# ST300S

## Phase Control Thyristors

STUD VERSION

Liujing rectifier co., Ltd.

## FEATURES

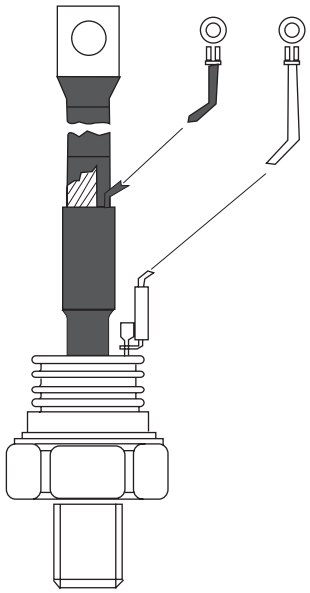
1). Center amplifying gate
2). Hermetic metal case with ceramic insulator
3). International standard case TO-209AE (TO-118)
4). Threaded studs UNF 3/4 - 16UNF2A or ISO M24x1.5
5). Compression Bonded Encapsulation for heavy duty operations such as severe thermal cycling

## TYPICAL APPLICATIONS

1). DC motor controls
2). Controlled DC power supplies
3). AC controllers

## MAJOR RATINGS AND CHARACTERISTICS

| Parameters | | ST300S | Unit |
|---|---|---|---|
| $I_{F(AV)}$ | | 300 | A |
| | @ $T_C$ | 75 | ℃ |
| $I_{F(RMS)}$ | | 470 | A |
| $I_{FSM}$ | @ 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 | ℃ |



## ELECTRICAL SPECIFICATIONS

1). Voltage Ratings

| Type number | Voltage Code | $V_{DRM}/V_{RRM}$, maximum repetitive peak reverse voltage | $V_{RSM}$, maximum non-repetitive peak reverse voltage | $I_{DRM}/I_{RRM}$, max. @ $T_J = T_J$ max |
|---|---|---|---|---|
| | | V | V | mA |
| ST300S | 04 | 400 | 500 | 30 |
| | 08 | 800 | 900 | |
| | 12 | 1200 | 1300 | |
| | 16 | 1600 | 1700 | |
| | 18 | 1800 | 1900 | |
| | 20 | 2000 | 2100 | |

## 2). Forward Conduction

| Parameters | | ST300S | Unit | Conditions | | |
|---|---|---|---|---|---|---|
| $I_{T(AV)}$ | Max. average forward current | 300 | A | 180° conduction, half sine wave | | |
| | @ Case temperature | 75 | ℃ | | | |
| $I_{T(RMS)}$ | Max. RMS forward current | 470 | A | DC @ 64℃ case temperature | | |
| $I_{TSM}$ | Max. peak, one-cycle forward, 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 | | |
| $I^2\surd t$ | Maximum $I^2\surd t$ for fusing | 3200 | $KA^2\surd s$ | 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 $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ max. | | |
| $V_{T(TO)2}$ | High level value of threshold voltage | 0.98 | | (I > π x $I_{F(AV)}$), $T_J = T_J$ max. | | |
| $r_{t1}$ | Low level value of forward slope resistance | 0.74 | mΩ | (16.7% x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ max. | | |
| $r_{t2}$ | High level value of forward slope resistance | 0.73 | | (I > π x $I_{F(AV)}$), $T_J = T_J$ max. | | |
| $V_{TM}$ | Max. forward voltage drop | 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℃, anode supply 12V resistive load | | |
| $I_L$ | Typical latching current | 1000 | | | | |
| di/dt | Max. non-repetitive rate of rise of turned-on current | 1000 | A/μs | Gate drive 20V, 20Ω, tr ≤ 1 μs<br>$T_J = T_J$ max, anode voltage ≤ 80% $V_{DRM}$ | | |
| $t_d$ | Typical delay time | 1.0 | μs | Gate current 1A, $di_g/d_t$ = 1A/μs<br>$V_d$ = 0.67% V , T = 25℃ $V_{DRM}$, $T_J$ =25℃ | | |
| $t_q$ | Typical turn-off time | 100 | | $I_{TM}$ = 500A, $T_J = T_J$ max, di/dt = 40A/μs, $V_R$ = 50V<br>dv/dt = 20V/μs, Gate 0V 100Ω, $t_p$ = 500 μs | | |
| dv/dt | Maximum critical rate of rise of off-state voltage | 500 | V/μs | $T_J = T_J$ max. linear to 80% rated $V_{DRM}$ | | |
| $I_{DRM}$<br>$I_{RRM}$ | Max. peak reverse and off-state leakage current | 50 | mA | $T_J = T_J$ max. rated $V_{DRM}/V_{RRM}$ applied | | |

