

Preliminary

TOSHIBA CMOS Digital Integrated Circuit
Silicon Monolithic

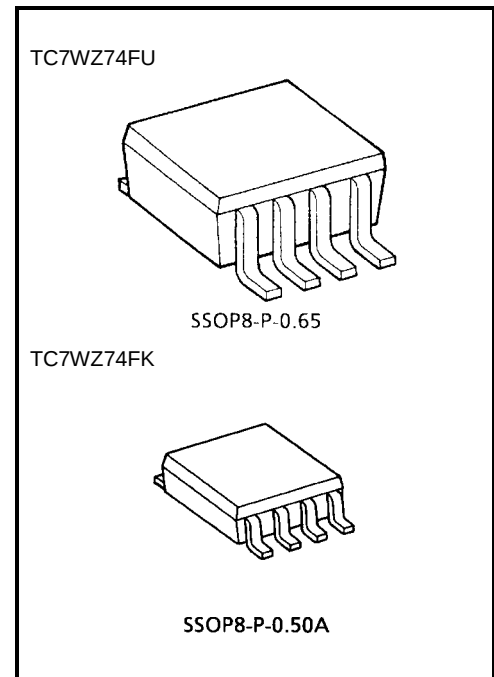
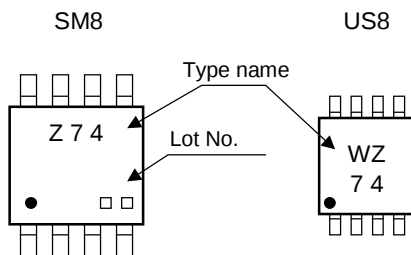
TC7WZ74FU, TC7WZ74FK

D-Type Flip Flop with Preset and Clear

Features

- High output current: ± 24 mA (min) @ $V_{CC} = 3$ V
- Propagation delay time: t_{pd} 2.8 ns (typ.) @ $V_{CC} = 3$ V, 50 pF
- Operating voltage range: $V_{CC} (opr) = 1.65 \sim 5.5$ V
- High latch-up immunity: ± 500 mA or more
- High ESD: ± 200 V or more (JEITA)
 ± 2000 V or more (MIL)
- Power down protection is provided on all inputs.
- Electrical characteristics when $V_{CC} = 3.3$ V is the same as TC74LCX series.

Marking



Weight

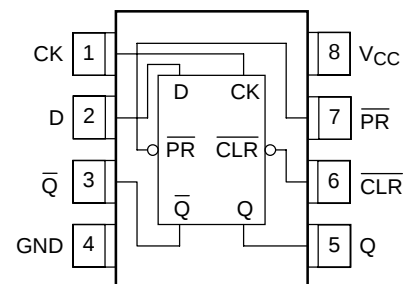
SSOP8-P-0.65 : 0.02 g (typ.)

SSOP8-P-0.50A : 0.01 g (typ.)

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5~6	V
DC input voltage	V_{IN}	-0.5~6	V
DC output voltage	V_{OUT}	-0.5~6	V
Input diode current	I_{IK}	-20	mA
Output diode current	I_{OK}	-20	mA
DC output current	I_{OUT}	± 50	mA
DC V_{CC} /ground current	I_{CC}	± 50	mA
Power dissipation	P_D	300 (SM8) 200 (US8)	mW
Storage temperature	T_{stg}	-65~150	°C
Lead temperature (10s)	T_L	260	°C

Pin Assignment (top view)

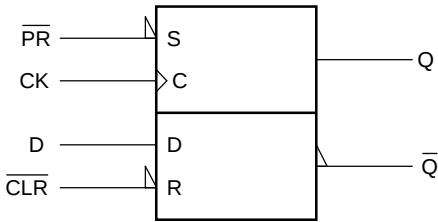


Truth Table

Inputs				Outputs		Function
$\overline{\text{CLR}}$	$\overline{\text{PR}}$	D	CK	Q	$\overline{\text{Q}}$	
L	H	X	X	L	H	Clear
H	L	X	X	H	L	Preset
L	L	X	X	H	H	—
H	H	L	$\uparrow$	L	H	—
H	H	H	$\uparrow$	H	L	—
H	H	X	$\downarrow$	Qn	Qn	No Change

