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## 74LCX760

### Low Voltage Buffer/Line Driver with 5V Tolerant Inputs and Open Drain Outputs

#### General Description

The LCX760 is the Open Drain version of the LCX244. The LCX760 contains eight non-inverting buffers with 3-STATE outputs. The device may be employed as a memory address driver, clock driver and bus-oriented transmitter/receiver. The LCX760 is designed for low voltage (2.5V or 3.3V)  $V_{CC}$  applications with capability of interfacing to a 5V signal environment.

The LCX760 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

#### Features

- Open drain version of the LCX244
- 5V tolerant inputs and outputs
- 2.3V–3.6V  $V_{CC}$  specifications provided
- 8.0 ns  $t_{PD}$  max ( $V_{CC} = 3.3V$ ), 10  $\mu A$   $I_{CC}$  max
- Power down high impedance inputs and outputs
- Supports live insertion/withdrawal (Note 1)
- 24 mA output drive ( $V_{CC} = 3.0V$ )
- Implements proprietary noise/EMI reduction circuitry
- Latch-up conforms to JEDEC JED78
- ESD performance:  
Human body model > 2000V  
Machine model > 200V

**Note 1:** To ensure the high-impedance state during power up or down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pull-up resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

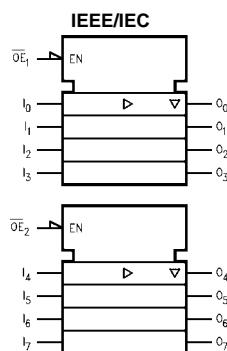
#### Ordering Code:

Order Number	Package Number	Package Description
74LCX760WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74LCX760SJ	M20D	Pb-Free 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LCX760MSA	MSA20	20-Lead Shrink Small Outline Package (SSOP), JEDEC MO-150, 5.3mm Wide
74LCX760MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

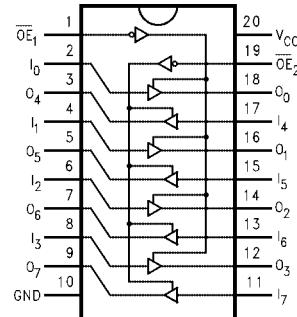
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Pb-Free package per JEDEC J-STD-020B.

#### Logic Symbol



#### Connection Diagram



## Pin Descriptions

Pin Names	Description
$\overline{OE}_1, \overline{OE}_2$	3-STATE Output Enable Inputs
$I_0-I_7$	Inputs
$O_0-O_7$	Outputs

## Truth Tables

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

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

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

### Absolute Maximum Ratings (Note 2)

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 HIGH or LOW State (Note 3)	V
$I_{IK}$	DC Input Diode Current	-50	$V_I < GND$	mA
$I_{OK}$	DC Output Diode Current	-50 +50	$V_O < GND$ $V_O > V_{CC}$	mA
$I_O$	DC Output Sink Current	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		°C

### Recommended Operating Conditions (Note 4)

Symbol	Parameter	Min	Max	Units
$V_{CC}$	Supply Voltage	Operating	2.0	V
		Data Retention	1.5	
$V_I$	Input Voltage	0	5.5	V
$V_O$	Output Voltage	0	5.5	V
$I_{OL}$	Output Current	$V_{CC} = 3.0V - 3.6V$ $V_{CC} = 2.7V - 3.0V$ $V_{CC} = 2.3V - 2.7V$	24 12 8	mA
$T_A$	Free-Air Operating Temperature	-40	85	°C
$\Delta t/\Delta V$	Input Edge Rate, $V_{IN} = 0.8V - 2.0V$ , $V_{CC} = 3.0V$	0	10	ns/V

**Note 2:** 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 tables are not guaranteed at the Absolute Maximum Ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

