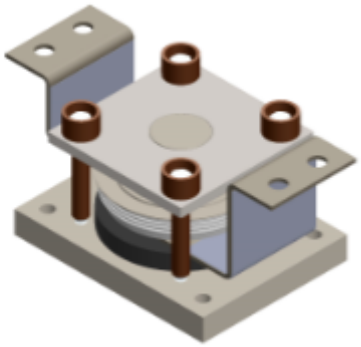
IXYS UK WESTCODE



Date: 5th Sept, 2017

Data Sheet Issue: A1

Rectifier Diode Module
Types W9830TJ120MBR & W9830TJ150MBR

Absolute Maximum Ratings

V_{RRM} [V]	Types
1200	W9830TJ120MBR
1500	W9830TJ150MBR

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V_{RRM}	Repetitive peak reverse voltage [1]	1200-1500	V
V_{RSM}	Non-repetitive peak reverse voltage [1]	1300-1600	V

	OTHER RATINGS	MAXIMUM LIMITS	UNITS
$I_{F(AV)M}$	Maximum average forward current, T_c=55°C [2]	4020	A
$I_{F(AV)M}$	Maximum average forward current, T_c=100°C [2]	2980	A
$I_{F(AV)M}$	Maximum average forward current. T_c=85°C [2]	3345	A
$I_{F(RMS)M}$	Nominal RMS forward current, T_c=25°C [2]	7280	A
$I_{T(d.c.)}$	D.C. forward current, T_c=25°C	5850	A
I_{FSM}	Peak non-repetitive surge t_p=10ms, V_{rm}=60%V_{RRM} [3]	72	kA
I_{FSM2}	Peak non-repetitive surge t_p=10ms, V_{rm}≤10V [3]	80	kA
I^2t	I^2t capacity for fusing t_p=10ms, V_{rm}=60%V_{RRM} [3]	25.9×10^6	A^2s
I^2t	I^2t capacity for fusing t_p=10ms, V_{rm}≤10V [3]	32×10^6	A^2s
V_{ISOL}	Isolation Voltage [4]	3000	V
$T_{vj\ op}$	Operating temperature range	-40 to +190	°C
T_{stg}	Storage temperature range	-55 to +190	°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, 190°C T_{vj} initial.
4) AC RMS voltage, 50 Hz, 1min test

Characteristics

	PARAMETER	MIN.	TYP.	MAX.	TEST CONDITIONS [1]	UNITS
V_{FM}	Maximum peak forward voltage	-	-	0.95	I_{FM}=6800A	V
V_{FM}	Maximum peak forward voltage	-	-	1.24	I_{FM}=17000A	V
V_{T0}	Threshold voltage	-	-	0.67	Valid from 2000A to 6000A	V
r_T	Slope resistance	-	-	0.043		mΩ
I_{RRM}	Peak reverse current	-	-	100	Rated V_{RRM}	mA
Q_{rr}	Recovered charge	-	3700	4250	I_{TM}=2000A, t_p=2000µs, di/dt=10A/µs, V_r=100V	µC
Q_{ra}	Recovered charge, 50% Chord	-	3000	-		µC
I_{rm}	Reverse recovery current	-	200	-		A
t_{rr}	Reverse recovery time, 50% chord	-	30	-		µs
R_{thJC}	Thermal resistance, junction to case	-	-	0.0306		K/W
R_{thCK}	Thermal resistance, case to heatsink	-	-	0.0035		K/W
F_1	Mounting torque (to heatsink)[2]	16	-	23		Nm
F_2	Mounting torque (to terminals)[3]	15	-	20		Nm
W_t	Weight	-	8.14	-		kg

Notes:

1) Unless otherwise indicated T_{vj}=190°C.
2) Heatsink use M10.
3) Terminals use M12.

Notes on Ratings and Characteristics

1.0 Voltage Grade Table

Voltage Grade	V_{RRM} V	V_{RSM} V	V_R DC V
12	1200	1300	720
15	1500	1600	900

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 Computer Modelling Parameters

6.1 Diode 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} = 0.67V, r_T = 0.043mΩ.

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

ff = Form factor, see table below.

