



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 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 | I ² t capacity for fusing t _p =10ms, V _{rm} ≤10V, (note 3) | 183×10 ³ | A ² s |
| 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 _{R_{RRM}} | Peak reverse current | - | - | 15 | Rated V _{R_{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

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

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

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

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

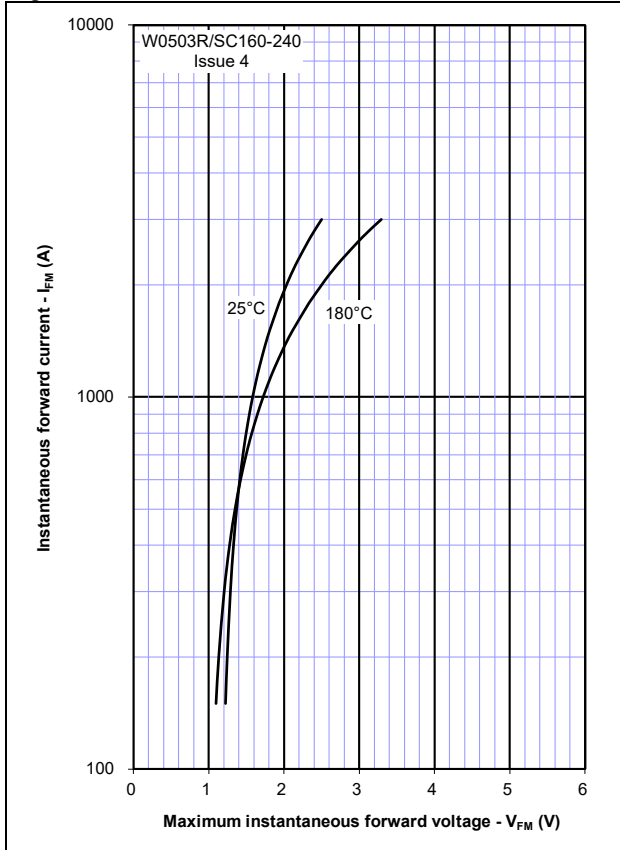


Figure 2 – Transient Thermal Impedance

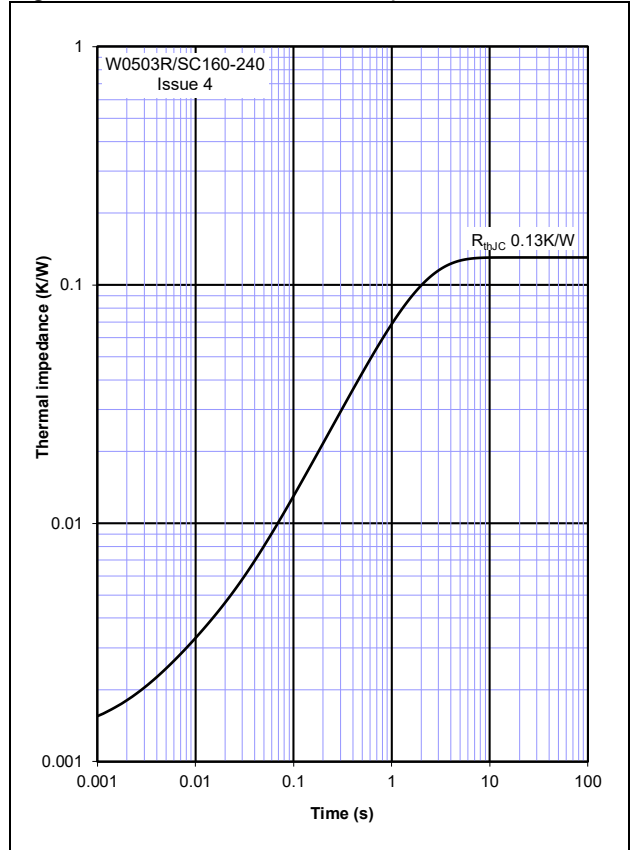


Figure 3 – Maximum surge and I²t Ratings

