

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

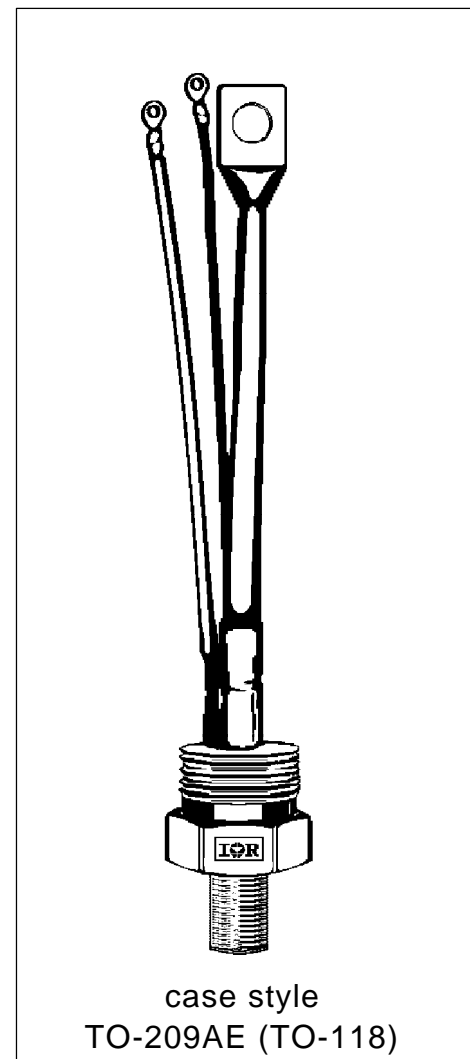
330A

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 ² s |
| @ 60Hz | 370 | KA ² s |
| V_{DRM}/V_{RRM} | 400 to 1600 | 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 |
|-------------|--------------|---|--|---|
| 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 reappplied |
| | 7570 | | t = 10ms 100% V_{RRM} |
| | 7920 | | t = 8.3ms reappplied |
| I^2t Maximum I^2t for fusing | 405 | KA ² s | t = 10ms No voltage |
| | 370 | | t = 8.3ms reappplied |
| | 287 | | t = 10ms 100% V_{RRM} |
| | 262 | | t = 8.3ms reappplied |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing | 4050 | KA ² √s | t = 0.1 to 10ms, no voltage reappplied |
| | | | |
| $V_{T(TO)1}$ 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_{t1} 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_{t2} 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 | | |

