

Bulletin I27116 rev. C 03/02

# 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 ( $Al_2O_3$ )
- 3500  $V_{RMS}$  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
$I_{F(AV)}$	165	195	230	A
@ $T_C$	100	100	100	°C
$I_{F(RMS)}$	260	305	360	A
$I_{FSM}$ @ 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
$V_{RRM}$	400 to 1600			V
$T_J$ 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	195	230	A	180° conduction, half sine wave	
	100	100	100	°C		
$I_{F(RMS)}$ Max. RMS on-state current	260	305	360	A		
$I_{FSM}$ Maximum peak, one-cycle on-state, non-repetitive surge current	4000	4750	5500	A	t = 10ms No voltage	Sine half wave, Initial $T_J = T_J \text{ max.}$
	4200	4980	5765		t = 8.3ms reappplied	
	3350	4000	4630		t = 10ms 100% $V_{RRM}$	
	3500	4200	4850		t = 8.3ms reappplied	
$I^2t$ Maximum $I^2t$ for fusing	80	113	151	KA <sup>2</sup> s	t = 10ms No voltage	
	73	103	138		t = 8.3ms reappplied	
	56	80	107		t = 10ms 100% $V_{RRM}$	
	52	73	98		t = 8.3ms reappplied	
$I^2\sqrt{t}$ 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% x $\pi \times I_{F(AV)} < I < \pi \times I_{F(AV)}$ ), @ $T_J \text{ max.}$	
$V_{F(TO)2}$ High level value of threshold voltage	0.88	0.78	0.83		( $I > \pi \times I_{F(AV)}$ ), @ $T_J \text{ max.}$	
$r_{\theta 1}$ Low level value on-state slope resistance	1.5	1.3	1.2	mΩ	(16.7% x $\pi \times I_{F(AV)} < I < \pi \times I_{F(AV)}$ ), @ $T_J \text{ max.}$	
$r_{\theta 2}$ High level value on-state slope resistance	1.26	1.2	1.07		( $I > \pi \times I_{F(AV)}$ ), @ $T_J \text{ max.}$	
$V_{FM}$ 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 torque ± 10%	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.
IAP to heatsink 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	

