MR750 SERIES

MR754 and MR760 are Preferred Devices

High Current Lead Mounted Rectifiers

ON Semiconductor®

http://onsemi.com

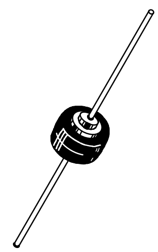
HIGH CURRENT LEAD MOUNTED SILICON RECTIFIERS 50 − 1000 VOLTS DIFFUSED JUNCTION

Features

- Current Capacity Comparable to Chassis Mounted Rectifiers
- Very High Surge Capacity
- Insulated Case
- Pb−Free Packages are Available*

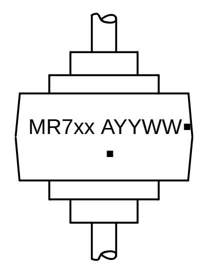
Mechanical Characteristics:

- Case: Epoxy, Molded
- Weight: 2.5 grams (approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Lead is Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds
- Polarity: Cathode Polarity Band



AXIAL LEAD
BUTTON
CASE 194
STYLE 1

MARKING DIAGRAM



MR7 = Device Code
xx = 50, 51, 52, 54, 56 or 60
A = Location Code
YY = Year
WW = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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

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

MAXIMUM RATINGS

Characteristic	Symbol	MR750	MR751	MR752	MR754	MR756	MR760	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	50	100	200	400	600	1000	V
Non−Repetitive Peak Reverse Voltage (Halfwave, single phase, 60 Hz peak)	V_{RSM}	60	120	240	480	720	1200	V
RMS Reverse Voltage	$V_{R(RMS)}$	35	70	140	280	420	700	V
Average Rectified Forward Current (Single phase, resistive load, 60 Hz) (See Figures 5 and 6)	I_O	22 (T_L = 60°C, 1/8 in Lead Lengths) 6.0 (T_A = 60°C, P.C. Board mounting)						A
Non−Repetitive Peak Surge Current (Surge applied at rated load conditions)	I_{FSM}	400 (for 1 cycle)						A
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +175						°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.

ELECTRICAL CHARACTERISTICS

Characteristic and Conditions	Symbol	Max	Unit
Maximum Instantaneous Forward Voltage Drop (i_F = 100 A, T_J = 25°C)	v_F	1.25	V
Maximum Forward Voltage Drop (I_F = 6.0 A, T_A = 25°C, 3/8 in leads)	V_F	0.90	V
Maximum Reverse Current (Rated DC Voltage) T_J = 25°C T_J = 100°C	I_R	25 1.0	μA mA

