

**PHASE CONTROL THYRISTORS**
**Hockey Puk Version**
**Features**

- Double side cooling
- High surge capability
- High mean current
- Fatigue free

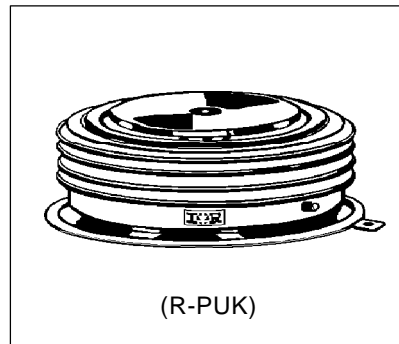
**Typical Applications**

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

**Major Ratings and Characteristics**

| Parameters        | ST2100C..R   | Units                  |
|-------------------|--------------|------------------------|
| $I_{T(AV)}$       | 1770         | A                      |
|                   | @ $T_C$      | 80 °C                  |
| $I_{T(AV)}$       | 2090         | A                      |
|                   | @ $T_{hs}$   | 55 °C                  |
| $I_{T(RMS)}$      | 3850         | A                      |
|                   | @ $T_{hs}$   | 25 °C                  |
| $I_{TSM}$         | @ 50Hz       | 36250 A                |
|                   | @ 60Hz       | 38000 A                |
| $I^2t$            | @ 50Hz       | 6570 KA <sup>2</sup> s |
|                   | @ 60Hz       | 5990 KA <sup>2</sup> s |
| $V_{DRM}/V_{RRM}$ | 3000 to 4200 | V                      |
| $t_q$             | typical      | 500 $\mu$ s            |
| $T_J$             | max.         | 125 °C                 |

2090A



## ST2100C..R 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>@ $T_C = 125^\circ\text{C}$<br>mA |
|-------------|--------------|---|--|---|
| ST2100C..R  | 30           | 3000  | 3100   | 250   |
|             | 32           | 3200  | 3300   |   |
|             | 34           | 3400  | 3500   |   |
|             | 36           | 3600  | 3700   |   |
|             | 38           | 3800  | 3900   |   |
|             | 40           | 4000  | 4100   |   |
|             | 42           | 4200  | 4300   |   |

#### On-state Conduction

| Parameter  | ST2100C..R  | Units             | Conditions  |
|--|-------------|-------------------|---|
| $I_{T(AV)}$ Max. average on-state current @ Case temperature     | 1770 (1150) | A                 | 180° conduction, half sine wave<br>double side (single side [anode side]) cooled<br>DC @ 25°C heatsink temperature double side cooled<br>Sinusoidal half wave,<br>Initial $T_C = 125^\circ\text{C}$ |
|  | 80          | °C                |   |
| $I_{T(AV)}$ Max. average on-state current @ Heatsink temperature | 2090 (940)  | A                 |   |
|  | 55 (85)     | °C                |   |
| $I_{T(RMS)}$ Max. RMS on-state current                           | 3850        | A                 |   |
| $I_{TSM}$ Max. peak, one-cycle non-repetitive surge current      | 36250       | A                 |   |
|  | 38000       |                   | t = 8.3ms reappplied  |
|  | 29000       |                   | t = 10ms 50% $V_{RRM}$  |
|  | 30350       |                   | t = 8.3ms reappplied  |
| $I^2t$ Maximum $I^2t$ for fusing                                 | 6570        | KA <sup>2</sup> s | t = 10ms No voltage   |
|  | 5990        |                   | t = 8.3ms reappplied  |
|  | 4205        |                   | t = 10ms 50% $V_{RRM}$  |
|  | 3820        |                   | t = 8.3ms reappplied  |
| $V_{T(TO)}$ Max. value of threshold voltage                      | 1.03        | V                 | $T_J = T_J$ max.  |
| $r_t$ Max. value of on-state slope resistance                    | 0.32        | mΩ                | $T_J = T_J$ max.  |
| $V_{TM}$ Max. on-state voltage                                   | 1.875       | V                 | $I_{pk} = 2900\text{A}$ , $T_C = 25^\circ\text{C}$  |
| $I_L$ Typical latching current                                   | 300         | mA                | $T_J = 25^\circ\text{C}$ , $V_D = 5\text{V}$  |

