

# 74LCX00

## Low Voltage Quad 2-Input NAND Gate with 5V Tolerant Inputs

### General Description

The LCX00 contains four 2-input NAND gates. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

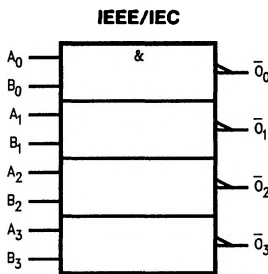
The 74LCX00 is fabricated with advanced CMOS technology to achieve high speed operation while maintaining CMOS low power dissipation.

### Features

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

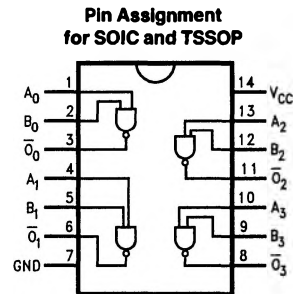
- Power down high impedance inputs and outputs
- 2.0V–3.6V  $V_{CC}$  supply operation
- $\pm 24$  mA output drive
- Implements patented Quiet Series™ noise/EMI reduction circuitry
- Functionally compatible with 74 series 00
- Latch-up performance exceeds 500 mA
- ESD performance:
  - Human body model > 2000V
  - Machine model > 200V

### Logic Symbol



TL/F/12408-1

### Connection Diagram



TL/F/12408-2

Pin Names	Description
$A_n, B_n$	Inputs
$\bar{O}_n$	Outputs

	SOIC JEDEC	SOIC EIAJ	TSSOP
Order Number	74LCX00M 74LCX00MX	74LCX00SJ 74LCX00SJX	74LCX00MTC 74LCX00MTCX
See NS Package Number	M14A	M14D	MTC14

**Preliminary Data: National Semiconductor reserves the right to make changes at any time without notice.**

**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 $V_{CC} + 0.5$	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	$\pm 50$		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		$^{\circ}\text{C}$

**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	2.0 1.5	3.6 3.6	V
$V_I$	Input Voltage	0	5.5	V
$V_O$	Output Voltage	0	$V_{CC}$	V
$I_{OH}/I_{OL}$	Output Current	$V_{CC} = 3.0\text{V} - 3.6\text{V}$ $V_{CC} = 2.7\text{V}$	$\pm 24$ $\pm 12$	mA
$T_A$	Free-Air Operating Temperature	-40	85	$^{\circ}\text{C}$
$\Delta t/\Delta V$	Input Edge Rate, $V_{IN} = 0.8\text{V} - 2.0\text{V}$ , $V_{CC} = 3.0\text{V}$	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	$0 \leq V_I \leq 5.5\text{V}$	2.7-3.6		$\pm 5.0$	$\mu\text{A}$
$I_{OFF}$	Power-Off Leakage Current	$V_I$ or $V_O = 5.5\text{V}$	0		100	$\mu\text{A}$
$I_{CC}$	Quiescent Supply Current	$V_I = V_{CC}$ or GND	2.7-3.6		10	$\mu\text{A}$
		$3.6\text{V} \leq V_I, V_O \leq 5.5\text{V}$	2.7-3.6		$\pm 10$	$\mu\text{A}$
$\Delta I_{CC}$	Increase in $I_{CC}$ per Input	$V_{IH} = V_{CC} - 0.6\text{V}$	2.7-3.6		500	$\mu\text{A}$

**AC Electrical Characteristics** (Preliminary)

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 1.5	5.2 5.2	1.5 1.5	6.0 6.0	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 ( $t_{OSLH}$ ).

**Dynamic Switching Characteristics**

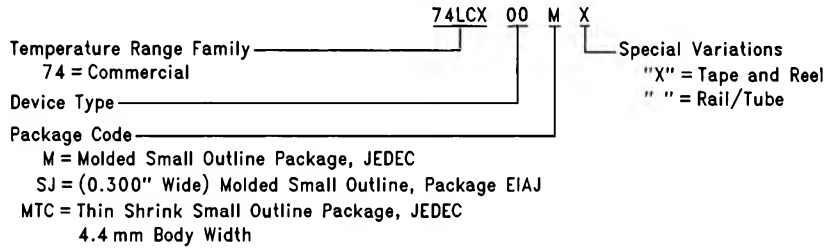
Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A = 25^{\circ}\text{C}$	Unit
				Typical	
$V_{OLP}$	Quiet Output Dynamic Peak $V_{OL}$	$C_L = 50\text{ pF}, V_{IH} = 3.3\text{V}, V_{IL} = 0\text{V}$	3.3	0.8	V
$V_{OLV}$	Quiet Output Dynamic Valley $V_{OL}$	$C_L = 50\text{ pF}, V_{IH} = 3.3\text{V}, V_{IL}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

## 74LCX00 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/12408-3