

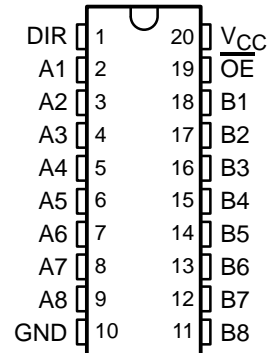
SN54LS245, SN74LS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SDLS146A – OCTOBER 1976 – REVISED FEBRUARY 2002

- 3-State Outputs Drive Bus Lines Directly
- PNP Inputs Reduce dc Loading on Bus Lines
- Hysteresis at Bus Inputs Improves Noise Margins
- Typical Propagation Delay Times Port to Port, 8 ns

| TYPE | I _{OL} (SINK CURRENT) | I _{OH} (SOURCE CURRENT) |
|-----------|--------------------------------------|--|
| SN54LS245 | 12 mA | -12 mA |
| SN74LS245 | 24 mA | -15 mA |

SN54LS245 . . . J OR W PACKAGE
SN74LS245 . . . DB, DW, N, OR NS PACKAGE
(TOP VIEW)

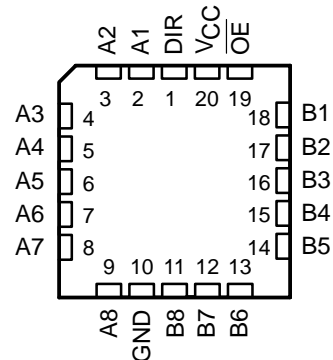


description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

The devices 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 disable the device so that the buses are effectively isolated.

SN54LS245 . . . FK PACKAGE
(TOP VIEW)



ORDERING INFORMATION

| T _A | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|---------------|---------------|-----------------------|------------------|
| 0°C to 70°C | PDIP – N | Tube | SN74LS245N | SN74LS245N |
| | SOIC – DW | Tube | SN74LS245DW | LS245 |
| | | Tape and reel | SN74LS245DWR | |
| | SOP – NS | Tape and reel | SN74LS245NSR | 74LS245 |
| SSOP – DB | Tape and reel | SN74LS245DBR | LS245 | |
| -55°C to 125°C | CDIP – J | Tube | SN54LS245J | SN54LS245J |
| | | Tube | SNJ54LS245J | SNJ54LS245J |
| | CFP – W | Tube | SNJ54LS245W | SNJ54LS245W |
| | LCCC – FK | Tube | SN54LS245FK | SN54LS245FK |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

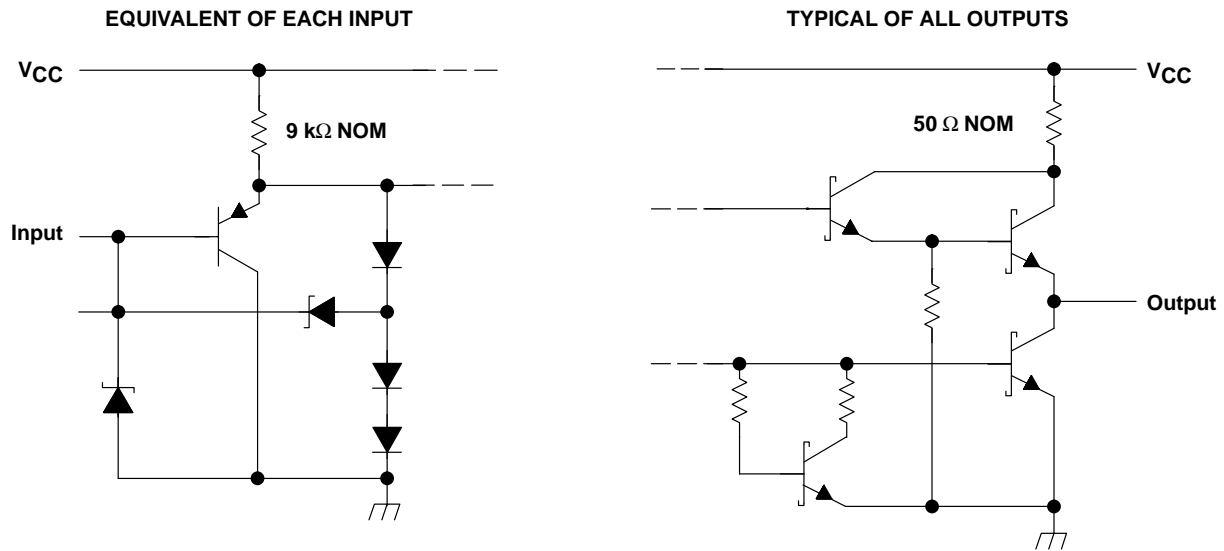
SN54LS245, SN74LS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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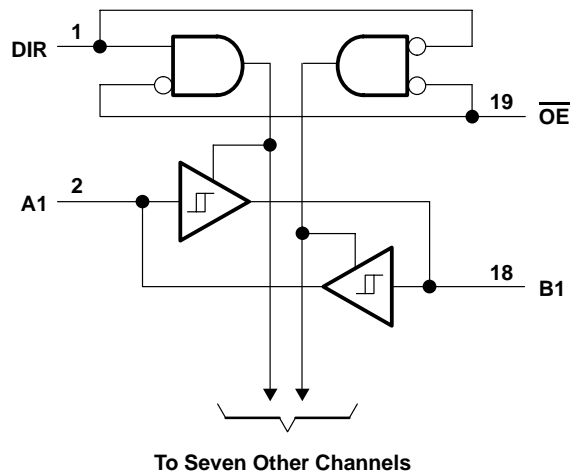
FUNCTION TABLE

