Octal Bus Transceiver
With 5V–Tolerant Inputs

The MC74LVX245 is an advanced high speed CMOS octal bus transceiver.

It is intended for two–way asynchronous communication between data buses. The direction of data transmission is determined by the level of the T/$\overline{R}$ input. The output enable pin ($\overline{OE}$) can be used to disable the device, so that the buses are effectively isolated.

All inputs are equipped with protection circuits against static discharge.

- High Speed: t_{PD} = 4.7ns (Typ) at V_{CC} = 3.3V
- Low Power Dissipation: I_{CC} = 4μA (Max) at T_A = 25°C
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Low Noise: V_{OLP} = 0.8V (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300mA
- ESD Performance: HBM > 2000V; Machine Model > 200V

APPLICATION NOTES

- Do not force a signal on an I/O pin when it is an active output, damage may occur.
- All floating (high impedance) input or I/O pins must be fixed by means of pull up or pull down resistors or bus terminator ICs.
- A parasitic diode is formed between the bus and V_{CC} terminals. Therefore, the LVX245 cannot be used to interface 5V to 3V systems directly.

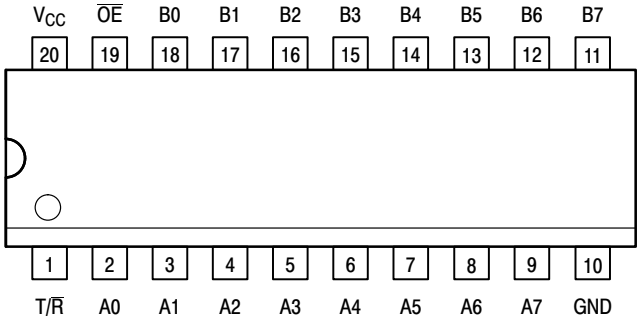
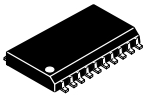


Figure 1. 20–Lead Pinout (Top View)

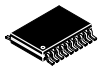
MC74LVX245

LVX

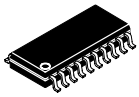
LOW–VOLTAGE CMOS



DW SUFFIX
20–LEAD SOIC PACKAGE
CASE 751D–04



DT SUFFIX
20–LEAD TSSOP PACKAGE
CASE 948E–02



M SUFFIX
20–LEAD SOIC EIAJ PACKAGE
CASE 967–01

PIN NAMES

Pins	Function
$\overline{OE}$	Output Enable Input
T/$\overline{R}$	Transmit/Receive Input
A0–A7	Side A 3–State Inputs or 3–State Outputs
B0–B7	Side B 3–State Inputs or 3–State Outputs

