

Thyristor \ Diode Module

$$V_{RRM} = 2 \times 1200 \text{ V}$$

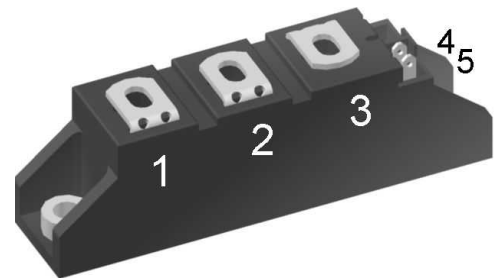
$$I_{TAV} = 85 \text{ A}$$

$$V_T = 1.18 \text{ V}$$


Phase leg

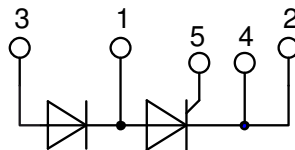
Part number

MCMA85PD1200TB



Backside: isolated

 E72873



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

Terms .Conditions of usage:

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact your local sales office.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact your local sales office.

Should you intend to use the product in aviation, in health or life endangering or life support applications, please notify. For any such application we urgently recommend

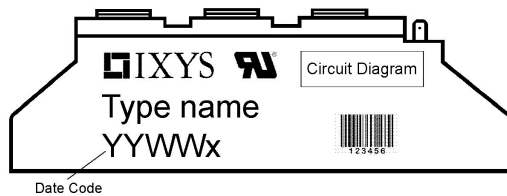
- to perform joint risk and quality assessments;

- the conclusion of quality agreements;

- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

| Rectifier | | | | Ratings | | | |
|----------------|--|---|--------------------------------|---------|------|------|-------------------|
| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
| $V_{RSM/DSM}$ | max. non-repetitive reverse/forward blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$ | | | | 1300 | V |
| $V_{RRM/DRM}$ | max. repetitive reverse/forward blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$ | | | | 1200 | V |
| $I_{R/D}$ | reverse current, drain current | $V_{R/D} = 1200\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | | 100 | μA |
| | | $V_{R/D} = 1200\text{ V}$ | $T_{VJ} = 140^{\circ}\text{C}$ | | | 10 | mA |
| V_T | forward voltage drop | $I_T = 85\text{ A}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | | 1.21 | V |
| | | $I_T = 170\text{ A}$ | | | | 1.47 | V |
| | | $I_T = 85\text{ A}$ | $T_{VJ} = 125^{\circ}\text{C}$ | | | 1.18 | V |
| | | $I_T = 170\text{ A}$ | | | | 1.51 | V |
| I_{TAV} | average forward current | $T_C = 85^{\circ}\text{C}$ | $T_{VJ} = 140^{\circ}\text{C}$ | | | 85 | A |
| $I_{T(RMS)}$ | RMS forward current | 180° sine | | | | 135 | A |
| V_{T0} | threshold voltage | } for power loss calculation only | $T_{VJ} = 140^{\circ}\text{C}$ | | | 0.85 | V |
| r_T | slope resistance | | | | | 3.9 | m Ω |
| R_{thJC} | thermal resistance junction to case | | | | | 0.38 | K/W |
| R_{thCH} | thermal resistance case to heatsink | | | | 0.20 | | K/W |
| P_{tot} | total power dissipation | | $T_C = 25^{\circ}\text{C}$ | | | 300 | W |
| I_{TSM} | max. forward surge current | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 45^{\circ}\text{C}$ | | | 1.50 | kA |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | | 1.62 | kA |
| | | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 140^{\circ}\text{C}$ | | | 1.28 | kA |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | | 1.38 | kA |
| I^2t | value for fusing | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 45^{\circ}\text{C}$ | | | 11.3 | kA ² s |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | | 10.9 | kA ² s |
| | | $t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$ | $T_{VJ} = 140^{\circ}\text{C}$ | | | 8.13 | kA ² s |
| | | $t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$ | $V_R = 0\text{ V}$ | | | 7.87 | kA ² s |
| C_J | junction capacitance | $V_R = 400\text{ V}$ $f = 1\text{ MHz}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | 74 | | pF |
| P_{GM} | max. gate power dissipation | $t_p = 30\text{ }\mu\text{s}$ | $T_C = 140^{\circ}\text{C}$ | | | 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 | $T_{VJ} = 140^{\circ}\text{C}; f = 50\text{ Hz}$ repetitive, $I_T = 255\text{ A}$ | | | | 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., $I_T = 85\text{ A}$ | | | | 500 | A/ μs |
| $(dv/dt)_{cr}$ | critical rate of rise of voltage | $V = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 140^{\circ}\text{C}$ | | | 1000 | V/ μs |
| | | $R_{GK} = \infty$; method 1 (linear voltage rise) | | | | | |
| V_{GT} | gate trigger voltage | $V_D = 6\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | | 1.5 | V |
| | | | $T_{VJ} = -40^{\circ}\text{C}$ | | | 1.6 | V |
| I_{GT} | gate trigger current | $V_D = 6\text{ V}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | | 95 | mA |
| | | | $T_{VJ} = -40^{\circ}\text{C}$ | | | 200 | mA |
| V_{GD} | gate non-trigger voltage | $V_D = \frac{2}{3} V_{DRM}$ | $T_{VJ} = 140^{\circ}\text{C}$ | | | 0.2 | V |
| I_{GD} | gate non-trigger current | | | | | 10 | mA |
| I_L | latching current | $t_p = 10\text{ }\mu\text{s}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | | 200 | mA |
| | | $I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$ | | | | | |
| I_H | holding current | $V_D = 6\text{ V}$ $R_{GK} = \infty$ | $T_{VJ} = 25^{\circ}\text{C}$ | | | 200 | mA |
| t_{gd} | gate controlled delay time | $V_D = \frac{1}{2} V_{DRM}$ | $T_{VJ} = 25^{\circ}\text{C}$ | | | 2 | μs |
| | | $I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$ | | | | | |
| t_q | turn-off time | $V_R = 100\text{ V}; I_T = 85\text{ A}; V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 125^{\circ}\text{C}$ $di/dt = 10\text{ A}/\mu\text{s}$ $dv/dt = 20\text{ V}/\mu\text{s}$ $t_p = 200\text{ }\mu\text{s}$ | | | 150 | | μs |

