

International  
**IR** Rectifier

## SERIES IRK.166, .196, .236

**STANDARD RECOVERY DIODES**

**NEW INT-A-pak Power Modules**

### Features

- High Voltage
- Electrically Isolated by DBC Ceramic (  $\text{Al}_2\text{O}_3$  )
- 3500  $V_{\text{RMS}}$  Isolating Voltage
- Industrial Standard Package
- High Surge Capability
- Glass Passivated Chips
- Modules uses High Voltage Power diodes in four Basic Configurations
- Simple Mounting
- UL E78996 approved 

165 A  
195 A  
230 A

### Applications

- DC Motor Control and Drives
- Battery Charges
- Welders
- Power Converters

### Major Ratings and Characteristics

Parameters	IRK.166..	IRK.196..	IRK.236..	Units
$I_{\text{F(AV)}}$	165	195	230	A
@ $T_{\text{C}}$	100	100	100	°C
$I_{\text{F(RMS)}}$	260	305	360	A
$I_{\text{FSM}}$ @ 50Hz	4000	4750	5500	A
@ 60Hz	4200	4980	5765	A
$I^2t$ @ 50Hz	80	113	151	KA <sup>2</sup> s
@ 60Hz	73	103	138	KA <sup>2</sup> s
$I^2\sqrt{t}$	798	1130	1516	KA <sup>2</sup> √s
$V_{\text{RRM}}$	400 to 1600			V
$T_{\text{J}}$ range	-40 to 150			°C

CASE STYLE NEW INT-A-PAK



## Electrical Specifications

## Voltage Ratings

Type number	Voltage Code	$V_{RRM}$ , Maximum repetitive peak reverse voltage V	$V_{RSM}$ , Maximum non-repetitive peak reverse voltage V	$I_{RRM}$ 150°C mA
IRK.166	04	400	500	20
IRK.196	08	800	900	
IRK.236	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

## Forward Conduction

Parameter	IRK.166	IRK.196	IRK.236	Units	Conditions
$I_{F(AV)}$ Max. average on-state current @ Case temperature	165 100	195 100	230 100	A °C	180° conduction, half sine wave
$I_{F(RMS)}$ Max. RMS on-state current	260	305	360	A	
$I_{FSM}$ Maximum peak, one-cycle on-state, non-repetitive surge current	4000 4200 3350 3500	4750 4980 4000 4200	5500 5765 4630 4850	A	<div> <div> t = 10ms t = 8.3ms t = 10ms t = 8.3ms </div> <div> No voltage reappplied 100% <math>V_{RRM}</math> reappplied </div> </div>
$I^2t$ Maximum $I^2t$ for fusing	80 73 56 52	113 103 80 73	151 138 107 98	KA <sup>2</sup> s	<div> <div> t = 10ms t = 8.3ms t = 10ms t = 8.3ms </div> <div> No voltage reappplied 100% <math>V_{RRM}</math> reappplied </div> </div>
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	798	1130	1516	KA <sup>2</sup> √s	t = 0.1 to 10ms, no voltage reappplied
$V_{F(TO)1}$ Low level value of threshold voltage	0.73	0.69	0.7	V	(16.7% $\times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)}$ ), @ $T_J$ max.
$V_{F(TO)2}$ High level value of threshold voltage	0.88	0.78	0.83		( $I > \pi \times I_{F(AV)}$ ), @ $T_J$ max.
$r_{t1}$ Low level value on-state slope resistance	1.5	1.3	1.2	mΩ	(16.7% $\times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)}$ ), @ $T_J$ max.
$r_{t2}$ High level value on-state slope resistance	1.26	1.2	1.07		( $I > \pi \times I_{F(AV)}$ ), @ $T_J$ max.
$V_{FM}$ Maximum forward voltage drop	1.43	1.38	1.46	V	$I_{FM} = \pi \times I_{F(AV)}$ , $T_J = 25^\circ\text{C}$ , 180° conduction Av. power = $V_{F(TO)} \times I_{F(AV)} + r_f \times (I_{F(RMS)})^2$

## Blocking

$I_{RRM}$ Maximum peak reverse and off-state leakage current	20	mA	$T_J = 150^\circ\text{C}$
$V_{INS}$ RMS isolation voltage	3500	V	50Hz, circuit to base, all terminals shorted, t = 1s

### Thermal and Mechanical Specifications

Parameter		IRK.166	IRK.196	IRK.236	Units	Conditions
T <sub>J</sub>	Max. junction operating temperature range	-40 to 150			°C	
T <sub>stg</sub>	Max. storage temperature range	-40 to 150			°C	
R <sub>thJC</sub>	Max. thermal resistance, junction to case	0.2	0.16	0.14	K/W	DC operation, per junction
R <sub>thCS</sub>	Max. thermal resistance, case to heatsink	0.05			K/W	Mounting surface smooth, flat and greased Per module
T	Mounting IAP to heatsink	4 to 6			Nm	A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound. Lubricated threads.
	torque ± 10% busbar to IAP	4 to 6				
wt	Approximate weight	200 (7.1)			g (oz)	
Case Style		New Int-A-Pak				