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

schematics of inputs and outputs



logic diagram (positive logic)



SN54LS245, SN74LS245
OCTAL BUS TRANSCEIVERS
WITH 3-STATE OUTPUTS

SDLS146A – OCTOBER 1976 – REVISED FEBRUARY 2002

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

| | |
|--|----------------|
| Supply voltage, V_{CC} | 7 V |
| Input voltage, V_I (see Note 1) | 7 V |
| Package thermal impedance, θ_{JA} (see Note 2): | |
| DB package | 70°C/W |
| DW package | 58°C/W |
| N package | 69°C/W |
| NS package | 60°C/W |
| Storage temperature range, T_{stg} | –65°C to 150°C |

† 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. All voltage values are with respect to GND.
 2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

| | SN54LS245 | | | SN74LS245 | | | UNIT |
|--------------------------------------|-----------|-----|-----|-----------|-----|------|------|
| | MIN | NOM | MAX | MIN | NOM | MAX | |
| V_{CC} Supply voltage | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.25 | V |
| I_{OH} High-level output current | | | –12 | | | –15 | mA |
| I_{OL} Low-level output current | | | 12 | | | 24 | mA |
| T_A Operating free-air temperature | –55 | | 125 | 0 | | 70 | °C |



SN54LS245, SN74LS245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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

| PARAMETER | | TEST CONDITION† | SN54LS245 | | | SN74LS245 | | | UNIT | |
|---|--|--|-------------------------|------------------------|------|-----------|------|------|------|----|
| | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | | |
| V _{IH} | High-level input voltage | | 2 | | | 2 | | | V | |
| V _{IL} | Low-level input voltage | | | | 0.7 | | | 0.8 | V | |
| V _{IK} | Input clamp voltage | V _{CC} = MIN, I _I = -18 mA | | | -1.5 | | | -1.5 | V | |
| Hysteresis (V _{T+} - V _{T-}) | | A or B V _{CC} = MIN | 0.2 | 0.4 | | 0.2 | 0.4 | | V | |
| V _{OH} | High-level output voltage | V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = V _{IL(max)} | I _{OH} = -3 mA | | 2.4 | 3.4 | 2.4 | 3.4 | V | |
| | | | I _{OH} = MAX | | 2 | | 2 | | | |
| V _{OL} | Low-level output voltage | V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = V _{IL(max)} | I _{OL} = 12 mA | | | | 0.4 | 0.4 | V | |
| | | | I _{OL} = 24 mA | | | | | 0.5 | | |
| I _{OZH} | Off-state output current, high-level voltage applied | V _{CC} = MAX, OE at 2 V | V _O = 2.7 V | | | 20 | | 20 | μA | |
| I _{OZL} | Off-state output current, low-level voltage applied | V _{CC} = MAX, OE at 2 V | V _O = 0.4 V | | | -200 | | -200 | μA | |
| I _I | Input current at maximum input voltage | A or B DIR or OE | V _{CC} = MAX | V _I = 5.5 V | | | 0.1 | 0.1 | mA | |
| | | | | V _I = 7 V | | | 0.1 | 0.1 | | |
| I _{IH} | High-level input current | V _{CC} = MAX, V _{IH} = 2.7 V | | | 20 | | | 20 | μA | |
| I _{IL} | Low-level input current | V _{CC} = MAX, V _{IL} = 0.4 V | | | -0.2 | | | -0.2 | mA | |
| I _{OS} | Short-circuit output current§ | V _{CC} = MAX | -40 | | -225 | 40 | | -225 | mA | |
| I _{CC} | Supply current | Total, outputs high Total, outputs low Outputs at high Z | V _{CC} = MAX | Outputs open | | 48 | 70 | 48 | 70 | mA |
| | | | | | | 62 | 90 | 62 | 90 | |
| | | | | | | 64 | 95 | 64 | 95 | |

