

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

350A



case style TO-200AB (A-PUK)

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	A
@ 60Hz	5230	A
I^2t @ 50Hz	125	KA ² s
@ 60Hz	114	KA ² s
V_{DRM}/V_{RRM}	400 to 2000	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
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)	A	180° conduction, half sine wave double side (single side) cooled
	55 (85)	°C	
$I_{T(RMS)}$ Max. RMS on-state current	660	A	@ 25°C heatsink temperature double side cooled
I_{TSM} Max. peak, one-cycle non-repetitive surge current	5000		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		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^2/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)		

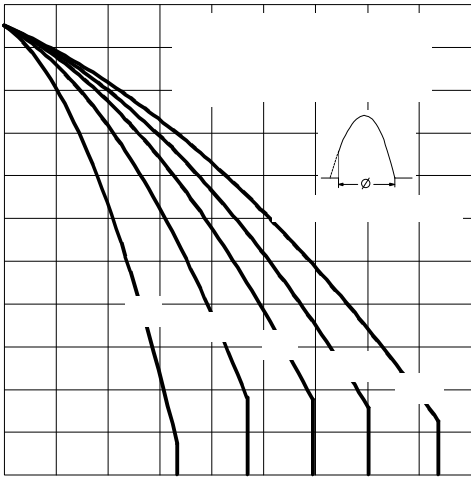


Fig. 3 - Current Ratings Characteristics

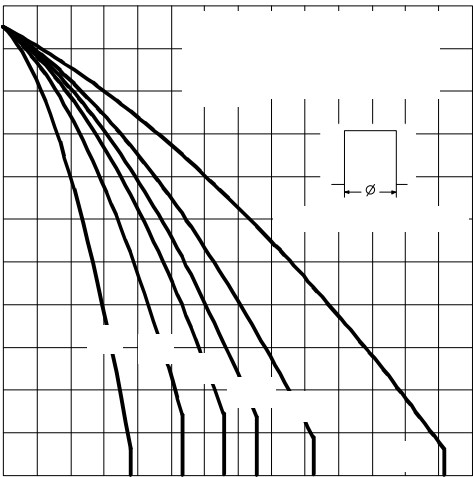


Fig. 4 - Current Ratings Characteristics

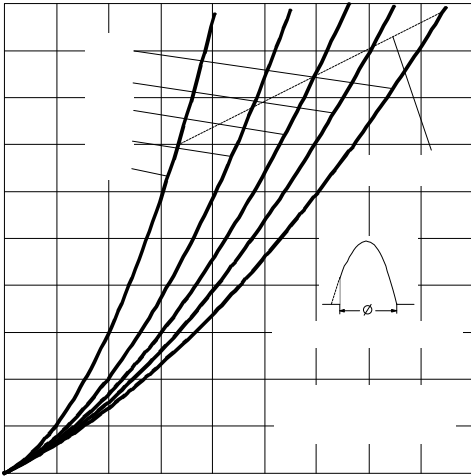


Fig. 5- On-state Power Loss Characteristics

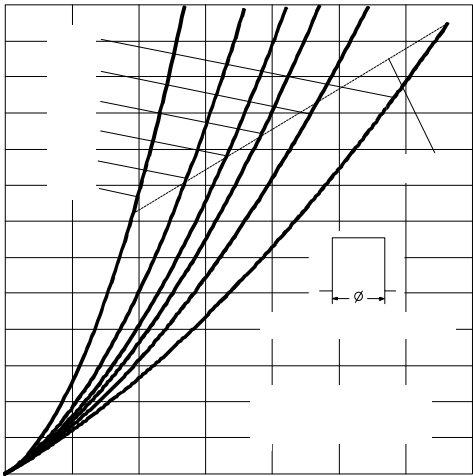


Fig. 6- On-state Power Loss Characteristics

