

International
IR Rectifier

180/181RKI SERIES

PHASE CONTROL THYRISTORS

Stud Version

Features

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

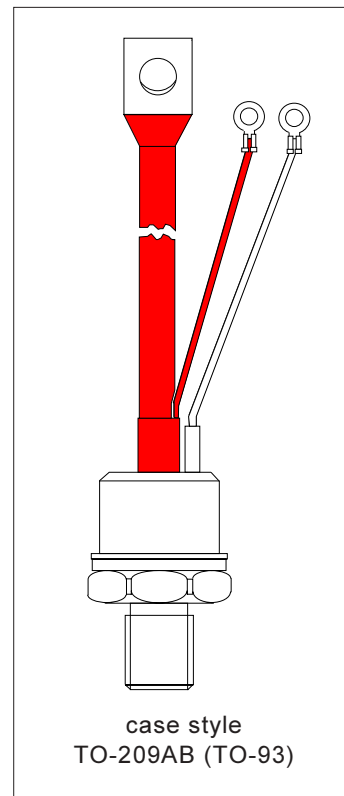
180A

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 ² s
@ 60Hz	66	KA ² 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 ² 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 ² √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/ μ s	$T_J = T_J \text{ max. linear to } 80\% \text{ rated } V_{DRM}$
I_{RRM} I_{DRM} Max. peak reverse and off-state leakage current	30	mA	$T_J = T_J \text{ max, rated } V_{DRM}/V_{RRM} \text{ applied}$

Triggering

Parameter	180/181RKI	Units	Conditions
P_{GM} Maximum peak gate power	10	W	$T_J = T_J \text{ max, } t_p \leq 5\text{ms}$
$P_{G(AV)}$ Maximum average gate power	2.0		$T_J = T_J \text{ max, } f = 50\text{Hz, } d\% = 50$
I_{GM} Max. peak positive gate current	3.0	A	$T_J = T_J \text{ max, } t_p \leq 5\text{ms}$
$+V_{GM}$ Maximum peak positive gate voltage	20	V	$T_J = T_J \text{ max., } t_p \leq 5\text{ms}$
$-V_{GM}$ Maximum peak negative gate voltage	5.0		
I_{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_{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_{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_{DRM} anode-to-cathode applied
V_{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_{stg} Max. storage temperature range	-40 to 150		
R_{thJC} Max. thermal resistance, junction to case	0.15	K/W	DC operation
R_{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

ΔR_{thJC} Conduction

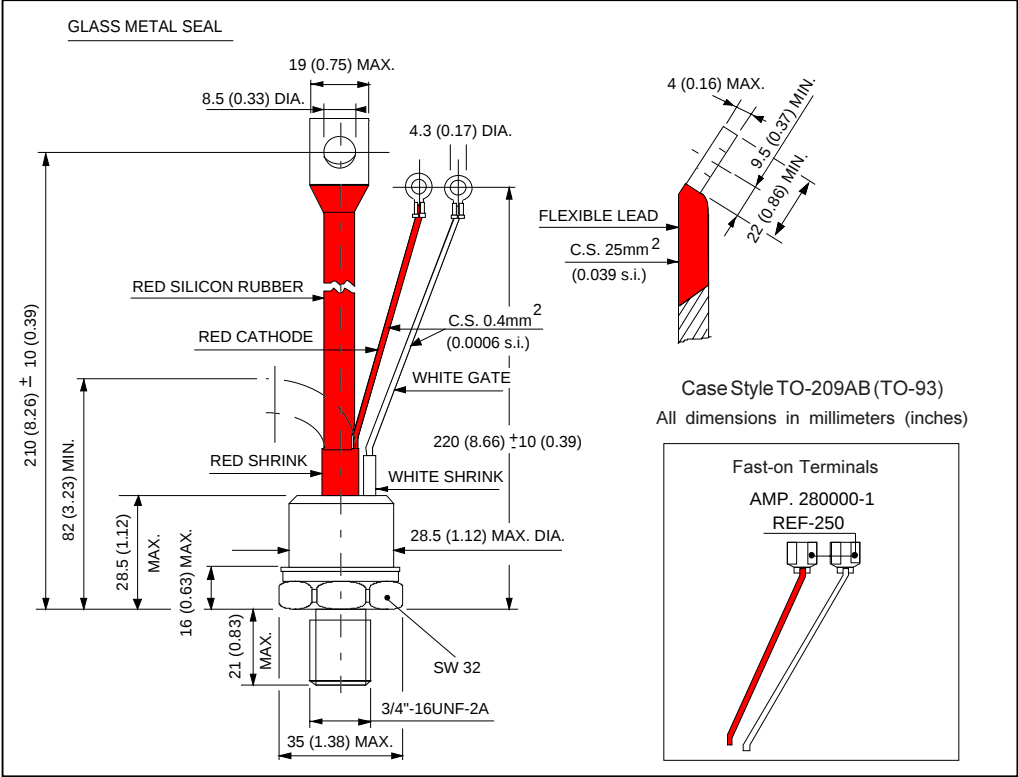
(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

