

# NCR169D

## General Purpose Sensitive Gate Silicon Controlled Rectifier Reverse Blocking Thyristor

PNPN device designed for line-powered general purpose applications such as relay and lamp drivers, small motor controls, gate drivers for larger thyristors, and sensing and detection circuits. Supplied in a cost effective plastic TO-226AA package.

### Features

- Sensitive Gate Allows Direct Triggering by Microcontrollers and Other Logic Circuits
- On-State Current Rating of 0.8 Amperes RMS at 80°C
- Surge Current Capability – 10 Amperes
- Immunity to dV/dt – 20 V/μsec Minimum at 110°C
- Glass-Passivated Surface for Reliability and Uniformity
- This is a Pb-Free Device

### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage (Note 1.) (T <sub>J</sub> = -40 to 110°C, Sine Wave, 50 to 60 Hz; Gate Open)	V <sub>DRM</sub> , V <sub>RRM</sub>	400	Volts
On-State RMS Current (T <sub>C</sub> = 80°C) 180° Conduction Angles	I <sub>T(RMS)</sub>	0.8	Amp
Peak Non-Repetitive Surge Current (1/2 Cycle, Sine Wave, 60 Hz, T <sub>J</sub> = 25°C)	I <sub>TSM</sub>	10	Amps
Circuit Fusing Consideration (t = 10 ms)	I <sup>2</sup> t	0.415	A <sup>2</sup> s
Forward Peak Gate Power (T <sub>A</sub> = 25°C, Pulse Width ≤ 1.0 μs)	P <sub>GM</sub>	0.1	Watt
Forward Average Gate Power (T <sub>A</sub> = 25°C, t = 20 ms)	P <sub>G(AV)</sub>	0.10	Watt
Forward Peak Gate Current (T <sub>A</sub> = 25°C, Pulse Width ≤ 1.0 μs)	I <sub>GM</sub>	1.0	Amp
Reverse Peak Gate Voltage (T <sub>A</sub> = 25°C, Pulse Width ≤ 1.0 μs)	V <sub>G(RM)</sub>	5.0	Volts
Operating Junction Temperature Range @ Rate V <sub>RRM</sub> and V <sub>DRM</sub>	T <sub>J</sub>	-40 to 110	°C
Storage Temperature Range	T <sub>stg</sub>	-40 to 150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. V<sub>DRM</sub> and V<sub>RRM</sub> for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, 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.



ON Semiconductor®

<http://onsemi.com>

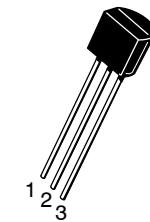
**SCR**  
**0.8 AMPERES RMS**  
**400 VOLTS**



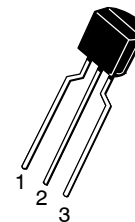
### MARKING DIAGRAM

TO-92  
(TO-226)  
CASE 029-11  
STYLE 10

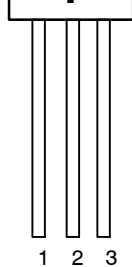
NCR  
169D  
ALYWW▪



STRAIGHT LEAD  
BULK PACK



BENT LEAD  
TAPE & REEL  
AMMO PACK



A = Assembly Location  
L = Wafer Lot  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package

(\*Note: Microdot may be in either location)

### PIN ASSIGNMENT

1	Cathode
2	Gate
3	Anode

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# NCR169D

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance – Junction to Case	$R_{\theta JC}$	75	$^{\circ}C/W$
– Junction to Ambient	$R_{\theta JA}$	200	$^{\circ}C/W$
Lead Solder Temperature (< 1/16" from case, 10 secs max)	$T_L$	260	$^{\circ}C$

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

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

## OFF CHARACTERISTICS

Peak Repetitive Forward or Reverse Blocking Current (Note 1.) ( $V_D = \text{Rated } V_{DRM}$ and $V_{RRM}$ ; $R_{GK} = 1.0 \text{ k}\Omega$ )	$I_{DRM}, I_{RRM}$	$T_C = 25^{\circ}C$ $T_C = 110^{\circ}C$	– –	– –	10 0.1	$\mu A$ mA
---	--------------------	---	--------	--------	-----------	---------------

