

Bulletin I25158 rev. B 01/94

International
IOR Rectifier

ST300S SERIES

PHASE CONTROL THYRISTORS

Stud Version

Features

- Center amplifying gate
- Hermetic metal case with ceramic insulator
- International standard case TO-209AE (TO-118)
- Threaded studs UNF 3/4 - 16UNF2A or ISO M24x1.5
- Compression Bonded Encapsulation for heavy duty operations such as severe thermal cycling

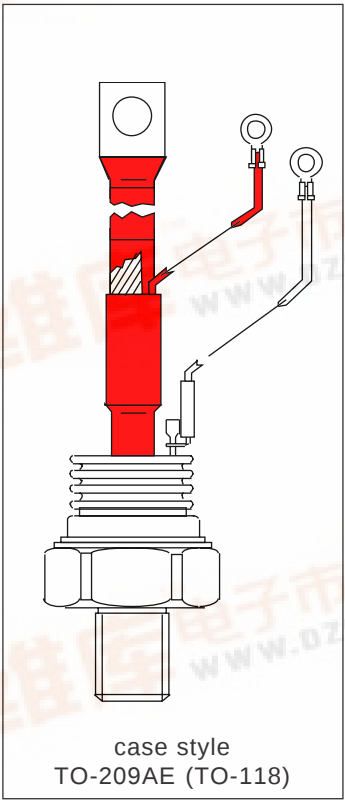
300A

Typical Applications

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

Major Ratings and Characteristics

Parameters	ST300S	Units
$I_{T(AV)}$	300	A
@ T_C	75	°C
$I_{T(RMS)}$	470	A
I_{TSM} @ 50Hz	8000	A
@ 60Hz	8380	A
I^2t @ 50Hz	320	KA ² s
@ 60Hz	292	KA ² s
V_{DRM}/V_{RRM}	400 to 2000	V
t_q typical	100	μs
T_J	- 40 to 125	°C



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ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{DRM}/V_{RRM} , max. repetitive peak and off-state voltage V	V_{RSM} , maximum non-repetitive peak voltage V	I_{DRM}/I_{RRM} max. @ $T_J = T_J \text{ max}$ mA
ST300S	04	400	500	50
	08	800	900	
	12	1200	1300	
	16	1600	1700	
	18	1800	1900	
	20	2000	2100	

On-state Conduction

Parameter		ST300S	Units	Conditions			
$I_{T(AV)}$	Max. average on-state current @ Case temperature	300	A	180° conduction, half sine wave			
		75	°C				
$I_{T(RMS)}$	Max. RMS on-state current	470	A	DC @ 64°C case temperature			
I_{TSM}	Max. peak, one-cycle non-repetitive surge current	8000	A	t = 10ms	No voltage	Sinusoidal half wave, Initial $T_J = T_J \text{ max.}$	
		8380		t = 8.3ms	reapplied		
		6730		t = 10ms	100% V_{RRM}		
		7040		t = 8.3ms	reapplied		
I^2t	Maximum I^2t for fusing	320	KA ² s	t = 10ms	No voltage		
		292		t = 8.3ms	reapplied		
		226		t = 10ms	100% V_{RRM}		
		207		t = 8.3ms	reapplied		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	3200	KA ² /s	t = 0.1 to 10ms, no voltage reapplied			
$V_{T(TO)1}$	Low level value of threshold voltage	0.97	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$			
$V_{T(TO)2}$	High level value of threshold voltage	0.98		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$			
r_{t1}	Low level value of on-state slope resistance	0.74	mΩ	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$			
r_{t2}	High level value of on-state slope resistance	0.73		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$			
V_{TM}	Max. on-state voltage	1.66	V	$I_{pk} = 940A, T_J = T_J \text{ max, } t_p = 10\text{ms sine pulse}$			
I_H	Maximum holding current	600	mA	$T_J = 25^\circ\text{C, anode supply 12V resistive load}$			
I_l	Typical latching current	1000					

