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

Power Rectifier Avalanche Diodes
Type DA243-500-28

Average forward current		I_{FAV}	500 A		
Repetitive peak reverse voltage		V_{RRM}	2000...2800 V		
V_{RRM}, V	2000	2200	2400	2600	2800
Voltage code	20	22	24	26	28
T_j, °C	–60...+150				

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{FAV}	Maximum allowable average forward current	A	500 757	T_c=122 °C; Double side cooled; T_c=100 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	785	T_c=122 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	13.0 15.0	T_j=$T_{j\,max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V;
			14.0 16.0	T_j=$T_{j\,max}$ T_j=25 °C	180° half-sine wave; t_p=8.3 ms; single pulse; V_R=0 V;
I^2t	Safety factor	$A^2s\cdot10^3$	840 1120	T_j=$T_{j\,max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V;
			810 1060	T_j=$T_{j\,max}$ T_j=25 °C	180° half-sine wave; t_p=8.3 ms; single pulse; V_R=0 V;
BLOCKING					
V_{RRM}	Repetitive peak reverse voltages	V	2000...2800	$T_{j\,min}$< T_j <$T_{j\,max}$; 180° half-sine wave; 50 Hz;	
$V_{(BR)}$	Breakdown voltage	V	2450...3250	T_j=25 °C; I_{br}=100 mA; t_p=10 ms; 5 Hz	
V_R	Reverse continuous voltages	V	0.6·V_{RRM}	T_j=$T_{j\,max}$;	
P_{RSM}	Surge reverse power dissipation	kW	16	T_j= $T_{j\,max}$; t_p=100 µs; 180° half-sine current waveforms; single pulse	
THERMAL					
T_{stg}	Storage temperature	°C	–60...+50		
T_j	Operating junction temperature	°C	–60...+150		
MECHANICAL					
F	Mounting force	kN	14.0...16.0		
a	Acceleration	m/s^2	50	Device clamped	

CHARACTERISTICS

Symbols and parameters		Units	Values	Conditions	
ON-STATE					
V_{FM}	Peak forward voltage, max	V	1.90	T_j=25 °C; I_{FM}=1570A	
$V_{F(TO)}$	Forward threshold voltage, max	V	1.212	T_j=$T_{j\ max}$; 0.5 π I_{FAV} < I_T < 1.5 π I_{FAV}	
r_T	Forward slope resistance, max	mΩ	0.532		
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, max	μC	3470	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	42		
I_{rr}	Reverse recovery current, max	A	165		
THERMAL					
R_{thjc}	Thermal resistance, junction to case, max	°C/W	0.030	Direct current	Double side cooled
R_{thjc-A}			0.066		Anode side cooled
R_{thjc-K}			0.054		Cathode side cooled
R_{thck}	Thermal resistance, case to heatsink, max	°C/W	0.006	Direct current	
MECHANICAL					
m	Weight, max	g	260		
D_s	Surface creepage distance	mm (inch)	23.69 (0.933)		
D_a	Air strike distance	mm (inch)	19.10 (0.752)		

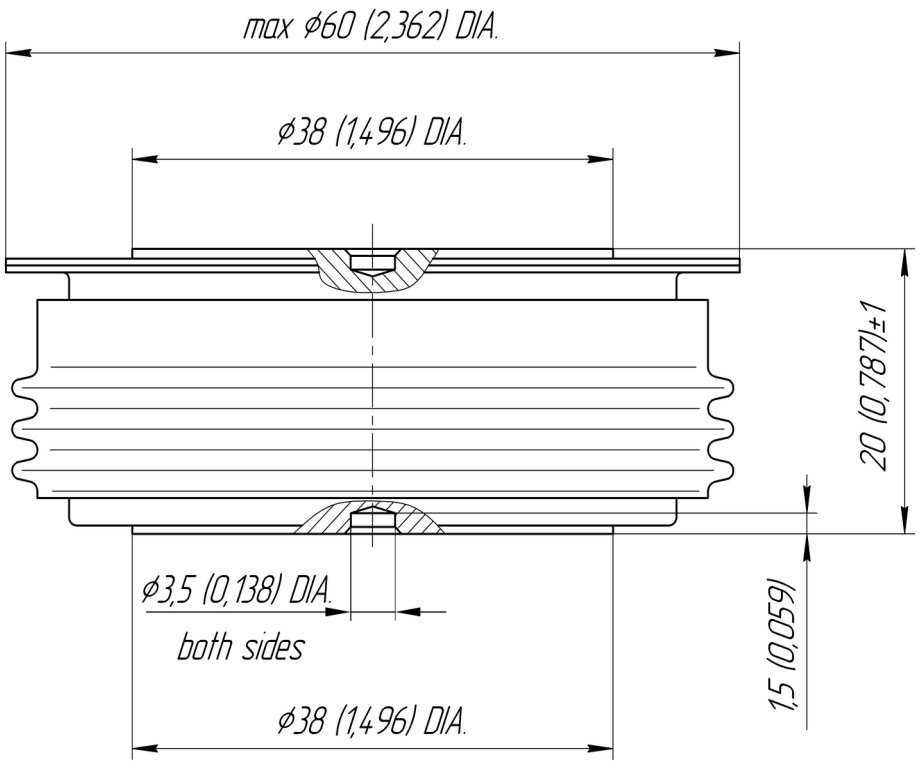
PART NUMBERING GUIDE

DA	243	500	28	N
1	2	3	4	5

1. DA — Avalanche Diode
2. Design version
3. Average forward current, A
4. Voltage code
5. Ambient conditions: N – normal; T – tropical

OVERALL DIMENSIONS

Package type: D.C2



All dimensions in millimeters (inches)

