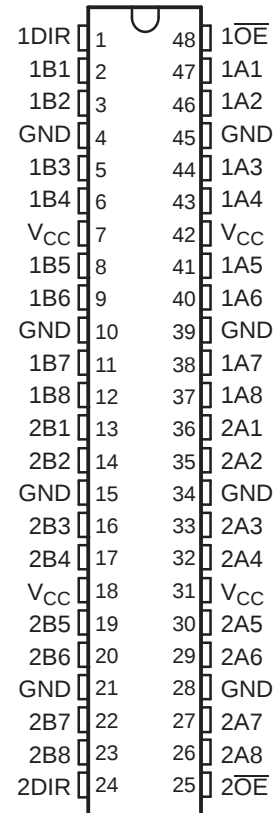


## FEATURES

- Member of the Texas Instruments Widebus™ Family
- State-of-the-Art Advanced BiCMOS Technology (ABT) Design for 3.3-V Operation and Low Static-Power Dissipation
- Support Mixed-Mode Signal Operation (5-V Input and Output Voltages With 3.3-V  $V_{CC}$ )
- Support Unregulated Battery Operation Down to 2.7 V
- Typical  $V_{OLP}$  (Output Ground Bounce) <0.8 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- $I_{off}$  and Power-Up 3-State Support Hot Insertion
- Distributed  $V_{CC}$  and GND Pins Minimize High-Speed Switching Noise
- Flow-Through Architecture Optimizes PCB Layout
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

SN54LVT16245B . . . WD PACKAGE  
SN74LVT16245B . . . DGG, DGV, OR DL PACKAGE  
(TOP VIEW)



## DESCRIPTION/ORDERING INFORMATION

### ORDERING INFORMATION

| $T_A$          | PACKAGE <sup>(1)</sup> |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------------------|--------------|-----------------------|------------------|
| –40°C to 85°C  | FBGA – GRD             | Reel of 1000 | SN74LVT16245BGRDR     | VD245B           |
|                | FBGA – ZRD (Pb-free)   |              | SN74LVT16245BZRDR     |                  |
|                | SSOP – DL              | Tube of 25   | SN74LVT16245BDL       | LVT16245B        |
|                |                        |              | SN74LVT16245BDLG4     |                  |
|                |                        | Reel of 1000 | SN74LVT16245BDLR      |                  |
|                |                        |              | 74LVT16245BDLRG4      |                  |
|                | TSSOP – DGG            | Reel of 2000 | SN74LVT16245BDGGR     | LVT16245B        |
|                |                        |              | 74LVT16245BDGGRE4     |                  |
|                | TVSOP – DGV            | Reel of 2000 | SN74LVT16245BDGVR     | VD245B           |
|                |                        |              | 74LVT16245BDGVRE4     |                  |
| –55°C to 125°C | VFBGA – GQL            | Reel of 1000 | SN74LVT16245BGQLR     | VD245B           |
|                | VFBGA – ZQL (Pb-free)  |              | SN74LVT16245BZQLR     |                  |
|                | CFP – WD               | Tube         | SNJ54LVT16245BWD      | SNJ54LVT16245BWD |
|                |                        |              |                       |                  |

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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.

Widebus is a trademark of Texas Instruments.

# SN54LVT16245B, SN74LVT16245B

## 3.3-V ABT 16-BIT BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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## DESCRIPTION/ORDERING INFORMATION (CONTINUED)

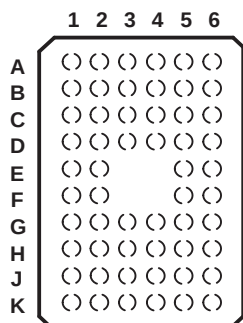
The 'LVT16245B devices are 16-bit (dual-octal) noninverting 3-state transceivers designed for low-voltage (3.3-V)  $V_{CC}$  operation, but with the capability to provide a TTL interface to a 5-V system environment.

These devices are designed for asynchronous communication between two data buses. The logic levels of the direction-control (DIR) input and the output-enable ( $\overline{OE}$ ) input activate either the B-port outputs or the A-port outputs or place both output ports into the high-impedance mode. The device transmits data from the A bus to the B bus when the B-port outputs are activated, and from the B bus to the A bus when the A-port outputs are activated. The input circuitry on both A and B ports is always active and must have a logic HIGH or LOW level applied to prevent excess  $I_{CC}$  and  $I_{CCZ}$ .

When  $V_{CC}$  is between 0 and 1.5 V, the devices are in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 1.5 V,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

These devices are fully specified for hot-insertion applications using  $I_{off}$  and power-up 3-state. The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down. The power-up 3-state circuitry places the outputs in the high-impedance state during power up and power down, which prevents driver conflict.

**GQL OR ZQL PACKAGE**  
(TOP VIEW)

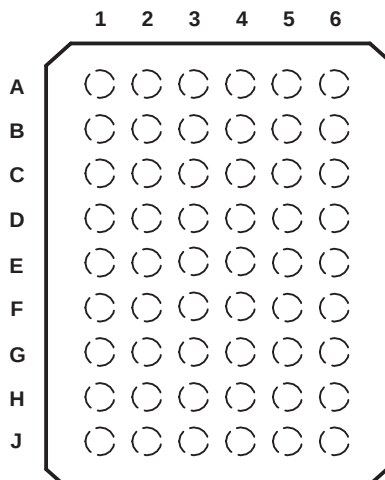


**TERMINAL ASSIGNMENTS<sup>(1)</sup>**  
(56-Ball GQL/ZQL Package)

|          | 1    | 2   | 3        | 4        | 5   | 6                 |
|----------|------|-----|----------|----------|-----|-------------------|
| <b>A</b> | 1DIR | NC  | NC       | NC       | NC  | 1 $\overline{OE}$ |
| <b>B</b> | 1B2  | 1B1 | GND      | GND      | 1A1 | 1A2               |
| <b>C</b> | 1B4  | 1B3 | $V_{CC}$ | $V_{CC}$ | 1A3 | 1A4               |
| <b>D</b> | 1B6  | 1B5 | GND      | GND      | 1A5 | 1A6               |
| <b>E</b> | 1B8  | 1B7 |          |          | 1A7 | 1A8               |
| <b>F</b> | 2B1  | 2B2 |          |          | 2A2 | 2A1               |
| <b>G</b> | 2B3  | 2B4 | GND      | GND      | 2A4 | 2A3               |
| <b>H</b> | 2B5  | 2B6 | $V_{CC}$ | $V_{CC}$ | 2A6 | 2A5               |
| <b>J</b> | 2B7  | 2B8 | GND      | GND      | 2A8 | 2A7               |
| <b>K</b> | 2DIR | NC  | NC       | NC       | NC  | 2 $\overline{OE}$ |

