

### 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

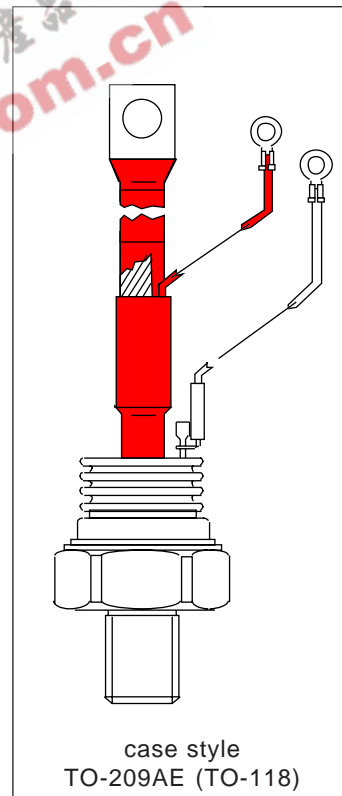
300A

#### 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 <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/μs	Gate drive 20V, 20Ω, t <sub>r</sub> ≤ 1μs T <sub>J</sub> = T <sub>J</sub> max, anode voltage ≤ 80% V <sub>DRM</sub>
t <sub>d</sub> Typical delay time	1.0	μs	Gate current 1A, di <sub>g</sub> /dt = 1A/μs V <sub>d</sub> = 0.67% V <sub>DRM</sub> , T <sub>J</sub> = 25°C
t <sub>q</sub> Typical turn-off time	100		I <sub>TM</sub> = 550A, T <sub>J</sub> = T <sub>J</sub> max, di/dt = 40A/μs, V <sub>R</sub> = 50V dv/dt = 20V/μs, Gate 0V 100Ω, t <sub>p</sub> = 500μs

**Blocking**

Parameter	ST300S	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/μs	T <sub>J</sub> = T <sub>J</sub> max. linear to 80% rated V <sub>DRM</sub>
I <sub>RRM</sub> I <sub>DRM</sub> Max. peak reverse and off-state leakage current	50	mA	T <sub>J</sub> = T <sub>J</sub> max. rated V <sub>DRM</sub> /V <sub>RRM</sub> applied

**Triggering**

Parameter	ST300S		Units	Conditions
P <sub>GM</sub> Maximum peak gate power	10.0		W	T <sub>J</sub> = T <sub>J</sub> max, t <sub>p</sub> ≤ 5ms
P <sub>G(AV)</sub> Maximum average gate power	2.0			T <sub>J</sub> = T <sub>J</sub> max, f = 50Hz, d% = 50
I <sub>GM</sub> Max. peak positive gate current	3.0		A	T <sub>J</sub> = T <sub>J</sub> max, t <sub>p</sub> ≤ 5ms
+V <sub>GM</sub> Maximum peak positive gate voltage	20		V	T <sub>J</sub> = T <sub>J</sub> max, t <sub>p</sub> ≤ 5ms
-V <sub>GM</sub> Maximum peak negative gate voltage	5.0			
I <sub>GT</sub> DC gate current required to trigger	TYP.	MAX.	mA	T <sub>J</sub> = - 40°C T <sub>J</sub> = 25°C T <sub>J</sub> = 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		
V <sub>GT</sub> DC gate voltage required to trigger	2.5	-	V	T <sub>J</sub> = - 40°C T <sub>J</sub> = 25°C T <sub>J</sub> = 125°C
	1.8	3		
	1.1	-		
I <sub>GD</sub> DC gate current not to trigger	10.0		mA	T <sub>J</sub> = T <sub>J</sub> max Max. gate current/ voltage not to trigger is the max. value which will not trigger any unit with rated V <sub>DRM</sub> anode-to-cathode applied
V <sub>GD</sub> 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
$T_J$ 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, $\pm 10\%$	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

