

International
IR Rectifier

ST1280C..K SERIES

PHASE CONTROL THYRISTORS

Hockey Puk Version

Features

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case A-24 (K-PUK)
- High profile hockey-puk

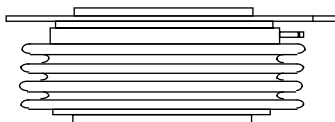
Typical Applications

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

Major Ratings and Characteristics

| Parameters | ST1280C..K | Units | |
|-------------------|-------------|-------|-------------------|
| $I_{T(AV)}$ | 2310 | A | |
| @ T_{hs} | 55 | °C | |
| $I_{T(RMS)}$ | 4150 | A | |
| @ T_{hs} | 25 | °C | |
| I_{TSM} | @ 50Hz | 42500 | A |
| | @ 60Hz | 44500 | A |
| I^2t | @ 50Hz | 9027 | KA ² s |
| | @ 60Hz | 8240 | KA ² s |
| V_{DRM}/V_{RRM} | 400 to 600 | V | |
| t_q | typical | 200 | μs |
| T_J | - 40 to 125 | °C | |

2310A



case style A-24 (K-PUK)

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Bulletin I25195 rev. B 02/00

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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 |
|-------------|--------------|---|--|---|
| ST1280C..K | 04 | 400 | 500 | 100 |
| | 06 | 600 | 700 | |

On-state Conduction

| Parameter | ST1280C..K | Units | Conditions | | |
|--|------------|--------------------|--|----------------|----------------|
| $I_{T(AV)}$ Max. average on-state current @ Heatsink temperature | 2310 (885) | A | 180° conduction, half sine wave double side (single side) cooled | | |
| | 55 (85) | °C | | | |
| $I_{T(RMS)}$ Max. RMS on-state current | 4150 | A | @ 25°C heatsink temperature double side cooled | | |
| I_{TSM} Max. peak, one-cycle non-repetitive surge current | 42500 | | t = 10ms | No voltage | |
| | 44500 | | t = 8.3ms | reapplied | |
| | 35700 | | t = 10ms | 100% V_{RRM} | |
| | 37400 | | t = 8.3ms | reapplied | |
| I^2t Maximum I^2t for fusing | 9027 | | KA ² s | t = 10ms | No voltage |
| | 8241 | | | t = 8.3ms | reapplied |
| | 6383 | | | t = 10ms | 100% V_{RRM} |
| | 5828 | t = 8.3ms | | reapplied | |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing | 90270 | KA ² √s | t = 0.1 to 10ms, no voltage reapplied | | |
| $V_{T(TO)1}$ Low level value of threshold voltage | 0.83 | 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 | 0.90 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max. | | |
| r_{t1} Low level value of on-state slope resistance | 0.077 | 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 | 0.068 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max. | | |
| V_{TM} Max. on-state voltage | 1.44 | V | $I_{pk} = 8000A$, $T_J = T_J$ 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 | ST1280C..K | 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 | 1.9 | 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 | 200 | | $I_{TM} = 550A$, $T_J = T_J$ max, $di/dt = 40A/\mu s$, $V_R = 50V$ $dv/dt = 20V/\mu s$, Gate 0V 100Ω, $t_p = 500\mu s$ |

Blocking

| Parameter | ST1280C..K | 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 | 100 | mA | $T_J = T_J$ max, rated V_{DRM}/V_{RRM} applied |

Triggering

| Parameter | ST1280C..K | Units | Conditions |
|--|------------|-------|---|
| P_{GM} Maximum peak gate power | 16 | W | $T_J = T_J$ max, $t_p \leq 5$ ms |
| $P_{G(AV)}$ Maximum average gate power | 3 | | $T_J = T_J$ 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 | 1.4 | - | $T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ |
| | 1.1 | 3.0 | |
| | 0.9 | - | |
| 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 | ST1280C..K | 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 | 0.042 0.021 | K/W | DC operation single side cooled DC operation double side cooled |
| R_{thC-hs} Max. thermal resistance, case to heatsink | 0.006 0.003 | K/W | DC operation single side cooled DC operation double side cooled |
| F Mounting force, $\pm 10\%$ | 24500 (2500) | N (Kg) | |
| wt Approximate weight | 425 | g | |
| Case style | A-24 (K-PUK) | | See Outline Table |