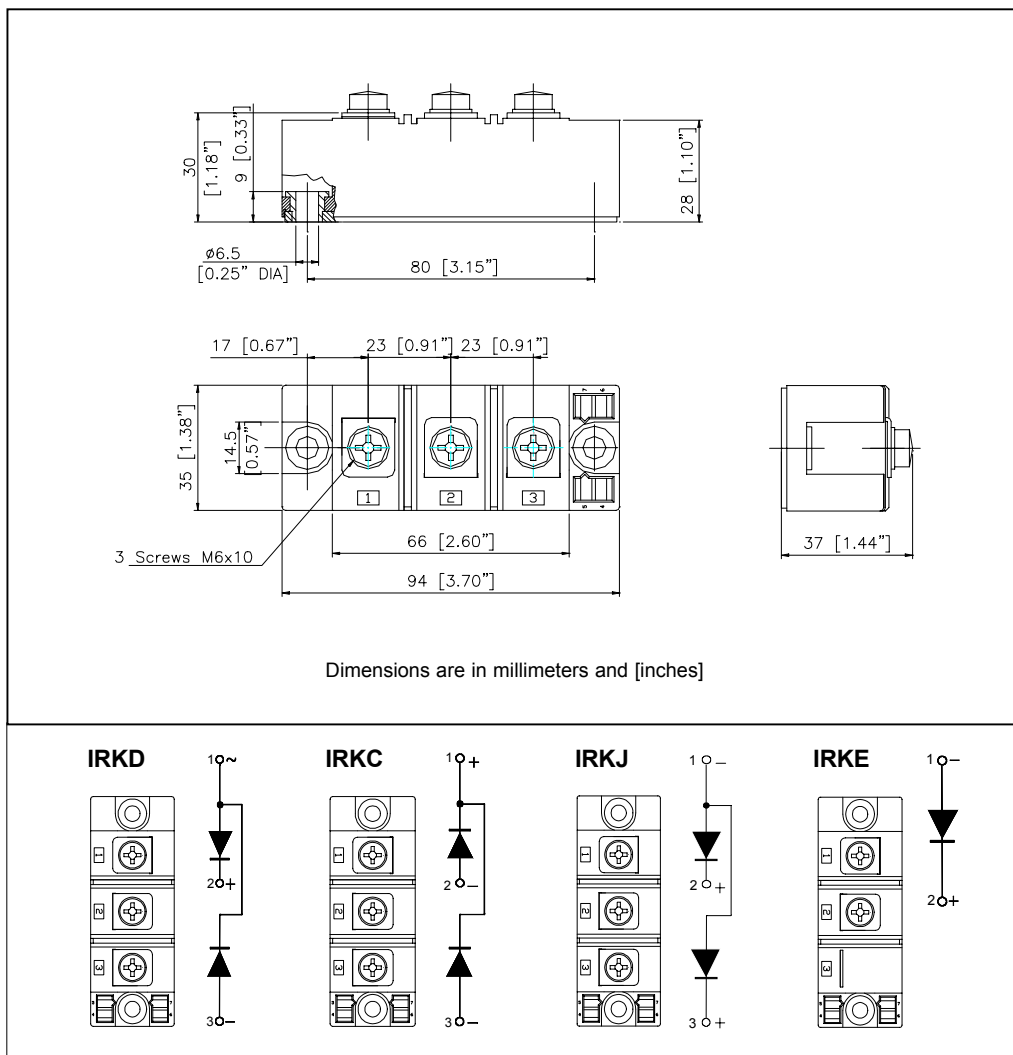
**Ordering Information Table**

**Device Code**

<b>IRK</b>	<b>D</b>	<b>236</b>	<b>/</b>	<b>16</b>
①	②	③		④

- 1** - Module Type
- 2** - Circuit Configuration
- 3** - Current Rating: I<sub>F(AV)</sub>
- 4** - Voltage Code: Code x 100 = V<sub>RRM</sub>

