TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7W74F, TC7W74FU, TC7W74FK

D-TYPE FLIP FLOP WITH PRESET AND CLEAR

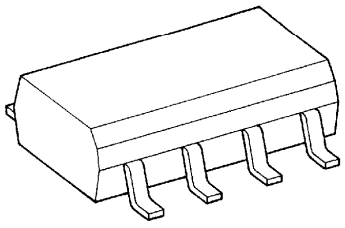
The TC7W74 is a high speed C^2MOS D FLIP FLOP fabricated with silicon gate C^2MOS technology.
It achieves the high speed operation similar to equivalent LSTTL while maintaining the C^2MOS low power dissipation.
The signal level applied to the D INPUT is transferred to Q OUTPUT during the positive going transition of the CLOCK pulse CLEAR and PRESET are independent of the CLOCK and are accomplished by setting the applopriate 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

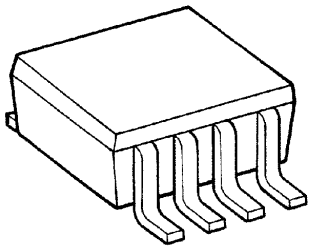
- High Speed ..... f_{MAX} = 77MHz (Typ.) at V_{CC} = 5V
- Low Power Dissipation ..... I_{CC} = 2μA (Max.) at Ta = 25°C
- High Noise Immunity ..... $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Output Drive Capability ..... 10 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = I_{OL}$ = 4mA (Min.)
- Balanced Propagation Delays ..... $t_{pLH} \fallingdotseq t_{pHL}$
- Wide Operating Voltage Range ... $V_{CC\,(opr)}$ = 2~6V

TC7W74F



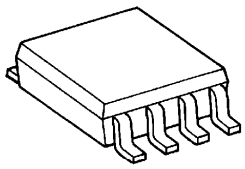
SOP8-P-1.27

TC7W74FU



SSOP8-P-0.65

TC7W74FK

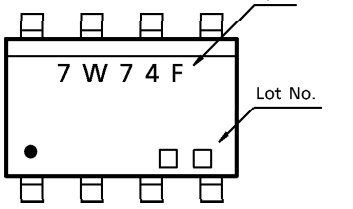


SSOP8-P-0.50A

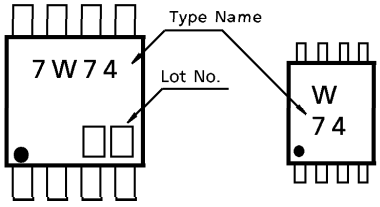
Weight
SOP8-P-1.27 : 0.05g (Typ.)
SSOP8-P-0.65 : 0.02g (Typ.)
SSOP8-P-0.50A : 0.01g (Typ.)

MARKING

TC7W74F



TC7W74FU



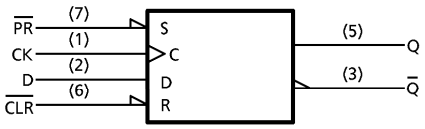
TC7W74FK

980910EBA1

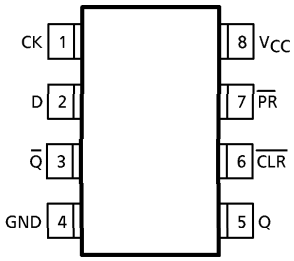
MAXIMUM RATINGS (Ta = 25°C)

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
$\overline{CLR}$	$\overline{PR}$	D	CK	Q	$\overline{Q}$	
L	H	×	×	L	H	CLEAR
H	L	×	×	H	L	PRESET
L	L	×	×	H	H	—
H	H	L	↓	L	H	—
H	H	H	↓	H	L	—
H	H	×	↑	Qn	$\overline{Q}$n	NO CHANGE