† For conditions shown as MIN or MAX, use the appropriate values specified under recommended operating conditions.

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

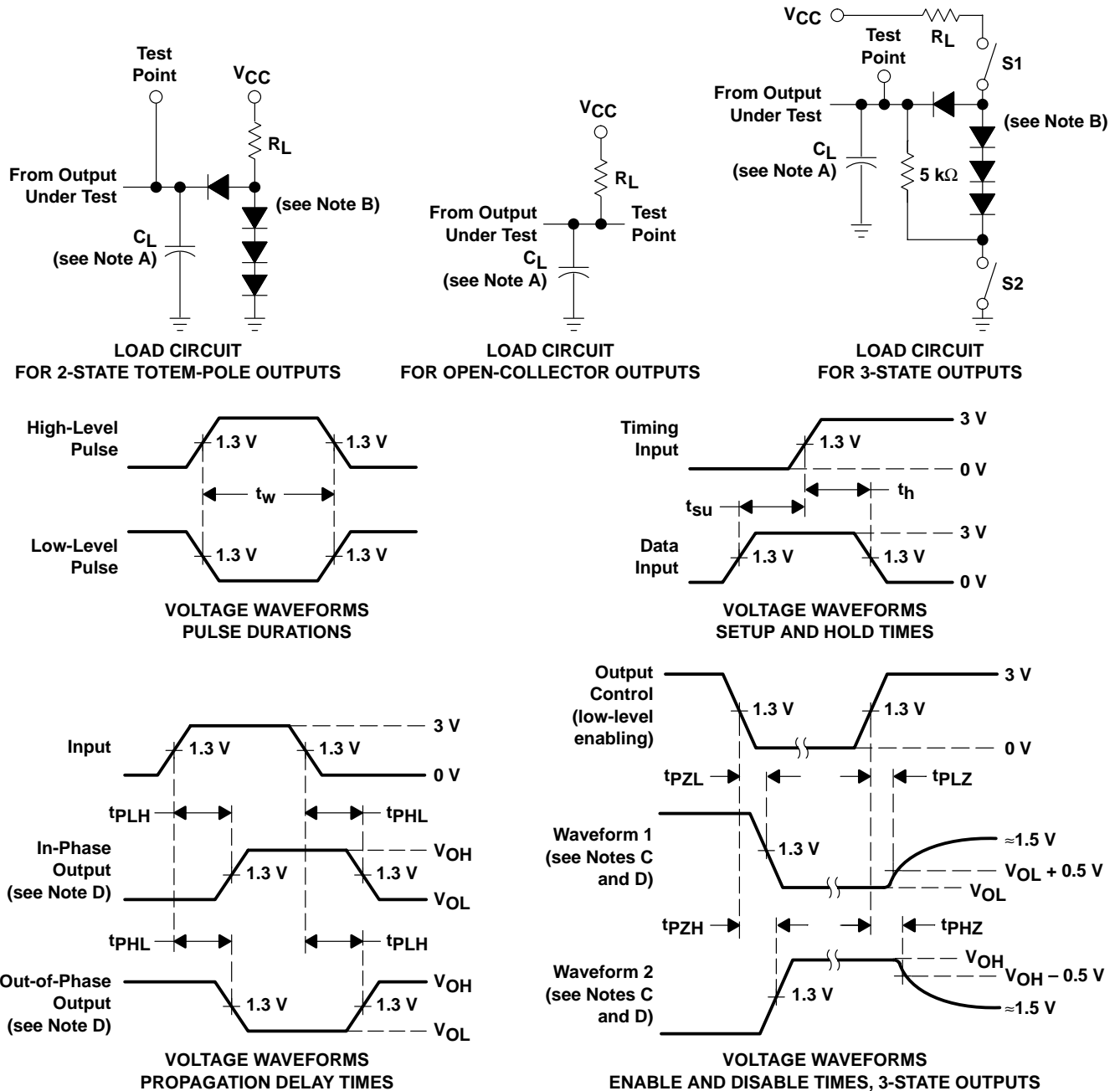
§ Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 1)

