

**TC74ACT273P, TC74ACT273F, TC74ACT273FW**

**OCTAL D-TYPE FLIP FLOP WITH CLEAR**

The TC74ACT273 is an advanced high speed CMOS OCTAL D-TYPE FLIP FLOP fabricated with silicon gate and double-layer metal wiring 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 device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.

Information signals applied to D inputs are transferred to the Q outputs on the positive going edge of the clock pulse.

When the CLR input is held "L", the Q outputs are at a low logic level independent of the other inputs.

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

**FEATURES :**

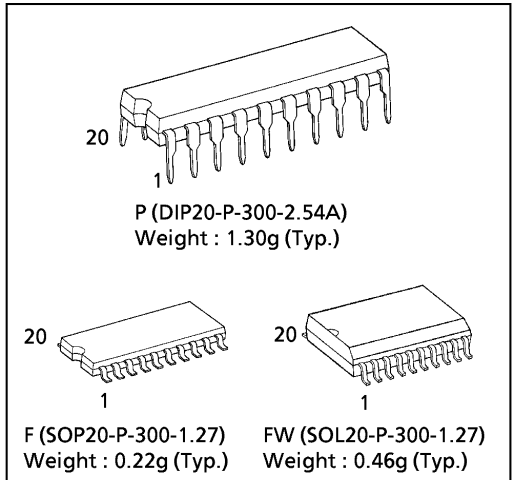
- High Speed.....  $f_{MAX} = 170\text{MHz}(\text{typ.})$   
at  $V_{CC} = 5\text{V}$
- Low Power Dissipation.....  $I_{CC} = 8\mu\text{A}(\text{Max.})$  at  $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs...  $V_{IL} = 0.8\text{V}(\text{Max.})$   
 $V_{IH} = 2.0\text{V}(\text{Min.})$
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 24\text{mA}(\text{Min.})$   
Capability of driving  $50\Omega$  transmission lines.
- Balanced Propagation Delays...  $t_{pLH} \approx t_{pHL}$
- Pin and Function Compatible with 74F273

**TRUTH TABLE**

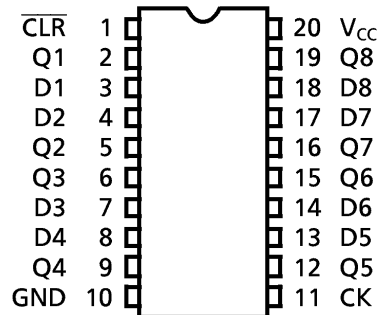
| INPUTS |   |    | OUTPUTS        | FUNCTION  |
|--------|---|----|----------------|-----------|
| CLR    | D | CK | Q              |           |
| L      | X | X  | L              | CLEAR     |
| H      | L |    | L              | —         |
| H      | H |    | H              | —         |
| H      | X |    | Q <sub>n</sub> | NO CHANGE |

X : Don't care

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

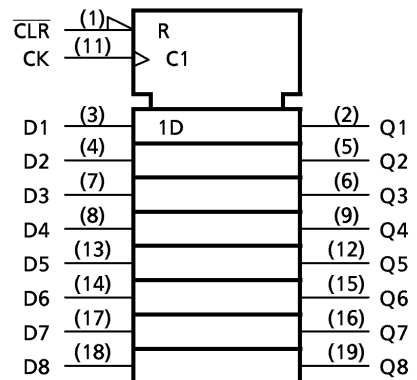


**PIN ASSIGNMENT**



(TOP VIEW)

