MP03 XXX 190 Series

Phase Control Dual SCR, SCR/Diode Modules

Replaces December 1998 version, DS5099-3.0

DS5099-4.0 January 2000

FEATURES

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

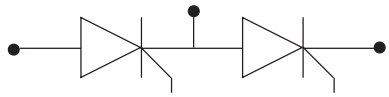
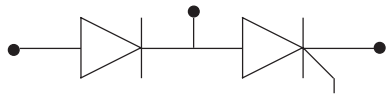
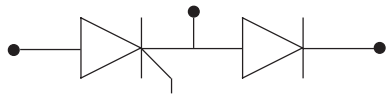
APPLICATIONS

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

KEY PARAMETERS

V_{DRM}	1200V
I_{TSM}	5500A
$I_{T(AV)}$(per arm)	190A
V_{isol}	2500V

CIRCUIT OPTIONS

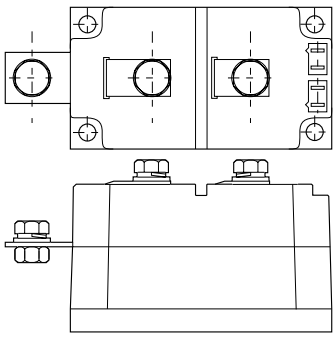
Code	Circuit
HBT	
HBP	
HBN	

VOLTAGE RATINGS

Type Number	Repetitive Peak Voltages V_{DRM} V_{RRM}	Conditions
MP03/190 - 12	1200	$T_{(vj)}$ = 125°C
MP03/190 - 10	1000	I_{DRM} = I_{RRM} = 30mA
MP03/190 - 08	800	V_{DSM} & V_{RSM} = V_{DRM} & V_{RRM} + 100V respectively

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

PACKAGE OUTLINE



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

CURRENT RATINGS - PER ARM

Symbol	Parameter	Conditions		Max.	Units
$I_{T(AV)}$	Mean on-state current	Halfwave, resistive load	T_{case} = 75°C	190	A
			T_{case} = 85°C	158	A
			$T_{heatsink}$ = 75°C	160	A
			$T_{heatsink}$ = 85°C	133	A
$I_{T(RMS)}$	RMS value	T_{case} = 75°C		300	A

SURGE RATINGS - PER ARM

Symbol	Parameter	Conditions		Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine; T_j = 125°C	V_R = 0	5500	A
			V_R = 50% V_{RRM}	4200	A
I^2t	I^2t for fusing	10ms half sine; T_j = 125°C	V_R = 0	151000	A^2s
			V_R = 50% V_{RRM}	88200	A^2s

THERMAL & MECHANICAL RATINGS

Symbol	Parameter	Conditions	Max.	Units
$R_{th(j-c)}$	Thermal resistance - junction to case per Thyristor or Diode	dc	0.21	°C/W
		halfwave	0.22	°C/W
		3 phase	0.23	°C/W
$R_{th(c-hs)}$	Thermal resistance - case to heatsink per Thyristor or Diode	Mounting torque = 5Nm with mounting compound	0.05	°C/W
T_{vj}	Virtual junction temperature		125	°C
T_{sto}	Storage temperature range		-40 to 125	°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 500A, T_{case} = 25°C - See Note 1		1.30	V
I_{RRM}/I_{DRM}	Peak reverse and off-state current	At V_{RRM}/V_{DRM}, T_j = 125°C		30	mA
dV/dt	Linear rate of rise of off-state voltage	To 60% V_{DRM} T_j = 125°C		200*	V/µs
dI/dt	Rate of rise of on-state current	From 67% V_{DRM} to 400A Gate source 20V, 20Ω Rise time 0.5µs, T_j =125°C	Repetitive 50Hz	100	A/µs
$V_{T(TO)}$	Threshold voltage	At T_{vj} = 125°C - See Note 1		0.88	V
r_T	On-state slope resistance	At T_{vj} = 125°C - See Note 1		0.70	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} = 6V, T_{case} = 25°C, R_L = 6Ω	-	3.0	V
I_{GT}	Gate trigger current	V_{DRM} = 6V, T_{case} = 25°C, R_L = 6Ω	-	200	mA
V_{GD}	Gate non-trigger voltage	$V_D = V_{DRM}$, T_j = 125°C	-	0.20	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 of as follows:

MP03 HBT 190 - 12

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

Examples:

MP03 HBP190 - 08
MP03 HBN190 - 12
MP03 HBT190 - 10

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°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 (32µin) 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

