74HC574; 74HCT574

Octal D-type flip-flop; positive edge-trigger; 3-state

Rev. 10 — 5 August 2024

Product data sheet

1. General description

The 74HC574; 74HCT574 is an 8-bit positive-edge triggered D-type flip-flop with 3-state outputs. The device features a clock (CP) and output enable (\overline{OE}) inputs. The flip-flops will store the state of their individual D-inputs that meet the set-up and hold time requirements on the LOW-to-HIGH clock (CP) transition. A HIGH on \overline{OE} causes the outputs to assume a high-impedance OFF-state. Operation of the \overline{OE} input does not affect the state of the flip-flops. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

2. Features and benefits

- Wide supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- · High noise immunity
- · Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards:
 - JESD8C (2.7 V to 3.6 V)
 - JESD7A (2.0 V to 6.0 V)
- Input levels:
 - For 74HC574: CMOS level
 - For 74HCT574: TTL level
- 3-state non-inverting outputs for bus oriented applications
- 8-bit positive, edge-triggered register
- · Common 3-state output enable input
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package	Package									
	Temperature range	Name	Description	Version							
74HC574D 74HCT574D	-40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1							
74HC574PW 74HCT574PW	-40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1							
74HC574BQ	-40 °C to +125 °C	DHVQFN20	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm	SOT764-1							



4. Functional diagram

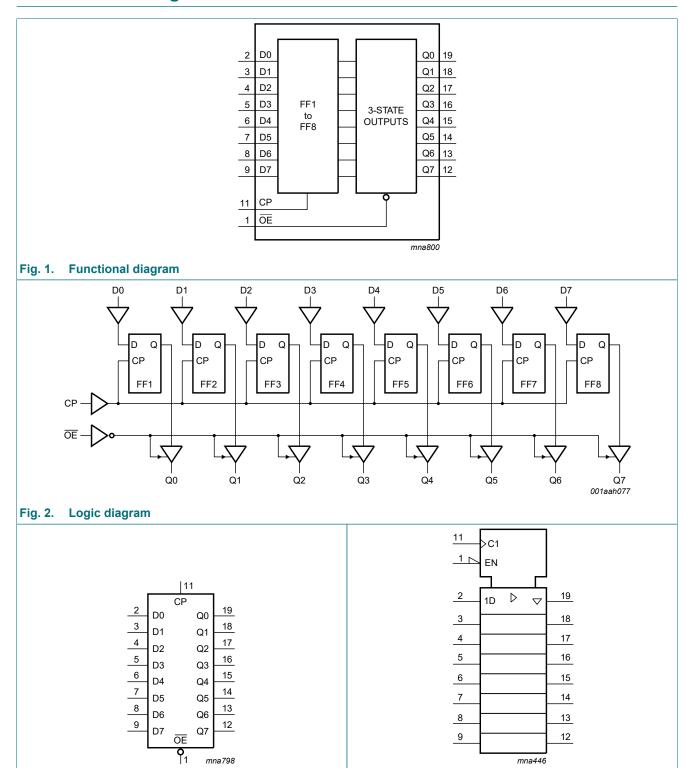
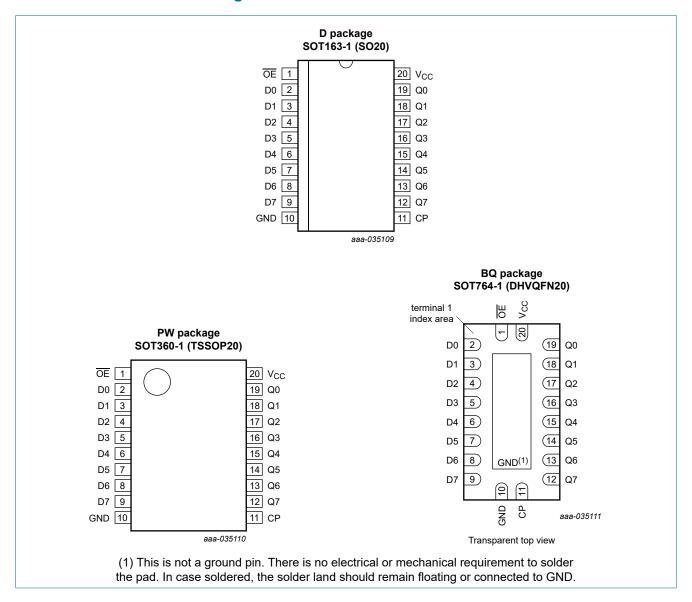