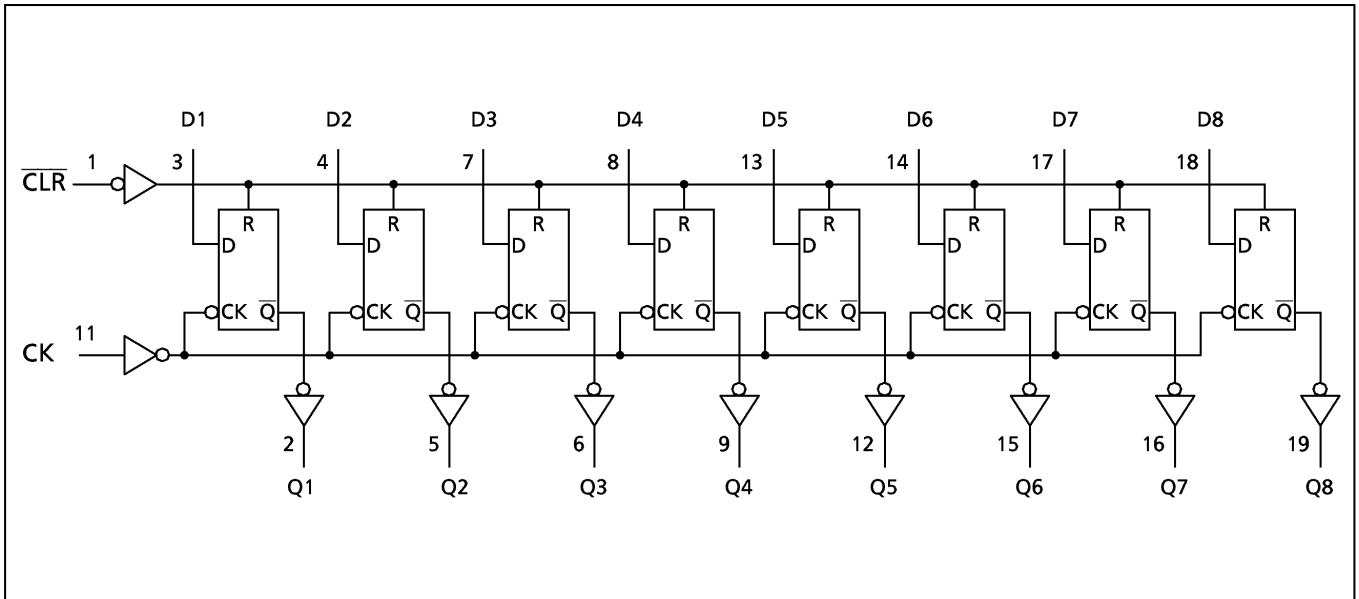
**IEC LOGIC SYMBOL**



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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~ $V_{CC} + 0.5$   | V    |
| DC Output Voltage           | $V_{OUT}$ | -0.5~ $V_{CC} + 0.5$   | V    |
| Input Diode Current         | $I_{IK}$  | ± 20                   | mA   |
| Output Diode Current        | $I_{OK}$  | ± 50                   | mA   |
| DC Output Current           | $I_{OUT}$ | ± 50                   | mA   |
| DC $V_{CC}$ /Ground Current | $I_{CC}$  | ± 200                  | mA   |
| Power Dissipation           | $P_D$     | 500 (DIP)* / 180 (SOP) | mW   |
| Storage Temperature         | $T_{stg}$ | -65~150                | °C   |

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

RECOMMENDED OPERATING CONDITIONS

| PARAMETER                | SYMBOL    | VALUE       | UNIT   |
|--------------------------|-----------|-------------|--------|
| Supply Voltage           | $V_{CC}$  | 4.5~5.5     | V      |
| Input Voltage            | $V_{IN}$  | 0~ $V_{CC}$ | V      |
| Output Voltage           | $V_{OUT}$ | 0~ $V_{CC}$ | V      |
| Operating Temperature    | $T_{opr}$ | -40~85      | °C     |
| Input Rise and Fall Time | $dt / dV$ | 0~10        | ns / V |

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## DC ELECTRICAL CHARACTERISTICS