(1) NC – No internal connection

**GRD OR ZRD PACKAGE**  
(TOP VIEW)



**TERMINAL ASSIGNMENTS<sup>(1)</sup>**  
(54-Ball GRD/ZRD Package)

|          | 1   | 2   | 3        | 4                 | 5   | 6   |
|----------|-----|-----|----------|-------------------|-----|-----|
| <b>A</b> | 1B1 | NC  | 1DIR     | 1 $\overline{OE}$ | NC  | 1A1 |
| <b>B</b> | 1B3 | 1B2 | NC       | NC                | 1A2 | 1A3 |
| <b>C</b> | 1B5 | 1B4 | $V_{CC}$ | $V_{CC}$          | 1A4 | 1A5 |
| <b>D</b> | 1B7 | 1B6 | GND      | GND               | 1A6 | 1A7 |
| <b>E</b> | 2B1 | 1B8 | GND      | GND               | 1A8 | 2A1 |
| <b>F</b> | 2B3 | 2B2 | GND      | GND               | 2A2 | 2A3 |
| <b>G</b> | 2B5 | 2B4 | $V_{CC}$ | $V_{CC}$          | 2A4 | 2A5 |
| <b>H</b> | 2B7 | 2B6 | NC       | NC                | 2A6 | 2A7 |
| <b>J</b> | 2B8 | NC  | 2DIR     | 2 $\overline{OE}$ | NC  | 2A8 |

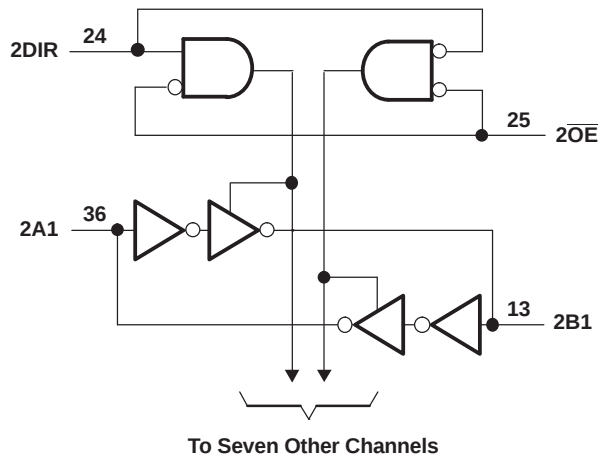
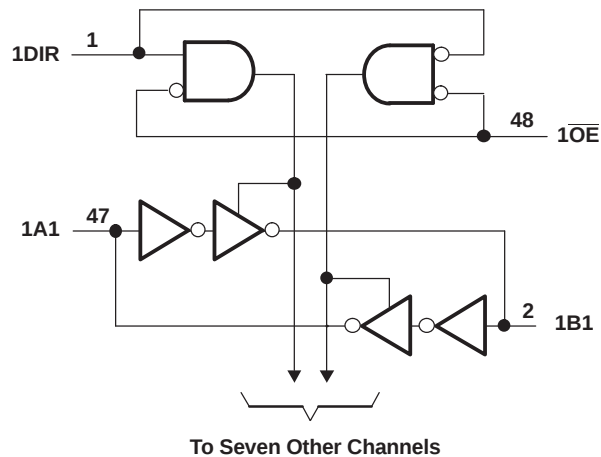
(1) NC – No internal connection

**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)



# SN54LVT16245B, SN74LVT16245B

## 3.3-V ABT 16-BIT BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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

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

|               |                                                                                             | MIN             | MAX            | UNIT |
|---------------|---------------------------------------------------------------------------------------------|-----------------|----------------|------|
| $V_{CC}$      | Supply voltage range                                                                        | –0.5            | 4.6            | V    |
| $V_I$         | Input voltage range <sup>(2)</sup>                                                          | –0.5            | 7              | V    |
| $V_O$         | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | –0.5            | 7              | V    |
| $V_O$         | Voltage range applied to any output in the high state <sup>(2)</sup>                        | –0.5            | $V_{CC} + 0.5$ | V    |
| $I_O$         | Current into any output in the low state                                                    | SN54LVT16245B   | 96             | mA   |
|               |                                                                                             | SN74LVT16245B   | 128            |      |
| $I_O$         | Current into any output in the high state <sup>(3)</sup>                                    | SN54LVT16245B   | 48             | mA   |
|               |                                                                                             | SN74LVT16245B   | 64             |      |
| $I_{IK}$      | Input clamp current                                                                         | $V_I < 0$       | –50            | mA   |
| $I_{OK}$      | Output clamp current                                                                        | $V_O < 0$       | –50            | mA   |
| $\theta_{JA}$ | Package thermal impedance <sup>(4)</sup>                                                    | DGG package     | 70             | °C/W |
|               |                                                                                             | DGV package     | 58             |      |
|               |                                                                                             | DL package      | 63             |      |
|               |                                                                                             | GQL/ZQL package | 42             |      |
|               |                                                                                             | GRD/ZRD package | 36             |      |
| $T_{stg}$     | 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) This current flows only when the output is in the high state and  $V_O > V_{CC}$ .

(4) The package thermal impedance is calculated in accordance with JESD 51-7.

## Recommended Operating Conditions<sup>(1)</sup>

|                     |                                    | SN54LVT16245B <sup>(2)</sup> |     | SN74LVT16245B |     | UNIT |
|---------------------|------------------------------------|------------------------------|-----|---------------|-----|------|
|                     |                                    | MIN                          | MAX | MIN           | MAX |      |
| V <sub>CC</sub>     | Supply voltage                     | 2.7                          | 3.6 | 2.7           | 3.6 | V    |
| V <sub>IH</sub>     | High-level input voltage           | 2                            |     | 2             |     | V    |
| V <sub>IL</sub>     | Low-level input voltage            |                              | 0.8 |               | 0.8 | V    |
| V <sub>I</sub>      | Input voltage                      |                              | 5.5 |               | 5.5 | V    |
| I <sub>OH</sub>     | High-level output current          |                              | –24 |               | –32 | mA   |
| I <sub>OL</sub>     | Low-level output current           |                              | 48  |               | 64  | mA   |
| Δt/Δv               | Input transition rise or fall rate | Outputs enabled              |     | 10            | 10  | ns/V |
| Δt/ΔV <sub>CC</sub> | Power-up ramp rate                 | 200                          |     | 200           |     | μs/V |
| T <sub>A</sub>      | Operating free-air temperature     | –55                          | 125 | –40           | 85  | °C   |

(1) All unused or undriven (floating) inputs (I/Os) of the device must be held at logic HIGH or LOW (preferably V<sub>CC</sub> 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.

