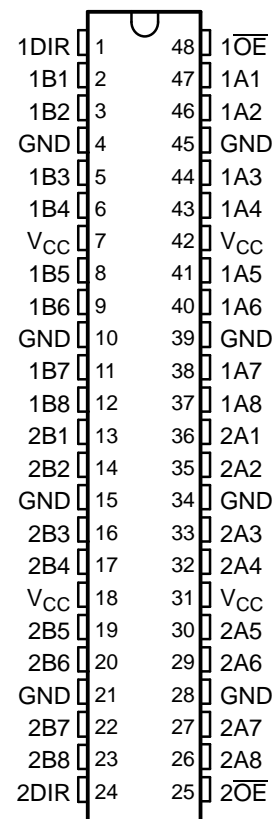


FEATURES

- Members of the Texas Instruments Widebus™ Family
- State-of-the-Art EPIC-IIB™ BiCMOS Design Significantly Reduces Power Dissipation
- Typical V_{OLP} (Output Ground Bounce) <1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- High-Impedance State During Power Up and Power Down
- Distributed V_{CC} and GND Pin Configuration Minimizes High-Speed Switching Noise
- Flow-Through Architecture Optimizes PCB Layout
- High-Drive Outputs ($-32\text{-mA } I_{OH}$, $64\text{-mA } I_{OL}$)
- Latch-Up Performance Exceeds 500 mA Per JESD 70
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model ($C = 200$ pF, $R = 0$)
- Package Options Includes Plastic Thin Very Small-Outline (DGV), Shrink Small-Outline (DL), and Thin Shrink Small-Outline (DGG) Packages and 380-mil Fine-Pitch Ceramic (WD) Flat Package Using 25-mil Center-to-Center Spacings

SN54ABT16245A . . . WD PACKAGE
SN74ABT16245A . . . DGG, DGV, OR DL PACKAGE
(TOP VIEW)



DESCRIPTION

The 'ABT16245A devices are 16-bit noninverting 3-state transceivers designed for synchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

These devices can be used as two 8-bit transceivers or one 16-bit transceiver. They allow 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 output-enable (\overline{OE}) input can be used to disable the device so that the buses are effectively isolated.

When V_{CC} is between 0 and 2.1 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 2.1 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.

The SN54ABT16245A is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT16245A is characterized for operation from -40°C to 85°C .



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.

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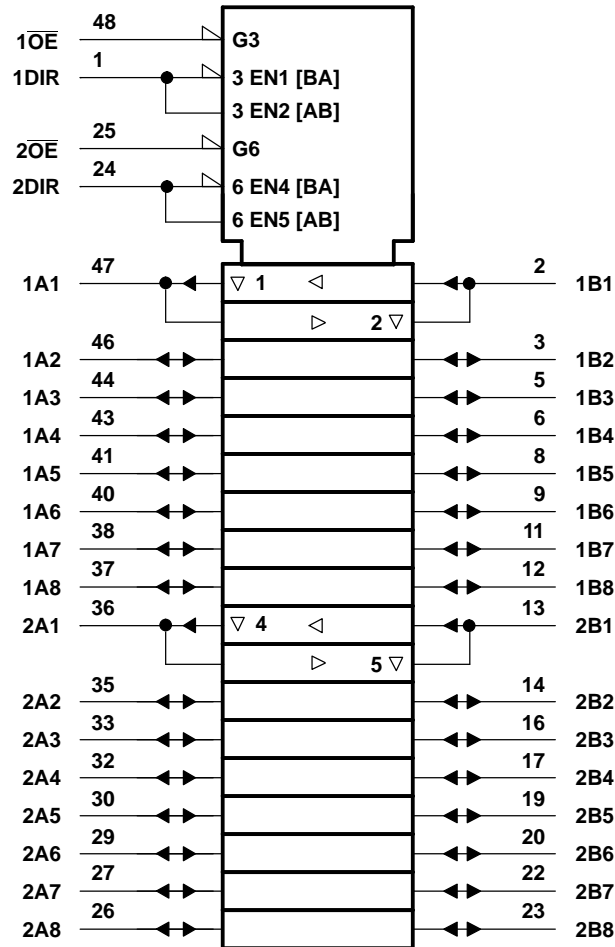
SN54ABT16245A, SN74ABT16245A
16-BIT BUS TRANSCEIVERS
WITH 3-STATE OUTPUTS