X: Don't care

Logic Diagram



Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	1.65~5.5	V
		1.5~5.5 (Note 1)	
Input voltage	V_{IN}	0~5.5	V
Output voltage	V_{OUT}	0~5.5 (Note 2)	V
		0~ V_{CC} (Note 3)	
Operating temperature	T_{opr}	-40~85	°C
Input rise and fall time	dt/dv	0~20 ($V_{\text{CC}} = 1.8 \text{ V} \pm 0.15 \text{ V}$, 2.5 V $\pm 0.2 \text{ V}$)	ns/V
		0~10 ($V_{\text{CC}} = 3.3 \text{ V} \pm 0.3 \text{ V}$)	
		0~5 ($V_{\text{CC}} = 5.5 \text{ V} \pm 0.5 \text{ V}$)	

Note 1: Data retention only

Note 2: $V_{\text{CC}} = 0 \text{ V}$

Note 3: High or low

Electrical Characteristics
DC Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C				Ta = -40~85°C		Unit
					V _{CC} (V)	Min	Typ.	Max	Min	Max	
Input voltage	High level	V _{IH}	—	1.65~1.8	0.75 × V _{CC}	—	—	0.75 × V _{CC}	—	V	
				2.3~5.5	0.7 × V _{CC}	—	—	0.7 × V _{CC}	—		
	Low level	V _{IL}	—	1.65~1.8	—	—	0.25 × V _{CC}	—	0.25 × V _{CC}		
				2.3~5.5	—	—	0.3 × V _{CC}	—	0.3 × V _{CC}		
Output voltage	High level	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = -100 μA	1.65	1.55	1.65	—	1.55	—	V
					2.3	2.2	2.3	—	2.2	—	
					3.0	2.9	3.0	—	2.9	—	
					4.5	4.4	4.5	—	4.4	—	
				I _{OL} = -4 mA	1.65	1.29	1.52	—	1.29	—	
				I _{OL} = -8 mA	2.3	1.9	2.15	—	1.9	—	
				I _{OL} = -16 mA	3.0	2.4	2.8	—	2.4	—	
				I _{OL} = -24 mA	3.0	2.3	2.68	—	2.3	—	
				I _{OL} = -32 mA	4.5	3.8	4.2	—	3.8	—	
	Low level	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 100 μA	1.8	—	0	0.1	—	0.1	V
					2.3	—	0	0.1	—	0.1	
					3.0	—	0	0.1		0.1	
					4.5	—	0	0.1	—	0.1	
				I _{OL} = 4 mA	1.65	—	0.08	0.24	—	0.24	
				I _{OL} = 8 mA	2.3	—	0.1	0.3		0.3	
				I _{OL} =							