Outline Table



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

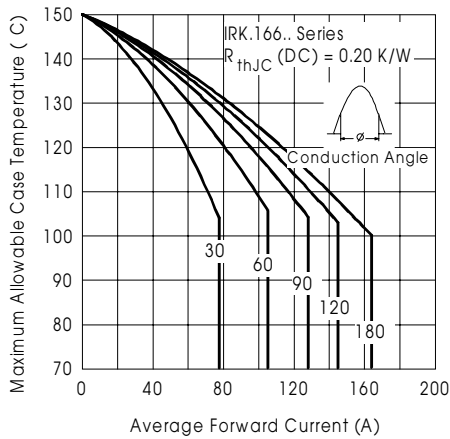


Fig. 1 - Current Ratings Characteristics

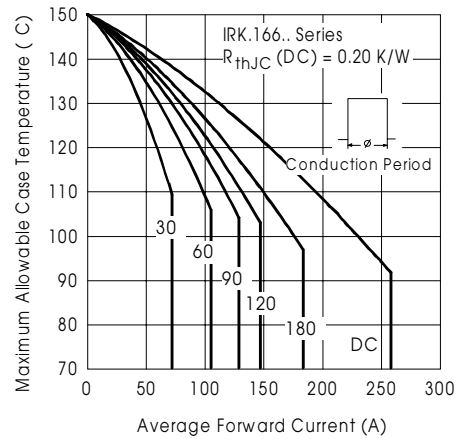


Fig. 2 - Current Ratings Characteristics

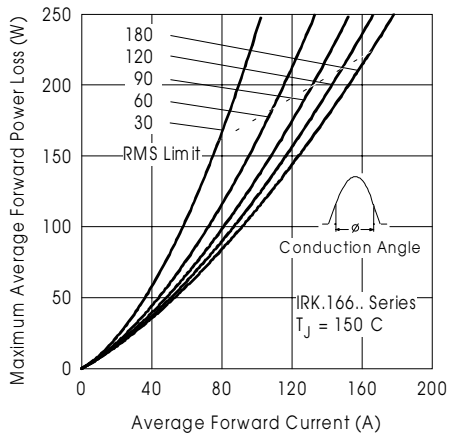


Fig. 3 - On-State Power Loss Characteristics

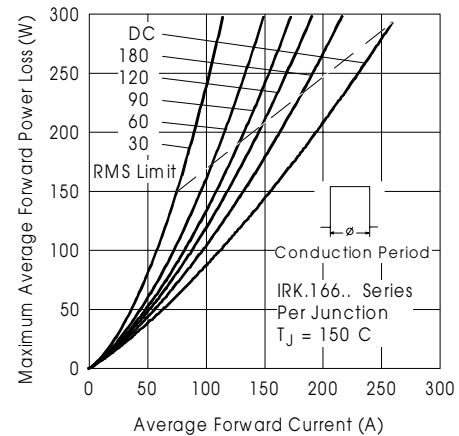


Fig. 4 - On-State Power Loss Characteristics

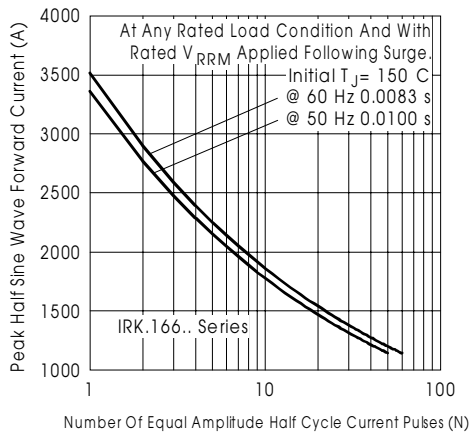


Fig. 5 - Maximum Non-Repetitive Surge Current

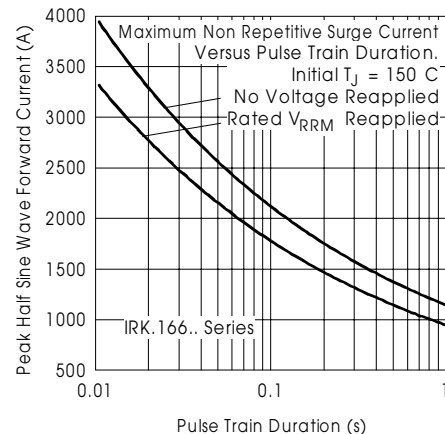


