



Low switching losses
Low reverse recovery charge
High power cycling capability

Fast Recovery Diode Type DF223-320-16

Average forward current				I_{FAV}	320 A		
Repetitive peak reverse voltage				V_{RRM}	1000...1600 V		
Reverse recovery time				t_{rr}	2.50, 3.20, 4.00, 5.00 μ s		
V_{RRM} , V	1000	1100	1200	1300	1400	1500	1600
Voltage code	10	11	12	13	14	15	16
T_j , °C	-60...+150						

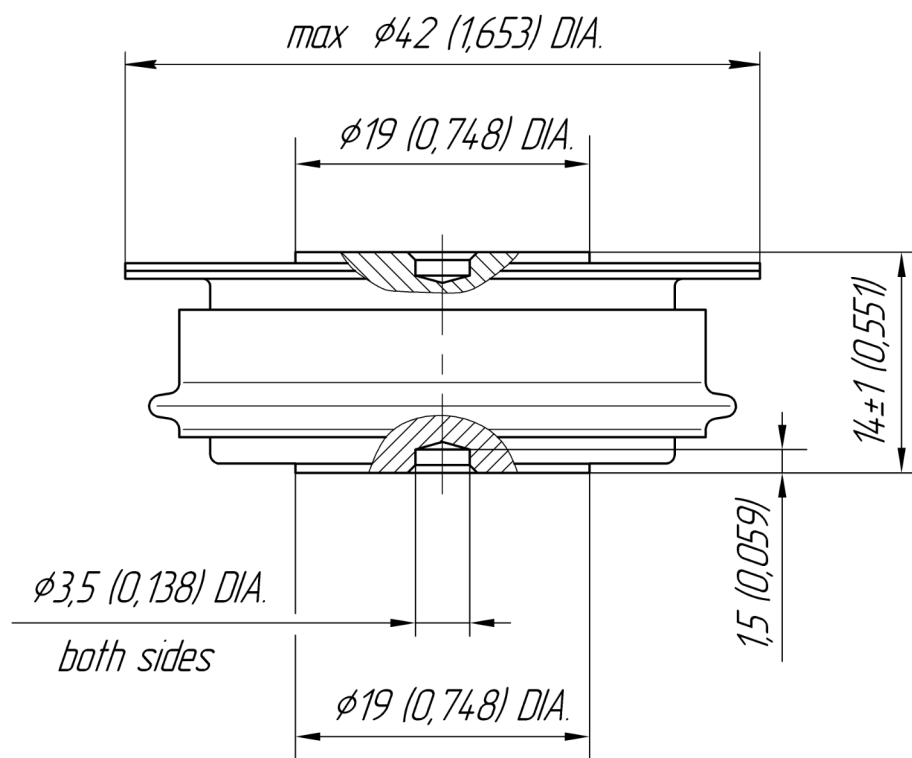
MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I _{FAV}	Maximum allowable average forward current	A	320 540	T _c =104 °C; Double side cooled; T _c =55 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I _{FRMS}	RMS forward current	A	502	T _c =104 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I _{FSM}	Surge forward current	kA	5.0 6.0	T _j =T _{j max} T _j =25 °C	180° half-sine wave; t _p =10 ms; single pulse; V _R =0 V;
			5.5 6.5	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 ² t	Safety factor	A ² s·10 ³	120 180	T _j =T _{j max} T _j =25 °C	180° half-sine wave; t _p =10 ms; single pulse; V _R =0 V;
			120 170	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...1600	T _{j min} < T _j < T _{j max} ; 180° half-sine wave; 50 Hz;	
V _{RSM}	Non-repetitive peak reverse voltages	V	1100...1700	T _{j min} < T _j < T _{j max} ; 180° half-sine wave; single pulse;	
V _R	Reverse continuous voltages	V	0.6·V _{RRM}	T _j =T _{j max} ;	
THERMAL					
T _{stg}	Storage temperature	°C	−60...+55		
T _j	Operating junction temperature	°C	−60...+150		
MECHANICAL					
F	Mounting force	kN	5.0...7.0		
a	Acceleration	m/s ²	50	Device clamped	

CHARACTERISTICS

Symbols and parameters		Units	Values	Conditions	
ON-STATE					
V _{FM}	Peak forward voltage, max	V	2.20	T _j =25 °C; I _{FM} =1005 A	
V _{F(TO)}	Forward threshold voltage, max	V	1.320	T _j =T _{j max} ;	
r _T	Forward slope resistance, max	mΩ	0.899	0.5 π I _{FAV} < I _T < 1.5 π I _{FAV}	
BLOCKING					
I _{RRM}	Repetitive peak reverse current, max	mA	40	T _j =T _{j max} ; V _R =V _{RRM}	
SWITCHING					
Q _r	Recovered charge, max	μC	190	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	2.50, 3.20, 4.00, 5.00		
I _{rr}	Reverse recovery current, max	A	150		
THERMAL					
R _{thjc}	Thermal resistance, junction to case, max	°C/W	0.0700	Direct current	Double side cooled
R _{thjc-A}			0.1540		Anode side cooled
R _{thjc-K}			0.1260		Cathode side cooled
R _{thck}	Thermal resistance, case to heatsink, max	°C/W	0.0100	Direct current	
MECHANICAL					
m	Weight, max	g	65		
D _s	Surface creepage distance	mm (inch)	11.74 (0.462)		
D _a	Air strike distance	mm (inch)	11.60 (0.457)		

PART NUMBERING GUIDE						NOTES
DF	223	320	16	M4	N	1) Reverse recovery time
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						
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All dimensions in millimeters (inches)

