

# 74VCXH16245

## Low-Voltage 1.8/2.5/3.3V 16-Bit Transceiver With 3.6 V-Tolerant Inputs and Outputs (3-State, Non-Inverting)

The 74VCXH16245 is an advanced performance, non-inverting 16-bit transceiver. It is designed for very high-speed, very low-power operation in 1.8 V, 2.5 V or 3.3 V systems.

When operating at 2.5 V (or 1.8 V) the part is designed to tolerate voltages it may encounter on either inputs or outputs when interfacing to 3.3 V busses. It is guaranteed to be over-voltage tolerant to 3.6 V.

The VCXH16245 is designed with byte control. It can be operated as two separate octals, or with the controls tied together, as a 16-bit wide function. The Transmit/Receive ( $T/\overline{Rn}$ ) inputs determine the direction of data flow through the bi-directional transceiver. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B to A ports. The Output Enable inputs ( $\overline{OEn}$ ), when HIGH, disable both A and B ports by placing them in a HIGH Z condition. The data inputs include active bushold circuitry, eliminating the need for external pull-up resistors to hold unused or floating inputs at a valid logic state.

### Features

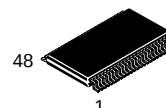
- Designed for Low Voltage Operation:  $V_{CC} = 1.65\text{--}3.6\text{ V}$
- 3.6 V Tolerant Inputs and Outputs
- High Speed Operation: 2.5 ns max for 3.0 to 3.6 V  
3.0 ns max for 2.3 to 2.7 V  
6.0 ns max for 1.65 to 1.95 V
- Static Drive:  $\pm 24\text{ mA}$  Drive at 3.0 V  
 $\pm 18\text{ mA}$  Drive at 2.3 V  
 $\pm 6\text{ mA}$  Drive at 1.65 V
- Supports Live Insertion and Withdrawal
- Includes Active Bushold to Hold Unused or Floating Inputs at a Valid Logic State
- $I_{OFF}$  Specification Guarantees High Impedance When  $V_{CC} = 0\text{ V}^*$
- Near Zero Static Supply Current in All Three Logic States (20  $\mu\text{A}$ ) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds  $\pm 250\text{ mA}$  @ 125°C
- ESD Performance: Human Body Model >2000 V;  
Machine Model >200 V
- Pb-Free Package is Available\*

\*NOTE: To ensure the outputs activate in the 3-state condition, the output enable pins should be connected to  $V_{CC}$  through a pull-up resistor. The value of the resistor is determined by the current sinking capability of the output connected to the  $\overline{OE}$  pin.



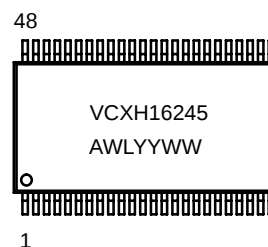
ON Semiconductor®

<http://onsemi.com>



TSSOP-48  
DT SUFFIX  
CASE 1201

### MARKING DIAGRAM



A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week

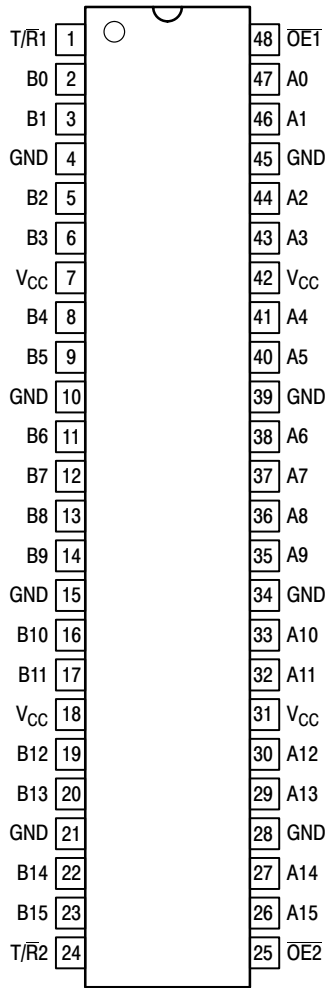
### ORDERING INFORMATION

| Device          | Package            | Shipping†        |
|-----------------|--------------------|------------------|
| 74VCXH16245DT   | TSSOP              | 39 / Rail        |
| 74VCXH16245DTR  | TSSOP              | 2500/Tape & Reel |
| 74VCXH16245DTRG | TSSOP<br>(Pb-Free) | 2500/Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