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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° | 0.003 | 0.003 | 0.002 | 0.002 | K/W | $T_J = T_{J \text{ max.}}$ |
| 120° | 0.004 | 0.004 | 0.004 | 0.004 | | |
| 90° | 0.005 | 0.005 | 0.005 | 0.005 | | |
| 60° | 0.007 | 0.007 | 0.007 | 0.007 | | |
| 30° | 0.012 | 0.012 | 0.012 | 0.012 | | |

Ordering Information Table

| Device Code | | | | | | | |
|-------------|---|----------|---|----------|--|---|--|
| ST | 128 | 0 | C | 06 | K | 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 | - K = Puk Case A-24(K-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) |
| 7 | - 1 = Fast-on terminals (Gate and Auxiliary Cathode Soldered Leads) | 3 | - 3 = Fast-on terminals (Gate and Auxiliary Cathode Soldered Leads) | 8 | - Critical dv/dt: None = 500V/μsec (Standard selection) | L = 1000V/μsec (Special selection) | |

Outline Table

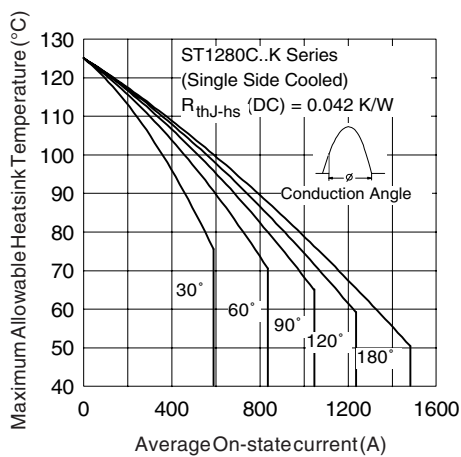
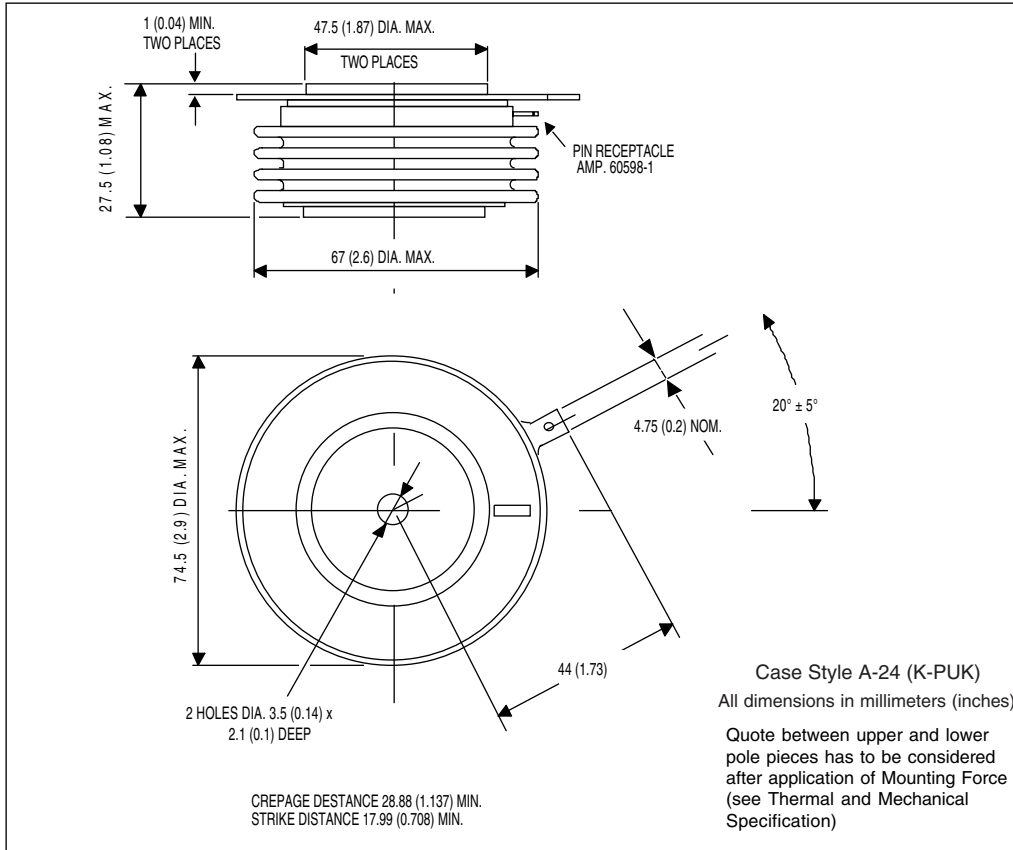


