



**THE DATASHEET OF  
SN74HC574DW**



# SN54HC574, SN74HC574 OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

SCLS148F – DECEMBER 1982 – REVISED AUGUST 2003

- Wide Operating Voltage Range of 2 V to 6 V
- High-Current 3-State Noninverting Outputs Drive Bus Lines Directly or Up To 15 LSTTL Loads
- Low Power Consumption, 80- $\mu$ A Max  $I_{CC}$
- Typical  $t_{pd} = 22$  ns
- $\pm 6$ -mA Output Drive at 5 V
- Low Input Current of 1  $\mu$ A Max
- Bus-Structured Pinout

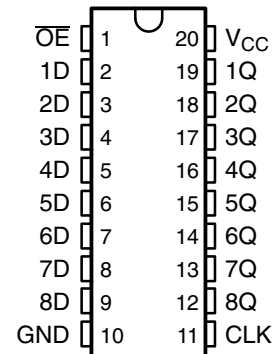
## description/ordering information

These octal edge-triggered D-type flip-flops feature 3-state outputs designed specifically for bus driving. They are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

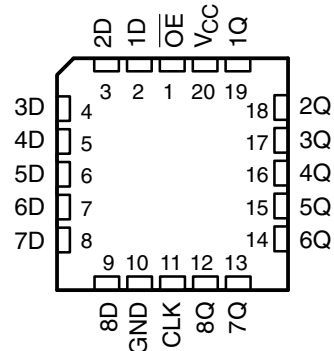
The eight flip-flops enter data on the low-to-high transition of the clock (CLK) input.

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 without interface or pullup components.

SN54HC574 . . . J OR W PACKAGE  
SN74HC574 . . . DB, DW, N, NS, OR PW PACKAGE  
(TOP VIEW)



SN54HC574 . . . FK PACKAGE  
(TOP VIEW)



## ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	PDIP – N	Tube of 20	SN74HC574N	SN74HC574N
	SOIC – DW	Tube of 25	SN74HC574DW	HC574
		Reel of 2000	SN74HC574DWR	
	SSOP – DB	Reel of 2000	SN74HC574DBR	HC574
	SOP – NS	Reel of 2000	SN74HC574NSR	HC574
	TSSOP – PW	Tube of 70	SN74HC574PW	HC574
Reel of 2000		SN74HC574PWR		
Reel of 250		SN74HC574PWT		
-55°C to 125°C	CDIP – J	Tube of 20	SNJ54HC574J	SNJ54HC574J
	CFP – W	Tube of 85	SNJ54HC574W	SNJ54HC574W
	LCCC – FK	Tube of 55	SNJ54HC574FK	SNJ54HC574FK

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



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS  
INSTRUMENTS**

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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

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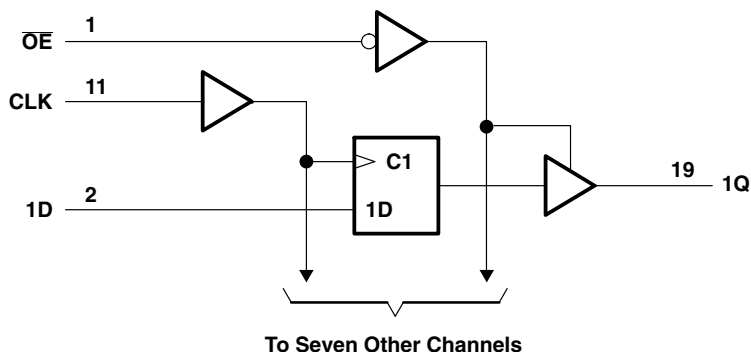
## description/ordering information (continued)

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

FUNCTION TABLE  
(each flip-flop)

INPUTS			OUTPUT
$\overline{OE}$	CLK	D	Q
L	↑	H	H
L	↑	L	L
L	H or L	X	$Q_0$
H	X	X	Z

## logic diagram (positive logic)



## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage range, $V_{CC}$	-0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see Note 1)	±20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1)	±20 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±35 mA
Continuous current through $V_{CC}$ or GND	±70 mA
Package thermal impedance, $\theta_{JA}$ (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

