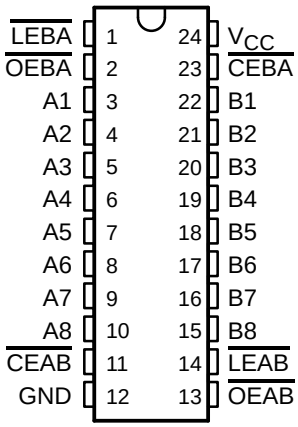
- **State-of-the-Art *EPIC*-II*B*™ BiCMOS Design Significantly Reduces Power Dissipation**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17**
- **Typical $V_{OLP}$ (Output Ground Bounce) < 1 V at $V_{CC}$ = 5 V, $T_A$ = 25°C**
- **High-Drive Outputs (–32-mA $I_{OH}$, 64-mA $I_{OL}$)**
- **Package Options Include Plastic Small-Outline (DW) and Shrink Small-Outline (DB) Packages, and Standard Plastic 300-mil DIPs (JT)**

**DB, DW, OR NT PACKAGE**
**(TOP VIEW)**




## description

The SN74ABT543A octal transceiver contains two sets of D-type latches for temporary storage of data flowing in either direction. Separate latch-enable ($\overline{LEAB}$ or $\overline{LEBA}$) and output-enable ($\overline{OEAB}$ or $\overline{OEBA}$) inputs are provided for each register to permit independent control in either direction of data flow.

The A-to-B enable ($\overline{CEAB}$) input must be low in order to enter data from A or to output data from B. If $\overline{CEAB}$ is low and $\overline{LEAB}$ is low, the A-to-B latches are transparent; a subsequent low-to-high transition of $\overline{LEAB}$ puts the A latches in the storage mode. With $\overline{CEAB}$ and $\overline{OEAB}$ both low, the 3-state B outputs are active and reflect the data present at the output of the A latches. Data flow from B to A is similar but requires using the $\overline{CEBA}$, $\overline{LEBA}$, and $\overline{OEBA}$ inputs.

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.

The SN74ABT543A is packaged in TI's shrink small-outline package (DB), which provides the same I/O pin count and functionality of standard small-outline packages in less than half the printed-circuit-board area.

The SN74ABT543A is characterized for operation from –40°C to 85°C.

**FUNCTION TABLE†**

| INPUTS | | | | OUTPUT |
|---|---|---|---|---|
| $\overline{CEAB}$ | $\overline{LEAB}$ | $\overline{OEAB}$ | A | B |
| H | X | X | X | Z |
| X | X | H | X | Z |
| L | H | L | X | $B_0$‡ |
| L | L | L | L | L |
| L | L | L | H | H |

† A-to-B data flow is shown; B-to-A flow control is the same except that it uses $\overline{CEBA}$, $\overline{LEBA}$, and $\overline{OEBA}$.
‡ Output level before the indicated steady-state input conditions were established.

