

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

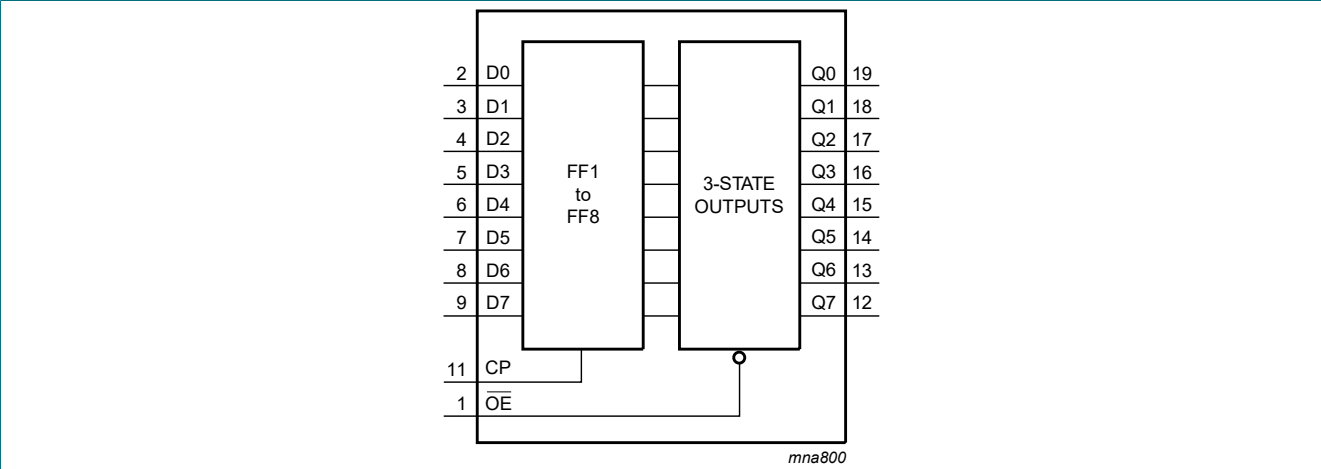


Fig. 1. Functional diagram

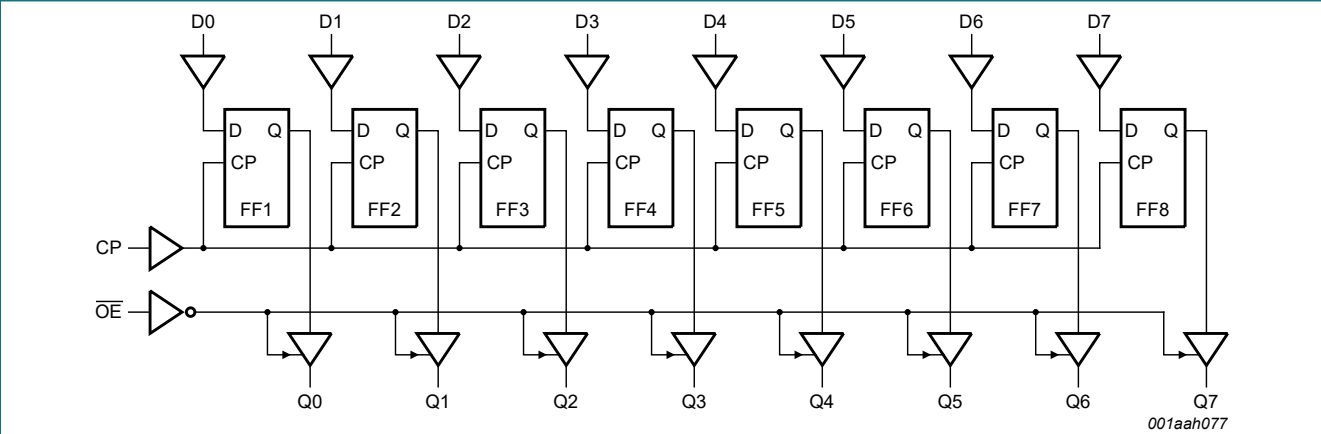


