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

Rectifier Diode
Type D253-1600-24

Average forward current		I_{FAV}	1600 A	
Repetitive peak reverse voltage		V_{RRM}	1800 ÷ 2400 V	
V_{RRM}, V	1800	2000	2200	2400
Voltage code	18	20	22	24
T_j, °C	-60 ÷ 190			

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{FAV}	Average forward current	A	1600 2760	T_c=147 °C; Double side cooled; T_c=100 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	2512	T_c=147 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	35.0 40.0	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;
			37.0 43.0	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	$A^2s\cdot10^3$	6125 8000	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;
			5680 7670	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	1800÷2400	$T_{j\,min}$< T_j <$T_{j\,max}$; 180° half-sine wave; 50 Hz;	
V_{RSM}	Non-repetitive peak reverse voltages	V	1900÷2500	$T_{j\,min}$< 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÷50		
T_j	Operating junction temperature	°C	-60÷190		
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	1.50	T_j=25 °C; I_{FM}=5024 A	
$V_{F(TO)}$	Forward threshold voltage, max	V	1.00	$T_j=T_{j\,max}$; 0.5 π I_{FAV} < I_T < 1.5 π I_{FAV}	
r_T	Forward slope resistance, max	mΩ	0.120		
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	100	$T_j=T_{j\,max}$; $V_R=V_{RRM}$	
SWITCHING					
Q_{rr}	Total recovered charge, max	μC	3700	$T_j=T_{j\,max}$; I_{FM}= I_{FAV}; di_R/dt=-10 A/μs; V_R=100 V	
t_{rr}	Reverse recovery time, max	μs	35.0		
I_{rrM}	Peak reverse recovery current, max	A	210		
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)		

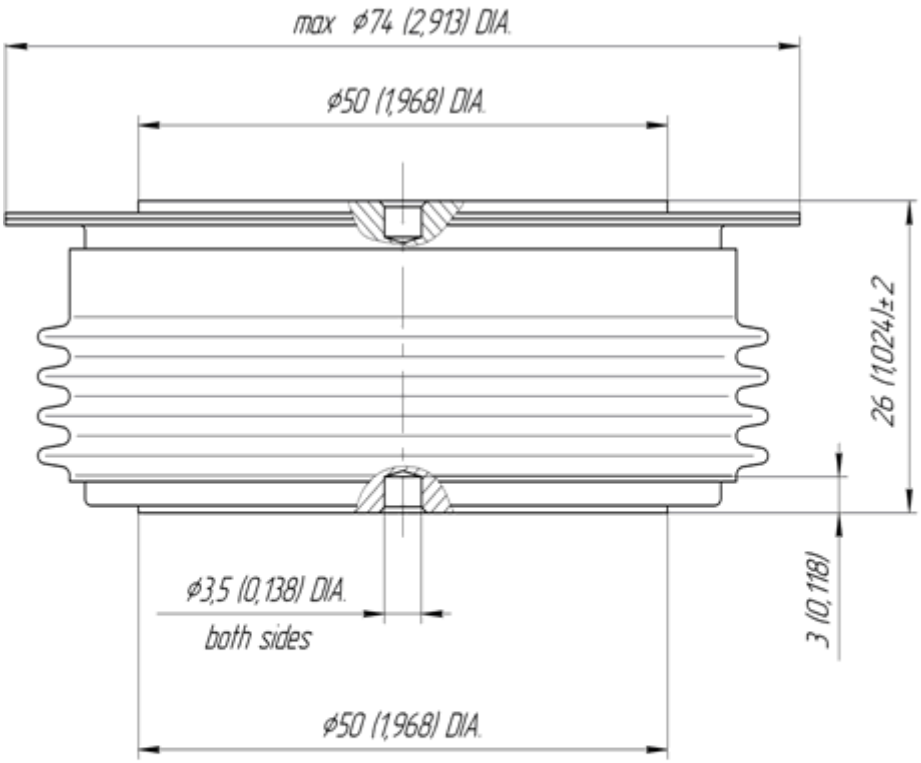
PART NUMBERING GUIDE

D	253	1600	24	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

OVERALL DIMENSIONS

Package type: D.D3



All dimensions in millimeters (inches)

