

### FEATURES

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

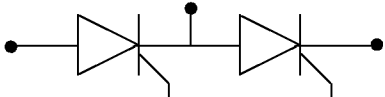
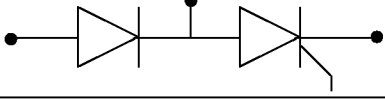
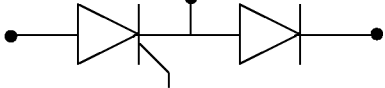
### APPLICATIONS

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

### KEY PARAMETERS

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

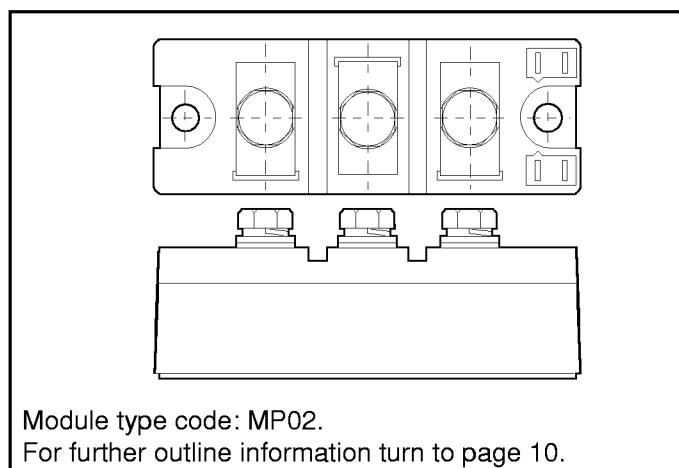
### CIRCUIT OPTIONS

Code	Circuit
HBT	
HBP	
HBN	

### VOLTAGE RATINGS

Type Number	Repetitive Peak Voltages $V_{DRM}$ $V_{RRM}$	Conditions
MP02/175-16	1600	$T_{vj} = 125^{\circ}\text{C}$
MP02/175-14	1400	$I_{DRM} = I_{RRM} = 30\text{mA}$
MP02/175-12	1200	$V_{DSM} \text{ \& } V_{RSM} =$
MP02/175-10	1000	$V_{DRM} \text{ \& } V_{RRM} + 100\text{V}$ respectively
Lower voltage grades available. 1800V product also available - consult factory. For full description of part number see "Ordering instructions" on page 3.		

### PACKAGE OUTLINE



### CURRENT RATINGS - PER ARM

Symbol	Parameter	Conditions	Max.	Units
$I_{T(AV)}$	Mean on-state current	$T_{case} = 75^{\circ}\text{C}$	175	A
		$T_{case} = 85^{\circ}\text{C}$	150	A
		$T_{heatsink} = 75^{\circ}\text{C}$	139	A
		$T_{heatsink} = 85^{\circ}\text{C}$	116	A
$I_{T(RMS)}$	RMS value	$T_{case} = 75^{\circ}\text{C}$	275	A

## MP02 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	0.19	$^\circ\text{C/W}$
		halfwave	0.20	$^\circ\text{C/W}$
		3 phase	0.21	$^\circ\text{C/W}$
$R_{th(c-hs)}$	Thermal resistance - case to heatsink per Thyristor or Diode	Mounting torque = 6Nm with mounting compound	0.07	$^\circ\text{C/W}$
$T_{vj}$	Virtual junction temperature		125	$^\circ\text{C}$
$T_{stg}$	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 <sub>TM</sub>	On-state voltage	At 1000A, T <sub>case</sub> = 25°C		1.75	V
I <sub>RRM</sub> /I <sub>DRM</sub>	Peak reverse and off-state current	At V <sub>RRM</sub> /V <sub>DRM</sub> , T <sub>j</sub> = 125°C		30	mA
dV/dt	Linear rate of rise of off-state voltage	To 67% V <sub>DRM</sub> , T <sub>j</sub> = 125°C		200*	V/μs
dI/dt	Rate of rise of on-state current	From 67% V <sub>DRM</sub> to 500A Gate source 10V, 5Ω Rise time 0.5μs, T <sub>j</sub> = 125°C	Repetitive 50Hz	100	A/μs
V <sub>T(TO)</sub>	Threshold voltage	At T <sub>vj</sub> = 125°C		1.05	V
r <sub>T</sub>	On-state slope resistance	At T <sub>vj</sub> = 125°C		0.80	mΩ
* Higher dV/dt values available, contact factory for particular requirements.					