Fig. 2. Logic diagram

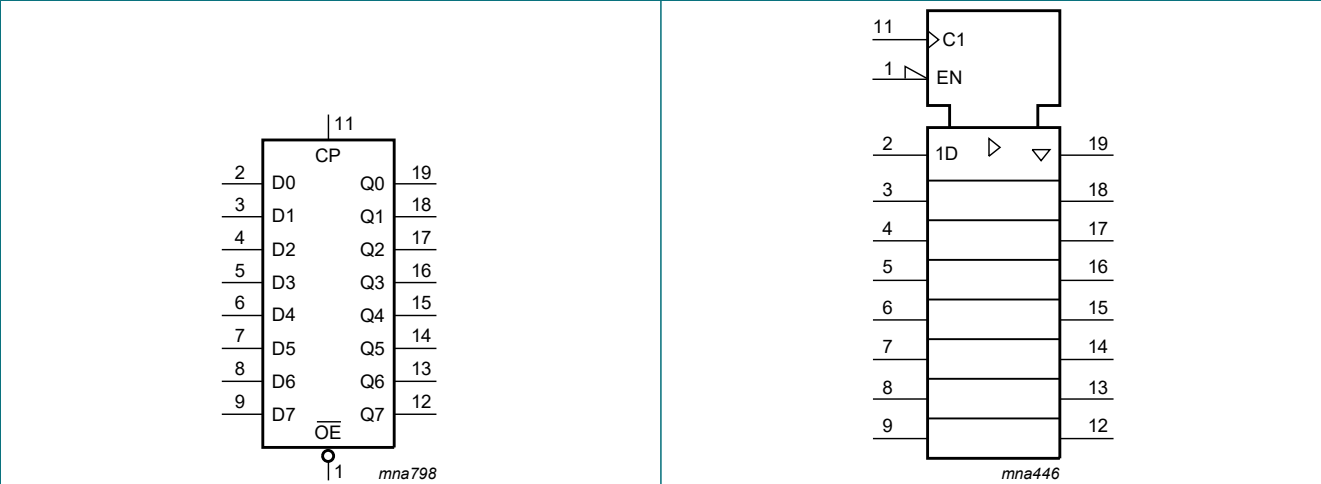


Fig. 3. Logic symbol

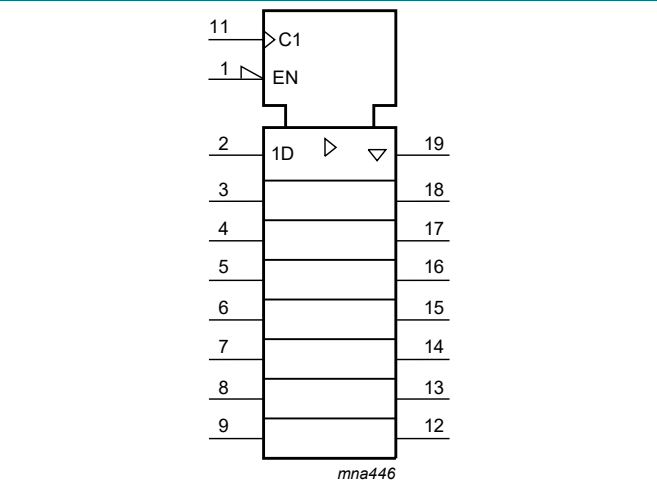
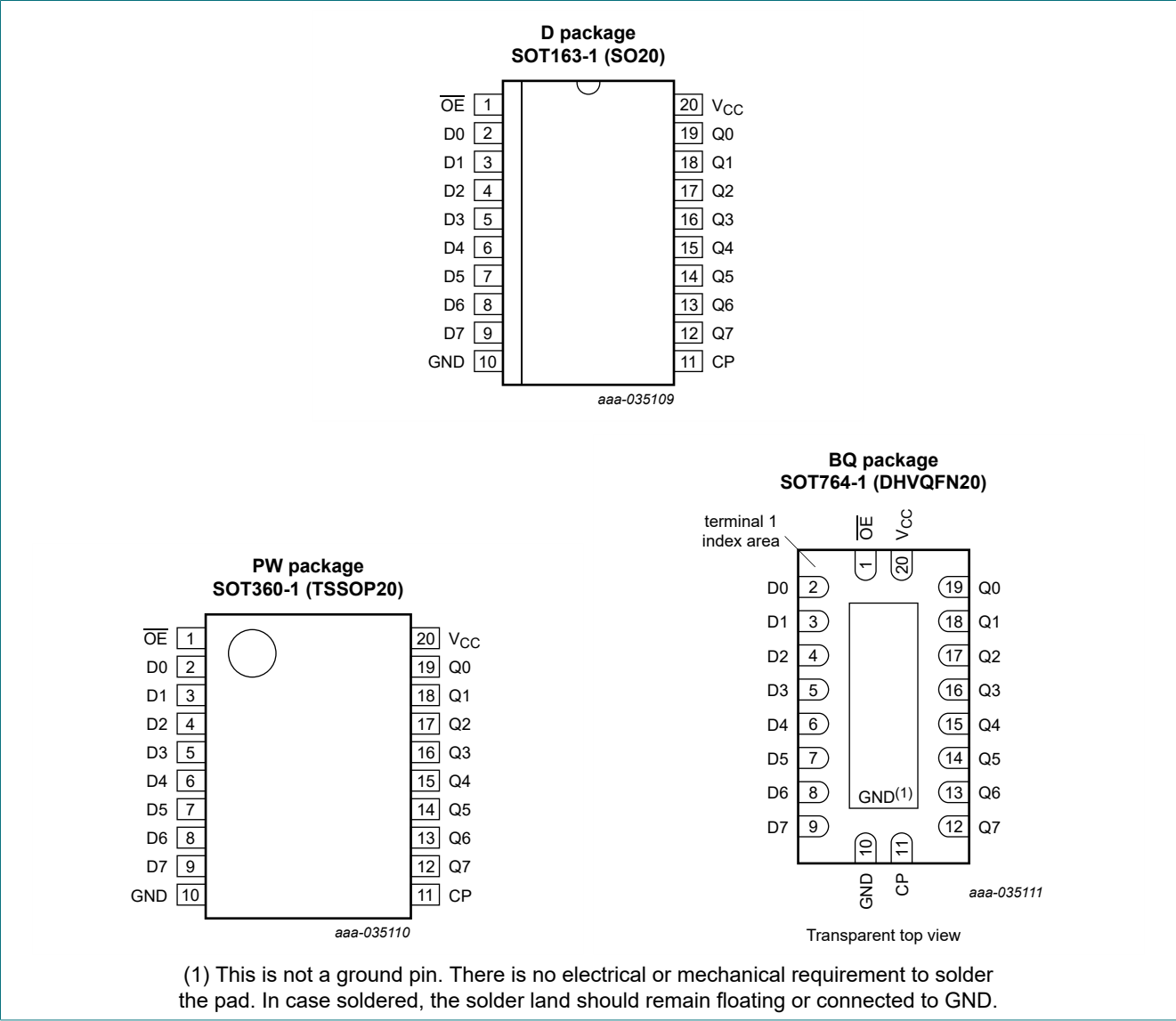