SCBS300G—MARCH 1994—REVISED JANUARY 2006

FUNCTION TABLE
(EACH 8-BIT SECTION)

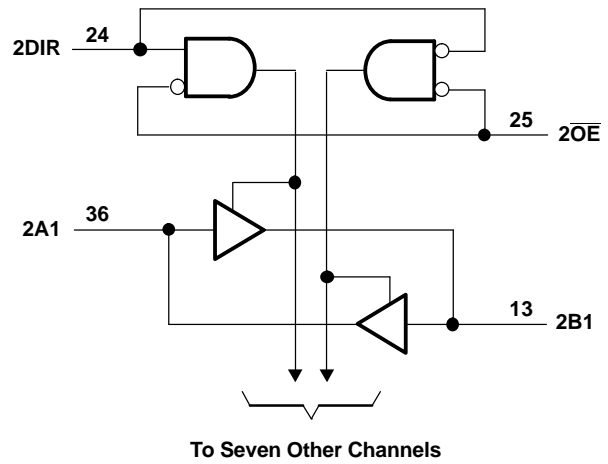
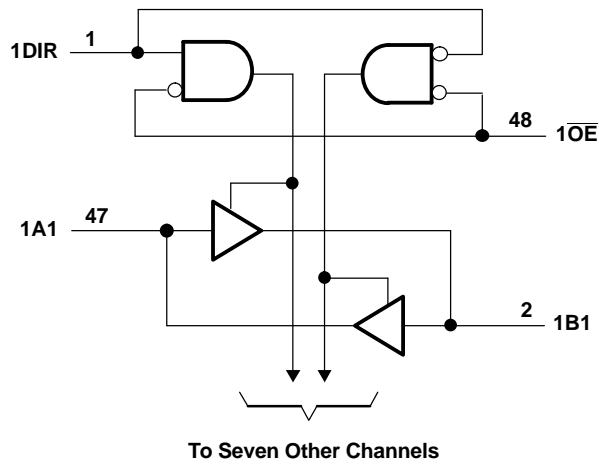
| INPUTS | | OPERATION |
|-----------------|-----|-----------------|
| \overline{OE} | DIR | |
| L | L | B data to A bus |
| L | H | A data to B bus |
| H | X | Isolation |

LOGIC SYMBOL ⁽¹⁾



(1) This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

LOGIC DIAGRAM (POSITIVE LOGIC)



Absolute Maximum Ratings⁽¹⁾

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

| | | MIN | MAX | UNIT |
|---------------|--|---------------|-----|------|
| V_{CC} | Supply voltage range | -0.5 | 7 | V |
| V_I | Input voltage range (except I/O ports) ⁽²⁾ | -0.5 | 7 | V |
| V_O | Voltage range applied to any output in the high or power-off state | -0.5 | 5.5 | V |
| I_O | Current into any output in the low state | SN54ABT16245A | | mA |
| | | SN74ABT16245A | | |
| I_{IK} | Input clamp current | $V_I < 0$ | | -18 |
| I_{OK} | Output clamp current | $V_O < 0$ | | -50 |
| θ_{JA} | Package thermal impedance ⁽³⁾ | DGG package | | 89 |
| | | DGV package | | 93 |
| | | DL package | | 94 |
| 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 clamp-current ratings are observed.
- (3) The package thermal impedance is calculated in accordance with JESD 51.

