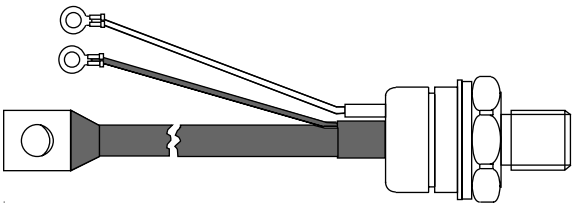
Phase Control Thyristors (Stud Version), 200 A



TO-209AB (TO-93)

FEATURES

- Center amplifying gate
- International standard case TO-209AB (TO-93)
- Hermetic metal case with ceramic insulator (Also available with glass-metal seal up to 1200 V)
- Compression bonded encapsulation for heavy duty operations such as severe thermal cycling
- Lead (Pb)-free
- Designed and qualified for industrial level

Pb-free

RoHS COMPLIANT

TYPICAL APPLICATIONS

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

PRODUCT SUMMARY	
$I_{T(AV)}$	200 A

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		200	A
	T_C	85	°C
$I_{T(RMS)}$		314	A
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
ST180S	04	400	500	30
	08	800	900	
	12	1200	1300	
	16	1600	1700	
	20	2000	2100	

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			200	A
					85	°C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 76 °C case temperature			314	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	5000	
		t = 8.3 ms			5230	
		t = 10 ms	100 % V_{RRM} reapplied		4200	
		t = 8.3 ms			4400	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		125	kA^2s
		t = 8.3 ms			114	
		t = 10 ms	100 % V_{RRM} reapplied		88	
		t = 8.3 ms			81	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied			1250	$kA^2\sqrt{s}$
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			1.08	V
High level value of threshold voltage	$V_{T(TO)2}$	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			1.14	
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			1.18	mΩ
High level value of on-state slope resistance	r_{t2}	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			1.14	
Maximum on-state voltage	V_{TM}	I_{pk} = 570 A, T_J = 125 °C, t_p = 10 ms sine pulse			1.75	V
Maximum holding current	I_H	$T_J = T_J$ maximum, 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, $t_p \leq 5$ 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, $t_p \leq 5$ 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 = 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_{thC-hs}	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 datasheeet	TO-209AB (TO-93)	

ΔR_{thJC} CONDUCTION				
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDITIONS	UNITS
180°	0.015	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

