

## 16 位双电源总线收发器

### 此收发器具有可配置电压转换和三态输出

查询样品: **SN74LVC16T245-EP**

#### 特性

- 控制输入  $V_{IH}$  和  $V_{IL}$  电平以  $V_{CCA}$  电压为基准
- $V_{CC}$  隔离特性-如果任何一个  $V_{CC}$  输入接地 (GND), 那么两个端口都处于高阻抗状态
- 过压耐受输入和输出可实现混合电压模式数据通信
- 完全可配置双电源轨设计可使每个端口在整个 **1.65V-5.5V** 电源电压范围内运行
- $I_{关闭}$  支持部分断电模式工作
- 锁断性能超过 **100mA** (符合 **JESD 78, II 类规范** 的要求)
- 静电放电 (ESD) 保护性能超过 **JESD 22** 规范要求
  - **2000V** 人体模型 (A114-A)
  - **200V** 机器模型 (A115-A)
  - **1000V** 充电器件模型 (C101)

#### 支持国防、航空航天、和医疗应用

- 受控基线
- 一个组装和测试场所
- 一个制造场所
- 军用 (**-55°C 至 125°C**) 温度范围内可用 (1)
- 延长的产品生命周期
- 延长的产品变更通知
- 产品可追溯性

(1) 可定制工作温度范围

#### 说明

这个 16 位非反相总线收发器使用两个独立的可配置电源轨。A 端口被设计用于跟踪  $V_{CCA}$ 。  $V_{CCA}$  可接受从 1.65V 到 5.5V 范围内的任意电源电压。B 端口被设计用于跟踪  $V_{CCB}$ 。  $V_{CCB}$  可接受从 1.65 至 5.5V 间的任一电源电压值。这可实现 1.8V, 2.5V, 3.3V 和 5V 电压节点间的通用低压双向转换。

#### 说明 (继续)

SN74LVC16T245 针对两条数据总线间的异步通信而设计。方向控制 (DIR) 输入和输出使能 ( $\overline{OE}$ ) 输入的逻辑电平激活 B 端口输出或者 A 端口输出, 或者将两个输出端口都置于高阻抗模式。当 B 端口输出被激活时, 此器件将数据从 A 总线发送到 B 总线, 而当 A 端口输出被激活时, 此器件将数据从 B 总线发送到 A 总线。A 端口和 B 端口上的输入电路一直处于激活状态并且必须施加一个逻辑高或低电平以防止过多的  $I_{CC}$  和  $I_{CC2}$ 。

SN74LVC16T245 的设计方式决定了控制引脚 (1DIR, 2DIR,  $\overline{1OE}$  和  $\overline{2OE}$ ) 由  $V_{CCA}$  供电。

该器件完全符合使用  $I_{关闭}$  的部分断电应用的规范要求。  $I_{关闭}$  电路禁用输出, 从而可防止其断电时破坏性电流从该器件回流。

**DGG 封装**  
(顶视图)

|           |    |    |                  |
|-----------|----|----|------------------|
| 1DIR      | 1  | 48 | $\overline{1OE}$ |
| 1B1       | 2  | 47 | 1A1              |
| 1B2       | 3  | 46 | 1A2              |
| GND       | 4  | 45 | GND              |
| 1B3       | 5  | 44 | 1A3              |
| 1B4       | 6  | 43 | 1A4              |
| $V_{CCB}$ | 7  | 42 | $V_{CCA}$        |
| 1B5       | 8  | 41 | 1A5              |
| 1B6       | 9  | 40 | 1A6              |
| GND       | 10 | 39 | GND              |
| 1B7       | 11 | 38 | 1A7              |
| 1B8       | 12 | 37 | 1A8              |
| 2B1       | 13 | 36 | 2A1              |
| 2B2       | 14 | 35 | 2A2              |
| GND       | 15 | 34 | GND              |
| 2B3       | 16 | 33 | 2A3              |
| 2B4       | 17 | 32 | 2A4              |
| $V_{CCB}$ | 18 | 31 | $V_{CCA}$        |
| 2B5       | 19 | 30 | 2A5              |
| 2B6       | 20 | 29 | 2A6              |
| GND       | 21 | 28 | GND              |
| 2B7       | 22 | 27 | 2A7              |
| 2B8       | 23 | 26 | 2A8              |
| 2DIR      | 24 | 25 | $\overline{2OE}$ |



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

V<sub>CC</sub>隔离特性可确保 V<sub>CC</sub>中的任何一个是否接地，然后两个端口都处于高阻抗状态。

为了确保加电或断电期间的高阻抗状态， $\overline{OE}$ 应通过一个上拉电阻器被连接至 V<sub>CC</sub>；该电阻器的最小值由驱动器的电流吸收能力来决定。

Table 1. ORDERING INFORMATION<sup>(1)</sup>

| T <sub>A</sub> | PACKAGE   |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING | VID NUMBER       |
|----------------|-----------|--------------|-----------------------|------------------|------------------|
| -55°C to 125°C | TSSOP-DGG | Reel of 2000 | CLVC16T245MDGGREP     | LVC16T245M       | V62/12667-01XE   |
|                |           | Tube of 40   | CLVC16T245MDGGEP      |                  | V62/12667-01XE-T |

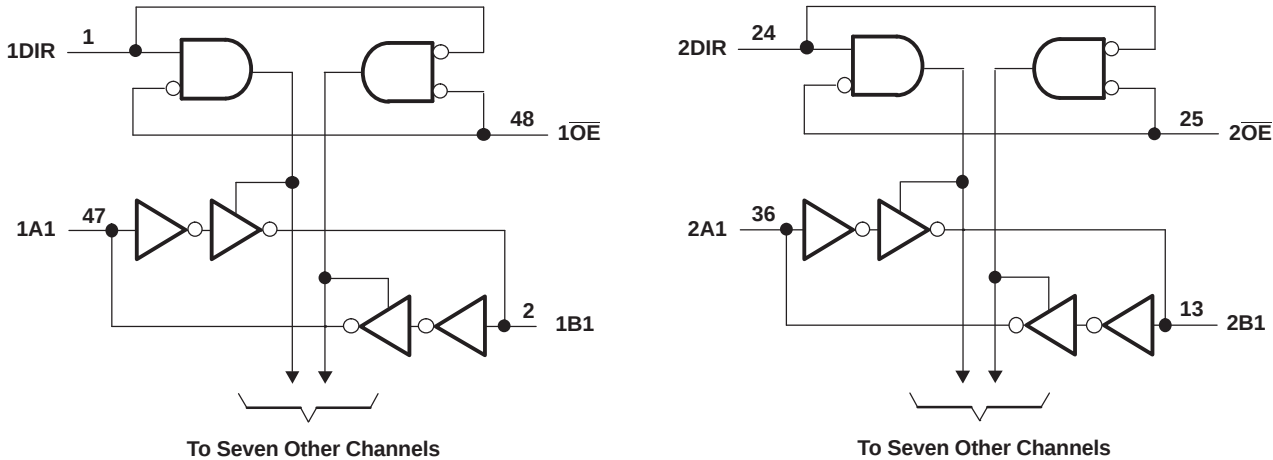
(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at [www.ti.com](http://www.ti.com).

