

High forward current capability
 Low forward losses
 Low thermal resistance
 High load cycle capability

Rectifier Diode For Welding Type D053-7100-4-N

Average forward current	I_{FAV}	7402 A
Repetitive peak reverse voltage	V_{RRM}	200 ÷ 400 V
V_{RRM}, V	200	400
Voltage code	2	4
$T_j, ^\circ C$	- 60 ÷ 170	

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions
ON-STATE				
I_{FAV}	Average forward current	A	7100 7402 6440	$T_c = 89,8 ^\circ C$; Double side cooled; $T_c = 85 ^\circ C$; Double side cooled; $T_c = 100 ^\circ C$; Double side cooled; 180° half-sine wave; 50 Hz
I_{FRMS}	RMS forward current	A	11147	$T_c = 89,8 ^\circ C$; Double side cooled; 180° half-sine wave; 50 Hz
I_{FSM}	Surge forward current	kA	55.0 63.0	$T_j = T_{j\max}$ $T_j = 25 ^\circ C$ 180° half-sine wave; 50 Hz ($t_p = 10$ ms); single pulse; $V_R = 0$ V;
			58.0 67.0	$T_j = T_{j\max}$ $T_j = 25 ^\circ C$ 180° half-sine wave; 60 Hz ($t_p = 8.3$ ms); single pulse; $V_R = 0$ V;
I^2t	Safety factor	$A^2s \cdot 10^3$	15125 19845	$T_j = T_{j\max}$ $T_j = 25 ^\circ C$ 180° half-sine wave; 50 Hz ($t_p = 10$ ms); single pulse; $V_R = 0$ V;
			13960 18625	$T_j = T_{j\max}$ $T_j = 25 ^\circ C$ 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	200 ÷ 400	$T_{j\min} < T_j < T_{j\max}$; 180° half-sine wave; 50 Hz;
V_{RSM}	Non-repetitive peak reverse voltages	V	300 ÷ 500	$T_{j\min} < T_j < T_{j\max}$; 180° half-sine wave; 50 Hz; single pulse;
V_R	Reverse continuous voltages	V	$0.75 \cdot V_{RRM}$	$T_j = T_{j\max}$;
THERMAL				
T_{stg}	Storage temperature	$^\circ C$	- 60 ÷ 170	
T_j	Operating junction temperature	$^\circ C$	- 60 ÷ 170	
MECHANICAL				
F	Mounting force	kN	30.0 ÷ 36.0	
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	1.05 0.89	$T_j=25\text{ }^\circ\text{C}; I_{FM} = 5000\text{ A}$ $T_j=T_{j\text{ max}}; I_{FM} = 5000\text{ A}$	
$V_{F(TO)}$	Forward threshold voltage, max	V	0.750	$T_j=T_{j\text{ max}};$ $5000\text{ A} < I_T < 14000\text{ A}$	
r_T	Forward slope resistance, max	m Ω	0.029		
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	50	$T_j=T_{j\text{ max}};$ $V_R=V_{RRM}$	
SWITCHING					
Q_{rr}	Total recovered charge, max	μC	950	$T_j=T_{j\text{ max}}; I_{FM}=1000\text{ A};$ $di_{FM}/dt=-30\text{ A}/\mu\text{s}$	
			620	$T_j=T_{j\text{ max}}; I_{FM}=1000\text{ A};$ $di_{FM}/dt=-10\text{ A}/\mu\text{s}$	
THERMAL					
R_{thjc}	Thermal resistance, junction to case, max	$^\circ\text{C}/\text{W}$	0.0090	Direct current	Double side cooled
R_{thjc-A}			0.0210		Anode side cooled
R_{thjc-K}			0.0160		Cathode side cooled
R_{thck}	Thermal resistance, case to heatsink, max	$^\circ\text{C}/\text{W}$	0.0050	Direct current	
MECHANICAL					
w	Weight, typ	g	140		
D_s	Surface creepage distance	mm (inch)	7.3 (0.287)		
D_a	Air strike distance	mm (inch)	4.0 (0.157)		

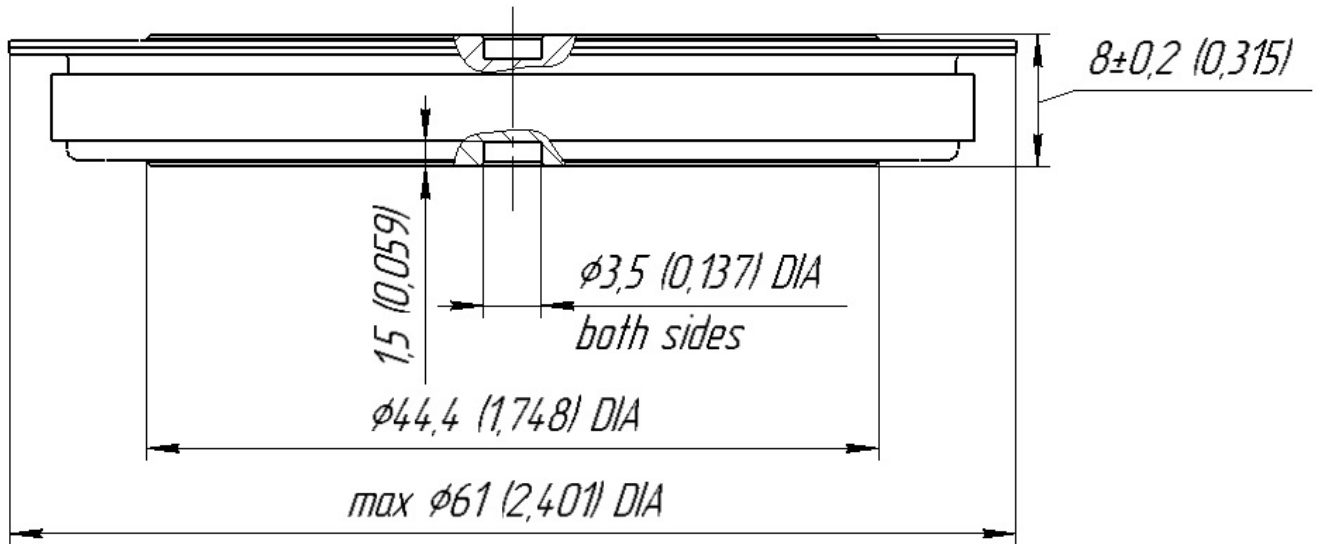
PART NUMBERING GUIDE

D	053	7100	4	N
1	2	3	4	

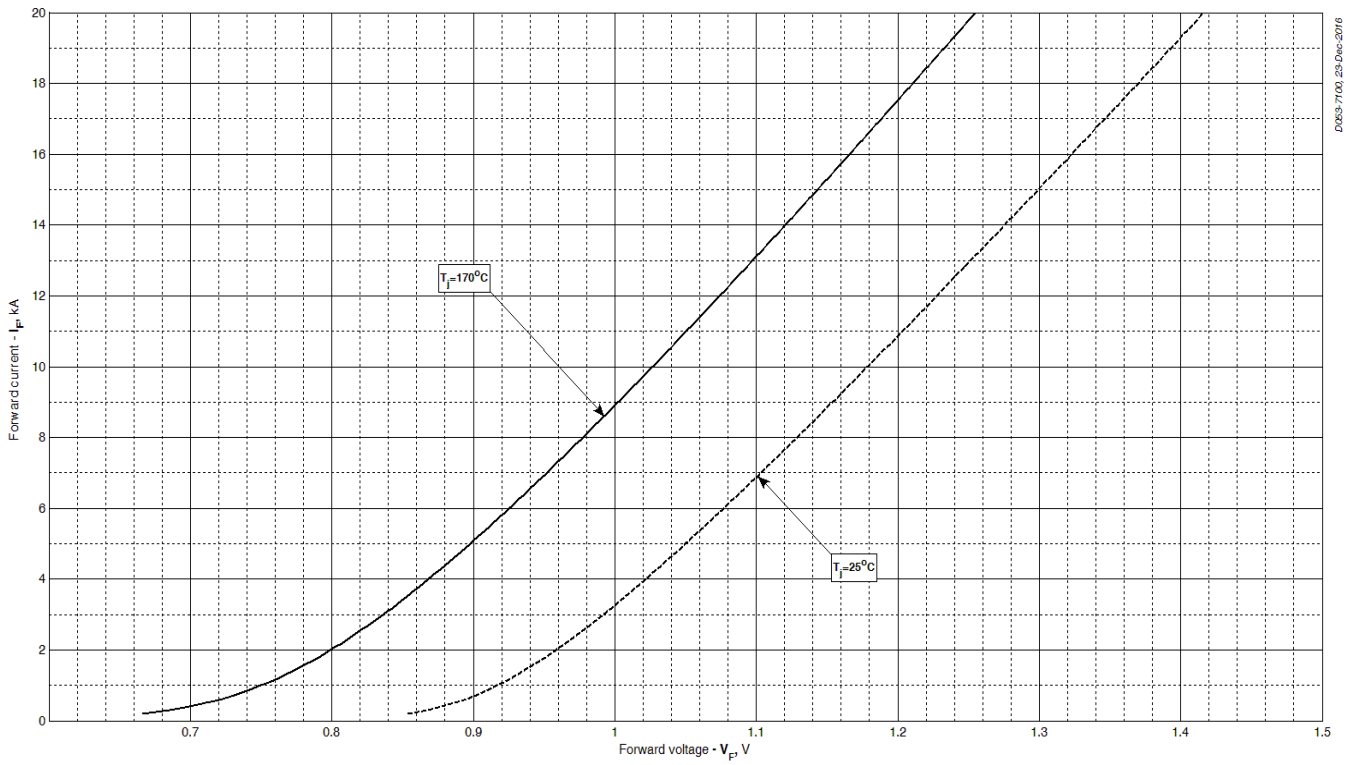
1. Design version
2. Average forward current, A
3. Voltage code
4. Ambient conditions: N – normal