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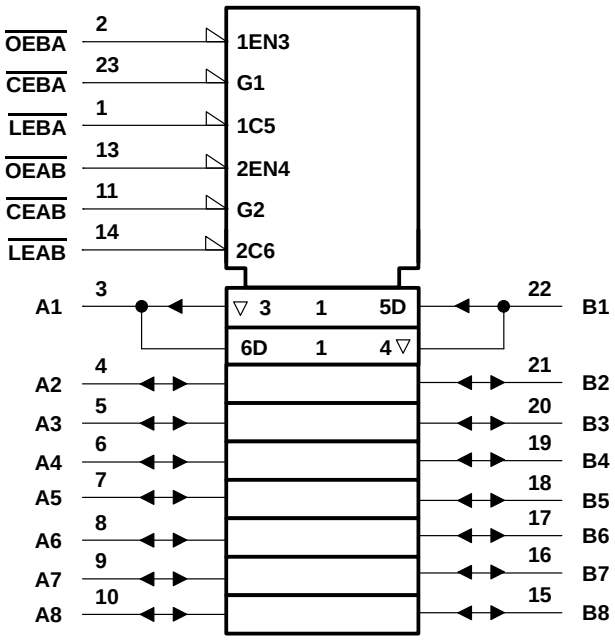
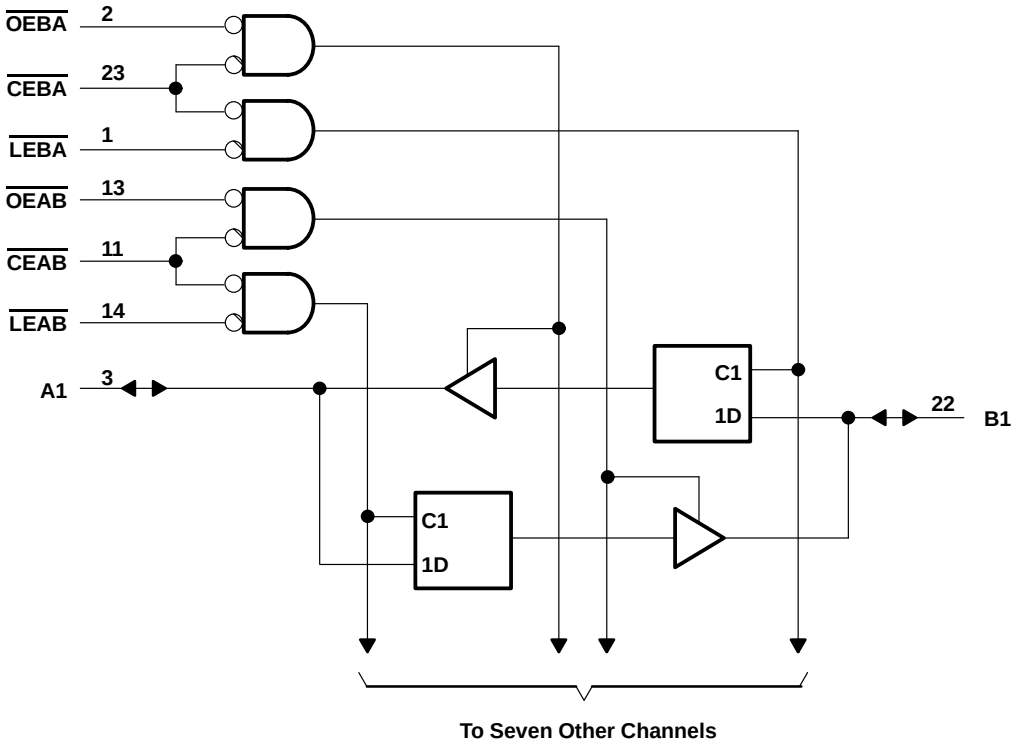
## logic symbol†




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

## logic diagram (positive logic)



### 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 state or power-off state, $V_O$ . . . . . –0.5 V to 5.5 V
Current into any output in the low state, $I_O$ . . . . . 128 mA
Input clamp current, $I_{IK}$ ($V_I$ < 0) . . . . . –18 mA
Output clamp current, $I_{OK}$ ($V_O$ < 0) . . . . . –50 mA
Maximum power dissipation at $T_A$ = 55°C (in still air): DB package . . . . . 0.7 W
DW package . . . . . 1 W
NT package . . . . . 1.3 W
Storage temperature range . . . . . –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.

NOTE 1: The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

### recommended operating conditions (see Note 2)

| | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | | 4.5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | | 2 | | V |
| $V_{IL}$ | Low-level input voltage | | | 0.8 | V |
| $V_I$ | Input voltage | | 0 | $V_{CC}$ | V |
| $I_{OH}$ | High-level output current | | | –32 | mA |
| $I_{OL}$ | Low-level output current | | | 64 | mA |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | Outputs enabled | | 5 | ns/V |
| $T_A$ | Operating free-air temperature | | –40 | 85 | °C |

NOTE 2: Unused or floating pins (input or I/O) must be held high or low.