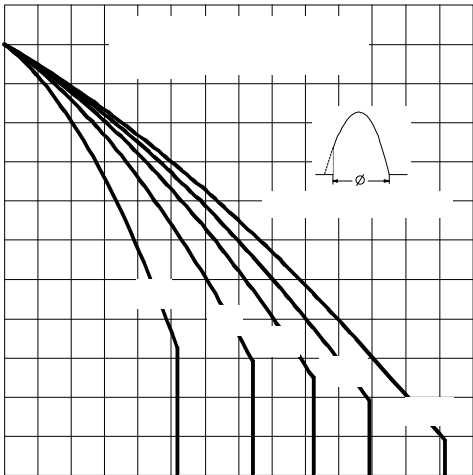


Fig. 1 - Current Ratings Characteristics

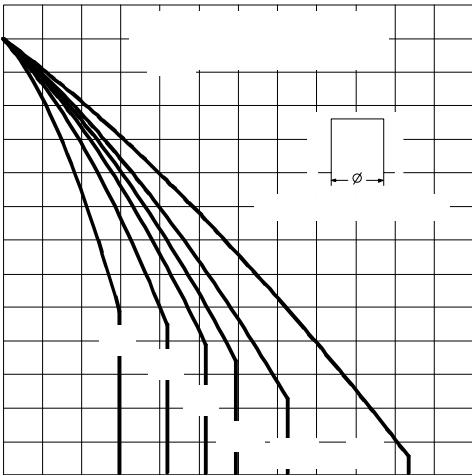


Fig. 2 - Current Ratings Characteristics

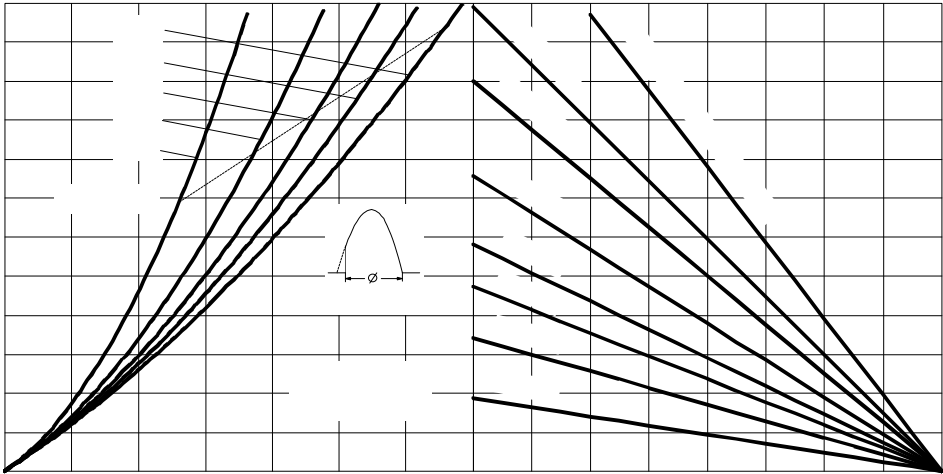


Fig. 3 - On-state Power Loss Characteristics

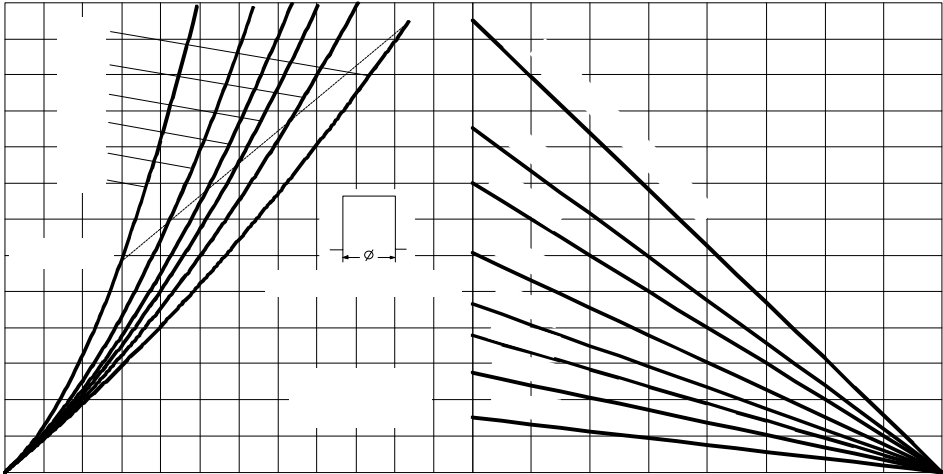


Fig. 4 - On-state Power Loss Characteristics

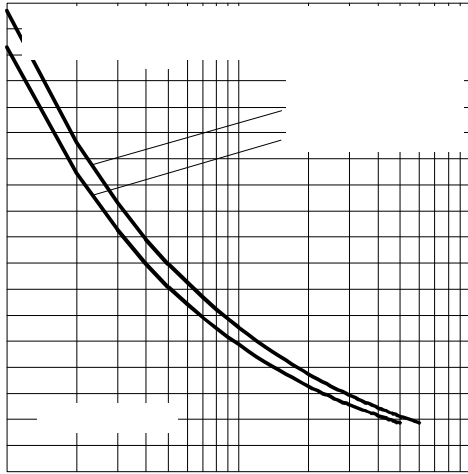


Fig. 5 - Maximum Non-Repetitive Surge Current

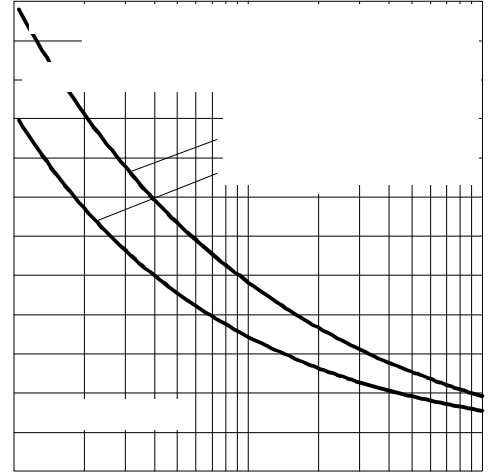


Fig. 6 - Maximum Non-Repetitive Surge Current

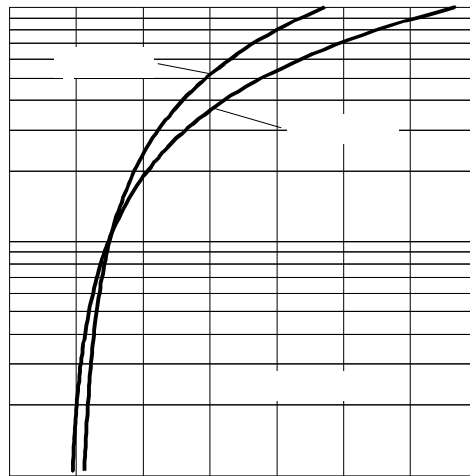


Fig. 7 - On-state Voltage Drop Characteristics

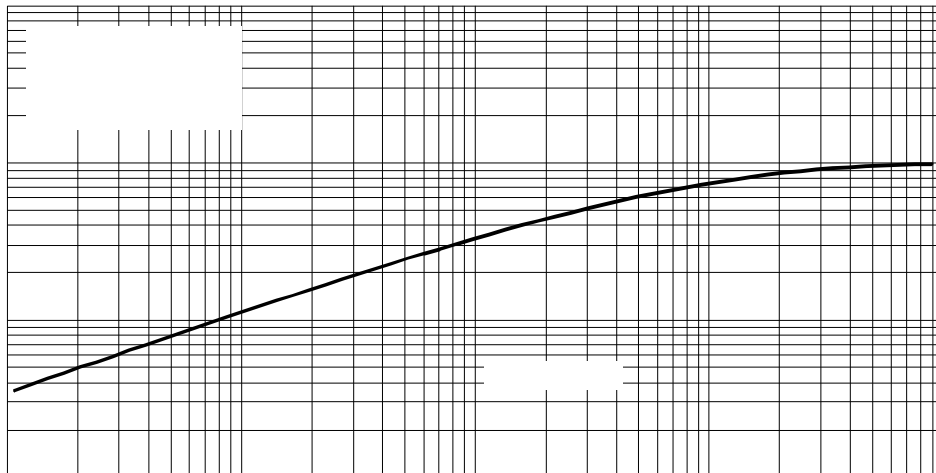


