

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

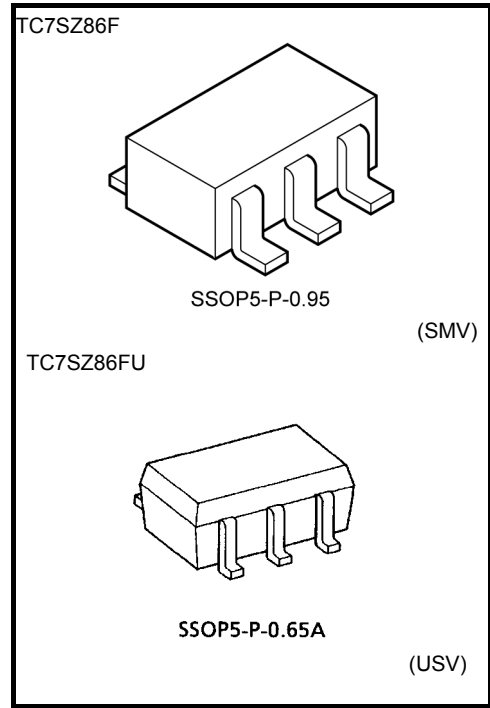
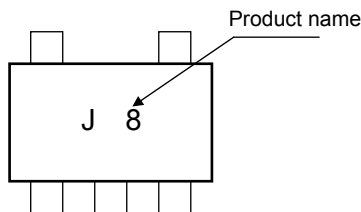
TC7SZ86F, TC7SZ86FU

2-Input EXCLUSIVE OR Gate

Features

- High output current : ± 24 mA (min) at $V_{CC} = 3$ V
- Super high speed operation : $t_{pd} = 2.9$ ns (typ.)
at $V_{CC} = 5$ V, $C_L = 50$ pF
- Operating voltage range : $V_{CC} = 1.8$ to 5.5 V
- 5.5-V tolerant inputs.
- 5.5-V power down protection output.
- Matches the performance of TC74LCX series when operated at 3.3 V V_{CC} .

Marking

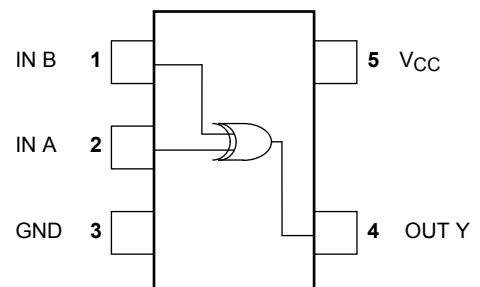


Weight:
 SSOP5-P-0.95 : 16.0 mg (typ.)
 SSOP5-P-0.65A : 6.0 mg (typ.)

Absolute Maximum Ratings (Ta=25°C)

Characteristic	Symbol	Rating	Unit
Supply voltage	V_{CC}	-0.5 to 6	V
DC input voltage	V_{IN}	-0.5 to 6	V
DC output voltage	V_{OUT}	-0.5 to 6 (Note 1)	V
		-0.5 to $V_{CC} + 0.5$ (Note 2)	
Input diode current	I_{IK}	-20	mA
Output diode current	I_{OK}	-20 (Note 3)	mA
DC output current	I_{OUT}	± 50	mA
DC V_{CC} /ground current	I_{CC}	± 50	mA
Power dissipation	P_D	200	mW
Storage temperature	T_{stg}	-65 to 150	°C
Lead temperature (10 s)	T_L	260	°C

Pin Assignment (top view)



Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

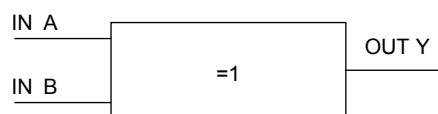
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: $V_{CC} = 0$ V

Note 2: High or Low State. Do not exceed I_{OUT} of absolute maximum ratings.

