

### PHASE CONTROL THYRISTORS

### Hockey Puk Version

#### Features

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

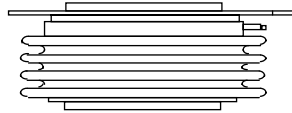
#### Typical Applications

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

#### Major Ratings and Characteristics

| Parameters        | ST700C..L    | Units                  |
|-------------------|--------------|------------------------|
| $I_{T(AV)}$       | 910          | A                      |
|                   | @ $T_{hs}$   | 55 °C                  |
| $I_{T(RMS)}$      | 1857         | A                      |
|                   | @ $T_{hs}$   | 25 °C                  |
| $I_{TSM}$         | @ 50Hz       | 15700 A                |
|                   | @ 60Hz       | 16400 A                |
| $I^2t$            | @ 50Hz       | 1232 KA <sup>2</sup> s |
|                   | @ 60Hz       | 1125 KA <sup>2</sup> s |
| $V_{DRM}/V_{RRM}$ | 1200 to 2000 | V                      |
| $t_q$ typical     | 150          | μs                     |
| $T_J$             | - 40 to 125  | °C                     |

910A



case style TO-200AC (B-PUK)

## ST700C..L Series

Bulletin I25190 rev.D 04/00

International  
 Rectifier

### 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 |
|-------------|--------------|---|--|---|
| ST700C..L   | 12           | 1200  | 1300   | 80  |
|             | 16           | 1600  | 1700   |   |
|             | 18           | 1800  | 1900   |   |
|             | 20           | 2000  | 2100   |   |

#### On-state Conduction

| Parameter  | ST700C..L | Units              | Conditions  |                       |   |
|--|-----------|--------------------|---|-----------------------|---|
| $I_{T(AV)}$ Max. average on-state current @ Heatsink temperature | 910 (355) | A                  | 180° conduction, half sine wave<br>double side (single side) cooled         |                       |   |
|  | 55 (85)   | °C                 |   |                       |   |
| $I_{T(RMS)}$ Max. RMS on-state current                           | 1857      | A                  | DC @ 25°C heatsink temperature double side cooled                           |                       |   |
| $I_{TSM}$ Max. peak, one-cycle non-repetitive surge current      | 15700     |                    | t = 10ms  | No voltage reappplied |   |
|  | 16400     |                    | t = 8.3ms   | reappplied            |   |
|  | 13200     |                    | t = 10ms  | 100% $V_{RRM}$        |   |
|  | 13800     |                    | t = 8.3ms   | reappplied            |   |
| $I^2t$ Maximum $I^2t$ for fusing                                 | 1232      | KA <sup>2</sup> s  | t = 10ms  | No voltage reappplied | Sinusoidal half wave,<br>Initial $T_J = T_J$ max. |
|  | 1125      |                    | t = 8.3ms   | reappplied            |   |
|  | 871       |                    | t = 10ms  | 100% $V_{RRM}$        |   |
|  | 795       |                    | t = 8.3ms   | reappplied            |   |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing                   | 12321     | KA <sup>2</sup> √s | t = 0.1 to 10ms, no voltage reappplied                                      |                       |   |
| $V_{T(TO)1}$ Low level value of threshold voltage                | 1.00      | V                  | (16.7% x $\pi$ x $I_{T(AV)}$ ) < I < $\pi$ x $I_{T(AV)}$ , $T_J = T_J$ max. |                       |   |
| $V_{T(TO)2}$ High level value of threshold voltage               | 1.13      |                    | (I > $\pi$ x $I_{T(AV)}$ ), $T_J = T_J$ max.                                |                       |   |
| $r_{t1}$ Low level value of on-state slope resistance            | 0.40      | mΩ                 | (16.7% x $\pi$ x $I_{T(AV)}$ ) < I < $\pi$ x $I_{T(AV)}$ , $T_J = T_J$ max. |                       |   |
| $r_{t2}$ High level value of on-state slope resistance           | 0.35      |                    | (I > $\pi$ x $I_{T(AV)}$ ), $T_J = T_J$ max.                                |                       |   |
| $V_{TM}$ Max. on-state voltage                                   | 1.80      | V                  | $I_{pk} = 2000A$ , $T_J = T_J$ 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  | ST700C..L | Units | Conditions  |
|--|-----------|-------|---|
| di/dt<br>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 $\leq 80\% V_{DRM}$                                 |
| $t_d$<br>Typical delay time                                    | 1.0       | μs    | Gate current 1A, $di_g/dt = 1A/\mu s$<br>$V_d = 0.67\% V_{DRM}$ , $T_J = 25^\circ C$  |
| $t_q$<br>Typical turn-off time                                 | 150       |       | $I_{TM} = 750A$ , $T_J = T_J \text{ max}$ , $di/dt = 60A/\mu s$ , $V_R = 50V$<br>$dv/dt = 20V/\mu s$ , Gate 0V 100Ω, $t_p = 500\mu s$ |

