

# HD74HC02

## Quad. 2-input NOR Gates

REJ03D0533-0200  
(Previous ADE-205-405)  
Rev.2.00  
Oct 06, 2005

### Features

- High Speed Operation:  $t_{pd} = 6.5 \text{ ns typ (} C_L = 50 \text{ pF)}$
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage:  $V_{CC} = 2 \text{ to } 6 \text{ V}$
- Low Input Current:  $1 \mu\text{A max}$
- Low Quiescent Supply Current:  $I_{CC} \text{ (static)} = 1 \mu\text{A max (} T_a = 25^\circ\text{C)}$
- Ordering Information

| Part Name    | Package Type       | Package Code<br>(Previous Code) | Package<br>Abbreviation | Taping Abbreviation<br>(Quantity) |
|--------------|--------------------|---------------------------------|-------------------------|-----------------------------------|
| HD74HC02P    | DILP-14 pin        | PRDP0014AB-B<br>(DP-14AV)       | P                       | —                                 |
| HD74HC02FPEL | SOP-14 pin (JEITA) | PRSP0014DF-B<br>(FP-14DAV)      | FP                      | EL (2,000 pcs/reel)               |
| HD74HC02RPEL | SOP-14 pin (JEDEC) | PRSP0014DE-A<br>(FP-14DNV)      | RP                      | EL (2,500 pcs/reel)               |
| HD74HC02TELL | TSSOP-14 pin       | PTSP0014JA-B<br>(TTP-14DV)      | T                       | ELL (2,000 pcs/reel)              |

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

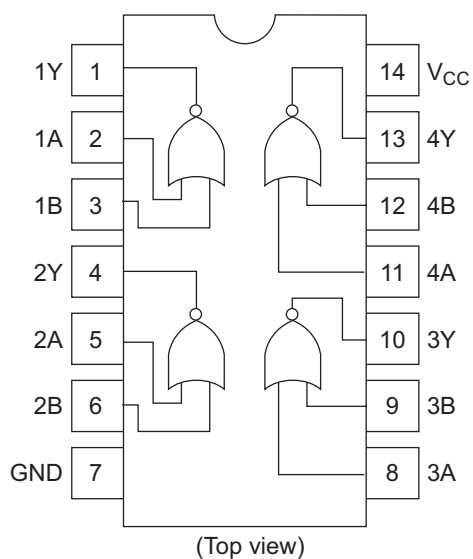
### Function Table

| Inputs |   | Output |
|--------|---|--------|
| A      | B | Y      |
| L      | L | H      |
| L      | H | L      |
| H      | L | L      |
| H      | H | L      |

H : High level

L : Low level

## Pin Arrangement



## Absolute Maximum Ratings

| Item                         | Symbol                | Ratings                | Unit |
|------------------------------|-----------------------|------------------------|------|
| Supply voltage range         | $V_{CC}$              | -0.5 to 7.0            | V    |
| Input / Output voltage       | $V_{in}, V_{out}$     | -0.5 to $V_{CC} + 0.5$ | V    |
| Input / Output diode current | $I_{IK}, I_{OK}$      | $\pm 20$               | mA   |
| Output current               | $I_O$                 | $\pm 25$               | mA   |
| $V_{CC}$ , GND current       | $I_{CC}$ or $I_{GND}$ | $\pm 50$               | mA   |
| Power dissipation            | $P_T$                 | 500                    | mW   |
| Storage temperature          | $T_{stg}$             | -65 to +150            | °C   |

Note: 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            | Ratings       | Unit | Conditions               |
|--------------------------------------|-------------------|---------------|------|--------------------------|
| Supply voltage                       | $V_{CC}$          | 2 to 6        | V    |                          |
| Input / Output voltage               | $V_{IN}, V_{OUT}$ | 0 to $V_{CC}$ | V    |                          |
| Operating temperature                | $T_a$             | -40 to 85     | °C   |                          |
| Input rise / fall time <sup>*1</sup> | $t_r, t_f$        | 0 to 1000     | ns   | $V_{CC} = 2.0 \text{ V}$ |
|                                      |                   | 0 to 500      |      | $V_{CC} = 4.5 \text{ V}$ |
|                                      |                   | 0 to 400      |      | $V_{CC} = 6.0 \text{ V}$ |

Note: 1. This item guarantees maximum limit when one input switches.  
Waveform: Refer to test circuit of switching characteristics.

