IXYS UK WESTCODE

Date:- 4th Jan, 2018

Data Sheet Issue:- 2

Rectifier Diode

Type W0428##250-320

Development Type No.: WX171##250-320

Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V_{RRM}	Repetitive peak reverse voltage, (note 1)	2500-3200	V
V_{RSM}	Non-repetitive peak reverse voltage, (note 1)	2600-3300	V

	OTHER RATINGS	MAXIMUM LIMITS	UNITS
$I_{F(AV)M}$	Maximum average forward current, T_{case}=55°C, (note 2)	428	A
$I_{F(AV)M}$	Maximum average forward current. T_{case} =70°C, (note 2)	380	A
$I_{F(AV)M}$	Maximum average forward current. T_{case} =100°C, (note 2)	271	A
$I_{F(RMS)}$	Nominal RMS forward current, T_{case} =100°C, (note 2)	425	A
$I_{F(RMS)}$	Nominal RMS forward current, T_{case} =25°C, (note 2)	809	A
$I_{F(d.c.)}$	D.C. forward current, T_{case} =25°C	675	A
I_{FSM}	Peak non-repetitive surge t_p=10ms, V_{rm}=60%V_{RRM}, (note 3)	5500	A
I_{FSM2}	Peak non-repetitive surge t_p=10ms, V_{rm}≤10V, (note 3)	6050	A
I^2t	I^2t capacity for fusing t_p=10ms, V_{rm}=60%V_{RRM}, (note 3)	151×10^3	A^2s
I^2t	I^2t capacity for fusing t_p=10ms, V_{rm}≤10V, (note 3)	183×10^3	A^2s
$T_{j\,op}$	Operating temperature range	-40 to +150	°C
T_{stg}	Storage temperature range	-40 to +150	°C

Notes:-

1) De-rating factor of 0.13% per °C is applicable for T_j below 25°C.
2) Single phase; 50Hz, 180° half-sinewave.
3) Half-sinewave, 150°C T_j initial.

Characteristics

	PARAMETER	MIN.	TYP.	MAX.	TEST CONDITIONS (Note 1)	UNITS
V_{FM}	Maximum peak forward voltage	-	-	1.60	I_{TM}=900A	V
V_{FM}	Maximum peak forward voltage	-	-	1.80	I_{TM}=1180A	V
V_{T0}	Threshold voltage	-	-	0.926		V
r_T	Slope resistance	-	-	0.739		mΩ
I_{RRM}	Peak reverse current	-	-	15	Rated V_{RRM}	mA
Q_{rr}	Recovered charge	-	1000	-	I_{TM}=100A, t_P=500µs, di/dt=10A/µs, V_r=50V	µC
Q_{ra}	Recovered charge, 50% chord	-	700	900		µC
I_{rr}	Reverse recovery current	-	75	-		A
t_{rr}	Reverse recovery time, 50% chord	-	19	-		µs
R_{thJC}	Thermal resistance, junction to case	-	-	0.13		K/W
R_{thCK}	Thermal resistance, case to heatsink	-	-	0.04		K/W
F	Mounting torque	24	-	30		Nm
W_t	Weight	-	175	-	Outline E	g
		-	250	-	Outline F	

Notes:-

1) Unless otherwise indicated T_j=150°C.

Notes on Ratings and Characteristics

1.0 Voltage Grade Table

Voltage Grade	V_{RRM} V	V_{RSM} V	V_R DC V
25	2500	2600	1500
28	2800	2900	1650
32	3200	3300	1850

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}=0.926V, r_T=0.739mΩ,

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	0.174	0.153	0.143	0.130
Sine wave	0.172	0.153	0.149	

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		150°C Coefficients	
A	0.7795642	A	0.6340984
B	0.04590695	B	0.04112559
C	4.64903×10^{-4}	C	5.72979×10^{-4}
D	2.19035×10^{-3}	D	5.790022×10^{-3}