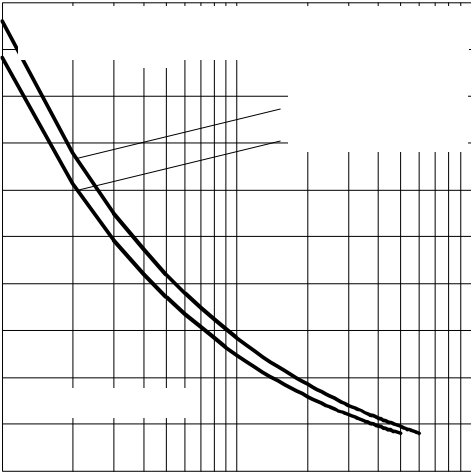


Fig. 7 - Maximum Non-Repetitive Surge Current

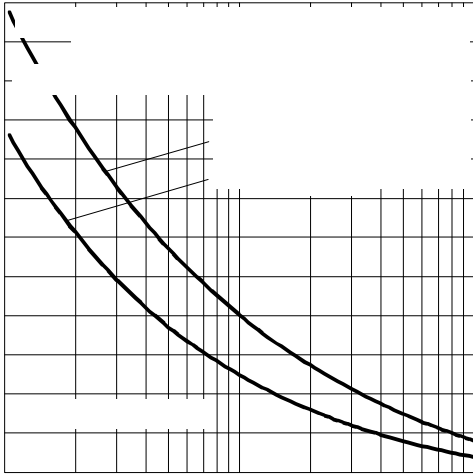


Fig. 8 - Maximum Non-Repetitive Surge Current

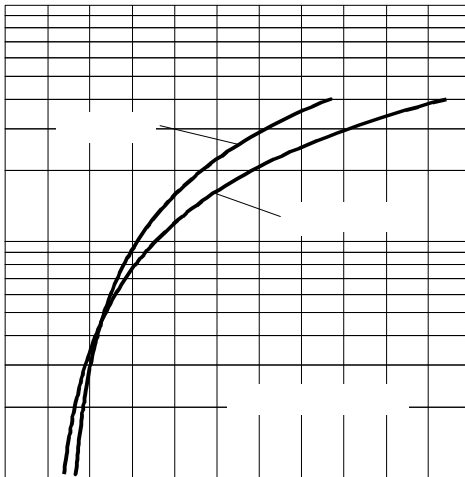


Fig. 9 - On-state Voltage Drop Characteristics

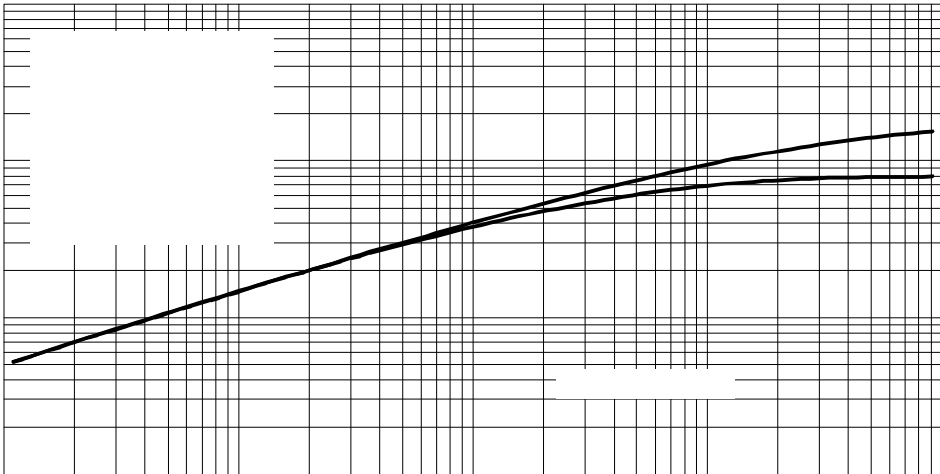


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

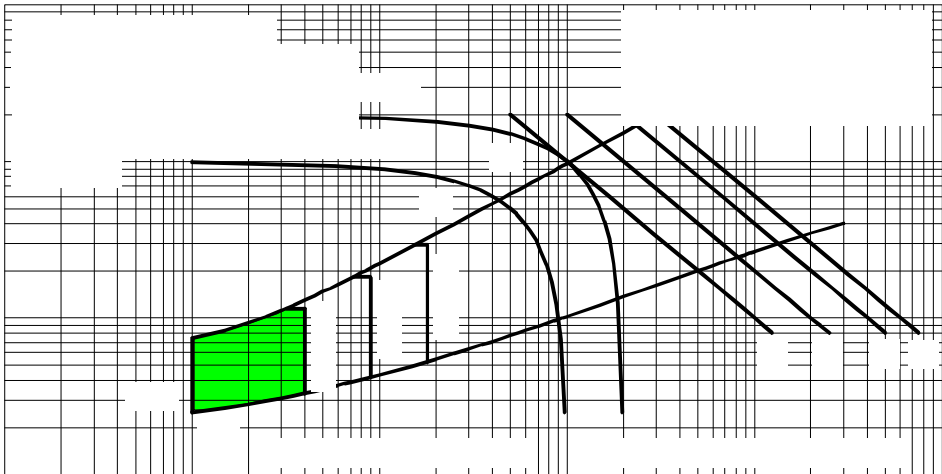


Fig. 11 - Gate Characteristics

Switching

Parameter	ST180C..C	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	1000	A/ μ s	Gate drive 20V, 20Ω , $t_r \leq 1\mu$ s $T_J = T_J \text{ max}$, anode voltage $\leq 80\% V_{\text{DRM}}$
t_d Typical delay time	1.0	μ s	Gate current 1A, $di_g/dt = 1\text{A}/\mu$ s $V_d = 0.67\% V_{\text{DRM}}$, $T_J = 25^\circ\text{C}$
t_q Typical turn-off time	100		$I_{\text{TM}} = 300\text{A}$, $T_J = T_J \text{ max}$, $di/dt = 20\text{A}/\mu$ s, $V_R = 50\text{V}$ $dv/dt = 20\text{V}/\mu$ 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/ μ s	$T_J = T_J \text{ max}$ 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 $V_{\text{DRM}}/V_{\text{RRM}}$ applied

