

Phase Control Thyristors (Hockey PUK Version), 720 A



TO-200AB (E-PUK)

FEATURES

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case TO-200AB (E-PUK)
- Lead (Pb)-free
- Designed and qualified for industrial level


RoHS
COMPLIANT

TYPICAL APPLICATIONS

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

PRODUCT SUMMARY

| | |
|-------------|-------|
| $I_{T(AV)}$ | 720 A |
|-------------|-------|

MAJOR RATINGS AND CHARACTERISTICS

| PARAMETER | TEST CONDITIONS | VALUES | UNITS |
|-------------------|-----------------|-------------|-------------------|
| $I_{T(AV)}$ | | 720 | A |
| | T_{hs} | 55 | °C |
| $I_{T(RMS)}$ | | 1420 | A |
| | T_{hs} | 25 | °C |
| I_{TSM} | 50 Hz | 9000 | A |
| | 60 Hz | 9420 | |
| I^2t | 50 Hz | 405 | kA ² s |
| | 60 Hz | 370 | |
| V_{DRM}/V_{RRM} | | 400 to 1600 | V |
| t_q | Typical | 100 | μs |
| T_J | | - 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 |
|-------------|--------------|--|--|--|
| ST330C..C | 04 | 400 | 500 | 50 |
| | 08 | 800 | 900 | |
| | 12 | 1200 | 1300 | |
| | 14 | 1400 | 1500 | |
| | 16 | 1600 | 1700 | |

| ABSOLUTE MAXIMUM RATINGS | | | | | | |
|--|---------------------|---|----------------------------------|---|-----------|--------------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | | VALUES | UNITS |
| Maximum average on-state current at heatsink temperature | I _{T(AV)} | 180° conduction, half sine wave double side (single side) cooled | | | 720 (350) | A |
| | | | | | 55 (75) | °C |
| Maximum RMS on-state current | I _{T(RMS)} | DC at 25 °C heatsink temperature double side cooled | | | 1420 | A |
| Maximum peak, one-cycle non-repetitive surge current | I _{TSM} | t = 10 ms | No voltage reapplied | Sinusoidal half wave, initial T _J = T _J maximum | 9000 | |
| | | t = 8.3 ms | | | 9420 | |
| | | t = 10 ms | 100 % V _{RRM} reapplied | | 7570 | |
| | | t = 8.3 ms | | | 7920 | |
| Maximum I ² t for fusing | I ² t | t = 10 ms | No voltage reapplied | | 405 | kA ² s |
| | | t = 8.3 ms | | 370 | | |
| | | t = 10 ms | 100 % V _{RRM} reapplied | 287 | | |
| | | t = 8.3 ms | | 262 | | |
| Maximum I ² √t for fusing | I ² √t | t = 0.1 to 10 ms, no voltage reapplied | | | 4050 | kA ² /s |
| Low level value of threshold voltage | V _{T(TO)1} | (16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum | | | 0.91 | V |
| High level value of threshold voltage | V _{T(TO)2} | (I > π × I _{T(AV)}), T _J = T _J maximum | | | 0.92 | |
| Low level value of on-state slope resistance | r _{t1} | (16.7 % × π × I _{T(AV)}) < I < π × I _{T(AV)} , T _J = T _J maximum | | | 0.58 | mΩ |
| High level value of on-state slope resistance | r _{t2} | (I > π × I _{T(AV)}), T _J = T _J maximum | | | 0.57 | |
| Maximum on-state voltage | V _{TM} | I _{pk} = 1810 A, T _J = T _J maximum, t _p = 10 ms sine pulse | | | 1.96 | V |
| Maximum holding current | I _H | T _J = 25 °C, anode supply 12 V resistive load | | | 600 | mA |
| Typical latching current | I _L | | | | 1000 | |

| 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, $t_r \leq 1$ μs $T_J = T_J$ maximum, anode voltage ≤ 80 % V_{DRM} | 1000 | A/μs |
| Typical delay time | t_d | Gate current 1 A, $di_g/dt = 1$ A/μs $V_d = 0.67$ % V_{DRM} , $T_J = 25$ °C | 1.0 | μs |
| Typical turn-off time | t_q | $I_{TM} = 550$ A, $T_J = T_J$ maximum, $di/dt = 40$ A/μs, $V_R = 50$ V, $dV/dt = 20$ V/μs, gate 0 V 100 Ω, $t_p = 500$ μs | 100 | |