## ON CHARACTERISTICS

Peak Forward On-State Voltage* ( $I_{TM} = 1.0 \text{ Amp Peak @ } T_A = 25^{\circ}C$ )	$V_{TM}$		–	–	1.7	Volts
Gate Trigger Current (Continuous dc) (Note 2.) ( $V_{AK} = 12 \text{ V}, R_L = 100 \text{ Ohms}$ )	$I_{GT}$	$T_C = 25^{\circ}C$	–	40	200	$\mu A$
Holding Current (Note 2.) ( $V_{AK} = 12 \text{ V}, I_{GT} = 0.5 \text{ mA}$ )	$I_H$	$T_C = 25^{\circ}C$ $T_C = -40^{\circ}C$	– –	0.5 –	5.0 10	mA
Latch Current ( $V_{AK} = 12 \text{ V}, I_{GT} = 0.5 \text{ mA}, R_{GK} = 1.0 \text{ k}$ )	$I_L$	$T_C = 25^{\circ}C$ $T_C = -40^{\circ}C$	– –	0.6 –	10 15	mA
Gate Trigger Voltage (Continuous dc) (Note 2.) ( $V_{AK} = 12 \text{ V}, R_L = 100 \text{ Ohms}, I_{GT} = 10 \text{ mA}$ )	$V_{GT}$	$T_C = 25^{\circ}C$ $T_C = -40^{\circ}C$	– –	0.62 –	0.8 1.2	Volts

## DYNAMIC CHARACTERISTICS

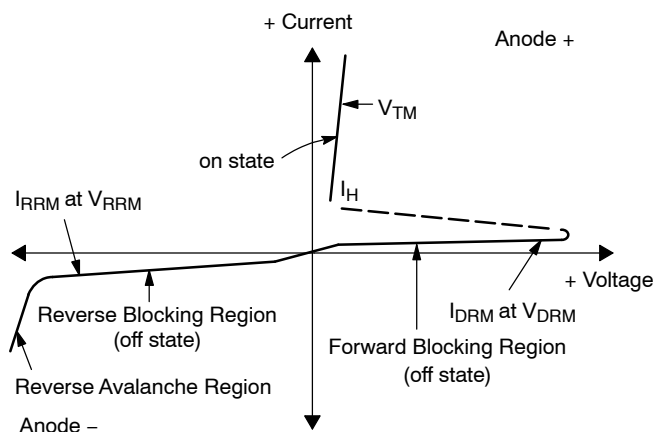
Critical Rate of Rise of Off-State Voltage ( $V_D = \text{Rated } V_{DRM}$ , Exponential Waveform, $R_{GK} = 1000 \text{ Ohms}$ , $T_J = 110^{\circ}C$ )	$dV/dt$	20	35	–	$V/\mu s$
Critical Rate of Rise of On-State Current ( $I_{PK} = 20 \text{ A}$ ; $P_w = 10 \mu sec$ ; $di/dt = 1.0 \text{ A}/\mu sec$ , $I_{gt} = 20 \text{ mA}$ )	$di/dt$	–	–	50	$A/\mu s$

\*Indicates Pulse Test: Pulse Width  $\leq 1.0 \text{ ms}$ , Duty Cycle  $\leq 1\%$ .

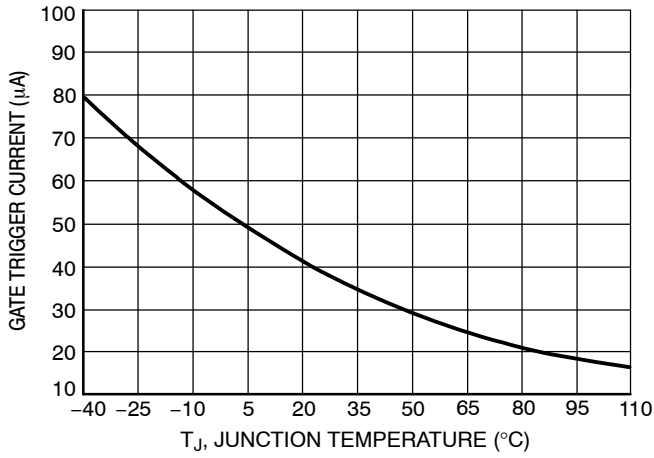
- $R_{GK} = 1000 \text{ Ohms}$  included in measurement.
- Does not include  $R_{GK}$  in measurement.