Switching

Parameter	ST300S	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	1000	A/μs	Gate drive 20V, 20Ω, $t_r \leq 1\mu s$ $T_J = T_J \text{ max}$, anode voltage $\leq 80\% V_{DRM}$
t_d Typical delay time	1.0	μs	Gate current 1A, $di_g/dt = 1A/\mu s$ $V_d = 0.67\% V_{DRM}$, $T_J = 25^\circ C$
t_q Typical turn-off time	100		$I_{TM} = 550A$, $T_J = T_J \text{ max}$, $di/dt = 40A/\mu s$, $V_R = 50V$ $dv/dt = 20V/\mu s$, Gate 0V 100Ω, $t_p = 500\mu s$

Blocking

Parameter	ST300S	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/μs	$T_J = T_J \text{ max}$. linear to 80% rated V_{DRM}
I_{RRM} I_{DRM} Max. peak reverse and off-state leakage current	50	mA	$T_J = T_J \text{ max}$, rated V_{DRM} V_{RRM} applied

Triggering

Parameter		ST300S		Units	Conditions	
P _{GM}	Maximum peak gate power	10.0		W	T _J = T _J max, t _p ≤ 5ms	
P _{G(AV)}	Maximum average gate power	2.0			T _J = T _J max, f = 50Hz, d% = 50	
I _{GM}	Max. peak positive gate current	3.0		A	T _J = T _J max, t _p ≤ 5ms	
+V _{GM}	Maximum peak positive gate voltage	20		V	T _J = T _J max, t _p ≤ 5ms	
-V _{GM}	Maximum peak negative gate voltage	5.0				
I _{GT}	DC gate current required to trigger	TYP.	MAX.	mA	T _J = - 40°C T _J = 25°C T _J = 125°C	Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
		200	-			
		100	200			
		50	-			
V _{GT}	DC gate voltage required to trigger	2.5	-	V	T _J = - 40°C T _J = 25°C T _J = 125°C	
		1.8	3			
		1.1	-			
I _{GD}	DC gate current not to trigger	10.0		mA	T _J = T _J max	Max. gate current/ voltage not to trigger is the max. value which will not trigger any unit with rated V _{DRM} anode-to-cathode applied
V _{GD}	DC gate voltage not to trigger	0.25		V		

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Thermal and Mechanical Specification

Parameter	ST300S	Units	Conditions
T _J Max. operating temperature range	-40 to 125	°C	
T _{stg} Max. storage temperature range	-40 to 150		
R _{thJC} Max. thermal resistance, junction to case	0.10	K/W	DC operation
R _{thCS} Max. thermal resistance, case to heatsink	0.03		Mounting surface, smooth, flat and greased
T Mounting torque, ± 10%	48.5 (425)	Nm (lbf-in)	Non lubricated threads
wt Approximate weight	535	g	
Case style	TO - 209AE (TO-118)		See Outline Table