(2) Product preview

# SN54LVT16245B, SN74LVT16245B

## 3.3-V ABT 16-BIT BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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#### Electrical Characteristics

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

| PARAMETER                       |                            | TEST CONDITIONS                                                                                              |                                  | SN54LVT16245B <sup>(1)</sup> |                    |     | SN74LVT16245B         |                    |     | UNIT |
|---------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------|--------------------|-----|-----------------------|--------------------|-----|------|
|                                 |                            |                                                                                                              |                                  | MIN                          | TYP <sup>(2)</sup> | MAX | MIN                   | TYP <sup>(2)</sup> | MAX |      |
| V <sub>IK</sub>                 |                            | V <sub>CC</sub> = 2.7 V, I <sub>I</sub> = −18 mA                                                             |                                  | −1.2                         |                    |     | −1.2                  |                    |     | V    |
| V <sub>OH</sub>                 |                            | V <sub>CC</sub> = 2.7 to 3.6 V, I <sub>OH</sub> = −100 μA                                                    |                                  | V <sub>CC</sub> − 0.2        |                    |     | V <sub>CC</sub> − 0.2 |                    |     | V    |
|                                 |                            | V <sub>CC</sub> = 2.7 V, I <sub>OH</sub> = −8 mA                                                             |                                  | 2.4                          |                    |     | 2.4                   |                    |     |      |
|                                 |                            | V <sub>CC</sub> = 3 V                                                                                        | I <sub>OH</sub> = −24 mA         | 2                            |                    |     |                       |                    |     |      |
|                                 |                            |                                                                                                              | I <sub>OH</sub> = −32 mA         |                              |                    |     | 2                     |                    |     |      |
| V <sub>OL</sub>                 |                            | V <sub>CC</sub> = 2.7 V                                                                                      | I <sub>OL</sub> = 100 μA         | 0.2                          |                    |     | 0.2                   |                    |     | V    |
|                                 |                            |                                                                                                              | I <sub>OL</sub> = 24 mA          | 0.5                          |                    |     | 0.5                   |                    |     |      |
|                                 |                            | V <sub>CC</sub> = 3 V                                                                                        | I <sub>OL</sub> = 16 mA          | 0.4                          |                    |     | 0.4                   |                    |     |      |
|                                 |                            |                                                                                                              | I <sub>OL</sub> = 32 mA          | 0.5                          |                    |     | 0.5                   |                    |     |      |
|                                 |                            |                                                                                                              | I <sub>OL</sub> = 48 mA          | 0.55                         |                    |     |                       |                    |     |      |
|                                 |                            |                                                                                                              | I <sub>OL</sub> = 64 mA          |                              |                    |     | 0.55                  |                    |     |      |
| I <sub>I</sub>                  | Control inputs             | V <sub>CC</sub> = 3.6 V, V <sub>I</sub> = V <sub>CC</sub> or GND                                             |                                  | ±1                           |                    |     | ±1                    |                    |     | μA   |
|                                 |                            | V <sub>CC</sub> = 0 or 3.6 V, V <sub>I</sub> = 5.5 V                                                         |                                  | 10                           |                    |     | 10                    |                    |     |      |
|                                 | A or B port <sup>(3)</sup> | V <sub>CC</sub> = 3.6 V                                                                                      | V <sub>I</sub> = 5.5 V           | 20                           |                    |     | 20                    |                    |     |      |
|                                 |                            |                                                                                                              | V <sub>I</sub> = V <sub>CC</sub> | 5                            |                    |     | 1                     |                    |     |      |
|                                 |                            |                                                                                                              | V <sub>I</sub> = 0               | −5                           |                    |     | −5                    |                    |     |      |
| I <sub>off</sub>                |                            | V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> = 0 to 4.5 V                                           |                                  |                              |                    |     | ±100                  |                    |     | μA   |
| I <sub>OZPU</sub>               |                            | V <sub>CC</sub> = 0 to 1.5 V, V <sub>O</sub> = 0.5 V to 3 V, OE = don't care                                 |                                  | ±100 <sup>(4)</sup>          |                    |     | ±100                  |                    |     | μA   |
| I <sub>OZPD</sub>               |                            | V <sub>CC</sub> = 1.5 V to 0, V <sub>O</sub> = 0.5 V to 3 V, OE = don't care                                 |                                  | ±100 <sup>(4)</sup>          |                    |     | ±100                  |                    |     | μA   |
| I <sub>CC</sub>                 |                            | V <sub>CC</sub> = 3.6 V, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND                         | Outputs high                     | 0.19                         |                    |     | 0.19                  |                    |     | mA   |
|                                 |                            |                                                                                                              | Outputs low                      | 5                            |                    |     | 5                     |                    |     |      |
|                                 |                            |                                                                                                              | Outputs disabled                 | 0.19                         |                    |     | 0.19                  |                    |     |      |
| ΔI <sub>CC</sub> <sup>(5)</sup> |                            | V <sub>CC</sub> = 3 V to 3.6 V, One input at V <sub>CC</sub> − 0.6 V, Other inputs at V <sub>CC</sub> or GND |                                  | 0.2                          |                    |     | 0.2                   |                    |     | mA   |
| C <sub>i</sub>                  |                            | V <sub>I</sub> = 3 V or 0                                                                                    |                                  | 4                            |                    |     | 4                     |                    |     | pF   |
| C <sub>iO</sub>                 |                            | V <sub>O</sub> = 3 V or 0                                                                                    |                                  | 10                           |                    |     | 10                    |                    |     | pF   |

(1) Product preview

(2) All typical values are at  $V_{CC} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

(3) Unused pins at  $V_{CC}\text{ or GND}$ .

(4) On products compliant to MIL-PRF-38535, this parameter is not production tested.

(5) This is the increase in supply current for each input that is at the specified TTL voltage level, rather than  $V_{CC}\text{ or GND}$ .

