

# HD74HCT373, HD74HCT533

Octal D-type Transparent Latches (with 3-state outputs)

Octal D-type Transparent Latches (with inverted 3-state outputs)

REJ03D0666-0200  
 (Previous ADE-205-555)  
 Rev.2.00  
 Mar 30, 2006

## Description

When the latch enable input is high, the Q outputs of HD74HCT373 will follow the D inputs and the Q outputs of HD74HCT533 will follow the inversion of the D inputs. When the latch enable goes low, data at the D inputs will be retained at the outputs until latch enable returns high again. When a high logic level is applied to the output control input, all outputs go to a high impedance state, regardless of what signals present at the other inputs and the state of the storage elements.

## Features

- LSTTL Output Logic Level Compatibility as well as CMOS Output Compatibility
- High Speed Operation:  $t_{pd}$  (Data to Q) = 14 ns typ ( $C_L = 50$  pF)
- High Output Current: Fanout of 15 LSTTL Loads
- Wide Operating Voltage:  $V_{CC} = 4.5$  to 5.5 V
- Low Input Current: 1  $\mu$ A max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 4  $\mu$ A max ( $T_a = 25^\circ\text{C}$ )
- Ordering Information

| Part Name                        | Package Type       | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|----------------------------------|--------------------|------------------------------|----------------------|--------------------------------|
| HD74HCT373P                      | DILP-20 pin        | PRDP0020AC-B (DP-20NEV)      | P                    | —                              |
| HD74HCT373FPEL                   | SOP-20 pin (JEITA) | PRSP0020DD-B (FP-20DAV)      | FP                   | EL (2,000 pcs/reel)            |
| HD74HCT373RPEL<br>HD74HCT533RPEL | SOP-20 pin (JEDEC) | PRSP0020DC-A (FP-20DBV)      | RP                   | EL (1,000 pcs/reel)            |
| HD74HCT373TELL                   | TSSOP-20 pin       | PTSP0020JB-A (TTP-20DAV)     | T                    | ELL (2,000 pcs/reel)           |

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

## Function Table

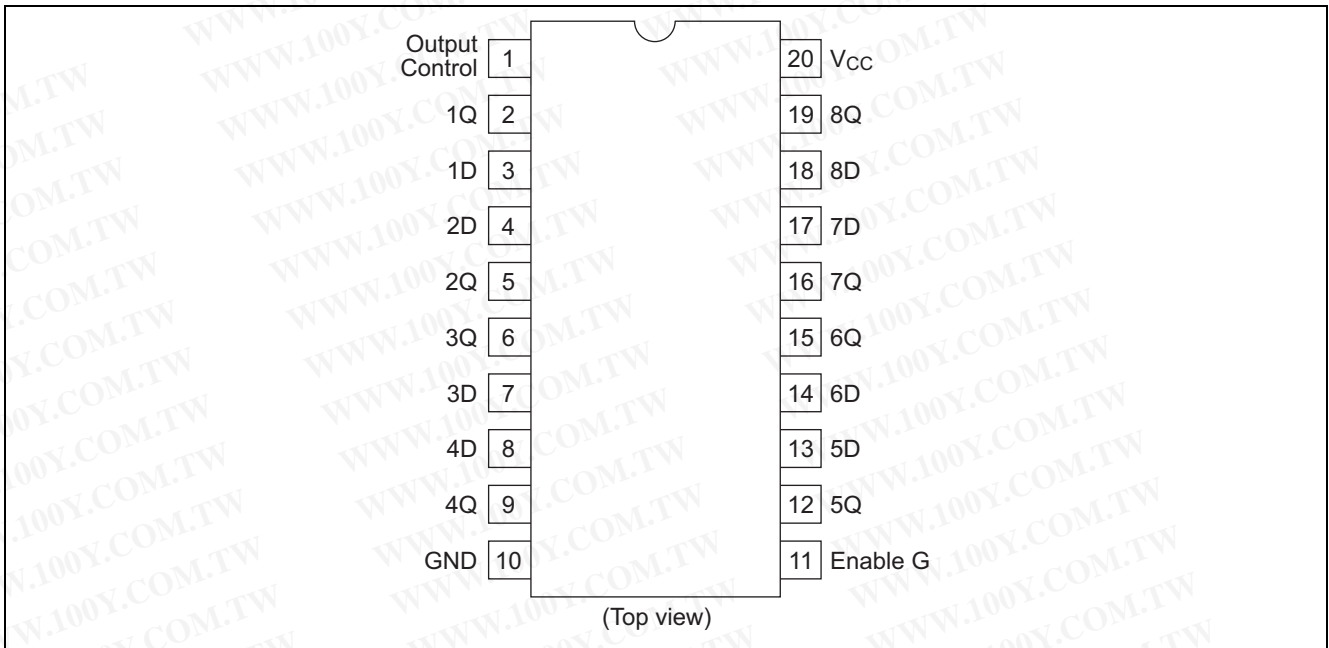
| Output Control | Enable G | D | HD74HCT373<br>Q | HD74HCT533<br>$\bar{Q}$ |
|----------------|----------|---|-----------------|-------------------------|
| L              | H        | H | H               | L                       |
| L              | H        | L | L               | H                       |
| L              | L        | X | No change       | No change               |
| H              | X        | X | Z               | Z                       |

