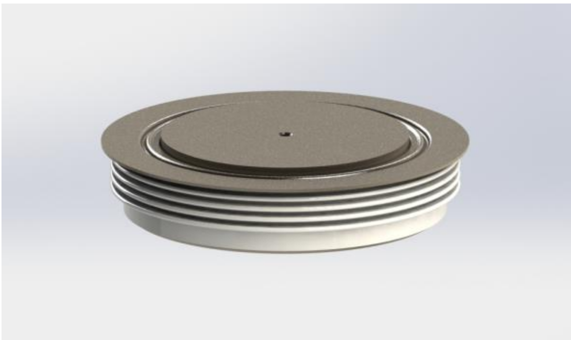
W6672T#320 & W6672T#350
Rectifier Diode



Product Summary

Characteristic	Value	Unit
V_{RRM}	3200-3500	V
$I_{F(AV)M}$ (T_{SINK} = 55 °C)	6672	A
I_{FSM}	73.0	kA
$R_{th,JK}$ DSC	0.008	K/W

Agency Approvals & Environmental

Environmental Approvals
RoHS

Component Symbol

Features

- Low conduction losses
- High temperature alloyed die construction
- Low thermal impedance
- Available in 26mm and 35mm package heights
- High power cycling capability

Applications

- Line frequency applications up to 400Hz
- Traction converters
- Trackside substations
- DC Power supplies
- Input rectifiers for Variable speed drives

Benefits

- High over-load capacity
- High power density

1. Maximum Ratings

Voltage Ratings	Symbol	Value	Unit
Repetitive Peak Reverse Voltage (1)	V_{RRM}	3200-3500	V
Non-repetitive Peak Reverse Voltage (1)	V_{RSM}	3300-3600	V

Ratings	Symbol	Value	Unit
Maximum Average Forward Current, T_{SINK} = 55 °C (2)	$I_{F(AV)M}$	6672	A
Maximum Average Forward Current, T_{SINK} = 100 °C (2)	$I_{F(AV)M}$	4612	A
Maximum Average Forward Current, T_{SINK} = 100 °C (3)	$I_{F(AV)M}$	2384	A
Nominal RMS Forward Current, T_{SINK} = 25 °C (2)	$I_{F(RMS)M}$	12288	A
D.C. Forward Current, T_{SINK} = 25 °C (4)	$I_{F(DC)}$	10682	A
Peak Non-repetitive Surge, t_p = 10 ms, Vrm = 60% VRRM (5)	I_{FSM}	65.7	kA
Peak Non-repetitive Surge, t_p = 10 ms, $V_{RM} \leq 10$ V (5)	I_{FSM2}	73.0	kA
I2t capacity for Fusing, t_p = 10 ms, V_{RM} = 60% V_{RRM} (5)	I^2t	21.58×10^6	A^2s
I2t capacity for Fusing, t_p = 10 ms, $V_{RM} \leq 10$ V (5)	I^2t	26.65×10^6	A^2s
Operating Temperature range	$T_{J,OP}$	-40 to +160	°C
Storage Temperature Range	T_{STG}	-55 to +160	°C

Footnote 1: De-rating factor of 0.13% per °C is applicable for T_J below 25 °C

Footnote 2: Double side cooled, single phase; 50 Hz, 180° half-sinewave

Footnote 3: Cathode side cooled, single phase; 50 Hz, 180° half-sinewave

Footnote 4: Double side cooled

Footnote 5: Half-sinewave, 160 °C T_J initial

2. Characteristics

Characteristic	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Maximum Peak Forward Voltage	V_{FM}	I_{FM} = 5000 A	-	-	1.18	V
		I_{FM} = 8000 A	-	-	1.37	
Threshold Voltage	V_0	-	-	-	0.864	V
Slope Resistance	r_S	-	-	-	0.067	mΩ
Peak Reverse Current	I_{RRM}	Rated V_{RRM}	-	-	100	mA
Recovered Charge	Q_{rr}	I_{TM} = 4000 A, t_p = 1000 µs, di/dt = 10 A/µs, V_r = 100 V	-	9500	-	µC
Recovered Charge, 50% Chord	Q_{ra}		-	7200	7900	µC
Reverse Recovery Current	I_{rm}		-	280	-	A
Reverse Recovery Time, 50% Chord	t_{rr}		-	52	-	µs
Thermal Resistance, Junction to Heatsink	$R_{th,JK}$	Double Side Cooled	-	-	0.008	K/W
		Anode Side Cooled	-	-	0.013	
		Cathode Side Cooled	-	-	0.020	
Mounting Force	F	For other clamp forces, please consult factory	60	-	70	kN
Weight	W_t	-	-	1.2	-	kg

