

Date: - 7th January, 2014

Data Sheet Issue:- 1

Rectifier Diode Types W3743Z#400 to W3743Z#500

Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V_{RRM}	Repetitive peak reverse voltage, (note 1)	4000-5000	V
V_{RSM}	Non-repetitive peak reverse voltage, (note 1)	4100-5100	V

	OTHER RATINGS	MAXIMUM LIMITS	UNITS
I _{F(AV)M}	Maximum average forward current, T _{sink} =55°C, (note 2)	3750	Α
I _{F(AV)M}	Maximum average forward current. T _{sink} =100°C, (note 2)	2625	Α
I _{F(AV)M}	Maximum average forward current. T _{sink} =100°C, (note 3)	1640	Α
I _{F(RMS)M}	Nominal RMS forward current, T _{sink} =25°C, (note 2)	6860	Α
I _{F(d.c.)}	D.C. forward current, T _{sink} =25°C, (note 4)	6100	Α
I _{FSM}	Peak non-repetitive surge t _p =10ms, V _m =60%V _{RRM} , (note 5)	35	kA
I _{FSM2}	Peak non-repetitive surge t _p =10ms, V _m ≤10V, (note 5)	39	kA
I ² t	I ² t capacity for fusing t _p =10ms, V _m =60%V _{RRM} , (note 5)	6.13×10^6	A^2s
I ² t	I²t capacity for fusing t _p =10ms, V _{rm} ≤10V, (note 5)	7.61 x 10 ⁶	A^2s
T _{j op}	Operating temperature range	-55 to +160	°C
T _{stg}	Storage temperature range	-55 to +160	°C

Notes:-

- 1) De-rating factor of 0.13% per °C is applicable for T_i below 25°C.
- 2) Double side cooled, single phase; 50Hz, 180° half-sinewave.
- 3) Single side cooled, single phase; 50Hz, 180° half-sinewave.
- 4) Double side cooled.
- 5) Half-sinewave, 160°C T_j initial.



Characteristics

	PARAMETER	MIN.	TYP.	MAX.	TEST CONDITIONS (Note 1)	UNITS
V_{FM}	Maximum peak forward voltage	-	-	2.00	I _{FM} =6000A	V
V_{FM}	Maximum peak forward voltage	-	-	2.90	I _{FM} =11250A	V
V _{T0}	Threshold voltage	-	-	0.976	V-1:-1 f	V
r _T	Slope resistance	_	-	0.170	Valid from 5000A to 15000A	mΩ
I _{RRM}	Peak reverse current	-	-	200	Rated V _{RRM}	mA
Q_{rr}	Recovered charge	-	12000	13000		μC
Q_{ra}	Recovered charge, 50% Chord	_	7150	-	 I _{TM} =2000A, t _p =1000μs, di/dt=10A/μs,	μC
I _{rm}	Reverse recovery current	_	263	-	V _r =100V	Α
t _{rr}	Reverse recovery time, 50% chord	-	55	-		μs
0	The survey was in the state of	-	-	0.011	Double side cooled	K/W
R_{thJK}	Thermal resistance, junction to heatsink	_	-	0.022	Single side cooled	K/W
F	Mounting force	27	-	47	Note 2	kN
١٨/	W-:-L4	-	1.7	-	Outline option ZC, ZT and ZY	17.
W _t	Weight	-	1.2	-	Outline Option ZD and ZV	Kg

Notes:-

- 1) Unless otherwise indicated $T_j=160$ °C.
- 2) For other clamp forces, please consult factory.

Notes on rupture rated packages.

This product is available with a non-rupture rated package.
For additional details on these products, please consult factory.



Notes on Ratings and Characteristics

1.0 Voltage Grade Table

Voltage Grade	V _{RRM} V	V _{RSM} V	V _R DC V
40	4000	4100	2400
45	4500	4600	2700
50	5000	5100	3000

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_j below 25°C.

4.0 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.

5.0 Computer Modelling Parameters

5.1 Device Dissipation Calculations

$$I_{AV} = \frac{-V_{T0} + \sqrt{{V_{T0}}^2 + 4 \cdot f\!f^2 \cdot r_T \cdot W_{AV}}}{2 \cdot f\!f^2 \cdot r_T} \qquad \qquad W_{AV} = \frac{\Delta T}{R_{th}}$$
 and:
$$\Delta T = T_{j\,\text{max}} - T_K$$

Where $V_{T0}=0.976V$, $r_{T}=0.17m\Omega$,

 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 Double Side Cooled	0.0144	0.0132	0.0126	0.0116		
Square wave Cathode Side Cooled	0.0262	0.0251	0.0244	0.0235		
Sine wave Double Side Cooled	0.0133	0.0124	0.0115			
Sine wave Cathode Side Cooled	0.0253	0.0244	0.0234			

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		



5.2 Calculating V_F using ABCD Coefficients

The on-state characteristic I_F vs. V_F, on page 6 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 representative equation for V_F in terms of I_F given below:

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

The constants, derived by curve fitting software, 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		160°C Coefficients	
Α	0.686301	Α	0.217584	
В	0.0361394	В	0.084283	
С	8.485046 x 10 ⁻⁵	С	1.511744 x 10 ⁻⁴	
D	3.117855 x 10 ⁻³	D	1.851405 x 10 ⁻³	



5.3 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, n is the 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.

