

PHASE CONTROL THYRISTORS

Hockey Puk Version

Features

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

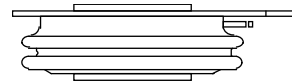
Typical Applications

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

Major Ratings and Characteristics

| Parameters | ST330C..C | Units | |
|-------------------|-------------|-------|-------------------|
| $I_{T(AV)}$ | 720 | A | |
| @ T_{hs} | 55 | °C | |
| $I_{T(RMS)}$ | 1420 | A | |
| @ T_{hs} | 25 | °C | |
| I_{TSM} | @ 50Hz | 9000 | A |
| | @ 60Hz | 9420 | A |
| I^2t | @ 50Hz | 405 | KA ² s |
| | @ 60Hz | 370 | KA ² s |
| V_{DRM}/V_{RRM} | 400 to 1600 | V | |
| t_q typical | 100 | μs | |
| T_J | - 40 to 125 | °C | |

720A



case style TO-200AB (E-PUK)

ST330C..C Series

Bulletin I25155 rev. C 04/00

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 |
|-------------|--------------|---|--|---|
| ST330C..C | 04 | 400 | 500 | 50 |
| | 08 | 800 | 900 | |
| | 12 | 1200 | 1300 | |
| | 14 | 1400 | 1500 | |
| | 16 | 1600 | 1700 | |

On-state Conduction

| Parameter | ST330C..C | Units | Conditions | |
|---|-----------|--------------------|--|-----------------------|
| $I_{T(AV)}$ Max. average on-state current @ Heatsink temperature | 720 (350) | A | 180° conduction, half sine wave | |
| | 55 (75) | °C | double side (single side) cooled | |
| $I_{T(RMS)}$ Max. RMS on-state current | 1420 | A | DC @ 25°C heatsink temperature double side cooled | |
| I_{TSM} Max. peak, one-cycle non-repetitive surge current | 9000 | | t = 10ms | No voltage reappplied |
| | 9420 | | t = 8.3ms | reappplied |
| | 7570 | | t = 10ms | 100% V_{RRM} |
| | 7920 | | t = 8.3ms | reappplied |
| I^2t Maximum I^2t for fusing | 405 | KA ² s | t = 10ms | No voltage reappplied |
| | 370 | | t = 8.3ms | reappplied |
| | 287 | | t = 10ms | 100% V_{RRM} |
| | 262 | | t = 8.3ms | reappplied |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing | 4050 | KA ² √s | t = 0.1 to 10ms, no voltage reappplied | |
| $V_{T(TO)1}$ Low level value of threshold voltage | 0.91 | V | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ max. | |
| $V_{T(TO)2}$ High level value of threshold voltage | 0.92 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max. | |
| r_{t1} Low level value of on-state slope resistance | 0.58 | mΩ | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ max. | |
| r_{t2} High level value of on-state slope resistance | 0.57 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max. | |
| V_{TM} Max. on-state voltage | 1.96 | V | $I_{pk} = 1810A$, $T_J = T_J$ max, $t_p = 10ms$ sine pulse | |
| I_H Maximum holding current | 600 | mA | $T_J = 25^\circ C$, anode supply 12V resistive load | |
| I_L Typical latching current | 1000 | | | |

Switching

| Parameter | ST330C..C | Units | Conditions |
|---|-----------|-------|--|
| di/dt Max. non-repetitive rate of rise of turned-on current | 1000 | A/μs | Gate drive 20V, 20Ω, $t_r \leq 1\mu s$ $T_J = T_J$ max, anode voltage $\leq 80\% V_{DRM}$ |
| t_d Typical delay time | 1.0 | μs | Gate current 1A, $di_g/dt = 1A/\mu s$ $V_d = 0.67\% V_{DRM}$, $T_J = 25^\circ C$ |
| t_q Typical turn-off time | 100 | | $I_{TM} = 550A$, $T_J = T_J$ max, $di/dt = 40A/\mu s$, $V_R = 50V$ $dv/dt = 20V/\mu s$, Gate 0V 100Ω, $t_p = 500\mu s$ |

Blocking

| Parameter | ST330C..C | Units | Conditions |
|--|-----------|------------|--|
| dv/dt Maximum critical rate of rise of off-state voltage | 500 | V/ μ s | $T_J = T_J$ max. linear to 80% rated V_{DRM} |
| I_{RRM} I_{DRM} Max. peak reverse and off-state leakage current | 50 | mA | $T_J = T_J$ max, rated V_{DRM}/V_{RRM} applied |

Triggering

| Parameter | ST330C..C | Units | Conditions |
|--|-----------|-------|---|
| P_{GM} Maximum peak gate power | 10.0 | W | $T_J = T_J$ max, $t_p \leq 5$ ms |
| $P_{G(AV)}$ Maximum average gate power | 2.0 | | $T_J = T_J$ max, $f = 50$ Hz, $d\% = 50$ |
| I_{GM} Max. peak positive gate current | 3.0 | A | $T_J = T_J$ max, $t_p \leq 5$ ms |
| $+V_{GM}$ Maximum peak positive gate voltage | 20 | V | $T_J = T_J$ max, $t_p \leq 5$ ms |
| $-V_{GM}$ Maximum peak negative gate voltage | 5.0 | | |
| I_{GT} DC gate current required to trigger | TYP. | MAX. | $T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied |
| | 200 | - | |
| | 100 | 200 | |
| V_{GT} DC gate voltage required to trigger | 2.5 | - | $T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ |
| | 1.8 | 3.0 | |
| | 1.1 | - | |
| 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 | |

