

PHASE CONTROL THYRISTORS

Hockey Puk Version

Features

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

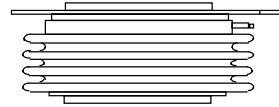
Typical Applications

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

Major Ratings and Characteristics

| Parameters | ST700C..L | Units |
|-------------------|-----------------|-------------------|
| $I_{T(AV)}$ | 910 | A |
| @ T_{hs} | 55 | °C |
| $I_{T(RMS)}$ | 1857 | A |
| @ T_{hs} | 25 | °C |
| I_{TSM} | @ 50Hz 15700 | A |
| | @ 60Hz 16400 | A |
| I^2t | @ 50Hz 1232 | KA ² s |
| | @ 60Hz 1125 | KA ² s |
| V_{DRM}/V_{RRM} | 1200 to 2000 | V |
| t_q typical | 150 | μs |
| T_J | - 40 to 125 | °C |

910A



case style TO-200AC (B-PUK)

ST700C..L Series

Bulletin I25190 rev.D 04/00

International
IR 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. @ $T_J = T_J \text{ max}$ mA |
|-------------|--------------|---|--|---|
| ST700C..L | 12 | 1200 | 1300 | 80 |
| | 16 | 1600 | 1700 | |
| | 18 | 1800 | 1900 | |
| | 20 | 2000 | 2100 | |

On-state Conduction

| Parameter | ST700C..L | Units | Conditions | | |
|--|-----------|--------------------|---|----------------|--|
| $I_{T(AV)}$ Max. average on-state current @ Heatsink temperature | 910 (355) | A | 180° conduction, half sine wave double side (single side) cooled | | |
| | 55 (85) | °C | | | |
| $I_{T(RMS)}$ Max. RMS on-state current | 1857 | A | DC @ 25°C heatsink temperature double side cooled | | |
| I_{TSM} Max. peak, one-cycle non-repetitive surge current | 15700 | | t = 10ms | No voltage | |
| | 16400 | | t = 8.3ms | reapplied | |
| | 13200 | | t = 10ms | 100% V_{RRM} | |
| | 13800 | t = 8.3ms | reapplied | | |
| I^2t Maximum I^2t for fusing | 1232 | KA ² s | t = 10ms | No voltage | Sinusoidal half wave, Initial $T_J = T_J \text{ max}$. |
| | 1125 | | t = 8.3ms | reapplied | |
| | 871 | | t = 10ms | 100% V_{RRM} | |
| | 795 | | t = 8.3ms | reapplied | |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing | 12321 | KA ² /s | t = 0.1 to 10ms, no voltage reapplied | | |
| $V_{T(TO)1}$ Low level value of threshold voltage | 1.00 | V | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J \text{ max}$. | | |
| $V_{T(TO)2}$ High level value of threshold voltage | 1.13 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_J \text{ max}$. | | |
| r_{t1} Low level value of on-state slope resistance | 0.40 | mΩ | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J \text{ max}$. | | |
| r_{t2} High level value of on-state slope resistance | 0.35 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_J \text{ max}$. | | |
| V_{TM} Max. on-state voltage | 1.80 | V | $I_{pk} = 2000A$, $T_J = T_J \text{ max}$, $t_p = 10ms$ 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 | ST700C..L | 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 _g = 0.67% V _{DRM} , T _J = 25°C |
| t _q Typical turn-off time | 150 | | I _{TM} = 750A, T _J = T _J max, di/dt = 60A/μs, V _R = 50V dv/dt = 20V/μs, Gate 0V 100Ω, t _p = 500μs |

Blocking

| Parameter | ST700C..L | 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 | 80 | mA | T _J = T _J max, rated V _{DRM} /V _{RRM} applied |

Triggering

| Parameter | ST700C..L | | Units | Conditions |
|---|-----------|------|-------|---|
| P _{GM} Maximum peak gate power | 10.0 | | 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 |
| | 200 | - | | |
| | 100 | 200 | | |
| V _{GT} DC gate voltage required to trigger | 2.5 | - | V | T _J = - 40°C T _J = 25°C T _J = 125°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 | |

