IXYS UK WESTCODE

Date:- 17 March, 2015

Data Sheet Issue:- 2

Rectifier Diode

Types W7032DB020 & W7032DB040

Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V_{RRM}	Repetitive peak reverse voltage, (note 1)	200-400	V
V_{RSM}	Non-repetitive peak reverse voltage, (note 1)	300-500	V

	OTHER RATINGS	MAXIMUM LIMITS	UNITS
$I_{F(AV)M}$	Maximum average forward current, T_{sink}=55°C, (note 2)	8690	A
$I_{F(AV)M}$	Maximum average forward current. T_{sink}=100°C, (note 2)	6135	A
$I_{F(AV)M}$	Maximum average forward current. T_{sink}=100°C, (note 3)	3375	A
$I_{F(RMS)M}$	Nominal RMS forward current, T_{sink}=25°C, (note 2)	15950	A
$I_{F(d.c.)}$	D.C. forward current, T_{sink}=25°C, (note 4)	13340	A
I_{FSM}	Peak non-repetitive surge t_p=10ms, V_{rm}=60%V_{RRM}, (note 5)	49.5	kA
I_{FSM2}	Peak non-repetitive surge t_p=10ms, V_{rm}≤10V, (note 5)	55	kA
I^2t	I^2t capacity for fusing t_p=10ms, V_{rm}=60%V_{RRM}, (note 5)	12.3×10^6	A^2s
I^2t	I^2t capacity for fusing t_p=10ms, V_{rm}≤10V, (note 5)	15.1×10^6	A^2s
$T_{j\ op}$	Operating temperature range	-60 to +170	°C
T_{stg}	Storage temperature range	-60 to +170	°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) Anode side cooled, single phase; 50Hz, 180° half-sinewave.
4) Double side cooled.
5) Half-sinewave, 170°C T_j initial.

Characteristics

	PARAMETER	MIN.	TYP.	MAX.	TEST CONDITIONS (Note 1)	UNITS
V_{FM}	Maximum peak forward voltage	-	-	0.95	I_{FM}=8000A	V
V_{FM}	Maximum peak forward voltage	-	-	1.47	I_{FM}=26000A	V
V_{T0}	Threshold voltage	-	-	0.70	Valid from 6000A to 18000A	V
r_T	Slope resistance	-	-	0.029		mΩ
I_{RRM}	Peak reverse current	-	-	50	Rated V_{RRM}	mA
R_{thJK}	Thermal resistance, junction to heatsink	-	-	0.010	Double side cooled	K/W
		-	-	0.022	Anode side cooled	K/W
		-	-	0.018	Cathode side cooled	K/W
F	Mounting force	20	-	24	Note 2	kN
W_t	Weight	-	120	-		g

Notes:-
1) Unless otherwise indicated T_j=170°C.
2) For other clamp forces, 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
02	200	300	150
04	400	500	300

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_{T0}=0.70V, r_T=0.029mΩ,

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	0.0163	0.0136	0.0120	0.0100
Square wave Anode Side Cooled	0.0291	0.0255	0.0240	0.0220
Square wave Cathode Side Cooled	0.0243	0.0215	0.0201	0.0180
Sine wave Double Side Cooled	0.0140	0.0118	0.0100	
Sine wave Anode Side Cooled	0.0241	0.0225	0.0220	
Sine wave Cathode Side Cooled	0.0217	0.0196	0.0180	

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_{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		170°C Coefficients	
A	0.8242387	A	0.5441488
B	5.955806×10^{-3}	B	5.099876×10^{-3}
C	1.86486×10^{-5}	C	1.99406×10^{-5}
D	1.155091×10^{-3}	D	2.196709×10^{-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	1	2	3	4	5	6
r_p	6.653×10^{-4}	8.075×10^{-3}	8.021×10^{-4}	2.097×10^{-6}	3.024×10^{-4}	1.541×10^{-4}
τ_p	0.1135	0.07453	0.02706	1.159×10^{-3}	1.065×10^{-4}	5.288×10^{-3}

D.C. Anode Side Cooled						
Term	1	2	3	4	5	6
r_p	0.0113	6.624×10^{-4}	9.027×10^{-3}	6.651×10^{-4}	4.564×10^{-5}	2.844×10^{-4}
τ_p	0.8627	0.6978	0.08402	0.01725	7.281×10^{-4}	9.948×10^{-5}

D.C. Cathode Side Cooled						
Term	1	2	3	4	5	6
r_p	7.842×10^{-3}	-8.694×10^{-6}	9.044×10^{-3}	6.37×10^{-4}	3.824×10^{-5}	2.913×10^{-4}
τ_p	0.855	5.938	0.08082	0.0161	9.731×10^{-4}	1.012×10^{-4}