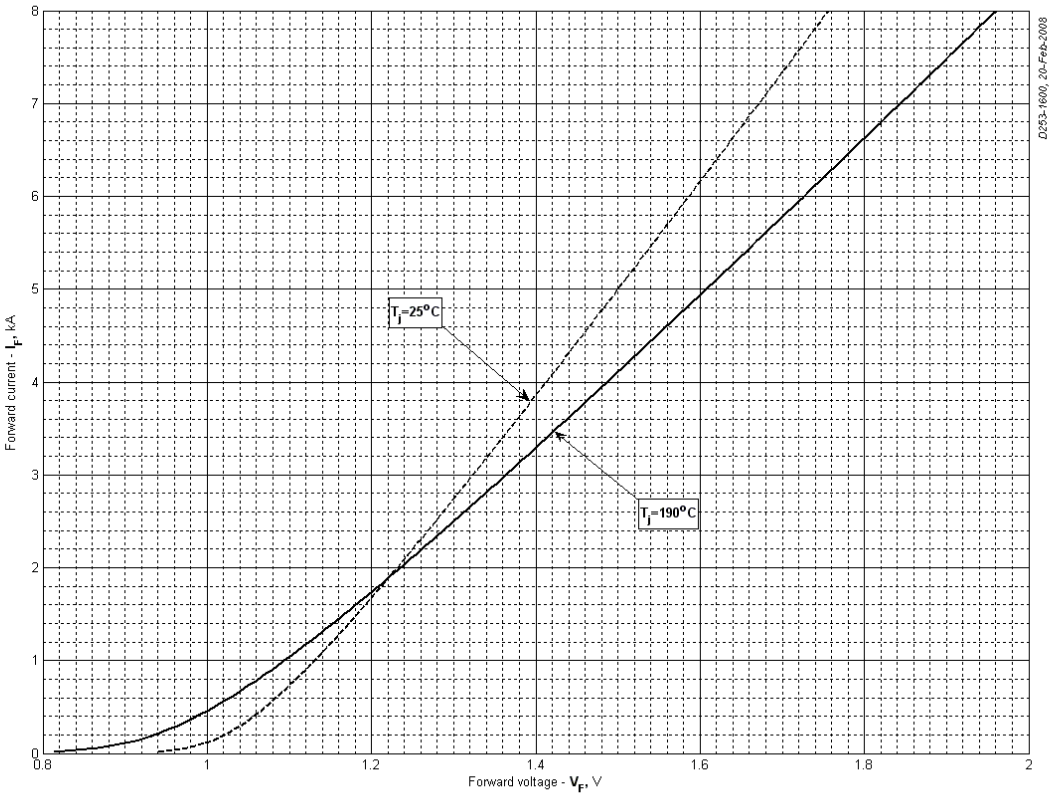


Fig 1 – On-state characteristics of Limit device

Analytical function for On-state 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	0.906021	0.760163
B	0.050049	0.062656
C	-0.197637	-0.307066
D	0.312236	0.485119

On-state characteristic model (see Fig. 1)

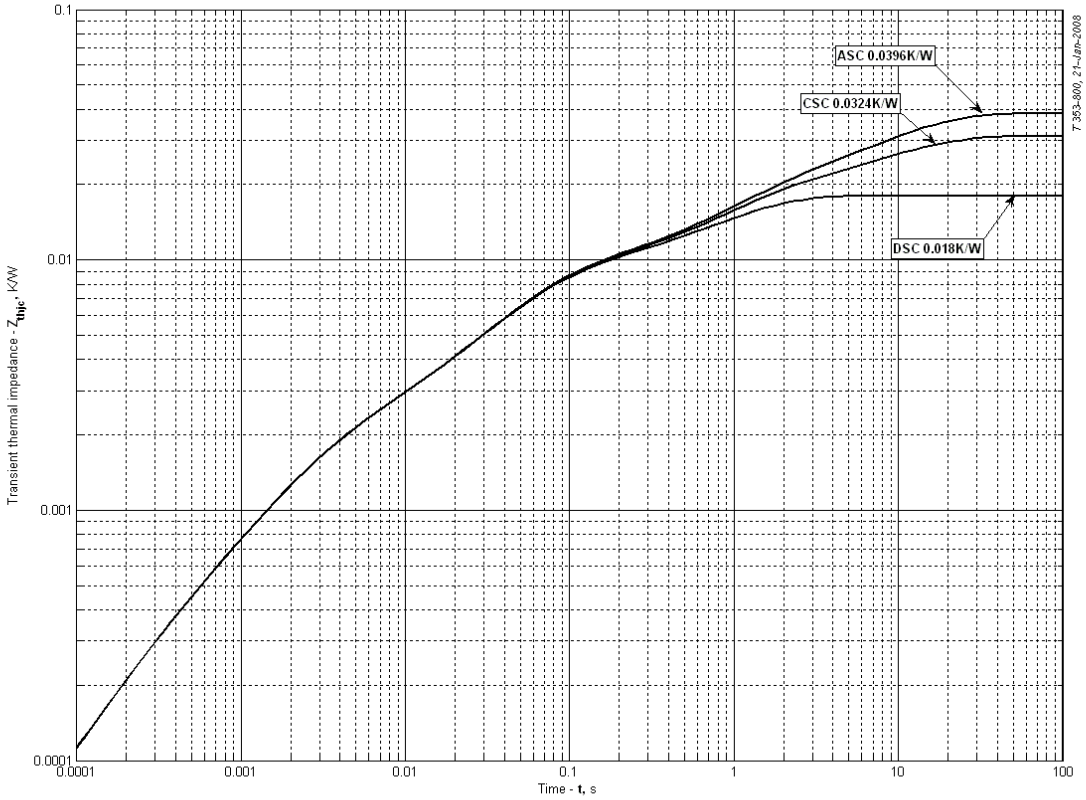


Fig 2 – Transient thermal impedance

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)

