



# PI74FCT273T (25Ω Series) PI74FCT2273T

## Fast CMOS Octal D Flip-Flop with Master Reset

### Product Features

- PI74FCT273/2273T is pin compatible with bipolar FAST™ Series at a higher speed and lower power consumption
- 25Ω series resistor on all outputs (FCT2XXX only)
- TTL input and output levels
- Low ground bounce outputs
- Extremely low static power
- Hysteresis on all inputs
- Industrial operating temperature range: -40°C to +85°C
- Packages available:
  - 20-pin 173 mil wide plastic TSSOP (L)
  - 20-pin 300 mil wide plastic DIP (P)
  - 20-pin 150 mil wide plastic QSOP (Q)
  - 20-pin 150 mil wide plastic TQSOP (R)
  - 20-pin 300 mil wide plastic SOIC (S)

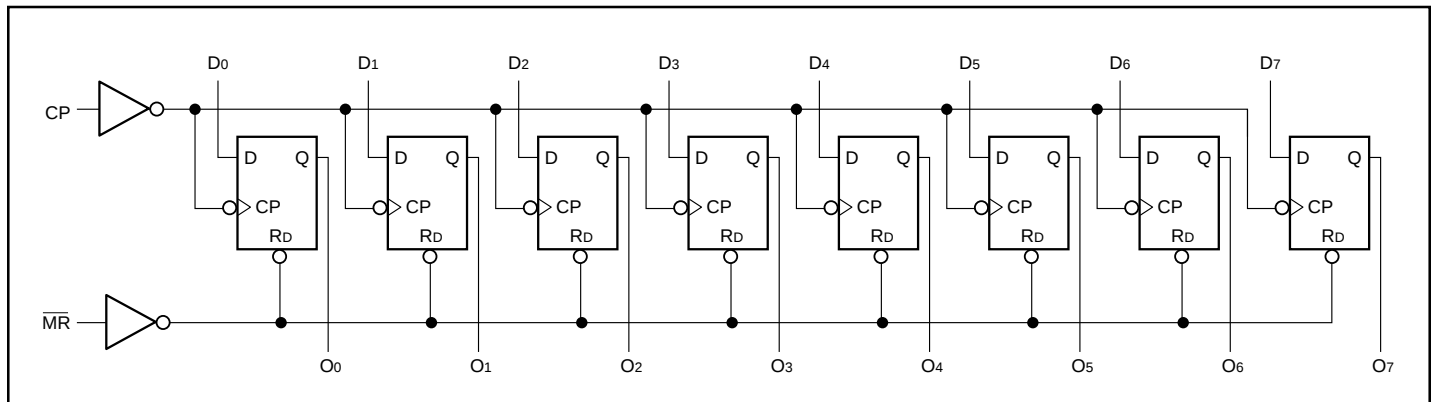
### Product Description

Pericom Semiconductor's PI74FCT series of logic circuits are produced in the Company's advanced 0.6/0.8 micron CMOS technology, achieving industry leading speed grades. All PI74FCT2XXX devices have a built-in 25-ohm series resistor on all outputs to reduce noise because of reflections, thus eliminating the need for an external terminating resistor.

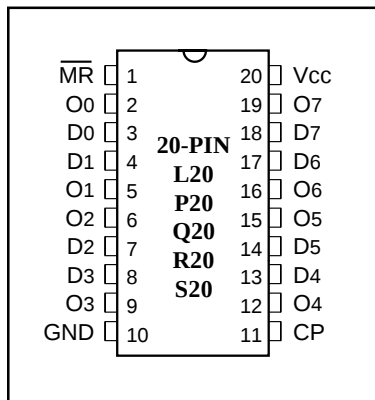
The PI74FCT273T and PI74FCT2273T is an 8-bit wide octal designed with eight edge-triggered D-type flip-flops with individual D inputs and O outputs. The common buffered Clock (CP) and Master Reset (MR) load and resets (clear) all flip-flops simultaneously. The register is fully edge-triggered. The D input state, one setup time before the LOW-to-HIGH clock transition, is transferred to the corresponding flip-flop's O output. All outputs will be forced LOW independently of Clock or Data inputs by a LOW voltage level on the MR input.

