IXYS
A Littelfuse Technology

Date: 24th Jan 2022

Data Sheet Issue: 4

Rectifier Diode

Types W0503R/SC160 to W0503R/SC240

Previous Type No. SW16-24PHN/R380

Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V_{RRM}	Repetitive peak reverse voltage, (note 1)	1600-2400	V
V_{RSM}	Non-repetitive peak reverse voltage, (note 1)	1700-2500	V

	OTHER RATINGS	MAXIMUM LIMITS	UNITS
$I_{F(AV)M}$	Maximum average forward current, T_{case}=55°C, (note 2)	503	A
$I_{F(AV)M}$	Maximum average forward current. T_{case}=100°C, (note 2)	369	A
$I_{F(RMS)M}$	Nominal RMS forward current, T_{case}=25°C, (note 2)	912	A
$I_{F(d.c.)}$	D.C. forward current, T_{case}=25°C, (note 3)	766	A
I_{FSM}	Peak non-repetitive surge t_p=10ms, V_{rm}=0.6V_{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}=0.6V_{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	-30 to +180	°C
T_{stg}	Storage temperature range	-40 to +200	°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, 180°C T_j initial.

Characteristics

	PARAMETER	MIN.	TYP.	MAX.	TEST CONDITIONS (Note 1)	UNITS
V_{FM}	Maximum peak forward voltage	-	-	1.88	I_{TM}=1200A	V
V_0	Threshold voltage	-	-	0.99		V
r_s	Slope resistance	-	-	0.74		mΩ
I_{RRM}	Peak reverse current	-	-	15	Rated V_{RRM}	mA
R_{thJK}	Thermal resistance, junction to heatsink	-	-	0.13	DC and 180° Sine Wave	K/W
F	Mounting torque	25	-	27.7		Nm
W_t	Weight	-	250	-		g

Notes:-
1) Unless otherwise indicated T_j=180°C.
2) Threads must not be lubricated.

Notes on Ratings and Characteristics

1.0 Voltage Grade Table

Voltage Grade	V_{RRM} V	V_{RSM} V	V_R DC V
16	1600	1700	1050
20	2000	2100	1250
24	2400	2500	1450

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.

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 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:

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

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

Where V_{T0}=0.99V, r_T=0.74mΩ,

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

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	

6.2 Calculating V_F using ABCD Coefficients

The on-state characteristic I_F vs. V_F, on page 5 is represented by 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		180°C Coefficients	
A	0.9965991	A	0.8873625
B	0.05728886	B	0.04107969
C	0.55959×10^{-3}	C	0.880763×10^{-3}
D	-0.0116016	D	-0.01037081

