

TC74VHC574F, TC74VHC574FW, TC74VHC574FS, TC74VHC574FT**OCTAL D-TYPE FLIP-FLOP WITH 3-STATE OUTPUT**

The TC74VHC574 is advanced high speed CMOS OCTAL FLIP-FLOP with 3-STATE OUTPUT fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

This 8-bit D-type flip-flop is controlled by a clock input (CK) and an output enable input ($\overline{OE}$).

When the $\overline{OE}$ input is high, the eight outputs are in a high impedance state.

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.

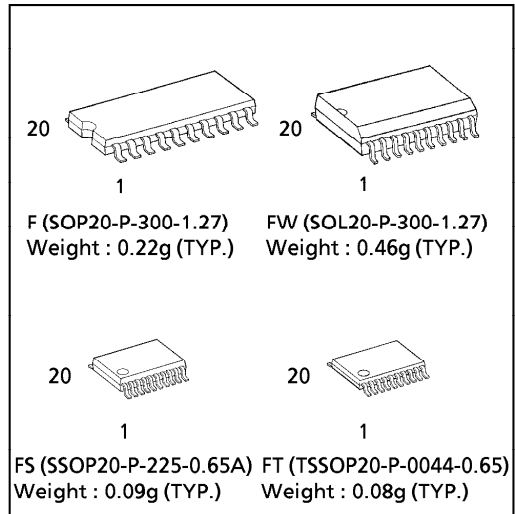
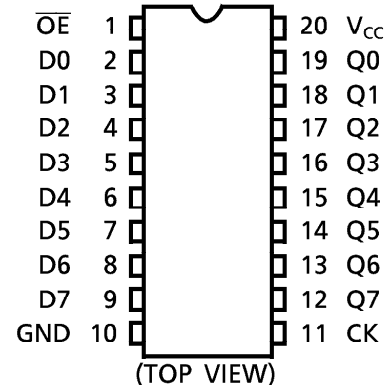
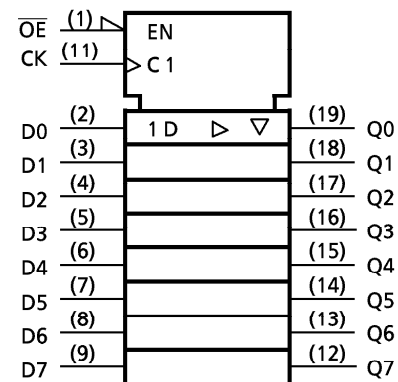
FEATURES:

- High Speed..... $f_{MAX} = 180\text{MHz}(\text{typ.})$
at $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 4\mu\text{A}(\text{Max.})$ at $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC} (\text{Min.})$
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays..... $t_{PLH} \approx t_{PHL}$
- Wide Operating Voltage Range.... $V_{CC} (\text{opr}) = 2\text{V} \sim 5.5\text{V}$
- Low Noise $V_{OLP} = 1.2\text{V} (\text{Max.})$
- Pin and Function Compatible with 74ALS574

TRUTH TABLE

INPUTS			OUTPUT
$\overline{OE}$	CK	D	Q
H	X	X	Z
L		X	Q_n
L		L	L
L		H	H

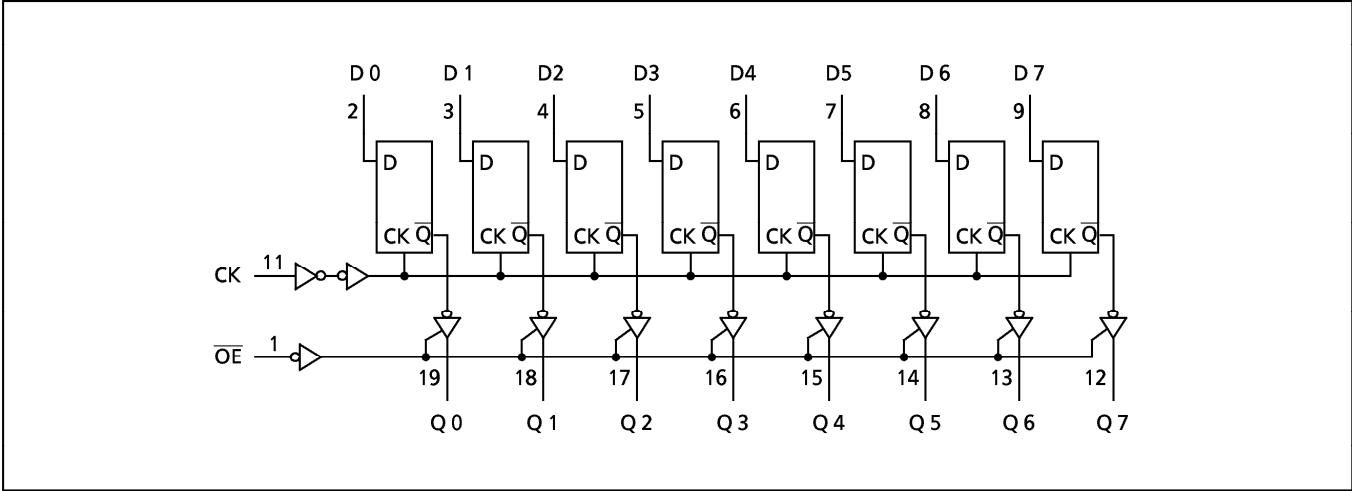
X : Don't Care
Z : High Impedance
 Q_n : No Change

**PIN ASSIGNMENT****IEC LOGIC SYMBOL**

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SYSTEM DIAGRAM



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7.0$	V
DC Input Voltage	V_{IN}	$-0.5 \sim 7.0$	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}	± 75	mA
Power Dissipation	P_D	180	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	$^{\circ}C$

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	2.0~5.5	V
Input Voltage	V_{IN}	0~5.5	V
Output Voltage	V_{OUT}	0~ V_{CC}	V
Operating Temperature	T_{opr}	$-40 \sim 85$	$^{\circ}C$
Input Rise and Fall Time	dt/dv	0~100 ($V_{CC} = 3.3 \pm 0.3V$) 0~20 ($V_{CC} = 5 \pm 0.5V$)	ns/V

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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}			2.0 3.0~ 5.5	1.50 $V_{CC} \times 0.7$	— —	— —	1.50 $V_{CC} \times 0.7$	— —	V
Low - Level Input Voltage	V_{IL}			2.0 3.0~ 5.5	— —	— —	0.50 $V_{CC} \times 0.3$	— $V_{CC} \times 0.3$	0.50	V
High - Level Output Voltage	V_{OH}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -50\mu A$	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5	— — —	1.9 2.9 4.4	— — —	V
			$I_{OH} = -4mA$ $I_{OH} = -8mA$	3.0 4.5	2.58 3.94	— —	— —	2.48 3.80	— —	
Low - Level Output Voltage	V_{OL}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 50\mu A$	2.0 3.0 4.5	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			$I_{OL} = 4mA$ $I_{OL} = 8mA$	3.0 4.5	— —	— —	0.36 0.36	— —	0.44 0.44	
3 - State Output Off - State Current	I_{OZ}	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $V_{OUT} = V_{CC} \text{ or GND}$		5.5	—	—	± 0.25	—	± 2.50	μA
Input Leakage Current	I_{IN}	$V_{IN} = 5.5V \text{ or GND}$		0~5.5	—	—	± 0.1	—	± 1.0	
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC} \text{ or GND}$		5.5	—	—	4.0	—	40.0	

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

PARAMETER	SYMBOL	TEST CONDITION		V_{CC} (V)	Ta = 25°C		Ta = -40~85°C	UNIT
					TYP.	LIMIT	LIMIT	
Minimum Pulse Width (CK)	$t_{W(H)}$ $t_{W(L)}$			3.3 $\pm$ 0.3	—	5.0	5.0	ns
				5.0 $\pm$ 0.5	—	5.0	5.0	
Minimum Set-up Time	t_s			3.3 $\pm$ 0.3	—	3.5	3.5	
				5.0 $\pm$ 0.5	—	3.5	3.5	
Minimum Hold Time	t_h			3.3 $\pm$ 0.3	—	1.5	1.5	
				5.0 $\pm$ 0.5	—	1.5	1.5	

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION			Ta = 25°C			Ta = − 40~85°C		UNIT
			V _{CC} (V)	CL (pF)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time (CK-Q)	t _{pLH} t _{pHL}		3.3 ± 0.3	15	—	8.5	13.2	1.0	15.5	ns
				50	—	11.0	16.7	1.0	19.0	
			5.0 ± 0.5	15	—	5.6	8.6	1.0	10.0	
				50	—	7.1	10.6	1.0	12.0	
3-State Output Enable Time	t _{pZL} t _{pZH}	RL = 1kΩ	3.3 ± 0.3	15	—	8.2	12.8	1.0	15.0	
				50	—	10.7	16.3	1.0	18.5	
			5.0 ± 0.5	15	—	5.9	9.0	1.0	10.5	
				50	—	7.4	11.0	1.0	12.5	
3-State Output Disable Time	t _{pL Z} t _{pHZ}	RL = 1kΩ	3.3 ± 0.3	50	—	11.0	15.0	1.0	17.0	
			5.0 ± 0.5	50	—	7.1	10.1	1.0	11.5	
Maximum Clock Frequency	f _{MAX}		3.3 ± 0.3	15	80	125	—	65	—	MHz
				50	50	75	—	45	—	
			5.0 ± 0.5	15	130	180	—	110	—	
				50	85	115	—	75	—	
Output to Output Skew	t _{osLH} t _{osHL}	(Note 1)	3.3 ± 0.3	50	—	—	1.5	—	1.5	ns
			5.0 ± 0.5	50	—	—	1.0	—	1.0	
Input Capacitance	C _{I N}				—	4	10	—	10	pF
Output Capacitance	C _{OUT}				—	6	—	—	—	
Power Dissipation Capacitance	C _{PD}	(Note 2)			—	28	—	—	—	

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

Note (2) 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 :

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

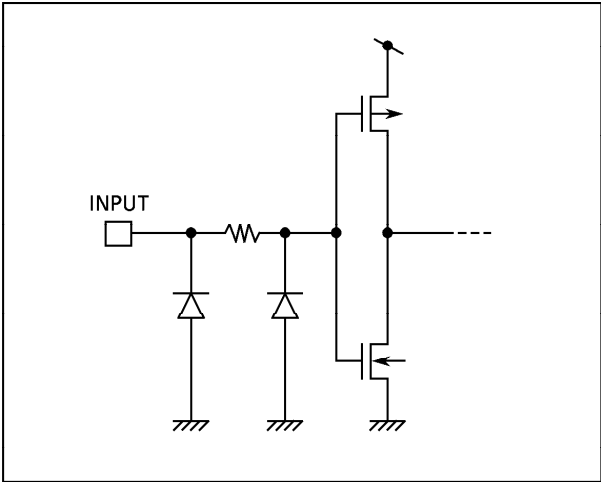
And the total C_{PD} when n pcs. of Latch operate can be gained by the following equation :

$$C_{\text{PD}} (\text{total}) = 20 + 8 \cdot n$$

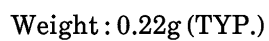
NOISE CHARACTERISTICS (Input $t_r = t_f = 3\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C		UNIT
			V _{CC} (V)	TYP.	MAX.
Quiet Output Maximum Dynamic V _{OL}	V _{OLP}	C _L = 50pF	5.0	0.9	1.2
Quiet Output Minimum Dynamic V _{OL}	V _{OLV}	C _L = 50pF	5.0	—0.9	—1.2
Minimum High Level Dynamic Input Voltage	V _{IHD}	C _L = 50pF	5.0	—	3.5
Maximum Low Level Dynamic Input Voltage	V _{ILD}	C _L = 50pF	5.0	—	1.5

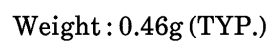
INPUT EQUIVALENT CIRCUIT



Unit in mm

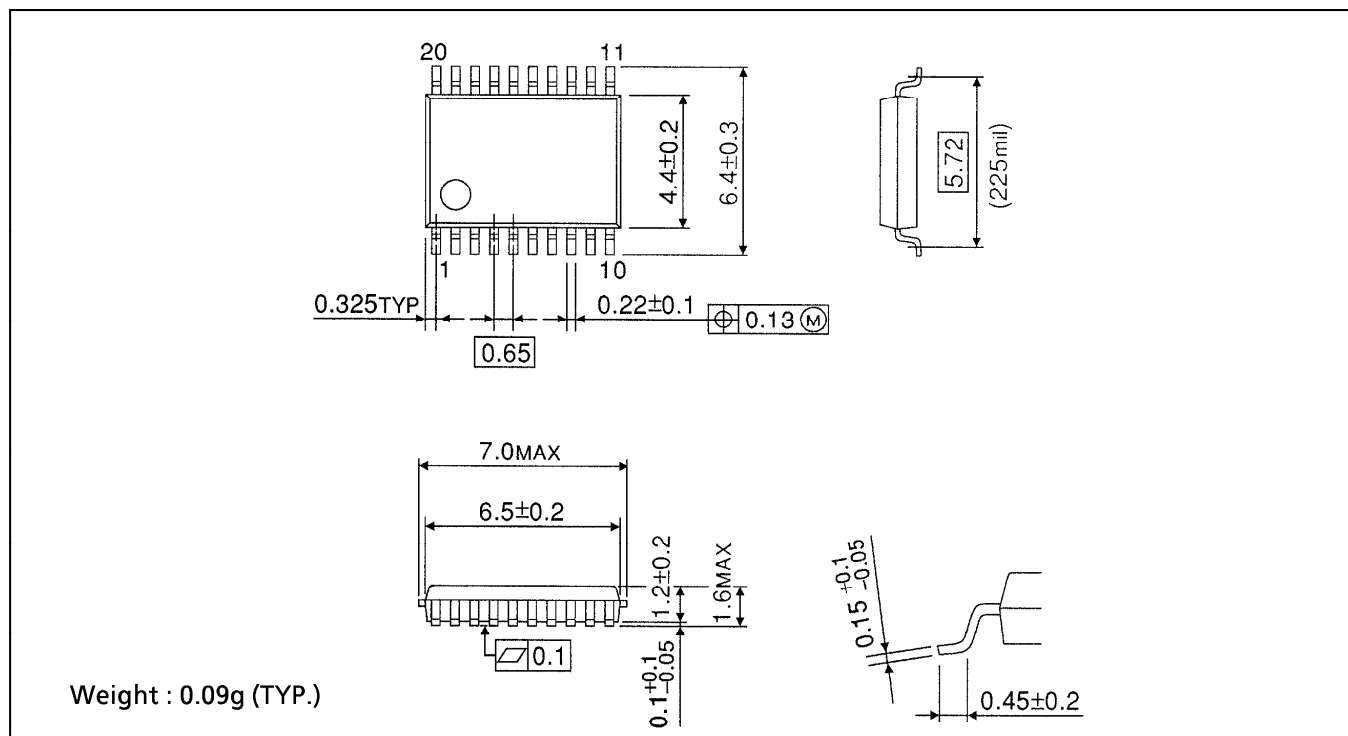


Unit in mm



SSOP 20PIN OUTLINE DRAWING (SSOP20-P-225-0.65A)

Unit in mm



TSSOP 20PIN OUTLINE DRAWING (TSSOP20-P-0044-0.65)

Unit in mm

