

# TC74LCX240F/FW/FS

## LOW VOLTAGE OCTAL BUS BUFFER (INVERTED) WITH 5V TOLERANT INPUTS AND OUTPUTS

The TC74LCX240 is a high performance CMOS OCTAL BUS BUFFER. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

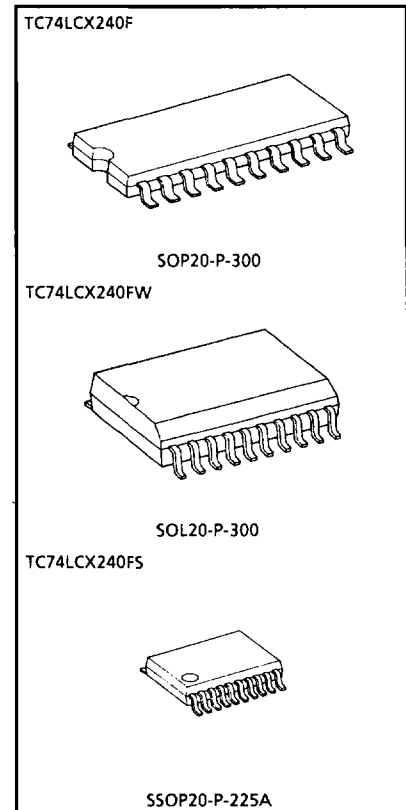
The device is designed for low-voltage (3.3V)  $V_{CC}$  applications, but it could be used to interface to 5V supply environment for both inputs and outputs.

The 74LCX240 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

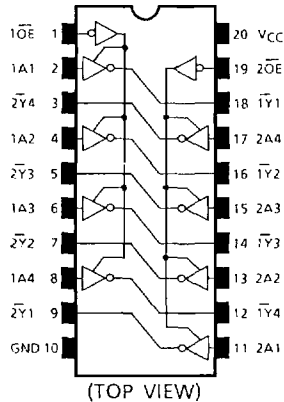
- Low voltage operation :  $V_{CC} = 2.0 \sim 3.6V$
- High speed operation :  $t_{pd} = 6.5ns$  (Max.)  
( $V_{CC} = 3.0 \sim 3.6V$ )
- Output current :  $|I_{OH}| / I_{OL} = 24mA$  (Min.)  
( $V_{CC} = 3.0V$ )
- Latch-up performance :  $\pm 500mA$
- Available in JEDEC SOP, EIAJ SOP and SSOP
- Power down protection is provided on all inputs and outputs.
- Pin and function compatible with the 74 series (74AC/VHC/HC/F/ALS/LS etc.) 240 type.



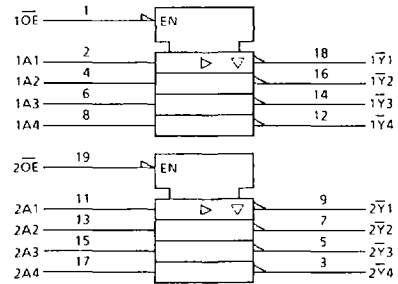
Weight SOP20-P-300 : 0.22g (Typ.)  
SOL20-P-300 : 0.46g (Typ.)  
SSOP20-P-225A : 0.09g (Typ.)

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## PIN ASSIGNMENT



## IEC LOGIC SYMBOL



## TRUTH TABLE

INPUTS		OUTPUTS
OE	An	
L	L	H
L	H	L
H	X	Z

X : Don't Care

Z : High Impedance

## MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7.0	V
DC Input Voltage	$V_{IN}$	-0.5~7.0	V
DC Output Voltage	$V_{OUT}$	-0.5~7.0 (Note 1)	V
		-0.5~ $V_{CC} + 0.5$ (Note 2)	
Input Diode Current	$I_{IK}$	-50	mA
Output Diode Current	$I_{OK}$	±50 (Note 3)	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	$T_{stg}$	-65~150	°C

(Note 1) Off-State

(Note 2) High or Low State.  $I_{OUT}$  absolute maximum rating must be observed.

(Note 3)  $V_{OUT} < GND$ ,  $V_{OUT} > V_{CC}$

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>CC</sub>	2.0~3.6	V
		1.5~3.6 (Note 4)	
Input Voltage	V <sub>IN</sub>	0~5.5	V
Output Voltage	V <sub>OUT</sub>	0~5.5 (Note 5)	V
		0~V <sub>CC</sub> (Note 6)	
Output Current	I <sub>OH</sub> / I <sub>OL</sub>	± 24 (Note 7)	mA
		± 12 (Note 8)	
Operating Temperature	T <sub>opr</sub>	- 40~85	°C
Input Rise And Fall Time	dt / dv	0~10 (Note 9)	ns / V

- (Note 4) Data Retention Only
- (Note 5) Off-State
- (Note 6) High or Low State
- (Note 7) V<sub>CC</sub> = 3.0~3.6V
- (Note 8) V<sub>CC</sub> = 2.7~3.0V
- (Note 9) V<sub>IN</sub> = 0.8~2.0V, V<sub>CC</sub> = 3.0V

