

Vishay High Power Products

Phase Control Thyristors (Hockey PUK Version), 350 A



TO-200AB (A-PUK)

FEATURES

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



• Designed and qualified for industrial level



ROHS

| PRODUCT SUMMARY | | | | |
|--------------------|-------|--|--|--|
| I _{T(AV)} | 350 A | | | |

TYPICAL APPLICATIONS

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

| MAJOR RATINGS AND CHARACTERISTICS | | | | | | |
|------------------------------------|-----------------|-------------|---------------------|--|--|--|
| PARAMETER | TEST CONDITIONS | VALUES | UNITS | | | |
| 1 | | 350 | A | | | |
| I _{T(AV)} | T _{hs} | 55 | °C | | | |
| 1 | | 660 | A | | | |
| I _{T(RMS)} | T _{hs} | 25 | °C | | | |
| | 50 Hz | 5000 | Α Α | | | |
| I _{TSM} | 60 Hz | 5230 | ^ | | | |
| l ² t | 50 Hz | 125 | - kA ² s | | | |
| 1-1 | 60 Hz | 114 | - KA-S | | | |
| V _{DRM} /V _{RRM} | | 400 to 2000 | V | | | |
| tq | Typical | 100 | μs | | | |
| TJ | | - 40 to 125 | °C | | | |

ELECTRICAL SPECIFICATIONS

| VOLTAGE RATINGS | | | | | | | | |
|------------------|-----------------|--|--|---|--|--|--|--|
| TYPE NUMBER | VOLTAGE CODE | V _{DRM} /V _{RRM} , MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V | V _{RSM} , MAXIMUM NON-REPETITIVE PEAK VOLTAGE V | $I_{DRM}/I_{RRM} \ MAXIMUM \\ AT \ T_J = T_J \ MAXIMUM \\ mA$ | | | | |
| | 04 | 400 | 500 | | | | | |
| | 08 | 800 | 900 | | | | | |
| ST180CC 12 16 18 | | 1200 | 1300 | 30 | | | | |
| | | 1600 | 1700 | 00 | | | | |
| | | 1800 | 1900 | | | | | |
| | 20 | 2000 | 2100 | | | | | |

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ST180CPbF Series



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| ABSOLUTE MAXIMUM RATIN | GS | | | | | |
|---|---------------------|---|--|---|------------|---------------------|
| PARAMETER | SYMBOL | | TEST CONDITIONS | | | UNITS |
| Maximum average on-state current | | 180° condu | ction, half sine v | vave | 350 (140) | Α |
| at heatsink temperature | I _{T(AV)} | double side | (single side) co | oled | 55 (85) | °C |
| Maximum RMS on-state current | I _{T(RMS)} | DC at 25 °C | heatsink tempe | erature double side cooled | 660 | |
| | | t = 10 ms | No voltage | | 5000 | |
| Maximum peak, one-cycle | | t = 8.3 ms | reapplied | | 5230 | A kA ² s |
| non-repetitive surge current | I _{TSM} | t = 10 ms | 100 % V _{RRM} | Sinusoidal half wave, initial $T_J = T_J$ maximum | 4200 | |
| | | t = 8.3 ms | reapplied | | 4400 | |
| Maximum I ² t for fusing | l ² t | t = 10 ms | No voltage reapplied | | 125 | |
| | | t = 8.3 ms | | | 114 | |
| | | t = 10 ms | | | 88 | |
| | | t = 8.3 ms | reapplied | | 81 | |
| Maximum I ² √t for fusing | l²√t | t = 0.1 to 10 | ms, no voltage | reapplied | 1250 | kA²√s |
| Low level value of threshold voltage | V _{T(TO)1} | (16.7 % x π | $(16.7 \% x \pi x I_{T(AV)} < I < \pi x I_{T(AV)}), T_J = T_J \text{ maximum}$ | | | V |
| High level value of threshold voltage | V _{T(TO)2} | $(I > \pi \times I_{T(AV)}), T_J = T_J \text{ maximum}$ | | | 1.14 | ľ |
| Low level value of on-state slope resistance | r _{t1} | (16.7 % x π x $I_{T(AV)} < I < \pi$ x $I_{T(AV)}$), $T_J = T_J$ maximum | | | 1.18 | m 0 |
| High level value of on-state slope resistance | r _{t2} | $(I > \pi \times I_{T(AV)}), T_J = T_J \text{ maximum}$ | | | 1.14 | mΩ |
| Maximum on-state voltage | V_{TM} | $I_{pk} = 750 \text{ A}, T_J = T_J \text{ maximum}, t_p = 10 \text{ ms sine pulse}$ | | | 1.96 | ٧ |
| Maximum holding current | I _H | T _ 05 °C | | | 600 | mA |
| Maximum (typical) latching current | ΙL | $T_J = 25$ °C, anode supply 12 V resistive load 1000 (300 | | | 1000 (300) | IIIA |

