

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74LCXZ240FT, TC74LCXZ240FK

Low Voltage Octal Bus Buffer with 5 V Tolerant Inputs and Outputs

The TC74LCXZ240 is a high-performance CMOS octal bus buffer. Designed for use in 3.3-V systems, it achieves high-speed operation while maintaining the CMOS low power dissipation. The device is designed for low-voltage (3.3 V) VCC applications, but it could be used to interface to 5-V supply environment for both inputs and outputs.

When Power supply voltage is turned on, turned off or Vcc is between 0 to 1.5V, output will be at high impedance.

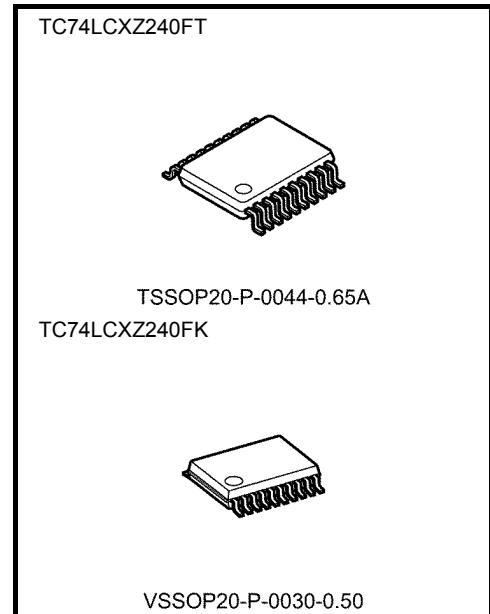
For operation at (3.3 V) VCC, hot board insertion is applicable.

The TC74LCXZ240 is an inverting 3-state buffer having two active-low output enables. This device is designed to be used with 3-state memory address drivers, etc.

All inputs are equipped with protection circuits against static discharge.

Features

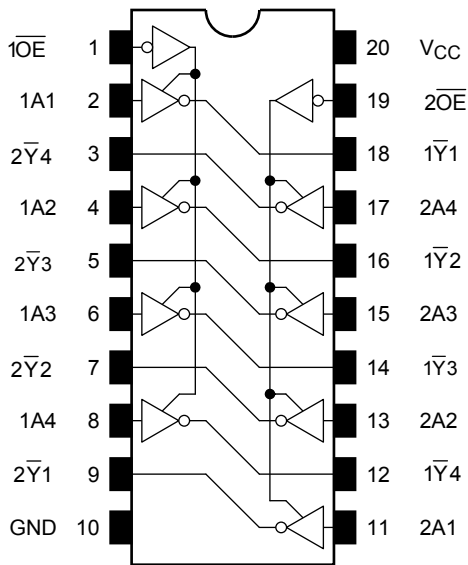
- Low-voltage operation: VCC = 2.7 to 3.6 V
- High-speed operation: tpd = 6.5 ns (max) (VCC = 3.0 to 3.6 V)
- Output current: IOH = -24 mA (min) / IOL = 36 mA (min)
(VCC = 3.0V)
- Available in TSSOP and VSSOP (US)
- Power-down protection provided on all inputs and outputs
- Pin and function compatible with the 74 series
(74AC/VHC/HC/F/ALS/LS etc.) 240 type



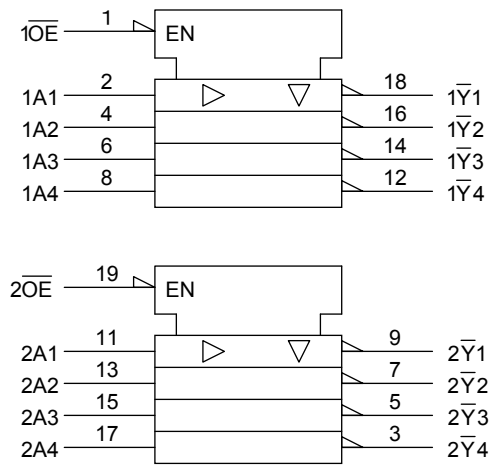
Weight

TSSOP20-P-0044-0.65A	: 0.08 g (typ.)
VSSOP20-P-0030-0.50	: 0.03 g (typ.)

Pin Assignment (top view)



IEC Logic Symbol



Truth Table

Inputs		Outputs
\overline{OE}	An	
L	L	H
L	H	L
H	X	Z

X: Don't care

Z: High impedance

Absolute Maximum Ratings (Note1)

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	-0.5 to 7.0	V
DC input voltage	V_{IN}	-0.5 to 7.0	V
DC output voltage	V_{OUT}	-0.5 to 7.0 (Note 2)	V
		-0.5 to $V_{CC} + 0.5$ (Note 3)	
Input diode current	I_{IK}	-50	mA
Output diode current	I_{OK}	± 50 (Note 4)	mA
DC output current	I_{OUT}	± 50	mA
Power dissipation	P_D	180	mW
DC V_{CC} /ground current	I_{CC}/I_{GND}	± 100	mA
Storage temperature	T_{stg}	-65 to 150	$^{\circ}C$

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

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 2: Output in off-state

Note 3: High or low state. I_{OUT} absolute maximum rating must be observed.

