ChunZheng

High-end Power Semiconductor Manufacturer

ZP1000A 2000-2600V

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}	1000 A	
Repetitive peak reverse voltage		V_{RRM}	2000 – 2600 V	
V_{RRM}, V	2000	2200	2400	2600
Voltage code	20	22	24	26
T_j, °C	-60 – 175			

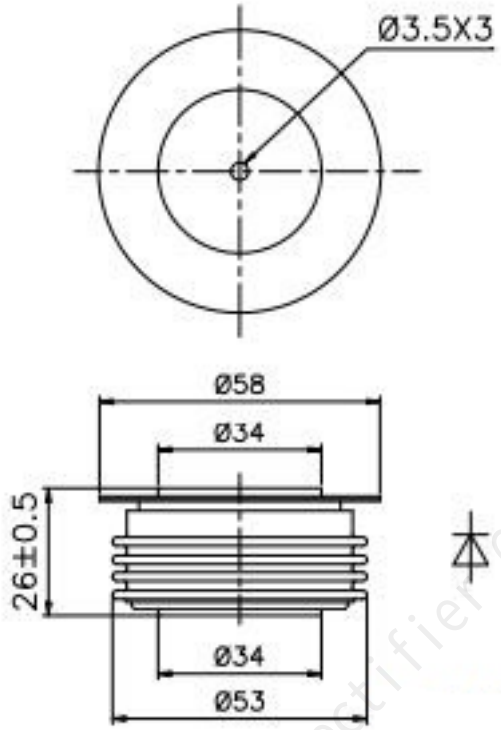
MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{FAV}	Average forward current	A	1000	T_c=100 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	1570	T_c=122 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	19.0 22.0	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;
			20.0 23.0	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	$A^2s{\cdot}10^3$	1805 2420	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;
			1660 2195	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	2000–2600	$T_{j\,min}$< T_j <$T_{j\,max}$; 180° half-sine wave; 50 Hz;	
V_{RSM}	Non-repetitive peak reverse voltages	V	2100–2700	$T_{j\,min}$< 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	-60–175		
T_j	Operating junction temperature	°C	-60–175		
MECHANICAL					
F	Mounting force	kN	14.0–16.0		
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	1.67	T_j=25 °C; I_{FM}=3140 A	
$V_{F(TO)}$	Forward threshold voltage, max	V	0.96	$T_j=T_{j\ max}$; 0.5 π I_{FAV} < I_T < 1.5 π I_{FAV}	
r_T	Forward slope resistance, max	mΩ	0.300		
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	70	$T_j=T_{j\ max}$; $V_R=V_{RRM}$	
SWITCHING					
Q_{rr}	Total recovered charge(50% chord), max	μC	2975	$T_j=T_{j\ max}$; I_{FM}=1000 A; di_R/dt=-10 A/μs; V_R=100 V	
t_{rr}	Reverse recovery time, max	μs	35		
I_{rrM}	Peak reverse recovery current, max	A	170		
THERMAL					
R_{thjc}	Thermal resistance, junction to case, max	°C/W	0.0320	Direct current	Double side cooled
R_{thjc-A}			0.0704		Anode side cooled
R_{thjc-K}			0.0576		Cathode side cooled
R_{thck}	Thermal resistance, case to heatsink, max	°C/W	0.0060	Direct current	
MECHANICAL					
w	Weight, typ	g	260		
D_s	Surface creepage distance	mm (inch)	23.69 (0.933)		
D_a	Air strike distance	mm (inch)	19.10 (0.752)		

