



# PI74FCT16373T PI74FCT162373T PI74FCT162H373T

## Fast CMOS 16-Bit Transparent Latches

### Product Features:

#### Common Features:

- PI74FCT16373T, PI74FCT162373T, and PI74FCT162H373T are high-speed, low power devices with high current drive.
- $V_{CC} = 5V \pm 10\%$
- Hysteresis on all inputs
- Packages available:
  - 48-pin 240 mil wide plastic TSSOP (A)
  - 48-pin 300 mil wide plastic SSOP (V)

#### PI74FCT16373T Features:

- High output drive:  $I_{OH} = -32 \text{ mA}$ ;  $I_{OL} = 64 \text{ mA}$
- Power off disable outputs permit "live insertion"
- Typical  $V_{OLP}$  (Output Ground Bounce)  $< 1.0V$  at  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$

#### PI74FCT162373T Features:

- Balanced output drivers:  $\pm 24 \text{ mA}$
- Reduced system switching noise
- Typical  $V_{OLP}$  (Output Ground Bounce)  $< 0.6V$  at  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$

#### PI74FCT162H373T Features:

- Bus Hold retains last active bus state during 3-state
- Eliminates the need for external pull-up resistors

### Product Description:

Pericom Semiconductor's PI74FCT series of logic circuits are produced in the Company's advanced 0.6 micron CMOS technology, achieving industry leading speed grades.

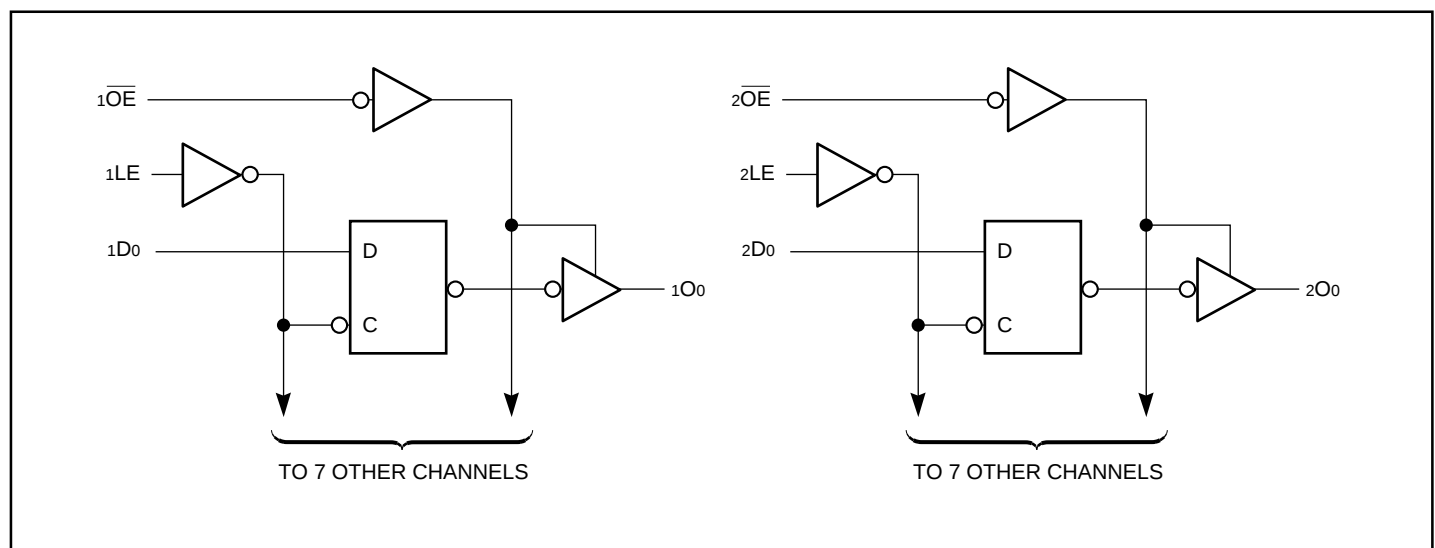
The PI74FCT16373T, PI74FCT162373T, and PI74FCT162H373T are 16-bit transparent latches designed with 3-state outputs and are intended for bus oriented applications. The Output Enable and Latch Enable controls are organized to operate as two 8-bit latches or one 16-bit latch. When Latch Enable (LE) is HIGH, the flip-flops appear transparent to the data. The data that meets the set-up time when LE is LOW is latched. When  $\overline{OE}$  is HIGH, the bus output is in the high impedance state.

