

International  
**IOR** Rectifier

## 180/181RKI SERIES

PHASE CONTROL THYRISTORS

Stud Version

### Features

- Hermetic glass-metal seal
- International standard case TO-209AB (TO-93)

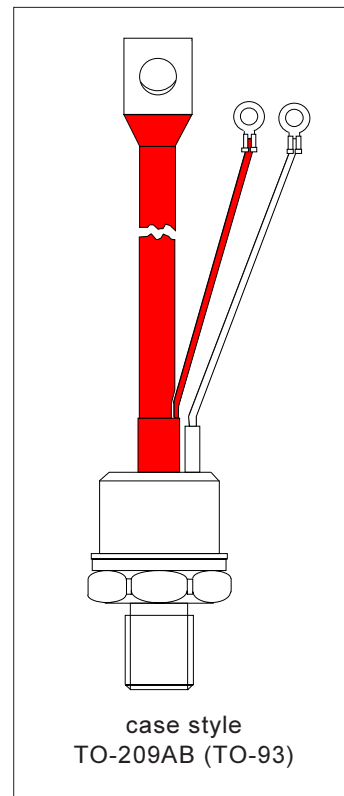
180A

### Typical Applications

- DC motor controls
- Controlled DC power supplies
- AC controllers

### Major Ratings and Characteristics

Parameters	180/181RKI	Units
$I_{T(AV)}$	180	A
@ $T_C$	80	°C
$I_{T(RMS)}$	285	A
$I_{TSM}$ @ 50Hz	3800	A
@ 60Hz	4000	A
$I^2t$ @ 50Hz	72	KA <sup>2</sup> s
@ 60Hz	66	KA <sup>2</sup> s
$V_{DRM}/V_{RRM}$	400 to 1000	V
$t_q$ typical	100	μs
$T_J$	- 40 to 125	°C



## ELECTRICAL SPECIFICATIONS

## Voltage Ratings

Type number	Voltage Code	$V_{DRM}/V_{RRM}$ , max. repetitive peak and off-state voltage V	$V_{RSM}$ , maximum non-repetitive peak voltage V	$I_{DRM}/I_{RRM}$ max. @ $T_J = T_J \text{ max.}$ mA
180/181RKI	40	400	500	30
	80	800	900	
	100	1000	1100	

## On-state Conduction

Parameter	180/181RKI	Units	Conditions
$I_{T(AV)}$ Max. average on-state current @ Case temperature	180 80	A °C	180° conduction, half sine wave
$I_{T(RMS)}$ Max. RMS on-state current	285		DC @ 79°C case temperature
$I_{TSM}$ Max. peak, one-cycle non-repetitive surge current	3800	A	t = 10ms No voltage
	4000		t = 8.3ms reapplied
	3500		t = 10ms 100% $V_{RRM}$
	3660		t = 8.3ms reapplied
$I^2t$ Maximum $I^2t$ for fusing	72	KA <sup>2</sup> s	t = 10ms No voltage
	66		t = 8.3ms reapplied
	61		t = 10ms 100% $V_{RRM}$
	56		t = 8.3ms reapplied
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	720	KA <sup>2</sup> /s	t = 0.1 to 10ms, no voltage reapplied
$V_{T(TO)1}$ Low level value of threshold voltage	0.83	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
$V_{T(TO)2}$ High level value of threshold voltage	0.89		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
$r_{t1}$ Low level value of on-state slope resistance	0.92	mΩ	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
$r_{t2}$ High level value of on-state slope resistance	0.81		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
$V_{TM}$ Max. on-state voltage	1.35	V	$I_{pk} = 570A, T_J = T_J \text{ max.}, t_p = 10ms$ sine pulse
$I_H$ Maximum holding current	600	mA	$T_J = 25^\circ\text{C}$ , anode supply 12V resistive load
$I_L$ Typical latching current	1000		

