

# MC4558V

## Dual Wide Bandwidth Operational Amplifiers

The MC4558V combine all the outstanding features of the MC1458 and, in addition offer three times the unity gain bandwidth of the industry standard.

- 2.0 MHz Unity Gain Bandwidth Guaranteed
- Internally Compensated
- Short Circuit Protection
- Gain and Phase Match between Amplifiers
- Low Power Consumption

### MAXIMUM RATINGS ( $T_A = +25^\circ\text{C}$ , unless otherwise noted.)

Rating	Symbol	Value	Unit
Power Supply Voltage	$V_{CC}$ $V_{EE}$	+18 -18	Vdc
Input Differential Voltage	$V_{ID}$	$\pm 30$	V
Input Common Mode Voltage (Note 1.)	$V_{ICM}$	$\pm 15$	V
Output Short Circuit Duration (Note 2.)	$t_{SC}$	Continuous	
Ambient Temperature Range	$T_A$	-40 to +85	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 to +125	$^\circ\text{C}$
Junction Temperature	$T_J$	150	$^\circ\text{C}$

1. For supply voltages less than  $\pm 15$  V, the absolute maximum input voltage is equal to the supply voltage.
2. Short circuit may be to ground or either supply.

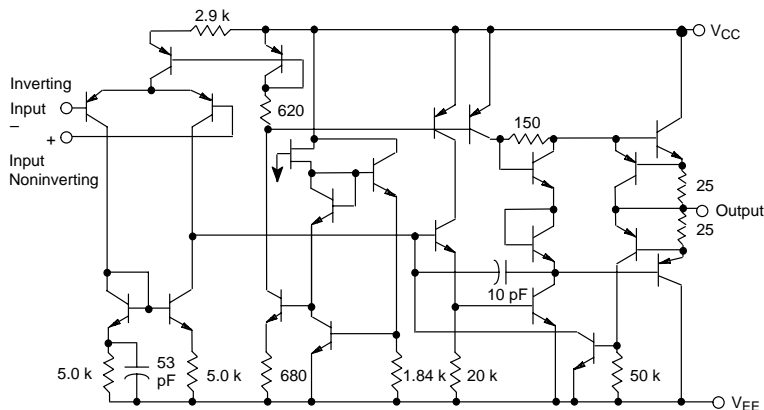


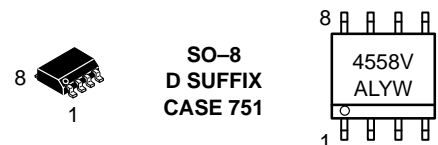
Figure 1. Representative Schematic Diagram  
(1/2 of Circuit Shown)



ON Semiconductor™

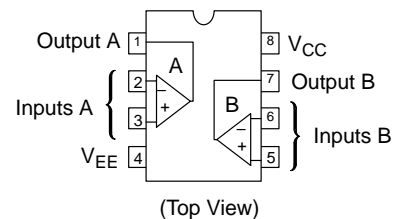
<http://onsemi.com>

### MARKING DIAGRAM



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

### PIN CONNECTIONS



### ORDERING INFORMATION

Device	Package	Shipping
MC4558VD	SO-8	98 Units/Rail
MC4558VDR2	SO-8	2500 Tape & Reel

# MC4558V

## FREQUENCY CHARACTERISTICS ( $V_{CC} = +15\text{ V}$ , $V_{EE} = -15\text{ V}$ , $T_A = 25^\circ\text{C}$ )

Characteristic	Symbol	Min	Typ	Max	Unit
Unity Gain Bandwidth	BW	2.0	2.8	–	MHz

## ELECTRICAL CHARACTERISTICS ( $V_{CC} = 15\text{ V}$ , $V_{EE} = -15\text{ V}$ , $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