ST700C..L Series

Bulletin I25190 rev. D 04/00

International
IR Rectifier

Thermal and Mechanical Specification

| Parameter | ST700C..L | 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 | 0.073 0.031 | K/W | DC operation single side cooled DC operation double side cooled |
| R_{thC-hs} Max. thermal resistance, case to heatsink | 0.011 0.006 | K/W | DC operation single side cooled DC operation double side cooled |
| F Mounting force, $\pm 10\%$ | 14700 (1500) | N (Kg) | |
| wt Approximate weight | 255 | g | |
| Case style | TO - 200AC (B-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° | 0.009 | 0.009 | 0.006 | 0.006 | K/W | $T_J = T_J \text{ max.}$ |
| 120° | 0.011 | 0.011 | 0.011 | 0.011 | | |
| 90° | 0.014 | 0.014 | 0.015 | 0.015 | | |
| 60° | 0.020 | 0.020 | 0.021 | 0.021 | | |
| 30° | 0.036 | 0.036 | 0.036 | 0.036 | | |

Ordering Information Table

| Device Code | | | | | | | |
|-------------|--|---|---|----|---|---|---|
| ST | 70 | 0 | C | 20 | L | 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 | - L = Puk Case TO-200AC (B-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

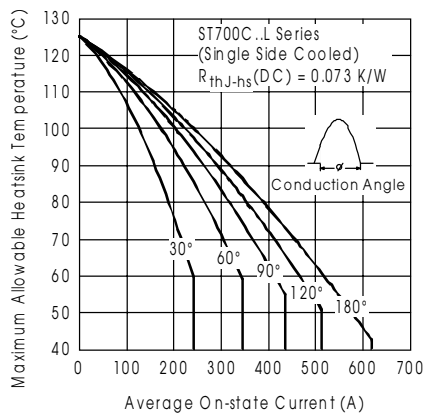
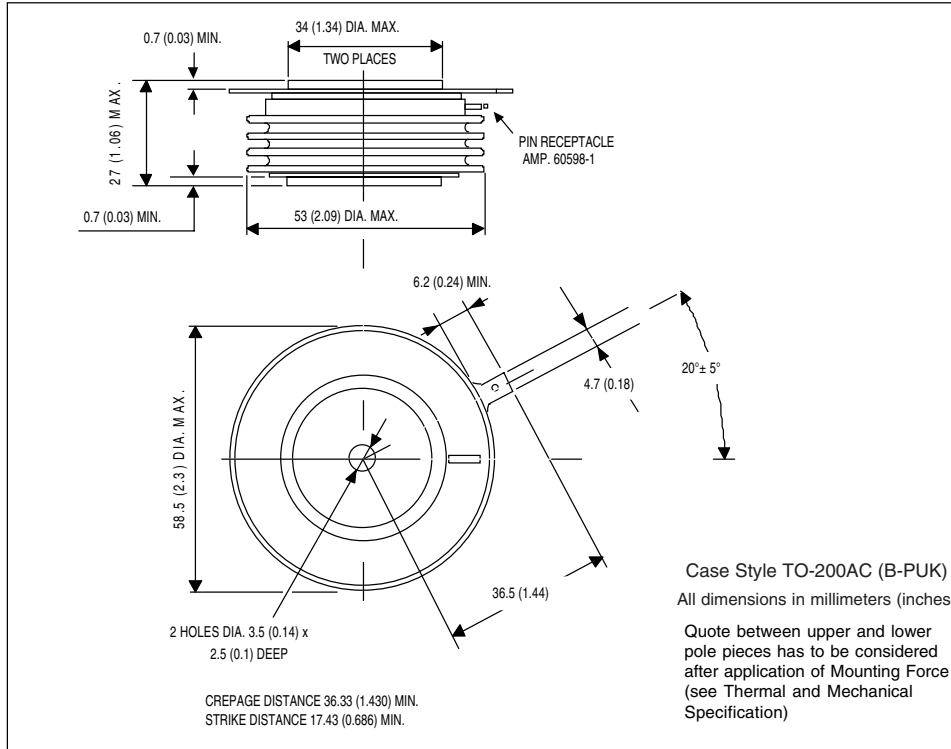


