WESTCODE

An IXYS Company

Date:- 14 July, 2008

Data Sheet Issue:- 3

Rectifier Diode

Type W5092Z#240 to W5092Z#350

Old Type No.: SW24-34C/DXC18C

Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V_{RRM}	Repetitive peak reverse voltage, (note 1)	2400-3500	V
V_{RSM}	Non-repetitive peak reverse voltage, (note 1)	2500-3600	V

	OTHER RATINGS	MAXIMUM LIMITS	UNITS
$I_{F(AV)M}$	Maximum average forward current, T_{sink}=55°C, (note 2)	5092	A
$I_{F(AV)M}$	Maximum average forward current. T_{sink}=100°C, (note 2)	3494	A
$I_{F(AV)M}$	Maximum average forward current. T_{sink}=100°C, (note 3)	2114	A
$I_{F(RMS)M}$	Nominal RMS forward current, T_{sink}=25°C, (note 2)	9405	A
$I_{F(d.c.)}$	D.C. forward current, T_{sink}=25°C, (note 4)	6765	A
I_{FSM}	Peak non-repetitive surge t_p=10ms, V_{rm}=0.6V_{RRM}, (note 5)	58.0	kA
I_{FSM2}	Peak non-repetitive surge t_p=10ms, V_{rm}≤10V, (note 5)	63.8	kA
I^2t	I^2t capacity for fusing t_p=10ms, V_{rm}=0.6V_{RRM}, (note 5)	16.8×10^6	A^2s
I^2t	I^2t capacity for fusing t_p=10ms, V_{rm}≤10V, (note 5)	20.4×10^6	A^2s
$T_{j\,op}$	Operating temperature range	-40 to +160	°C
T_{stg}	Storage temperature range	-40 to +160	°C

Notes:-

1) De-rating factor of 0.13% per °C is applicable for T_j 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	- -	- -	1.35 1.97	I_{TM}=6000A I_{TM}=15300A	V
V_{T0}	Threshold voltage	-	-	0.874		V
r_T	Slope resistance	-	-	0.0794		mΩ
I_{RRM}	Peak reverse current	- -	- -	150 150	Rated V_{RRM} Rated V_{RRM}, T_j=25°C	mA
R_{thJK}	Thermal resistance, junction to heatsink	- -	- -	0.011 0.022	Double side cooled Single side cooled	K/W
F	Mounting force	27	-	47		kN
W_t	Weight	- -	1.7 1.2	- -	Outline Option ZC Outline Option ZD	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
24	2400	2500	1400
26	2600	2700	1500
28	2800	2900	1600
30	3000	3100	1700
32	3200	3300	1800
34	3400	3500	1850
35	3500	3600	1875

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

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

and:

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

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

Where V_0=0.874V, r_s=0.0794mΩ,

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 Single Side Cooled	0.0262	0.0251	0.0244	0.0235
Sine wave Double Side Cooled	0.0133	0.0124	0.0115	
Sine wave Single 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 5 is represented in two ways;
(i) the well established V_0 and r_s 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
A	0.684623965	0.629239958
B	0.0319482014	-0.0126850173
C	5.6692×10^{-5}	2.6094×10^{-5}
D	8.51058904×10^{-4}	8.70839708×10^{-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. Single Side Cooled				
Term	1	2	3	4
r_p	0.01551	2.7827×10^{-3}	4.2105×10^{-3}	0.9443×10^{-3}
τ_p	10.04275	1.783567	0.2231307	3.428×10^{-3}

D.C. Double Side Cooled					
Term	1	2	3	4	5
r_p	6.4176×10^{-3}	2.7472×10^{-3}	1.2515×10^{-3}	0.6336×10^{-3}	0.59597×10^{-3}
τ_p	1.785337	0.34595	0.099651	0.014214	2.298151×10^{-3}

