74AHC574; 74AHCT574

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

Rev. 3 — 6 September 2023

Product data sheet

1. General description

The 74AHC574; 74AHCT574 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 are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

2. Features and benefits

- · Wide supply voltage range:
 - For 74AHC574: from 2.0 V to 5.5 V
 - For 74AHCT574: from 4.5 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- Balanced propagation delays
- · All inputs have a Schmitt-trigger action
- · High noise immunity
- 3-state non-inverting outputs for bus orientated applications
- CMOS low power dissipation
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- Input levels:
 - For 74AHC574: CMOS input level
 - For 74AHCT574: TTL input level
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package											
	Temperature range	Name	Description	Version								
74AHC574D 74AHCT574D	-40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1								
74AHC574PW 74AHCT574PW	-40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1								
74AHC574BQ 74AHCT574BQ	-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

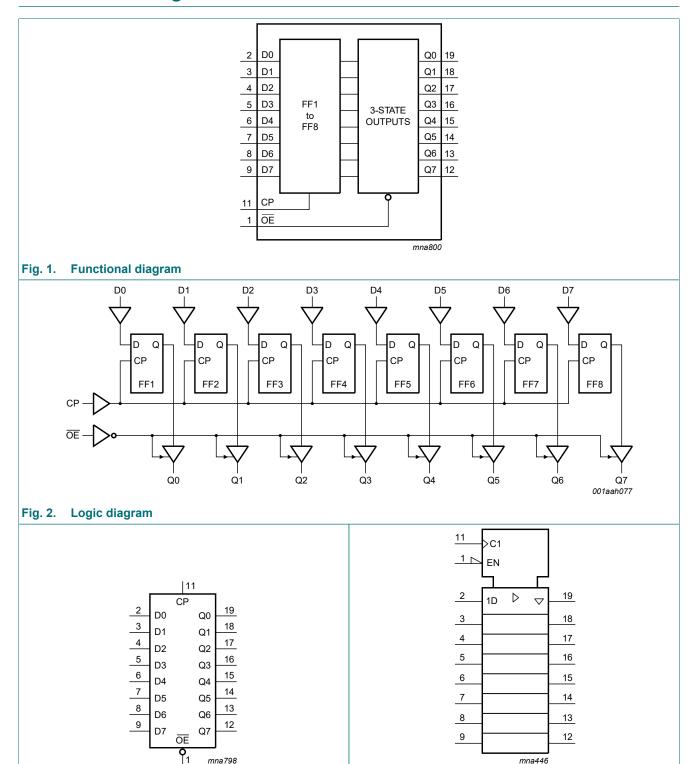
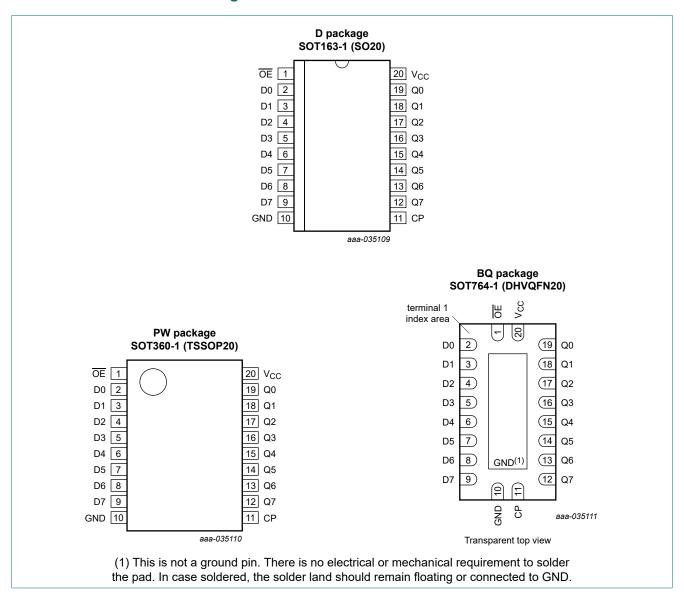


Fig. 4. IEC logic symbol

Fig. 3. Logic symbol

5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Table 2. I ill acscription		
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 input
GND	10	ground (0 V)
CP	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 output
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		Internal	Output	
	ŌĒ	СР	Dn	flip-flop	Qn
Load and read register	L	1	I	L	L
	L	1	h	Н	Н
Load register and disable output	Н	1	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	+7.0	V
VI	input voltage		-0.5	+7.0	V
I _{IK}	input clamping current	$V_{I} < -0.5 \text{ V}$ [1]	-20	-	mA
I _{OK}	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$ [1]	-	±20	mA
Io	output current	$V_{O} = -0.5 \text{ V to } (V_{CC} + 0.5 \text{ V})$	-	±25	mA
I _{CC}	supply current		-	75	mA
I_{GND}	ground current		-75	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$ [2]	-	500	mW

^[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

For SOT360-1 (TSSOP20) package: Ptot derates linearly with 10.0 mW/K above 100 °C.

