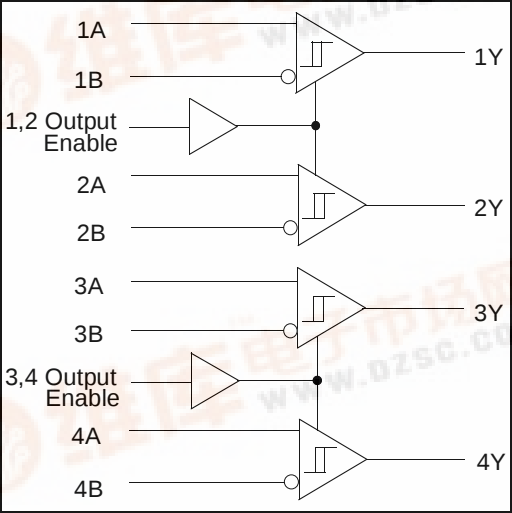


# HD293486

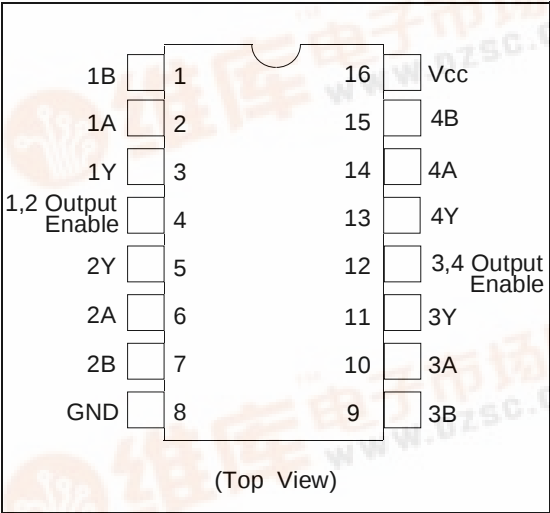
## Quadruple Dfferential Line Receivers With 3 State Outputs

The HD293486 features quadruple Differential line receivers designed to meet the specs of EIA RS-422A and RS-423A. This device operates from a single 5 V power supply. When the enable input is low the associated outputs are in a high impedance state.

### Logic Diagram



### Pin Arrangement



### Function Table

| Differential Input<br>A – B               | Output Enable | Output<br>Y |
|-------------------------------------------|---------------|-------------|
| $V_{ID} \geq 0.2 \text{ V}$               | H             | H           |
| $-0.2 \text{ V} < V_{ID} < 0.2 \text{ V}$ | H             | ?           |
| $V_{ID} \leq -0.2 \text{ V}$              | H             | L           |
| X                                         | L             | Z           |

H : High level  
L : Low level  
X : Irrelevant  
? : Indeterminate  
Z : High Impedance

**Absolute Maximum Ratings**

| Item                       | Symbol             | Ratings     | Unit |
|----------------------------|--------------------|-------------|------|
| Supply Voltage             | V <sub>CC</sub> *2 | 7.0         | V    |
| A , B Input Voltage        | V <sub>IN</sub>    | ±15.0       | V    |
| Differential Input Voltage | V <sub>ID</sub> *3 | ±25.0       | V    |
| Enable Input Voltage       | V <sub>IE</sub>    | 7.0         | V    |
| Output Current             | I <sub>OL</sub>    | 50          | mA   |
| Power Dissipation          | P <sub>T</sub> *1  | DP          | 1000 |
|                            |                    | FP          | 785  |
| Operating Temperature      | T <sub>opr</sub>   | 0 to +70    | °C   |
| Storage Temperature        | T <sub>stg</sub>   | −65 to +150 | °C   |

- Notes: 1. The above data were taken by the ΔV<sub>EB</sub> method mounting on a glass epoxy board (40 × 40 × 1.6 mm) of 10 % wiring density.
2. All voltage values except for differential input voltage are with respect to ground terminal.
3. Differential input voltage is measured at the noninverting input with respect to the corresponding inverting input.
4. The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