Fig. 4. IEC logic symbol

Fig. 3. Logic symbol

5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
ŌĒ	1	3-state output enable input (active LOW)
D0, D1, D2, D3, D4, D5, D6, D7	2, 3, 4, 5, 6, 7, 8, 9	data inputs
GND	10	ground (0 V)
СР	11	clock input (LOW-to-HIGH, edge triggered)
Q0, Q1, Q2, Q3, Q4, Q5, Q6, Q7	19, 18, 17, 16, 15, 14, 13, 12	3-state flip-flop outputs
V _{CC}	20	supply voltage

6. Functional description

Table 3. Function table

H = HIGH voltage level; h = HIGH voltage level one setup time prior to the HIGH-to-LOW CP transition;

L = LOW voltage level; I = LOW voltage level one setup time prior to the HIGH-to-LOW CP transition;

 $Z = high-impedance \ OFF-state; \uparrow = LOW-to-HIGH \ clock \ transition.$

Operating mode	Input				Output
	ŌE CP Dn		Dn	flip-flop	Qn
Load and read register	L	↑	I	L	L
	L	↑	h	Н	Н
Load register and disable output	Н	↑	I	L	Z
	Н	1	h	Н	Z

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		-0.5	+7	V
I _{IK}	input clamping current	$V_{I} < -0.5 \text{ V or } V_{I} > V_{CC} + 0.5 \text{ V}$	-	±20	mA
I _{OK}	output clamping current	$V_{O} < -0.5 \text{ V or } V_{O} > V_{CC} + 0.5 \text{ V}$	-	±20	mA
Io	output current	$V_O = -0.5 \text{ V to } (V_{CC} + 0.5 \text{ V})$	-	±35	mA
I _{CC}	supply current		-	+70	mA
I _{GND}	ground current		-	-70	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	[1]	-	500	mW

^[1] For SOT163-1 (SO20) package: P_{tot} derates linearly with 12.3 mW/K above 109 °C. For SOT360-1 (TSSOP20) package: P_{tot} derates linearly with 10.0 mW/K above 100 °C. For SOT764-1 (DHVQFN20) package: P_{tot} derates linearly with 12.9 mW/K above 111 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol			1	7	' 4	Unit			
			Min	Тур	Max	Min	Тур	Max	
V_{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
VI	input voltage		0	-	V _{CC}	0	-	V _{CC}	V
Vo	output voltage		0	-	V _{CC}	0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 2.0 V	-	-	625	-	-	-	ns/V
		V _{CC} = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V _{CC} = 6.0 V	-	-	83	-	-	-	ns/V

9. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		25 °C		-40 °C to	o +85 °C	-40 °C to	+125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
74HC57	4					'		1	'	
V _{IH}	HIGH-level	V _{CC} = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
	input voltage	V _{CC} = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V _{CC} = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V _{IL}	LOW-level	V _{CC} = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
	input voltage	V _{CC} = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V _{CC} = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	I _O = -20 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I _O = -20 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -20 μA; V _{CC} = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		$I_O = -6.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.98	4.32	-	3.84	-	3.7	-	V
		$I_O = -7.8 \text{ mA}; V_{CC} = 6.0 \text{ V}$	5.48	5.81	-	5.34	-	5.2	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	$I_O = 20 \mu A; V_{CC} = 2.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 4.5 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 6.0 V$	-	0	0.1	-	0.1	-	0.1	V
		I _O = 6.0 mA; V _{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I _O = 7.8 mA; V _{CC} = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V
I _I	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$	-	-	±0.1	-	±1.0	-	±1.0	μΑ
l _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 6.0$ V; $V_O = V_{CC}$ or GND	-	-	±0.5	-	±5.0	-	±10.0	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 6.0 \text{ V}$	-	-	8.0	-	80	-	160	μΑ
C _I	input capacitance		-	3.5	-	-	-	-	-	pF

