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April 1st, 2010
Renesas Electronics Corporation

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EOL product

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HD29413

Quadruple Differential Line Receivers With 3 State Outputs

REJ03D0306-0200Z
 (Previous ADE-205-582 (Z))
 Rev.2.00
 Jul.16.2004

Description

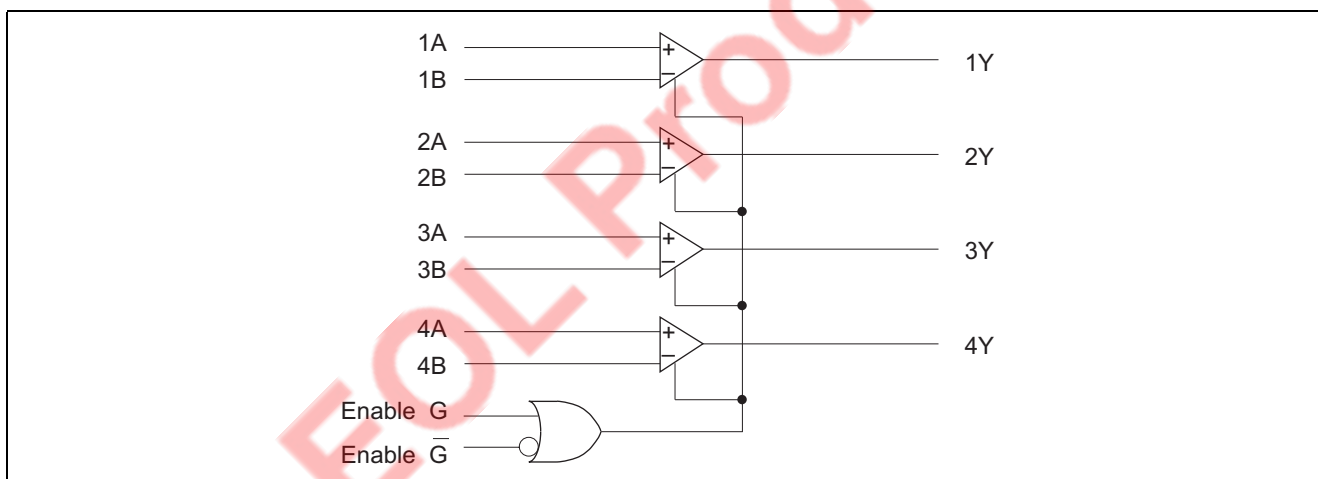
The HD29413 features quadruple differential line receivers designed to meet the spec of EIA RS-422A and RS-423A. The device operates from a single 5 V power supply. The enable function is common to all four receivers and offers a choice of active high or active low inputs. (Complementary output enable input.) Fail-safe circuit guarantees the outputs always at the high level when the inputs are open.

