# PERICOM®

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

## Features

- Pin compatible with bipolar FAST™ Series at a higher speed and lower power consumption
- 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
- Packaging:
  – 20-pin 173-mil wide plastic TSSOP (L)
  – 20-pin 150-mil wide plastic QSOP (Q)
  – 20-pin 300-mil wide plastic SOIC (S)

## Description

Pericom Semiconductor's PI74FCT273T is a 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 ($\overline{MR}$) 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 $\overline{MR}$ input.

Device models available upon request.

## Block Diagram
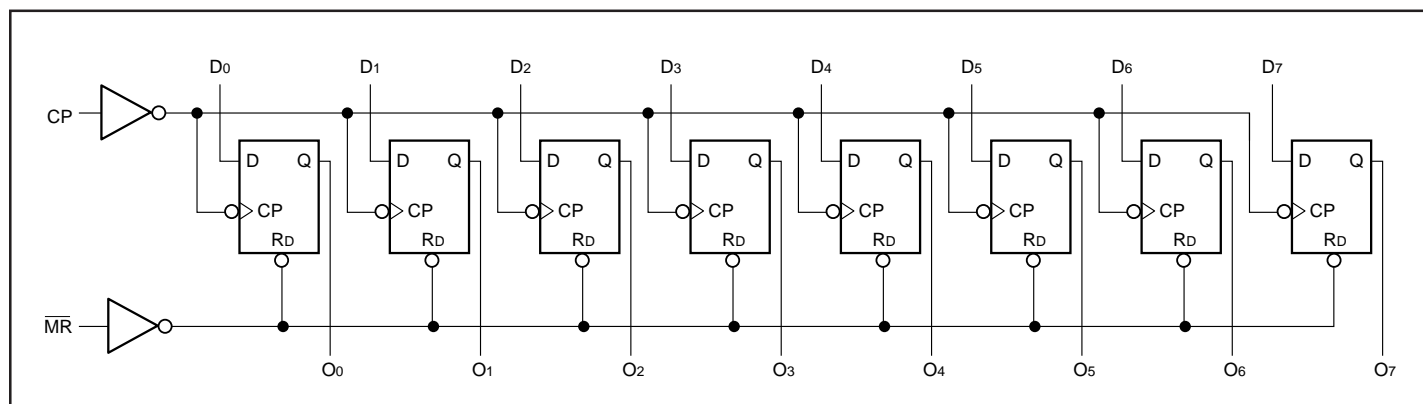


## Pin Configuration
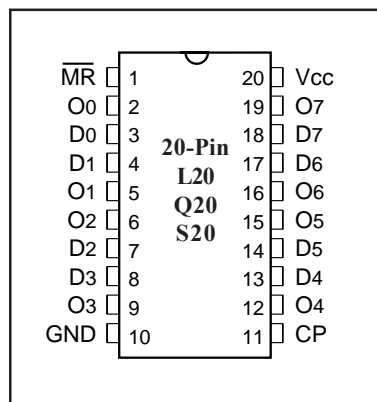


## Pin Description

| Pin Name | Description |
|---|---|
| $\overline{MR}$ | Master Reset (Active LOW) |
| CP | Clock Pulse Input (Active Rising Edge) |
| D0-D7 | Data Inputs |
| O0-O7 | Data Outputs |
| GND | Ground |
| $V_{CC}$ | Power |

## Truth Table[1]

| Mode | Inputs | | | Outputs |
|---|---|---|---|---|
| | $\overline{MR}$ | CP | $D_N$ | $O_N$ |
| 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 & Vcc 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, $T_A$ = –40°C to +85°C, $V_{CC}$ = 5.0V ± 5%)