Input Offset Voltage ( $R_S \leq 10\text{ k}\Omega$ )	$V_{IO}$	–	2.0	6.0	mV
Input Offset Current	$I_{IO}$	–	20	200	nA
Input Bias Current (Note 1.)	$I_{IB}$	–	80	500	nA
Input Resistance	$r_i$	0.3	2.0	–	$M\Omega$
Input Capacitance	$C_i$	–	1.4	–	pF
Common Mode Input Voltage Range	$V_{ICR}$	$\pm 12$	$\pm 13$	–	V
Large Signal Voltage Gain ( $V_O = \pm 10\text{ V}$ , $R_L = 2.0\text{ k}\Omega$ )	$A_{VOL}$	20	200	–	V/mV
Output Resistance	$r_o$	–	75	–	$\Omega$
Common Mode Rejection ( $R_S \leq 10\text{ k}\Omega$ )	CMR	70	90	–	dB
Supply Voltage Rejection Ratio ( $R_S \leq 10\text{ k}\Omega$ )	PSRR	–	30	150	$\mu\text{V/V}$
Output Voltage Swing ( $R_L \geq 10\text{ k}\Omega$ ) ( $R_L \geq 2.0\text{ k}\Omega$ )	$V_O$	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	– –	V
Output Short Circuit Current	$I_{SC}$	10	20	40	mA
Supply Currents (Both Amplifiers)	$I_D$	–	2.3	5.6	mA
Power Consumption (Both Amplifiers)	$P_C$	–	70	170	mW
Transient Response (Unity Gain) ( $V_I = 20\text{ mV}$ , $R_L \geq 2.0\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ ) Rise Time ( $V_I = 20\text{ mV}$ , $R_L \geq 2.0\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ ) Overshoot ( $V_I = 10\text{ V}$ , $R_L \geq 2.0\text{ k}\Omega$ , $C_L \leq 100\text{ pF}$ ) Slew Rate	$t_{TLH}$ $os$ SR	– – 1.0	0.3 15 1.6	– – –	$\mu\text{s}$ % V/ $\mu\text{s}$

## ELECTRICAL CHARACTERISTICS ( $V_{CC} = +15\text{ V}$ , $V_{EE} = -15\text{ V}$ , $T_A = T_{high}$ to $T_{low}$ , unless otherwise noted. See Note 2.)

Input Offset Voltage ( $R_S \leq 10\text{ k}\Omega$ )	$V_{IO}$	–	–	7.5	mV
Input Offset Current ( $T_A = T_{high}$ ) ( $T_A = T_{low}$ ) ( $T_A = -40^\circ$ to $+85^\circ\text{C}$ )	$I_{IO}$	– – –	– – –	– – 300	nA
Input Bias Current ( $T_A = T_{high}$ ) ( $T_A = T_{low}$ ) ( $T_A = -40^\circ$ to $+85^\circ\text{C}$ )	$I_{IB}$	– – –	– – –	– – 800	nA
Common Mode Input Voltage Range	$V_{ICR}$	–	–	–	V
Large Signal Voltage Gain ( $V_O = \pm 10\text{ V}$ , $R_L = 2.0\text{ k}\Omega$ )	$A_{VOL}$	15	–	–	V/mV
Common Mode Rejection ( $R_S \leq 10\text{ k}\Omega$ )	CMR	–	–	–	dB
Supply Voltage Rejection Ratio ( $R_S \leq 10\text{ k}\Omega$ )	PSRR	–	–	–	$\mu\text{V/V}$
Output Voltage Swing ( $R_L \geq 10\text{ k}\Omega$ ) ( $R_L \geq 2.0\text{ k}\Omega$ )	$V_O$	$\pm 12$ $\pm 10$	$\pm 14$ $\pm 13$	– –	V
Supply Currents (Both Amplifiers) ( $T_A = T_{high}$ ) ( $T_A = T_{low}$ )	$I_D$	– –	– –	5.0 6.7	mA
Power Consumption (Both Amplifiers) ( $T_A = T_{high}$ ) ( $T_A = T_{low}$ )	$P_C$	– –	– –	150 200	mW

- $I_{IB}$  is out of the amplifier due to PNP input transistors.
- $T_{high} = +85^\circ\text{C}$ ,  $T_{low} = -40^\circ\text{C}$ .

