

# HD74AC373/HD74ACT373

## Octal Transparent Latch with 3-State Output

REJ03D0273-0200Z  
(Previous ADE-205-394 (Z))  
Rev.2.00  
Jul.16.2004

### Description

The HD74AC373/HD74ACT373 consists of eight latches with 3-state outputs from bus organized system applications. The flip-flops appear transparent to the data when Latch Enable (LE) is High. When LE is Low, the data that meets the setup time is latched. Data appears on the bus when the Output Enable ( $\overline{OE}$ ) is Low. When  $\overline{OE}$  is High, the bus output is in the high impedance state.

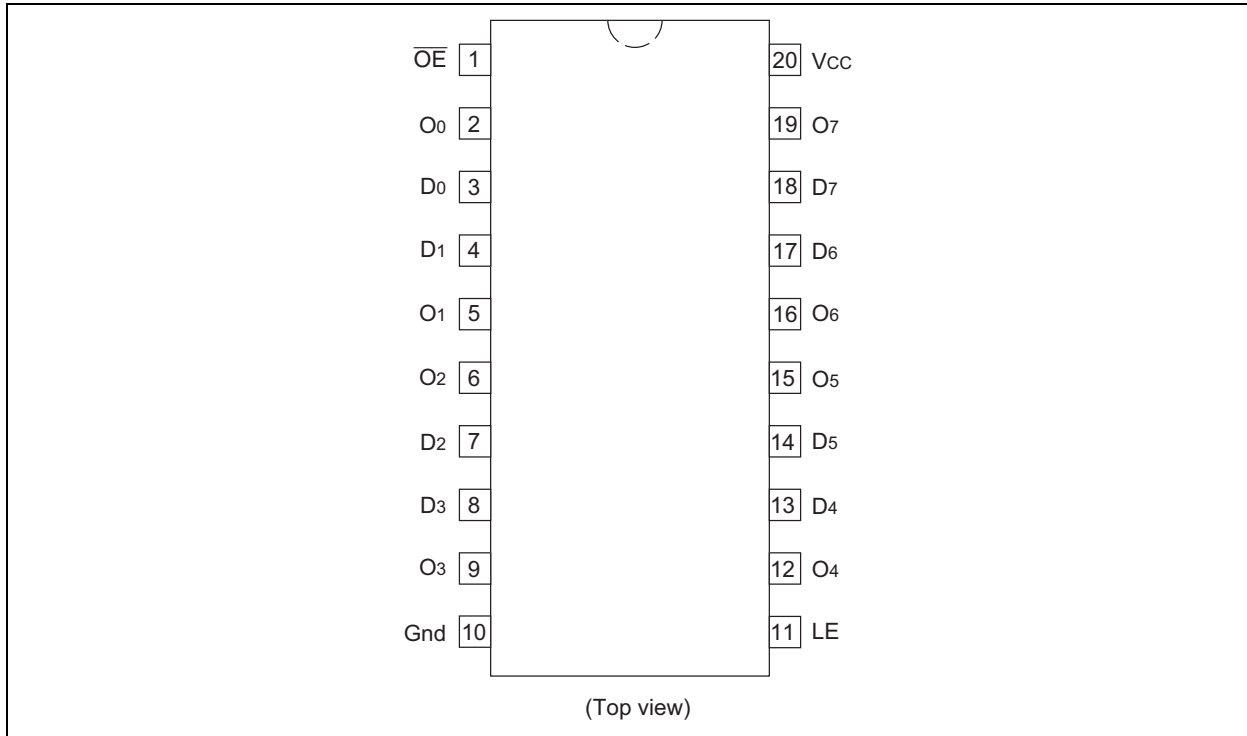
### Features

- Eight Latches in a Single Package
- 3-State Outputs for Bus Interfacing
- Outputs Source/Sink 24 mA
- HD74AC373 has TTL-Compatible Inputs
- Ordering Information: Ex. HD74AC373

