POWERSEM

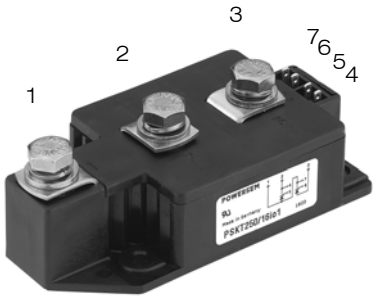
# Thyristor Modules
# Thyristor/Diode Modules

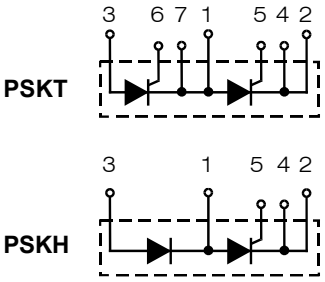
**PSKT 220**
**PSKH 220**

$I_{TRMS}$ = 2x 400 A
$I_{TAVM}$ = 2x 250 A
$V_{RRM}$ = 800-1600 V

Preliminary Data Sheet

| $V_{RSM}$ $V_{DSM}$ V | $V_{RRM}$ $V_{DRM}$ V | Type Version 1 | Version 1 |
|---|---|---|---|
| 900 | 800 | PSKT 220/08io1 | PSKH 220/08io1 |
| 1300 | 1200 | PSKT 220/12io1 | PSKH 220/12io1 |
| 1500 | 1400 | PSKT 220/14io1 | PSKH 220/14io1 |
| 1700 | 1600 | PSKT 220/16io1 | PSKH 220/16io1 |




| Symbol | Test Conditions | | Maximum Ratings | |
|---|---|---|---|---|
| $I_{TRMS}$, $I_{FRMS}$ | $T_{VJ} = T_{VJM}$ | | 400 | A |
| $I_{TAVM}$, $I_{FAVM}$ | $T_C$ = 85°C; 180° sine | | 250 | A |
| $I_{TSM}$, $I_{FSM}$ | $T_{VJ}$ = 45°C; | t = 10 ms (50 Hz), sine | 8500 | A |
| | $V_R$ = 0 | t = 8.3 ms (60 Hz), sine | 9000 | A |
| | $T_{VJ} = T_{VJM}$ | t = 10 ms (50 Hz), sine | 7000 | A |
| | $V_R$ = 0 | t = 8.3 ms (60 Hz), sine | 7600 | A |
| $\int i^2dt$ | $T_{VJ}$ = 45°C | t = 10 ms (50 Hz), sine | 360 000 | $A^2s$ |
| | $V_R$ = 0 | t = 8.3 ms (60 Hz), sine | 336 000 | $A^2s$ |
| | $T_{VJ} = T_{VJM}$ | t = 10 ms (50 Hz), sine | 245 000 | $A^2s$ |
| | $V_R$ = 0 | t = 8.3 ms (60 Hz), sine | 240 000 | $A^2s$ |
| $(di/dt)_{cr}$ | $T_{VJ} = T_{VJM}$ | repetitive, $I_T$ = 750 A | 100 | A/µs |
| | f =50 Hz, $t_P$ =200 µs | | | |
| | $V_D$ = 2/3 $V_{DRM}$ | | | |
| | $I_G$ = 1 A | non repetitive, $I_T$ = 250 A | 800 | A/µs |
| | $di_G/dt$ = 1 A/µs | | | |
| $(dv/dt)_{cr}$ | $T_{VJ} = T_{VJM}$; | $V_{DR}$ = 2/3 $V_{DRM}$ | 1000 | V/µs |
| | $R_{GK}$ = ∞; method 1 (linear voltage rise) | | | |
| $P_{GM}$ | $T_{VJ} = T_{VJM}$ | $t_P$ = 30 µs | 120 | W |
| | $I_T = I_{TAVM}$ | $t_P$ = 500 µs | 60 | W |
| $P_{GAV}$ | | | 20 | W |
| $V_{RGM}$ | | | 10 | V |
| $T_{VJ}$ | | | -40...+140 | °C |
| $T_{VJM}$ | | | 140 | °C |
| $T_{stg}$ | | | -40...+125 | °C |
| $V_{ISOL}$ | 50/60 Hz, RMS | t = 1 min | 3000 | V~ |
| | $I_{ISOL} \leq$ 1 mA | t = 1 s | 3600 | V~ |
| $M_d$ | Mounting torque (M5) | | 2.5-5/22-44 | Nm/lb.in. |
| | Terminal connection torque (M8) | | 12-15/106-132 | Nm/lb.in. |
| Weight | Typical including screws | | 320 | g |

