

# SN54ABT2245, SN74ABT2245 OCTAL TRANSCEIVERS AND LINE/MOS DRIVERS WITH 3-STATE OUTPUTS

SCBS234D – SEPTEMBER 1992 – REVISED MAY 1997

- B-Port Outputs Have Equivalent 25-Ω Series Resistors, So No External Resistors Are Required
- State-of-the-Art EPIC-IIB™ BiCMOS Design Significantly Reduces Power Dissipation
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- 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
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), Plastic (N) and Ceramic (J) DIPs, and Ceramic Flat (W) Package

## description

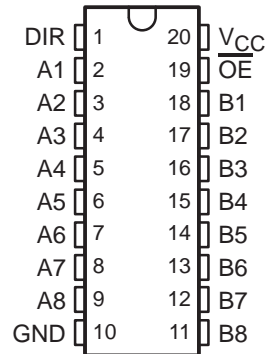
These octal transceivers and line drivers are designed for asynchronous communication between data buses. The devices transmit data from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can be used to disable the device so the buses are effectively isolated.

The B-port outputs, which are designed to sink up to 12 mA, include equivalent 25-Ω series resistors to reduce overshoot and undershoot.

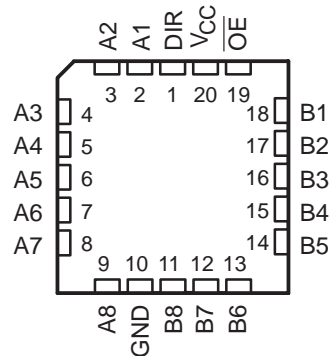
When  $V_{CC}$  is between 0 and 2.1 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 2.1 V,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking/current-sourcing capability of the driver.

The SN54ABT2245 is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN74ABT2245 is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

SN54ABT2245 . . . J OR W PACKAGE  
SN74ABT2245 . . . DB, DW, N, OR PW PACKAGE  
(TOP VIEW)



SN54ABT2245 . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE

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



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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**

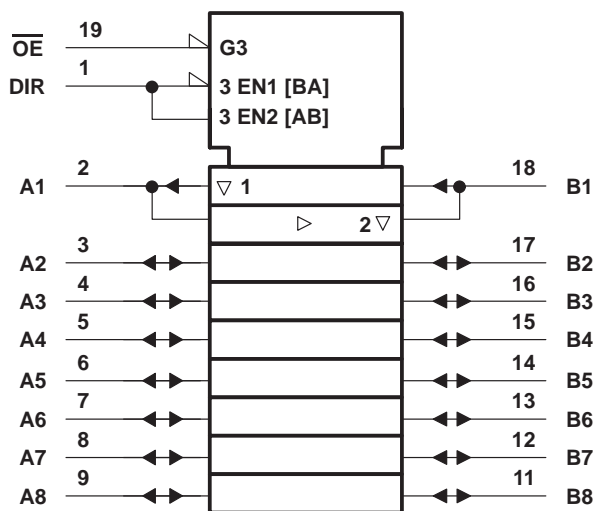
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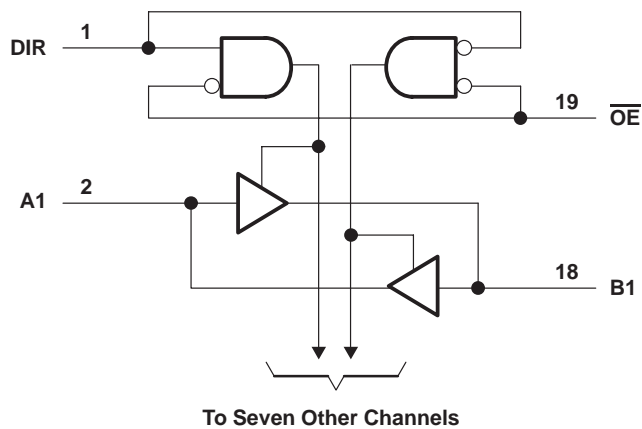
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## logic symbol†



