

Phase Control Thyristors (Hockey PUK Version), 350 A


A-PUK (TO-200AB)

FEATURES

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case A-PUK (TO-200AB)
- 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	
$I_{T(AV)}$	350 A
V_{DRM}/V_{RRM}	400 V, 800 V, 1200 V, 1600 V, 1800 V, 2000 V
V_{TM}	1.96 V
I_{GT}	90 mA
T_J	-40 °C to +125 °C
Package	A-PUK (TO-200AB)
Circuit configuration	Single SCR

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		350	A
	T_{hs}	55	°C
$I_{T(RMS)}$		660	A
	T_{hs}	25	°C
I_{TSM}	50 Hz	5000	A
	60 Hz	5230	
I^2t	50 Hz	125	kA^2s
	60 Hz	114	
V_{DRM}/V_{RRM}		400 to 2000	V
t_q	Typical	100	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-ST180C..C	04	400	500	30
	08	800	900	
	12	1200	1300	
	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			350 (140)	A	
					55 (85)	°C	
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 25 °C heatsink temperature double side cooled			660	A	
Maximum peak, one-cycle non-repetitive surge current	I_{TSM}	$t = 10 \text{ ms}$	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	5000		
		$t = 8.3 \text{ ms}$	5230				
		$t = 10 \text{ ms}$	100 % V_{RRM} reapplied		4200		
		$t = 8.3 \text{ ms}$	4400				
Maximum I^2t for fusing	I^2t	$t = 10 \text{ ms}$	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	125	kA^2s	
		$t = 8.3 \text{ ms}$	114				
		$t = 10 \text{ ms}$	100 % V_{RRM} reapplied		88		
		$t = 8.3 \text{ ms}$	81				
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1 \text{ to } 10 \text{ ms}$, no voltage reapplied			1250	$\text{kA}^2\sqrt{\text{s}}$	
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			1.08	V	
High level value of threshold voltage	$V_{T(TO)2}$	$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ maximum			1.14		
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			1.18	$\text{m}\Omega$	
High level value of on-state slope resistance	r_{t2}	$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ maximum			1.14		
Maximum on-state voltage	V_{TM}	$I_{pk} = 750 \text{ A}$, $T_J = T_J$ maximum, $t_p = 10 \text{ ms}$ sine pulse			1.96	V	
Maximum holding current	I_H	$T_J = 25 \text{ °C}$, anode supply 12 V resistive load			600	mA	
Maximum (typical) latching current	I_L				1000 (300)		

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 , $t_r \leq 1 \mu\text{s}$ $T_J = T_J$ maximum, anode voltage $\leq 80 \% V_{DRM}$			1000	$\text{A}/\mu\text{s}$
Typical delay time	t_d	Gate current 1 A, $dl_g/dt = 1 \text{ A}/\mu\text{s}$ $V_d = 0.67 \% V_{DRM}$, $T_J = 25 \text{ °C}$			1.0	μs
Typical turn-off time	t_q	$I_{TM} = 300 \text{ A}$, $T_J = T_J$ maximum, $dl/dt = 20 \text{ A}/\mu\text{s}$, $V_R = 50 \text{ V}$, $dV/dt = 20 \text{ V}/\mu\text{s}$, gate 0 V 100 Ω , $t_p = 500 \mu\text{s}$			100	

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	$\text{V}/\mu\text{s}$
Maximum peak reverse and off-state leakage current	I_{RRM} , I_{DRM}	$T_J = T_J$ maximum, rated V_{DRM}/V_{RRM} applied			30	mA

TRIGGERING						
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNIT S
		typ.	max.			
Maximum peak gate power	P _{GM}	T _J = T _J maximum, t _p ≤ 5 ms		10		W
Maximum average gate power	P _{G(AV)}	T _J = T _J maximum, f = 50 Hz, d% = 50		2.0		
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		
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	180	-	mA
		T _J = 25 °C		90	150	
		T _J = 125 °C		40	-	
DC gate voltage required to trigger	V _{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	2.9	-	V
		T _J = 25 °C		1.8	3.0	
		T _J = 125 °C		1.2	-	
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		

