

# 74LCX240

## Low-Voltage Octal Buffer/Line Driver with 5V Tolerant Inputs and Outputs

### General Description

The LCX240 is an inverting octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus oriented transmitter or receiver. The device is designed for low voltage (3.3V)  $V_{CC}$  applications with capability of interfacing to a 5V signal environment.

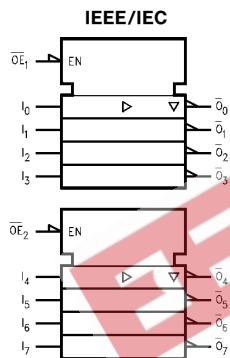
The LCX240 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

### Features

- 5V tolerant inputs and outputs
- 6.5 ns  $t_{PD}$  max, 10  $\mu A$   $I_{CCQ}$  max

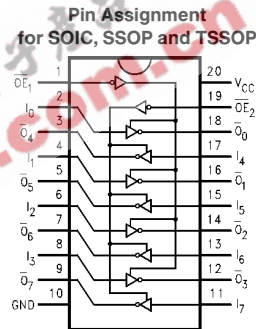
- Power-down high impedance inputs and outputs
- Supports live insertion/withdrawal
- 2.0V–3.6V  $V_{CC}$  supply operation
- $\pm 24$  mA output drive
- Implements patented Quiet Series™ noise/EMI reduction circuitry
- Functionally compatible with the 74 series 240
- Latch-up performance exceeds 500 mA
- ESD performance:
  - Human Body Model > 2000V
  - Machine Model > 200V

### Logic Symbol



TL/F/11993-1

### Connection Diagram



TL/F/11993-2

Pin Names	Description
$\overline{OE}_1, \overline{OE}_2$	TRI-STATE® Output Enable Inputs
$I_0-I_7$	Inputs
$O_0-O_7$	Outputs

### Truth Tables

Inputs		Outputs (Pins 12, 14, 16, 18)	Inputs		Outputs (Pins 3, 5, 7, 9)
$\overline{OE}_1$	$I_n$		$\overline{OE}_2$	$I_n$	
L	L	H	L	L	H
L	H	L	L	H	L
H	X	Z	L	X	Z

H = HIGH Voltage Level L = LOW Voltage Level X = Immaterial Z = High Impedance

	SOIC JEDEC	SOIC EIAJ	SSOP Type II	TSSOP
Order Number	74LCX240WM 74LCX240WMX	74LCX240SJ 74LCX240SJX	74LCX240MSA 74LCX240MSAX	74LCX240MTC 74LCX240MTCX
See NS Package Number	M20B	M20D	MSA20	MTC20

TRI-STATE® is a registered trademark of National Semiconductor Corporation.  
Quiet Series™ is a trademark of National Semiconductor Corporation.

## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Symbol	Parameter	Value	Conditions	Units
$V_{CC}$	Supply Voltage	-0.5 to +7.0		V
$V_I$	DC Input Voltage	-0.5 to +7.0		V
$V_O$	DC Output Voltage	-0.5 to +7.0	Output in TRI-STATE	V
		-0.5 to $V_{CC} + 0.5$	Output in High or Low State (Note 2)	V
$I_{IK}$	DC Input Diode Current	-50	$V_I < GND$	mA
$I_{OK}$	DC Output Diode Current	-50	$V_O < GND$	mA
		+50	$V_O > V_{CC}$	
$I_O$	DC Output Source/Sink Current	$\pm 50$		mA
$I_{CC}$	DC Supply Current per Supply Pin	$\pm 100$		mA
$I_{GND}$	DC Ground Current per Ground Pin	$\pm 100$		mA
$T_{STG}$	Storage Temperature	-65 to +150		$^{\circ}C$

**Note 1:** The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the Absolute Maximum Ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

**Note 2:**  $I_O$  Absolute Maximum Rating must be observed.

## Recommended Operating Conditions

Symbol	Parameter	Min	Max	Units	
$V_{CC}$	Supply Voltage	Operating	2.0	3.6	V
		Data Retention	1.5	3.6	
$V_I$	Input Voltage	0	5.5	V	
$V_O$	Output Voltage	HIGH or LOW State	0	$V_{CC}$	V
		TRI-STATE	0	5.5	
$I_{OH}/I_{OL}$	Output Current		$\pm 24$ $\pm 12$	mA	
$T_A$	Free-Air Operating Temperature	-40	85	$^{\circ}C$	
$\Delta t/\Delta V$	Input Edge Rate, $V_{IN} = 0.8V-2.0V$ , $V_{CC} = 3.0V$	0	10	ns/V	

