Bulletin I25162 rev. D 04/03

International
IOR Rectifier

ST230C..C SERIES

PHASE CONTROL THYRISTORS **Hockey Puk Version**

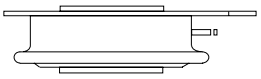
410A

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



case style TO-200AB (A-PUK)

Major Ratings and Characteristics

Parameters		ST230C..C	Units
$I_{T(AV)}$		410	A
	@ T_{hs}	55	°C
$I_{T(RMS)}$		780	A
	@ T_{hs}	25	°C
I_{TSM}	@ 50Hz	5700	A
	@ 60Hz	5970	A
I^2t	@ 50Hz	163	KA^2s
	@ 60Hz	149	KA^2s
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. @ $T_J = T_J$ max mA
ST230C..C	04	400	500	30
	08	800	900	
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	
	18	1800	1900	
	20	2000	2100	

On-state Conduction

	Parameter	ST230C..C	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	410 (165)	A	180° conduction, half sine wave		
	@ Heatsink temperature	55 (85)	°C	double side (single side) cooled		
$I_{T(RMS)}$	Max. RMS on-state current	780	A	DC @ 25°C heatsink temperature double side cooled		
I_{TSM}	Max. peak, one-cycle non-repetitive surge current	5700	A	t = 10ms	No voltage reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max.
		5970		t = 8.3ms		
		4800		t = 10ms	100% V_{RRM} reapplied	
		5000		t = 8.3ms		
I^2t	Maximum I^2t for fusing	163	KA^2s	t = 10ms	No voltage reapplied	
		148		t = 8.3ms		
		115		t = 10ms	100% V_{RRM} reapplied	
		105		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	1630	$KA^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		
$V_{T(TO)1}$	Low level value of threshold voltage	0.92	V	(16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ max.		
$V_{T(TO)2}$	High level value of threshold voltage	0.98		(I > π x $I_{T(AV)}$),$T_J = T_J$ max.		
r_{t1}	Low level value of on-state slope resistance	0.88	mΩ	(16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ max.		
r_{t2}	High level value of on-state slope resistance	0.81		(I > π x $I_{T(AV)}$),$T_J = T_J$ max.		
V_{TM}	Max. on-state voltage	1.69	V	I_{pk}= 880A, $T_J = T_J$ max, t_p = 10ms sine pulse		
I_H	Maximum holding current	600	mA	T_J = 25°C, anode supply 12V resistive load		
I_L	Max. (typical) latching current	1000 (300)				

Switching

	Parameter	ST230C..C	Units	Conditions
di/dt	Max. non-repetitive rate of rise of turned-on current	1000	A/µs	Gate drive 20V, 20Ω, $t_r \leq 1$µs $T_J = T_J$ max, anode voltage ≤ 80% V_{DRM}
t_d	Typical delay time	1.0	µs	Gate current 1A, di_g/dt = 1A/µs V_d = 0.67% V_{DRM}, T_J = 25°C
t_q	Typical turn-off time	100		I_{TM} = 300A, $T_J = T_J$ max, di/dt = 20A/µs, V_R = 50V dv/dt = 20V/µs, Gate 0V 100Ω, t_p = 500µs

Blocking

	Parameter	ST230C..C	Units	Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	500	V/µs	$T_J = T_J$ max. linear to 80% rated V_{DRM}
I_{DRM} I_{RRM}	Max. peak reverse and off-state leakage current	30	mA	$T_J = T_J$ max, rated V_{DRM}/V_{RRM} applied

