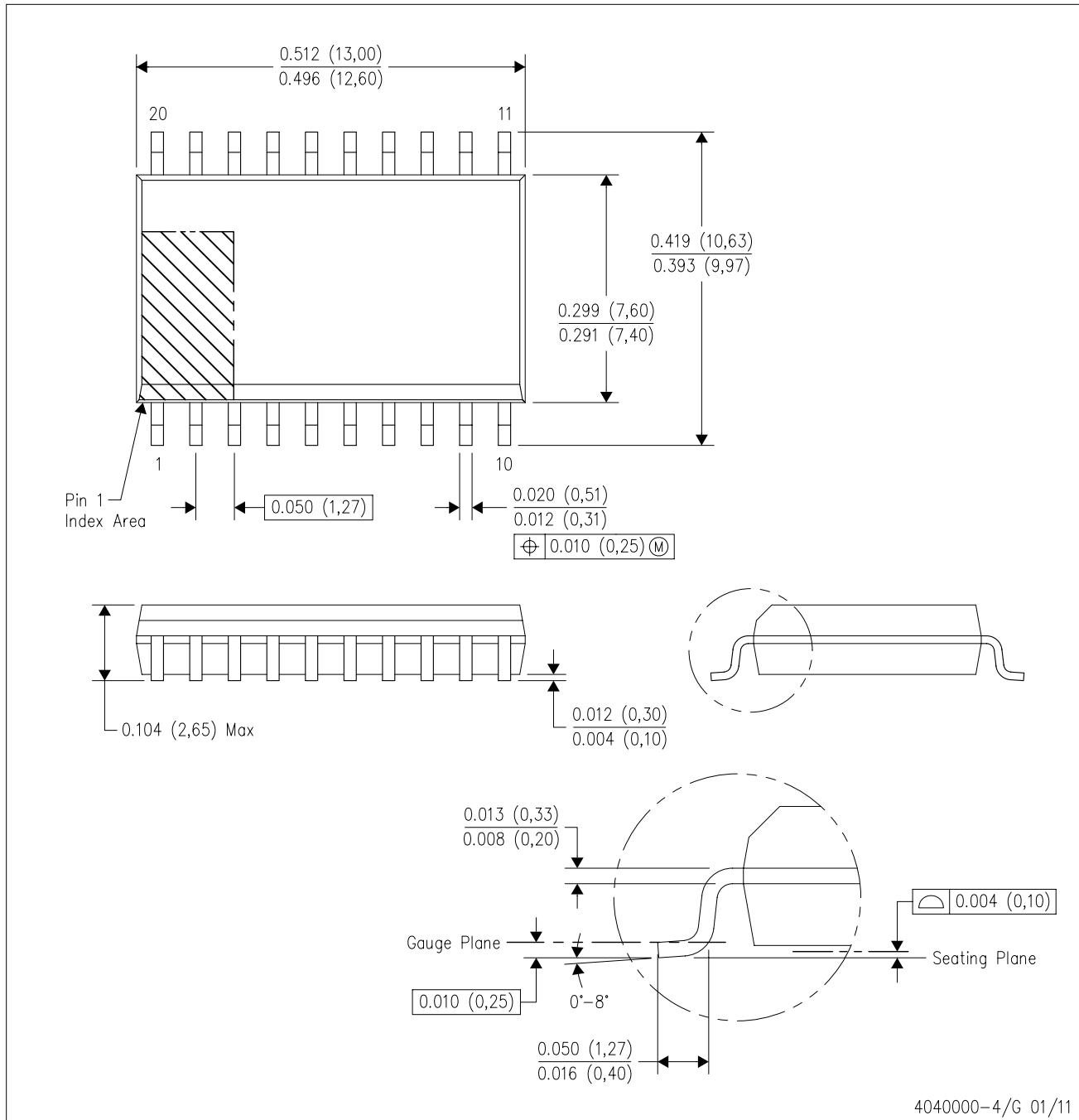
NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.

△ 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.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE

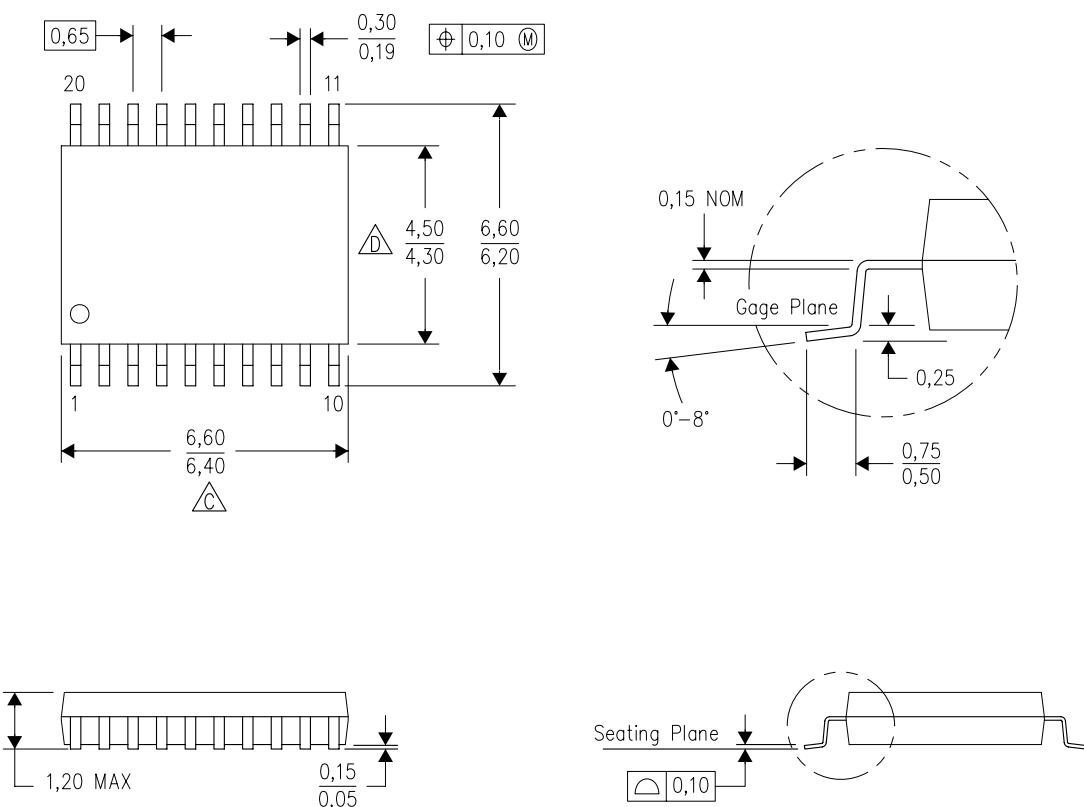


NOTES:

- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
- This drawing is subject to change without notice.
- Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0.15).
- Falls within JEDEC MS-013 variation AC.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.

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 0.15 each side.

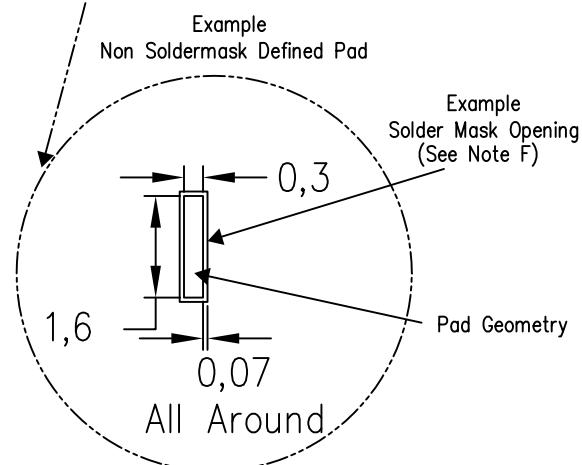
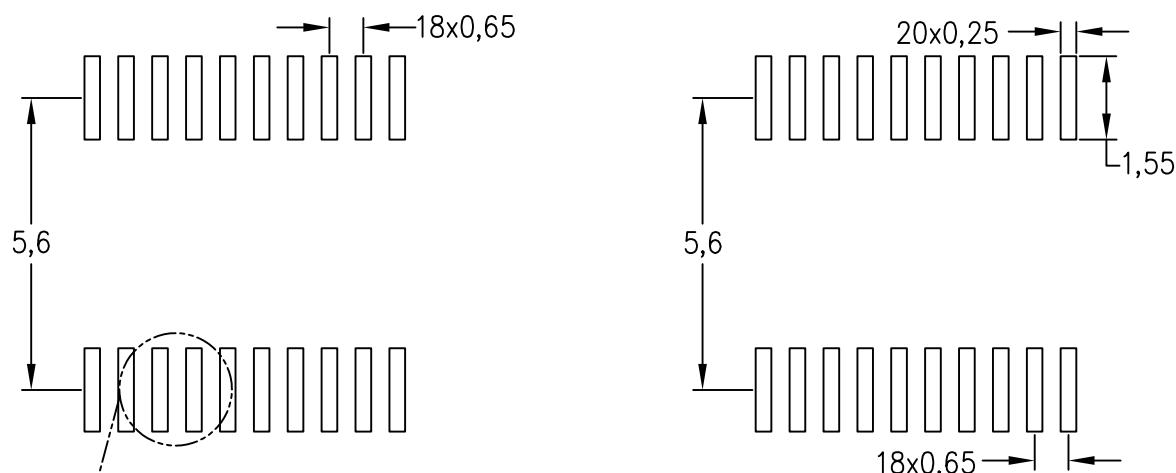
 Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

E. Falls within JFDEC M0-153

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE

Example Board Layout

Based on a stencil thickness
of .127mm (.005inch).

