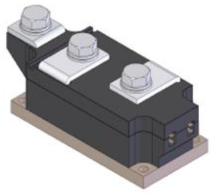
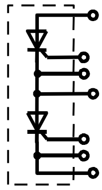
Date: 8th September 2020

Data Sheet Issue: 2



Dual Thyristor Module Types
MCC240-60io2 to MCC240-65io2

Absolute Maximum Ratings

V_{RRM} V_{DRM} [V]	 MCC
6000 6500	240-60io2 240-65io2

	VOLTAGE RATINGS	**MAXIMUM LIMITS**	**UNITS**
V_{DRM}	Repetitive peak off-state voltage [1)]	6000-6500	V
V_{DSM}	Non-repetitive peak off-state voltage [1)]	6100-6600	V
V_{RRM}	Repetitive peak reverse voltage [1)]	6000-6500	V
V_{RSM}	Non-repetitive peak reverse voltage [1)]	6100-6600	V

	OTHER RATINGS	**MAXIMUM LIMITS**	**UNITS**
$I_{T(AV)M}$	Maximum average on-state current, T_C = 85°C [2)]	240	A
$I_{T(AV)M}$	Maximum average on-state current. T_C = 100°C [2)]	170	A
$I_{T(RMS)M}$	Nominal RMS on-state current, T_C = 85°C [2)]	376	A
$I_{T(d.c.)}$	D.C. on-state current, T_C = 55°C	458	A
I_{TSM}	Peak non-repetitive surge t_p = 10 ms, V_{RM} = 60%V_{RRM} [3)]	4.40	kA
I_{TSM2}	Peak non-repetitive surge t_p = 10 ms, $V_{RM} \leq$ 10V [3)]	4.00	kA
I^2t	I^2t capacity for fusing t_p = 10 ms, V_{RM} = 60%V_{RRM} [3)]	80.0	kA^2s
I^2t	I^2t capacity for fusing t_p = 10 ms, $V_{RM} \leq$ 10 V [3)]	96.8	kA^2s
$(di/dt)_{cr}$	Critical rate of rise of on-state current (non-repetitive) [4)]	500	A/µs
V_{RGM}	Peak reverse gate voltage	5	V
P_{GM}	Peak forward gate power	4	W
V_{ISOL}	Isolation Voltage [5)]	3000	V
$T_{vj\ op}$	Operating temperature range	-40 to +125	°C
T_{stg}	Storage temperature range	-40 to +50	°C

Notes:
1) De-rating factor of 0.13% per °C is applicable for T_{vj} below 25°C.
2) Single phase; 50 Hz, 180° half-sinewave.
3) Half-sinewave, 125°C T_{vj} initial.
4) V_D = 67% V_{DRM}, I_{FG} = 2A, $di_g/dt \geq$ 2A/µs, T_C = 125°C.
5) AC RMS voltage, 50 Hz, 1min test

Characteristics

	PARAMETER	MIN.	TYP.	MAX.	TEST CONDITIONS [1]	UNITS
V_{TM}	Maximum peak on-state voltage	-	-	2.80	I_{TM} = 785 A, T_{vj} = 25°C	V
V_{T0}	Threshold voltage	-	-	1.10		V
r_T	Slope resistance	-	-	2.50		mΩ
$(dv/dt)_{cr}$	Critical rate of rise of off-state voltage	-	-	1000	V_D = 67% V_{DRM}, linear ramp, Gate o/c	V/µs
I_{DRM}	Peak off-state current	-	-	150	Rated V_{DRM}	mA
I_{RRM}	Peak reverse current	-	-	150	Rated V_{RRM}	mA
V_{GT}	Gate trigger voltage	-	-	2.5	T_{vj} = 25°C, V_D = 12 V, I_T = 3 A	V
I_{GT}	Gate trigger current	-	-	300		mA
V_{GD}	Gate non-trigger voltage	0.35	-	-	67% V_{DRM}	V
I_L	Latching current	-	-	1000	V_D = 12 V, I_{FG} = 2A, t_{GP} = 50µs, T_{vj} = 25°C	mA
I_H	Holding current	-	-	300	V_D = 12 V, Gate o/c, T_{vj} = 25°C	mA
t_{gd}	Gate controlled turn-on delay time	-	-	3.50	I_{FG} = 2 A, t_r = 50 µs, V_D = 40%V_{DRM}, I_{TM} = I_{TAV}, di/dt ≥ 2A/µs, T_{vj} = 25°C	µs
Q_{rr}	Recovered Charge	-	-	4100	I_{TM} = 1000 A, t_p = 1 ms, di/dt = 5A/µs, V_R = 100 V	µC
Q_{ra}	Recovered Charge, 25% chord	-	-	2600		µC
I_{rm}	Reverse recovery current	-	-	104		A
t_{rr}	Reverse recovery time, 25% chord	-	-	50		µs
t_q	Turn-off time	-	-	630	I_{TM} = 240A, t_p = 1 ms, di/dt = 10 A/µs, V_R = 100 V, V_{DR} = 67%V_{DRM}, dv_D/dt = 50 V/µs	µs
R_{thJC}	Thermal resistance, junction to case	-	-	0.068	Single Arm	K/W
		-	-	0.034	Whole Module	K/W
R_{thCH}	Thermal resistance, case to heatsink	-	-	0.020	Single Arm	K/W
		-	-	0.010	Whole Module	K/W
F_1	Mounting force (to heatsink)	-	6.00	-	[2]	Nm
F_2	Mounting force (to terminals)	-	12.00	-		Nm
W_t	Weight	-	1500	-		g

Notes:

1) Unless otherwise indicated T_{vj}=125°C.
2) Screws must be lubricated.