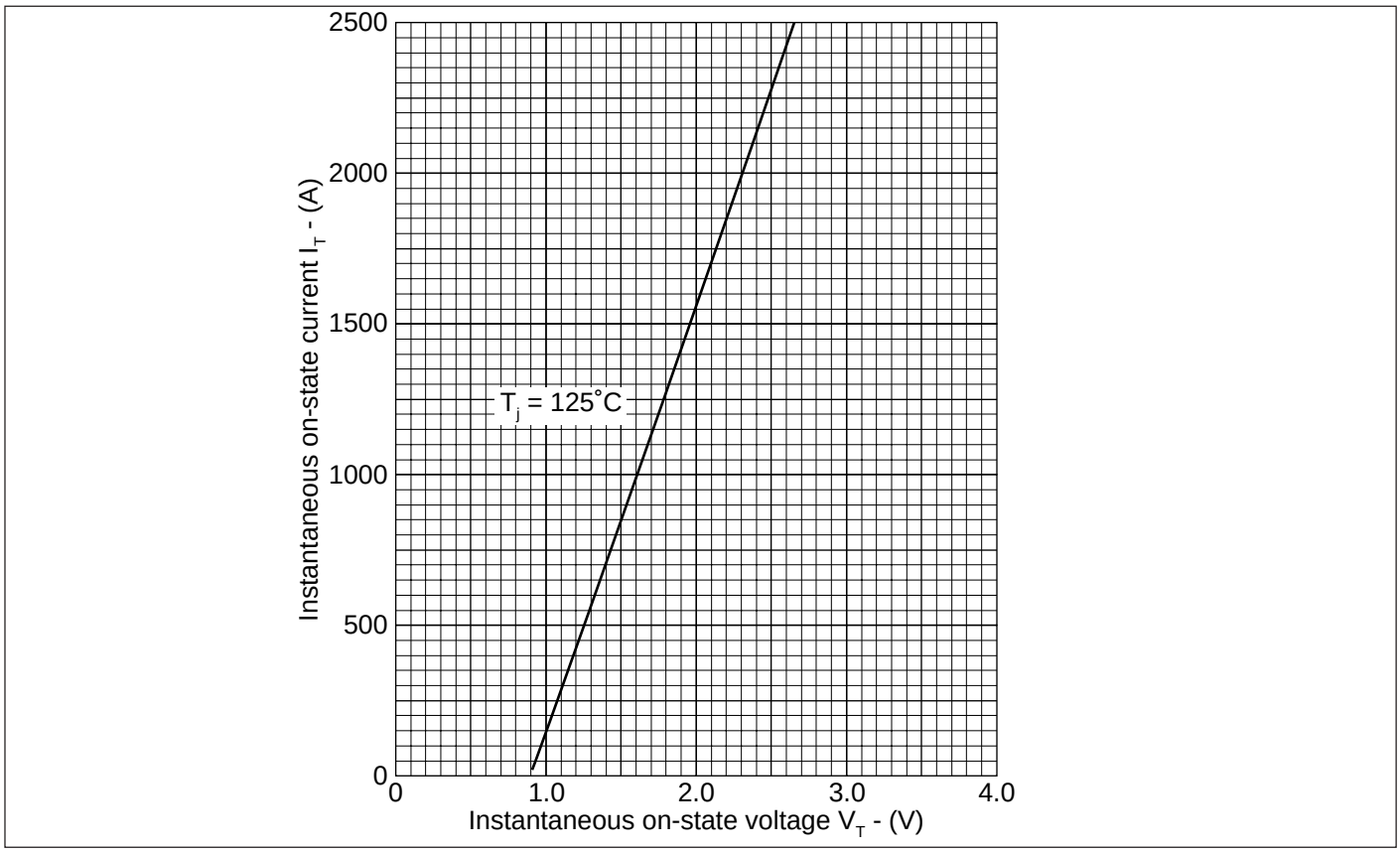


Fig. 1 Maximum (limit) on-state characteristics (thyristor or diode) - See Note 1