## DC Electrical Characteristics

Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A = -40^{\circ}C$ to $+85^{\circ}C$		Units
				Min	Max	
$V_{IH}$	HIGH Level Input Voltage		2.7-3.6	2.0		V
$V_{IL}$	LOW Level Input Voltage		2.7-3.6		0.8	V
$V_{OH}$	HIGH Level Output Voltage	$I_{OH} = -100 \mu A$	2.7-3.6	$V_{CC} - 0.2$		V
		$I_{OH} = -12 mA$	2.7	2.2		V
		$I_{OH} = -18 mA$	3.0	2.4		V
		$I_{OH} = -24 mA$	3.0	2.2		V
$V_{OL}$	LOW Level Output Voltage	$I_{OL} = 100 \mu A$	2.7-3.6		0.2	V
		$I_{OL} = 12 mA$	2.7		0.4	V
		$I_{OL} = 16 mA$	3.0		0.4	V
		$I_{OL} = 24 mA$	3.0		0.55	V
$I_I$	Input Leakage Current	$0 \leq V_I \leq 5.5V$	2.7-3.6		$\pm 5.0$	$\mu A$
$I_{OZ}$	TRI-STATE Output Leakage	$0 \leq V_O \leq 5.5V$ $V_I = V_{IH}$ or $V_{IL}$	2.7-3.6		$\pm 5.0$	$\mu A$
$I_{OFF}$	Power-Off Leakage Current	$V_I$ or $V_O = 5.5V$	0		10	$\mu A$
$I_{CC}$	Quiescent Supply Current	$V_I = V_{CC}$ or GND	2.7-3.6		10	$\mu A$
		$3.6V \leq V_I$ , $V_O \leq 5.5V$	2.7-3.6		$\pm 10$	$\mu A$
$\Delta I_{CC}$	Increase in $I_{CC}$ per Input	$V_{IH} = V_{CC} - 0.6V$	2.7-3.6		500	$\mu A$

<b>AC Electrical Characteristics</b>						
Symbol	Parameter	$T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$				Units
		$V_{CC} = 3.3\text{V} \pm 0.3\text{V}$		$V_{CC} = 2.7\text{V}$		
		Min	Max	Min	Max	
$t_{PHL}$ $t_{PLH}$	Propagation Delay Data to Output	1.5 1.5	6.5 6.5	1.5 1.5	7.5 7.5	ns
$t_{PZL}$ $t_{PZH}$	Output Enable Time	1.5 1.5	8.0 8.0	1.5 1.5	9.0 9.0	ns
$t_{PLZ}$ $t_{PHZ}$	Output Disable Time	1.5 1.5	7.0 7.0	1.5 1.5	8.0 8.0	ns
$t_{OSHL}$ $t_{OSLH}$	Output to Output Skew (Note 1)		1.0 1.0			ns

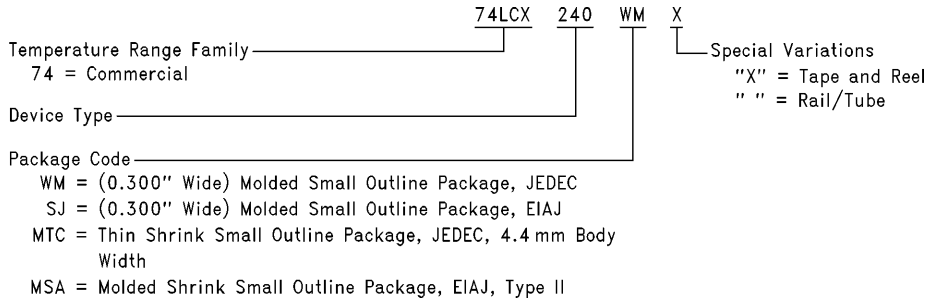
**Note 1:** Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH to LOW ( $t_{OSHL}$ ) or LOW to HIGH ( $t_{OSLH}$ ).

<b>Dynamic Switching Characteristics</b>					
Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A = 25^{\circ}\text{C}$	Units
				Typical	
$V_{OLP}$	Quiet Output Dynamic Peak $V_{OL}$	$C_L = 50\text{ pF}, V_{IH} = 3.3\text{V}, V_{IL} = 0\text{V}$	3.3	0.8	V
$V_{OLV}$	Quiet Output Dynamic Valley $V_{OL}$	$C_L = 50\text{ pF}, V_{IH} = 3.3\text{V}, V_{IL} = 0\text{V}$	3.3	-0.8	V

<b>Capacitance</b>				
Symbol	Parameter	Conditions	Typical	Units
$C_{IN}$	Input Capacitance	$V_{CC} = \text{Open}, V_I = 0\text{V or } V_{CC}$	7	pF
$C_{OUT}$	Output Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V or } V_{CC}$	8	pF
$C_{PD}$	Power Dissipation Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V or } V_{CC}, F = 10\text{ MHz}$	25	pF

