

TC74HCT273AP, TC74HCT273AF, TC74HCT273AFW

OCTAL D-TYPE FLIP FLOP WITH CLEAR

The TC74HCT273A is a high speed CMOS OCTAL D-TYPE FLIP FLOP fabricated with silicon gate C²MOS technology. It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. Their 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 $\overline{\text{CLR}}$ 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:

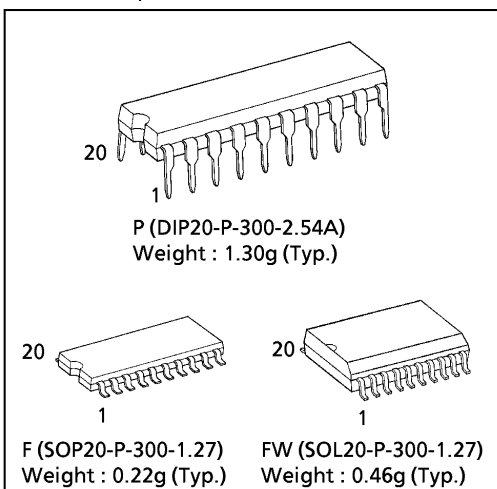
- High Speed..... $f_{\text{MAX}} = 90\text{MHz}$ (typ.)
at $V_{\text{CC}} = 5\text{V}$
- Low Power Dissipation..... $I_{\text{CC}} = 4\mu\text{A}$ (Max.) at $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs ... $V_{\text{IH}} = 2.0\text{V}$ (Min.)
 $V_{\text{IL}} = 0.8\text{V}$ (Max.)
- Wide interfacing ability..... LSTTL, NMOS, CMOS
- Output Drive Capability 10 LSTTL Loads
- Symmetrical Output Impedance... $|I_{\text{OH}}| = I_{\text{OL}} = 4\text{mA}$ (Min.)
- Balanced Propagation Delays..... $t_{\text{PLH}} \approx t_{\text{PHL}}$
- Pin and Function Compatible with 74LS273

TRUTH TABLE

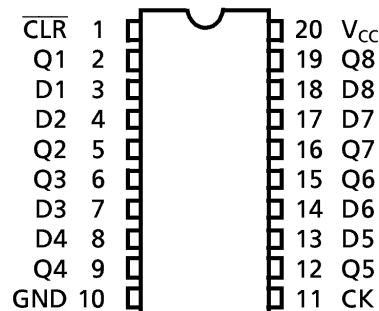
INPUTS			OUTPUTS	FUNCTION
$\overline{\text{CLR}}$	D	CK	Q	
L	X	X	L	CLEAR
H	L		L	—
H	H		H	—
H	X		Q _n	No change

X : Don't Care

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

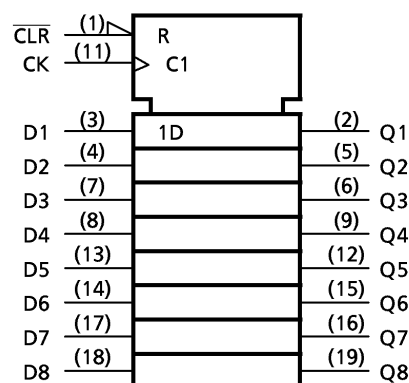


PIN ASSIGNMENT



(TOP VIEW)

IEC LOGIC SYMBOL



980508EBA2

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ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7$	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}	± 20	mA
Output Diode Current	I_{OK}	± 20	mA
DC Output Current	I_{OUT}	± 25	mA
DC V_{CC} /Ground Current	I_{CC}	± 50	mA
Power Dissipation	P_D	500 (DIP)* / 180 (SOP)	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	$^{\circ}\text{C}$

*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°C a derating factor of $-10\text{mW}/^{\circ}\text{C}$ shall be applied until 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}	$-40 \sim 85$	$^{\circ}\text{C}$
Input Rise and Fall Time	t_r, t_f	$0 \sim 500$	ns

