ChunZheng

High-end Power Semiconductor Manufacturer

ZP2500A 4600-5000V

Standard Rectifier Diode

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

Average forward current	I_{FAV}	2500 A	
Repetitive peak reverse voltage	V_{RRM}	4600−5000 V	
V_{RRM}, V	4600	4800	5000
Voltage code	46	48	50
T_j, °C	-60 – 150		

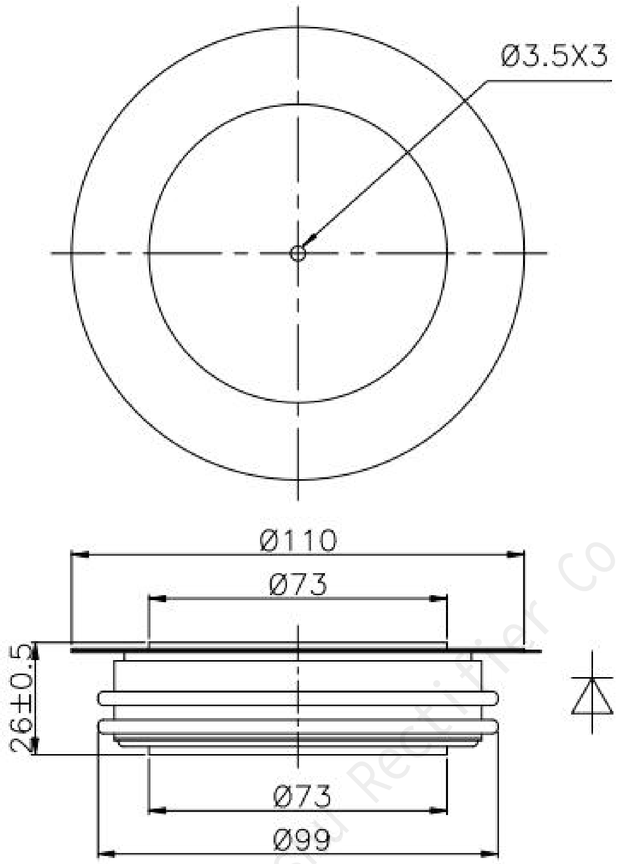
MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{FAV}	Average forward current	A	2500	T_c=100°C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	3925	T_c=112°C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	40.0 46.0	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; 50 Hz (t_p=10 ms); single pulse; V_R=0 V;
			42.0 48.0	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; 60 Hz (t_p=8.3 ms); single pulse; V_R=0 V;
I^2t	Safety factor	$A^2s\cdot10^3$	8000 10580	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; 50 Hz (t_p=10 ms); single pulse; V_R=0 V;
			7320 9560	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; 60 Hz (t_p=8.3 ms); single pulse; V_R=0 V;
BLOCKING					
V_{RRM}	Repetitive peak reverse voltages	V	4600–5000	$T_{j\ min}$< T_j <$T_{j\ max}$; 180° half-sine wave; 50 Hz;	
V_{RSM}	Non-repetitive peak reverse voltages	V	4700–5100	$T_{j\ min}$< T_j <$T_{j\ max}$; 180° half-sine wave; 50 Hz;single pulse;	
V_R	Reverse continuous voltages	V	0.75·V_{RRM}	T_j=$T_{j\ max}$;	
THERMAL					
T_{stg}	Storage temperature	°C	-60 – 150		
T_j	Operating junction temperature	°C	-60 – 150		
MECHANICAL					
F	Mounting force	kN	40.0 – 50.0		
a	Acceleration	m/s^2	50 100	Device unclamped Device clamped	

CHARACTERISTICS

Symbols and parameters		Units	Values	Conditions	
ON-STATE					
V_{FM}	Peak forward voltage, max	V	1.91	T_j=25 °C; I_{FM}=7850 A	
$V_{F(TO)}$	Forward threshold voltage, max	V	0.86	$T_j=T_{j\ max}$; $0.5\ \pi\ I_{FAV} < I_T < 1.5\ \pi\ I_{FAV}$	
r_T	Forward slope resistance, max	mΩ	0.170		
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	150	$T_j=T_{j\ max}$; $V_R=V_{RRM}$	
SWITCHING					
Q_{rr}	Total recovered charge, max	µC	9500	$T_j=T_{j\ max}$; I_{FM}=2000 A ; di_R/dt=-5 A/µs ; V_R=100 V;	
t_{rr}	Reverse recovery time, max	µs	100		
I_{rrM}	Peak reverse recovery current, max	A	190		
THERMAL					
R_{thjc}	Thermal resistance, junction to case, max	°C/W	0.0085	Direct current	Double side cooled
R_{thjc-A}			0.0187		Anode side cooled
R_{thjc-K}			0.0153		Cathode side cooled
R_{thck}	Thermal resistance, case to heatsink, max	°C/W	0.0020	Direct current	
MECHANICAL					
w	Weight, typ	g	1500		
D_s	Surface creepage distance	mm (inch)	41.40 (1.630)		
D_a	Air strike distance	mm (inch)	23.10 (0.909)		

