

PHASE CONTROL THYRISTORS

Hockey Puk Version

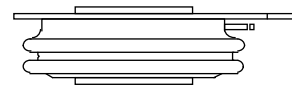
Features

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case TO-200AB (E-PUK)
- Low profile hockey-puk to increase current-carrying capability

960A

Typical Applications

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



case style TO-200AB (E-PUK)

Major Ratings and Characteristics

Parameters	ST380C..C	Units
$I_{T(AV)}$	960	A
@ T_{hs}	55	°C
$I_{T(RMS)}$	1900	A
@ T_{hs}	25	°C
I_{TSM} @ 50Hz	15000	A
@ 60Hz	15700	A
I^2t @ 50Hz	1130	KA ² s
@ 60Hz	1030	KA ² s
V_{DRM}/V_{RRM}	400 to 600	V
t_q typical	100	μs
T_J	- 40 to 125	°C

ST380C..C Series

Bulletin I25168 rev.C 04/00

International
IR 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
ST380C..C	04	400	500	50
	06	600	700	

On-state Conduction

Parameter		ST380C..C	Units	Conditions			
I _{T(AV)}	Max. average on-state current @ Heatsink temperature	960 (440)	A	180° conduction, half sine wave double side (single side) cooled			
		55 (75)	°C				
I _{T(RMS)}	Max. RMS on-state current	1900	A	DC @ 25°C heatsink temperature double side cooled			
I _{TSM}	Max. peak, one-cycle non-repetitive surge current	15000		t = 10ms	No voltage	Sinusoidal half wave, Initial T _J = T _J max.	
		15700		t = 8.3ms	reapplied		
		12600		t = 10ms	100% V _{RRM}		
		13200		t = 8.3ms	reapplied		
I ² t	Maximum I ² t for fusing	1130	KA ² s	t = 10ms	No voltage		
		1030		t = 8.3ms	reapplied		
		800		t = 10ms	100% V _{RRM}		
		725		t = 8.3ms	reapplied		
I ² √t	Maximum I ² √t for fusing	11300	KA ² √s	t = 0.1 to 10ms, no voltage reapplied			
V _{T(TO)1}	Low level value of threshold voltage	0.85	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	0.88		(I > π x I _{T(AV)}), T _J = T _J max.			
r _{t1}	Low level value of on-state slope resistance	0.25	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	0.24		(I > π x I _{T(AV)}), T _J = T _J max.			
V _{TM}	Max. on-state voltage	1.60	V	I _{pk} = 3000A, 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	Typical latching current	1000					

Switching

Parameter	ST380C..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		$I_{TM} = 550A, T_J = T_J \text{ max}, di/dt = 40A/\mu s, V_R = 50V$ $dv/dt = 20V/\mu s$, Gate 0V 100Ω, $t_p = 500\mu s$

Blocking

Parameter	ST380C..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_{RRM} I_{DRM} Max. peak reverse and off-state leakage current	50	mA	$T_J = T_J \text{ max.}$ rated V_{DRM}/V_{RRM} applied

Triggering

Parameter	ST380C..C		Units	Conditions
P_{GM} Maximum peak gate power	10.0		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.	mA	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
	200	-		
	100	200		
	50	-		
V_{GT} DC gate voltage required to trigger	2.5	-	V	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$
	1.8	3.0		
	1.1	-		
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	ST380C..C	Units	Conditions
T_J Max. operating temperature range	-40 to 125	$^\circ\text{C}$	
T_{stg} Max. storage temperature range	-40 to 150		
R_{thJ-hs} Max. thermal resistance, junction to heatsink	0.09 0.04	K/W	DC operation single side cooled DC operation double side cooled
R_{thC-hs} Max. thermal resistance, case to heatsink	0.02 0.01	K/W	DC operation single side cooled DC operation double side cooled
F Mounting force, $\pm 10\%$	9800 (1000)	N (Kg)	
wt Approximate weight	83	g	
Case style	TO - 200AB (E-PUK)	See Outline Table	

ST380C..C Series

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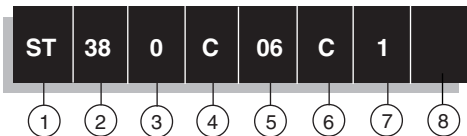
ΔR_{thJ-HS} Conduction

