2N5060 Series

Preferred Device

Sensitive Gate Silicon Controlled Rectifiers

Reverse Blocking Thyristors

Annular PNPN devices designed for high volume consumer applications such as relay and lamp drivers, small motor controls, gate drivers for larger thyristors, and sensing and detection circuits. Supplied in an inexpensive plastic TO-226AA (TO-92) package which is readily adaptable for use in automatic insertion equipment.

- Sensitive Gate Trigger Current — 200 µA Maximum
- Low Reverse and Forward Blocking Current — 50 µA Maximum, T_C = 110°C
- Low Holding Current — 5 mA Maximum
- Passivated Surface for Reliability and Uniformity
- Device Marking: Device Type, e.g., 2N5060, Date Code

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off–State Voltage(1) (T_J = −40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open) 2N5060 / 2N5061 / 2N5062 / 2N5064	V_{DRM}, V_{RRM}	30 / 60 / 100 / 200	Volts
On-State Current RMS (180° Conduction Angles; T_C = 80°C)	$I_{T(RMS)}$	0.8	Amp
*Average On-State Current (180° Conduction Angles) (T_C = 67°C) (T_C = 102°C)	$I_{T(AV)}$	0.51 / 0.255	Amp
*Peak Non-repetitive Surge Current, T_A = 25°C (1/2 cycle, Sine Wave, 60 Hz)	I_{TSM}	10	Amps
Circuit Fusing Considerations (t = 8.3 ms)	I^2t	0.4	A^2s
*Forward Peak Gate Power (Pulse Width ≤ 1.0 µsec; T_A = 25°C)	P_{GM}	0.1	Watt
*Forward Average Gate Power (T_A = 25°C, t = 8.3 ms)	$P_{G(AV)}$	0.01	Watt
*Forward Peak Gate Current (Pulse Width ≤ 1.0 µsec; T_A = 25°C)	I_{GM}	1.0	Amp
*Reverse Peak Gate Voltage (Pulse Width ≤ 1.0 µsec; T_A = 25°C)	V_{RGM}	5.0	Volts
*Operating Junction Temperature Range	T_J	–40 to +110	°C
*Storage Temperature Range	T_{stg}	–40 to +150	°C

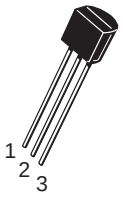
*Indicates JEDEC Registered Data.

(1) V_{DRM} and V_{RRM} 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

SCRs
0.8 AMPERES RMS
30 thru 200 VOLTS



TO–92 (TO–226AA)
CASE 029
STYLE 10

PIN ASSIGNMENT	
1	Cathode
2	Gate
3	Anode

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

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

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
*Thermal Resistance, Junction to Case(1)	$R_{\theta JC}$	75	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	°C/W
*Lead Solder Temperature (Lead Length ⩾ 1/16″ from case, 10 s Max)	—	+230*	°C

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
*Peak Repetitive Forward or Reverse Blocking Current(2) (V_{AK} = Rated V_{DRM} or V_{RRM})		I_{DRM}, I_{RRM}				
	T_C = 25°C		—	—	10	μA
	T_C = 110°C		—	—	50	μA
ON CHARACTERISTICS						
*Peak Forward On–State Voltage(3) (I_{TM} = 1.2 A peak @ T_A = 25°C)		V_{TM}	—	—	1.7	Volts
Gate Trigger Current (Continuous dc)(4)		I_{GT}				μA
*(V_{AK} = 7 Vdc, R_L = 100 Ohms)	T_C = 25°C		—	—	200	
	T_C = –40°C		—	—	350	
Gate Trigger Voltage (Continuous dc)(4)	T_C = 25°C	V_{GT}	—	—	0.8	Volts
*(V_{AK} = 7 Vdc, R_L = 100 Ohms)	T_C = –40°C		—	—	1.2	
*Gate Non–Trigger Voltage		V_{GD}				Volts
(V_{AK} = Rated V_{DRM}, R_L = 100 Ohms)	T_C = 110°C		0.1	—	—	
Holding Current(4)	T_C = 25°C	I_H	—	—	5.0	mA
*(V_{AK} = 7 Vdc, initiating current = 20 mA)	T_C = –40°C		—	—	10	
Turn-On Time						μs
Delay Time		t_d	—	3.0	—	
Rise Time		t_r	—	0.2	—	
(I_{GT} = 1 mA, V_D = Rated V_{DRM}, Forward Current = 1 A, di/dt = 6 A/μs						
Turn-Off Time		t_q				μs
(Forward Current = 1 A pulse, Pulse Width = 50 μs, 0.1% Duty Cycle, di/dt = 6 A/μs, dv/dt = 20 V/μs, I_{GT} = 1 mA)	2N5060, 2N5061		—	10	—	
	2N5062, 2N5064		—	30	—	
DYNAMIC CHARACTERISTICS						
Critical Rate of Rise of Off–State Voltage (Rated V_{DRM}, Exponential)		dv/dt	—	30	—	V/μs

*Indicates JEDEC Registered Data.

