VS-ST280C Series

Vishay Semiconductors



Phase Control Thyristors (Hockey PUK Version), 500 A



A-PUK (TO-200AB)

PRIMARY CHARACTERISTICS							
I _{T(AV)} 500 A							
V _{DRM} /V _{RRM}	400 V, 600 V						
V _{TM}	1.36 V						
I _{GT}	90 mA						
TJ	-40 °C to +125 °C						
Package	A-PUK (TO-200AB)						
Circuit configuration	Single SCR						

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 <u>www.vishay.com/doc?99912</u>

TYPICAL APPLICATIONS

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

MAJOR RATINGS AND CHARACTERISTICS							
PARAMETER	TEST CONDITIONS	VALUES	UNITS				
1		500	A				
I _{T(AV)}	W) T _{hs}	55	°C				
1		960	A				
T(RMS) T _{hs}	T _{hs}	25	°C				
1	50 Hz	7850	A				
ITSM	60 Hz	8220					
l ² t	50 Hz	308	1.42-				
1-1	60 Hz	281	– kA ² s				
V _{DRM} /V _{RRM}		400 to 600	V				
tq	Typical	100	μs				
TJ		- 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	$I_{DRM}/I_{RRM} MAXIMUM AT T_J = T_J MAXIMUM mA$						
ST280CC	04	400	500	30						
3120000	06	600	700	50						

Revision: 27-Sep-17 1 Document Number: 94400 For technical questions within your region: <u>DiodesAmericas@vishay.com</u>, <u>DiodesAsia@vishay.com</u>, <u>DiodesEurope@vishay.com</u> THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT <u>www.vishay.com/doc?91000</u>



COMPLIANT

VS-ST280C Series



www.vishay.com

Vishay Semiconductors

ABSOLUTE MAXIMUM RATINGS							
PARAMETER	SYMBOL		TEST CON	IDITIONS	VALUES	UNITS	
Maximum average on-state current		180° condu	ction, half sine v	wave	500 (185)	A	
at heatsink temperature	I _{T(AV)}	double side	(single side) coo	bled	55 (85)	°C	
Maximum RMS on-state current	I _{T(RMS)}	DC at 25 °C	Cheatsink tempe	erature double side cooled	960		
		t = 10 ms	No voltage		7850		
Maximum peak, one-cycle		t = 8.3 ms	reapplied		8220	А	
non-repetitive surge current	I _{TSM}	t = 10 ms	100 % V _{RRM}		6600		
		t = 8.3 ms	reapplied	Sinusoidal half wave,	6900		
Maximum I ² t for fusing		t = 10 ms	No voltage	initial $T_J = T_J$ maximum	308	- kA ² s	
	l ² t	t = 8.3 ms	reapplied		281		
	1-1	t = 10 ms	100 % V _{RRM}		218		
		t = 8.3 ms	reapplied		200	1	
Maximum I ² \sqrt{t} for fusing	l²√t	t = 0.1 to 10) ms, no voltage	e reapplied	3080	kA²√s	
Low level value of threshold voltage	V _{T(TO)1}	(16.7 % x π	$x _{T(AV)} < l < \pi x$	$I_{T(AV)}$), $T_J = T_J$ maximum	0.84	v	
High level value of threshold voltage	V _{T(TO)2}	$(I > \pi x I_{T(AV)}), T_J = T_J maximum$		0.88	v		
Low level value of on-state slope resistance	r _{t1}	(16.7 % x π x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$), $T_J = T_J$ maximum		0.50	mΩ		
High level value of on-state slope resistance	r _{t2}	$(I > \pi x I_{T(AV)}), T_J = T_J maximum$		0.47	11152		
Maximum on-state voltage	V _{TM}	I_{pk} = 1050 A, T _J = 125 °C, t _p = 10 ms sine pulse		1.36	V		
Maximum holding current	Ι _Η	T 25 °C	anodo supply 1	2 V resistive load	600	mA	
Maximum (typical) latching current	ΙL	$1_{\rm J} = 25$ C,	anoue supply 1	2 V TESISLIVE IUAU	1000 (300)	IIIA	

SWITCHING								
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS				
Maximum non-repetitive rate of rise of turned-on current	dl/dt	Gate drive 20 V, 20 $\Omega,$ $t_r \leq 1~\mu s$ T_J = T_J maximum, anode voltage $\leq 80~\%~V_{DRM}$	1000	A/µs				
Typical delay time	t _d	Gate current 1 A, dl _g /dt = 1 A/ μ s V _d = 0.67 % V _{DRM} , T _J = 25 °C	1.0					
Typical turn-off time	tq	I_{TM} = 300 A, T_J = T_J maximum, dl/dt = 20 A/µs, V_R = 50 V, dV/dt = 20 V/µs, gate 0 V 100 $\Omega,$ t_p = 500 µs	100	μs				