Symbol	Parameter	Conditions		25 °C		-40 °C t	o +85 °C	-40 °C to	+125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
74HCT5	74						-		'	
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	1.2	8.0	-	0.8	-	0.8	V
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 V$								
	output voltage	I _O = -20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -6 mA	3.98	4.32	-	3.84	-	3.7	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5$ V								
output voltage	Ι _Ο = 20 μΑ	-	0	0.1	-	0.1	-	0.1	V	
		I _O = 6.0 mA	-	0.16	0.26	-	0.33	-	0.4	V
I _I	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.1	-	±1.0	-	±1.0	μΑ
l _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 5.5$ V; $V_O = V_{CC}$ or GND	-	-	±0.5	-	±5.0	-	±10	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	8.0	-	80	-	160	μΑ
ΔI _{CC}	additional supply current	$V_I = V_{CC} - 2.1 \text{ V};$ other inputs at V_{CC} or GND; $V_{CC} = 4.5 \text{ V}$ to 5.5 V; $I_O = 0 \text{ A}$								
		per input pin; Dn inputs	-	50	180	-	225	-	245	μΑ
		per input pin; OE input	-	125	450	-	563	-	613	μΑ
		per input pin; CP input	-	150	540	-	675	-	735	μΑ
Cı	input capacitance		-	3.5	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); C_L = 50 pF unless otherwise specified; for test circuit see Fig. 8.

Symbol	Parameter	Conditions		25 °C		-40 °C t	o +85 °C	-40 °C to	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	1
74HC57	4				1					
t _{pd}	propagation	CP to Qn; see Fig. 5]							
	delay	V _{CC} = 2.0 V	-	47	150	-	190	-	225	ns
		V _{CC} = 4.5 V	-	17	30	-	35	-	45	ns
		$V_{CC} = 5 \text{ V}; C_L = 15 \text{ pF}$	-	14	-	-	-	-	-	ns
		V _{CC} = 6.0 V	-	14	26	-	33	-	38	ns
t _{en}	enable time	OE to Qn; see Fig. 7	2]							
		V _{CC} = 2.0 V	-	44	140	-	175	-	210	ns
		V _{CC} = 4.5 V	-	16	28	-	35	-	42	ns
		V _{CC} = 6.0 V	-	13	24	-	30	-	36	ns
t _{dis}	disable time	OE to Qn; see Fig. 7	3]							
		V _{CC} = 2.0 V	-	39	125	-	155	-	190	ns
		V _{CC} = 4.5 V	-	14	25	-	31	-	38	ns
		V _{CC} = 6.0 V	-	11	21	-	26	-	32	ns
t _t	transition	Qn; see Fig. 5	1]							
	time	V _{CC} = 2.0 V	-	14	60	-	75	-	90	ns
		V _{CC} = 4.5 V	-	5	12	-	15	-	18	ns
		V _{CC} = 6.0 V	-	4	10	-	13	-	15	ns
t _W	pulse width	CP HIGH or LOW; see Fig. 6								
		V _{CC} = 2.0 V	80	14	-	100	-	120	-	ns
		V _{CC} = 4.5 V	16	5	-	20	-	24	-	ns
		V _{CC} = 6.0 V	14	4	-	17	-	20	-	ns
t _{su}	set-up time	Dn to CP; see Fig. 6								
		V _{CC} = 2.0 V	60	6	-	75	-	90	-	ns
		V _{CC} = 4.5 V	12	2	-	15	-	18	-	ns
		V _{CC} = 6.0 V	10	2	-	13	-	15	-	ns
t _h	hold time	Dn to CP; see Fig. 6								
		V _{CC} = 2.0 V	5	0	-	5	-	5	-	ns
		V _{CC} = 4.5 V	5	0	-	5	-	5	-	ns
		V _{CC} = 6.0 V	5	0	-	5	-	5	-	ns
f _{max}	maximum	CP; see Fig. 5								
	frequency	V _{CC} = 2.0 V	6.0	37	-	4.8	-	4.0	-	MHz
		V _{CC} = 4.5 V	30	112	-	24	-	20	-	MHz
		V _{CC} = 5 V; C _L = 15 pF	-	123	-	-	-	-	-	MHz
		V _{CC} = 6.0 V	35	133	-	28	-	24	-	MHz
C _{PD}	power dissipation capacitance	$C_L = 50 \text{ pF; } f = 1 \text{ MHz;}$ [§ $V_I = \text{GND to } V_{CC}$	5] -	22	-	-	-	-	-	pF