### Features

- International standard package
- Direct copper bonded $Al_2O_3$ -ceramic base plate
- Planar passivated chips
- Isolation voltage 3600 V~
- UL registered, E 148688
- Keyed gate/cathode twin pins

### Applications

- Motor control
- Power converter
- Heat and temperature control for industrial furnaces and chemical processes
- Lighting control
- Contactless switches

### Advantages

- Space and weight savings
- Simple mounting with two screws
- Improved temperature and power cycling capability
- Reduced protection circuits

Data according to IEC 60747 and refer to a single thyristor/diode unless otherwise stated.

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| Symbol | Test Conditions | | Characteristic Values | |
|---|---|---|---|---|
| $I_{RRM}$ | $T_{VJ} = T_{VJM}$; $V_R = V_{RRM}$; $V_D = V_{DRM}$ | | 70 | mA |
| $I_{DRM}$ | | | 40 | mA |
| $V_T$, $V_F$ | $I_T$, $I_F$ = 600 A; $T_{VJ}$ = 25°C | | 1.53 | V |
| $V_{T0}$ | For power-loss calculations only ($T_{VJ}$ = 140°C) | | 0.9 | V |
| $r_T$ | | | 1.0 | mΩ |
| $V_{GT}$ | $V_D$ = 6 V; | $T_{VJ}$ = 25°C | 2 | V |
| | | $T_{VJ}$ = -40°C | 3 | V |
| $I_{GT}$ | $V_D$ = 6 V; | $T_{VJ}$ = 25°C | 150 | mA |
| | | $T_{VJ}$ = -40°C | 200 | mA |
| $V_{GD}$ | $T_{VJ} = T_{VJM}$; | $V_D$ = 2/3 $V_{DRM}$ | 0.25 | V |
| $I_{GD}$ | | | 10 | mA |
| $I_L$ | $T_{VJ}$ = 25°C; $t_P$ = 30 µs; $V_D$ = 6 V<br>$I_G$ = 0.45 A; $di_G/dt$ = 0.45 A/µs | | 200 | mA |
| $I_H$ | $T_{VJ}$ = 25°C; $V_D$ = 6 V; $R_{GK}$ = ∞ | | 150 | mA |
| $t_{gd}$ | $T_{VJ}$ = 25°C; $V_D$ = 1/2 $V_{DRM}$<br>$I_G$ = 1 A; $di_G/dt$ = 1 A/µs | | 2 | µs |
| $t_q$ | $T_{VJ} = T_{VJM}$; $I_T$ = 300 A, $t_P$ = 200 µs; -di/dt = 10 A/µs<br>$V_R$ = 100 V; dv/dt = 50 V/µs; $V_D$ = 2/3 $V_{DRM}$ | typ. | 200 | µs |
| $Q_S$ | $T_{VJ}$ = 125°C; $I_T$, $I_F$ = 400 A, -di/dt = 50 A/µs | | 760 | µC |
| $I_{RM}$ | | | 275 | A |
| $R_{thJC}$ | per thyristor/diode; DC current | other values see Fig. 8/9 | 0.139 | K/W |
| | per module | | 0.0695 | K/W |
| $R_{thJK}$ | per thyristor/diode; DC current | | 0.179 | K/W |
| | per module | | 0.0895 | K/W |
| $d_S$ | Creepage distance on surface | | 12.7 | mm |
| $d_A$ | Strike distance through air | | 9.6 | mm |
| a | Maximum allowable acceleration | | 50 | $m/s^2$ |

