



PROTON-ELECTROTEX RUSSIA

Optimum power handling
Low switching losses
Low reverse recovery charge
High power cycling capability

Fast Recovery Stud Diode Type DF271-500-14

Mean on-state current			I _{FAV}		500 A	
Repetitive peak reverse voltage			V _{RRM}		1000...1400 V	
Reverse recovery time			t _{rr}		4.0, 5.0, 6.3, 8.0 μs	
V _{RRM} , V	1000	1100	1200	1300	1400	
Voltage code	10	11	12	13	14	
T _j , °C	−60...+150					

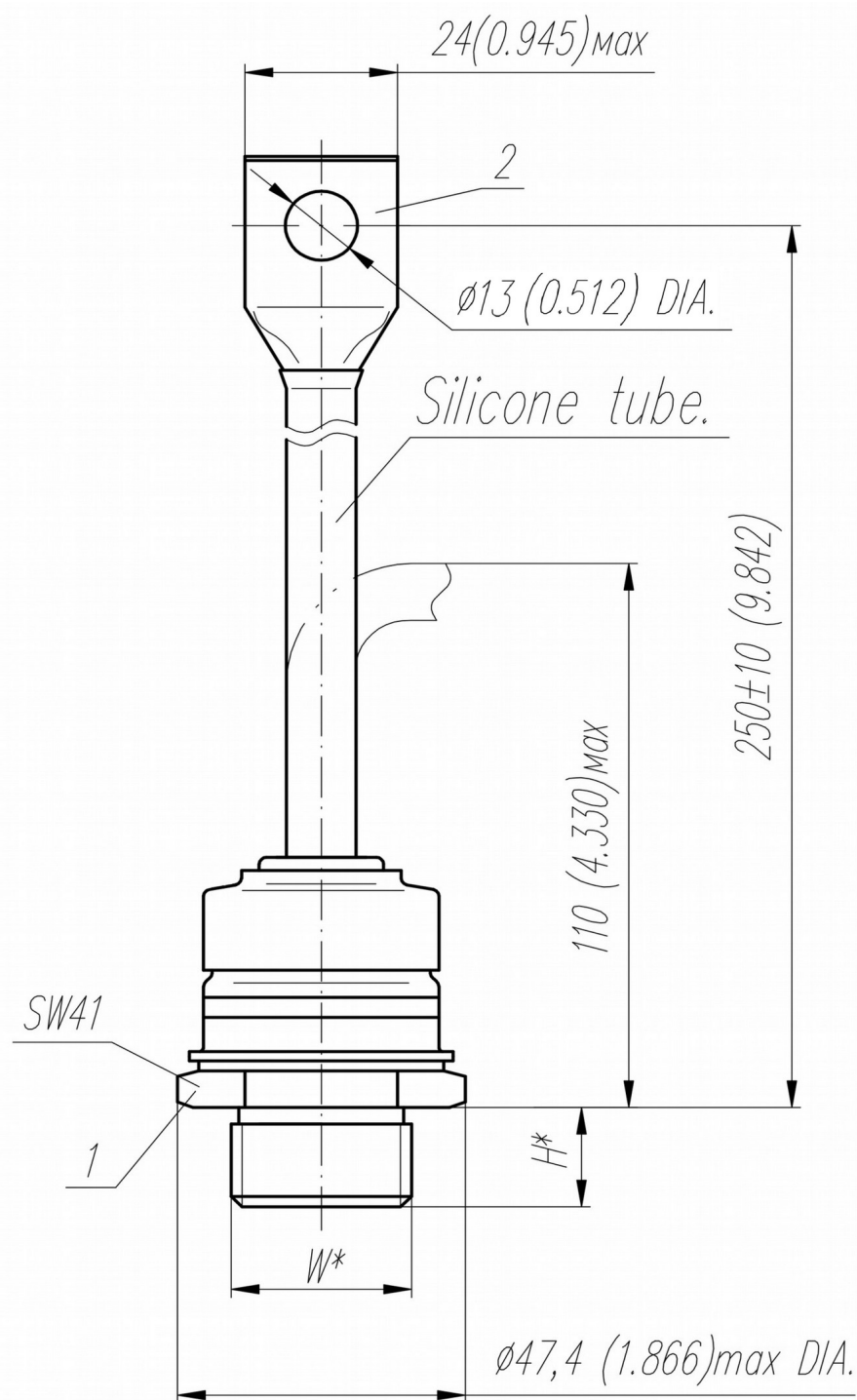
MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I _{FAV}	Maximum allowable average forward current	A	500 590	T _c =75 °C; T _c =55 °C; 180° half-sine wave; 50 Hz	
I _{FRMS}	RMS forward current	A	785	T _c =75 °C; 180° half-sine wave; 50 Hz	
I _{FSM}	Surge forward current	kA	12.0 14.0	T _j =T _{j max} T _j =25 °C	180° half-sine wave; t _p =10 ms; single pulse; V _R =0 V;
			13.0 15.0	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 ² t	Safety factor	A ² s·10 ³	720 980	T _j =T _{j max} T _j =25 °C	180° half-sine wave; t _p =10 ms; single pulse; V _R =0 V;
			700 930	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...1400	T _{j min} < T _j < T _{j max} ; 180° half-sine wave; 50 Hz;	
V _{RSM}	Non-repetitive peak reverse voltages	V	1100...1500	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...+50		
T _j	Operating junction temperature	°C	−60...+150		
MECHANICAL					
M	Tightening torque	Nm	25...35		
a	Acceleration	m/s ²	100		