| Package TO-240AA | | | | Ratings | | | |
|----------------------|--|----------------------|---|---------|------|------|------|
| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
| I _{RMS} | RMS current | per terminal | | | | 150 | A |
| T _{VJ} | virtual junction temperature | | | -40 | | 140 | °C |
| T _{op} | operation temperature | | | -40 | | 125 | °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 | 50/60 Hz, RMS; I _{ISOL} ≤ 1 mA | | 4800 | | V |
| | | t = 1 minute | | | 4000 | | V |



Part description

M = Module
 C = Thyristor (SCR)
 M = Thyristor
 A = (up to 1800V)
 85 = Current Rating [A]
 PD = Phase leg
 1200 = Reverse Voltage [V]
 TB = TO-240AA-1B

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | MCMA85PD1200TB | MCMA85PD1200TB | Box | 36 | 513043 |

Equivalent Circuits for Simulation

* on die level

 $T_{VJ} = 140^\circ\text{C}$

| | | | |
|--------------|--------------------|-----------|----|
| | | Thyristor | |
| $V_{0 \max}$ | threshold voltage | 0.85 | V |
| $R_{0 \max}$ | slope resistance * | 2.7 | mΩ |

Technical drawing of a 5-pin DIN connector. The drawing shows the front and side views with the following dimensions and labels:

- Overall length: 92 ± 0.5
- Distance from front face to center of pin 1: 80 ± 0.3
- Pin diameter: 6
- Pin 1 thread: $M5$
- Pin 1 diameter: 10 ± 0.1
- Pin 1 height: 14.8
- Pin 1 to pin 2 distance: 5.5 ± 0.1
- Pin 2 diameter: 10 ± 0.1
- Pin 2 height: 14.8
- Pin 2 to pin 3 distance: 5.5 ± 0.1
- Pin 3 diameter: 10 ± 0.1
- Pin 3 height: 14.8
- Pin 3 to pin 4 distance: 5.5 ± 0.1
- Pin 4 diameter: 10 ± 0.1
- Pin 4 height: 14.8
- Pin 4 to pin 5 distance: 5.5 ± 0.1
- Pin 5 diameter: 10 ± 0.1
- Pin 5 height: 14.8
- Pin 5 to pin 6 distance: 5.5 ± 0.1
- Pin 6 diameter: 10 ± 0.1
- Pin 6 height: 14.8
- Pin 6 to pin 7 distance: 5.5 ± 0.1
- Pin 7 diameter: 10 ± 0.1
- Pin 7 height: 14.8
- Pin 7 to pin 8 distance: 5.5 ± 0.1
- Pin 8 diameter: 10 ± 0.1
- Pin 8 height: 14.8
- Pin 8 to pin 9 distance: 5.5 ± 0.1
- Pin 9 diameter: 10 ± 0.1
- Pin 9 height: 14.8
- Pin 9 to pin 10 distance: 5.5 ± 0.1
- Pin 10 diameter: 10 ± 0.1
- Pin 10 height: 14.8
- Pin 10 to pin 11 distance: 5.5 ± 0.1
- Pin 11 diameter: 10 ± 0.1
- Pin 11 height: 14.8
- Pin 11 to pin 12 distance: 5.5 ± 0.1
- Pin 12 diameter: 10 ± 0.1
- Pin 12 height: 14.8
- Pin 12 to pin 13 distance: 5.5 ± 0.1
- Pin 13 diameter: 10 ± 0.1
- Pin 13 height: 14.8
- Pin 13 to pin 14 distance: 5.5 ± 0.1
- Pin 14 diameter: 10 ± 0.1
- Pin 14 height: 14.8
- Pin 14 to pin 15 distance: 5.5 ± 0.1
- Pin 15 diameter: 10 ± 0.1
- Pin 15 height: 14.8
- Pin 15 to pin 16 distance: 5.5 ± 0.1
- Pin 16 diameter: 10 ± 0.1
- Pin 16 height: 14.8
- Pin 16 to pin 17 distance: 5.5 ± 0.1
- Pin 17 diameter: 10 ± 0.1
- Pin 17 height: 14.8
- Pin 17 to pin 18 distance: 5.5 ± 0.1
- Pin 18 diameter: 10 ± 0.1
- Pin 18 height: 14.8
- Pin 18 to pin 19 distance: 5.5 ± 0.1
- Pin 19 diameter: 10 ± 0.1
- Pin 19 height: 14.8
- Pin 19 to pin 20 distance: 5.5 ± 0.1
- Pin 20 diameter: 10 ± 0.1
- Pin 20 height: 14.8
- Pin 20 to pin 21 distance: 5.5 ± 0.1
- Pin 21 diameter: 10 ± 0.1
- Pin 21 height: 14.8
- Pin 21 to pin 22 distance: 5.5 ± 0.1
- Pin 22 diameter: 10 ± 0.1
- Pin 22 height: 14.8
- Pin 22 to pin 23 distance: 5.5 ± 0.1
- Pin 23 diameter: 10 ± 0.1
- Pin 23 height: 14.8
- Pin 23 to pin 24 distance: 5.5 ± 0.1
- Pin 24 diameter: 10 ± 0.1
- Pin 24 height: 14.8
- Pin 24 to pin 25 distance: 5.5 ± 0.1
- Pin 25 diameter: 10 ± 0.1
- Pin 25 height: 14.8
- Pin 25 to pin 26 distance: 5.5 ± 0.1
- Pin 26 diameter: 10 ± 0.1
- Pin 26 height: 14.8
- Pin 26 to pin 27 distance: 5.5 ± 0.1
- Pin 27 diameter: 10 ± 0.1
- Pin 27 height: 14.8
- Pin 27 to pin 28 distance: 5.5 ± 0.1
- Pin 28 diameter: 10 ± 0.1
- Pin 28 height: 14.8
- Pin 28 to pin 29 distance: 5.5 ± 0.1
- Pin 29 diameter: 10 ± 0.1
- Pin 29 height: 14.8
- Pin 29 to pin 30 distance: 5.5 ± 0.1
- Pin 30 diameter: 10 ± 0.1
- Pin 30 height: 14.8
- Pin 30 to pin 31 distance: 5.5 ± 0.1
- Pin 31 diameter: 10 ± 0.1
- Pin 31 height: 14.8
- Pin 31 to pin 32 distance: 5.5 ± 0.1
- Pin 32 diameter: 10 ± 0.1
- Pin 32 height: 14.8
- Pin 32 to pin 33 distance: 5.5 ± 0.1
- Pin 33 diameter: 10 ± 0.1
- Pin 33 height: 14.8
- Pin 33 to pin 34 distance: 5.5 ± 0.1
- Pin 34 diameter: 10 ± 0.1
- Pin 34 height: 14.8
- Pin 34 to pin 35 distance: 5.5 ± 0.1
- Pin 35 diameter: 10 ± 0.1
- Pin 35 height: 14.8
- Pin 35 to pin 36 distance: 5.5 ± 0.1
- Pin 36 diameter: 10 ± 0.1
- Pin 36 height: 14.8
- Pin 36 to pin 37 distance: 5.5 ± 0.1
- Pin 37 diameter: 10 ± 0.1
- Pin 37 height: 14.8
- Pin 37 to pin 38 distance: 5.5 ± 0.1
- Pin 38 diameter: 10 ± 0.1
- Pin 38 height: 14.8
- Pin 38 to pin 39 distance: 5.5 ± 0.1
- Pin 39 diameter: 10 ± 0.1
- Pin 39 height: 14.8
- Pin 39 to pin 40 distance: 5.5 ± 0.1
- Pin 40 diameter: 10 ± 0.1
- Pin 40 height: 14.8
- Pin 40 to pin 41 distance: 5.5 ± 0.1
- Pin 41 diameter: 10 ± 0.1
- Pin 41 height: 14.8
- Pin 41 to pin 42 distance: 5.5 ± 0.1
- Pin 42 diameter: 10 ± 0.1
- Pin 42 height: 14.8
- Pin 42 to pin 43 distance: 5.5 ± 0.1
- Pin 43 diameter: 10 ± 0.1
- Pin 43 height: 14.8
- Pin 43 to pin 44 distance: 5.5 ± 0.1
- Pin 44 diameter: 10 ± 0.1
- Pin 44 height: 14.8
- Pin 44 to pin 45 distance: 5.5 ± 0.1
- Pin 45 diameter: 10 ± 0.1
- Pin 45 height: 14.8
- Pin 45 to pin 46 distance: 5.5 ± 0.1
- Pin 46 diameter: 10 ± 0.1
- Pin 46 height: 14.8
- Pin 46 to pin 47 distance: 5.5 ± 0.1
- Pin 47 diameter: 10 ± 0.1
- Pin 47 height: 14.8
- Pin 47 to pin 48 distance: 5.5 ± 0.1
- Pin 48 diameter: 10 ± 0.1
- Pin 48 height: 14.8
- Pin 48 to pin 49 distance: 5.5 ± 0.1
- Pin 49 diameter: 10 ± 0.1
- Pin 49 height: 14.8
- Pin 49 to pin 50 distance: 5.5 ± 0.1
- Pin 50 diameter: 10 ± 0.1
- Pin 50 height: 14.8
- Pin 50 to pin 51 distance: 5.5 ± 0.1
- Pin 51 diameter: 10 ± 0.1
- Pin 51 height: 14.8
- Pin 51 to pin 52 distance: 5.5 ± 0.1
- Pin 52 diameter: 10 ± 0.1
- Pin 52 height: 14.8
- Pin 52 to pin 53 distance: $5.5 \pm$

