Bulletin I25158 rev. B 01/94

International
IOR Rectifier

ST300S SERIES

PHASE CONTROL THYRISTORS

Stud Version

300A

Features

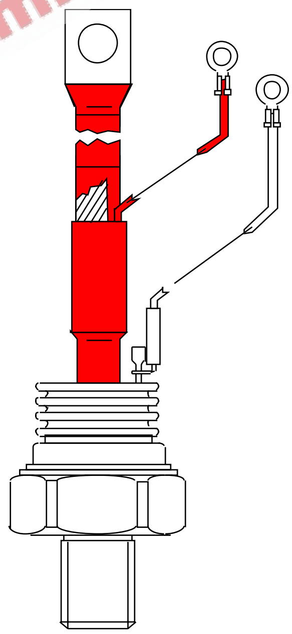
- Center amplifying gate
- Hermetic metal case with ceramic insulator
- International standard case TO-209AE (TO-118)
- Threaded studs UNF 3/4 - 16UNF2A or ISO M24x1.5
- Compression Bonded Encapsulation for heavy duty operations such as severe thermal cycling

TypicalApplications

- 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^2s
	@ 60Hz	292	KA^2s
V_{DRM}/V_{RRM}		400 to 2000	V
t_q	typical	100	µs
T_J		- 40 to 125	°C



case style
TO-209AE (TO-118)

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. @ $T_J = T_J$ 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 reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max.
		8380		t = 8.3ms		
		6730		t = 10ms	100% V_{RRM} reapplied	
		7040		t = 8.3ms		
I^2t	Maximum I^2t for fusing	320	KA^2s	t = 10ms	No voltage reapplied	
		292		t = 8.3ms		
		226		t = 10ms	100% V_{RRM} reapplied	
		207		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	3200	$KA^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		
$V_{T(TO)1}$	Low level value of threshold voltage	0.97	V	(16.7% x π x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$), $T_J = T_J$ max.		
$V_{T(TO)2}$	High level value of threshold voltage	0.98		($I > \pi$ x $I_{T(AV)}$),$T_J = T_J$ max.		
r_{t1}	Low level value of on-state slope resistance	0.74	mΩ	(16.7% x π x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$), $T_J = T_J$ max.		
r_{t2}	High level value of on-state slope resistance	0.73		($I > \pi$ x $I_{T(AV)}$),$T_J = T_J$ max.		
V_{TM}	Max. on-state voltage	1.66	V	I_{pk}= 940A, $T_J = T_J$ max, t_p = 10ms sine pulse		
I_H	Maximum holding current	600	mA	T_J = 25°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, $t_r \leq 1µs$ $T_J = T_J$ max, anode voltage ≤ 80% V_{DRM}
t_d	Typical delay time	1.0	µs	Gate current 1A, di_g/dt = 1A/µs V_d = 0.67% V_{DRM}, T_J = 25°C
t_q	Typical turn-off time	100		I_{TM} = 550A, $T_J = T_J$ max, di/dt = 40A/µs, V_R = 50V dv/dt = 20V/µs, Gate 0V 100Ω, t_p = 500µs

Blocking

	Parameter	ST300S	Units	Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	500	V/µs	$T_J = T_J$ max. linear to 80% rated V_{DRM}
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	50	mA	$T_J = T_J$ 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, $t_p \leq 5ms$	
$P_{G(AV)}$	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, $t_p \leq 5ms$	
$+V_{GM}$	Maximum peak positive gate voltage	20		V	$T_J = T_J$ max, $t_p \leq 5ms$	
$-V_{GM}$	Maximum peak negative gate voltage	5.0				
		TYP.	MAX.			
I_{GT}	DC gate current required to trigger	200	-	mA	T_J = - 40°C	Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
		100	200		T_J = 25°C	
		50	-		T_J = 125°C	
V_{GT}	DC gate voltage required to trigger	2.5	-	V	T_J = - 40°C	
		1.8	3		T_J = 25°C	
		1.1	-		T_J = 125°C	
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		

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

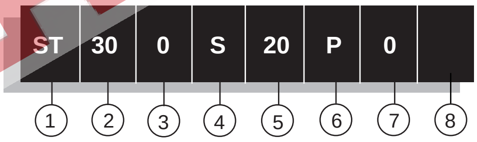
ΔR_{thJC} Conduction

(The following table shows the increment of thermal resistence 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		