Triggering

	Parameter	ST230C..C		Units	Conditions	
P_{GM}	Maximum peak gate power	10.0		W	$T_J = T_J$ max, $t_p \leq 5$ms	
$P_{G(AV)}$	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, $t_p \leq 5$ms	
$+V_{GM}$	Maximum peak positive gate voltage	20		V	$T_J = T_J$ max, $t_p \leq 5$ms	
$-V_{GM}$	Maximum peak negative gate voltage	5.0				
		TYP.	MAX.			
I_{GT}	DC gate current required to trigger	180	-	mA	T_J = - 40°C	Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
		90	150		T_J = 25°C	
		40	-		T_J = 125°C	
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	$T_J = T_J$ 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	ST230C..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	K/W	DC operation single side cooled
		0.08		DC operation double side cooled
R_{thC-hs}	Max. thermal resistance, case to heatsink	0.033	K/W	DC operation single side cooled
		0.017		DC operation double side cooled
F	Mounting force, ±10%	4900	N	
		(500)	(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	0.017	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		

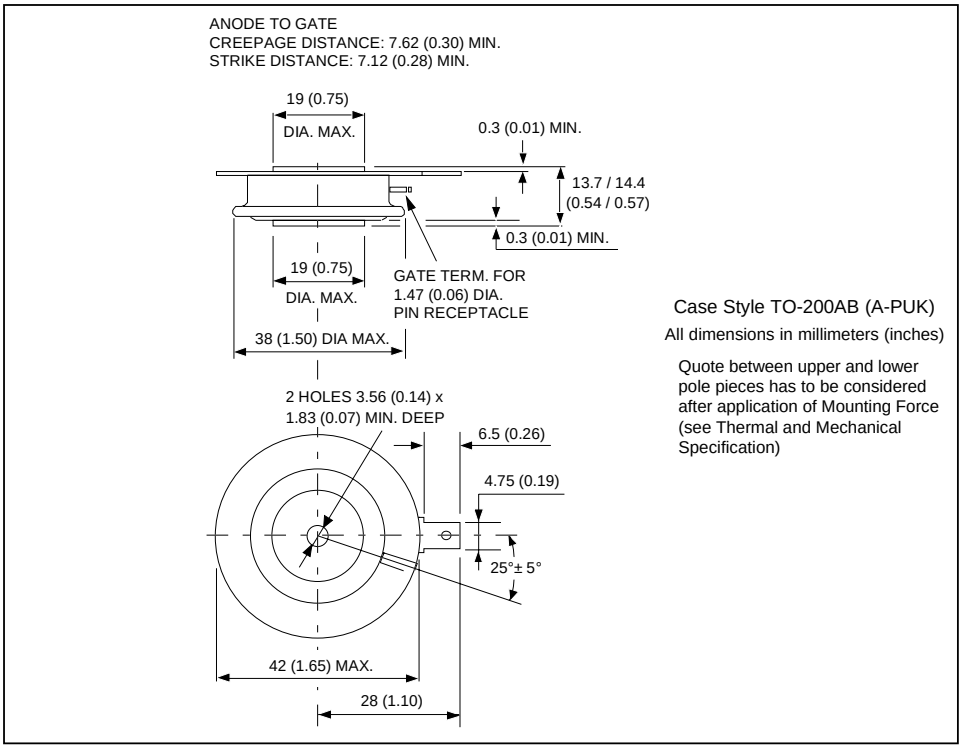
Ordering Information Table

Device Code

ST	23	0	C	20	C	1	
1	2	3	4	5	6	7	8

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 selection)
L = 1000V/µsec (Special selection)

Outline Table



Case Style TO-200AB (A-PUK)

All dimensions in millimeters (inches)

Quote between upper and lower pole pieces has to be considered after application of Mounting Force (see Thermal and Mechanical Specification)