Fig. 6 - Maximum Non-Repetitive Surge Current

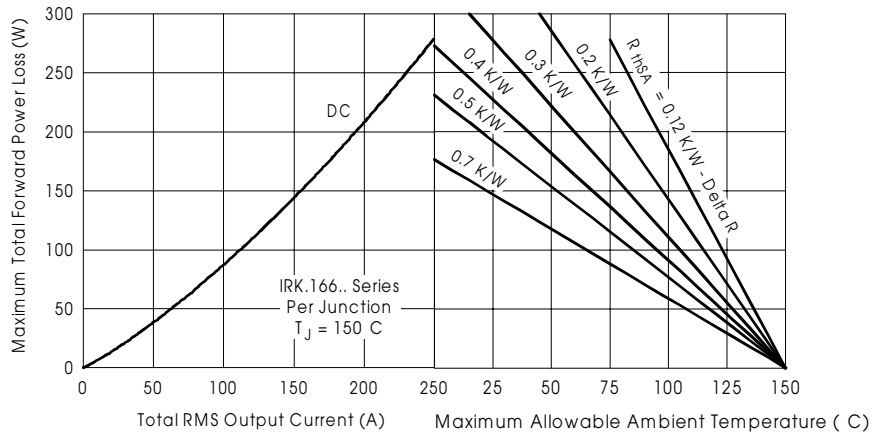


Fig.7 - On State Power Loss Characteristics

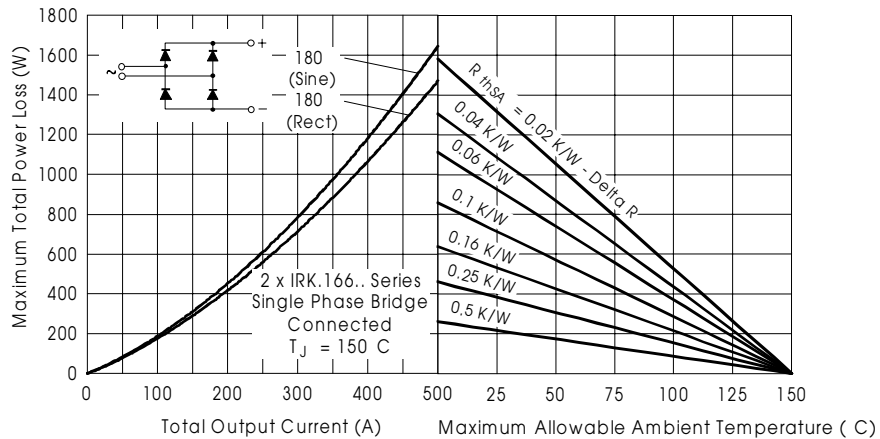


Fig.8 - On State Power Loss Characteristics

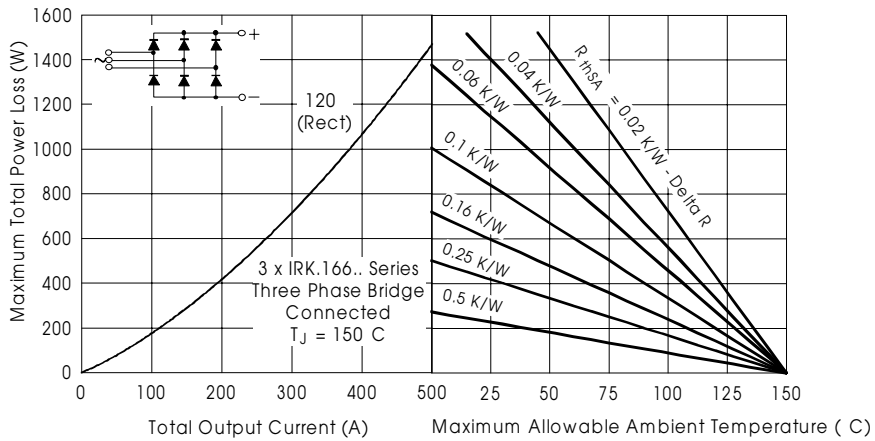


Fig.9 - On State Power Loss Characteristics

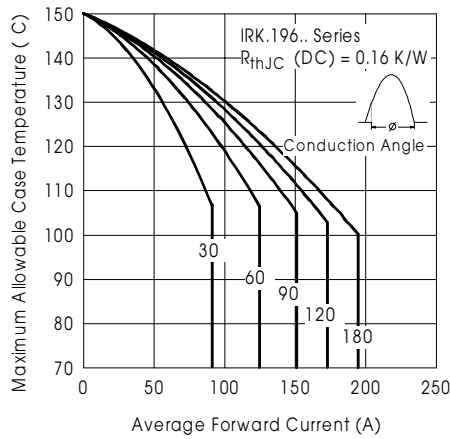


Fig. 10 - Current Ratings Characteristics

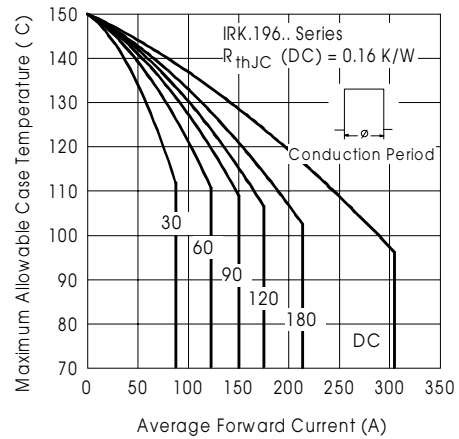


Fig. 11 - Current Ratings Characteristics

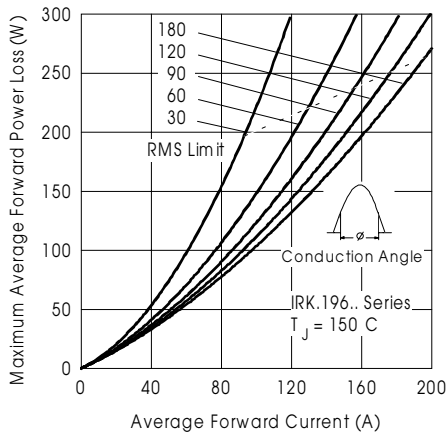


