

### 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

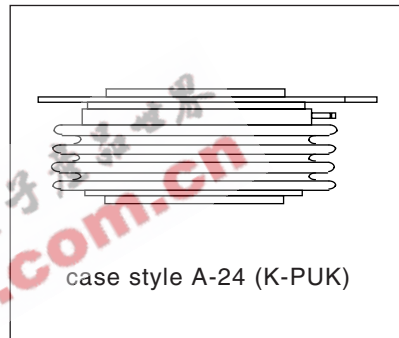
#### Typical Applications

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

#### Major Ratings and Characteristics

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

2310A



## ST1280C..K Series

Bulletin I25195 rev. B 02/00

International  
IRF 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. @ $T_J = T_J$ 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)	A	180° conduction, half sine wave double side (single side) cooled	
	55 (85)	°C		
$I_{T(RMS)}$ 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% x $\pi$ x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$ ), $T_J = T_J$ max.	
$V_{T(TO)2}$ High level value of threshold voltage	0.90		( $I > \pi$ x $I_{T(AV)}$ ), $T_J = T_J$ max.	
$r_{t1}$ Low level value of on-state slope resistance	0.077	mΩ	(16.7% x $\pi$ x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$ ), $T_J = T_J$ max.	
$r_{t2}$ High level value of on-state slope resistance	0.068		( $I > \pi$ x $I_{T(AV)}$ ), $T_J = T_J$ max.	
$V_{TM}$ Max. on-state voltage	1.44	V	$I_{pk} = 8000A$ , $T_J = T_J$ max, $t_p = 10ms$ sine pulse	
$I_H$ Maximum holding current	600	mA	$T_J = 25^\circ C$ , anode supply 12V resistive load	
$I_L$ 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, $t_r \leq 1\mu s$ $T_J = T_J$ max, anode voltage $\leq 80\%$ $V_{DRM}$
$t_d$ Typical delay time	1.9	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	200		$I_{TM} = 550A$ , $T_J = T_J$ max, $di/dt = 40A/\mu s$ , $V_R = 50V$ $dv/dt = 20V/\mu s$ , Gate 0V 100Ω, $t_p = 500\mu s$

**Blocking**

Parameter	ST1280C..K	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/μs	T <sub>J</sub> = T <sub>J</sub> max. linear to 80% rated V <sub>DRM</sub>
I <sub>RRM</sub> I <sub>DRM</sub> Max. peak reverse and off-state leakage current	100	mA	T <sub>J</sub> = T <sub>J</sub> max, rated V <sub>DRM</sub> /V <sub>RRM</sub> applied

**Triggering**

Parameter	ST1280C..K	Units	Conditions
P <sub>GM</sub> Maximum peak gate power	16	W	T <sub>J</sub> = T <sub>J</sub> max, t <sub>p</sub> ≤ 5ms
P <sub>G(AV)</sub> Maximum average gate power	3		T <sub>J</sub> = T <sub>J</sub> max, f = 50Hz, d% = 50
I <sub>GM</sub> Max. peak positive gate current	3.0	A	T <sub>J</sub> = T <sub>J</sub> max, t <sub>p</sub> ≤ 5ms
+V <sub>GM</sub> Maximum peak positive gate voltage	20	V	T <sub>J</sub> = T <sub>J</sub> max, t <sub>p</sub> ≤ 5ms
-V <sub>GM</sub> Maximum peak negative gate voltage	5.0		
I <sub>GT</sub> DC gate current required to trigger	TYP.	MAX.	T <sub>J</sub> = - 40°C T <sub>J</sub> = 25°C T <sub>J</sub> = 125°C Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
	200	-	
	100	200	
V <sub>GT</sub> DC gate voltage required to trigger	1.4	-	T <sub>J</sub> = - 40°C
	1.1	3.0	T <sub>J</sub> = 25°C
	0.9	-	T <sub>J</sub> = 125°C
I <sub>GD</sub> DC gate current not to trigger	10	mA	T <sub>J</sub> = T <sub>J</sub> max Max. gate current/voltage not to trigger is the max. value which will not trigger any unit with rated V <sub>DRM</sub> anode-to-cathode applied
V <sub>GD</sub> DC gate voltage not to trigger	0.25	V	

