

# ST180C..C SERIES

## PHASE CONTROL THYRISTORS

## Hockey Puk Version

### Features

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case TO-200AB (A-PUK)

### Typical Applications

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

### Major Ratings and Characteristics

Parameters	ST180C..C	Units
$I_{T(AV)}$	350	A
@ $T_{hs}$	55	°C
$I_{T(RMS)}$	660	A
@ $T_{hs}$	25	°C
$I_{TSM}$	@ 50Hz	5000
	@ 60Hz	5230
$I^2t$	@ 50Hz	125
	@ 60Hz	114
$V_{DRM}/V_{RRM}$	400 to 2000	V
$t_q$ typical	100	μs
$T_J$	- 40 to 125	°C

350A



case style TO-200AB (A-PUK)

## ST180C..C Series

Bulletin I25164 rev. C 02/00

International  
**IOR** Rectifier

### 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
ST180C..C	04	400	500	30
	08	800	900	
	12	1200	1300	
	16	1600	1700	
	18	1800	1900	
	20	2000	2100	

#### On-state Conduction

Parameter	ST180C..C	Units	Conditions
$I_{T(AV)}$ Max. average on-state current @ Heatsink temperature	350 (140) 55 (85)	A °C	180° conduction, half sine wave double side (single side) cooled
$I_{T(RMS)}$ Max. RMS on-state current	660		@ 25°C heatsink temperature double side cooled
$I_{TSM}$ Max. peak, one-cycle non-repetitive surge current	5000	A	t = 10ms No voltage
	5230		t = 8.3ms reapplied
	4200		t = 10ms 100% $V_{RRM}$
	4400		t = 8.3ms reapplied
$I^2t$ Maximum $I^2t$ for fusing	125	KA <sup>2</sup> s	t = 10ms No voltage
	114		t = 8.3ms reapplied
	88		t = 10ms 100% $V_{RRM}$
	81		t = 8.3ms reapplied
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	1250	KA <sup>2</sup> /s	t = 0.1 to 10ms, no voltage reapplied
$V_{T(TO)1}$ Low level value of threshold voltage	1.08	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	1.14		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
$r_{t1}$ Low level value of on-state slope resistance	1.18	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	1.14		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
$V_{TM}$ Max. on-state voltage	1.96	V	$I_{pk} = 750A, T_J = T_J \text{ max, } t_p = 10ms$ sine pulse
$I_H$ Maximum holding current	600	mA	$T_J = T_J \text{ max, anode supply 12V resistive load}$
$I_L$ Max. (typical) latching current	1000 (300)		

### Switching

Parameter	ST180C..C	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	1000	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, $di_g/dt = 1A/\mu s$ $V_d = 0.67\% V_{DRM}$ , $T_J = 25^\circ C$
$t_q$ Typical turn-off time	100		$I_{TM} = 300A$ , $T_J = T_J \text{ max}$ , $di/dt = 20A/\mu s$ , $V_R = 50V$ $dv/dt = 20V/\mu s$ , Gate 0V 100Ω, $t_p = 500\mu s$

### Blocking

Parameter	ST180C..C	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/μs	$T_J = T_J \text{ max}$ linear to 80% rated $V_{DRM}$
$I_{DRM}$ $I_{RRM}$ Max. peak reverse and off-state leakage current	30	mA	$T_J = T_J \text{ max}$ , rated $V_{DRM}/V_{RRM}$ applied