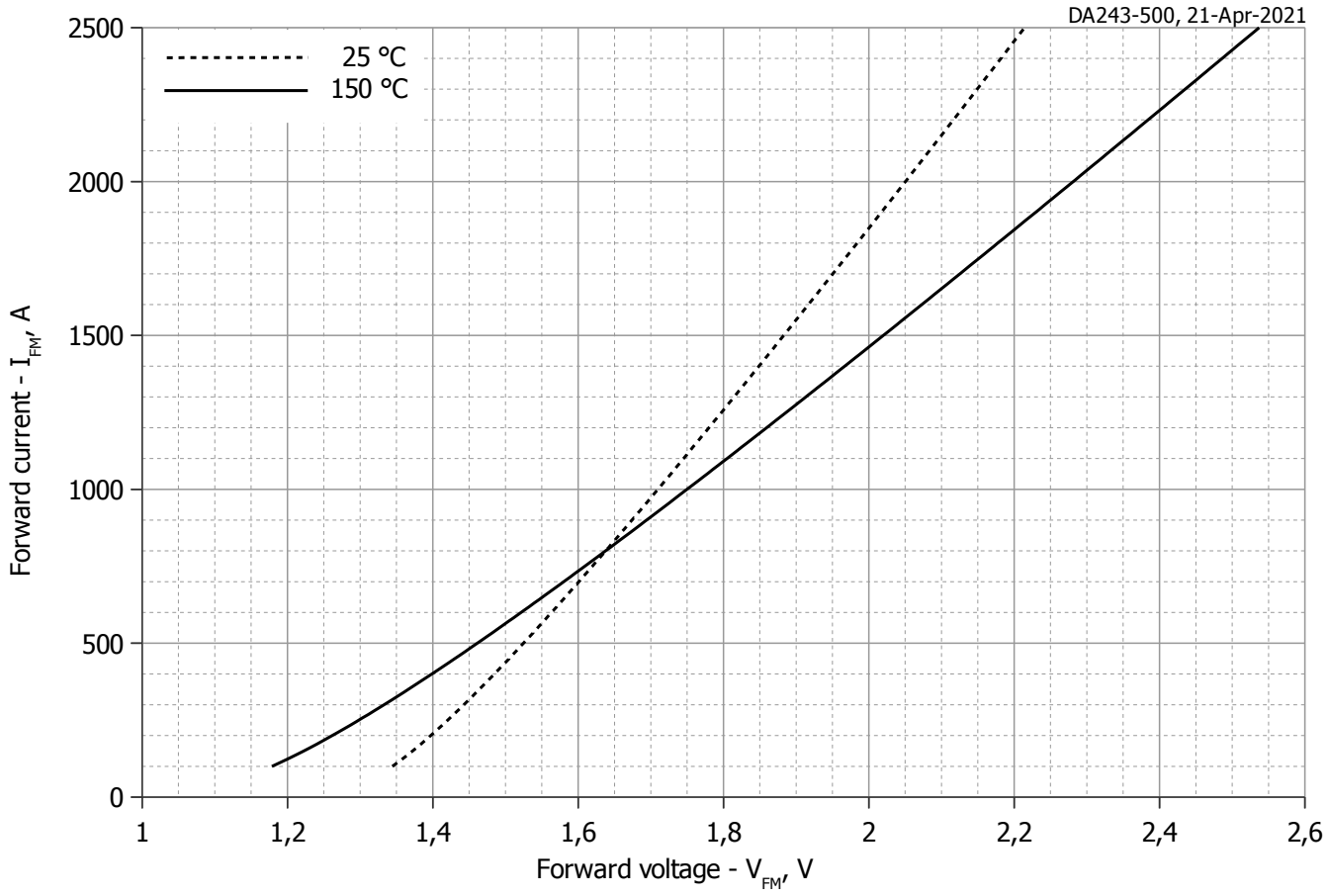


Fig 1 – Forward characteristics of Limit device

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	1.21813223	0.97439050
B	0.00028237	0.00044212
C	0.01308953	0.02248738
D	0.00375778	0.00562896

Forward characteristic model (see Fig. 1).

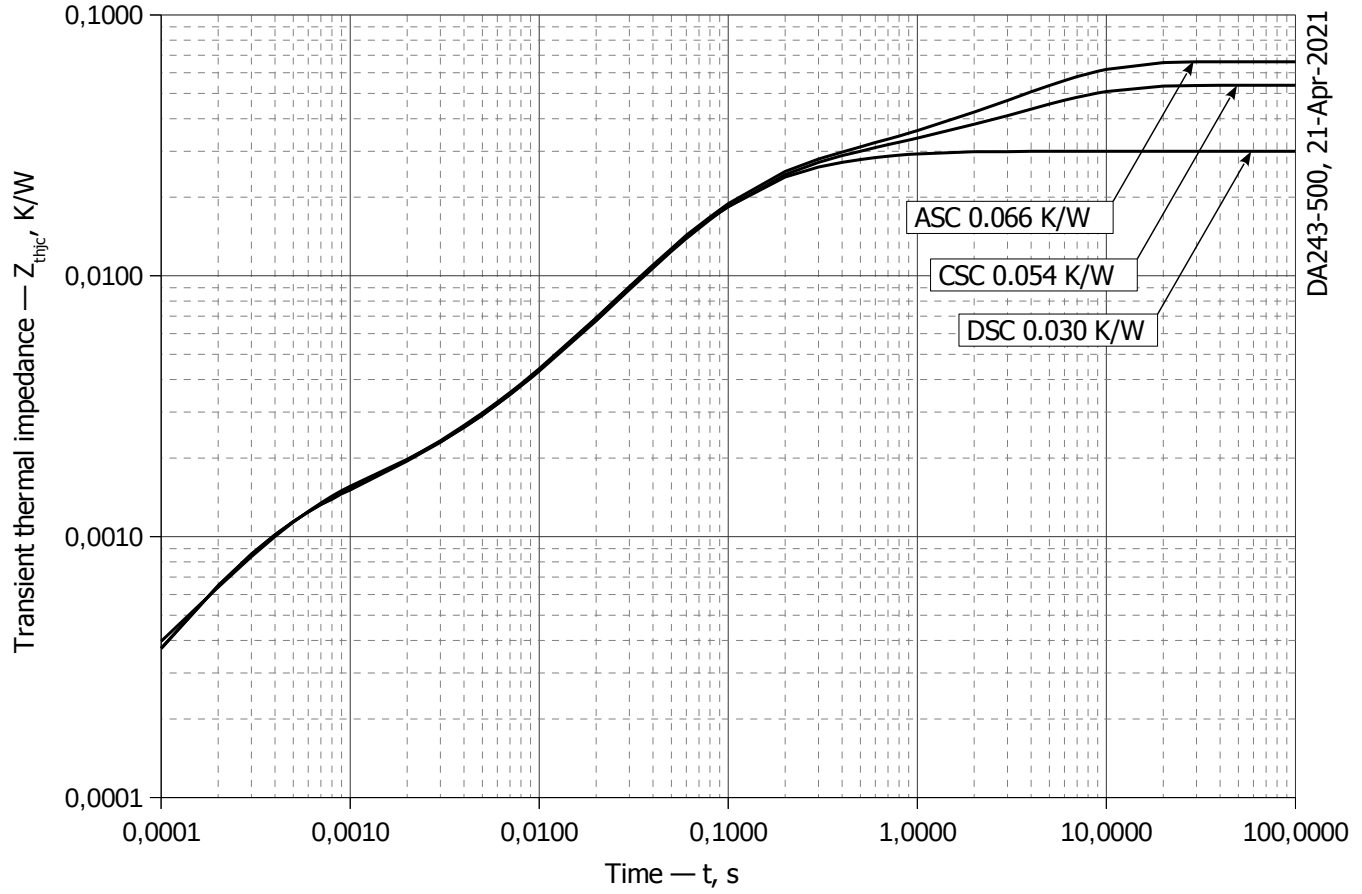


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

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	0.0007052	0.01986	0.001443	0.006652	0.001253	0.00009733
τ_i, s	1.200	0.083	0.0205	0.350	0.0004173	0.000001