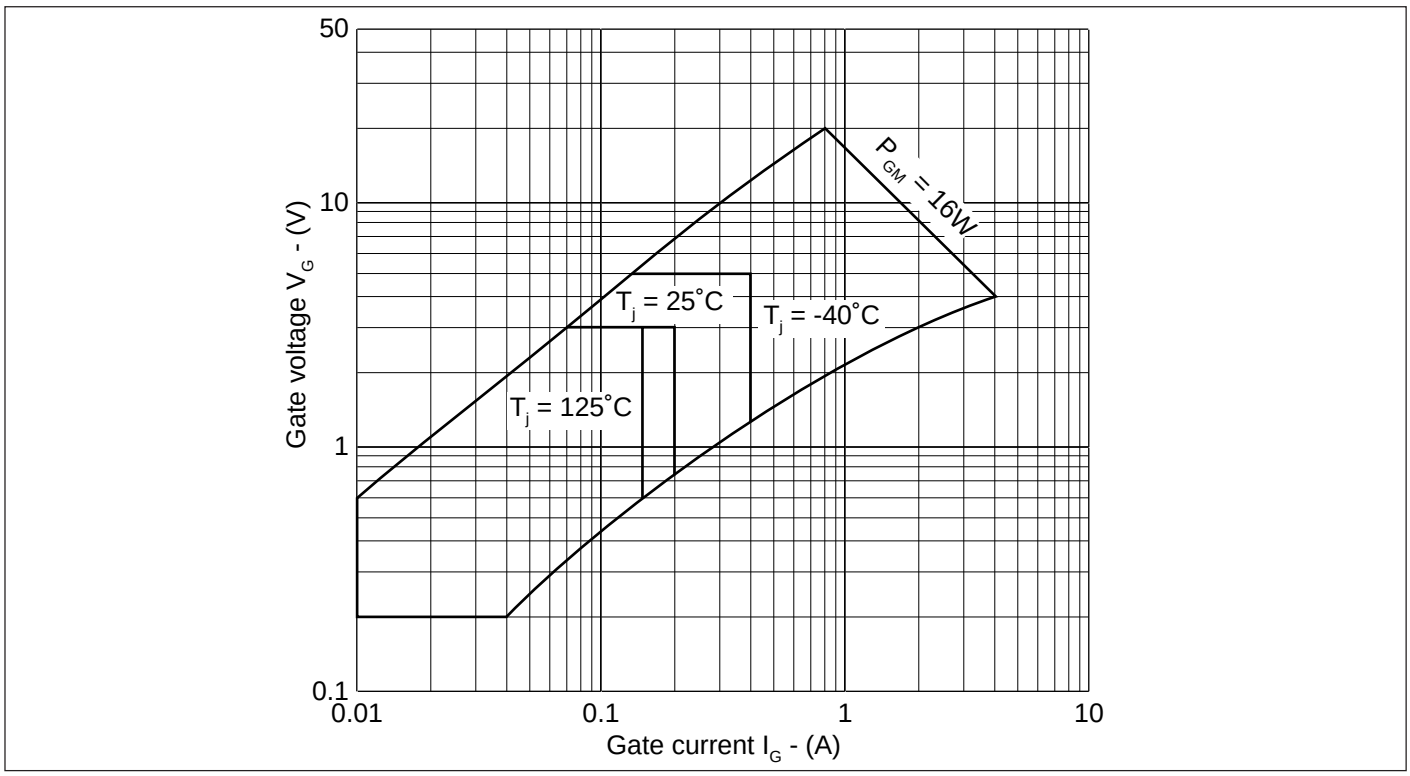


Fig. 2 Gate trigger characteristics

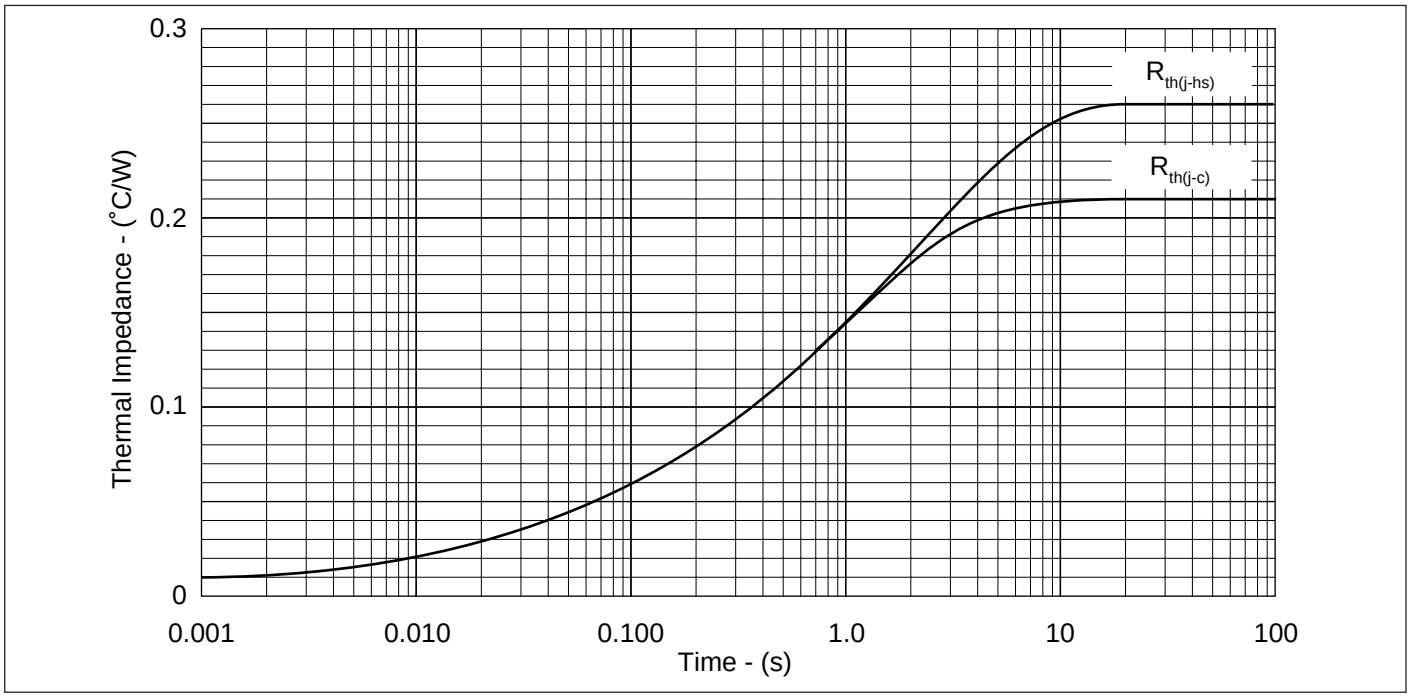


Fig. 3 Transient thermal impedance (DC) - (Thyristor or diode)