(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°	0.010	0.011	0.007	0.007	K/W	$T_J = T_{J \text{ max.}}$
120°	0.012	0.012	0.012	0.013		
90°	0.015	0.015	0.016	0.017		
60°	0.022	0.022	0.023	0.023		
30°	0.036	0.036	0.036	0.037		

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 (E-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/ μ sec (Standard selection)
L = 1000V/ μ sec (Special selection)

Outline Table

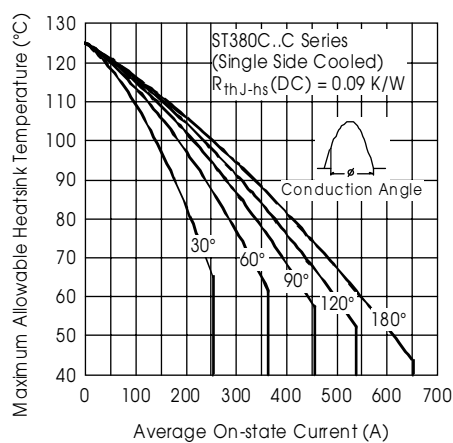
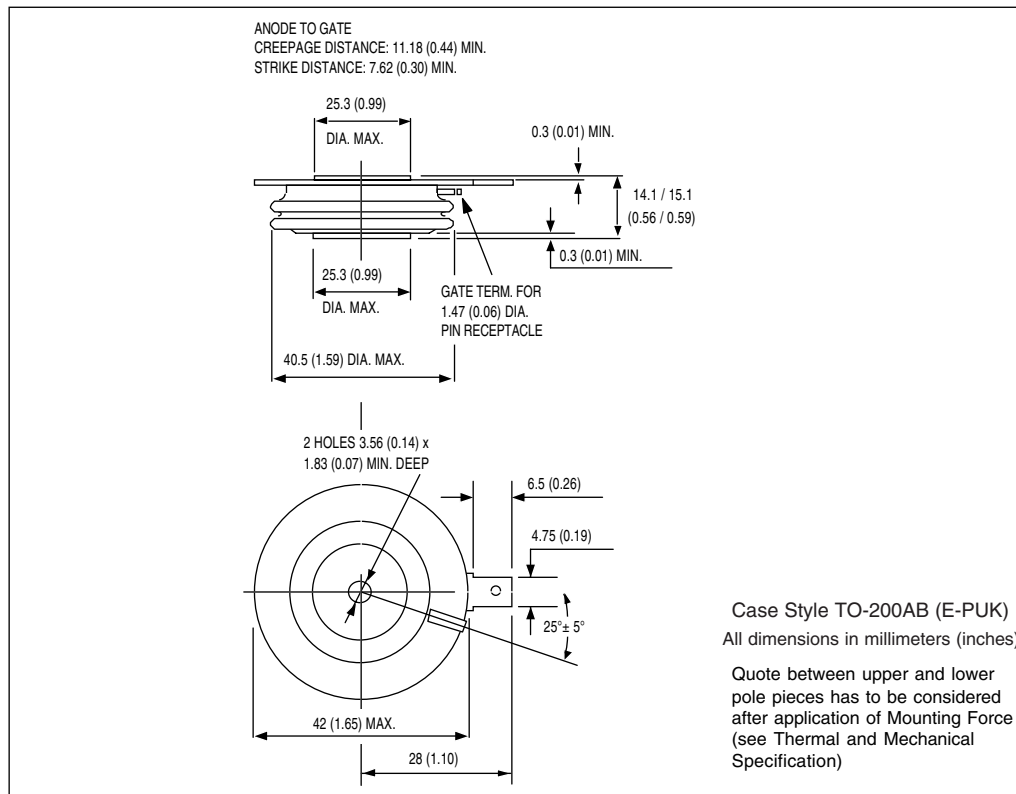


