

# ST1280C..K SERIES

## PHASE CONTROL THYRISTORS

## Hockey Puk Version

### Features

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case A-24 (K-PUK)
- High profile hockey-puk

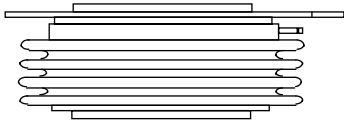
### Typical Applications

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

### Major Ratings and Characteristics

Parameters	ST1280C..K	Units	
I <sub>T(AV)</sub>	2310	A	
@ T <sub>hs</sub>	55	°C	
I <sub>T(RMS)</sub>	4150	A	
@ T <sub>hs</sub>	25	°C	
I <sub>TSM</sub>	@ 50Hz	42500	A
	@ 60Hz	44500	A
I <sup>2</sup> t	@ 50Hz	9027	KA <sup>2</sup> s
	@ 60Hz	8240	KA <sup>2</sup> s
V <sub>DRM</sub> /V <sub>RRM</sub>	400 to 600	V	
t <sub>q</sub>	typical	200	μs
T <sub>J</sub>	- 40 to 125	°C	

2310A



case style A-24 (K-PUK)

## ST1280C..K Series

Bulletin I25195 rev. B 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
ST1280C..K	04	400	500	100
	06	600	700	

#### On-state Conduction

Parameter	ST1280C..K	Units	Conditions
$I_{T(AV)}$ Max. average on-state current @ Heatsink temperature	2310 (885) 55 (85)	A °C	180° conduction, half sine wave double side (single side) cooled
$I_{T(RMS)}$ Max. RMS on-state current	4150	A	@ 25°C heatsink temperature double side cooled
$I_{TSM}$ Max. peak, one-cycle non-repetitive surge current	42500		t = 10ms No voltage
	44500		t = 8.3ms reapplied
	35700		t = 10ms 100% $V_{RRM}$
	37400		t = 8.3ms reapplied
$I^2t$ Maximum $I^2t$ for fusing	9027	KA <sup>2</sup> s	t = 10ms No voltage
	8241		t = 8.3ms reapplied
	6383		t = 10ms 100% $V_{RRM}$
	5828		t = 8.3ms reapplied
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	90270	KA <sup>2</sup> √s	t = 0.1 to 10ms, no voltage reapplied
$V_{T(TO)1}$ Low level value of threshold voltage	0.83	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	0.90		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
$r_{t1}$ Low level value of on-state slope resistance	0.077	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	0.068		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
$V_{TM}$ Max. on-state voltage	1.44	V	$I_{pk} = 8000A, T_J = T_J \text{ max, } t_p = 10ms \text{ sine pulse}$
$I_H$ Maximum holding current	600	mA	$T_J = 25^\circ C$ , anode supply 12V resistive load
$I_L$ Typical latching current	1000		

#### Switching

Parameter	ST1280C..K	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	1.9	μs	Gate current 1A, $di/dt = 1A/\mu s$ $V_d = 0.67\% V_{DRM}, T_J = 25^\circ C$
$t_q$ Typical turn-off time	200		$I_{TM} = 550A, T_J = T_J \text{ max, } di/dt = 40A/\mu s, V_R = 50V$ $dv/dt = 20V/\mu s, \text{ Gate } 0V \text{ } 100\Omega, t_p = 500\mu s$

### Blocking

Parameter	ST1280C..K	Units	Conditions
$dv/dt$ Maximum critical rate of rise of off-state voltage	500	V/ $\mu$ s	$T_J = T_J \text{ max. linear to } 80\% \text{ rated } V_{\text{DRM}}$
$I_{\text{RRM}}$ $I_{\text{DRM}}$ Max. peak reverse and off-state leakage current	100	mA	$T_J = T_J \text{ max, rated } V_{\text{DRM}}/V_{\text{RRM}}$ applied

### Triggering

Parameter	ST1280C..K		Units	Conditions
$P_{\text{GM}}$ Maximum peak gate power	16		W	$T_J = T_J \text{ max, } t_p \leq 5\text{ms}$
$P_{\text{G(AV)}}$ Maximum average gate power	3			$T_J = T_J \text{ max, } f = 50\text{Hz, } d\% = 50$
$I_{\text{GM}}$ Max. peak positive gate current	3.0		A	$T_J = T_J \text{ max, } t_p \leq 5\text{ms}$
$+V_{\text{GM}}$ Maximum peak positive gate voltage	20		V	$T_J = T_J \text{ max, } t_p \leq 5\text{ms}$
$-V_{\text{GM}}$ Maximum peak negative gate voltage	5.0			
$I_{\text{GT}}$ 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	-		
$V_{\text{GT}}$ DC gate voltage required to trigger	1.4	-	V	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$
	1.1	3.0		
	0.9	-		
$I_{\text{GD}}$ 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 $V_{\text{DRM}}$ anode-to-cathode applied
$V_{\text{GD}}$ DC gate voltage not to trigger	0.25		V	