Note: Unless otherwise indicated, T_J = 160 °C

3. Notes on Ratings and Characteristics

3.1. Voltage Grade Table

Voltage Grade	V_{RRM} (V)	V_{RSM} (V)	V_R (V_{DC})
32	3200	3300	1750
35	3500	3600	1900

3.2. Extension of Voltage Grades

This report is applicable to other voltage grades when supply has been agreed by Sales/Production.

3.3. De-rating Factor

A blocking voltage de-rating factor of 0.13%/°C is applicable to this device for T_J below 25 °C.

3.4. 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.

3.5. Computer Modelling Parameters

3.5.1. Device Dissipation Calculations

$$I_{AV} = \frac{-V_0 + \sqrt{{V_0}^2 + 4 \cdot ff^2 \cdot r_s \cdot W_{AV}}}{2 \cdot ff^2 \cdot r_s}$$

and

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

$$\Delta T = T_{J,Max} - T_K$$

Where:

- V_0 = 0.864 V
- r_S = 0.067 mΩ
- R_{th} = Supplementary thermal impedance, see Table 1 below
- ff = Form factor, see Table 2 below

Supplementary Thermal Impedance				
Conduction Angle	6 Phase (60°)	3 Phase (120°)	½ Phase (180°)	DC
Square Wave Double Side Cooled	0.00866	0.00847	0.00832	0.00800
Square Wave Cathode Side Cooled	0.02118	0.02101	0.02086	0.02000
Sine Wave Double Side Cooled	0.00855	0.00837	0.00813	-
Sine Wave Cathode Side Cooled	0.02108	0.02091	0.02068	-

Table 1. Supplementary Thermal Impedance Values

Form Factors				
Conduction Angle	6 Phase (60°)	3 Phase (120°)	½ Phase (180°)	DC
Square Wave	2.449	1.732	1.414	1
Sine Wave	2.778	1.879	1.57	-

Table 2. Form Factor Values

3.6. Calculating V_F using ABCD Coefficients

The on-state characteristic I_F vs. V_F, on page 7 are represented in two ways:

- The well-established V_0 and r_S tangent used for rating purposes
- A set of constants A, B, C, D, forming the coefficients of the representative equation for VF in terms of IF 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		160 °C Coefficients	
A	0.7063900	A	0.39067
B	0.01555266	B	0.033410
C	2.926184×10^{-5}	C	4.7250×10^{-5}
D	3.197501×10^{-3}	D	3.8157×10^{-3}

3.7. DC 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 show in the tables below:

D.C. Double Side Cooled				
Term	1	2	3	4
r_p	3.81150×10^{-3}	1.89558×10^{-3}	1.71360×10^{-3}	5.24282×10^{-3}
τ_p	1.01434	0.34872	0.08992	0.01065

Table 3. Coefficient Values for D.C. Double Side Cooled

D.C. Cathode Side Cooled			
Term	1	2	3
r_p	0.01653	3.37618×10^{-3}	5.93598×10^{-4}
τ_p	5.31595	0.15120	0.01207

Table 4. Coefficient Values for D.C. Cathode Side Cooled

3.8. Reverse Recovery Ratings

- Q_{ra} is based on 50% I_{rm} chord as shown in Diagram 1

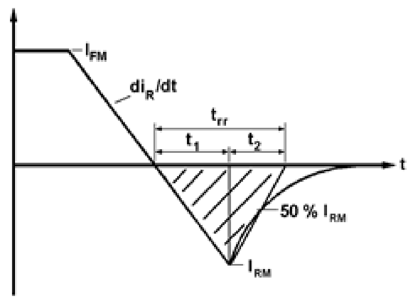


Diagram 1. Reverse Recovery Waveform Example

- Q_{rr} is based on a 150 µs integration time. I.e.: $Q_{rr} = \int_0^{150\ \mu s} i_{rr} \cdot dt$
- $K\ Factor\ = \frac{t_1}{t_2}$

