# HD74LV573A

## Octal D-type Transparent Latches with 3-state Outputs

REJ03D0519–0100
Rev.1.00
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## Description

The HD74LV573A has eight D type latches with three state outputs in a 20 pin package. When the latch enables input is high, the Q outputs will follow the D inputs. When the latch enables 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 are present at the other inputs and the state of the storage elements. Low-voltage and high-speed operation is suitable for the battery-powered products (e.g., notebook computers), and the low-power consumption extends the battery life.

## Features

- $V_{CC}$ = 2.0 V to 5.5 V operation
- All inputs $V_{IH}$ (Max.) = 5.5 V (@$V_{CC}$ = 0 V to 5.5 V)
- All outputs $V_O$ (Max.) = 5.5 V (@$V_{CC}$ = 0 V)
- Typical $V_{OL}$ ground bounce < 0.8 V (@$V_{CC}$ = 3.3 V, Ta = 25°C)
- Typical $V_{OH}$ undershoot > 2.3 V (@$V_{CC}$ = 3.3 V, Ta = 25°C)
- Output current ±8 mA (@$V_{CC}$ = 3.0 V to 3.6 V), ±16 mA (@$V_{CC}$ = 4.5 V to 5.5 V)
- Ordering Information

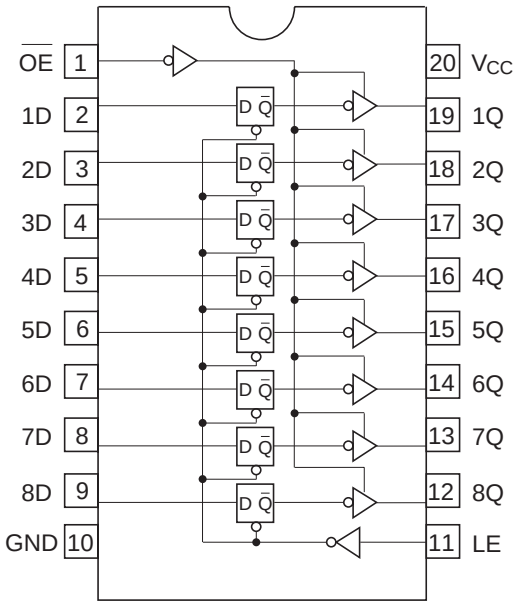
| Part Name | Package Type | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|---|---|---|---|---|
| HD74LV573AFPEL | SOP–20 pin (JEITA) | PRSP0020DD–B (FP–20DAV) | FP | EL (2,000 pcs/reel) |
| HD74LV573ATELL | TSSOP–20 pin | PTSP0020JB–A (TTP–20DAV) | T | ELL (2,000 pcs/reel) |

## Function Table

| Inputs | | | Output Q |
|---|---|---|---|
| $\overline{OE}$ | LE | D | |
| H | X | X | Z |
| L | H | L | L |
| L | H | H | H |
| L | L | X | $Q_0$ |

Note: H: High level
L: Low level
X: Immaterial
Z: High impedance
$Q_0$: Output level before the indicated steady state input conditions were established.

## Pin Arrangement




(Top view)

## Absolute Maximum Ratings

| Item | Symbol | Ratings | Unit | Conditions |
|---|---|---|---|---|
| Supply voltage range | $V_{CC}$ | –0.5 to 7.0 | V | |
| Input voltage range*[1] | $V_I$ | –0.5 to 7.0 | V | |
| Output voltage range*[1, 2] | $V_O$ | –0.5 to $V_{CC}$ + 0.5 | V | Output: H or L |
| | | –0.5 to 7.0 | | $V_{CC}$: OFF or Output: Z |
| Input clamp current | $I_{IK}$ | –20 | mA | $V_I < 0$ |
| Output clamp current | $I_{OK}$ | ±50 | mA | $V_O < 0$ or $V_O > V_{CC}$ |
| Continuous output current | $I_O$ | ±35 | mA | $V_O$ = 0 to $V_{CC}$ |
| Continuous current through $V_{CC}$ or GND | $I_{CC}$ or $I_{GND}$ | ±70 | mA | |
| Maximum power dissipation at Ta = 25°C (in still air)*[3] | $P_T$ | 835 | mW | SOP |
| | | 757 | | TSSOP |
| Storage temperature | Tstg | –65 to 150 | °C | |

Notes: 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.