### Thermal and Mechanical Specification

Parameter	ST1280C..K	Units	Conditions
$T_J$ Max. operating temperature range	-40 to 125	$^\circ\text{C}$	
$T_{\text{stg}}$ Max. storage temperature range	-40 to 150		
$R_{\text{thJ-hs}}$ Max. thermal resistance, junction to heatsink	0.042 0.021	K/W	DC operation single side cooled DC operation double side cooled
$R_{\text{thC-hs}}$ Max. thermal resistance, case to heatsink	0.006 0.003	K/W	DC operation single side cooled DC operation double side cooled
F Mounting force, $\pm 10\%$	24500 (2500)	N (Kg)	
wt Approximate weight	425	g	
Case style	A-24 (K-PUK)		See Outline Table

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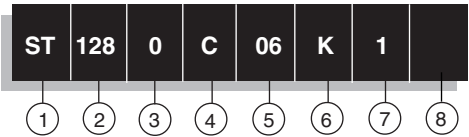
$\Delta R_{thJ-hs}$  Conduction

(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°	0.003	0.003	0.002	0.002	K/W	$T_J = T_{J \text{ max.}}$
120°	0.004	0.004	0.004	0.004		
90°	0.005	0.005	0.005	0.005		
60°	0.007	0.007	0.007	0.007		
30°	0.012	0.012	0.012	0.012		

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** - K = Puk Case A-24(K-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

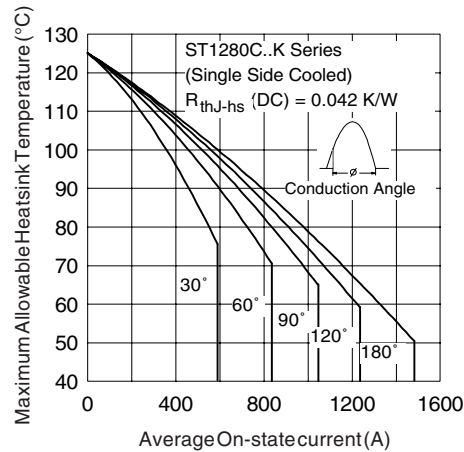
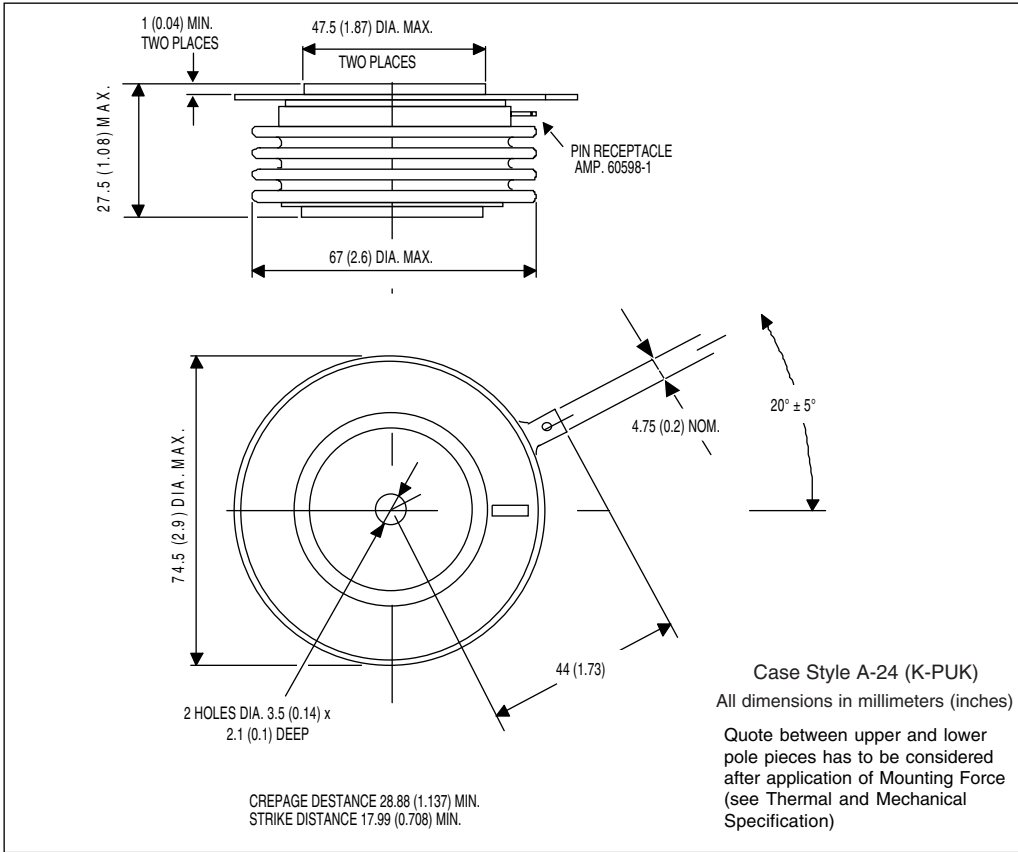