De-rating Main characteristics vs Mounting force

Symbols and parameters		Units	Values (F=20 kN)	Values (F=25 kN)	Conditions	
I_{FAV}	Average forward current	A	5287	5788	$T_c= 100\text{ }^\circ\text{C};$ Double side cooled; 180° half-sine wave; 50 Hz	
V_{FM}	Peak forward voltage, max	V	1.06 0.90	1.06 0.90	$T_j=25\text{ }^\circ\text{C}; I_{FM} = 5000\text{ A}$ $T_j=T_{j\text{ max}}; I_{FM} = 5000\text{ A}$	
$V_{F(TO)}$	Forward threshold voltage, max	V	0.770	0.760	$T_j=T_{j\text{ max}};$ $5000\text{ A} < I_T < 14000\text{ A}$	
r_T	Forward slope resistance, max	m Ω	0.031	0.030		
R_{thjc}	Thermal resistance, junction to case, max	$^\circ\text{C}/\text{W}$	0.0113	0.0102	Direct current	Double side cooled
R_{thjc-A}			0.0264	0.0235		Anode side cooled
R_{thjc-K}			0.0218	0.0180		Cathode side cooled



All dimensions in millimeters (inches)



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

	Coefficients for max curves	
	$T_j = 25^\circ\text{C}$	$T_j = T_{j\text{max}}$
A	0.869879	0.692620
B	0.022542	0.021003
C	0.074643	0.110962
D	-0.029819	-0.044329

Forward characteristic model (see Fig. 1).

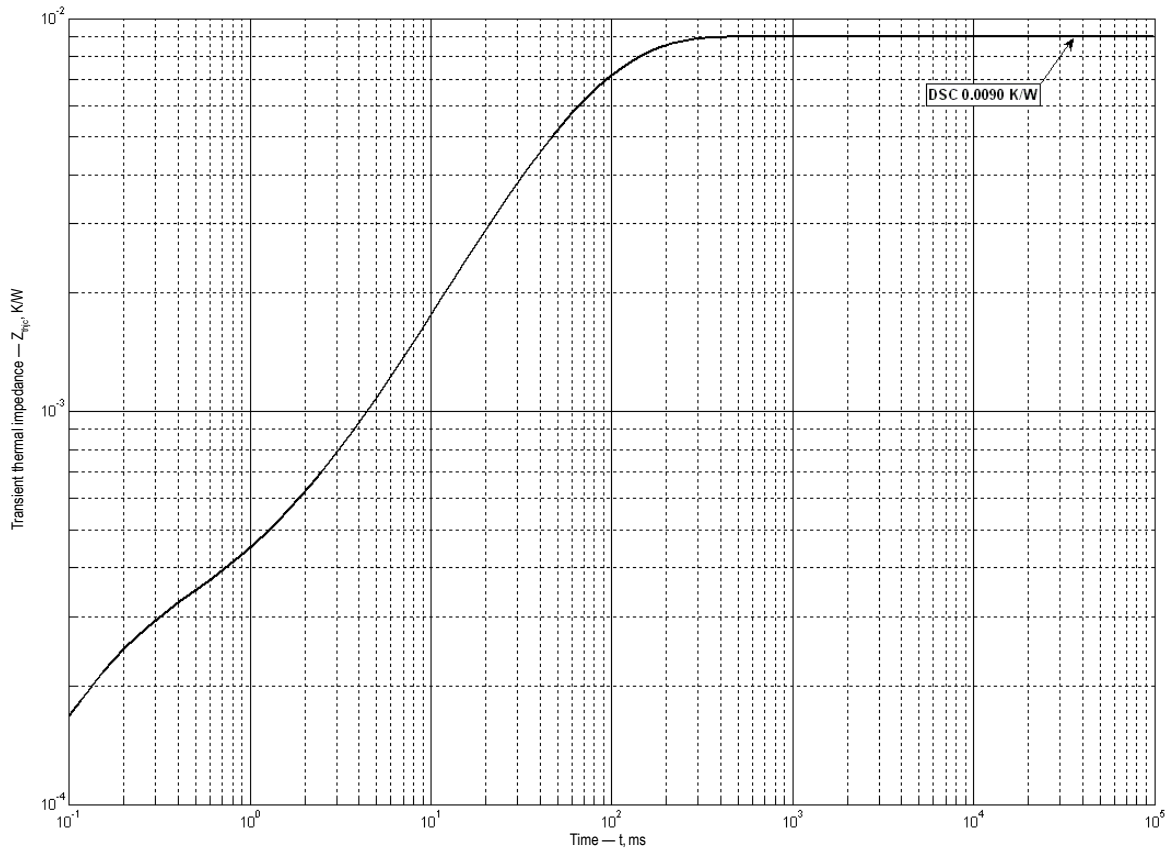


Fig 2 – Transient thermal impedance

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

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	0.001448	0.006594	0.0006431	0.00004826	0.00004138	0.0002254
τ_i, s	0.08908	0.06263	0.01451	0.00151	0.0003338	0.0001058

