Bulletin I27116 rev. C 03/02

International
IOR Rectifier

SERIES IRK.166, .196, .236

STANDARD RECOVERY DIODES

NEW INT-A-pak Power Modules

165 A
195 A
230 A

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

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^2s
@ 60Hz	73	103	138	KA^2s
$I^2\sqrt{t}$	798	1130	1516	$KA^2\sqrt{s}$
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 m A
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	165	195	230	A	180° conduction, half sine wave		
	@ Case temperature	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 reapplied	Sine half wave, Initial $T_J = T_J$ max.
		4200	4980	5765		t = 8.3ms		
		3350	4000	4630		t = 10ms	100% V_{RRM} reapplied	
		3500	4200	4850		t = 8.3ms		
I^2t	Maximum I^2t for fusing	80	113	151	KA^2s	t = 10ms	No voltage reapplied	
		73	103	138		t = 8.3ms		
		56	80	107		t = 10ms	100% V_{RRM} reapplied	
		52	73	98		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	798	1130	1516	$KA^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		
$V_{F(TO)1}$	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°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°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_J	Max. junction operating temperature range	-40 to 150			°C	
T_{stg}	Max. storage temperature range	-40 to 150			°C	
R_{thJC}	Max. thermal resistance, junction to case	0.2	0.16	0.14	K/W	DC operation, per junction
R_{thCS}	Max. thermal resistance, case to heatsink	0.05			K/W	Mounting surface smooth, flat and greased Per module
T	Mounting torque ± 10% — 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.
	Mounting torque ± 10% — busbar to IAP	4 to 6				
wt	Approximate weight	200 (7.1)			g (oz)	
	Case Style	New Int-A-Pak				

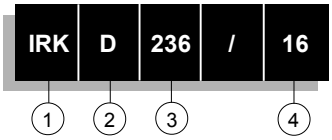
ΔR Conduction (per Junction)

(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

Devices	Sinusoidal conduction @ T_J max.					Rectangular conduction @ T_J 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	

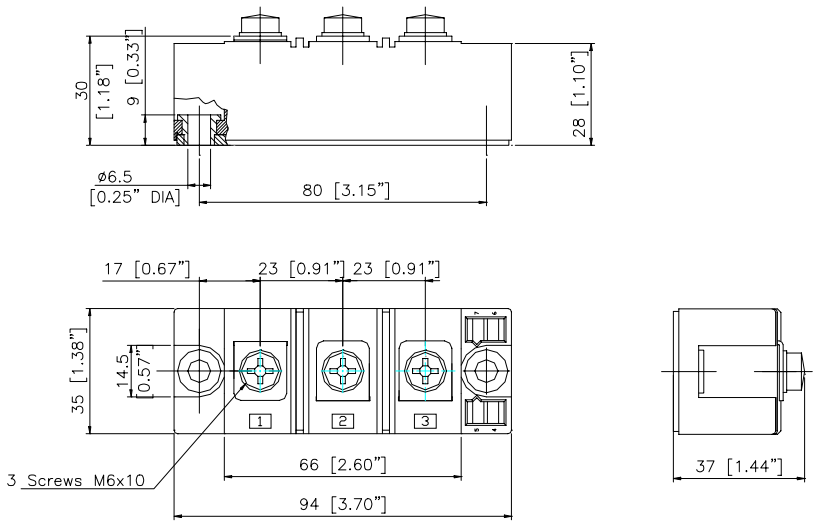
Ordering Information Table

Device Code

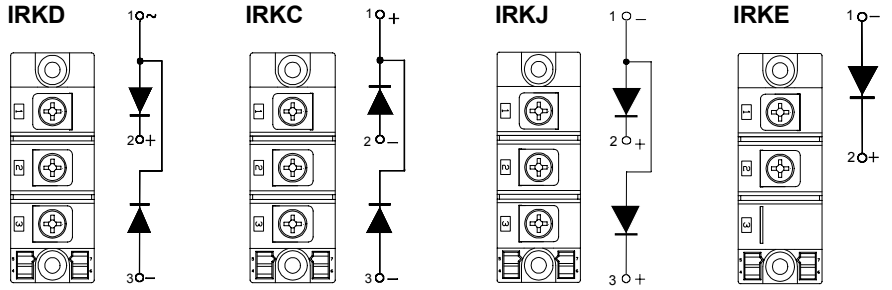


1 - Module Type
2 - Circuit Configuration
3 - Current Rating: $I_{F(AV)}$
4 - Voltage Code: Code x 100 = V_{RRM}

