MP02X130 Series

Phase Control Dual SCR, SCR/Diode Modules

Replaces January 2000 version, DS4477-4.0

DS4477-5.0 August 2001

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}	**2000V**
I_{TSM}	**4000A**
$I_{T(AV)(per\ arm)}$	**134A**
V_{isol}	**3000V**

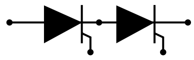
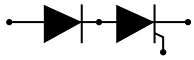
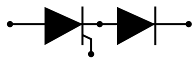
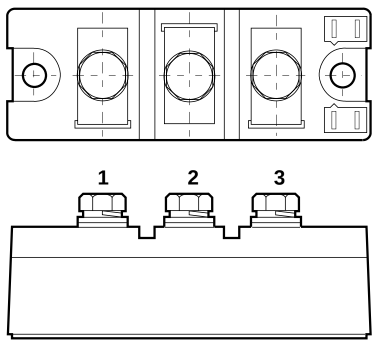
Code	Circuit
HBT	
HBP	
HBN	

Fig.1 Circuit diagrams



Module type code: MP02.
For further information see Package Details.

Fig. 2 Electrical connections - (not to scale)

VOLTAGE RATINGS

Type Number	Repetitive Peak Voltages V_{DRM} V_{RRM}	Conditions
MP02X130-20	2000	$T_{vj} = 125^oC$
MP02X130-18	1800	$I_{DRM} = I_{RRM} = 30mA$
MP02X130-16	1600	V_{DSM} & V_{RSM} = V_{DRM} & V_{RRM} + 100V respectively

Lower voltage grades available.

ORDERING INFORMATION

Order As:

MP02HBT130-20 or **MP02HBT130-18** or **MP02HBT130-16**
MP02HBP130-20 or **MP02HBP130-18** or **MP02HBP130-16**
MP02HBN130-20 or **MP02HBN130-18** or **MP02HBN130-16**

Note: When ordering, please use the complete part number.

ABSOLUTE MAXIMUM RATINGS - PER ARM

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum Ratings may affect device reliability.

Symbol	Parameter	Test Conditions		Max.	Units
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	T_{case} = 75˚C	134	A
			T_{case} = 85˚C	112	A
$I_{T(RMS}$	RMS value	T_{case} = 75˚C		210	A
I_{TSM}	Surge (non-repetitive) on-current	10ms half sine, T_j = 125˚C		4.0	kA
I^2t	I^2t for fusing	V_R = 0		80 x 10^3	A^2s
I_{TSM}	Surge (non-repetitive) on-current	10ms half sine, T_j = 125˚C		3.2	kA
I^2t	I^2t for fusing	V_R = 50% V_{DRM}		51.2 x 10^3	A^2s
V_{isol}	Isolation voltage	Commoned terminals to base plate. AC RMS, 1 min, 50Hz		3000	V

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - junction to case	dc	-	0.21	˚C/kW
	(per thyristor or diode)	Half wave	-	0.22	˚C/kW
		3 Phase	-	0.23	˚C/kW
$R_{th(c-hs)}$	Thermal resistance - case to heatsink (per thyristor or diode)	Mounting torque = 5Nm with mounting compound	-	0.07	˚C/kW
T_{vj}	Virtual junction temperature	Reverse (blocking)	-	125	˚C
T_{stg}	Storage temperature range	-	–40	125	˚C
-	Screw torque	Mounting - M6	-	6 (55)	Nm (lb.ins)
		Electrical connections - M6	-	5 (44)	Nm (lb.ins)
-	Weight (nominal)	-	-	350	g

DYNAMIC CHARACTERISTICS - THYRISTOR

Symbol	Parameter	Test Conditions		Min.	Max.	Units
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 67% V_{DRM}, T_j = 125°C		-	1000	V/µs
dI/dt	Rate of rise of on-state current	From 67% V_{DRM} to 400A, gate source 20V, 20Ω, t_r = 0.5µs, T_j = 125°C	Repetitive 50Hz	-	500	A/µs
$V_{T(TO)}$	Threshold voltage	At T_{vj} = 125°C. See note 1		-	1.25	V
r_T	On-state slope resistance	At T_{vj} = 125°C. See note 1		-	1.33	mΩ