**Thermal and Mechanical Specification**

Parameter	ST1280C..K	Units	Conditions
T <sub>J</sub> Max. operating temperature range	-40 to 125	°C	
T <sub>stg</sub> Max. storage temperature range	-40 to 150		
R <sub>thJ-hs</sub> Max. thermal resistance, junction to heatsink	0.042 0.021	K/W	DC operation single side cooled DC operation double side cooled
R <sub>thC-hs</sub> 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, ± 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							
ST	128	0	C	06	K	1	
1	2	3	4	5	6	7	8
<b>1</b>	-	Thyristor					
<b>2</b>	-	Essential part number					
<b>3</b>	-	0 = Converter grade					
<b>4</b>	-	C = Ceramic Puk					
<b>5</b>	-	Voltage code: Code x 100 = $V_{RRM}$ (See Voltage Rating Table)					
<b>6</b>	-	K = Puk Case A-24(K-PUK)					
<b>7</b>	-	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)					
<b>8</b>	-	Critical dv/dt: None = 500V/ $\mu$ sec (Standard selection)					
		L = 1000V/ $\mu$ sec (Special selection)					

Outline Table

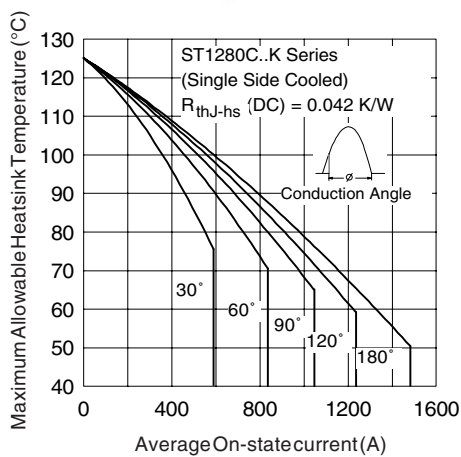
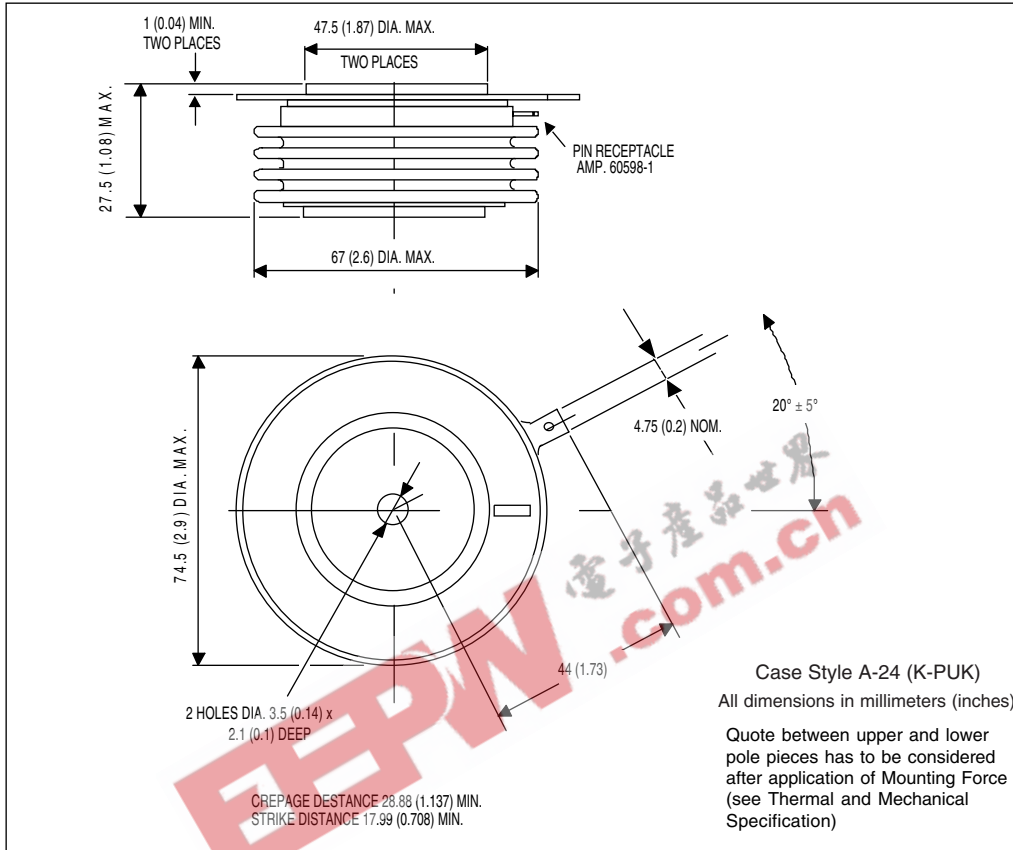


