

## PHASE CONTROL THYRISTORS

## Hockey Puk Version

### Features

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

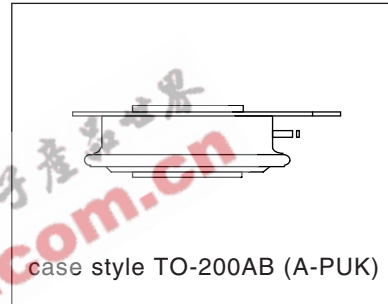
### Typical Applications

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

### Major Ratings and Characteristics

| Parameters        | ST180C..C      | Units             |
|-------------------|----------------|-------------------|
| $I_{T(AV)}$       | 350            | A                 |
| @ $T_{hs}$        | 55             | °C                |
| $I_{T(RMS)}$      | 660            | A                 |
| @ $T_{hs}$        | 25             | °C                |
| $I_{TSM}$         | @ 50Hz<br>5000 | A                 |
|                   | @ 60Hz<br>5230 | A                 |
| $I^2t$            | @ 50Hz<br>125  | KA <sup>2</sup> s |
|                   | @ 60Hz<br>114  | KA <sup>2</sup> s |
| $V_{DRM}/V_{RRM}$ | 400 to 2000    | V                 |
| $t_q$             | typical<br>100 | μs                |
| $T_J$             | - 40 to 125    | °C                |

350A



case style TO-200AB (A-PUK)

## ST180C..C Series

Bulletin I25164 rev. C 02/00

International  
IRF 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 |
|-------------|--------------|---|--|---|
| ST180C..C   | 04           | 400   | 500  | 30  |
|             | 08           | 800   | 900  |   |
|             | 12           | 1200  | 1300   |   |
|             | 16           | 1600  | 1700   |   |
|             | 18           | 1800  | 1900   |   |
|             | 20           | 2000  | 2100   |   |

#### On-state Conduction

| Parameter  | ST180C..C  | Units              | Conditions   |
|--|------------|--------------------|--|
| $I_{T(AV)}$ Max. average on-state current @ Heatsink temperature | 350 (140)  | A                  | 180° conduction, half sine wave<br>double side (single side) cooled      |
|  | 55 (85)    | °C                 |  |
| $I_{T(RMS)}$ Max. RMS on-state current                           | 660        |                    | @ 25°C heatsink temperature double side cooled                           |
| $I_{TSM}$ Max. peak, one-cycle non-repetitive surge current      | 5000       | A                  | t = 10ms No voltage  |
|  | 5230       |                    | t = 8.3ms reappplied   |
|  | 4200       |                    | t = 10ms 100% $V_{RRM}$  |
|  | 4400       |                    | t = 8.3ms reappplied   |
| $I^2t$ Maximum $I^2t$ for fusing                                 | 125        | KA <sup>2</sup> s  | t = 10ms No voltage  |
|  | 114        |                    | t = 8.3ms reappplied   |
|  | 88         |                    | t = 10ms 100% $V_{RRM}$  |
|  | 81         |                    | t = 8.3ms reappplied   |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing                   | 1250       | KA <sup>2</sup> √s | t = 0.1 to 10ms, no voltage reappplied                                   |
| $V_{T(TO)1}$ Low level value of threshold voltage                | 1.08       | 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               | 1.14       |                    | ( $I > \pi$ x $I_{T(AV)}$ ), $T_J = T_J$ max.                            |
| $r_{t1}$ Low level value of on-state slope resistance            | 1.18       | 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           | 1.14       |                    | ( $I > \pi$ x $I_{T(AV)}$ ), $T_J = T_J$ max.                            |
| $V_{TM}$ Max. on-state voltage                                   | 1.96       | V                  | $I_{pk} = 750A$ , $T_J = T_J$ max, $t_p = 10ms$ sine pulse               |
| $I_H$ Maximum holding current                                    | 600        | mA                 | $T_J = T_J$ max, anode supply 12V resistive load                         |
| $I_L$ Max. (typical) latching current                            | 1000 (300) |                    |  |