Device models available upon request.

### Logic Block Diagram



### Product Pin Configuration



### Product Pin Description

| Pin Name | Description                            |
|----------|----------------------------------------|
| MR       | Master Reset (Active LOW)              |
| CP       | Clock Pulse Input (Active Rising Edge) |
| D0-D7    | Data Inputs                            |
| O0-O7    | Data Outputs                           |
| GND      | Ground                                 |
| Vcc      | Power                                  |

### Truth Table<sup>(1)</sup>

|               | Inputs |    |                | Outputs        |
|---------------|--------|----|----------------|----------------|
| Mode          | MR     | CP | D <sub>N</sub> | O <sub>N</sub> |
| Reset (Clear) | L      | X  | X              | L              |
| Load "1"      | H      | ↑  | h              | H              |
| Load "0"      | H      | ↑  | l              | L              |

1. H = High Voltage Level  
h = High Voltage Level one setup time prior to the LOW-to-HIGH Clock transition  
L = Low Voltage Level  
l = LOW Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition  
X = Don't Care  
↑ = LOW-to-HIGH Clock Transition

## Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

|                                                                          |                 |
|--------------------------------------------------------------------------|-----------------|
| Storage Temperature .....                                                | −65°C to +150°C |
| Ambient Temperature with Power Applied .....                             | −40°C to +85°C  |
| Supply Voltage to Ground Potential (Inputs & V <sub>CC</sub> Only) ..... | −0.5V to +7.0V  |
| Supply Voltage to Ground Potential (Outputs & D/O Only) ..               | −0.5V to +7.0V  |
| DC Input Voltage .....                                                   | −0.5V to +7.0V  |
| DC Output Current .....                                                  | 120 mA          |
| Power Dissipation .....                                                  | 0.5W            |

### Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## DC Electrical Characteristics (Over the Operating Range, T<sub>A</sub> = −40°C to +85°C, V<sub>CC</sub> = 5.0V ± 5%)

| Parameters       | Description           | Test Conditions <sup>(1)</sup>                                               |                                     | Min. | Typ <sup>(2)</sup> | Max. | Units |
|------------------|-----------------------|------------------------------------------------------------------------------|-------------------------------------|------|--------------------|------|-------|
| V <sub>OH</sub>  | Output HIGH Voltage   | V <sub>CC</sub> = Min., V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OH</sub> = −15.0mA           | 2.4  | 3.0                |      | V     |
| V <sub>OL</sub>  | Output LOW Current    | V <sub>CC</sub> = Min., V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OL</sub> = 64mA              |      | 0.3                | 0.55 | V     |
| V <sub>OL</sub>  | Output LOW Current    | V <sub>CC</sub> = Min., V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OL</sub> = 12mA (25Ω Series) |      | 0.3                | 0.50 | V     |
| V <sub>IH</sub>  | Input HIGH Voltage    | Guaranteed Logic HIGH Level                                                  |                                     | 2.0  |                    |      | V     |
| V <sub>IL</sub>  | Input LOW Voltage     | Guaranteed Logic LOW Level                                                   |                                     |      |                    | 0.8  | V     |
| I <sub>IH</sub>  | Input HIGH Current    | V <sub>CC</sub> = Max.                                                       | V <sub>IN</sub> = V <sub>CC</sub>   |      |                    | 1    | μA    |
| I <sub>IL</sub>  | Input LOW Current     | V <sub>CC</sub> = Max.                                                       | V <sub>IN</sub> = GND               |      |                    | −1   | μA    |
| I <sub>OZH</sub> | High Impedance        | V <sub>CC</sub> = Max.                                                       | V <sub>OUT</sub> = 2.7V             |      |                    | 1    | μA    |
| I <sub>OZL</sub> | Output Current        |                                                                              | V <sub>OUT</sub> = 0.5V             |      |                    | −1   | μA    |
| V <sub>IK</sub>  | Clamp Diode Voltage   | V <sub>CC</sub> = Min., I <sub>IN</sub> = −18mA                              |                                     |      | −0.7               | −1.2 | V     |
| I <sub>OFF</sub> | Power Down Disable    | V <sub>CC</sub> = GND, V <sub>OUT</sub> = 4.5V                               |                                     | —    | —                  | 100  | μA    |
| I <sub>OS</sub>  | Short Circuit Current | V <sub>CC</sub> = Max. <sup>(3)</sup> , V <sub>OUT</sub> = GND               |                                     | −60  | −120               |      | mA    |
| V <sub>H</sub>   | Input Hysteresis      |                                                                              |                                     |      | 200                |      | mV    |