FUNCTION TABLE<sup>(1)</sup>  
(EACH 8-BIT SECTION)

| CONTROL INPUTS  |     | OUTPUT CIRCUITS |         | OPERATION       |
|-----------------|-----|-----------------|---------|-----------------|
| $\overline{OE}$ | DIR | A PORT          | B PORT  |                 |
| L               | L   | Enabled         | Hi-Z    | B data to A bus |
| L               | H   | Hi-Z            | Enabled | A data to B bus |
| H               | X   | Hi-Z            | Hi-Z    | Isolation       |

(1) Input circuits of the data I/Os always are active.

LOGIC DIAGRAM (POSITIVE LOGIC)



## Absolute Maximum Ratings<sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted)

|                        |                                                                                             | MIN                | MAX  | UNIT            |
|------------------------|---------------------------------------------------------------------------------------------|--------------------|------|-----------------|
| $V_{CCA}$<br>$V_{CCB}$ | Supply voltage range                                                                        | –0.5               | 6.5  | V               |
| $V_I$                  | Input voltage range <sup>(2)</sup>                                                          | I/O ports (A port) | –0.5 | 6.5             |
|                        |                                                                                             | I/O ports (B port) | –0.5 | 6.5             |
|                        |                                                                                             | Control inputs     | –0.5 | 6.5             |
| $V_O$                  | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | A port             | –0.5 | 6.5             |
|                        |                                                                                             | B port             | –0.5 | 6.5             |
| $V_O$                  | Voltage range applied to any output in the high or low state <sup>(2) (3)</sup>             | A port             | –0.5 | $V_{CCA} + 0.5$ |
|                        |                                                                                             | B port             | –0.5 | $V_{CCB} + 0.5$ |
| $I_{IK}$               | Input clamp current                                                                         | $V_I < 0$          | –50  | mA              |
| $I_{OK}$               | Output clamp current                                                                        | $V_O < 0$          | –50  | mA              |
| $I_O$                  | Continuous output current                                                                   |                    | ±50  | mA              |
|                        | Continuous current through each $V_{CCA}$ , $V_{CCB}$ , and GND                             |                    | ±100 | mA              |
| $T_J$                  | Maximum junction temperature                                                                |                    | 150  | °C              |
| $T_{stg}$              | Storage temperature range                                                                   | –65                | 150  | °C              |

- (1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The output positive-voltage rating may be exceeded up to 6.5 V maximum if the output current rating is observed.

## THERMAL INFORMATION

| THERMAL METRIC <sup>(1)</sup> |                                                             | SN74LVC16T245 | UNITS |
|-------------------------------|-------------------------------------------------------------|---------------|-------|
|                               |                                                             | DGG           |       |
|                               |                                                             | 48 PINS       |       |
| $\theta_{JA}$                 | Junction-to-ambient thermal resistance <sup>(2)</sup>       | 59.9          | °C/W  |
| $\theta_{JCTop}$              | Junction-to-case (top) thermal resistance <sup>(3)</sup>    | 13.9          |       |
| $\theta_{JB}$                 | Junction-to-board thermal resistance <sup>(4)</sup>         | 27.1          |       |
| $\Psi_{JT}$                   | Junction-to-top characterization parameter <sup>(5)</sup>   | 0.5           |       |
| $\Psi_{JB}$                   | Junction-to-board characterization parameter <sup>(6)</sup> | 26.8          |       |
| $\theta_{JCbott}$             | Junction-to-case (bottom) thermal resistance <sup>(7)</sup> | N/A           |       |

- (1) 有关传统和新的热 度量的更多信息，请参阅IC 封装热度量应用报告， [SPRA953](#)。
- (2) 在 JESD51-2a 描述的环境中，按照 JESD51-7 的指定，在一个 JEDEC 标准高 K 电路板上进行仿真，从而获得自然 对流条件下的结至环境热阻。
- (3) 通过在封装顶部模拟一个冷板测试来获得结至芯片外壳（顶部）的热阻。不存在特定的 JEDEC 标准测试，但 可在 ANSI SEMI 标准 G30-88 中找到内容接近的说明。
- (4) 按照 JESD51-8 中的说明，通过 在配有用于控制 PCB 温度的环形冷板夹具的环境中进行仿真，以获得结板热阻。
- (5) 结至顶部特征参数，  $\Psi_{JT}$ ，估算真实系统中器件的结温，并使用 JESD51-2a（第 6 章和第 7 章）中 描述的程序从仿真数据中 提取出该参数以便获得  $\theta_{JA}$ 。
- (6) 结至电路板特征参数，  $\Psi_{JB}$ ，估算真实系统中器件的结温，并使用 JESD51-2a（第 6 章和第 7 章）中 描述的程序从仿真数据中 提取出该参数以便获得  $\theta_{JA}$ 。
- (7) 通过在外露（电源）焊盘上进行冷板测试仿真来获得 结至芯片外壳（底部）热阻。不存在特定的 JEDEC 标准 测试，但可在 ANSI SEMI 标准 G30-88 中找到内容接近的说明。

