# Dual Low-Voltage CMOS 2-to-4 Decoder/Demultiplexer

## With 5 V-Tolerant Inputs

The MC74LCX139 is a high performance, 2–to–4 decoder/ demultiplexer operating from a 2.3 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<sub>I</sub> specification of 5.5 V allows MC74LCX139 inputs to be safely driven from 5 V devices. The MC74LCX139 is suitable for memory address decoding and other TTL level bus oriented applications.

The MC74LCX139 high-speed 2-to-4 decoder/demultiplexer accepts two binary weighted inputs (A0, A1) and, when enabled, provides four mutually exclusive active-LOW outputs. The LCX139 features an active low Enable input. All outputs will be HIGH unless En is LOW. The LCX139 can be used as an 8-output demultiplexer by using one of the active-LOW Enable inputs as the data input and the other Enable input as a strobe. The Enable inputs which are not used must be permanently tied to ground.

Current drive capability is 24 mA at the outputs.

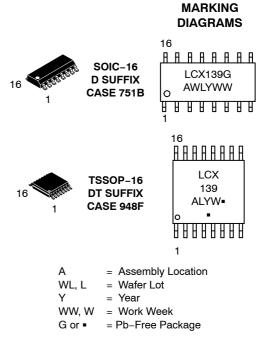
### Features

- Designed for 2.3 to 3.6 V V<sub>CC</sub> Operation
- 5 V Tolerant Inputs Interface Capability With 5 V 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
- Latchup Performance Exceeds 500 mA
- ESD Performance:
  - ♦ Human Body Model >2000 V
  - Machine Model >200 V
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant



### **ON Semiconductor®**

http://onsemi.com



(Note: Microdot may be in either location)

#### **ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

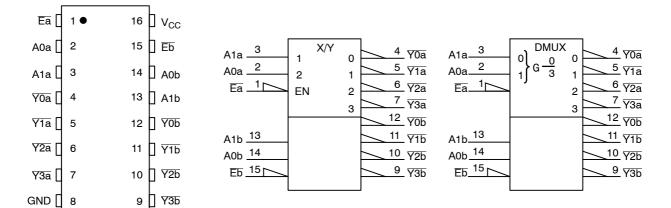


Figure 1. Pin Assignment

Figure 2. IEC Logic Diagram

### **PIN NAMES**

Pins	Function
A0n-A1n	Address Inputs
En	Enable Inputs
Y0n-Y3n	Outputs

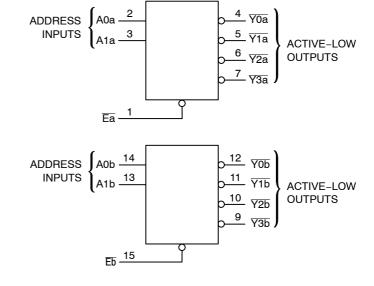
#### **TRUTH TABLE**

Inputs				Out	puts	
Ē	A1	A0	YO	<b>Y1</b>	<u>Y2</u>	<u>Y3</u>
н	х	Х	н	Н	н	Н
L	L	L	L	Н	Н	Н
L	L	Н	н	L	Н	Н
L	н	L	н	Н	L	Н
L	н	Н	н	Н	Н	L

H = High Voltage Level;

L = Low Voltage Level;

Z = High Impedance State





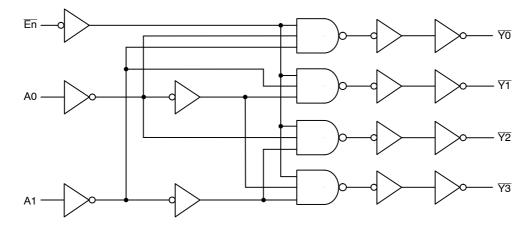


Figure 4. Expanded Logic Diagram (1/2 of Device)

### MAXIMUM RATINGS

Symbol	Parameter	Value	Condition	Units
V <sub>CC</sub>	DC Supply Voltage	-0.5 to +7.0		V
VI	DC Input Voltage	$-0.5 \le V_{\rm I} \le +7.0$		V
Vo	DC Output Voltage	$-0.5 \leq V_{\rm O} \leq V_{\rm CC} + 0.5$	Output in HIGH or LOW State. (Note 1)	V
l <sub>IK</sub>	DC Input Diode Current	-50	V <sub>I</sub> < GND	mA
I <sub>OK</sub>	DC Output Diode Current	-50	V <sub>O</sub> < GND	mA
		+50	V <sub>O</sub> > V <sub>CC</sub>	mA
Ι <sub>Ο</sub>	DC Output Source/Sink Current	±50		mA
Icc	DC Supply Current Per Supply Pin	±100		mA
I <sub>GND</sub>	DC Ground Current Per Ground Pin	±100		mA
T <sub>STG</sub>	Storage Temperature Range	–65 to +150		°C
MSL	Moisture Sensitivity		Level 1	

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.
1. I<sub>O</sub> absolute maximum rating must be observed.