| PARAMETER                   | SYMBOL          | TEST CONDITION                                                             | V <sub>CC</sub><br>(V)   | Ta = 25°C |      |      | Ta = -40~85°C |      | UNIT |   |
|-----------------------------|-----------------|----------------------------------------------------------------------------|--------------------------|-----------|------|------|---------------|------|------|---|
|                             |                 |                                                                            |                          | MIN.      | TYP. | MAX. | MIN.          | MAX. |      |   |
| High - Level Input Voltage  | V <sub>IH</sub> |                                                                            | 4.5<br>}<br>5.5          | 2.0       | —    | —    | 2.0           | —    | V    |   |
| Low - Level Input Voltage   | V <sub>IL</sub> |                                                                            | 4.5<br>}<br>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       | 4.4  | 4.5  | —             | 4.4  | —    | V |
|                             |                 |                                                                            | I <sub>OH</sub> = -24mA  | 4.5       | 3.94 | —    | —             | 3.80 | —    |   |
|                             |                 |                                                                            | I <sub>OH</sub> = -75mA* | 5.5       | —    | —    | —             | 3.85 | —    |   |
| 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> = 24mA   | 4.5       | —    | —    | 0.36          | —    | 0.44 |   |
|                             |                 |                                                                            | I <sub>OL</sub> = 75mA*  | 5.5       | —    | —    | —             | —    | 1.65 |   |
| Input Leakage Current       | I <sub>IN</sub> | V <sub>IN</sub> = V <sub>CC</sub> or GND                                   | 5.5                      | —         | —    | ±0.1 | —             | ±1.0 | μA   |   |
| Quiescent Supply Current    | I <sub>CC</sub> | V <sub>IN</sub> = V <sub>CC</sub> or GND                                   | 5.5                      | —         | —    | 8.0  | —             | 80.0 |      |   |
|                             | I <sub>C</sub>  | PER INPUT : V <sub>IN</sub> = 3.4V<br>OTHER INPUT : V <sub>CC</sub> or GND | 5.5                      | —         | —    | 1.35 | —             | 1.5  | mA   |   |

\* : This spec indicates the capability of driving 50Ω transmission lines.

One output should be tested at a time for a 10ms maximum duration.

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

| PARAMETER                     | SYMBOL            | TEST CONDITION | V <sub>CC</sub> (V) | Ta = 25°C | Ta = -40~85°C | UNIT |
|-------------------------------|-------------------|----------------|---------------------|-----------|---------------|------|
|                               |                   |                |                     | LIMIT     | LIMIT         |      |
| Minimum Pulse Width<br>(CK)   | t <sub>W(L)</sub> |                | 5.0 ± 0.5           | 5.0       | 5.0           | ns   |
|                               | t <sub>W(H)</sub> |                |                     |           |               |      |
| Minimum Pulse Width<br>(CLR)  | t <sub>W(L)</sub> |                | 5.0 ± 0.5           | 5.0       | 5.0           |      |
| Minimum Set - up Time         | t <sub>s</sub>    |                | 5.0 ± 0.5           | 3.5       | 3.5           |      |
| Minimum Hold Time             | t <sub>h</sub>    |                | 5.0 ± 0.5           | 1.5       | 1.5           |      |
| Minimum Removal Time<br>(CLR) | t <sub>rem</sub>  |                | 5.0 ± 0.5           | 3.0       | 3.0           |      |

AC ELECTRICAL CHARACTERISTICS (  $C_L = 50\text{pF}$ ,  $R_L = 500\ \Omega$ , Input  $t_r = t_f = 3\text{ns}$  )

| PARAMETER                                               | SYMBOL                 | TEST CONDITION | Ta = 25°C           |      |      | Ta = -40~85°C |      | UNIT |      |
|---------------------------------------------------------|------------------------|----------------|---------------------|------|------|---------------|------|------|------|
|                                                         |                        |                | V <sub>CC</sub> (V) | MIN. | TYP. | MAX.          | MIN. |      | MAX. |
| Propagation Delay Time<br>(CK-Q)                        | $t_{pLH}$<br>$t_{pHL}$ |                | 5.0 ± 0.5           | —    | 6.6  | 10.5          | 1.0  | 12.0 | ns   |
| Propagation Delay Time<br>( $\overline{\text{CLR}}$ -Q) | $t_{pHL}$              |                | 5.0 ± 0.5           | —    | 7.4  | 10.8          | 1.0  | 12.3 |      |
| Maximum<br>Clock Frequency                              | f <sub>MAX</sub>       |                | 5.0 ± 0.5           | 80   | 150  | —             | 80   | —    | MHz  |
| Input Capacitance                                       | C <sub>IN</sub>        |                |                     | —    | 5    | 10            | —    | 10   | pF   |
| Power Dissipation Capacitance                           | C <sub>PD</sub> (1)    |                |                     | —    | 34   | —             | —    | —    |      |

Note (1) 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 :

