To our customers,

## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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# HD74LV125A

## Quad. Bus Buffer Gates with 3-state Outputs

REJ03D0315–0300Z
(Previous ADE-205-245A (Z))
Rev.3.00
Jun. 03, 2004

### Description

The HD74LV125A features independent line drivers with three state outputs. Each output is disabled when the associated output enable ($\overline{OE}$) input is high. To ensure the high impedance state during power up or power down, $\overline{OE}$ should be connected to $V_{CC}$ through a pull-down resistor; the minimum value of the resistor is determined by the current souring capability of the driver. 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 | Package Abbreviation | Taping Abbreviation (Quantity) |
|---|---|---|---|---|
| HD74LV125AFPEL | SOP–14 pin(JEITA) | FP–14DAV | FP | EL (2,000 pcs/reel) |
| HD74LV125ARPEL | SOP–14 pin(JEDEC) | FP–14DNV | RP | EL (2,500 pcs/reel) |
| HD74LV125ATELL | TSSOP–14 pin | TTP–14DV | T | ELL (2,000 pcs/reel) |

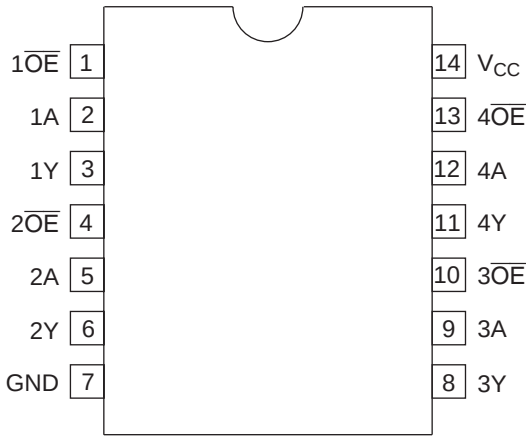
Note: Please consult the sales office for the above package availability.

### Function Table

| Inputs | | |
|---|---|---|
| $\overline{OE}$ | A | Output Y |
| L | H | H |
| L | L | L |
| H | X | Z |

Note: H: High level
L: Low level
X: Immaterial
Z: High impedance

## 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] | $P_T$ | 785 | mW | SOP |
| | | 500 | | 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.

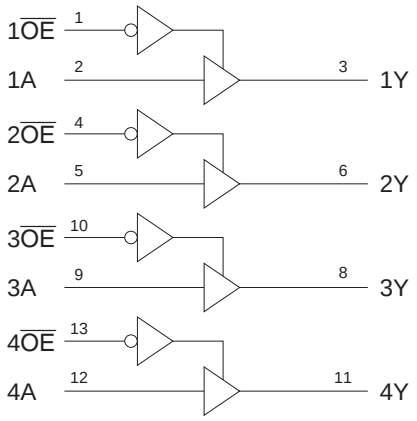
1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 5.5 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

## 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.

## Logic Diagram



## 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 | $V_I$ = 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 | $V_I$ = $V_{CC}$ or GND, $I_O$ = 0 |
| Output leakage current | $I_{OFF}$ | 0 | — | — | 5 | µA | $V_I$ or $V_O$ = 0 V to 5.5 V |
| Input capacitance | $C_{IN}$ | 3.3 | — | 3.0 | — | 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 Min | Typ | Max | Ta = –40 to 85°C Min | Max | Unit | Test Conditions | FROM (Input) | TO (Output) |
|---|---|---|---|---|---|---|---|---|---|---|
| Propagation delay time | $t_{PLH}$ | — | 6.8 | 13.0 | 1.0 | 15.5 | ns | $C_L$ = 15 pF | A | Y |
| | $t_{PHL}$ | — | 8.7 | 16.5 | 1.0 | 18.5 | | $C_L$ = 50 pF | | |
| Enable time | $t_{ZH}$ | — | 7.0 | 13.0 | 1.0 | 15.5 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Y |
| | $t_{ZL}$ | — | 8.8 | 16.5 | 1.0 | 18.5 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 5.1 | 14.7 | 1.0 | 17.0 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Y |
| | $t_{LZ}$ | — | 7.3 | 18.2 | 1.0 | 20.5 | | $C_L$ = 50 pF | | |