Notes on Ratings and Characteristics

1.0 Voltage Grade Table

Voltage Grade	V_{DRM} V	V_{RRM} V	V_{DSM} V	V_{RSM} V	V_D DC V	V_R DC V
60	6000	6000	6100	6100	3600	3600
65	6500	6500	6600	6600	3900	3900

2.0 Extension of Voltage Grades

This report is applicable to other voltage grades when supply has been agreed by Sales/Production.

3.0 De-rating Factor

A blocking voltage de-rating factor of 0.13%/°C is applicable to this device for T_{vj} below 25°C.

4.0 Repetitive dv/dt

Standard dv/dt is 1000V/µs.

5.0 Snubber Components

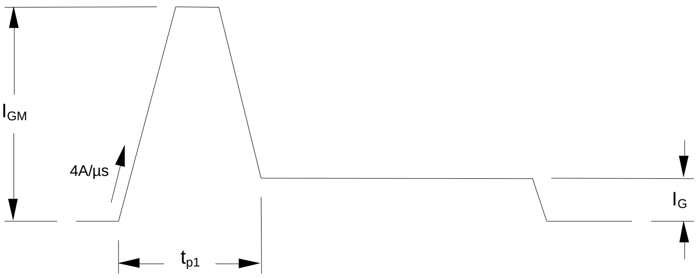
When selecting snubber components, care must be taken not to use excessively large values of snubber capacitor or excessively small values of snubber resistor. Such excessive component values may lead to device damage due to the large resultant values of snubber discharge current. If required, please consult the factory for assistance.

6.0 Rate of rise of on-state current

The maximum un-primed rate of rise of on-state current must not exceed 400A/µs at any time during turn-on on a non-repetitive basis. For repetitive performance, the on-state rate of rise of current must not exceed 200A/µs at any time during turn-on. Note that these values of rate of rise of current apply to the total device current including that from any local snubber network.

7.0 Gate Drive

The nominal requirement for a typical gate drive is illustrated below. An open circuit voltage of at least 30V is assumed. This gate drive must be applied when using the full di/dt capability of the device.



The magnitude of I_{GM} should be between five and ten times I_{GT}, which is shown on page 2. Its duration (t_{p1}) should be 20µs or sufficient to allow the anode current to reach ten times I_L, whichever is greater. Otherwise, an increase in pulse current could be needed to supply the necessary charge to trigger. The 'back-porch' current I_G should remain flowing for the same duration as the anode current and have a magnitude in the order of 1.5 times I_{GT}.

8.0 Computer Modelling Parameters

8.1 Thyristor Dissipation Calculations

$$I_{AV} = \frac{-V_{T0} + \sqrt{V_{T0}^{\;2} + 4 \cdot ff^{\,2} \cdot r_T \cdot W_{AV}}}{2 \cdot ff^{\,2} \cdot r_T}$$

and:

$$W_{AV} = \frac{\Delta T}{R_{th}}$$

$$\Delta T = T_{j\max} - T_C$$

Where V_{T0} = 1.1 V, r_T = 2.5 mΩ.

R_{th} = Supplementary thermal impedance, see table below and

ff = Form factor, see table below.

Supplementary Thermal Impedance							
Conduction Angle	30°	60°	90°	120°	180°	270°	d.c.
Square wave	0.1214	0.1185	0.1165	0.1149	0.1128	0.1108	0.1100
Sine wave	0.1188	0.1155	0.1138	0.1112	0.1098		

Form Factors							
Conduction Angle	30°	60°	90°	120°	180°	270°	d.c.
Square wave	3.464	2.449	2.000	1.732	1.414	1.149	1.000
Sine wave	4.025	2.778	2.220	1.879	1.568		

8.2 Calculating thyristor V_T using ABCD Coefficients

The on-state characteristic I_T vs. V_T, on page 6 is represented by a set of constants A, B, C, D, forming the coefficients of the representative equation for V_T in terms of I_T given below:

$$V_T = A + B \cdot \ln(I_T) + C \cdot I_T + D \cdot \sqrt{I_T}$$

The constants, derived by curve fitting software, are given below for both hot and cold characteristics. The resulting values for V_T agree with the true device characteristic over a current range, which is limited to that plotted.

25°C Coefficients		125°C Coefficients	
A	1.15851108	A	1.1169632
B	3.581416×10^{-2}	B	-0.059215663
C	1.839981×10^{-3}	C	2.130761×10^{-3}
D	-1.565977×10^{-3}	D	0.020248478

8.2 D.C. Thermal Impedance Calculation

$$r_t = \sum_{p=1}^{p=n} r_p \cdot \left(1 - e^{\frac{-t}{\tau_p}}\right)$$

Where *p* = *1* to *n and:*

- n = number of terms in the series
- t = Duration of heating pulse in seconds
- r_t = Thermal resistance at time t
- r_p = Amplitude of p_{th} term
- τ_p = Time Constant of r_{th} term

The coefficients for this device are shown in the table below:

D.C.						
Term	1	2	3	4	5	6
r_p	0.0385	0.01253	0.0144	0.007273	0.001871	0.0001367
τ_p	3.124	0.8558	0.1999	0.009185	0.002295	0.000238