Outline Table



Dimensions are in millimeters and [inches]



NOTE: To order the Optional Hardware see Bulletin I27900

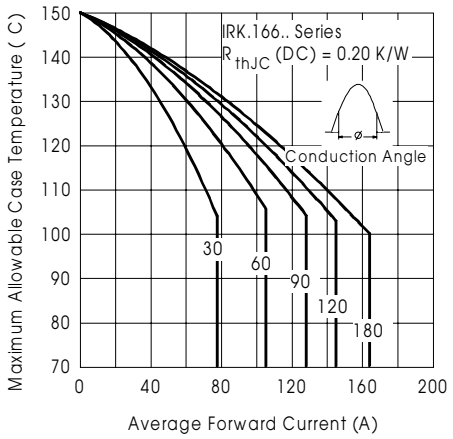


Fig. 1 - Current Ratings Characteristics

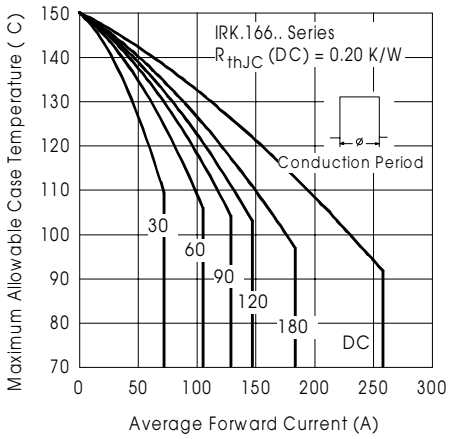


Fig. 2 - Current Ratings Characteristics

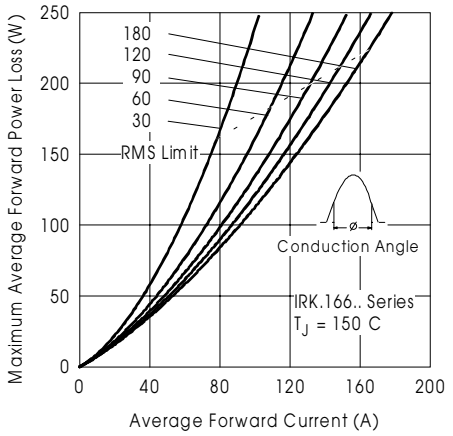


Fig. 3 - On-State Power Loss Characteristics

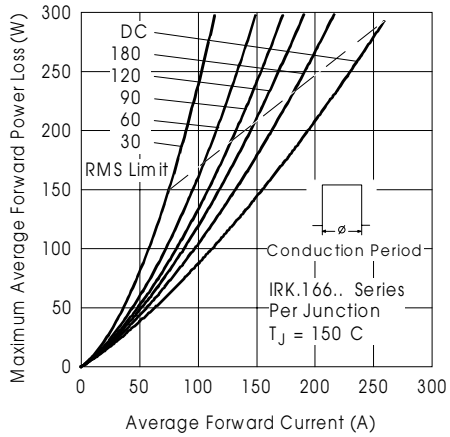


Fig. 4 - On-State Power Loss Characteristics