Fig. 12 - On-State Power Loss Characteristics

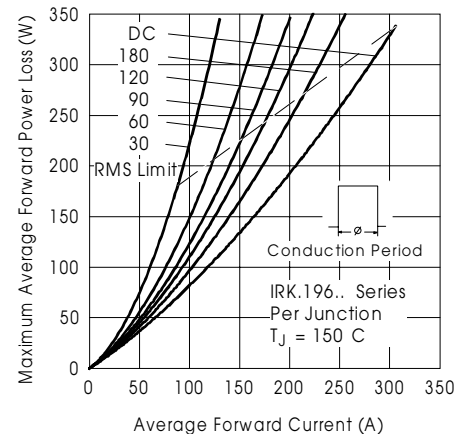


Fig. 13 - On-State Power Loss Characteristics

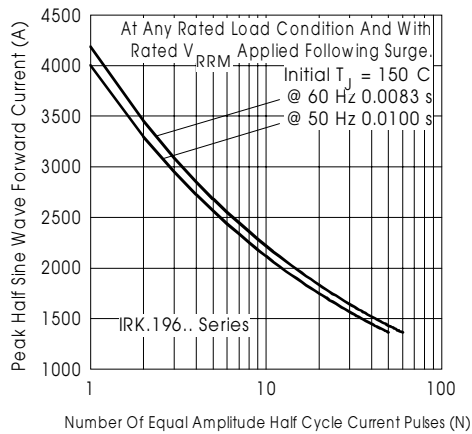


Fig. 14 - Maximum Non-Replicative Surge Current

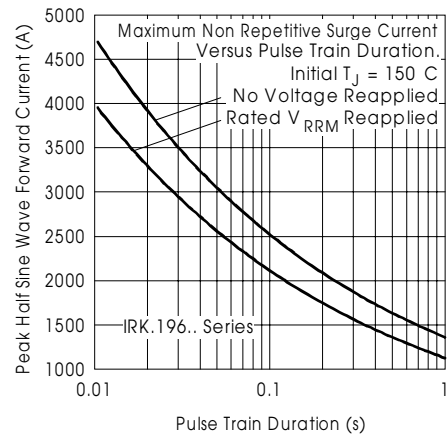


Fig. 15 - Maximum Non-Replicative Surge Current

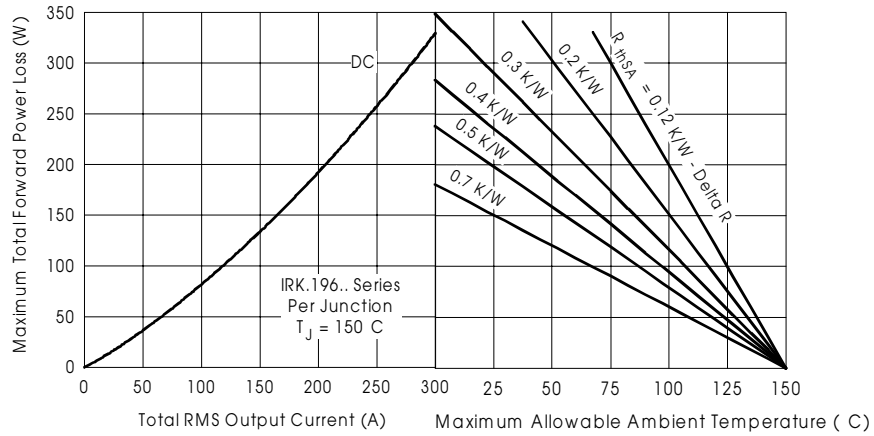


Fig.16 - On State Power Loss Characteristics

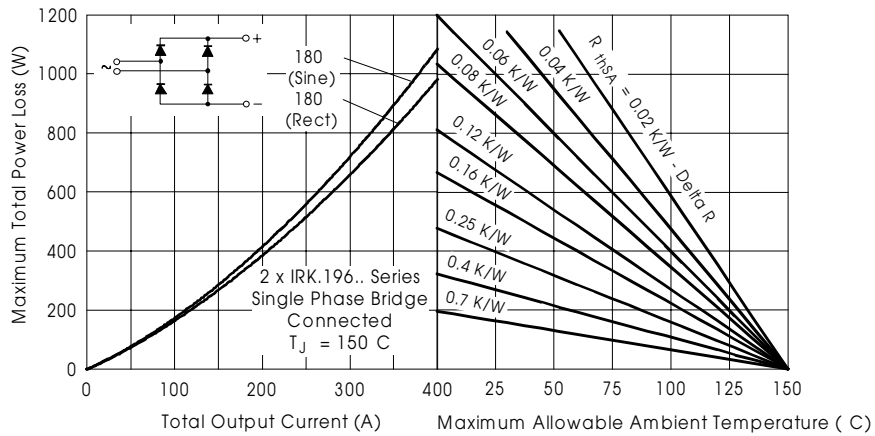


Fig.17 - On State Power Loss Characteristics

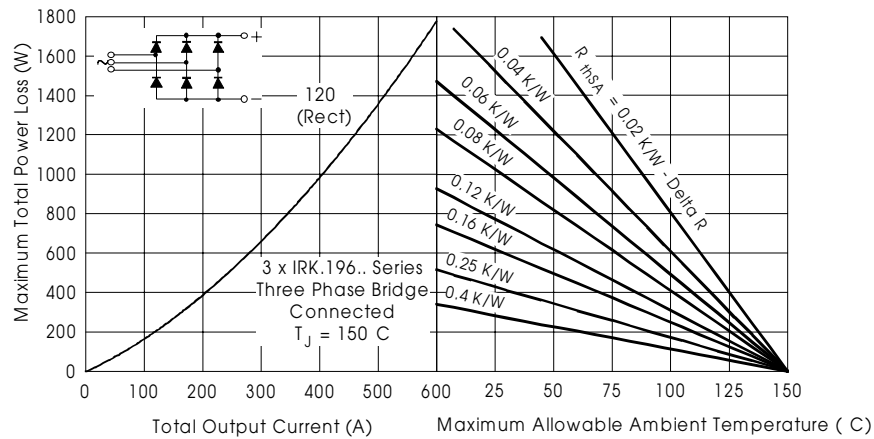


