

74HC574-Q100; 74HCT574-Q100

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

Rev. 2 — 26 January 2015

Product data sheet

1. General description

The 74HC574-Q100; 74HCT574-Q100 is a high-speed Si-gate CMOS device and is pin compatible with Low-power Schottky TTL. It is specified in compliance with JEDEC standard no. 7A.

The 74HC574-Q100; 74HCT574-Q100 are octal D-type flip-flops featuring separate D-type inputs for each flip-flop and 3-state outputs for bus-oriented applications. A clock (CP) and an output enable (\overline{OE}) input are common to all flip-flops. The 8 flip-flops store the state of their individual D-inputs that meet the set-up and hold times requirements on the LOW-to-HIGH CP transition. When \overline{OE} is LOW the contents of the 8 flip-flops 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 flip-flops.

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 $+125\text{ }^{\circ}\text{C}$
- 3-state non-inverting outputs for bus-oriented applications
- 8-bit positive, edge-triggered register
- Common 3-state output enable input
- 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)
- Multiple package options

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|-----------------|-------------------|---------|---|----------|
| | Temperature range | Name | Description | |
| 74HC574D-Q100 | -40 °C to +125 °C | SO20 | plastic small outline package; 20 leads; body width 7.5 mm | SOT163-1 |
| 74HCT574D-Q100 | | | | |
| 74HC574PW-Q100 | -40 °C to +125 °C | TSSOP20 | plastic thin shrink small outline package; 20 leads; body width 4.4 mm | SOT360-1 |
| 74HCT574PW-Q100 | | | | |