OVERALL DIMENSIONS



ZT80

All dimensions in millimeters

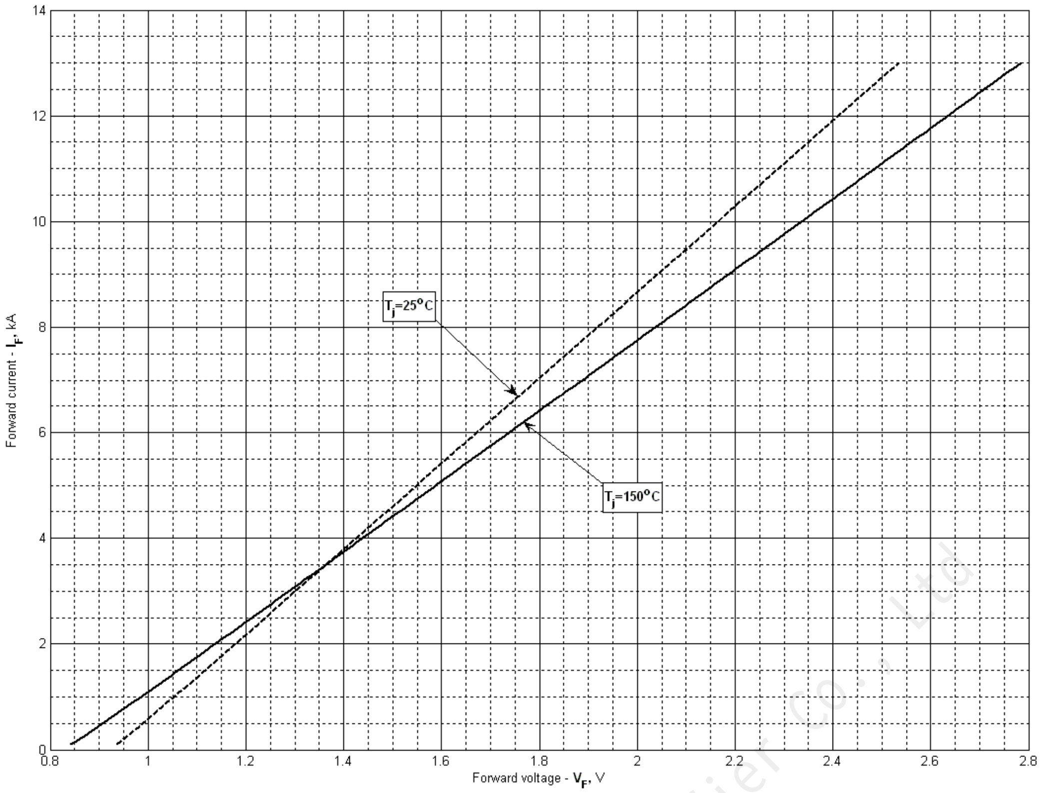


Fig 1 – Forward characteristics of Limit device

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°C	$T_j = T_{j\ max}$
A	0.915746	0.816156
B	0.119861	0.144828
C	-0.021205	-0.030099
D	0.032065	0.045516

Forward characteristic model (see Fig. 1).

