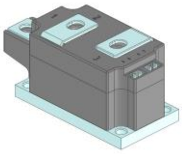
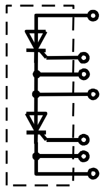
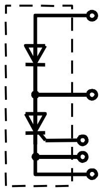
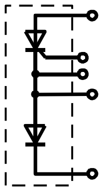


Date: 20.08.2015

Data Sheet Issue: 1

Thyristor/Diode Modules M##265

Absolute Maximum Ratings

V_{RRM} V_{DRM} [V]	 MCC	 MCD	 MDC
2400	265-24io3	265-24io3	265-24io3

	VOLTAGE RATINGS	**MAXIMUM LIMITS**	**UNITS**
V_{DRM}	Repetitive peak off-state voltage 1)	2400	V
V_{DSM}	Non-repetitive peak off-state voltage 1)	2500	V
V_{RRM}	Repetitive peak reverse voltage 1)	2400	V
V_{RSM}	Non-repetitive peak reverse voltage 1)	2500	V

	OTHER RATINGS	**MAXIMUM LIMITS**	**UNITS**
$I_{T(AV)M}$	Maximum average on-state current, $T_C = 85°C$ 2)	280	A
$I_{T(AV)M}$	Maximum average on-state current. $T_C = 100°C$ 2)	200	A
$I_{T(RMS)M}$	Nominal RMS on-state current, $T_C = 55°C$ 2)	655	A
$I_{T(d.c.)}$	D.C. on-state current, $T_C = 55°C$	540	A
I_{TSM}	Peak non-repetitive surge $t_p = 10$ ms, $V_{RM} = 60\%V_{RRM}$ 3)	6.9	kA
I_{TSM2}	Peak non-repetitive surge $t_p = 10$ ms, $V_{RM} \leq 10V$ 3)	7.6	kA
I^2t	I^2t capacity for fusing $t_p = 10$ ms, $V_{RM} = 60\%V_{RRM}$ 3)	238	kA^2s
I^2t	I^2t capacity for fusing $t_p = 10$ ms, $V_{RM} \leq 10$ V 3)	285	kA^2s
$(di/dt)_{cr}$	Critical rate of rise of on-state current (repetitive) 4)	250	A/µs
	Critical rate of rise of on-state current (non-repetitive) 4)	500	
V_{RGM}	Peak reverse gate voltage	5	V
P_{GM}	Peak forward gate power	3	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 +125	°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) $V_D = 67\%\ V_{DRM}$, $I_{FG} = 2$ A, $di_g/dt = 1A/µs$, $T_C = 125°C$.
5) AC RMS voltage, 50 Hz, 1min test

Characteristics

	PARAMETER	MIN.	TYP.	MAX.	TEST CONDITIONS [1]	UNITS
V_{TM}	Maximum peak on-state voltage	-	-	1.50	I_{TM} = 785 A, T_{VJ} = 25°C	V
V_{T0}	Threshold voltage	-	-	0.80		V
r_T	Slope resistance	-	-	0.70		mΩ
$(dv/dt)_{cr}$	Critical rate of rise of off-state voltage	-	-	1000	V_D = 80% V_{DRM}, linear ramp, Gate o/c	V/µs
I_{DRM}	Peak off-state current	-	-	40	Rated V_{DRM}	mA
I_{RRM}	Peak reverse current	-	-	40	Rated V_{RRM}	mA
V_{GT}	Gate trigger voltage	-	2.0	-	T_{vj} = 25°C, V_D = 12 V, I_T = 3 A	V
I_{GT}	Gate trigger current	-	150	-		mA
V_{GD}	Gate non-trigger voltage	-	0.25	-	67% V_{DRM}	V
I_L	Latching current	-	-	700	V_D = 12 V, T_{vj} = 25°C	mA
I_H	Holding current	-	-	300	V_D = 12 V, T_{vj} = 25°C	mA
t_{gd}	Gate controlled turn-on delay time	-	-	2.5	I_{FG} = 2 A, t_r = 500 µs, V_D = 40%V_{DRM}, I_{TM} = I_{TAV}, di/dt = 1A/µs, T_{vj} = 25°C	µs
t_q	Turn-off time	-	-	200	I_{TM} = 285A, t_p = 1 ms, di/dt = 10 A/µs, V_R = 100 V, V_{DR} = 67%V_{DRM}, dv_{DR}/dt = 50 V/µs	µs
R_{thJC}	Thermal resistance, junction to case	-	0.1100	-	Single Arm	K/W
		-	0.0550	-	Whole Module	K/W
R_{thCH}	Thermal resistance, case to heatsink	-	0.040	-	Single Arm	K/W
		-	0.020	-	Whole Module	K/W
F_1	Mounting force (to heatsink)	-	6.00	-		Nm
F_2	Mounting force (to terminals)	-	9.00	-	[2]	Nm
W_t	Weight	-	800	-		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_{RRM} V	V_{DSM} V_{RSM} V	V_D V_R DC V
24	2400	2500	1450