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

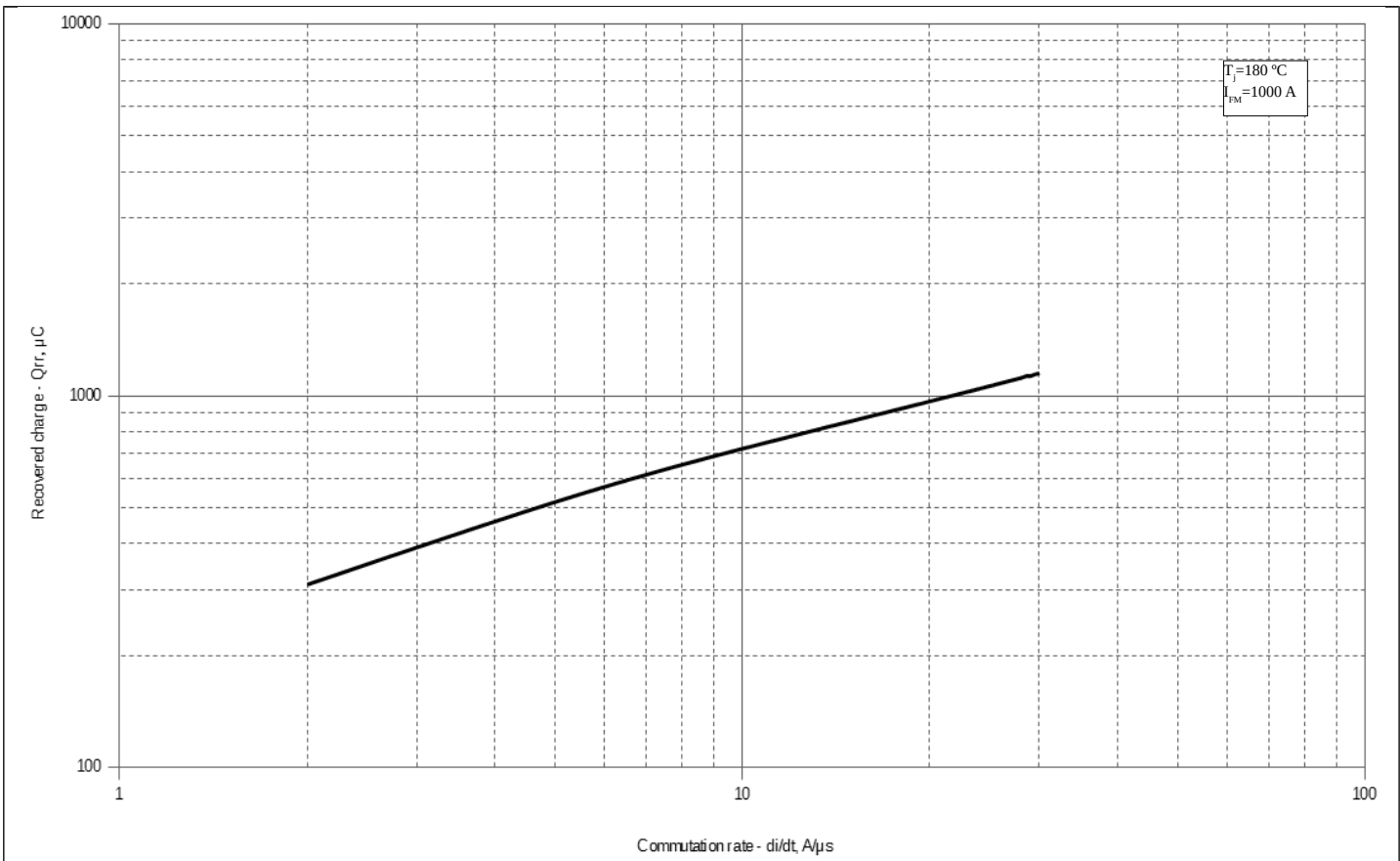


Fig 3 - Recovered charge, Q_{rr}

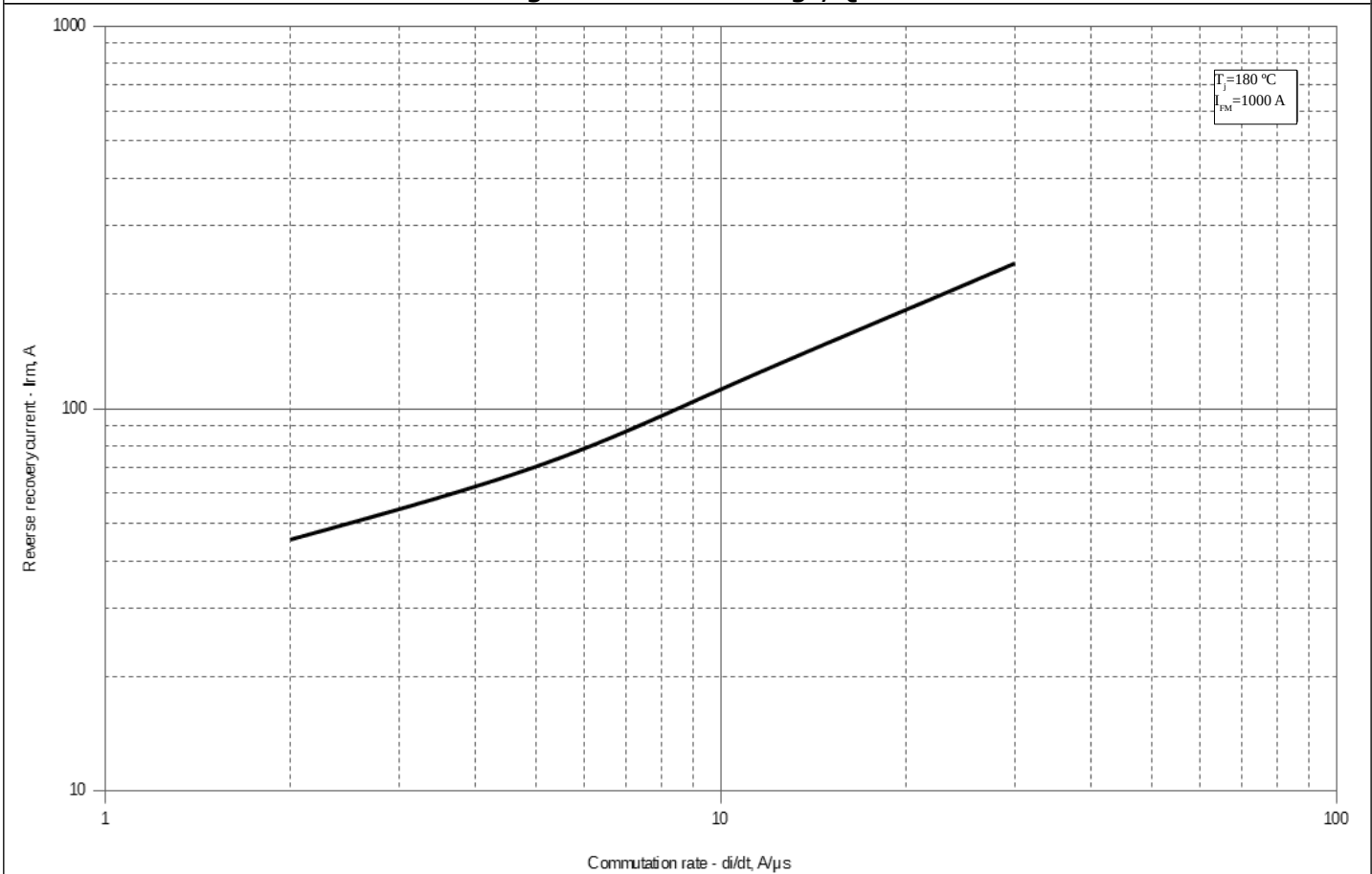


Fig 4 - Peak reverse recovery current, I_{rrm}

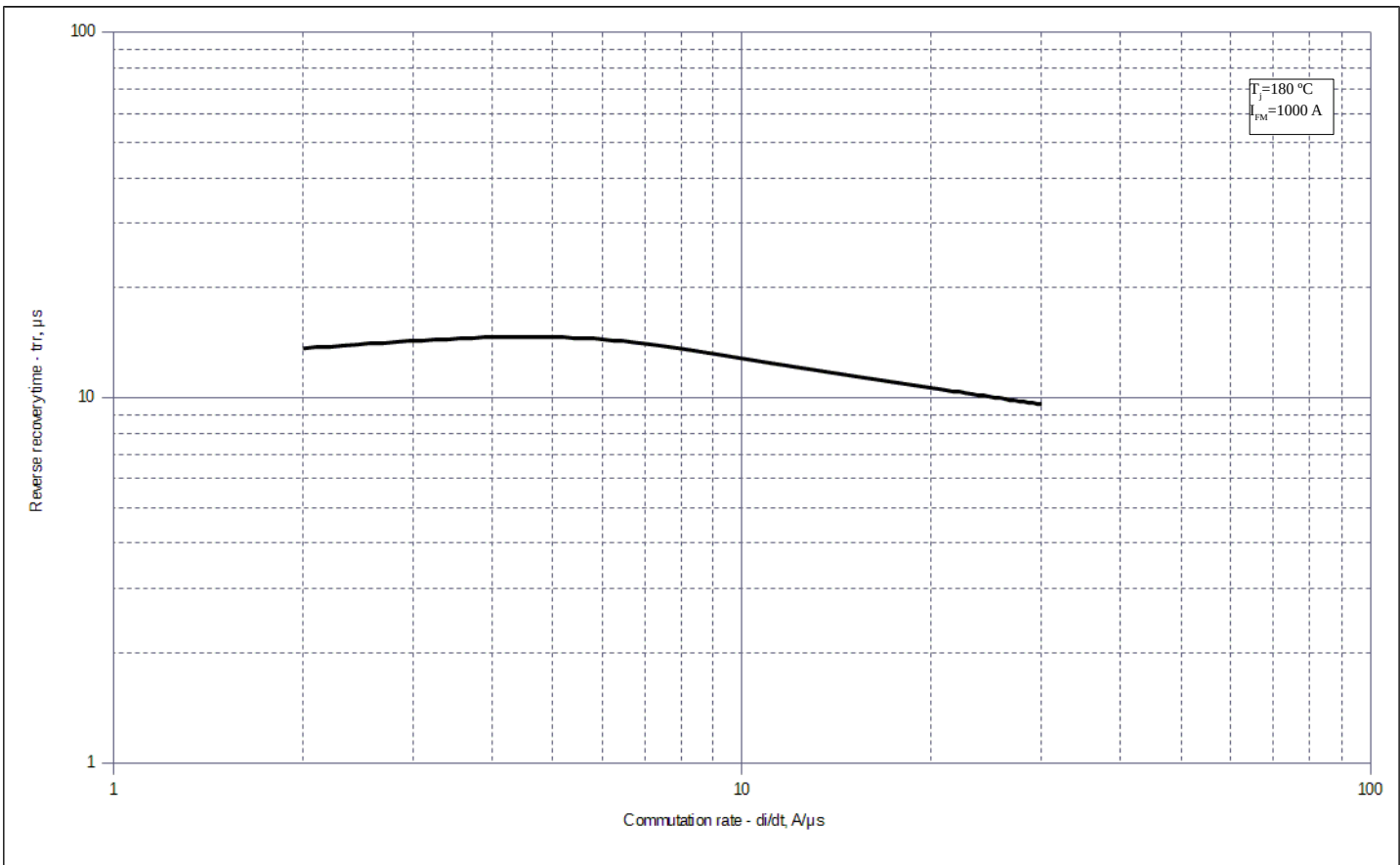


Fig 5 – Maximum recovery time, t_{rr} (linear)