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

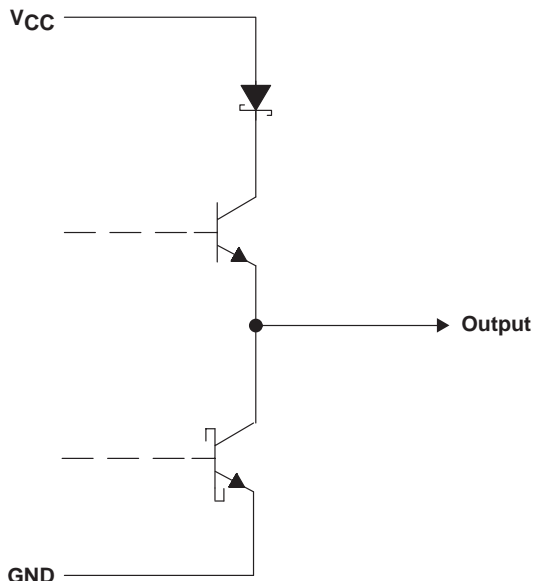
## logic diagram (positive logic)



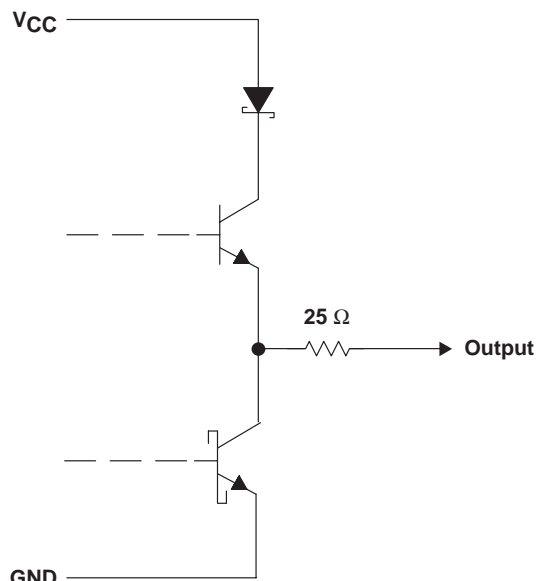
# SN54ABT2245, SN74ABT2245 OCTAL TRANSCEIVERS AND LINE/MOS DRIVERS WITH 3-STATE OUTPUTS

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**schematic of A-port outputs**



**schematic of B-port outputs**



All resistor values shown are nominal.

**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, $V_I$ (except I/O ports) (see Note 1) .....                    | -0.5 V to 7 V   |
| Voltage range applied to any output in the high or power-off state, $V_O$ .....     | -0.5 V to 5.5 V |
| Current into any output in the low state, $I_O$ : SN54ABT2245 (except B port) ..... | 96 mA           |
| SN74ABT2245 (except B port) .....   | 128 mA          |
| B port .....  | 30 mA           |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....                                   | -18 mA          |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....                                  | -50 mA          |
| Package thermal impedance, $\theta_{JA}$ (see Note 2): DB package .....             | 115°C/W         |
| DW package .....  | 97°C/W          |
| N package .....   | 67°C/W          |
| PW package .....  | 128°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 negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.  
 2. The package thermal impedance is calculated in accordance with EIA/JEDEC Std JESD51, except for through-hole packages, which use a trace length of zero.

# SN54ABT2245, SN74ABT2245 OCTAL TRANSCEIVERS AND LINE/MOS DRIVERS WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 3)

|                          |                                    | SN54ABT2245     |          | SN74ABT2245 |          | 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          | A port          |          | -24         |          | mA           |
|                          |                                    | B port          |          | -12         |          |              |
| $I_{OL}$                 | Low-level output current           | A port          |          | 48          |          | mA           |
|                          |                                    | B port          |          | 12          |          |              |
| $\Delta t/\Delta v$      | Input transition rise or fall rate | Outputs enabled |          | 5           |          | ns/V         |
| $\Delta t/\Delta V_{CC}$ | Power-up ramp rate                 | 200             |          | 200         |          | $\mu$ s/V    |
| $T_A$                    | Operating free-air temperature     | -55             | 125      | -40         | 85       | $^{\circ}$ C |

NOTE 3: Unused pins (input or I/O) must be held high or low to prevent them from floating.