| 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 | 50 | mA |



| TRIGGERING | | | | | | |
|-------------------------------------|--------------------|--|---|--------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | | UNITS |
| | | | | TYP. | MAX. | |
| Maximum peak gate power | P _{GM} | T _J = T _J maximum, t _p ≤ 5 ms | | 10.0 | | W |
| Maximum average gate power | P _{G(AV)} | T _J = T _J maximum, f = 50 Hz, d% = 50 | | 2.0 | | |
| Maximum peak positive gate current | I _{GM} | T _J = T _J maximum, t _p ≤ 5 ms | | 3.0 | | A |
| Maximum peak positive gate voltage | + V _{GM} | T _J = T _J maximum, t _p ≤ 5 ms | | 20 | | V |
| Maximum peak negative gate voltage | - V _{GM} | | | 5.0 | | |
| DC gate current required to trigger | I _{GT} | T _J = - 40 °C | Maximum required gate trigger/ current/voltage are the lowest value which will trigger all units 12 V anode to cathode applied | 200 | - | mA |
| | | T _J = 25 °C | | 100 | 200 | |
| | | T _J = 125 °C | | 50 | - | |
| DC gate voltage required to trigger | V _{GT} | T _J = - 40 °C | | 2.5 | - | V |
| | | T _J = 25 °C | | 1.8 | 3.0 | |
| | | T _J = 125 °C | | 1.1 | - | |
| DC gate current not to trigger | I _{GD} | T _J = T _J maximum | Maximum gate current/voltage not to trigger is the maximum value which will not trigger any unit with rated V _{DRM} anode to cathode applied | 10 | | mA |
| DC gate voltage not to trigger | V _{GD} | | | 0.25 | | V |

| THERMAL AND MECHANICAL SPECIFICATIONS | | | | | |
|--|--------------|---|--|------------------|-----------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
| Maximum operating junction temperature range | T_J | | | - 40 to 125 | °C |
| Maximum storage temperature range | T_{Stg} | | | - 40 to 150 | |
| Maximum thermal resistance, junction to heatsink | R_{thJ-hs} | DC operation single side cooled | | 0.09 | K/W |
| | | DC operation double side cooled | | 0.04 | |
| Maximum thermal resistance, case to heatsink | R_{thC-hs} | DC operation single side cooled | | 0.02 | |
| | | DC operation double side cooled | | 0.01 | |
| Mounting force, ± 10 % | | | | 9800 (1000) | N (kg) |
| Approximate weight | | | | 83 | g |
| Case style | | See dimensions - link at the end of datasheet | | TO-200AB (E-PUK) | |

| ΔR_{thJ-hs} CONDUCTION | | | | | | |
|--------------------------------|-----------------------|-------------|------------------------|-------------|---------------------|-------|
| CONDUCTION ANGLE | SINUSOIDAL CONDUCTION | | RECTANGULAR CONDUCTION | | TEST CONDITIONS | UNITS |
| | SINGLE SIDE | DOUBLE SIDE | SINGLE SIDE | DOUBLE SIDE | | |
| 180° | 0.012 | 0.011 | 0.008 | 0.007 | $T_J = T_J$ maximum | K/W |
| 120° | 0.014 | 0.012 | 0.014 | 0.013 | | |
| 90° | 0.017 | 0.015 | 0.019 | 0.017 | | |
| 60° | 0.025 | 0.022 | 0.026 | 0.023 | | |
| 30° | 0.043 | 0.036 | 0.043 | 0.037 | | |

Note

- The table above shows the increment of thermal resistance R_{thJ-hs} when devices operate at different conduction angles than DC