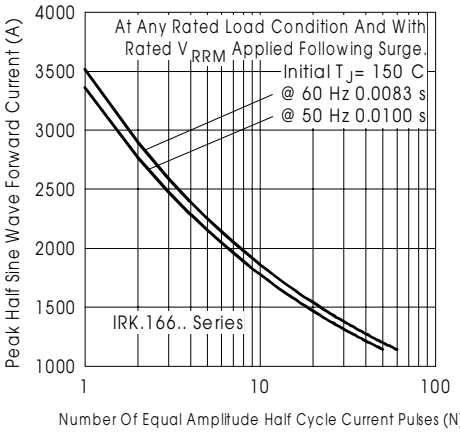


Fig.5 - Maximum Non-Repetitive Surge Current

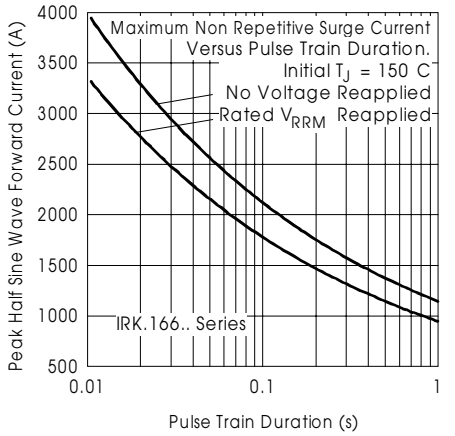


Fig. 6 - Maximum Non-Repetitive Surge Current

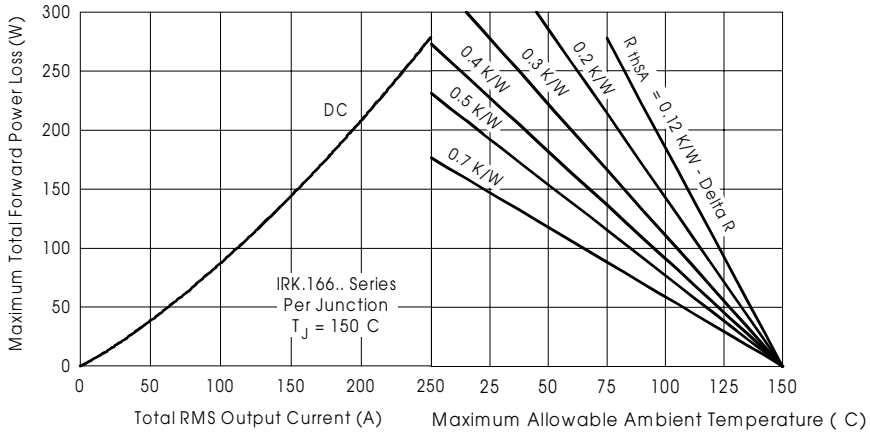


Fig.7 - On State Power Loss Characteristics

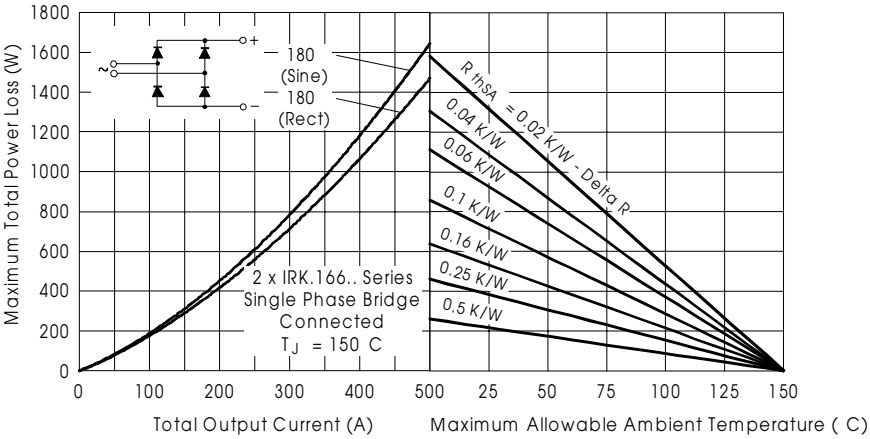


Fig.8 - On State Power Loss Characteristics

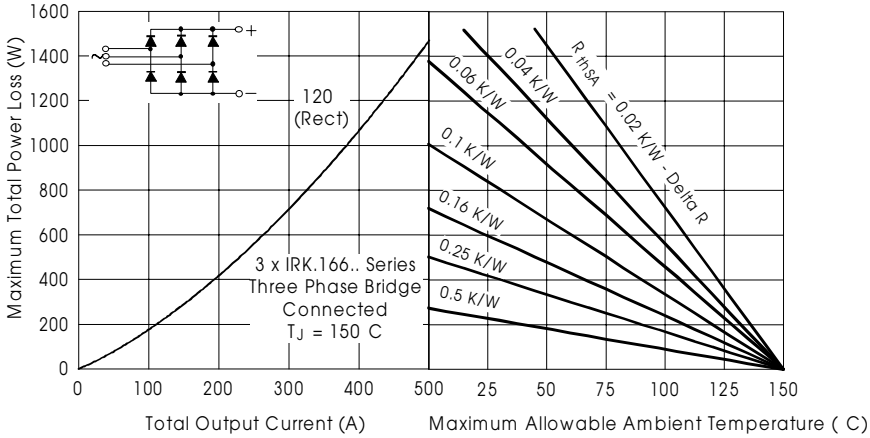


Fig.9- On State Power Loss Characteristics

