MAS220S

Fast Turn-off Asymmetric Thyristor/Diode Module

Supersedes December 1995 version, DS4199-1.1

DS4199-4.2 April 1999

Applications

- High Frequency High Power Choppers And Inverters.
- Ultrasonic Generators.
- Welding.
- PWM Inverters.

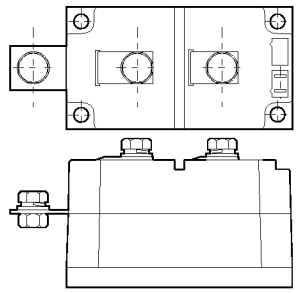
Key Parameters

V_{DRM}	1400V
I_{TSM}	4800A
$I_{T(AV)}$ per arm	216A
V_{isol}	2500V
t_q	8/10/12/15µs

Description

The MAS220S is a fast thyristor/diode module in an electrically isolated package. The semiconductors are are pressure contact mounted giving high resistance to thermal fatigue, and having excellent heat dissipation qualities.

Isolation medium is non-toxic alumina.



Outline type code: MP03
See Package Details for further information.

Fig.1 Package outline - (not to scale)

Voltage Ratings

Type Number	Repetitive Peak Off-state Voltage V_{DRM} V	Conditions
MAS220S 14	1400	T_{vj} = 125°C,
MAS220S 12	1200	I_{DRM} = 50mA,
MAS220S 10	1000	$V_{DSM} = V_{DRM}$ + 100V
MAS220S 08	800	
MAS220S 06	600	

For full description of part number see 'Ordering Information'.

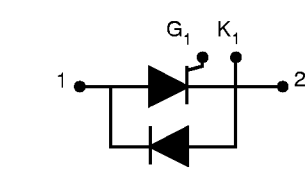


Fig.2 Single circuit

Thyristor Current Ratings

Symbol	Parameter	Conditions		Max.	Units
$I_{T(AV)}$	Mean forward current	Half wave resistive load 50Hz	T_{case} = 75°C	216	A
			T_{case} = 75°C	180	A
			T_{case} = 75°C	166	A
			T_{case} = 75°C	138	A
$I_{T(RMS)}$	RMS value	T_{case} = 75°C		350	A

Thyristor Surge Ratings

Symbol	Parameter	Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine; T_{case} = 125°C	4.8	kA
I^2t	I^2t for fusing	V_R = 0% V_{DRM}	115 x 10^3	A^2s

Thyristor Dynamic Characteristics

Symbol	Parameter	Conditions		Min.	Max.	Units
V_{TM}	Maximum on-state voltage	At 600A peak, T_{case} = 25°C		-	1.9	V
I_{DRM}	Peak off-state current	At V_{DRM}, T_{case} = 125°C		-	50	mA
dV/dt	Maximum linear rate of rise of off-state voltage	To 60% V_{DRM} T_j = 125°C, Gate open circuit		-	1000	V/µs
dI/dt	Rate of rise of on-state current	From 67% V_{DRM} to 600A, 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		-	1.3	V
r_T	On-state slope resistance	At T_{vj} = 125°C		-	0.9	mΩ
t_q	Turn-off time	I_T = 200A, T_j = 125°C, dI_R/dt = 50A/µs, V_{GK} = 0V dV/dt = 200V/µs to 60% V_{DRM}	t_q code: R	-	8	µs
			t_q code: W	-	10	µs
			t_q code: S	-	12	µs
			t_q code: X	-	15	µs

Thyristor Gate Trigger Characteristics and Ratings

Symbol	Parameter	Conditions	Typ.	Max.	Units
V_{GT}	Gate trigger voltage	V_{DRM} = 12V, T_{case} = 25°C, R_L = 6Ω	-	3.0	V
I_{GT}	Gate trigger current	V_{DRM} = 12V, T_{case} = 25°C, R_L = 6Ω	-	300	mA
V_{GD}	Gate non-trigger voltage	V_D = V_{DRM} T_{case} = 125°C	-	0.2	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