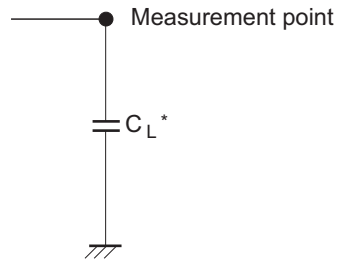
## Electrical Characteristics

| Item                     | Symbol          | V <sub>CC</sub> (V) | Ta = 25°C |     |      | Ta = -40 to +85°C |      | Unit | Test Conditions                                       |                           |
|--------------------------|-----------------|---------------------|-----------|-----|------|-------------------|------|------|-------------------------------------------------------|---------------------------|
|                          |                 |                     | Min       | Typ | Max  | Min               | Max  |      |                                                       |                           |
| Input voltage            | V <sub>IH</sub> | 2.0                 | 1.5       | —   | —    | 1.5               | —    | V    |                                                       |                           |
|                          |                 | 4.5                 | 3.15      | —   | —    | 3.15              | —    |      |                                                       |                           |
|                          |                 | 6.0                 | 4.2       | —   | —    | 4.2               | —    |      |                                                       |                           |
|                          | V <sub>IL</sub> | 2.0                 | —         | —   | 0.5  | —                 | 0.5  | V    |                                                       |                           |
|                          |                 | 4.5                 | —         | —   | 1.35 | —                 | 1.35 |      |                                                       |                           |
|                          |                 | 6.0                 | —         | —   | 1.8  | —                 | 1.8  |      |                                                       |                           |
| Output voltage           | V <sub>OH</sub> | 2.0                 | 1.9       | 2.0 | —    | 1.9               | —    | V    | Vin = V <sub>IH</sub> or V <sub>IL</sub>              | I <sub>OH</sub> = -20 µA  |
|                          |                 | 4.5                 | 4.4       | 4.5 | —    | 4.4               | —    |      |                                                       |                           |
|                          |                 | 6.0                 | 5.9       | 6.0 | —    | 5.9               | —    |      |                                                       |                           |
|                          |                 | 4.5                 | 4.18      | —   | —    | 4.13              | —    |      |                                                       | I <sub>OH</sub> = -4 mA   |
|                          |                 | 6.0                 | 5.68      | —   | —    | 5.63              | —    |      |                                                       | I <sub>OH</sub> = -5.2 mA |
|                          |                 | 6.0                 | —         | —   | —    | —                 | —    |      |                                                       |                           |
|                          | V <sub>OL</sub> | 2.0                 | —         | 0.0 | 0.1  | —                 | 0.1  | V    | Vin = V <sub>IH</sub> or V <sub>IL</sub>              | I <sub>OL</sub> = 20 µA   |
|                          |                 | 4.5                 | —         | 0.0 | 0.1  | —                 | 0.1  |      |                                                       |                           |
|                          |                 | 6.0                 | —         | 0.0 | 0.1  | —                 | 0.1  |      |                                                       |                           |
|                          |                 | 4.5                 | —         | —   | 0.26 | —                 | 0.33 |      |                                                       | I <sub>OL</sub> = 4 mA    |
|                          |                 | 6.0                 | —         | —   | 0.26 | —                 | 0.33 |      |                                                       | I <sub>OL</sub> = 5.2 mA  |
|                          |                 | 6.0                 | —         | —   | —    | —                 | —    |      |                                                       |                           |
| Input current            | I <sub>in</sub> | 6.0                 | —         | —   | ±0.1 | —                 | ±1.0 | µA   | Vin = V <sub>CC</sub> or GND                          |                           |
| Quiescent supply current | I <sub>CC</sub> | 6.0                 | —         | —   | 1.0  | —                 | 10   | µA   | Vin = V <sub>CC</sub> or GND, I <sub>out</sub> = 0 µA |                           |

