**FAIRCHILD**

SEMICONDUCTOR™

# DM74LS645
# Octal Bus Transceiver

## General Description

These octal bus transceivers are designed for asynchronous two-way 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 upon the level at the direction control (DIR) input. The enable input (G̅) can be used to disable the device so that the buses are effectively isolated.

## Features

■ Bi-directional bus transceivers in high-density 20-pin packages
■ Hysteresis at bus inputs improves noise margins
■ 3-STATE outputs

## Ordering Code:

| Order Number | Package Number | Package Description |
|---|---|---|
| DM74LS645WM | M20B | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| DM74LS645N | N20A | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

## Connection Diagram
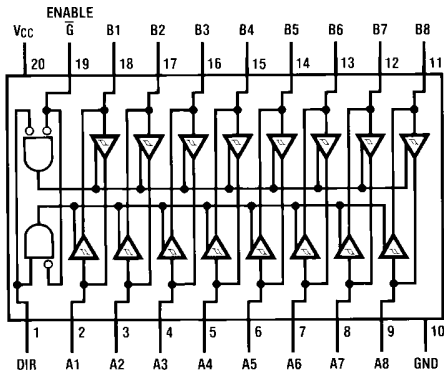


## Function Table

| Control Inputs | | DM74LS645 |
|---|---|---|
| G̅ | DIR | |
| 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

# Absolute Maximum Ratings (Note 1)

| | |
|---|---|
| Supply Voltage | 7V |
| Input Voltage | 7V |
| Operating Free Air Temperature Range | 0°C to +70°C |
| Storage Temperature Range | −55°C to +150°C |

**Note 1:** The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

# Recommended Operating Conditions

| Symbol | Parameter | Min | Nom | Max | Units |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage (Note 2) | 4.75 | 5 | 5.25 | V |
| $V_{IH}$ | HIGH Level Input Voltage | 2 | | | V |
| $V_{IL}$ | LOW Level Input Voltage | | | 0.6 | V |
| $I_{OH}$ | HIGH Level Output Current | | | −15 | mA |
| $I_{OL}$ | LOW Level Output Current | | | 24 | mA |
| $T_A$ | Free Air Operating Temperature | 0 | | 70 | °C |

**Note 2:** Voltage values are with respect to the network ground terminal.

# Electrical Characteristics

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

| Symbol | Parameter | Conditions (Note 3) | | | Min | Typ (Note 4) | Max | Units |
|---|---|---|---|---|---|---|---|---|
| $V_I$ | Input Clamp Voltage | $V_{CC}$ = Min, $I_I$ = 18 mA | | | | | −1.5 | V |
| $H_{YS}$ | Hysteresis ($V_{T+} − V_−$) A or B Input | $V_{CC}$ = Min | | | 0.2 | 0.4 | | V |
| $V_{OH}$ | HIGH Level Output Voltage | $V_{CC}$ = Min, $V_{IH}$ = 2V, $V_{IL}$ = Max | $I_{OH}$ = −3 mA | | 2.4 | 3.4 | | V |
| | | | $I_{OH}$ = Max | | 2 | | | |
| $V_{OL}$ | LOW Level Output Voltage | $V_{CC}$ = Min, $V_{IH}$ = 2V, $V_{IL}$ = Max | $I_{OL}$ = 12 mA | | | 0.25 | 0.4 | V |
| | | | $I_{OL}$ = 24 mA | | | 0.35 | 0.5 | |
| $I_{OZH}$ | Off-State Output Current, HIGH Level Voltage Applied | $V_{CC}$ = Max, G at 2V, $V_O$ = 2.7V | | | | | 20 | μA |
| $I_{OZL}$ | Off-State Output Current, LOW Level Voltage Applied | $V_{CC}$ = Max, G at 2V $V_O$ = 0.4V | | | | | −400 | μA |
| $I_I$ | Input Current at Maximum Input Voltage | $V_{CC}$ = Max | A or B | $V_I$ = 5.5V | | | 0.1 | mA |
| | | | DIR or G | $V_I$ = 7V | | | 0.1 | |
| $I_{IH}$ | HIGH Level Input Current | $V_{CC}$ = Max, $V_{IH}$ = 2.7 | | | | | 20 | μA |
| $I_{IL}$ | LOW Level Input Current | $V_{CC}$ = Max, $V_{IL}$ = 0.4V | | | | | −0.4 | mA |
| $I_{OS}$ | Short Circuit Output Current (Note 5) | $V_{CC}$ = Max | | | −40 | | −225 | mA |
| $I_{CC}$ | Total Supply Current | Outputs HIGH | $V_{CC}$ = Max, Outputs Open | | | 48 | 70 | mA |
| | | Outputs LOW | | | | 62 | 90 | |
| | | Outputs at Hi-Z | | | | 64 | 95 | |

**Note 3:** For conditions shown as Min or Max, use the appropriate value specified under Recommended Operating Conditions.