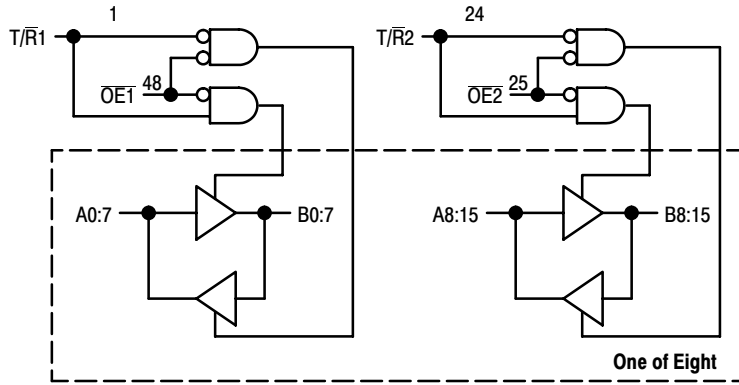
# 74VCXH16245



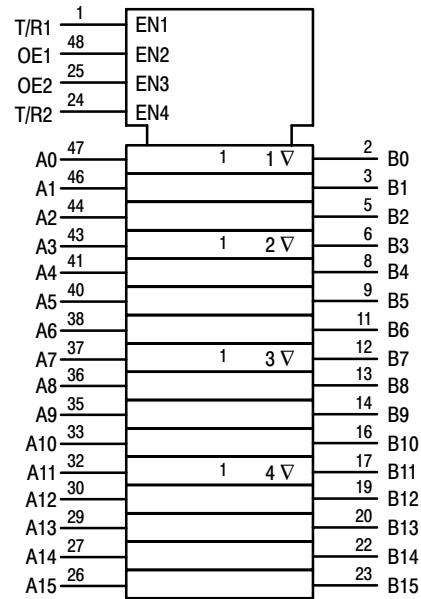
**Figure 1. 48-Lead Pinout**  
(Top View)

## PIN NAMES

| Pins             | Function                         |
|------------------|----------------------------------|
| $\overline{OE}n$ | Output Enable Inputs             |
| T/Rn             | Transmit/Receive Inputs          |
| A0–A15           | Side A Inputs or 3–State Outputs |
| B0–B15           | Side B Inputs or 3–State Outputs |



**Figure 2. Logic Diagram**



**Figure 3. IEC Logic Diagram**

| Inputs           |      | Outputs                    | Inputs           |      | Outputs                      |
|------------------|------|----------------------------|------------------|------|------------------------------|
| $\overline{OE}1$ | T/R1 |                            | $\overline{OE}2$ | T/R2 |                              |
| L                | L    | Bus B0:7 Data to Bus A0:7  | L                | L    | Bus B8:15 Data to Bus A8:15  |
| L                | H    | Bus A0:7 Data to Bus B0:7  | L                | H    | Bus A8:15 Data to Bus B8:15  |
| H                | X    | High Z State on A0:7, B0:7 | H                | X    | High Z State on A8:15, B8:15 |

H = High Voltage Level; L = Low Voltage Level; X = High or Low Voltage Level and Transitions Are Acceptable

# 74VCXH16245

## ABSOLUTE MAXIMUM RATINGS\*

| Symbol    | Parameter                        | Value                             | Condition               | Unit |
|-----------|----------------------------------|-----------------------------------|-------------------------|------|
| $V_{CC}$  | DC Supply Voltage                | -0.5 to +4.6                      |                         | V    |
| $V_I$     | DC Input Voltage                 | $-0.5 \leq V_I \leq +4.6$         |                         | V    |
| $V_O$     | DC Output Voltage                | $-0.5 \leq V_O \leq +4.6$         | Output in 3-State       | V    |
|           |                                  | $-0.5 \leq V_O \leq V_{CC} + 0.5$ | Note 1.; Outputs Active | V    |
| $I_{IK}$  | DC Input Diode Current           | -50                               | $V_I < GND$             | mA   |
| $I_{OK}$  | DC Output Diode Current          | -50                               | $V_O < GND$             | mA   |
|           |                                  | +50                               | $V_O > V_{CC}$          | mA   |
| $I_O$     | DC Output Source/Sink Current    | $\pm 50$                          |                         | mA   |
| $I_{CC}$  | DC Supply Current Per Supply Pin | $\pm 100$                         |                         | mA   |
| $I_{GND}$ | DC Ground Current Per Ground Pin | $\pm 100$                         |                         | mA   |
| $T_{STG}$ | Storage Temperature Range        | -65 to +150                       |                         | °C   |

\* Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied.