### ΔR Conduction (per Junction)

(The following table shows the increment of thermal resistance R<sub>thJC</sub> when devices operate at different conduction angles than DC)

Devices	Sinusoidal conduction @ T <sub>J</sub> max.					Rectangular conduction @ T <sub>J</sub> max.					Units
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
IRK.166	0.025	0.03	0.038	0.055	0.089	0.018	0.031	0.041	0.057	0.089	K/W
IRK.196	0.016	0.019	0.024	0.034	0.053	0.012	0.02	0.026	0.035	0.054	
IRK.236	0.009	0.010	0.014	0.018	0.025	0.008	0.012	0.015	0.019	0.025	

### Ordering Information Table

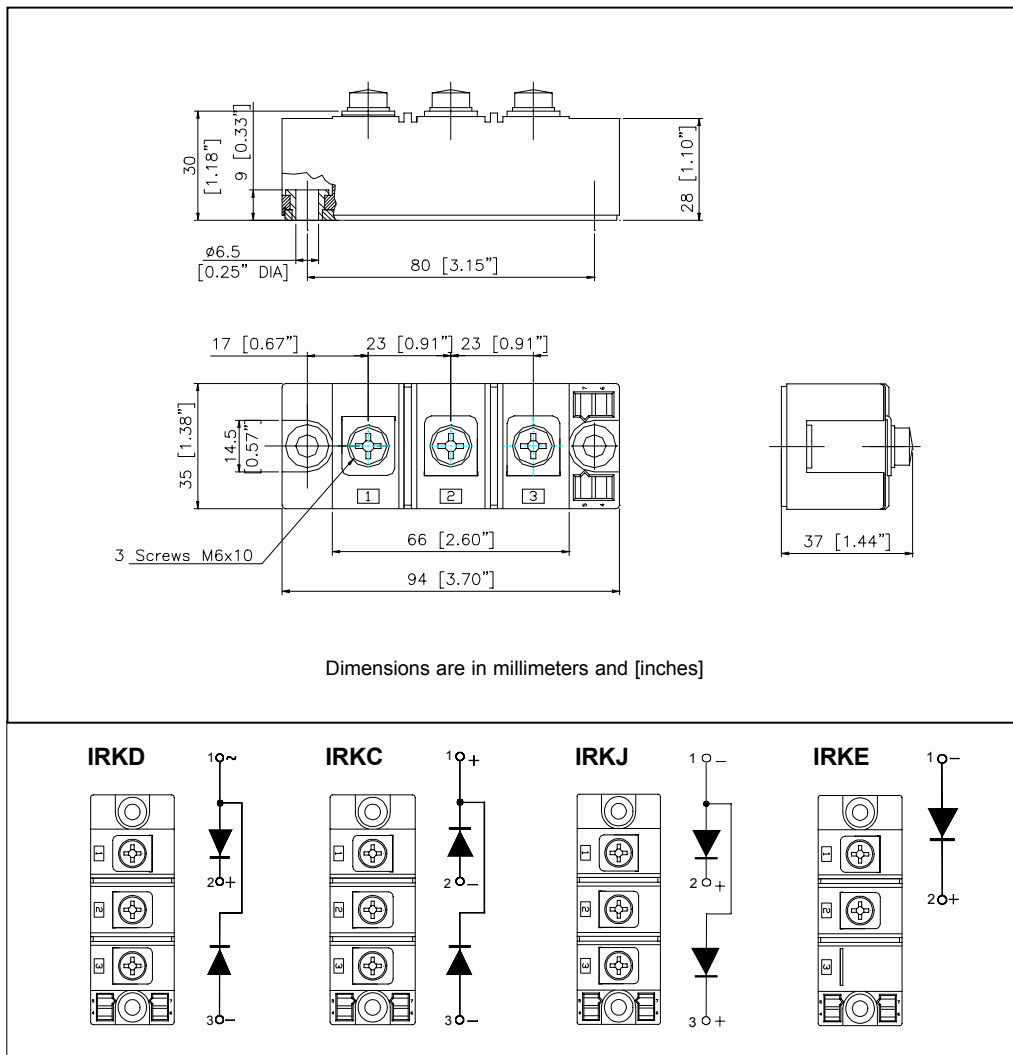
<b>Device Code</b>		<div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; padding: 2px 5px; margin: 0 2px;">IRK</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 0 2px;">D</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 0 2px;">236</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 0 2px;">/</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 0 2px;">16</div> </div>			
		①	②	③	④
<b>1</b>	-	Module Type			
<b>2</b>	-	Circuit Configuration			
<b>3</b>	-	Current Rating: I <sub>F(AV)</sub>			
<b>4</b>	-	Voltage Code: Code x 100 = V <sub>RRM</sub>			