OVERALL DIMENSIONS



ZT40

All dimensions in millimeters

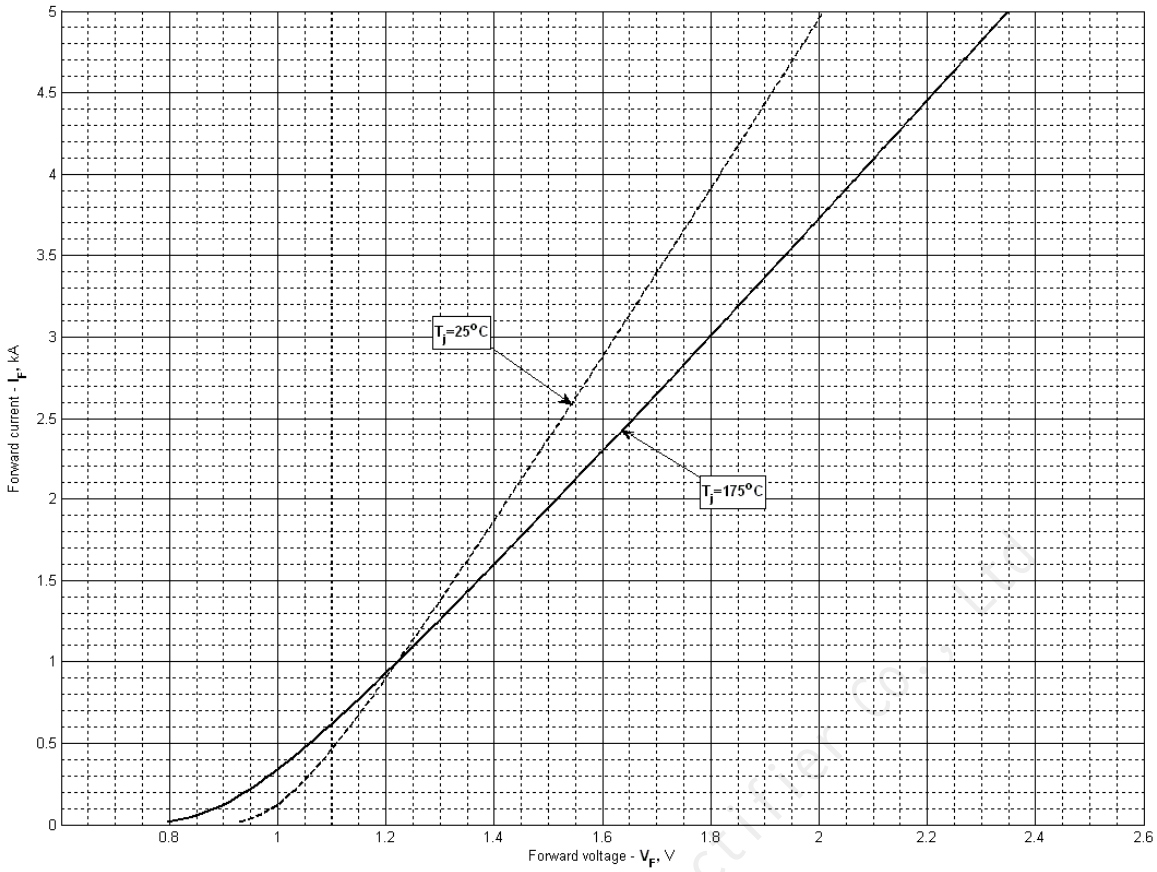


Fig 1 – Forward characteristics of Limit device

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	0.894064	0.743278
B	0.154336	0.218149
C	-0.183099	-0.275263
D	0.300058	0.451094

Forward characteristic model (see Fig. 1).

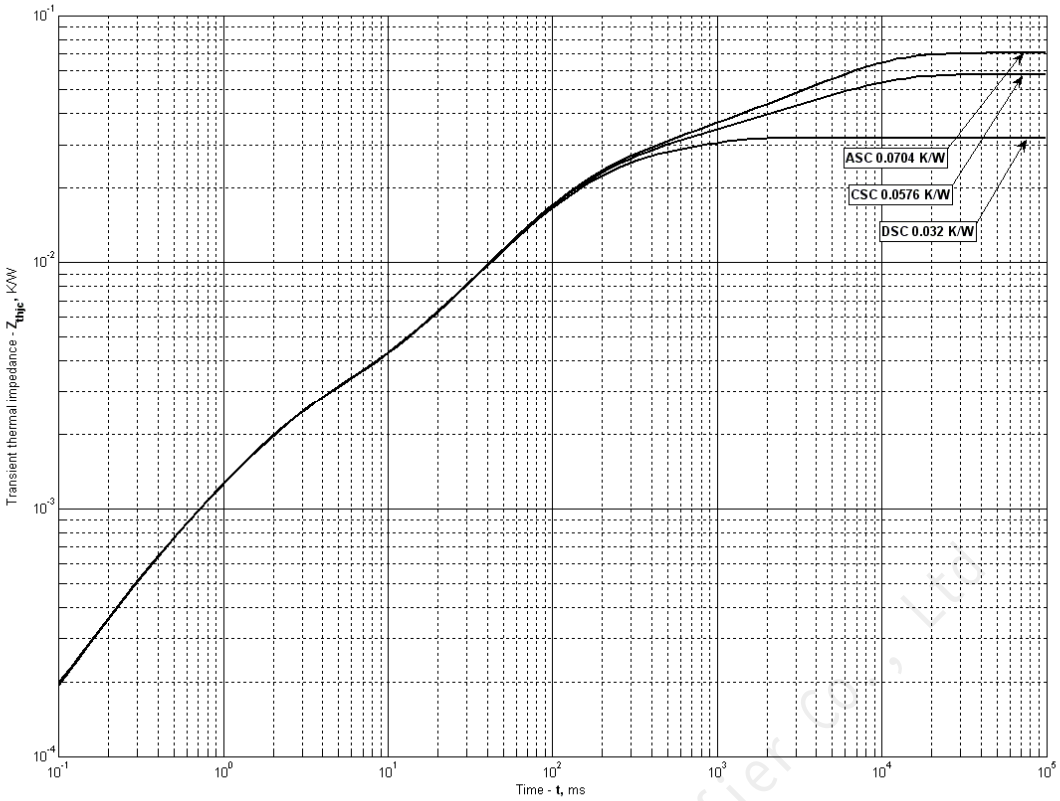


Fig 2 – Transient thermal impedance

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 constatnt of r_{th} term.

DC Double side cooled

i	1	2	3	4	5	6
R_i, K/W	0.000005619	0.01031	0.01922	0.0004148	0.001895	0.0001521
τ_i, s	7.790	0.5094	0.09719	0.01725	0.0016	0.0002257

DC Anode side cooled

i	1	2	3	4	5	6
R_i, K/W	0.0381	0.008681	0.01867	0.001961	0.0001787	0.002771
τ_i, s	5.351	0.4584	0.09325	0.001734	0.0002174	0.9059

DC Cathode side cooled

i	1	2	3	4	5	6
R_i, K/W	0.02561	0.001472	0.01786	0.001926	0.0001928	0.01052
τ_i, s	5.328	0.1832	0.09031	0.001714	0.0002598	0.525

