

### 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
	$V_{DRM}$	$V_{RRM}$	
MP03/175-16	1600		$T_{(Vj)} = 125^{\circ}\text{C}$ $I_{DRM} = I_{RRM} = 30\text{mA}$ $V_{DSM} \text{ \& } V_{RSM} =$ $V_{DRM} \text{ \& } V_{RRM} + 100\text{V}$ respectively
MP03/175-14	1400		
MP03/175-12	1200		
MP03/175-10	1000		

Lower voltage grades available. 1800V product also available - consult factory. For full description of part number see "Ordering instructions" on page 3.

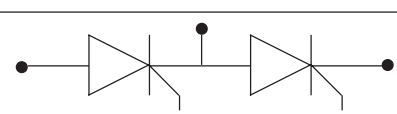
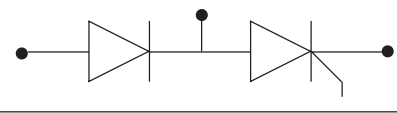
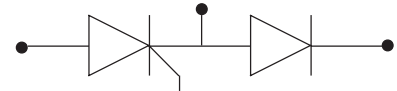
### CURRENT RATINGS - PER ARM

Symbol	Parameter	Conditions	Max.	Units	
$I_{T(AV)}$	Mean on-state current	Halfwave, resistive load	$T_{case} = 75^{\circ}\text{C}$	175	A
			$T_{case} = 85^{\circ}\text{C}$	146	A
			$T_{heatsink} = 75^{\circ}\text{C}$	148	A
			$T_{heatsink} = 85^{\circ}\text{C}$	123	A
$I_{T(RMS)}$	RMS value	$T_{case} = 75^{\circ}\text{C}$	275	A	

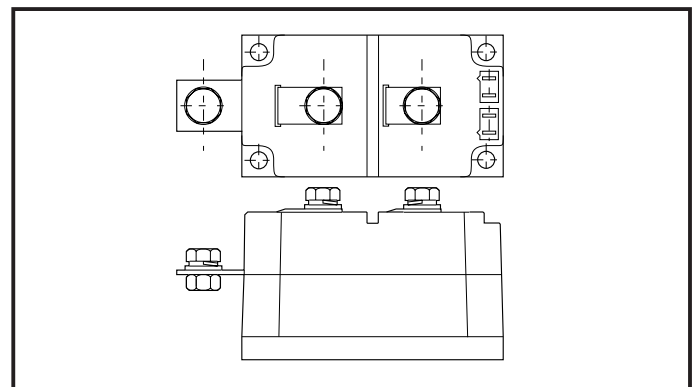
### KEY PARAMETERS

$V_{DRM}$	1600V
$I_{TSM}$	6800A
$I_{T(AV)}$ (per arm)	175A
$V_{isol}$	2500V

### CIRCUIT OPTIONS

Code	Circuit
HBT	
HBP	
HBN	

### PACKAGE OUTLINE



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

## MP03 XXX 175 Series

### SURGE RATINGS - PER ARM

Symbol	Parameter	Conditions		Max.	Units
$I_{TSM}$	Surge (non-repetitive) on-state current	10ms half sine; $T_j = 125^\circ\text{C}$	$V_R = 0$	6800	A
			$V_R = 50\% V_{RRM}$	5500	A
$I^2t$	$I^2t$ for fusing	10ms half sine; $T_j = 125^\circ\text{C}$	$V_R = 0$	231000	$\text{A}^2\text{s}$
			$V_R = 50\% V_{RRM}$	150000	$\text{A}^2\text{s}$

### 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 - THYRISTOR

Symbol	Parameter	Conditions	Max.	Units
$V_{TM}$	On-state voltage	At 500A, $T_{case} = 25^\circ\text{C}$ - See Note 1	1.3	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 67% $V_{DRM}$ , $T_j = 125^\circ\text{C}$	200*	$\text{V}/\mu\text{s}$
di/dt	Rate of rise of on-state current	From 67% $V_{DRM}$ to 500A Gate source 10V, 5Ω Rise time 0.5μs, $T_j = 125^\circ\text{C}$	100	$\text{A}/\mu\text{s}$
$V_{T(TO)}$	Threshold voltage	At $T_{vj} = 125^\circ\text{C}$ - See Note 1	0.98	V
$r_T$	On-state slope resistance	At $T_{vj} = 125^\circ\text{C}$ - See Note 1	0.75	mΩ

\* 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	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	-	150	mA
$V_{GD}$	Gate non-trigger voltage	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	-	0.25	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	-	10	A
$P_{GM}$	Peak gate power	$t_p = 25\mu s$	-	100	W
$P_{G(AV)}$	Mean gate power		-	5	W

## ORDERING INSTRUCTIONS

Part number is made up as follows:

MP03 HBT 175 - 12

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

Examples:

MP03 HBP175-12  
 MP03 HBN175-16  
 MP03 HBT175-10

NOTE: Diode ratings and characteristics are comparable with the SCR in types HBP or HBN.  
 Types HBP and 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.
- 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.
- 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.