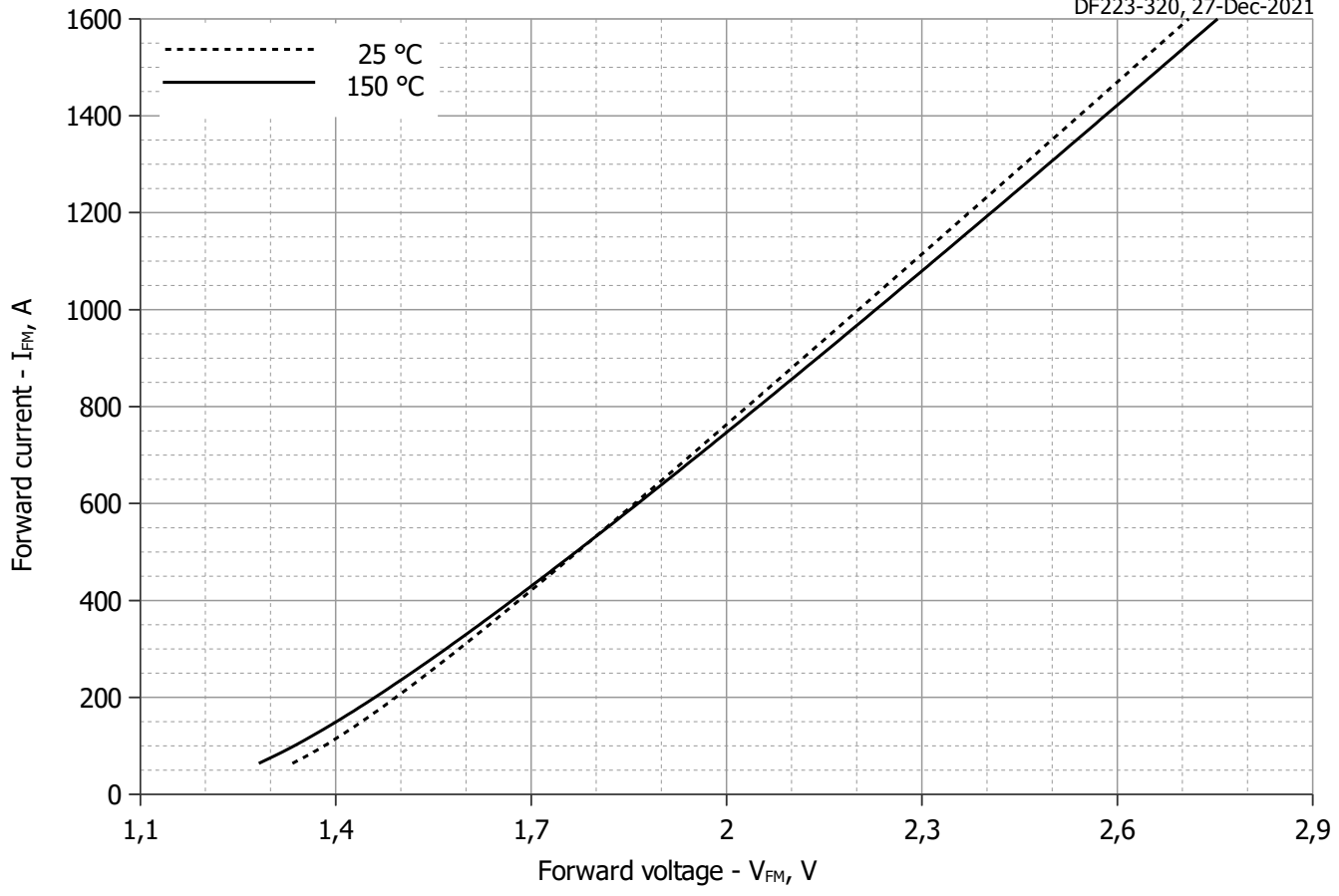


Fig 1 – Forward characteristics of Limit device

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	
	$T_j = 25^{\circ}\text{C}$	$T_j = T_{j\text{ max}}$
A	1.07152729	1.04286955
B	0.00084485	0.00076915
C	0.05581842	0.03471872
D	-0.00313625	0.00560675

Forward characteristic model (see Fig. 1).

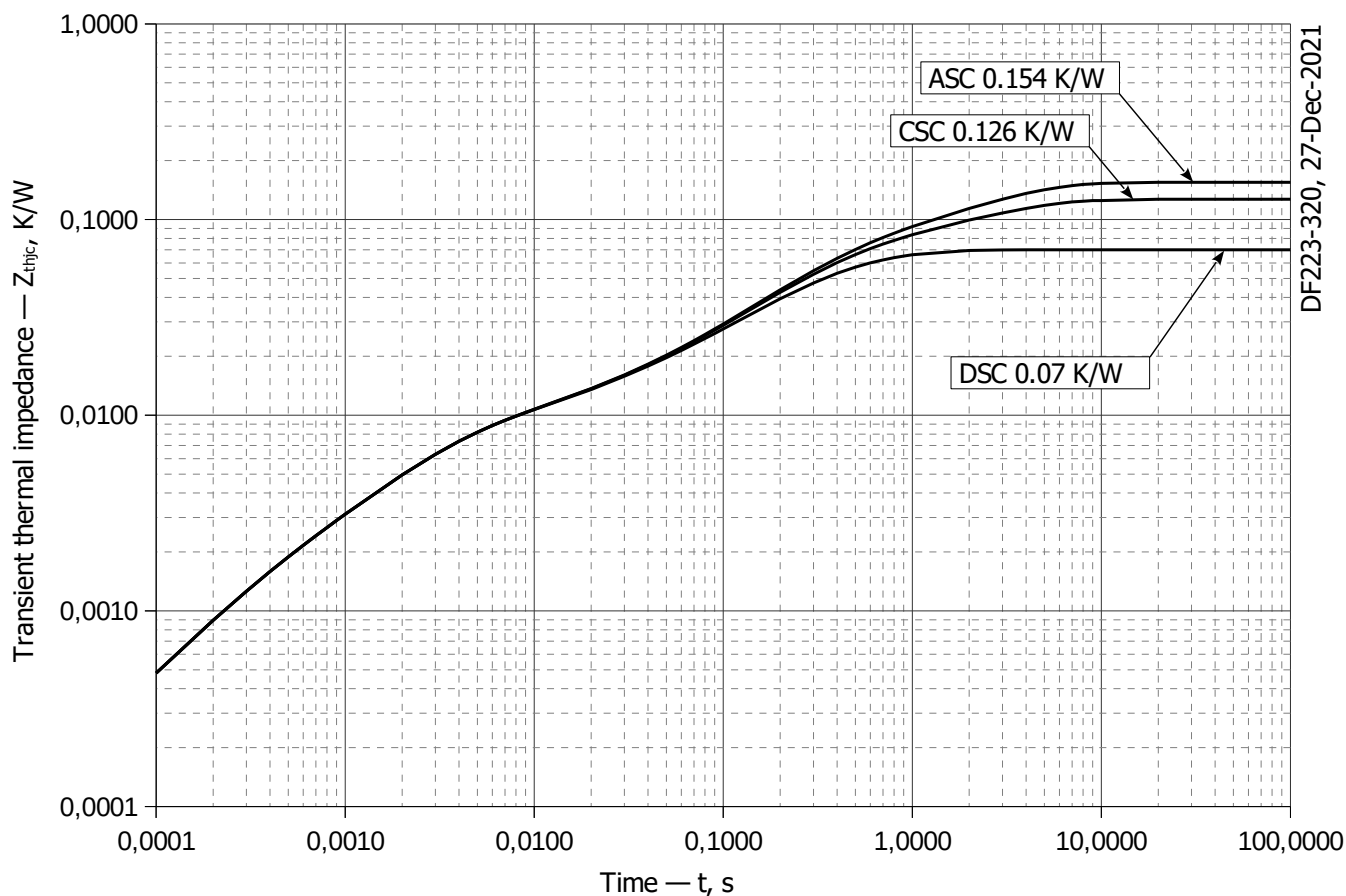


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

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 constant of r_{th} term.