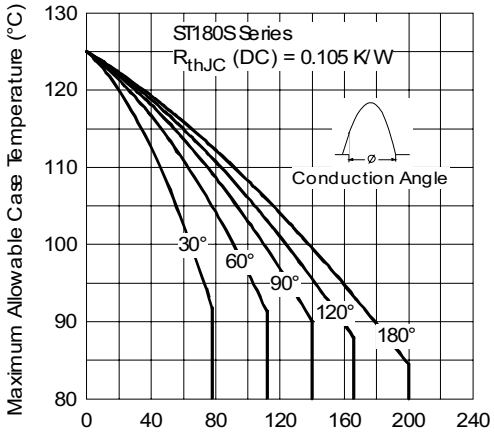


Fig. 1 - Current Ratings Characteristics

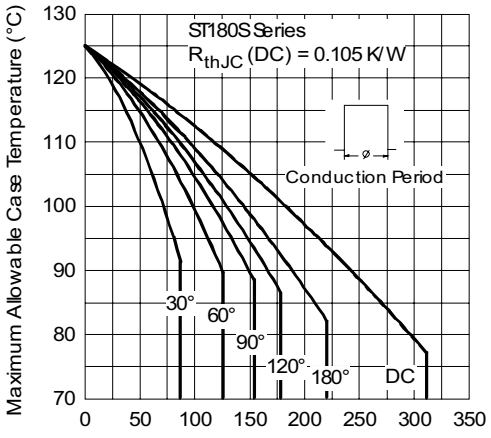


Fig. 2 - Current Ratings Characteristics

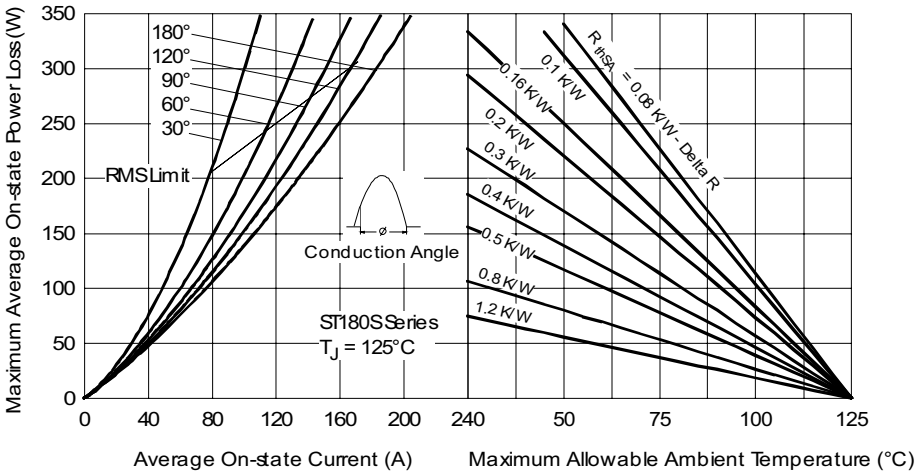


Fig. 3 - On-State Power Loss Characteristics

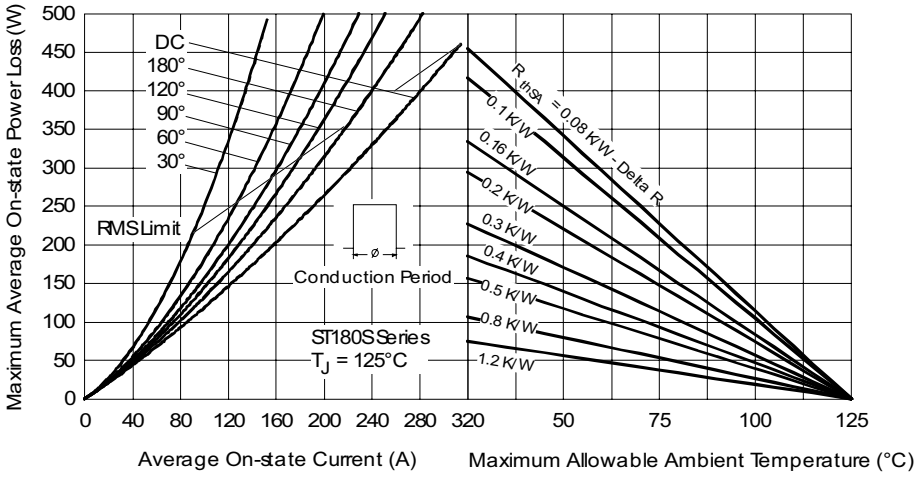


Fig. 4 - On-State Power Loss Characteristics

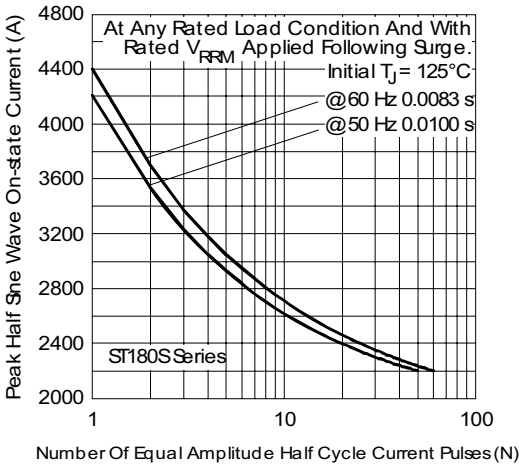


Fig. 5 - Maximum Non-Repetitive Surge Current

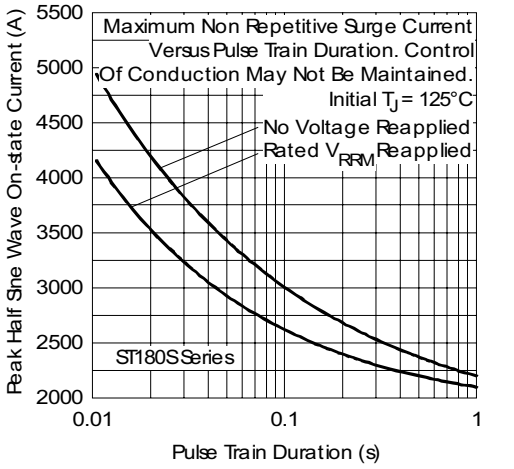


Fig. 6 - Maximum Non-Repetitive Surge Current