CHARACTERISTICS

Symbols and parameters		Units	Values	Conditions
ON-STATE				
V _{FM}	Peak forward voltage, max	V	1.85	T _j =25 °C; I _{FM} =1570 A
V _{F(TO)}	Forward threshold voltage, max	V	1.040	T _j =T _{j max} ;
r _T	Forward slope resistance, max	mΩ	0.591	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	500	T _j =T _{j max} ; I _{FM} =500 A; di _R /dt=-100 A/μs; V _R =100 V;
t _{rr}	Reverse recovery time, max	μs	4.0, 5.0, 6.3, 8.0	
I _{rr}	Reverse recovery current, max	A	250	
THERMAL				
R _{thjc}	Thermal resistance, junction to case, max	°C/W	0.0850	Direct current
MECHANICAL				
m	Weight, max	g	440	
D _s	Surface creepage distance	mm (inch)	12.4 (4.882)	
D _a	Air strike distance	mm (inch)	12.4 (4.882)	

PART NUMBERING GUIDE							GROUP OF RECOVERY TIME				
DF	271	500		14	H4	N	Group Symbol	H4	E4	C4	B4
1	2	3	4	5	6	7	$t_{rr}, \mu\text{s}$	4.0	5.0	6.3	8.0
1. Fast recovery diode 2. Design version 3. Average forward current, A 4. Polarity: X – Cathode to Stud; Anode to Stud – no symbol 5. Voltage code 6. Group of reverse recovery time 7. Ambient conditions: N – normal; T – tropical											



Type of screw	W	H
Metric Screw Type C	M24x1,5 – 8g	19
Metric Screw Type B(upon request)	M20x1,5 – 8g	15

Polarity		Example of code designation	Reference designation	Colors	
				Anode	Cathode
Normal	Anode to stud	DF271-500-14	∇	-	Red tube

All dimensions in millimeters (inches)