Features

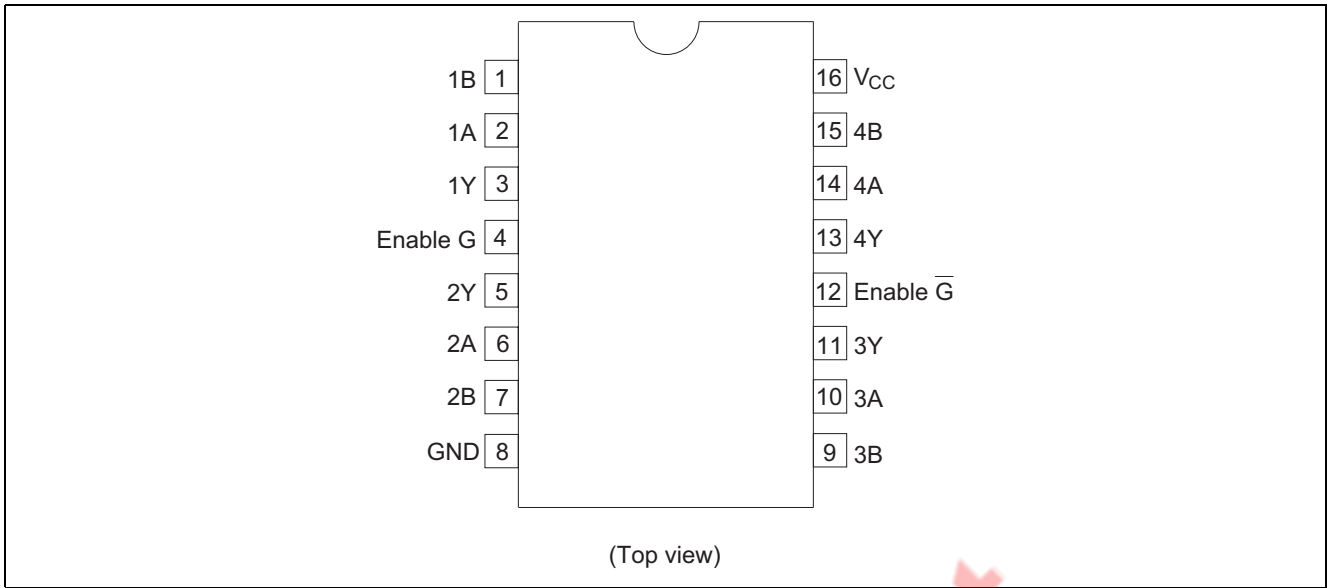
- Ordering Information

| Part Name | Package Type | Package Code | Package Abbreviation | Taping Abbreviation (Quantity) |
|-----------|--------------|---------------|----------------------|--------------------------------|
| HD29413P | DILP-16 pin | DP-16E, -16FV | P | — |

Logic Diagram



Pin Arrangement



Function Table

| Differential Input $V_{IA} - V_{IB}$ | Enable | | Output Y |
|---|--------|-----------|-------------|
| | G | \bar{G} | |
| + | H | X | H |
| + | X | L | H |
| — | H | X | L |
| — | X | L | L |
| X | L | H | Z |

- H : High level
- L : Low level
- X : Irrelevant
- Z : High impedance

Absolute Maximum Ratings

| Item | Symbol | Ratings | Unit |
|----------------------------|---------------|-------------|------|
| Supply Voltage | V_{CC}^{*1} | +7 | V |
| In Phase Input Voltage | V_{IC}^{*2} | -25 to +25 | V |
| Differential Input Voltage | V_{ID}^{*3} | 0 to +25 | V |
| Enable Input Voltage | V_{IN} | +7 | V |
| Output Sink Current | I_O | +50 | mA |
| Operating Temperature | T_{opr} | 0 to +70 | °C |
| Storage Temperature | T_{stg} | -65 to +150 | °C |

- Notes:
1. All voltage values except for differential input voltage are with respect to ground terminal.
 2. $V_{IC} = 1/2 (V_{IA} + V_{IB})$ $|V_{ID}| = |V_{IA} - V_{IB}|$
 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_{CC} | 4.75 | 5.0 | 5.25 | V |
| In Phase Input Voltage | V_{IC} | -7 | — | +7 | V |
| Differential Input Voltage | V_{ID} | +0.3 | — | +6.0 | V |
| Output Current | I_{OH} | — | — | -440 | μ A |
| | I_{OL} | — | — | 8 | mA |
| Operating Temperature | Topr | 0 | — | 70 | $^{\circ}$ C |

Electrical Characteristics (Ta = 0 to + 70 $^{\circ}$ C)