The PI74FCT16373T output buffers are designed with a Power-Off disable allowing "live insertion" of boards when used as backplane drivers.

The PI74FCT162373T has  $\pm 24 \text{ mA}$  balanced output drivers. It is designed with current limiting resistors at its outputs to control the output edge rate resulting in lower ground bounce and undershoot. This eliminates the need for external terminating resistors for most interface applications.

The PI74FCT162H373T has "Bus Hold" which retains the input's last state whenever the input goes to high-impedance preventing "floating" inputs and eliminating the need for pull-up/down resistors.

### Logic Block Diagram



## Product Pin Description

| Pin Name         | Description                       |
|------------------|-----------------------------------|
| $\overline{xOE}$ | Output Enable Inputs (Active LOW) |
| $\overline{xLE}$ | Latch Enable Inputs (Active HIGH) |
| $\overline{xDx}$ | Inputs <sup>(1)</sup>             |
| $\overline{xOx}$ | 3-State Outputs                   |
| GND              | Ground                            |
| VCC              | Power                             |

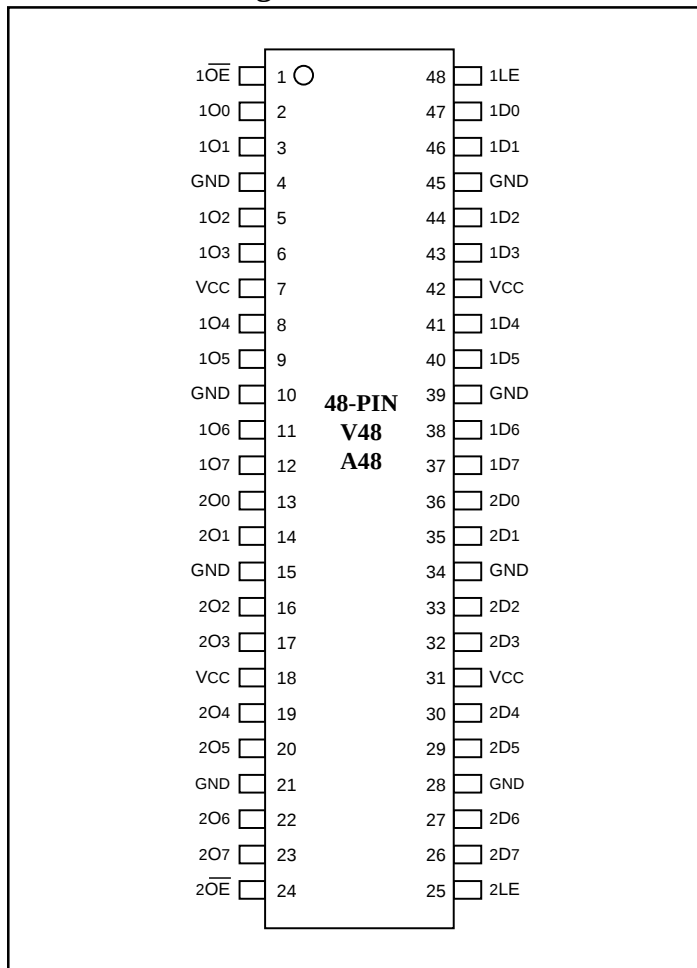
**Note:** 1. For the PI74FCT162H373T, these pins have “Bus Hold.” All other pins are standard, outputs, or I/Os.

