# SN54LS245, SN74LS245
# OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

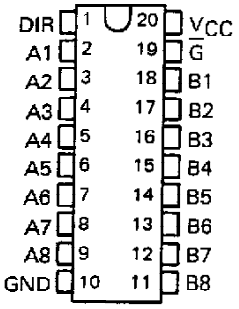
SDLS146

OCTOBER 1976 – REVISED MARCH 1988

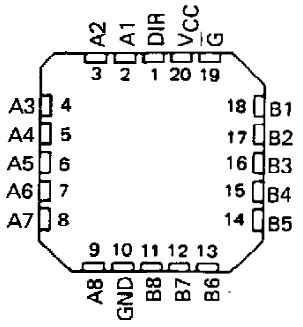
- **Bi-directional Bus Transceiver in a High-Density 20-Pin Package**
- **3-State Outputs Drive Bus Lines Directly**
- **PNP Inputs Reduce D-C Loading on Bus Lines**
- **Hysteresis at Bus Inputs Improve Noise Margins**
- **Typical Propagation Delay Times, Port-to-Port . . . 8 ns**

| 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 . . . DW OR N PACKAGE**
**(TOP VIEW)**




**SN54LS245 . . . FK PACKAGE**
**(TOP VIEW)**



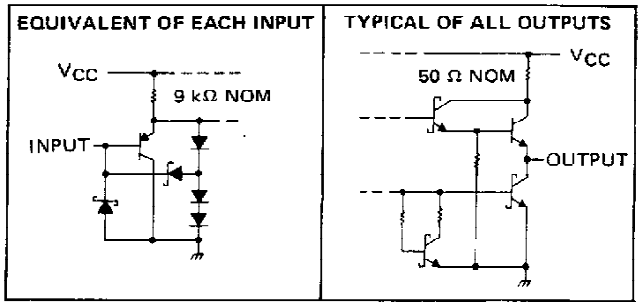

## description

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 upon the logic level at the direction control (DIR) input. The enable input ($\overline{G}$) can be used to disable the device so that the buses are effectively isolated.

The SN54LS245 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74LS245 is characterized for operation from 0°C to 70°C.

## schematics of inputs and outputs

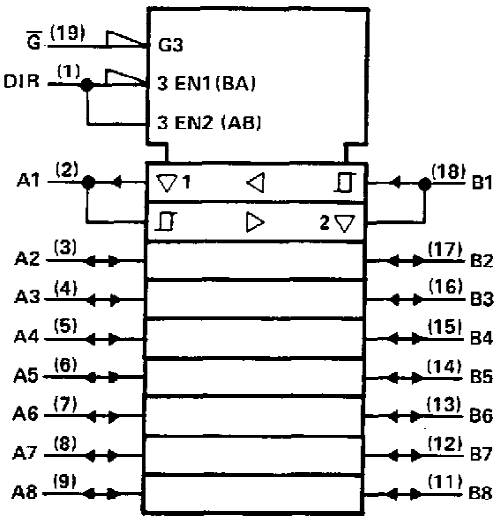



**FUNCTION TABLE**

| ENABLE $\overline{G}$ | DIRECTION CONTROL DIR | OPERATION |
|---|---|---|
| L | L | B data to A bus |
| L | H | A data to B bus |
| H | X | Isolation |

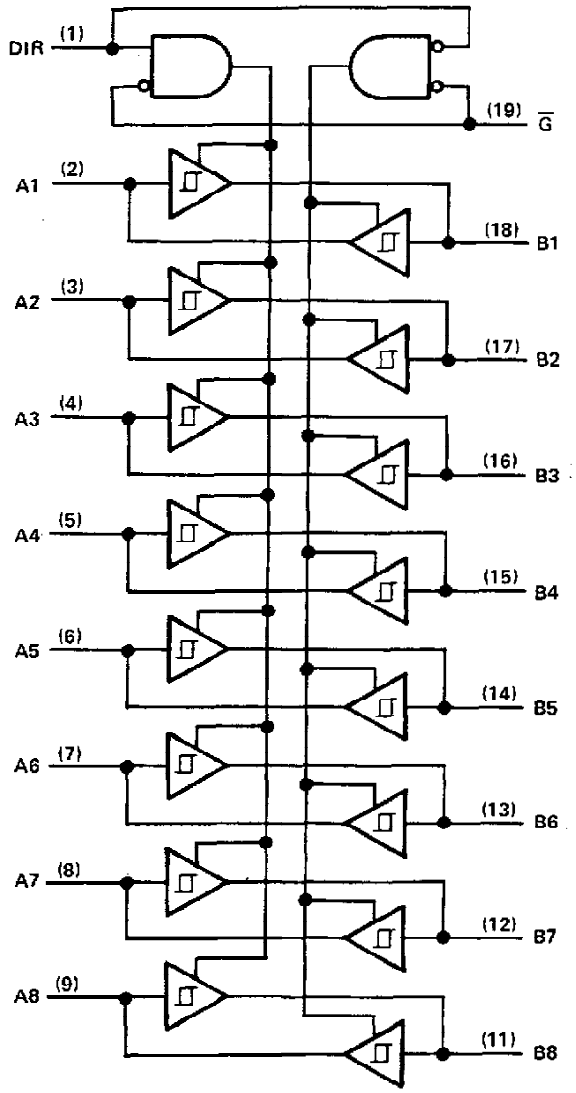
H = high level, L = low level, X = irrelevant

## logic symbol†




†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, J, N, and W packages.

## logic diagram (positive logic)




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

| | |
|---|---|
| Supply voltage, $V_{CC}$ (see Note 1) | 7 V |
| Input voltage | 7 V |
| Off-state output voltage | 5.5 V |
| Operating free-air temperature range: SN54LS245 | −55°C to 125°C |
| SN74LS245 | 0°C to 70°C |
| Storage temperature range | −65°C to 150°C |

NOTE 1: Voltage values are with respect to network ground terminal.

## recommended operating conditions

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

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

| PARAMETER | | | TEST CONDITIONS† | | 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 input | $V_{CC}$ = 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, $\overline{G}$ at 2 V | $V_O$ = 2.7 V | | | 20 | | | 20 | μA |
| $I_{OZL}$ | Off-state output current, low-level voltage applied | | | $V_O$ = 0.4 V | | | −200 | | | −200 | |
| $I_I$ | Input current at maximum input voltage | A or B | $V_{CC}$ = MAX, | $V_I$ = 5.5 V | | | 0.1 | | | 0.1 | mA |
| | | DIR or $\overline{G}$ | | $V_I$ = 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 | $V_{CC}$ = MAX, | Outputs open | | 48 | 70 | | 48 | 70 | mA |
| | | Total, outputs low | | | | 62 | 90 | | 62 | 90 | |
| | | Outputs at Hi-Z | | | | 64 | 95 | | 64 | 95 | |

†For conditions shown as MIN or MAX, use the appropriate value 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

| 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, | See Note 2 | | 8 | 12 | ns |
| $t_{PHL}$ | Propagation delay time, high-to-low-level output | | | | | 8 | 12 | ns |
| $t_{PZL}$ | Output enable time to low level | | | | | 27 | 40 | ns |
| $t_{PZH}$ | Output enable time to high level | | | | | 25 | 40 | ns |
| $t_{PLZ}$ | Output disable time from low level | $C_L$ = 5 pF, | $R_L$ = 667 Ω, | See Note 2 | | 15 | 25 | ns |
| $t_{PHZ}$ | Output disable time from high level | | | | | 15 | 28 | ns |

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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