Product Preview

Low Voltage CMOS Hex Schmitt Inverter

With 5 V-Tolerant Inputs

The MC74LCX14 is a high performance hex inverter with Schmitt–Trigger inputs operating from a 2.7 to 3.6 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers, while TTL compatible outputs offer improved switching noise performance. A $V_{\rm I}$ specification of 5.5 V allows MC74LCX14 inputs to be safely driven from 5 V devices.

Pin configuration and function are the same as the MC74LCX04, but the inputs have hysteresis and, with its Schmitt trigger function, the LCX14 can be used as a line receiver which will receive slow input signals.

- Designed for 2.3 V to 3.6 V V_{CC} Operation
- 5 V Tolerant Inputs Interface Capability With 5 F TTL Logic
- LVTTL Compatible
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current (10 μA) Substantially Reduces System Power Requirements
- Latch Performance Exceeds 500 mA
- Current Drive Capability is 24 mA at the Outputs
- Pin and Function Compatible with Other Standard Logic Families
- ESD Performance: HBM > 2000 V; Machine Model > 200 V
- Chip Complexity: 60 FETs or 15 Equivalent Gates



http://onsemi.com

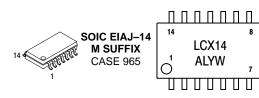
MARKING

SOIC-14
D SUFFIX
CASE 751A

TSSOP-14
DT SUFFIX
CASE 948G

DIAGRAMS

14
LCX14
AWLYWW
7
LULU LULU
14
LCX
14
LCX
14
AWLYWW
7



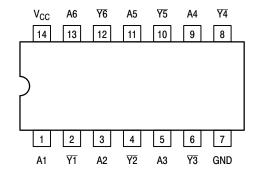
A =Assembly Location
WL or L = Wafer Lot
Y = Year
WW or W = Work Week

ORDERING INFORMATION

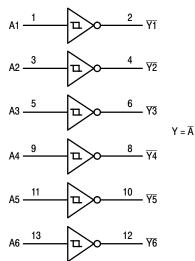
Device	Package	Shipping
MC74LCX14D	SOIC-14	55 Units/Rail
MC74LCX14DR2	SOIC-14	2500 Units/Reel
MC74LCX14DT	TSSOP-14	96 Untis/Rail
MC74LCX14DTR2	TSSOP-14	2500 Units/Reel
MC74LCX14M	SOIC EIAJ-14	50 Units/Rail
MC74LCX14MEL	SOIC EIAJ-14	2000 Units/Reel

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

Pinout: 14-Lead Packages (Top View)



LOGIC DIAGRAM



PIN NAMES

Pins	Function
An	Data Inputs
Yn	Outputs

FUNCTION TABLE

Inputs	Outputs		
A	Y		
L H	H		

ABSOLUTE MAXIMUM RATINGS*

Symbol	Parameter	Value	Condition	Unit
V _{CC}	DC Supply Voltage	-0.5 to +7.0		V
V _I	DC Input Voltage	$-0.5 \le V_1 \le +7.0$		V
Vo	DC Output Voltage	$-0.5 \le V_O \le V_{CC} + 0.5$	Note 1.	V
I _{IK}	DC Input Diode Current	-50	V _I < GND	mA
I _{OK}	DC Output Diode Current	-50	V _O < GND	mA
		+50	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 Range	-65 to +150		°C

^{*} Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute—maximum—rated conditions is not implied.

^{1.} Output in HIGH or LOW State. $\rm I_{\hbox{\scriptsize O}}$ absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Тур	Max	Unit
V _{CC}	Supply Voltage	Operating Data Retention Only	2.0 1.5	2.3 to 3.3	3.6 3.6	V
VI	Input Voltage		0		5.5	V
Vo	Output Voltage	(HIGH or LOW State)	0		V _{CC}	V
I _{OH}	HIGH Level Output Current	V _{CC} = 3.0V-3.6V V _{CC} = 2.7V-3.0V V _{CC} = 2.3V-2.7V			-24 -12 -8	mA
I _{OL}	LOW Level Output Current	V _{CC} = 3.0V-3.6V V _{CC} = 2.7V-3.0V V _{CC} = 2.3V-2.7V			+24 +12 +8	mA
T _A	Operating Free–Air Temperature		-40		+85	°C