# MC4558V

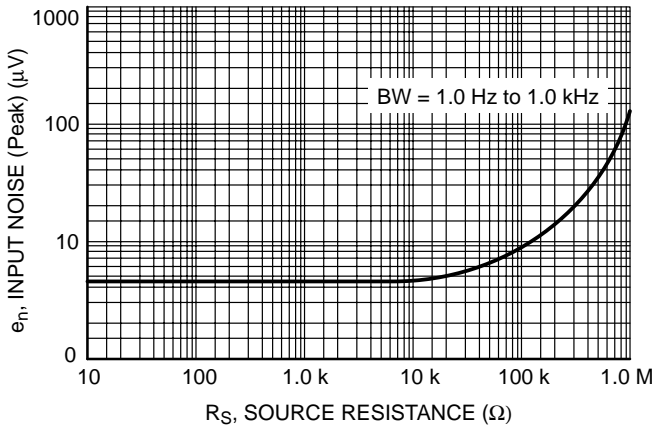


Figure 2. Burst Noise vs. Source Resistance

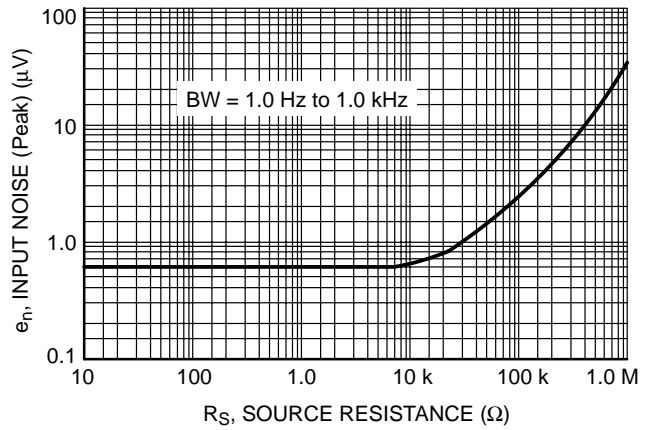


Figure 3. RMS Noise vs. Source Resistance

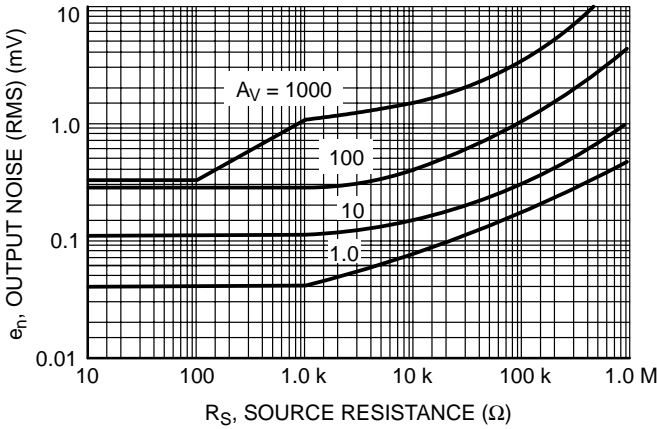


Figure 4. Output Noise vs. Source Resistance

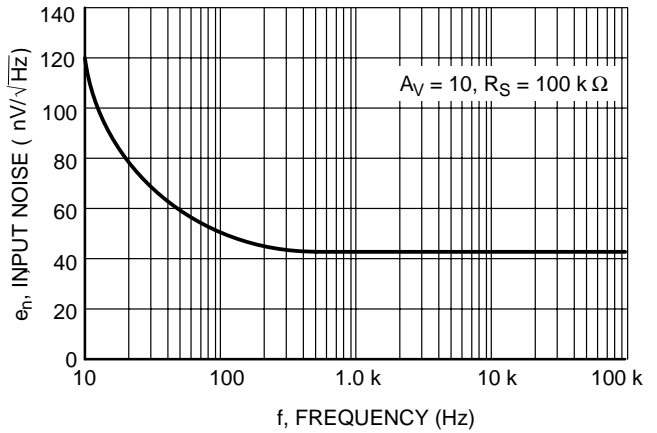
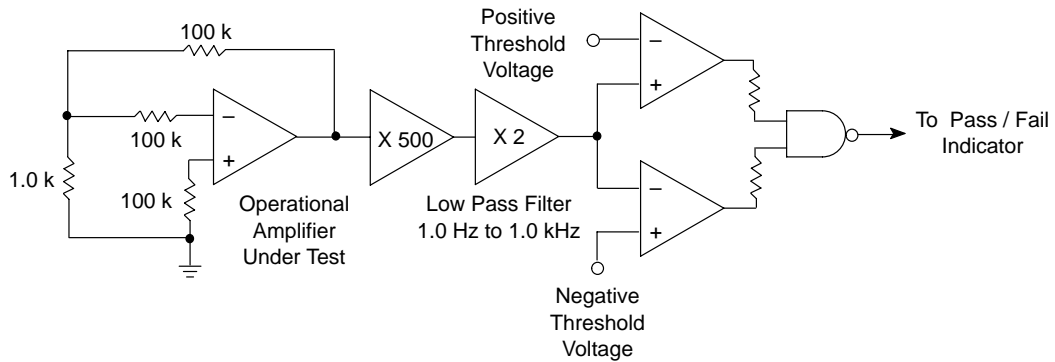