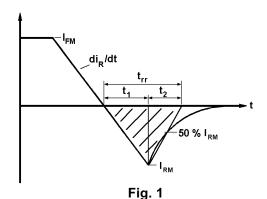
The coefficients for this device are shown in the tables below:

D.C. Double Side Cooled						
Term	Term 1 2 3 4					
r p	0.01551	2.7827×10 ⁻³	4.2105×10 ⁻³	0.9443×10 ⁻³		
$ au_{\!P}$	10.04275	1.783567	0.2231307	3.428×10 ⁻³		

D.C. Double Side Cooled						
Term	1	2	3	4	5	
rp	6.4176×10 ⁻³	2.7472×10 ⁻³	1.2515×10 ⁻³	0.6336×10 ⁻³	0.59597×10 ⁻³	
$ au_{\mathcal{P}}$	1.785337	0.34595	0.099651	0.014214	2.298151×10 ⁻³	

6.0 Reverse recovery ratings

(i) Qra is based on 50% Irm chord as shown in Fig. 1



(ii) Q_{rr} is based on a 150μs integration time i.e.

$$Q_{rr} = \int_{0}^{150 \, \mu s} i_{rr}.dt$$

(iii)
$$K Factor = \frac{t_1}{t_2}$$



Curves

Figure 1 – Forward characteristics of Limit device

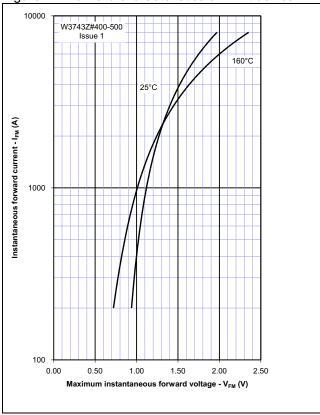


Figure 2 – Transient thermal impedance

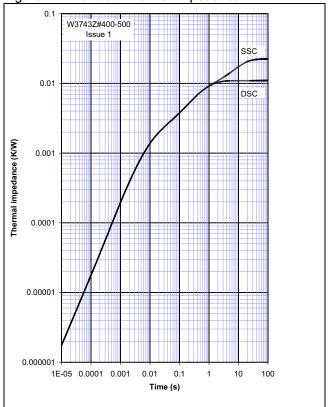
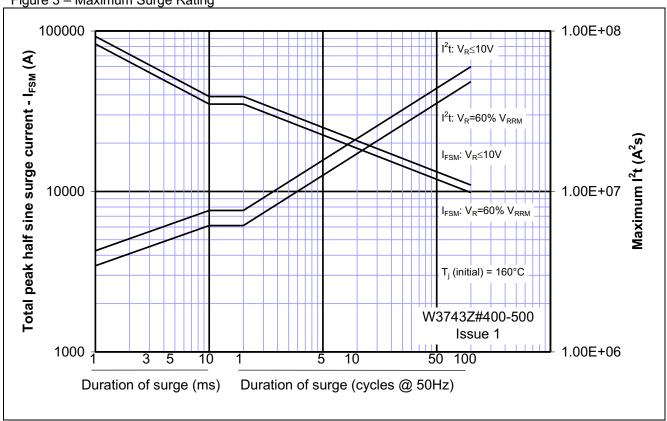
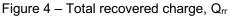


Figure 3 - Maximum Surge Rating







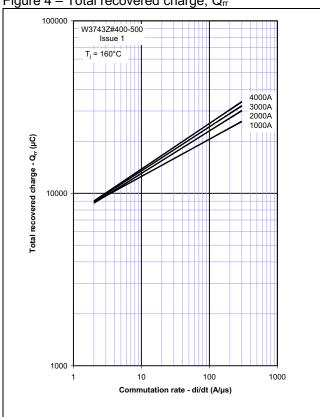
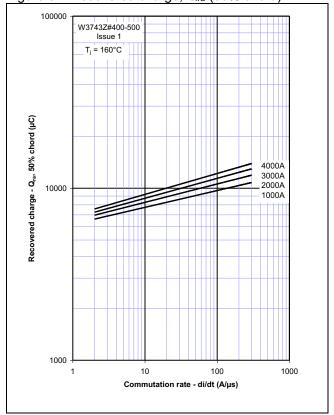


Figure 5 - Recovered charge, Q_{ra} (50% chord)



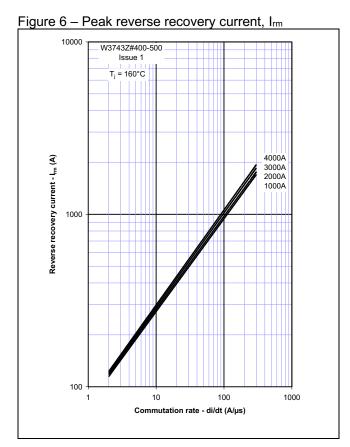


Figure 7 – Maximum recovery time, t_{rr} (50% chord)