Fig. 1 - Current Ratings Characteristics

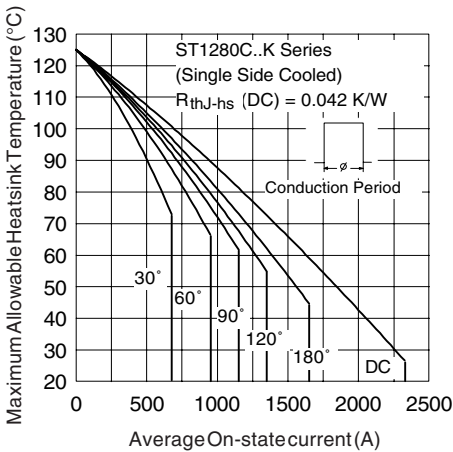


Fig. 2 - Current Ratings Characteristics

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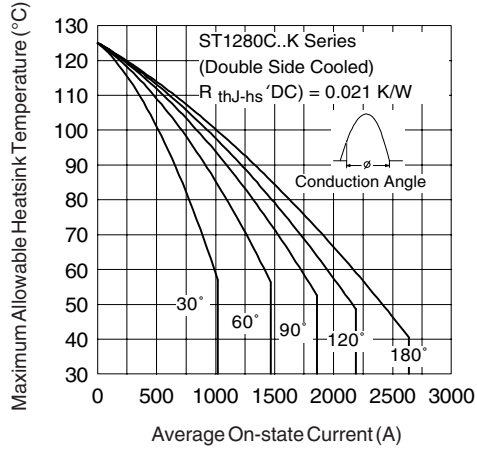