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

## Capacitance ($T_A$ = 25°C, f = 1 MHz)

| Parameters[4] | Description | Test Conditions | Typ | Max. | Units |
|---|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | $V_{IN}$ = 0V | 6 | 10 | pF |
| $C_{OUT}$ | Output Capacitance | $V_{OUT}$ = 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 Vcc = 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[1] | | Min. | Typ[2] | Max. | Units |
|---|---|---|---|---|---|---|---|
| $I_{CC}$ | Quiescent Power Supply Current | $V_{CC}$ = Max. | $V_{IN}$ = GND or $V_{CC}$ | | 0.1 | 500 | μA |
| $\Delta I_{CC}$ | Supply Current per per Input @ TTL HIGH | $V_{CC}$ = Max. | $V_{IN}$ = 3.4V[3] | | 0.5 | 2.0 | mA |
| $I_{CCD}$ | Supply Current per Input per MHx[4] | $V_{CC}$ = Max., Outputs Open $\overline{MR}$ = Vcc, One Input Toggling 50% Duty Cycle | $V_{IN}$ = $V_{CC}$ $V_{IN}$ = GND | | 0.15 | 0.25 | mA/ MHz |
| $I_C$ | Total Power Supply Current[6] | $V_{CC}$ = Max., Outputs Open $f_{CP}$ = 10 MHz, 50% Duty Cycle | $V_{IN}$ = $V_{CC}$ $V_{IN}$ = GND | | 1.5 | 3.5[5] | mA |
| | | $\overline{MR}$ = Vcc, 50% Duty Cycle One Bit toggling at $f_i$ = 5 MHz | $V_{IN}$ = 3.4V $V_{IN}$ = GND | | 2.0 | 3.5[5] | |