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “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)

		SN54HC574			SN74HC574			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	2	5	6	2	5	6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V	1.5		1.5		V	
		V <sub>CC</sub> = 4.5 V	3.15		3.15			
		V <sub>CC</sub> = 6 V	4.2		4.2			
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V	0.5		0.5		V	
		V <sub>CC</sub> = 4.5 V	1.35		1.35			
		V <sub>CC</sub> = 6 V	1.8		1.8			
V <sub>I</sub>	Input voltage	0	V <sub>CC</sub>		0	V <sub>CC</sub>		V
V <sub>O</sub>	Output voltage	0	V <sub>CC</sub>		0	V <sub>CC</sub>		V
Δt/Δv	Input transition rise/fall time	V <sub>CC</sub> = 2 V	1000		1000		ns	
		V <sub>CC</sub> = 4.5 V	500		500			
		V <sub>CC</sub> = 6 V	400		400			
T <sub>A</sub>	Operating free-air temperature	-55	125		-40	85		°C

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS		V <sub>CC</sub>	T <sub>A</sub> = 25°C		SN54HC574		SN74HC574		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	
V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 μA	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 <sub>OH</sub> = -6 mA	4.5 V	3.98	4.3	3.7	3.84			
		I <sub>OH</sub> = -7.8 mA	6 V	5.48	5.8	5.2	5.34			
V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20 μA	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 <sub>OL</sub> = 6 mA	4.5 V	0.17	0.26	0.4	0.33			
		I <sub>OL</sub> = 7.8 mA	6 V	0.15	0.26	0.4	0.33			
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0	6 V	±0.1	±100	±1000	±1000	nA			
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or 0	6 V	±0.01	±0.5	±10	±5	μA			
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0	6 V	8		160	80	μA			
C <sub>i</sub>		2 V to 6 V	3	10	10	10	pF			



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

	$V_{CC}$	$T_A = 25^\circ\text{C}$		SN54HC574		SN74HC574		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
$f_{\text{clock}}$ Clock frequency	2 V		6		4		5	MHz
	4.5 V		30		20		24	
	6 V		38		24		28	
$t_w$ Pulse duration, CLK high or low	2 V	80		120		100		ns
	4.5 V	16		24		20		
	6 V	14		20		17		
$t_{su}$ Setup time, data before CLK $\uparrow$	2 V	100		150		125		ns
	4.5 V	20		30		25		
	6 V	17		26		21		
$t_h$ Hold time, data after CLK $\uparrow$	2 V	5		5		5		ns
	4.5 V	5		5		5		
	6 V	5		5		5		

switching characteristics over recommended operating free-air temperature range,  $C_L = 50$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC574		SN74HC574		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$f_{\text{max}}$			2 V	6	11		4		5	MHz	
			4.5 V	30	36		20		24		
			6 V	36	40		24		28		
$t_{pd}$	CLK	Any Q	2 V		90	180		270		225	ns
			4.5 V		28	36		54		45	
			6 V		24	31		46		38	
$t_{en}$	$\overline{OE}$	Any Q	2 V		77	150		225		190	ns
			4.5 V		26	30		45		38	
			6 V		23	26		38		32	
$t_{dis}$	$\overline{OE}$	Any Q	2 V		52	150		225		190	ns
			4.5 V		24	30		45		38	
			6 V		22	26		38		32	
$t_t$		Any Q	2 V		28	60		90		75	ns
			4.5 V		8	12		18		15	
			6 V		6	10		15		13	



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switching characteristics over recommended operating free-air temperature range,  $C_L = 150 \text{ pF}$   
(unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC574		SN74HC574		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$f_{max}$			2 V	6					5		MHz
			4.5 V	30					24		
			6 V	36					28		
$t_{pd}$	CLK	Any Q	2 V	105	265	400		330		ns	
			4.5 V	36	53	80		66			
			6 V	31	46	68		57			
$t_{en}$	$\overline{OE}$	Any Q	2 V	95	235	355		295		ns	
			4.5 V	32	47	71		59			
			6 V	28	41	60		51			
$t_t$		Any Q	2 V	60	210	315		265		ns	
			4.5 V	17	42	63		53			
			6 V	14	36	53		45			

