OCTAL D-TYPE FLIP FLOP WITH CLEAR

The TC74LVX273 is a high speed CMOS OCTAL D-FLIP FLOP fabricated with silicon gate C^2MOS technology. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

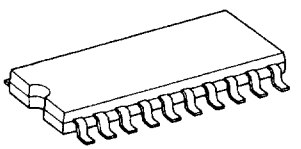
This device is suitable for low voltage and battery operated systems.

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

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

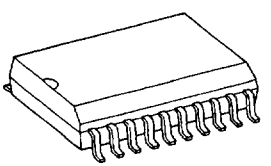
An input protection circuit ensures that 0 to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

TC74LVX273F



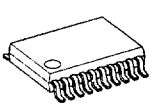
SOP20-P-300

TC74LVX273FW



SOL20-P-300

TC74LVX273FS



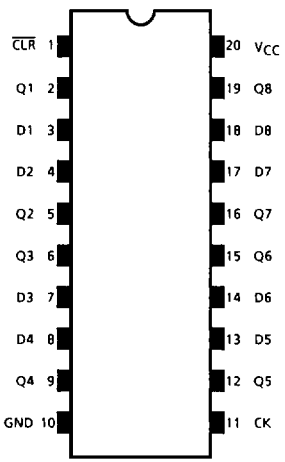
SSOP20-P-225A

Weight SOP20-P-300 : 0.22g (Typ.)
SOL20-P-300 : 0.46g (Typ.)
SSOP20-P-225A : 0.09g (Typ.)

FEATURES

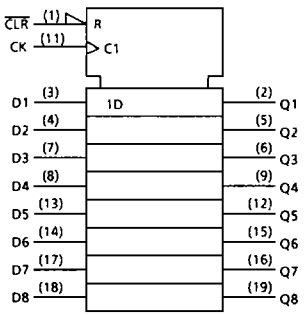
- High speed : $f_{MAX} = 150MHz$ (Typ.) ($V_{CC} = 3V$)
- Low power dissipation : $I_{CC} = 4\mu A$ (Max.) ($Ta = 25°C$)
- Input voltage level : $V_{IL} = 0.8V$ (Max.) ($V_{CC} = 3V$)
  $V_{IH} = 2.0V$ (Min.) ($V_{CC} = 3V$)
- Power down protection is provided on all inputs.
- Balanced propagation delays
  : $t_{pLH} \simeq t_{pHL}$
- Low noise : $V_{OLP} = 0.8V$ (Max.)
- Pin and function compatible with 74HC273

PIN ASSIGNMENT



(TOP VIEW)

IEC LOGIC SYMBOL

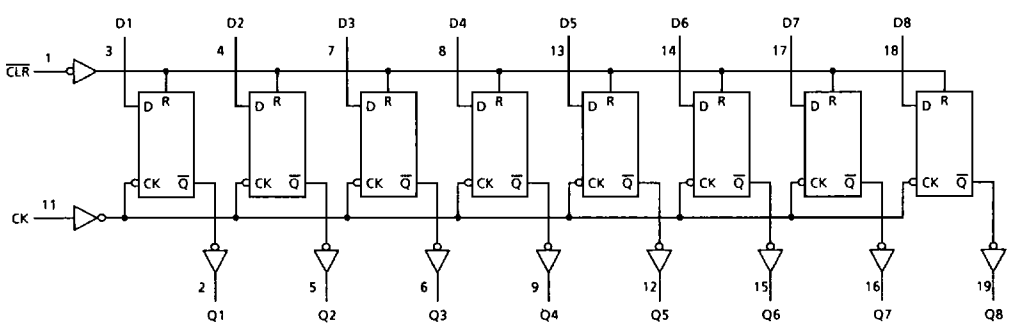


TRUTH TABLE

INPUTS			OUTPUTS	FUNCTION
$\overline{CLR}$	D	CK	Q	
L	X	X	L	CLEAR
H	L	↑	L	—
H	H	↑	H	—
H	X	↓	Qn	NO CHANGE

X : Don't Care

SYSTEM DIAGRAM



MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	−0.5~7.0	V
DC Input Voltage	V_{IN}	−0.5~7.0	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}	±75	mA
Power Dissipation	P_D	180	mW
Storage Temperature	T_{stg}	−65~150	°C
Lead Temperature 10s	T_L	300	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	2.0~3.6	V
Input Voltage	V_{IN}	0~5.5	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	ns/V