× : 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 MIN.	TYP.	MAX.	Ta = −40~85°C MIN.	MAX.	UNIT
High-Level Input Voltage	V_{IH}	—		2.0	1.5	—	—	1.5	—	V
				4.5	3.15	—	—	3.15	—	
				6.0	4.2	—	—	4.2	—	
Low-Level Input Voltage	V_{IL}	—		2.0	—	—	0.5	—	0.5	V
				4.5	—	—	1.35	—	1.35	
				6.0	—	—	1.8	—	1.8	
High-Level Output Voltage	V_{OH}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -20\mu A$	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
				6.0	5.9	6.0	—	5.9	—	
			$I_{OH} = -4mA$	4.5	4.18	4.31	—	4.13	—	
			$I_{OH} = -5.2mA$	6.0	5.68	5.80	—	5.63	—	
Low-Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 20\mu A$	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
				6.0	—	0.0	0.1	—	0.1	
			$I_{OL} = 4mA$	4.5	—	0.17	0.26	—	0.33	
			$I_{OL} = 5.2mA$	6.0	—	0.18	0.26	—	0.33	
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 TYP.	LIMIT	Ta = −40~85°C LIMIT	UNIT
Minimum Pulse Width (CLOCK)	t_{W} (L) t_{W} (H)	—	2.0	—	75	95	ns
			4.5	—	15	19	
			6.0	—	13	16	
Minimum Pulse Width ($\overline{CLR}$, $\overline{PR}$)	t_{W} (L)	—	2.0	—	75	95	
			4.5	—	15	19	
			6.0	—	13	16	
Minimum Set-up Time	t_s	—	2.0	—	75	95	
			4.5	—	15	19	
			6.0	—	13	16	
Minimum Hold Time	t_h	—	2.0	—	0	0	
			4.5	—	0	0	
			6.0	—	0	0	
Minimum Removal Time ($\overline{CLR}$, $\overline{PR}$)	t_{rem}	—	2.0	—	25	30	
			4.5	—	5	6	
			6.0	—	4	5	
Clock Frequency	f	—	2.0	—	6	5	MHz
			4.5	—	31	25	
			6.0	—	36	29	

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}	—	—	6	12	ns
Propagation Delay Time (CLOCK-Q, Q)	t_{pLH} t_{pHL}	—	—	13	26	
Propagation Delay Time ($\overline{CLR}$, $\overline{PR}$-Q, Q)	t_{pLH} t_{pHL}	—	—	14	26	
Maximum Clock Frequency	f_{MAX}	—	36	77	—	MHz

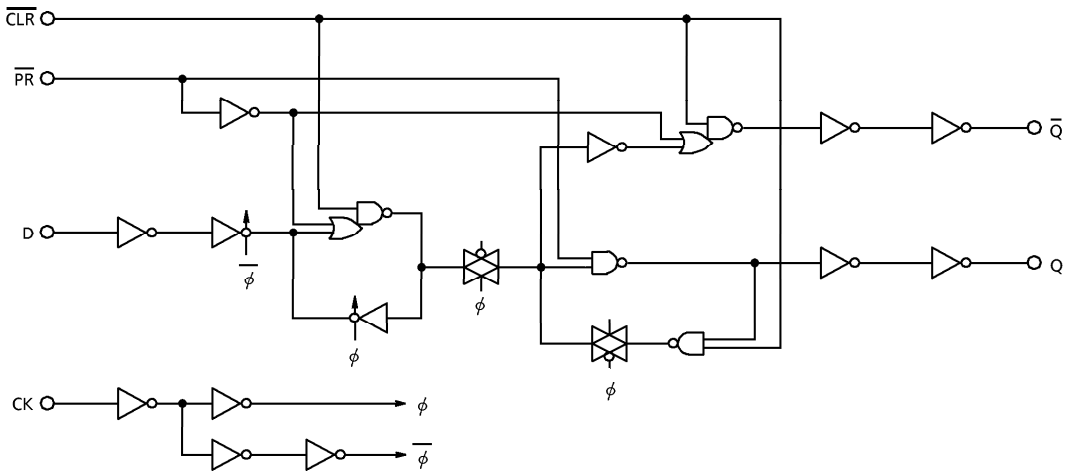
AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, Input $t_r = t_f$ = 6ns)

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}	—	2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation Delay Time (CLOCK-Q, $\overline{Q}$)	t_{pLH} t_{pHL}	—	2.0	—	48	150	—	190	
			4.5	—	16	30	—	38	
			6.0	—	13	26	—	32	
Propagation Delay Time ($\overline{CLR}$, $\overline{PR}$-Q, $\overline{Q}$)	t_{pLH} t_{pHL}	—	2.0	—	51	150	—	190	
			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.