## 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:

MP02 HBT 175 - 12

MP = Pressure contact module  
 02 = 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:

MP02 HBP175-12  
 MP02 HBN175-16  
 MP02 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.

■ 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.

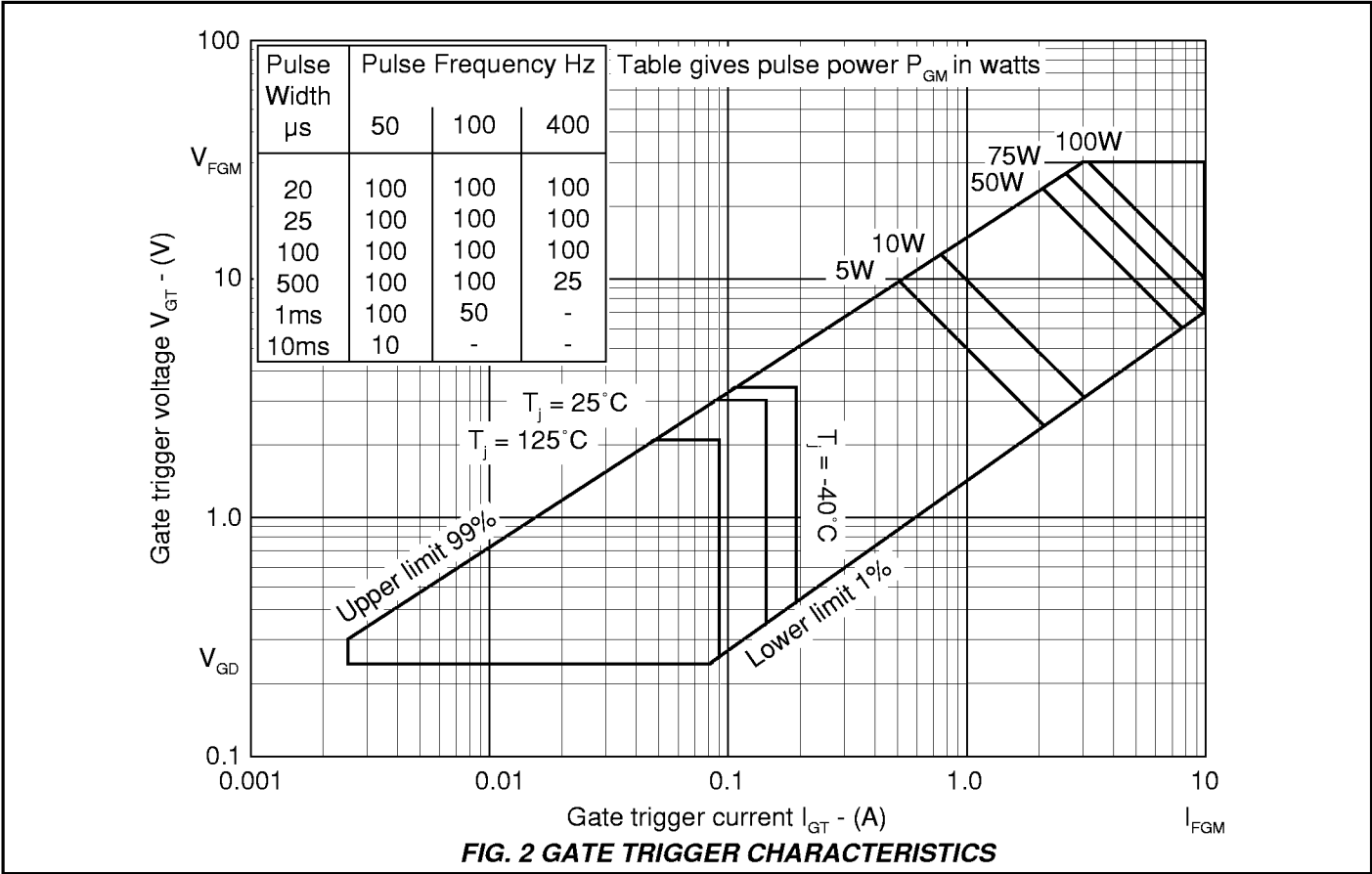
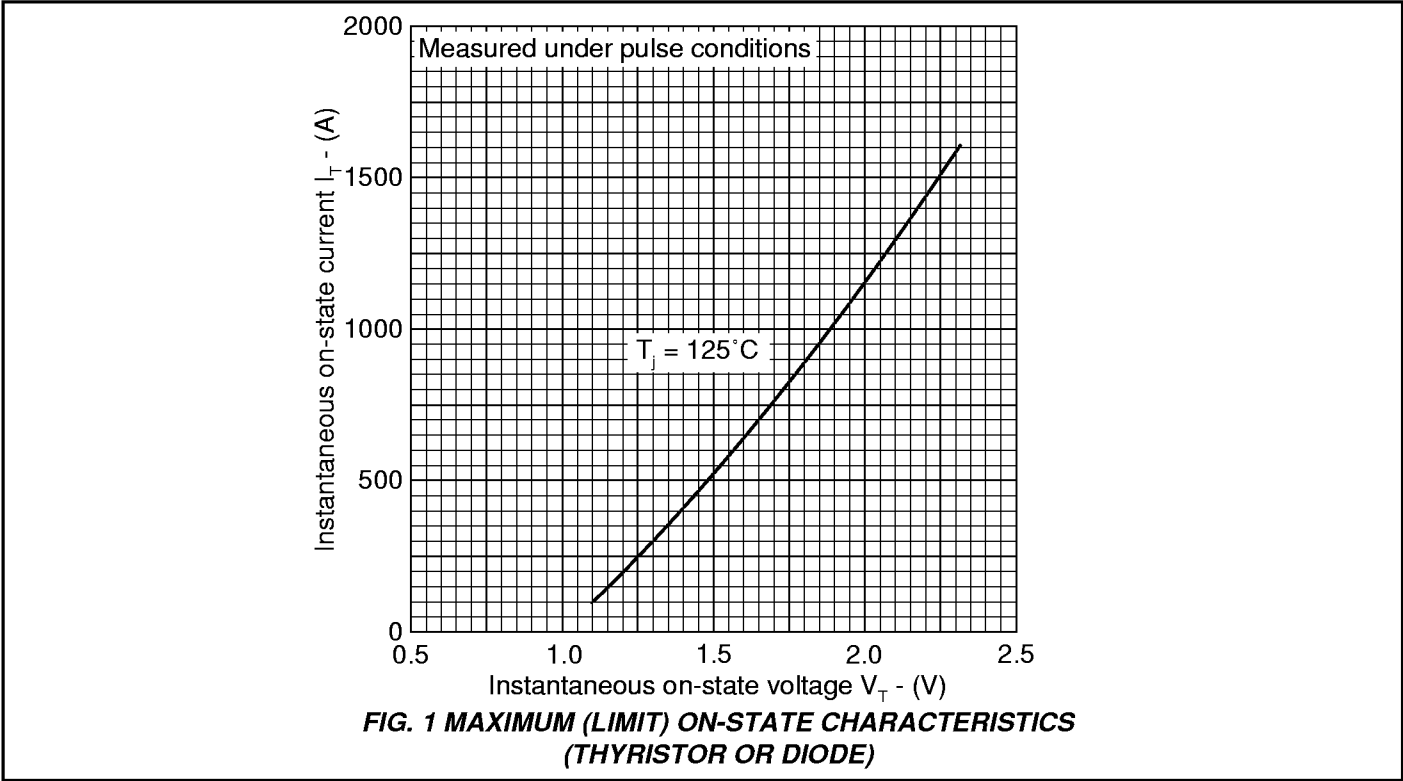
■ Immediately prior to mounting, the heatsink surface should be lightly scrubbed with fine emery, Scotch Brite or a mild chemical etchant and then cleaned with a solvent to remove oxide build up and foreign material. Care should be taken to ensure no foreign particles remain.