**Recommended Operating Conditions**<sup>(1)(2)(3)(4)</sup>

|                  |                                    |                                                                 | V <sub>CCI</sub> | V <sub>CCO</sub> | MIN                     | MAX              | UNIT |
|------------------|------------------------------------|-----------------------------------------------------------------|------------------|------------------|-------------------------|------------------|------|
| V <sub>CCA</sub> | Supply voltage                     |                                                                 |                  |                  | 1.65                    | 5.5              | V    |
| V <sub>CCB</sub> |                                    |                                                                 |                  |                  | 1.65                    | 5.5              |      |
| V <sub>IH</sub>  | High-level input voltage           | Data inputs <sup>(5)</sup>                                      | 1.65 V to 1.95 V |                  | V <sub>CCI</sub> × 0.65 |                  | V    |
|                  |                                    |                                                                 | 2.3 V to 2.7 V   |                  | 1.7                     |                  |      |
|                  |                                    |                                                                 | 3 V to 3.6 V     |                  | 2                       |                  |      |
|                  |                                    |                                                                 | 4.5 V to 5.5 V   |                  | V <sub>CCI</sub> × 0.7  |                  |      |
| V <sub>IL</sub>  | Low-level input voltage            | Data inputs <sup>(5)</sup>                                      | 1.65 V to 1.95 V |                  | V <sub>CCI</sub> × 0.35 |                  | V    |
|                  |                                    |                                                                 | 2.3 V to 2.7 V   |                  | 0.7                     |                  |      |
|                  |                                    |                                                                 | 3 V to 3.6 V     |                  | 0.8                     |                  |      |
|                  |                                    |                                                                 | 4.5 V to 5.5 V   |                  | V <sub>CCI</sub> × 0.3  |                  |      |
| V <sub>IH</sub>  | High-level input voltage           | Control inputs (referenced to V <sub>CCA</sub> ) <sup>(6)</sup> | 1.65 V to 1.95 V |                  | V <sub>CCA</sub> × 0.65 |                  | V    |
|                  |                                    |                                                                 | 2.3 V to 2.7 V   |                  | 1.7                     |                  |      |
|                  |                                    |                                                                 | 3 V to 3.6 V     |                  | 2                       |                  |      |
|                  |                                    |                                                                 | 4.5 V to 5.5 V   |                  | V <sub>CCA</sub> × 0.7  |                  |      |
| V <sub>IL</sub>  | Low-level input voltage            | Control inputs (referenced to V <sub>CCA</sub> ) <sup>(6)</sup> | 1.65 V to 1.95 V |                  | V <sub>CCA</sub> × 0.35 |                  | V    |
|                  |                                    |                                                                 | 2.3 V to 2.7 V   |                  | 0.7                     |                  |      |
|                  |                                    |                                                                 | 3 V to 3.6 V     |                  | 0.8                     |                  |      |
|                  |                                    |                                                                 | 4.5 V to 5.5 V   |                  | V <sub>CCA</sub> × 0.3  |                  |      |
| V <sub>I</sub>   | Input voltage                      | Control inputs                                                  |                  |                  | 0                       | 5.5              | V    |
| V <sub>I/O</sub> | Input/output voltage               | Active state                                                    |                  |                  | 0                       | V <sub>CCO</sub> | V    |
|                  |                                    | 3-State                                                         |                  |                  | 0                       | 5.5              |      |
| I <sub>OH</sub>  | High-level output current          |                                                                 |                  | 1.65 V to 1.95 V |                         | –4               | mA   |
|                  |                                    |                                                                 |                  | 2.3 V to 2.7 V   |                         | –8               |      |
|                  |                                    |                                                                 |                  | 3 V to 3.6 V     |                         | –24              |      |
|                  |                                    |                                                                 |                  | 4.5 V to 5.5 V   |                         | –32              |      |
| I <sub>OL</sub>  | Low-level output current           |                                                                 |                  | 1.65 V to 1.95 V |                         | 4                | mA   |
|                  |                                    |                                                                 |                  | 2.3 V to 2.7 V   |                         | 8                |      |
|                  |                                    |                                                                 |                  | 3 V to 3.6 V     |                         | 24               |      |
|                  |                                    |                                                                 |                  | 4.5 V to 5.5 V   |                         | 32               |      |
| Δt/Δv            | Input transition rise or fall rate | Data inputs                                                     | 1.65 V to 1.95 V |                  |                         | 20               | ns/V |
|                  |                                    |                                                                 | 2.3 V to 2.7 V   |                  |                         | 20               |      |
|                  |                                    |                                                                 | 3 V to 3.6 V     |                  |                         | 10               |      |
|                  |                                    |                                                                 | 4.5 V to 5.5 V   |                  |                         | 5                |      |
| T <sub>A</sub>   | Operating free-air temperature     |                                                                 |                  |                  | –55                     | 125              | °C   |

(1)  $V_{CCI}$  is the  $V_{CC}$  associated with the input port.(2)  $V_{CCO}$  is the  $V_{CC}$  associated with the output port.(3) All unused or driven (floating) data inputs (I/Os) of the device must be held at logic HIGH or LOW (preferably  $V_{CCI}$  or GND) to ensure proper device operation and minimize power. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.(4) All unused data inputs of the device must be held at  $V_{CCA}$  or GND to ensure proper device operation.(5) For  $V_{CCI}$  values not specified in the data sheet,  $V_{IH}$  min =  $V_{CCI} \times 0.7$  V,  $V_{IL}$  max =  $V_{CCI} \times 0.3$  V.(6) For  $V_{CCA}$  values not specified in the data sheet,  $V_{IH}$  min =  $V_{CCA} \times 0.7$  V,  $V_{IL}$  max =  $V_{CCA} \times 0.3$  V.

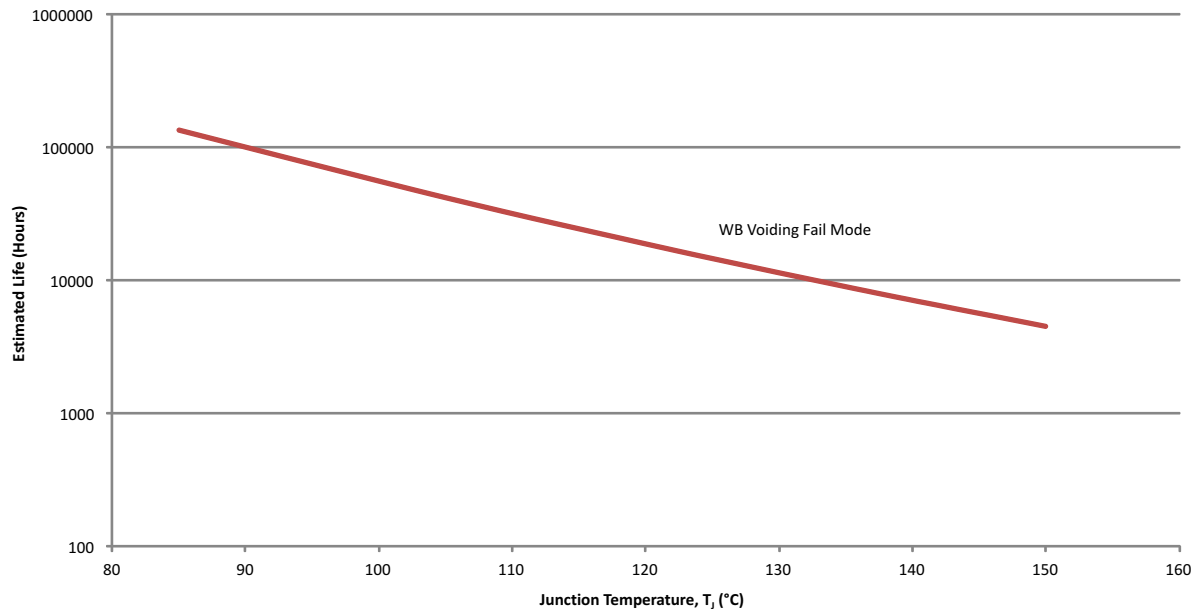
## Electrical Characteristics<sup>(1)(2)</sup>

