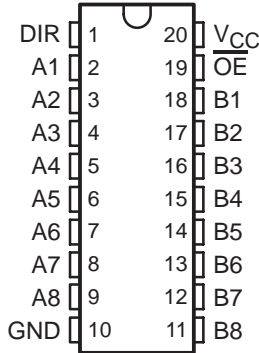


SN54AHCT245, SN74AHCT245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

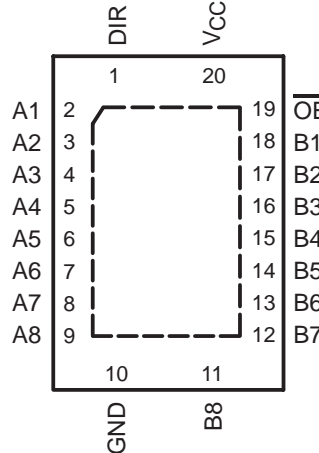
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- Inputs Are TTL-Voltage Compatible
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

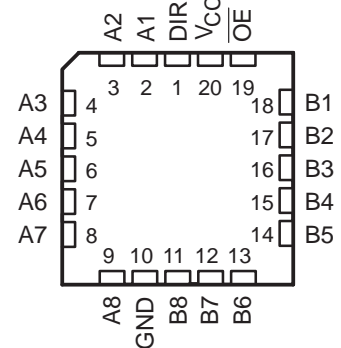
SN54AHCT245 . . . J OR W PACKAGE
SN74AHCT245 . . . DB, DGV, DW, N, NS,
OR PW PACKAGE
(TOP VIEW)



SN74AHCT245 . . . RGY PACKAGE
(TOP VIEW)



SN54AHCT245 . . . FK PACKAGE
(TOP VIEW)



description/ordering information

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

The 'AHCT245 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 be used to disable the device so that the buses effectively are isolated.

To ensure the high-impedance state during power up or power down, \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.

ORDERING INFORMATION

| TA | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-------------|----------------|-----------------------|------------------|
| -40°C to 85°C | PDIP – N | Tube | SN74AHCT245N | SN74AHCT245N |
| | QFN – RGY | Tape and reel | SN74AHCT245RGYR | HB245 |
| | SOIC – DW | Tube | SN74AHCT245DW | AHCT245 |
| | | Tape and reel | SN74AHCT245DWR | |
| | SOP – NS | Tape and reel | SN74AHCT245NSR | AHCT245 |
| | SSOP – DB | Tape and reel | SN74AHCT245DBR | HB245 |
| | TSSOP – PW | Tube | SN74AHCT245PW | HB245 |
| Tape and reel | | SN74AHCT245PWR | | |
| -55°C to 125°C | TVSOP – DGV | Tape and reel | SN74AHCT245DGVR | HB245 |
| | CDIP – J | Tube | SNJ54AHCT245J | SNJ54AHCT245J |
| | CFP – W | Tube | SNJ54AHCT245W | SNJ54AHCT245W |
| | LCCC – FK | Tube | SNJ54AHCT245FK | SNJ54AHCT245FK |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at 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.



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.

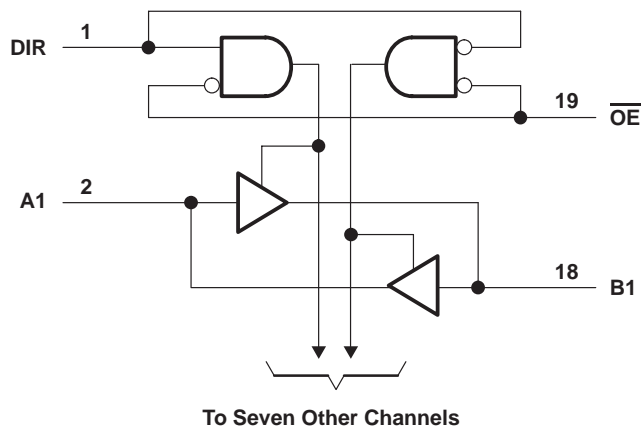
SN54AHCT245, SN74AHCT245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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FUNCTION TABLE
(each transceiver)

| INPUTS | | OPERATION |
|-----------------|-----|-----------------|
| \overline{OE} | 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)†

| | |
|---|----------------------------|
| Supply voltage range, V_{CC} | -0.5 V to 7 V |
| Input voltage range, V_I (see Note 1): Control inputs | -0.5 V to 7 V |
| I/O, Output voltage range, V_O (see Note 1) | -0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, I_{IK} ($V_I < 0$): Control inputs | -20 mA |
| I/O, Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) | ± 20 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ± 25 mA |
| Continuous current through V_{CC} or GND | ± 75 mA |
| Package thermal impedance, θ_{JA} (see Note 2): DB package | 70°C/W |
| (see Note 2): DGV package | 92°C/W |
| (see Note 2): DW package | 58°C/W |
| (see Note 2): N package | 69°C/W |
| (see Note 2): NS package | 60°C/W |
| (see Note 2): PW package | 83°C/W |
| (see Note 3): RGY package | 37°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. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.
3. The package thermal impedance is calculated in accordance with JESD 51-5.