Notes: 1. H; High level, L; Low level, X; Irrelevant, Z; High impedance

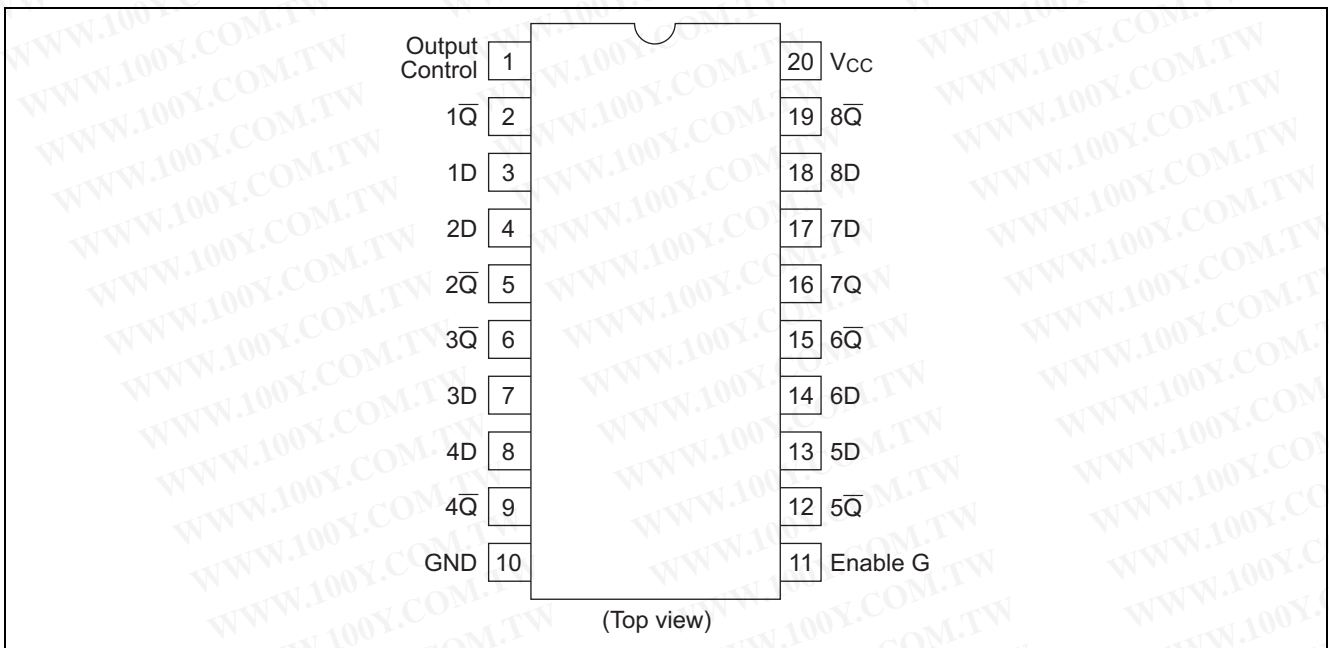
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## Pin Arrangement

