

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.

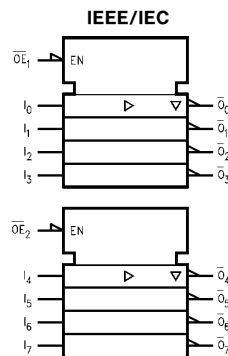
The LCX240 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Features

- 5V tolerant inputs and outputs
- 6.5 ns t_{PD} max, 10 μA I_{CCQ} max

- Power-down high impedance inputs and outputs
- Supports live insertion/withdrawal
- 2.0V–3.6V V_{CC} supply operation
- ± 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

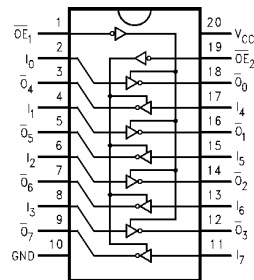
Logic Symbol



TL/F/11993-1

Connection Diagram

Pin Assignment
for SOIC, SSOP and TSSOP



TL/F/11993-2

Pin Names	Description
$\overline{OE}_1, \overline{OE}_2$	TRI-STATE® Output Enable Inputs
I_0-I_7	Inputs
$\overline{O}_0-\overline{O}_7$	Outputs

Truth Tables

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

Inputs		Outputs (Pins 3, 5, 7, 9)
$\overline{OE}_2$	I_n	
L	L	H
L	H	L
H	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

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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	$V_I < \text{GND}$	mA
I_{OK}	DC Output Diode Current	-50 +50	$V_O < \text{GND}$ $V_O > V_{CC}$	mA
I_O	DC Output Source/Sink Current	± 50		mA
I_{CC}	DC Supply Current per Supply Pin	± 100		mA
I_{GND}	DC Ground Current per Ground Pin	± 100		mA
T_{STG}	Storage Temperature	-65 to +150		°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 Data Retention	2.0 1.5	3.6 3.6	V
V _I	Input Voltage	0	5.5	V
V _O	Output Voltage HIGH or LOW State TRI-STATE	0 0	V _{CC} 5.5	V
I _{OH} /I _{OL}	Output Current V _{CC} = 3.0V–3.6V V _{CC} = 2.7V		± 24 ± 12	mA
T _A	Free-Air Operating Temperature	− 40	85	°C
Δt/ΔV	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)	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		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	$I_{OH} = -100 \mu\text{A}$	2.7-3.6	$V_{CC} - 0.2$		V
		$I_{OH} = -12 \text{ mA}$	2.7	2.2		V
		$I_{OH} = -18 \text{ mA}$	3.0	2.4		V
		$I_{OH} = -24 \text{ mA}$	3.0	2.2		V
V_{OL}	LOW Level Output Voltage	$I_{OL} = 100 \mu\text{A}$	2.7-3.6		0.2	V
		$I_{OL} = 12 \text{ mA}$	2.7		0.4	V
		$I_{OL} = 16 \text{ mA}$	3.0		0.4	V
		$I_{OL} = 24 \text{ mA}$	3.0		0.55	V
I_I	Input Leakage Current	$0 \leq V_I \leq 5.5V$	2.7-3.6		± 5.0	μA
I_{OZ}	TRI-STATE Output Leakage	$0 \leq V_O \leq 5.5V$ $V_I = V_{IH} \text{ or } V_{IL}$	2.7-3.6		± 5.0	μA
I_{OFF}	Power-Off Leakage Current	$V_I \text{ or } V_O = 5.5V$	0		10	μA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC} \text{ or } \text{GND}$	2.7-3.6		10	μA
		$3.6V \leq V_I, V_O \leq 5.5V$	2.7-3.6		± 10	μA
ΔI_{CC}	Increase in I_{CC} per Input	$V_{IH} = V_{CC} - 0.6V$	2.7-3.6		500	μA

AC Electrical Characteristics

Symbol	Parameter	T _A = −40°C to +85°C				Units
		V _{CC} = 3.3V ±0.3V		V _{CC} = 2.7V		
		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_{OSH}) or LOW to HIGH (t_{OSLH}).