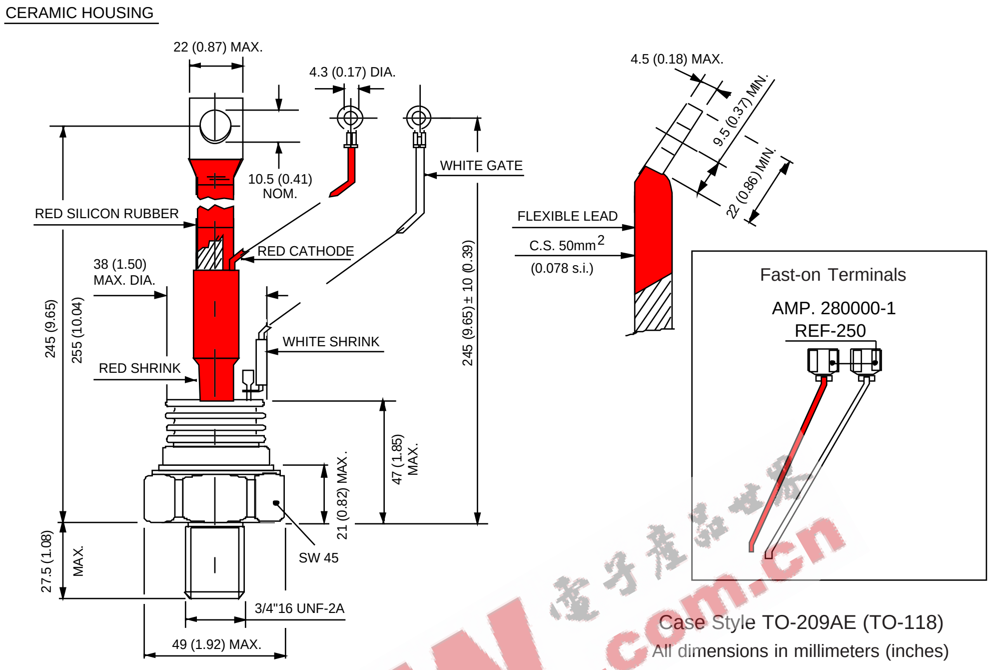
Ordering Information Table

Device Code



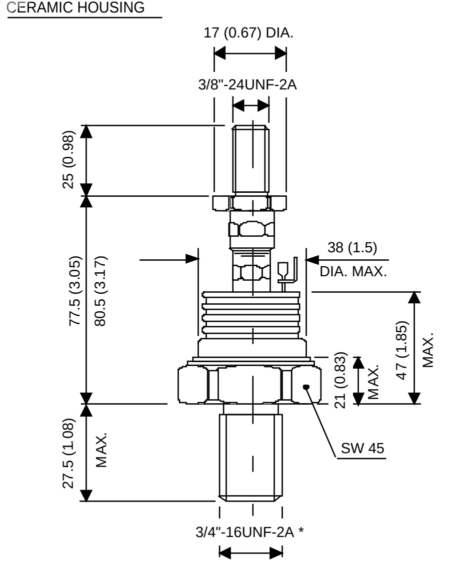
1 - Thyristor
2 - Essential part number
3 - 0 = Converter grade
4 - S = Compression bonding Stud
5 - Voltage code: Code x 100 = V_{RRM} (See Voltage Rating Table)
6 - P = Stud base 16UNF threads
M = Stud base metric threads (M24 x 1.5)
7 - 0 = Eyelet terminals (Gate and Auxiliary Cathode Leads)
1 = Fast - 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



Case Style TO-209AE (TO-118)
All dimensions in millimeters (inches)

* FOR METRIC DEVICE: M24 X 1.5 - LENGHT SCREW 21 (0.83) MAX.



Case Style TO-209AE (TO-118)
with top thread terminal 3/8"
All dimensions in millimeters (inches)

* FOR METRIC DEVICE: M24 x 1.5 - LENGHT SCREW 21 (0.83) MAX.