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	Test Conditions	Max.	Units
V_{GT}	Gate trigger voltage	V_{DRM} = 5V, T_{case} = 25ºC	3.0	V
I_{GT}	Gate trigger current	V_{DRM} = 5V, T_{case} = 25ºC	200	mA
V_{GD}	Gate non-trigger voltage	V_{DRM} = 5V, T_{case} = 25ºC	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	V
I_{FGM}	Peak forward gate current	Anode positive with respect to cathode	4	A
P_{GM}	Peak gate power	See table fig. 5	16	W
$P_{G(AV)}$	Mean gate power	-	3	W

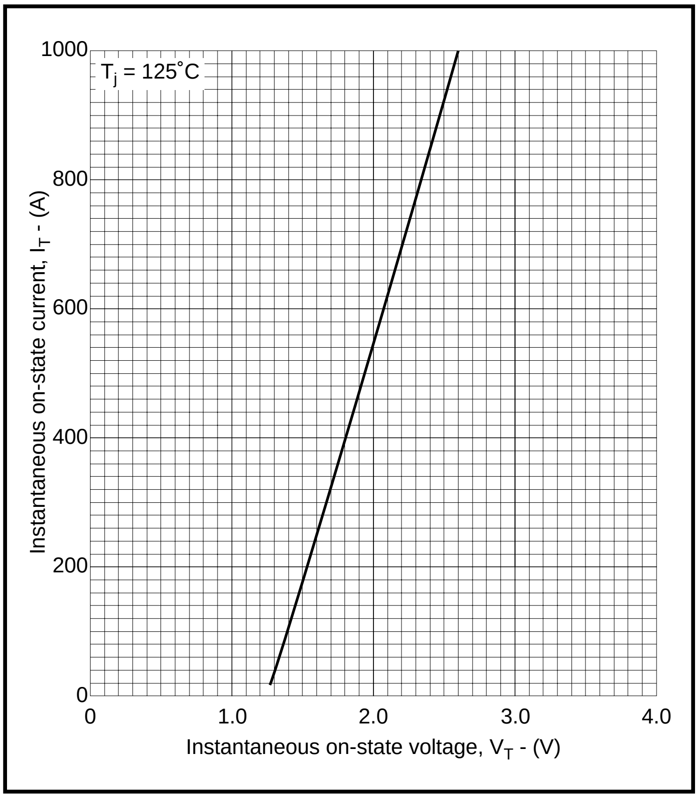


Fig. 3 Maximum (limit) on-state characteristics

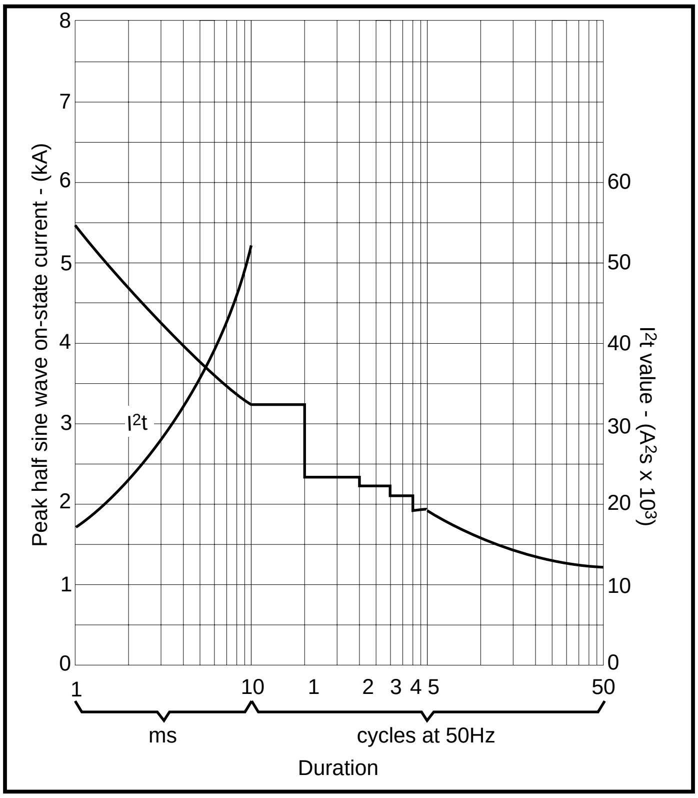


Fig. 4 Surge (non-repetitive) on-state current vs time (Thyristor or diode with 50% V_{RRM} at T_{case} = 125˚C)