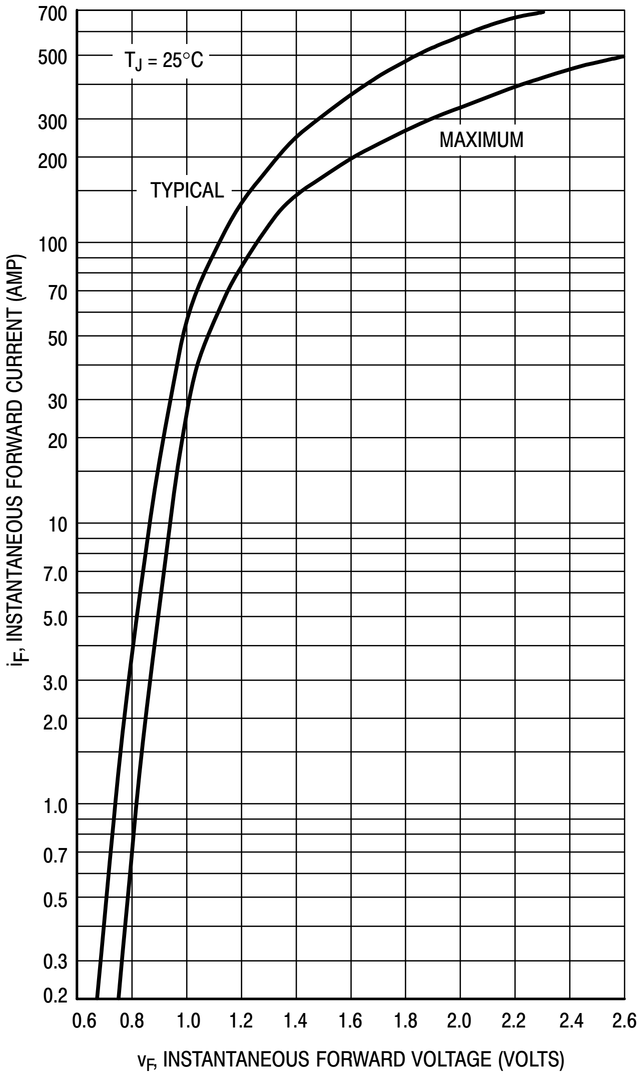


Figure 1. Forward Voltage

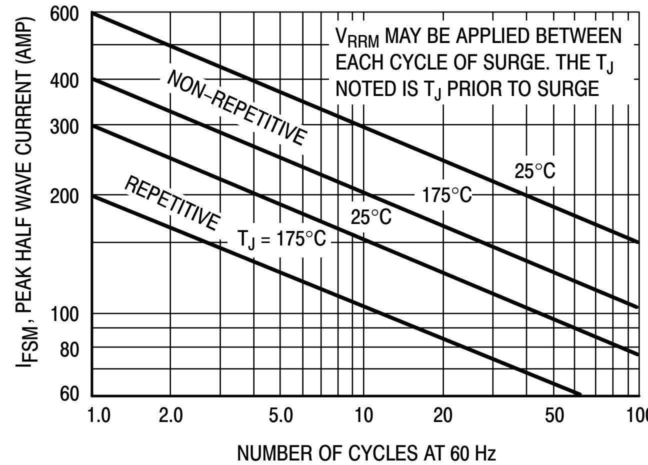


Figure 2. Maximum Surge Capability

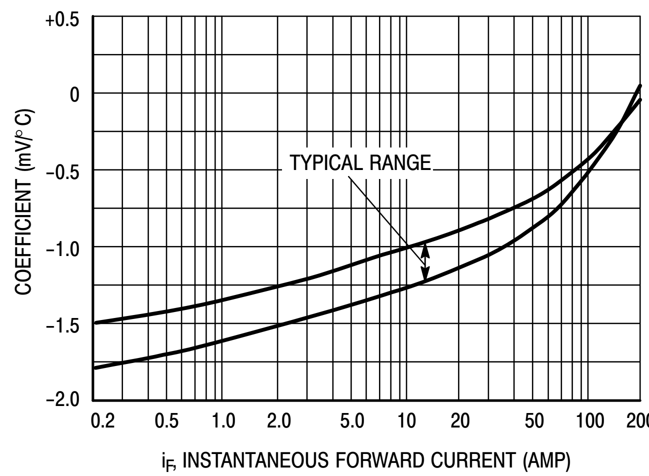


Figure 3. Forward Voltage Temperature Coefficient

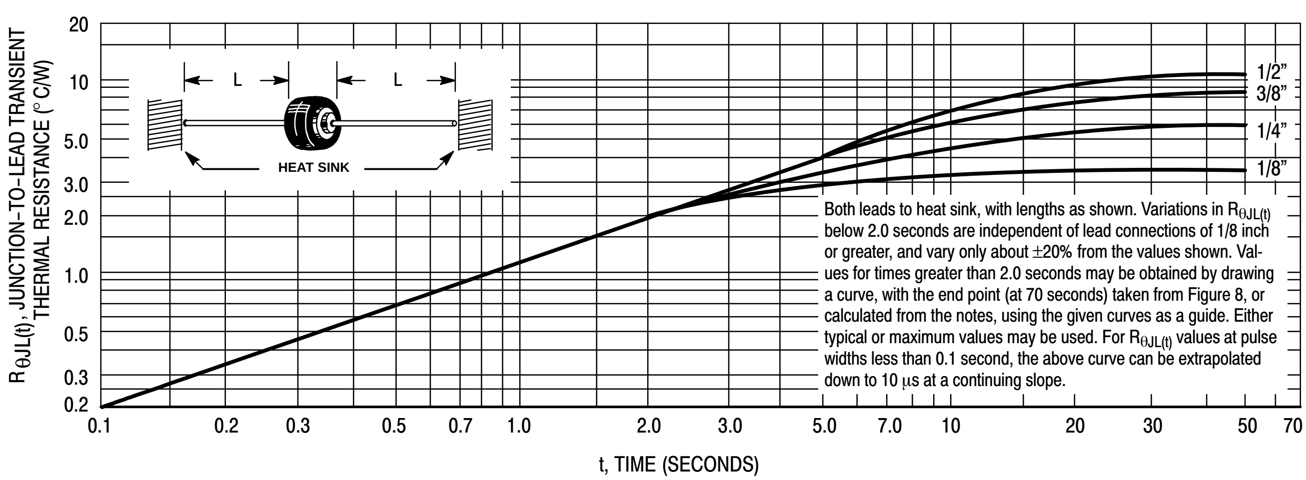


Figure 4. Typical Transient Thermal Resistance

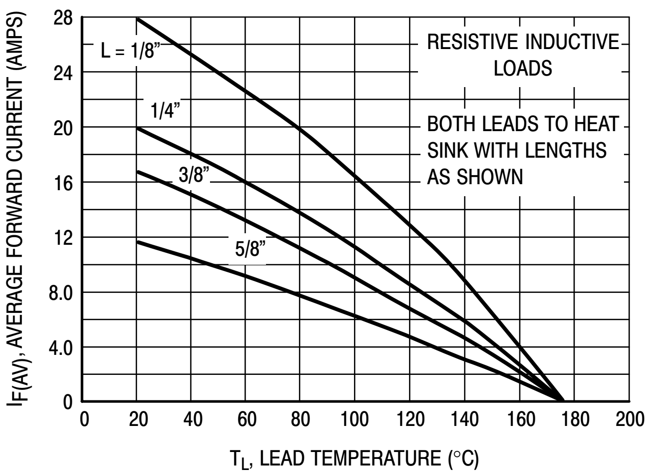


Figure 5. Maximum Current Ratings

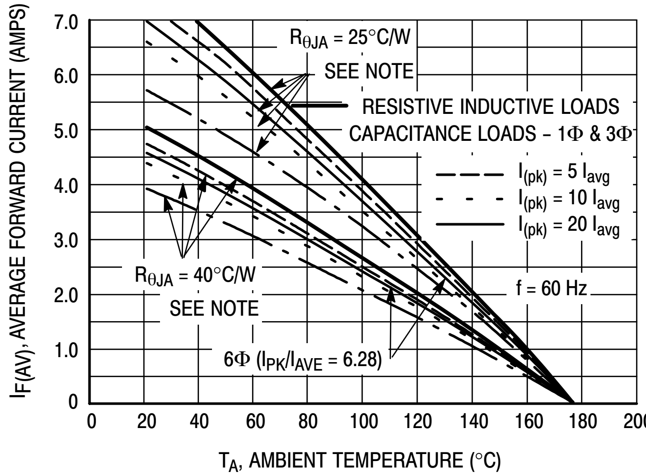


Figure 6. Maximum Current Ratings

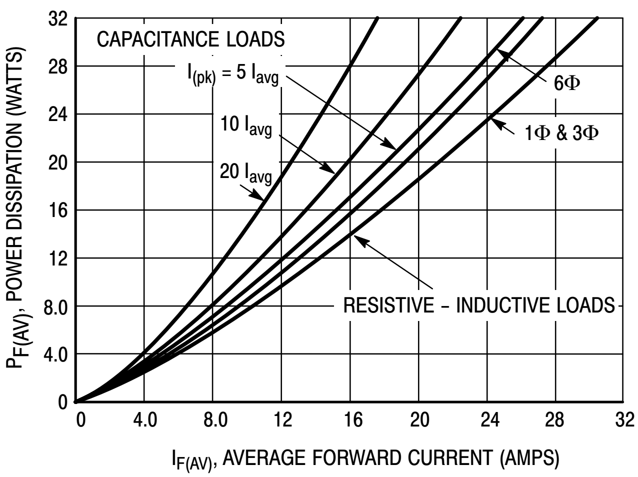


Figure 7. Power Dissipation

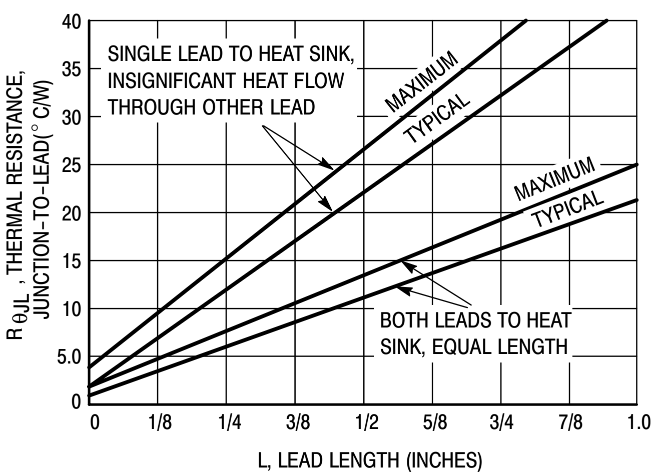
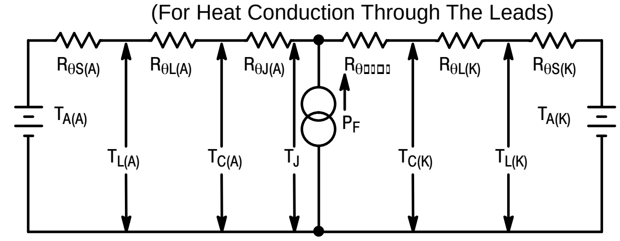


Figure 8. Steady State Thermal Resistance

NOTES

THERMAL CIRCUIT MODEL

(For Heat Conduction Through The Leads)

