

- **Controlled Baseline**
  - One Assembly/Test Site, One Fabrication Site
- **Extended Temperature Performance of**  
–40°C to 125°C
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product Change Notification**
- **Qualification Pedigree<sup>†</sup>**
- **Member of the Texas Instruments Widebus™ Family**
- **Inputs Are TTL-Voltage Compatible**
- **3-State Outputs Drive Bus Lines Directly**
- **Flow-Through Architecture Optimizes PCB Layout**
- **Distributed V<sub>CC</sub> and GND Pins Minimize High-Speed Switching Noise**

<sup>†</sup> Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, highly accelerated stress test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life.

## description

The SN74ACT16245Q-EP is a 16-bit bus transceiver organized as dual-octal noninverting 3-state transceivers and designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

The device allows data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The enable ( $\overline{G}$ ) input can be used to disable the devices so that the buses are effectively isolated.

**DL PACKAGE**  
(TOP VIEW)

|                 |    |    |                  |
|-----------------|----|----|------------------|
| 1DIR            | 1  | 48 | 1 $\overline{G}$ |
| 1B1             | 2  | 47 | 1A1              |
| 1B2             | 3  | 46 | 1A2              |
| GND             | 4  | 45 | GND              |
| 1B3             | 5  | 44 | 1A3              |
| 1B4             | 6  | 43 | 1A4              |
| V <sub>CC</sub> | 7  | 42 | V <sub>CC</sub>  |
| 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 <sub>CC</sub> | 18 | 31 | V <sub>CC</sub>  |
| 2B5             | 19 | 30 | 2A5              |
| 2B6             | 20 | 29 | 2A6              |
| GND             | 21 | 28 | GND              |
| 2B7             | 22 | 27 | 2A7              |
| 2B8             | 23 | 26 | 2A8              |
| 2DIR            | 24 | 25 | 2 $\overline{G}$ |

## ORDERING INFORMATION

| T <sub>A</sub> | PACKAGE <sup>‡</sup> |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|----------------------|---------------|-----------------------|------------------|
| –40°C to 125°C | SSOP – DL            | Tape and reel | SN74ACT16245QDLREP    | ACT16245QEP      |

<sup>‡</sup> 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).



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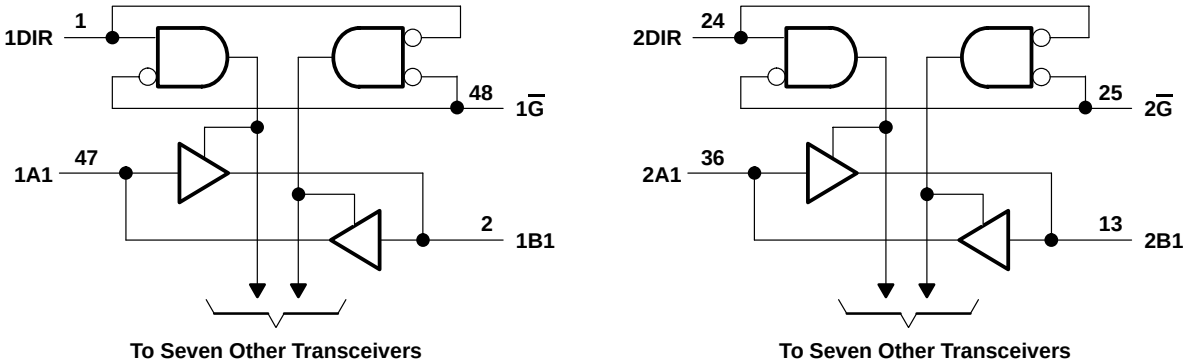
**SN74ACT16245Q-EP**  
**16-BIT BUS TRANSCEIVER**  
**WITH 3-STATE OUTPUTS**

SCAS677A – MAY 2002 – REVISED JULY 2002

FUNCTION TABLE  
 (each section)

| CONTROL INPUTS |     | OPERATION       |
|----------------|-----|-----------------|
| $\overline{G}$ | DIR |                 |
| L              | L   | B data to A bus |
| L              | H   | A data to B bus |
| H              | X   | Isolation       |