## Voltage Current Characteristic of SCR

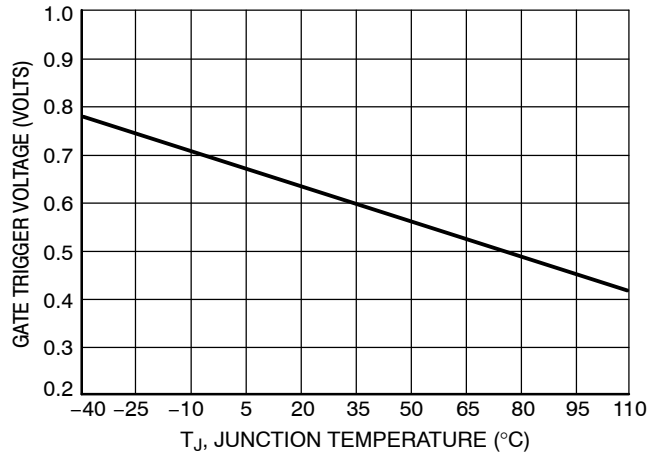
Symbol	Parameter
$V_{DRM}$	Peak Repetitive Off State Forward Voltage
$I_{DRM}$	Peak Forward Blocking Current
$V_{RRM}$	Peak Repetitive Off State Reverse Voltage
$I_{RRM}$	Peak Reverse Blocking Current
$V_{TM}$	Peak on State Voltage
$I_H$	Holding Current



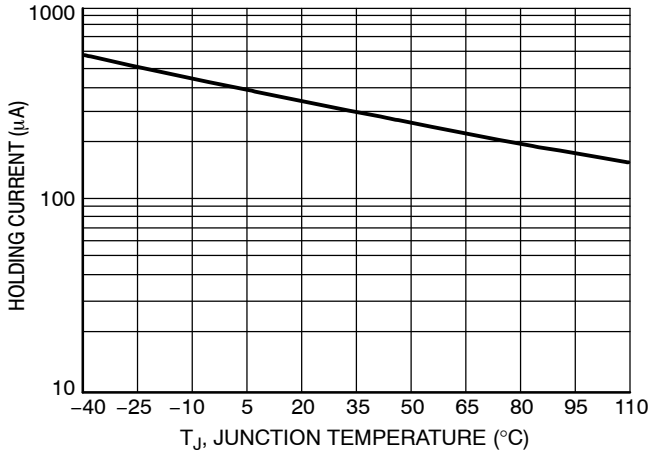
# NCR169D



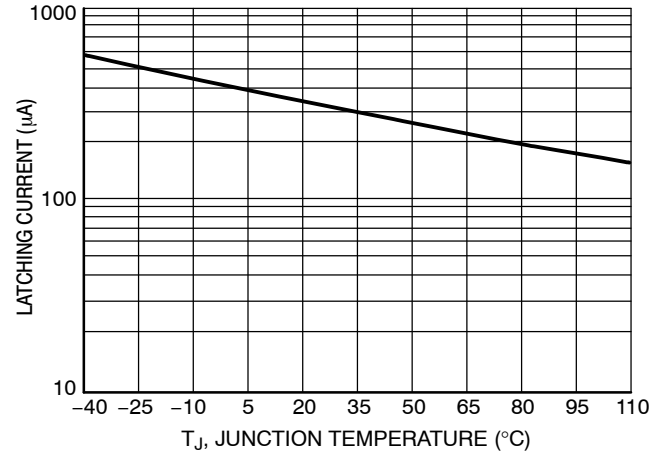
**Figure 1. Typical Gate Trigger Current versus Junction Temperature**