**Note 3:**  $I_O$  Absolute Maximum Rating must be observed.

**Note 4:** Unused inputs or I/Os must be held HIGH or LOW. They may not float.

### DC Electrical Characteristics

Symbol	Parameter	Conditions	$V_{CC}$	$T_A = -40^{\circ}C$ to $+85^{\circ}C$	Units
			(V)	Min	
$V_{IH}$	HIGH Level Input Voltage		2.3 - 2.7	1.7	V
			2.7 - 3.6	2.0	
$V_{IL}$	LOW Level Input Voltage		2.3 - 2.7	0.7	V
			2.7 - 3.6	0.8	
$V_{OL}$	LOW Level Output Voltage	$I_{OL} = 100 \mu A$	2.3 - 3.6	0.2	V
		$I_{OL} = 8 mA$	2.3	0.6	
		$I_{OL} = 12 mA$	2.7	0.4	
		$I_{OL} = 16 mA$	3.0	0.4	
		$I_{OL} = 24 mA$	3.0	0.55	
$I_I$	Input Leakage Current	$0 \leq V_I \leq 5.5V$	2.3 - 3.6	$\pm 5.0$	$\mu A$
$I_{OZ}$	3-STATE Output Leakage	$0 \leq V_O \leq 5.5V$ $V_I = V_{IH}$ or $V_{IL}$	2.3 - 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	2.3 - 3.6	10	$\mu A$
		$3.6V \leq V_I, V_O \leq 5.5V$ (Note 5)	2.3 - 3.6	$\pm 10$	
$\Delta I_{CC}$	Increase in $I_{CC}$ per Input	$V_{IH} = V_{CC} - 0.6V$	2.3 - 3.6	500	$\mu A$
$I_{OHZ}$	Off State Current	$V_O = 5.5$	2 - 3.6	10	$\mu A$

**Note 5:** Outputs disabled or 3-STATE only.

## AC Electrical Characteristics

Symbol	Parameter	$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ , $R_L = 500\Omega$						Units	
		$V_{CC} = 3.3\text{V} \pm 0.3\text{V}$		$V_{CC} = 2.7\text{V}$		$V_{CC} = 2.5\text{V} \pm 0.2$			
		$C_L = 50 \text{ pF}$		$C_L = 50 \text{ pF}$		$C_L = 30 \text{ pF}$			
		Min	Max	Min	Max	Min	Max		
$t_{PZL}$	Propagation Delay Data to Output	0.5	8.0	0.5	9.0	0.5	10.0	ns	
$t_{PLZ}$	Output Enable Time $\bar{OE}_n$ to Out	0.5	8.0	0.5	9.0	0.5	10.0	ns	
$t_{PLZ}$	Output Disable Time $\bar{OE}_n$ to Out	0.5	7.0	0.5	8.0	0.5	8.4	ns	
$t_{OSHL}$	Output to Output Skew (Note 6)			1.0				ns	
$t_{OSLH}$				1.0					

**Note 6:** 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 ( $t_{OSLH}$ ).

## Dynamic Switching Characteristics

Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^\circ\text{C}$	Units
			(V)	Typical	
$V_{OLP}$	Quiet Output Dynamic Peak $V_{OL}$	$C_L = 50 \text{ pF}$ , $V_{IH} = 3.3\text{V}$ , $V_{IL} = 0\text{V}$ $C_L = 30 \text{ pF}$ , $V_{IH} = 2.5\text{V}$ , $V_{IL} = 0\text{V}$	3.3 2.5	0.8 0.6	V
$V_{OLV}$	Quiet Output Dynamic Valley $V_{OL}$	$C_L = 50 \text{ pF}$ , $V_{IH} = 3.3\text{V}$ , $V_{IL} = 0\text{V}$ $C_L = 30 \text{ pF}$ , $V_{IH} = 2.5\text{V}$ , $V_{IL} = 0\text{V}$	3.3 2.5	-0.8 -0.6	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 $V_{CC}$ , $f = 10 \text{ MHz}$	10	pF

## AC LOADING and WAVEFORMS

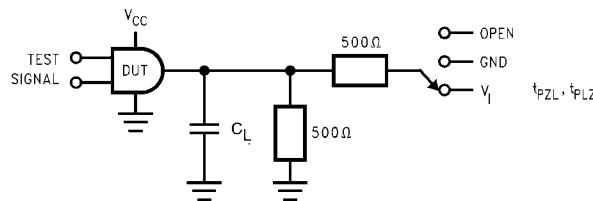
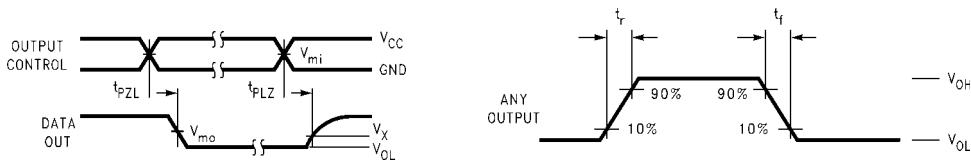