DC Double side cooled

i	1	2	3	4	5	6
R_i , K/W	0.03233	0.02226	0.005231	0.002739	0.006738	0.0006988
τ_i , s	0.2392	0.533	0.1478	0.01499	0.002749	0.0002969

DC Anode side cooled

i	1	2	3	4	5	6
R_i , K/W	0.08459	0.02327	0.002598	0.006598	0.0006736	0.03694
τ_i , s	2.653	0.5669	0.01311	0.00269	0.0002871	0.2416

DC Cathode side cooled

i	1	2	3	4	5	6
R_i , K/W	0.05654	0.03706	0.002638	0.006637	0.0006786	0.02303
τ_i , s	2.653	0.2338	0.01361	0.002704	0.000289	0.5476

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

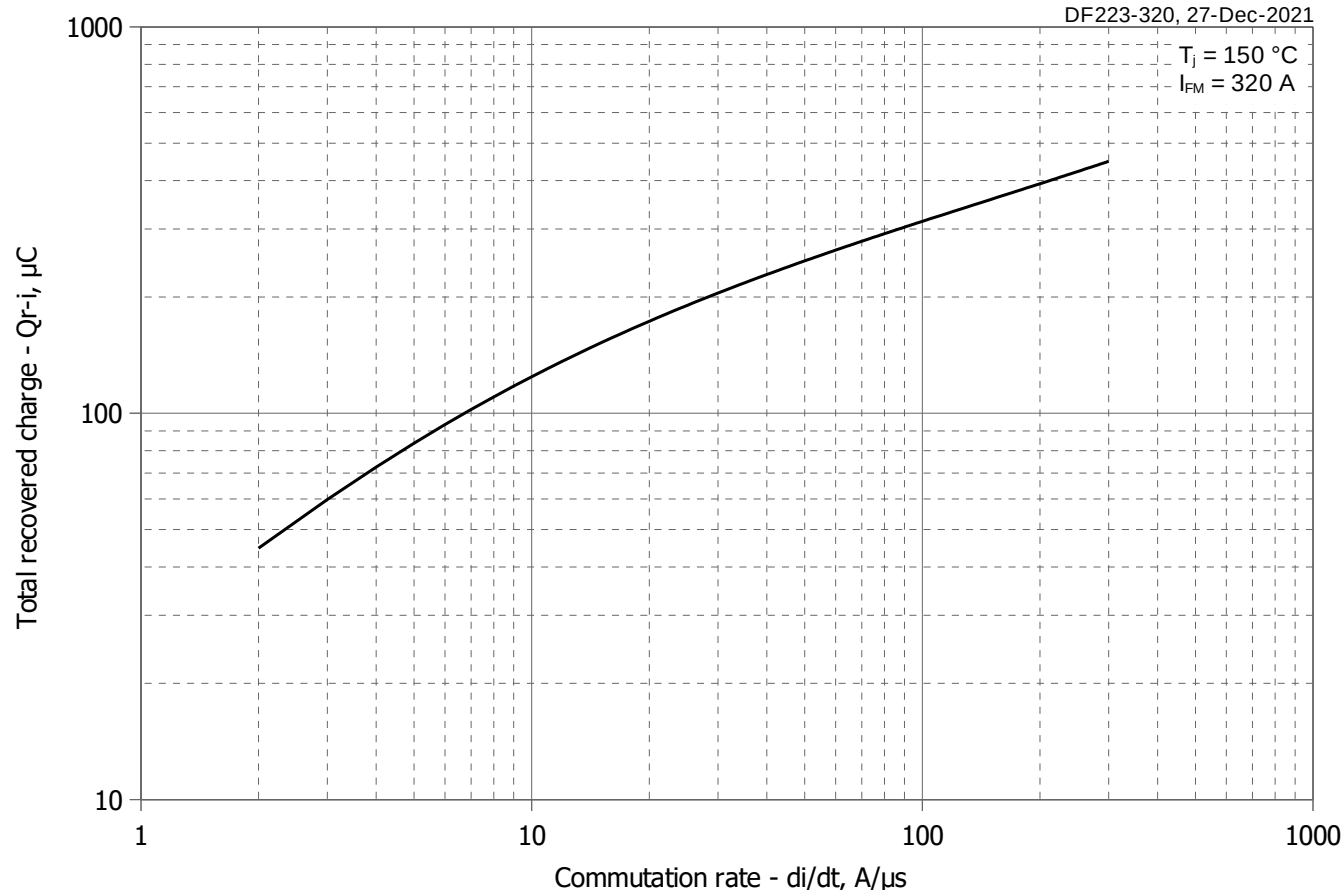


Fig 3 - Total recovered charge Q_{r-i} (integral) vs. commutation rate di_R/dt

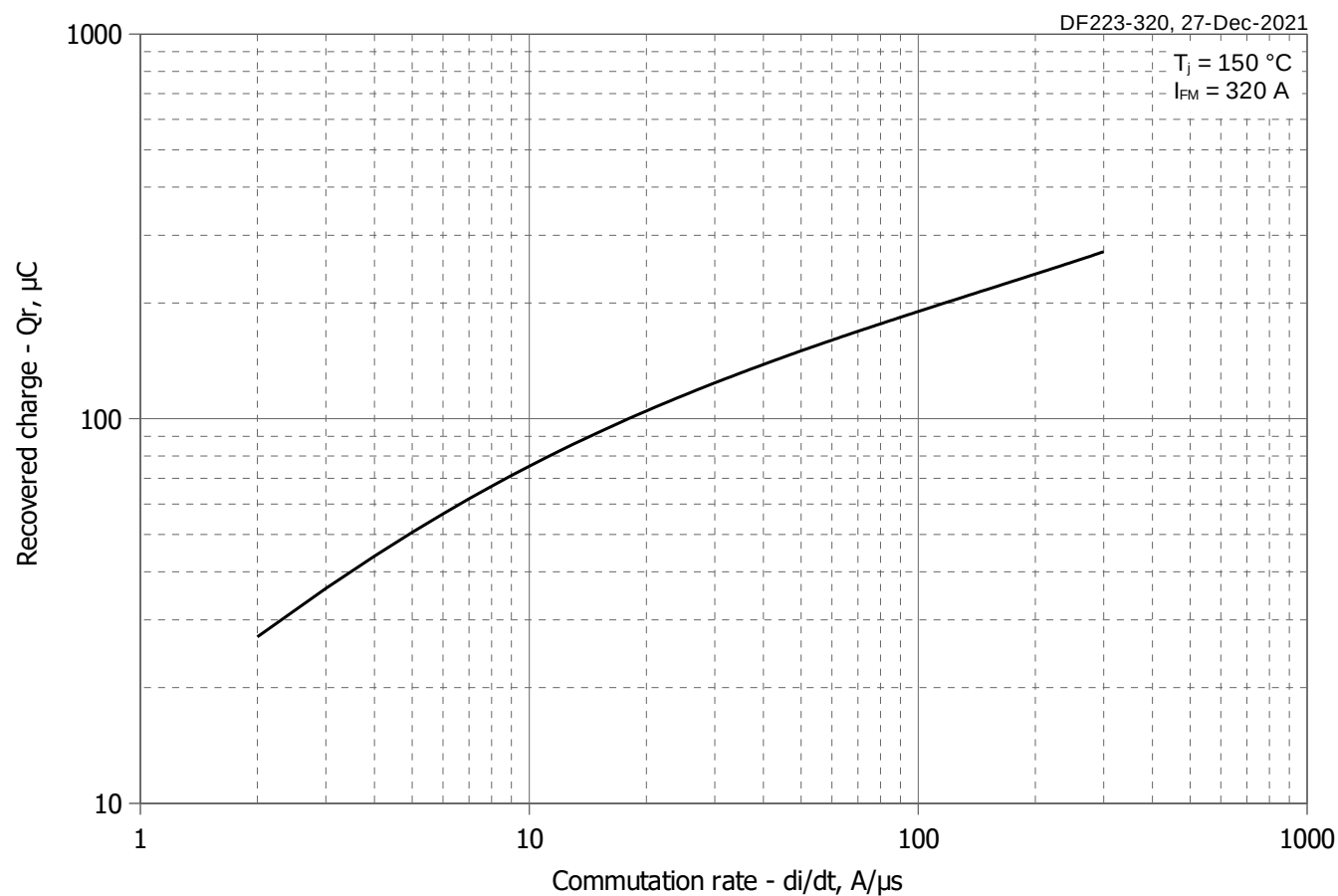
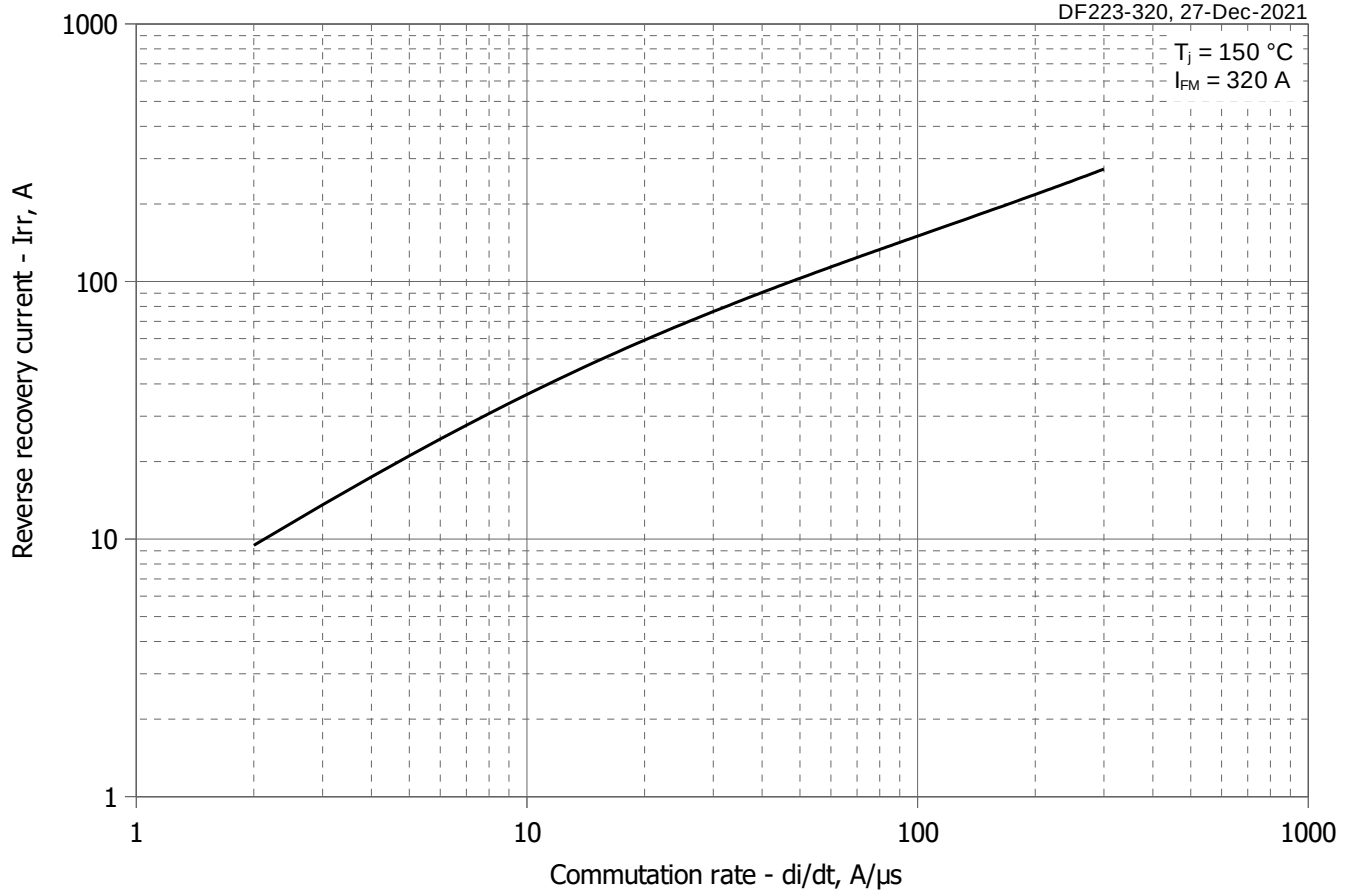
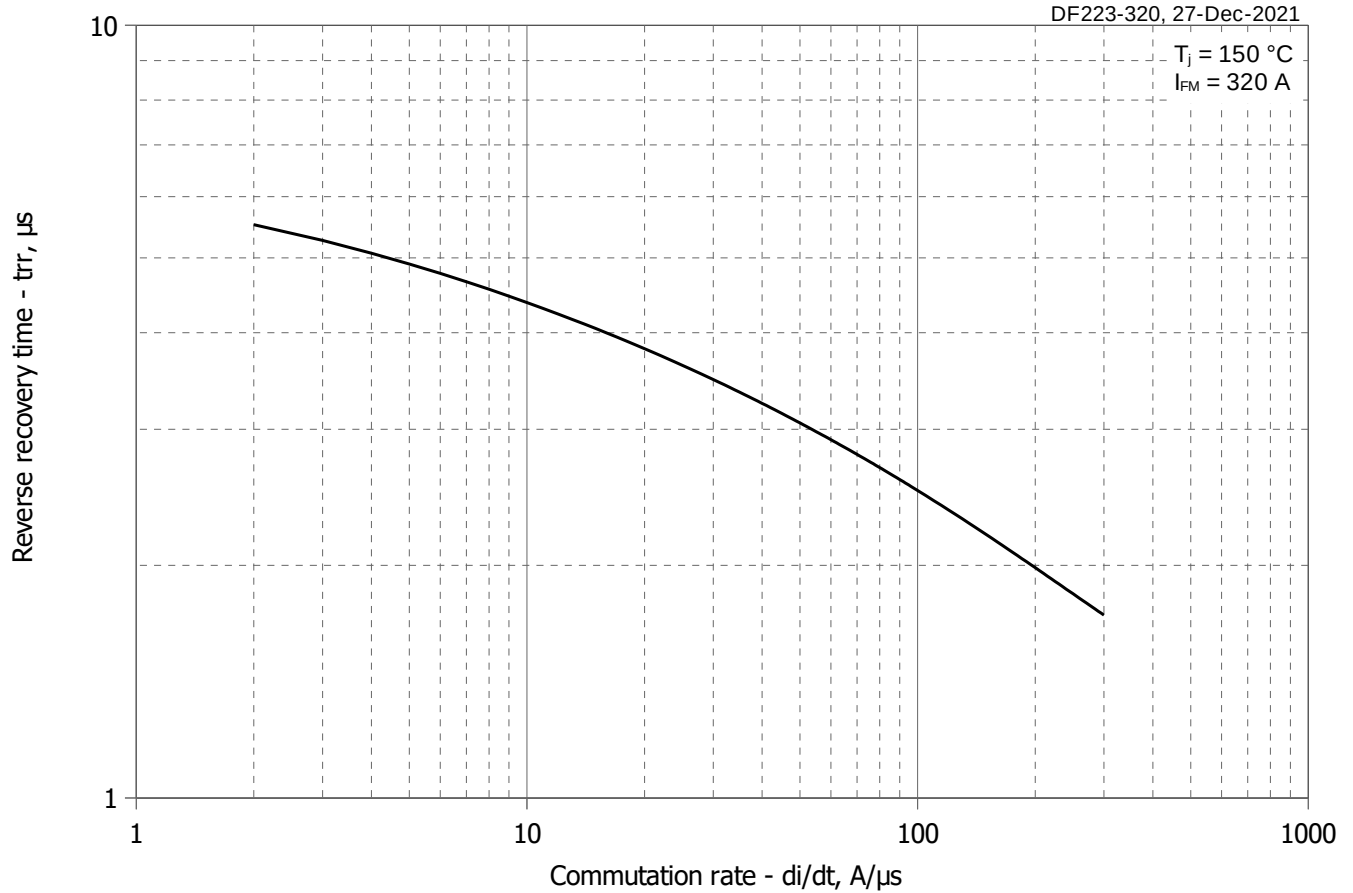