Fig. 3 - Current Ratings Characteristics

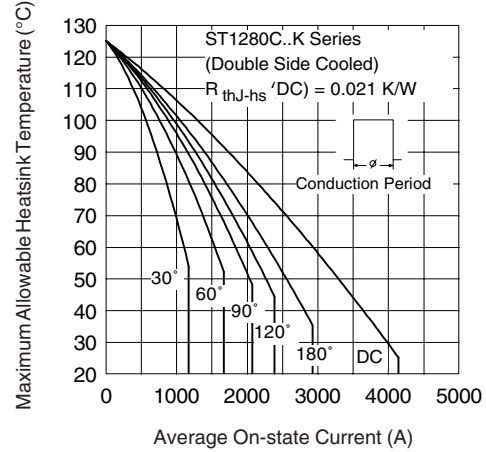


Fig. 4 - Current Ratings Characteristics

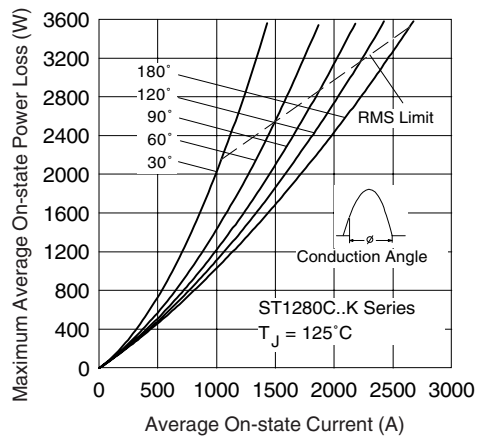


Fig. 5 - On-state Power Loss Characteristics

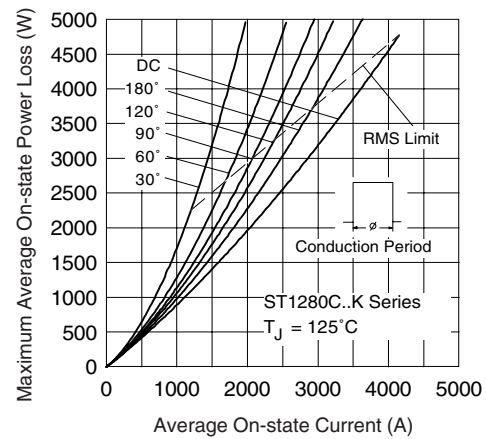


Fig. 6 - On-state Power Loss Characteristics

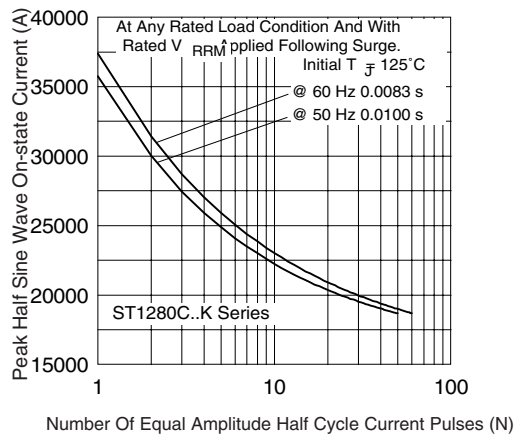


Fig. 7 - Maximum Non-Repetitive Surge Current  
Single and Double Side Cooled

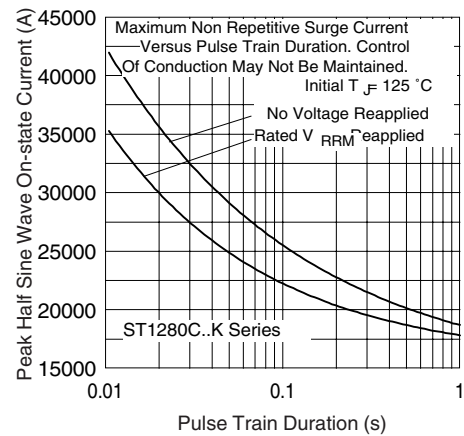


Fig. 8 - Maximum Non-Repetitive Surge Current  
Single and Double Side Cooled

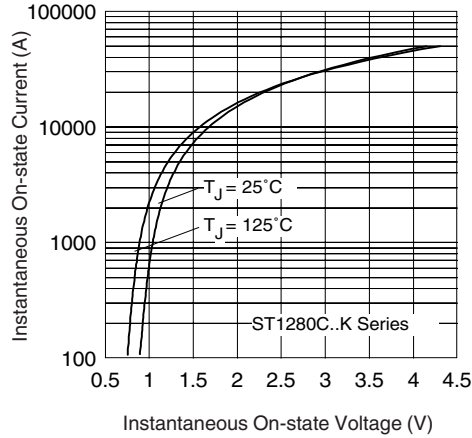


Fig. 9 - On-state Voltage Drop Characteristics

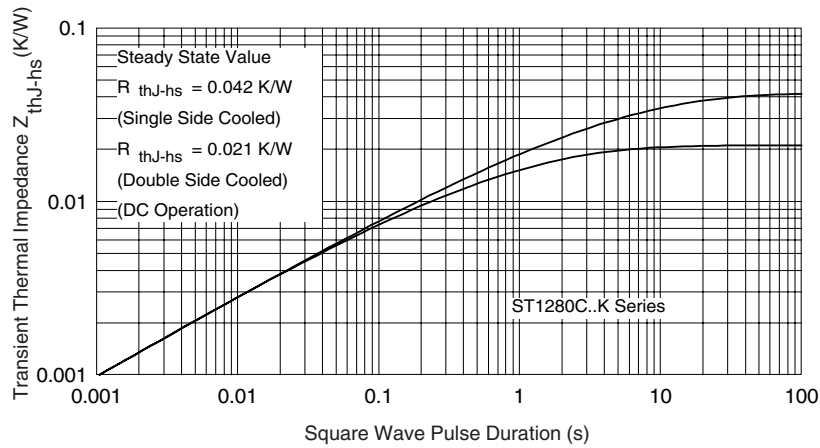


Fig. 10 - Thermal Impedance  $Z_{thJ-hs}$  Characteristics

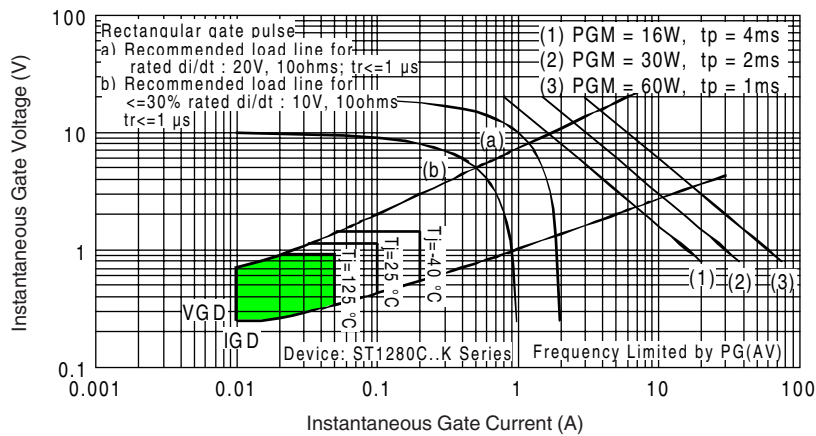


Fig. 11 - Gate Characteristics