

### FEATURES

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

### APPLICATIONS

- Motor Control
- Controlled Rectifier Bridges
- Heater Control
- AC Phase Control

### VOLTAGE RATINGS

Type Number	Repetitive Peak Voltages		Conditions
	$V_{DRM}$	$V_{RRM}$	
MP03/130-20	2000		$T_{vj} = 125^{\circ}\text{C}$ $I_{DRM} = I_{RRM} = 30\text{mA}$ $V_{DSM} \text{ \& } V_{RSM} =$ $V_{DRM} \text{ \& } V_{RRM} + 100\text{V}$ respectively
MP03/130-18	1800		
MP03/130-16	1600		

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

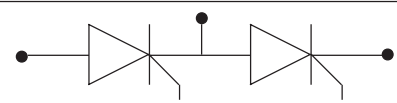
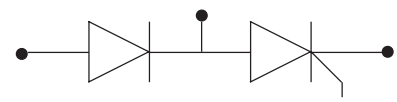
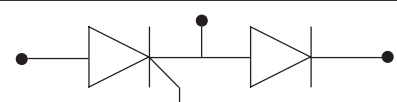
### CURRENT RATINGS - PER ARM

Symbol	Parameter	Conditions	Max.	Units	
$I_{T(AV)}$	Mean on-state current	Halfwave, resistive load	$T_{case} = 75^{\circ}\text{C}$	134	A
			$T_{case} = 85^{\circ}\text{C}$	112	A
			$T_{heatsink} = 75^{\circ}\text{C}$	114	A
			$T_{heatsink} = 85^{\circ}\text{C}$	95	A
$I_{T(RMS)}$	RMS value	$T_{case} = 75^{\circ}\text{C}$	210	A	

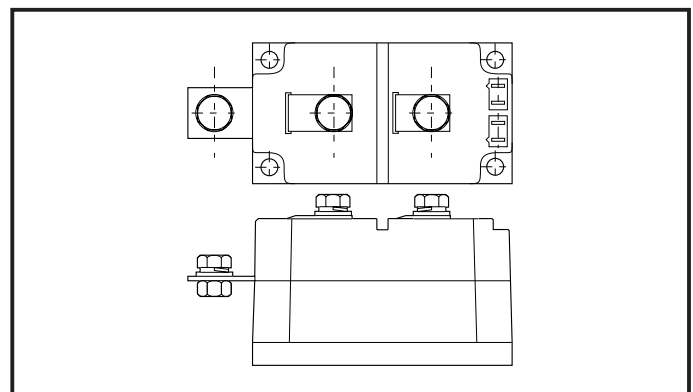
### KEY PARAMETERS

$V_{DRM}$	2000V
$I_{TSM}$	4000A
$I_{T(AV)}$ (per arm)	134A
$V_{isol}$	2500V

### CIRCUIT OPTIONS

Code	Circuit
HBT	
HBP	
HBN	

### PACKAGE OUTLINE



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

## MP03 XXX 130 Series

### SURGE RATINGS - PER ARM

Symbol	Parameter	Conditions	Max.	Units
$I_{TSM}$	Surge (non-repetitive) on-state current	10ms half sine; $V_R = 0$ $T_j = 125^\circ\text{C}$	4000	A
		$V_R = 50\% V_{RRM}$	3200	A
$I^2t$	$I^2t$ for fusing	10ms half sine; $V_R = 0$ $T_j = 125^\circ\text{C}$	80000	$\text{A}^2\text{s}$
		$V_R = 50\% V_{RRM}$	51200	$\text{A}^2\text{s}$

### THERMAL & MECHANICAL RATINGS

Symbol	Parameter	Conditions	Max.	Units
$R_{th(j-c)}$	Thermal resistance - junction to case per Thyristor or Diode	dc	0.21	$^\circ\text{C}/\text{W}$
		halfwave	0.22	$^\circ\text{C}/\text{W}$
		3 phase	0.23	$^\circ\text{C}/\text{W}$
$R_{th(c-hs)}$	Thermal resistance - case to heatsink per Thyristor or Diode	Mounting torque = 5Nm with mounting compound	0.05	$^\circ\text{C}/\text{W}$
$T_{vj}$	Virtual junction temperature		125	$^\circ\text{C}$
$T_{sto}$	Storage temperature range		-40 to 125	$^\circ\text{C}$
$V_{isol}$	Isolation voltage	Commoned terminals to base plate AC RMS, 1min, 50Hz	2.5	kV

### DYNAMIC CHARACTERISTICS

Symbol	Parameter	Conditions	Max.	Units
$V_{TM}$	On-state voltage	At 450A, $T_{case} = 25^\circ\text{C}$ - See Note 1	1.90	V
$I_{RRM}/I_{DRM}$	Peak reverse and off-state current	At $V_{RRM}/V_{DRM}$ , $T_j = 125^\circ\text{C}$	30	mA
dV/dt	Linear rate of rise of off-state voltage	To 60% $V_{DRM}$ , $T_j = 125^\circ\text{C}$	200*	$\text{V}/\mu\text{s}$
dI/dt	Rate of rise of on-state current	From 67% $V_{DRM}$ to 400A Gate source 20V, 20 $\Omega$ Rise time 0.5 $\mu\text{s}$ , $T_j = 125^\circ\text{C}$	100	$\text{A}/\mu\text{s}$
$V_{T(TO)}$	Threshold voltage	At $T_{vj} = 125^\circ\text{C}$ - See Note 1	1.25	V
$r_T$	On-state slope resistance	At $T_{vj} = 125^\circ\text{C}$ - See Note 1	1.33	m $\Omega$

\* Higher dV/dt values available, contact factory for particular requirements.