9.0 Reverse recovery ratings

(i) Q_{ra} is based on 25% I_{RM} chord as shown in Fig. 1

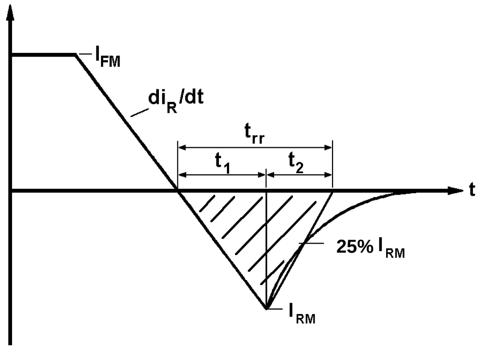


Fig. 1

(ii)

$$K\ Factor = \frac{t_1}{t_2}$$

Curves

Figure 1 – On-state characteristics of Limit device

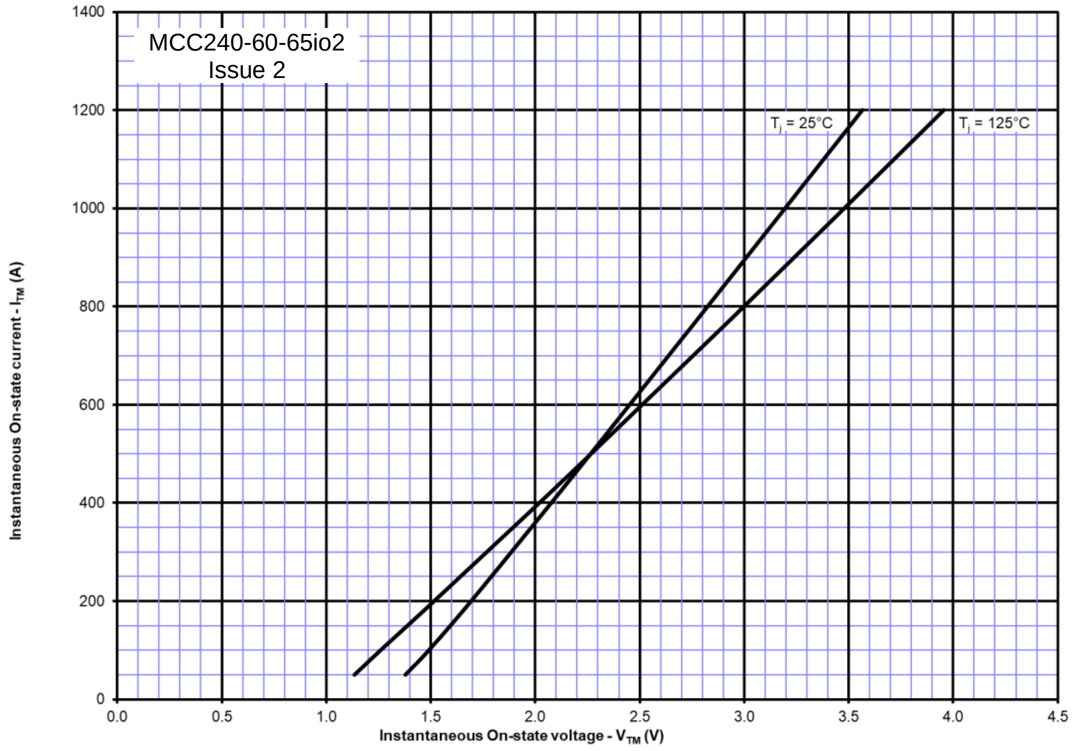


Figure 2 – Transient thermal impedance