DC ELECTRICAL CHARACTERISTICS

			T _A :	= - 40 to 85	5°C	
Symbol	Characteristic	Condition	Min	Тур	Max	Unit
V _{T+}	Positive Input Threshold Voltage (Figure 3.)	$2.3V \le V_{CC} < 2.7V$ $2.7V \le V_{CC} < 3.0V$ $3.0V \le V_{CC} < 3.6V$	0.9 TBD 1.2	TBD TBD TBD	1.7 TBD 2.2	V
V _{T-}	Negative Input Threshold Voltage (Figure 3.)	$2.3V \le V_{CC} < 2.7V$ $2.7V \le V_{CC} < 3.0V$ $3.0V \le V_{CC} < 3.6V$	0.4 TBD 0.6	TBD TBD TBD	1.1 TBD 1.5	V
V _H	Input Hysteresis Voltage (Figure 3.)	$2.3V \le V_{CC} < 2.7V$ $2.7V \le V_{CC} < 3.0V$ $3.0V \le V_{CC} < 3.6V$	0.3 TBD 0.4	TBD TBD TBD	1.0 TBD 1.2	V
V _{OH}	Minimum HIGH-Level Output Voltage	$\begin{array}{l} 2.3V \leq V_{CC} \leq 3.6V, I_{OH} = 100 \mu A \\ V_{CC} = 2.3V, I_{OH} = 8 \text{mA} \\ V_{CC} = 2.7V, I_{OH} = 12 \text{mA} \\ V_{CC} = 3.0V, I_{OH} = 18 \text{mA} \\ V_{CC} = 3.0V, I_{OH} = 24 \text{mA} \end{array}$	V _{CC} - 0.2 1.7 2.2 2.4 2.2			V
V _{OL}	Maximum LOW-Level Output Voltage	$\begin{array}{l} 2.3 \text{V} \leq \text{V}_{\text{CC}} \leq 3.6 \text{V}, \text{I}_{\text{OL}} = 100 \mu \text{A} \\ \text{V}_{\text{CC}} = 2.3 \text{V}, \text{I}_{\text{OL}} = 8 \text{mA} \\ \text{V}_{\text{CC}} = 2.7 \text{V}, \text{I}_{\text{OL}} = 12 \text{mA} \\ \text{V}_{\text{CC}} = 3.0 \text{V}, \text{I}_{\text{OL}} = 18 \text{mA} \\ \text{V}_{\text{CC}} = 3.0 \text{V}, \text{I}_{\text{OL}} = 24 \text{mA} \end{array}$			0.2 0.7 0.4 0.4 0.55	V
l _l	Maximum Input Leakage Current	$2.3V \le V_{CC} \le 3.6V$, $0V \le V_I \le 5.5V$			±5.0	μΑ
I _{CC}	Maximum Quiescent Supply Current	$\begin{array}{c} 2.3 \text{V} \leq \text{V}_{\text{CC}} \leq 3.6 \text{V}, \text{V}_{\text{I}}\text{=} \text{V}_{\text{CC}} \text{or GND} \\ 2.3 \text{V} \leq \text{V}_{\text{CC}} \leq 3.6 \text{V}, 3.6 \text{V} \leq \text{V}_{\text{I}} \leq 5.5 \text{V} \end{array}$			10 ±10.0	μА
Δl _{CC}	Increase in I _{CC} per Input	$2.3 \text{V} \leq \text{V}_{\text{CC}} \leq 3.6 \text{V},$ One Input at $\text{V}_{\text{IH}} = \text{V}_{\text{CC}} - 0.6$			500	μА

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns)

Symbol	Parameter	Limits						
		T _A = -40°C to +85°C						
		V_{CC} = 3.0V to 3.6V V_{CC} = 2.7V C_L = 50pF C_L = 50pF		V _{CC} = 2.3V to 2.7V		1		
				C _L = 50pF		C _L = 30pF		1
		Min	Max	Min	Max	Min	Max	1
t _{PLH} , t _{PHL}	Propagation Delay, A to Y	1.5 1.5	6.5 6.5	1.5 1.5	7.5 7.5	1.5 1.5	7.8 7.8	ns
t _{OSHL} , t _{OSLH}	Output-to-Output Skew		1.0 1.0					ns