Note 1: The data given in this datasheet with regard to forward voltage drop is for calculation of the power dissipation in the semiconductor elements only. Forward voltage drops measured at the power terminals of the module will be in excess of these figures due to the impedance of the busbar from the terminal to the semiconductor.

## GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Conditions	Typ.	Max.	Units
$V_{GT}$	Gate trigger voltage	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	-	3.0	V
$I_{GT}$	Gate trigger current	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	-	200	mA
$V_{GD}$	Gate non-trigger voltage	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	-	0.2	V
$V_{FGM}$	Peak forward gate voltage	Anode positive with respect to cathode	-	30	V
$V_{FGN}$	Peak forward gate voltage	Anode negative with respect to cathode	-	0.25	V
$V_{RGM}$	Peak reverse gate voltage		-	5.0	V
$I_{FGM}$	Peak forward gate current	Anode positive with respect to cathode	-	4	A
$P_{GM}$	Peak gate power		-	16	W
$P_{G(AV)}$	Mean gate power		-	3	W

## ORDERING INSTRUCTIONS

Part number is made up as follows:

MP03 HBT 130 - 18

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

Examples:

MP03 HBP130-16  
 MP03 HBN130-20  
 MP03 HBT130-16

Note: Diode ratings and characteristics are comparable with SCR in types HBP or HBN.  
 Types HBP or HBN can also be supplied with diode polarity reversed, to special order.

## 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  $V_{T(TO)}$  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.

CURVES

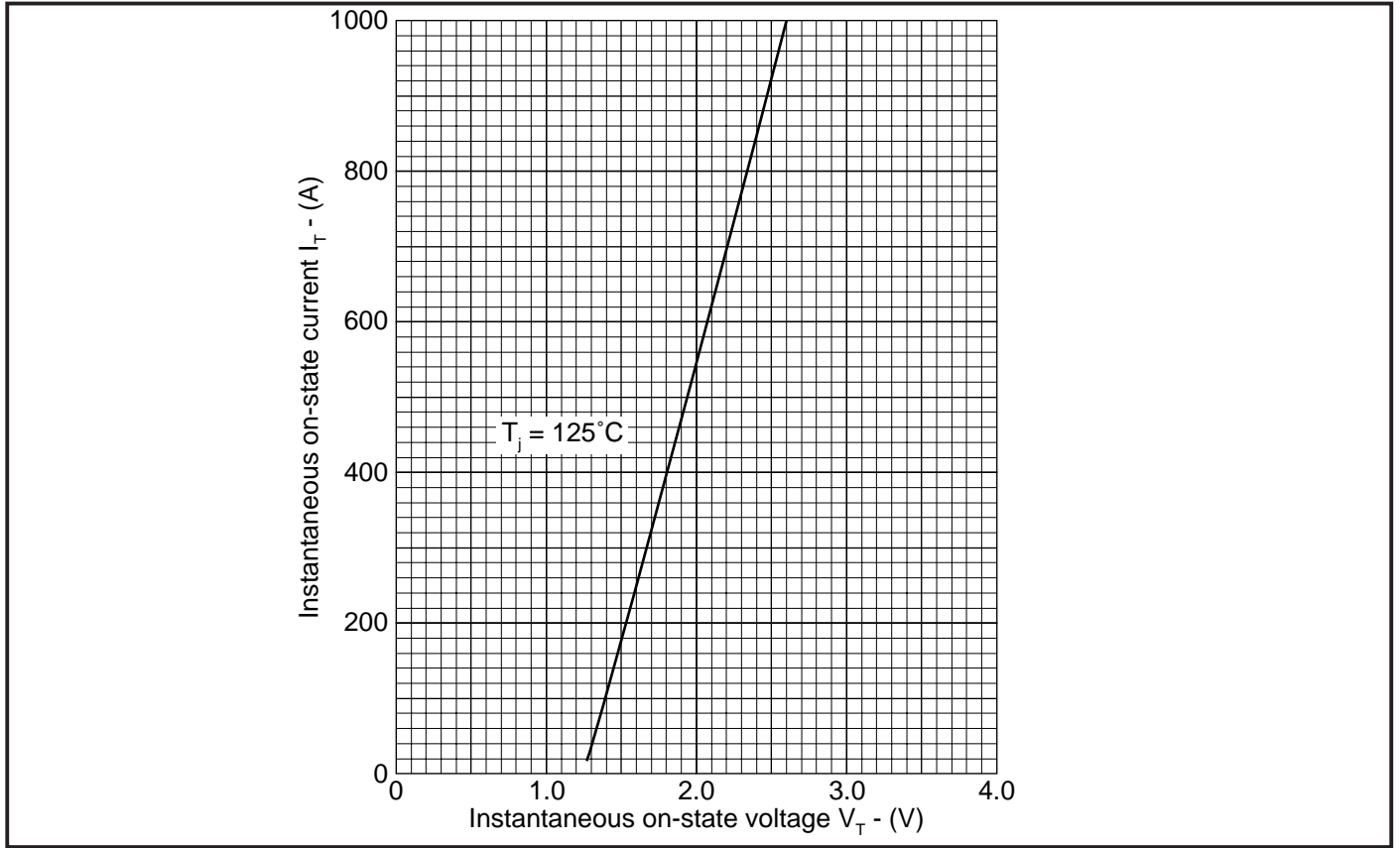


Fig. 1 Maximum (limit) on-state characteristics (thyristor or diode) - See Note 1