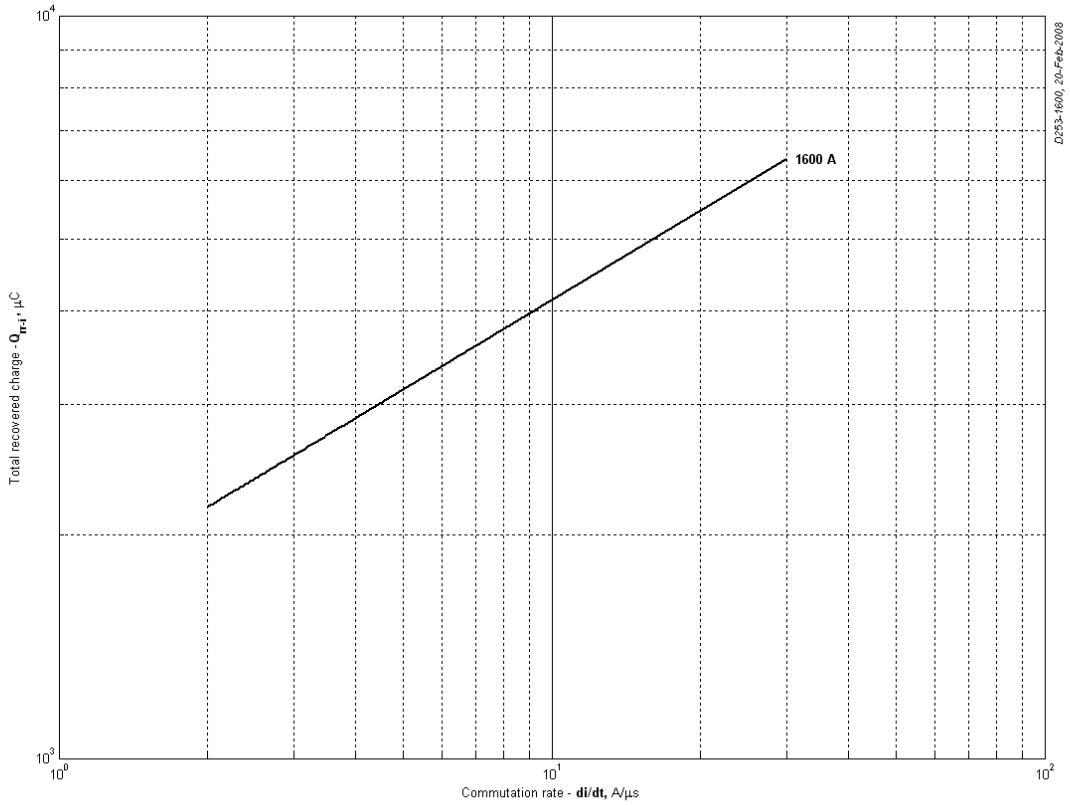


Fig 3 – Total recovered charge, Q_{rr-i} (integral)