### **RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Тур	Max	Units
V <sub>CC</sub>	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 <sub>CC</sub>	V
I <sub>OH</sub>				-24 -12 -8	mA
I <sub>OL</sub>	$      LOW Level Output Current \\ V_{CC} = 3.0 V - 3.6 V \\ V_{CC} = 2.7 V - 3.0 V \\ V_{CC} = 2.3 V - 2.7 V $			+24 +12 +8	mA
T <sub>A</sub>	Operating Free-Air Temperature	-40		+85	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate, VIN from 0.8 V to 2.0 V, V_{CC} = $$ 3.0 V	0		10	ns/V

### **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>
MC74LCX139DR2G	SOIC-16 (Pb-Free)	2500 Tape & Reel
MC74LCX139DTG	TSSOP-16 (Pb-Free)	96 Units / Rail
MC74LCX139DTR2G	TSSOP-16 (Pb-Free)	2500 Tape & Reel

+For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

### DC ELECTRICAL CHARACTERISTICS

			T <sub>A</sub> = −40°C	to +85°C	
Symbol	Characteristic	Condition	Min	Max	Units
VIH	HIGH Level Input Voltage (Note 2)	$2.3 \text{ V} \le \text{V}_{\text{CC}} \le 2.7 \text{ V}$	1.7		V
		$2.7 \text{ V} \le \text{V}_{\text{CC}} \le 3.6 \text{ V}$	2.0		
VIL	LOW Level Input Voltage (Note 2)	$2.3 \text{ V} \le \text{V}_{\text{CC}} \le 2.7 \text{ V}$		0.7	V
		$2.7 \text{ V} \le \text{V}_{\text{CC}} \le 3.6 \text{ V}$		0.8	
V <sub>OH</sub>	HIGH Level Output Voltage	$2.3 \text{ V} \le \text{V}_{\text{CC}} \le 3.6 \text{ V}; \text{ I}_{\text{OL}} = 100 \ \mu\text{A}$	V <sub>CC</sub> – 0.2		V
		V <sub>CC</sub> = 2.3 V; I <sub>OH</sub> = -8 mA	1.7		
		V <sub>CC</sub> = 2.7 V; I <sub>OH</sub> = -12 mA	2.2		
		V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = -18 mA	2.4		
		V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = -24 mA	2.2		
V <sub>OL</sub>	LOW Level Output Voltage	$2.3 \text{ V} \leq \text{V}_{\text{CC}} \leq 3.6 \text{ V}; \text{ I}_{\text{OL}} = 100 \ \mu\text{A}$		0.2	V
		V <sub>CC</sub> = 2.3 V; I <sub>OL</sub> = 8 mA		0.7	
		V <sub>CC</sub> = 2.7 V; I <sub>OL</sub> = 12 mA		0.4	
		V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 16 mA		0.4	
		V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 24 mA		0.55	
I <sub>OFF</sub>	Power Off Leakage Current	$V_{CC}$ = 0, $V_{IN}$ = 5.5 V or $V_{OUT}$ = 5.5 V		10	μA
I <sub>IN</sub>	Input Leakage Current	$V_{CC}$ = 3.6 V, $V_{IN}$ = 5.5 V or GND		±5	μΑ
I <sub>CC</sub>	Quiescent Supply Current	$V_{CC}$ = 3.6 V, $V_{IN}$ = 5.5 V or GND		10	μΑ
$\Delta I_{CC}$	Increase in I <sub>CC</sub> per Input	$2.3 \le V_{CC} \le 3.6 \text{ V}; \text{ V}_{IH} = V_{CC} - 0.6 \text{ V}$		500	μA