### Triggering

Parameter		ST180C..C		Units	Conditions	
P <sub>GM</sub>	Maximum peak gate power	10	W	A	T <sub>J</sub> = T <sub>J</sub> max, t <sub>p</sub> ≤ 5ms	
P <sub>G(AV)</sub>	Maximum average gate power	2.0			T <sub>J</sub> = T <sub>J</sub> max, f = 50Hz, d% = 50	
I <sub>GM</sub>	Max. peak positive gate current	3.0			T <sub>J</sub> = T <sub>J</sub> max, t <sub>p</sub> ≤ 5ms	
+V <sub>GM</sub>	Maximum peak positive gate voltage	20	V		T <sub>J</sub> = T <sub>J</sub> max, t <sub>p</sub> ≤ 5ms	
-V <sub>GM</sub>	Maximum peak negative gate voltage	5.0				
I <sub>GT</sub>	DC gate current required to trigger	TYP.	MAX.	mA	Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied	
		180	-			
		90	150			
		40	-			
V <sub>GT</sub>	DC gate voltage required to trigger	2.9	-	V		T <sub>J</sub> = - 40°C
		1.8	3.0			T <sub>J</sub> = 25°C
		1.2	-		T <sub>J</sub> = 125°C	
I <sub>GD</sub>	DC gate current not to trigger	10		mA	T <sub>J</sub> = T <sub>J</sub> max	Max. gate current/voltage not to trigger is the max. value which will not trigger any unit with rated V <sub>DRM</sub> anode-to-cathode applied
V <sub>GD</sub>	DC gate voltage not to trigger	0.25				

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### Thermal and Mechanical Specification

Parameter	ST180C..C	Units	Conditions
$T_J$ Max. operating temperature range	-40 to 125	°C	
$T_{stg}$ Max. storage temperature range	-40 to 150		
$R_{thJ-hs}$ Max. thermal resistance, junction to heatsink	0.17 0.08	K/W	DC operation single side cooled DC operation double side cooled
$R_{thC-hs}$ Max. thermal resistance, case to heatsink	0.033 0.017	K/W	DC operation single side cooled DC operation double side cooled
F Mounting force, $\pm 10\%$	4900 (500)	N (Kg)	
wt Approximate weight	50	g	
Case style	TO - 200AB (A-PUK)		See Outline Table

### $\Delta R_{thJ-hs}$ Conduction

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

Conduction angle	Sinusoidal conduction		Rectangular conduction		Units	Conditions
	Single Side	Double Side	Single Side	Double Side		
180°	0.015	0.015	0.011	0.011	K/W	$T_J = T_J \text{ max.}$
120°	0.018	0.019	0.019	0.019		
90°	0.024	0.024	0.026	0.026		
60°	0.035	0.035	0.036	0.037		
30°	0.060	0.060	0.060	0.061		

### Ordering Information Table

Device Code							
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	1	2	3	4	5	6	7
	8						
<b>1</b>	-	Thyristor					
<b>2</b>	-	Essential part number					
<b>3</b>	-	0 = Converter grade					
<b>4</b>	-	C = Ceramic Puk					
<b>5</b>	-	Voltage code: Code x 100 = $V_{RRM}$ (See Voltage Rating Table)					
<b>6</b>	-	C = Puk Case TO-200AB (A-PUK)					
<b>7</b>	-	0 = Eyelet terminals (Gate and Auxiliary Cathode Unsoldered Leads)					
		1 = Fast-on terminals (Gate and Auxiliary Cathode Unsoldered Leads)					
		2 = Eyelet terminals (Gate and Auxiliary Cathode Soldered Leads)					
		3 = Fast-on terminals (Gate and Auxiliary Cathode Soldered Leads)					
<b>8</b>	-	Critical dv/dt: None = 500V/ $\mu$ sec (Standard value)					
		L = 1000V/ $\mu$ sec (Special selection)					