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}		$4.5 \begin{smallmatrix} \text{ } \\ \text{ } \end{smallmatrix} 5.5$	2.0	—	—	2.0	—	V
Low - Level Input Voltage	V_{IL}		$4.5 \begin{smallmatrix} \text{ } \\ \text{ } \end{smallmatrix} 5.5$	—	—	0.8	—	0.8	V
High - Level Output Voltage	V_{OH}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -20 \mu\text{A}$	4.5	4.4	4.5	—	4.4	V
			$I_{OH} = -4 \text{ mA}$	4.5	4.18	4.31	—	4.13	
Low - Level Output Voltage	V_{OL}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 20 \mu\text{A}$	4.5	—	0.0	0.1	—	V
			$I_{OL} = 4 \text{ mA}$	4.5	—	0.17	0.26	—	
Input Leakage Current	I_{IN}	$V_{IN} = V_{CC} \text{ or } \text{GND}$	5.5	—	—	± 0.1	—	± 1.0	μA
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC} \text{ or } \text{GND}$	5.5	—	—	4.0	—	40.0	
	I_C	PER INPUT: $V_{IN} = 0.5\text{V or } 2.4\text{V}$ OTHER INPUT: $V_{CC} \text{ or } \text{GND}$	5.5	—	—	2.0	—	2.9	mA

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TIMING REQUIREMENTS (Input $t_r = t_f = 6\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	Ta = 25°C		Ta = -40~85°C	UNIT
				TYP.	LIMIT	LIMIT	
Minimum Pulse Width (CK)	$t_{W(L)}$		4.5	—	15	19	ns
	$t_{W(H)}$		5.5	—	14	17	
Minimum Pulse Width (CLR)	$t_{W(L)}$		4.5	—	15	19	
			5.5	—	14	17	
Minimum Set—up Time	t_s		4.5	—	10	13	
			5.5	—	10	13	
Minimum Hold Time	t_h		4.5	—	5	6	
			5.5	—	10	13	
Minimum Removal Time (CLR)	t_{rem}		4.5	—	10	13	
			5.5	—	9	12	
Clock Frequency	f		4.5	—	30	24	MHz
			5.5	—	35	28	

AC ELECTRICAL CHARACTERISTICS ($C_L = 15\text{pF}$, $V_{CC} = 5\text{V}$, Ta = 25°C, Input $t_r = t_f = 6\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}		—	4	8	ns
Propagation Delay Time (CK—Q)	t_{PLH} t_{PHL}		—	15	25	
Propagation Delay Time (CLR—Q)	t_{pHL} t_{pHL}		—	18	28	
Maximum Clock Frequency	f_{MAX}		40	90	—	MHz

AC ELECTRICAL CHARACTERISTICS ($C_L = 50\text{pF}$, Input $t_r = t_f = 6\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	Ta = 25°C			Ta = -40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t_{TLH}		4.5	—	9	15	—	19	ns
	t_{THL}		5.5	—	8	14	—	18	
Propagation Delay Time (CK—Q)	t_{PLH}		4.5	—	19	30	—	38	
	t_{PHL}		5.5	—	17	27	—	34	
Propagation Delay Time (CLR—Q)	t_{pLH}		4.5	—	22	32	—	40	
	t_{pHL}		5.5	—	18	29	—	36	
Maximum Clock Frequency	f_{MAX}		4.5	30	71	—	24	—	MHz
			5.5	35	81	—	28	—	
Input Capacitance	C_{IN}			—	5	10	—	10	pF
Power Dissipation Capacitance	C_{PD} (1)			—	29	—	—	—	

Note (1) C_{PD} 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 :

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

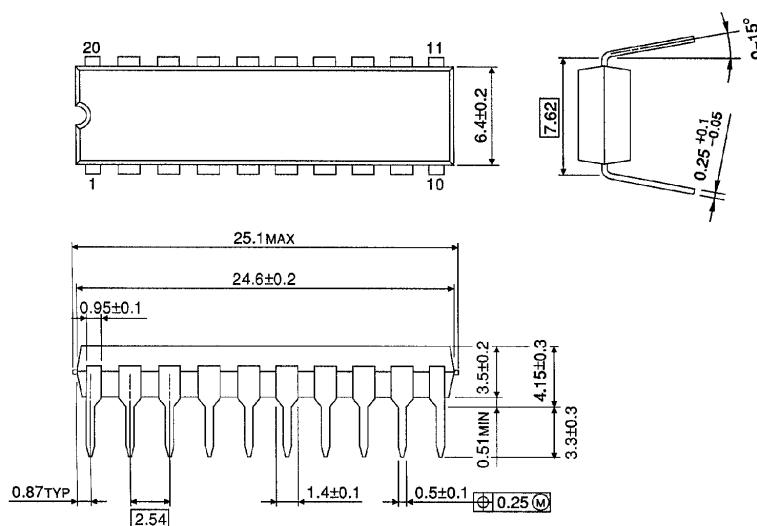
And the total C_{PD} when n pcs. of Flip Flop operate can be gained by the following equation :