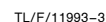
Dynamic Switching Characteristics

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

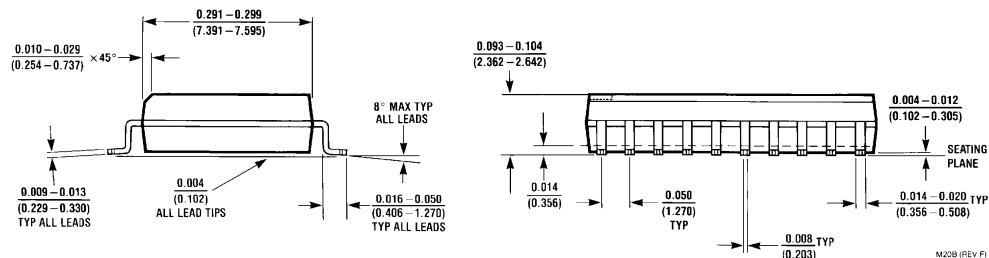
Capacitance

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

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

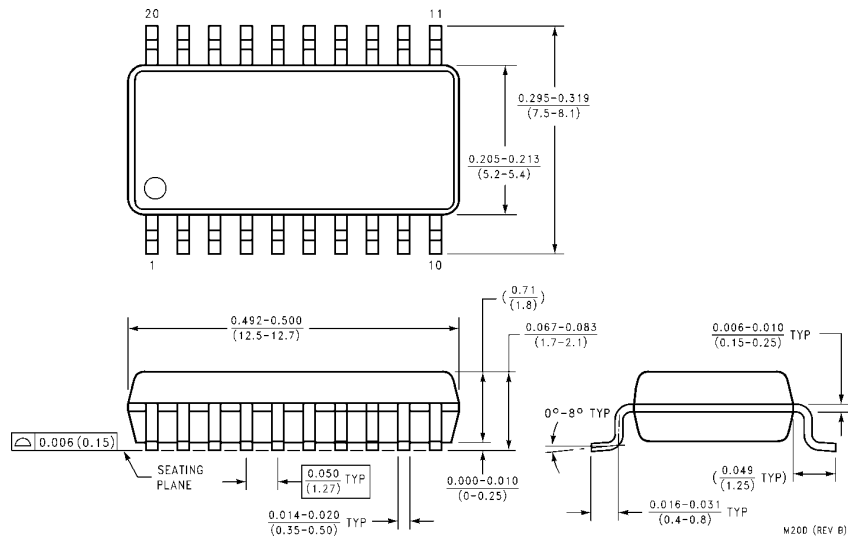


Top view of a rectangular PCB. Dimensions are given in inches and millimeters. The overall width is 0.496 - 0.512 (12.598 - 13.005). The overall height is 0.394 - 0.419 (10.008 - 10.643). There are 11 pins along the top edge, numbered 20 to 11 from left to right. There are 10 pins along the bottom edge, numbered 1 to 10 from left to right. A circular feature is located on the left side, with a dimension of 0.394 - 0.419 (10.008 - 10.643) from the left edge. A dimension of 0.010 MAX (0.254) is shown for the bottom edge, with a 30° TYP angle. A label 'LEAD NO. 1 IDENT' points to the first pin on the bottom edge.