Switching

| Parameter  | ST180C..C | Units | Conditions  |
|--|-----------|-------|---|
| di/dt<br>Max. non-repetitive rate of rise of turned-on current | 1000      | A/μs  | Gate drive 20V, 20Ω, t <sub>r</sub> ≤ 1μs<br>T <sub>J</sub> = T <sub>J</sub> max, anode voltage ≤ 80% V <sub>DRM</sub>                                    |
| t <sub>d</sub><br>Typical delay time                           | 1.0       | μs    | Gate current 1A, di <sub>g</sub> /dt = 1A/μs<br>V <sub>d</sub> = 0.67% V <sub>DRM</sub> , T <sub>J</sub> = 25°C   |
| t <sub>q</sub><br>Typical turn-off time                        | 100       |       | I <sub>TM</sub> = 300A, T <sub>J</sub> = T <sub>J</sub> max, di/dt = 20A/μs, V <sub>R</sub> = 50V<br>dv/dt = 20V/μs, Gate 0V 100Ω, t <sub>p</sub> = 500μs |

Blocking

| Parameter   | ST180C..C | Units | Conditions  |
|---|-----------|-------|---|
| dv/dt<br>Maximum critical rate of rise of off-state voltage                             | 500       | V/μs  | T <sub>J</sub> = T <sub>J</sub> max linear to 80% rated V <sub>DRM</sub>              |
| I <sub>DRM</sub><br>I <sub>RRM</sub><br>Max. peak reverse and off-state leakage current | 30        | mA    | T <sub>J</sub> = T <sub>J</sub> max, rated V <sub>DRM</sub> /V <sub>RRM</sub> applied |

Triggering

| Parameter  | ST180C..C |      | Units | Conditions  |
|--|-----------|------|-------|---|
| P <sub>GM</sub><br>Maximum peak gate power             | 10        |      | W     | T <sub>J</sub> = T <sub>J</sub> max, t <sub>p</sub> ≤ 5ms   |
| P <sub>G(AV)</sub><br>Maximum average gate power       | 2.0       |      |       | T <sub>J</sub> = T <sub>J</sub> max, f = 50Hz, d% = 50  |
| I <sub>GM</sub><br>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><br>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><br>Maximum peak negative gate voltage | 5.0       |      |       |   |
| I <sub>GT</sub><br>DC gate current required to trigger | TYP.      | MAX. | mA    | T <sub>J</sub> = - 40°C<br>T <sub>J</sub> = 25°C<br>T <sub>J</sub> = 125°C<br><br>Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied |
|  | 180       | -    |       |   |
|  | 90        | 150  |       |   |
| V <sub>GT</sub><br>DC gate voltage required to trigger | 2.9       | -    | V     | T <sub>J</sub> = - 40°C<br>T <sub>J</sub> = 25°C<br>T <sub>J</sub> = 125°C  |
|  | 1.8       | 3.0  |       |   |
|  | 1.2       | -    |       |   |
| I <sub>GD</sub><br>DC gate current not to trigger      | 10        |      | mA    | T <sub>J</sub> = T <sub>J</sub> max<br>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                        |
| V <sub>GD</sub><br>DC gate voltage not to trigger      | 0.25      |      | V     |   |

## ST180C..C Series

Bulletin I25164 rev. C 02/00

International  
**IRF** Rectifier

### Thermal and Mechanical Specification

| Parameter   | ST180C..C          | 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 | 0.17<br>0.08       | K/W       | DC operation single side cooled<br>DC operation double side cooled |
| R <sub>thC-hs</sub> Max. thermal resistance, case to heatsink     | 0.033<br>0.017     |           | K/W  |
| F Mounting force, ± 10%   | 4900<br>(500)      | N<br>(Kg) |  |
| wt Approximate weight   | 50                 | g         |  |
| Case style  | TO - 200AB (A-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°             | 0.015                 | 0.015       | 0.011                  | 0.011       | K/W   | T <sub>J</sub> = T <sub>J</sub> max. |
| 120°             | 0.018                 | 0.019       | 0.019                  | 0.019       |       |                                      |
| 90°              | 0.024                 | 0.024       | 0.026                  | 0.026       |       |                                      |
| 60°              | 0.035                 | 0.035       | 0.036                  | 0.037       |       |                                      |
| 30°              | 0.060                 | 0.060       | 0.060                  | 0.061       |       |                                      |