Fig. 4. IEC logic symbol

5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
$\overline{OE}$	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; l = LOW voltage level one setup time prior to the HIGH-to-LOW CP transition;
Z = high-impedance OFF-state; ↑ = LOW-to-HIGH clock transition.

Operating mode	Input			Internal flip-flop	Output Qn
	OE	CP	Dn		
Load and read register	L	↑	l	L	L
	L	↑	h	H	H
Load register and disable output	H	↑	l	L	Z
	H	↑	h	H	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
V _I	input voltage		-0.5	+7.0	V
I _{IK}	input clamping current	V _I < -0.5 V [1]	-20	-	mA
I _{OK}	output clamping current	V _O < -0.5 V or V _O > V _{CC} + 0.5 V [1]	-	±20	mA
I _O	output current	V _O = -0.5 V to (V _{CC} + 0.5 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 °C to +125 °C [2]	-	500	mW

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

[2] 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	Parameter	Conditions	74AHC574			74AHCT574			Unit
			Min	Typ	Max	Min	Typ	Max	
V _{CC}	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
V _I	input voltage		0	-	5.5	0	-	5.5	V
V _O	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} = 3.3 V ± 0.3 V	-	-	100	-	-	-	ns/V
		V _{CC} = 5.0 V ± 0.5 V	-	-	20	-	-	20	ns/V

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 to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74AHC574										
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
		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 input voltage	V _{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
		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 output voltage	V _I = V _{IH} or V _{IL}								
		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 mA; V _{CC} = 3.0 V	2.58	-	-	2.48	-	2.40	-	V
V _{OL}	LOW-level output voltage	I _O = -8.0 mA; V _{CC} = 4.5 V	3.94	-	-	3.8	-	3.70	-	V
		V _I = V _{IH} or V _{IL}								
		I _O = 50 µA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 50 µA; 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 mA; V _{CC} = 3.0 V	-	-	0.36	-	0.44	-	0.55	V
I _{OZ}	OFF-state output current	I _O = 8.0 mA; V _{CC} = 4.5 V	-	-	0.36	-	0.44	-	0.55	V
		V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 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 V	-	-	4.0	-	40	-	80	µA
C _I	input capacitance		-	3.0	10	-	10	-	10	pF
C _O	output capacitance		-	4.0	-	-	-	-	-	pF

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74AHCT574										
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 output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V								
		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 output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V								
		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 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 V	-	-	4.0	-	40	-	80	µA
ΔI _{CC}	additional supply current	per input pin; V _I = V _{CC} - 2.1 V; I _O = 0 A; other pins at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C _I	input capacitance		-	3	10	-	10	-	10	pF
C _O	output capacitance		-	4.0	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