$T_A = -55^\circ\text{C}$  to  $125^\circ\text{C}$ , over recommended input voltage range (unless otherwise noted)

| PARAMETER                           |                | TEST CONDITIONS                                                                   | V <sub>CCA</sub> | V <sub>CCB</sub> | MIN                    | TYP | MAX  | UNIT |
|-------------------------------------|----------------|-----------------------------------------------------------------------------------|------------------|------------------|------------------------|-----|------|------|
| V <sub>OH</sub>                     |                | I <sub>OH</sub> = −100 μA, V <sub>I</sub> = V <sub>IH</sub>                       | 1.65 V to 4.5 V  | 1.65 V to 4.5 V  | V <sub>CCO</sub> − 0.1 |     |      | V    |
|                                     |                | I <sub>OH</sub> = −4 mA, V <sub>I</sub> = V <sub>IH</sub>                         | 1.65 V           | 1.65 V           | 1.2                    |     |      |      |
|                                     |                | I <sub>OH</sub> = −8 mA, V <sub>I</sub> = V <sub>IH</sub>                         | 2.3 V            | 2.3 V            | 1.9                    |     |      |      |
|                                     |                | I <sub>OH</sub> = −24 mA, V <sub>I</sub> = V <sub>IH</sub>                        | 3 V              | 3 V              | 2.35                   |     |      |      |
|                                     |                | I <sub>OH</sub> = −32 mA, V <sub>I</sub> = V <sub>IH</sub>                        | 4.5 V            | 4.5 V            | 3.75                   |     |      |      |
| V <sub>OL</sub>                     |                | I <sub>OL</sub> = 100 μA, V <sub>I</sub> = V <sub>IL</sub>                        | 1.65 V to 4.5 V  | 1.65 V to 4.5 V  |                        |     | 0.1  | V    |
|                                     |                | I <sub>OL</sub> = 4 mA, V <sub>I</sub> = V <sub>IL</sub>                          | 1.65 V           | 1.65 V           |                        |     | 0.45 |      |
|                                     |                | I <sub>OL</sub> = 8 mA, V <sub>I</sub> = V <sub>IL</sub>                          | 2.3 V            | 2.3 V            |                        |     | 0.3  |      |
|                                     |                | I <sub>OL</sub> = 24 mA, V <sub>I</sub> = V <sub>IL</sub>                         | 3 V              | 3 V              |                        |     | 0.65 |      |
|                                     |                | I <sub>OL</sub> = 32 mA, V <sub>I</sub> = V <sub>IL</sub>                         | 4.5 V            | 4.5 V            |                        |     | 0.65 |      |
| I <sub>I</sub>                      | Control inputs | V <sub>I</sub> = V <sub>CCA</sub> or GND                                          | 1.65 V to 5.5 V  | 1.65 V to 5.5 V  |                        |     | ±2   | μA   |
| I <sub>off</sub>                    | A or B port    | V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V                                     | 0 V              | 0 to 5.5 V       |                        |     | ±10  | μA   |
|                                     |                |                                                                                   | 0 to 5.5 V       | 0 V              |                        |     | ±10  |      |
| I <sub>OZ</sub>                     | A or B port    | V <sub>O</sub> = V <sub>CCO</sub> or GND, OE = V <sub>IH</sub>                    | 1.65 V to 5.5 V  | 1.65 V to 5.5 V  |                        |     | ±10  | μA   |
| I <sub>CCA</sub>                    |                | V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0                      | 1.65 V to 5.5 V  | 1.65 V to 5.5 V  |                        |     | 20   | μA   |
|                                     |                |                                                                                   | 5 V              | 0 V              |                        |     | 20   |      |
|                                     |                |                                                                                   | 0 V              | 5 V              |                        |     | −2.5 |      |
| I <sub>CCB</sub>                    |                | V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0                      | 1.65 V to 5.5 V  | 1.65 V to 5.5 V  |                        |     | 20   | μA   |
|                                     |                |                                                                                   | 5 V              | 0 V              |                        |     | −2.5 |      |
|                                     |                |                                                                                   | 0 V              | 5 V              |                        |     | 20   |      |
| I <sub>CCA</sub> + I <sub>CCB</sub> |                | V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0                      | 1.65 V to 5.5 V  | 1.65 V to 5.5 V  |                        |     | 30   | μA   |
| ΔI <sub>CCA</sub>                   | A port         | One A port at V <sub>CCA</sub> − 0.6 V, DIR at V <sub>CCA</sub> , B port = open   | 3 V to 5.5 V     | 3 V to 5.5 V     |                        |     | 50   | μA   |
|                                     | DIR            | DIR at V <sub>CCA</sub> − 0.6 V, B port = open, A port at V <sub>CCA</sub> or GND |                  |                  |                        |     | 50   |      |
| ΔI <sub>CCB</sub>                   | B port         | One B port at V <sub>CCB</sub> − 0.6 V, DIR at GND, A port = open                 | 3 V to 5.5 V     | 3 V to 5.5 V     |                        |     | 50   | μA   |
| C <sub>i</sub>                      | Control inputs | V <sub>I</sub> = V <sub>CCA</sub> or GND                                          | 3.3 V            | 3.3 V            |                        | 4   |      | pF   |
| C <sub>i0</sub>                     | A or B port    | V <sub>O</sub> = V <sub>CCA/B</sub> or GND                                        | 3.3 V            | 3.3 V            |                        | 8.5 |      | pF   |

(1)  $V_{CCO}$  is the  $V_{CC}$  associated with the output port.

(2)  $V_{CCI}$  is the  $V_{CC}$  associated with the input port.



- (1) See datasheet for absolute maximum and minimum recommended operating conditions.

**Figure 1. SN74LVC16T245-EP Operating Life Derating Chart**

## Switching Characteristics

$T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CCA} = 1.8\text{ V} \pm 0.15\text{ V}$  (unless otherwise noted) (see [Figure 2](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$ |      | $V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$ |      | $V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$ |      | $V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$ |      | UNIT |
|-----------|-----------------|----------------|--------------------------------------------|------|-------------------------------------------|------|-------------------------------------------|------|-----------------------------------------|------|------|
|           |                 |                | MIN                                        | MAX  | MIN                                       | MAX  | MIN                                       | MAX  | MIN                                     | MAX  |      |
| $t_{PLH}$ | A               | B              | 1.7                                        | 21.9 | 1.3                                       | 9.2  | 1                                         | 7.4  | 0.8                                     | 7.1  | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PLH}$ | B               | A              | 0.9                                        | 23.8 | 0.8                                       | 23.6 | 0.7                                       | 23.4 | 0.7                                     | 23.4 | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              | 1.6                                        | 29.6 | 1.5                                       | 29.4 | 1.5                                       | 29.3 | 1.4                                     | 29.2 | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              | 2.4                                        | 32.2 | 1.9                                       | 13.1 | 1.7                                       | 12   | 1.3                                     | 10.3 | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PZH}$ | $\overline{OE}$ | A              | 0.4                                        | 24   | 0.4                                       | 23.8 | 0.4                                       | 23.7 | 0.4                                     | 23.7 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PZH}$ | $\overline{OE}$ | B              | 1.8                                        | 32   | 1.6                                       | 16   | 1.2                                       | 12.6 | 0.9                                     | 10.8 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |

## Switching Characteristics

$T_A = -55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ ,  $V_{CCA} = 1.8\text{ V} \pm 0.15\text{ V}$  (unless otherwise noted) (see [Figure 2](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$ |      | $V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$ |      | $V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$ |      | $V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$ |      | UNIT |
|-----------|-----------------|----------------|--------------------------------------------|------|-------------------------------------------|------|-------------------------------------------|------|-----------------------------------------|------|------|
|           |                 |                | MIN                                        | MAX  | MIN                                       | MAX  | MIN                                       | MAX  | MIN                                     | MAX  |      |
| $t_{PLH}$ | A               | B              |                                            | 25.9 |                                           | 13.2 |                                           | 11.4 |                                         | 11.1 | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PLH}$ | B               | A              |                                            | 27.8 |                                           | 27.8 |                                           | 27.4 |                                         | 27.4 | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              |                                            | 33.6 |                                           | 33.4 |                                           | 33.3 |                                         | 33.2 | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              |                                            | 36.2 |                                           | 17.1 |                                           | 16   |                                         | 14.3 | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PZH}$ | $\overline{OE}$ | A              |                                            | 28   |                                           | 27.8 |                                           | 27.7 |                                         | 27.7 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PZH}$ | $\overline{OE}$ | B              |                                            | 36   |                                           | 22   |                                           | 16.6 |                                         | 14.8 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |

## Switching Characteristics

$T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$ ,  $V_{CCA} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted) (see [Figure 2](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$ |      | $V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$ |      | $V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$ |      | $V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$ |      | UNIT |
|-----------|-----------------|----------------|--------------------------------------------|------|-------------------------------------------|------|-------------------------------------------|------|-----------------------------------------|------|------|
|           |                 |                | MIN                                        | MAX  | MIN                                       | MAX  | MIN                                       | MAX  | MIN                                     | MAX  |      |
| $t_{PLH}$ | A               | B              | 1.6                                        | 21.4 | 1.2                                       | 9    | 0.8                                       | 6.2  | 0.6                                     | 4.8  | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PLH}$ | B               | A              | 1.2                                        | 9.3  | 1                                         | 9.1  | 1                                         | 8.9  | 0.9                                     | 8.8  | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              | 1.4                                        | 9    | 1.4                                       | 9    | 1.4                                       | 9    | 1.4                                     | 9    | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              | 2.3                                        | 29.6 | 1.8                                       | 11   | 1.7                                       | 9.3  | 0.9                                     | 6.9  | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PZH}$ | $\overline{OE}$ | A              | 1                                          | 10.9 | 1                                         | 10.9 | 1                                         | 10.9 | 1                                       | 10.9 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PZH}$ | $\overline{OE}$ | B              | 1.7                                        | 28.2 | 1.6                                       | 12.9 | 1.2                                       | 9.4  | 1                                       | 6.9  | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |

## Switching Characteristics

$T_A = -55^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{CCA} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted) (see [Figure 2](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$ |      | $V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$ |      | $V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$ |      | $V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$ |      | UNIT |
|-----------|-----------------|----------------|--------------------------------------------|------|-------------------------------------------|------|-------------------------------------------|------|-----------------------------------------|------|------|
|           |                 |                | MIN                                        | MAX  | MIN                                       | MAX  | MIN                                       | MAX  | MIN                                     | MAX  |      |
| $t_{PLH}$ | A               | B              |                                            | 25.4 |                                           | 13   |                                           | 10.2 |                                         | 8.8  | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PLH}$ | B               | A              |                                            | 13.3 |                                           | 13.1 |                                           | 12.9 |                                         | 12.8 | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              |                                            | 13   |                                           | 13   |                                           | 13   |                                         | 13   | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              |                                            | 33.6 |                                           | 14   |                                           | 14.3 |                                         | 10.9 | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PZH}$ | $\overline{OE}$ | A              |                                            | 14.9 |                                           | 14.9 |                                           | 14.9 |                                         | 14.9 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PZH}$ | $\overline{OE}$ | B              |                                            | 32.2 |                                           | 16.9 |                                           | 13.4 |                                         | 10.9 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |

## Switching Characteristics

$T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{CCA} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see [Figure 2](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$ |      | $V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$ |      | $V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$ |     | $V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$ |     | UNIT |
|-----------|-----------------|----------------|--------------------------------------------|------|-------------------------------------------|------|-------------------------------------------|-----|-----------------------------------------|-----|------|
|           |                 |                | MIN                                        | MAX  | MIN                                       | MAX  | MIN                                       | MAX | MIN                                     | MAX |      |
| $t_{PLH}$ | A               | B              | 1.5                                        | 21.2 | 1.1                                       | 8.8  | 0.8                                       | 6.1 | 0.5                                     | 4.4 | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |     |                                         |     |      |
| $t_{PLH}$ | B               | A              | 0.9                                        | 7.2  | 0.8                                       | 6.2  | 0.7                                       | 6.1 | 0.6                                     | 6   | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |     |                                         |     |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              | 1.6                                        | 8.2  | 1.6                                       | 8.2  | 1.6                                       | 6.2 | 1.6                                     | 8.2 | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |     |                                         |     |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              | 2.1                                        | 29   | 1.7                                       | 10.3 | 1.5                                       | 8.6 | 0.8                                     | 6.3 | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |     |                                         |     |      |
| $t_{PZH}$ | $\overline{OE}$ | A              | 0.8                                        | 7.8  | 0.8                                       | 7.8  | 0.8                                       | 7.8 | 0.8                                     | 7.8 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |     |                                         |     |      |
| $t_{PZH}$ | $\overline{OE}$ | B              | 1.6                                        | 27.7 | 1.4                                       | 12.4 | 1.1                                       | 8.5 | 0.9                                     | 8.4 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |     |                                         |     |      |

