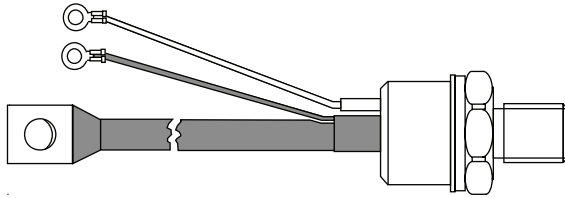


Phase Control Thyristors (Stud Version), 280 A



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
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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	
Maximum peak, one-cycle non-repetitive surge current	I_{TSM}	t = 10 ms	No voltage reapplied	7850	A
		t = 8.3 ms		8220	
		t = 10 ms	100 % V_{RRM} reapplied	6600	
		t = 8.3 ms		6900	
Maximum I^2t for fusing	I^2t	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 $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied		3100	kA ² /s
Low level value of threshold voltage	$V_{T(TO)1}$	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ maximum		0.84	V
High level value of threshold voltage	$V_{T(TO)2}$	$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ maximum		0.88	
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		0.50	mΩ
High level value of on-state slope resistance	r_{t2}	$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ 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 $\leq 80\%$ 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		30	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	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	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

ST280SPbF Series



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

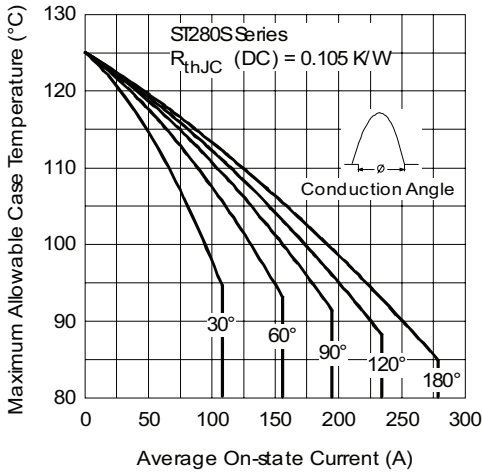


Fig. 1 - Current Ratings Characteristics

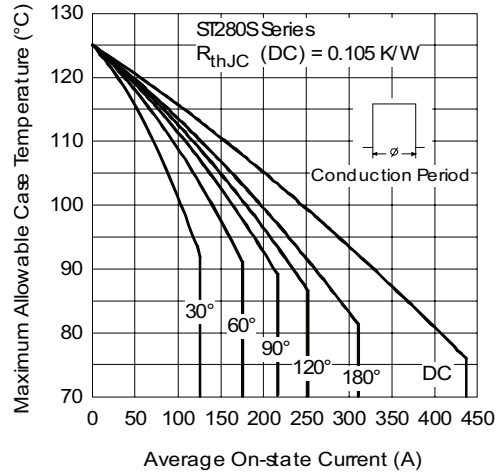


Fig. 2 - Current Ratings Characteristics

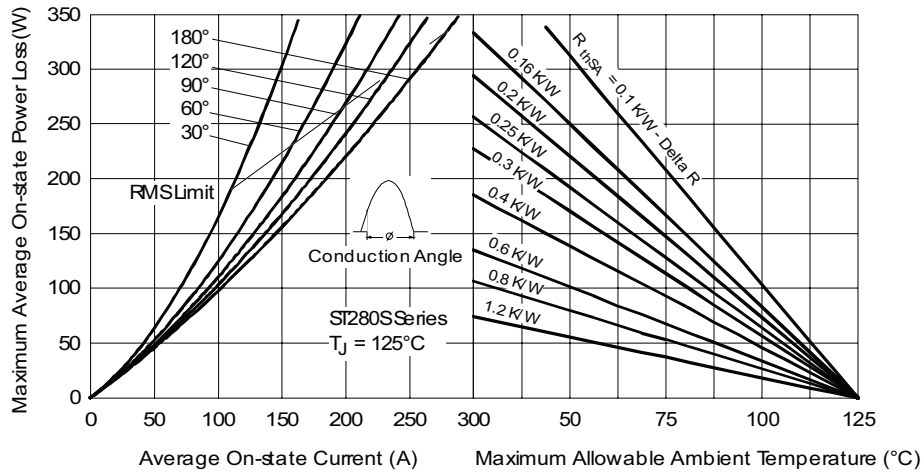


Fig. 3 - On-State Power Loss Characteristics

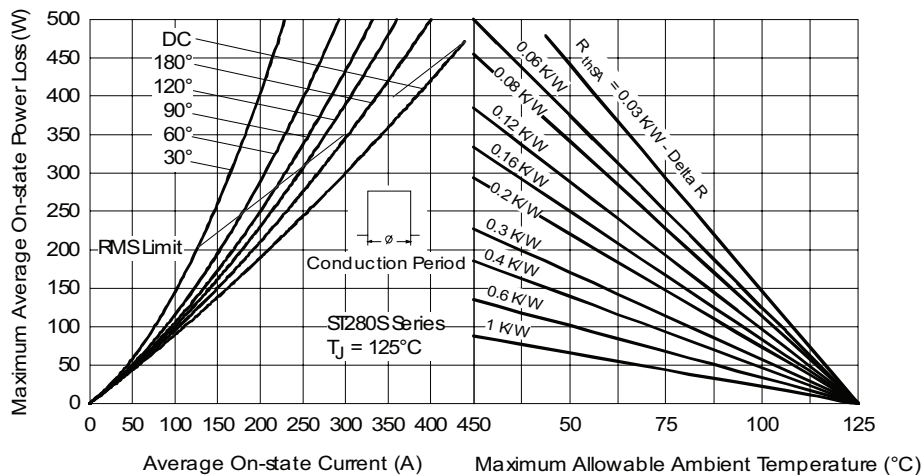


Fig. 4 - On-State Power Loss Characteristics

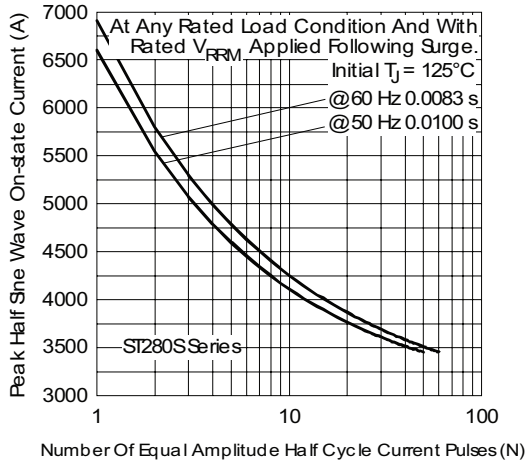


Fig. 5 - Maximum Non-Repetitive Surge Current

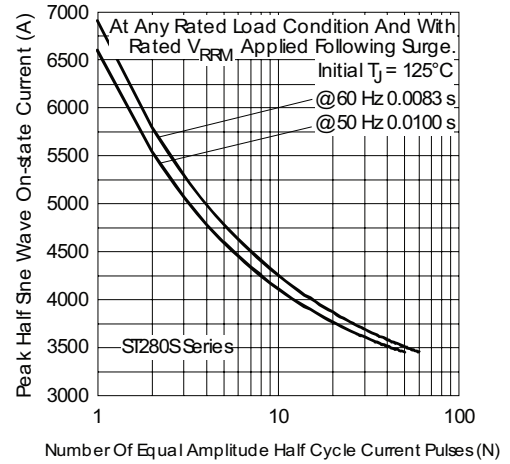


Fig. 6 - Maximum Non-Repetitive Surge Current

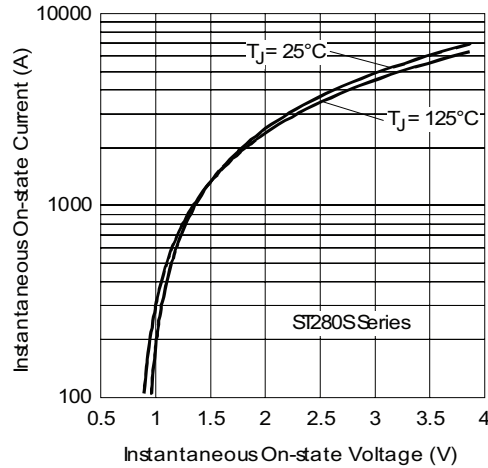


Fig. 7 - On-State Voltage Drop Characteristics

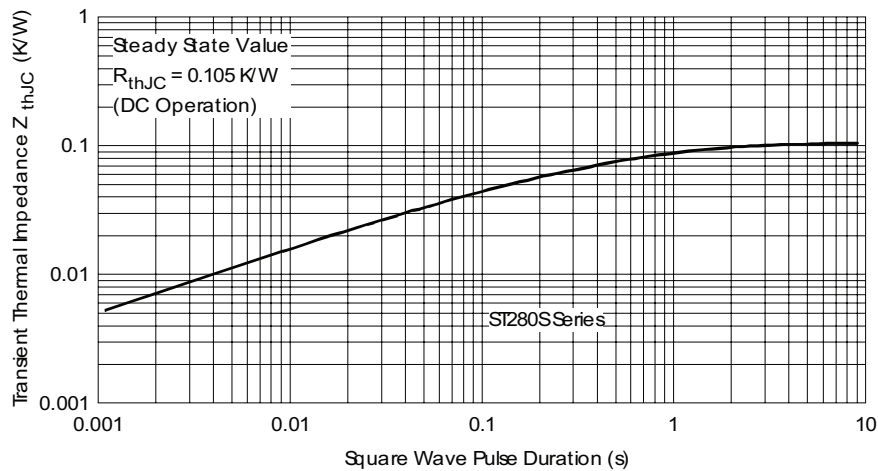


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

ST280SPbF Series



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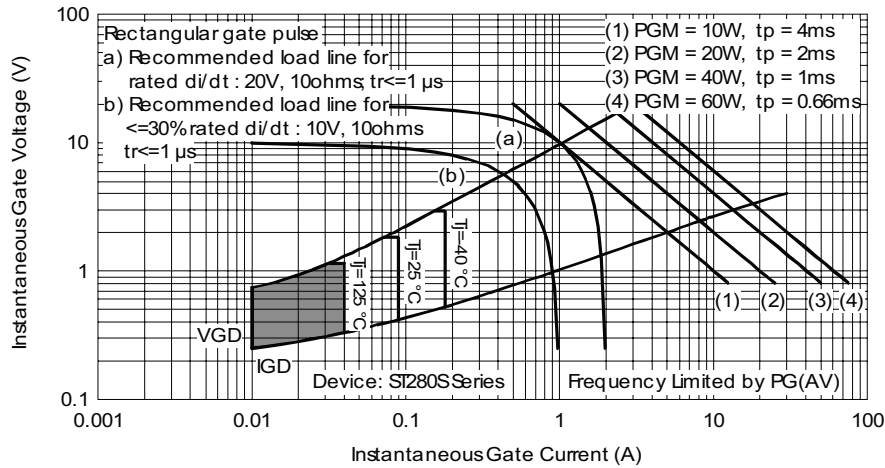


Fig. 9 - Gate Characteristics

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

TO-209AB (TO-93)

DIMENSIONS in millimeters (inches)





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