CURVES

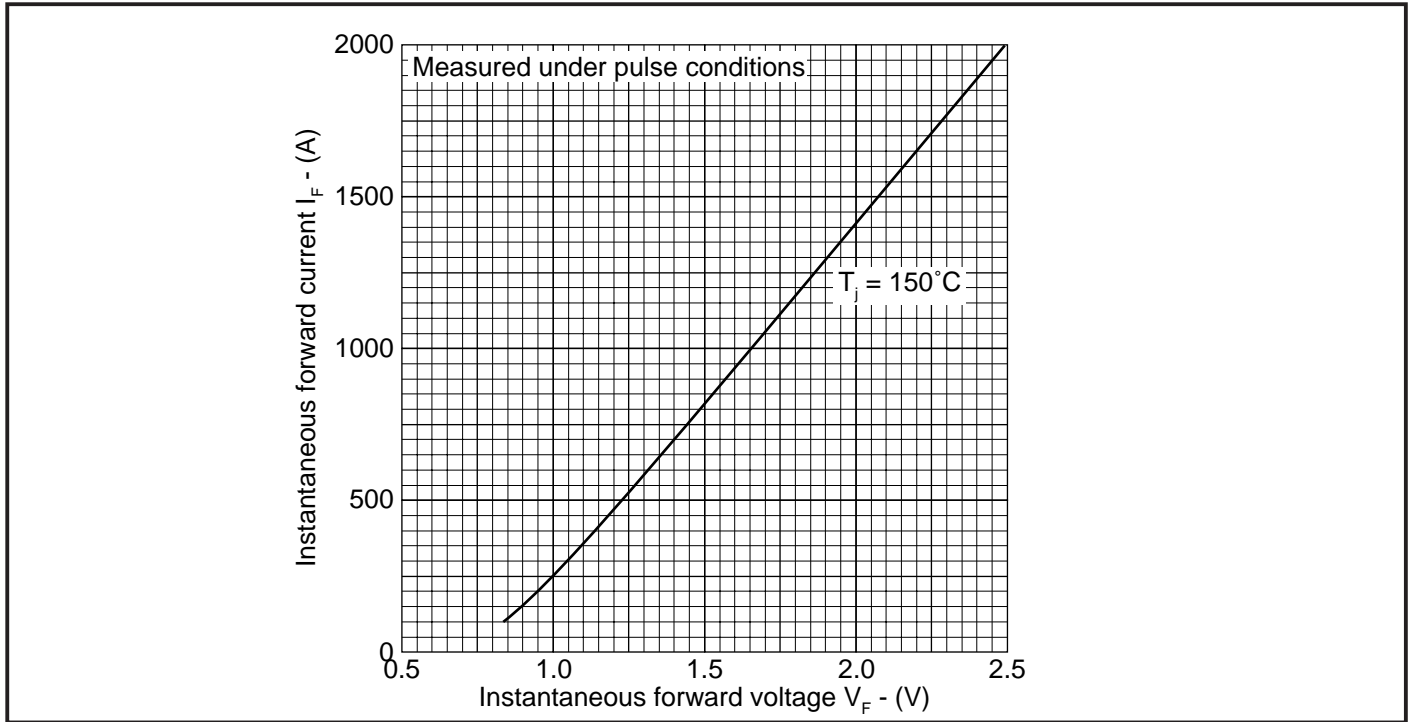


Fig. 1 Maximum (limit) on-state characteristics (thyristor or diode) - See Note 1

