TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7WZ246FU,TC7WZ246FK

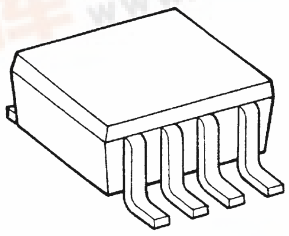
Dual Bus Transceiver
Buffer And Buffer (Open Drain Outputs)

Features

- High output drive : ±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 : $V_{CC\ (opr)}$ = 1.65~5.5 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}

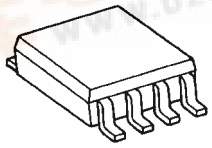
Note : Do not apply a signal to any bus pins when it is in the output mode. Damage may result.

TC7WZ246FU



SSOP8-P-0.65

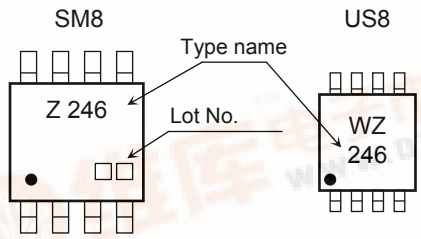
TC7WZ246FK



SSOP8-P-0.50A

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

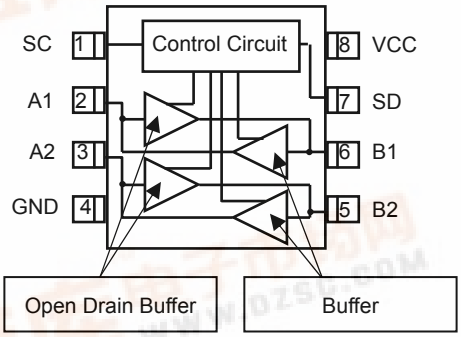
Marking



Absolute 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, +50(Note 1)	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 (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 : Open Drain Buffer Output diode current.

Truth Table

INPUT		FUNCTION				OUTPUT
SC	SD	A1BUS	A2 BUS	B1 BUS	B2 BUS	
L	L	OUTPUT	OUTPUT	INPUT	INPUT	A1=B1,A2=B2
L	H	OUTPUT	INPUT	INPUT	OUTPUT*	A1=B1,B2=A2
H	L	INPUT	OUTPUT	OUTPUT*	INPUT	B1=A1,A2=B2
H	H	INPUT	INPUT	OUTPUT*	OUTPUT*	B1=A1,B2=A2

* : High Impedance

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	1.65~5.5	V
		1.5~5.5 (Note 2)	
Input voltage	V_{IN}	0~5.5	V
Output voltage	V_{OUT}	0~5.5 (Note 3)	V
		0~ V_{CC} (Note 4)	
Operating temperature	T_{opr}	−40~85	°C
Input rise and fall time	dt/dv	0~20 (V_{CC} = 1.8 V ± 0.15 V , 2.5 V ± 0.2 V)	ns/V
		0~10 (V_{CC} = 3.3 V ± 0.3 V)	
		0~5 (V_{CC} = 5.5 V ± 0.5 V)	

