

74LCX14

Low Voltage Hex Inverter with 5V Tolerant Schmitt Trigger Inputs

General Description

The LCX14 contains six inverter gates each with a Schmitt trigger input. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. In addition, they have a greater noise margin than conventional inverters.

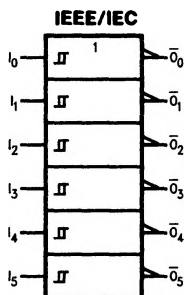
The LCX14 has hysteresis between the positive-going and negative-going input thresholds (typically 1.0V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

Features

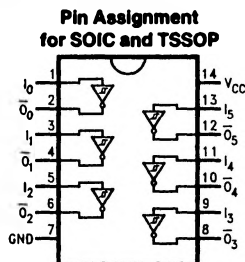
- 5V tolerant inputs
- 6.5 ns t_{PD} max, 10 μ A I_{CCQ} max
- Power-down high impedance inputs and outputs
- 2.0V–3.6V V_{CC} supply operation
- ± 24 mA output drive
- Implements patented Quiet Series™ noise/ EMI reduction circuitry
- Functionally compatible with 74 series 14
- Latch-up performance exceeds 500 mA
- ESD performance:
 - Human body model > 2000V
 - Machine model > 200V

Logic Symbol



TL/F/12412-1

Connection Diagram



TL/F/12412-2

Pin Names	Description
I_n	Inputs
\bar{O}_n	Outputs

Truth Table

Input	Output
A	\bar{O}
L	H
H	L

	SOIC JEDEC	SOIC EIAJ	TSSOP
Order Number	74LCX14M 74LCX14MX	74LCX14SJ 74LCX14SJX	74LCX14MTC 74LCX14MTCX
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	$V_I < GND$	mA
I_{OK}	DC Output Diode Current	-50 +50	$V_O < GND$ $V_O > V_{CC}$	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	2.0	3.6	V
	Data Retention	1.5	3.6	
V_I	Input Voltage	0	5.5	V
V_O	Output Voltage	0	V_{CC}	V
I_{OH}/I_{OL}	Output Current			
	$V_{CC} = 3.0V - 3.6V$		±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

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = -40^\circ C$ to $+85^\circ C$		Units
				Min	Max	
V_{t+}	Positive Input Threshold		3.0	1.2	2.2	V
V_{t-}	Negative Input Threshold		3.0	0.6	1.5	V
V_H	Hysteresis		3.0	0.4	1.2	
V_{OH}	HIGH Level Output Voltage	$I_{OH} = -100 \mu A$	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	$I_{OL} = 100 \mu A$	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	$0 \leq V_I \leq 5.5V$	2.7-3.6	±5.0		μA
I_{OFF}	Power-Off Leakage Current	V_I or $V_O = 5.5V$	0	100		μA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC}$ or 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	$T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$				Units
		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 2.7V$		
		Min	Max	Min	Max	
t_{PHL} t_{PLH}	Propagation Delay	1.5	6.5	1.5	7.5	ns
t_{OSLH} t_{OSHL}	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

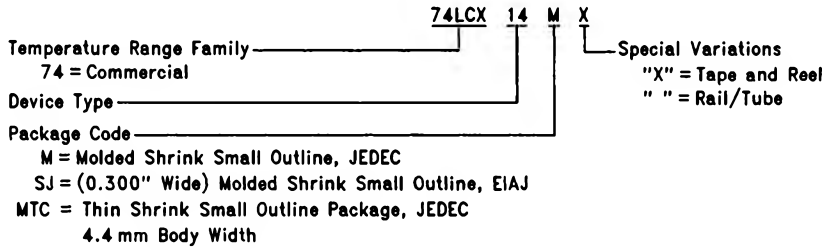
Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = 25^{\circ}\text{C}$	Units
				Typical	
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	$C_L = 50 \text{ pF}, V_{IH} = 3.3V, V_{IL} = 0V$	3.3	0.8	V
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	$C_L = 50 \text{ pF}, V_{IH} = 3.3V, V_{IL} = 0V$	3.3	0.8	V

Capacitance

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

74LCX14 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/12412-3