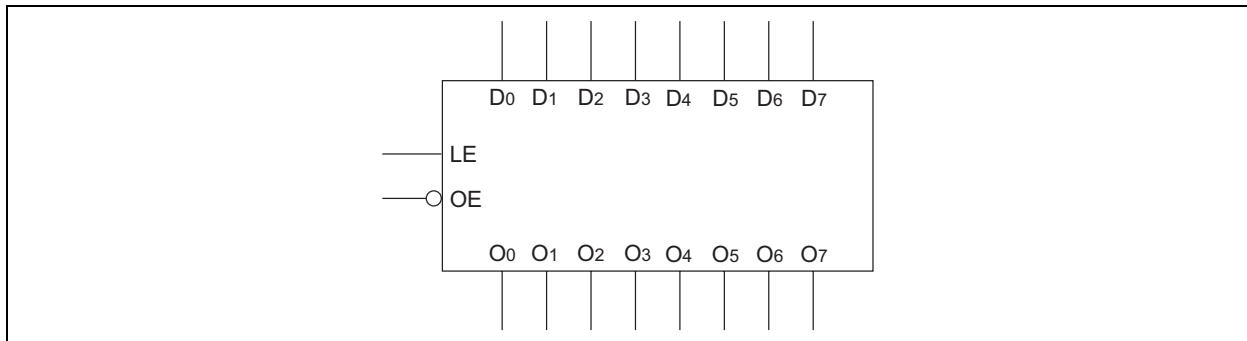
| Part Name     | Package Type       | Package Code   | Package Abbreviation | Taping Abbreviation (Quantity) |
|---------------|--------------------|----------------|----------------------|--------------------------------|
| HD74AC373P    | DIP-20 pin         | DP-20N, -20NEV | P                    | —                              |
| HD74AC373FPEL | SOP-20 pin (JEITA) | FP-20DAV       | FP                   | EL (2,000 pcs/reel)            |
| HD74AC373RPEL | SOP-20 pin (JEDEC) | FP-20DBV       | RP                   | EL (1,000 pcs/reel)            |
| HD74AC373TELL | TSSOP-20 pin       | TTP-20DAV      | T                    | ELL (2,000 pcs/reel)           |

- Notes: 1. Please consult the sales office for the above package availability.  
2. The packages with lead-free pins are distinguished from the conventional products by adding V at the end of the package code.

### Pin Arrangement



### Logic Symbol



### Pin Names

- D<sub>0</sub> – D<sub>7</sub> Data Inputs
- LE Latch Enable Input
- $\overline{OE}$  Output Enable Input
- O<sub>0</sub> – O<sub>7</sub> 3-State Latch Outputs

**Truth Table**

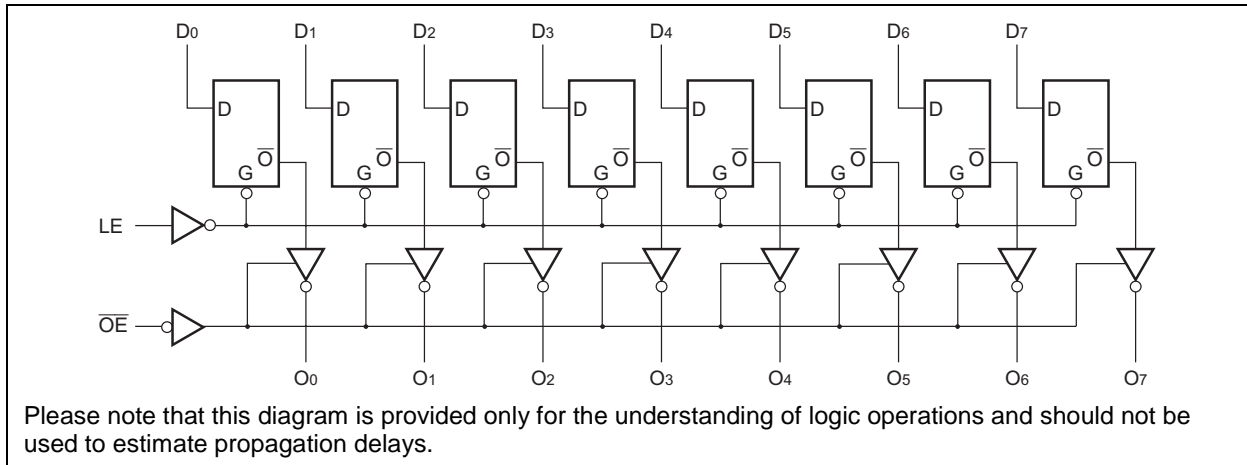
| Inputs          |    |       | Outputs |
|-----------------|----|-------|---------|
| $\overline{OE}$ | LE | $D_n$ | $O_n$   |
| H               | X  | X     | Z       |
| L               | H  | L     | L       |
| L               | H  | H     | H       |
| L               | L  | X     | $O_0$   |

- H : High Voltage Level
- L : Low Voltage Level
- Z : High Impedance
- X : Immaterial
- $O_0$  : Previous  $O_0$  before Low-to-High Transition of Clock

