



# MP03 XX 440 Series

## Dual Diode Modules

Replaces December 1998 version, DS5106-2.0

DS5106-3.0 January 2000

### FEATURES

- Dual Device Module
- Electrically Isolated Package
- Pressure Contact Construction
- International Standard Footprint
- Alumina (non-toxic) Isolation Medium

### APPLICATIONS

- Rectifier Bridges
- DC Power Supplies
- Plating Rectifiers
- Traction Systems

### VOLTAGE RATINGS

| Type Number   | Repetitive Peak Voltages $V_{RRM}$ | Conditions                 |
|---------------|------------------------------------|----------------------------|
| MP03/440 - 21 | 2100                               | $T_{vj} = 150^{\circ}C$    |
| MP03/440 - 20 | 2000                               | $I_{RM} = 30mA$            |
| MP03/440 - 18 | 1800                               | $V_{RSM} = V_{RRM} + 100V$ |
| MP03/440 - 16 | 1600                               | respectively               |

Lower voltage grades available. For full description of part number see "Ordering Instructions" on page 3.

### CURRENT RATINGS - PER ARM

| Symbol       | Parameter            | Conditions               | Max.                         | Units |   |
|--------------|----------------------|--------------------------|------------------------------|-------|---|
| $I_{F(AV)}$  | Mean forward current | Halfwave, resistive load | $T_{case} = 75^{\circ}C$     | 440   | A |
|              |                      |                          | $T_{case} = 85^{\circ}C$     | 390   | A |
|              |                      |                          | $T_{heatsink} = 75^{\circ}C$ | 340   | A |
|              |                      |                          | $T_{heatsink} = 85^{\circ}C$ | 300   | A |
| $I_{F(RMS)}$ | RMS value            | $T_{case} = 75^{\circ}C$ | 690                          | A     |   |

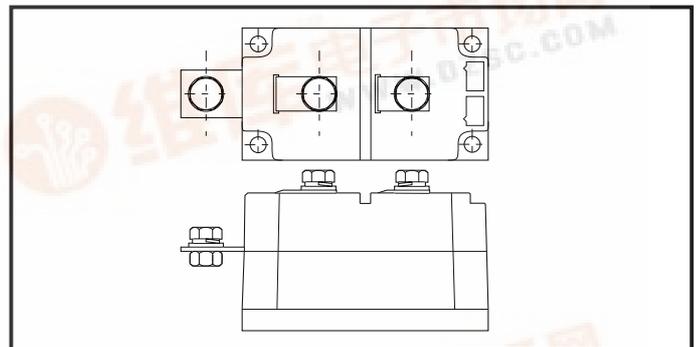
### KEY PARAMETERS

|                       |        |
|-----------------------|--------|
| $V_{RRM}$             | 2100V  |
| $I_{FSM}$             | 11250A |
| $I_{F(AV)}$ (per arm) | 440A   |
| $V_{isol}$            | 2500V  |

### CIRCUIT OPTIONS

| Code | Circuit |
|------|---------|
| HB   |         |
| G    |         |
| GN   |         |

### PACKAGE OUTLINE



Module outline type code: MP03.  
See Package Details for further information.



## MP03 XX 440 Series

### SURGE RATINGS - PER ARM

| Symbol    | Parameter                               | Conditions                                   |                      | Max.   | Units                |
|-----------|---|--|----------------------|--------|----------------------|
| $I_{FSM}$ | Surge (non-repetitive) on-state current | 10ms half sine;<br>$T_j = 150^\circ\text{C}$ | $V_R = 0$            | 11250  | A                    |
|           |   |  | $V_R = 50\% V_{RRM}$ | 9000   | A                    |
| $I^2t$    | $I^2t$ for fusing                       | 10ms half sine;<br>$T_j = 150^\circ\text{C}$ | $V_R = 0$            | 630000 | $\text{A}^2\text{s}$ |
|           |   |  | $V_R = 50\% V_{RRM}$ | 405000 | $\text{A}^2\text{s}$ |

### THERMAL & MECHANICAL RATINGS

| Symbol         | Parameter                                       | Conditions   | Max.       | Units                     |
|----------------|---|--|------------|---------------------------|
| $R_{th(j-c)}$  | Thermal resistance - junction to case per Diode | dc   | 0.12       | $^\circ\text{C}/\text{W}$ |
|                |   | halfwave   | 0.13       | $^\circ\text{C}/\text{W}$ |
|                |   | 3 phase  | 0.14       | $^\circ\text{C}/\text{W}$ |
| $R_{th(c-hs)}$ | Thermal resistance - case to heatsink per Diode | Mounting torque = 5Nm<br>with mounting compound        | 0.05       | $^\circ\text{C}/\text{W}$ |
| $T_{vj}$       | Virtual junction temperature                    |  | 150        | $^\circ\text{C}$          |
| $T_{sto}$      | Storage temperature range                       |  | -40 to 150 | $^\circ\text{C}$          |
| $V_{isol}$     | Isolation voltage                               | Commoned terminals to base plate<br>AC RMS, 1min, 50Hz | 2.5        | kV                        |

