

**BUFFERS/DRIVERS**

**54/74365A, 366A, 367A, 368A, LS365A, LS366A, LS367A, LS368A**

**'365A, '367A Hex Buffer/Driver (3-State)  
'366A, '368A Hex Inverter Buffer (3-State)**

| TYPE           | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (Total) |
|----------------|---------------------------|--------------------------------|
| 74365A, 367A   | 10ns                      | 65mA                           |
| 74LS365A, 367A | 10ns                      | 14mA                           |
| 74366A, 368A   | 9ns                       | 59mA                           |
| 74LS366A, 368A | 10ns                      | 12mA                           |

**ORDERING CODE**

| PACKAGES    | COMMERCIAL RANGES  | MILITARY RANGES  |
|-------------|--|--|
|             | V <sub>CC</sub> = 5V ± 5%; T <sub>A</sub> = 0°C to + 70°C  | V <sub>CC</sub> = 5V ± 10%; T <sub>A</sub> = -55°C to + 125°C                                    |
| Plastic DIP | N74365AN • N74LS365AN<br>N74366AN • N74LS366AN<br>N74367AN • N74LS367AN<br>N74368AN • N74LS368AN |  |
| Plastic SO  | N74LS365AD • N74LS367AD<br>N74LS368AD  |  |
| Ceramic DIP |  | S54365AF • S54LS365AF<br>S54366AF • S54LS366AF<br>S54367AF • S54LS367AF<br>S54368AF • S54LS368AF |
| Flatpack    |  | S54365AW • S54LS365AW<br>S54366AW • S54LS366AW<br>S54367AW • S54LS367AW<br>S54368AW • S54LS368AW |
| LLCC        |  | S54LS365AG<br>S54LS367AG   |

**FUNCTION TABLE, '365A, '366A**

| INPUTS          |                 |   | OUTPUTS |     |
|-----------------|-----------------|---|---------|-----|
| OE <sub>1</sub> | OE <sub>2</sub> | I | Y       | Ȳ  |
| L               | L               | L | L       | H   |
| L               | L               | H | H       | L   |
| X               | H               | X | (Z)     | (Z) |
| H               | X               | X | (Z)     | (Z) |

**FUNCTION TABLE, '367A, '368A**

| INPUTS |   | OUTPUTS |     |
|--------|---|---------|-----|
| OE     | I | Y       | Ȳ  |
| L      | L | L       | H   |
| L      | H | H       | L   |
| H      | X | (Z)     | (Z) |

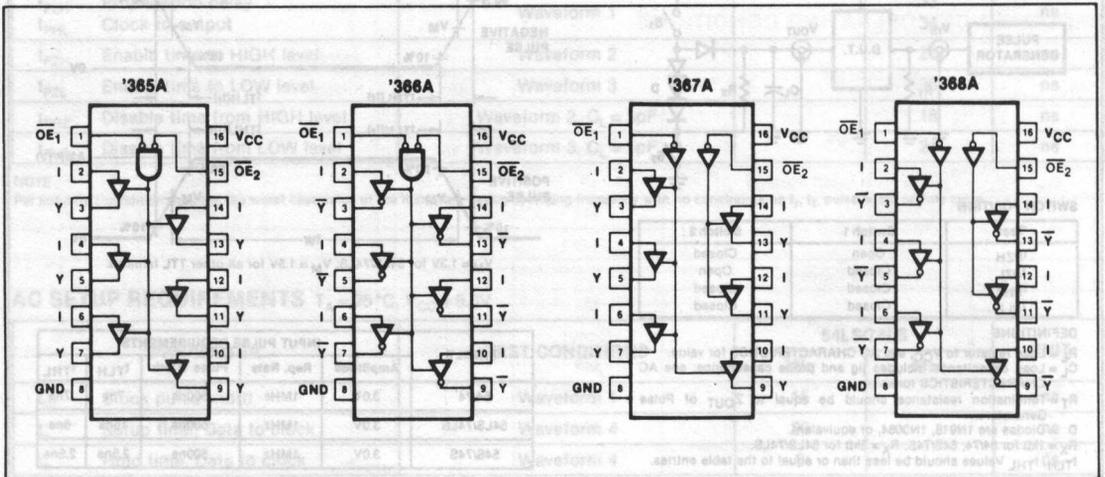
L = LOW voltage level  
H = HIGH voltage level  
X = Don't care  
(Z) = HIGH impedance (off) state