#### Switching

| Parameter  | ST2100C..R | Units | Conditions   |
|--|------------|-------|--|
| $di/dt$ Max. repetitive 50Hz (no repetitive) rate of rise of turned-on current | 150 (300)  | A/μs  | From 67% $V_{DRM}$ to 1000A gate drive 20V, 10Ω, $t_r = 0.5\mu\text{s}$<br>$T_J = T_J$ max.  |
| $t_d$ Maximum delay time   | 2.5        | μs    | Gate drive 30V, 15Ω, $V_d = 67\% V_{DRM}$ , $T_J = 25^\circ\text{C}$<br>Rise time 0.5μs  |
| $t_q$ Typical turn-off time  | 500        |       | $I_T = 1000\text{A}$ , $t_p = 1\text{ms}$ , $T_J = T_J$ max, $V_{RM} = 50\text{V}$ ,<br>$dl_{RR}/dt = 2\text{A}/\mu\text{s}$ , $V_{DR} = 67\% V_{DRM}$ , $dV_{DR}/dt = 8\text{V}/\mu\text{s}$ linear |

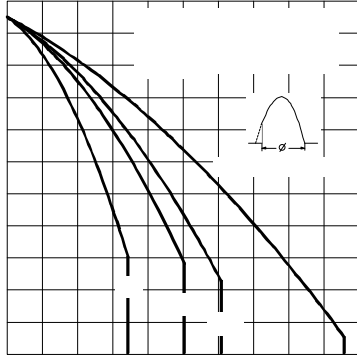


Fig. 1 - Current Ratings Characteristics

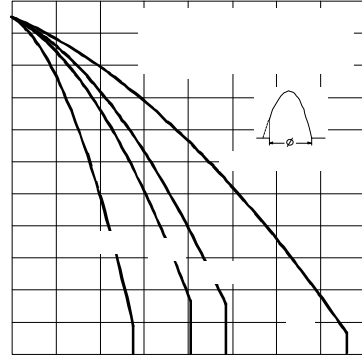


Fig. 2 - Current Ratings Characteristics

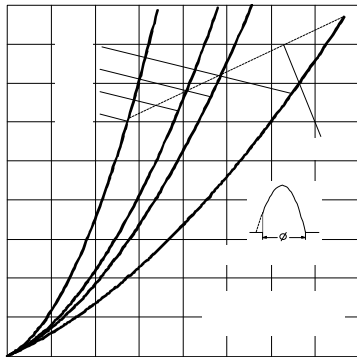


Fig. 3 - On-state Power Loss Characteristics

