

To our customers,

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# HD74LS645

## Octal Bus Transceivers (non-inverted 3-state outputs)

REJ03D0491-0200

Rev.2.00

Feb.18.2005

This octal bus transceivers is 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 ( $\bar{G}$ ) can be used to disable the device so that the buses are effectively isolated.

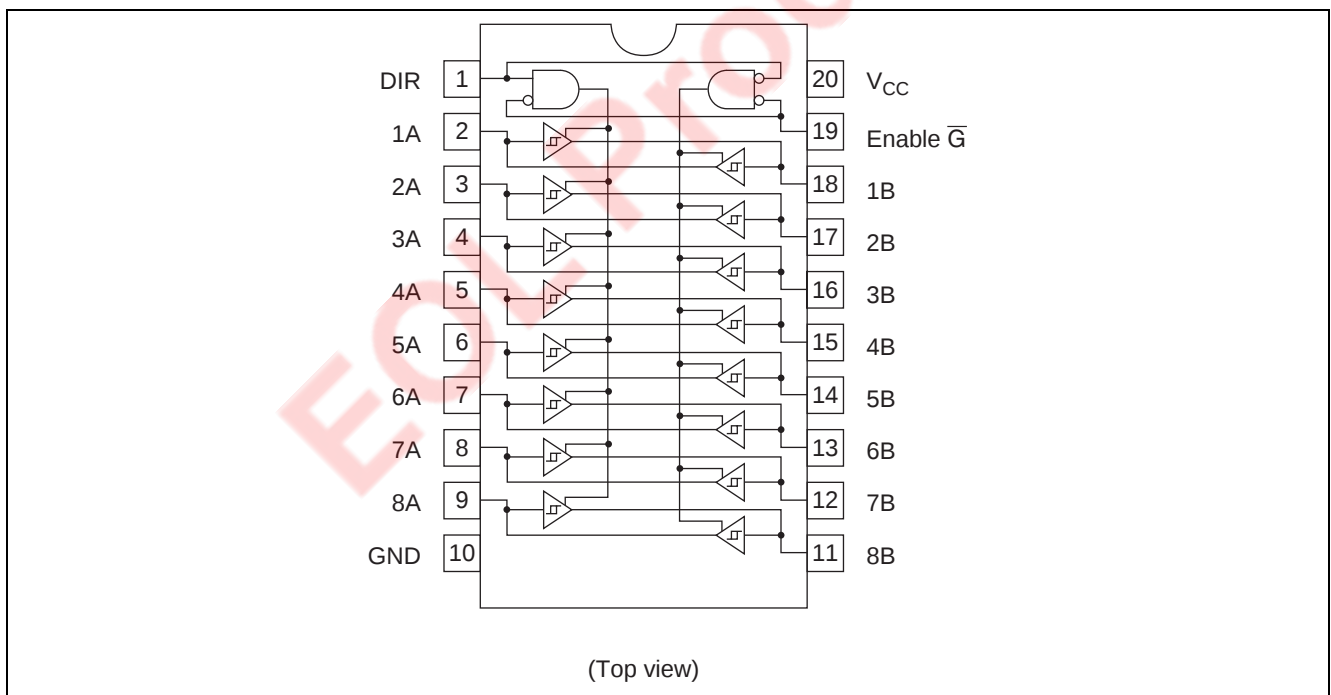
### Features

- Ordering Information

| Part Name     | Package Type       | Package Code<br>(Previous Code) | Package<br>Abbreviation | Taping Abbreviation<br>(Quantity) |
|---------------|--------------------|---------------------------------|-------------------------|-----------------------------------|
| HD74LS645P    | DILP-20 pin        | PRDP0020AC-B<br>(DP-20NEV)      | P                       | —                                 |
| HD74LS645FPEL | SOP-20 pin (JEITA) | PRSP0020DD-B<br>(FP-20DAV)      | FP                      | EL (2,000 pcs/reel)               |

Note: Please consult the sales office for the above package availability.