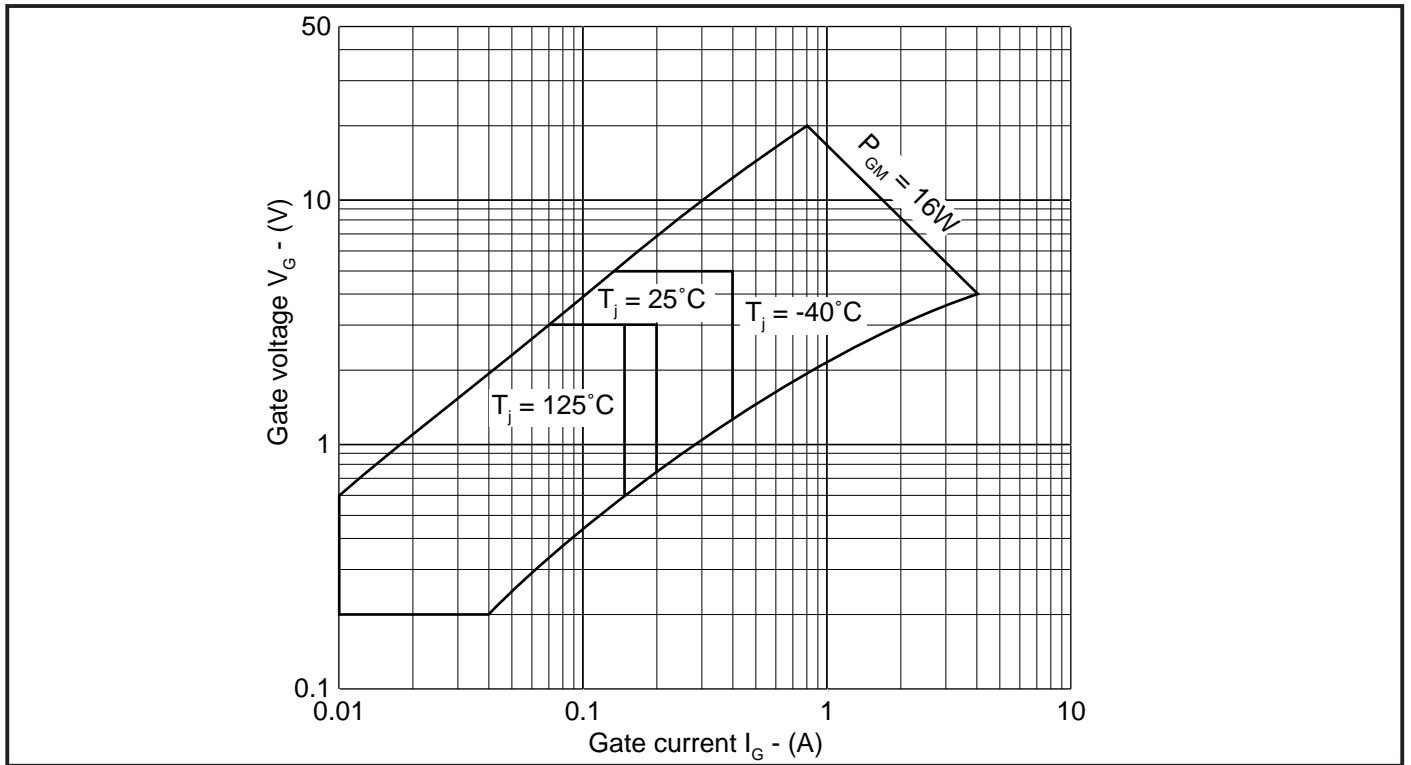


Fig. 2 Gate trigger characteristics

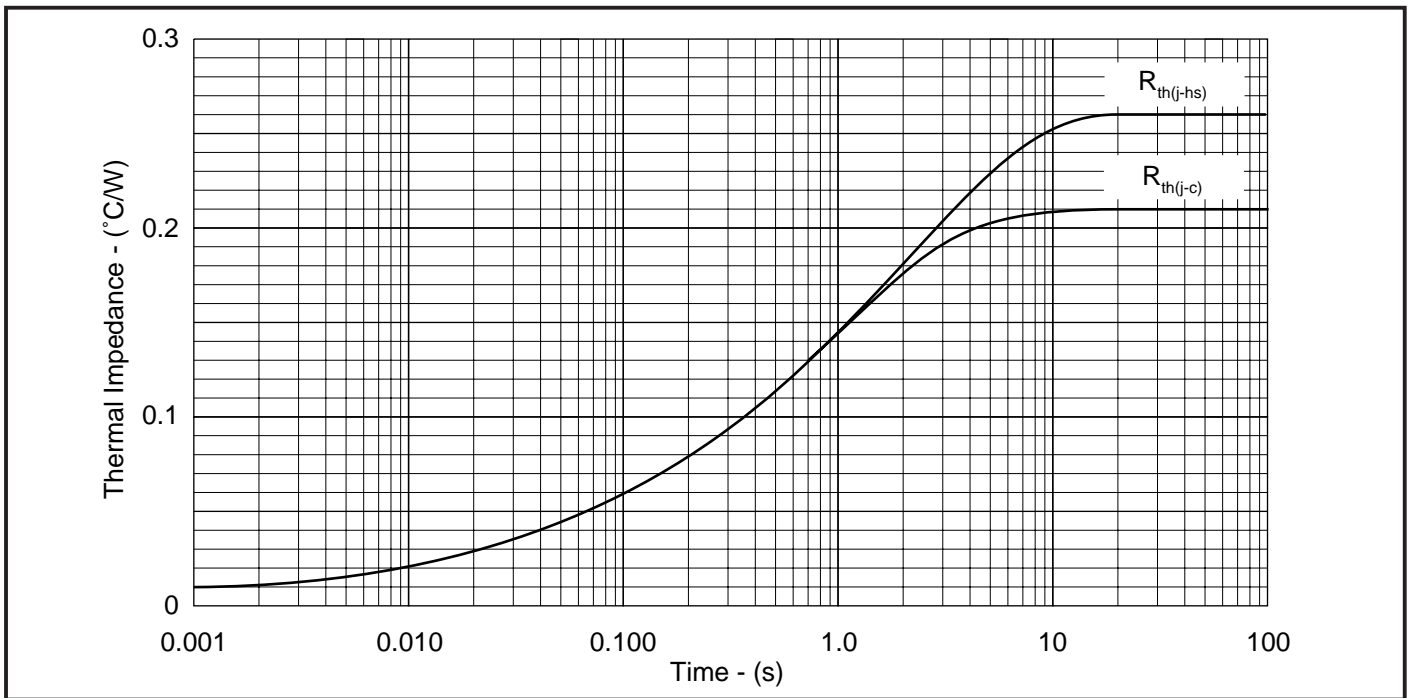


Fig. 3 Transient thermal impedance (DC) - (Thyristor or diode)

