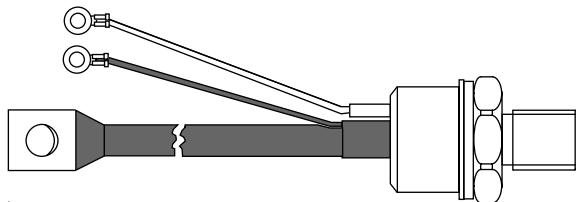


## Phase Control Thyristors (Stud Version), 180 A



TO-209AB (TO-93)

### FEATURES

- Hermetic glass-metal seal
- International standard case TO-209AB (TO-93)
- RoHS compliant
- Designed and qualified for industrial level



### PRODUCT SUMMARY

$I_{T(AV)}$	180 A
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### TYPICAL APPLICATIONS

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

### MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		180	A
	$T_C$	80	°C
$I_{T(RMS)}$		285	A
$I_{TSM}$	50 Hz	3800	A
	60 Hz	4000	
$I^2t$	50 Hz	72	$kA^2s$
	60 Hz	66	
$V_{DRM}/V_{RRM}$		400 to 1000	V
$t_q$	Typical	100	μs
$T_J$		- 40 to 125	°C

### ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS				
TYPE NUMBER	VOLTAGE CODE	$V_{DRM}/V_{RRM}$ , MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	$I_{DRM}/I_{RRM}$ MAXIMUM AT $T_J = T_J$ MAXIMUM mA
180/181RKI	40	400	500	30
	80	800	900	
	100	1000	1100	

# 180/181RKI Series

Vishay High Power Products Phase Control Thyristors  
(Stud Version), 180 A



## ABSOLUTE MAXIMUM RATINGS

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

## SWITCHING

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum non-repetitive rate of rise of turned-on current	$dl/dt$	$Gate \text{ drive } 20 \text{ V}$ , $20 \Omega$ , $t_r \leq 1 \mu\text{s}$ $T_J = T_J$ maximum, anode voltage $\leq 80\% V_{DRM}$		300	$\text{A}/\mu\text{s}$
Typical delay time	$t_d$	$Gate \text{ current } 1 \text{ A}$ , $dl_g/dt = 1 \text{ A}/\mu\text{s}$ $V_d = 0.67\% V_{DRM}$ , $T_J = 25 \text{ }^\circ\text{C}$		1.0	$\mu\text{s}$
Typical turn-off time	$t_q$	$I_{TM} = 50 \text{ A}$ , $T_J = T_J$ maximum, $dl/dt = 10 \text{ A}/\mu\text{s}$ , $V_R = 100 \text{ V}$ , $dV/dt = 20 \text{ V}/\mu\text{s}$		100	

## BLOCKING

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum critical rate of rise of off-state voltage	$dV/dt$	$T_J = T_J$ maximum linear to 80 % rated $V_{DRM}$		500	$\text{V}/\mu\text{s}$
Maximum peak reverse and off-state leakage current	$I_{RRM}$ , $I_{DRM}$	$T_J = T_J$ maximum, rated $V_{DRM}/V_{RRM}$ applied		30	mA



TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	
		TYP.	MAX.	UNITS	
Maximum peak gate power	$P_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms	10		W
Maximum average gate power	$P_{G(AV)}$	$T_J = T_J$ maximum, $f = 50$ Hz, $d\% = 50$	2.0		
Maximum peak positive gate current	$I_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms	3.0		A
Maximum peak positive gate voltage	$+V_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms	20		V
Maximum peak negative gate voltage	$-V_{GM}$		5.0		
DC gate current required to trigger	$I_{GT}$	$T_J = -40$ °C	Maximum required gate trigger/current/voltage are the lowest value which will trigger all units 12 V anode to cathode applied	130	mA
		$T_J = 25$ °C		65	
		$T_J = 125$ °C		35	
DC gate voltage required to trigger	$V_{GT}$	$T_J = -40$ °C	Maximum required gate trigger/current/voltage are the lowest value which will trigger all units 12 V anode to cathode applied	2.0	V
		$T_J = 25$ °C		1.2	
		$T_J = 125$ °C		0.9	
DC gate current not to trigger	$I_{GD}$	$T_J = T_J$ maximum	Maximum gate current/voltage not to trigger is the maximum value which will not trigger any unit with rated $V_{DRM}$ anode to cathode applied	10	mA
DC gate voltage not to trigger	$V_{GD}$			0.25	V