## IRK.166, .196, .236 Series

Bulletin I27116 rev. C 03/02

International  
**IOR** Rectifier

Outline Table



**NOTE:** To order the Optional Hardware see Bulletin I27900

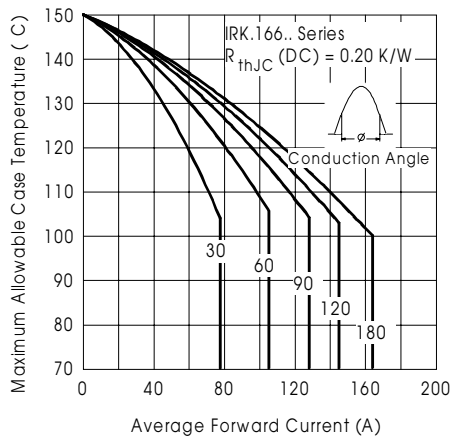


Fig. 1 - Current Ratings Characteristics

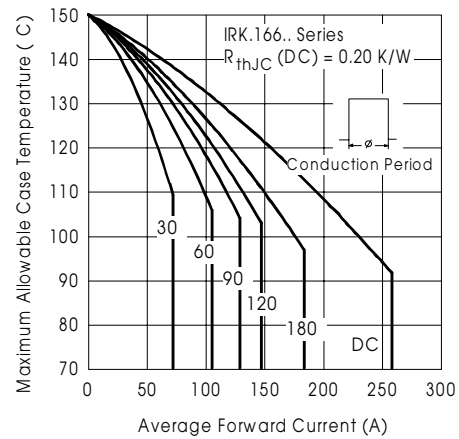


Fig. 2 - Current Ratings Characteristics

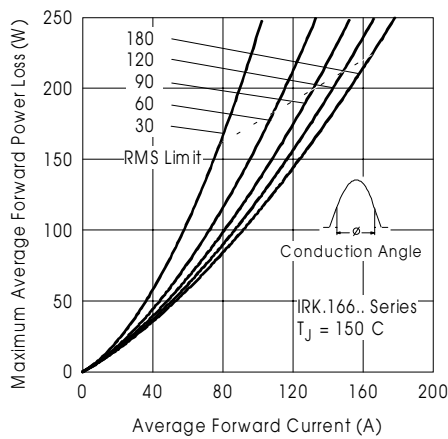


Fig. 3 - On-State Power Loss Characteristics

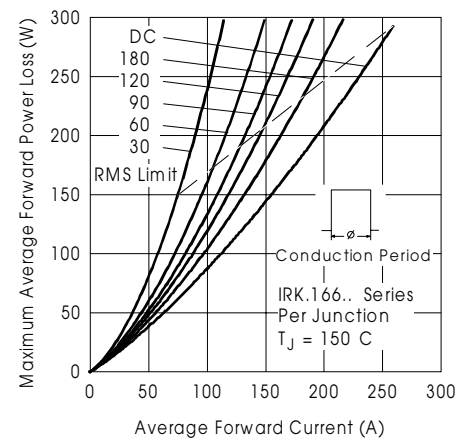


Fig. 4 - On-State Power Loss Characteristics

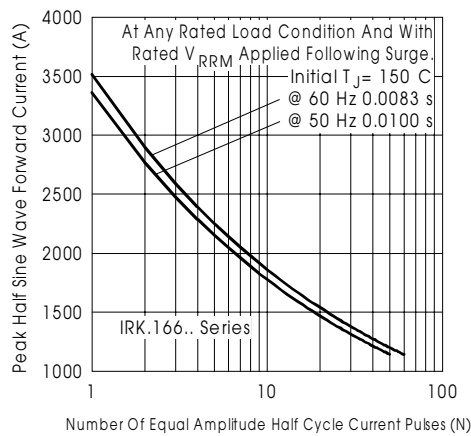


Fig. 5 - Maximum Non-Repetitive Surge Current

