

**TC74VHCT573AF, TC74VHCT573AFW, TC74VHCT573AFT**

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

The TC74VHCT573A is an advanced 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 Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

This 8-bit D-type latch is controlled by a latch enable input (LE) and a output enable input (OE).

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

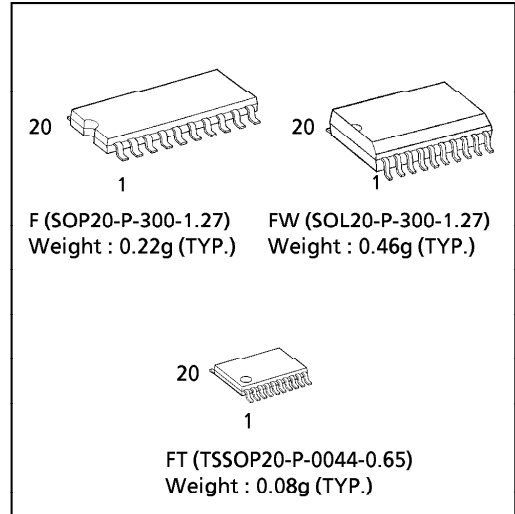
The input voltage are compatible with TTL output voltage. This device may be used as a level converter for interfacing 3.3V to 5V system.

Input protection and output circuit ensure that 0 to 5.5V can be applied to the input and output\*1 pins without regard to the supply voltage. These structure prevents device destruction due to mismatched supply and input/output voltages such as battery back up, hot board insertion, etc.

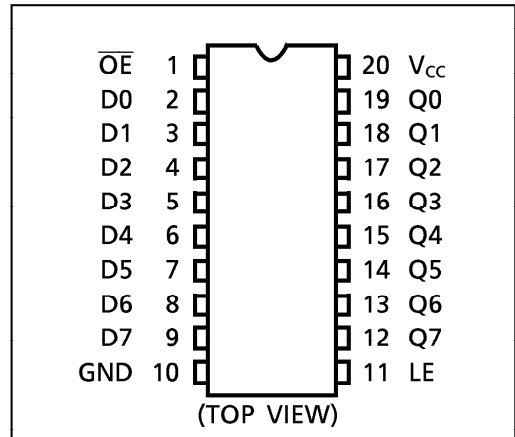
\*1: output in off-state

**FEATURES :**

- High Speed..... $t_{pd} = 7.7\text{ns}(\text{typ.})$  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....  $V_{IL} = 0.8\text{V}(\text{Max.})$   
 $V_{IH} = 2.0\text{V}(\text{Min.})$
- Power Down Protection is provided on all inputs and outputs.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Low Noise..... $V_{OLP} = 1.6\text{V}(\text{Max.})$
- Pin and Function Compatible with the 74 series (74AC / HC / F / ALS / LS etc.) 573 type.



**PIN ASSIGNMENT**

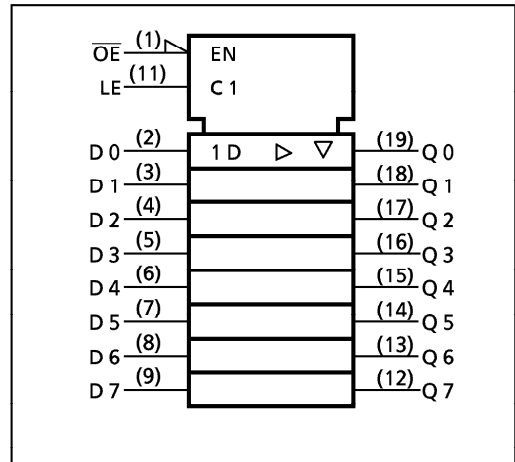


**TRUTH TABLE**

| INPUTS |    |   | OUTPUT         |
|--------|----|---|----------------|
| OE     | LE | D |                |
| H      | X  | X | Z              |
| L      | L  | X | Q <sub>n</sub> |
| L      | H  | L | L              |
| L      | H  | H | H              |

X : Don't Care  
Z : High Impedance  
Q<sub>n</sub> : Q outputs are latched at the time when the LE input is taken to a low logic level.

