

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC74AC374P, TC74AC374F, TC74AC374FW, TC74AC374FT**  
**TC74AC534P, TC74AC534F, TC74AC534FW**

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

**TC74AC374P/F/FW/FT NON - INVERTING**  
**TC74AC534P/F/FW INVERTING**

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

The TC74AC374 and TC74AC534 are advanced high speed CMOS OCTAL FLIP - FLOPS fabricated with silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

They achieve 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 an output enable input ( $\overline{OE}$ ).

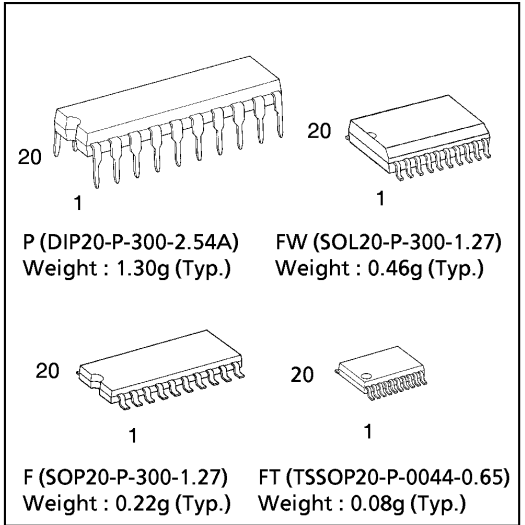
When the  $\overline{OE}$  input is high, the eight outputs are in a high impedance state.

The TC74AC374 has non-inverting outputs, and TC74AC534 has inverting outputs.

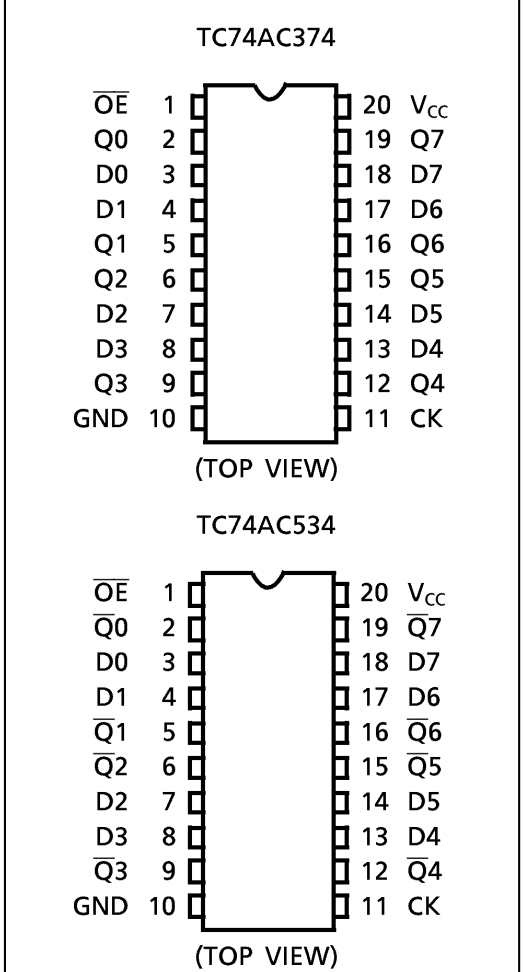
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

**FEATURES :**

- High Speed..... $f_{MAX} = 200\text{MHz}(\text{typ.})$  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  $50\Omega$  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 74F 374/534



