

# 74LCX540

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

### General Description

The LCX540 is an octal buffer/line drivers designed to be employed as memory and address drivers, clock drivers and bus oriented transmitter/receivers.

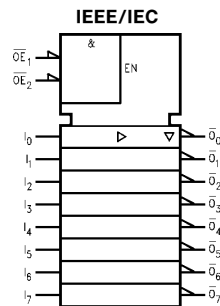
These devices are similar in function to the 74LCX240 while providing flow-through architecture (inputs on opposite side from outputs). This pinout arrangement makes these devices especially useful as output ports for microprocessors, allowing ease of layout and greater PC board density.

The LCX540 is designed for low voltage (3.3V)  $V_{CC}$  applications with capability of interfacing to a 5V signal environment. The LCX540 is fabricated with an advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

### Features

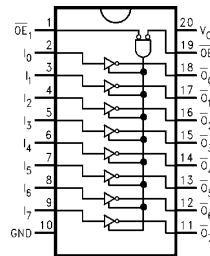
- 5V tolerant inputs and outputs
- 6.5 ns  $t_{PD}$  max, 10  $\mu A$   $I_{CCQ}$  max
- Power down high impedance inputs and outputs
- Supports live insertion/withdrawal
- 2.0V–3.6V  $V_{CC}$  supply operation
- $\pm 24$  mA output drive
- Implements patented Quiet Series™ noise/EMI reduction circuitry
- Functionally compatible with 74 series 540
- Latch-up performance exceeds 500 mA
- ESD performance:
  - Human body model > 2000V
  - Machine model > 200V

### Logic Symbol



TL/F/12403-1

### Connection Diagram

**Pin Assignment for SOIC, SSOP and TSSOP**


TL/F/12403-2

### Truth Table

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

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

	SOIC JEDEC	SOIC EIAJ	SSOP Type II	TSSOP JEDEC
Order Number	74LCX540WM 74LCX540WMX	74LCX540SJ 74LCX540SJX	74LCX540MSA 74LCX540MSAX	74LCX540MTC 74LCX540MTCX
See NS Package Number	M20B	M20D	MSA20	MTC20

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## 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 <sub>CC</sub>	Supply Voltage	-0.5 to +7.0		V
V <sub>I</sub>	DC Input Voltage	-0.5 to +7.0		V
V <sub>O</sub>	DC Output Voltage	-0.5 to +7.0	Output in TRI-STATE	V
		-0.5 to V <sub>CC</sub> + 0.5	Output in High or Low State (Note 2)	V
I <sub>IK</sub>	DC Input Diode Current	-50	V <sub>I</sub> < GND	mA
I <sub>OK</sub>	DC Output Diode Current	-50	V <sub>O</sub> < GND	mA
		+50	V <sub>O</sub> > V <sub>CC</sub>	
I <sub>O</sub>	DC Output Source/Sink Current	±50		mA
I <sub>CC</sub>	DC Supply Current per Supply Pin	±100		mA
I <sub>GND</sub>	DC Ground Current per Ground Pin	±100		mA
T <sub>STG</sub>	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<sub>O</sub> Absolute Maximum Rating must be observed.

## Recommended Operating Conditions

Symbol	Parameter	Min	Max	Units	
V <sub>CC</sub>	Supply Voltage	Operating	2.0	3.6	V
		Data Retention	1.5	3.6	
V <sub>I</sub>	Input Voltage	0	5.5	V	
V <sub>O</sub>	Output Voltage	HIGH or LOW State	0	V <sub>CC</sub>	V
		TRI-STATE	0	5.5	
I <sub>OH</sub> /I <sub>OL</sub>	Output Current	V <sub>CC</sub> = 3.0V - 3.6V V <sub>CC</sub> = 2.7V		±24 ±12	mA
T <sub>A</sub>	Free-Air Operating Temperature	-40	85	°C	
Δt/ΔV	Input Edge Rate, V <sub>IN</sub> = 0.8V-2.0V, V <sub>CC</sub> = 3.0V	0	10	ns/V	