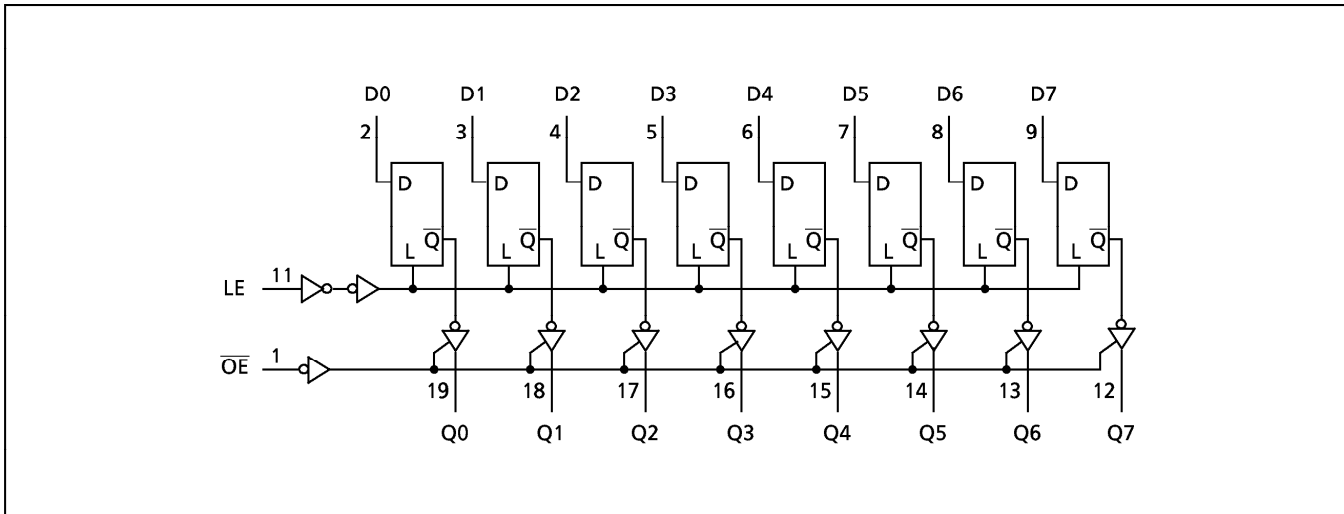
**IEC LOGIC SYMBOL**



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**SYSTEM DIAGRAM**



**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER             | SYMBOL    | VALUE                         | UNIT |
|-----------------------|-----------|-------------------------------|------|
| Supply Voltage Range  | $V_{CC}$  | -0.5~7.0                      | V    |
| DC Input Voltage      | $V_{IN}$  | -0.5~7.0                      | V    |
| DC Output Voltage     | $V_{OUT}$ | -0.5~7.0 (Note 1)             | V    |
|                       |           | -0.5~ $V_{CC} + 0.5$ (Note 2) |      |
| Input Diode Current   | $I_{IK}$  | -20                           | mA   |
| Output Diode Current  | $I_{OK}$  | ±20 (Note 3)                  | mA   |
| DC Output Current     | $I_{OUT}$ | ±25                           | mA   |
| DC Vcc/Ground Current | $I_{CC}$  | ±75                           | mA   |
| Power Dissipation     | $P_D$     | 180                           | mW   |
| Storage Temperature   | $T_{stg}$ | -65~150                       | °C   |

(Note 1) Output in Off-State

(Note 2) High or Low State.  $I_{OUT}$  absolute maximum rating must be observed.