4. Functional diagram

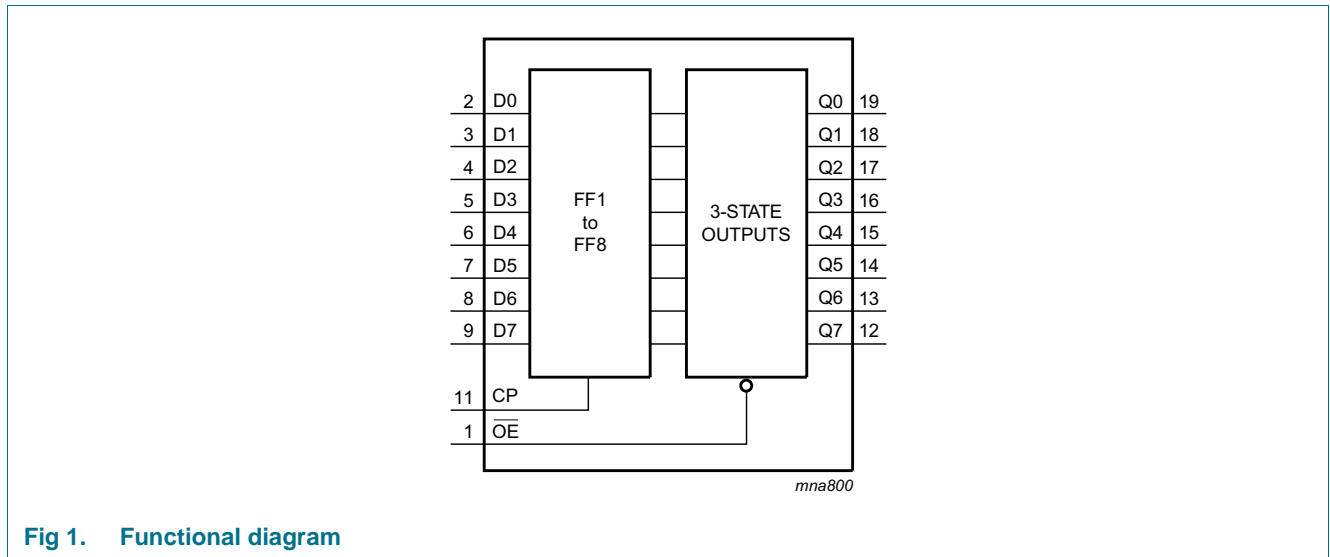


Fig 1. Functional diagram

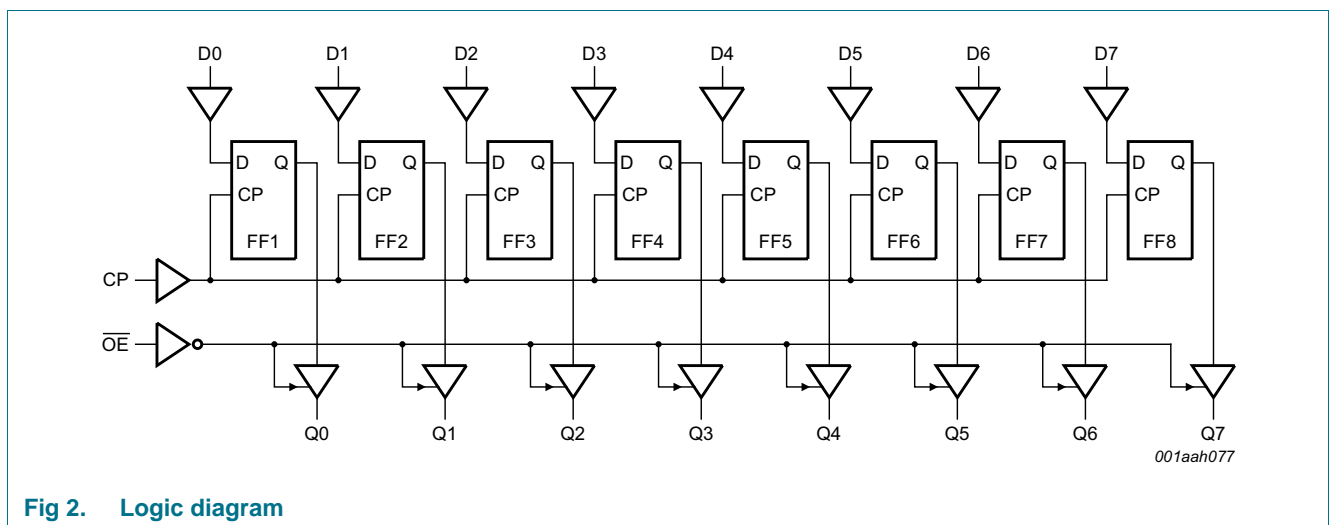


Fig 2. Logic diagram

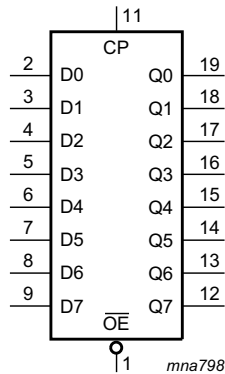


Fig 3. Logic symbol

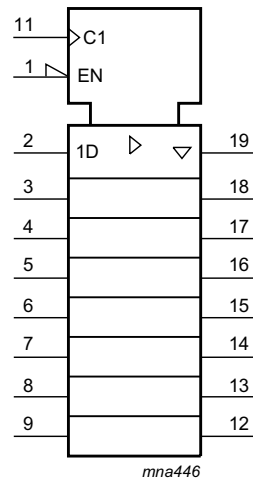


Fig 4. IEC logic symbol

5. Pinning information

5.1 Pinning

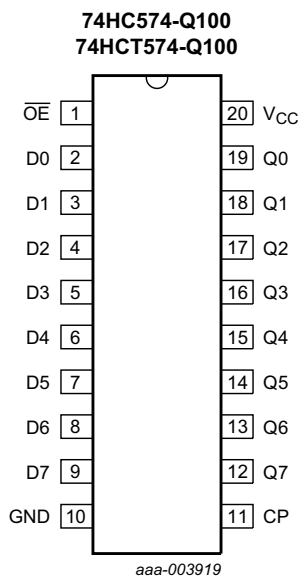


Fig 5. Pin configuration SO20

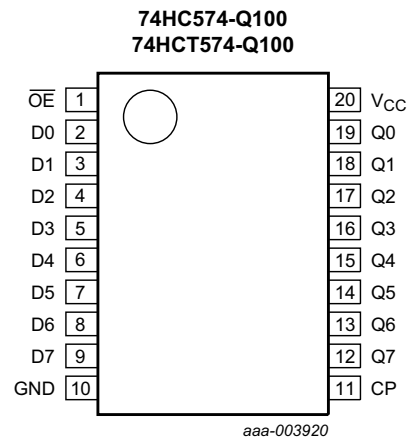


Fig 6. Pin configuration TSSOP20

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) |
| CP | 11 | clock input (LOW-to-HIGH, edge triggered) |
| Q[0:7] | 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^[1]

