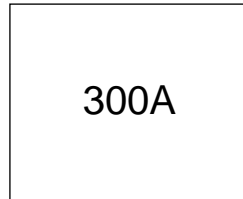


**PHASE CONTROL THYRISTORS**

**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

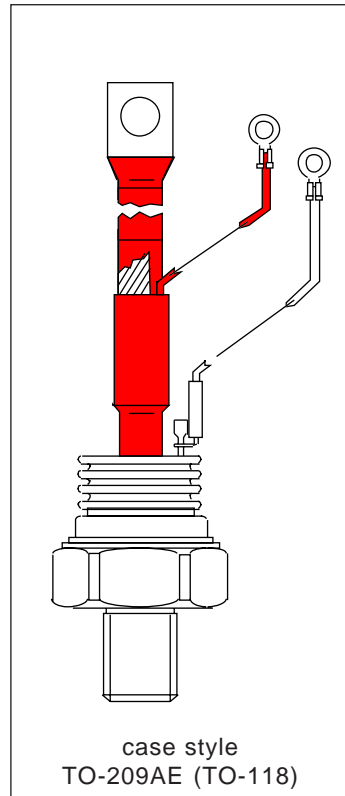


**Typical Applications**

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



**ELECTRICAL SPECIFICATIONS**

Voltage Ratings

Type number	Voltage Code	$V_{DRM}/V_{RRM}$ , 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
	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 <sup>2</sup> 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 <sup>2</sup> √s	t = 0.1 to 10ms, no voltage reapplied
$V_{T(TO)1}$ Low level value of threshold voltage	0.97	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J$ max.
$V_{T(TO)2}$ High level value of threshold voltage	0.98		$(I > \pi \times I_{T(AV)})$ , $T_J = T_J$ max.
$r_{t1}$ Low level value of on-state slope resistance	0.74	mΩ	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J$ max.
$r_{t2}$ High level value of on-state slope resistance	0.73		$(I > \pi \times I_{T(AV)})$ , $T_J = T_J$ 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	$T_J = 25^\circ C$ , 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/ $\mu$ s	Gate drive 20V, 20 $\Omega$ , $t_r \leq 1\mu$ s $T_J = T_J$ max, anode voltage $\leq 80\% V_{DRM}$
$t_d$ Typical delay time	1.0	$\mu$ s	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		$I_{TM} = 550A$ , $T_J = T_J$ max, $di/dt = 40A/\mu$ s, $V_R = 50V$ $dv/dt = 20V/\mu$ s, Gate 0V 100 $\Omega$ , $t_p = 500\mu$ s

**Blocking**

Parameter	ST300S	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/ $\mu$ s	$T_J = T_J$ 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, $t_p \leq 5ms$ $T_J = T_J$ max, $f = 50Hz$ , $d\% = 50$
$P_{G(AV)}$ Maximum average gate power	2.0			
$I_{GM}$ 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			
$I_{GT}$ DC gate current required to trigger	TYP.	MAX.	mA	$T_J = -40^\circ$ C $T_J = 25^\circ$ C $T_J = 125^\circ$ C  Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
	200	-		
	100	200		
$V_{GT}$ DC gate voltage required to trigger	50	-	V	$T_J = -40^\circ$ C $T_J = 25^\circ$ C $T_J = 125^\circ$ C
	2.5	-		
	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	

## ST300S Series

Bulletin I25158 rev. B 01/94

International  
**IRF** Rectifier

### Thermal and Mechanical Specification

Parameter	ST300S	Units	Conditions
T <sub>J</sub> Max. operating temperature range	-40 to 125	°C	
T <sub>stg</sub> Max. storage temperature range	-40 to 150		
R <sub>thJC</sub> Max. thermal resistance, junction to case	0.10	K/W	DC operation
R <sub>thCS</sub> 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