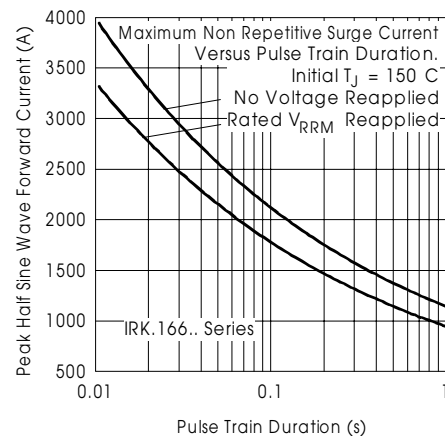


Fig. 6 - Maximum Non-Repetitive Surge Current

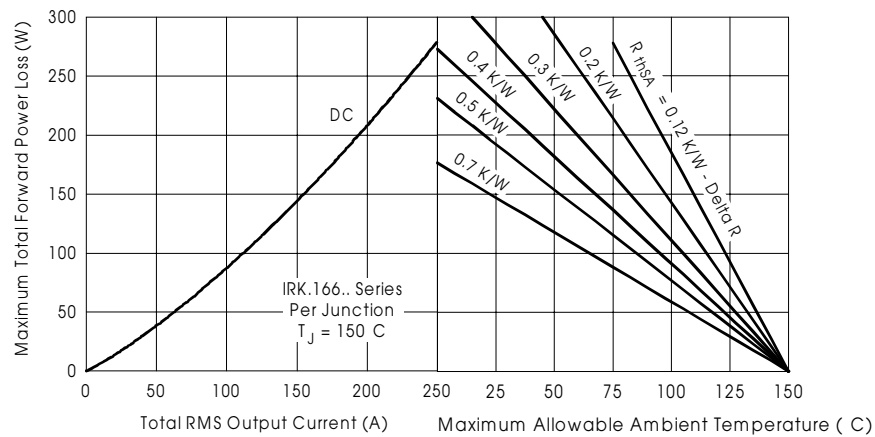


Fig.7 - On State Power Loss Characteristics

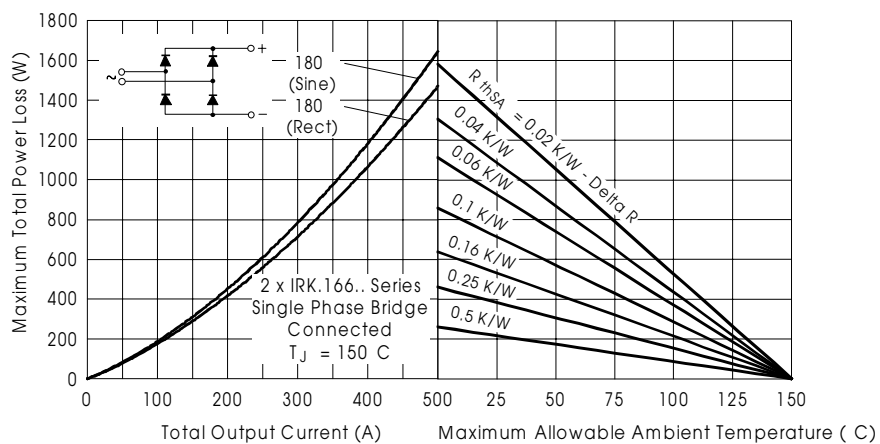


Fig.8 - On State Power Loss Characteristics

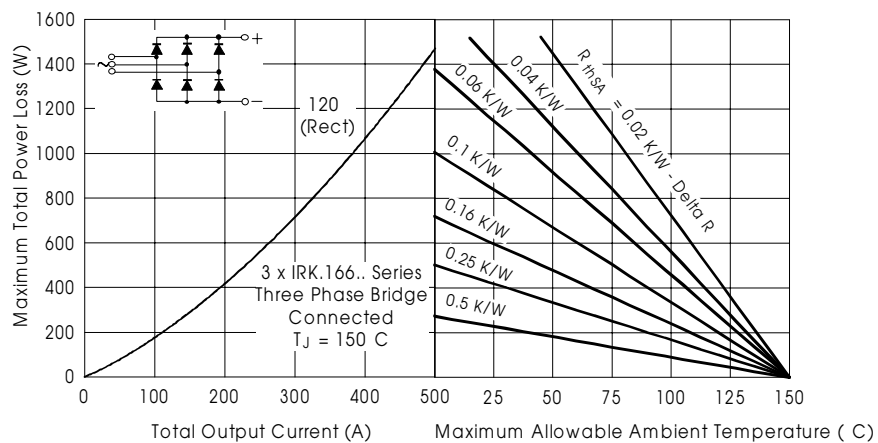


Fig.9 - On State Power Loss Characteristics

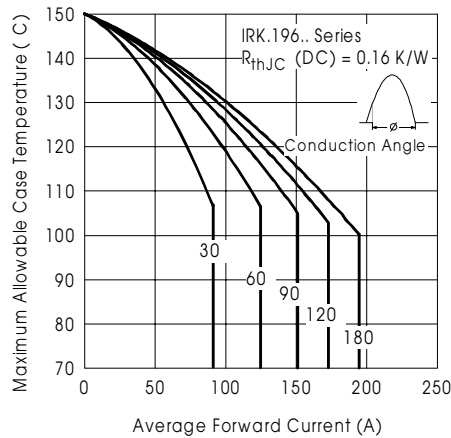


Fig. 10 - Current Ratings Characteristics

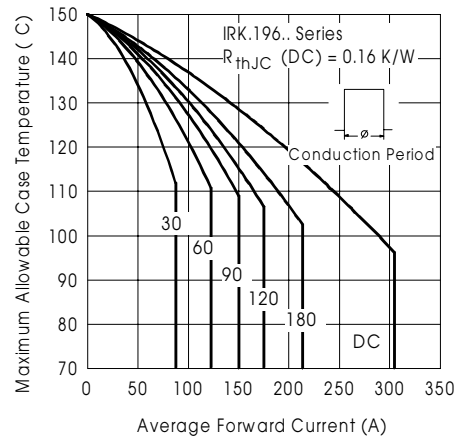


Fig. 11 - Current Ratings Characteristics

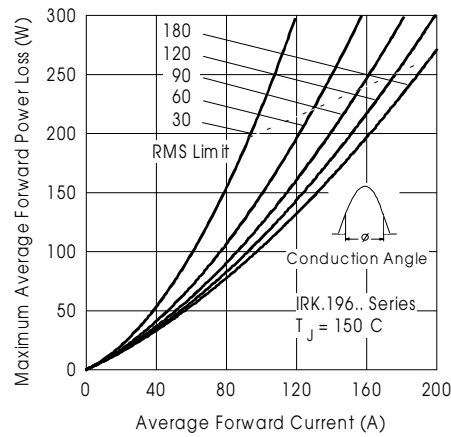


Fig. 12 - On-State Power Loss Characteristics

