

**PHASE CONTROL THYRISTORS**
**Stud Version**
**Features**

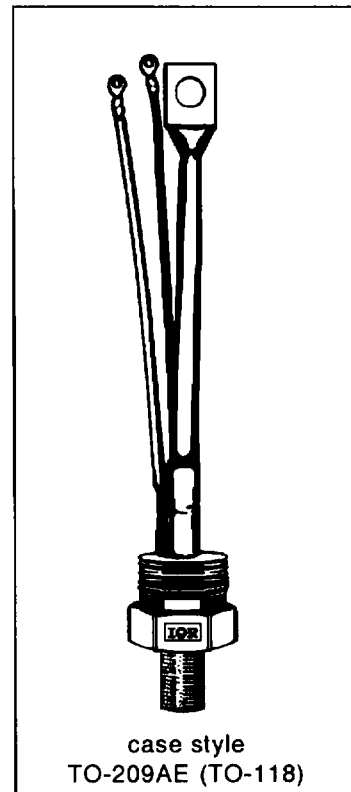
- Center amplifying gate
- Hermetic metal case with ceramic insulator
- International standard case TO-209AE (TO-118)
- Threaded studs UNF 3/4 - 16UNF2A or ISO M24x1.5
- Compression Bonded Encapsulation for heavy duty operations such as severe thermal cycling

**330A**
**Typical Applications**

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

**Major Ratings and Characteristics**

Parameters	ST330S	Units
$I_{T(AV)}$	330	A
	@ $T_C$	75 °C
$I_{T(RMS)}$	520	A
$I_{TSM}$	@ 50Hz	9000 A
	@ 60Hz	9420 A
$I^2t$	@ 50Hz	405 KA <sup>2</sup> s
	@ 60Hz	370 KA <sup>2</sup> s
$V_{DRM}/V_{RRM}$	400 to 1600	V
$t_q$	typical	100 $\mu$ s
$T_J$	- 40 to 125	°C



## ST330S Series

### 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
ST330S	04	400	500	50
	08	800	900	
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

#### On-state Conduction

Parameter	ST330S	Units	Conditions
$I_{T(AV)}$ Max. average on-state current @ Case temperature	330	A	180° conduction, half sine wave
	75	°C	
$I_{T(RMS)}$ Max. RMS on-state current	520	A	DC @ 62°C case temperature
$I_{TSM}$ Max. peak, one-cycle non-repetitive surge current	9000	A	t = 10ms No voltage
	9420		t = 8.3ms reapplied
	7570		t = 10ms 100% $V_{RRM}$
	7920		t = 8.3ms reapplied
$I^2t$ Maximum $I^2t$ for fusing	405	KA <sup>2</sup> s	t = 10ms No voltage
	370		t = 8.3ms reapplied
	287		t = 10ms 100% $V_{RRM}$
	262		t = 8.3ms reapplied
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	4050	KA <sup>2</sup> √s	t = 0.1 to 10ms, no voltage reapplied
$V_{T(TO)1}$ Low level value of threshold voltage	0.91	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	0.92		( $I > \pi \times I_{T(AV)}$ ), $T_J = T_J$ max.
$r_{11}$ Low level value of on-state slope resistance	0.58	mΩ	( $16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$ ), $T_J = T_J$ max.
$r_{12}$ High level value of on-state slope resistance	0.57		( $I > \pi \times I_{T(AV)}$ ), $T_J = T_J$ max.
$V_{TM}$ Max. on-state voltage	1.51	V	$I_{pk} = 1040A$ , $T_J = T_J$ 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	ST330S	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 A, $di_g/dt = 1A/\mu s$ $V_g = 0.67\% V_{DRM}, T_J = 25^\circ C$
$t_q$ Typical turn-off time	100		$I_{TM} = 550A, T_J = T_J \text{ max, } di/dt = 40A/\mu s, V_R = 50V$ $dv/dt = 20V/\mu s, \text{ Gate } 0V \text{ } 100\Omega, t_p = 500\mu s$

