74HC573-Q100; 74HCT573-Q100

Octal D-type transparent latch; 3-state

Rev. 2 — 16 August 2012 Product data sheet

1. General description

The 74HC573-Q100; 74HCT573-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 74HC573-Q100; 74HCT573-Q100 has octal D-type transparent latches featuring separate D-type inputs for each latch and 3-state true outputs for bus-oriented applications. A latch enable (LE) input and an output enable ($\overline{OE}$) input are common to all latches.

When LE is HIGH, data at the Dn inputs enter the latches. In this condition, the latches are transparent, i.e. a latch output changes state each time its corresponding D input changes.

When LE is LOW the latches store the information that was present at the D-inputs a set-up time preceding the HIGH-to-LOW transition of LE. When $\overline{OE}$ is LOW, the contents of the 8 latches are available at the outputs. When $\overline{OE}$ 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 °C to +85 °C and from −40 °C to +125 °C
- Input levels:
  - For 74HC573: CMOS level
  - For 74HCT573: TTL level
- Inputs and outputs on opposite sides of package allowing easy interface with microprocessors
- Useful as input or output port for microprocessors and microcomputers
- 3-state non-inverting outputs for bus-oriented applications
- Common 3-state output enable input
- Multiple package options
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC573D-Q100	−40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74HCT573D-Q100				
74HC573PW-Q100	−40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74HCT573PW-Q100				
74HC573BQ-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
74HCT573BQ-Q100				

4. Functional diagram

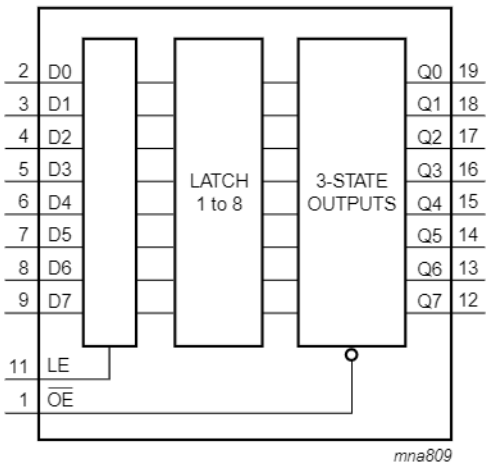


Fig 1. Functional diagram

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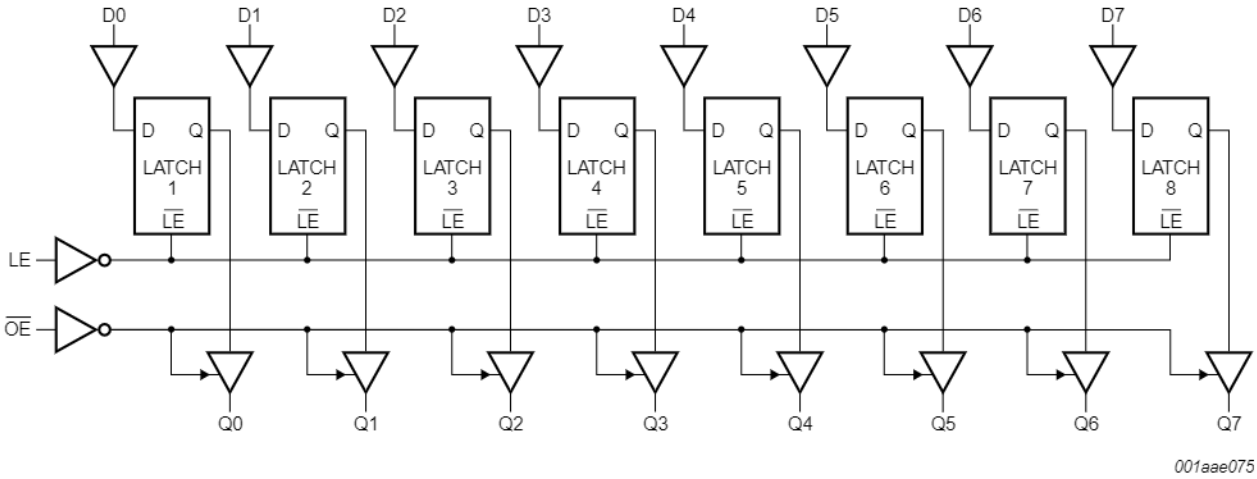