1.  $I_O$  absolute maximum rating must be observed.

## RECOMMENDED OPERATING CONDITIONS

| Symbol              | Parameter                                                                                 | Min  | Typ | Max      | Unit |
|---------------------|-------------------------------------------------------------------------------------------|------|-----|----------|------|
| $V_{CC}$            | Supply Voltage                                                                            | 1.65 | 3.3 | 3.6      | V    |
|                     |                                                                                           | 1.2  | 3.3 | 3.6      |      |
| $V_I$               | Input Voltage                                                                             | -0.3 |     | 3.6      | V    |
| $V_O$               | Output Voltage                                                                            | 0    |     | $V_{CC}$ | V    |
|                     |                                                                                           | 0    |     | 3.6      |      |
| $I_{OH}$            | HIGH Level Output Current, $V_{CC} = 3.0\text{ V} - 3.6\text{ V}$                         |      |     | -24      | mA   |
| $I_{OL}$            | LOW Level Output Current, $V_{CC} = 3.0\text{ V} - 3.6\text{ V}$                          |      |     | 24       | mA   |
| $I_{OH}$            | HIGH Level Output Current, $V_{CC} = 2.3\text{ V} - 2.7\text{ V}$                         |      |     | -18      | mA   |
| $I_{OL}$            | LOW Level Output Current, $V_{CC} = 2.3\text{ V} - 2.7\text{ V}$                          |      |     | 18       | mA   |
| $I_{OH}$            | HIGH Level Output Current, $V_{CC} = 1.65 - 1.95\text{ V}$                                |      |     | -6       | mA   |
| $I_{OL}$            | LOW Level Output Current, $V_{CC} = 1.65 - 1.95\text{ V}$                                 |      |     | 6        | mA   |
| $T_A$               | Operating Free-Air Temperature                                                            | -40  |     | +85      | °C   |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate, $V_{IN}$ from 0.8 V to 2.0 V, $V_{CC} = 3.0\text{ V}$ | 0    |     | 10       | ns/V |