$V_{CC}$ = 3.3 ± 0.3 V

| Item | Symbol | Ta = 25°C Min | Typ | Max | Ta = –40 to 85°C Min | Max | Unit | Test Conditions | FROM (Input) | TO (Output) |
|---|---|---|---|---|---|---|---|---|---|---|
| Propagation delay time | $t_{PLH}$ | — | 4.8 | 8.0 | 1.0 | 9.5 | ns | $C_L$ = 15 pF | A | Y |
| | $t_{PHL}$ | — | 6.1 | 11.5 | 1.0 | 13.0 | | $C_L$ = 50 pF | | |
| Enable time | $t_{ZH}$ | — | 4.8 | 8.0 | 1.0 | 9.5 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Y |
| | $t_{ZL}$ | — | 6.2 | 11.5 | 1.0 | 13.0 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 4.1 | 9.7 | 1.0 | 11.5 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Y |
| | $t_{LZ}$ | — | 5.5 | 13.2 | 1.0 | 15.0 | | $C_L$ = 50 pF | | |

$V_{CC}$ = 5.0 ± 0.5 V

| Item | Symbol | Ta = 25°C Min | Typ | Max | Ta = –40 to 85°C Min | Max | Unit | Test Conditions | FROM (Input) | TO (Output) |
|---|---|---|---|---|---|---|---|---|---|---|
| Propagation delay time | $t_{PLH}$ | — | 3.4 | 5.5 | 1.0 | 6.5 | ns | $C_L$ = 15 pF | A | Y |
| | $t_{PHL}$ | — | 4.3 | 7.5 | 1.0 | 8.5 | | $C_L$ = 50 pF | | |
| Enable time | $t_{ZH}$ | — | 3.4 | 5.1 | 1.0 | 6.0 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Y |
| | $t_{ZL}$ | — | 4.4 | 7.1 | 1.0 | 8.0 | | $C_L$ = 50 pF | | |
| Disable time | $t_{HZ}$ | — | 3.2 | 6.8 | 1.0 | 8.0 | ns | $C_L$ = 15 pF | $\overline{OE}$ | Y |
| | $t_{LZ}$ | — | 4.0 | 8.8 | 1.0 | 10.0 | | $C_L$ = 50 pF | | |

## Output-skew Characteristics

| Item | Symbol | $V_{CC}$ = (V) | Ta = 25°C Min | Max | Ta = –40 to 85°C Min | Max | Unit |
|---|---|---|---|---|---|---|---|
| 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

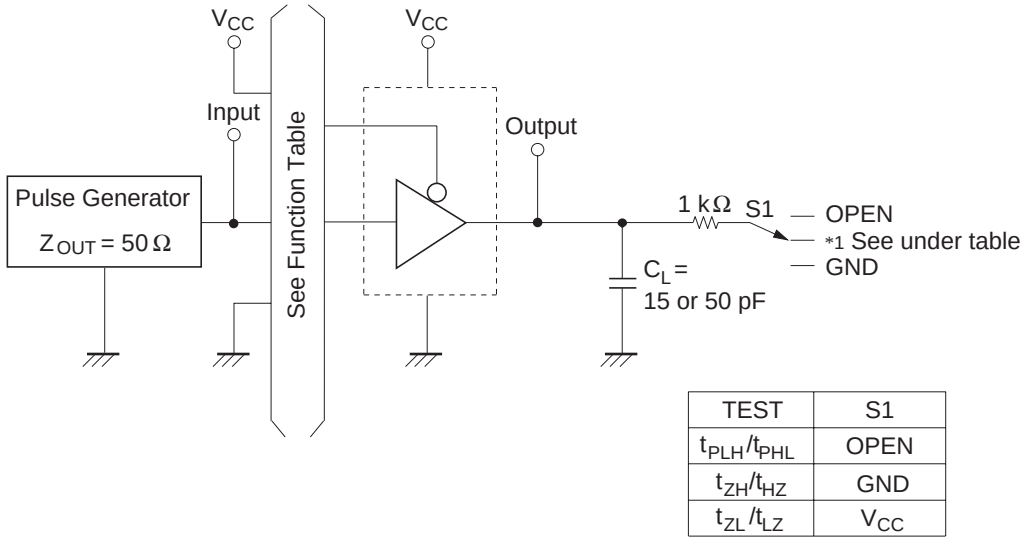
| Item | Symbol | $V_{CC}$ = (V) | Ta = 25°C Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| Power dissipation capacitance | $C_{PD}$ | 3.3 | — | 15.5 | — | pF | f = 10 MHz |
| | | 5.0 | — | 17.6 | — | | |