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

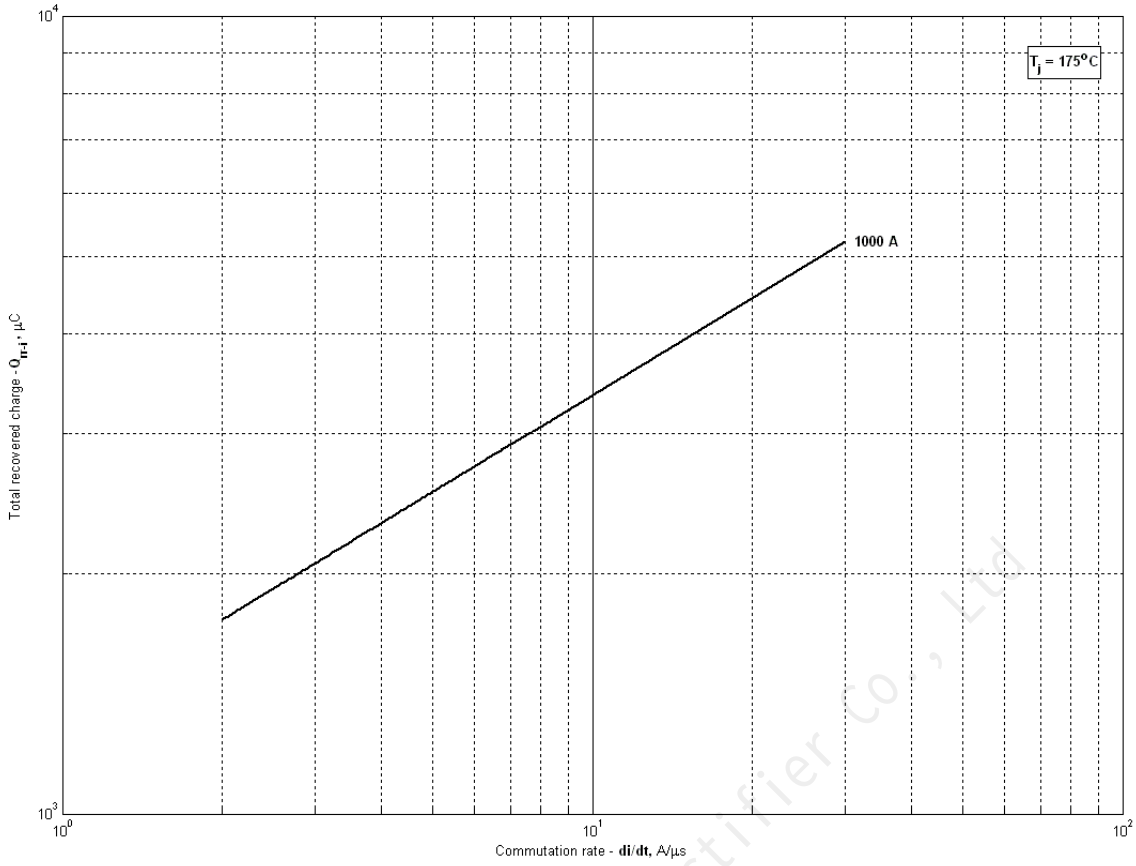


Fig 3 - Total recovered charge(integral), Q_{rr-i}

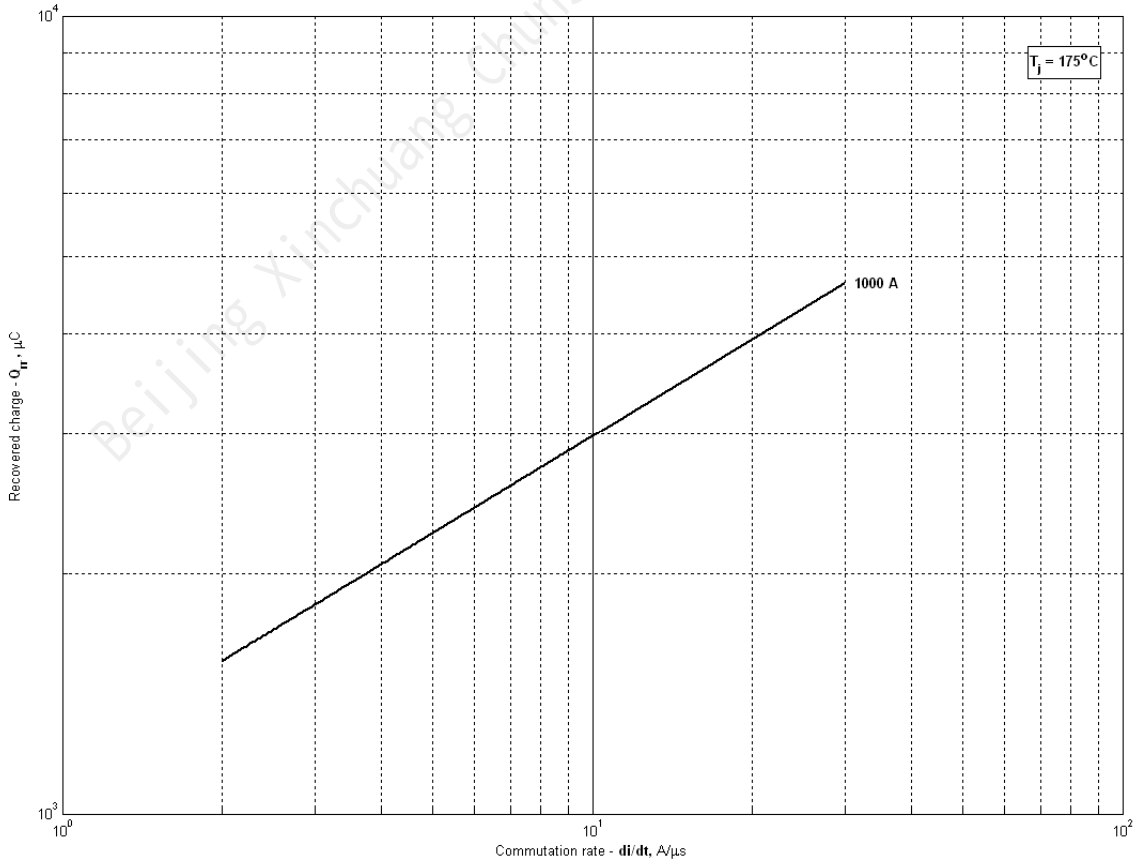


