

# MCR25D, MCR25M, MCR25N

Preferred Device

## Silicon Controlled Rectifiers

### Reverse Blocking Thyristors

Designed primarily for half-wave ac control applications, such as motor controls, heating controls, and power supplies; or wherever half-wave, silicon gate-controlled devices are needed.

#### Features

- Blocking Voltage to 800 Volts
- On-State Current Rating of 25 Amperes RMS
- High Surge Current Capability – 300 Amperes
- Rugged, Economical TO–220AB Package
- Glass Passivated Junctions for Reliability and Uniformity
- Minimum and Maximum Values of  $I_{GT}$ ,  $V_{GT}$ , and  $I_H$  Specified for Ease of Design
- High Immunity to  $dv/dt$  – 100 V/ $\mu$ sec Minimum @ 125°C
- Pb–Free Packages are Available\*

#### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off–State Voltage (Note 1) ( $T_J = -40$ to $125^\circ\text{C}$ , Sine Wave, 50 to 60 Hz, Gate Open)	$V_{DRM}$ , $V_{RRM}$	400 600 800	V
On–State RMS Current ( $180^\circ$ Conduction Angles; $T_C = 80^\circ\text{C}$ )	$I_{T(RMS)}$	25	A
Peak Non-repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, $T_J = 125^\circ\text{C}$ )	$I_{TSM}$	300	A
Circuit Fusing Consideration ( $t = 8.3$ ms)	$I^2t$	373	A <sup>2</sup> sec
Forward Peak Gate Power (Pulse Width $\leq 1.0$ $\mu$ s, $T_C = 80^\circ\text{C}$ )	$P_{GM}$	20.0	W
Forward Average Gate Power ( $t = 8.3$ ms, $T_C = 80^\circ\text{C}$ )	$P_{G(AV)}$	0.5	W
Forward Peak Gate Current (Pulse Width $\leq 1.0$ $\mu$ s, $T_C = 80^\circ\text{C}$ )	$I_{GM}$	2.0	A
Operating Junction Temperature Range	$T_J$	–40 to +125	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	–40 to +150	$^\circ\text{C}$

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.  $V_{DRM}$  and  $V_{RRM}$  for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

\*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



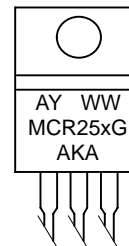
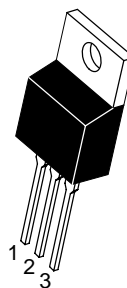
ON Semiconductor®

<http://onsemi.com>

SCRs  
25 AMPERES RMS  
400 thru 800 VOLTS



#### MARKING DIAGRAM



TO–220AB  
CASE 221A–09  
STYLE 3

A = Assembly Location  
Y = Year  
WW = Work Week  
x = D, M, or N  
G = Pb–Free Package  
AKA = Diode Polarity

#### PIN ASSIGNMENT

1	Cathode
2	Anode
3	Gate
4	Anode

#### ORDERING INFORMATION

Device	Package	Shipping
MCR25D	TO–220AB	50 Units / Rail
MCR25DG	TO–220AB (Pb–Free)	50 Units / Rail
MCR25M	TO–220AB	50 Units / Rail
MCR25MG	TO–220AB (Pb–Free)	50 Units / Rail
MCR25N	TO–220AB	50 Units / Rail
MCR25NG	TO–220AB (Pb–Free)	50 Units / Rail

Preferred devices are recommended choices for future use and best overall value.

# MCR25D, MCR25M, MCR25N

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.5	$^{\circ}C/W$
Junction-to-Ambient	$R_{\theta JA}$	62.5	$^{\circ}C/W$
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	$T_L$	260	$^{\circ}C$

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^{\circ}C$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

## OFF CHARACTERISTICS

Peak Repetitive Forward or Reverse Blocking Current ( $V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}$ , Gate Open)	$I_{DRM}$	-	-	0.01	mA
	$I_{RRM}$	-	-	2.0	mA
					$T_J = 25^{\circ}C$
					$T_J = 125^{\circ}C$

