

Thyristor Modules

Thyristor/Diode Modules

$$I_{TRMS} = 2x 520 A$$

$$I_{TAVM} = 2x 320 A$$

$$V_{RRM} = 1200-1800 V$$

| V_{RSM} V_{DSM} V | V_{RRM} V_{DRM} V | Type | |
|-----------------------------|-----------------------------|---------------|---------------|
| 1300 | 1200 | MCC 312-12io1 | MCD 312-12io1 |
| 1500 | 1400 | MCC 312-14io1 | MCD 312-14io1 |
| 1700 | 1600 | MCC 312-16io1 | MCD 312-16io1 |
| 1900 | 1800 | MCC 312-18io1 | MCD 312-18io1 |



| Symbol | Conditions | Maximum Ratings | | |
|--|---|---|------------------|--------------------------|
| I_{TRMS}, I_{FRMS} I_{TAVM}, I_{FAVM} | $T_{VJ} = T_{VJM}$ $T_C = 85^\circ C; 180^\circ$ sine | 520 320 | A A | |
| I_{TSM}, I_{FSM} | $T_{VJ} = 45^\circ C; V_R = 0$ $t = 10$ ms (50 Hz) $t = 8.3$ ms (60 Hz) | 9200 10100 | A A | |
| I^2t | $T_{VJ} = 45^\circ C; V_R = 0$ $t = 10$ ms (50 Hz) $t = 8.3$ ms (60 Hz) | 423 000 423 000 | A^2s A^2s | |
| | $T_{VJ} = T_{VJM}; V_R = 0$ $t = 10$ ms (50 Hz) $t = 8.3$ ms (60 Hz) | 320 000 321 000 | A^2s A^2s | |
| $(di/dt)_{cr}$ | $T_{VJ} = T_{VJM}; f = 50$ Hz; $t_p = 200$ μs ; $V_D = \frac{2}{3} V_{DRM}; I_G = 1$ A; $di_G/dt = 1$ A/ μs | repetitive, $I_T = 960$ A non repetitive, $I_T = I_{TAVM}$ | 100 500 | A/ μs A/ μs |
| $(dv/dt)_{cr}$ | $T_{VJ} = T_{VJM}; V_D = \frac{2}{3} V_{DRM}; R_{GK} = \infty$; method 1 (linear voltage rise) | | 1000 | V/ μs |
| P_{GM} | $T_{VJ} = T_{VJM}; t_p = 30$ μs $I_T = I_{T(AV)M}; t_p = 500$ μs | 120 60 | W W | |
| P_{GAV} | | 20 | W | |
| V_{RGM} | | 10 | V | |
| T_{VJ} | | -40...+140 | $^\circ C$ | |
| T_{VJM} | | 140 | $^\circ C$ | |
| T_{stg} | | -40...+125 | $^\circ C$ | |
| V_{ISOL} | 50/60 Hz, RMS $I_{ISOL} \leq 1$ mA | $t = 1$ min $t = 1$ s | 3000 3600 | V~ V~ |
| M_d | Mounting torque (M6) Terminal connection torque (M8) | 4.5 - 7 11 - 13 | Nm Nm | |
| Weight | Typical including screws | 750 | g | |

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



Features

- International standard package
- **D**irect **C**opper **B**onded Al_2O_3 -ceramic with copper base plate
- Planar passivated chips
- Isolation voltage 3600 V~
- UL registered, E 72873
- Keyed gate/cathode twin pins

Applications

- Motor control, softstarter
- Power converter
- Heat and temperature control for industrial furnaces and chemical processes
- Lighting control
- Solid state switches

Advantages

- Simple mounting
- Improved temperature and power cycling
- Reduced protection circuits

