



**MOTOROLA**

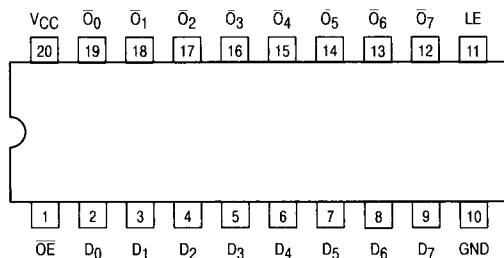
## MC74AC563 MC74ACT563

### Octal D-Type Latch with 3-State Outputs

The MC74AC563/74ACT563 is a high-speed octal latch with buffered common Latch Enable (LE) and buffered common Output Enable ( $\overline{OE}$ ) inputs.

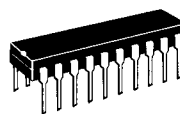
The MC74AC563/74ACT563 device is functionally identical to the MC74AC573/74ACT573, but with inverted outputs.

- Inputs and Outputs on Opposite Sides of Package Allowing Easy Interface with Microprocessors
- Useful as Input or Output Port for Microprocessors
- Functionally Identical to MC74AC573/74ACT573 but with Inverted Outputs
- Outputs Source/Sink 24 mA
- 'ACT563 Has TTL Compatible Inputs



#### PIN NAMES

|                 |                             |
|-----------------|-----------------------------|
| $D_0$ – $D_7$   | Data Inputs                 |
| LE              | Latch Enable Input          |
| $\overline{OE}$ | 3-State Output Enable Input |
| $O_0$ – $O_7$   | 3-State Latch Outputs       |

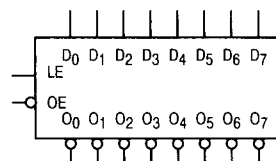


N SUFFIX  
CASE 738-03  
PLASTIC



DW SUFFIX  
CASE 751D-04  
PLASTIC

#### LOGIC SYMBOL



## MC74AC563 • MC74ACT563

### FUNCTIONAL DESCRIPTION

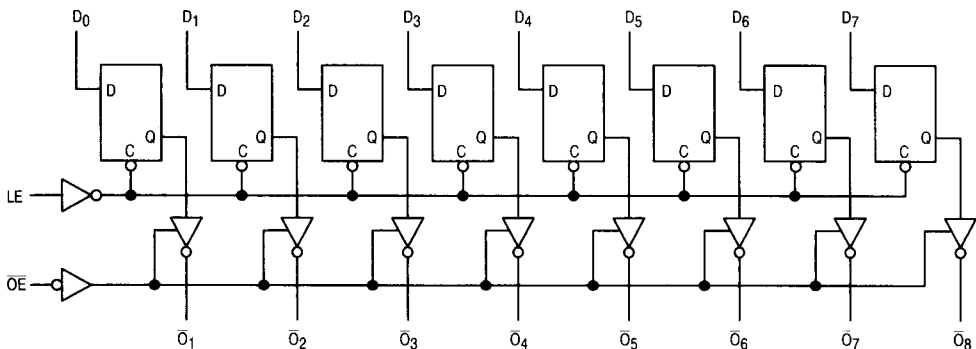
The MC74AC563/74ACT563 contains eight D-type latches with 3-state complementary outputs. When the Latch Enable (LE) input is HIGH, data on the  $D_n$  inputs enters the latches. In this condition the latches are transparent, i.e., a latch output will change state each time its D input changes. When LE is LOW the latches store the information that was present on the D inputs a setup time preceding the HIGH-to-LOW transition of LE. The 3-state buffers are controlled by the Output Enable ( $\overline{OE}$ ) input. When  $\overline{OE}$  is LOW, the buffers are in the bi-state mode. When  $\overline{OE}$  is HIGH the buffers are in the high impedance mode but that does not interfere with entering new data into the latches.