1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 5.5 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

## Recommended Operating Conditions

| Item | Symbol | Min | Max | Unit | Conditions |
|---|---|---|---|---|---|
| Supply voltage range | $V_{CC}$ | 2.0 | 5.5 | V | |
| Input voltage range | $V_I$ | 0 | 5.5 | V | |
| Output voltage range | $V_O$ | 0 | $V_{CC}$ | V | H or L |
| | | 0 | 5.5 | | High impedance state |
| Output current | $I_{OH}$ | — | –50 | µA | $V_{CC}$ = 2.0 V |
| | | — | –2 | mA | $V_{CC}$ = 2.3 to 2.7 V |
| | | — | –8 | | $V_{CC}$ = 3.0 to 3.6 V |
| | | — | –16 | | $V_{CC}$ = 4.5 to 5.5 V |
| | $I_{OL}$ | — | 50 | µA | $V_{CC}$ = 2.0 V |
| | | — | 2 | mA | $V_{CC}$ = 2.3 to 2.7 V |
| | | — | 8 | | $V_{CC}$ = 3.0 to 3.6 V |
| | | — | 16 | | $V_{CC}$ = 4.5 to 5.5 V |
| Input transition rise or fall rate | Δt /Δv | 0 | 200 | ns/V | $V_{CC}$ = 2.3 to 2.7 V |
| | | 0 | 100 | | $V_{CC}$ = 3.0 to 3.6 V |
| | | 0 | 20 | | $V_{CC}$ = 4.5 to 5.5 V |
| Operating free-air temperature | Ta | –40 | 85 | °C | |

Note: Unused or floating inputs must be held high or low.

## DC Electrical Characteristics

Ta = –40 to 85°C

| Item | Symbol | $V_{CC}$ (V)* | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| Input voltage | $V_{IH}$ | 2.0 | 1.5 | — | — | V | |
| | | 2.3 to 2.7 | $V_{CC} \times 0.7$ | — | — | | |
| | | 3.0 to 3.6 | $V_{CC} \times 0.7$ | — | — | | |
| | | 4.5 to 5.5 | $V_{CC} \times 0.7$ | — | — | | |
| | $V_{IL}$ | 2.0 | — | — | 0.5 | | |
| | | 2.3 to 2.7 | — | — | $V_{CC} \times 0.3$ | | |
| | | 3.0 to 3.6 | — | — | $V_{CC} \times 0.3$ | | |
| | | 4.5 to 5.5 | — | — | $V_{CC} \times 0.3$ | | |
| Output voltage | $V_{OH}$ | Min to Max | $V_{CC}$ – 0.1 | — | — | V | $I_{OH}$ = –50 µA |
| | | 2.3 | 2.0 | — | — | | $I_{OH}$ = –2 mA |
| | | 3.0 | 2.48 | — | — | | $I_{OH}$ = –8 mA |
| | | 4.5 | 3.8 | — | — | | $I_{OH}$ = –16 mA |
| | $V_{OL}$ | Min to Max | — | — | 0.1 | | $I_{OL}$ = 50 µA |
| | | 2.3 | — | — | 0.4 | | $I_{OL}$ = 2 mA |
| | | 3.0 | — | — | 0.44 | | $I_{OL}$ = 8 mA |
| | | 4.5 | — | — | 0.55 | | $I_{OL}$ = 16 mA |
| Input current | $I_{IN}$ | 0 to 5.5 | — | — | ±1 | µA | $V_{IN}$ = 5.5 V or GND |
| Off-state output current | $I_{OZ}$ | 5.5 | — | — | ±5 | µA | $V_O$ = $V_{CC}$ or GND |
| Quiescent supply current | $I_{CC}$ | 5.5 | — | — | 20 | µA | $V_{IN}$ = $V_{CC}$ or GND, $I_O$ = 0 |
| Output leakage current | $I_{OFF}$ | 0 | — | — | 5 | µA | $V_I$ or $V_O$ = 0 to 5.5 V |
| Input capacitance | $C_{IN}$ | 3.3 | — | 2.9 | — | pF | $V_I$ = $V_{CC}$ or GND |