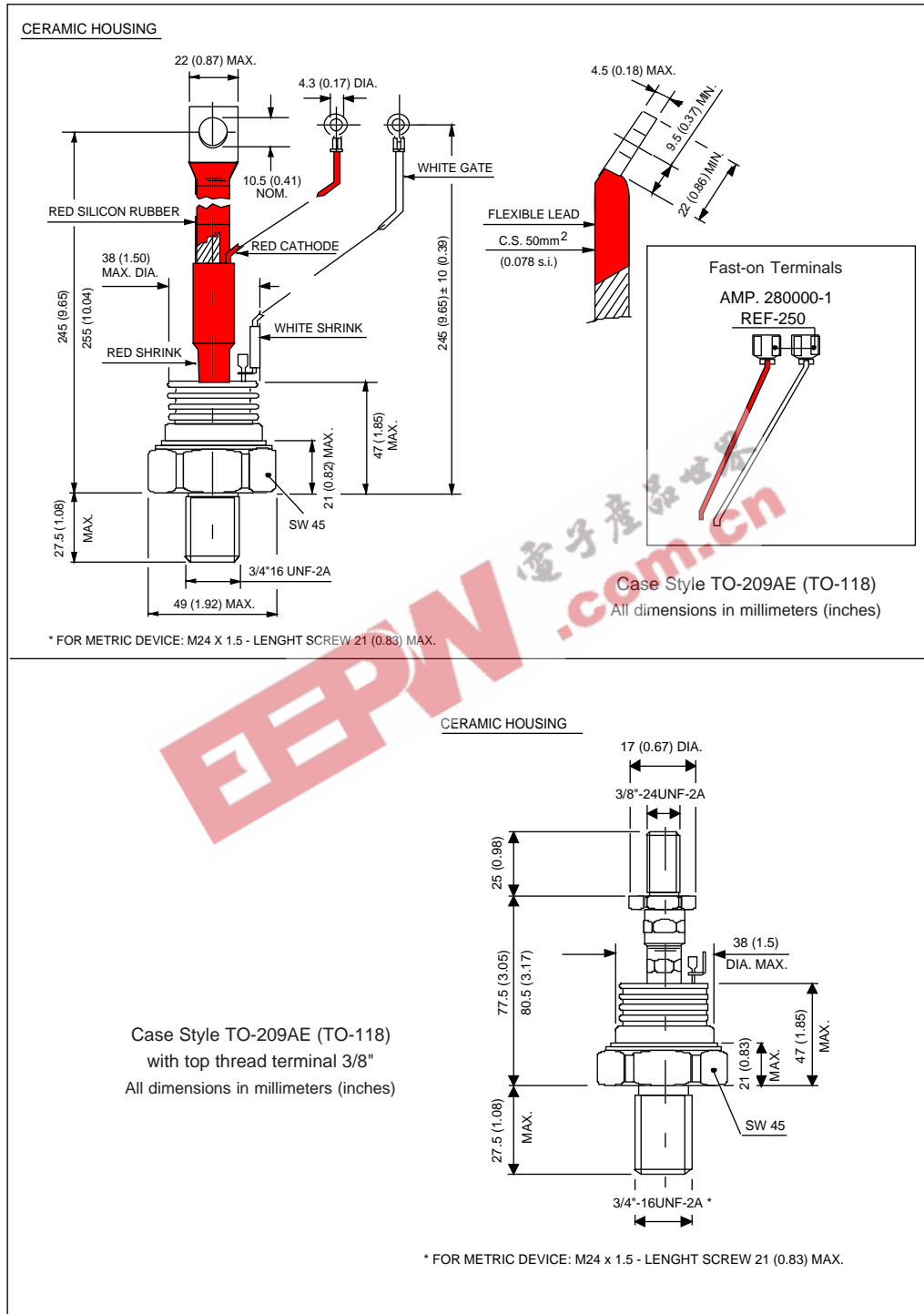
(The following table shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC)

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	2	3	4	5	6	7	8
ST	30	0	S	20	P	0	
<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 = $V_{RRM}$ (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/ $\mu$ sec (Standard value) L = 1000V/ $\mu$ sec (Special selection)