## Truth Table

| Inputs <sup>(1)</sup> |                  |                  | Outputs <sup>(1)</sup> |
|-----------------------|------------------|------------------|------------------------|
| $\overline{xDx}$      | $\overline{xOE}$ | $\overline{xLE}$ | $\overline{xOx}$       |
| H                     | L                | H                | H                      |
| L                     | L                | H                | L                      |
| X                     | H                | X                | Z                      |

**Note:** 1. H = High Voltage Level, X = Don’t Care, L = Low Voltage Level, Z = High Impedance

## Product Pin Configuration



## 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 .....                                                  | 120mA           |
| Power Dissipation .....                                                  | 1.0W            |

### 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 ± 10%)

| Parameters                      | Description           | Test Conditions <sup>(1)</sup>                                  |                                   | Min. | Typ <sup>(2)</sup> | Max. | Units |
|---------------------------------|-----------------------|-----------------------------------------------------------------|-----------------------------------|------|--------------------|------|-------|
| 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    | Standard Input, V <sub>CC</sub> = Max.                          | V <sub>IN</sub> = V <sub>CC</sub> |      |                    | 1    | μA    |
| I <sub>IH</sub>                 | Input HIGH Current    | Standard I/O, V <sub>CC</sub> = Max.                            | V <sub>IN</sub> = V <sub>CC</sub> |      |                    | 1    | μA    |
| I <sub>IH</sub>                 | Input HIGH Current    | Bus Hold Input <sup>(4)</sup> , V <sub>CC</sub> = Max.          | V <sub>IN</sub> = V <sub>CC</sub> |      |                    | ±100 | μA    |
| I <sub>IH</sub>                 | Input HIGH Current    | Bus Hold I/O <sup>(4)</sup> , V <sub>CC</sub> = Max.            | V <sub>IN</sub> = V <sub>CC</sub> |      |                    | ±100 | μA    |
| I <sub>IL</sub>                 | Input LOW Current     | Standard Input, V <sub>CC</sub> = Min.                          | V <sub>IN</sub> = GND             |      |                    | –1   | μA    |
| I <sub>IL</sub>                 | Input LOW Current     | Standard I/O, V <sub>CC</sub> = Min.                            | V <sub>IN</sub> = GND             |      |                    | –1   | μA    |
| I <sub>IL</sub>                 | Input LOW Current     | Bus Hold Input <sup>(4)</sup> , V <sub>CC</sub> = Min.          | V <sub>IN</sub> = GND             |      |                    | ±100 | μA    |
| I <sub>IL</sub>                 | Input LOW Current     | Bus Hold I/O <sup>(4)</sup> , V <sub>CC</sub> = Min.            | V <sub>IN</sub> = GND             |      |                    | ±100 | μA    |
| I <sub>BHH</sub>                | Bus Hold              | Bus Hold Input <sup>(4)</sup> , V <sub>CC</sub> = Min.          | V <sub>IN</sub> = 2.0V            | –50  |                    |      | μA    |
| I <sub>BHL</sub>                | Sustain Current       |                                                                 | V <sub>IN</sub> = 0.8V            | +50  |                    |      |       |
| I <sub>OZH</sub> <sup>(5)</sup> | High Impedance        | V <sub>CC</sub> = Max.                                          | V <sub>OUT</sub> = 2.7V           |      |                    | 1    | μA    |
| I <sub>OZL</sub> <sup>(5)</sup> | Output Current        | V <sub>CC</sub> = Max.                                          | V <sub>OUT</sub> = 0.5V           |      |                    | –1   | μA    |
| V <sub>IK</sub>                 | Clamp Diode Voltage   | V <sub>CC</sub> = Min., I <sub>IN</sub> = –18 mA                |                                   |      | –0.7               | –1.2 | V     |
| I <sub>OS</sub>                 | Short Circuit Current | V <sub>CC</sub> = Max. <sup>(3)</sup> , V <sub>OUT</sub> = GND  |                                   | –80  | –140               | –200 | mA    |
| I <sub>O</sub>                  | Output Drive Current  | V <sub>CC</sub> = Max. <sup>(3)</sup> , V <sub>OUT</sub> = 2.5V |                                   | –50  |                    | –180 | mA    |
| V <sub>H</sub>                  | Input Hysteresis      |                                                                 |                                   |      | 100                |      | mV    |

### 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. Pins with Bus Hold are identified in the pin description.
5. This specification does not apply to bi-directional functionalities with Bus Hold.