**INPUT AND OUTPUT LOADING AND FAN-OUT TABLE**

| PINS | DESCRIPTION | 54/74 | 54/74LS |
|------|-------------|-------|---------|
| All  | Inputs      | 1ul   | 1LSul   |
| All  | Outputs     | 20ul  | 30LSul  |

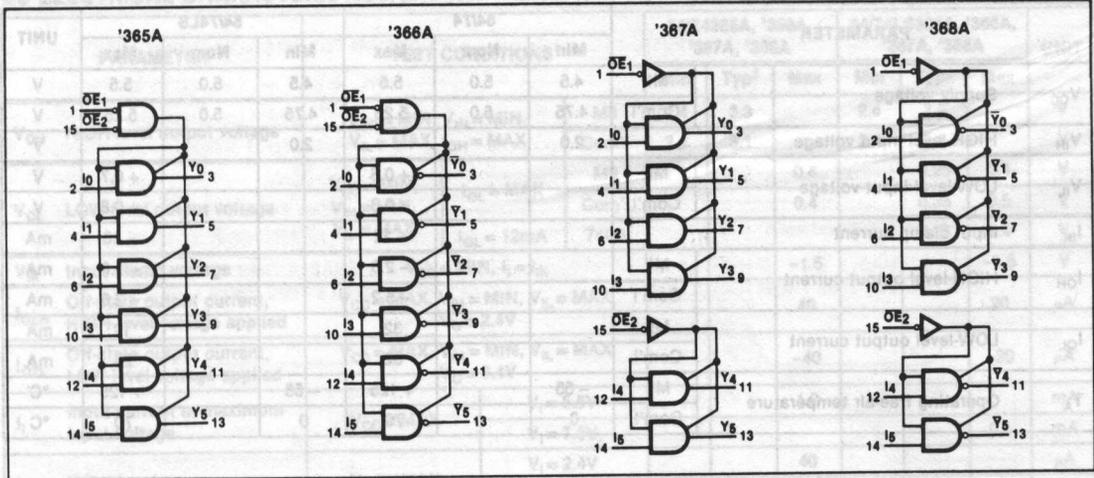
NOTE  
Where a 54/74 unit load (ul) is understood to be 40µA I<sub>IH</sub> and - 1.6mA I<sub>IL</sub> and a 54/74LS unit load (LSul) is 20µA I<sub>IH</sub> and - 0.4mA I<sub>IL</sub>.

**PIN CONFIGURATION**



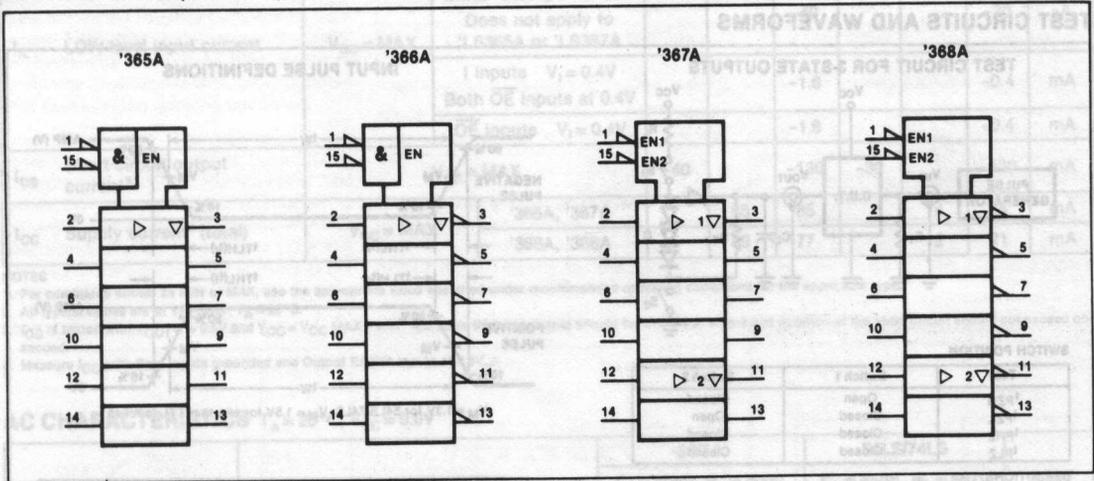
**BUFFERS/DRIVERS 54/74365A, 366A, 367A, 368A, LS365A, LS366A, LS367A, LS368A**