(1) This measurement is made with the case mounted “flat side down” on a heat sink and held in position by means of a metal clamp over the curved surface.

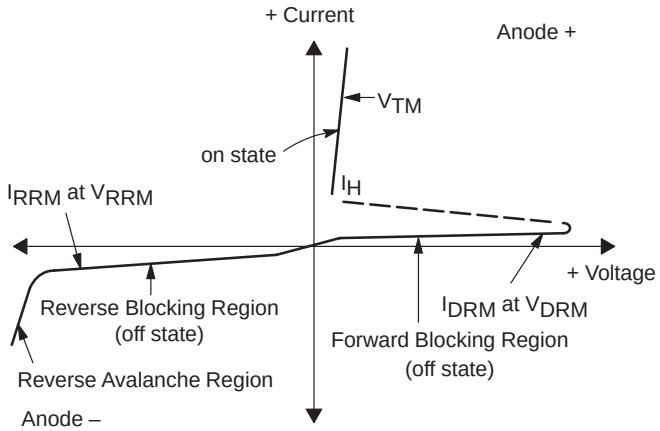
(2) R_{GK} = 1000 Ω is included in measurement.

(3) Forward current applied for 1 ms maximum duration, duty cycle ⩽ 1%.

(4) R_{GK} current is not included 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