## DC Electrical Characteristics

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = -40°C to +85°C		Units
				Min	Max	
V <sub>IH</sub>	HIGH Level Input Voltage		2.7-3.6	2.0		V
V <sub>IL</sub>	LOW Level Input Voltage		2.7-3.6		0.8	V
V <sub>OH</sub>	HIGH Level Output Voltage	I <sub>OH</sub> = -100 μA	2.7-3.6	V <sub>CC</sub> - 0.2		V
		I <sub>OH</sub> = -12 mA	2.7	2.2		V
		I <sub>OH</sub> = -18 mA	3.0	2.4		V
		I <sub>OH</sub> = -24 mA	3.0	2.2		V
V <sub>OL</sub>	LOW Level Output Voltage	I <sub>OL</sub> = 100 μA	2.7-3.6		0.2	V
		I <sub>OL</sub> = 12 mA	2.7		0.4	V
		I <sub>OL</sub> = 16 mA	3.0		0.4	V
		I <sub>OL</sub> = 24 mA	3.0		0.55	V
I <sub>I</sub>	Input Leakage Current	0 ≤ V <sub>I</sub> ≤ 5.5V	2.7-3.6		±5.0	μA
I <sub>OZ</sub>	TRI-STATE Output Leakage	0 ≤ V <sub>O</sub> ≤ 5.5V V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	2.7-3.6		±5.0	μA
I <sub>OFF</sub>	Power-Off Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 5.5V	0		10	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>I</sub> = V <sub>CC</sub> or GND	2.7-3.6		10	μA
		3.6V ≤ V <sub>I</sub> , V <sub>O</sub> ≤ 5.5V	2.7-3.6		±10	μA
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	V <sub>IH</sub> = V <sub>CC</sub> - 0.6V	2.7-3.6		500	μA

## AC Electrical Characteristics

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	1.5	6.5	1.5	7.5	ns
$t_{PZL}$ $t_{PZH}$	Output Enable Time	1.5	8.5	1.5	9.5	ns
$t_{PLZ}$ $t_{PHZ}$	Output Disable Time	1.5	7.5	1.5	8.5	ns
$t_{OSHL}$ $t_{OSLH}$	Output to Output Skew (Note 3)		1.0			ns

**Note 3:** 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

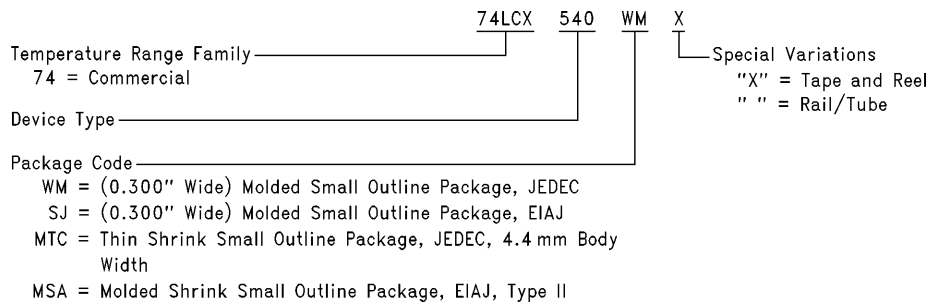
Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A = 25^{\circ}\text{C}$	Units
				Typical	
$V_{OLP}$	Quiet Output Dynamic Peak $V_{OL}$	$C_L = 50\text{ pF}$ , $V_{IH} = 3.3\text{V}$ , $V_{IL} = 0\text{V}$	3.3	0.8	V
$V_{OLV}$	Quiet Output Dynamic Valley $V_{OL}$	$C_L = 50\text{ pF}$ , $V_{IH} = 3.3\text{V}$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