Optional accessories for modules
Keyed gate/cathode twin plugs with wire length = 350 mm, gate = yellow, cathode = red
Type **ZY 180L** (L = Left for pin pair 4/5) } UL 758, style 1385,
Type **ZY 180R** (R = right for pin pair 6/7) } CSA class 5851, guide 460-1-1

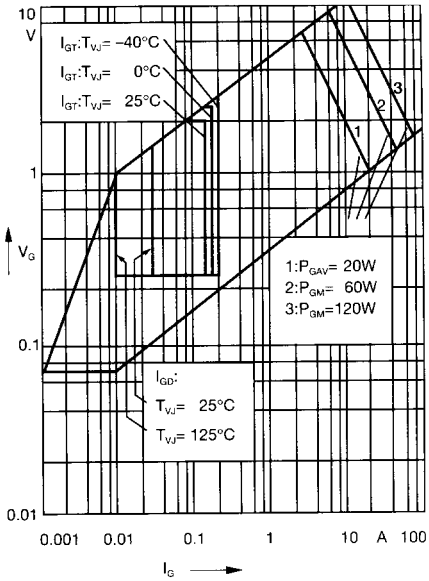


Fig. 1 Gate trigger characteristics

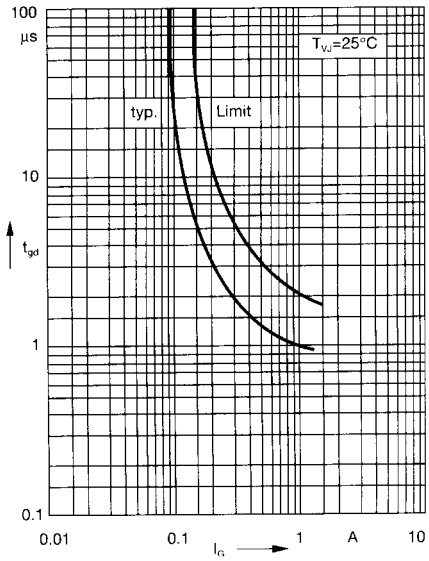
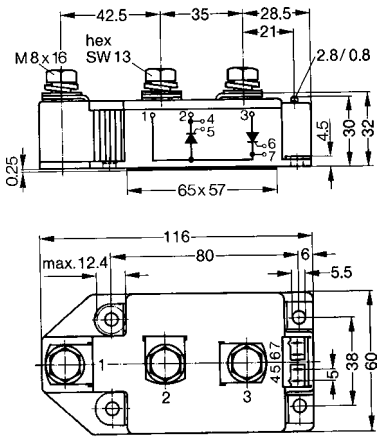


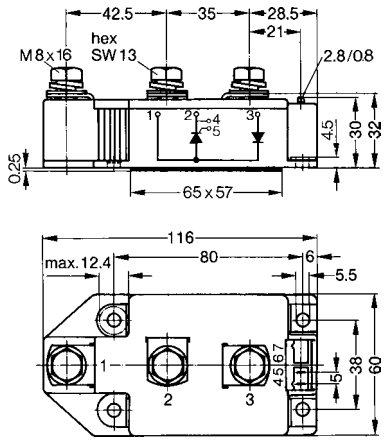
Fig. 2 Gate trigger delay time

**Dimensions in mm (1 mm = 0.0394")**

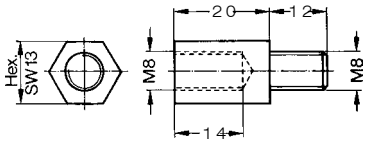
**PSKT**




**PSKH**




Threaded spacer for higher Anode/ Cathode construction:
Type **ZY 250**, material brass