### Pin Arrangement

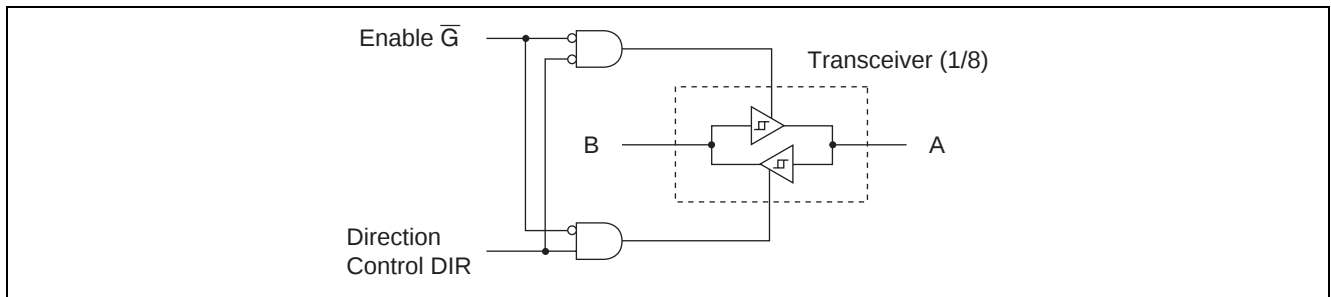


### Function Table

| Enable<br>$\bar{G}$ | Direction Control<br>DIR | Operation       |
|---------------------|--------------------------|-----------------|
| L                   | L                        |                 |
| L                   | H                        | A data to B bus |
| H                   | X                        | Isolation       |

Note: H; high level, L; low level, X; irrelevant

## Block Diagram



## Absolute Maximum Ratings

| Item                | Symbol    | Ratings     | Unit |
|---------------------|-----------|-------------|------|
| Supply voltage      | $V_{CC}$  | 7           | V    |
| Input voltage       | $V_{IN}$  | 7           | V    |
| Power dissipation   | $P_T$     | 400         | mW   |
| Storage temperature | $T_{stg}$ | -65 to +150 | °C   |

Note: Voltage value, unless otherwise noted, are with respect to network ground terminal.

## Recommended Operating Conditions

| Item                  | Symbol    | Min  | Typ  | Max  | Unit |
|-----------------------|-----------|------|------|------|------|
| Supply voltage        | $V_{CC}$  | 4.75 | 5.00 | 5.25 | V    |
| Output current        | $I_{OH}$  | —    | —    | -15  | mA   |
|                       | $I_{OL}$  | —    | —    | 24   | mA   |
| Operating temperature | $T_{opr}$ | -20  | 25   | 75   | °C   |

## Electrical Characteristics

(Ta = -20 to +75 °C)

| Item                         | Symbol                                                    | min.           | typ.* | max. | Unit | Condition                                                                                            |
|------------------------------|-----------------------------------------------------------|----------------|-------|------|------|------------------------------------------------------------------------------------------------------|
| Input voltage                | V <sub>IH</sub>                                           | 2.0            | —     | —    | V    |                                                                                                      |
|                              | V <sub>IL</sub>                                           | —              | —     | 0.8  |      |                                                                                                      |
| Hysteresis                   | V <sub>T</sub> <sup>+</sup> - V <sub>T</sub> <sup>-</sup> | 0.2            | —     | —    | V    | V <sub>CC</sub> = 4.75 V                                                                             |
| Output voltage               | V <sub>OH</sub>                                           | 2.4            | —     | —    | V    | V <sub>CC</sub> = 4.75 V,<br>I <sub>OH</sub> = -3 mA, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V |
|                              |                                                           | 2              | —     | —    |      |                                                                                                      |
|                              | V <sub>OL</sub>                                           | —              | —     | 0.4  | V    | V <sub>CC</sub> = 4.75 V,<br>I <sub>OL</sub> = 12 mA, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V |
|                              |                                                           | —              | —     | 0.5  |      |                                                                                                      |
| Output current               | I <sub>OZH</sub>                                          | —              | —     | 20   | μA   | V <sub>O</sub> = 2.7 V, V <sub>CC</sub> = 5.25 V,<br>G input = 2 V                                   |
|                              | I <sub>OZL</sub>                                          | —              | —     | -400 |      |                                                                                                      |
| Input current                | I <sub>IH</sub>                                           | —              | —     | 20   | μA   | V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 2.7 V                                                     |
|                              | I <sub>IL</sub>                                           | —              | —     | -400 | μA   | V <sub>CC</sub> = 5.25 V, V <sub>I</sub> = 0.4 V                                                     |
|                              | A or B<br>DIR or G                                        | I <sub>I</sub> | —     | 0.1  | mA   | V <sub>CC</sub> = 5.25 V                                                                             |
|                              |                                                           |                |       |      |      |                                                                                                      |
| Short-circuit output current | I <sub>OS</sub> <sup>***</sup>                            | -40            | —     | -225 | mA   | V <sub>CC</sub> = 5.25 V                                                                             |
| Supply current**             | I <sub>CCH</sub>                                          | —              | 48    | 70   | mA   | V <sub>CC</sub> = 5.25 V, Output open                                                                |
|                              | I <sub>CCL</sub>                                          | —              | 62    | 90   |      |                                                                                                      |
|                              | I <sub>CCZ</sub>                                          | —              | 64    | 95   |      |                                                                                                      |
| Input clamp voltage          | V <sub>IK</sub>                                           | —              | —     | -1.5 | V    | V <sub>CC</sub> = 4.75 V, I <sub>IN</sub> = -18 mA                                                   |