# 74VCXH16245

## DC ELECTRICAL CHARACTERISTICS

| Symbol               | Characteristic                                            | Condition                                                                                                              | T <sub>A</sub> = -40°C to +85°C |                        | Unit |
|----------------------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------|------|
|                      |                                                           |                                                                                                                        | Min                             | Max                    |      |
| V <sub>IH</sub>      | HIGH Level Input Voltage (Note 2.)                        | 1.65 V ≤ V <sub>CC</sub> < 2.3 V                                                                                       | 0.65 x V <sub>CC</sub>          |                        | V    |
|                      |                                                           | 2.3 V ≤ V <sub>CC</sub> ≤ 2.7 V                                                                                        | 1.6                             |                        |      |
|                      |                                                           | 2.7 V < V <sub>CC</sub> ≤ 3.6 V                                                                                        | 2.0                             |                        |      |
| V <sub>IL</sub>      | LOW Level Input Voltage (Note 2.)                         | 1.65 V ≤ V <sub>CC</sub> < 2.3 V                                                                                       |                                 | 0.35 x V <sub>CC</sub> | V    |
|                      |                                                           | 2.3 V ≤ V <sub>CC</sub> ≤ 2.7 V                                                                                        |                                 | 0.7                    |      |
|                      |                                                           | 2.7 V < V <sub>CC</sub> ≤ 3.6 V                                                                                        |                                 | 0.8                    |      |
| V <sub>OH</sub>      | HIGH Level Output Voltage                                 | 1.65 V ≤ V <sub>CC</sub> ≤ 3.6 V; I <sub>OH</sub> = -100μA                                                             | V <sub>CC</sub> - 0.2           |                        | V    |
|                      |                                                           | V <sub>CC</sub> = 1.65 V; I <sub>OH</sub> = -6mA                                                                       | 1.25                            |                        |      |
|                      |                                                           | V <sub>CC</sub> = 2.3 V; I <sub>OH</sub> = -6mA                                                                        | 2.0                             |                        |      |
|                      |                                                           | V <sub>CC</sub> = 2.3 V; I <sub>OH</sub> = -12mA                                                                       | 1.8                             |                        |      |
|                      |                                                           | V <sub>CC</sub> = 2.3 V; I <sub>OH</sub> = -18mA                                                                       | 1.7                             |                        |      |
|                      |                                                           | V <sub>CC</sub> = 2.7 V; I <sub>OH</sub> = -12mA                                                                       | 2.2                             |                        |      |
|                      |                                                           | V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = -18mA                                                                       | 2.4                             |                        |      |
|                      |                                                           | V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = -24mA                                                                       | 2.2                             |                        |      |
| V <sub>OL</sub>      | LOW Level Output Voltage                                  | 1.65 V ≤ V <sub>CC</sub> ≤ 3.6 V; I <sub>OL</sub> = 100μA                                                              |                                 | 0.2                    | V    |
|                      |                                                           | V <sub>CC</sub> = 1.65 V; I <sub>OL</sub> = 6mA                                                                        |                                 | 0.3                    |      |
|                      |                                                           | V <sub>CC</sub> = 2.3 V; I <sub>OL</sub> = 12mA                                                                        |                                 | 0.4                    |      |
|                      |                                                           | V <sub>CC</sub> = 2.3 V; I <sub>OL</sub> = 18mA                                                                        |                                 | 0.6                    |      |
|                      |                                                           | V <sub>CC</sub> = 2.7 V; I <sub>OL</sub> = 12mA                                                                        |                                 | 0.4                    |      |
|                      |                                                           | V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 18mA                                                                        |                                 | 0.4                    |      |
|                      |                                                           | V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 24mA                                                                        |                                 | 0.55                   |      |
| I <sub>I</sub>       | Input Leakage Current                                     | 1.65 V ≤ V <sub>CC</sub> ≤ 3.6 V; 0V ≤ V <sub>I</sub> ≤ 3.6 V                                                          |                                 | ±5.0                   | μA   |
| I <sub>I(HOLD)</sub> | Minimum Bushold Input Current                             | V <sub>CC</sub> = 3.0 V, V <sub>IN</sub> = 0.8V                                                                        | 75                              |                        | μA   |
|                      |                                                           | V <sub>CC</sub> = 3.0 V, V <sub>IN</sub> = 2.0V                                                                        | -75                             |                        |      |
|                      |                                                           | V <sub>CC</sub> = 2.3 V, V <sub>IN</sub> = 0.7V                                                                        | 45                              |                        |      |
|                      |                                                           | V <sub>CC</sub> = 2.3 V, V <sub>IN</sub> = 1.6V                                                                        | -45                             |                        |      |
|                      |                                                           | V <sub>CC</sub> = 1.65 V, V <sub>IN</sub> = 0.57V                                                                      | 25                              |                        |      |
|                      |                                                           | V <sub>CC</sub> = 1.65 V, V <sub>IN</sub> = 1.07V                                                                      | -25                             |                        |      |
| I <sub>I(OD)</sub>   | Minimum Bushold Over-Drive Current Needed to Change State | V <sub>CC</sub> = 3.6 V, (Note 3.)                                                                                     | 450                             |                        | μA   |
|                      |                                                           | V <sub>CC</sub> = 3.6 V, (Note 4.)                                                                                     | -450                            |                        |      |
|                      |                                                           | V <sub>CC</sub> = 2.7 V, (Note 3.)                                                                                     | 300                             |                        |      |
|                      |                                                           | V <sub>CC</sub> = 2.7 V, (Note 4.)                                                                                     | -300                            |                        |      |
|                      |                                                           | V <sub>CC</sub> = 1.95 V, (Note 3.)                                                                                    | 200                             |                        |      |
|                      |                                                           | V <sub>CC</sub> = 1.95 V, (Note 4.)                                                                                    | -200                            |                        |      |
| I <sub>OZ</sub>      | 3-State Output Current                                    | 1.65 V ≤ V <sub>CC</sub> ≤ 3.6 V; 0 V ≤ V <sub>O</sub> ≤ 3.6 V;<br>V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> |                                 | ±10                    | μA   |
| I <sub>OFF</sub>     | Power-Off Leakage Current                                 | V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 3.6 V                                                        |                                 | 10                     | μA   |
| I <sub>CC</sub>      | Quiescent Supply Current (Note 5.)                        | 1.65 V ≤ V <sub>CC</sub> ≤ 3.6 V; V <sub>I</sub> = GND or V <sub>CC</sub>                                              |                                 | 20                     | μA   |
|                      |                                                           | 1.65 V ≤ V <sub>CC</sub> ≤ 3.6 V; 3.6 V ≤ V <sub>I</sub> , V <sub>O</sub> ≤ 3.6 V                                      |                                 | ±20                    | μA   |
| ΔI <sub>CC</sub>     | Increase in I <sub>CC</sub> per Input                     | 2.7 V < V <sub>CC</sub> ≤ 3.6 V; V <sub>IH</sub> = V <sub>CC</sub> - 0.6 V                                             |                                 | 750                    | μA   |