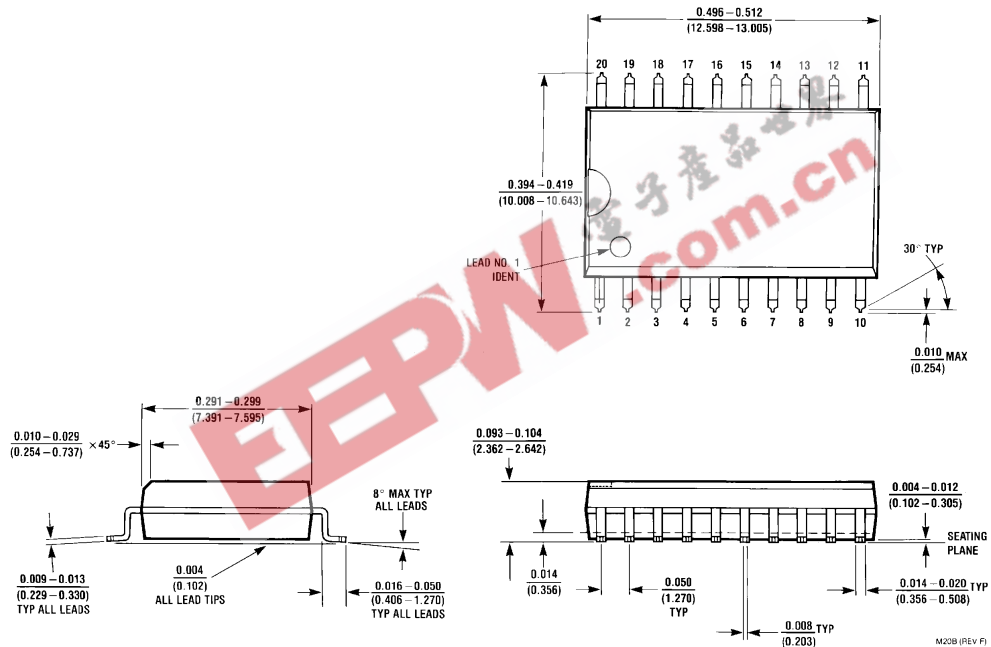
## 74LCX240 Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



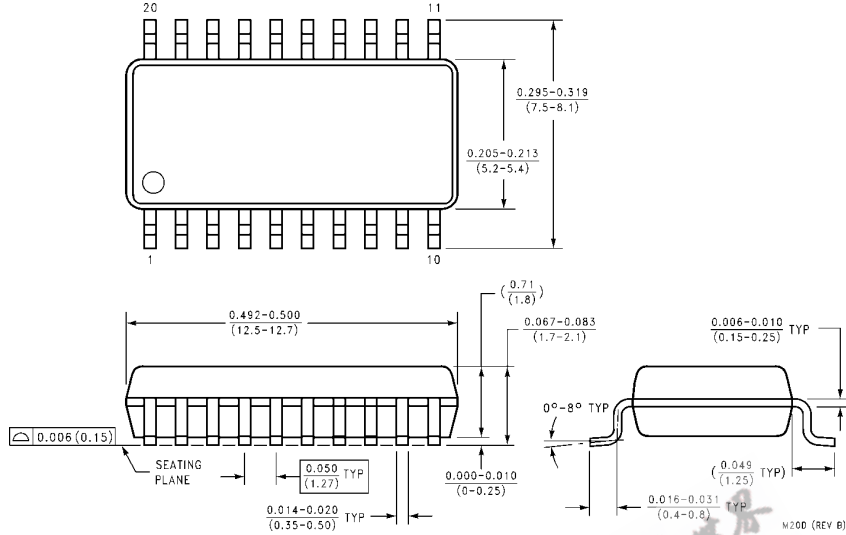
TL/F/11993-3

## Physical Dimensions inches (millimeters) unless otherwise noted

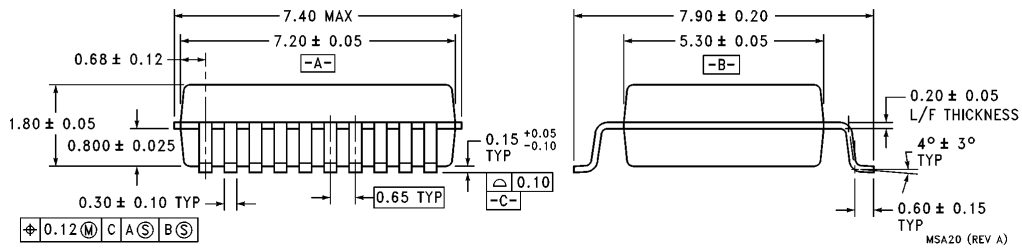
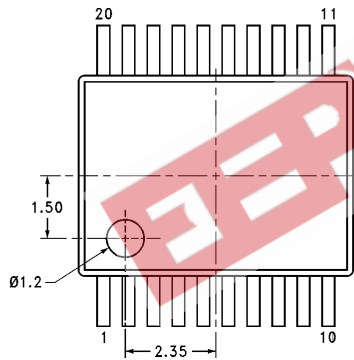