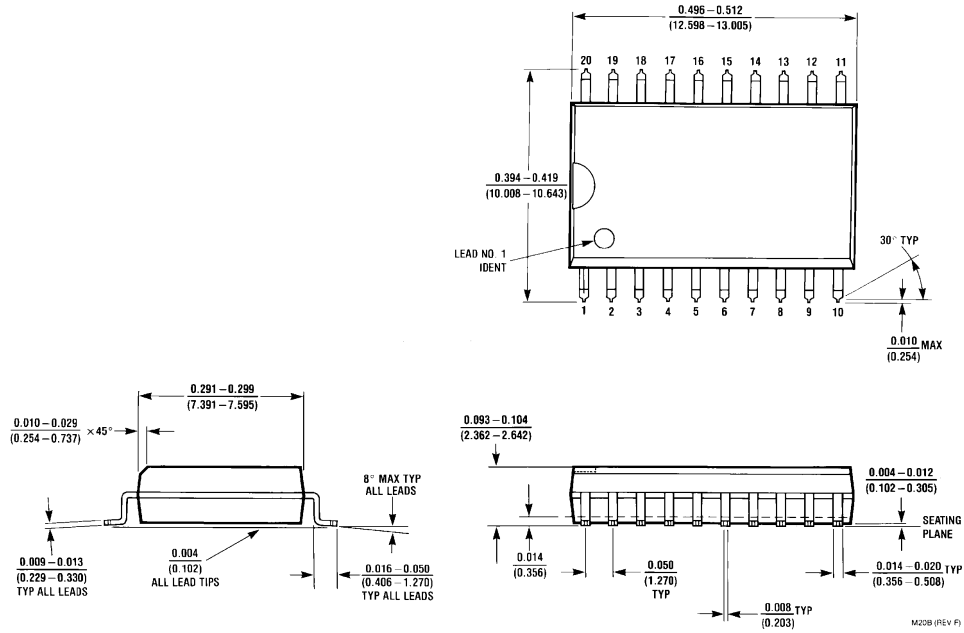**Note 4:** All typicals are at $V_{CC}$ = 5V, $T_A$ = 25°C.

**Note 5:** Not more than one output should be shorted at a time, and the duration should not exceed one second.

## Switching Characteristics

at $V_{CC} = 5V$ and $T_A = 25°C$

| Symbol | Parameter | From (Input) To (Output) | $R_L = 667\Omega$ | | | | Units |
|---|---|---|---|---|---|---|---|
| | | | $C_L = 45$ pF | | $C_L = 5$ pF | | |
| | | | Min | Max | Min | Max | |
| $t_{PLH}$ | Propagation Delay Time LOW-to-HIGH Level Output | A to B | | 15 | | | ns |
| $t_{PHL}$ | Propagation Delay Time HIGH-to-LOW Level Output | A to B | | 15 | | | ns |
| $t_{PLH}$ | Propagation Delay Time LOW-to-HIGH Level Output | B to A | | 15 | | | ns |
| $t_{PHL}$ | Propagation Delay Time HIGH-to-LOW Level Output | B to A | | 15 | | | ns |
| $t_{PZL}$ | Output Enable Time to LOW Level | $\overline{G}$ to A | | 40 | | | ns |
| $t_{PZH}$ | Output Enable Time to HIGH Level | $\overline{G}$ to A | | 40 | | | ns |
| $t_{PZL}$ | Output Enable Time to LOW Level | $\overline{G}$ to B | | 40 | | | ns |
| $t_{PZH}$ | Output Enable Time to HIGH Level | $\overline{G}$ to B | | 40 | | | ns |
| $t_{PLZ}$ | Output Disable Time to LOW Level | $\overline{G}$ to A | | | | 25 | ns |
| $t_{PHZ}$ | Output Disable Time to HIGH Level | $\overline{G}$ to A | | | | 25 | ns |
| $t_{PLZ}$ | Output Disable Time to LOW Level | $\overline{G}$ to B | | | | 25 | ns |
| $t_{PHZ}$ | Output Disable Time to HIGH Level | $\overline{G}$ to B | | | | 25 | ns |

**Physical Dimensions** inches (millimeters) unless otherwise noted

$\frac{0.496 - 0.512}{(12.598 - 13.005)}$

20  19  18  17  16  15  14  13  12  11

$\frac{0.394 - 0.419}{(10.008 - 10.643)}$

LEAD NO. 1
IDENT

1  2  3  4  5  6  7  8  9  10

30° TYP

$\frac{0.010}{(0.254)}$ MAX

$\frac{0.291 - 0.299}{(7.391 - 7.595)}$

$\frac{0.010 - 0.029}{(0.254 - 0.737)}$ × 45°

8° MAX TYP
ALL LEADS

$\frac{0.009 - 0.013}{(0.229 - 0.330)}$
TYP ALL LEADS

$\frac{0.004}{(0.102)}$
ALL LEAD TIPS

$\frac{0.016 - 0.050}{(0.406 - 1.270)}$
TYP ALL LEADS

$\frac{0.093 - 0.104}{(2.362 - 2.642)}$

$\frac{0.004 - 0.012}{(0.102 - 0.305)}$

SEATING
PLANE

$\frac{0.014}{(0.356)}$

$\frac{0.050}{(1.270)}$
TYP

$\frac{0.008}{(0.203)}$ TYP

$\frac{0.014 - 0.020}{(0.356 - 0.508)}$ TYP

M20B (REV F)

**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide**
**Package Number M20B**

## Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
Package Number N20A

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