| Operating mode | Input | | | Internal flip-flop | Output Q _n |
|----------------------------------|-------|----|----------------|--------------------|-----------------------|
| | OE | CP | D _n | | |
| 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 |

- [1] 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.

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 | | ^[1] - | 500 | mW |

- [1] For SO20 packages: P_{tot} derates linearly with 8 mW/K above 70 °C.
 For TSSOP20 packages: P_{tot} derates linearly with 5.5 mW/K above 60 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

| Symbol | Parameter | Conditions | 74HC574-Q100 | | | 74HCT574-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 |
| 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 +85 °C | | -40 °C to +125 °C | | Unit |
|---------------------|---------------------------|--|-------|------|------|------------------|------|-------------------|-------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC574-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 |
| 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 _{OZ} | OFF-state output current | I _O = 7.8 mA; V _{CC} = 6.0 V | - | 0.16 | 0.26 | - | 0.33 | - | 0.4 | V |
| | | V _I = V _{IH} or V _{IL} ; V _O = 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 |

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 |
| 74HCT574-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 | - | 50 | 180 | - | 225 | - | 245 | μA |
| | | per input pin; \overline{OE} input | - | 125 | 450 | - | 563 | - | 613 | μA |
| | | per input pin; CP input | - | 150 | 540 | - | 675 | - | 735 | μA |
| C _I | 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 [Figure 10](#).

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---------------------|-------------------|---|-------|-----|-----|------------------|-----|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC574-Q100 | | | | | | | | | | |
| t_{pd} | propagation delay | CP to Qn; see Figure 7 ^[1] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 47 | 150 | - | 190 | - | 225 | ns |
| | | $V_{CC} = 4.5$ V | - | 17 | 30 | - | 35 | - | 45 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 14 | - | - | - | - | - | ns |
| | | $V_{CC} = 6.0$ V | - | 14 | 26 | - | 33 | - | 38 | ns |
| t_{en} | enable time | 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 | OE to Qn; see Figure 9 ^[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 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 | CP HIGH or LOW; 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 CP; see Figure 8 | | | | | | | | |
| | | $V_{CC} = 2.0$ 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 Figure 8 | | | | | | | | |
| | | $V_{CC} = 2.0$ 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 frequency | CP; see Figure 7 | | | | | | | | |
| | | $V_{CC} = 2.0$ 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 |

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 10](#).

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|----------------------|-------------------------------|---|-------|-----|-----|------------------|-----|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| C_{PD} | power dissipation capacitance | $C_L = 50$ pF; $f = 1$ MHz; $V_I = \text{GND to } V_{CC}$ [5] | - | 22 | - | - | - | - | - | pF |
| 74HCT574-Q100 | | | | | | | | | | |
| t_{pd} | propagation delay | CP to Qn; see Figure 7 [1] | | | | | | | | |
| | | $V_{CC} = 4.5$ V | - | 18 | 33 | - | 41 | - | 50 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 15 | - | - | - | - | - | ns |
| t_{en} | enable time | OE to Qn; see Figure 9 [2] | | | | | | | | |
| | | $V_{CC} = 4.5$ V | - | 19 | 33 | - | 41 | - | 50 | ns |
| t_{dis} | disable time | OE to Qn; see Figure 9 [3] | | | | | | | | |
| | | $V_{CC} = 4.5$ V | - | 16 | 28 | - | 35 | - | 42 | ns |
| t_t | transition time | Qn; see Figure 7 [4] | | | | | | | | |
| | | $V_{CC} = 4.5$ V | - | 5 | 12 | - | 15 | - | 18 | ns |
| t_W | pulse width | CP HIGH or LOW; see Figure 8 | | | | | | | | |
| | | $V_{CC} = 4.5$ V | 16 | 7 | - | 20 | - | 24 | - | ns |
| t_{su} | set-up time | Dn to CP; see Figure 8 | | | | | | | | |
| | | $V_{CC} = 4.5$ V | 12 | 3 | - | 15 | - | 18 | - | ns |
| t_h | hold time | Dn to CP; see Figure 8 | | | | | | | | |
| | | $V_{CC} = 4.5$ V | 5 | -1 | - | 5 | - | 5 | - | ns |
| f_{max} | maximum frequency | CP; see Figure 7 | | | | | | | | |
| | | $V_{CC} = 4.5$ V | 30 | 69 | - | 24 | - | 20 | - | MHz |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 76 | - | - | - | - | - | MHz |
| C_{PD} | power dissipation capacitance | $C_L = 50$ pF; $f = 1$ MHz; $V_I = \text{GND to } V_{CC} - 1.5$ V [5] | - | 25 | - | - | - | - | - | 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).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