2. These values of V<sub>I</sub> are used to test DC electrical characteristics only.

3. An external driver must source at least the specified current to switch from LOW-to-HIGH.

4. An external driver must source at least the specified current to switch from HIGH-to-LOW.

5. Outputs disabled or 3-state only.

# 74VCXH16245

## AC CHARACTERISTICS (Note 6.; $t_R = t_F = 2.0\text{ns}$ ; $C_L = 30\text{pF}$ ; $R_L = 500\Omega$ )

| Symbol                                 | Parameter                                      | Waveform | Limits                           |            |                                  |            |                                 |              | Unit |
|----------------------------------------|------------------------------------------------|----------|----------------------------------|------------|----------------------------------|------------|---------------------------------|--------------|------|
|                                        |                                                |          | T <sub>A</sub> = -40°C to +85°C  |            |                                  |            |                                 |              |      |
|                                        |                                                |          | V <sub>CC</sub> = 3.0 V to 3.6 V |            | V <sub>CC</sub> = 2.3 V to 2.7 V |            | V <sub>CC</sub> = 1.65 to1.95 V |              |      |
|                                        |                                                |          | Min                              | Max        | Min                              | Max        | Min                             | Max          |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub>   | Propagation Delay<br>Input to Output           | 1        | 0.8<br>0.8                       | 2.5<br>2.5 | 1.0<br>1.0                       | 3.0<br>3.0 | 1.5<br>1.5                      | 6.0<br>6.0   | ns   |
| t <sub>PZH</sub><br>t <sub>PZL</sub>   | Output Enable Time to<br>High and Low Level    | 2        | 0.8<br>0.8                       | 3.8<br>3.8 | 1.0<br>1.0                       | 4.9<br>4.9 | 1.5<br>1.5                      | 9.3<br>9.3   | ns   |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub>   | Output Disable Time From<br>High and Low Level | 2        | 0.8<br>0.8                       | 3.7<br>3.7 | 1.0<br>1.0                       | 4.2<br>4.2 | 1.5<br>1.5                      | 7.6<br>7.6   | ns   |
| t <sub>OSHL</sub><br>t <sub>OSLH</sub> | Output-to-Output Skew<br>(Note 7.)             |          |                                  | 0.5<br>0.5 |                                  | 0.5<br>0.5 |                                 | 0.75<br>0.75 | ns   |

6. For  $C_L = 50\text{pF}$ , add approximately 300ps to the AC maximum specification.

7. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW ( $t_{OSHL}$ ) or LOW-to-HIGH ( $t_{OSLH}$ ); parameter guaranteed by design.