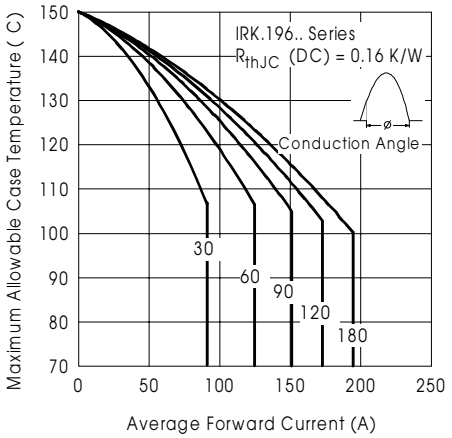


Fig. 10 - Current Ratings Characteristics

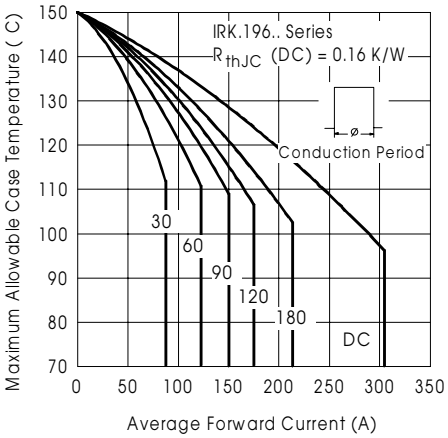


Fig. 11 - Current Ratings Characteristics

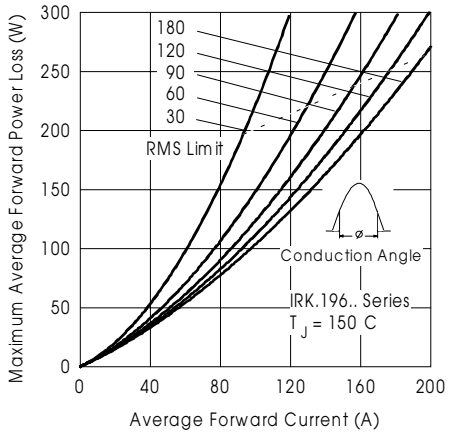


Fig. 12 - On-State Power Loss Characteristics

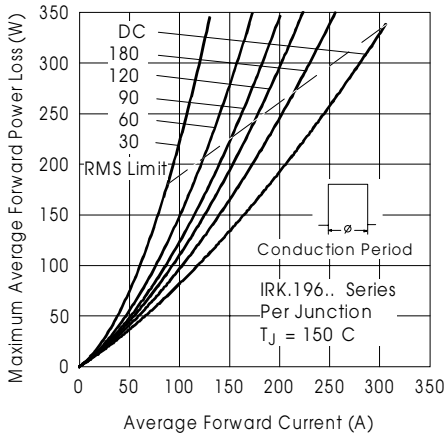


Fig. 13 - On-State Power Loss Characteristics

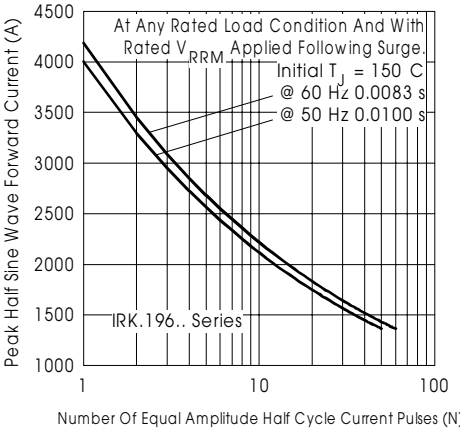


Fig.14 - Maximum Non-Repetitive Surge Current