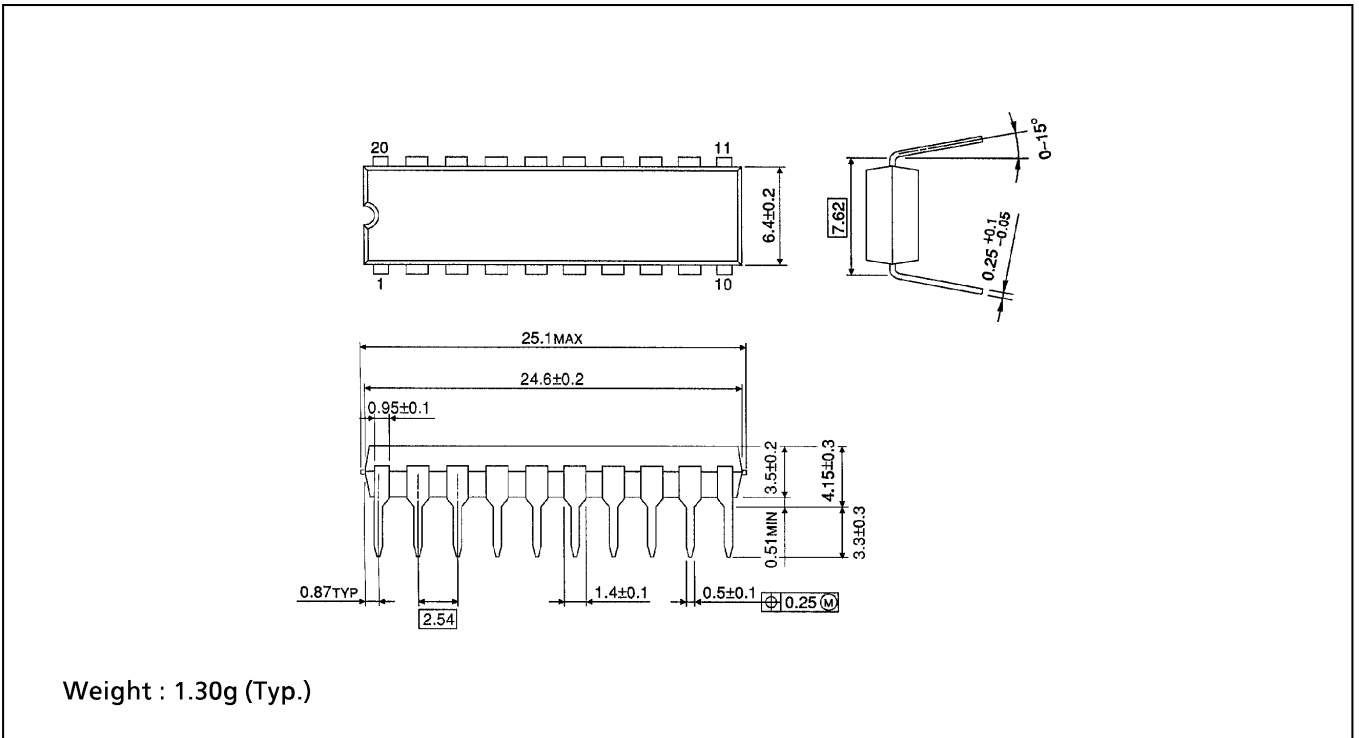
$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 8 \text{ (per F/F)}$$

