

PHASE CONTROL THYRISTORS

Hockey Puk Version

Features

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

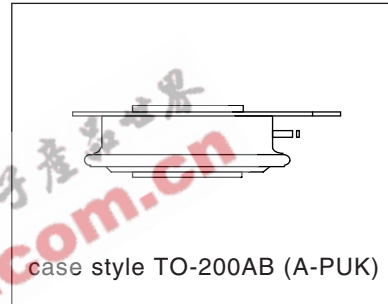
Typical Applications

- 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 | 5000 | A |
| | @ 60Hz | 5230 | A |
| I^2t | @ 50Hz | 125 | KA ² s |
| | @ 60Hz | 114 | KA ² s |
| V_{DRM}/V_{RRM} | 400 to 2000 | V | |
| t_q | typical | 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 V | V_{RSM} , maximum non-repetitive peak voltage V | I_{DRM}/I_{RRM} max. @ $T_J = T_J$ max 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 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 ² 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 ² √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 π 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 π 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 Max. non-repetitive rate of rise of turned-on current | 1000 | A/μs | Gate drive 20V, 20Ω, t _r ≤ 1μs T _J = T _J max, anode voltage ≤ 80% V _{DRM} |
| t _d Typical delay time | 1.0 | μs | Gate current 1A, di _g /dt = 1A/μs V _d = 0.67% V _{DRM} , T _J = 25°C |
| t _q Typical turn-off time | 100 | | I _{TM} = 300A, T _J = T _J max, di/dt = 20A/μs, V _R = 50V dv/dt = 20V/μs, Gate 0V 100Ω, t _p = 500μs |

Blocking

| Parameter | ST180C..C | Units | Conditions |
|---|-----------|-------|---|
| 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} I _{RRM} Max. peak reverse and off-state leakage current | 30 | mA | T _J = T _J max, rated V _{DRM} /V _{RRM} applied |

Triggering

| Parameter | ST180C..C | | Units | Conditions |
|--|-----------|------|-------|---|
| P _{GM} Maximum peak gate power | 10 | | W | T _J = T _J max, t _p ≤ 5ms |
| P _{G(AV)} Maximum average gate power | 2.0 | | | T _J = T _J max, f = 50Hz, d% = 50 |
| I _{GM} Max. peak positive gate current | 3.0 | | A | T _J = T _J max, t _p ≤ 5ms |
| +V _{GM} Maximum peak positive gate voltage | 20 | | V | T _J = T _J max, t _p ≤ 5ms |
| -V _{GM} Maximum peak negative gate voltage | 5.0 | | | |
| I _{GT} DC gate current required to trigger | TYP. | MAX. | mA | T _J = - 40°C T _J = 25°C T _J = 125°C Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied |
| | 180 | - | | |
| | 90 | 150 | | |
| V _{GT} DC gate voltage required to trigger | 2.9 | - | V | T _J = - 40°C T _J = 25°C T _J = 125°C |
| | 1.8 | 3.0 | | |
| | 1.2 | - | | |
| 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 | |

ST180C..C Series

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International
IRF Rectifier

Thermal and Mechanical Specification

| Parameter | ST180C..C | 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 | 0.17 | K/W | DC operation single side cooled |
| | 0.08 | | DC operation double side cooled |
| R_{thC-hs} Max. thermal resistance, case to heatsink | 0.033 | K/W | DC operation single side cooled |
| | 0.017 | | DC operation double side cooled |
| F Mounting force, $\pm 10\%$ | 4900 | N | |
| | (500) | (Kg) | |
| wt Approximate weight | 50 | g | |
| Case style | TO - 200AB (A-PUK) | | See Outline Table |

ΔR_{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° | 0.015 | 0.015 | 0.011 | 0.011 | K/W | $T_J = T_{J \text{ max.}}$ |
| 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 | |
| 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 | - | C = Puk Case TO-200AB (A-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/ μ sec (Standard value) | | | | | |
| | | L = 1000V/ μ sec (Special selection) | | | | | |