SN54AHCT245, SN74AHCT245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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recommended operating conditions (see Note 4)

| | SN54AHCT245 | | SN74AHCT245 | | 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 | 5.5 | 0 | 5.5 | V |
| V _O Output voltage | 0 | V _{CC} | 0 | V _{CC} | V |
| I _{OH} High-level output current | | -8 | | -8 | mA |
| I _{OL} Low-level output current | | 8 | | 8 | mA |
| Δt/Δv Input transition rise or fall rate | | 20 | | 20 | ns/V |
| T _A Operating free-air temperature | -55 | 125 | -40 | 85 | °C |

NOTE 4: 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 | V _{CC} | T _A = 25°C | | | SN54AHCT245 | | SN74AHCT245 | | UNIT |
|--------------------|---|-----------------|-----------------------|-----|-------|-------------|------|-------------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V _{OH} | I _{OH} = -50 μA | 4.5 V | 4.4 | 4.5 | | 4.4 | | 4.4 | V | |
| | I _{OH} = -8 mA | | 3.94 | | | 3.8 | | 3.8 | | |
| V _{OL} | I _{OL} = 50 μA | 4.5 V | | | 0.1 | 0.1 | | 0.1 | V | |
| | I _{OL} = 8 mA | | | | 0.36 | 0.44 | 0.44 | | | |
| I _I | \overline{OE} or DIR V _I = 5.5 V or GND | 0 V to 5.5 V | | | ±0.1 | ±1* | | ±1 | μA | |
| I _{OZ} | A or B inputs† V _O = V _{CC} or GND | 5.5 V | | | ±0.25 | ±2.5 | | ±2.5 | μA | |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | | | 4 | 40 | | 40 | μA | |
| ΔI _{CC} ‡ | One input at 3.4 V, Other inputs at V _{CC} or GND | 5.5 V | | | 1.35 | 1.5 | | 1.5 | mA | |
| C _i | \overline{OE} or DIR V _I = V _{CC} or GND | 5 V | | 2.5 | 10 | | | 10 | pF | |
| C _{iO} | A or B inputs V _I = V _{CC} or GND | 5 V | | 4 | | | | | pF | |

* On products compliant to MIL-PRF-38535, this parameter is not production tested at V_{CC} = 0 V.

† For I/O ports, the parameter I_{OZ} includes the input leakage current.

‡ This is the increase in supply current for each input at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

SN54AHCT245, SN74AHCT245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | $T_A = 25^\circ\text{C}$ | | | SN54AHCT245 | | SN74AHCT245 | | UNIT |
|-------------|-----------------|-------------|----------------------|--------------------------|--------|-----|-------------|-----|-------------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A or B | B or A | $C_L = 15\text{ pF}$ | 4.5** | 7.7** | 1** | 10** | 1 | 8.5 | ns | |
| t_{PHL} | | | | 4.5** | 7.7** | 1** | 10** | 1 | 8.5 | | |
| t_{PZH} | \overline{OE} | A or B | $C_L = 15\text{ pF}$ | 8.9** | 13.8** | 1** | 16** | 1 | 15 | ns | |
| t_{PZL} | | | | 8.9** | 13.8** | 1** | 16** | 1 | 15 | | |
| t_{PHZ} | \overline{OE} | A or B | $C_L = 15\text{ pF}$ | 9.2** | 14.4** | 1** | 16.5** | 1 | 15.5 | ns | |
| t_{PLZ} | | | | 9.2** | 14.4** | 1** | 16.5** | 1 | 15.5 | | |
| t_{PLH} | A or B | B or A | $C_L = 50\text{ pF}$ | 5.3 | 8.7 | 1 | 11 | 1 | 9.5 | ns | |
| t_{PHL} | | | | 5.3 | 8.7 | 1 | 11 | 1 | 9.5 | | |
| t_{PZH} | \overline{OE} | A or B | $C_L = 50\text{ pF}$ | 9.7 | 14.8 | 1 | 17 | 1 | 16 | ns | |
| t_{PZL} | | | | 9.7 | 14.8 | 1 | 17 | 1 | 16 | | |
| t_{PHZ} | \overline{OE} | A or B | $C_L = 50\text{ pF}$ | 10 | 15.4 | 1 | 17.5 | 1 | 16.5 | ns | |
| t_{PLZ} | | | | 10 | 15.4 | 1 | 17.5 | 1 | 16.5 | | |
| $t_{sk(o)}$ | | | $C_L = 50\text{ pF}$ | | | 1** | | | 1 | ns | |