## Switching Characteristics

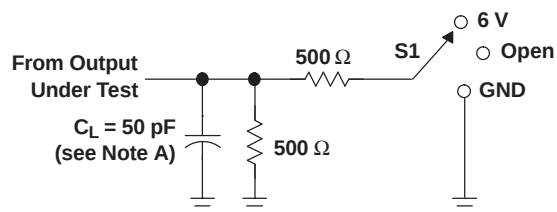
over recommended operating free-air temperature range,  $C_L = 50$  pF (unless otherwise noted) (see [Figure 1](#))

| PARAMETER            | FROM<br>(INPUT) | TO<br>(OUTPUT) | SN54LVT16245B <sup>(1)</sup>       |     |                         |     | SN74LVT16245B                      |                    |                         |     | UNIT |     |
|----------------------|-----------------|----------------|------------------------------------|-----|-------------------------|-----|------------------------------------|--------------------|-------------------------|-----|------|-----|
|                      |                 |                | V <sub>CC</sub> = 3.3 V<br>± 0.3 V |     | V <sub>CC</sub> = 2.7 V |     | V <sub>CC</sub> = 3.3 V<br>± 0.3 V |                    | V <sub>CC</sub> = 2.7 V |     |      |     |
|                      |                 |                | MIN                                | MAX | MIN                     | MAX | MIN                                | TYP <sup>(2)</sup> | MAX                     | MIN |      | MAX |
| t <sub>PLH</sub>     | A or B          | B or A         | 0.5                                | 4.5 | 4.6                     |     | 1.5                                | 2.3                | 3.3                     | 3.7 |      | ns  |
| t <sub>PHL</sub>     |                 |                | 0.5                                | 4.4 | 3.9                     |     | 1.3                                | 2.1                | 3.3                     | 3.5 |      |     |
| t <sub>PZH</sub>     | OE              | A or B         | 0.5                                | 6.5 | 6.6                     |     | 1.5                                | 2.8                | 4.5                     | 5.3 |      | ns  |
| t <sub>PZL</sub>     |                 |                | 0.5                                | 5.4 | 6.2                     |     | 1.6                                | 2.9                | 4.6                     | 5.2 |      |     |
| t <sub>PHZ</sub>     | OE              | A or B         | 1                                  | 6.8 | 7                       |     | 2.3                                | 3.7                | 5.1                     | 5.5 |      | ns  |
| t <sub>PLZ</sub>     |                 |                | 1                                  | 6.2 | 6.3                     |     | 2.2                                | 3.5                | 5.1                     | 5.4 |      |     |
| t <sub>sk</sub> (LH) |                 |                |                                    |     |                         |     |                                    |                    | 0.5                     |     | ns   |     |
| t <sub>sk</sub> (HL) |                 |                |                                    |     |                         |     |                                    |                    | 0.5                     |     |      |     |

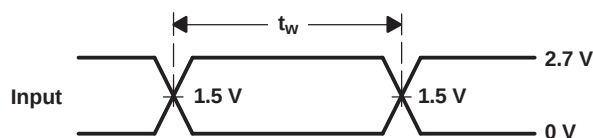
(1) Product preview

(2) All typical values are at  $V_{CC} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

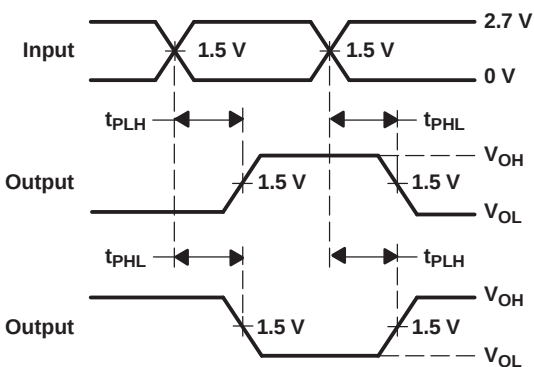
## PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT

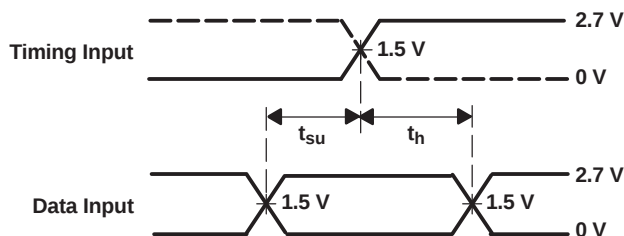


VOLTAGE WAVEFORMS  
PULSE DURATION

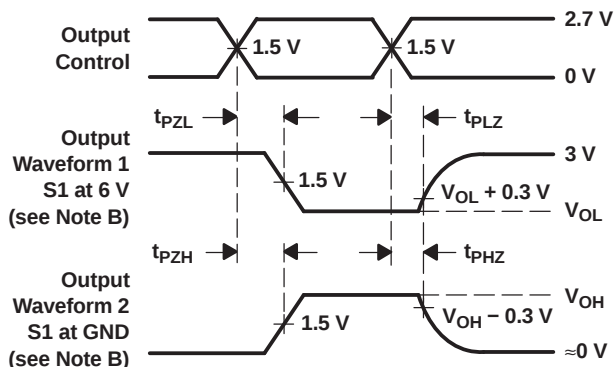


VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS

| TEST              | S1   |
|-------------------|------|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | 6 V  |
| $t_{PHZ}/t_{PZH}$ | GND  |



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLING

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. 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.  
C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .  
D. The outputs are measured one at a time, with one transition per measurement.

Figure 1. 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                 |
|-------------------|---------------|--------------|--------------------|------|----------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| 74LVT16245BDGGRE4 | ACTIVE        | TSSOP        | DGG                | 48   | 2000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | LVT16245B               | <a href="#">Samples</a> |
| SN74LVT16245BDGGR | ACTIVE        | TSSOP        | DGG                | 48   | 2000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | LVT16245B               | <a href="#">Samples</a> |
| SN74LVT16245BDGVR | ACTIVE        | TVSOP        | DGV                | 48   | 2000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | VD245B                  | <a href="#">Samples</a> |
| SN74LVT16245BDL   | ACTIVE        | SSOP         | DL                 | 48   | 25             | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | LVT16245B               | <a href="#">Samples</a> |
| SN74LVT16245BDLR  | ACTIVE        | SSOP         | DL                 | 48   | 1000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | LVT16245B               | <a href="#">Samples</a> |

(1) 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.

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

(2) **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.

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

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

(5) 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.

