

74AHC573-Q100; 74AHCT573-Q100

Octal D-type transparent latch; 3-state

Rev. 1 — 10 June 2013

Product data sheet

1. General description

The 74AHC573-Q100; 74AHCT573-Q100 is a high-speed Si-gate CMOS device and is pin compatible with Low-power Schottky TTL (LSTTL). It is specified in compliance with JEDEC standard No. 7A.

The 74AHC573-Q100; 74AHCT573-Q100 consists of eight D-type transparent latches featuring separate D-type inputs for each latch and 3-state true outputs for bus oriented applications. A latch enable input (LE) and an output enable input ($\overline{OE}$) are common to all latches.

When pin LE is HIGH, data at the Dn inputs enters the latches. In this condition the latches are transparent, i.e. a latch output will change state each time its corresponding Dn input changes. When pin LE is LOW, the latches store the information that is present at the Dn inputs, after a set-up time preceding the HIGH-to-LOW transition of LE.

When pin $\overline{OE}$ is LOW, the contents of the 8 latches are available at the outputs. When pin $\overline{OE}$ is HIGH, the outputs go to the high-impedance OFF-state. Operation of the $\overline{OE}$ input does not affect the state of the latches.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - ◆ Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and from $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$
- Balanced propagation delays
- All inputs have a Schmitt trigger action
- Common 3-state output enable input
- Inputs accept voltages higher than V_{CC}
- Input levels:
 - ◆ For 74AHC573-Q100: CMOS input level
 - ◆ For 74AHCT573-Q100: TTL input level
- ESD protection:
 - ◆ MIL-STD-883, method 3015 exceeds 2000V
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V ($C = 200\text{ pF}$, $R = 0\text{ }\Omega$)
- Multiple package options



3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AHC573D-Q100 74AHCT573D-Q100	−40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74AHC573PW-Q100 74AHCT573PW-Q100	−40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74AHC573BQ-Q100 74AHCT573BQ-Q100	−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