## Switching Characteristics

$T_A = -55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ ,  $V_{CCA} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see [Figure 2](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$ |      | $V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$ |      | $V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$ |      | $V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$ |      | UNIT |
|-----------|-----------------|----------------|--------------------------------------------|------|-------------------------------------------|------|-------------------------------------------|------|-----------------------------------------|------|------|
|           |                 |                | MIN                                        | MAX  | MIN                                       | MAX  | MIN                                       | MAX  | MIN                                     | MAX  |      |
| $t_{PLH}$ | A               | B              |                                            | 25.2 |                                           | 12.8 |                                           | 10.2 |                                         | 8.4  | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PLH}$ | B               | A              |                                            | 11.2 |                                           | 10.2 |                                           | 10.1 |                                         | 10   | ns   |
| $t_{PHL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              |                                            | 12.2 |                                           | 12.2 |                                           | 12.2 |                                         | 12.2 | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              |                                            | 33   |                                           | 14.3 |                                           | 12.8 |                                         | 10.3 | ns   |
| $t_{PLZ}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PZH}$ | $\overline{OE}$ | A              |                                            | 11.8 |                                           | 12.1 |                                           | 12.1 |                                         | 12.1 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |
| $t_{PZH}$ | $\overline{OE}$ | B              |                                            | 31.7 |                                           | 16.4 |                                           | 12.9 |                                         | 10.4 | ns   |
| $t_{PZL}$ |                 |                |                                            |      |                                           |      |                                           |      |                                         |      |      |

## Switching Characteristics

$T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$ ,  $V_{CCA} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see [Figure 2](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$ |      | $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ |      | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ |     | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ |     | UNIT |
|-----------|-----------------|----------------|-------------------------------------------|------|------------------------------------------|------|------------------------------------------|-----|----------------------------------------|-----|------|
|           |                 |                | MIN                                       | MAX  | MIN                                      | MAX  | MIN                                      | MAX | MIN                                    | MAX |      |
| $t_{PLH}$ | A               | B              | 1.6                                       | 21.4 | 1                                        | 8.8  | 0.7                                      | 6   | 0.4                                    | 4.2 | ns   |
| $t_{PHL}$ |                 |                |                                           |      |                                          |      |                                          |     |                                        |     |      |
| $t_{PLH}$ | B               | A              | 0.7                                       | 6.8  | 0.4                                      | 4.8  | 0.3                                      | 4.5 | 0.3                                    | 4.3 | ns   |
| $t_{PHL}$ |                 |                |                                           |      |                                          |      |                                          |     |                                        |     |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              | 0.3                                       | 5.4  | 0.3                                      | 5.4  | 0.3                                      | 5.4 | 0.3                                    | 6.4 | ns   |
| $t_{PLZ}$ |                 |                |                                           |      |                                          |      |                                          |     |                                        |     |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              | 2                                         | 28.7 | 1.6                                      | 9.7  | 1.4                                      | 8   | 0.7                                    | 5.7 | ns   |
| $t_{PLZ}$ |                 |                |                                           |      |                                          |      |                                          |     |                                        |     |      |
| $t_{PZH}$ | $\overline{OE}$ | A              | 0.7                                       | 5.5  | 0.7                                      | 5.5  | 0.7                                      | 5.5 | 0.7                                    | 5.5 | ns   |
| $t_{PZL}$ |                 |                |                                           |      |                                          |      |                                          |     |                                        |     |      |
| $t_{PZH}$ | $\overline{OE}$ | B              | 1.6                                       | 27.6 | 1.3                                      | 11.4 | 1                                        | 8.1 | 0.9                                    | 6   | ns   |
| $t_{PZL}$ |                 |                |                                           |      |                                          |      |                                          |     |                                        |     |      |

## Switching Characteristics

$T_A = -55^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{CCA} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see [Figure 2](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$ |      | $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ |      | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ |      | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ |      | UNIT |
|-----------|-----------------|----------------|-------------------------------------------|------|------------------------------------------|------|------------------------------------------|------|----------------------------------------|------|------|
|           |                 |                | MIN                                       | MAX  | MIN                                      | MAX  | MIN                                      | MAX  | MIN                                    | MAX  |      |
| $t_{PLH}$ | A               | B              |                                           | 25.4 |                                          | 14.3 |                                          | 10   |                                        | 8.2  | ns   |
| $t_{PHL}$ |                 |                |                                           |      |                                          |      |                                          |      |                                        |      |      |
| $t_{PLH}$ | B               | A              |                                           | 11   |                                          | 8.8  |                                          | 8.5  |                                        | 8.3  | ns   |
| $t_{PHL}$ |                 |                |                                           |      |                                          |      |                                          |      |                                        |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              |                                           | 9.4  |                                          | 9.4  |                                          | 9.4  |                                        | 9.4  | ns   |
| $t_{PLZ}$ |                 |                |                                           |      |                                          |      |                                          |      |                                        |      |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              |                                           | 32.7 |                                          | 13.7 |                                          | 12   |                                        | 9.7  | ns   |
| $t_{PLZ}$ |                 |                |                                           |      |                                          |      |                                          |      |                                        |      |      |
| $t_{PZH}$ | $\overline{OE}$ | A              |                                           | 10.4 |                                          | 10.4 |                                          | 10.4 |                                        | 10.4 | ns   |
| $t_{PZL}$ |                 |                |                                           |      |                                          |      |                                          |      |                                        |      |      |
| $t_{PZH}$ | $\overline{OE}$ | B              |                                           | 31.6 |                                          | 19.3 |                                          | 12.6 |                                        | 10   | ns   |
| $t_{PZL}$ |                 |                |                                           |      |                                          |      |                                          |      |                                        |      |      |

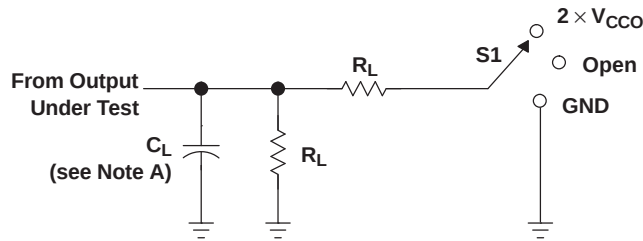
## Operating Characteristics

$T_A = 25^\circ\text{C}$

| PARAMETER                |                             | TEST<br>CONDITIONS                                                | $V_{CCA} =$<br>$V_{CCB} = 1.8\text{ V}$ | $V_{CCA} =$<br>$V_{CCB} = 2.5\text{ V}$ | $V_{CCA} =$<br>$V_{CCB} = 3.3\text{ V}$ | $V_{CCA} =$<br>$V_{CCB} = 5\text{ V}$ | UNIT |
|--------------------------|-----------------------------|-------------------------------------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|---------------------------------------|------|
|                          |                             |                                                                   | TYP                                     | TYP                                     | TYP                                     | TYP                                   |      |
| $C_{pdA}$ <sup>(1)</sup> | A-port input, B-port output | $C_L = 0$ ,<br>$f = 10\text{ MHz}$ ,<br>$t_r = t_f = 1\text{ ns}$ | 2                                       | 2                                       | 2                                       | 3                                     | pF   |
|                          | B-port input, A-port output |                                                                   | 18                                      | 19                                      | 19                                      | 22                                    |      |
| $C_{pdB}$ <sup>(1)</sup> | A-port input, B-port output |                                                                   | 18                                      | 19                                      | 20                                      | 22                                    |      |
|                          | B-port input, A-port output |                                                                   | 2                                       | 2                                       | 2                                       | 2                                     |      |