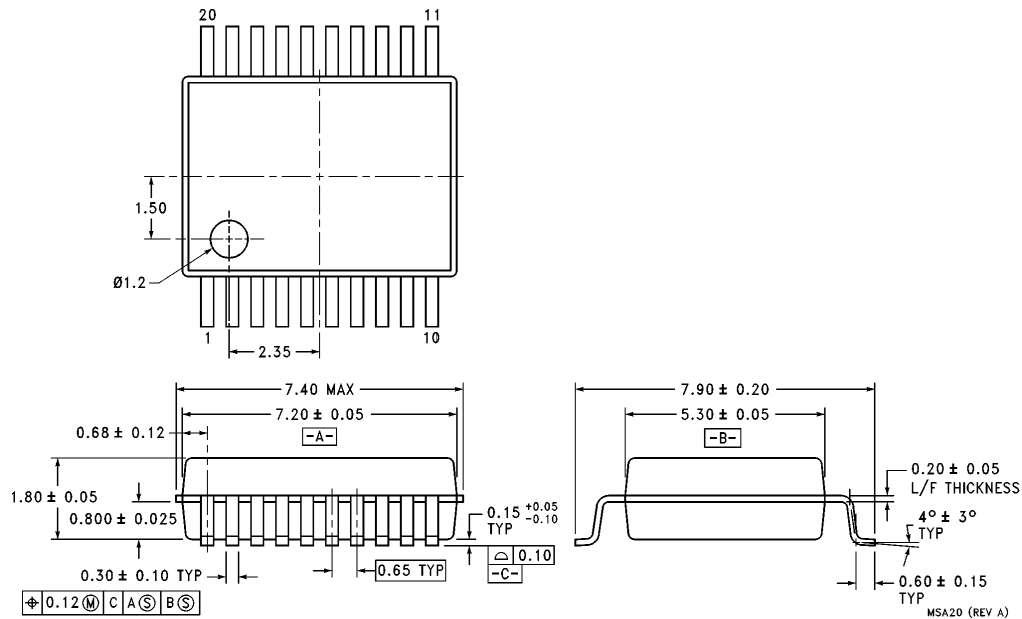


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Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



20-Lead Small Outline Package, EIAJ (SJ)
Order Number 74LCX240SJ or 74LCX240SJX
NS Package Number M200

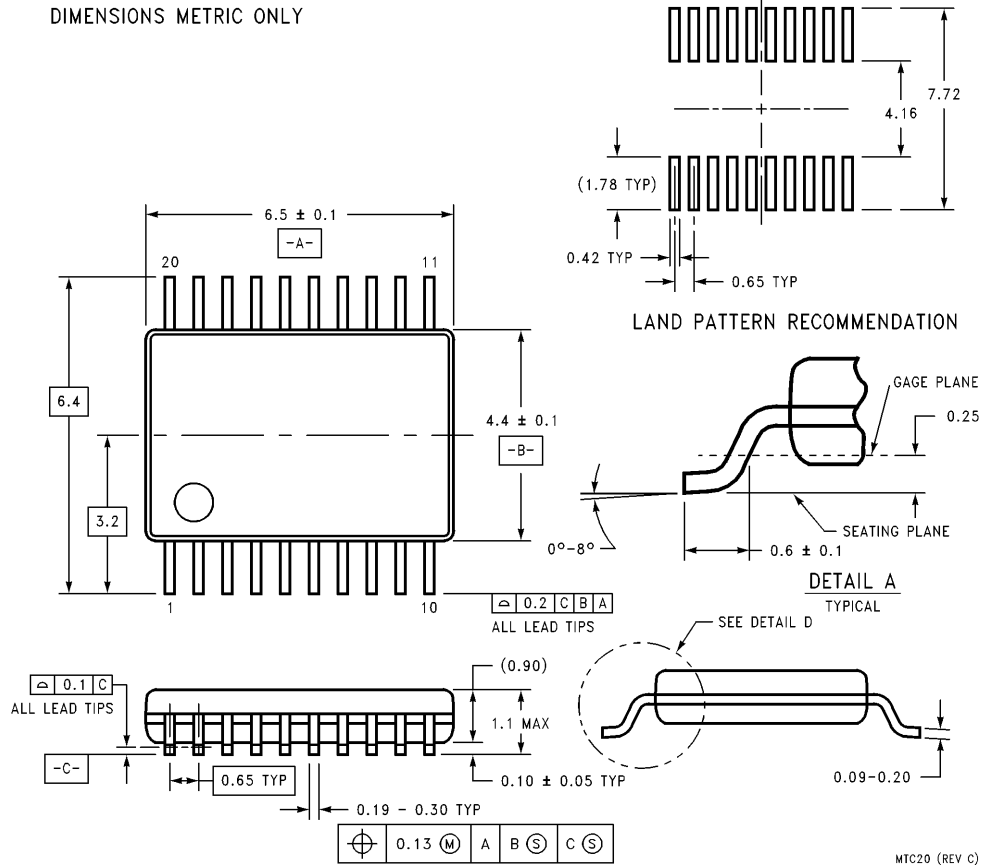


All dimensions are in millimeters.

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)



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

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