

High power cycling capability
 Low on-state and switching losses
 Optimized for line frequency rectifiers
 Designed for traction and industrial applications

Rectifier Diode Type D123-500-18

Average forward current		I_{FAV}		500 A				
Repetitive peak reverse voltage		V_{RRM}		1000 ÷ 1800 V				
V_{RRM}, V	1000	1100	1200	1300	1400	1500	1600	1800
Voltage code	10	11	12	13	14	15	16	18
$T_j, ^\circ C$	-60 ÷ 190							

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions
ON-STATE				
I_{FAV}	Average forward current	A	500 720	$T_c=137\text{ }^\circ C$; Double side cooled; $T_c=100\text{ }^\circ C$; Double side cooled; 180° half-sine wave; 50 Hz
I_{FRMS}	RMS forward current	A	785	$T_c=137\text{ }^\circ C$; Double side cooled; 180° half-sine wave; 50 Hz
I_{FSM}	Surge forward current	kA	7.5 8.6	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^\circ C$ 180° half-sine wave; 50 Hz ($t_p=10\text{ ms}$); single pulse; $V_R=0\text{ V}$;
			8.0 9.2	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^\circ C$ 180° half-sine wave; 60 Hz ($t_p=8.3\text{ ms}$); single pulse; $V_R=0\text{ V}$;
I^2t	Safety factor	$A^2s \cdot 10^3$	280 365	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^\circ C$ 180° half-sine wave; 50 Hz ($t_p=10\text{ ms}$); single pulse; $V_R=0\text{ V}$;
			265 350	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^\circ C$ 180° half-sine wave; 60 Hz ($t_p=8.3\text{ ms}$); single pulse; $V_R=0\text{ V}$;
BLOCKING				
V_{RRM}	Repetitive peak reverse voltages	V	1000 ÷ 1800	$T_{j\text{ min}} < T_j < T_{j\text{ max}}$; 180° half-sine wave; 50 Hz;
V_{RSM}	Non-repetitive peak reverse voltages	V	1100 ÷ 1900	$T_{j\text{ min}} < T_j < T_{j\text{ max}}$; 180° half-sine wave; 50 Hz; single pulse;
V_R	Reverse continuous voltages	V	$0.75 \cdot V_{RRM}$	$T_j = T_{j\text{ max}}$;
THERMAL				
T_{stg}	Storage temperature	$^\circ C$	-60 ÷ 50	
T_j	Operating junction temperature	$^\circ C$	-60 ÷ 190	
MECHANICAL				
F	Mounting force	kN	5.0 ÷ 7.0	
a	Acceleration	m/s^2	50	Device unclamped
			100	Device clamped