For SOT764-1 (DHVQFN20) package: Ptot 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	Parameter	Conditions	7	74AHC57	4	7	Unit		
			Min	Тур	Max	Min	Тур	Max	
V _{CC}	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
VI	input voltage		0	-	5.5	0	-	5.5	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	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	-	-	100	-	-	-	ns/V
	and fall rate	$V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	-	-	20	-	-	20	ns/V

^[2] For SOT163-1 (SO20) package: P_{tot} derates linearly with 12.3 mW/K above 109 °C.

9. Static characteristics

Table 6. Static characteristics

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		25 °C		-40 °C	to +85 °C	-40 °C t	Unit	
			Min	Тур	Max	Min	Max	Min	Max	
74AHC5	74									
V _{IH}	HIGH-level	V _{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
	input voltage	V _{CC} = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V _{CC} = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
V _{IL}	LOW-level	V _{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
	input voltage	V _{CC} = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V _{CC} = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V _{OH}	HIGH-level	V _I = V _{IH} or V _{IL}								
	output voltage	I _O = -50 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I _O = -50 μA; V _{CC} = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V
		I _O = -50 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
	$I_O = -4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.58	-	-	2.48	-	2.40	-	V	
		$I_O = -8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.94	-	-	3.8	-	3.70	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	I _O = 50 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A; V_{CC} = 3.0 V$	-	0	0.1	-	0.1	-	0.1	V
		I _O = 50 μA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
		$I_O = 8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
I _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.25	-	±2.5	-	±10.0	μA
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	4.0	-	40	-	80	μA
C _I	input capacitance		-	3.0	10	-	10	-	10	pF
Co	output capacitance		-	4.0	-	-	-	-	-	pF

Symbol	Parameter	Conditions		25 °C		-40 °C	to +85 °C	-40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	1
74AHCT	574									
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V _{OH}	HIGH-level	1 111 127 00								
	output voltage I _O = -50 μA		4.4	4.5	-	4.4	-	4.4	-	V
	I _O = -8.0 mA		3.94	-	-	3.8	-	3.70	-	V
V _{OL}	LOW-level $V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$									
output voltage		I _O = 50 μA	-	0	0.1	-	0.1	-	0.1	V
		I _O = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V
I _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.25	-	±2.5	-	±10.0	μA
l _l	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	4.0	-	40	-	80	μΑ
ΔI _{CC}	additional supply current	per input pin; $V_I = V_{CC} - 2.1 \text{ V}; I_O = 0 \text{ A};$ other pins at V_{CC} or GND; $V_{CC} = 4.5 \text{ V}$ to 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C _I	input capacitance		-	3	10	-	10	-	10	pF
Co	output capacitance		-	4.0	-	-	-	-	-	pF

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10. Dynamic characteristics

Table 7. Dynamic characteristics

GND = 0 V. For test circuit see Fig. 8.

