Low switching losses
Low reverse recovery charge
High power cycling capability

Fast Recovery Diode
Type DF243-630-18

Average forward current				I_{FAV}		630 A		
Repetitive peak reverse voltage				V_{RRM}		1000...1800 V		
Reverse recovery time				t_{rr}		3.20, 4.00, 5.00, 6.30 μs		
V_{RRM}, V	1000	1100	1200	1300	1400	1500	1600	1800
Voltage code	10	11	12	13	14	15	16	18
T_j, °C	–60...+125							

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{FAV}	Maximum allowable average forward current	A	630 888	T_c=81 °C; Double side cooled; T_c=55 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	989	T_c=81 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	15.0 17.0	T_j=$T_{j\,max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V;
			16.0 18.0	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	$A^2s\cdot10^3$	1100 1400	T_j=$T_{j\,max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V;
			1000 1300	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	1000...1800	$T_{j\,min}$< T_j <$T_{j\,max}$; 180° half-sine wave; 50 Hz;	
V_{RSM}	Non-repetitive peak reverse voltages	V	1100...1900	$T_{j\,min}$< T_j <$T_{j\,max}$; 180° half-sine wave; single pulse;	
V_R	Reverse continuous voltages	V	$0.6\cdot V_{RRM}$	T_j=$T_{j\,max}$;	
THERMAL					
T_{stg}	Storage temperature	°C	–60...+55		
T_j	Operating junction temperature	°C	–60...+125		
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	2.30	T_j=25 °C; I_{FM}=1978 A	
$V_{F(TO)}$	Forward threshold voltage, max	V	1.472	$T_j=T_{j\,max}$; 0.5 π I_{FAV} < I_T < 1.5 π I_{FAV}	
r_T	Forward slope resistance, max	mΩ	0.530		
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	70	$T_j=T_{j\,max}$; $V_R=V_{RRM}$	
SWITCHING					
Q_r	Recovered charge, max	μC	300	$T_j=T_{j\,max}$; $I_{FM}=I_{FAV}$; di_R/dt=-100 A/μs; V_R=100 V;	
t_{rr}	Reverse recovery time[1], max	μs	3.20, 4.00, 5.00, 6.30		
I_{rr}	Reverse recovery current, max	A	185		
THERMAL					
R_{thjc}	Thermal resistance, junction to case, max	°C/W	0.0300	Direct current	Double side cooled
R_{thjc-A}			0.0660		Anode side cooled
R_{thjc-K}			0.0540		Cathode side cooled
R_{thck}	Thermal resistance, case to heatsink, max	°C/W	0.0060	Direct current	
MECHANICAL					
m	Weight, max	g	250		
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

DF	243	630	18	K4	N
1	2	3	4	5	6

1. Fast recovery diode
2. Design version
3. Average forward current, A
4. Voltage code
5. Group of reverse recovery time
6. Ambient conditions: N – normal; T – tropical

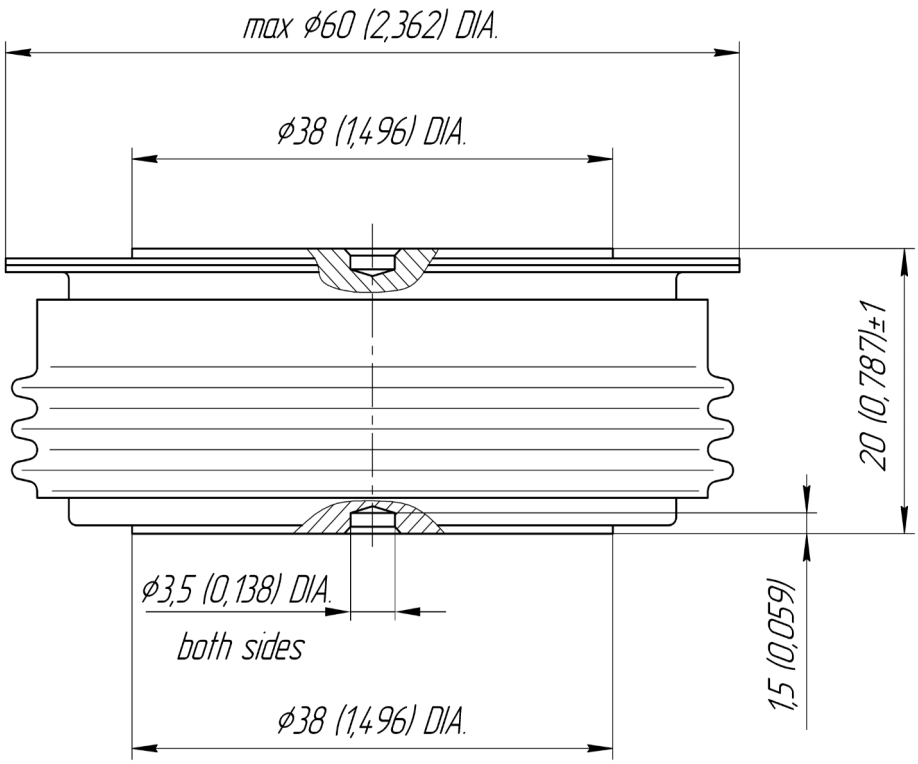
NOTES

[1] Reverse recovery time

Symbol of group	K4	H4	E4	C4
t_{rr}, μs	3.20	4.00	5.00	6.30

OVERALL DIMENSIONS

Package type: D.C2



All dimensions in millimeters (inches)