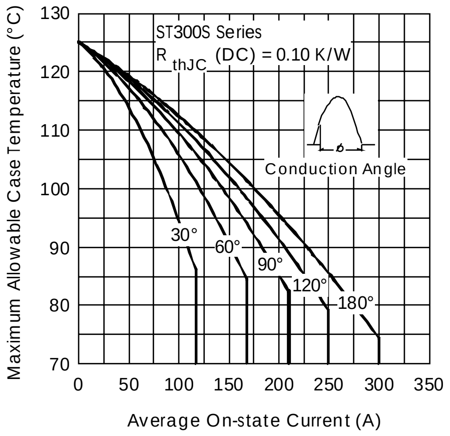


Fig. 1 - Current Ratings Characteristics

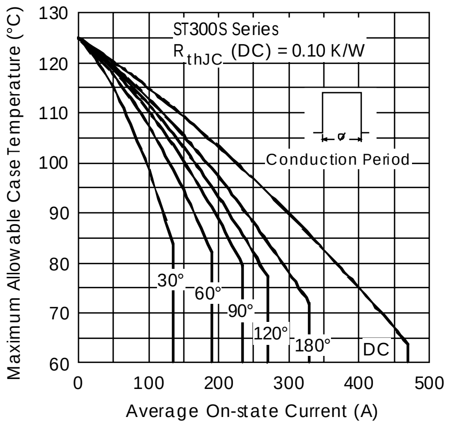


Fig. 2 - Current Ratings Characteristics

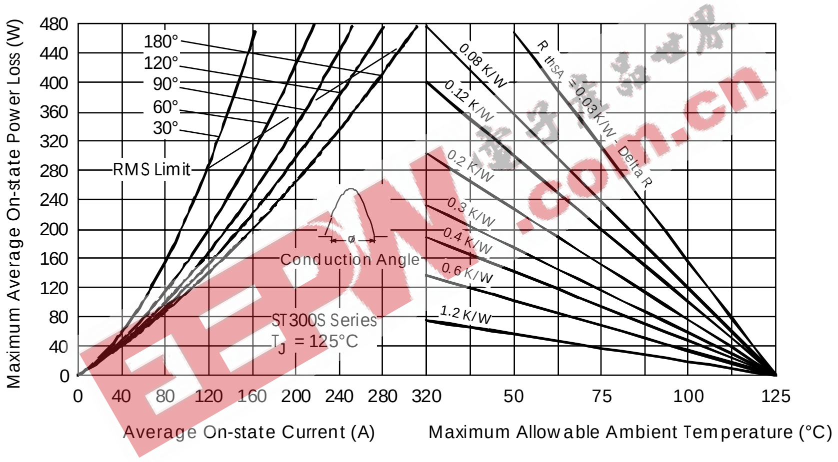


Fig. 3 - On-state Power Loss Characteristics

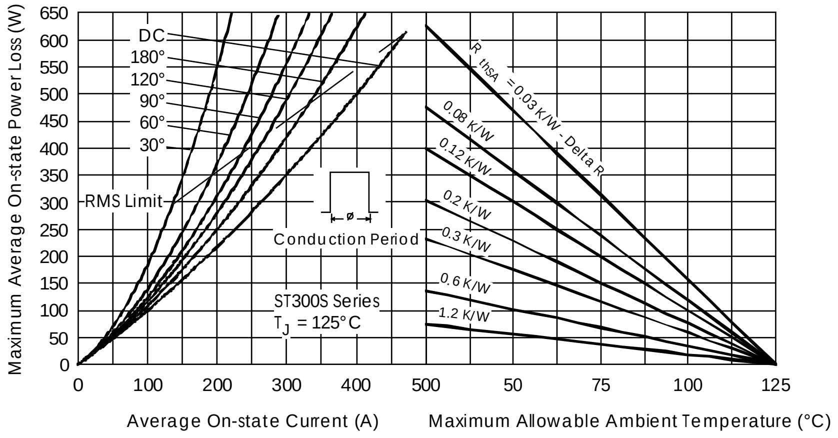


Fig. 4 - On-state Power Loss Characteristics

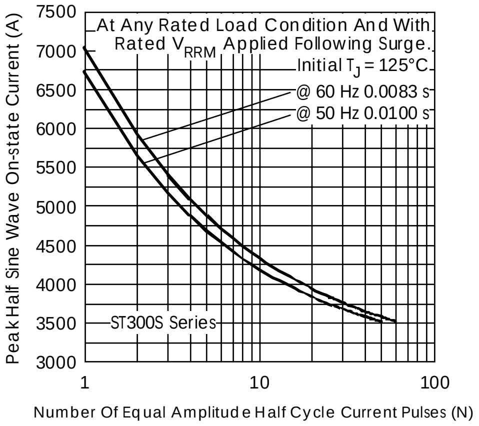


