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Phase Control Thyristors (Hockey PUK Version), 1473 A

A-24 (K-PUK)

FEATURES

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

Pb-free

RoHS COMPLIANT

TYPICAL APPLICATIONS

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

PRODUCT SUMMARY	
Package	A-24 (K-PUK)
Diode variation	Single SCR
$I_{T(AV)}$	1473 A
V_{DRM}/V_{RRM}	1200 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

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^2s
	60 Hz	1865	
$I^2\sqrt{t}$		20 000	$kA^2\sqrt{s}$
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 °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	$I_{T(AV)}$	180° conduction, half sine wave Double side (single side) cooled			1473 (630)	A
					55 (85)	°C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 25 °C heatsink temperature double side cooled			6540	A
Maximum peak, one-cycle, non-repetitive surge current	I_{TSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	20.0	kA
		t = 8.3 ms			21.2	
		t = 10 ms	100 % V_{RRM} reapplied		17.0	
		t = 8.3 ms			18.1	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		2000	kA^2s
		t = 8.3 ms			1865	
		t = 10 ms	100 % V_{RRM} reapplied		1445	
		t = 8.3 ms			1360	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			20 000	$kA^2\sqrt{s}$
Low level value of threshold voltage	$V_{T(TO)1}$	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ maximum			0.950	V
High level value of threshold voltage	$V_{T(TO)2}$	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			1.024	
Low level value of on-state slope resistance	r_{t1}	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ maximum			0.283	mΩ
High level value of on-state slope resistance	r_{t2}	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			0.265	
Maximum on-state voltage drop	V_{TM}	I_{pk} = 3000 A, T_J = 125 °C, t_p = 10 ms sine pulse			1.80	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	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 TYP.	VALUES MAX.	UNITS
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		W
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	$+V_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms		20		V
Maximum peak negative gate voltage	$-V_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms		5.0		V
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	mA
		T_J = 125 °C		50	-	mA
DC gate voltage required to trigger	V_{GT}	T_J = -40 °C		1.4	-	V
		T_J = 25 °C		1.1	3.0	V
		T_J = 125 °C		0.9	-	V
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}	$T_J = T_J$ maximum		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	°C
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	K/W
Maximum thermal resistance, case to heatsink	R_{thC-hs}	DC operation single side cooled	0.006	K/W
		DC operation double side cooled	0.003	K/W
Mounting force, ± 10 %			24 500 (2500)	N (kg)
Approximate weight			425	g
Case style		See dimensions - link at the end of datasheet	A-24 (K-PUK)	