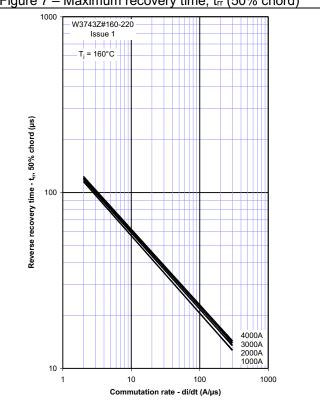




Figure 8 – Forward current vs. Power dissipation – Double Side Cooled

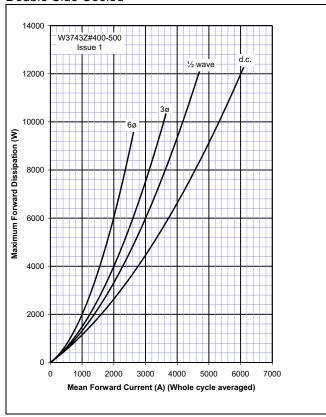


Figure 10 – Forward current vs. Power dissipation – Cathode Side Cooled

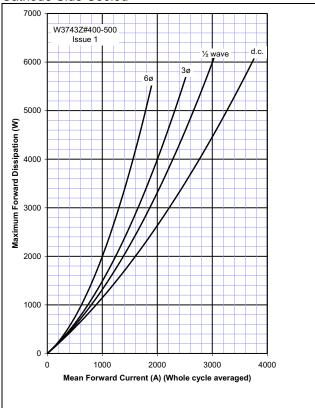


Figure 9 – Forward current vs. Heatsink temperature – Double Side Cooled

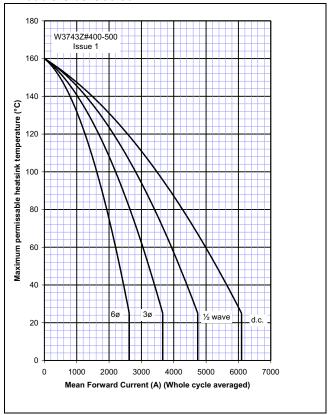
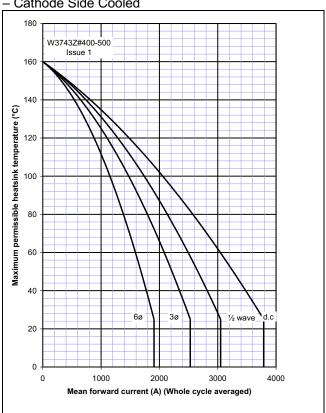
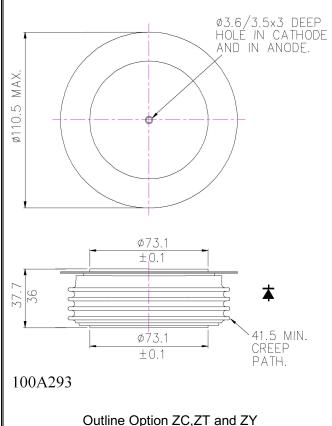


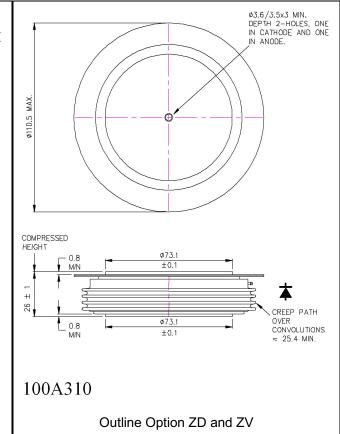
Figure 11 – Forward current vs. Heatsink temperature – Cathode Side Cooled





Outline Drawing & Ordering Information





ORDERING INFORMATION (Please quote 10 digit code as below)				
W3743	Z#	**	0	
Fixed Type Code	Fixed outline code ZC = 37.7mm Clamp height, ZT = 37.7mm rupture rated capsule, ZY = 37.7mm extended rupture rated capsule ZD = 26mm Clamp height, ZV = 26mm rupture rated capsule	Voltage code V _{RRM} /100 40-50	Fixed code	

Order code: W3743ZD440 - 4400V V_{RRM}, 26mm clamp height capsule.

IXYS Semiconductor GmbH

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



www.ixysuk.com

www.ixys.com

Fax: +44 (0)1249 659448 E-mail: sales@ixysuk.com

IXYS Long Beach

IXYS UK Westcode Ltd

Tel: +44 (0)1249 444524

IXYS Long Beach, Inc 2500 Mira Mar Ave, Long Beach CA 90815

Langley Park Way, Langley Park,

Chippenham, Wiltshire, SN15 1GE.

Tel: +1 (562) 296 6584 Fax: +1 (562) 296 6585

E-mail: service@ixyslongbeach.com

IXYS Corporation 1590 Buckeye Drive

Milpitas CA 95035-7418 Tel: +1 (408) 457 9000 Fax: +1 (408) 496 0670 E-mail: sales@ixys.net

The information contained herein is confidential and is protected by Copyright. The information may not be used or disclosed

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

except with the written permission of and in the manner permitted by the proprietors IXYS UK Westcode Ltd.

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.

