

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	Α
I _{F(AV)M}	Maximum average forward current. T _{case} =100°C, (note 2)	369	Α
I _{F(RMS)M}	Nominal RMS forward current, T _{case} =25°C, (note 2)	912	Α
I _{F(d.c.)}	D.C. forward current, T _{case} =25°C, (note 3)	766	Α
I _{FSM}	Peak non-repetitive surge t _p =10ms, V _{rm} =0.6V _{RRM} , (note 3)	5500	Α
I _{FSM2}	Peak non-repetitive surge t _p =10ms, V _{rm} ≤10V, (note 3)	6050	Α
I ² t	I ² t capacity for fusing t _p =10ms, V _{rm} =0.6V _{RRM} , (note 3)	151×10 ³	A ² s
I ² t	l²t capacity for fusing t _p =10ms, V _{rm} ≤10V, (note 3)	183×10 ³	A ² s
Тј ор	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_i below 25°C.
- 2) Single phase; 50Hz, 180° half-sinewave.
- 3) Half-sinewave, 180°C T_i 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
rs	Slope resistance	_	-	0.74		mΩ
I _{RRM}	Peak reverse current	-	-	15	Rated V _{RRM}	mA
RthJK	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_i 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

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

Where V_{T0} =0.99V, r_T =0.74 $m\Omega$,

 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		
Α	0.9965991	Α	0.8873625	
В	0.05728886	В	0.04107969	
С	0.55959×10 ⁻³	С	0.880763×10 ⁻³	
D	-0.0116016	D	-0.01037081	



Curves

Figure 1 – Forward characteristics of Limit device

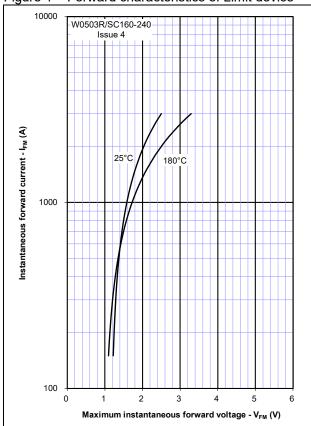


Figure 2 – Transient Thermal Impedance

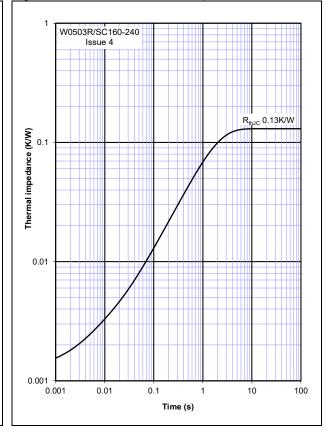


Figure 3 – Maximum surge and I²t Ratings

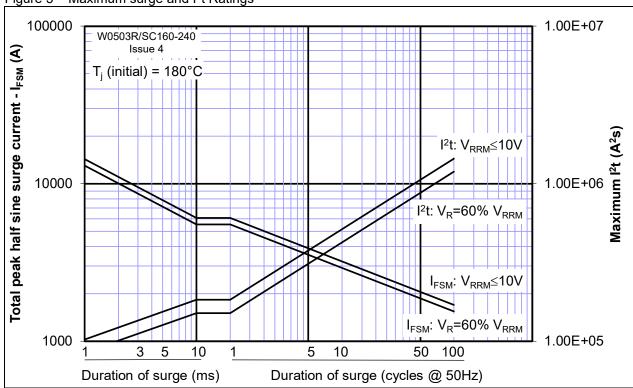




Figure 4 – Forward current vs. Power dissipation

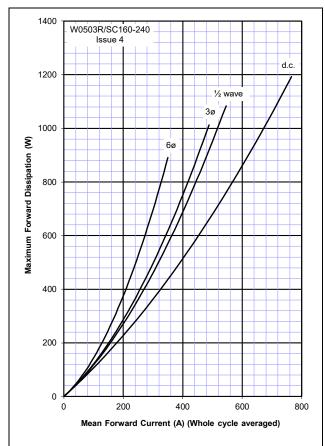
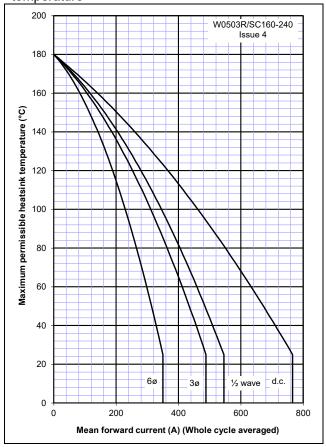
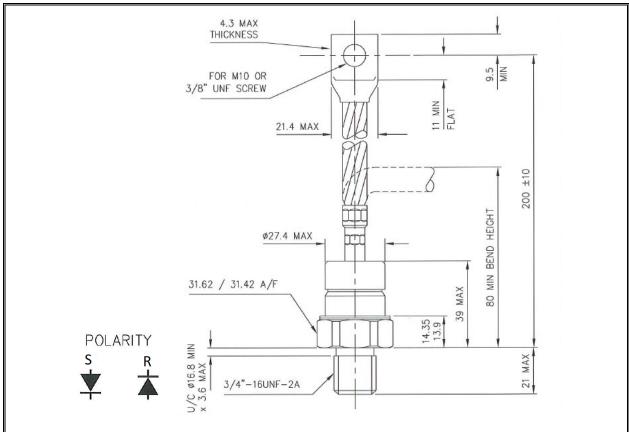


Figure 5 – Forward current vs. Heatsink temperature





Outline Drawing & Ordering Information



100A280

ORDE	RING 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	l.			

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