SN54ABT16245A, SN74ABT16245A 16-BIT BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCBS300G—MARCH 1994—REVISED JANUARY 2006

Recommended Operating Conditions⁽¹⁾

| | | SN54ABT16245A | | SN74ABT16245A | | UNIT |
|--------------------------|------------------------------------|---------------|----------|---------------|----------|--------------|
| | | MIN | MAX | MIN | MAX | |
| V_{CC} | Supply voltage | 4.5 | 5.5 | 4.5 | 5.5 | V |
| V_{IH} | High-level input voltage | 2 | | 2 | | V |
| V_{IL} | Low-level input voltage | | 0.8 | | 0.8 | V |
| V_I | Input voltage | 0 | V_{CC} | 0 | V_{CC} | V |
| I_{OH} | High-level output current | | -24 | | -32 | mA |
| I_{OL} | Low-level output current | | 48 | | 64 | mA |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | | 10 | | 10 | ns/V |
| | Outputs enabled | | | | | |
| $\Delta t/\Delta V_{CC}$ | Power-up ramp rate | 200 | | 200 | | μ s/V |
| T_A | Operating free-air temperature | -55 | 125 | -40 | 85 | $^{\circ}$ C |

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

Electrical Characteristics

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

| PARAMETER | TEST CONDITIONS | | T _A = 25°C | | | SN54ABT16245A | | SN74ABT16245A | | UNIT |
|---------------------------------|--------------------------|--|-----------------------|--------------------|---------------------|---------------|--------------------|---------------|--------------------|------|
| | | | MIN | TYP ⁽¹⁾ | MAX | MIN | MAX | MIN | MAX | |
| V _{IK} | V _{CC} = 4.5 V, | I _I = -18 mA | | | -1.2 | | -1.2 | | -1.2 | V |
| V _{OH} | V _{CC} = 4.5 V, | I _{OH} = -3 mA | 2.5 | | | 2.5 | | 2.5 | | V |
| | V _{CC} = 5 V, | I _{OH} = -3 mA | 3 | | | 3 | | 3 | | |
| | V _{CC} = 4.5 V | I _{OH} = -24 mA | 2 | | | 2 | | | | |
| I _{OH} = -32 mA | | 2 ⁽²⁾ | | | | | 2 | | | |
| V _{OL} | V _{CC} = 4.5 V | I _{OL} = 48 mA | | | 0.55 | | 0.55 | | | V |
| | | I _{OL} = 64 mA | | | 0.55 ⁽²⁾ | | | 0.55 | | |
| V _{hys} | | | | 100 | | | | | | mV |
| I _I | Control inputs | V _{CC} = 0 to 5.5 V, V _I = V _{CC} or GND | | | ±1 | | ±1 | | ±1 | μA |
| | A or B port | V _{CC} = 2.1 V to 5.5 V, V _I = V _{CC} or GND | | | ±20 ⁽²⁾ | | ±100 | | ±20 | |
| I _{OZPU} | | V _{CC} = 0 to 2.1 V, V _O = 0.5 V to 2.7 V, $\overline{OE} = X$ | | | ±50 ⁽³⁾ | | ±50 ⁽³⁾ | | ±50 | μA |
| I _{OZPD} | | V _{CC} = 2.1 V to 0, V _O = 0.5 V to 2.7 V, $\overline{OE} = X$ | | | ±50 ⁽³⁾ | | ±50 ⁽³⁾ | | ±50 | μA |
| I _{OZH} ⁽⁴⁾ | | V _{CC} = 2.1 V to 5.5 V, V _O = 2.7 V, $\overline{OE} \geq 2$ V | | | 10 ⁽⁵⁾ | | 10 | | 10 ⁽⁵⁾ | μA |
| I _{OZL} ⁽⁴⁾ | | V _{CC} = 2.1 V to 5.5 V, V _O = 0.5 V, OE ≥ 2 V | | | -10 ⁽⁵⁾ | | -10 | | -10 ⁽⁵⁾ | μA |
| I _{off} | | V _{CC} = 0, V _I or V _O ≤ 5.5 V | | | ±100 | | | | ±100 | μA |
| I _{CEX} | | V _{CC} = 5.5 V, V _O = 5.5 V | | | 50 | | 50 | | 50 | μA |
| I _O ⁽⁶⁾ | | V _{CC} = 5.5 V, V _O = 2.5 V | -50 | -100 | -180 | -50 | -180 | -50 | -180 | mA |
| I _{CC} | A or B port | V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND | Outputs high | | 2 | 2 | | 2 | | mA |
| | | | Outputs low | | 32 | 32 | | 32 | | |
| | | | Outputs disabled | | 2 | 2 | | 2 | | |
| ΔI _{CC} ⁽⁷⁾ | Data inputs | V _{CC} = 5.5 V, One inputs at 3.4 V, Other inputs at V _{CC} or GND | Outputs enabled | | 2 | 1.5 | | 2 | | mA |
| | | | Outputs disabled | | 0.05 | 1 | | 0.05 | | |
| | Control inputs | V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND | | | 1.5 | 1.5 | | 1.5 | | |
| C _i | Control inputs | V _I = 2.5 V or 0.5 V | | | 3 | | | | | pF |
| C _o | A or B port | V _O = 2.5 V or 0.5 V | | | 6 | | | | | pF |