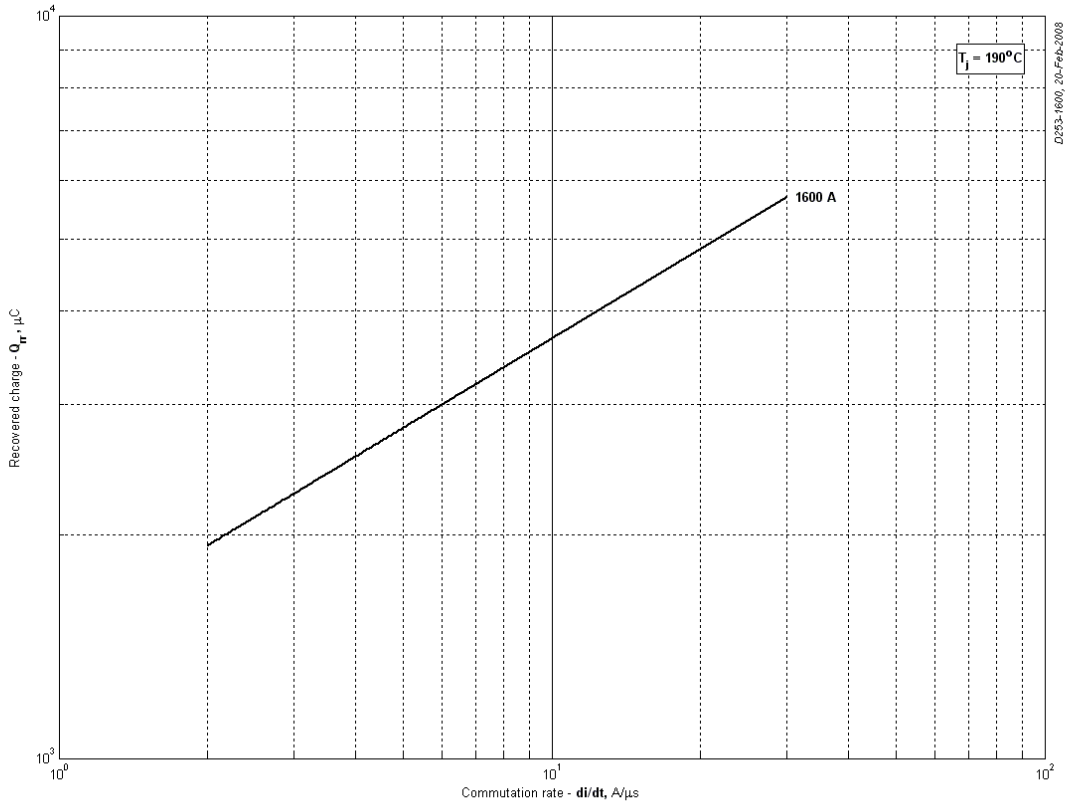


Fig 4 - Recovered charge, Q_{rr} (linear)