### $\Delta R_{thJC}$ Conduction

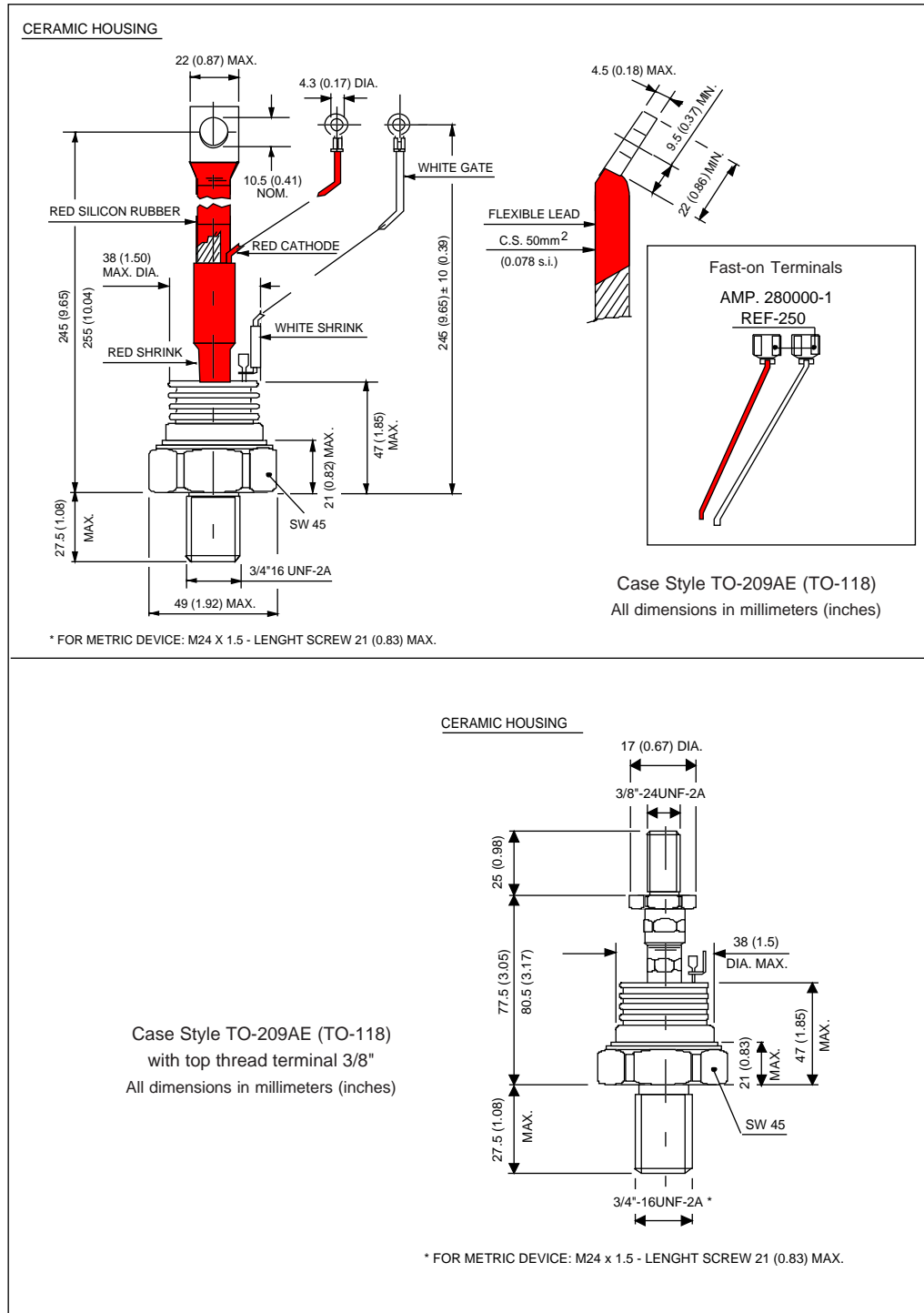
(The following table shows the increment of thermal resistance R<sub>thJC</sub> when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.011	0.008	K/W	T <sub>J</sub> = T <sub>J</sub> 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	
<b>1</b>	- Thyristor
<b>2</b>	- Essential part number
<b>3</b>	- 0 = Converter grade
<b>4</b>	- S = Compression bonding Stud
<b>5</b>	- Voltage code: Code x 100 = V <sub>RRM</sub> (See Voltage Rating Table)
<b>6</b>	- P = Stud base 16UNF threads M = Stud base metric threads (M24 x 1.5)
<b>7</b>	- 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
<b>8</b>	- Critical dv/dt: None = 500V/μsec (Standard value) L = 1000V/μsec (Special selection)