 (1) All typical values are at V_{CC} = 5 V.

(2) On products compliant to MIL-PRF-38535, this parameter does not apply.

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

 (4) The parameters I_{OZH} and I_{OZL} include the input leakage current.

(5) This limit may vary among suppliers.

(6) Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

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

SN54ABT16245A, SN74ABT16245A 16-BIT BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCBS300G—MARCH 1994—REVISED JANUARY 2006

Switching Characteristics

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

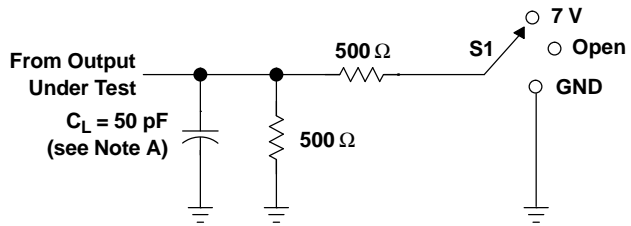
| PARAMETER | FROM (INPUT) | TO (OUTPUT) | SN54ABT16245A | | | | | UNIT |
|-----------|-----------------|----------------|---------------------------------------|-----|-----|-----|-----|------|
| | | | $V_{CC} = 5$ V, $T_A = 25^\circ$ C | | | MIN | MAX | |
| | | | MIN | TYP | MAX | | | |
| t_{PLH} | A or B | B or A | 0.5 | 2.2 | 3.4 | 0.5 | 4 | ns |
| t_{PHL} | | | 0.5 | 2.3 | 3.8 | 0.5 | 4.6 | |
| t_{PZH} | \overline{OE} | B or A | 0.8 | 3.6 | 5.2 | 0.8 | 5.5 | ns |
| t_{PZL} | | | 0.9 | 3.7 | 6.1 | 0.1 | 7.3 | |
| t_{PHZ} | \overline{OE} | B or A | 1.3 | 4.4 | 5.8 | 1.3 | 6.3 | ns |
| t_{PLZ} | | | 1.4 | 3.3 | 4.7 | 1.4 | 5.5 | |

Switching Characteristics

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

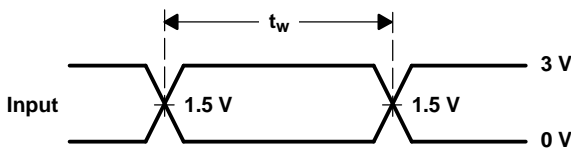
| PARAMETER | FROM (INPUT) | TO (OUTPUT) | SN74ABT16245A | | | | | UNIT |
|-----------|-----------------|----------------|---------------------------------------|-----|-----|-----|-----|------|
| | | | $V_{CC} = 5$ V, $T_A = 25^\circ$ C | | | MIN | MAX | |
| | | | MIN | TYP | MAX | | | |
| t_{PLH} | A or B | B or A | 1 | 2.2 | 3.4 | 1 | 3.9 | ns |
| t_{PHL} | | | 1 | 2.3 | 3.7 | 1 | 4.2 | |
| t_{PZH} | \overline{OE} | B or A | 1 | 3.6 | 5.2 | 1 | 6.3 | ns |
| t_{PZL} | | | 1 | 3.7 | 5.4 | 1 | 6.4 | |
| t_{PHZ} | \overline{OE} | B or A | 2 | 4.4 | 5.8 | 2 | 6.3 | ns |
| t_{PLZ} | | | 1.5 | 3.3 | 4.7 | 1.5 | 5.2 | |