Supplementary Thermal Impedance				
Conduction Angle	6 phase (60°)	3 phase (120°)	½ wave (180°)	d.c.
Square wave	0.030619	0.030616	0.030614	0.0306
Sine wave	0.030617	0.030615	0.030611	

Form Factors				
Conduction Angle	6 phase (60°)	3 phase (120°)	½ wave (180°)	d.c.
Square wave	2.449	1.732	1.414	1
Sine wave	2.778	1.879	1.57	

6.2 Calculating diode V_F using ABCD coefficients – For loss calculations

The forward characteristic, I_F vs. V_F, is represented in two ways;
(i) the well established V_{T0} and r_T tangent used for rating purposes and
(ii) a set of constants A, B, C, D, forming the coefficients of the equation for V_F in terms of I_T given below:

$$V_F = A + B \cdot \ln(I_F) + C \cdot I_F + D \cdot \sqrt{I_F}$$

The ABCD constants are given below for both hot and cold characteristics. The resulting values for V_F agree with the true device characteristic over a current range, which is limited to that plotted.

25°C Coefficients		190°C Coefficients	
A	0.798634	A	0.2669197
B	2.80249×10^{-4}	B	0.05121623
C	-4.07743×10^{-6}	C	1.71352×10^{-5}
D	4.359019×10^{-3}	D	1.404316×10^{-3}

6.3 D.C. Thermal Impedance Calculation

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

n= number of terms in the series and
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 tables below:

D.C. Junction to Case			
Term	1	2	3
r_p	0.01981779	0.009602212	0.001187377
τ_p	128.6835	15.59559	1.860866