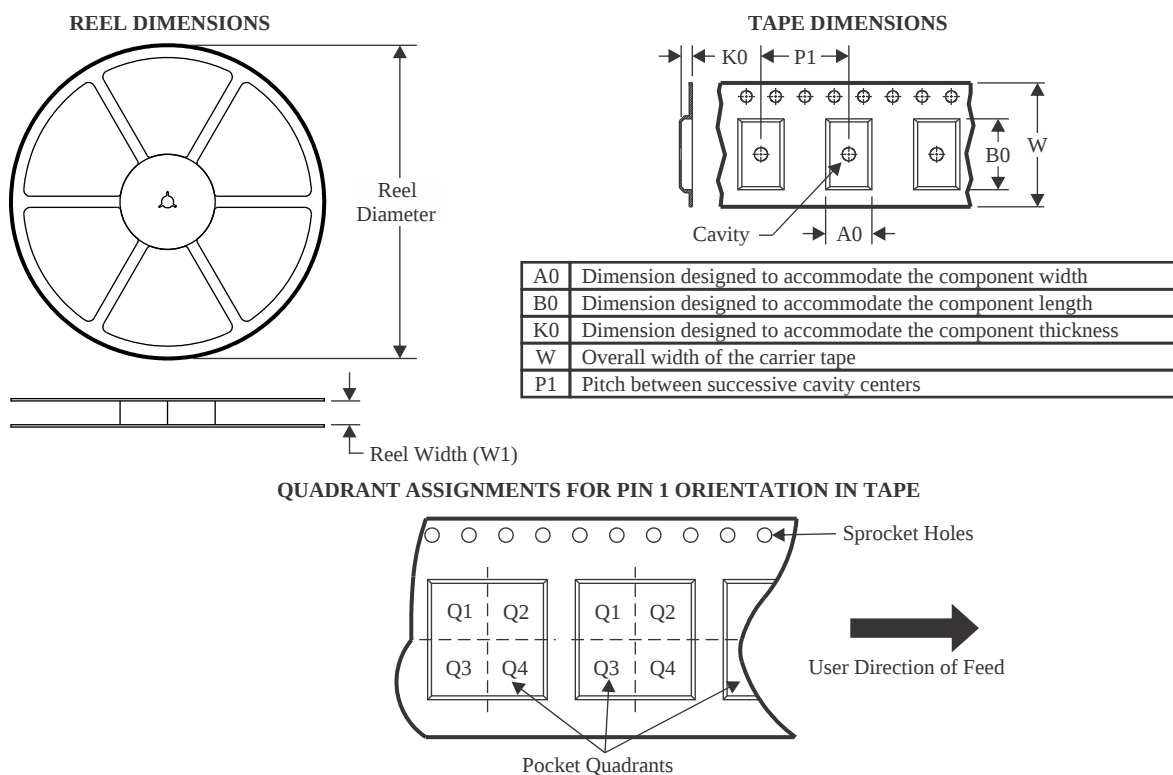
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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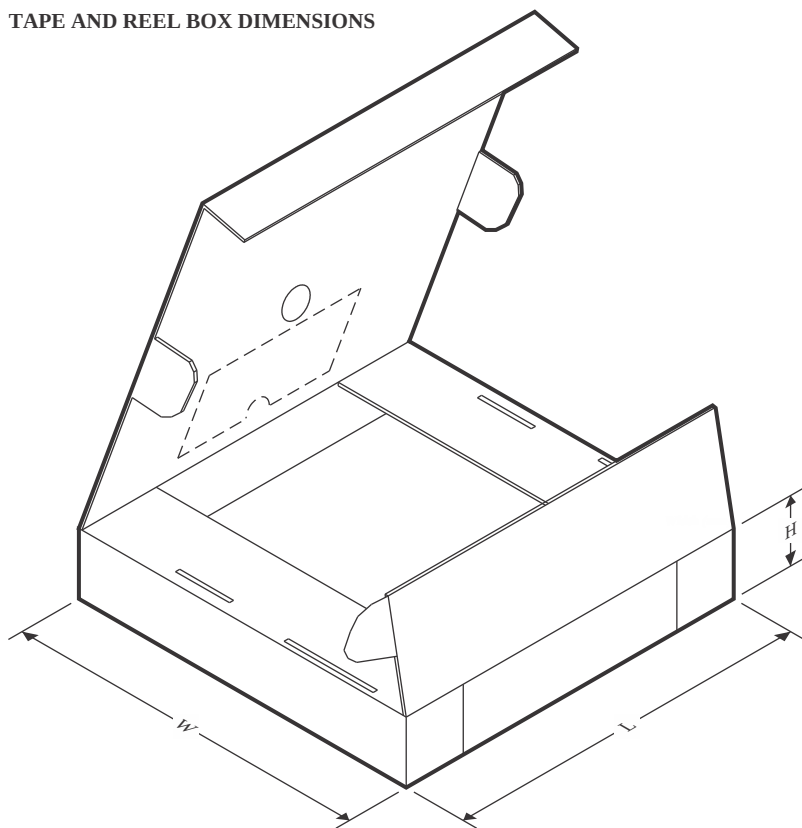
## TAPE AND REEL INFORMATION



\*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 |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LVT16245BDGGR | TSSOP        | DGG             | 48   | 2000 | 330.0              | 24.4               | 8.6     | 13.0    | 1.8     | 12.0    | 24.0   | Q1            |
| SN74LVT16245BDGVR | TVSOP        | DGV             | 48   | 2000 | 330.0              | 16.4               | 7.1     | 10.2    | 1.6     | 12.0    | 16.0   | Q1            |
| SN74LVT16245BDLR  | SSOP         | DL              | 48   | 1000 | 330.0              | 32.4               | 11.35   | 16.2    | 3.1     | 16.0    | 32.0   | Q1            |

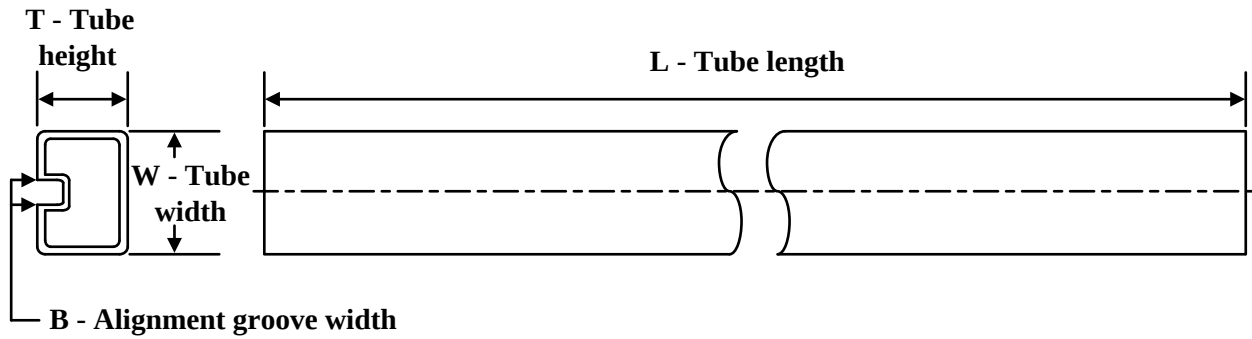
## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device            | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LVT16245BDGGR | TSSOP        | DGG             | 48   | 2000 | 367.0       | 367.0      | 45.0        |
| SN74LVT16245BDGVR | TVSOP        | DGV             | 48   | 2000 | 356.0       | 356.0      | 35.0        |
| SN74LVT16245BDLR  | SSOP         | DL              | 48   | 1000 | 367.0       | 367.0      | 55.0        |