DC Anode side cooled

i	1	2	3	4	5	6
R_i, K/W	0.03615	0.006266	0.0178	0.004365	0.0004912	0.001067
τ_i, s	4.713	0.5062	0.09497	0.04557	0.002123	0.0002807

DC Cathode side cooled

i	1	2	3	4	5	6
R_i, K/W	0.001065	0.0004934	0.004583	0.01764	0.006202	0.0237
τ_i, s	0.0002798	0.002114	0.04598	0.09501	0.4891	4.712

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

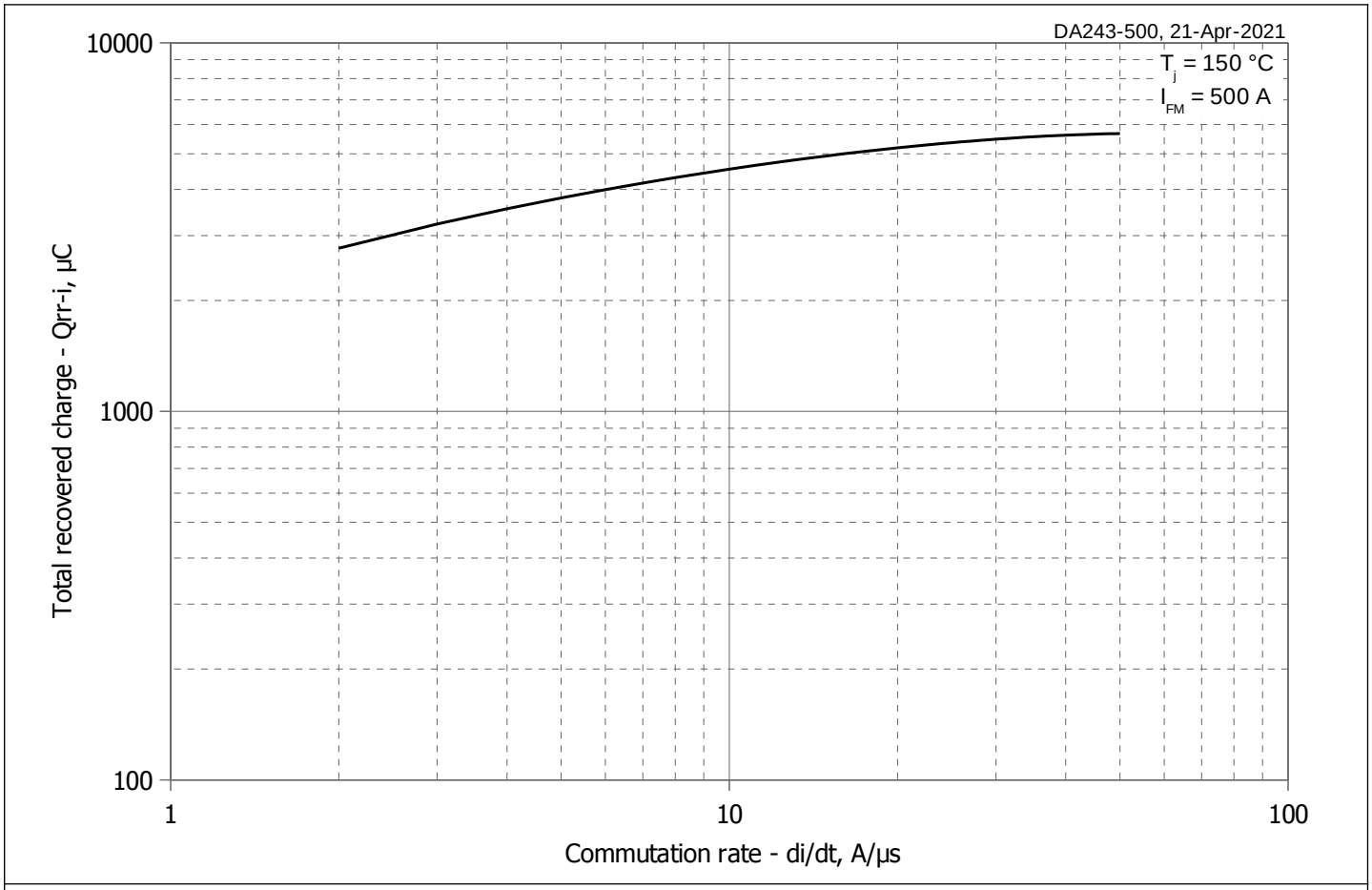


Fig 3 - Total recovered charge Q_{rr-i} (integral) vs. commutation rate di_R/dt

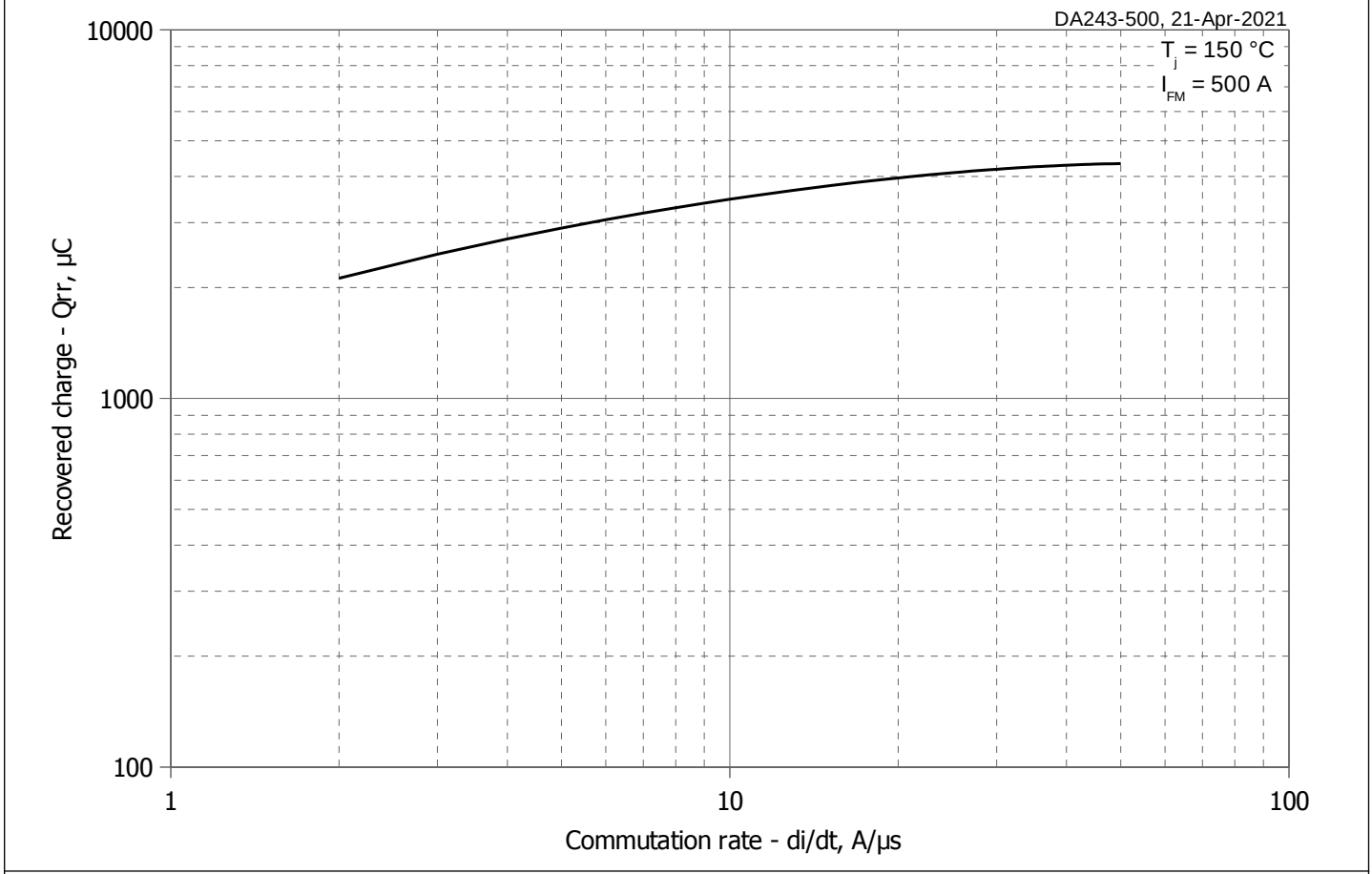


Fig 4 - Maximum recovered charge Q_{rr} vs. commutation rate di_R/dt (25% chord)