2. These values of V<sub>1</sub> are used to test DC electrical characteristics only.

### **AC CHARACTERISTICS** ( $t_R = t_F = 2.5 \text{ ns}$ ; $C_L = 50 \text{ pF}$ ; $R_L = 500 \Omega$ )

			Limits					
			T <sub>A</sub> = −40°C to +85°C					
		V <sub>CC</sub> = 3.0	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$ $V_{CC} = 2.7 \text{ V}$ $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$				V to 2.7 V	
		C <sub>L</sub> =	C <sub>L</sub> = 50 pF C <sub>L</sub> = 50 pF		C <sub>L</sub> = 30pF			
Symbol	Parameter	Min	Max	Min	Max	Min	Max	Units
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A to Y	0.8 0.8	6.2 6.2	1.0 1.0	7.3 7.3	0.8 0.8	9.3 9.3	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay E to Y	0.8 0.8	4.7 4.7	1.0 1.0	5.2 5.2	0.8 0.8	7.2 7.2	ns
t <sub>OSHL</sub> t <sub>OSLH</sub>	Output-to-Output Skew (Note 3)		1.0 1.0					ns

### **CAPACITIVE CHARACTERISTICS**

Symbol	Parameter	Parameter Condition		Units
C <sub>IN</sub>	Input Capacitance	$V_{CC}$ = 3.3 V, $V_{I}$ = 0 V or $V_{CC}$	7	pF
C <sub>OUT</sub>	Output Capacitance	$V_{CC}$ = 3.3 V, $V_{I}$ = 0 V or $V_{CC}$	8	pF
C <sub>PD</sub>	Power Dissipation Capacitance	10MHz, V_{CC} = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	25	pF

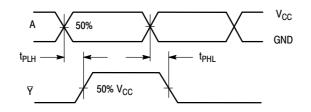


Figure 5. Waveform 1 Prop Delays

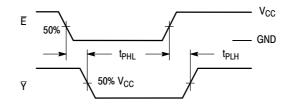
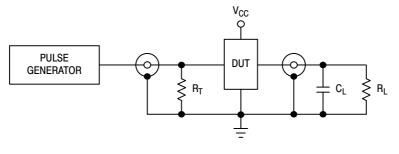


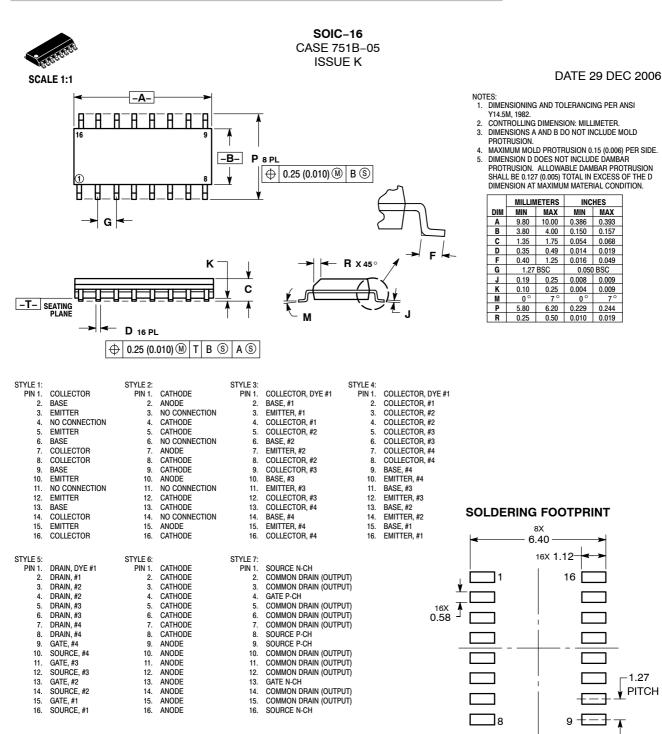
Figure 6. Waveform 2 Output Enable



 $\begin{array}{l} C_L = 50 \text{ pF or equivalent (Includes jig and probe capacitance)} \\ R_L = R_1 = 500 \ \Omega \text{ or equivalent} \\ R_T = Z_{OUT} \text{ of pulse generator (typically 50 } \Omega) \end{array}$ 