### HD74HCT373



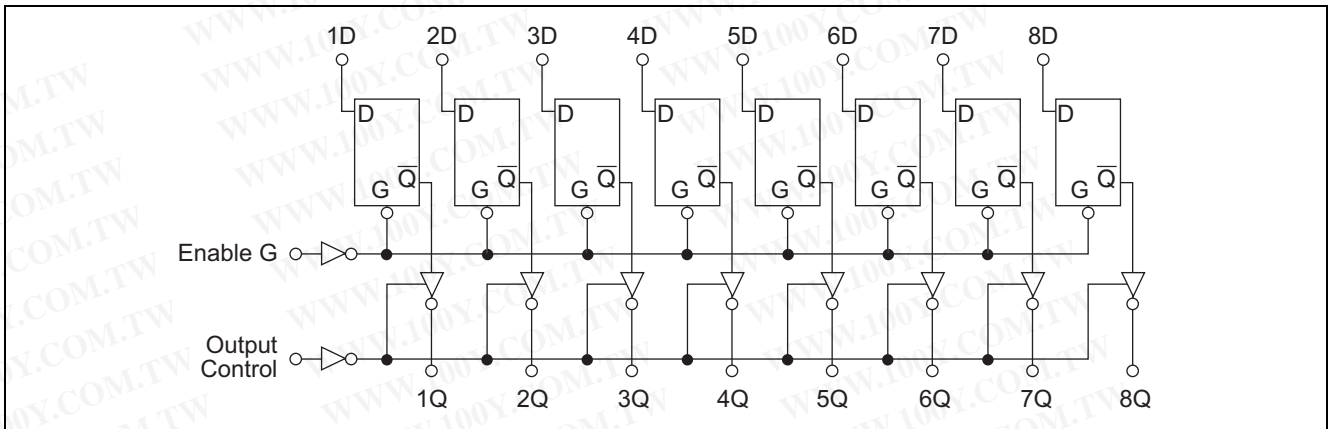
### HD74HCT533



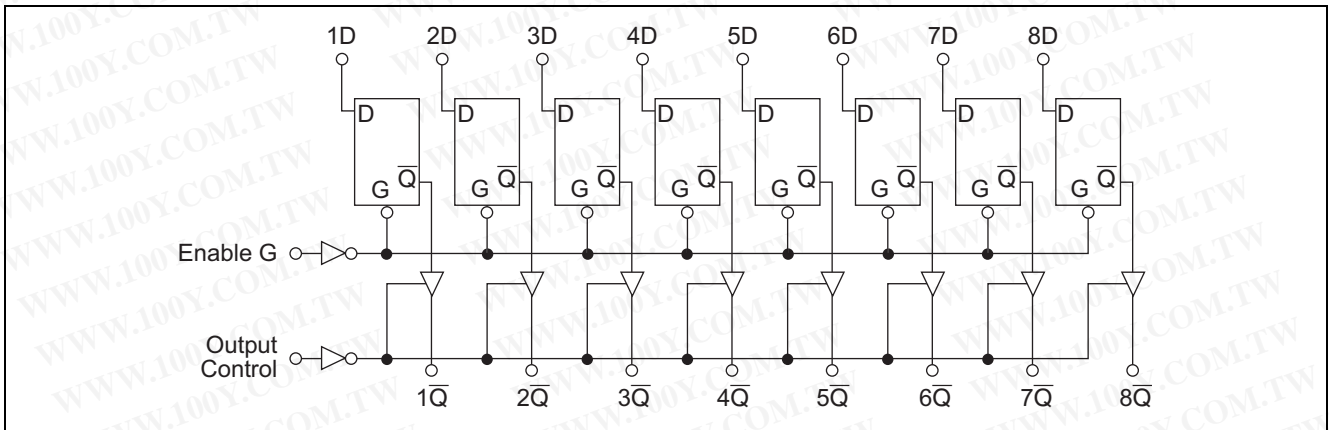
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Logic Diagram

HD74HCT373



HD74HCT533



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               | $I_{OUT}$             | $\pm 35$               | mA          |
| $V_{CC}, GND$ current        | $I_{CC}$ OR $I_{GND}$ | $\pm 75$               | mA          |
| Power dissipation            | $P_T$                 | 500                    | mW          |
| Storage temperature          | $T_{stg}$             | -65 to +150            | $^{\circ}C$ |

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                       | $V_{CC}$          | 4.5 to 5.5    | V           |                  |
| Input / Output voltage               | $V_{IN}, V_{OUT}$ | 0 to $V_{CC}$ | V           |                  |
| Operating temperature                | $T_a$             | -40 to 85     | $^{\circ}C$ |                  |
| Input rise / fall time <sup>*1</sup> | $t_r, t_f$        | 0 to 500      | ns          | $V_{CC} = 4.5 V$ |