Notes: \* V<sub>CC</sub> = 5 V, Ta = 25°C\*\* I<sub>CC</sub> is measured with all outputs open.

\*\*\* Not more than one output shall be shorted at a time. the duration of the short circuit shall not exceed one second.

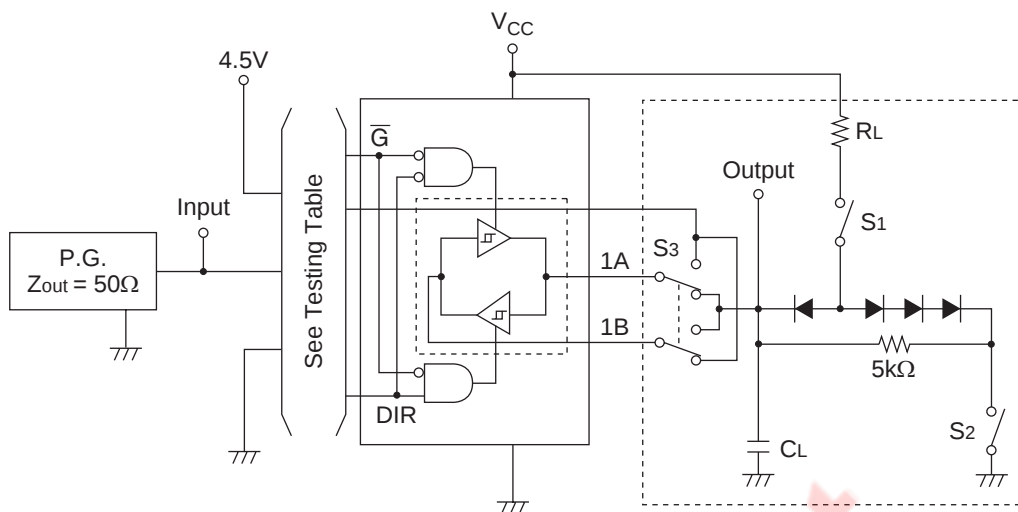
## Switching Characteristics

(V<sub>CC</sub> = 5 V, Ta = 25°C)