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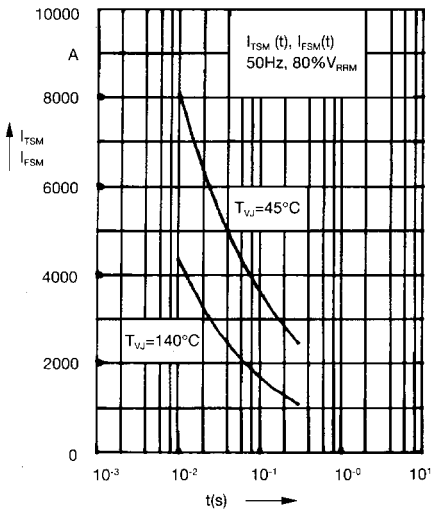


Fig. 3 Surge overload current
$I_{TSM}$, $I_{FSM}$: Crest value, t: duration

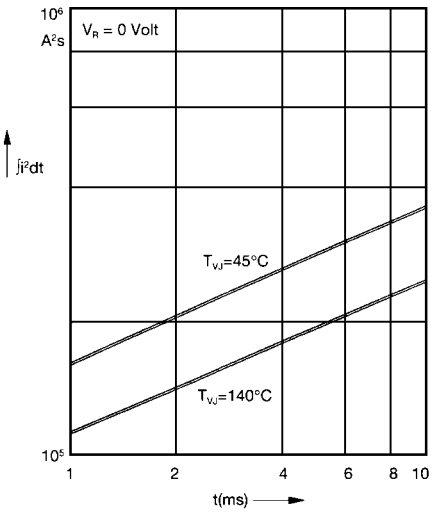


Fig. 4 $\int i^2dt$ versus time (1-10 ms)