Fig 4 - Total recovered charge(50% chord), Q_{rr}

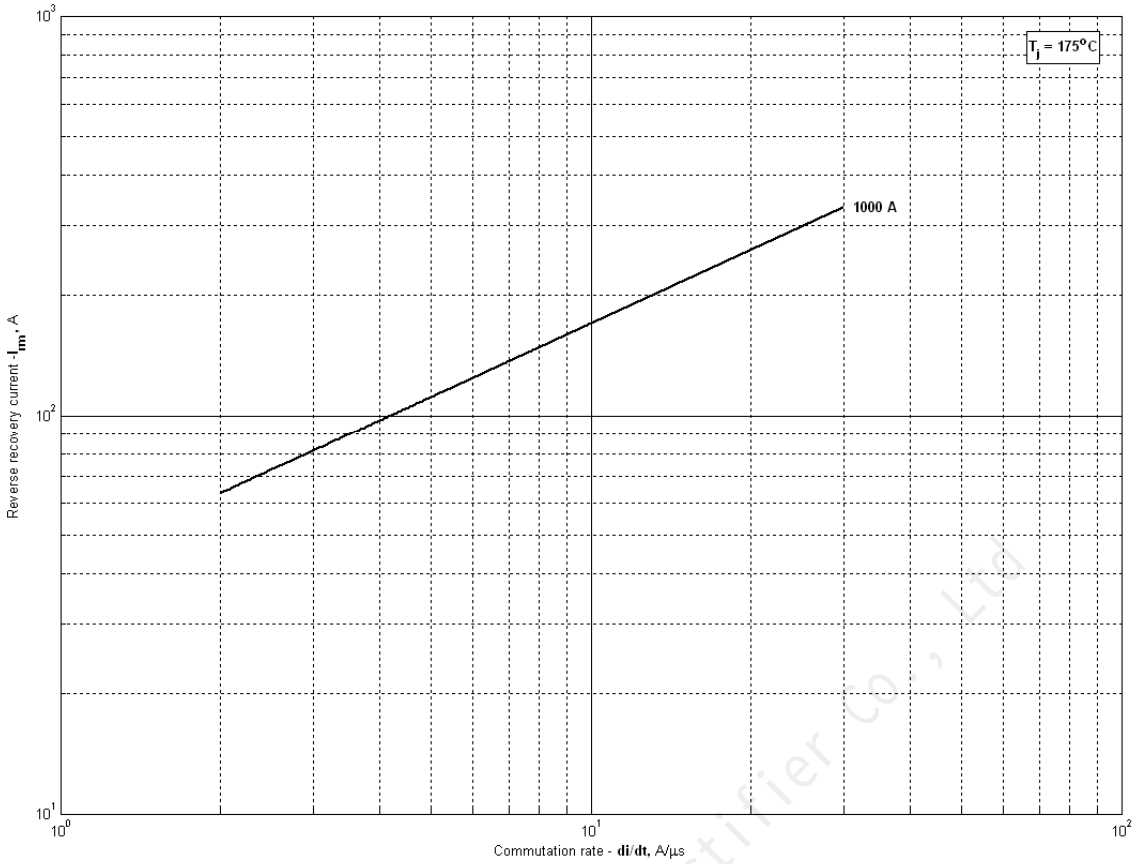


Fig 5 - Peak reverse recovery current, I_{rm}

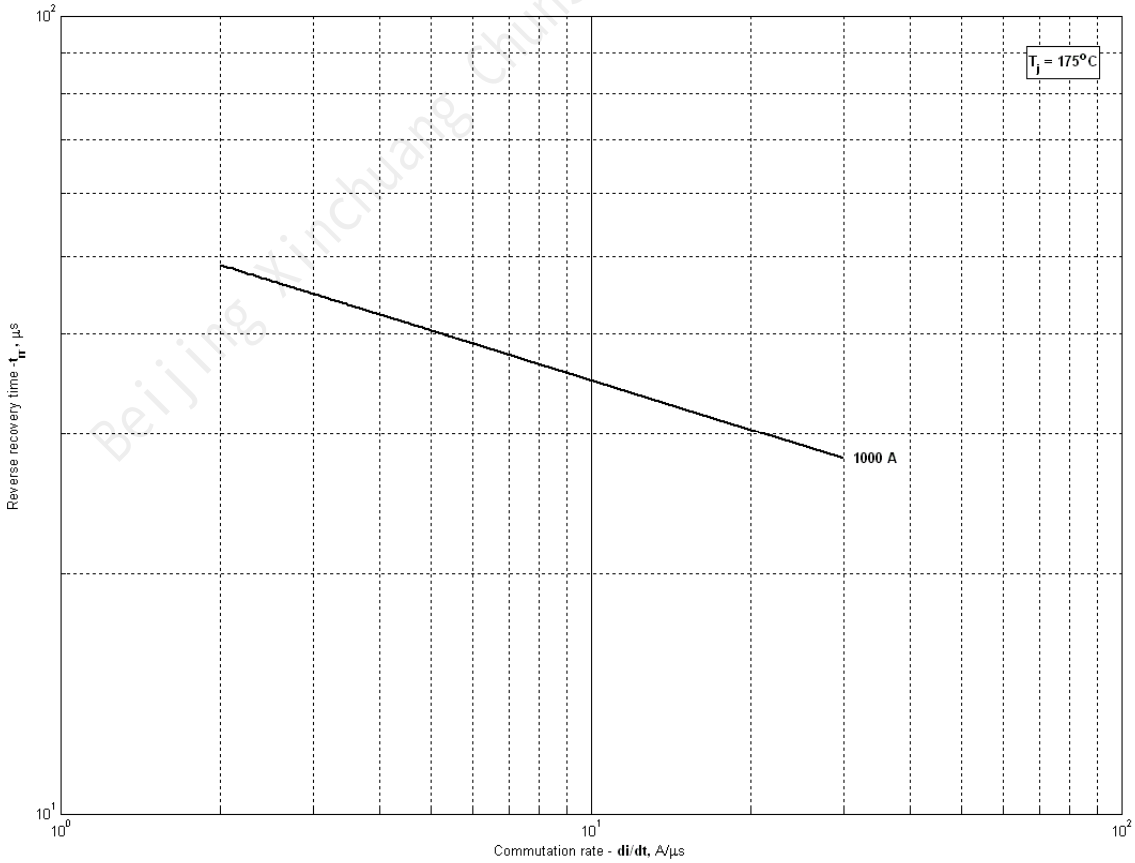