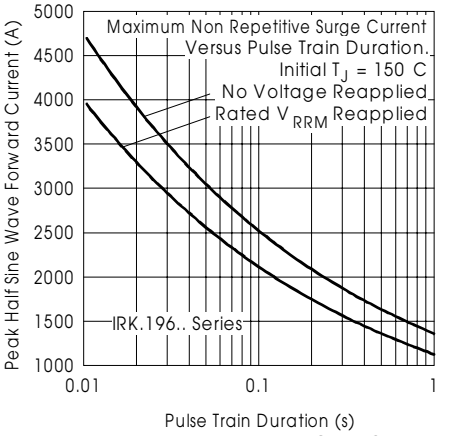


Fig. 15 - Maximum Non-Repetitive Surge Current

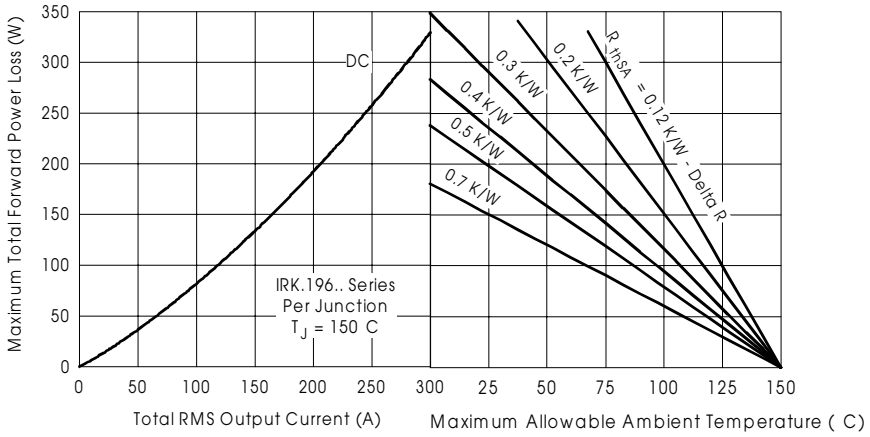


Fig.16 - On State Power Loss Characteristics

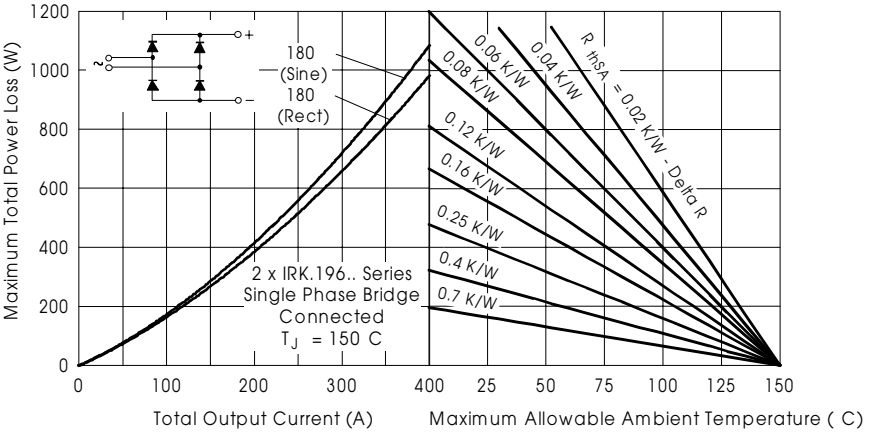


Fig.17 - On State Power Loss Characteristics

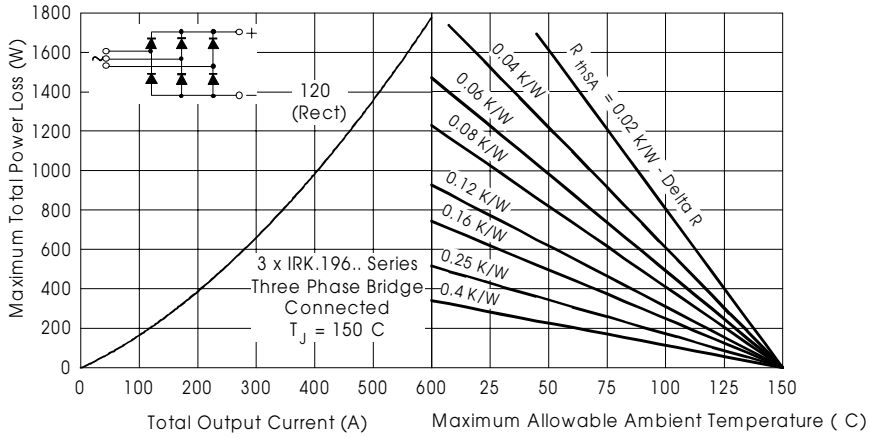


Fig.18- On State Power Loss Characteristics

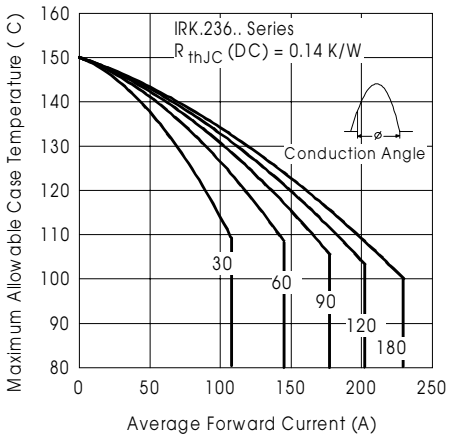


Fig. 19 - Current Ratings Characteristics