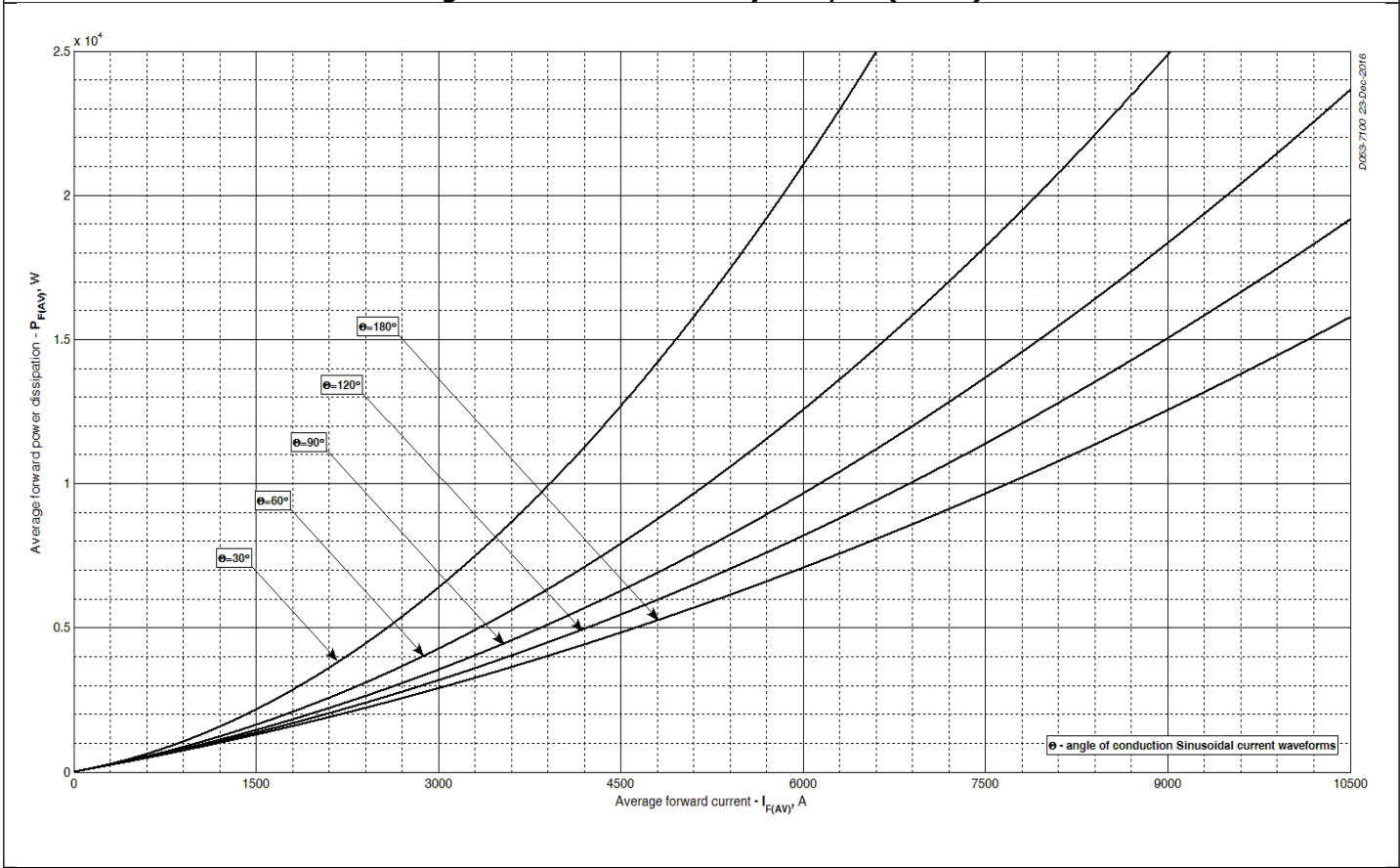


Fig 6 – Mean forward power dissipation P_{FAV} vs. Mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$, DSC)

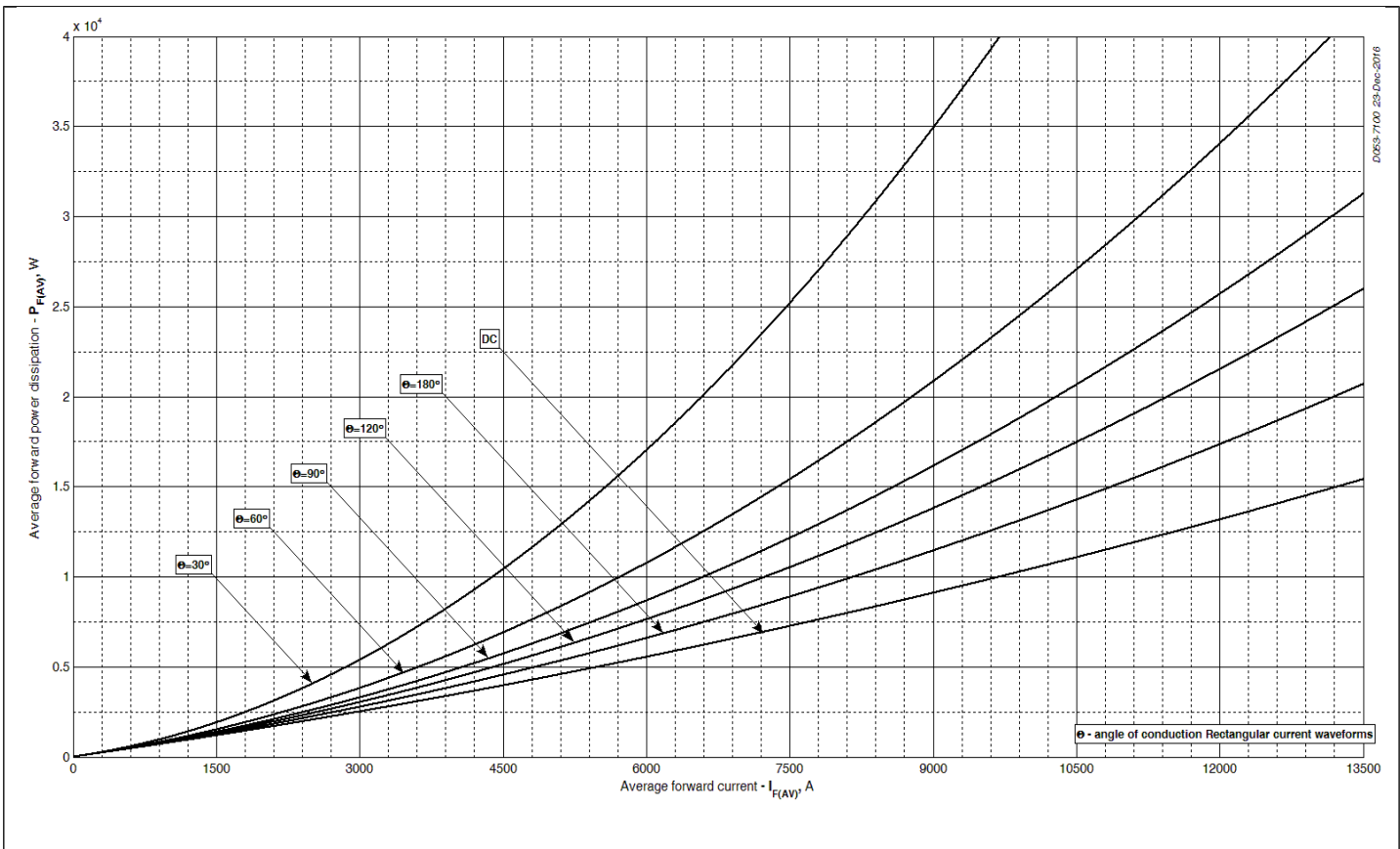


Fig 7 – Mean forward power dissipation P_{FAV} vs. Mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$, DSC)