| SWITCHING | | | | |
|--|----------------|--|--------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum non-repetitive rate of rise of turned-on current | dI/dt | Gate drive 20 V, 20 Ω , $t_r \le 1~\mu s$ $T_J = T_J$ maximum, anode voltage $\le 80~\%$ V_{DRM} | 1000 | A/µs |
| Typical delay time | t _d | Gate current 1 A, $dl_g/dt = 1$ A/ μ s $V_d = 0.67 \% V_{DRM}$, $T_J = 25 °C$ | 1.0 | - 10 |
| Typical turn-off time | tq | $I_{TM}=300~A,~T_J=T_J~maximum,~dl/dt=20~A/\mu s, \\ V_R=50~V,~dV/dt=20~V/\mu s,~gate~0~V~100~\Omega,~t_p=500~\mu s$ | 100 | μs |

| BLOCKING | | | | |
|--|--|--|--------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
| Maximum critical rate of rise of off-state voltage | dV/dt | $T_J = T_J$ maximum linear to 80 % rated V_{DRM} | 500 | V/µs |
| Maximum peak reverse and off-state leakage current | I _{RRM} , I _{DRM} | $T_J = T_J$ maximum, rated V_{DRM}/V_{RRM} applied | 30 | mA |



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| TRIGGERING | | | | | | |
|-------------------------------------|-------------------------|--|--|------|--------|-------|
| DADAMETER | CVMDOL | TEGT COURTIONS | | | VALUES | |
| PARAMETER | SYMBOL | ' | TEST CONDITIONS | TYP. | MAX. | UNITS |
| Maximum peak gate power | P _{GM} | $T_J = T_J$ maximum, | , t _p ≤ 5 ms | 10 | | w |
| Maximum average gate power | P _{G(AV)} | $T_J = T_J$ maximum, | f = 50 Hz, d% = 50 | 2 | .0 | l vv |
| Maximum peak positive gate current | I _{GM} | | | 3 | .0 | Α |
| Maximum peak positive gate voltage | + V _{GM} | $T_J = T_J$ maximum, $t_p \le 5$ ms | | 20 | V | |
| Maximum peak negative gate voltage | - V _{GM} |] | | 5.0 | | 7 |
| | I _{GT} | T _J = - 40 °C | Maximum required gate trigger/ | 180 | - | |
| DC gate current required to trigger | | T _J = 25 °C | | 90 | 150 | mA |
| | | T _J = 125 °C | current/voltage are the lowest value | 40 | - | |
| | | T _J = - 40 °C which will trigger all units 12 V | 2.9 | - | | |
| DC gate voltage required to trigger | V _{GT} | T _J = 25 °C | anode to cathode applied | 1.8 | 3.0 | V |
| | T _J = 125 °C | | | 1.2 | - | |
| DC gate current not to trigger | I _{GD} | T _ T movimum | Maximum gate current/voltage not to trigger is the maximum value | 10 | | mA |
| DC gate voltage not to trigger | V _{GD} | $T_J = T_J \text{ maximum}$ | which will not trigger any unit with rated V _{DRM} anode to cathode applied | 0.25 | | V |

