

# ST280CH..C SERIES

## PHASE CONTROL THYRISTORS

## Hockey Puk Version

### Features

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

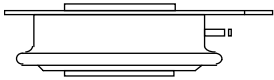
### Typical Applications

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

### Major Ratings and Characteristics

Parameters	ST280CH..C	Units
$I_{T(AV)}$	500	A
@ $T_{hs}$	80	°C
$I_{T(RMS)}$	1130	A
@ $T_{hs}$	25	°C
$I_{TSM}$	@ 50Hz	7200 A
	@ 60Hz	7500 A
$I^2t$	@ 50Hz	260 KA <sup>2</sup> s
	@ 60Hz	230 KA <sup>2</sup> s
$V_{DRM}/V_{RRM}$	400 to 600	V
$t_q$ typical	100	μs
$T_J$	- 40 to 150	°C

500A



case style TO-200AB (A-PUK)

## ST280CH..C Series

Bulletin I25160 rev. C 02/00

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
ST280CH..C	04	400	500	75
	06	600	700	

#### On-state Conduction

Parameter	ST280CH..C	Units	Conditions
$I_{T(AV)}$ Max. average on-state current @ Heatsink temperature	500 (185) 80 (110)	A °C	180° conduction, half sine wave double side (single side) cooled
$I_{T(RMS)}$ Max. RMS on-state current	1130		DC @ 25°C heatsink temperature double side cooled
$I_{TSM}$ Max. peak, one-cycle non-repetitive surge current	7200	A	t = 10ms No voltage
	7500		t = 8.3ms reapplied
	6000		t = 10ms 100% $V_{RRM}$
	6300		t = 8.3ms reapplied
$I^2t$ Maximum $I^2t$ for fusing	260	KA <sup>2</sup> s	t = 10ms No voltage
	235		t = 8.3ms reapplied
	180		t = 10ms 100% $V_{RRM}$
	165		t = 8.3ms reapplied
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	2600	KA <sup>2</sup> √s	t = 0.1 to 10ms, no voltage reapplied
$V_{T(TO)1}$ Low level value of threshold voltage	0.84	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	0.88		$(I > \pi \times I_{T(AV)})$ , $T_J = T_J \text{ max.}$
$r_{t1}$ Low level value of on-state slope resistance	0.50	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	0.47		$(I > \pi \times I_{T(AV)})$ , $T_J = T_J \text{ max.}$
$V_{TM}$ Max. on-state voltage	1.35	V	$I_{pk} = 1000A$ , $T_J = T_J \text{ max}$ , $t_p = 10ms$ sine pulse
$I_H$ Maximum holding current	600	mA	$T_J = 25^\circ C$ , anode supply 12V resistive load
$I_L$ Max (typical) latching current	1000 (300)		

#### Switching

Parameter	ST280CH..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	ST280CH..C	Units	Conditions
$dv/dt$ Maximum critical rate of rise of off-state voltage	500	V/ $\mu$ s	$T_J = T_J$ max. linear to 80% rated $V_{DRM}$
$I_{DRM}$ $I_{RRM}$ Max. peak reverse and off-state leakage current	75	mA	$T_J = T_J$ max, rated $V_{DRM}/V_{RRM}$ applied

### Triggering

Parameter	ST280CH..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		
$I_{GT}$ DC gate current required to trigger	TYP.	MAX.	$T_J = -40^\circ C$ $T_J = 25^\circ C$ $T_J = 150^\circ C$ Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
	180	-	
	90	150	
	30	-	
$V_{GT}$ DC gate voltage required to trigger	2.9	-	$T_J = -40^\circ C$
	1.8	3.0	$T_J = 25^\circ C$
	1.0	-	$T_J = 150^\circ C$
$I_{GD}$ 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	0.30	V	

### Thermal and Mechanical Specification

Parameter	ST280CH..C	Units	Conditions
$T_J$ Max. operating temperature range	-40 to 150	$^\circ C$	
$T_{stg}$ 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

ST280CH..C Series

Bulletin I25160 rev. C 02/00

$\Delta R_{thJ-hs}$  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°	0.016	0.017	0.011	0.011	K/W	$T_J = T_{J \text{ max.}}$
120°	0.019	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	28	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 (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/ $\mu$ sec (Standard selection)  
L = 1000V/ $\mu$ sec (Special selection)