## Capacitance (T<sub>A</sub> = 25°C, f = 1 MHz)

| Parameters <sup>(4)</sup> | Description        | Test Conditions       | Typ | Max. | Units |
|---------------------------|--------------------|-----------------------|-----|------|-------|
| C <sub>IN</sub>           | Input Capacitance  | V <sub>IN</sub> = 0V  | 6   | 10   | pF    |
| C <sub>OUT</sub>          | Output Capacitance | V <sub>OUT</sub> = 0V | 8   | 12   | pF    |

### Notes:

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V<sub>CC</sub> = 5.0V, +25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is determined by device characterization but is not production tested.

## Power Supply Characteristics

| Parameters       | Description                                     | Test Conditions <sup>(1)</sup>                                                                                                                                          |                                                            | Min. | Typ <sup>(2)</sup> | Max.                | Units      |
|------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------|--------------------|---------------------|------------|
| I <sub>CC</sub>  | Quiescent Power Supply Current                  | V <sub>CC</sub> = Max.                                                                                                                                                  | V <sub>IN</sub> = GND or V <sub>CC</sub>                   |      | 0.1                | 500                 | μA         |
| ΔI <sub>CC</sub> | Supply Current per per Input @ TTL HIGH         | V <sub>CC</sub> = Max.                                                                                                                                                  | V <sub>IN</sub> = 3.4V <sup>(3)</sup>                      |      | 0.5                | 2.0                 | mA         |
| I <sub>CCD</sub> | Supply Current per Input per MHz <sup>(4)</sup> | V <sub>CC</sub> = Max., Outputs Open<br>MR = V <sub>CC</sub> , One Input Toggling<br>50% Duty Cycle                                                                     | V <sub>IN</sub> = V <sub>CC</sub><br>V <sub>IN</sub> = GND |      | 0.15               | 0.25                | mA/<br>MHz |
| I <sub>C</sub>   | Total Power Supply Current <sup>(6)</sup>       | V <sub>CC</sub> = Max., Outputs Open<br>f <sub>CP</sub> = 10 MHz, 50% Duty Cycle<br>MR = V <sub>CC</sub> , 50% Duty Cycle<br>One Bit toggling at f <sub>i</sub> = 5 MHz | V <sub>IN</sub> = V <sub>CC</sub><br>V <sub>IN</sub> = GND |      | 1.5                | 3.5 <sup>(5)</sup>  | mA         |
|                  |                                                 |                                                                                                                                                                         | V <sub>IN</sub> = 3.4V<br>V <sub>IN</sub> = GND            |      | 2.0                | 3.5 <sup>(5)</sup>  |            |
|                  |                                                 | V <sub>CC</sub> = Max., Outputs Open<br>f <sub>CP</sub> = 10 MHz, 50% Duty Cycle<br>MR = V <sub>CC</sub> , 50% Duty Cycle                                               | V <sub>IN</sub> = V <sub>CC</sub><br>V <sub>IN</sub> = GND |      | 3.8                | 7.3 <sup>(5)</sup>  |            |
|                  |                                                 | Eight Bits toggling at<br>f <sub>i</sub> = 2.5 MHz, 50% Duty Cycle                                                                                                      | V <sub>IN</sub> = 3.4V<br>V <sub>IN</sub> = GND            |      | 6.0                | 16.3 <sup>(5)</sup> |            |

### Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at V<sub>CC</sub> = 5.0V, +25°C ambient.
- Per TTL driven input (V<sub>IN</sub> = 3.4V); all other inputs at V<sub>CC</sub> or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the I<sub>CC</sub> formula. These limits are guaranteed but not tested.
- I<sub>C</sub> = I<sub>QUIESCENT</sub> + I<sub>INPUTS</sub> + I<sub>DYNAMIC</sub>  
I<sub>C</sub> = I<sub>CC</sub> + ΔI<sub>CC</sub> D<sub>H</sub>N<sub>T</sub> + I<sub>CCD</sub> (f<sub>CP</sub>/2 + f<sub>i</sub>N<sub>i</sub>)  
I<sub>CC</sub> = Quiescent Current  
ΔI<sub>CC</sub> = Power Supply Current for a TTL High Input (V<sub>IN</sub> = 3.4V)  
D<sub>H</sub> = Duty Cycle for TTL Inputs High  
N<sub>T</sub> = Number of TTL Inputs at D<sub>H</sub>  
I<sub>CCD</sub> = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)  
f<sub>CP</sub> = Clock Frequency for Register Devices (Zero for Non-Register Devices)  
f<sub>i</sub> = Input Frequency  
N<sub>i</sub> = Number of Inputs at f<sub>i</sub>  
All currents are in milliamps and all frequencies are in megahertz.

### Switching Characteristics over Operating Range

| Parameters | Description                                       | Conditions <sup>(1)</sup> | 273T/2273T |      | 273AT/2273AT |     | 273CT/2273CT |     | 273DT |     | Unit |
|------------|---------------------------------------------------|---------------------------|------------|------|--------------|-----|--------------|-----|-------|-----|------|
|            |                                                   |                           | Com.       |      | Com.         |     | Com.         |     | Com.  |     |      |
|            |                                                   |                           | Min        | Max  | Min          | Max | Min          | Max | Min   | Max |      |
| tPLH       | Propagation Delay                                 | CL = 50pF<br>RL = 500Ω    | 2.0        | 13.0 | 2.0          | 7.2 | 2.0          | 5.8 | 2.0   | 4.4 | ns   |
| tPHL       | CP to ON                                          |                           |            |      |              |     |              |     |       |     |      |
| tPHL       | Propagation Delay                                 |                           | 2.0        | 13.0 | 2.0          | 7.2 | 2.0          | 6.1 | 2.0   | 5.0 | ns   |
| tPLH       | $\overline{\text{MR}}$ to ON                      |                           |            |      |              |     |              |     |       |     |      |
| tsU        | Setup Time, HIGH or LOW                           |                           | 3.0        | —    | 2.0          | —   | 2.0          | —   | 2.0   | —   | ns   |
|            | Dn to CP                                          |                           |            |      |              |     |              |     |       |     |      |
| th         | Hold Time, HIGH or LOW                            |                           | 2.0        | —    | 1.5          | —   | 1.5          | —   | 1.5   | —   | ns   |
|            | Dn to CP                                          |                           |            |      |              |     |              |     |       |     |      |
| tw         | CP Pulse Width <sup>(3)</sup>                     | 7.0                       | —          | 6.0  | —            | 6.0 | —            | 6.0 | —     | ns  |      |
|            | HIGH or LOW                                       |                           |            |      |              |     |              |     |       |     |      |
| tw         | $\overline{\text{MR}}$ Pulse Width <sup>(3)</sup> | 7.0                       | —          | 6.0  | —            | 6.0 | —            | 6.0 | —     | ns  |      |
|            | LOW                                               |                           |            |      |              |     |              |     |       |     |      |
| tREM       | Recovery Time MR to CP <sup>(3)</sup>             | 4.0                       | —          | 2.0  | —            | 2.0 | —            | 2.0 | —     | ns  |      |

**Notes:**

1. See test circuit and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter guaranteed but not production tested.