Fig 4 - Maximum recovered charge Q_r vs. commutation rate di_R/dt (50% chord)

$T_j = 150\text{ }^{\circ}\text{C}$
 $I_{FM} = 320\text{ A}$

Fig 5 - Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt
 $T_j = 150\text{ }^{\circ}\text{C}$
 $I_{FM} = 320\text{ A}$

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

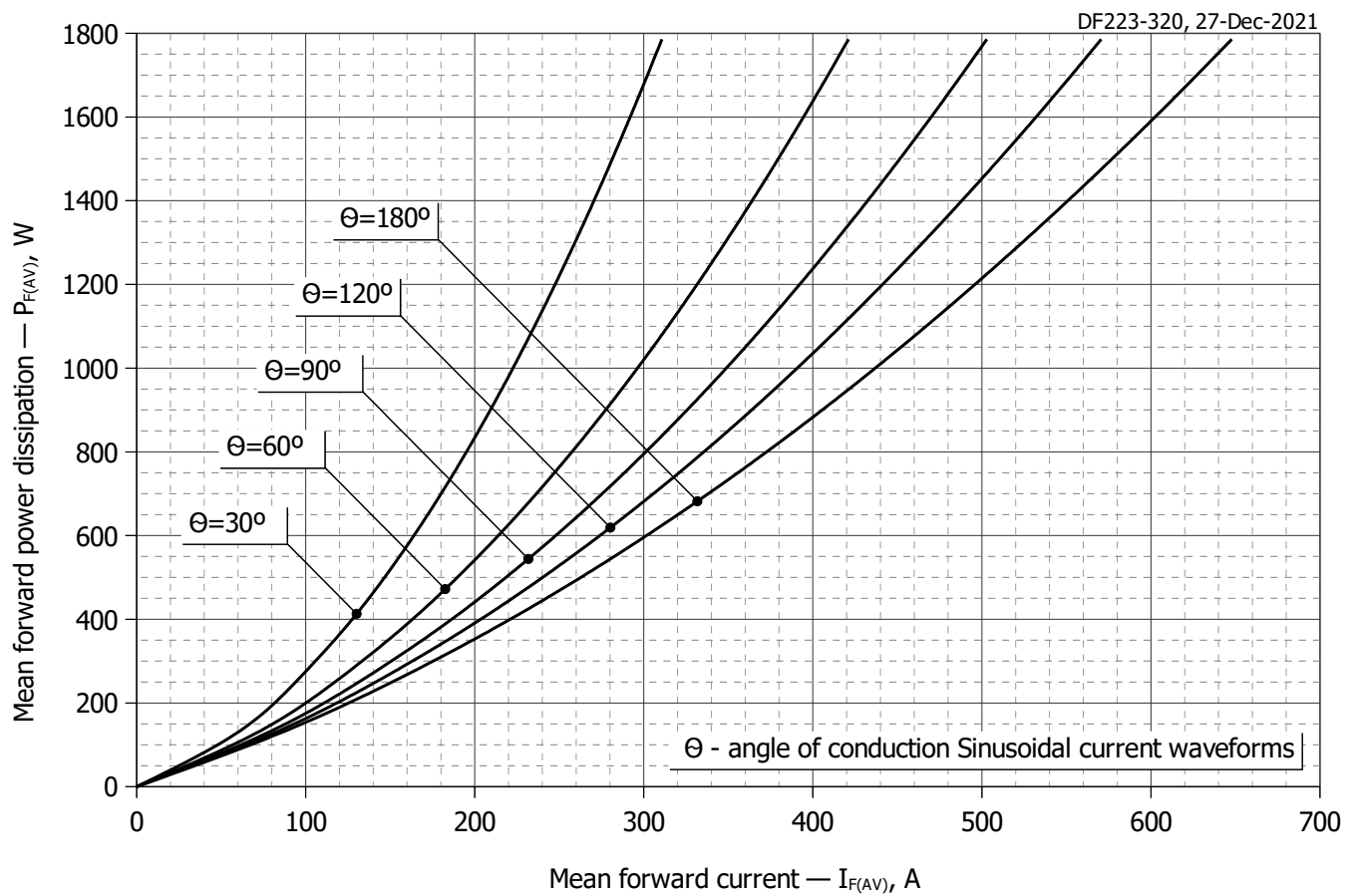


Fig. 7 - Mean forward power dissipation $P_{F(AV)}$ vs. mean forward current $I_{F(AV)}$ for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$, DSC)