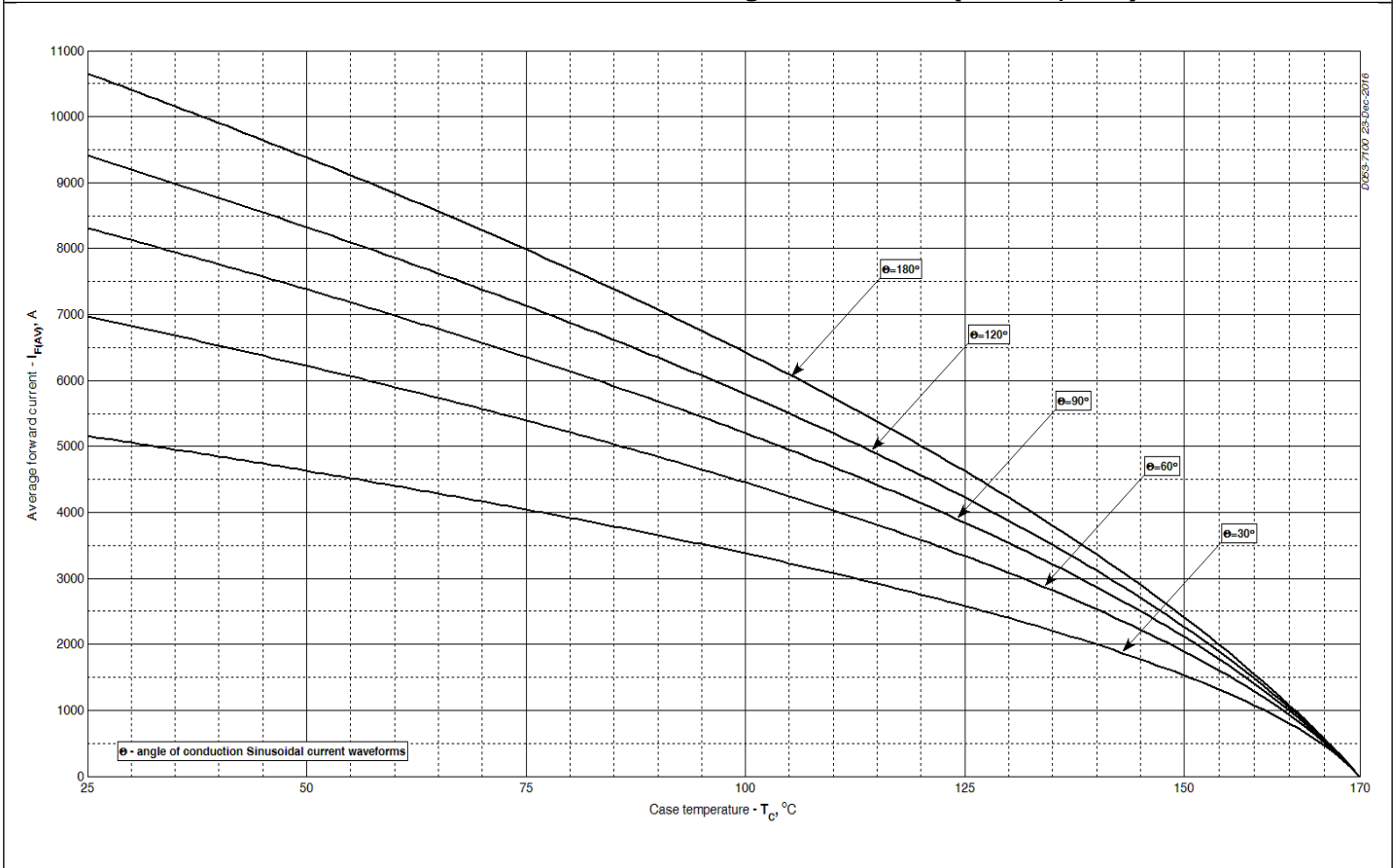


Fig 8 - Mean forward current I_{FAV} vs. Case temperature T_C for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$, DSC)

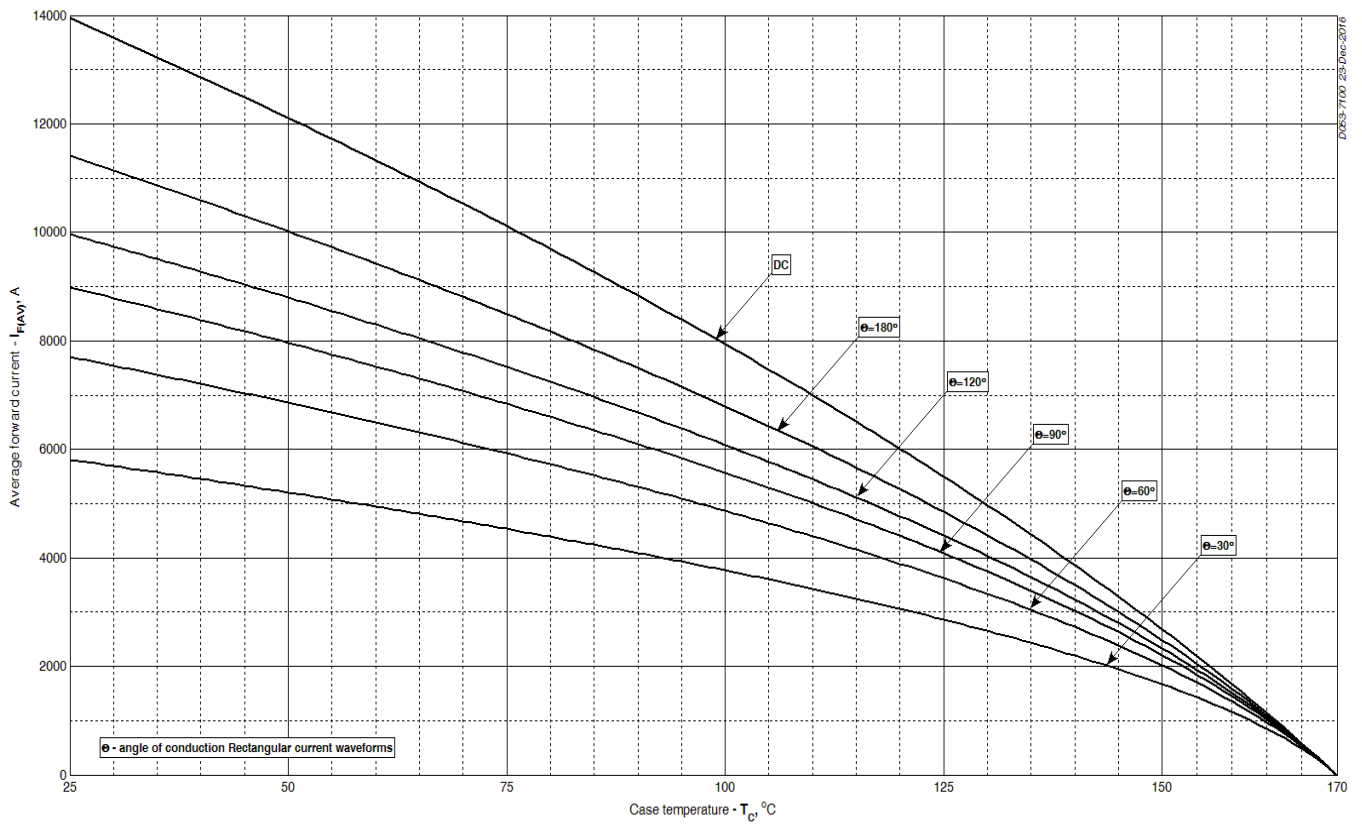


Fig 9 – Mean forward current I_{FAV} vs. Case temperature T_c for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$, DSC)

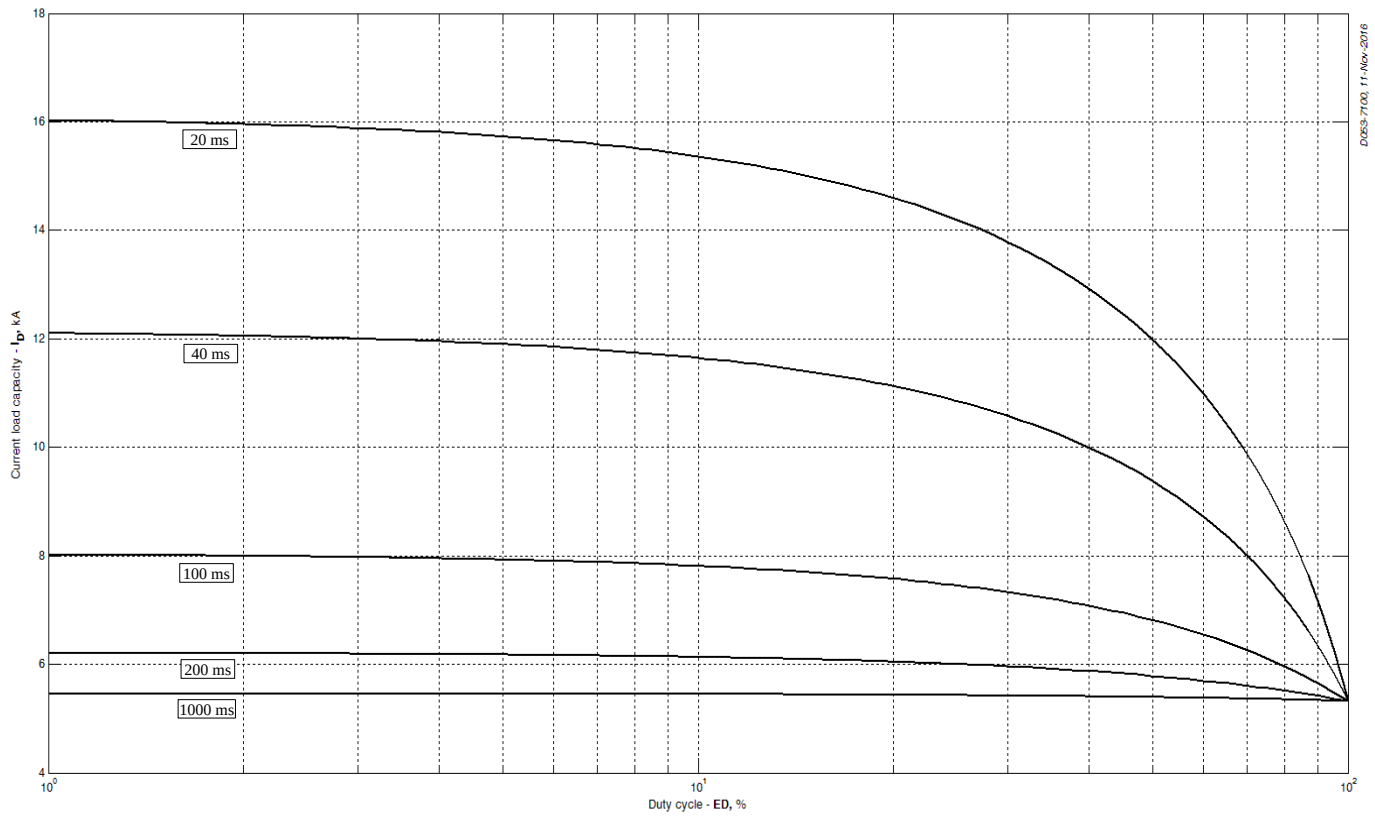


Fig 10 – Current load capability ($f=1000\text{ Hz}$, square wave, $T_c = 40\text{ °C}$)