Fig. 1 - Current Ratings Characteristics

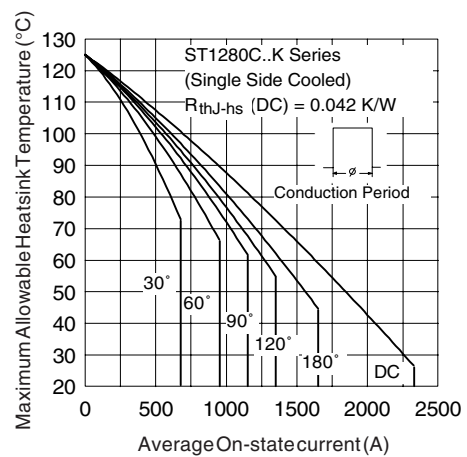


Fig. 2 - Current Ratings Characteristics

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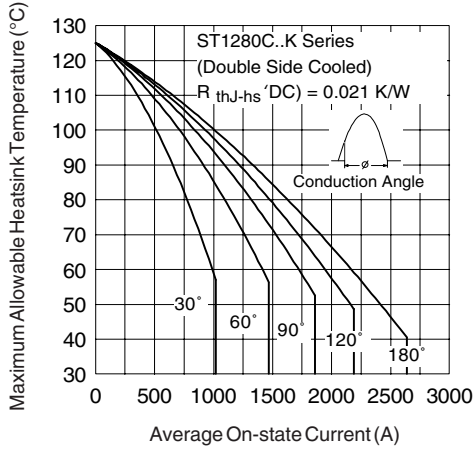