## Noise Characteristics

$C_L$ = 50 pF

| Item | Symbol | $V_{CC}$ = (V) | Ta = 25°C Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|---|
| Quiet output, maximum dynamic $V_{OL}$ | $V_{OL (P)}$ | 3.3 | — | 0.3 | 0.8 | V | |
| Quiet output, minimum dynamic $V_{OL}$ | $V_{OL (V)}$ | 3.3 | — | –0.3 | –0.8 | V | |
| Quiet output, minimum dynamic $V_{OH}$ | $V_{OH (V)}$ | 3.3 | — | 3.0 | — | 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 | |

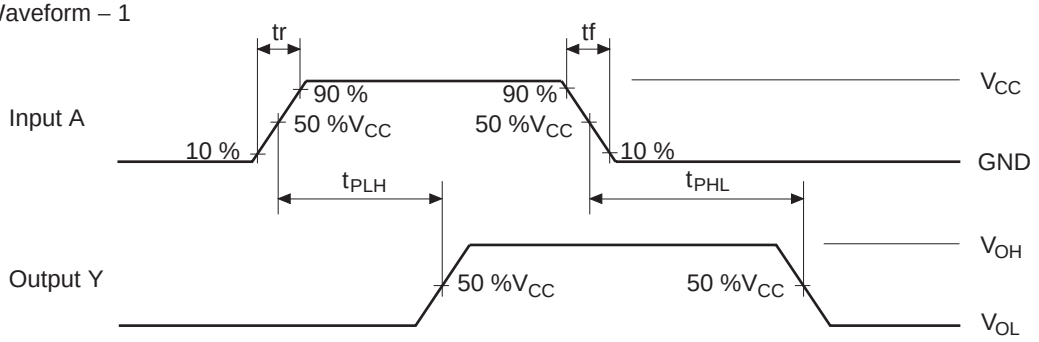
## Test Circuit



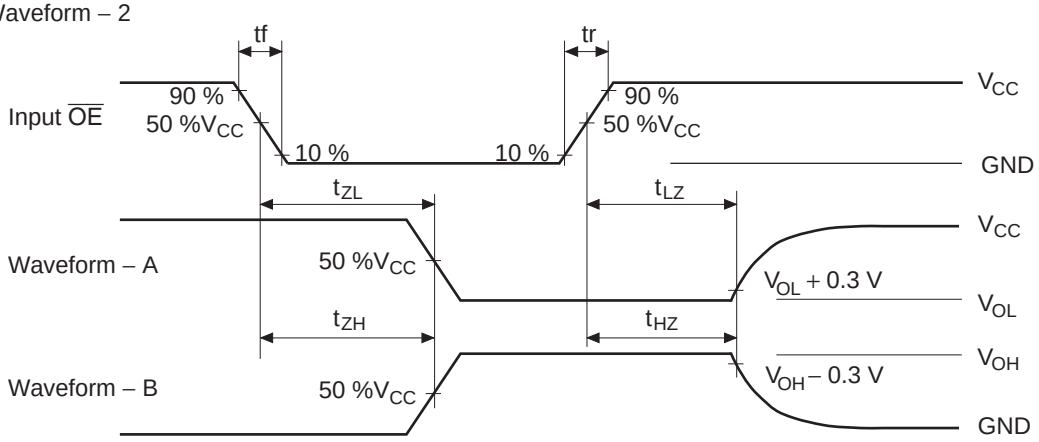

| TEST | S1 |
|---|---|
| $t_{PLH}/t_{PHL}$ | OPEN |
| $t_{ZH}/t_{HZ}$ | GND |
| $t_{ZL}/t_{LZ}$ | $V_{CC}$ |

Note: 1. $C_L$ includes probe and jig capacitance.