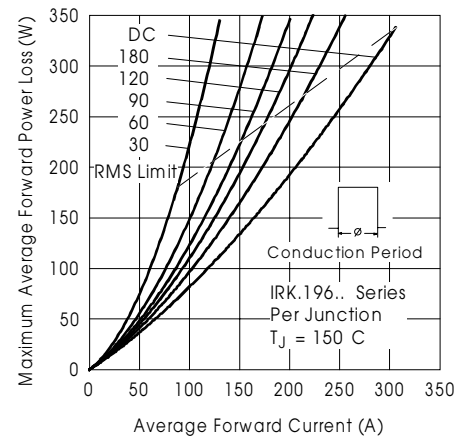


Fig. 13 - On-State Power Loss Characteristics

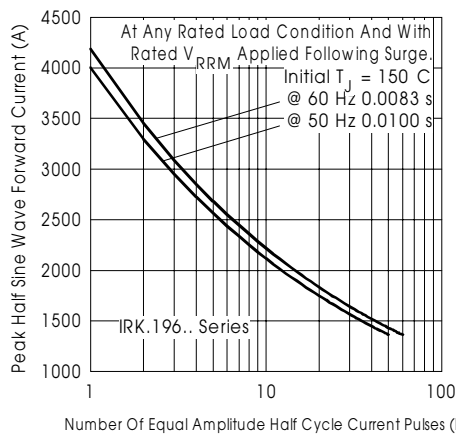


Fig. 14 - Maximum Non-Repetitive Surge Current

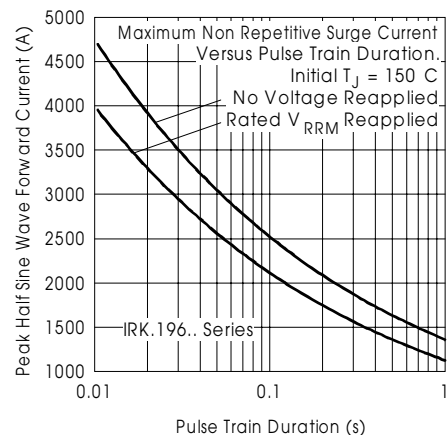


Fig. 15 - Maximum Non-Repetitive Surge Current

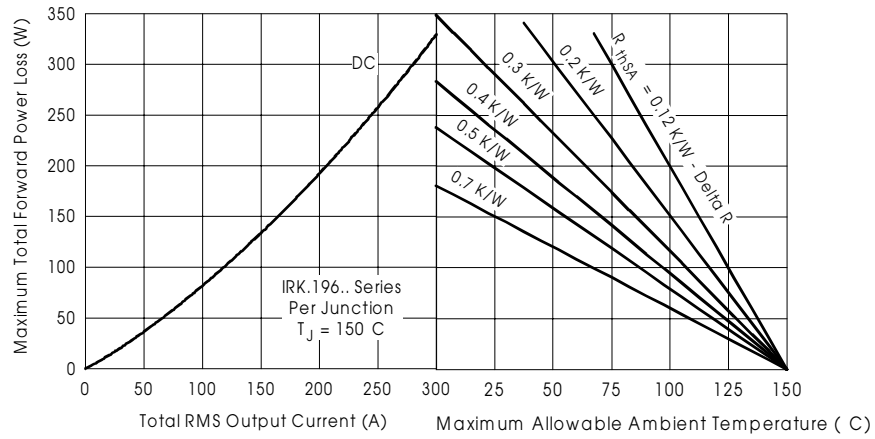


Fig.16 - On State Power Loss Characteristics

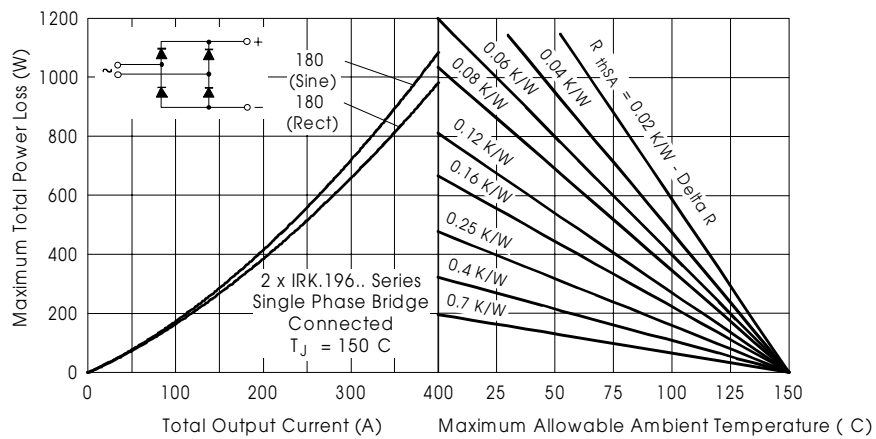


Fig.17 - On State Power Loss Characteristics

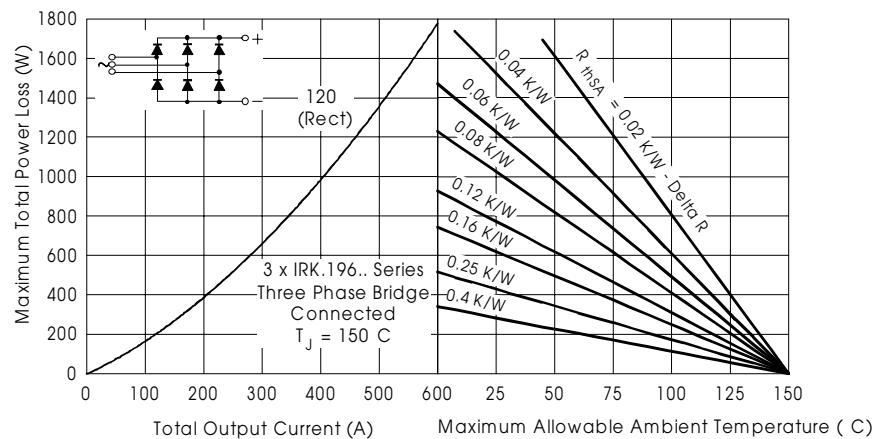


Fig.18- On State Power Loss Characteristics



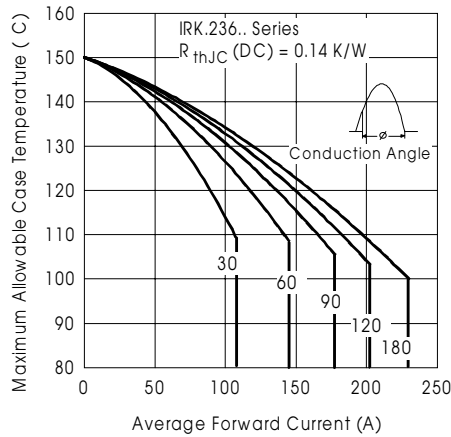