Outline Table

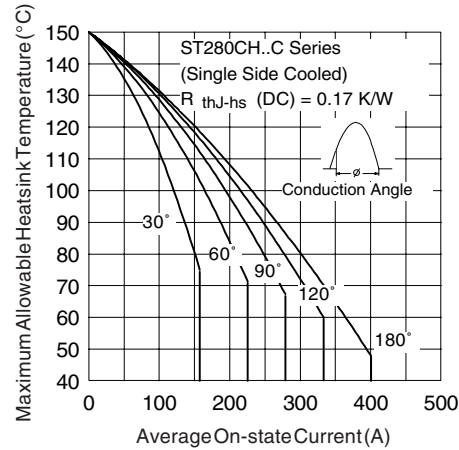
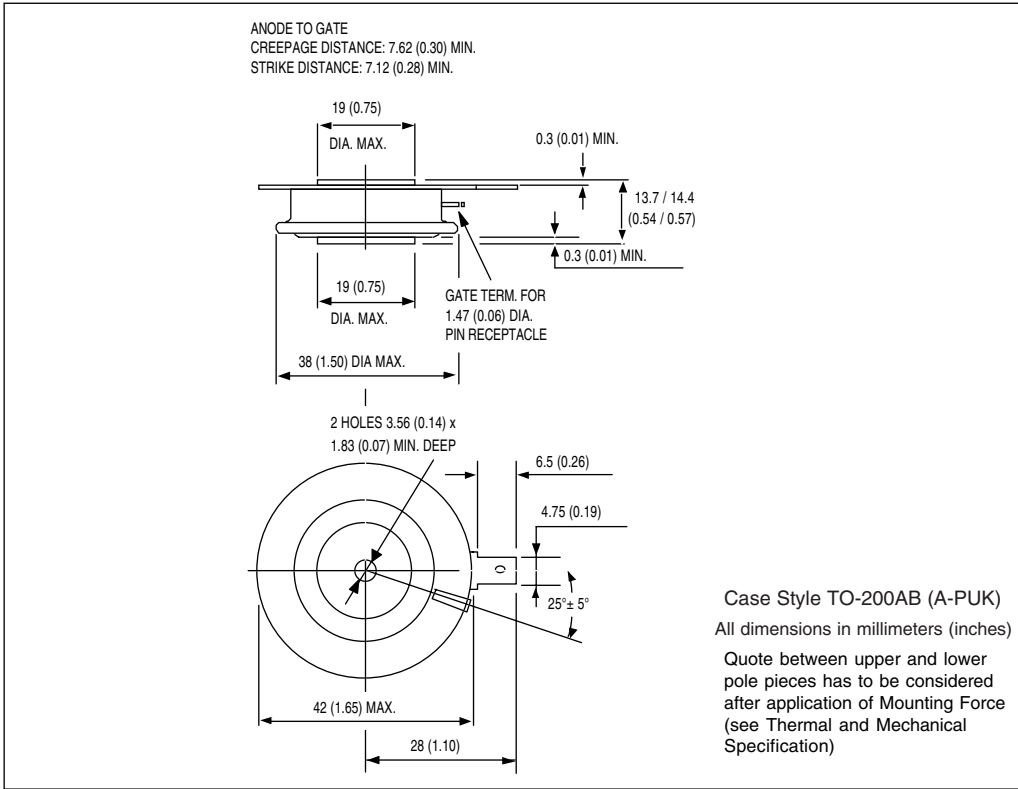