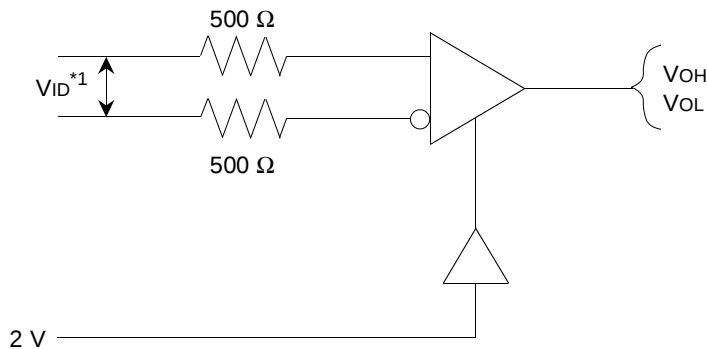
**Recommended Operating Conditions**

| Item                       | Symbol           | Min  | Typ  | Max  | Unit |
|----------------------------|------------------|------|------|------|------|
| Supply Voltage             | V <sub>CC</sub>  | 4.75 | 5.00 | 5.25 | V    |
| In Phase Input Voltage     | V <sub>IC</sub>  | —    | —    | ±7   | V    |
| Differential Input Voltage | V <sub>ID</sub>  | —    | —    | ±6   | V    |
| Output Current             | I <sub>OH</sub>  | —    | —    | −0.4 | mA   |
|                            | I <sub>OL</sub>  | —    | —    | 8.0  | mA   |
| Operating Temperature      | T <sub>opr</sub> | 0    | —    | 70   | °C   |

**Electrical Characteristics (Ta = 0 to +70°C)**

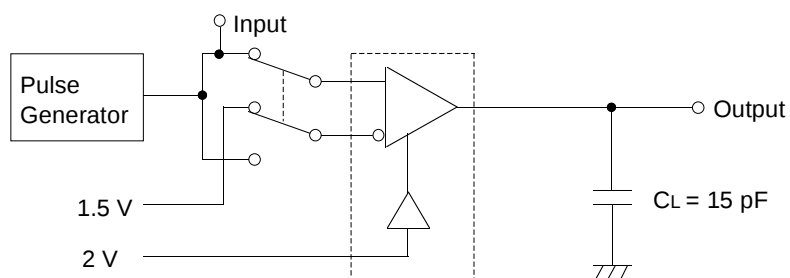
| Item                                      | Symbol             | Conditions                                                              | Min | Typ | Max   | Unit |
|-------------------------------------------|--------------------|-------------------------------------------------------------------------|-----|-----|-------|------|
| Differential Input High Threshold Voltage | V <sub>TH</sub>    | V <sub>O</sub> = 2.7 V, I <sub>O</sub> = -0.4 mA                        | —   | —   | 0.2   | V    |
| Differential Input Low Threshold Voltage  | V <sub>TL</sub>    | V <sub>O</sub> = 0.5 V, I <sub>O</sub> = 8 mA                           | —   | —   | -0.2  | V    |
| Enable Input Voltage                      | V <sub>IH</sub>    |                                                                         | 2.0 | —   | —     | V    |
|                                           | V <sub>IL</sub>    |                                                                         | —   | —   | 0.8   |      |
| Input Clamp Voltage                       | V <sub>IK</sub>    | I <sub>I</sub> = -10 mA                                                 | —   | —   | -1.5  | V    |
| Output Voltage                            | V <sub>OH</sub>    | V <sub>ID</sub> *1 = 0.4 V, I <sub>O</sub> = -0.4 mA                    | 2.7 | —   | —     | V    |
|                                           | V <sub>OL</sub>    | V <sub>ID</sub> *1 = -0.4 V, I <sub>O</sub> = 8 mA                      | —   | —   | 0.5   |      |
| Off State Output Current                  | I <sub>OZ</sub>    | V <sub>IE</sub> = 0.8 V, V <sub>ID</sub> = -3 V, V <sub>O</sub> = 2.7 V | —   | —   | 40    | μA   |
|                                           | I <sub>OZ</sub>    | V <sub>IE</sub> = 0.8 V, V <sub>ID</sub> = 3 V, V <sub>O</sub> = 0.5 V  | —   | —   | 40    |      |
| Differential Input Bias Current           | I <sub>IB</sub>    | V <sub>CC</sub> = 0 V, V <sub>I</sub> = -10 V                           | —   | —   | -3.25 | mA   |
|                                           |                    | or 5.25 V, V <sub>I</sub> = -3 V                                        | —   | —   | -1.5  |      |
|                                           |                    | Other Input = 0 V, V <sub>I</sub> = 3 V                                 | —   | —   | 1.5   |      |
|                                           |                    | V <sub>I</sub> = 10 V                                                   | —   | —   | 3.25  |      |
| Enable Input Current                      | I <sub>IH</sub>    | V <sub>I</sub> = 5.25 V                                                 | —   | —   | 100   | μA   |
|                                           | I <sub>IH</sub>    | V <sub>I</sub> = 2.7 V                                                  | —   | —   | 20    |      |
|                                           | I <sub>IL</sub>    | V <sub>I</sub> = 0.5 V                                                  | —   | —   | -100  |      |
| Short Circuit Output Current              | I <sub>OS</sub> *2 | V <sub>ID</sub> = 3 V, V <sub>O</sub> = 0 V                             | -15 | —   | -100  | mA   |
| Supply Current                            | I <sub>CC</sub>    | V <sub>IE</sub> = 0 V                                                   | —   | —   | 85    | mA   |