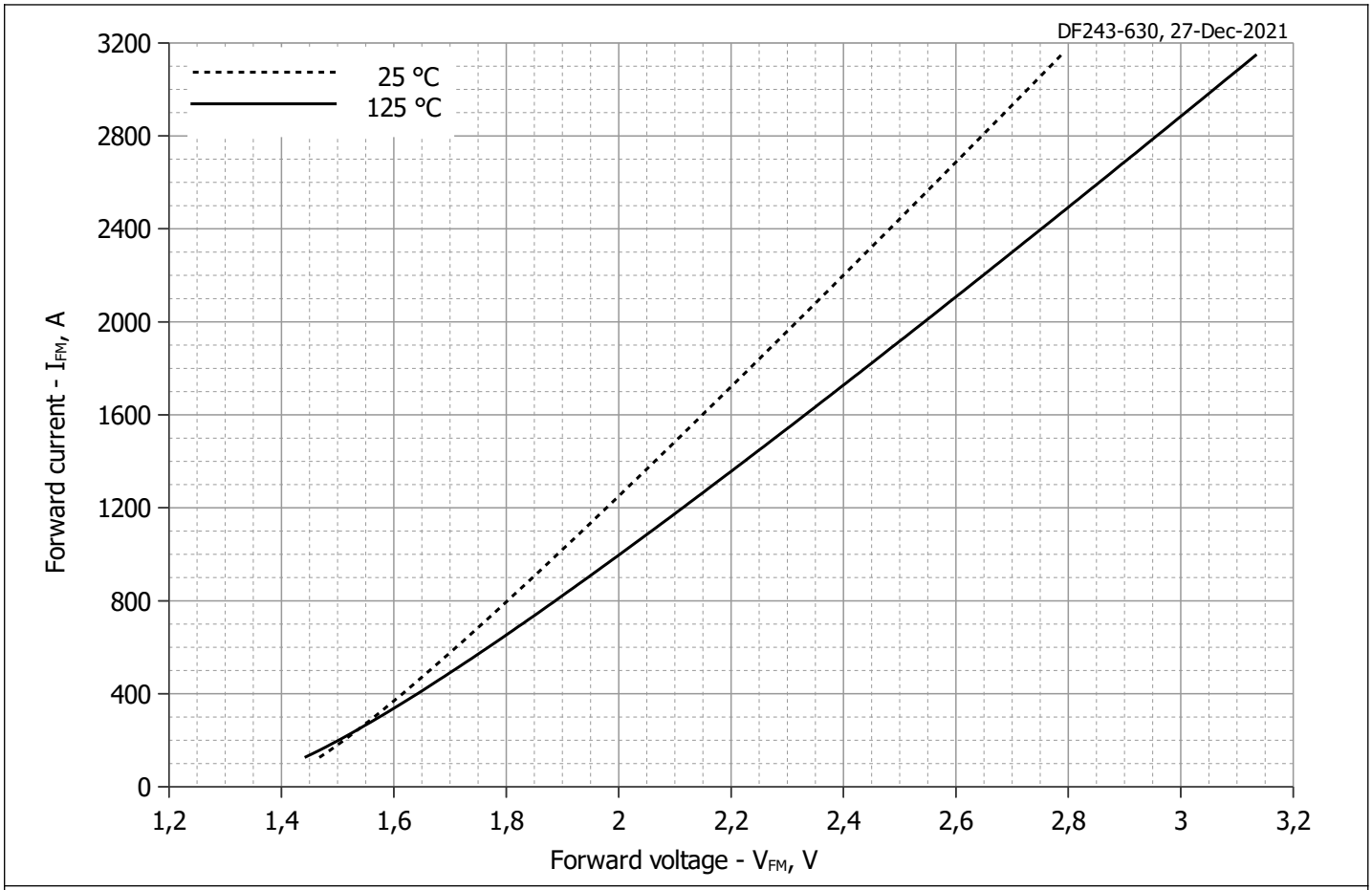


Fig 1 – Forward characteristics of Limit device

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	1.32048563	1.23671352
B	0.00036777	0.00043433
C	0.01197723	0.01359247
D	0.00379416	0.00749193

Forward characteristic model (see Fig. 1).

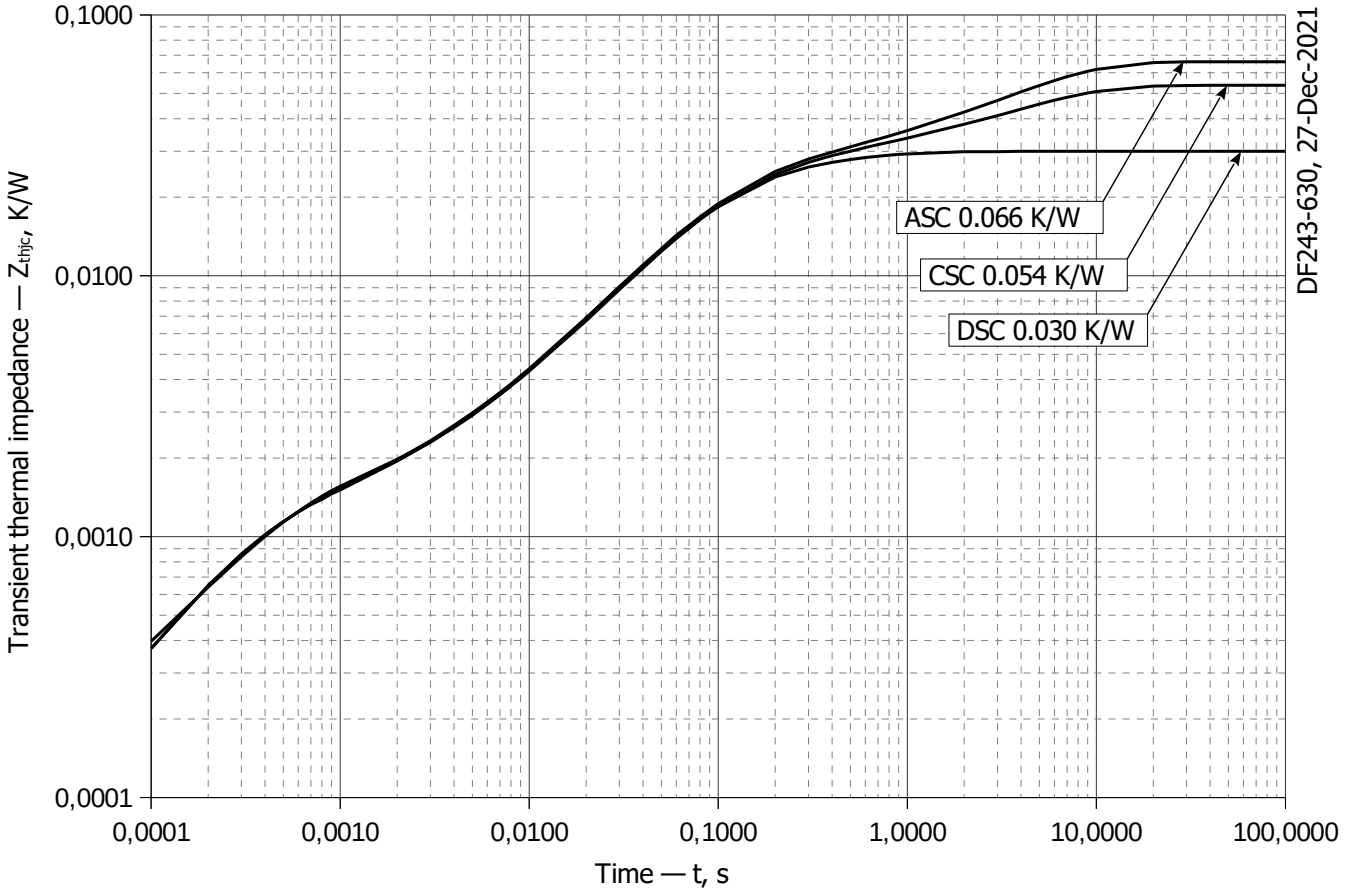


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

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.