Diode Current Ratings

Symbol	Parameter	Conditions	Max.	Units
$I_{F(AV)}$	Mean forward current	Half wave resistive load, T_{case} = 75°C	117	A
$I_{F(RMS)}$	RMS value	T_{case} = 75°C	183	A

Diode Surge Ratings

Symbol	Parameter	Conditions	Max.	Units
I_{FSM}	Surge (non-repetitive) forward current	10ms half sine; T_{case} = 125°C	3.5	kA
I^2t	I^2t for fusing	V_R = 0% V_{RRM}	61.25 x 10^3	A^2s

Diode Dynamic Characteristics

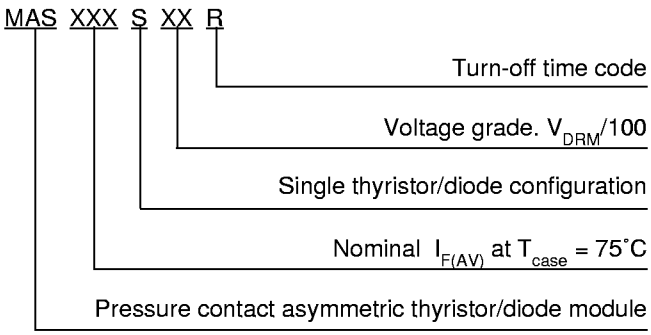
Symbol	Parameter	Conditions	Max.	Units
V_{FM}	Forward voltage	At 600A, T_{case} = 25˚C.	2.65	V
I_{RRM}	Peak reverse current	At V_{RRM}, T_{case} = 125˚C.	40	mA
t_{rr}	Reverse recovery time	T_{case} = 125˚C, dI_R/dt = 50A/µs, I_{FM} = 200A, typ.	1.22	µs
V_{TO}	Threshold voltage	At T_{vj} = 125˚C.	1.6	V
r_T	Forward slope resistance	At T_{vj} = 125˚C.	1.5	mΩ

Thermal and Mechanical Data

Symbol	Parameter	Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - junction to case	dc Thyristor Diode	- -	0.12 0.21	°C/W
$R_{th(c-h)}$	Thermal resistance - case to heatsink (Thyristor or diode)	Mounting torque 5Nm with mounting compound.	-	0.05	°C/W
T_{vj}	Virtual junction temperature	-	-	125	°C
T_{op}	Operating temperature range	-	-40	125	°C
T_{stg}	Storage temperature range		-40	125	°C
V_{isol}	Isolation voltage	Commoned terminals to base plate. AC RMS, 1 min, 50Hz.	-	2.5	kV
-	Mounting torque		-	5.0	Nm

Ordering Information

The module type number is made up as follows:



Examples:

MAS 220 S 12 R
MAS 220 S 08 X

Module 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 and loss curves 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