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

*** On products compliant to MIL-PRF-38535, this parameter does not apply.

noise characteristics, $V_{CC} = 5\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ (see Note 5)

| PARAMETER | SN74AHCT245 | | | UNIT |
|--|-------------|-----|-----|------|
| | MIN | TYP | MAX | |
| $V_{OH(V)}$ Quiet output, minimum dynamic V_{OH} | | 4 | | V |
| $V_{IH(D)}$ High-level dynamic input voltage | 2 | | | V |
| $V_{IL(D)}$ Low-level dynamic input voltage | | | 0.8 | V |

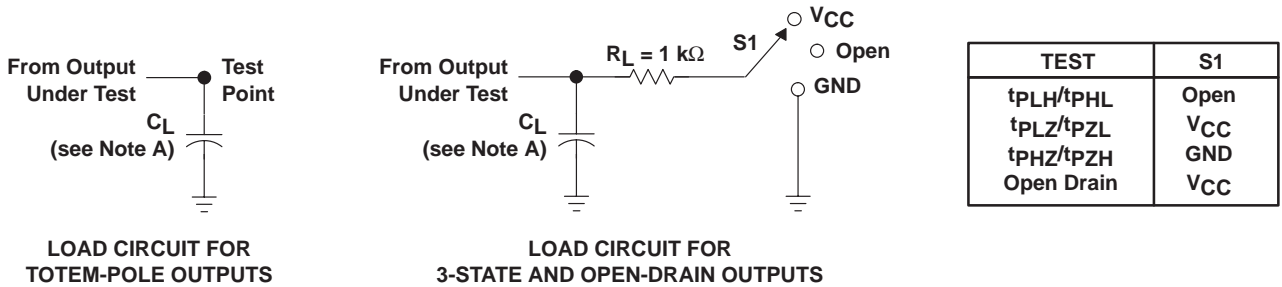
NOTE 5: Characteristics are for surface-mount packages only.

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|-----------------------------|-----|------|
| C_{pd} Power dissipation capacitance | No load, $f = 1\text{ MHz}$ | 13 | pF |