**LOGIC SYMBOL**



**4**

**LOGIC SYMBOL (IEEE/IEC)**



**ABSOLUTE MAXIMUM RATINGS** (Over operating free-air temperature range unless otherwise noted.)

| PARAMETER   | 54                       | 54LS                     | 74                       | 74LS                     | UNIT |
|---|--------------------------|--------------------------|--------------------------|--------------------------|------|
| V <sub>CC</sub> Supply voltage                                  | 7.0                      | 7.0                      | 7.0                      | 7.0                      | V    |
| V <sub>IN</sub> Input voltage                                   | -0.5 to +5.5             | -0.5 to +7.0             | -0.5 to +5.5             | -0.5 to +7.0             | V    |
| I <sub>IN</sub> Input current                                   | -30 to +5                | -30 to +1                | -30 to +5                | -30 to +1                | mA   |
| V <sub>OUT</sub> Voltage applied to output in HIGH output state | -0.5 to +V <sub>CC</sub> | V    |
| T <sub>A</sub> Operating free-air temperature range             | -55 to +125              |                          | 0 to 70                  |                          | °C   |

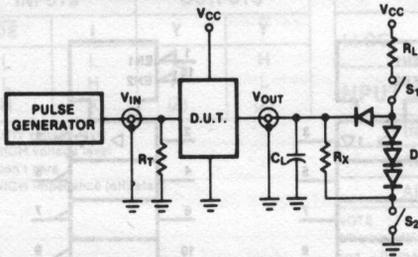
**BUFFERS/DRIVERS 54/74365A, 366A, 367A, 368A, LS365A, LS366A, LS367A, LS368A**

**RECOMMENDED OPERATING CONDITIONS**

| PARAMETER                                     |       | 54/74 |     |       | 54/74LS |     |       | UNIT |
|---|-------|-------|-----|-------|---------|-----|-------|------|
|   |       | Min   | Nom | Max   | Min     | Nom | Max   |      |
| V <sub>CC</sub> Supply voltage                | Mil   | 4.5   | 5.0 | 5.5   | 4.5     | 5.0 | 5.5   | V    |
|   | Com'l | 4.75  | 5.0 | 5.25  | 4.75    | 5.0 | 5.25  | V    |
| V <sub>IH</sub> HIGH-level input voltage      |       | 2.0   |     |       | 2.0     |     |       | V    |
| V <sub>IL</sub> LOW-level input voltage       | Mil   |       |     | + 0.8 |         |     | + 0.7 | V    |
|   | Com'l |       |     | + 0.8 |         |     | + 0.8 | V    |
| I <sub>IK</sub> Input clamp current           |       |       |     | - 12  |         |     | - 18  | mA   |
| I <sub>OH</sub> HIGH-level output current     | Mil   |       |     | - 2.0 |         |     | - 1.0 | mA   |
|   | Com'l |       |     | - 5.2 |         |     | - 2.6 | mA   |
| I <sub>OL</sub> LOW-level output current      | Mil   |       |     | 32    |         |     | 12    | mA   |
|   | Com'l |       |     | 32    |         |     | 24    | mA   |
| T <sub>A</sub> Operating free-air temperature | Mil   | - 55  |     | + 125 | - 55    |     | + 125 | °C   |
|   | Com'l | 0     |     | 70    | 0       |     | 70    | °C   |