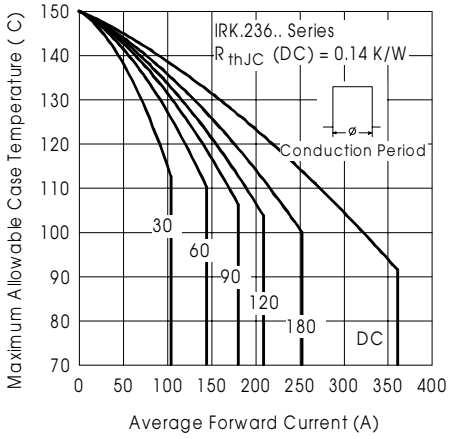


Fig. 20 - Current Ratings Characteristics

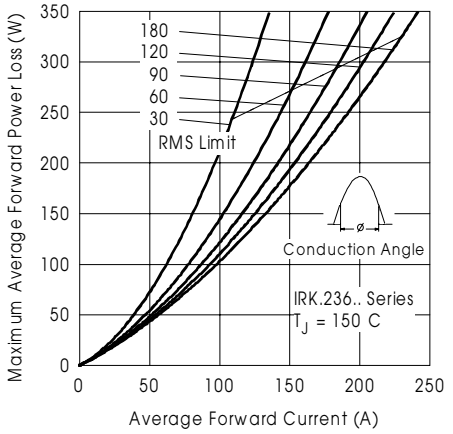


Fig. 21 - On-State Power Loss Characteristics

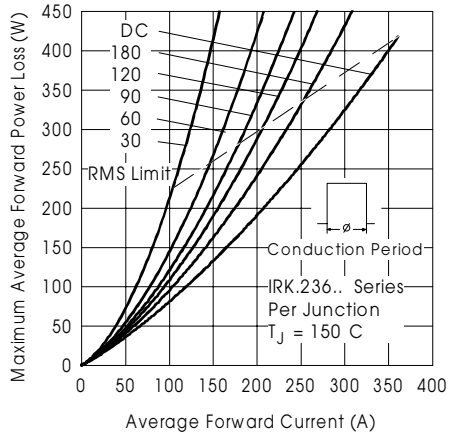


Fig. 22 - On-State Power Loss Characteristics

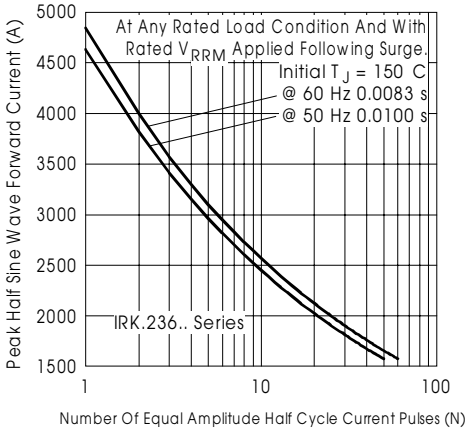


Fig.23 - Maximum Non-Repetitive Surge Current

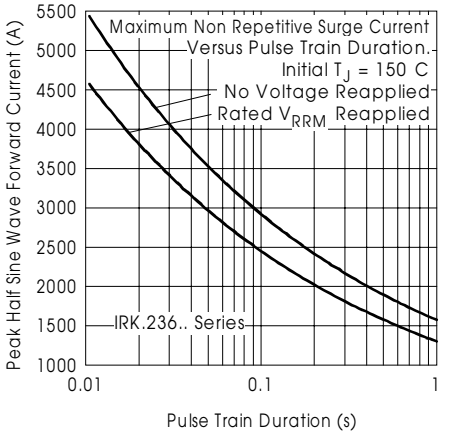


Fig. 24 - Maximum Non-Repetitive Surge Current

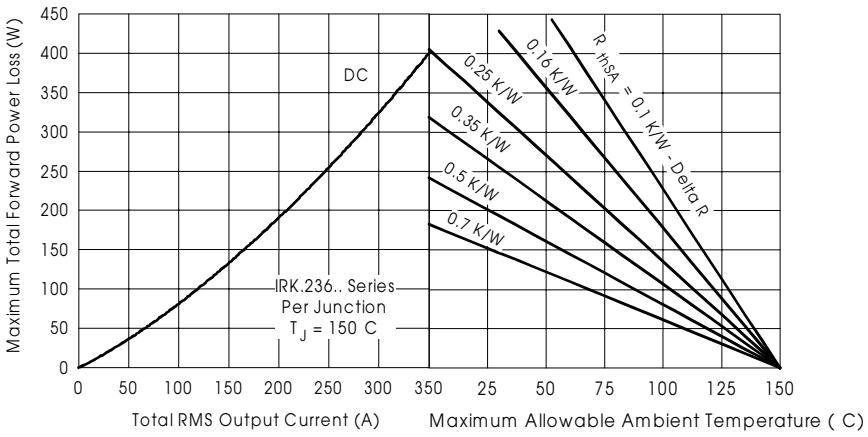


