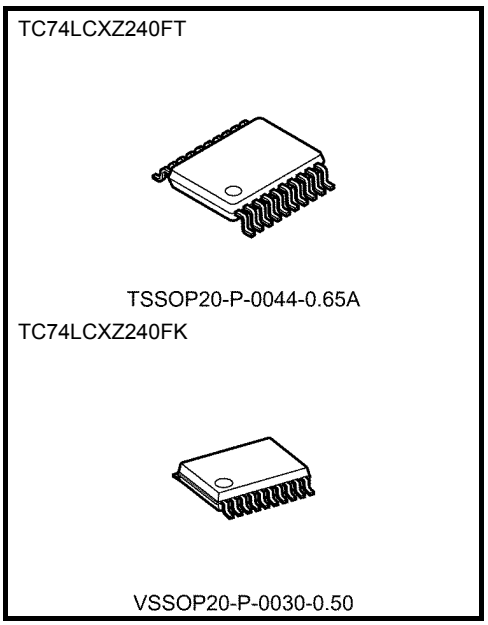
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

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) V_{CC} 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 V_{CC} is between 0 to 1.5V, output will be at high impedance.
For operation at (3.3 V) V_{CC}, 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.



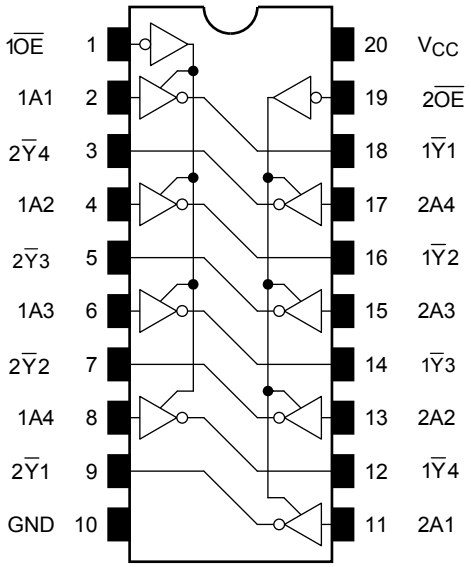
Weight
TSSOP20-P-0044-0.65A : 0.08 g (typ.)
VSSOP20-P-0030-0.50 : 0.03 g (typ.)

Features

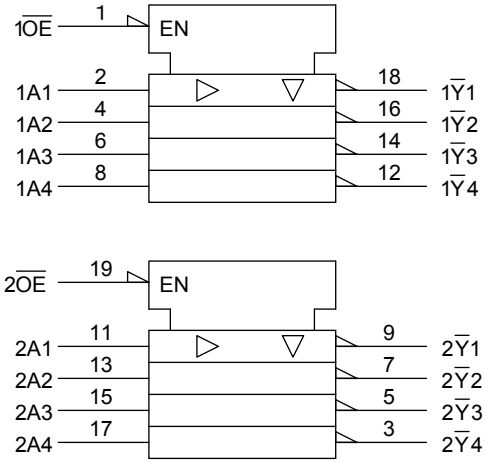
- Low-voltage operation: V_{CC} = 2.7 to 3.6 V
- High-speed operation: tpd = 6.5 ns (max) (V_{CC} = 3.0 to 3.6 V)
- Output current: I_{OH} = −24 mA (min) /I_{OL} = 36 mA (min)
  (V_{CC} = 3.0V)
- Available in TSSOP and VSSOP (US)
- Power-down protection provided on all inputs and outputs
- Pin and function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

Start of commercial production
2011-03

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	°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	°C
Input rise and fall time	dt/dv	0 to 10 (Note 6)	ns/V
Power-up ramp rate	dt/dV_{CC}	150 (min)	μs/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	μA
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} t_{pHL}	Figure 1, Figure 2	2.7	—	7.5	ns
			3.3 ± 0.3	1.5	6.5	
Output enable time	t_{pZL} t_{pZH}	Figure 1, Figure 3	2.7	—	9.0	ns
			3.3 ± 0.3	1.5	8.0	
Output disable time	t_{pLZ} t_{pHZ}	Figure 1, Figure 3	2.7	—	8.0	ns
			3.3 ± 0.3	1.5	7.0	
Output to output skew	t_{osLH} t_{osHL}	(Note1)	2.7	—	—	ns
			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, $R_L = 500\ \Omega$)

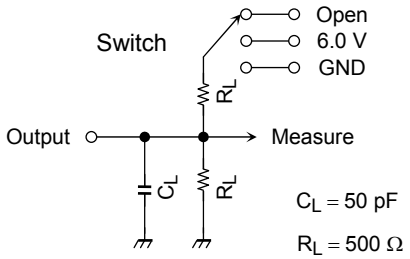
Characteristics	Symbol	Test Condition	V_{CC} (V)	Typ.	Unit
Quiet output maximum dynamic V_{OL}	V_{OLP}	V_{IH} = 3.3 V, V_{IL} = 0 V	3.3	1.0	V
Quiet output minimum dynamic V_{OL}	$\|V_{OLV}\|$	V_{IH} = 3.3 V, V_{IL} = 0 V	3.3	1.0	V