# SN54ABT2245, SN74ABT2245 OCTAL TRANSCEIVERS AND LINE/MOS DRIVERS WITH 3-STATE OUTPUTS

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

| PARAMETER               |                                 | TEST CONDITIONS  |                          | T <sub>A</sub> = 25°C   |      |         | SN54ABT2245 |      | SN74ABT2245 |      | UNIT |     |      |
|-------------------------|---------------------------------|--|--------------------------|---|------|---------|-------------|------|-------------|------|------|-----|------|
|                         |                                 |  |                          | MIN   | TYP† | MAX     | MIN         | MAX  | MIN         | MAX  |      |     |      |
| V <sub>IK</sub>         |                                 | V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA                                     |                          | -1.2  |      |         | -1.2        |      | -1.2        |      | V    |     |      |
| V <sub>OH</sub>         | B port                          | V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -1 mA                                     |                          | 3.35  |      |         | 3.3         |      | 3.35        |      | V    |     |      |
|                         |                                 | V <sub>CC</sub> = 5 V, I <sub>OH</sub> = -1 mA                                       |                          | 3.85  |      |         | 3.8         |      | 3.85        |      |      |     |      |
|                         |                                 | V <sub>CC</sub> = 4.5 V  |                          | I <sub>OH</sub> = -3 mA   |      | 2.6     |             |      | 3           |      |      | 3.1 |      |
|                         | V <sub>CC</sub> = 4.5 V         |  | I <sub>OH</sub> = -12 mA |   | 2.6  |         |             | 2.6  |             | 2.6  |      |     |      |
|                         | A port                          | V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -3 mA                                     |                          | 2.5   |      |         | 2.5         |      | 2.5         |      |      | 2.5 |      |
|                         |                                 | V <sub>CC</sub> = 5 V, I <sub>OH</sub> = -3 mA                                       |                          | 3   |      |         | 3           |      | 3           |      |      | 3   |      |
| V <sub>CC</sub> = 4.5 V |                                 | I <sub>OH</sub> = -24 mA   |                          | 2   |      |         | 2           |      | 2           |      |      |     |      |
| V <sub>CC</sub> = 4.5 V |                                 | I <sub>OH</sub> = -32 mA   |                          | 2*  |      |         | 2           |      | 2           |      | 2    |     |      |
| V <sub>OL</sub>         | B port                          | V <sub>CC</sub> = 4.5 V  |                          | I <sub>OL</sub> = 8 mA  |      | 0.65    |             |      | 0.8         |      | 0.65 |     |      |
|                         |                                 |  |                          | I <sub>OL</sub> = 12 mA   |      | 0.8     |             |      | 0.8         |      | 0.8  |     |      |
|                         | A port                          |  |                          | I <sub>OL</sub> = 48 mA   |      | 0.55    |             |      | 0.55        |      | 0.55 |     |      |
|                         |                                 |  |                          | I <sub>OL</sub> = 64 mA   |      | 0.55*   |             |      | 0.55        |      | 0.55 |     |      |
| V <sub>hys</sub>        |                                 |  |                          | 100   |      |         |             |      |             |      | mV   |     |      |
| I <sub>I</sub>          | Control inputs                  | V <sub>CC</sub> = 0 to 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND                |                          | ±1  |      |         | ±1          |      | ±1          |      | μA   |     |      |
|                         | A or B ports                    | V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND            |                          | ±20   |      |         | ±20         |      | ±20         |      |      |     |      |
| I <sub>OZH</sub> ‡      |                                 | V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>O</sub> = 2.7 V, $\overline{OE} \geq 2$ V   |                          | 10  |      |         | 10          |      | 10          |      | μA   |     |      |
| I <sub>OZL</sub> ‡      |                                 | V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>O</sub> = 0.5 V, $\overline{OE} \geq 2$ V   |                          | -10   |      |         | -10         |      | -10         |      | μA   |     |      |
| I <sub>OZPU</sub> §     |                                 | V <sub>CC</sub> = 0 to 2.1 V, V <sub>O</sub> = 0.5 V to 2.7 V, $\overline{OE} = X$   |                          | ±50   |      |         | ±50         |      | ±50         |      | μA   |     |      |
| I <sub>OZPD</sub> §     |                                 | V <sub>CC</sub> = 2.1 V to 0, V <sub>O</sub> = 0.5 V to 2.7 V, $\overline{OE} = X$   |                          | ±50   |      |         | ±50         |      | ±50         |      | μA   |     |      |
| I <sub>off</sub>        |                                 | V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> ≤ 4.5 V                        |                          | ±100  |      |         |             |      | ±100        |      | μA   |     |      |
| I <sub>CEX</sub>        | Outputs high                    | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 5.5 V                                      |                          | 50  |      |         | 50          |      | 50          |      | μA   |     |      |
| I <sub>O</sub> ¶        | B port                          | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.5 V                                      |                          | -25   |      | -100    |             | -25  |             | -100 |      | mA  |      |
|                         | A port                          |  |                          | -50   |      | -100    |             | -180 |             | -50  |      |     | -180 |
| I <sub>CC</sub>         | A or B ports                    | V <sub>CC</sub> = 5.5 V, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND |                          | Outputs high  |      | 1 250   |             | 250  |             | 250  |      | μA  |      |
|                         |                                 |  |                          | Outputs low   |      | 24 32   |             | 32   |             | 32   |      | mA  |      |
|                         |                                 |  |                          | Outputs disabled  |      | 0.5 250 |             | 250  |             | 250  |      | μA  |      |
| ΔI <sub>CC</sub> #      | Data inputs                     | V <sub>CC</sub> = 5.5 V, One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND  |                          | Outputs enabled   |      | 1.5     |             | 1.5  |             | 1.5  |      | mA  |      |
|                         |                                 |  |                          | Outputs disabled  |      | 0.05    |             | 0.05 |             | 0.05 |      |     |      |
|                         | Control inputs                  |  |                          | V <sub>CC</sub> = 5.5 V, One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND |      | 1.5     |             | 1.5  |             | 1.5  |      |     |      |
| C <sub>i</sub>          | V <sub>I</sub> = 2.5 V or 0.5 V |  | 3                        |   |      |         |             |      |             | pF   |      |     |      |
| C <sub>io</sub>         | V <sub>O</sub> = 2.5 V or 0.5 V |  | 6                        |   |      |         |             |      |             | pF   |      |     |      |

