**Octal D-type Flip-flop with Reset; Positive Edge-trigger**

# CJ74HC/HCT273 Logic

## 1 Introduction

The CJ74HC/HCT273 is an octal positive-edge triggered D-type flip-flop. The device features clock (CP) and master reset (/MR) inputs. The outputs Qn will assume the state of their corresponding Dn inputs that meet the set-up and hold time requirements on the LOW-to-HIGH clock (CP) transition. A LOW on /MR forces the outputs LOW independently of clock and data inputs. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of $V_{CC}$.

## 2 Available Packages

| PART NUMBER | PACKAGE |
|---|---|
| CJ74HC273 | SOP20 |
| | TSSOP20 |
| CJ74HCT273 | SOP20 |
| | TSSOP20 |

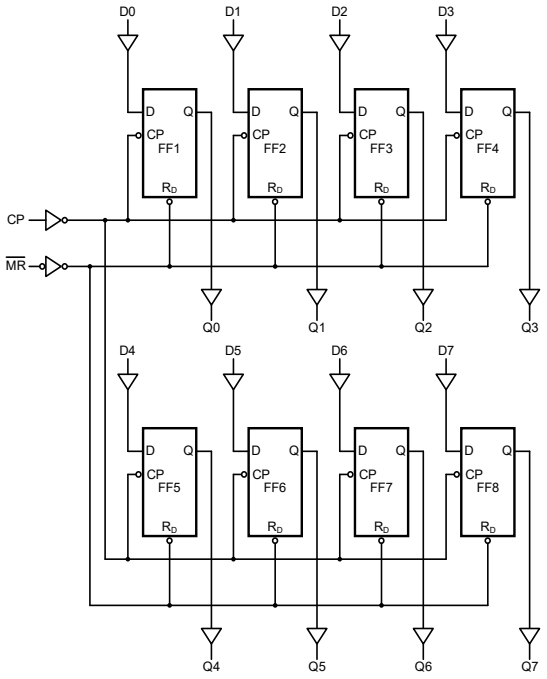
**Note:** For all available packages, please refer to the part Orderable Information.

## 3 Features

- Input levels:
  - For CJ74HC273: CMOS level
  - For CJ74HCT273: TTL level
- Common clock and master reset
- Eight positive edge-triggered D-type flip-flops
- Specified from -40°C to +125°C

## 4 Applications

- Buffer or store registers
- Shift registers
- Pattern generators




Logic diagram

## 5 Orderable Information

| DEVICE | PACKAGE | OP TEMP | ECO PLAN | MSL | PACKING OPTION | SORT |
|---|---|---|---|---|---|---|
| CJ74HC273AGN | SOP20 | -40~125°C | RoHS & Green | Level 3 168HR | Tape and Reel 2000 Units / Reel | Active |
| CJ74HCT273AGN | SOP20 | -40~125°C | RoHS & Green | Level 3 168HR | Tape and Reel 2000 Units / Reel | Active |
| CJ74HC273BGN | TSSOP20 | -40~125°C | RoHS & Green | Level 3 168HR | Tape and Reel 4000 Units / Reel | Active |
| CJ74HCT273BGN | TSSOP20 | -40~125°C | RoHS & Green | Level 3 168HR | Tape and Reel 4000 Units / Reel | Active |

**Note:**

**ECO PLAN:** For the RoHS and Green certification standards of this product, please refer to the official report provided by JSCJ.

**MSL:** Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

**SORT:** Specifically defined as follows:
Active: Recommended for new products;
Customized: Products manufactured to meet the specific needs of customers;
Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;
NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;
Obsolete: The device has been discontinued.

# 6 Pin Configuration and Marking Information

## 6.1 Pin Configuration

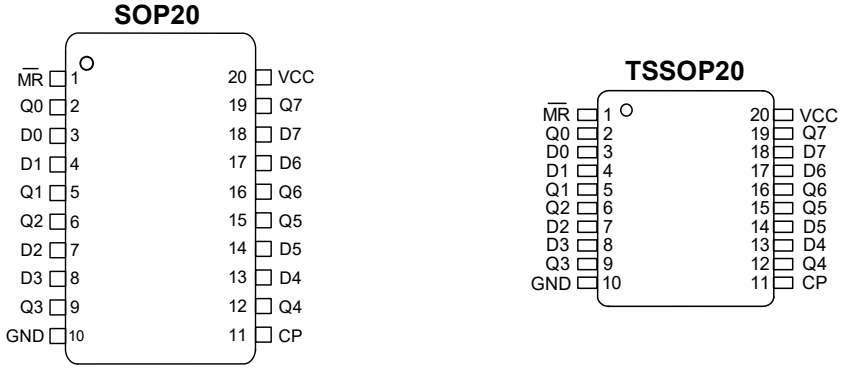



**Figure 6-1 Pin configuration**

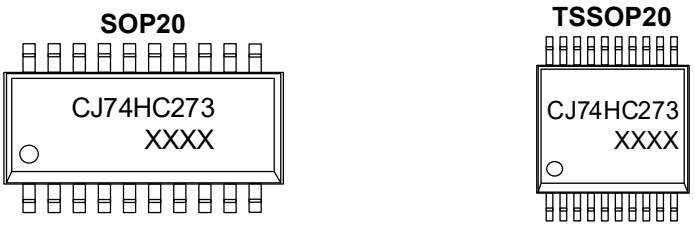
## 6.2 Pin Function

| PIN | | I/O(1) | DESCRIPTION |
|---|---|---|---|
| No. | NAME | | |
| 1 | $\overline{MR}$ | I | Master reset input (active LOW) |
| 2 | Q0 | O | Flip-flop output |
| 3 | D0 | I | Data input |
| 4 | D1 | I | Data input |
| 5 | Q1 | O | Flip-flop output |
| 6 | Q2 | O | Flip-flop output |
| 7 | D2 | I | Data input |
| 8 | D3 | I | Data input |
| 9 | Q3 | O | Flip-flop output |
| 10 | GND | G | Ground (0V) |
| 11 | CP | I | Clock input (LOW-to-HIGH, edge-triggered) |
| 12 | Q4 | O | Flip-flop output |
| 13 | D4 | I | Data input |
| 14 | D5 | I | Data input |
| 15 | Q5 | O | Flip-flop output |
| 16 | Q6 | O | Flip-flop output |
| 17 | D6 | I | Data input |
| 18 | D7 | I | Data input |
| 19 | Q7 | O | Flip-flop output |
| 20 | VCC | P | Supply voltage |

(1) I-Input, O-Output, P-Power, G-Ground

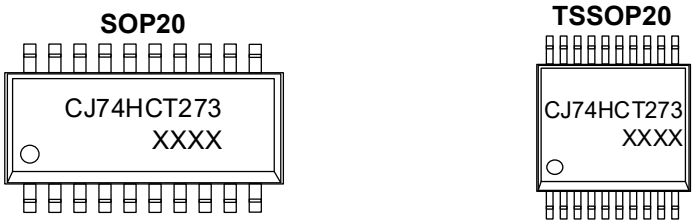
## 6.3 Marking Information

### 6.3.1 CJ74HC273




XXXX: Code, indicates weekly record information.