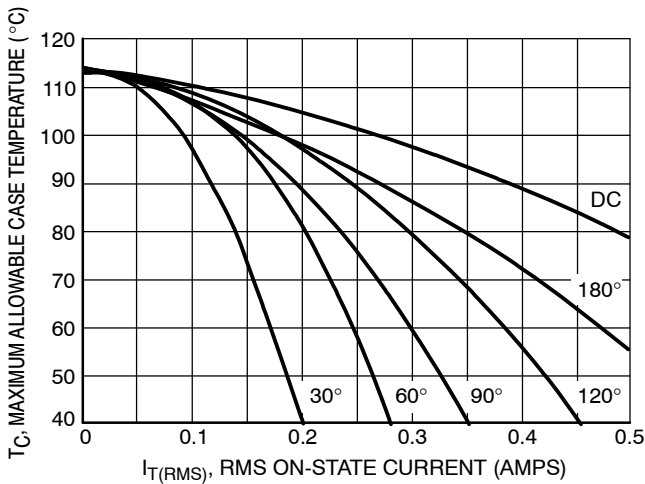
**Figure 2. Typical Gate Trigger Voltage versus Junction Temperature**



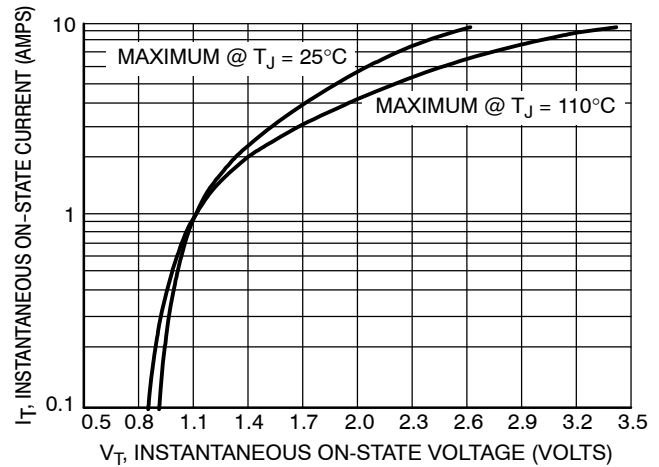
**Figure 3. Typical Holding Current versus Junction Temperature**



