ChunZheng

High-end Power Semiconductor Manufacturer

ZK800A 3800-4400V
Fast Recovery Diode

- Low switching losses
- Low reverse recovery charge High
- power cycling capability

Average forward current		I_{FAV}	800 A	
Repetitive peak reverse voltage		V_{RRM}	3800 – 4400 V	
Reverse recovery time		t_{rr}	5.3 μs	
V_{RRM}, V	3800	4000	4200	4400
Voltage code	38	40	42	44
T_j, °C	– 60 – 125			

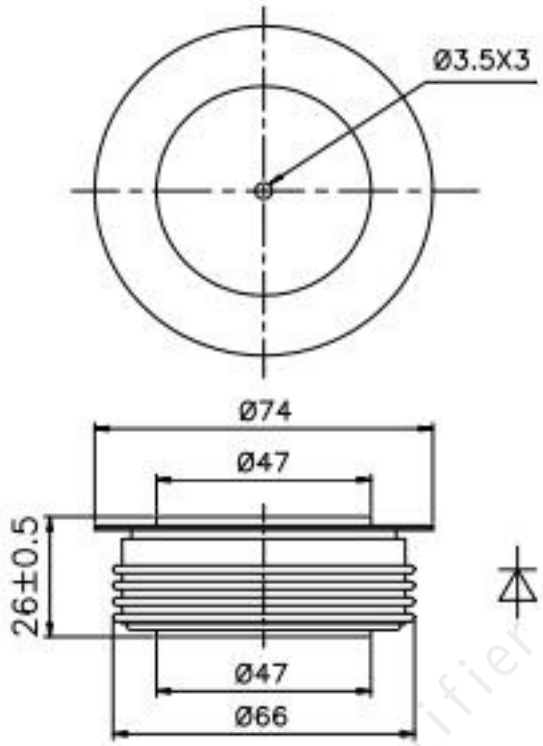
MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions
ON-STATE				
I_{FAV}	Average forward current	A	800	T_c=85 °C; Double side cooled; 180° half-sine wave; 50 Hz
I_{FRMS}	RMS forward current	A	1256	T_c=85 °C; Double side cooled; 180° half-sine wave; 50 Hz
I_{FSM}	Surge forward current	kA	13.5 16.0	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;
			15.0 17.0	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	$A^2s{\cdot}10^3$	910 1280	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;
			930 1195	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	3800–4400	$T_{j\,min}$< T_j <$T_{j\,max}$; 180° half-sine wave; 50 Hz;
V_{RSM}	Non-repetitive peak reverse voltages	V	3900–4500	$T_{j\,min}$< 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 – 125	
T_j	Operating junction temperature	°C	– 60 – 125	
MECHANICAL				
F	Mounting force	kN	24.0 – 28.0	
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	2.90	T_j=25 °C; I_{FM}=2512 A	
$V_{F(TO)}$	Forward threshold voltage, max	V	1.40	$T_j=T_{j\ max}$; $0.5\ \pi\ I_{FAV} < I_T < 1.5\ \pi\ I_{FAV}$	
r_T	Forward slope resistance, max	mΩ	0.700		
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	120	$T_j=T_{j\ max}$; $V_R=V_{RRM}$	
SWITCHING					
Q_{rr}	Total recovered charge, max	μC	880	$T_j=T_{j\ max}$; $I_{FM}= I_{FAV}$; di_R/dt=-100 A/μs; V_R=100 V;	
t_{rr}	Reverse recovery time, max	μs	5.3		
I_{rrM}	Peak reverse recovery current, max	A	332		
THERMAL					
R_{thjc}	Thermal resistance, junction to case, max	°C/W	0.0180	Direct current	Double side cooled
R_{thjc-A}			0.0396		Anode side cooled
R_{thjc-K}			0.0324		Cathode side cooled
R_{thck}	Thermal resistance, case to heatsink, max	°C/W	0.0040	Direct current	
MECHANICAL					
w	Weight, typ	g	510		
D_s	Surface creepage distance	mm (inch)	38.84 (1.529)		
D_a	Air strike distance	mm (inch)	22.50 (0.886)		