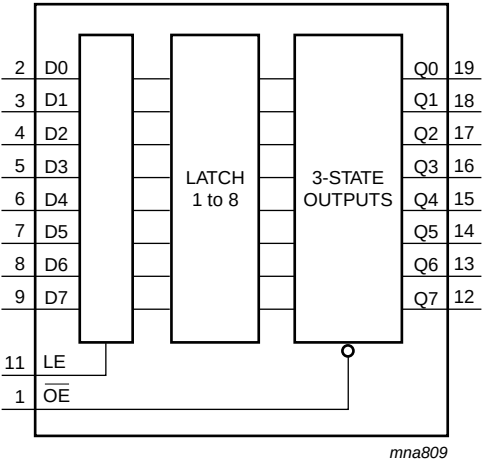


Fig 1. Functional diagram

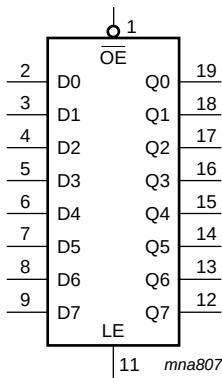


Fig 2. Logic symbol

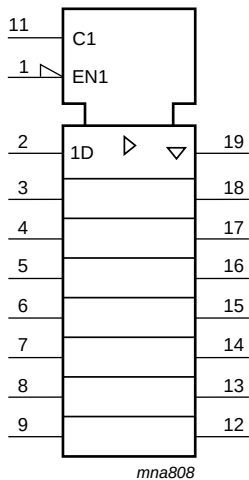


Fig 3. IEC logic symbol

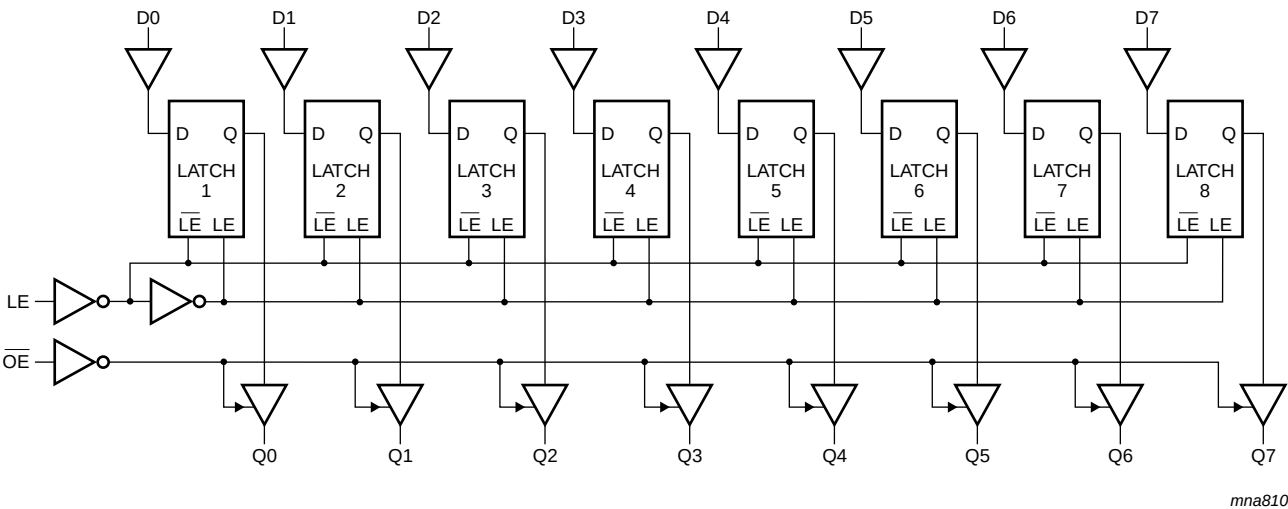


Fig 4. Logic diagram

5. Pinning information

5.1 Pinning

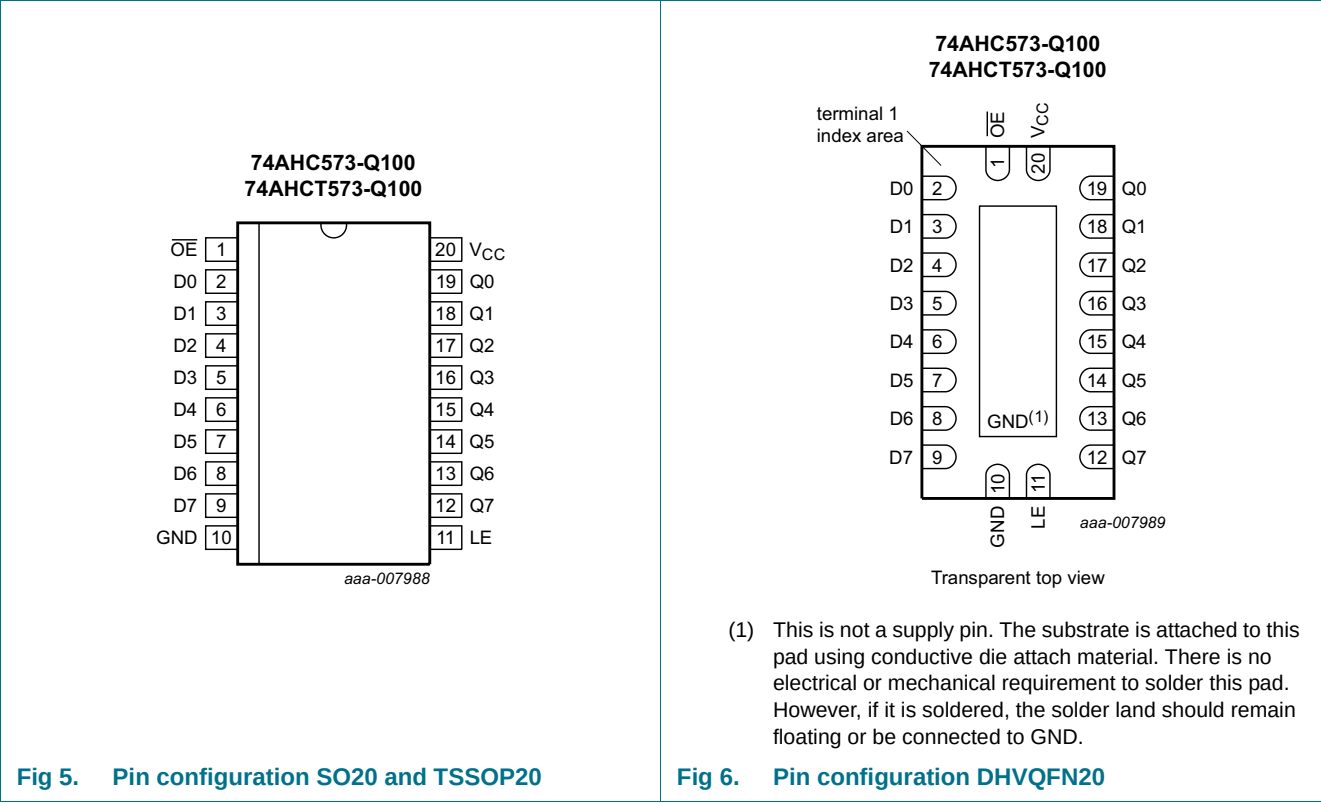


Fig 5. Pin configuration SO20 and TSSOP20

Fig 6. Pin configuration DHVQFN20

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
$\overline{OE}$	1	output enable input (active LOW)
D0 to D7	2, 3, 4, 5, 6, 7, 8, 9	data input
GND	10	ground (0 V)
LE	11	latch enable (active HIGH)
Q0 to Q7	19, 18, 17, 16, 15, 14, 13, 12	data output
V _{CC}	20	supply voltage