**PI74FCT16373T Output Drive Characteristics** (Over the Operating Range)

| Parameters | Description         | Test Conditions <sup>(1)</sup> |                | Min. | Typ <sup>(2)</sup> | Max. | Units |
|------------|---------------------|--------------------------------|----------------|------|--------------------|------|-------|
| VOH        | Output HIGH Voltage | VCC = Min., VIN = VIH or VIL   | IOH = -3.0 mA  | 2.5  | 3.5                |      | V     |
|            |                     |                                | IOH = -15.0 mA | 2.4  | 3.5                |      |       |
|            |                     |                                | IOH = -32.0 mA | 2.0  | 3.0                |      |       |
| VOL        | Output LOW Voltage  | VCC = Min., VIN = VIH or VIL   | IOL = 64 mA    |      | 0.2                | 0.55 | V     |
| IOFF       | Power Down Disable  | VCC = 0V, VIN or VOUT ≤ 4.5V   |                | —    | —                  | ±100 | μA    |

**PI74FCT162373T/162H373T Output Drive Characteristics** (Over the Operating Range)

| Parameters | Description         | Test Conditions <sup>(1)</sup>                         |                | Min. | Typ <sup>(2)</sup> | Max. | Units |
|------------|---------------------|--------------------------------------------------------|----------------|------|--------------------|------|-------|
| VOH        | Output HIGH Voltage | VCC = Min., VIN = VIH or VIL                           | IOH = -24.0 mA | 2.4  | 3.3                |      | V     |
| VOL        | Output LOW Voltage  | VCC = Min., VIN = VIH or VIL                           | IOL = 24 mA    |      | 0.3                | 0.55 | V     |
| IODL       | Output LOW Current  | VCC = 5V, VIN = VIH or VIL, VOUT = 1.5V <sup>(3)</sup> |                | 60   | 115                | 150  | mA    |
| IODH       | Output HIGH Current | VCC = 5V, VIN = VIH or VIL, VOUT = 1.5V <sup>(3)</sup> |                | -60  | -115               | -150 | mA    |

**Capacitance** (TA = 25°C, f = 1 MHz)

| Parameters <sup>(4)</sup> | Description        | Test Conditions | Typ | Max. | Units |
|---------------------------|--------------------|-----------------|-----|------|-------|
| CIN                       | Input Capacitance  | VIN = 0V        | 4.5 | 6    | pF    |
| COUT                      | Output Capacitance | VOUT = 0V       | 5.5 | 8    | 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 <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 Input @ TTL HIGH             | V <sub>CC</sub> = Max.                                                                                                                                      | V <sub>IN</sub> = 3.4V <sup>(3)</sup>                      |      | 0.5                | 1.5                 | mA         |
| I <sub>CCD</sub> | Supply Current per Input per MHz <sup>(4)</sup> | V <sub>CC</sub> = Max.,<br>Outputs Open<br>x $\overline{OE}$ = GND, xLE = V <sub>CC</sub><br>One Bit Toggling<br>50% Duty Cycle                             | V <sub>IN</sub> = V <sub>CC</sub><br>V <sub>IN</sub> = GND |      | 60                 | 100                 | μA/<br>MHz |
| I <sub>C</sub>   | Total Power Supply Current <sup>(6)</sup>       | V <sub>CC</sub> = Max.,<br>Outputs Open<br>f <sub>i</sub> = 10 MHz<br>50% Duty Cycle<br>x $\overline{OE}$ = GND, xLE = V <sub>CC</sub><br>One Bit Toggling  | V <sub>IN</sub> = V <sub>CC</sub><br>V <sub>IN</sub> = GND |      | 0.6                | 1.5 <sup>(5)</sup>  | mA         |
|                  |                                                 |                                                                                                                                                             | V <sub>IN</sub> = 3.4V<br>V <sub>IN</sub> = GND            |      | 0.9                | 2.3 <sup>(5)</sup>  |            |
|                  |                                                 | V <sub>CC</sub> = Max.,<br>Outputs Open<br>f <sub>i</sub> = 2.5 MHz<br>50% Duty Cycle<br>x $\overline{OE}$ = GND, xLE = V <sub>CC</sub><br>16 Bits Toggling | V <sub>IN</sub> = V <sub>CC</sub><br>V <sub>IN</sub> = GND |      | 2.4                | 4.5 <sup>(5)</sup>  |            |
|                  |                                                 |                                                                                                                                                             | V <sub>IN</sub> = 3.4V<br>V <sub>IN</sub> = GND            |      | 6.4                | 16.5 <sup>(5)</sup> |            |

### Notes:

- For conditions shown as Max. or Min., 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>  
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_i)$   
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.