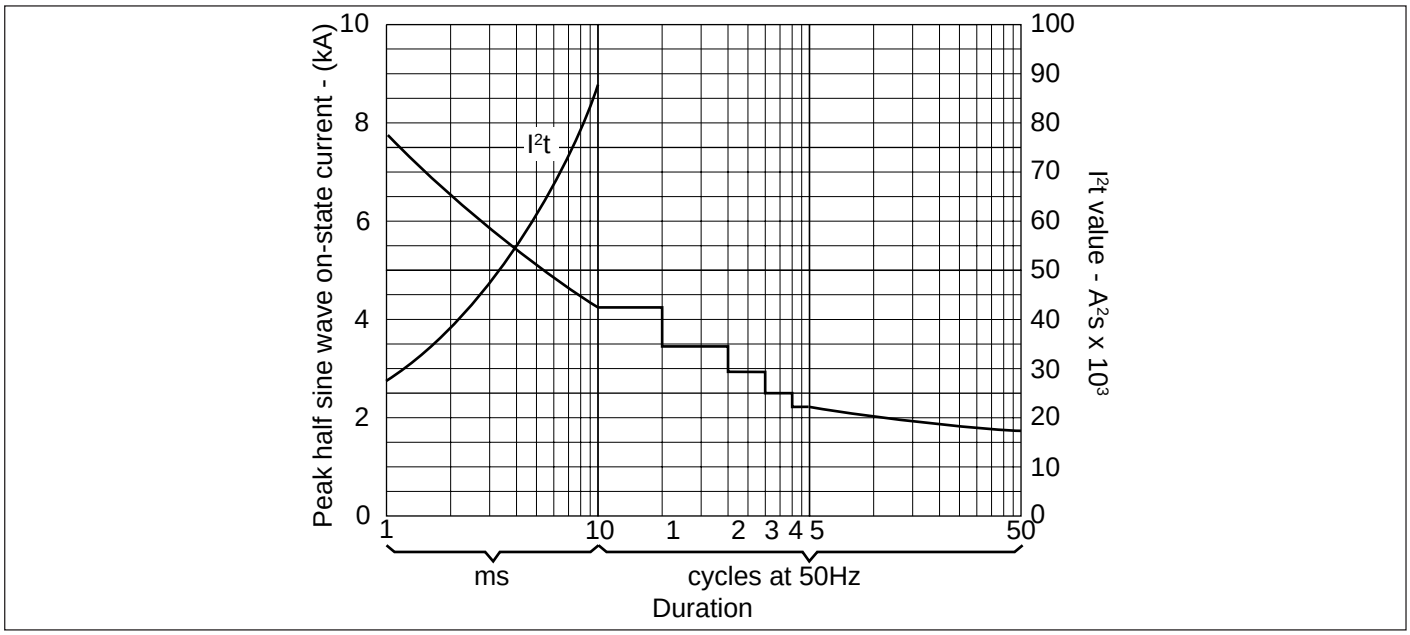


Fig. 4 Surge (non-repetitive) on-state current vs time (with 50% V_{RRM}, T_{case} = 125°C (Thyristor or diode)