6. Functional description

Table 3. Function table^[1]

Operating mode	Input			Internal latch	Output Qn
	OE	LE	Dn		
Enable and read register (transparent mode)	L	H	L	L	L
			H	H	H
Latch and read register	L	L	l	L	L
			h	H	H
Latch register and disable outputs	H	L	l	L	Z
			h	H	Z

- [1] H = HIGH voltage level;
 h = HIGH voltage level one set-up time prior to the HIGH-to-LOW LE transition;
 L = LOW voltage level;
 l = LOW voltage level one set-up time prior to the HIGH-to-LOW LE transition;
 Z = high-impedance OFF-state.

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	+20	mA
I _O	output current	V _O = -0.5 V to (V _{CC} + 0.5 V)	-25	+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 SO20 packages: above 70 °C the value of P_{tot} derates linearly at 8 mW/K.
 For TSSOP20 packages: above 60 °C the value of P_{tot} derates linearly at 5.5 mW/K.
 For DHVQFN20 packages: above 60 °C the value of P_{tot} derates linearly with 4.5 mW/K.

8. Recommended operating conditions

Table 5. Operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
74AHC573-Q100						
V_{CC}	supply voltage		2.0	5.0	5.5	V
V_I	input voltage		0	-	5.5	V
V_O	output voltage		0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	-	-	100	ns/V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	-	-	20	ns/V
74AHCT573-Q100						
V_{CC}	supply voltage		4.5	5.0	5.5	V
V_I	input voltage		0	-	5.5	V
V_O	output voltage		0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	-	-	20	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 +85 °C		−40 °C to +125 °C			Unit
			Min	Typ	Max	Min	Max	Min	Typ	Max	
74AHC573-Q100											
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	-	-	3.80	-	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
V _{OL}	LOW-level output voltage	I _O = 4.0 mA; V _{CC} = 3.0 V	-	-	0.36	-	0.44	-	-	0.55	V
		I _O = 8.0 mA; V _{CC} = 4.5 V	-	-	0.36	-	0.44	-	-	0.55	V

Table 6. Static characteristics ...continued

At recommended operating conditions; 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	Typ	Max	
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 = V _{CC} 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	V _I = V _{CC} or GND	-	3	10	-	10	-	-	10	pF
C _O	output capacitance		-	4	-	-	-	-	-	10	pF
74AHCT573-Q100											
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	-	-	3.80	-	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 per input pin; other inputs at V _{CC} or GND; I _O = 0 A	-	-	±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	V _I = V _{CC} or GND	-	3	10	-	10	-	-	10	pF
C _O	output capacitance		-	4	-	-	-	-	-	10	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 11](#).

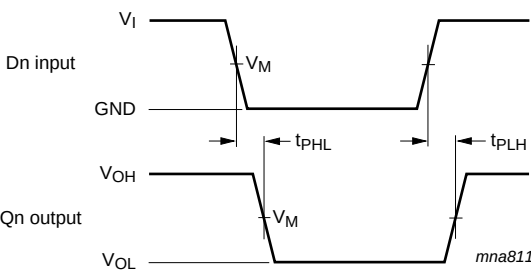
Symbol	Parameter	Conditions	25 °C			−40 °C to +85 °C		−40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	Min	Max	
74AHC573-Q100										
t _{pd}	propagation delay	Dn to Qn; see Figure 7								
		V _{CC} = 3.0 V to 3.6 V								
		C _L = 15 pF	-	5.5	11.0	1.0	13.0	1.0	14.0	ns
		C _L = 50 pF	-	7.8	14.5	1.0	16.5	1.0	18.5	ns
		V _{CC} = 4.5 V to 5.5 V								
		C _L = 15 pF	-	3.9	6.8	1.0	8.0	1.0	8.5	ns
		C _L = 50 pF	-	5.5	8.8	1.0	10.0	1.0	11.0	ns
		LE to Qn; see Figure 8								
		V _{CC} = 3.0 V to 3.6 V								
		C _L = 15 pF	-	5.8	11.9	1.0	14.0	1.0	15.0	ns
		C _L = 50 pF	-	8.3	15.4	1.0	17.5	1.0	19.5	ns
		V _{CC} = 4.5 V to 5.5 V								
		C _L = 15 pF	-	4.2	7.7	1.0	9.0	1.0	10.0	ns
		C _L = 50 pF	-	5.9	9.7	1.0	11.0	1.0	12.5	ns
t _{en}	enable time	OE to Qn; see Figure 9								
		V _{CC} = 3.0 V to 3.6 V								
		C _L = 15 pF	-	5.8	11.5	1.0	13.5	1.0	14.5	ns
		C _L = 50 pF	-	8.3	15.0	1.0	17.0	1.0	19.0	ns
		V _{CC} = 4.5 V to 5.5 V								
		C _L = 15 pF	-	4.4	7.7	1.0	9.0	1.0	10.0	ns
t _{dis}	disable time	OE to Qn; see Figure 9								
		V _{CC} = 3.0 V to 3.6 V								
		C _L = 15 pF	-	6.8	11.0	1.0	13.0	1.0	14.0	ns
		C _L = 50 pF	-	9.7	14.5	1.0	16.5	1.0	18.5	ns
		V _{CC} = 4.5 V to 5.5 V								
		C _L = 15 pF	-	4.6	7.7	1.0	9.0	1.0	10.0	ns
t _W	pulse width	LE HIGH; see Figure 8								
		V _{CC} = 3.0 V to 3.6 V	5.0	-	-	5.0	-	5.0	-	ns
		V _{CC} = 4.5 V to 5.5 V	5.0	-	-	5.0	-	5.0	-	ns
t _{su}	set-up time	Dn to LE; see Figure 10								
		V _{CC} = 3.0 V to 3.6 V	3.5	-	-	3.5	-	3.5	-	ns
		V _{CC} = 4.5 V to 5.5 V	3.5	-	-	3.5	-	3.5	-	ns