Curves

Figure 1 – Forward characteristics of Limit device

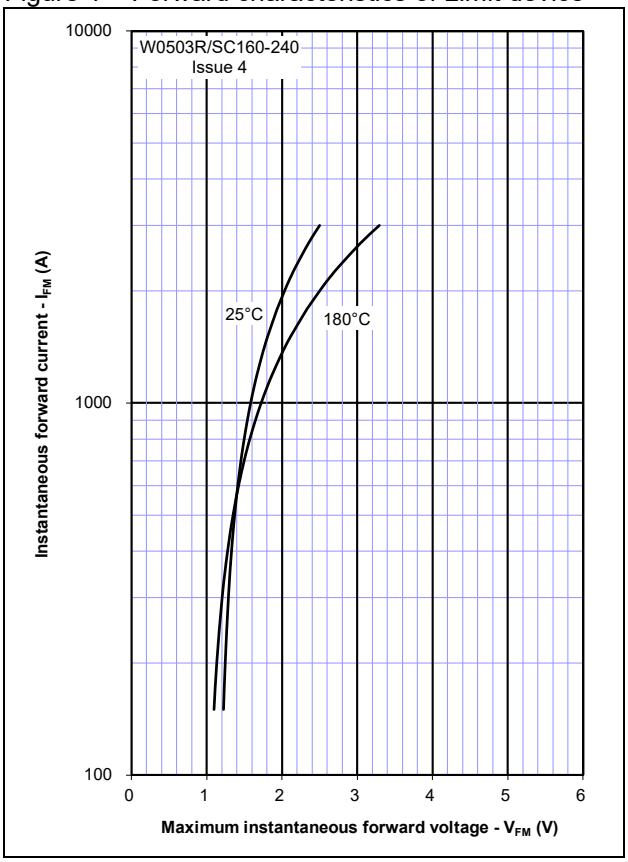


Figure 2 – Transient Thermal Impedance

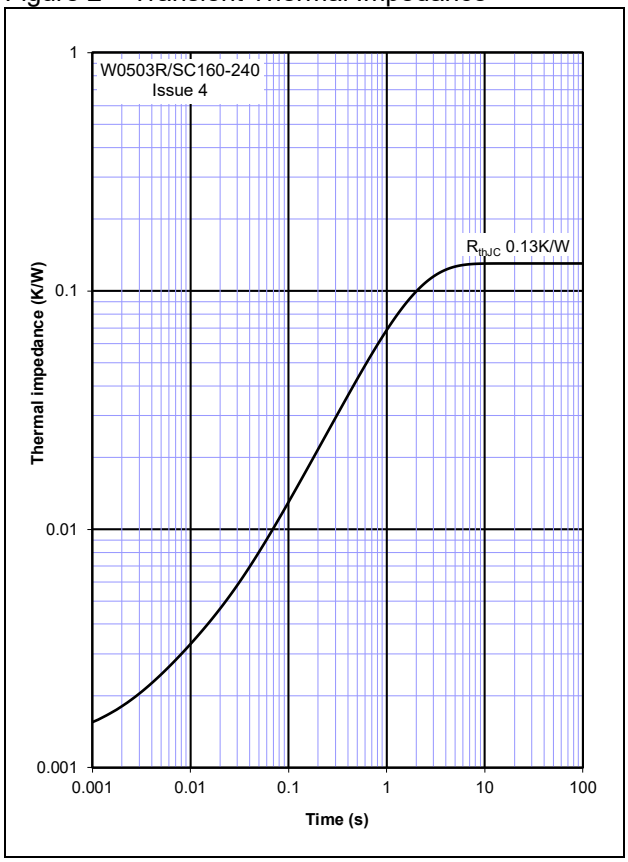


Figure 3 – Maximum surge and I^2t Ratings

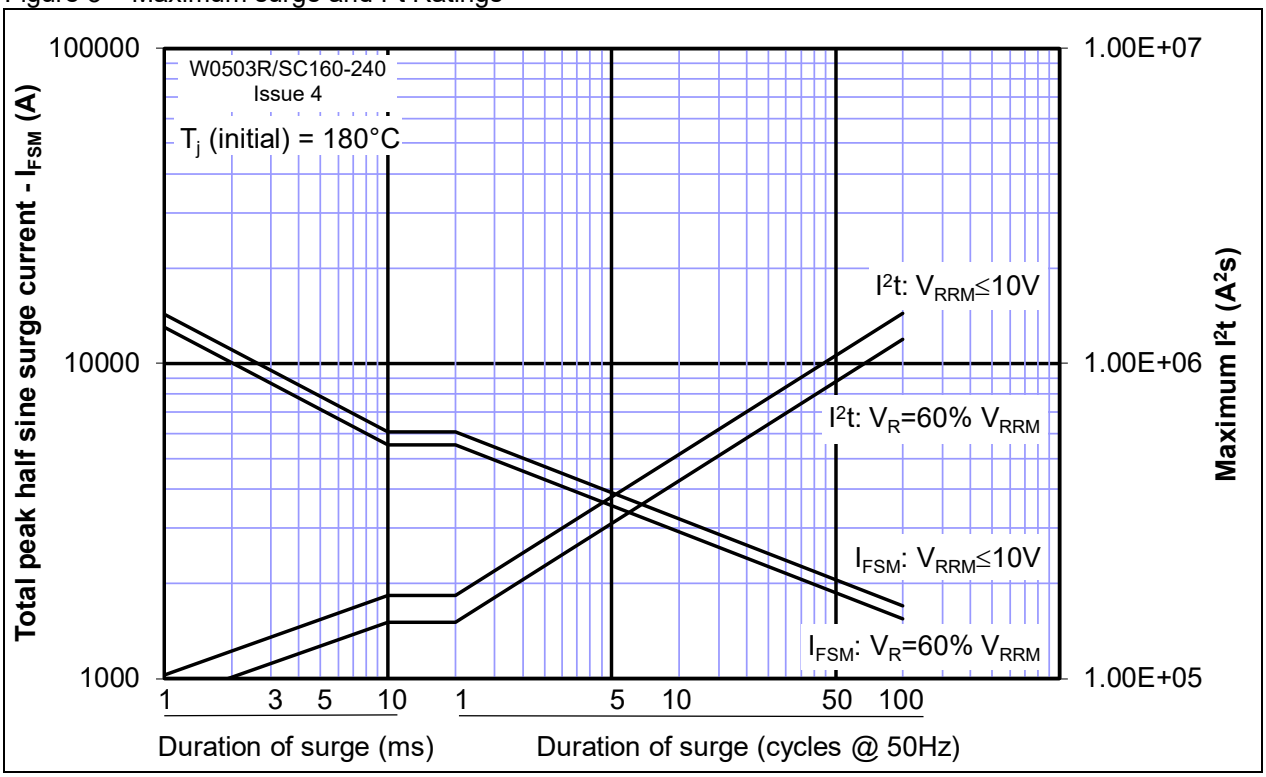


