

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC74AC574P, TC74AC574F, TC74AC574FW, TC74AC574FT**

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

The TC74AC574 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.

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

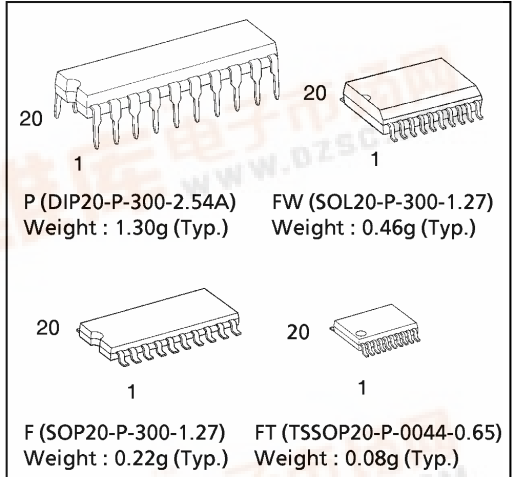
When the OE input is high, the eight outputs are in a high impedance state.

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

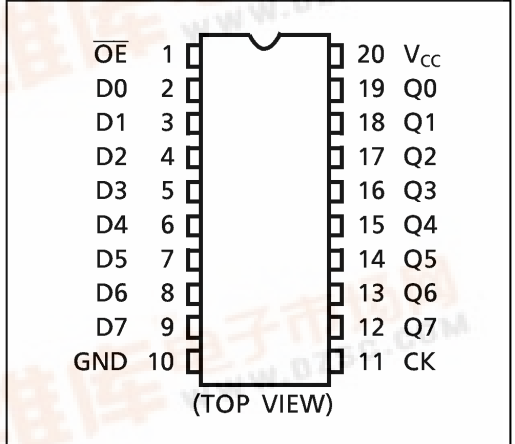
**FEATURES :**

- High Speed.....  $f_{MAX} = 180\text{MHz}(\text{typ.})$   
at  $V_{CC} = 5\text{V}$
- Low Power Dissipation.....  $I_{CC} = 8\mu\text{A}(\text{Max.})$  at  $T_a = 25^\circ\text{C}$
- High Noise Immunity.....  $V_{NIH} = V_{NIL} = 28\% V_{CC} (\text{Min.})$
- Symmetrical Output Impedance...  $|I_{OH}| = |I_{OL}| = 24\text{mA}(\text{Min.})$   
Capability of driving 50Ω transmission lines.
- Balanced Propagation Delays.....  $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range...  $V_{CC} (\text{opr}) = 2\text{V} \sim 5.5\text{V}$
- Pin and Function Compatible with 74F574