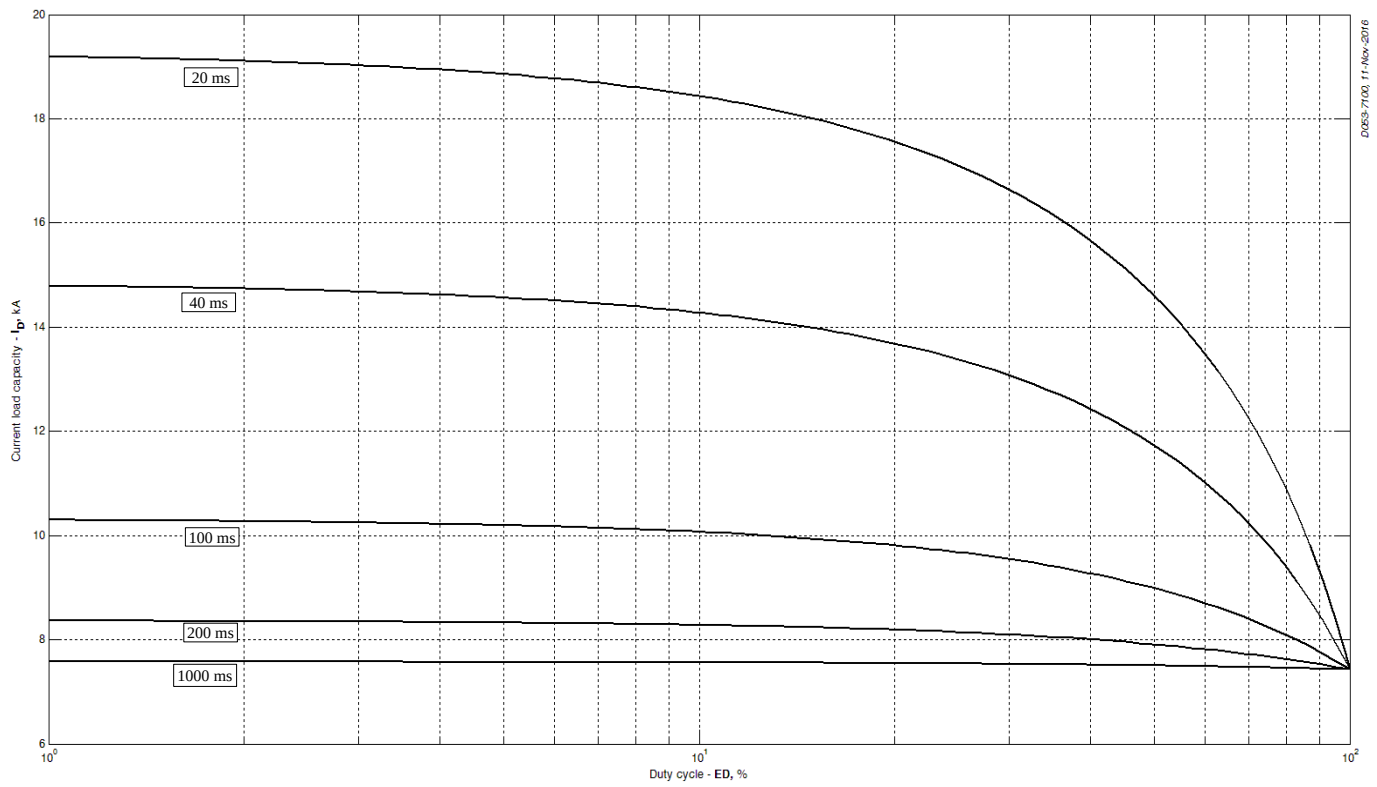


Fig 11 – Current load capability (f=1000 Hz, square wave, T_c = 60 °C)

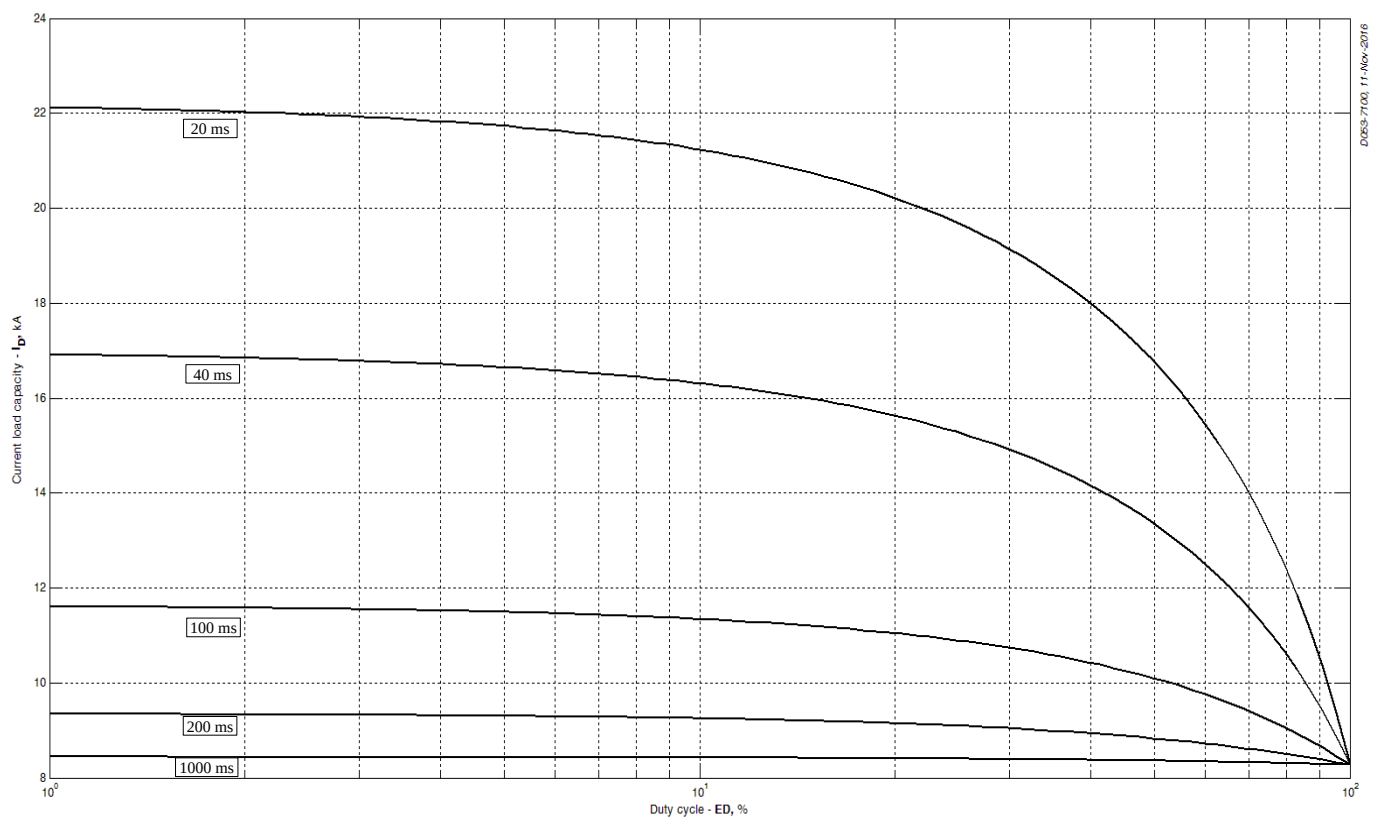


Fig 12 – Current load capability (f=1000 Hz, square wave, T_c = 70 °C)