### 6.3.2 CJ74HCT273




XXXX: Code, indicates weekly record information.

# 7 Specifications

## 7.1 Absolute Maximum Ratings

Voltages are referenced to GND (ground=0V), unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | - | | -0.5 | +7.0 | V |
| $I_{IK}$ | Input clamping current | $V_I$ < -0.5V or $V_I$ > $V_{CC}$+0.5V | | - | ±20 | mA |
| $I_{OK}$ | Output clamping current | $V_O$ < -0.5V or $V_O$ > $V_{CC}$+0.5V | | - | ±20 | mA |
| $I_O$ | Output current | -0.5V < $V_O$ < $V_{CC}$+0.5V | | - | ±25 | mA |
| $I_{CC}$ | Supply current | - | | - | 50 | mA |
| $I_{GND}$ | Ground current | - | | -50 | - | mA |
| $T_{stg}$ | Storage temperature | - | | -65 | +150 | °C |
| $P_{tot}$ | Total power dissipation | - | | - | 500 | mW |
| $T_L$ | Soldering temperature | 10s | SOP/TSSOP | - | 260 | °C |

**Note:** Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to GND. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

## 7.2 Recommended Operating Conditions

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| **CJ74HC273** | | | | | | |
| $V_{CC}$ | Supply voltage | - | 2.0 | 5.0 | 6.0 | V |
| $V_I$ | Input voltage | - | 0 | - | $V_{CC}$ | V |
| $V_O$ | Output voltage | - | 0 | - | $V_{CC}$ | V |
| Δt/ΔV | Input transition rise and fall rate | $V_{CC}$=2.0V | - | - | 625 | ns/V |
| | | $V_{CC}$=4.5V | - | 1.67 | 139 | ns/V |
| | | $V_{CC}$=6.0V | - | - | 83 | ns/V |
| $T_{amb}$ | Ambient temperature | - | -40 | - | +85 | °C |
| **CJ74HCT273** | | | | | | |
| $V_{CC}$ | Supply voltage | - | 4.5 | 5.0 | 5.5 | V |
| $V_I$ | Input voltage | - | 0 | - | $V_{CC}$ | V |
| $V_O$ | Output voltage | - | 0 | - | $V_{CC}$ | V |
| Δt/ΔV | Input transition rise and fall rate | $V_{CC}$=2.0V | - | - | - | ns/V |
| | | $V_{CC}$=4.5V | - | 1.67 | 139 | ns/V |
| | | $V_{CC}$=6.0V | - | - | - | ns/V |
| $T_{amb}$ | Ambient temperature | - | -40 | - | +85 | °C |

## 7.3 ESD Ratings

| SYMBOL | ESD RATINGS | | VALUE | UNIT |
|---|---|---|---|---|
| $V_{ESD-HBM}$ | Electrostatic discharge | Human body model (HBM)(1) | ±4000 | V |

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

## 7.4 Electrical Characteristics

### 7.4.1 DC Characteristics 1

$T_{amb}$=25°C, voltages are referenced to GND (ground=0V), unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| **CJ74HC273** | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$=2.0V | | 1.5 | - | - | V |
| | | $V_{CC}$=4.5V | | 3.15 | - | - | V |
| | | $V_{CC}$=6.0V | | 4.2 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$=2.0V | | - | - | 0.5 | V |
| | | $V_{CC}$=4.5V | | - | - | 1.35 | V |
| | | $V_{CC}$=6.0V | | - | - | 1.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$ | $I_O$=-20uA; $V_{CC}$=2.0V | 1.9 | 2.0 | - | V |
| | | | $I_O$=-20uA; $V_{CC}$=4.5V | 4.4 | 4.5 | - | V |
| | | | $I_O$=-20uA; $V_{CC}$=6.0V | 5.9 | 6.0 | - | V |
| | | | $I_O$=-4.0mA; $V_{CC}$=4.5V | 3.98 | 4.32 | - | V |
| | | | $I_O$=-5.2mA; $V_{CC}$=6.0V | 5.48 | 5.81 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$ | $I_O$=20uA; $V_{CC}$=2.0V | - | 0 | 0.1 | V |
| | | | $I_O$=20uA; $V_{CC}$=4.5V | - | 0 | 0.1 | V |
| | | | $I_O$=20uA; $V_{CC}$=6.0V | - | 0 | 0.1 | V |
| | | | $I_O$=4.0mA; $V_{CC}$=4.5V | - | 0.15 | 0.26 | V |
| | | | $I_O$=5.2mA; $V_{CC}$=6.0V | - | 0.16 | 0.26 | V |
| $I_I$ | Input leakage current | $V_I$=$V_{CC}$ or GND; $V_{CC}$=6.0V | | - | - | ±1.0 | uA |
| $I_{CC}$ | Supply current | $V_I$=$V_{CC}$ or GND; $I_O$=0A; $V_{CC}$=6.0V | | - | - | 8.0 | uA |
| $C_I$ | Input capacitance | - | | - | 3.5 | - | pF |
| **CJ74HCT273** | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$=4.5V to 5.5V | | 2.0 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$=4.5V to 5.5V | | - | - | 0.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$; | $I_O$=-20uA; $V_{CC}$=4.5V | 4.4 | 4.5 | - | V |
| | | | $I_O$=-4.0mA; $V_{CC}$=4.5V | 3.98 | 4.32 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$ | $I_O$=20uA; $V_{CC}$=4.5V | - | 0 | 0.1 | V |
| | | | $I_O$=5.2mA; $V_{CC}$=5.5V | - | 0.15 | 0.26 | V |
| $I_I$ | Input leakage current | $V_I$=$V_{CC}$ or GND; $V_{CC}$=5.5V | | - | - | ±1.0 | uA |
| $I_{CC}$ | Supply current | $V_I$=$V_{CC}$ or GND; $I_O$=0A; $V_{CC}$=5.5V | | - | - | 8.0 | uA |
| $\Delta I_{CC}$ | Additional supply current | Per input pin; $V_I$=$V_{CC}$-2.1V; Other inputs at $V_{CC}$ or GND; $V_{CC}$=4.5V to 5.5V | $\overline{MR}$ input | - | - | 360 | uA |
| | | | CP input | - | - | 630 | uA |
| | | | Dn input | - | - | 54 | uA |

| | | | | | | |
|---|---|---|---|---|---|---|
| $C_I$ | Input capacitance | - | - | 3.5 | - | pF |