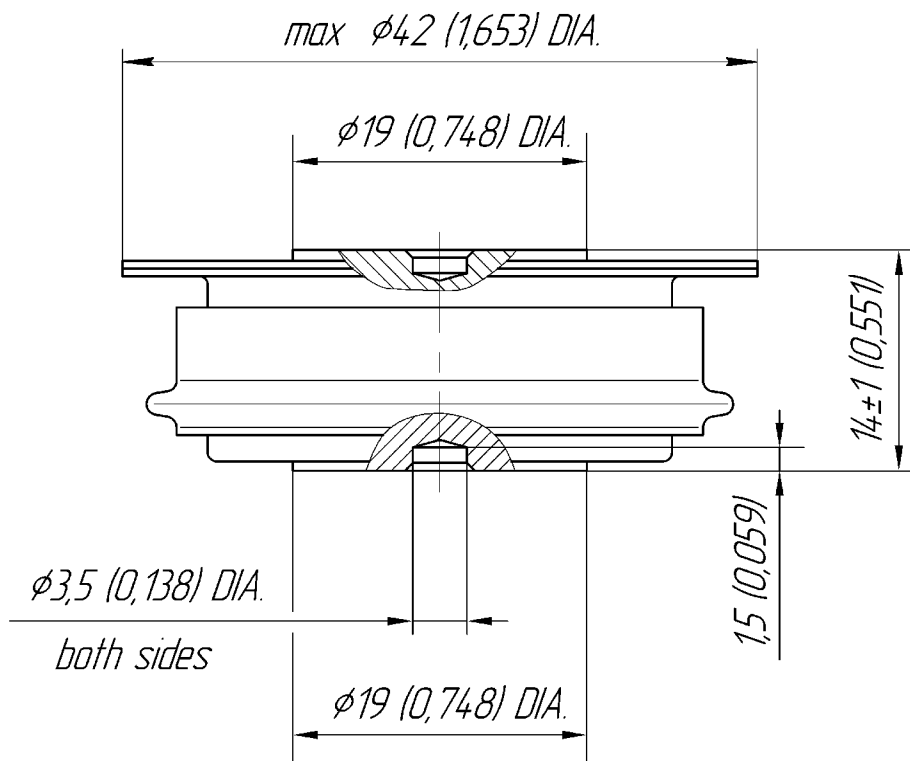
CHARACTERISTICS

Symbols and parameters		Units	Values	Conditions	
ON-STATE					
V_{FM}	Peak forward voltage, max	V	1.55	$T_j=25\text{ }^\circ\text{C}; I_{FM}=1570\text{ A}$	
$V_{F(TO)}$	Forward threshold voltage, max	V	0.90	$T_j=T_{j\text{ max}};$	
r_T	Forward slope resistance, max	m Ω	0.500	$0.5\pi I_{FAV} < I_T < 1.5\pi I_{FAV}$	
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	35	$T_j=T_{j\text{ max}};$ $V_R=V_{RRM}$	
THERMAL					
R_{thjc}	Thermal resistance, junction to case, max	$^\circ\text{C/W}$	0.070	Direct current	Double side cooled
R_{thjc-A}			0.154		Anode side cooled
R_{thjc-K}			0.126		Cathode side cooled
R_{thck}	Thermal resistance, case to heatsink, max	$^\circ\text{C/W}$	0.010	Direct current	
MECHANICAL					
w	Weight, typ	g	65		
D_s	Surface creepage distance	mm (inch)	11.74 (0.462)		
D_a	Air strike distance	mm (inch)	11.60 (0.457)		