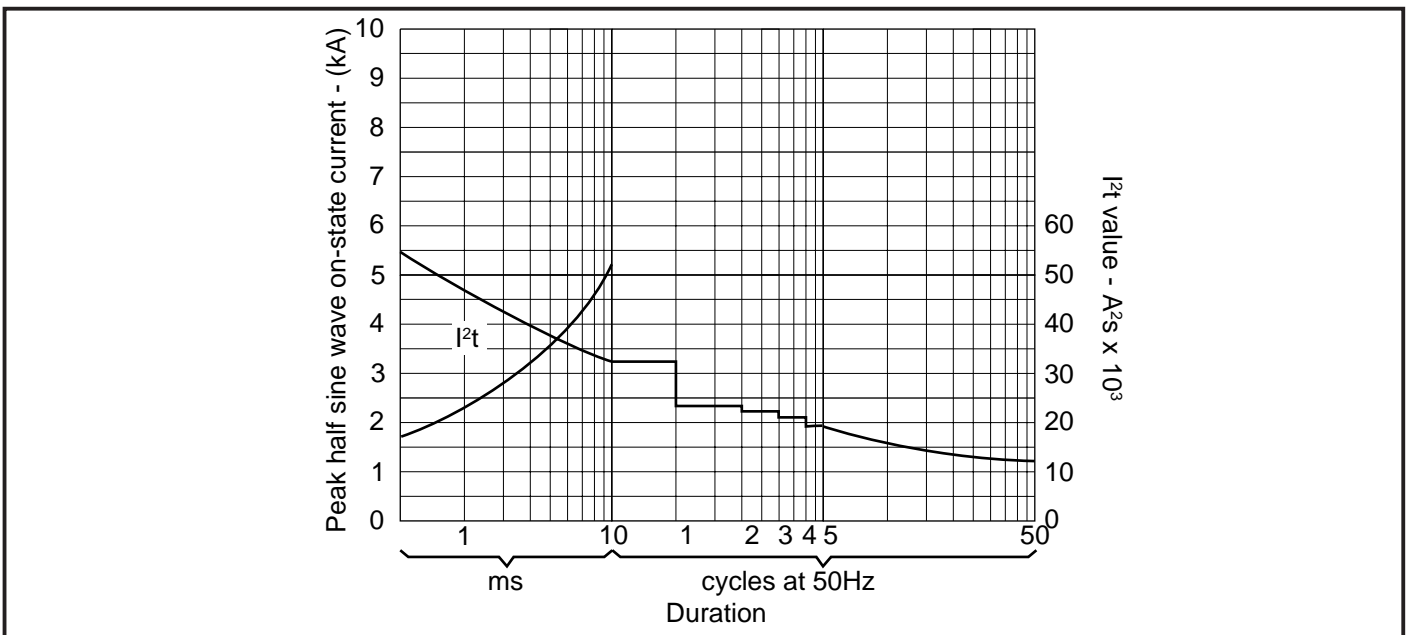


Fig. 4 Surge (non-repetitive) on-state current vs time (with 50%  $V_{RRM}$ ,  $T_{case} = 125^{\circ}\text{C}$  (Thyristor or diode))