**Blocking**

| Parameter   | ST700C..L | Units | Conditions  |
|---|-----------|-------|---|
| dv/dt<br>Maximum critical rate of rise of off-state voltage               | 500       | V/μs  | $T_J = T_J \text{ max}$ . linear to 80% rated $V_{DRM}$   |
| $I_{DRM}$<br>$I_{RRM}$<br>Max. peak reverse and off-state leakage current | 80        | mA    | $T_J = T_J \text{ max}$ , rated $V_{DRM}/V_{RRM}$ applied |

**Triggering**

| Parameter                                       | ST700C..L |      | Units | Conditions  |
|---|-----------|------|-------|---|
| $P_{GM}$<br>Maximum peak gate power             | 10.0      |      | W     | $T_J = T_J \text{ max}$ , $t_p \leq 5ms$  |
| $P_{G(AV)}$<br>Maximum average gate power       | 2.0       |      |       | $T_J = T_J \text{ max}$ , $f = 50Hz$ , $d\% = 50$   |
| $I_{GM}$<br>Max. peak positive gate current     | 3.0       |      | A     | $T_J = T_J \text{ max}$ , $t_p \leq 5ms$  |
| $+V_{GM}$<br>Maximum peak positive gate voltage | 20        |      | V     | $T_J = T_J \text{ max}$ , $t_p \leq 5ms$  |
| $-V_{GM}$<br>Maximum peak negative gate voltage | 5.0       |      |       |   |
| $I_{GT}$<br>DC gate current required to trigger | TYP.      | MAX. | mA    | $T_J = -40^\circ C$<br>$T_J = 25^\circ C$<br>$T_J = 125^\circ C$<br><br>Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied |
|   | 200       | -    |       |   |
|   | 100       | 200  |       |   |
| $V_{GT}$<br>DC gate voltage required to trigger | 2.5       | -    | V     | $T_J = -40^\circ C$<br>$T_J = 25^\circ C$<br>$T_J = 125^\circ C$  |
|   | 1.8       | 3.0  |       |   |
|   | 1.1       | -    |       |   |
| $I_{GD}$<br>DC gate current not to trigger      | 10        |      | mA    | 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  |
| $V_{GD}$<br>DC gate voltage not to trigger      | 0.25      |      | V     |   |

## ST700C..L Series

Bulletin I25190 rev. D 04/00

International  
IRF Rectifier

### Thermal and Mechanical Specification

| Parameter   | ST700C..L        | Units     | Conditions   |
|---|------------------|-----------|--|
| T <sub>J</sub> Max. operating temperature range                   | -40 to 125       | °C        |  |
| T <sub>stg</sub> Max. storage temperature range                   | -40 to 150       |           |  |
| R <sub>thJ-hs</sub> Max. thermal resistance, junction to heatsink | 0.073<br>0.031   | K/W       | DC operation single side cooled<br>DC operation double side cooled |
| R <sub>thC-hs</sub> 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, ± 10%   | 14700<br>(1500)  | N<br>(Kg) |  |
| wt Approximate weight   | 255              | g         |  |
| Case style  | TO-200AC (B-PUK) |           | See Outline Table  |

### ΔR<sub>thJ-hs</sub> Conduction

(The following table shows the increment of thermal resistance R<sub>thJ-hs</sub> 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°             | 0.009                 | 0.009       | 0.006                  | 0.006       | K/W   | T <sub>J</sub> = T <sub>J</sub> max. |
| 120°             | 0.011                 | 0.011       | 0.011                  | 0.011       |       |                                      |
| 90°              | 0.014                 | 0.014       | 0.015                  | 0.015       |       |                                      |
| 60°              | 0.020                 | 0.020       | 0.021                  | 0.021       |       |                                      |
| 30°              | 0.036                 | 0.036       | 0.036                  | 0.036       |       |                                      |

