

TC74HC273AP, TC74HC273AF, TC74HC273AFW

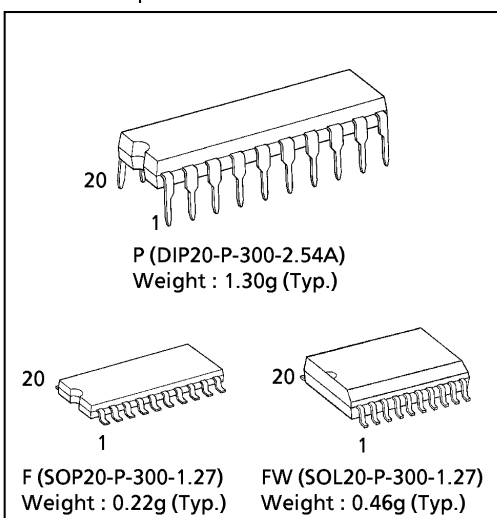
OCTAL D-TYPE FLIP FLOP WITH CLEAR

The TC74HC273A 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. 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.

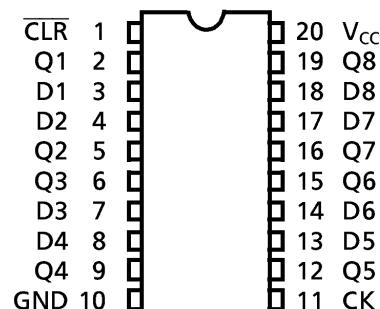
FEATURES:

- High Speed..... $f_{\text{MAX}} = 67\text{MHz}(\text{typ.})$
at $V_{\text{CC}} = 5\text{V}$
- Low Power Dissipation..... $I_{\text{CC}} = 4\mu\text{A}(\text{Max.})$ at $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{\text{NIH}} = V_{\text{NIL}} = 28\% V_{\text{CC}}(\text{Min.})$
- Output Drive Capability 10 LSTTL Loads
- Symmetrical Output Impedance... $|I_{\text{OH}}| = |I_{\text{OL}}| = 4\text{mA}(\text{Min.})$
- Balanced Propagation Delays..... $t_{\text{PLH}} \approx t_{\text{PHL}}$
- Wide Operating Voltage Range.... $V_{\text{CC}}(\text{opr.}) = 2\text{V} \sim 6\text{V}$
- Pin and Function Compatible with 74LS273

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



PIN ASSIGNMENT



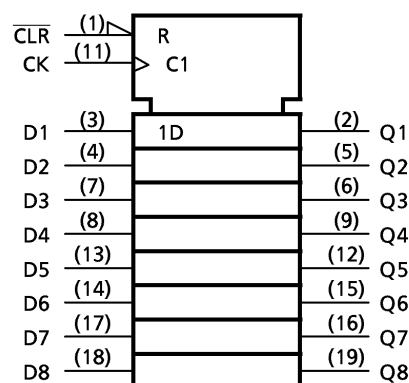
(TOP VIEW)

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

IEC LOGIC SYMBOL



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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}	$2 \sim 6$	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	$0 \sim 1000$ ($V_{CC} = 2.0\text{V}$) $0 \sim 500$ ($V_{CC} = 4.5\text{V}$) $0 \sim 400$ ($V_{CC} = 6.0\text{V}$)	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}		2.0	1.50	—	—	1.50	—	V
			4.5	3.15	—	—	3.15	—	
			6.0	4.20	—	—	4.20	—	
Low - Level Input Voltage	V_{IL}		2.0	—	—	0.50	—	0.50	V
			4.5	—	—	1.35	—	1.35	
			6.0	—	—	1.80	—	1.80	
High - Level Output Voltage	V_{OH}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -20\mu\text{A}$	2.0	1.9	2.0	—	1.9	V
			4.5	4.4	4.5	—	4.4	—	
			6.0	5.9	6.0	—	5.9	—	
			$I_{OH} = -4 \text{ mA}$	4.5	4.18	4.31	—	4.13	V
			$I_{OH} = -5.2 \text{ mA}$	6.0	5.68	5.80	—	5.63	
Low - Level Output Voltage	V_{OL}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 20\mu\text{A}$	2.0	—	0.0	0.1	—	V
			4.5	—	0.0	0.1	—	0.1	
			6.0	—	0.0	0.1	—	0.1	
			$I_{OL} = 4 \text{ mA}$	4.5	—	0.17	0.26	—	V
			$I_{OL} = 5.2 \text{ mA}$	6.0	—	0.18	0.26	—	
Input Leakage Current	I_{IN}	$V_{IN} = V_{CC} \text{ or GND}$	6.0	—	—	± 0.1	—	± 1.0	μA
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC} \text{ or GND}$	6.0	—	—	4.0	—	40.0	