| Item                   | Symbol           | Inputs | Outputs | min. | typ. | max. | Unit | Condition                                         |
|------------------------|------------------|--------|---------|------|------|------|------|---------------------------------------------------|
| Propagation delay time | t <sub>PLH</sub> | A      | B       | —    | 8    | 15   | ns   | C <sub>L</sub> = 45 pF,<br>R <sub>L</sub> = 667 Ω |
|                        |                  | B      | A       | —    | 8    | 15   | ns   |                                                   |
|                        | t <sub>PHL</sub> | A      | B       | —    | 11   | 15   | ns   |                                                   |
|                        |                  | B      | A       | —    | 11   | 15   | ns   |                                                   |
| Output enable time     | t <sub>ZL</sub>  | G      | A       | —    | 31   | 40   | ns   |                                                   |
|                        |                  | G      | B       | —    | 31   | 40   | ns   |                                                   |
|                        | t <sub>ZH</sub>  | G      | A       | —    | 26   | 40   | ns   |                                                   |
|                        |                  | G      | B       | —    | 26   | 40   | ns   |                                                   |
| Output disable time    | t <sub>LZ</sub>  | G      | A       | —    | 15   | 25   | ns   | C <sub>L</sub> = 5 pF,<br>R <sub>L</sub> = 667 Ω  |
|                        |                  | G      | B       | —    | 15   | 25   | ns   |                                                   |
|                        | t <sub>HZ</sub>  | G      | A       | —    | 15   | 25   | ns   |                                                   |
|                        |                  | G      | B       | —    | 15   | 25   | ns   |                                                   |

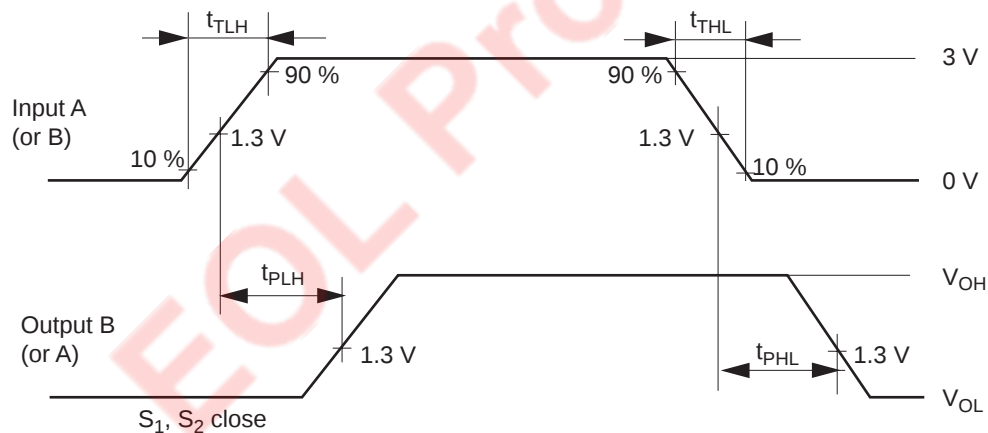
## Testing Method

### Test Circuit



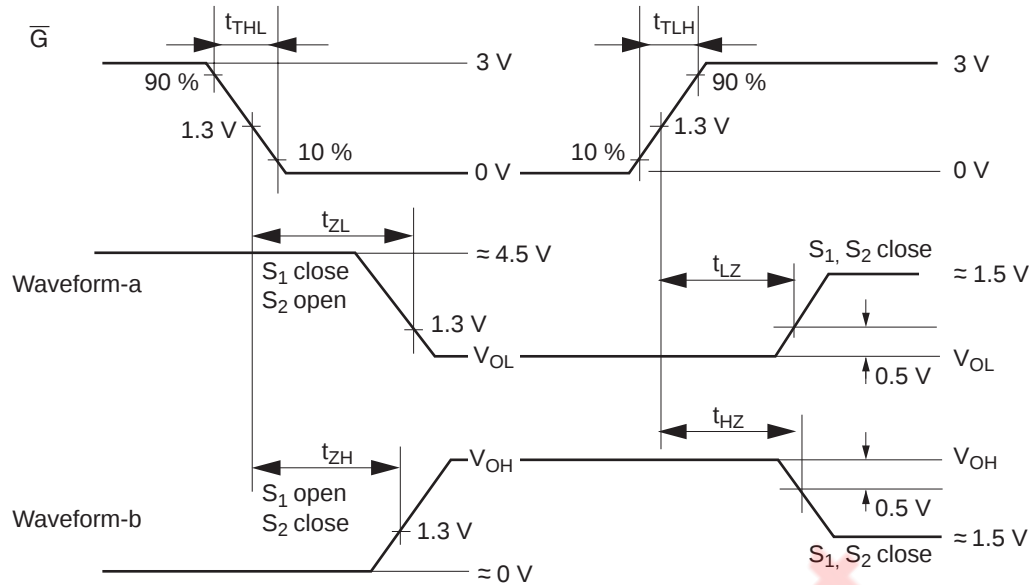
- Notes:
1.  $C_L$  includes probe and jig capacitance.
  2. 2A-2B, 3A-3B, 4A-4B, 5A-5B, 6A-6B, 7A-7B, 8A-8B, are identical to above load circuit.
  3.  $S_3$  is a input-output switch.
  4. All diodes are 1S2074(H).