6.0 Reverse recovery ratings

(i) Q_{ra} is based on 50% I_{rm} chord as shown in Fig. 1

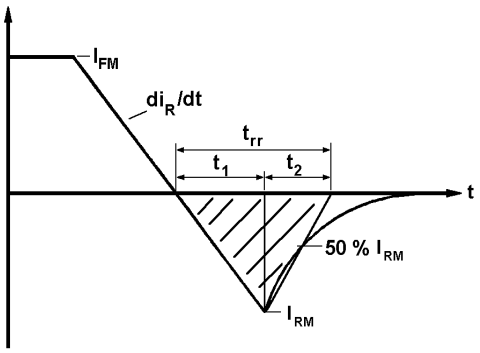


Fig. 1

(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

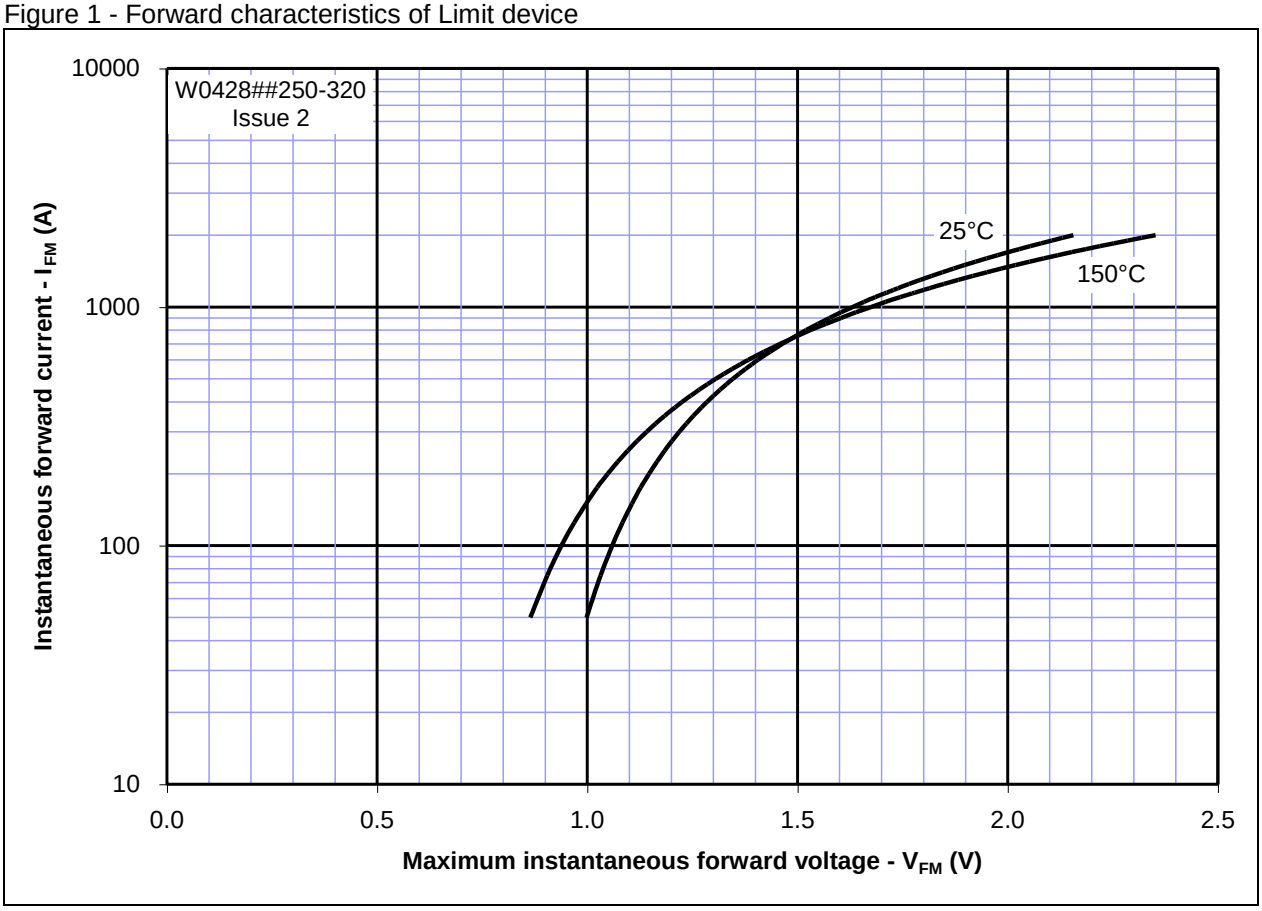


Figure 2 - Maximum surge and I^2t ratings

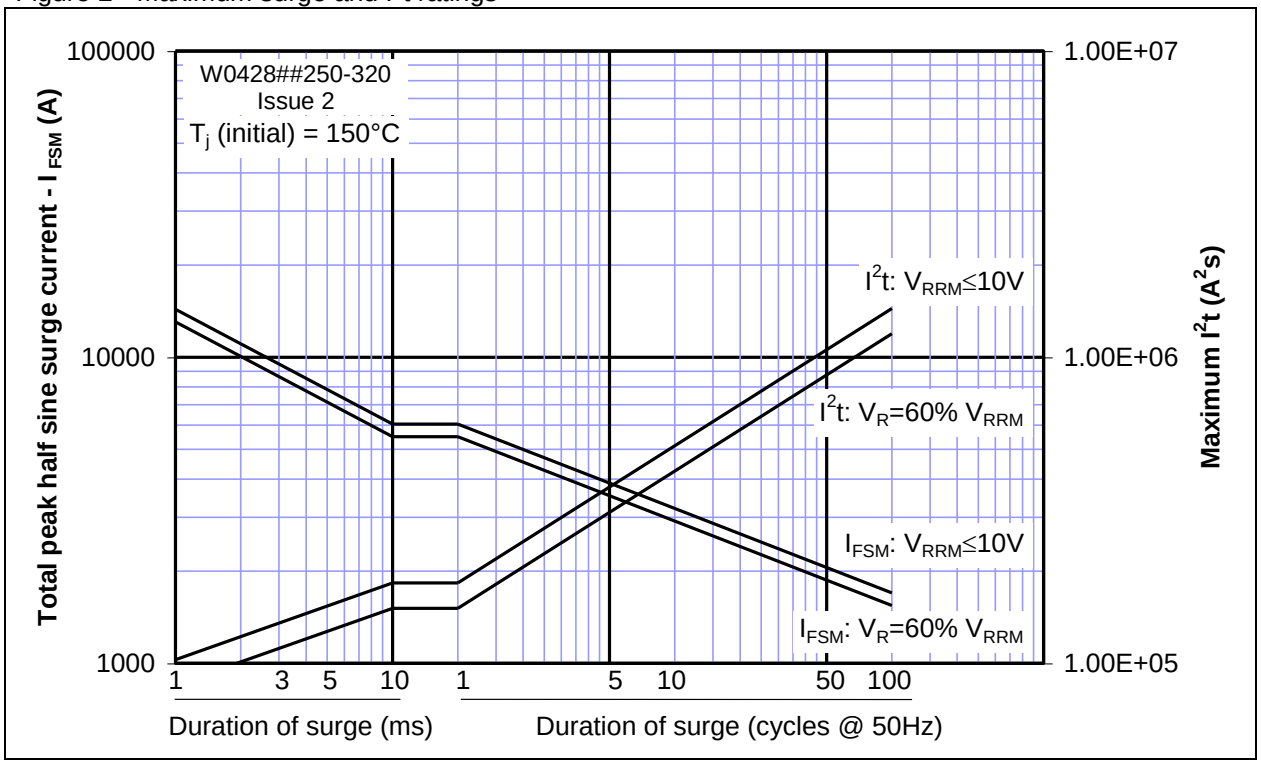


Figure 3 – Total recovered charge, Q_{rr}

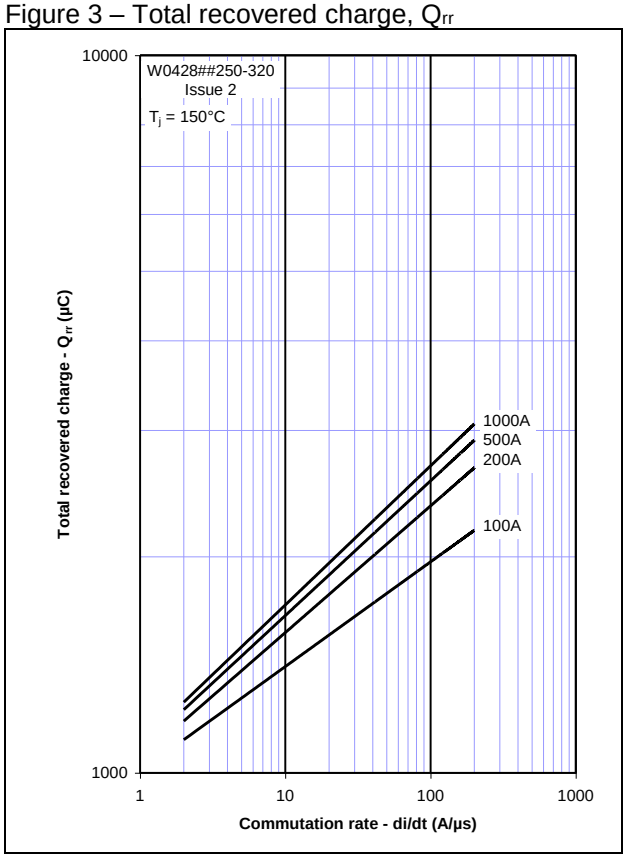


