

# MC74LCX16245

## Low-Voltage CMOS 16-Bit Transceiver

### With 5 V-Tolerant Inputs and Outputs (3-State, Non-Inverting)

The MC74LCX16245 is a high performance, non-inverting 16-bit transceiver operating from a 2.3 to 3.6 V supply. The device is byte controlled. Each byte has separate Output Enable inputs which can be tied together for full 16-bit operation. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A  $V_I$  specification of 5.5 V allows MC74LCX16245 inputs to be safely driven from 5.0 V devices. The MC74LCX16245 is suitable for memory address driving and all TTL level bus oriented transceiver applications.

The 4.5 ns maximum propagation delays support high performance applications. Current drive capability is 24 mA at both A and B ports. The Transmit/Receive ( $T/\bar{R}n$ ) inputs determine the direction of data flow through the bidirectional transceiver. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B to A ports. The Output Enable inputs ( $\overline{OEn}$ ), when HIGH, disable both A and B ports by placing them in a HIGH Z condition.

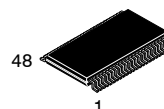
#### Features

- Designed for 2.3 to 3.6 V  $V_{CC}$  Operation
- 4.5 ns Maximum  $t_{pd}$
- 5.0 V Tolerant – Interface Capability With 5.0 V TTL Logic
- Supports Live Insertion and Withdrawal
- $I_{OFF}$  Specification Guarantees High Impedance When  $V_{CC} = 0$  V
- LVTTL Compatible
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current in All Three Logic States (20  $\mu$ A)  
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 and are RoHS Compliant



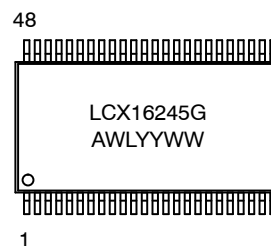
ON Semiconductor®

<http://onsemi.com>



TSSOP-48  
DT SUFFIX  
CASE 1201

#### MARKING DIAGRAM



A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

#### ORDERING INFORMATION

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

# MC74LCX16245

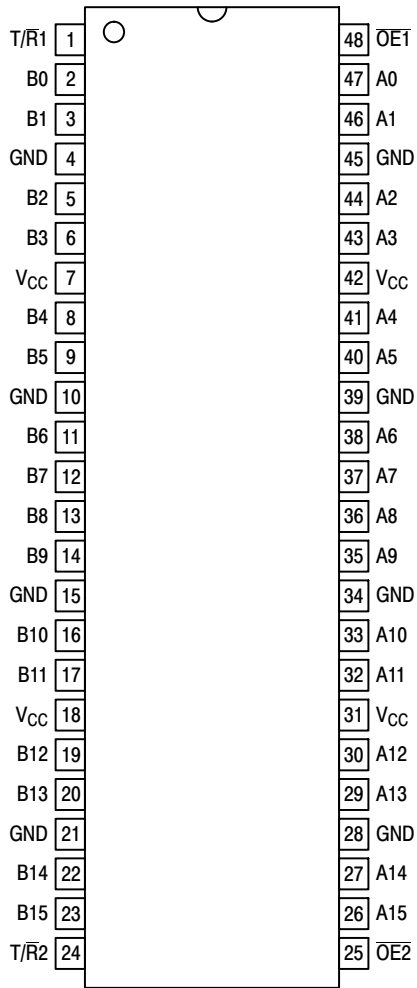


Figure 1. Pinout: 48-Lead (Top View)

Table 1. PIN NAMES

Pins	Function
$\overline{OE}n$	Output Enable Inputs
T/Rn	Transmit/Receive Inputs
A0 – A15	Side A Inputs or 3-State Outputs
B0 – B15	Side B Inputs or 3-State Outputs