Curves

Figure 1 – Forward characteristics of Limit device

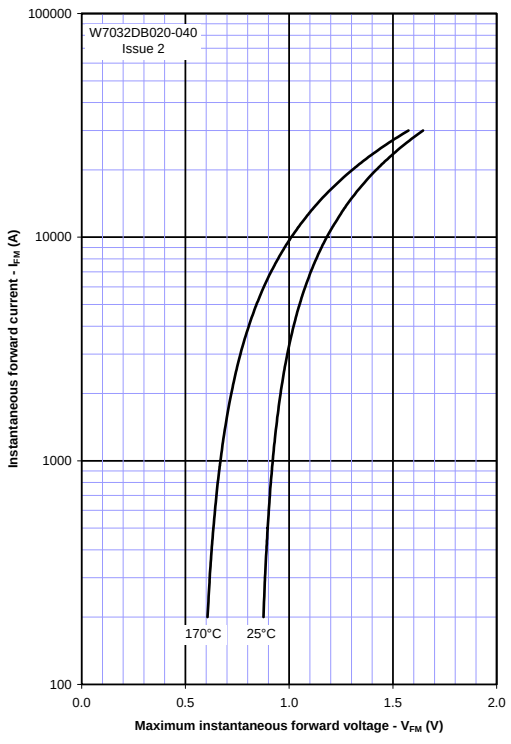


Figure 2 – Transient thermal impedance

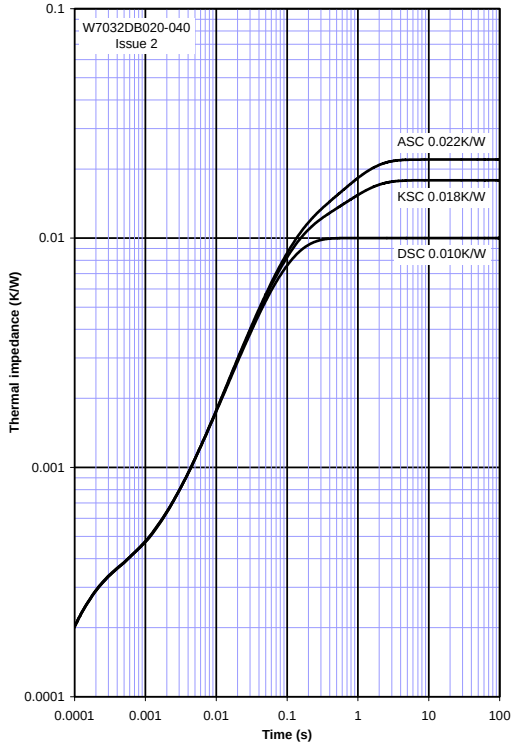


Figure 3 – Maximum surge and I^2t Ratings

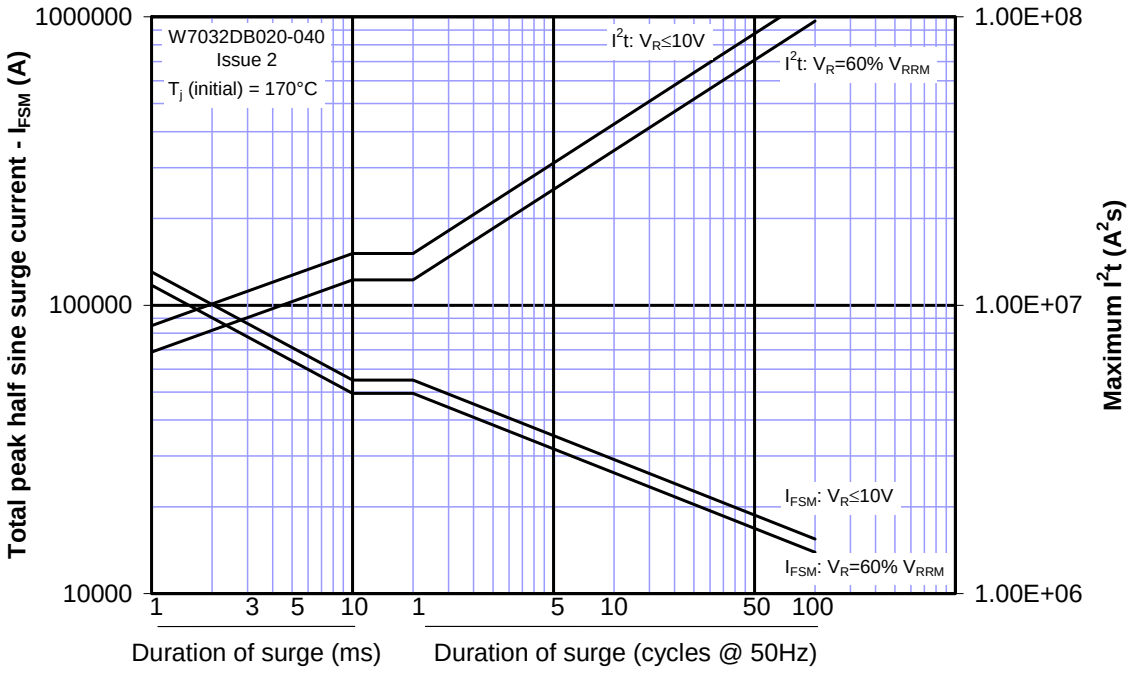