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

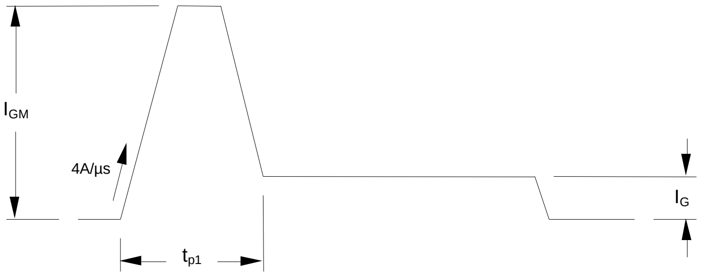
When selecting snubber components, care must be taken not to use excessively large values of snubber capacitor or excessively small values of snubber resistor. Such excessive component values may lead to device damage due to the large resultant values of snubber discharge current. If required, please 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 $V_{T0} = 0.8$ V, $r_T = 0.7$ 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	3.46	2.45	2	1.73	1.41	1.15	1
Sine wave	3.98	2.78	2.22	1.88	1.57		

Form Factors							
Conduction Angle	30°	60°	90°	120°	180°	270°	d.c.
Square wave	3.464	2.449	2	1.732	1.414	1.149	1
Sine wave	3.98	2.778	2.22	1.879	1.57		