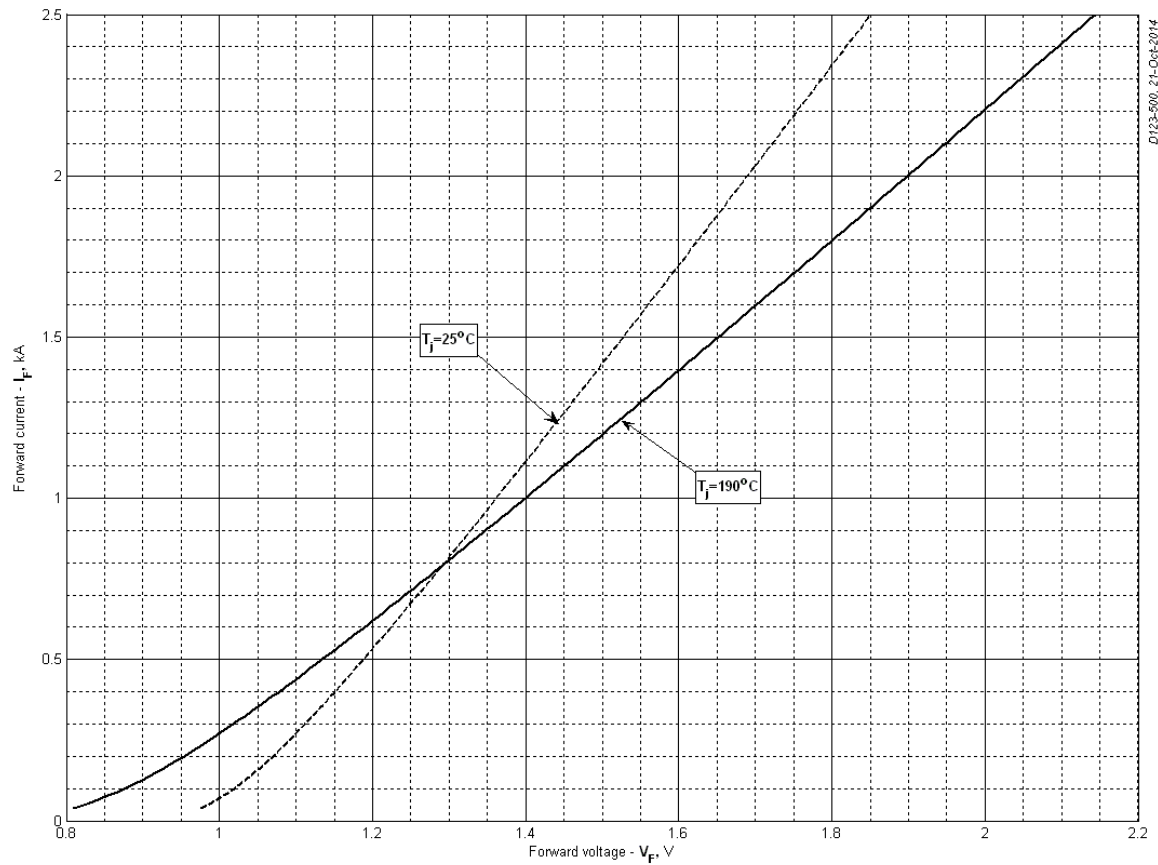
PART NUMBERING GUIDE

D	123	500	18	N
1	2	3	4	5

1. D — Rectifier Diode
2. Design version
3. Average forward current, A
4. Voltage code
5. Ambient conditions: N – normal; T – tropical



All dimensions in millimeters (inches)



D123-500, 21-Oct-2014

Fig 1 – Forward characteristics of Limit device

Analytical function for Forward characteristic:

$$V_F = A + B \cdot i_F + C \cdot \ln(i_F + 1) + D \cdot \sqrt{i_F}$$

	Coefficients for max curves	
	$T_J = 25^\circ\text{C}$	$T_J = T_{j,max}$
A	0.917612	0.719512
B	0.281488	0.427255
C	-0.174830	-0.271631
D	0.283733	0.440834

Forward characteristic model (see Fig. 1)

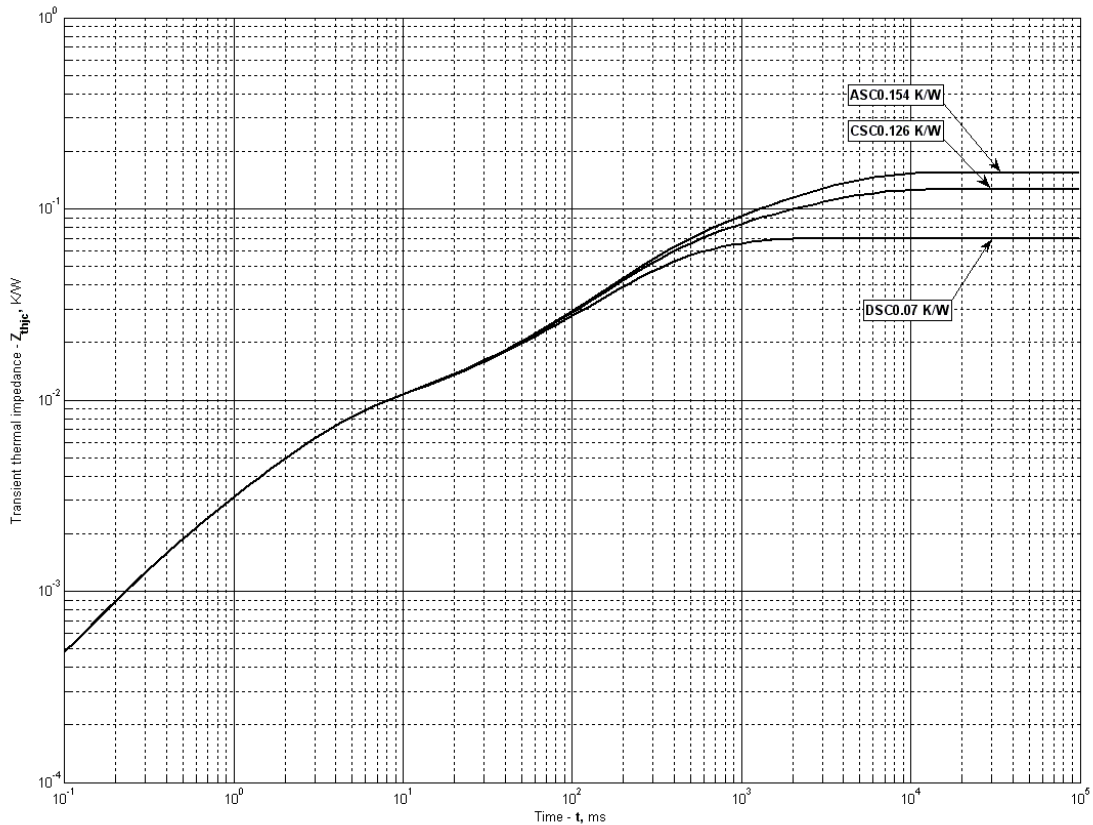


Fig 2 – Transient thermal impedance

Analytical function for Transient thermal impedance junction to case Z_{thjc} for DC:

$$Z_{thjc} = \sum_{i=1}^n R_i \left(1 - e^{-\frac{t}{\tau_i}} \right)$$

Where $i = 1$ to n , n is the number of terms in the series.

t = Duration of heating pulse in seconds.

Z_{thjc} = Thermal resistance at time t .

R_i = Amplitude of p_{th} term.

τ_i = Time constant of r_{th} term.

DC Double side cooled

i	1	2	3	4	5	6
R_i , K/W	0.03233	0.02226	0.005231	0.002739	0.006738	0.0006988
τ_i , S	0.2392	0.533	0.1478	0.01499	0.002749	0.0002969

DC Anode side cooled

i	1	2	3	4	5	6
R_i , K/W	0.08459	0.02327	0.002598	0.006598	0.0006736	0.03694
τ_i , S	2.653	0.5669	0.01311	0.00269	0.0002871	0.2416

DC Cathode side cooled

i	1	2	3	4	5	6
R_i , K/W	0.05654	0.03706	0.002638	0.006637	0.0006786	0.02303
τ_i , S	2.653	0.2338	0.01361	0.002704	0.000289	0.5476

Transient thermal impedance junction to case Z_{thjc} model (see Fig. 2)

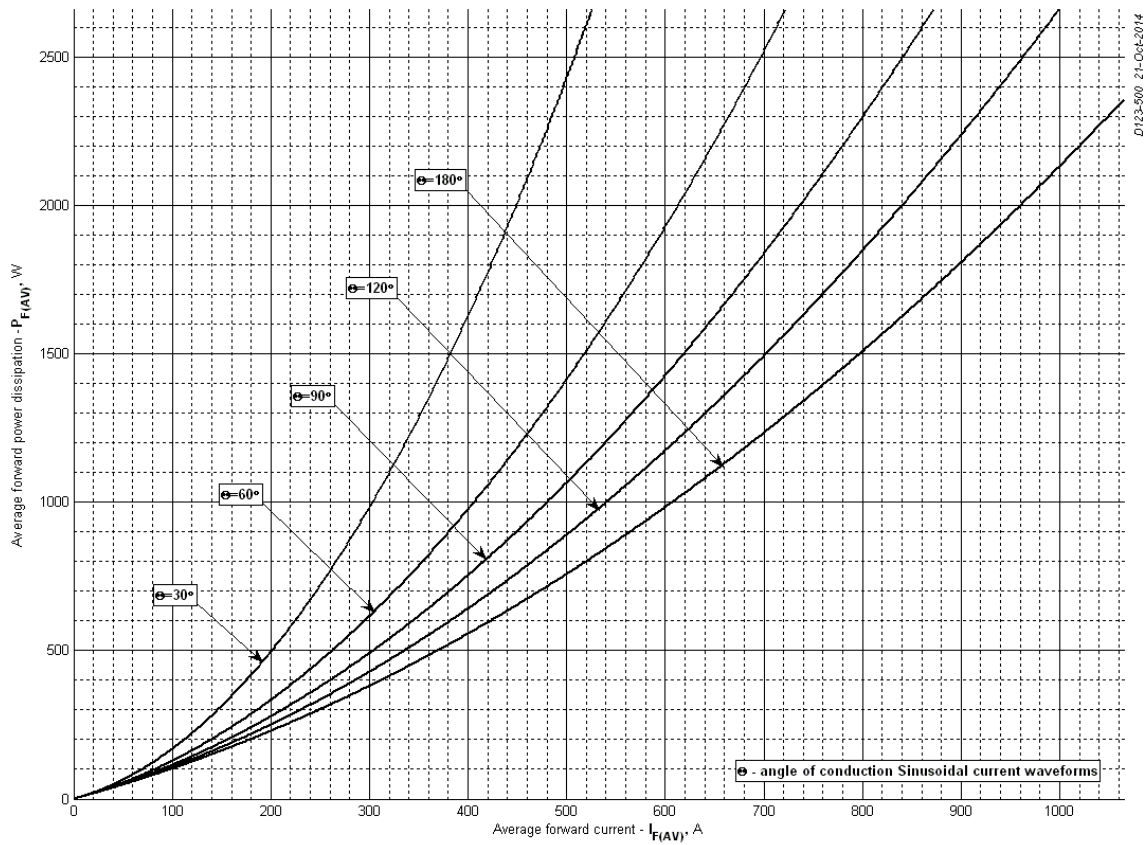


Fig 3 - Mean forward power dissipation P_{FAV} vs. Mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$, DSC)

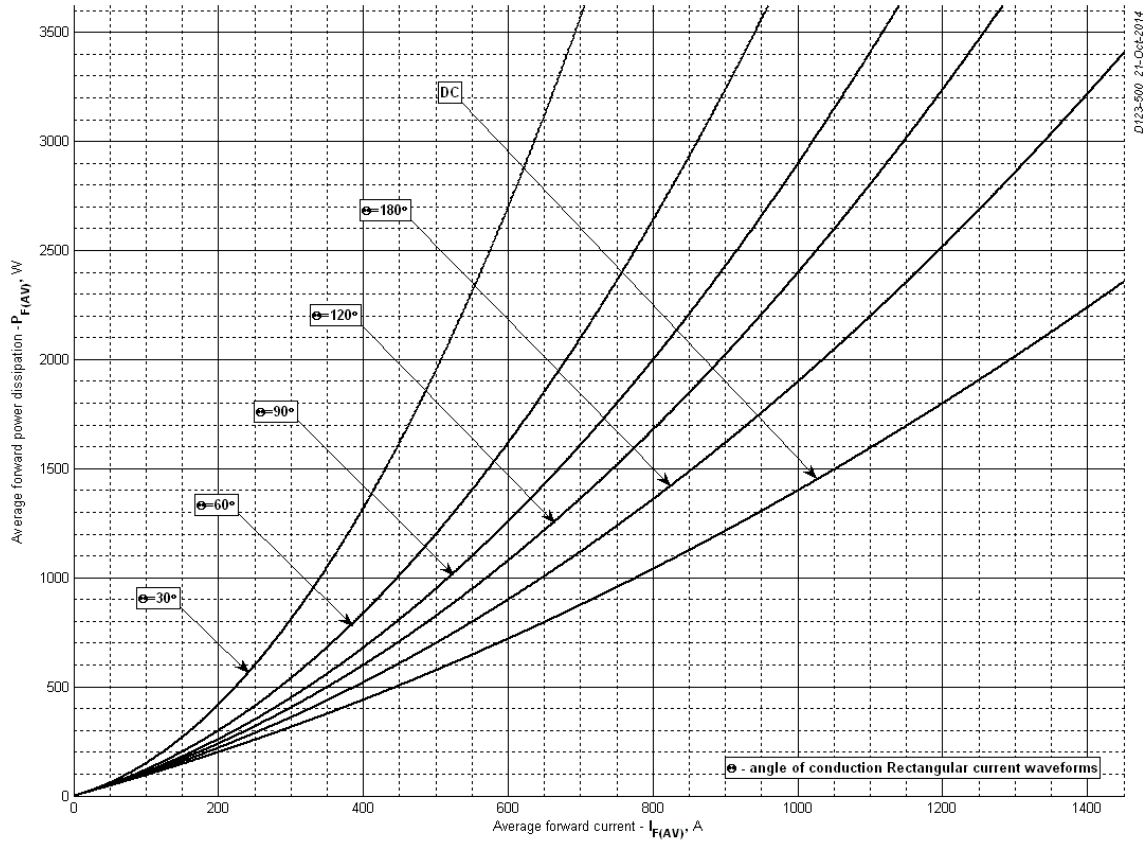


Fig 4 – Mean forward power dissipation P_{FAV} vs. Mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$, DSC)