• Waveform – 1




• Waveform – 2

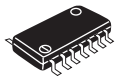


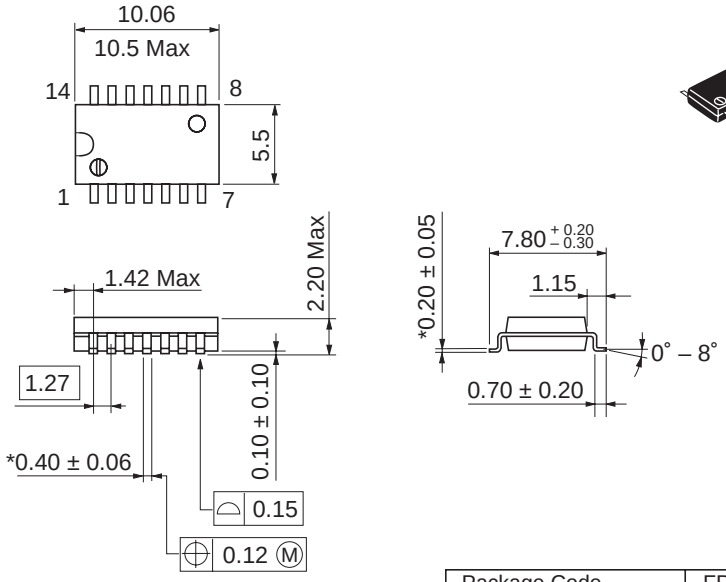

Notes: 1. $t_r \leq 3$ ns, $t_f \leq 3$ ns
2. Input waveform: PRR ≤ 1 MHz, duty cycle 50%
3. Waveform–A is for an output with internal conditions such that the output is low except when disabled by the output control.
4. Waveform–B is for an output with internal conditions such that the output is high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

## Package Dimensions

As of January, 2003

Unit: mm



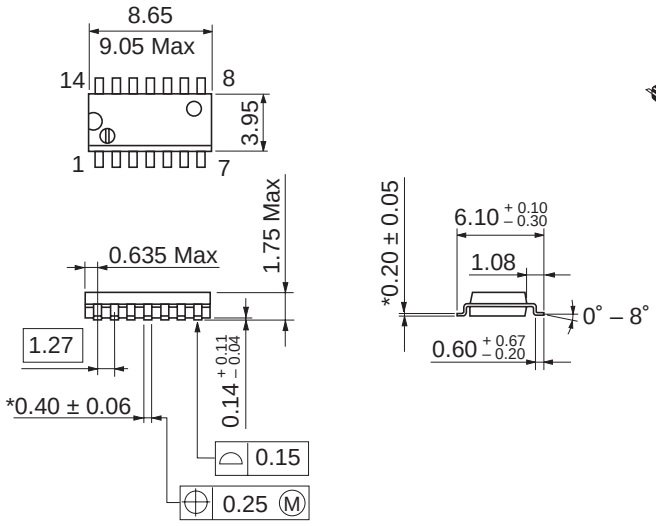



*Ni/Pd/Au plating

| | |
|---|---|
| Package Code | FP-14DAV |
| JEDEC | — |
| JEITA | Conforms |
| Mass (reference value) | 0.23 g |

As of January, 2003

Unit: mm

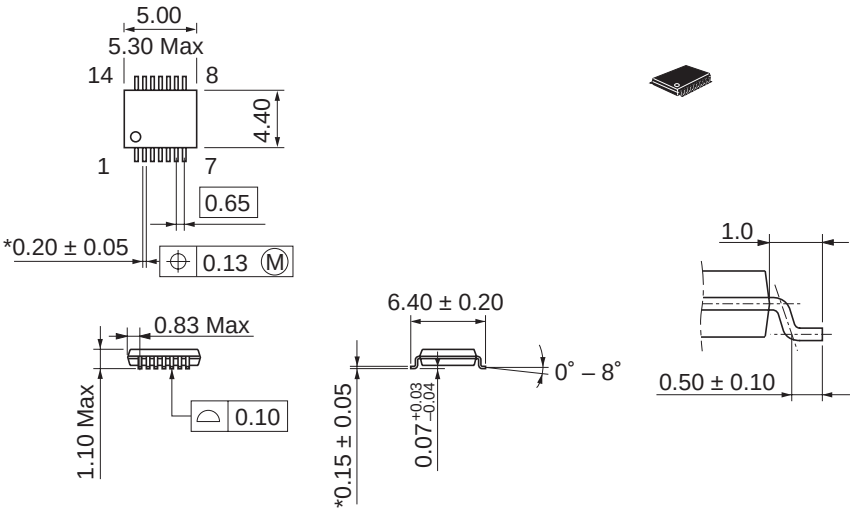



*Ni/Pd/Au plating

| | |
|---|---|
| Package Code | FP-14DNV |
| JEDEC | Conforms |
| JEITA | Conforms |
| Mass (reference value) | 0.13 g |

As of January, 2003

Unit: mm




| | |
|---|---|
| Package Code | TTP-14DV |
| JEDEC | — |
| JEITA | — |
| Mass (reference value) | 0.05 g |

*Ni/Pd/Au plating

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