MP03 XXX 130 Series

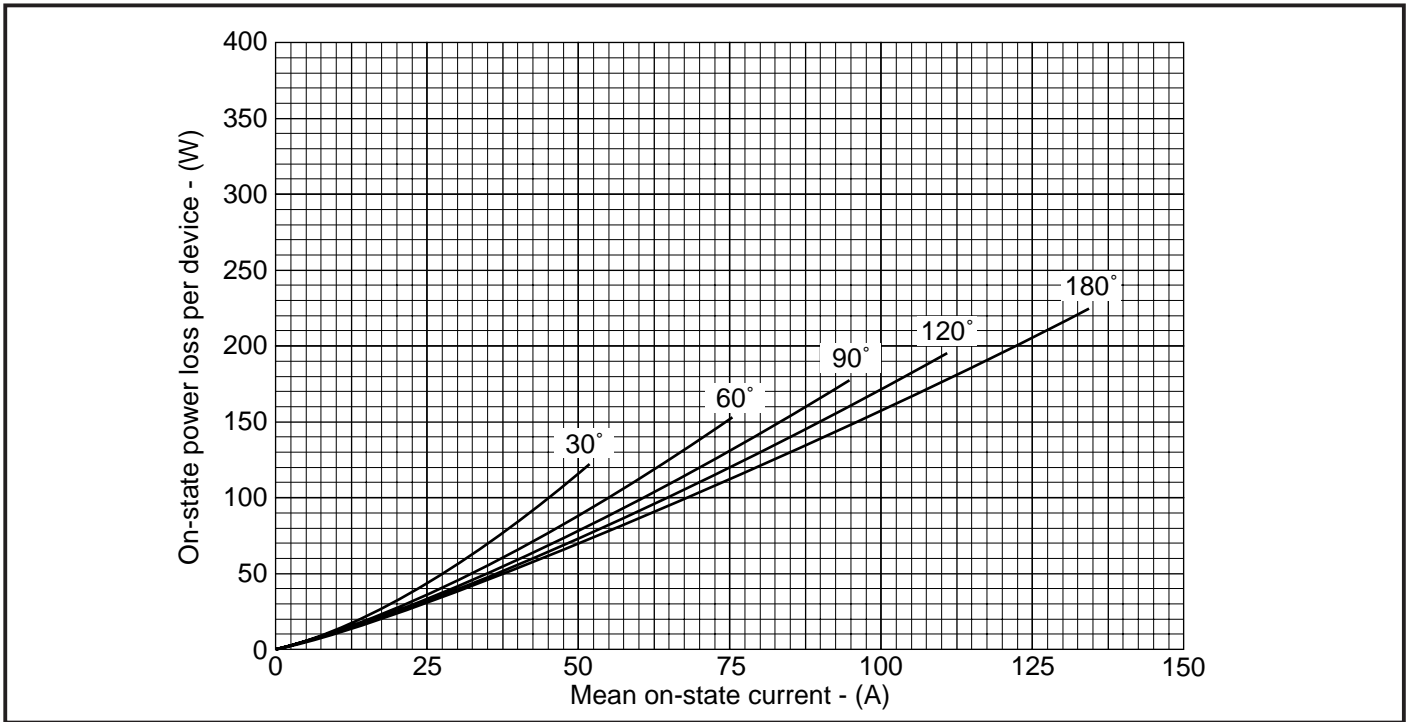


Fig. 5 On-state power loss per arm vs forward current at various conduction angles, sine wave, 50/60Hz

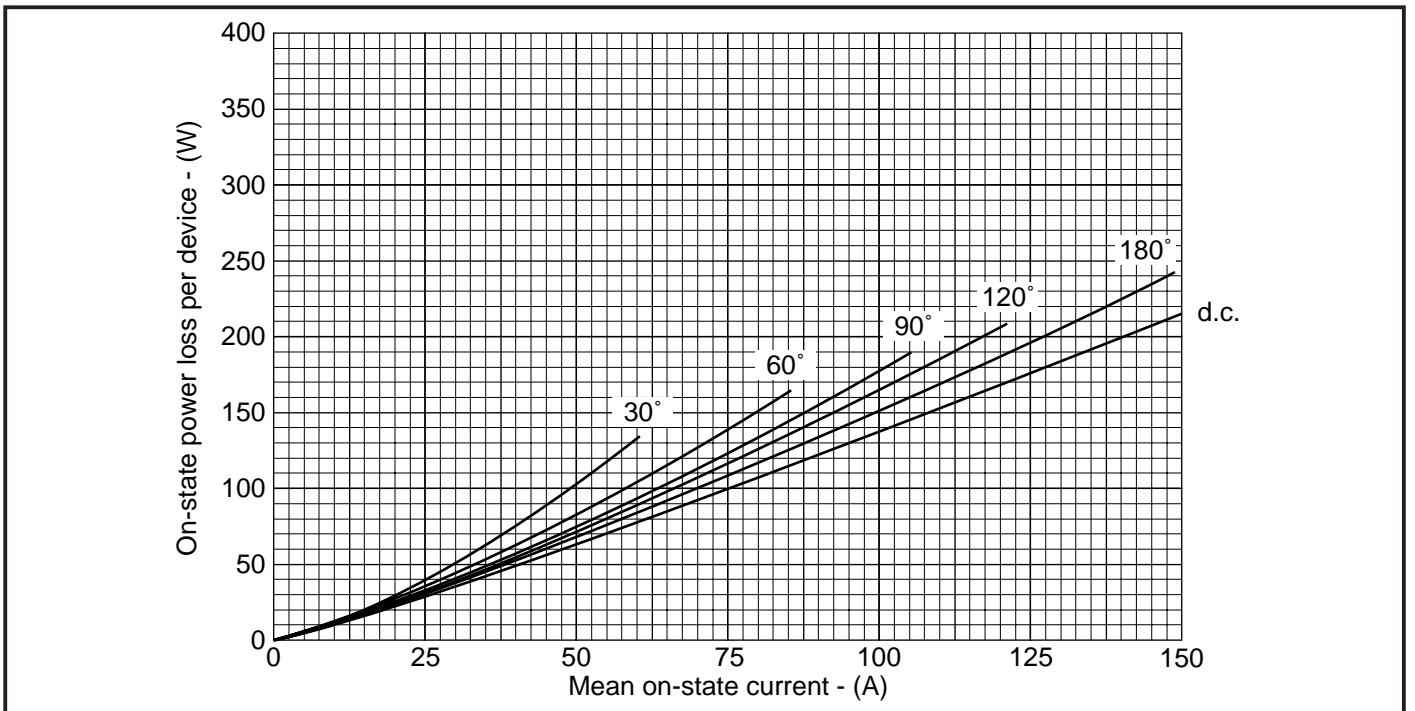


Fig. 6 On-state power loss per arm vs forward current at various conduction angles, square wave, 50/60Hz