PARAMETER MEASUREMENT INFORMATION

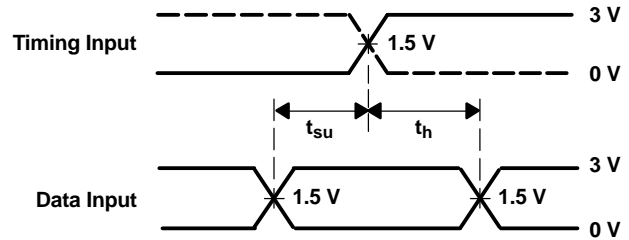


LOAD CIRCUIT

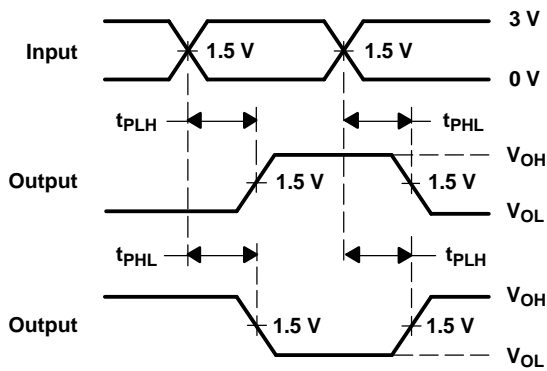
| TEST | S1 |
|-------------------|------|
| t_{PLH}/t_{PHL} | Open |
| t_{PLZ}/t_{PZL} | 7 V |
| t_{PHZ}/t_{PZH} | Open |



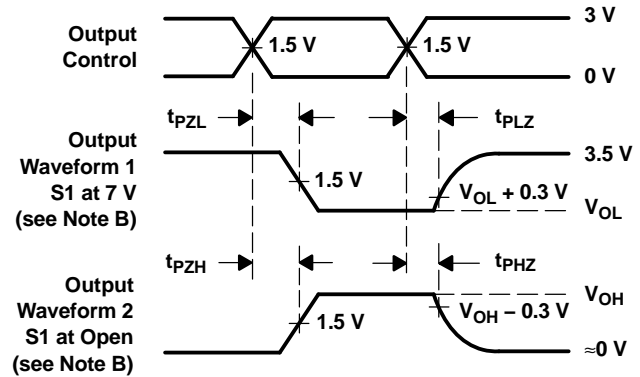
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



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 (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|-------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|---|-------------------------|
| 5962-9317501MXA | ACTIVE | CFP | WD | 48 | 15 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9317501MX A SNJ54ABT16245A WD | Samples |
| 74ABT16245ADGGRG4 | ACTIVE | TSSOP | DGG | 48 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | ABT16245A | Samples |
| SN74ABT16245ADGGR | ACTIVE | TSSOP | DGG | 48 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | ABT16245A | Samples |
| SN74ABT16245ADGVR | ACTIVE | TVSOP | DGV | 48 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AH245A | Samples |
| SN74ABT16245ADL | ACTIVE | SSOP | DL | 48 | 25 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | ABT16245A | Samples |
| SN74ABT16245ADLR | ACTIVE | SSOP | DL | 48 | 1000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | ABT16245A | Samples |
| SNJ54ABT16245AWD | ACTIVE | CFP | WD | 48 | 15 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9317501MX A SNJ54ABT16245A WD | Samples |

(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.

OBSELETE: 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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OTHER QUALIFIED VERSIONS OF SN54ABT16245A, SN74ABT16245A :

- Catalog : [SN74ABT16245A](#)

- Enhanced Product : [SN74ABT16245A-EP](#), [SN74ABT16245A-EP](#)