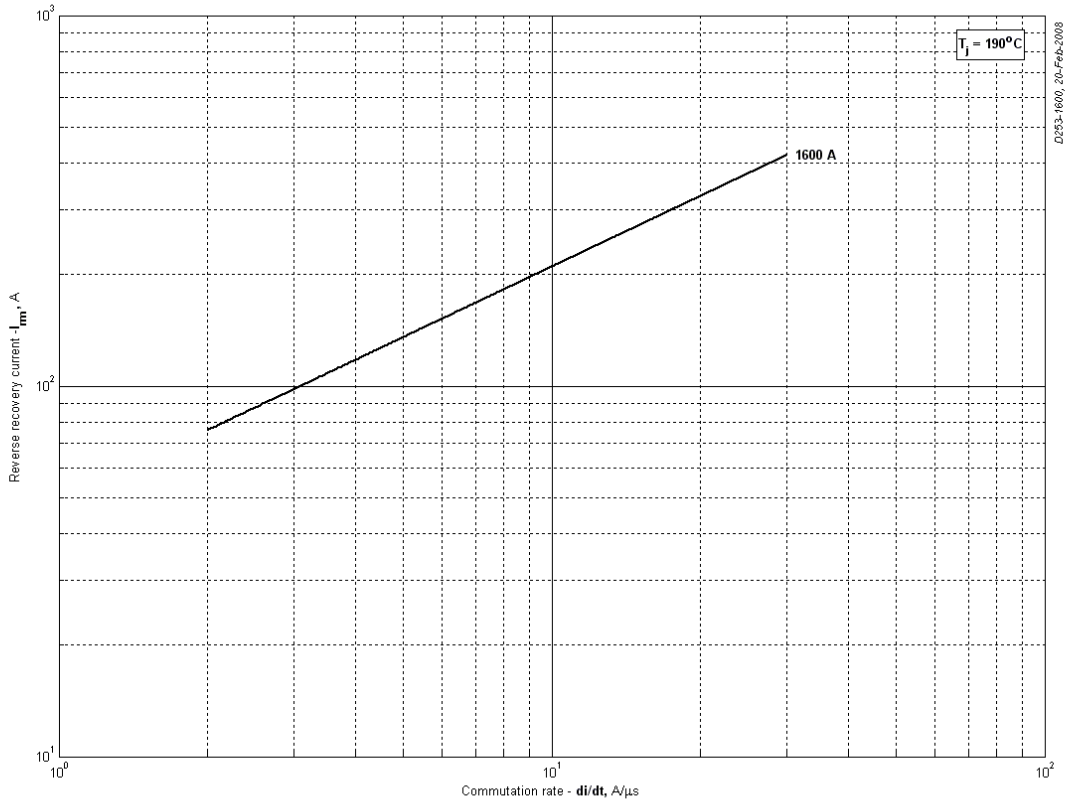


Fig 5 – Peak reverse recovery current, I_{rm}

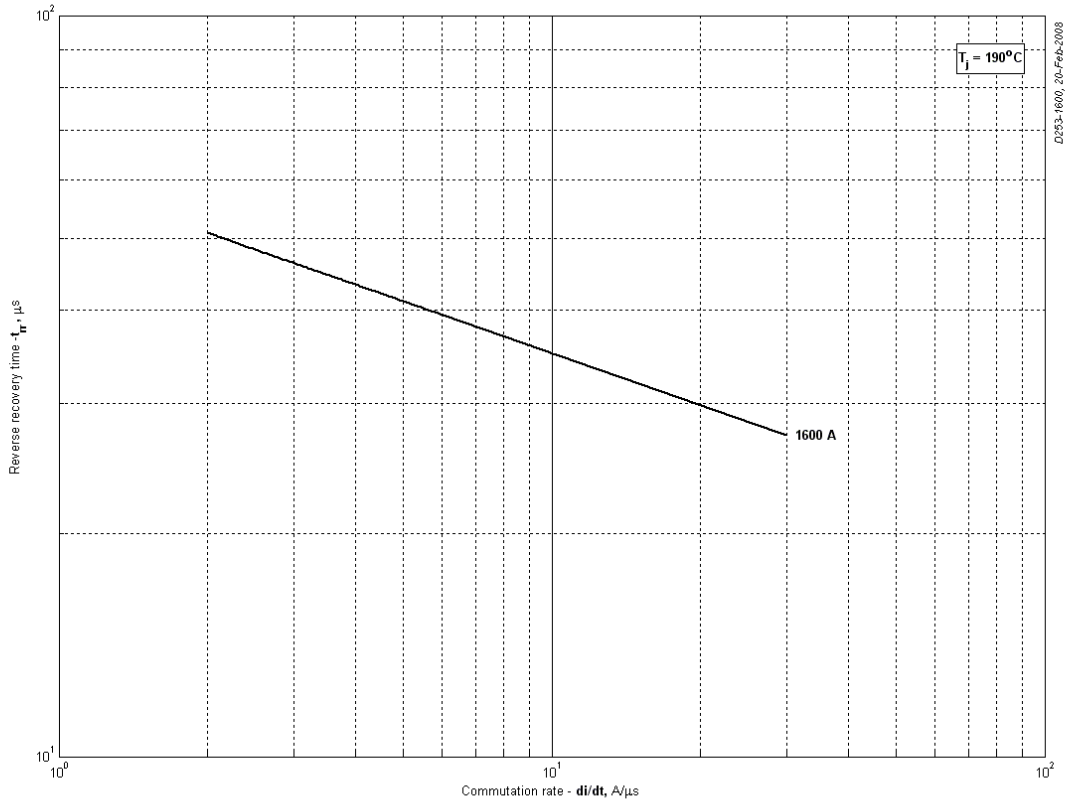


Fig 6 – Maximum recovery time, t_{rr} (linear)

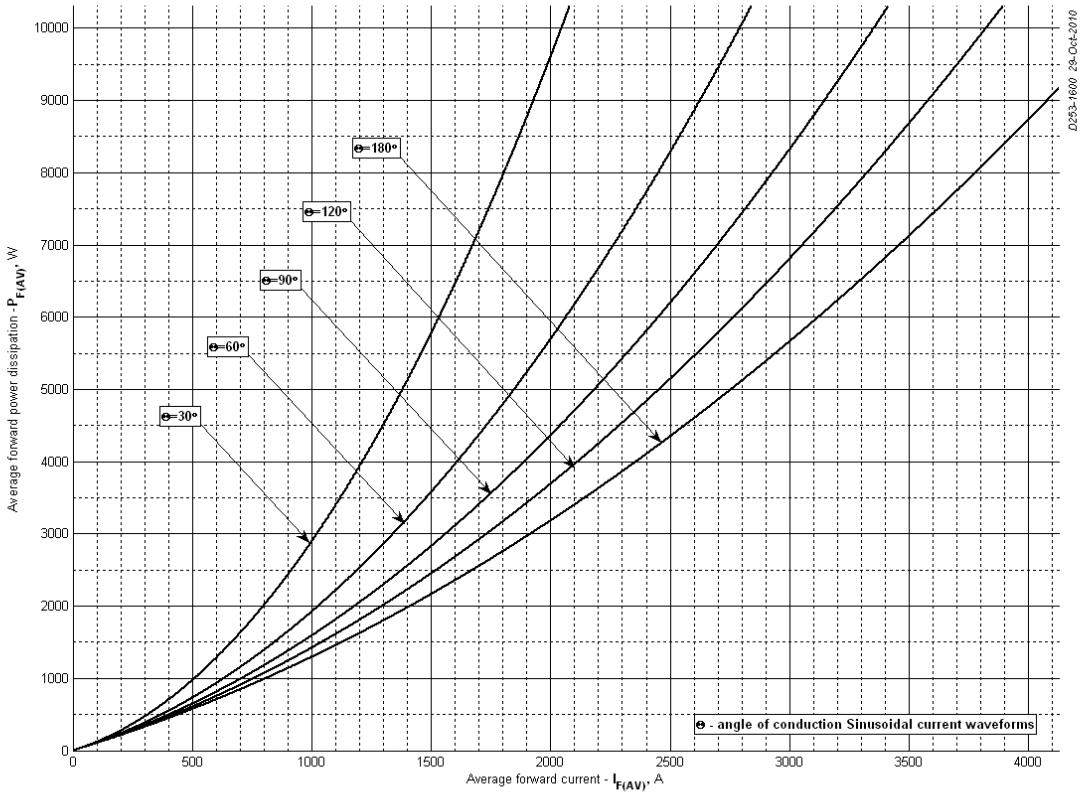


Fig 7 – On-state power loss (sinusoidal current waveforms)