$GND = 0\text{ V}$. For test circuit see [Fig. 8](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
74AHC574										
t _{pd}	propagation delay	CP to Qn; see Fig. 5 [2]								
		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 frequency	CP; see Fig. 5								
		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								
		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 to +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 V to 3.6 V; C _L = 50 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 pF; f _i = 1 MHz; [3] V _I = GND to V _{CC}	-	10	-	-	-	-	-	pF
74AHCT574										
t _{pd}	propagation delay	CP to Qn; see Fig. 5 [2]								
		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 frequency	CP; see Fig. 5								
		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 V to 5.5 V; C _L = 50 pF	5.0	-	-	5.5	-	5.5	-	ns
t _{su}	set-up time	Dn to CP; see Fig. 6								
		V _{CC} = 4.5 V to 5.5 V; C _L = 50 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; [3] f = 1 MHz; V _I = GND to V _{CC}	-	12	-	-	-	-	-	pF

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

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

t_{en} is the same as t_{PZL} and t_{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 (μW).

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

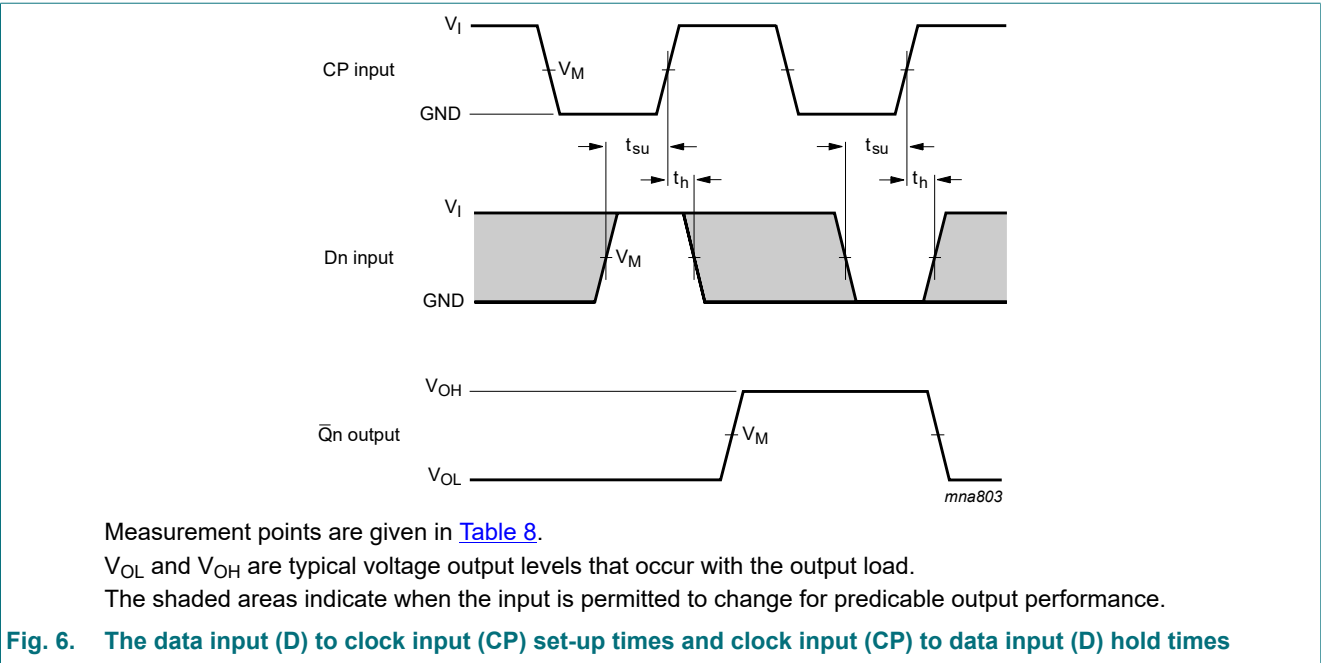
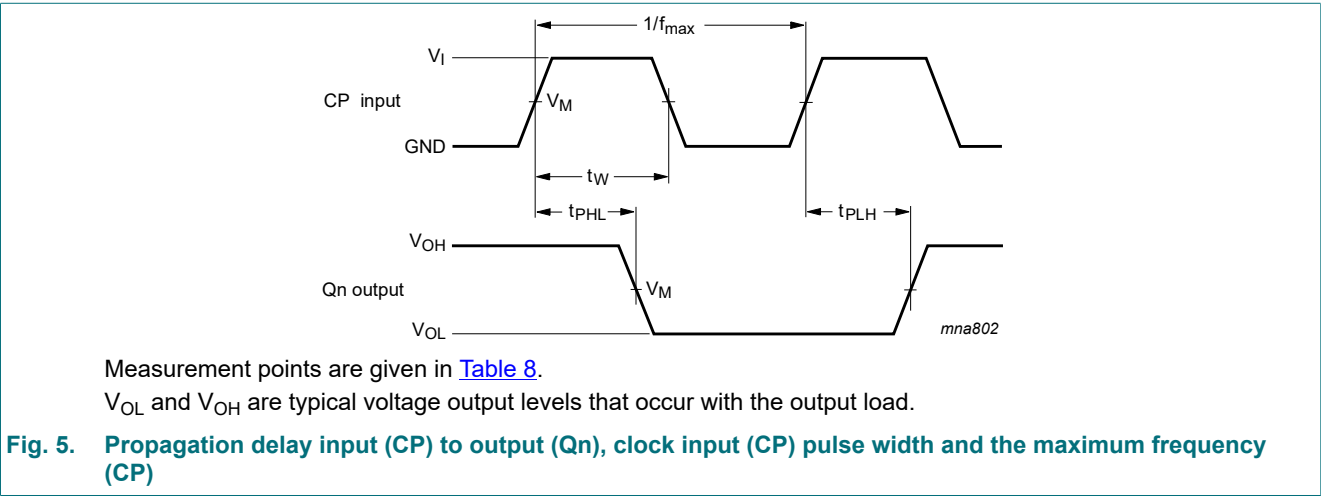
f_i = input frequency in MHz;