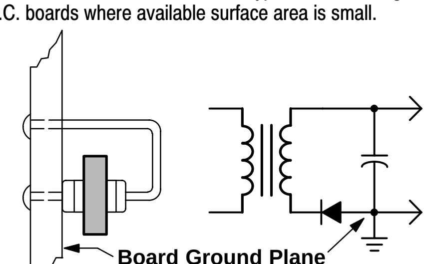


Use of the above model permits junction to lead thermal resistance for any mounting configuration to be found. Lowest values occur when one side of the rectifier is brought as close as possible to the heat sink as shown below. Terms in the model signify:

T_A = Ambient Temperature T_C = Case Temperature
T_L = Lead Temperature T_J = Junction Temperature
$R_{\theta S}$ = Thermal Resistance, Heat Sink to Ambient
$R_{\theta L}$ = Thermal Resistance, Lead to Heat Sink
$R_{\theta J}$ = Thermal Resistance, Junction to Case
P_F = Power Dissipation
(Subscripts A and K refer to anode and cathode sides, respectively.)
Values for thermal resistance components are:
$R_{\theta L}$ = 40°C/W/in. Typically and 44°C/W/in Maximum.
$R_{\theta J}$ = 2°C/W typically and 4°C/W Maximum.

Since $R_{\theta J}$ is so low, measurements of the case temperature, T_C, will be approximately equal to junction temperature in practical lead mounted applications. When used as a 60 Hz rectifierm the slow thermal response holds $T_{J(PK)}$ close to $T_{J(AVG)}$. Therefore maximum lead temperature may be found from: $T_L = 175° - R_{\theta JL}\ P_F$. P_F may be found from Figure 7.

The recommended method of mounting to a P.C. board is shown on the sketch, where $R_{\theta JA}$ is approximately 25°C/W for a 1−1/2" x 1−1/2" copper surface area. Values of 40°C/W are typical for mounting to terminal strips or P.C. boards where available surface area is small.