### Ordering Information Table

| Device Code |  |          |                                 |          |  |          |   |
|-------------|--|----------|---------------------------------|----------|--|----------|---|
| 1           | 2  | 3        | 4                               | 5        | 6  | 7        | 8   |
| ST          | 18   | 0        | C                               | 20       | C  | 1        |   |
| <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> | - C = Puk Case TO-200AB (A-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 value)<br>L = 1000V/μsec (Special selection) |

Outline Table

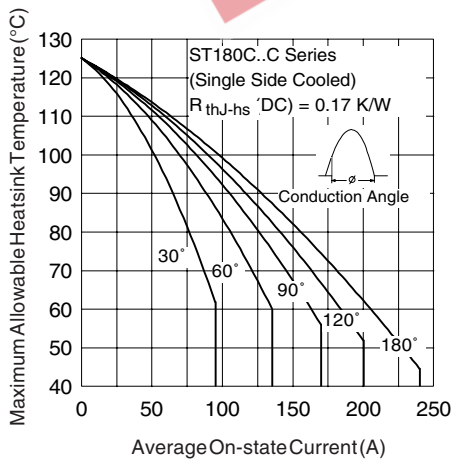
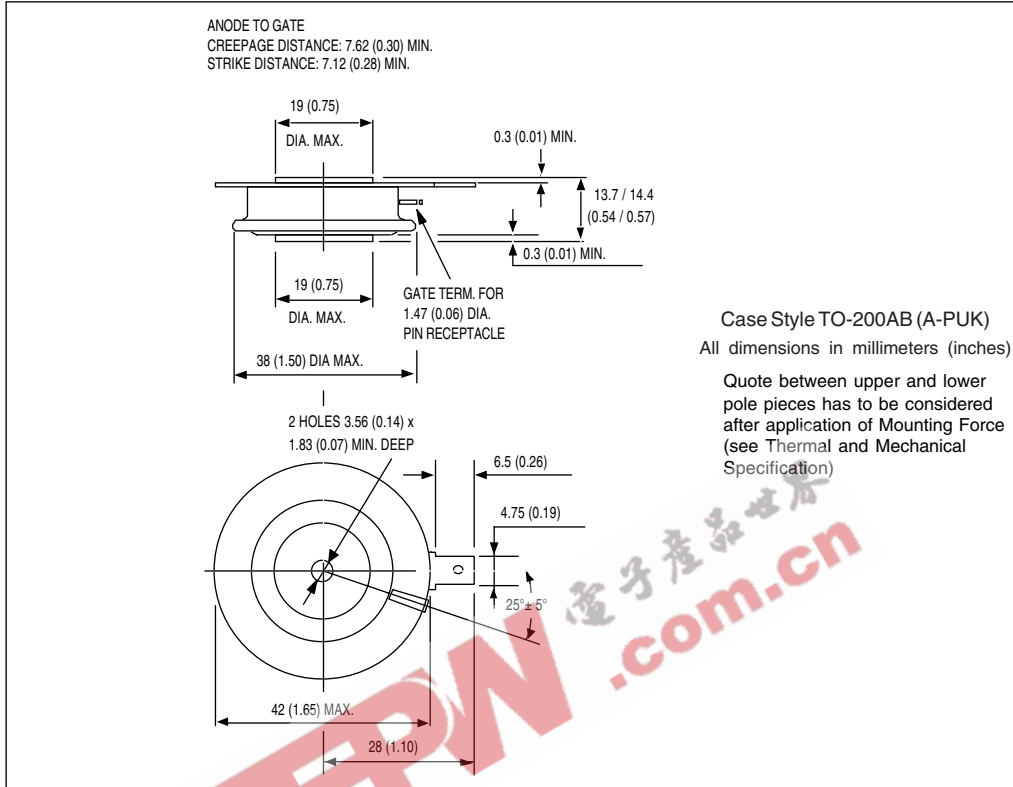