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

|                                                                                                 |                            |
|-------------------------------------------------------------------------------------------------|----------------------------|
| Supply voltage range, $V_{CC}$                                                                  | –0.5 V to 7 V              |
| Input voltage range, $V_I$ (see Note 1)                                                         | –0.5 V to $V_{CC} + 0.5$ V |
| Output voltage range, $V_O$ (see Note 1)                                                        | –0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ )                                   | ±20 mA                     |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )                                  | ±24 mA                     |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )                                      | ±24 mA                     |
| Continuous current through $V_{CC}$ or GND                                                      | ±260 mA                    |
| Maximum power dissipation at $T_A = 55^{\circ}\text{C}$ (in still air) (see Note 2): DL package | 1.2 W                      |
| Storage temperature range, $T_{stg}$                                                            | –65°C to 150°C             |

<sup>†</sup> 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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils.

**recommended operating conditions (see Note 3)**

|                 |                                    | MIN | MAX             | UNIT |
|-----------------|------------------------------------|-----|-----------------|------|
| V <sub>CC</sub> | Supply voltage (see Note 4)        | 4.5 | 5.5             | V    |
| V <sub>IH</sub> | High-level input voltage           | 2   |                 | V    |
| V <sub>IL</sub> | Low-level input voltage            |     | 0.8             | V    |
| V <sub>I</sub>  | Input voltage                      | 0   | V <sub>CC</sub> | V    |
| V <sub>O</sub>  | Output voltage                     | 0   | V <sub>CC</sub> | V    |
| I <sub>OH</sub> | High-level output current          |     | –16             | mA   |
| I <sub>OL</sub> | Low-level output current           |     | 16              | mA   |
| Δt/Δv           | Input transition rise or fall rate | 0   | 10              | ns/V |
| T <sub>A</sub>  | Operating free-air temperature     | –40 | 125             | °C   |

- NOTES: 3. Unused inputs should be tied to V<sub>CC</sub> through a pullup resistor of approximately 5 kΩ or greater to keep them from floating. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.
4. All V<sub>CC</sub> and GND pins must be connected to the proper-voltage power supply.

**SN74ACT16245Q-EP**  
**16-BIT BUS TRANSCEIVER**  
**WITH 3-STATE OUTPUTS**

SCAS677A – MAY 2002 – REVISED JULY 2002

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

| PARAMETER          |                | TEST CONDITIONS                                             | V <sub>CC</sub> | T <sub>A</sub> = 25°C |     |      | MIN  | MAX | UNIT |
|--------------------|----------------|-------------------------------------------------------------|-----------------|-----------------------|-----|------|------|-----|------|
|                    |                |                                                             |                 | MIN                   | TYP | MAX  |      |     |      |
| V <sub>OH</sub>    |                | I <sub>OH</sub> = –50 µA                                    | 4.5 V           | 4.4                   |     |      | 4.4  |     | V    |
|                    |                |                                                             | 5.5 V           | 5.4                   |     |      | 5.4  |     |      |
|                    |                | I <sub>OH</sub> = –16 mA                                    | 4.5 V           | 3.94                  |     |      | 3.94 |     |      |
|                    |                |                                                             | 5.5 V           | 4.94                  |     |      | 4.94 |     |      |
|                    |                | I <sub>OH</sub> = –24 mA†                                   | 5.5 V           |                       |     |      | 3.85 |     |      |
| V <sub>OL</sub>    |                | I <sub>OL</sub> = 50 µA                                     | 4.5 V           |                       |     | 0.1  |      | 0.1 | V    |
|                    |                |                                                             | 5.5 V           |                       |     | 0.1  |      | 0.1 |      |
|                    |                | I <sub>OL</sub> = 16 mA                                     | 4.5 V           |                       |     | 0.36 |      | 0.5 |      |
|                    |                |                                                             | 5.5 V           |                       |     | 0.36 |      | 0.5 |      |
|                    |                | I <sub>OL</sub> = 24 mA†                                    | 5.5 V           |                       |     |      |      | 0.5 |      |
| I <sub>I</sub>     | Control inputs | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 5.5 V           |                       |     | ±0.1 |      | ±1  | µA   |
| I <sub>OZ</sub>    | A or B ports‡  | V <sub>O</sub> = V <sub>CC</sub> or GND                     | 5.5 V           |                       |     | ±0.5 |      | ±10 | µA   |
| I <sub>CC</sub>    |                | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0 | 5.5 V           |                       |     | 8    |      | 160 | µA   |
| ΔI <sub>CC</sub> § |                | One input at 3.4 V, Other inputs at GND or V <sub>CC</sub>  | 5.5 V           |                       |     | 0.9  |      | 1   | mA   |
| C <sub>i</sub>     | Control inputs | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 5 V             |                       | 4.5 |      |      |     | pF   |
| C <sub>io</sub>    | A or B ports   | V <sub>O</sub> = V <sub>CC</sub> or GND                     | 5 V             |                       | 16  |      |      |     | pF   |

† Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

‡ For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current I<sub>I</sub>.

§ This is the increase in supply current for each input that is at one of the specified TTL-voltage levels rather than 0 V or V<sub>CC</sub>.

**switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)**

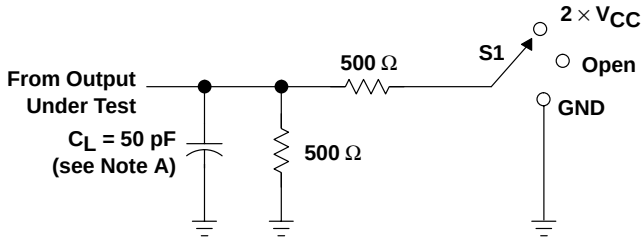
| PARAMETER        | FROM (INPUT)   | TO (OUTPUT) | T <sub>A</sub> = 25°C |     |      | MIN | MAX  | UNIT |
|------------------|----------------|-------------|-----------------------|-----|------|-----|------|------|
|                  |                |             | MIN                   | TYP | MAX  |     |      |      |
| t <sub>PLH</sub> | A or B         | B or A      | 3.2                   | 6.9 | 9.3  | 3.2 | 11.5 | ns   |
| t <sub>PHL</sub> |                |             | 2.6                   | 6.4 | 9.2  | 2.6 | 11.1 |      |
| t <sub>PZH</sub> | $\overline{G}$ | B or A      | 2.7                   | 6.4 | 9.1  | 2.7 | 10.9 | ns   |
| t <sub>PZL</sub> |                |             | 3.4                   | 7.4 | 10.5 | 3.4 | 12.6 |      |
| t <sub>PHZ</sub> | $\overline{G}$ | B or A      | 5.8                   | 9.2 | 11.6 | 5.8 | 13.4 | ns   |
| t <sub>PLZ</sub> |                |             | 5.5                   | 8.5 | 10.8 | 5.5 | 12.7 |      |

**operating characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C**

| PARAMETER       |                                               | TEST CONDITIONS  |                                   | TYP | UNIT |
|-----------------|-----------------------------------------------|------------------|-----------------------------------|-----|------|
| C <sub>pd</sub> | Power dissipation capacitance per transceiver | Outputs enabled  | C <sub>L</sub> = 50 pF, f = 1 MHz | 52  | pF   |
|                 |                                               | Outputs disabled |                                   | 10  |      |