| Symbol | Conditions | Characteristic Values | |
|--------------------|--|------------------------------|----------------------|
| | | typ. | max. |
| I_{RRM}, I_{DRM} | $V_R / V_D = V_{RRM} / V_{DRM}$ | $T_{VJ} = T_{VJM}$ | 40 mA |
| V_T, V_F | $I_T, I_F = 600$ A | $T_{VJ} = 25^\circ\text{C}$ | 1.32 V |
| V_{T0} | For power-loss calculations only | | 0.8 V |
| r_t | | $T_{VJ} = T_{VJM}$ | 0.68 mΩ |
| V_{GT} | $V_D = 6$ V | $T_{VJ} = 25^\circ\text{C}$ | 2 V |
| | | $T_{VJ} = -40^\circ\text{C}$ | 3 V |
| I_{GT} | $V_D = 6$ V | $T_{VJ} = 25^\circ\text{C}$ | 150 mA |
| | | $T_{VJ} = -40^\circ\text{C}$ | 220 mA |
| V_{GD} | $V_D = 2/3 V_{DRM}$ | $T_{VJ} = T_{VJM}$ | 0.25 V |
| I_{GD} | | | 10 mA |
| I_L | $t_p = 30 \mu\text{s}; V_D = 6$ V $I_G = 0.45$ A; $di_G/dt = 0.45$ A/ μs | $T_{VJ} = 25^\circ\text{C}$ | 200 mA |
| I_H | $V_D = 6$ V; $R_{GK} = \infty$; | $T_{VJ} = 25^\circ\text{C}$ | 150 mA |
| t_{gd} | $V_D = 1/2 V_{DRM}$ $I_G = 1$ A; $di_G/dt = 1$ A/ μs | $T_{VJ} = 25^\circ\text{C}$ | 2 μs |
| t_q | $V_D = 2/3 V_{DRM}$ $dv/dt = 50$ V/ μs ; $-di/dt = 10$ A/ μs $I_T = 300$ A; $V_R = 100$ V; $t_p = 200 \mu\text{s}$ | $T_{VJ} = T_{VJM}$ | 200 μs |
| Q_S | $I_T = 300$ A; $-di/dt = 50$ A/ μs | $T_{VJ} = T_{VJM}$ | 760 μC |
| I_{RM} | | | 275 A |
| R_{thJC} | per thyristor; DC current per module | | 0.12 K/W 0.06 K/W |
| R_{thJK} | per thyristor; DC current per module | | 0.16 K/W 0.08 K/W |
| d_s | Creeping distance on surface | | 12.7 mm |
| d_A | Creepage distance in air | | 9.6 mm |
| a | Maximum allowable acceleration | | 50 m/s ² |