### Ordering Information Table

| Device Code |  |          |                                 |          |  |          |   |
|-------------|--|----------|---------------------------------|----------|--|----------|---|
| ST          | 70   | 0        | C                               | 20       | L  | 1        |   |
| ①           | ②  | ③        | ④                               | ⑤        | ⑥  | ⑦        | ⑧   |
| <b>1</b>    | - Thyristor  | <b>2</b> | - Essential part number         | <b>3</b> | - 0 = Converter grade  | <b>4</b> | - C = Ceramic Puk   |
| <b>5</b>    | - Voltage code: Code x 100 = V <sub>RRM</sub> (See Voltage Rating Table) | <b>6</b> | - L = Puk Case TO-200AC (B-PUK) | <b>7</b> | - 0 = Eyelet terminals (Gate and Auxiliary Cathode Unsoldered Leads)<br>1 = Fast-on terminals (Gate and Auxiliary Cathode Unsoldered Leads)<br>2 = Eyelet terminals (Gate and Auxiliary Cathode Soldered Leads)<br>3 = Fast-on terminals (Gate and Auxiliary Cathode Soldered Leads) | <b>8</b> | - Critical dv/dt: None = 500V/μsec (Standard selection)<br>L = 1000V/μsec (Special selection) |

Outline Table

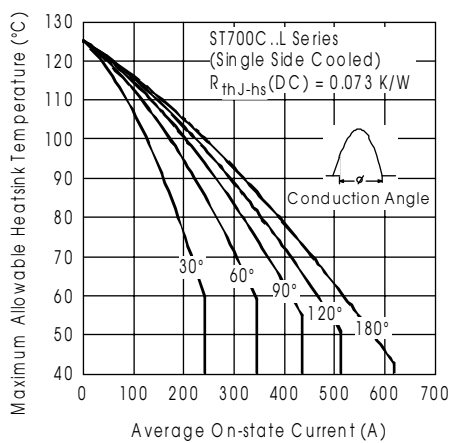
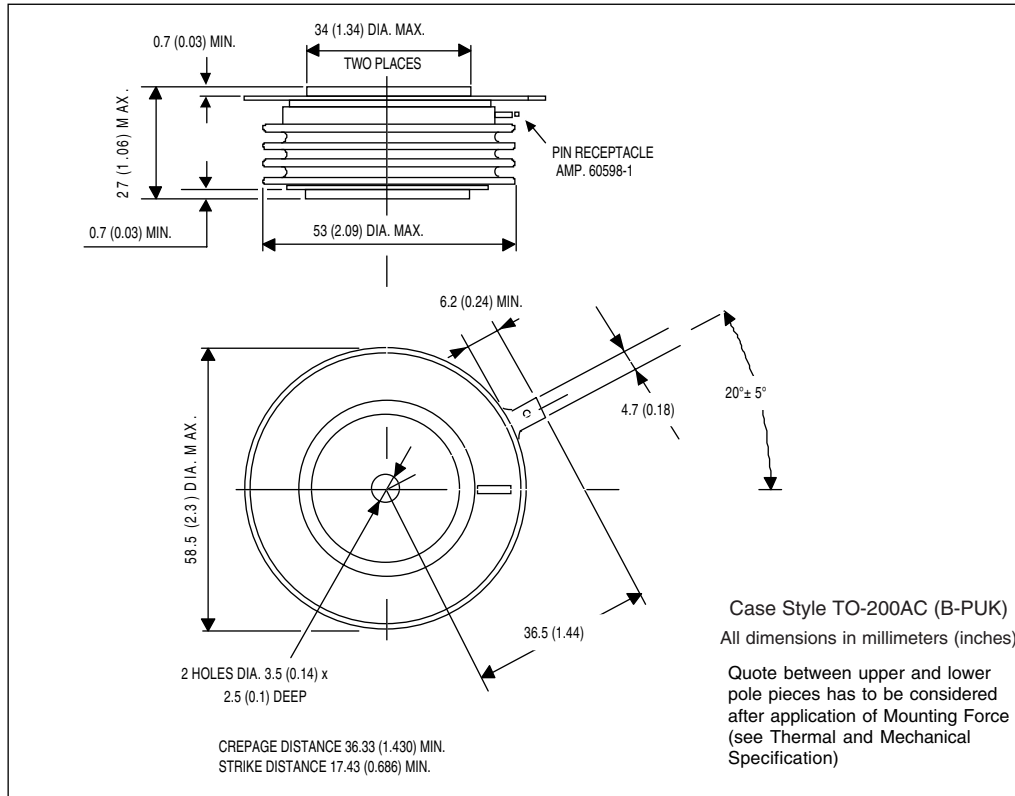