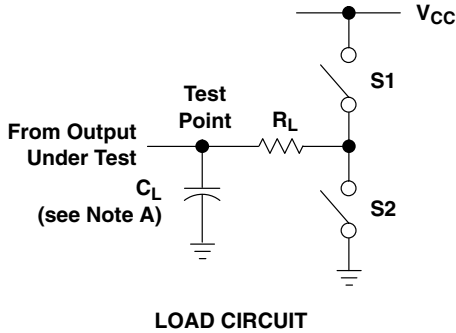
operating characteristics,  $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance per flip-flop	No load	100	pF

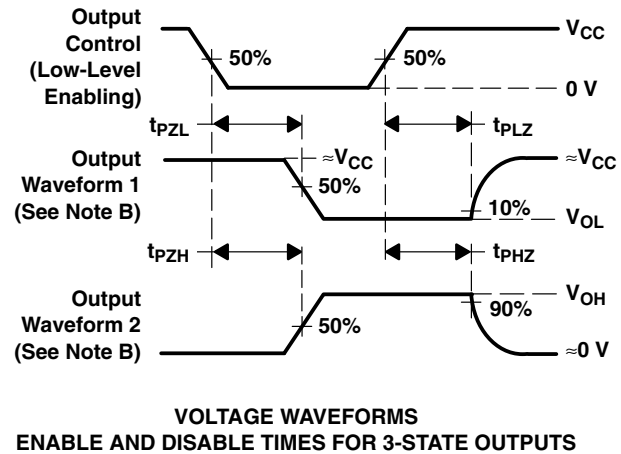
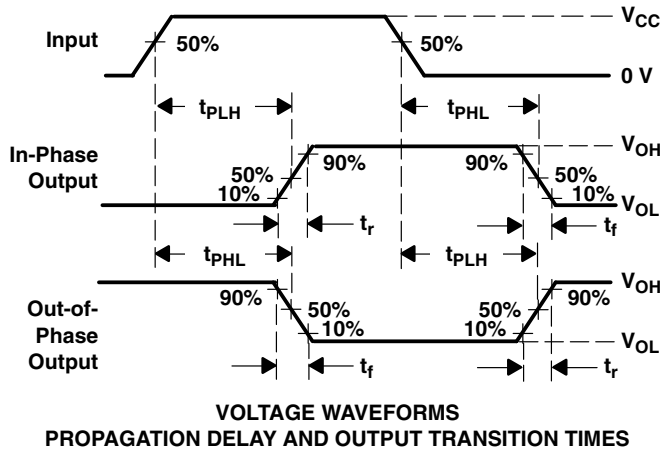
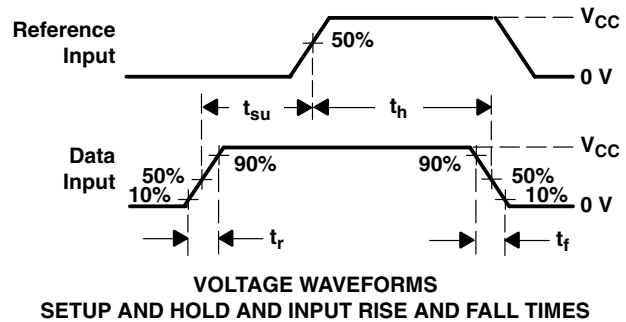
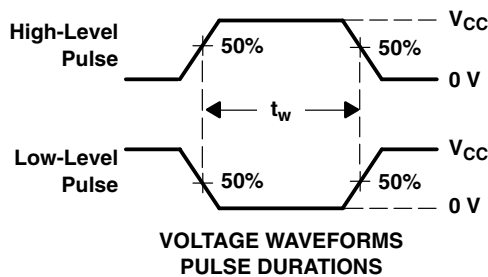
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## PARAMETER MEASUREMENT INFORMATION