3). Triggering

| Parameters | | ST300S | | Unit | Conditions | |
|---|---|---|---|---|---|---|
| $P_{GM}$ | Maximum peak gate power | 10.0 | | W | $T_J = T_J$ max, $t_p \leq 5$ms | |
| $P_{G(AV)}$ | Maximum average gate power | 2.0 | | | | |
| $I_{GM}$ | Max. peak positive gate current | 3.0 | | A | $T_J = T_J$ max, f = 50Hz, d% = 50 | |
| $+V_{GM}$ | Max. peak positive gate current | 20 | | V | $T_J = T_J$ max, $t_p \leq 5$ms | |
| $-V_{GM}$ | Maximum peak positive gate voltage | 5.0 | | | | |
| $I_{GT}$ | DC gate current required to trigger | TYP. | MAX. | mA | | Max. required gate trigger current/voltage are the lowest value which will trigger all units 6V anode-to-cathode applied |
| | | 200 | - | | $T_J$ = - 40℃ | |
| | | 100 | 200 | | $T_J$ = 25℃ | |
| | | 50 | - | | $T_J$ = 125℃ | |
| $V_{GT}$ | DC gate voltage required to trigger | 2.5 | - | V | $T_J$ = - 40℃ | |
| | | 1.8 | 3 | | $T_J$ = 25℃ | |
| | | 1.1 | - | | $T_J$ = 125℃ | |
| $I_{GD}$ | DC gate current not to trigger | 10 | | 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 | | |
| $T_J$ | Max. operating temperature range | -40 to 125 | | ℃ | | |
| $T_{stg}$ | 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 | | K/W | Mounting surface, smooth, flat and greased | |
| T | Mounting torque | 48.5 (425) | | Nm (lbf-in) | Non lubricated threads | |
| wt | Approximate weight | 535 | | g | | |
| | Case style | TO-118 | | | See Outline Table | |