Outline Table

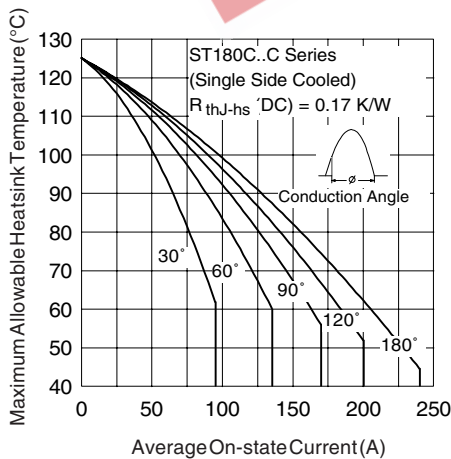
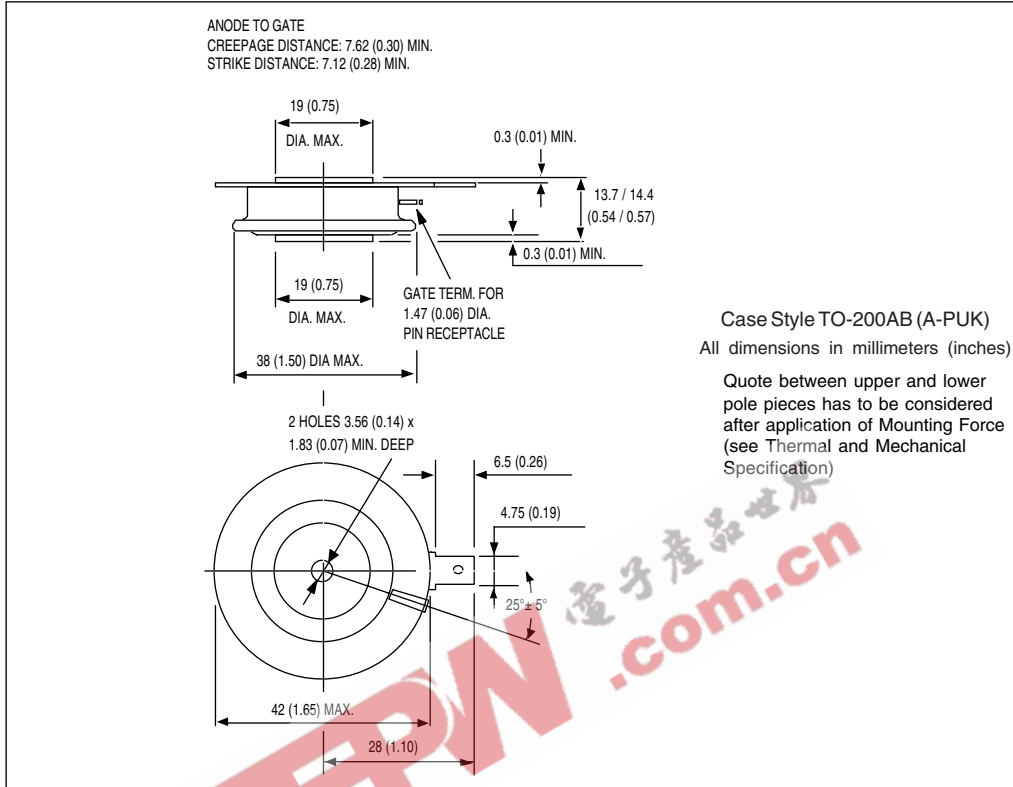