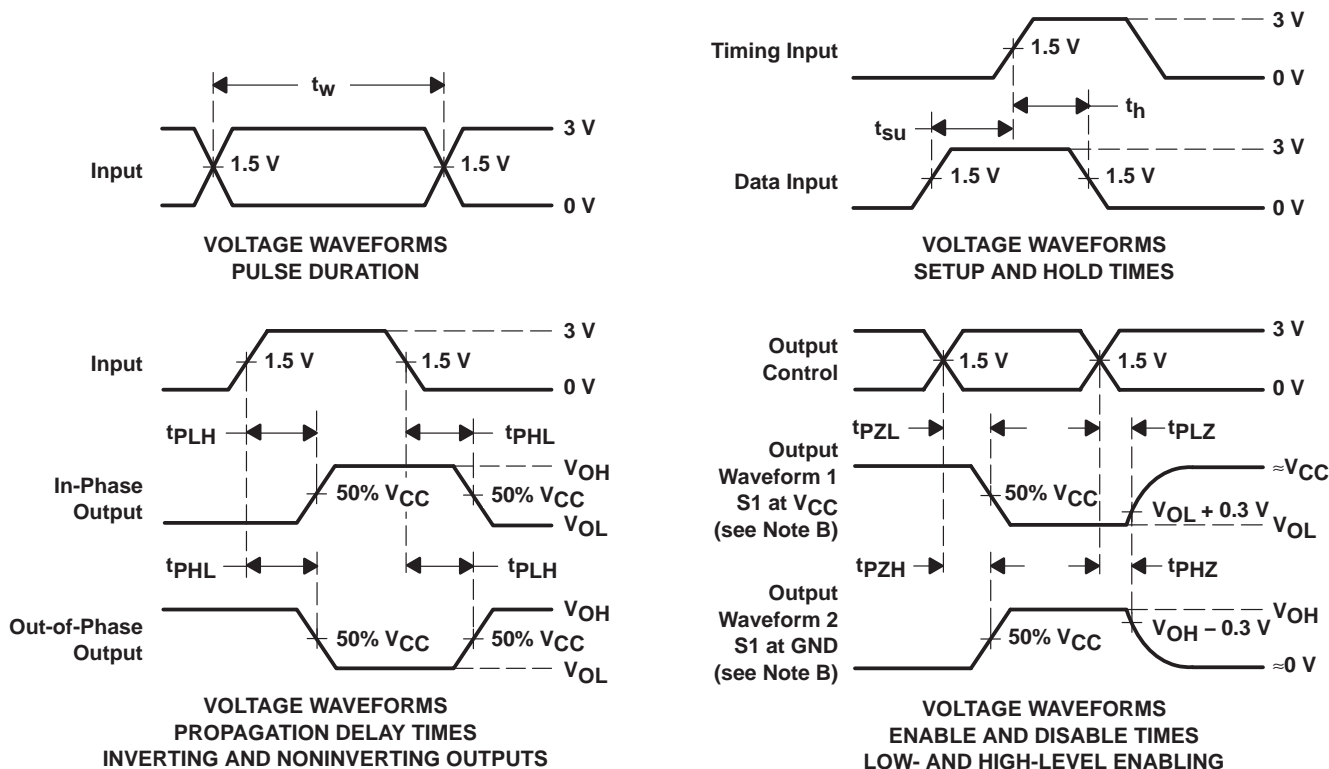


PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT FOR
TOTEM-POLE OUTPUTS

LOAD CIRCUIT FOR
3-STATE AND OPEN-DRAIN OUTPUTS



- 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 MHz, $Z_O = 50 \Omega$, $t_r \leq 3$ ns, $t_f \leq 3$ ns.
 D. The outputs are measured one at a time with one input transition per measurement.
 E. All parameters and waveforms are not applicable to all devices.

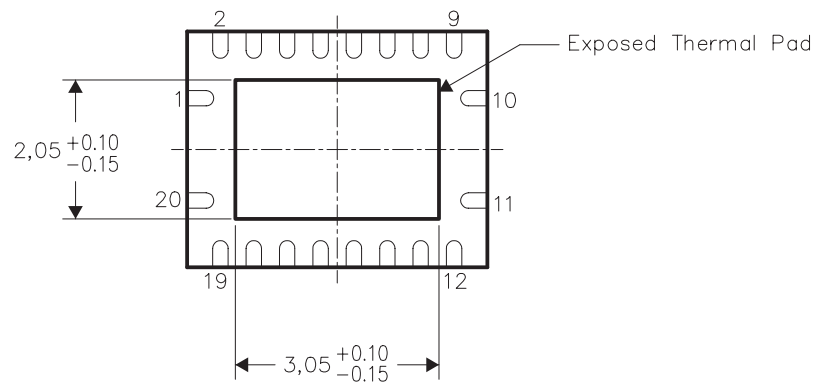
Figure 1. Load Circuit and Voltage Waveforms

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB), the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to a ground plane or special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, Quad Flatpack No-Lead Logic Packages, Texas Instruments Literature No. SCBA017. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|-------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 5962-9681901Q2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| 5962-9681901QRA | ACTIVE | CDIP | J | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| 5962-9681901QSA | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN74AHCT245DBLE | OBSOLETE | SSOP | DB | 20 | | TBD | Call TI | Call TI |
| SN74AHCT245DBR | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245DBRE4 | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245DGVR | ACTIVE | TVSOP | DGV | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245DGVRE4 | ACTIVE | TVSOP | DGV | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74AHCT245NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245PW | ACTIVE | TSSOP | PW | 20 | 70 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245PWE4 | ACTIVE | TSSOP | PW | 20 | 70 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245PWLE | OBSOLETE | TSSOP | PW | 20 | | TBD | Call TI | Call TI |
| SN74AHCT245PWR | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245PWRE4 | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245PWRG4 | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AHCT245RGYR | ACTIVE | QFN | RGY | 20 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1YEAR |
| SN74AHCT245RGYRG4 | ACTIVE | QFN | RGY | 20 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1YEAR |
| SNJ54AHCT245FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54AHCT245J | ACTIVE | CDIP | J | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54AHCT245W | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |

⁽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) 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.

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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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.