Symbol	Parameter	Conditions			25 °C		-40 °C t	o +85 °C	-40 °C to	+125 °C	Unit
				Min	Typ[1]	Max	Min	Max	Min	Max	
74AHC5	74				ı					1	
t _{pd}	propagation	CP to Qn; see Fig. 5	[2]								T
	delay	V _{CC} = 3.0 V to 3.6 V									
		C _L = 15 pF		-	6.5	13.2	1.0	15.5	1.0	16.5	ns
		C _L = 50 pF		-	9.3	16.7	1.0	19.0	1.0	21.0	ns
		V _{CC} = 4.5 V to 5.5 V									
		C _L = 15 pF		-	4.4	8.6	1.0	10.0	1.0	11.0	ns
		C _L = 50 pF			6.2	10.6	1.0	12.0	1.0	13.5	ns
t _{en}	enable time	OE to Qn; see Fig. 7									
		V _{CC} = 3.0 V to 3.6 V									
		C _L = 15 pF		-	5.7	12.8	1.0	15.0	1.0	16.0	ns
		C _L = 50 pF		-	8.2	16.3	1.0	18.5	1.0	20.5	ns
		V _{CC} = 4.5 V to 5.5 V									
		C _L = 15 pF		-	4.2	9.0	1.0	10.5	1.0	11.5	ns
		C _L = 50 pF		-	5.9	11.0	1.0	12.5	1.0	14.0	ns
t _{dis}	disable time	OE to Qn; see Fig. 7	[2]								
		V _{CC} = 3.0 V to 3.6 V									
		C _L = 15 pF		-	6.3	13.0	1.0	15.0	1.0	16.5	ns
		C _L = 50 pF		-	9.1	15.0	1.0	17.0	1.0	19.0	ns
		V _{CC} = 4.5 V to 5.5 V									
		C _L = 15 pF		-	4.3	9.0	1.0	10.5	1.0	11.5	ns
		C _L = 50 pF		-	6.9	10.1	1.0	11.5	1.0	13.0	ns
f _{max}	maximum	CP; see Fig. 5									
	frequency	V _{CC} = 3.0 V to 3.6 V									
		C _L = 15 pF		80	125	-	65	-	65	-	MHz
		C _L = 50 pF		50	75	-	45	-	45	-	MHz
		V _{CC} = 4.5 V to 5.5 V									
		C _L = 15 pF		130	180	-	110	-	110	-	MHz
		C _L = 50 pF		85	115	-	75	-	75	-	MHz
t _W	pulse width	CP; HIGH or LOW; see Fig. 5									
		V _{CC} = 3.0 V to 3.6 V; C _L = 50 pF		5.0	-	-	5.0	-	5.0	-	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 50 pF		5.0	-	-	5.0	-	5.0	-	ns
t _{su}	set-up time	Dn to CP; see Fig. 6									1
		V _{CC} = 3.0 V to 3.6 V; C _L = 50 pF		3.5	-	-	3.5	-	3.5	-	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 50 pF		3.0	-	-	3.0	-	3.0	-	ns

Symbol	Parameter	Conditions			25 °C		-40 °C t	o +85 °C	-40 °C to	+125 °C	Unit
				Min	Typ[1]	Max	Min	Max	Min	Max	
t _h	hold time	Dn to CP; see Fig. 6									
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V};$ $C_L = 50 \text{ pF}$		1.5	-	-	1.5	-	1.5	-	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 50 pF		1.5	-	-	1.5	-	1.5	-	ns
C _{PD}	power dissipation capacitance	$C_L = 50 \text{ pF}; f_i = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	[3]	-	10	-	-	-	-	-	pF
74AHCT	574										
t _{pd}	propagation	CP to Qn; see Fig. 5	[2]								
	delay	V _{CC} = 4.5 V to 5.5 V									
		C _L = 15 pF		-	4.4	8.6	1.0	10.0	1.0	11.0	ns
		C _L = 50 pF		-	6.3	10.6	1.0	12.0	1.0	13.5	ns
t _{en}	enable time	OE to Qn; see Fig. 7									
		V _{CC} = 4.5 V to 5.5 V									
		C _L = 15 pF		-	4.3	9.0	1.0	10.5	1.0	11.5	ns
		C _L = 50 pF		-	6.1	11.0	1.0	12.5	1.0	14.0	ns
t _{dis}	disable time	OE to Qn; see Fig. 7	[2]								
		V _{CC} = 4.5 V to 5.5 V									
		C _L = 15 pF		-	4.3	9.0	1.0	10.5	1.0	11.5	ns
		C _L = 50 pF		-	6.2	10.1	1.0	11.5	1.0	13.0	ns
f _{max}	maximum	CP; see Fig. 5									
	frequency	V _{CC} = 4.5 V to 5.5 V									
		C _L = 15 pF		130	180	-	110	-	110	-	MHz
		C _L = 50 pF		85	115	-	75	-	75	-	MHz
t _W	pulse width	CP; HIGH or LOW; see Fig. 5									
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V};$ $C_L = 50 \text{ pF}$		5.0	-	-	5.5	-	5.5	-	ns
t _{su}	set-up time	Dn to CP; see Fig. 6									
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V};$ $C_L = 50 \text{ pF}$		3.0	-	-	3.5	-	3.5	-	ns
t _h	hold time	Dn to CP; see Fig. 6									
		V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF		1.5	-	-	1.5	-	1.5	-	ns
C _{PD}	power dissipation capacitance	per buffer; C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC}	[3]	-	12	-	-	-	-	-	pF

^[1] Typical values are measured at nominal supply voltage (V_{CC} = 3.3 V and V_{CC} = 5.0 V).

 t_{en} is the same as t_{PZL} and $t_{\text{PZH}}.$

 t_{dis} is the same as t_{PLZ} and t_{PHZ} . [3] C_{PD} is used to determine the dynamic power dissipation P_D (μ W). $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ 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.

^[2] t_{pd} is the same as t_{PLH} and t_{PHL} .