Outline Table



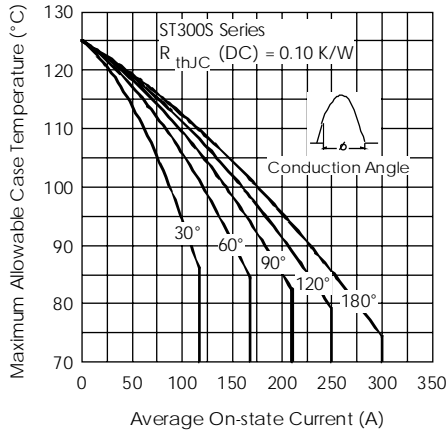


Fig. 1 - Current Ratings Characteristics

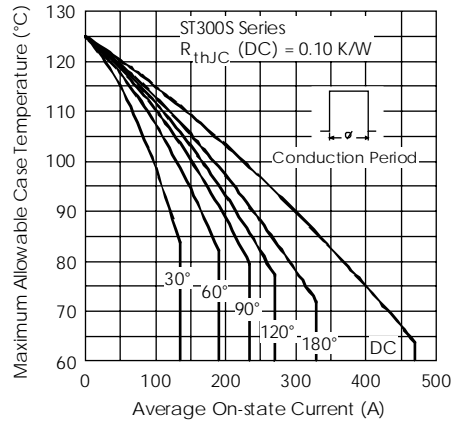


Fig. 2 - Current Ratings Characteristics

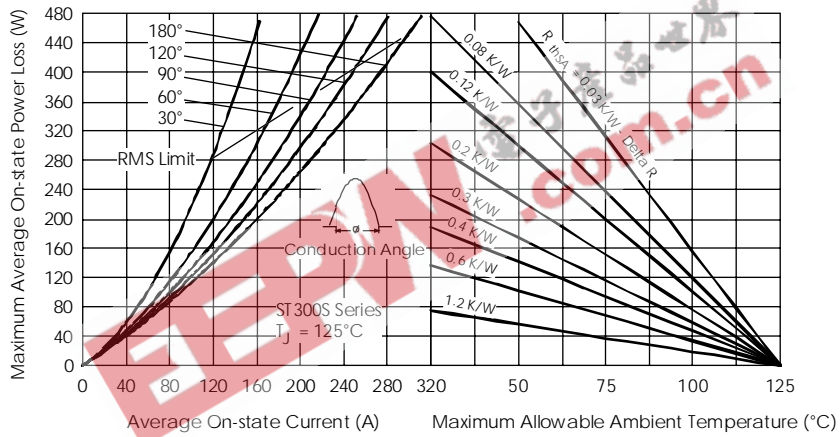


Fig. 3 - On-state Power Loss Characteristics

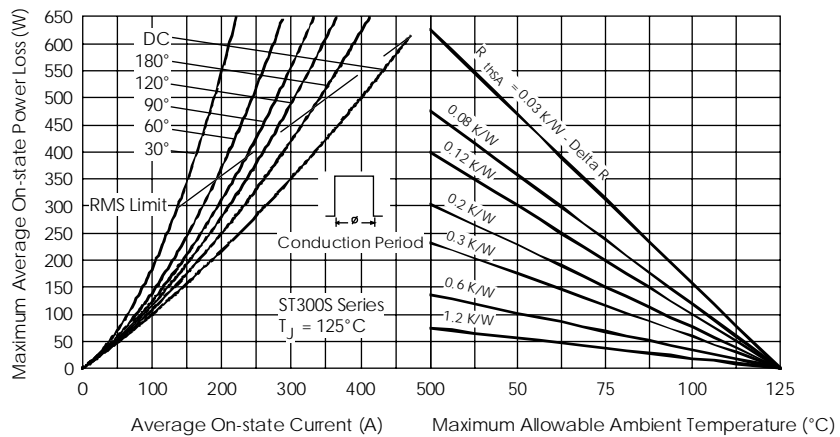


Fig. 4 - On-state Power Loss Characteristics

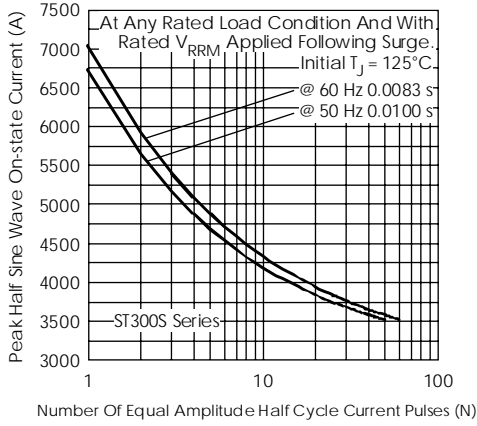