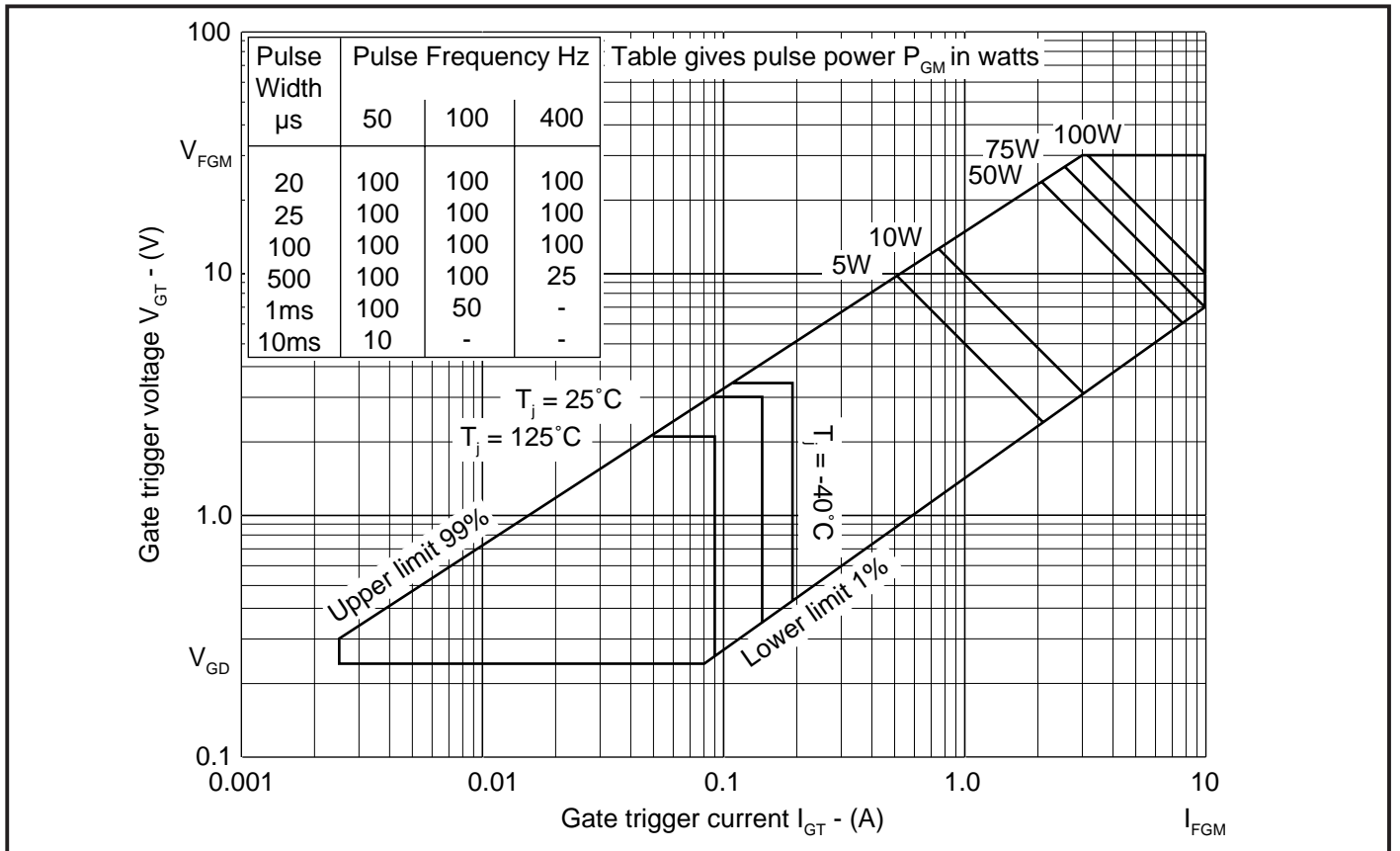


Fig. 2 Gate trigger characteristics

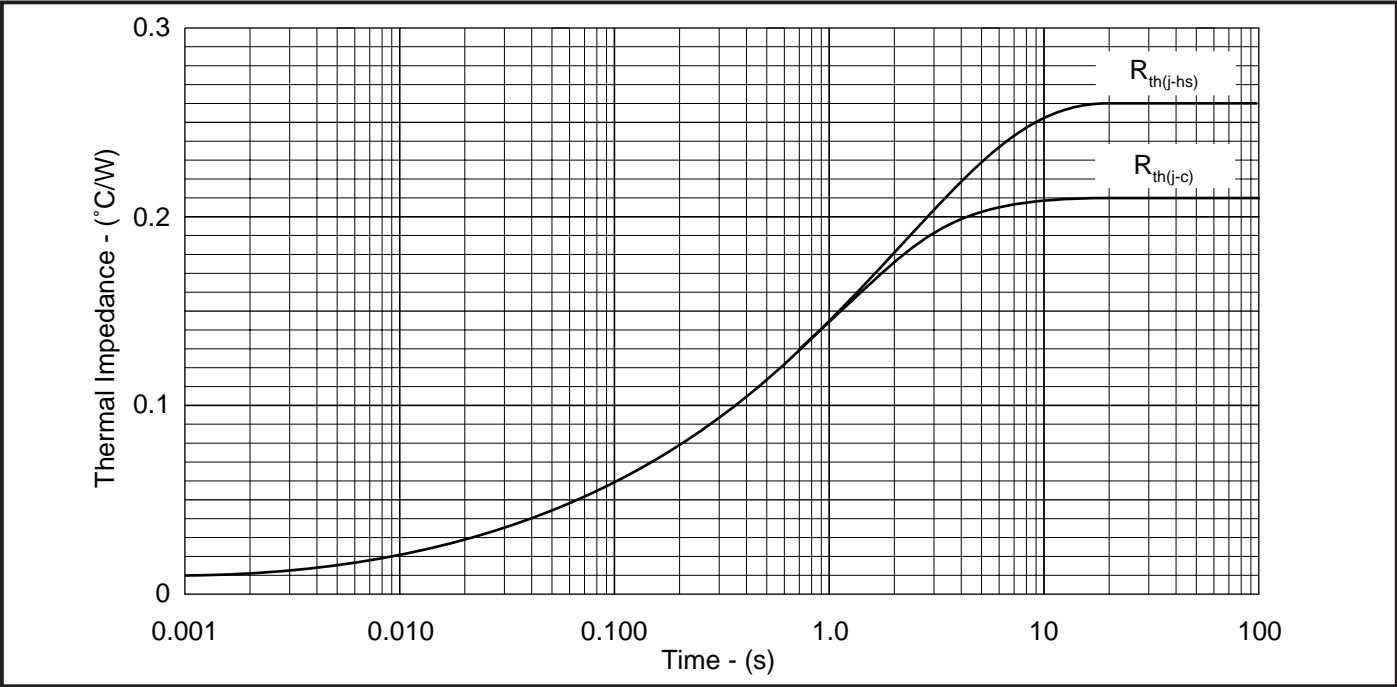


Fig. 3 Transient thermal impedance (DC) - (Thyristor or diode)