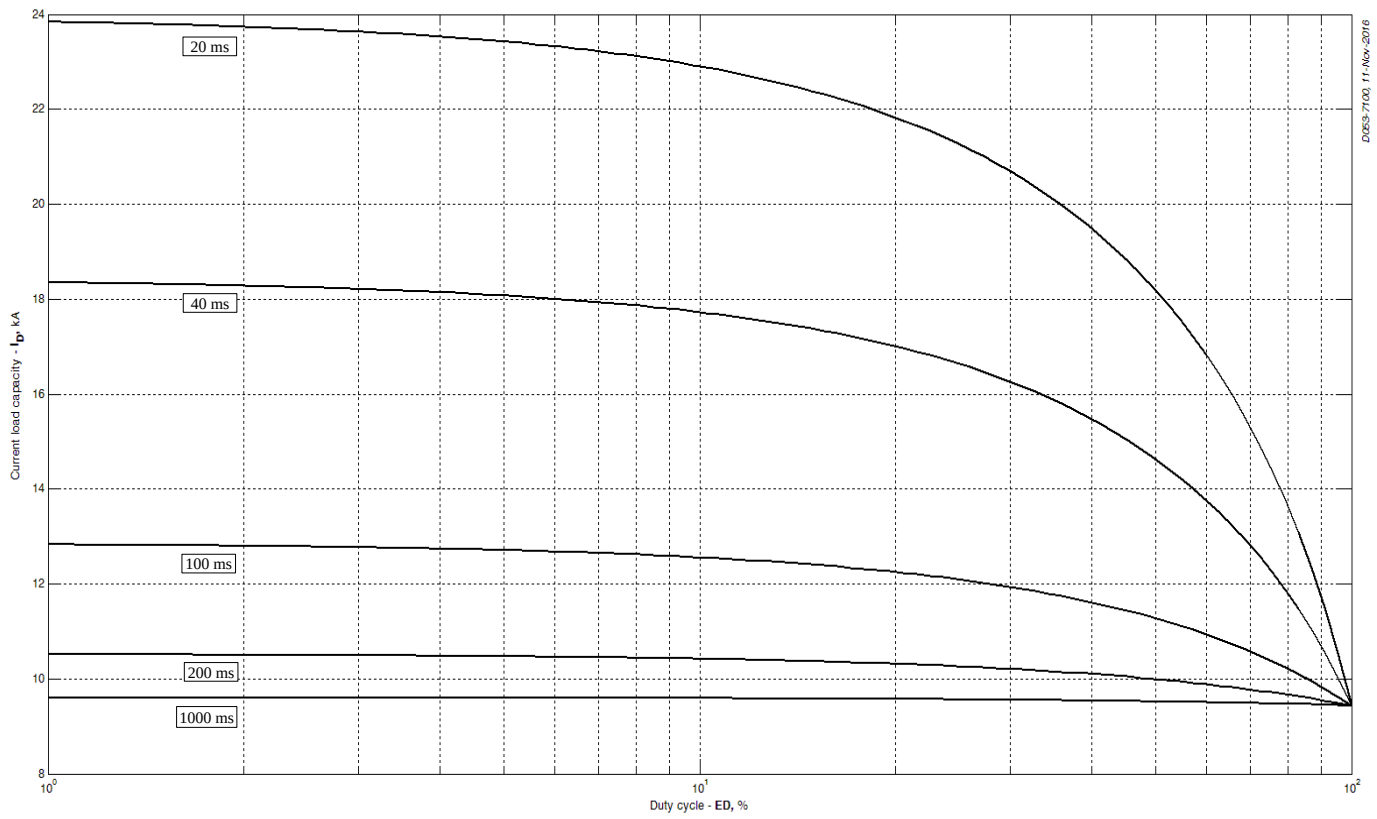


Fig 13 – Current load capability (f=1000 Hz, square wave, $T_c = 80\text{ }^\circ\text{C}$)