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

† All typical values are at V<sub>CC</sub> = 5 V.

‡ The parameters I<sub>OZH</sub> and I<sub>OZL</sub> include the input leakage current.

§ This parameter is characterized but not production tested.

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

# This is the increase in supply current for each input that is at the specified TTL voltage level rather than V<sub>CC</sub> or GND.



**SN54ABT2245, SN74ABT2245**  
**OCTAL TRANSCEIVERS AND LINE/MOS DRIVERS**  
**WITH 3-STATE OUTPUTS**

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switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50 \text{ pF}$  (unless otherwise noted) (see Figure 1)

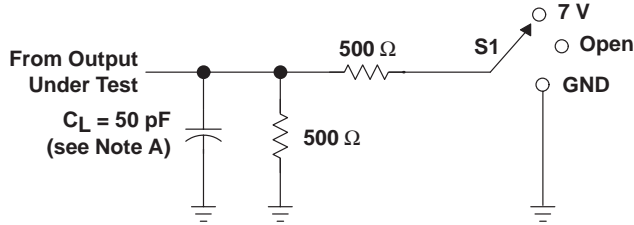
| PARAMETER | FROM (INPUT)    | TO (OUTPUT) | $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ |     |     | SN54ABT2245 |     | SN74ABT2245 |     | UNIT |
|-----------|-----------------|-------------|--|-----|-----|-------------|-----|-------------|-----|------|
|           |                 |             | MIN  | TYP | MAX | MIN         | MAX | MIN         | MAX |      |
| $t_{PLH}$ | A               | B           | 1  | 2.5 | 3.4 | 1           | 4   | 1           | 3.8 | ns   |
| $t_{PHL}$ |                 |             | 1  | 3.2 | 4.2 | 1           | 4.6 | 1           | 4.5 |      |
| $t_{PLH}$ | B               | A           | 1  | 2.2 | 3.2 | 1           | 3.8 | 1           | 3.6 | ns   |
| $t_{PHL}$ |                 |             | 1  | 2.7 | 3.6 | 1           | 4.2 | 1           | 4   |      |
| $t_{PZH}$ | $\overline{OE}$ | A           | 1  | 3.3 | 4.6 | 1           | 5.6 | 1           | 5.5 | ns   |
| $t_{PZL}$ |                 |             | 1  | 3.2 | 4.7 | 1           | 6   | 1           | 5.7 |      |
| $t_{PHZ}$ | $\overline{OE}$ | A           | 2  | 4   | 5.1 | 2           | 5.7 | 2           | 5.6 | ns   |
| $t_{PLZ}$ |                 |             | 1  | 2.9 | 4   | 1           | 4.6 | 1           | 4.5 |      |
| $t_{PZH}$ | $\overline{OE}$ | B           | 1.5  | 3.6 | 4.9 | 1.5         | 6.3 | 1.5         | 6.1 | ns   |
| $t_{PZL}$ |                 |             | 1.5  | 3.9 | 5.3 | 1.5         | 6.6 | 1.5         | 6.3 |      |
| $t_{PHZ}$ | $\overline{OE}$ | B           | 1.5  | 3.6 | 4.7 | 1.5         | 5.5 | 1.5         | 5.3 | ns   |
| $t_{PLZ}$ |                 |             | 1.5  | 3.3 | 4.4 | 1.5         | 4.9 | 1.5         | 4.8 |      |



