

## Phase Control Thyristors (Hockey PUK Version), 1473 A



K-PUK (A-24)

### FEATURES

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case K-PUK (A-24)
- High profile hockey PUK
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### TYPICAL APPLICATIONS

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

### PRIMARY CHARACTERISTICS

$I_{T(AV)}$	1473 A
$V_{DRM}/V_{RRM}$	1200 V, 1400 V, 1600 V, 1800 V, 2000 V, 2200 V, 2400 V
$V_{TM}$	1.80 V
$I_{GT}$	100 mA
$T_J$	-40 °C to +125 °C
Package	K-PUK (A-24)
Circuit configuration	Single SCR

### MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		1473	A
	$T_{hs}$	55	°C
$I_{T(RMS)}$		2913	A
	$T_{hs}$	25	°C
$I_{TSM}$	50 Hz	20.0	A
	60 Hz	21.2	
$I^2t$	50 Hz	2000	kA <sup>2</sup> s
	60 Hz	1865	
$I^2\sqrt{t}$		20 000	kA <sup>2</sup> √s
$V_{DRM}/V_{RRM}$	Range	1200 to 2400	V
$t_q$	Typical	300	μs
$T_J$	Range	-40 to +125	°C

### ELECTRICAL SPECIFICATIONS

#### VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	$V_{RRM}$ , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}$ MAXIMUM AT $T_J = 125\text{ °C}$ mA
VS-ST1000C..K	12	1200	1300	100
	14	1400	1500	
	16	1600	1700	
	18	1800	1900	
	20	2000	2100	
	22	2200	2300	
	24	2400	2500	

**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS
Maximum average on-state current at heatsink temperature	I <sub>T(AV)</sub>	180° conduction, half sine wave Double side (single side) cooled			1473 (630)	A
					55 (85)	°C
Maximum RMS on-state current	I <sub>T(RMS)</sub>	DC at 25 °C heatsink temperature double side cooled			6540	A
Maximum peak, one-cycle, non-repetitive surge current	I <sub>TSM</sub>	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial T <sub>J</sub> = T <sub>J</sub> maximum	20.0	kA
		t = 8.3 ms			21.2	
		t = 10 ms	100 % V <sub>RRM</sub> reapplied		17.0	
		t = 8.3 ms			18.1	
Maximum I <sup>2</sup> t for fusing	I <sup>2</sup> t	t = 10 ms	No voltage reapplied		2000	kA <sup>2</sup> s
		t = 8.3 ms			1865	
		t = 10 ms	100 % V <sub>RRM</sub> reapplied		1445	
		t = 8.3 ms			1360	
Maximum I <sup>2</sup> √t for fusing	I <sup>2</sup> √t	t = 0.1 ms to 10 ms, no voltage reapplied			20 000	kA <sup>2</sup> √s
Low level value of threshold voltage	V <sub>T(TO)1</sub>	(16.7 % × π × I <sub>T(AV)</sub> < I < π × I <sub>T(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum			0.950	V
High level value of threshold voltage	V <sub>T(TO)2</sub>	(I > π × I <sub>T(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum			1.024	
Low level value of on-state slope resistance	r <sub>t1</sub>	(16.7 % × π × I <sub>T(AV)</sub> < I < π × I <sub>T(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum			0.283	mΩ
High level value of on-state slope resistance	r <sub>t2</sub>	(I > π × I <sub>T(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum			0.265	
Maximum on-state voltage drop	V <sub>TM</sub>	I <sub>pk</sub> = 3000 A, T <sub>J</sub> = 125 °C, t <sub>p</sub> = 10 ms sine pulse			1.80	V
Maximum holding current	I <sub>H</sub>	T <sub>J</sub> = 25 °C, anode supply 12 V resistive load			600	mA
Typical latching current	I <sub>L</sub>				1000	