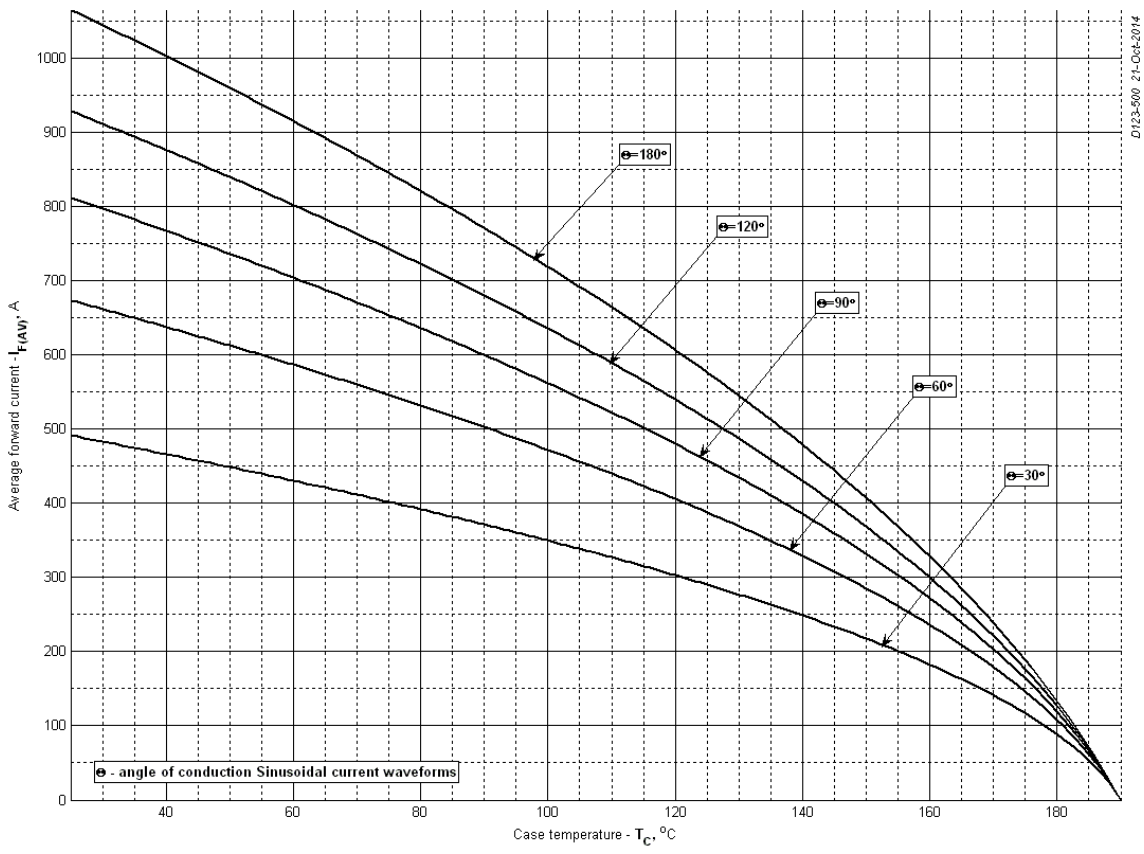


Fig 5 – Mean forward current I_{FAV} vs. Case temperature T_C for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$, DSC)