## ON CHARACTERISTICS

Peak Forward On-State Voltage (Note 2) ( $I_{TM} = 50 \text{ A}$ )	$V_{TM}$	-	-	1.8	V
Gate Trigger Current (Continuous dc) ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )	$I_{GT}$	4.0	12	30	mA
Gate Trigger Voltage (Continuous dc) ( $V_D = 12 \text{ V}$ , $R_L = 100 \Omega$ )	$V_{GT}$	0.5	0.67	1.0	V
Holding Current ( $V_D = 12 \text{ Vdc}$ , Initiating Current = 200 mA, Gate Open)	$I_H$	5.0	13	40	mA
Latching Current ( $V_D = 12 \text{ V}$ , $I_G = 30 \text{ mA}$ )	$I_L$	-	35	80	mA

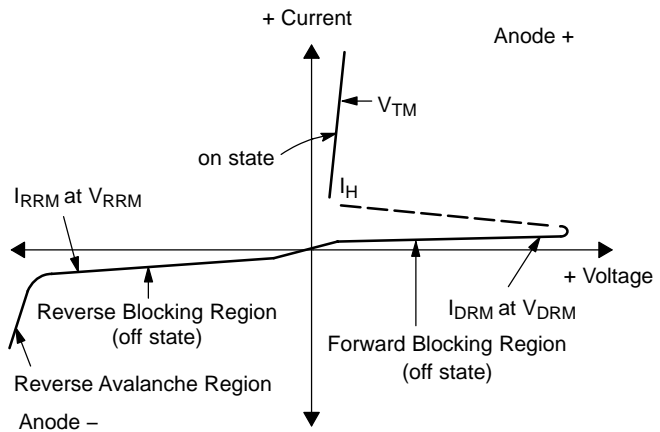
## DYNAMIC CHARACTERISTICS

Critical Rate of Rise of Off-State Voltage ( $V_D = 67\%$ of Rated $V_{DRM}$ , Exponential Waveform, Gate Open, $T_J = 125^{\circ}C$ )	dv/dt	100	250	-	V/ $\mu s$
Critical Rate of Rise of On-State Current ( $I_{PK} = 50 \text{ A}$ , $P_w = 30 \mu\text{sec}$ , diG/dt = 1 A/ $\mu\text{sec}$ , Igt = 50 mA)	di/dt	-	-	50	A/ $\mu s$

2. Indicates Pulse Test: Pulse Width  $\leq 2.0 \text{ ms}$ , Duty Cycle  $\leq 2\%$ .

## Voltage Current Characteristic of SCR

Symbol	Parameter
$V_{DRM}$	Peak Repetitive Off State Forward Voltage
$I_{DRM}$	Peak Forward Blocking Current
$V_{RRM}$	Peak Repetitive Off State Reverse Voltage
$I_{RRM}$	Peak Reverse Blocking Current
$V_{TM}$	Peak On State Voltage
$I_H$	Holding Current



