Phase Control Thyristors (Hockey PUK Version), 500 A

A-PUK (TO-200AB)

FEATURES

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case A-PUK (TO-200AB)
- Extended temperature range
- 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

PRIMARY CHARACTERISTICS	
$I_{T(AV)}$	500 A
V_{DRM}/V_{RRM}	400 V, 600 V
V_{TM}	1.35 V
I_{GT}	90 mA
T_J	-40 °C to +150 °C
Package	A-PUK (TO-200AB)
Circuit configuration	Single SCR

MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		500	A
	T_{hs}	80	°C
$I_{T(RMS)}$		1130	A
	T_{hs}	25	°C
I_{TSM}	50 Hz	7200	A
	60 Hz	7500	
I^2t	50 Hz	260	kA^2s
	60 Hz	230	
V_{DRM}/V_{RRM}		400 to 600	V
t_q	Typical	100	µs
T_J		-40 to 150	°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-ST280CH..C	04	400	500	75
	06	600	700	

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			500 (185)	A
					80 (110)	°C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 25 °C heatsink temperature double side cooled			1130	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	7200	
		t = 8.3 ms			7500	
		t = 10 ms	100 % V_{RRM} reapplied		6000	
		t = 8.3 ms			6300	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		260	kA^2s
		t = 8.3 ms			235	
		t = 10 ms	100 % V_{RRM} reapplied		180	
		t = 8.3 ms			165	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied			2600	$kA^2\sqrt{s}$
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			0.84	V
High level value of threshold voltage	$V_{T(TO)2}$	(I > π x $I_{T(AV)}$), T_J = T_J maximum			0.88	
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			0.50	mΩ
High level value of on-state slope resistance	r_{t2}	(I > π x $I_{T(AV)}$), T_J = T_J maximum			0.47	
Maximum on-state voltage	V_{TM}	I_{pk} = 1000 A, T_J = T_J maximum, t_p = 10 ms sine pulse			1.35	V
Maximum holding current	I_H	T_J = 25 °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 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	1.0	µs
Typical turn-off time	t_q	I_{TM} = 300 A, T_J = T_J maximum, dI/dt = 20 A/µs, V_R = 50 V, dV/dt = 20 V/µs, gate 0 V 100 Ω, t_p = 500 µs	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	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	75	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		10.0		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, $t_p \leq 5$ 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	$- V_{GM}$			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	
		$T_J = 150$ °C		30	-	
DC gate voltage required to trigger	V_{GT}	$T_J = - 40$ °C		2.9	-	V
		$T_J = 25$ °C		1.8	3.0	
		$T_J = 150$ °C		1.0	-	
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}			0.30		V

THERMAL AND MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum operating junction and storage temperature range	T_J, T_{Stg}		- 40 to 150	°C
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_{thJ-hs} CONDUCTION

CONDUCTION ANGLE	SINUSOIDAL CONDUCTION		RECTANGULAR CONDUCTION		TEST CONDITIONS	UNITS
	SINGLE SIDE	DOUBLE SIDE	SINGLE SIDE	DOUBLE SIDE		
180°	0.016	0.017	0.011	0.011	$T_J = T_J$ maximum	K/W
120°	0.019	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_{thJ-hs} when devices operate at different conduction angles than DC