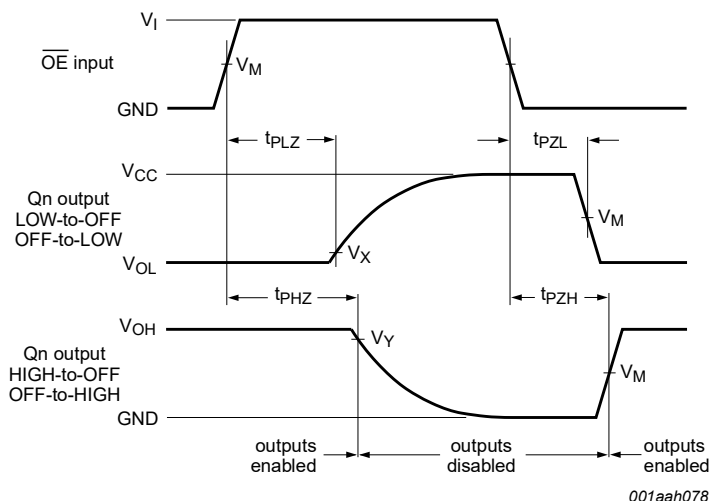
f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in V.

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. 7. Enable and disable times

Table 8. Measurement points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
74AHC574	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$
74AHCT574	1.5 V	$0.5 \times V_{CC}$	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$