ΔR_{thJC} Conduction

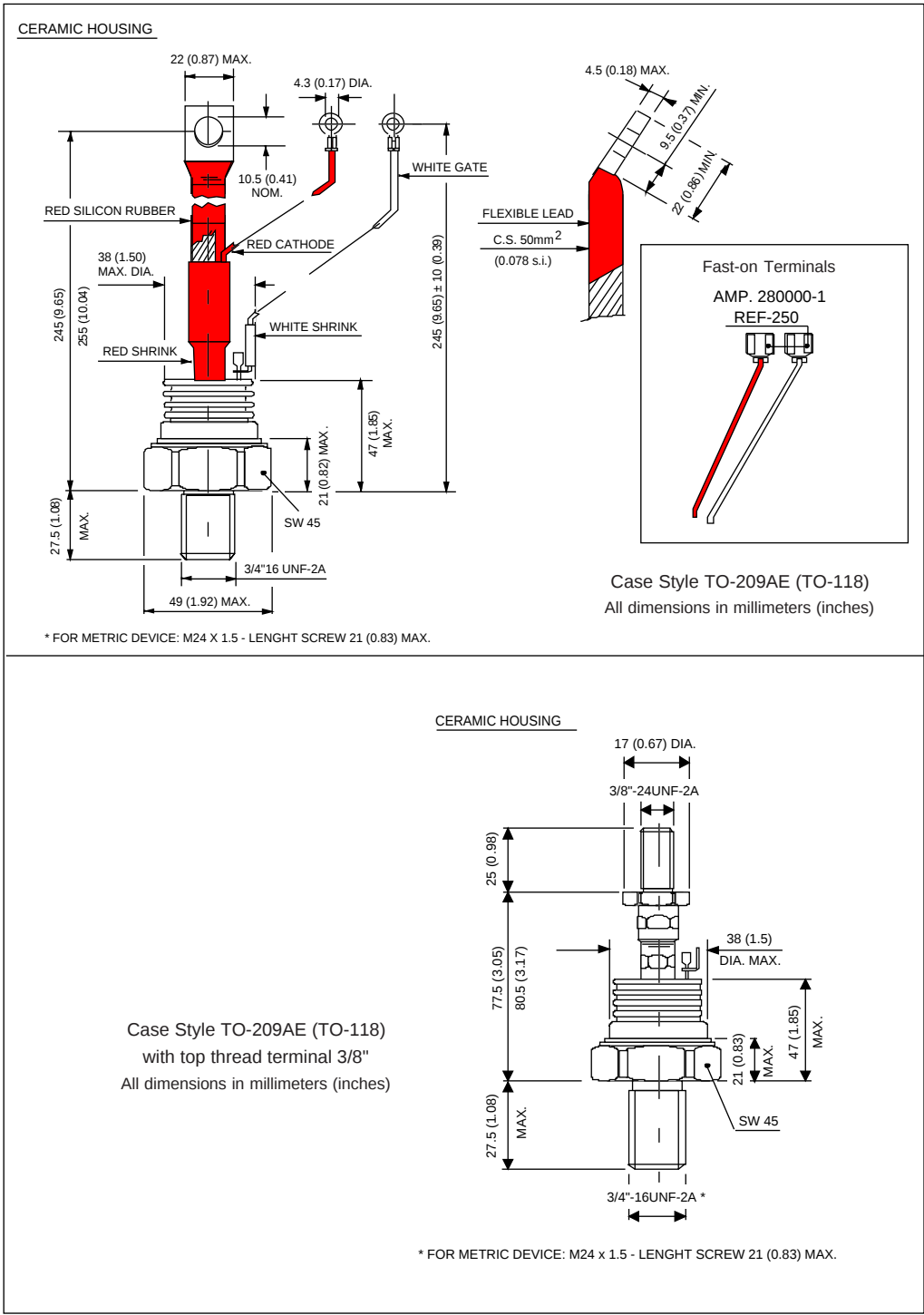
(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.011	0.008	K/W	T _J = T _J max.
120°	0.013	0.014		
90°	0.017	0.018		
60°	0.025	0.026		
30°	0.041	0.042		

Ordering Information Table

Device Code							
	ST	30	0	S	20	P	0
	①	②	③	④	⑤	⑥	⑦
①	- Thyristor						
②	- Essential part number						
③	- 0 = Converter grade						
④	- S = Compression bonding Stud						
⑤	- Voltage code: Code x 100 = V _{RRM} (See Voltage Rating Table)						
⑥	- P = Stud base 16UNF threads M = Stud base metric threads (M24 x 1.5)						
⑦	- 0 = Eyelet terminals (Gate and Auxiliary Cathode Leads) 1 = Fast - on terminals (Gate and Auxiliary Cathode Leads) 3 = Threaded top terminal 3/8" 24UNF-2A						
⑧	- Critical dv/dt: None = 500V/μsec (Standard value) L = 1000V/μsec (Special selection)						

Outline Table



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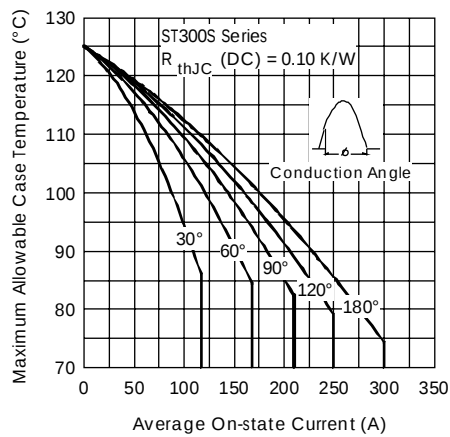