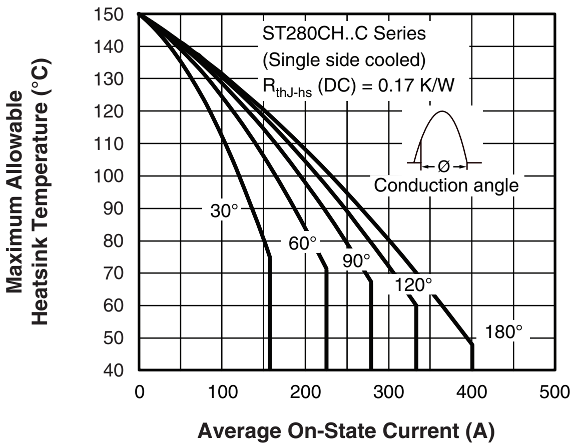


Fig. 1 - Current Ratings Characteristics

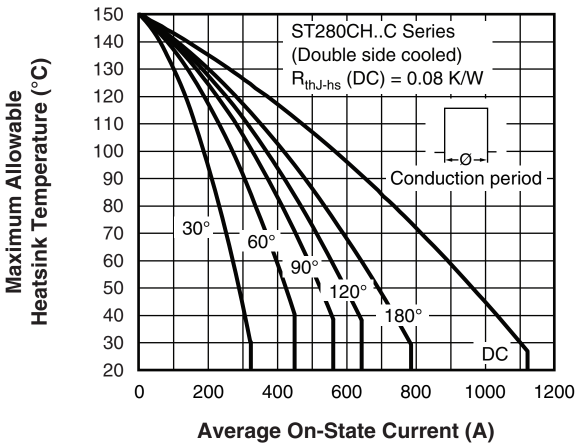


Fig. 4 - Current Ratings Characteristics

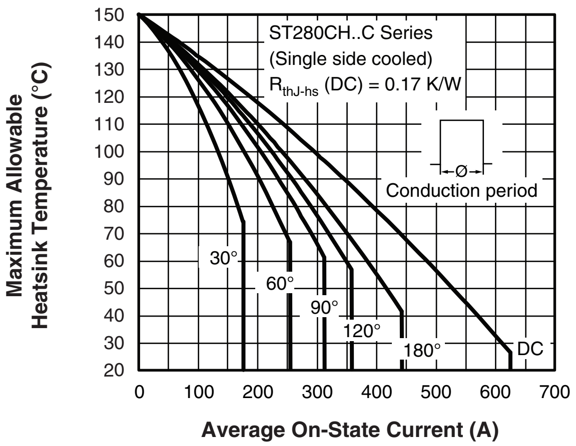


Fig. 2 - Current Ratings Characteristics

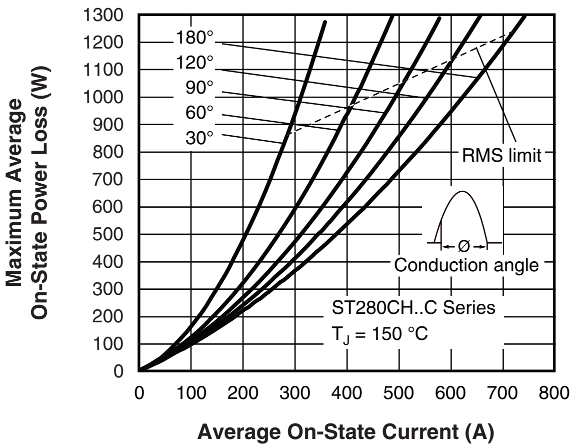


Fig. 5 - On-State Power Loss Characteristics

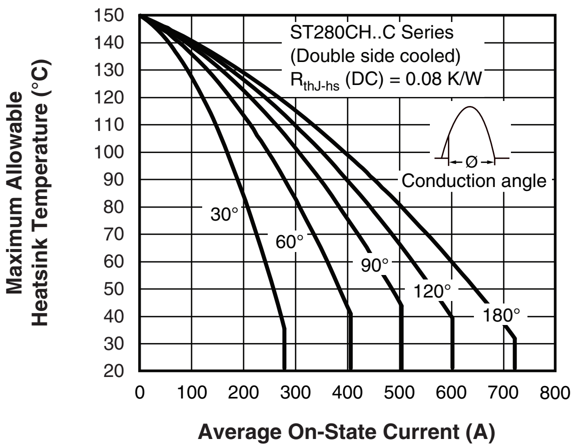


Fig. 3 - Current Ratings Characteristics

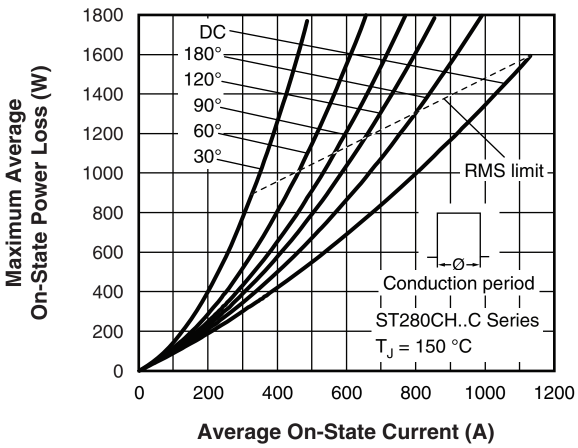