| PARAMETER | | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|------------------|---|--|--|-----|-----|-----|------|
| t _{PLH} | Propagation delay time, low- to high-level output | C _L = 45 pF, R _L = 667 Ω | | | 8 | 12 | ns |
| t _{PHL} | Propagation delay time, high- to low-level output | | | | 8 | 12 | |
| t _{PZL} | Output enable time to low level | C _L = 45 pF, R _L = 667 Ω | | | 27 | 40 | ns |
| t _{PZH} | Output enable time to high level | | | | 25 | 40 | |
| t _{PLZ} | Output disable time from low level | C _L = 5 pF, R _L = 667 Ω | | | 15 | 25 | ns |
| t _{PHZ} | Output disable time from high level | | | | 15 | 28 | |



PARAMETER MEASUREMENT INFORMATION
SERIES 54LS/74LS DEVICES



- NOTES: A. C_L includes probe and jig capacitance.
 B. All diodes are 1N3064 or equivalent.
 C. 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.
 D. S1 and S2 are closed for t_{PLH} , t_{PHL} , t_{PHZ} , and t_{PLZ} ; S1 is open and S2 is closed for t_{pZH} ; S1 is closed and S2 is open for t_{pZL} .
 E. Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.
 F. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O \approx 50 \Omega$, $t_r \leq 1.5$ ns, $t_f \leq 2.6$ ns.
 G. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 5962-8002101VRA | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 | N / A for Pkg Type |
| 5962-8002101VSA | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | N / A for Pkg Type |
| 80021012A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| 8002101SA | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | N / A for Pkg Type |
| JM38510/32803B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| JM38510/32803BRA | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 | N / A for Pkg Type |
| JM38510/32803BSA | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | N / A for Pkg Type |
| SN54LS245J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 | N / A for Pkg Type |
| SN74LS245DBR | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS245DBRE4 | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS245DBRG4 | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS245DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS245DWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS245DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS245DWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS245J | OBSOLETE | CDIP | J | 20 | | TBD | Call TI | Call TI |
| SN74LS245N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74LS245N3 | OBSOLETE | PDIP | N | 20 | | TBD | Call TI | Call TI |
| SN74LS245NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74LS245NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS245NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS245NSRG4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SNJ54LS245FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| SNJ54LS245J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 | N / A for Pkg Type |
| SNJ54LS245W | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | N / A for Pkg Type |

⁽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⁾ 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)

⁽³⁾ 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



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 |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LS245DBR | SSOP | DB | 20 | 2000 | 330.0 | 16.4 | 8.2 | 7.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74LS245DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.0 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74LS245NSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.2 | 13.0 | 2.5 | 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) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LS245DBR | SSOP | DB | 20 | 2000 | 346.0 | 346.0 | 33.0 |
| SN74LS245DWR | SOIC | DW | 20 | 2000 | 346.0 | 346.0 | 41.0 |
| SN74LS245NSR | SO | NS | 20 | 2000 | 346.0 | 346.0 | 41.0 |

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 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.
 D. Falls within JEDEC MO-150

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---------------|------------------------|------------------------|------------------------|------------------------|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B MIN | — | — | — | — |
| C MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87) | 0.300 (7,62) |
| C MIN | 0.245 (6,22) | 0.245 (6,22) | 0.220 (5,59) | 0.245 (6,22) |



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package is hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-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.