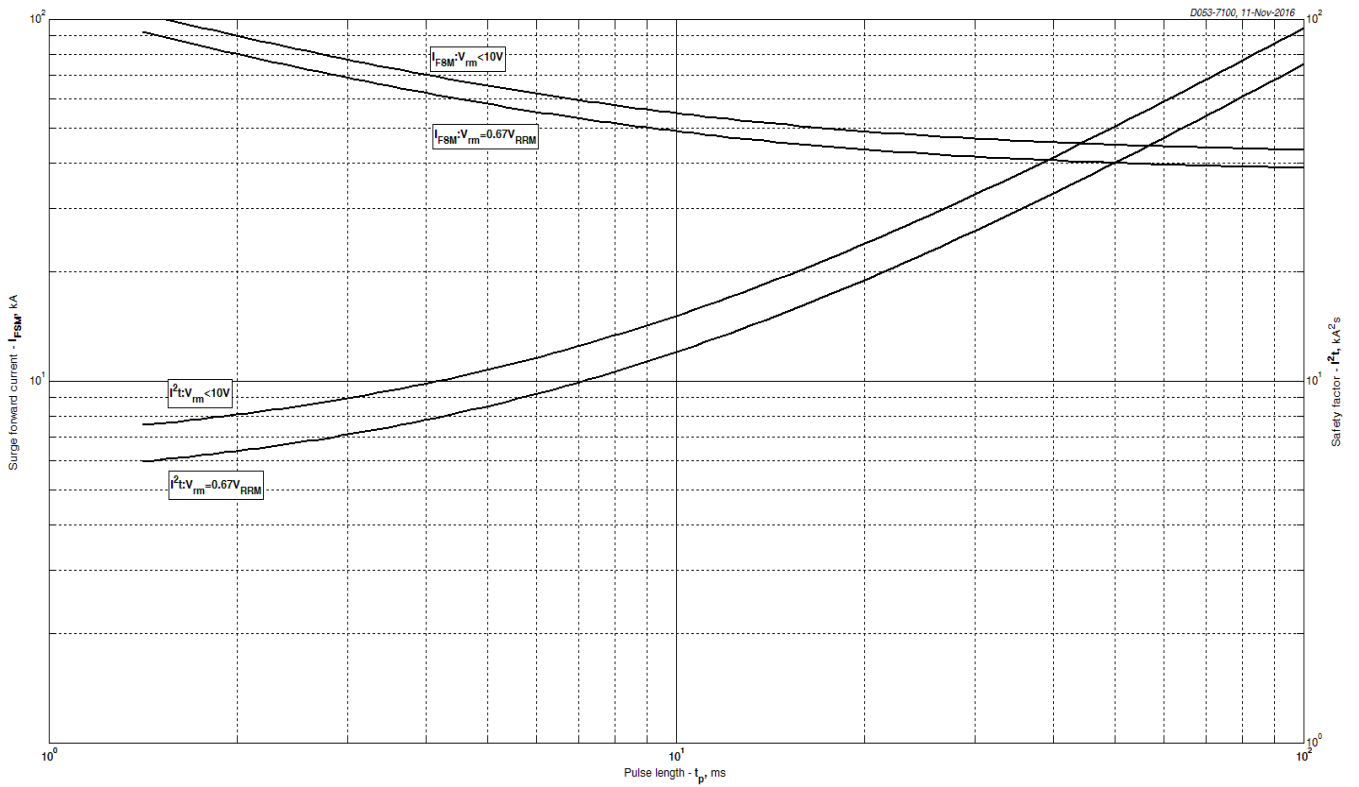


Fig 14 – Maximum surge and I^2t ratings

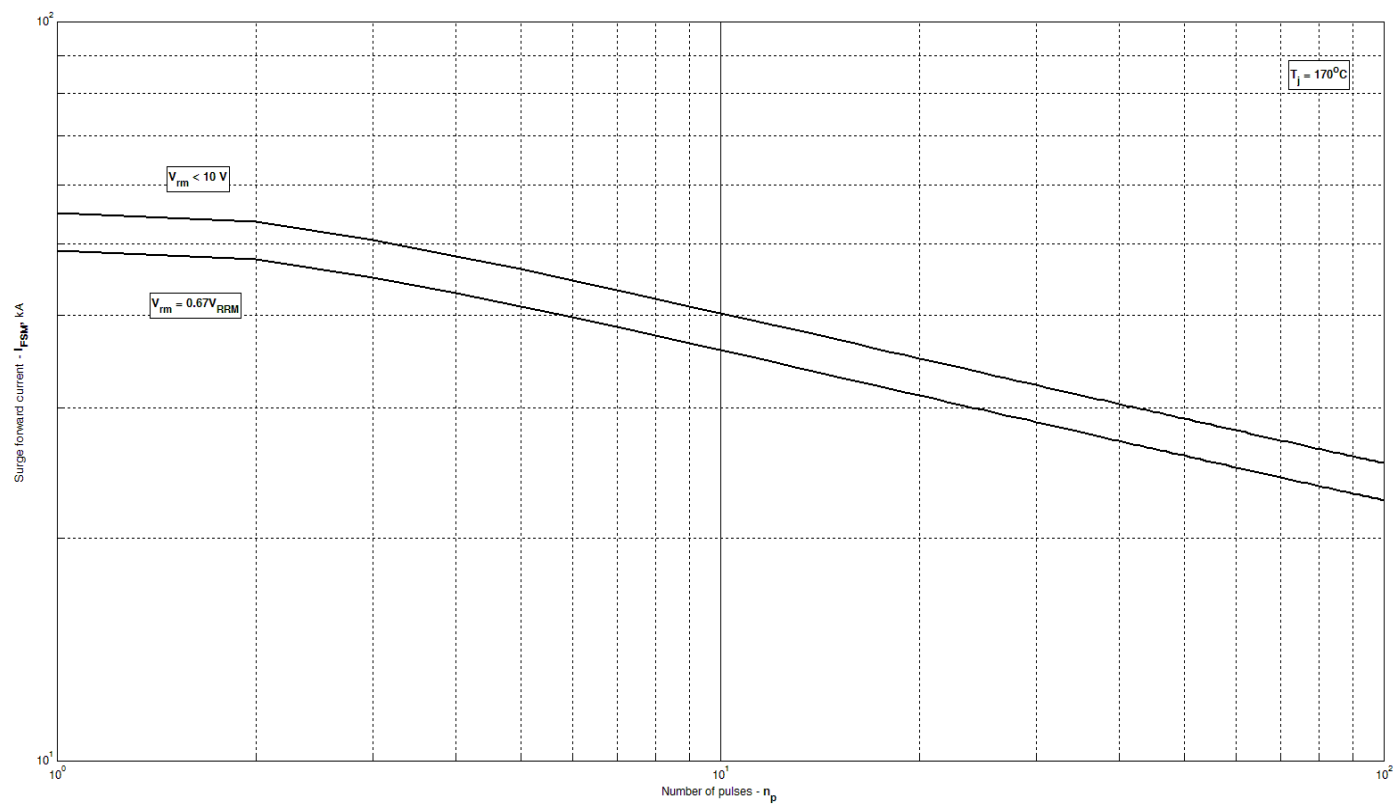


Fig 15 – Maximum surge ratings

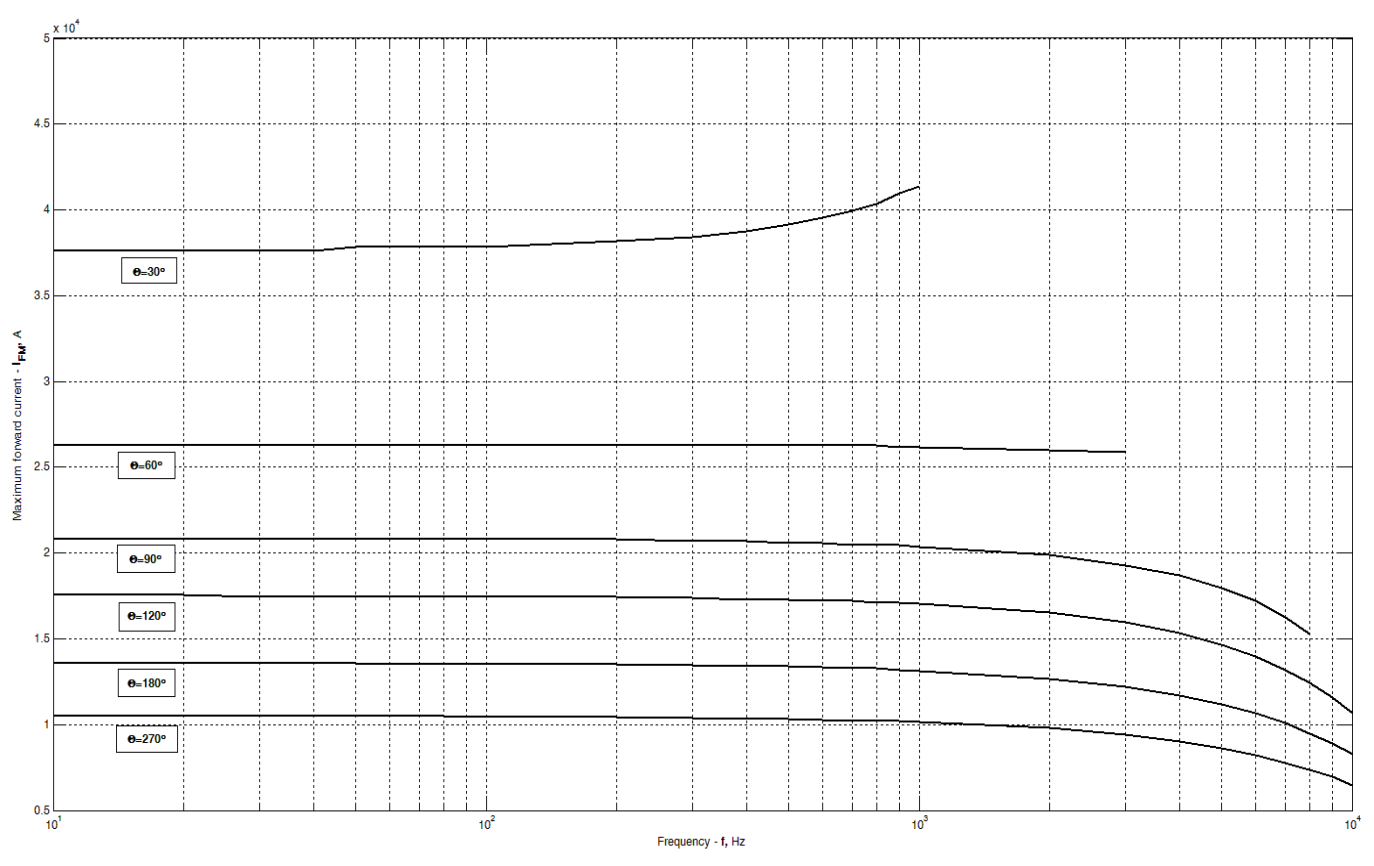
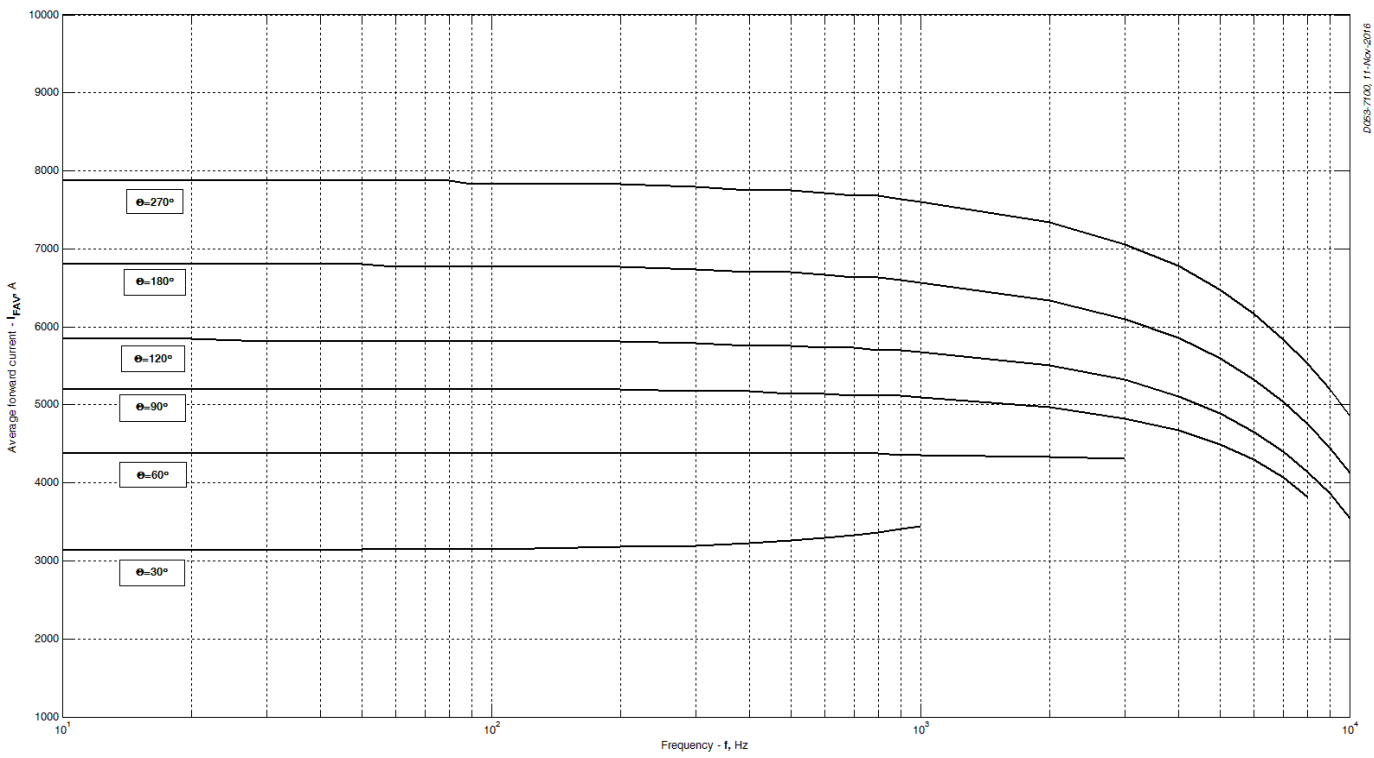


Fig 16 –Maximum forward current vs. frequency, trapezoid waveform, $T_C=85^\circ\text{C}$, $di_F/dt=\pm 500\text{ A}/\mu\text{s}$, $V_R=100\text{ V}$



**Fig 17 –Average forward current vs. frequency, trapezoid waveform,
T C =85 °C, di_F/dt=±500 A/μs, V_R =100 V**