## DYNAMIC SWITCHING CHARACTERISTICS

| Symbol    | Characteristic                           | Condition                                                                        | $T_A = +25^\circ\text{C}$ | Unit |
|-----------|------------------------------------------|----------------------------------------------------------------------------------|---------------------------|------|
|           |                                          |                                                                                  | Typ                       |      |
| $V_{OLP}$ | Dynamic LOW Peak Voltage<br>(Note 8.)    | $V_{CC} = 1.8\text{ V}, C_L = 30\text{pF}, V_{IH} = V_{CC}, V_{IL} = 0\text{ V}$ | 0.25                      | V    |
|           |                                          | $V_{CC} = 2.5\text{ V}, C_L = 30\text{pF}, V_{IH} = V_{CC}, V_{IL} = 0\text{ V}$ | 0.6                       |      |
|           |                                          | $V_{CC} = 3.3\text{ V}, C_L = 30\text{pF}, V_{IH} = V_{CC}, V_{IL} = 0\text{ V}$ | 0.8                       |      |
| $V_{OLV}$ | Dynamic LOW Valley Voltage<br>(Note 8.)  | $V_{CC} = 1.8\text{ V}, C_L = 30\text{pF}, V_{IH} = V_{CC}, V_{IL} = 0\text{ V}$ | -0.25                     | V    |
|           |                                          | $V_{CC} = 2.5\text{ V}, C_L = 30\text{pF}, V_{IH} = V_{CC}, V_{IL} = 0\text{ V}$ | -0.6                      |      |
|           |                                          | $V_{CC} = 3.3\text{ V}, C_L = 30\text{pF}, V_{IH} = V_{CC}, V_{IL} = 0\text{ V}$ | -0.8                      |      |
| $V_{OHV}$ | Dynamic HIGH Valley Voltage<br>(Note 9.) | $V_{CC} = 1.8\text{ V}, C_L = 30\text{pF}, V_{IH} = V_{CC}, V_{IL} = 0\text{ V}$ | 1.5                       | V    |
|           |                                          | $V_{CC} = 2.5\text{ V}, C_L = 30\text{pF}, V_{IH} = V_{CC}, V_{IL} = 0\text{ V}$ | 1.9                       |      |
|           |                                          | $V_{CC} = 3.3\text{ V}, C_L = 30\text{pF}, V_{IH} = V_{CC}, V_{IL} = 0\text{ V}$ | 2.2                       |      |

8. Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

9. Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the HIGH state.

## CAPACITIVE CHARACTERISTICS

| Symbol    | Parameter                     | Condition       | Typical | Unit |
|-----------|-------------------------------|-----------------|---------|------|
| $C_{IN}$  | Input Capacitance             | Note 10.        | 6       | pF   |
| $C_{OUT}$ | Output Capacitance            | Note 10.        | 7       | pF   |
| $C_{PD}$  | Power Dissipation Capacitance | Note 10., 10MHz | 20      | pF   |

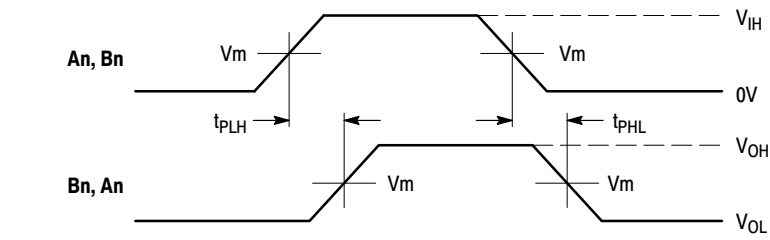
10.  $V_{CC} = 1.8, 2.5$  or  $3.3\text{ V}$ ;  $V_I = 0\text{ V}$  or  $V_{CC}$ .

## AC CHARACTERISTICS ( $t_R = t_F = 2.0\text{ns}$ ; $C_L = 50\text{pF}$ ; $R_L = 500\Omega$ )

| Symbol                                 | Parameter                                      | Waveform | Limits                           |            |                         |            | Unit |
|----------------------------------------|------------------------------------------------|----------|----------------------------------|------------|-------------------------|------------|------|
|                                        |                                                |          | T <sub>A</sub> = −40°C to +85°C  |            |                         |            |      |
|                                        |                                                |          | V <sub>CC</sub> = 3.0 V to 3.6 V |            | V <sub>CC</sub> = 2.7 V |            |      |
|                                        |                                                |          | Min                              | Max        | Min                     | Max        |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub>   | Propagation Delay<br>Input to Output           | 3        | 1.0<br>1.0                       | 3.0<br>3.0 |                         | 3.6<br>3.6 | ns   |
| t <sub>PZH</sub><br>t <sub>PZL</sub>   | Output Enable Time to<br>High and Low Level    | 4        | 1.0<br>1.0                       | 4.4<br>4.4 |                         | 5.4<br>5.4 | ns   |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub>   | Output Disable Time From<br>High and Low Level | 4        | 1.0<br>1.0                       | 4.1<br>4.1 |                         | 4.6<br>4.6 | ns   |
| t <sub>OSHL</sub><br>t <sub>OSLH</sub> | Output-to-Output Skew<br>(Note 11.)            |          |                                  | 0.5<br>0.5 |                         | 0.5<br>0.5 | ns   |

