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***DISCRETE POWER DIODES and THYRISTORS***  
***DATA BOOK***

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## ST300C..L SERIES

### PHASE CONTROL THYRISTORS

### Hockey Puk Version

#### Features

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case TO-200AC (B-PUK)

#### Typical Applications

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

#### Major Ratings and Characteristics

| Parameters        | ST300C..L   | Units             |
|-------------------|-------------|-------------------|
| $I_{T(AV)}$       | 560         | A                 |
| @ $T_{hs}$        | 55          | °C                |
| $I_{T(RMS)}$      | 1115        | A                 |
| @ $T_{hs}$        | 25          | °C                |
| $I_{TSM}$ @ 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                |

560A



case style TO-200AC (B-PUK)

## ST300C..L Series

### ELECTRICAL SPECIFICATIONS

#### Voltage Ratings

| Type number | Voltage Code | $V_{DRM}/V_{RRM}$ , max. repetitive peak and off-state voltage<br>V | $V_{RSM}$ , maximum non-repetitive peak voltage<br>V | $I_{DRM}/I_{RRM}$ max.<br>@ $T_J = T_J$ max<br>mA |
|-------------|--------------|---------------------------------------------------------------------|------------------------------------------------------|---------------------------------------------------|
| ST300C..L   | 04           | 400                                                                 | 500                                                  | 50                                                |
|             | 08           | 800                                                                 | 900                                                  |                                                   |
|             | 12           | 1200                                                                | 1300                                                 |                                                   |
|             | 16           | 1600                                                                | 1700                                                 |                                                   |
|             | 18           | 1800                                                                | 1900                                                 |                                                   |
|             | 20           | 2000                                                                | 2100                                                 |                                                   |

#### On-state Conduction

| Parameter                                                        | ST300C..L            | Units              | Conditions                                                                        |
|------------------------------------------------------------------|----------------------|--------------------|-----------------------------------------------------------------------------------|
| $I_{T(AV)}$ Max. average on-state current @ Heatsink temperature | 560 (275)<br>55 (75) | A<br>°C            | 180° conduction, half sine wave<br>double side (single side) cooled               |
| $I_{T(RMS)}$ Max. RMS on-state current                           | 1115                 | A                  | DC @ 25°C heatsink temperature double side cooled                                 |
| $I_{TSM}$ Max. peak, one-cycle non-repetitive surge current      | 8000                 |                    | 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                                   | 2.18                 | V                  | $I_{pk} = 1635A, T_J = T_J$ 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                 |                    |                                                                                   |