### 7.4.2 DC Characteristics 2

$T_{amb}$=-40°C to +85°C, voltages are referenced to GND (ground=0V), unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| **CJ74HC273** | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$=2.0V | | 1.5 | - | - | V |
| | | $V_{CC}$=4.5V | | 3.15 | - | - | V |
| | | $V_{CC}$=6.0V | | 4.2 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$=2.0V | | - | - | 0.5 | V |
| | | $V_{CC}$=4.5V | | - | - | 1.35 | V |
| | | $V_{CC}$=6.0V | | - | - | 1.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$ | $I_O$=-20uA; $V_{CC}$=2.0V | 1.9 | - | - | V |
| | | | $I_O$=-20uA; $V_{CC}$=4.5V | 4.4 | - | - | V |
| | | | $I_O$=-20uA; $V_{CC}$=6.0V | 5.9 | - | - | V |
| | | | $I_O$=-4.0mA; $V_{CC}$=4.5V | 3.84 | - | - | V |
| | | | $I_O$=-5.2mA; $V_{CC}$=6.0V | 5.34 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$ | $I_O$=20uA; $V_{CC}$=2.0V | - | - | 0.1 | V |
| | | | $I_O$=20uA; $V_{CC}$=4.5V | - | - | 0.1 | V |
| | | | $I_O$=20uA; $V_{CC}$=6.0V | - | - | 0.1 | V |
| | | | $I_O$=4.0mA; $V_{CC}$=4.5V | - | - | 0.33 | V |
| | | | $I_O$=5.2mA; $V_{CC}$=6.0V | - | - | 0.33 | V |
| $I_I$ | Input leakage current | $V_I$=$V_{CC}$ or GND; $V_{CC}$=6.0V | | - | - | ±1.0 | uA |
| $I_{CC}$ | Supply current | $V_I$=$V_{CC}$ or GND; $I_O$=0A; $V_{CC}$=6.0V | | - | - | 80 | uA |
| **CJ74HCT273** | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$=4.5V to 5.5V | | 2.0 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$=4.5V to 5.5V | | - | - | 0.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$; | $I_O$=-20uA; $V_{CC}$=4.5V | 4.4 | - | - | V |
| | | | $I_O$=-4.0mA; $V_{CC}$=4.5V | 3.84 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$; | $I_O$=20uA; $V_{CC}$=4.5V | - | - | 0.1 | V |
| | | | $I_O$=5.2mA; $V_{CC}$=5.5V | - | - | 0.33 | V |
| $I_I$ | Input leakage current | $V_I$=$V_{CC}$ or GND; $V_{CC}$=5.5V | | - | - | ±1.0 | uA |
| $I_{CC}$ | Supply current | $V_I$=$V_{CC}$ or GND; $I_O$=0A; $V_{CC}$=5.5V | | - | - | 80 | uA |
| $\Delta I_{CC}$ | Additional supply current | Per input pin; $V_I$=$V_{CC}$-2.1V; Other inputs at $V_{CC}$ or GND; $V_{CC}$=4.5V to 5.5V | $\overline{MR}$ input | - | - | 450 | uA |
| | | | CP input | - | - | 787.5 | uA |
| | | | Dn input | - | - | 67.5 | uA |

### 7.4.3 DC Characteristics 3

$T_{amb}$=-40°C to +125°C, voltages are referenced to GND (ground=0V), unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| **CJ74HC273** | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$=2.0V | | 1.5 | - | - | V |
| | | $V_{CC}$=4.5V | | 3.15 | - | - | V |
| | | $V_{CC}$=6.0V | | 4.2 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$=2.0V | | - | - | 0.5 | V |
| | | $V_{CC}$=4.5V | | - | - | 1.35 | V |
| | | $V_{CC}$=6.0V | | - | - | 1.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$ | $I_O$=-20uA; $V_{CC}$=2.0V | 1.9 | - | - | V |
| | | | $I_O$=-20uA; $V_{CC}$=4.5V | 4.4 | - | - | V |
| | | | $I_O$=-20uA; $V_{CC}$=6.0V | 5.9 | - | - | V |
| | | | $I_O$=-4.0mA; $V_{CC}$=4.5V | 3.7 | - | - | V |
| | | | $I_O$=-5.2mA; $V_{CC}$=6.0V | 5.2 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$ | $I_O$=20uA; $V_{CC}$=2.0V | - | - | 0.1 | V |
| | | | $I_O$=20uA; $V_{CC}$=4.5V | - | - | 0.1 | V |
| | | | $I_O$=20uA; $V_{CC}$=6.0V | - | - | 0.1 | V |
| | | | $I_O$=4.0mA; $V_{CC}$=4.5V | - | - | 0.4 | V |
| | | | $I_O$=5.2mA; $V_{CC}$=6.0V | - | - | 0.4 | V |
| $I_I$ | Input leakage current | $V_I$=$V_{CC}$ or GND; $V_{CC}$=6.0V | | - | - | ±1.0 | uA |
| $I_{CC}$ | Supply current | $V_I$=$V_{CC}$ or GND; $I_O$=0A; $V_{CC}$=6.0V | | - | - | 160 | uA |
| **CJ74HCT273** | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$=4.5V to 5.5V | | 2.0 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$=4.5V to 5.5V | | - | - | 0.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$; | $I_O$=-20uA; $V_{CC}$=4.5V | 4.4 | - | - | V |
| | | | $I_O$=-4.0mA;$V_{CC}$=4.5V | 3.7 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$=$V_{IH}$ or $V_{IL}$; | $I_O$=20uA; $V_{CC}$=4.5V | - | - | 0.1 | V |
| | | | $I_O$=5.2mA; $V_{CC}$=5.5V | - | - | 0.4 | V |
| $I_I$ | Input leakage current | $V_I$=$V_{CC}$ or GND; $V_{CC}$=5.5V | | - | - | ±1.0 | uA |
| $I_{CC}$ | Supply current | $V_I$=$V_{CC}$ or GND; $I_O$=0A; $V_{CC}$=5.5V | | - | - | 160 | uA |
| $\Delta I_{CC}$ | Additional supply current | Per input pin; $V_I$=$V_{CC}$-2.1V; Other inputs at $V_{CC}$ or GND; $V_{CC}$=4.5V to 5.5V; | $\overline{MR}$ input | - | - | 490 | uA |
| | | | CP input | - | - | 857.5 | uA |
| | | | Dn input | - | - | 73.5 | uA |