Fig.25 - On State Power Loss Characteristics

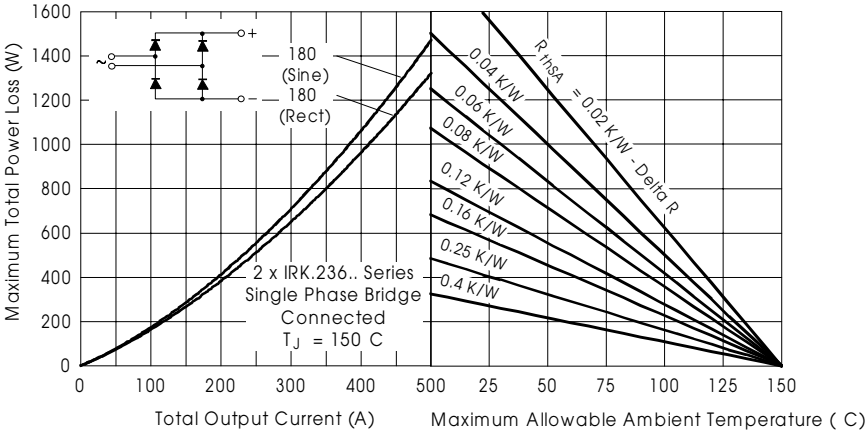


Fig.26 - On State Power Loss Characteristics

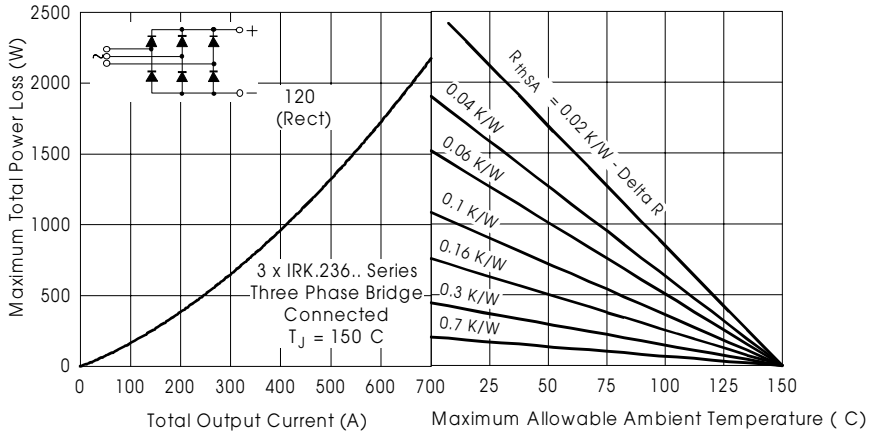


Fig.27- On State Power Loss Characteristics

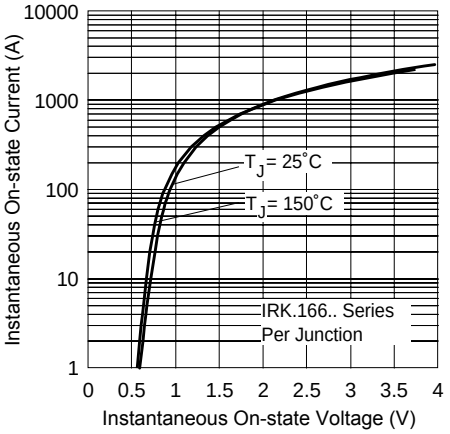


Fig.28 - On State Voltage Drop Characteristics

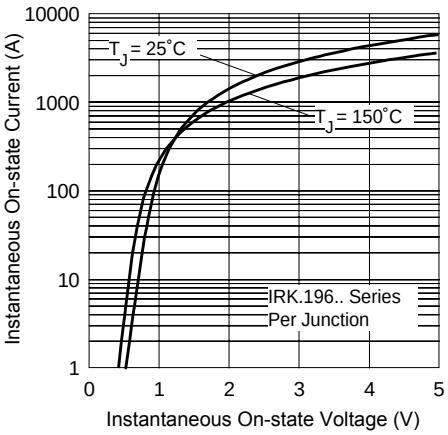


Fig.29 - On State Voltage Drop Characteristics

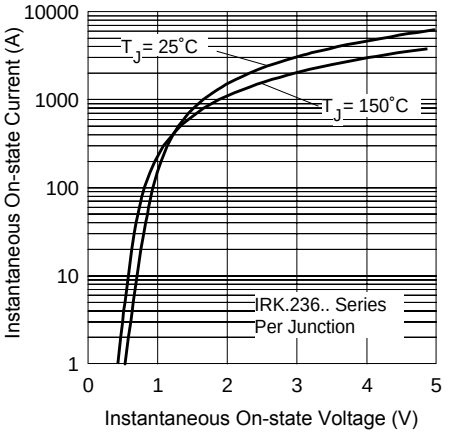