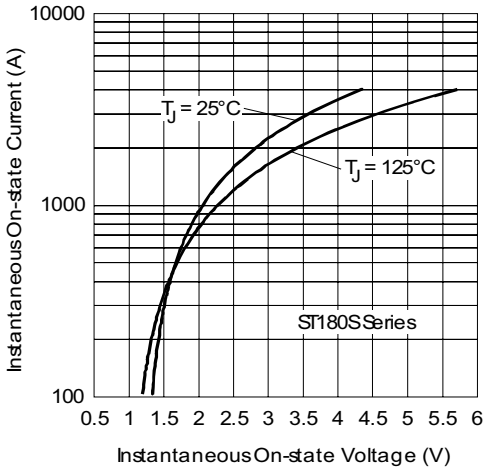


Fig. 7 - On-State Voltage Drop Characteristics

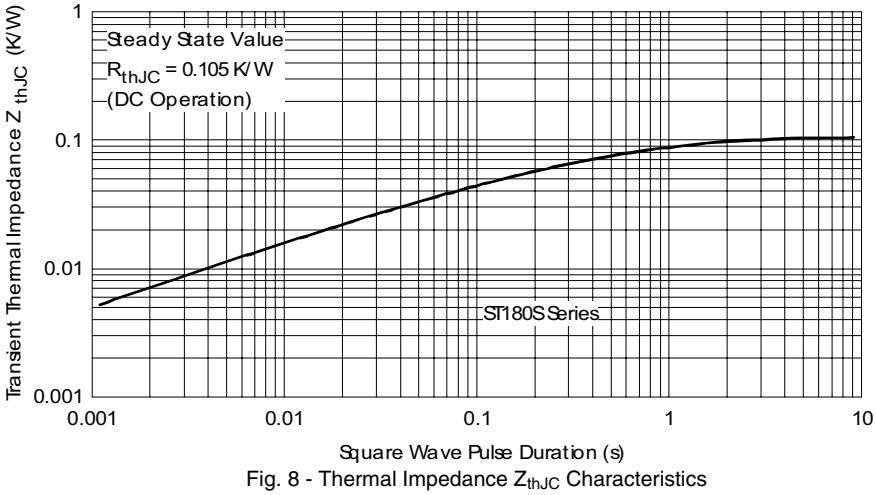


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

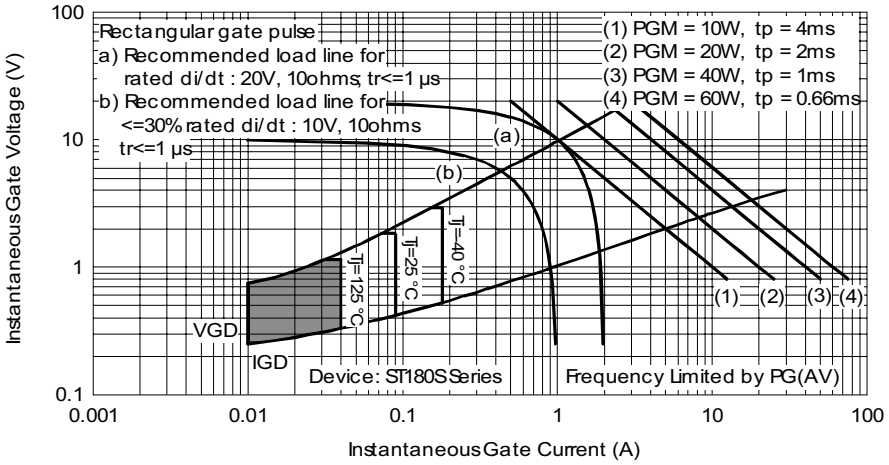


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

ST	18	0	S	20	P	0	-	PbF
1	2	3	4	5	6	7	8	9

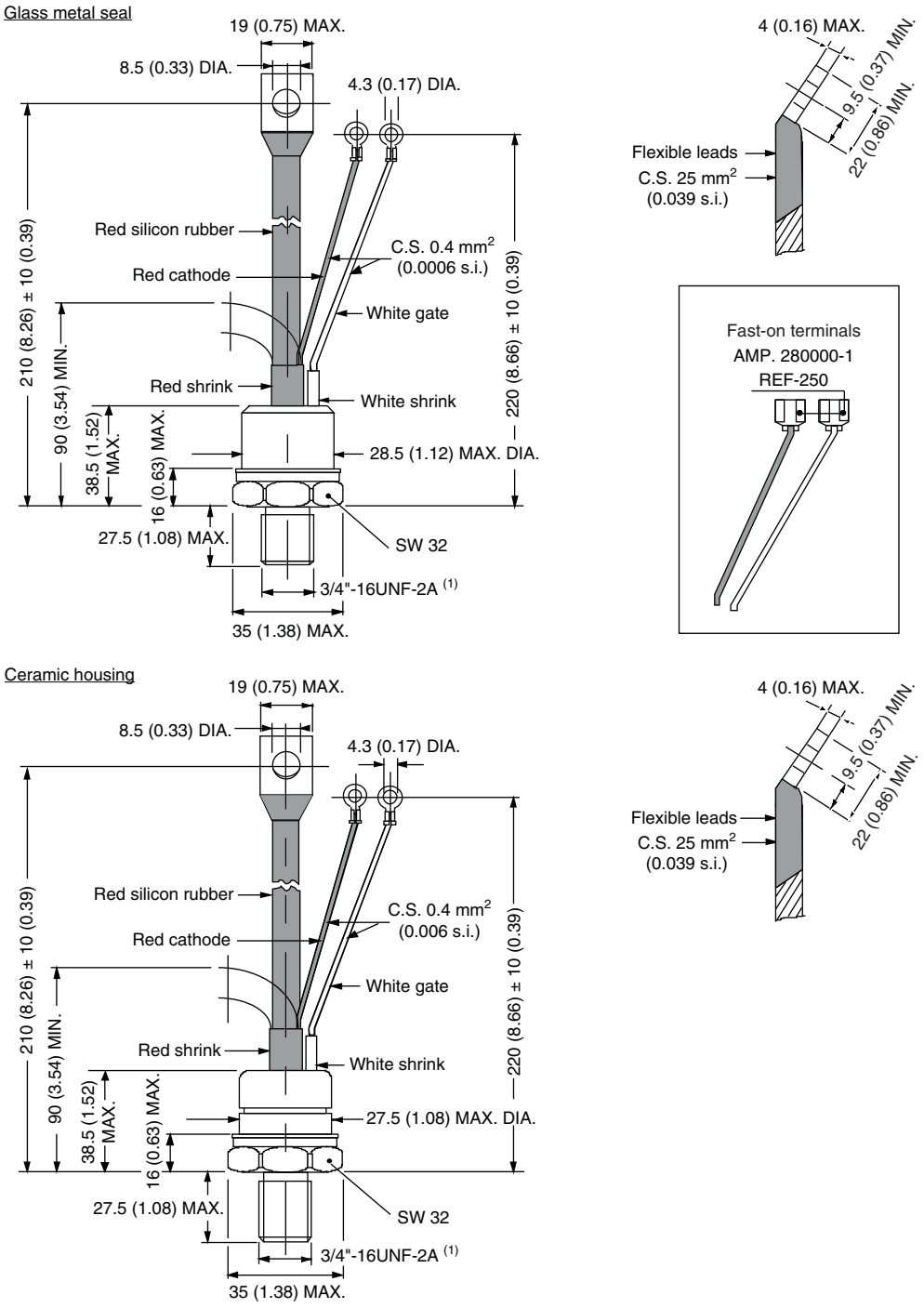
- 1 - Thyristor
- 2 - Essential part number
- 3 - 0 = Converter grade
- 4 - S = Compression bonding stud
- 5 - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)
- 6 - P = Stud base 3/4"-16UNF2A threads
- 7 - 0 = Eyelet terminals (gate and auxiliary cathode leads)
  1 = Fast-on terminals (gate and auxiliary cathode leads)
- 8 - V = Glass-metal seal (only up to 1200 V)
  None = Ceramic housing (over 1200 V)
- 9 - Lead (Pb)-free

Note: For metric device M16 x 1.5 contact factory

LINKS TO RELATED DOCUMENTS	
Dimensions	http://www.vishay.com/doc?95082

TO-209AB (TO-93)

DIMENSIONS in millimeters (inches)



Note

(1) For metric device: M16 x 1.5 - length 21 (0.83) maximum

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