Curves

Figure 1 – Forward characteristics of Limit device

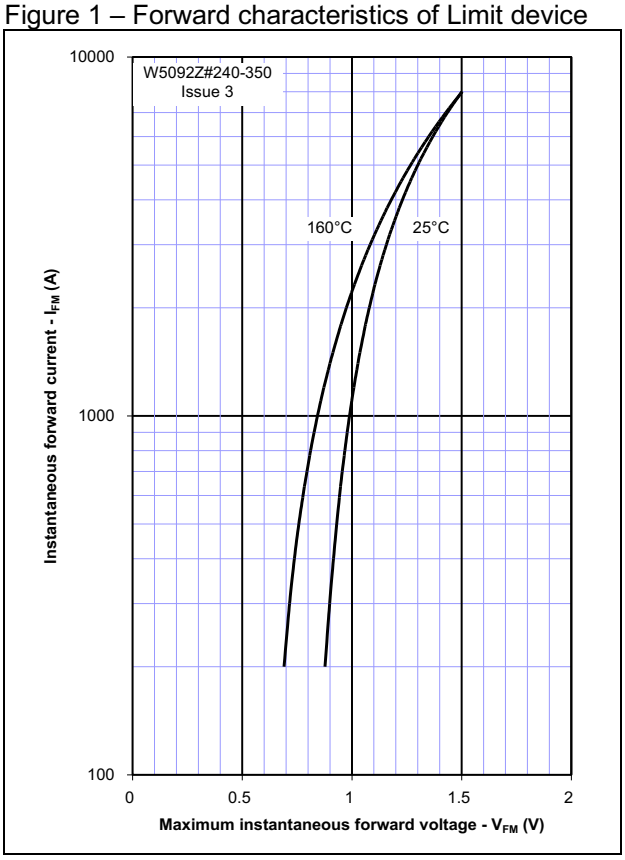


Figure 2 – Transient thermal impedance

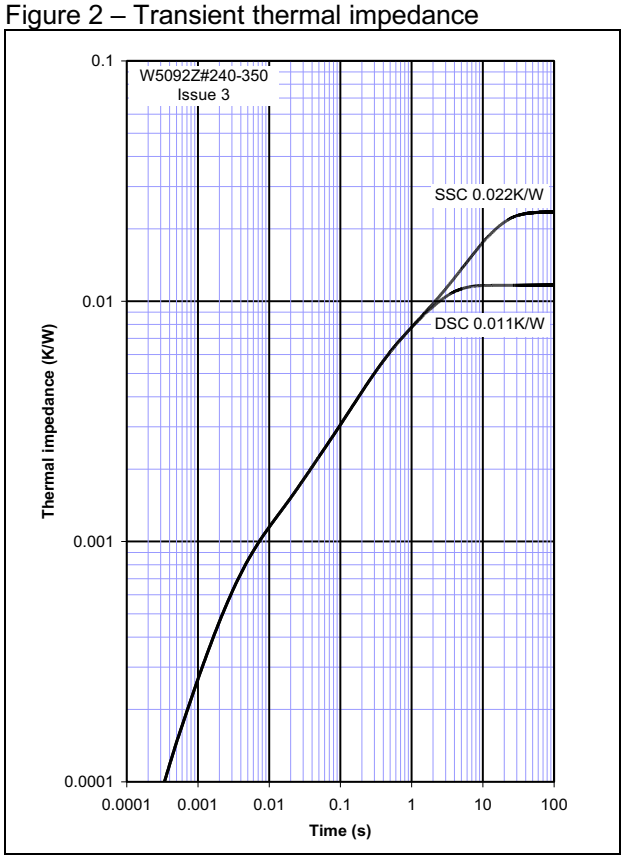


Figure 3 – Maximum surge Rating