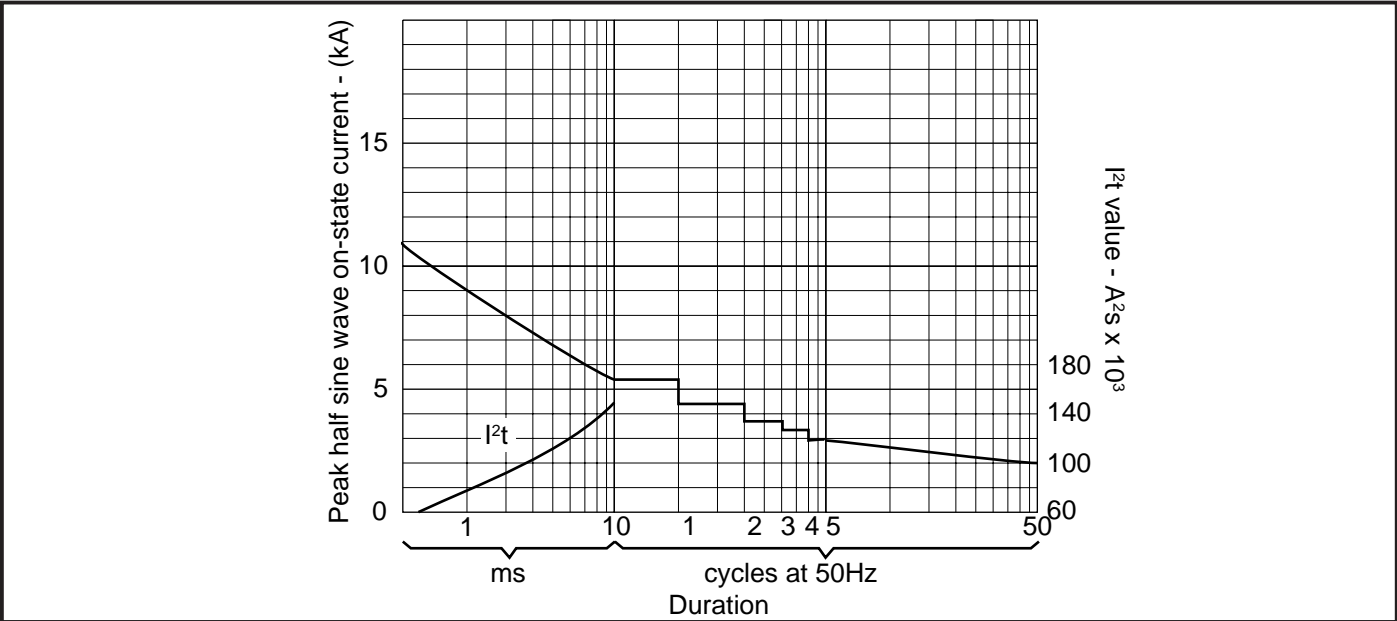


Fig. 4 Surge (non-repetitive) on-state current vs time (with 50%  $V_{RRM}$ ,  $T_{case} = 125^{\circ}\text{C}$  (Thyristor or diode))

MP03 XXX 175 Series

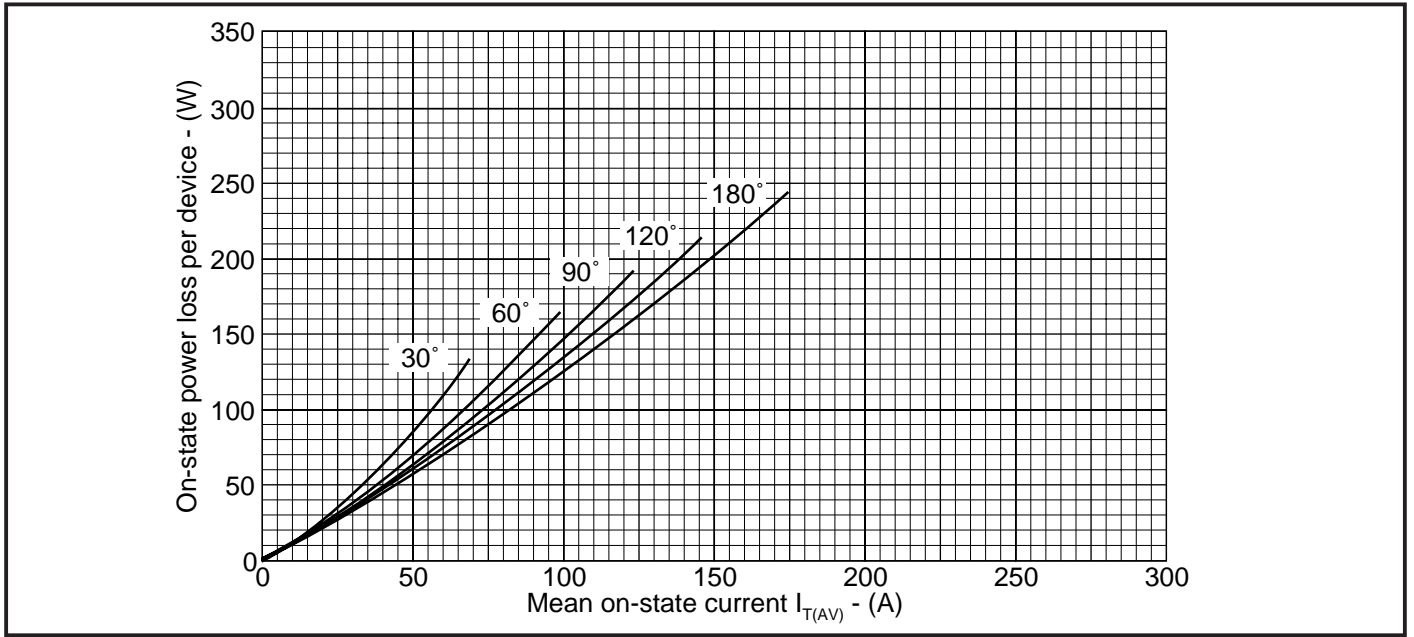


Fig. 5 On-state power loss per arm vs forward current at various conduction angles, sine wave, 50/60Hz