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

PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}(\text{V})$	$T_a = 25^\circ\text{C}$		$T_a = -40\sim 85^\circ\text{C}$	UNIT
				TYP.	LIMIT	LIMIT	
Minimum Pulse Width (CK)	$t_{W(L)}$ $t_{W(H)}$		2.0	—	75	95	ns
			4.5	—	15	19	
			6.0	—	13	16	
Minimum Pulse Width (CLR)	$t_{W(L)}$		2.0	—	75	95	
			4.5	—	15	19	
			6.0	—	13	16	
Minimum Set—up Time	t_s		2.0	—	75	95	
			4.5	—	15	19	
			6.0	—	13	16	
Minimum Hold Time	t_h		2.0	—	0	0	
			4.5	—	0	0	
			6.0	—	0	0	
Minimum Removal Time (CLR)	t_{rem}		2.0	—	50	65	
			4.5	—	10	13	
			6.0	—	9	11	
Clock Frequency	f		2.0	—	6	5	MHz
			4.5	—	30	24	
			6.0	—	35	28	

AC ELECTRICAL CHARACTERISTICS ($C_L = 15\text{pF}$, $V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$, 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 _{pLH} t _{pHL}		—	16	27	
Maximum Clock Frequency	f _{MAX}		40	67	—	MHz

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

PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}(\text{V})$	$T_a = 25^\circ\text{C}$			$T_a = -40\sim 85^\circ\text{C}$		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t_{TLH} t_{THL}		2.0	—	25	75	—	95	ns
			4.5	—	7	15	—	19	
			6.0	—	6	13	—	16	
Propagation Delay Time (CK—Q)	t_{PLH} t_{PHL}		2.0	—	54	145	—	180	
			4.5	—	18	29	—	36	
			6.0	—	15	25	—	31	
Propagation Delay Time (CLR—Q)	t_{PLH} t_{PHL}		2.0	—	60	160	—	200	
			4.5	—	20	32	—	40	
			6.0	—	17	27	—	34	
Maximum Clock Frequency	f_{MAX}		2.0	6	18	—	5	—	MHz
			4.5	30	56	—	24	—	
			6.0	35	66	—	28	—	
Input Capacitance	C_{IN}			—	5	10	—	10	pF
Power Dissipation Capacitance	$C_{PD} (1)$			—	43	—	—	—	

Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

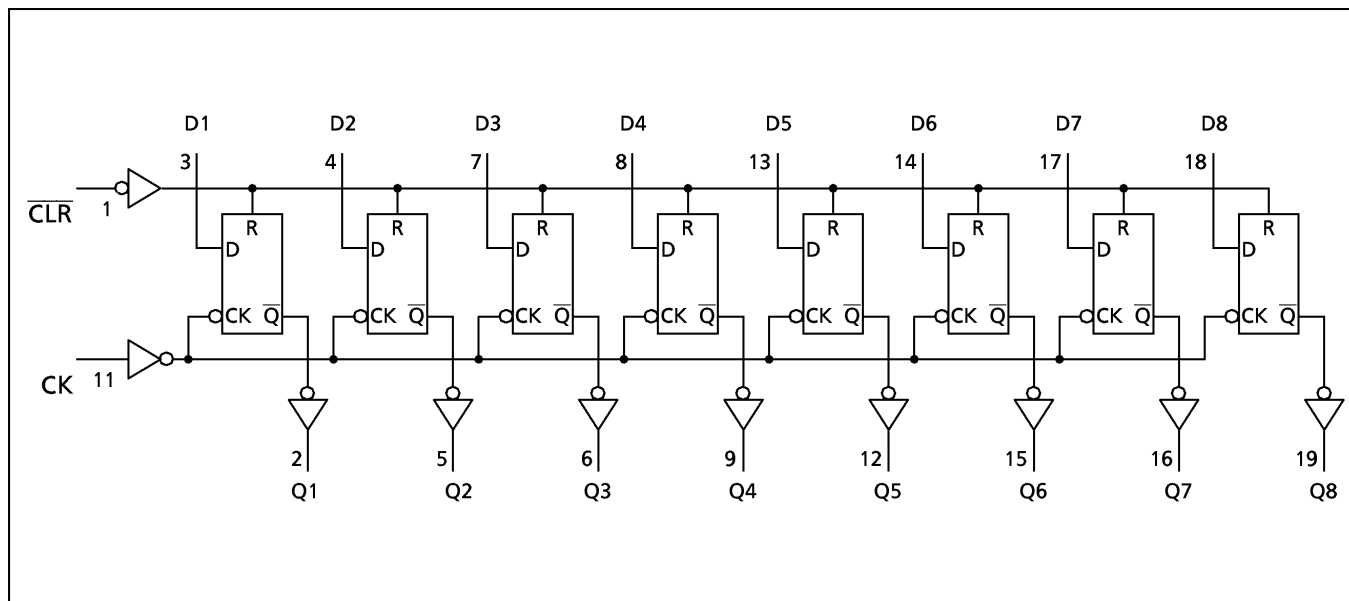
Average operating current can be obtained by the equation:

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

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

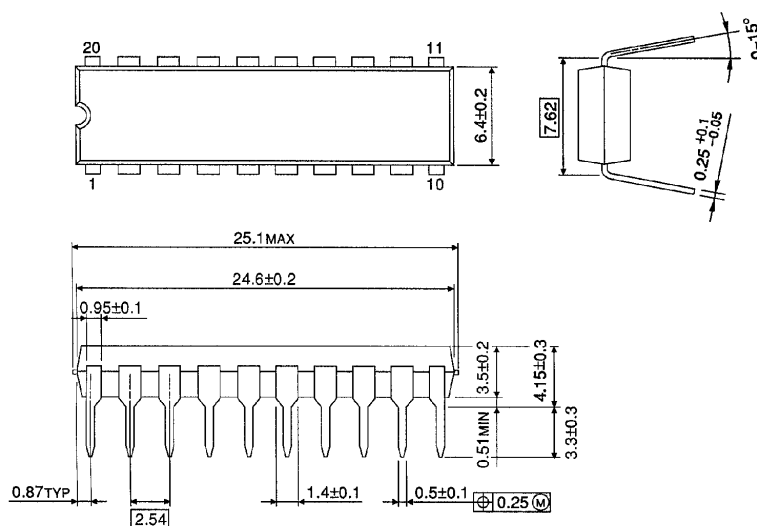
$$C_{PD}(\text{total}) = 32 + 11 \cdot n$$

SYSTEM DIAGRAM



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

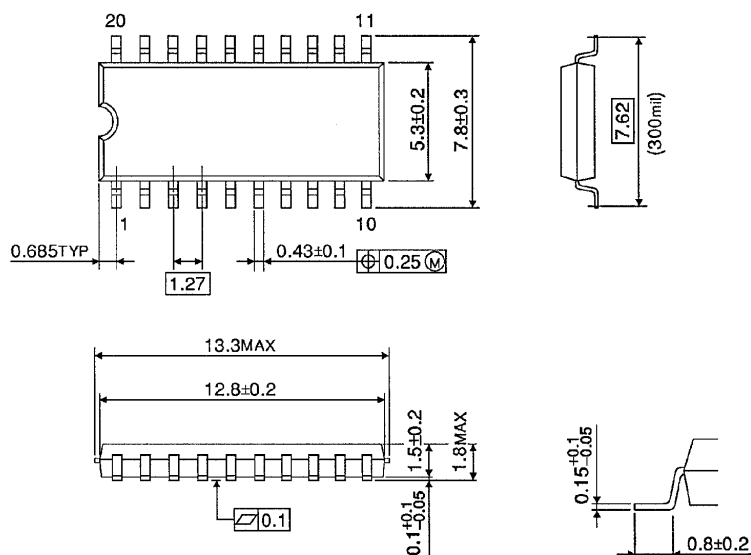
Unit in mm



Weight : 1.30g (Typ.)

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

Unit in mm

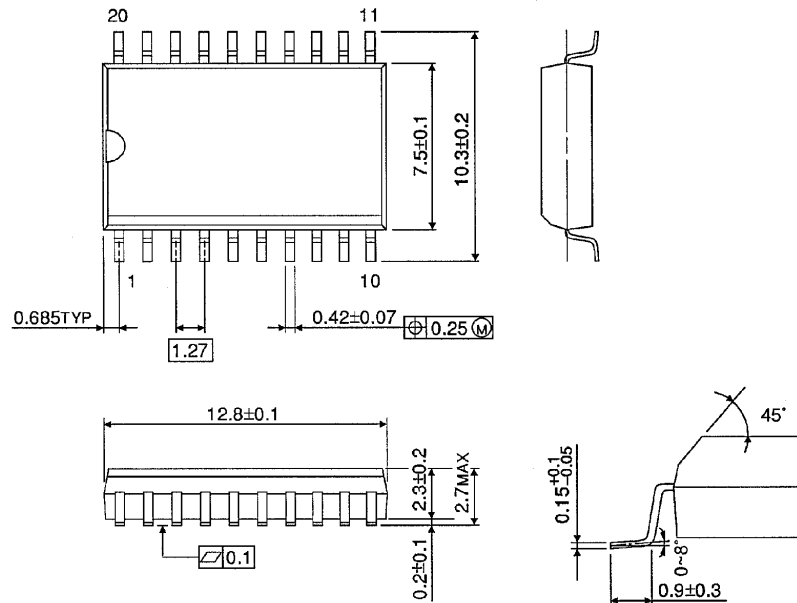


Weight : 0.22g (Typ.)

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.)