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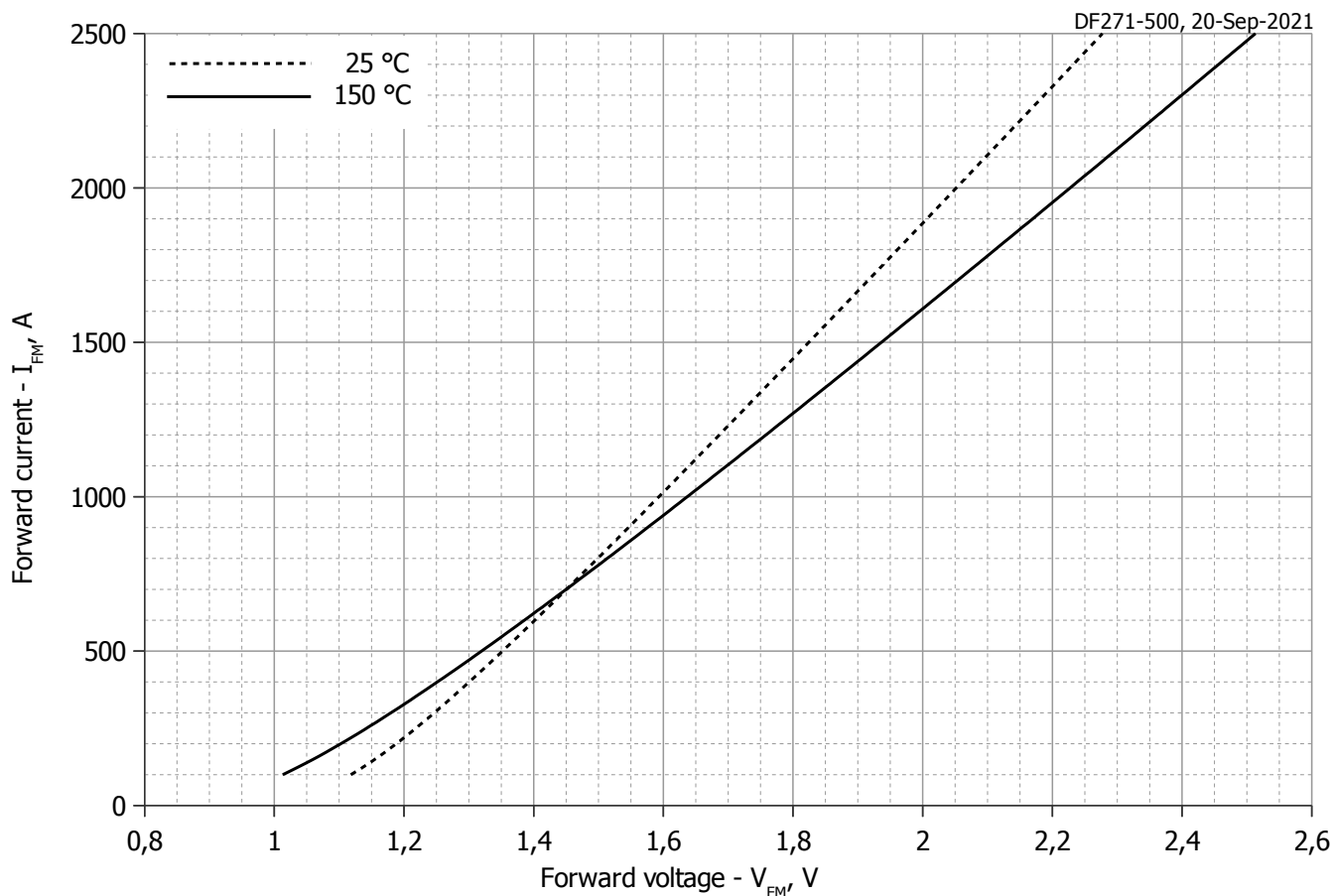


Fig 1 – Forward characteristics of Limit device

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	
	$T_j = 25^\circ\text{C}$	$T_j = T_{j \max}$
A	0.87594401	0.78400558
B	0.00044589	0.00051083
C	0.04590157	0.02864949
D	-0.00144850	0.00456096

Forward characteristic model (see Fig. 1).

