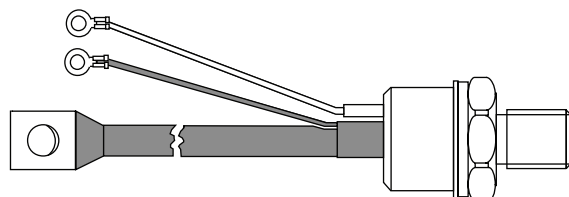


Phase Control Thyristors (Stud Version), 280 A



TO-209AB (TO-93)

FEATURES

- Center amplifying gate
- International standard case TO-209AB (TO-93)
- Hermetic metal case with glass-metal seal insulator
- Compression bonded encapsulation for heavy duty operations such as severe thermal cycling
- Lead (Pb)-free
- Designed and qualified for industrial level



RoHS
COMPLIANT

PRODUCT SUMMARY

$I_{T(AV)}$	280 A
-------------	-------

TYPICAL APPLICATIONS

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

MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		280	A
	T_C	85	°C
$I_{T(RMS)}$		440	A
I_{TSM}	50 Hz	7850	
	60 Hz	8220	
I^2t	50 Hz	308	kA ² s
	60 Hz	281	
V_{DRM}/V_{RRM}		400/600	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
ST280S	04	400	500	30
	06	600	700	

ABSOLUTE MAXIMUM RATINGS						
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS
Maximum average on-state current at case temperature	I _{T(AV)}	180° conduction, half sine wave			280	A
					85	°C
Maximum RMS on-state current	I _{T(RMS)}	DC at 75 °C case temperature			440	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	7850	
		t = 8.3 ms			8220	
		t = 10 ms	100 % V _{RRM} reapplied		6600	
		t = 8.3 ms			6900	
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage reapplied		310	kA ² s
		t = 8.3 ms		220		
		t = 10 ms	100 % V _{RRM} reapplied	218		
		t = 8.3 ms		200		
Maximum I ² √t for fusing	I ² √t	t = 0.1 to 10 ms, no voltage reapplied			3100	kA ² /s
Low level value of threshold voltage	V _{T(TO)1}	(16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum			0.84	V
High level value of threshold voltage	V _{T(TO)2}	(I > π × I _{T(AV)}), T _J = T _J maximum			0.88	
Low level value of on-state slope resistance	r _{t1}	(16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum			0.50	mΩ
High level value of on-state slope resistance	r _{t2}	(I > π × I _{T(AV)}), T _J = T _J maximum			0.47	
Maximum on-state voltage	V _{TM}	I _{pk} = 880 A, T _J = T _J maximum, t _p = 10 ms sine pulse			1.28	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 ≤ 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	30	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		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 ≤ 5 ms		3.0		A	
Maximum peak positive gate voltage	+ V _{GM}	T _J = T _J maximum, t _p ≤ 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 = 125 °C		40	-		
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 = 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		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 case	R _{thJC}	DC operation	0.105	K/W
Maximum thermal resistance, case to heatsink	R _{thCS}	Mounting surface, smooth, flat and greased	0.04	
Mounting torque, ± 10 %		Non-lubricated threads	31 (275)	N · m (lbf · in)
		Lubricated threads	24.5 (210)	
Approximate weight			280	g
Case style		See dimensions - link at the end of datasheet	TO-209AB (TO-93)	

ΔR_{thJC} CONDUCTION				
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDITIONS	UNITS
180°	0.016	0.012	$T_J = T_J$ maximum	K/W
120°	0.019	0.020		
90°	0.025	0.027		
60°	0.036	0.037		
30°	0.060	0.060		