**SWITCHING**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum non-repetitive rate of rise of turned-on current	$di/dt$	Gate drive 20 V, 20 Ω, $t_r \leq 1$ μs $T_J = T_J$ maximum, anode voltage $\leq 80$ % $V_{DRM}$	1000	A/μs
Typical delay time	$t_d$	Gate current 1 A, $di_g/dt = 1$ A/μs $V_d = 0.67$ % $V_{DRM}$ , $T_J = 25$ °C	1.9	μs
Typical turn-off time	$t_q$	$I_{TM} = 550$ A, $T_J = T_J$ maximum, $di/dt = 40$ A/μs, $V_R = 50$ V, $dV/dt = 20$ V/μs, gate 0 V 100 Ω, $t_p = 500$ μs	300	

**BLOCKING**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum critical rate of rise of off-state voltage	$dV/dt$	$T_J = T_J$ maximum linear to 80 % rated $V_{DRM}$	500	V/μs
Maximum peak reverse and off-state leakage current	$I_{RRM}$ , $I_{DRM}$	$T_J = T_J$ maximum, rated $V_{DRM}/V_{RRM}$ applied	100	mA



TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNITS
			TYP.	MAX.	
Maximum peak gate power	$P_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms	16		W
Maximum peak average gate power	$P_{G(AV)}$	$T_J = T_J$ maximum, $f = 50$ Hz, $d\% = 50$	3		
Maximum peak positive gate current	$I_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms	3.0		A
Maximum peak positive gate voltage	$+V_{GM}$		20		V
Maximum peak negative gate voltage	$-V_{GM}$		5.0		
DC gate current required to trigger	$I_{GT}$	$T_J = -40$ °C	200	-	mA
		$T_J = 25$ °C	100	200	
		$T_J = 125$ °C	50	-	
DC gate voltage required to trigger	$V_{GT}$	$T_J = -40$ °C	1.4	-	V
		$T_J = 25$ °C	1.1	3.0	
		$T_J = 125$ °C	0.9	-	
DC gate current not to trigger	$I_{GD}$	$T_J = T_J$ maximum	10		mA
DC gate voltage not to trigger	$V_{GD}$		0.25		V

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum operating temperature range	$T_J$		-40 to +125	°C
Maximum storage temperature range	$T_{Stg}$		-40 to +150	
Maximum thermal resistance, junction to heatsink	$R_{thJ-hs}$	DC operation single side cooled	0.042	K/W
		DC operation double side cooled	0.021	
Maximum thermal resistance, case to heatsink	$R_{thC-hs}$	DC operation single side cooled	0.006	
		DC operation double side cooled	0.003	
Mounting force, $\pm 10$ %			24 500 (2500)	N (kg)
Approximate weight			425	g
Case style		See dimensions - link at the end of datasheet	K-PUK (A-24)	

$\Delta R_{thJC}$ CONDUCTION						
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION		RECTANGULAR CONDUCTION		TEST CONDITIONS	UNITS
	SINGLE SIDE	DOUBLE SIDE	SINGLE SIDE	DOUBLE SIDE		
180°	0.003	0.003	0.002	0.002	T <sub>J</sub> = T <sub>J</sub> maximum	K/W
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		