Switching Characteristics (C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6 ns)

| Item                   | Symbol           | V <sub>CC</sub> (V) | Ta = 25°C |     |     | Ta = -40 to +85°C |     | Unit | Test Conditions |  |
|------------------------|------------------|---------------------|-----------|-----|-----|-------------------|-----|------|-----------------|--|
|                        |                  |                     | Min       | Typ | Max | Min               | Max |      |                 |  |
| Propagation delay time | t <sub>PLH</sub> | 2.0                 | —         | —   | 90  | —                 | 115 | ns   |                 |  |
|                        |                  | 4.5                 | —         | 7   | 18  | —                 | 23  |      |                 |  |
|                        |                  | 6.0                 | —         | —   | 15  | —                 | 20  |      |                 |  |
|                        | t <sub>PHL</sub> | 2.0                 | —         | —   | 90  | —                 | 115 | ns   |                 |  |
|                        |                  | 4.5                 | —         | 6   | 18  | —                 | 23  |      |                 |  |
|                        |                  | 6.0                 | —         | —   | 15  | —                 | 20  |      |                 |  |
| Output rise time       | t <sub>TLH</sub> | 2.0                 | —         | —   | 75  | —                 | 95  | ns   |                 |  |
|                        |                  | 4.5                 | —         | 5   | 15  | —                 | 19  |      |                 |  |
|                        |                  | 6.0                 | —         | —   | 13  | —                 | 16  |      |                 |  |
| Output fall time       | t <sub>THL</sub> | 2.0                 | —         | —   | 75  | —                 | 95  | ns   |                 |  |
|                        |                  | 4.5                 | —         | 5   | 15  | —                 | 19  |      |                 |  |
|                        |                  | 6.0                 | —         | —   | 13  | —                 | 16  |      |                 |  |
| Input capacitance      | C <sub>in</sub>  | —                   | —         | 5   | 10  | —                 | 10  | pF   |                 |  |

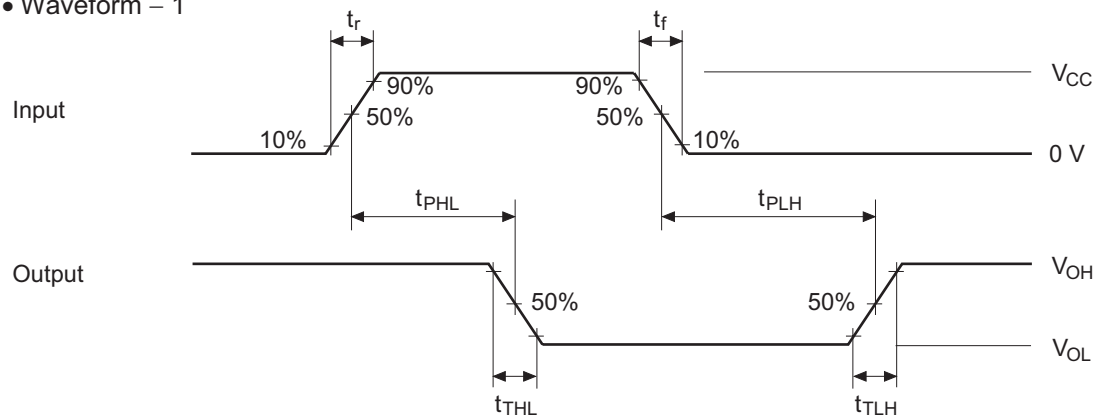
## Test Circuit



Note:  $C_L$  includes the probe and fig capacitance.

