

# TC74HCT373AP, TC74HCT373AF, TC74HCT373AFW

## OCTAL D-TYPE LATCH WITH 3-STATE OUTPUT

The TC74HCT373A is a high speed CMOS OCTAL LATCH with 3-STATE OUTPUT fabricated with silicon gate C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. Their inputs are compatible with TTL, NMOS, and CMOS output voltage levels.

These 8-bit D-type latches are controlled by a latch enable input (LE) and an output enable input (OE).

When the OE input is high, the eight outputs are in a high impedance state.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

### FEATURES:

- High Speed..... $t_{pd} = 17\text{ns}(\text{typ.})$  at  $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 4\mu\text{A}(\text{Max.})$  at  $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs....  $V_{IH} = 2\text{V}(\text{Min.})$   
 $V_{IL} = 0.8\text{V}(\text{Max.})$
- Wide interfacing ability..... LSTTL, NMOS, CMOS
- Output Drive Capability..... 15 LSTTL Loads
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 6\text{mA}(\text{Min.})$
- Balanced Propagation Delays....  $t_{pLH} \approx t_{pHL}$
- Pin and Function Compatible with 74LS373

### TRUTH TABLE

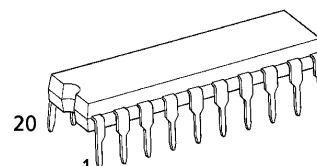
| INPUTS |    |   | OUTPUTS |
|--------|----|---|---------|
| OE     | LE | D | Q       |
| H      | X  | X | Z       |
| L      | L  | X | $Q_n$   |
| L      | H  | L | L       |
| L      | H  | H | H       |

X : Don't Care

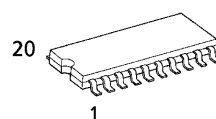
Z : High Impedance

$Q_n$  : Q outputs are latched at the time when the LE input is taken to a low logic level.

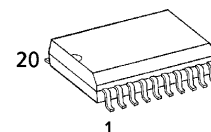
(Note) The JEDEC SOP (FW) is not available in Japan.



P (DIP20-P-300-2.54A)  
Weight : 1.30g (Typ.)

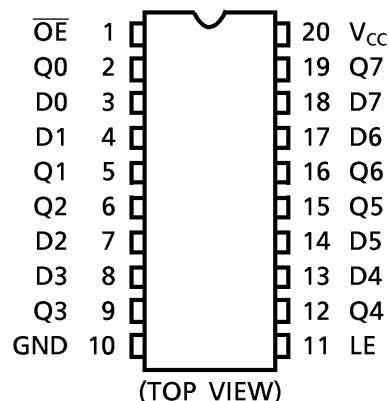


F (SOP20-P-300-1.27)  
Weight : 0.22g (Typ.)

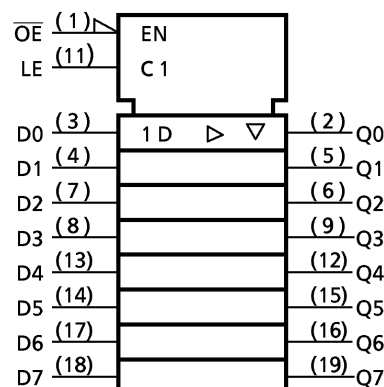


FW (SOL20-P-300-1.27)  
Weight : 0.46g (Typ.)