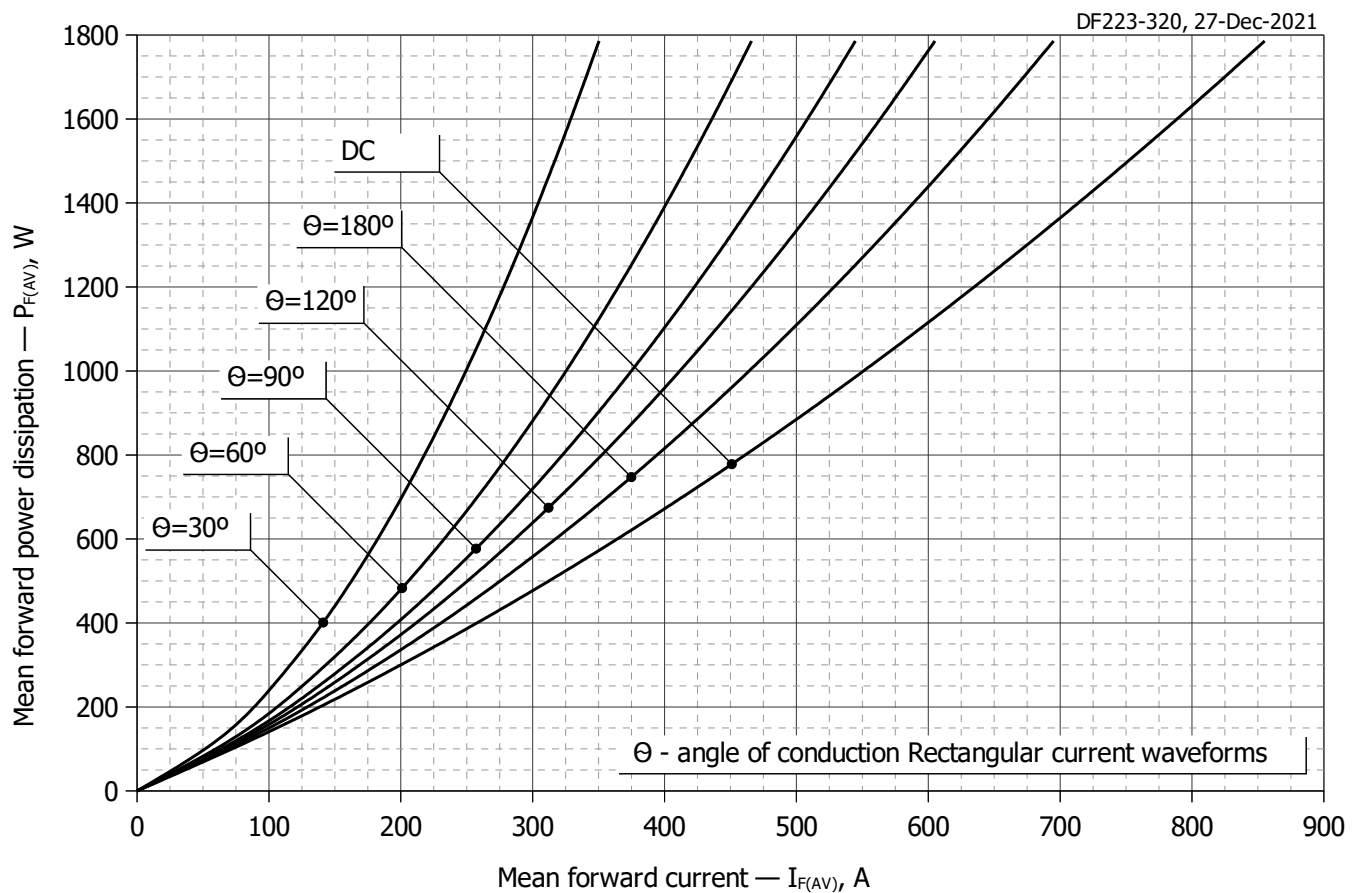


Fig. 8 – Mean forward power dissipation $P_{F(AV)}$ vs. mean forward current $I_{F(AV)}$ for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$, DSC)