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	30	mA			



Vishay Semiconductors

TRIGGERING							
PARAMETER	SYMBOL	DL TEST CONDITIONS		VAL	UNITS		
	STIVIBOL	16	STCONDITIONS	TYP.	MAX.	UNITS	
Maximum peak gate power	P _{GM}	$T_J = T_J$ maximum,	t _p ≤ 5 ms	10	0.0	w	
Maximum average gate power	P _{G(AV)}	$T_J = T_J$ maximum,	f = 50 Hz, d% = 50	2	.0	vv	
Maximum peak positive gate current	I _{GM}	$T_J = T_J$ maximum,	$t_p \le 5 \text{ ms}$	3	.0	А	
Maximum peak positive gate voltage	+ V _{GM}		t < 5 mg	2	20	V	
Maximum peak negative gate voltage	- V _{GM}	$T_J = T_J$ maximum, $t_p \le 5$ ms 5.0		.0	v		
		T _J = - 40 °C		180	-	mA	
DC gate current required to trigger	I _{GT}	T _J = 25 °C		90	150		
		T _J = 125 °C	Maximum required gate trigger/ current/voltage are the lowest	40	-		
		T _J = - 40 °C	value which will trigger all units 12 V anode to cathode applied	2.9	-		
DC gate voltage required to trigger	V _{GT}	T _J = 25 °C	12 V anoue to cathode applied	1.8	3.0	V	
		T _J = 125 °C	25 °C		-		
DC gate current not to trigger	I _{GD}	T T. movimum	Maximum gate current/voltage not to trigger is the maximum	10		mA	
DC gate voltage not to trigger	V _{GD}	$T_J = T_J maximum$	value which will not trigger any unit with rated V _{DRM} anode to cathode applied	0.30		v	

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS		
Maximum operating junction temperature range	TJ		- 40 to 125	°C		
Maximum storage temperature range	T _{Stg}		- 40 to 150			
Maximum thermal resistance,	Р	DC operation single side cooled	0.17			
junction to heatsink	R _{thJ-hs}	DC operation double side cooled	0.08	K/W		
Maximum thermal resistance,	Р	DC operation single side cooled	0.033	r √vv		
case to heatsink	R _{thC-hs}	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-20	DAB)		

CONDUCTION ANGLE	SINUSOIDAL CONDU		RECTANGULAR	TEST CONDITIONS	UNITS			
CONDUCTION ANGLE	SINGLE SIDE	DOUBLE SIDE	SINGLE SIDE	DOUBLE SIDE	TEST CONDITIONS	UNITS		
180°	0.016	0.016	0.011	0.011				
120°	0.019	0.019	0.019	0.019				
90°	0.024	0.024	0.026	0.026	$T_J = T_J$ maximum	K/W		
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

Revision: 27-Sep-17



Vishay Semiconductors

onduction Period

DC

RMS Limit

Conduction Angle

ST280C..C Series

Conduction Period

ST280C..C Series

800

1000

T_{.1} = 125°C

600

400

Fig. 6 - On-State Power Loss Characteristics

AverageOn-stateCurrent(A)

125°C

200 300 400 500 600 700

T_ =

AverageOn-stateCurrent(A)

1000

800

ST280C..C Series

30

200

180°

120

90°

60

30

100

DĊ

180°

120°

90°

60°

30

200

60

90

400

\120[°]

AverageOn-stateCurrent(A)

(Double Side Cooled)