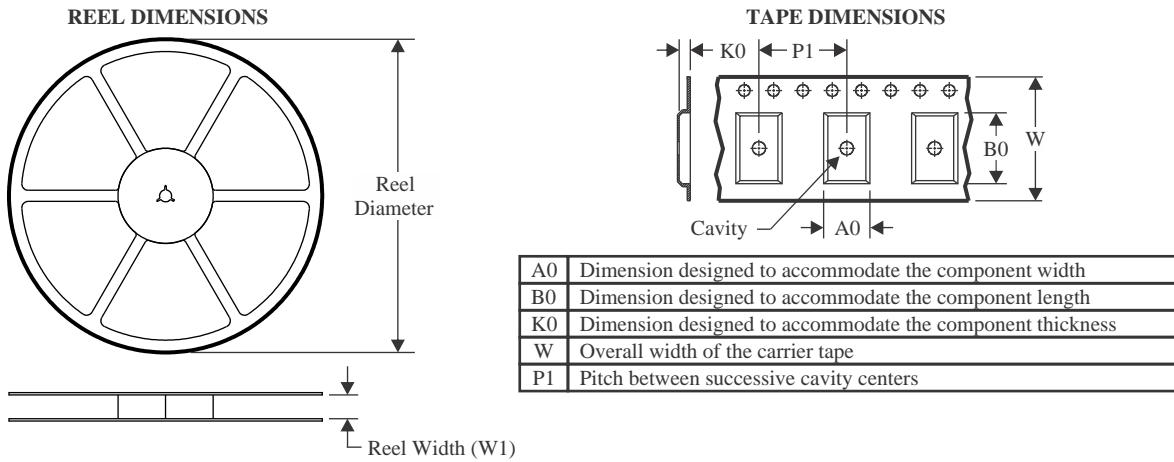
- Military : [SN54ABT16245A](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

- Enhanced Product - Supports Defense, Aerospace and Medical Applications

- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*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 |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74ABT16245ADGGR | TSSOP | DGG | 48 | 2000 | 330.0 | 24.4 | 8.6 | 13.0 | 1.8 | 12.0 | 24.0 | Q1 |
| SN74ABT16245ADGVR | TVSOP | DGV | 48 | 2000 | 330.0 | 16.4 | 7.1 | 10.2 | 1.6 | 12.0 | 16.0 | Q1 |
| SN74ABT16245ADLR | 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) |
|-------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74ABT16245ADGGR | TSSOP | DGG | 48 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ABT16245ADGVR | TVSOP | DGV | 48 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74ABT16245ADLR | 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) |
|-----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74ABT16245ADL | DL | SSOP | 48 | 25 | 473.7 | 14.24 | 5110 | 7.87 |

MECHANICAL DATA

DL (R-PDSO-G48)

PLASTIC SMALL-OUTLINE PACKAGE



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

PowerPAD is a trademark of Texas Instruments.