**Figure 4. Typical Latching Current versus Junction Temperature**



**Figure 5. Typical RMS Current Derating**



**Figure 6. Typical On-State Characteristics**

# NCR169D

## TO-92 EIA RADIAL TAPE IN FAN FOLD BOX OR ON REEL

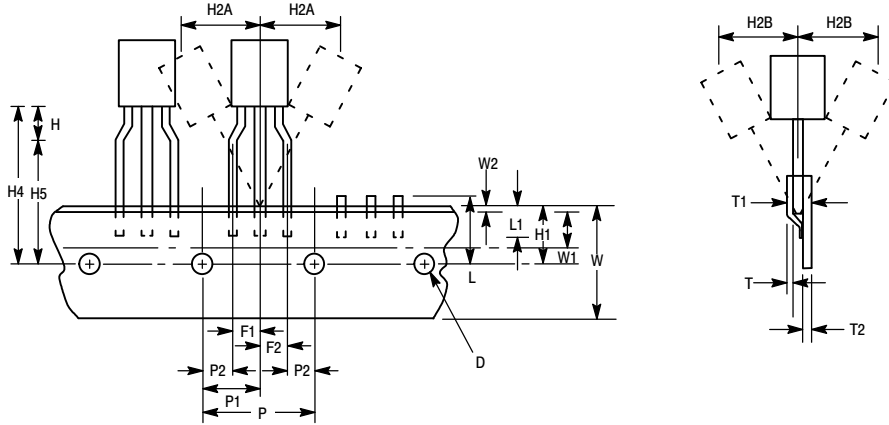


Figure 7. Device Positioning on Tape

Symbol	Item	Specification			
		Inches		Millimeter	
		Min	Max	Min	Max
D	Tape Feedhole Diameter	0.1496	0.1653	3.8	4.2
D2	Component Lead Thickness Dimension	0.015	0.020	0.38	0.51
F1, F2	Component Lead Pitch	0.0945	0.110	2.4	2.8
H	Bottom of Component to Seating Plane	.059	.156	1.5	4.0
H1	Feedhole Location	0.3346	0.3741	8.5	9.5
H2A	Deflection Left or Right	0	0.039	0	1.0
H2B	Deflection Front or Rear	0	0.051	0	1.0
H4	Feedhole to Bottom of Component	0.7086	0.768	18	19.5
H5	Feedhole to Seating Plane	0.610	0.649	15.5	16.5
L	Defective Unit Clipped Dimension	0.3346	0.433	8.5	11
L1	Lead Wire Enclosure	0.09842	-	2.5	-
P	Feedhole Pitch	0.4921	0.5079	12.5	12.9
P1	Feedhole Center to Center Lead	0.2342	0.2658	5.95	6.75
P2	First Lead Spacing Dimension	0.1397	0.1556	3.55	3.95
T	Adhesive Tape Thickness	0.06	0.08	0.15	0.20
T1	Overall Taped Package Thickness	-	0.0567	-	1.44
T2	Carrier Strip Thickness	0.014	0.027	0.35	0.65
W	Carrier Strip Width	0.6889	0.7481	17.5	19
W1	Adhesive Tape Width	0.2165	0.2841	5.5	6.3
W2	Adhesive Tape Position	.0059	0.01968	.15	0.5

NOTES:

1. Maximum alignment deviation between leads not to be greater than 0.2 mm.
2. Defective components shall be clipped from the carrier tape such that the remaining protrusion (L) does not exceed a maximum of 11 mm.
3. Component lead to tape adhesion must meet the pull test requirements.
4. Maximum non-cumulative variation between tape feed holes shall not exceed 1 mm in 20 pitches.
5. Holddown tape not to extend beyond the edge(s) of carrier tape and there shall be no exposure of adhesive.
6. No more than 1 consecutive missing component is permitted.
7. A tape trailer and leader, having at least three feed holes is required before the first and after the last component.
8. Splices will not interfere with the sprocket feed holes.

## NCR169D

### ORDERING & SHIPPING INFORMATION: MCR100 Series packaging options, Device Suffix

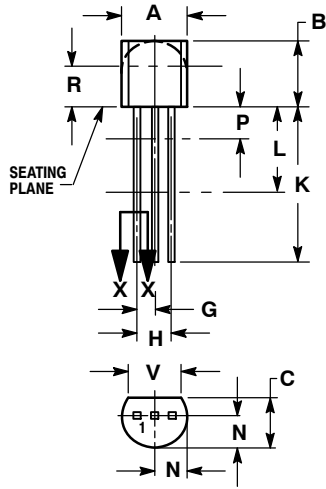
Device	Description of TO92 Tape Orientation	Shipping
NCR169DG	N/A, Bulk	Bulk in Box (5K/Box) (Pb-Free)
NCR169DRLRAG	Round side of TO92 and adhesive tape visible	Radial Tape and Reel (2K/Reel) (Pb-Free)

†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.

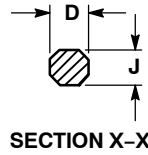
# NCR169D

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
CASE 029-11  
ISSUE AM



STRAIGHT LEAD  
BULK PACK



SECTION X-X

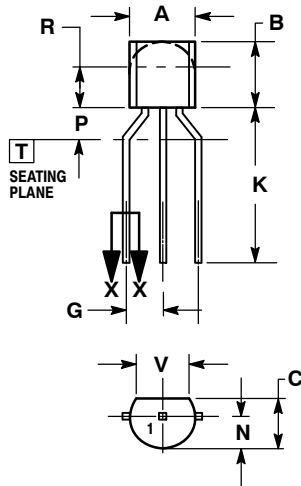
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

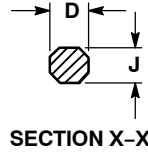
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---

STYLE 10:

- PIN 1. CATHODE
- GATE
- ANODE



BENT LEAD  
TAPE & REEL  
AMMO PACK



SECTION X-X

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	MILLIMETERS	
	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). 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](mailto: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: 81-3-5817-1050

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