$\mathbf{Z_{thjc}}$ = Thermal resistance at time t.

$\mathbf{R_i}$ = Amplitude of p_{th} term.

τ_i = Time constatnt of r_{th} term.

DC Double side cooled

i	1	2	3	4	5	6
$\mathbf{R_i}$, **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
$\mathbf{R_i}$, **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
$\mathbf{R_i}$, **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)

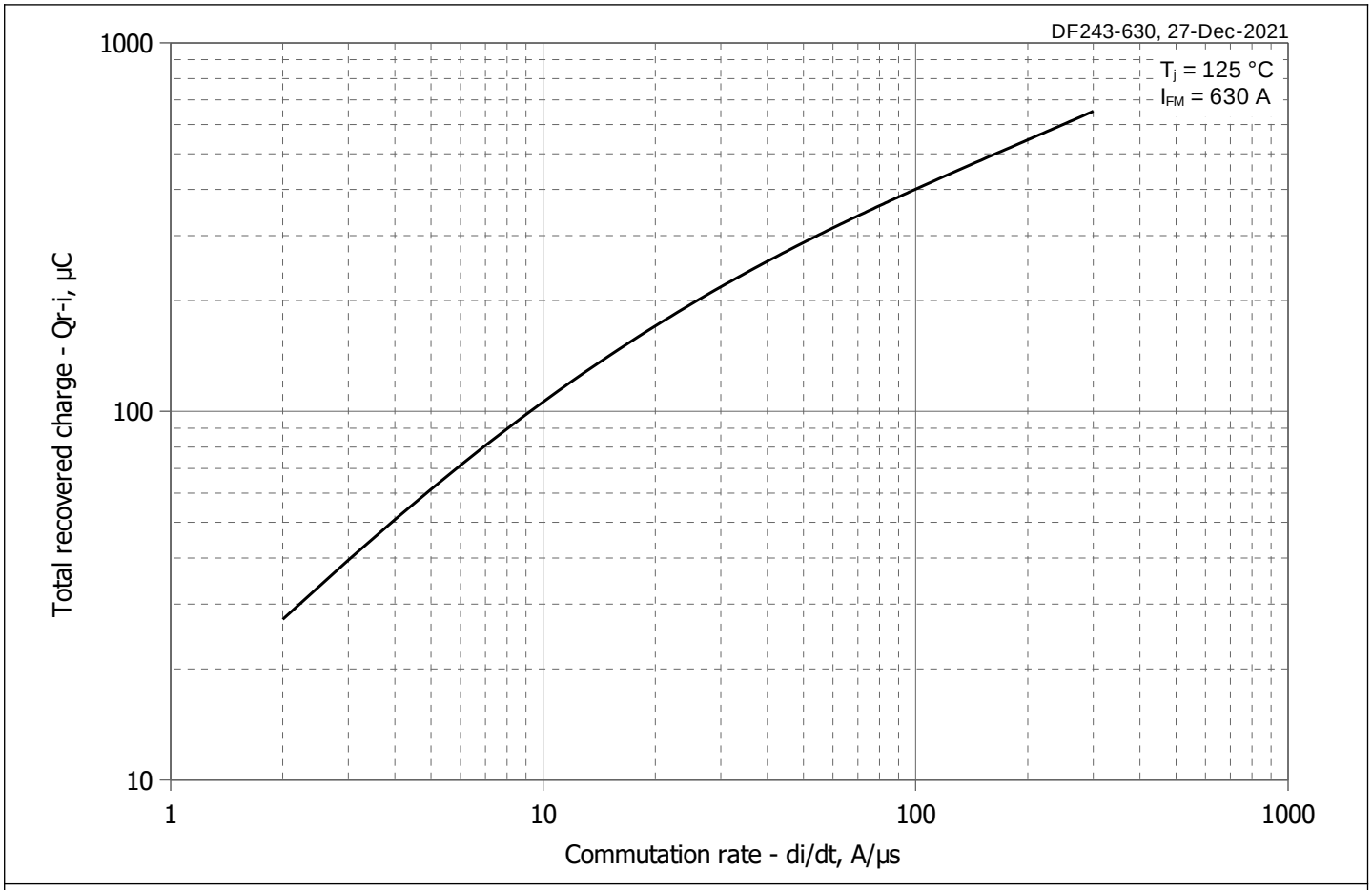


Fig 3 - Total recovered charge Q_{r-i} (integral) vs. commutation rate di_R/dt

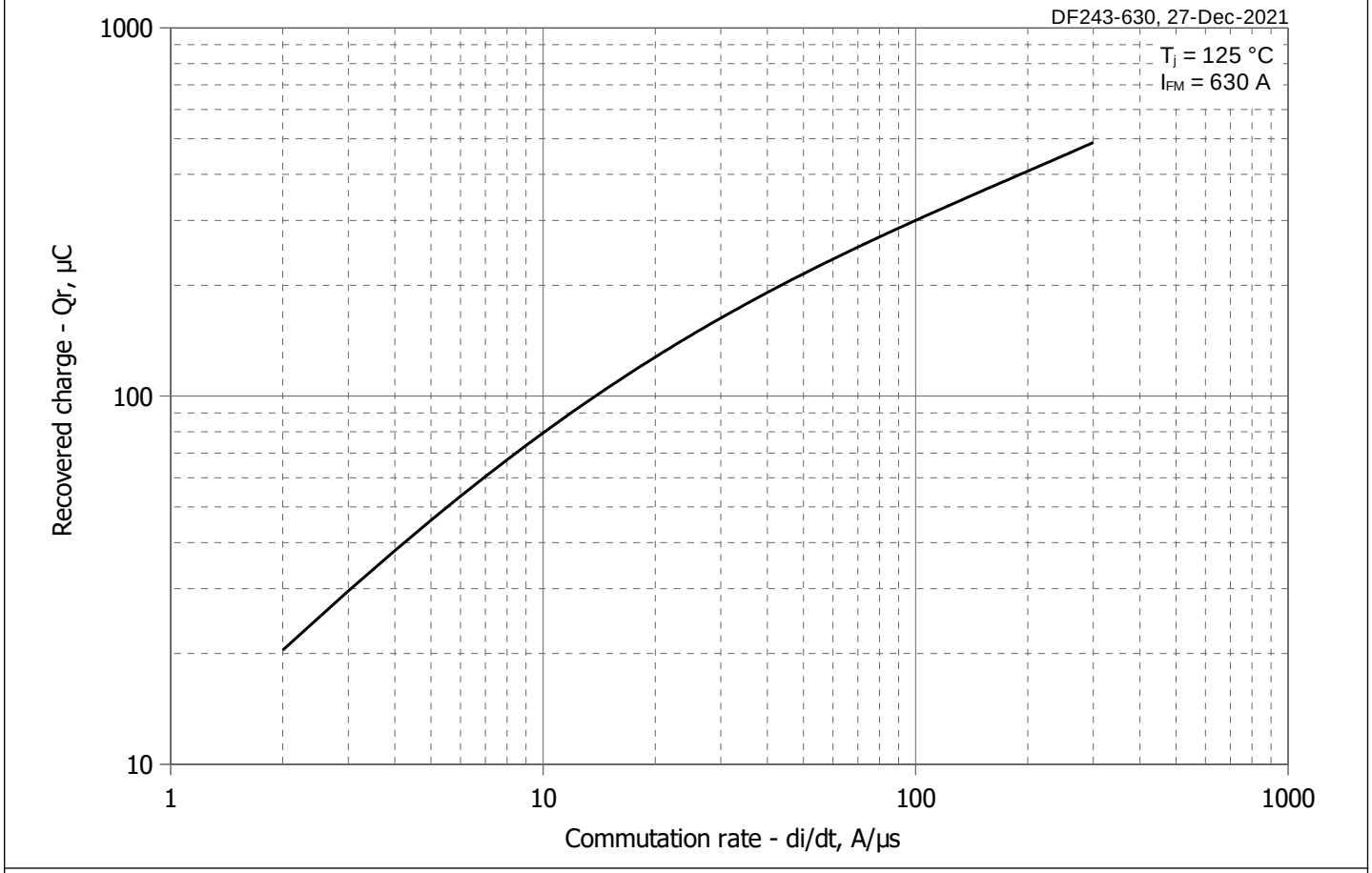


Fig 4 - Maximum recovered charge Q_r vs. commutation rate di_R/dt (50% chord)