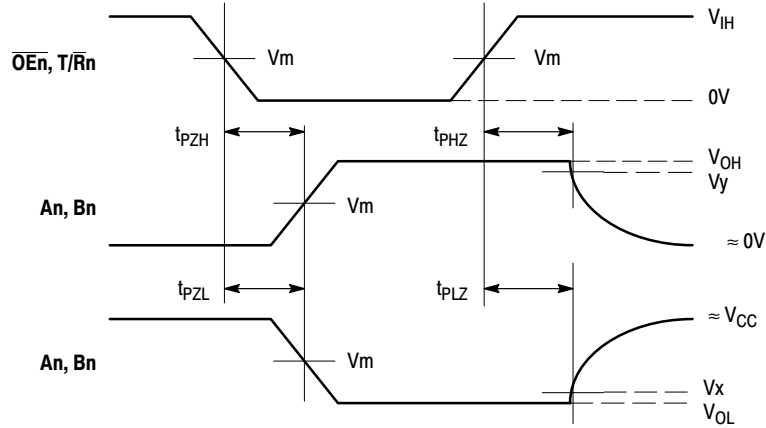
11. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW ( $t_{OSHL}$ ) or LOW-to-HIGH ( $t_{OSLH}$ ); parameter guaranteed by design.

## 74VCXH16245



**WAVEFORM 1 - PROPAGATION DELAYS**

$t_R = t_F = 2.0\text{ns}$ , 10% to 90%;  $f = 1\text{MHz}$ ;  $t_W = 500\text{ns}$

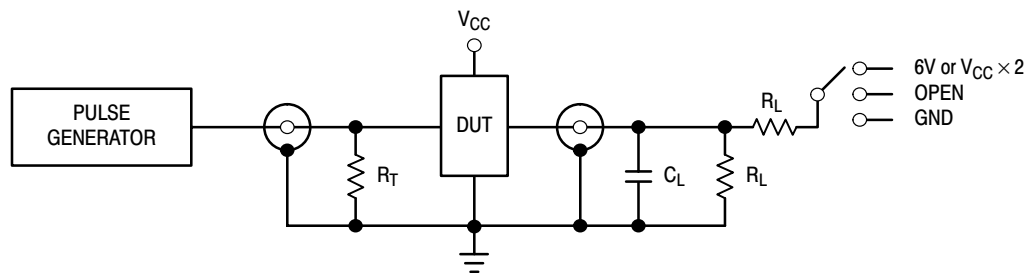


**WAVEFORM 2 - OUTPUT ENABLE AND DISABLE TIMES**

$t_R = t_F = 2.0\text{ns}$ , 10% to 90%;  $f = 1\text{MHz}$ ;  $t_W = 500\text{ns}$

**Figure 4. AC Waveforms**

| Symbol   | $V_{CC}$                        |                                 |                                  |
|----------|---------------------------------|---------------------------------|----------------------------------|
|          | $3.3\text{ V} \pm 0.3\text{ V}$ | $2.5\text{ V} \pm 0.2\text{ V}$ | $1.8\text{ V} \pm 0.15\text{ V}$ |
| $V_{IH}$ | 2.7 V                           | $V_{CC}$                        | $V_{CC}$                         |
| $V_m$    | 1.5 V                           | $V_{CC}/2$                      | $V_{CC}/2$                       |
| $V_x$    | $V_{OL} + 0.3\text{ V}$         | $V_{OL} + 0.15\text{ V}$        | $V_{OL} + 0.15\text{ V}$         |
| $V_y$    | $V_{OH} - 0.3\text{ V}$         | $V_{OH} - 0.15\text{ V}$        | $V_{OH} - 0.15\text{ V}$         |



| TEST                  | SWITCH                                                                                                                              |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| $t_{PLH}$ , $t_{PHL}$ | Open                                                                                                                                |
| $t_{PZL}$ , $t_{PLZ}$ | 6 V at $V_{CC} = 3.3 \pm 0.3\text{ V}$ ;<br>$V_{CC} \times 2$ at $V_{CC} = 2.5 \pm 0.2\text{ V}$ ; $1.8\text{ V} \pm 0.15\text{ V}$ |
| $t_{PZH}$ , $t_{PHZ}$ | GND                                                                                                                                 |

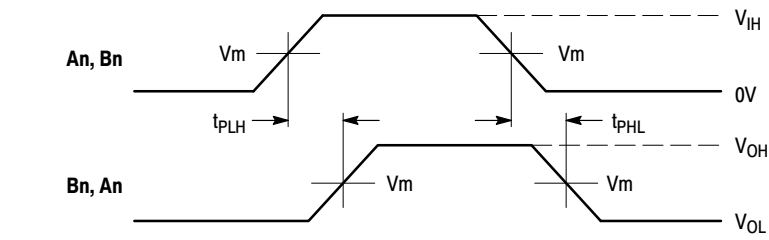
$C_L = 30\text{pF}$  or equivalent (Includes jig and probe capacitance)