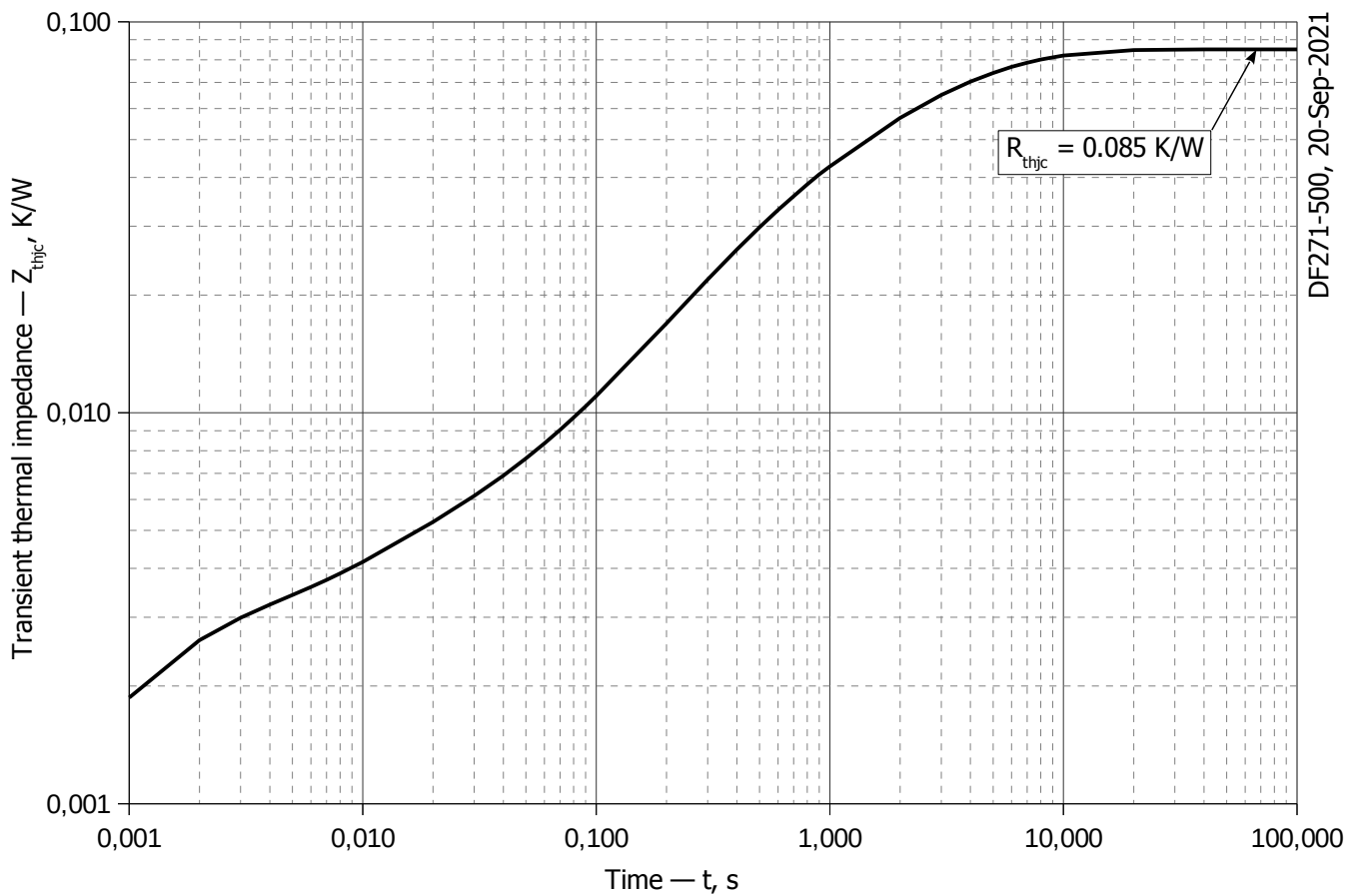


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

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

i	1	2	3	4	5	6
R_i , K/W	0.023357	0.02733	0.01495	0.001445	0.002488	0.01543
τ_i , s	4.627	2.249	0.3406	0.01043	0.0009112	0.9081