Fig 2. Logic diagram

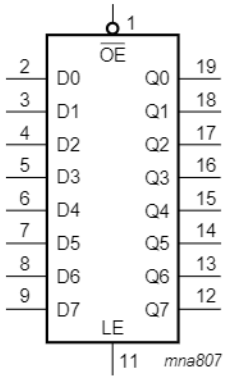


Fig 3. Logic symbol

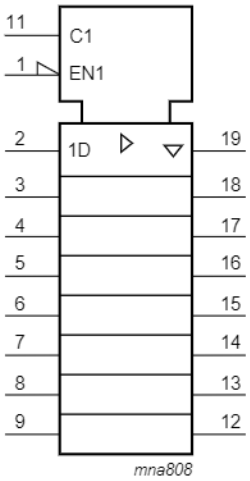


Fig 4. IEC logic symbol

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5. Pinning information

5.1 Pinning

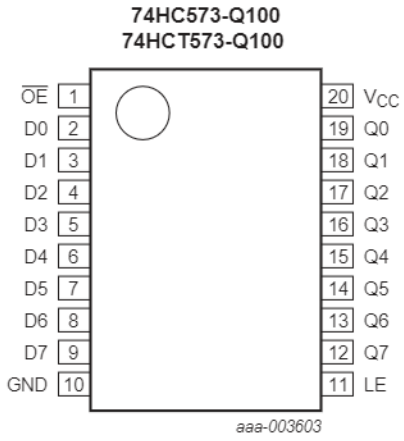
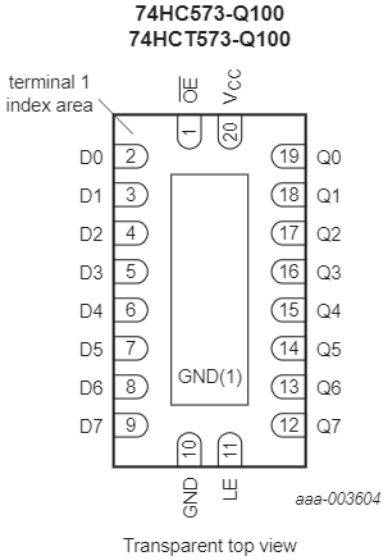


Fig 5. Pin configuration SO20 and TSSOP20



(1) The die substrate is attached to this pad using conductive die attach material. It cannot be used as supply pin or input

Fig 6. Pin configuration DHVQFN20

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
$\overline{OE}$	1	3-state output enable input (active LOW)
D[0:7]	2, 3, 4, 5, 6, 7, 8, 9	data input
GND	10	ground (0 V)
LE	11	latch enable input (active HIGH)
Q[0:7]	19, 18, 17, 16, 15, 14, 13, 12	3-state latch output
V_{CC}	20	supply voltage

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6. Functional description

Table 3. Function table[1]

Operating mode	Control		Input	Internal latches	Output
	$\overline{OE}$	LE	Dn		Qn
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	V
I_{IK}	input clamping current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V		-	±20	mA
I_{OK}	output clamping current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V		-	±20	mA
I_O	output current	$V_O = -0.5$ V to $(V_{CC} + 0.5$ 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	DIP20 package	[1]	-	750	mW
		SO20, SSOP20, TSSOP20 and DHVQFN20 packages	[2]	-	500	mW

[1] For DIP20 package: P_{tot} derates linearly with 12 mW/K above 70 °C.