Figure 4 – Recovered charge, Q_{ra} (50% chord)

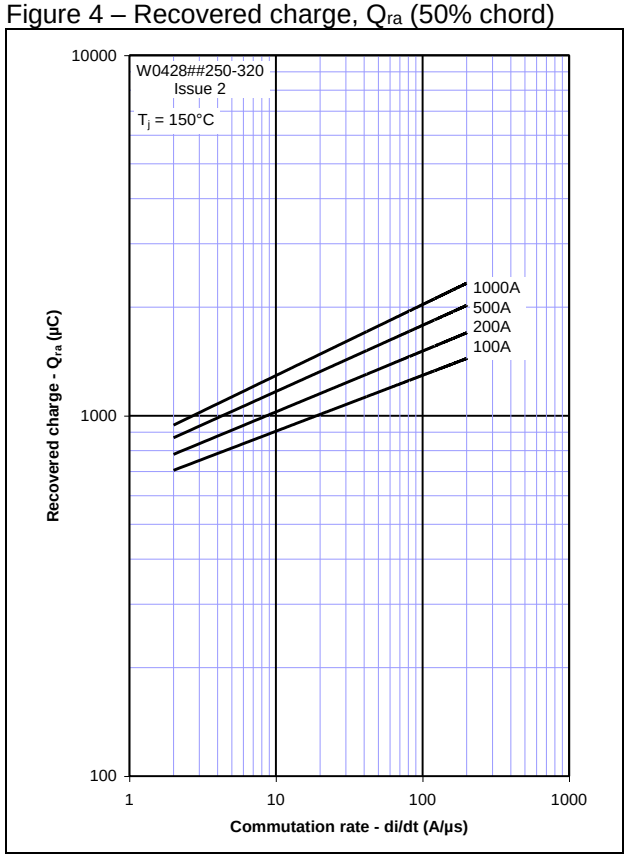


Figure 5 – Peak reverse recovery current, I_{rm}

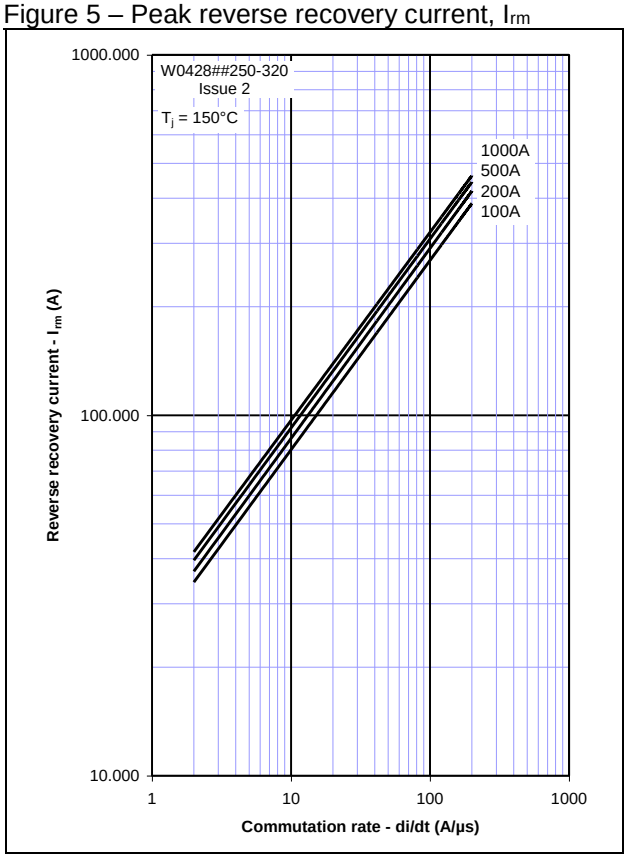


Figure 6 – Maximum recovery time, t_{rr} (50% chord)