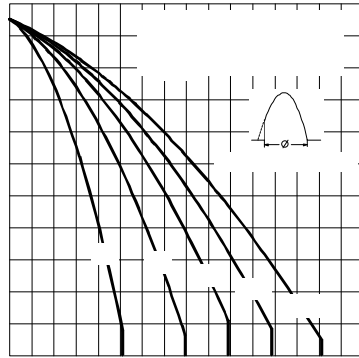


Fig. 3 - Current Ratings Characteristics

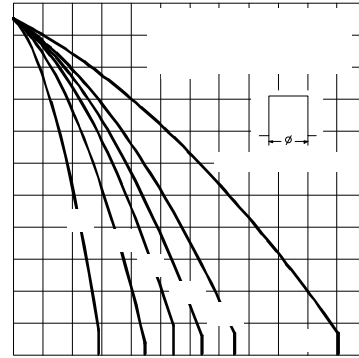


Fig. 4 - Current Ratings Characteristics

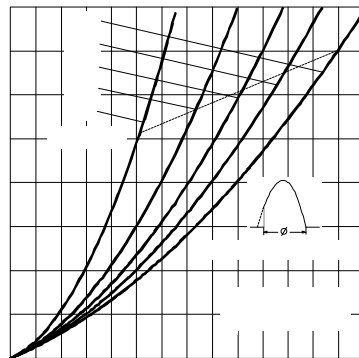


Fig. 5 - On-state Power Loss Characteristics

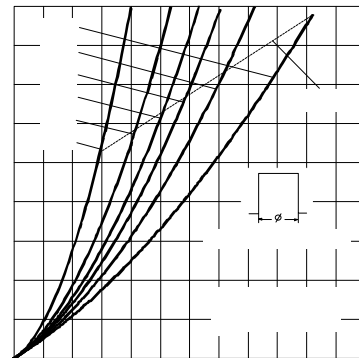


Fig. 6 - On-state Power Loss Characteristics

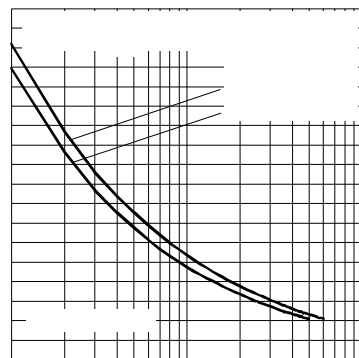


Fig. 7 - Maximum Non-Repetitive Surge Current  
Single and Double Side Cooled

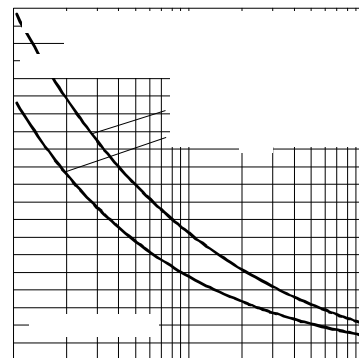


Fig. 8 - Maximum Non-Repetitive Surge Current  
Single and Double Side Cooled

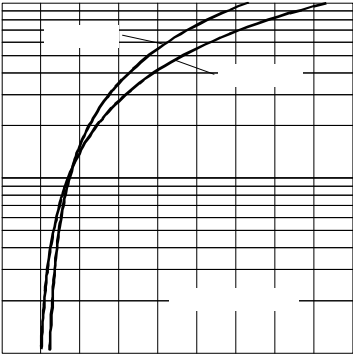


Fig. 9 - On-state Voltage Drop Characteristics

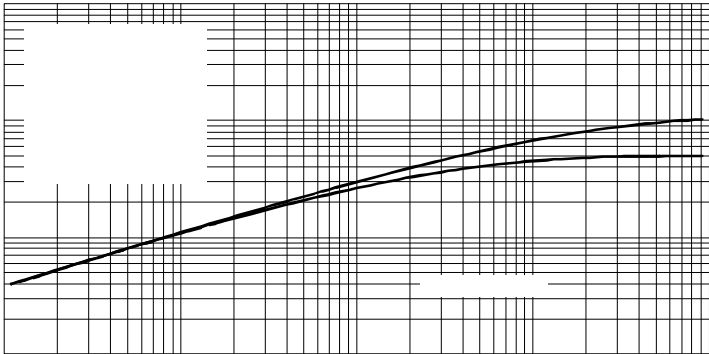


Fig. 10 - Thermal Impedance  $Z_{thj-hs}$  Characteristics

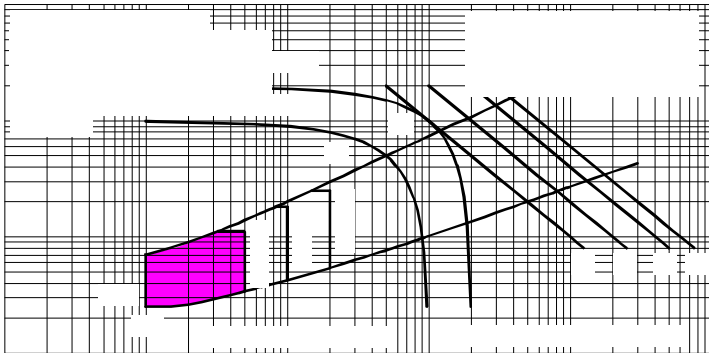


Fig. 11 - Gate Characteristics

## Switching

| Parameter                                                      | ST300C..L | Units | Conditions                                                                                                                            |
|----------------------------------------------------------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| di/dt    Max. non-repetitive rate of rise of turned-on current | 1000      | A/μs  | Gate drive 20V, 20Ω, $t_r \leq 1\mu s$<br>$T_J = T_J \text{ max}$ , anode voltage $\leq 80\% V_{DRM}$                                 |
| $t_d$ Typical delay time                                       | 1.0       | μs    | Gate current 1A, $di_g/dt = 1A/\mu s$<br>$V_d = 0.67\% V_{DRM}$ , $T_J = 25^\circ C$                                                  |
| $t_q$ Typical turn-off time                                    | 100       |       | $I_{TM} = 550A$ , $T_J = T_J \text{ max}$ , $di/dt = 40A/\mu s$ , $V_R = 50V$<br>$dv/dt = 20V/\mu s$ , Gate 0V 100Ω, $t_p = 500\mu s$ |