**Functional Description**

The HD74AC373/HD74ACT373 contains eight D-type latches with 3-state standard outputs. When the Latch Enable (LE) input is High, data on the  $D_n$  inputs enters the latches. In this condition the latches are transparent, i.e., a latch output will change state each time its D input changes. When LE is Low, the latches store the information that was present on the D inputs setup time preceding the High-to-Low transition of LE. The 3-state standard outputs are controlled by the Output Enable ( $\overline{OE}$ ) input. When  $\overline{OE}$  is Low, the standard outputs are in the 2-state mode. When  $\overline{OE}$  is High, the standard outputs are in the high impedance mode but this does not interfere with entering new data into the latches.

**Logic Diagram**



**Absolute Maximum Ratings**

| Item   | Symbol            | Ratings              | Unit        | Condition           |
|--|-------------------|----------------------|-------------|---------------------|
| Supply voltage                               | $V_{CC}$          | -0.5 to 7            | V           |                     |
| DC input diode current                       | $I_{IK}$          | -20                  | mA          | $V_I = -0.5V$       |
|  |                   | 20                   | mA          | $V_I = V_{CC}+0.5V$ |
| DC input voltage                             | $V_I$             | -0.5 to $V_{CC}+0.5$ | V           |                     |
| DC output diode current                      | $I_{OK}$          | -50                  | mA          | $V_O = -0.5V$       |
|  |                   | 50                   | mA          | $V_O = V_{CC}+0.5V$ |
| DC output voltage                            | $V_O$             | -0.5 to $V_{CC}+0.5$ | V           |                     |
| DC output source or sink current             | $I_O$             | $\pm 50$             | mA          |                     |
| DC $V_{CC}$ or ground current per output pin | $I_{CC}, I_{GND}$ | $\pm 50$             | mA          |                     |
| Storage temperature                          | $T_{stg}$         | -65 to +150          | $^{\circ}C$ |                     |

**Recommended Operating Conditions: HD74AC373**

| Item  | Symbol     | Ratings       | Unit | Condition        |
|---|------------|---------------|------|------------------|
| Supply voltage  | $V_{CC}$   | 2 to 6        | V    |                  |
| Input and Output voltage  | $V_I, V_O$ | 0 to $V_{CC}$ | V    |                  |
| Operating temperature   | $T_a$      | -40 to +85    | °C   |                  |
| Input rise and fall time<br>(except Schmitt inputs)<br>$V_{IN}$ 30% to 70% $V_{CC}$ | tr, tf     | 8             | ns/V | $V_{CC} = 3.0V$  |
|   |            |               |      | $V_{CC} = 4.5 V$ |
|   |            |               |      | $V_{CC} = 5.5 V$ |