## TUBE



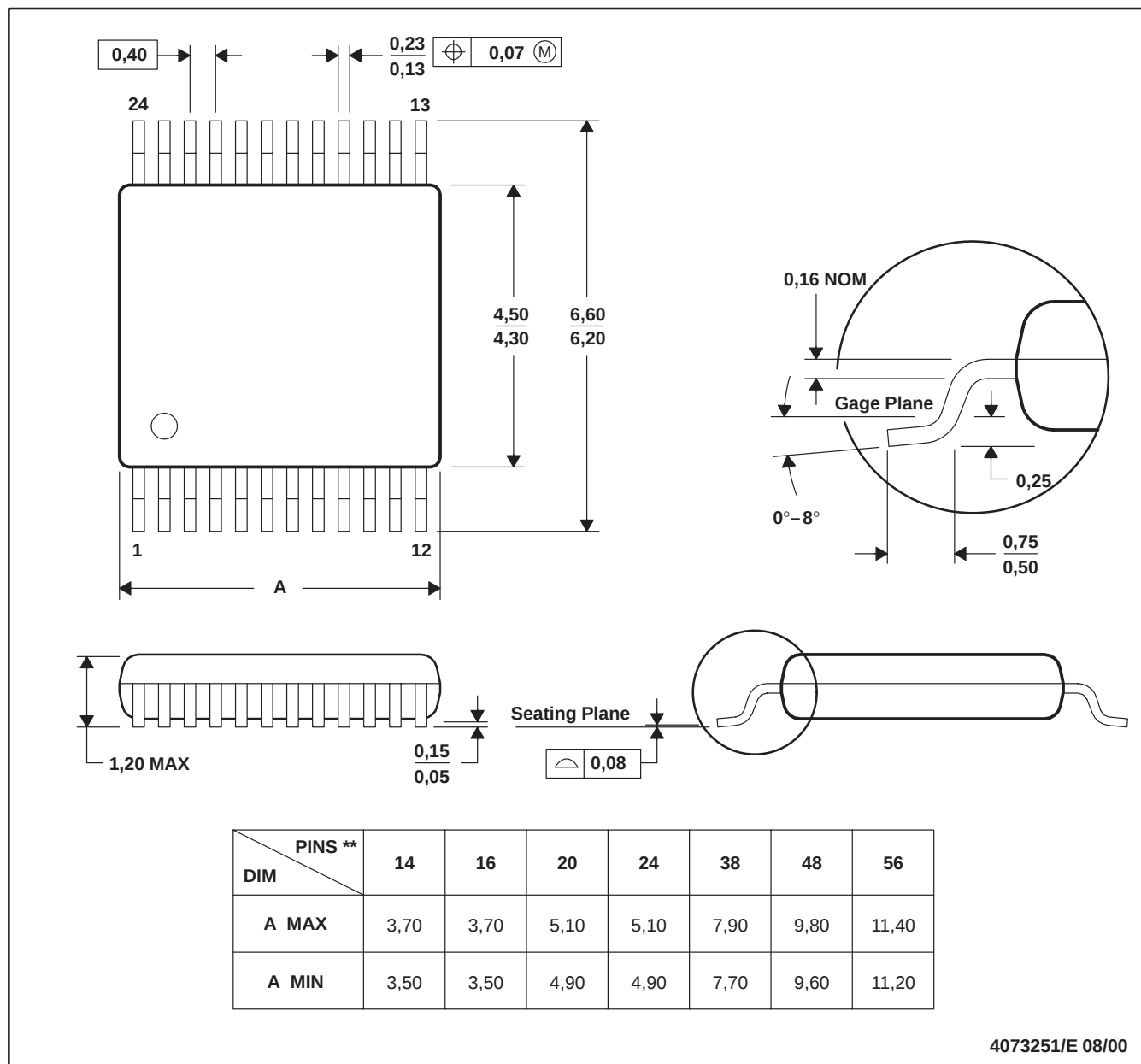
\*All dimensions are nominal

| Device          | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|-----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74LVT16245BDL | DL           | SSOP         | 48   | 25  | 473.7  | 14.24  | 5110   | 7.87   |

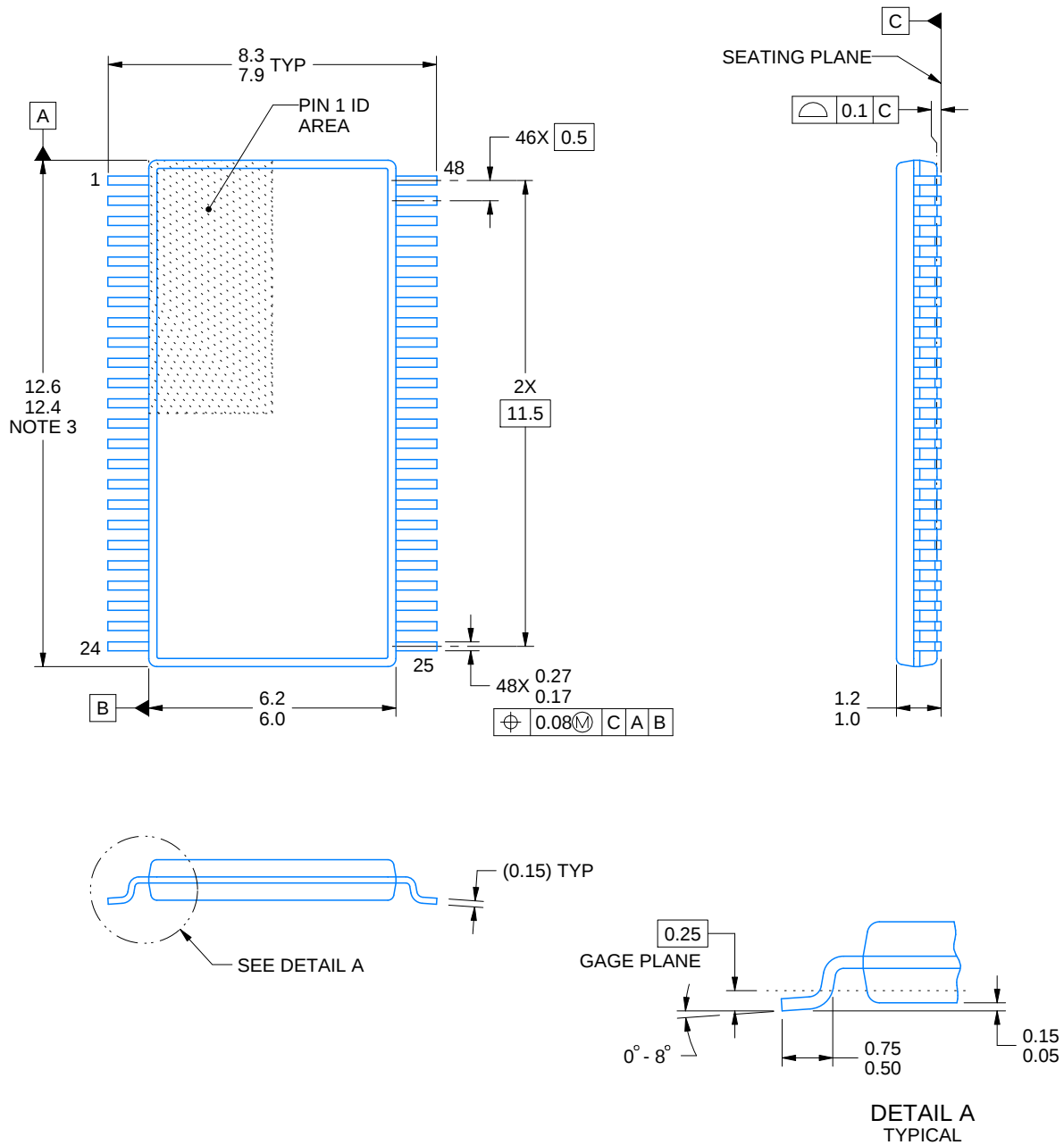
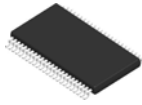
## DGV (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