## Switching

Parameter	180/181RKI	Units	Conditions
$di/dt$ Max. non-repetitive rate of rise of turned-on current	300	A/μs	Gate drive 20V, 20Ω, $t_r \leq 1\mu s$ $T_J = T_J \text{ max.}$ , anode voltage $\leq 80\% V_{DRM}$
$t_d$ Typical delay time	1.0	μs	Gate current 1A, $di_g/dt = 1A/\mu s$ $V_d = 0.67\% V_{DRM}, T_J = 25^\circ\text{C}$
$t_q$ Typical turn-off time	100		$I_{TM} = 50A, T_J = T_J \text{ max.}, di/dt = 10A/\mu s, V_R = 100V$ $dv/dt = 20V/\mu s$

### Blocking

Parameter	180/181RKI	Units	Conditions
$dv/dt$ Maximum critical rate of rise of off-state voltage	500	V/ $\mu$ s	$T_J = T_J \text{ max. linear to } 80\% \text{ rated } V_{\text{DRM}}$
$I_{\text{RRM}}$ $I_{\text{DRM}}$ Max. peak reverse and off-state leakage current	30	mA	$T_J = T_J \text{ max, rated } V_{\text{DRM}}/V_{\text{RRM}}$ applied

### Triggering

Parameter	180/181RKI	Units	Conditions
$P_{\text{GM}}$ Maximum peak gate power	10	W	$T_J = T_J \text{ max, } t_p \leq 5\text{ms}$
$P_{\text{G(AV)}}$ Maximum average gate power	2.0		$T_J = T_J \text{ max, } f = 50\text{Hz, } d\% = 50$
$I_{\text{GM}}$ Max. peak positive gate current	3.0	A	$T_J = T_J \text{ max, } t_p \leq 5\text{ms}$
$+V_{\text{GM}}$ Maximum peak positive gate voltage	20	V	$T_J = T_J \text{ max, } t_p \leq 5\text{ms}$
$-V_{\text{GM}}$ Maximum peak negative gate voltage	5.0		
$I_{\text{GT}}$ DC gate current required to trigger	TYP.	MAX.	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
	130	-	
	65	150	
	35	-	
$V_{\text{GT}}$ DC gate voltage required to trigger	2.0	-	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$
	1.2	2.5	
	0.9	-	
$I_{\text{GD}}$ DC gate current not to trigger	10	mA	$T_J = T_J \text{ max.}$ Max. gate current/ voltage not to trigger is the max. value which will not trigger any unit with rated $V_{\text{DRM}}$ anode-to-cathode applied
$V_{\text{GD}}$ DC gate voltage not to trigger	0.25	V	

### Thermal and Mechanical Specification

Parameter	180/181RKI	Units	Conditions
$T_J$ Max. operating temperature range	-40 to 125	$^\circ\text{C}$	
$T_{\text{stg}}$ Max. storage temperature range	-40 to 150		
$R_{\text{thJC}}$ Max. thermal resistance, junction to case	0.15	K/W	DC operation
$R_{\text{thCS}}$ Max. thermal resistance, case to heatsink	0.04		Mounting surface, smooth, flat and greased
T Mounting torque, $\pm 10\%$	31	Nm (lbf-in)	Non lubricated threads
	(275)		
	24.5 (210)		Lubricated threads
wt Approximate weight	280	g	
Case style	TO-209AB (TO-93)		See Outline Table