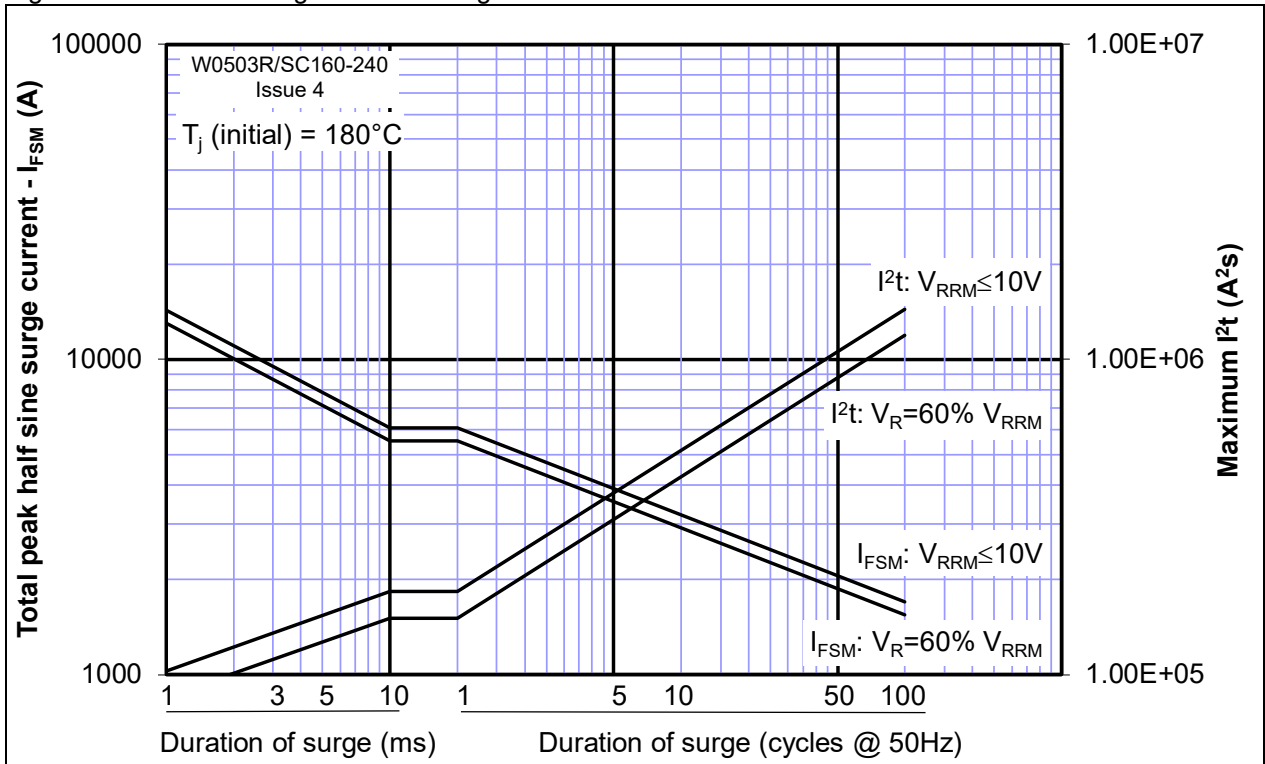


Figure 4 – Forward current vs. Power dissipation

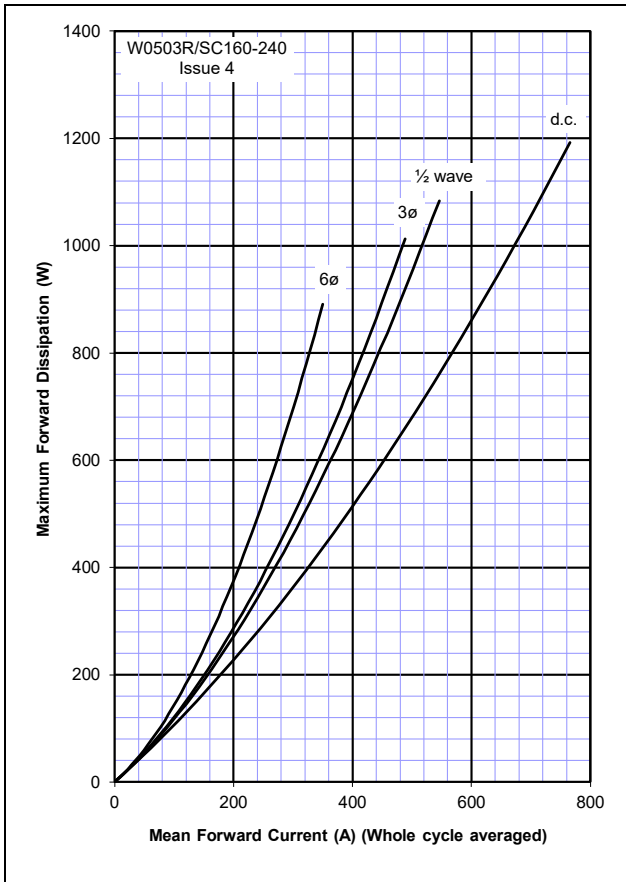
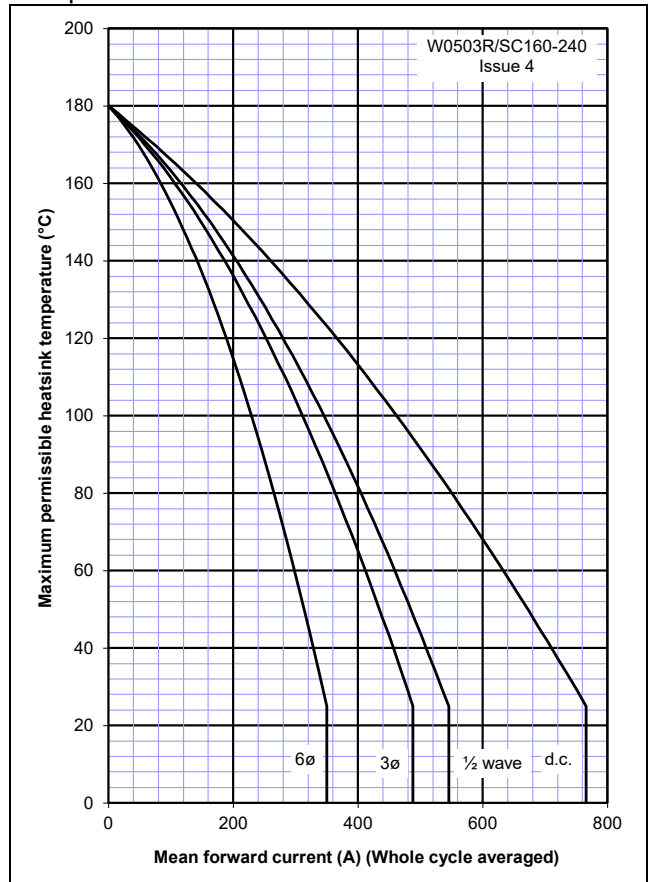
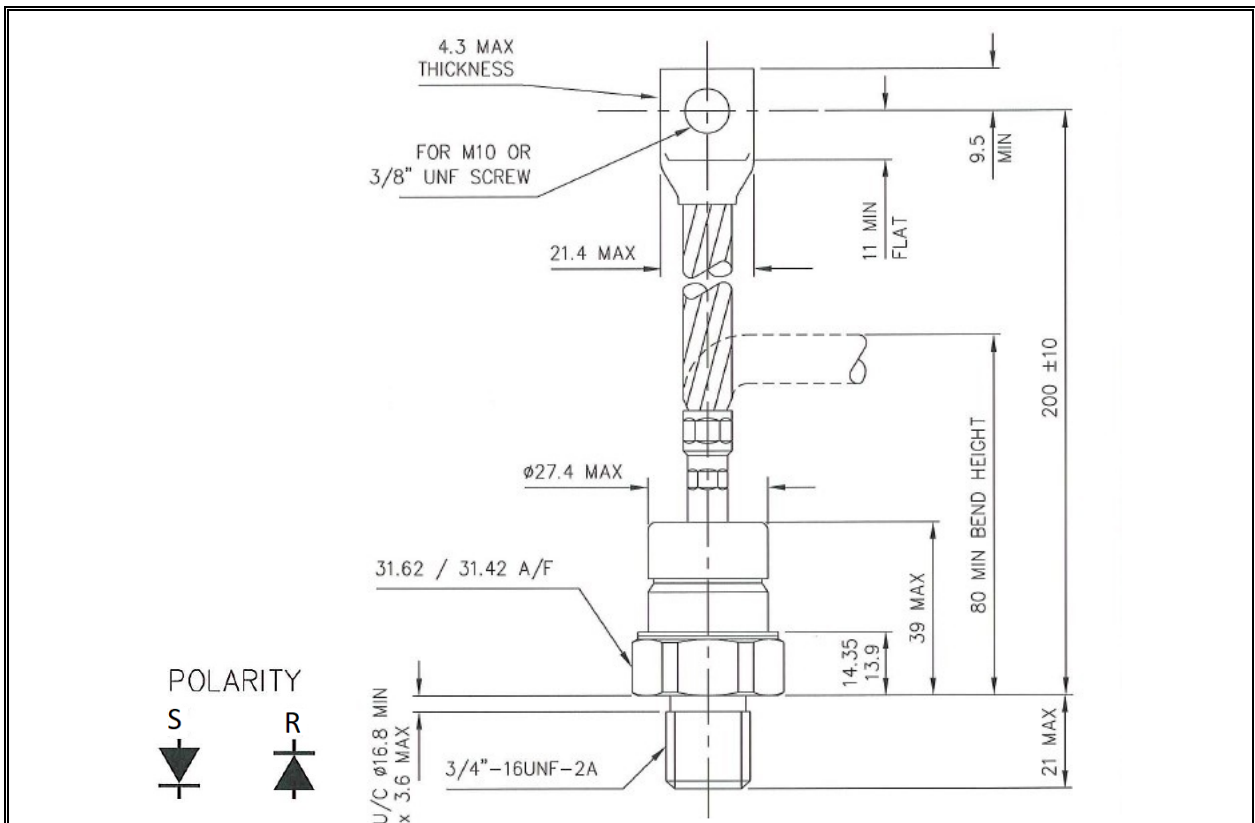


Figure 5 – Forward current vs. Heatsink temperature



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}, 3/4" stud, cathode base.

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