TC74LVQ273F/FW/FS

OCTAL D-TYPE FLIP FLOP WITH CLEAR

The TC74LVQ273 is a high speed CMOS OCTAL D - FLIP FLOP fabricated with silicon gate and double - layer metal wiring C²MOS technology.

Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

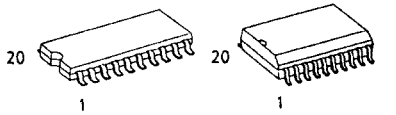
Information signals applied to D inputs are transferred to the Q outputs on the positive going edge of the clock pulse.

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

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

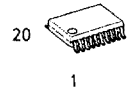
FEATURES:

- High Speed ..... f_{MAX} = 160MHz (typ.) at V_{CC} = 3.3V
- Low Power Dissipation ..... I_{CC} = 4μA(Max.) at Ta = 25°C
- Input Voltage Level ..... V_{IL} = 0.8V (Max.) at V_{CC} = 3V, V_{IH} = 2.0V (Min.) at V_{CC} = 3V
- Symmetrical Output Impedance .. $|I_{OH}| = I_{OL}$ = 12mA(Min.)
- Balanced Propagation Delays .... $t_{pLH} \simeq t_{pHL}$
- Pin and Function Compatible with 74HC273



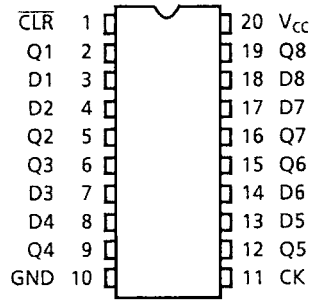
F (SOP20-P-300)
Weight : 0.22g (TYP.)

FW (SOL20-P-300)
Weitht : 0.46g (TYP.)



FS (SSOP20-P-225A)
Weight : 0.09g (TYP.)

PIN ASSIGNMENT



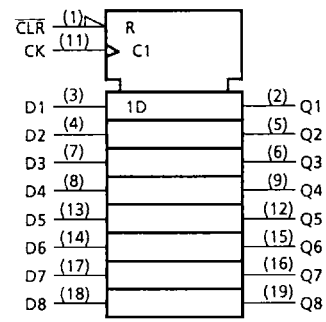
(TOP VIEW)

TRUTH TABLE

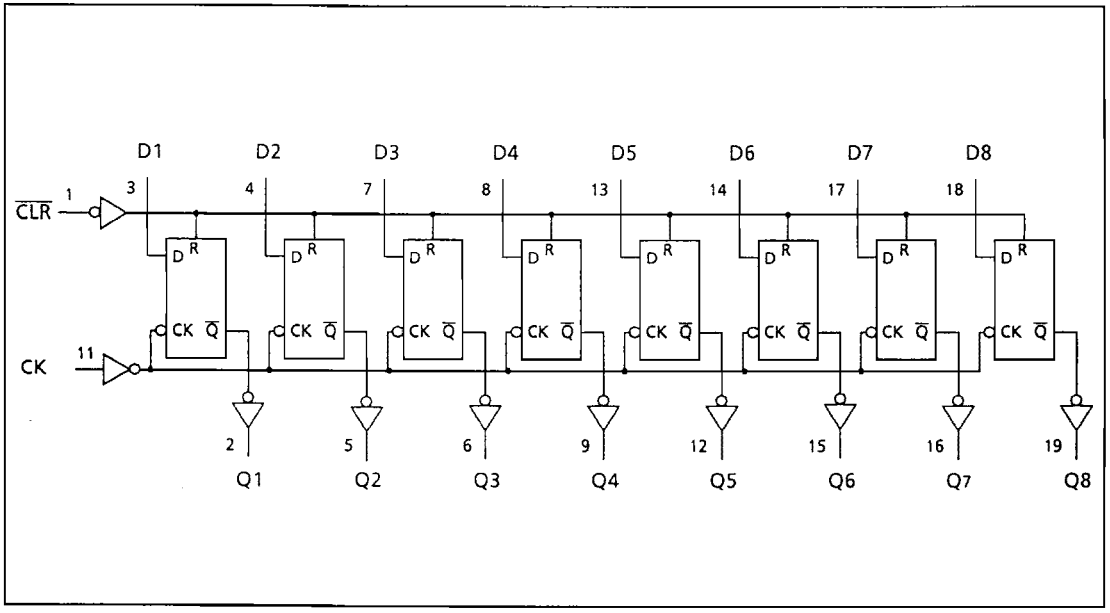
INPUTS			OUTPUTS	FUNCTION
$\overline{CLR}$	D	CK	Q	
L	X	X	L	CLEAR
H	L	↑	L	—
H	H	↑	H	—
H	X	↓	Q_n	NO CHANGE

X : Don't Care

IEC LOGIC SYMBOL



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	180	mW
Storage Temperature	T_{stg}	−65~150	°C
Lead Temperature 10sec	T_L	300	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	2.0~3.6	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	ns/V

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC} (V)	Ta = 25°C			Ta = −40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	V_{IH}			3.0	2.0	—	—	2.0	—	V
Low - Level Input Voltage	V_{IL}			3.0	—	—	0.8	—	0.8	
High - Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −50μA	3.0	2.9	3.0	—	2.9	—	
			I_{OH} = −12mA	3.0	2.58	—	—	2.48	—	
Low - Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50μA	3.0	—	0.0	0.1	—	0.1	
			I_{OL} = 12mA	3.0	—	—	0.36	—	0.44	
Input Leakage Current	I_{IN}	V_{IN} = V_{CC} 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	

TIMING REQUIREMENTS (Input $t_r = t_f = 3ns$)

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C	Ta = −40~85°C	UNIT
		V_{CC} (V)	LIMIT	LIMIT	
Minimum Pulse Width (CK)	$t_{W(L)}$	2.7	10.0	11.5	ns
	$t_{W(H)}$	3.3 ± 0.3	8.0	8.0	
Minimum Pulse Width ($\overline{CLR}$)	$t_{W(L)}$	2.7	9.5	11.0	
		3.3 ± 0.3	7.5	7.5	
Minimum Set - up Time	t_s	2.7	10.5	12.0	
		3.3 ± 0.3	8.5	8.5	
Minimum Hold Time	t_h	2.7	0.0	0.0	
		3.3 ± 0.3	0.0	0.0	
Minimum Removal Time ($\overline{CLR}$)	t_{rem}	2.7	9.0	10.0	
		3.3 ± 0.3	7.0	7.0	

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3ns$, $C_L = 50pF$, $R_L = 500\Omega$)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC} (V)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time (CK−Q)	t_{pLH} t_{pHL}		2.7 3.3 ± 0.3	— —	8.2 6.8	18.3 13.0	1.0 1.0	21.0 14.5	ns
Propagation Delay Time ($\overline{CLR}$−Q)	t_{pHL}		2.7 3.3 ± 0.3	— —	7.9 6.6	18.3 13.0	1.0 1.0	20.0 14.0	
Maximum Clock Frequency	f_{MAX}		2.7 3.3 ± 0.3	50 75	120 140	— —	40 65	— —	MHz
Output to Output Skew	t_{osLH} t_{osHL}	(Note 1)	2.7 3.3 ± 0.3	— —	— —	1.5 1.5	— —	1.5 1.5	ns
Input Capacitance	C_{IN}	(Note 2)		—	5	10	—	10	pF
Power Dissipation Capacitance	C_{PD}	(Note 3)		—	40	—	—	—	

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

$$C_{PD}(total) = 29 + 11 \cdot n$$

NOISE CHARACTERISTICS (Input $t_r = t_f = 3ns$, $C_L = 50pF$, $R_L = 500\Omega$)

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C		UNIT
		V_{CC} (V)	TYP.	MAX.	
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