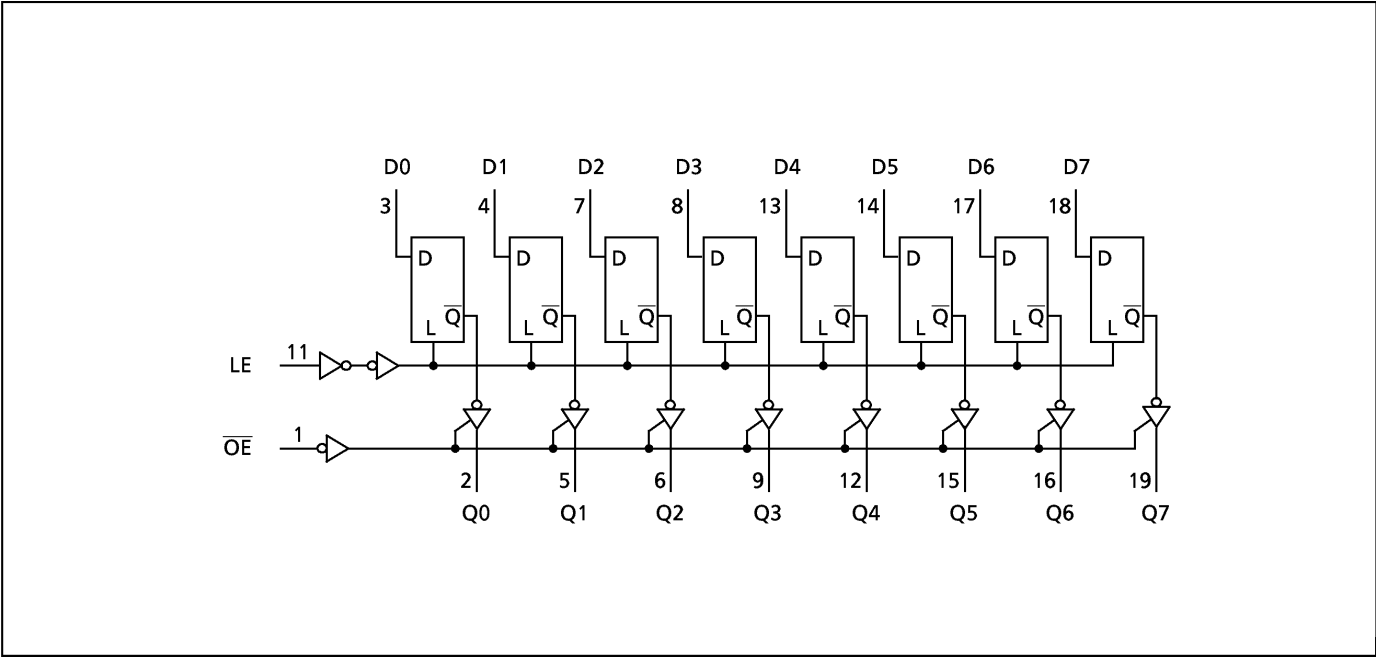
### PIN ASSIGNMENT



### IEC LOGIC SYMBOL



SYSTEM DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                   | SYMBOL    | VALUE                    | UNIT               |
|-----------------------------|-----------|--------------------------|--------------------|
| Supply Voltage Range        | $V_{CC}$  | $-0.5 \sim 7$            | V                  |
| DC Input Voltage            | $V_{IN}$  | $-0.5 \sim V_{CC} + 0.5$ | V                  |
| DC Output Voltage           | $V_{OUT}$ | $-0.5 \sim V_{CC} + 0.5$ | V                  |
| Input Diode Current         | $I_{IK}$  | $\pm 20$                 | mA                 |
| Output Diode Current        | $I_{OK}$  | $\pm 20$                 | mA                 |
| DC Output Current           | $I_{OUT}$ | $\pm 35$                 | mA                 |
| DC $V_{CC}$ /Ground Current | $I_{CC}$  | $\pm 75$                 | mA                 |
| Power Dissipation           | $P_D$     | 500 (DIP)* / 180 (SOP)   | mW                 |
| Storage Temperature         | $T_{stg}$ | $-65 \sim 150$           | $^{\circ}\text{C}$ |

\*500mW in the range of  $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$ . From  $T_a = 65^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  a derating factor of  $-10\text{mW}/^{\circ}\text{C}$  shall be applied until 300mW.