Note 4: $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

Operating Ranges (Note1)

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	2.7 to 3.6	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to 5.5 (Note 2)	V
		0 to V_{CC} (Note 3)	
Output current	I_{OH}/I_{OL}	-24/36 (Note 4)	mA
		-12/18 (Note 5)	
Operating temperature	T_{opr}	-40 to 85	$^{\circ}C$
Input rise and fall time	dt/dv	0 to 10 (Note 6)	ns/V
Power-up ramp rate	dt/dV_{CC}	150(min)	$\mu s/V$

Note 1: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either V_{CC} or GND.

Note 2: Output in off-state

Note 3: High or low state.

Note 4: $V_{CC} = 3.0$ to 3.6 V

Note 5: $V_{CC} = 2.7$ to 3.0 V

Note 6: $V_{IN} = 0.8$ to 2.0 V, $V_{CC} = 3.0$ V

Electrical Characteristics

DC Characteristics (Ta = -40 to 85°C)

Characteristics		Symbol	Test Condition	V _{CC} (V)	Min	Max	Unit	
Input voltage	H-level	V _{IH}	—	2.7 to 3.6	2.0	—	V	
	L-level	V _{IL}	—	2.7 to 3.6	—	0.8		
Output voltage	H-level	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -100 μA	2.7 to 3.6	V _{CC} - 0.2	—	V
				I _{OH} = -12 mA	2.7	2.2	—	
				I _{OH} = -18 mA	3.0	2.4	—	
				I _{OH} = -24 mA	3.0	2.2	—	
	L-level	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 100 μA	2.7 to 3.6	—	0.2	
				I _{OL} = 18 mA	2.7	—	0.4	
				I _{OL} = 27 mA	3.0	—	0.4	
				I _{OL} = 36 mA	3.0	—	0.55	
Input leakage current		I _{IN}	V _{IN} = 0 to 5.5 V	2.7 to 3.6	—	±5.0	μA	
3-state output off-state current		I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = 0 to 5.5 V	2.7 to 3.6	—	±5.0	μA	
			I _{OZPU} I _{OZPD}	Output enable=don't care V _{out} =0.5 to 5.5 V	0 to 1.5	—	±5.0	μA
		Power off leakage current		I _{OFF}	V _{IN} /V _{OUT} = 5.5 V	0	—	10.0
Quiescent supply current		I _{CC}	V _{IN} = V _{CC} or GND	2.7 to 3.6	—	40	μA	
			V _{IN} /V _{OUT} = 3.6 to 5.5 V	2.7 to 3.6	—	±40		
Increase in I _{CC} per input		ΔI _{CC}	V _{IH} = V _{CC} - 0.6V	2.7 to 3.6	—	500		

AC Characteristics (Ta = -40 to 85°C)

Characteristics	Symbol	Test Condition	V _{CC} (V)	Min	Max	Unit
Propagation delay time	t _{pLH}	Figure 1, Figure 2	2.7	—	7.5	ns
	t _{pHL}		3.3 ± 0.3	1.5	6.5	
Output enable time	t _{pZL}	Figure 1, Figure 3	2.7	—	9.0	ns
	t _{pZH}		3.3 ± 0.3	1.5	8.0	
Output disable time	t _{pLZ}	Figure 1, Figure 3	2.7	—	8.0	ns
	t _{pHZ}		3.3 ± 0.3	1.5	7.0	
Output to output skew	t _{osLH}	(Note1)	2.7	—	—	ns
	t _{osHL}		3.3 ± 0.3	—	1.0	

Note1: Parameter guaranteed by design.

$$(t_{osLH} = |t_{pLHm} - t_{pLHn}|, t_{osHL} = |t_{pHLm} - t_{pHLn}|)$$

Dynamic Switching Characteristics (Ta = 25°C, input: t_r = t_f = 2.5 ns, C_L = 50 pF, R_L = 500 Ω)

Characteristics	Symbol	Test Condition	V _{CC} (V)	Typ.	Unit
Quiet output maximum dynamic V _{OL}	V _{OLP}	V _{IH} = 3.3 V, V _{IL} = 0 V	3.3	1.0	V
Quiet output minimum dynamic V _{OL}	V _{OLV}	V _{IH} = 3.3 V, V _{IL} = 0 V	3.3	1.0	V

Capacitive Characteristics (Ta = 25°C)

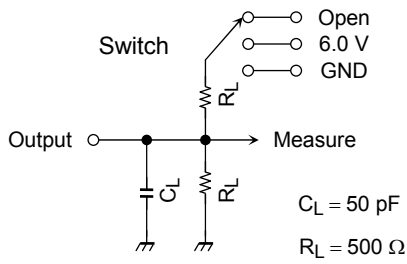
Characteristics	Symbol	Test Condition	V _{CC} (V)	Typ.	Unit	
Input capacitance	C _{IN}	—	3.3	5	pF	
Output capacitance	C _{OUT}	—	3.3	7	pF	
Power dissipation capacitance	C _{PD}	f _{IN} = 10 MHz	(Note)	3.3	19	pF

Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption.

