Octal D-Type Flip-Flop With Clear

The TC74HCT273A is a high speed CMOS OCTAL D-TYPE FLIP-FLOP fabricated with silicon gate C^2MOS 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.

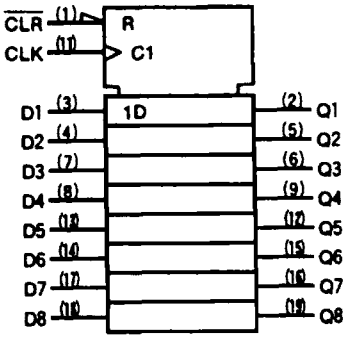
Information signals applied to D inputs are transferred to the Q outputs on the positive going edge of the clock pulse.

When the $\overline{CLEAR}$ input is held low, the Q outputs are at a low logic level independent of the other inputs.

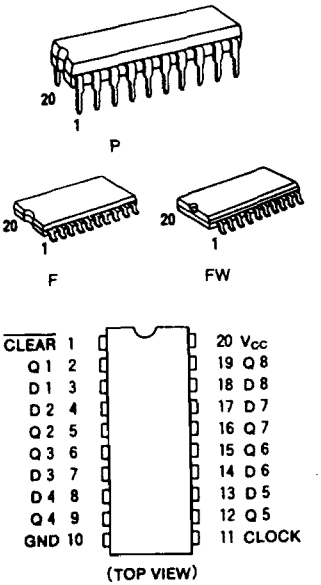
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

Features

- High Speed: f_{MAX} = 90MHz(Typ.) at V_{CC} = 5V
- Low Power Dissipation: I_{CC} = 4μA(Max.) at Ta = 25°C
- Compatible with TTL outputs: V_{IH} = 2V(Min.)
  V_{IL} = 0.8V(Max.)
- Wide Interfacing Ability: LSTTL, NMOS, CMOS
- Output Drive Capability: 10 LSTTL Loads
- Symmetrical Output Impedance: $|I_{OH}| = I_{OL}$ = 4mA(Min.)
- Balanced Propagation Delays: $t_{pLH} = t_{pHL}$
- Pin and Function Compatible with 74LS273



IEC Logic Symbol



Pin Assignment

Truth Table

Inputs			Outputs	Functions
$\overline{CLEAR}$	D	CLOCK	Q	
L	X	X	L	Clear
H	L	↑	L	-
H	H	↑	H	-
H	X	↓	Q_n	No change

X: Don't Care

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage Range	V_{CC}	-0.5 ~ 7	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}	±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(SOIC)	mW
Storage Temperature	T_{stg}	-65 ~ 150	°C
Lead Temperature 10sec	T_L	300	°C

*500mW in the range of Ta = -40°C ~ 65°C. From Ta = 65°C to 85°C a derating factor of -10mW/°C shall be applied until 300mW.

Recommended Operating Conditions

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	4.5 ~ 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	t_r, t_f	0 ~ 500	ns

DC Electrical Characteristics

Parameter	Symbol	Test Condition		V_{CC}	Ta = 25°C Min.	Ta = 25°C Typ.	Ta = 25°C Max.	Ta = -40 ~ 85°C Min.	Ta = -40 ~ 85°C Max.	Unit
High-Level Input Voltage	V_{IH}	–		4.5 ∫ 5.5	2.0	–	–	2.0	–	V
Low-Level Input Voltage	V_{IL}	–		4.5 ∫ 5.5	–	–	0.8	–	0.8	V
High-Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = -20μA	4.5	4.4	4.5	–	4.4	–	V
			I_{OH} = -4 mA	4.5	4.18	4.31	–	4.13	–	
Low-Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = -20μA	4.5	–	0.0	0.1	–	0.1	V
			I_{OL} = -4 mA	4.5	–	0.17	0.26	–	0.33	
Input Leakage Current	I_{IN}	V_{IN} = V_{CC} or GND		5.5	–	–	±0.1	–	±1.0	μA
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	–	–	4.0	–	40.0	μA
	ΔI_{CC}	Per input: V_{IN} = 0.5V or 2.4V Other Input: V_{CC} or GND		5.5	–	–	2.0	–	2.9	mA