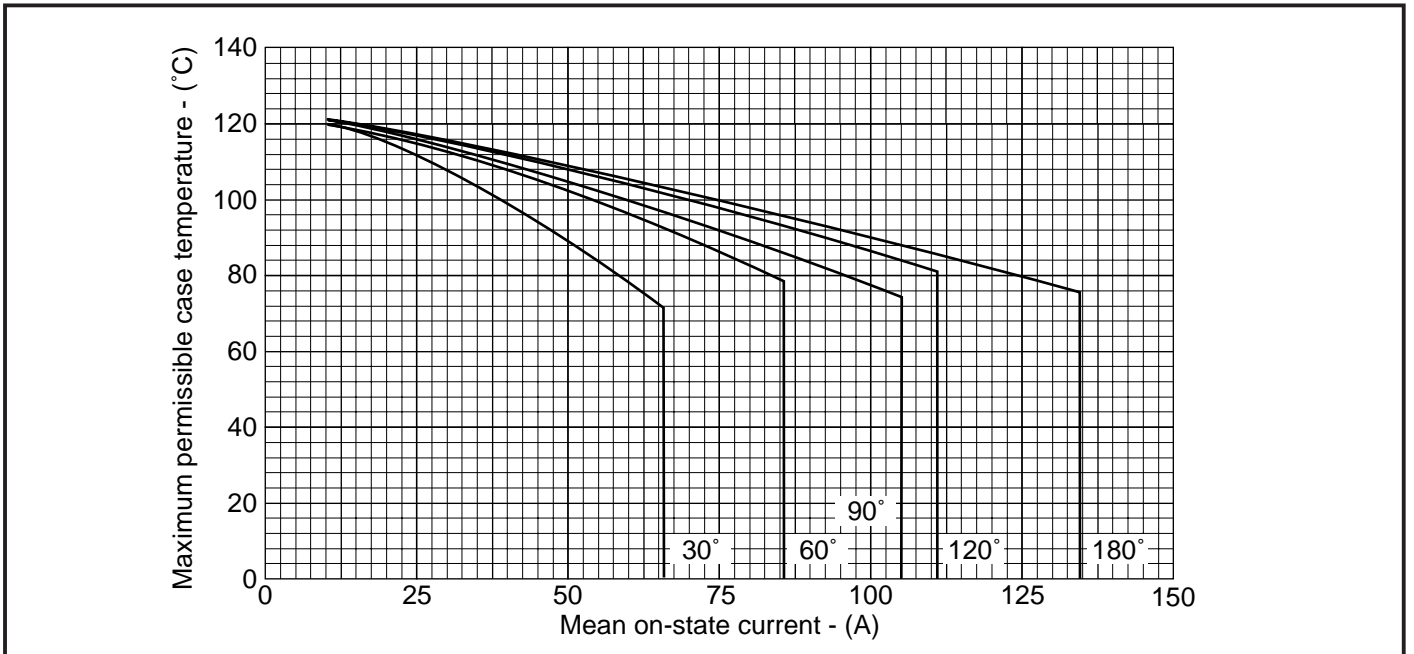


Fig. 7 Maximum permissible case temperature vs forward current per arm at various conduction angles, sine wave, 50/60Hz