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

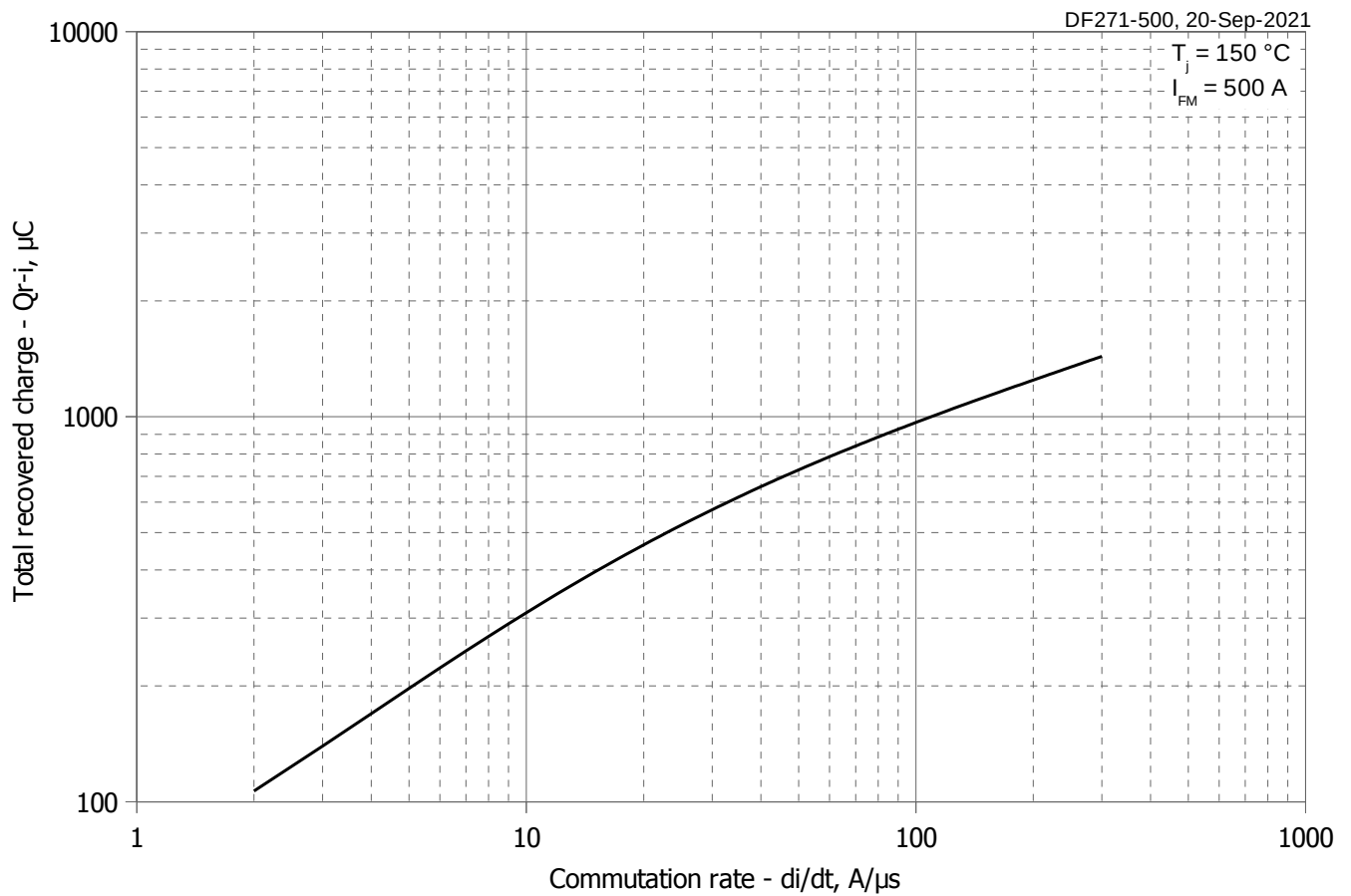


Fig 3 – Maximum recovered charge Q_{r-i} (integral) vs. commutation