Recommended mounting for half wave circuit

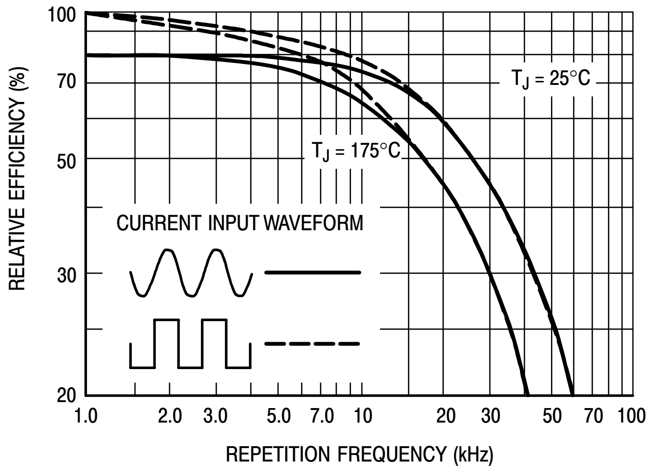


Figure 9. Rectification Efficiency

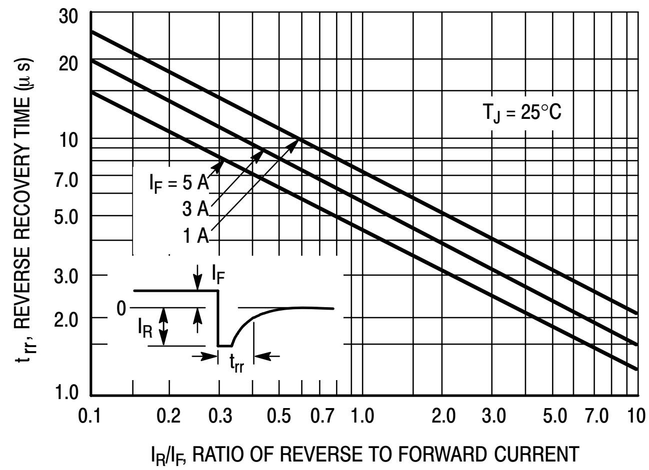


Figure 10. Reverse Recovery Time

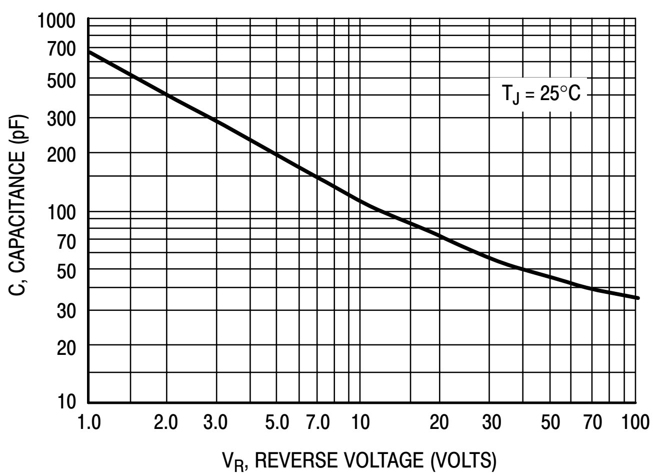


Figure 11. Junction Capacitance

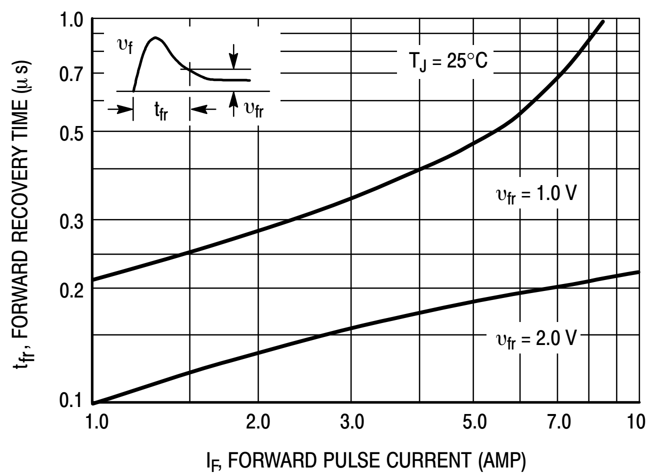


Figure 12. Forward Recovery Time

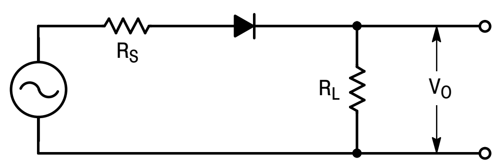


Figure 13. Single−Phase Half−Wave Rectifier Circuit

The rectification efficiency factor σ shown in Figure 9 was calculated using the formula:

$$\sigma = \frac{P_{(dc)}}{P_{(rms)}} = \frac{\frac{V^2{}_{o(dc)}}{R_L}}{\frac{V^2{}_{o(rms)}}{R_L}} \cdot 100\% = \frac{V^2{}_{o(dc)}}{V^2{}_{o(ac)} + V^2{}_{o(dc)}} \cdot 100\% \qquad (1)$$

For a sine wave input V_m sin (wt) to the diode, assumed lossless, the maximum theoretical efficiency factor becomes:

$$\sigma_{(sine)} = \frac{\frac{V^2{}_m}{\pi^2 R_L}}{\frac{V^2{}_m}{4R_L}} \cdot 100\% = \frac{4}{\pi^2} \cdot 100\% = 40.6\% \qquad (2)$$

For a square wave input of amplitude V_m, the efficiency factor becomes:

$$\sigma_{(square)} = \frac{\frac{V^2{}_m}{2R_L}}{\frac{V^2{}_m}{R_L}} \cdot 100\% = 50\% \qquad (3)$$

(A full wave circuit has twice these efficiencies)

As the frequency of the input signal is increased, the reverse recovery time of the diode (Figure 10) becomes significant, resulting in an increasing AC voltage component across R_L which is opposite in polarity to the forward current, thereby reducing the value of the efficiency factor σ, as shown on Figure 9.

It should be emphasized that Figure 9 shows waveform efficiency only; it does not provide a measure of diode losses. Data was obtained by measuring the AC component of V_o with a true rms AC voltmeter and the DC component with a DC voltmeter. The data was used in Equation 1 to obtain points for Figure 9.

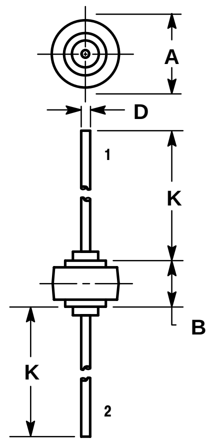
ORDERING INFORMATION

Device	Package	Shipping†
MR750	Axial Lead	1000 Units / Box
MR750G	Axial Lead (Pb−Free)	
MR750RL	Axial Lead	800 / Tape & Reel
MR750RLG	Axial Lead (Pb−Free)	
MR751	Axial Lead	1000 Units / Box
MR751G	Axial Lead (Pb−Free)	
MR751RL	Axial Lead	800 / Tape & Reel
MR751RLG	Axial Lead (Pb−Free)	
MR752	Axial Lead	1000 Units / Box
MR752G	Axial Lead (Pb−Free)	
MR752RL	Axial Lead	800 / Tape & Reel
MR752RLG	Axial Lead (Pb−Free)	
MR754	Axial Lead	1000 Units / Box
MR754G	Axial Lead (Pb−Free)	
MR754RL	Axial Lead	800 / Tape & Reel
MR754RLG	Axial Lead (Pb−Free)	
MR756	Axial Lead	1000 Units / Box
MR756G	Axial Lead (Pb−Free)	
MR756RL	Axial Lead	800 / Tape & Reel
MR756RLG	Axial Lead (Pb−Free)	
MR760	Axial Lead	1000 Units / Box
MR760G	Axial Lead (Pb−Free)	
MR760RL	Axial Lead	800 / Tape & Reel
MR760RLG	Axial Lead (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.

PACKAGE DIMENSIONS

AXIAL LEAD BUTTON
CASE 194−04
ISSUE H



NOTES:
1. CATHODE SYMBOL ON PACKAGE.
2. 194−01 OBSOLETE, 194−04 NEW STANDARD.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.43	8.69	0.332	0.342
B	5.94	6.25	0.234	0.246
D	1.27	1.35	0.050	0.053
K	25.15	25.65	0.990	1.010

STYLE 1:
PIN 1. CATHODE
2. ANODE

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
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