FIGURE 1. AC Test Circuit ( $C_L$  includes probe and jig capacitance)

Test	Switch
$t_{PZL}, t_{PLZ}$	6V at $V_{CC} = 3.3 \pm 0.3V$ $V_{CC} \times 2$ at $V_{CC} = 2.5 \pm 0.2V$



3-STATE Output Low Enable and  
Disable Times for Logic

FIGURE 2. Waveforms  
(Input Characteristics;  $f = 1MHz$ ,  $t_r = t_f = 3ns$ )

Symbol	$V_{CC}$		
	3.3V $\pm 0.3V$	2.7V	2.5V $\pm 0.2V$
$V_{mi}$	1.5V	1.5V	$V_{CC}/2$
$V_{mo}$	1.5V	1.5V	$V_{CC}/2$
$V_x$	$V_{OL} + 0.3V$	$V_{OL} + 0.3V$	$V_{OL} + 0.15V$
$V_y$	$V_{OH} - 0.3V$	$V_{OH} - 0.3V$	$V_{OH} - 0.15V$

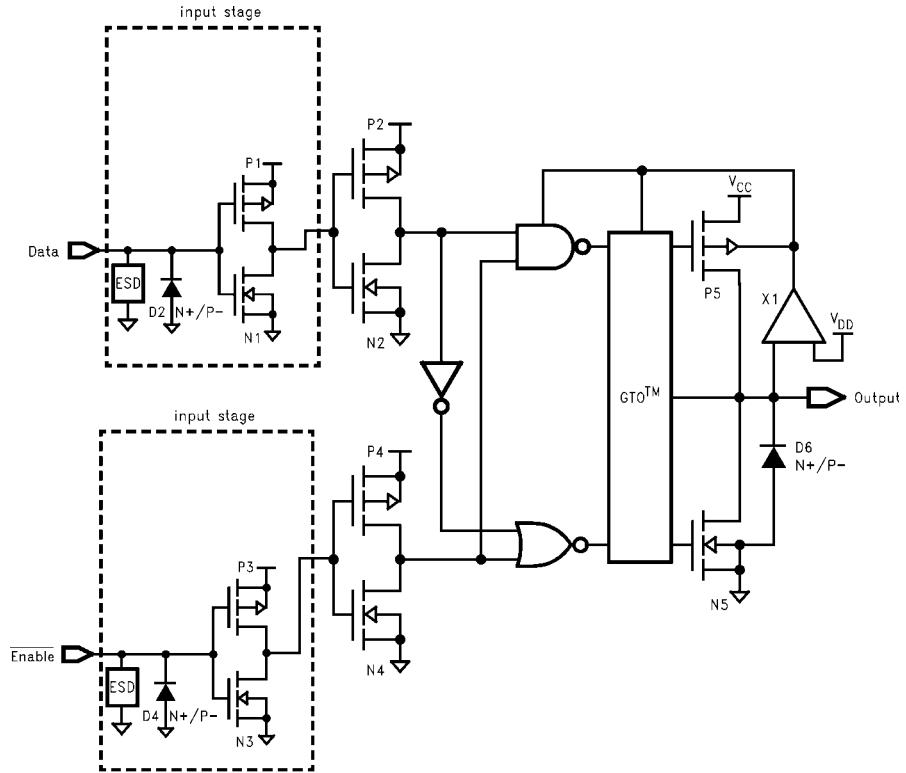
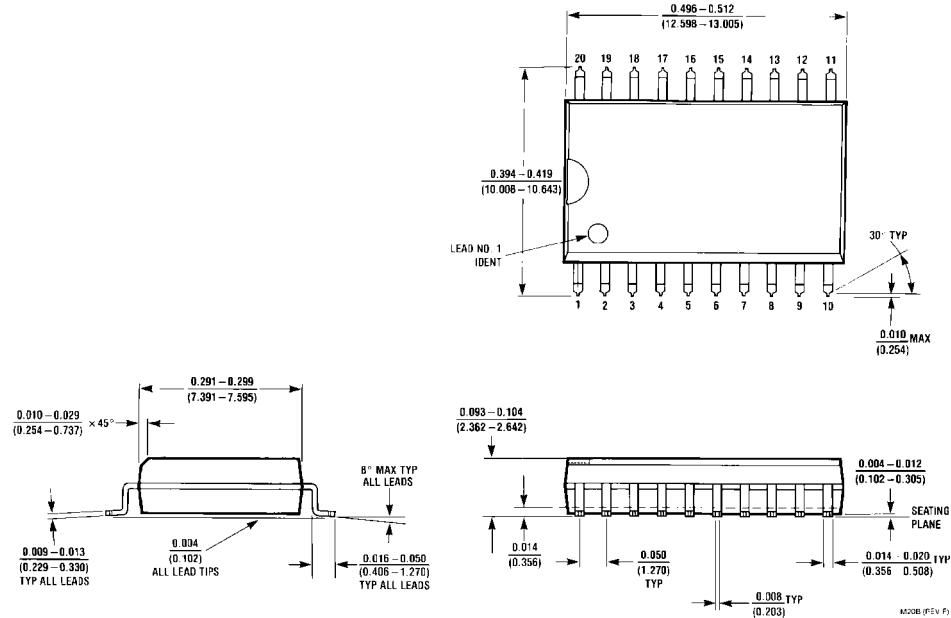
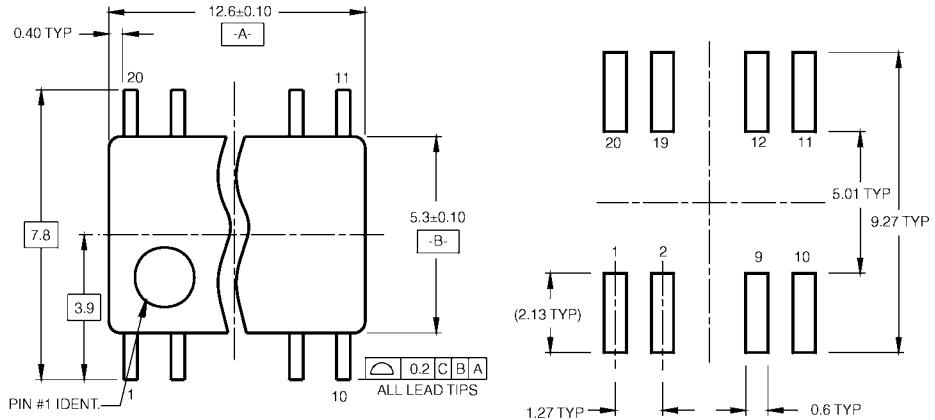
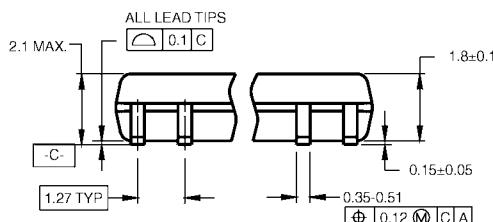
**Schematic Diagram** Generic for LCX Family (output pull-up circuitry is not applicable to open drain versions)

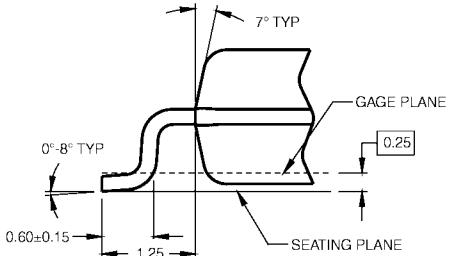
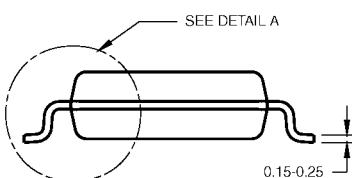
FIGURE 3.