Table 7. Dynamic characteristics ...continuedVoltages are referenced to GND (ground = 0 V); for test circuit see [Figure 11](#).

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 LE; see Figure 10								
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.5	-	-	1.5	-	1.5	-	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	1.5	-	-	1.5	-	1.5	-	ns
C_{PD}	power dissipation capacitance	$f_i = 1 \text{ MHz};$ $V_i = \text{GND to } V_{CC}$	^[5] -	12	-	-	-	-	-	pF
74AHCT573-Q100; $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$										
t_{pd}	propagation delay	Dn to Qn; see Figure 7	^[2]							
		$C_L = 15 \text{ pF}$	-	3.5	5.5	1	6.5	1	7.0	ns
		$C_L = 50 \text{ pF}$	-	4.9	7.5	1	8.5	1	9.5	ns
		LE to Qn; see Figure 8	^[2]							
		$C_L = 15 \text{ pF}$	-	3.9	6.0	1	7.0	1	7.5	ns
t_{en}	enable time	OE to Qn; see Figure 9	^[3]							
		$C_L = 15 \text{ pF}$	-	4.1	6.5	1	7.5	1	8.5	ns
		$C_L = 50 \text{ pF}$	-	5.9	8.5	1	10.0	1	11.0	ns
t_{dis}	disable time	$\overline{\text{OE}}$ to Qn; see Figure 9	^[4]							
		$C_L = 15 \text{ pF}$	-	4.5	6.5	1	7.5	1	8.5	ns
		$C_L = 50 \text{ pF}$	-	6.4	9.0	1	10.0	1	11.5	ns
t_W	pulse width	LE HIGH; see Figure 8	5.0	-	-	5.0	-	5.0	-	ns
t_{su}	set-up time	Dn to LE; see Figure 10	3.5	-	-	3.5	-	3.5	-	ns
t_h	hold time	Dn to LE; see Figure 10	1.5	-	-	1.5	-	1.5	-	ns
C_{PD}	power dissipation capacitance	$f_i = 1 \text{ MHz};$ $V_i = \text{GND to } V_{CC}$	^[5] -	18	-	-	-	-	-	pF

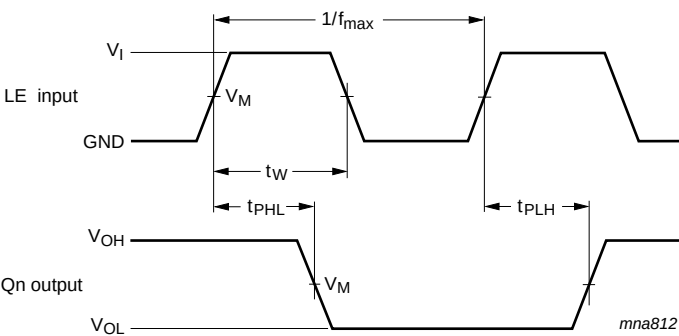
[1] Typical values are measured at nominal supply voltage ($V_{CC} = 3.3 \text{ V}$ and $V_{CC} = 5.0 \text{ V}$).[2] t_{pd} is the same as t_{PHL} and t_{PLH} .[3] t_{en} is the same as t_{PZH} and t_{PZL} .[4] t_{dis} is the same as t_{PHZ} and t_{PLZ} .[5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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; N = number of inputs switching; $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