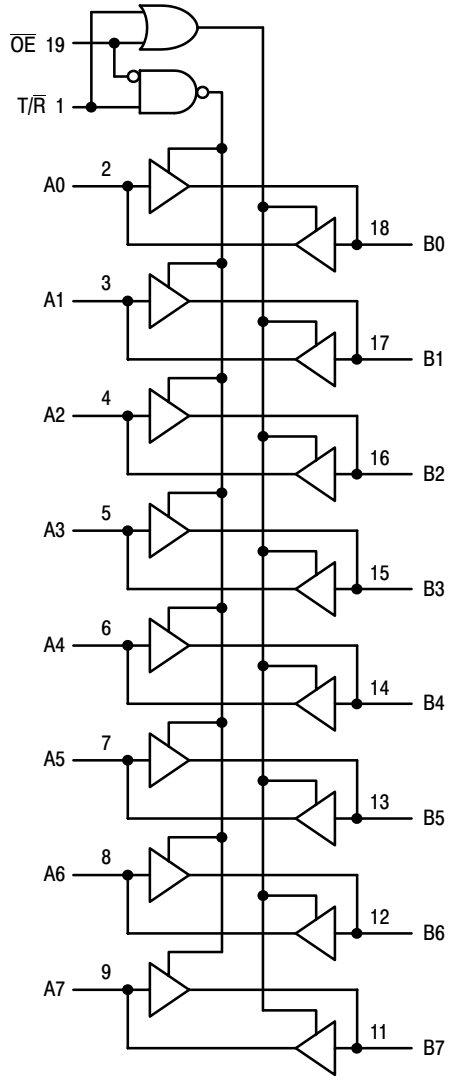


Figure 2. Logic Diagram

INPUTS		OPERATING MODE Non–Inverting
$\overline{OE}$	T/$\overline{R}$	
L	L	B Data to A Bus
L	H	A Data to B Bus
H	X	Z

H = High Voltage Level; L = Low Voltage Level; Z = High Impedance State; X = High or Low Voltage Level and Transitions are Acceptable; For I_{CC} reasons, Do Not Float Inputs

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage	–0.5 to +7.0	V
V_{in}	DC Input Voltage (T/$\overline{R}$, $\overline{OE}$)	–0.5 to +7.0	V
$V_{I/O}$	DC Output Voltage	–0.5 to V_{CC} +0.5	V
I_{IK}	Input Diode Current	–20	mA
I_{OK}	Output Diode Current	±20	mA
I_{out}	DC Output Current, per Pin	±25	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	±75	mA
P_D	Power Dissipation	180	mW
T_{stg}	Storage Temperature	–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.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage	2.0	3.6	V
V_{in}	DC Input Voltage (T/$\overline{R}$, $\overline{OE}$)	0	5.5	V
$V_{I/O}$	DC Output Voltage	0	V_{CC}	V
T_A	Operating Temperature, All Package Types	–40	+85	°C
$\Delta t/\Delta V$	Input Rise and Fall Time	0	100	ns/V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V_{CC} V	T_A = 25°C			T_A = – 40 to 85°C		Unit
				Min	Typ	Max	Min	Max	
V_{IH}	High–Level Input Voltage		2.0 3.0 3.6	1.5 2.0 2.4			1.5 2.0 2.4		V
V_{IL}	Low–Level Input Voltage		2.0 3.0 3.6			0.5 0.8 0.8		0.5 0.8 0.8	V
V_{OH}	High–Level Output Voltage (V_{in} = V_{IH} or V_{IL})	I_{OH} = –50μA I_{OH} = –50μA I_{OH} = –4mA	2.0 3.0 3.0	1.9 2.9 2.58	2.0 3.0		1.9 2.9 2.48		V
V_{OL}	Low–Level Output Voltage (V_{in} = V_{IH} or V_{IL})	I_{OL} = 50μA I_{OL} = 50μA I_{OL} = 4mA	2.0 3.0 3.0		0.0 0.0	0.1 0.1 0.36		0.1 0.1 0.44	V
I_{in}	Input Leakage Current	V_{in} = 5.5V or GND (T/$\overline{R}$, $\overline{OE}$)	3.6			±0.1		±1.0	μA
I_{OZ}	Maximum Three–State Leakage Current	V_{in} = V_{IL} or V_{IH} V_{out} = V_{CC} or GND	3.6			±0.25		±2.5	μA
I_{CC}	Quiescent Supply Current	V_{in} = V_{CC} or GND	3.6			4.0		40.0	μA