Note 2 : Data retention only

Note 3 : V_{CC} = 0 V

Note 4 : High or low state

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		V_{CC} (V)	Ta = 25°C Min	Ta = 25°C Typ.	Ta = 25°C Max	Ta = −40~85°C Min	Ta = −40~85°C Max	Unit
High-Level Input Voltage	V_{IH}	—		1.65~1.95	V_{CC} × 0.75	—	—	V_{CC} × 0.75	—	V
				2.3~5.5	V_{CC} × 0.7	—	—	V_{CC} × 0.7	—	
Low-Level Input Voltage	V_{IL}	—		1.65~1.95	—	—	V_{CC} × 0.25	—	V_{CC} × 0.25	
				2.3~5.5	—	—	V_{CC} × 0.3	—	V_{CC} × 0.3	
High-level output voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = -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_{OH} = - 4 mA	1.65	1.29	1.52	—	1.29	—	
			I_{OH} = - 8 mA	2.3	1.9	2.14	—	1.9	—	
			I_{OH} = - 16 mA	3.0	2.4	2.75	—	2.4	—	
			I_{OH} = - 24 mA	3.0	2.3	2.62	—	2.3	—	
			I_{OH} = - 32 mA	4.5	3.8	4.13	—	3.8	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 100 μA	1.65	—	0	0.1	—	0.1	
				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} = 16 mA	3.0	—	0.16	0.4	—	0.4	
			I_{OL} = 24 mA	3.0	—	0.24	0.55	—	0.55	
			I_{OL} = 32 mA	4.5	—	0.25	0.55	—	0.55	
Input leakage current	I_{IN}	V_{IN} = 5.5 V or GND		0~5.5	—	—	±1	—	±10	μA
3-State Output Off-State Current	I_{OZ}	VIN=VIH or VIL VOUT=VCC or GND		1.65~ 5.5	—	—	±5	—	±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} = 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		Ta = 25°C			Ta = −40~85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Propagation delay time (Buffer output)	t_{pLH} t_{pHL}	C_L = 15 pF, R_L = 1 MΩ	1.8 ± 0.15	2.0	—	17.0	2.0	18.5	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 Ω	3.3 ± 0.3	1.5	—	6.7	1.5	7.0	
			5.0 ± 0.5	0.8	—	5.0	0.8	5.3	
Output to output skew	tos_{LH} tos_{HL}	(Note 5)	3.3 ± 0.3	—	—	1.0	—	1.0	ns
3-state output Disable time (Open drain output)	t_{pLZ} $_{pLZ}$	C_L = 50 pF, R_L = 500 Ω	1.8 ± 0.15	1.8	—	9.5	1.8	10.5	ns
			2.5 ± 0.2	1.2	—	5.8	1.2	6.4	
			3.3 ± 0.3	0.8	—	5.0	0.8	5.3	
			5.0 ± 0.5	0.5	—	4.2	0.5	4.5	
Input capacitance	C_{IN}	—	0	—	7	—	—	—	pF
Bus input capacitance	$C_{I/O}$	—	5.5	—	8	—	—	—	pF
Output capacitance	C_{OUT}	—	5.5	—	9	—	—	—	pF
Power dissipation capacitance	C_{PD}	(Note 6)	3.3	—	29	—	—	—	pF
			5.5	—	33	—	—	—	
Minimum set-up time	S_{ts}	(Note 7)	2.5 ± 0.2	7.5	—	—	9.0	—	ns
			3.3 ± 0.3	7.0	—	—	8.2	—	
			5.0 ± 0.5	6.5	—	—	7.4	—	

Note 5 :Parameter guaranteed by desigh. $t_{osLH} = |t_{pLHm} - t_{pLHn}|$, $t_{osHL} = |t_{pHLm} - t_{pHLn}|$

Note 6 : 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:

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

Note 7 : Sts is the time which must be waited for an input signal when a bus signal direction is switched.

AC Characteristics (input: $t_r = t_f = 3$ ns , Bn = Pull Up ($R_{Pull\ Up} = 500\ \Omega$, $V_{Pull\ Up} = 5$ V))

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40~85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Propagation delay time (An-Bn)	t_{pZL} t_{pLZ}	Input = An = VIH or VIL Output = Bn CL= 50 pF	3.3 ± 0.3	1.0	—	9.0	1.0	11.0	ns
Propagation delay time (Bn-An)	t_{pLH} t_{pHL}	Input = Bn = 5 V or VIL Output = An CL= 50 pF	3.3 ± 0.3	1.0	—	6.5	1.0	7.0	ns
Output to output skew	tos_{LH} tos_{HL}	(Note 8)	3.3 ± 0.3	—	—	1.0	—	1.0	ns

Note 8 :Parameter guaranteed by desigh. $t_{osLH} = |t_{pLHm} - t_{pLHn}|$、$t_{osHL} = |t_{pHLm} - t_{pHLn}|$

