

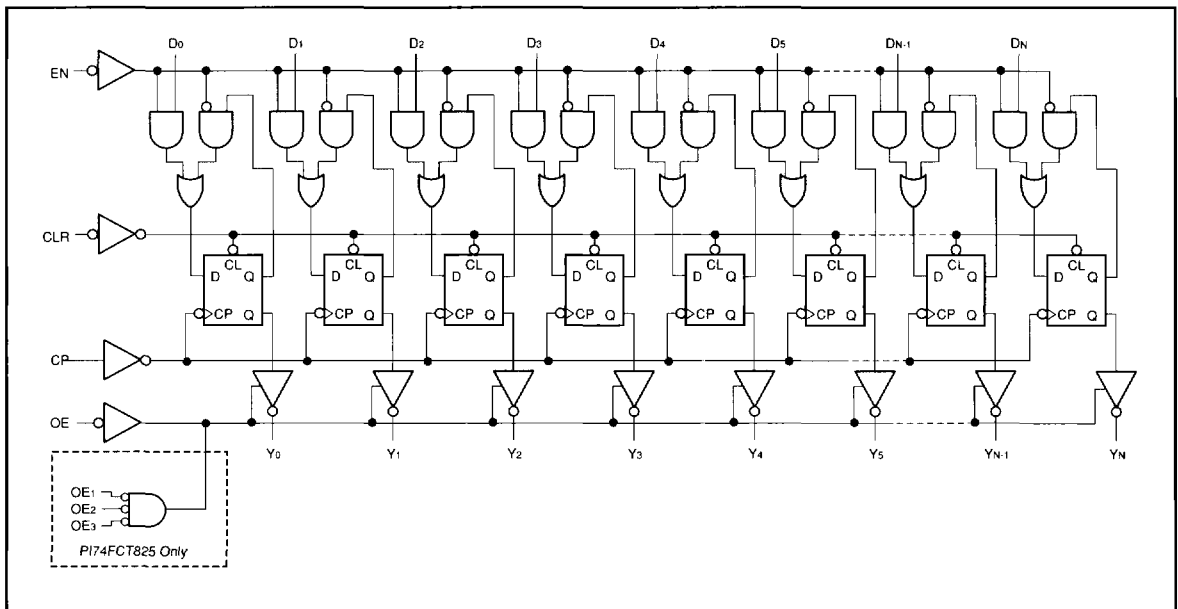
**Fast CMOS  
Bus Interface Registers**
**Product Features:**

- PI74FCT821T/823T/825T/2821T/2823T 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:
  - 24-pin 300 mil wide plastic DIP (P24)
  - 24-pin 150 mil wide plastic QSOP (Q24)
  - 24-pin 150 mil wide plastic TQSOP (R24)
  - 24-pin 300 mil wide plastic SOIC (S24)
- Device models available upon request

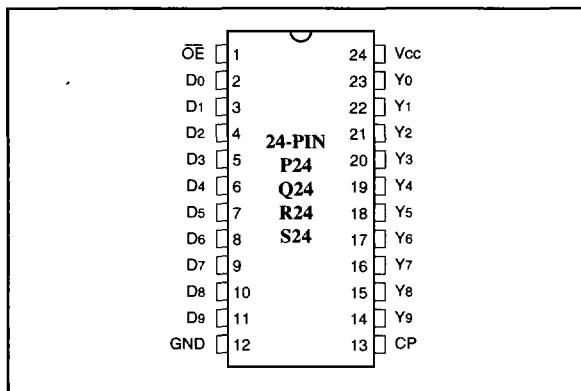
**Product Description:**

Pericom Semiconductor's PI74FCT series of logic circuits are produced in the Company's advanced 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 PI74FCT821T/2821T is a 10-bit wide register designed with ten D-type flip-flops with a buffered common clock and buffered 3-state outputs. The PI74FCT823/2823T is a 9-bit wide register designed with Clock Enable and Clear. The PI74FCT825T is an 8-bit wide register with all PI74FCT823T controls plus multiple enables. When output enable ( $\overline{OE}$ ) is LOW, the outputs are enabled. When OE is HIGH, the outputs are in the high impedance state. Input data meeting the setup and hold time requirements of the D inputs is transferred to the Y outputs on the LOW-to-HIGH transition of the clock input.

