



Thyristor Module

$V_{RRM} = 2 \times 2000 \text{ V}$

$I_{TAV} = 104 \text{ A}$

$V_T = 1.46 \text{ V}$

Phase leg

Part number

MCC94-20io1B



Backside: isolated



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al₂O₃-ceramic

Applications:

- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

Package: TO-240AA

- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

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| Thyristor | | | Ratings | | | |
|----------------|--|--|----------------------------------|------|------|-------------------|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
| $V_{RSM/DSM}$ | max. non-repetitive reverse/forward blocking voltage | $T_{VJ} = 25^{\circ}C$ | | | 2100 | V |
| $V_{RRM/DRM}$ | max. repetitive reverse/forward blocking voltage | $T_{VJ} = 25^{\circ}C$ | | | 2000 | V |
| I_{RD} | reverse current, drain current | $V_{R/D} = 2000\text{ V}$ | $T_{VJ} = 25^{\circ}C$ | | 200 | μA |
| | | $V_{R/D} = 2000\text{ V}$ | $T_{VJ} = 125^{\circ}C$ | | 15 | mA |
| V_T | forward voltage drop | $I_T = 150\text{ A}$ | $T_{VJ} = 25^{\circ}C$ | | 1.44 | V |
| | | $I_T = 300\text{ A}$ | | | 1.74 | V |
| | | $I_T = 150\text{ A}$ | $T_{VJ} = 125^{\circ}C$ | | 1.46 | V |
| | | $I_T = 300\text{ A}$ | | | 1.99 | V |
| I_{TAV} | average forward current | $T_C = 85^{\circ}C$ | $T_{VJ} = 125^{\circ}C$ | | 104 | A |
| $I_{T(RMS)}$ | RMS forward current | 180° sine | | | 163 | A |
| V_{T0} | threshold voltage | } for power loss calculation only | $T_{VJ} = 125^{\circ}C$ | | 0.85 | V |
| r_T | slope resistance | | | | 3.2 | m Ω |
| R_{thJC} | thermal resistance junction to case | | | | 0.22 | K/W |
| R_{thCH} | thermal resistance case to heatsink | | | 0.2 | | K/W |
| P_{tot} | total power dissipation | | $T_C = 25^{\circ}C$ | | 455 | W |
| I_{TSM} | max. forward surge current | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 45^{\circ}C$ | | 1.70 | kA |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 1.84 | kA |
| | | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 125^{\circ}C$ | | 1.45 | kA |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 1.56 | kA |
| I^2t | value for fusing | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 45^{\circ}C$ | | 14.5 | kA ² s |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 14.0 | kA ² s |
| | | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 125^{\circ}C$ | | 10.4 | kA ² s |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 10.1 | kA ² s |
| C_J | junction capacitance | $V_R = 700\text{ V } f = 1\text{ MHz}$ | $T_{VJ} = 25^{\circ}C$ | | 63 | pF |
| P_{GM} | max. gate power dissipation | $t_p = 30\text{ }\mu s$ | $T_C = 125^{\circ}C$ | | 10 | W |
| | | $t_p = 300\text{ }\mu s$ | | | 5 | W |
| P_{GAV} | average gate power dissipation | | | | 0.5 | W |
| $(di/dt)_{cr}$ | critical rate of rise of current | $T_{VJ} = 125^{\circ}C; f = 50\text{ Hz}$ | repetitive, $I_T = 250\text{ A}$ | | 150 | A/ μs |
| | | $t_p = 200\text{ }\mu s; di_G/dt = 0.45\text{ A}/\mu s;$ | non-repet., $I_T = 104\text{ A}$ | | 500 | A/ μs |
| $(dv/dt)_{cr}$ | critical rate of rise of voltage | $V = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 125^{\circ}C$ | | 1000 | V/ μs |
| | | $R_{GK} = \infty; \text{ method 1 (linear voltage rise)}$ | | | | |
| V_{GT} | gate trigger voltage | $V_D = 6\text{ V}$ | $T_{VJ} = 25^{\circ}C$ | | 1.5 | V |
| | | | $T_{VJ} = -40^{\circ}C$ | | 1.6 | V |
| I_{GT} | gate trigger current | $V_D = 6\text{ V}$ | $T_{VJ} = 25^{\circ}C$ | | 150 | mA |
| | | | $T_{VJ} = -40^{\circ}C$ | | 200 | mA |
| V_{GD} | gate non-trigger voltage | $V_D = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 125^{\circ}C$ | | 0.25 | V |
| I_{GD} | gate non-trigger current | | | | 10 | mA |
| I_L | latching current | $t_p = 10\text{ }\mu s$ | $T_{VJ} = 25^{\circ}C$ | | 200 | mA |
| | | $I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu s$ | | | | |
| I_H | holding current | $V_D = 6\text{ V } R_{GK} = \infty$ | $T_{VJ} = 25^{\circ}C$ | | 150 | mA |
| t_{gd} | gate controlled delay time | $V_D = \frac{1}{2} V_{DRM}$ | $T_{VJ} = 25^{\circ}C$ | | 2 | μs |
| | | $I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu s$ | | | | |
| t_q | turn-off time | $V_R = 100\text{ V}; I_T = 150\text{ A}; V = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 100^{\circ}C$ | | 185 | μs |
| | | $di/dt = 10\text{ A}/\mu s \quad dv/dt = 20\text{ V}/\mu s \quad t_p = 200\text{ }\mu s$ | | | | |