Fig. 5 - Maximum Non-Repetitive Surge Current

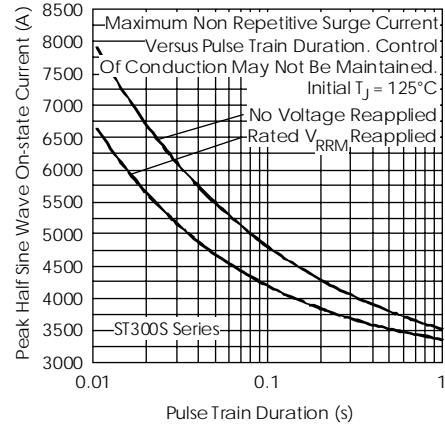


Fig. 6 - Maximum Non-Repetitive Surge Current

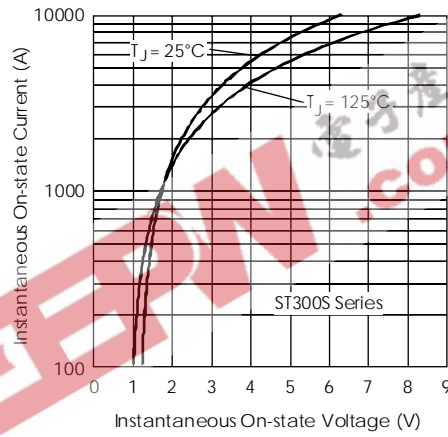


Fig. 7 - On-state Voltage Drop Characteristics

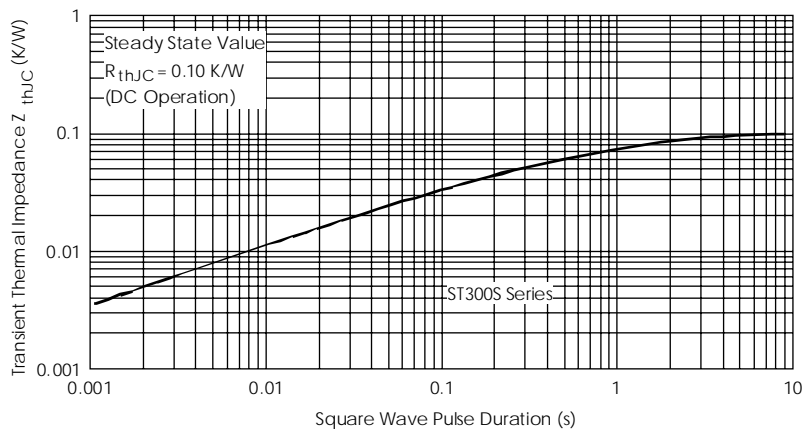


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

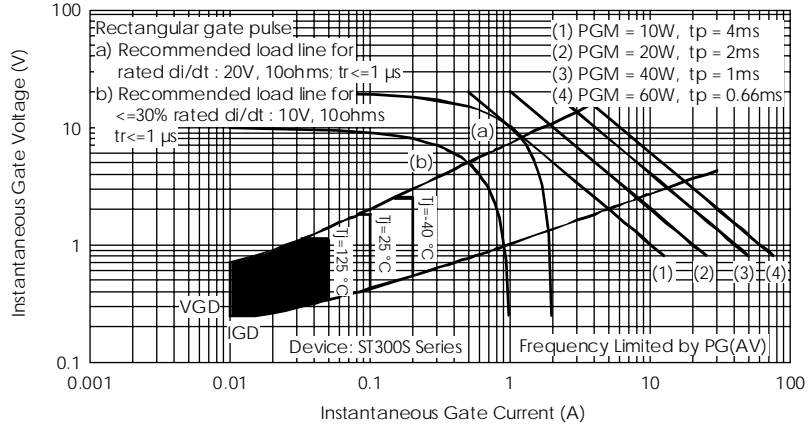


Fig. 9 - Gate Characteristics

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