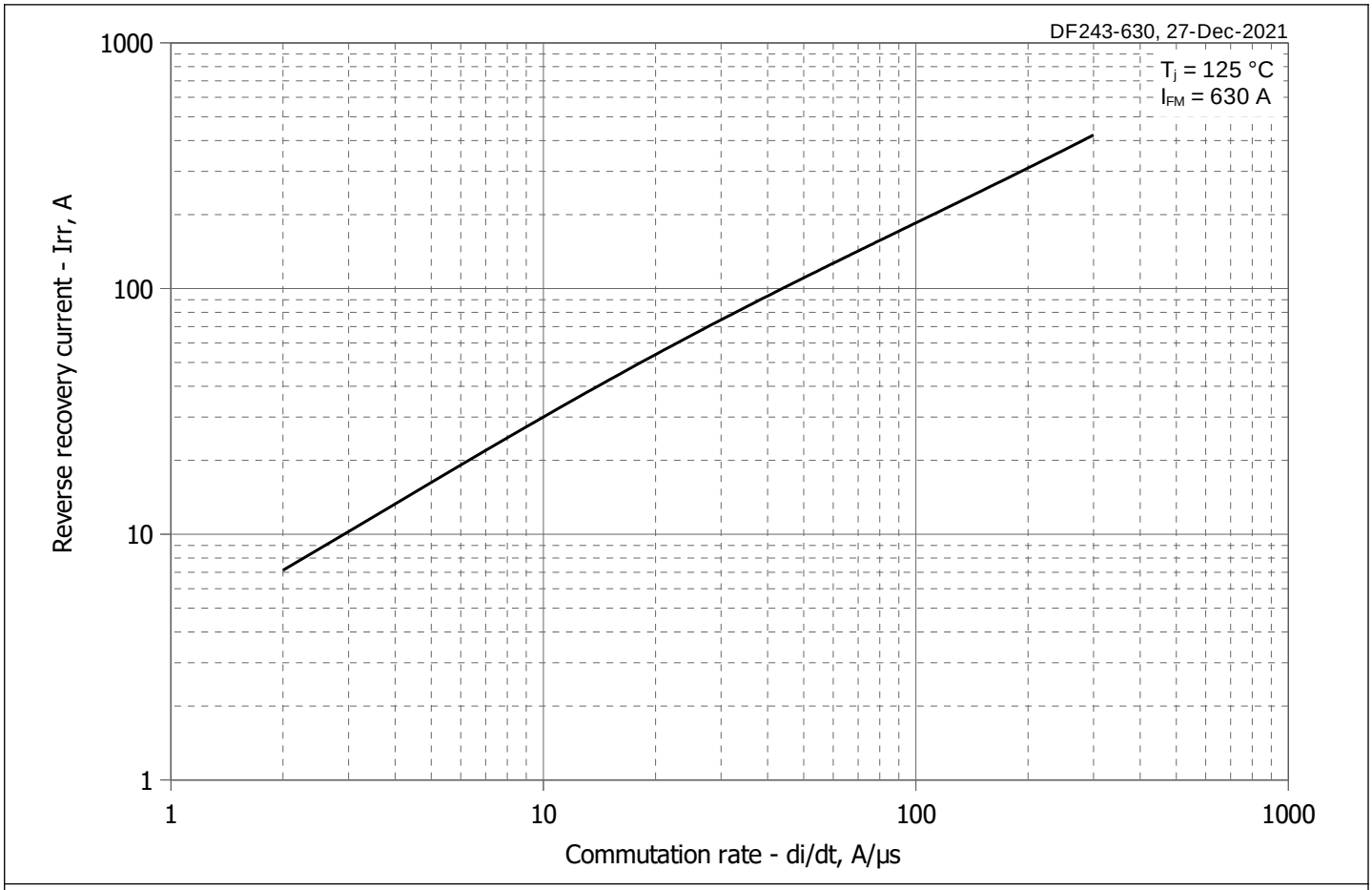


Fig 5 - Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

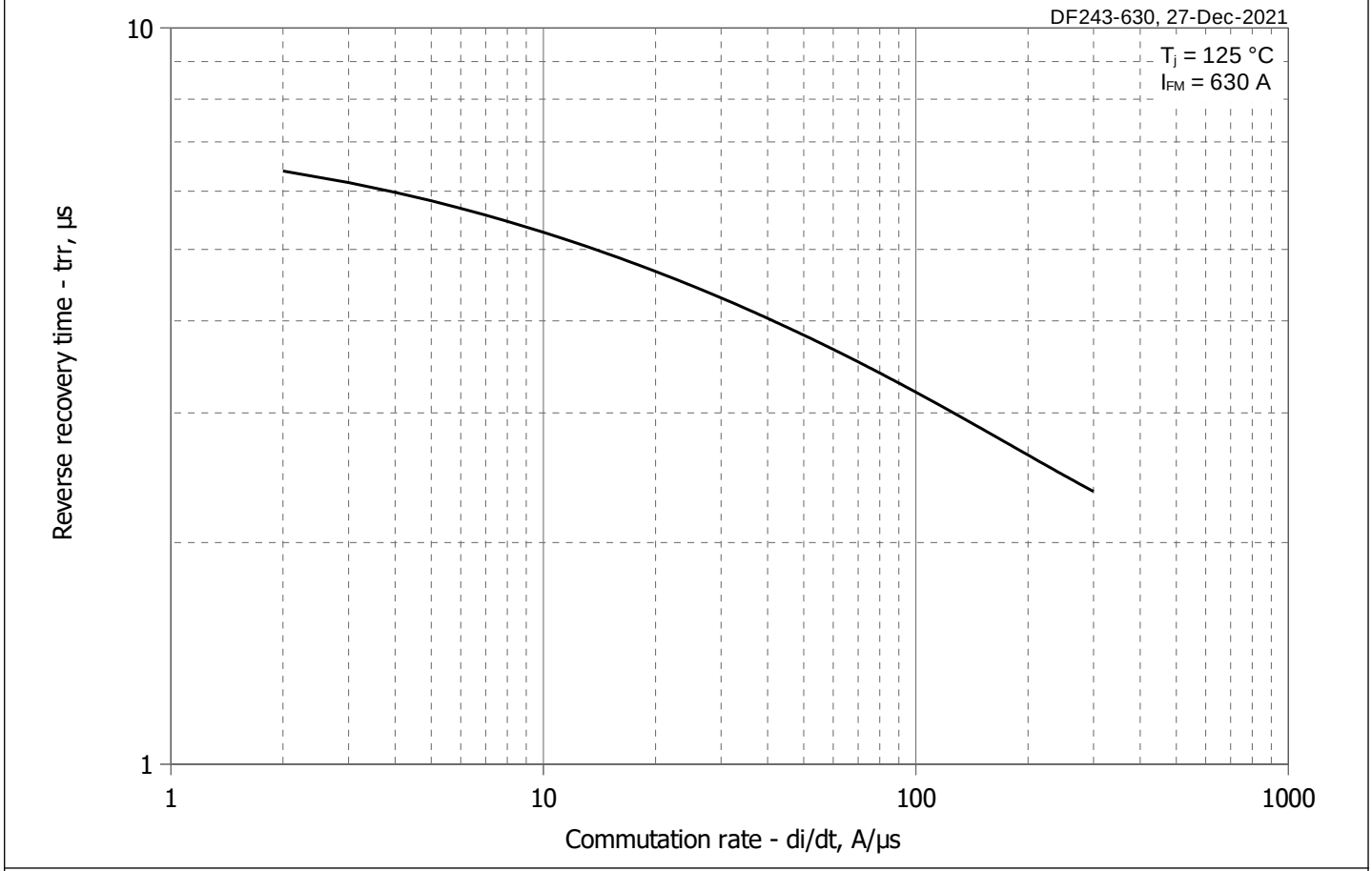