**PI74FCT16373T Switching Characteristics over Operating Range**

| Parameters   | Description                                      | Conditions <sup>(1)</sup> | 16373T |      | 16373AT |     | 16373CT |     | 16373DT |     | 16373ET |     | Unit |
|--------------|--------------------------------------------------|---------------------------|--------|------|---------|-----|---------|-----|---------|-----|---------|-----|------|
|              |                                                  |                           | Com.   |      | Com.    |     | Com.    |     | Com.    |     | Com.    |     |      |
|              |                                                  |                           | Min    | Max  | Min     | Max | Min     | Max | Min     | Max | Min     | Max |      |
| tPLH<br>tPHL | Propagation Delay<br>xDx to xOx                  | CL = 50 pF<br>RL = 500Ω   | 1.5    | 8.0  | 1.5     | 5.2 | 1.5     | 4.2 | 1.5     | 3.8 | 1.5     | 3.4 | ns   |
| tPLH<br>tPHL | Propagation Delay<br>xLE to xOx                  |                           | 2.0    | 13.0 | 2.0     | 8.5 | 2.0     | 5.5 | 1.5     | 4.0 | 1.5     | 3.7 | ns   |
| tpZH<br>tpZL | Output Enable Time<br>xOE to xOx                 |                           | 1.5    | 12.0 | 1.5     | 6.5 | 1.5     | 5.5 | 1.5     | 4.8 | 1.5     | 4.4 | ns   |
| tpHZ<br>tPLZ | Output Disable Time <sup>(3)</sup><br>xOE to xOx |                           | 1.5    | 7.5  | 1.5     | 5.5 | 1.5     | 5.0 | 1.5     | 4.0 | 1.5     | 4.0 | ns   |
| tsU          | Setup Time HIGH<br>or LOW, xDx to xLE            |                           | 2.0    | —    | 2.0     | —   | 2.0     | —   | 1.5     | —   | 1.0     | —   | ns   |
| th           | Hold Time HIGH<br>or LOW, xDx to xLE             |                           | 1.5    | —    | 1.5     | —   | 1.5     | —   | 1.0     | —   | 1.0     | —   | ns   |
| tw           | xLE Pulse Width<br>HIGH <sup>(3)</sup>           |                           | 6.0    | —    | 5.0     | —   | 5.0     | —   | 3.0     | —   | 3.0     | —   | ns   |
| tsk(0)       | Output Skew <sup>(4)</sup>                       |                           | —      | 0.5  | —       | 0.5 | —       | 0.5 | —       | 0.5 | —       | 0.5 | ns   |