Fig. 1 - Current Ratings Characteristics

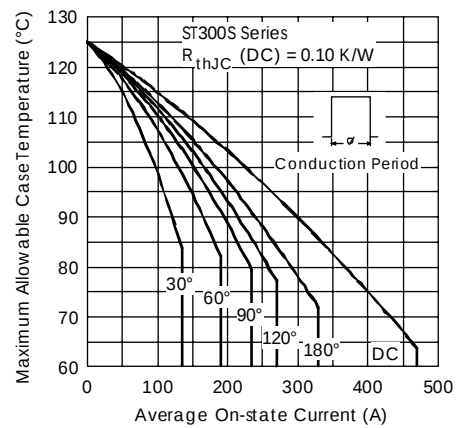


Fig. 2 - Current Ratings Characteristics

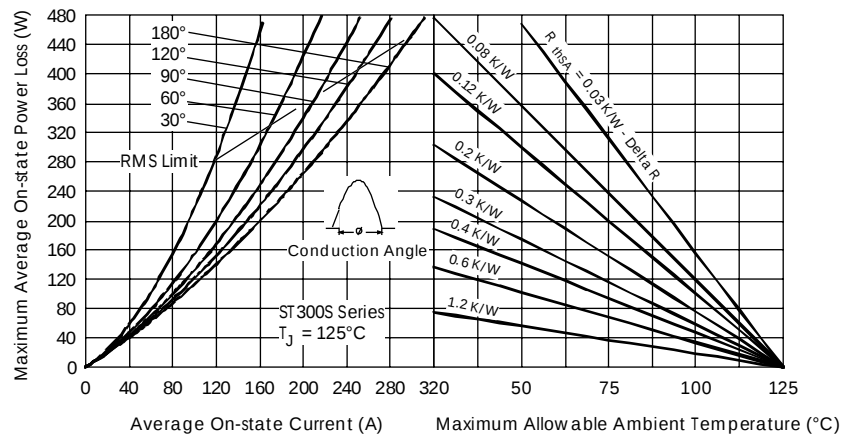


Fig. 3 - On-state Power Loss Characteristics

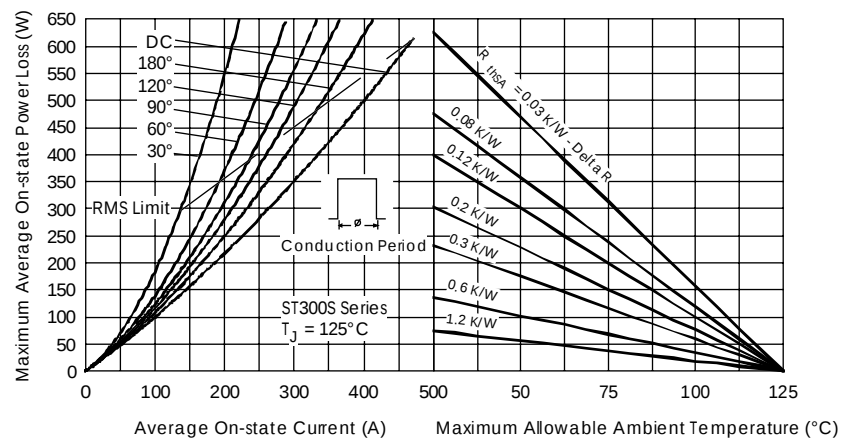


Fig. 4 - On-state Power Loss Characteristics

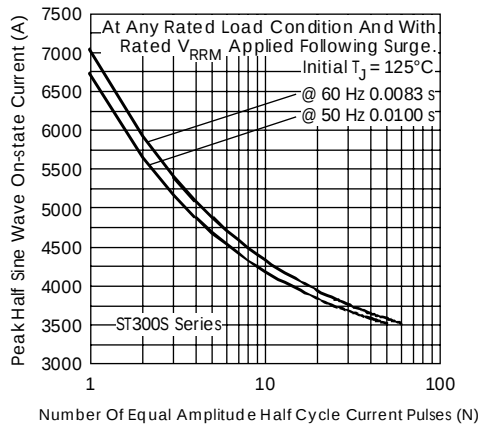


Fig. 5 - Maximum Non-Repetitive Surge Current