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

## PERFORMANCE CURVES FIGURE

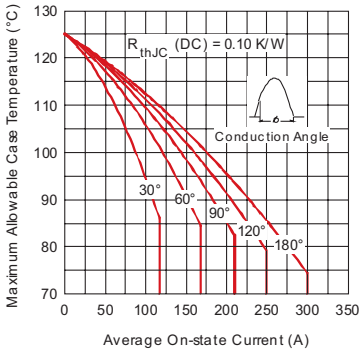



Fig. 1 - Current Ratings Characteristics

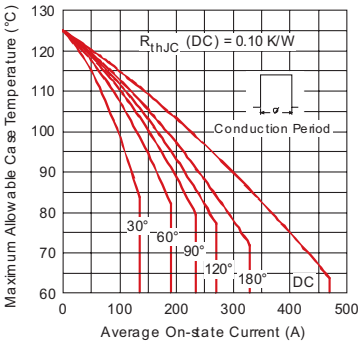



Fig. 2 - Current Ratings Characteristics

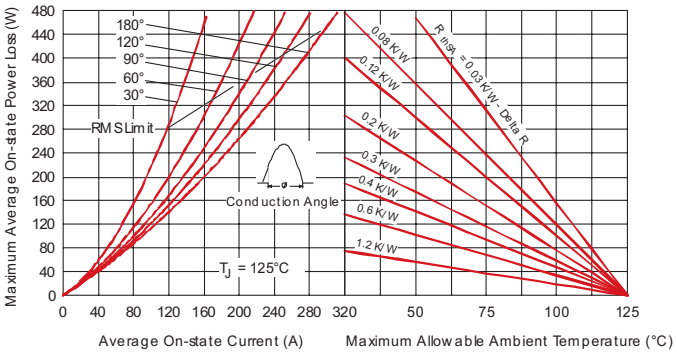



Fig. 3 - On-state Power Loss Characteristics

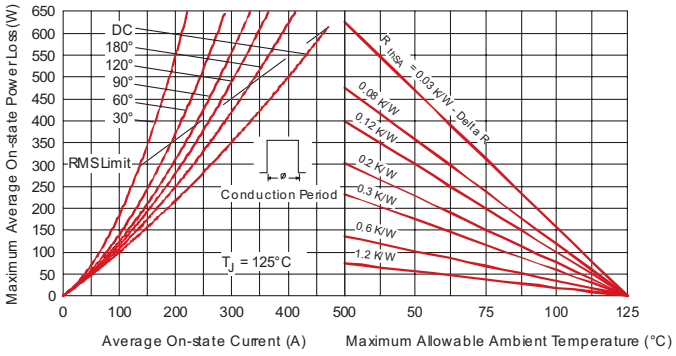



Fig. 4 - On-state Power Loss Characteristics

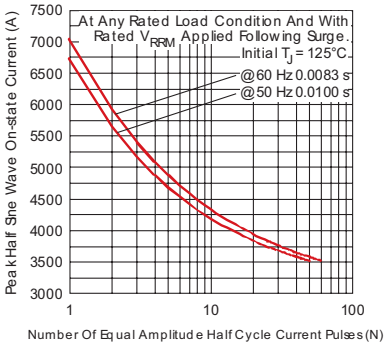



Fig. 5 - Maximum Non-Repetitive Surge Current

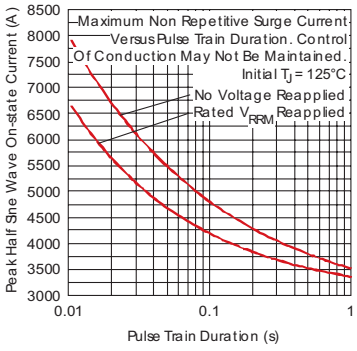



Fig. 6 - Maximum Non-Repetitive Surge Current

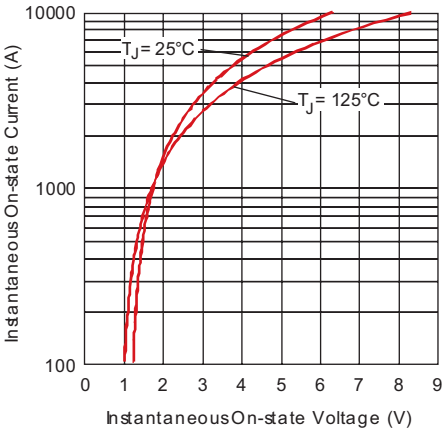



Fig. 7 - On-state Voltage Drop Characteristics

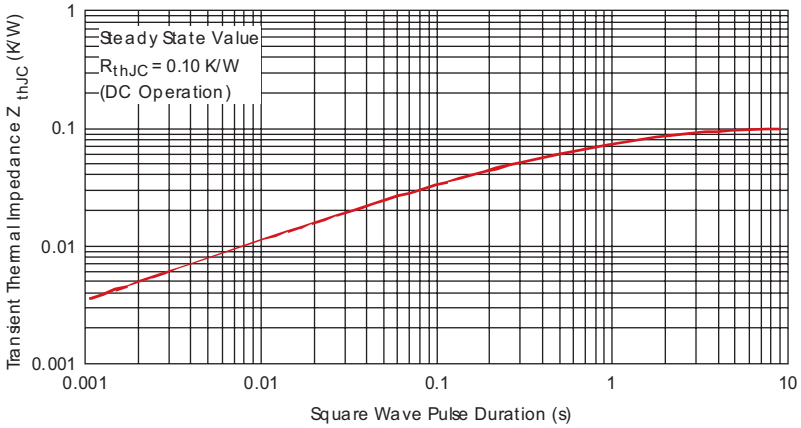



Fig. 8 - Thermal Impedance $Z_{thJC}$ Characteristic

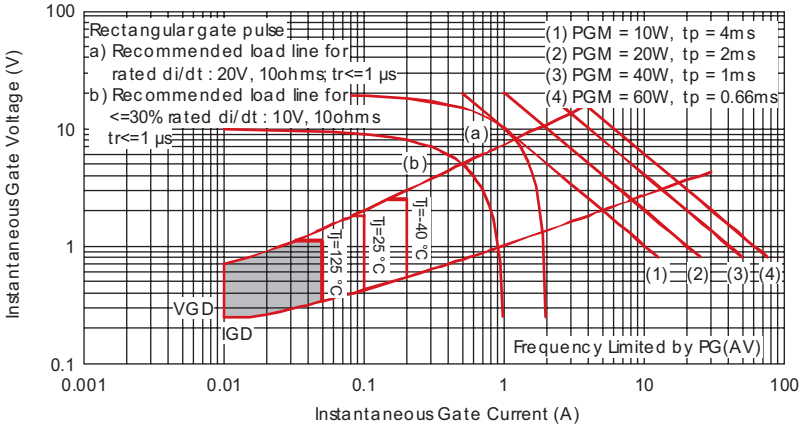
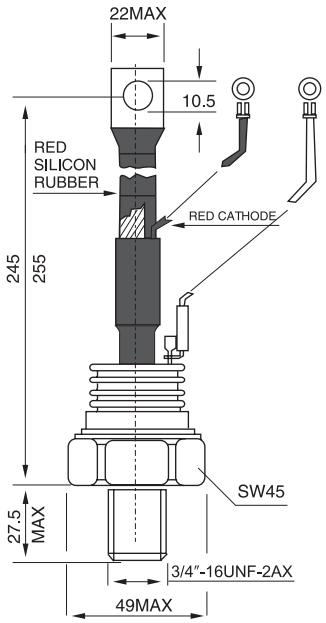



Fig. 9 - Gate Characteristics

## OUTLINE




*FOR METRIC DEVICES;
M20×1.5/M24×1.5-LENGHT21 MAX

**Case Style TO-118**

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