Outline Table



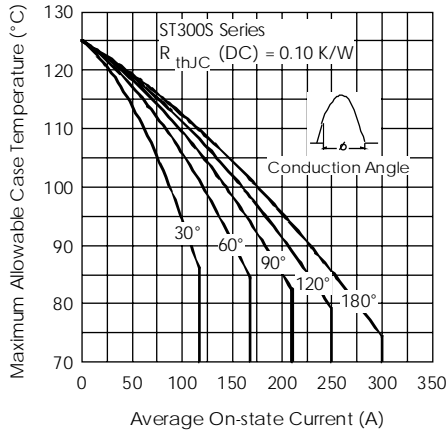


Fig. 1 - Current Ratings Characteristics

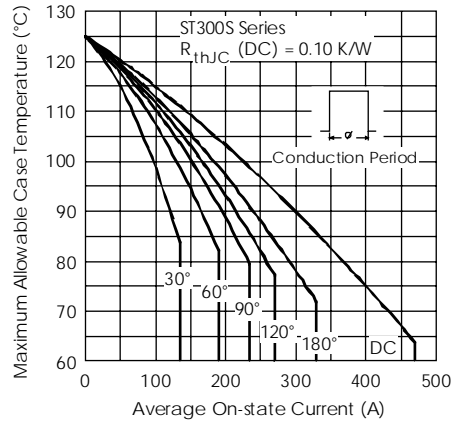


Fig. 2 - Current Ratings Characteristics

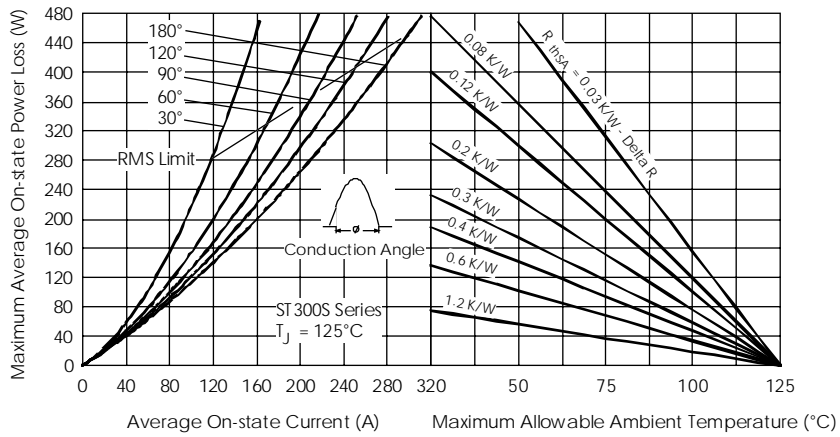


Fig. 3 - On-state Power Loss Characteristics

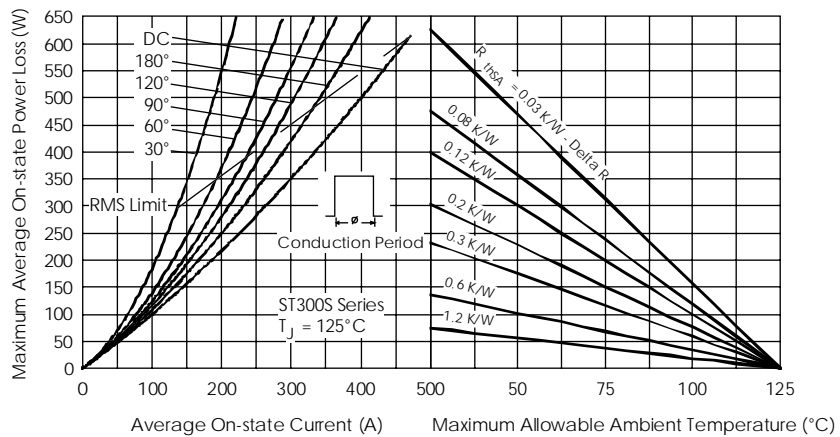


Fig. 4 - On-state Power Loss Characteristics

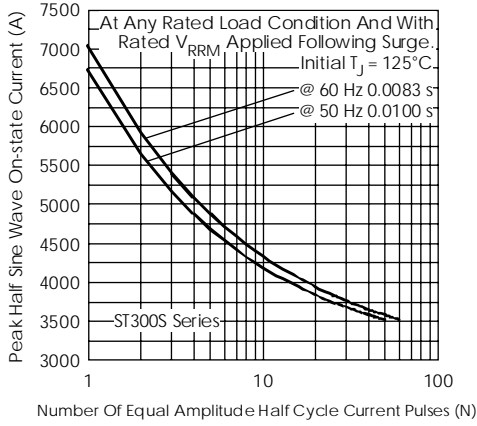