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

$$C_{PD}(\text{total}) = 23 + 11 \cdot n$$

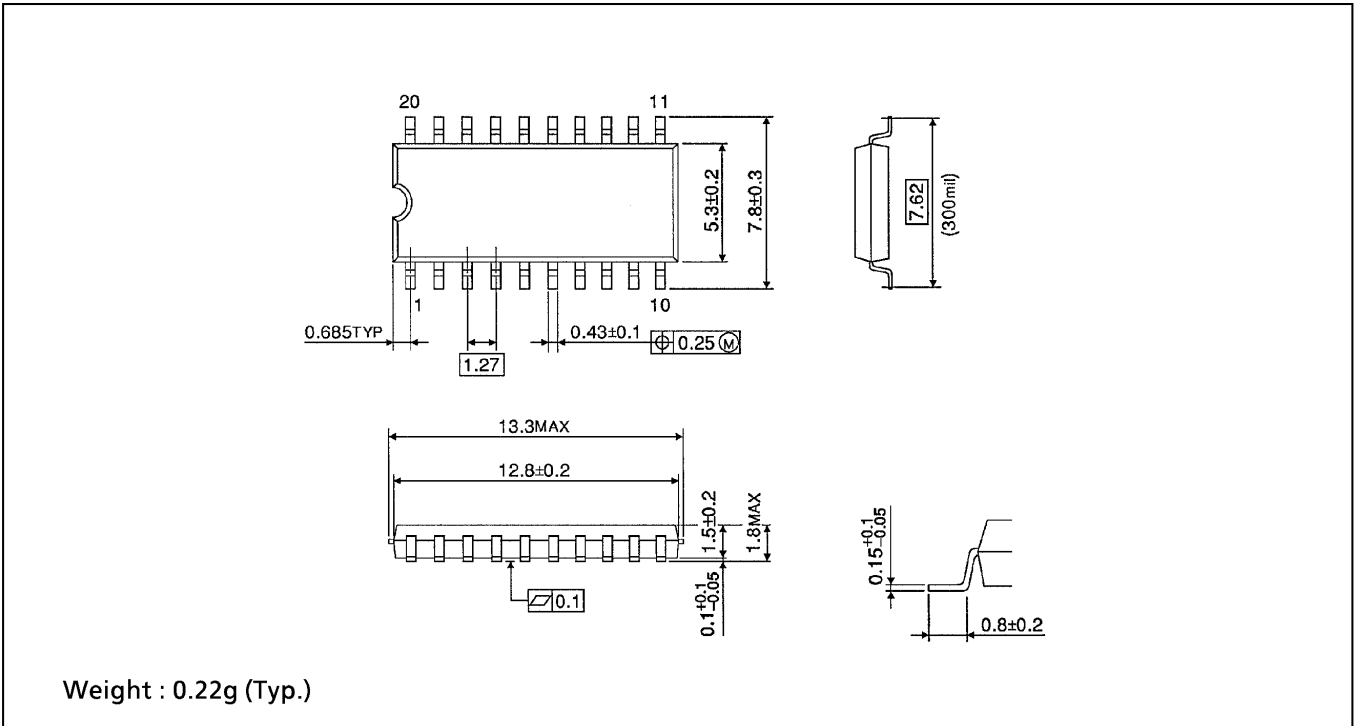
DIP 20PIN OUTLINE DRAWING (DIP20-P-300-2.54A)

Unit in mm



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

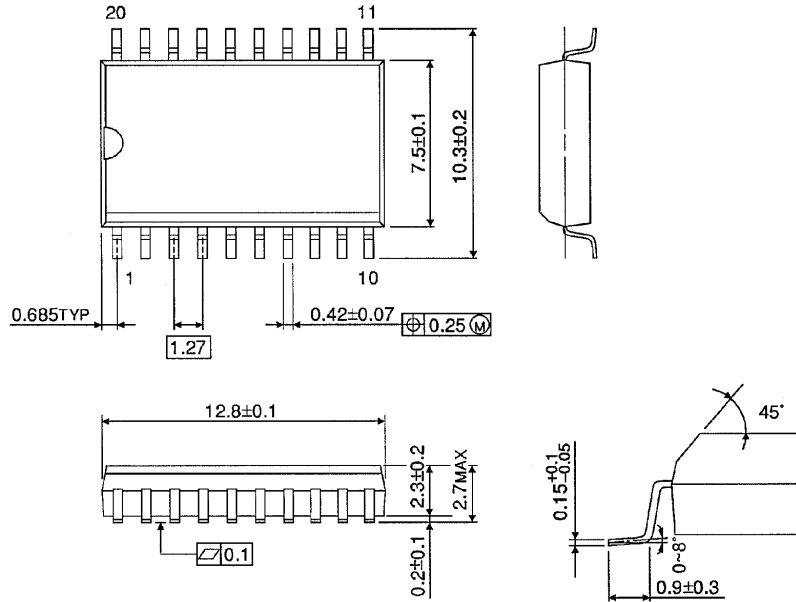
Unit in mm



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

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)