(Note 3)  $V_{OUT} < GND, V_{OUT} > V_{CC}$

**RECOMMENDED OPERATING CONDITIONS**

| PARAMETER                | SYMBOL    | VALUE                | UNIT |
|--------------------------|-----------|----------------------|------|
| Supply Voltage           | $V_{CC}$  | 4.5~5.5              | V    |
| Input Voltage            | $V_{IN}$  | 0~5.5                | V    |
| Output Voltage           | $V_{OUT}$ | 0~5.5 (Note 4)       | V    |
|                          |           | 0~ $V_{CC}$ (Note 5) |      |
| Operating Temperature    | $T_{opr}$ | -40~85               | °C   |
| Input Rise and Fall Time | $dt/dV$   | 0~20                 | ns/V |

(Note 4) Output in Off-State

(Note 5) High or Low State

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## DC ELECTRICAL CHARACTERISTICS

| PARAMETER                            | SYMBOL           | CONDITON  |                         | Ta = 25°C           |      |      | Ta = -40~85°C |      | UNIT  |      |
|--------------------------------------|------------------|---|-------------------------|---------------------|------|------|---------------|------|-------|------|
|                                      |                  |   |                         | V <sub>CC</sub> (V) | MIN. | TYP. | MAX.          | MIN. |       | MAX. |
| High - Level Input Voltage           | V <sub>IH</sub>  |   |                         | 4.5~5.5             | 2.0  | —    | —             | 2.0  | —     | V    |
| Low - Level Input Voltage            | V <sub>IL</sub>  |   |                         | 4.5~5.5             | —    | —    | 0.8           | —    | 0.8   | V    |
| High - Level Output Voltage          | V <sub>OH</sub>  | V <sub>IN</sub> =<br>V <sub>IH</sub> or V <sub>IL</sub>   | I <sub>OH</sub> = -50μA | 4.5                 | 4.40 | 4.50 | —             | 4.40 | —     | V    |
|                                      |                  |   | I <sub>OH</sub> = -8mA  | 4.5                 | 3.94 | —    | —             | 3.80 | —     |      |
| Low - Level Output Voltage           | V <sub>OL</sub>  | V <sub>IN</sub> =<br>V <sub>IH</sub> or V <sub>IL</sub>   | I <sub>OL</sub> = 50μA  | 4.5                 | —    | 0.0  | 0.1           | —    | 0.1   | V    |
|                                      |                  |   | I <sub>OL</sub> = 8mA   | 4.5                 | —    | —    | 0.36          | —    | 0.44  |      |
| 3 - State Output Off - State Current | I <sub>OZ</sub>  | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>V <sub>OUT</sub> = V <sub>CC</sub> or GND |                         | 5.5                 | —    | —    | ±0.25         | —    | ±2.50 | μA   |
| Input Leakage Current                | I <sub>IN</sub>  | V <sub>IN</sub> = 5.5V or GND   |                         | 0~5.5               | —    | —    | ±0.1          | —    | ±1.0  |      |
| Quiescent Supply Current             | I <sub>CC</sub>  | V <sub>IN</sub> = V <sub>CC</sub> or GND  |                         | 5.5                 | —    | —    | 4.0           | —    | 40.0  | mA   |
|                                      | I <sub>CCT</sub> | PER INPUT : V <sub>IN</sub> = 3.4V<br>OTHER INPUT : V <sub>CC</sub> or GND                        |                         | 5.5                 | —    | —    | 1.35          | —    | 1.50  |      |
| Output Leakage Current               | I <sub>OPD</sub> | V <sub>OUT</sub> = 5.5V   |                         | 0                   | —    | —    | 0.5           | —    | 5.0   | μA   |