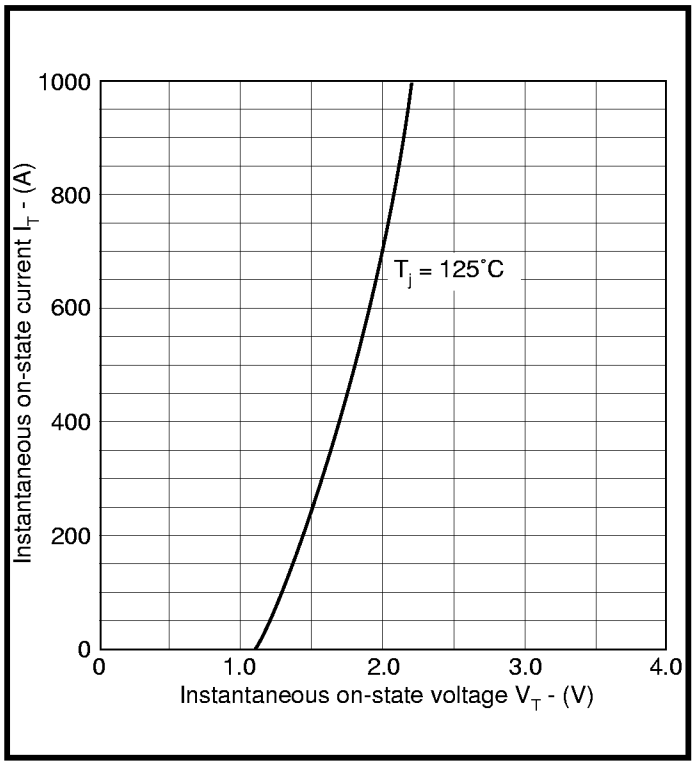


Fig.3 Maximum (limit) on-state characteristics (thyristor)

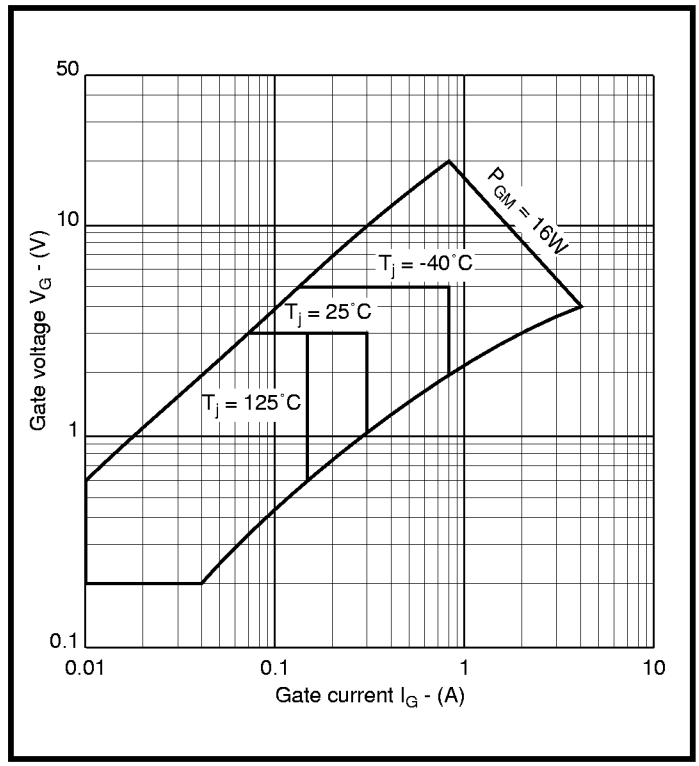


Fig.4 Gate characteristics (thyristor)

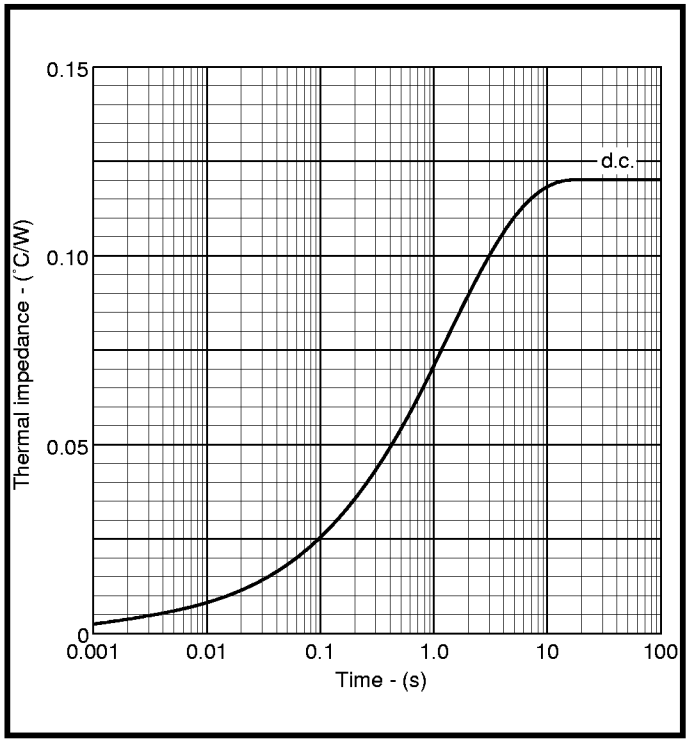


Fig.5 Transient thermal impedance - junction to case (thyristor or diode)