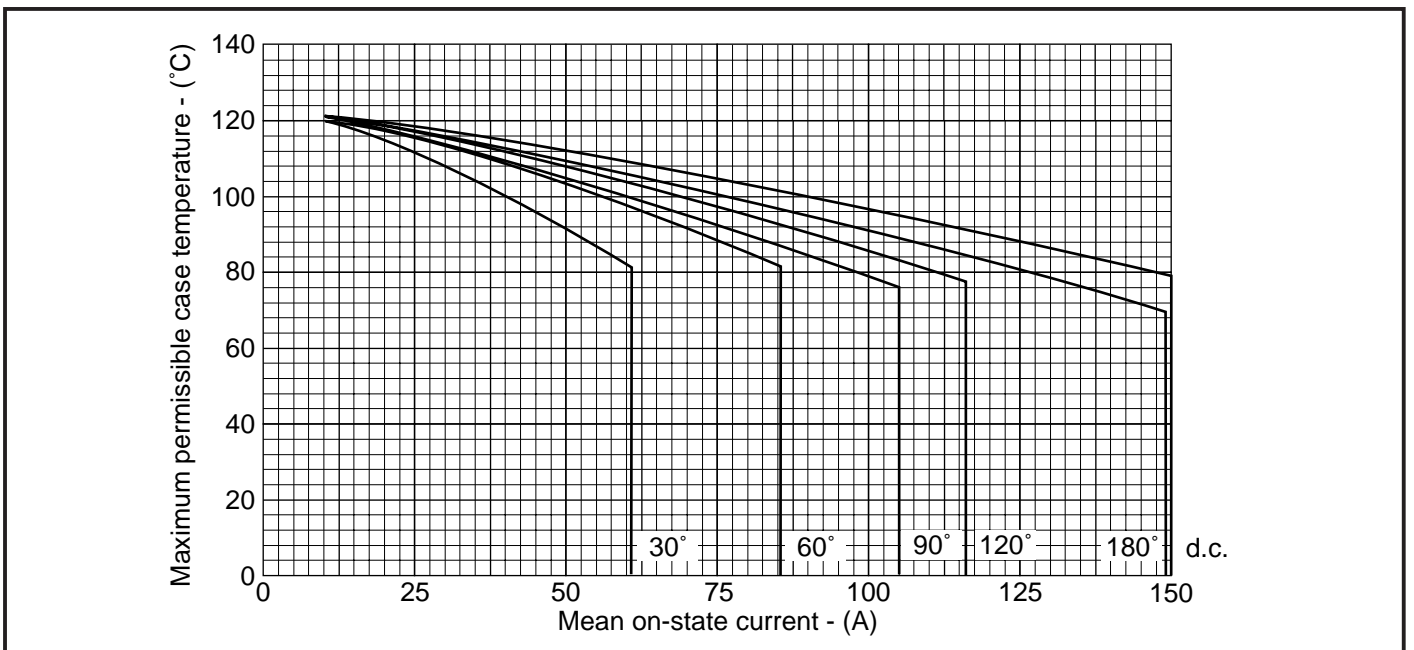
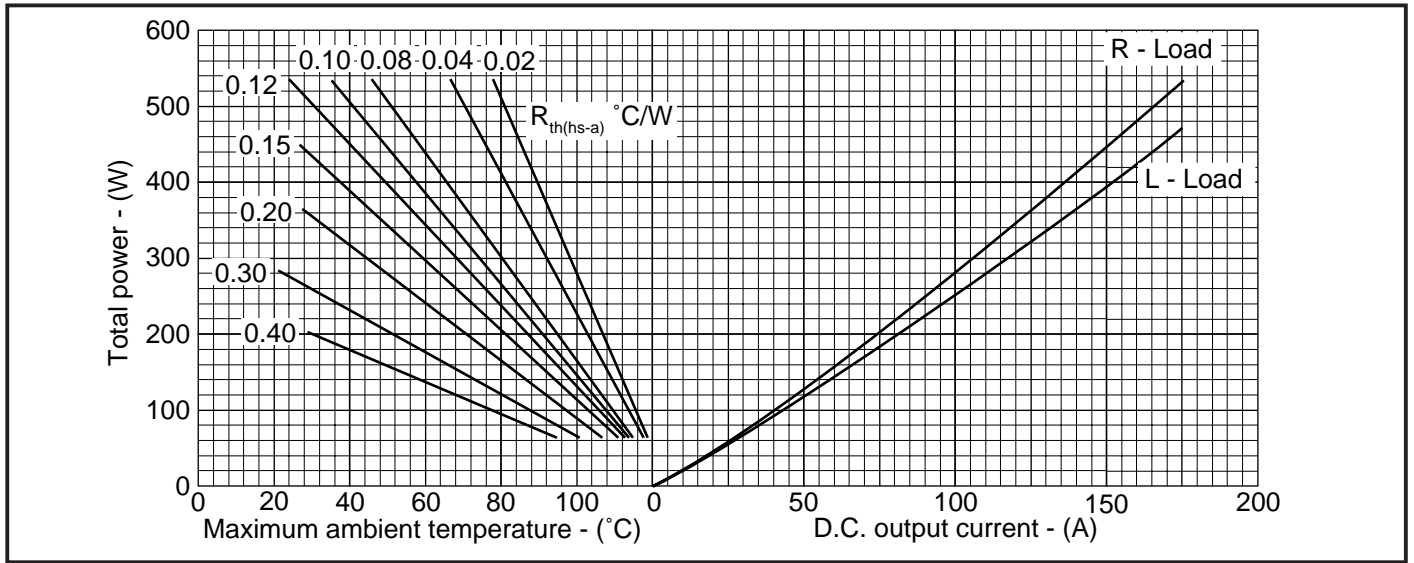


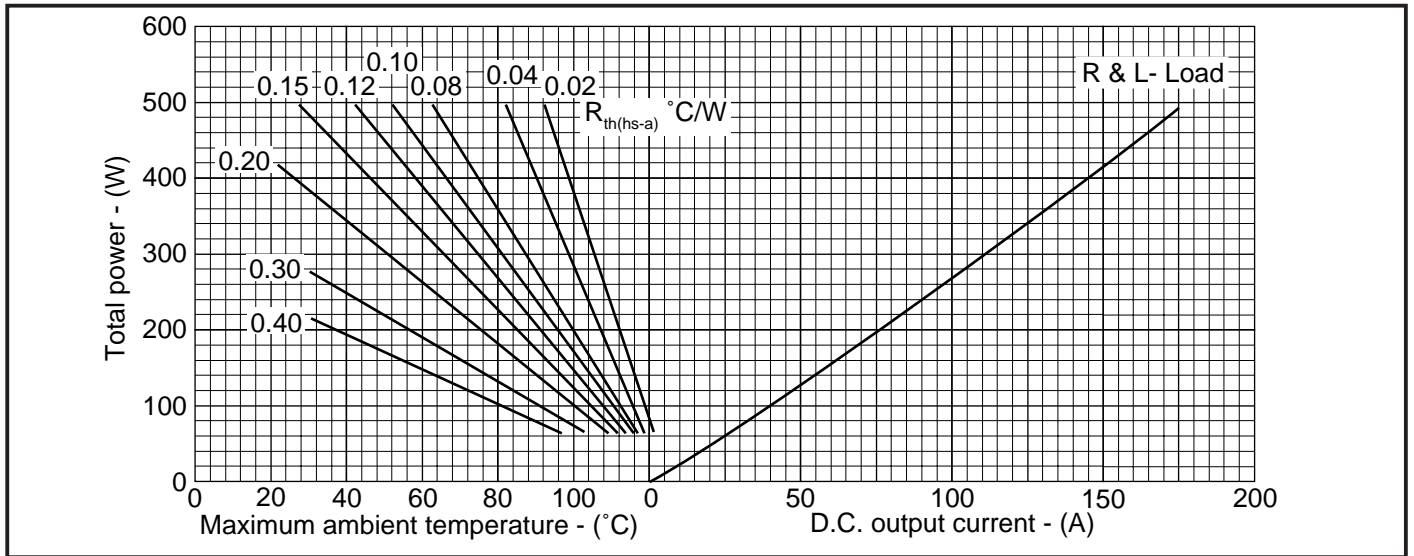
Fig. 8 Maximum permissible case temperature vs forward current per arm at various conduction angles, square wave, 50/60Hz