[2] For SO20: P_{tot} derates linearly with 8 mW/K above 70 °C.
For SSOP20 and TSSOP20 packages: P_{tot} derates linearly with 5.5 mW/K above 60 °C.
For DHVQFN20 package: P_{tot} derates linearly with 4.5 mW/K above 60 °C.

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8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74HC573-Q100			74HCT573-Q100			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V_I	input voltage		0	-	V_{CC}	0	-	V_{CC}	V
V_O	output voltage		0	-	V_{CC}	0	-	V_{CC}	V
T_{amb}	ambient temperature		–40	+25	+125	–40	+25	+125	°C
$\Delta t/\Delta V$	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 +85 °C		–40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC573-Q100										
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
		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 input voltage	V_{CC} = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
		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 output voltage	V_I = V_{IH} or V_{IL}								
		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 mA; V_{CC} = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		I_O = –7.8 mA; V_{CC} = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}								
		I_O = 20 μA; V_{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 20 μA; V_{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 20 μA; 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 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL}; V_O = V_{CC} or GND; V_{CC} = 6.0 V	-	-	±0.5	-	±5.0	-	±10.0	μA

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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	Max	
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 6.0$ V	-	-	8.0	-	80	-	160	µA
C_I	input capacitance		-	3.5	-					pF
74HCT573-Q100										
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	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								
		$I_O = -20$ 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 output voltage	$V_I = V_{IH}$ or V_{IL}; $V_{CC} = 4.5$ V								
		$I_O = 20$ µA	-	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; $V_{CC} = 5.5$ V	-	-	±0.1	-	±1.0	-	±1.0	µA
I_{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL}; $V_{CC} = 5.5$ V; $V_O = V_{CC}$ or GND per input pin; other inputs at V_{CC} or GND; $I_O = 0$ A	-	-	±0.5	-	±5.0	-	±10	µA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	8.0	-	80	-	160	µA
ΔI_{CC}	additional supply current	$V_I = V_{CC} - 2.1$ V; other inputs at V_{CC} or GND; $V_{CC} = 4.5$ V to 5.5 V; $I_O = 0$ A								
		per input pin; Dn inputs	-	35	126	-	158	-	172	µA
		per input pin; LE input	-	65	234	-	293	-	319	µA
		per input pin; $\overline{OE}$ input	-	125	450	-	563	-	613	µA
C_I	input capacitance		-	3.5	-					pF

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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 Figure 11.

Symbol	Parameter	Conditions		25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
For type 74HC573-Q100											
t_{pd}	propagation delay	Dn to Qn; see Figure 7	[1]								
		V_{CC} = 2.0 V		-	47	150	-	190	-	225	ns
		V_{CC} = 4.5 V		-	17	30	-	38	-	45	ns
		V_{CC} = 5 V; C_L = 15 pF		-	14	-	-	-	-	-	ns
		V_{CC} = 6.0 V		-	14	26	-	33	-	38	ns
t_{pd}	propagation delay	LE to Qn; see Figure 8	[1]								
		V_{CC} = 2.0 V		-	50	150	-	190	-	225	ns
		V_{CC} = 4.5 V		-	18	30	-	38	-	45	ns
		V_{CC} = 5 V; C_L = 15 pF		-	15	-	-	-	-	-	ns
		V_{CC} = 6.0 V		-	14	26	-	33	-	38	ns
t_{en}	enable time	$\overline{OE}$ to Qn; see Figure 9	[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	$\overline{OE}$ to Qn; see Figure 9	[3]								
		V_{CC} = 2.0 V		-	55	150	-	190	-	225	ns
		V_{CC} = 4.5 V		-	20	30	-	38	-	45	ns
		V_{CC} = 6.0 V		-	16	26	-	33	-	38	ns
t_t	transition time	Qn; see Figure 7	[4]								
		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	LE HIGH; see Figure 8									
		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 LE; see Figure 10									
		V_{CC} = 2.0 V		50	11	-	65	-	75	-	ns
		V_{CC} = 4.5 V		10	4	-	13	-	15	-	ns
		V_{CC} = 6.0 V		9	3	-	11	-	13	-	ns
t_h	hold time	Dn to LE; see Figure 10									
		V_{CC} = 2.0 V		5	3	-	5	-	5	-	ns
		V_{CC} = 4.5 V		5	1	-	5	-	5	-	ns
		V_{CC} = 6.0 V		5	1	-	5	-	5	-	ns
C_{PD}	power dissipation capacitance	C_L = 50 pF; f = 1 MHz; V_I = GND to V_{CC}	[5]	-	26	-	-	-	-	-	pF