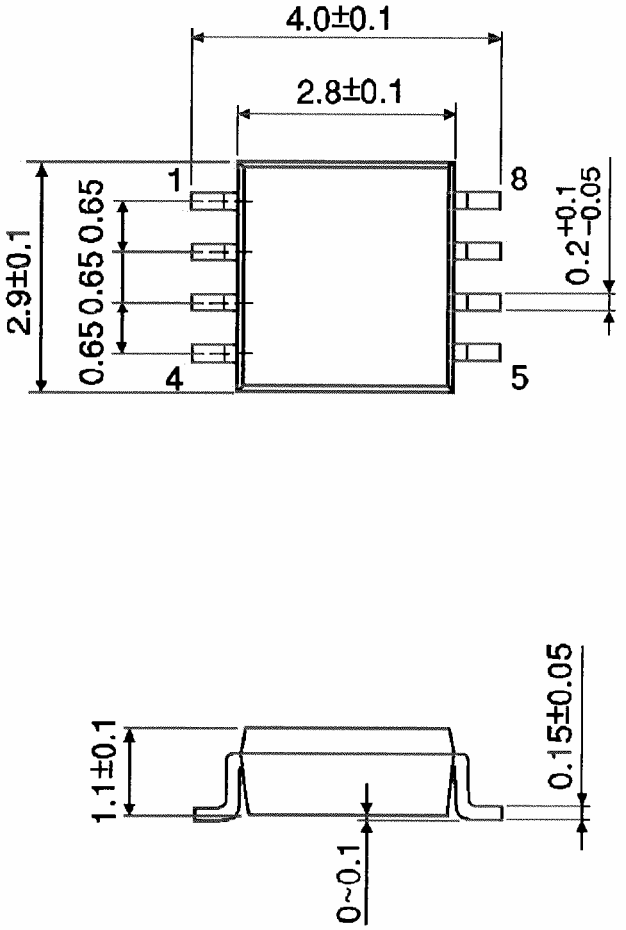
AC Characteristics (input: $t_r = t_f = 3$ ns , Bn = Pull Up ($R_{Pull\ Up} = 10k\ \Omega$, $V_{Pull\ Up} = 5$ V))

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40~85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Propagation delay time (An-Bn)	t_{pZL}	Input = An = VIH or VIL Output = Bn CL= 50 pF	3.3 ± 0.3	1.0	—	6.7	1.0	7.3	ns
	t_{pLZ}			—	—	70.0	—	90.0	
Propagation delay time (Bn-An)	t_{pLH} t_{pHL}	Input = Bn = 5 V or VIL Output = An CL= 50 pF	3.3 ± 0.3	1.0	—	6.3	1.0	7.0	ns
Output to output skew	tos_{LH} tos_{HL}	(Note 9)	3.3 ± 0.3	—	—	1.0	—	1.0	ns

Note 9 :Parameter guaranteed by desigh. $t_{osLH} = |t_{pLHm} - t_{pLHn}|$、$t_{osHL} = |t_{pHLm} - t_{pHLn}|$

Package Dimensions

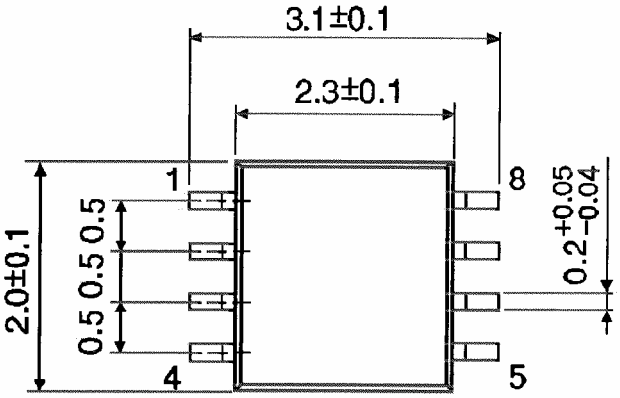
SSOP8-P-0.65 Unit : mm

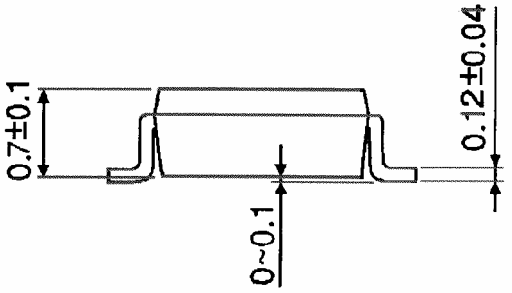


Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A Unit : mm





Weight: 0.01 g (typ.)

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20070701-EN GENERAL

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