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

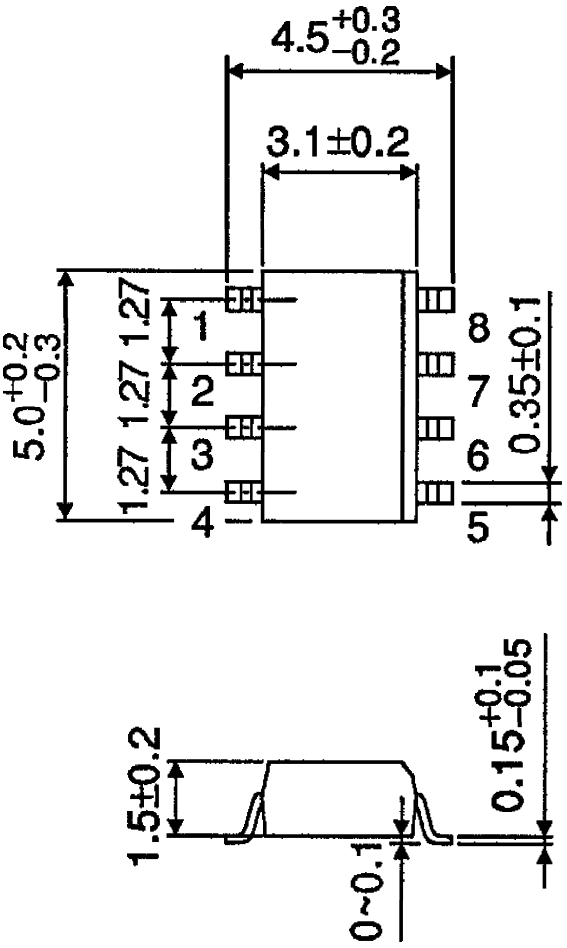
SYSTEM DIAGRAM



OUTLINE DRAWING

SOP8-P-1.27

Unit : mm

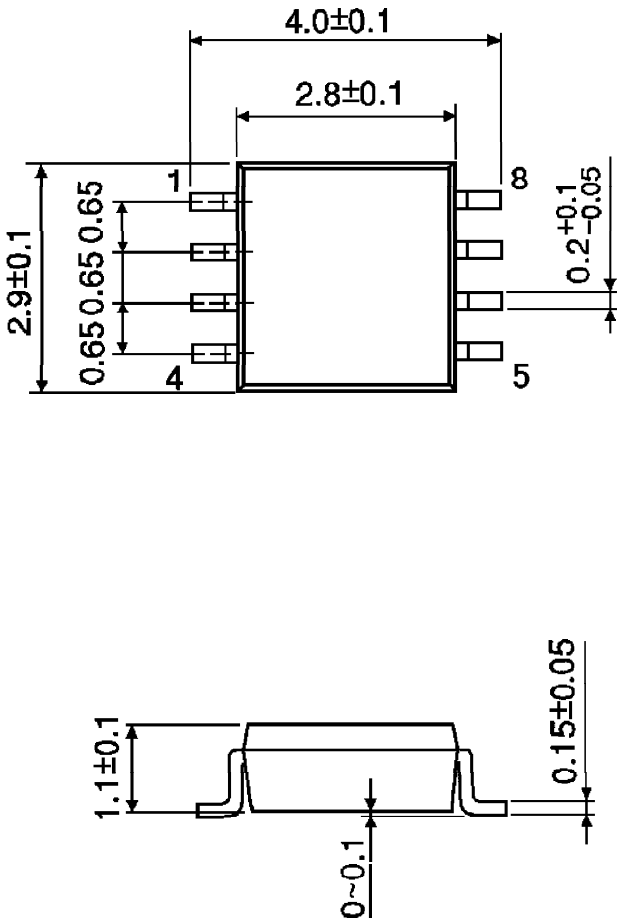


Weight : 0.05g (Typ.)

OUTLINE DRAWING

SSOP8-P-0.65

Unit : mm

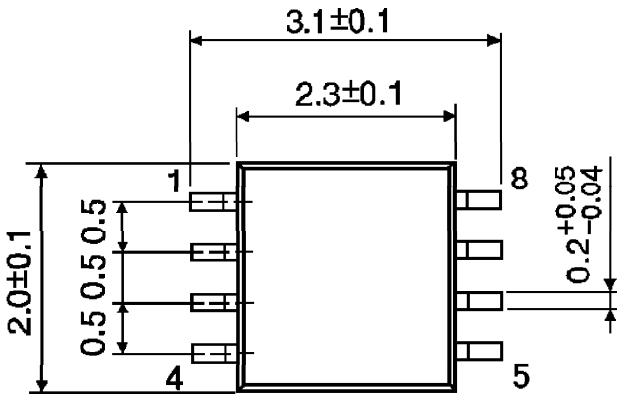


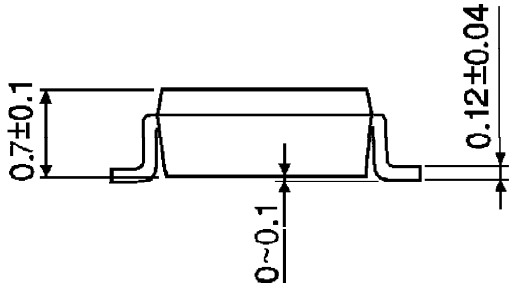
Weight : 0.02g (Typ.)

OUTLINE DRAWING

SSOP8-P-0.50A

Unit : mm





Weight : 0.01g (Typ.)