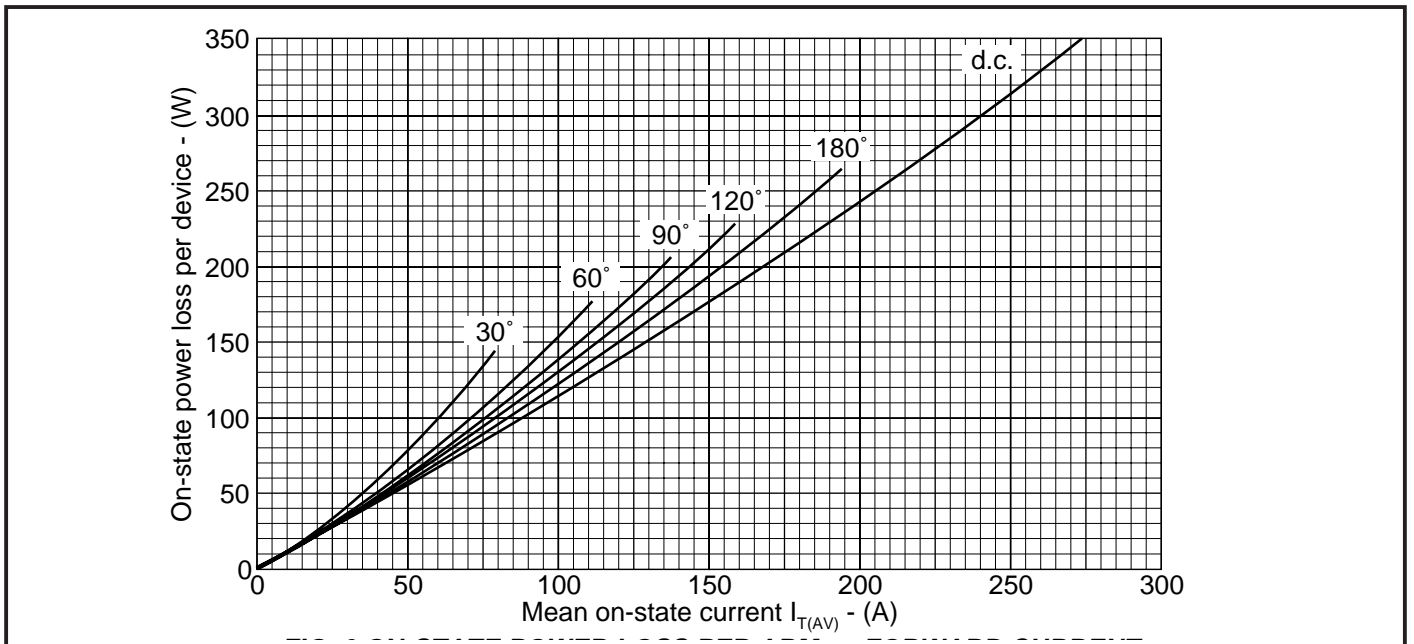


Fig. 6 On-state power loss per arm vs forward current at various conduction angles, square wave, 50/60Hz

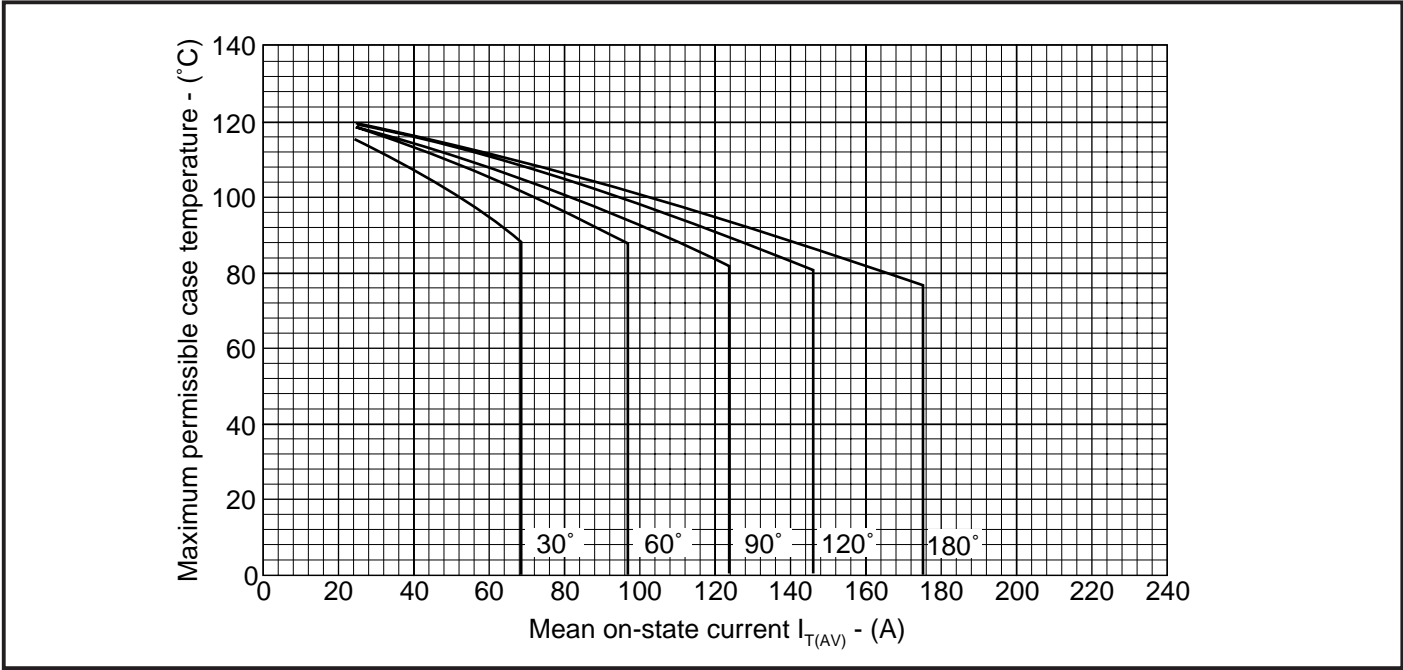


Fig. 7 Maximum permissible case temperature vs forward current per arm at various conduction angles, sine wave, 50/60Hz