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



**PIN ASSIGNMENT**

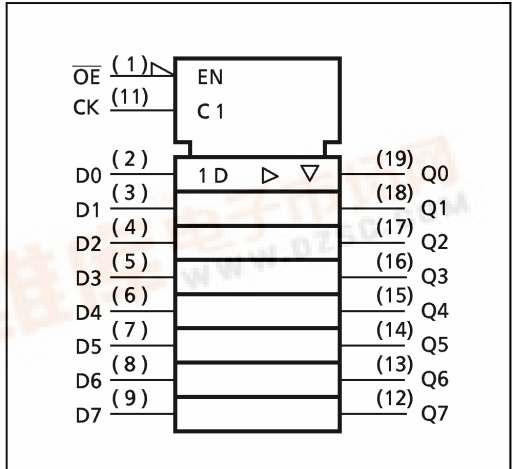


**TRUTH TABLE**

INPUTS			OUTPUTS
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**

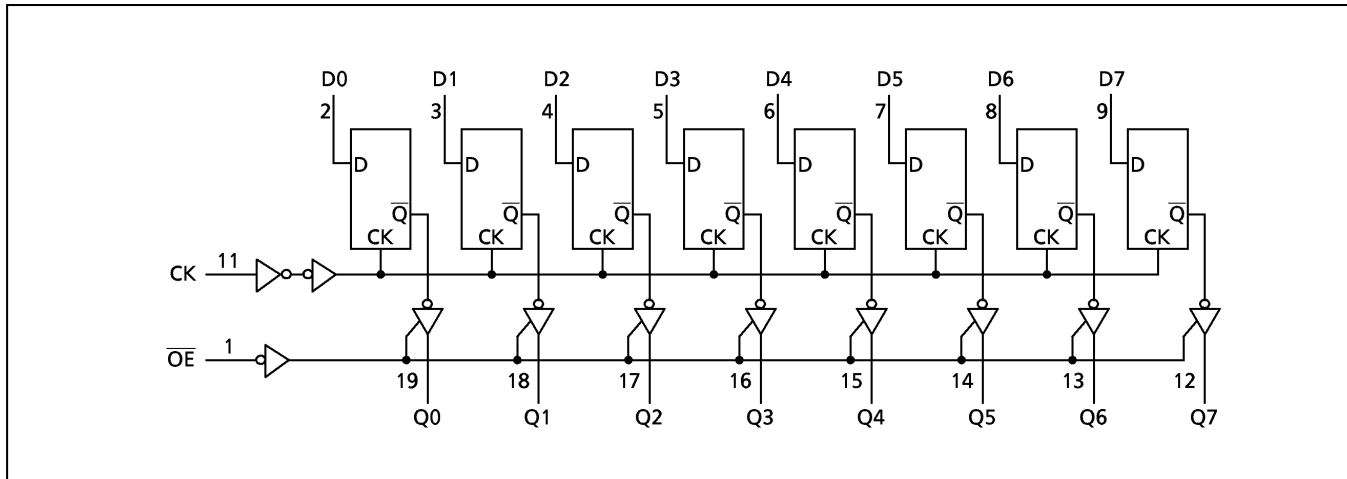


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**SYSTEM DIAGRAM**



**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7.0	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	$I_{IK}$	$\pm 20$	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	$T_{stg}$	-65~150	$^{\circ}C$

\*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	$V_{CC}$	2.0~5.5	V
Input Voltage	$V_{IN}$	0~ $V_{CC}$	V
Output Voltage	$V_{OUT}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40~85	$^{\circ}C$
Input Rise and Fall Time	$dt/dV$	0~100 ( $V_{CC} = 3.3 \pm 0.3V$ ) 0~20 ( $V_{CC} = 5 \pm 0.5V$ )	ns/V

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**DC ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	TEST CONDITION		V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	V <sub>IH</sub>			2.0 3.0 5.5	1.50 2.10 3.85	— — —	— — —	1.50 2.10 3.85	— — —	V
Low - Level Input Voltage	V <sub>IL</sub>			2.0 3.0 5.5	— — —	— — —	0.50 0.90 1.65	— — —	0.50 0.90 1.65	V
High - Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -50μA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5	— — —	1.9 2.9 4.4	— — —	V
			I <sub>OH</sub> = -4mA	3.0	2.58	—	—	2.48	—	
			I <sub>OH</sub> = -24mA	4.5	3.94	—	—	3.80	—	
Low - Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 50μA	2.0 3.0 4.5	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			I <sub>OL</sub> = 12mA	3.0	—	—	0.36	—	0.44	
			I <sub>OL</sub> = 24mA	4.5	—	—	0.36	—	0.44	
I <sub>OL</sub> = 75mA*	5.5	—	—	—	—	—	1.65			
3 - State Output Off - State Current	I <sub>OZ</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> 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	

\* : 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 (CK)	t <sub>W</sub> (H)		3.3 ± 0.3	7.0	7.0	ns
	t <sub>W</sub> (L)		5.0 ± 0.5	5.0	5.0	
Minimum Set - up Time	t <sub>s</sub>		3.3 ± 0.3	9.0	9.0	
			5.0 ± 0.5	4.5	4.5	
Minimum Hold Time	t <sub>h</sub>		3.3 ± 0.3	1.0	1.0	
			5.0 ± 0.5	1.0	1.0	