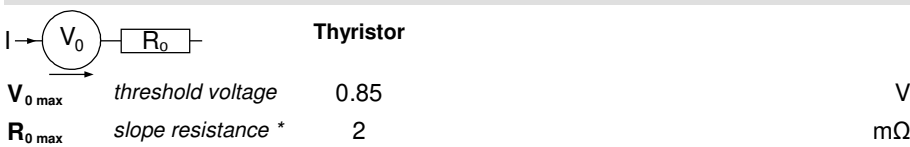
| Package TO-240AA | | | | Ratings | | | |
|------------------|--|----------------------|-------------------------------------|---------|------|------|--|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit | |
| I_{RMS} | RMS current | per terminal | | | 200 | A | |
| T_{VJ} | virtual junction temperature | | -40 | | 125 | °C | |
| T_{op} | operation temperature | | -40 | | 100 | °C | |
| T_{stg} | storage temperature | | -40 | | 125 | °C | |
| Weight | | | | | 81 | g | |
| M_D | mounting torque | | 2.5 | | 4 | Nm | |
| M_T | terminal torque | | 2.5 | | 4 | Nm | |
| $d_{Spp/App}$ | creepage distance on surface striking distance through air | terminal to terminal | 13.0 | 9.7 | | mm | |
| $d_{Spb/Apb}$ | | terminal to backside | 16.0 | 16.0 | | mm | |
| V_{ISOL} | isolation voltage | t = 1 second | | 4800 | | V | |
| | | t = 1 minute | 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA | 4000 | | V | |



| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MCC94-20io1B | MCC94-20io1B | Box | 36 | 463485 |

| Similar Part | Package | Voltage class |
|----------------|-------------|---------------|
| MCNA120P2200TA | TO-240AA-1B | 2200 |

Equivalent Circuits for Simulation * on die level $T_{VJ} = 125^{\circ}C$





Outlines TO-240AA



General tolerance: DIN ISO 2768 class „c“



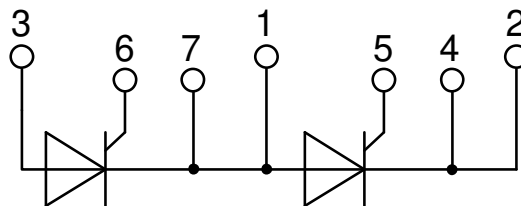
Optional accessories for modules

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

Type ZY 200L (L = Left for pin pair 4/5)

Type ZY 200R (R = Right for pin pair 6/7)

UL 758, style 3751



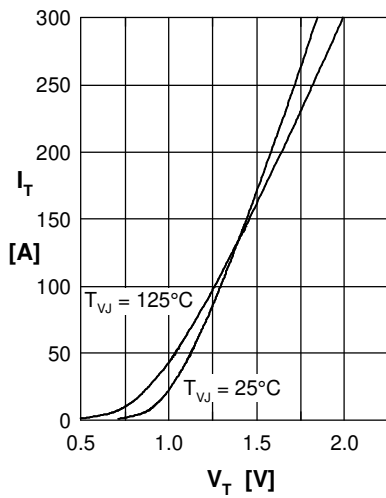
Thyristor


Fig. 1 Forward characteristics

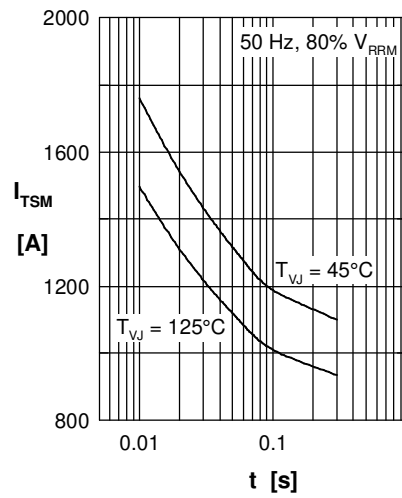
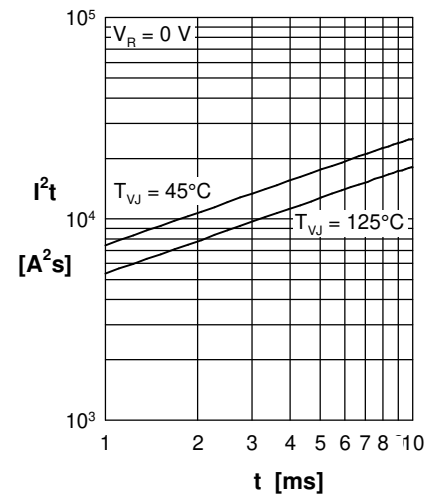
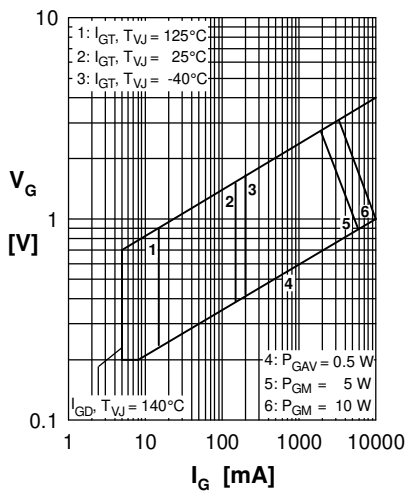