Fig.18 - On State Power Loss Characteristics

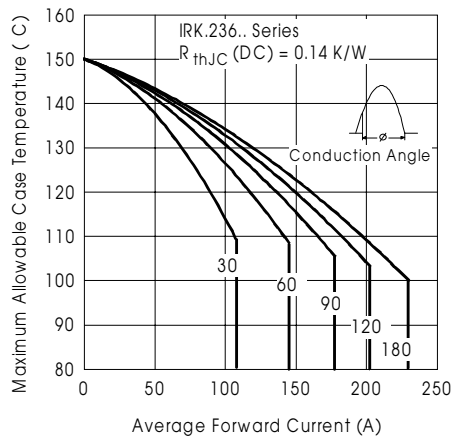


Fig. 19 - Current Ratings Characteristics

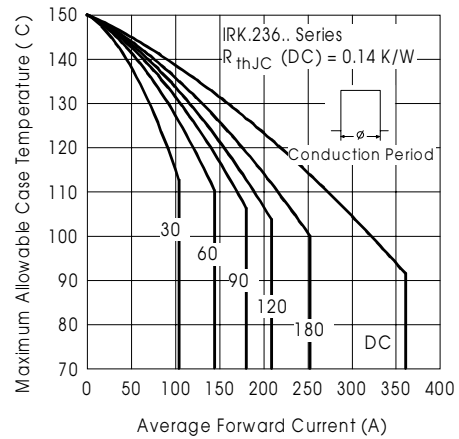


Fig. 20 - Current Ratings Characteristics

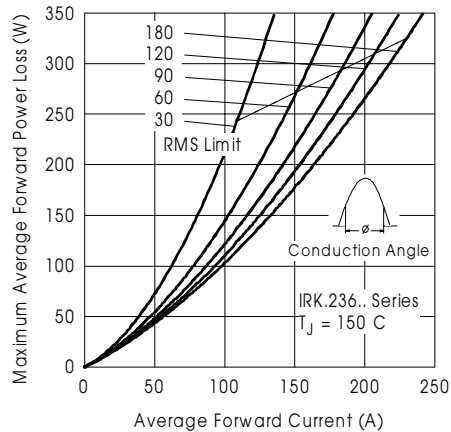


Fig. 21 - On-State Power Loss Characteristics

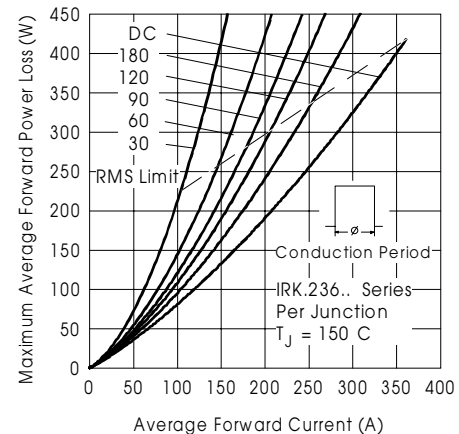


Fig. 22 - On-State Power Loss Characteristics

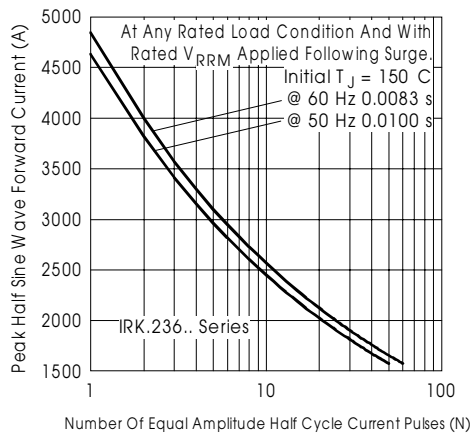


Fig. 23 - Maximum Non-Repetitive Surge Current

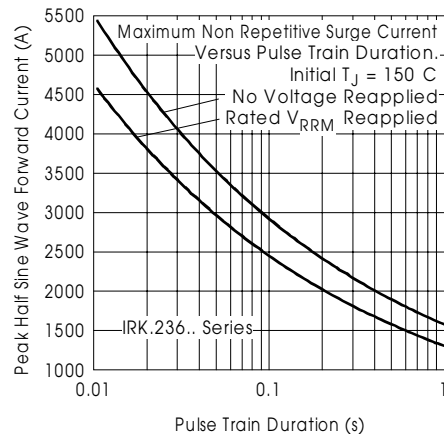