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 (CK-Q)	t <sub>pLH</sub> t <sub>pHL</sub>		3.3 ± 0.3	—	9.8	16.7	1.0	19.0	ns
			5.0 ± 0.5	—	6.1	9.2	1.0	10.5	
Output Enable Time	t <sub>pZL</sub> t <sub>pZH</sub>		3.3 ± 0.3	—	9.2	15.8	1.0	18.0	
			5.0 ± 0.5	—	6.1	9.3	1.0	10.6	
Output Disable Time	t <sub>pLZ</sub> t <sub>pHZ</sub>		3.3 ± 0.3	—	6.6	11.0	1.0	12.5	
			5.0 ± 0.5	—	5.8	8.8	1.0	10.0	
Maximum Clock Frequency	f <sub>MAX</sub>		3.3 ± 0.3	50	100	—	50	—	MHz
			5.0 ± 0.5	95	160	—	95	—	
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)			—	36	—	—	—	

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 :

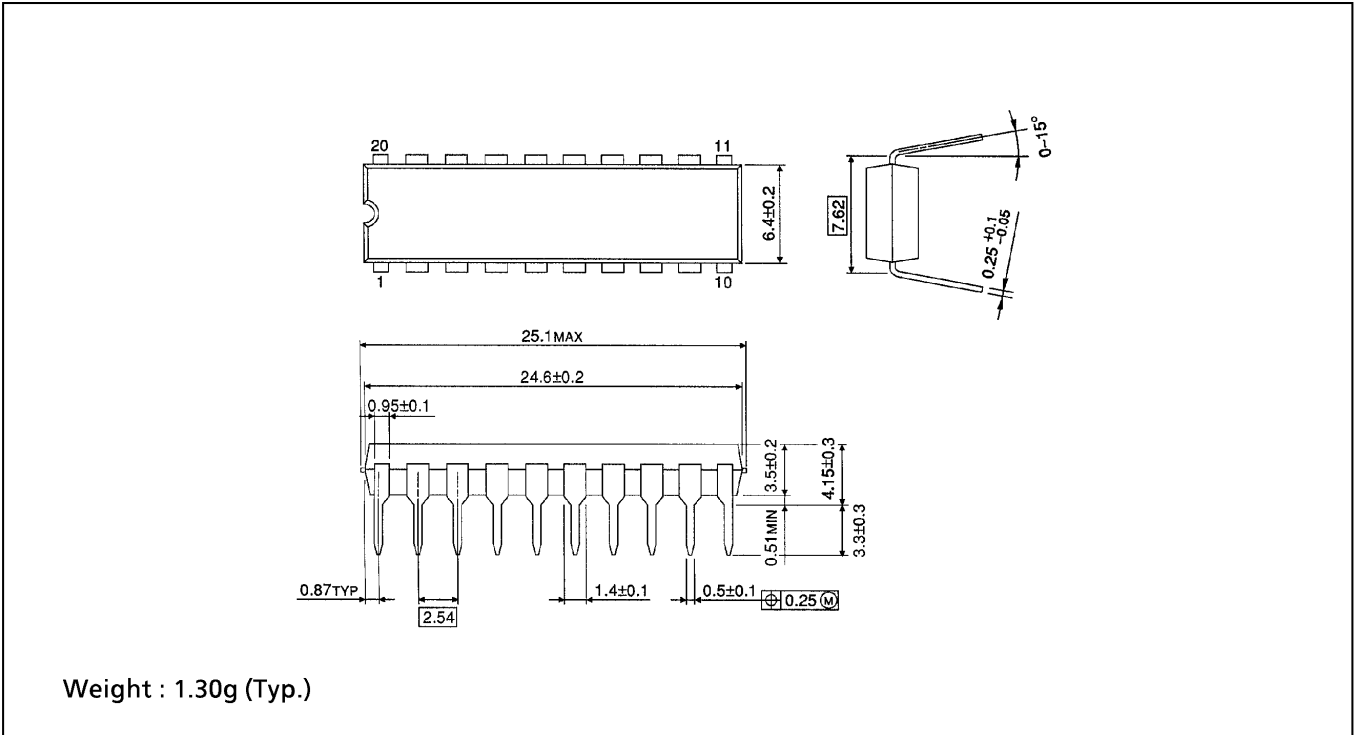
$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ ( per F/F )}$$