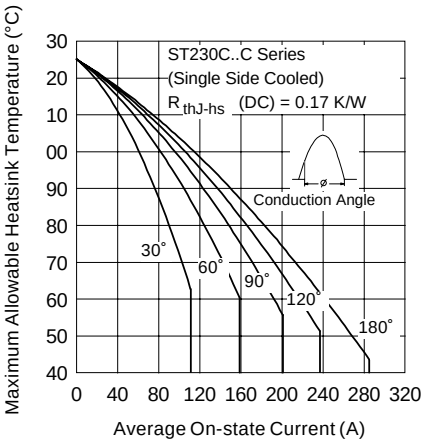


Fig. 1 - Current Ratings Characteristics

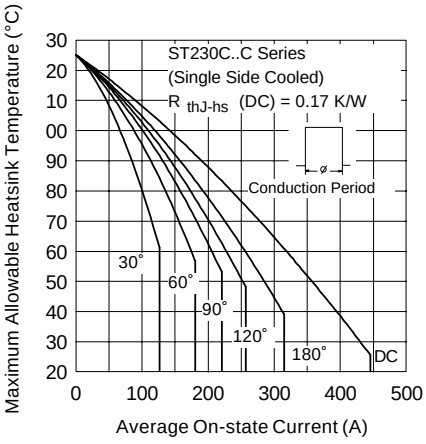


Fig. 2 - Current Ratings Characteristics

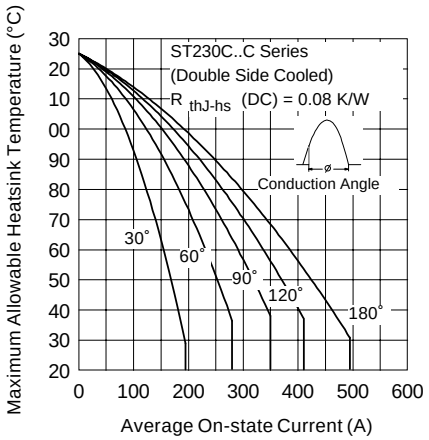


Fig. 3 - Current Ratings Characteristics

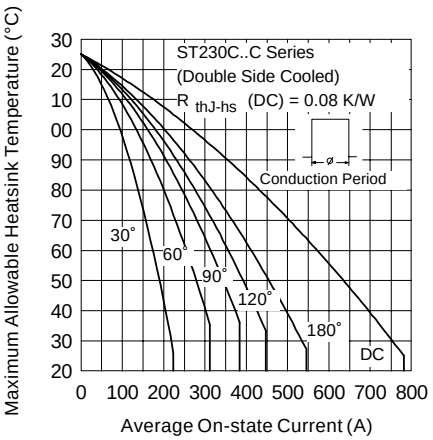


Fig. 4 - Current Ratings Characteristics

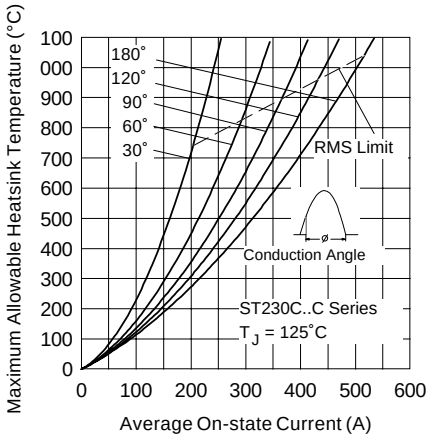


Fig. 5- On-state Power Loss Characteristics

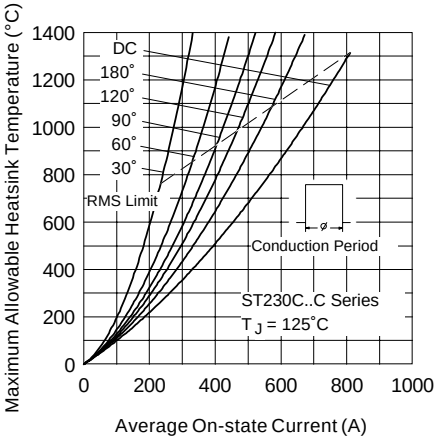


Fig. 6- On-state Power Loss Characteristics

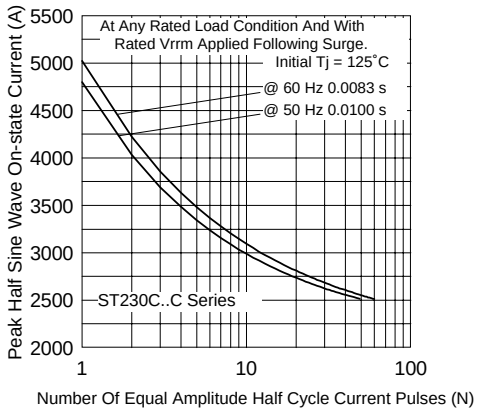