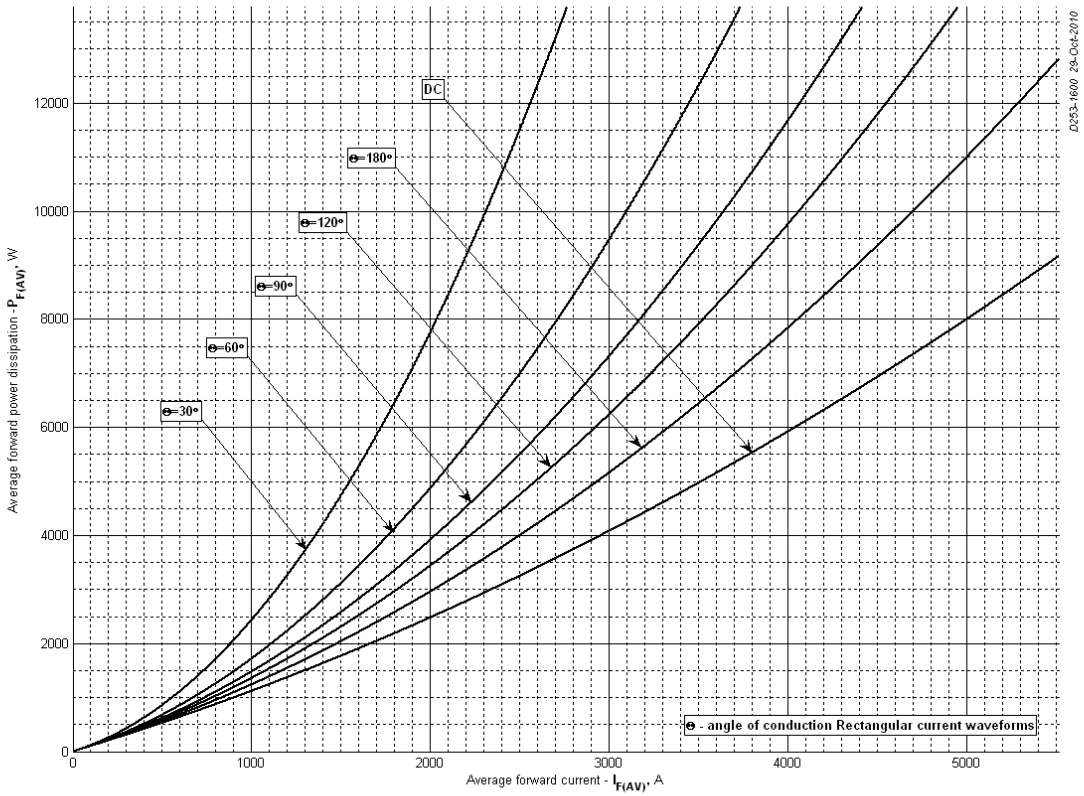


Fig 8 – On-state power loss (rectangular current waveforms)