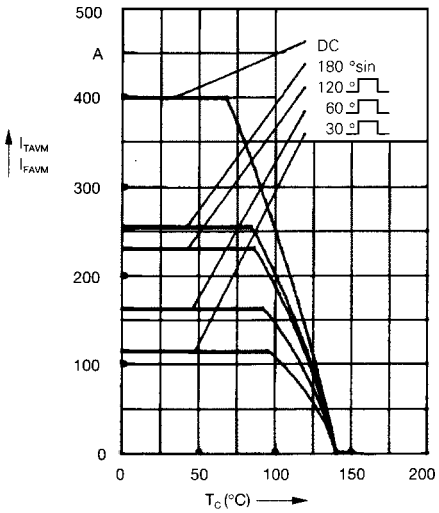


Fig. 4a Maximum forward current at case temperature

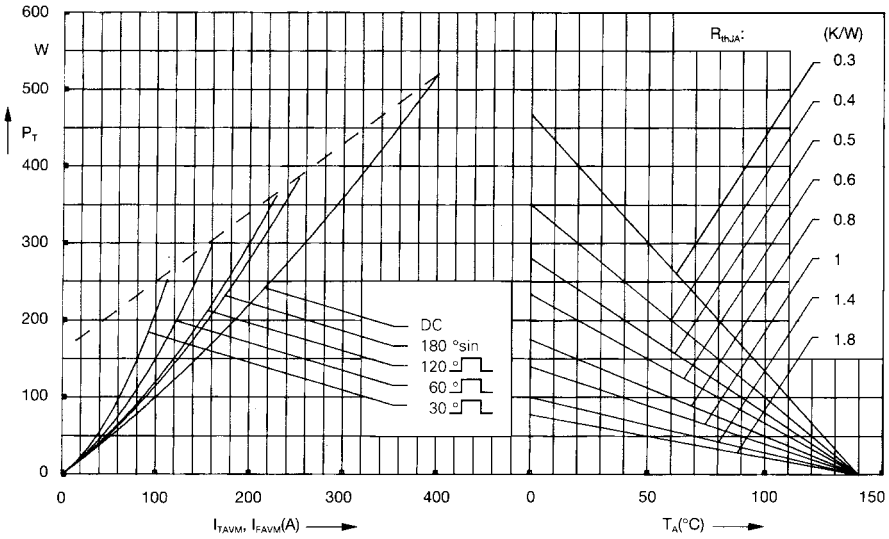


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

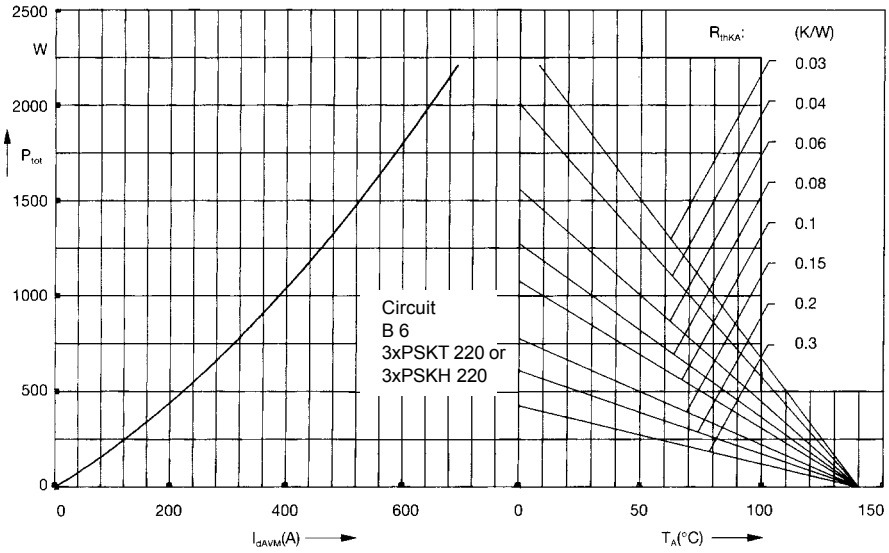


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

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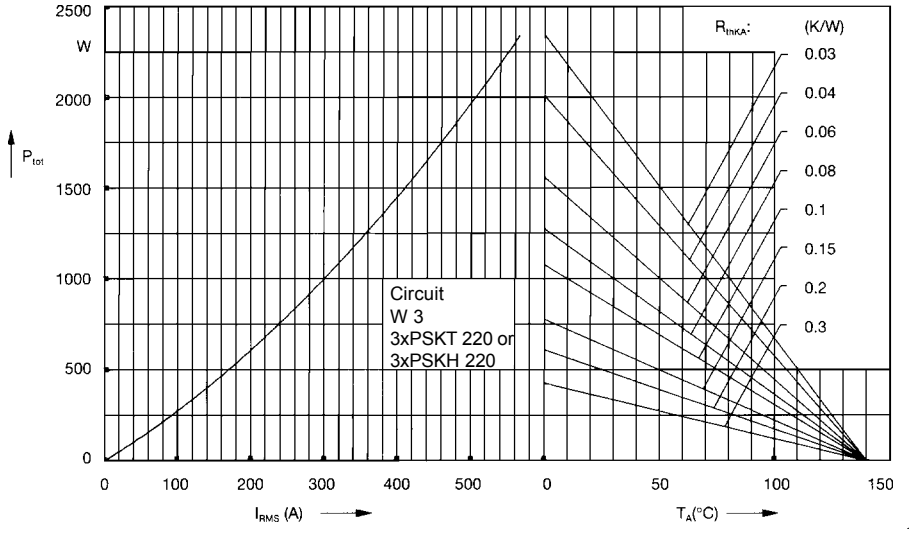


