

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.

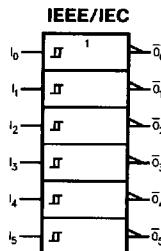
The LCX14 has hysteresis between the positive-going and negative-going input thresholds (typically 1.0V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

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

Features

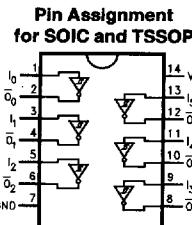
- 5V tolerant inputs
- 6.5 ns t_{PD} max, 10 μ A I_{CCQ} max
- Power-down high impedance inputs and outputs
- Supports live insertion/withdrawal
- 2.0V–3.6V V_{CC} supply operation
- ± 24 mA output drive
- Implements patented Quiet Series™ noise/ EMI reduction circuitry
- Functionally compatible with 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 Ō _n	Inputs Outputs

Truth Table

Input	Output
A	Ō
L	H
H	L

	SOIC JEDEC	SOIC EIAJ	TSSOP
Order Number	74LCX14M 74LCX14MX	74LCX14SJ 74LCX14SJX	74LCX14MTC 74LCX14MTCX
See NS Package Number	M14A	M14D	MTC14

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	Operating Data Retention	Min	Max	Units
V _{CC}	Supply Voltage	Operating Data Retention	2.0 1.5	3.6 3.6	V
V _I	Input Voltage		0	5.5	V
V _O	Output Voltage	HIGH or LOW State	0	V _{CC}	V
I _{OH} /I _{OL}	Output Current	V _{CC} = 3.0V - 3.6V V _{CC} = 2.7V		±24 ±12	mA
T _A	Free-Air Operating Temperature		-40	85	°C

DC Electrical Characteristics

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = -40°C to +85°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 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 _{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	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$				Units	
		$V_{CC} = 3.3\text{V} \pm 0.3\text{V}$		$V_{CC} = 2.7\text{V}$			
		Min	Max	Min	Max		
t_{PHL}	Propagation Delay	1.5	6.5	1.5	7.5	ns	
t_{PLH}		1.5	6.5	1.5	7.5	ns	
t_{OSLH}	Output to Output Skew (Note 3)		1.0			ns	
t_{OSHL}			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	$V_{CC} = \text{Open}, V_I = 0\text{V} \text{ or } V_{CC}$	7	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V} \text{ or } V_{CC}$	8	pF
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V} \text{ or } V_{CC}, f = 10\text{ MHz}$	25	pF