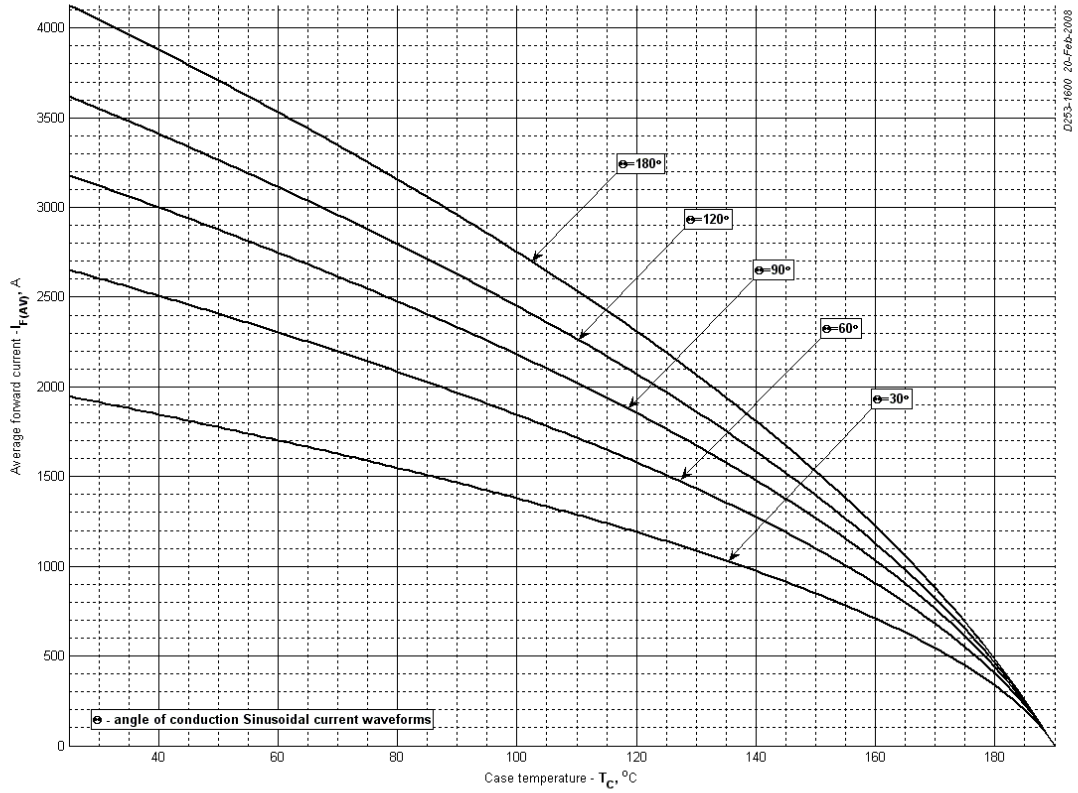


Fig 9 – Maximum case temperature DSC (sinusoidal current waveforms)

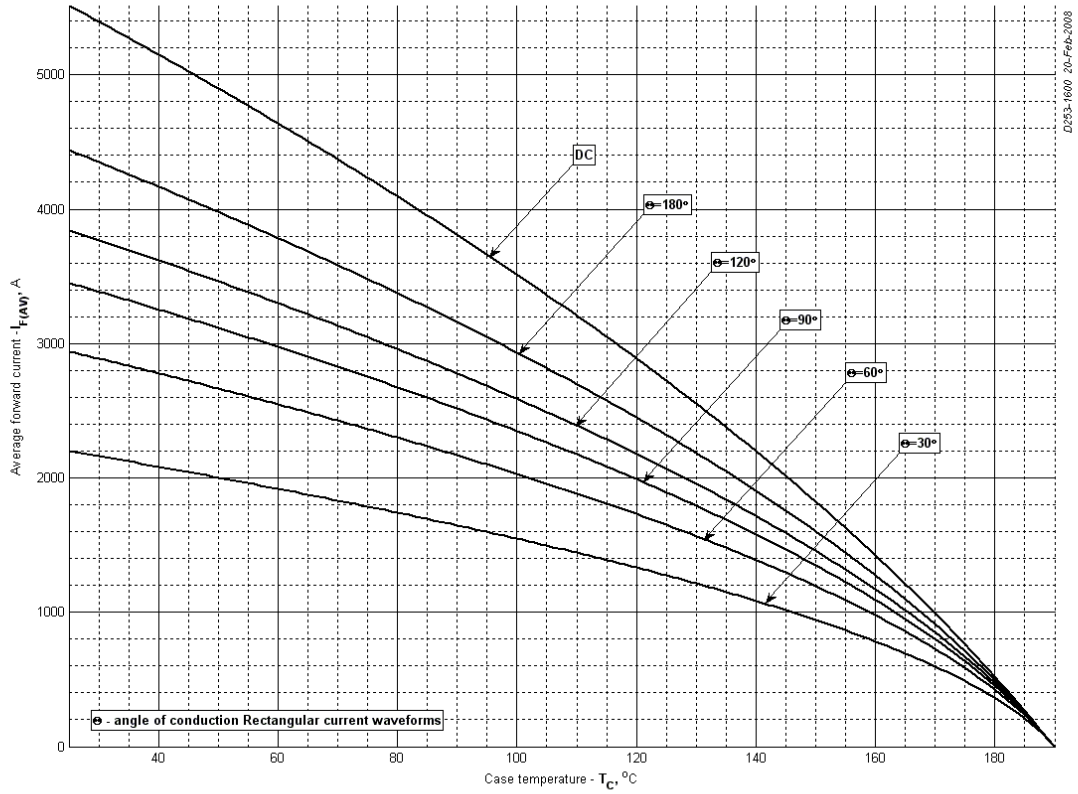


Fig 10 – Maximum case temperature DSC (rectangular current waveforms)