OVERALL DIMENSIONS



ZT55

All dimensions in millimeters

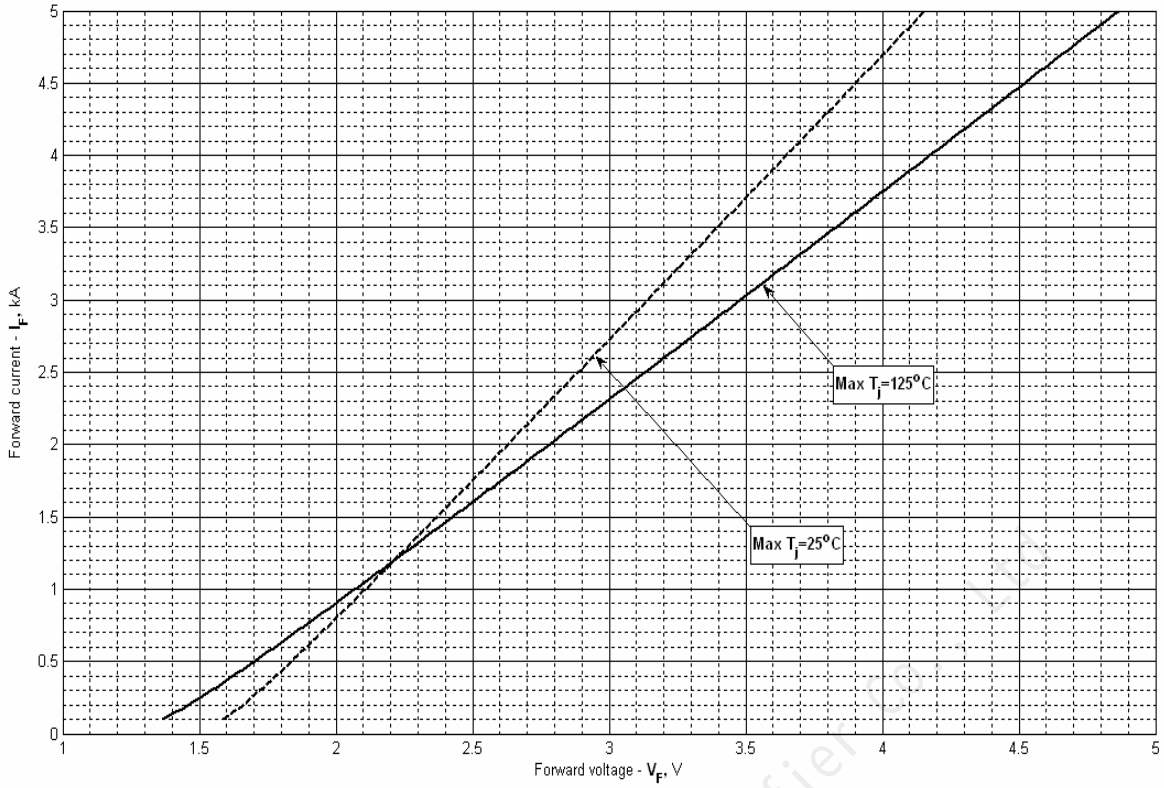


Fig 1 – Forward characteristics of Limit device

Analytical function for Forward characteristic:

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

	Coefficients for max curves	
	T_j = 25°C	$T_j = T_{j\,max}$
A	1.469142	1.202344
B	0.469424	0.642163
C	-0.158239	-0.211339
D	0.278291	0.371677

Forward characteristic model (see Fig. 1).