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

| PARAMETER | TEST CONDITIONS | | | $T_A$ = 25°C | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP† | MAX | | | |
| $V_{IK}$ | $V_{CC}$ = 4.5 V, | $I_I$ = –18 mA | | | | –1.2 | | –1.2 | V |
| $V_{OH}$ | $V_{CC}$ = 4.5 V, | $I_{OH}$ = –3 mA | | 2.5 | | | 2.5 | | V |
| | $V_{CC}$ = 5 V, | $I_{OH}$ = –3 mA | | 3 | | | 3 | | |
| | $V_{CC}$ = 4.5 V | $I_{OH}$ = –24 mA | | 2 | | | | | |
| | | $I_{OH}$ = –32 mA | | | | | 2 | | |
| $V_{OL}$ | $V_{CC}$ = 4.5 V | $I_{OL}$ = 48 mA | | | | 0.55 | | | V |
| | | $I_{OL}$ = 64 mA | | | | | | 0.55 | |
| $I_I$ | $V_{CC}$ = 5.5 V, | $V_I$ = $V_{CC}$ or GND | Control inputs | | | ±1 | | ±1 | µA |
| | | | A or B ports | | | ±100 | | ±100 | |
| $I_{OZH}$‡ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.7 V | | | | 50 | | 50 | µA |
| $I_{OZL}$‡ | $V_{CC}$ = 5.5 V, | $V_O$ = 0.5 V | | | | –50 | | –50 | µA |
| $I_{OFF}$ | $V_{CC}$ = 0, | $V_I$ or $V_O$ ≤ 4.5 V | | | | ±100 | | ±100 | µA |
| $I_{CEX}$ | $V_{CC}$ = 5.5 V, | $V_O$ = 5.5 V | Outputs high | | | 50 | | 50 | µA |
| $I_O$§ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.5 V | | –50 | –100 | –180 | –50 | –180 | mA |
| $I_{CC}$ | $V_{CC}$ = 5.5 V, $I_O$ = 0, $V_I$ = $V_{CC}$ or GND | A or B ports | Outputs high | | 1 | 250 | | 250 | µA |
| | | | Outputs low | | 24 | 34 | | 34 | mA |
| | | | Outputs disabled | | 0.5 | 250 | | 250 | µA |
| $\Delta I_{CC}$¶ | $V_{CC}$ = 5.5 V, Other inputs at $V_{CC}$ or GND | One input at 3.4 V, | | | | 1.5 | | 1.5 | mA |
| $C_i$ | $V_I$ = 2.5 V or 0.5 V | | Control inputs | | 4 | | | | pF |
| $C_{io}$ | $V_O$ = 2.5 V or 0.5 V | | A or B ports | | 7 | | | | pF |

† All typical values are at $V_{CC}$ = 5 V.
‡ The parameters $I_{OZH}$ and $I_{OZL}$ include the input leakage current.
§ 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 $V_{CC}$ or GND.

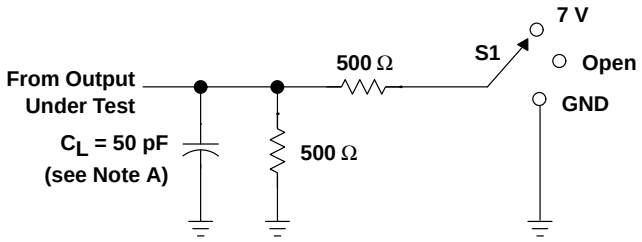
## timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

| | | | | $V_{CC}$ = 5 V, $T_A$ = 25°C | | MIN | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | MIN | MAX | | | |
| $t_w$ | Pulse duration, $\overline{LEAB}$ or $\overline{LEBA}$ low | | | 3.5 | | 3.5 | | ns |
| $t_{su}$ | Setup time | Data before LEAB or LEBA↑ | High | 2.5 | | 2.5 | | ns |
| | | | Low | 3 | | 3 | | |
| | | Data before CEAB or CEBA↑ | High | 2.5 | | 2.5 | | |
| | | | Low | 2.5 | | 2.5 | | |
| $t_h$ | Hold time | Data after $\overline{LEAB}$ or $\overline{LEBA}$↑ | | 1 | | 1 | | ns |
| | | Data after $\overline{CEAB}$ or $\overline{CEBA}$↑ | | 1 | | 1 | | |