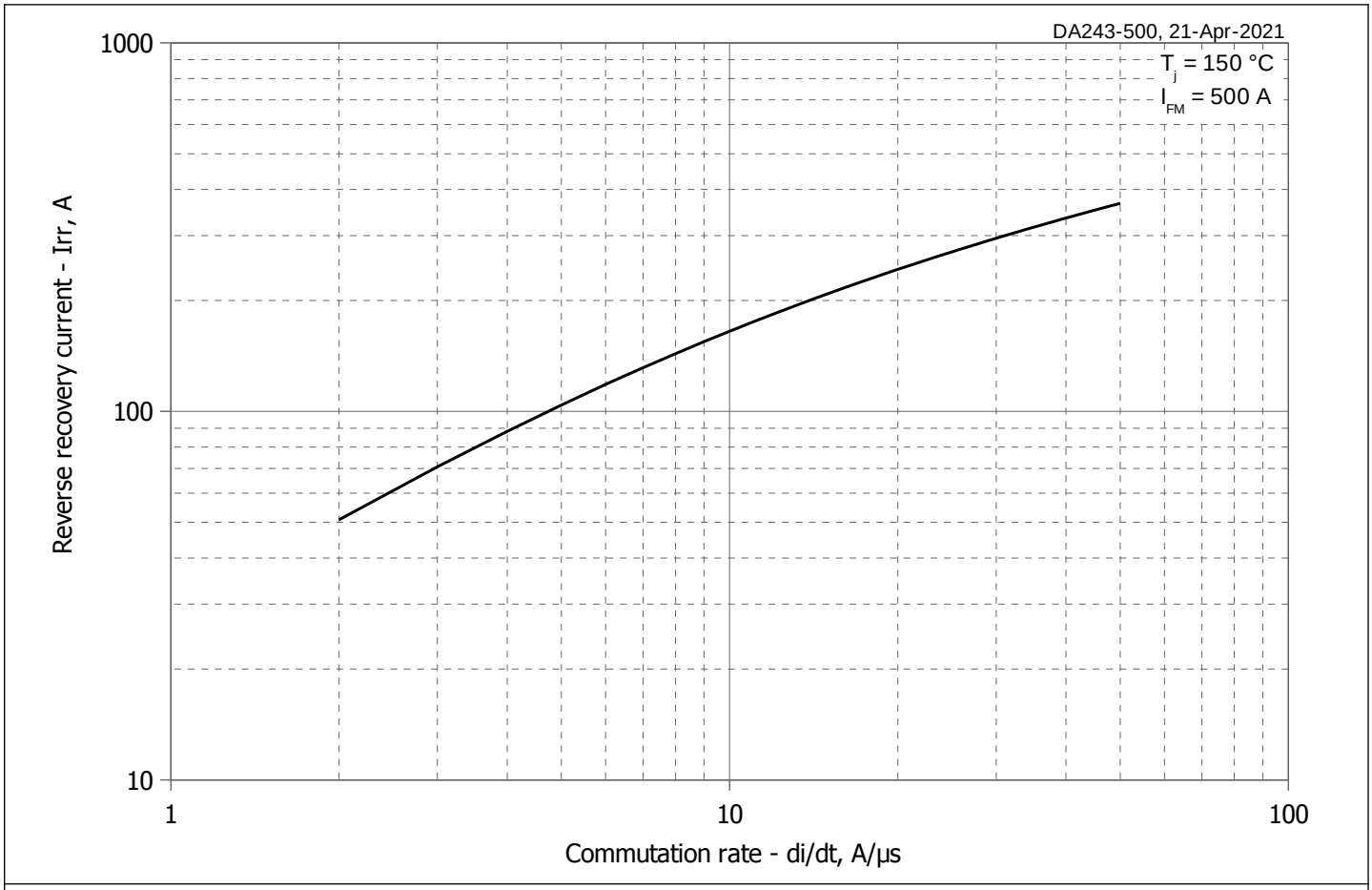


Fig 5 - Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

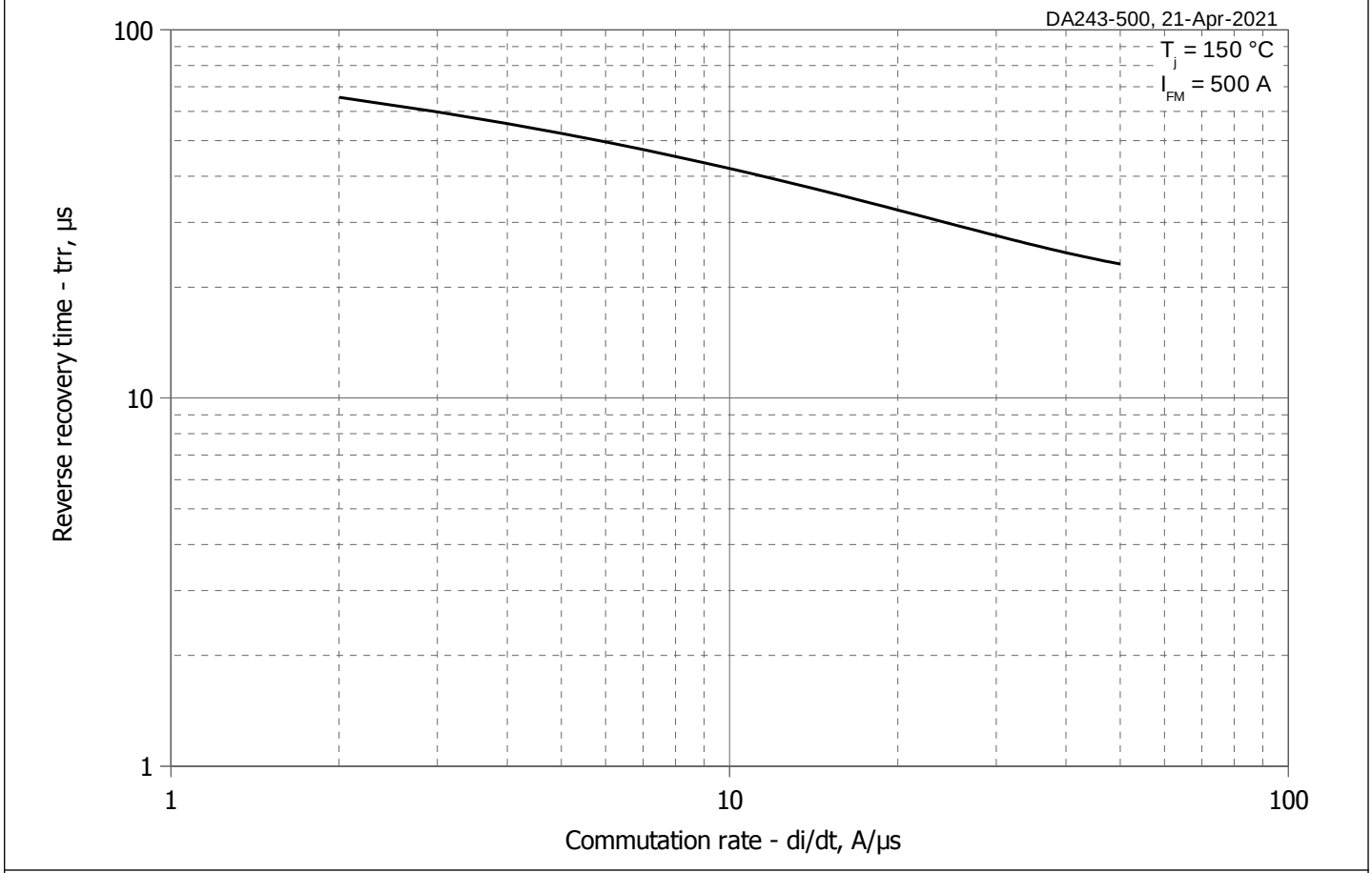