Fig.30 - On State Voltage Drop Characteristics

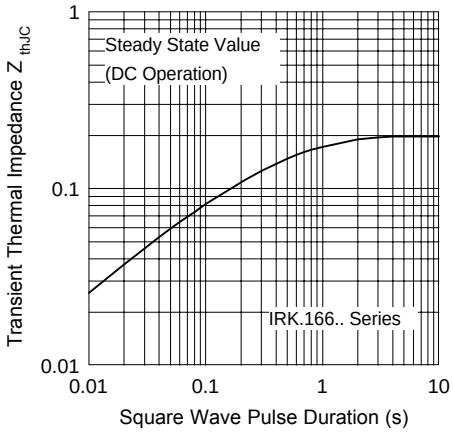


Fig.31 - Thermal Impedance Z_{thJC} Characteristics

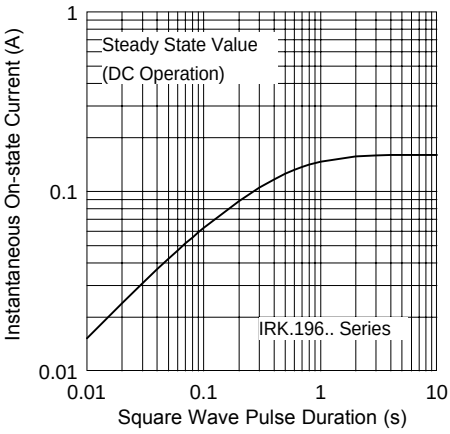


Fig.32 - Thermal Impedance Z_{thJC} Characteristics

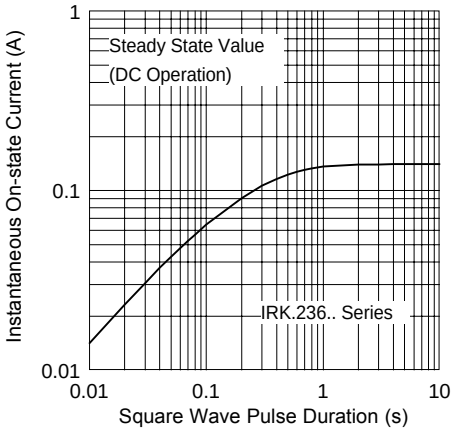


Fig.33 - Thermal Impedance Z_{thJC} Characteristics

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

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