Fig. 24 - Maximum Non-Repetitive Surge Current

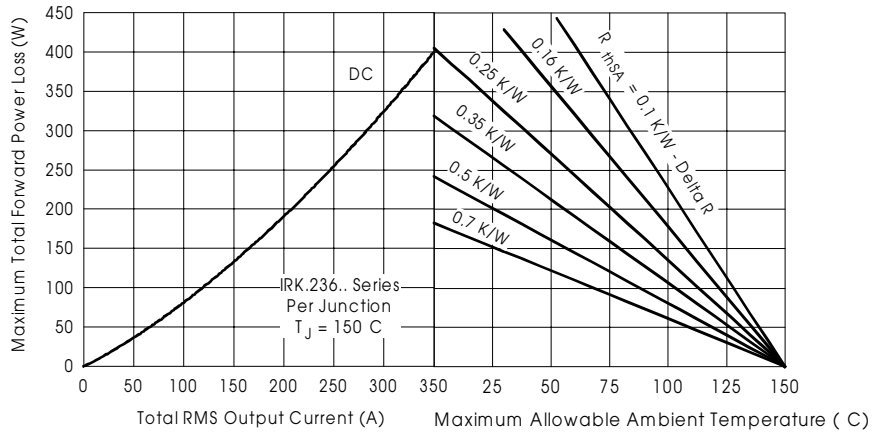


Fig.25 - On State Power Loss Characteristics

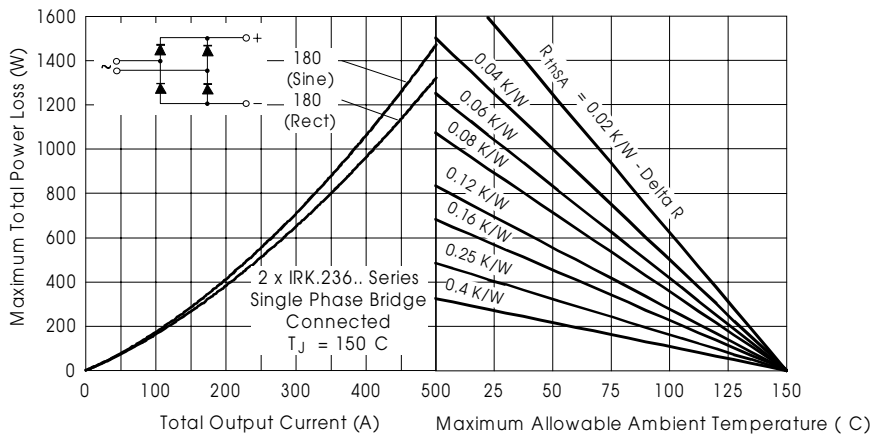


Fig.26 - On State Power Loss Characteristics

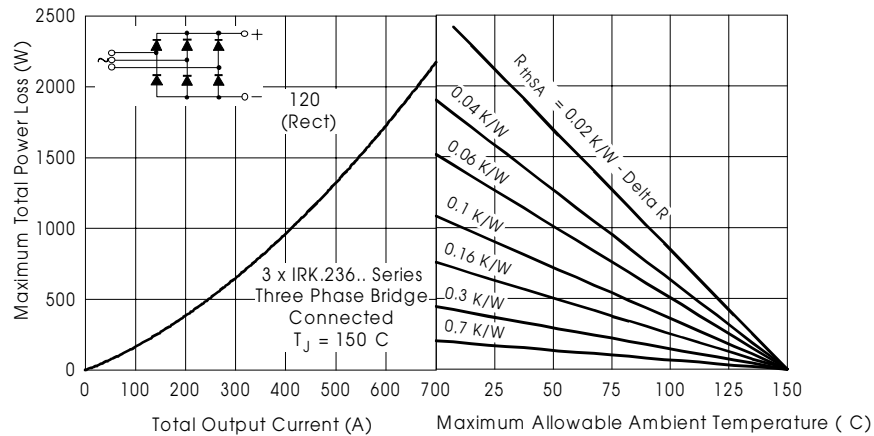


Fig.27 - On State Power Loss Characteristics

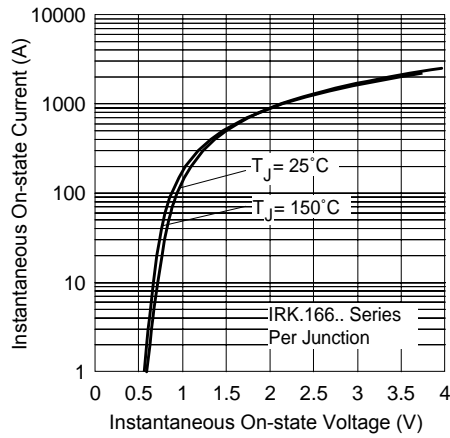


Fig.28 - On State Voltage Drop Characteristics

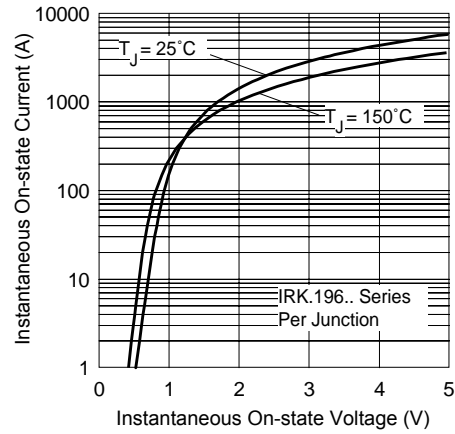


Fig.29 - On State Voltage Drop Characteristics

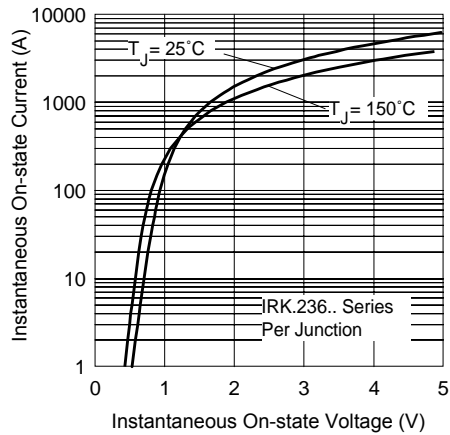