Fig 6 - Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

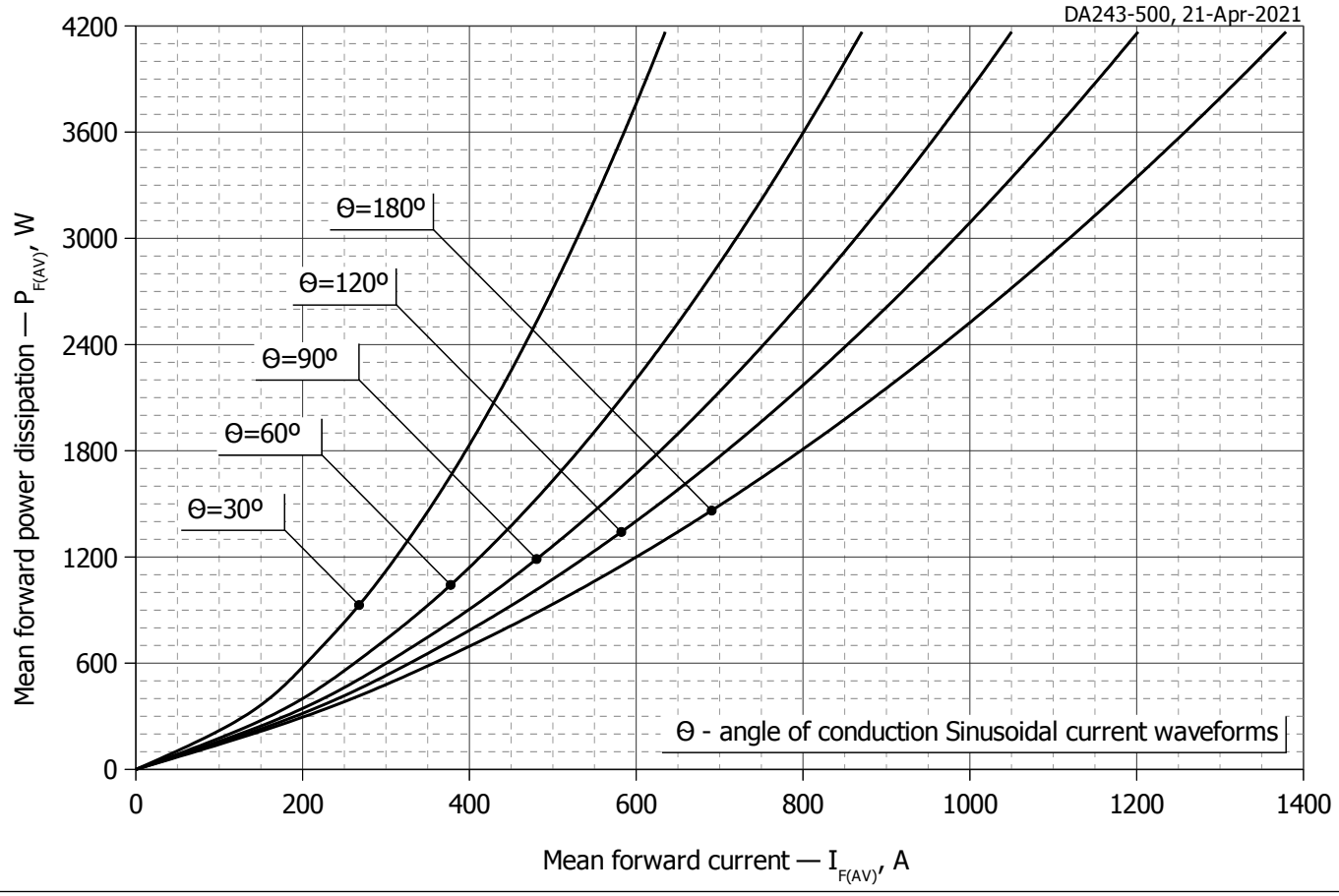


Fig. 7 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)