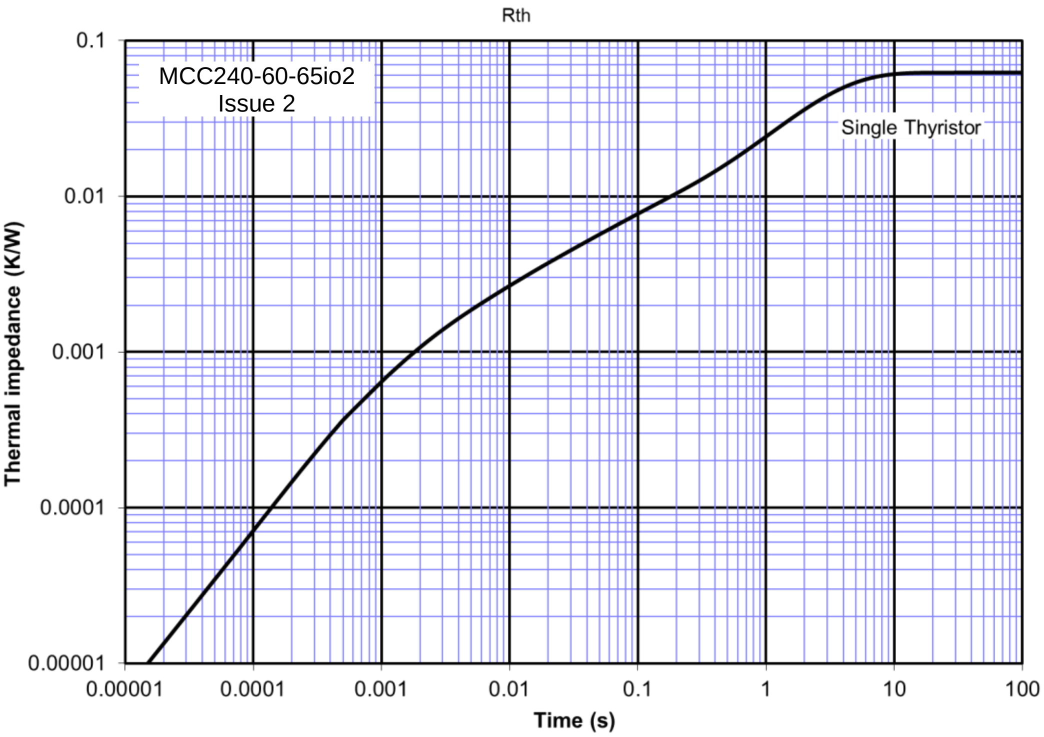


Figure 3 – Gate characteristics – Trigger limits

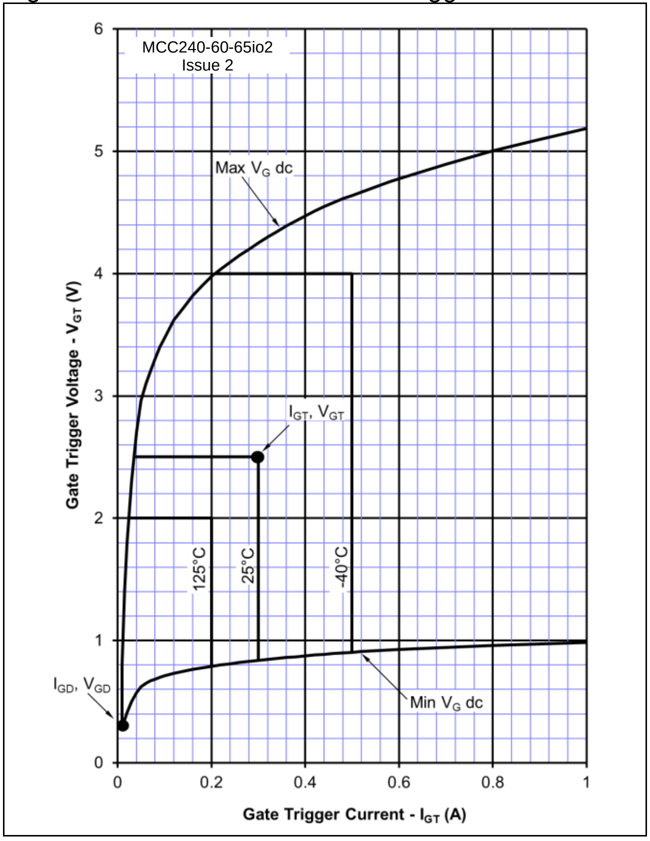


Figure 4 – Gate characteristics – Power curves

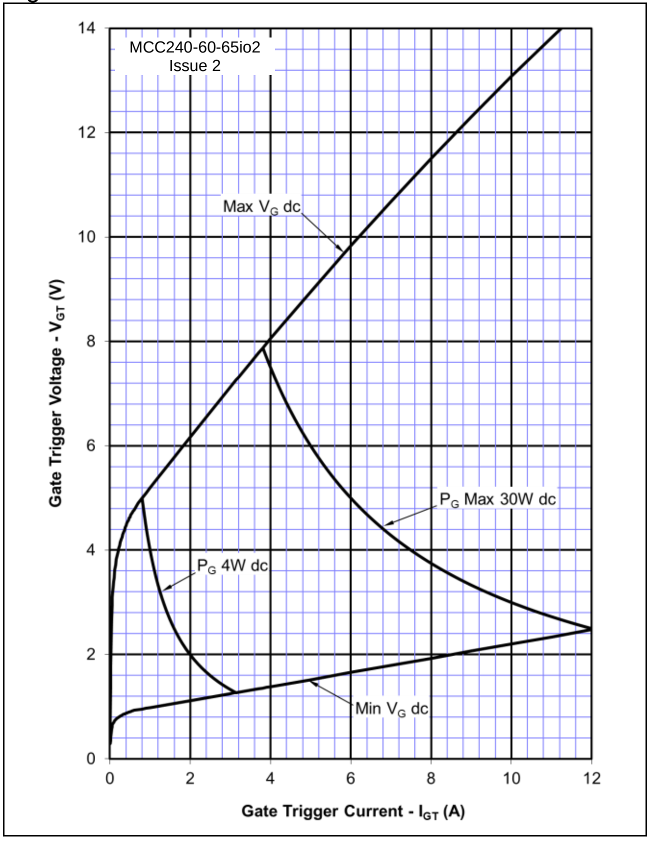


Figure 5 - Total recovered charge, Q_{rr}

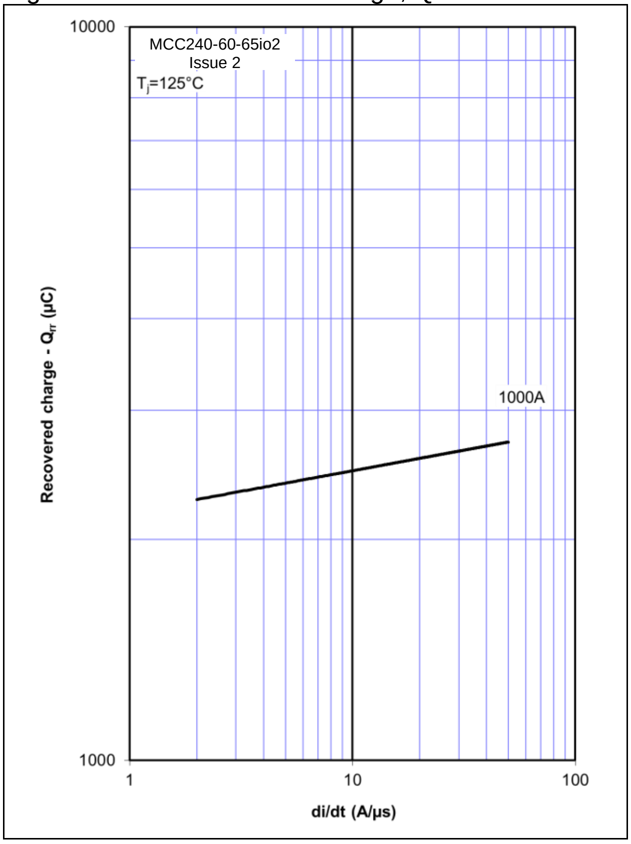


Figure 6 - Recovered charge, Q_{ra} (25% chord)