Blocking

Parameter	ST330S	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/μs	$T_J = T_J \text{ max. linear to } 80\% \text{ rated } V_{DRM}$
$I_{RRM}$ $I_{DRM}$ Max. peak reverse and off-state leakage current	50	mA	$T_J = T_J \text{ max, rated } V_{DRM}/V_{RRM} \text{ applied}$

Triggering

Parameter	ST330S		Units	Conditions
$P_{GM}$ Maximum peak gate power	10.0		W	$T_J = T_J \text{ max, } t_p \leq 5ms$
$P_{G(AV)}$ Maximum average gate power	2.0			$T_J = T_J \text{ max, } f = 50Hz, d\% = 50$
$I_{GM}$ Max. peak positive gate current	3.0		A	$T_J = T_J \text{ max, } t_p \leq 5ms$
$+V_{GM}$ Maximum peak positive gate voltage	20		V	$T_J = T_J \text{ max, } t_p \leq 5ms$
$-V_{GM}$ 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	2.5	-	V	$T_J = -40^\circ C$ $T_J = 25^\circ C$ $T_J = 125^\circ C$
	1.8	3.0		
	1.1	-		
$I_{GD}$ DC gate current not to trigger	10		mA	$T_J = T_J \text{ max}$ 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	



## ST330S Series

### Thermal and Mechanical Specification

Parameter	ST330S	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

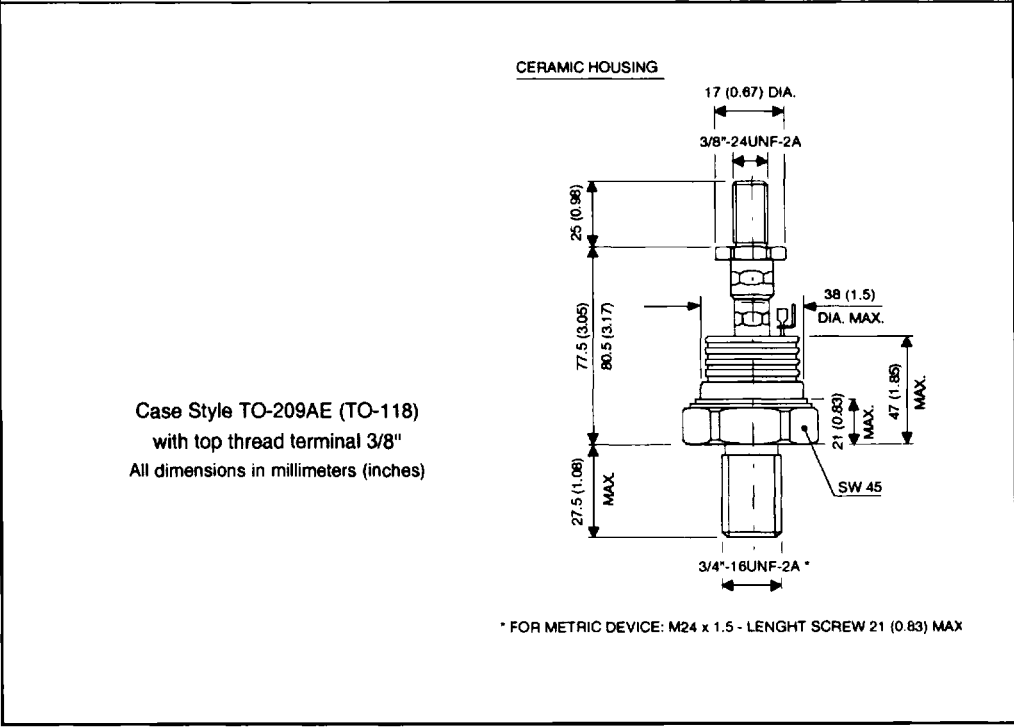
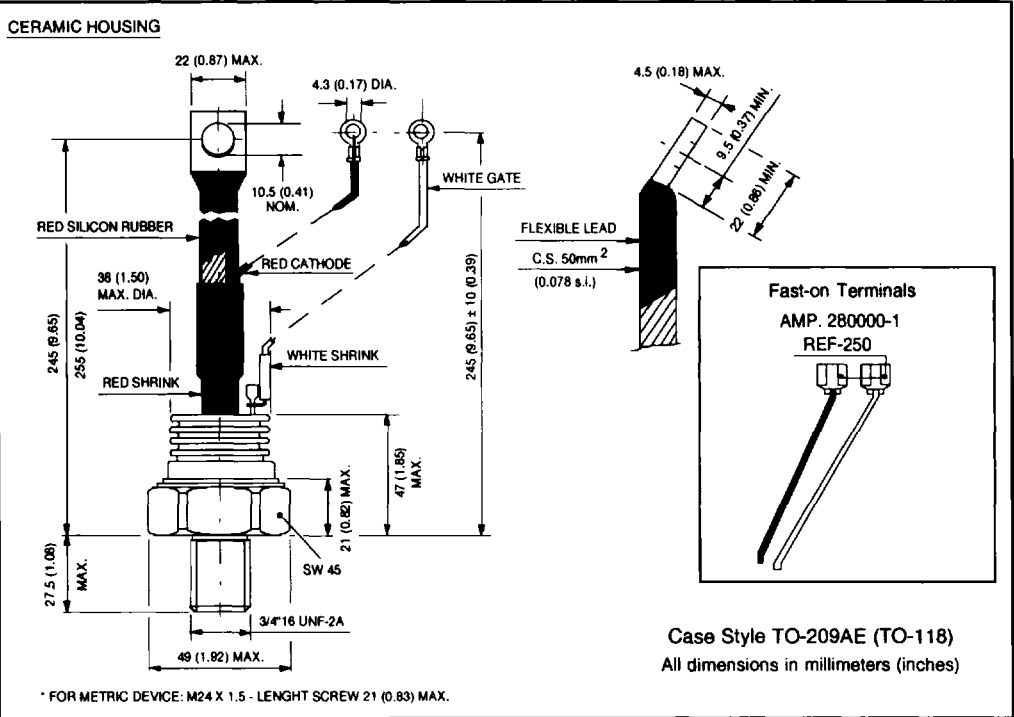
(The following table shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.011	0.008	K/W	$T_J = T_J \text{ max.}$
120°	0.013	0.014		
90°	0.017	0.018		
60°	0.025	0.026		
30°	0.041	0.041		

### Ordering Information Table

Device Code	1	2	3	4	5	6	7	8
	ST	33	0	S	16	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 selection) L = 1000V/ $\mu$ sec (Special selection)							