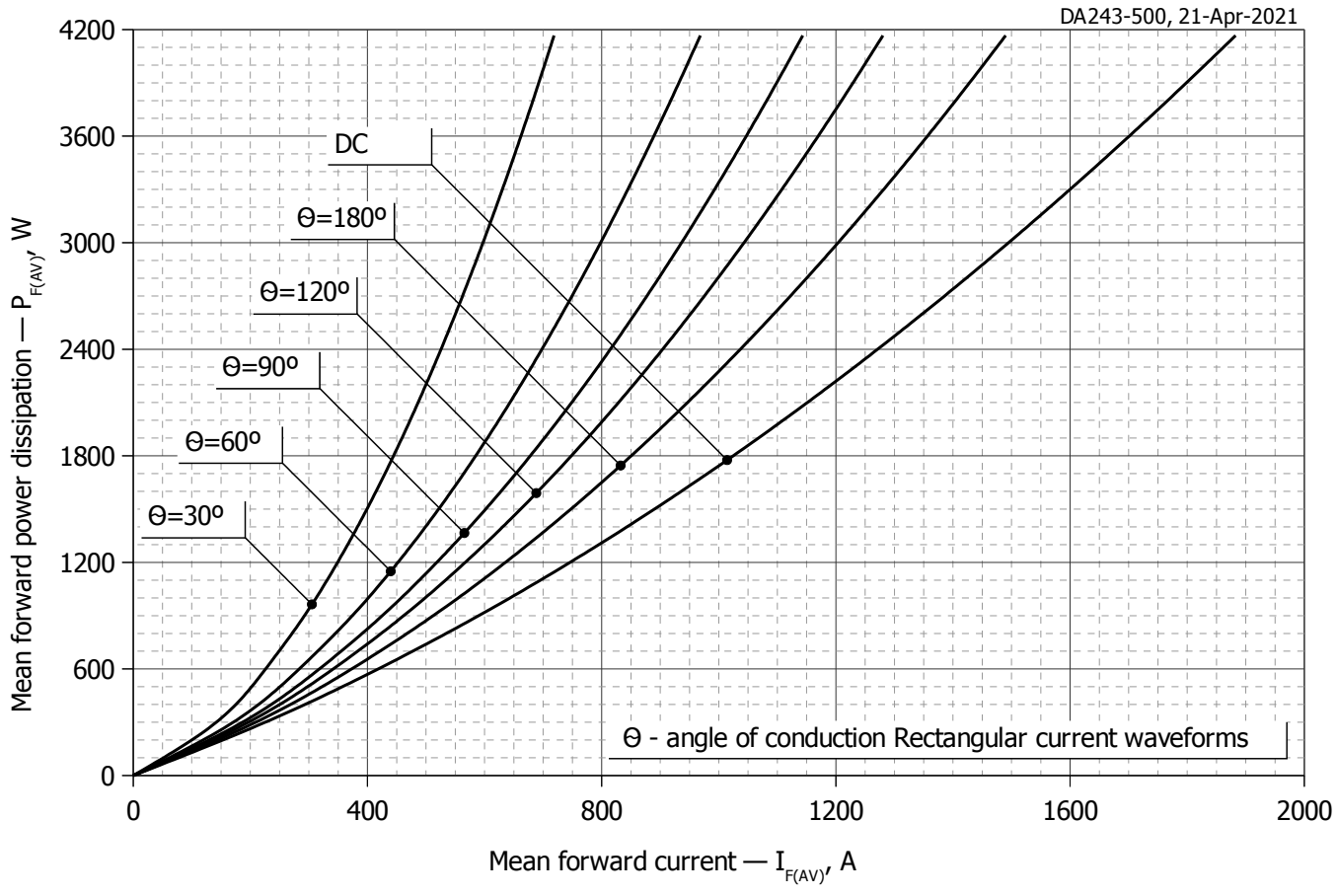


Fig. 8 – Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC (f=50Hz, DSC)