**TEST CIRCUITS AND WAVEFORMS**

**TEST CIRCUIT FOR 3-STATE OUTPUTS**



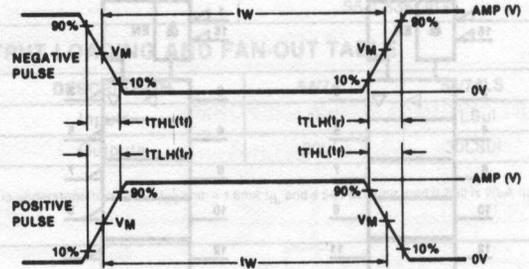
**SWITCH POSITION**

| Test             | Switch 1 | Switch 2 |
|------------------|----------|----------|
| I <sub>PZH</sub> | Open     | Closed   |
| I <sub>PZL</sub> | Closed   | Open     |
| I <sub>PHZ</sub> | Closed   | Closed   |
| I <sub>PLZ</sub> | Closed   | Closed   |

**DEFINITIONS**

R<sub>L</sub> = Load resistor to V<sub>CC</sub>; see AC CHARACTERISTICS for value.  
 C<sub>L</sub> = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.  
 R<sub>T</sub> = Termination resistance should be equal to Z<sub>OUT</sub> of Pulse Generators.  
 D = Diodes are 1N916, 1N3064, or equivalent.  
 R<sub>X</sub> = 1kΩ for 54/74, 54S/74S, R<sub>X</sub> = 5kΩ for 54LS/74LS.  
 t<sub>TLH</sub>, t<sub>THL</sub> Values should be less than or equal to the table entries.

**INPUT PULSE DEFINITIONS**



V<sub>M</sub> = 1.3V for 54LS/74LS; V<sub>M</sub> = 1.5V for all other TTL families.

| FAMILY    | INPUT PULSE REQUIREMENTS |           |             |                  |                  |
|-----------|--------------------------|-----------|-------------|------------------|------------------|
|           | Amplitude                | Rep. Rate | Pulse Width | t <sub>TLH</sub> | t <sub>THL</sub> |
| 54/74     | 3.0V                     | 1MHz      | 500ns       | 7ns              | 7ns              |
| 54LS/74LS | 3.0V                     | 1MHz      | 500ns       | 15ns             | 6ns              |
| 54S/74S   | 3.0V                     | 1MHz      | 500ns       | 2.5ns            | 2.5ns            |

