

# **TC74ACT574P, TC74ACT574F, TC74ACT574FW, TC74ACT574FT**

## **OCTAL D - TYPE FLIP - FLOP WITH 3 - STATE OUTPUT**

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

The TC74ACT574 is an advanced high speed CMOS OCTAL 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.

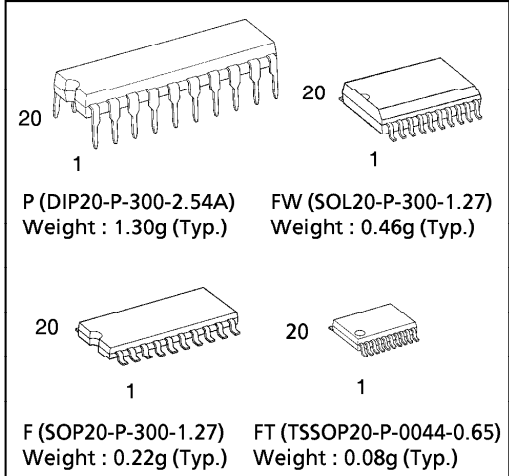
These 8-bit D-type flip-flops are controlled by a clock input (CK) and a output enable input ( $\overline{OE}$ ).

When the  $\overline{OE}$  input is high, the eight outputs are in a high impedance state.

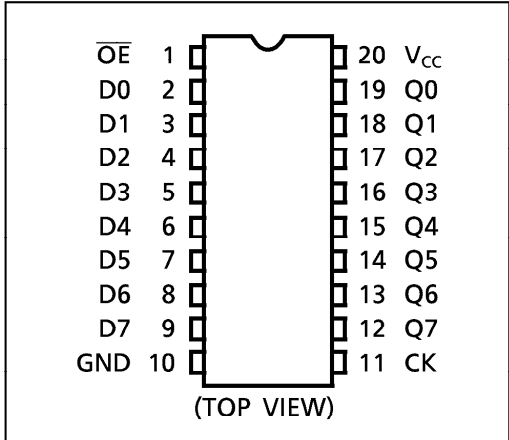
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

### **FEATURES:**

- High Speed..... $f_{MAX} = 180\text{MHz}$  (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 74F574



### **PIN ASSIGNMENT**

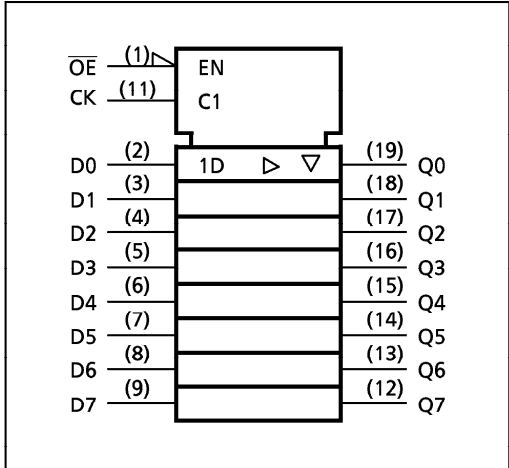


### **TRUTH TABLE**

| INPUTS          |    |   | OUTPUTS        |
|-----------------|----|---|----------------|
| $\overline{OE}$ | CK | D | Q              |
| H               | X  | X | Z              |
| L               |    | X | Q <sub>n</sub> |
| L               |    | L | L              |
| L               |    | H | H              |