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

**Electrical Characteristics**

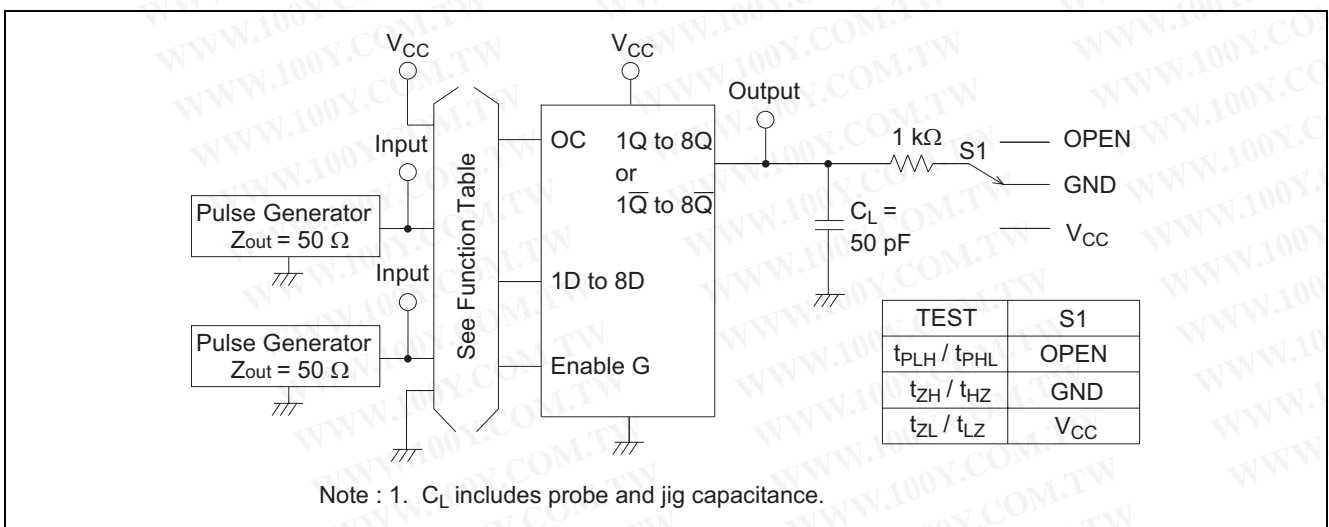
| Item                     | Symbol          | V <sub>CC</sub> (V) | Ta = 25°C |     |      | Ta = -40 to +85°C |      | Unit | Test Conditions   |                          |
|--------------------------|-----------------|---------------------|-----------|-----|------|-------------------|------|------|---|--------------------------|
|                          |                 |                     | Min       | Typ | Max  | Min               | Max  |      |   |                          |
| Input voltage            | V <sub>IH</sub> | 4.5 to 5.5          | 2.0       | —   | —    | 2.0               | —    | V    |   |                          |
|                          | V <sub>IL</sub> | 4.5 to 5.5          | —         | —   | 0.8  | —                 | 0.8  | V    |   |                          |
| Output voltage           | V <sub>OH</sub> | 4.5                 | 4.4       | —   | —    | 4.4               | —    | V    | Vin = V <sub>IH</sub> or V <sub>IL</sub>                                    | I <sub>OH</sub> = -20 μA |
|                          |                 | 4.5                 | 4.18      | —   | —    | 4.13              | —    | V    |   | I <sub>OH</sub> = -6 mA  |
|                          | V <sub>OL</sub> | 4.5                 | —         | —   | 0.1  | —                 | 0.1  | V    | Vin = V <sub>IH</sub> or V <sub>IL</sub>                                    | I <sub>OL</sub> = 20 μA  |
|                          |                 | 4.5                 | —         | —   | 0.26 | —                 | 0.33 | V    |   | I <sub>OL</sub> = 6 mA   |
| Off-state output current | I <sub>oz</sub> | 5.5                 | —         | —   | ±0.5 | —                 | ±5.0 | μA   | Vin = V <sub>IH</sub> or V <sub>IL</sub> ,<br>Vout = V <sub>CC</sub> or GND |                          |
| Input current            | I <sub>in</sub> | 5.5                 | —         | —   | ±0.1 | —                 | ±1.0 | μA   | Vin = V <sub>CC</sub> or GND  |                          |
| Quiescent current        | I <sub>CC</sub> | 5.5                 | —         | —   | 4.0  | —                 | 40   | μA   | Vin = V <sub>CC</sub> or GND, I <sub>out</sub> = 0 μA                       |                          |

**Switching Characteristics**

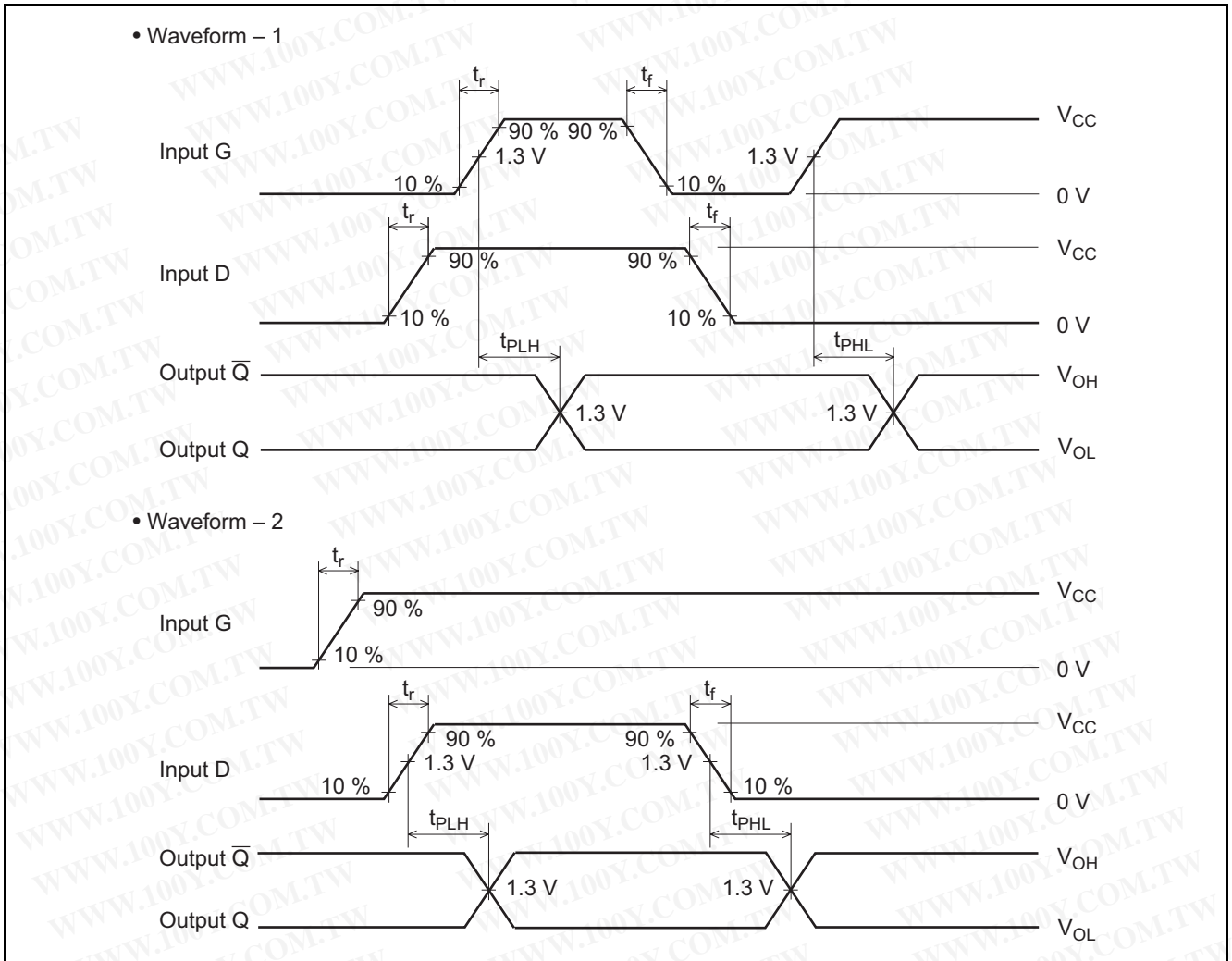
(C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6 ns)