Figure 4 – Forward current vs. Power dissipation – Double Side Cooled

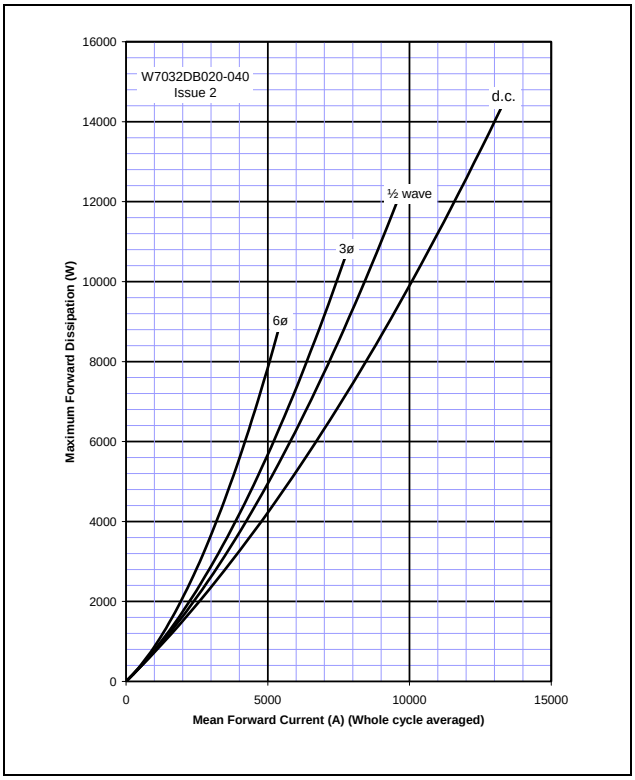


Figure 5 – Forward current vs. Heatsink temperature - Double Side Cooled

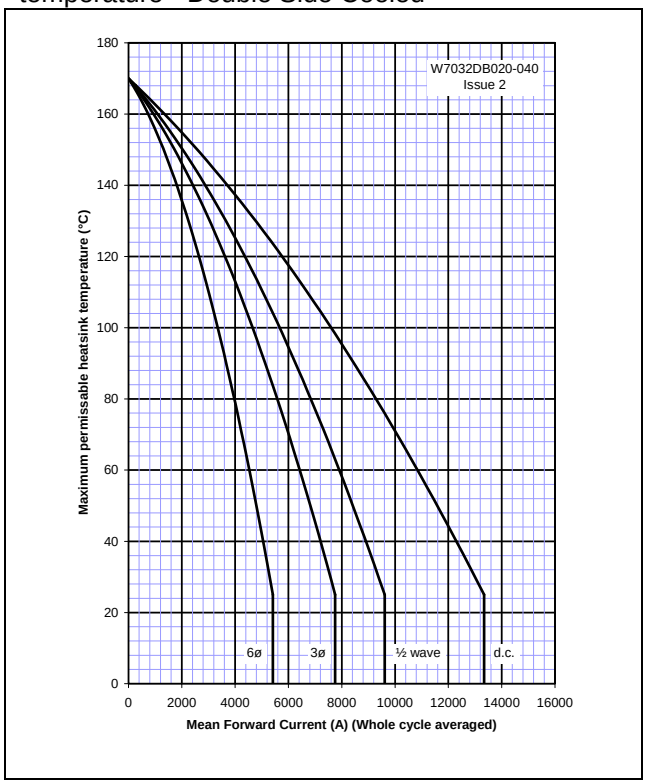


Figure 6 – Forward current vs. Power dissipation – Anode Side Cooled

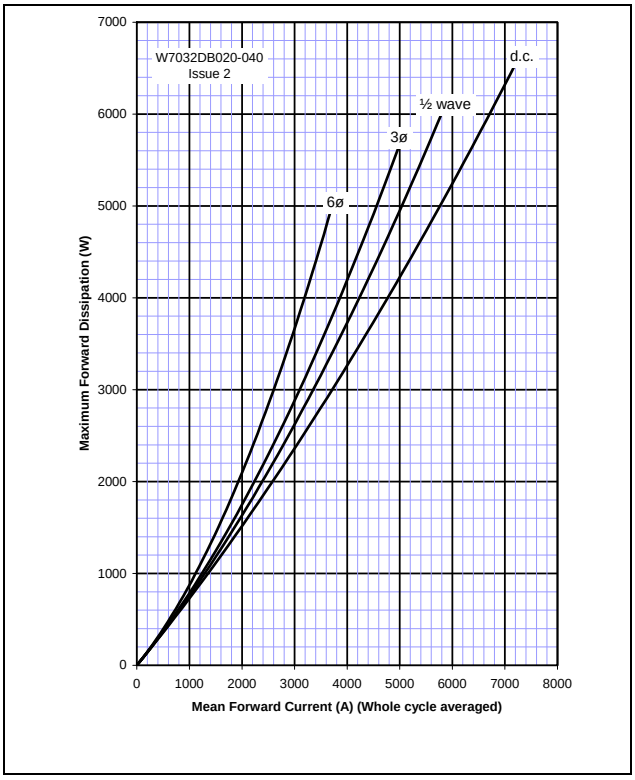