**BUFFERS/DRIVERS 54/74365A, 366A, 367A, 368A, LS365A, LS366A, LS367A, LS368A**

**DC ELECTRICAL CHARACTERISTICS** (Over recommended operating free-air temperature range unless otherwise noted.)

| PARAMETER   | TEST CONDITIONS <sup>1</sup>   | 54/74365A, '366A, '367A, '368A  |                  |      | 54/74LS365A, '366A, '367A, '368A |                  |      | UNIT |     |
|---|--|---|------------------|------|----------------------------------|------------------|------|------|-----|
|   |  | Min   | Typ <sup>2</sup> | Max  | Min                              | Typ <sup>2</sup> | Max  |      |     |
| V <sub>OH</sub> HIGH-level output voltage                             | V <sub>CC</sub> = MIN, V <sub>IH</sub> = MIN, V <sub>IL</sub> = MAX, I <sub>OH</sub> = MAX | Mil   | 2.4              | 3.3  |                                  | 2.4              | 3.3  | V    |     |
|   |  | Com'l   | 2.4              | 3.1  |                                  | 2.4              | 3.1  | V    |     |
| V <sub>OL</sub> LOW-level output voltage                              | V <sub>CC</sub> = MIN, V <sub>IH</sub> = MIN, V <sub>IL</sub> = MAX                        | I <sub>OL</sub> = MAX   | Mil              |      | 0.4                              |                  | 0.25 | 0.4  | V   |
|   |  |   | Com'l            |      |                                  | 0.4              |      | 0.35 | 0.5 |
|   |  | I <sub>OL</sub> = 12mA  | 74LS             |      |                                  |                  |      | 0.25 | 0.4 |
| V <sub>IK</sub> Input clamp voltage                                   | V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>                                    |   |                  | -1.5 |                                  |                  | -1.5 | V    |     |
| I <sub>OZH</sub> Off-state output current, HIGH-level voltage applied | V <sub>CC</sub> = MAX, V <sub>IH</sub> = MIN, V <sub>IL</sub> = MAX, V <sub>O</sub> = 2.4V |   |                  | 40   |                                  |                  | 20   | μA   |     |
| I <sub>OZL</sub> Off-state output current, LOW-level voltage applied  | V <sub>CC</sub> = MAX, V <sub>IH</sub> = MIN, V <sub>IL</sub> = MAX, V <sub>O</sub> = 0.4V |   |                  | -40  |                                  |                  | -20  | μA   |     |
| I <sub>I</sub> Input current at maximum input voltage                 | V <sub>CC</sub> = MAX  | V <sub>I</sub> = 5.5V   |                  |      | 1.0                              |                  |      | mA   |     |
|   |  | V <sub>I</sub> = 7.0V   |                  |      |                                  |                  | 0.1  | mA   |     |
| I <sub>IH</sub> HIGH-level input current                              | V <sub>CC</sub> = MAX  | V <sub>I</sub> = 2.4V   |                  |      | 40                               |                  |      | μA   |     |
|   |  | V <sub>I</sub> = 2.7V   |                  |      |                                  |                  | 20   | μA   |     |
| I <sub>IL</sub> LOW-level input current                               | V <sub>CC</sub> = MAX  | 1 inputs, V <sub>I</sub> = 0.5V<br>Either $\overline{OE}$ input at 2.0V<br>Does not apply to 'LS365A or 'LS367A |                  |      | -40                              |                  | -20  | μA   |     |
|   |  | 1 inputs V <sub>I</sub> = 0.4V<br>Both $\overline{OE}$ inputs at 0.4V   |                  |      | -1.6                             |                  | -0.4 | mA   |     |
|   |  | $\overline{OE}$ inputs V <sub>I</sub> = 0.4V  |                  |      | -1.6                             |                  | -0.4 | mA   |     |
| I <sub>OS</sub> Short-circuit output current <sup>3</sup>             | V <sub>CC</sub> = MAX  | -40   |                  | -130 | -30                              |                  | -130 | mA   |     |
| I <sub>CC</sub> Supply current <sup>4</sup> (total)                   | V <sub>CC</sub> = MAX  | '365A, '367A  | 65               | 85   |                                  | 14               | 24   | mA   |     |
|   |  | '366A, '368A  | 59               | 77   |                                  | 12               | 21   | mA   |     |