4. Performance Curves

Figure 1. Forward Characteristics of Limit Device

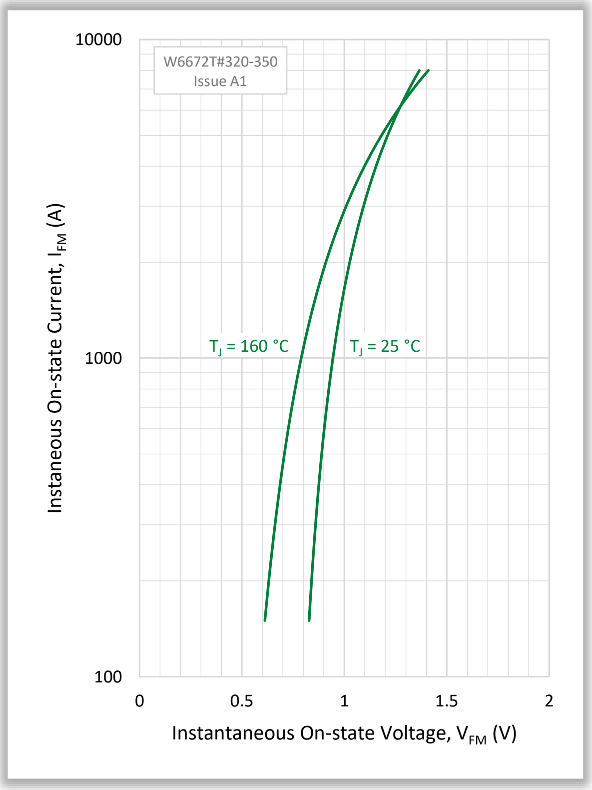


Figure 2. Transient Thermal Impedance

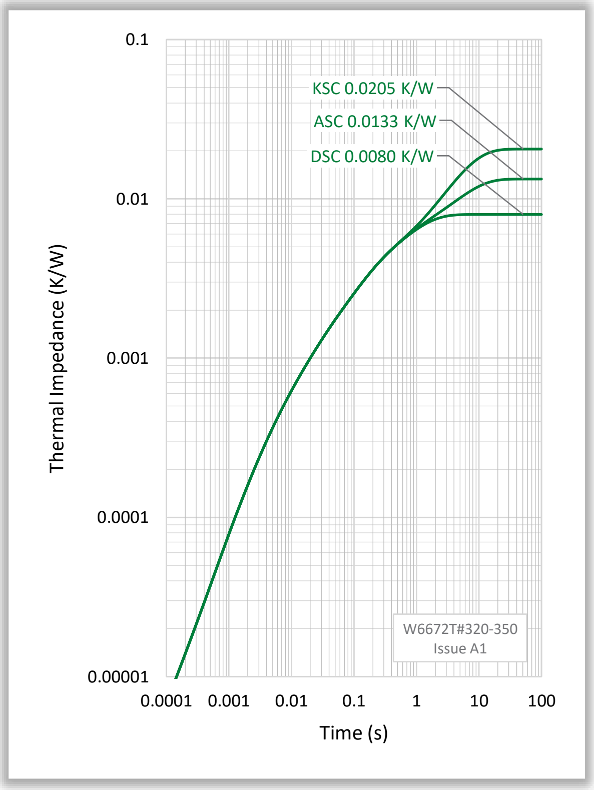


Figure 3. Total Recovered Charge, Q_{rr}