rate di_R/dt

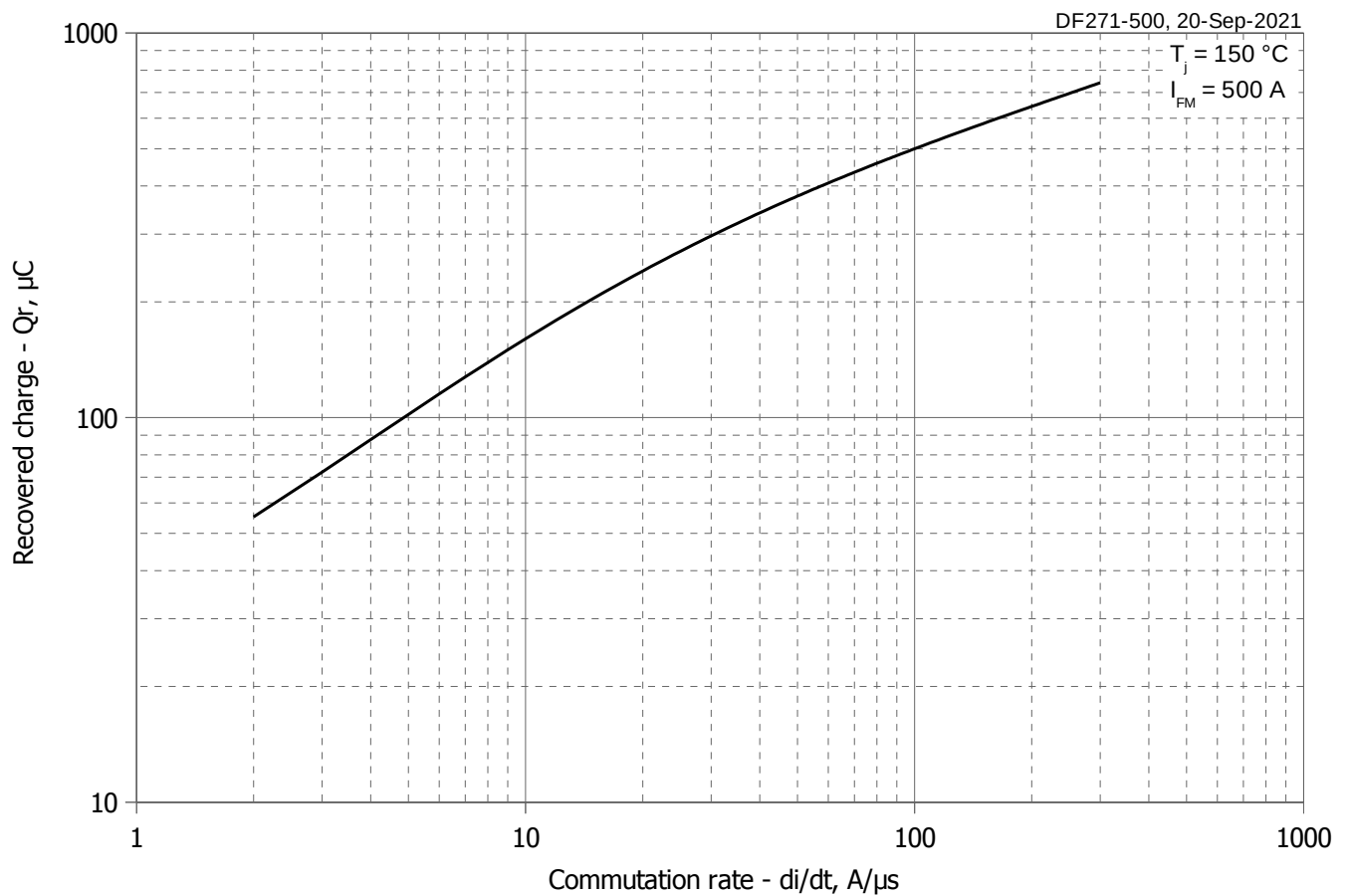


Fig 4 – Maximum recovered charge Q_r vs. commutation rate di_R/dt (25% chord)