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			
1	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



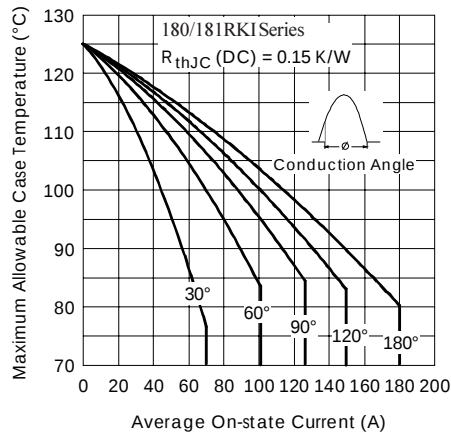


Fig. 1 - Current Ratings Characteristics

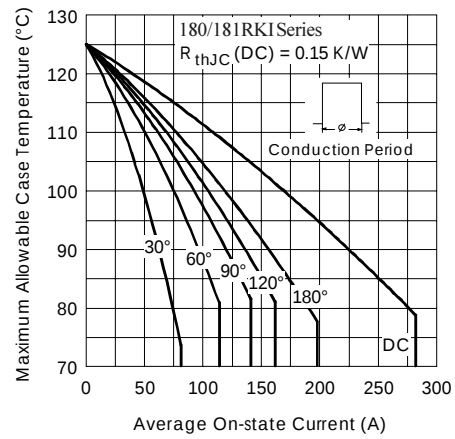


Fig. 2 - Current Ratings Characteristics

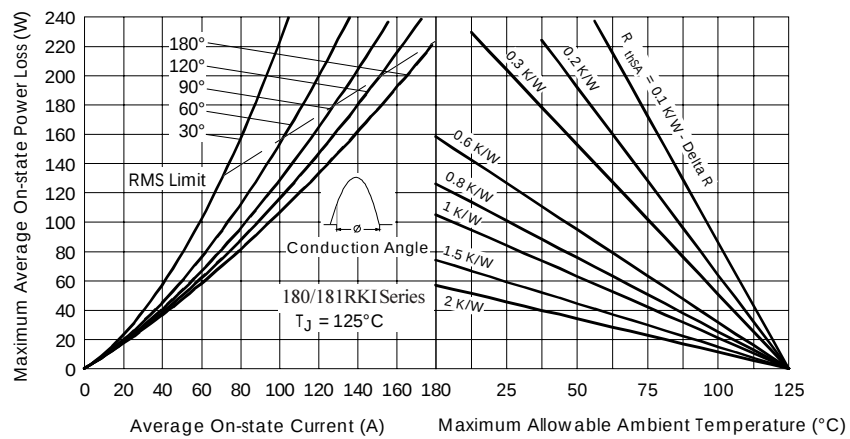


Fig. 3 - On-state Power Loss Characteristics

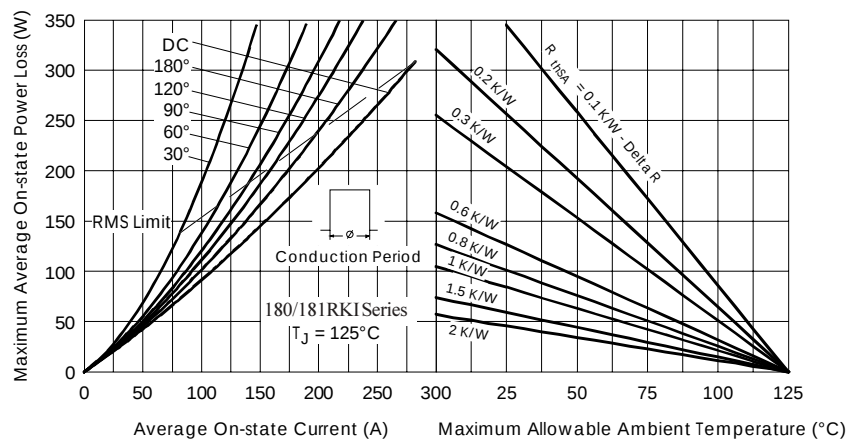


Fig. 4 - On-state Power Loss Characteristics

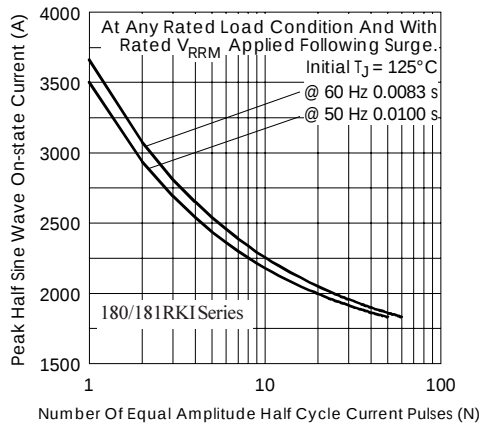