Fig. 3 - Current Ratings Characteristics

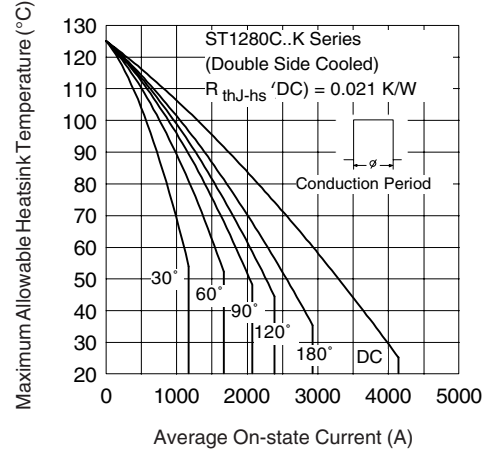


Fig. 4 - Current Ratings Characteristics

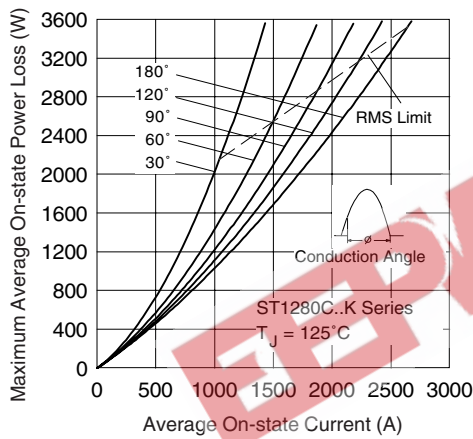


Fig. 5 - On-state Power Loss Characteristics

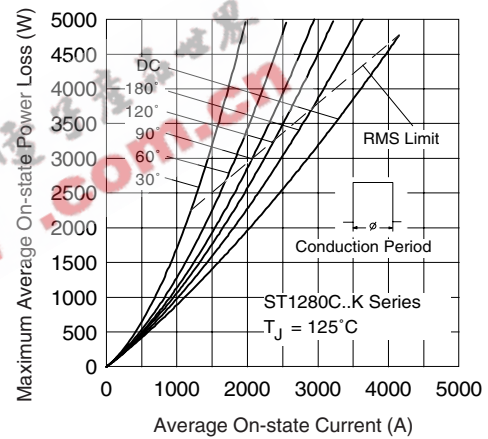


Fig. 6 - On-state Power Loss Characteristics

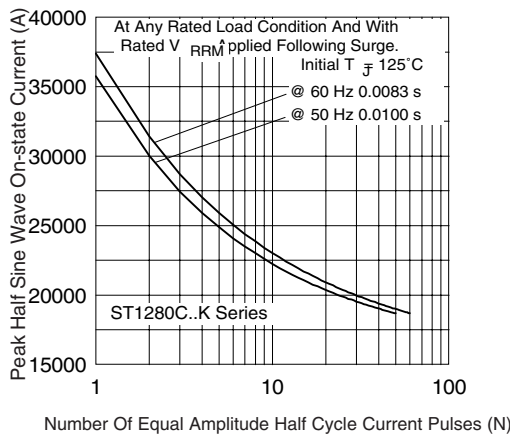


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

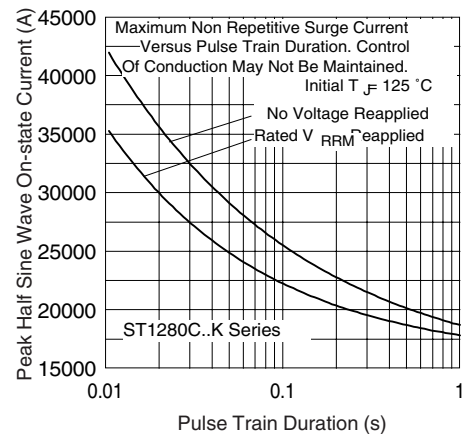


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

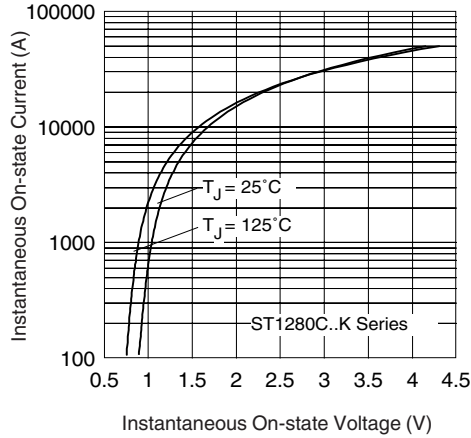


Fig. 9 - On-state Voltage Drop Characteristics

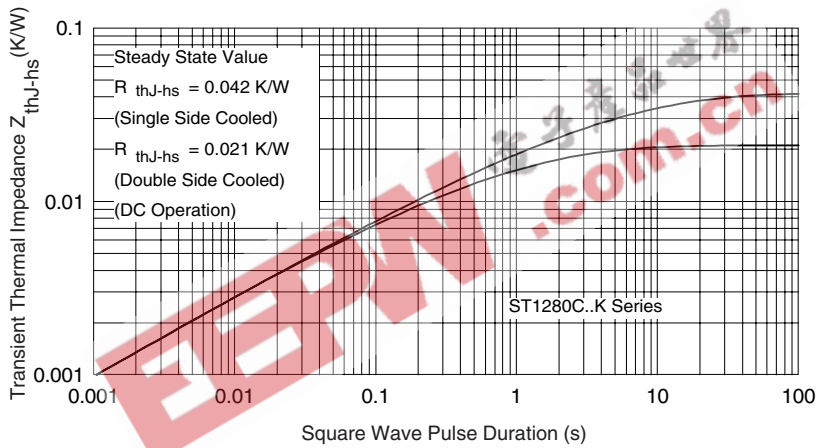


Fig. 10 - Thermal Impedance  $Z_{thJ-hs}$  Characteristics

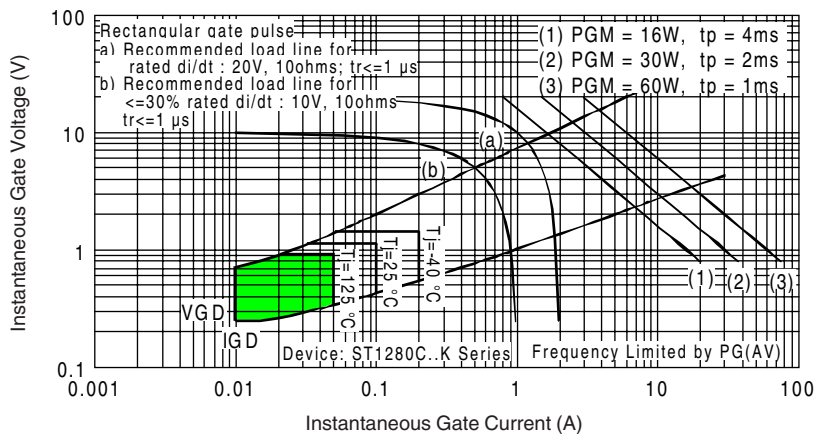


Fig. 11 - Gate Characteristics