Note: 1. Not more than one output should be shorted at a time.



**Switching Characteristics ( $V_{CC} = 5\text{ V}$ ,  $T_a = 25^\circ\text{C}$ )**

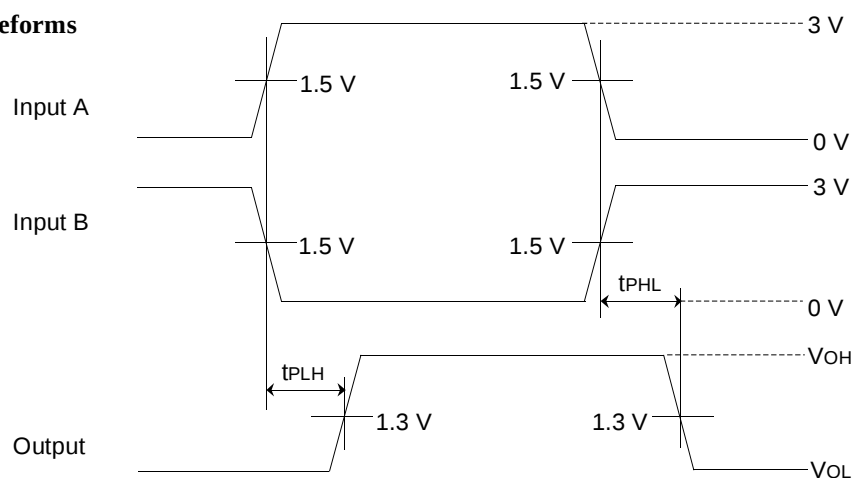
| Item                   | Symbol    | Conditions           | Min | Typ | Max | Unit |
|------------------------|-----------|----------------------|-----|-----|-----|------|
| Propagation Delay Time | $t_{PHL}$ | $C_L = 15\text{ pF}$ | —   | 28  | 35  | ns   |
|                        | $t_{PLH}$ |                      | —   | 27  | 30  |      |
| Output Disable Time    | $t_{HZ}$  |                      | —   | 26  | 35  | ns   |
|                        | $t_{LZ}$  |                      | —   | 27  | 35  |      |
| Output Enable Time     | $t_{ZH}$  |                      | —   | 13  | 30  | ns   |
|                        | $t_{ZL}$  |                      | —   | 20  | 30  |      |

**Switching Time Test Method****1.  $t_{PLH}$ ,  $t_{PHL}$** **Test circuit**

Notes : 1. The pulse generator has following characteristics:

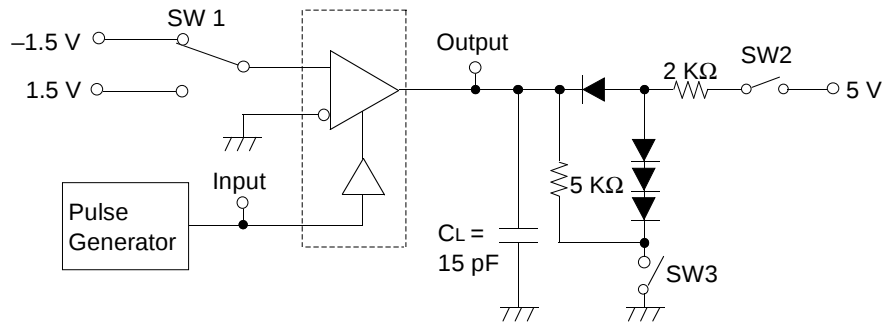
PRR = 1 MHz, 50 % duty cycle,  $t_r \leq 6\text{ ns}$ ,  $t_f \leq 6\text{ ns}$ ,  $Z_{out} = 50\ \Omega$

2.  $C_L$  includes probe and jig capacitance.

**Waveforms**

2.  $t_{HZ}$ ,  $t_{ZH}$ ,  $t_{LZ}$ ,  $t_{ZL}$ 

## Test circuit



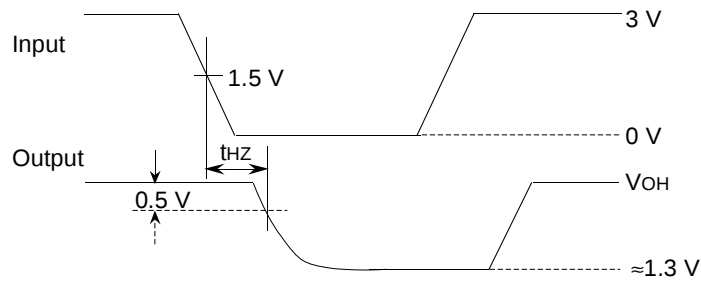
Notes: 1. The pulse generator has following characteristics:

PRR = 1 MHz, 50 % duty cycle,  $t_r \leq 6\text{ ns}$ ,  $t_f \leq 6\text{ ns}$ ,  $Z_{out} = 50\ \Omega$

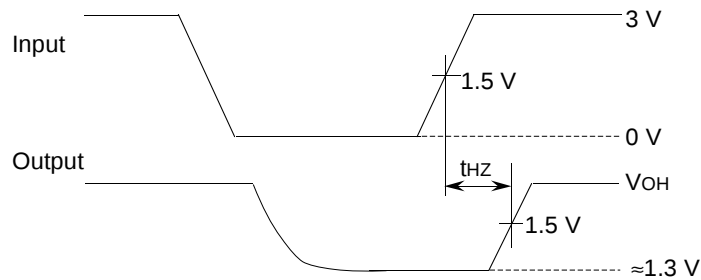
2.  $C_L$  includes probe and jig capacitance.

3. All diodes are 1S2074(H)

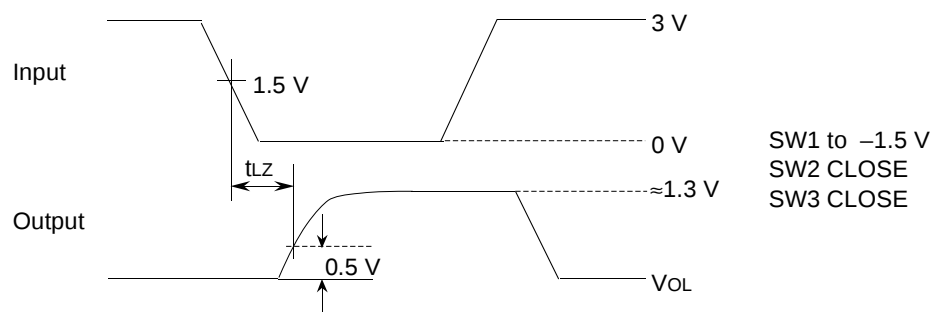
## Waveforms

(1)  $t_{HZ}$ 

SW1 to 1.5 V  
SW2 CLOSE  
SW3 CLOSE

(2)  $t_{ZH}$ 

SW1 to 1.5 V  
SW2 OPEN  
SW3 CLOSE

**(3)  $t_{LZ}$** **(4)  $t_{ZL}$** 