Fig. 8 - Thermal Impedance $Z_{th,IC}$ Characteristic

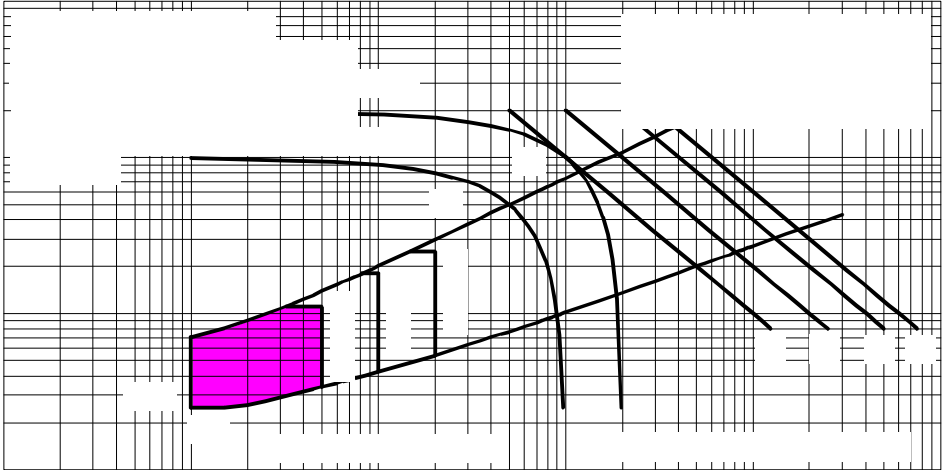


Fig. 9 - Gate Characteristics

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, $di_g/dt = 1A/\mu s$ $V_d = 0.67\% V_{DRM}$, $T_J = 25^\circ C$ |
| 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 | 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% 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 | 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, ± 10% | 48.5 (425) | Nm (lbf-in) | Non lubricated threads |
| wt Approximate weight | 535 | g | |
| Case style | TO - 209AE (TO-118) | | See Outline Table |