Fig. 1 - Current Ratings Characteristics

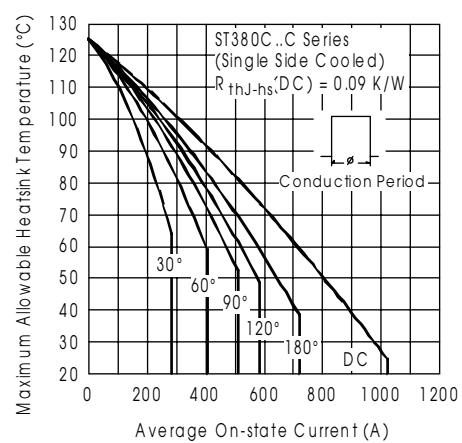


Fig. 2 - Current Ratings Characteristics

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International
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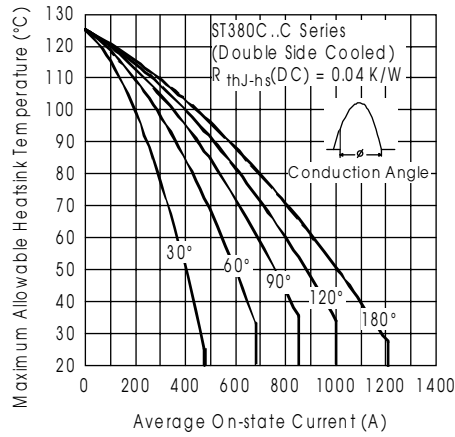