Symbol	Parameter	Conditions		25 °C		-40 °C t	o +85 °C	-40 °C to	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	1
74HCT5	74					1				
t _{pd}	propagation	CP to Qn; see Fig. 5 [1]							
	delay	V _{CC} = 4.5 V	-	18	33	-	41	-	50	ns
		V _{CC} = 5 V; C _L = 15 pF	-	15	-	-	-	-	-	ns
t _{en}	enable time	OE to Qn; see Fig. 7 [2]							
		V _{CC} = 4.5 V	-	19	33	-	41	-	50	ns
t _{dis}	disable time	OE to Qn; see Fig. 7 [3]							
		V _{CC} = 4.5 V	-	16	28	-	35	-	42	ns
t _t	transition	Qn; see <u>Fig. 5</u> [4]							
	time	V _{CC} = 4.5 V	-	5	12	-	15	-	18	ns
t _W	pulse width	CP HIGH or LOW; see Fig. 6								
		V _{CC} = 4.5 V	16	7	-	20	-	24	-	ns
t _{su}	set-up time	Dn to CP; see Fig. 6								
		V _{CC} = 4.5 V	12	3	-	15	-	18	-	ns
t _h	hold time	Dn to CP; see Fig. 6								
		V _{CC} = 4.5 V	5	-1	-	5	-	5	-	ns
f _{max}	maximum	CP; see Fig. 5								
	frequency	V _{CC} = 4.5 V	30	69	-	24	-	20	-	MHz
		V _{CC} = 5 V; C _L = 15 pF	-	76	-	-	-	-	-	MHz
C _{PD}	power dissipation capacitance	$C_L = 50 \text{ pF; } f = 1 \text{ MHz;}$ [5 $V_I = \text{GND to } V_{CC} - 1.5 \text{ V}$] -	25	-	-	-	-	-	pF

- [1] t_{pd} is the same as t_{PLH} and t_{PHL} .
- t_{en} is the same as t_{PZH} and t_{PZL} . t_{dis} is the same as t_{PLZ} and t_{PHZ} . [2]
- [3]
- t_{dis} is the same as t_{THL} and t_{TLH}.
 C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
 P_D = C_{PD} × V_{CC}² × f_i × N + Σ(C_L × V_{CC}² × f_o) where:

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma (C_1 \times V_{CC}^2 \times f_o)$$
 where:

 f_i = input frequency in MHz;

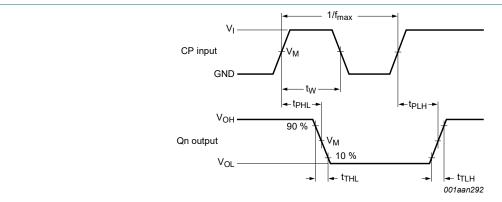
f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching; $\Sigma(C_L \times V_{CC}^2 \times f_0) = \text{sum of outputs.}$

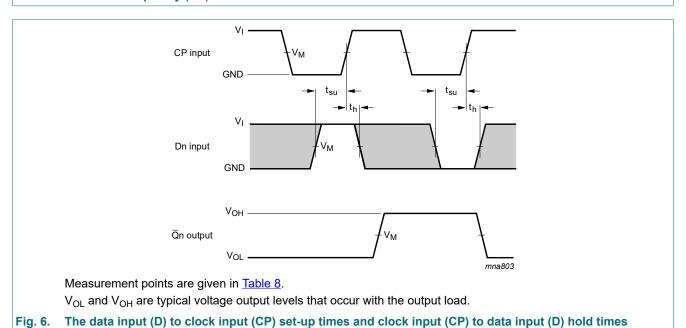
10.1. Waveforms and test circuit



Measurement points are given in Table 8.

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig. 5. Propagation delay input (CP) to output (Qn), output transition time, clock input (CP) pulse width and the maximum frequency (CP)



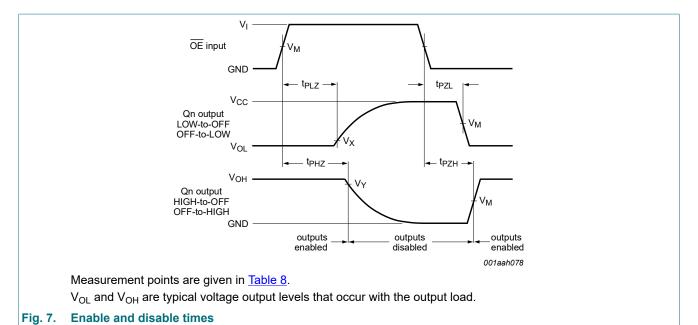
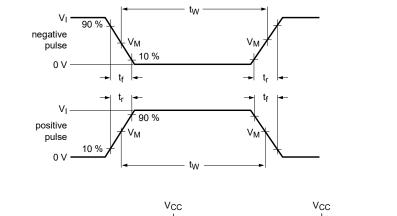
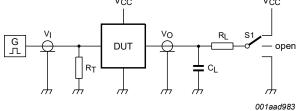