## Blocking

| Parameter                                                              | ST300C..L | 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 $V_{DRM}$   |
| $I_{RRM}$ Max. peak reverse and off-state leakage current<br>$I_{DRM}$ | 50        | mA    | $T_J = T_J \text{ max}$ , rated $V_{DRM}/V_{RRM}$ applied |

## Triggering

| Parameter          |                                     | ST300C..L |      | 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    | Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied                     |                                     |
|                    |                                     | 200       | -    |       |                                                                                                                                                 |                                     |
|                    |                                     | 100       | 200  |       |                                                                                                                                                 |                                     |
|                    |                                     | 50        | -    |       |                                                                                                                                                 |                                     |
| V <sub>GT</sub>    | DC gate voltage required to trigger | 2.5       | -    | V     |                                                                                                                                                 | T <sub>J</sub> = - 40°C             |
|                    |                                     | 1.8       | 3.0  |       |                                                                                                                                                 | T <sub>J</sub> = 25°C               |
|                    |                                     | 1.1       | -    |       |                                                                                                                                                 | T <sub>J</sub> = 125°C              |
| I <sub>GD</sub>    | DC gate current not to trigger      | 10.0      |      | mA    |                                                                                                                                                 | T <sub>J</sub> = T <sub>J</sub> max |
| V <sub>GD</sub>    | DC gate voltage not to trigger      | 0.25      |      |       | 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 |                                     |

## ST300C..L Series

### Thermal and Mechanical Specification

| Parameter                                                  | ST300C..L          | Units     | Conditions                                                         |
|------------------------------------------------------------|--------------------|-----------|--------------------------------------------------------------------|
| $T_J$ Max. operating temperature range                     | -40 to 125         | °C        |                                                                    |
| $T_{stg}$ Max. storage temperature range                   | -40 to 150         |           |                                                                    |
| $R_{thJ-hs}$ Max. thermal resistance, junction to heatsink | 0.11<br>0.05       | K/W       | DC operation single side cooled<br>DC operation double side cooled |
| $R_{thC-hs}$ Max. thermal resistance, case to heatsink     | 0.011<br>0.006     | K/W       | DC operation single side cooled<br>DC operation double side cooled |
| F Mounting force, $\pm 10\%$                               | 9800<br>(1000)     | N<br>(Kg) |                                                                    |
| wt Approximate weight                                      | 250                | g         |                                                                    |
| Case style                                                 | TO - 200AC (B-PUK) |           | See Outline Table                                                  |

### $\Delta R_{thJ-hs}$ Conduction

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

| Conduction angle | Sinusoidal conduction |             | Rectangular conduction |             | Units | Conditions                 |
|------------------|-----------------------|-------------|------------------------|-------------|-------|----------------------------|
|                  | Single Side           | Double Side | Single Side            | Double Side |       |                            |
| 180°             | 0.012                 | 0.010       | 0.008                  | 0.008       | K/W   | $T_J = T_{J \text{ max.}}$ |
| 120°             | 0.014                 | 0.015       | 0.014                  | 0.014       |       |                            |
| 90°              | 0.018                 | 0.018       | 0.019                  | 0.019       |       |                            |
| 60°              | 0.026                 | 0.027       | 0.027                  | 0.028       |       |                            |
| 30°              | 0.045                 | 0.046       | 0.046                  | 0.046       |       |                            |

### Ordering Information Table

| Device Code |                                                                      |   |   |    |   |   |   |
|-------------|----------------------------------------------------------------------|---|---|----|---|---|---|
| ST          | 30                                                                   | 0 | C | 20 | L | 1 |   |
| 1           | 2                                                                    | 3 | 4 | 5  | 6 | 7 | 8 |
| 1           | - Thyristor                                                          |   |   |    |   |   |   |
| 2           | - Essential part number                                              |   |   |    |   |   |   |
| 3           | - 0 = Converter grade                                                |   |   |    |   |   |   |
| 4           | - C = Ceramic Puk                                                    |   |   |    |   |   |   |
| 5           | - Voltage code: Code x 100 = $V_{RRM}$ (See Voltage Rating Table)    |   |   |    |   |   |   |
| 6           | - L = Puk Case TO-200AC (B-PUK)                                      |   |   |    |   |   |   |
| 7           | - 0 = Eyelet terminals (Gate and Auxiliary Cathode Unsoldered Leads) |   |   |    |   |   |   |
|             | 1 = Fast-on terminals (Gate and Auxiliary Cathode Unsoldered Leads)  |   |   |    |   |   |   |
|             | 2 = Eyelet terminals (Gate and Auxiliary Cathode Soldered Leads)     |   |   |    |   |   |   |
|             | 3 = Fast-on terminals (Gate and Auxiliary Cathode Soldered Leads)    |   |   |    |   |   |   |
| 8           | - Critical dv/dt: None = 500V/ $\mu$ sec (Standard value)            |   |   |    |   |   |   |
|             | L = 1000V/ $\mu$ sec (Special selection)                             |   |   |    |   |   |   |