**Note**

- The table above shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC

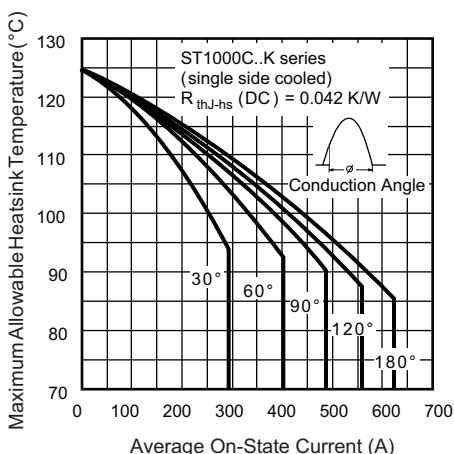


Fig. 1 - Current Ratings Characteristics

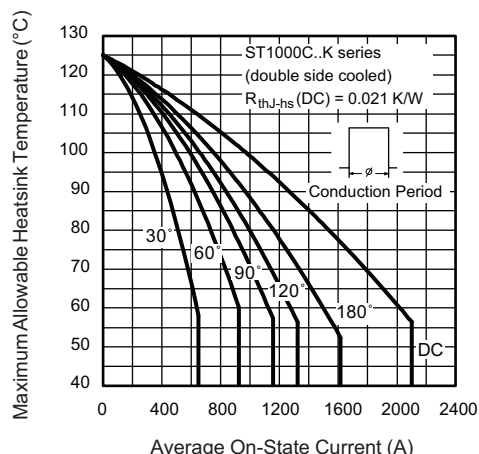


Fig. 4 - Current Ratings Characteristics

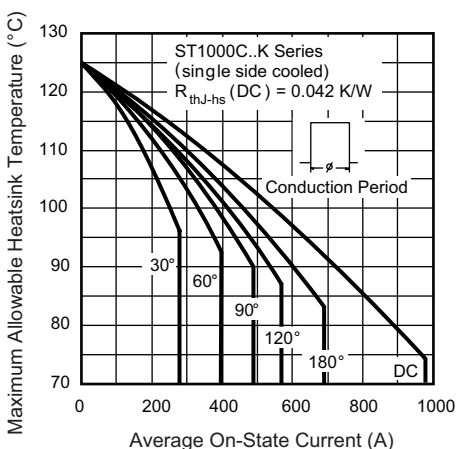


Fig. 2 - Current Ratings Characteristics

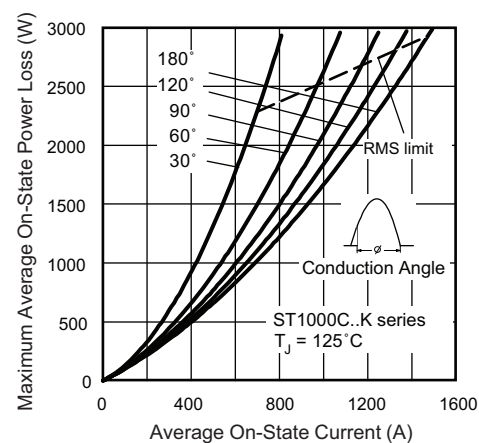


Fig. 5 - On-State Power Loss Characteristics

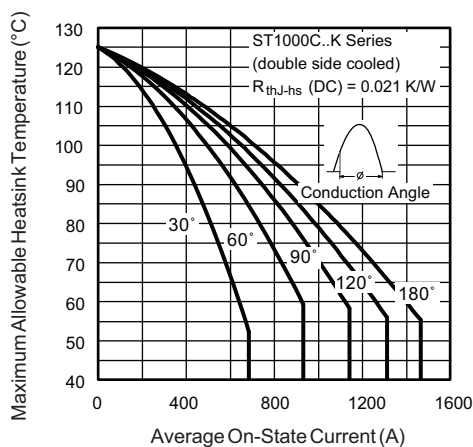


Fig. 3 - Current Ratings Characteristics

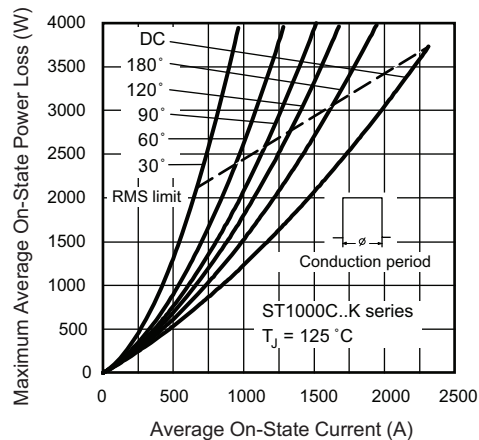


Fig. 6 - On-State Power Loss Characteristics

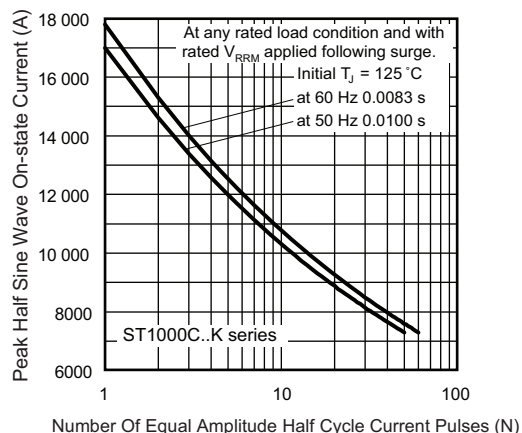


Fig. 7 - Maximum Non-Repetitive Surge Current  
Single and Double Side Cooled

