

# TC7WZ245FU, TC7WZ245FK

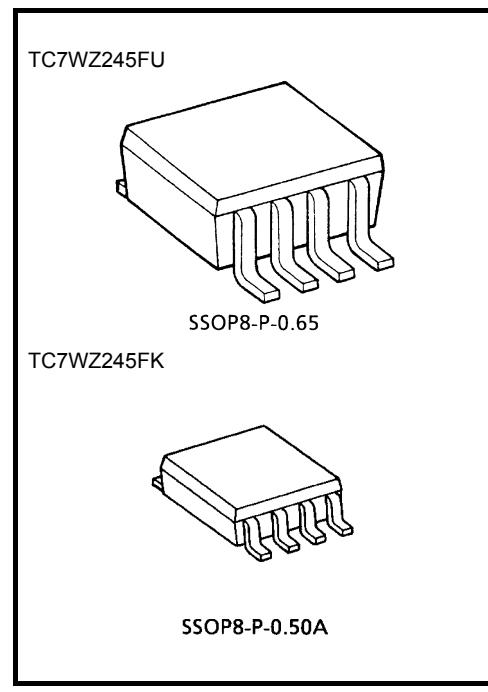
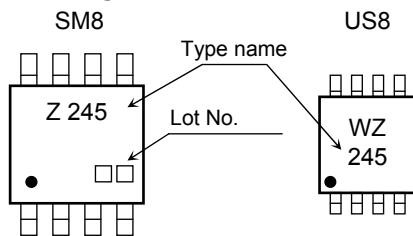
Dual Bus Transceiver

## Features

- High output drive :  $\pm 24$  mA (min) at  $V_{CC} = 3$  V
- Super high speed operation :  $t_{pd} = 5.0$  ns(max) at  $V_{CC} = 5$  V, 50 pF
- Operation voltage range :  $V_{CC} (\text{opr}) = 1.65 \sim 5.5$  V
- 5.5-V tolerant inputs
- 5.5-V power down protection outputs
- Matches the performance of TC74LCX series when operated at 3.3-V  $V_{CC}$

Note : Do not apply a signal to any pins when it is the output mode. Damage may result.  
All floating (high impedance) bus pins must have their input levels fixed by means of pull-up or pull-down resistors.

## Marking

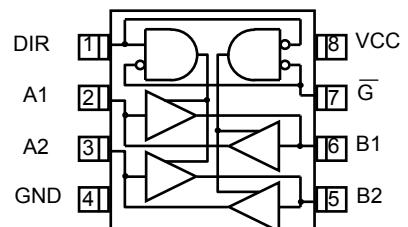


Weight  
SSOP8-P-0.65 : 0.02 g (typ.)  
SSOP8-P-0.50A : 0.01 g (typ.)

## Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

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	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 50$	mA
Power dissipation	$P_D$	300 (SM8) 200 (US8)	mW
Storage temperature	$T_{stg}$	-65~150	°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).

**Truth Table**

INPUT		FUNCTION		OUTPUT
$\overline{G}$	DIR	A BUS	B BUS	
L	L	OUTPUT	INPUT	$A = B$
L	H	INPUT	OUTPUT	$B = A$
H	X	High Impedance		Z

X : Don't Care

Z : High Impedance

**Operating Ranges**

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 ( $V_{CC} = 1.8 V \pm 0.15 V$ , $2.5 V \pm 0.2 V$ )	ns/V
		0~10 ( $V_{CC} = 3.3 V \pm 0.3 V$ )	
		0~5 ( $V_{CC} = 5.5 V \pm 0.5 V$ )	