Fig. 6 - On-State Power Loss Characteristics

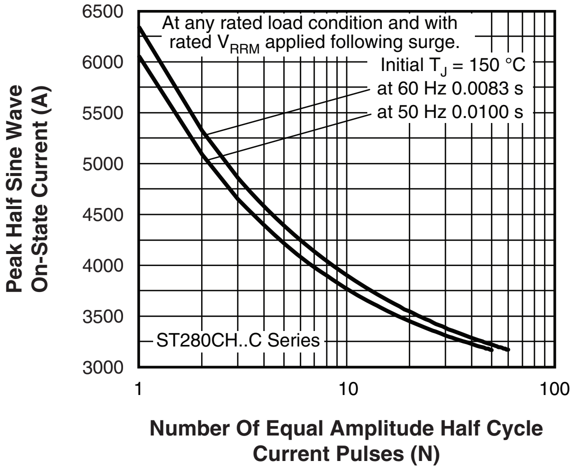


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

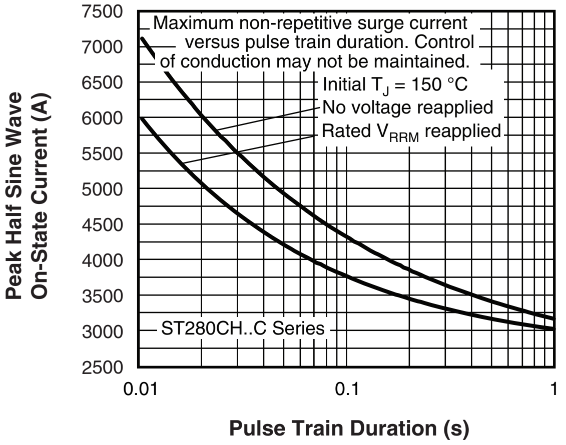


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

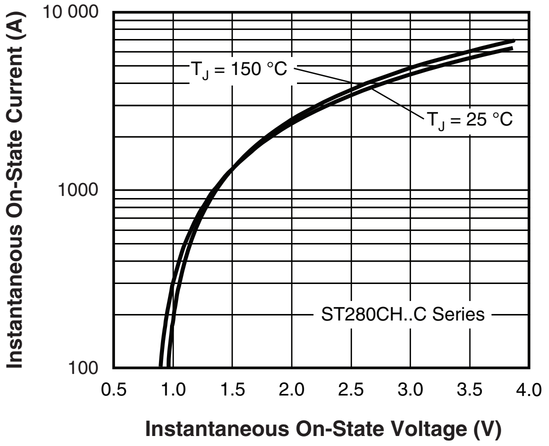


Fig. 9 - On-State Voltage Drop Characteristics

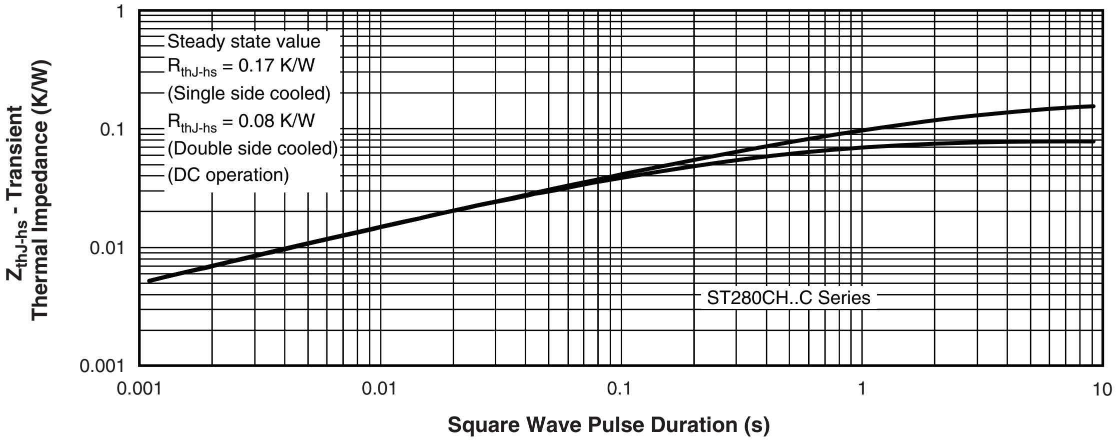


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

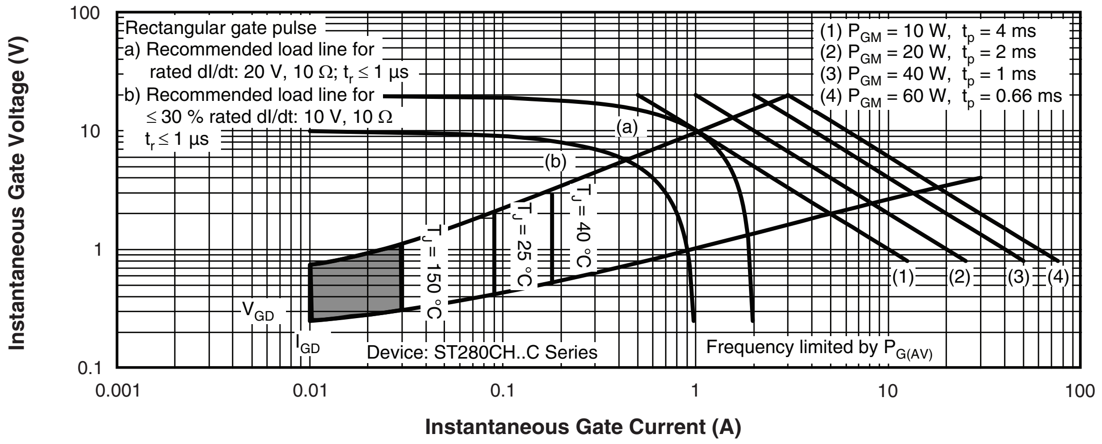