FUNCTION TABLE

| Inputs          |    |   | Internal | Outputs | Function    |
|-----------------|----|---|----------|---------|-------------|
| $\overline{OE}$ | LE | D |          |         |             |
| H               | X  | X | X        | Z       | High Z      |
| H               | H  | L | H        | Z       | High Z      |
| H               | H  | H | L        | Z       | High Z      |
| H               | L  | X | NC       | Z       | Latched     |
| L               | H  | L | H        | H       | Transparent |
| L               | H  | H | L        | L       | Transparent |
| L               | L  | X | NC       | NC      | Latched     |

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial  
 Z = High Impedance  
 NC = No Change

LOGIC DIAGRAM



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

## MC74AC563 • MC74ACT563

### MAXIMUM RATINGS\*

| Symbol    | Parameter                                 | Value                  | Unit |
|-----------|-------------------------------------------|------------------------|------|
| $V_{CC}$  | DC Supply Voltage (Referenced to GND)     | -0.5 to +7.0           | V    |
| $V_{in}$  | DC Input Voltage (Referenced to GND)      | -0.5 to $V_{CC} + 0.5$ | V    |
| $V_{out}$ | DC Output Voltage (Referenced to GND)     | -0.5 to $V_{CC} + 0.5$ | V    |
| $I_{in}$  | DC Input Current, per Pin                 | $\pm 20$               | mA   |
| $I_{out}$ | DC Output Sink/Source Current, per Pin    | $\pm 50$               | mA   |
| $I_{CC}$  | DC $V_{CC}$ or GND Current per Output Pin | $\pm 50$               | mA   |
| $T_{stg}$ | Storage Temperature                       | -65 to +150            | °C   |

\* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

### RECOMMENDED OPERATING CONDITIONS

| Symbol            | Parameter                                                               | Min                     | Typ | Max      | Unit |
|-------------------|-------------------------------------------------------------------------|-------------------------|-----|----------|------|
| $V_{CC}$          | Supply Voltage                                                          | 'AC                     | 2.0 | 5.0      | V    |
|                   |                                                                         | 'ACT                    | 4.5 | 5.0      |      |
| $V_{in}, V_{out}$ | DC Input Voltage, Output Voltage (Ref. to GND)                          | 0                       |     | $V_{CC}$ | V    |
| $t_r, t_f$        | Input Rise and Fall Time (Note 1)<br>'AC Devices except Schmitt Inputs  | $V_{CC} @ 3.0\text{ V}$ | 150 |          | ns/V |
|                   |                                                                         | $V_{CC} @ 4.5\text{ V}$ | 40  |          |      |
|                   |                                                                         | $V_{CC} @ 5.5\text{ V}$ | 25  |          |      |
| $t_r, t_f$        | Input Rise and Fall Time (Note 2)<br>'ACT Devices except Schmitt Inputs | $V_{CC} @ 4.5\text{ V}$ | 10  |          | ns/V |
|                   |                                                                         | $V_{CC} @ 5.5\text{ V}$ | 8.0 |          |      |
| $T_J$             | Junction Temperature (PDIP)                                             |                         |     | 140      | °C   |
| $T_A$             | Operating Ambient Temperature Range                                     | -40                     | 25  | 85       | °C   |
| $I_{OH}$          | Output Current — High                                                   |                         |     | -24      | mA   |
| $I_{OL}$          | Output Current — Low                                                    |                         |     | 24       | mA   |

1.  $V_{in}$  from 30% to 70%  $V_{CC}$ ; see individual Data Sheets for devices that differ from the typical input rise and fall times.