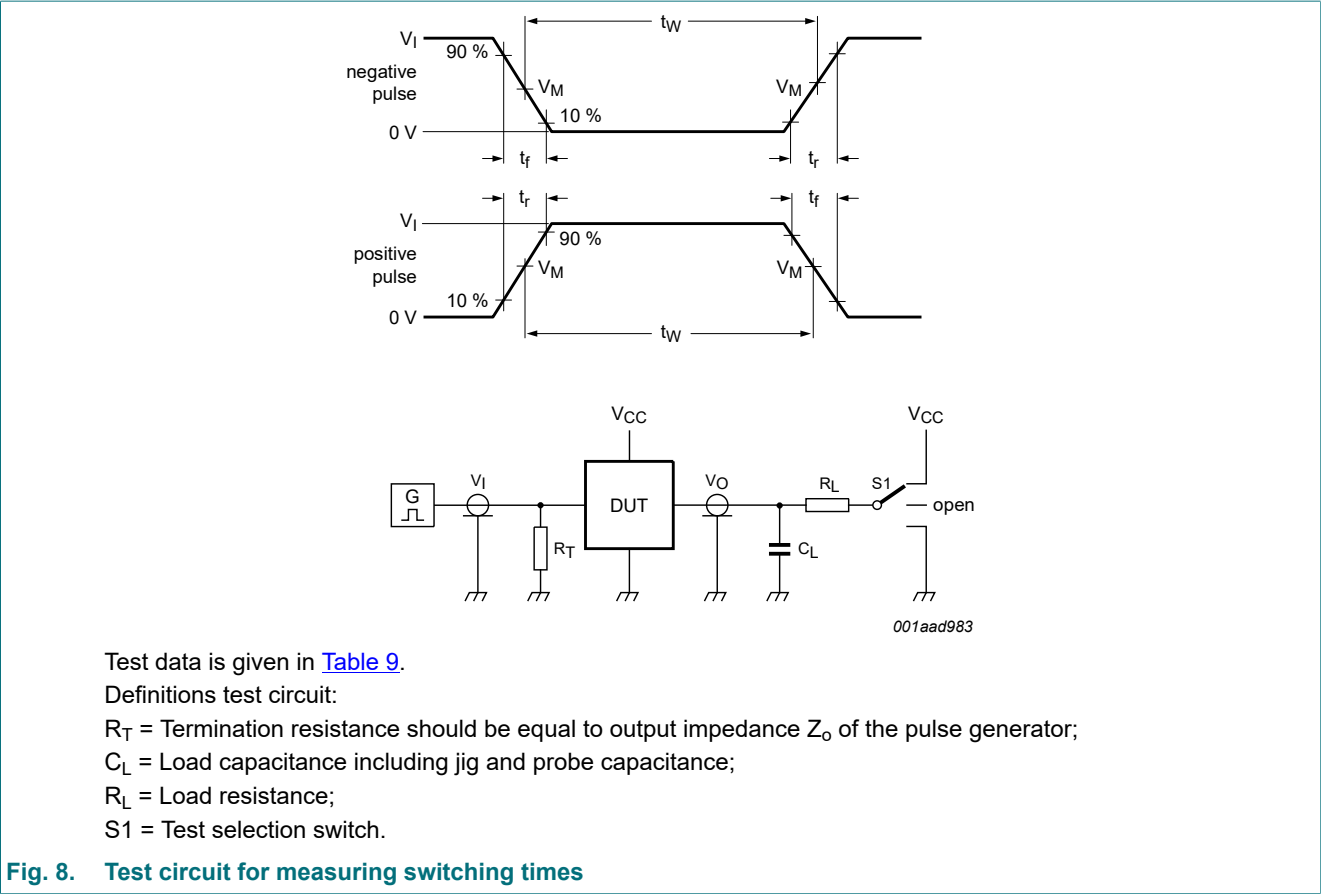


Fig. 8. Test circuit for measuring switching times

Table 9. Test data

Type	Input		Load		S1 position		
	V_I	t_r, t_f	C_L	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 k Ω	open	GND	V_{CC}
74AHCT574	3.0 V	3.0 ns	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}