Curves

Figure 1 – Forward Characteristics of Limit Device

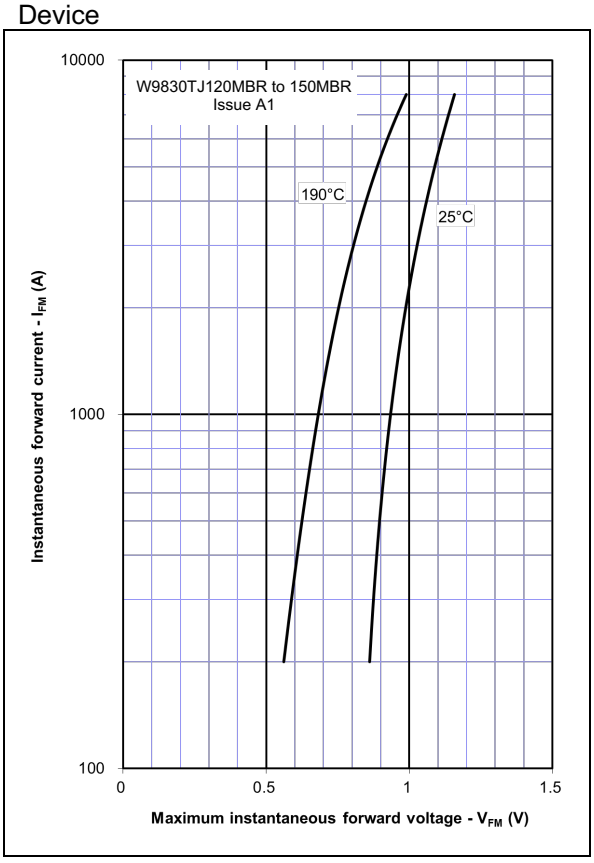


Figure 2 – Transient Thermal Impedance

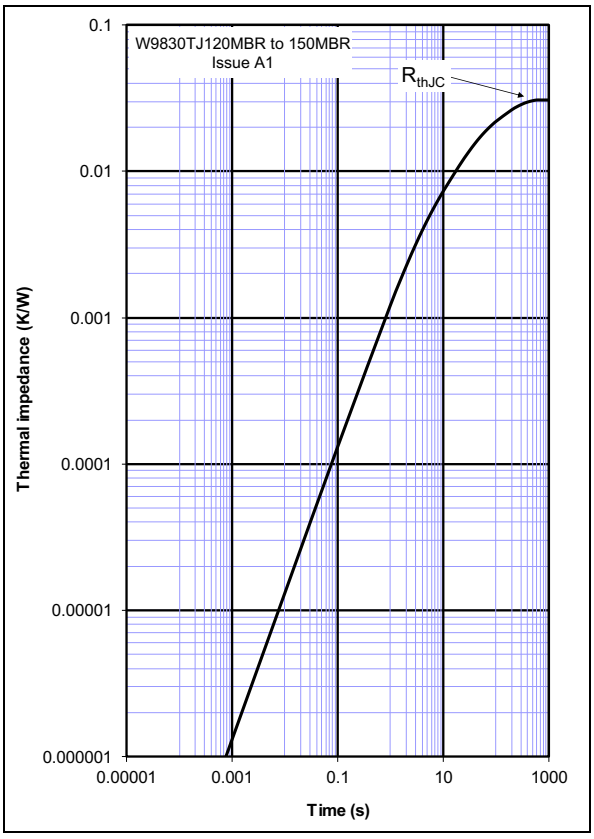


Figure 3 – Forward current vs. Power dissipation

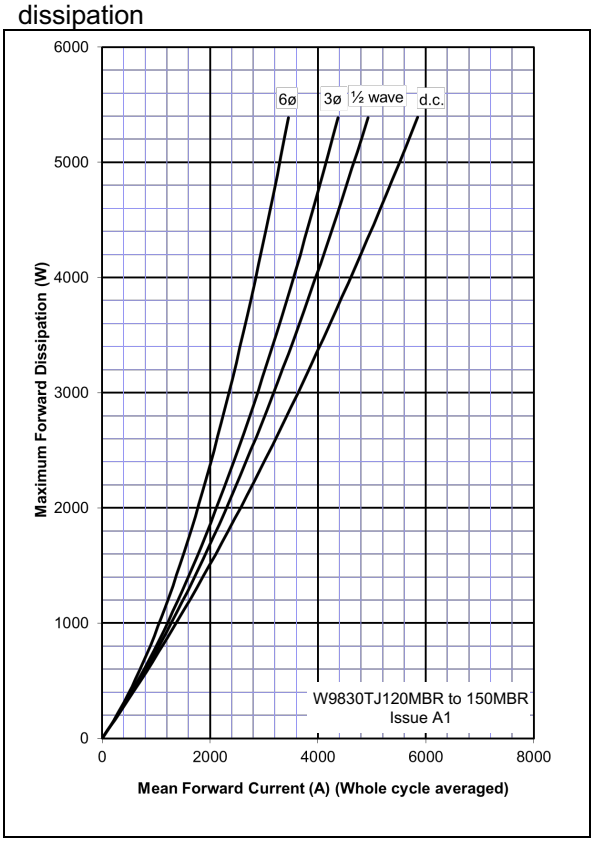


Figure 4 – Forward current vs. Heatsink temperature