Triggering

Parameter		ST180C..C		Units	Conditions	
P _{GM}	Maximum peak gate power	10		W	T _J = T _J max, t _p ≤ 5ms	
P _{G(AV)}	Maximum average gate power	2.0			T _J = T _J max, f = 50Hz, d% = 50	
I _{GM}	Max. peak positive gate current	3.0		A	T _J = T _J max, t _p ≤ 5ms	
+V _{GM}	Maximum peak positive gate voltage	20		V	T _J = T _J max, t _p ≤ 5ms	
-V _{GM}	Maximum peak negative gate voltage	5.0				
I _{GT}	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 _{GT}	DC gate voltage required to trigger	2.9	-	V		T _J = - 40°C
		1.8	3.0			T _J = 25°C
		1.2	-			T _J = 125°C
I _{GD}	DC gate current not to trigger	10		mA	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

ST180C..C Series

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, ± 10%	4900 (500)	N (Kg)	
wt Approximate weight	50	g	
Case style	TO - 200AB (A-PUK)		See Outline Table

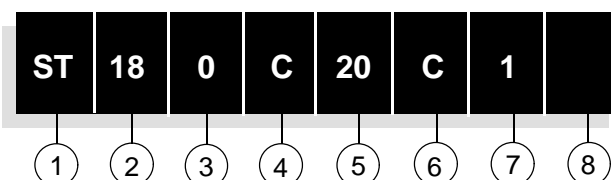
ΔR_{thJ-hs} Conduction

(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 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