11. Waveforms



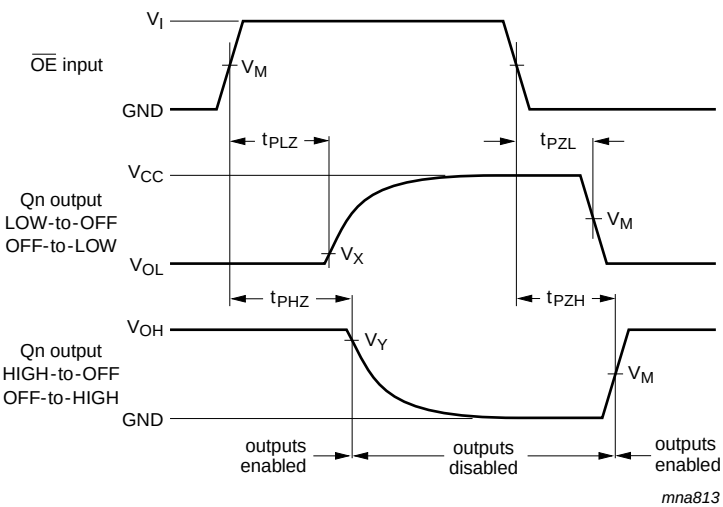
Measurement points are given in [Table 8](#).
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 7. Data input to output propagation delays



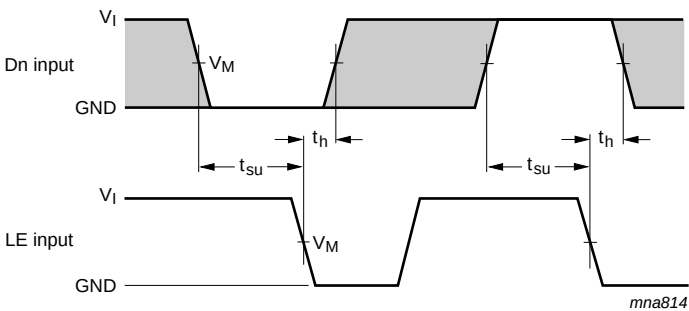
V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 8. Latch enable input to output propagation delays



Measurement points are given in [Table 8](#).
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 9. Enable and disable times



Measurement points are given in [Table 8](#).
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.
The shaded areas indicate when the input is permitted to change for predicable output performance.

Fig 10. Data set-up and hold times

Table 8. Measurement points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
74AHC573-Q100	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$
74AHCT573-Q100	1.5 V	$0.5 \times V_{CC}$	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$