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

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL 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 metal lid.
 - D. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

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.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



4073251/E 08/00

- 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

DW (R-PDSO-G20)

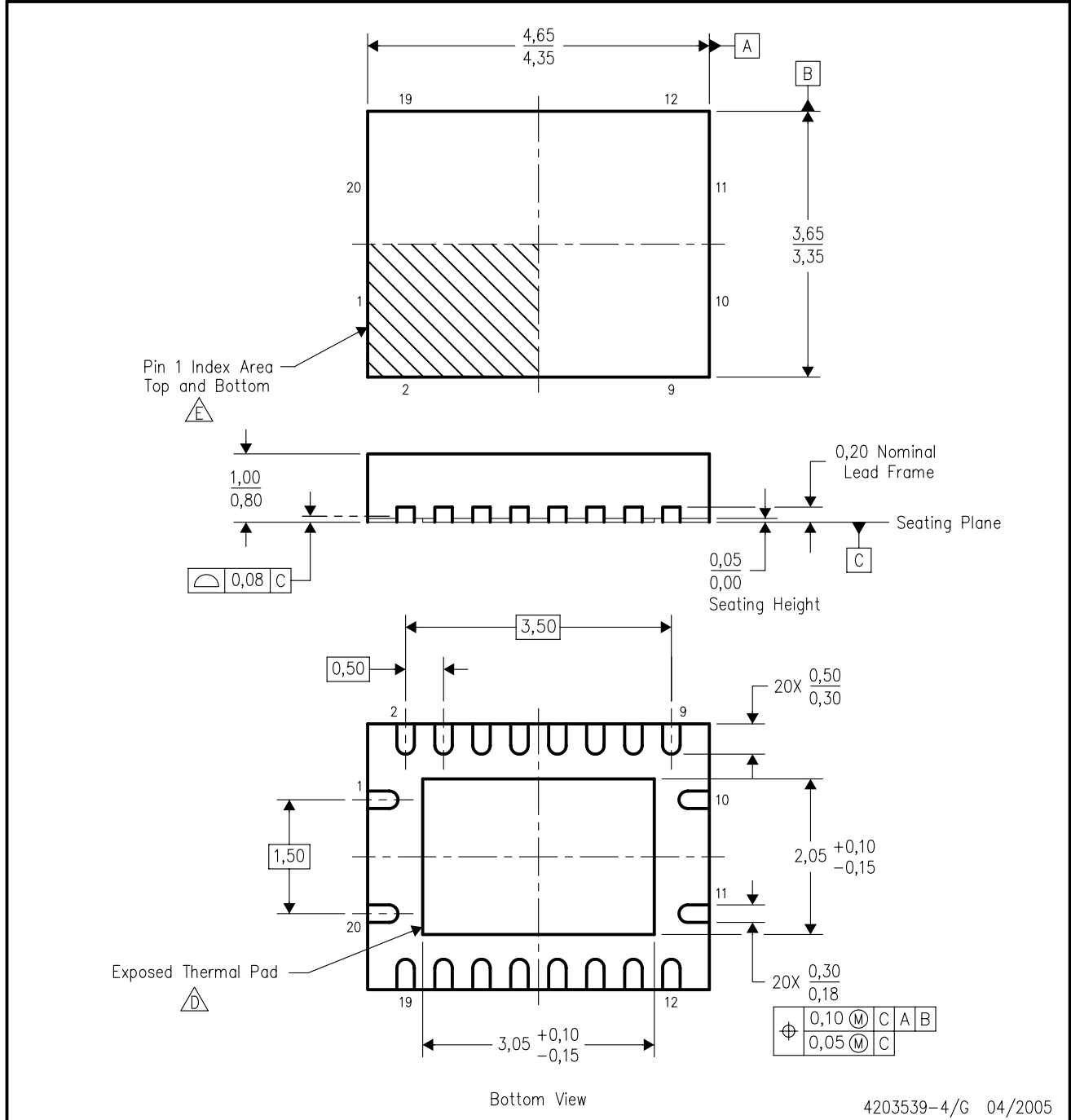
PLASTIC SMALL-OUTLINE PACKAGE





- 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 MS-013 variation AC.

RGY (R-PQFP-N20)

PLASTIC QUAD FLATPACK



4203539-4/G 04/2005

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-Lead) package configuration.
 -  The package thermal pad must be soldered to the board for thermal and mechanical performance.
 -  Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
 - F. Package complies to JEDEC MO-241 variation BC.

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.

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

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- 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-153

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