TIMING REQUIREMENTS ( Input t<sub>r</sub> = t<sub>f</sub> = 3ns )

| PARAMETER                | SYMBOL             | TEST CONDITION |  | Ta = 25°C           |       | Ta = -40~85°C | UNIT |       |
|--------------------------|--------------------|----------------|--|---------------------|-------|---------------|------|-------|
|                          |                    |                |  | V <sub>CC</sub> (V) | TYP . | LIMIT         |      | LIMIT |
| Minimum Pulse Width (LE) | t <sub>W</sub> (H) |                |  | 5.0 ± 0.5           | —     | 6.5           | 8.5  | ns    |
| Minimum Set - up Time    | t <sub>s</sub>     |                |  | 5.0 ± 0.5           | —     | 1.5           | 1.5  |       |
| Minimum Hold Time        | t <sub>h</sub>     |                |  | 5.0 ± 0.5           | —     | 3.5           | 3.5  |       |

**AC ELECTRICAL CHARACTERISTICS ( Input  $t_r = t_f = 3ns$  )**

| PARAMETER                     | SYMBOL                                 | TEST CONDITION        |         | Ta = 25°C |      |      | Ta = -40~85°C |      | UNIT |
|-------------------------------|--|-----------------------|---------|-----------|------|------|---------------|------|------|
|                               |  | V <sub>CC</sub> (V)   | CL (pF) | MIN.      | TYP. | MAX. | MIN.          | MAX. |      |
| Propagation Delay Time (LE-Q) | t <sub>pLH</sub><br>t <sub>pHL</sub>   | 5.0 ± 0.5             | 15      | —         | 7.7  | 12.3 | 1.0           | 13.5 | ns   |
|                               |  |                       | 50      | —         | 8.5  | 13.3 | 1.0           | 14.5 |      |
| Propagation Delay Time (D-Q)  | t <sub>pLH</sub><br>t <sub>pHL</sub>   | 5.0 ± 0.5             | 15      | —         | 5.1  | 8.5  | 1.0           | 9.5  |      |
|                               |  |                       | 50      | —         | 5.9  | 9.5  | 1.0           | 10.5 |      |
| 3-State Output Enable Time    | t <sub>pZL</sub><br>t <sub>pZH</sub>   | RL = 1kΩ<br>5.0 ± 0.5 | 15      | —         | 6.3  | 10.9 | 1.0           | 12.5 |      |
|                               |  |                       | 50      | —         | 7.1  | 11.9 | 1.0           | 13.5 |      |
| 3-State Output Disable Time   | t <sub>pLZ</sub><br>t <sub>pHZ</sub>   | RL = 1kΩ<br>5.0 ± 0.5 | 50      | —         | 8.8  | 11.2 | 1.0           | 12.0 |      |
| Output to Output Skew         | t <sub>osLH</sub><br>t <sub>osHL</sub> | (Note 6)<br>5.0 ± 0.5 | 50      | —         | —    | 1.0  | —             | 1.0  |      |
| Input Capacitance             | C <sub>IN</sub>                        |                       |         | —         | 4    | 10   | —             | 10   | pF   |
| Output Capacitance            | C <sub>OUT</sub>                       |                       |         | —         | 6    | —    | —             | —    |      |
| Power Dissipation Capacitance | C <sub>PD</sub>                        | (Note 7)              |         | —         | 25   | —    | —             | —    |      |

(Note 6) Parameter guaranteed by design.  $t_{osLH} = |t_{pLHm} - t_{pLHn}|$ ,  $t_{osHL} = |t_{pHLm} - t_{pHLn}|$

(Note 7) C<sub>PD</sub> 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 :

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

And the total C<sub>PD</sub> when n pcs. of Latch operate can be gained by the following equation :

