



Thyristor Module

$V_{RRM} = 2 \times 1400 \text{ V}$

$I_{TAV} = 21 \text{ A}$

$V_T = 1.52 \text{ V}$

Phase leg

Part number

MCC21-14io8B



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: 3600 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 | $T_{VJ} = 25^{\circ}\text{C}$ | | | 1500 | V |
| $V_{RRM/DRM}$ | max. repetitive reverse/forward blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$ | | | 1400 | V |
| I_{RD} | reverse current, drain current | $V_{R/D} = 1400\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 100 | μA |
| | | $V_{R/D} = 1400\text{ V}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 5 | mA |
| V_T | forward voltage drop | $I_T = 45\text{ A}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 1.45 | V |
| | | $I_T = 90\text{ A}$ | | | 1.89 | V |
| | | $I_T = 45\text{ A}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 1.52 | V |
| | | $I_T = 90\text{ A}$ | | | 2.20 | V |
| I_{TAV} | average forward current | $T_C = 85^{\circ}\text{C}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 21 | A |
| $I_{T(RMS)}$ | RMS forward current | 180° sine | | | 33 | A |
| V_{T0} | threshold voltage | } for power loss calculation only | $T_{VJ} = 125^{\circ}\text{C}$ | | 0.85 | V |
| r_T | slope resistance | | | | 15 | m Ω |
| R_{thJC} | thermal resistance junction to case | | | | 1.1 | K/W |
| R_{thCH} | thermal resistance case to heatsink | | | 0.2 | | K/W |
| P_{tot} | total power dissipation | | $T_C = 25^{\circ}\text{C}$ | | 90 | W |
| I_{TSM} | max. forward surge current | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 45^{\circ}\text{C}$ | | 320 | A |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 345 | A |
| | | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 270 | A |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 295 | A |
| I^2t | value for fusing | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 45^{\circ}\text{C}$ | | 510 | A ² s |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 495 | A ² s |
| | | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 365 | A ² s |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | 360 | A ² s |
| C_J | junction capacitance | $V_R = 400\text{ V}$ $f = 1\text{ MHz}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 22 | pF |
| P_{GM} | max. gate power dissipation | $t_p = 30\text{ }\mu\text{s}$ | $T_C = 125^{\circ}\text{C}$ | | 10 | W |
| | | $t_p = 300\text{ }\mu\text{s}$ | | | 5 | W |
| P_{GAV} | average gate power dissipation | | | | 0.5 | W |
| $(di/dt)_{cr}$ | critical rate of rise of current | $T_{VJ} = 125^{\circ}\text{C}; f = 50\text{ Hz}$ repetitive, $I_T = 45\text{ A}$ | | | 150 | A/ μs |
| | | $t_p = 200\text{ }\mu\text{s}; di_G/dt = 0.45\text{ A}/\mu\text{s};$ $I_G = 0.45\text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 21\text{ A}$ | | | 500 | A/ μs |
| $(dv/dt)_{cr}$ | critical rate of rise of voltage | $V = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise) | $T_{VJ} = 125^{\circ}\text{C}$ | | 1000 | V/ μs |
| V_{GT} | gate trigger voltage | $V_D = 6\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 1 | V |
| | | | $T_{VJ} = -40^{\circ}\text{C}$ | | 1.2 | V |
| I_{GT} | gate trigger current | $V_D = 6\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 65 | mA |
| | | | $T_{VJ} = -40^{\circ}\text{C}$ | | 80 | mA |
| V_{GD} | gate non-trigger voltage | $V_D = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | 0.2 | V |
| I_{GD} | gate non-trigger current | | | | 5 | mA |
| I_L | latching current | $t_p = 10\text{ }\mu\text{s}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 150 | mA |
| | | $I_G = 0.3\text{ A}; di_G/dt = 0.3\text{ A}/\mu\text{s}$ | | | | |
| I_H | holding current | $V_D = 6\text{ V}$ $R_{GK} = \infty$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 100 | mA |
| t_{gd} | gate controlled delay time | $V_D = \frac{1}{2} V_{DRM}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 2 | μs |
| | | $I_G = 0.3\text{ A}; di_G/dt = 0.3\text{ A}/\mu\text{s}$ | | | | |
| t_q | turn-off time | $V_R = 100\text{ V}; I_T = 15\text{ A}; V = \frac{2}{3} V_{DRM}$ $di/dt = 10\text{ A}/\mu\text{s}$ $dv/dt = 20\text{ V}/\mu\text{s}$ $t_p = 300\text{ }\mu\text{s}$ | $T_{VJ} = 100^{\circ}\text{C}$ | | 150 | μs |



| 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 | | 3600 | | V | |
| | | t = 1 minute | 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA | 3000 | | V | |



| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MCC21-14io8B | MCC21-14io8B | Box | 36 | 469785 |

| Similar Part | Package | Voltage class |
|---------------|-------------|---------------|
| MCMA25P1600TA | TO-240AA-1B | 1600 |
| MCMA35P1600TA | TO-240AA-1B | 1600 |

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 125^{\circ}\text{C}$



Thyristor

| | | | |
|--------------|--------------------|------|----|
| $V_{0\ max}$ | threshold voltage | 0.85 | V |
| $R_{0\ max}$ | slope resistance * | 13.8 | mΩ |



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

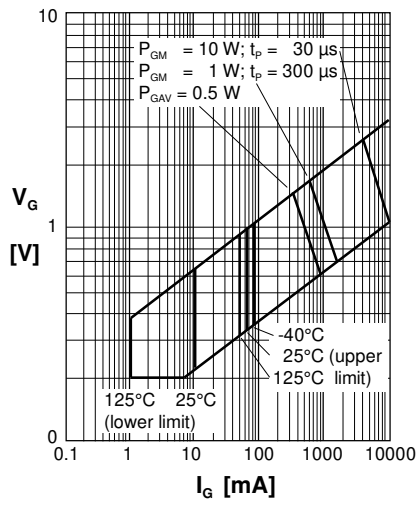


Fig. 1 Gate trigger characteristics

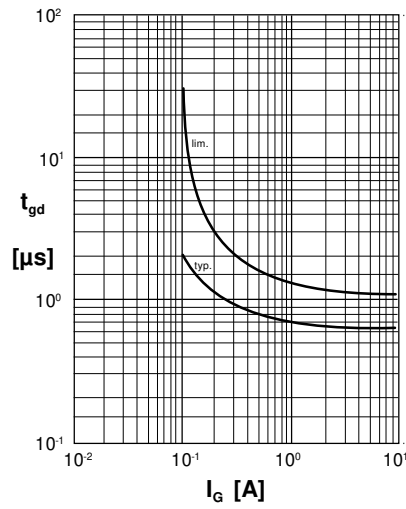


Fig. 2 Gate trigger delay time