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

$$C_{PD}(\text{total}) = 26 + 10 \cdot n$$

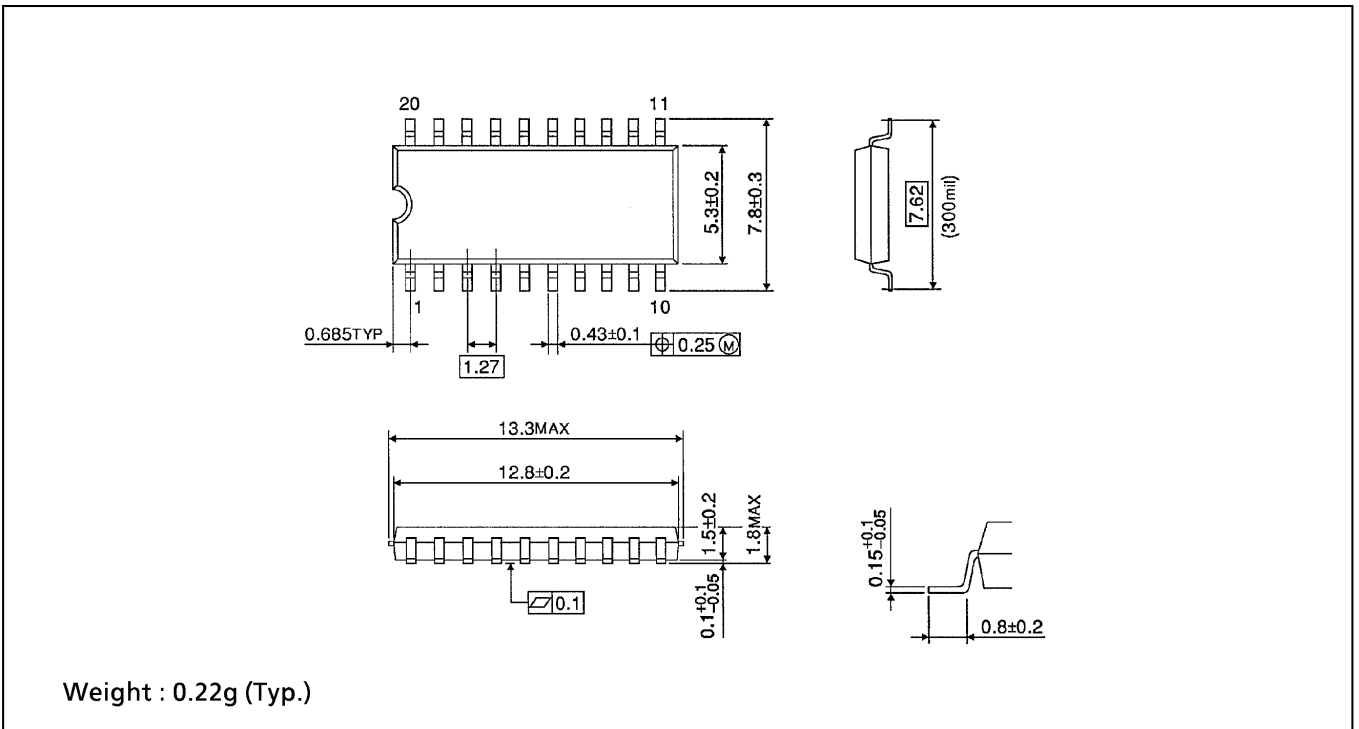
**DIP 20PIN OUTLINE DRAWING (DIP20-P-300-2.54A)**