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNIT S
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			0.17	K/W
		DC operation double side cooled			0.08	
Maximum thermal resistance, case to heatsink	R _{thC-hs}	DC operation single side cooled			0.033	
		DC operation double side cooled			0.017	
Mounting force, ± 10 %					4900 (500)	N (kg)
Approximate weight					50	g
Case style		See dimensions - link at the end of datasheet			A-PUK (TO-200AB)	

ΔR _{thJC} CONDUCTION						
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION		RECTANGULAR CONDUCTION		TEST CONDITIONS	UNITS
	SINGLE SIDE	DOUBLE SIDE	SINGLE SIDE	DOUBLE SIDE		
180°	0.015	0.015	0.011	0.011	T _J = T _J maximum	K/W
120°	0.018	0.019	0.019	0.019		
90°	0.024	0.024	0.026	0.026		
60°	0.035	0.035	0.036	0.037		
30°	0.060	0.060	0.060	0.061		

Note

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

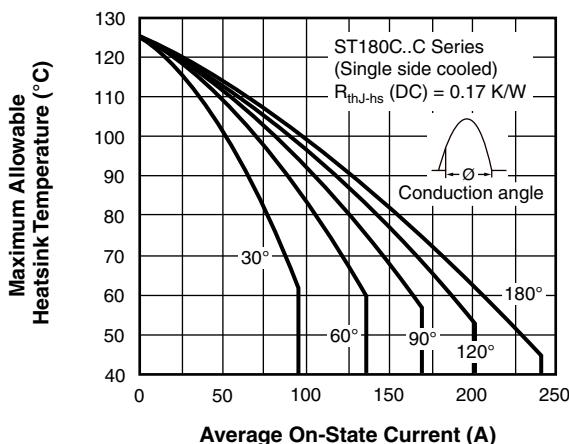


Fig. 1 - Current Ratings Characteristics

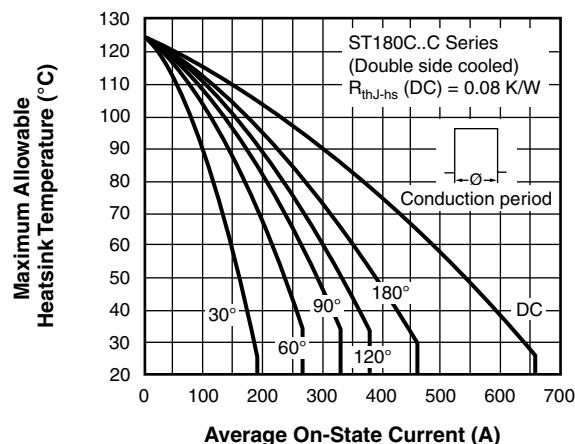


Fig. 4 - Current Ratings Characteristics

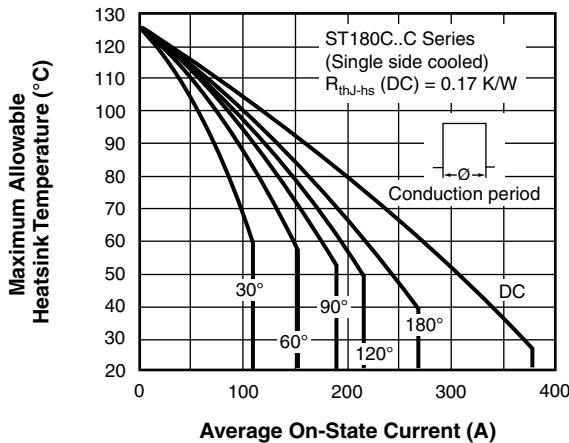


Fig. 2 - Current Ratings Characteristics

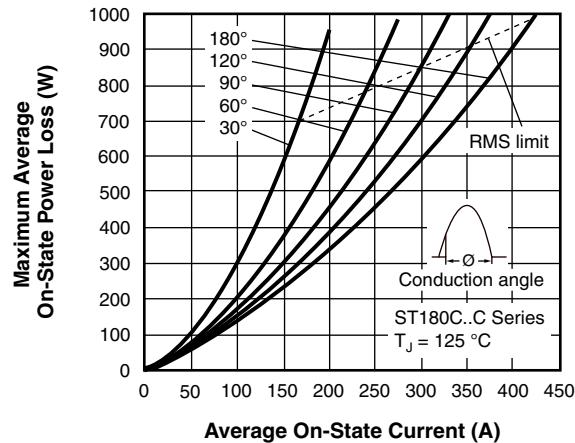


Fig. 5 - On-State Power Loss Characteristics

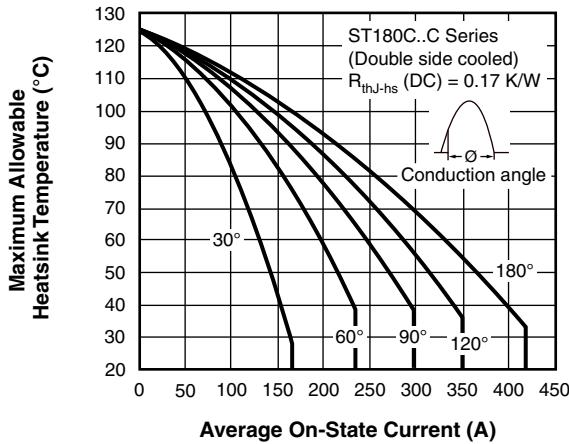


Fig. 3 - Current Ratings Characteristics