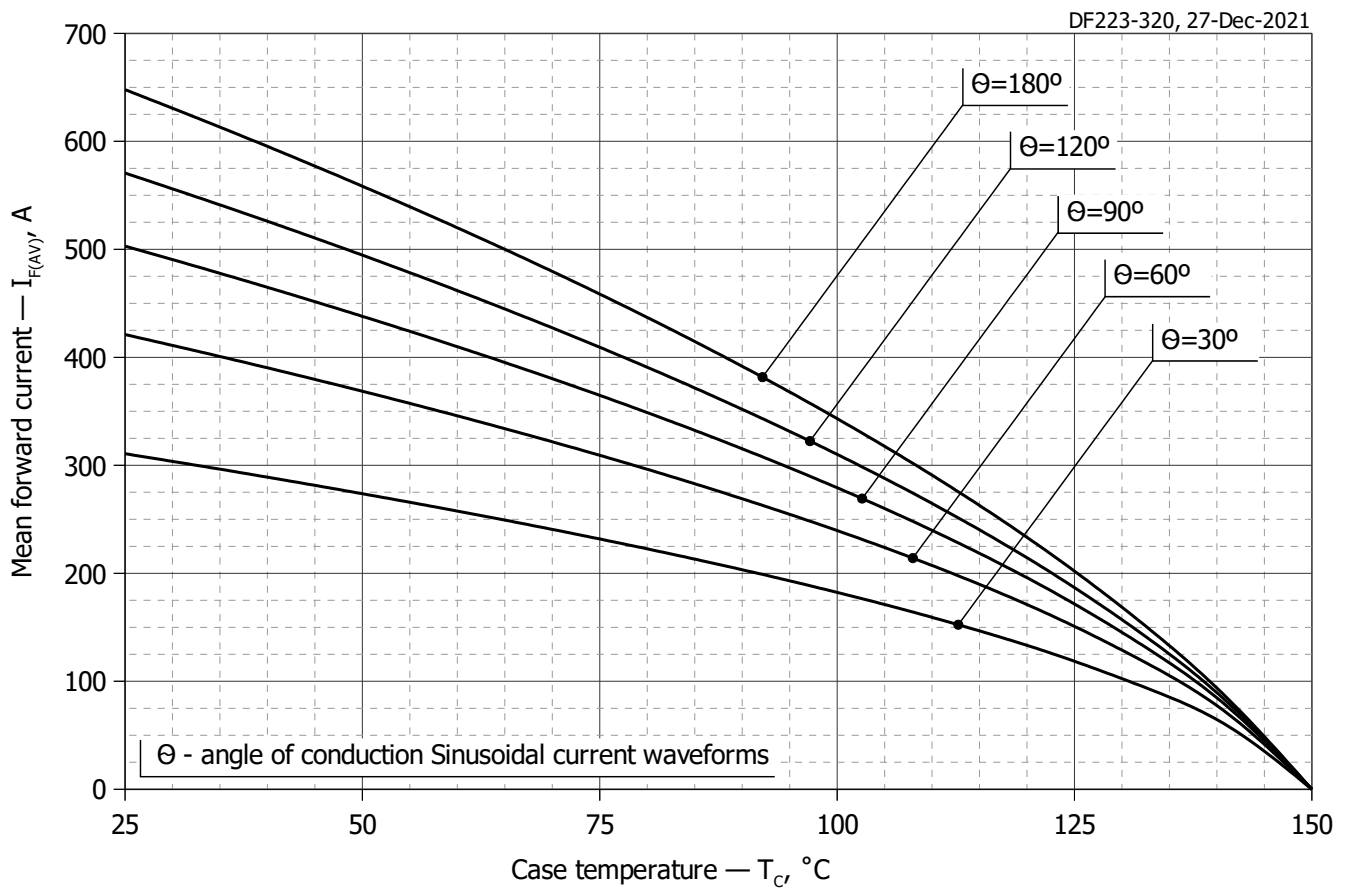


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$, DSC)

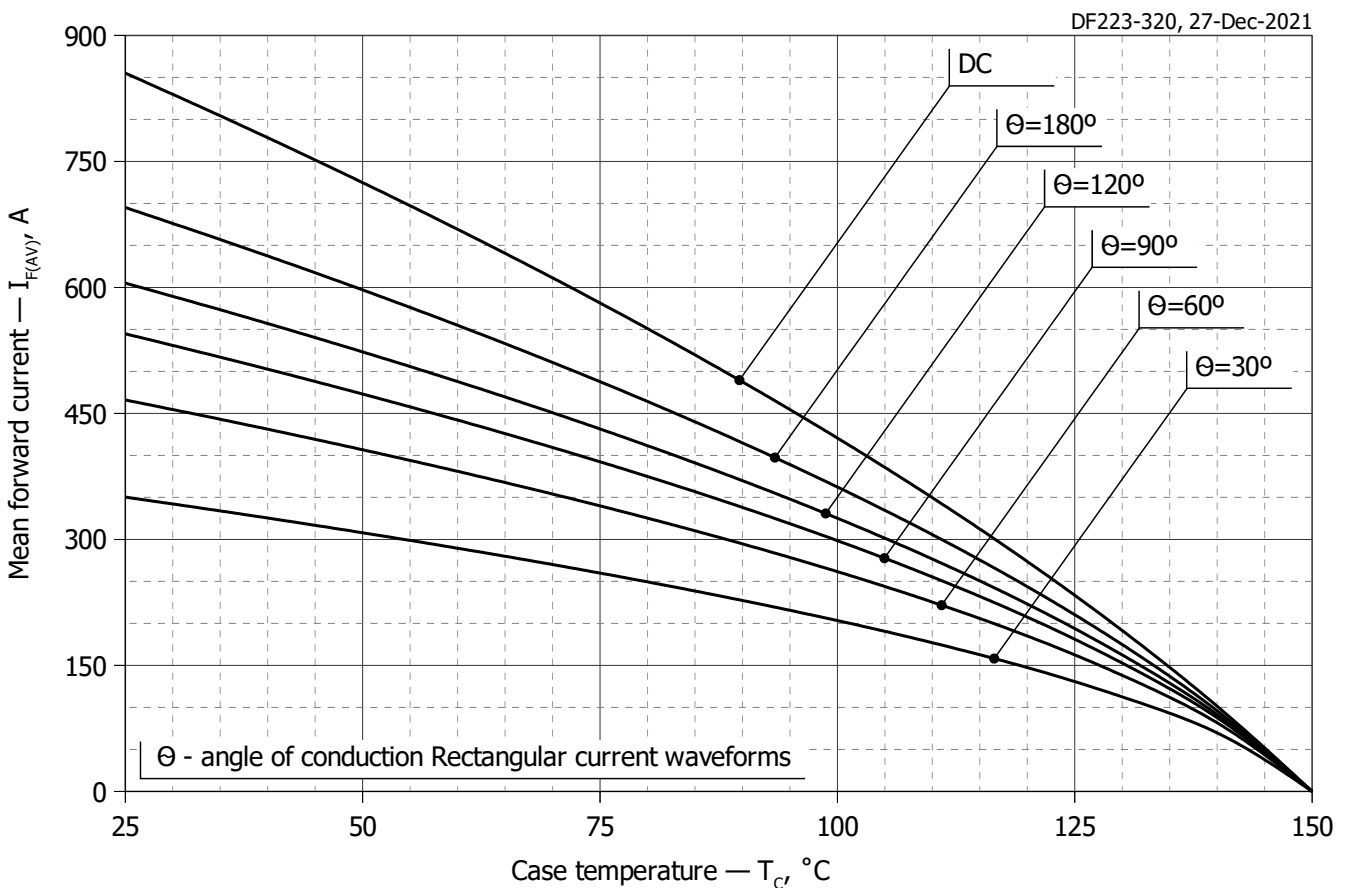


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$, DSC)