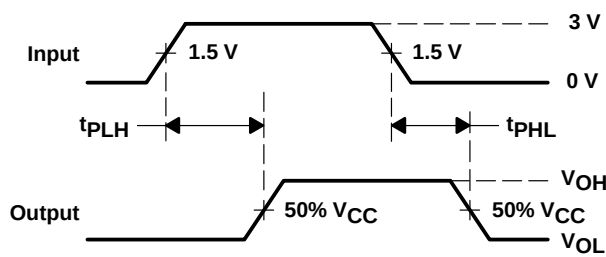


## PARAMETER MEASUREMENT INFORMATION

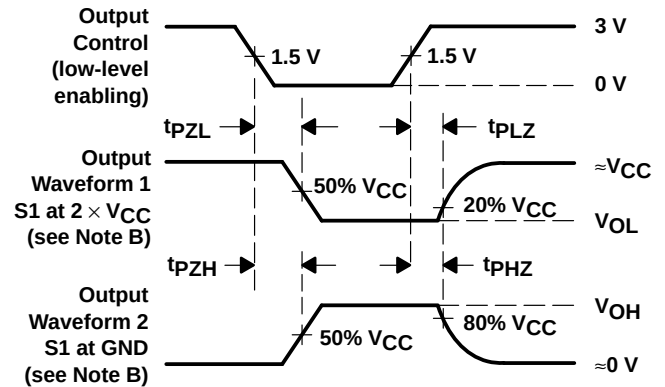


LOAD CIRCUIT

| TEST              | S1                |
|-------------------|-------------------|
| $t_{PLH}/t_{PHL}$ | Open              |
| $t_{PLZ}/t_{PZL}$ | 2 $\times V_{CC}$ |
| $t_{PHZ}/t_{PZH}$ | GND               |



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS

- 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:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r = 3 \text{ ns}$ ,  $t_f = 3 \text{ ns}$ .
  - D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

## PACKAGING INFORMATION

| Orderable Device   | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|--------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74ACT16245QDLREP | ACTIVE                | SSOP         | DL              | 48   | 1000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| V62/03601-01XE     | ACTIVE                | SSOP         | DL              | 48   | 1000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

<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.

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

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

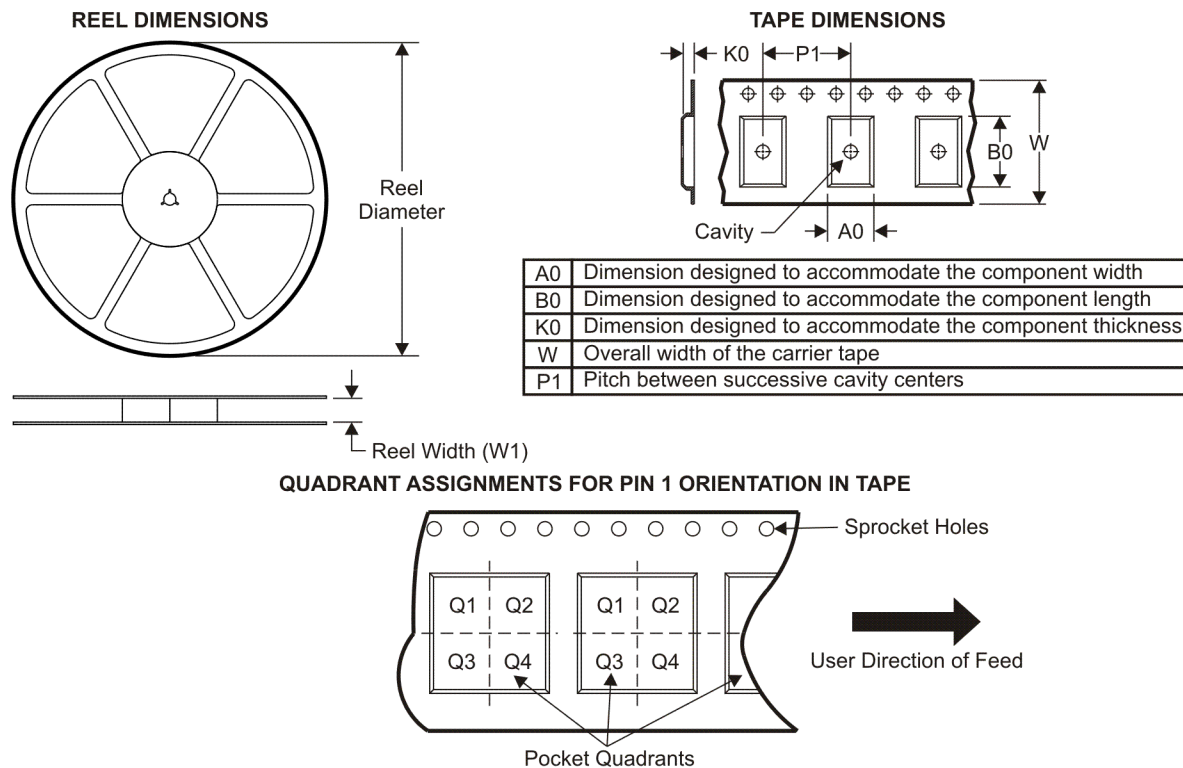
**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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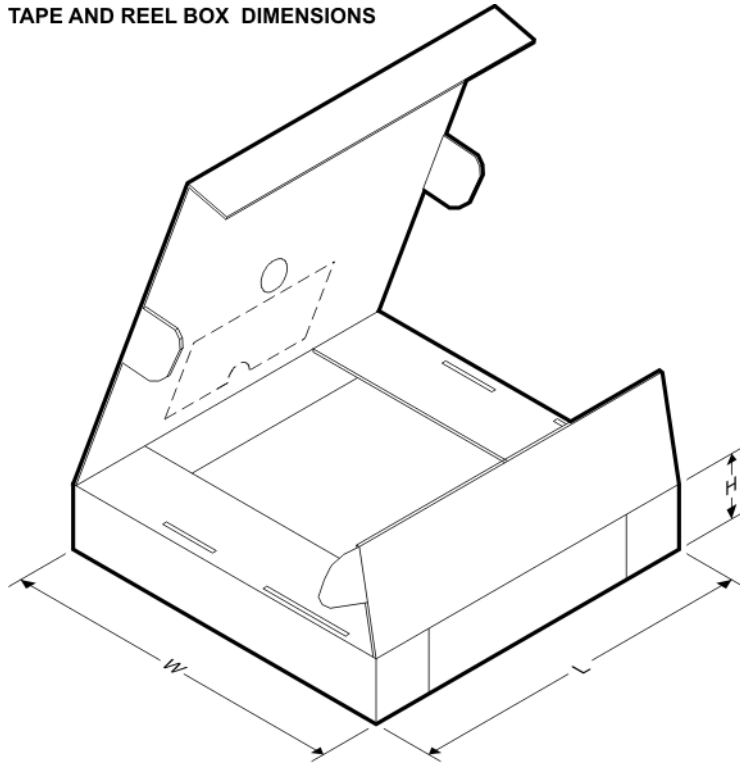
**TAPE AND REEL INFORMATION**