10.1. Waveforms and test circuit

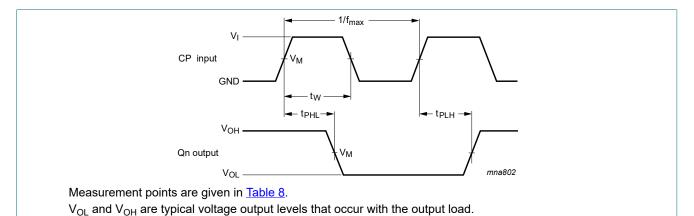
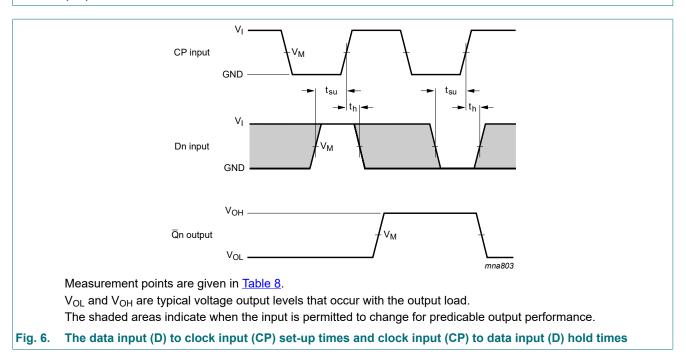


Fig. 5. Propagation delay input (CP) to output (Qn), clock input (CP) pulse width and the maximum frequency (CP)



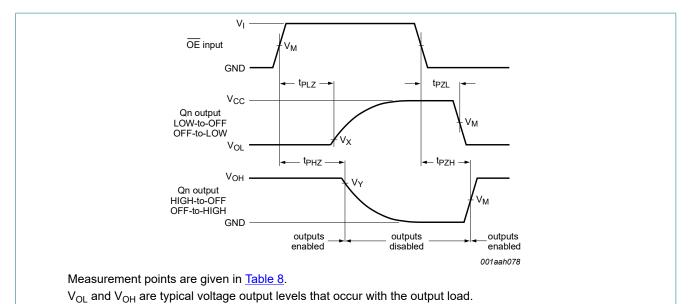
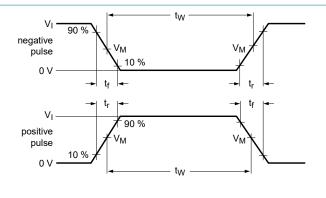
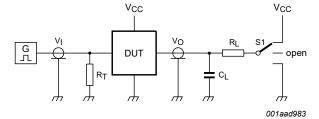


Fig. 7. Enable and disable times

Table 8. Measurement points

Table of medical content points								
Туре	Input	Output	Output					
	V _M	V _M	V _X	V _Y				
74AHC574	0.5 × V _{CC}	0.5 × V _{CC}	V _{OL} + 0.3 V	V _{OH} - 0.3 V				
74AHCT574	1.5 V	0.5 × V _{CC}	V _{OL} + 0.3 V	V _{OH} - 0.3 V				





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

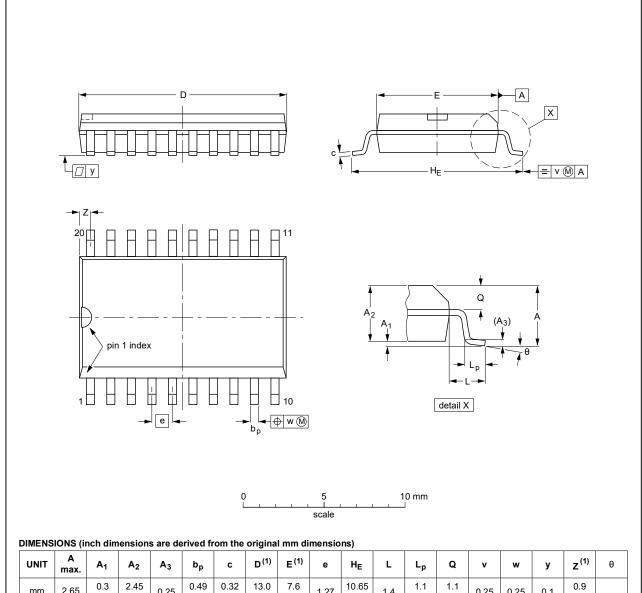
Table 9. Test data

Туре	Input		Load		S1 position			
	V _I	t _r , t _f	CL	R _L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}	
74AHC574	V _{CC}	3.0 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}	
74AHCT574	3.0 V	3.0 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