## RECOMMENDED OPERATING CONDITIONS

| PARAMETER                | SYMBOL     | VALUE           | UNIT               |
|--------------------------|------------|-----------------|--------------------|
| Supply Voltage           | $V_{CC}$   | $4.5 \sim 5.5$  | V                  |
| Input Voltage            | $V_{IN}$   | $0 \sim V_{CC}$ | V                  |
| Output Voltage           | $V_{OUT}$  | $0 \sim V_{CC}$ | V                  |
| Operating Temperature    | $T_{opr}$  | $-40 \sim 85$   | $^{\circ}\text{C}$ |
| Input Rise and Fall Time | $t_r, t_f$ | $0 \sim 500$    | ns                 |

## DC ELECTRICAL CHARACTERISTICS

| PARAMETER                            | SYMBOL   | TEST CONDITION                                                                            | $V_{CC}$<br>(V)                                                      | $T_a = 25^{\circ}\text{C}$ |      |           | $T_a = -40 \sim 85^{\circ}\text{C}$ |           | UNIT          |
|--------------------------------------|----------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------|------|-----------|-------------------------------------|-----------|---------------|
|                                      |          |                                                                                           |                                                                      | MIN.                       | TYP. | MAX.      | MIN.                                | MAX.      |               |
| High - Level Input Voltage           | $V_{IH}$ |                                                                                           | $4.5 \begin{smallmatrix} \text{ } \\ \text{ } \end{smallmatrix} 5.5$ | 2.0                        | —    | —         | 2.0                                 | —         | V             |
| Low - Level Input Voltage            | $V_{IL}$ |                                                                                           | $4.5 \begin{smallmatrix} \text{ } \\ \text{ } \end{smallmatrix} 5.5$ | —                          | —    | 0.8       | —                                   | 0.8       | V             |
| High - Level Output Voltage          | $V_{OH}$ | $V_{IN} = V_{IH}$                                                                         | $I_{OH} = -20 \mu\text{A}$                                           | 4.5                        | 4.4  | 4.5       | —                                   | 4.4       | V             |
|                                      |          |                                                                                           | $I_{OH} = -6 \text{ mA}$                                             | 4.5                        | 4.18 | 4.31      | —                                   | 4.13      |               |
| Low - Level Output Voltage           | $V_{OL}$ | $V_{IN} = V_{IL}$                                                                         | $I_{OL} = 20 \mu\text{A}$                                            | 4.5                        | —    | 0.0       | 0.1                                 | —         | V             |
|                                      |          |                                                                                           | $I_{OL} = 6 \text{ mA}$                                              | 4.5                        | —    | 0.17      | 0.26                                | —         |               |
| 3 - State Output Off - State Current | $I_{OZ}$ | $V_{IN} = V_{IH} \text{ or } V_{IL}$<br>$V_{OUT} = V_{CC} \text{ or GND}$                 | 5.5                                                                  | —                          | —    | $\pm 0.5$ | —                                   | $\pm 5.0$ |               |
| Input Leakage Current                | $I_{IN}$ | $V_{IN} = V_{CC} \text{ or GND}$                                                          | 5.5                                                                  | —                          | —    | $\pm 0.1$ | —                                   | $\pm 1.0$ | $\mu\text{A}$ |
| Quiescent Supply Current             | $I_{CC}$ | $V_{IN} = V_{CC} \text{ or GND}$                                                          | 5.5                                                                  | —                          | —    | 4.0       | —                                   | 40.0      |               |
|                                      | $I_C$    | Per input: $V_{IN} = 0.5\text{V or } 2.4\text{V}$<br>Other input: $V_{CC} \text{ or GND}$ | 5.5                                                                  | —                          | —    | 2.0       | —                                   | 2.9       | mA            |

TIMING REQUIREMENTS ( Input  $t_r = t_f = 6\text{ns}$  )

| PARAMETER                     | SYMBOL     | TEST CONDITION | $V_{CC}(\text{V})$ | $T_a = 25^\circ\text{C}$ |          | $T_a = -40\sim 85^\circ\text{C}$ | UNIT |
|-------------------------------|------------|----------------|--------------------|--------------------------|----------|----------------------------------|------|
|                               |            |                |                    | TYP.                     | LIMIT    | LIMIT                            |      |
| Minimum Pulse Width<br>( LE ) | $t_{W(H)}$ |                | 4.5<br>5.5         | —<br>—                   | 15<br>14 | 19<br>17                         | ns   |
| Minimum Set-up Time<br>( Dn ) | $t_s$      |                | 4.5<br>5.5         | —<br>—                   | 10<br>9  | 13<br>12                         |      |
| Minimum Hold Time<br>( Dn )   | $t_h$      |                | 4.5<br>5.5         | —<br>—                   | 5<br>5   | 5<br>5                           |      |