Figure 7. Test Circuit



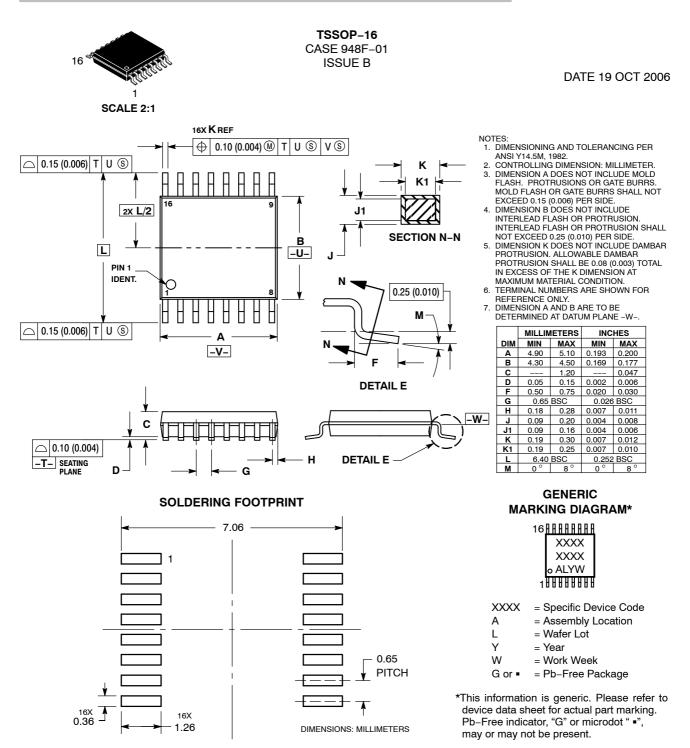


DIMENSIONS: MILLIMETERS

DOCUMENT NUMBER:	98ASB42566B	Electronic versions are uncontrolled except when accessed directly from the Document Repositor Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.					
DESCRIPTION:	SOIC-16						
ON Semiconductor and ()) are trac ON Semiconductor reserves the right	ON Semiconductor and 👊 are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding						

ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.





DOCUMENT NUMBER:	98ASH70247A	Electronic versions are uncontrolled except when accessed directly from the Document Reposito Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.					
DESCRIPTION:	TSSOP-16		PAGE 1 OF 1				
	ON Semiconductor and ()) are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding						

ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

© Semiconductor Components Industries, LLC, 2019

onsemi, OnSemi, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at <u>www.onsemi.com/site/pdf/Patent-Marking.pdf</u>. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi 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. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters, including "Typicals" must be provided in **onsemi** 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. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems. or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use onsemi products for any such unintended or unauthorized application, Buyer shall indemnify and hold onsemi 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 **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

#### PUBLICATION ORDERING INFORMATION

#### LITERATURE FULFILLMENT:

### Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

## **TECHNICAL SUPPORT**

North American Technical Support: Voice Mail: 1 800–282–9855 Toll Free USA/Canada Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support: Phone: 00421 33 790 2910 For additional information, please contact your local Sales Representative

# **X-ON Electronics**

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Encoders, Decoders, Multiplexers & Demultiplexers category:

Click to view products by ON Semiconductor manufacturer:

Other Similar products are found below :

MC74HC163ADTG 74HC253N NLV74VHC1G01DFT1G TC74AC138P(F) NLV14051BDR2G NLV74HC238ADTR2G COMX-CAR-210 5962-8607001EA NTE74LS247 5962-8756601EA SN74LS148N 8CA3052APGGI8 TC74VHC138F(EL,K,F PI3B3251LE PI3B3251QE NTE4028B NTE4514B NTE4515B NTE4543B NTE4547B NTE74LS249 NLV74HC4851AMNTWG MC74LVX257DG M74HCT4851ADWR2G AP4373AW5-7-01 NL7SZ19DBVT1G MC74LVX257DTR2G 74VHC4066AFT(BJ) 74VHCT138AFT(BJ) 74HC158D.652 74HC4052D(BJ) 74VHC138MTC COMX-CAR-P1 JM38510/65852BEA 74VHC138MTCX 74HC138D(BJ) NL7SZ19DFT2G 74AHCT138T16-13 74LCX138FT(AJ) 74LCX157FT(AJ) NL7SZ18MUR2G PCA9540BD,118 QS3VH16233PAG8 SNJ54HC251J SN54LS139AJ SN74CBTLV3257PWG4 SN74ALS156DR SN74AHCT139PWR 74HC251D.652 74HC257D.652