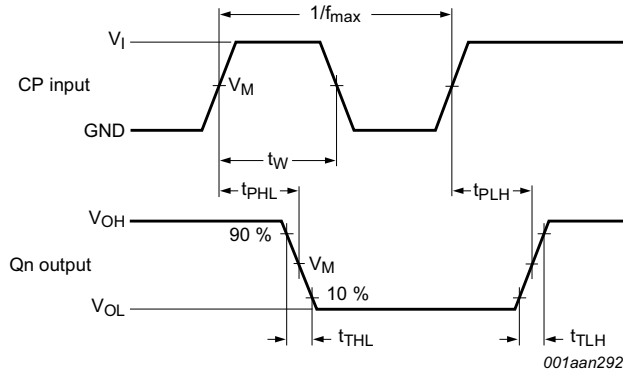
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

$\sum(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

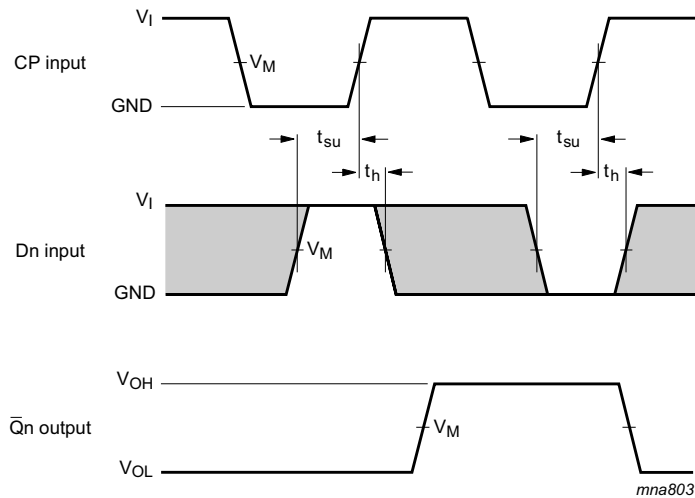
11. Waveforms



Measurement points are given in [Table 8](#).

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

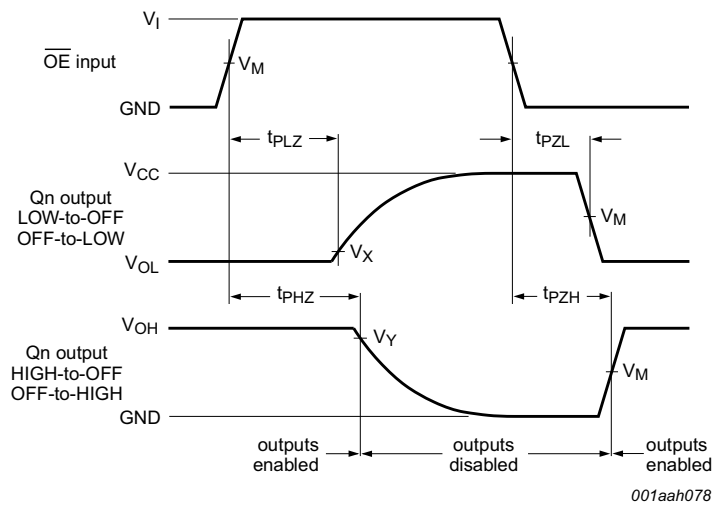
Fig 7. Propagation delay input (CP) to output (Qn), output transition time, clock input (CP) pulse width and the maximum frequency (CP)



Measurement points are given in [Table 8](#).