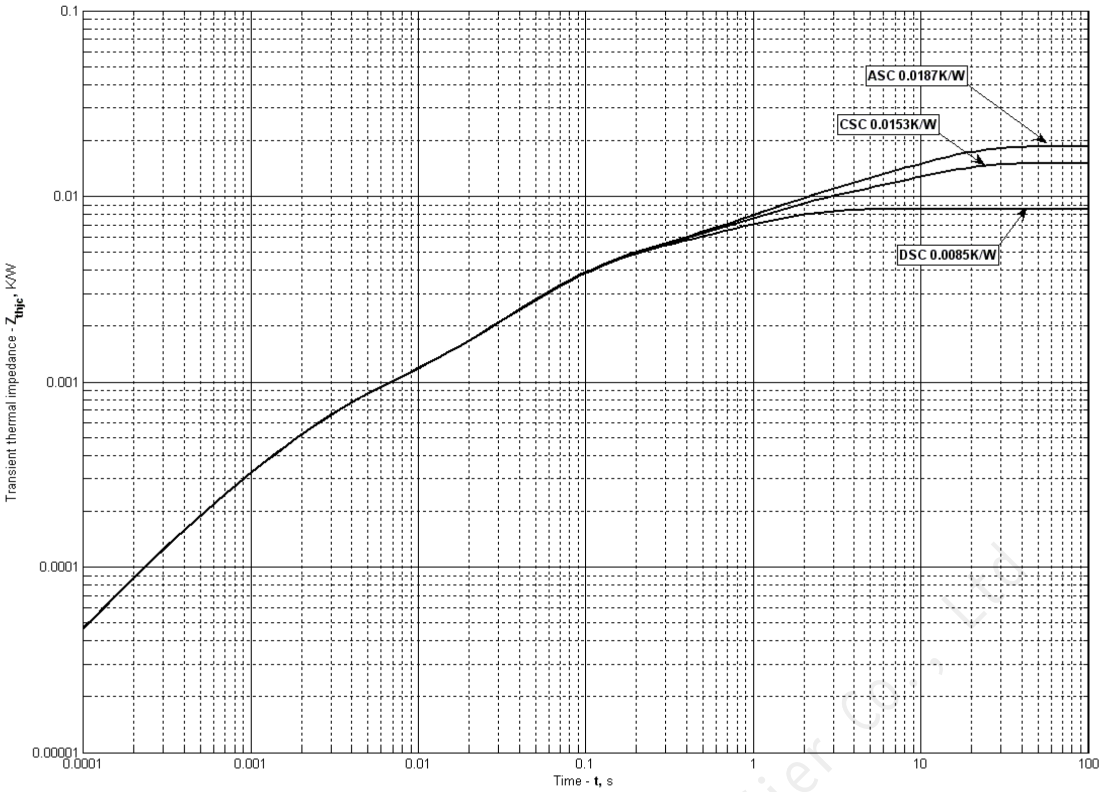


Fig 2 – Transient thermal impedance

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.

$\mathbf{Z_{thjc}}$ = Thermal resistance at time t.

$\mathbf{R_i}$ = Amplitude of p_{th} term.

$\boldsymbol{\tau_i}$ = Time constatnt of r_{th} term.

DC Double side cooled

i	1	2	3	4	5	6
R_i, K/W	0.00007989	0.002973	0.0005936	0.000846	0.00005975	0.003948
τ_i, s	1.688	0.06219	0.002329	0.138	0.0003243	0.9533

DC Cathode side cooled

i	1	2	3	4	5	6
R_i, K/W	0.006619	0.004034	0.0008595	0.002956	0.0005965	0.00005□89
τ_i, s	9.744	1.025	0.1394	0.06237	0.002318	0.0003037

DC Anode side cooled

i	1	2	3	4	5	6
R_i, K/W	0.01013	0.004062	0.0009401	0.002853	0.0005963	0.00005641
τ_i, s	9.747	1.058	0.1304	0.06179	0.002313	0.0003013