AC ELECTRICAL CHARACTERISTICS (  $C_L = 50\text{pF}$ , Input  $t_r = t_f = 6\text{ns}$  )

| PARAMETER                          | SYMBOL                 | TEST CONDITION          | CL (pF) | $V_{CC}(\text{V})$ | $T_a = 25^\circ\text{C}$ |          |          | $T_a = -40\sim 85^\circ\text{C}$ |          | UNIT |
|------------------------------------|------------------------|-------------------------|---------|--------------------|--------------------------|----------|----------|----------------------------------|----------|------|
|                                    |                        |                         |         |                    | MIN.                     | TYP.     | MAX.     | MIN.                             | MAX.     |      |
| Output Transition Time             | $t_{TLH}$<br>$t_{THL}$ |                         | 50      | 4.5<br>5.5         | —<br>—                   | 7<br>6   | 12<br>11 | —<br>—                           | 15<br>14 | ns   |
| Propagation Delay Time<br>( LE—Q ) | $t_{PLH}$<br>$t_{PHL}$ |                         | 50      | 4.5<br>5.5         | —<br>—                   | 19<br>16 | 30<br>27 | —<br>—                           | 38<br>34 |      |
|                                    |                        |                         | 150     | 4.5<br>5.5         | —<br>—                   | 24<br>22 | 38<br>34 | —<br>—                           | 48<br>43 |      |
| Propagation Delay Time<br>( D—Q )  | $t_{PLH}$<br>$t_{PHL}$ |                         | 50      | 4.5<br>5.5         | —<br>—                   | 20<br>18 | 30<br>27 | —<br>—                           | 38<br>34 |      |
|                                    |                        |                         | 150     | 4.5<br>5.5         | —<br>—                   | 25<br>22 | 38<br>34 | —<br>—                           | 48<br>43 |      |
| Output Enable Time                 | $t_{pZL}$<br>$t_{pZH}$ | $R_L = 1\text{k}\Omega$ | 50      | 4.5<br>5.5         | —<br>—                   | 19<br>16 | 30<br>27 | —<br>—                           | 38<br>34 |      |
|                                    |                        |                         | 150     | 4.5<br>5.5         | —<br>—                   | 24<br>22 | 38<br>34 | —<br>—                           | 48<br>43 |      |
| Output Disable Time                | $t_{pLZ}$<br>$t_{pHZ}$ | $R_L = 1\text{k}\Omega$ | 50      | 4.5<br>5.5         | —<br>—                   | 20<br>18 | 30<br>27 | —<br>—                           | 38<br>34 |      |
| Input Capacitance                  | $C_{IN}$               |                         |         |                    | —                        | 5        | 10       | —                                | 10       | pF   |
| Output Capacitance                 | $C_{OUT}$              |                         |         |                    | —                        | 10       | —        | —                                | —        |      |
| Power Dissipation Capacitance      | $C_{PD} (1)$           |                         |         |                    | —                        | 36       | —        | —                                | —        |      |

Note (1)  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

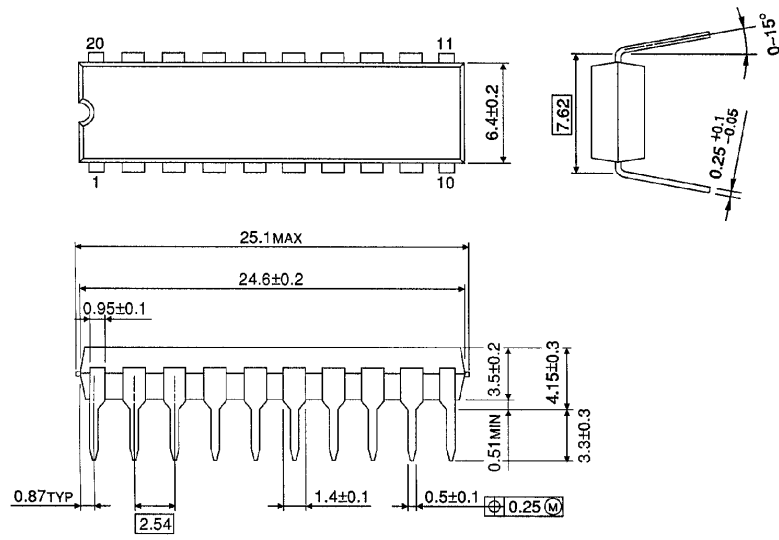
$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 8 \text{ ( per Latch )}$$

