National Semiconductor

74LVX14
Low Voltage Hex Inverter with Schmitt Trigger Input

General Description

The LVX14 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 LVX14 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.

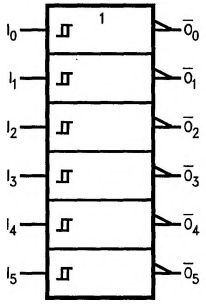
The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

Features

- Input voltage level translation from 5V to 3V
- Ideal for low power/low noise 3.3V applications
- Available in SOIC JEDEC, SOIC EIAJ and SSOP packages
- Guaranteed simultaneous switching noise level and dynamic threshold performance

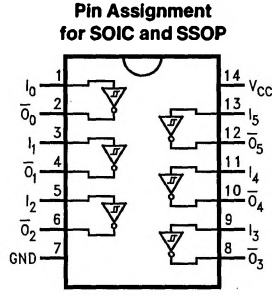
Ordering Code: See Section 11

Logic Symbol



TL/F/11603–2

Connection Diagram



TL/F/11603–1

Pin Names	Description
I_n	Inputs
$\overline{O}_n$	Outputs

Truth Table

Input	Output
A	$\overline{O}$
L	H
H	L

	SOIC JEDEC	SOIC EIAJ	SSOP TYPE I
Order Number	74LVX14M 74LVX14MX	74LVX14SJ 74LVX14SJX	74LVX14MSCX
See NS Package Number	M14A	M14D	MSC14

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Diode Current (I_{IK})	
V_I = −0.5V	−20 mA
DC Input Voltage (V_I)	−0.5V to 7V
DC Output Diode Current (I_{OK})	
V_O = −0.5V	−20 mA
V_O = V_{CC} + 0.5V	+20 mA
DC Output Voltage (V_O)	−0.5V to V_{CC} + 0.5V
DC Output Source or Sink Current (I_O)	±25 mA
DC V_{CC} or Ground Current (I_{CC} or I_{GND})	±50 mA
Storage Temperature (T_{STG})	−65°C to +150°C
Power Dissipation	180 mW

Note: *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.*

Recommended Operating Conditions

Supply Voltage (V_{CC})	2.0V to 3.6V
Input Voltage (V_I)	0V to 5.5V
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	−40°C to +85°C
Input Rise and Fall Time (Δ_t/Δ_v)	0 ns/V to 100 ns/V

DC Electrical Characteristics

Symbol	Parameter	V_{CC}	74LVX14 T_A = +25°C			74LVX14 T_A = −40°C to +85°C		Units	Conditions	
			Min	Typ	Max	Min	Max			
V_t+	Positive Threshold	3.0			2.2		2.2	V		
V_t-	Negative Threshold	3.0	0.9			0.9		V		
V_H	Hysteresis	3.0	0.3		1.2	0.3	1.2	V		
V_{OH}	High Level Output Voltage	2.0	1.9	2.0		1.9		V	V_{IN} = V_{IL} or V_{IH}	I_{OH} = −50 μA
		3.0	2.9	3.0		2.9				I_{OH} = −50 μA
		3.0	2.58			2.48				I_{OH} = −4 mA
V_{OL}	Low Level Output Voltage	2.0		0.0	0.1		0.1	V	V_{IN} = V_{IL} or V_{IH}	I_{OL} = 50 μA
		3.0		0.0	0.1		0.1			I_{OL} = 50 μA
		3.0			0.36		0.44			I_{OL} = 4 mA
I_{IN}	Input Leakage Current	3.6			±0.1		±1.0	μA	V_{IN} = 5.5V or GND	
I_{CC}	Quiescent Supply Current	3.6			2.0		20	μA	V_{IN} = V_{CC} or GND	

Noise Characteristics: See Section 2 for Test Methodology

Symbol	Parameter	V_{CC} (V)	74LVX14 T_A = 25°C		Units	C_L (pF)
			Typ	Limit		
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	3.3	0.3	0.5	V	50
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	3.3	−0.3	−0.5	V	50
V_{IHD}	Minimum High Level Dynamic Input Voltage	3.3		2.0	V	50
V_{ILD}	Maximum Low Level Dynamic Input Voltage	3.3		0.8	V	50

Note: Input $t_r = t_f = 3$ ns

AC Electrical Characteristics: See Section 2 for Test Methodology

Symbol	Parameter	V_{CC} (V)	74LVX14 T_A = +25°C			74LVX14 T_A = −40°C to +85°C		Units	C_L (pF)
			Min	Typ	Max	Min	Max		
t_{PLH}, t_{PHL}	Propagation Delay Time	2.7		8.7	16.3	1.0	19.5	ns	15
				11.2	19.8	1.0	23.0		50
		3.3 ±0.3		6.8	10.6	1.0	12.5		15
				9.3	14.1	1.0	16.0		50
t_{OSLH}, t_{OSHL}	Output to Output Skew (Note 1)	2.7			1.5		1.5	ns	50

Note 1: Parameter guaranteed by design. $t_{OSLH} = |t_{PLHm} - t_{PLHn}|$, $t_{OSHL} = |t_{PHLm} - t_{PHLn}|$

Capacitance

Symbol	Parameter	74LVX14 T_A = +25°C			74LVX14 T_A = −40°C to +85°C		Units
		Min	Typ	Max	Min	Max	
C_{IN}	Input Capacitance		4	10		10	pF
C_{PD}	Power Dissipation Capacitance (Note 1)		21				pF

Note 1: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation: $I_{CC(opr.)} = \frac{C_{PD} \times V_{CC} \times f_{IN} + I_{CC}}{6 \text{ (per Gate)}}$