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

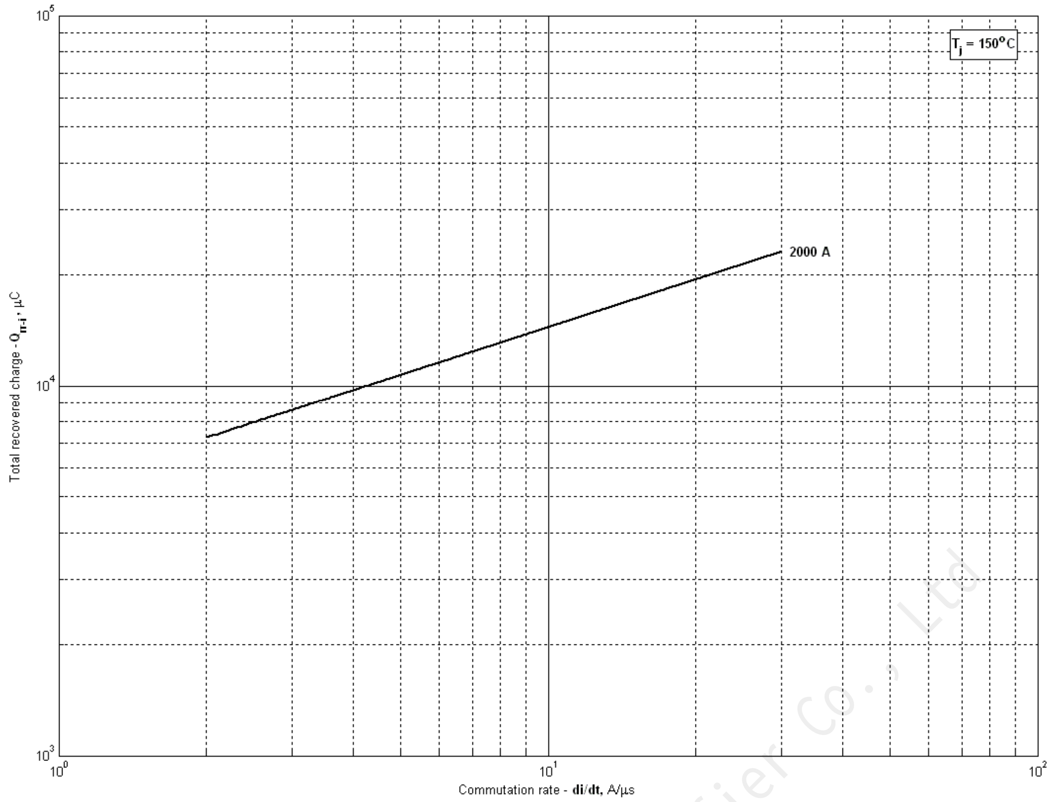


Fig 3 - Total recovered charge(integral), Q_{rr-i}

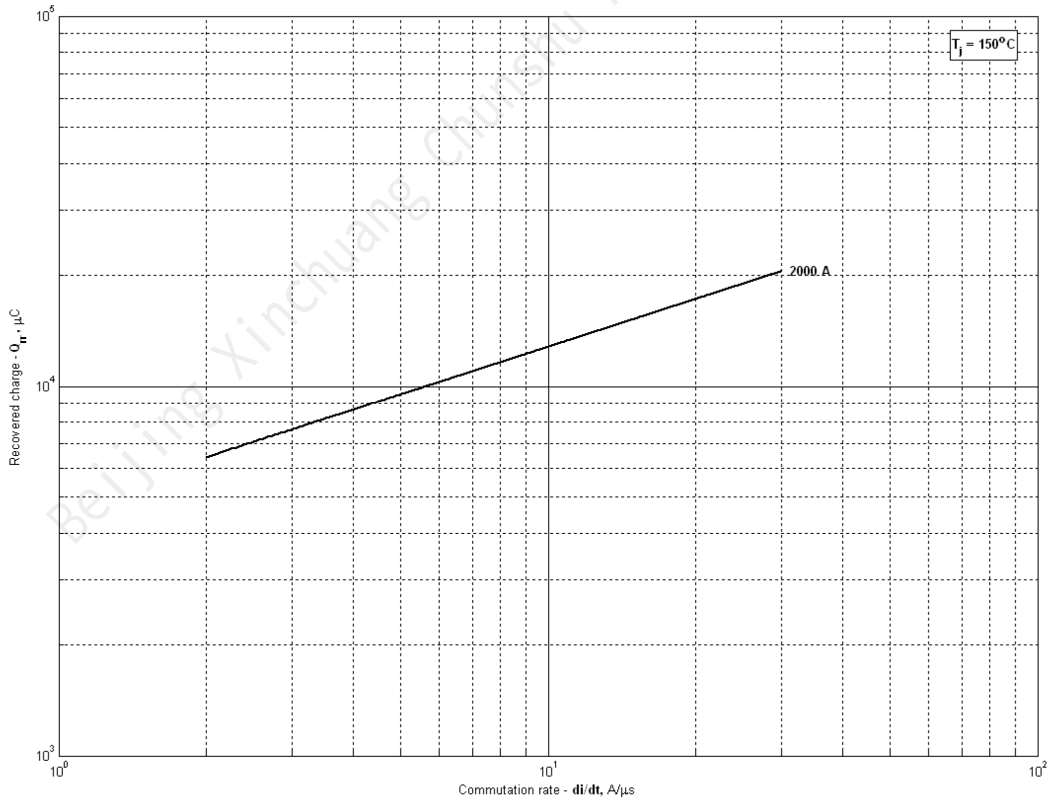