| THERMAL AND MECHANICAL SPECIFICATIONS | | | | | | |
|--|---------------------|---|---------------|-----------|--|--|
| PARAMETER | SYMBOL | TEST CONDITIONS | | UNITS | | |
| Maximum operating junction temperature range | TJ | | - 40 to 125 | °C | | |
| Maximum storage temperature range | T _{Stg} | | - 40 to 150 | | | |
| Maximum thermal resistance, | R _{thJ-hs} | DC operation single side cooled | 0.17 | | | |
| junction to heatsink | □thJ-hs | DC operation double side cooled | 0.08 | K/W | | |
| Maximum thermal resistance, | D | DC operation single side cooled | 0.033 | IV VV | | |
| case to heatsink | R _{thC-hs} | DC operation double side cooled | 0.017 | | | |
| Mounting force, ± 10 % | | | 4900 (500) | N (kg) | | |
| Approximate weight | | | 50 | g | | |
| Case style | | See dimensions - link at the end of datasheet TO-200AB (A | | A-PUK) | | |

| △R _{thJC} CONDUCTION | | | | | | | | |
|-------------------------------|--------------------------|-------------|-------------|-------------|---|-------|--|--|
| CONDUCTION ANGLE | SINUSOIDAL CONDUCTION | | CONDUCTION | | TEST CONDITIONS | UNITS | | |
| | SINGLE SIDE | DOUBLE SIDE | SINGLE SIDE | DOUBLE SIDE | | | | |
| 180° | 0.015 | 0.015 | 0.011 | 0.011 | T _J = T _J maximum | | | |
| 120° | 0.018 | 0.019 | 0.019 | 0.019 | | | | |
| 90° | 0.024 | 0.024 | 0.026 | 0.026 | | K/W | | |
| 60° | 0.035 | 0.035 | 0.036 | 0.037 | | | | |
| 30° | 0.060 | 0.060 | 0.060 | 0.061 | | | | |

Note

[•] The table above shows the increment of thermal resistance RthJC when devices operate at different conduction angles than DC

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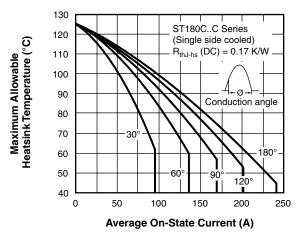
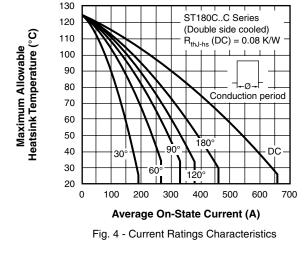


Fig. 1 - Current Ratings Characteristics



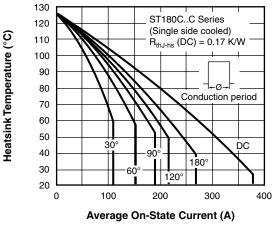


Fig. 2 - Current Ratings Characteristics

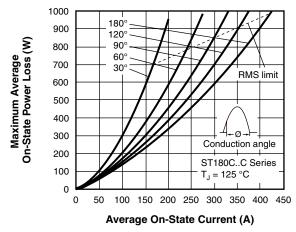


Fig. 5 - On-State Power Loss Characteristics

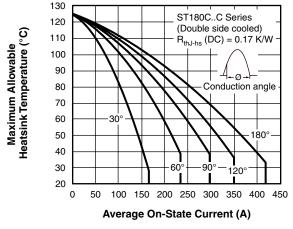


Fig. 3 - Current Ratings Characteristics

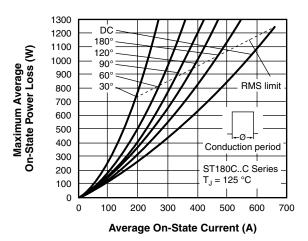


Fig. 6 - On-State Power Loss Characteristics

Maximum Allowable



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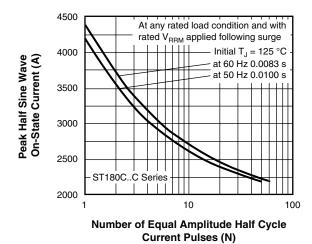