Fig 6 - Recovery time, t_{rr} (50% chord)

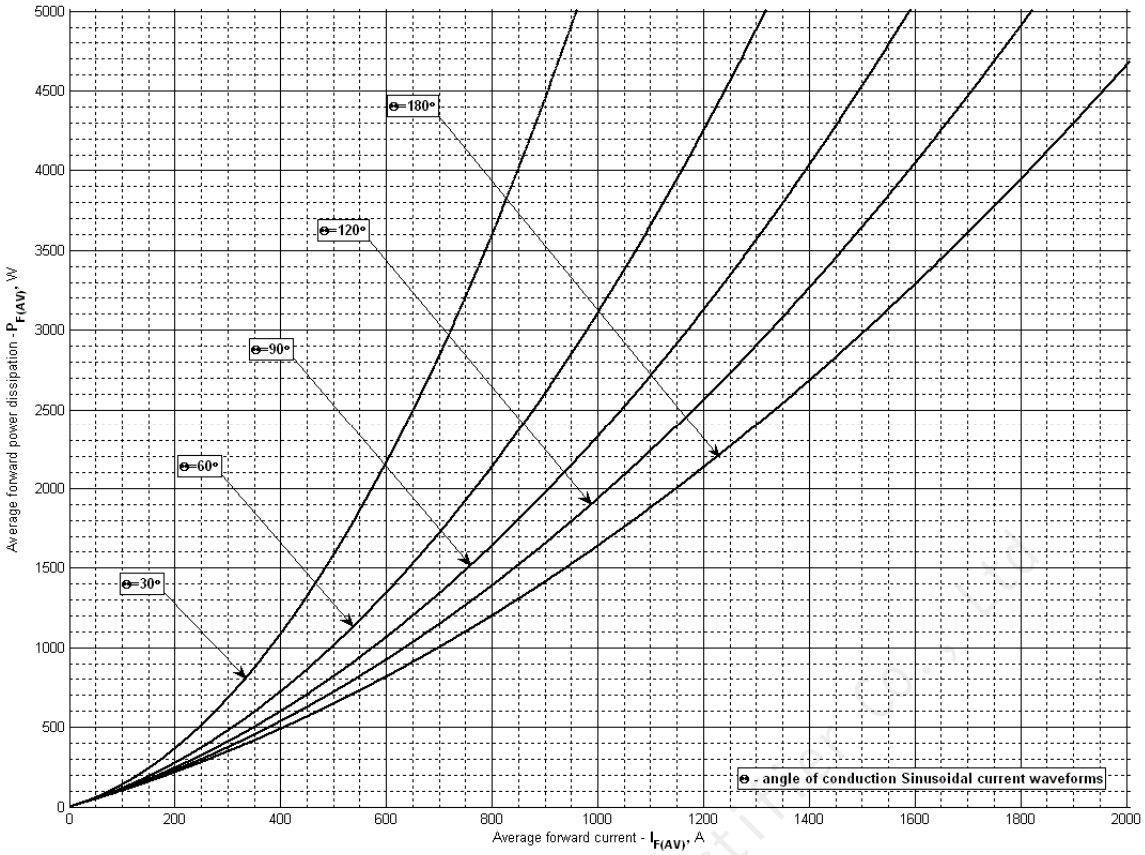


Fig 7 - Mean forward power dissipation P_{FAV} vs. Mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)