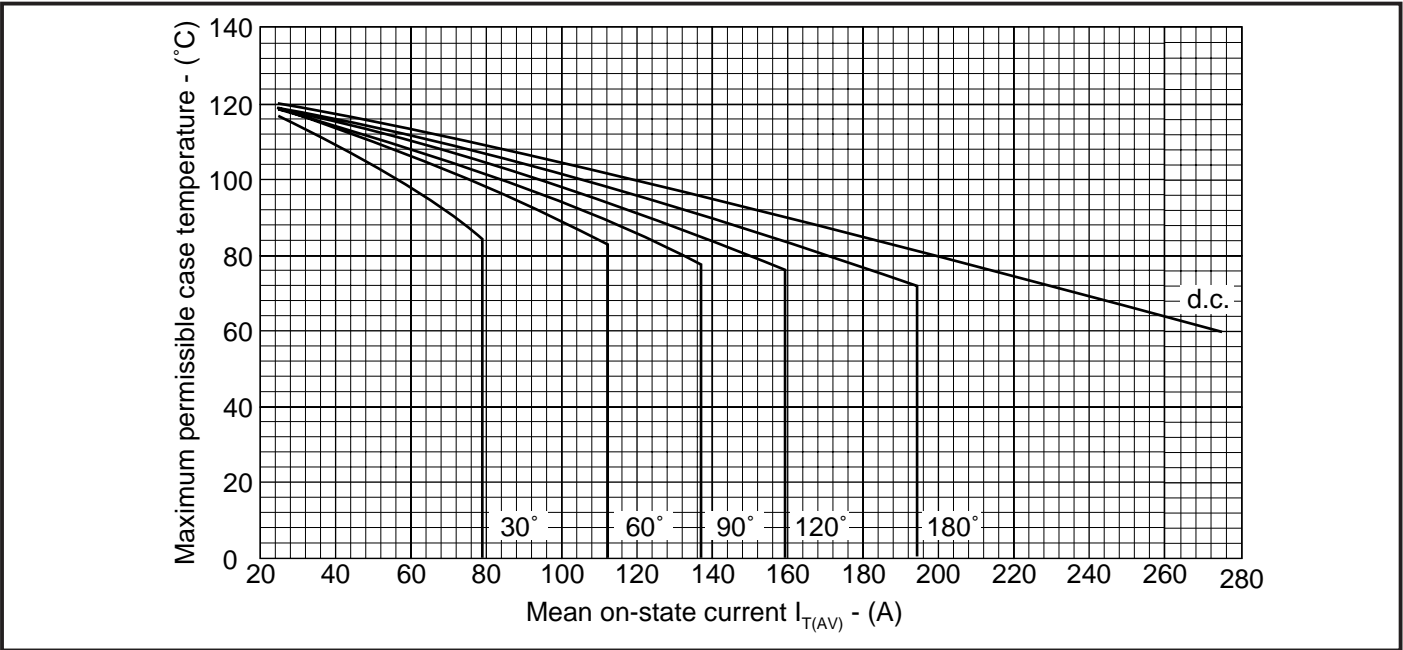
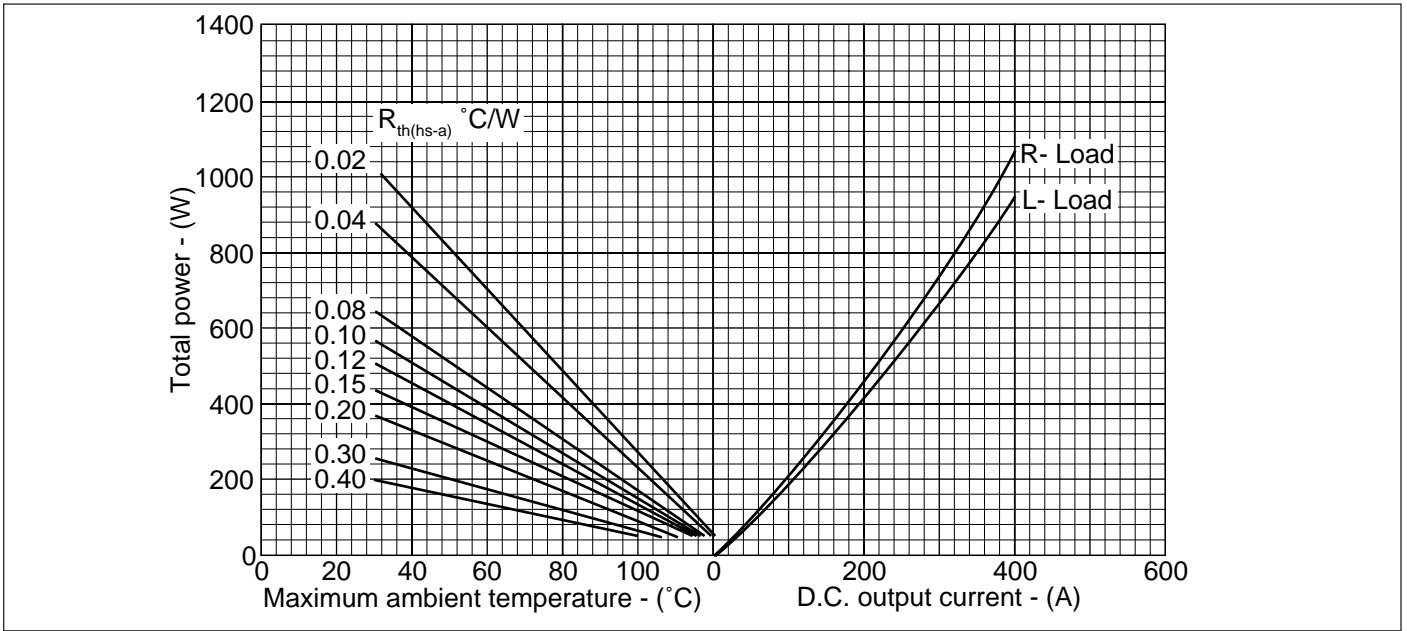