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

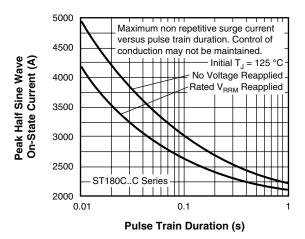


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

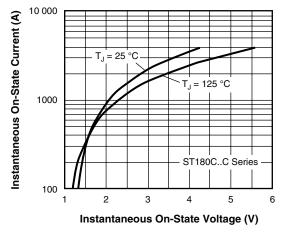


Fig. 9 - On-State Voltage Drop Characteristics

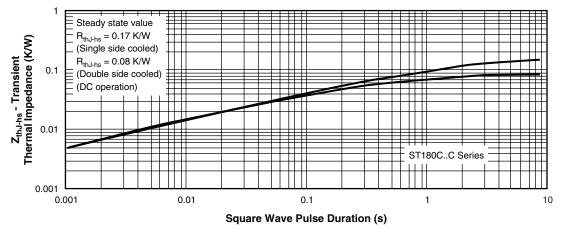


Fig. 10 - Thermal Impedance $Z_{thJ\text{-}hs}$ Characteristics

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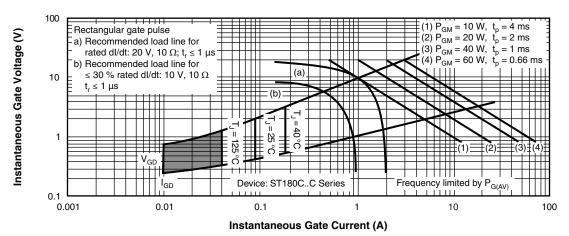
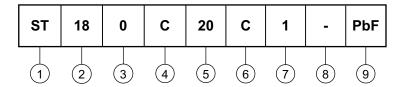


Fig. 11 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code



1 - Thyristor

2 - Essential part number

3 - 0 = Converter grade

4 - C = Ceramic PUK

5 - Voltage code x 100 = V_{RRM} (see Voltage Ratings 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 = 500 V/µs (standard selection)

• L = 1000 V/µs (special selection)

9 - Lead (Pb)-free

| LINKS TO RELATED DOCUMENTS | | | |
|----------------------------|---------------------------------|--|--|
| Dimensions | http://www.vishay.com/doc?95074 | | |



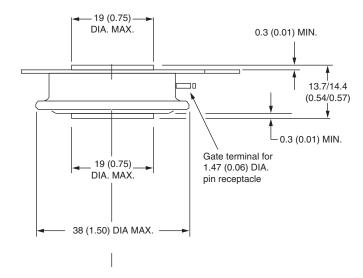
Vishay Semiconductors

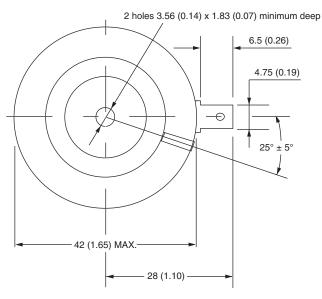
TO-200AB (A-PUK)

DIMENSIONS in millimeters (inches)

Anode to gate

Creepage distance: 7.62 (0.30) minimum Strike distance: 7.12 (0.28) minimum





Quote between upper and lower pole pieces has to be considered after application of mounting force (see thermal and mechanical specification)



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