| | | $V_{CC}$ = Max., Outputs Open $f_{CP}$ = 10 MHz, 50% Duty Cycle | $V_{IN}$ = $V_{CC}$ $V_{IN}$ = GND | | 3.8 | 7.3[5] | |
| | | $\overline{MR}$ = $V_{CC}$, 50% Duty Cycle Eight Bits toggling at $f_i$ = 2.5 MHz, 50% Duty Cycle | $V_{IN}$ = 3.4V $V_{IN}$ = GND | | 6.0 | 16.3[5] | |

**Notes:**
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at Vcc = 5.0V, +25°C ambient.
3. Per TTL driven input ($V_{IN}$ = 3.4V); all other inputs at Vcc or GND.
4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
5. Values for these conditions are examples of the Icc formula. These limits are guaranteed but not tested.
6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_I)$
   $I_{CC}$ = Quiescent Current
   $\Delta I_{CC}$ = Power Supply Current for a TTL High Input ($V_{IN}$ = 3.4V)
   $D_H$ = Duty Cycle for TTL Inputs High
   $N_T$ = Number of TTL Inputs at $D_H$
   $I_{CCD}$ = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)
   $f_{CP}$ = Clock Frequency for Register Devices (Zero for Non-Register Devices)
   $f_i$ = Input Frequency
   $N_I$ = Number of Inputs at $f_i$
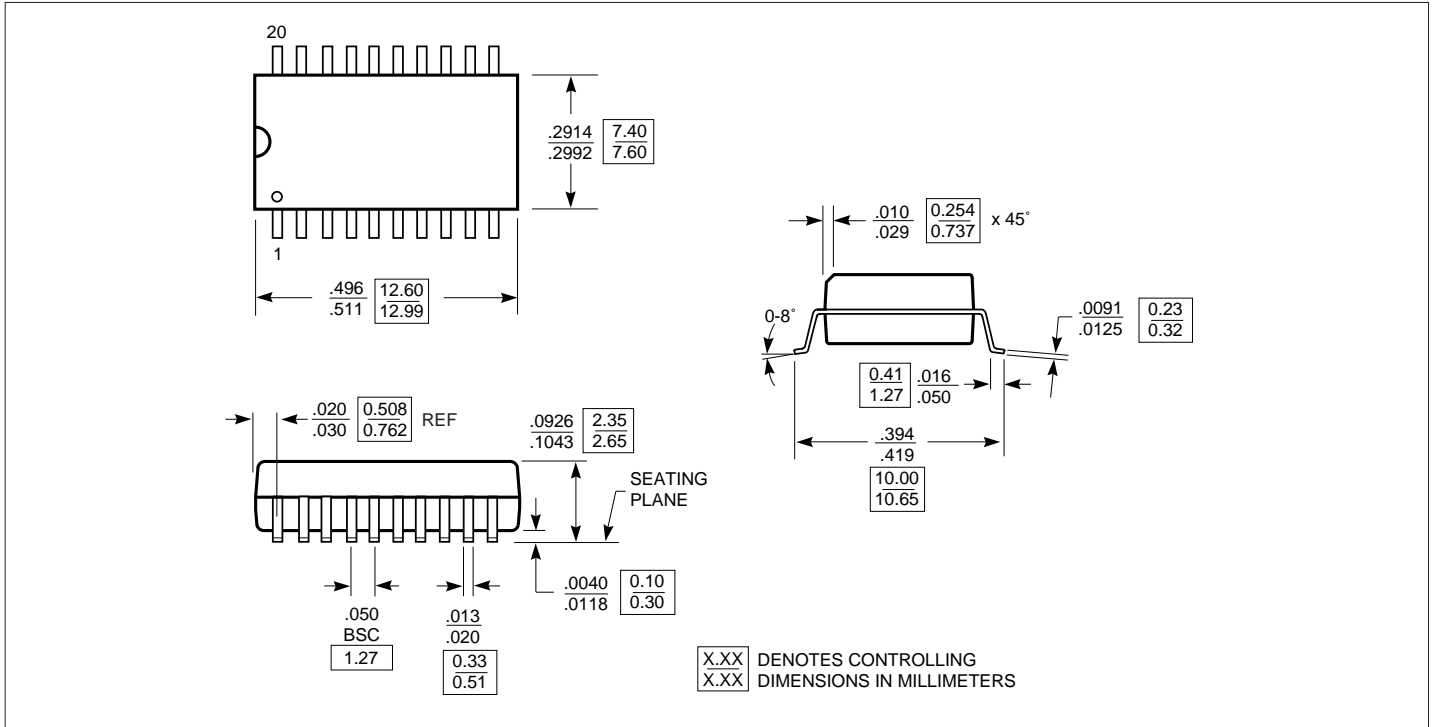   All currents are in milliamps and all frequencies are in megahertz.