Fig. 5 - Maximum Non-Repetitive Surge Current

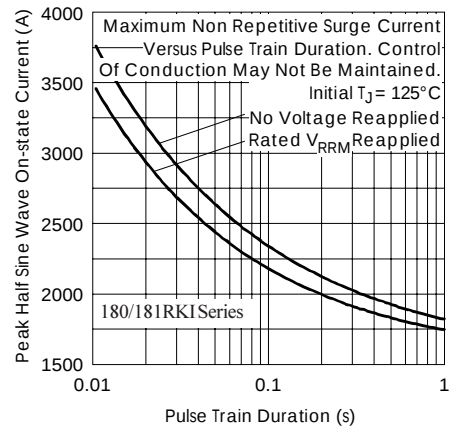


Fig. 6 - Maximum Non-Repetitive Surge Current

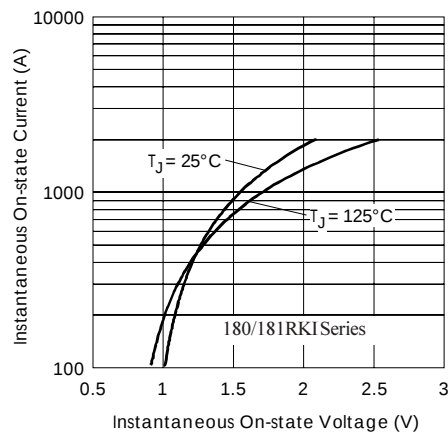


Fig. 7 - On-state Voltage Drop Characteristics

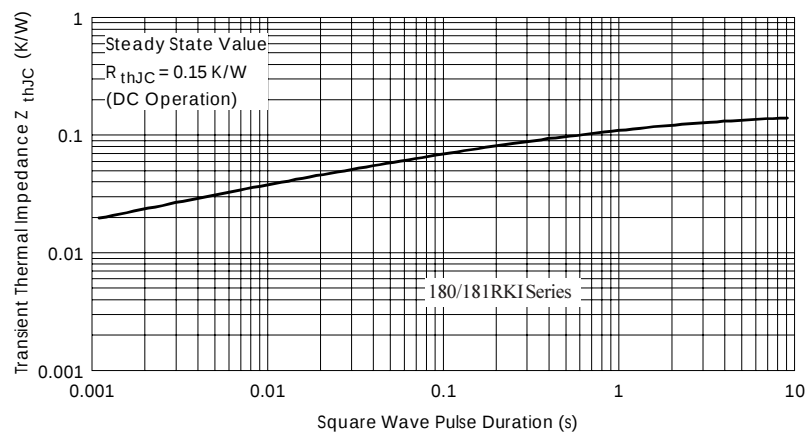


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

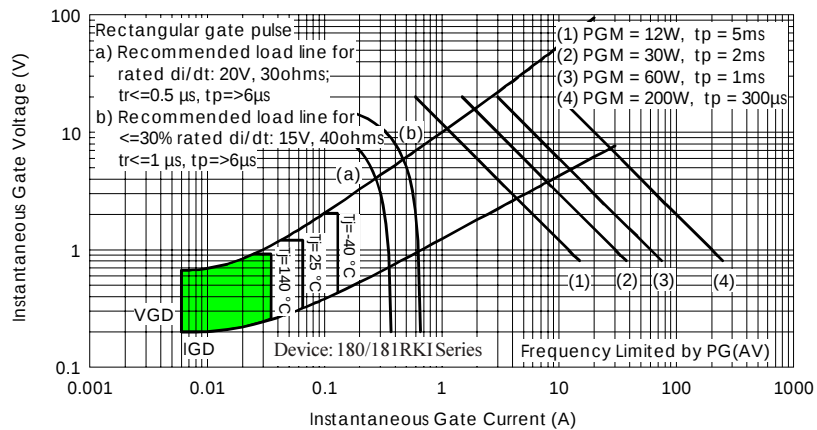


Fig. 9 - Gate Characteristics

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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