### CHARACTERISTICS

| Symbol   | Parameter                 | Conditions                               | Max. | Units            |
|----------|---------------------------|--|------|------------------|
| $V_{FM}$ | Forward voltage           | At 1000A, $T_{case} = 25^\circ\text{C}$  | 1.29 | V                |
| $I_{RM}$ | Peak reverse current      | At $V_{RRM}$ , $T_j = 150^\circ\text{C}$ | 30   | mA               |
| $V_{TO}$ | Threshold voltage         | At $T_{vj} = 150^\circ\text{C}$          | 0.94 | V                |
| $r_T$    | On-state slope resistance | At $T_{vj} = 150^\circ\text{C}$          | 0.32 | $\text{m}\Omega$ |

## ORDERING INSTRUCTIONS

Part number is made up as follows:

MP03 HB 440 - 18

MP = Pressure contact module  
03 = Outline type  
HB = Circuit configuration code (see "circuit options" - front page)  
440 = Nominal average current rating at  $T_{case} = 75^{\circ}C$   
18 =  $V_{RRM}/100$

Examples:

MP03HB440 - 21  
MP03G440 - 16  
MP03GN440 - 18

Note: Preferred type is HB configuration. G and GN types are available for specific applications, only when requested.

## MOUNTING RECOMMENDATIONS

- Adequate heatsinking is required to maintain the base temperature at  $75^{\circ}C$  if full rated current is to be achieved. Power dissipation may be calculated by use of  $V_{TO}$  and  $r_T$  information in accordance with standard formulae. We can provide assistance with calculations or choice of heatsink if required.
- The heatsink surface must be smooth and flat; a surface finish of N6 ( $32\mu in$ ) and a flatness within  $0.05mm$  ( $0.002''$ ) are recommended.
- Immediately prior to mounting, the heatsink surface should be lightly scrubbed with fine emery, Scotch Brite or a mild chemical etchant and then cleaned with a solvent to remove oxide build up and foreign material. Care should be taken to ensure no foreign particles remain.
- An even coating of thermal compound (eg. Unial) should be applied to both the heatsink and module mounting surfaces. This should ideally be  $0.05mm$  ( $0.002''$ ) per surface to ensure optimum thermal performance.
- After application of thermal compound, place the module squarely over the mounting holes, (or 'T' slots) in the heatsink. Using a torque wrench, slowly tighten the recommended fixing bolts at each end, rotating each in turn no more than  $1/4$  of a revolution at a time. Continue until the required torque of  $5Nm$  ( $44lb.ins$ ) is reached at both ends.
- It is not acceptable to fully tighten one fixing bolt before starting to tighten the others. Such action may DAMAGE the module.