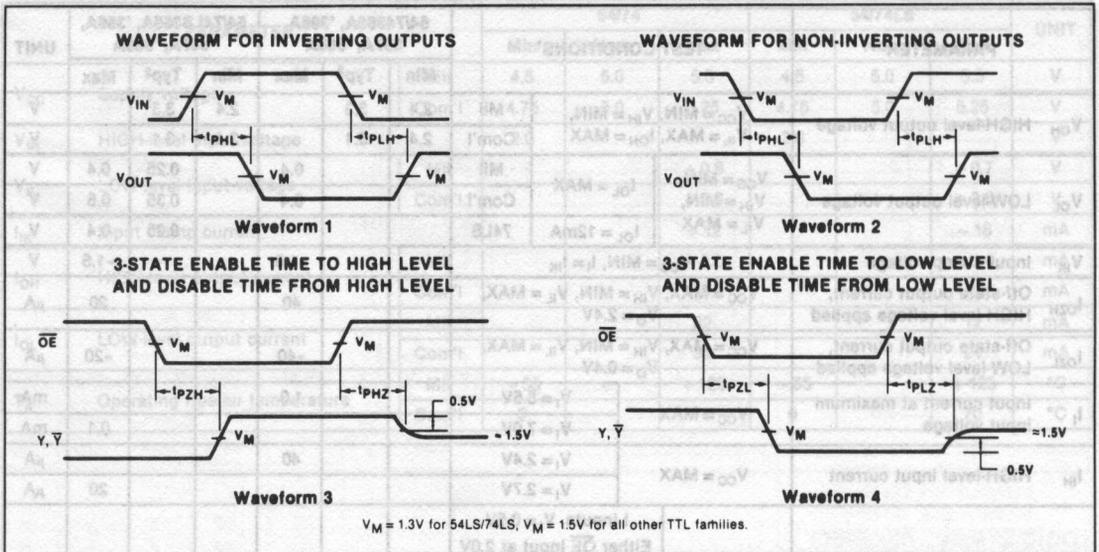
- NOTES
- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
  - All typical values are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.
  - I<sub>OS</sub> is tested with V<sub>OUT</sub> = +0.5V and V<sub>CC</sub> = V<sub>CC</sub> MAX + 0.5V. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.
  - Measure I<sub>CC</sub> with Data inputs grounded and Output Enable inputs at 4.5V.

**AC CHARACTERISTICS** T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5.0V

| PARAMETER                          | TEST CONDITIONS                  | 54/74  |     | 54LS/74LS                                    |     | UNIT |
|------------------------------------|----------------------------------|--|-----|--|-----|------|
|                                    |                                  | C <sub>L</sub> = 50pF, R <sub>L</sub> = 400Ω |     | C <sub>L</sub> = 45pF, R <sub>L</sub> = 667Ω |     |      |
|                                    |                                  | Min  | Max | Min  | Max |      |
| t <sub>PLH</sub> Propagation delay | Waveform 1, '366A, '368A         |  | 17  |  | 15  | ns   |
|                                    |                                  |  | 16  |  | 18  |      |
| t <sub>PLH</sub> Propagation delay | Waveform 2, '365A, '367A         |  | 16  |  | 16  | ns   |
|                                    |                                  |  | 22  |  | 22  |      |
| t <sub>PZH</sub> Enable to HIGH    | Waveform 3                       |  | 35  |  | 35  | ns   |
| t <sub>PZL</sub> Enable to LOW     | Waveform 4                       | '365A, '367A                                 | 37  |  | 40  | ns   |
|                                    |                                  | '366A, '368A                                 | 37  |  | 45  | ns   |
| t <sub>PHZ</sub> Disable from HIGH | Waveform 3, C <sub>L</sub> = 5pF | '365A, '367A                                 | 11  |  | 30  | ns   |
|                                    |                                  | '366A, '368A                                 | 11  |  | 32  | ns   |
| t <sub>PLZ</sub> Disable from LOW  | Waveform 4, C <sub>L</sub> = 5pF |  | 27  |  | 35  | ns   |

**BUFFERS/DRIVERS 54/74365A, 366A, 367A, 368A, LS365A, LS366A, LS367A, LS368A**

**AC WAVEFORMS**



| TEST CIRCUIT | TEST CONDITIONS             | PARAMETER         | UNIT             |
|--------------|-----------------------------|-------------------|------------------|
| Am 1.0-1.1   | Does not apply to 54LS/74LS | Enable to HIGH    | t <sub>PHL</sub> |
| Am 1.0-1.1   | Does not apply to 54LS/74LS | Enable to LOW     | t <sub>PLH</sub> |
| Am 1.0-1.1   | Does not apply to 54LS/74LS | Disable from HIGH | t <sub>PHL</sub> |
| Am 1.0-1.1   | Does not apply to 54LS/74LS | Disable from LOW  | t <sub>PLH</sub> |