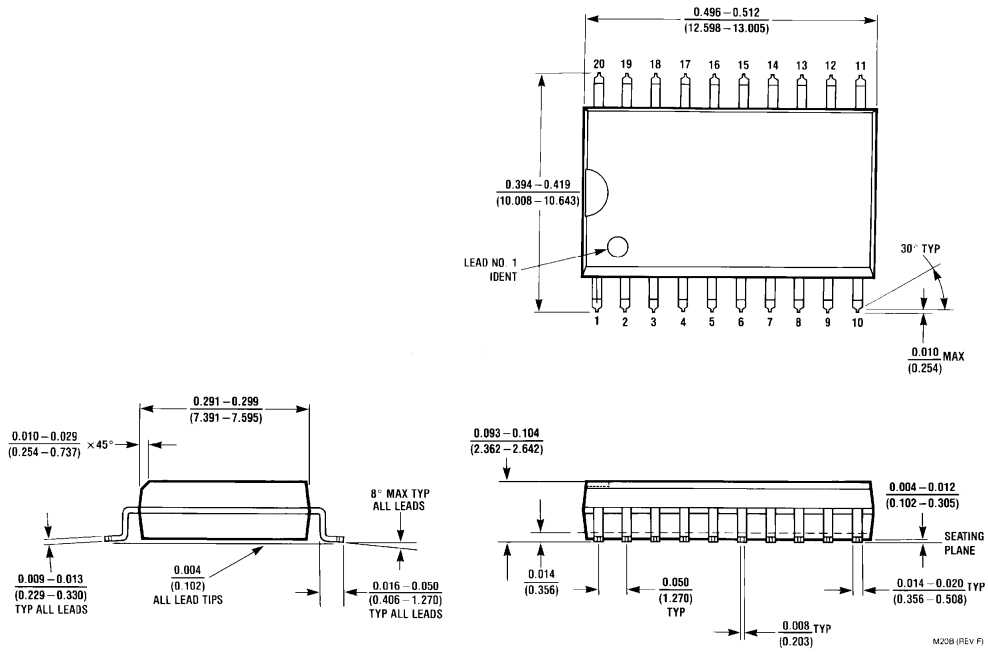
## 74LCX540 Ordering Information

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



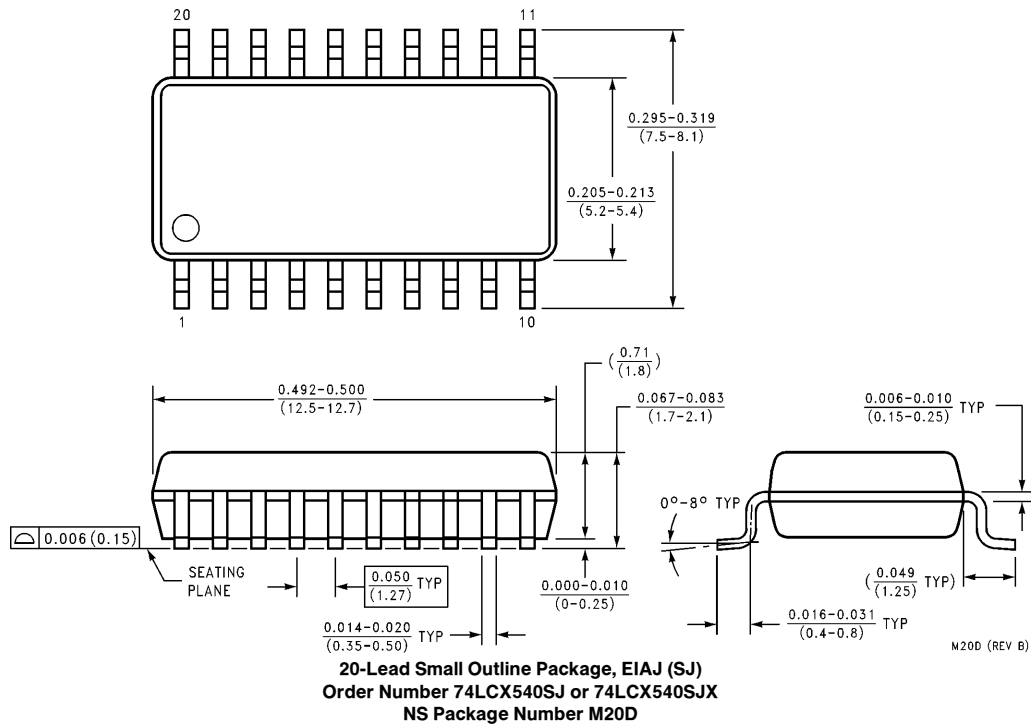
TL/F/12403-4

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

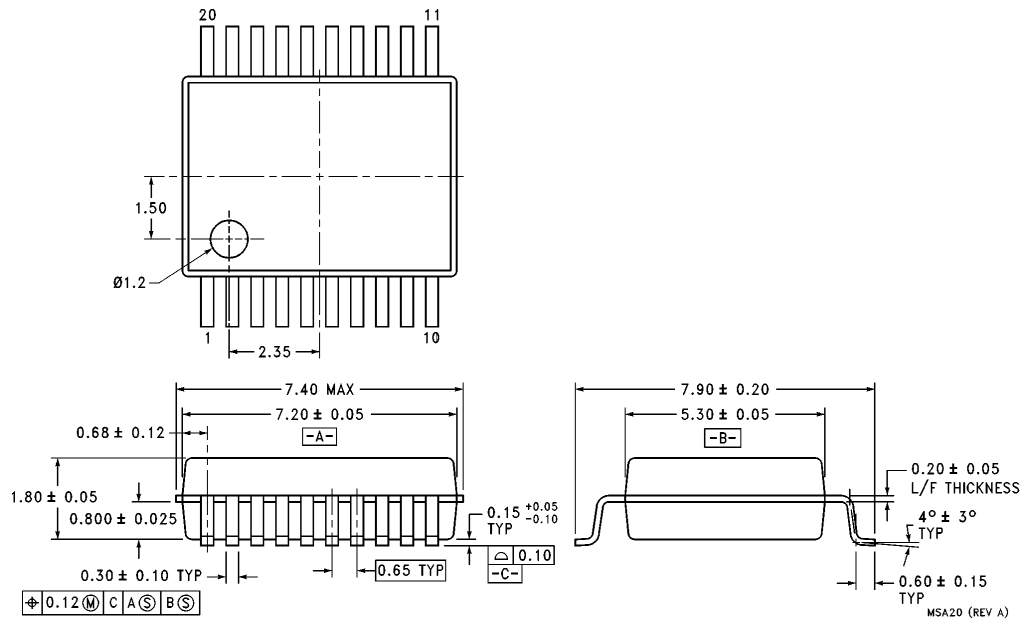


**20-Lead Small Outline Integrated Circuit (WM)**  
**Order Number 74LCX540WM or 74LCX540WMX**  
**NS Package Number M20B**

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



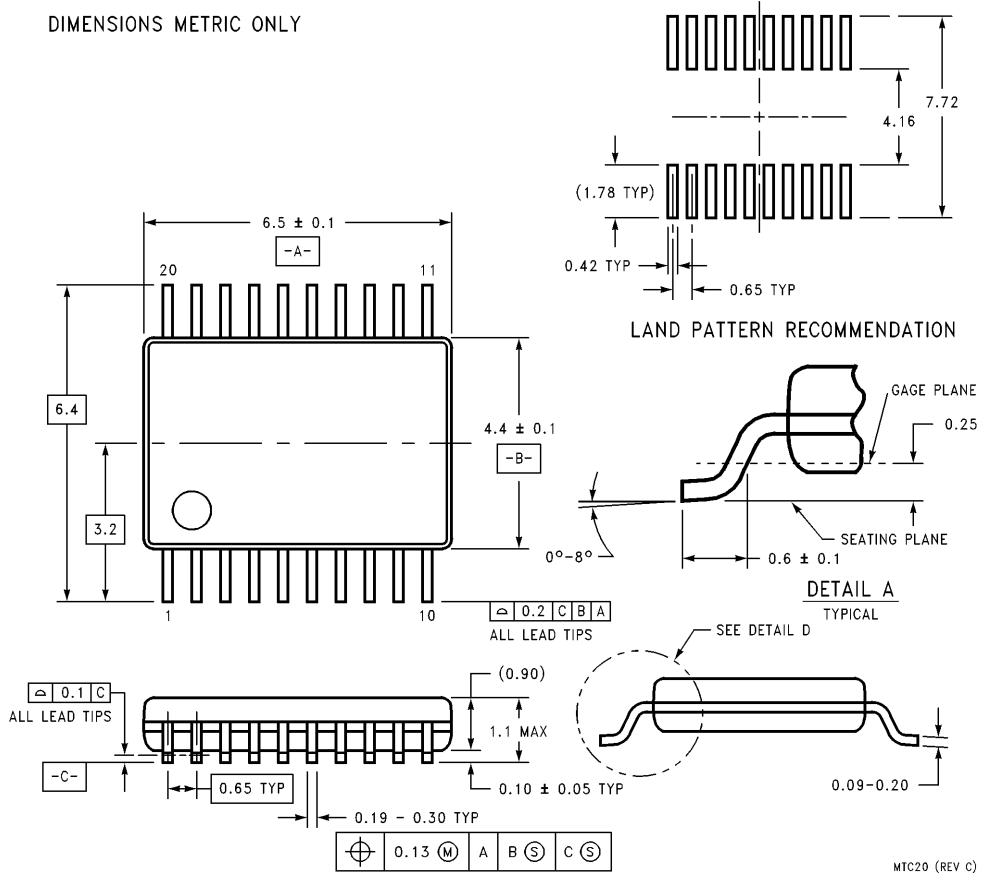
**Physical Dimensions** All dimensions in millimeters (Continued)



**20-Lead Molded Shrink Small Outline Package, EIAJ, Type II**  
**Order Number 74LCX540MSA or 74LCX540MSAX**  
**NS Package Number MSA20**

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

DIMENSIONS METRIC ONLY



**20-Lead Thin Shrink Small Outline Package, JEDEC**  
**Order Number 74LCX540MTC or 74LCX540MTCX**  
**NS Package Number MTC20**

MTC20 (REV C)

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