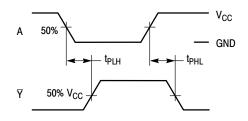
DYNAMIC SWITCHING CHARACTERISTICS

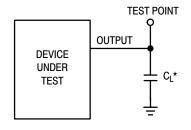
			T _A = +25°C			
Symbol	Characteristic	Condition	Min	Тур	Max	Unit
V _{OLP}	Dynamic LOW Peak Voltage (Note 1.)	$\begin{aligned} & V_{CC} = 3.3 \text{V, } C_L = 50 \text{pF, } V_{IH} = 3.3 \text{V, } V_{IL} = 0 \text{V} \\ & V_{CC} = 2.5 \text{V, } C_L = 30 \text{pF, } V_{IH} = 2.5 \text{V, } V_{IL} = 0 \text{V} \end{aligned}$		0.9 0.7		V
V _{OLV}	Dynamic LOW Valley Voltage (Note 1.)	$\begin{aligned} &V_{CC} = 3.3 \text{V, } C_L = 50 \text{pF, } V_{IH} = 3.3 \text{V, } V_{IL} = 0 \text{V} \\ &V_{CC} = 2.5 \text{V, } C_L = 30 \text{pF, } V_{IH} = 2.5 \text{V, } V_{IL} = 0 \text{V} \end{aligned}$		-0.8 -0.6		٧

^{1.} Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C _{IN}	Input Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	7	pF
C _{OUT}	Output Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	8	pF
C _{PD}	Power Dissipation Capacitance	10MHz, $V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	25	pF





*Includes all probe and jig capacitance

Figure 1. Switching Waveforms



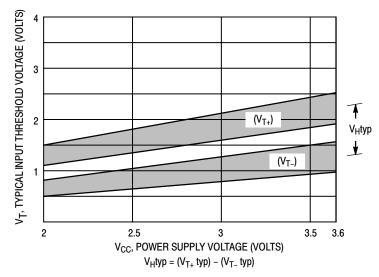
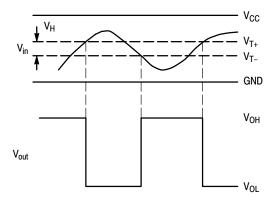


Figure 3. Typical Input Threshold, V_{T+} , V_{T-} versus Power Supply Voltage

(a) A Schmitt-Trigger Squares Up Inputs With Slow Rise and Fall Times





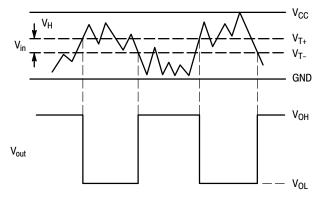


Figure 4. Typical Schmitt-Trigger Applications

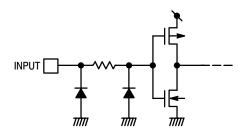
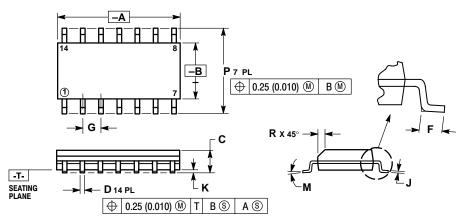


Figure 5. Input Equivalent Circuit

PACKAGE DIMENSIONS

SOIC-14 **D SUFFIX** CASE 751A-03 ISSUE F



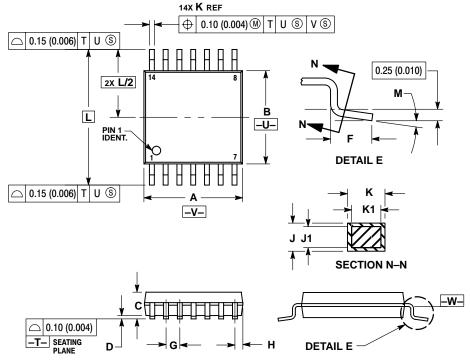
NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 MAXIMUM MOLD PROTRUSION 0.15 (0.006)
- PER SIDE.
- PEH SIDE.

 DIMENSION D DOES NOT INCLUDE DAMBAR
 PROTRUSION. ALLOWABLE DAMBAR
 PROTRUSION SHALL BE 0.127 (0.005) TOTAL
 IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIM	ETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
Α	8.55	8.75	0.337	0.344
В	3.80	4.00	0.150	0.157
С	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050	BSC
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
Р	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

TSSOP-14 **DT SUFFIX** CASE 948G-01 **ISSUE O**



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI DIMENSION Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- B. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
- U. 13 (U.UU6) PEH SIDE.
 4. DIMENSION B DOES NOT INCLUDE
 INTERLEAD FLASH OR PROTRUSION.
 INTERLEAD FLASH OR PROTRUSION SHALL NOT
 EXCEED
- EXCEED 0.25 (0.010) PER SIDE.