Fig. 1 - Current Ratings Characteristics

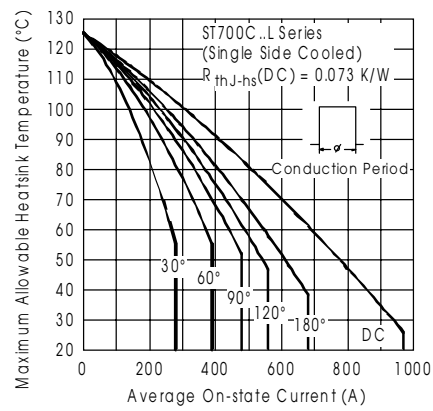


Fig. 2 - Current Ratings Characteristics

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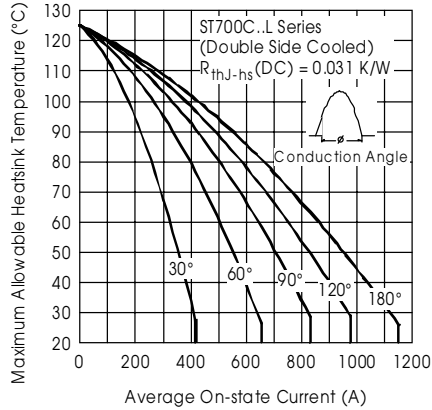