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

Symbol	Parameter	Test Conditions	$T_A = 25°C$ Min	$T_A = 25°C$ Typ	$T_A = 25°C$ Max	$T_A = -40$ to $85°C$ Min	$T_A = -40$ to $85°C$ Max	Unit
t_{PLH}, t_{PHL}	Propagation Delay Input to Output	V_{CC} = 2.7V C_L = 15pF		6.1	10.7	1.0	13.5	ns
		V_{CC} = 2.7V C_L = 50pF		8.6	14.2	1.0	17.0	
		V_{CC} = 3.3 ± 0.3V C_L = 15pF		4.7	6.6	1.0	8.0	
		V_{CC} = 3.3 ± 0.3V C_L = 50pF		7.2	10.1	1.0	11.5	
t_{PZL}, t_{PZH}	Output Enable Time to High and Low Level	V_{CC} = 2.7V C_L = 15pF, R_L = 1kΩ		9.0	16.9	1.0	20.5	ns
		V_{CC} = 2.7V C_L = 50pF, R_L = 1kΩ		11.5	20.4	1.0	24.0	
		V_{CC} = 3.3 ± 0.3V C_L = 15pF, R_L = 1kΩ		7.1	11.0	1.0	13.0	
		V_{CC} = 3.3 ± 0.3V C_L = 50pF, R_L = 1kΩ		9.6	14.5	1.0	16.5	
t_{PLZ}, t_{PHZ}	Output Disable Time From High and Low Level	V_{CC} = 2.7V C_L = 50pF, R_L = 1kΩ		11.5	18.0	1.0	21.0	ns
		V_{CC} = 3.3 ± 0.3V C_L = 50pF, R_L = 1kΩ		9.6	12.8	1.0	14.5	
t_{OSHL} t_{OSLH}	Output–to–Output Skew (Note 1.)	V_{CC} = 2.7V C_L = 50pF			1.5		1.5	ns
		V_{CC} = 3.3 ±0.3V C_L = 50pF			1.5		1.5	

1. 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}); parameter guaranteed by design.

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	$T_A = 25°C$ Min	$T_A = 25°C$ Typ	$T_A = 25°C$ Max	$T_A = -40$ to $85°C$ Min	$T_A = -40$ to $85°C$ Max	Unit
C_{in}	Input Capacitance (T/$\overline{R}$, $\overline{OE}$)		4	10		10	pF
$C_{I/O}$	Maximum Three–State I/O Capacitance		8				pF
C_{PD}	Power Dissipation Capacitance (Note 2.)		21				pF

2. 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: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}/8$ (per bit). C_{PD} is used to determine the no–load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

NOISE CHARACTERISTICS (Input $t_r = t_f = 3.0$ns, $C_L = 50$pF, $V_{CC} = 3.3$V, Measured in SOIC Package)

Symbol	Characteristic	$T_A = 25°C$ Typ	$T_A = 25°C$ Max	Unit
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	0.5	0.8	V
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	–0.5	–0.8	V
V_{IHD}	Minimum High Level Dynamic Input Voltage		2.0	V
V_{ILD}	Maximum Low Level Dynamic Input Voltage		0.8	V

SWITCHING WAVEFORMS

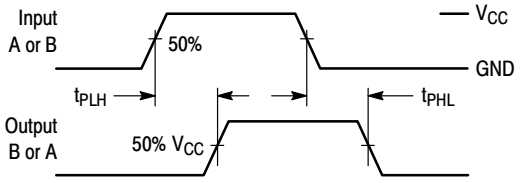


Figure 3.

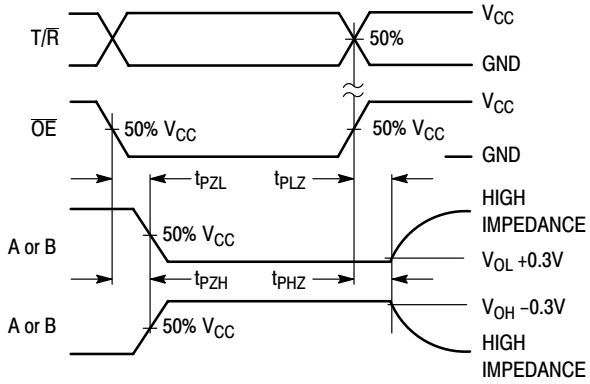
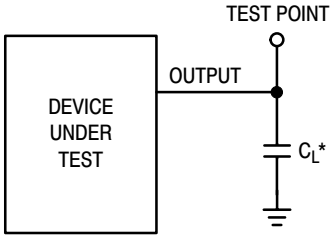


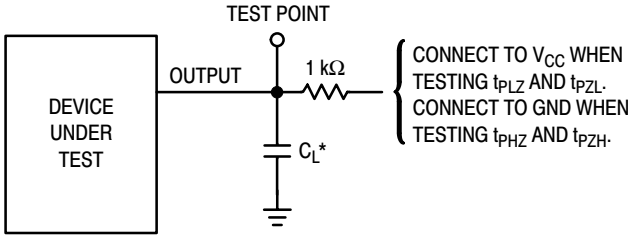
Figure 4.