X : Don't Care  
Z : High Impedance  
Q<sub>n</sub> : No Change

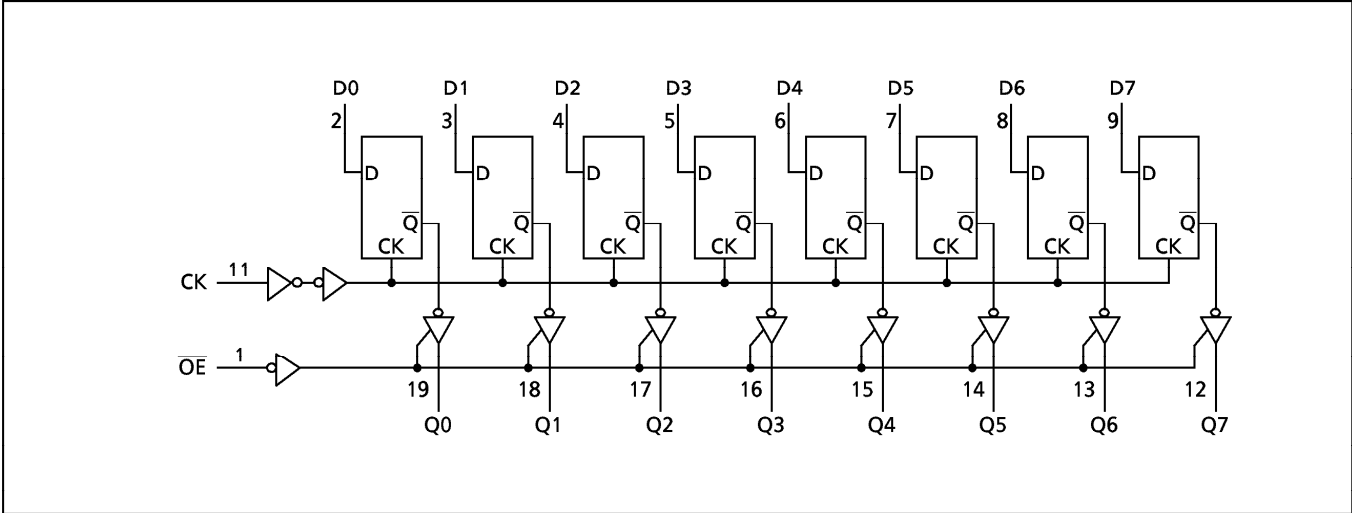
### **IEC LOGIC SYMBOL**



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SYSTEM DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| PARAMETER                   | SYMBOL    | VALUE                       | UNIT        |
|-----------------------------|-----------|-----------------------------|-------------|
| Supply Voltage Range        | $V_{CC}$  | $-0.5 \sim 7.0$             | 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        | $I_{OK}$  | $\pm 50$                    | mA          |
| DC Output Current           | $I_{OUT}$ | $\pm 50$                    | mA          |
| DC $V_{CC}$ /Ground Current | $I_{CC}$  | $\pm 200$                   | mA          |
| Power Dissipation           | $P_D$     | 500 (DIP)*/ 180 (SOP/TSSOP) | mW          |
| Storage Temperature         | $T_{stg}$ | $-65 \sim 150$              | $^{\circ}C$ |

\*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           | $V_{CC}$  | $4.5 \sim 5.5$  | V           |
| Input Voltage            | $V_{IN}$  | $0 \sim V_{CC}$ | V           |
| Output Voltage           | $V_{OUT}$ | $0 \sim V_{CC}$ | V           |
| Operating Temperature    | $T_{opr}$ | $-40 \sim 85$   | $^{\circ}C$ |
| Input Rise and Fall Time | $dt / dV$ | $0 \sim 10$     | 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<br>I <sub>OH</sub> = -24mA<br>I <sub>OH</sub> = -75mA* | 4.5<br>4.5<br>5.5      | 4.4<br>3.94<br>— | 4.5<br>—<br>— | —<br>—<br>—      | 4.4<br>3.80<br>3.85 | —<br>—<br>—         | V    |
| 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<br>I <sub>OL</sub> = 24mA<br>I <sub>OL</sub> = 75mA*    | 4.5<br>4.5<br>5.5      | —<br>—<br>—      | 0.0<br>—<br>— | 0.1<br>0.36<br>— | —<br>—<br>—         | 0.1<br>0.44<br>1.65 | V    |
| 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                    | —                | —             | ± 0.5            | —                   | ± 5.0               | μA   |
| Input Leakage Current                | I <sub>IN</sub> | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                          |                                                                                | 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                    | —                | —             | 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 |           | Ta = 25°C | Ta = -40~85°C | UNIT |
|----------------------------|------------------------------------------|----------------|-----------|-----------|---------------|------|
|                            |                                          |                |           | LIMIT     | LIMIT         |      |
| Minimum Pulse Width ( CK ) | t <sub>W</sub> (H)<br>t <sub>W</sub> (L) |                | 5.0 ± 0.5 | 5.0       | 5.0           | ns   |
| Minimum Set - up Time      | t <sub>s</sub>                           |                | 5.0 ± 0.5 | 3.0       | 3.0           |      |
| Minimum Hold Time          | t <sub>h</sub>                           |                | 5.0 ± 0.5 | 2.0       | 2.0           |      |

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 <sub>pLH</sub><br>t <sub>pHL</sub> |                | 5.0 ± 0.5           | —         | 6.2  | 10.1 | 1.0            | 11.5 | ns   |
| Output Enable Time                 | t <sub>pZL</sub><br>t <sub>pZH</sub> |                | 5.0 ± 0.5           | —         | 6.3  | 10.5 | 1.0            | 12.0 |      |
| Output Disable Time                | t <sub>pLZ</sub><br>t <sub>pHZ</sub> |                | 5.0 ± 0.5           | —         | 6.6  | 9.6  | 1.0            | 11.0 |      |
| Maximum<br>Clock Frequency         | f <sub>MAX</sub>                     |                | 5.0 ± 0.5           | 85        | 160  | —    | 85             | —    | MHz  |
| Input Capacitance                  | C <sub>IN</sub>                      |                |                     | —         | 5    | 10   | —              | 10   | pF   |
| Output Capacitance                 | C <sub>OUT</sub>                     |                |                     | —         | 10   | —    | —              | —    |      |
| Power Dissipation Capacitance      | C <sub>PD</sub> (1)                  |                |                     | —         | 33   | —    | —              | —    |      |