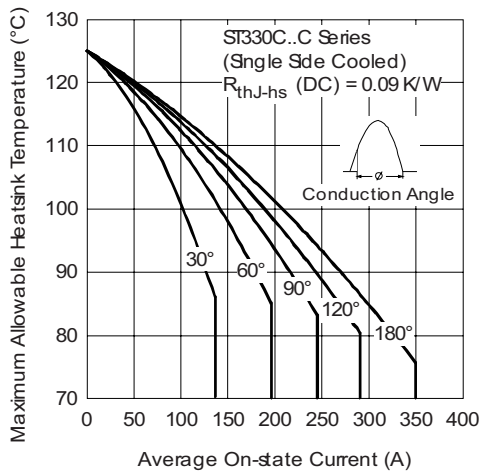


Fig. 1 - Current Ratings Characteristics

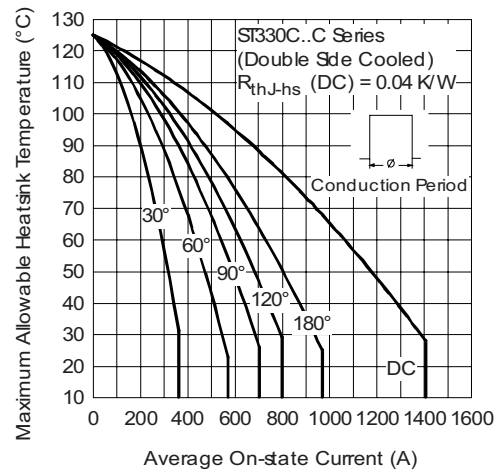


Fig. 4 - Current Ratings Characteristics

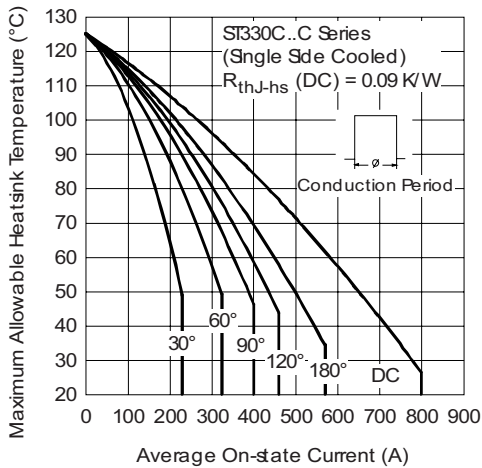


Fig. 2 - Current Ratings Characteristics

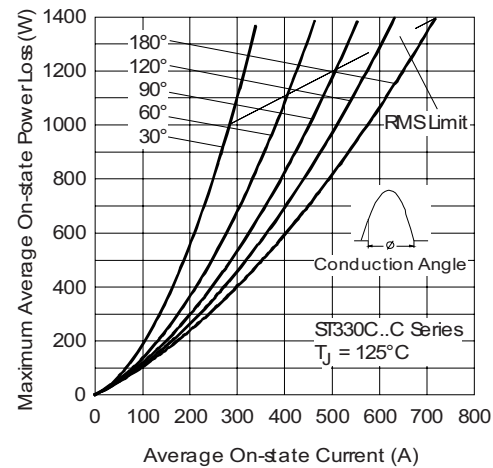


Fig. 5 - On-State Power Loss Characteristics

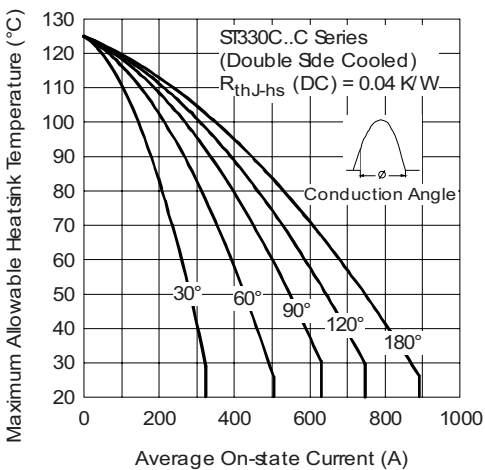


Fig. 3 - Current Ratings Characteristics

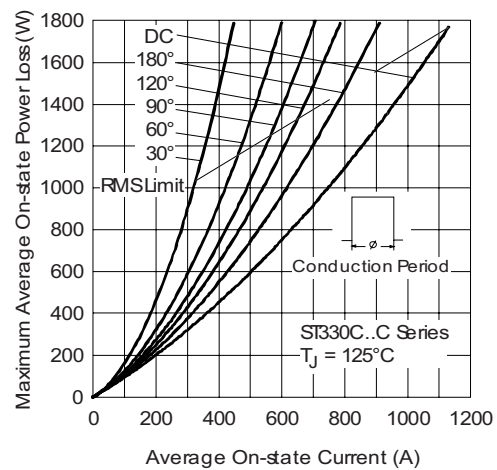


Fig. 6 - On-State Power Loss Characteristics

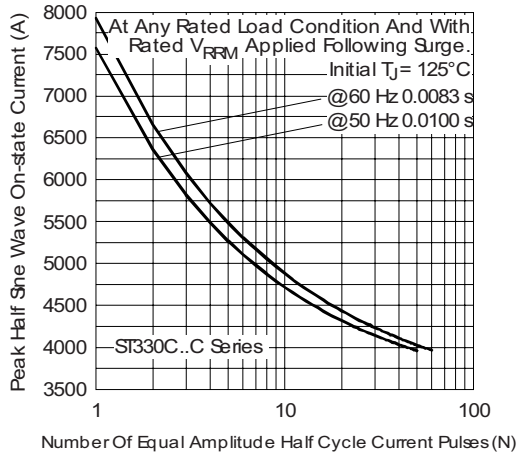


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