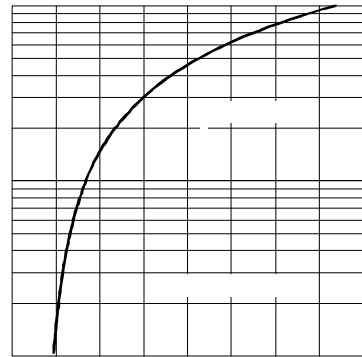


Fig. 4 - On-state Voltage Drop Characteristics

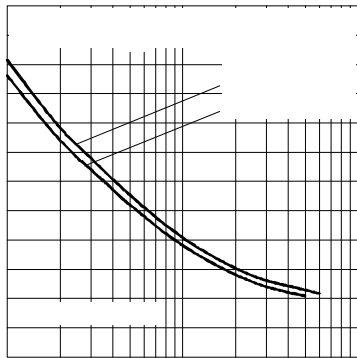


Fig. 5 - Maximum Non-Repetitive Surge Current

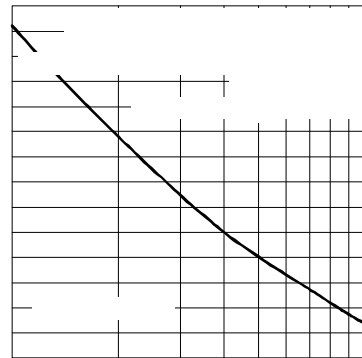


Fig. 6 - Maximum Non-Repetitive Surge Current

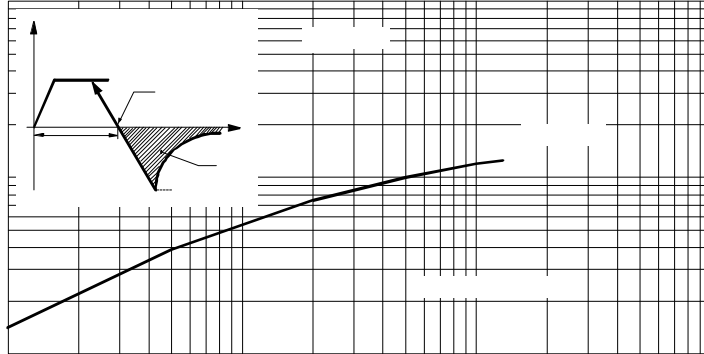


Fig. 7 - Stored Charged

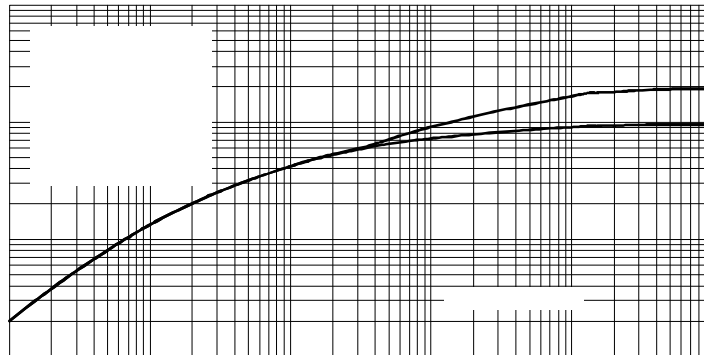


Fig. 8 - Thermal Impedance  $Z_{thJ-C}$  Characteristics

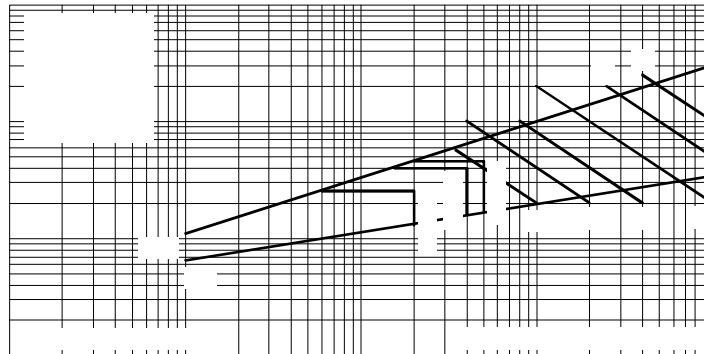


Fig. 9 - Gate Characteristics

Blocking

| Parameter  | ST2100C..R | Units      | Conditions  |
|--|------------|------------|---|
| dv/dt Maximum linear rate of rise of off-state voltage                               | 500        | V/ $\mu$ s | $T_J = T_J \text{ max. to } 67\% \text{ rated } V_{\text{DRM}}$         |
| $I_{\text{RRM}}$<br>$I_{\text{DRM}}$ Max. peak reverse and off-state leakage current | 250        | mA         | $T_J = 125^\circ\text{C}$ rated $V_{\text{DRM}}/V_{\text{RRM}}$ applied |