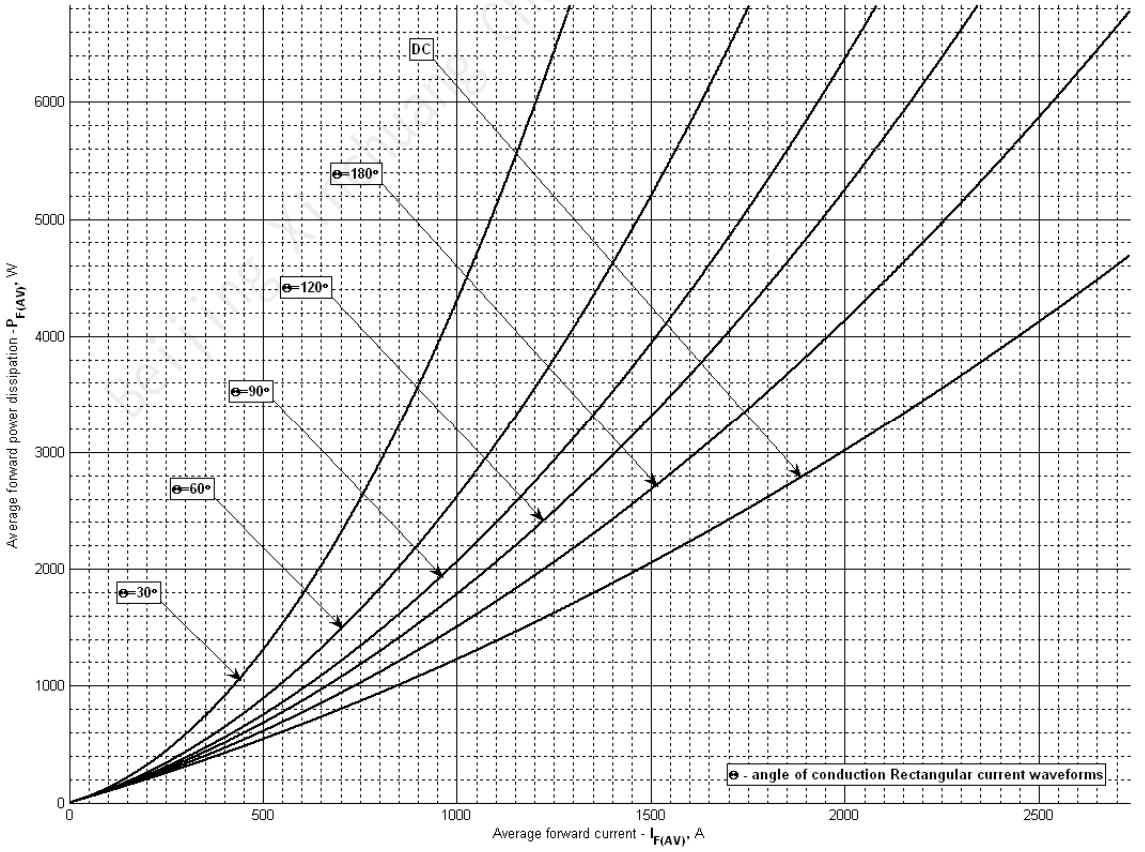


Fig 8 – Mean forward power dissipation P_{FAV} vs. Mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC (f=50Hz, DSC)