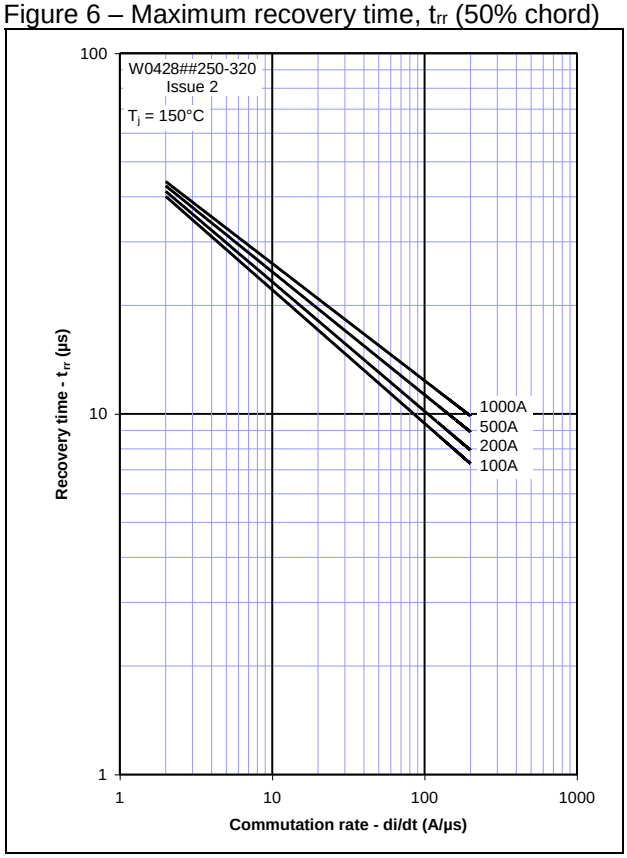


Figure 7 – Forward current vs. Power dissipation

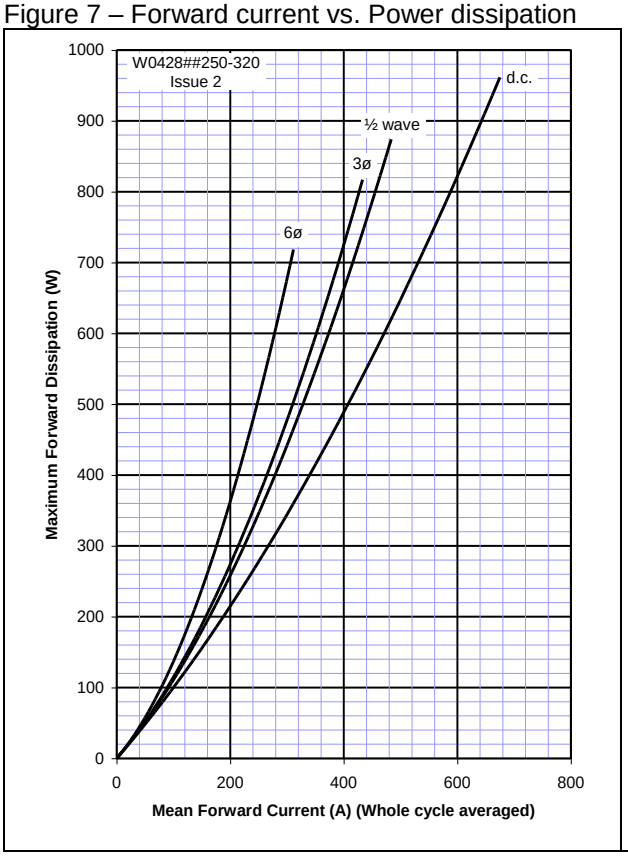