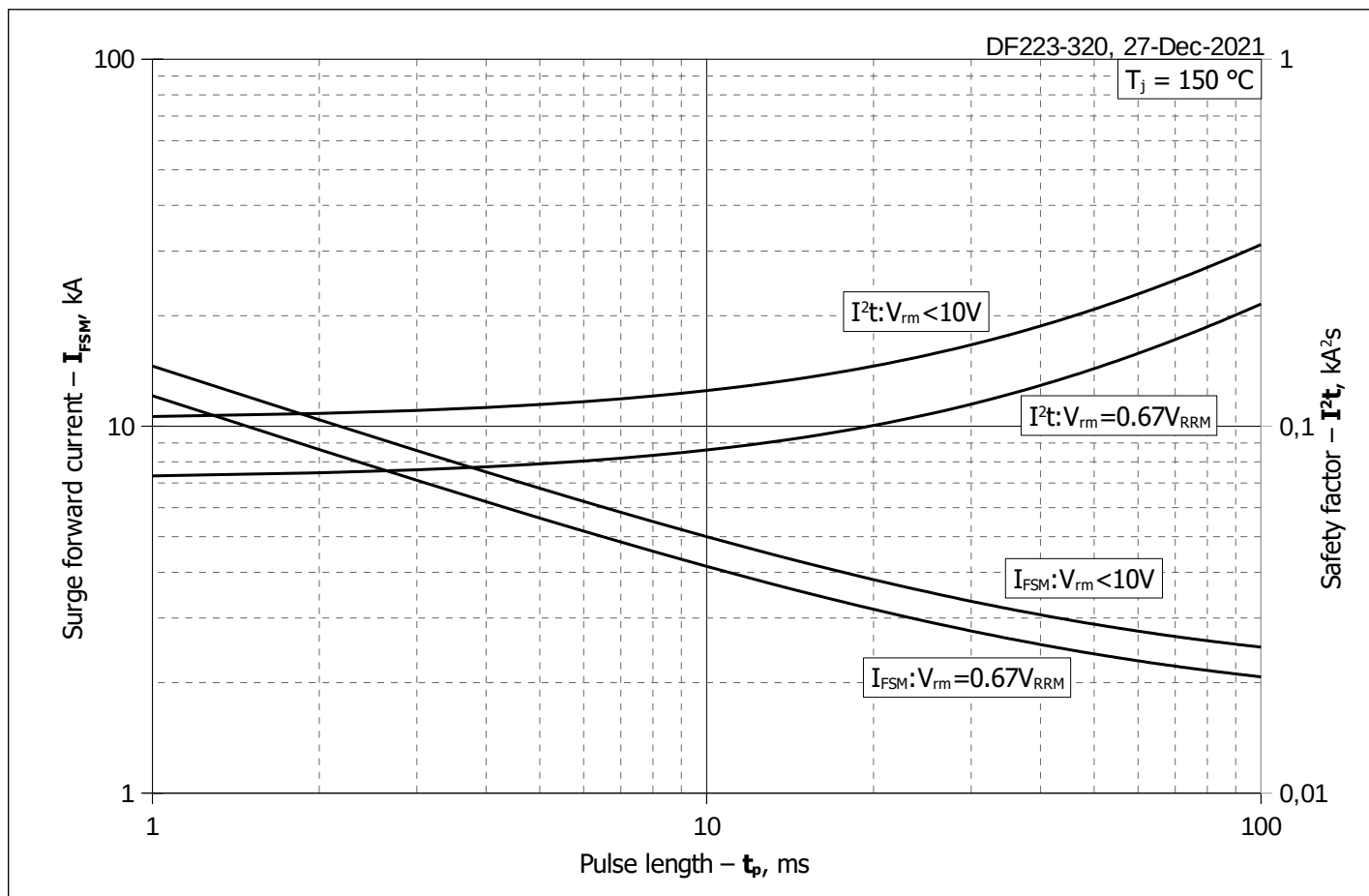


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

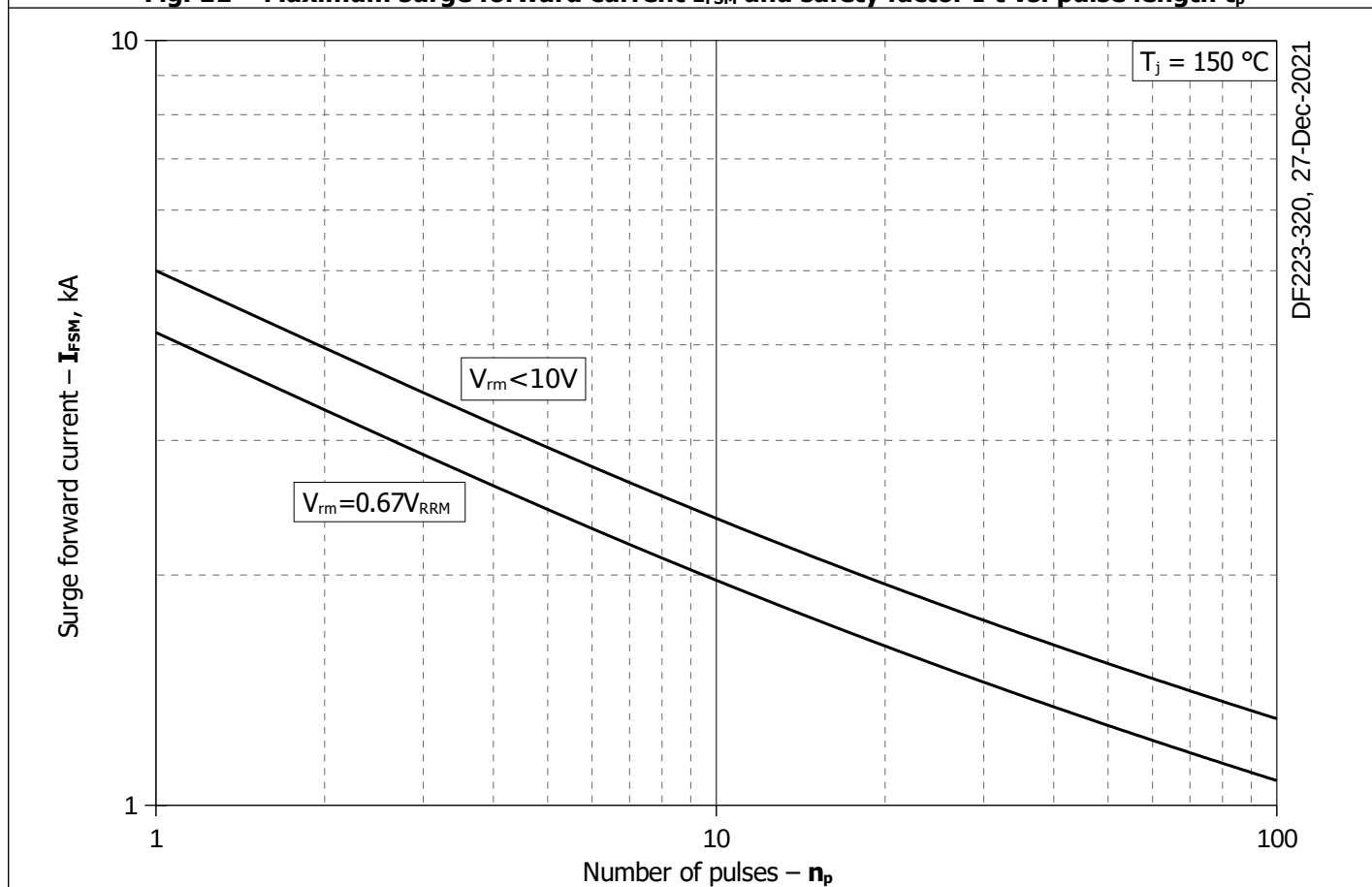


Fig. 12 - Maximum surge forward current I_{FSM} vs. number of pulses n_p