Triggering

| Parameter   | ST2100C..R | Units | Conditions   |
|---|------------|-------|--|
| $P_{\text{GM}}$ Maximum peak gate power                     | 150        | W     | $t_p = 100\mu\text{s}$   |
| $P_{\text{G(AV)}}$ Maximum average gate power               | 10         |       |  |
| $I_{\text{GM}}$ Max. peak positive gate current             | 30         | A     | Anode positive with respect to cathode   |
| $V_{\text{GM}}$ Max. peak positive gate voltage             | 30         | V     | Anode positive with respect to cathode   |
| $-V_{\text{GM}}$ Max. peak negative gate voltage            | 0.25       | V     | Anode positive with respect to cathode   |
| $I_{\text{GT}}$ Maximum DC gate current required to trigger | 400        | mA    | $T_C = 25^\circ\text{C}$ , $V_{\text{DRM}} = 5\text{V}$  |
| $V_{\text{GT}}$ Maximum gate voltage required to trigger    | 4          | V     | $T_C = 25^\circ\text{C}$ , $V_{\text{DRM}} = 5\text{V}$  |
| $V_{\text{GD}}$ DC gate voltage not to trigger              | 0.25       | V     | $T_C = 125^\circ\text{C}$<br>Max. gate current/voltage not to trigger is the max. value which will not trigger any unit with rated $V_{\text{DRM}}$ anode-to-cathode applied |

Thermal and Mechanical Specification

| Parameter   | ST2100C..R      | Units            | Conditions   |  |
|---|-----------------|------------------|--|--|
| $T_J \text{ max.}$ Max. operating temperature             | 125             | $^\circ\text{C}$ | On-state (conducting)  |  |
| $T_{\text{stg}}$ Max. storage temperature range           | -55 to 125      |                  |  |  |
| $R_{\text{thJ-C}}$ Thermal resistance, junction to case   | 0.019<br>0.0095 | K/W              | DC operation single side cooled<br>DC operation double side cooled |  |
| $R_{\text{th(C-h)}}$ Thermal resistance, case to heatsink | 0.004<br>0.002  | K/W              | Single side cooled<br>Double side cooled                           | Clamping force 43KN with mounting compound |
| F Mounting force $\pm 10\%$                               | 43000<br>(4400) | N<br>(Kg)        |  |  |
| wt Approximate weight                                     | 1600            | g                |  |  |
| Case style  | (R-PUK)         |                  | See Outline Table  |  |

$\Delta R_{\text{thJ-C}}$  Conduction

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

| Conduction angle | Single side | Double side | Units | Conditions               |
|------------------|-------------|-------------|-------|--------------------------|
| 180 $^\circ$     | 0.0010      | 0.0010      | K/W   | $T_J = T_J \text{ max.}$ |
| 120 $^\circ$     | 0.0017      | 0.0017      |       |                          |
| 60 $^\circ$      | 0.0044      | 0.0044      |       |                          |

## ST2100C..R Series

### Ordering Information Table

| Device Code |            |          |          |           |          |          |          |
|-------------|------------|----------|----------|-----------|----------|----------|----------|
| 1           | 2          | 3        | 4        | 5         | 6        | 7        | 8        |
| <b>ST</b>   | <b>210</b> | <b>0</b> | <b>C</b> | <b>42</b> | <b>R</b> | <b>1</b> | <b> </b> |

|  |
|--|
| <p><b>1</b> - Thyristor</p> <p><b>2</b> - Essential part number</p> <p><b>3</b> - 0 = Converter grade</p> <p><b>4</b> - C = Ceramic Puk</p> <p><b>5</b> - Voltage code: Code x 100 = <math>V_{RRM}</math> (See Voltage Rating Table)</p> <p><b>6</b> - R = Puk Case</p> <p><b>7</b> - 0 = Eyelet terminals (Gate and Auxiliary Cathode Unsoldered Leads)</p> <p style="padding-left: 20px;">1 = Fast-on terminals (Gate and Auxiliary Cathode Unsoldered Leads)</p> <p style="padding-left: 20px;">2 = Eyelet terminals (Gate and Auxiliary Cathode Soldered Leads)</p> <p style="padding-left: 20px;">3 = Fast-on terminals (Gate and Auxiliary Cathode Soldered Leads)</p> <p><b>8</b> - Critical dv/dt: None = 500V/<math>\mu</math>sec (Standard selection)</p> <p style="padding-left: 20px;">L = 1000V/<math>\mu</math>sec (Special selection)</p> |
|--|

### Outline Table