| Item | Symbol | Min | Typ*1 | Max | Unit | Conditions | | |
|---|---------------|-----|-------|-------|---------|--|---|------------------------------|
| Differential Input High Threshold Voltage | V_{TH} | — | — | 0.3 | V | $V_{CC} = 5\text{ V} \pm 5\%$, $V_{IC} = -7\text{ to }+7\text{ V}$ | $V_{OH} \geq 2.7\text{ V}$, $I_{OH} = -440\ \mu\text{A}$ | |
| | V_{TL} | — | — | -0.3 | V | | $V_{OL} \leq 0.4\text{ V}$, $I_{OL} = 4\text{ mA}$ | |
| Enable Input Voltage | V_{IH} | 2.0 | — | — | V | | | |
| | V_{IL} | — | — | 0.8 | V | | | |
| Enable Input Clamp Voltage | V_{IK} | — | — | -1.5 | V | $V_{CC} = 4.75\text{ V}$, $I_{IN} = -18\text{ mA}$ | | |
| Output Voltage | V_{OH} | 2.7 | — | — | V | $V_{CC} = 4.75\text{ V}$ | $V_{ID} = 0.3\text{ to }6\text{ V}$ | $I_{OH} = -440\ \mu\text{A}$ |
| | V_{OL} | — | — | 0.4 | V | $V_{IL}(\bar{G}) = 0.8\text{ V}$ | $V_{ID} = -0.3\text{ to }-6\text{ V}$ | $I_{OL} = 4\text{ mA}$ |
| | | — | — | 0.45 | V | $V_{IH}(G) = 2\text{ V}$ | | $I_{OL} = 8\text{ mA}$ |
| Off State (High impedance) Output Current | I_{OZ} | — | — | 20 | μ A | $V_{CC} = 5.25\text{ V}$ | | $V_O = 2.4\text{ V}$ |
| | | — | — | -20 | μ A | $V_{IL}(G) = 0.8\text{ V}$, $V_{IH}(\bar{G}) = 2\text{ V}$ | | $V_O = 0.4\text{ V}$ |
| Line Input Current | I_{IN} | — | — | 2.2 | mA | $V_{CC} = 5.25\text{ V}$ or $V_{CC} = 0\text{ V}$ | | $V_I = -10\text{ V}$ |
| | | 0 | — | 1.0 | mA | | | $V_I = 3\text{ V}$ |
| | | 0 | — | -1.0 | mA | | | $V_I = -3\text{ V}$ |
| | | — | — | -2.2 | mA | | | $V_I = -10\text{ V}$ |
| Enable Input Current | $I_{I(EN)}$ | — | — | 100 | μ A | $V_{CC} = 5.25\text{ V}$ | | $V_I = 5.5\text{ V}$ |
| | | — | — | 20 | μ A | | | $V_I = 2.7\text{ V}$ |
| | | — | — | -0.36 | mA | | | $V_I = 0.4\text{ V}$ |
| Short Circuit Output Current | I_{OS}^{*2} | -15 | — | -85 | mA | $V_{CC} = 5.25\text{ V}$, $V_O = 0\text{ V}$ | | |
| Supply Current | I_{CC} | — | — | 70 | mA | $V_{CC} = 5.25\text{ V}$, $V_I = 0\text{ V}$ (All Output Disable) | | |

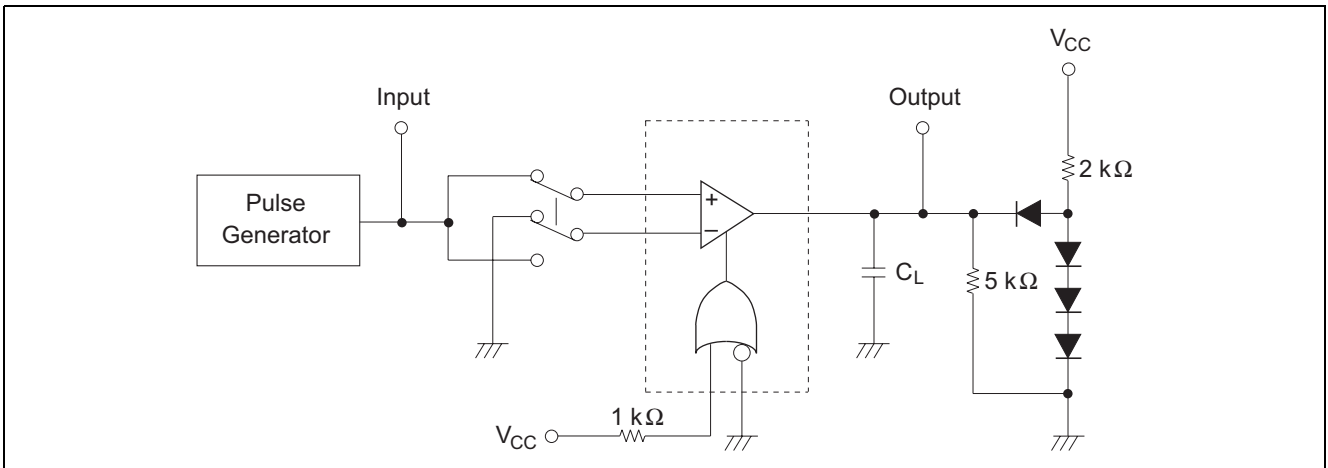
- Notes: 1. All typical values are at $V_{CC} = 5\text{ V}$, $T_a = 25^{\circ}\text{C}$, $V_{IC} = 0$
 2. Not more than one output should be shorted at a time.