### 7.4.4 AC Characteristics 1

$T_{amb}$=25°C, GND=0V, $C_L$=50pF, unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| **CJ74HC273** | | | | | | | |
| $t_{pd}$ | CP to Qn propagation delay | See Figure 8-6 | $V_{CC}$=2.0V | - | 41 | 150 | ns |
| | | | $V_{CC}$=4.5V | - | 15 | 30 | ns |
| | | | $V_{CC}$=5.0V; $C_L$=15pF | - | 15 | - | ns |
| | | | $V_{CC}$=6.0V | - | 13 | 26 | ns |
| $t_{PHL}$ | $\overline{MR}$ to Qn HIGH to LOW propagation delay | See Figure 8-7 | $V_{CC}$=2.0V | - | 44 | 150 | ns |
| | | | $V_{CC}$=4.5V | - | 16 | 30 | ns |
| | | | $V_{CC}$=5.0V; $C_L$=15pF | - | 15 | - | ns |
| | | | $V_{CC}$=6.0V | - | 14 | 26 | ns |
| $t_t$ | Transition time | Qn output; See Figure 8-6 | $V_{CC}$=2.0V | - | 19 | 75 | ns |
| | | | $V_{CC}$=4.5V | - | 7 | 15 | ns |
| | | | $V_{CC}$=6.0V | - | 6 | 13 | ns |
| $t_W$ | Pulse width | CP input HIGH or LOW; See Figure 8-6 | $V_{CC}$=2.0V | 80 | - | - | ns |
| | | | $V_{CC}$=4.5V | 16 | - | - | ns |
| | | | $V_{CC}$=6.0V | 14 | - | - | ns |
| | | $\overline{MR}$ input LOW; See Figure 8-7 | $V_{CC}$=2.0V | 60 | - | - | ns |
| | | | $V_{CC}$=4.5V | 12 | - | - | ns |
| | | | $V_{CC}$=6.0V | 10 | - | - | ns |
| $t_{rec}$ | Recovery time | $\overline{MR}$ to CP; See Figure 8-7 | $V_{CC}$=2.0V | 50 | - | - | ns |
| | | | $V_{CC}$=4.5V | 10 | - | - | ns |
| | | | $V_{CC}$=6.0V | 9 | - | - | ns |
| $t_{su}$ | Set-up time | Dn to CP; See Figure 8-8 | $V_{CC}$=2.0V | 60 | - | - | ns |
| | | | $V_{CC}$=4.5V | 12 | - | - | ns |
| | | | $V_{CC}$=6.0V | 10 | - | - | ns |
| $t_h$ | Hold time | Dn to CP; See Figure 8-8 | $V_{CC}$=2.0V | 3 | - | - | ns |
| | | | $V_{CC}$=4.5V | 3 | - | - | ns |
| | | | $V_{CC}$=6.0V | 3 | - | - | ns |
| $f_{max}$ | Maximum frequency | CP input; See Figure 8-6 | $V_{CC}$=2.0V | 6 | 20.6 | - | MHz |
| | | | $V_{CC}$=4.5V | 30 | 103 | - | MHz |
| | | | $V_{CC}$=5.0V; $C_L$=15pF | - | 66 | - | MHz |
| | | | $V_{CC}$=6.0V | 35 | 122 | - | MHz |
| $C_{PD}$ | Power dissipation capacitance | Per package; $V_I$=GND to $V_{CC}$ | | - | 20 | - | pF |
| **CJ74HCT273** | | | | | | | |
| $t_{pd}$ | CP to Qn propagation delay | See Figure 8-6 | $V_{CC}$=4.5V | - | 16 | 30 | ns |
| | | | $V_{CC}$=5.0V; $C_L$=15pF | - | 15 | - | ns |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $t_{PHL}$ | $\overline{MR}$ to Qn HIGH to LOW propagation delay | See Figure 8-7 | $V_{CC}$=4.5V | - | 23 | 34 | ns |
| | | | $V_{CC}$=5.0V; $C_L$=15pF | - | 20 | - | ns |
| $t_t$ | Transition time | See Figure 8-6 | $V_{CC}$=4.5V | - | 7 | 15 | ns |
| $t_W$ | Pulse width | CP input ; See Figure 8-6 | $V_{CC}$=4.5V | 16 | - | - | ns |
| | | $\overline{MR}$ input LOW ; See Figure 8-7 | $V_{CC}$=4.5V | 16 | - | - | ns |
| $t_{rec}$ | Recovery time | $\overline{MR}$ to CP; See Figure 8-7 | $V_{CC}$=4.5V | 10 | - | - | ns |
| $t_{su}$ | Set-up time | Dn to CP; See Figure 8-8 | $V_{CC}$=4.5V | 12 | - | - | ns |
| $t_h$ | Hold time | Dn to CP; See Figure 8-8 | $V_{CC}$=4.5V | 3 | - | - | ns |
| $f_{max}$ | Maximum frequency | CP input; See Figure 8-6 | $V_{CC}$=4.5V | 30 | 56 | - | MHz |
| | | | $V_{CC}$=5.0V; $C_L$=15pF | - | 36 | - | MHz |
| $C_{PD}$ | Power dissipation capacitance | Per package; $V_I$=GND to $V_{CC}$-1.5V | | - | 23 | - | pF |

**Note:**

(1) $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$.

(2) $t_t$ is the same as $t_{THL}$ and $t_{TLH}$.

(3) $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in uW).

$P_D=C_{PD}xV_{CC}^2xf_i+\sum(C_LxV_{CC}^2xf_o)$ 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;

$\sum(C_LxV_{CC}^2xf_o)$=sum of outputs.