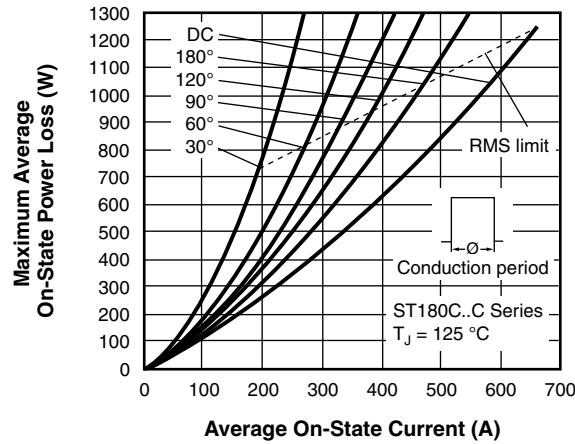


Fig. 6 - On-State Power Loss Characteristics

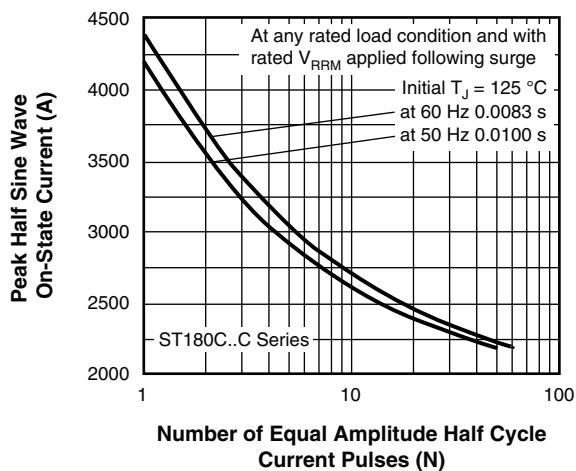


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

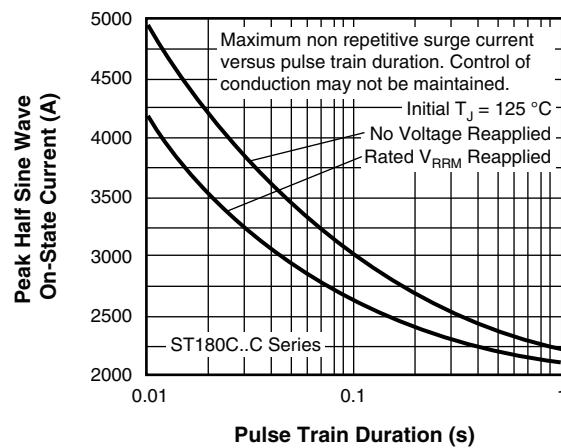


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

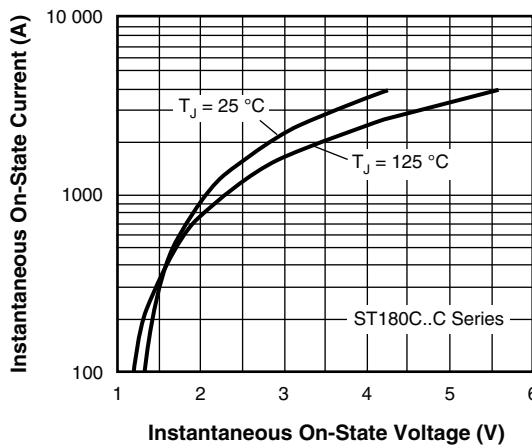


Fig. 9 - On-State Voltage Drop Characteristics

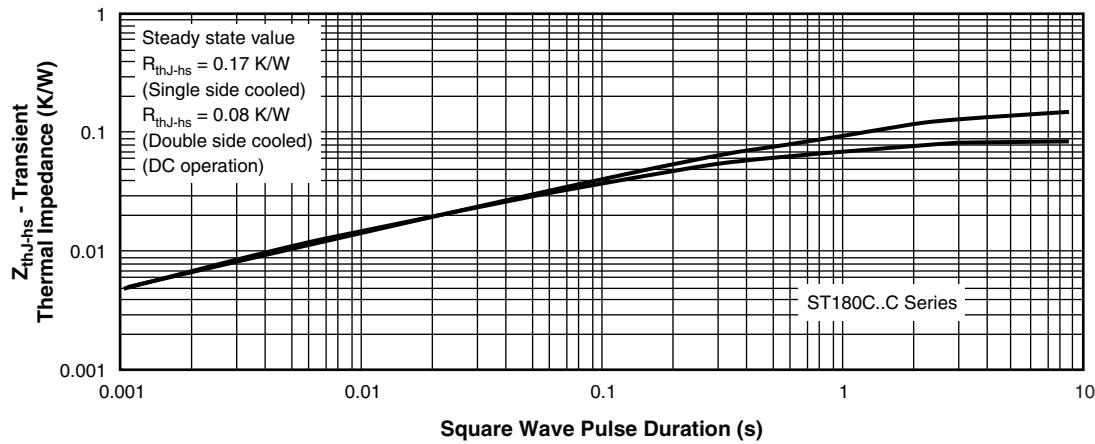


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

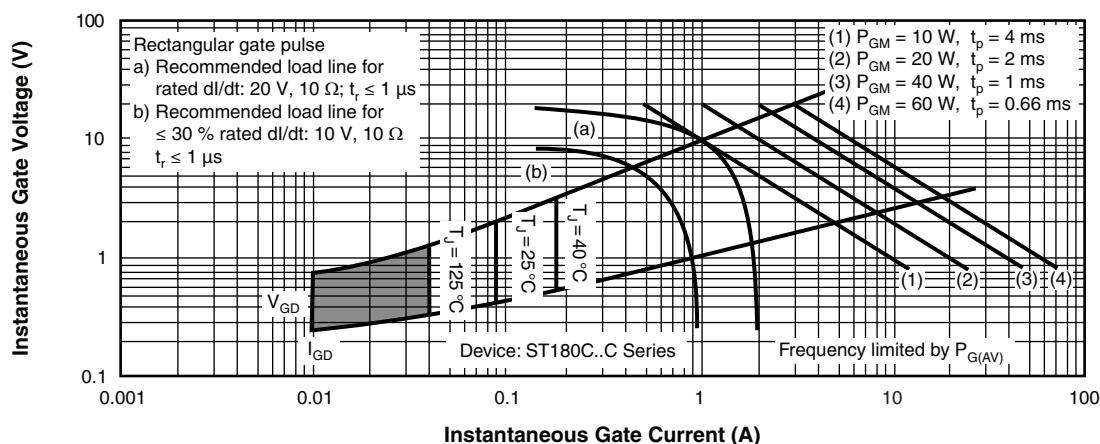


Fig. 11 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	VS-	ST	18	0	C	20	C	1	-
	1	2	3	4	5	6	7	8	9

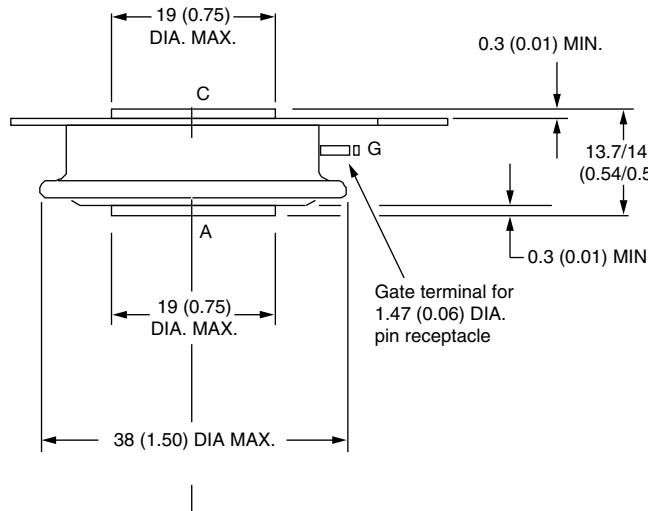