11. Package outline

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

SOT163-1

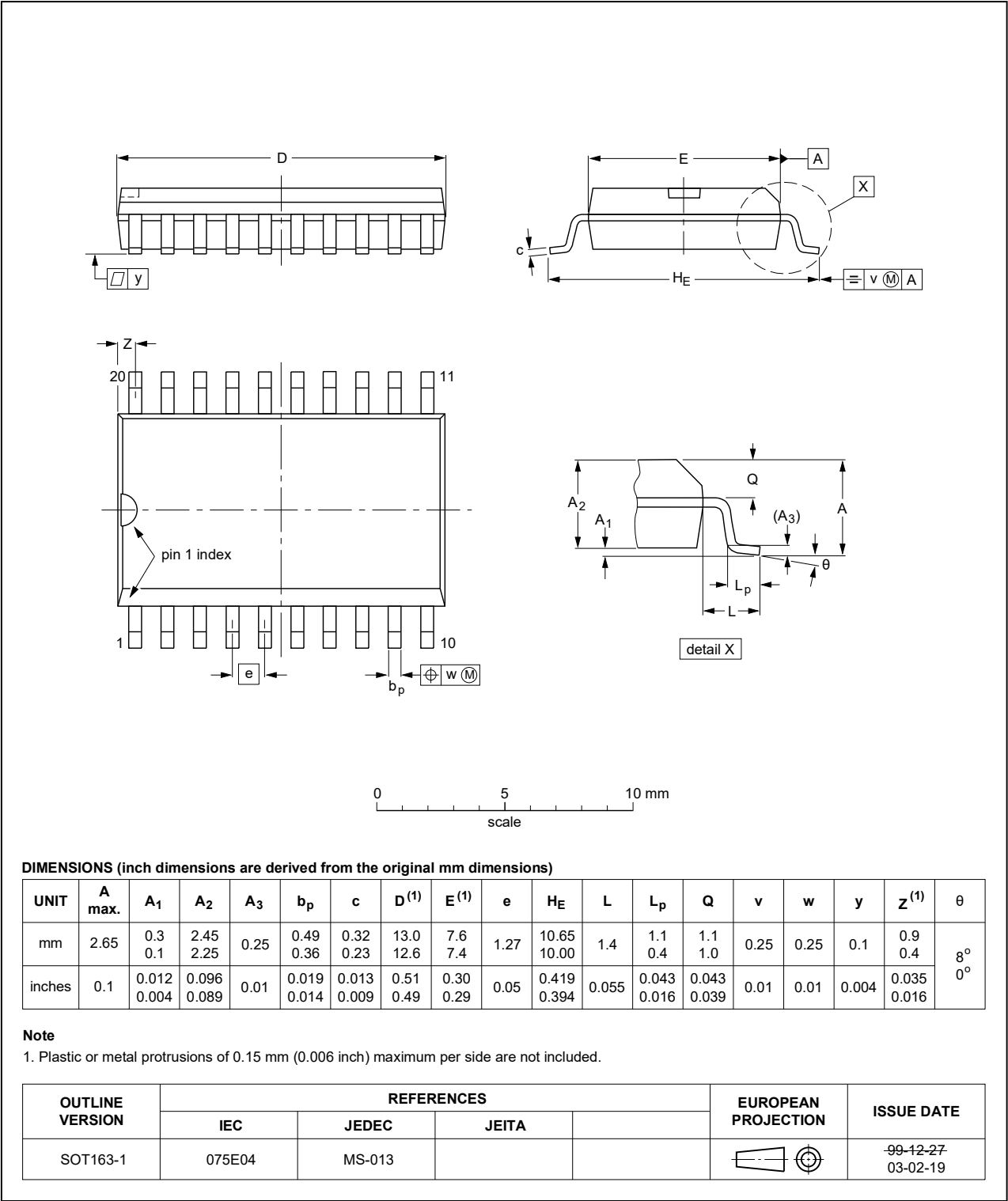


Fig. 9. Package outline SOT163-1 (SO20)

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

SOT360-1

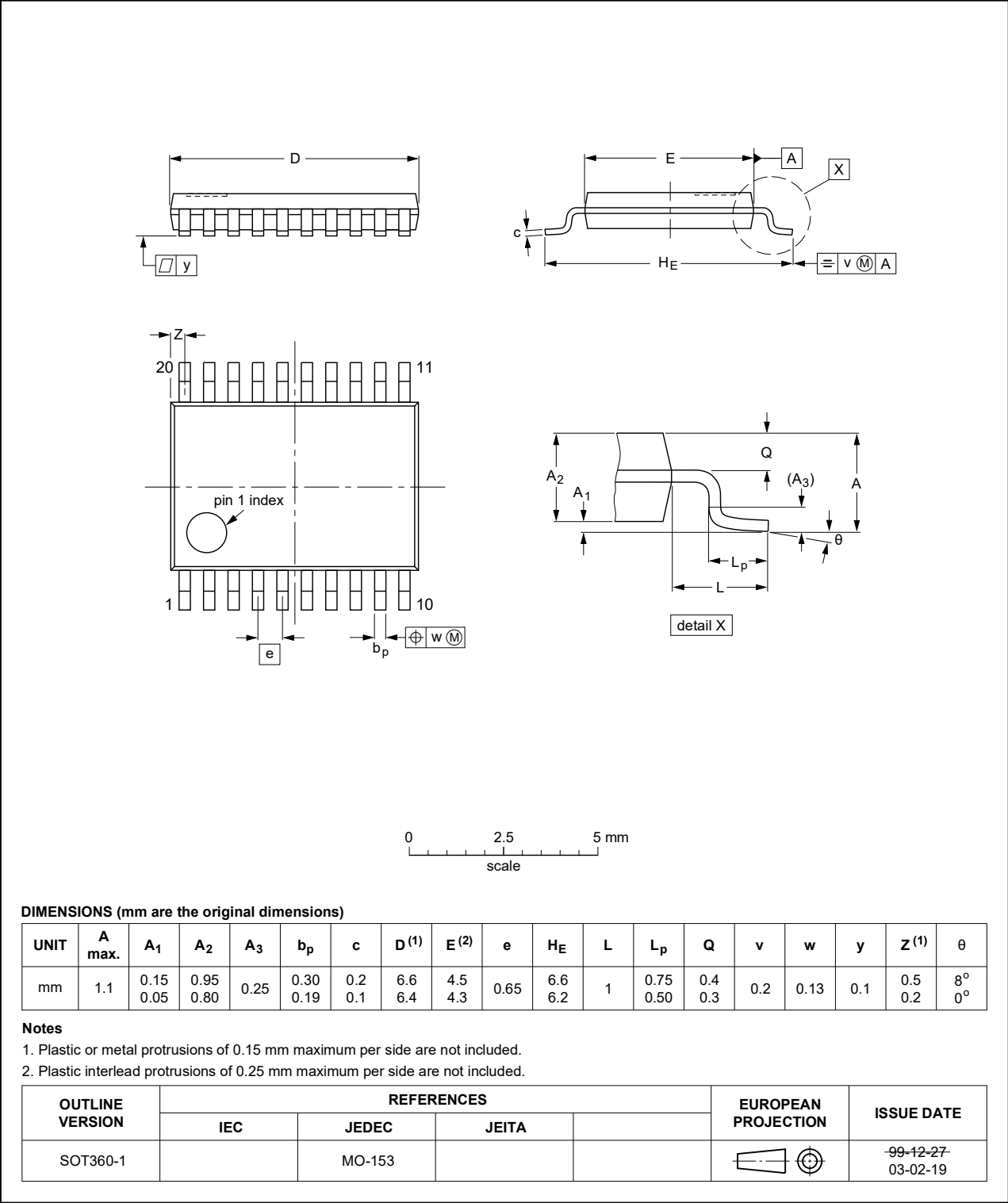


Fig. 10. Package outline SOT360-1 (TSSOP20)