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

Fig 8. The data input (D) to clock input (CP) set-up times and clock input (CP) to data input (D) hold times



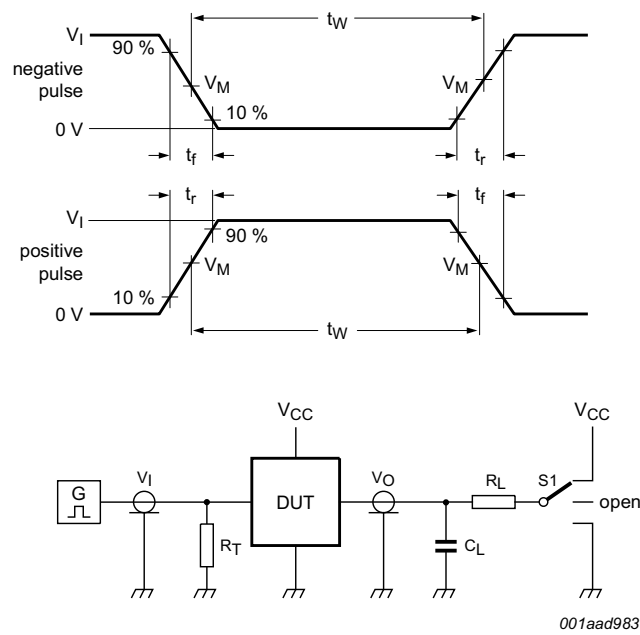
Measurement points are given in [Table 8](#).

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

Fig 9. Enable and disable times

Table 8. Measurement points

| Type | Input | Output | | |
|---------------|-------------|-------------|-------------|-------------|
| | V_M | V_M | V_X | V_Y |
| 74HC574-Q100 | $0.5V_{CC}$ | $0.5V_{CC}$ | $0.1V_{CC}$ | $0.9V_{CC}$ |
| 74HCT574-Q100 | 1.3 V | 1.3 V | $0.1V_{CC}$ | $0.9V_{CC}$ |



001aad983

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 10. 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} |
| 74HC574-Q100 | V_{CC} | 6 ns | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |
| 74HCT574-Q100 | 3 V | 6 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