Average operating current can be obtained by the equation:

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ (per bit)}$$

AC Test Circuit



Parameter	Switch
t_{pLH} , t_{pHL}	Open
t_{pLZ} , t_{pZL}	6.0 V
t_{pHZ} , t_{pZH}	GND

Figure 1

AC Waveform

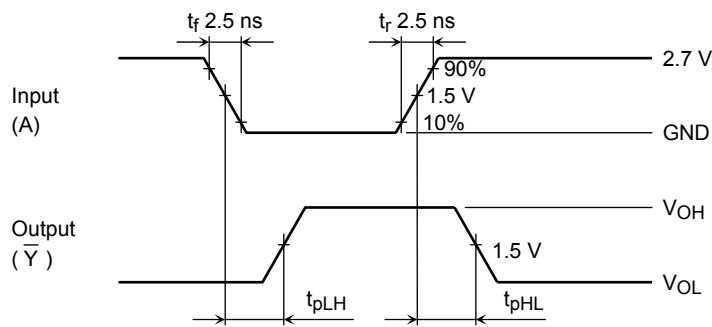


Figure 2 t_{pLH} , t_{pHL}

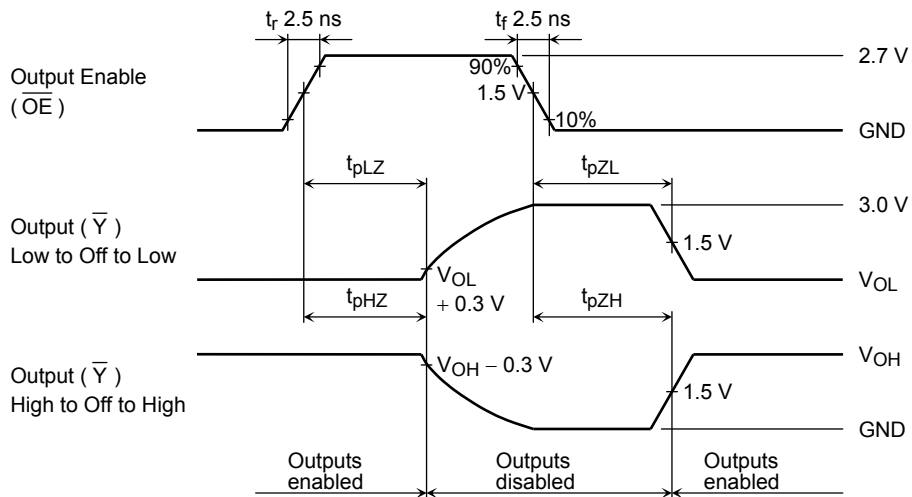
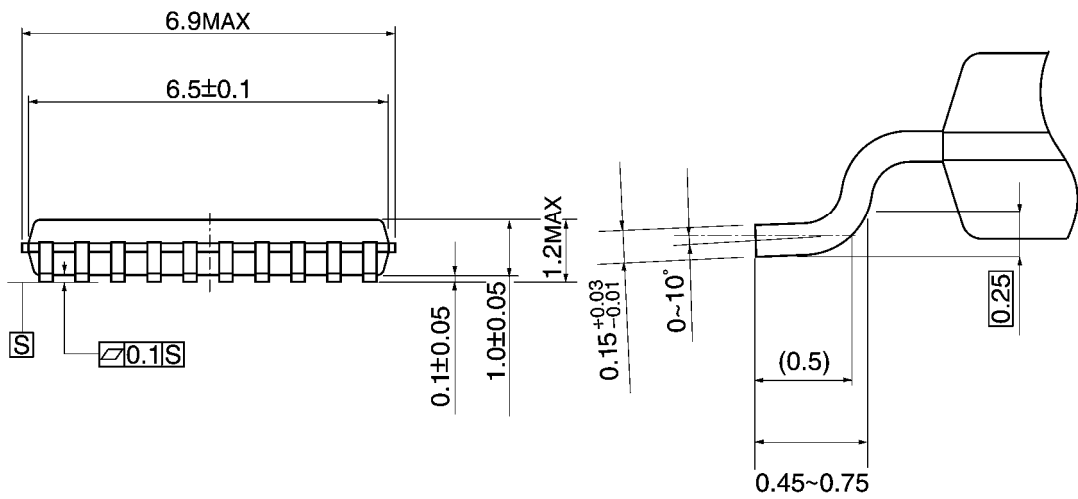
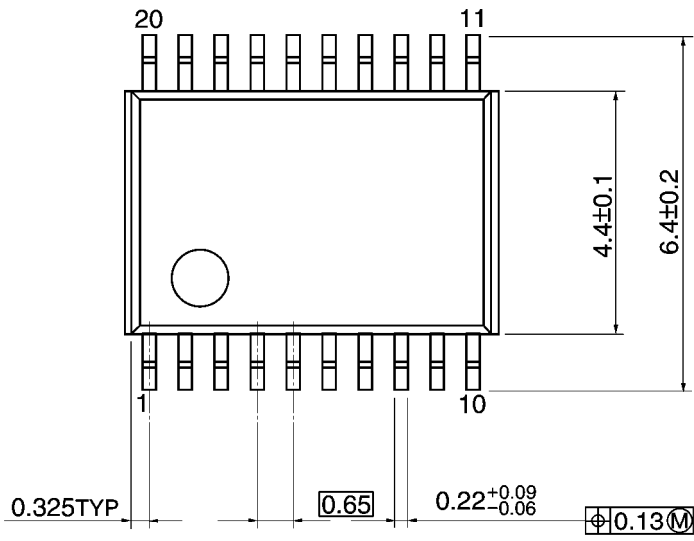