■ 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 6Nm (55lb.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



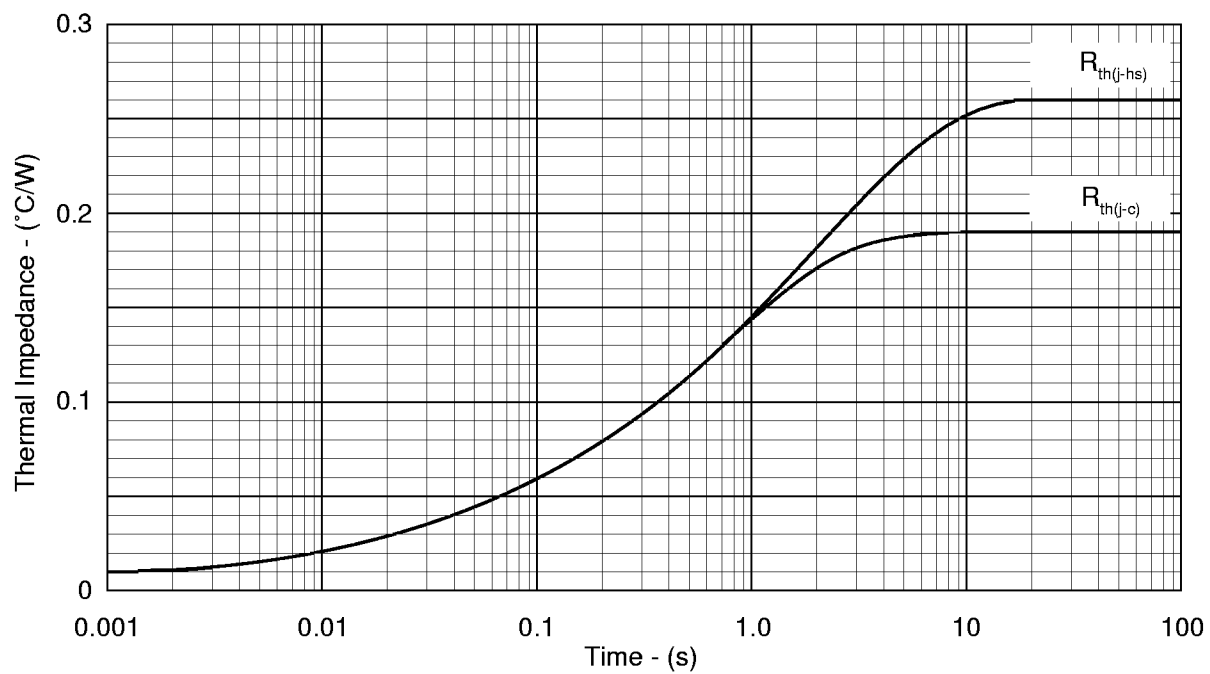


FIG. 3 TRANSIENT THERMAL IMPEDANCE (DC) - (Thyristor or Diode)