Fig.30 - On State Voltage Drop Characteristics

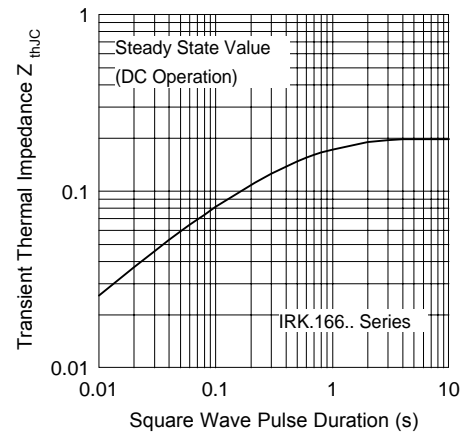


Fig.31 - Thermal Impedance  $Z_{thJC}$  Characteristics

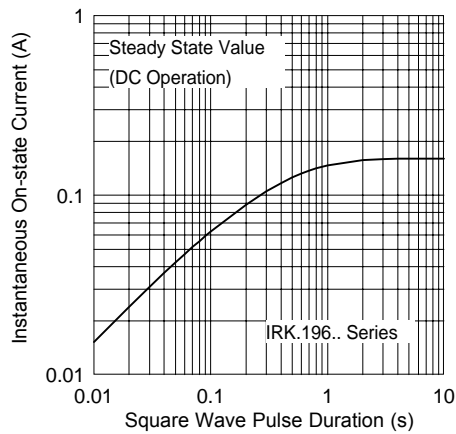


Fig.32 - Thermal Impedance  $Z_{thJC}$  Characteristics

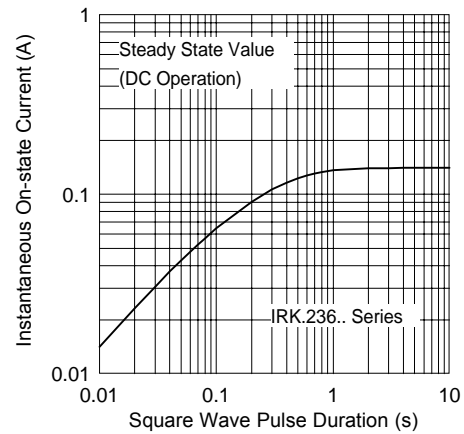


Fig.33 - Thermal Impedance  $Z_{thJC}$  Characteristics

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

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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.

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