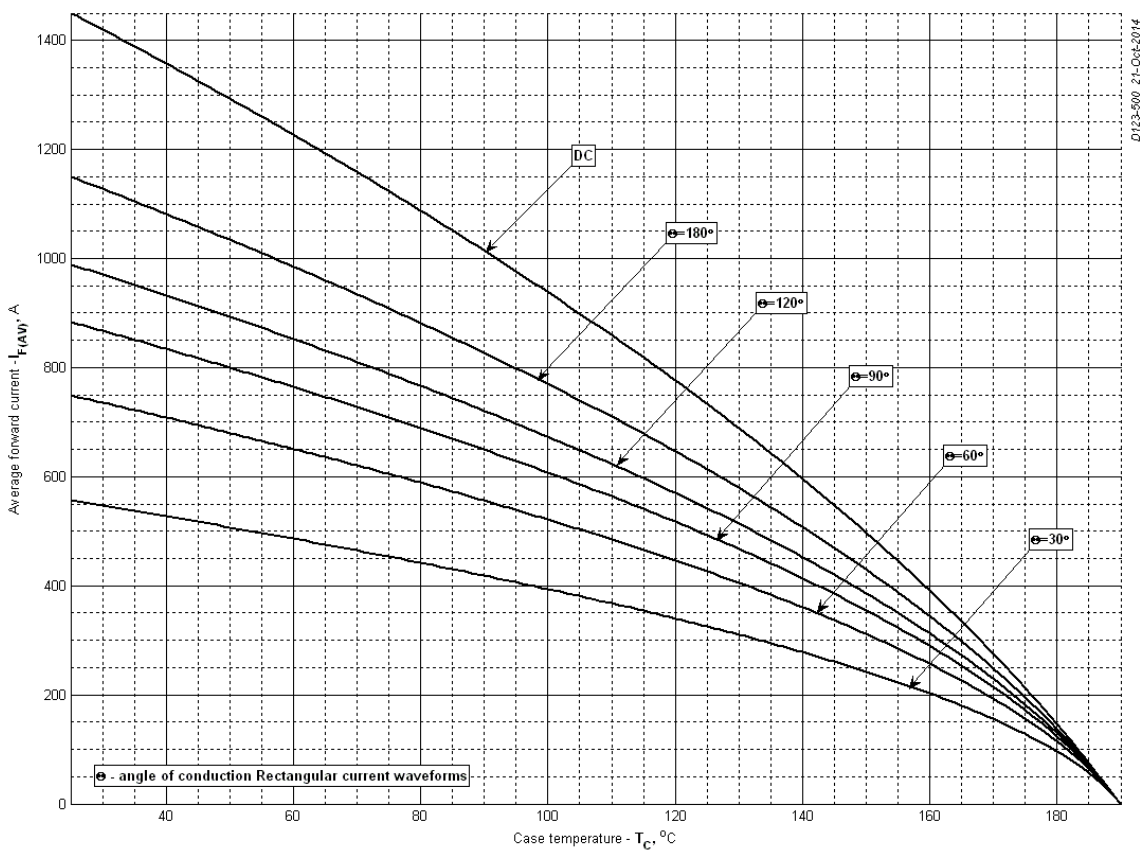


Fig 6 - Mean forward current I_{FAV} vs. Case temperature T_C for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$, DSC)