- 1** - Vishay Semiconductors product
- 2** - Thyristor
- 3** - Essential part number
- 4** - 0 = converter grade
- 5** - C = ceramic PUK
- 6** - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)
- 7** - C = PUK case A-PUK (TO-200AB)
- 8** - 0 = eyelet terminals (gate and auxiliary cathode unsoldered 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?95074

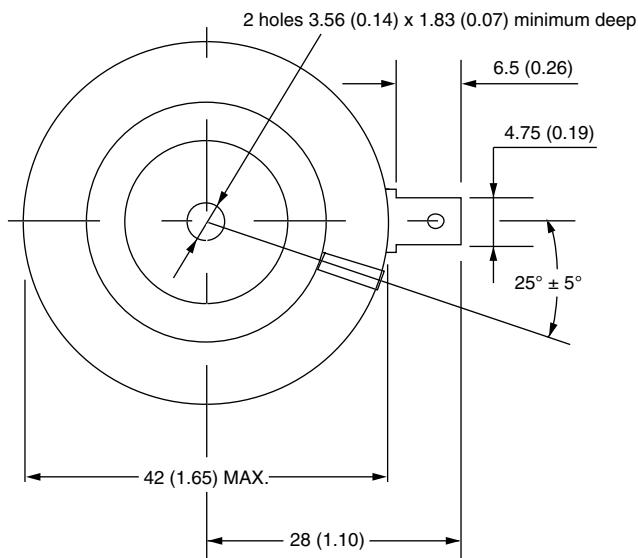
A-PUK (TO-200AB)

DIMENSIONS in millimeters (inches)

Anode to gate
 Creepage distance: 7.62 (0.30) minimum
 Strike distance: 7.12 (0.28) 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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