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

## Switching Characteristics

$V_{CC}$ = 2.5 ± 0.2 V

| Item | Symbol | Ta = 25°C | | | Ta = –40 to 85°C | | Unit | Test Conditions | FROM (Input) | TO (Output) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | | | | |
| Propagation delay time | $t_{PLH}$ | — | 8.3 | 15.8 | 1.0 | 18.0 | ns | $C_L$ = 15 pF | D | Q |
| | $t_{PHL}$ | — | 9.1 | 16.2 | 1.0 | 19.0 | | | LE | |
| | | — | 10.4 | 18.7 | 1.0 | 21.0 | | $C_L$ = 50 pF | D | |
| | | — | 11.1 | 19.1 | 1.0 | 23.0 | | | LE | |
| Enable time | $t_{ZH}$ | — | 8.9 | 16.2 | 1.0 | 19.0 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Q |
| | $t_{ZL}$ | — | 10.9 | 19.0 | 1.0 | 22.0 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 6.2 | 12.6 | 1.0 | 15.0 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Q |
| | $t_{LZ}$ | — | 8.3 | 17.3 | 1.0 | 19.0 | | $C_L$ = 50 pF | | |
| Setup time | $t_{SU}$ | 5.0 | — | — | 5.0 | — | ns | | Data before LE ↓ | |
| Hold time | $t_h$ | 2.0 | — | — | 2.0 | — | ns | | Data after LE ↓ | |
| Pulse width | $t_w$ | 6.5 | — | — | 6.5 | — | ns | | LE "H" | |

$V_{CC}$ = 3.3 ± 0.3 V

| Item | Symbol | Ta = 25°C | | | Ta = –40 to 85°C | | Unit | Test Conditions | FROM (Input) | TO (Output) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | | | | |
| Propagation delay time | $t_{PLH}$ | — | 5.8 | 11.0 | 1.0 | 13.0 | ns | $C_L$ = 15 pF | D | Q |
| | $t_{PHL}$ | — | 6.4 | 11.9 | 1.0 | 14.0 | | | LE | |
| | | — | 7.3 | 14.5 | 1.0 | 16.5 | | $C_L$ = 50 pF | D | |
| | | — | 7.8 | 15.4 | 1.0 | 17.5 | | | LE | |
| Enable time | $t_{ZH}$ | — | 6.3 | 11.5 | 1.0 | 13.5 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Q |
| | $t_{ZL}$ | — | 7.7 | 15.0 | 1.0 | 17.0 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 4.7 | 11.0 | 1.0 | 13.0 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Q |
| | $t_{LZ}$ | — | 6.0 | 14.5 | 1.0 | 16.5 | | $C_L$ = 50 pF | | |
| Setup time | $t_{SU}$ | 3.5 | — | — | 3.5 | — | ns | | Data before LE ↓ | |
| Hold time | $t_h$ | 1.5 | — | — | 1.5 | — | ns | | Data after LE ↓ | |
| Pulse width | $t_w$ | 5.0 | — | — | 5.0 | — | ns | | LE "H" | |

$V_{CC}$ = 5.0 ± 0.5 V

| Item | Symbol | Ta = 25°C | | | Ta = –40 to 85°C | | Unit | Test Conditions | FROM (Input) | TO (Output) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | | | | |
| Propagation delay time | $t_{PLH}$ | — | 4.1 | 6.8 | 1.0 | 8.0 | ns | $C_L$ = 15 pF | D | Q |
| | $t_{PHL}$ | — | 4.5 | 7.7 | 1.0 | 9.0 | | | LE | |
| | | — | 5.1 | 8.8 | 1.0 | 10.0 | | $C_L$ = 50 pF | D | |
| | | — | 5.5 | 9.7 | 1.0 | 11.0 | | | LE | |
| Enable time | $t_{ZH}$ | — | 4.5 | 7.7 | 1.0 | 9.0 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Q |
| | $t_{ZL}$ | — | 5.5 | 9.7 | 1.0 | 11.0 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 3.3 | 7.7 | 1.0 | 9.0 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Q |
| | $t_{LZ}$ | — | 4.0 | 9.7 | 1.0 | 11.0 | | $C_L$ = 50 pF | | |
| Setup time | $t_{SU}$ | 3.5 | — | — | 3.5 | — | ns | | Data before LE ↓ | |
| Hold time | $t_h$ | 1.5 | — | — | 1.5 | — | ns | | Data after LE ↓ | |
| Pulse width | $t_w$ | 5.0 | — | — | 5.0 | — | ns | | LE "H" | |

## Output-skew Characteristics

$C_L$ = 50 pF

| Item | Symbol | $V_{CC}$ = (V) | Ta = 25°C | | Ta = –40 to 85°C | | Unit |
|---|---|---|---|---|---|---|---|
| | | | Min | Max | Min | Max | |
| Output skew | $t_{sk\ (O)}$ | 2.3 to 2.7 | — | 2.0 | — | 2.0 | ns |
| | | 3.0 to 3.6 | — | 1.5 | — | 1.5 | |
| | | 4.5 to 5.5 | — | 1.0 | — | 1.0 | |

Note: Skew between any outputs of the same package switching in the same direction. This parameter is warranted but not production tested.