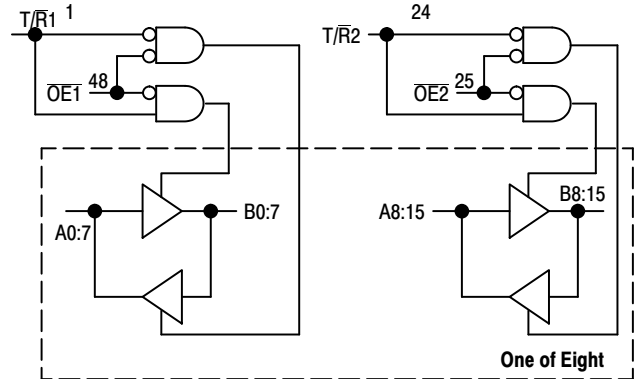


Figure 2. Logic Diagram

## TRUTH TABLE

Inputs		Outputs	Inputs		Outputs
OE1	T/R1		OE2	T/R2	
L	L	Bus B0:7 Data to Bus A0:7	L	L	Bus B8:15 Data to Bus A8:15
L	H	Bus A0:7 Data to Bus B0:7	L	H	Bus A8:15 Data to Bus B8:15
H	X	High Z State on A0:7, B0:7	H	X	High Z State on A8:15, B8:15

H = High Voltage Level

L = Low Voltage Level

Z = High Impedance State

X = High or Low Voltage Level and Transitions Are Acceptable; for I<sub>CC</sub> reasons, DO NOT FLOAT Inputs

# MC74LCX16245

## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MC74LCX16245DTG	TSSOP-48*	39 Units / Rail
M74LCX16245DTR2G	TSSOP-48*	2500 / Tape & Reel

<sup>†</sup>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.

\*This package is inherently Pb-Free.

## MAXIMUM RATINGS

Symbol	Parameter	Condition	Value	Units
V <sub>CC</sub>	DC Supply Voltage		-0.5 to +7.0	V
V <sub>I</sub>	DC Input Voltage		-0.5 ≤ V <sub>I</sub> ≤ +7.0	V
V <sub>O</sub>	DC Output Voltage	Output in 3-State	-0.5 ≤ V <sub>O</sub> ≤ +7.0	V
		Output in HIGH or LOW State. (Note 1)	-0.5 ≤ V <sub>O</sub> ≤ V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	V <sub>I</sub> < GND	-50	mA
I <sub>OK</sub>	DC Output Diode Current	V <sub>O</sub> < GND	-50	mA
		V <sub>O</sub> > V <sub>CC</sub>	+50	mA
I <sub>O</sub>	DC Output Source/Sink Current		±50	mA
I <sub>CC</sub>	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

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	Typ	Max	Units
V <sub>CC</sub>	Supply Voltage Operating Data Retention Only	2.0	2.5, 3.3	3.6	V
		1.5	2.5, 3.3	3.6	
V <sub>I</sub>	Input Voltage	0		5.5	V
V <sub>O</sub>	Output Voltage (HIGH or LOW State) (3-State)	0		V <sub>CC</sub>	V
		0		5.5	
I <sub>OH</sub>	HIGH Level Output Current V <sub>CC</sub> = 3.0 V - 3.6 V V <sub>CC</sub> = 2.7 V - 3.0 V V <sub>CC</sub> = 2.3 V - 2.7 V			-24	mA
				-12	
				-8	
I <sub>OL</sub>	LOW Level Output Current V <sub>CC</sub> = 3.0 V - 3.6 V V <sub>CC</sub> = 2.7 V - 3.0 V V <sub>CC</sub> = 2.3 V - 2.7 V			+24	mA
				+12	
				+8	
T <sub>A</sub>	Operating Free-Air Temperature	-40		+85	°C
Δt/ΔV	Input Transition Rise or Fall Rate, V <sub>IN</sub> from 0.8 V to 2.0 V, V <sub>CC</sub> = 3.0 V	0		10	ns/V