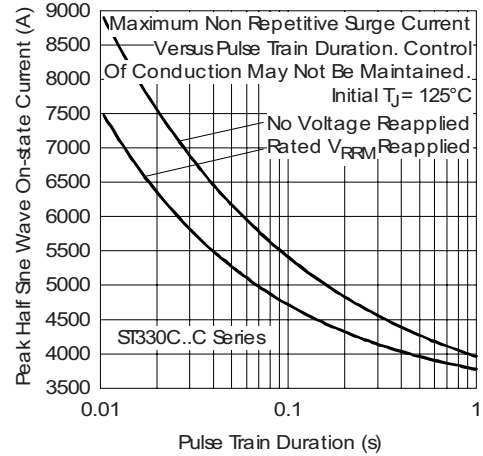


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

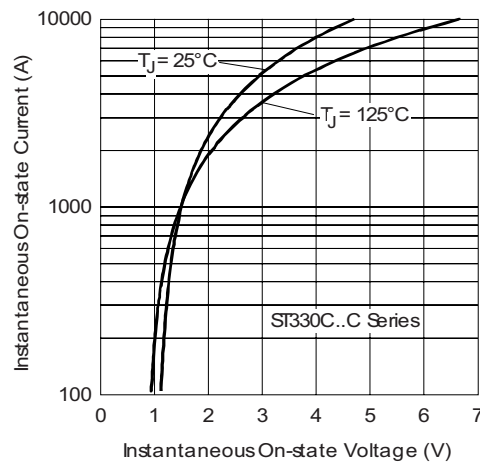


Fig. 9 - On-State Voltage Drop Characteristics

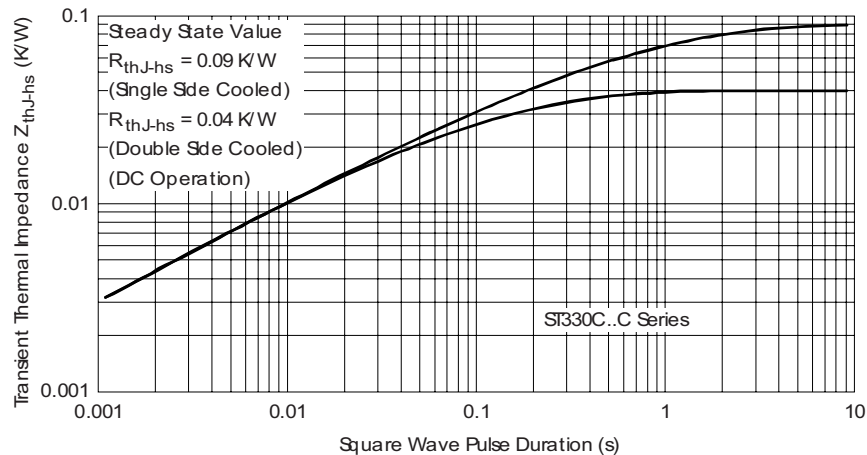


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

ST330CPbF Series



Vishay High Power Products Phase Control Thyristors
(Hockey PUK Version), 720 A

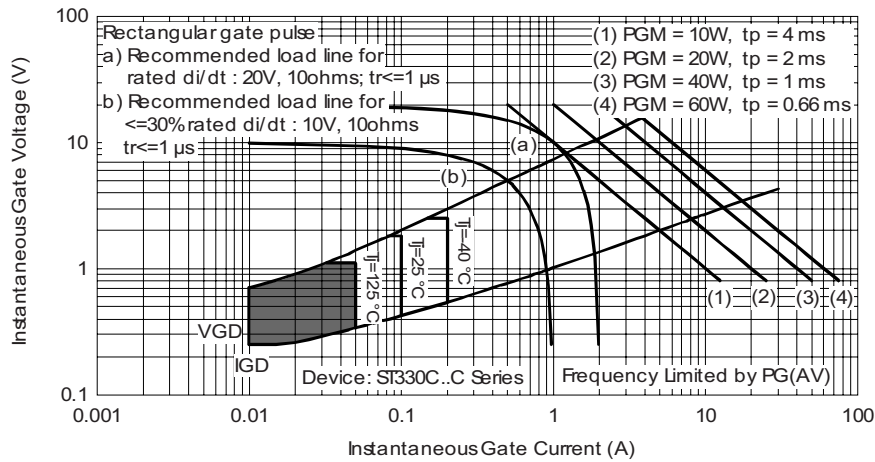


Fig. 11 - Gate Characteristics

ORDERING INFORMATION TABLE

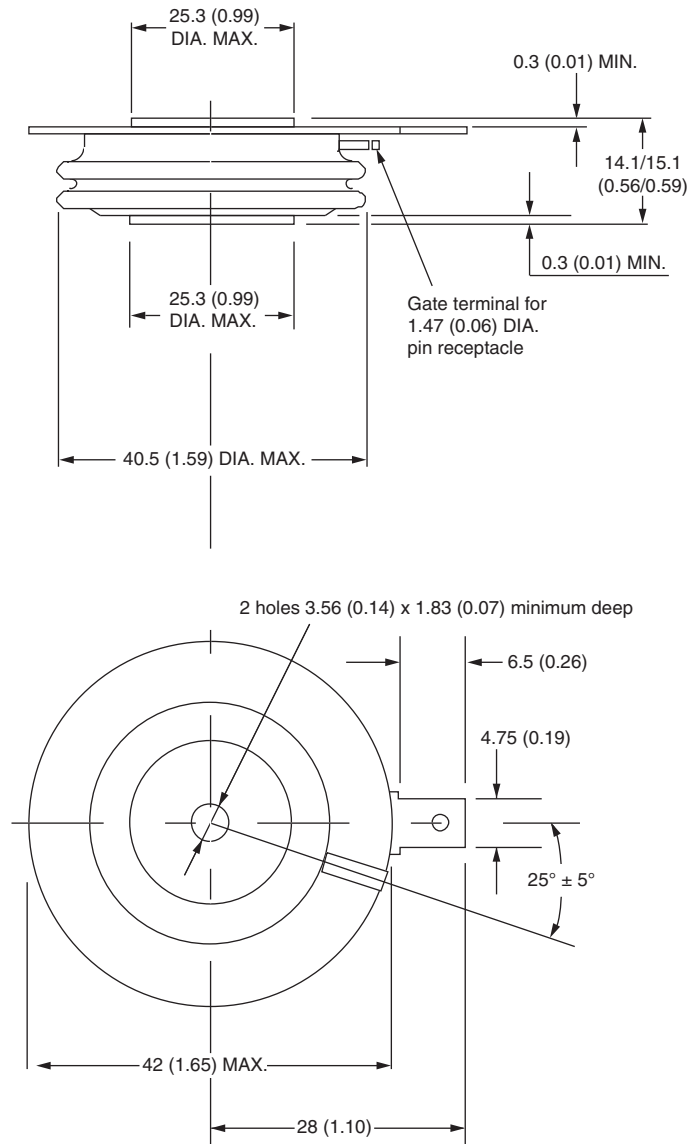
| Device code | ST | 33 | 0 | C | 16 | C | 1 | - | PbF |
|-------------|--|----|---|---|----|---|---|---|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | - Thyristor | | | | | | | | |
| 2 | - Essential part number | | | | | | | | |
| 3 | - 0 = Converter grade | | | | | | | | |
| 4 | - C = Ceramic PUK | | | | | | | | |
| 5 | - Voltage code x 100 = V_{RRM} (see Voltage Ratings table) | | | | | | | | |
| 6 | - C = PUK case TO-200AB (E-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?95075 |

TO-200AB (E-PUK)

DIMENSIONS in millimeters (inches)

Anode to gate
Creepage distance: 11.18 (0.44) minimum
Strike distance: 7.62 (0.30) 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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