PARAMETER	$R_L$	$C_L$	S1	S2
$t_{en}$	1 k $\Omega$	50 pF or 150 pF	Open	Closed
			Closed	Open
$t_{dis}$	1 k $\Omega$	50 pF	Open	Closed
			Closed	Open
$t_{pd}$ or $t_t$	--	50 pF or 150 pF	Open	Open



- NOTES: A.  $C_L$  includes probe and test-fixture 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. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.  
 D. For clock inputs,  $f_{max}$  is measured when the input duty cycle is 50%.  
 E. The outputs are measured one at a time with one input transition per measurement.  
 F.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .  
 G.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .  
 H.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

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 (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
JM38510/65604BRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 65604BRA	<a href="#">Samples</a>
M38510/65604BRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 65604BRA	<a href="#">Samples</a>
SN54HC574J	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54HC574J	<a href="#">Samples</a>
SN74HC574APWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC574A	<a href="#">Samples</a>
SN74HC574DBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC574	<a href="#">Samples</a>
SN74HC574DBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC574	<a href="#">Samples</a>
SN74HC574DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC574	<a href="#">Samples</a>
SN74HC574DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC574	<a href="#">Samples</a>
SN74HC574DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU   CU SN	Level-1-260C-UNLIM	-40 to 85	HC574	<a href="#">Samples</a>
SN74HC574N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC574N	<a href="#">Samples</a>
SN74HC574NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC574N	<a href="#">Samples</a>
SN74HC574NSR	ACTIVE	SO	NS	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC574	<a href="#">Samples</a>
SN74HC574PW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC574	<a href="#">Samples</a>
SN74HC574PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU   CU SN	Level-1-260C-UNLIM	-40 to 85	HC574	<a href="#">Samples</a>
SN74HC574PWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC574	<a href="#">Samples</a>
SN74HC574PWT	ACTIVE	TSSOP	PW	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC574	<a href="#">Samples</a>
SNJ54HC574FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	SNJ54HC 574FK	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SNJ54HC574J	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ54HC574J	<a href="#">Samples</a>
SNJ54HC574W	ACTIVE	CFP	W	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	SNJ54HC574W	<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.

**OBSELETE:** 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/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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**OTHER QUALIFIED VERSIONS OF SN54HC574, SN74HC574 :**

- Catalog: [SN74HC574](#)
- Military: [SN54HC574](#)

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
SN74HC574DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74HC574DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74HC574DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74HC574NSR	SO	NS	20	2000	330.0	24.4	8.4	13.0	2.5	12.0	24.0	Q1
SN74HC574PWR	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)
SN74HC574DBR	SSOP	DB	20	2000	367.0	367.0	38.0
SN74HC574DWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74HC574DWR	SOIC	DW	20	2000	364.0	361.0	36.0
SN74HC574NSR	SO	NS	20	2000	367.0	367.0	45.0
SN74HC574PWR	TSSOP	PW	20	2000	364.0	364.0	27.0

W (R-GDFP-F20)

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-F20

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



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.



PW (R-PDSO-G20)

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 design.
  - 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.

