

# TC7WZ245FU, TC7WZ245FK

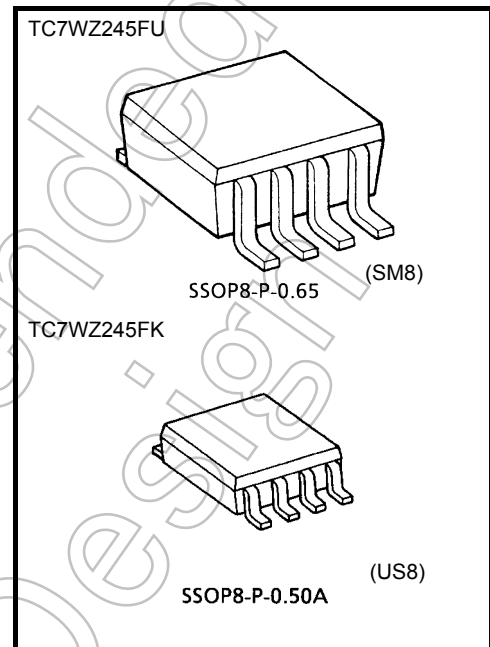
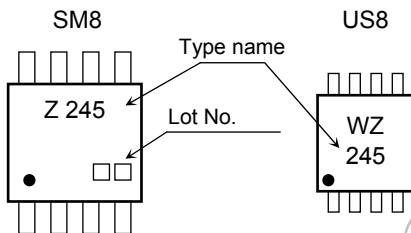
## Dual Bus Transceiver

### Features

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

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 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	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 50$	mA
Power dissipation	$P_D$	300 (SM8)	mW
		200 (US8)	
Storage temperature	$T_{stg}$	-65 to 150	$^\circ\text{C}$
Lead temperature (10 s)	$T_L$	260	$^\circ\text{C}$

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.

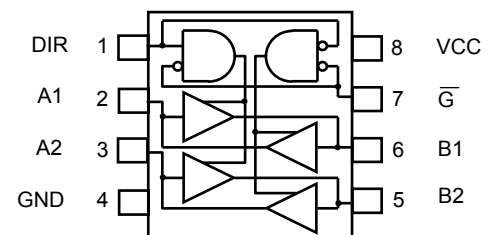
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1:  $V_{CC} = 0\text{V}$  or High impedance condition

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

Note 3:  $V_{OUT} < \text{GND}$

### Pin Assignment (top view)



DIR 1 8 VCC  
 A1 2 7  $\bar{G}$   
 A2 3 6 B1  
 GND 4 5 B2

Start of commercial production  
 2003-07

## 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 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 ( $V_{CC} = 1.80\text{ V} \pm 0.15\text{ V}$ , $2.5\text{ V} \pm 0.2\text{ V}$ )	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:  $V_{CC} = 0\text{ V}$  or High impedance condition

Note 6: High or low state

Not Recommended for New

## Electrical Characteristics

### DC Characteristics

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40 to 85°C		Unit	
				Min	Typ.	Max	Min	Max		
High-Level Input Voltage	V <sub>IH</sub>	—	1.65 to 1.95	V <sub>CC</sub> × 0.75	—	—	V <sub>CC</sub> × 0.75	—	V	
			2.3 to 5.5	V <sub>CC</sub> × 0.7	—	—	V <sub>CC</sub> × 0.7	—		
Low-Level Input Voltage	V <sub>IL</sub>	—	1.65 to 1.95	—	—	V <sub>CC</sub> × 0.25	—	V <sub>CC</sub> × 0.25	V	
			2.3 to 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	—	
				2.3	1.9	2.14	—	1.9	—	
				3.0	2.4	2.75	—	2.4	—	
				4.5	3.8	4.13	—	3.8	—	
Low-level output voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = 100 μA	1.65	—	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 <sub>OH</sub> = 4 mA	1.65	—	0.08	0.24	—	0.24	
				2.3	—	0.1	0.3	—	0.3	
				3.0	—	0.16	0.4	—	0.4	
				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 to 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 to 5.5	—	—	±0.5	—
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 to 5.5	—	—	1	—	10	μA	

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

Characteristics	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 $\Omega$	1.80 ± 0.15	2.0	—	15.0	2.0	16.5	ns
			2.5 ± 0.2	1.0	—	7.5	1.0	8.0	
			3.3 ± 0.3	0.8	—	5.2	1.2	6.0	
			5.0 ± 0.5	0.5	—	4.5	0.8	5.5	
		$C_L = 50$ pF, $R_L = 500$ $\Omega$	3.3 ± 0.3	1.5	—	6.7	1.5	7.0	
			5.0 ± 0.5	0.8	—	5.0	0.8	5.3	
3-state output Enable time	$t_{pZL}$ $t_{pZH}$	$C_L = 50$ pF, $R_L = 500$ $\Omega$	1.80 ± 0.15	2.0	—	20.0	2.0	22.0	ns
			2.5 ± 0.2	1.8	—	10.5	1.8	11.2	
			3.3 ± 0.3	1.5	—	8.1	1.5	8.5	
			5.0 ± 0.5	0.8	—	5.5	0.8	5.8	
3-state output Disable time	$t_{pLZ}$ $t_{pHZ}$	$C_L = 50$ pF, $R_L = 500$ $\Omega$	1.80 ± 0.15	2.5	—	17.0	2.5	18.8	ns
			2.5 ± 0.2	1.5	—	8.6	1.5	9.1	
			3.3 ± 0.3	1.5	—	7.1	1.5	7.5	
			5.0 ± 0.5	0.3	—	4.7	0.3	5.0	
Output to output skew	$t_{oS LH}$	(Note 7)	3.3 ± 0.3	—	—	1.0	—	1.0	ns
	$t_{oS HL}$		5.0 ± 0.5	—	—	0.8	—	0.8	
Input capacitance	$C_{IN}$	DIR, DE	0	—	7	—	—	—	pF
Bus input capacitance	$C_{I/O}$	An, Bn	5.5	—	8	—	—	—	pF
Power dissipation capacitance	$C_{PD}$	(Note 8)	3.3	—	29	—	—	—	pF
			5.5	—	33	—	—	—	

Note 7: Parameter guaranteed by design.  
 $t_{oS LH} = |t_{pLHm} - t_{pLHn}|$ ,  $t_{oS HL} = |t_{pHLm} - t_{pHLn}|$

Note 8:  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

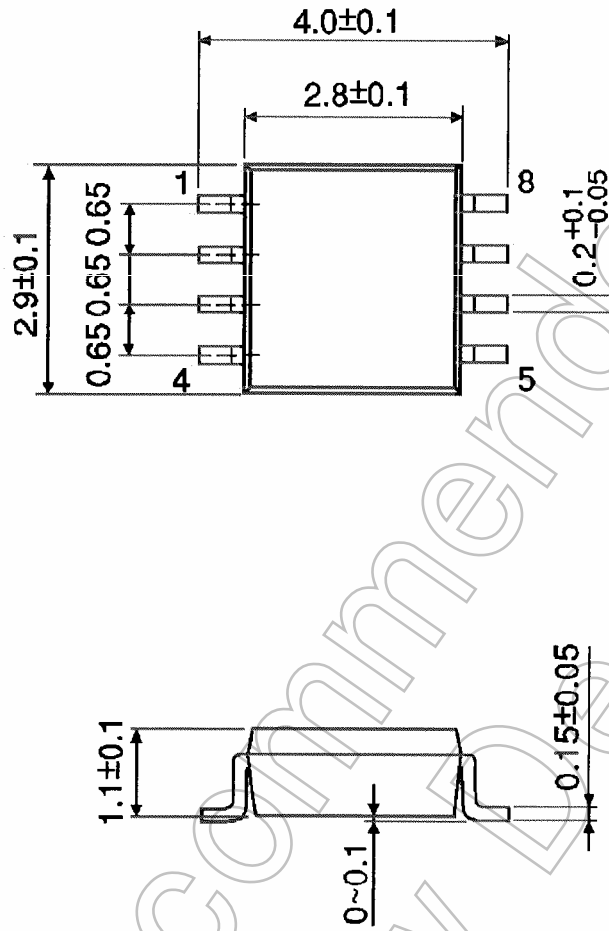
Average operating current can be obtained by the equation:

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

**Package Dimensions**

SSOP8-P-0.65

Unit : mm



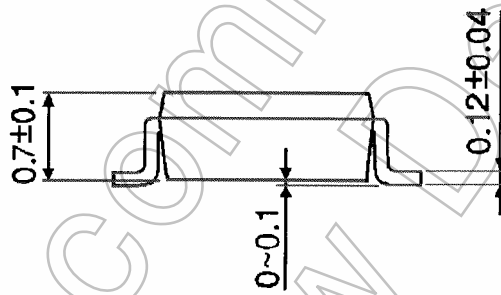
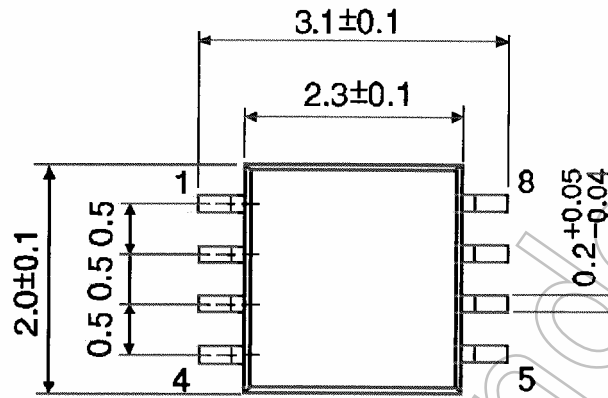
Weight: 0.02 g (typ.)

Not Recommended for New Design

Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

Not Recommended for New Design

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