Fig. 11 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	VS-	ST	28	0	CH	06	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 - CH = ceramic PUK, high temperature

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)

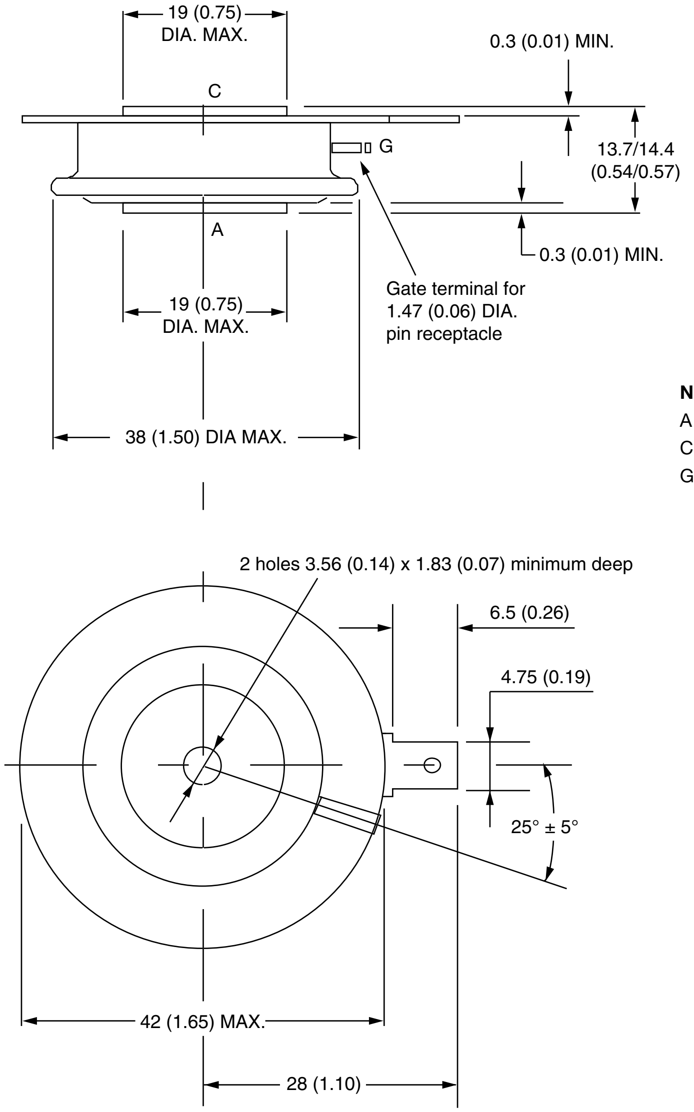
9 - Critical dV/dt:
- None = 500 V/µs (standard selection)
- L = 1000 V/µs (special selection)

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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