Outline Table

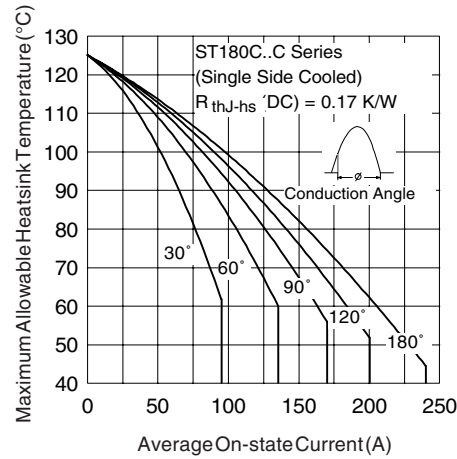
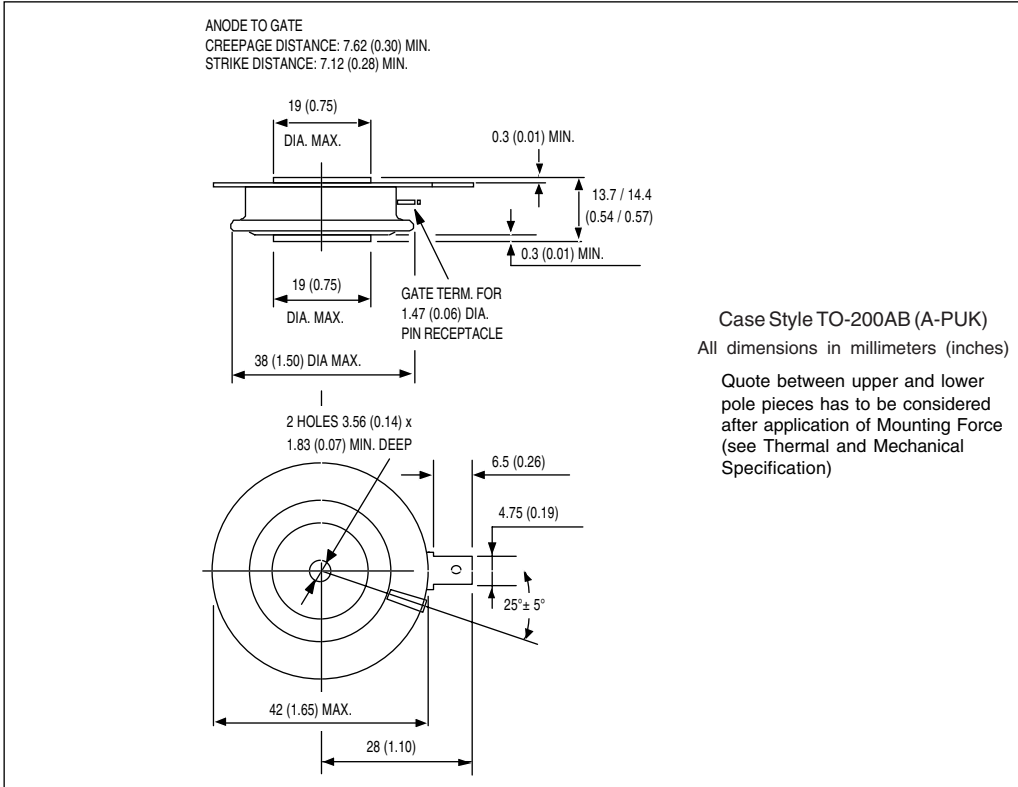


Fig. 1 - Current Ratings Characteristics

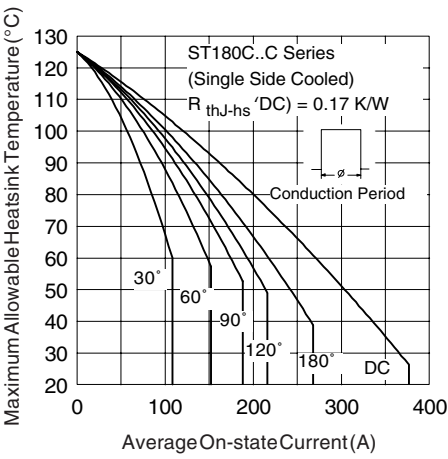


Fig. 2 - Current Ratings Characteristics

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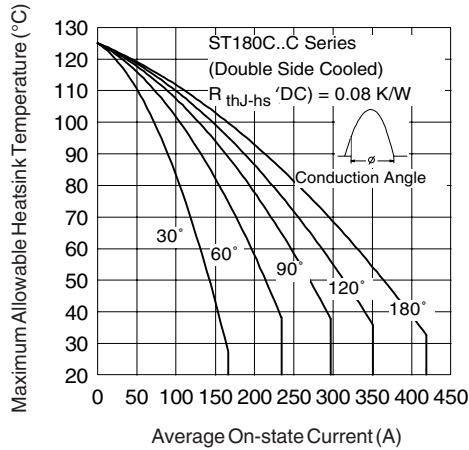