8.2 D.C. Thermal Impedance Calculation

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

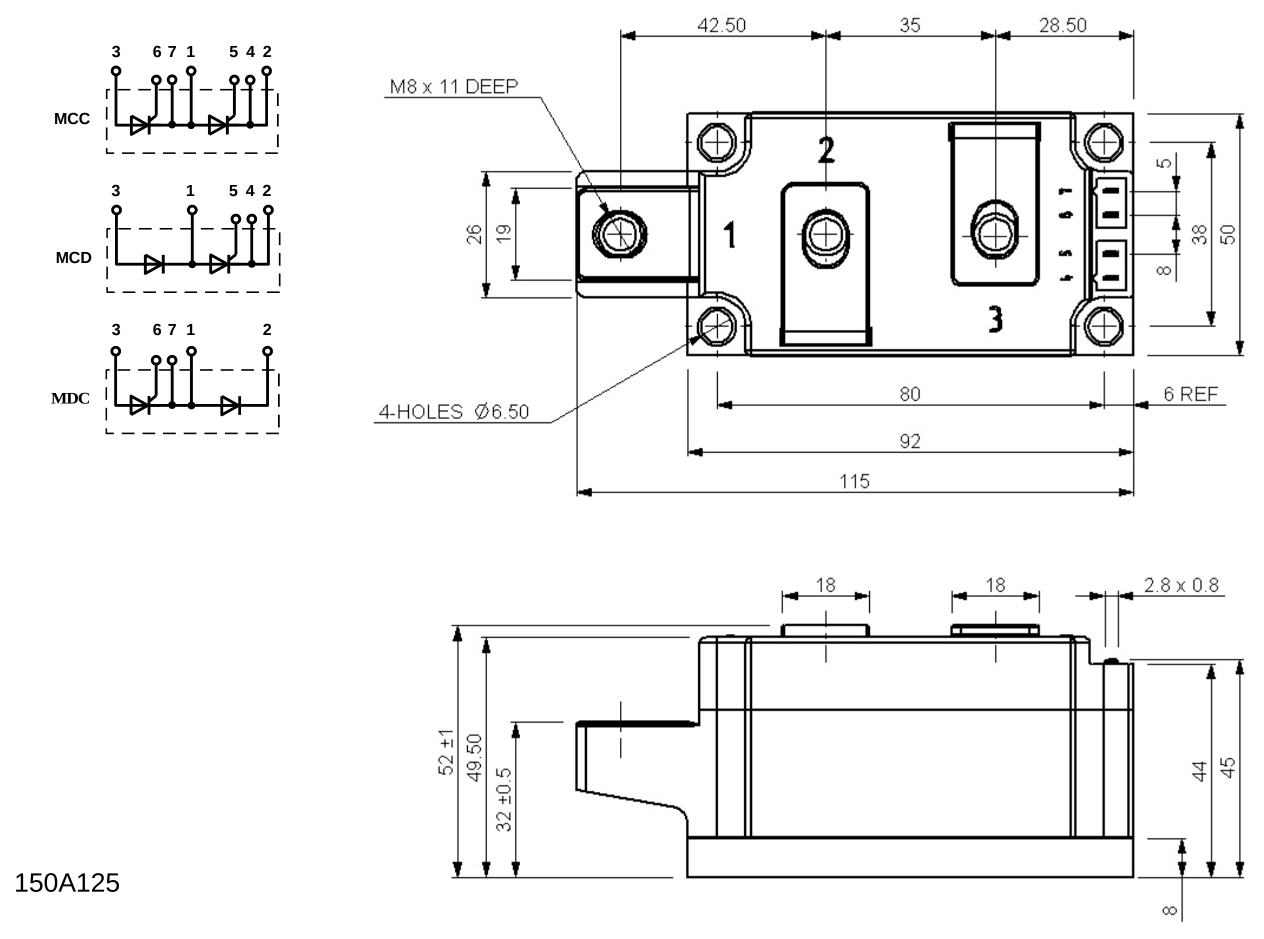
Where $p = 1$ to n *and:*

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	0.1293	0.01314	0.02771	-0.05535	0.0528	0.002749
τ_p	2.823	1.393	0.3322	0.0611	0.05731	0.002713

Outline Drawing & Ordering Information



ORDERING INFORMATION (Please quote 11 digit code as below)

M	##	265	♦♦	io	3
Fixed Type Code	Configuration code CC, CD or DC	Fixed Type Code	Voltage code V_{RRM}/100 24	i = Critical dv/dt 1000 V/µs o = Typical turn-off time	Fixed Version Code

Typical order code: MCD265-28io2– MCD configuration, 2400V V_{RRM}

IXYS Semiconductor GmbH
Edisonstraße 15
D-68623 Lampertheim
Tel: +49 6206 503-0
Fax: +49 6206 503-627
E-mail: marcom@ixys.de

IXYS UK Westcode Ltd
Langley Park Way, Langley Park,
Chippenham, Wiltshire, SN15 1GE.
Tel: +44 (0)1249 444524
Fax: +44 (0)1249 659448
E-mail: sales@ixysuk.com

IXYS Corporation
1590 Buckeye Drive
Milpitas CA 95035-7418
Tel: +1 (408) 547 9000
Fax: +1 (408) 496 0670
E-mail: sales@ixys.net

www.ixysuk.com

www.ixys.com

IXYS Long Beach, Inc
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

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.