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Table 7. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); C_L = 50 pF unless otherwise specified; for test circuit see Figure 11.

Symbol	Parameter	Conditions		25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
For type 74HCT573-Q100											
t_{pd}	propagation delay	Dn to Qn; see Figure 7	[1]								
		V_{CC} = 4.5 V		-	20	35	-	44	-	53	ns
		V_{CC} = 5 V; C_L = 15 pF		-	17	-	-	-	-	-	ns
t_{pd}	propagation delay	LE to Qn; see Figure 8	[1]								
		V_{CC} = 4.5 V		-	18	35	-	44	-	53	ns
		V_{CC} = 5 V; C_L = 15 pF		-	15	-	-	-	-	-	ns
t_{en}	enable time	$\overline{OE}$ to Qn; see Figure 9	[2]								
		V_{CC} = 4.5 V		-	17	30	-	38	-	45	ns
t_{dis}	disable time	$\overline{OE}$ to Qn; see Figure 9	[3]								
		V_{CC} = 4.5 V		-	18	30	-	38	-	45	ns
t_t	transition time	Qn; see Figure 7	[4]								
		V_{CC} = 4.5 V		-	5	12	-	15	-	18	ns
t_W	pulse width	LE HIGH; see Figure 8									
		V_{CC} = 4.5 V		16	5	-	20	-	24	-	ns
t_{su}	set-up time	Dn to LE; see Figure 10									
		V_{CC} = 4.5 V		13	7	-	16	-	20	-	ns
t_h	hold time	Dn to LE; see Figure 10									
		V_{CC} = 4.5 V		9	4	-	11	-	15	-	ns
C_{PD}	power dissipation capacitance	C_L = 50 pF; f = 1 MHz; V_I = GND to V_{CC}	[5]	-	26	-	-	-	-	-	pF

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

[2] t_{en} is the same as t_{PZH} and t_{PZL}.

[3] t_{dis} is the same as t_{PLZ} and t_{PHZ}.

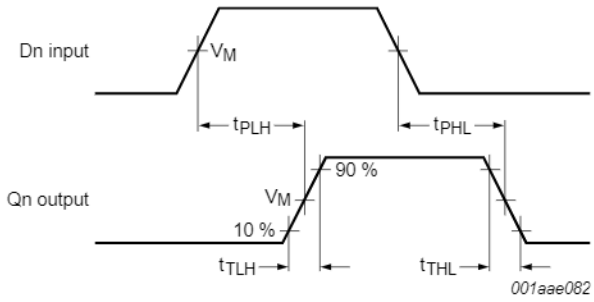
[4] t_t is the same as t_{THL} and t_{TLH}.

[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 outputs.

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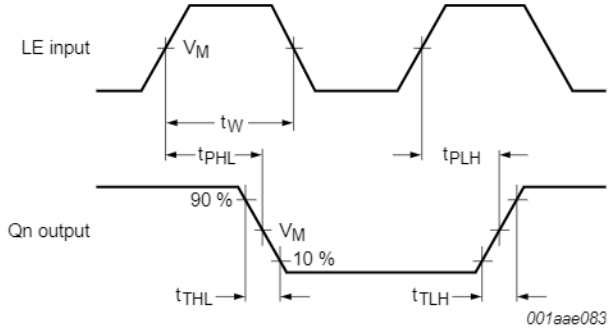
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11. Waveforms



Measurement points are given in Table 8.