**PIN ASSIGNMENT**

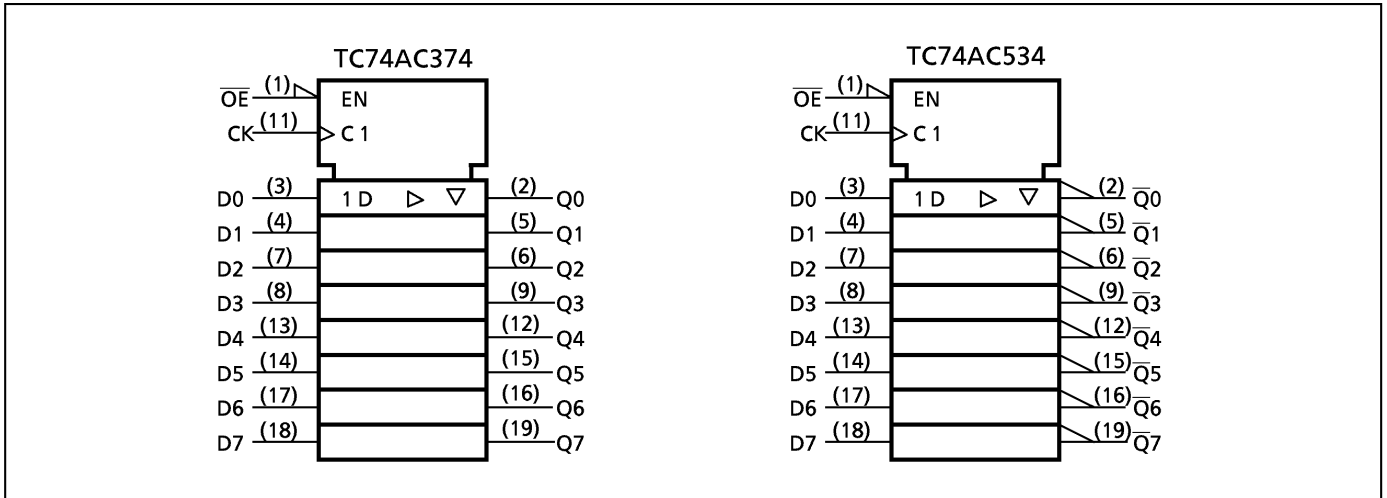


**TRUTH TABLE**

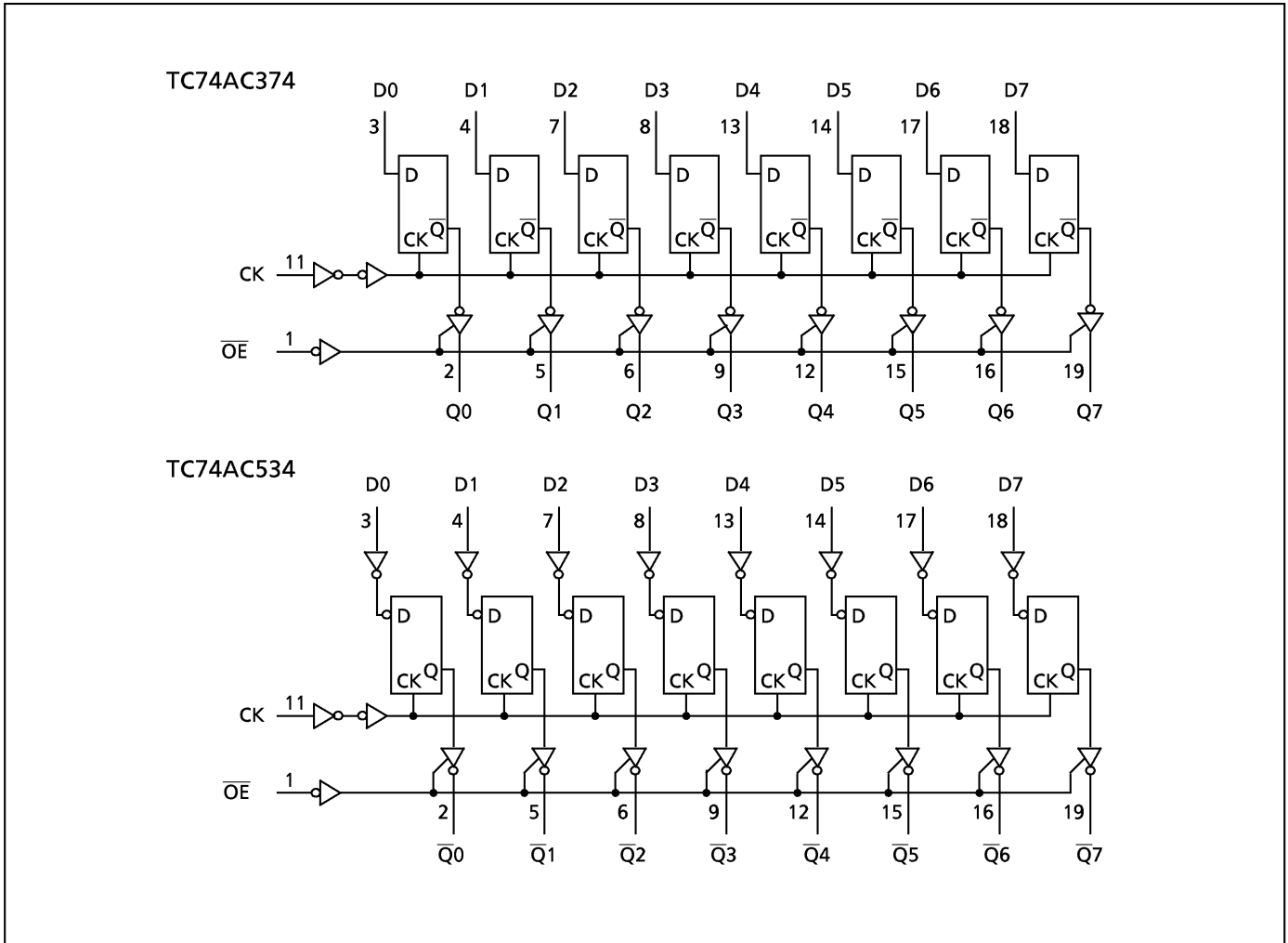
INPUTS			OUTPUTS	
$\overline{OE}$	CK	D	Q(374)	$\overline{Q}$ (534)
H	X	X	Z	Z
L		X	$Q_n$	$\overline{Q}_n$
L		L	L	H
L		H	H	L