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

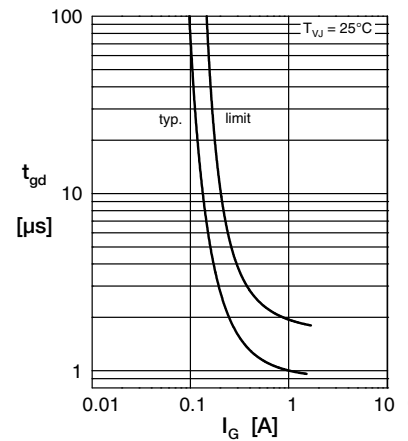
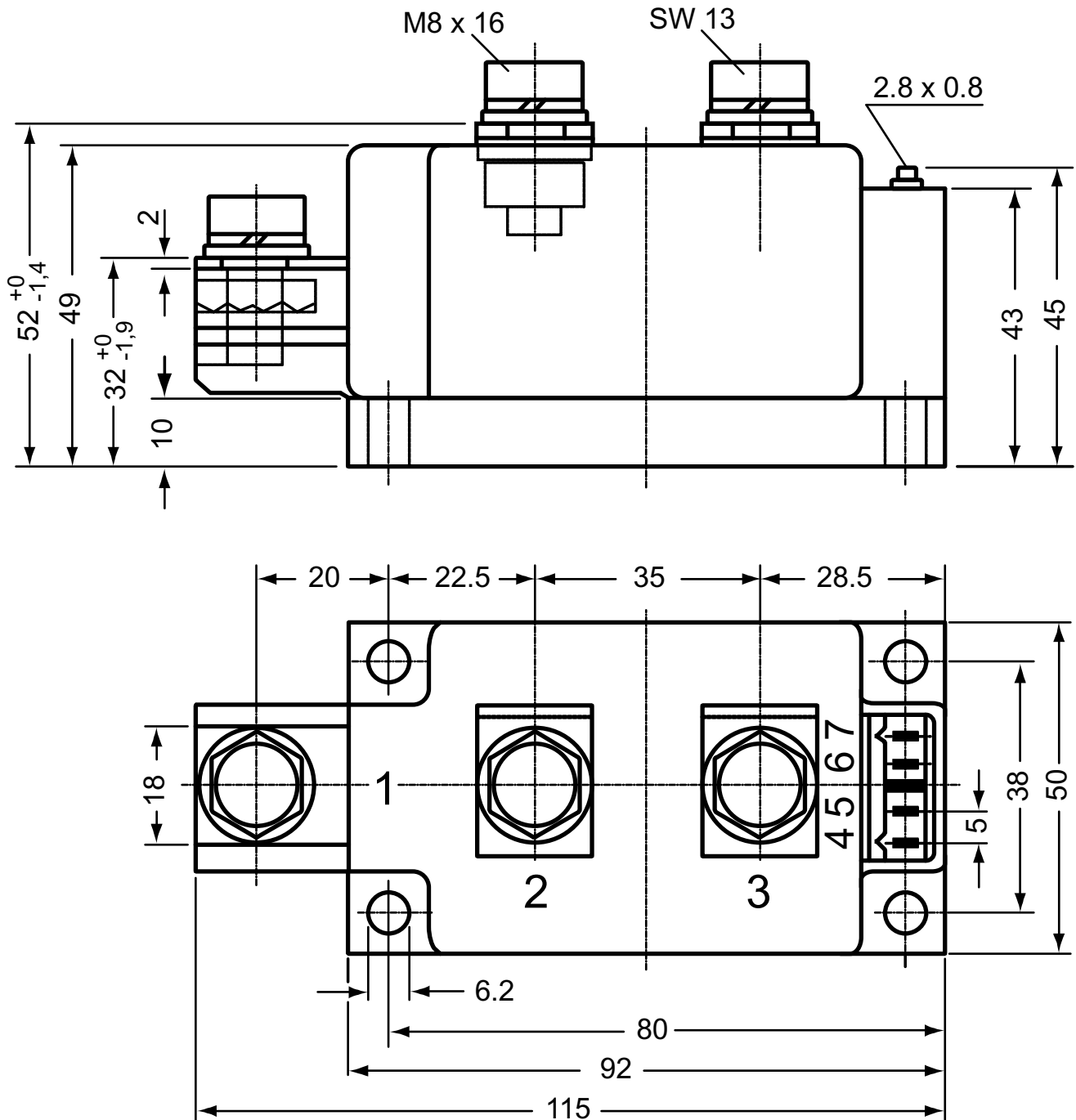


Fig. 2 Gate trigger delay time

Dimensions in mm (1 mm = 0.0394")



Optional accessories for modules

Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red

Type ZY 180L (L = Left for pin pair 4/5)