Fig 6 - Maximum recovery time t_{rr} vs. commutation rate di_R/dt (50% chord)

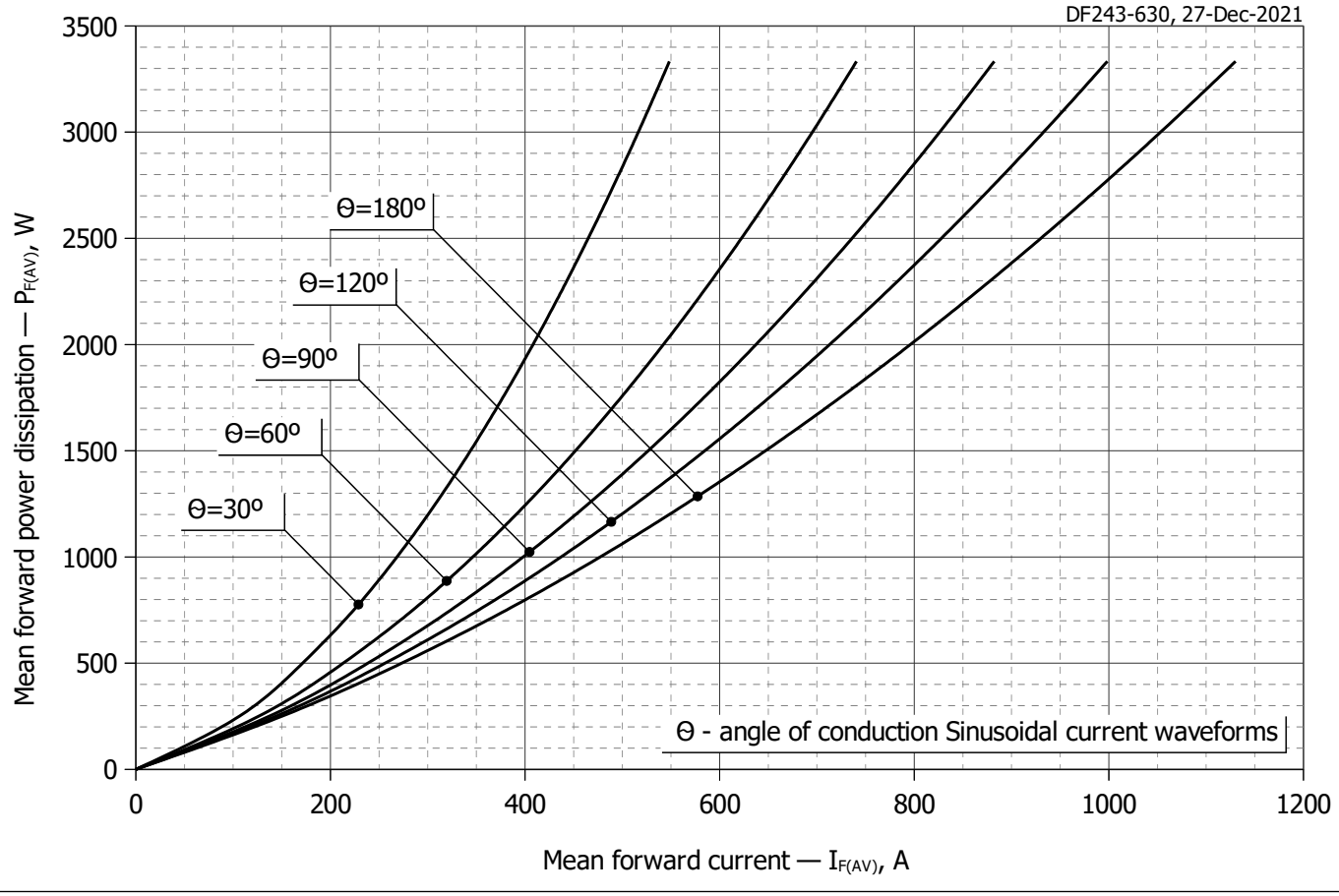


Fig. 7 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)