24 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 flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194



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## NOTES:

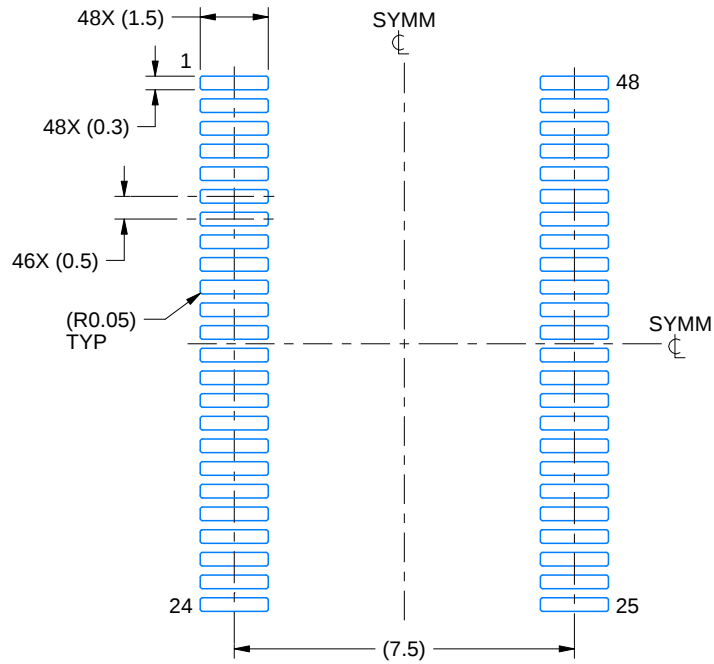
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

# EXAMPLE BOARD LAYOUT

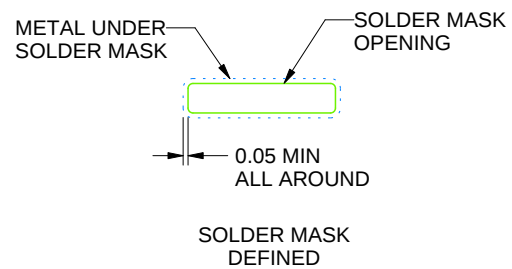
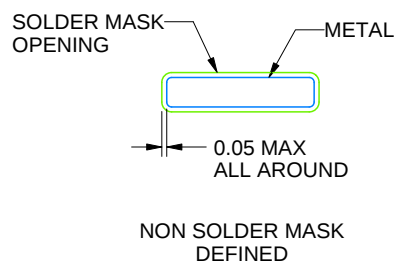
DGG0048A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

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NOTES: (continued)

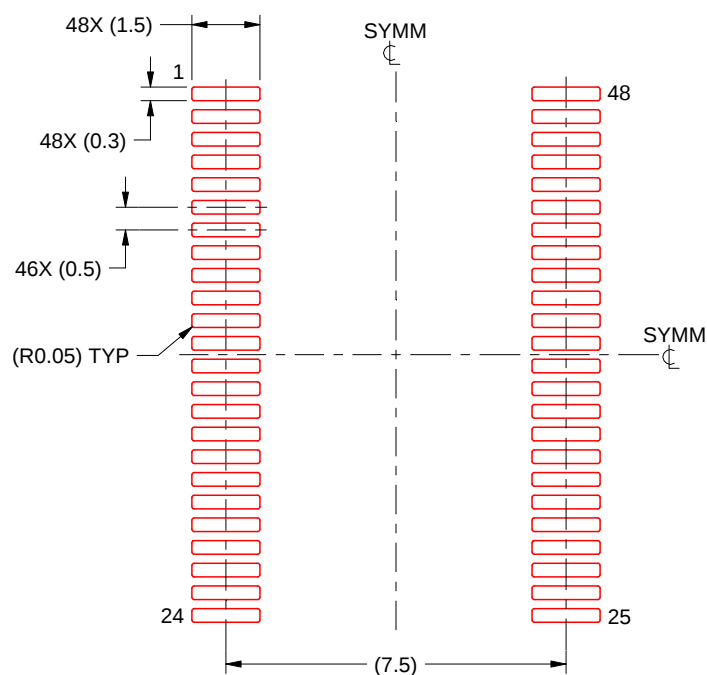
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## 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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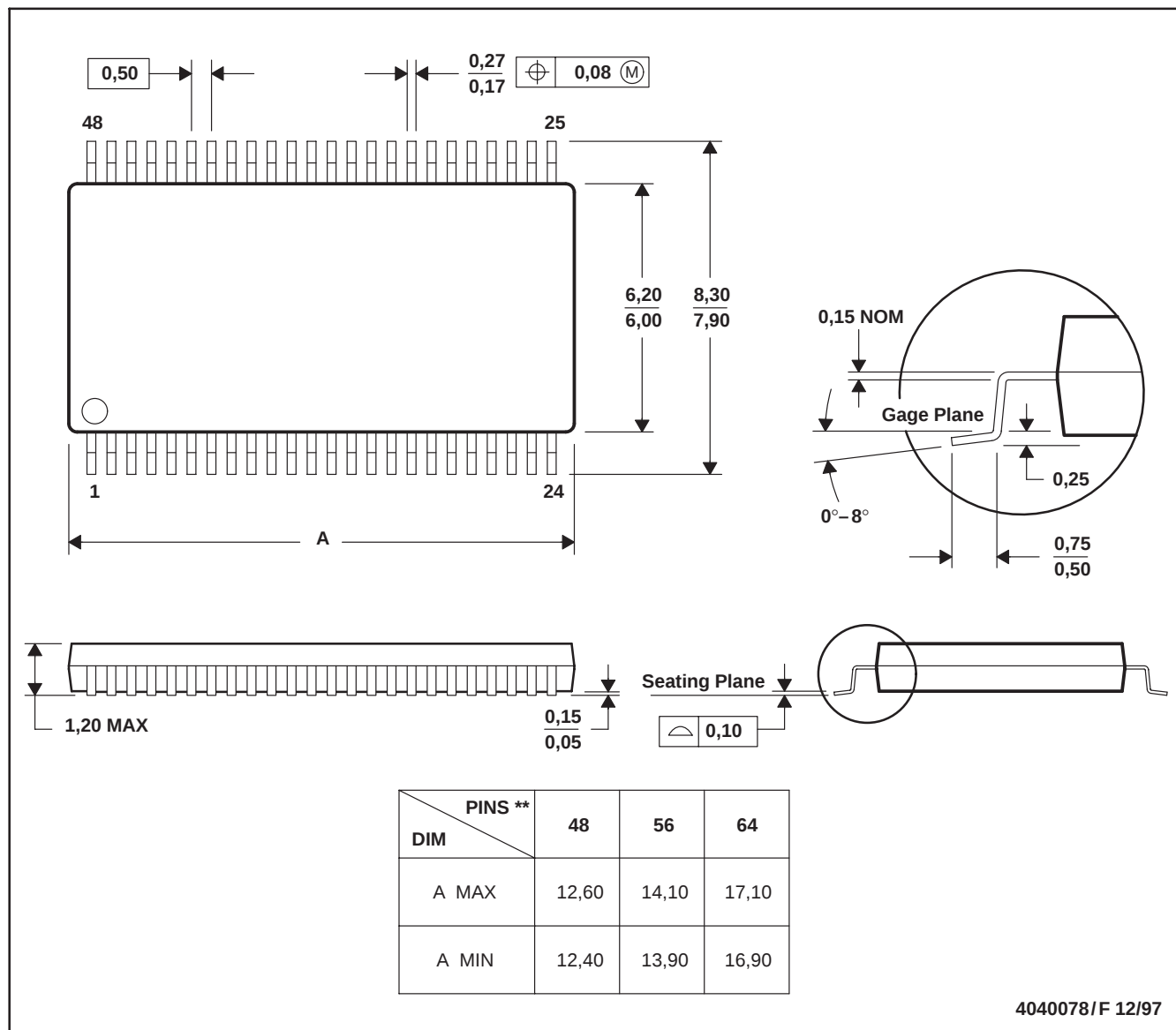
NOTES: (continued)