Note 1 : Data retention only

Note 2 :  $V_{CC_{min}} = 0 V$ 

Note 3 : High or low state

## Electrical Characteristics

## DC Characteristics

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		Unit	
				Min	Typ.	Max	Min	Max		
High-Level Input Voltage	V <sub>IH</sub>	—	1.65~1.95	V <sub>CC</sub> × 0.75	—	—	V <sub>CC</sub> × 0.75	—	V	
			2.3~5.5	V <sub>CC</sub> × 0.7	—	—	V <sub>CC</sub> × 0.7	—		
Low-Level Input Voltage	V <sub>IL</sub>	—	1.65~1.95	—	—	V <sub>CC</sub> × 0.25	—	V <sub>CC</sub> × 0.25	V	
			2.3~5.5	—	—	V <sub>CC</sub> × 0.3	—	V <sub>CC</sub> × 0.3		
High-level output voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -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 <sub>OH</sub> = -4 mA	1.65	1.29	1.52	—	1.29		
			I <sub>OH</sub> = -8 mA	2.3	1.9	2.14	—	1.9		
			I <sub>OH</sub> = -16 mA	3.0	2.4	2.75	—	2.4		
			I <sub>OH</sub> = -24 mA	3.0	2.3	2.62	—	2.3		
			I <sub>OH</sub> = -32 mA	4.5	3.8	4.13	—	3.8		
			I <sub>OH</sub> = 100 μA	1.65	—	0	0.1	—	0.1	
Low-level output voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>		2.3	—	0	0.1	—	0.1	
				3.0	—	0	0.1	—	0.1	
				4.5	—	0	0.1	—	0.1	
		I <sub>OH</sub> = 4 mA	1.65	—	0.08	0.24	—	0.24		
		I <sub>OH</sub> = 8 mA	2.3	—	0.1	0.3	—	0.3		
		I <sub>OH</sub> = 16 mA	3.0	—	0.16	0.4	—	0.4		
		I <sub>OH</sub> = 24 mA	3.0	—	0.24	0.55	—	0.55		
		I <sub>OH</sub> = 32 mA	4.5	—	0.25	0.55	—	0.55		
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> = 5.5 V or GND	0~5.5	—	—	±1	—	±10	μA	
3-State Output Off-State Current	I <sub>OZ</sub>	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> =V <sub>CC</sub> or GND	1.65~5.5	—	—	±0.5	—	±5	μA	
Power off leakage current	I <sub>OFF</sub>	V <sub>IN</sub> or V <sub>OUT</sub> = 5.5 V	0.0	—	—	1	—	10	μA	
Quiescent supply current	I <sub>CC</sub>	V <sub>IN</sub> = 5.5 V or GND	1.65~5.5	—	—	1	—	10	μA	

AC Characteristics (input:  $t_r = t_f = 3$  ns)

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Ta = 25°C			Ta = -40~85°C		Unit
				Min	Typ.	Max	Min	Max	
Propagation delay time	$t_{pLH}$ $t_{pHL}$	$C_L = 15$ pF, $R_L = 1$ MΩ	$1.8 \pm 0.15$	2.0	—	15.0	2.0	16.5	ns
			$2.5 \pm 0.2$	1.0	—	7.5	1.0	8.0	
			$3.3 \pm 0.3$	0.8	—	5.2	1.2	6.0	
			$5.0 \pm 0.5$	0.5	—	4.5	0.8	5.5	
	$t_{pZL}$ $t_{pZH}$	$C_L = 50$ pF, $R_L = 500$ Ω	$3.3 \pm 0.3$	1.5	—	6.7	1.5	7.0	ns
			$5.0 \pm 0.5$	0.8	—	5.0	0.8	5.3	
			$1.8 \pm 0.15$	2.0	—	20.0	2.0	22.0	
			$2.5 \pm 0.2$	1.8	—	10.5	1.8	11.2	
3-state output Enable time	$t_{pLZ}$ $t_{pHZ}$	$C_L = 50$ pF, $R_L = 500$ Ω	$3.3 \pm 0.3$	1.5	—	8.1	1.5	8.5	ns
			$5.0 \pm 0.5$	0.8	—	5.5	0.8	5.8	
			$1.8 \pm 0.15$	2.5	—	17.0	2.5	18.8	
			$2.5 \pm 0.2$	1.5	—	8.6	1.5	9.1	
3-state output Disable time	$t_{osLH}$ $t_{osHL}$	$C_L = 50$ pF, $R_L = 500$ Ω	$3.3 \pm 0.3$	1.5	—	7.1	1.5	7.5	ns
			$5.0 \pm 0.5$	0.3	—	4.7	0.3	5.0	
			$3.3 \pm 0.3$	—	—	1.0	—	1.0	
			$5.0 \pm 0.5$	—	—	0.8	—	0.8	
Input capacitance	$C_{IN}$	DIR,DE	0	—	7	—	—	—	pF
Bus input capacitance	$C_{I/0}$	An,Bn	5.5	—	8	—	—	—	pF
Power dissipation capacitance	$C_{PD}$	(Note 5)	3.3	—	29	—	—	—	pF
			5.5	—	33	—	—	—	