# MCR25D, MCR25M, MCR25N

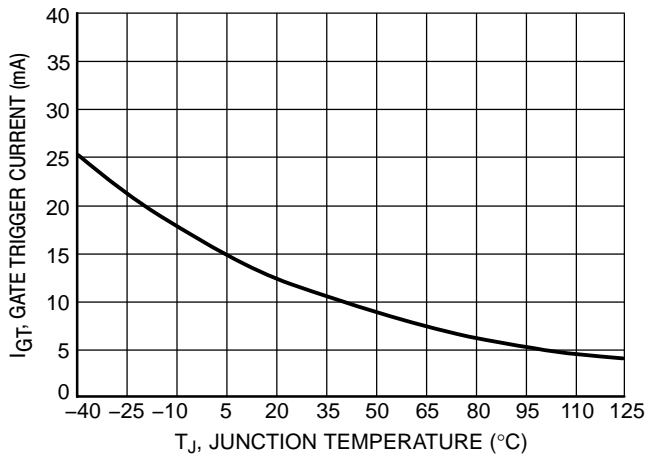


Figure 1. Typical Gate Trigger Current versus Junction Temperature

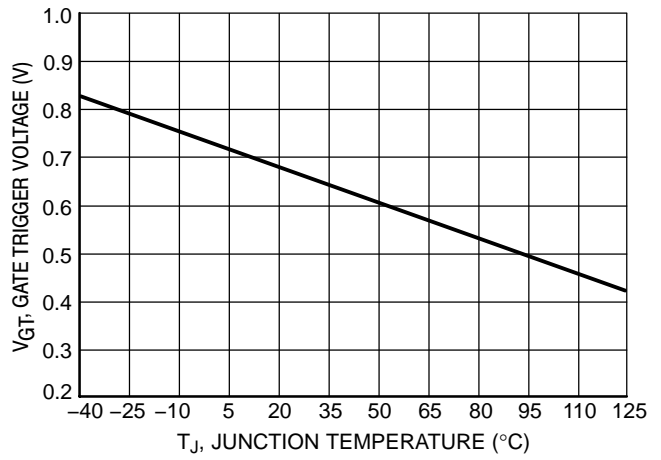


Figure 2. Typical Gate Trigger Voltage versus Junction Temperature

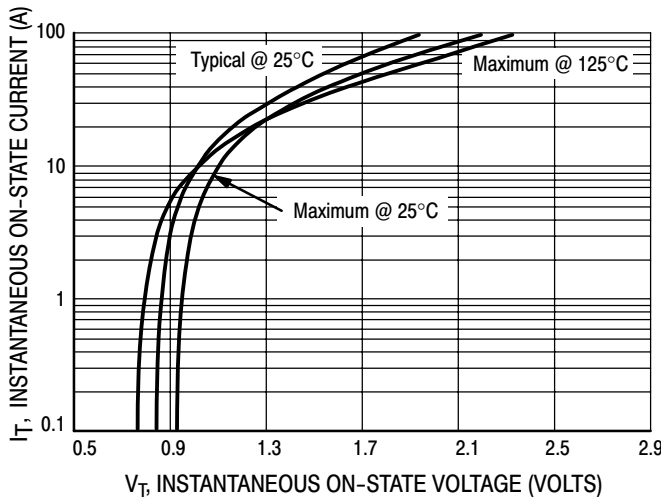


Figure 3. Typical On-State Characteristics

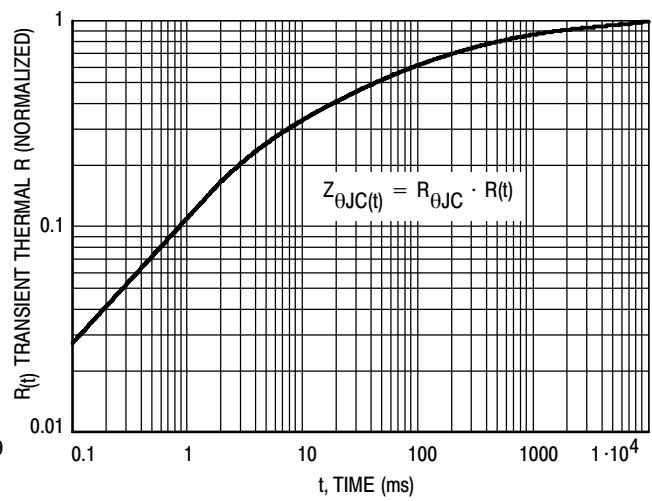


Figure 4. Transient Thermal Response

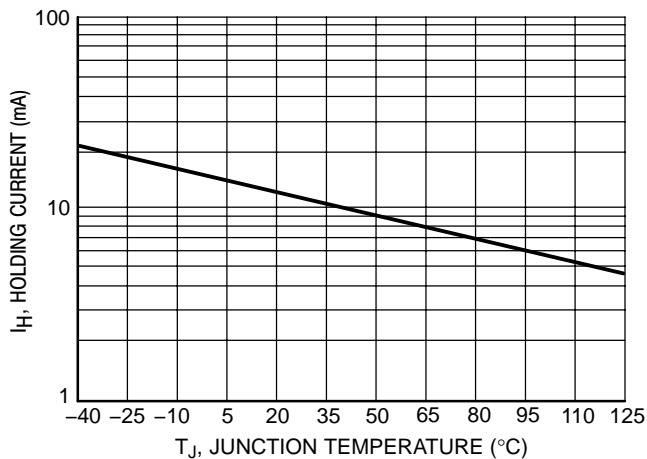


Figure 5. Typical Holding Current versus Junction Temperature

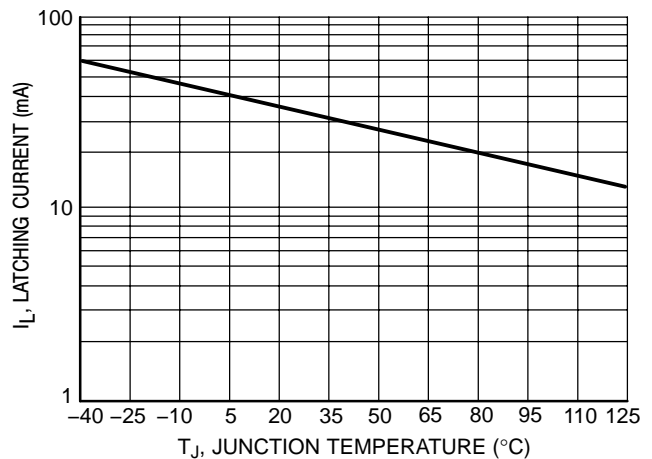


Figure 6. Typical Latching Current versus Junction Temperature

# MCR25D, MCR25M, MCR25N

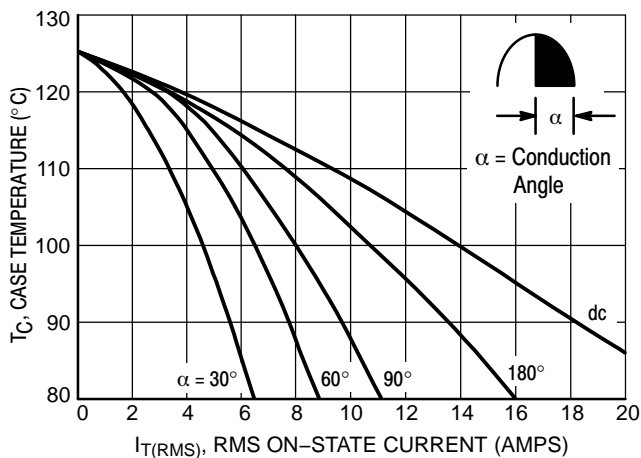