DHVQFN20: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads;
20 terminals; body 2.5 x 4.5 x 0.85 mm

SOT764-1

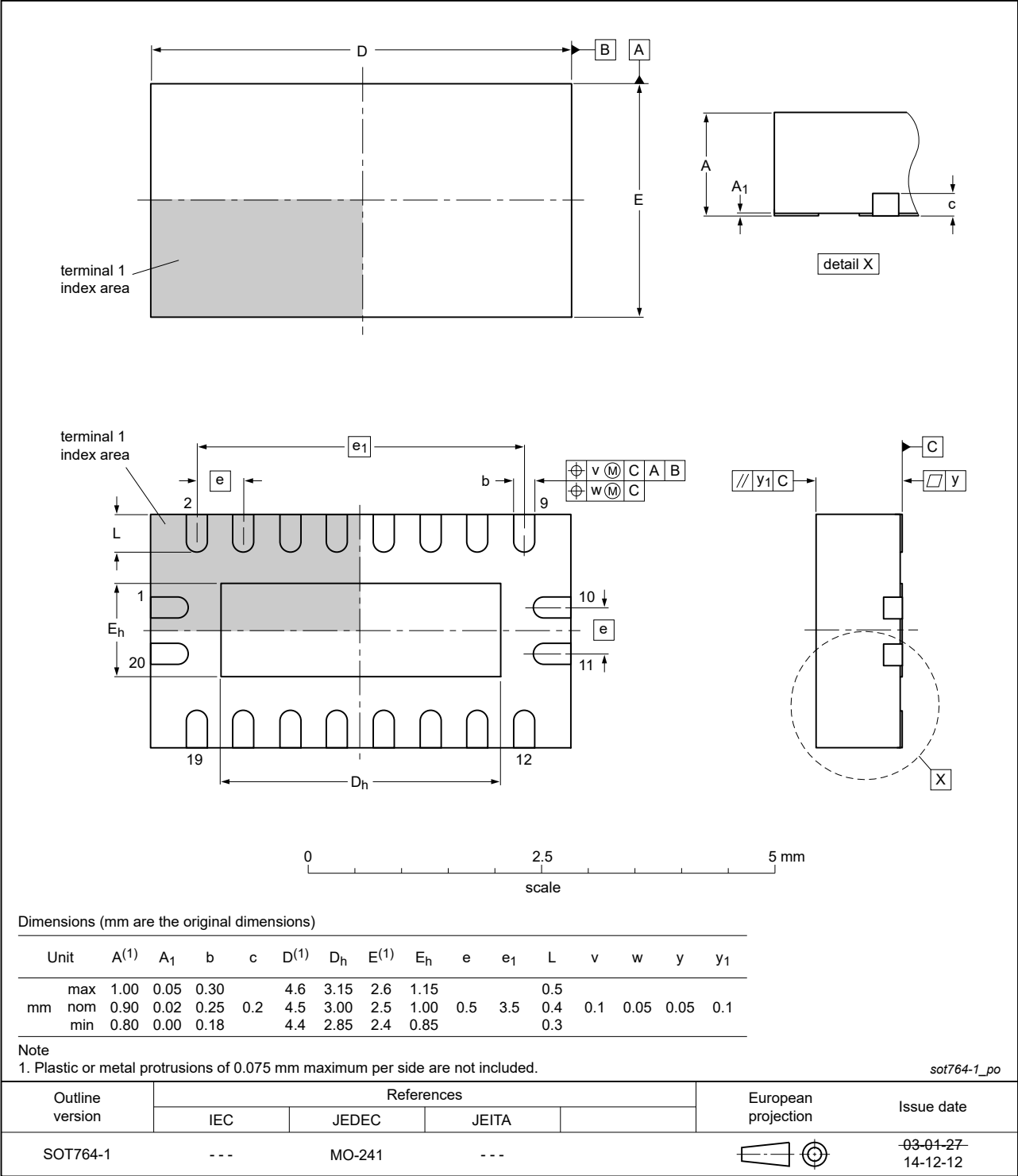


Fig. 11. Package outline SOT764-1 (DHVQFN20)

12. Abbreviations

Table 10. Abbreviations

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

13. Revision history

Table 11. Revision history

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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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