$R_L = 500\Omega$  or equivalent

$R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

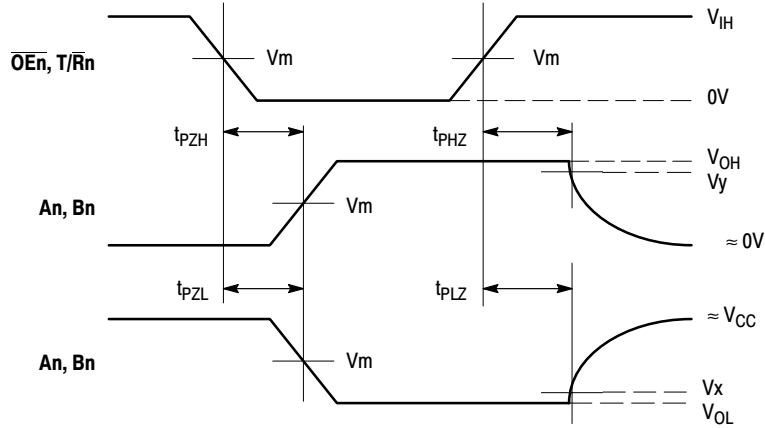
**Figure 5. Test Circuit**

## 74VCXH16245



**WAVEFORM 3 - PROPAGATION DELAYS**

$t_R = t_F = 2.0\text{ns}$ , 10% to 90%;  $f = 1\text{MHz}$ ;  $t_W = 500\text{ns}$

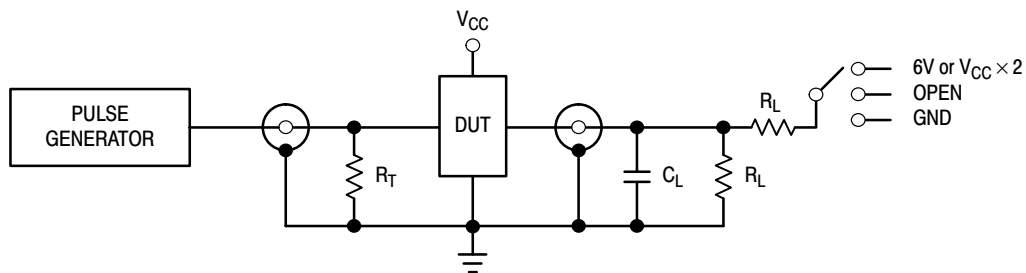


**WAVEFORM 4 - OUTPUT ENABLE AND DISABLE TIMES**

$t_R = t_F = 2.0\text{ns}$ , 10% to 90%;  $f = 1\text{MHz}$ ;  $t_W = 500\text{ns}$

**Figure 6. AC Waveforms**

| Symbol   | $V_{CC}$                      |                        |
|----------|-------------------------------|------------------------|
|          | $3.3\text{V} \pm 0.3\text{V}$ | $2.7\text{V}$          |
| $V_{IH}$ | $2.7\text{V}$                 | $2.7\text{V}$          |
| $V_m$    | $1.5\text{V}$                 | $1.5\text{V}$          |
| $V_x$    | $V_{OL} + 0.3\text{V}$        | $V_{OL} + 0.3\text{V}$ |
| $V_y$    | $V_{OH} - 0.3\text{V}$        | $V_{OH} - 0.3\text{V}$ |



| TEST                  | SWITCH                                                                                                                          |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------|
| $t_{PLH}$ , $t_{PHL}$ | Open                                                                                                                            |
| $t_{PZL}$ , $t_{PLZ}$ | $6\text{V}$ at $V_{CC} = 3.3 \pm 0.3\text{V}$ ;<br>$V_{CC} \times 2$ at $V_{CC} = 2.5 \pm 0.2\text{V}$ ; $1.8 \pm 0.15\text{V}$ |
| $t_{PZH}$ , $t_{PHZ}$ | GND                                                                                                                             |

$C_L = 50\text{pF}$  or equivalent (Includes jig and probe capacitance)

$R_L = 500\Omega$  or equivalent

$R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

**Figure 7. Test Circuit**