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

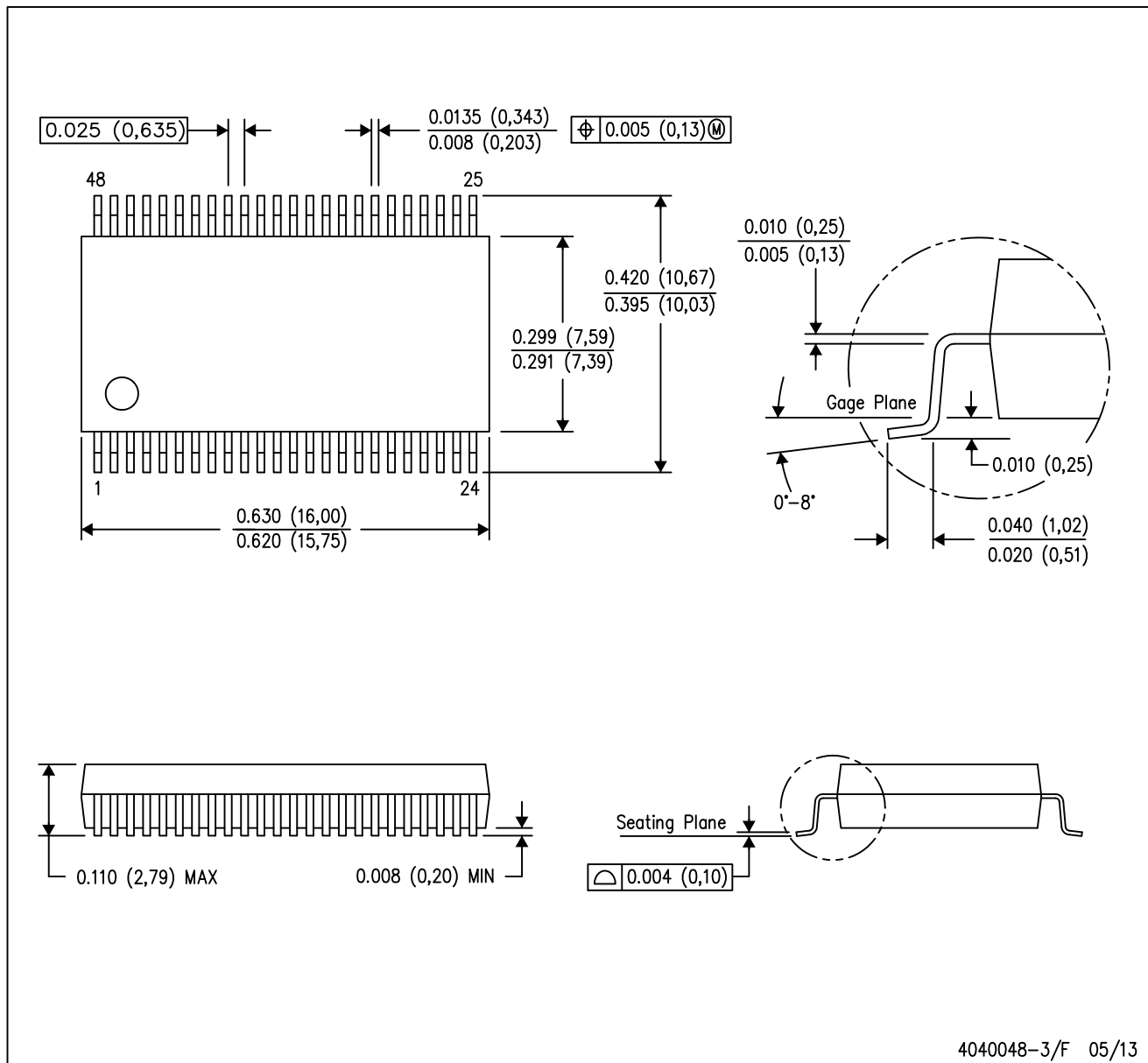
48 PINS SHOWN



- 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

DL (R-PDSO-G48)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MO-118

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