Fig 4 - Total recovered charge(50% chord), Q_{rr}

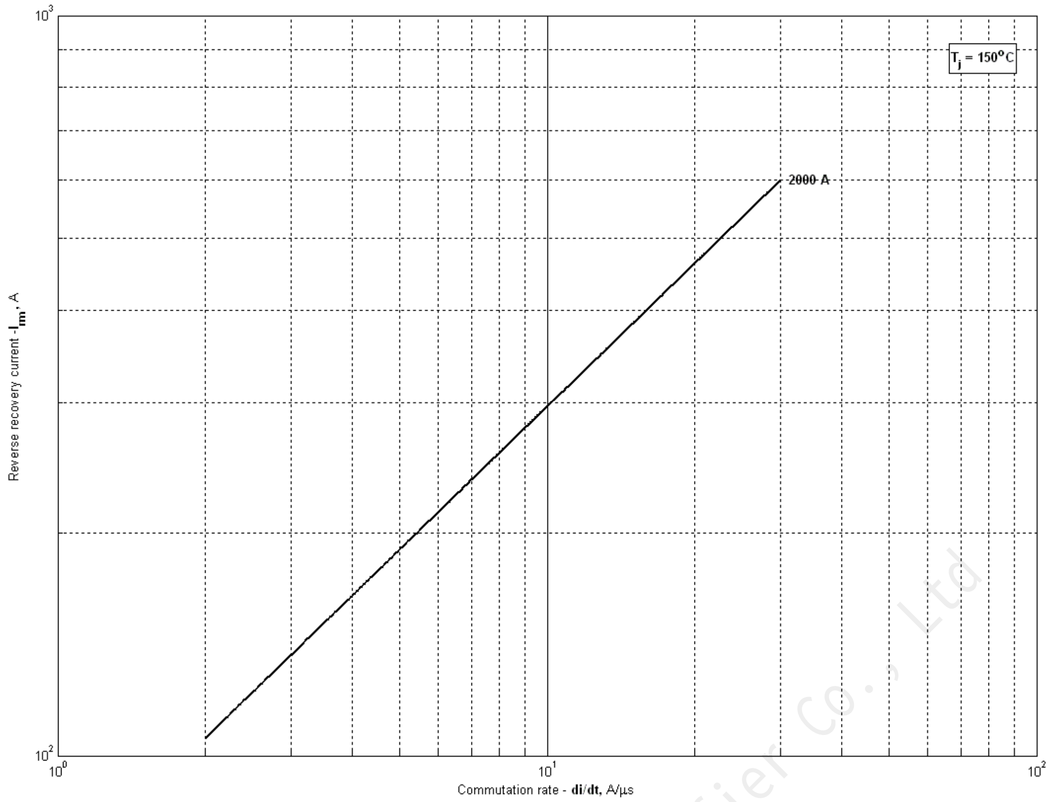


Fig 5 - Peak reverse recovery current, I_{rm}

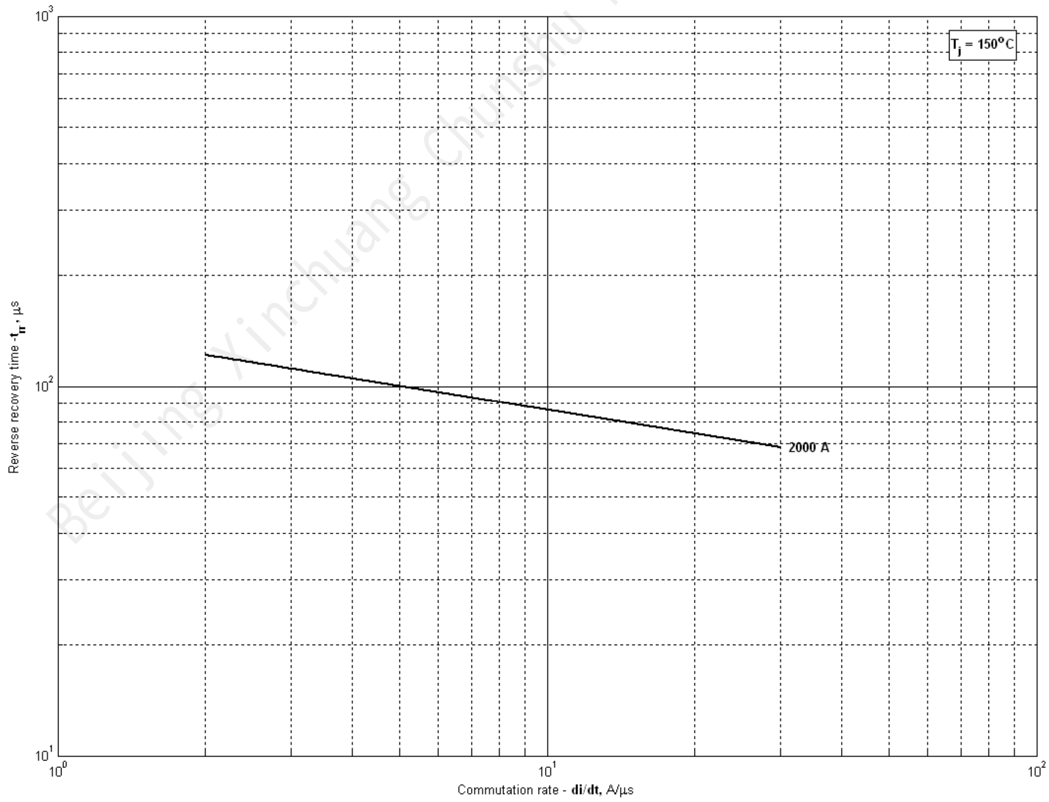


Fig 6 - Recovery time, t_{rr} (50% chord)