AC Characteristics (unless otherwise specified, Input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40~85°C		Unit
			V _{CC} (V)	Min	Typ.	Max	Min	Max
Maximum clock frequency	f _{MAX}	C _L = 50 pF, R _L = 500 Ω	1.8 ± 0.15	51	—	—	38	—
			2.5 ± 0.2	130	—	—	100	—
			3.3 ± 0.3	200	—	—	150	—
			5.0 ± 0.5	200	—	—	180	—
Propagation delay time (CK-Q, $\bar{Q}$)	t _{pLH} t _{pHL}	C _L = 15 pF, R _L = 1 MΩ	1.8 ± 0.15	2.5	10.0	18.0	2.1	23.0
			2.5 ± 0.2	2.0	4.9	7.5	1.7	9.0
			3.3 ± 0.3	1.5	3.3	4.8	1.3	5.6
			5.0 ± 0.5	1.0	2.4	3.5	1.0	3.9
		C _L = 50 pF, R _L = 500 Ω	3.3 ± 0.3	2.0	4.3	5.7	1.5	7.0
			5.0 ± 0.5	1.5	2.8	4.0	1.3	4.4
Propagation delay time ($\bar{CLR}$, $\bar{PR}$ -Q, $\bar{Q}$)	t _{pLH} t _{pHL}	C _L = 15 pF, R _L = 1 MΩ	1.8 ± 0.15	2.5	10.0	17.0	2.1	21.0
			2.5 ± 0.2	2.0	5.0	7.3	1.7	8.8
			3.3 ± 0.3	1.5	3.4	4.8	1.3	5.6
			5.0 ± 0.5	1.5	2.2	3.5	1.0	3.9
		C _L = 50 pF, R _L = 500 Ω	3.3 ± 0.3	2.0	4.3	5.7	1.5	7.0
			5.0 ± 0.5	1.0	3.1	3.9	1.0	4.3
Minimum setup time	t _s	C _L = 50 pF, R _L = 500 Ω	2.5 ± 0.2	3.4	—	—	4.1	—
			3.3 ± 0.3	2.1	—	—	2.5	—
			5.0 ± 0.5	1.5	—	—	1.7	—
Minimum hold time	t _h	C _L = 50 pF, R _L = 500 Ω	2.5 ± 0.2	2.4	—	—	2.9	—
			3.3 ± 0.3	1.4	—	—	1.5	—
			5.0 ± 0.5	1.0	—	—	1.1	—
Minimum pulse width (CK)	t _W (L) t _W (H)	C _L = 50 pF, R _L = 500 Ω	2.5 ± 0.2	3.0	—	—	3.6	—
			3.3 ± 0.3	3.0	—	—	3.3	—
			5.0 ± 0.5	3.0	—	—	3.2	—
Minimum pulse width ($\bar{CLR}$, $\bar{PR}$)	t _W (L)	C _L = 50 pF, R _L = 500 Ω	2.5 ± 0.2	3.0	—	—	3.6	—
			3.3 ± 0.3	3.0	—	—	3.3	—
			5.0 ± 0.5	3.0	—	—	3.2	—
Minimum removal time	t _{rem}	C _L = 50 pF, R _L = 500 Ω	2.5 ± 0.2	3.6	—	—	4.4	—
			3.3 ± 0.3	2.2	—	—	2.5	—
			5.0 ± 0.5	1.3	—	—	1.4	—
Input capacitance	C _{IN}	—	0~0.5	—	3.0	—	—	pF
Output capacitance	C _{OUT}	—	0~0.5	—	5.0	—	—	pF
Power dissipation capacitance	C _{PD}	(Note 4)	3.3	—	30	—	—	pF
			5.5	—	47	—	—	

Note 4: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

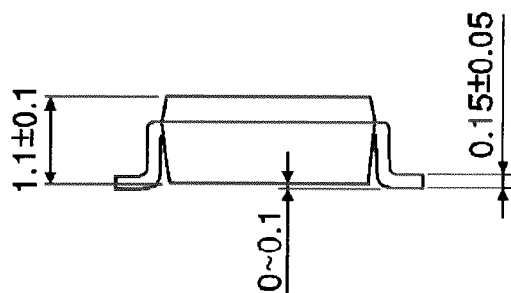
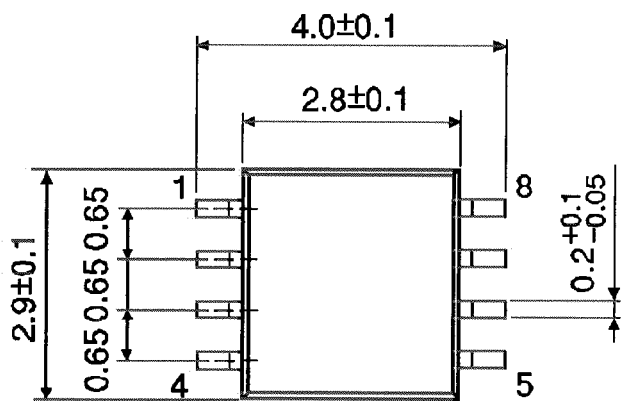
Average operating current can be obtained by the equation:

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

Package Dimensions

SSOP8-P-0.65

Unit : mm



Weight: 0.02 g (typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.