# MC74LCX16245

## DC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic	Condition	T <sub>A</sub> = -40°C to +85°C		Units
			Min	Max	
V <sub>IH</sub>	HIGH Level Input Voltage (Note 2)	2.3 V ≤ V <sub>CC</sub> ≤ 2.7 V	1.7		V
		2.7 V ≤ V <sub>CC</sub> ≤ 3.6 V	2.0		
V <sub>IL</sub>	LOW Level Input Voltage (Note 2)	2.3 V ≤ V <sub>CC</sub> ≤ 2.7 V		0.7	V
		2.7 V ≤ V <sub>CC</sub> ≤ 3.6 V		0.8	
V <sub>OH</sub>	HIGH Level Output Voltage	2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V; I <sub>OL</sub> = 100 μA	V <sub>CC</sub> - 0.2		V
		V <sub>CC</sub> = 2.3 V; I <sub>OH</sub> = -8 mA	1.8		
		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 V ≤ V <sub>CC</sub> ≤ 3.6 V; I <sub>OL</sub> = 100 μA		0.2	V
		V <sub>CC</sub> = 2.3 V; I <sub>OL</sub> = 8 mA		0.6	
		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>OZ</sub>	3-State Output Current	V <sub>CC</sub> = 3.6 V, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> = 0 to 5.5 V		±5	μA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>CC</sub> = 0, V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V		10	μA
I <sub>IN</sub>	Input Leakage Current	V <sub>CC</sub> = 3.6 V, V <sub>IN</sub> = 5.5 V or GND		±5	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>CC</sub> = 3.6 V, V <sub>IN</sub> = 5.5 V or GND		10	μA
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	2.3 ≤ V <sub>CC</sub> ≤ 3.6 V; V <sub>IH</sub> = V <sub>CC</sub> - 0.6 V		500	μA

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

## AC CHARACTERISTICS (t<sub>R</sub> = t<sub>F</sub> = 2.5 ns; R<sub>L</sub> = 500 Ω)

Symbol	Parameter	Waveform	T <sub>A</sub> = -40°C to +85°C						Units
			V <sub>CC</sub> = 3.3 V ± 0.3 V C <sub>L</sub> = 50 pF		V <sub>CC</sub> = 2.7 V C <sub>L</sub> = 50 pF		V <sub>CC</sub> = 2.5 V ± 0.2 V C <sub>L</sub> = 30 pF		
			Min	Max	Min	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Input to Output	1	1.5 1.5	4.5 4.5	1.5 1.5	5.2 5.2	1.5 1.5	5.4 5.4	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time to High and Low Level	2	1.5 1.5	6.5 6.5	1.5 1.5	7.2 7.2	1.5 1.5	8.5 8.5	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time From High and Low Level	2	1.5 1.5	6.4 6.4	1.5 1.5	6.9 6.9	1.5 1.5	7.7 7.7	ns
t <sub>OSSL</sub> t <sub>OSLH</sub>	Output-to-Output Skew (Note 3)			1.0 1.0					ns

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<sub>OSSL</sub>) or LOW-to-HIGH (t<sub>OSLH</sub>); parameter guaranteed by design.

# MC74LCX16245

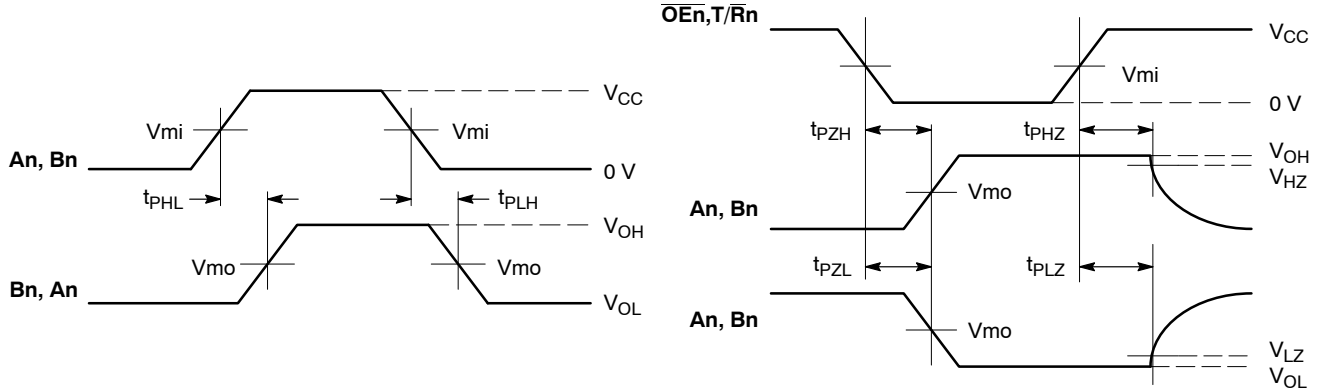
## DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Characteristic	Condition	T <sub>A</sub> = +25°C			Units
			Min	Typ	Max	
V <sub>OLP</sub>	Dynamic LOW Peak Voltage (Note 4)	V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V V <sub>CC</sub> = 2.5 V, C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V		0.8 0.6		V V
V <sub>OLV</sub>	Dynamic LOW Valley Voltage (Note 4)	V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V V <sub>CC</sub> = 2.5 V, C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V		-0.8 -0.6		V V