X : Don't Care  
 Z : High Impedance  
 $Q_n(\overline{Q}_n)$  : No Change

**IEC LOGIC SYMBOL**



**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/TSSOP)	mW
Storage Temperature	$T_{stg}$	-65~150	°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  $-10\text{mW}/^{\circ}\text{C}$  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	°C
Input Rise and Fall Time	dt / dV	0~ 100 ( $V_{CC} = 3.3 \pm 0.3\text{V}$ ) 0~ 20 ( $V_{CC} = 5 \pm 0.5\text{V}$ )	ns / V

## DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}$ (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	$V_{IH}$		2.0 3.0 5.5	1.50 2.10 3.85	— — —	— — —	1.50 2.10 3.85	— — —	V	
Low - Level Input Voltage	$V_{IL}$		2.0 3.0 5.5	— — —	— — —	0.50 0.90 1.65	— — —	0.50 0.90 1.65	— — —	V
High - Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -50\mu\text{A}$	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
			$I_{OH} = -4\text{mA}$	3.0	2.58	—	—	2.48	—	
			$I_{OH} = -24\text{mA}$ $I_{OH} = -75\text{mA}^*$	4.5 5.5	3.94 —	— —	— —	3.80 3.85	— —	
Low - Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 50\mu\text{A}$	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
			$I_{OL} = 12\text{mA}$	3.0	—	—	0.36	—	0.44	
			$I_{OL} = 24\text{mA}$ $I_{OL} = 75\text{mA}^*$	4.5 5.5	— —	— —	0.36 —	— —	0.44 1.65	
3 - State Output Off - State Current	$I_{OZ}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = V_{CC}$ or GND	5.5	—	—	± 0.5	—	± 5.0	$\mu\text{A}$	
Input Leakage Current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	5.5	—	—	± 0.1	—	± 1.0		
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC}$ 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  $t_r = t_f = 3\text{ns}$  )

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C		Ta = -40~85°C		UNIT
			V <sub>CC</sub> (V)	LIMIT	LIMIT	LIMIT	
Minimum Pulse Width (CK)	t <sub>W(H)</sub>		3.3 ± 0.3	7.0	7.0	7.0	ns
	t <sub>W(L)</sub>		5.0 ± 0.5	5.0	5.0	5.0	
Minimum Set - up Time	t <sub>s</sub>		3.3 ± 0.3	9.0	9.0	9.0	
			5.0 ± 0.5	5.0	5.0	5.0	
Minimum Hold Time	t <sub>h</sub>		3.3 ± 0.3	0.0	0.0	0.0	
			5.0 ± 0.5	0.0	0.0	0.0	

AC ELECTRICAL CHARACTERISTICS ( C<sub>L</sub> = 50pF , R<sub>L</sub> = 500Ω , 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, Q̄)	t <sub>pLH</sub> t <sub>pHL</sub>		3.3 ± 0.3	—	8.5	15.8	1.0	18.0	ns
			5.0 ± 0.5	—	6.1	8.7	1.0	10.0	
Output Enable Time	t <sub>pZL</sub> t <sub>pZH</sub>		3.3 ± 0.3	—	7.5	14.0	1.0	16.0	
			5.0 ± 0.5	—	6.1	8.7	1.0	10.0	
Output Disable Time	t <sub>pLZ</sub> t <sub>pHZ</sub>		3.3 ± 0.3	—	5.5	12.3	1.0	14.0	MHz
			5.0 ± 0.5	—	4.7	7.0	1.0	8.0	
Maximum Clock Frequency	f <sub>MAX</sub>		3.3 ± 0.3 5.0 ± 0.5	55 100	120 160	— —	55 100	— —	pF
Input Capacitance	C <sub>IN</sub>			—	5	10	—	10	
Output Capacitance	C <sub>OUT</sub>			—	10	—	—	—	
Power Dissipation Capacitance	C <sub>PD(1)</sub>			—	37	—	—	—	

Note (1) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption.