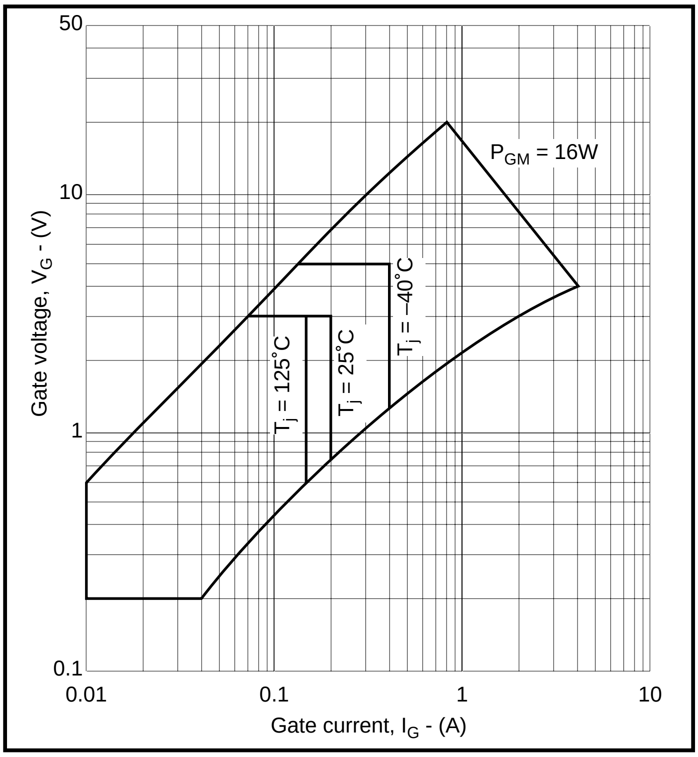


Fig. 5 Gate characteristics

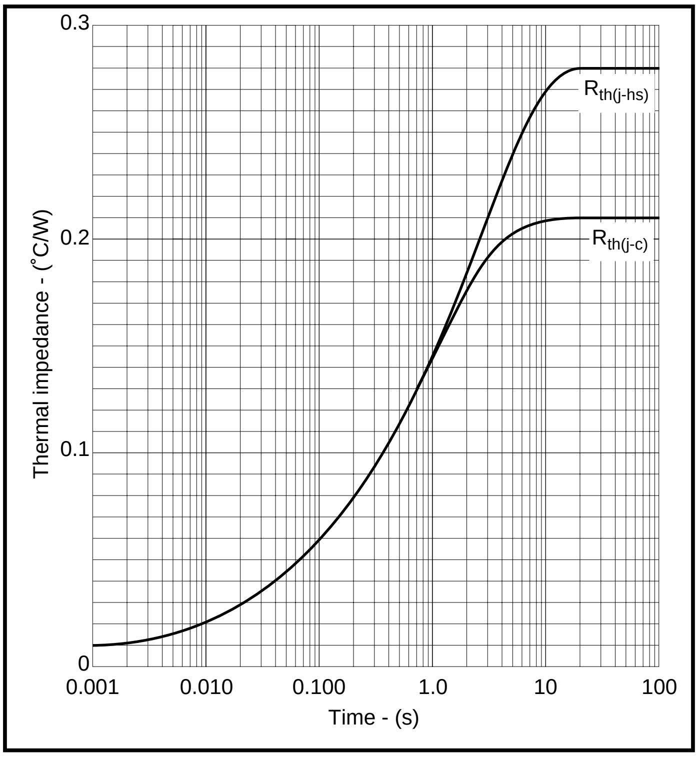


Fig. 6 Transient thermal impedance - dc

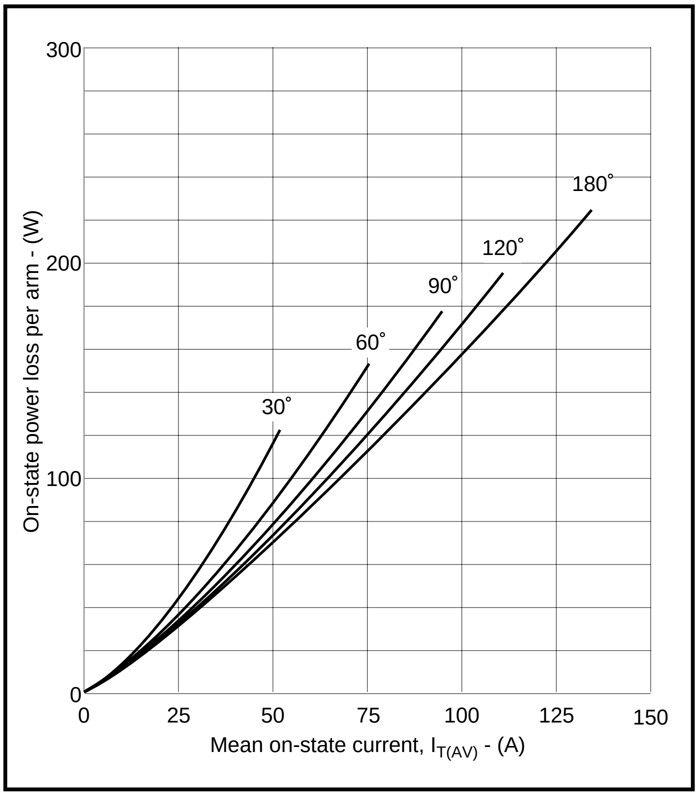


Fig. 7 On-state power loss per arm vs on-state current at specified conduction angles, sine wave 50/60Hz

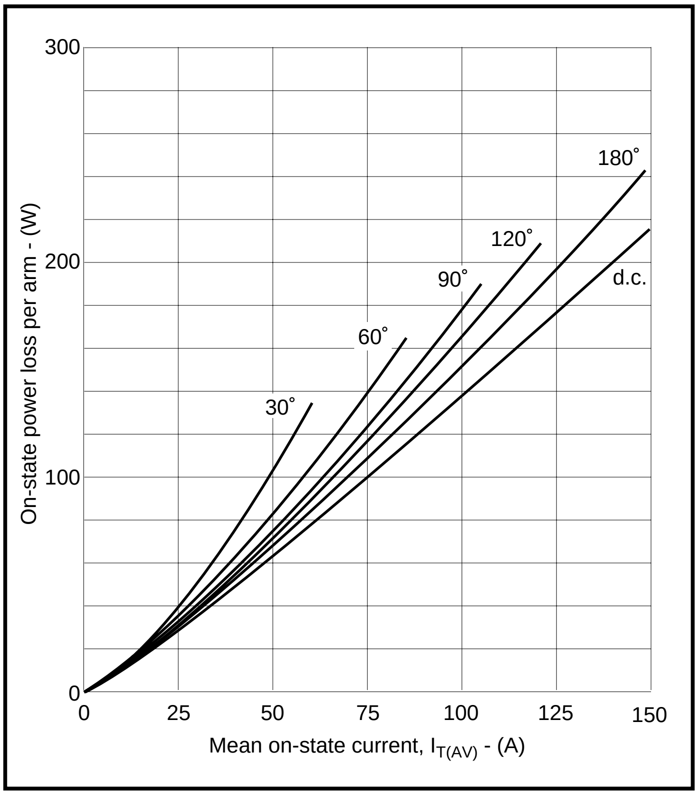


Fig. 8 On-state power loss per arm vs on-state current at specified conduction angles, square wave 50/60Hz

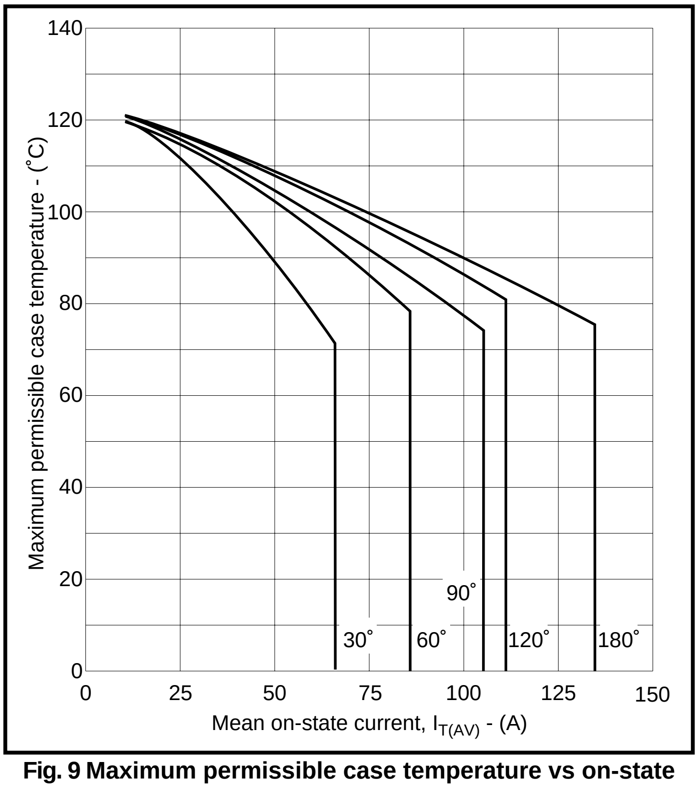


Fig. 9 Maximum permissible case temperature vs on-state current at specified conduction angles, sine wave 50/60Hz

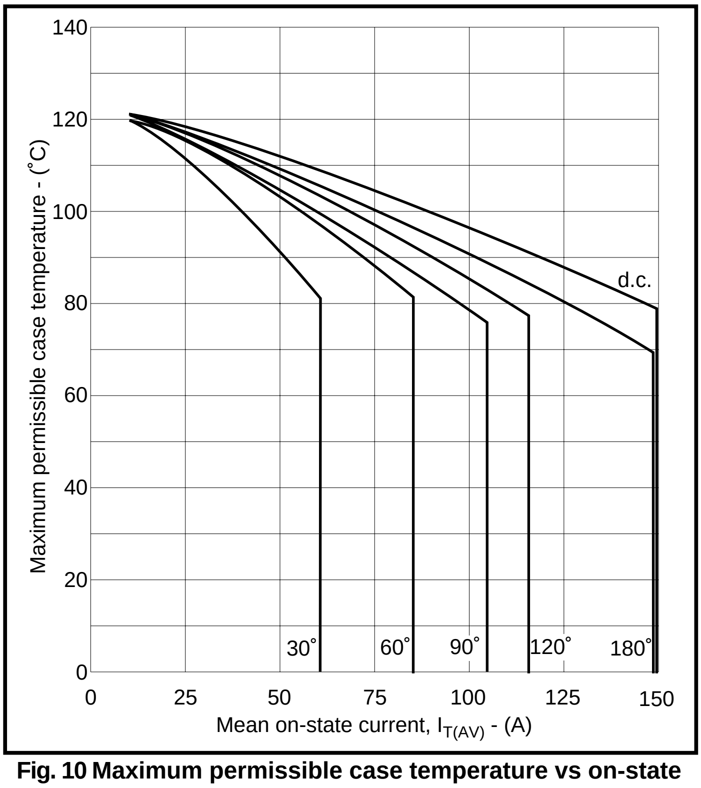


Fig. 10 Maximum permissible case temperature vs on-state current at specified conduction angles, square wave 50/60Hz

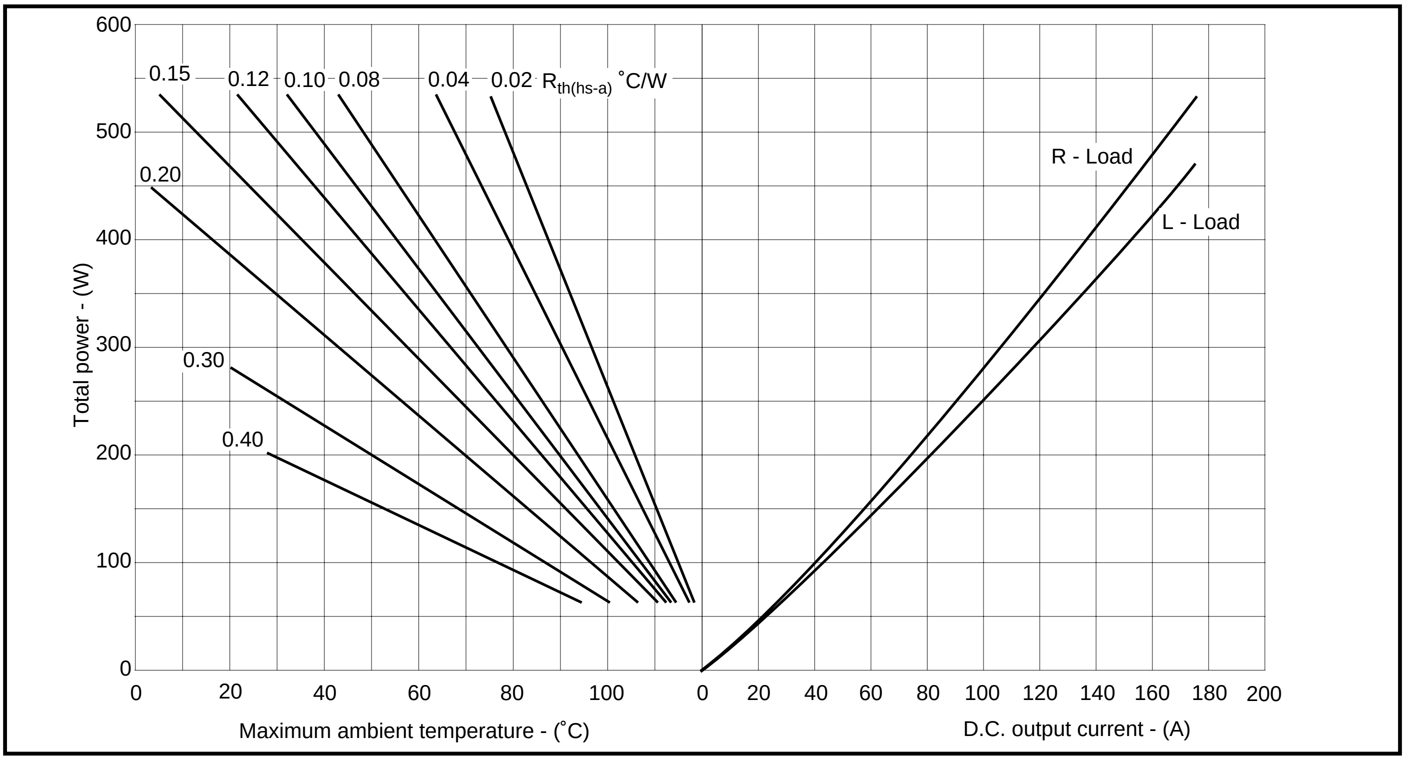


Fig. 11 50/60Hz single phase bridge dc output current vs power loss and maximum permissible ambient temperature for various values of heatsink thermal resistance

(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)

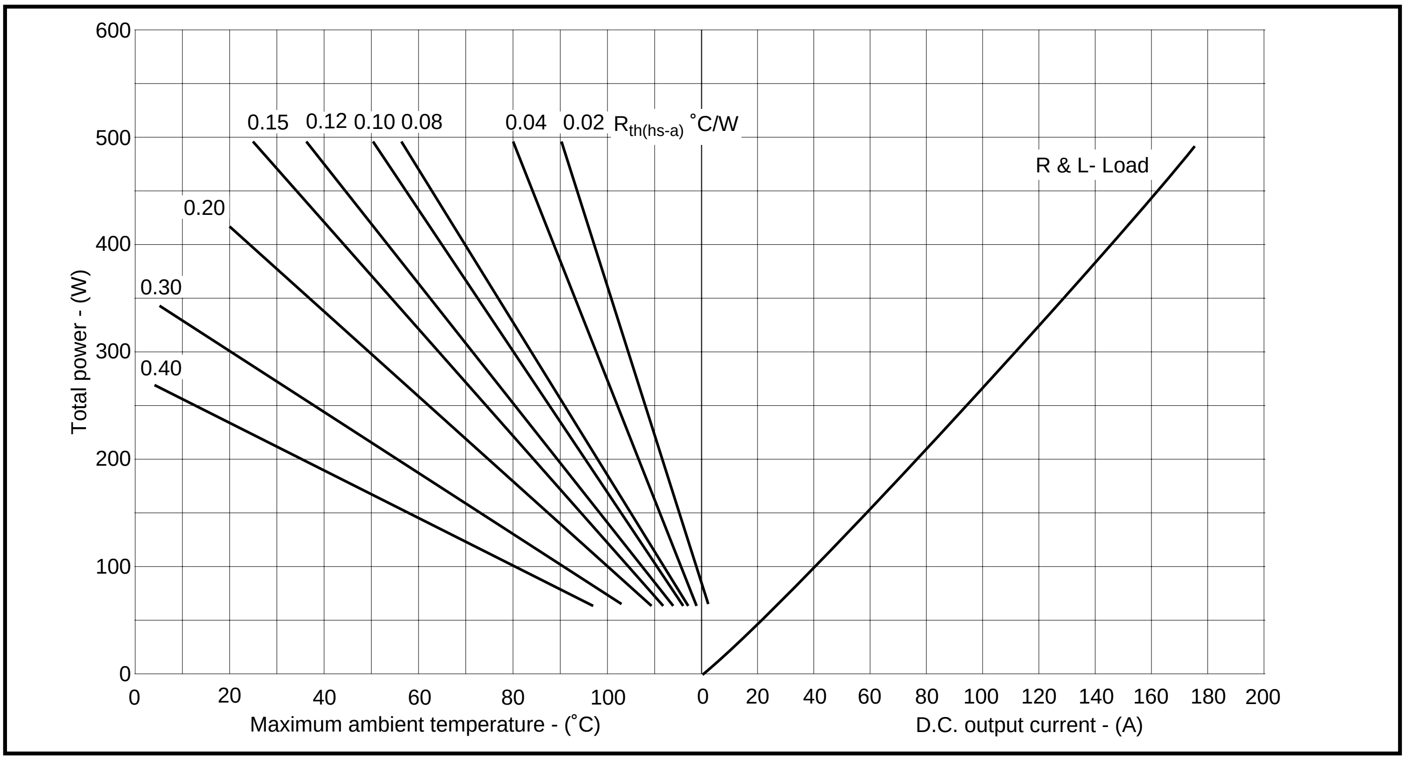
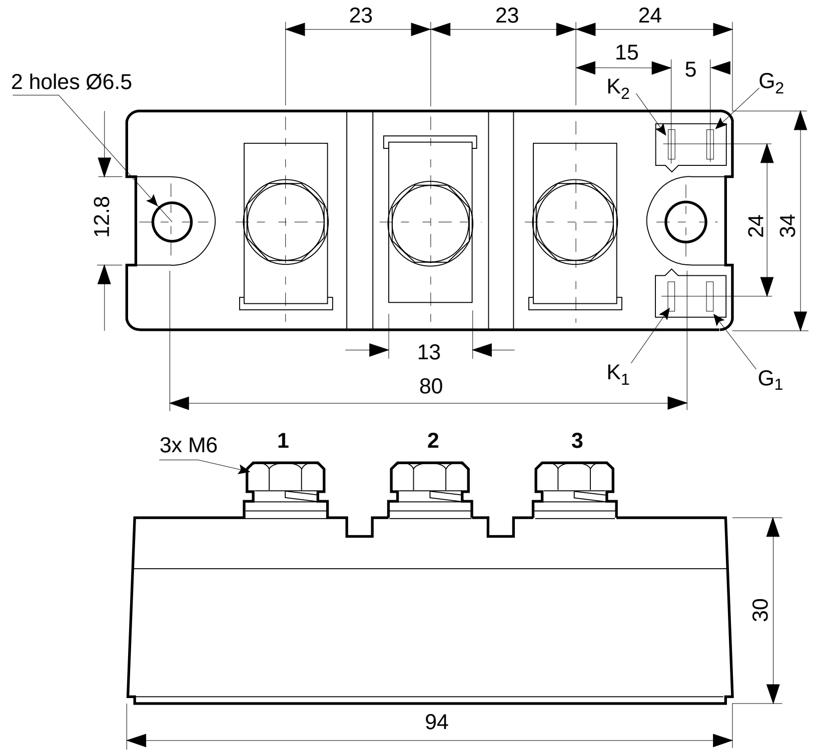