**DC Characteristics: HD74AC373**

| Item                     | Symbol    | Vcc (V) | Ta = 25°C |       |           | Ta = -40 to +85°C |           | Unit    | Condition  |                               |                   |
|--------------------------|-----------|---------|-----------|-------|-----------|-------------------|-----------|---------|--|-------------------------------|-------------------|
|                          |           |         | min.      | typ.  | max.      | min.              | max.      |         |  |                               |                   |
| Input Voltage            | $V_{IH}$  | 3.0     | 2.1       | 1.5   | —         | 2.1               | —         | V       | $V_{OUT} = 0.1 V$ or $V_{CC} - 0.1 V$  |                               |                   |
|                          |           | 4.5     | 3.15      | 2.25  | —         | 3.15              | —         |         |  |                               |                   |
|                          |           | 5.5     | 3.85      | 2.75  | —         | 3.85              | —         |         |  |                               |                   |
|                          | $V_{IL}$  | 3.0     | —         | 1.50  | 0.9       | —                 | 0.9       |         | $V_{OUT} = 0.1 V$ or $V_{CC} - 0.1 V$  |                               |                   |
|                          |           | 4.5     | —         | 2.25  | 1.35      | —                 | 1.35      |         |  |                               |                   |
|                          |           | 5.5     | —         | 2.75  | 1.65      | —                 | 1.65      |         |  |                               |                   |
| Output voltage           | $V_{OH}$  | 3.0     | 2.9       | 2.99  | —         | 2.9               | —         | V       | $V_{IN} = V_{IL}$ or $V_{IH}$<br>$I_{OUT} = -50 \mu A$                                 |                               |                   |
|                          |           | 4.5     | 4.4       | 4.49  | —         | 4.4               | —         |         |  |                               |                   |
|                          |           | 5.5     | 5.4       | 5.49  | —         | 5.4               | —         |         |  |                               |                   |
|                          |           | 3.0     | 2.58      | —     | —         | 2.48              | —         |         |  | $V_{IN} = V_{IL}$ or $V_{IH}$ | $I_{OH} = -12 mA$ |
|                          |           | 4.5     | 3.94      | —     | —         | 3.80              | —         |         |  |                               | $I_{OH} = -24 mA$ |
|                          |           | 5.5     | 4.94      | —     | —         | 4.80              | —         |         |  |                               | $I_{OH} = -24 mA$ |
|                          | $V_{OL}$  | 3.0     | —         | 0.002 | 0.1       | —                 | 0.1       | V       | $V_{IN} = V_{IL}$ or $V_{IH}$<br>$I_{OUT} = 50 \mu A$                                  |                               |                   |
|                          |           | 4.5     | —         | 0.001 | 0.1       | —                 | 0.1       |         |  |                               |                   |
|                          |           | 5.5     | —         | 0.001 | 0.1       | —                 | 0.1       |         |  |                               |                   |
|                          |           | 3.0     | —         | —     | 0.32      | —                 | 0.37      |         |  | $V_{IN} = V_{IL}$ or $V_{IH}$ | $I_{OL} = 12 mA$  |
|                          |           | 4.5     | —         | —     | 0.32      | —                 | 0.37      |         |  |                               | $I_{OL} = 24 mA$  |
|                          |           | 5.5     | —         | —     | 0.32      | —                 | 0.37      |         |  |                               | $I_{OL} = 24 mA$  |
| Input leakage current    | $I_{IN}$  | 5.5     | —         | —     | $\pm 0.1$ | —                 | $\pm 1.0$ | $\mu A$ | $V_{IN} = V_{CC}$ or GND   |                               |                   |
| 3 State current          | $I_{OZ}$  | 5.5     | —         | —     | $\pm 0.5$ | —                 | $\pm 5.0$ | $\mu A$ | $V_{IN(OE)} = V_{IL}, V_{IH}$<br>$V_{IN} = V_{CC}$ or GND<br>$V_{OUT} = V_{CC}$ or GND |                               |                   |
| Dynamic output current*  | $I_{OLD}$ | 5.5     | —         | —     | —         | 86                | —         | mA      | $V_{OLD} = 1.1 V$  |                               |                   |
|                          | $I_{OHD}$ | 5.5     | —         | —     | —         | -75               | —         | mA      | $V_{OHD} = 3.85 V$   |                               |                   |
| Quiescent supply current | $I_{CC}$  | 5.5     | —         | —     | 8.0       | —                 | 80        | $\mu A$ | $V_{IN} = V_{CC}$ or ground  |                               |                   |

\*Maximum test duration 2.0 ms, one output loaded at a time.

**Recommended Operating Conditions: HD74ACT373**

| Item   | Symbol     | Ratings       | Unit | Condition                          |
|--|------------|---------------|------|------------------------------------|
| Supply voltage   | $V_{CC}$   | 2 to 6        | V    |                                    |
| Input and output voltage   | $V_I, V_O$ | 0 to $V_{CC}$ | V    |                                    |
| Operating temperature  | $T_a$      | -40 to +85    | °C   |                                    |
| Input rise and fall time<br>(except Schmitt inputs)<br>$V_{IN}$ 0.8 to 2.0 V | tr, tf     | 8             | ns/V | $V_{CC} = 4.5V$<br>$V_{CC} = 5.5V$ |