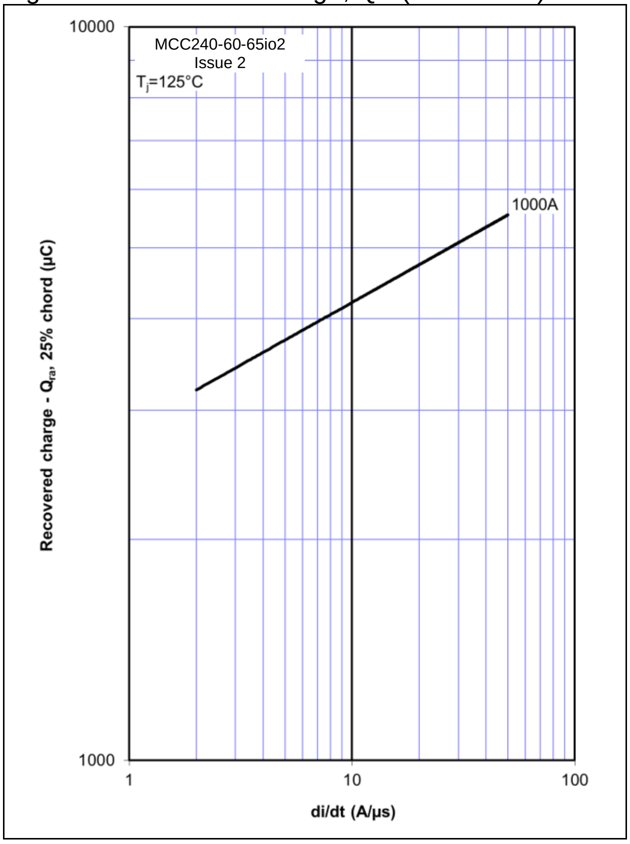


Figure 7 - Peak reverse recovery current, I_{rm}

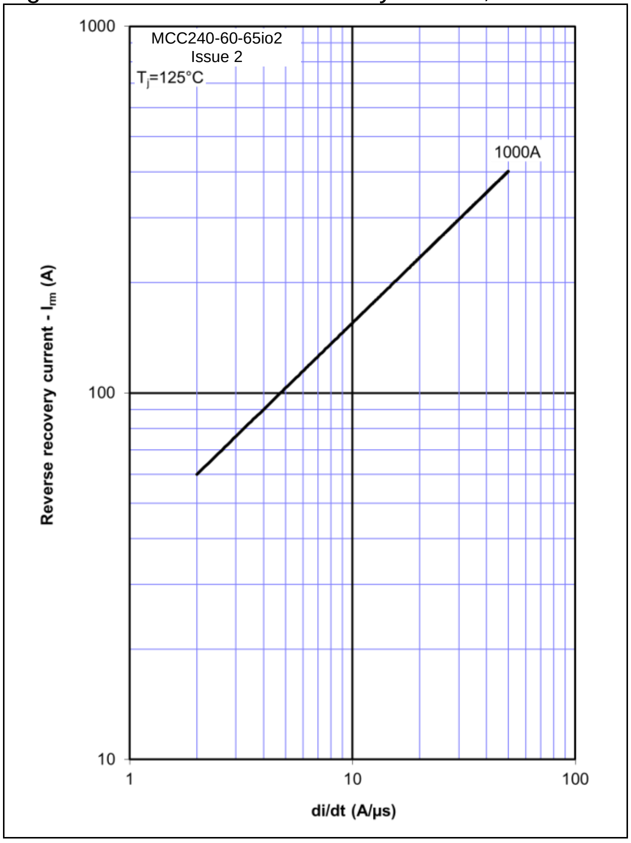


Figure 8 - Maximum recovery time, t_{rr} (25% chord)