Thermal and Mechanical Specification

| Parameter | ST330C..C | Units | Conditions |
|--|--------------------|------------------|---------------------------------|
| T_J Max. operating temperature range | -40 to 125 | $^\circ\text{C}$ | |
| T_{stg} Max. storage temperature range | -40 to 150 | | |
| R_{thJ-hs} Max. thermal resistance, junction to heatsink | 0.09 | K/W | DC operation single side cooled |
| | 0.04 | | DC operation double side cooled |
| R_{thC-hs} Max. thermal resistance, case to heatsink | 0.02 | K/W | DC operation single side cooled |
| | 0.01 | | DC operation double side cooled |
| F Mounting force, $\pm 10\%$ | 9800 | N | |
| | (1000) | (Kg) | |
| wt Approximate weight | 83 | g | |
| Case style | TO - 200AB (E-PUK) | | See Outline Table |

ST330C..C Series

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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° | 0.012 | 0.011 | 0.008 | 0.007 | K/W | $T_J = T_{J \text{ max.}}$ |
| 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 | | |

Ordering Information Table

| Device Code | | | | | | | |
|-------------|---|----------|---------------------------------|----------|--|----------|---|
| ST | 33 | 0 | C | 16 | C | 1 | |
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ |
| 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 (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 = 500V/ μ sec (Standard selection) L = 1000V/ μ sec (Special selection) |

Outline Table



Fig. 1 - Current Ratings Characteristics

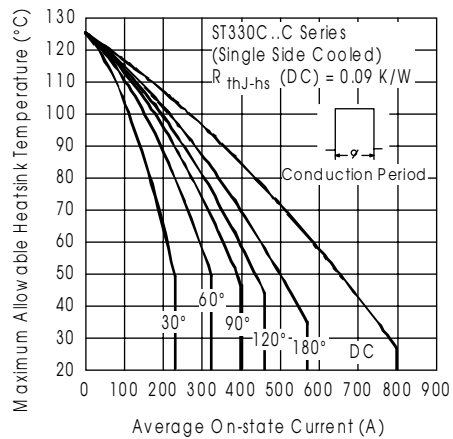


Fig. 2 - Current Ratings Characteristics

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Fig. 3 - Current Ratings Characteristics

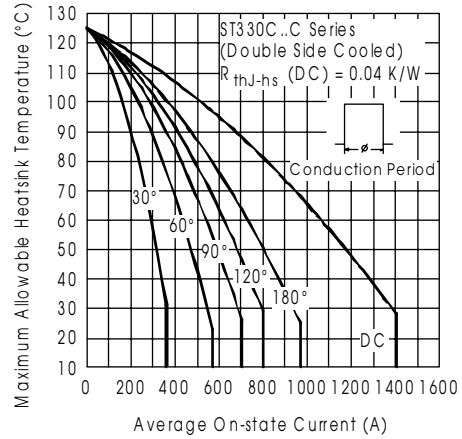


Fig. 4 - Current Ratings Characteristics



Fig. 5 - On-state Power Loss Characteristics

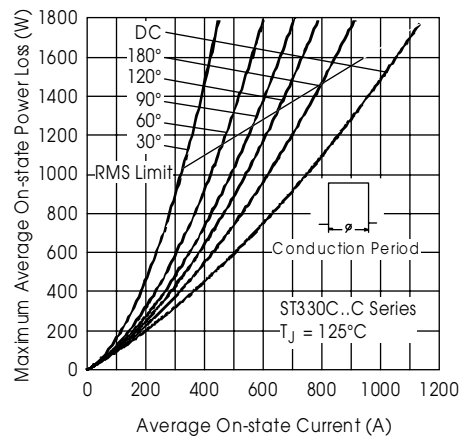


Fig. 6 - On-state Power Loss Characteristics



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



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

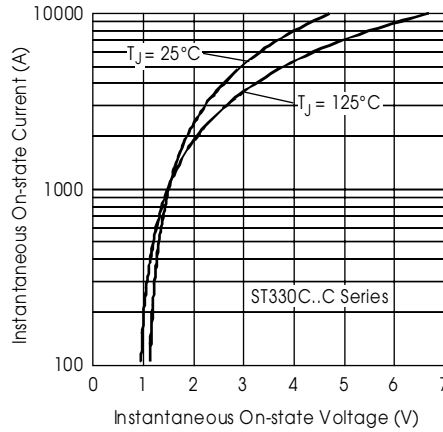


Fig. 9 - On-state Voltage Drop Characteristics



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

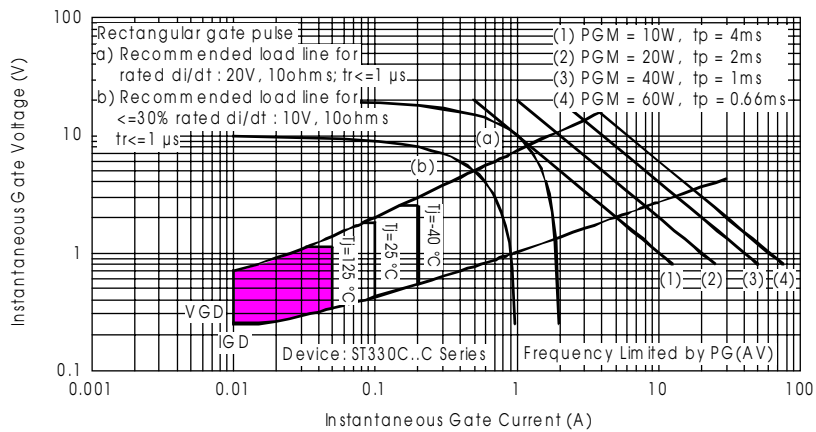


Fig. 11 - Gate Characteristics

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