**Logic Block Diagram**


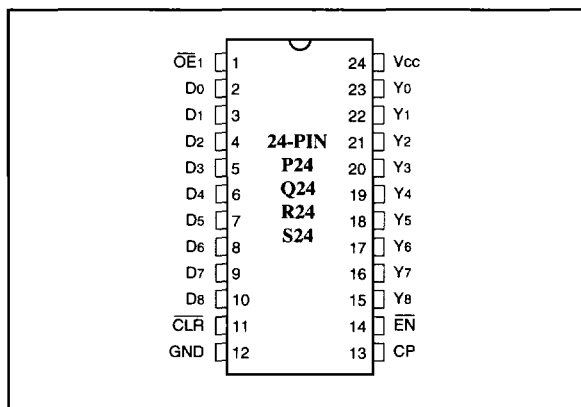
### PI74FCT821/2821T Product Pin Configuration



### Product Pin Description

| Pin Name         | Description   |
|------------------|---|
| $\overline{OE}$  | Output Enable Input (Active LOW)                                    |
| CP               | Clock Pulse for the register. Enters data on LOW-to-HIGH transition |
| DN               | Data Inputs   |
| YN               | 3-State Outputs   |
| $\overline{CLR}$ | Clear Input (Active LOW)<br>(823/825/2823 Only)                     |
| $\overline{EN}$  | Clock Enable Input (Active LOW)                                     |
| GND              | Ground  |
| Vcc              | Power   |

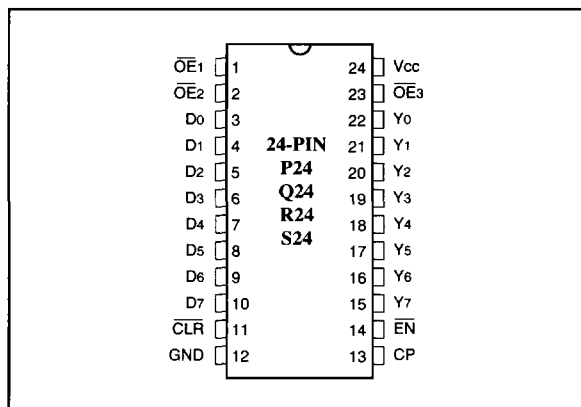
### PI74FCT823/2823T Product Pin Configuration



### PI74FCT821/823/825/2821/2823T Truth Table<sup>(1)</sup>

| Function | Inputs |    |    |    |    | Outputs | Internal |
|----------|--------|----|----|----|----|---------|----------|
|          | CLR    | EN | OE | CP | DN | YN      | QN       |
| High-Z   | H      | L  | H  | ↑  | L  | Z       | L        |
|          | H      | L  | H  | ↑  | H  | Z       | H        |
| Clear    | L      | X  | H  | X  | X  | Z       | L        |
|          | L      | X  | L  | X  | X  | L       | L        |
| Hold     | H      | H  | H  | X  | X  | Z       | NC       |
|          | H      | H  | L  | X  | X  | NC      | NC       |
| Load     | H      | L  | H  | ↑  | L  | Z       | L        |
|          | H      | L  | H  | ↑  | H  | Z       | H        |
|          | H      | L  | L  | ↑  | L  | L       | L        |
|          | H      | L  | L  | ↑  | H  | H       | H        |