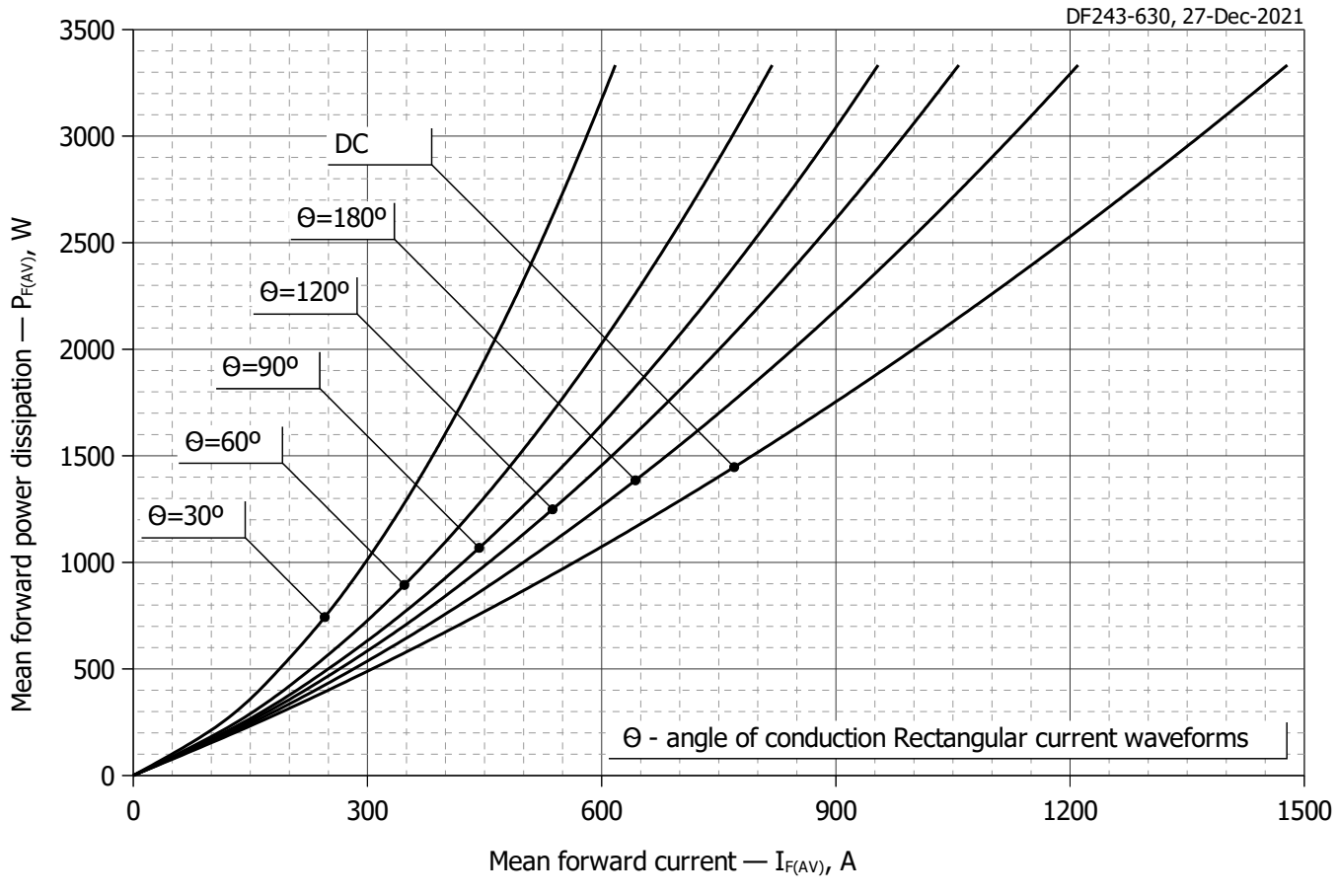


Fig. 8 – Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC (f=50Hz, DSC)