### 7.4.5 AC Characteristics 2

$T_{amb}$=-40°C to +85°C, GND=0V, $C_L$=50pF, unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| **CJ74HC273** | | | | | | | |
| $t_{pd}$ | CP to Qn propagation delay | See Figure 8-6 | $V_{CC}$=2.0V | - | - | 185 | ns |
| | | | $V_{CC}$=4.5V | - | - | 37 | ns |
| | | | $V_{CC}$=6.0V | - | - | 31 | ns |
| $t_{PHL}$ | $\overline{MR}$ to Qn HIGH to LOW propagation delay | See Figure 8-7 | $V_{CC}$=2.0V | - | - | 185 | ns |
| | | | $V_{CC}$=4.5V | - | - | 37 | ns |
| | | | $V_{CC}$=6.0V | - | - | 31 | ns |
| $t_t$ | Transition time | Qn output; See Figure 8-6 | $V_{CC}$=2.0V | - | - | 95 | ns |
| | | | $V_{CC}$=4.5V | - | - | 19 | ns |
| | | | $V_{CC}$=6.0V | - | - | 15 | ns |
| $t_W$ | Pulse width | CP input HIGH or LOW; See Figure 8-6 | $V_{CC}$=2.0V | 100 | - | - | ns |
| | | | $V_{CC}$=4.5V | 20 | - | - | ns |
| | | | $V_{CC}$=6.0V | 17 | - | - | ns |
| | | $\overline{MR}$ input LOW; | $V_{CC}$=2.0V | 75 | - | - | ns |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | See Figure 8-7 | $V_{CC}$=4.5V | 15 | - | - | ns |
| | | | $V_{CC}$=6.0V | 13 | - | - | ns |
| $t_{rec}$ | Recovery time | $\overline{MR}$ to CP; See Figure 8-7 | $V_{CC}$=2.0V | 65 | - | - | ns |
| | | | $V_{CC}$=4.5V | 13 | - | - | ns |
| | | | $V_{CC}$=6.0V | 11 | - | - | ns |
| $t_{su}$ | Set-up time | Dn to CP; See Figure 8-8 | $V_{CC}$=2.0V | 75 | - | - | ns |
| | | | $V_{CC}$=4.5V | 15 | - | - | ns |
| | | | $V_{CC}$=6.0V | 73 | - | - | ns |
| $t_h$ | Hold time | Dn to CP; See Figure 8-8 | $V_{CC}$=2.0V | 3 | - | - | ns |
| | | | $V_{CC}$=4.5V | 3 | - | - | ns |
| | | | $V_{CC}$=6.0V | 3 | - | - | ns |
| $f_{max}$ | Maximum frequency | CP input; See Figure 8-6 | $V_{CC}$=2.0V | 4.8 | - | - | MHz |
| | | | $V_{CC}$=4.5V | 24 | - | - | MHz |
| | | | $V_{CC}$=6.0V | 28 | - | - | MHz |
| **CJ74HCT273** | | | | | | | |
| $t_{pd}$ | CP to Qn propagation delay | See Figure 8-6 | $V_{CC}$=4.5V | - | - | 38 | ns |
| $t_{PHL}$ | $\overline{MR}$ to Qn HIGH to LOW propagation delay | See Figure 8-7 | $V_{CC}$=4.5V | - | - | 43 | ns |
| $t_t$ | Transition time | See Figure 8-6 | $V_{CC}$=4.5V | - | - | 19 | ns |
| $t_W$ | Pulse width | CP input ; See Figure 8-6 | $V_{CC}$=4.5V | 20 | - | - | ns |
| | | $\overline{MR}$ input LOW ; See Figure 8-7 | $V_{CC}$=4.5V | 20 | - | - | ns |
| $t_{rec}$ | Recovery time | $\overline{MR}$ to CP; See Figure 8-7 | $V_{CC}$=4.5V | 13 | - | - | ns |
| $t_{su}$ | Set-up time | Dn to CP; See Figure 8-8 | $V_{CC}$=4.5V | 15 | - | - | ns |
| $t_h$ | Hold time | Dn to CP; See Figure 8-8 | $V_{CC}$=4.5V | 3 | - | - | ns |
| $f_{max}$ | Maximum frequency | CP input; See Figure 8-6 | $V_{CC}$=4.5V | 24 | - | - | MHz |

**Note:**

(1) $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$.

(2) $t_t$ is the same as $t_{THL}$ and $t_{TLH}$.

### 7.4.6 AC Characteristics 3

$T_{amb}$=-40°C to +125°C, GND=0V, $C_L$=50pF, unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| **CJ74HC273** | | | | | | | |
| $t_{pd}$ | CP to Qn propagation delay | See Figure 8-6 | $V_{CC}$=2.0V | - | - | 225 | ns |
| | | | $V_{CC}$=4.5V | - | - | 45 | ns |
| | | | $V_{CC}$=6.0V | - | - | 38 | ns |
| $t_{PHL}$ | $\overline{MR}$ to Qn HIGH to LOW propagation delay | See Figure 8-7 | $V_{CC}$=2.0V | - | - | 225 | ns |
| | | | $V_{CC}$=4.5V | - | - | 45 | ns |
| | | | $V_{CC}$=6.0V | - | - | 38 | ns |
| $t_t$ | Transition time | Qn output; See Figure 8-6 | $V_{CC}$=2.0V | - | - | 110 | ns |
| | | | $V_{CC}$=4.5V | - | - | 22 | ns |
| | | | $V_{CC}$=6.0V | - | - | 19 | ns |
| $t_W$ | Pulse width | CP input HIGH or LOW; See Figure 8-6 | $V_{CC}$=2.0V | 120 | - | - | ns |
| | | | $V_{CC}$=4.5V | 24 | - | - | ns |
| | | | $V_{CC}$=6.0V | 20 | - | - | ns |
| | | $\overline{MR}$ input LOW; See Figure 8-7 | $V_{CC}$=2.0V | 90 | - | - | ns |
| | | | $V_{CC}$=4.5V | 18 | - | - | ns |
| | | | $V_{CC}$=6.0V | 15 | - | - | ns |
| $t_{rec}$ | Recovery time | $\overline{MR}$ to CP; See Figure 8-7 | $V_{CC}$=2.0V | 75 | - | - | ns |
| | | | $V_{CC}$=4.5V | 15 | - | - | ns |
| | | | $V_{CC}$=6.0V | 13 | - | - | ns |
| $t_{su}$ | Set-up time | Dn to CP; See Figure 8-8 | $V_{CC}$=2.0V | 90 | - | - | ns |
| | | | $V_{CC}$=4.5V | 18 | - | - | ns |
| | | | $V_{CC}$=6.0V | 15 | - | - | ns |
| $t_h$ | Hold time | Dn to CP; See Figure 8-8 | $V_{CC}$=2.0V | 3 | - | - | ns |
| | | | $V_{CC}$=4.5V | 3 | - | - | ns |
| | | | $V_{CC}$=6.0V | 3 | - | - | ns |
| $f_{max}$ | Maximum frequency | CP input; See Figure 8-6 | $V_{CC}$=2.0V | 4 | - | - | MHz |
| | | | $V_{CC}$=4.5V | 20 | - | - | MHz |
| | | | $V_{CC}$=6.0V | 24 | - | - | MHz |
| **CJ74HCT273** | | | | | | | |
| $t_{pd}$ | CP to Qn propagation delay | See Figure 8-6 | $V_{CC}$=4.5V | - | - | 45 | ns |
| $t_{PHL}$ | $\overline{MR}$ to Qn HIGH to LOW propagation delay | See Figure 8-7 | $V_{CC}$=4.5V | - | - | 51 | ns |
| $t_t$ | Transition time | See Figure 8-6 | $V_{CC}$=4.5V | - | - | 22 | ns |
| $t_W$ | Pulse width | CP input ; See Figure 8-6 | $V_{CC}$=4.5V | 24 | - | - | ns |
| | | $\overline{MR}$ input LOW ; | $V_{CC}$=4.5V | 24 | - | - | ns |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | See Figure 8-7 | | | | | |
| $t_{rec}$ | Recovery time | $\overline{MR}$ to CP; See Figure 8-7 | $V_{CC}$=4.5V | 15 | - | - | ns |
| $t_{su}$ | Set-up time | Dn to CP; See Figure 8-8 | $V_{CC}$=4.5V | 18 | - | - | ns |
| $t_h$ | Hold time | Dn to CP; See Figure 8-8 | $V_{CC}$=4.5V | 3 | - | - | ns |
| $f_{max}$ | Maximum frequency | CP input; See Figure 8-6 | $V_{CC}$=4.5V | 20 | - | - | MHz |