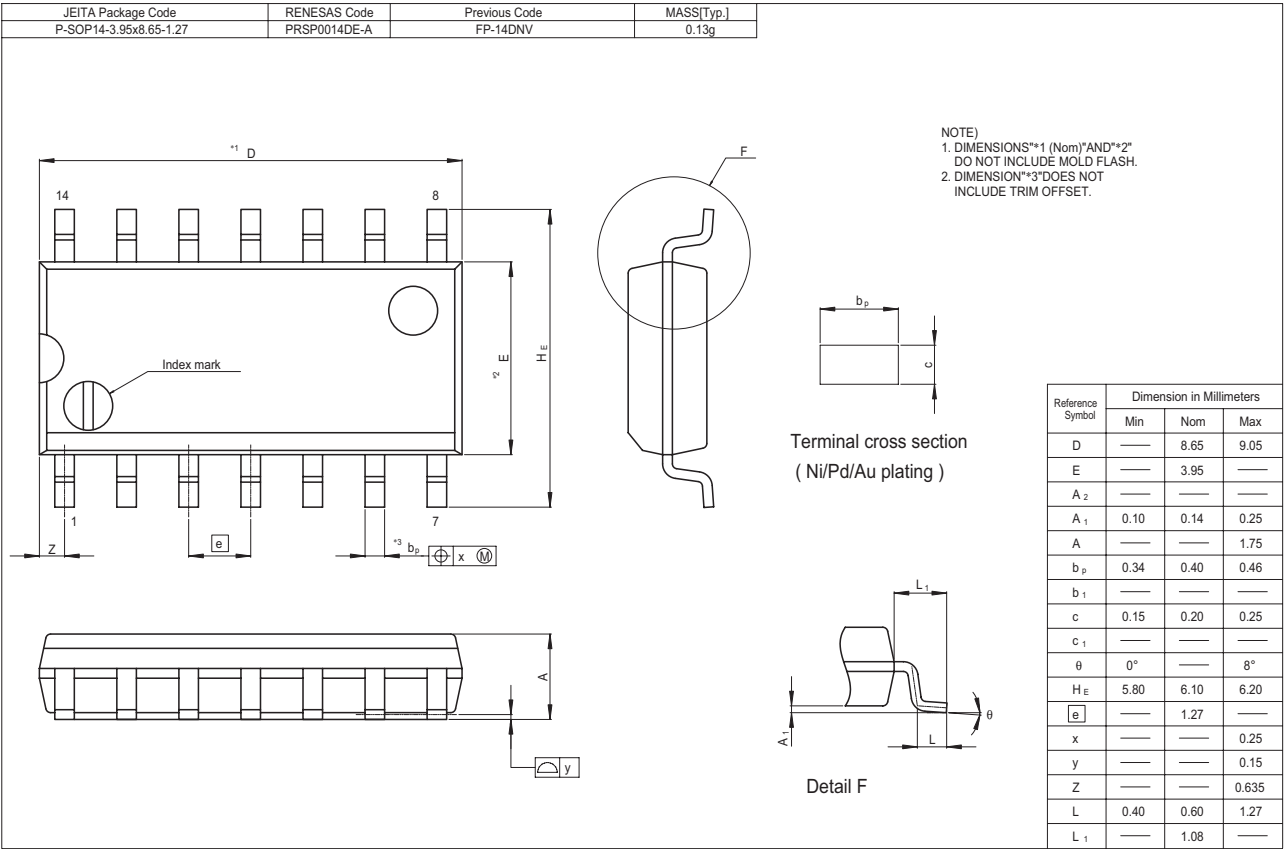
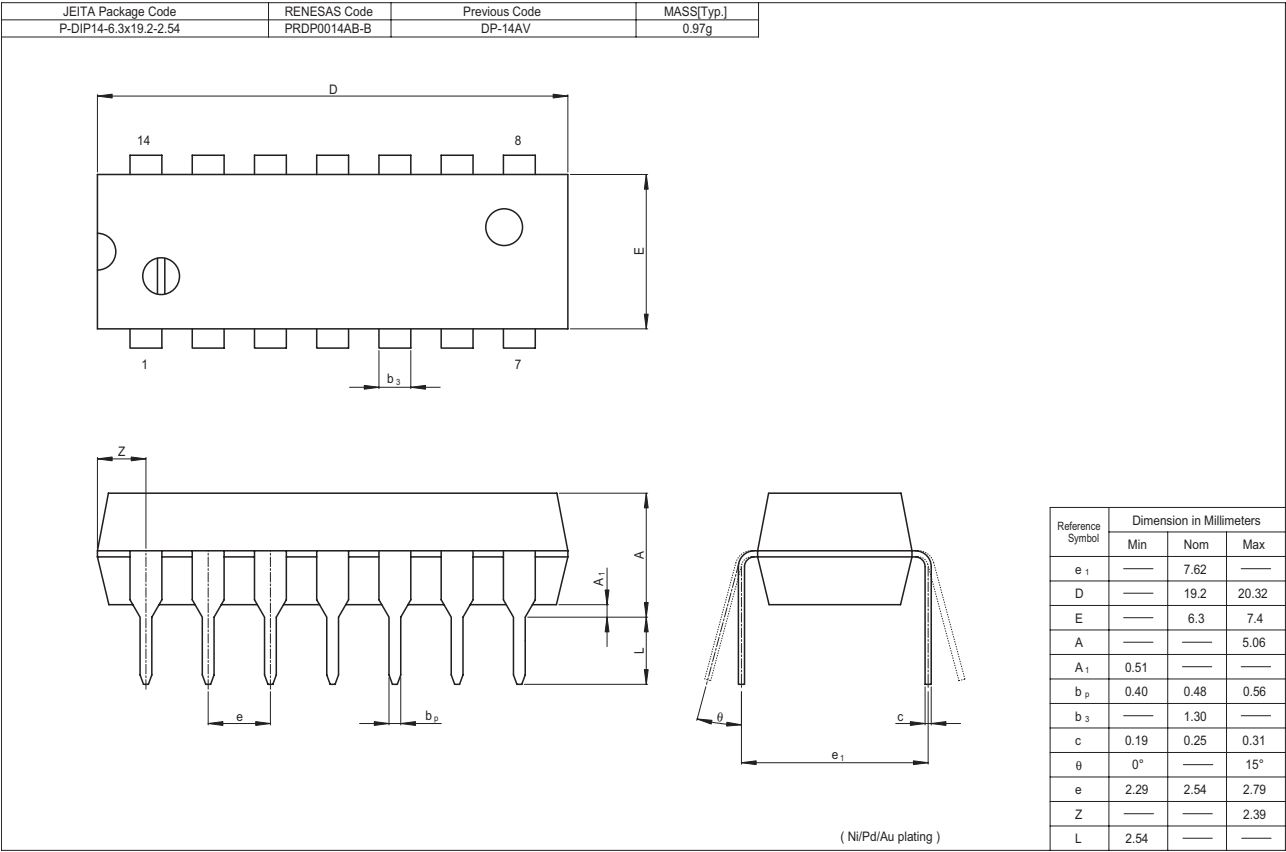
## Waveforms