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## Curves

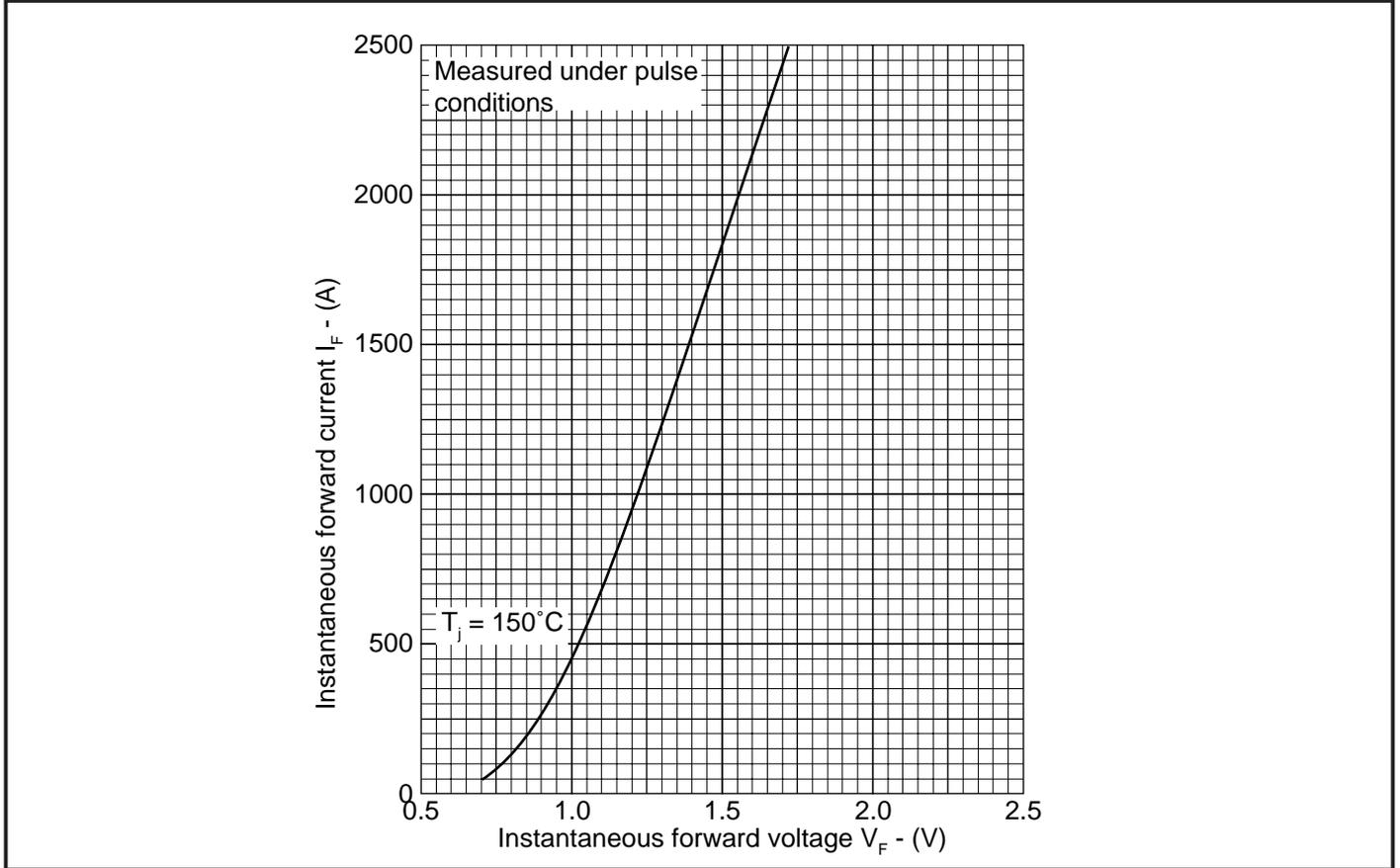


Fig. 1 Maximum (limit) forward characteristics (Per diode)

