FAIRCHILD SEMICONDUCTOR™

January 1998

74LCX541
Low Voltage Octal Buffer/Line Driver with 5V Tolerant Inputs and Outputs

General Description

The LCX541 is an octal buffer/line driver designed to be employed as memory and address drivers, clock drivers and bus oriented transmitter/receivers. The LCX541 is a noninverting option of the LCX540.

This device is similar in function to the LCX244 while providing flow-through architecture (inputs on opposite side from outputs). This pinout arrangement makes this device especially useful as an output port for microprocessors, allowing ease of layout and greater PC board density.

The LCX541 is designed for low voltage (3.3V) V_{CC} applications with capability of interfacing to a 5V signal environment. The LCX541 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

Features

- 5V tolerant input 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 noise/ EMI reduction circuitry
- Functionally compatible with 74 series 541
- Latch-up performance exceeds 500 mA
- ESD performance:
  Human body model > 2000V
  Machine model > 200V

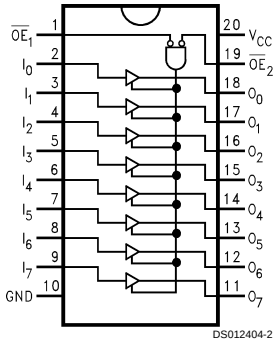
Ordering Code:

Order Number	Package Number	Package Description
74LCX541WM	M20B	20-Lead (0.300" Wide) Molded Small Outline, SOIC, JEDEC
74LCX541SJ	M20D	20-Lead Molded Small Outline, SOIC, EIAJ
74LCX541MSA	MSA20	20-Lead Molded Shrink Small Outline, SSOP Type II
74LCX541MTC	MTC20	20-Lead Thin Shrink Small Outline, TSSOP, JEDEC

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

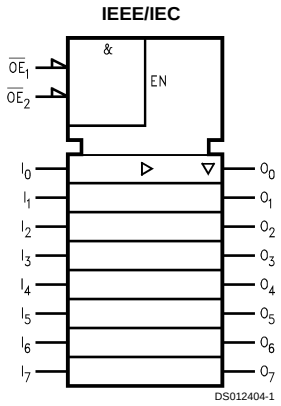
Connection Diagram

Pin Assignment for SOIC, SSOP and TSSOP



DS012404-2

Logic Symbol



Truth Tables

Inputs			Outputs
$\overline{OE}_1$	$\overline{OE}_2$	I	
L	L	H	H
H	X	X	Z
X	H	X	Z
L	L	L	L

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

Absolute Maximum Ratings (Note 1)

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 3-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	±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

Recommended Operating Conditions (Note 3)

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
		3-STATE	0	5.5	
I_{OH}/I_{OL}	Output Current	V_{CC} = 3.0V − 3.6V		±24	mA
		V_{CC} = 2.7V		±12	
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 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 tables 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.

Note 3: Unused inputs or I/O's must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC}	T_A = −40˚C to +85˚C		Units
			(V)	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 µA	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 µA	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 ≤ V_I ≤ 5.5V	2.7–3.6		±5.0	µA
I_{OZ}	3-STATE Output Leakage	0 ≤ V_O ≤ 5.5V	2.7–3.6		±5.0	µA
		V_I = V_{IH} or V_{IL}				
I_{OFF}	Power-Off Leakage Current	V_I or V_O = 5.5V	0		10	µA
I_{CC}	Quiescent Supply Current	V_I = V_{CC}or GND	2.7–3.6		10	µA
		3.6V ≤ V_I, V_O ≤ 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	$T_A = -40^\circ C$ to $+85^\circ C$, $C_L = 50pF$, $R_L = 500\ \Omega$				Units
		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 2.7V$		
		Min	Max	Min	Max	
t_{PHL}	Propagation Delay	1.5	6.5	1.5	7.5	ns
t_{PLH}		1.5	6.5	1.5	7.5	
t_{PZL}	Output Enable Time	1.5	8.5	1.5	9.5	ns
t_{PZH}		1.5	8.5	1.5	9.5	
t_{PLZ}	Output Disable Time	1.5	7.5	1.5	8.5	ns
t_{PHZ}		1.5	7.5	1.5	8.5	
t_{OSHL}	Output to Output Skew		1.0			ns
t_{OSLH}	(Note 4)		1.0			