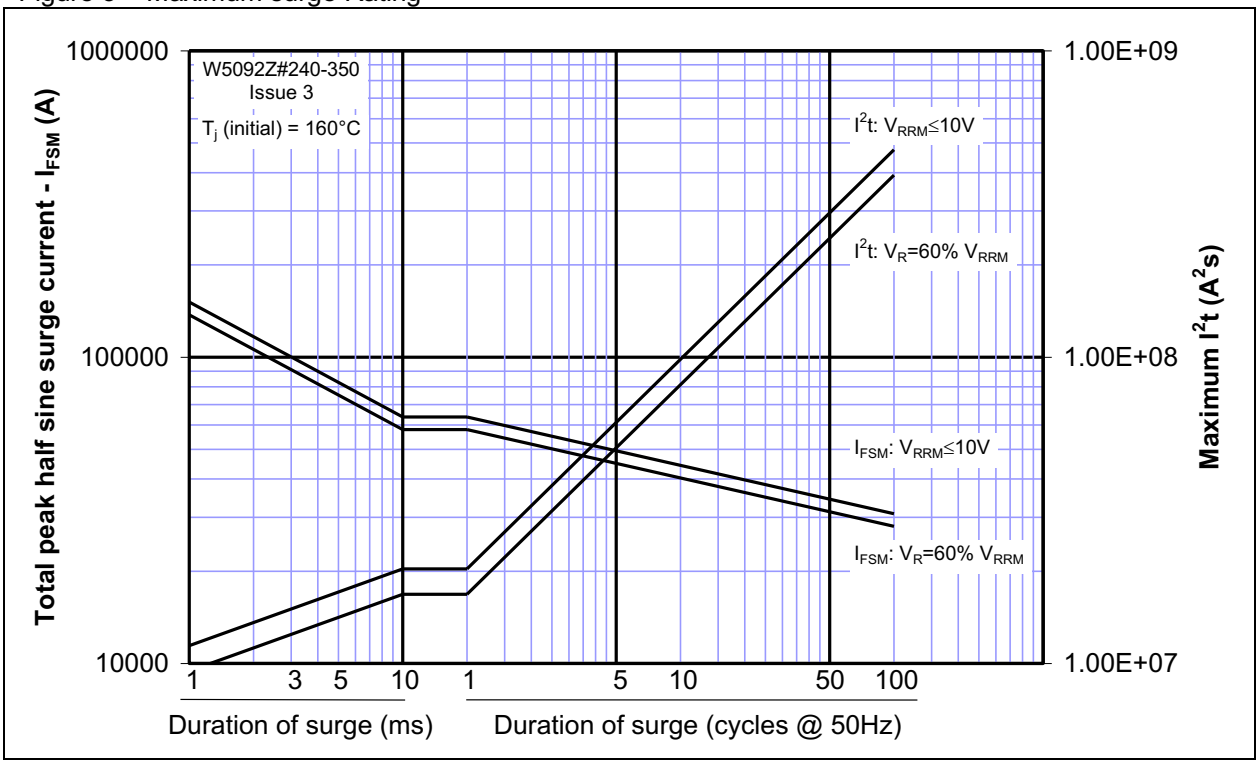


Figure 4 – Forward current vs. Power dissipation – Double Side Cooled

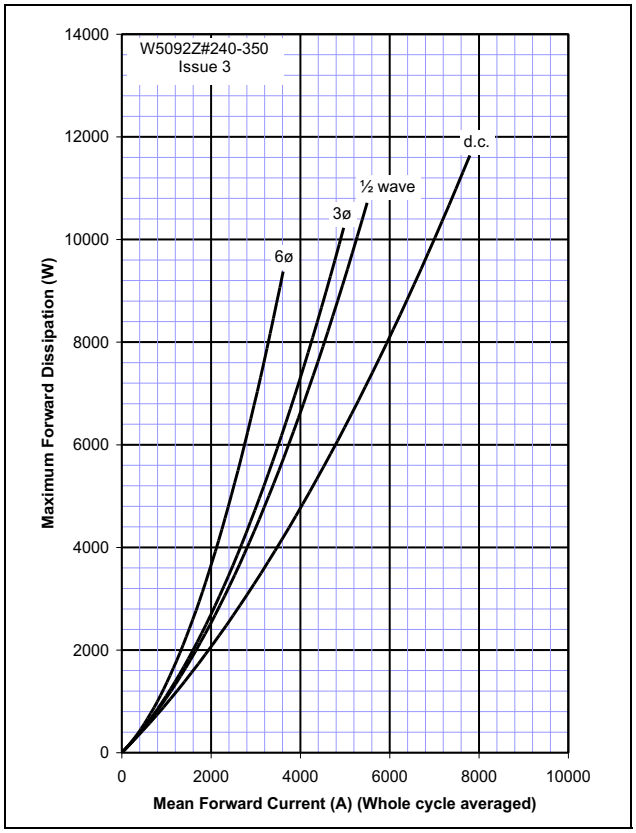


Figure 5 – Forward current vs. Heatsink temperature - Double Side Cooled