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

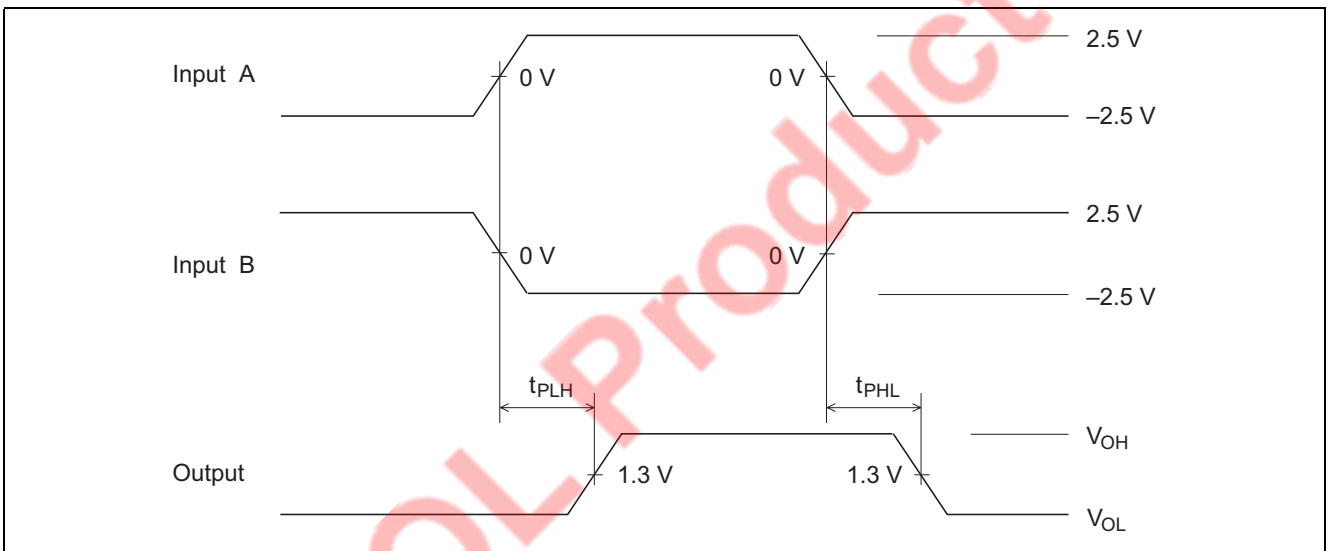
| Item | Symbol | Min | Typ | Max | Unit | Conditions |
|------------------------|-----------------------|-----|-----|-----|------|----------------------|
| Propagation Delay Time | t_{PLH} , t_{PHL} | — | 17 | 25 | ns | $C_L = 15\text{ pF}$ |
| Output Enable Time | t_{ZH} , t_{ZL} | — | 15 | 22 | ns | |
| Output Disable Time | t_{HZ} | — | 15 | 22 | ns | $C_L = 5\text{ pF}$ |
| | t_{LZ} | — | 20 | 30 | ns | |