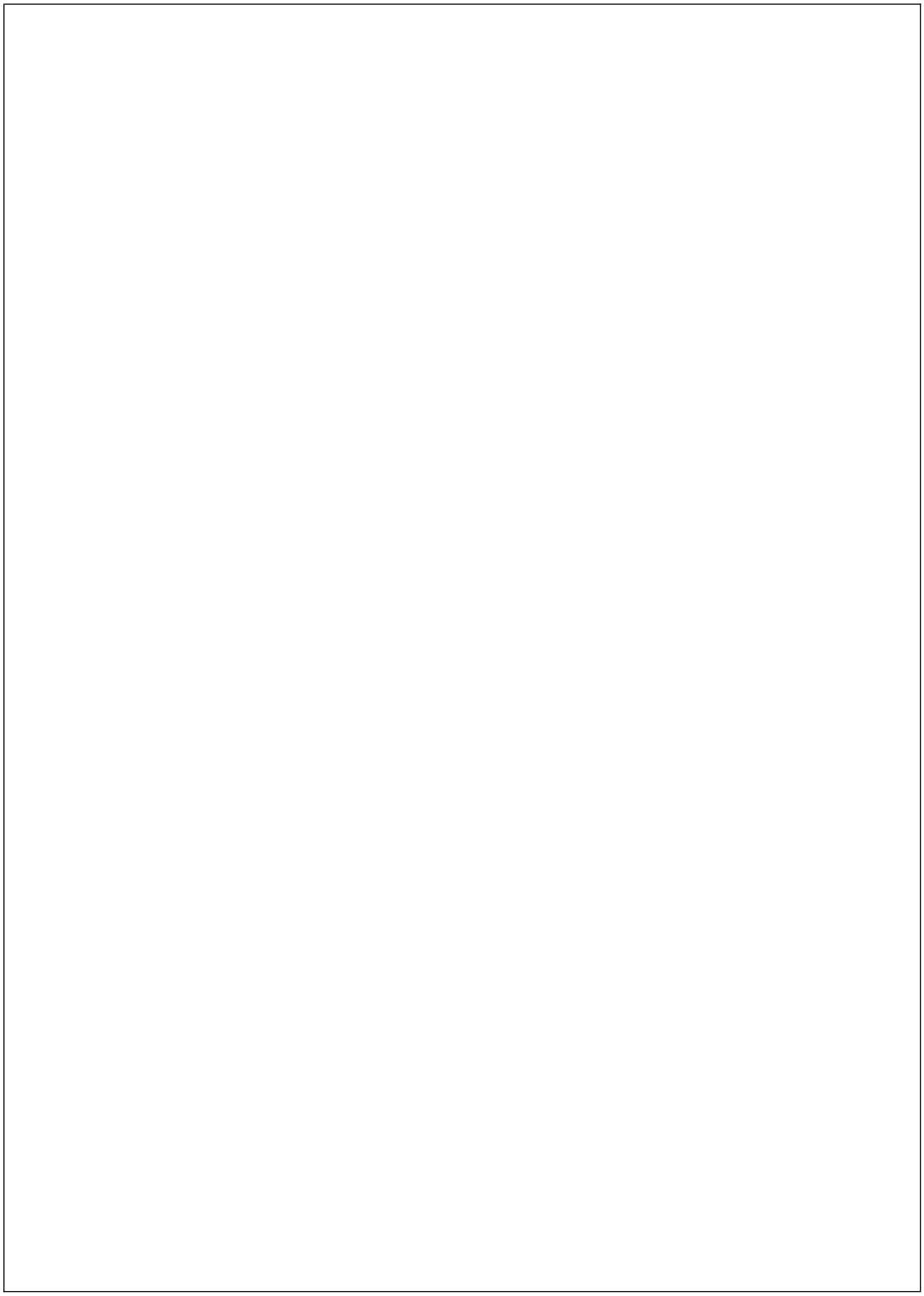
Note 4: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH to LOW (t_{OSHL}) or LOW to HIGH (t_{OSLH}).