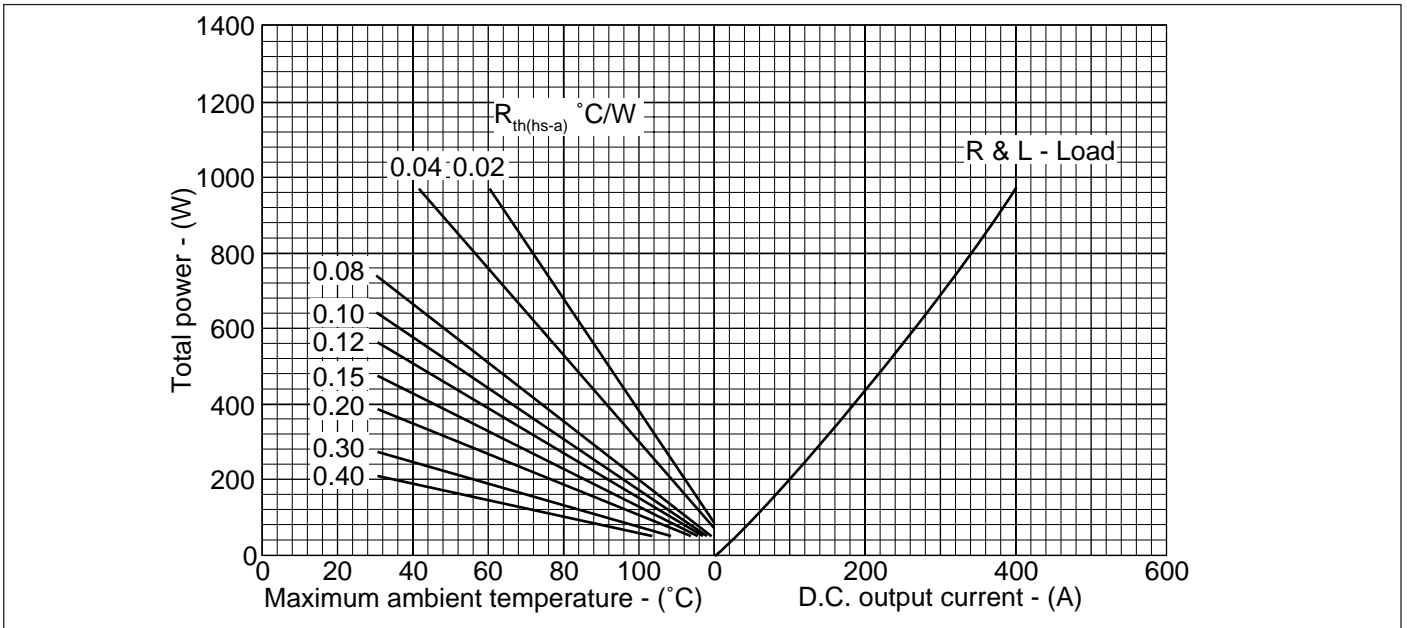
Fig. 8 Maximum permissible case temperature vs forward current per arm at various conduction angles, square wave, 50/60Hz

**MP03 XXX 175 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).



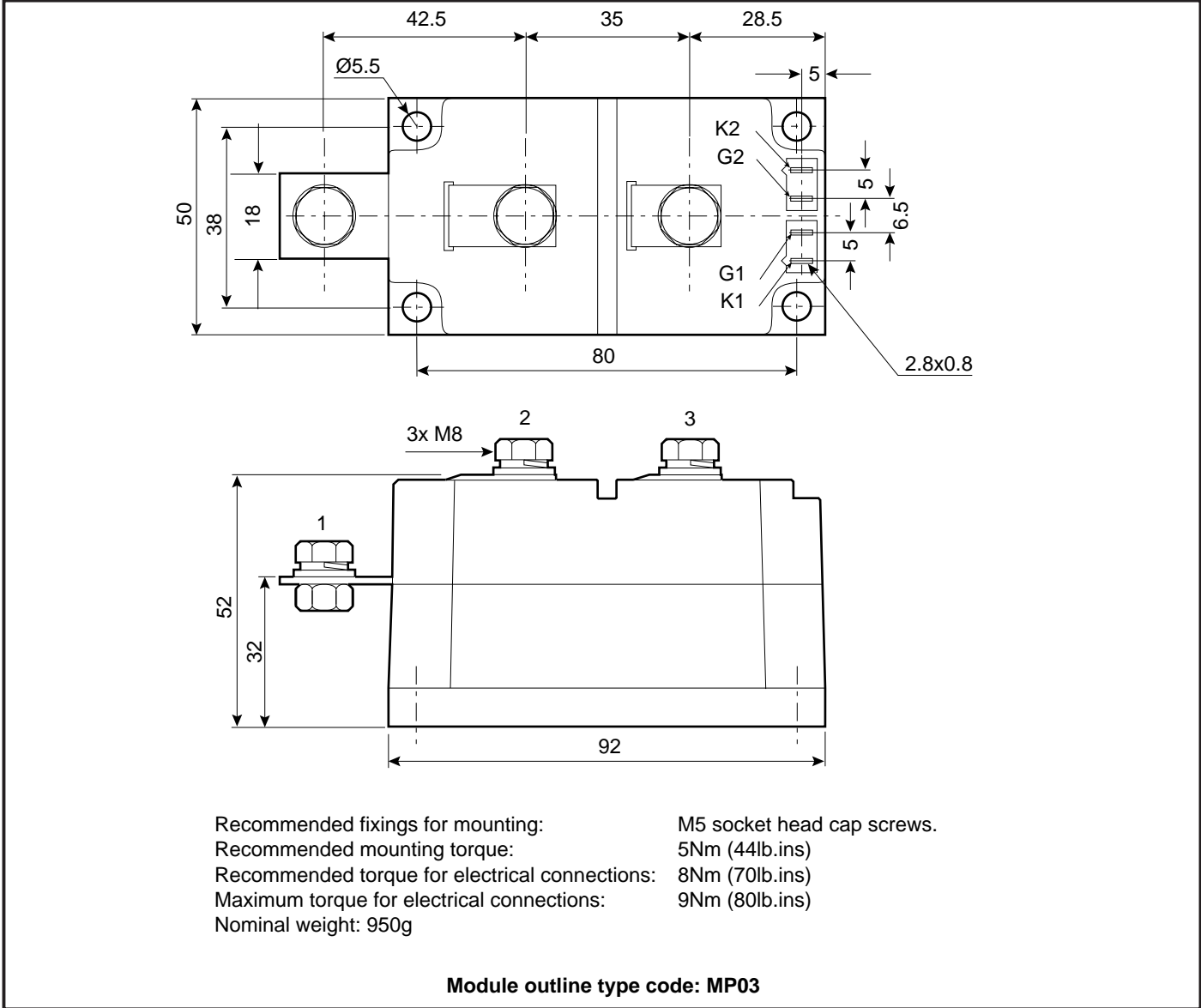
**Fig. 9 50/60Hz 3- phase bridge dc output current vs power loss and maximum permissible ambient temperature for various values of heatsink thermal resistance.**

(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).