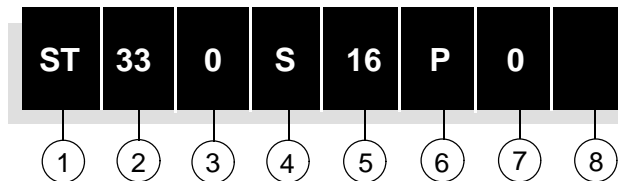
ΔR_{thJC} Conduction

(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 | 0.041 | | |

Ordering Information Table

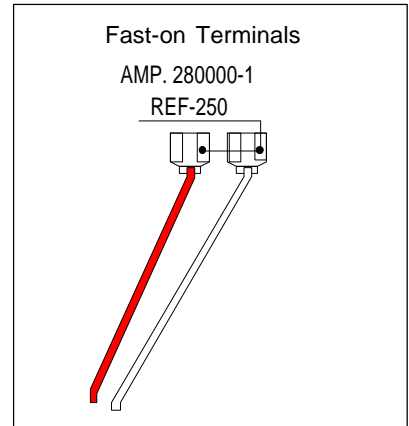
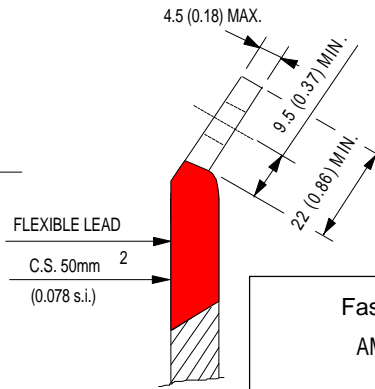
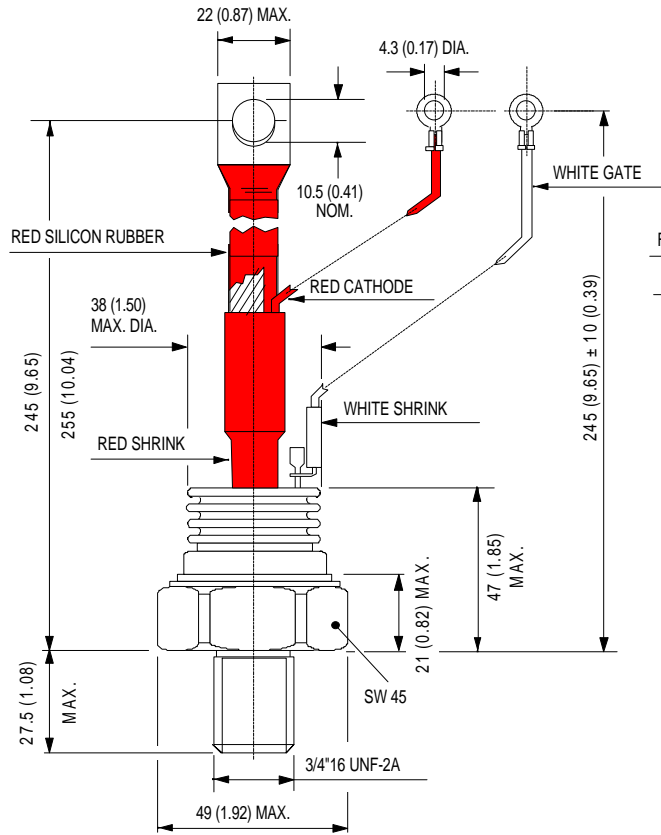
Device Code



- 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 selection)
L = 1000V/μsec (Special selection)

Outline Table

CERAMIC HOUSING

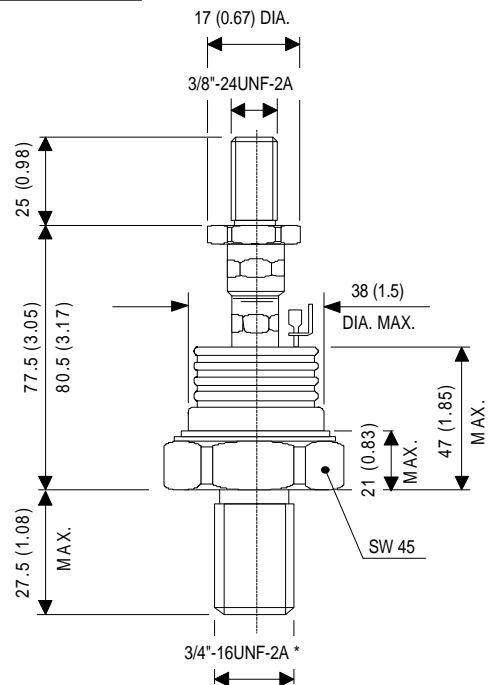


Case Style TO-209AE (TO-118)
All dimensions in millimeters (inches)

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

CERAMIC HOUSING

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.