| 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> | 4.5                 | —         | 13  | 30  | —                 | 38  | ns   | Latch control to Q            |                       |
|                        | t <sub>PHL</sub> | 4.5                 | —         | 16  | 30  | —                 | 38  |      | ns                            | Data to Q             |
|                        | t <sub>PLH</sub> | 4.5                 | —         | 14  | 25  | —                 | 31  | ns   |                               | Data to Q             |
|                        | t <sub>PHL</sub> | 4.5                 | —         | 12  | 25  | —                 | 31  |      | ns                            | Data to Q             |
| Output enable time     | t <sub>ZL</sub>  | 4.5                 | —         | 16  | 30  | —                 | 38  | ns   |                               |                       |
|                        | t <sub>ZH</sub>  | 4.5                 | —         | 15  | 30  | —                 | 38  |      | ns                            |                       |
| Output disable time    | t <sub>LZ</sub>  | 4.5                 | —         | 14  | 30  | —                 | 38  | ns   |                               |                       |
|                        | t <sub>HZ</sub>  | 4.5                 | —         | 16  | 30  | —                 | 38  |      | ns                            |                       |
| Setup time             | t <sub>su</sub>  | 4.5                 | 20        | —   | —   | 25                | —   | ns   |                               | Data to latch control |
| Hold time              | t <sub>h</sub>   | 4.5                 | 10        | —   | —   | 13                | —   | ns   | Latch control to data         |                       |
| Pulse width            | t <sub>w</sub>   | 4.5                 | 16        | —   | —   | 20                | —   | ns   | Latch control, output control |                       |
| Output rise/fall time  | t <sub>TLH</sub> | 4.5                 | —         | 4   | 12  | —                 | 15  | ns   |                               |                       |
|                        | t <sub>THL</sub> |                     |           |     |     |                   |     |      |                               |                       |
| Input capacitance      | C <sub>in</sub>  | —                   | —         | 5   | 10  | —                 | 10  | pF   |                               |                       |