2.  $V_{in}$  from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

# MC74AC563 • MC74ACT563

## DC CHARACTERISTICS

| Symbol           | Parameter                         | V <sub>CC</sub><br>(V) | 74AC                   |                   | 74AC                               | Unit | Conditions                                                                                                                                  |
|------------------|-----------------------------------|------------------------|------------------------|-------------------|------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------|
|                  |                                   |                        | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> =<br>–40°C to +85°C |      |                                                                                                                                             |
|                  |                                   |                        | Typ                    | Guaranteed Limits |                                    |      |                                                                                                                                             |
| V <sub>IH</sub>  | Minimum High Level Input Voltage  | 3.0                    | 1.5                    | 2.1               | 2.1                                | V    | V <sub>OUT</sub> = 0.1 V<br>or V <sub>CC</sub> – 0.1 V                                                                                      |
|                  |                                   | 4.5                    | 2.25                   | 3.15              | 3.15                               |      |                                                                                                                                             |
|                  |                                   | 5.5                    | 2.75                   | 3.85              | 3.85                               |      |                                                                                                                                             |
| V <sub>IL</sub>  | Maximum Low Level Input Voltage   | 3.0                    | 1.5                    | 0.9               | 0.9                                | V    | V <sub>OUT</sub> = 0.1 V<br>or V <sub>CC</sub> – 0.1 V                                                                                      |
|                  |                                   | 4.5                    | 2.25                   | 1.35              | 1.35                               |      |                                                                                                                                             |
|                  |                                   | 5.5                    | 2.75                   | 1.65              | 1.65                               |      |                                                                                                                                             |
| V <sub>OH</sub>  | Minimum High Level Output Voltage | 3.0                    | 2.99                   | 2.9               | 2.9                                | V    | I <sub>OUT</sub> = –50 μA                                                                                                                   |
|                  |                                   | 4.5                    | 4.49                   | 4.4               | 4.4                                |      |                                                                                                                                             |
|                  |                                   | 5.5                    | 5.49                   | 5.4               | 5.4                                |      |                                                                                                                                             |
|                  |                                   | 3.0                    |                        | 2.56              | 2.46                               | V    | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>–12 mA<br>I <sub>OH</sub> –24 mA<br>–24 mA                                         |
|                  |                                   | 4.5                    |                        | 3.86              | 3.76                               |      |                                                                                                                                             |
|                  |                                   | 5.5                    |                        | 4.86              | 4.76                               |      |                                                                                                                                             |
| V <sub>OL</sub>  | Maximum Low Level Output Voltage  | 3.0                    | 0.002                  | 0.1               | 0.1                                | V    | I <sub>OUT</sub> = 50 μA                                                                                                                    |
|                  |                                   | 4.5                    | 0.001                  | 0.1               | 0.1                                |      |                                                                                                                                             |
|                  |                                   | 5.5                    | 0.001                  | 0.1               | 0.1                                |      |                                                                                                                                             |
|                  |                                   | 3.0                    |                        | 0.36              | 0.44                               | V    | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>12 mA<br>I <sub>OL</sub> 24 mA<br>24 mA                                            |
|                  |                                   | 4.5                    |                        | 0.36              | 0.44                               |      |                                                                                                                                             |
|                  |                                   | 5.5                    |                        | 0.36              | 0.44                               |      |                                                                                                                                             |
| I <sub>IN</sub>  | Maximum Input Leakage Current     | 5.5                    |                        | ±0.1              | ±1.0                               | μA   | V <sub>I</sub> = V <sub>CC</sub> , GND                                                                                                      |
| I <sub>OZ</sub>  | Maximum 3-State Current           | 5.5                    |                        | ±0.5              | ±5.0                               | μA   | V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub><br>V <sub>I</sub> = V <sub>CC</sub> , GND<br>V <sub>O</sub> = V <sub>CC</sub> , GND |
| I <sub>OLD</sub> | †Minimum Dynamic Output Current   | 5.5                    |                        |                   | 75                                 | mA   | V <sub>OLD</sub> = 1.65 V Max                                                                                                               |
| I <sub>OHD</sub> |                                   | 5.5                    |                        |                   | –75                                | mA   | V <sub>OHD</sub> = 3.85 V Min                                                                                                               |
| I <sub>CC</sub>  | Maximum Quiescent Supply Current  | 5.5                    |                        | 8.0               | 80                                 | μA   | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                                                    |

\* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

Note: I<sub>IN</sub> and I<sub>CC</sub> @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V<sub>CC</sub>.