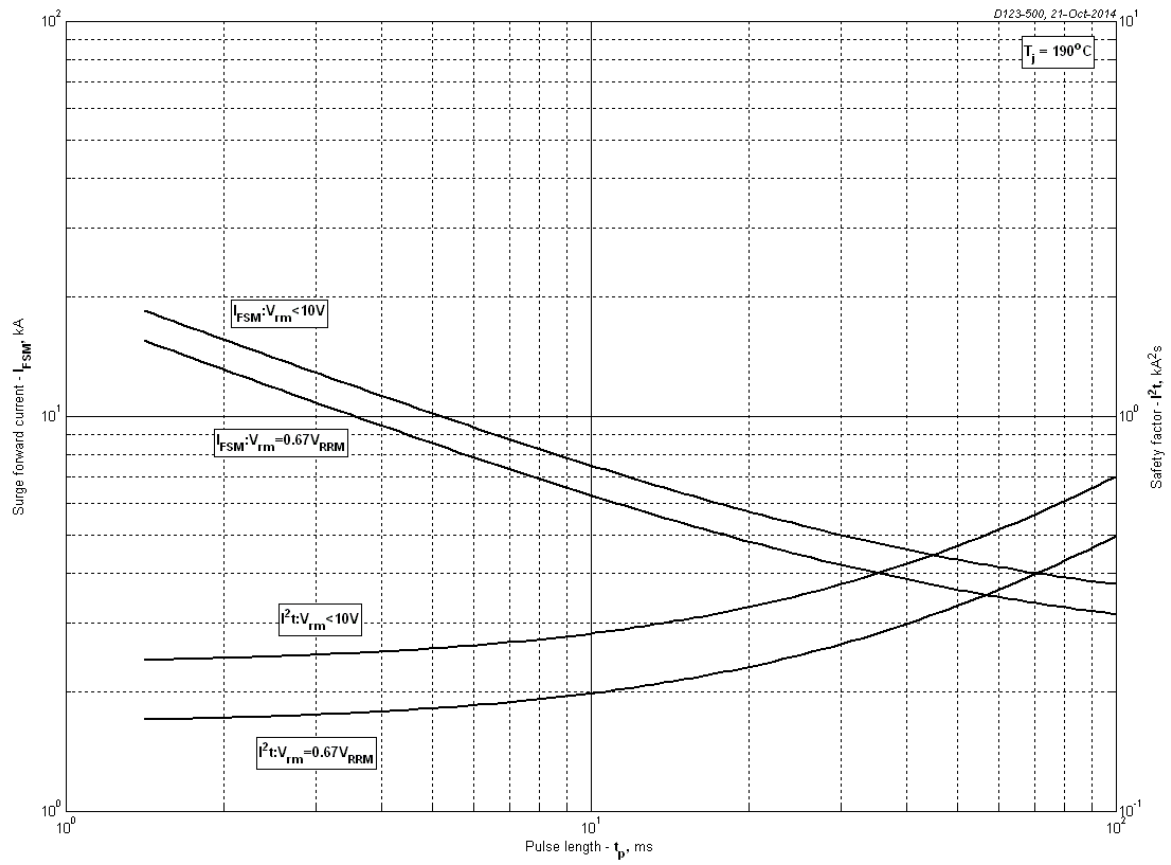


Fig 7 – Maximum surge and I^2t ratings

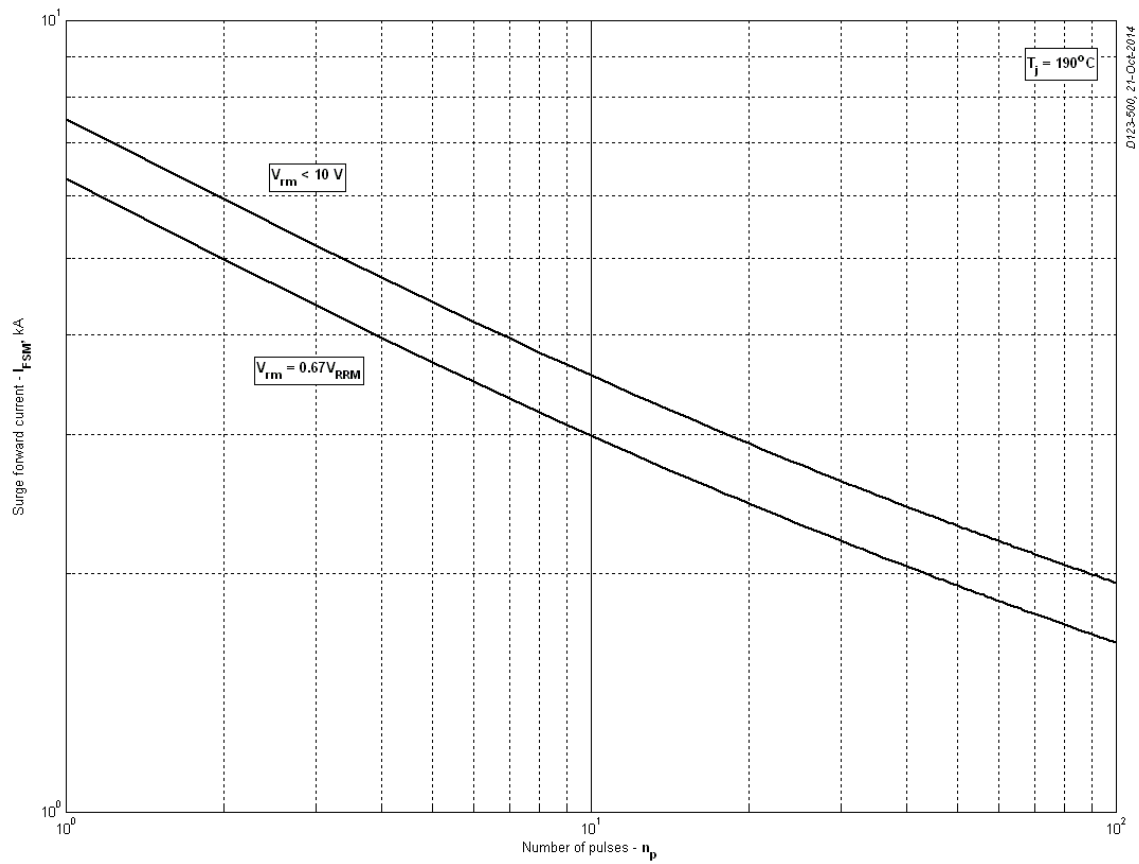


Fig 8 - Maximum surge ratings