Fig 7. Propagation delay data input (Dn) to output (Qn) and output transition time

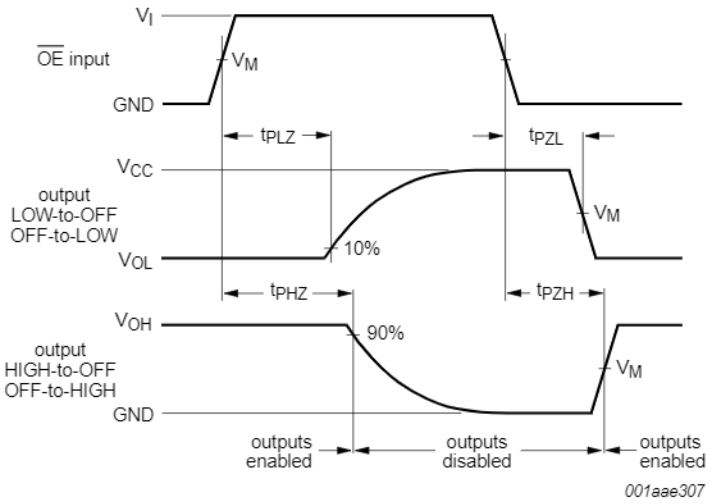


Measurement points are given in Table 8.

Fig 8. Pulse width latch enable input (LE), propagation delay latch enable input (LE) to output (Qn) and output transition time

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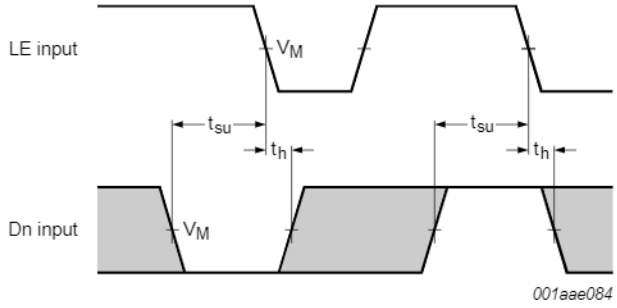
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Measurement points are given in Table 8.

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.

The shaded areas indicate when the input is permitted to change for predictable output performance.

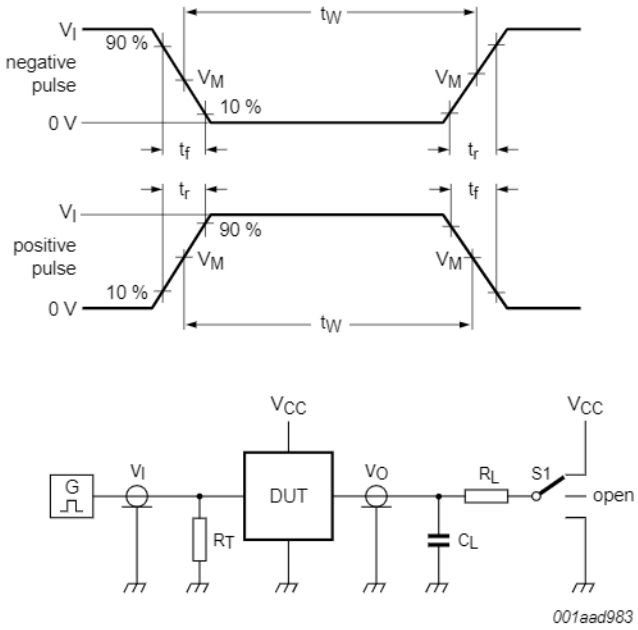
Fig 10. Set-up and hold times for data input (Dn) to latch input (LE)

Table 8. Measurement points

Type	Input	Output
	V_M	V_M
74HC573-Q100	$0.5V_{CC}$	$0.5V_{CC}$
74HCT573-Q100	1.3 V	1.3 V

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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_o of the pulse generator.