TEST CIRCUITS



*Includes all probe and jig capacitance

Figure 5. Propagation Delay Test Circuit

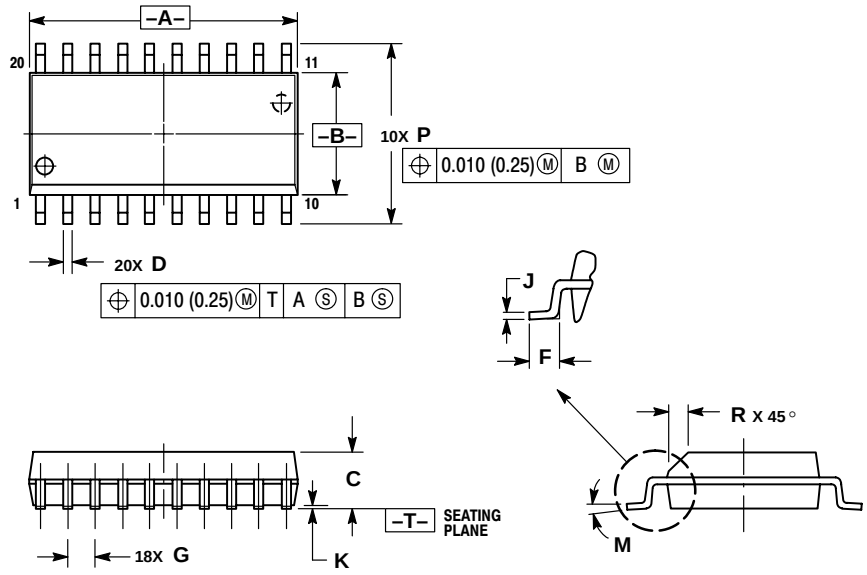


*Includes all probe and jig capacitance

Figure 6. Three–State Test Circuit

OUTLINE DIMENSIONS

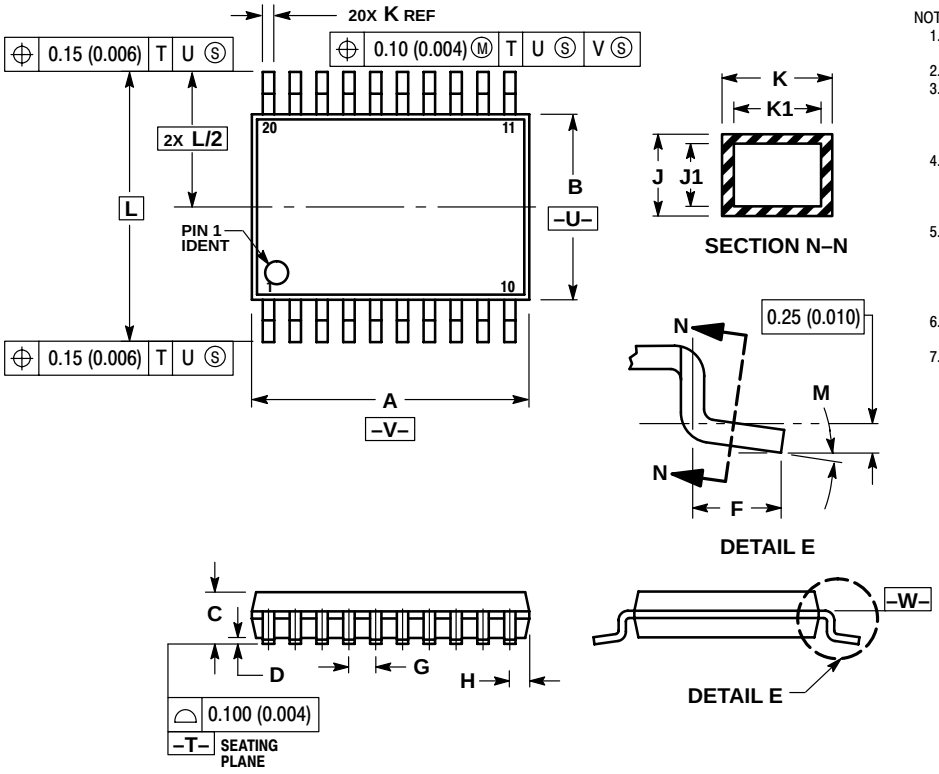
DW SUFFIX
PLASTIC SOIC PACKAGE
CASE 751D–04
ISSUE E