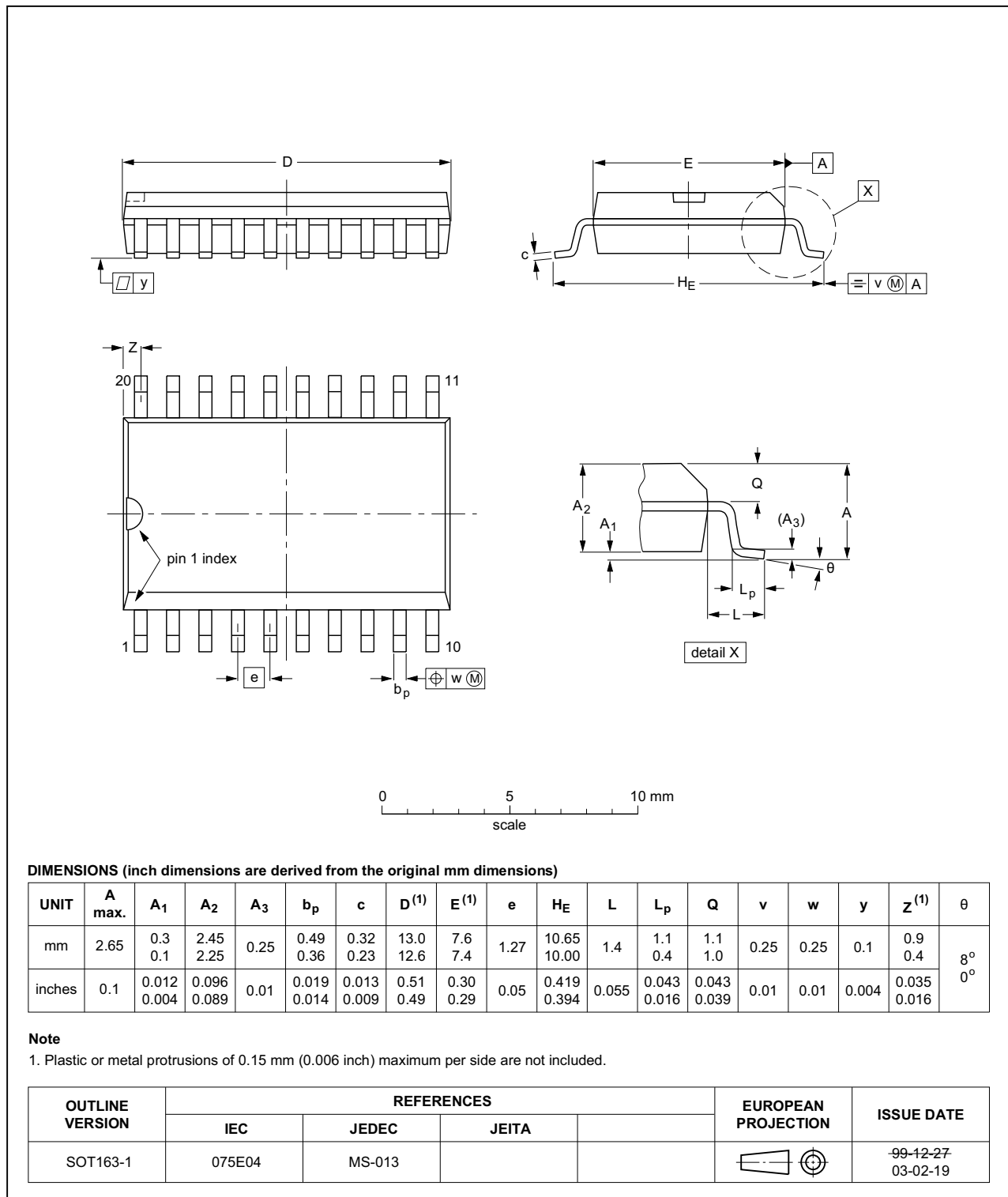


Fig 11. Package outline SOT163-1 (SO20)