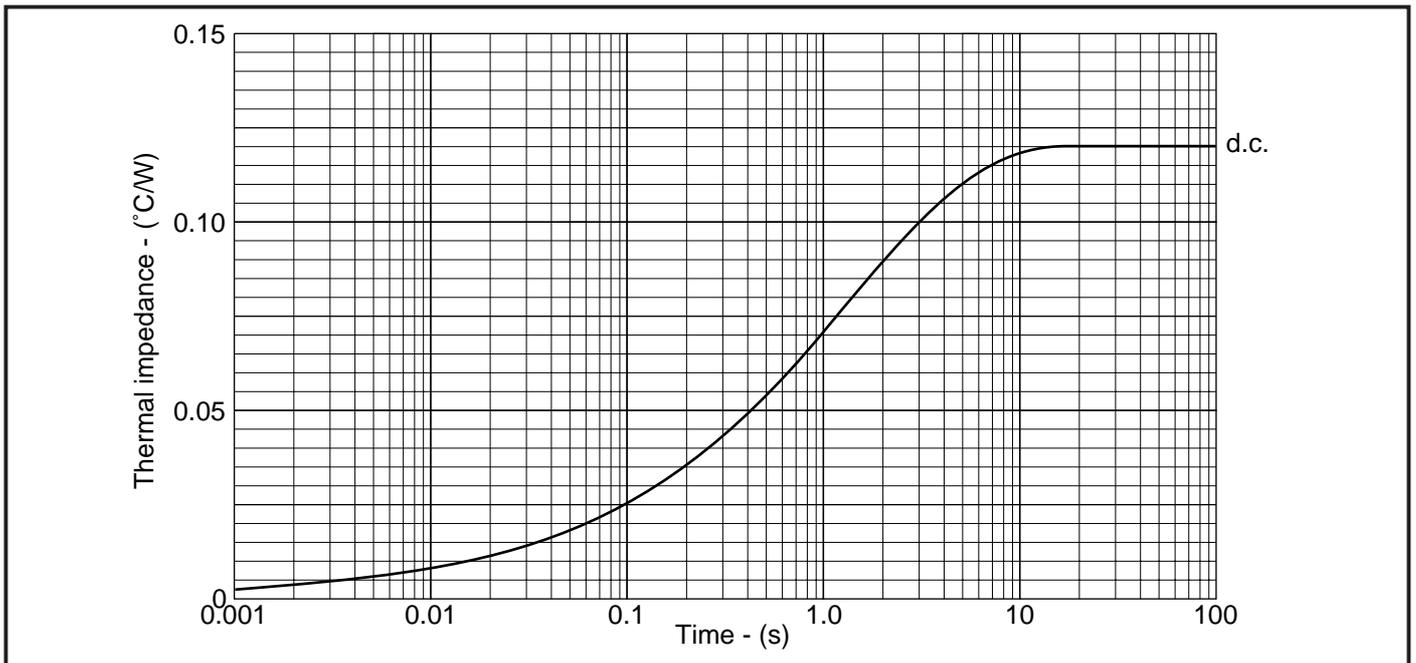


Fig. 2 Transient thermal impedance (DC) - (Per diode)

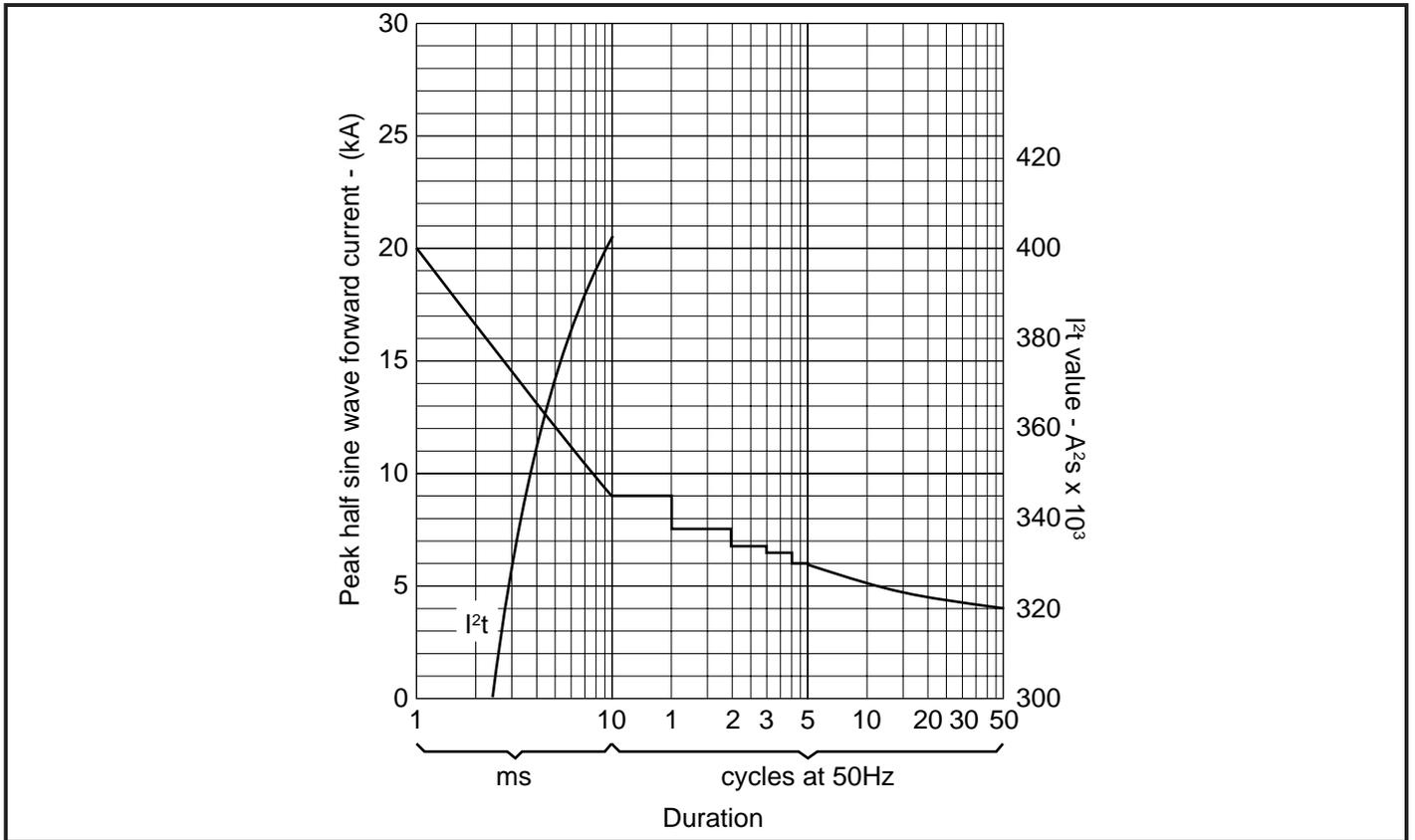


Fig. 3 Surge (non-repetitive) forward current vs time (with 0%  $V_{RRM}$ ,  $T_{case} = 150^\circ C$ )