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

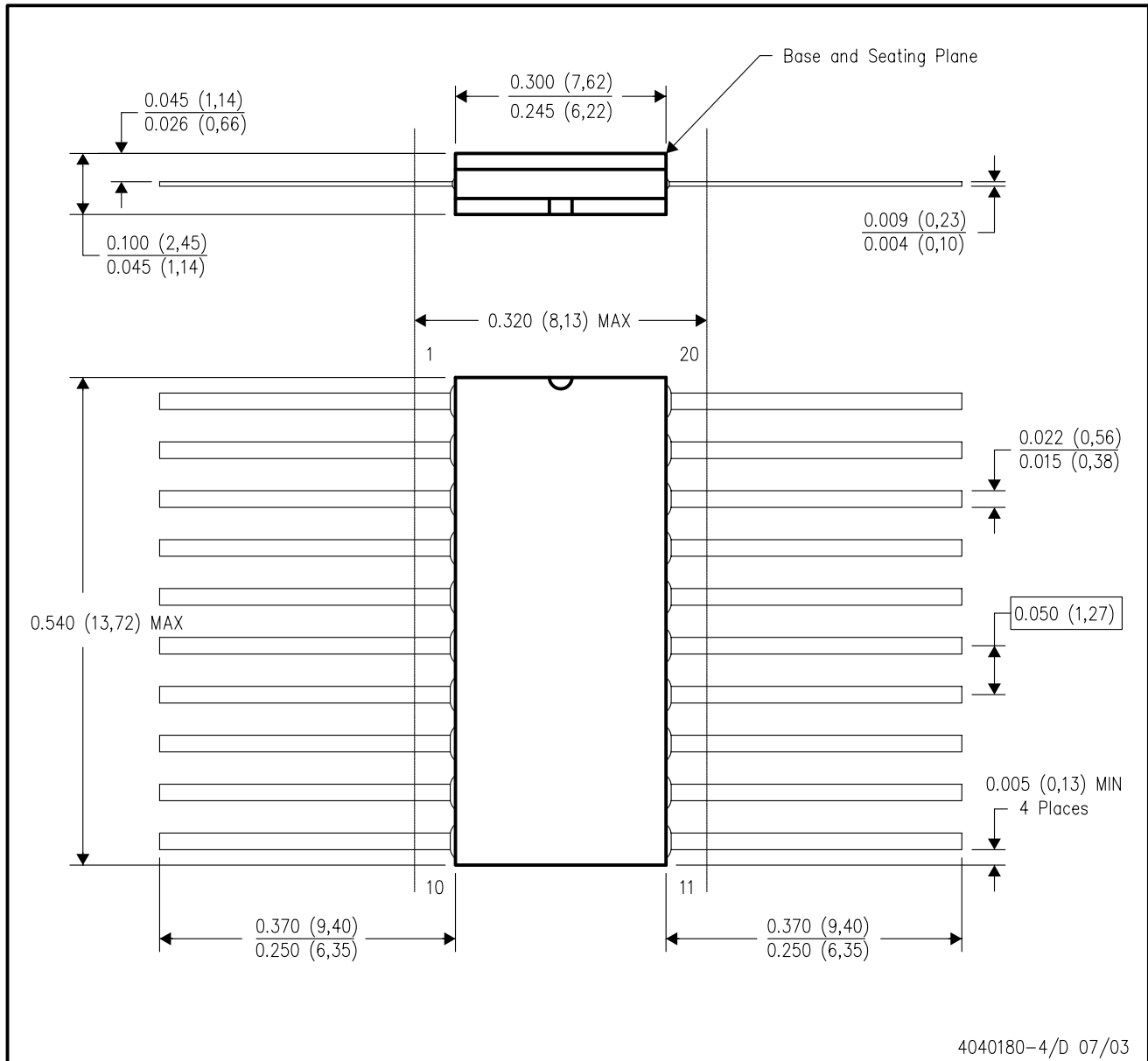


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- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a metal lid.
 - D. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



- 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 GDFP2-F20

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - $\triangle D$ The 20 pin end lead shoulder width is a vendor option, either half or full width.

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