Fig. 1 - Current Ratings Characteristics

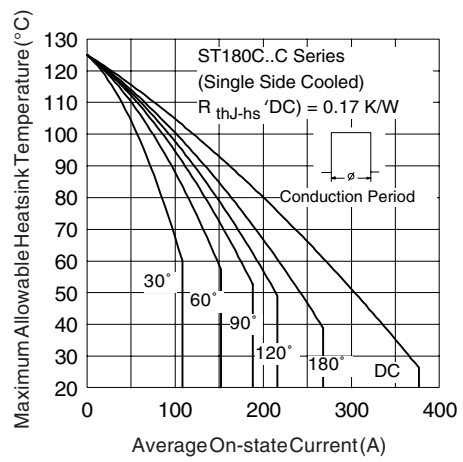


Fig. 2 - Current Ratings Characteristics

# ST180C..C Series

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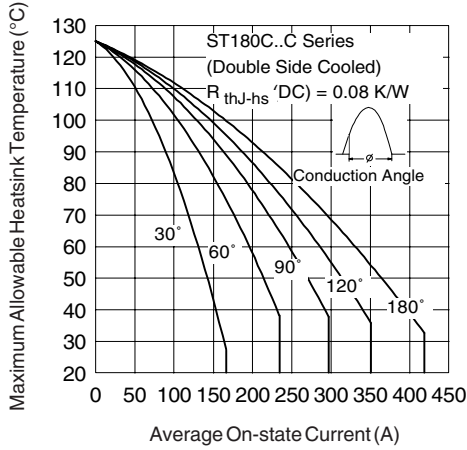