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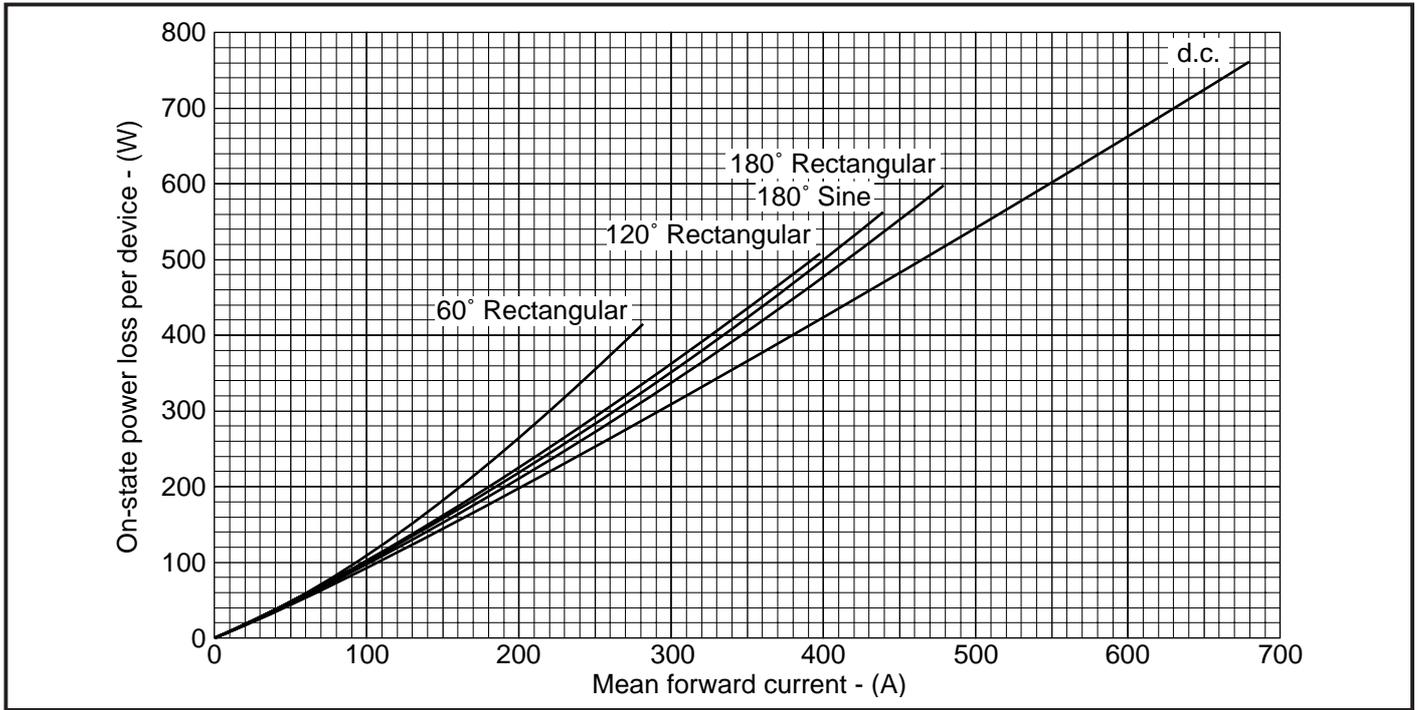


Fig. 4 On-state power loss per arm vs forward current at various conduction angles, 50/60Hz