# MC74AC563 • MC74ACT563

## AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

| Symbol           | Parameter                                          | V <sub>CC</sub> *<br>(V) | 74AC                                             |     |              | 74AC                                                         |              | Unit | Fig.<br>No. |
|------------------|----------------------------------------------------|--------------------------|--------------------------------------------------|-----|--------------|--------------------------------------------------------------|--------------|------|-------------|
|                  |                                                    |                          | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |     |              | T <sub>A</sub> = -40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF |              |      |             |
|                  |                                                    |                          | Min                                              | Typ | Max          | Min                                                          | Max          |      |             |
| t <sub>PLH</sub> | Propagation Delay<br>D <sub>n</sub> to $\bar{O}_n$ | 3.3<br>5.0               | 3.5<br>2.0                                       |     | 13.0<br>10.0 | 3.5<br>2.0                                                   | 15.0<br>11.5 | ns   | 3-5         |
| t <sub>PHL</sub> | Propagation Delay<br>D <sub>n</sub> to $\bar{O}_n$ | 3.3<br>5.0               | 3.5<br>2.0                                       |     | 12.0<br>9.5  | 3.5<br>2.0                                                   | 14.0<br>11.0 | ns   | 3-5         |
| t <sub>PLH</sub> | Propagation Delay<br>LE to $\bar{O}_n$             | 3.3<br>5.0               | 3.5<br>2.0                                       |     | 13.0<br>9.5  | 3.5<br>2.0                                                   | 15.0<br>11.0 | ns   | 3-6         |
| t <sub>PHL</sub> | Propagation Delay<br>LE to $\bar{O}_n$             | 3.3<br>5.0               | 3.5<br>2.0                                       |     | 12.0<br>8.5  | 3.5<br>2.0                                                   | 14.0<br>9.5  | ns   | 3-6         |
| t <sub>PZH</sub> | Output Enable Time                                 | 3.3<br>5.0               | 2.5<br>2.0                                       |     | 11.0<br>9.0  | 2.5<br>2.0                                                   | 12.0<br>10.0 | ns   | 3-7         |
| t <sub>PZL</sub> | Output Enable Time                                 | 3.3<br>5.0               | 3.0<br>1.5                                       |     | 11.0<br>8.5  | 3.5<br>2.0                                                   | 12.5<br>9.5  | ns   | 3-8         |
| t <sub>PHZ</sub> | Output Disable Time                                | 3.3<br>5.0               | 4.0<br>2.0                                       |     | 12.5<br>11.0 | 4.5<br>2.0                                                   | 13.5<br>12.0 | ns   | 3-7         |
| t <sub>PLZ</sub> | Output Disable Time                                | 3.3<br>5.0               | 2.0<br>1.5                                       |     | 9.5<br>8.0   | 2.5<br>1.5                                                   | 10.5<br>9.0  | ns   | 3-8         |

\* Voltage Range 3.3 V is 3.3 V ±0.3 V.  
Voltage Range 5.0 V is 5.0 V ±0.5 V.

## AC OPERATING REQUIREMENTS

| Symbol         | Parameter                                       | V <sub>CC</sub> *<br>(V) | 74AC                                             |                    | 74AC                                                         | Unit | Fig.<br>No. |
|----------------|-------------------------------------------------|--------------------------|--------------------------------------------------|--------------------|--------------------------------------------------------------|------|-------------|
|                |                                                 |                          | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |                    | T <sub>A</sub> = -40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF |      |             |
|                |                                                 |                          | Typ                                              | Guaranteed Minimum |                                                              |      |             |
| t <sub>s</sub> | Setup Time, HIGH or LOW<br>D <sub>n</sub> to LE | 3.3                      |                                                  | 2.5                | 3.0                                                          | ns   | 3-9         |
|                |                                                 | 5.0                      |                                                  | 2.0                | 2.5                                                          |      |             |
| t <sub>h</sub> | Hold Time, HIGH or LOW<br>D <sub>n</sub> to LE  | 3.3                      |                                                  | 2.0                | 2.0                                                          | ns   | 3-9         |
|                |                                                 | 5.0                      |                                                  | 2.0                | 2.0                                                          |      |             |
| t <sub>w</sub> | LE Pulse Width, HIGH                            | 3.3                      |                                                  | 6.0                | 7.0                                                          | ns   | 3-6         |
|                |                                                 | 5.0                      |                                                  | 4.0                | 5.0                                                          |      |             |

\* Voltage Range 3.3 V is 3.3 V ±0.3 V.  
Voltage Range 5.0 V is 5.0 V ±0.5 V.