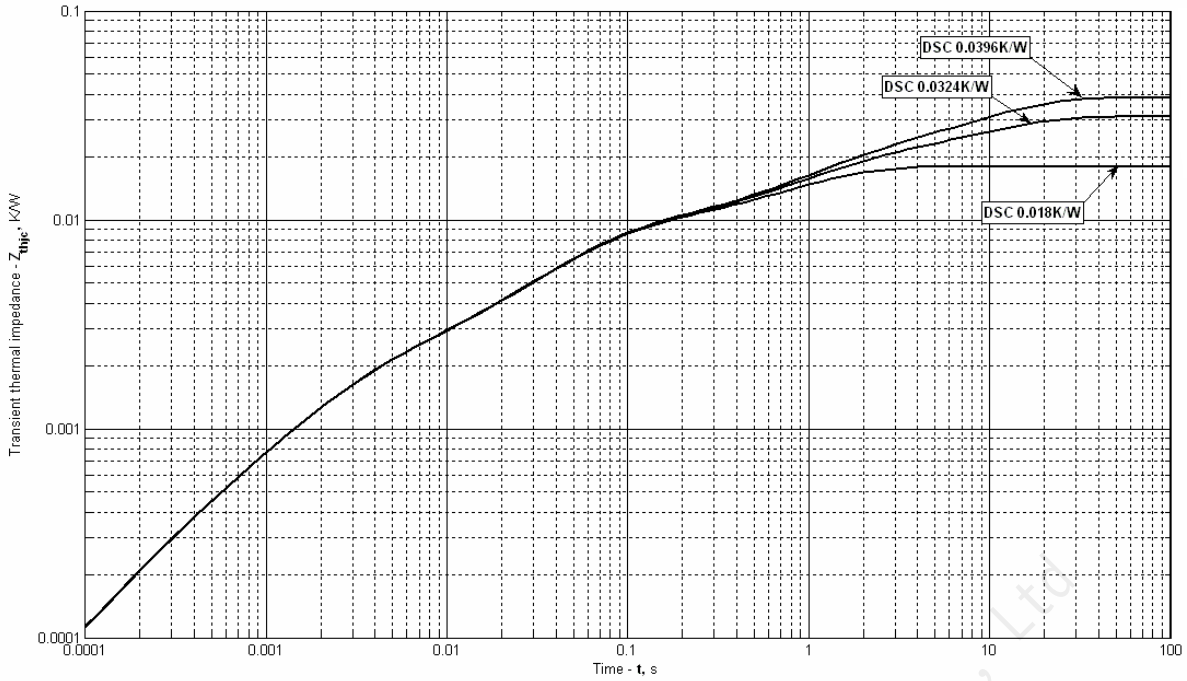


Fig 2 – Transient thermal impedance

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
$\mathbf{R_i}$, **K/W**	0.009241	0.006037	0.001231	0.001054	0.0003396	0.00009575
$\boldsymbol{\tau_i}$, **s**	0.9673	0.04967	0.002733	0.07734	0.001638	0.0002248

DC Cathode side cooled

i	1	2	3	4	5	6
$\mathbf{R_i}$, **K/W**	0.01318	0.009281	0.006055	0.001018	0.001535	0.0001182
$\boldsymbol{\tau_i}$, **s**	9.745	1.028	0.05591	0.03732	0.002468	0.0002687

DC Anode side cooled

i	1	2	3	4	5	6
$\mathbf{R_i}$, **K/W**	0.02041	0.009325	0.006949	0.0001252	0.001516	0.0001119
$\boldsymbol{\tau_i}$, **s**	9.752	1.065	0.05344	0.01407	0.002421	0.0002554