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

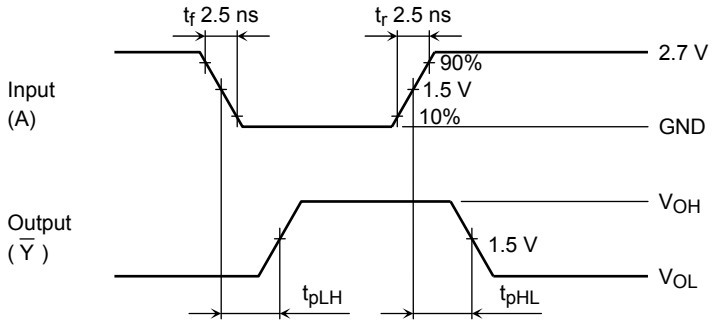


Figure 2 t_{pLH}, t_{pHL}

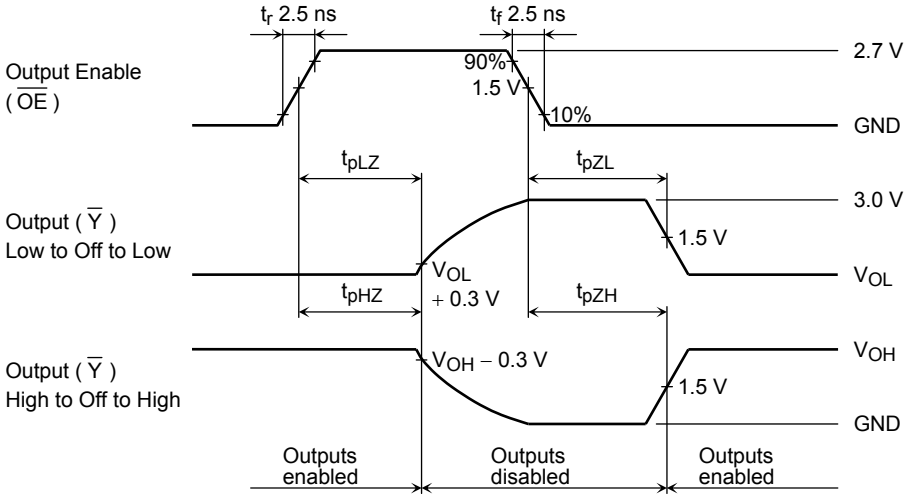
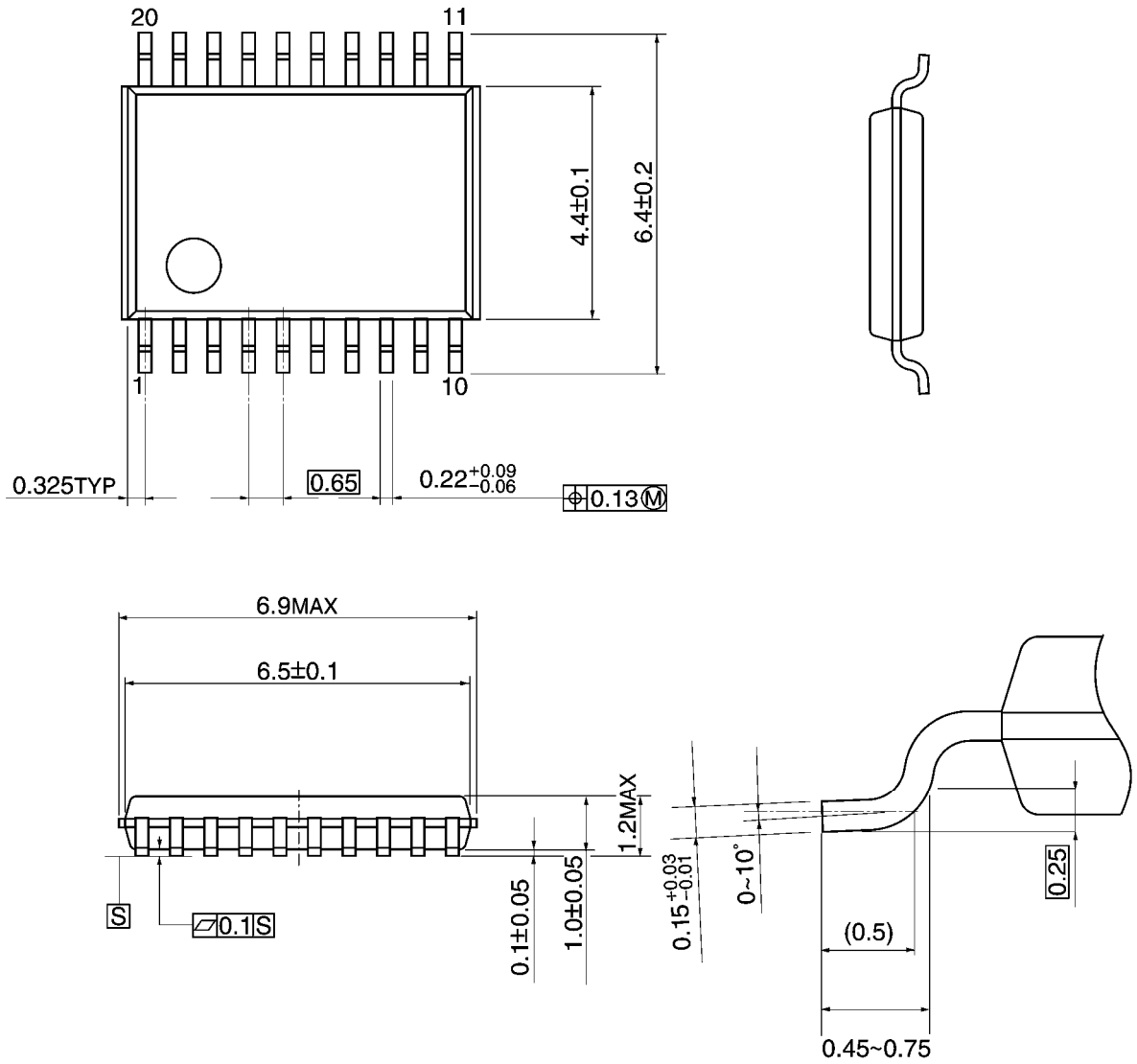