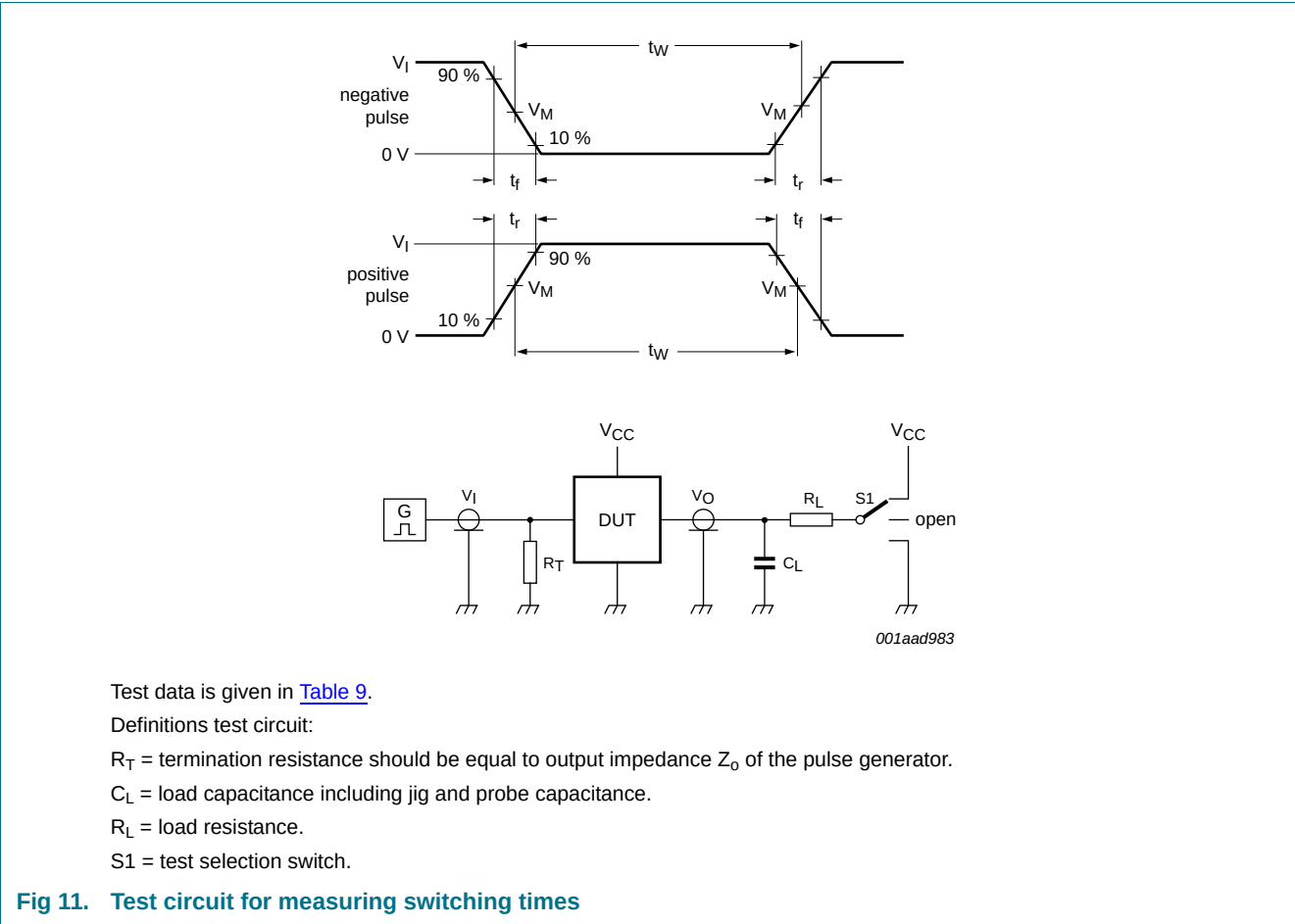


Fig 11. Test circuit for measuring switching times

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}
74AHC573-Q100	V_{CC}	$\leq 3.0 \text{ ns}$	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}
74AHCT573-Q100	3.0 V	$\leq 3.0 \text{ ns}$	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}