## Operating Characteristics

$C_L$ = 50 pF

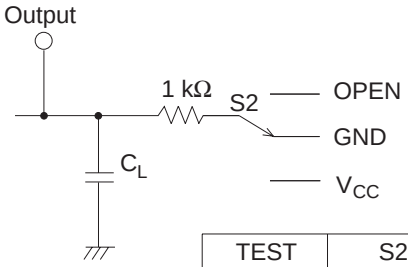
| Item | Symbol | $V_{CC}$ = (V) | Ta = 25°C | | | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Power dissipation capacitance | $C_{PD}$ | 3.3 | — | 16.6 | — | pF | f = 10 MHz |
| | | 5.0 | — | 18.2 | — | | |

## Noise Characteristics

$C_L$ = 50 pF

| Item | Symbol | $V_{CC}$ = (V) | Ta = 25°C | | | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | | |
| Quiet output, maximum dynamic $V_{OL}$ | $V_{OL\ (P)}$ | 3.3 | — | 0.6 | 0.8 | V | |
| Quiet output, minimum dynamic $V_{OL}$ | $V_{OL\ (V)}$ | 3.3 | — | –0.6 | –0.8 | V | |
| Quiet output, minimum dynamic $V_{OH}$ | $V_{OH\ (V)}$ | 3.3 | — | 2.9 | — | V | |
| High-level dynamic input voltage | $V_{IH\ (D)}$ | 3.3 | 2.31 | — | — | V | |
| Low-level dynamic input voltage | $V_{IL\ (D)}$ | 3.3 | — | — | 0.99 | V | |