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

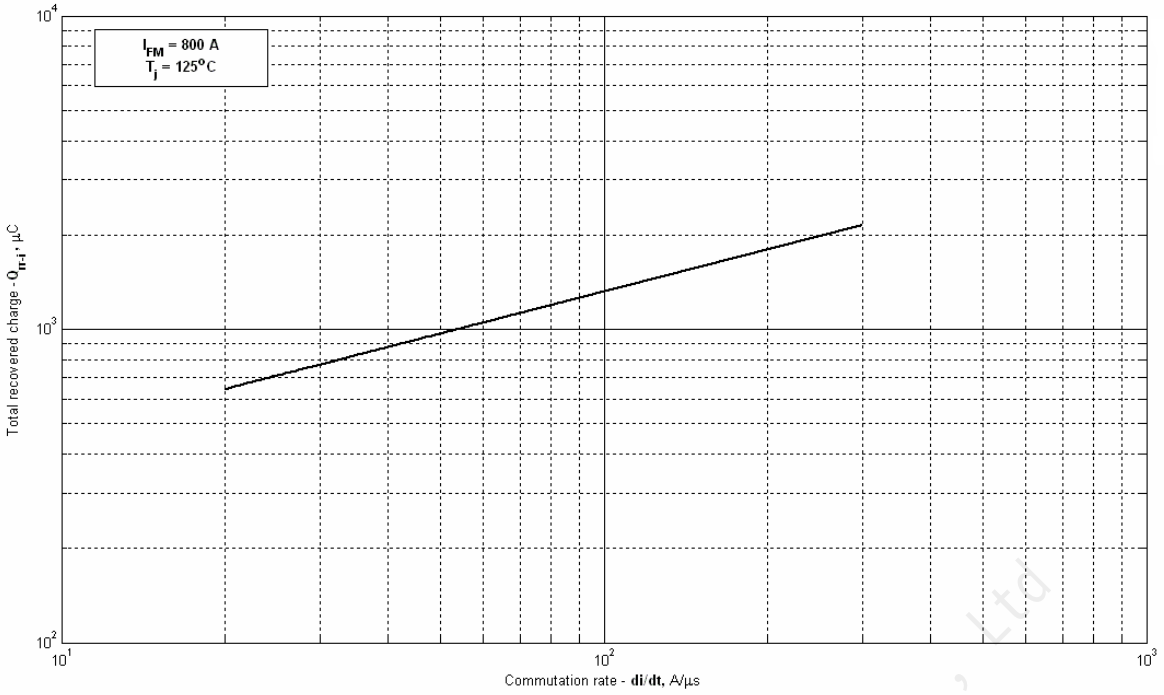


Fig 3 - Total recovered charge(integral), Q_{rr-i}

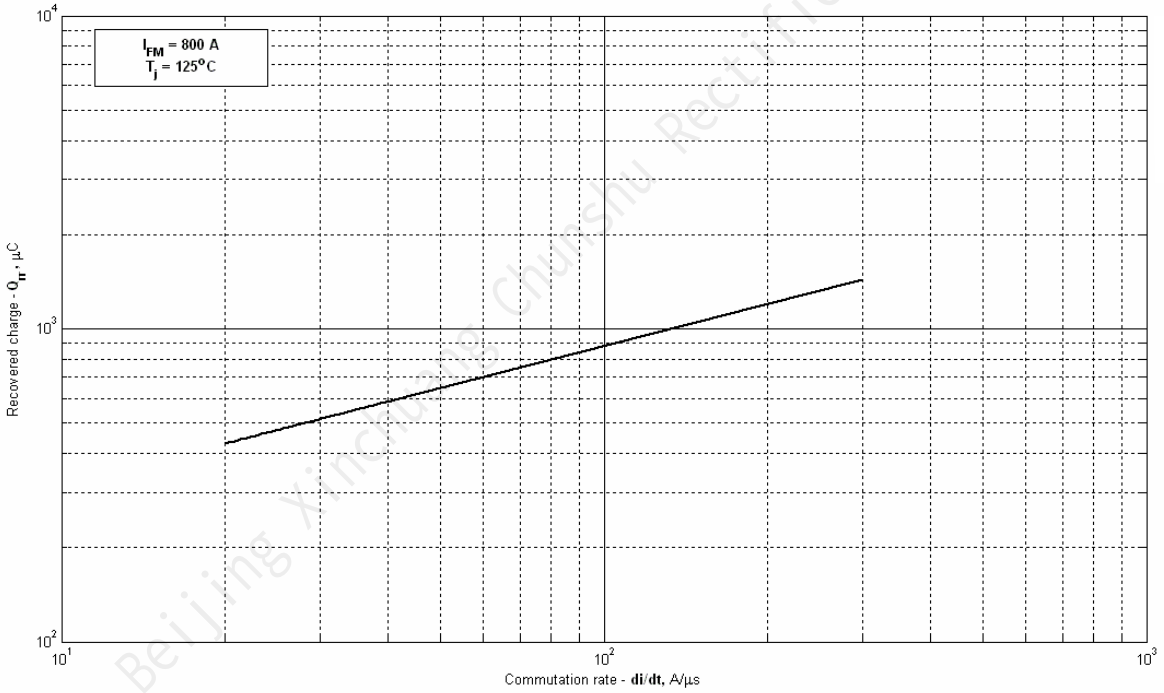