## Outline Table

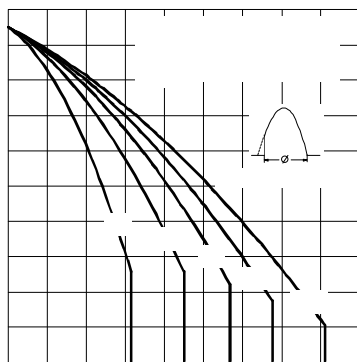
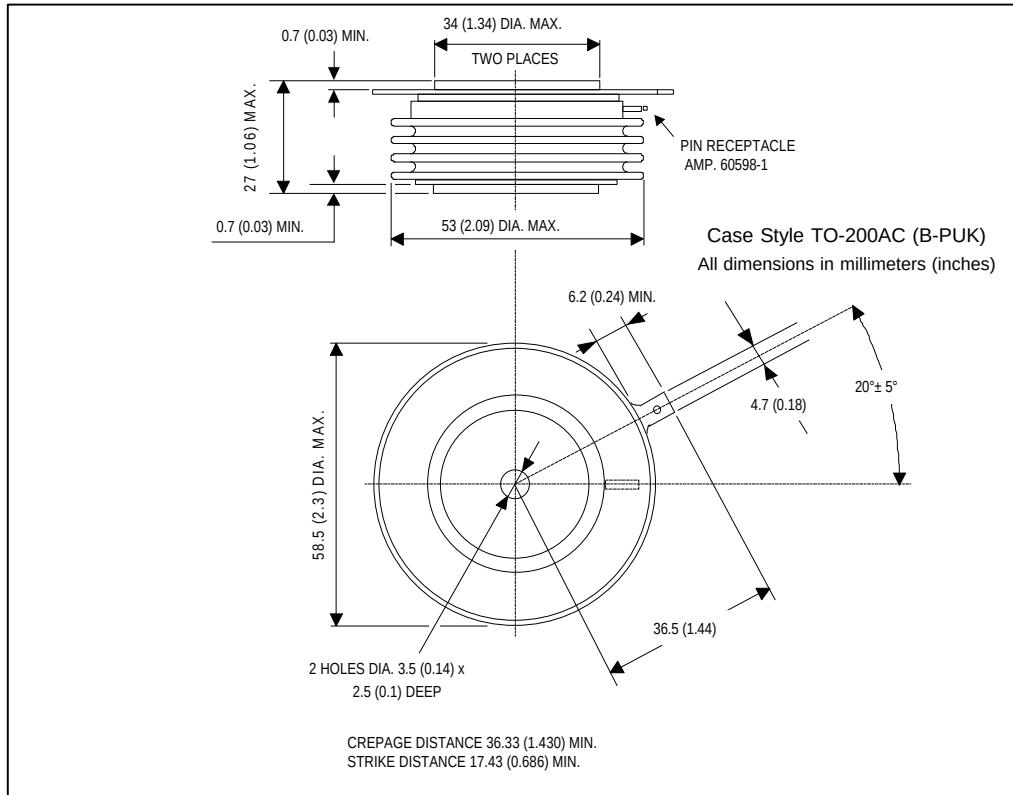


Fig. 1 - Current Ratings Characteristics

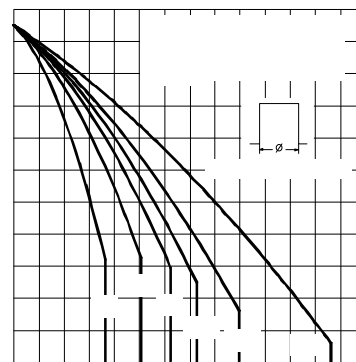


Fig. 2 - Current Ratings Characteristics