Fig. 5 - Maximum Non-Repetitive Surge Current

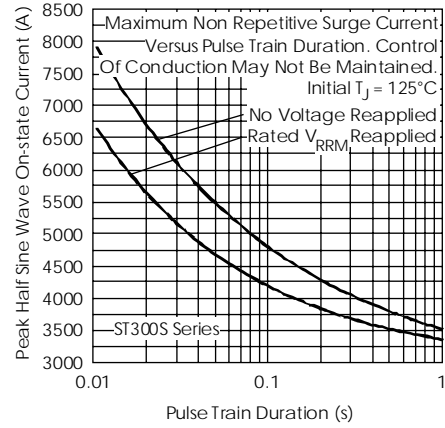


Fig. 6 - Maximum Non-Repetitive Surge Current

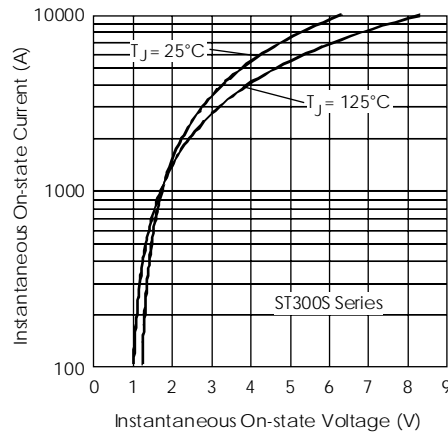


Fig. 7 - On-state Voltage Drop Characteristics

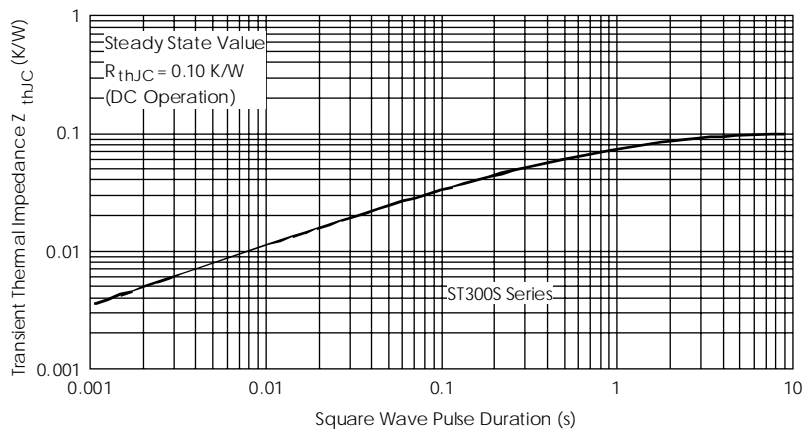


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

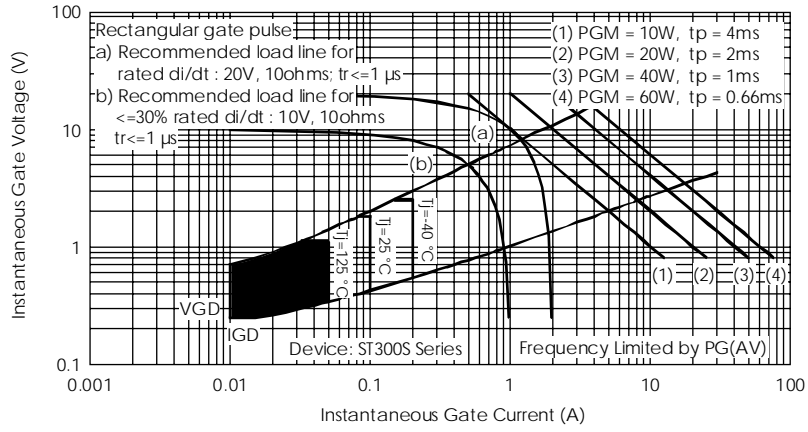


Fig. 9 - Gate Characteristics