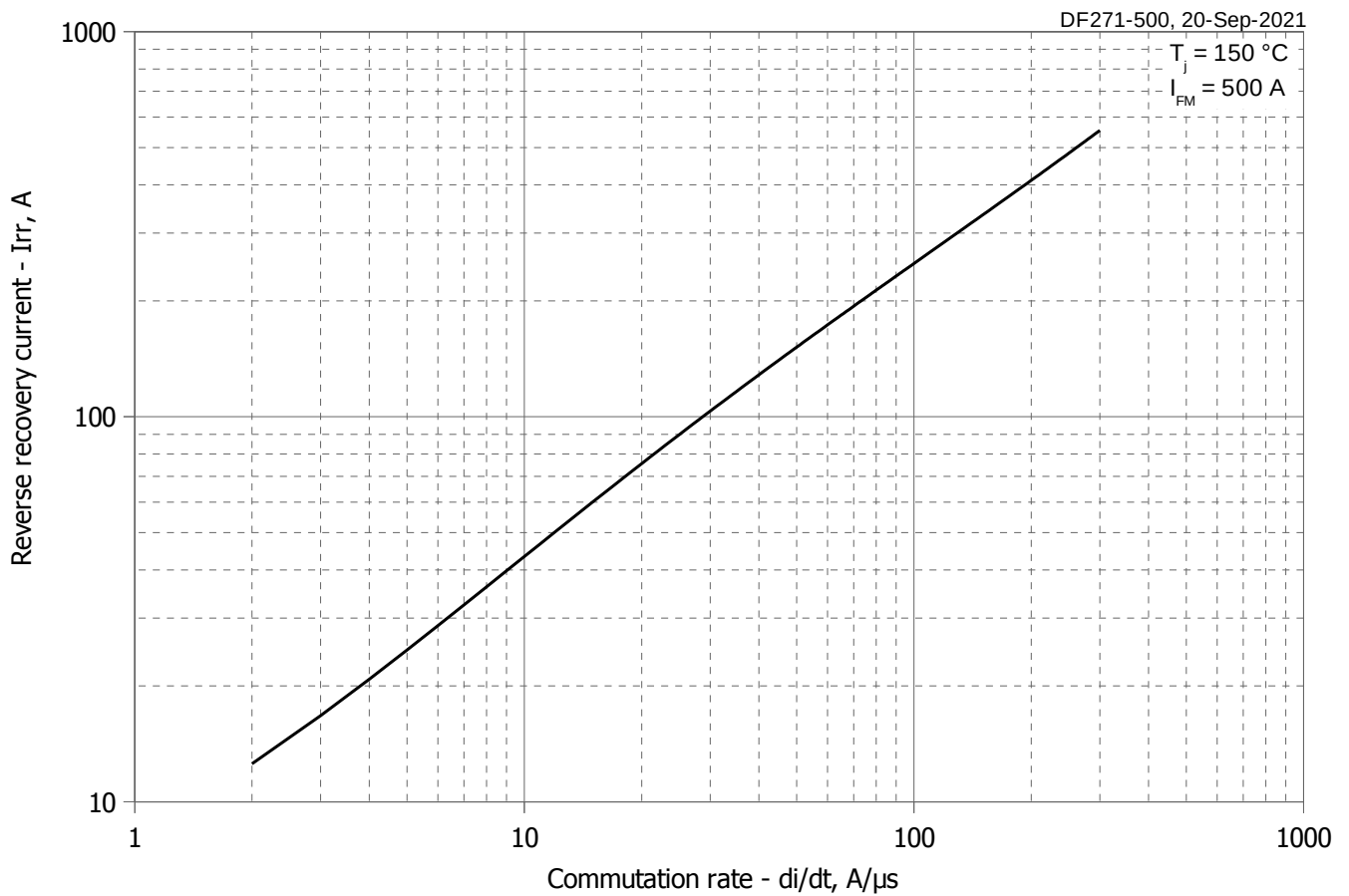


Fig 5 – Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

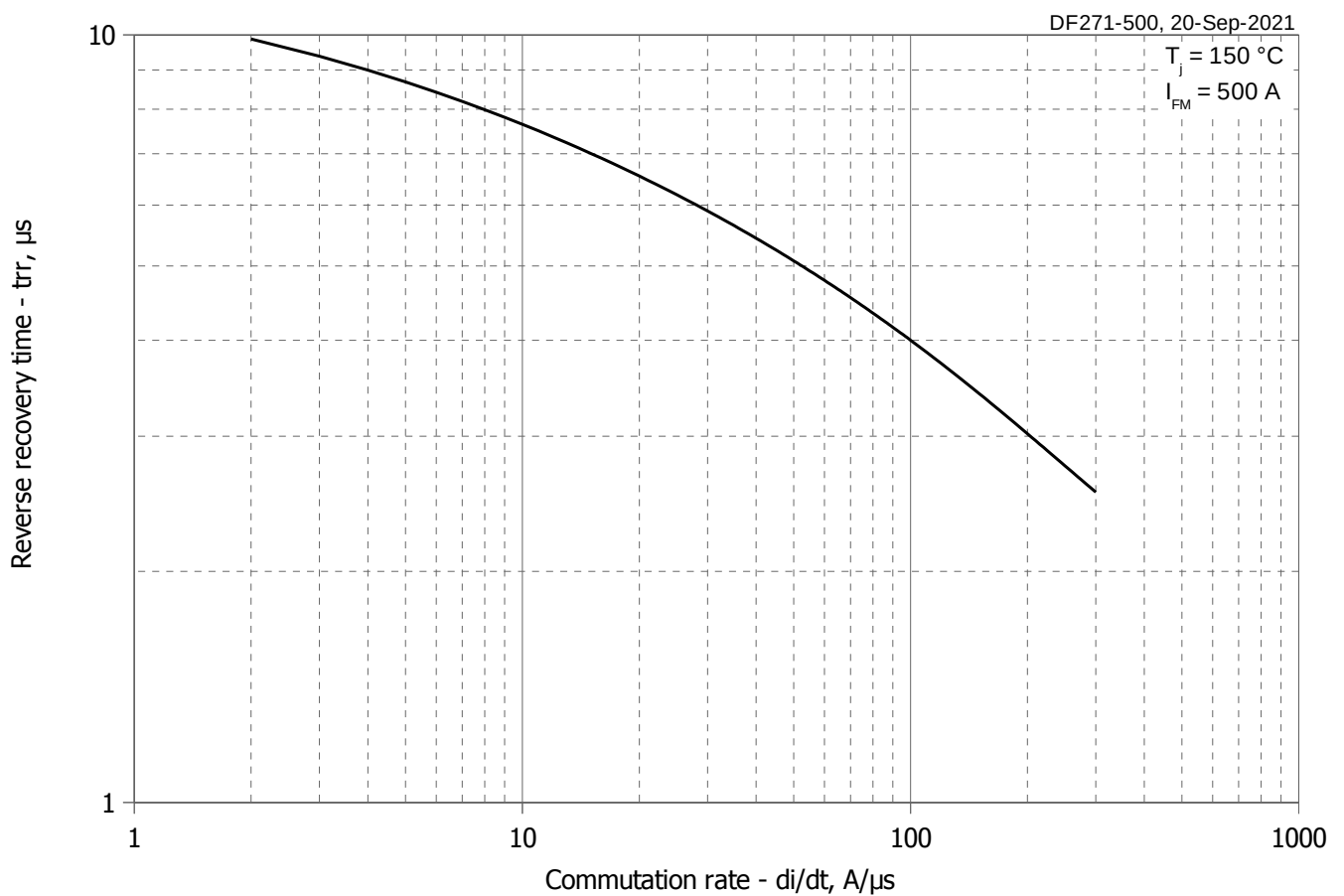


Fig 6 – Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