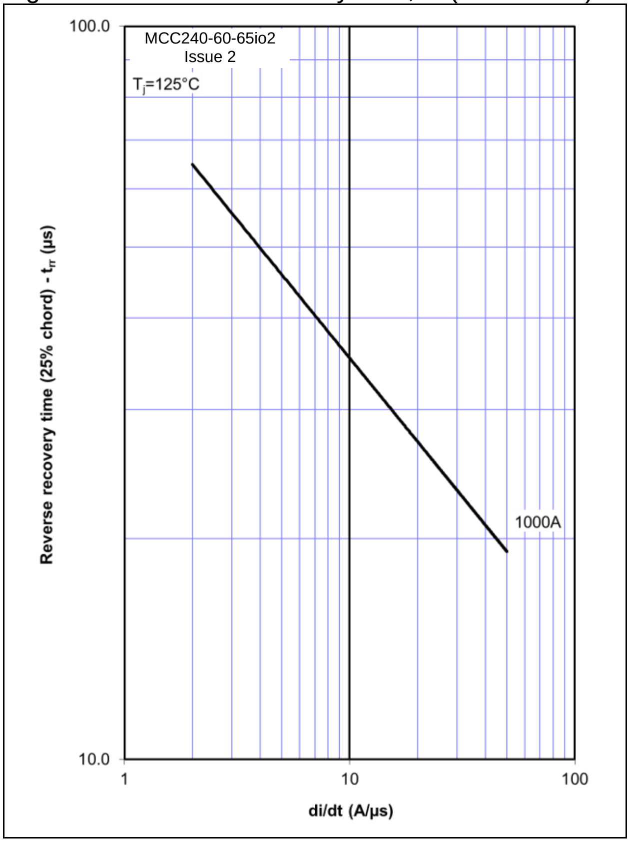


Figure 9 – On-state current vs. Power dissipation – Sine wave

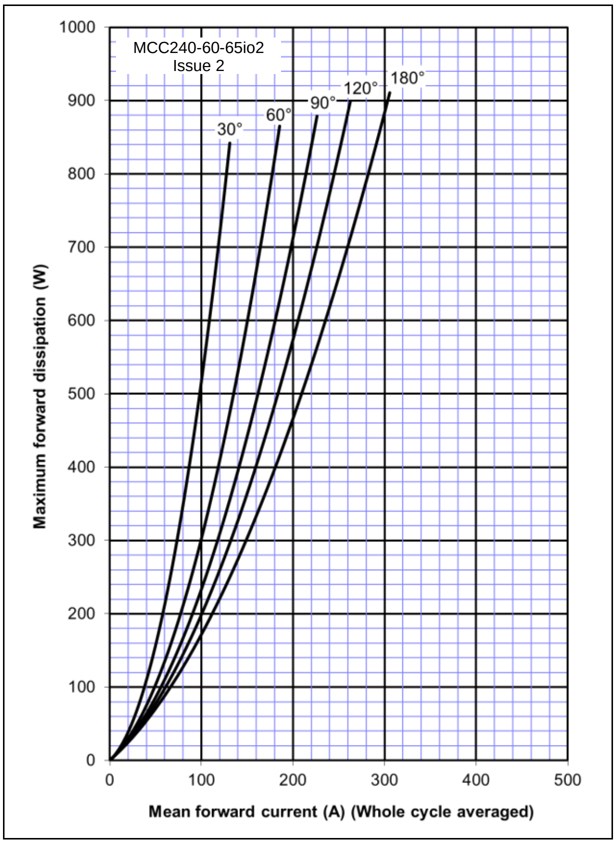


Figure 10 – On-state current vs. Heatsink temperature – Sine wave

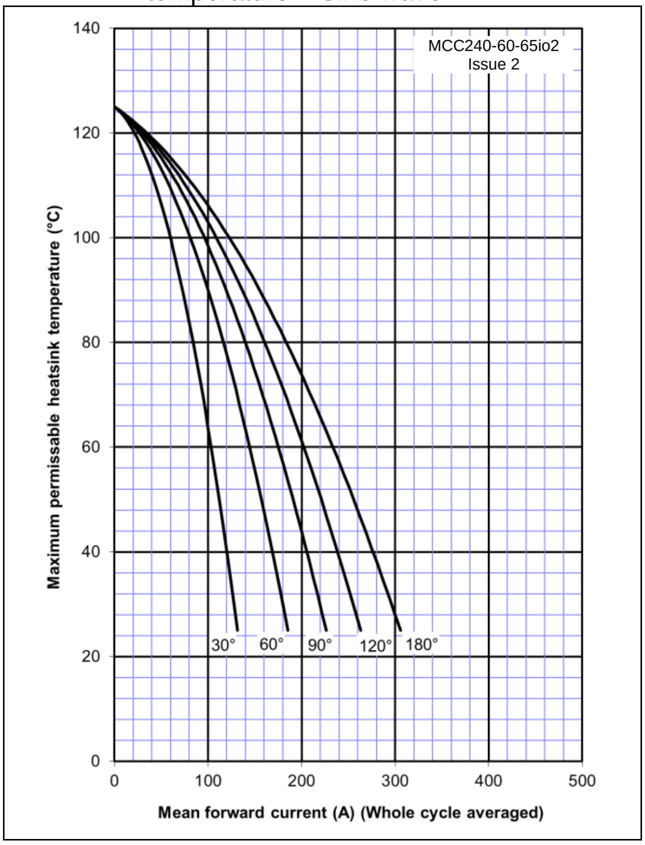