Thyristor

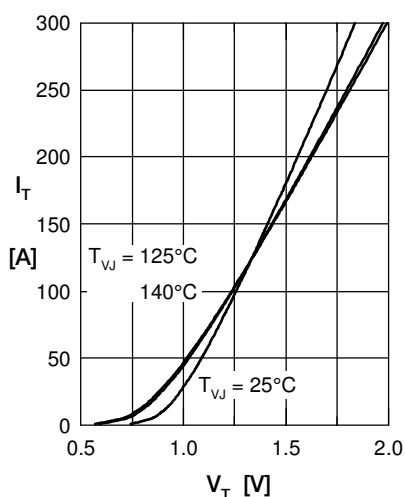


Fig. 1 Forward characteristics

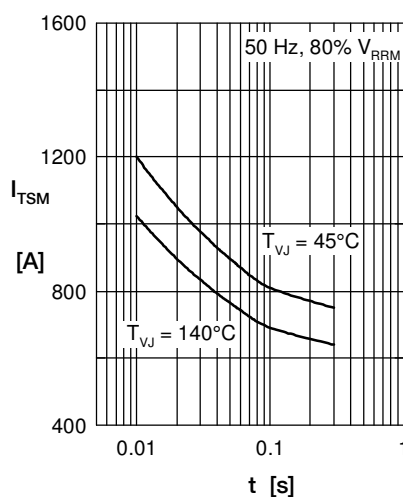


Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

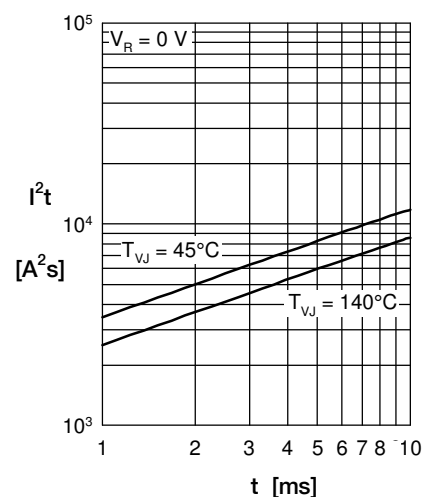


Fig. 3 I^2t versus time (1-10 s)