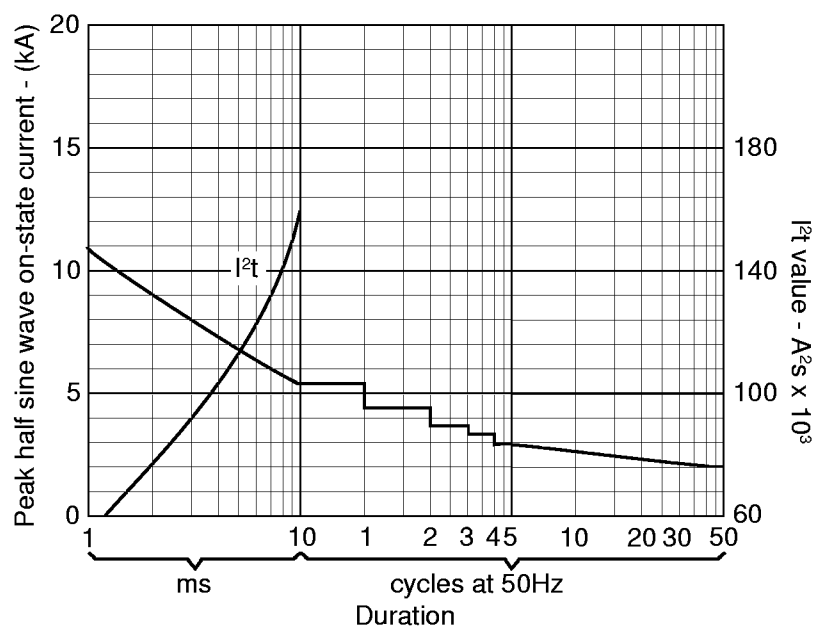
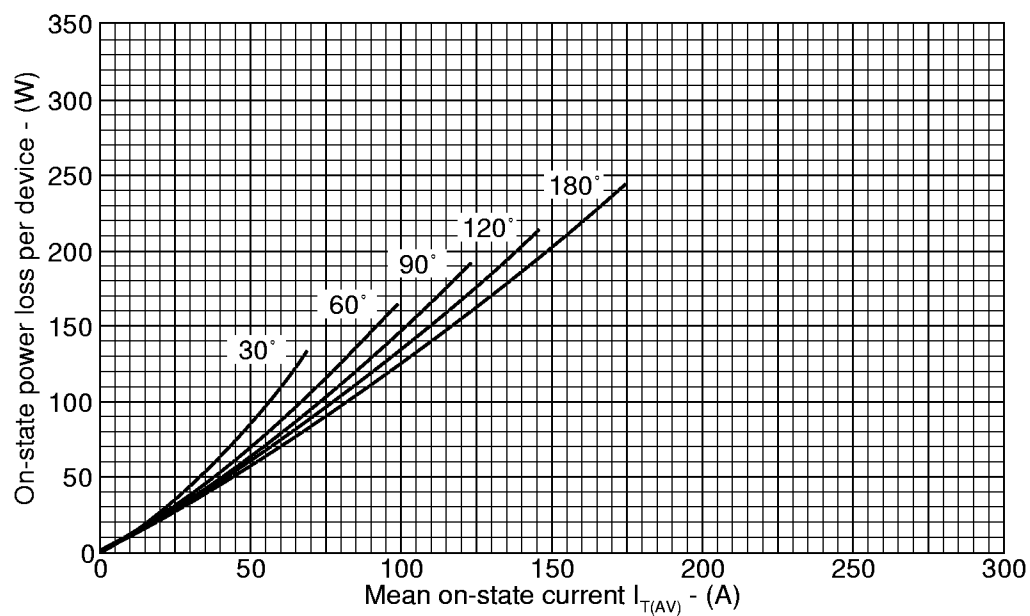
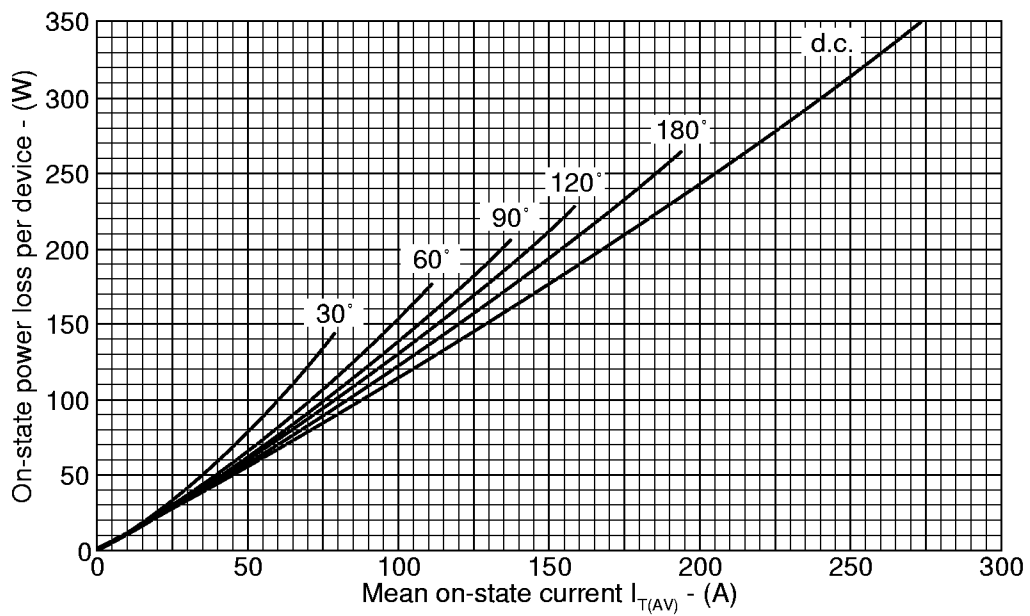