Outline Table



# ST330S Series

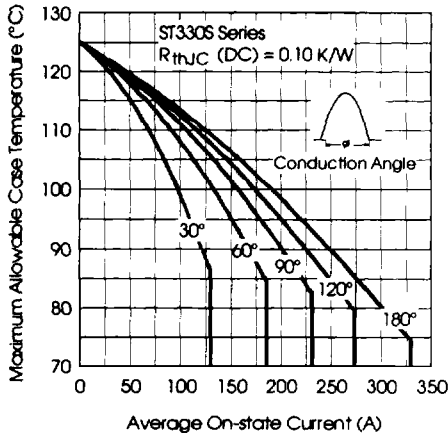


Fig. 1 - Current Ratings Characteristics

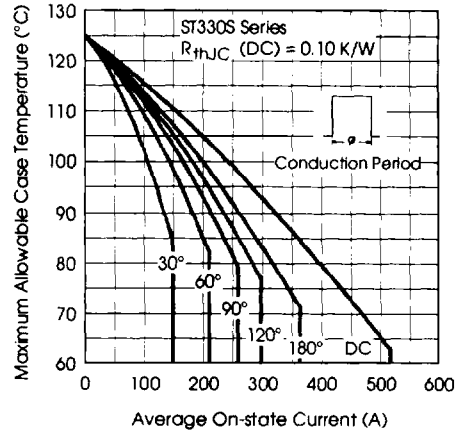


Fig. 2 - Current Ratings Characteristics

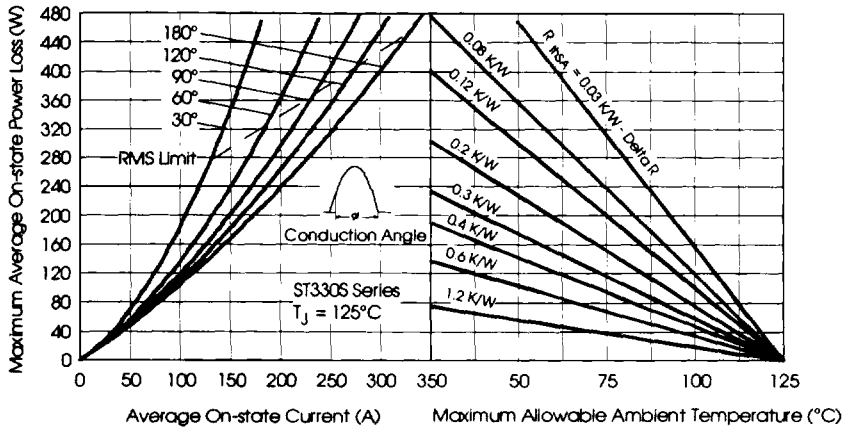


Fig. 3 - On-state Power Loss Characteristics

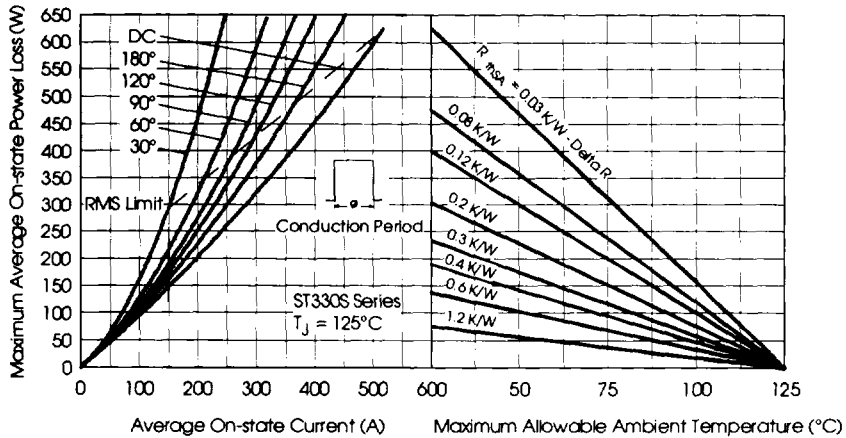


Fig. 4 - On-state Power Loss Characteristics

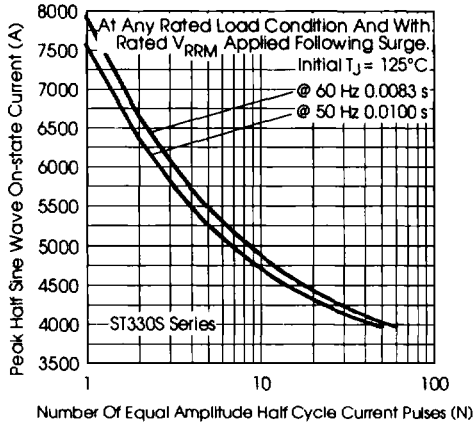