Table 8. Measurement points

rabio or inicacaro	mont pomic							
Туре	Input	Output	Output					
	V _M	V _M	V _X	V _Y				
74HC574	0.5 × V _{CC}	0.5 × V _{CC}	0.1 × V _{CC}	0.9 × V _{CC}				
74HCT574	1.3 V	1.3 V	0.1 × V _{CC}	0.9 × V _{CC}				

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Test data is given in Table 9.

Definitions test circuit:

 R_T = Termination resistance should be equal to output impedance Z_0 of the pulse generator;

C_L = Load capacitance including jig and probe capacitance;

R_L = Load resistance;

S1 = Test selection switch.

Fig. 8. Test circuit for measuring switching times

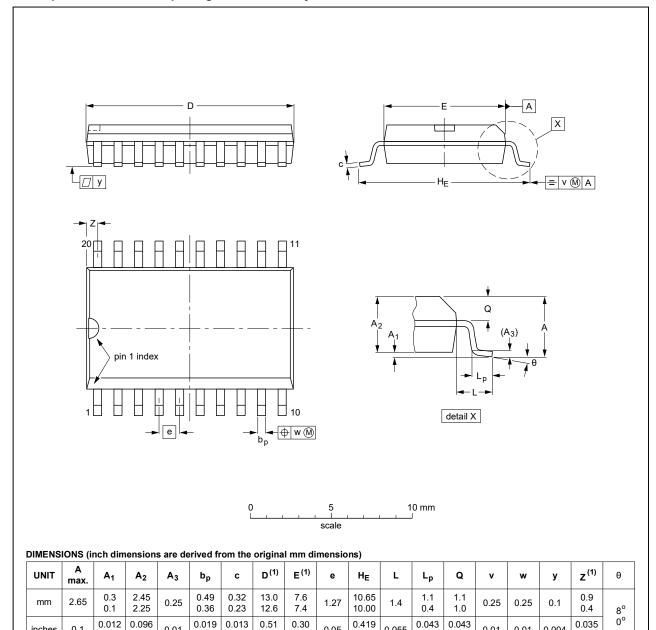
Table 9. Test data

Туре	/pe Input I		Load	Load		S1 position		
	V_{l}	t _r , t _f	CL	R_L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t_{PZL}, t_{PLZ}	
74HC574	V _{CC}	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}	
74HCT574	3 V	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}	

11. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



0.012 inches 0.004

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

0.019

0.014

0.013

0.009

0.51

0.49

0.30

0.29

OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT163-1	075E04	MS-013				99-12-27 03-02-19

0.05

0.419

0.394

0.055

0.043

0.016

0.043

0.039

0.01

0.01

Fig. 9. Package outline SOT163-1 (SO20)

0.096

0.089

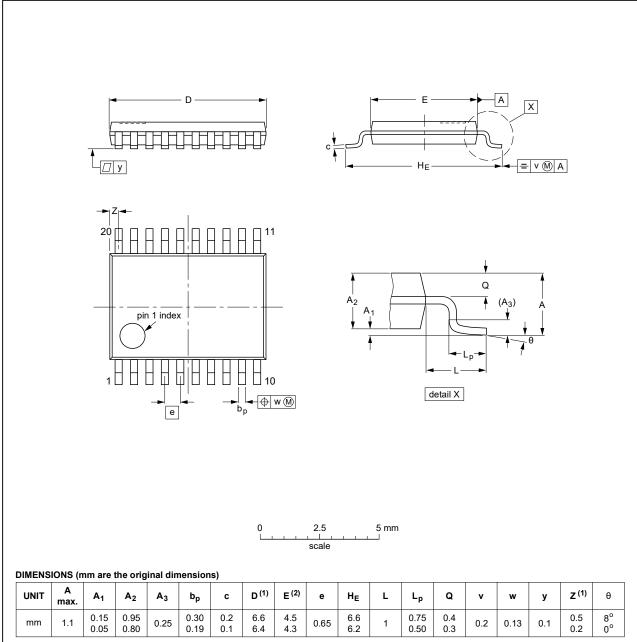
0.01

12 / 17

0.016

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1



Notes

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN	ISSUE DATE
	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT360-1		MO-153				99-12-27 03-02-19