ELECTRICAL CHARACTERISTICS

DC characteristics

PARAMETER		SYMBOL	TEST CONDITION		V_{CC} (V)	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	Ta = −40~85°C MIN.	Ta = −40~85°C MAX.	UNIT
Input Voltage	"H" Level	V_{IH}			2.0	1.5	—	—	1.5	—	V
					3.0	2.0	—	—	2.0	—	
					3.6	2.4	—	—	2.4	—	
	"L" Level	V_{IL}			2.0	—	—	0.5	—	0.5	
					3.0	—	—	0.8	—	0.8	
					3.6	—	—	0.8	—	0.8	
Output Voltage	"H" Level	V_{OH}	V_{IN} = V_{IH}	I_{OH} = −50μA	2.0	1.9	2.0	—	1.9	—	V
				I_{OH} = −50μA	3.0	2.9	3.0	—	2.9	—	
			or V_{IL}	I_{OH} = −4mA	3.0	2.58	—	—	2.48	—	
	"L" Level	V_{OL}	V_{IN} = V_{IH}	I_{OL} = 50μA	2.0	—	0.0	0.1	—	0.1	
				I_{OL} = 50μA	3.0	—	0.0	0.1	—	0.1	
			or V_{IL}	I_{OL} = 4mA	3.0	—	—	0.36	—	0.44	
Input Leakage Current		I_{IN}	V_{IN} = 5.5V or GND		3.6	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current		I_{CC}	V_{IN} = V_{CC} or GND		3.6	—	—	4.0	—	40.0	μA

Timing requirements (Input $t_r = t_f = 3ns$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	Ta = 25°C LIMIT	Ta = −40~85°C LIMIT	UNIT
Minimum Pulse Width (CK)	$t_{W(L)}$ $t_{W(H)}$		2.7	8.0	9.5	ns
			3.3 ± 0.3	5.5	6.5	
Minimum Pulse Width ($\overline{CLR}$)	$t_{W(L)}$		2.7	7.5	8.5	ns
			3.3 ± 0.3	5.0	6.0	
Minimum Set-up Time	t_s		2.7	8.0	9.5	ns
			3.3 ± 0.3	5.5	6.5	
Minimum Hold Time	t_h		2.7	1.0	1.0	ns
			3.3 ± 0.3	1.0	1.0	
Minimum Removal Time ($\overline{CLR}$)	t_{rem}		2.7	4.0	4.0	ns
			3.3 ± 0.3	2.5	2.5	

AC characteristics (Input $t_r = t_f = 3ns$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	C_L (pF)	Ta = 25°C MIN.	TYP.	MAX.	Ta = −40~85°C MIN.	MAX.	UNIT
Propagation Delay Time (CK-Q)	t_{pLH} t_{pHL}		2.7	15	—	9.0	16.9	1.0	20.5	ns
				50	—	11.5	20.4	1.0	24.0	
			3.3 ± 0.3	15	—	7.1	11.0	1.0	13.0	
				50	—	9.6	14.5	1.0	16.5	
Propagation Delay Time ($\overline{CLR}$-Q)	t_{pHL}		2.7	15	—	9.3	17.6	1.0	20.5	ns
				50	—	11.8	21.1	1.0	24.0	
			3.3 ± 0.3	15	—	7.3	11.5	1.0	13.5	
				50	—	9.8	15.0	1.0	17.0	
Maximum Clock Frequency	f_{MAX}		2.7	15	55	110	—	55	—	MHz
				50	45	60	—	40	—	
			3.3 ± 0.3	15	95	150	—	80	—	
				50	60	90	—	50	—	
Output To Output Skew	t_{osLH} t_{osHL}	(Note 1)	2.7	50	—	—	1.5	—	1.5	ns
			3.3 ± 0.3	50	—	—	1.5	—	1.5	
Input Capacitance	C_{IN}	(Note 2)			—	4	10	—	10	pF
Power Dissipation Capacitance	C_{PD}	(Note 3)			—	31	—	—	—	pF

(Note 1) Parameter guaranteed by design.
($t_{osLH} = |t_{pLHm} - t_{pLHn}|$, $t_{osHL} = |t_{pHLm} - t_{pHLn}|$)

(Note 2) Parameter guaranteed by design.

(Note 3) C_{PD} 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 :

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

And the total CPD when n pcs. of F/F operate can be gained by the following equation :

$$C_{PD}(total) = 22 + 9 \cdot n$$

Noise characteristics (Ta = 25°C, Input $t_r = t_f = 3ns$, $C_L = 50pF$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP.	LIMIT	UNIT
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}		3.3	0.5	0.8	V
Quiet Output Minimum Dynamic V_{OL}	V_{OLV}		3.3	−0.5	−0.8	V
Minimum High Level Dynamic Input Voltage	V_{IHD}		3.3	—	2.0	V
Maximum Low Level Dynamic Input Voltage	V_{ILD}		3.3	—	0.8	V

INPUT EQUIVALENT CIRCUIT