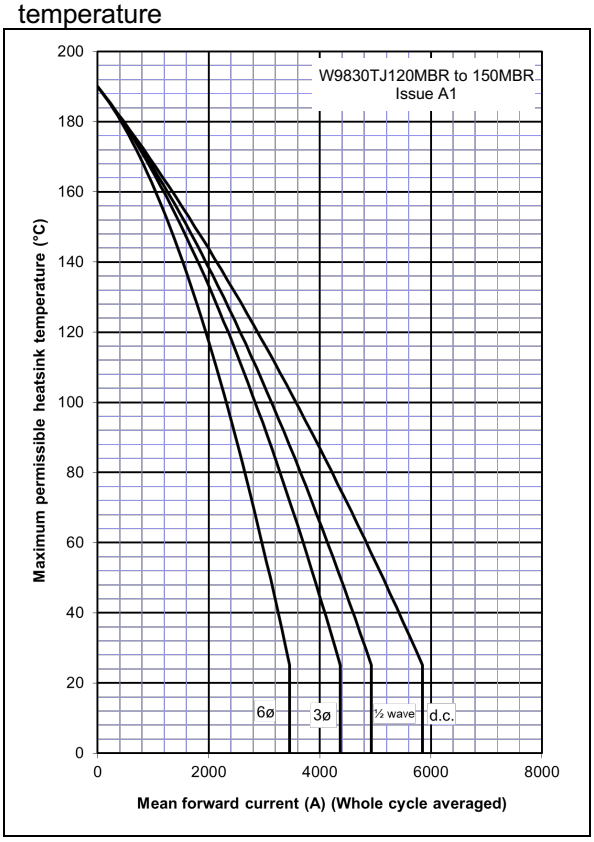


Figure 5 – Total recovered charge, Q_{rr}

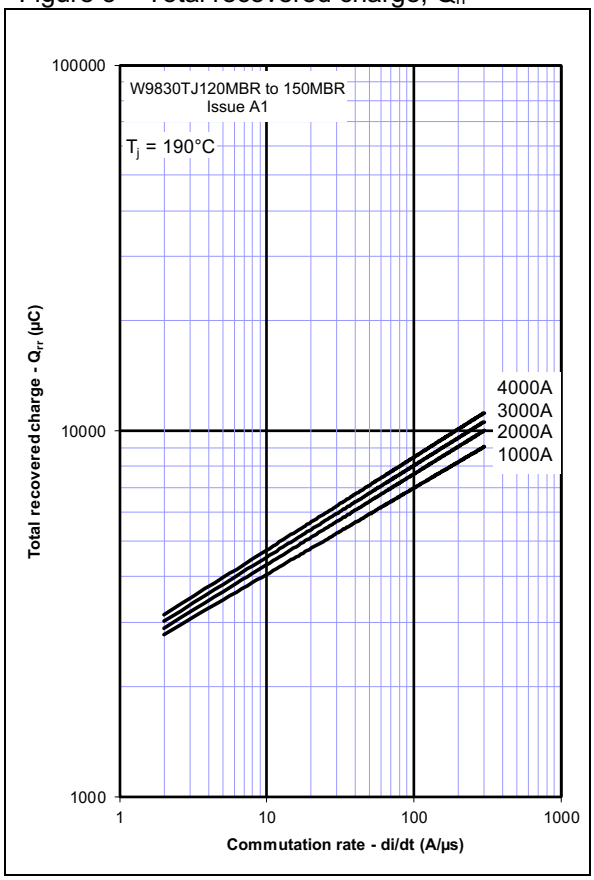


Figure 6 – Recovered charge, Q_{ra} (50% chord)

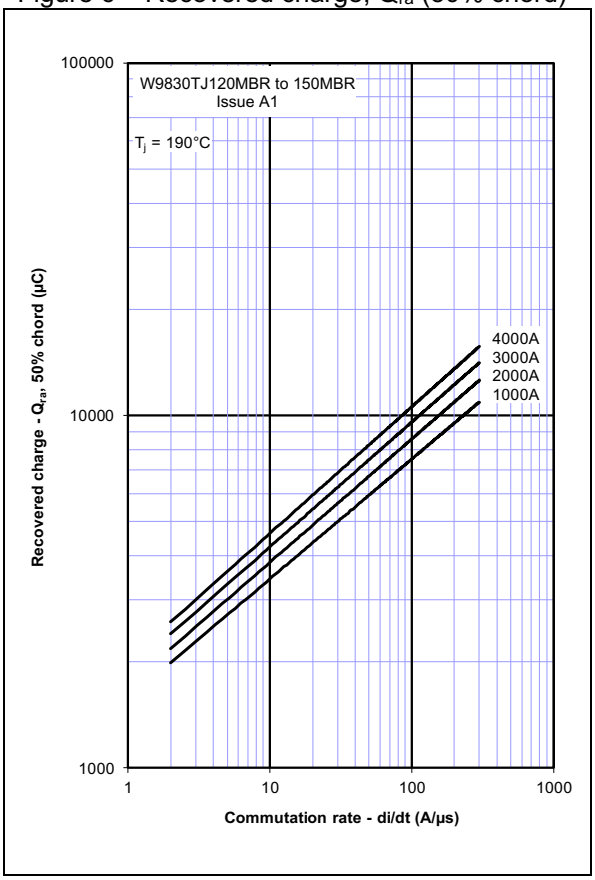


Figure 7 – Peak reverse recovery current, I_{rm}

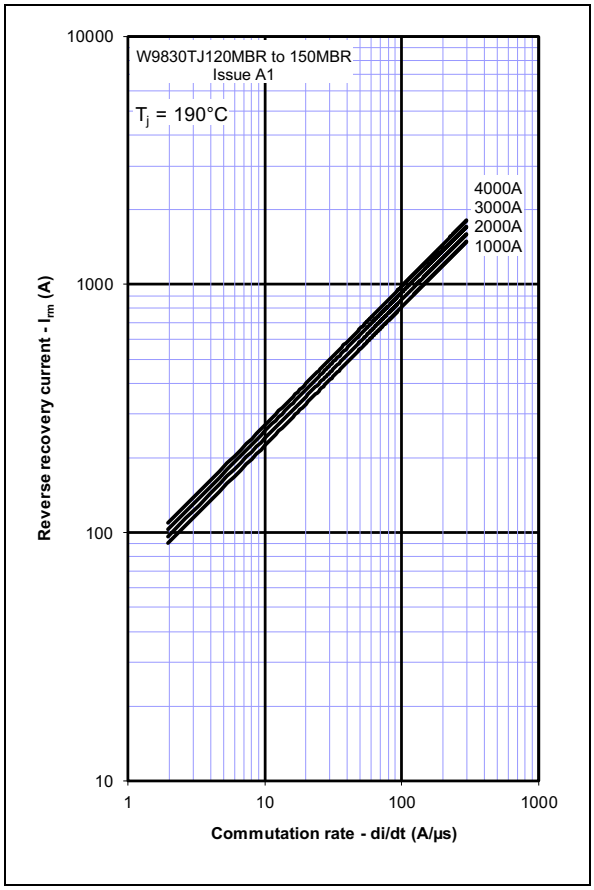


Figure 8 – Maximum recovery time, t_{rr} (50% chord)