# MC74AC563 • MC74ACT563

## DC CHARACTERISTICS

| Symbol            | Parameter                              | V <sub>CC</sub><br>(V) | 74ACT                  |                   | 74ACT                              |    | Unit                                                                                                                                        | Conditions |
|-------------------|----------------------------------------|------------------------|------------------------|-------------------|------------------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------------|------------|
|                   |                                        |                        | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> =<br>–40°C to +85°C |    |                                                                                                                                             |            |
|                   |                                        |                        | Typ                    | Guaranteed Limits |                                    |    |                                                                                                                                             |            |
| V <sub>IH</sub>   | Minimum High Level Input Voltage       | 4.5                    | 1.5                    | 2.0               | 2.0                                | V  | V <sub>OUT</sub> = 0.1 V<br>or V <sub>CC</sub> – 0.1 V                                                                                      |            |
|                   |                                        | 5.5                    | 1.5                    | 2.0               | 2.0                                |    |                                                                                                                                             |            |
| V <sub>IL</sub>   | Maximum Low Level Input Voltage        | 4.5                    | 1.5                    | 0.8               | 0.8                                | V  | V <sub>OUT</sub> = 0.1 V<br>or V <sub>CC</sub> – 0.1 V                                                                                      |            |
|                   |                                        | 5.5                    | 1.5                    | 0.8               | 0.8                                |    |                                                                                                                                             |            |
| V <sub>OH</sub>   | Minimum High Level Output Voltage      | 4.5                    | 4.49                   | 4.4               | 4.4                                | V  | I <sub>OUT</sub> = –50 μA                                                                                                                   |            |
|                   |                                        | 5.5                    | 5.49                   | 5.4               | 5.4                                |    |                                                                                                                                             |            |
|                   |                                        | 4.5                    |                        | 3.86              | 3.76                               | V  | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>–24 mA<br>I <sub>OH</sub> –24 mA                                                   |            |
|                   |                                        | 5.5                    |                        | 4.86              | 4.76                               |    |                                                                                                                                             |            |
| V <sub>OL</sub>   | Maximum Low Level Output Voltage       | 4.5                    | 0.001                  | 0.1               | 0.1                                | V  | I <sub>OUT</sub> = 50 μA                                                                                                                    |            |
|                   |                                        | 5.5                    | 0.001                  | 0.1               | 0.1                                |    |                                                                                                                                             |            |
|                   |                                        | 4.5                    |                        | 0.36              | 0.44                               | V  | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>24 mA<br>I <sub>OL</sub> 24 mA                                                     |            |
|                   |                                        | 5.5                    |                        | 0.36              | 0.44                               |    |                                                                                                                                             |            |
| I <sub>IN</sub>   | Maximum Input Leakage Current          | 5.5                    |                        | ±0.1              | ±1.0                               | μA | V <sub>I</sub> = V <sub>CC</sub> , GND                                                                                                      |            |
| ΔI <sub>CCT</sub> | Additional Max. I <sub>CC</sub> /Input | 5.5                    | 0.6                    |                   | 1.5                                | mA | V <sub>I</sub> = V <sub>CC</sub> – 2.1 V                                                                                                    |            |
| I <sub>OZ</sub>   | Maximum 3-State Current                | 5.5                    |                        | ±0.5              | ±5.0                               | μA | V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub><br>V <sub>I</sub> = V <sub>CC</sub> , GND<br>V <sub>O</sub> = V <sub>CC</sub> , GND |            |
| I <sub>OLD</sub>  | †Minimum Dynamic Output Current        | 5.5                    |                        |                   | 75                                 | mA | V <sub>OLD</sub> = 1.65 V Max                                                                                                               |            |
| I <sub>OHD</sub>  |                                        | 5.5                    |                        |                   | –75                                | mA | V <sub>OHD</sub> = 3.85 V Min                                                                                                               |            |
| I <sub>CC</sub>   | Maximum Quiescent Supply Current       | 5.5                    |                        | 8.0               | 80                                 | μA | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                                                                    |            |

\* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

## AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

| Symbol           | Parameter                                          | V <sub>CC</sub> *<br>(V) | 74ACT                                            |     |      | 74ACT                                                        |      | Unit | Fig.<br>No. |
|------------------|----------------------------------------------------|--------------------------|--------------------------------------------------|-----|------|--------------------------------------------------------------|------|------|-------------|
|                  |                                                    |                          | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |     |      | T <sub>A</sub> = –40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF |      |      |             |
|                  |                                                    |                          | Min                                              | Typ | Max  | Min                                                          | Max  |      |             |
| t <sub>PLH</sub> | Propagation Delay<br>D <sub>n</sub> to $\bar{O}_n$ | 5.0                      | 3.0                                              |     | 11.5 | 2.5                                                          | 12.5 | ns   | 3-5         |
| t <sub>PHL</sub> | Propagation Delay<br>D <sub>n</sub> to $\bar{O}_n$ | 5.0                      | 3.0                                              |     | 10   | 2.5                                                          | 11   | ns   | 3-5         |
| t <sub>PLH</sub> | Propagation Delay<br>LE to $\bar{O}_n$             | 5.0                      | 3.0                                              |     | 10.5 | 2.5                                                          | 11.5 | ns   | 3-6         |
| t <sub>PHL</sub> | Propagation Delay<br>LE to $\bar{O}_n$             | 5.0                      | 2.5                                              |     | 9.5  | 2.0                                                          | 10.5 | ns   | 3-6         |
| t <sub>PZH</sub> | Output Enable Time                                 | 5.0                      | 2.5                                              |     | 9.0  | 2.0                                                          | 10   | ns   | 3-7         |
| t <sub>PZL</sub> | Output Enable Time                                 | 5.0                      | 2.0                                              |     | 8.5  | 2.0                                                          | 9.5  | ns   | 3-8         |
| t <sub>PHZ</sub> | Output Disable Time                                | 5.0                      | 3.5                                              |     | 10.5 | 2.5                                                          | 11.5 | ns   | 3-7         |
| t <sub>PLZ</sub> | Output Disable Time                                | 5.0                      | 2.0                                              |     | 8.0  | 1.0                                                          | 8.5  | ns   | 3-8         |

\* Voltage Range 5.0 V is 5.0 V ±0.5 V.

# MC74AC563 • MC74ACT563

## AC OPERATING REQUIREMENTS

| Symbol         | Parameter                                       | V <sub>CC</sub> *<br>(V) | 74ACT                                            |                    | 74ACT                                                        | Unit | Fig.<br>No. |
|----------------|-------------------------------------------------|--------------------------|--------------------------------------------------|--------------------|--------------------------------------------------------------|------|-------------|
|                |                                                 |                          | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |                    | T <sub>A</sub> = -40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF |      |             |
|                |                                                 |                          | Typ                                              | Guaranteed Minimum |                                                              |      |             |
| t <sub>s</sub> | Setup Time, HIGH or LOW<br>D <sub>n</sub> to LE | 5.0                      |                                                  | 4.0                | 4.5                                                          | ns   | 3-9         |
| t <sub>h</sub> | Hold Time, HIGH or LOW<br>D <sub>n</sub> to LE  | 5.0                      |                                                  | 0                  | 0                                                            | ns   | 3-9         |
| t <sub>w</sub> | LE Pulse Width, HIGH                            | 5.0                      |                                                  | 3.0                | 3.0                                                          | ns   | 3-6         |

\* Voltage Range 5.0 V is 5.0 V ±0.5 V.

## CAPACITANCE

| Symbol          | Parameter                     | Value<br>Typ | Unit | Test Conditions         |
|-----------------|-------------------------------|--------------|------|-------------------------|
| C <sub>IN</sub> | Input Capacitance             | 4.5          | pF   | V <sub>CC</sub> = 5.0 V |
| C <sub>PD</sub> | Power Dissipation Capacitance | 50           | pF   | V <sub>CC</sub> = 5.0 V |