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum operating junction temperature range	$T_J$			- 40 to 125	°C
Maximum storage temperature range	$T_{Stg}$			- 40 to 150	
Maximum thermal resistance, junction to case	$R_{thJC}$	DC operation		0.15	K/W
Maximum thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, smooth, flat and greased		0.04	
Mounting torque, $\pm 10$ %		Non-lubricated threads		31 (275)	N · m (lbf · in)
		Lubricated threads		24.5 (210)	
Approximate weight				280	g
Case style		See dimensions - link at the end of datasheet		TO-209AB (TO-93)	

$\Delta R_{thJC}$ CONDUCTION					
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDITIONS		UNITS
180°	0.050	0.032	$T_J = T_J$ maximum	K/W	
120°	0.063	0.059			
90°	0.080	0.082			
60°	0.118	0.124			
30°	0.225	0.228			

**Note**

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

# 180/181RKI Series

Vishay High Power Products Phase Control Thyristors  
(Stud Version), 180 A

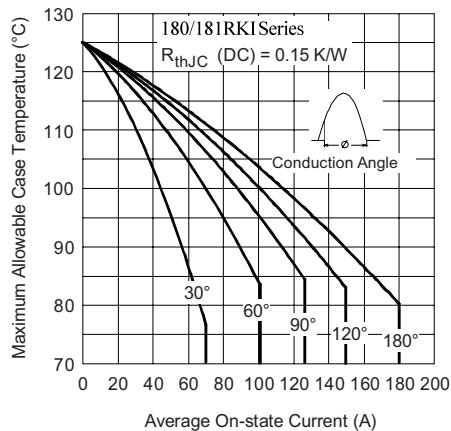


Fig. 1 - Current Ratings Characteristics

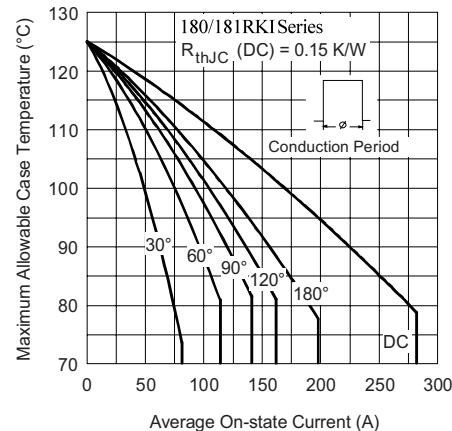


Fig. 2 - Current Ratings Characteristics

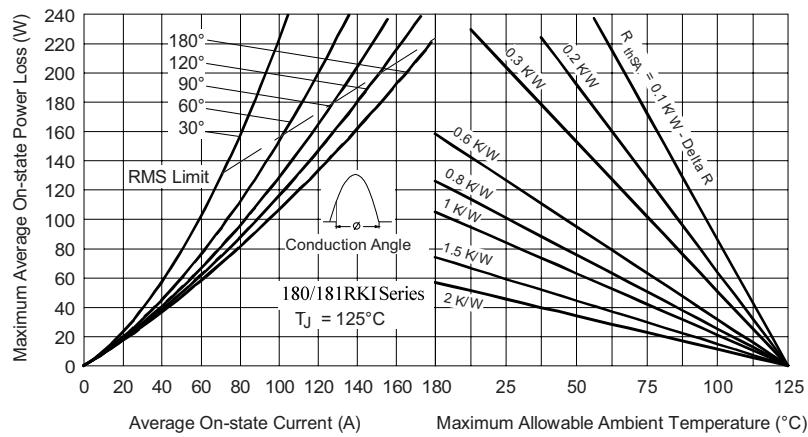


Fig. 3 - On-State Power Loss Characteristics

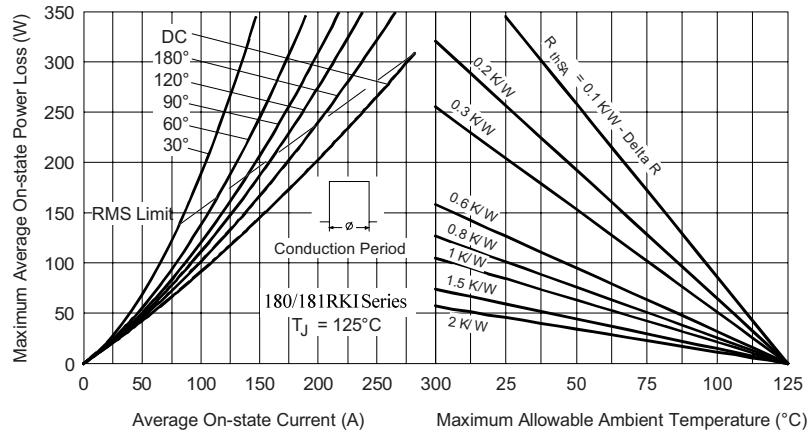


Fig. 4 - On-State Power Loss Characteristics

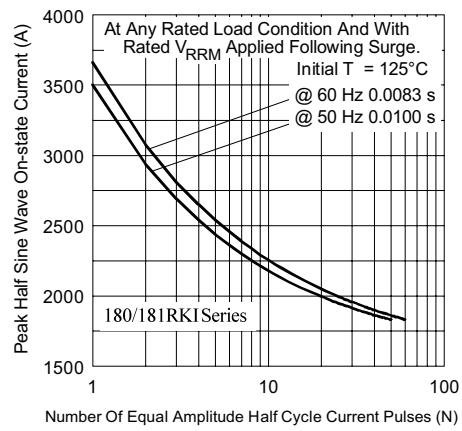
**Phase Control Thyristors  
(Stud Version), 180 A**
**Vishay High Power Products**