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

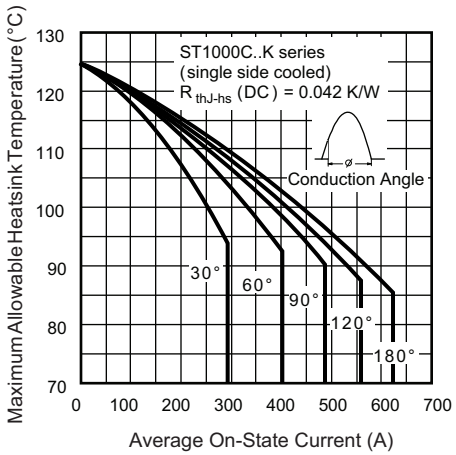


Fig. 1 - Current Ratings Characteristics

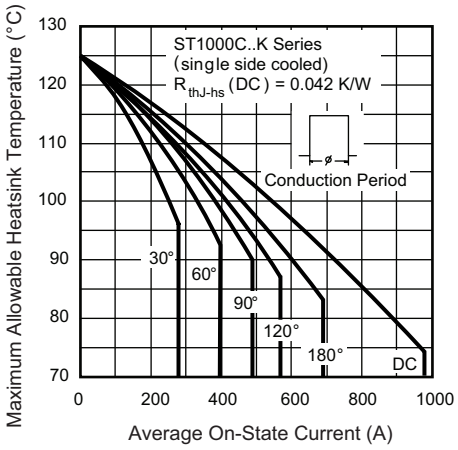


Fig. 2 - Current Ratings Characteristics

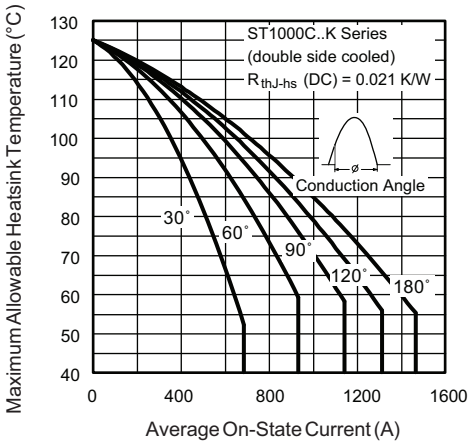


Fig. 3 - Current Ratings Characteristics

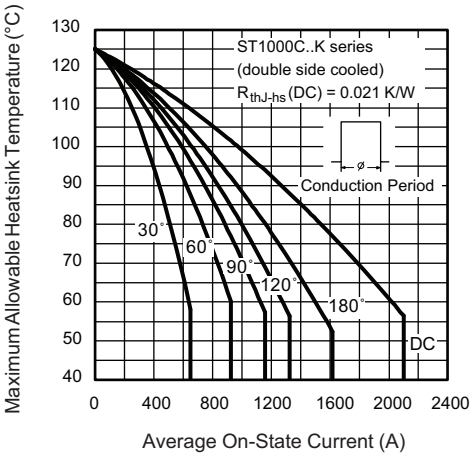


Fig. 4 - Current Ratings Characteristics

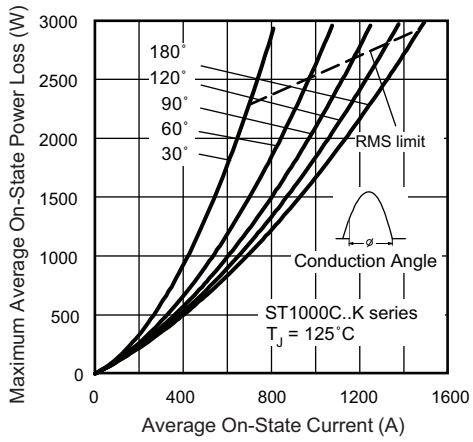


Fig. 5 - On-State Power Loss Characteristics

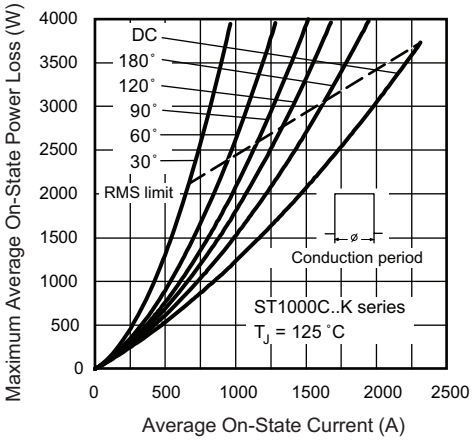


Fig. 6 - On-State Power Loss Characteristics

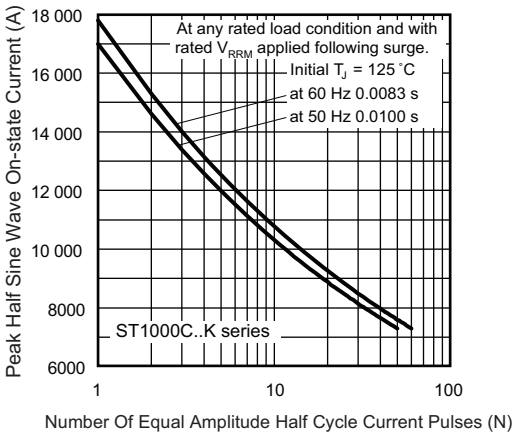


Fig. 7 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

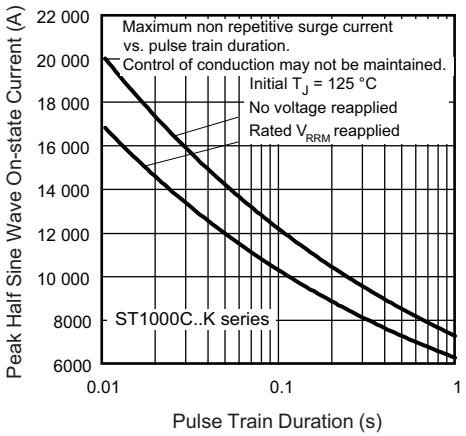


Fig. 8 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

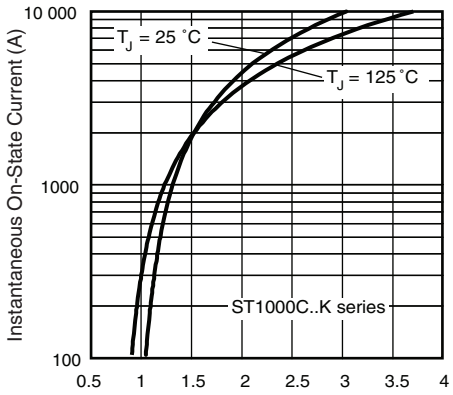


Fig. 9 - On-State Voltage Drop Characteristics

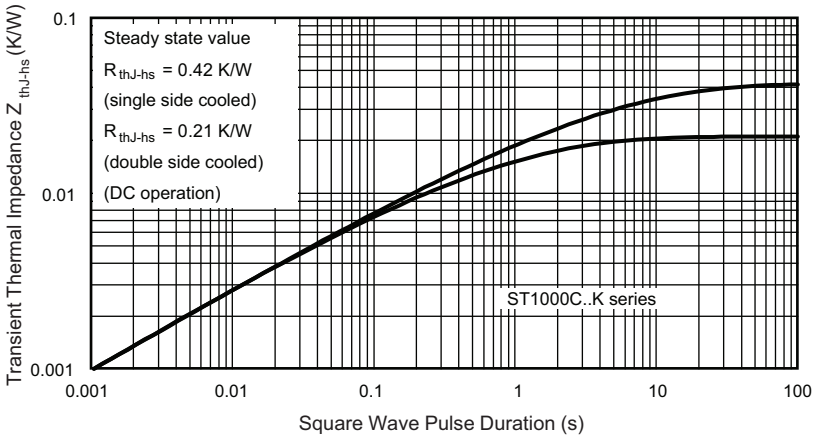