Figure 5. Spectral Noise Density



Unlike conventional peak reading or RMS meters, this system was especially designed to provide the quick response time essential to burst (popcorn) noise testing.

The test time employed is 10 sec and the 20  $\mu\text{V}$  peak limit refers to the operational amplifier input thus eliminating errors in the closed loop gain factor of the operational amplifier.

Figure 6. Burst Noise Test Circuit

# MC4558V

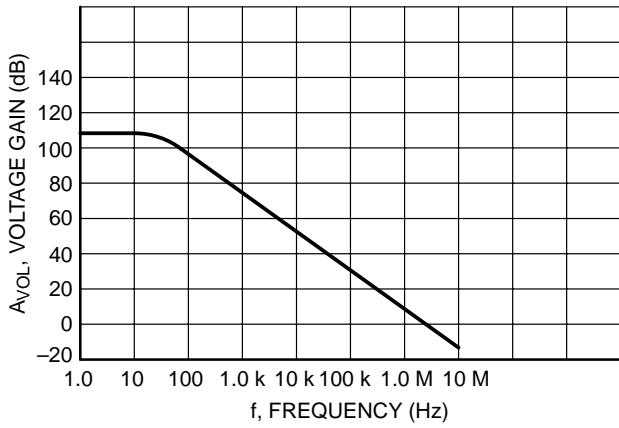


Figure 7. Open Loop Frequency Response

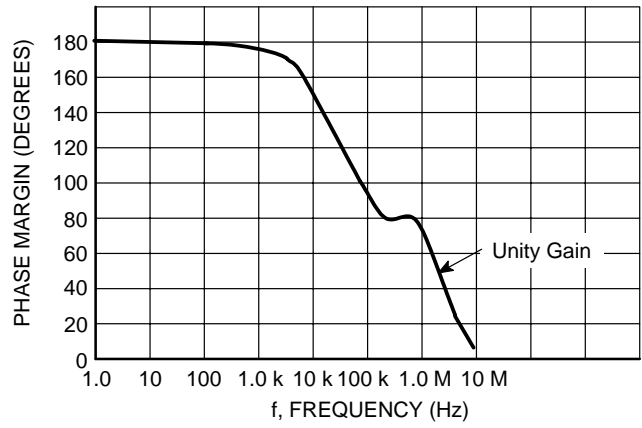


Figure 8. Phase Margin versus Frequency

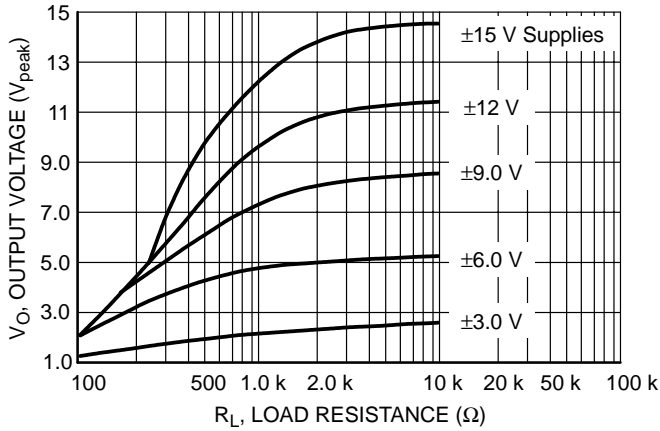


Figure 9. Positive Output Voltage Swing versus Load Resistance