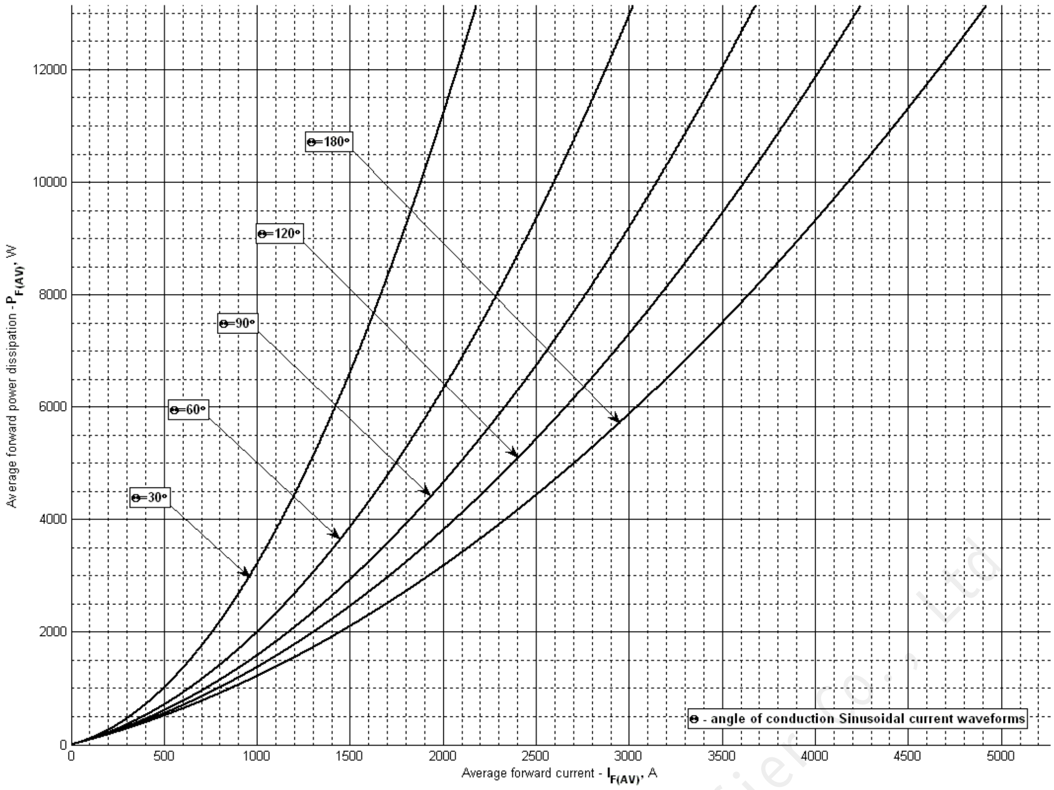


Fig 7 - Mean forward power dissipation P_{FAV} vs. Mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)

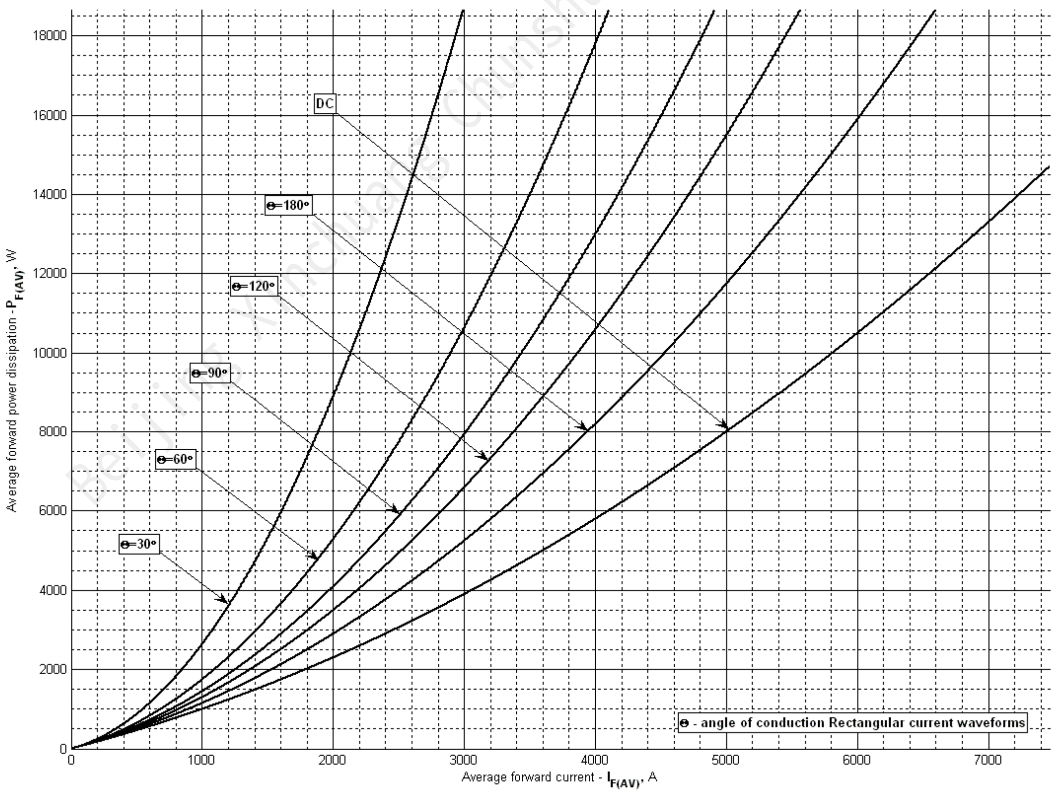


Fig 8 – Mean forward power dissipation P_{FAV} vs. Mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC (f=50Hz, DSC)