### PI74FCT825T Product Pin Configuration



- H = High Voltage Level  
 L = Low Voltage Level  
 X = Don't Care  
 Z = High Impedance  
 NC = No Change  
 ↑ = LOW-to-HIGH 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, TA = -40°C to +85°C, VCC = 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><br>I <sub>OH</sub> = -15.0 mA           | 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><br>I <sub>OL</sub> = 48 mA              |      | 0.3                | 0.50 | 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><br>I <sub>OL</sub> = 12 mA (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.<br>V <sub>IN</sub> = V <sub>CC</sub>  |      |                    | 1    | μA    |
| I <sub>IL</sub>  | Input LOW Current     | V <sub>CC</sub> = Max.<br>V <sub>IN</sub> = GND  |      |                    | -1   | μA    |
| I <sub>OZH</sub> | High Impedance        | V <sub>CC</sub> = Max.<br>V <sub>OUT</sub> = 2.7V  |      |                    | 1    | μA    |
| I <sub>OZL</sub> | Output Current        | V <sub>CC</sub> = Max.<br>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>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 (TA = 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 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.,<br>Outputs Open<br>OE = EN = GND<br>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.,<br>Outputs Open<br>f <sub>CP</sub> = 10 MHz<br>50% Duty Cycle<br>OE = EN = GND<br>fi = 5 MHz<br>One Bit Toggling                        | 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                | 5.5 <sup>(5)</sup>  |            |
|                  |   | V <sub>CC</sub> = Max.,<br>Outputs Open<br>f <sub>CP</sub> = 10 MHz<br>50% Duty Cycle<br>OE = EN = GND<br>Eight Bits Toggling<br>fi = 2.5 MHz<br>50% Duty Cycle | V <sub>IN</sub> = V <sub>CC</sub><br>V <sub>IN</sub> = GND |      | 3.8                | 7.3 <sup>(5)</sup>  |            |
|                  |   |   | V <sub>IN</sub> = 3.4V<br>V <sub>IN</sub> = GND            |      | 6.0                | 16.3 <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> = 3.4 V)  
 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 milliamperes and all frequencies are in megahertz.

**PI74FCT821/2821T Switching Characteristics over Operating Range**

| Parameters                           | Description   | Conditions <sup>(1)</sup>                                       | 821AT/2821AT  |      | 821BT/2821BT |      | 821CT/2821CT |      | Unit |    |
|--------------------------------------|---|---|---|------|--------------|------|--------------|------|------|----|
|                                      |   |   | Com.  |      | Com.         |      | Com.         |      |      |    |
|                                      |   |   | Min   | Max  | Min          | Max  | Min          | Max  |      |    |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>CP to Y <sub>N</sub><br>( $\overline{OE}$ = LOW)   | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω                 | 1.5   | 10.0 | 1.5          | 7.5  | 1.5          | 6.0  | ns   |    |
|                                      |   |   | 1.5   | 20.0 | 1.5          | 15.0 | 1.5          | 12.5 | ns   |    |
| t <sub>SU</sub>                      | Setup Time HIGH or<br>LOW, D <sub>N</sub> to CP                         | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω                 | 4.0   | —    | 3.0          | —    | 3.0          | —    | ns   |    |
| t <sub>H</sub>                       | Hold Time HIGH or<br>LOW, D <sub>N</sub> to CP                          |   | 2.0   | —    | 1.5          | —    | 1.5          | —    | ns   |    |
| t <sub>SU</sub>                      | Setup Time HIGH or<br>LOW, $\overline{EN}$ to CP                        |   | 4.0   | —    | 3.0          | —    | 3.0          | —    | ns   |    |
| t <sub>H</sub>                       | Hold Time HIGH or<br>LOW, $\overline{EN}$ to CP                         |   | 2.0   | —    | 0            | —    | 0            | —    | ns   |    |
| t <sub>PHL</sub>                     | Propagation Delay,<br>$\overline{CLR}$ to Y <sub>N</sub>                |   | 1.5   | 14.0 | 1.5          | 9.0  | 1.5          | 8.0  | ns   |    |
| t <sub>REM</sub>                     | Recovery Time, <sup>(1)</sup><br>$\overline{CLR}$ to CP                 |   | 6.0   | —    | 6.0          | —    | 6.0          | —    | ns   |    |
| t <sub>W</sub>                       | Clock Pulse Width <sup>(3)</sup><br>HIGH or LOW                         |   | 7.0   | —    | 5.0          | —    | 6.0          | —    | ns   |    |
| t <sub>W</sub>                       | $\overline{CLR}$ Pulse Width <sup>(3)</sup><br>LOW                      |   | 6.0   | —    | 6.0          | —    | 6.0          | —    | ns   |    |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable Time<br>$\overline{OE}$ to Y <sub>N</sub>                 |   | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω                 | 1.5  | 11.5         | 1.5  | 8.0          | 1.5  | 7.0  | ns |
|                                      |   |   | C <sub>L</sub> = 300 pF <sup>(3)</sup><br>R <sub>L</sub> = 500Ω | 1.5  | 23.0         | 1.5  | 15.0         | 1.5  | 12.5 | ns |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable Time <sup>(3)</sup><br>$\overline{OE}$ to Y <sub>N</sub> | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω                 | 1.5   | 7.0  | 1.5          | 6.5  | 1.5          | 6.2  | ns   |    |
|                                      |   | C <sub>L</sub> = 300 pF <sup>(3)</sup><br>R <sub>L</sub> = 500Ω | 1.5   | 8.0  | 1.5          | 7.5  | 1.5          | 6.5  | 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.