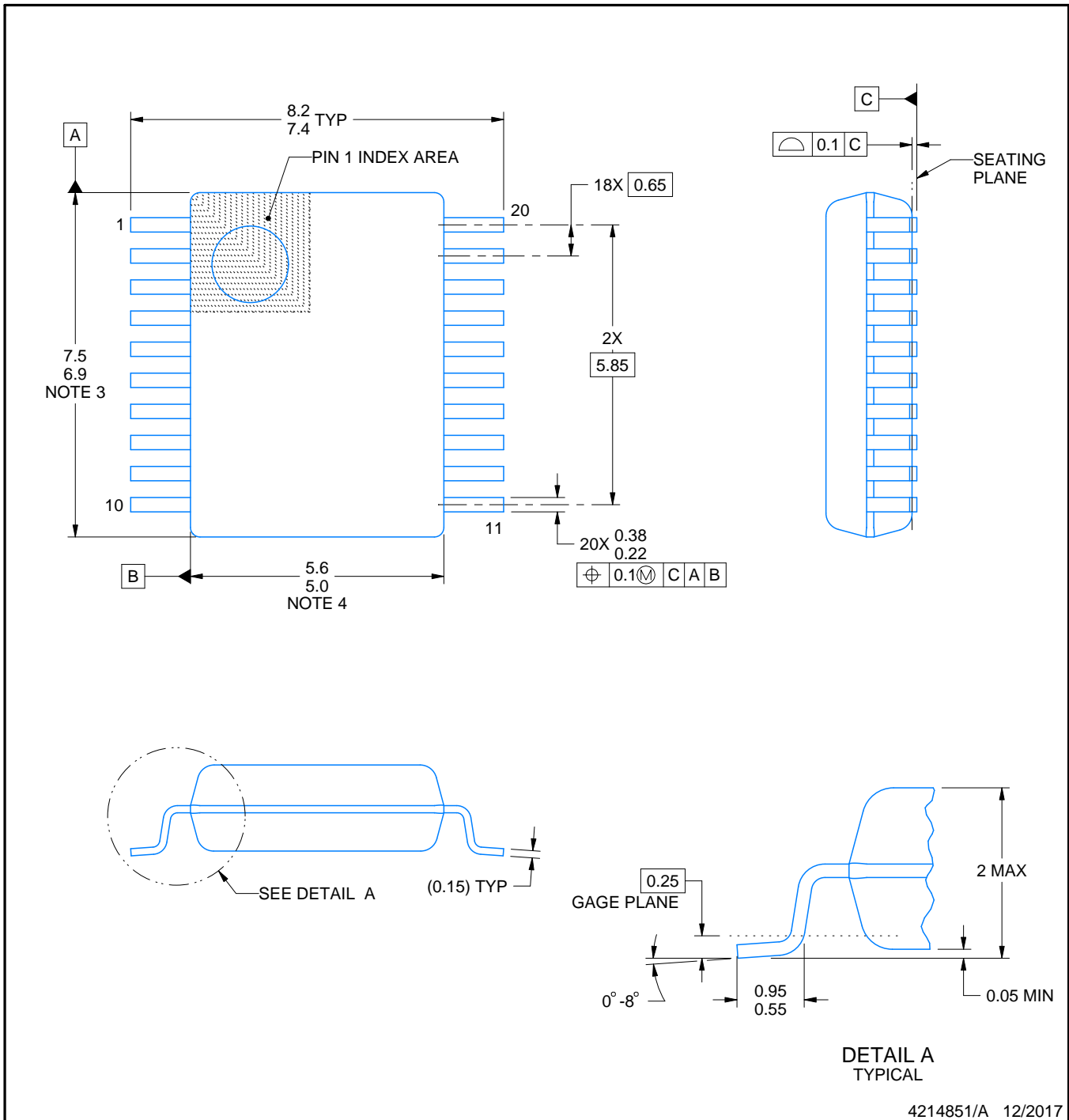
# DB0020A



# PACKAGE OUTLINE

## TSSOP - 2 mm max height

SMALL OUTLINE PACKAGE



4214851/A 12/2017

### NOTES:

- All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- 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.
- This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
- Reference JEDEC registration MO-150.

# EXAMPLE BOARD LAYOUT

DB0020A

TSSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4214851/A 12/2017

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

DB0020A

TSSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

4214851/A 12/2017

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.

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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



4040049/E 12/2002

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

# DW0020A



# PACKAGE OUTLINE

## SOIC - 2.65 mm max height

SOIC



4220724/A 05/2016

**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 0.43 mm per side.
5. Reference JEDEC registration MS-013.

# EXAMPLE BOARD LAYOUT

DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

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

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

4220724/A 05/2016

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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