Fig. 5 - Maximum Non-Repetitive Surge Current

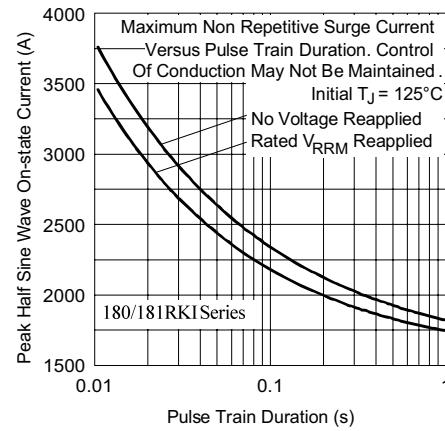


Fig. 6 - Maximum Non-Repetitive Surge Current

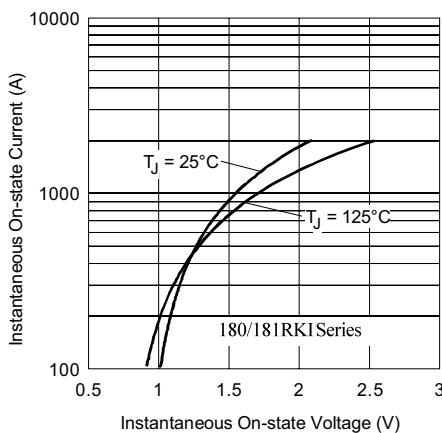


Fig. 7 - On-State Voltage Drop Characteristics

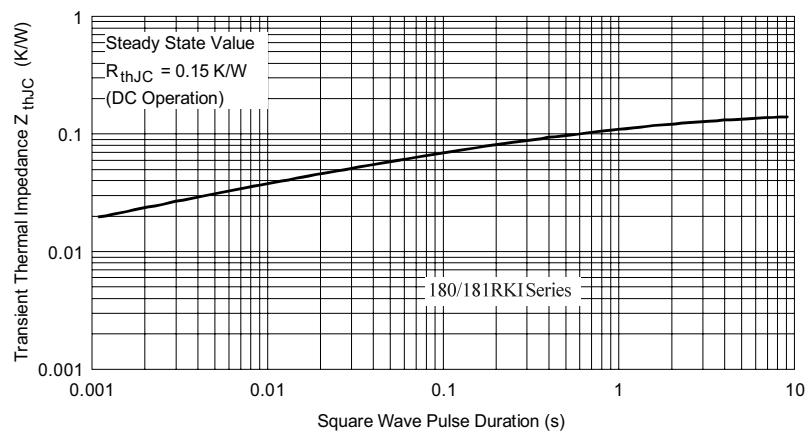


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

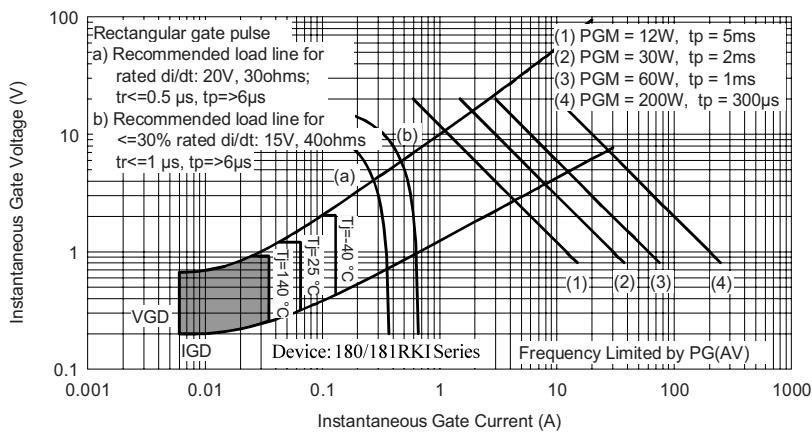


Fig. 9 - Gate Characteristics