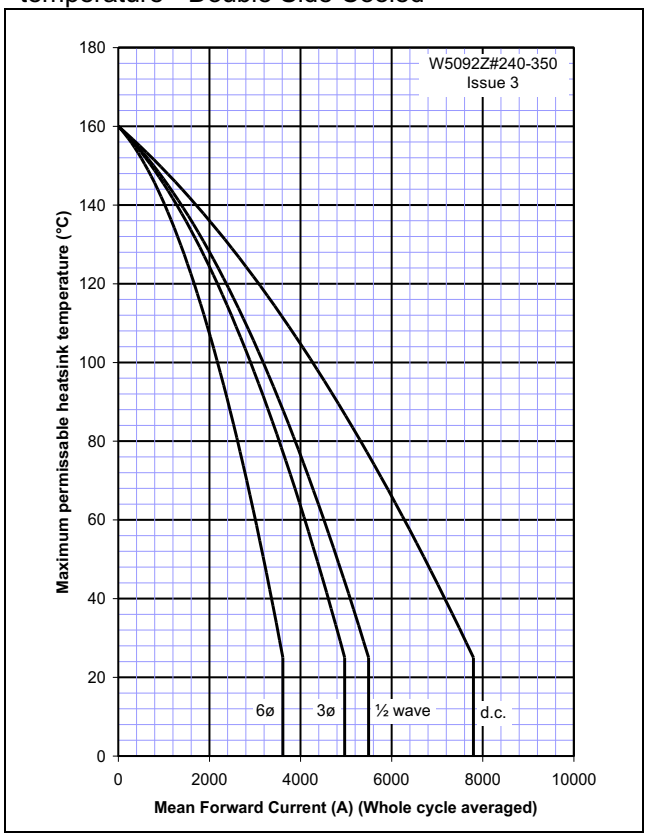


Figure 6 – Forward current vs. Power dissipation – Single Side Cooled

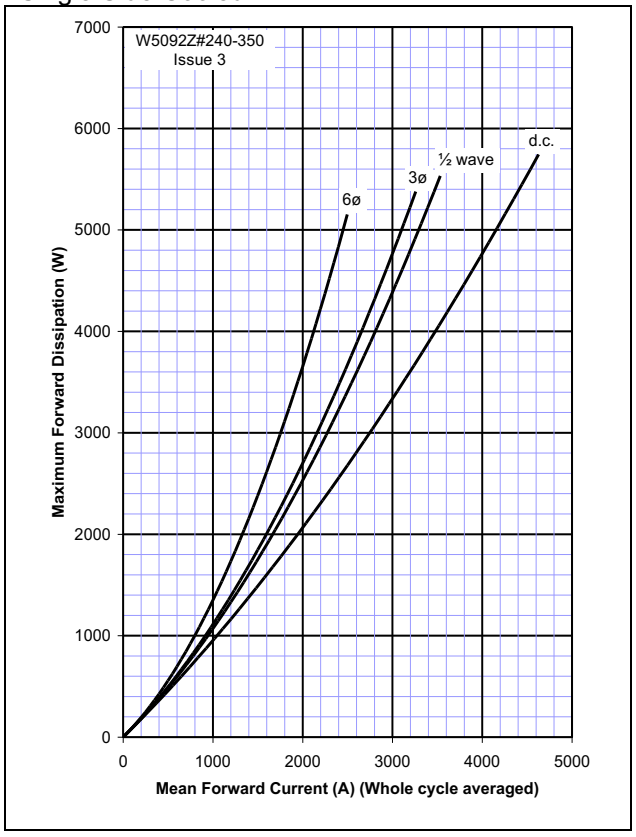
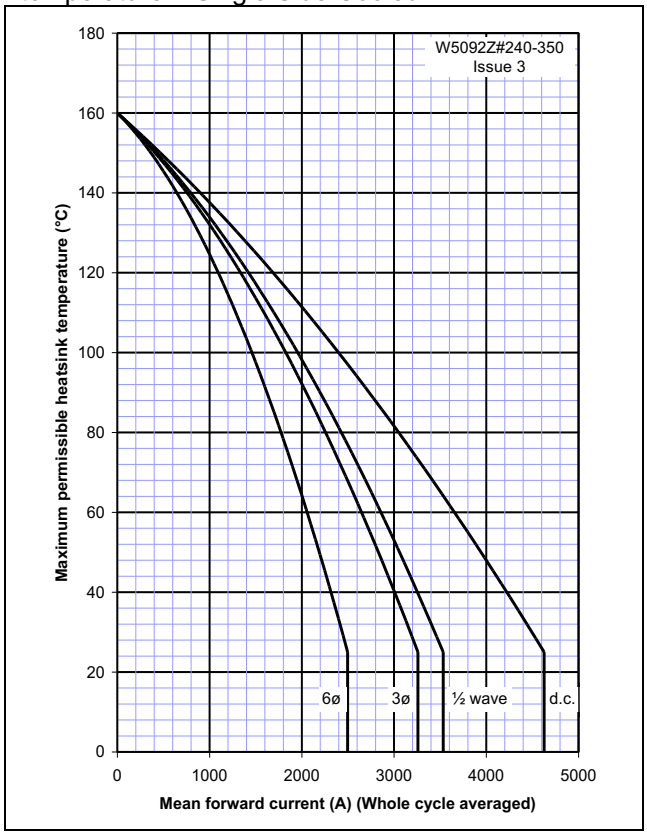
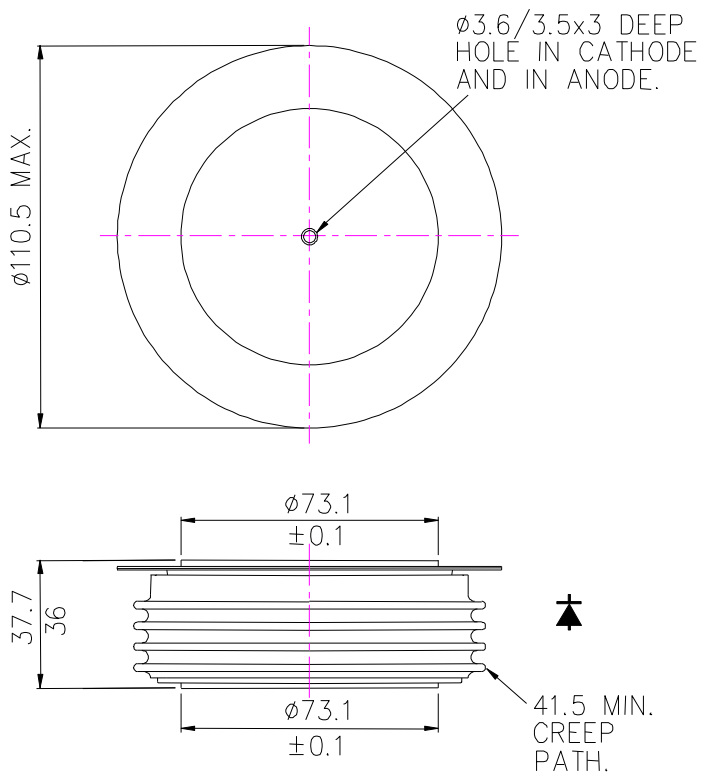