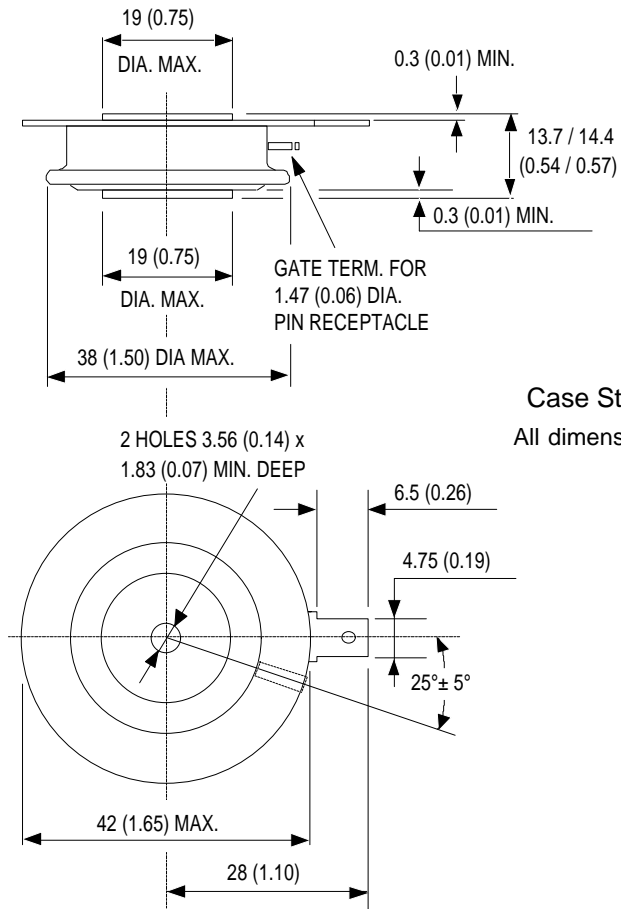
Device Code



- 1** - Thyristor
- 2** - Essential part number
- 3** - 0 = Converter grade
- 4** - C = Ceramic Puk
- 5** - Voltage code: Code x 100 = V_{RRM} (See Voltage Rating Table)
- 6** - C = Puk Case TO-200AB (A-PUK)
- 7** - 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)
- 8** - Critical dv/dt: None = 500V/μsec (Standard value)
L = 1000V/μsec (Special selection)

Outline Table

ANODE TO GATE
CREEPAGE DISTANCE: 7.62 (0.30) MIN.
STRIKE DISTANCE: 7.12 (0.28) MIN.



Case Style TO-200AB (A-PUK)
All dimensions in millimeters (inches)

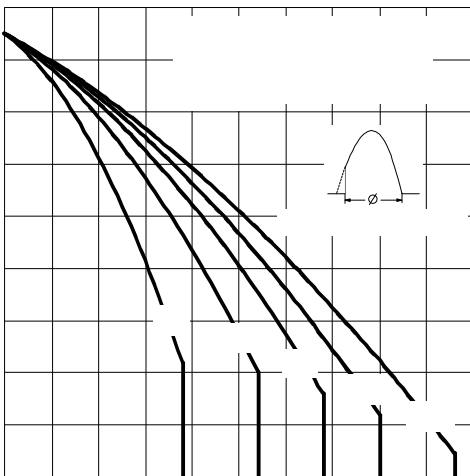


Fig. 1 - Current Ratings Characteristics

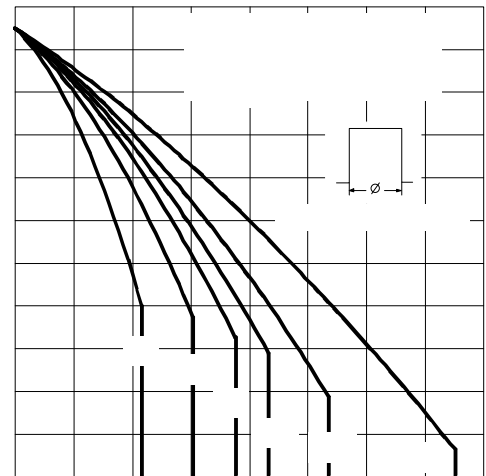


Fig. 2 - Current Ratings Characteristics