4. 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	Units
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	7	pF
C <sub>I/O</sub>	Input/Output Capacitance	V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	8	pF
C <sub>PD</sub>	Power Dissipation Capacitance	10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	20	pF



**WAVEFORM 1 – PROPAGATION DELAYS**  
t<sub>R</sub> = t<sub>F</sub> = 2.5 ns, 10% to 90%; f = 1 MHz; t<sub>W</sub> = 500 ns

**WAVEFORM 2 – OUTPUT ENABLE AND DISABLE TIMES**  
t<sub>R</sub> = t<sub>F</sub> = 2.5 ns, 10% to 90%; f = 1 MHz; t<sub>W</sub> = 500 ns

**Figure 3. AC Waveforms**

**Table 2. AC WAVEFORMS**

Symbol	V <sub>CC</sub>		
	3.3 V ± 0.3 V	2.7 V	2.5 V ± 0.2 V
V <sub>mi</sub>	1.5 V	1.5 V	V <sub>CC</sub> / 2
V <sub>mo</sub>	1.5 V	1.5 V	V <sub>CC</sub> / 2
V <sub>HZ</sub>	V <sub>OL</sub> + 0.3 V	V <sub>OL</sub> + 0.3 V	V <sub>OL</sub> + 0.15 V
V <sub>LZ</sub>	V <sub>OH</sub> - 0.3 V	V <sub>OH</sub> - 0.3 V	V <sub>OH</sub> - 0.15 V