C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistance.

S1 = Test selection switch.

Fig 11. Test circuit for measuring switching times

Table 9. Test data

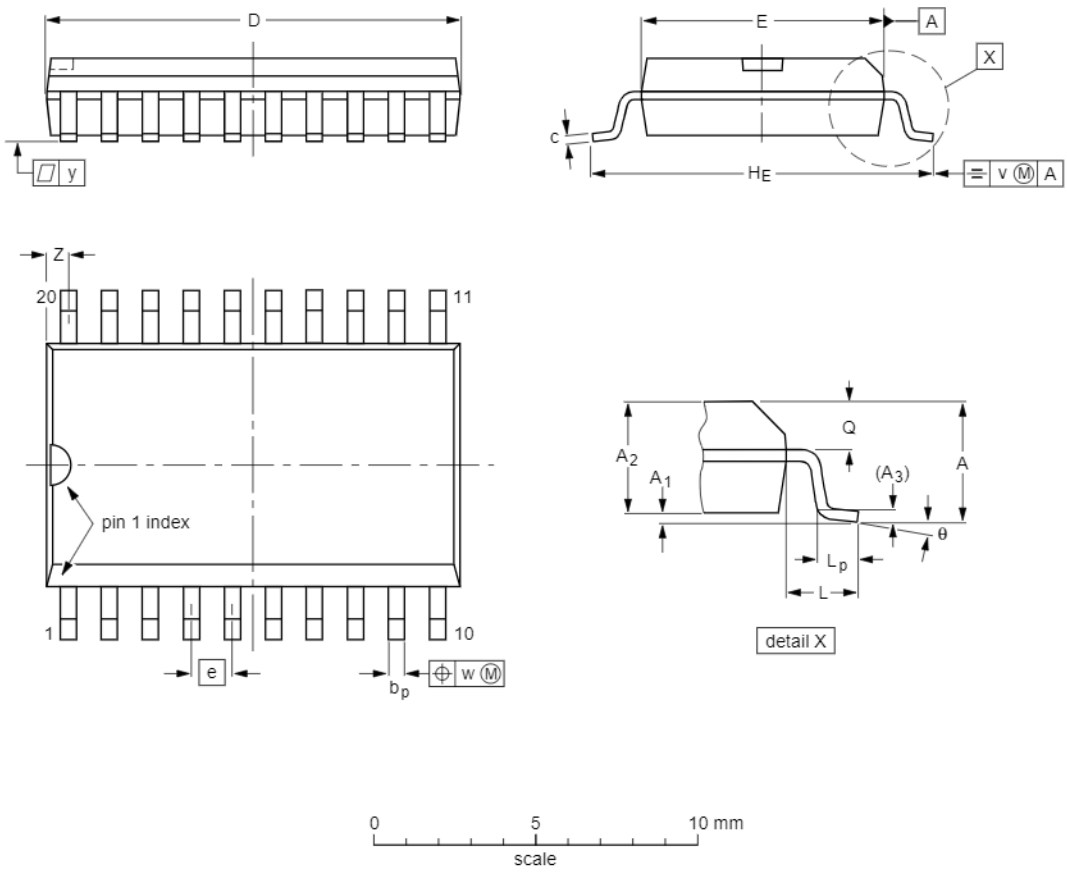
Type	Input		Load		S1 position		
	V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
74HC573-Q100	V_{CC}	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}
74HCT573-Q100	3 V	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}

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12. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm **SOT163-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	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° 0°
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	

Note

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

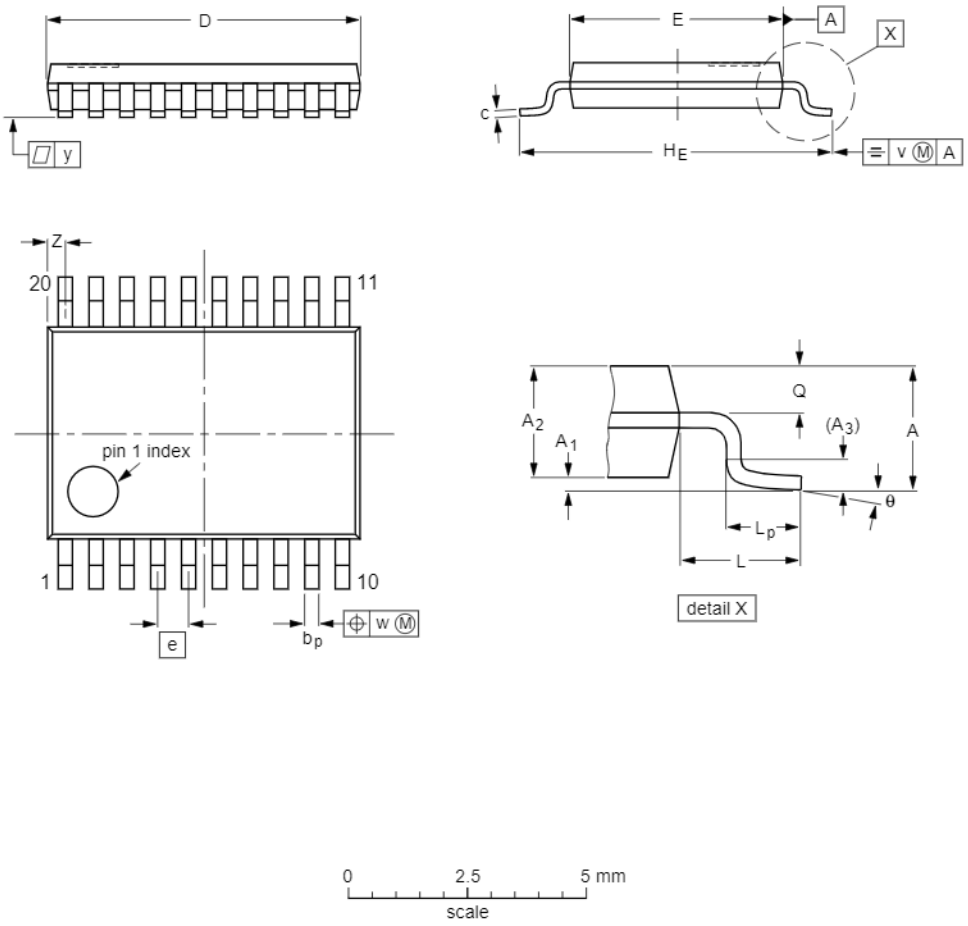
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT163-1	075E04	MS-013				~~99-12-27~~ 03-02-19

Fig 12. Package outline SOT163-1 (SO20)

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TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm **SOT360-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.5 0.2	8° 0°

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.