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 :

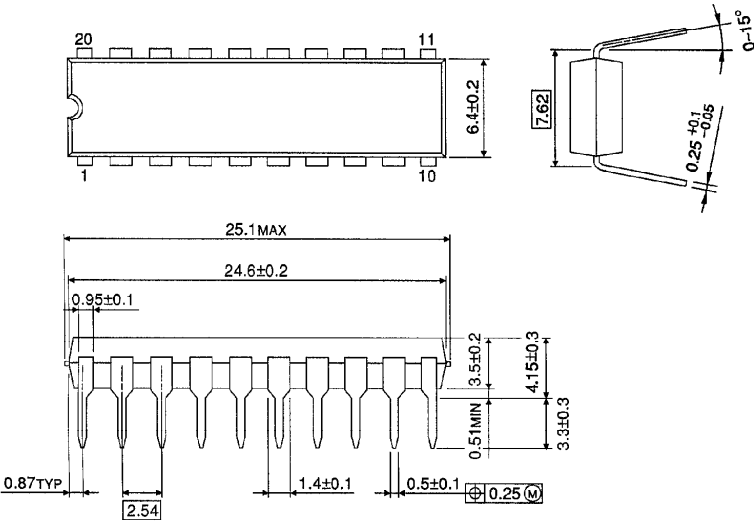
$$I_{\text{CC}}(\text{opr.}) = C_{\text{PD}} \cdot V_{\text{CC}} \cdot f_{\text{IN}} + I_{\text{CC}}/8 \text{ (per F/F)}$$

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

$$C_{\text{PD}}(\text{total}) = 21 + 12 \cdot n$$

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

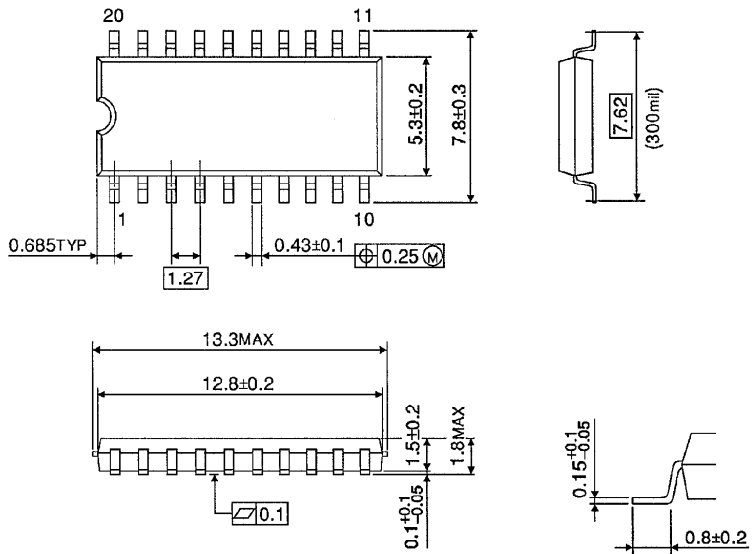
Unit in mm



Weight : 1.30g (Typ.)

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

Unit in mm

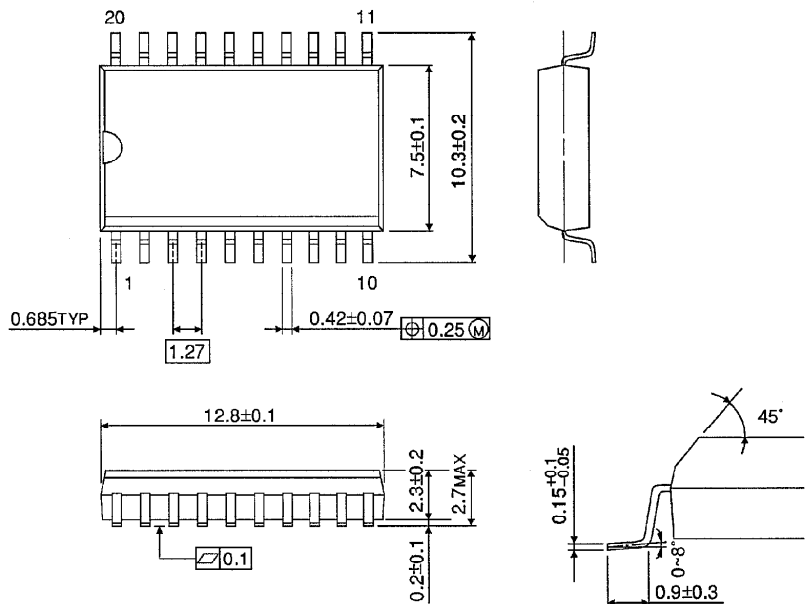


Weight : 0.22g (Typ.)

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

Unit in mm

(Note) This package is not available in Japan.



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

Unit in mm