Figure 7 – Forward current vs. Heatsink temperature – Single Side Cooled



Outline Drawing & Ordering Information



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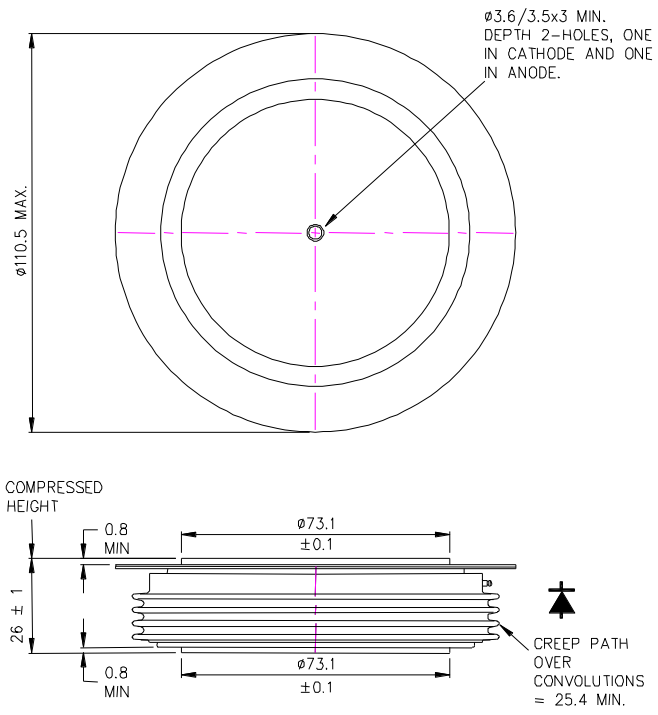
Outline options ZC, ZT and ZY



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Outline options ZD and ZV

ORDERING INFORMATION

(Please quote 10 digit code as below)

W5092	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 24-35	Fixed turn-off time code

Order code: W5092ZC350 – 3500V V_{RRM}, 37.7mm clamp height capsule.

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