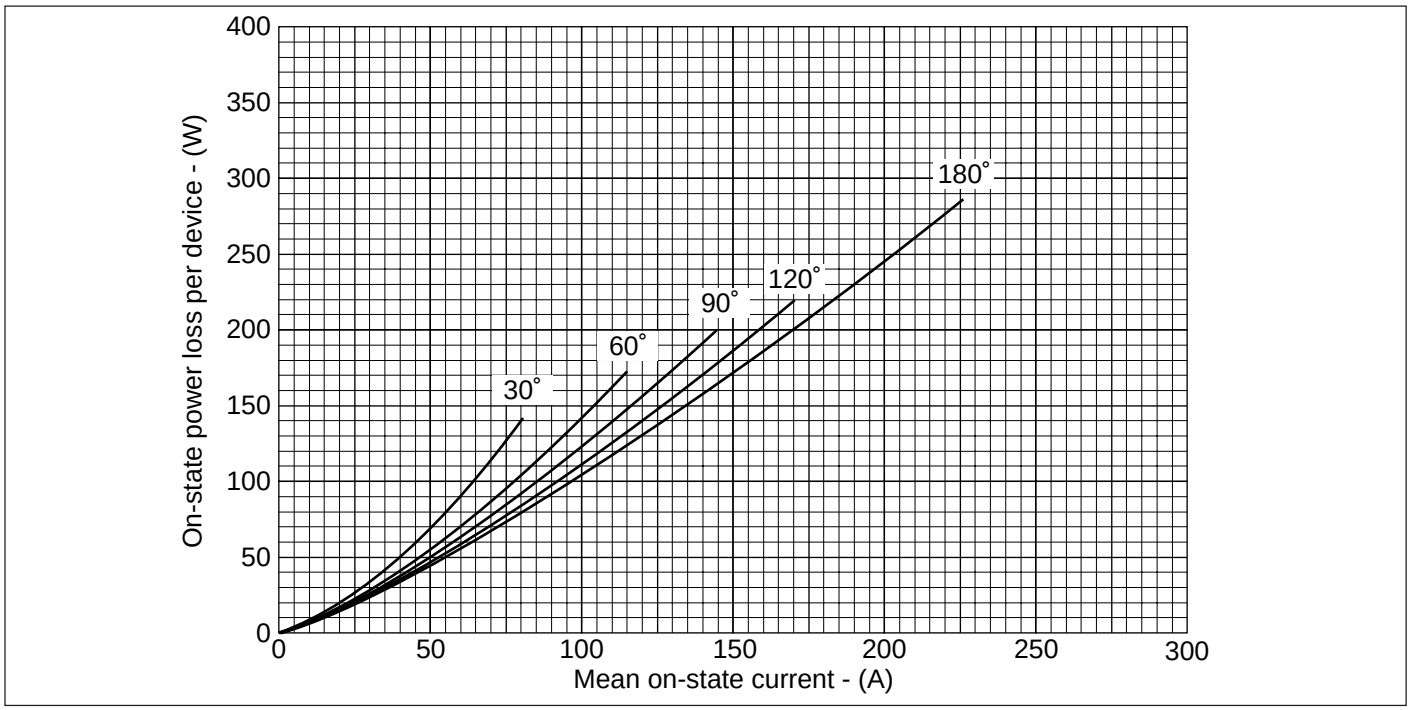


Fig. 5 On-state power loss per arm vs forward current at various conduction angles, sine wave, 50/60Hz

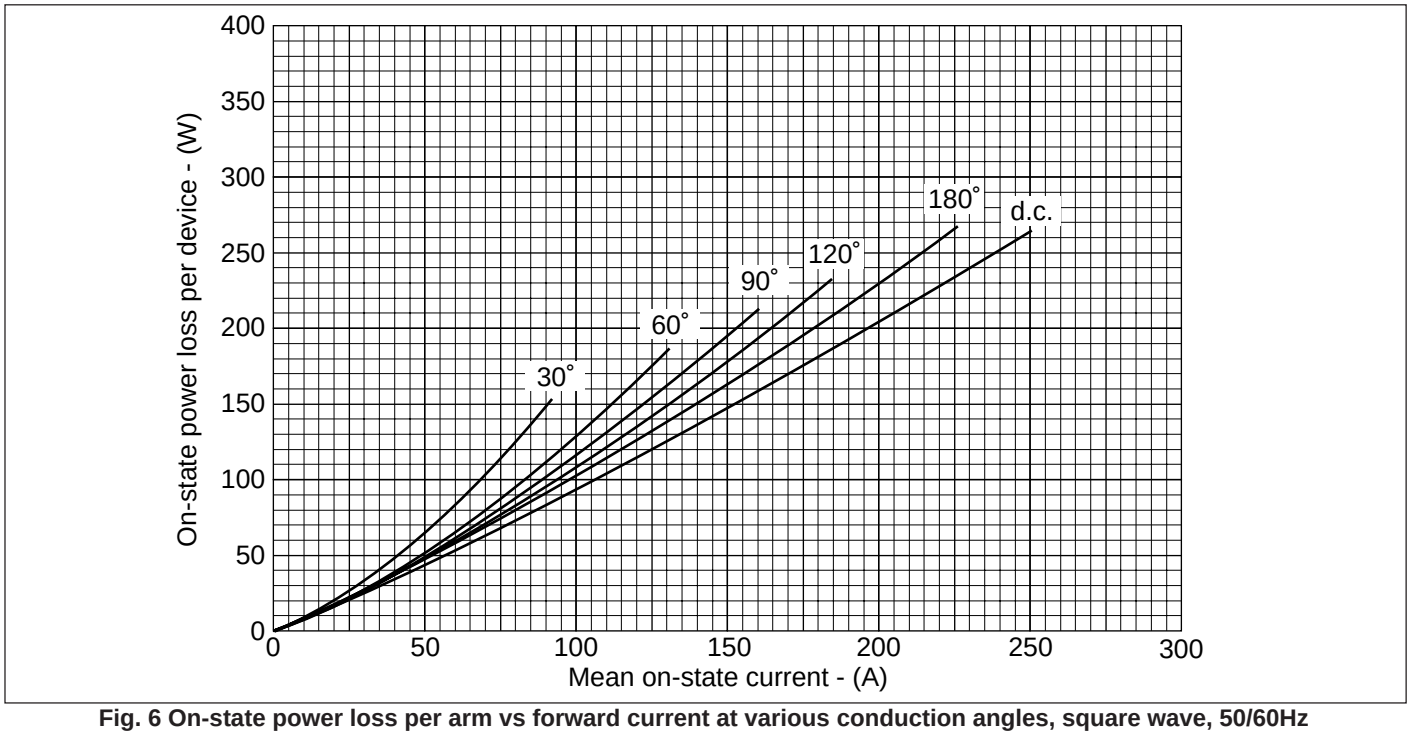


Fig. 6 On-state power loss per arm vs forward current at various conduction angles, square wave, 50/60Hz