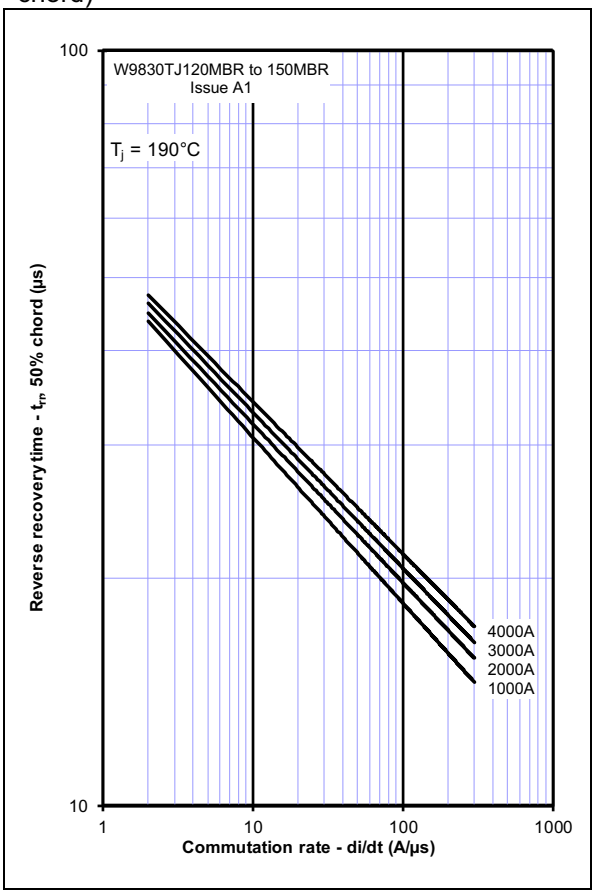
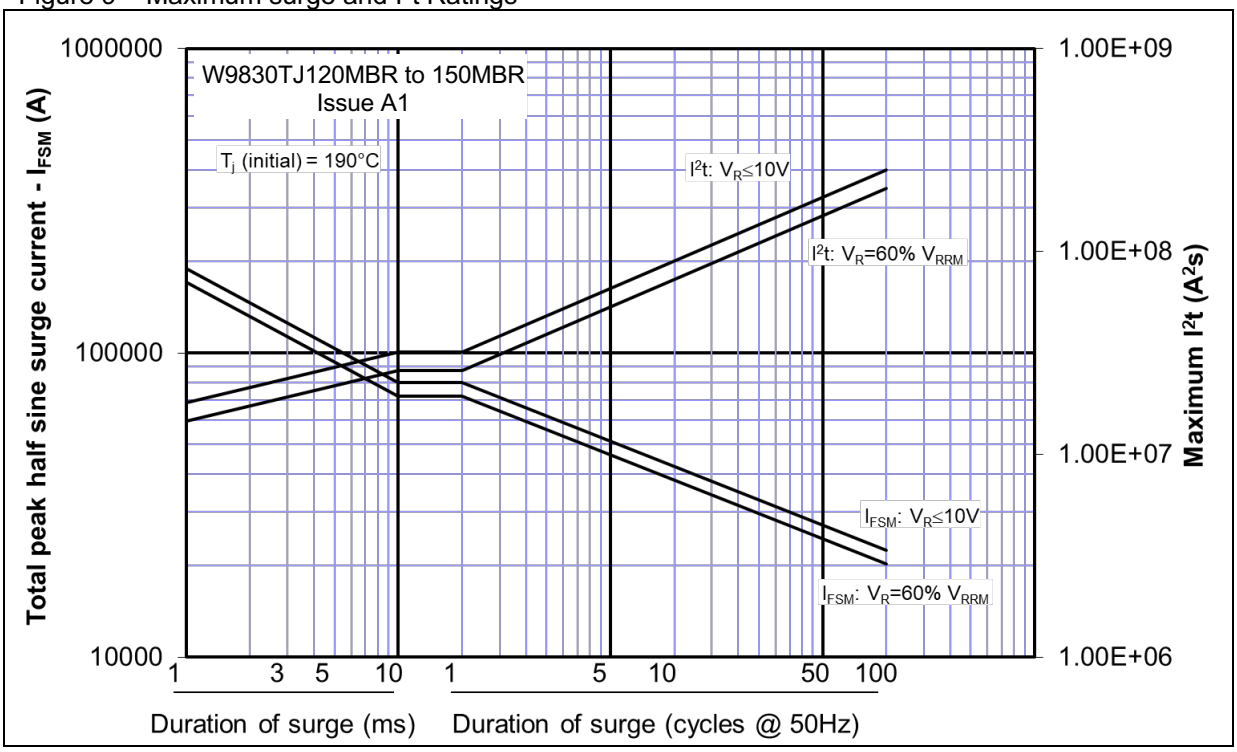
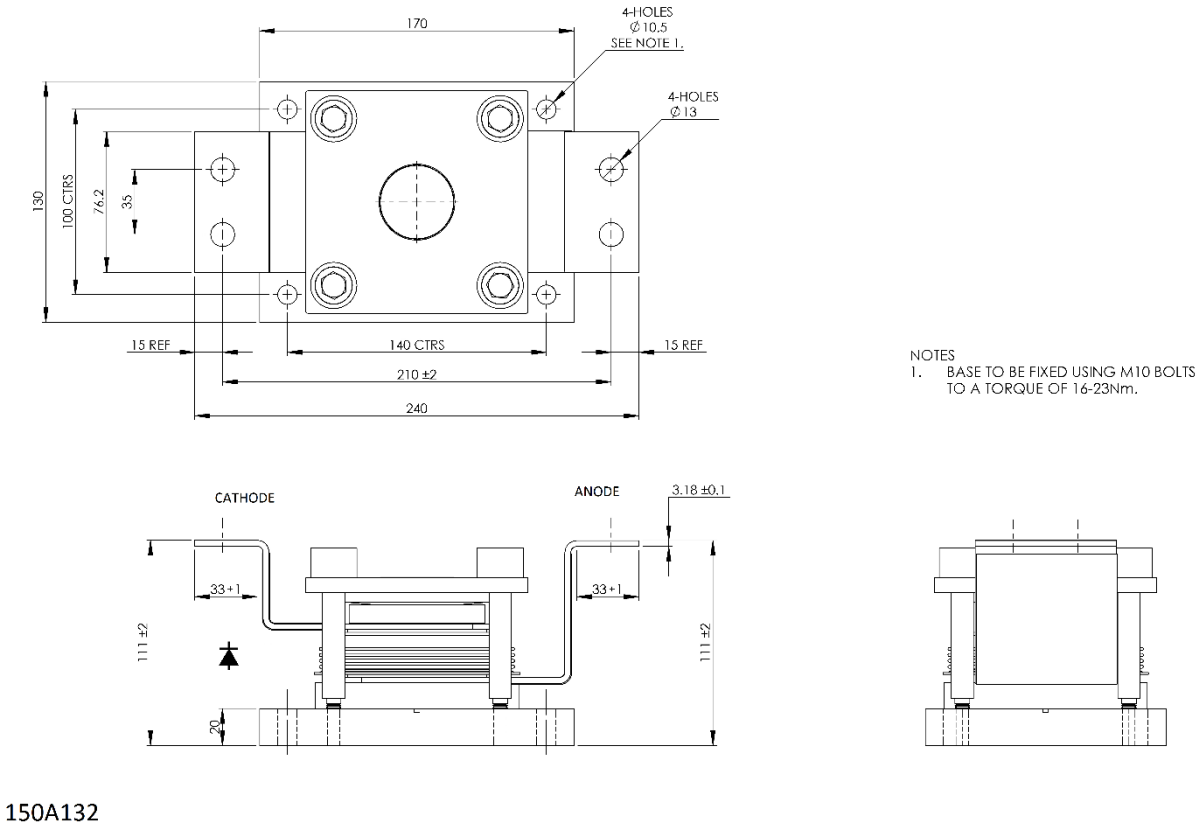


Figure 9 – Maximum surge and I^2t Ratings



Outline Drawing & Ordering Information



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ORDERING INFORMATION (Please quote 13 digit code as below)				
W9830	**TJ**	**12-15**	**0**	**MBR**
Fixed Type Code	Fixed Configuration code	Voltage code V_{RRM} x 100	Fixed code	Fixed Version Code
Typical order code: W9830TJ150MBR, 1500V V_{RRM} Rectifier Diode Module				

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