**Test Circuit**

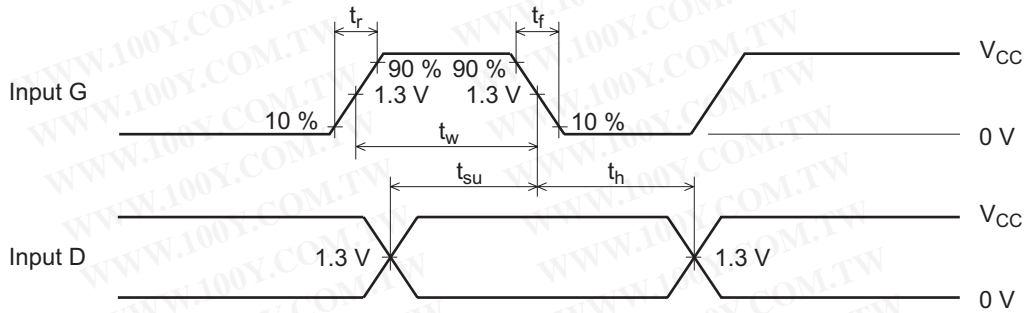


Waveforms

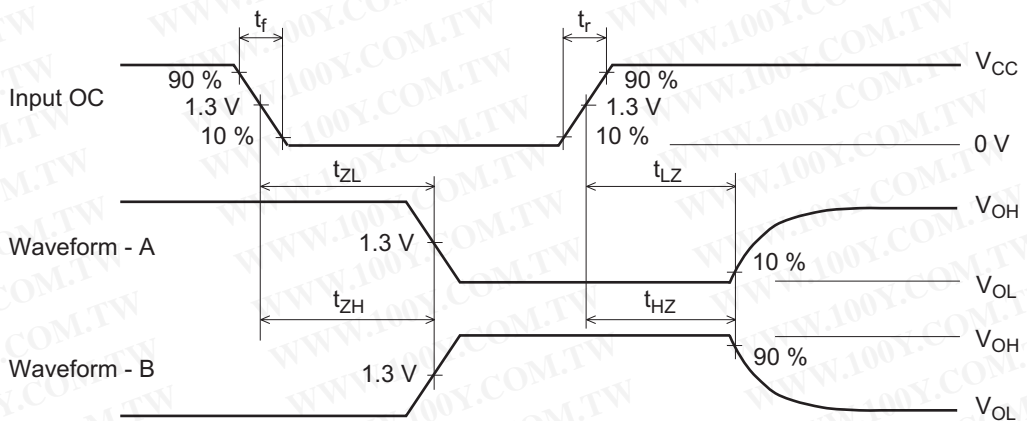


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• Waveform – 3



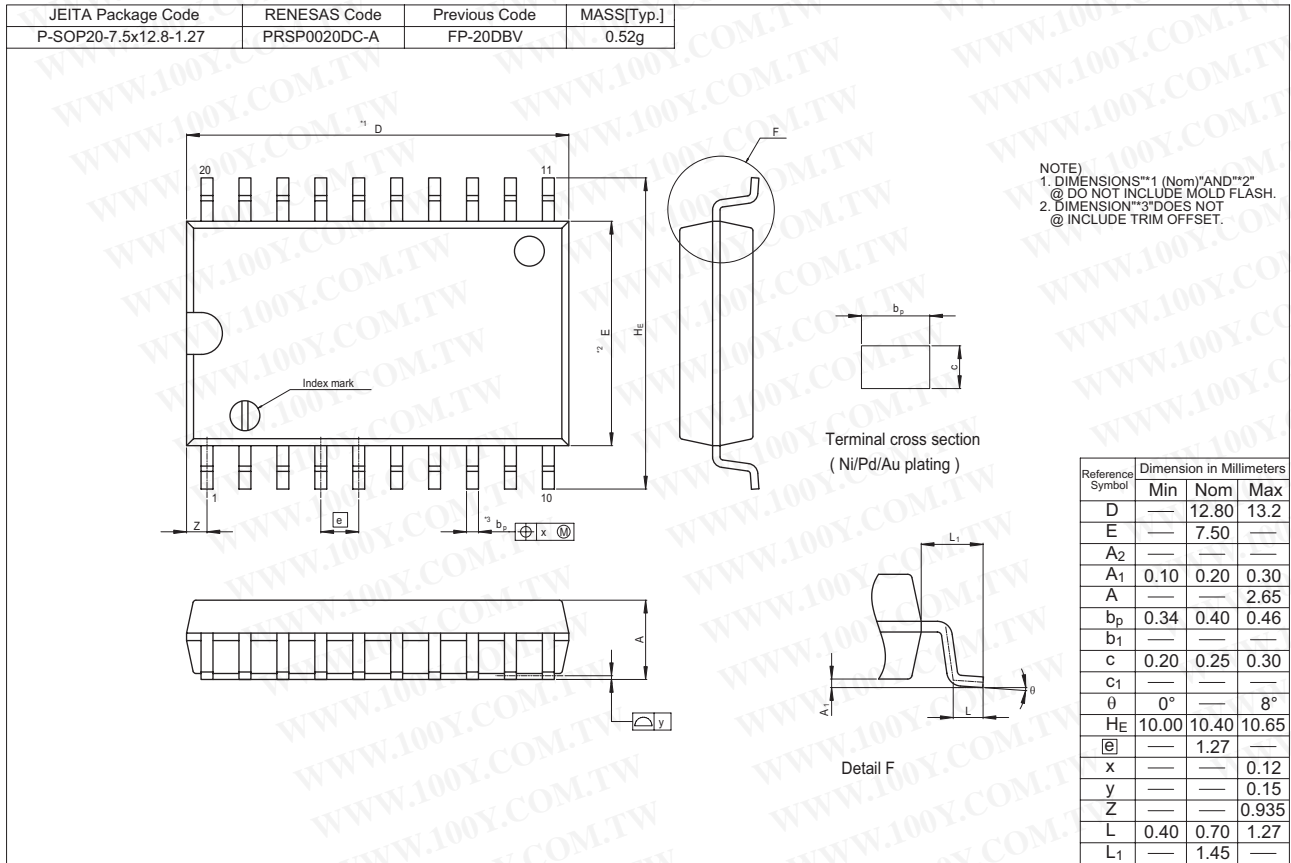
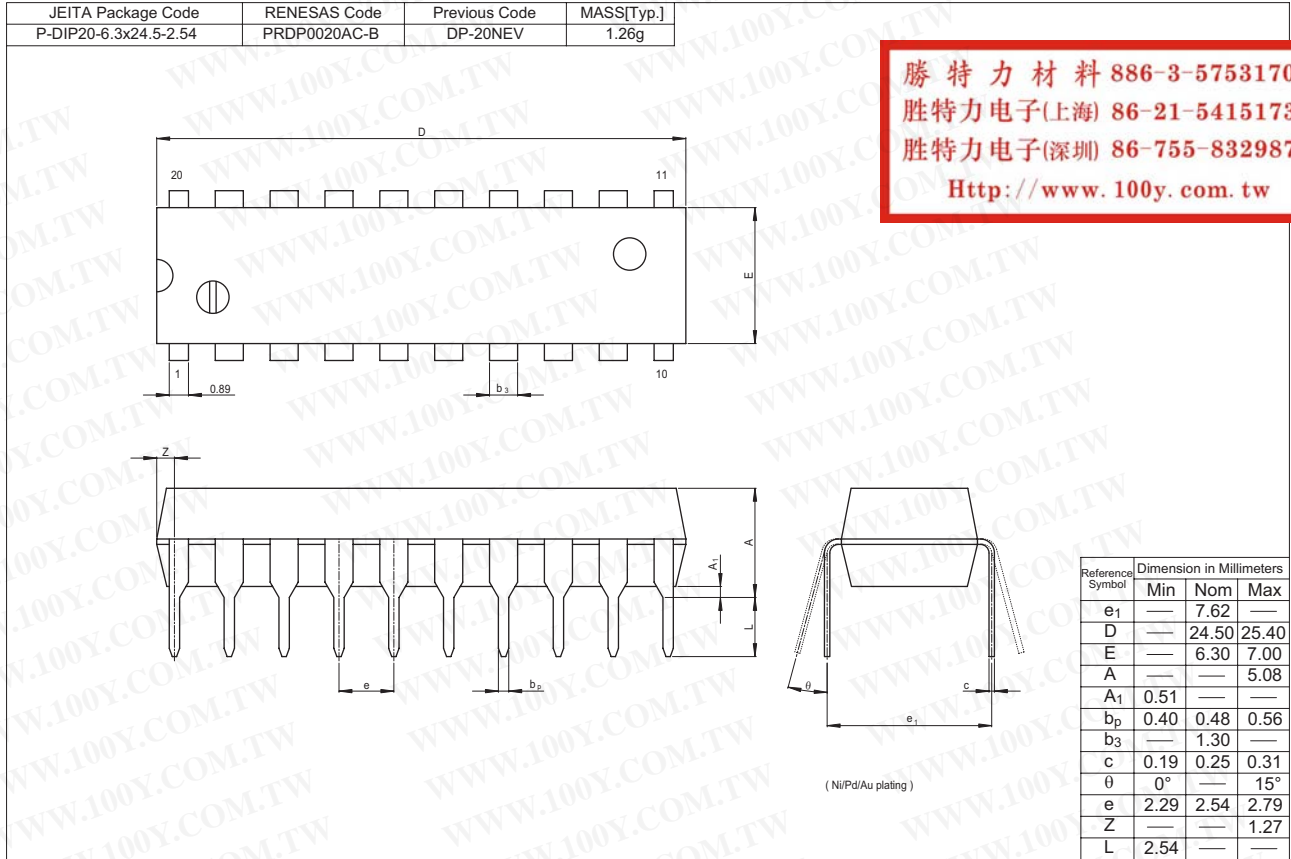
• Waveform – 4