Fig. 1 - Current Ratings Characteristics

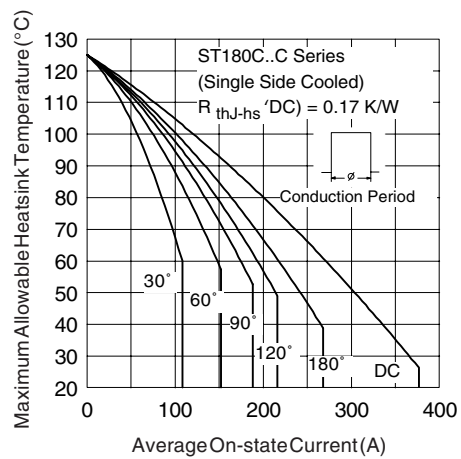


Fig. 2 - Current Ratings Characteristics

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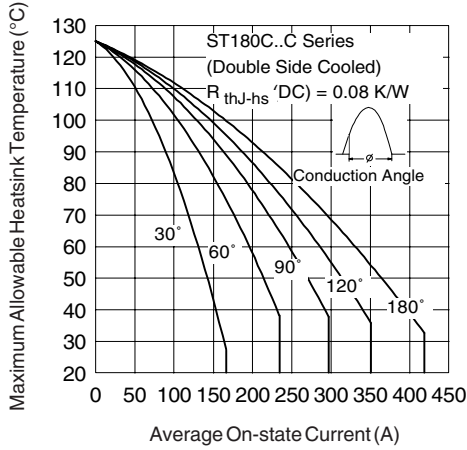