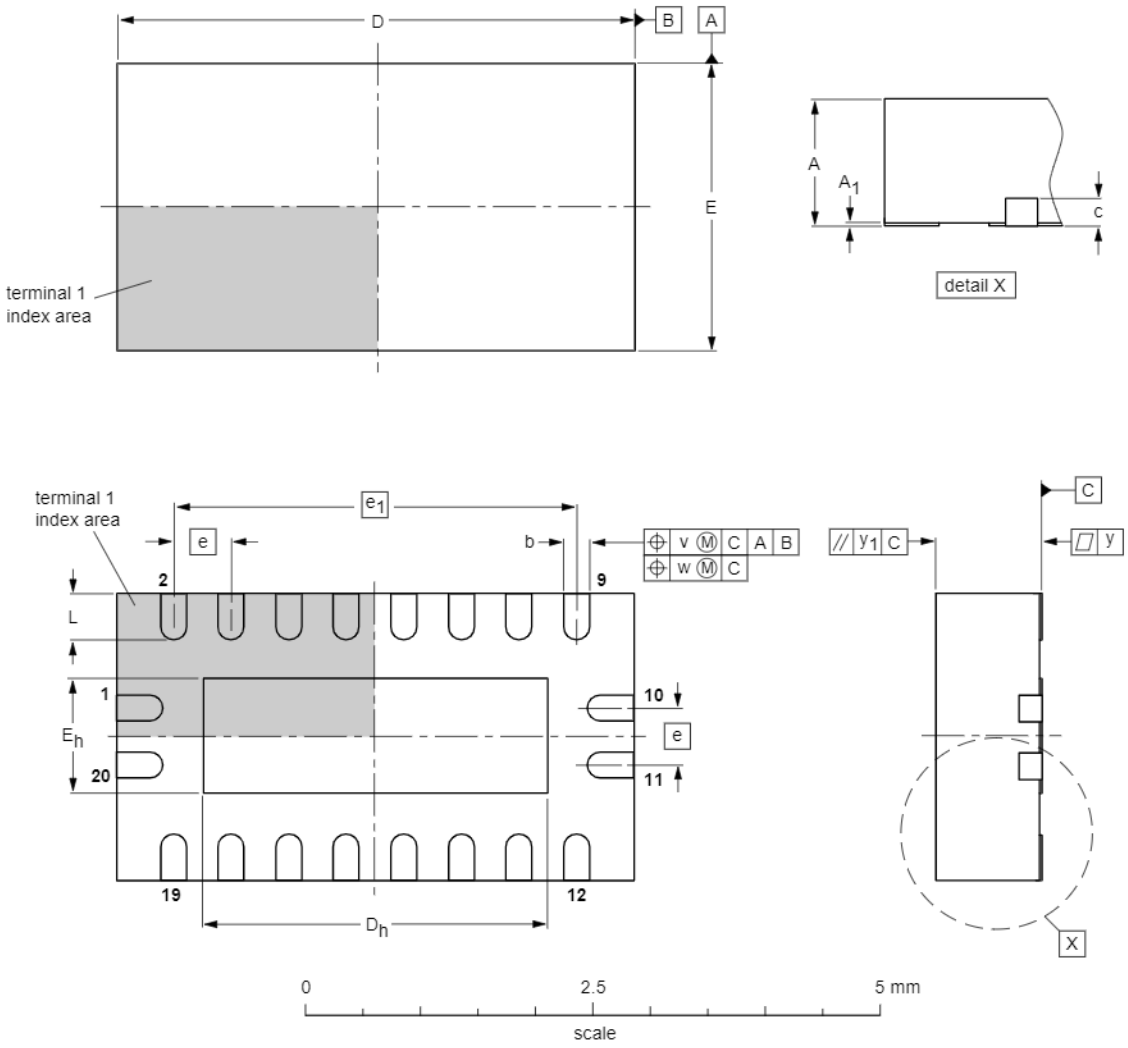
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT360-1		MO-153				~~99-12-27~~ 03-02-19

Fig 13. Package outline SOT360-1 (TSSOP20)

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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**



DIMENSIONS (mm are the original dimensions)

UNIT	A(1) max.	A_1	b	c	D(1)	D_h	E(1)	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.30 0.18	0.2	4.6 4.4	3.15 2.85	2.6 2.4	1.15 0.85	0.5	3.5	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT764-1	- - -	MO-241	- - -			~~02-10-17~~ 03-01-27

Fig 14. Package outline SOT764-1 (DHVQFN20)

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13. Abbreviations

Table 10. Abbreviations

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

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT573_Q100 v.2	20120816	Product data sheet	-	74HC_HCT573_Q100 v.1
Modifications:	• Alternative descriptive title corrected (errata).			
74HC_HCT573_Q100 v.1	20120802	Product data sheet	-	-

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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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