

TOSHIBA**TC7W74F/FU/FK**

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7W74F, TC7W74FU, TC7W74FK**D-TYPE FLIP FLOP WITH PRESET AND CLEAR**

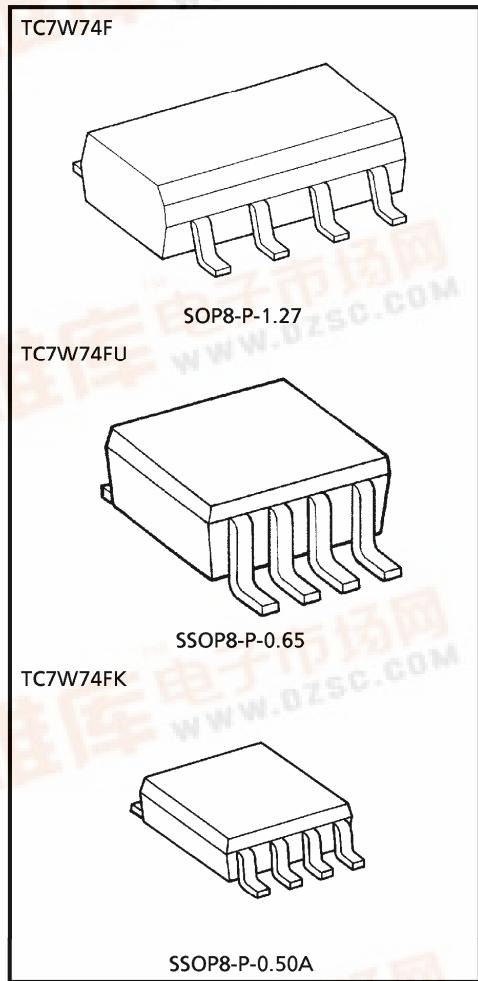
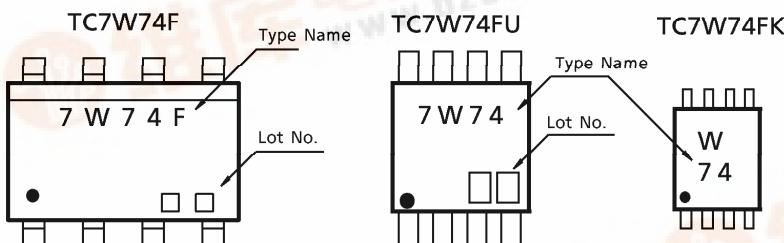
The TC7W74 is a high speed C²MOS D FLIP FLOP fabricated with silicon gate C²MOS technology. It achieves the high speed operation similar to equivalent LSTTL while maintaining the C²MOS low power dissipation.

The signal level applied to the D INPUT is transferred to Q OUTPUT during the positive going transition of the CLOCK pulse. CLEAR and PRESET are independent of the CLOCK and are accomplished by setting the appropriate input to an "L" level. Input is equipped with protection circuits against static discharge or transient excess voltage.

Weight SOP8-P-1.27 : 0.05g (Typ.)
SSOP8-P-0.65 : 0.02g (Typ.)

FEATURES

- High Speed $f_{MAX} = 77\text{MHz}$ (Typ.) at $V_{CC} = 5\text{V}$
- Low Power Dissipation $I_{CC} = 2\mu\text{A}$ (Max.) at $T_a = 25^\circ\text{C}$
- High Noise Immunity $V_{NIH} = V_{NIL} = 28\%$ V_{CC} (Min.)
- Output Drive Capability 10 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = |I_{OL}| = 4\text{mA}$ (Min.)
- Balanced Propagation Delays $t_{PLH} = t_{PHL}$
- Wide Operating Voltage Range ... $V_{CC}(\text{opr}) = 2\sim 6\text{V}$

MARKING

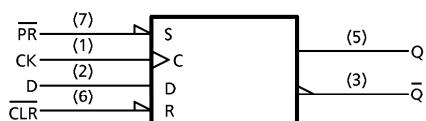
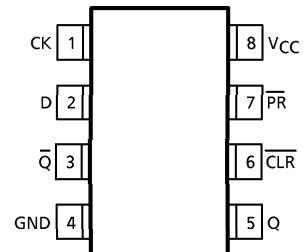
Weight
SOP8-P-1.27 : 0.05g (Typ.)
SSOP8-P-0.65 : 0.02g (Typ.)
SSOP8-P-0.50A : 0.01g (Typ.)