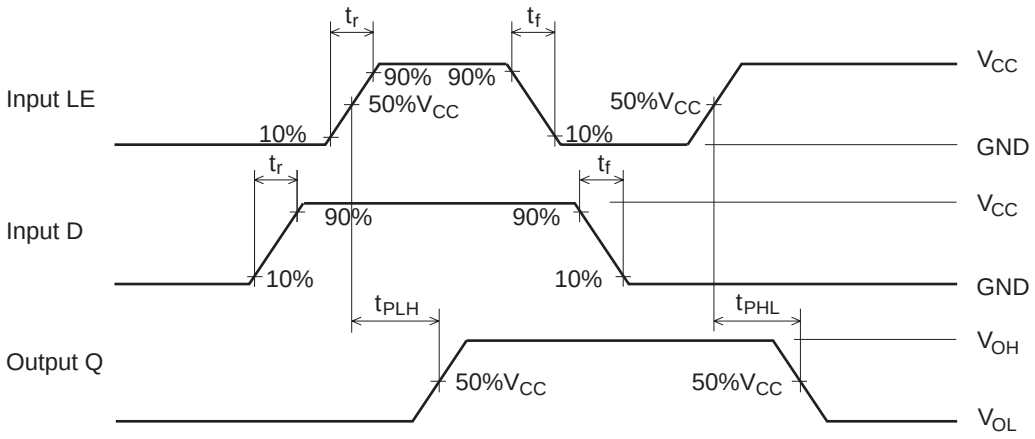
## Test Circuit



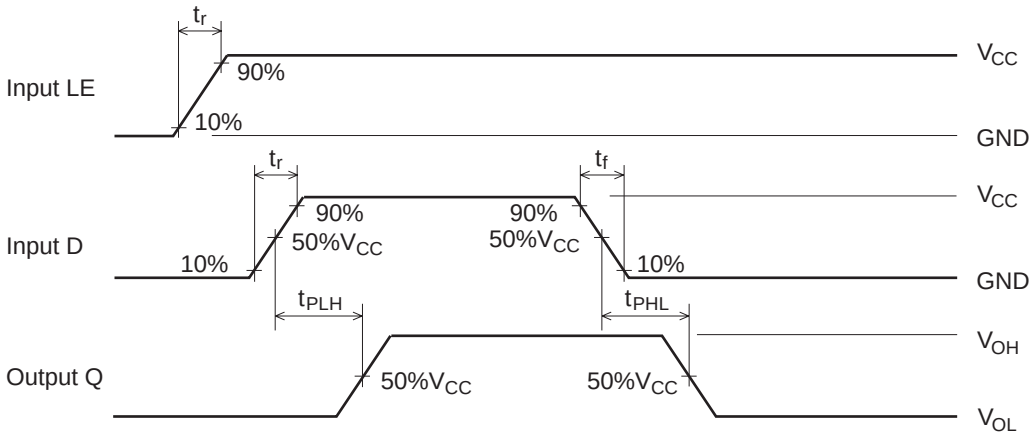

| TEST | S2 |
|---|---|
| $t_{PLH}/t_{PHL}$ | OPEN |
| $t_{ZH}/t_{HZ}$ | GND |
| $t_{ZL}/t_{LZ}$ | $V_{CC}$ |

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

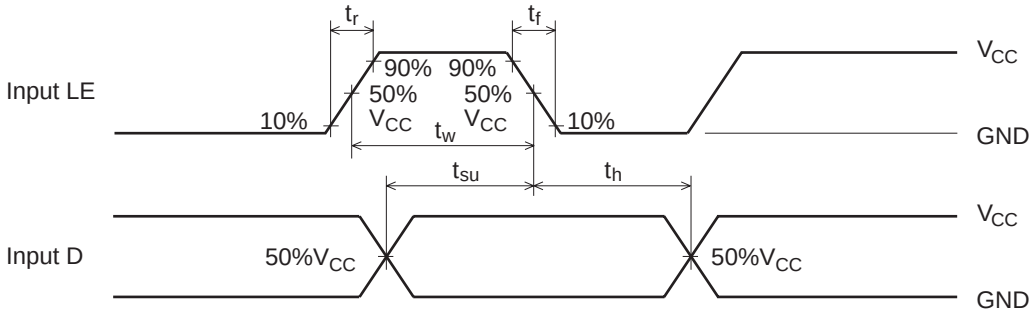
• Waveform – 1



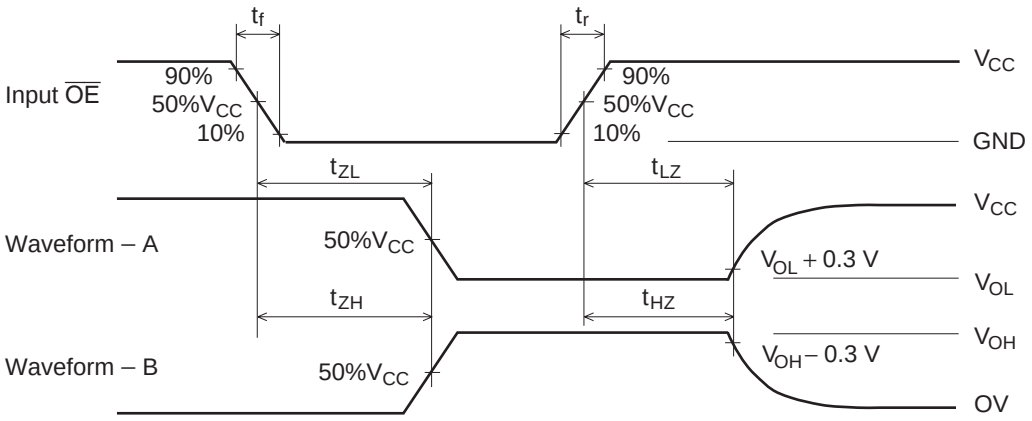

• Waveform – 2




• Waveform – 3



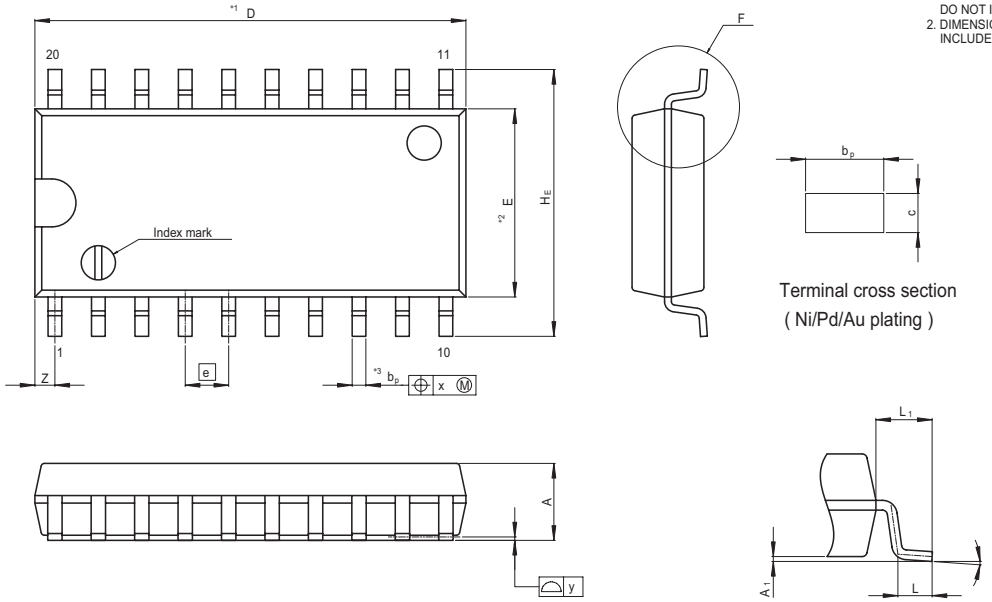
• Waveform – 4




Notes: 1. $t_r \leq 3$ ns, $t_f \leq 3$ ns
2. Input waveform: PRR ≤ 1 MHZ, duty cycle 50%
3. Waveform–A is for an output with internal conditions such that the output is low except when disabled by the output control.
4. Waveform–B is for an output with internal conditions such that the output is high except when disabled by the output control.

# Package Dimensions

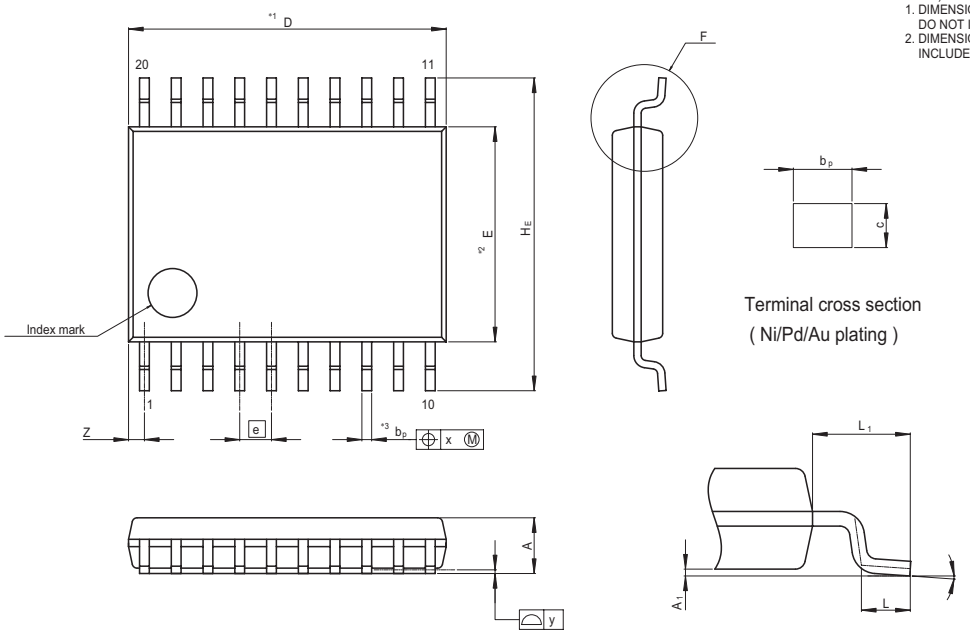
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-SOP20-5.5x12.6-1.27 | PRSP0020DD-B | FP-20DAV | 0.31g |




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 | —— |
| $A_2$ | —— | —— | —— |
| $A_1$ | 0.00 | 0.10 | 0.20 |
| A | —— | —— | 2.20 |
| $b_p$ | 0.34 | 0.40 | 0.46 |
| $b_1$ | —— | —— | —— |
| c | 0.15 | 0.20 | 0.25 |
| $c_1$ | —— | —— | —— |
| | 0° | —— | 8° |
| $H_E$ | 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 |
| $L_1$ | —— | 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)
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2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.

| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| D | —— | 6.50 | 6.80 |
| E | —— | 4.40 | —— |
| $A_2$ | —— | —— | —— |
| $A_1$ | 0.03 | 0.07 | 0.10 |
| A | —— | —— | 1.10 |
| $b_p$ | 0.15 | 0.20 | 0.25 |
| $b_1$ | —— | —— | —— |
| c | 0.10 | 0.15 | 0.20 |
| $c_1$ | —— | —— | —— |
| | 0° | —— | 8° |
| $H_E$ | 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 |
| $L_1$ | —— | 1.0 | —— |

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