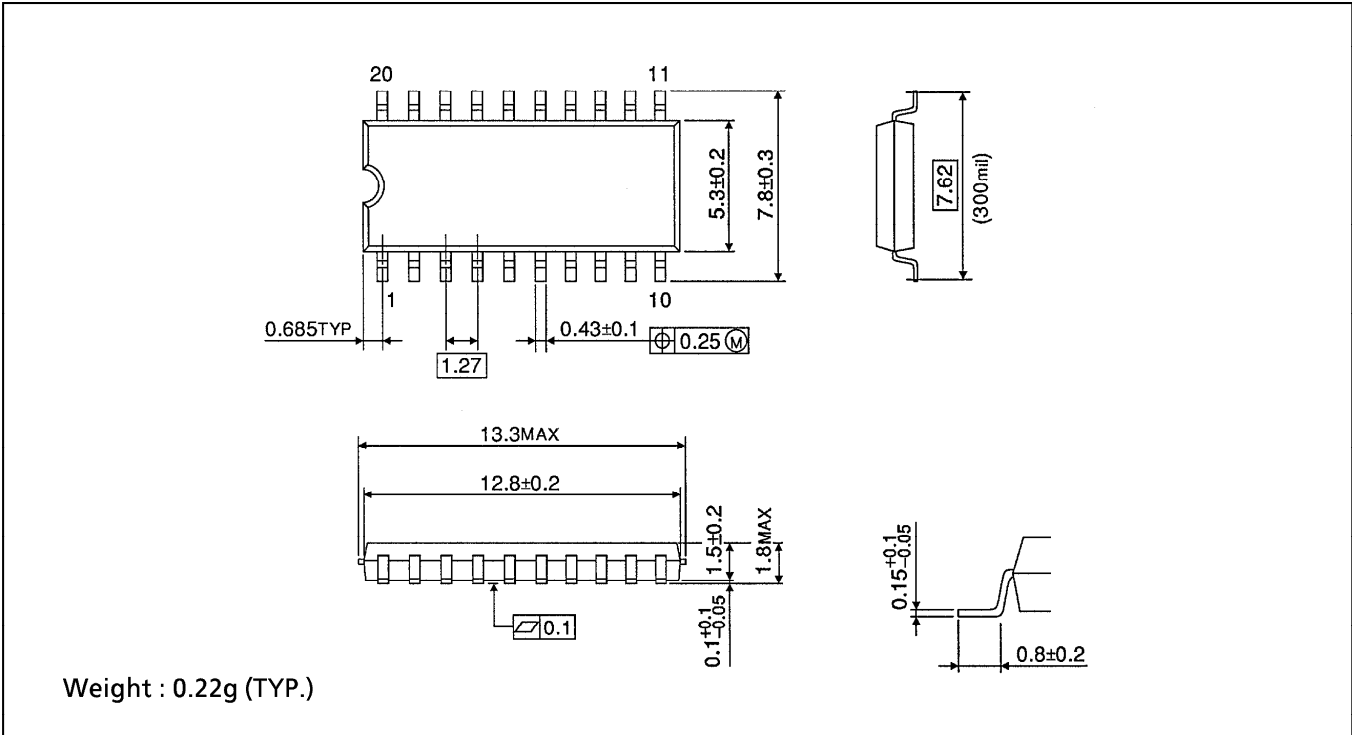
$$C_{PD} \text{ (total)} = 14 + 11 \cdot n$$

**NOISE CHARACTERISTICS ( Input  $t_r = t_f = 3ns$  )**

| PARAMETER                                    | SYMBOL           | TEST CONDITION        |     | Ta = 25°C |      | UNIT |
|--|------------------|-----------------------|-----|-----------|------|------|
|  |                  | V <sub>CC</sub> (V)   |     | TYP.      | MAX. |      |
| Quiet Output Maximum Dynamic V <sub>OL</sub> | V <sub>OLP</sub> | C <sub>L</sub> = 50pF | 5.0 | 1.2       | 1.6  | V    |
| Quiet Output Minimum Dynamic V <sub>OL</sub> | V <sub>OLV</sub> | C <sub>L</sub> = 50pF | 5.0 | -1.2      | -1.6 | V    |
| Minimum High Level Dynamic Input Voltage     | V <sub>IHD</sub> | C <sub>L</sub> = 50pF | 5.0 | —         | 2.0  | V    |
| Maximum Low Level Dynamic Input Voltage      | V <sub>ILD</sub> | C <sub>L</sub> = 50pF | 5.0 | —         | 0.8  | V    |