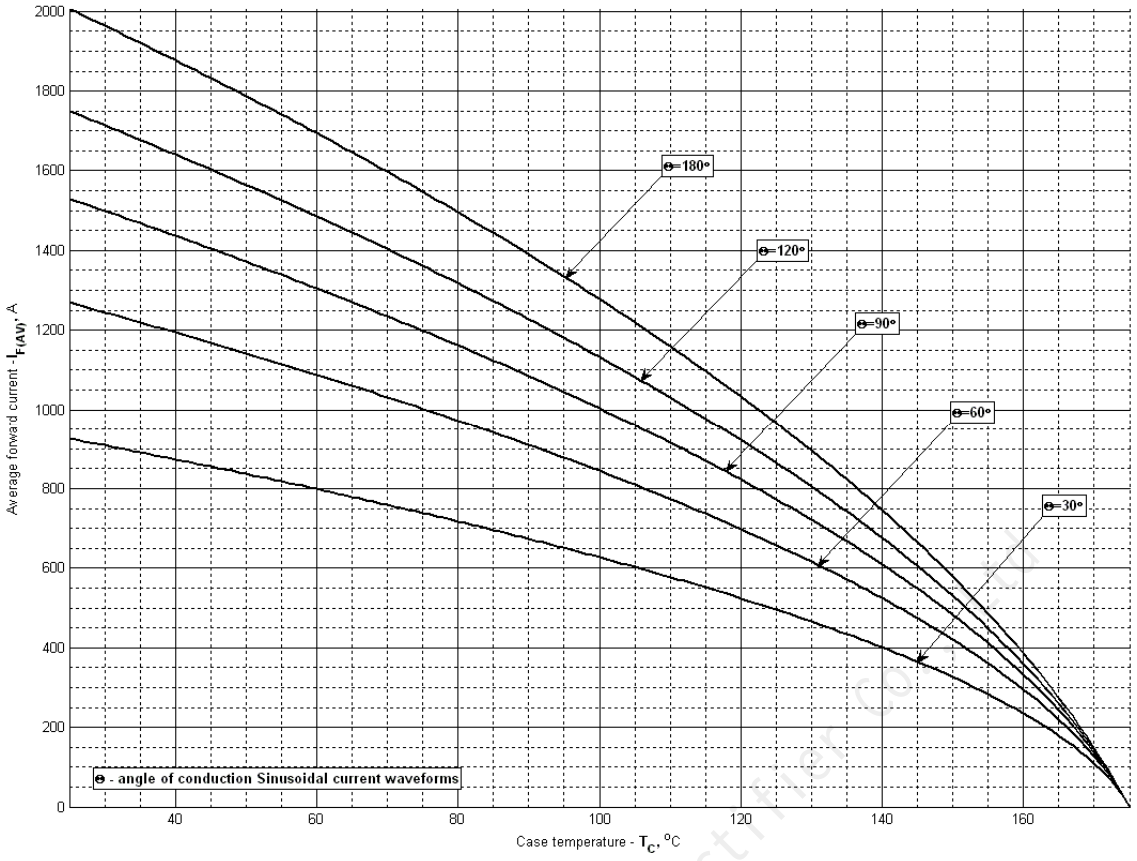


Fig 9 – Mean forward current I_{FAV} vs. Case temperature T_C for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)

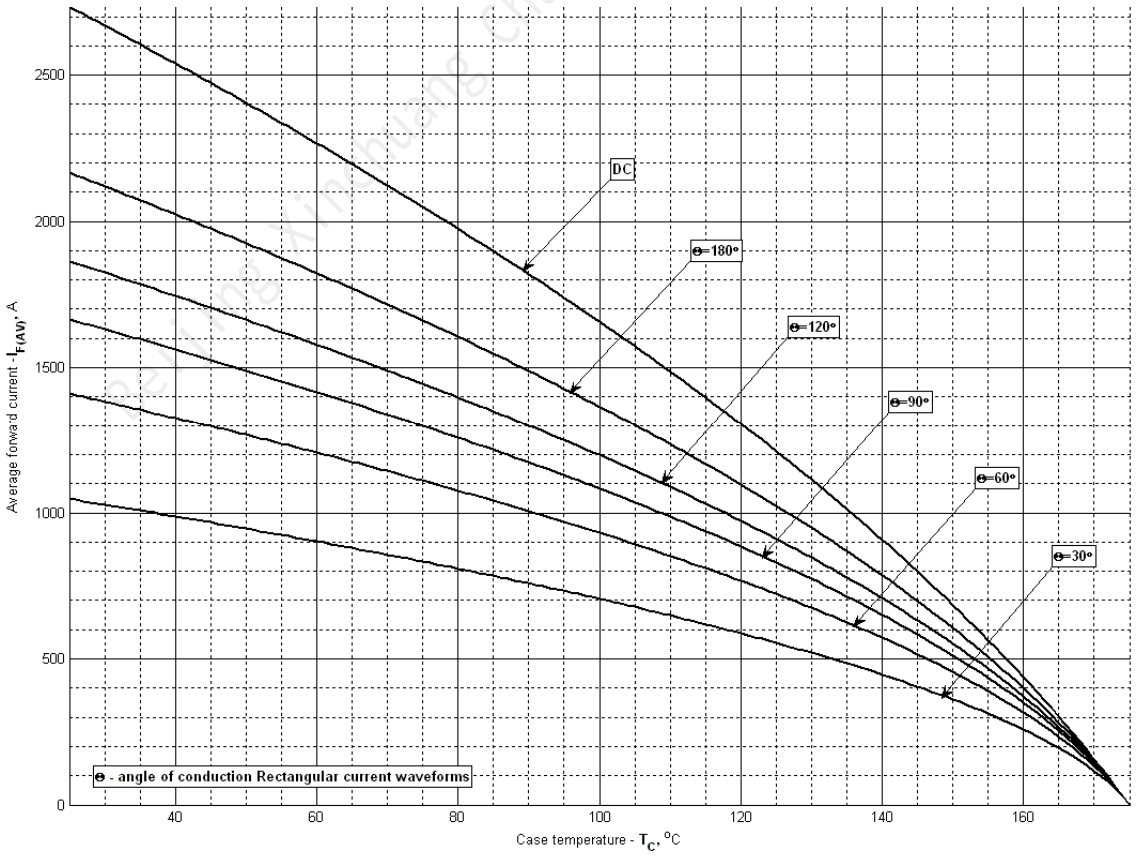


Fig 10 - Mean forward current I_{FAV} vs. Case temperature T_C for rectangular current waveforms at different conduction angles and for DC (f=50Hz, DSC)