4211284-5/E 07/12

NOTES:

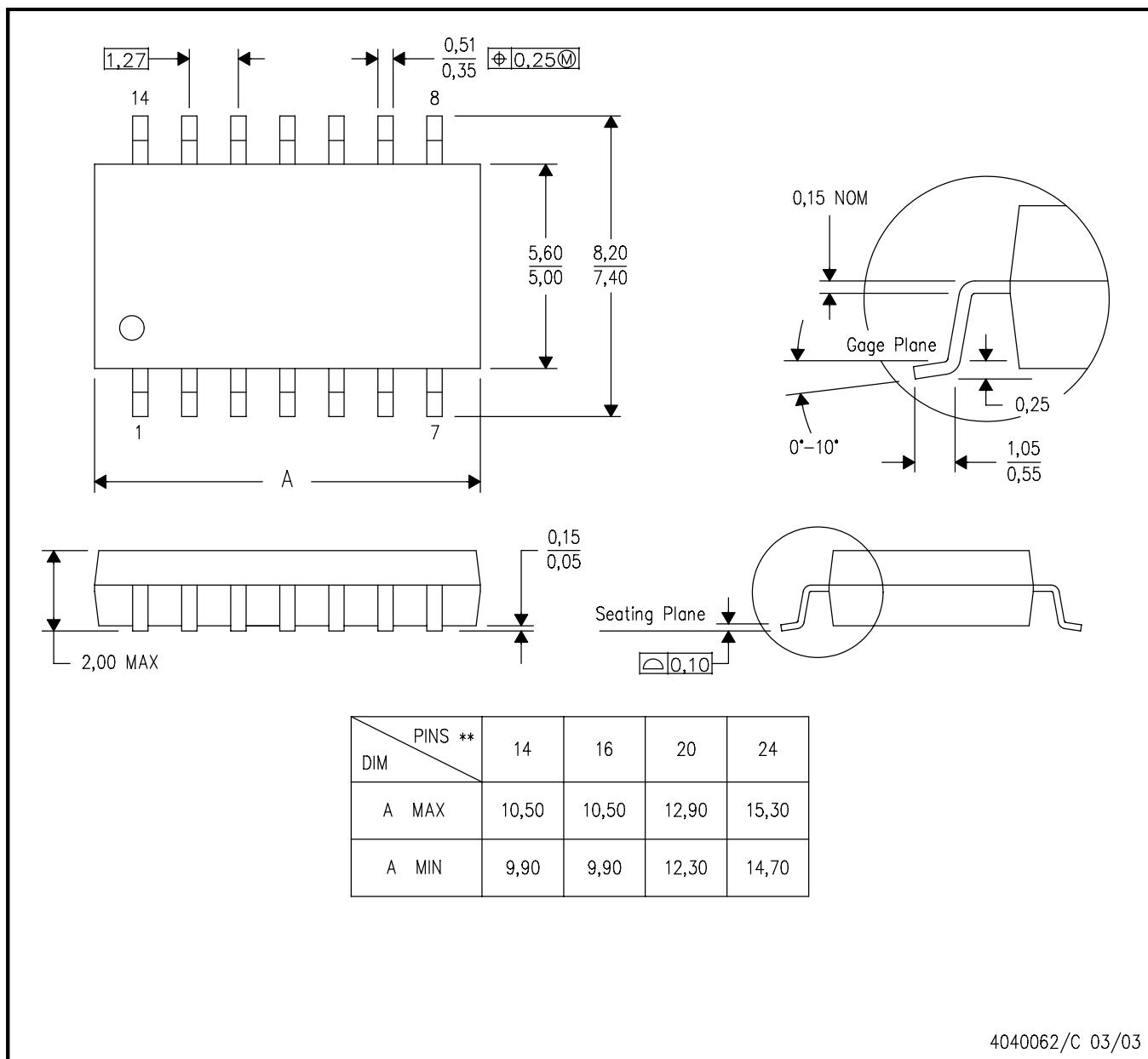
- All linear dimensions are in millimeters.
- This drawing is subject to change without notice.
- Publication IPC-7351 is recommended for alternate design.
- Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board 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.

MECHANICAL DATA

NS (R-PDSO-G**)

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



4040062/C 03/03

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.

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 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.
 D. Falls within JEDEC MO-150

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