(1) Power dissipation capacitance per transceiver

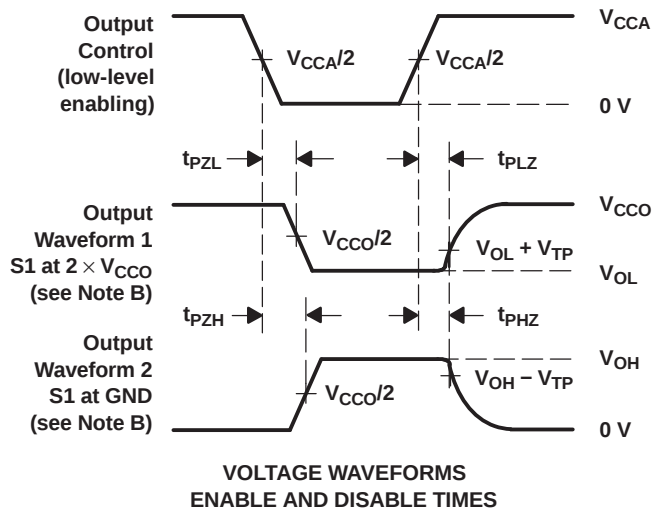
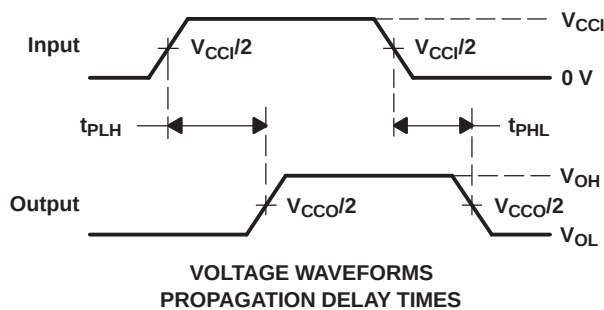
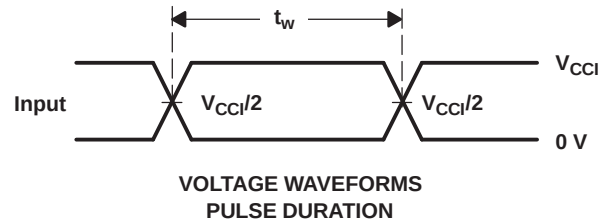
## PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT

| $V_{CCO}$                        | $C_L$ | $R_L$        | $V_{TP}$ |
|----------------------------------|-------|--------------|----------|
| $1.8\text{ V} \pm 0.15\text{ V}$ | 15 pF | 2 k $\Omega$ | 0.15 V   |
| $2.5\text{ V} \pm 0.2\text{ V}$  | 15 pF | 2 k $\Omega$ | 0.15 V   |
| $3.3\text{ V} \pm 0.3\text{ V}$  | 15 pF | 2 k $\Omega$ | 0.3 V    |
| $5\text{ V} \pm 0.5\text{ V}$    | 15 pF | 2 k $\Omega$ | 0.3 V    |

| TEST              | S1                 |
|-------------------|--------------------|
| $t_{pd}$          | Open               |
| $t_{PLZ}/t_{PZL}$ | $2 \times V_{CCO}$ |
| $t_{PHZ}/t_{PZH}$ | GND                |



- NOTES:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $dv/dt \geq 1\text{ V/ns}$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - $V_{CCI}$  is the  $V_{CC}$  associated with the input port.
  - $V_{CCO}$  is the  $V_{CC}$  associated with the output port.
  - All parameters and waveforms are not applicable to all devices.

Figure 2. Load Circuit and Voltage Waveforms

## PACKAGING INFORMATION

| Orderable Device  | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2) | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|-------------------|---------------|--------------|--------------------|------|----------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| CLVC16T245MDGGEP  | ACTIVE        | TSSOP        | DGG                | 48   | 40             | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | LVC16T245M              | <a href="#">Samples</a> |
| CLVC16T245MDGGREP | ACTIVE        | TSSOP        | DGG                | 48   | 2000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | LVC16T245M              | <a href="#">Samples</a> |
| V62/12667-01XE    | ACTIVE        | TSSOP        | DGG                | 48   | 2000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | LVC16T245M              | <a href="#">Samples</a> |
| V62/12667-01XE-T  | ACTIVE        | TSSOP        | DGG                | 48   | 40             | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | LVC16T245M              | <a href="#">Samples</a> |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSELETE:** TI has discontinued the production of the device.