Fig. 19 - Current Ratings Characteristics

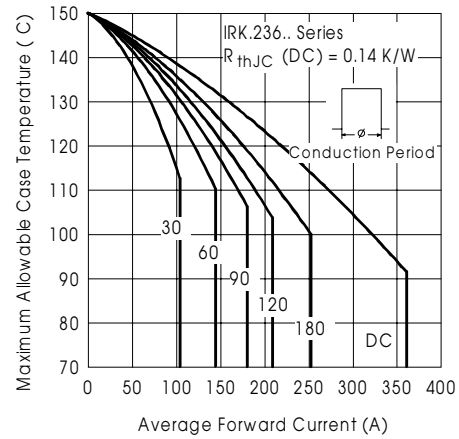


Fig. 20 - Current Ratings Characteristics

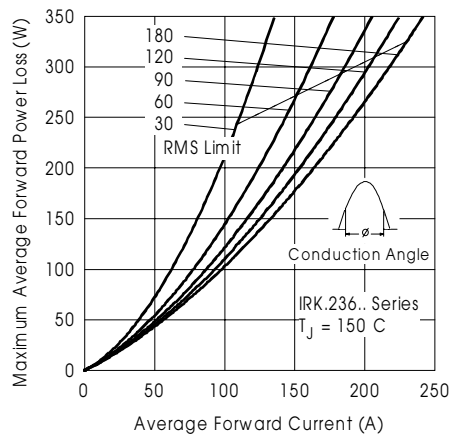


Fig. 21 - On-State Power Loss Characteristics

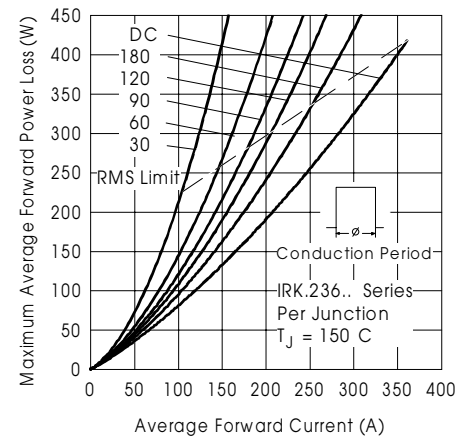


Fig. 22 - On-State Power Loss Characteristics

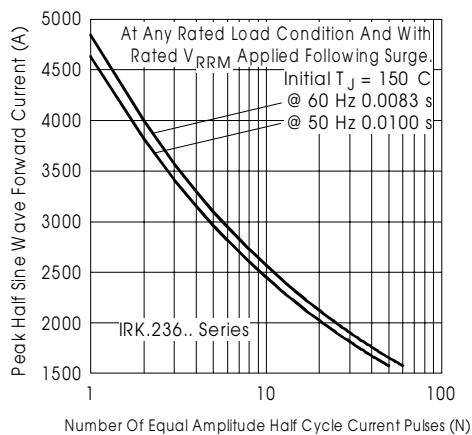


Fig.23 - Maximum Non-Repetitive Surge Current

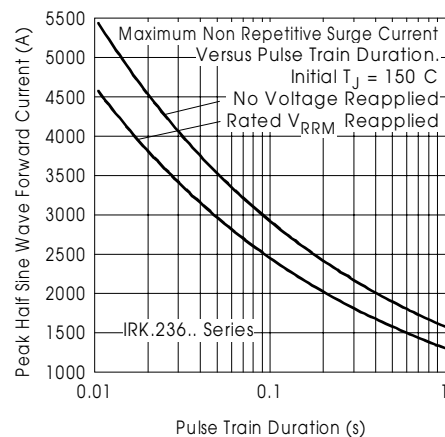


Fig. 24 - Maximum Non-Repetitive Surge Current

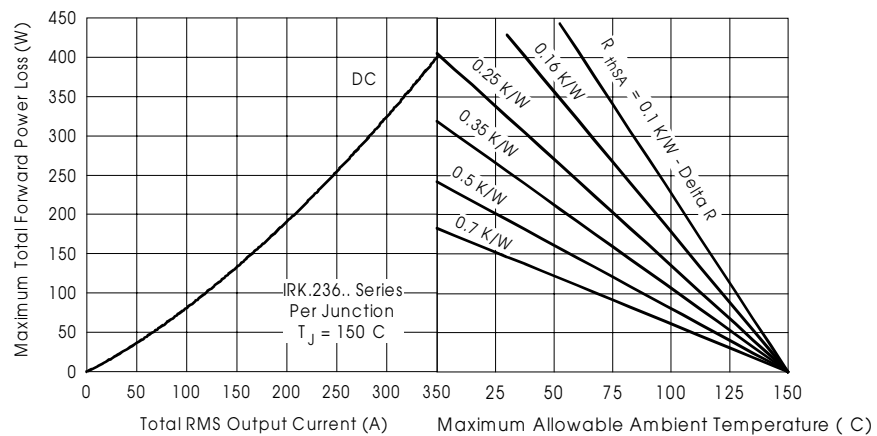


Fig.25 - On State Power Loss Characteristics

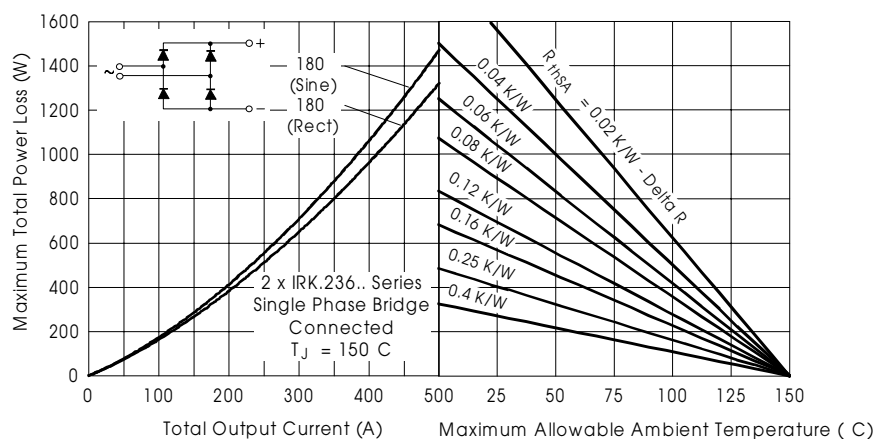