Fig. 1 - Current Ratings Characteristics

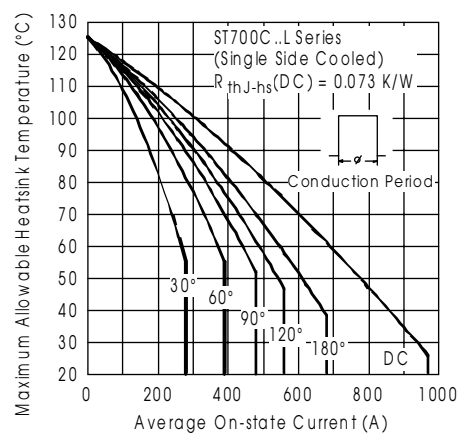


Fig. 2 - Current Ratings Characteristics

# ST700C..L Series

Bulletin I25190 rev.D 04/00

International  
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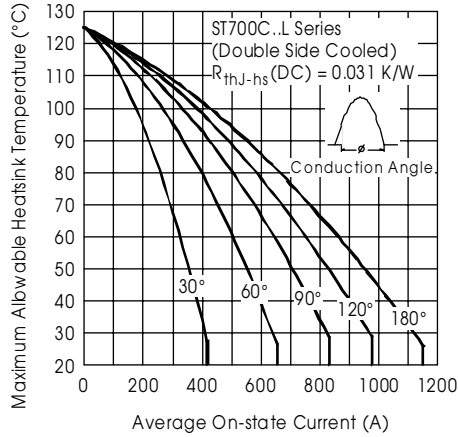