Figure 4 – Forward current vs. Power dissipation

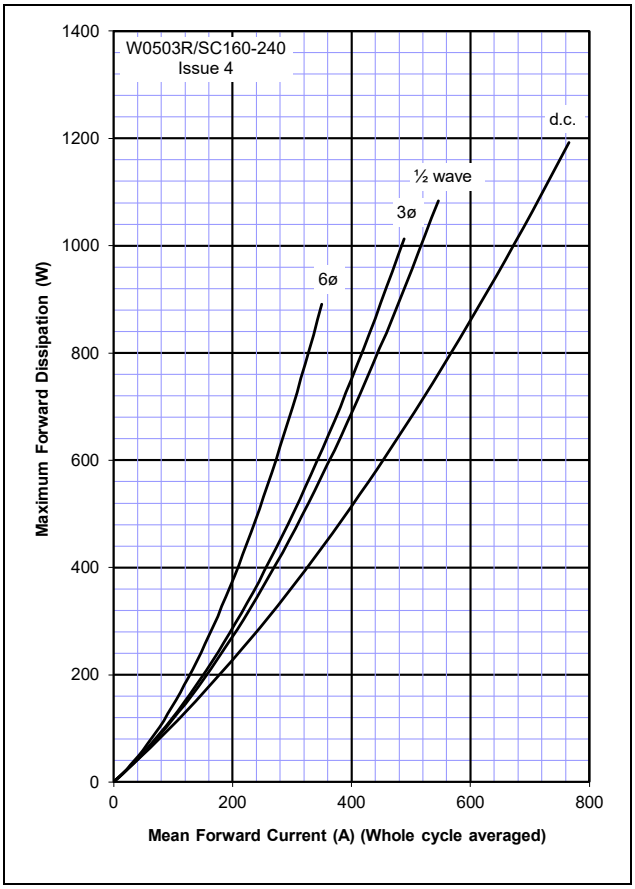
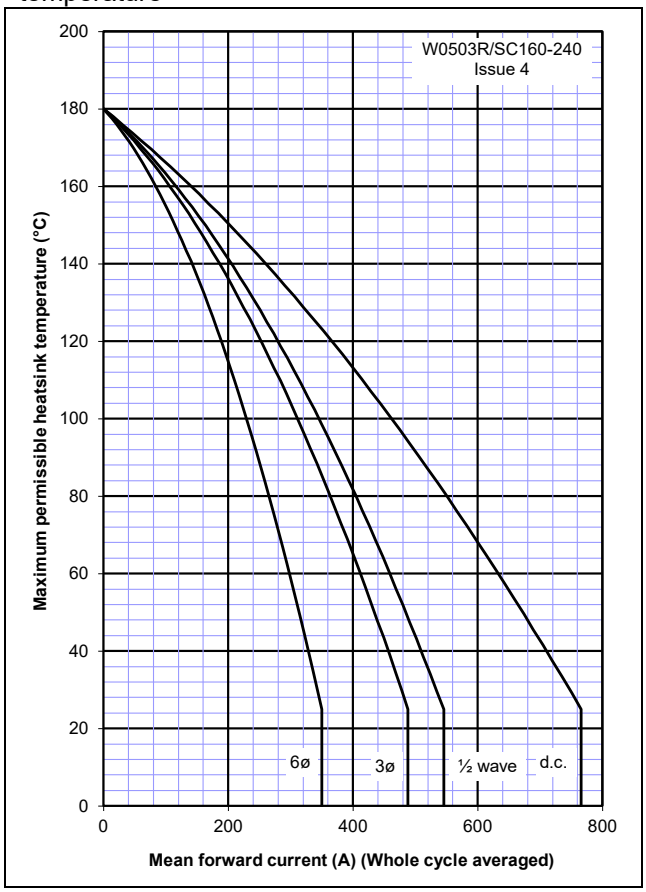
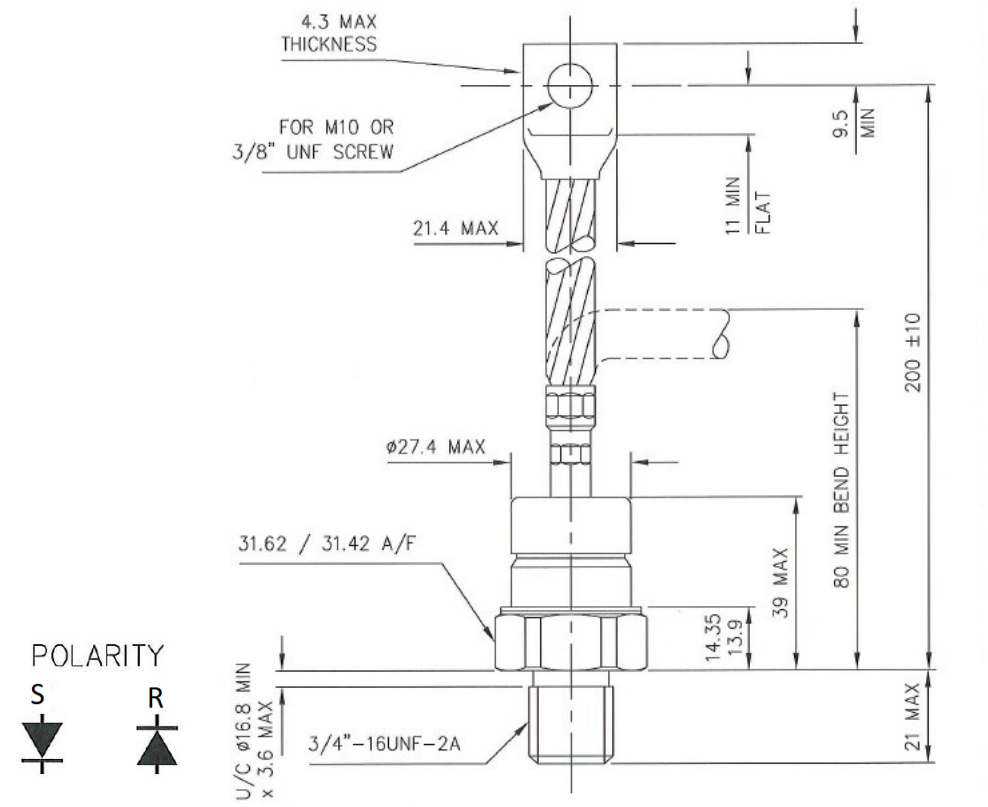


Figure 5 – Forward current vs. Heatsink temperature



Outline Drawing & Ordering Information



100A280

ORDERING INFORMATION		(Please quote 10 digit code as below)	
W0503	**RC/SC**	**♦♦**	**0**
Fixed Type Code	RC=Anode case SC=Cathode case	Voltage code V_{DRM}/100 16-24	Fixed turn-off time code

Order code: W0503SC240– 2400V V_{RRM}, ¾" stud, cathode base.

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