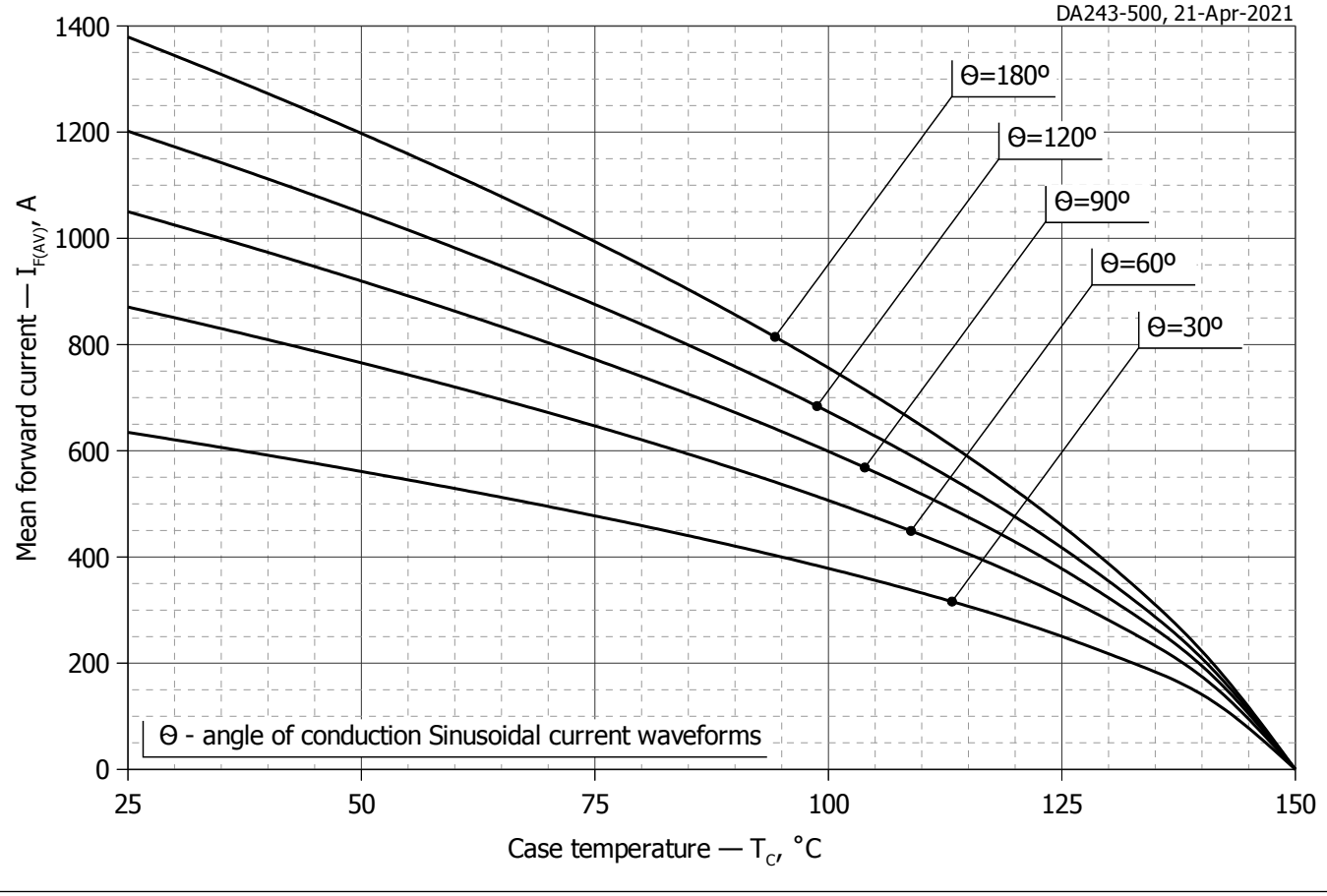


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)

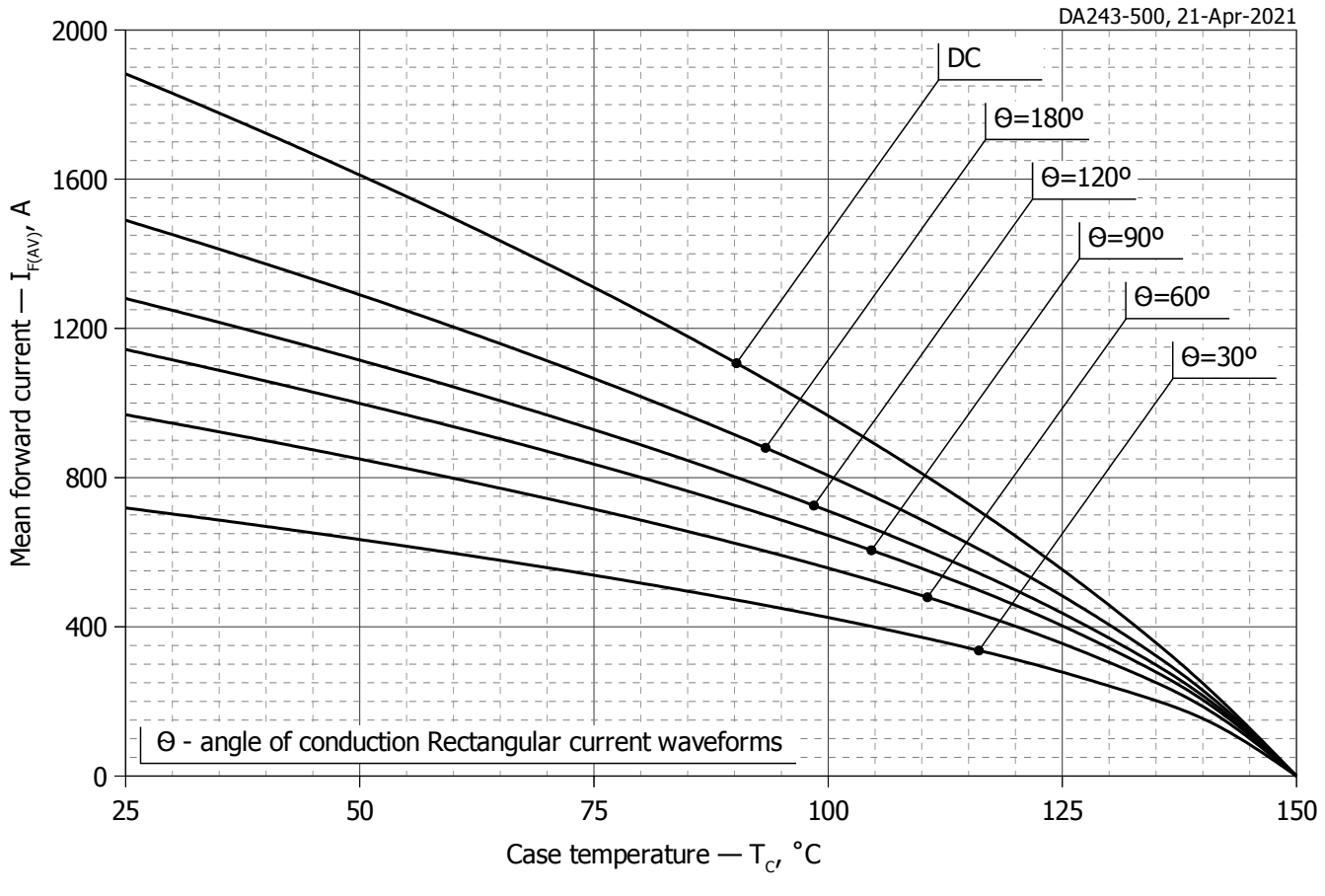


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC (f=50Hz, DSC)