Unit in mm



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

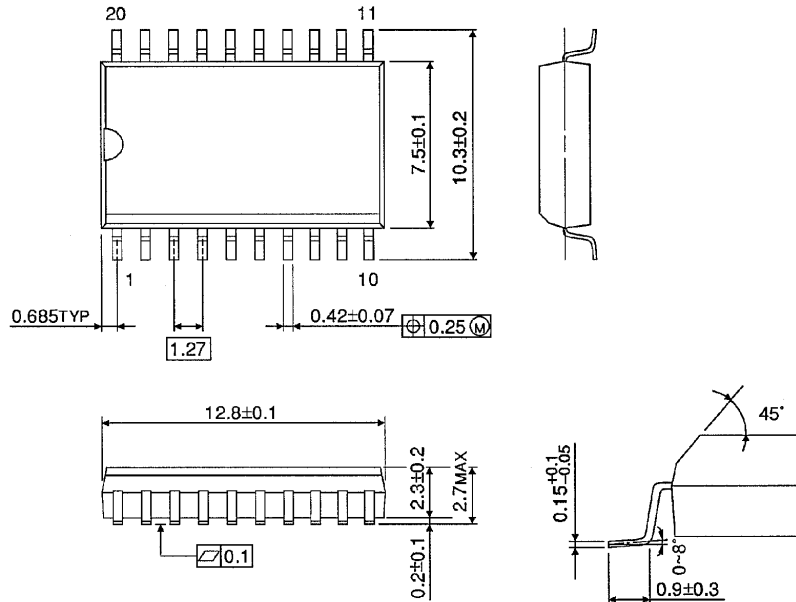
Unit in mm



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

Unit in mm

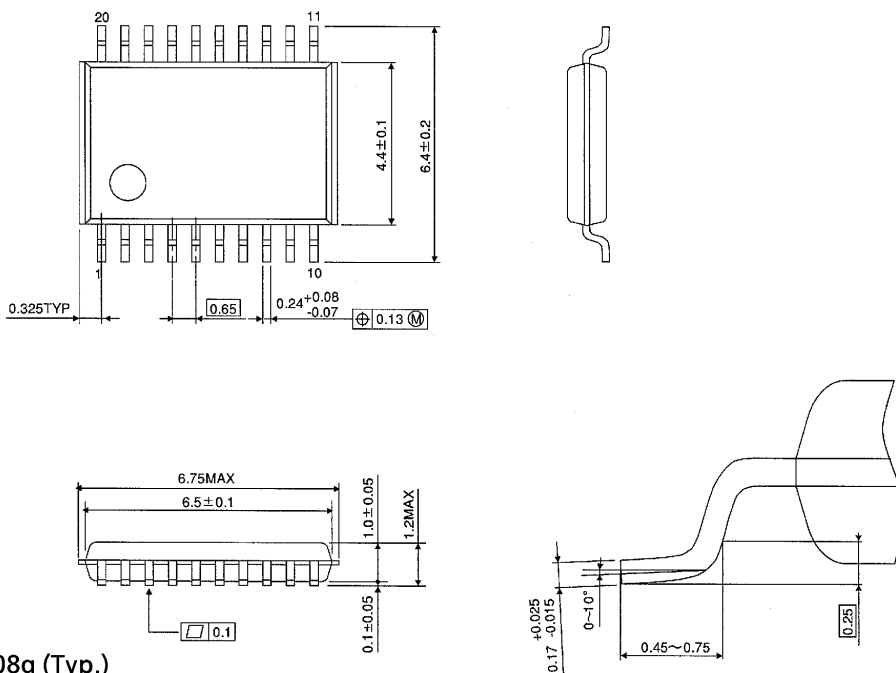
(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)

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

Unit in mm



Weight : 0.08g (Typ.)