Fig. 3 - Current Ratings Characteristics

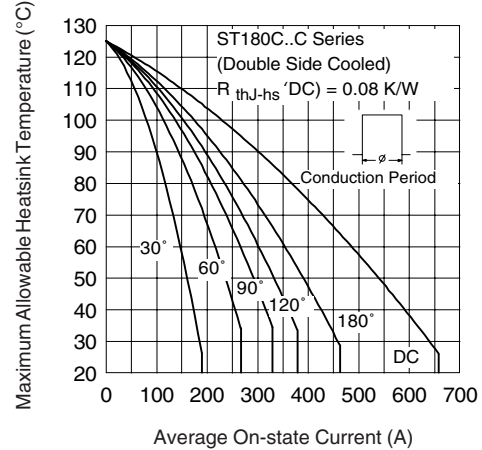


Fig. 4 - Current Ratings Characteristics

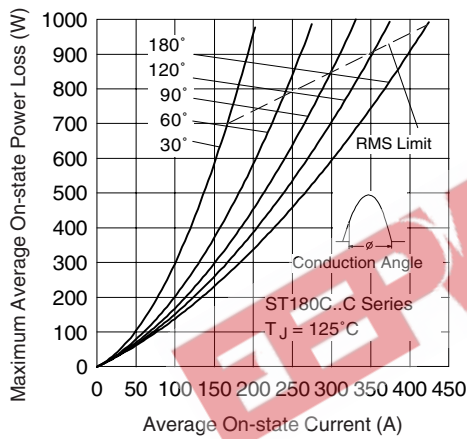


Fig. 5 - On-state Power Loss Characteristics

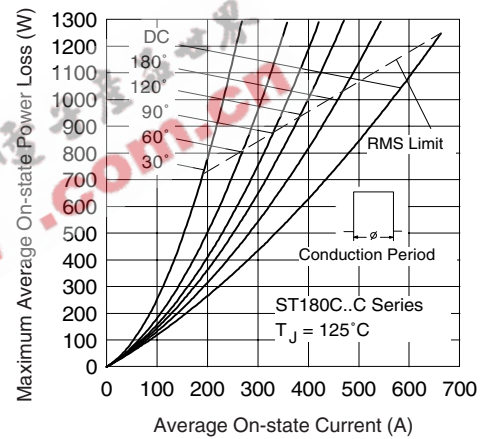


Fig. 6 - On-state Power Loss Characteristics

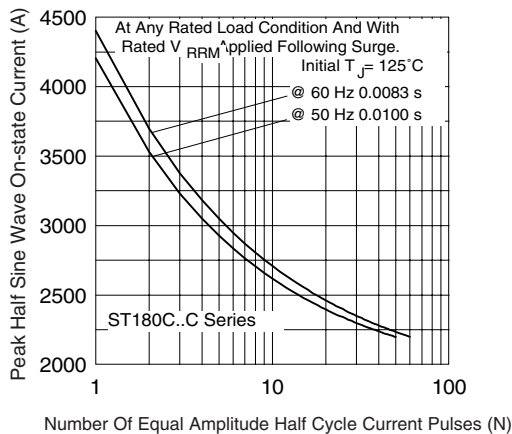


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

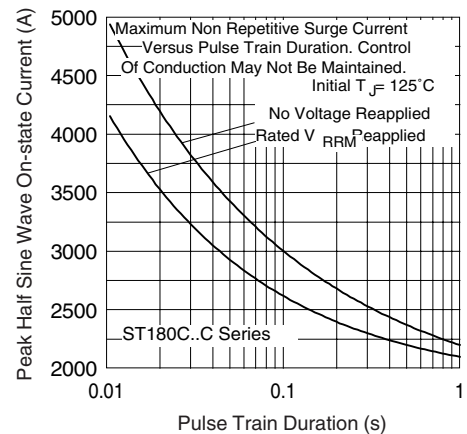


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

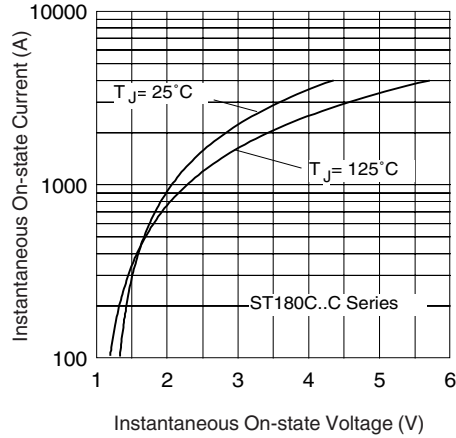


Fig. 9 - On-state Voltage Drop Characteristics

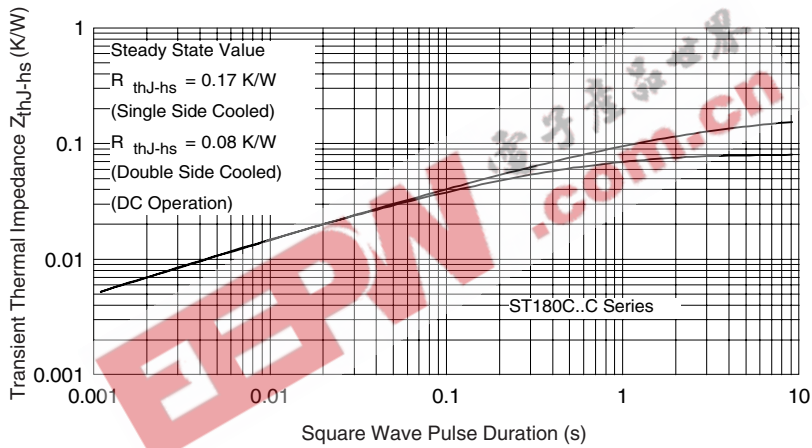


Fig. 10 - Thermal Impedance  $Z_{thJ-hs}$  Characteristics

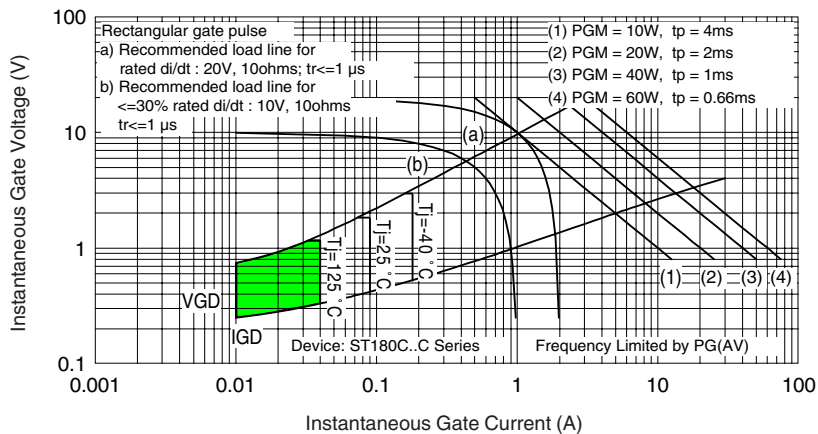


Fig. 11 - Gate Characteristics