**PI74FCT823/2823T Switching Characteristics over Operating Range**

| Parameters   | Description  | Conditions <sup>1)</sup>  | 823AT/2823AT |      | 823BT/2823BT |      | 823CT/2823CT |      | Unit |
|--------------|--|---|--------------|------|--------------|------|--------------|------|------|
|              |  |   | Com.         |      | Com.         |      | Com.         |      |      |
|              |  |   | Min          | Max  | Min          | Max  | Min          | Max  |      |
| tPLH<br>tPHL | Propagation Delay<br>CP to Y <sub>N</sub><br>( $\overline{OE}$ = LOW)  | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω<br>C <sub>L</sub> = 300 pF <sup>3)</sup><br>R <sub>L</sub> = 500Ω | 1.5          | 10.0 | 1.5          | 7.5  | 1.5          | 6.0  | ns   |
|              |  |   | 1.5          | 20.0 | 1.5          | 15.0 | 1.5          | 12.5 | ns   |
| tSU          | Setup Time HIGH or<br>LOW, D <sub>N</sub> to CP                        | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω   | 4.0          | —    | 3.0          | —    | 3.0          | —    | ns   |
| tH           | Hold Time HIGH or<br>LOW, D <sub>N</sub> to CP                         |   | 2.0          | —    | 1.5          | —    | 1.5          | —    | ns   |
| tSU          | Setup Time HIGH or<br>LOW, $\overline{EN}$ to CP                       |   | 4.0          | —    | 3.0          | —    | 3.0          | —    | ns   |
| tH           | Hold Time HIGH or<br>LOW, $\overline{EN}$ to CP                        |   | 2.0          | —    | 0            | —    | 0            | —    | ns   |
| tPHL         | Propagation Delay,<br>$\overline{CLR}$ to Y <sub>N</sub>               |   | 1.5          | 13.0 | 1.5          | 9.0  | 1.5          | 8.0  | ns   |
| tREM         | Recovery Time, <sup>3)</sup><br>$\overline{CLR}$ to CP                 |   | 6.0          | —    | 6.0          | —    | 6.0          | —    | ns   |
| tW           | Clock Pulse Width <sup>3)</sup><br>HIGH or LOW                         |   | 7.0          | —    | 5.0          | —    | 6.0          | —    | ns   |
| tW           | $\overline{CLR}$ Pulse Width <sup>3)</sup><br>LOW                      |   | 6.0          | —    | 6.0          | —    | 6.0          | —    | ns   |
| tPZH<br>tPZL | Output Enable Time<br>$\overline{OE}$ to Y <sub>N</sub>                | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω<br>C <sub>L</sub> = 300 pF <sup>3)</sup><br>R <sub>L</sub> = 500Ω | 1.5          | 11.5 | 1.5          | 8.0  | 1.5          | 7.0  | ns   |
|              |  |   | 1.5          | 23.0 | 1.5          | 15.0 | 1.5          | 12.5 | ns   |
| tPHZ<br>tPLZ | Output Disable Time <sup>3)</sup><br>$\overline{OE}$ to Y <sub>N</sub> | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω<br>C <sub>L</sub> = 300 pF <sup>3)</sup><br>R <sub>L</sub> = 500Ω | 1.5          | 7.0  | 1.5          | 6.5  | 1.5          | 6.2  | ns   |
|              |  |   | 1.5          | 8.0  | 1.5          | 7.5  | 1.5          | 6.5  | 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.