**DC Characteristics: HD74ACT373**

| Item                           | Symbol           | V <sub>CC</sub> (V) | Ta = 25°C |       |      | Ta = -40 to +85°C |      | Unit | Condition  |                                   |                          |
|--------------------------------|------------------|---------------------|-----------|-------|------|-------------------|------|------|--|-----------------------------------|--------------------------|
|                                |                  |                     | min.      | typ.  | max. | min.              | max. |      |  |                                   |                          |
| Input voltage                  | V <sub>IH</sub>  | 4.5                 | 2.0       | 1.5   | —    | 2.0               | —    | V    | V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> -0.1 V   |                                   |                          |
|                                |                  | 5.5                 | 2.0       | 1.5   | —    | 2.0               | —    |      |  |                                   |                          |
|                                | V <sub>IL</sub>  | 4.5                 | —         | 1.5   | 0.8  | —                 | 0.8  |      | V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> -0.1 V   |                                   |                          |
|                                |                  | 5.5                 | —         | 1.5   | 0.8  | —                 | 0.8  |      |  |                                   |                          |
| Output voltage                 | V <sub>OH</sub>  | 4.5                 | 4.4       | 4.49  | —    | 4.4               | —    | V    | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>I <sub>OUT</sub> = -50 μA                |                                   |                          |
|                                |                  | 5.5                 | 5.4       | 5.49  | —    | 5.4               | —    |      |  |                                   |                          |
|                                |                  | 4.5                 | 3.94      | —     | —    | 3.80              | —    |      |  | V <sub>IN</sub> = V <sub>IL</sub> | I <sub>OH</sub> = -24 mA |
|                                |                  | 5.5                 | 4.94      | —     | —    | 4.80              | —    |      |  |                                   | I <sub>OH</sub> = -24 mA |
|                                | V <sub>OL</sub>  | 4.5                 | —         | 0.001 | 0.1  | —                 | 0.1  |      | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>I <sub>OUT</sub> = 50 μA                 |                                   |                          |
|                                |                  | 5.5                 | —         | 0.001 | 0.1  | —                 | 0.1  |      |  |                                   |                          |
|                                |                  | 4.5                 | —         | —     | 0.32 | —                 | 0.37 |      |  | V <sub>IN</sub> = V <sub>IL</sub> | I <sub>OL</sub> = 24 mA  |
|                                |                  | 5.5                 | —         | —     | 0.32 | —                 | 0.37 |      |  |                                   | I <sub>OL</sub> = 24 mA  |
| Input current                  | I <sub>IN</sub>  | 5.5                 | —         | —     | ±0.1 | —                 | ±1.0 | μA   | V <sub>IN</sub> = V <sub>CC</sub> or GND   |                                   |                          |
| 3 State current                | I <sub>OZ</sub>  | 5.5                 | —         | —     | ±0.5 | —                 | ±5.0 | μA   | V <sub>IN</sub> = V <sub>IL</sub> , V <sub>IH</sub><br>V <sub>OUT</sub> = V <sub>CC</sub> or GND |                                   |                          |
| I <sub>CC</sub> /input current | I <sub>CCT</sub> | 5.5                 | —         | 0.6   | —    | —                 | 1.5  | mA   | V <sub>IN</sub> = V <sub>CC</sub> -2.1 V   |                                   |                          |
| Dynamic output current*        | I <sub>OLD</sub> | 5.5                 | —         | —     | —    | 86                | —    | mA   | V <sub>OLD</sub> = 1.1 V   |                                   |                          |
|                                | I <sub>OHD</sub> | 5.5                 | —         | —     | —    | -75               | —    | mA   | V <sub>OHD</sub> = 3.85 V  |                                   |                          |
| Quiescent supply current       | I <sub>CC</sub>  | 5.5                 | —         | —     | 8.0  | —                 | 80   | μA   | V <sub>IN</sub> = V <sub>CC</sub> or ground  |                                   |                          |

\*Maximum test duration 2.0 ms, one output loaded at a time.