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

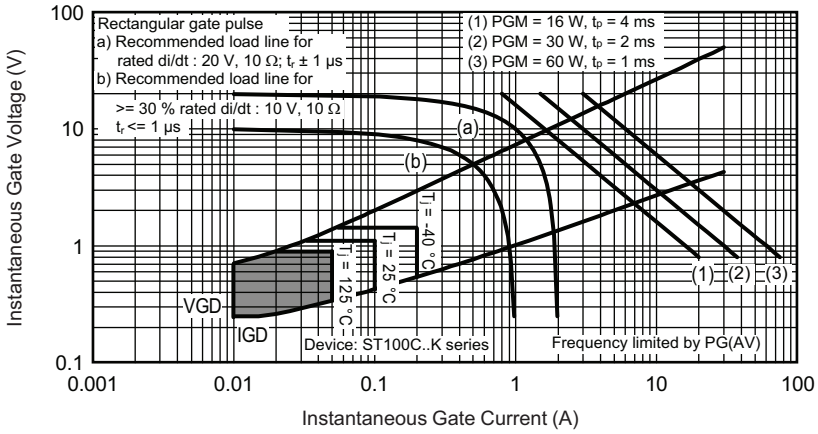


Fig. 11 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	ST	100	0	C	24	K	1	-
1	2	3	4	5	6	7	8	9

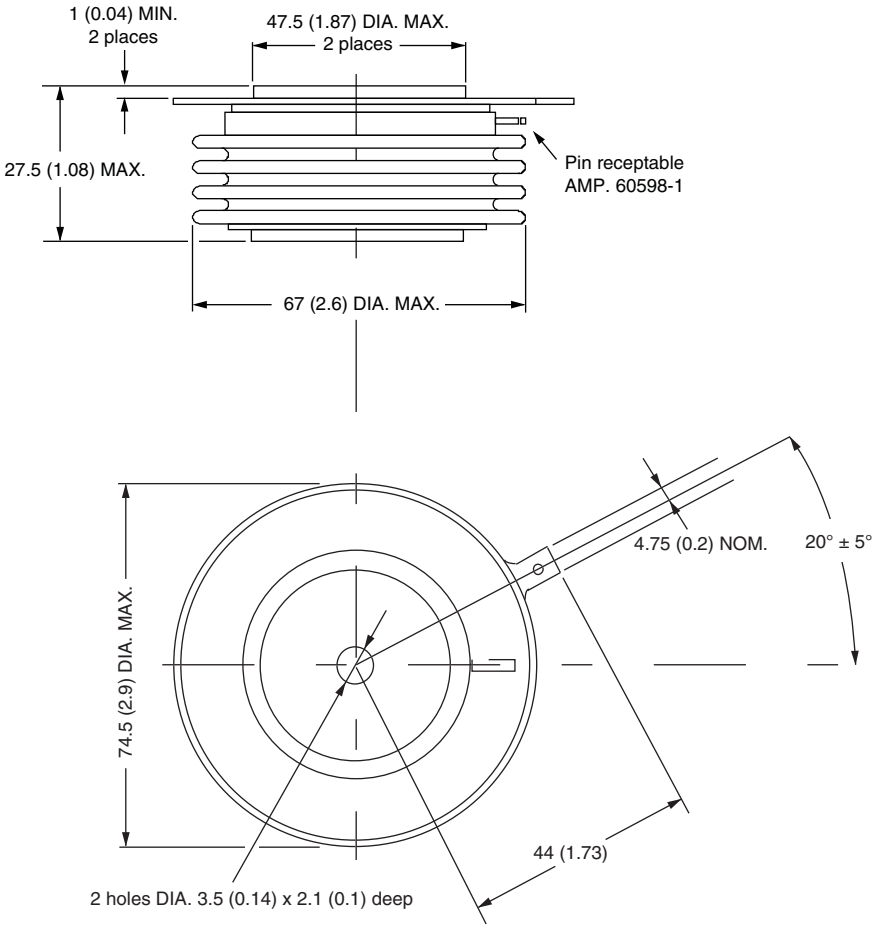
- **1** - Vishay Semiconductors product
- **2** - Thyristor
- **3** - Essential part number
- **4** - 0 = converter grade
- **5** - C = ceramic PUK
- **6** - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)
- **7** - K = PUK case A-24 (K-PUK)
- **8** - 0 = eyelet terminals (gate and auxiliary 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/µs (standard selection)
  • L = 1000 V/µs (special selection)

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95081

A-24 (K-PUK)

DIMENSIONS in millimeters (inches)

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



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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