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

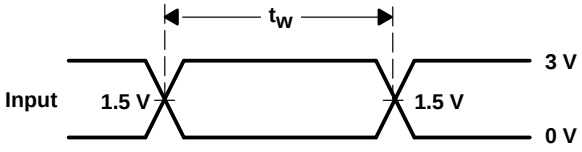
| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 5 V, $T_A$ = 25°C | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | | | |
| $t_{PLH}$ | A or B | B or A | 1.6 | 3.3 | 4.4 | 1.6 | 5 | ns |
| $t_{PHL}$ | | | 1.6 | 4.1 | 5.1 | 1.6 | 6 | |
| $t_{PLH}$ | $\overline{LEBA}$ or $\overline{LEAB}$ | A or B | 1.6 | 3.9 | 5.1 | 1.6 | 6.2 | ns |
| $t_{PHL}$ | | | 1.6 | 4.4 | 5.4 | 1.6 | 6.3 | |
| $t_{PZH}$ | $\overline{OEBA}$ or $\overline{OEAB}$ | A or B | 1.4 | 3.1 | 4.1 | 1.4 | 5 | ns |
| $t_{PZL}$ | | | 2 | 3.9 | 4.9 | 2 | 5.7 | |
| $t_{PHZ}$ | $\overline{OEBA}$ or $\overline{OEAB}$ | A or B | 2.5 | 4.2 | 5.8 | 2.5 | 6.7 | ns |
| $t_{PLZ}$ | | | 2.5 | 4.8 | 6.1 | 2.5 | 7 | |
| $t_{PZH}$ | $\overline{CEBA}$ or $\overline{CEAB}$ | A or B | 1.4 | 3.4 | 4.4 | 1.4 | 5.4 | ns |
| $t_{PZL}$ | | | 2 | 4.1 | 5.2 | 2 | 6.1 | |
| $t_{PHZ}$ | $\overline{CEBA}$ or $\overline{CEAB}$ | A or B | 3.2 | 4.7 | 6.1 | 3.2 | 7 | ns |
| $t_{PLZ}$ | | | 2.5 | 5 | 6.7 | 2.5 | 7.3 | |

## PARAMETER MEASUREMENT INFORMATION

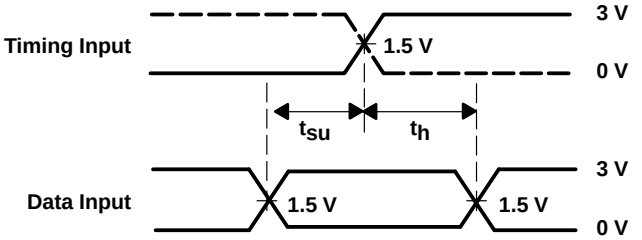



| TEST | S1 |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | 7 V |
| $t_{PHZ}/t_{PZH}$ | Open |

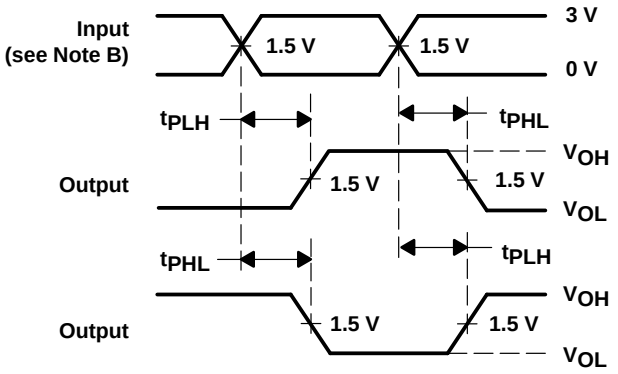
LOAD CIRCUIT FOR OUTPUTS



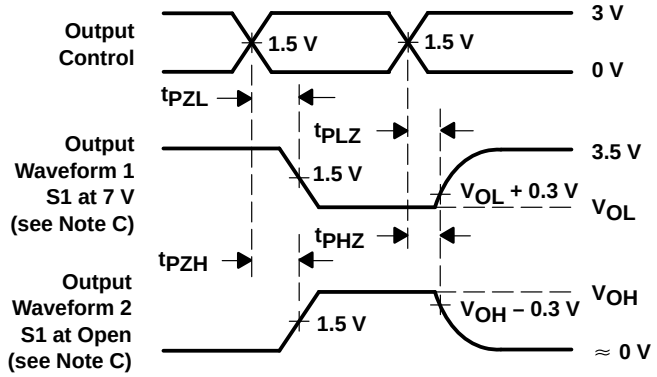

VOLTAGE WAVEFORMS
PULSE DURATION




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. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O$ = 50 Ω, $t_r$ ≤ 2.5 ns, $t_f$ ≤ 2.5 ns.
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. The outputs are measured one at a time with one transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**

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