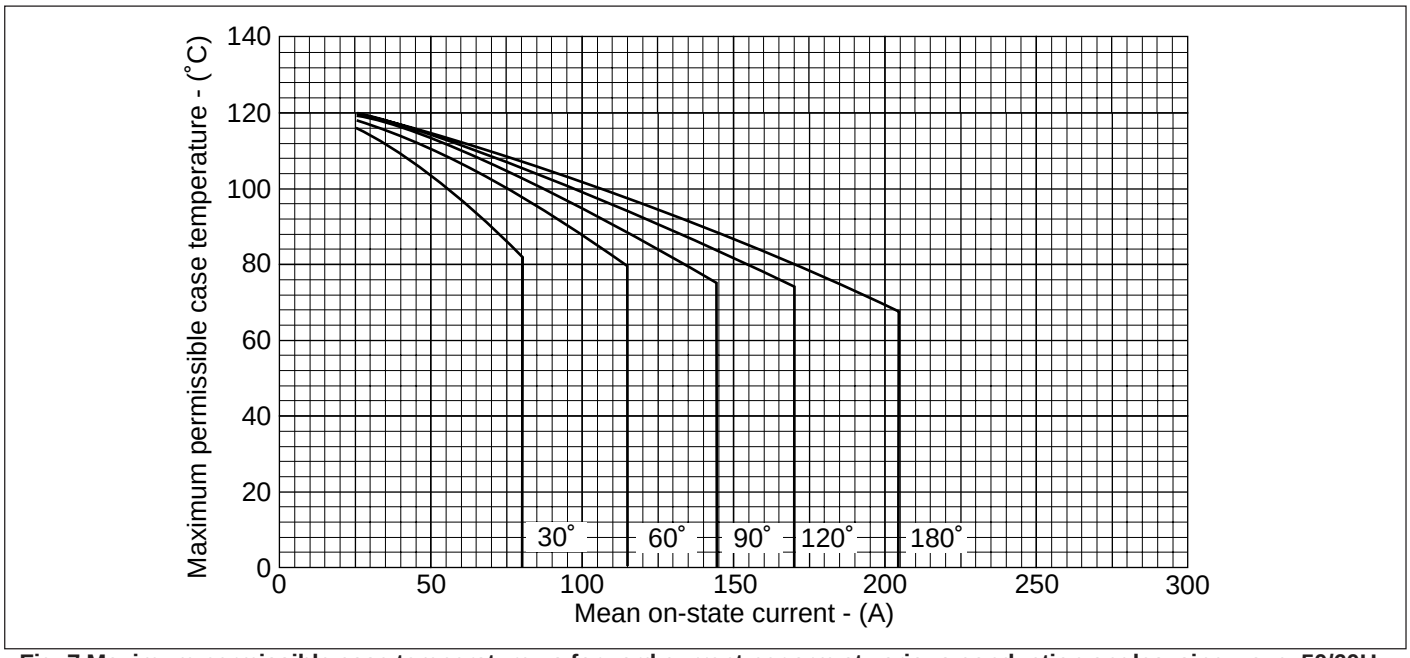


Fig. 7 Maximum permissible case temperature vs forward current per arm at various conduction angles, sine wave, 50/60Hz

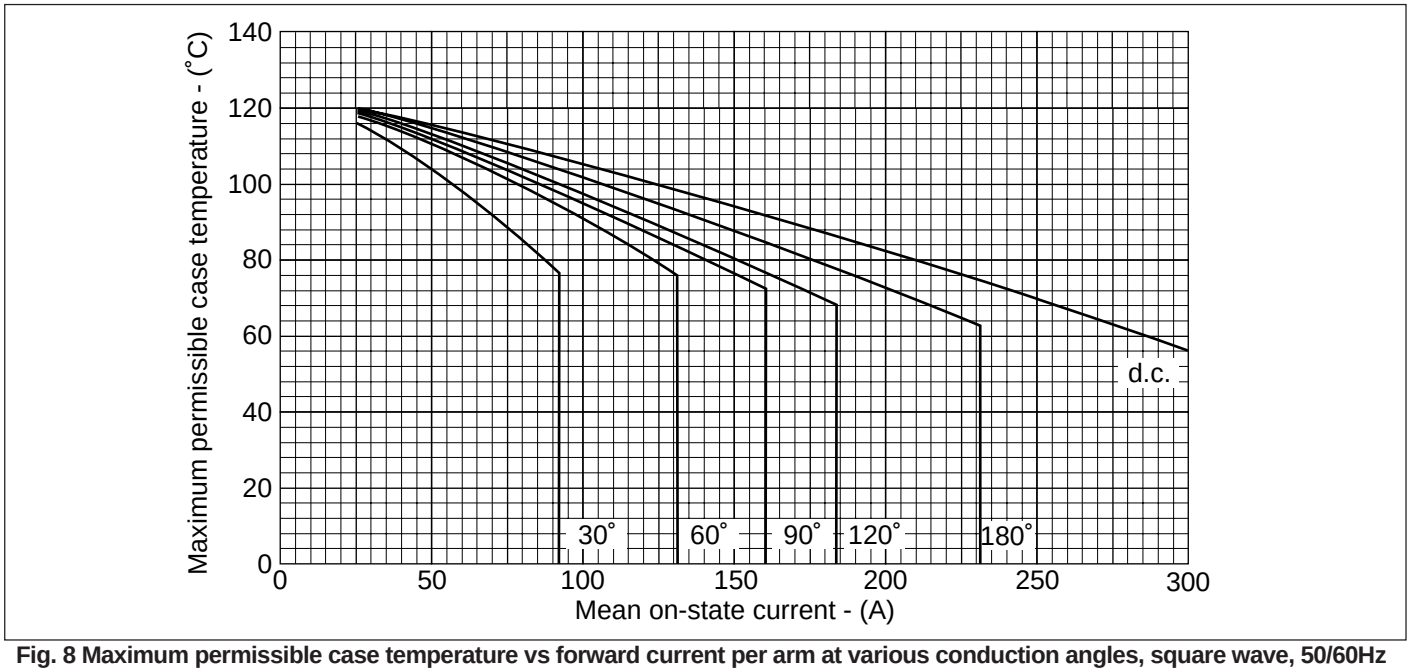


Fig. 8 Maximum permissible case temperature vs forward current per arm at various conduction angles, square wave, 50/60Hz

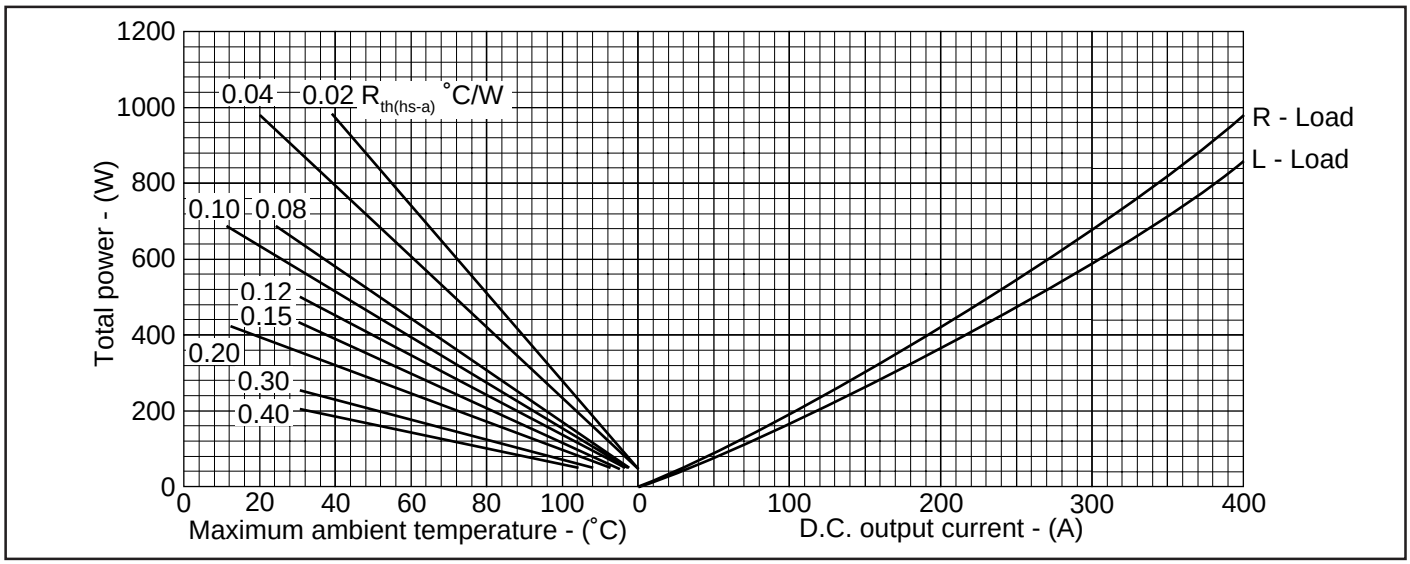


Fig. 9 50/60Hz single phase bridge dc output current vs power loss and maximum permissible ambient temperature for various values of heatsink thermal resistance.

(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).