**Note:**

(1) $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$.

(2) $t_t$ is the same as $t_{THL}$ and $t_{TLH}$.

# 8 Detailed Description

## 8.1 Overview

The CJ74HC/HCT273 is an octal positive-edge triggered D-type flip-flop. The device features clock (CP) and master reset (/MR) inputs. The outputs Qn will assume the state of their corresponding Dn inputs that meet the set-up and hold time requirements on the LOW-to-HIGH clock (CP) transition. A LOW on /MR forces the outputs LOW independently of clock and data inputs. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of $V_{CC}$.

## 8.2 Functional Block Diagram

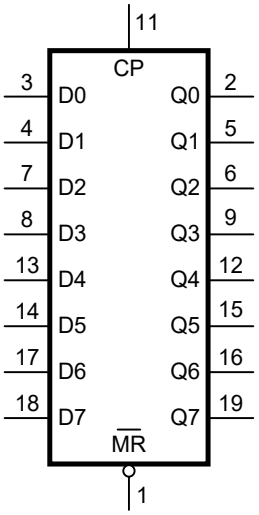



Figure 8-1 Logic symbol

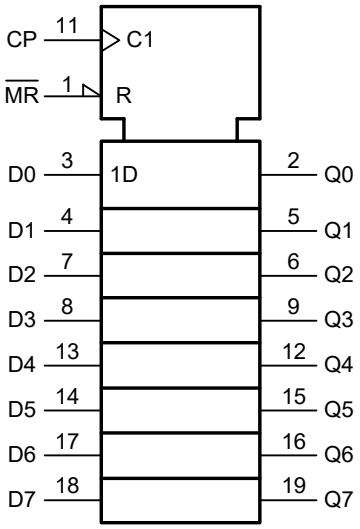



Figure 8-2 IEC logic symbol

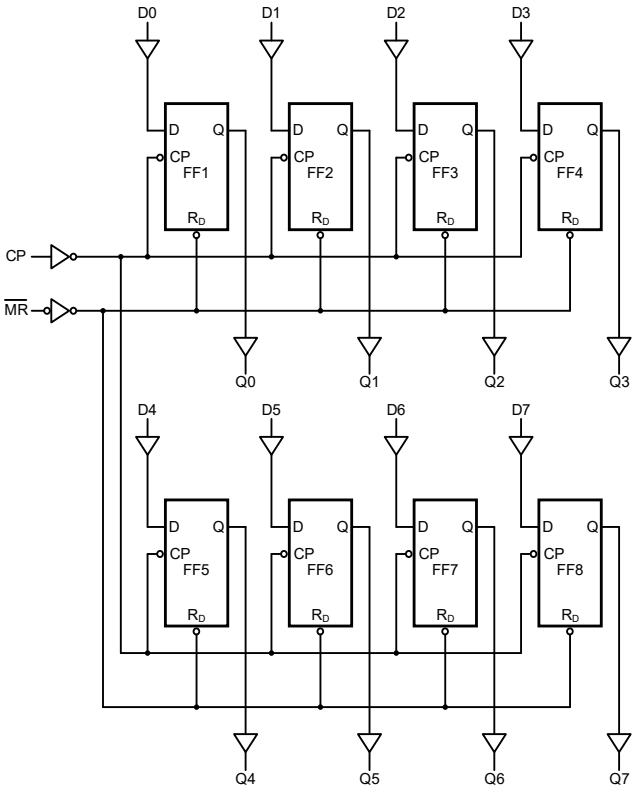



Figure 8-3 Logic diagram

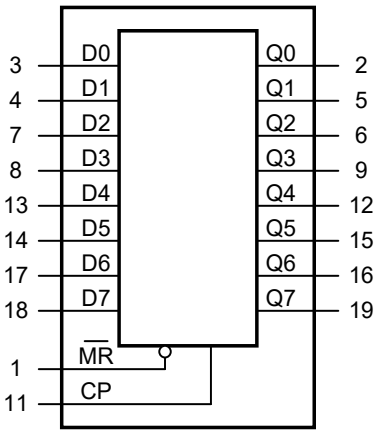



Figure 8-4 Functional diagram

## 8.3 Function Table

| OPERATING MODES | INPUT | | | OUTPUT |
|---|---|---|---|---|
| | $\overline{MR}$ | CP | Dn | Qn |
| Reset (clear) | L | X | X | L |
| Load “1” | H | ↑ | h | H |
| Load “0” | H | ↑ | l | L |

**Note:**

(1) H=HIGH voltage level; L=LOW voltage level; X=don’t care;

(2) h=HIGH voltage level one set-up time prior to the LOW-to-HIGH clock transition;

(3) l=LOW voltage level one set-up time prior to the LOW-to-HIGH clock transition;

(4) ↑=LOW-to-HIGH clock transition.