Type ZY 180R (R = Right for pin pair 6/7) } UL 758, style 3751



Fig. 3 Surge overload current
 $I_{T(F)SM}$: Crest value, t: duration



Fig. 4 I^2dt versus time



Fig. 4a Max. forward current at case temperature

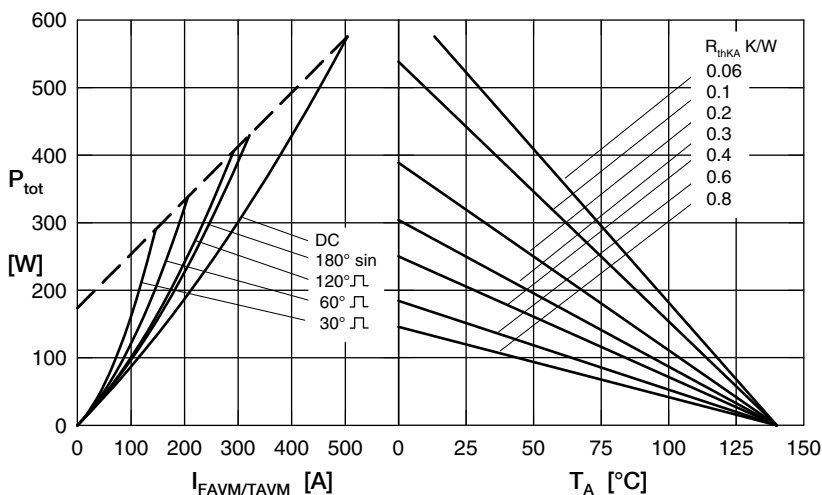


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

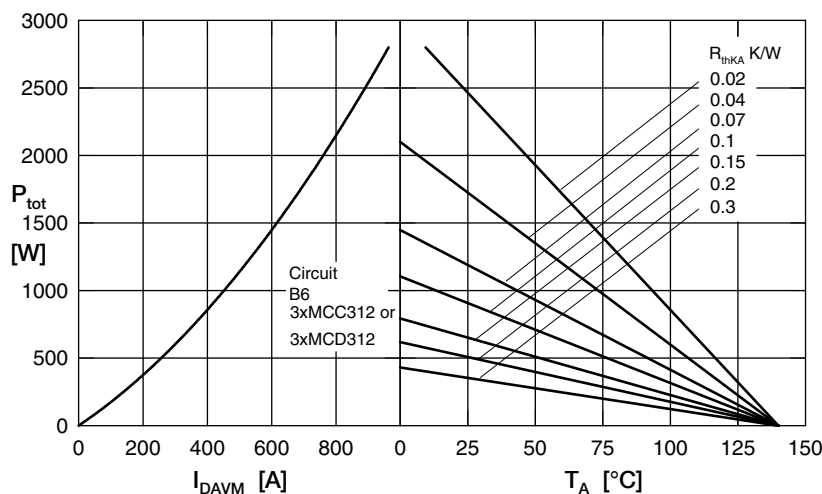


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature



Fig. 7 Three phase AC-controller: Power dissipation versus R_{MS} output current and ambient temperature

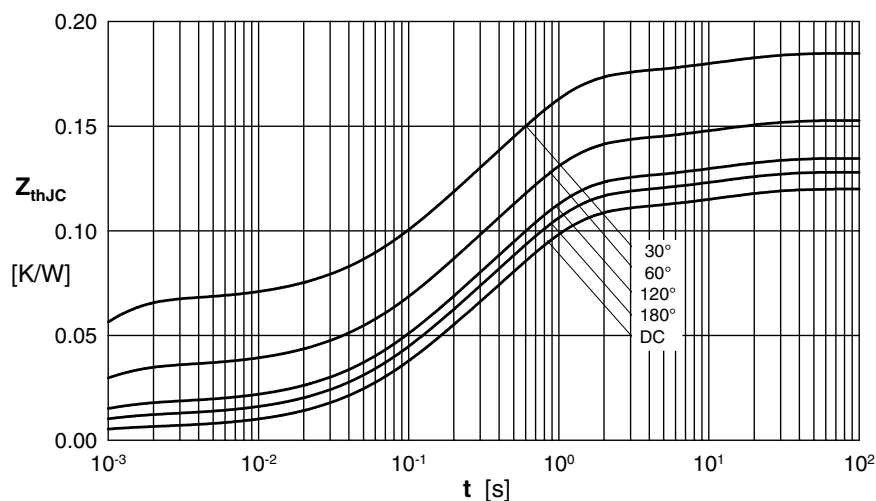


Fig. 8 Transient thermal impedance junction to case (per thyristor/diode)

R_{thJC} for various conduct. angles d:

| d | R_{thJC} (K/W) |
|------|------------------|
| DC | 0.120 |
| 180° | 0.128 |
| 120° | 0.135 |
| 60° | 0.153 |
| 30° | 0.185 |

Constants for Z_{thJC} calculation:

| i | R_{thi} (K/W) | t_i (s) |
|---|-----------------|-----------|
| 1 | 0.0058 | 0.00054 |
| 2 | 0.031 | 0.098 |
| 3 | 0.072 | 0.54 |
| 4 | 0.0112 | 12 |



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

R_{thJK} for various conduct. angles d:

| d | R_{thJK} (K/W) |
|------|------------------|
| DC | 0.160 |
| 180° | 0.168 |
| 120° | 0.175 |
| 60° | 0.193 |
| 30° | 0.225 |

Constants for Z_{thJK} calculation:

| i | R_{thi} (K/W) | t_i (s) |
|---|-----------------|-----------|
| 1 | 0.0058 | 0.00054 |
| 2 | 0.031 | 0.098 |
| 3 | 0.072 | 0.54 |
| 4 | 0.0112 | 12 |
| 5 | 0.04 | 12 |