Dynamic Switching Characteristics

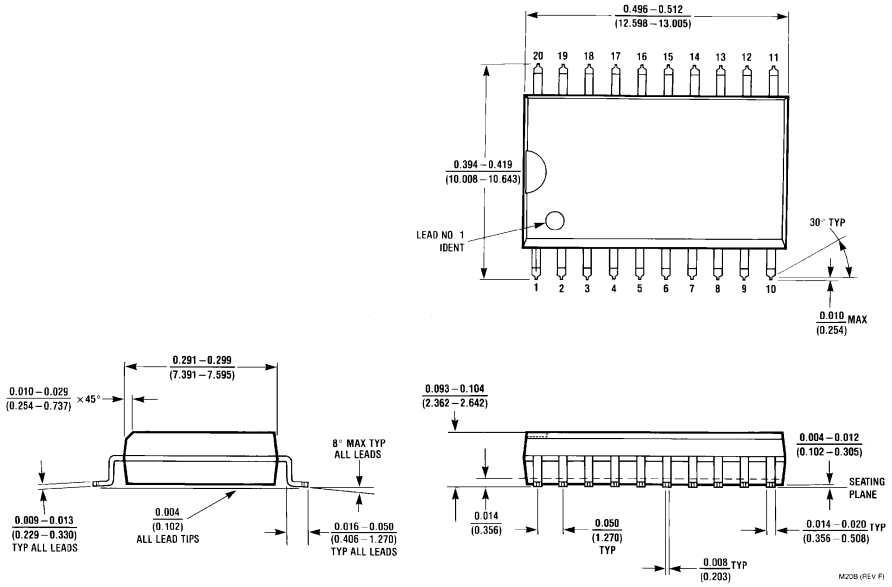
Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = 25^\circ C$	Units
				Typical	
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	$C_L = 50$ pF, $V_{IH} = 3.3V$, $V_{IL} = 0V$	3.3	0.8	V
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	$C_L = 50$ pF, $V_{IH} = 3.3V$, $V_{IL} = 0V$	3.3	−0.8	V

Capacitance

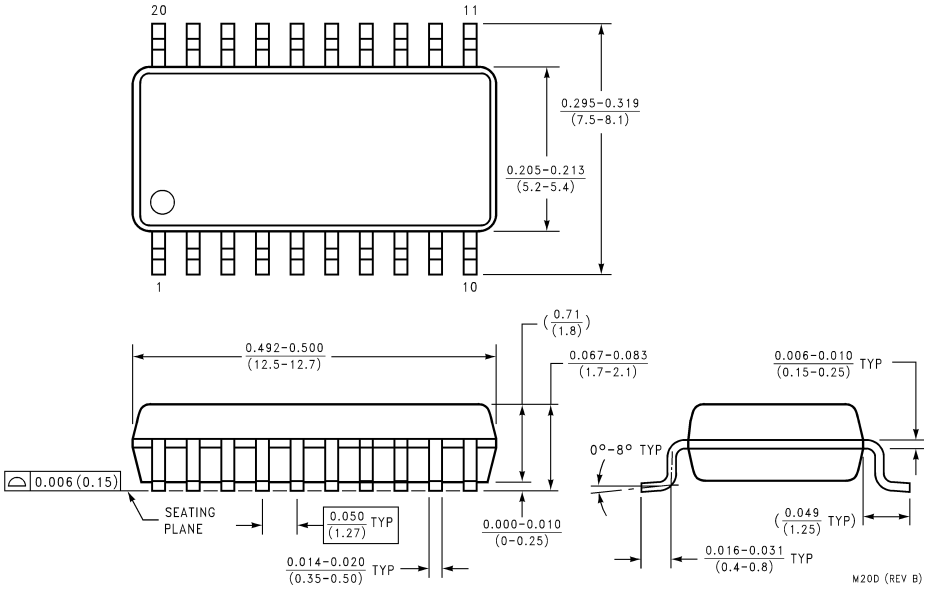
Symbol	Parameter	Conditions	Typical	Units
C_{IN}	Input Capacitance	V_{CC} = Open, $V_I = 0V$ or V_{CC}	7	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}, f = 10 MHz	25	pF