Fig. 1 - Current Ratings Characteristics

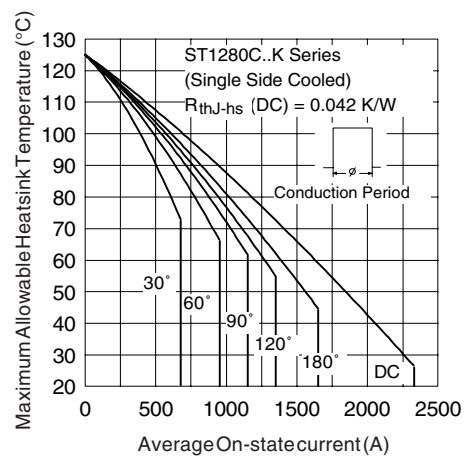


Fig. 2 - Current Ratings Characteristics

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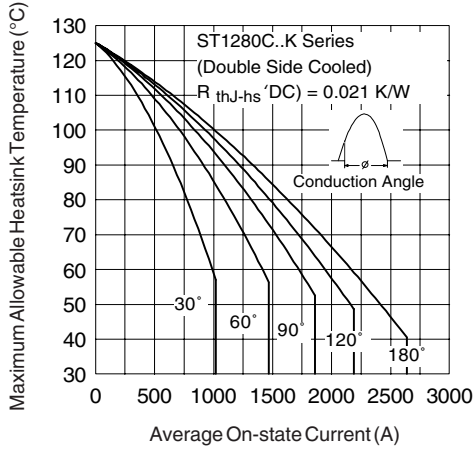