Note

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

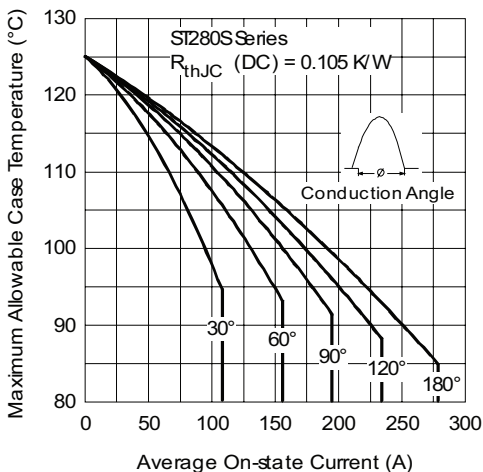


Fig. 1 - Current Ratings Characteristics

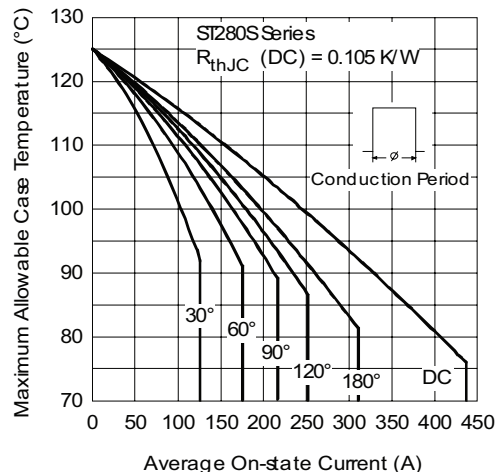


Fig. 2 - Current Ratings Characteristics

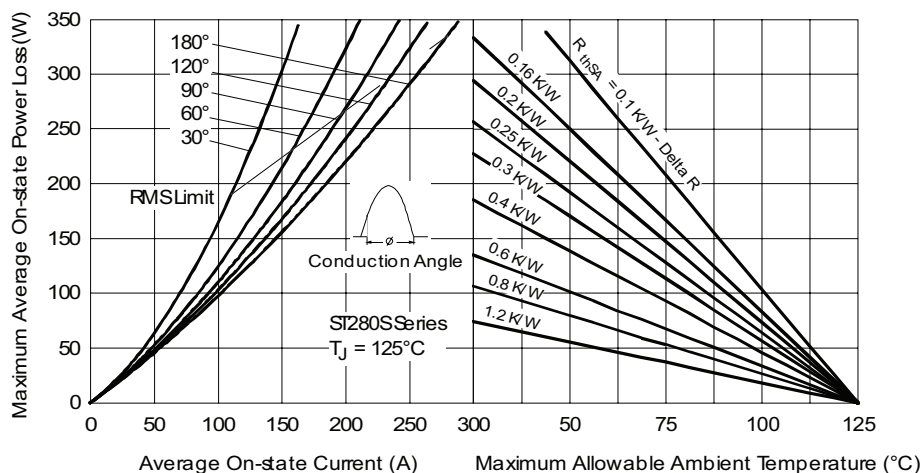


Fig. 3 - On-State Power Loss Characteristics

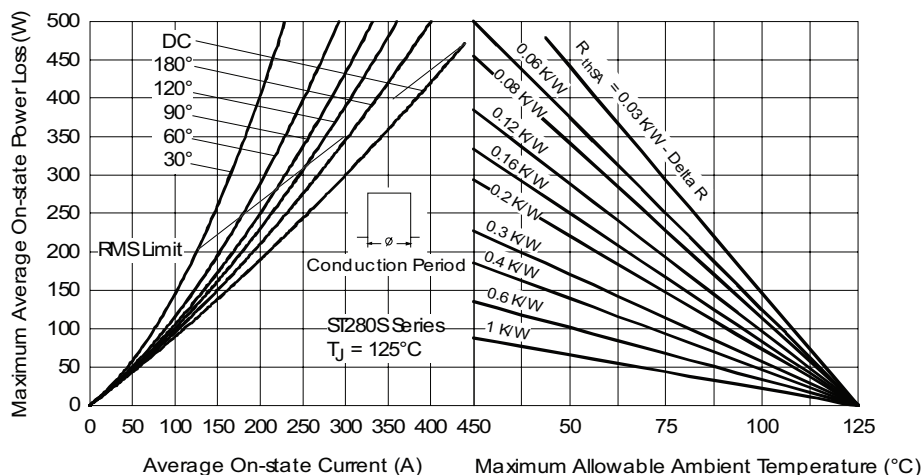


Fig. 4 - On-State Power Loss Characteristics

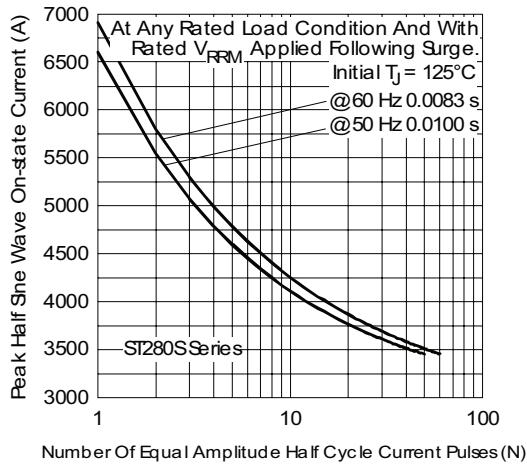


Fig. 5 - Maximum Non-Repetitive Surge Current

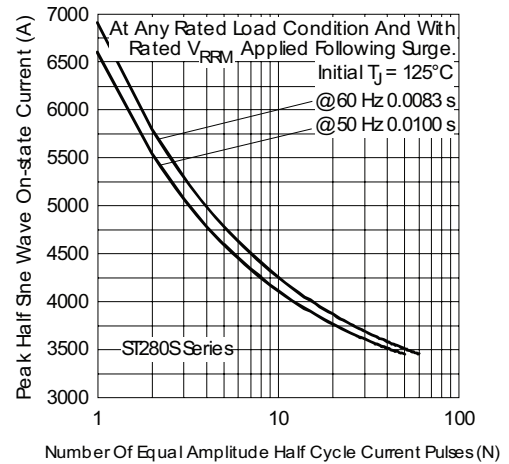


Fig. 6 - Maximum Non-Repetitive Surge Current

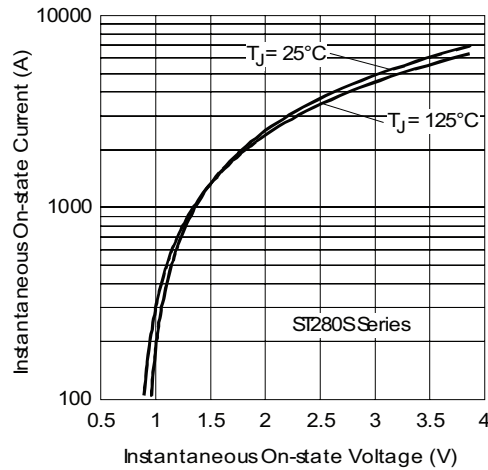


Fig. 7 - On-State Voltage Drop Characteristics

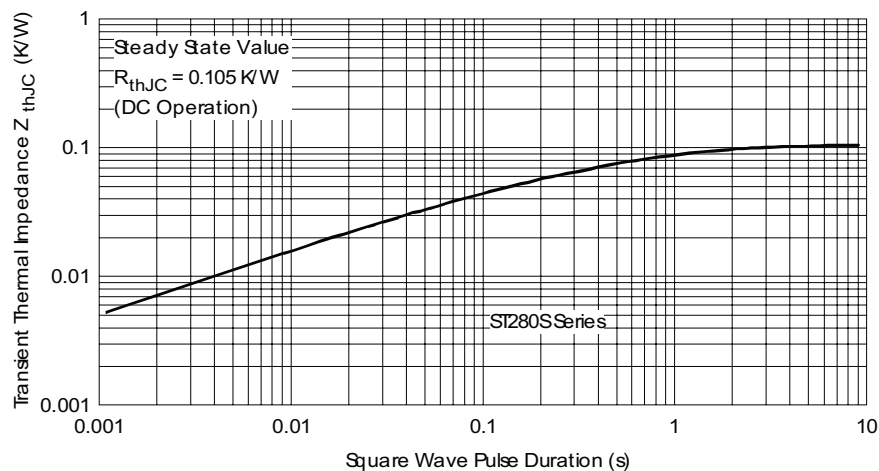


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

ST280SPbF Series



Vishay High Power Products Phase Control Thyristors
(Stud Version), 280 A

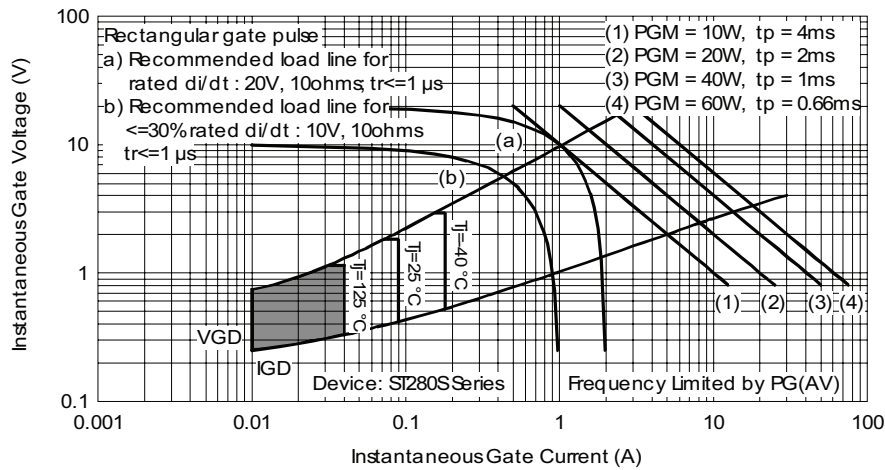


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	ST	28	0	S	06	P	0	V	PbF
	①	②	③	④	⑤	⑥	⑦	⑧	⑨
①	- Thyristor								
②	- Essential part number								
③	- 0 = Converter grade								
④	- S = Compression bonding stud								
⑤	- Voltage code x 100 = V_{RRM} (see Voltage Ratings table)								
⑥	- P = Stud base 3/4"-16UNF-2A threads								
⑦	- 0 = Eyelet terminals (gate and auxiliary cathode leads) 1 = Fast-on terminals (gate and auxiliary cathode leads)								
⑧	- V = Glass-metal seal								
⑨	- Lead (Pb)-free								

Note: For metric device M16 x 1.5 contact factory

LINKS TO RELATED DOCUMENTS	
Dimensions	http://www.vishay.com/doc?95077



Disclaimer

All product specifications and data are subject to change without notice.

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 herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

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.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.