R _{thJ-hs} (DC) = 0.08 K/W

180

600

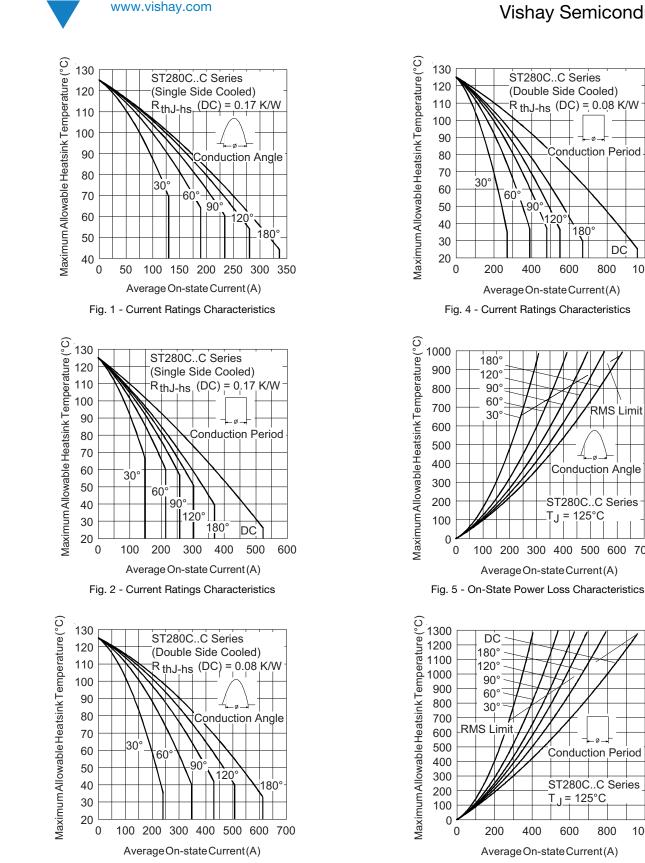


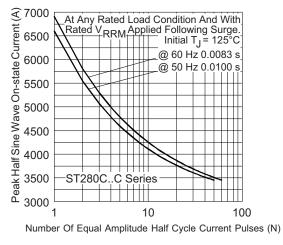
Fig. 3 - Current Ratings Characteristics

Revision: 27-Sep-17

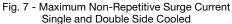


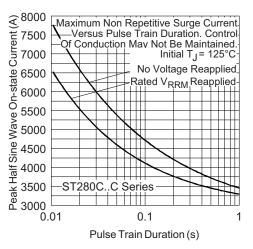
For technical questions within your region: DiodesAmericas@vishay.com, Diode THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishav.com/doc?91000

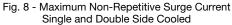
Vishay Semiconductors



www.vishay.com







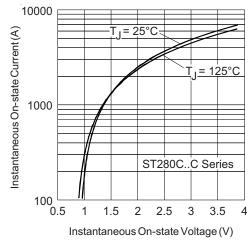
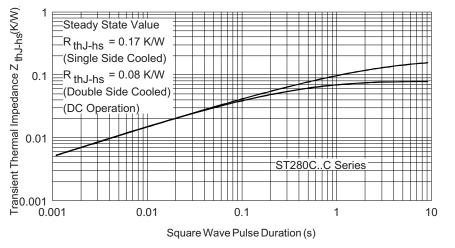
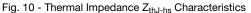


Fig. 9 - On-State Voltage Drop Characteristics





VS-ST280C Series



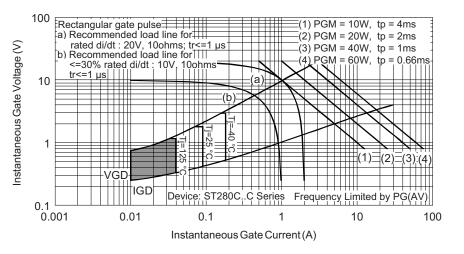


Fig. 11 - Gate Charactersitics

ORDERING INFORMATION TABLE

www.vishay.com

Device code	VS-	ST	28	0	с	06	С	1	-
		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	_	\bigcirc	\bigcirc	0	0	\bigcirc	\bigcirc	\bigcirc	\bigcirc
	1 -	· Visł	nay Sem	nicondu	ctors pr	oduct			
	2 -	· Thy	ristor						
	3 -	- Ess	ential p	art numl	ber				
	4 -	· 0 =	convert	er grade	е				
	5 -	- C =	cerami	c PUK					
	6 -	Vol	tage coo	de: code	e x 100 :	= V _{RRM}	(see Vo	Itage Ra	atings ta
	7 -	- C =	PUK ca	ase A-Pl	UK (TO-	200AB)			
	8 -	0 =	evelet t	erminals	s (gate a	and aux	iliary ca	thode u	Insolder
			-	termina			-		
				erminals			-		
			,	termina	10		,		
							-		
	9 -	· Crit	ical dV/	dt: • No					tion)
				• L =	= 1000 V	//µs (sp	ecial se	lection)	

LINKS TO RELATED DOCUMENTS					
Dimensions	www.vishay.com/doc?95074				



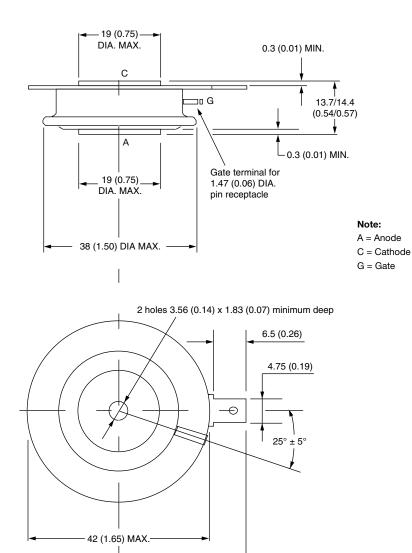


A-PUK (TO-200AB)

DIMENSIONS in millimeters (inches)

Anode to gate

Creepage distance: 7.62 (0.30) minimum Strike distance: 7.12 (0.28) minimum



◄ 28 (1.10) →

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



Vishay

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.