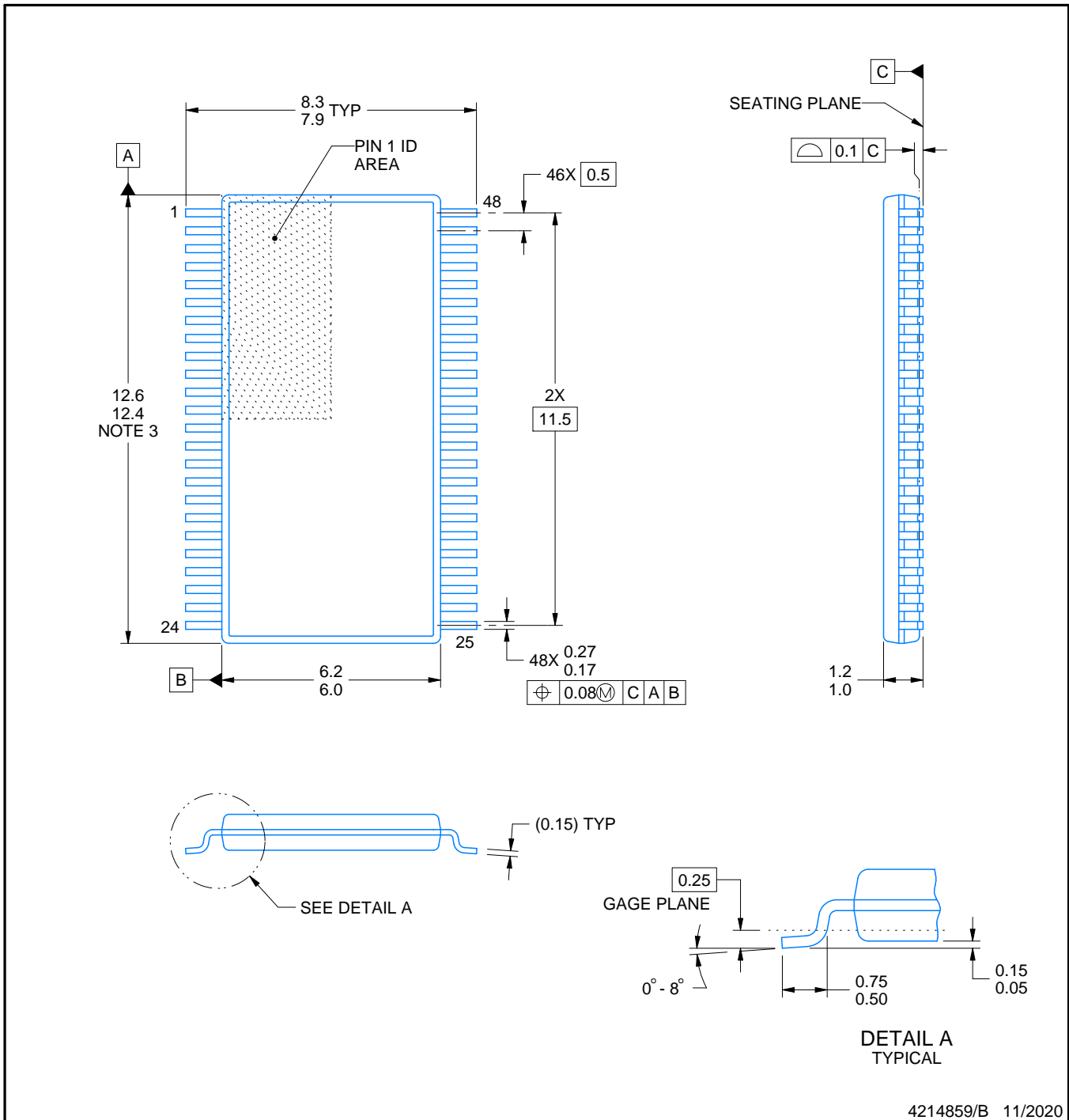
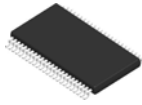
DGV (R-PDSO-G**)