Fig. 3 - Current Ratings Characteristics

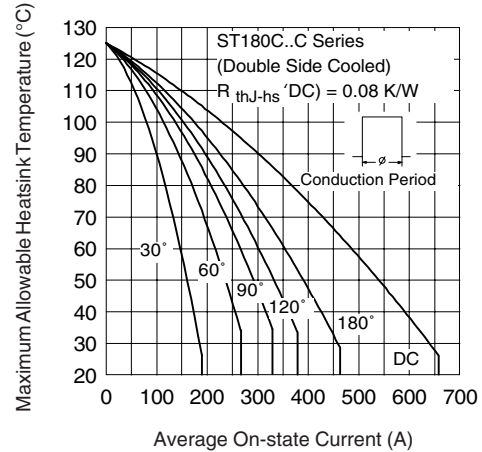


Fig. 4 - Current Ratings Characteristics

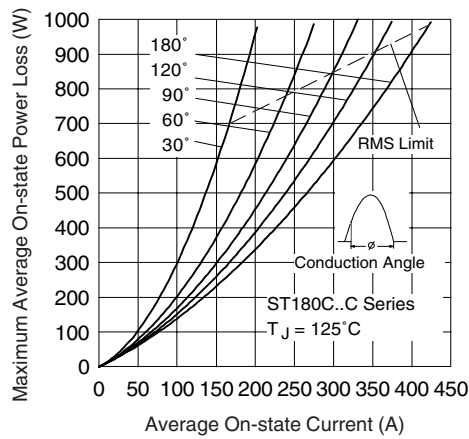


Fig. 5 - On-state Power Loss Characteristics

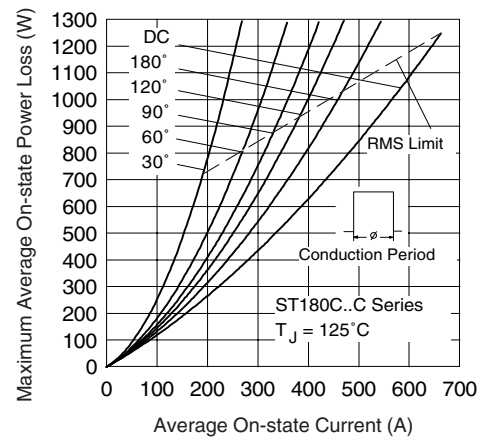


Fig. 6 - On-state Power Loss Characteristics

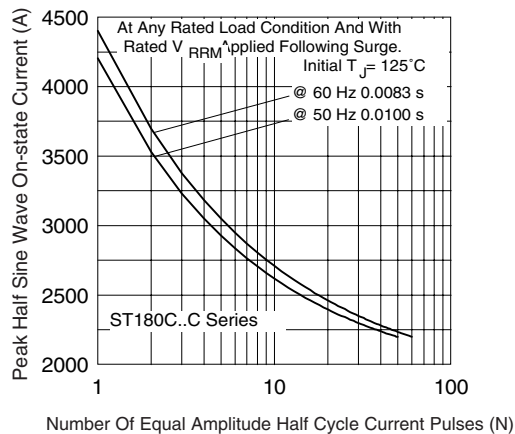


Fig. 7 - Maximum Non-Repetitive Surge Current  