Fig. 10. Package outline SOT360-1 (TSSOP20)

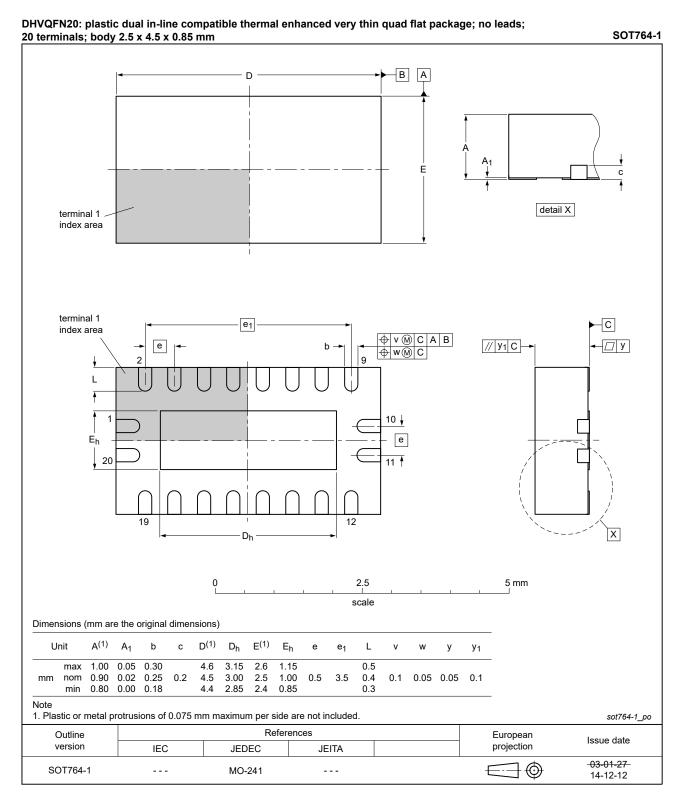


Fig. 11. Package outline SOT764-1 (DHVQFN20)

12. Abbreviations

Table 10. Abbreviations

Acronym	Description
ANSI	American National Standards Institute
CDM	Charged Device Model
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
НВМ	Human Body Model
JEDEC	Joint Electron Device Engineering Council
TTL	Transistor-Transistor Logic

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74HC_HCT574 v.10	20240805	Product data sheet	-	74HC_HCT574 v.9		
Modifications:	Section 2: E	<u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.				
74HC_HCT574 v.9	20221020	Product data sheet	-	74HC_HCT574 v.8		
Modifications:	Type number	Type number 74HC574BQ (SOT764-1/DHVQFN20) added.				
74HC_HCT574 v.8	20210730	Product data sheet	-	74HC_HCT574 v.7		
Modifications:	guidelines of Legal texts Type number Section 2 up	 The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Type numbers 74HC574DB and 74HCT574DB (SOT339-1/SSOP20) removed. Section 2 updated. Section 7: Derating values for P_{tot} total power dissipation updated. 				
74HC_HCT574 v.7	20160304	Product data sheet	-	74HC_HCT574 v.6		
Modifications:	Type number	Type numbers 74HC574N and 74HCT574N (SOT146-1) removed.				
74HC_HCT574 v.6	20150126	Product data sheet	-	74HC_HCT574 v.5		
Modifications:	Section 7: F	<u>Section 7</u> : Power dissipation capacitance condition for 74HCT574 is corrected.				
74HC_HCT574 v.5	20120425	Product data sheet	-	74HC_HCT574 v.4		
Modifications:	 V_X and V_Y r 	V _X and V _Y measurement points added to <u>Table 8</u> .				
74HC_HCT574 v.4	20111219	Product data sheet	-	74HC_HCT574 v.3		
Modifications:	Legal pages	Legal pages updated.				
74HC_HCT574 v.3	20101215	Product data sheet	-	74HC_HCT574_CNV v.2		
74HC_HCT574_CNV v.2	19970827	Product specification	-	-		

14. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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Octal D-type flip-flop; positive edge-trigger; 3-state

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For more information, please visit: http://www.nexperia.com For sales office addresses, please send an email to: salesaddresses@nexperia.com Date of release: 5 August 2024

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