CURRENT DERATING

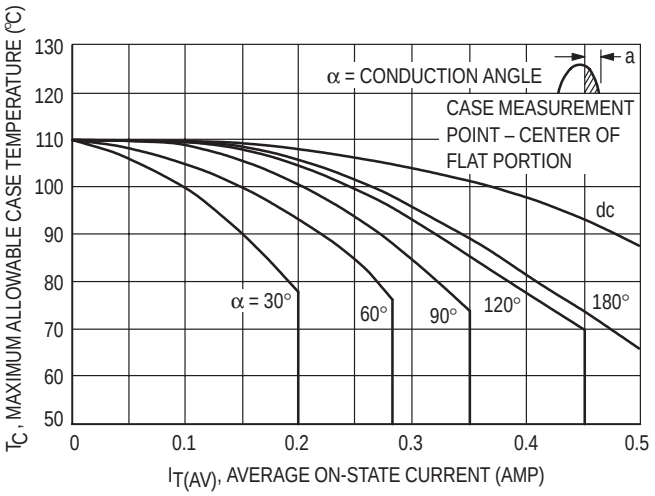


Figure 1. Maximum Case Temperature

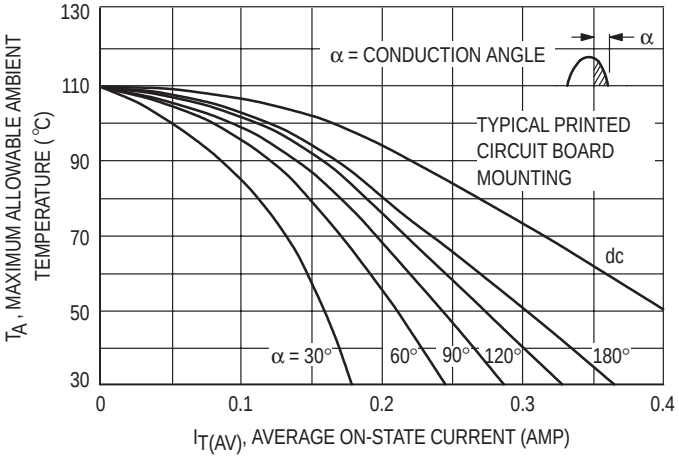


Figure 2. Maximum Ambient Temperature

CURRENT DERATING

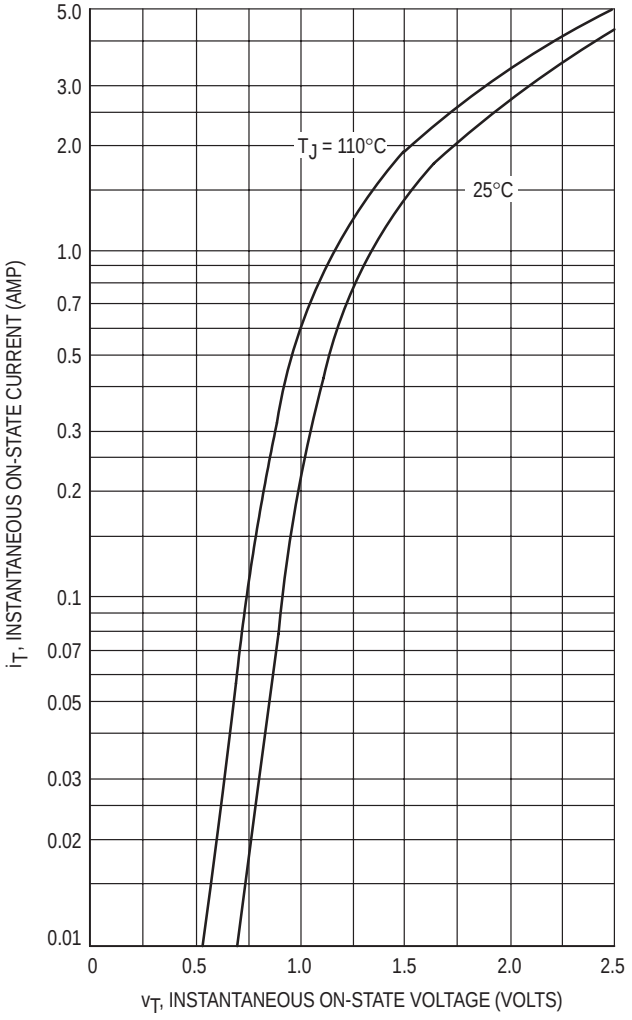


Figure 3. Typical Forward Voltage

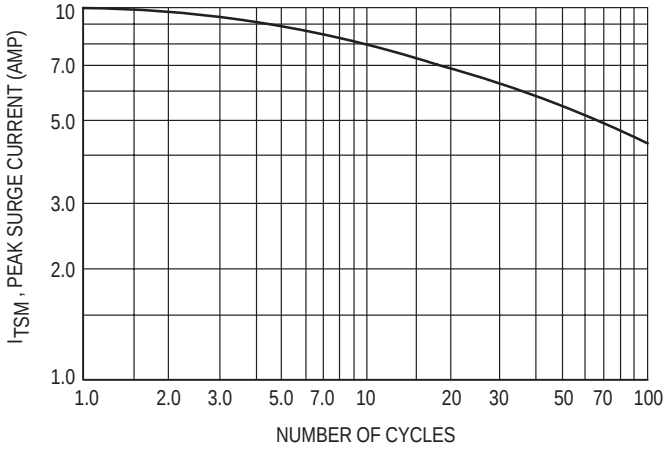


Figure 4. Maximum Non–Repetitive Surge Current

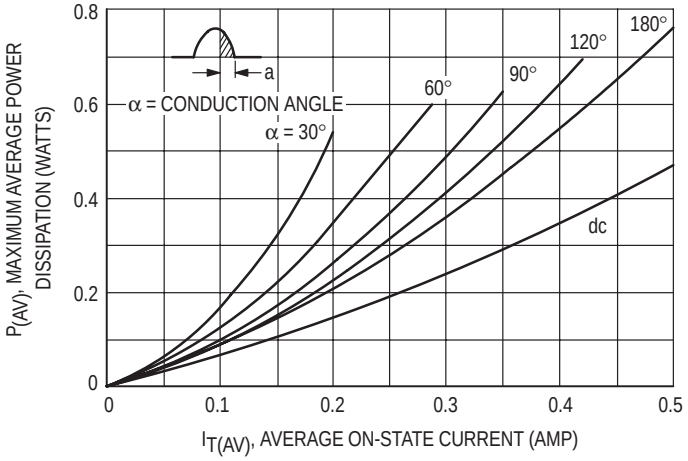


Figure 5. Power Dissipation

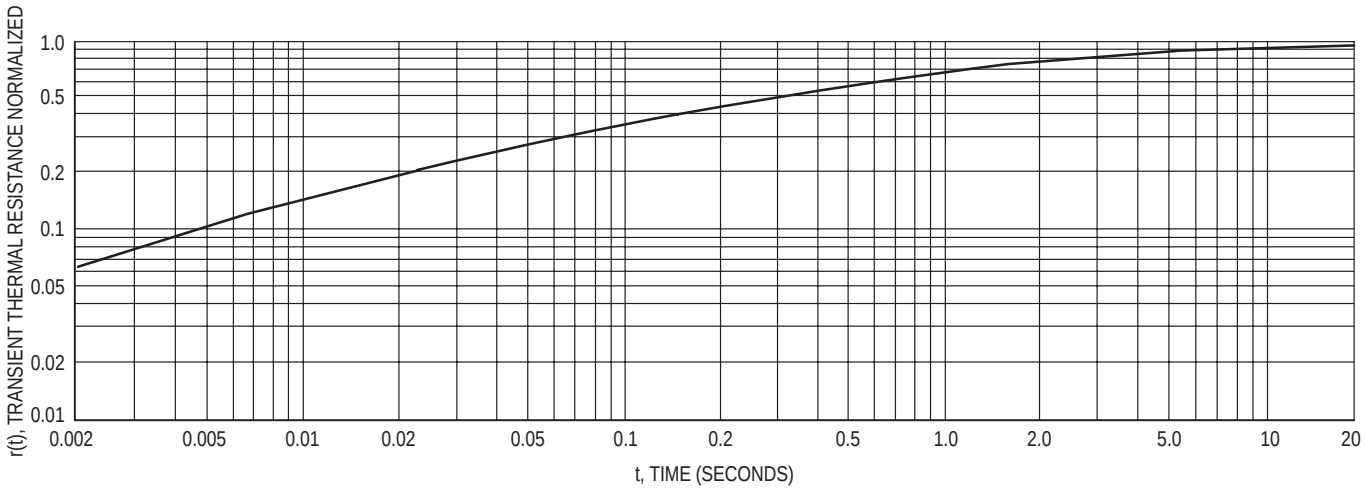


Figure 6. Thermal Response

TYPICAL CHARACTERISTICS

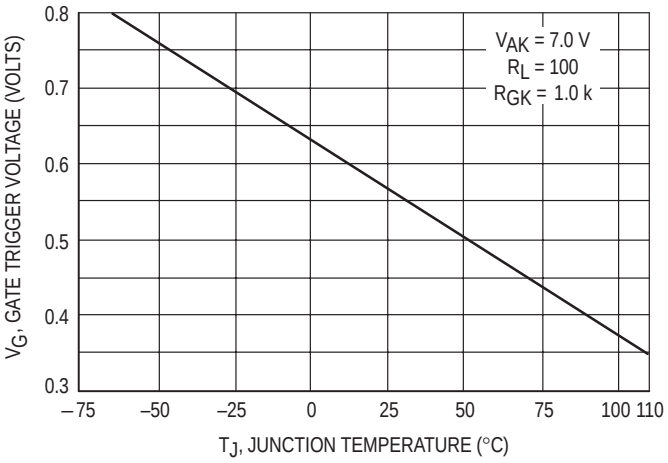


Figure 7. Typical Gate Trigger Voltage

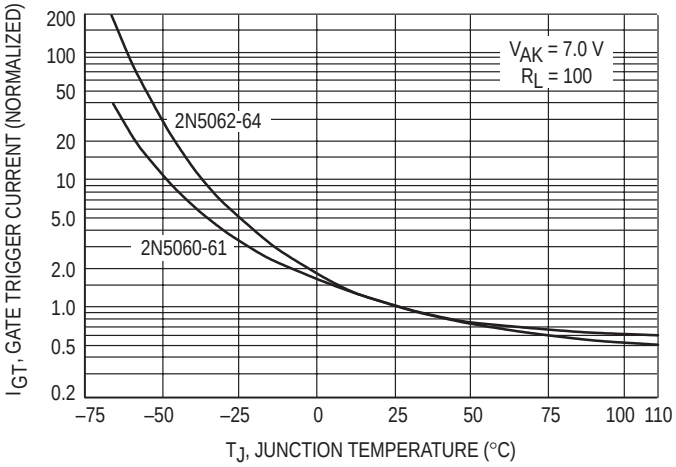


Figure 8. Typical Gate Trigger Current

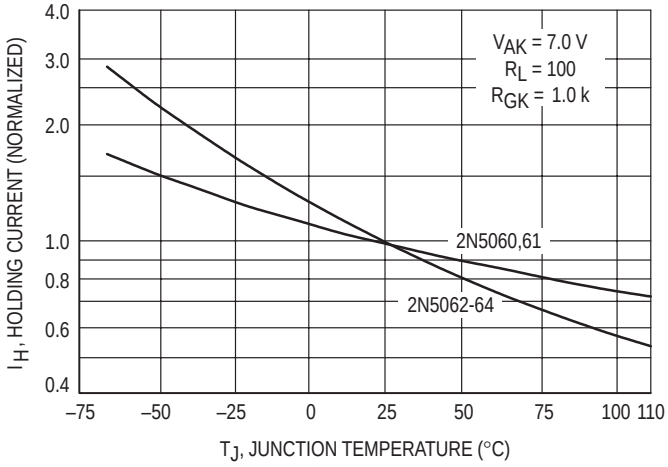


Figure 9. Typical Holding Current

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

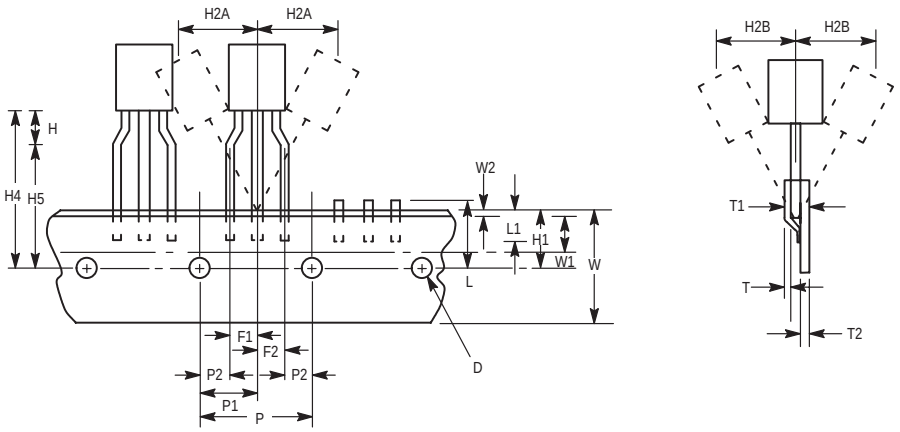


Figure 10. Device Positioning on Tape