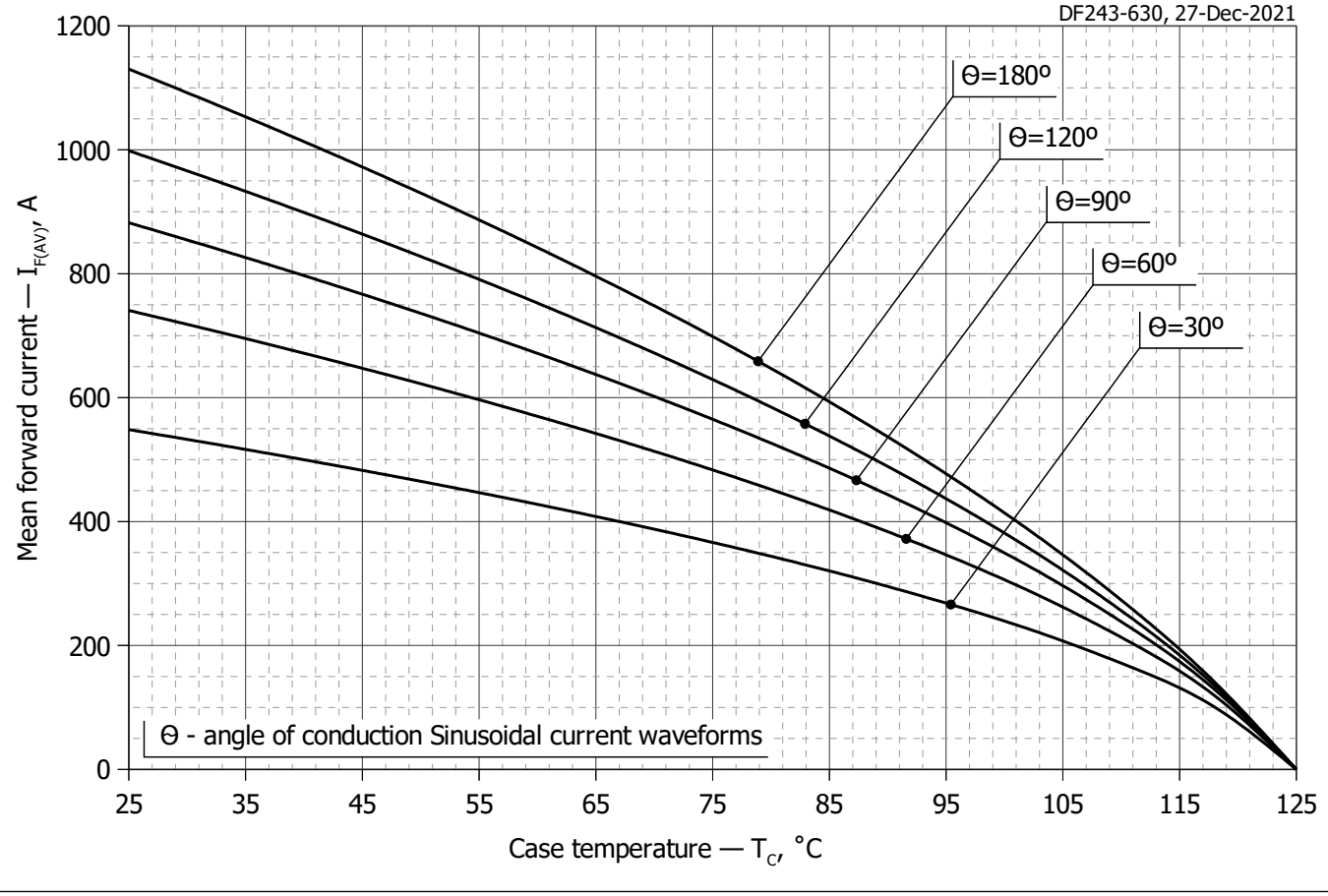


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)

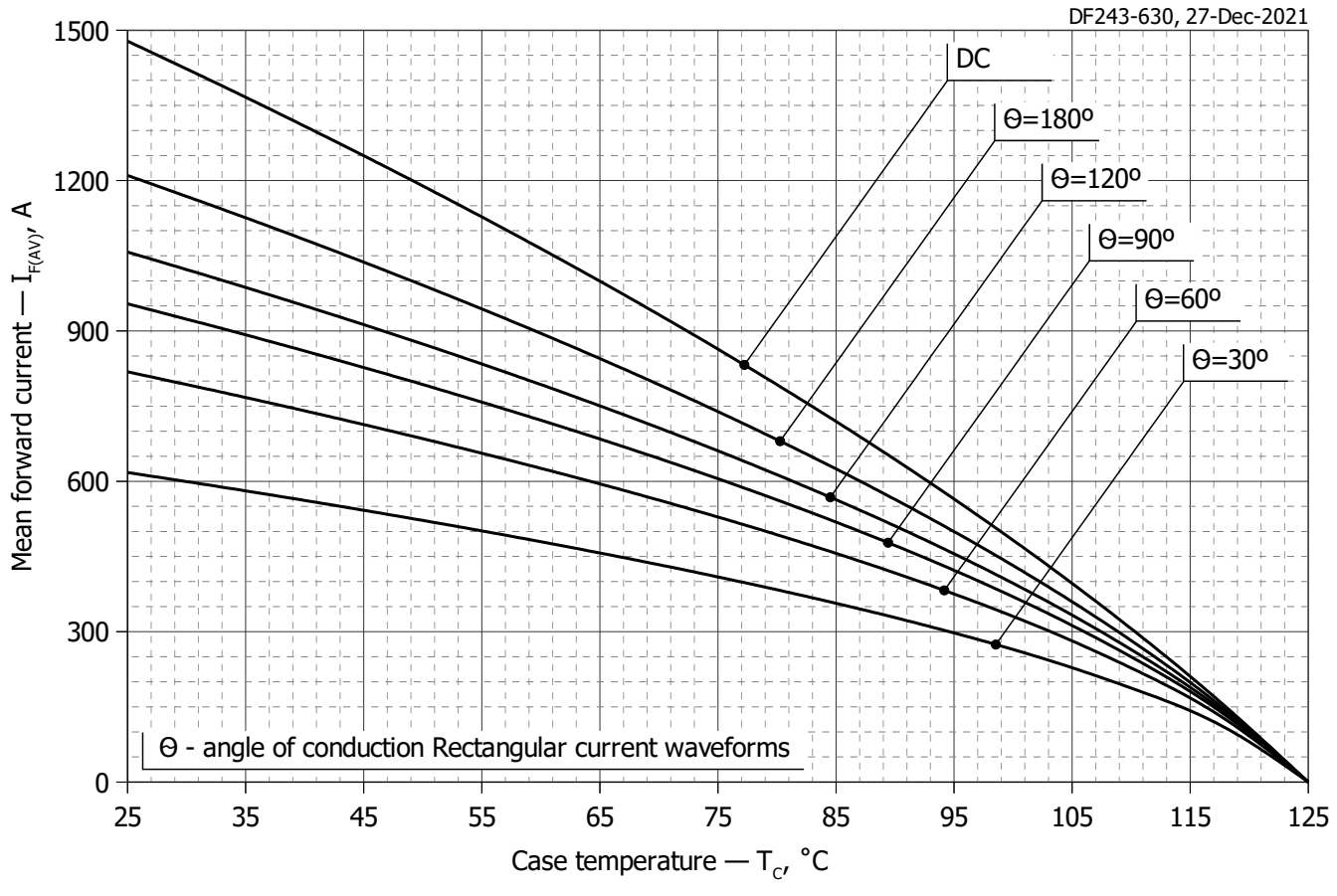


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC (f=50Hz, DSC)