Figure 3 t_{pLZ} , t_{pHZ} , t_{pZL} , t_{pZH}

Package Dimensions

TSSOP20-P-0044-0.65A

Unit: mm

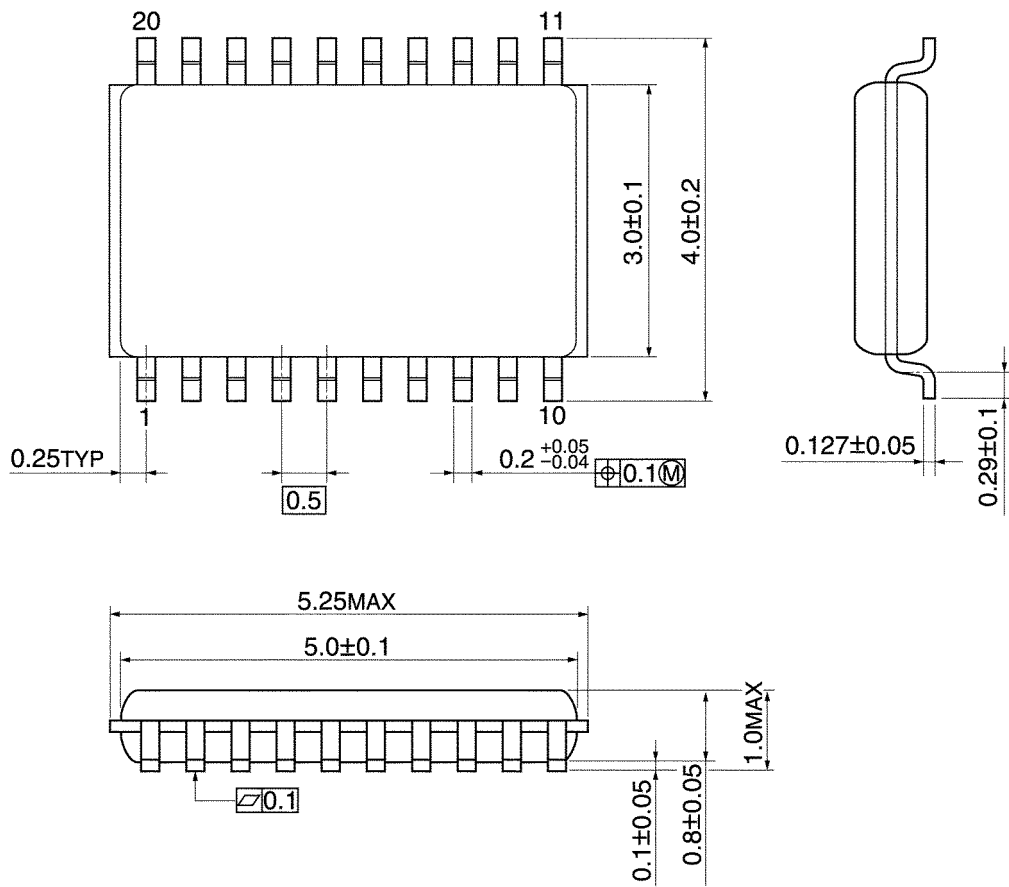


Weight: 0.08 g (typ.)

Package Dimensions

VSSOP20-P-0030-0.50

Unit: mm



Weight: 0.03 g (typ.)

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