# MC74LCX16245

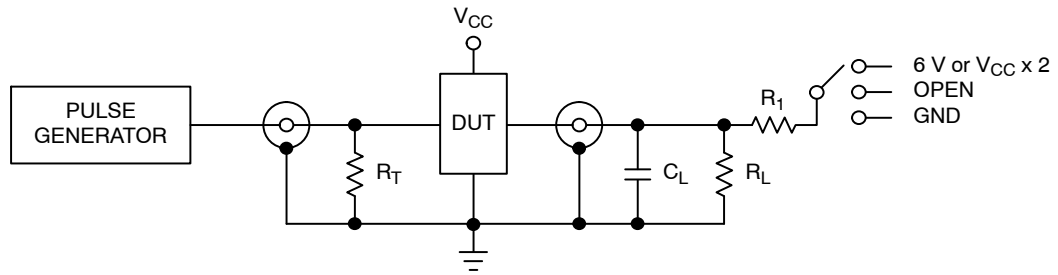


Figure 4. Test Circuit

Table 3. TEST CIRCUIT

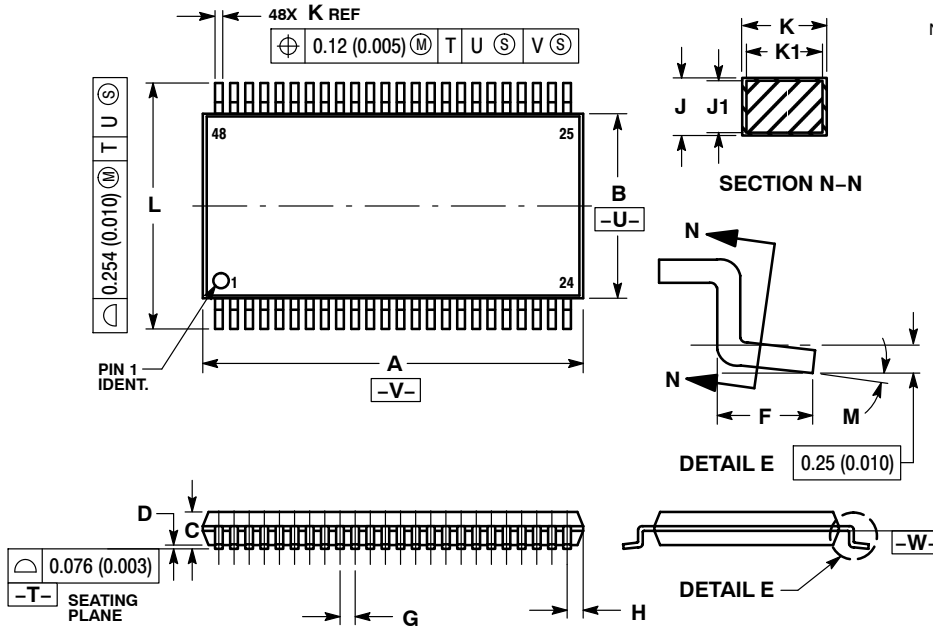
Test	Switch
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PZL}$ , $t_{PLZ}$	6 V at $V_{CC} = 3.3 \pm 0.3$ V 6 V at $V_{CC} = 2.5 \pm 0.2$ V
Open Collector/Drain $t_{PLH}$ and $t_{PHL}$	6 V
$t_{PZH}$ , $t_{PHZ}$	GND

$C_L = 50$  pF at  $V_{CC} = 3.3 \pm 0.3$  V or equivalent (includes jig and probe capacitance)  
 $C_L = 30$  pF at  $V_{CC} = 2.5 \pm 0.2$  V or equivalent (includes jig and probe capacitance)  
 $R_L = R_1 = 500 \Omega$  or equivalent  
 $R_T = Z_{OUT}$  of pulse generator (typically 50  $\Omega$ )

# MC74LCX16245

## PACKAGE DIMENSIONS

TSSOP-48  
DT SUFFIX  
CASE 1201-01  
ISSUE B

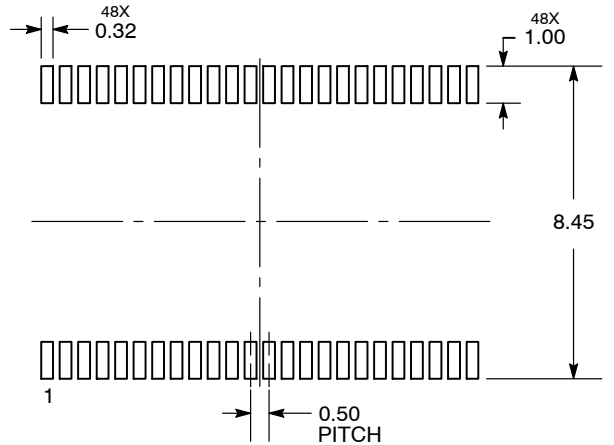


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
6. DIMENSIONS A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	12.40	12.60	0.488	0.496
B	6.00	6.20	0.236	0.244
C	---	1.10	---	0.043
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.50 BSC		0.0197 BSC	
H	0.37	---	0.015	---
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.17	0.27	0.007	0.011
K1	0.17	0.23	0.007	0.009
L	7.95	8.25	0.313	0.325
M	0°	8°	0°	8°

### RECOMMENDED SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

ON Semiconductor and are registered 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. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

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: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada  
Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910  
Japan Customer Focus Center  
Phone: 81-3-5773-3850

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative