



Phase Control Thyristors (Hockey PUK Version), 1650 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
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS
COMPLIANT

TYPICAL APPLICATIONS

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

PRIMARY CHARACTERISTICS

$I_{T(AV)}$	1650 A
V_{DRM}/V_{RRM}	1200 V, 1400 V, 1600 V, 1800 V, 2000 V
V_{TM}	1.73 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
$I_{T(AV)}$		1650	A
	T_{hs}	55	°C
$I_{T(RMS)}$		3080	A
	T_{hs}	25	°C
I_{TSM}	50 Hz	30 500	A
	60 Hz	32 000	
I^2t	50 Hz	4651	kA ² s
	60 Hz	4250	
V_{DRM}/V_{RRM}		1200 to 2000	V
t_q	Typical	200	μs
T_J		-40 to +125	°C

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	V_{DRM}/V_{RRM} , MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V	V_{RSM} , MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	I_{DRM}/I_{RRM} MAXIMUM AT $T_J = T_J$ MAXIMUM mA
VS-ST1200C..K	12	1200	1300	100
	14	1400	1500	
	16	1600	1700	
	18	1800	1900	
	20	2000	2100	

**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average on-state current at heatsink temperature	$I_{T(AV)}$	180° conduction, half sine wave double side (single side) cooled	1650 (700)	A
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 25 °C heatsink temperature double side cooled	55 (85)	°C
Maximum peak, one-cycle non-repetitive surge current	I_{TSM}	t = 10 ms No voltage reapplied t = 8.3 ms 100 % V_{RRM} reapplied	30 500	A
			32 000	
			25 700	
			26 900	
Maximum I^2t for fusing	I^2t	t = 10 ms No voltage reapplied t = 8.3 ms 100 % V_{RRM} reapplied	4651	kA ² s
			4250	
			3300	
			3000	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied	46 510	kA ² √s
Low level value of threshold voltage	$V_{T(TO)1}$	(16.7 % $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$), $T_J = T_J$ maximum	0.91	V
High level value of threshold voltage	$V_{T(TO)2}$	($I > \pi \times I_{T(AV)}$), $T_J = T_J$ maximum	1.01	
Low level value of on-state slope resistance	r_{t1}	(16.7 % $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$), $T_J = T_J$ maximum	0.21	mΩ
High level value of on-state slope resistance	r_{t2}	($I > \pi \times I_{T(AV)}$), $T_J = T_J$ maximum	0.19	
Maximum on-state voltage	V_{TM}	$I_{pk} = 4000$ A, $T_J = T_J$ maximum, $t_p = 10$ ms sine pulse	1.73	V
Maximum holding current	I_H	$T_J = 25$ °C, anode supply 12 V resistive load	600	mA
Typical latching current	I_L		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 ≤ 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	200	

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 ≤ 5 ms		16		W
Maximum 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 ≤ 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	Maximum required gate trigger/ current/voltage are the lowest value which will trigger all units 12 V anode to cathode applied	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	Maximum gate current/voltage not to trigger is the maximum value which will not trigger any unit with rated V _{DRM} anode to cathode applied	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 junction 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, ± 10 %			24 500 (2500)	N (kg)
Approximate weight			425	g
Case style		See dimensions - link at the end of datasheet	K-PUK (A-24)	

ΔR_{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 _J = T _J 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

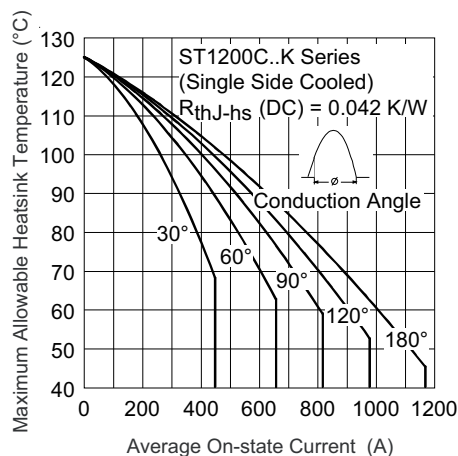


Fig. 1 - Current Ratings Characteristics

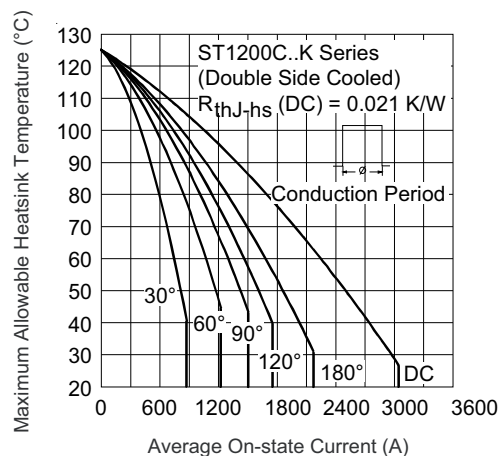


Fig. 4 - Current Ratings Characteristics

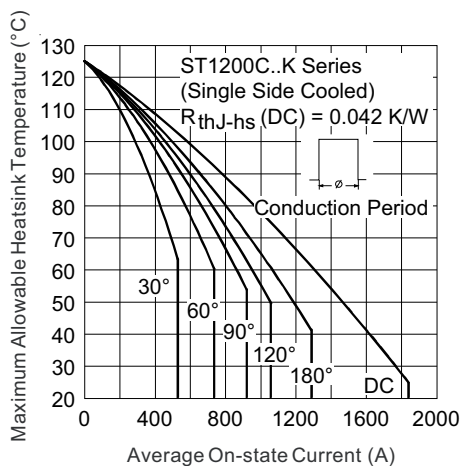


Fig. 2 - Current Ratings Characteristics

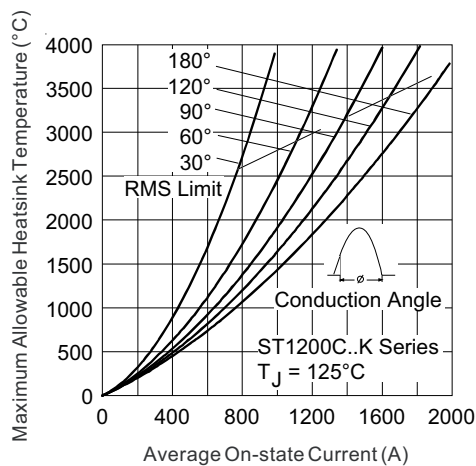


Fig. 5 - On-State Power Loss Characteristics

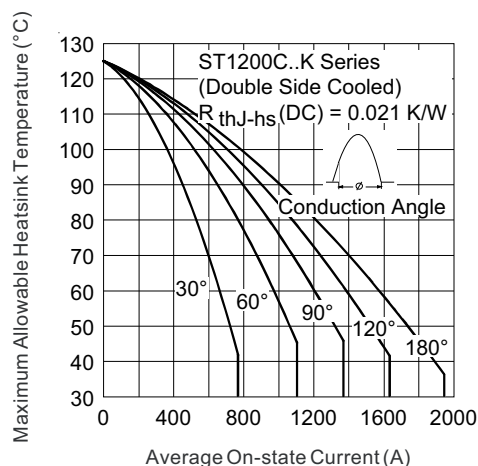


Fig. 3 - Current Ratings Characteristics

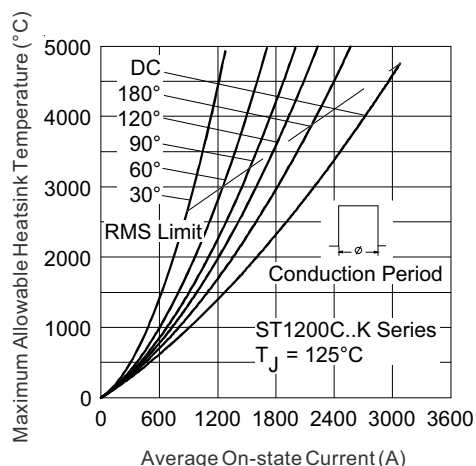


Fig. 6 - On-State Power Loss Characteristics

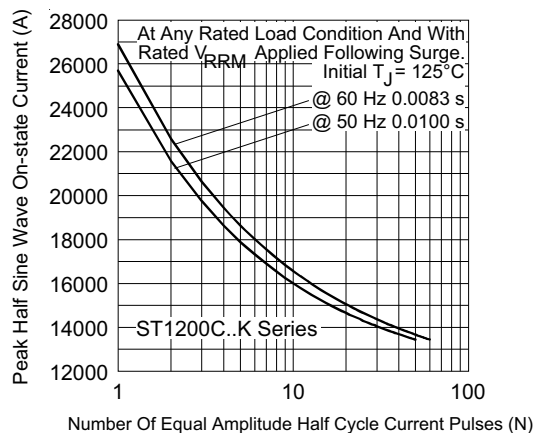


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

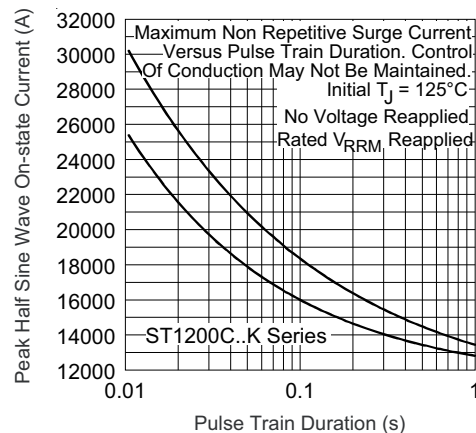


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

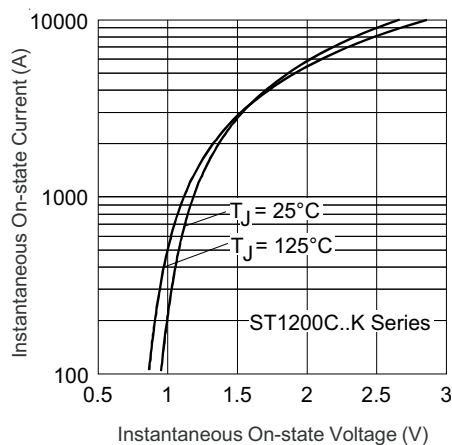
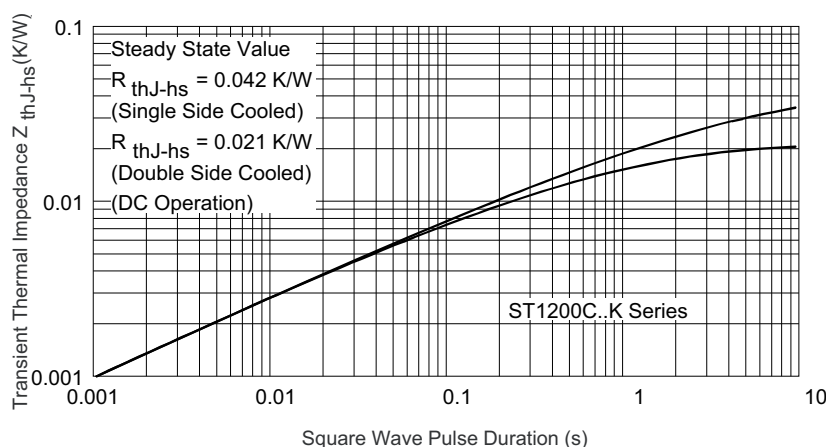