UNIT	A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E ⁽¹⁾	е	HE	L	Lp	Q	v	w	у	z ⁽¹⁾	θ
mm	2.65	0.3 0.1	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8°
inches	0.1	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.05	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	0°

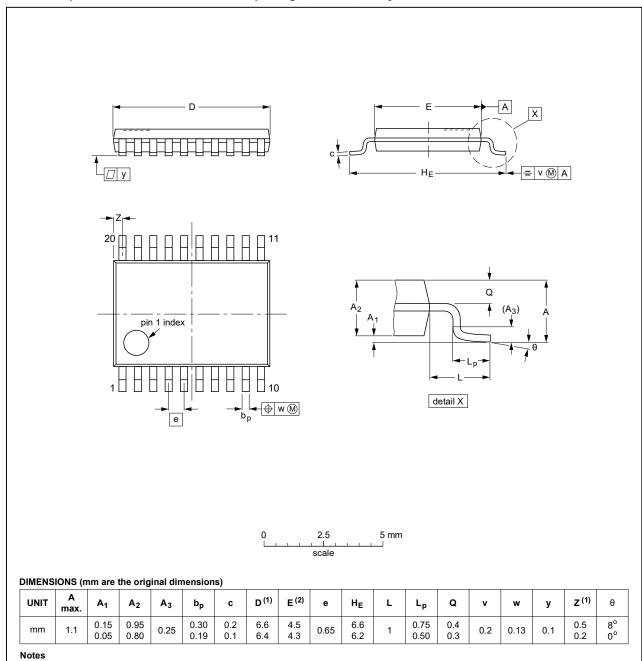
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

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

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

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

SOT360-1



- 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)

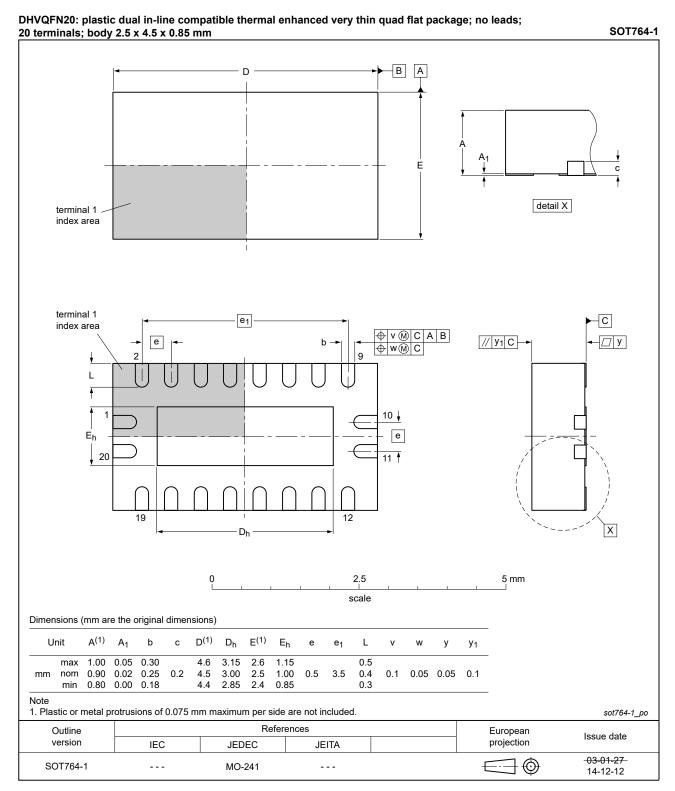


Fig. 11. Package outline SOT764-1 (DHVQFN20)

12. Abbreviations

Table 10. Abbreviations

Acronym	Description
CDM	Charged-Device Model
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
TTL	Transistor-Transistor Logic

13. Revision history

Table 11. Revision history

Document ID Release date Data sheet status Change notice Supersedes						
Document ID	Release date	Data sheet status	Change notice	Supersedes		
74AHC_AHCT574 v.3	20230906	Product data sheet	-	74AHC_AHCT574 v.2		
Modifications:	 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. Section 1 and Section 2 updated. Section 2: ESD specification updated according to the latest JEDEC standard. Section 7: Derating values for P_{tot} total power dissipation updated. Section 9: For 74AHCT574: Conditions I_{OZ} corrected inline with 74AHC574. Fig. 11: Package outline drawing SOT764-1 (DHVQFN20) has been updated. 					
74AHC_AHCT574_2	20080124	Product data sheet	-	74AHC_AHCT574_1		
Modifications:	 The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name where appropriate. Section 3: DHVQFN20 package added. Section 7: derating values added for DHVQFN20 package. Section 11: outline drawing added for DHVQFN20 package. 					
74AHC_AHCT574_1	19990616	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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