Fig. 3 - Current Ratings Characteristics

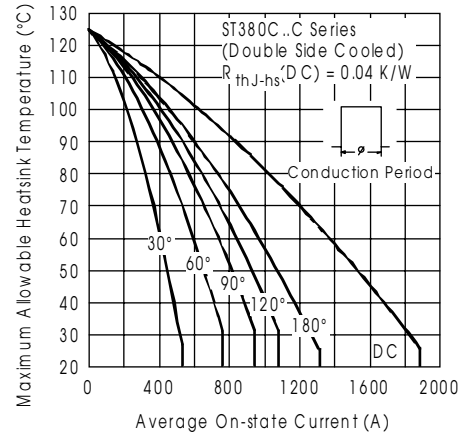


Fig. 4 - Current Ratings Characteristics

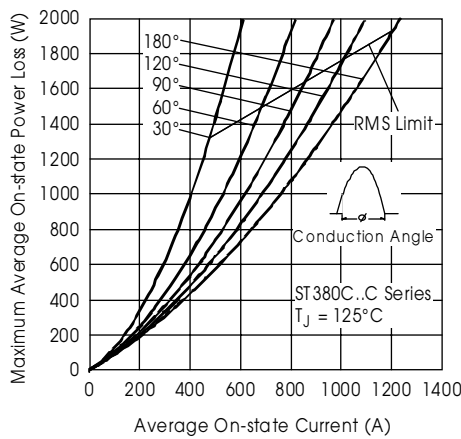


Fig. 5 - On-state Power Loss Characteristics

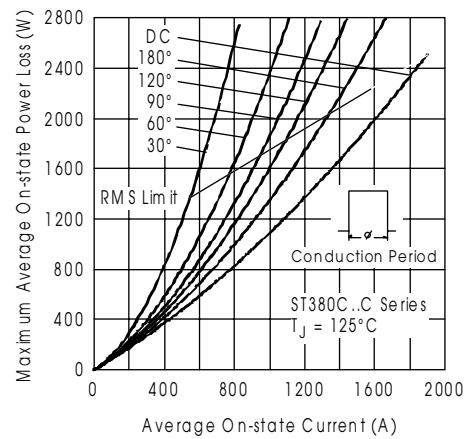


Fig. 6 - On-state Power Loss Characteristics

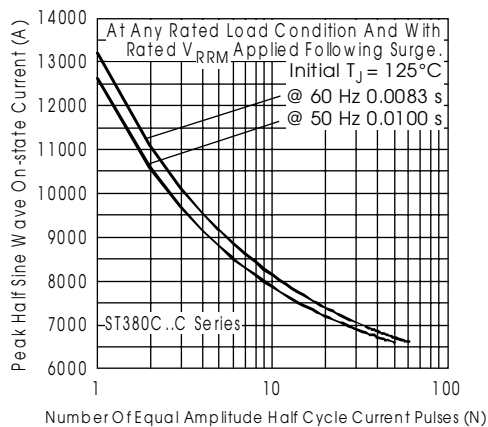


Fig. 7 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

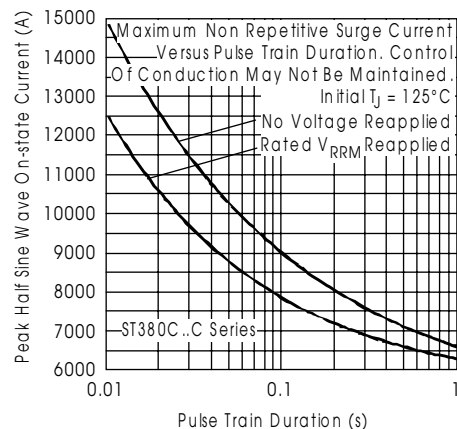


Fig. 8 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

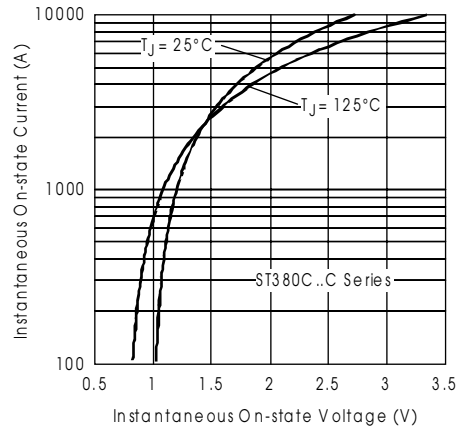


Fig. 9 - On-state Voltage Drop Characteristics

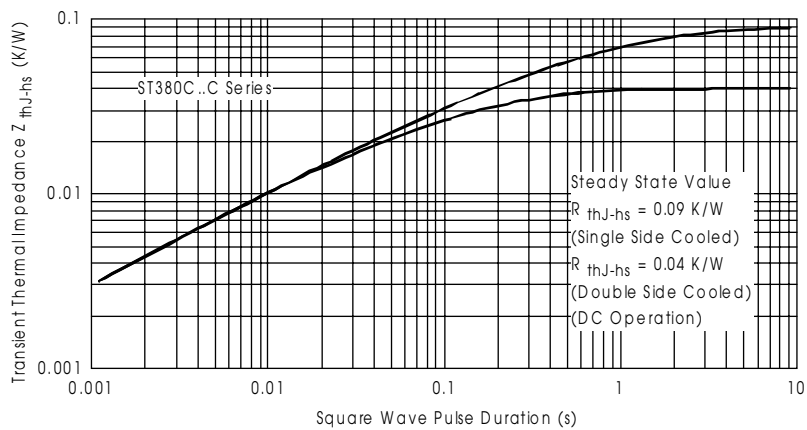


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

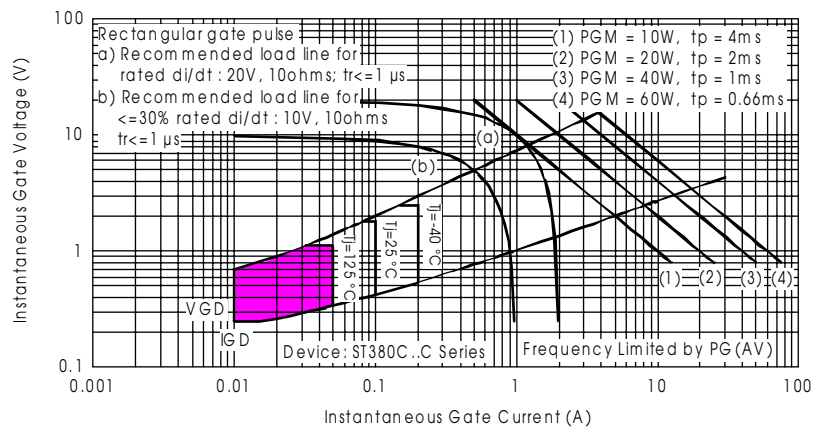


Fig. 11 - Gate Characteristics