Figure 7. Typical RMS Current Derating

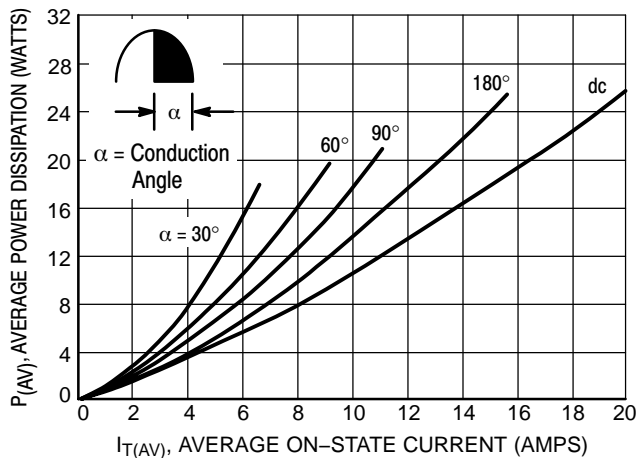


Figure 8. On State Power Dissipation

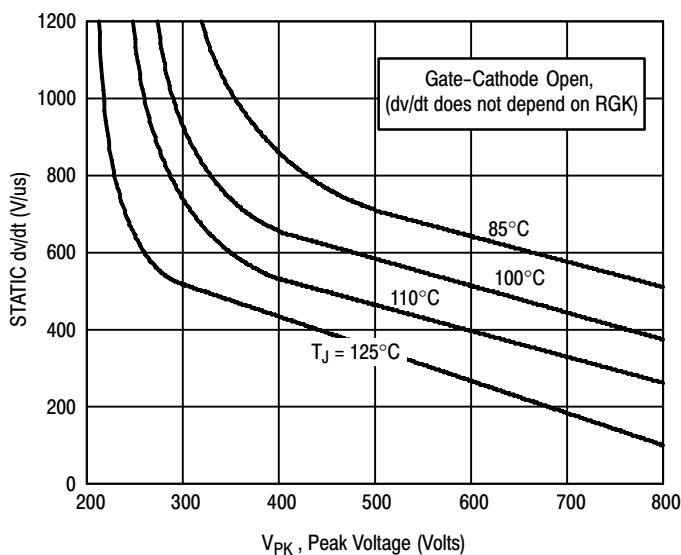


Figure 9. Typical Exponential Static dv/dt Versus Peak Voltage

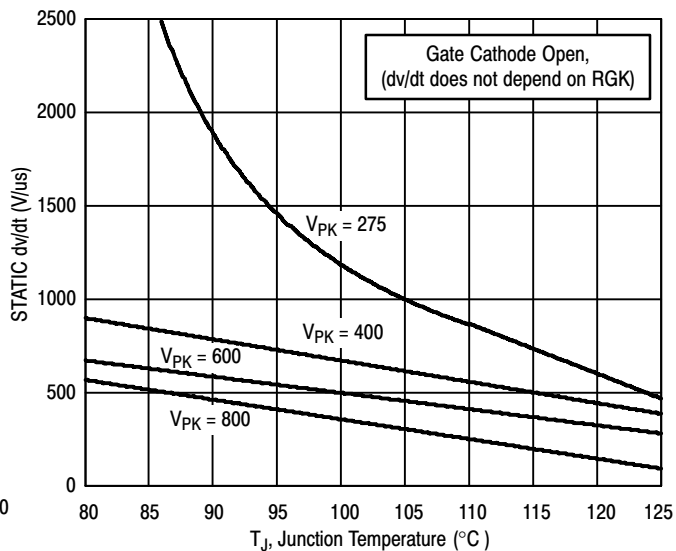


Figure 10. Typical Exponential Static dv/dt Versus Junction Temperature

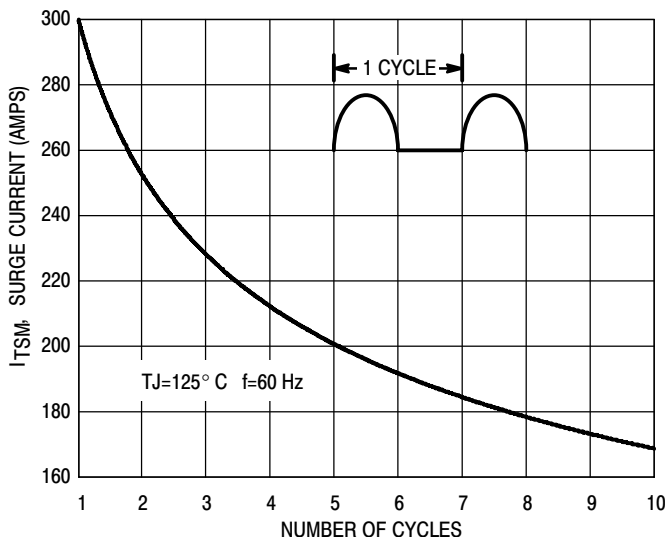
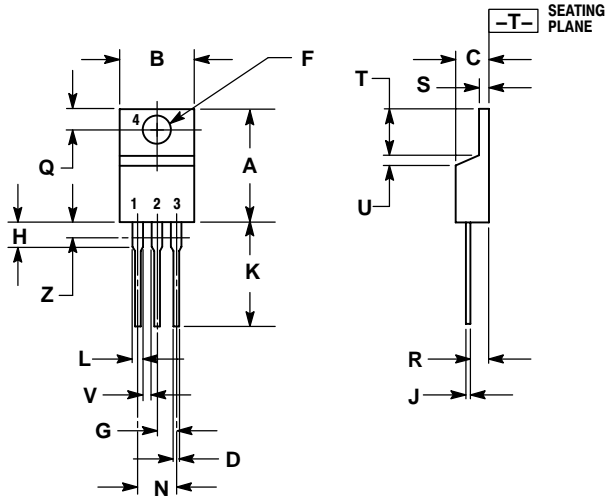


Figure 11. Maximum Non-Repertive Surge Current

# MCR25D, MCR25M, MCR25N

## PACKAGE DIMENSIONS

TO-220AB  
CASE 221A-09  
ISSUE AA




### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

### STYLE 3:

1. CATHODE
2. ANODE
3. GATE
4. ANODE

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 61312, Phoenix, Arizona 85082-1312 USA  
Phone: 480-829-7710 or 800-344-3860 Toll Free USA/Canada  
Fax: 480-829-7709 or 800-344-3867 Toll Free USA/Canada  
Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

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

Japan: ON Semiconductor, Japan Customer Focus Center  
2-9-1 Kamimeguro, Meguro-ku, Tokyo, Japan 153-0051  
Phone: 81-3-5773-3850

ON Semiconductor Website: <http://onsemi.com>

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

For additional information, please contact your local Sales Representative.