**20-Lead Small Outline Integrated Circuit**  
**Order Number 74LCX240WM or 74LCX240WMX**  
**NS Package Number M20B**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**20-Lead Small Outline Package, EIAJ (SJ)**  
**Order Number 74LCX240SJ or 74LCX240SJX**  
**NS Package Number M20D**

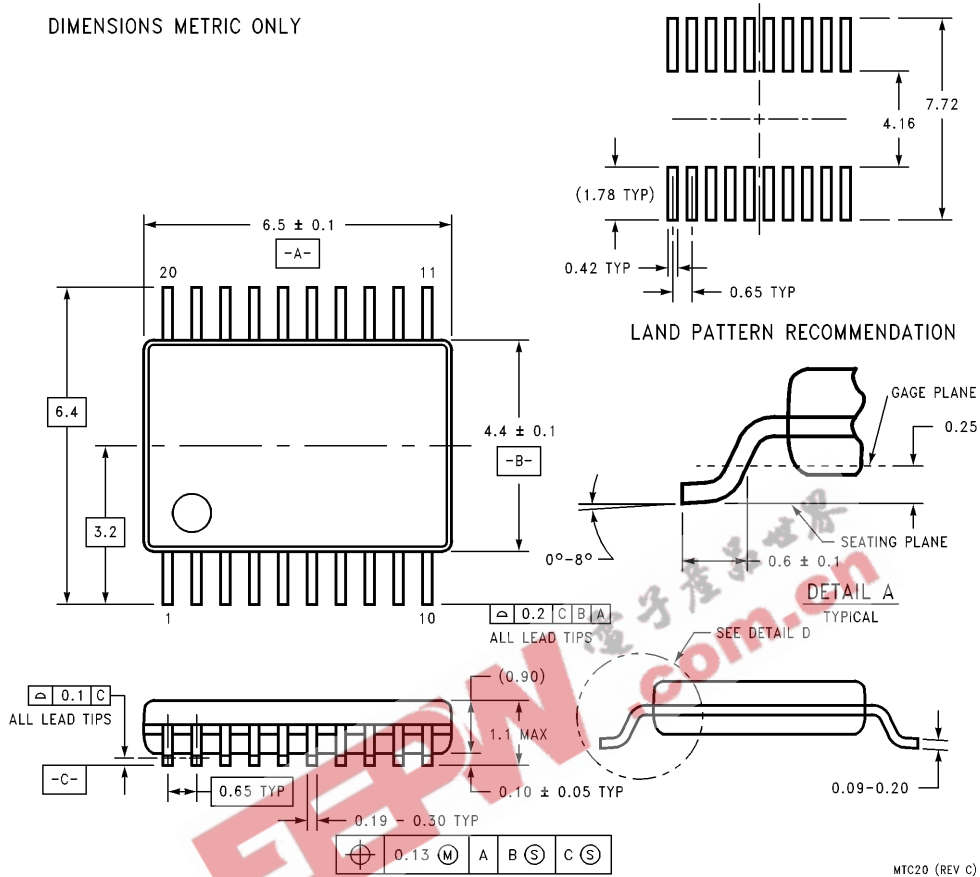


All dimensions are in millimeters.

**20-Lead Molded Shrink Small Outline Package, EIAJ, Type II**  
**Order Number 74LCX240MSA or 74LCX240MSAX**  
**NS Package Number MSA20**

**Physical Dimensions** All dimensions are in millimeters (Continued)

DIMENSIONS METRIC ONLY



**20-Lead Thin Shrink Small Outline Package, JEDEC**  
**Order Number 74LCX240MTC or 74LCX240MTCX**  
**NS Package Number MTC20**

MTC20 (REV C)

**LIFE SUPPORT POLICY**

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



**National Semiconductor Corporation**  
**Americas**  
 Tel: 1(800) 272-9959  
 Fax: 1(800) 737-7018  
 Email: support@nsc.com

**National Semiconductor Europe**  
 Fax: +49 (0) 180-530 85 86  
 Email: europe.support@nsc.com  
 Deutsch Tel: +49 (0) 180-530 85 85  
 English Tel: +49 (0) 180-532 78 32  
 Français Tel: +49 (0) 180-532 93 58  
 Italiano Tel: +49 (0) 180-534 16 80

**National Semiconductor Southeast Asia**  
 Fax: (852) 2376 3901  
 Email: sea.support@nsc.com

**National Semiconductor Japan Ltd.**  
 Tel: 81-3-5620-7561  
 Fax: 81-3-5620-6179

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.