Fig. 5 - Maximum Non-Repetitive Surge Current

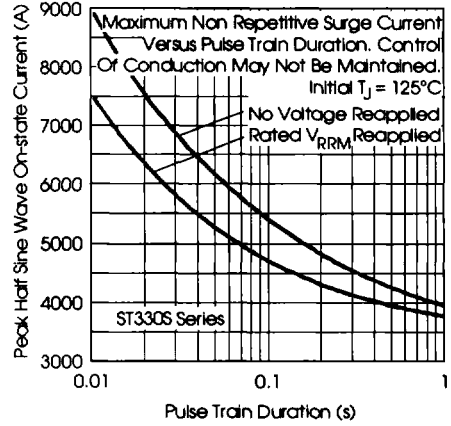


Fig. 6 - Maximum Non-Repetitive Surge Current

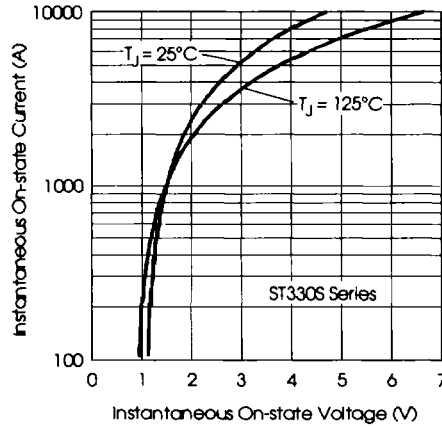


Fig. 7 - On-state Voltage Drop Characteristics

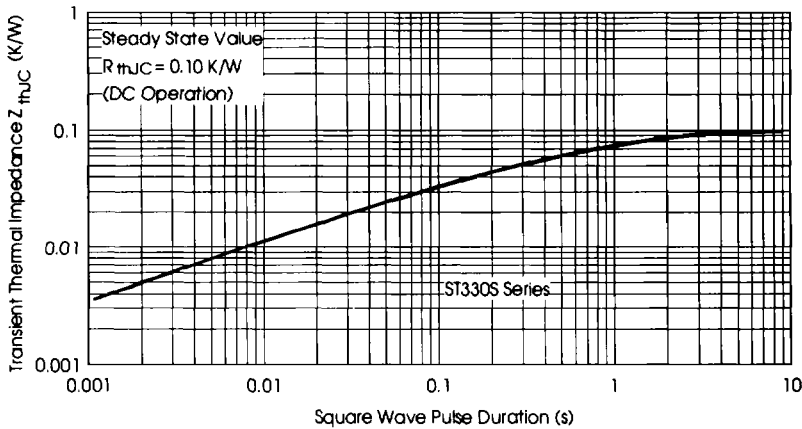


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

SCA STUD  
 INTD

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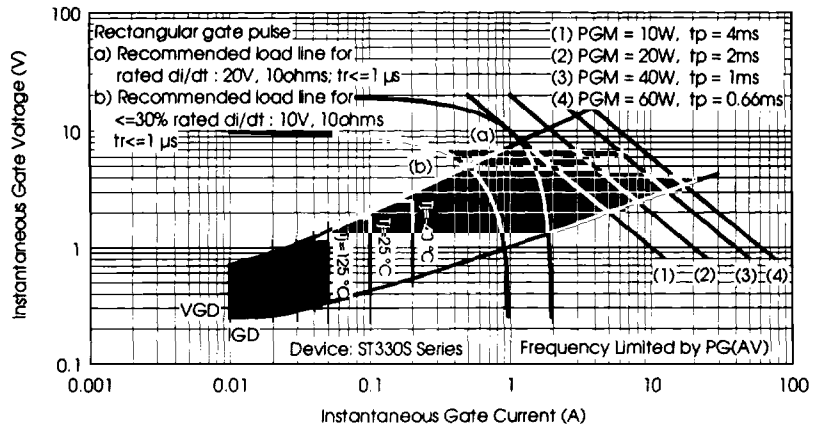


Fig. 9 - Gate Characteristics