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MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	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}	±25	mA
Power Dissipation	P _D	300	mW
Storage Temperature	T _{stg}	-65~150	°C
Lead Temperature (10s)	T _L	260	°C

LOGIC DIAGRAM**PIN ASSIGNMENT (TOP VIEW)****TRUTH TABLE**

INPUTS				OUTPUTS		FUNCTION
CLR	PR	D	CK	Q	Q̄	
L	H	X	X	L	H	CLEAR
H	L	X	X	H	L	PRESET
L	L	X	X	H	H	—
H	H	L	↓	L	H	—
H	H	H	↓	H	L	—
H	H	X	↓	Qn	Q̄n	NO CHANGE

x : Don't care

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V _{CC}	2~6	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	t _r , t _f	0~1000 (V _{CC} = 2.0V) 0~ 500 (V _{CC} = 4.5V) 0~ 400 (V _{CC} = 6.0V)	ns

DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{CC}	Ta = 25°C			Ta = - 40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
High-Level Input Voltage	V_{IH}	—	2.0 4.5 6.0	1.5 3.15 4.2	— — —	— — —	1.5 3.15 4.2	— — —	V
Low-Level Input Voltage	V_{IL}	—	2.0 4.5 6.0	— — —	— — —	0.5 1.35 1.8	— — —	0.5 1.35 1.8	V
High-Level Output Voltage	V_{OH}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -20\mu A$ $I_{OH} = -4mA$ $I_{OH} = -5.2mA$	2.0 4.5 6.0	1.9 4.4 5.9	2.0 4.5 6.0	— — —	1.9 4.4 5.9	— — —
Low-Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 20\mu A$ $I_{OL} = 4mA$ $I_{OL} = 5.2mA$	2.0 4.5 6.0	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1
Input Leakage Current	I_{IN}	$V_{IN} = V_{CC}$ or GND	6.0	—	—	± 0.1	—	± 1.0	μA
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC}$ or GND	6.0	—	—	2.0	—	20.0	μA

TIMING REQUIREMENTS (Input $t_r = t_f = 6ns$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC}	Ta = 25°C		Ta = - 40~85°C		UNIT
				TYP.	LIMIT	LIMIT		
Minimum Pulse Width (CLOCK)	$t_W(L)$ $t_W(H)$	—	2.0 4.5 6.0	— — —	75 15 13	95 19 16		ns
Minimum Pulse Width (CLR, PR)	$t_W(L)$	—	2.0 4.5 6.0	— — —	75 15 13	95 19 16		
Minimum Set-up Time	t_s	—	2.0 4.5 6.0	— — —	75 15 13	95 19 16		
Minimum Hold Time	t_h	—	2.0 4.5 6.0	— — —	0 0 0	0 0 0		
Minimum Removal Time (CLR, PR)	t_{rem}	—	2.0 4.5 6.0	— — —	25 5 4	30 6 5		
Clock Frequency	f	—	2.0 4.5 6.0	— — —	6 31 36	5 25 29	MHz	

AC ELECTRICAL CHARACTERISTICS ($C_L = 15\text{pF}$, $V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}	—	—	6	12	ns
Propagation Delay Time (CLOCK-Q, Q)	t_{pLH} t_{pHL}	—	—	13	26	
Propagation Delay Time (CLR, PR-Q, Q)	t_{pLH} t_{pHL}	—	—	14	26	
Maximum Clock Frequency	f_{MAX}	—	36	77	—	MHz