Note 4 :Parameter guaranteed by design.  $t_{osLH} = |t_{pLHm} - t_{pLHn}|$ ,  $t_{osHL} = |t_{pHLm} - t_{pHLn}|$

Note 5 :  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

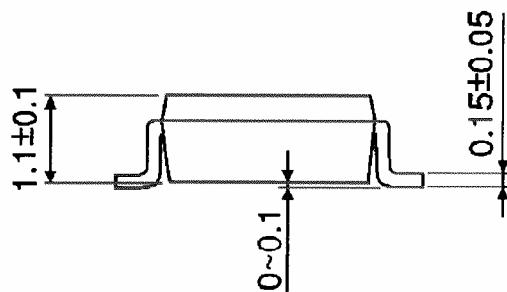
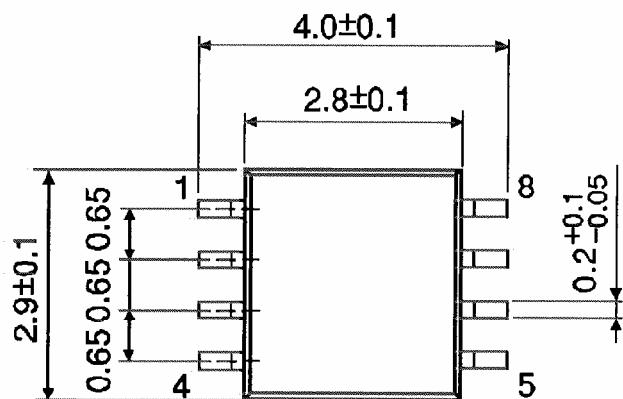
Average operating current can be obtained by the equation:

$$I_{CC\ (\text{opr.})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2$$

**Package Dimensions**

SSOP8-P-0.65

Unit : mm

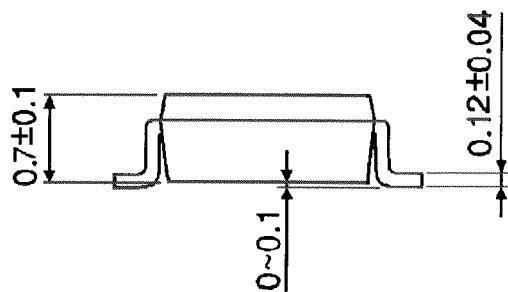
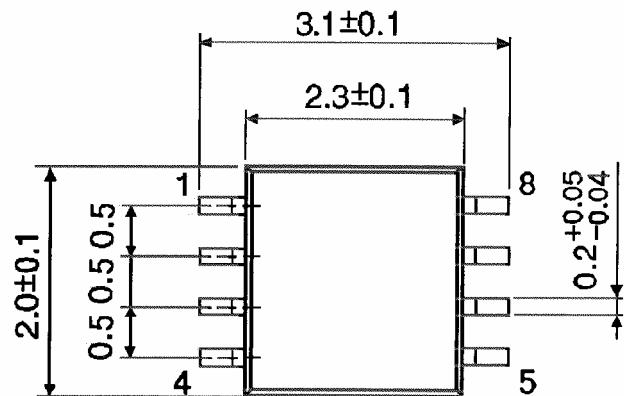


Weight: 0.02 g (typ.)

**Package Dimensions**

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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20070701-EN GENERAL

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