1. t_{PLH} , t_{PHL}

Test Circuit

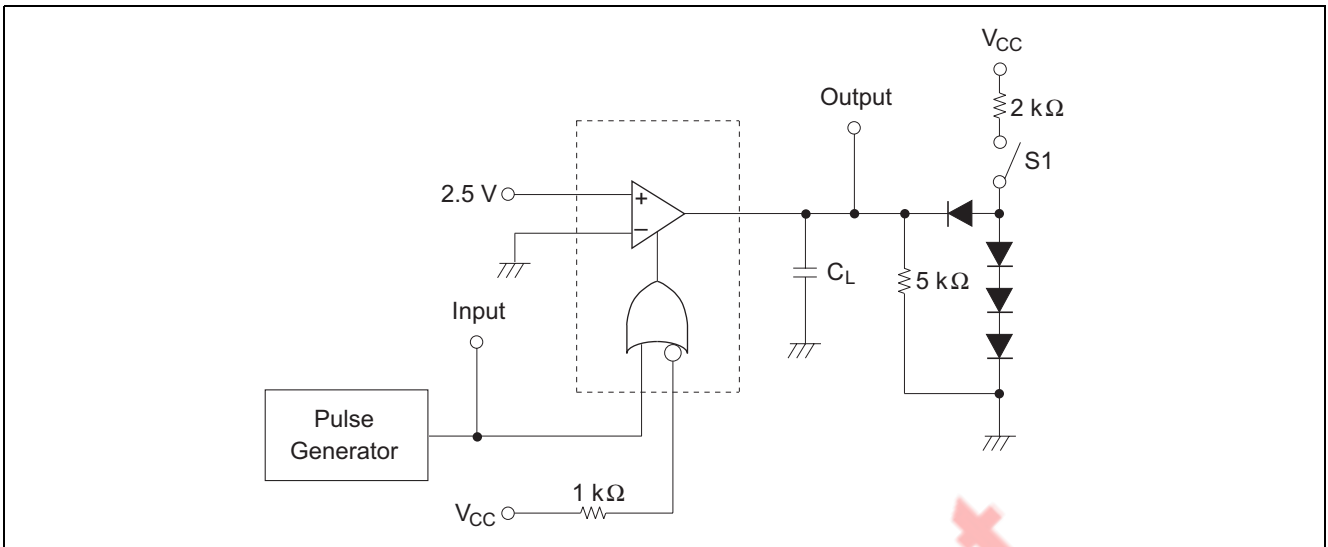


Waveforms

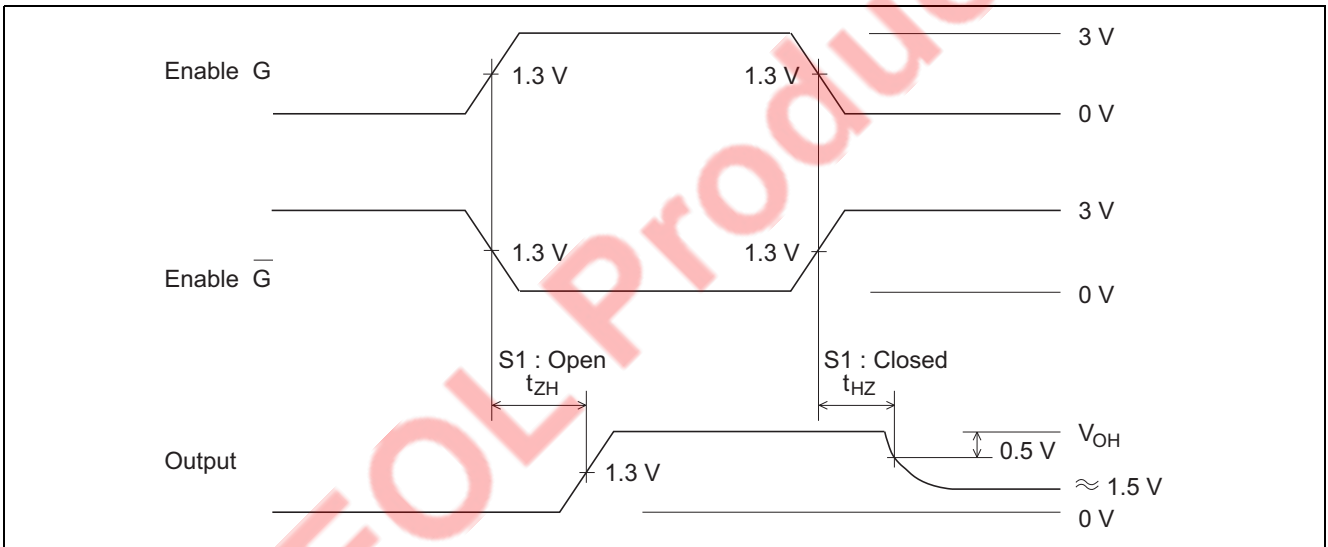


2. t_{HZ} , t_{ZH}

Test Circuit

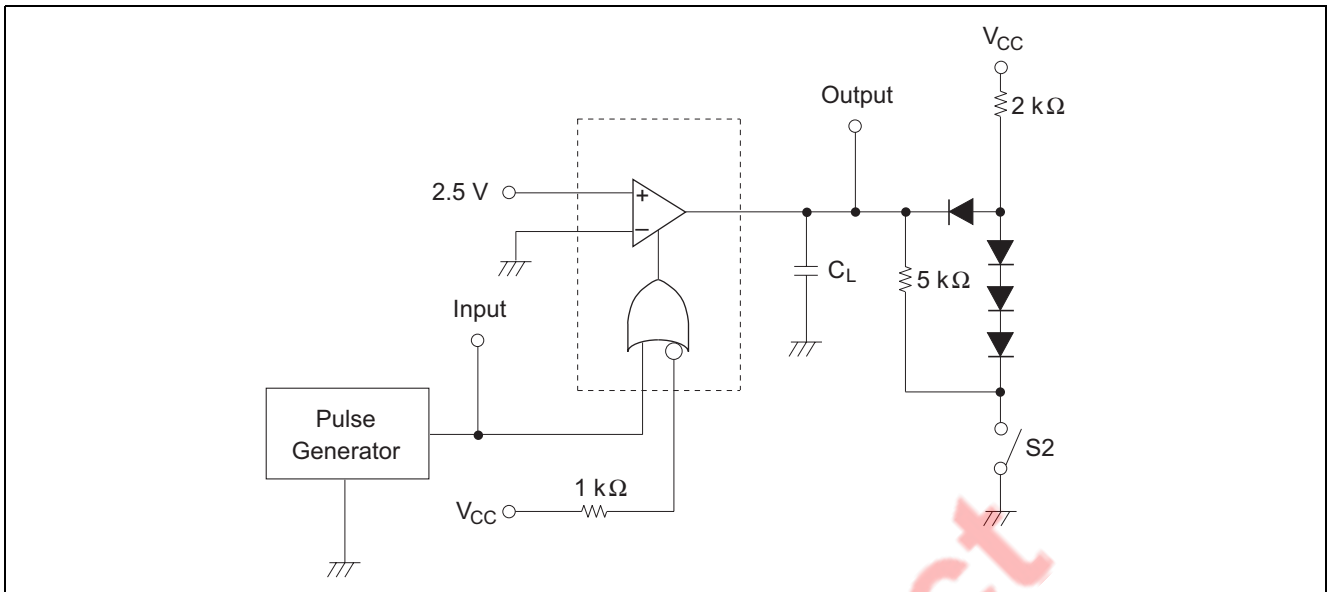


Waveforms

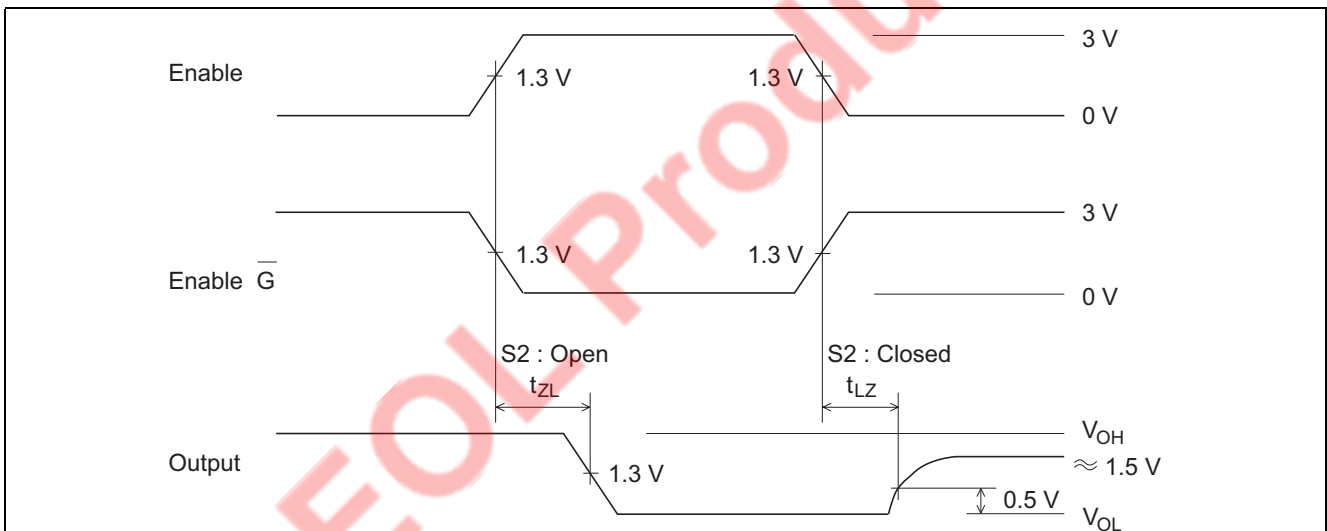


3. t_{LZ} , t_{ZL}

Test Circuit



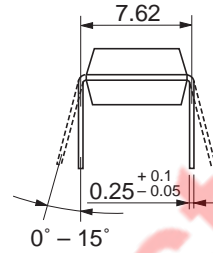
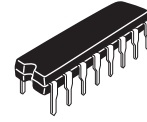
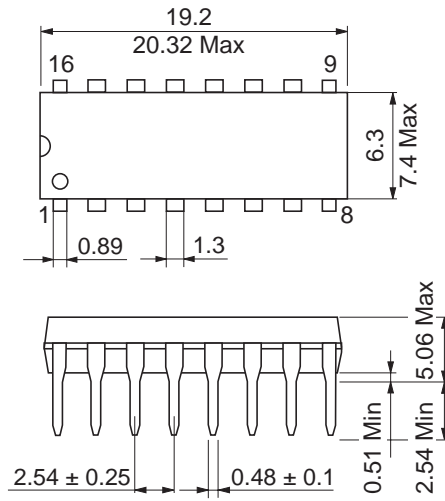
Waveforms