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

20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M20B

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)LAND PATTERN RECOMMENDATION

DIMENSIONS ARE IN MILLIMETERS



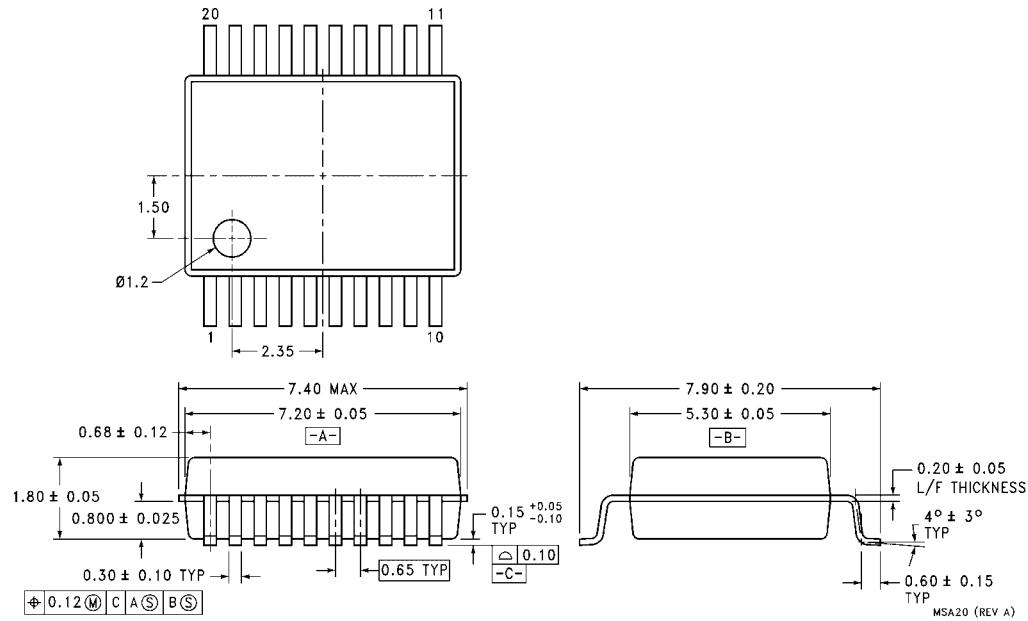
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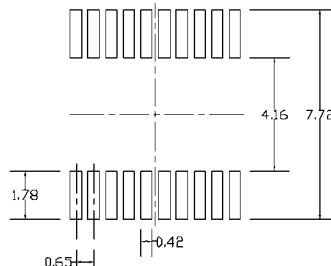
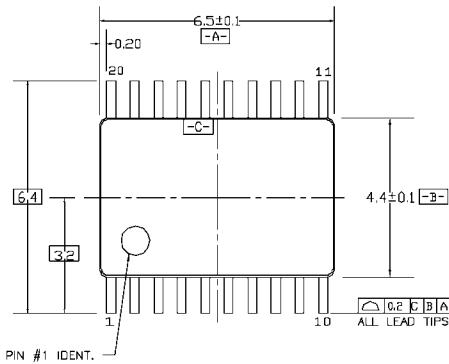
M20DRevB1

DETAIL A

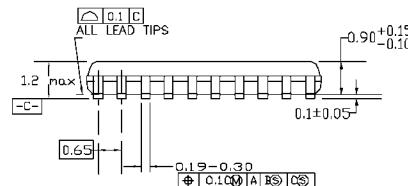
**Pb-Free 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide**  
**Package Number M20D**

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

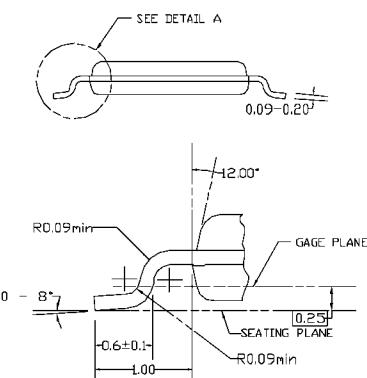
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



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DETAIL A

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- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REV01

**20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide**  
**Package Number MTC20**

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