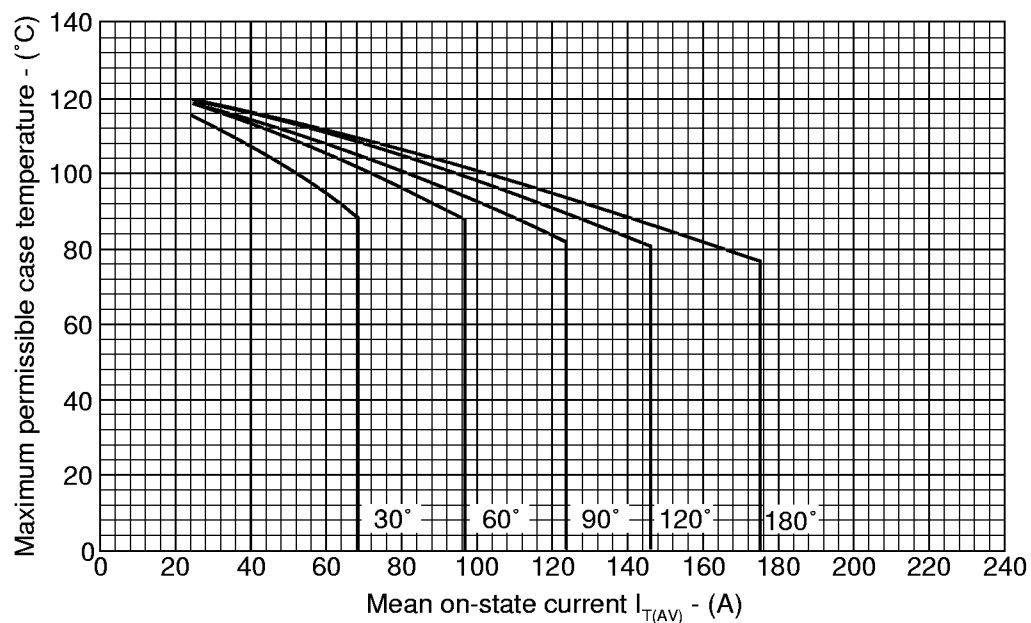
FIG. 4 SURGE (NON-REPETITIVE) ON-STATE CURRENT vs TIME (with 50%  $V_{RRM}$   $T_{case}$  125°C) (Thyristor or Diode)



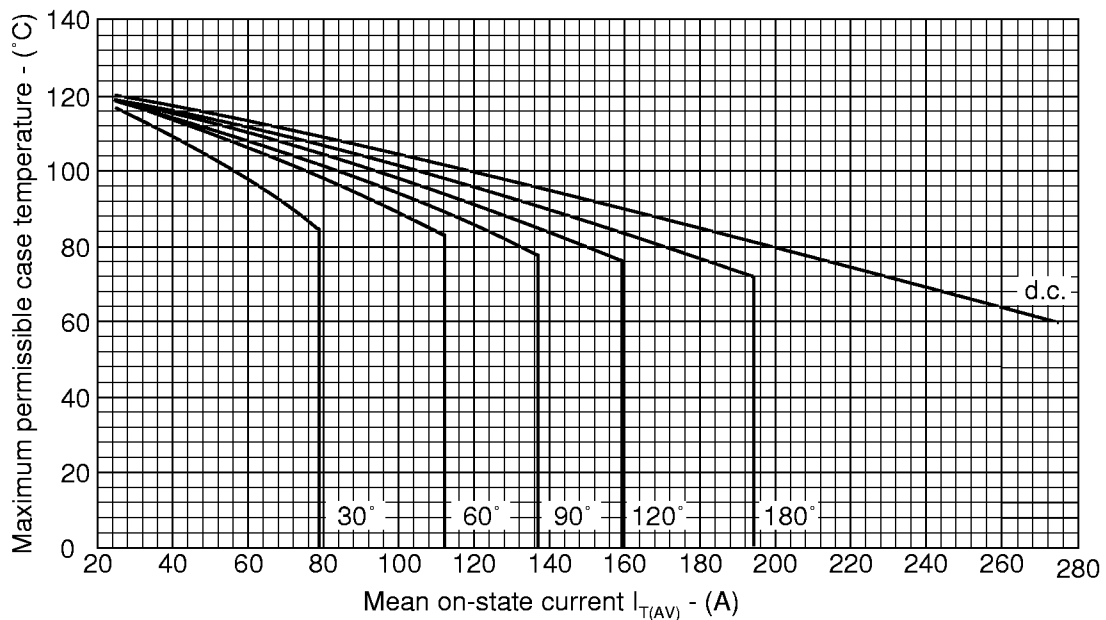
**FIG. 5 ON-STATE POWER LOSS PER ARM vs FORWARD CURRENT AT VARIOUS CONDUCTION ANGLES, SINE WAVE, 50/60Hz.**