### Waveforms 1



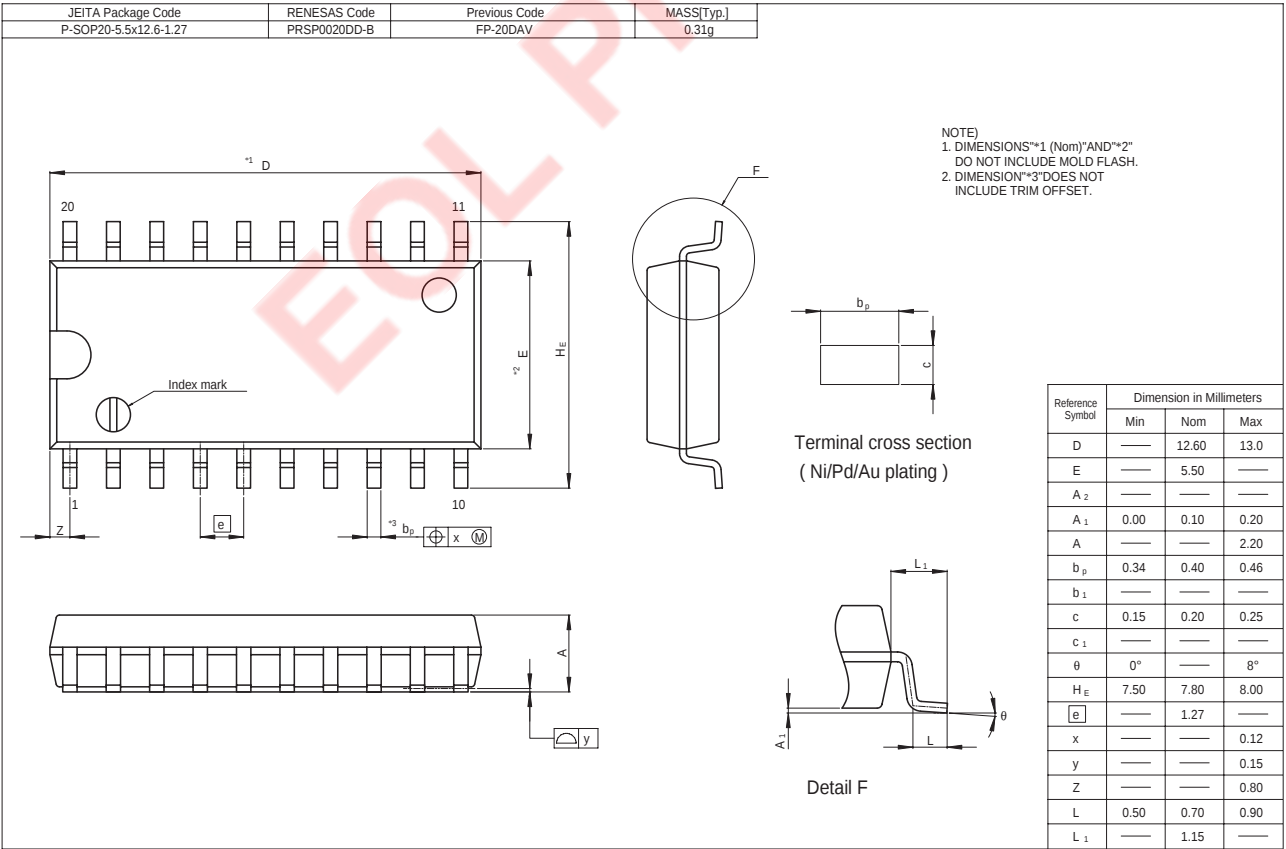
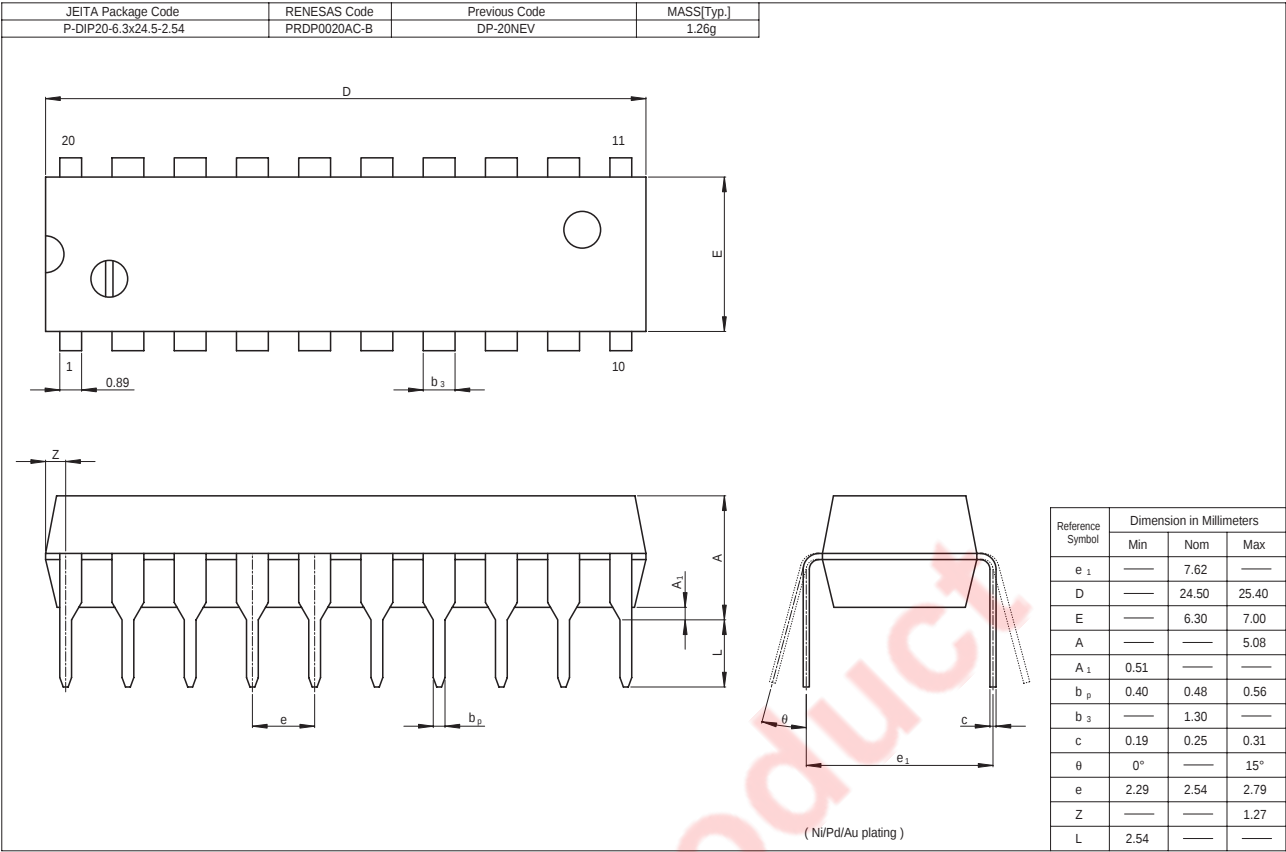
Note: Input pulse:  $t_{TLH} \leq 15 \text{ ns}$ ,  $t_{THL} \leq 6 \text{ ns}$ ,  $\text{PRR} = 1 \text{ MHz}$ , duty cycle 50%

## Waveforms 2



- Notes:
1. Input pulse:  $t_{TLH} \leq 15$  ns,  $t_{THL} \leq 6$  ns, PRR = 1 MHz, duty cycle 50%
  2. Waveform a is an output by internal conditions like "L" except for the case where an output is disabled by output control.
  3. Waveform b is an output by internal conditions like "H" except for the case where an output is disabled by output control.

Package Dimensions



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