Fig. 9 - On-State Voltage Drop Characteristics

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

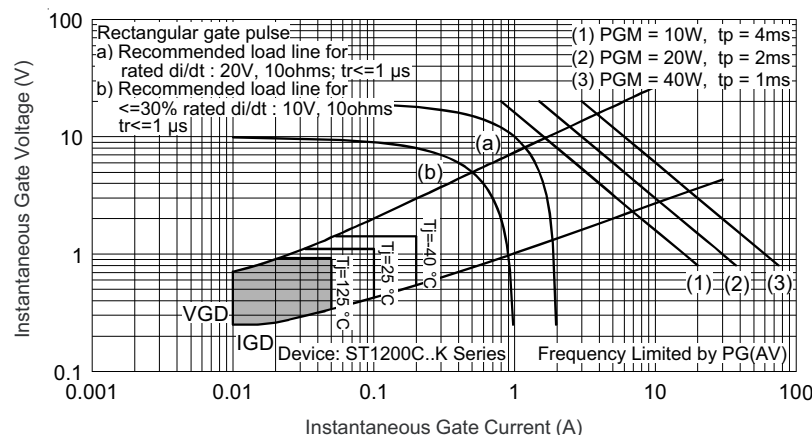


Fig. 11 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	VS-	ST	120	0	C	20	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: 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)							
9	-	Critical dV/dt: • None = 500 V/μs (standard selection)							
	-	• L = 1000 V/μs (special selection)							

LINKS TO RELATED DOCUMENTS

Dimensions

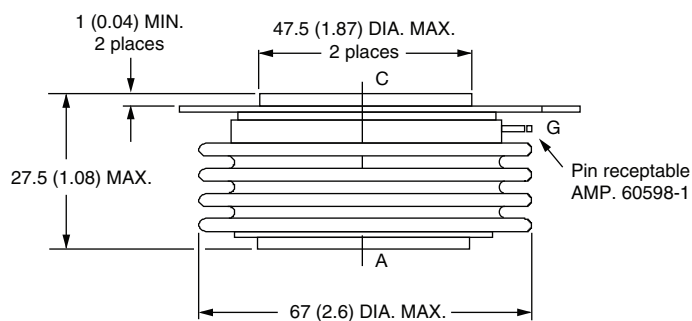
www.vishay.com/doc?95081



K-PUK (A-24)

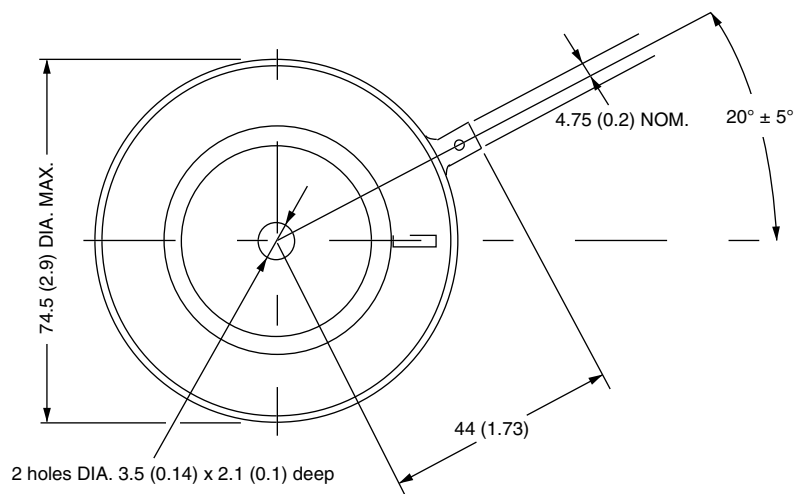
DIMENSIONS in millimeters (inches)

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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