Fig. 3 - Current Ratings Characteristics

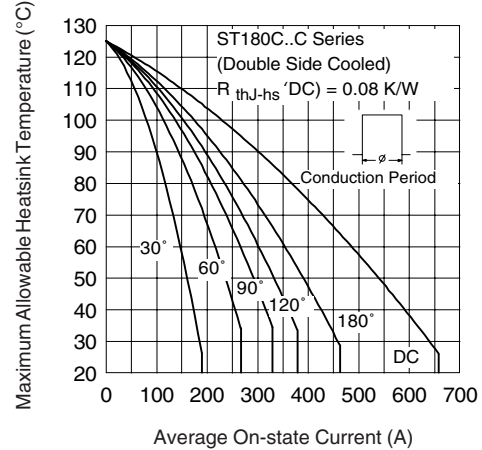


Fig. 4 - Current Ratings Characteristics

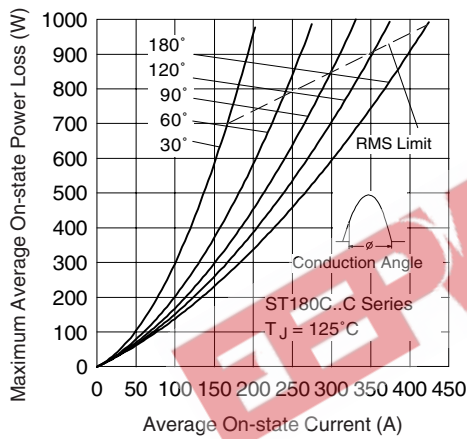


Fig. 5 - On-state Power Loss Characteristics

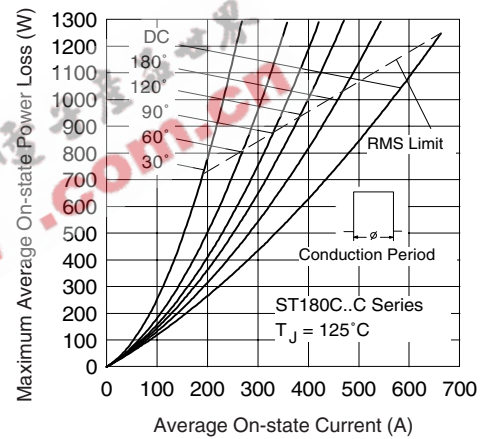


Fig. 6 - On-state Power Loss Characteristics

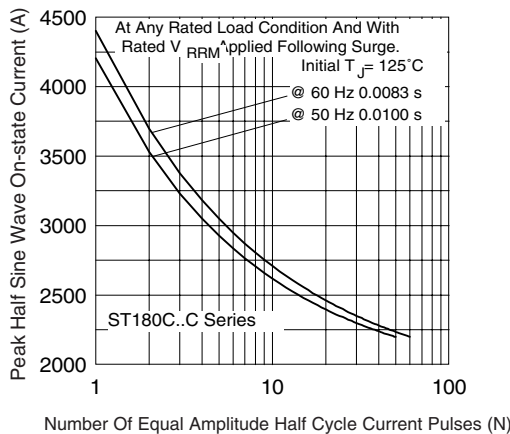


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

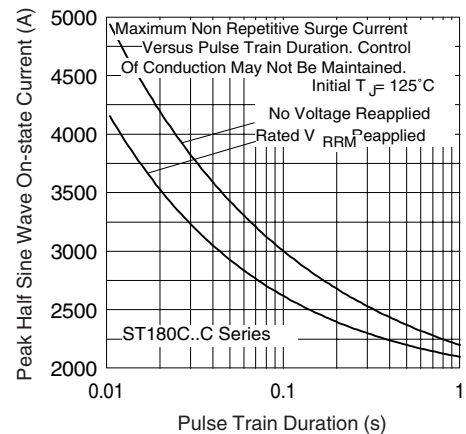


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

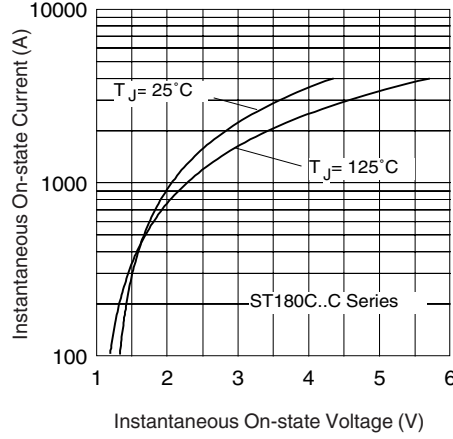


Fig. 9 - On-state Voltage Drop Characteristics

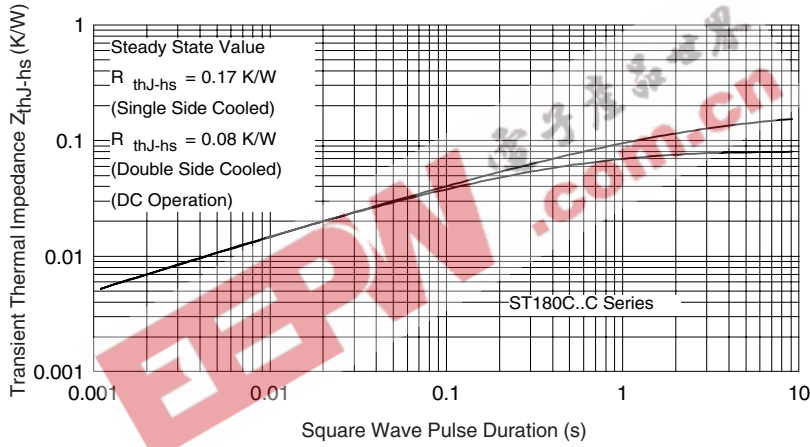


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

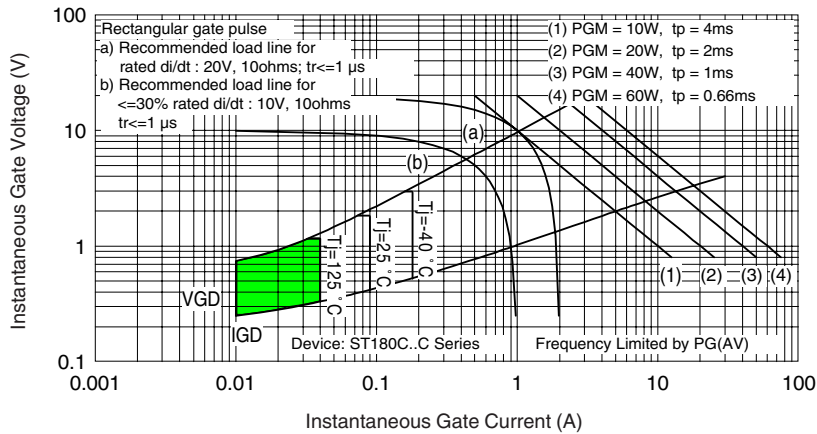


Fig. 11 - Gate Characteristics