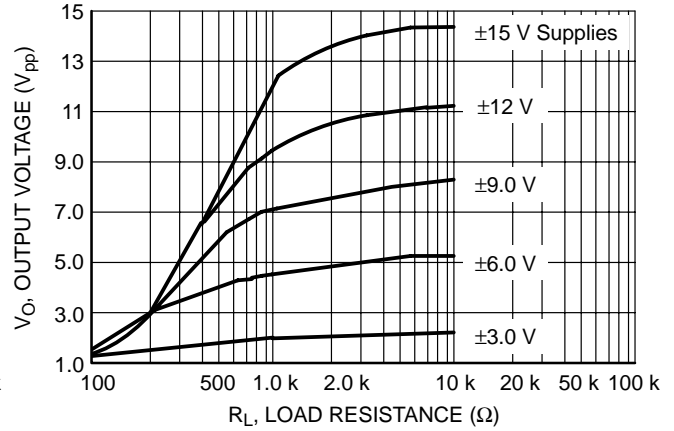


Figure 10. Negative Output Voltage Swing versus Load Resistance

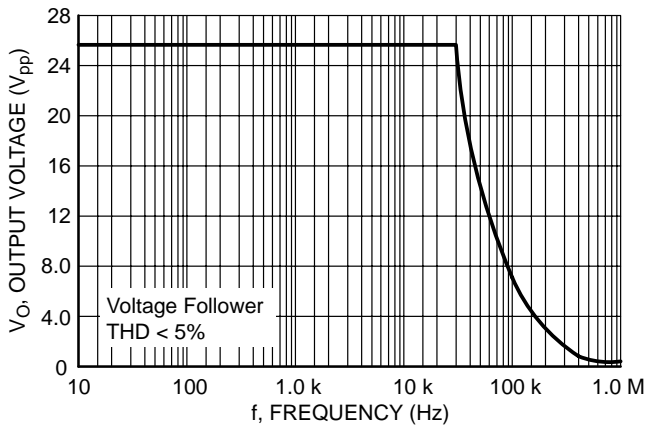


Figure 11. Power Bandwidth (Large Signal Swing versus Frequency)

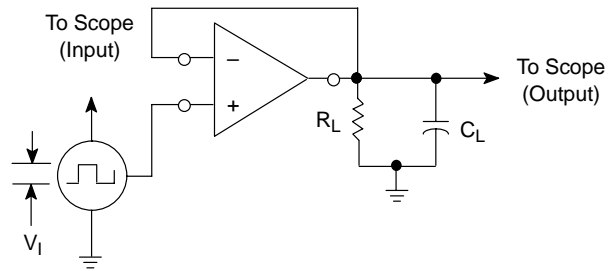
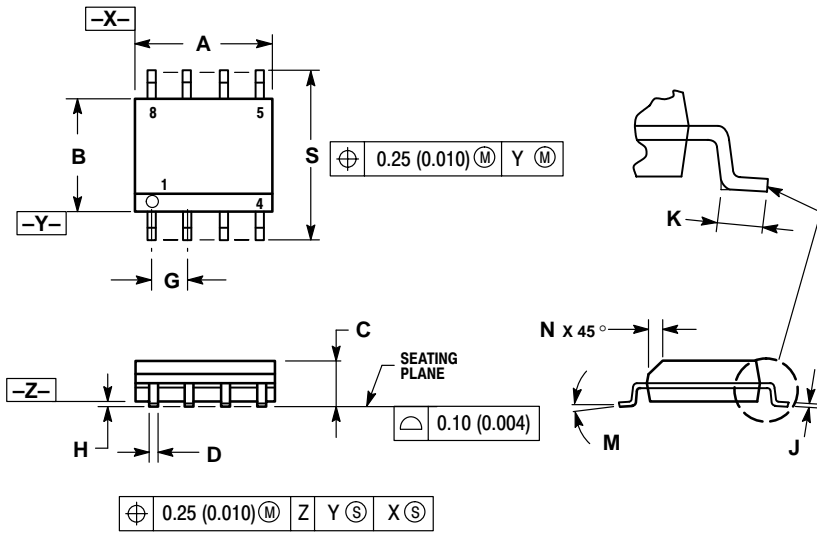


Figure 12. Transient Response Test Circuit

# MC4558V

## PACKAGE DIMENSIONS

SO-8  
D SUFFIX  
CASE 751-07  
ISSUE V




NOTES:

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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

**Notes**

**Notes**

**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, 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.