Figure 11 – On-state current vs. Power dissipation – Square wave

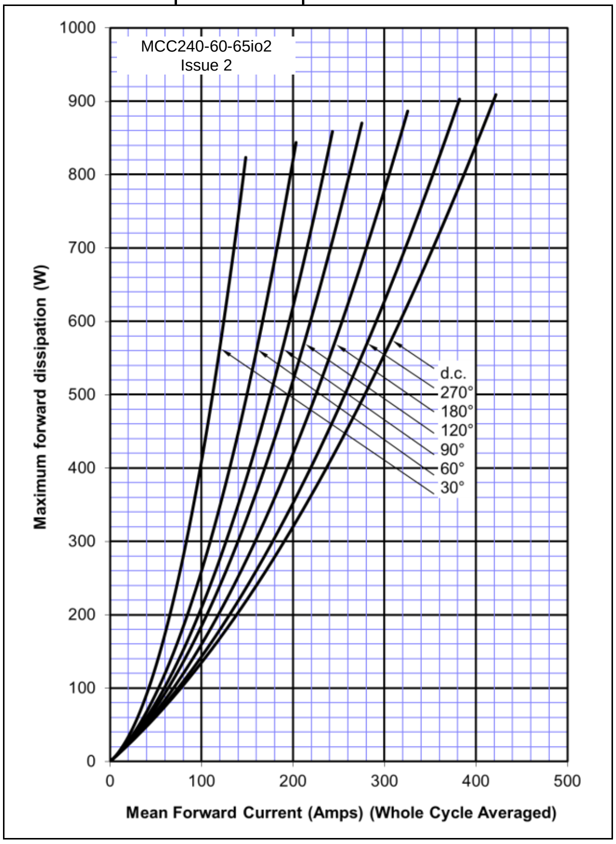


Figure 12 – On-state current vs. Heatsink temperature – Square wave

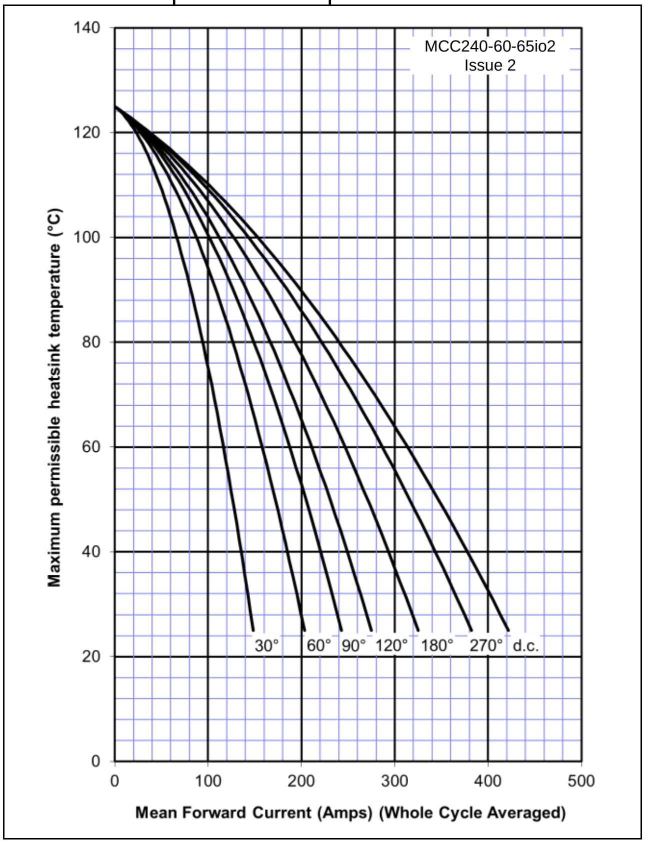
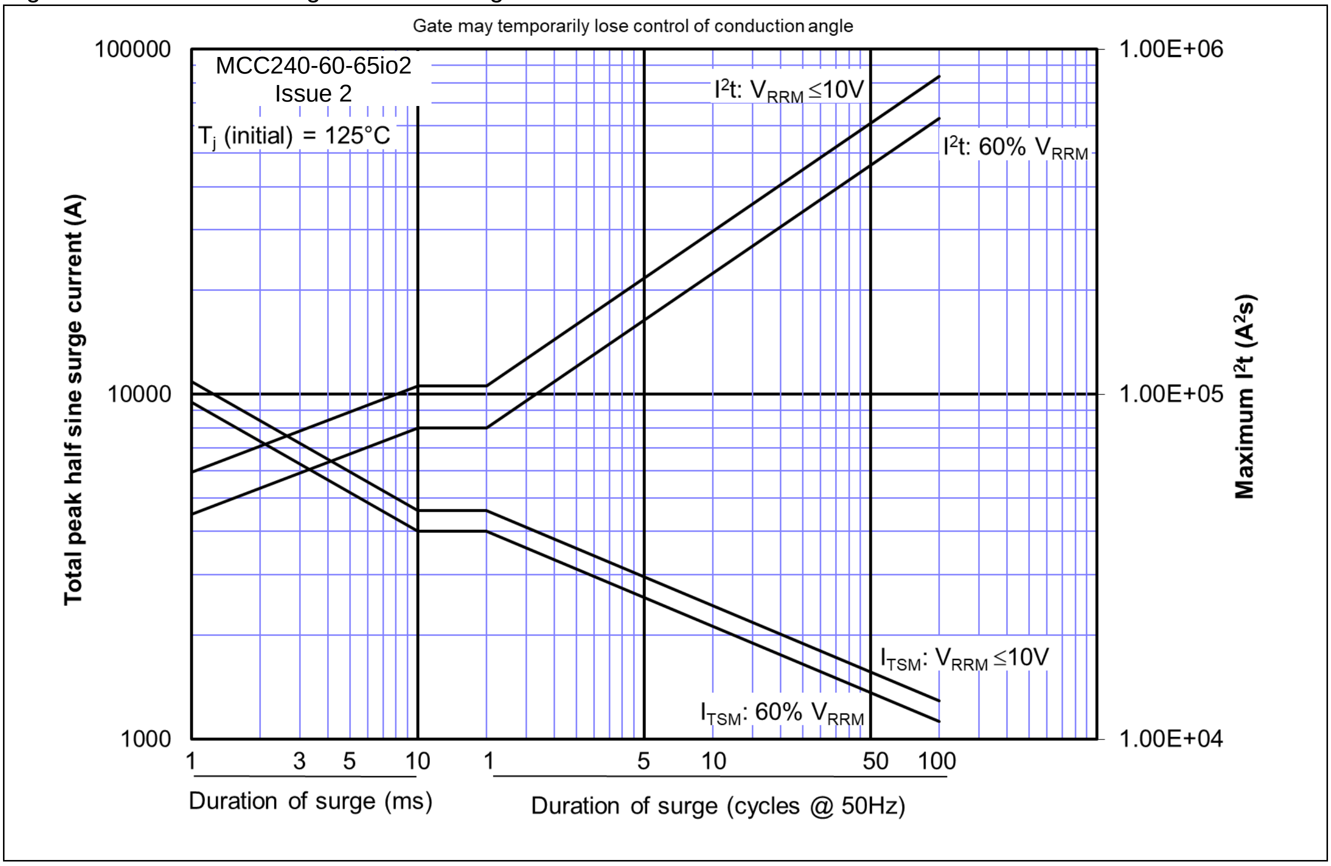
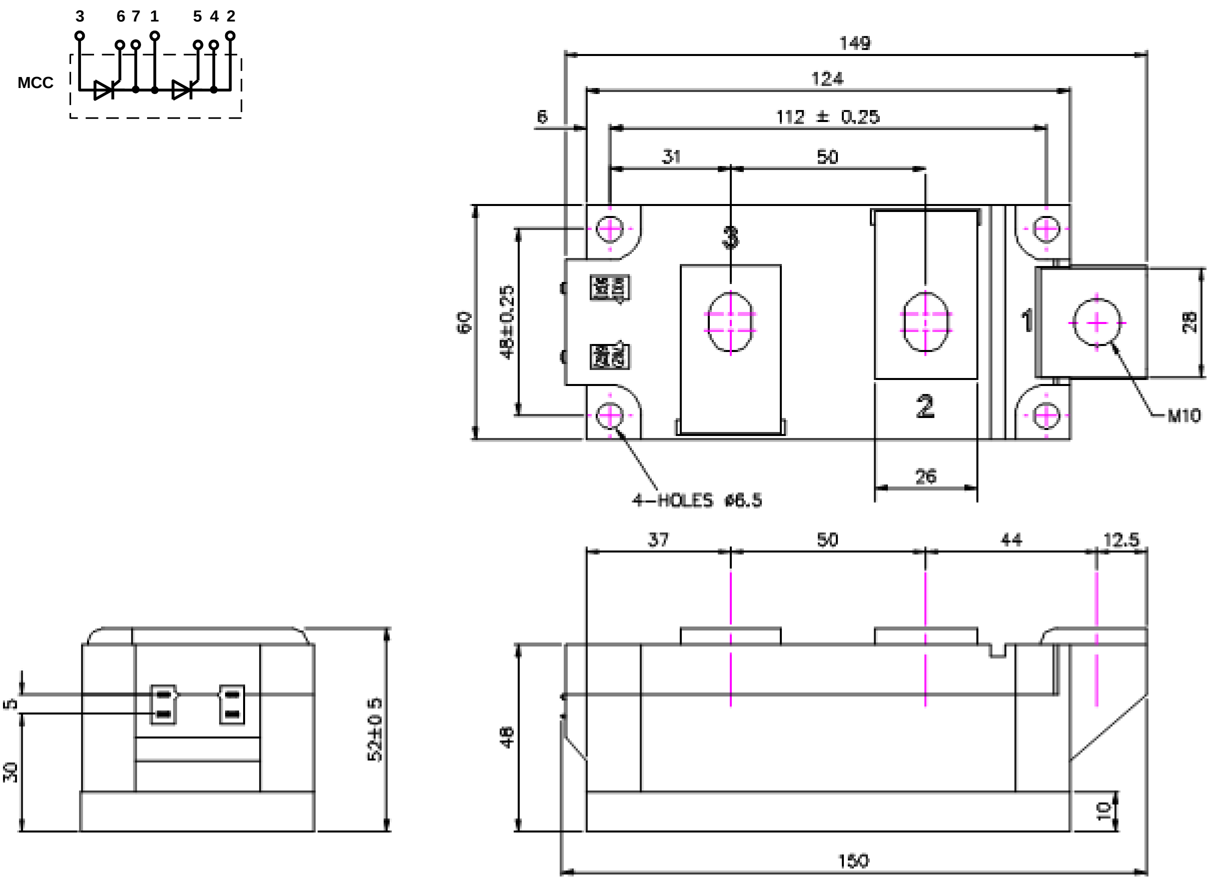