180/181RKI Series

Bulletin I25153 rev. D 09/03

$\Delta R_{thJC}$  Conduction

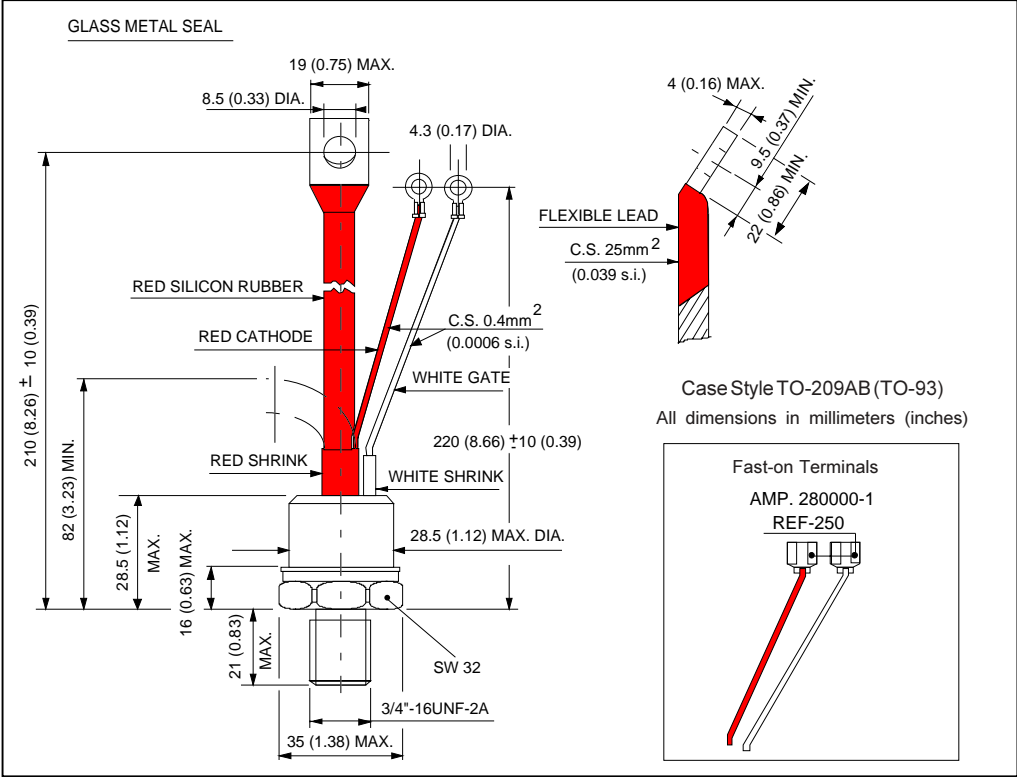
(The following table shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.050	0.032	K/W	$T_J = T_{J \text{ max.}}$
120°	0.063	0.059		
90°	0.080	0.082		
60°	0.118	0.124		
30°	0.225	0.228		

Ordering Information Table

Device Code			
18	1	RKI	100
1	2	3	4
1	$I_{T(AV)}$ rated average output current (rounded/10)		
2	0 = Eyelet terminals (Gate and Auxiliary Cathode Leads) 1 = Fast - on terminals (Gate and Auxiliary Cathode Leads)		
3	Thyristor		
4	Voltage code: Code x 10 = $V_{RRM}$ (See Voltage Rating Table)		