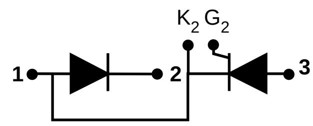
Fig. 12 50/60Hz 3- phase bridge dc output current vs power loss and maximum permissible ambient temperature for various values of heatsink thermal resistance

(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)

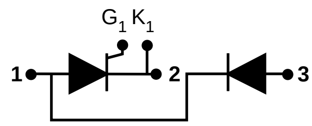
PACKAGE DETAILS

For further package information, please visit our website or contact your nearest Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.

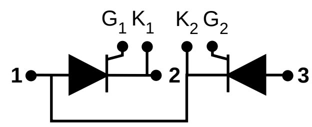




Circuit type: HBN



Circuit type: HBP



Circuit type: HBT

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

Module outline type code: MP02

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. Fit and finger tighten the recommended fixing bolts at each end. Using a torque wrench, continue to tighten the fixing bolts by rotating each bolt in turn no more than 1/4 of a revolution at a time, until the required torque of 6Nm (55lbs.ins) is reached on all bolts 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.

POWER ASSEMBLY CAPABILITY

The Power Assembly group provides support for those customers requiring more than the basic semiconductor switch. Using CAD design tools the group has developed a flexible range of heatsink / clamping systems in line with advances in device types and the voltage and current capability of Dynex semiconductors.

An extensive range of air and liquid cooled assemblies is available covering the range of circuit designs in general use today.

HEATSINKS

The Power Assembly group has a proprietary range of extruded aluminium heatsinks. These were designed to optimise the performance of Dynex 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 customer service office.

http://www.dynexsemi.com

e-mail: 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.
99 Bank Street, Suite 410,
Ottawa, Ontario, Canada, K1P 6B9
Tel: 613.723.7035
Fax: 613.723.1518
Toll Free: 1.888.33.DYNEX (39639)

CUSTOMER SERVICE CENTRES
Mainland Europe Tel: +33 (0)1 58 04 91 00. Fax: +33 (0)1 46 38 51 33
North America Tel: (613) 723-7035. Fax: (613) 723-1518.
UK, Scandinavia & Rest Of World Tel: +44 (0)1522 500500. Fax: +44 (0)1522 500020

SALES OFFICES
Mainland Europe Tel: +33 (0)1 58 04 91 00. Fax: +33 (0)1 46 38 51 33
North America Tel: (613) 723-7035. Fax: (613) 723-1518. Toll Free: 1.888.33.DYNEX (39639) / Tel: (949) 733-3005. Fax: (949) 733-2986.
UK, 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.

Datasheet Annotations:

Dynex Semiconductor annotate datasheets in the top right hard 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.