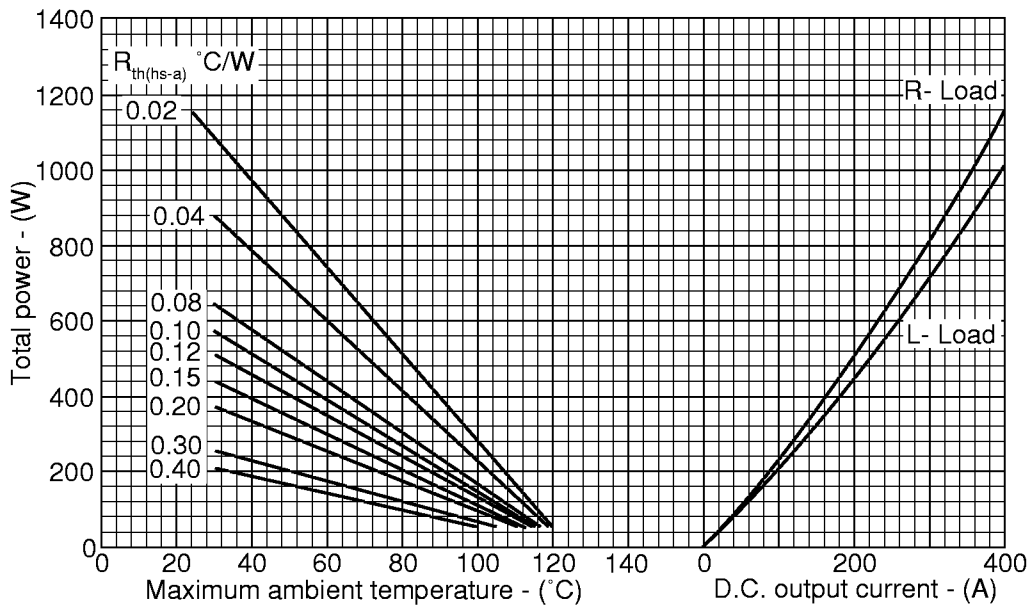
**FIG. 6 ON-STATE POWER LOSS PER ARM vs FORWARD CURRENT AT VARIOUS CONDUCTION ANGLES, SQUARE WAVE, 50/60Hz.**



**FIG. 7 MAXIMUM PERMISSIBLE CASE TEMPERATURE vs FORWARD CURRENT PER ARM AT VARIOUS CONDUCTION ANGLES, SINE WAVE, 50/60Hz.**

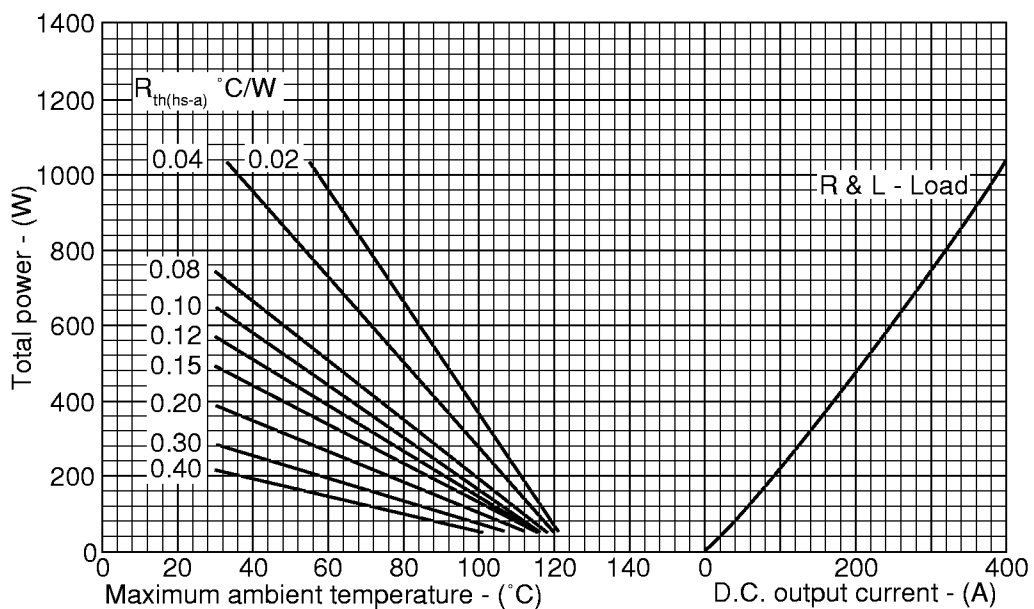


**FIG. 8 MAXIMUM PERMISSIBLE CASE TEMPERATURE vs FORWARD CURRENT PER ARM AT VARIOUS CONDUCTION ANGLES, SQUARE WAVE, 50/60Hz.**



**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. 10 50/60Hz 3-PHASE BRIDGE DC OUTPUT CURRENT vs POWER LOSS AND MAXIMUM PERMISSIBLE AMBIENT TEMPERATURE FOR VARIOUS VALUES OF HEATSINK THERMAL RESISTANCE.**