Outline Table



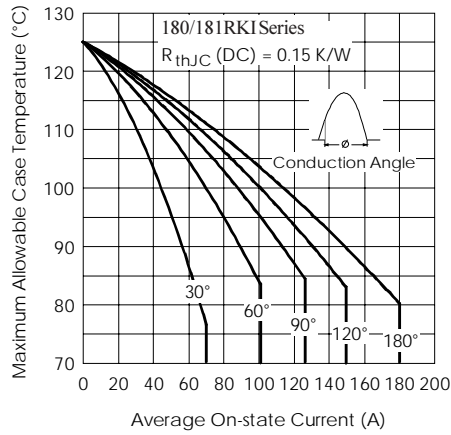


Fig. 1 - Current Ratings Characteristics

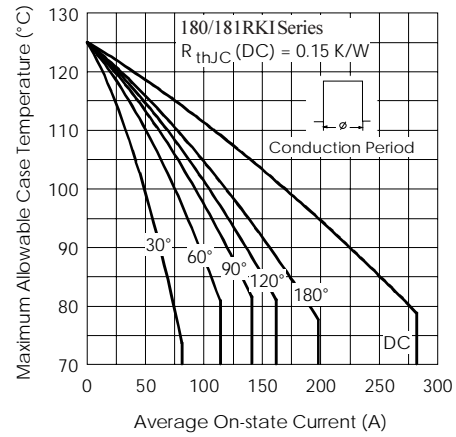


Fig. 2 - Current Ratings Characteristics

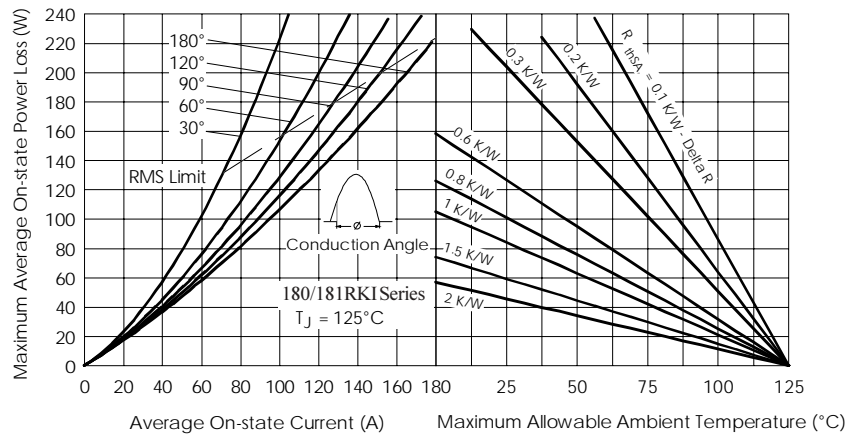


Fig. 3 - On-state Power Loss Characteristics

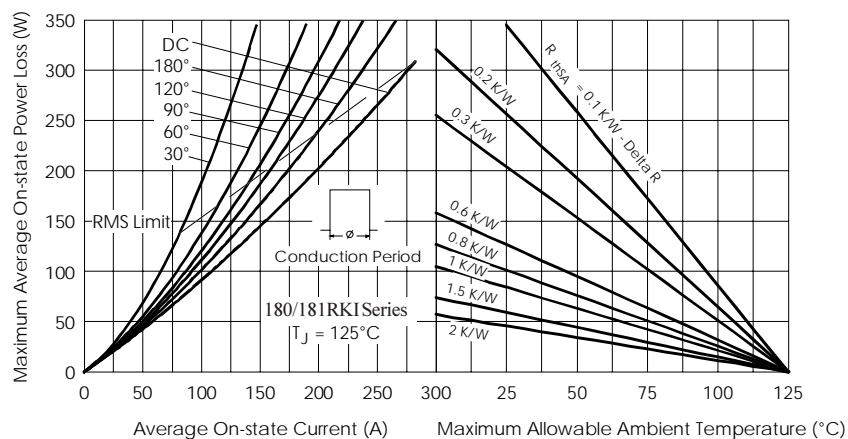


Fig. 4 - On-state Power Loss Characteristics

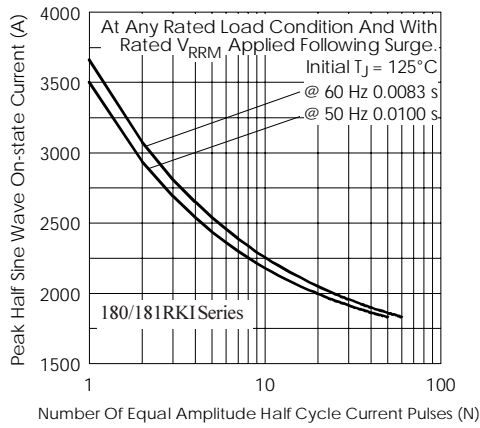


Fig. 5 - Maximum Non-Repetitive Surge Current