# SN54ABT2245, SN74ABT2245 OCTAL TRANSCEIVERS AND LINE/MOS DRIVERS WITH 3-STATE OUTPUTS

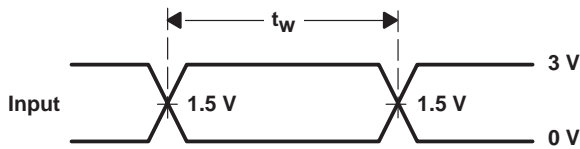
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## PARAMETER MEASUREMENT INFORMATION

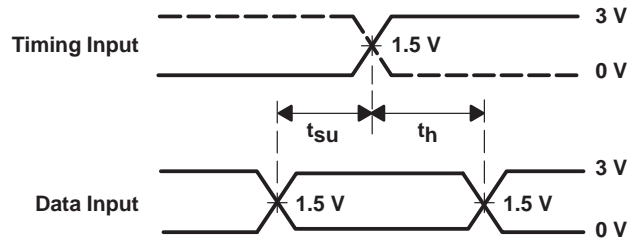


LOAD CIRCUIT

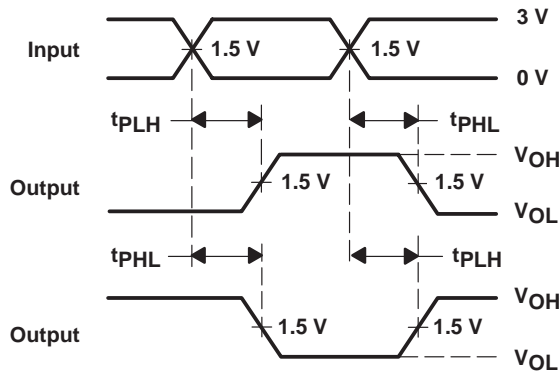
| TEST              | S1   |
|-------------------|------|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | 7 V  |
| $t_{PHZ}/t_{PZH}$ | Open |



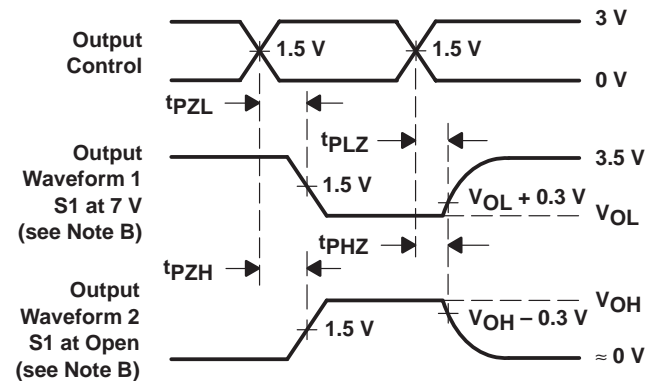
VOLTAGE WAVEFORMS  
PULSE DURATION



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 <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 5962-9560601Q2A  | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| 5962-9560601QRA  | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| 5962-9560601QSA  | ACTIVE                | CFP          | W               | 20   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| SN74ABT2245DBLE  | OBSOLETE              | SSOP         | DB              | 20   |             | TBD                     | Call TI          | Call TI                      |
| SN74ABT2245DBR   | ACTIVE                | SSOP         | DB              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245DBRG4 | ACTIVE                | SSOP         | DB              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245DW    | ACTIVE                | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245DWE4  | ACTIVE                | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245DWR   | ACTIVE                | SOIC         | DW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245DWRE4 | ACTIVE                | SOIC         | DW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245N     | ACTIVE                | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74ABT2245NE4   | ACTIVE                | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74ABT2245NSR   | ACTIVE                | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245NSRE4 | ACTIVE                | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245PW    | ACTIVE                | TSSOP        | PW              | 20   | 70          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245PWE4  | ACTIVE                | TSSOP        | PW              | 20   | 70          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245PWLE  | OBSOLETE              | TSSOP        | PW              | 20   |             | TBD                     | Call TI          | Call TI                      |
| SN74ABT2245PWR   | ACTIVE                | TSSOP        | PW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74ABT2245PWRE4 | ACTIVE                | TSSOP        | PW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SNJ54ABT2245FK   | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| SNJ54ABT2245J    | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SNJ54ABT2245W    | ACTIVE                | CFP          | W               | 20   | 1           | TBD                     | A42              | N / A for Pkg Type           |