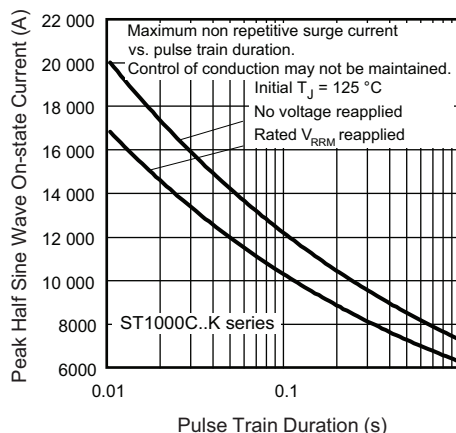


Fig. 8 - Maximum Non-Repetitive Surge Current  
Single and Double Side Cooled

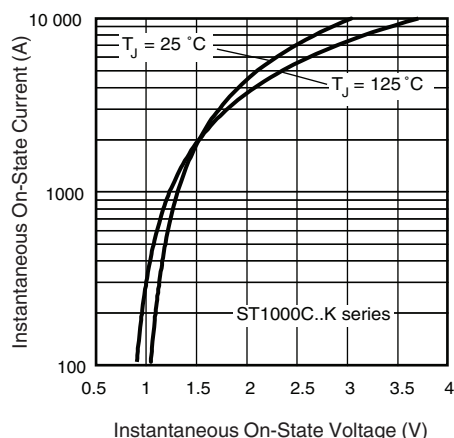


Fig. 9 - On-State Voltage Drop Characteristics

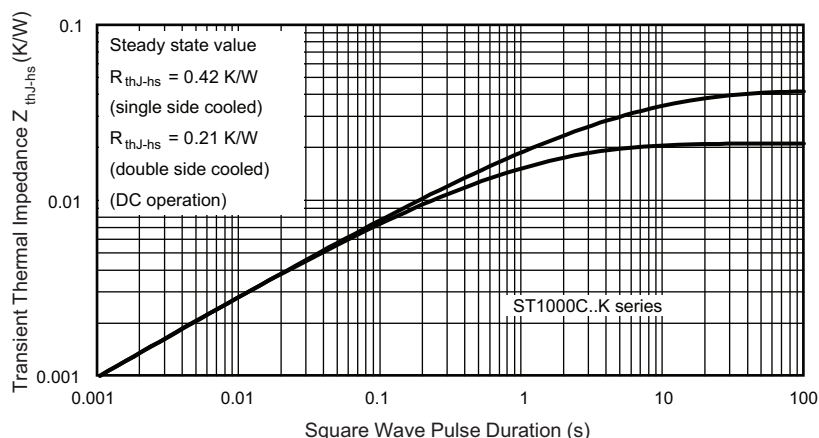


Fig. 10 - Thermal Impedance  $Z_{thJ-hs}$  Characteristics

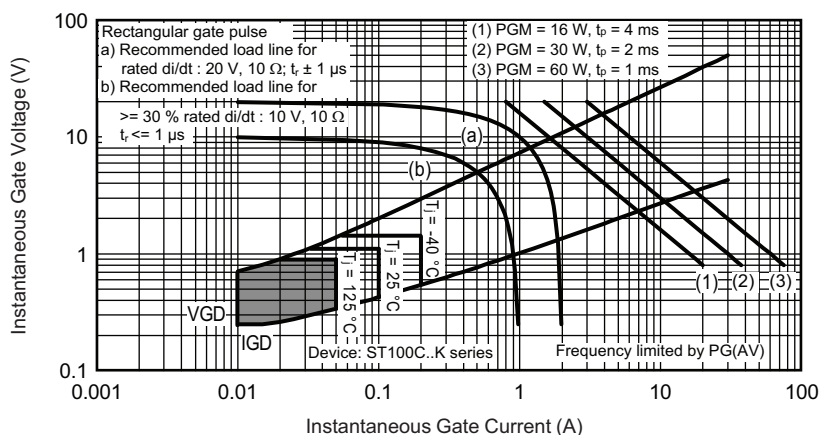


Fig. 11 - Gate Characteristics

## ORDERING INFORMATION TABLE

Device code	VS-	ST	100	0	C	24	K	1	-
	1	2	3	4	5	6	7	8	9
1	-	Vishay Semiconductors product							
2	-	Thyristor							
3	-	Essential part number							
4	-	0 = converter grade							
5	-	C = ceramic PUK							
6	-	Voltage code x 100 = $V_{RRM}$ (see Voltage Ratings table)							
7	-	K = PUK case K-PUK (A-24)							