## 8.4 Testing Circuit

### 8.4.1 AC Testing Circuit

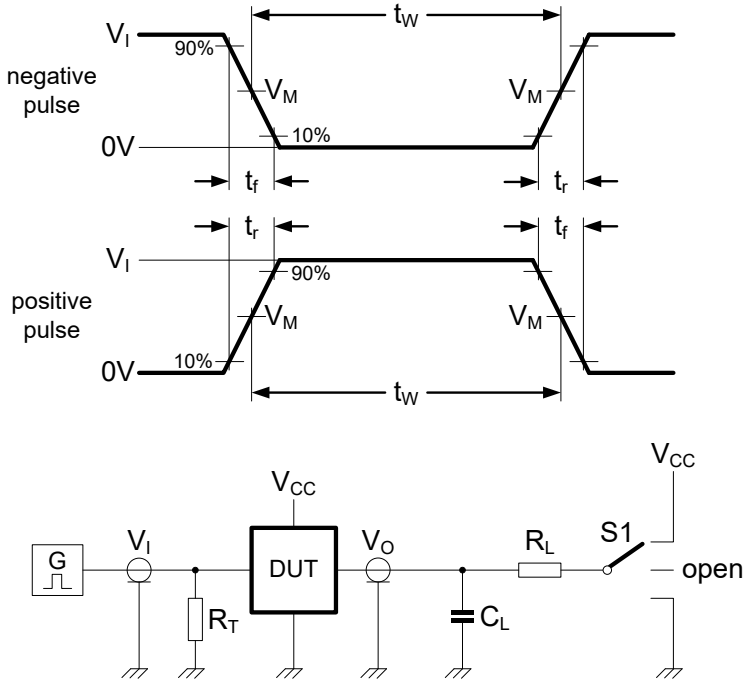



**Figure 8-5 Test circuit for measuring switching times**

Definitions for test circuit:

$R_L$=Load resistance.

$C_L$=Load capacitance including jig and probe capacitance.

$R_T$=Termination resistance should be equal to the output impedance $Z_o$ of the pulse generator.

S1=Test selection switch.

### 8.4.2 AC Testing Waveforms

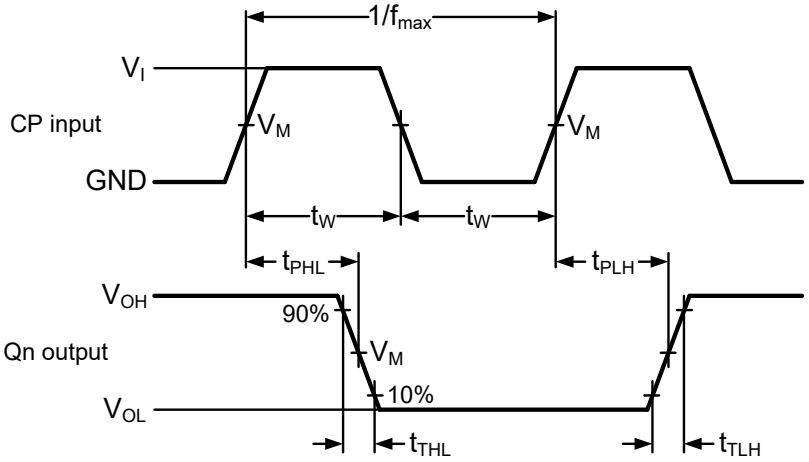



**Figure 8-6 Propagation delay clock input (CP) to output (Qn), clock (CP) pulse width, output transition time and the maximum clock pulse frequency**

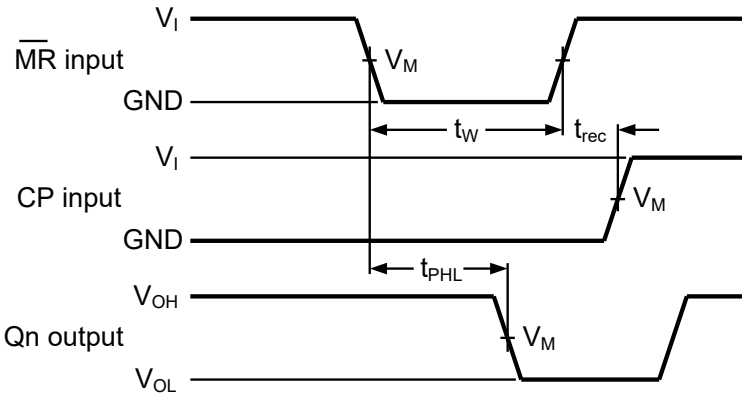



**Figure 8-7 Propagation delay master reset ($\overline{MR}$) to output (Qn), pulse width master reset ($\overline{MR}$) and recovery time master reset ($\overline{MR}$) to clock (CP)**

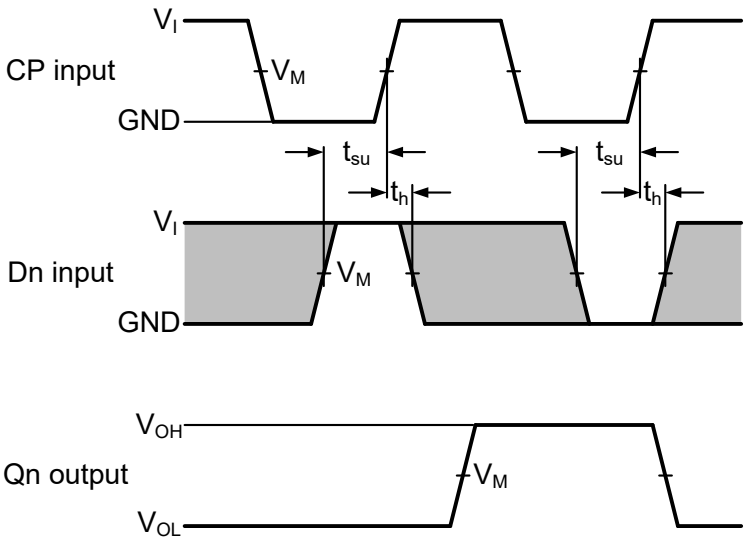



**Figure 8-8 Data set-up and hold times data input (Dn)**

### 8.4.3 Measurement Points

| TYPE | INPUT | | OUTPUT |
|---|---|---|---|
| | $V_I$ | $V_M$ | $V_M$ |
| CJ74HC273 | $V_{CC}$ | 0.5x$V_{CC}$ | 0.5x$V_{CC}$ |
| CJ74HCT273 | 3V | 1.3V | 1.3V |