And the total  $C_{PD}$  when n pcs. of Flip Flop operate can be gained by the following equation :

$$C_{PD}(\text{total}) = 19 + 17 \cdot n$$

DIP 20PIN PACKAGE DIMENSIONS (DIP20-P-300-2.54A)

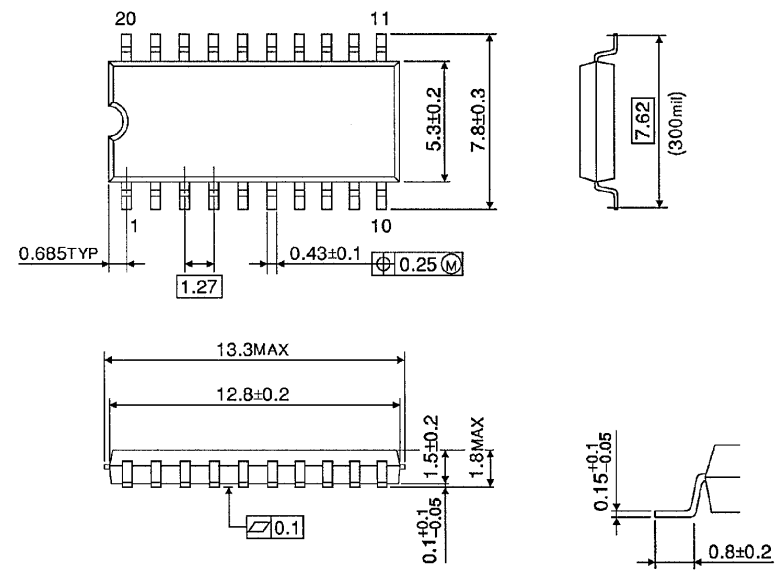
Unit in mm



Weight : 1.30g (Typ.)

SOP 20PIN (200mil BODY) PACKAGE DIMENSIONS (SOP20-P-300-1.27)

Unit in mm

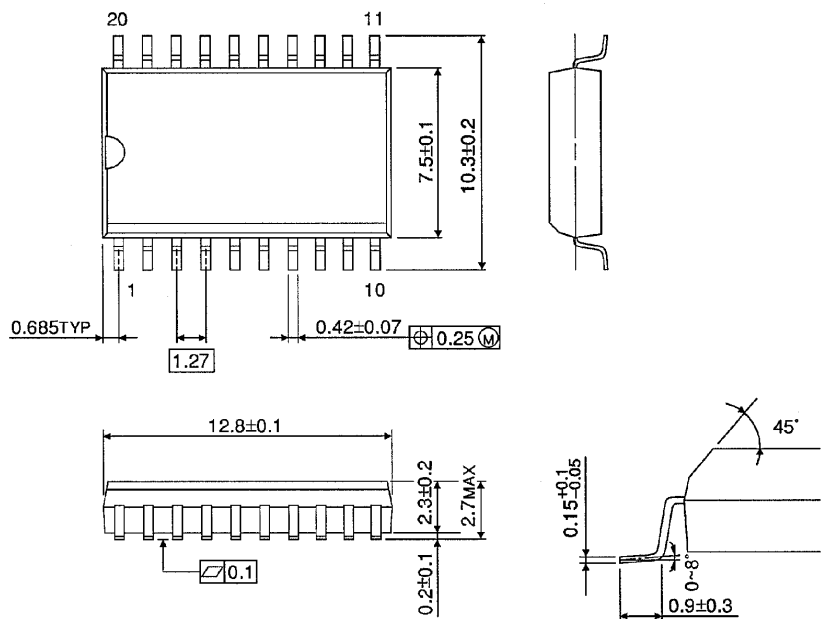


Weight : 0.22g (Typ.)

SOP 20PIN (300mil BODY) PACKAGE DIMENSIONS (SOL20-P-300-1.27)

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)

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