- Notes :
1. Input waveform : PRR  $\leq$  1 MHz, duty cycle 50%,  $t_r \leq$  6 ns,  $t_f \leq$  6 ns
  2. Waveform- A is for an output with internal conditions such that the output is low except when disabled by the output control.
  3. Waveform- B is for an output with internal conditions such that the output is high except when disabled by the output control.
  4. The output are measured one at a time with one transition per measurement.

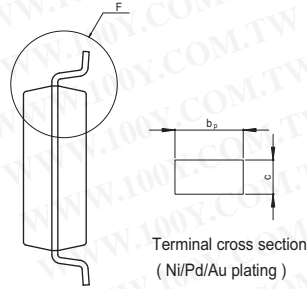
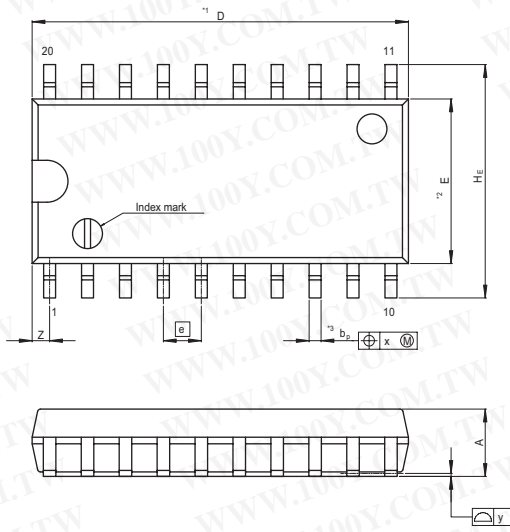
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Package Dimensions