Figure 13 – Maximum surge and I^2t Ratings



Outline Drawing & Ordering Information



150A123

ORDERING INFORMATION			(Please quote 11 digit code as below)		
M	**CC**	**240**	**♦♦**	**io**	**2**
Fixed Type Code	Configuration code CC	Fixed Type Code	Voltage code V_{RRM}/100 60-65	i = Critical dv/dt 1000 V/µs o = Typical turn-off time	Fixed Version Code
Typical order code: MCC340-65io2– MCC configuration, 6500V V_{RRM}					

IXYS UK Westcode Ltd
Langley Park Way,
Langley Park,
Chippenham,
Wiltshire,
SN15 1GE.
Tel: +44 (0)1249 444524
E-mail: sales@ixysuk.com

www.littelfuse.com

www.littelfuse.com/products/power-semiconductors/high-power

IXYS Long Beach
IXYS Long Beach, Inc
2500 Mira Mar Ave,
Long Beach
CA 90815
Tel: +1 (562) 296 6584
Fax: +1 (562) 296 6585
E-mail: service@ixyslongbeach.com

The information contained herein is confidential and is protected by Copyright. The information may not be used or disclosed except with the written permission of and in the manner permitted by the proprietors IXYS UK Westcode Ltd.

In the interest of product improvement, IXYS UK Westcode Ltd reserves the right to change specifications at any time without prior notice.

Devices with a suffix code (2-letter, 3-letter or letter/digit/letter combination) added to their generic code are not necessarily subject to the conditions and limits contained in this report.

© IXYS UK Westcode Ltd.

Disclaimer Notice

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for SCR Modules ***category:***

Click to view products by IXYS ***manufacturer:***

Other Similar products are found below :

DT430N22KOF T1851N60TOH T420N12TOF T470N16TOF T901N36TOF TD140N18KOF TD162N16KOF-A TD330N16AOF T300N14TOF T3710N06TOF VT T390N16TOF T460N24TOF T590N16TOF TD180N16KOF VSKE236/16PBF T1081N60TOH TT61N08KOF TD430N22KOF TT162N08KOF T2001N34TOF T901N35TOF T1080N02TOF T360N22TOF TZ810N22KOF T420N18TOF T420N14TOF TD305N16KOF T740N26TOF T360N24TOF T430N16TOF T300N16TOF TD520N22KOF TT305N16KOF TT270N16KOF TT190N16SOF TD600N16KOF T740N22TOF T640N12TOF T470N12TOF T360N26TOF NTE5728 ETZ1100N16P70HPSA1 T430N18TOF TD700N22KOFHPSA1 T3441N52TOH T2851N48TOH TD820N16KOFHPSA1 MCD501-16IO2 MCD501-18IO2 SK 100 KQ 12