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

SOT360-1

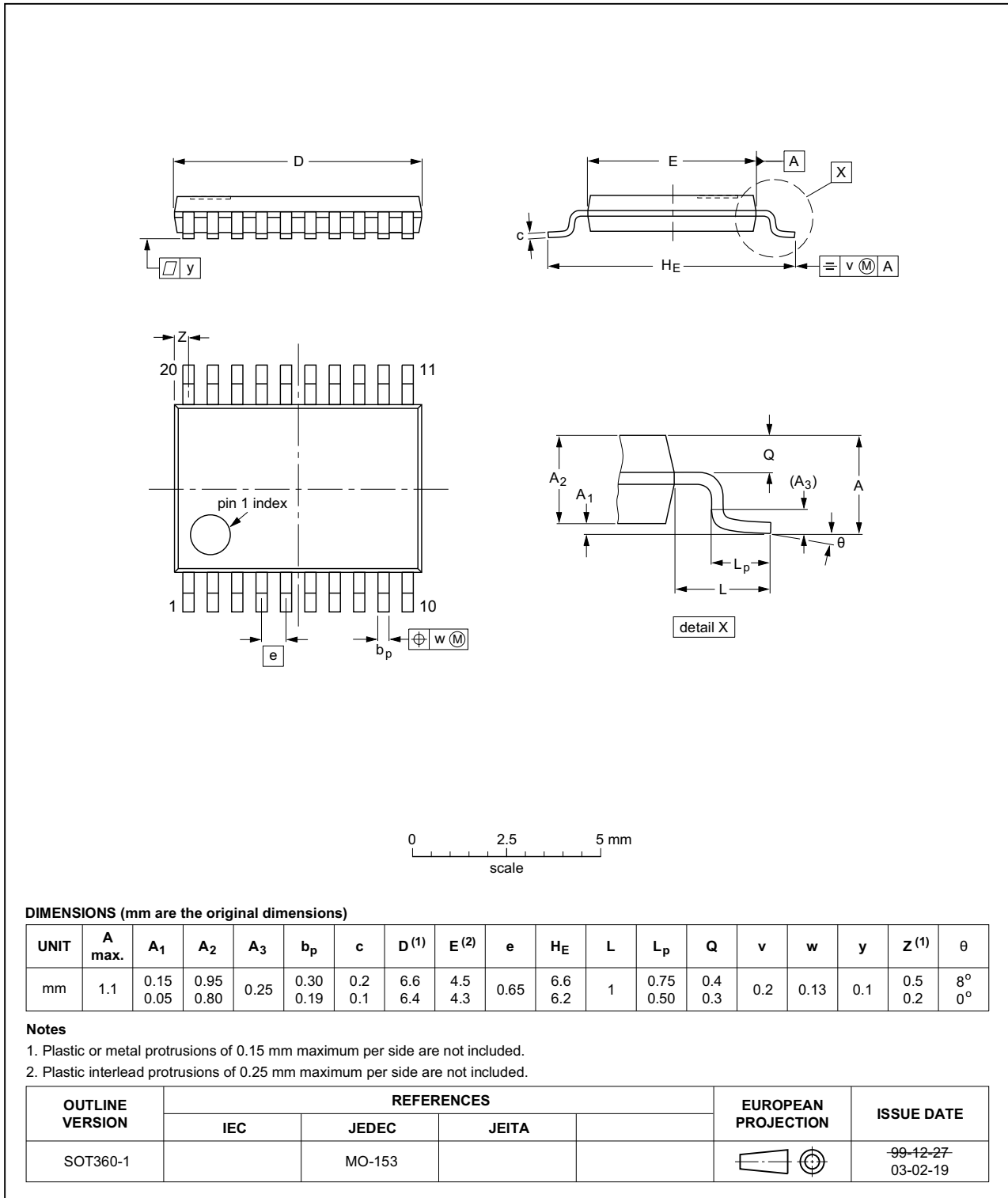


Fig 12. Package outline SOT360-1 (TSSOP20)

13. Abbreviations

Table 10. Abbreviations

| Acronym | Description |
|---------|---|
| CMOS | Complementary Metal Oxide Semiconductor |
| DUT | Device Under Test |
| 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_HCT574_Q100 v.2 | 20150126 | Product data sheet | - | 74HC_HCT574_Q100 v.1 |
| Modifications: | • Table 7 : Power dissipation capacitance condition for 74HCT574-Q100 is corrected. | | | |
| 74HC_HCT574_Q100 v.1 | 20120802 | 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".

[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 URL <http://www.nexperia.com>.

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17. Contents

| | | |
|-----------|---|-----------|
| 1 | General description | 1 |
| 2 | Features and benefits | 1 |
| 3 | Ordering information | 2 |
| 4 | Functional diagram | 2 |
| 5 | Pinning information | 3 |
| 5.1 | Pinning | 3 |
| 5.2 | Pin description | 4 |
| 6 | Functional description | 4 |
| 7 | Limiting values | 4 |
| 8 | Recommended operating conditions | 5 |
| 9 | Static characteristics | 5 |
| 10 | Dynamic characteristics | 7 |
| 11 | Waveforms | 9 |
| 12 | Package outline | 12 |
| 13 | Abbreviations | 14 |
| 14 | Revision history | 14 |
| 15 | Legal information | 15 |
| 15.1 | Data sheet status | 15 |
| 15.2 | Definitions | 15 |
| 15.3 | Disclaimers | 15 |
| 15.4 | Trademarks | 16 |
| 16 | Contact information | 16 |
| 17 | Contents | 17 |