\*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 |
|--------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74ACT16245QDLREP | SSOP         | DL              | 48   | 1000 | 330.0              | 32.4               | 11.35   | 16.2    | 3.1     | 16.0    | 32.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



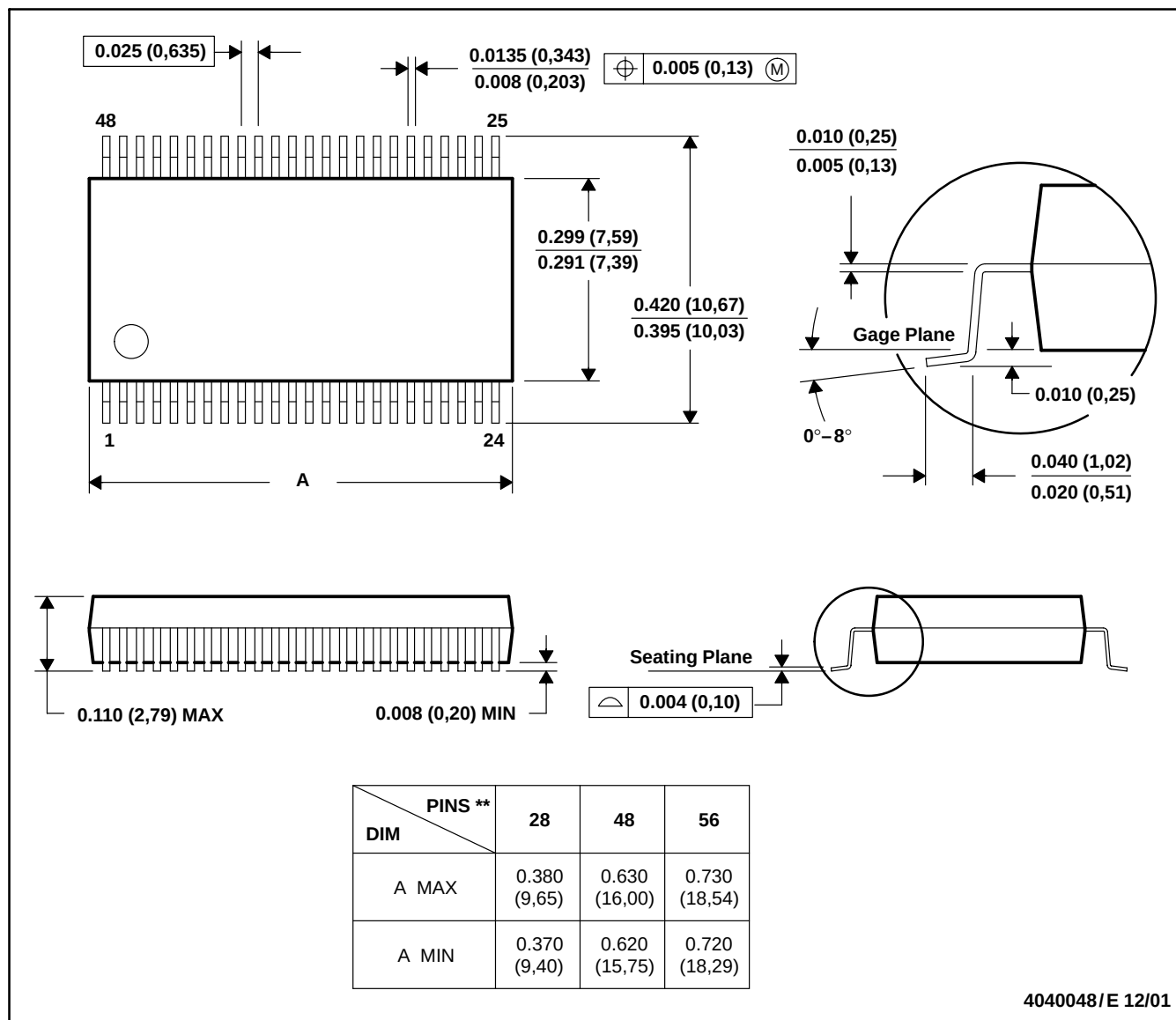
\*All dimensions are nominal

| Device             | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|--------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74ACT16245QDLREP | SSOP         | DL              | 48   | 1000 | 346.0       | 346.0      | 49.0        |

DL (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN



- 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

## PACKAGING INFORMATION

| Orderable part number              | Status<br>(1) | Material type<br>(2) | Package   Pins | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|------------------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| <a href="#">SN74ACT16245QDLREP</a> | Active        | Production           | SSOP (DL)   48 | 1000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | ACT16245QEP         |
| SN74ACT16245QDLREP.A               | Active        | Production           | SSOP (DL)   48 | 1000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | ACT16245QEP         |
| <a href="#">V62/03601-01XE</a>     | Active        | Production           | SSOP (DL)   48 | 1000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | ACT16245QEP         |

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts 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.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