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

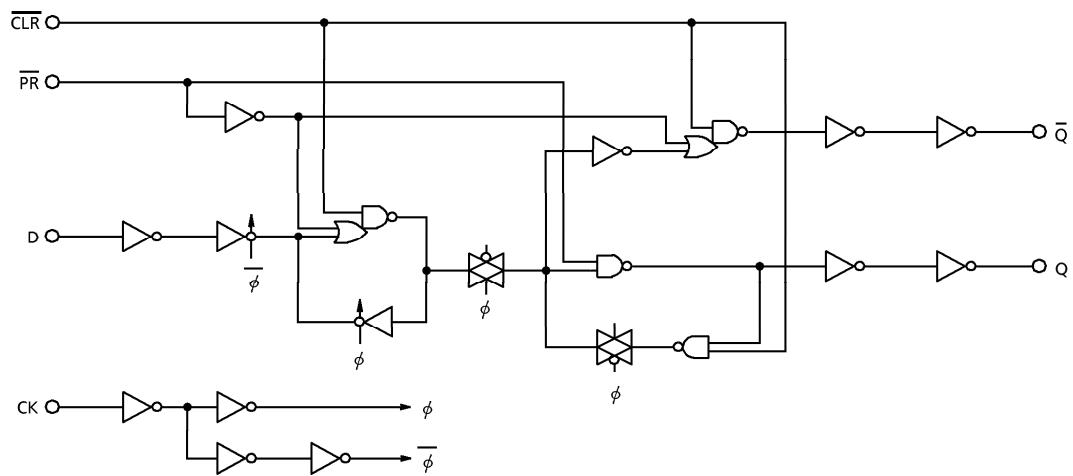
PARAMETER	SYMBOL	TEST CONDITION	V_{CC}	$T_a = 25^\circ\text{C}$			$T_a = -40\sim 85^\circ\text{C}$		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t_{TLH} t_{THL}	—	2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation Delay Time (CLOCK-Q, \bar{Q})	t_{pLH} t_{pHL}	—	2.0	—	48	150	—	190	ns
			4.5	—	16	30	—	38	
			6.0	—	13	26	—	32	
Propagation Delay Time (CLR, PR-Q, \bar{Q})	t_{pLH} t_{pHL}	—	2.0	—	51	150	—	190	ns
			4.5	—	17	30	—	38	
			6.0	—	15	26	—	32	
Maximum Clock Frequency	f_{MAX}	—	2.0	6	21	—	5	—	MHz
			4.5	31	63	—	25	—	
			6.0	36	67	—	29	—	
Input Capacitance	C_{IN}	—	—	5	10	—	10	—	pF
Power Dissipation Capacitance	C_{PD}	(Note 1)	—	34	—	—	—	—	

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

Average operating current can be obtained by the equation.