Physical Dimensions inches (millimeters) unless otherwise noted

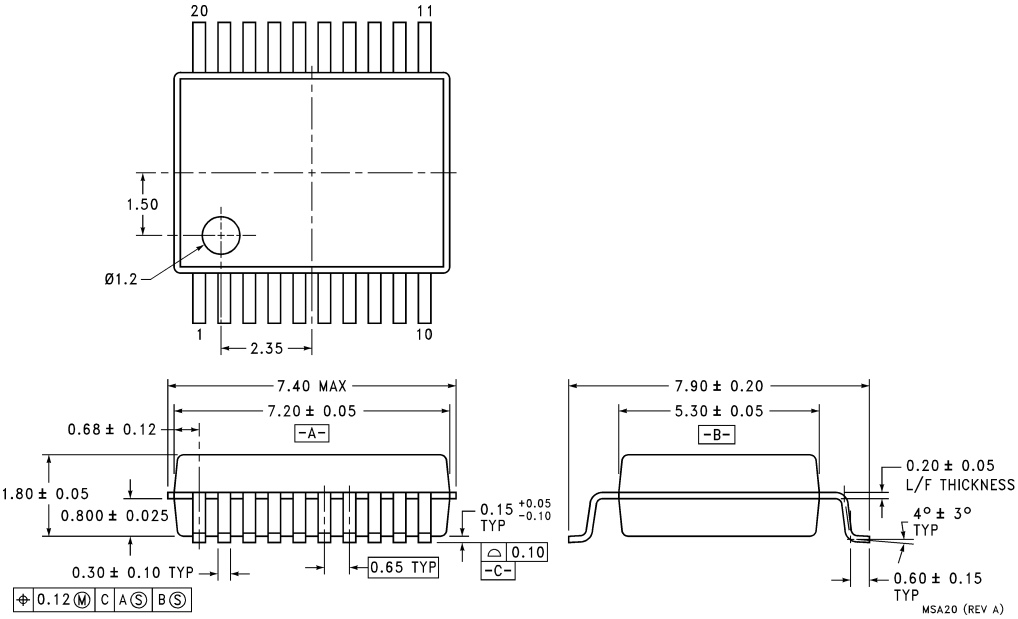


20-Lead (0.300" Wide) Molded Small Outline Package, JEDEC
Package Number M20B



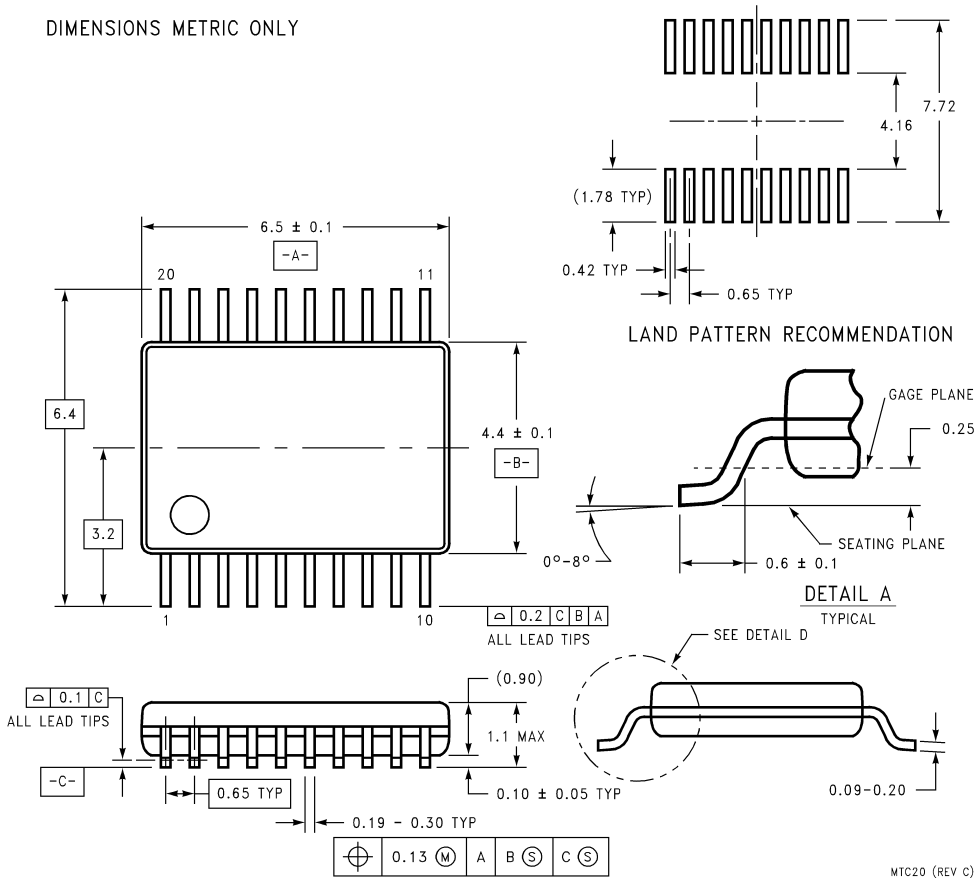
20-Lead Molded Small Outline Package, EIAJ (SJ)
Package Number M20D

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



20-Lead Molded Shrink Small Outline Package, EIAJ, Type II
Package Number MSA20

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



20-Lead Thin Shrink Small Outline Package, JEDEC
Package Number MTC20

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2. A critical component in 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.

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