**PI74FCT162373T Switching Characteristics over Operating Range**

| Parameters   | Description                                      | Conditions <sup>(1)</sup> | 162373T |      | 162373AT |     | 162373CT |     | 162373DT |     | 162373ET |     | Unit |
|--------------|--------------------------------------------------|---------------------------|---------|------|----------|-----|----------|-----|----------|-----|----------|-----|------|
|              |                                                  |                           | Com.    |      | Com.     |     | Com.     |     | Com.     |     | Com.     |     |      |
|              |                                                  |                           | Min     | Max  | Min      | Max | Min      | Max | Min      | Max | Min      | Max |      |
| tPLH<br>tPHL | Propagation Delay<br>xDx to xOx                  | CL = 50 pF<br>RL = 500Ω   | 1.5     | 8.0  | 1.5      | 5.2 | 1.5      | 4.2 | 1.5      | 3.8 | 1.5      | 3.4 | ns   |
| tPLH<br>tPHL | Propagation Delay<br>xLE to xOx                  |                           | 2.0     | 13.0 | 2.0      | 8.5 | 2.0      | 5.5 | 1.5      | 4.0 | 1.5      | 3.7 | ns   |
| tpZH<br>tpZL | Output Enable Time<br>xOE to xOx                 |                           | 1.5     | 12.0 | 1.5      | 6.5 | 1.5      | 5.5 | 1.5      | 4.8 | 1.5      | 4.4 | ns   |
| tpHZ<br>tpLZ | Output Disable Time <sup>(3)</sup><br>xOE to xOx |                           | 1.5     | 7.5  | 1.5      | 5.5 | 1.5      | 5.0 | 1.5      | 4.0 | 1.5      | 4.0 | ns   |
| tsU          | Setup Time HIGH<br>or LOW, xDx to xLE            |                           | 2.0     | —    | 2.0      | —   | 2.0      | —   | 1.5      | —   | 1.0      | —   | ns   |
| th           | Hold Time HIGH<br>or LOW, xDx to xLE             |                           | 1.5     | —    | 1.5      | —   | 1.5      | —   | 1.0      | —   | 1.0      | —   | ns   |
| tw           | xLE Pulse Width<br>HIGH <sup>(3)</sup>           |                           | 6.0     | —    | 5.0      | —   | 5.0      | —   | 3.0      | —   | 3.0      | —   | ns   |
| tsk(0)       | Output Skew <sup>(4)</sup>                       |                           | —       | 0.5  | —        | 0.5 | —        | 0.5 | —        | 0.5 | —        | 0.5 | ns   |

**Notes:**

1. See test circuit and wave forms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not production tested.
4. Skew between any two outputs, of the same package, switching in the same direction. This parameter is guaranteed by design.

**PI74FCT162H373T Switching Characteristics over Operating Range**

| Parameters   | Description                                      | Conditions <sup>(1)</sup> | 162H373T |      | 162H373AT |     | 162H373CT |     | 162H373DT |     | 162H373ET |     | Unit |
|--------------|--------------------------------------------------|---------------------------|----------|------|-----------|-----|-----------|-----|-----------|-----|-----------|-----|------|
|              |                                                  |                           | Com.     |      | Com.      |     | Com.      |     | Com.      |     | Com.      |     |      |
|              |                                                  |                           | Min      | Max  | Min       | Max | Min       | Max | Min       | Max | Min       | Max |      |
| tPLH<br>tPHL | Propagation Delay<br>xDx to xOx                  | CL = 50 pF<br>RL = 500Ω   | 1.5      | 8.0  | 1.5       | 5.2 | 1.5       | 4.2 | 1.5       | 3.8 | 1.5       | 3.4 | ns   |
| tPLH<br>tPHL | Propagation Delay<br>xLE to xOx                  |                           | 2.0      | 13.0 | 2.0       | 8.5 | 2.0       | 5.5 | 1.5       | 4.0 | 1.5       | 3.7 | ns   |
| tpZH<br>tpZL | Output Enable Time<br>xOE to xOx                 |                           | 1.5      | 12.0 | 1.5       | 6.5 | 1.5       | 5.5 | 1.5       | 4.8 | 1.5       | 4.4 | ns   |
| tpHZ<br>tplZ | Output Disable Time <sup>(3)</sup><br>xOE to xOx |                           | 1.5      | 7.5  | 1.5       | 5.5 | 1.5       | 5.0 | 1.5       | 4.0 | 1.5       | 4.0 | ns   |
| tSU          | Setup Time HIGH<br>or LOW, xDx to xLE            |                           | 2.0      | —    | 2.0       | —   | 2.0       | —   | 1.5       | —   | 1.0       | —   | ns   |
| tH           | Hold Time HIGH<br>or LOW, xDx to xLE             |                           | 1.5      | —    | 1.5       | —   | 1.5       | —   | 1.0       | —   | 1.0       | —   | ns   |
| tw           | xLE Pulse Width<br>HIGH <sup>(3)</sup>           |                           | 6.0      | —    | 5.0       | —   | 5.0       | —   | 3.0       | —   | 3.0       | —   | ns   |
| tsk(o)       | Output Skew <sup>(4)</sup>                       |                           | —        | 0.5  | —         | 0.5 | —         | 0.5 | —         | 0.5 | —         | 0.5 | ns   |

**Notes:**

1. See test circuit and wave forms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not production tested.
4. Skew between any two outputs, of the same package, switching in the same direction. This parameter is guaranteed by design.