Single and Double Side Cooled

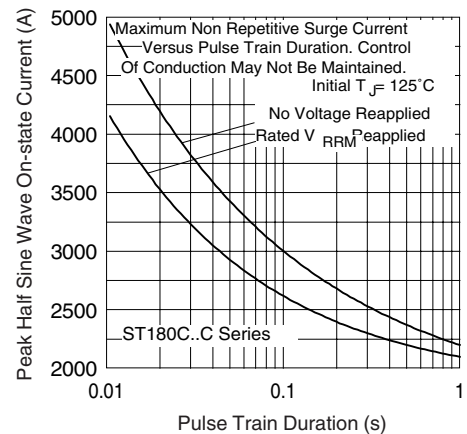


Fig. 8 - Maximum Non-Repetitive Surge Current  
Single and Double Side Cooled

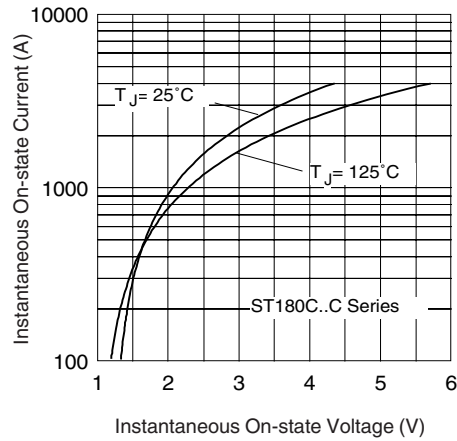


Fig. 9 - On-state Voltage Drop Characteristics

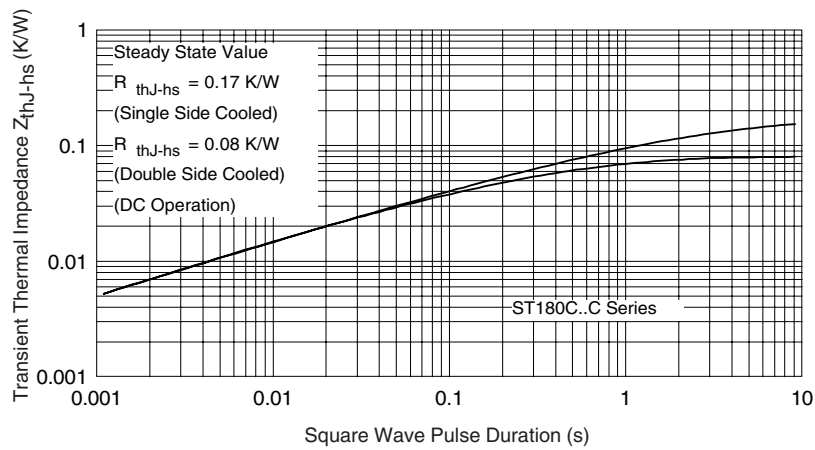


Fig. 10 - Thermal Impedance  $Z_{thJ-hs}$  Characteristics

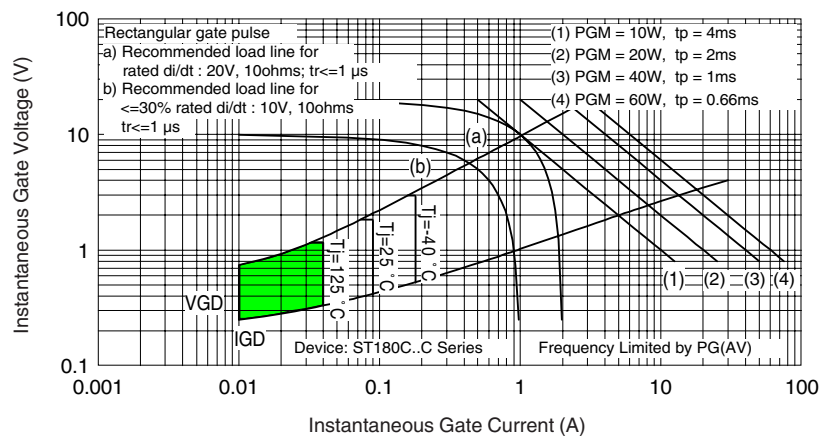


Fig. 11 - Gate Characteristics