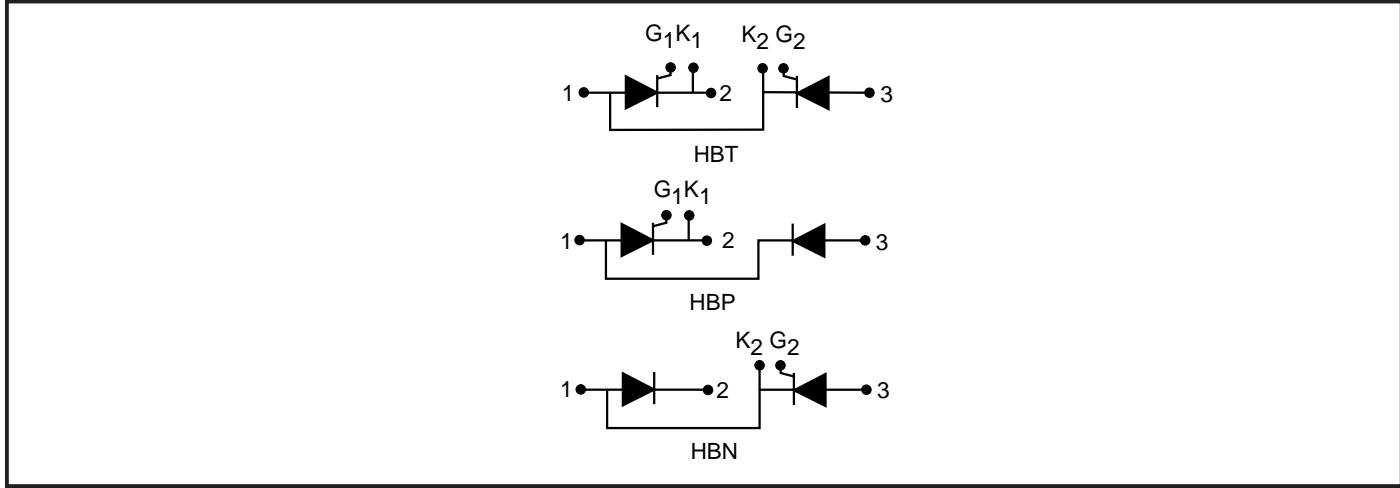


**PACKAGE DETAILS**

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



**CIRCUIT CONFIGURATIONS**



## MP03 XXX 175 Series



<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)

CUSTOMER SERVICE CENTRES  
**France, Benelux, Italy and Spain** Tel: +33 (0)1 69 18 90 00. Fax: +33 (0)1 64 46 54 50  
**North America** Tel: 011-800-5554-5554. Fax: 011-800-5444-5444  
**UK, Germany, Scandinavia & Rest Of World** Tel: +44 (0)1522 500500. Fax: +44 (0)1522 500020

SALES OFFICES  
**France, Benelux, Italy and Spain** Tel: +33 (0)1 69 18 90 00. Fax: +33 (0)1 64 46 54 50  
**Germany** Tel: 07351 827723  
**North America** Tel: (613) 723-7035. Fax: (613) 723-1518. Toll Free: 1.888.33.DYNEX (39639) /  
Tel: (831) 440-1988. Fax: (831) 440-1989 / Tel: (949) 733-3005. Fax: (949) 733-2986.  
**UK, Germany, Scandinavia & Rest Of World** Tel: +44 (0)1522 500500. Fax: +44 (0)1522 500020  
These offices are supported by Representatives and Distributors in many countries world-wide.  
© Dynex Semiconductor 2000 Publication No. DS5098-4 Issue No. 4.0 January 2000  
TECHNICAL DOCUMENTATION – NOT FOR RESALE. PRINTED IN UNITED KINGDOM

### Datasheet Annotations:

Dynex Semiconductor annotate datasheets in the top right hand corner of the front page, to indicate product status. The annotations are as follows:-

**Target Information:** This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.

**Preliminary Information:** The product is in design and development. The datasheet represents the product as it is understood but details may change.

**Advance Information:** The product design is complete and final characterisation for volume production is well in hand.

**No Annotation:** The product parameters are fixed and the product is available to datasheet specification.

This publication is issued to provide information only which (unless agreed by the Company in writing) may not be used, applied or reproduced for any purpose nor form part of any order or contract nor to be regarded as a representation relating to the products or services concerned. No warranty or guarantee express or implied is made regarding the capability, performance or suitability of any product or service. The Company reserves the right to alter without prior notice the specification, design or price of any product or service. Information concerning possible methods of use is provided as a guide only and does not constitute any guarantee that such methods of use will be satisfactory in a specific piece of equipment. It is the user's responsibility to fully determine the performance and suitability of any equipment using such information and to ensure that any publication or data used is up to date and has not been superseded. These products are not suitable for use in any medical products whose failure to perform may result in significant injury or death to the user. All products and materials are sold and services provided subject to the Company's conditions of sale, which are available on request.

All brand names and product names used in this publication are trademarks, registered trademarks or trade names of their respective owners.