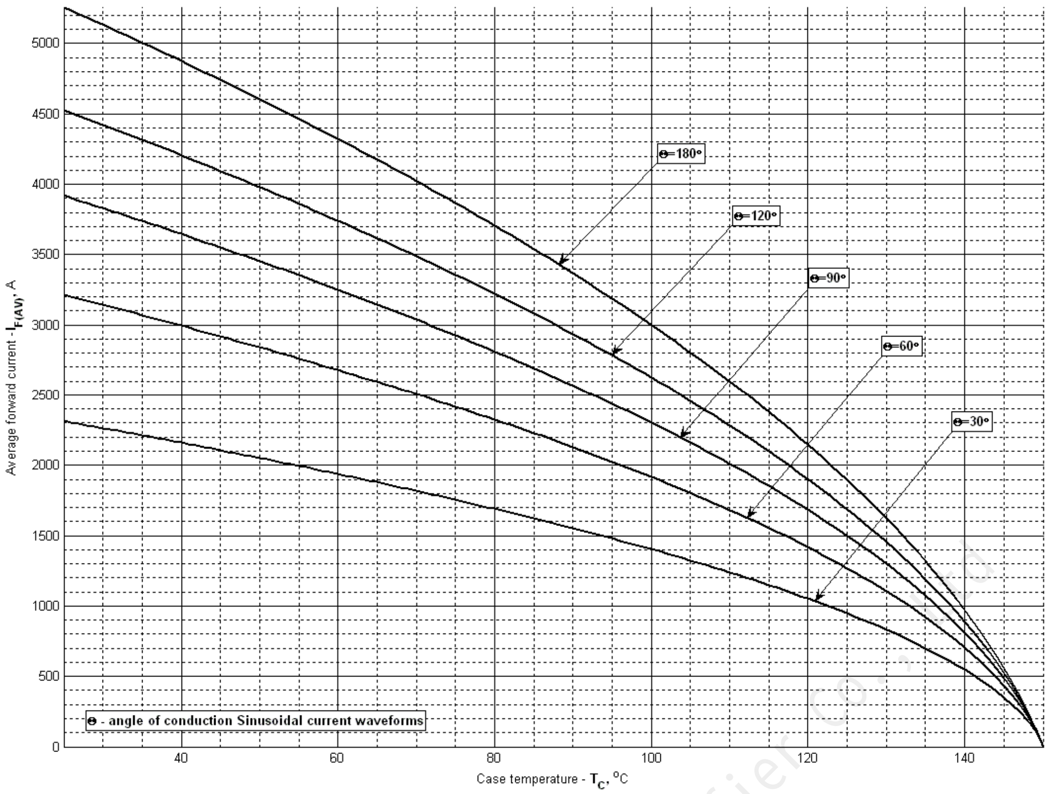


Fig 9 – Mean forward current I_{FAV} vs. Case temperature T_C for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)

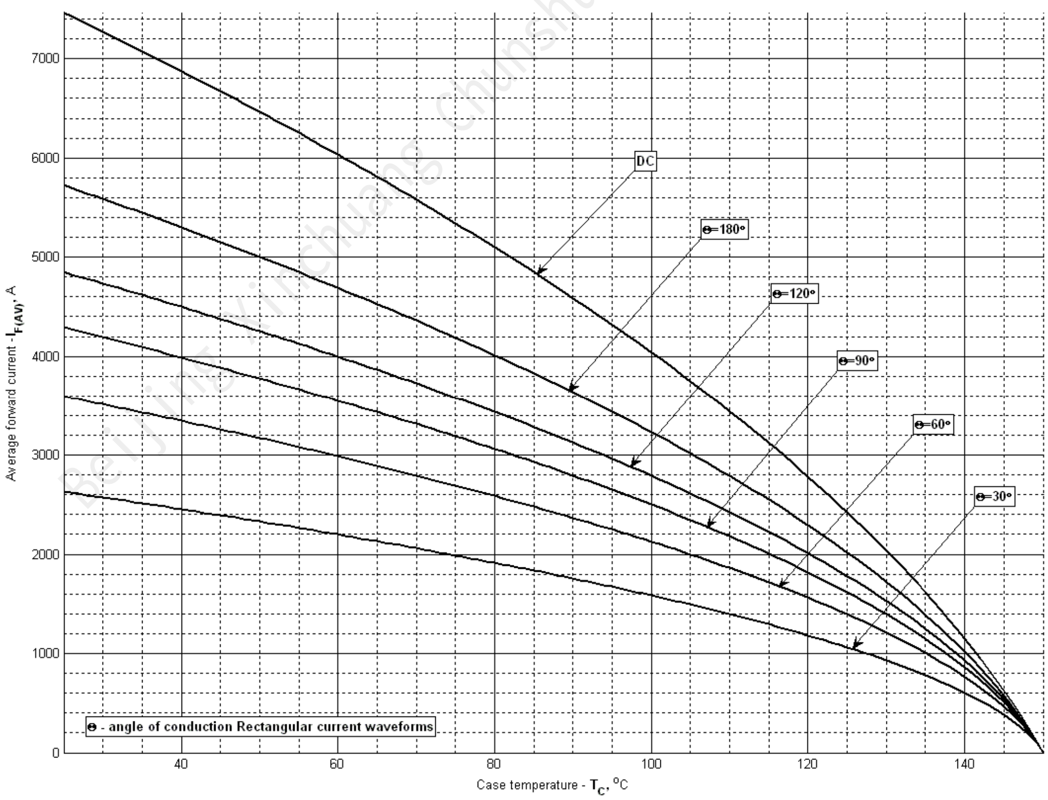


Fig 10 - Mean forward current I_{FAV} vs. Case temperature T_C for rectangular current waveforms at different conduction angles and for DC (f=50Hz, DSC)