8	-	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)							
9	-	Critical $dV/dt$ : • none = 500 V/ $\mu s$ (standard selection)							
		• L = 1000 V/ $\mu s$ (special selection)							

## LINKS TO RELATED DOCUMENTS

Dimensions

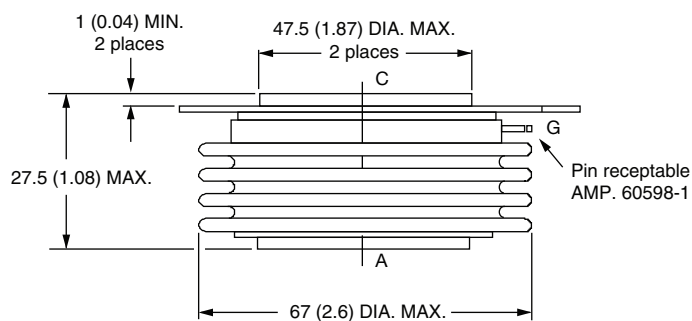
[www.vishay.com/doc?95081](http://www.vishay.com/doc?95081)



## K-PUK (A-24)

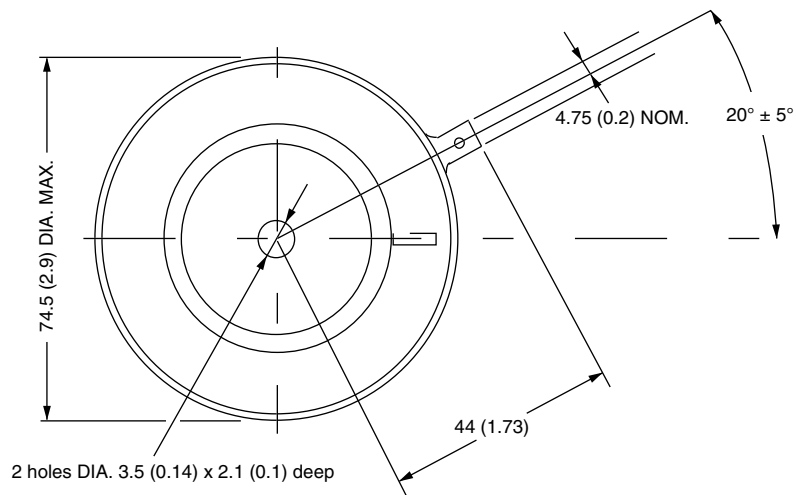
### DIMENSIONS in millimeters (inches)

Creepage distance: 28.88 (1.137) minimum  
Strike distance: 17.99 (0.708) minimum



#### Note:

A = Anode  
C = Cathode  
G = Gate



Quote between upper and lower pole pieces has to be considered after application of mounting force (see thermal and mechanical specification)



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