## Switching Characteristics over Operating Range

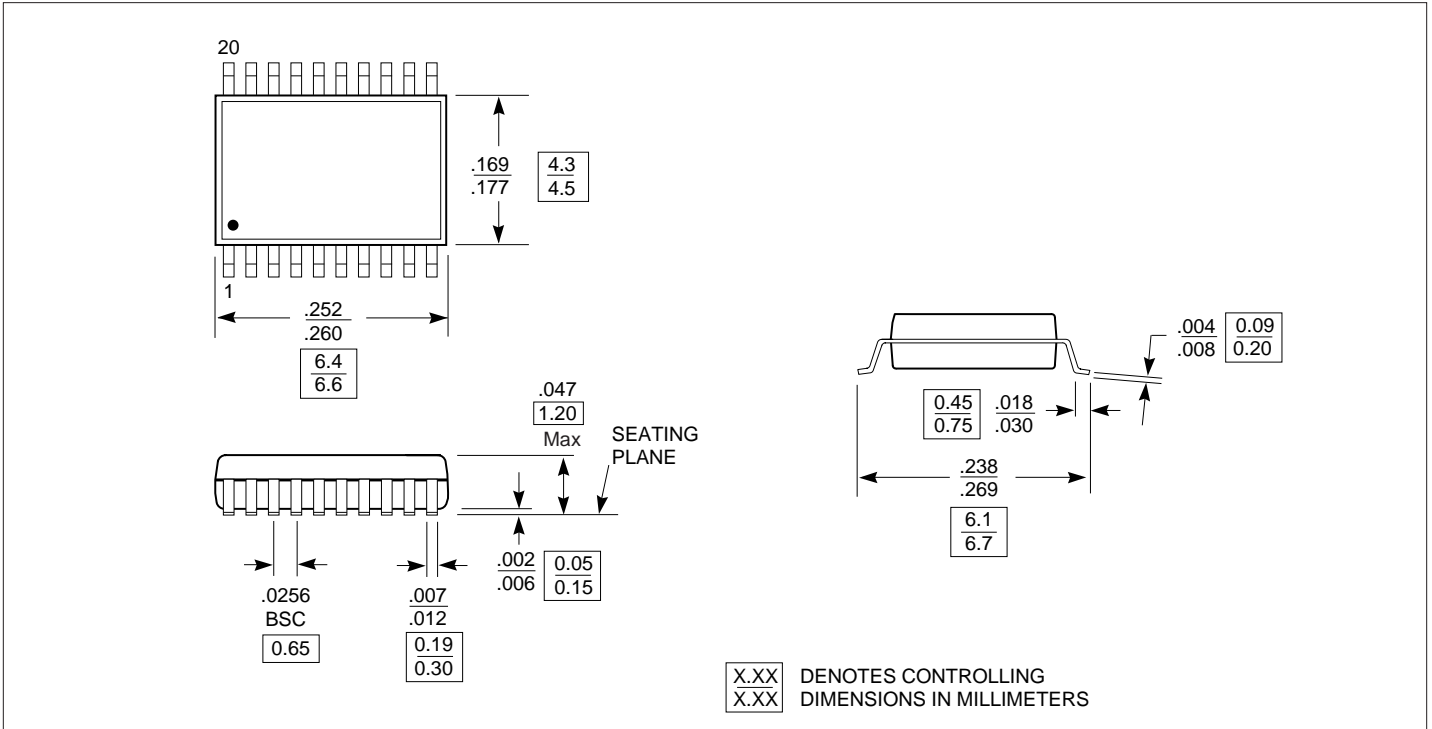| Parameters | Description | Conditions[1] | 273T/2273T Com. | | 273AT/2273AT Com. | | 273CT/2273CT Com. | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Max | Min | Max | Min | Max | |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay CP to O$_N$ | $C_L = 50pF$ $R_L = 500\Omega$ | 2.0 | 13.0 | 2.0 | 7.2 | 2.0 | 5.8 | ns |
| $t_{PHL}$ $t_{PLH}$ | Propagation Delay $\overline{MR}$ to O$_N$ | | 2.0 | 13.0 | 2.0 | 7.2 | 2.0 | 6.1 | ns |
| $t_{SU}$ | Setup Time, HIGH or LOW Dn to CP | | 3.0 | — | 2.0 | — | 2.0 | — | ns |
| $t_H$ | Hold Time, HIGH or LOW Dn to CP | | 2.0 | — | 1.5 | — | 1.5 | — | ns |
| $t_W$ | CP Pulse Width[3] HIGH or LOW | | 7.0 | — | 6.0 | — | 6.0 | — | ns |
| $t_W$ | $\overline{MR}$ Pulse Width[3] LOW | | 7.0 | — | 6.0 | — | 6.0 | — | ns |
| $t_{REM}$ | Recovery Time MR to CP[3] | | 4.0 | — | 2.0 | — | 2.0 | — | ns |