<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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J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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

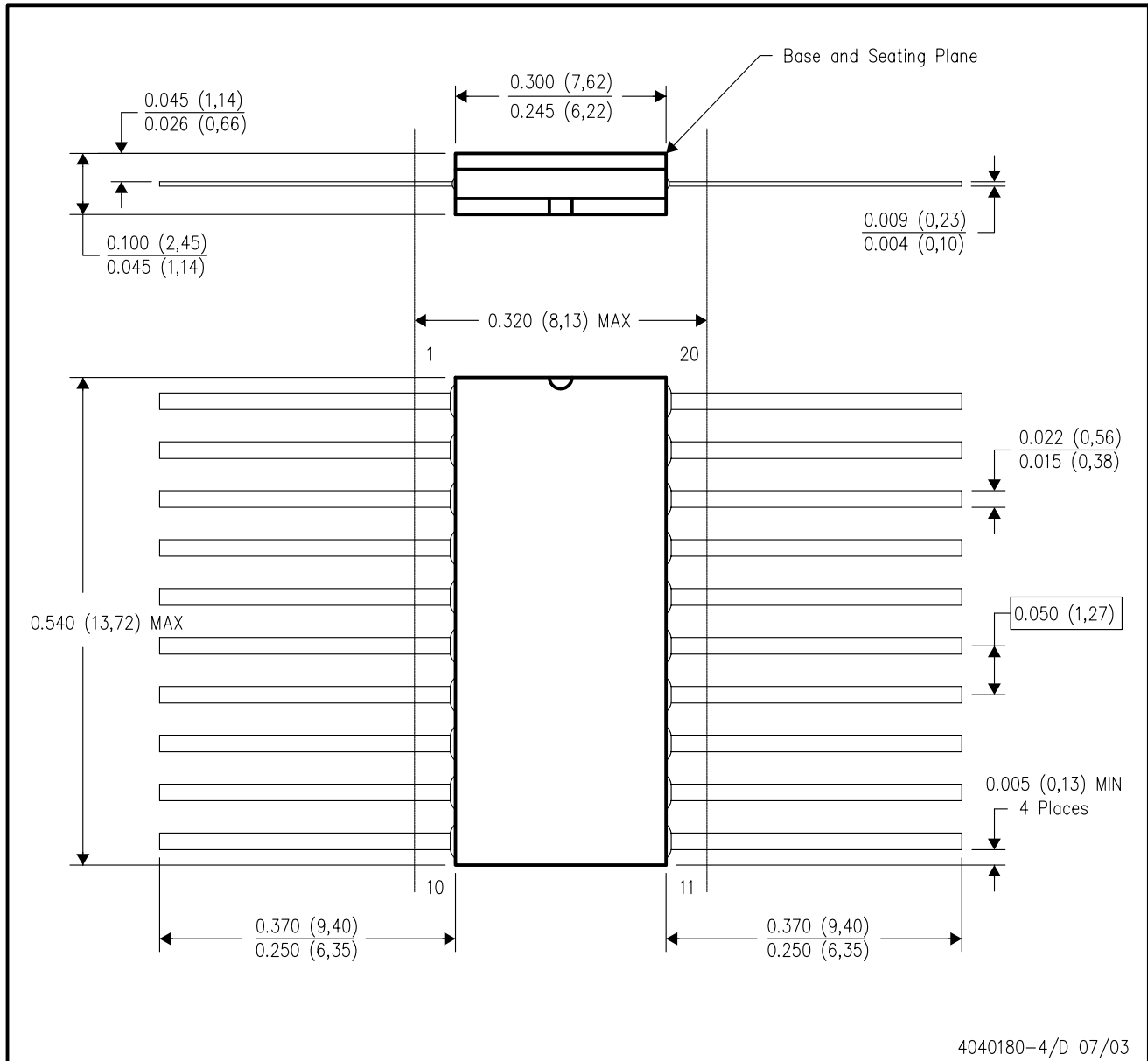


4040083/F 03/03

- 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



4040049/E 12/2002

- 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.

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.

# 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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