**AC Characteristics: HD74AC373**

| Item  | Symbol           | V <sub>CC</sub> (V)*1 | Ta = +25°C<br>C <sub>L</sub> = 50 pF |      |      | Ta = -40°C to +85°C<br>C <sub>L</sub> = 50 pF |      | Unit |
|---|------------------|-----------------------|--------------------------------------|------|------|---|------|------|
|   |                  |                       | Min                                  | Typ  | Max  | Min   | Max  |      |
| Propagation delay<br>D <sub>n</sub> to O <sub>n</sub> | t <sub>PLH</sub> | 3.3                   | 1.0                                  | 10.0 | 13.5 | 1.0   | 15.0 | ns   |
|   |                  | 5.0                   | 1.0                                  | 7.0  | 9.5  | 1.0   | 10.5 |      |
| Propagation delay<br>D <sub>n</sub> to O <sub>n</sub> | t <sub>PHL</sub> | 3.3                   | 1.0                                  | 9.5  | 13.0 | 1.0   | 14.5 | ns   |
|   |                  | 5.0                   | 1.0                                  | 7.0  | 9.5  | 1.0   | 10.5 |      |
| Propagation delay<br>LE to O <sub>n</sub>             | t <sub>PLH</sub> | 3.3                   | 1.0                                  | 10.0 | 13.5 | 1.0   | 15.0 | ns   |
|   |                  | 5.0                   | 1.0                                  | 7.5  | 9.5  | 1.0   | 10.5 |      |
| Propagation delay<br>LE to O <sub>n</sub>             | t <sub>PHL</sub> | 3.3                   | 1.0                                  | 9.5  | 12.5 | 1.0   | 14.0 | ns   |
|   |                  | 5.0                   | 1.0                                  | 7.0  | 9.5  | 1.0   | 10.5 |      |
| Output enable time                                    | t <sub>ZH</sub>  | 3.3                   | 1.0                                  | 9.0  | 11.5 | 1.0   | 13.0 | ns   |
|   |                  | 5.0                   | 1.0                                  | 7.0  | 8.5  | 1.0   | 9.5  |      |
| Output enable time                                    | t <sub>ZL</sub>  | 3.3                   | 1.0                                  | 8.5  | 11.5 | 1.0   | 13.0 | ns   |
|   |                  | 5.0                   | 1.0                                  | 6.5  | 8.5  | 1.0   | 9.5  |      |
| Output disable time                                   | t <sub>HZ</sub>  | 3.3                   | 1.0                                  | 10.0 | 12.5 | 1.0   | 14.5 | ns   |
|   |                  | 5.0                   | 1.0                                  | 8.0  | 11.0 | 1.0   | 12.5 |      |
| Output disable time                                   | t <sub>LZ</sub>  | 3.3                   | 1.0                                  | 8.0  | 11.5 | 1.0   | 12.5 | ns   |
|   |                  | 5.0                   | 1.0                                  | 6.5  | 8.5  | 1.0   | 10.0 |      |

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V  
Voltage Range 5.0 is 5.0 V ± 0.5 V

**AC Characteristics: HD74AC373**

| Item  | Symbol           | V <sub>CC</sub> (V)*1 | Ta = +25°C<br>C <sub>L</sub> = 50 pF |     |      | Ta = -40°C to +85°C<br>C <sub>L</sub> = 50 pF |      | Unit |
|---|------------------|-----------------------|--------------------------------------|-----|------|---|------|------|
|   |                  |                       | Min                                  | Typ | Max  | Min   | Max  |      |
| Propagation delay<br>D <sub>n</sub> to O <sub>n</sub> | t <sub>PLH</sub> | 5.0                   | 1.0                                  | 8.5 | 10.0 | 1.0   | 11.5 | ns   |
| Propagation delay<br>D <sub>n</sub> to O <sub>n</sub> | t <sub>PHL</sub> | 5.0                   | 1.0                                  | 8.0 | 10.0 | 1.0   | 11.5 | ns   |
| Propagation delay<br>LE to O <sub>n</sub>             | t <sub>PLH</sub> | 5.0                   | 1.0                                  | 8.5 | 11.0 | 1.0   | 11.5 | ns   |
| Propagation delay<br>LE to O <sub>n</sub>             | t <sub>PHL</sub> | 5.0                   | 1.0                                  | 8.0 | 10.0 | 1.0   | 11.5 | ns   |
| Output enable time                                    | t <sub>ZH</sub>  | 5.0                   | 1.0                                  | 8.0 | 9.5  | 1.0   | 10.5 | ns   |
| Output enable time                                    | t <sub>ZL</sub>  | 5.0                   | 1.0                                  | 7.5 | 9.0  | 1.0   | 10.5 | ns   |
| Output disable time                                   | t <sub>HZ</sub>  | 5.0                   | 1.0                                  | 9.0 | 11.0 | 1.0   | 12.5 | ns   |
| Output disable time                                   | t <sub>LZ</sub>  | 5.0                   | 1.0                                  | 7.5 | 8.5  | 1.0   | 10.0 | ns   |

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V  
Voltage Range 5.0 is 5.0 V ± 0.5 V

**AC Operating Requirements: HD74AC373**

| Item  | Symbol          | V <sub>CC</sub> (V)*1 | Ta = +25°C<br>C <sub>L</sub> = 50 pF |                    | Ta = -40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF | Unit |
|---|-----------------|-----------------------|--------------------------------------|--------------------|--|------|
|   |                 |                       | Typ                                  | Guaranteed Minimum |  |      |
| Setup time, HIGH or LOW<br>D <sub>n</sub> to LE | t <sub>su</sub> | 3.3                   | 3.5                                  | 5.5                | 6.0  | ns   |
|   |                 | 5.0                   | 2.0                                  | 4.0                | 4.5  |      |
| Hold time, HIGH or LOW<br>D <sub>n</sub> to LE  | t <sub>h</sub>  | 3.3                   | -3.0                                 | 0.0                | 0.0  | ns   |
|   |                 | 5.0                   | -1.5                                 | 0.0                | 0.0  |      |
| LE pulse width, HIGH                            | t <sub>w</sub>  | 3.3                   | 4.0                                  | 5.5                | 6.0  | ns   |
|   |                 | 5.0                   | 2.0                                  | 4.0                | 4.5  |      |