12. Package outline

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

SOT163-1

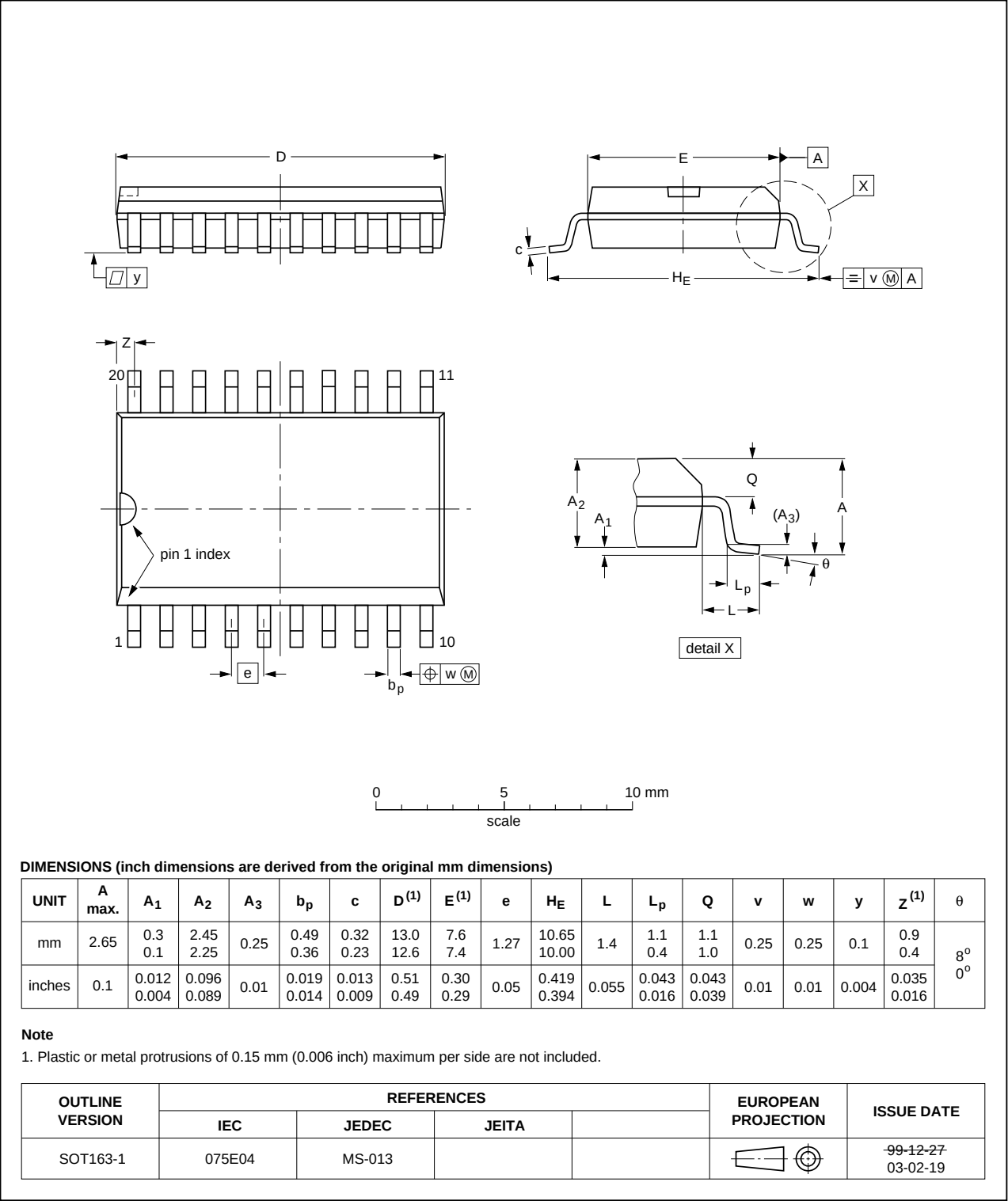


Fig 12. Package outline SOT163-1 (SO20)

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

SOT360-1

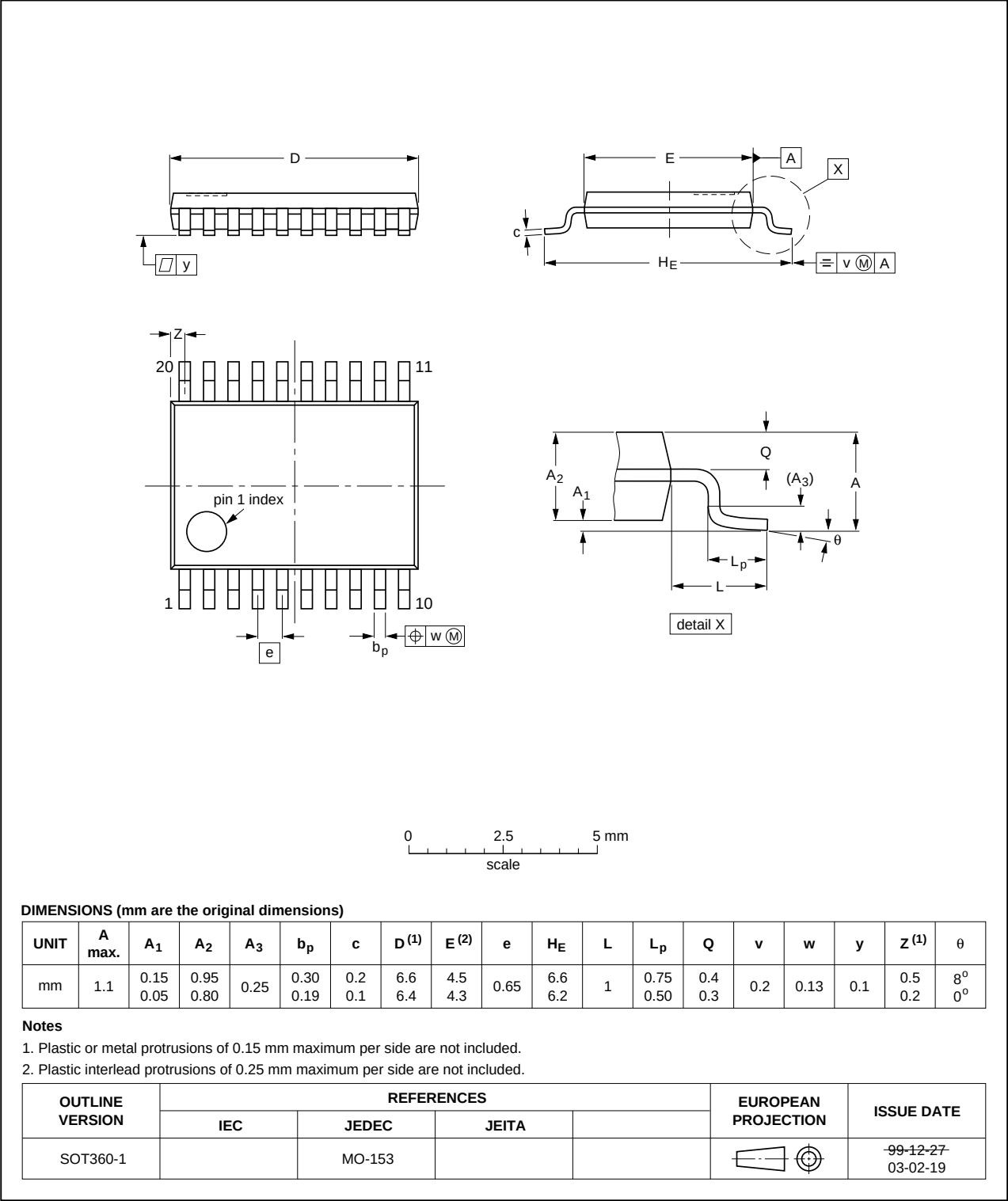


Fig 13. Package outline SOT360-1 (TSSOP20)