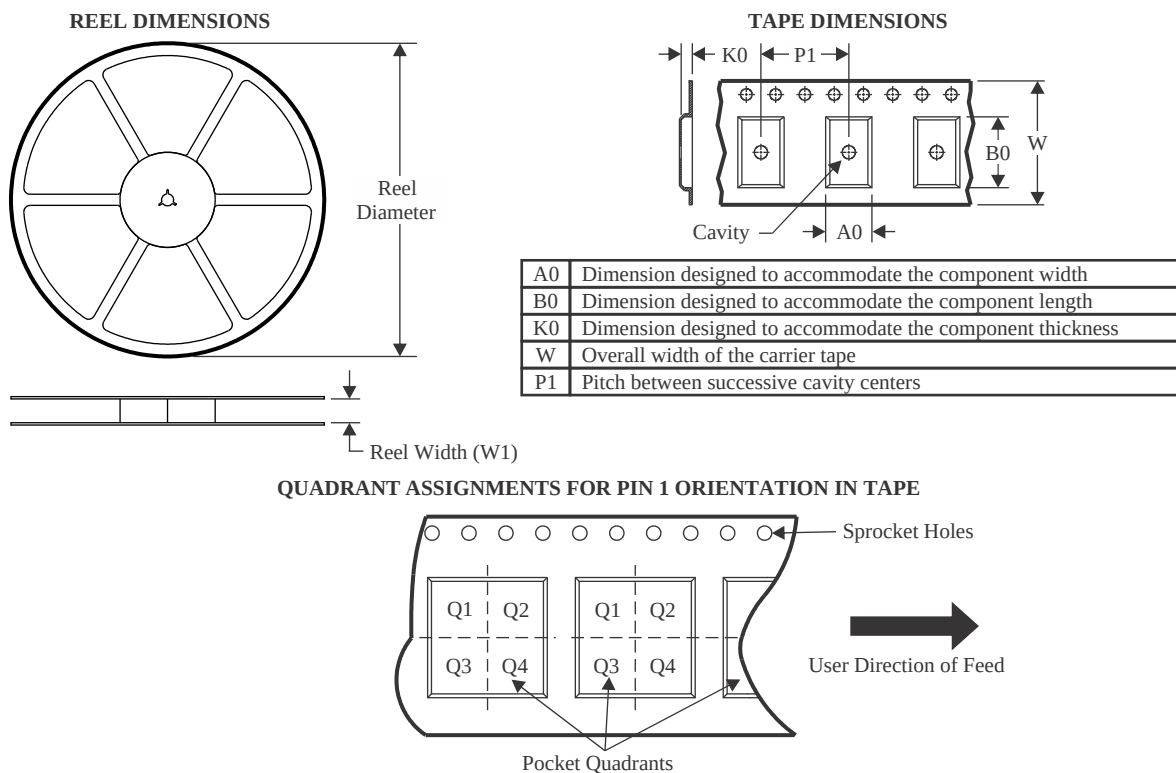
<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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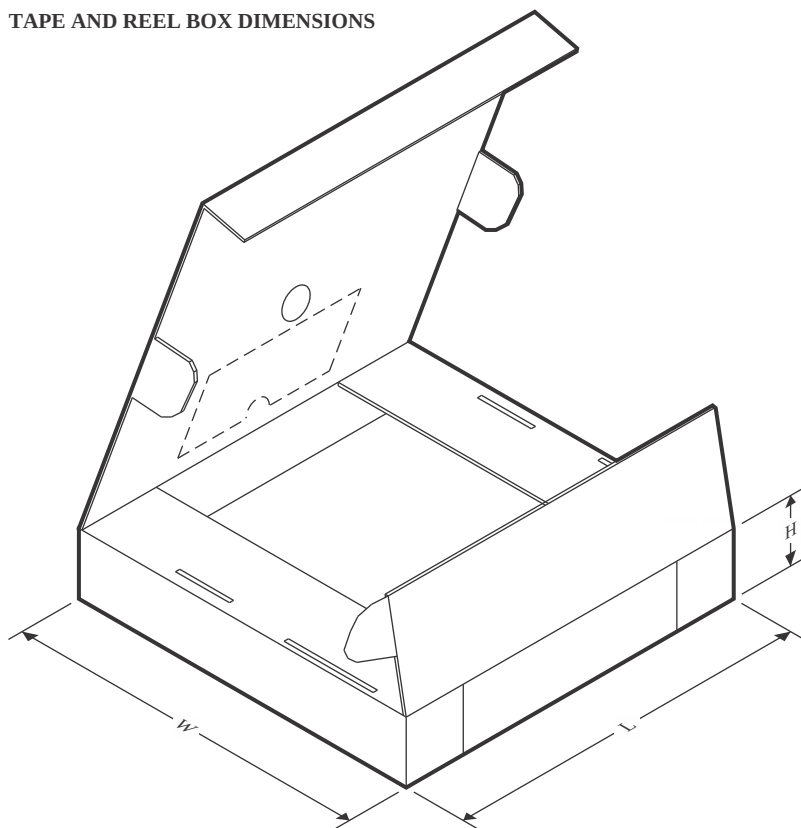
## TAPE AND REEL INFORMATION



\*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 |
|--------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74ACT16245QDLREP | SSOP         | DL              | 48   | 1000 | 330.0              | 32.4               | 11.35   | 16.2    | 3.1     | 16.0    | 32.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS

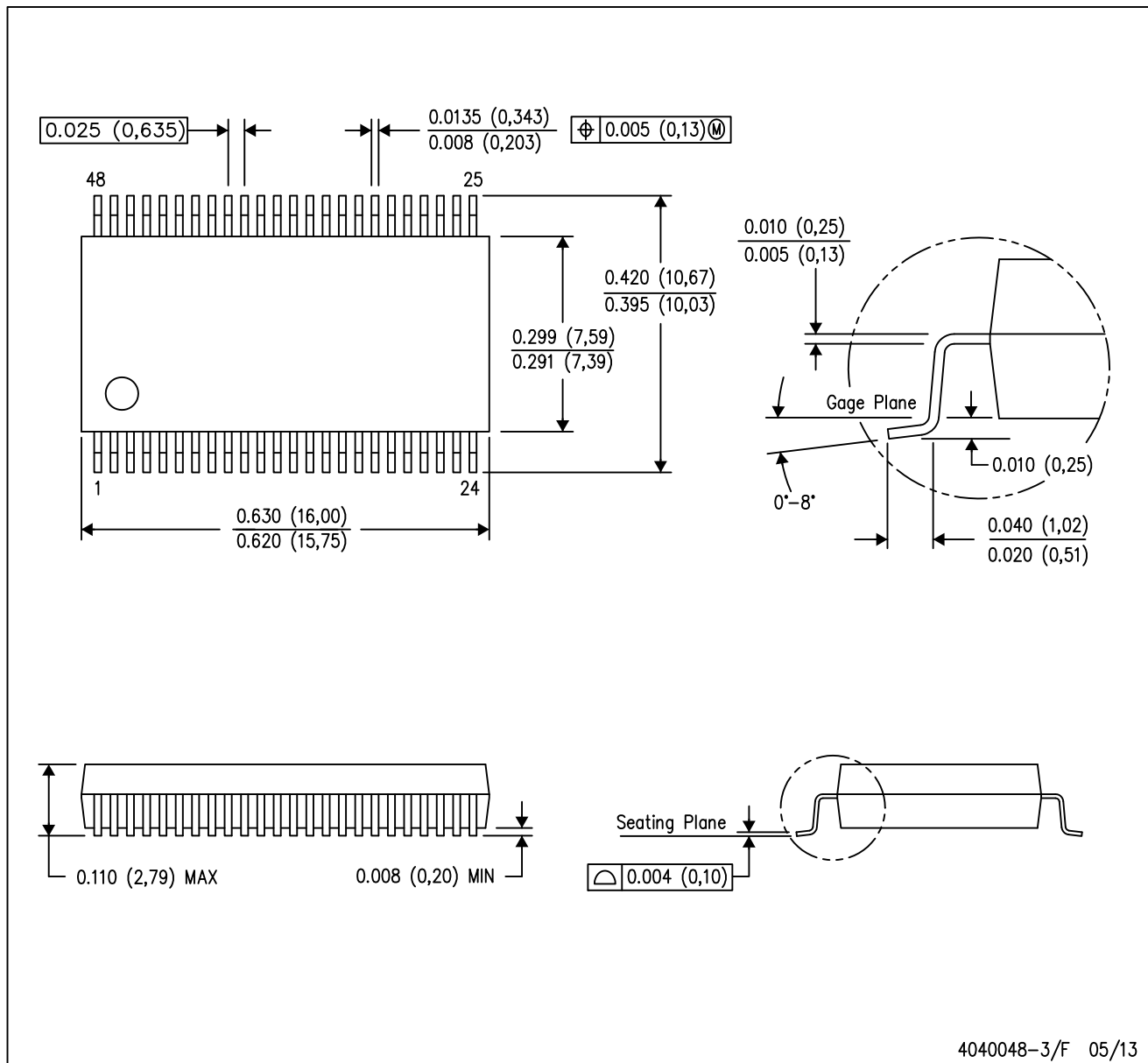


\*All dimensions are nominal

| Device             | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|--------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74ACT16245QDLREP | SSOP         | DL              | 48   | 1000 | 367.0       | 367.0      | 55.0        |

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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