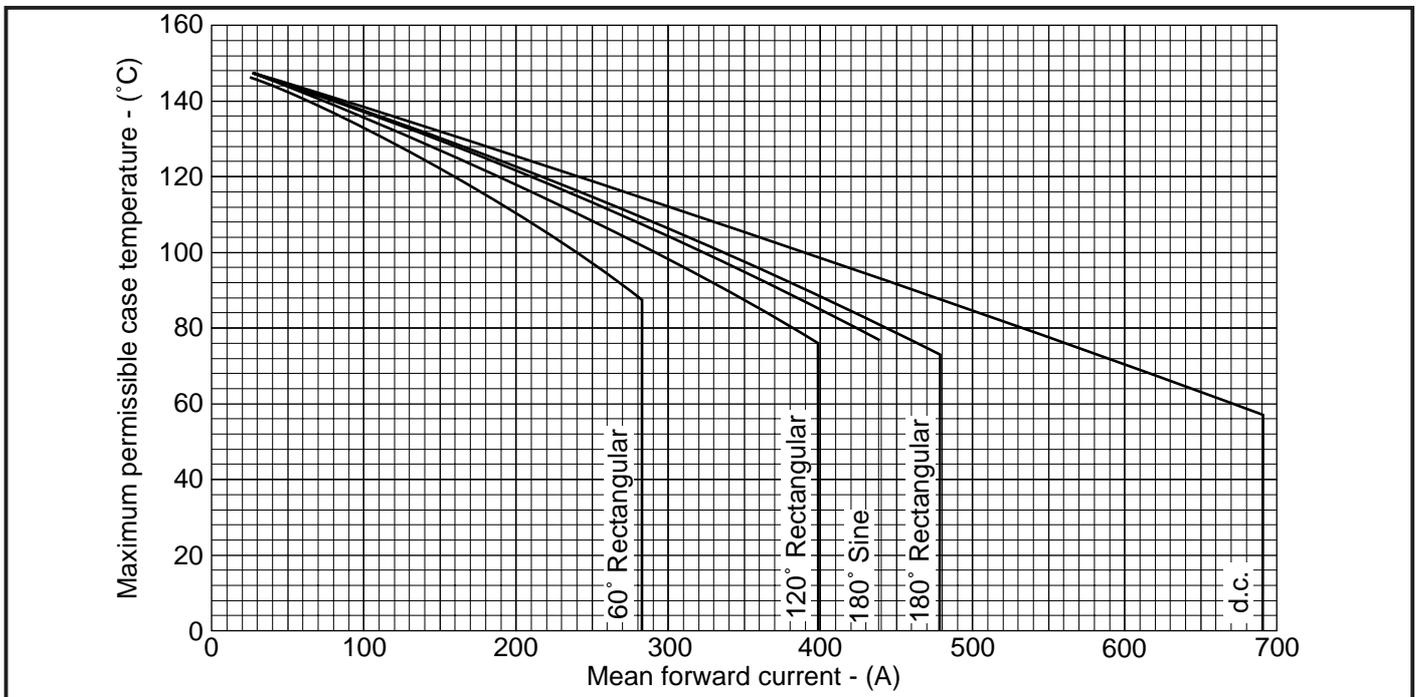
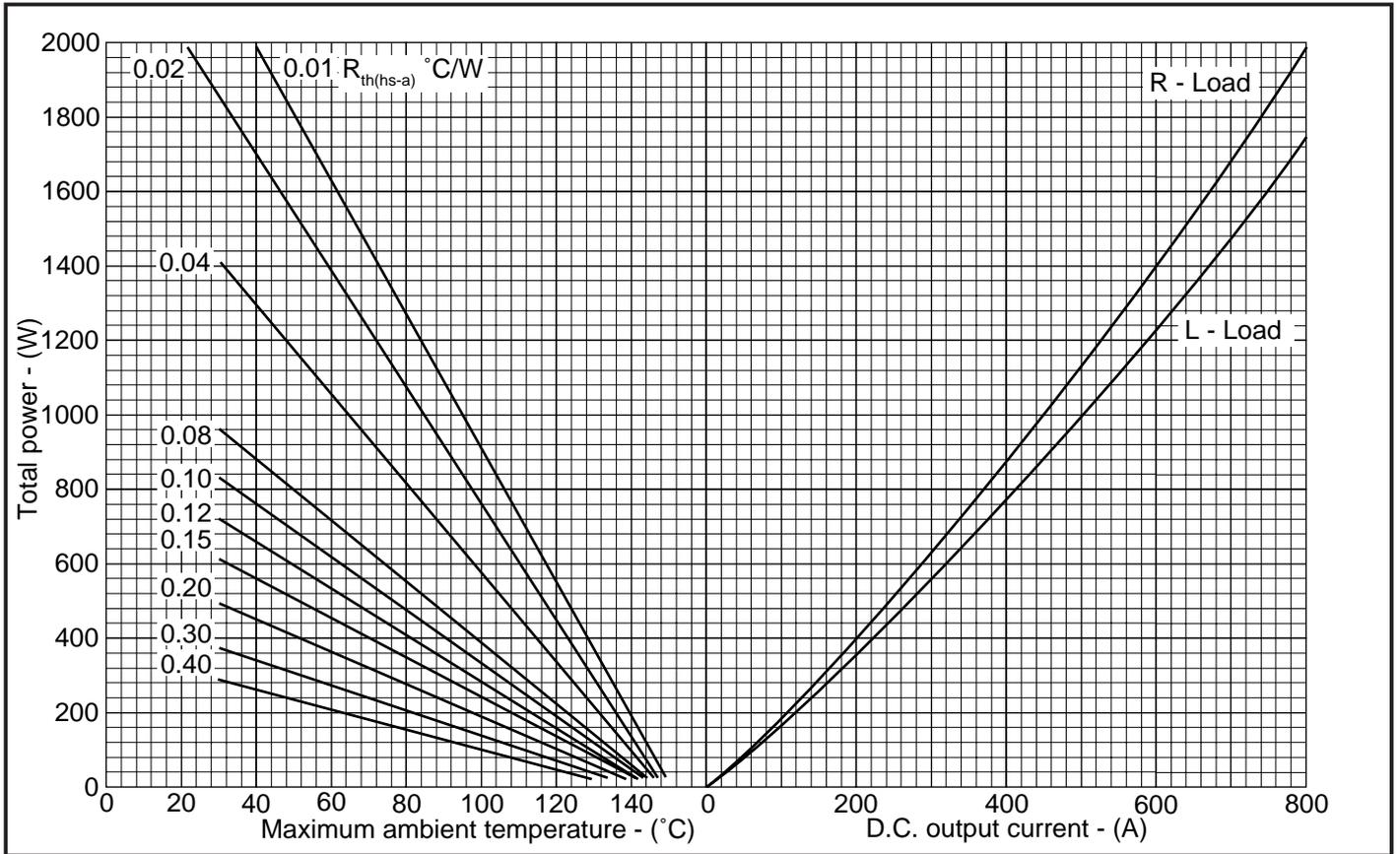