Note 3: $V_{OUT} < GND$

IEC Logic Symbol



Truth Table

A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

Operating Ranges

Characteristic	Symbol	Rating	Unit
Supply voltage	V_{CC}	1.8 to 5.5	V
		1.5 to 5.5 (Note 4)	
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to 5.5 (Note 5)	V
		0 to V_{CC} (Note 6)	
Operating temperature	T_{opr}	-40 to 85	°C
Input rise and fall time	dt/dv	0 to 20 ($V_{CC} = 1.8\text{ V}, 2.5\text{ V} \pm 0.2\text{ V}$)	ns/V
		0 to 10 ($V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$)	
		0 to 5 ($V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$)	

Note 4: Data retention only

Note 5: $V_{CC} = 0\text{ V}$

Note 6: High or Low state

Electrical Characteristics

DC Characteristics

Characteristic	Symbol	Test Condition	V _{CC} (V)	Ta = 25°C			Ta = -40 to 85°C		Unit			
				Min	Typ.	Max	Min	Max				
Input voltage	High level	V _{IH}	—	1.8	V _{CC} × 0.75	—	—	V _{CC} × 0.75	—	V		
				2.3 to 5.5	V _{CC} × 0.7	—	—	V _{CC} × 0.7	—			
	Low level	V _{IL}	—	1.8	—	—	V _{CC} × 0.25	—	V _{CC} × 0.25			
				2.3 to 5.5	—	—	V _{CC} × 0.3	—	V _{CC} × 0.3			
Output voltage	High level	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -100 μA	1.8	1.7	1.8	—	1.7	—	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 _{OH} = -8 mA	2.3	1.9	2.15	—	1.9		—
					I _{OH} = -16 mA	3.0	2.4	2.8	—	2.4		—
					I _{OH} = -24 mA	3.0	2.3	2.68	—	2.3		—
	I _{OH} = -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} = 8 mA	2.3	—	0.1	0.3	—		0.3
					I _{OL} = 16 mA	3.0	—	0.15	0.4	—		0.4
I _{OL} = 24 mA					3.0	—	0.22	0.55	—	0.55		
I _{OL} = 32 mA	4.5	—	0.22	0.55	—	0.55						
Input leakage current	I _{IN}	V _{IN} = 5.5 V or GND	0 to 5.5	—	—	±1	—	±10	μA			
Power off leakage current	I _{OFF}	V _{IN} or V _{OUT} = 5.5 V	0.0	—	—	1	—	10	μA			
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND	5.5	—	—	2	—	20	μA			

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

Characteristic	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit	
			VCC (V)	Min	Typ.	Max	Min		Max
Propagation delay time	t_{pLH} t_{pHL}	$C_L = 15$ pF, $R_L = 1$ M Ω	1.8 ± 0.15	2.0	5.7	11.5	2.0	12.0	ns
			2.5 ± 0.2	0.8	3.8	8.0	0.8	8.5	
			3.3 ± 0.3	0.5	3.0	5.7	0.5	6.0	
			5.0 ± 0.5	0.5	2.4	5.0	0.5	5.4	
	$C_L = 50$ pF, $R_L = 500$ Ω	3.3 ± 0.3	1.2	3.5	6.2	1.2	6.5	ns	
		5.0 ± 0.5	0.8	2.9	5.4	0.8	5.8		
Input capacitance	C_{IN}	—	0 to 5.5	—	4	—	—	pF	
Power dissipation capacitance	C_{PD}	(Note 7)	3.3	—	21	—	—	—	pF
			5.5	—	24	—	—	—	