Fig.26 - On State Power Loss Characteristics

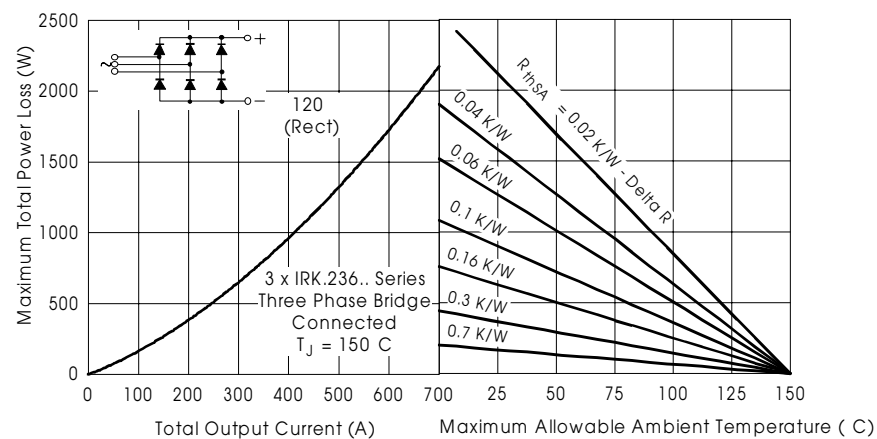


Fig.27 - On State Power Loss Characteristics

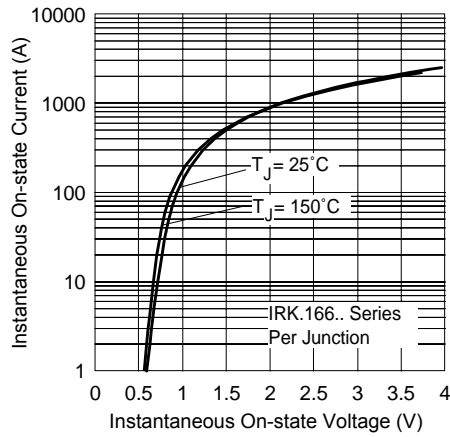


Fig.28 - On State Voltage Drop Characteristics

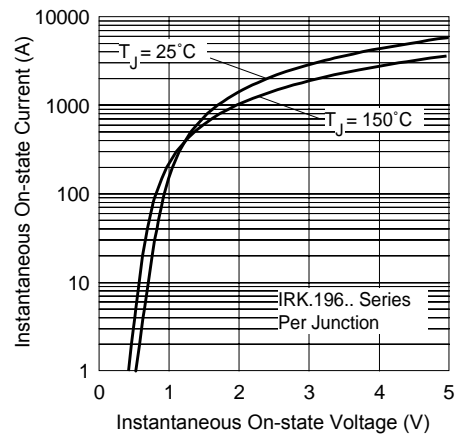


Fig.29 - On State Voltage Drop Characteristics

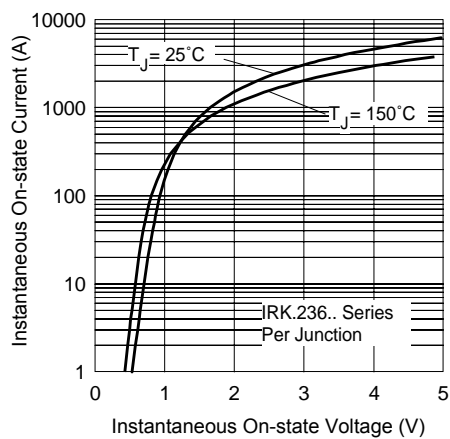


Fig.30 - On State Voltage Drop Characteristics

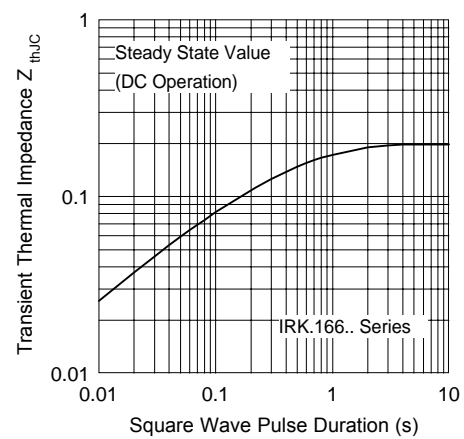


Fig.31 - Thermal Impedance  $Z_{thJC}$  Characteristics

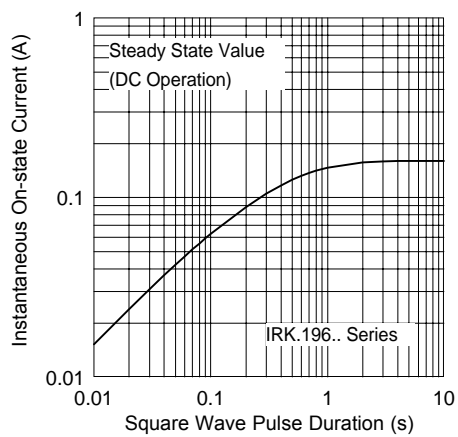


Fig.32 - Thermal Impedance  $Z_{thJC}$  Characteristics

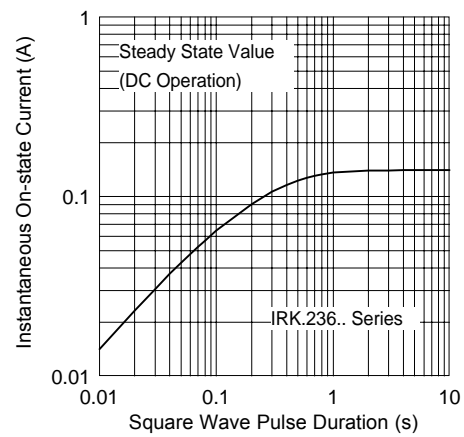


Fig.33 - Thermal Impedance  $Z_{thJC}$  Characteristics

**IRK.166, .196, .236 Series**

Bulletin I27116 rev. C 03/02

International  
**IOR** Rectifier

Data and specifications subject to change without notice.  
This product has been designed and qualified for Multiple Level.  
Qualification Standards can be found on IR's Web site.

International  
**IOR** Rectifier

**IR WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105  
TAC Fax: (310) 252-7309  
Visit us at [www.irf.com](http://www.irf.com) for sales contact information. 03/02