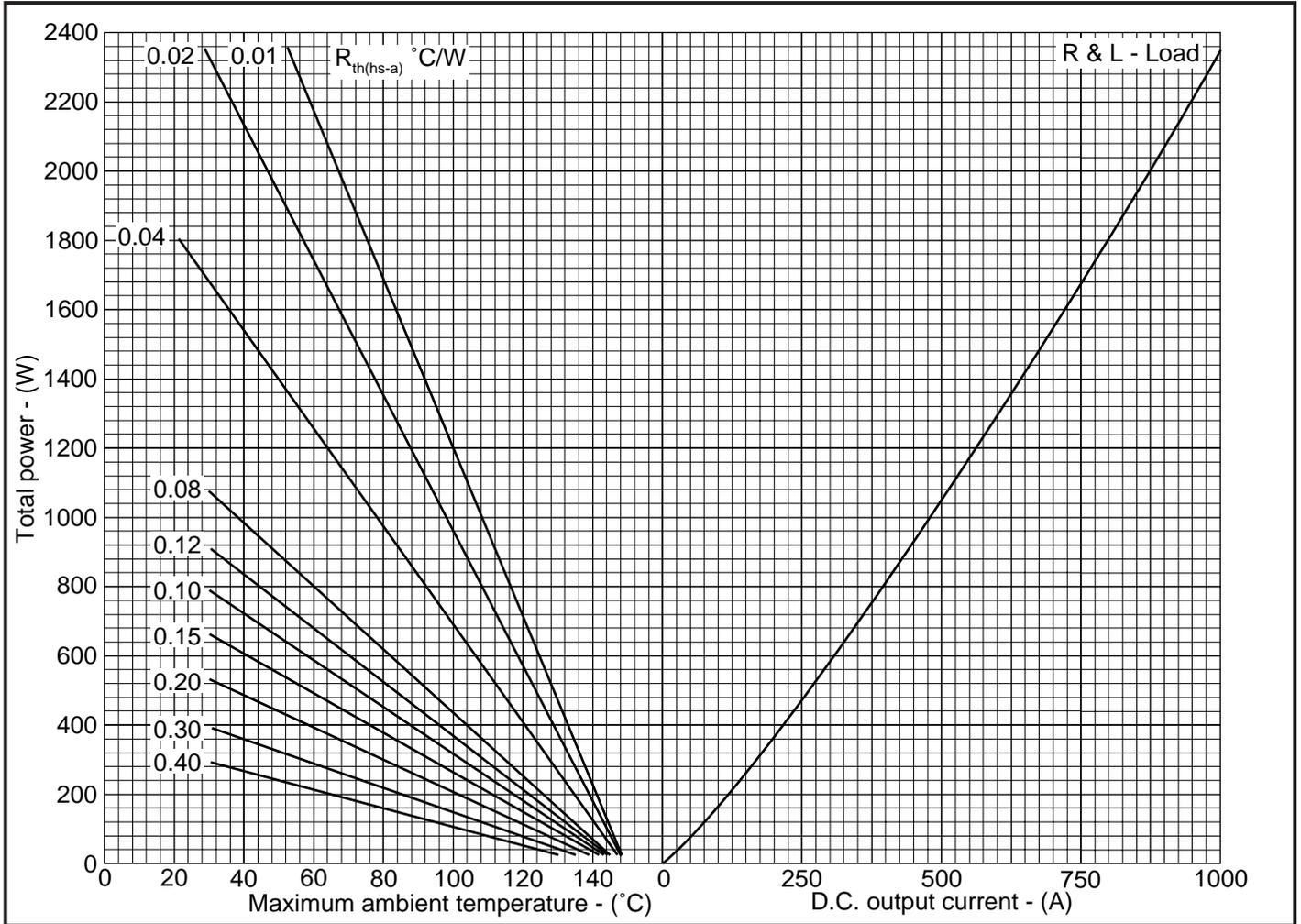
Fig. 5 Maximum permissible case temperature vs forward current per arm at various conduction angles, 50/60Hz