Figure 3 t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}

Package Dimensions

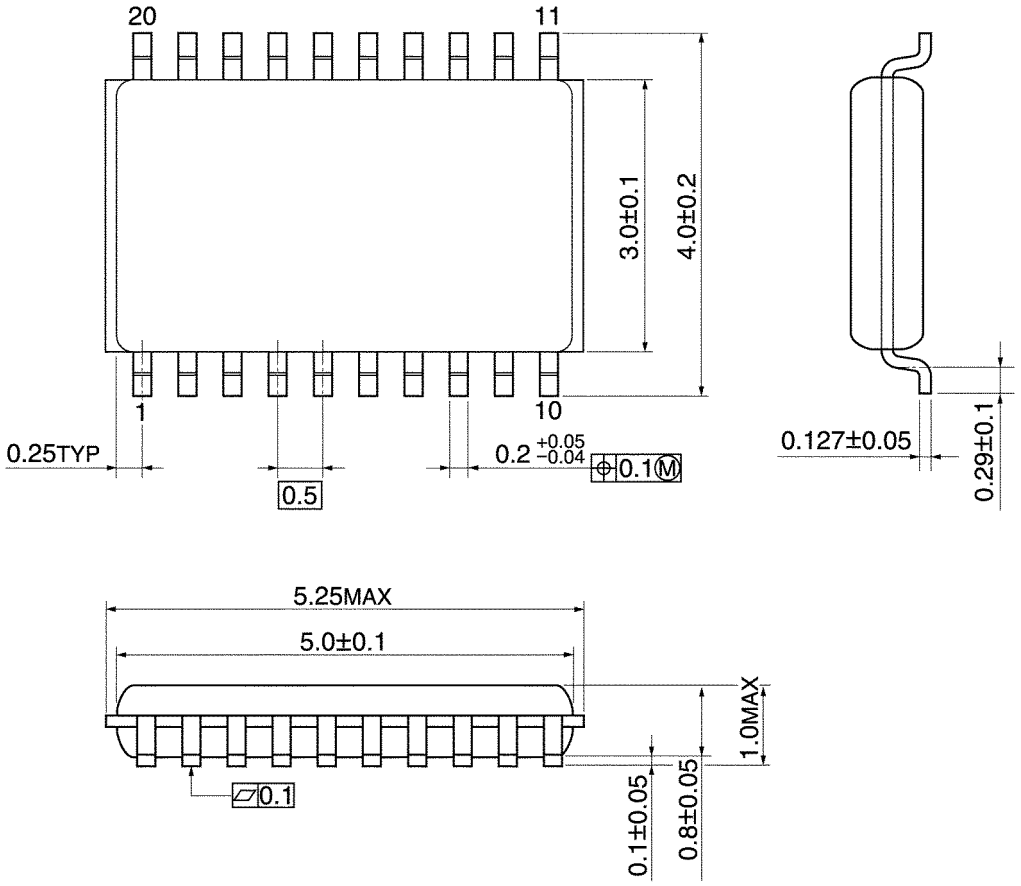
TSSOP20-P-0044-0.65A Unit: mm



Weight: 0.08 g (typ.)

Package Dimensions

VSSOP20-P-0030-0.50 Unit: mm



Weight: 0.03 g (typ.)

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