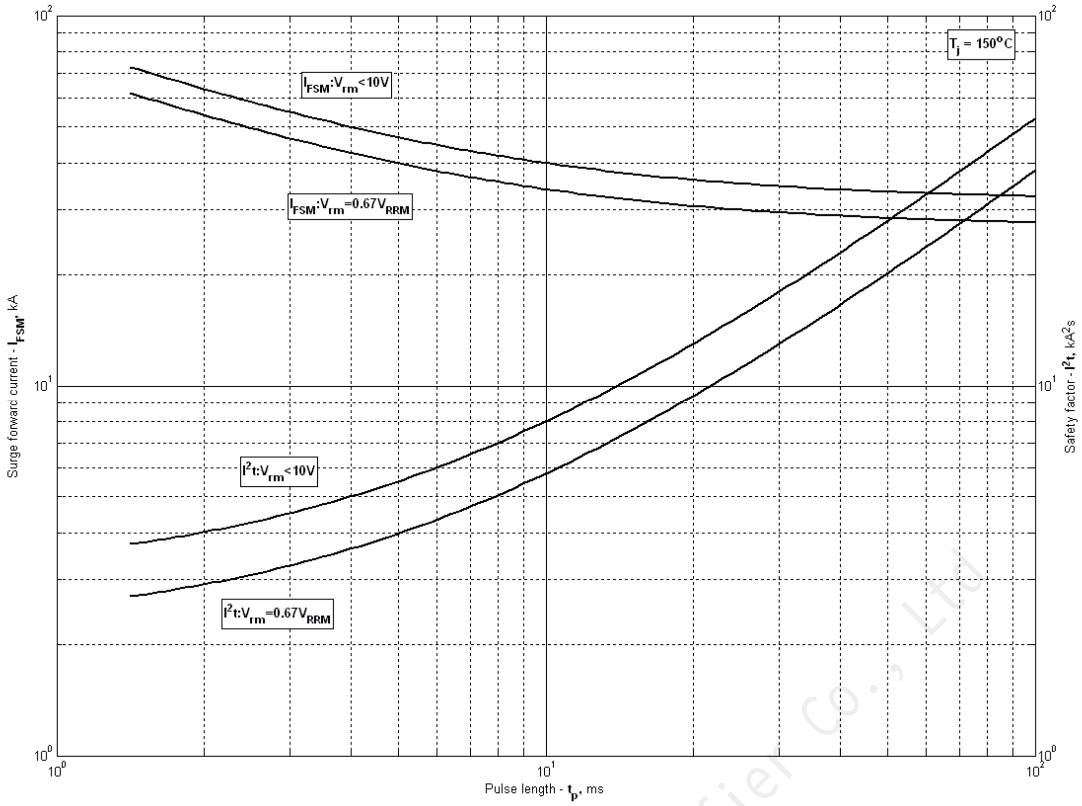


Fig 11 – Maximum surge and I^2t ratings

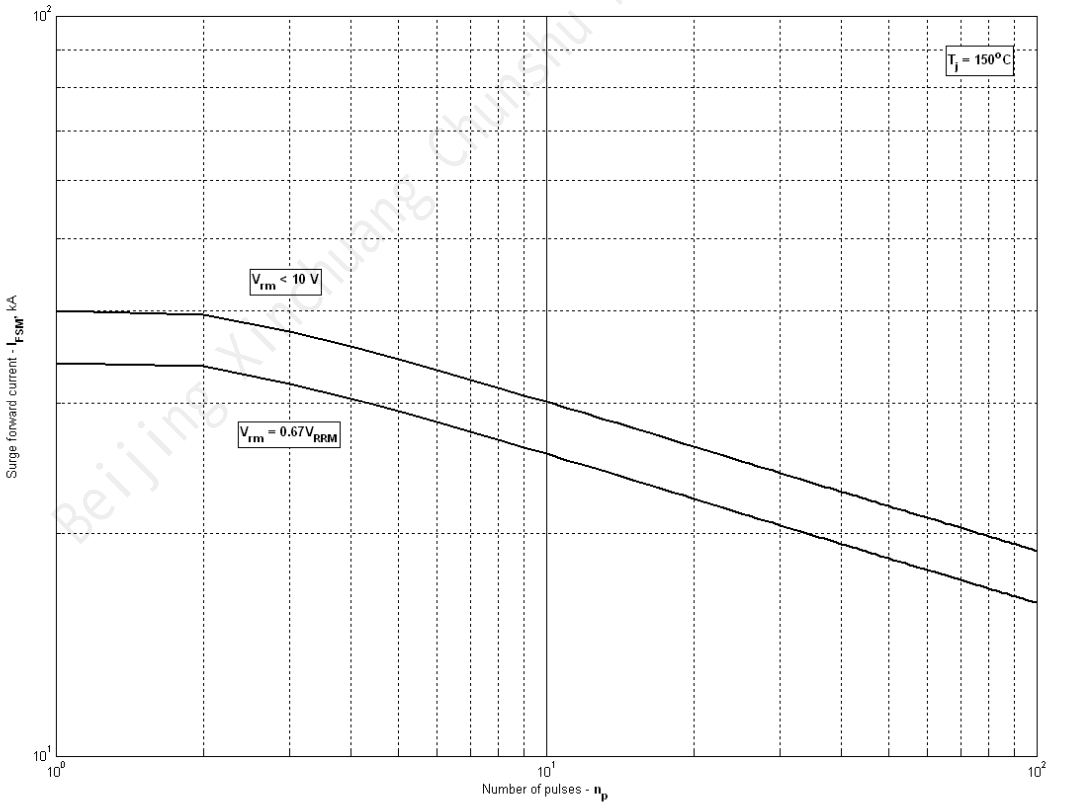


Fig 12 - Maximum surge ratings