**Fig. 6 50/60Hz single phase bridge dc output current vs power loss and maximum permissible ambient temperature for various values of heatsink thermal resistance.**

(Note:  $R_{th(hs-a)}$  values given above are true heatsink thermal resistances to ambient and already account for  $R_{th(c-hs)}$  module contact thermal).

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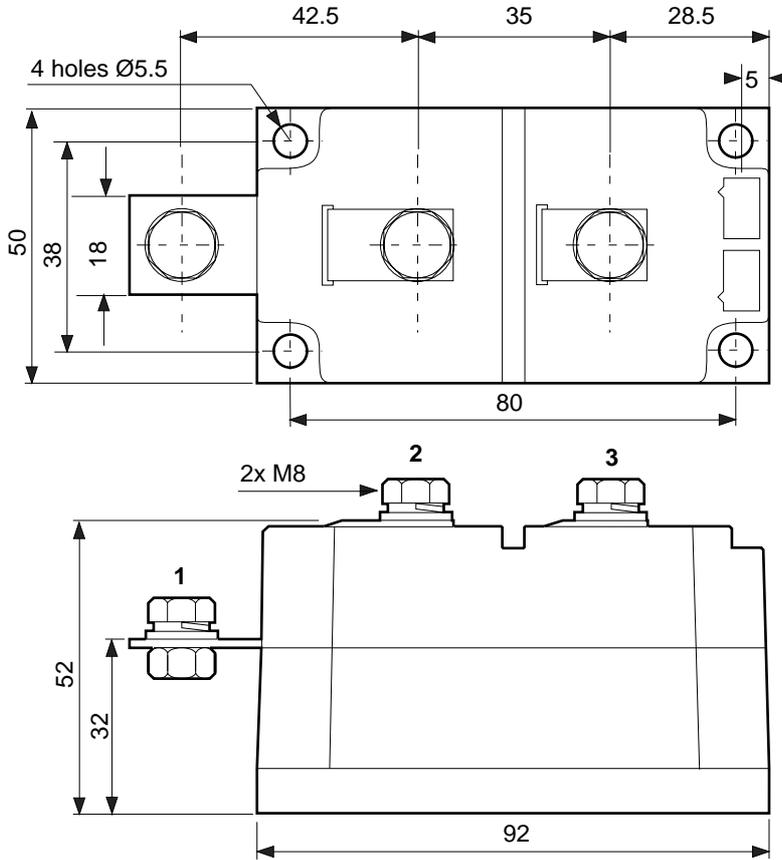


**Fig. 7 50/60Hz 3- phase bridge dc output current vs power loss and maximum permissible ambient temperature for various values of heatsink thermal resistance.**

(Note:  $R_{th(hs-a)}$  values given above are true heatsink thermal resistances to ambient and already account for  $R_{th(c-hs)}$  module contact thermal).

**PACKAGE DETAILS**

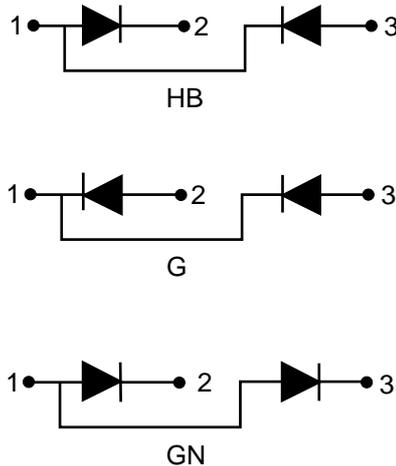
For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



|  |                            |
|--|----------------------------|
| Recommended fixings for mounting:              | M5 socket head cap screws. |
| Recommended mounting torque:                   | 5Nm (44lb.ins)             |
| Recommended torque for electrical connections: | 8Nm (70lb.ins)             |
| Maximum torque for electrical connections:     | 9Nm (80lb.ins)             |
| Nominal weight:                                | 950g                       |

**Module outline type code: MP03**

**CIRCUIT CONFIGURATIONS**



## MP03 XX 440 Series



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