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.150 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	12.65	12.95	0.499	0.510
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.50	0.90	0.020	0.035
G	1.27 BSC		0.050 BSC	
J	0.25	0.32	0.010	0.012
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

DT SUFFIX
PLASTIC TSSOP PACKAGE
CASE 948E–02
ISSUE A

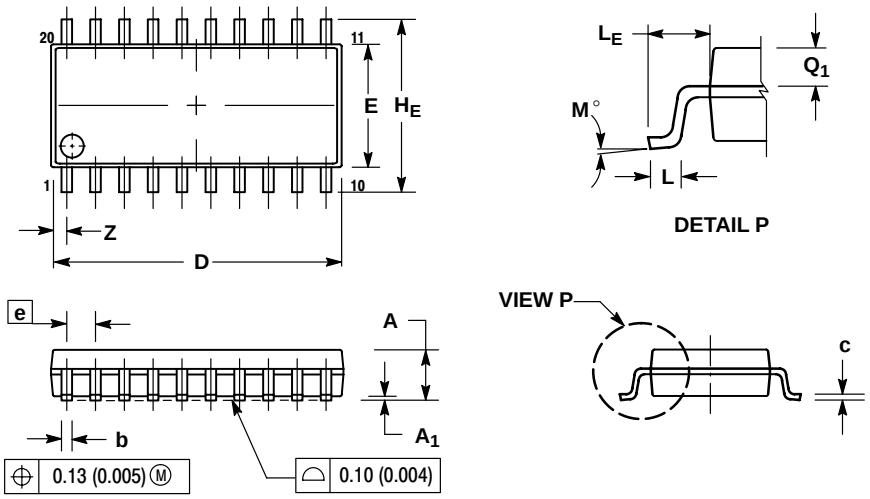


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. 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.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE –W–.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
B	4.30	4.50	0.169	0.177
C	---	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 BSC		0.026 BSC	
H	0.27	0.37	0.011	0.015
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°

OUTLINE DIMENSIONS

M SUFFIX
PLASTIC SOIC EIAJ PACKAGE
CASE 967–01
ISSUE O



NOTES:
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. ALLOWABLE 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 SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	---	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	12.35	12.80	0.486	0.504
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
H_E	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L_E	1.10	1.50	0.043	0.059
M	0 °	10 °	0 °	10 °
Q_1	0.70	0.90	0.028	0.035
Z	---	0.81	---	0.032

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, Ireland

CENTRAL/SOUTH AMERICA:
Spanish Phone: 303–308–7143 (Mon–Fri 8:00am to 5:00pm MST)
Email: ONlit–spanish@hibbertco.com
Toll–Free from Mexico: Dial 01–800–288–2872 for Access –
then Dial 866–297–9322

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: 81–3–5740–2700
Email: r14525@onsemi.com

ON Semiconductor Website: http://onsemi.com

For additional information, please contact your local
Sales Representative.