$$I_{CC(\text{opr})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

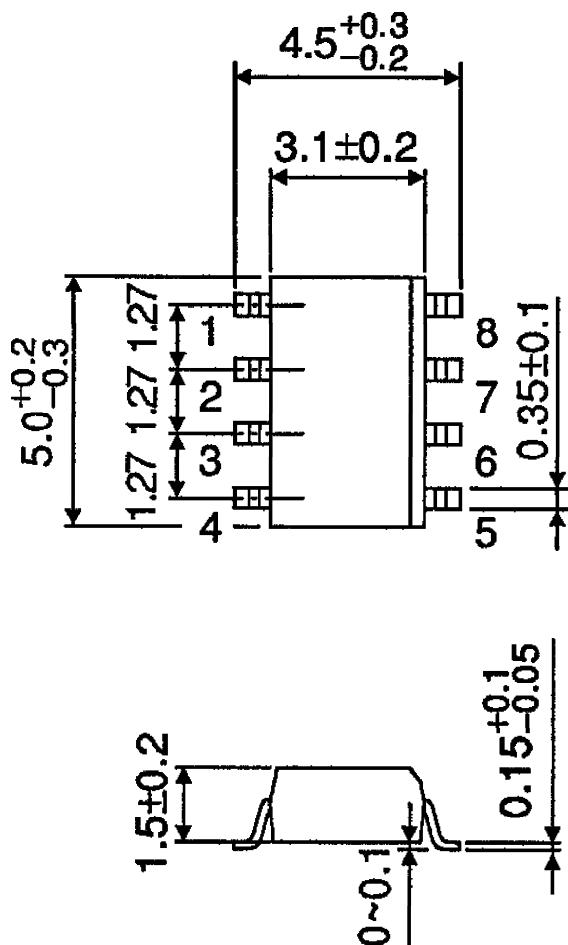
SYSTEM DIAGRAM



OUTLINE DRAWING

SOP8-P-1.27

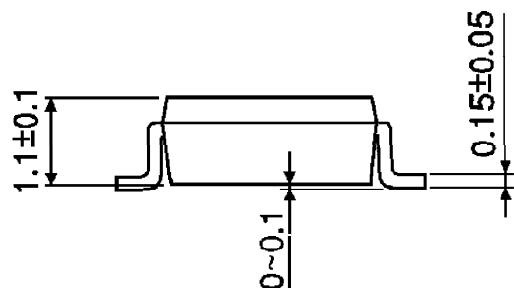
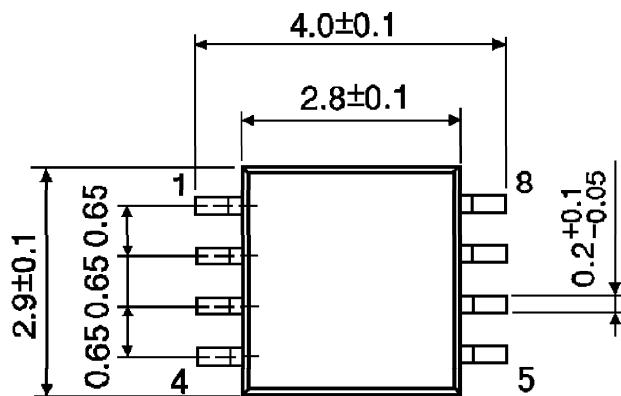
Unit : mm



Weight : 0.05g (Typ.)

OUTLINE DRAWING
SSOP8-P-0.65

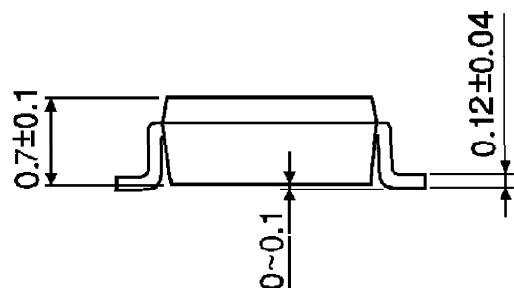
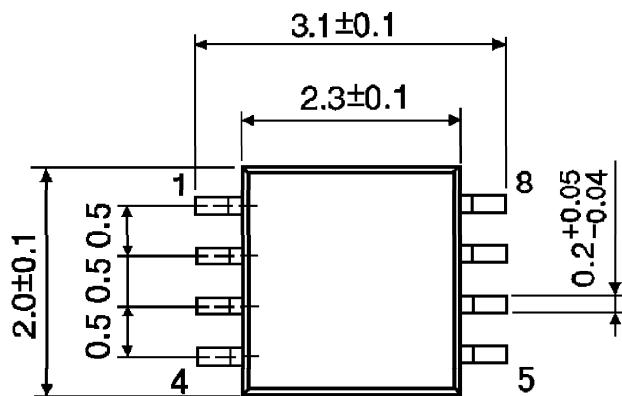
Unit : mm



Weight : 0.02g (Typ.)

OUTLINE DRAWING
SSOP8-P-0.50A

Unit : mm



Weight : 0.01g (Typ.)