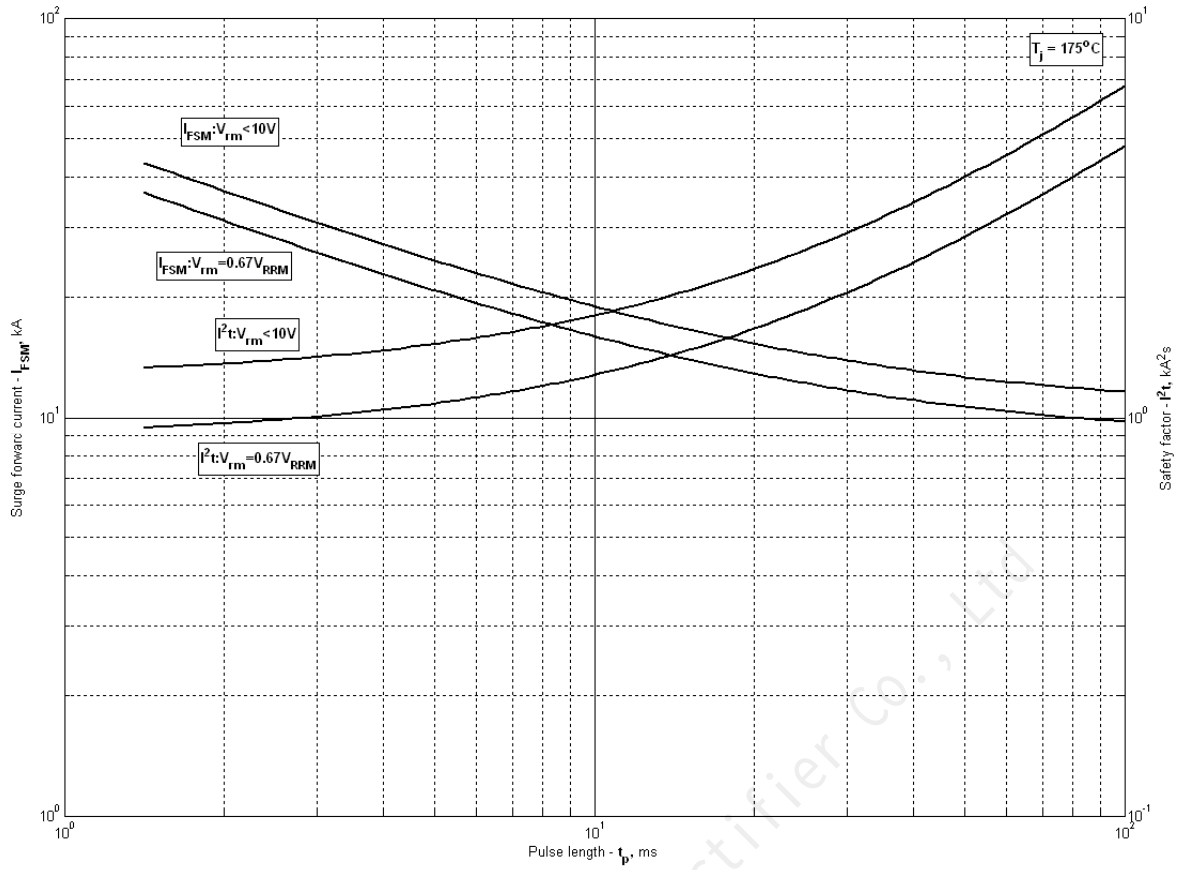


Fig 11 – Maximum surge and I^2t ratings

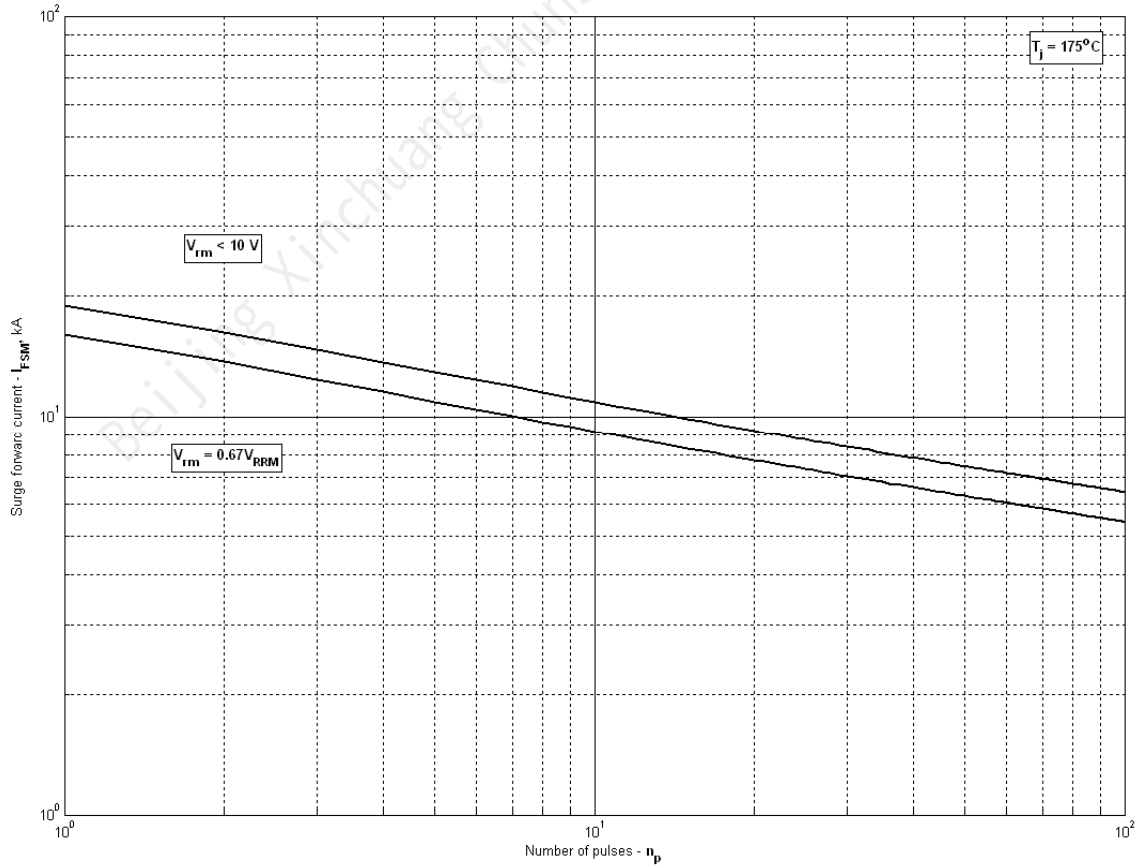


Fig 12 - Maximum surge ratings