### ORDERING INFORMATION TABLE

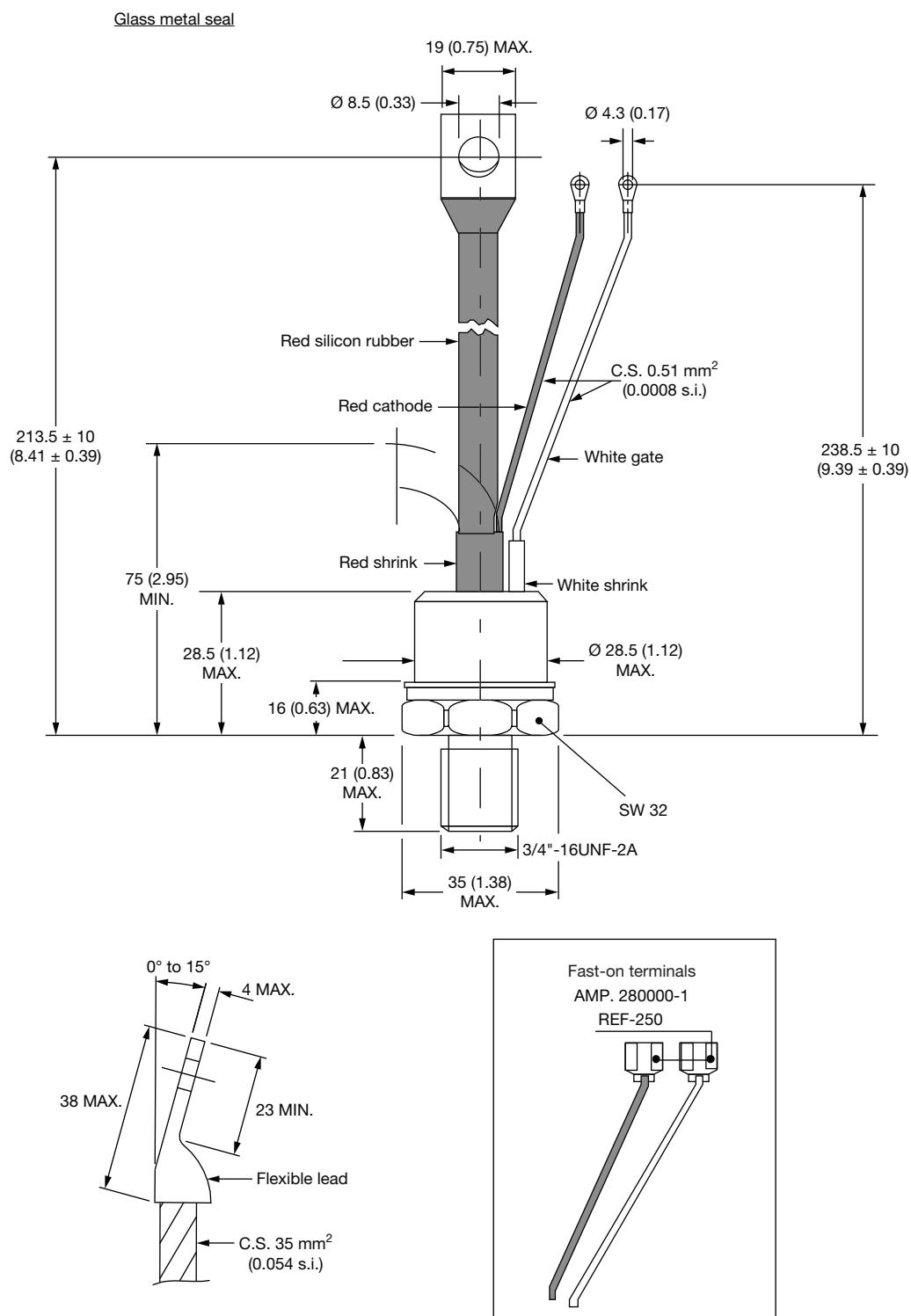
Device code	18	1	RKI	100
	1	2	3	4

- 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 x 10 =  $V_{RRM}$  (see Voltage Ratings table)

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95077">http://www.vishay.com/doc?95077</a>

### TO-209AB (TO-93)

#### DIMENSIONS in millimeters (inches)



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