ELECTRICAL CHARACTERISTICS

DC characteristics (Ta = - 40~85°C)

PARAMETER		SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	MIN.	MAX.	UNIT	
Input Voltage	"H" Level	V <sub>IH</sub>		2.7~3.6	2.0	—	V	
	"L" Level	V <sub>IL</sub>		2.7~3.6	—	0.8		
Output Voltage	"H" Level	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = - 100μA	2.7~3.6	V <sub>CC</sub> - 0.2	—	V
				I <sub>OH</sub> = - 12mA	2.7	2.2	—	
				I <sub>OH</sub> = - 18mA	3.0	2.4	—	
				I <sub>OH</sub> = - 24mA	3.0	2.2	—	
	"L" Level	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 100μA	2.7~3.6	—	0.2	
				I <sub>OL</sub> = 12mA	2.7	—	0.4	
				I <sub>OL</sub> = 16mA	3.0	—	0.4	
			I <sub>OL</sub> = 24mA	3.0	—	0.55		
Input Leakage Current		I <sub>IN</sub>	V <sub>IN</sub> = 0~5.5V	2.7~3.6	—	± 5.0	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> = 0~5.5V	2.7~3.6	—	± 5.0	μA	
Power Off Leakage Current		I <sub>OFF</sub>	V <sub>IN</sub> / V <sub>OUT</sub> = 5.5V	0	—	10.0	μA	
Quiescent Supply Current		I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	2.7~3.6	—	10.0	μA	
			V <sub>IN</sub> / V <sub>OUT</sub> = 3.6~5.5V	2.7~3.6	—	± 10.0		
Increase In I <sub>CC</sub> Per Input		ΔI <sub>CC</sub>	V <sub>IH</sub> = V <sub>CC</sub> - 0.6V	2.7~3.6	—	500	μA	

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AC characteristic (Ta = -40~85°C)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	MIN.	MAX.	UNIT
Propagation Delay Time	t <sub>pLH</sub>	(Fig. 1, 2)	2.7	—	7.5	ns
	t <sub>pHL</sub>		3.3 ± 0.3	1.5	6.5	
Output Enable Time	t <sub>pZL</sub>	(Fig. 1, 3)	2.7	—	9.0	ns
	t <sub>pZH</sub>		3.3 ± 0.3	1.5	8.0	
Output Disable Time	t <sub>pLZ</sub>	(Fig. 1, 3)	2.7	—	8.0	ns
	t <sub>pHZ</sub>		3.3 ± 0.3	1.5	7.0	
Output To Output Skew	t <sub>osLH</sub>	(Note 10)	2.7	—	—	ns
	t <sub>osHL</sub>		3.3 ± 0.3	—	1.0	

(Note 10) Parameter guaranteed by design.  
 (t<sub>osLH</sub> = |t<sub>pLHm</sub> - t<sub>pLHn</sub>|, t<sub>osHL</sub> = |t<sub>pHLm</sub> - t<sub>pHLn</sub>|)

DYNAMIC SWITCHING CHARACTERISTICS (Ta = 25°C, Input t<sub>r</sub> = t<sub>f</sub> = 2.5ns, C<sub>L</sub> = 50pF, R<sub>L</sub> = 500Ω)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	TYP.	UNIT
Quiet Output Maximum Dynamic V <sub>OL</sub>	V <sub>OLP</sub>	V <sub>IH</sub> = 3.3V, V <sub>IL</sub> = 0V	3.3	0.8	V
Quiet Output Minimum Dynamic V <sub>OL</sub>	V <sub>OLV</sub>	V <sub>IH</sub> = 3.3V, V <sub>IL</sub> = 0V	3.3	0.8	V

CAPACITIVE CHARACTERISTICS (Ta = 25°C)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	TYP.	UNIT
Input Capacitance	C <sub>IN</sub>	—	3.3	7	pF
Output Capacitance	C <sub>OUT</sub>		3.3	8	pF
Power Dissipation Capacitance	C <sub>PD</sub>	f <sub>IN</sub> = 10MHz (Note 11)	3.3	25	pF

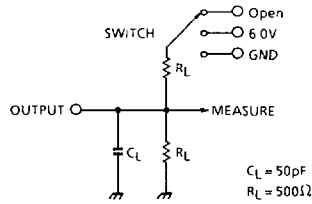
(Note 11) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption.

Average operating current can be obtained by the equation :

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

TEST CIRCUIT

Fig.1



PARAMETER	SWITCH
$t_{pLH}, t_{pHL}$	Open
$t_{pLZ}, t_{pZL}$	6.0V
$t_{pHZ}, t_{pZH}$	GND

AC WAVEFORM

Fig.2  $t_{pLH}, t_{pHL}$

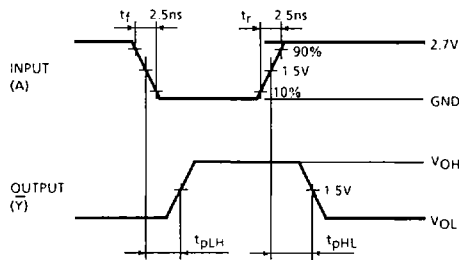


Fig.3  $t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}$