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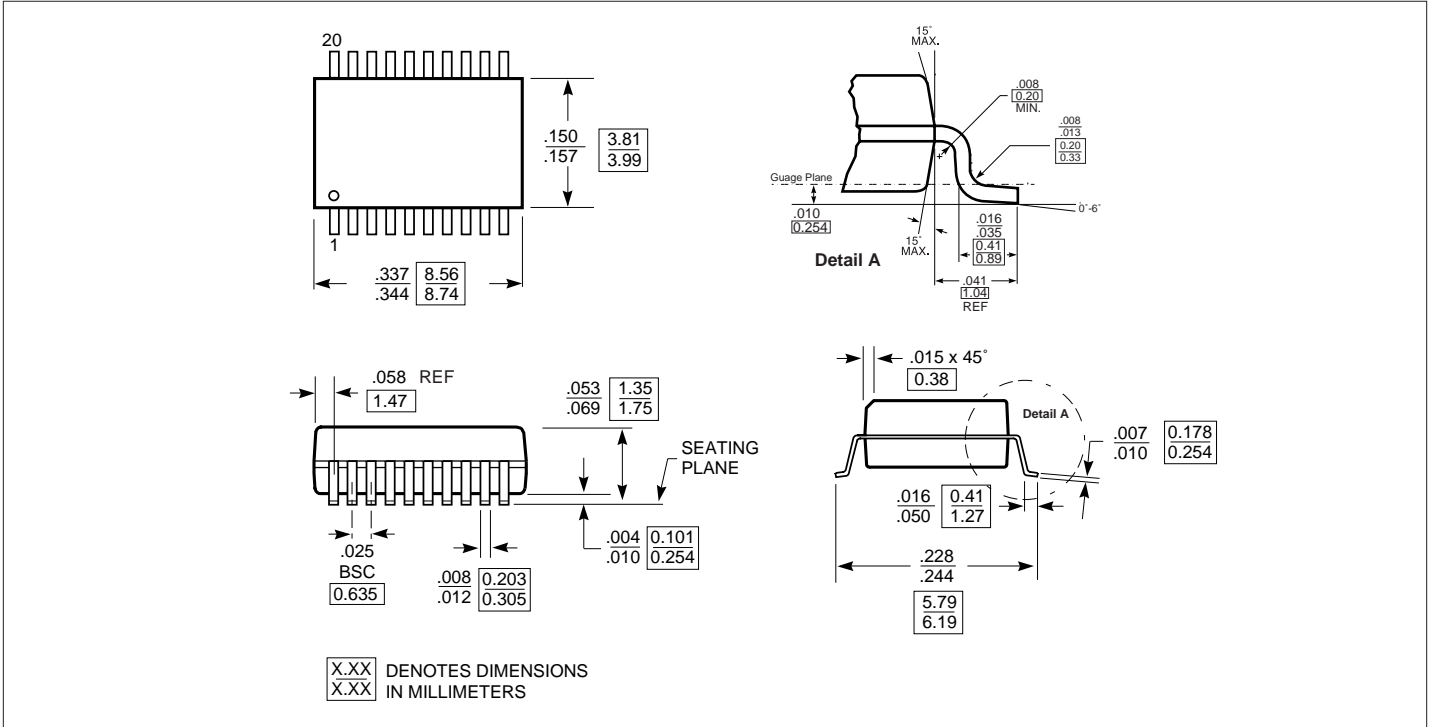3. This parameter guaranteed but not production tested.

## Packaging Mechanical: 20-pin SOIC (S)

PS2013B   10/07/04

## Packaging Mechanical: 20-Pin TSSOP (L)



.169 / .177 → 4.3 / 4.5

.252 / .260 → 6.4 / 6.6

.047 / 1.20 Max

SEATING PLANE

.002 / .006 → 0.05 / 0.15

.0256 BSC → 0.65

.007 / .012 → 0.19 / 0.30

.004 / .008 → 0.09 / 0.20

0.45 / 0.75

.018 / .030

.238 / .269 → 6.1 / 6.7

X.XX / X.XX DENOTES CONTROLLING DIMENSIONS IN MILLIMETERS

## Packaging Mechanical: 20-pin QSOP (Q)



.150 / .157 → 3.81 / 3.99

.337 / .344 → 8.56 / 8.74

15° MAX.

.008 / 0.20 MIN.

.008 / .013 → 0.20 / 0.33

Guage Plane

.010 / 0.254

15° MAX.

.016 / .035 → 0.41 / 0.89

0°-6°

**Detail A**

.041 / 1.04 REF

.058 REF / 1.47

.053 / .069 → 1.35 / 1.75

SEATING PLANE

.004 / .010 → 0.101 / 0.254

.025 BSC → 0.635

.008 / .012 → 0.203 / 0.305

.015 x 45° / 0.38

**Detail A**

.007 / .010 → 0.178 / 0.254

.016 / .050 → 0.41 / 1.27

.228 / .244 → 5.79 / 6.19

X.XX / X.XX DENOTES DIMENSIONS IN MILLIMETERS

## Ordering Information

| Ordering Code | Package Code | Speed Grade | Package Type |
|---|---|---|---|
| PI74FCT273TQ | Q | Blank | 20-pin QSOP |
| PI74FCT273TS | S | Blank | 20-pin SOIC |
| PI74FCT273ATL | L | A | 20-pin TSSOP |
| PI74FCT273ATS | S | A | 20-pin SOIC |
| PI74FCT273ATQ | Q | A | 20-pin QSOP |
| PI74FCT273CTL | L | C | 20-pin TSSOP |
| PI74FCT273CTS | S | C | 20-pin SOIC |
| PI74FCT273CTQ | Q | C | 20-pin QSOP |

**Notes:**
1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/