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

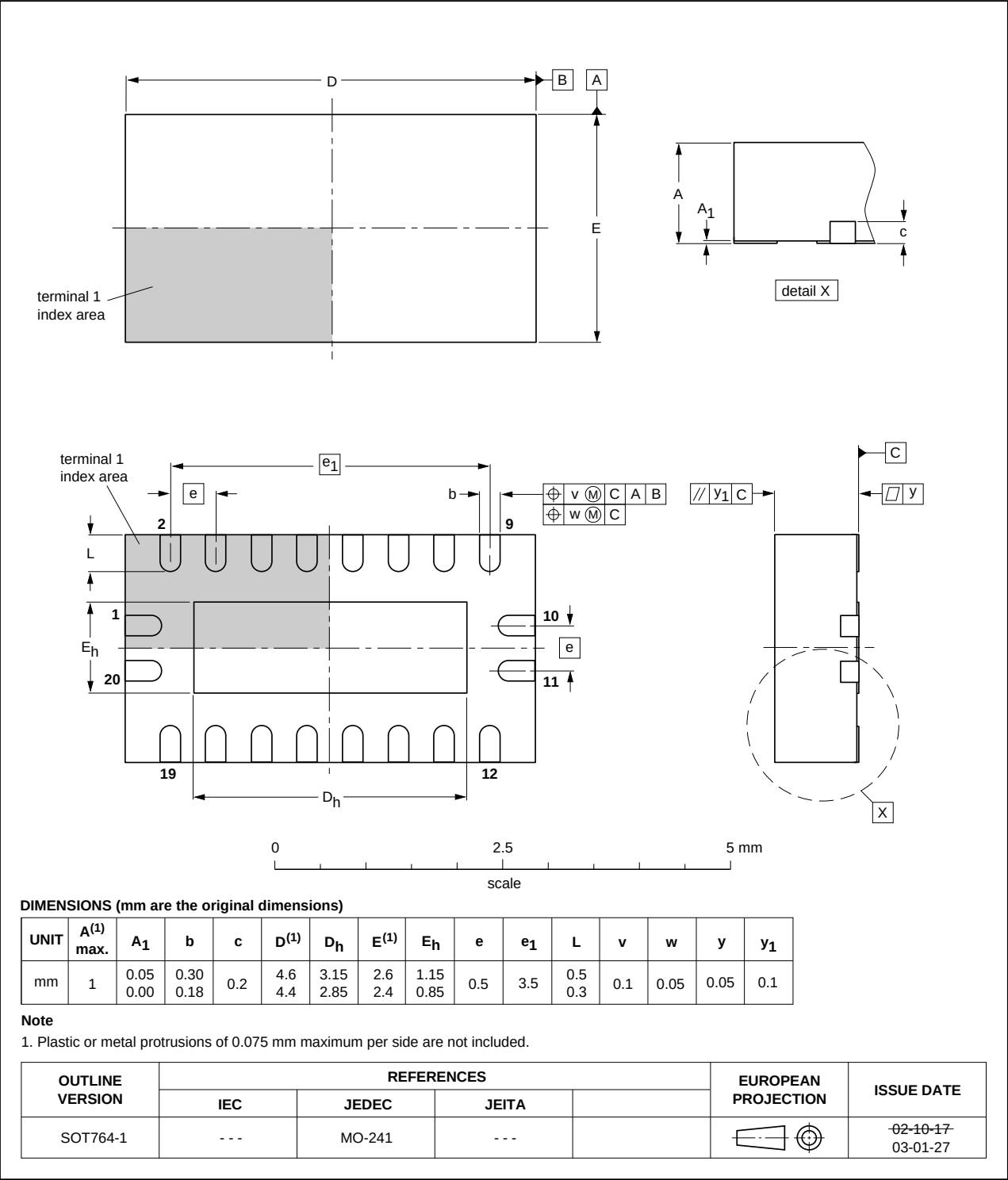


Fig 14. Package outline SOT764-1 (DHVQFN20)

13. Abbreviations

Table 10. Abbreviations

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

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT573_Q100 v.1	20130610	Product data sheet	-	-

15. Legal information

15.1 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".

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