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



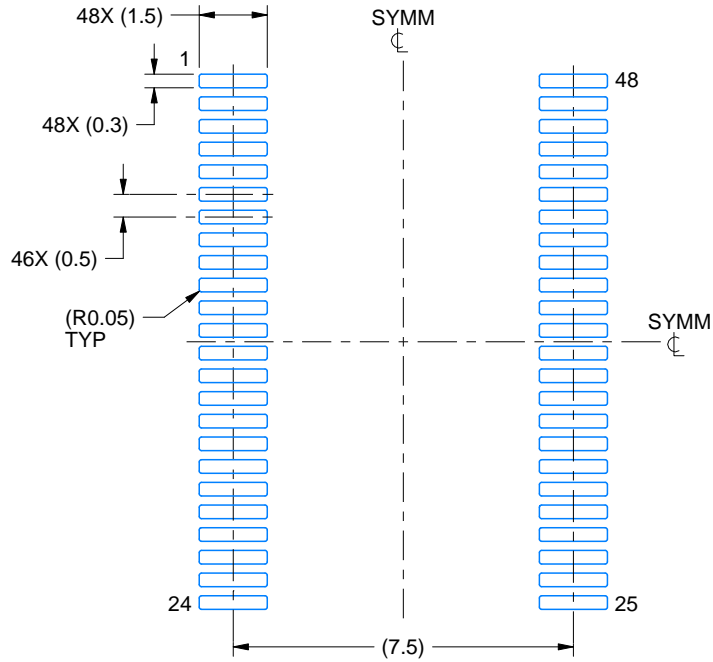
4214859/B 11/2020

EXAMPLE BOARD LAYOUT

DGG0048A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
SCALE:6X



SOLDER MASK DETAILS

4214859/B 11/2020

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

4214859/B 11/2020

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

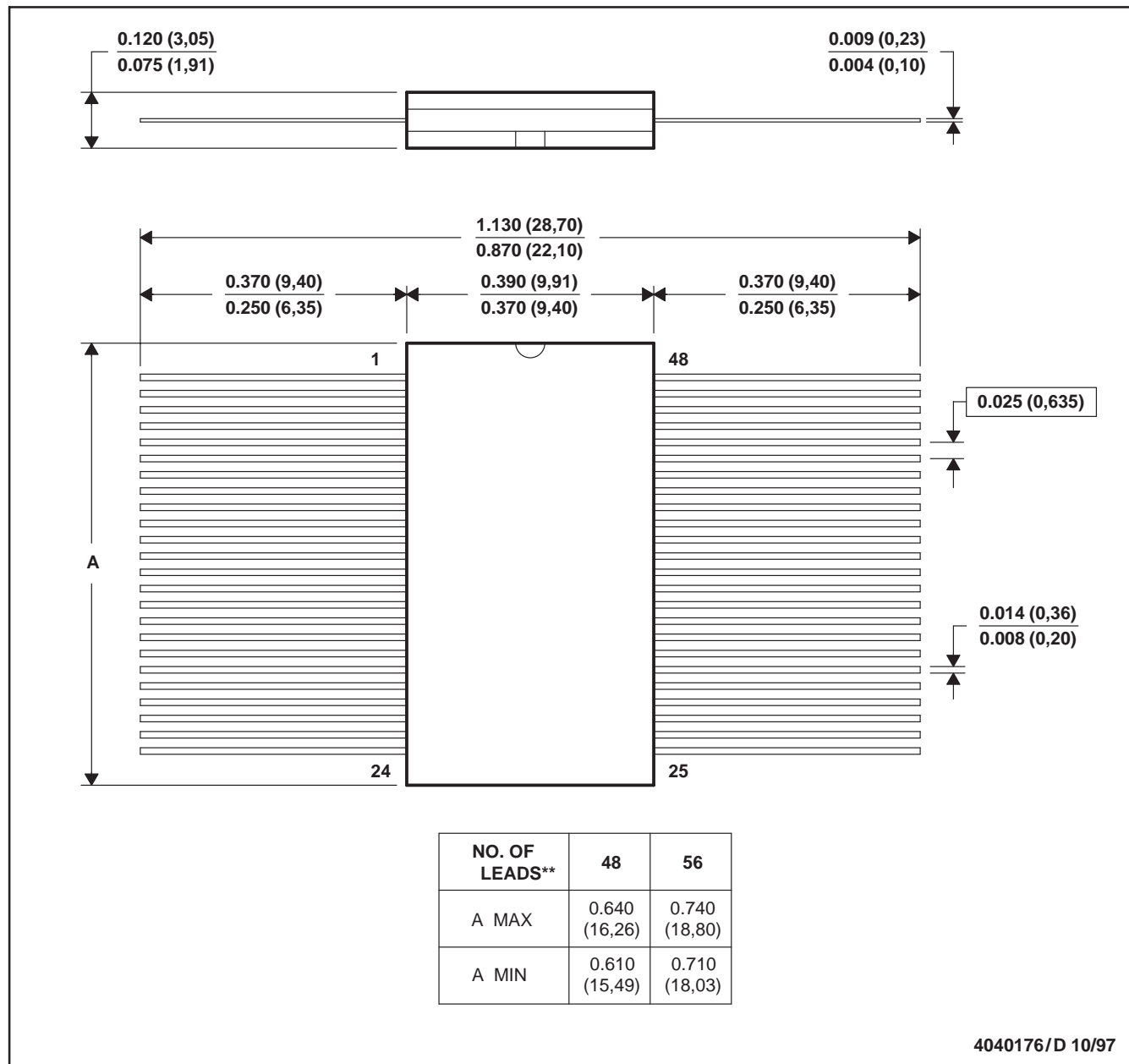


- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

WD (R-GDFP-F**)

CERAMIC DUAL FLATPACK

48 LEADS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. This package can be hermetically sealed with a ceramic lid using glass frit.
 D. Index point is provided on cap for terminal identification only
 E. Falls within MIL STD 1835: GDFP1-F48 and JEDEC MO-146AA
 GDFP1-F56 and JEDEC MO-146AB

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