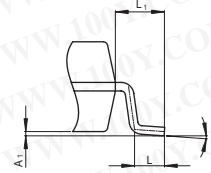


**HD74HCT373, HD74HCT533**

|                       |              |               |            |
|-----------------------|--------------|---------------|------------|
| JEITA Package Code    | RENESAS Code | Previous Code | MASS[Typ.] |
| P-SOP20-5.5x12.6-1.27 | PRSP0020DD-B | FP-20DAV      | 0.31g      |

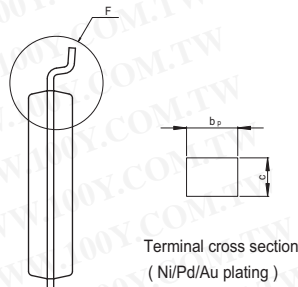
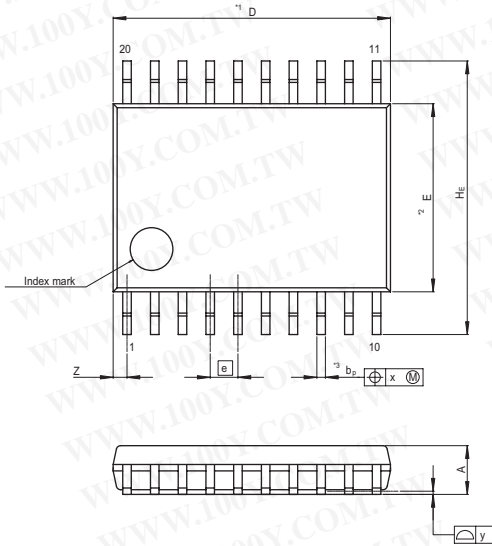


NOTE  
1. DIMENSIONS\*\*1 (Nom)\*\*AND\*\*2\*  
DO NOT INCLUDE MOLD FLASH.  
2. DIMENSION\*\*3\*DOES NOT  
INCLUDE TRIM OFFSET.

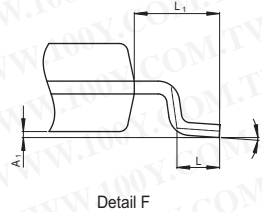


| Reference Symbol | Dimension in Millimeters |       |      |
|------------------|--------------------------|-------|------|
|                  | Min                      | Nom   | Max  |
| D                | —                        | 12.60 | 13.0 |
| E                | —                        | 5.50  | —    |
| A <sub>2</sub>   | —                        | —     | —    |
| A <sub>1</sub>   | 0.00                     | 0.10  | 0.20 |
| A                | —                        | —     | 2.20 |
| b <sub>P</sub>   | 0.34                     | 0.40  | 0.46 |
| b <sub>1</sub>   | —                        | —     | —    |
| c                | 0.15                     | 0.20  | 0.25 |
| c <sub>1</sub>   | —                        | —     | —    |
| θ                | 0°                       | —     | 8°   |
| HE               | 7.50                     | 7.80  | 8.00 |
| e                | —                        | 1.27  | —    |
| x                | —                        | —     | 0.12 |
| y                | —                        | —     | 0.15 |
| Z                | —                        | —     | 0.80 |
| L                | 0.50                     | 0.70  | 0.90 |
| L <sub>1</sub>   | —                        | 1.15  | —    |

|                        |              |               |            |
|------------------------|--------------|---------------|------------|
| JEITA Package Code     | RENESAS Code | Previous Code | MASS[Typ.] |
| P-TSSOP20-4.4x6.5-0.65 | PTSP0020JB-A | TTP-20DAV     | 0.07g      |



NOTE  
1. DIMENSIONS\*\*1 (Nom)\*\*AND\*\*2\*  
DO NOT INCLUDE MOLD FLASH.  
2. DIMENSION\*\*3\*DOES NOT  
INCLUDE TRIM OFFSET.



| Reference Symbol | Dimension in Millimeters |      |      |
|------------------|--------------------------|------|------|
|                  | Min                      | Nom  | Max  |
| D                | —                        | 6.50 | 6.80 |
| E                | —                        | 4.40 | —    |
| A <sub>2</sub>   | —                        | —    | —    |
| A <sub>1</sub>   | 0.03                     | 0.07 | 0.10 |
| A                | —                        | —    | 1.10 |
| b <sub>P</sub>   | 0.15                     | 0.20 | 0.25 |
| b <sub>1</sub>   | —                        | —    | —    |
| c                | 0.10                     | 0.15 | 0.20 |
| c <sub>1</sub>   | —                        | —    | —    |
| θ                | 0°                       | —    | 8°   |
| HE               | 6.20                     | 6.40 | 6.60 |
| e                | —                        | 0.65 | —    |
| x                | —                        | —    | 0.13 |
| y                | —                        | —    | 0.10 |
| Z                | —                        | —    | 0.65 |
| L                | 0.4                      | 0.5  | 0.6  |
| L <sub>1</sub>   | —                        | 1.0  | —    |

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