Note 7: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

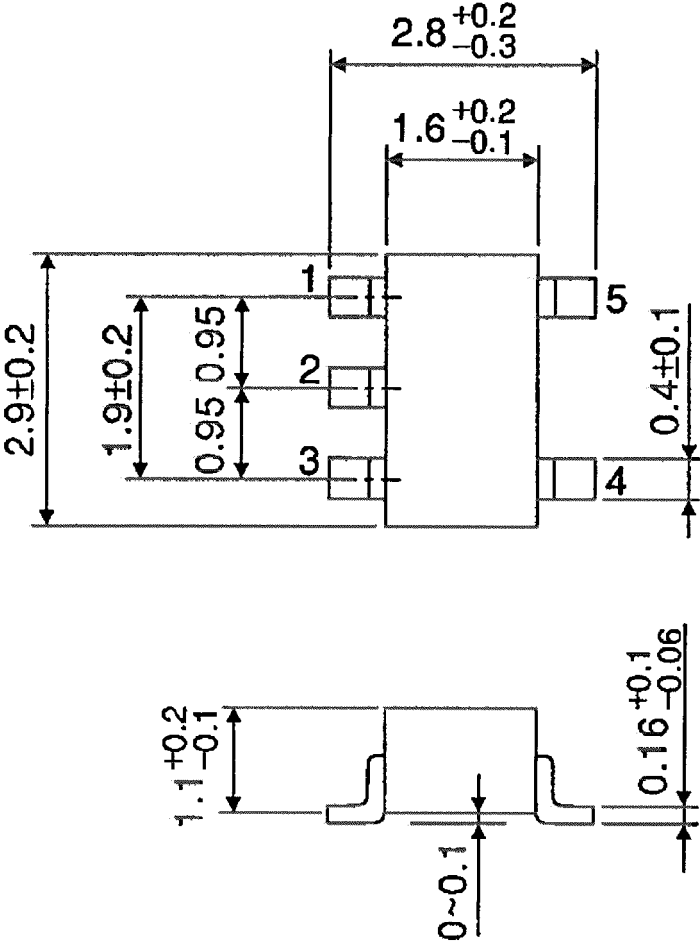
Average operating current can be obtained by the equation:

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

Package Dimensions

SSOP5-P-0.95

Unit : mm

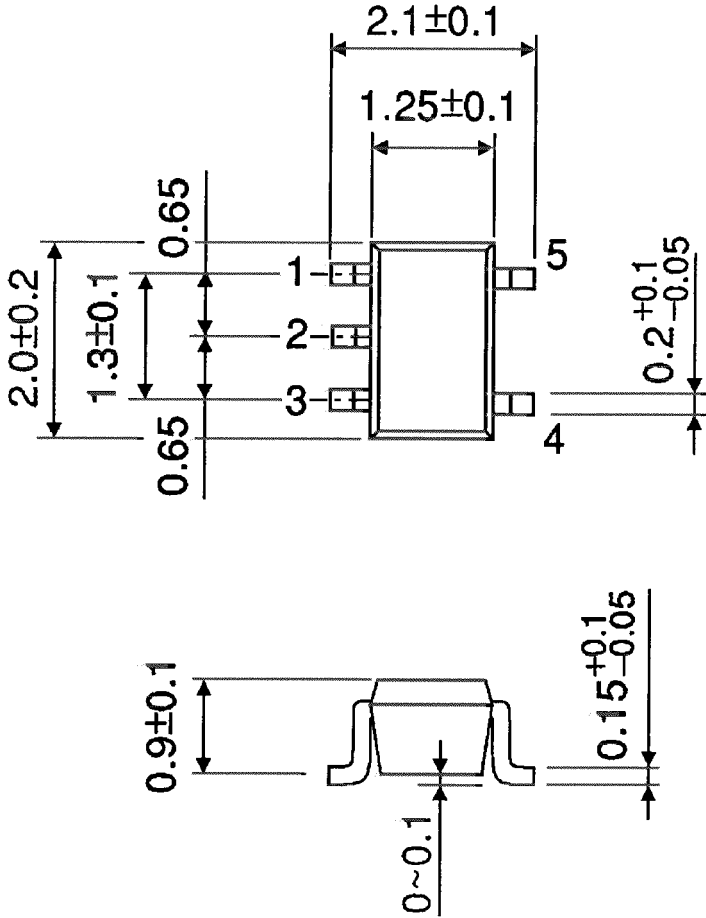


Weight: 16.0 mg (typ.)

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 6.0 mg (typ.)

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