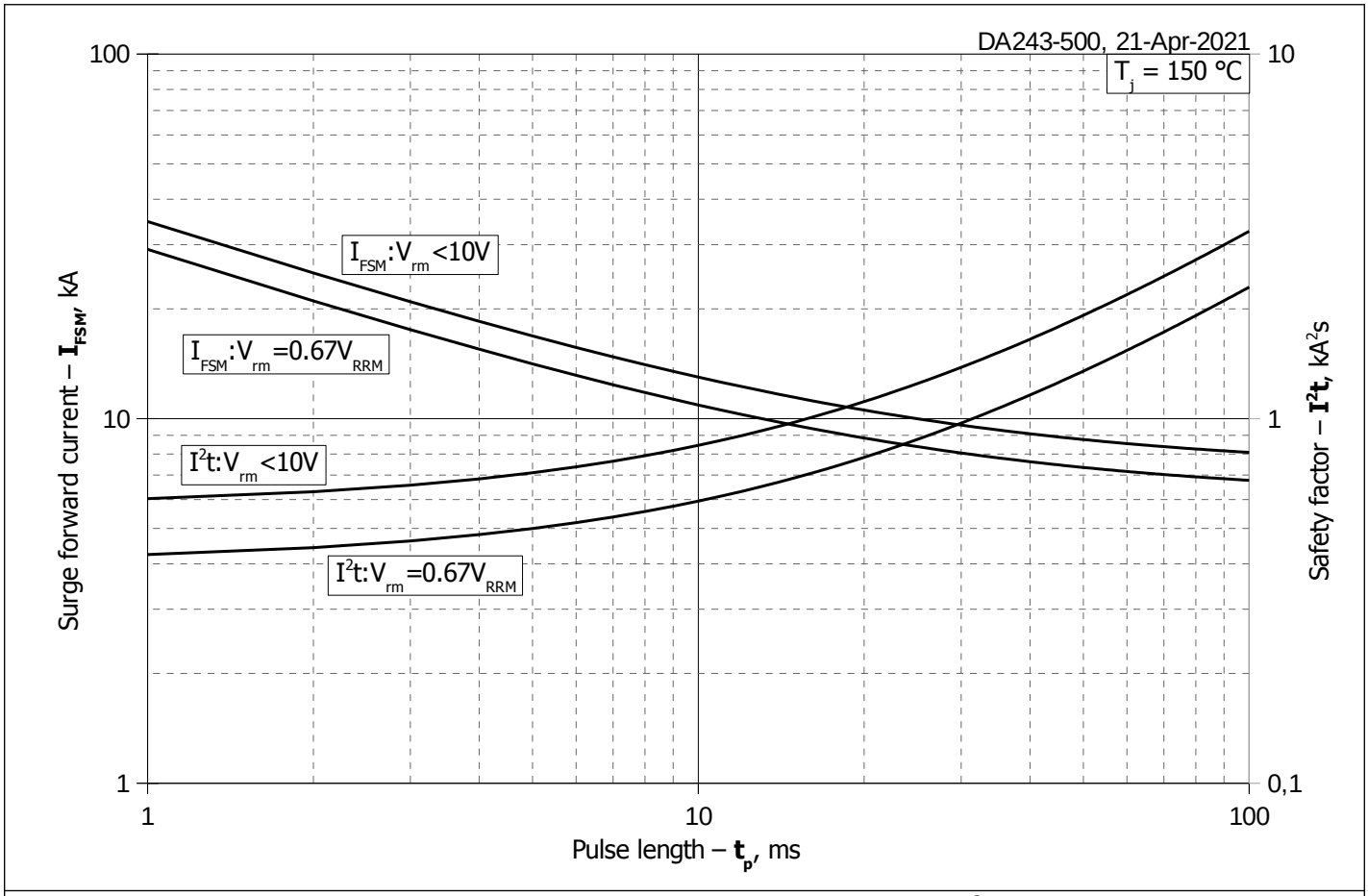


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

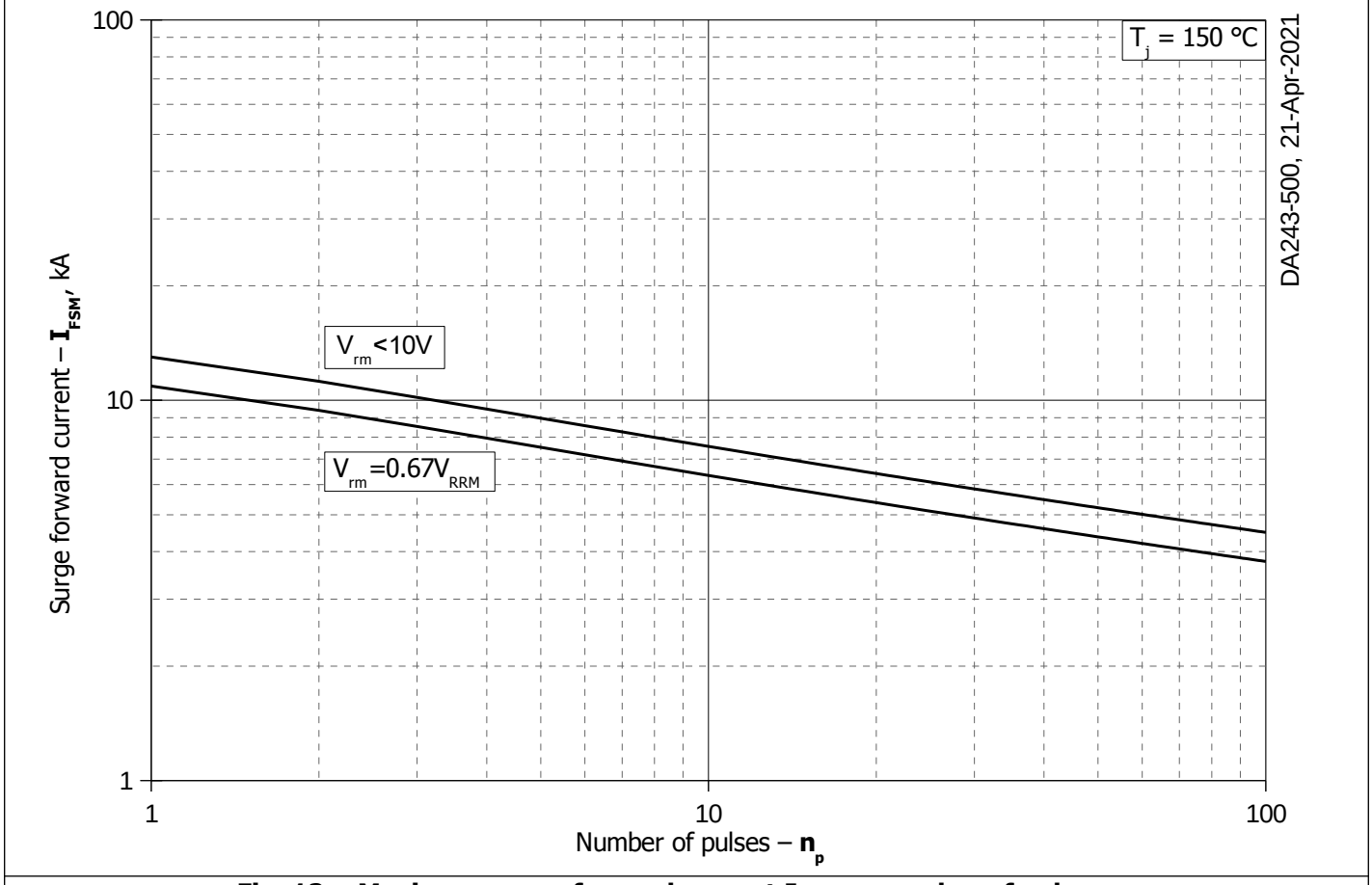


Fig. 12 - Maximum surge forward current I_{FSM} vs. number of pulses n_p