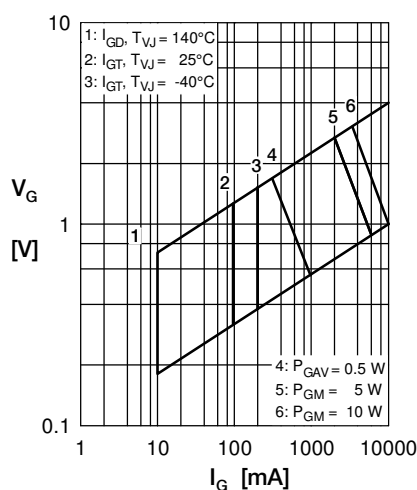


Fig. 4 Gate voltage & gate current

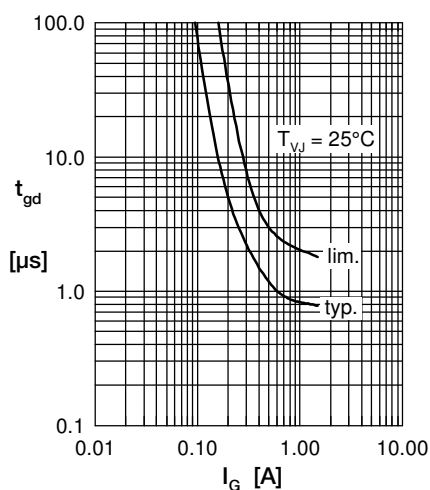


Fig. 5 Gate controlled delay time t_{gd}

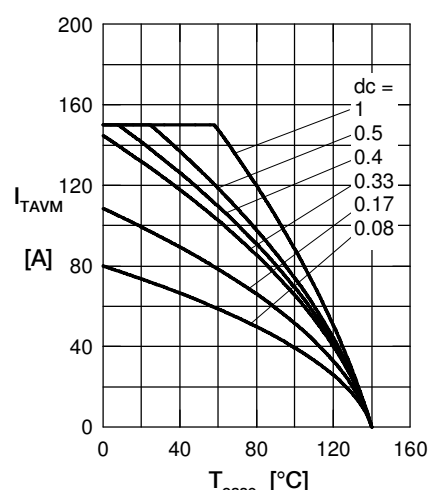


Fig. 6 Max. forward current at case temperature

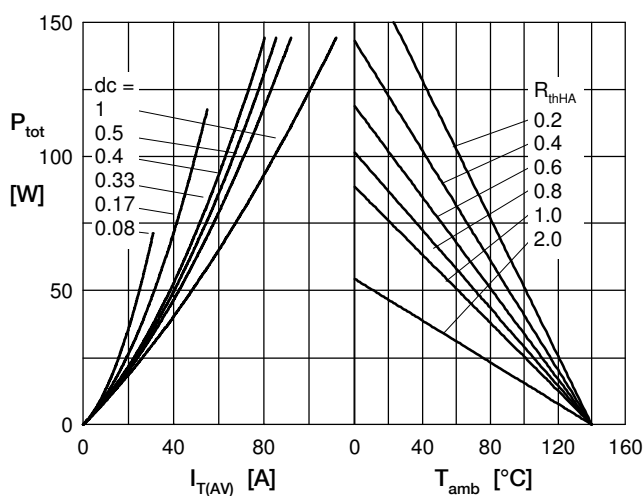


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature

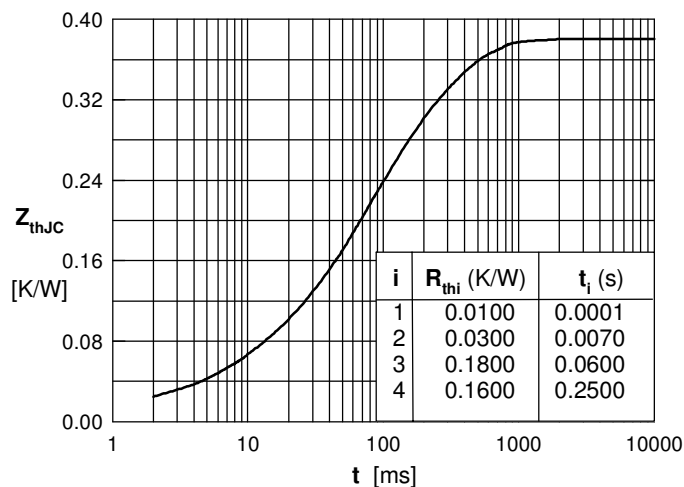


Fig. 8 Transient thermal impedance junction to case