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 F/F operate can be gained by the following equation :

$$C_{PD(\text{total})} = 25 + 12 \cdot n$$

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

Unit in mm



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

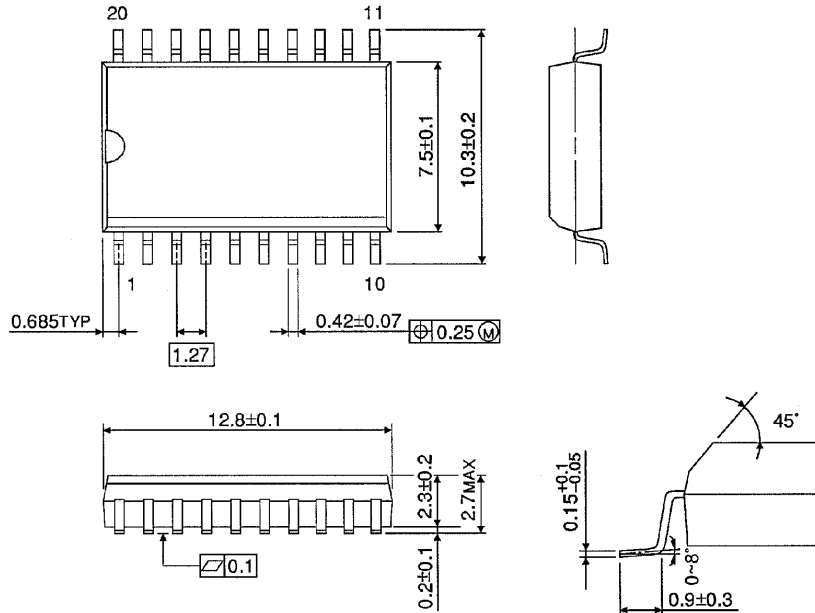
Unit in mm



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

Unit in mm

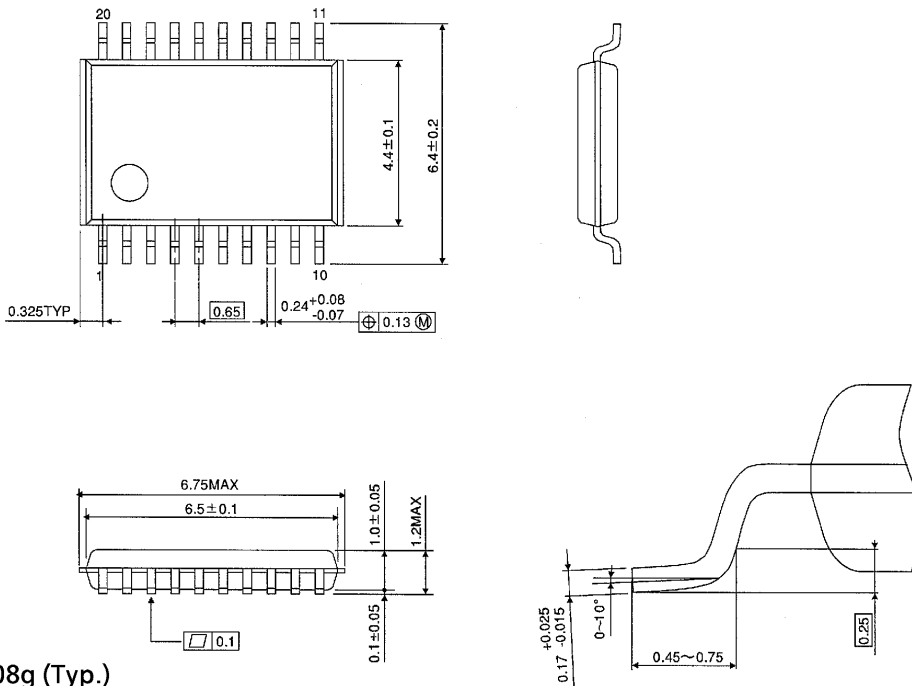
(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)

**TSSOP 20PIN PACKAGE DIMENSIONS (TSSOP20-P-0044-0.65)**

Unit in mm



Weight : 0.08g (Typ.)

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000707EBA

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