- Notes:
1. The pulse generator has the following characteristics: PRR = 1 MHz duty cycle 50%, $t_r \leq 15$ ns, $t_f \leq 6$ ns, $Z_{out} = 50 \Omega$.
 2. C_L include probe and jig capacitance.
 3. All diodes are 1S2074(H)
 4. To test G input, ground G input and apply an inverted input waveform.

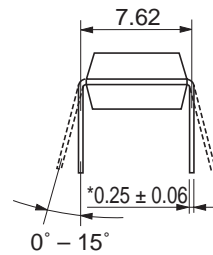
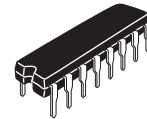
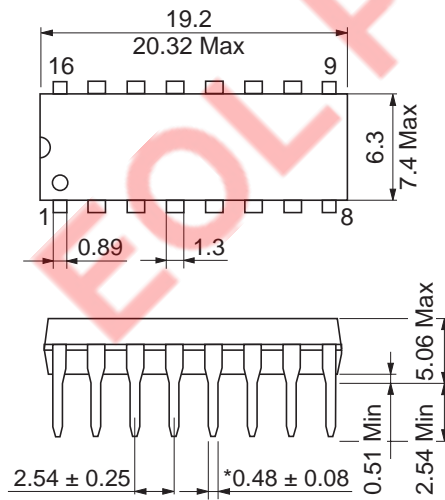
Package Dimensions

As of January, 2003
Unit: mm



| | |
|------------------------|----------|
| Package Code | DP-16E |
| JEDEC | Conforms |
| JEITA | Conforms |
| Mass (reference value) | 1.05 g |

Unit: mm



*Ni/Pd/AU Plating

| | |
|------------------------|----------|
| Package Code | DP-16FV |
| JEDEC | Conforms |
| JEITA | Conforms |
| Mass (reference value) | 1.05 g |

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