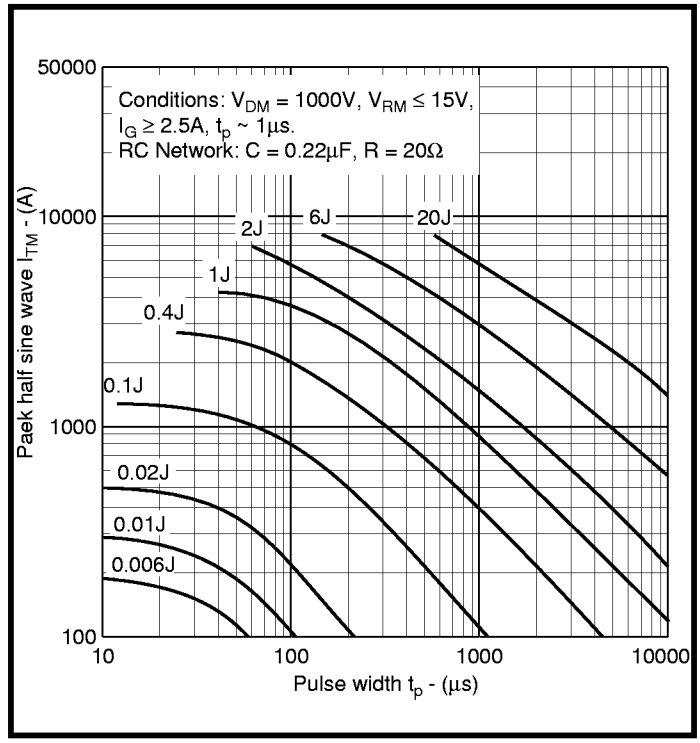
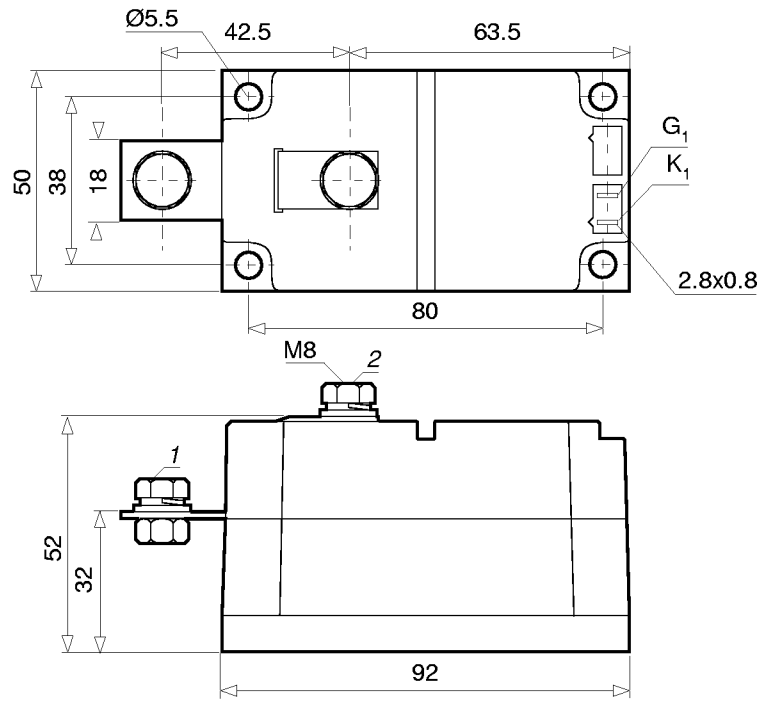


Fig.6 Energy per pulse

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 conections:	8Nm (70lb.ins)
Maximum torques for electrical connections:	9Nm (80lb.ins)
Nominal weight:	950g

Package Outline Type Code: MP03