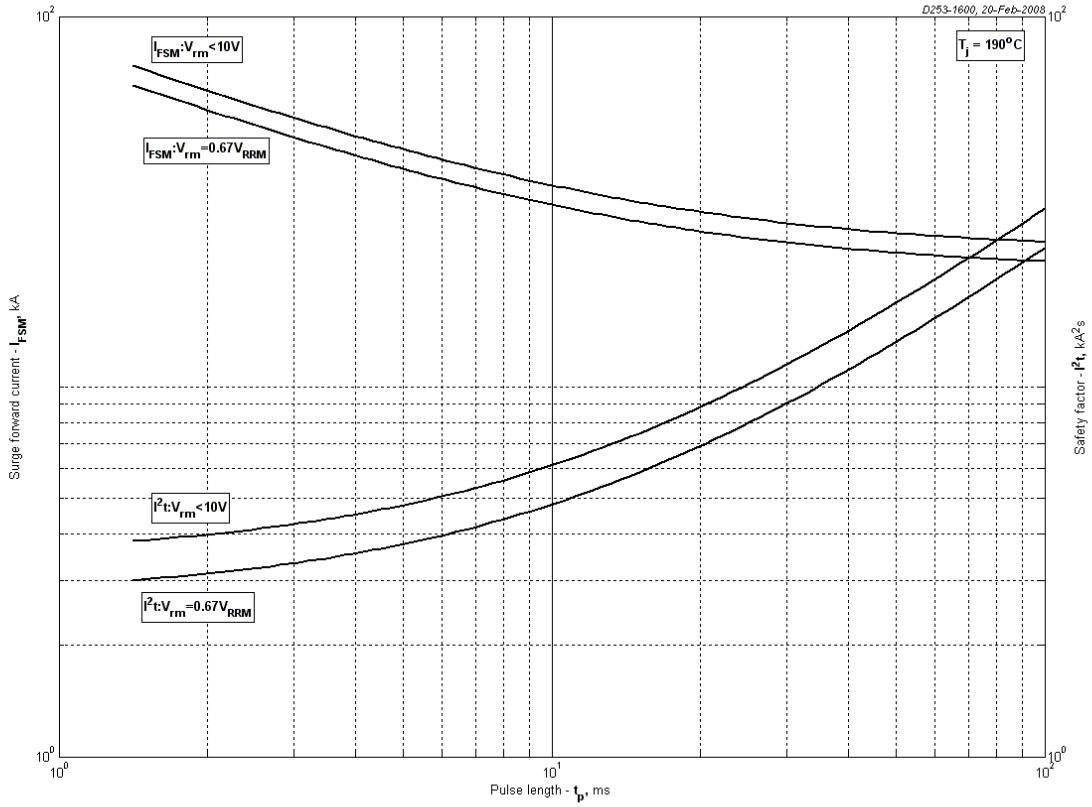


Fig 11 – Maximum surge and I^2t ratings

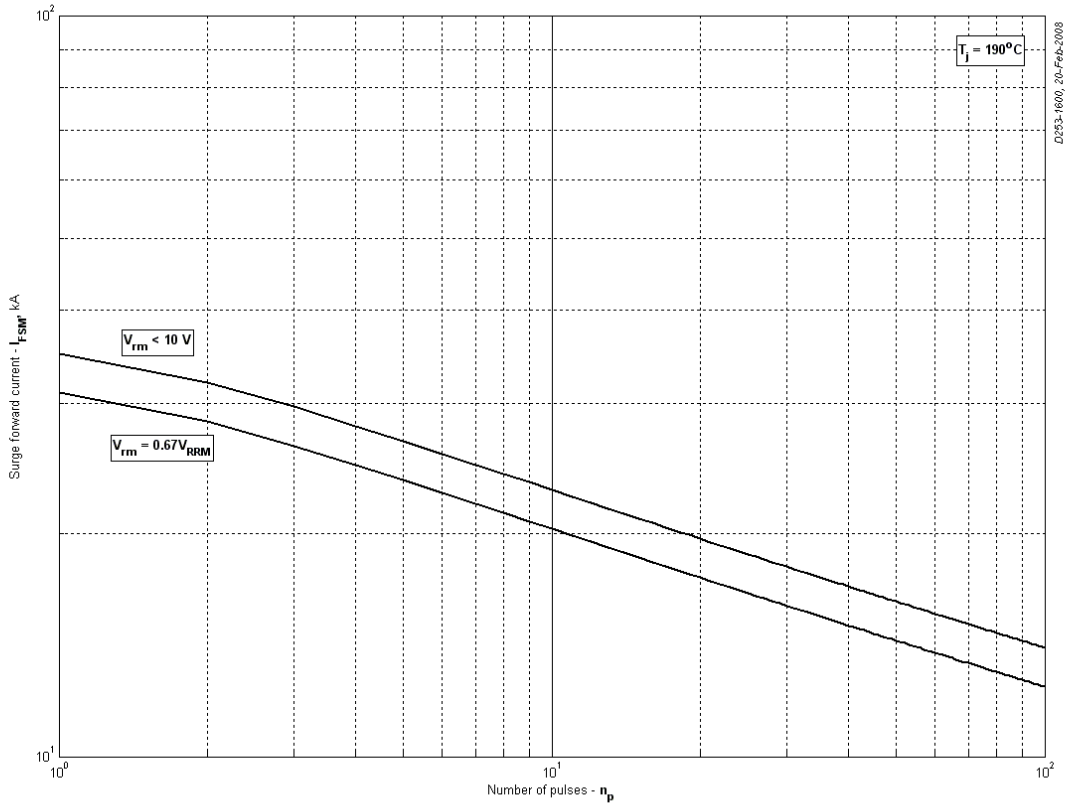


Fig 12 – Maximum surge ratings