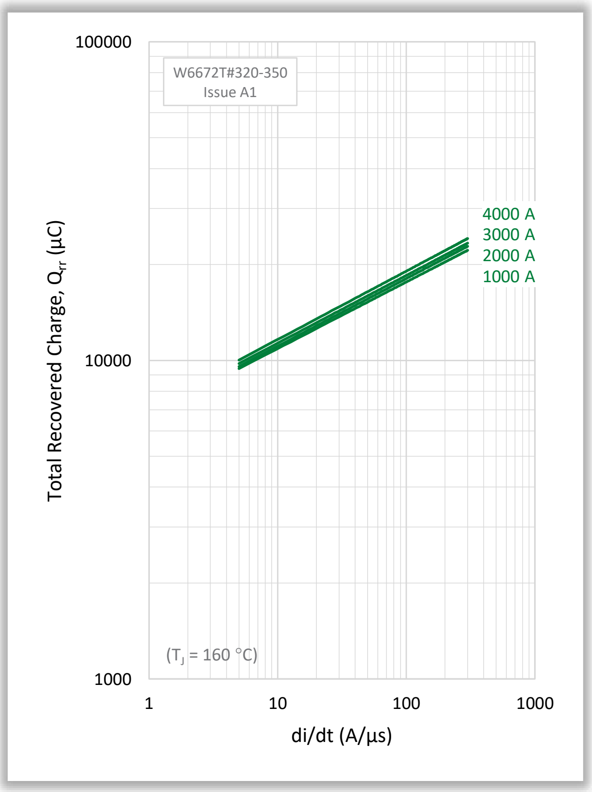


Figure 4. Recovered Charge, Q_{ra} (50% Chord)

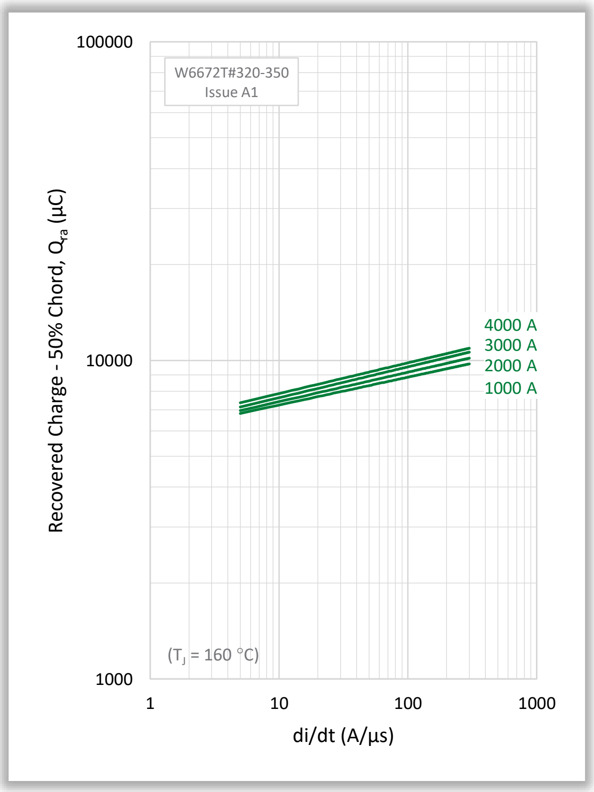


Figure 5. Peak Reverse Recovery Current, I_{rm}

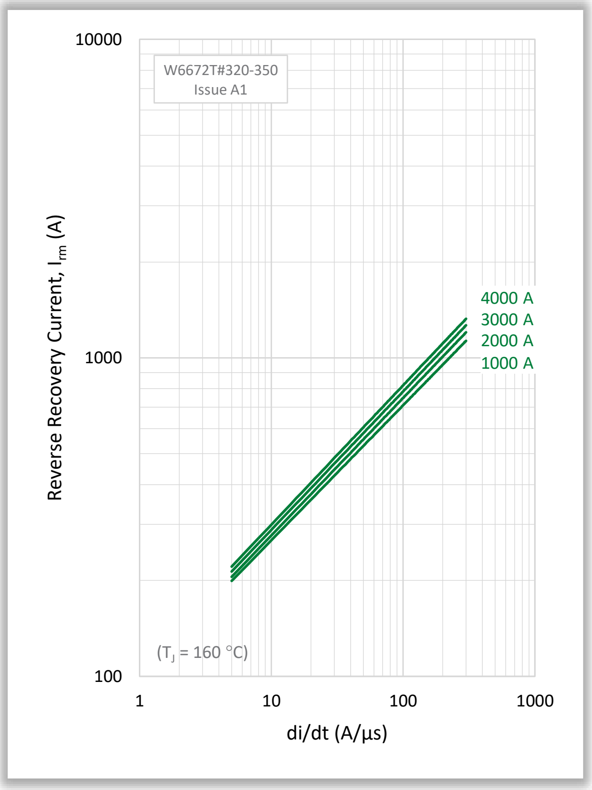


Figure 6. Maximum Recovery Time, t_{rr} (50% Chord)