Fig. 3 - Current Ratings Characteristics

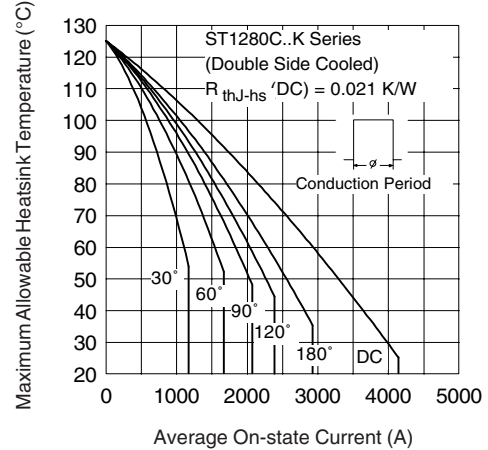


Fig. 4 - Current Ratings Characteristics

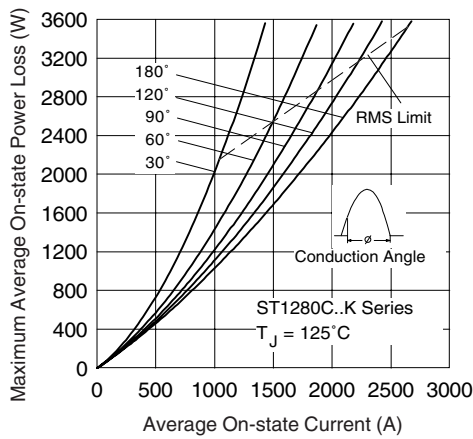


Fig. 5 - On-state Power Loss Characteristics

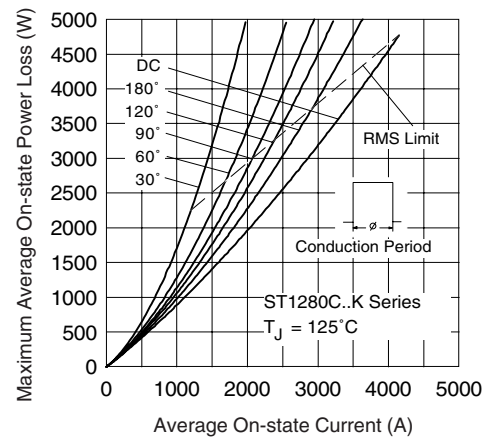


Fig. 6 - On-state Power Loss Characteristics

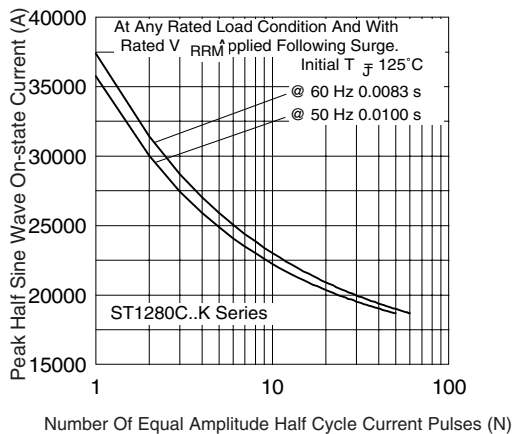


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

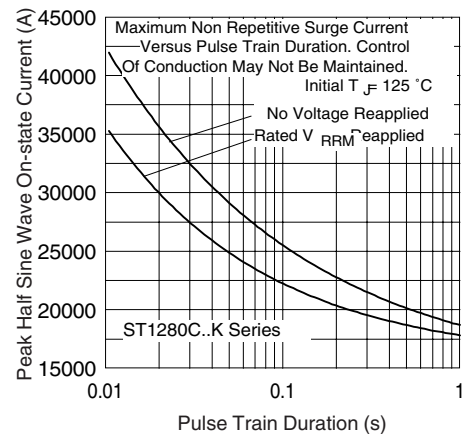


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

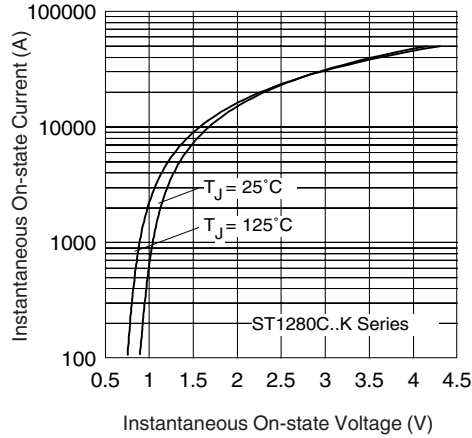


Fig. 9 - On-state Voltage Drop Characteristics

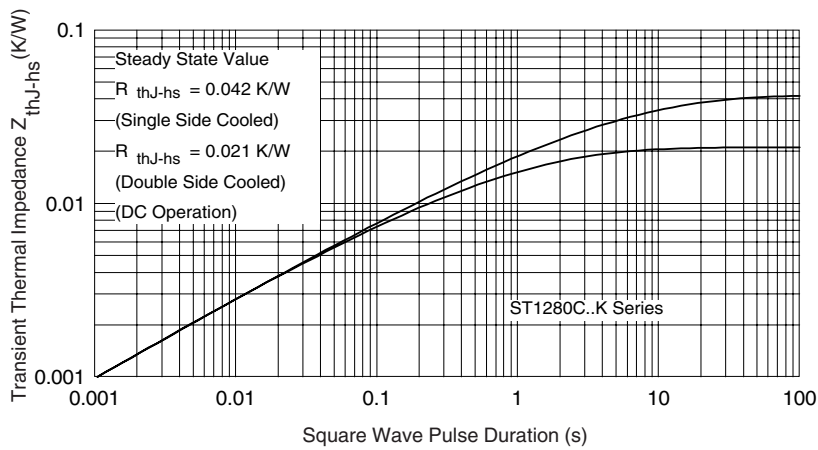


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

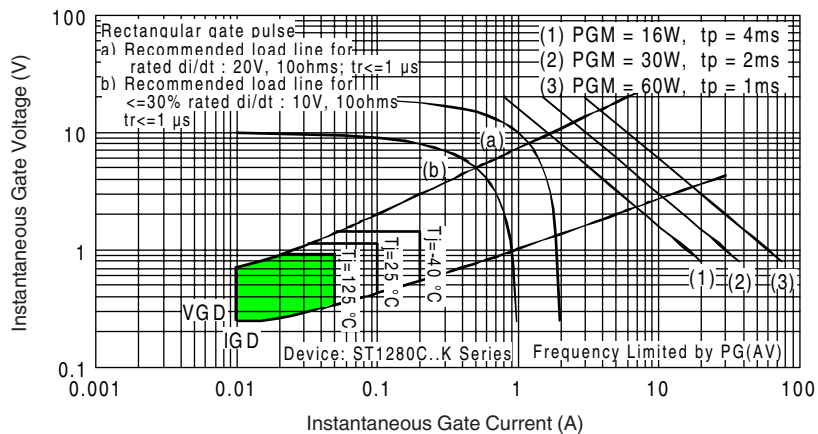


Fig. 11 - Gate Characteristics