**MP03 XXX 130 Series**



**Fig. 9 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).



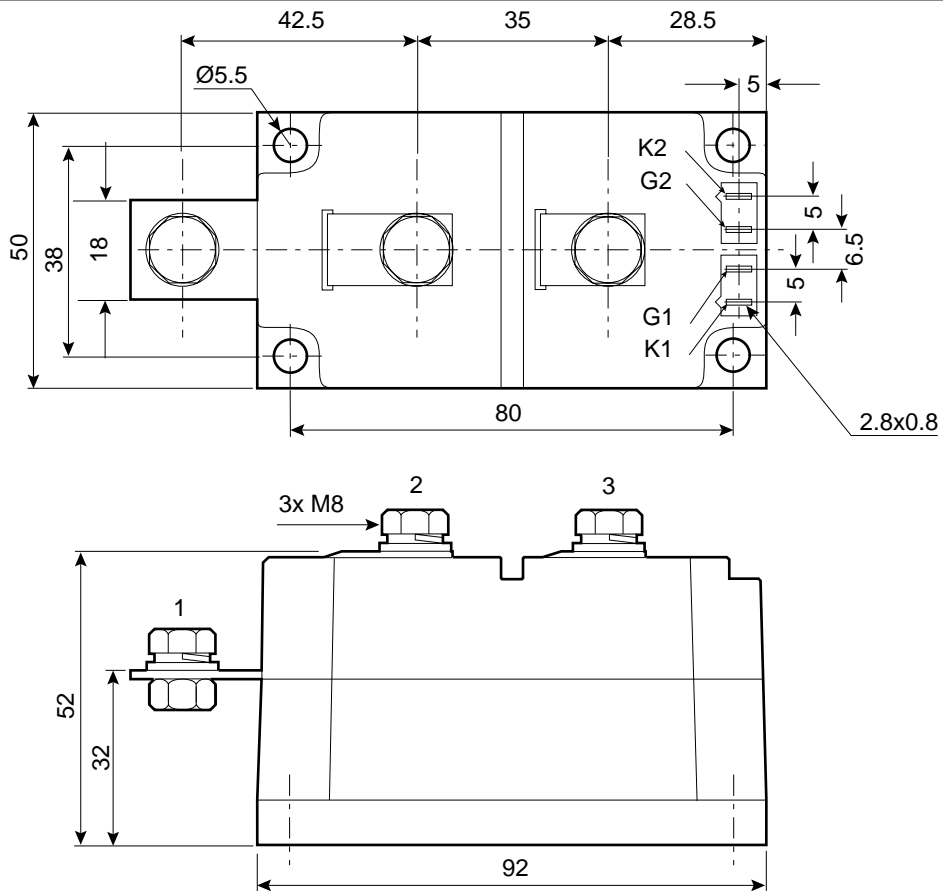
**Fig. 9 50/60Hz 3- phase bridge dc output current vs power loss and maximum permissible ambient temperature for various values of heatsink thermal resistance.**

(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**

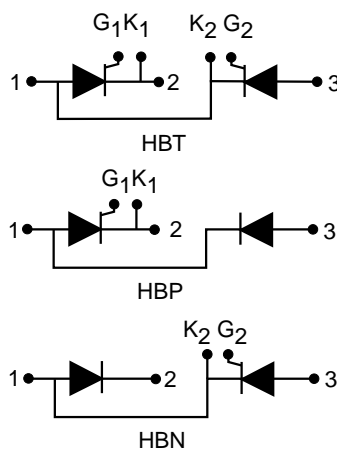
For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



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 XXX 130 Series

### ASSOCIATED PUBLICATIONS

Title	Application Note Number
Calculating the junction temperature or power semiconductors	AN4506
Thyristor and diode measurement with a multi-meter	AN4853
Use of $V_{TO}$ , $r_T$ on-state characteristic	AN5001

### POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink / clamping systems in line with advances in device types and the voltage and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group continues to offer high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the up to date CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete solution (PACs).

### HEATSINKS

Power Assembly has its own proprietary range of extruded aluminium heatsinks. They have been designed to optimise the performance of our semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest Sales Representative or the factory.



<http://www.dynexsemi.com>

e-mail: [power\\_solutions@dynexsemi.com](mailto:power_solutions@dynexsemi.com)

HEADQUARTERS OPERATIONS  
**DYNEX SEMICONDUCTOR LTD**  
Doddington Road, Lincoln.  
Lincolnshire. LN6 3LF. United Kingdom.  
Tel: 00-44-(0)1522-500500  
Fax: 00-44-(0)1522-500550

**DYNEX POWER INC.**  
Unit 7 - 58 Antares Drive,  
Nepean, Ontario, Canada K2E 7W6.  
Tel: 613.723.7035  
Fax: 613.723.1518  
Toll Free: 1.888.33.DYNEX (39639)

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**France, Benelux, Italy and Spain** Tel: +33 (0)1 69 18 90 00. Fax: +33 (0)1 64 46 54 50  
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**UK, Germany, Scandinavia & Rest Of World** Tel: +44 (0)1522 500500. Fax: +44 (0)1522 500020  
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