International **IQR** Rectifier

ST380CH..C SERIES

**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
■ Extended temperature range

960A

Typical Applications

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

case style TO-200AB (E-PUK)
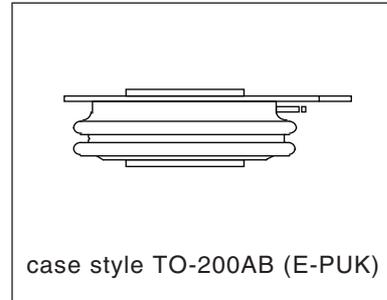
Major Ratings and Characteristics

Parameters		ST380CH..C	Units
$I_{T(AV)}$		960	A
	@ T_{hs}	80	°C
$I_{T(RMS)}$		2220	A
	@ T_{hs}	25	°C
I_{TSM}	@ 50Hz	12500	A
	@ 60Hz	13000	A
I^2t	@ 50Hz	782	KA^2s
	@ 60Hz	713	KA^2s
V_{DRM}/V_{RRM}		400 to 600	V
t_q	typical	100	µs
T_J		- 40 to 150	°C

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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
ST380CH..C	04	400	500	100
	06	600	700	

On-state Conduction

	Parameter	ST380CH..C	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	960 (440)	A	180° conduction, half sine wave		
	@ Heatsink temperature	80 (110)	°C	double side (single side) cooled		
$I_{T(RMS)}$	Max. RMS on-state current	2220		DC @ 25°C heatsink temperature double side cooled		
I_{TSM}	Max. peak, one-cycle	12500	A	t = 10ms	No voltage	
	non-repetitive surge current	13000		t = 8.3ms	reapplied	
		10500		t = 10ms	100% V_{RRM}	
		11000		t = 8.3ms	reapplied	Sinusoidal half wave,
I^2t	Maximum I^2t for fusing	782	KA^{2}s	t = 10ms	No voltage	Initial $T_J = T_J$ max.
		713		t = 8.3ms	reapplied	
		553		t = 10ms	100% V_{RRM}	
		505		t = 8.3ms	reapplied	
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	7820	KA$^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		
$V_{T(TO)1}$	Low level value of threshold voltage	0.85	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ max.		
$V_{T(TO)2}$	High level value of threshold voltage	0.88		$(I > \pi \times I_{T(AV)})$,$T_J = T_J$ max.		
r_{t1}	Low level value of on-state slope resistance	0.25	mΩ	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ max.		
r_{t2}	High level value of on-state slope resistance	0.24		$(I > \pi \times I_{T(AV)})$,$T_J = T_J$ max.		
V_{TM}	Max. on-state voltage	1.58	V	I_{pk} = 2900A, $T_J = T_J$ 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	ST380CH..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 $\leq$ 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} = 550A, $T_J = T_J$ max, di/dt = 40A/µs, V_R = 50V dv/dt = 20V/µs, Gate 0V 100Ω, t_p = 500µs

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Blocking

	Parameter	ST380CH..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_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	100	mA	$T_J = T_J$ max, rated V_{DRM}/V_{RRM} applied

Triggering

	Parameter	ST380CH..C		Units	Conditions	
P_{GM}	Maximum peak gate power	10.0		W	$T_J = T_J$ max, $t_p \leq$ 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, $t_p \leq$ 5ms	
+V_{GM}	Maximum peak positive gate voltage	20		V	$T_J = T_J$ max, $t_p \leq$ 5ms	
-V_{GM}	Maximum peak negative gate voltage	5.0				
		TYP.	MAX.			
I_{GT}	DC gate current required to trigger	200	-	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
		100	200		T_J = 25°C	
		40	-		T_J = 150°C	
V_{GT}	DC gate voltage required to trigger	2.5	-	V	T_J = - 40°C	
		1.8	3.0		T_J = 25°C	
		1.0	-		T_J = 150°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	ST380CH..C	Units	Conditions
T_J	Max. operating temperature range	-40 to 150	°C	
T_{stg}	Max. storage temperature range	-40 to 150		
R_{thJ-hs}	Max. thermal resistance, junction to heatsink	0.09	K/W	DC operation single side cooled
		0.04		DC operation double side cooled
R_{thC-hs}	Max. thermal resistance, case to heatsink	0.02	K/W	DC operation single side cooled
		0.01		DC operation double side cooled
F	Mounting force, ± 10%	9800	N	
		(1000)	(Kg)	
wt	Approximate weight	83	g	
	Case style	TO - 200AB (E-PUK)		See Outline Table

ΔR_{thJ-hs} Conduction

(The following table shows the increment of thermal resistence 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		$T_J = T_J$ max.
120°	0.012	0.012	0.012	0.013		
90°	0.015	0.015	0.016	0.017	K/W	
60°	0.022	0.022	0.023	0.023		
30°	0.036	0.036	0.036	0.037		

Ordering Information Table

Device Code

ST	38	0	CH	06	C	1	
①	②	③	④	⑤	⑥	⑦	⑧

1 - Thyristor

2 - Essential part number

3 - 0 = Converter grade

4 - CH = Ceramic Puk, High temperature

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/µsec (Standard selection)