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:

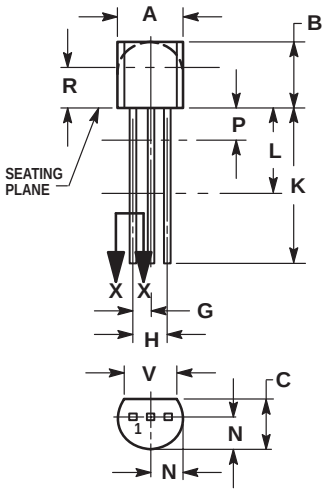
1. Maximum alignment deviation between leads not to be greater than 0.2 mm.
2. Defective components shall be clipped from the carrier tape such that the remaining protrusion (L) does not exceed a maximum of 11 mm.
3. Component lead to tape adhesion must meet the pull test requirements.
4. Maximum non–cumulative 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.

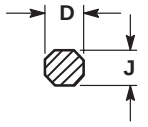
ORDERING & SHIPPING INFORMATION: 2N5060 Series packaging options, Device Suffix

U.S.	Europe Equivalent	Shipping	Description of TO92 Tape Orientation
2N5060,61,62,64		Bulk in Box (5K/Box)	N/A, Bulk
2N5060,61,62,64RLRA		Radial Tape and Reel (2K/Reel)	Round side of TO92 and adhesive tape visible
2N5060,64RLRM	2N5060RL1	Radial Tape and Fan Fold Box (2K/Box)	Flat side of TO92 and adhesive tape visible

PACKAGE DIMENSIONS

TO–92 (TO–226AA)
CASE 029–11
ISSUE AJ





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.

	INCHES		MILLIMETERS	
DIM	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
2. GATE
3. ANODE

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 (M–F 1:00pm to 5:00pm Munich Time)
Email: ONlit–german@hibbertco.com
French Phone: (+1) 303–308–7141 (M–F 1:00pm to 5:00pm Toulouse Time)
Email: ONlit–french@hibbertco.com
English Phone: (+1) 303–308–7142 (M–F 12:00pm to 5:00pm UK Time)
Email: ONlit@hibbertco.com

EUROPEAN TOLL–FREE ACCESS*: 00–800–4422–3781
*Available from Germany, France, Italy, England, Ireland

CENTRAL/SOUTH AMERICA:
Spanish Phone: 303–308–7143 (Mon–Fri 8:00am to 5:00pm MST)
Email: ONlit–spanish@hibbertco.com

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: 81–3–5740–2745
Email: r14525@onsemi.com

ON Semiconductor Website: http://onsemi.com

For additional information, please contact your local
Sales Representative.