Fig. 3 - Current Ratings Characteristics

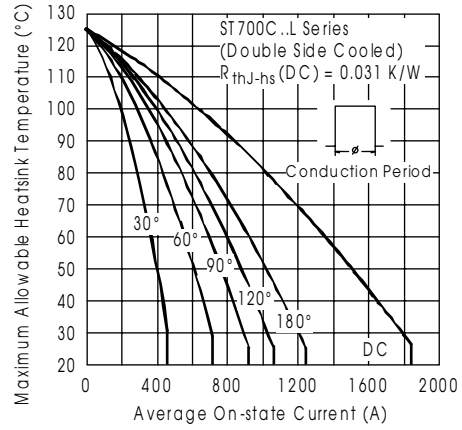


Fig. 4 - Current Ratings Characteristics

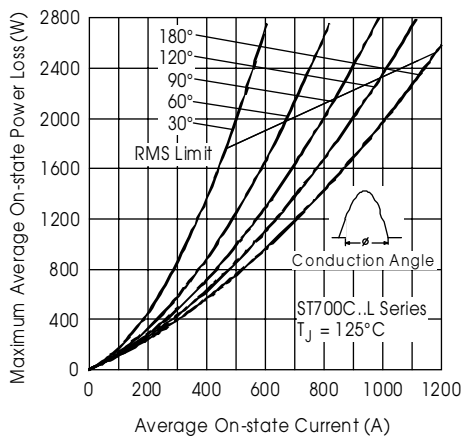


Fig. 5 - On-state Power Loss Characteristics

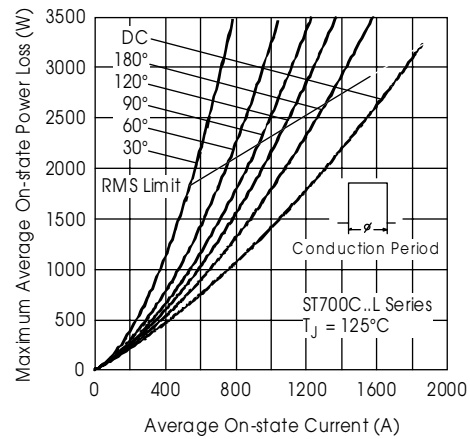


Fig. 6 - On-state Power Loss Characteristics

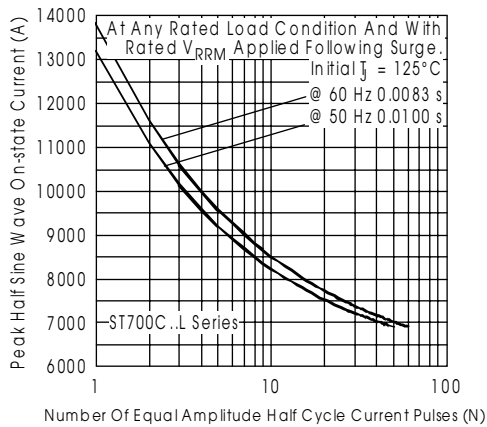


Fig. 7 - Maximum Non-Repetitive Surge Current  
 Single and Double Side Cooled

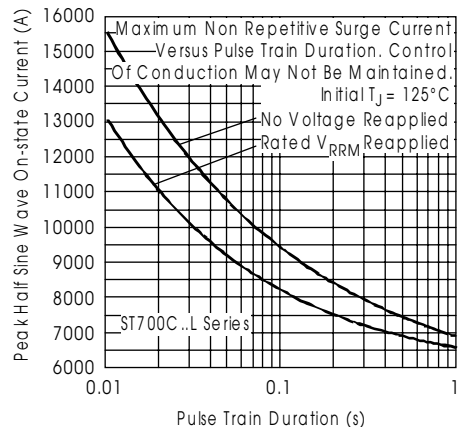


Fig. 8 - Maximum Non-Repetitive Surge Current  
 Single and Double Side Cooled

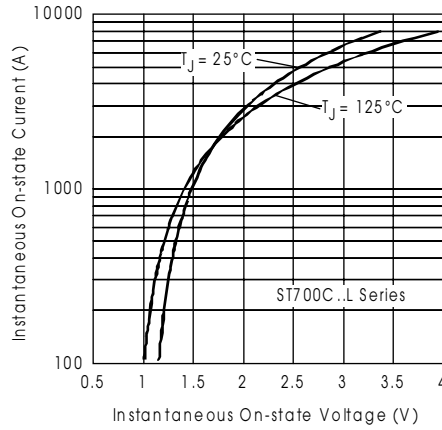


Fig. 9 - On-state Voltage Drop Characteristics

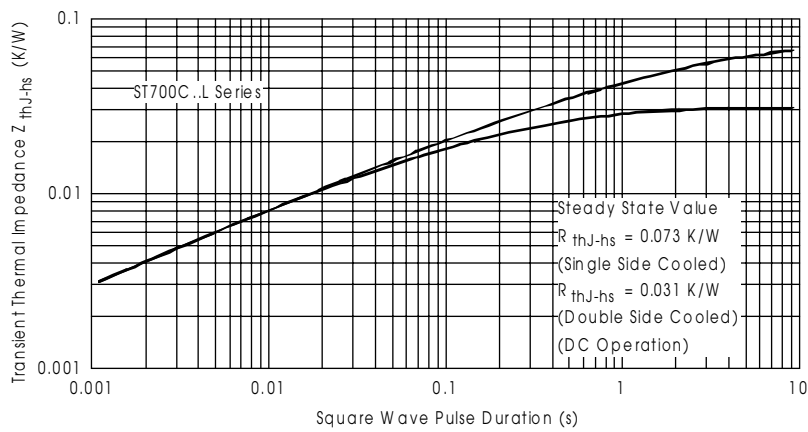


Fig. 10 - Thermal Impedance  $Z_{thJ-hs}$  Characteristics

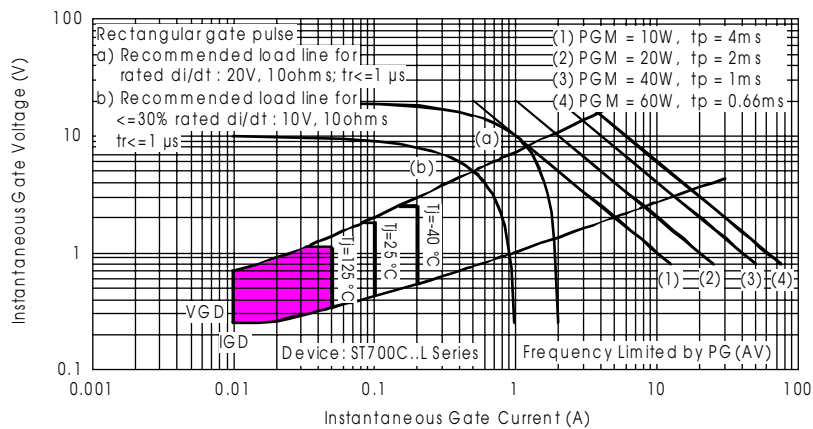


Fig. 11 - Gate Characteristics

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