Fig. 1 - Current Ratings Characteristics

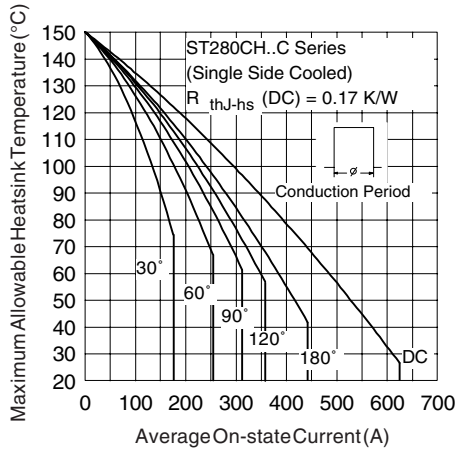


Fig. 2 - Current Ratings Characteristics

## ST280C..H Series

Bulletin I25160 rev. C 02/00

International  
IOR Rectifier

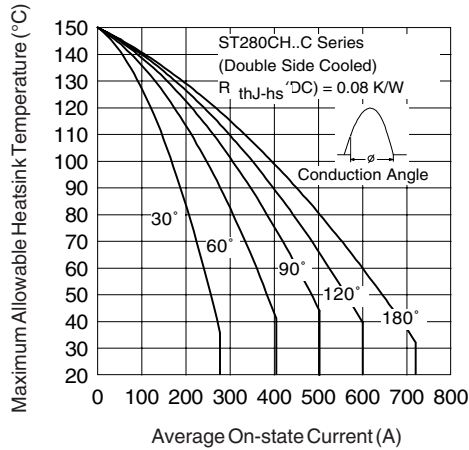


Fig. 3 - Current Ratings Characteristics

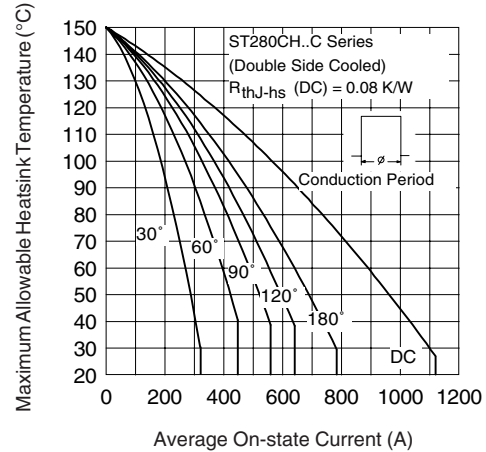


Fig. 4 - Current Ratings Characteristics

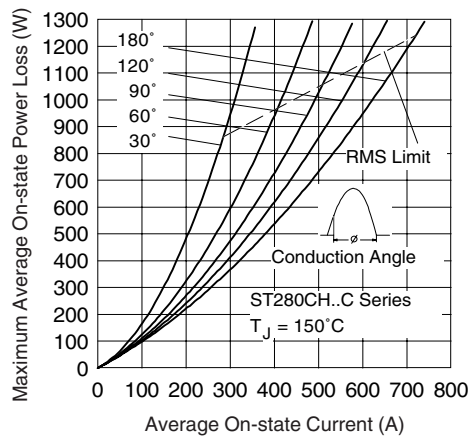


Fig. 5 - On-state Power Loss Characteristics

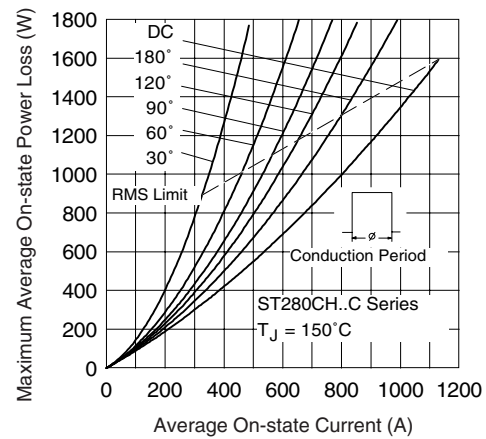


Fig. 6 - On-state Power Loss Characteristics

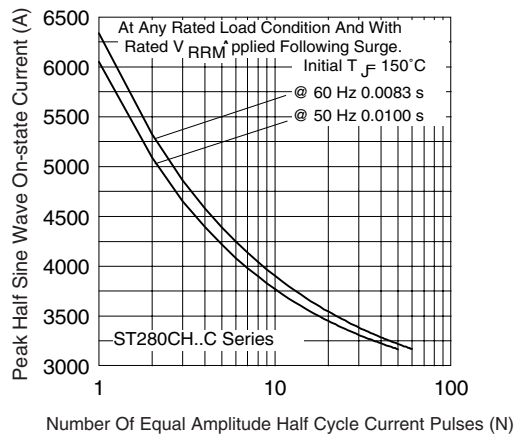


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

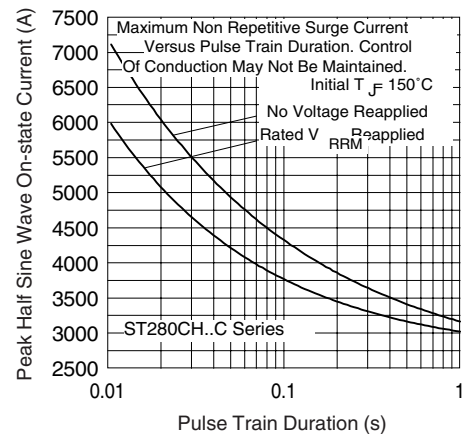


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

Instantaneous On-state Current (A)

Instantaneous On-state Voltage (V)  
Fig. 9 - On-state Voltage Drop Characteristics

Transient Thermal Impedance  $Z_{thJ-HS}$  (K/W)

Square Wave Pulse Duration (s)  
Fig. 10 - Thermal Impedance  $Z_{thJ-HS}$  Characteristics

Instantaneous Gate Voltage (V)

Instantaneous Gate Current (A)  
Fig. 11 - Gate Characteristics