Timing Requirements (Input $t_r = t_f$ = 6ns)

Parameter	Symbol	Test Condition		Ta = 25°C		Ta = -40 ~ 85°C	Unit
			V_{CC}	Typ.	Limit	Limit	
Minimum Pulse Width (CLOCK)	$t_{W(L)}$ $t_{W(H)}$	–	4.5 5.5	– –	15 14	19 17	ns
Minimum Pulse Width ($\overline{CLEAR}$)	$t_{W(L)}$	–	4.5 5.5	– –	15 14	19 17	
Minimum Setup Time	t_s	–	4.5 5.5	– –	10 10	13 13	
Minimum Hold Time	t_h	–	4.5 5.5	– –	5 10	6 13	
Minimum Removal Time ($\overline{CLEAR}$)	t_{rem}	–	4.5 5.5	– –	10 9	13 12	
Clock Frequency	f	–	4.5 5.5	– –	30 35	24 28	MHz

AC Electrical Characteristics (C_L = 15pF, V_{CC} = 5V, Ta = 25°C)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Transition Time	t_{TLH} t_{THL}	–	–	4	8	ns
Propagation Delay Time (CLOCK-Q)	t_{pLH} t_{pHL}	–	–	15	25	
Propagation Delay Time ($\overline{CLEAR}$-Q)	t_{pLH} t_{pHL}	–	–	18	28	
Maximum Clock Frequency	f_{MAX}	–	40	90	–	MHz

AC Electrical Characteristics (C_L = 50pF, Input $t_r = t_f$ = 6ns)

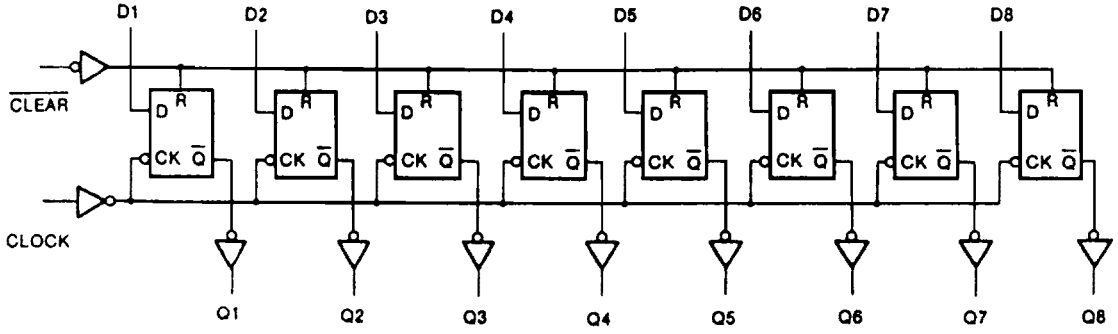
Parameter	Symbol	Test Condition		Ta = 25°C			Ta = -40 ~ 85°C		Unit
			V_{CC}	Min.	Typ.	Max.	Min.	Max.	
Output Transition Time	t_{TLH} t_{THL}	–	4.5 5.5	– –	9 8	15 14	– –	19 18	ns
Propagation Delay Time (CLOCK-Q)	t_{pLH} t_{pHL}	–	4.5 5.5	– –	19 17	30 27	– –	38 34	
Propagation Delay Time ($\overline{CLEAR}$-Q)	t_{pLH} t_{pHL}	–	4.5 5.5	– –	22 18	32 29	– –	40 36	
Maximum Clock Frequency	f_{MAX}	–	4.5 5.5	30 35	71 81	– –	24 28	– –	MHz
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:

$I_{CC(opr)} = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}/2$(per Decoder)

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

C_{PD}(total) = 18 + 11 • n



Logic Diagram