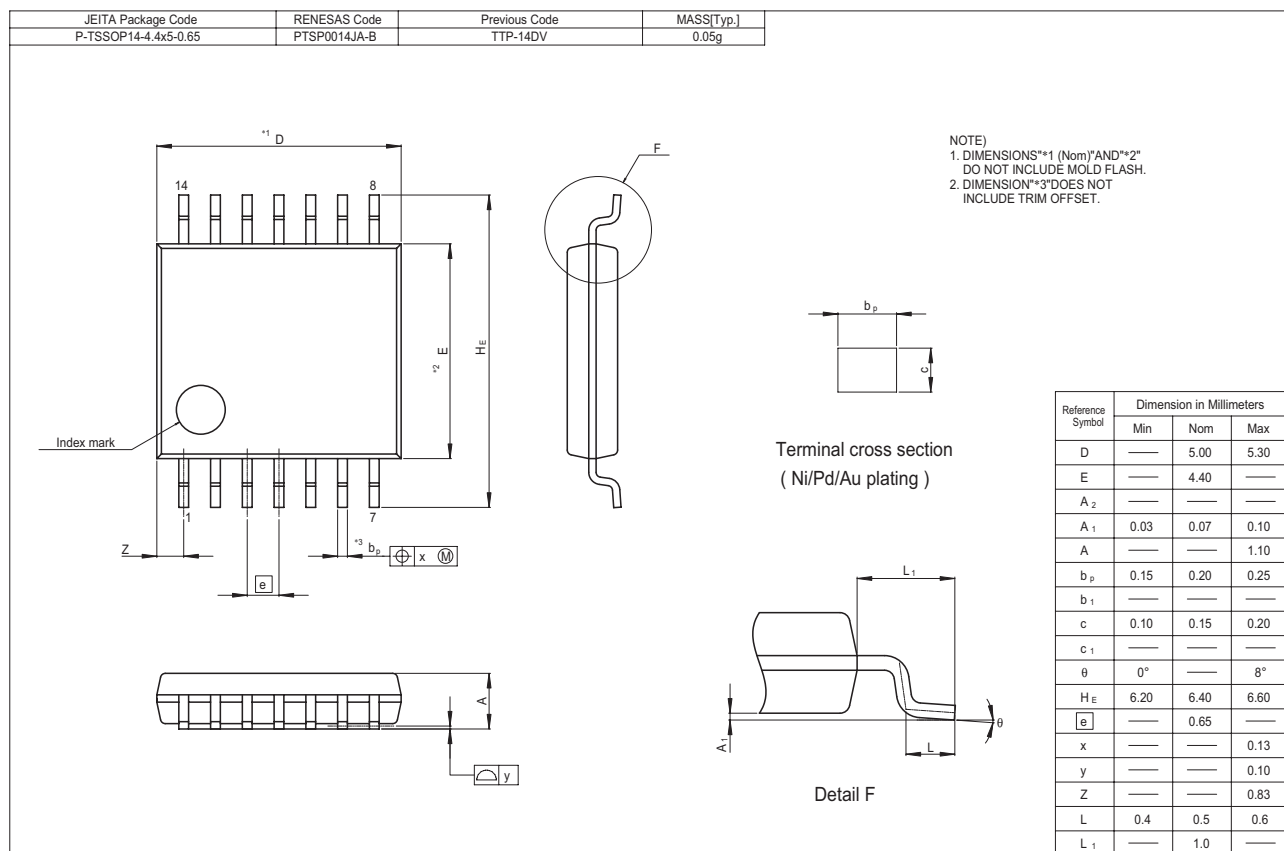
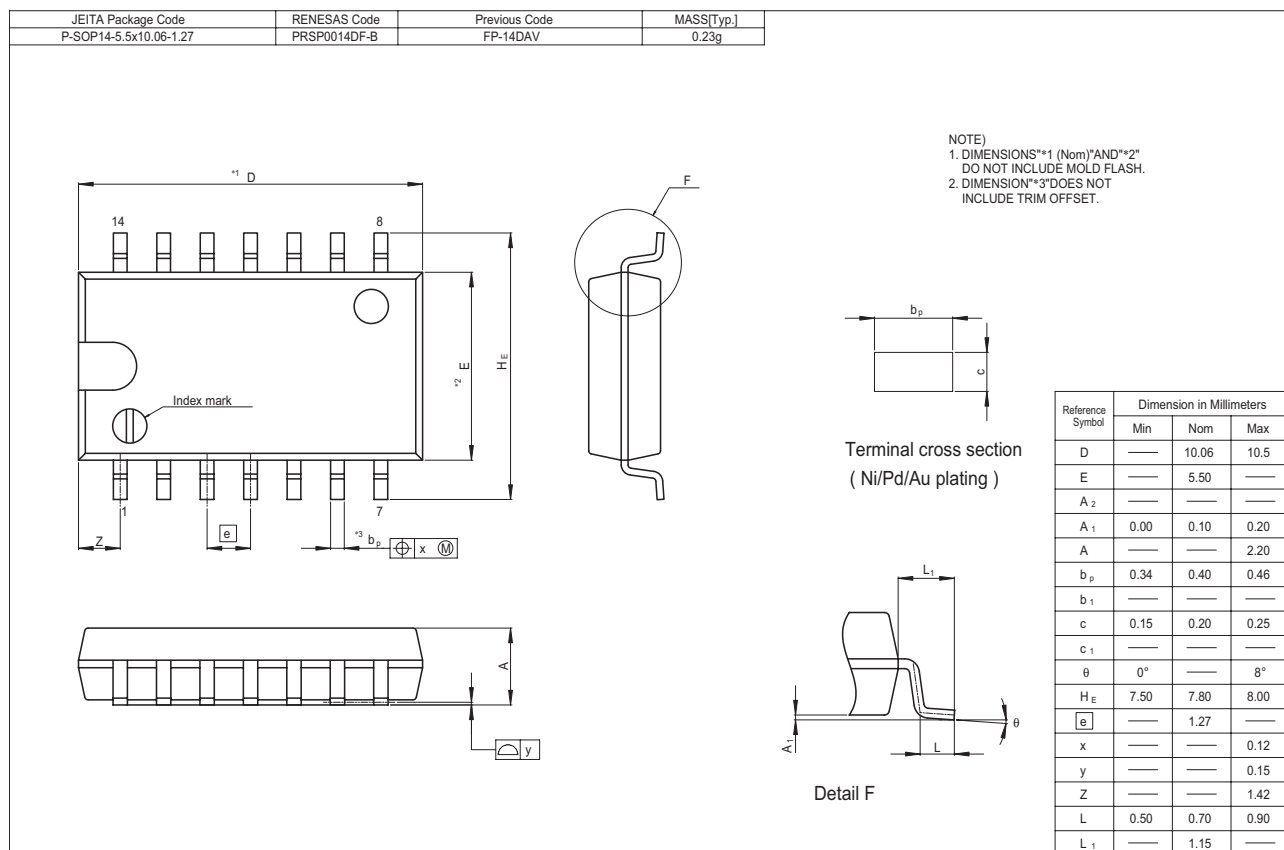
### • Waveform – 1



Notes: 1. Input waveform:  $PRR \leq 1 \text{ MHz}$ ,  $Z_o = 50 \Omega$ ,  $t_r \leq 6 \text{ ns}$ ,  $t_f \leq 6 \text{ ns}$   
 2. The output are measured one at a time with one transition per measurement.

Package Dimensions





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