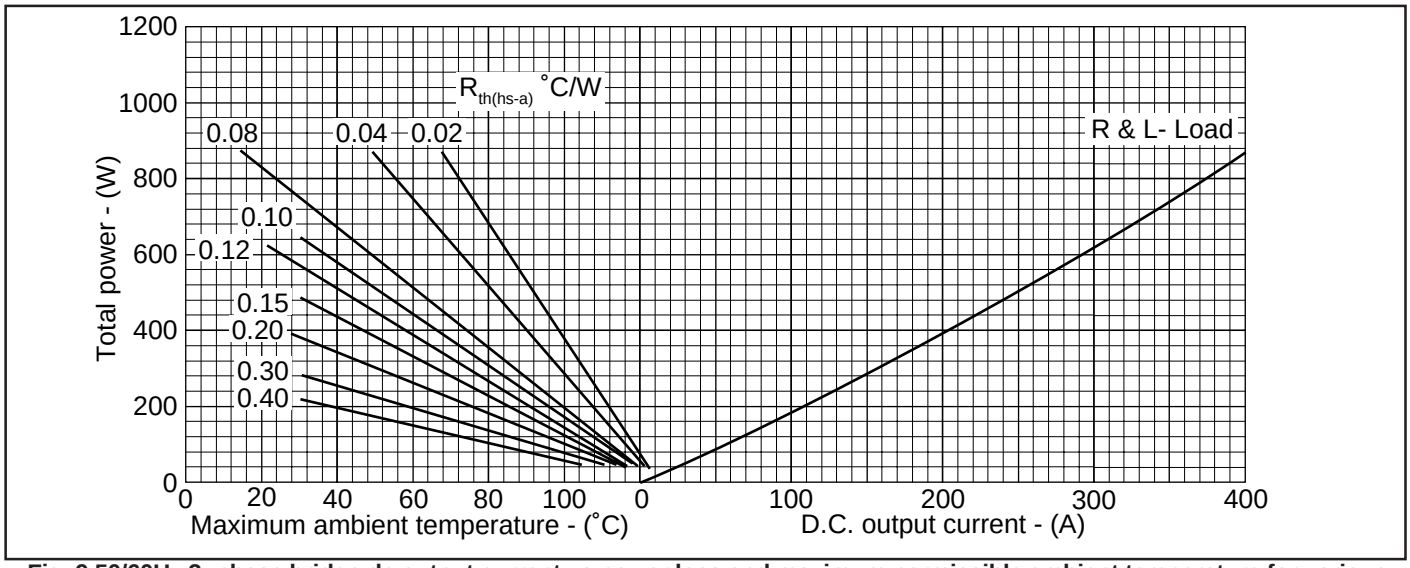
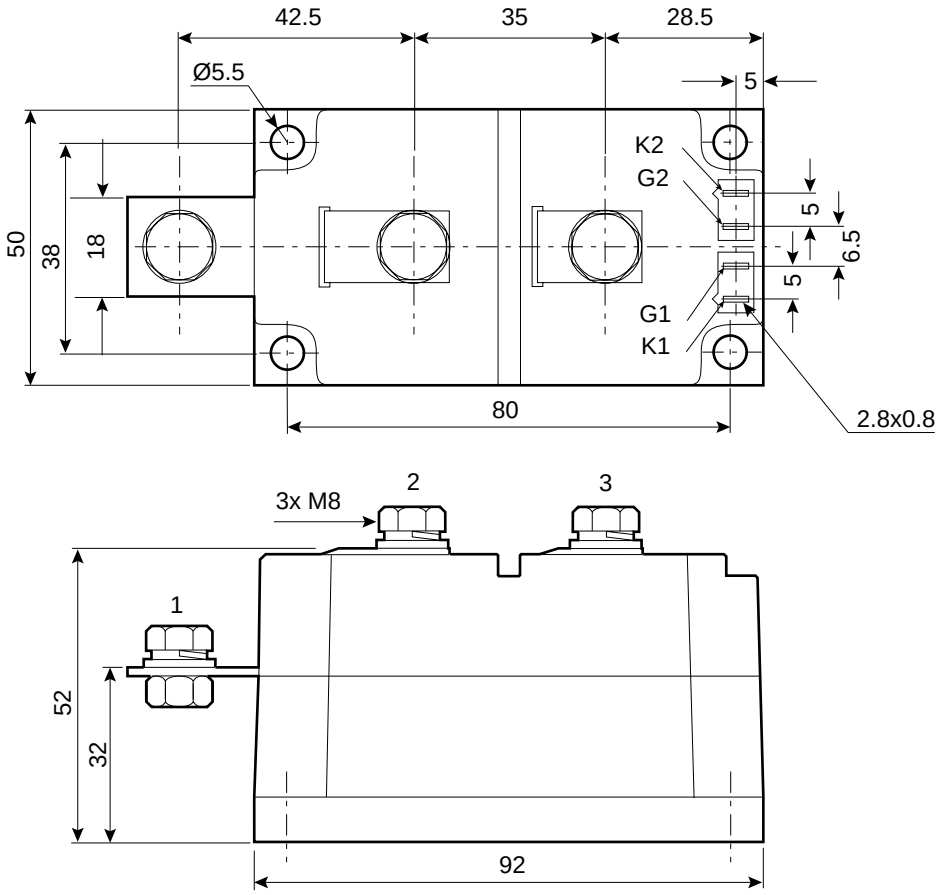


Fig. 9 50/60Hz 3- phase bridge dc output current vs power loss and maximum permissible ambient temperature for various values of heatsink thermal resistance.

(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

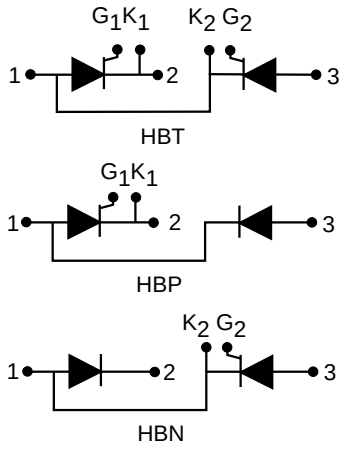
For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



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



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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.