Figure 8 – Forward current vs. Heatsink temperature

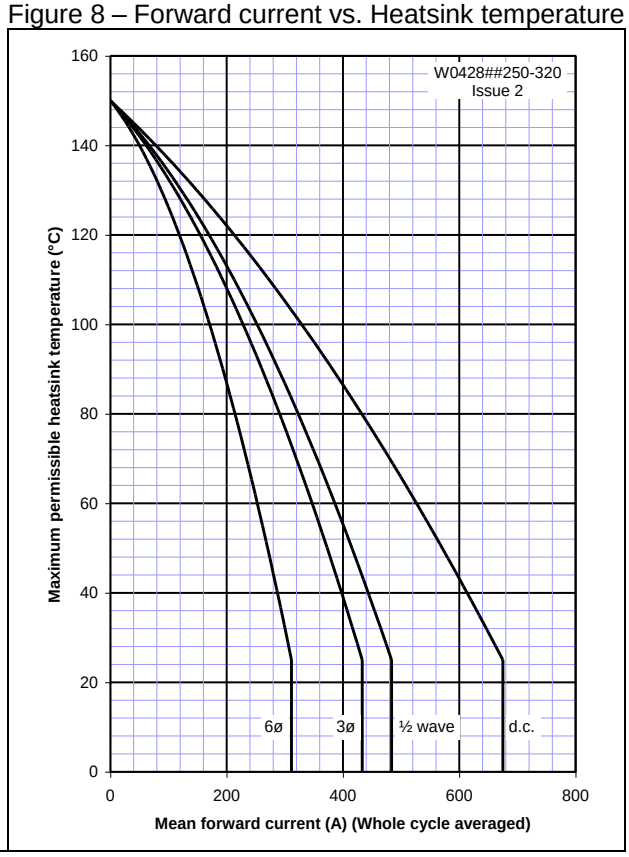
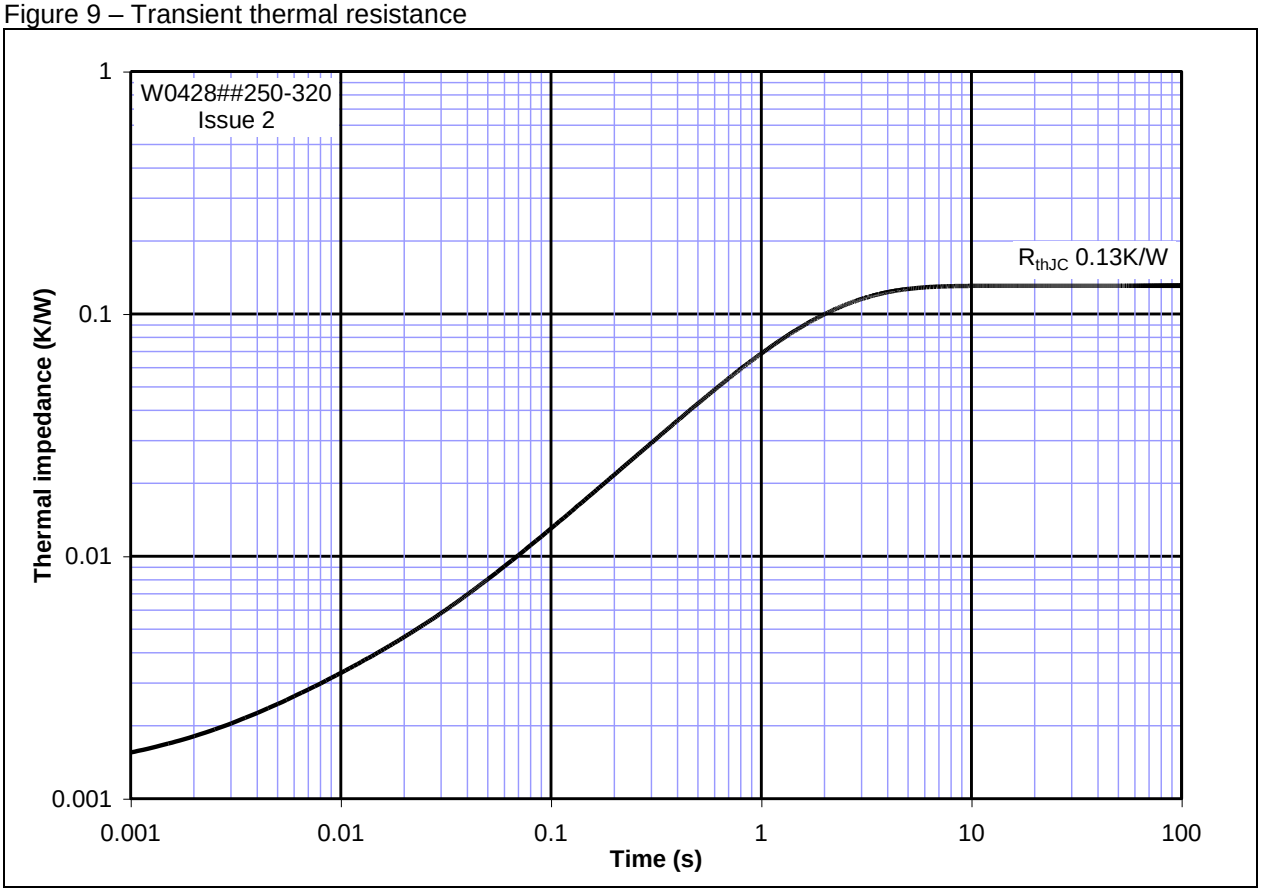
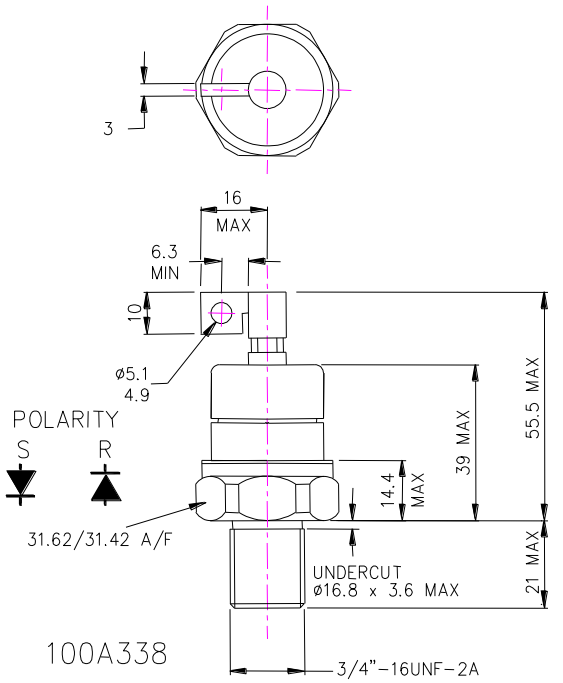