Figure 7 – Forward current vs. Heatsink temperature – Anode Side Cooled

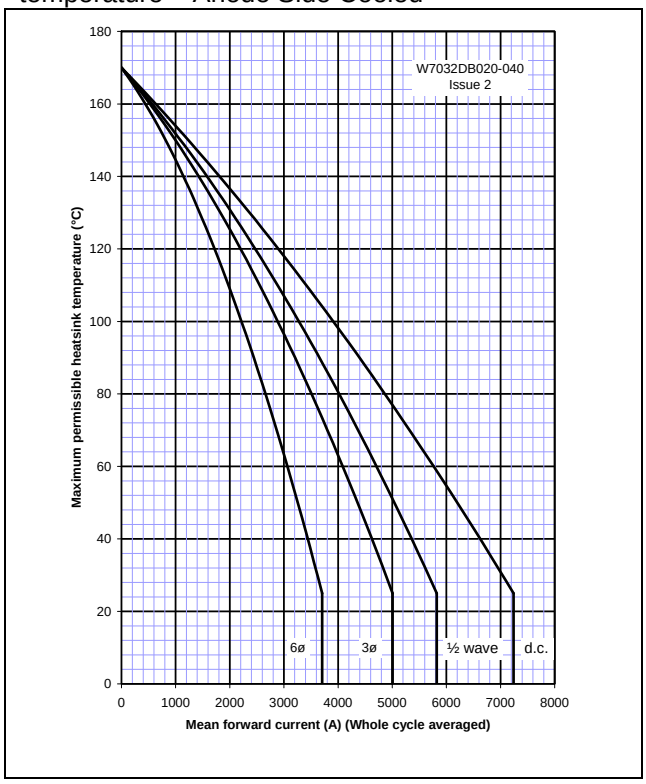
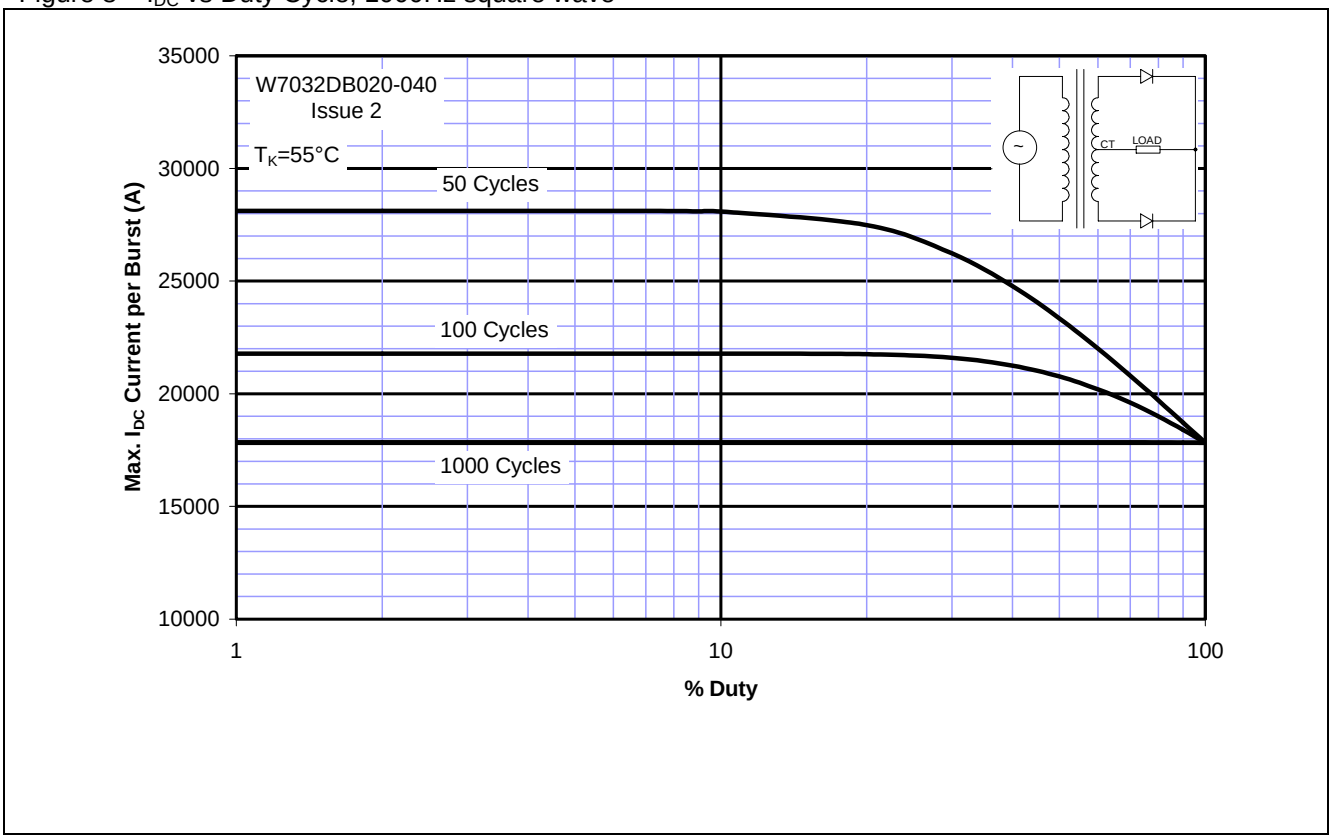
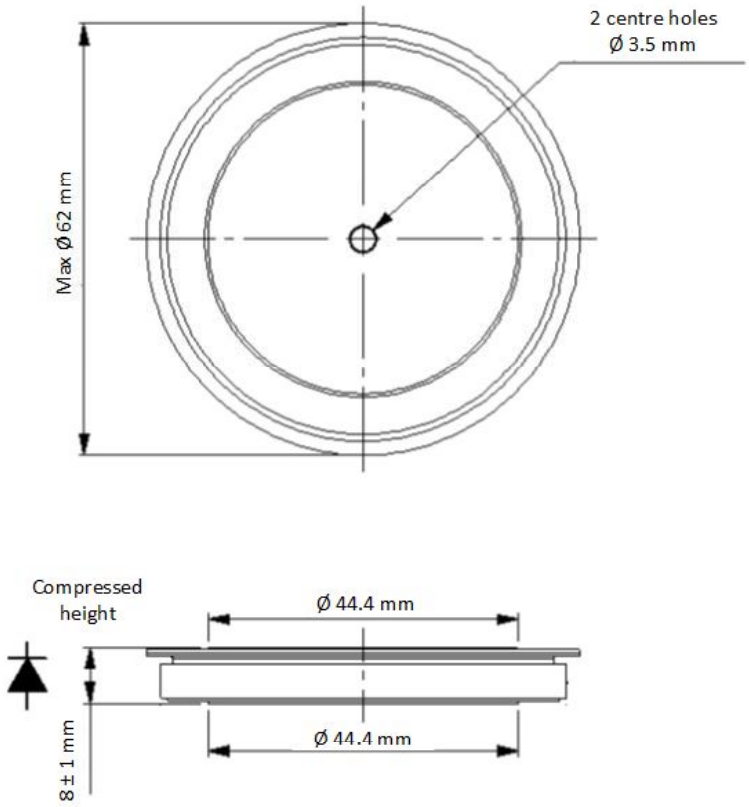


Figure 8 – I_{DC} vs Duty Cycle, 1000Hz square wave



Outline Drawing & Ordering Information



ORDERING INFORMATION		(Please quote 10 digit code as below)	
W7032	**DB**	**02**	**0**
Fixed Type Code	Fixed Outline Code	Voltage code V_{RRM}/100 02 & 04	Fixed code

Typical order code: W7032DB020 – 200V V_{RRM}, 8mm clamp height capsule.

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