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V  
Voltage Range 5.0 is 5.0 V ± 0.5 V

**AC Operating Requirements: HD74ACT373**

| Item  | Symbol          | V <sub>CC</sub> (V)*1 | Ta = +25°C<br>C <sub>L</sub> = 50 pF |                    | Ta = -40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF | Unit |
|---|-----------------|-----------------------|--------------------------------------|--------------------|--|------|
|   |                 |                       | Typ                                  | Guaranteed Minimum |  |      |
| Setup time, HIGH or LOW<br>D <sub>n</sub> to LE | t <sub>su</sub> | 5.0                   | 3.0                                  | 7.0                | 8.0  | ns   |
| Hold time, HIGH or LOW<br>D <sub>n</sub> to LE  | t <sub>h</sub>  | 5.0                   | 0.0                                  | 0.0                | 1.0  | ns   |
| LE pulse width, HIGH                            | t <sub>w</sub>  | 5.0                   | 2.0                                  | 7.0                | 8.0  | ns   |

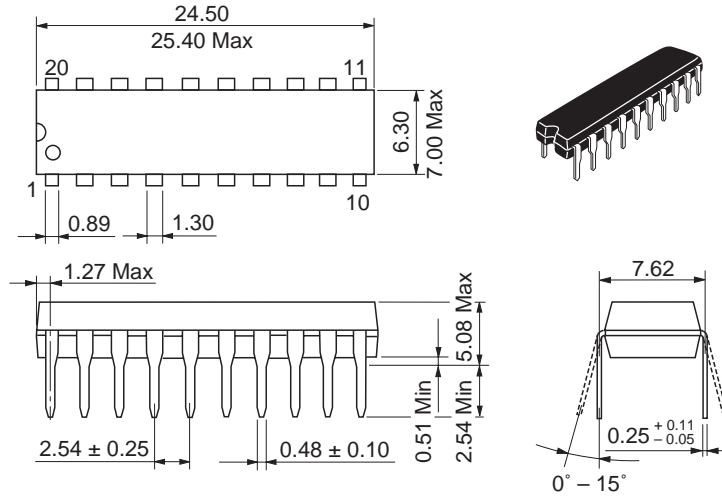
Note: 1. Voltage Range 5.0 is 5.0 V ± 0.5 V

**Capacitance**

| Item                          | Symbol          | Typ  | Unit | Condition               |
|-------------------------------|-----------------|------|------|-------------------------|
| Input capacitance             | C <sub>IN</sub> | 4.5  | pF   | V <sub>CC</sub> = 5.5 V |
| Power dissipation capacitance | C <sub>PD</sub> | 40.0 | pF   | V <sub>CC</sub> = 5.0 V |

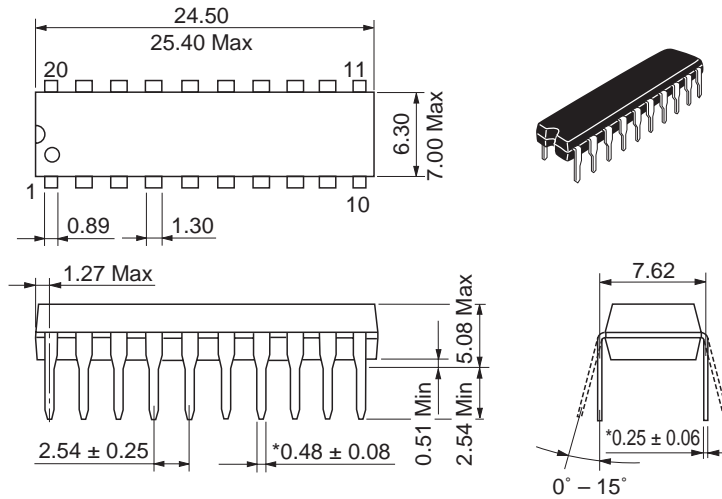
Package Dimensions

As of January, 2003  
Unit: mm



|                        |          |
|------------------------|----------|
| Package Code           | DP-20N   |
| JEDEC                  | —        |
| JEITA                  | Conforms |
| Mass (reference value) | 1.26 g   |