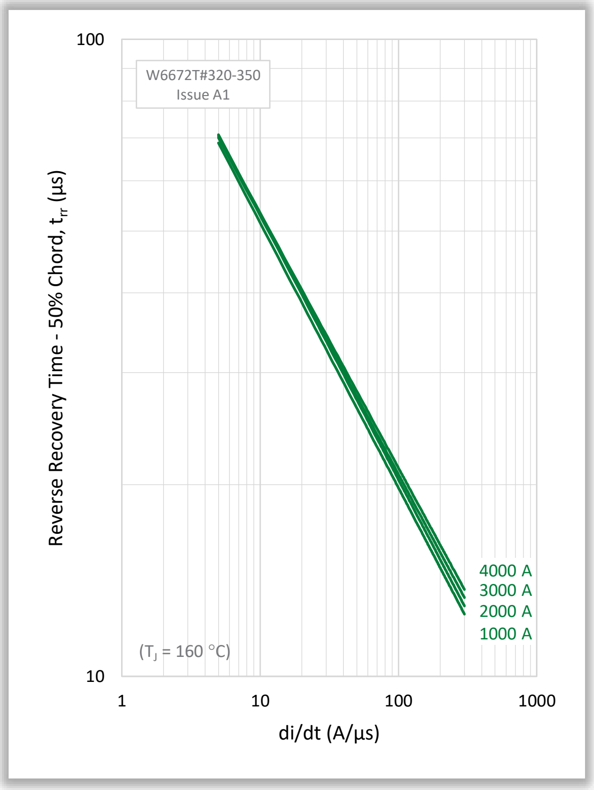


Figure 7. Forward Current vs. Power Dissipation (Double Side Cooled)

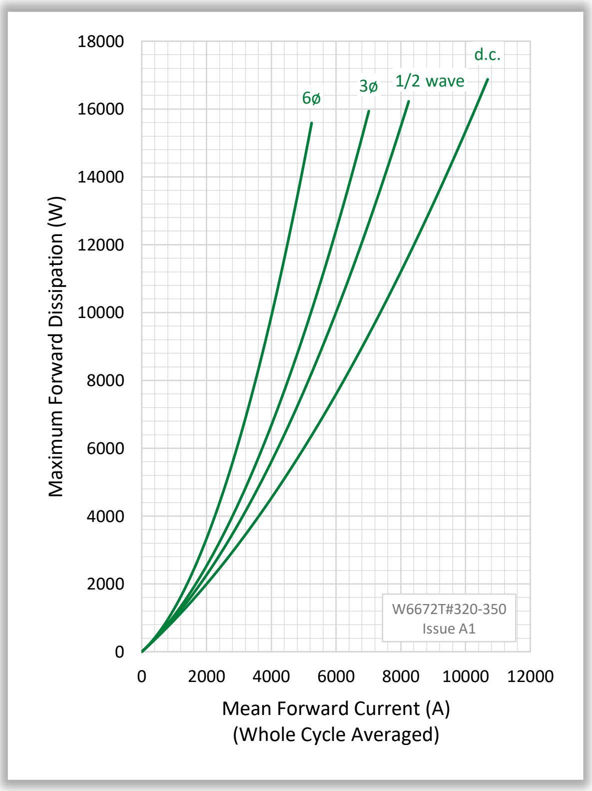


Figure 8. Forward Current vs. Heat Sink Temperature (Double Side Cooled)