Fig. 7 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

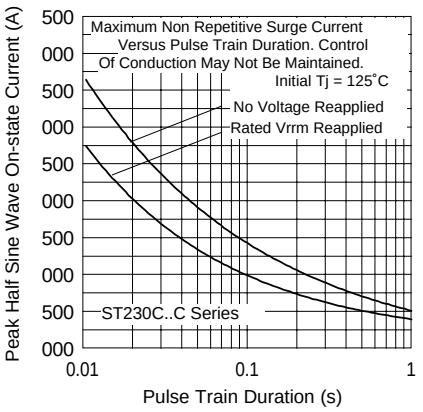


Fig. 8 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

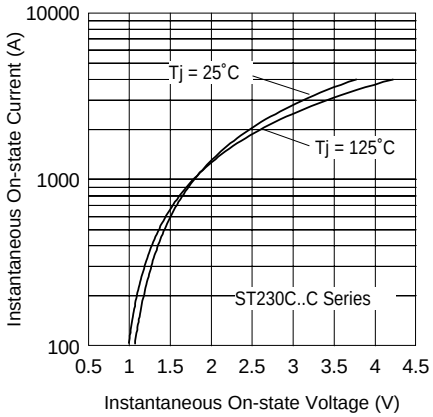


Fig. 9 - On-state Voltage Drop Characteristics

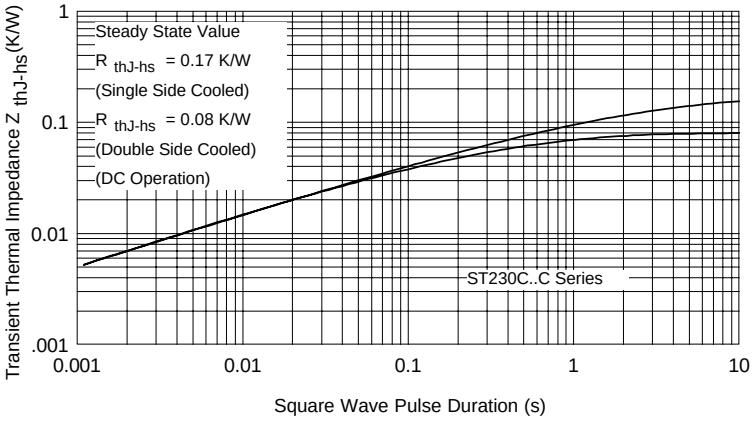


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

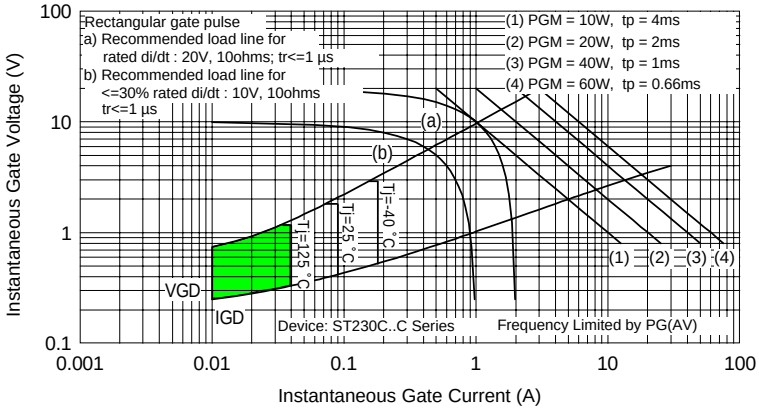


Fig. 11 - Gate Characteristics

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 IOR Rectifier

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