$$C_{PD}(\text{total}) = 18 + 11 \cdot n$$

The diagram illustrates an 8-bit shift register implemented with eight D flip-flops. The flip-flops are labeled D1 through D8. The clock input (CK) is connected to the CK input of all flip-flops. The output of each flip-flop (Q) is connected to the D input of the next flip-flop in the sequence (Q1 to D2, Q2 to D3, etc.). The output of the last flip-flop (Q8) is connected to the D input of the first flip-flop (D1), forming a closed loop. The output of each flip-flop is also connected to a buffer (represented by a triangle symbol) and labeled Q1 through Q8. The circuit is controlled by a CLR (clear) signal and a CK (clock) signal.

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

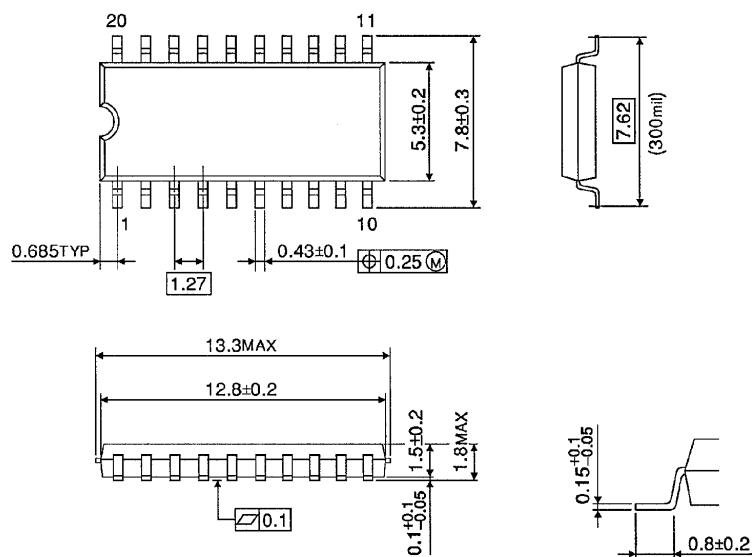
Unit in mm



Weight : 1.30g (Typ.)

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

Unit in mm

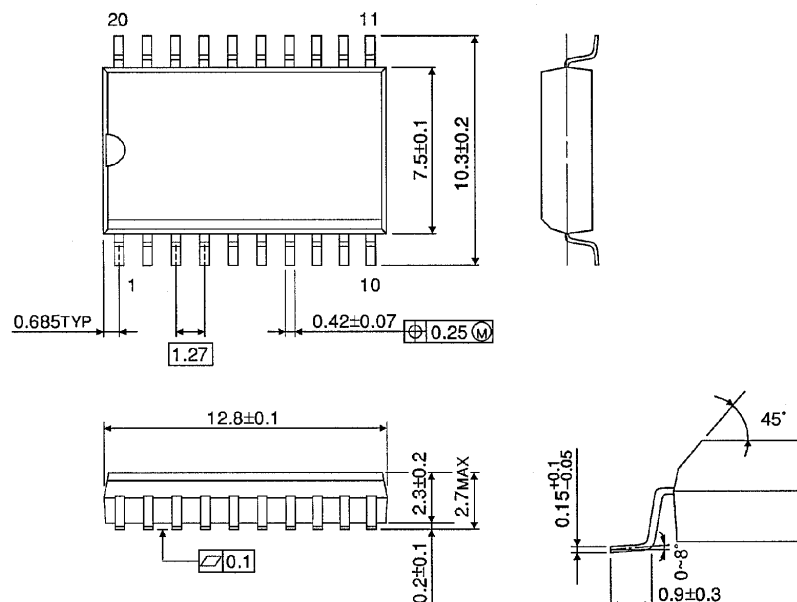


Weight : 0.22g (Typ.)

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

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)