Fig. 3 - Current Ratings Characteristics

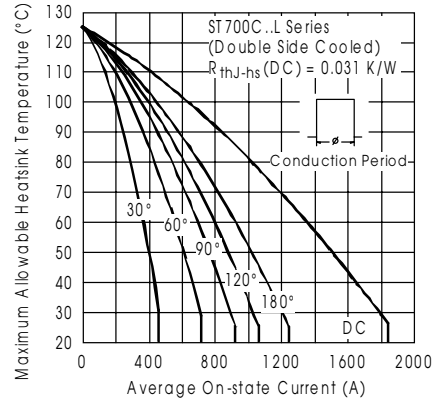


Fig. 4 - Current Ratings Characteristics

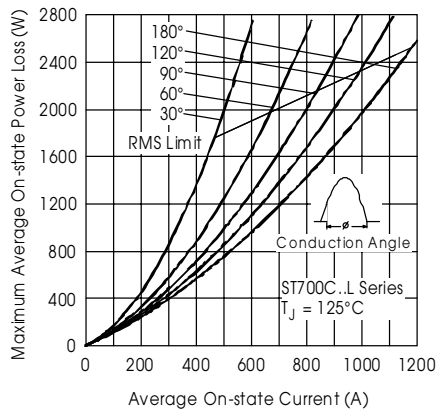


Fig. 5 - On-state Power Loss Characteristics

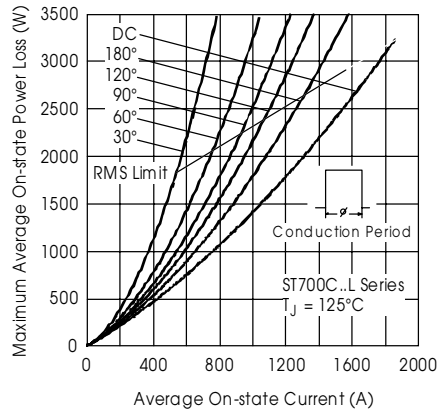


Fig. 6 - On-state Power Loss Characteristics

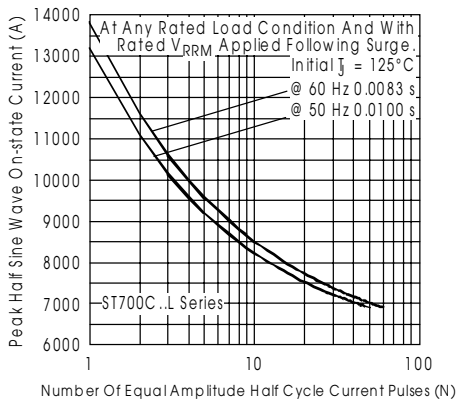


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

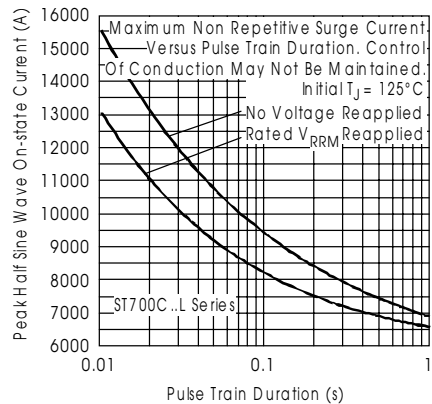


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

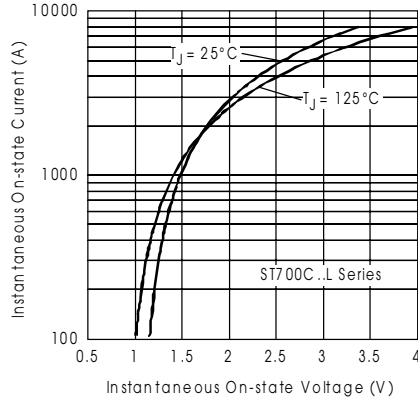


Fig. 9 - On-state Voltage Drop Characteristics

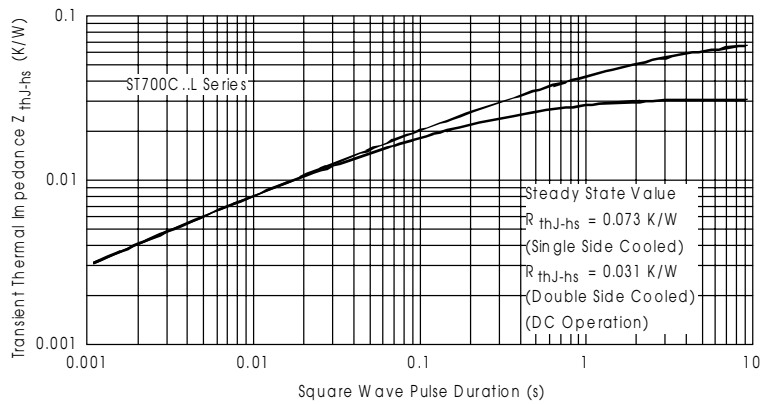


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

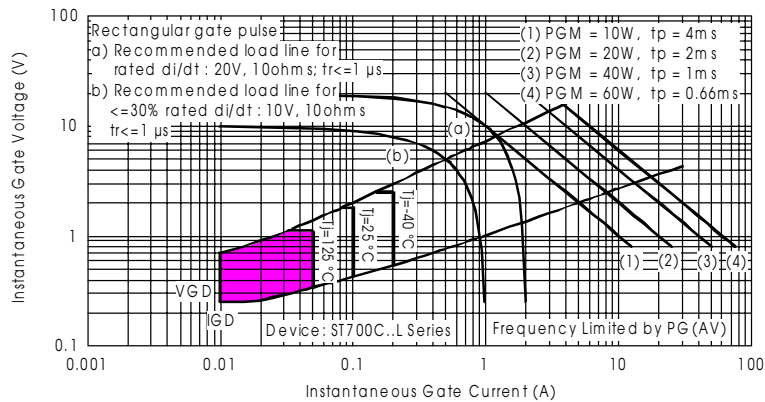


Fig. 11 - Gate Characteristics