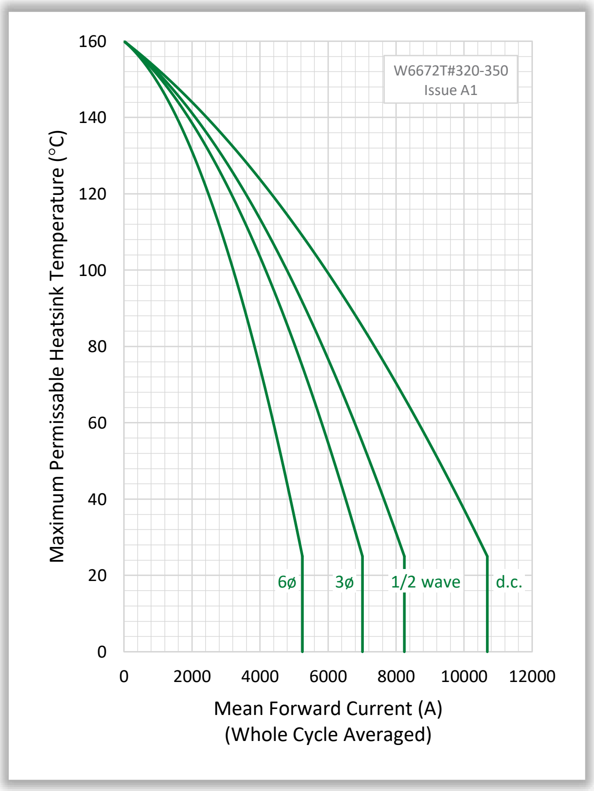


Figure 9. Forward Current vs. Power Dissipation (Cathode Side Cooled)

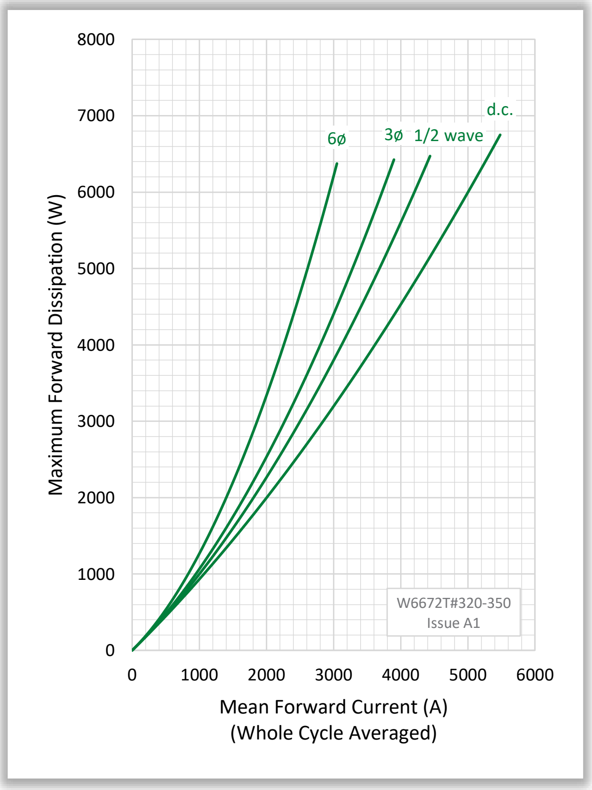


Figure 10. Forward Current vs. Heatsink Temperature (Cathode Side Cooled)

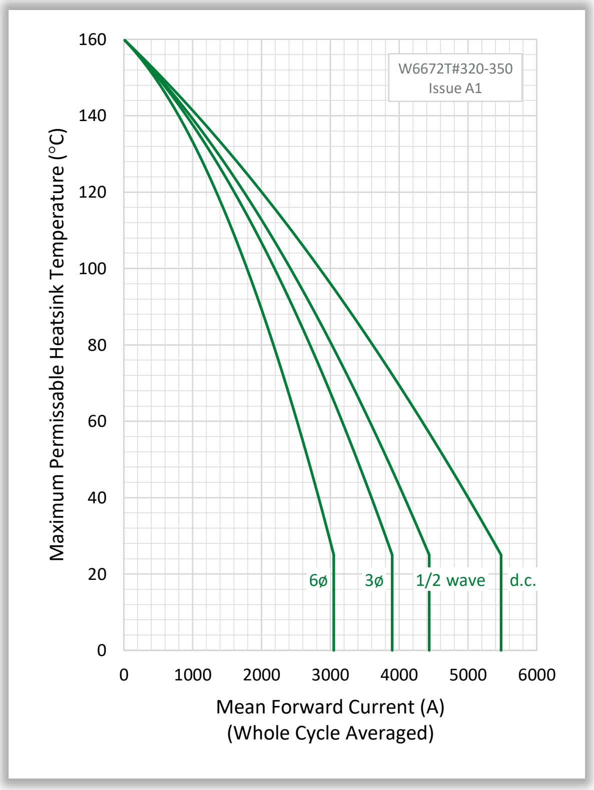


Figure 11. Maximum Surge Current