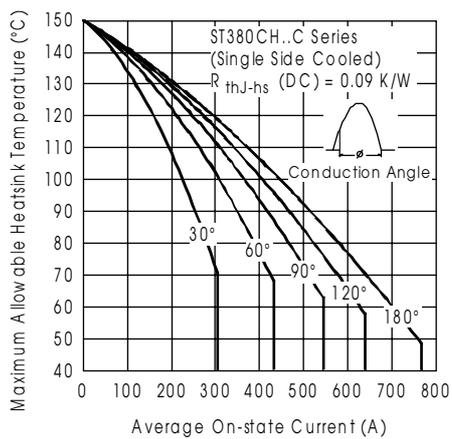   L   = 1000V/µsec (Special selection)

Outline Table

ANODE TO GATE
CREEPAGE DISTANCE: 11.18 (0.44) MIN.
STRIKE DISTANCE: 7.62 (0.30) MIN.

25.3 (0.99)
DIA. MAX.

0.3 (0.01) MIN.

14.1 / 15.1
(0.56 / 0.59)

0.3 (0.01) MIN.

25.3 (0.99)
DIA. MAX.

GATE TERM. FOR
1.47 (0.06) DIA.
PIN RECEPTACLE

40.5 (1.59) DIA. MAX.

2 HOLES 3.56 (0.14) x
1.83 (0.07) MIN. DEEP

6.5 (0.26)

4.75 (0.19)

25°± 5°

42 (1.65) MAX.

28 (1.10)

Case Style TO-200AB (E-PUK)

All dimensions in millimeters (inches)

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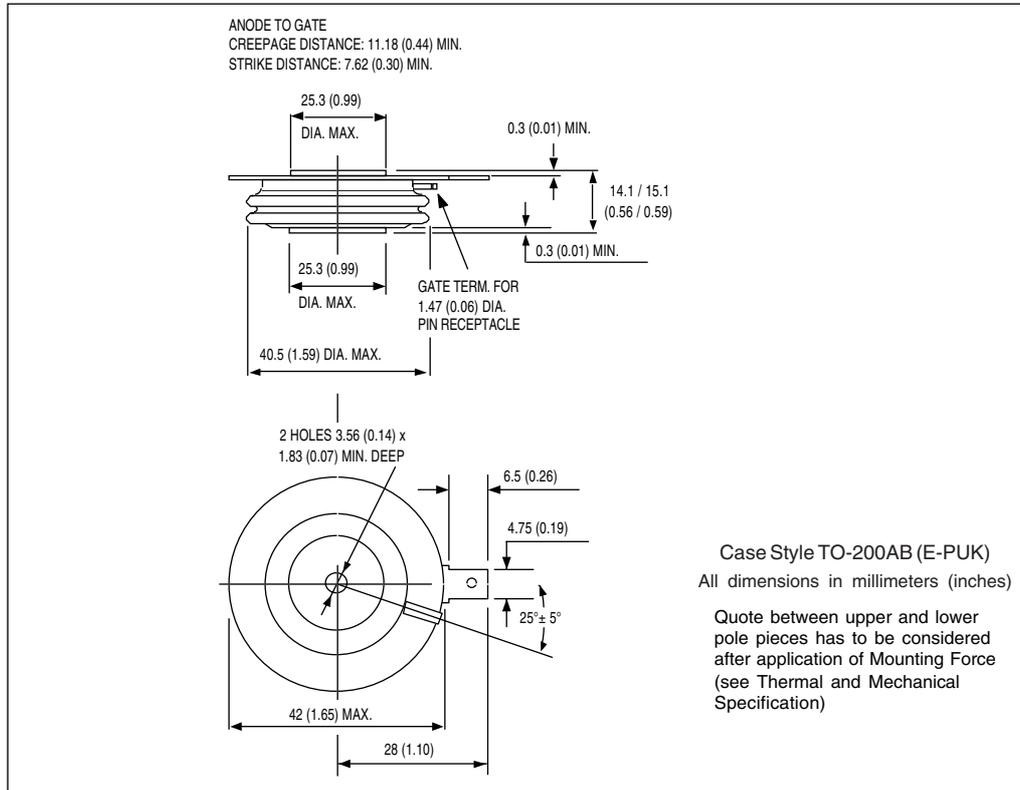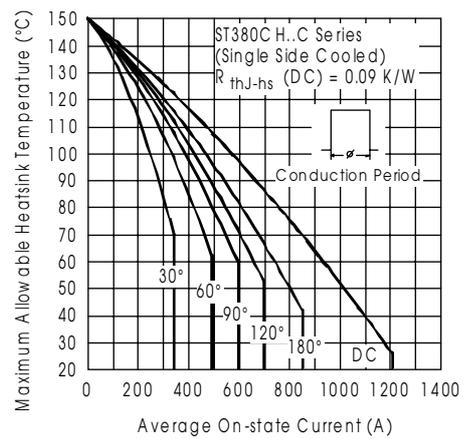(see Thermal and Mechanical
Specification)

Fig. 1 - Current Ratings Characteristics

Fig. 2 - Current Ratings Characteristics