Unit: mm

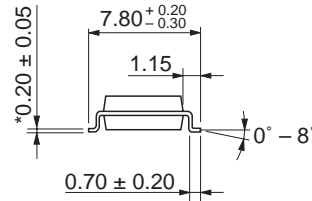
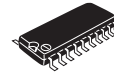
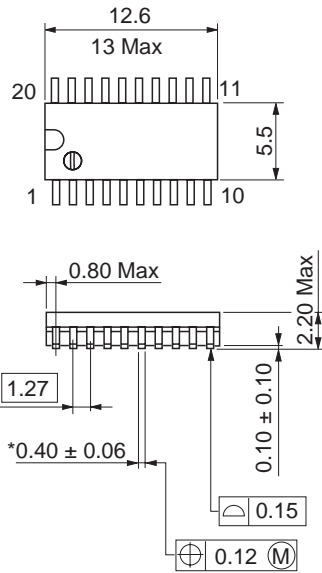


\*Ni/Pd/AU Plating

|                        |          |
|------------------------|----------|
| Package Code           | DP-20NEV |
| JEDEC                  | —        |
| JEITA                  | Conforms |
| Mass (reference value) | 1.26 g   |

As of January, 2003

Unit: mm

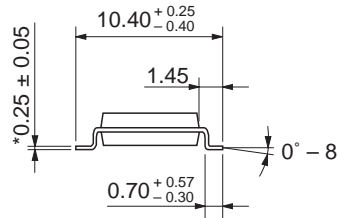
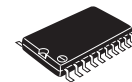
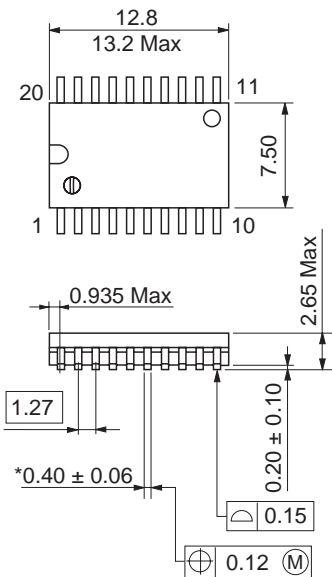


|                        |          |
|------------------------|----------|
| Package Code           | FP-20DAV |
| JEDEC                  | —        |
| JEITA                  | Conforms |
| Mass (reference value) | 0.31 g   |

\*Ni/Pd/Au plating

As of January, 2003

Unit: mm



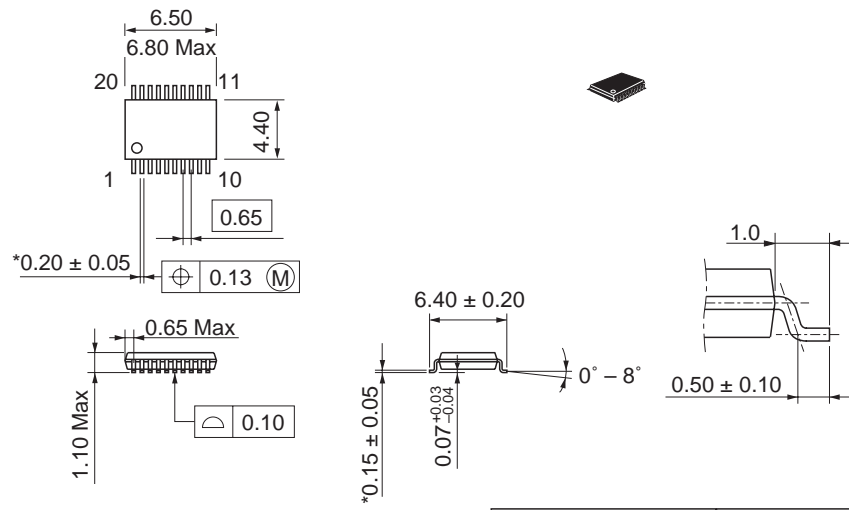
|                        |          |
|------------------------|----------|
| Package Code           | FP-20DBV |
| JEDEC                  | Conforms |
| JEITA                  | —        |
| Mass (reference value) | 0.52 g   |

\*Ni/Pd/Au plating



As of January, 2003

Unit: mm



\*Ni/Pd/Au plating

|                        |           |
|------------------------|-----------|
| Package Code           | TTP-20DAV |
| JEDEC                  | —         |
| JEITA                  | —         |
| Mass (reference value) | 0.07 g    |

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