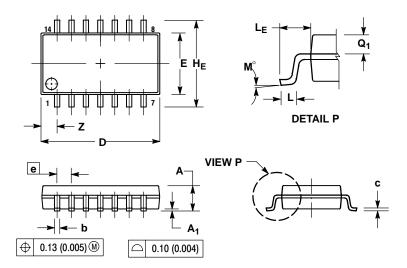
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.03) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL COLUMNOR. MATERIAL CONDITION. 5. TERMINAL NUMBERS ARE SHOWN FOR
- REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE

DETE	DETERMINED AT DATUM PLANE -W					
	MILLIN	IETERS	INCHES			
DIM	MIN	MAX	MIN	MAX		
Α	4.90	5.10	0.193	0.200		
В	4.30	4.50	0.169	0.177		
С		1.20		0.047		
D	0.05	0.15	0.002	0.006		
F	0.50	0.75	0.020	0.030		
G	0.65	0.65 BSC		BSC		
Н	0.50	0.60	0.020	0.024		
J	0.09	0.20	0.004	0.008		
J1	0.09	0.16	0.004	0.006		
K	0.19	0.30	0.007	0.012		
K1	0.19	0.25	0.007	0.010		
L	6.40 BSC		0.252 BSC			
M	0°	8°	0°	8°		

PACKAGE DIMENSIONS

SOIC EIAJ-14 M SUFFIX

CASE 965-01 ISSUE O



- NOTES:

 1. DIMENSIONING AND TOLERANCING PER ANSI

 - OTES:

 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

 2. CONTROLLING DIMENSION: MILLIMETER.

 3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.

 4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

 5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACES THE LEAD TO BE 0.46 (0.018). TO BE 0.46 (0.018).

	MILLIN	IETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
Α		2.05		0.081
A ₁	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
C	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
е	1.27 BSC		0.050	BSC
HE	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
LE	1.10	1.50	0.043	0.059
M	0 °	10°	0 °	10°
Q_1	0.70	0.90	0.028	0.035
Z		1.42		0.056

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

PUBLICATION ORDERING INFORMATION

NORTH AMERICA Literature Fulfillment:

Literature Distribution Center for ON Semiconductor P.O. Box 5163, Denver, Colorado 80217 USA

Phone: 303–675–2175 or 800–344–3860 Toll Free USA/Canada **Fax**: 303–675–2176 or 800–344–3867 Toll Free USA/Canada

Email: ONlit@hibbertco.com

Fax Response Line: 303-675-2167 or 800-344-3810 Toll Free USA/Canada

N. American Technical Support: 800-282-9855 Toll Free USA/Canada

EUROPE: LDC for ON Semiconductor - European Support

German Phone: (+1) 303-308-7140 (Mon-Fri 2:30pm to 7:00pm CET)

Email: ONlit-german@hibbertco.com

French Phone: (+1) 303–308–7141 (Mon–Fri 2:00pm to 7:00pm CET)

Email: ONlit-french@hibbertco.com

English Phone: (+1) 303–308–7142 (Mon–Fri 12:00pm to 5:00pm GMT)

Email: ONlit@hibbertco.com

EUROPEAN TOLL-FREE ACCESS*: 00-800-4422-3781

*Available from Germany, France, Italy, UK

CENTRAL/SOUTH AMERICA:

Spanish Phone: 303-308-7143 (Mon-Fri 8:00am to 5:00pm MST)

Email: ONlit-spanish@hibbertco.com

ASIA/PACIFIC: LDC for ON Semiconductor – Asia Support

Phone: 303-675-2121 (Tue-Fri 9:00am to 1:00pm, Hong Kong Time)

Toll Free from Hong Kong & Singapore: 001–800–4422–3781

Email: ONlit-asia@hibbertco.com

JAPAN: ON Semiconductor, Japan Customer Focus Center 4–32–1 Nishi–Gotanda, Shinagawa–ku, Tokyo, Japan 141–0031

Phone: 81–3–5740–2745 Email: r14525@onsemi.com

ON Semiconductor Website: http://onsemi.com

For additional information, please contact your local Sales Representative.