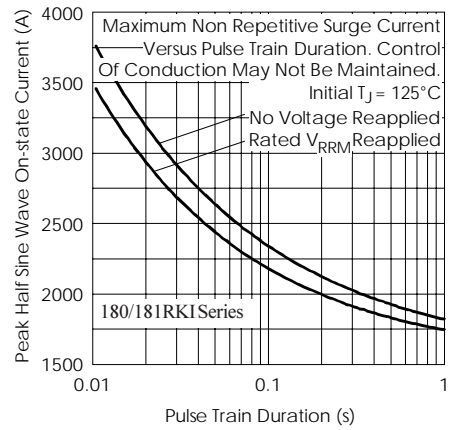


Fig. 6 - Maximum Non-Repetitive Surge Current

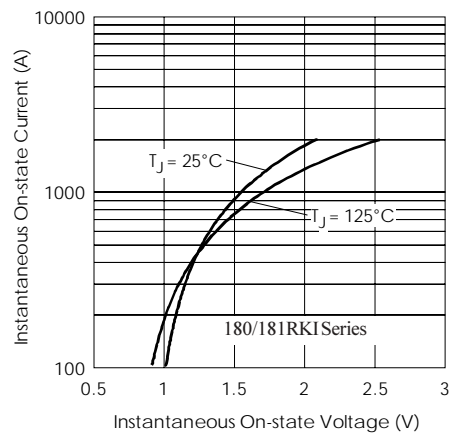


Fig. 7 - On-state Voltage Drop Characteristics

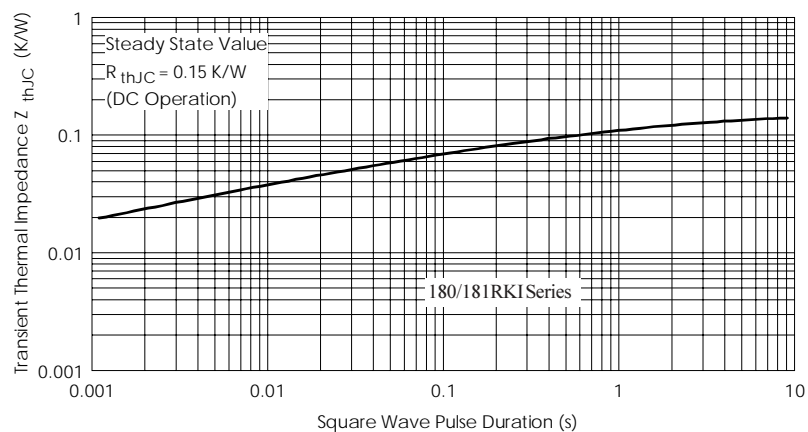


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

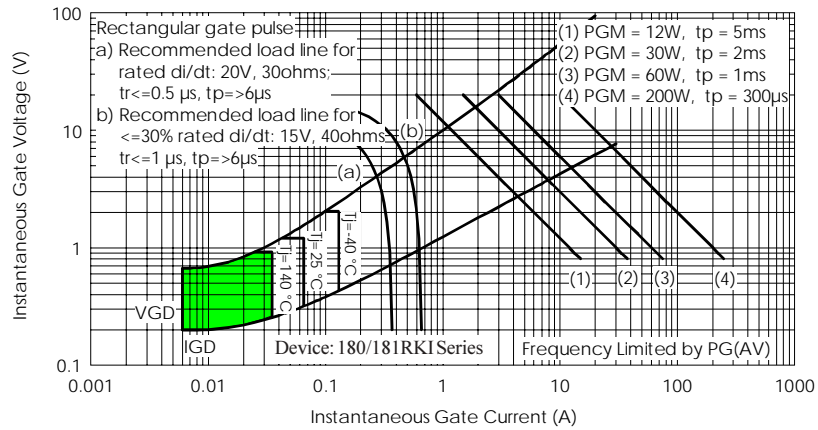


Fig. 9 - Gate Characteristics

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

International  
**IR** Rectifier

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