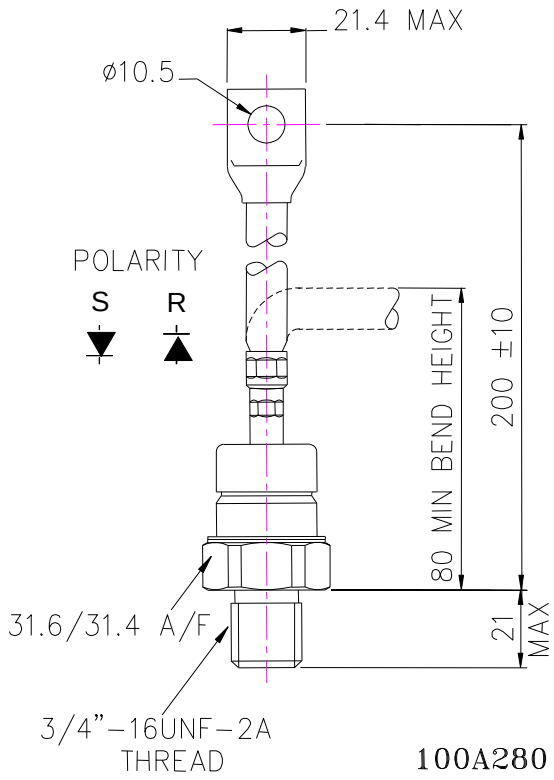
Figure 9 – Transient thermal resistance



Outline Drawing & Ordering Information



Outline option E



Outline option F

ORDERING INFORMATION (Please quote 13 digit code as below)

W0428	#	#	♦♦	0
Fixed Type Code	Polarity code R = Base Anode S = Base Cathode	Outline code E=¾" HV ceramic stud + lug F=¾" HV ceramic stud	Voltage Code V_{DRM}/100 25-32	Fixed code

Typical order code: W0428SE250 – 2500V V_{RRM}, cathode base, ¾" high voltage stud, ceramic housing with lug

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