Fig 4 - Total recovered charge, Q_{rr}

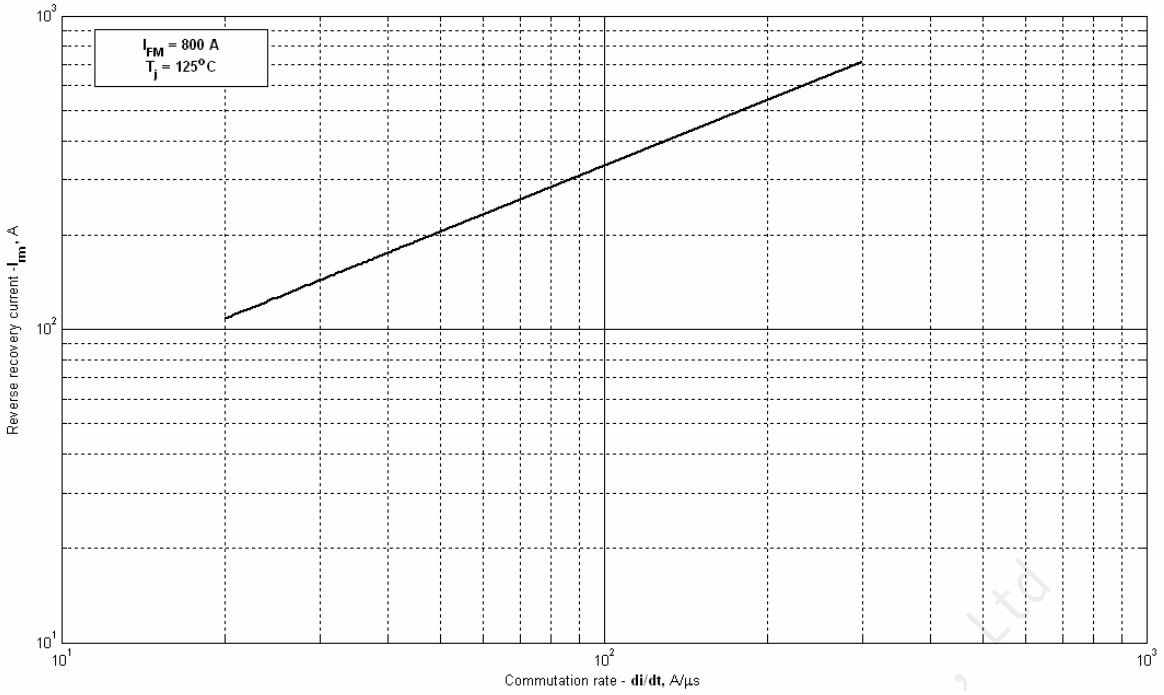


Fig 5 - Peak reverse recovery current, I_{rm}

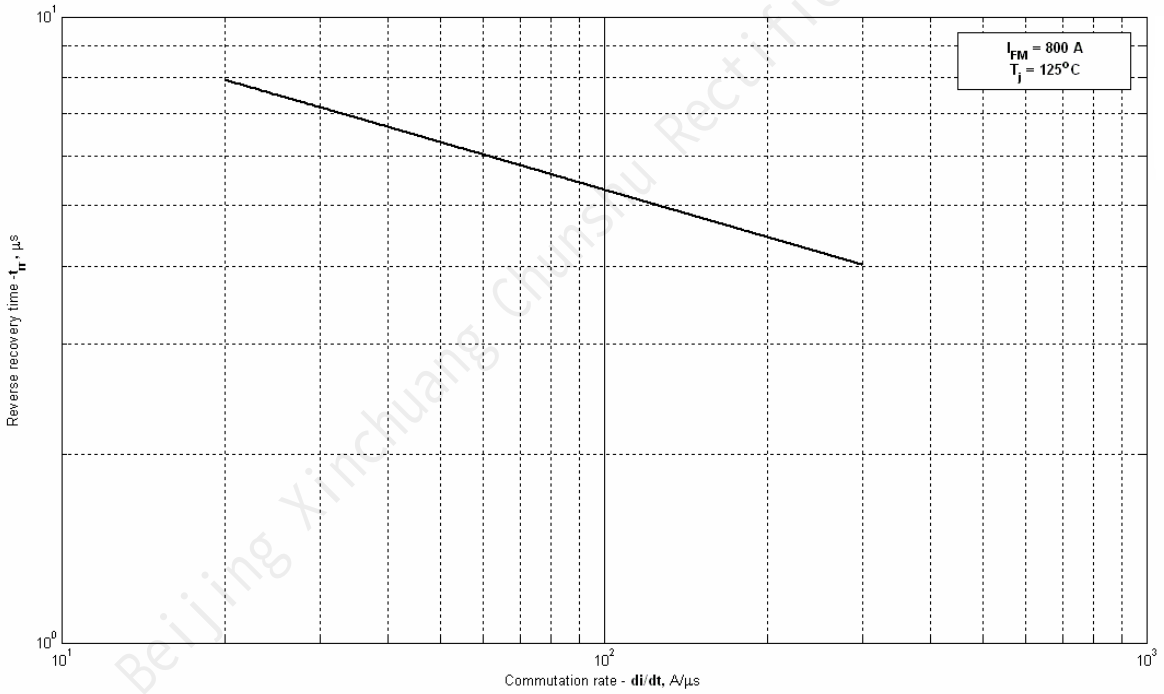


Fig 6 - Recovery time, t_{rr} (50% chord)