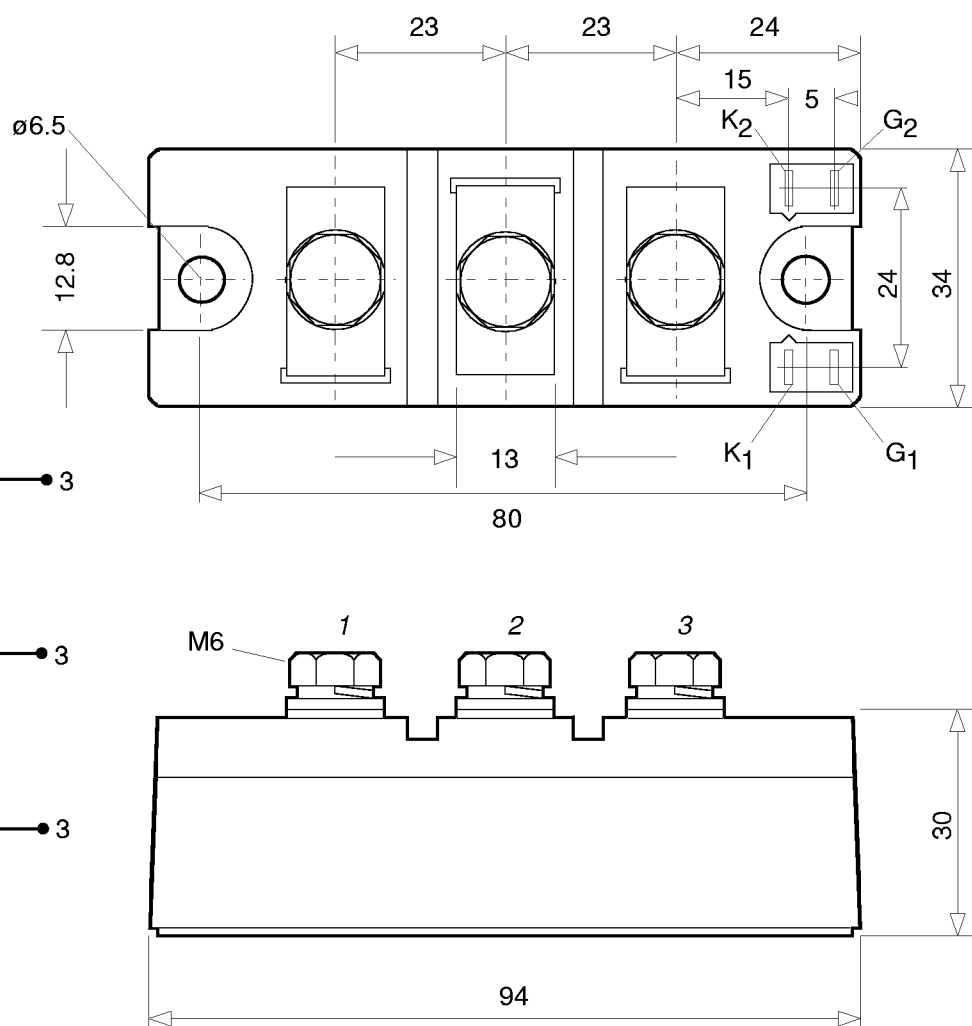
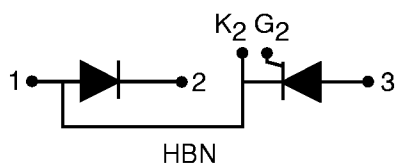
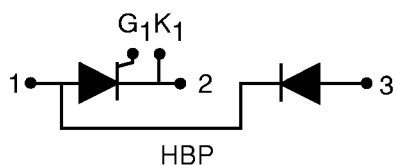
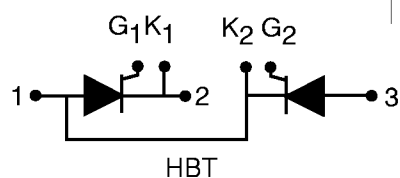
(Note:  $R_{th(hs-a)}$  values given above are **true** heatsink thermal resistances to ambient and already account for  $R_{th(c-hs)}$  module contact thermal).



## OUTLINE - MP02

All Dimensions in mm, unless stated otherwise. DO NOT SCALE.

Circuit Configurations:



Recommended fixings for mounting:	M6 socket head cap screws
Recommended mounting torque:	6Nm (55lb.ins)
Recommended torque, electrical connections:	5Nm (44lb.ins)
Maximum torque, electrical connections:	8Nm (70lb.ins)
Weight:	350g

## MP02 XXX 175 Series



### HEADQUARTERS POWER OPERATIONS

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