 Fig. 2 Surge overload current
 I_{TSM} : crest value, t: duration

 Fig. 3 I^2t versus time (1-10 s)


Fig. 4 Gate voltage & gate current

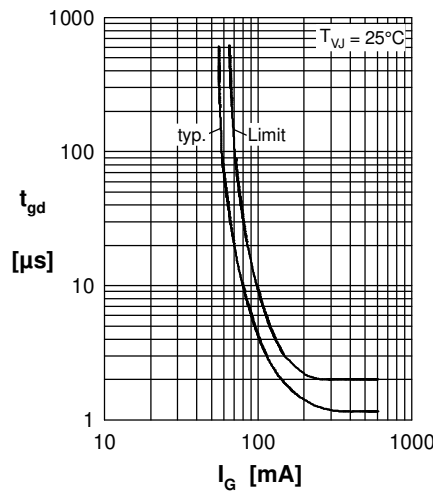
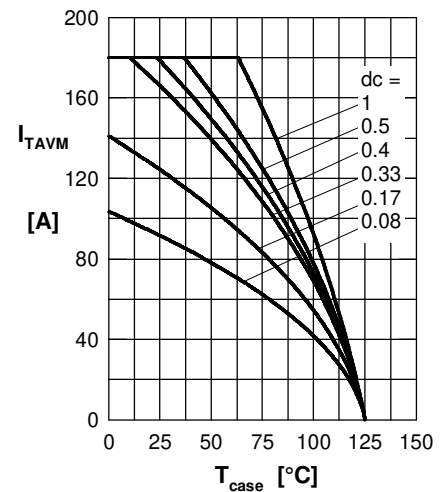

 Fig. 5 Gate controlled delay time t_{gd}


Fig. 6 Max. forward current at case temperature

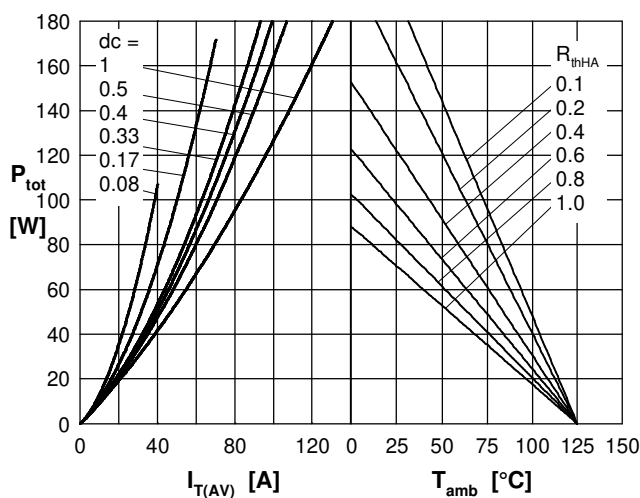
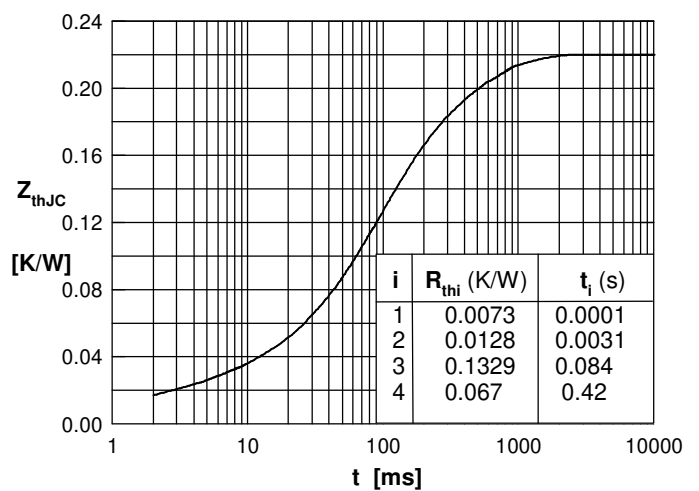

 Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case