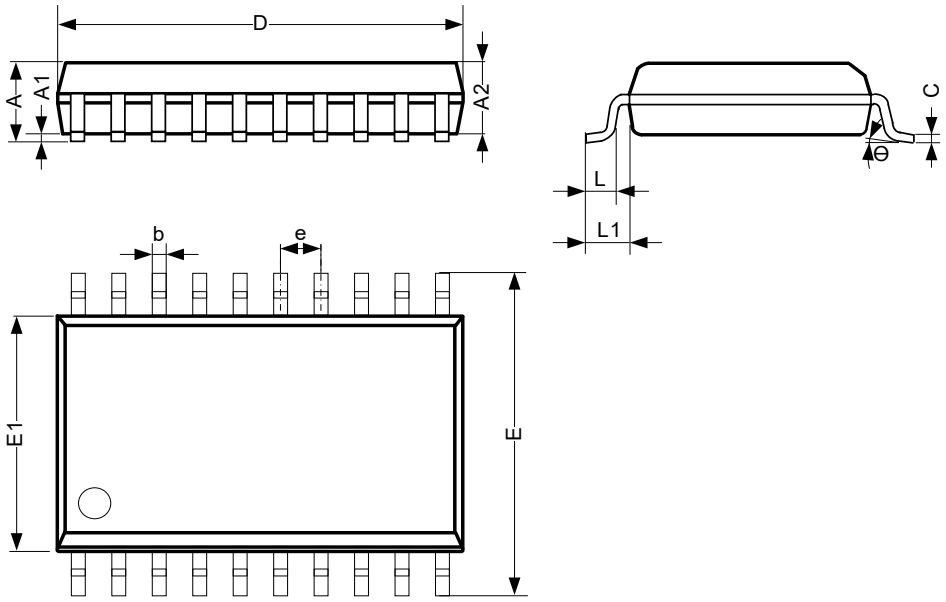
### 8.4.4 Test Data

| TYPE | INPUT | | LOAD | | S1 POSITION |
|---|---|---|---|---|---|
| | $V_I$ | $t_r$ , $t_f$ | $C_L$ | $R_L$ | $t_{PHL}$, $t_{PLH}$ |
| CJ74HC273 | $V_{CC}$ | 6ns | 15pF, 50pF | 1kΩ | Open |
| CJ74HCT273 | 3V | 6ns | 15pF, 50pF | 1kΩ | Open |

# 9 Mechanical Information

## 9.1 SOP20 Mechanical Information

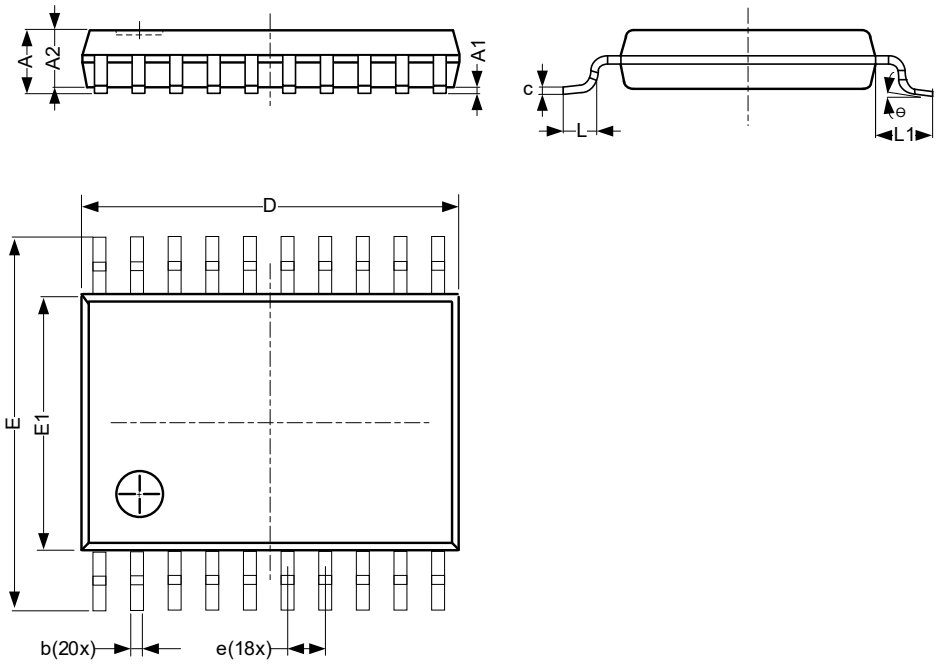
### 9.1.1 SOP20 Outline Dimensions




| SYMBOL | Dimensions In Millimeters | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | 2.47 | - | 2.65 |
| A1 | 0.05 | - | 0.30 |
| A2 | 2.20 | - | 2.44 |
| b | 0.35 | - | 0.50 |
| c | 0.15 | - | 0.30 |
| D | 12.54 | - | 12.94 |
| E | 10.00 | - | 10.60 |
| E1 | 7.30 | - | 7.70 |
| e | 1.27 BSC | | |
| L | 0.40 | - | 1.05 |
| L1 | 1.30 | - | 1.50 |
| Θ | 0° | - | 8° |
| Unit: mm | | | |

## 9.2 TSSOP20 Mechanical Information

### 9.2.1 TSSOP20 Outline Dimensions




| SYMBOL | Dimensions In Millimeters | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | - | - | 1.20 |
| A1 | 0.05 | - | 0.15 |
| A2 | 0.80 | - | 1.05 |
| b | 0.19 | - | 0.30 |
| c | 0.09 | - | 0.20 |
| D | 6.40 | - | 6.60 |
| E | 6.20 | - | 6.60 |
| E1 | 4.30 | - | 4.50 |
| e | 0.65 BSC | | |
| L | 0.45 | - | 0.75 |
| L1 | - | 1.00 | - |
| θ | 0° | - | 8° |
| Unit: mm | | | |

# 10 Notes and Revision History

## 10.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of JSCJ -- ***https:www.jscj-elec.com*** for more details.

## 10.2 Notes

**Electrostatic Discharge Caution**

This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

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