Fig. 7 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

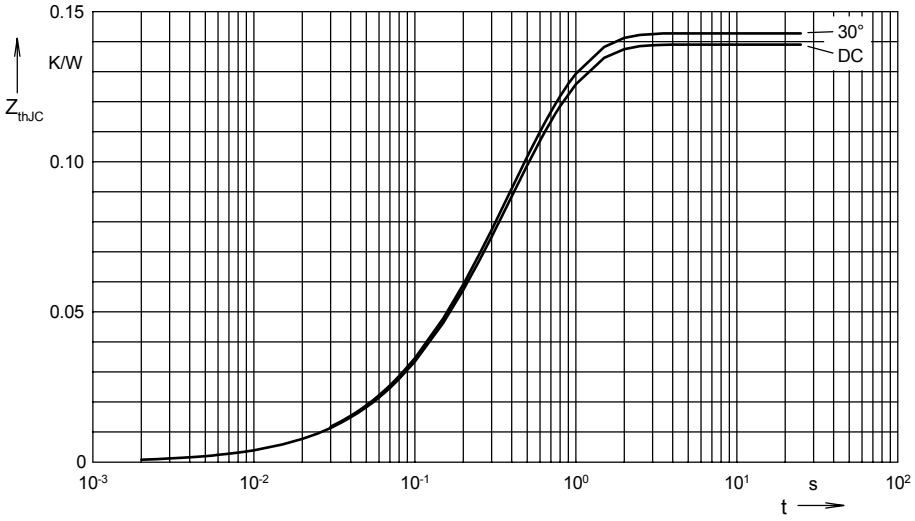


Fig. 8 Transient thermal impedance junction to case (per thyristor or diode)

$R_{thJC}$ for various conduction angles d:

| d | $R_{thJC}$ (K/W) |
|---|---|
| DC | 0.139 |
| 180°C | 0.141 |
| 120°C | 0.142 |
| 60°C | 0.142 |
| 30°C | 0.143 |

Constants for $Z_{thJC}$ calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|---|---|
| 1 | 0.0037 | 0.0099 |
| 2 | 0.0177 | 0.168 |
| 3 | 0.1175 | 0.456 |

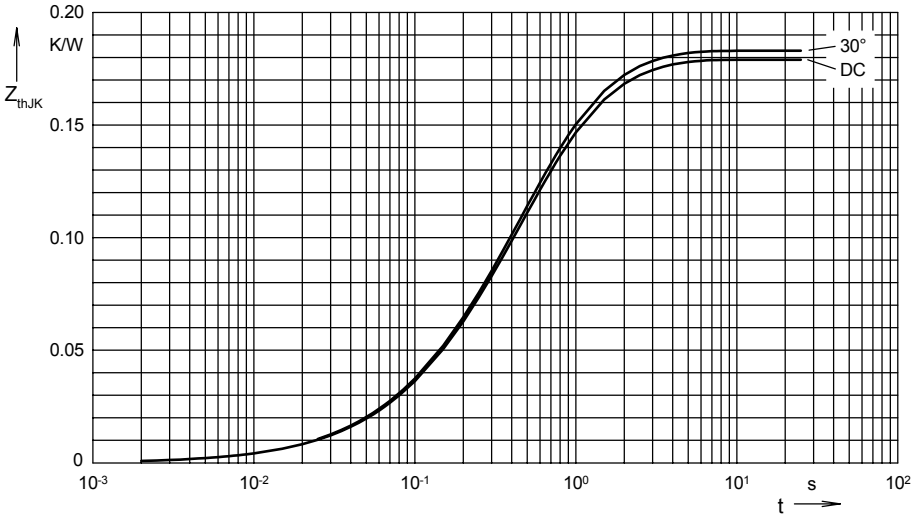


Fig. 9 Transient thermal impedance junction to heatsink (per thyristor or diode)

$R_{thJK}$ for various conduction angles d:

| d | $R_{thJK}$ (K/W) |
|---|---|
| DC | 0.179 |
| 180°C | 0.181 |
| 120°C | 0.182 |
| 60°C | 0.183 |
| 30°C | 0.183 |

Constants for $Z_{thJK}$ calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|---|---|
| 1 | 0.0037 | 0.0099 |
| 2 | 0.0177 | 0.168 |
| 3 | 0.1175 | 0.456 |
| 4 | 0.04 | 1.36 |

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