**PI74FCT825T Switching Characteristics over Operating Range**

| Parameters   | Description  | Conditions <sup>(1)</sup>                                       | 825AT |      | 825BT |      | 825CT |      | Unit |
|--------------|--|---|-------|------|-------|------|-------|------|------|
|              |  |   | Com.  |      | Com.  |      | Com.  |      |      |
|              |  |   | Min   | Max  | Min   | Max  | Min   | Max  |      |
| tPLH<br>tPHL | Propagation Delay<br>CP to Y <sub>N</sub><br>( $\bar{O}\bar{E}$ = LOW)   | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω                 | 1.5   | 10.0 | 1.5   | 7.5  | 1.5   | 6.0  | ns   |
|              |  | C <sub>L</sub> = 300 pF <sup>(3)</sup><br>R <sub>L</sub> = 500Ω | 1.5   | 20.0 | 1.5   | 15.0 | 1.5   | 12.5 | ns   |
| tSU          | Setup Time HIGH or<br>LOW, D <sub>N</sub> to CP                          | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω                 | 4.0   | —    | 3.0   | —    | 3.0   | —    | ns   |
| tH           | Hold Time HIGH or<br>LOW, D <sub>N</sub> to CP                           |   | 2.0   | —    | 1.5   | —    | 1.5   | —    | ns   |
| tSU          | Setup Time HIGH or<br>LOW, $\bar{E}\bar{N}$ to CP                        |   | 4.0   | —    | 3.0   | —    | 3.0   | —    | ns   |
| tH           | Hold Time HIGH or<br>LOW, $\bar{E}\bar{N}$ to CP                         |   | 2.0   | —    | 0     | —    | 0     | —    | ns   |
| tPHL         | Propagation Delay,<br>$\bar{C}\bar{L}\bar{R}$ to Y <sub>N</sub>          |   | 1.5   | 13.0 | 1.5   | 9.0  | 1.5   | 8.0  | ns   |
| tREM         | Recovery Time,<br>$\bar{C}\bar{L}\bar{R}$ to CP                          |   | 6.0   | —    | 6.0   | —    | 6.0   | —    | ns   |
| tW           | Clock Pulse Width<br>HIGH or LOW   |   | 7.0   | —    | 5.0   | —    | 6.0   | —    | ns   |
| tW           | $\bar{C}\bar{L}\bar{R}$ Pulse Width <sup>(3)</sup><br>LOW                |   | 6.0   | —    | 6.0   | —    | 6.0   | —    | ns   |
| tPZH<br>tPZL | Output Enable Time<br>$\bar{O}\bar{E}$ to Y <sub>N</sub>                 | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω                 | 1.5   | 11.5 | 1.5   | 8.0  | 1.5   | 7.0  | ns   |
|              |  | C <sub>L</sub> = 300 pF <sup>(3)</sup><br>R <sub>L</sub> = 500Ω | 1.5   | 23.0 | 1.5   | 15.0 | 1.5   | 12.5 | ns   |
| tPHZ<br>tPLZ | Output Disable Time <sup>(3)</sup><br>$\bar{O}\bar{E}$ to Y <sub>N</sub> | C <sub>L</sub> = 50 pF<br>R <sub>L</sub> = 500Ω                 | 1.5   | 7.0  | 1.5   | 6.5  | 1.5   | 6.2  | ns   |
|              |  | C <sub>L</sub> = 300 pF <sup>(3)</sup><br>R <sub>L</sub> = 500Ω | 1.5   | 8.0  | 1.5   | 7.5  | 1.5   | 6.5  | 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.