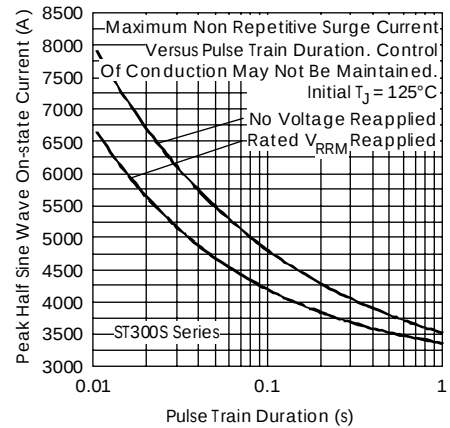


Fig. 6 - Maximum Non-Repetitive Surge Current

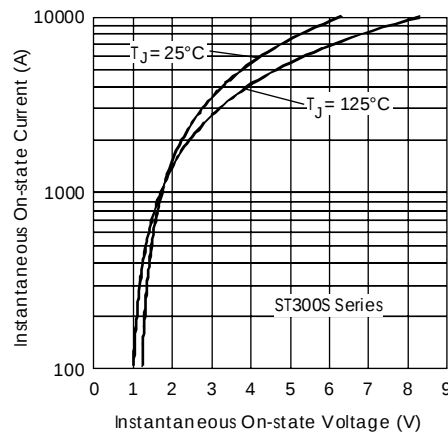


Fig. 7 - On-state Voltage Drop Characteristics

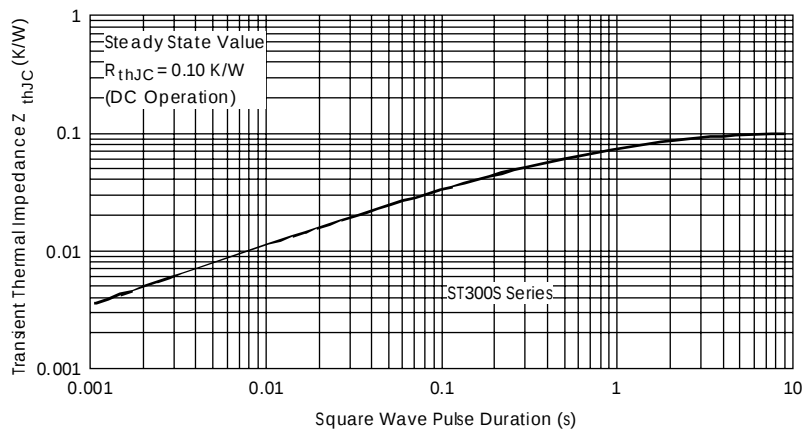


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

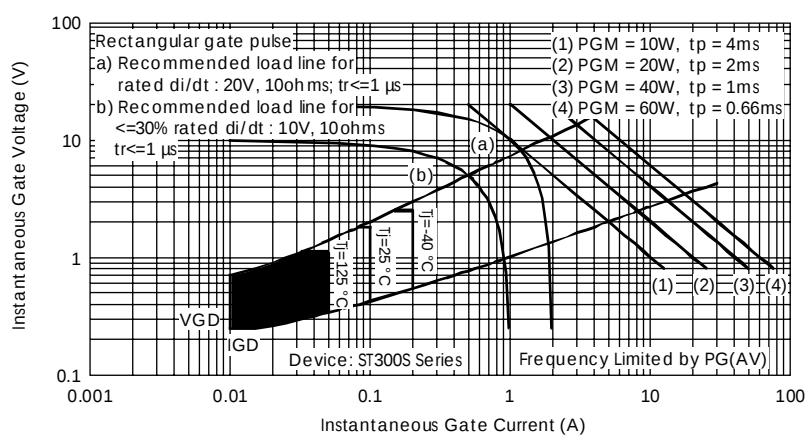


Fig. 9 - Gate Characteristics