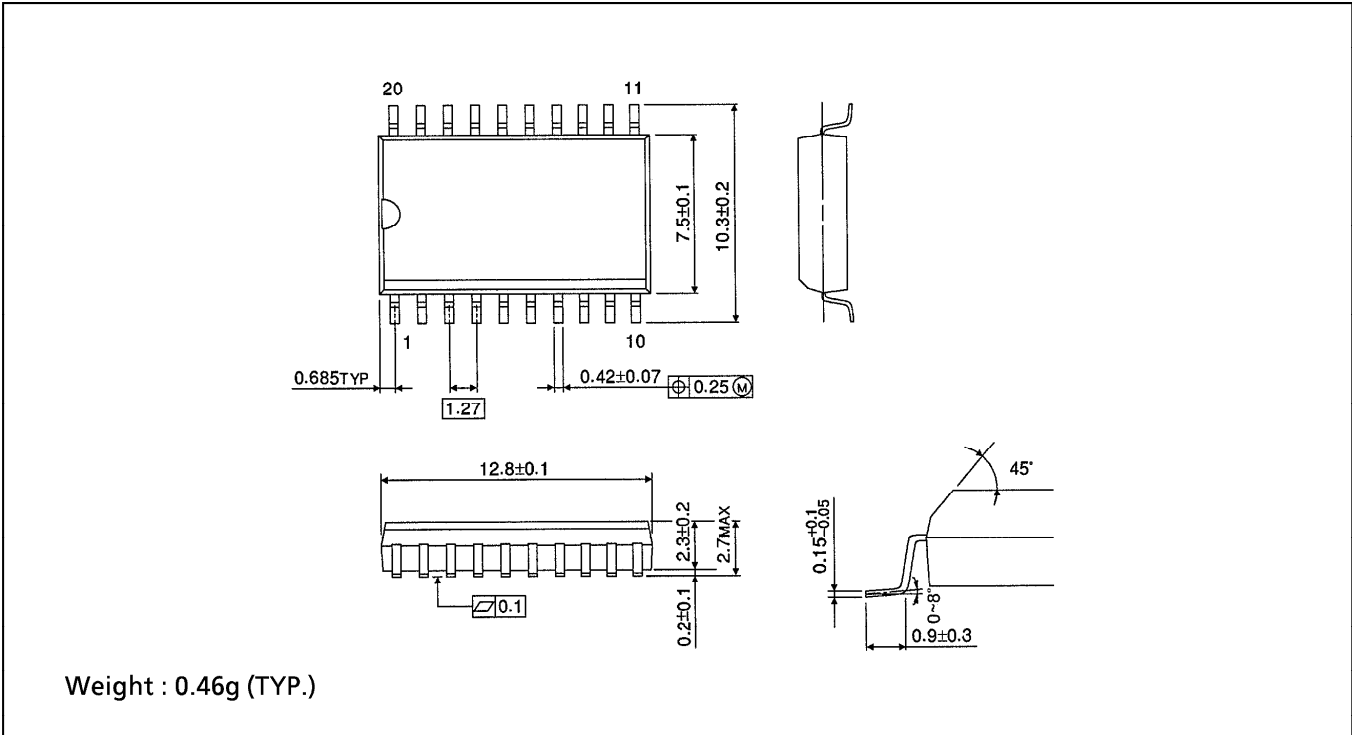
**SOP 20PIN (200mil BODY) OUTLINE DRAWING (SOP20-P-300-1.27)**

Unit in mm



**SOP 20PIN (300mil BODY) OUTLINE DRAWING (SOL20-P-300-1.27)**

Unit in mm



**TSSOP 20PIN OUTLINE DRAWING (TSSOP20-P-0044-0.65)**

Unit in mm