<sup>(2)</sup> **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

<sup>(3)</sup> MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

<sup>(4)</sup> There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

<sup>(5)</sup> Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

<sup>(6)</sup> Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

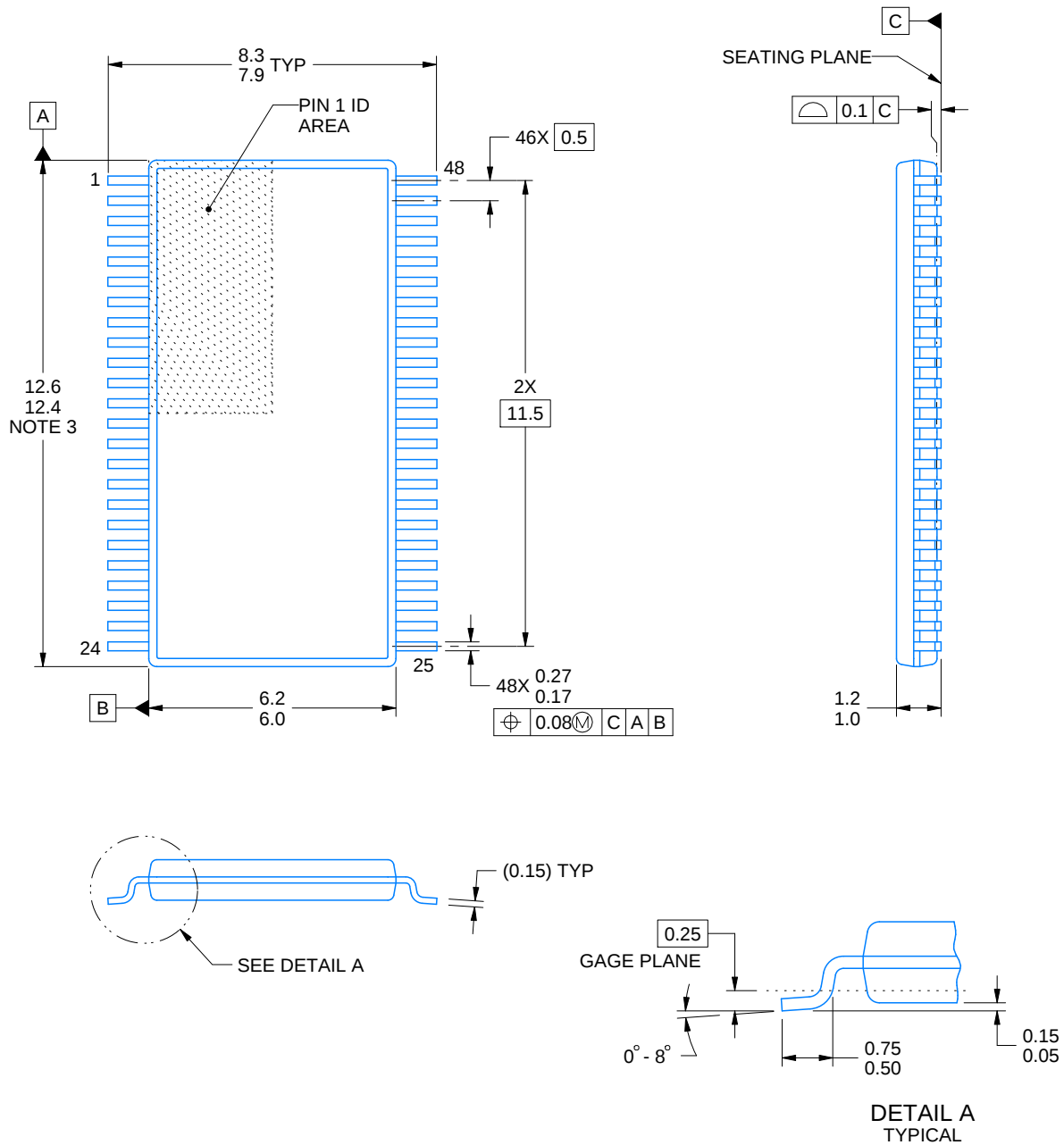
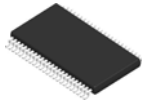
| Device            | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CLVC16T245MDGGREP | TSSOP        | DGG             | 48   | 2000 | 330.0              | 24.4               | 8.6     | 13.0    | 1.8     | 12.0    | 24.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device            | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CLVC16T245MDGGREP | TSSOP        | DGG             | 48   | 2000 | 367.0       | 367.0      | 45.0        |



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## NOTES:

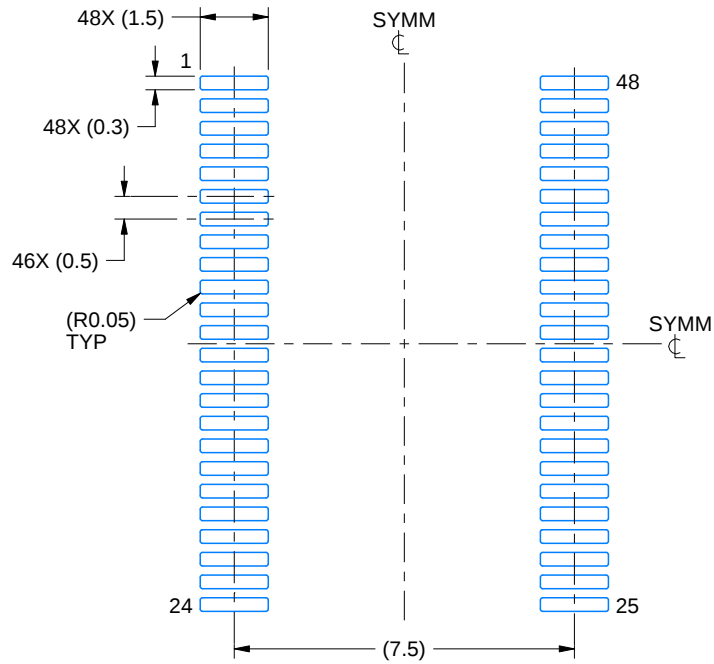
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

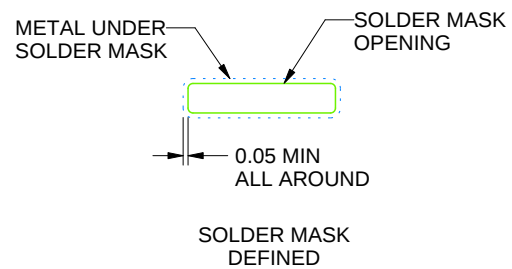
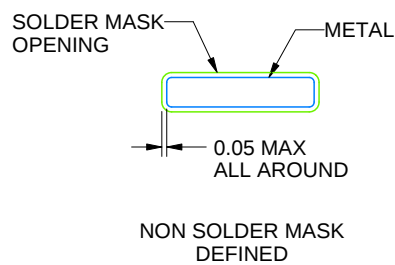
DGG0048A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

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NOTES: (continued)

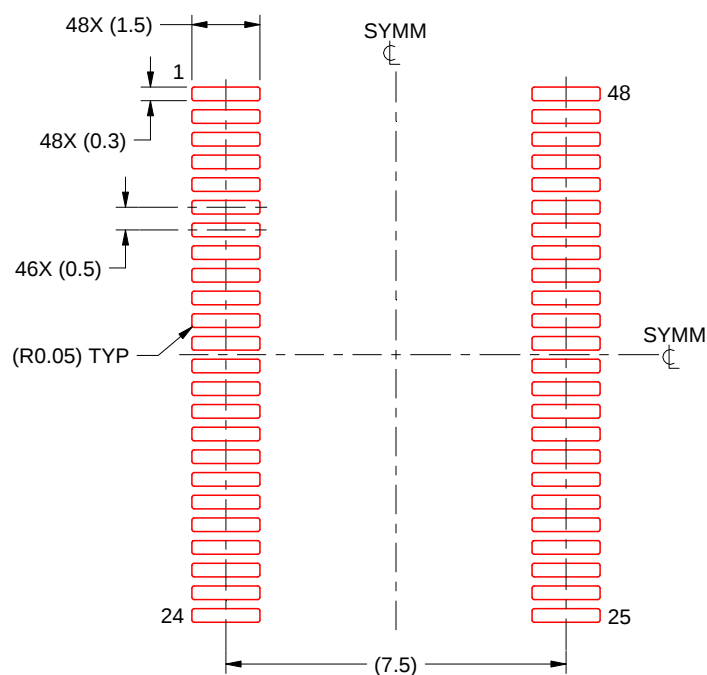
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DGG0048A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

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NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

## DGG (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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