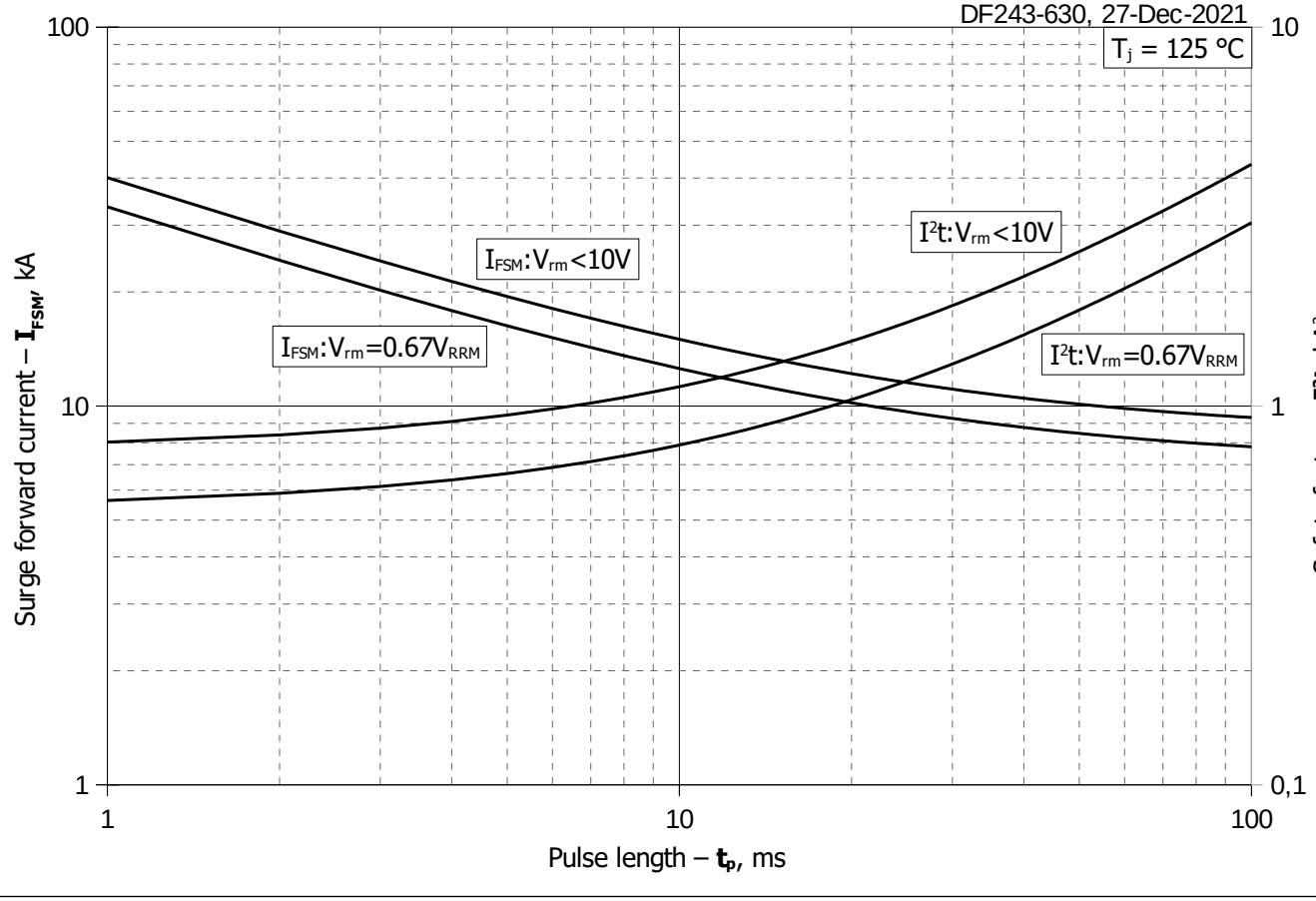


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

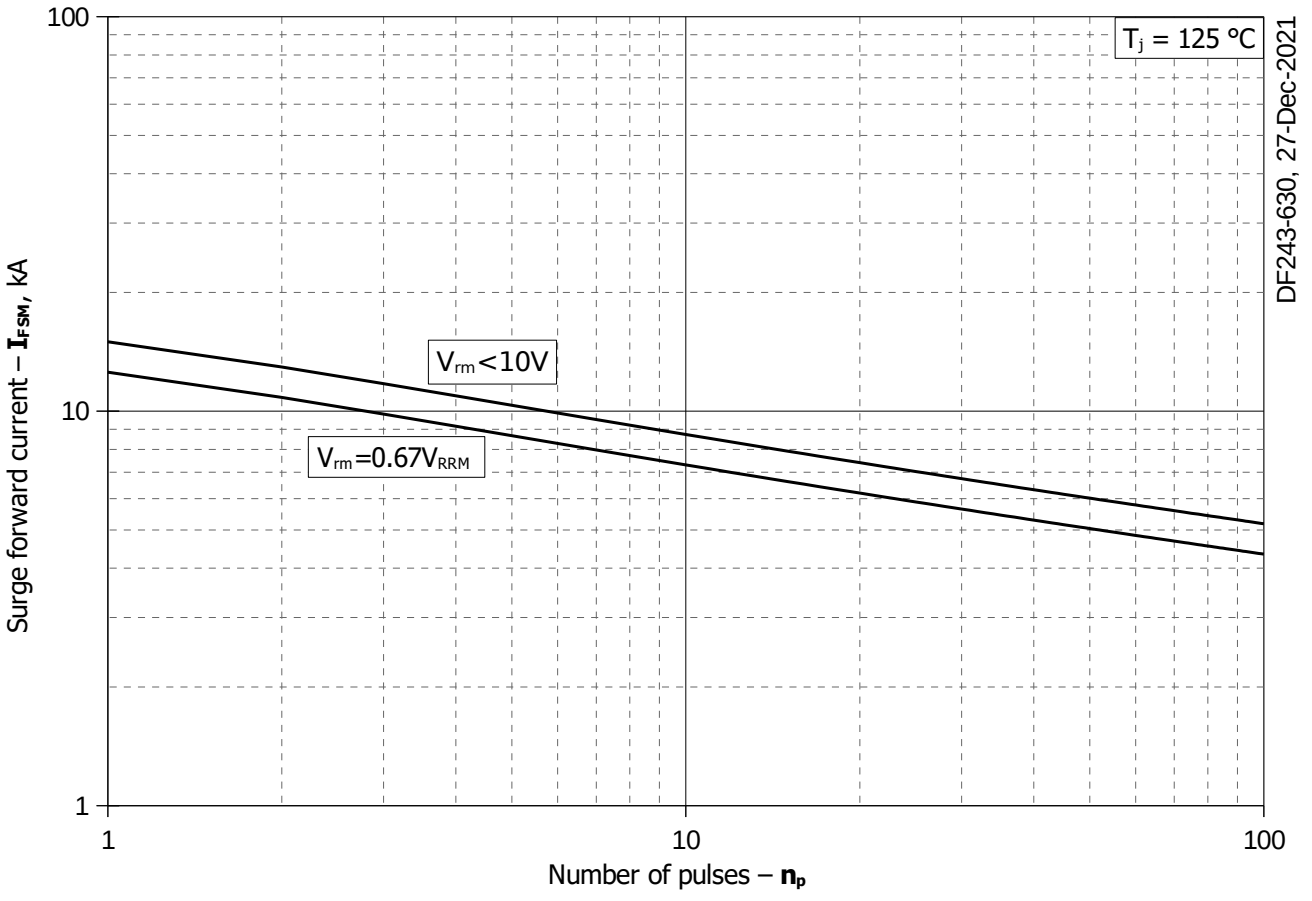


Fig. 12 - Maximum surge forward current I_{FSM} vs. number of pulses n_p