Fig. 5 - Maximum Non-Repetitive Surge Current

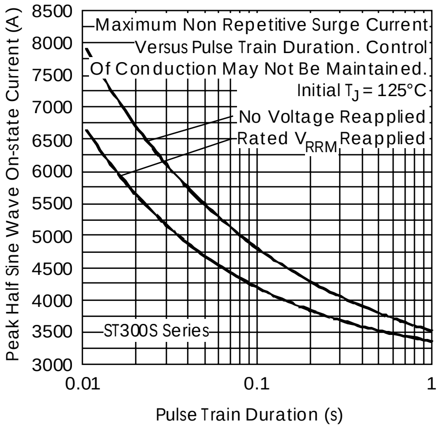


Fig. 6 - Maximum Non-Repetitive Surge Current

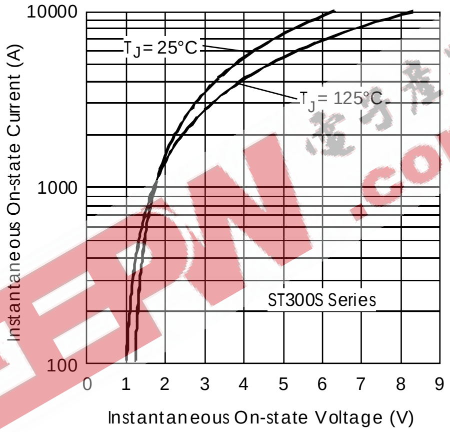


Fig. 7 - On-state Voltage Drop Characteristics

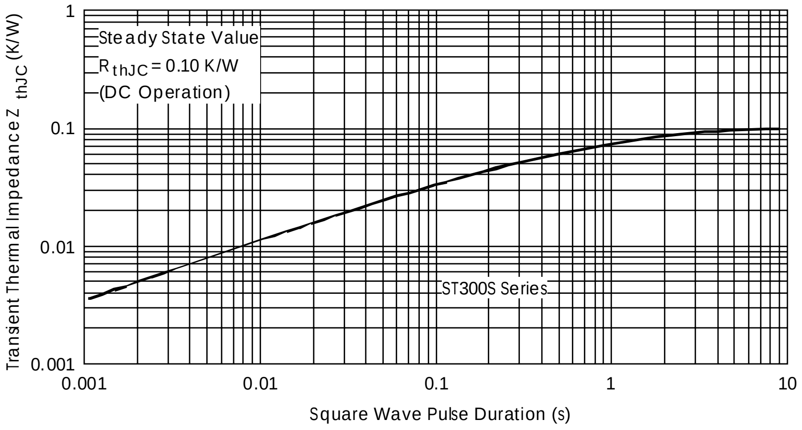


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

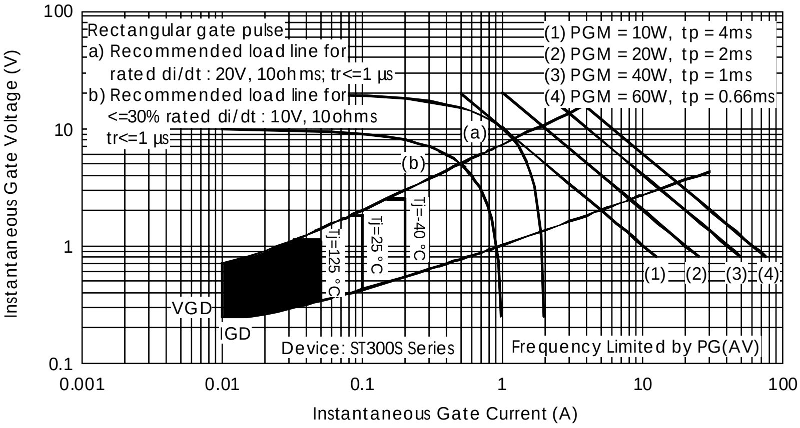


Fig. 9 - Gate Characteristics