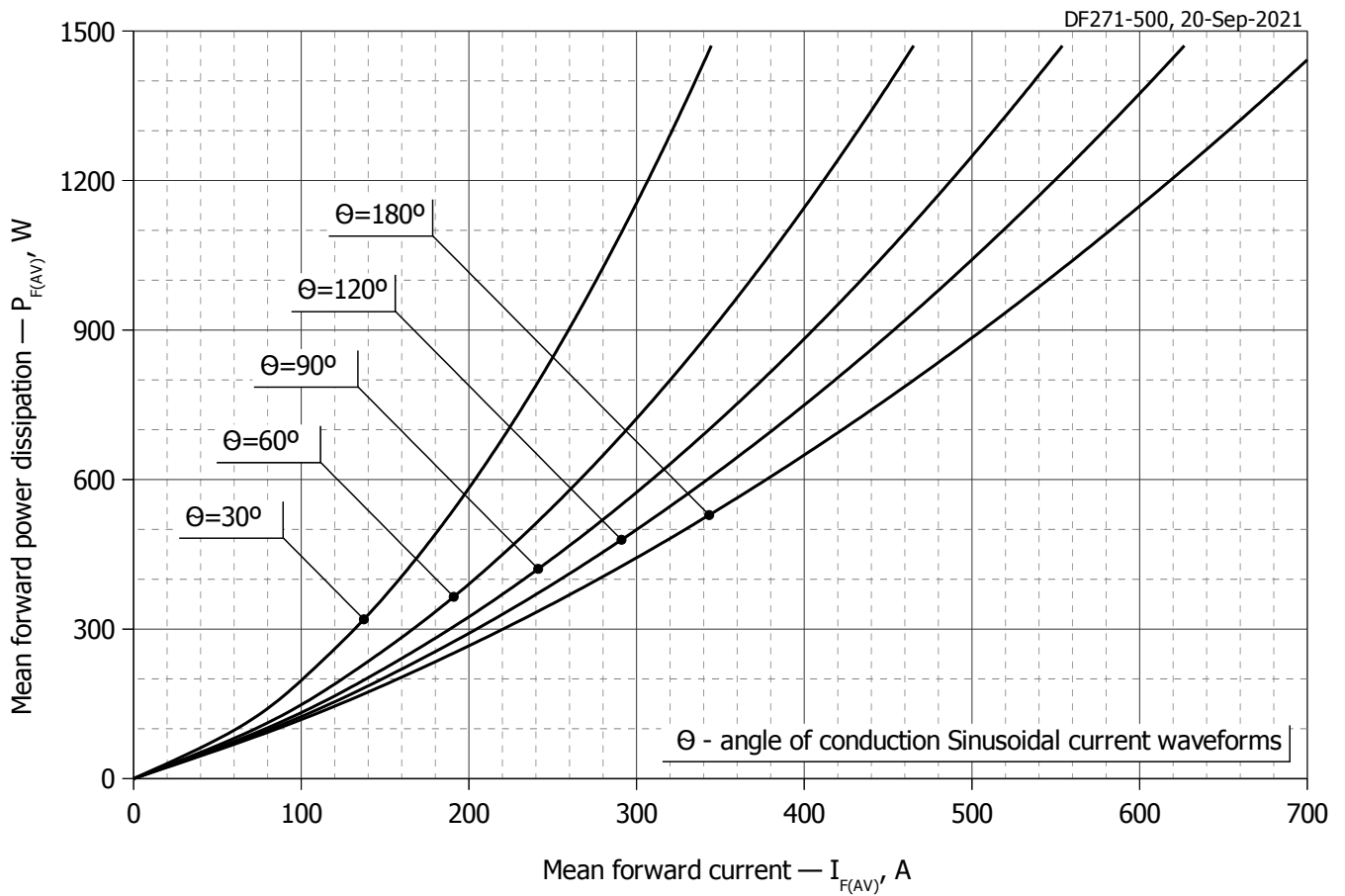


Fig. 7 - Mean forward power dissipation $P_{F(AV)}$ vs. mean forward current $I_{F(AV)}$ for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$)

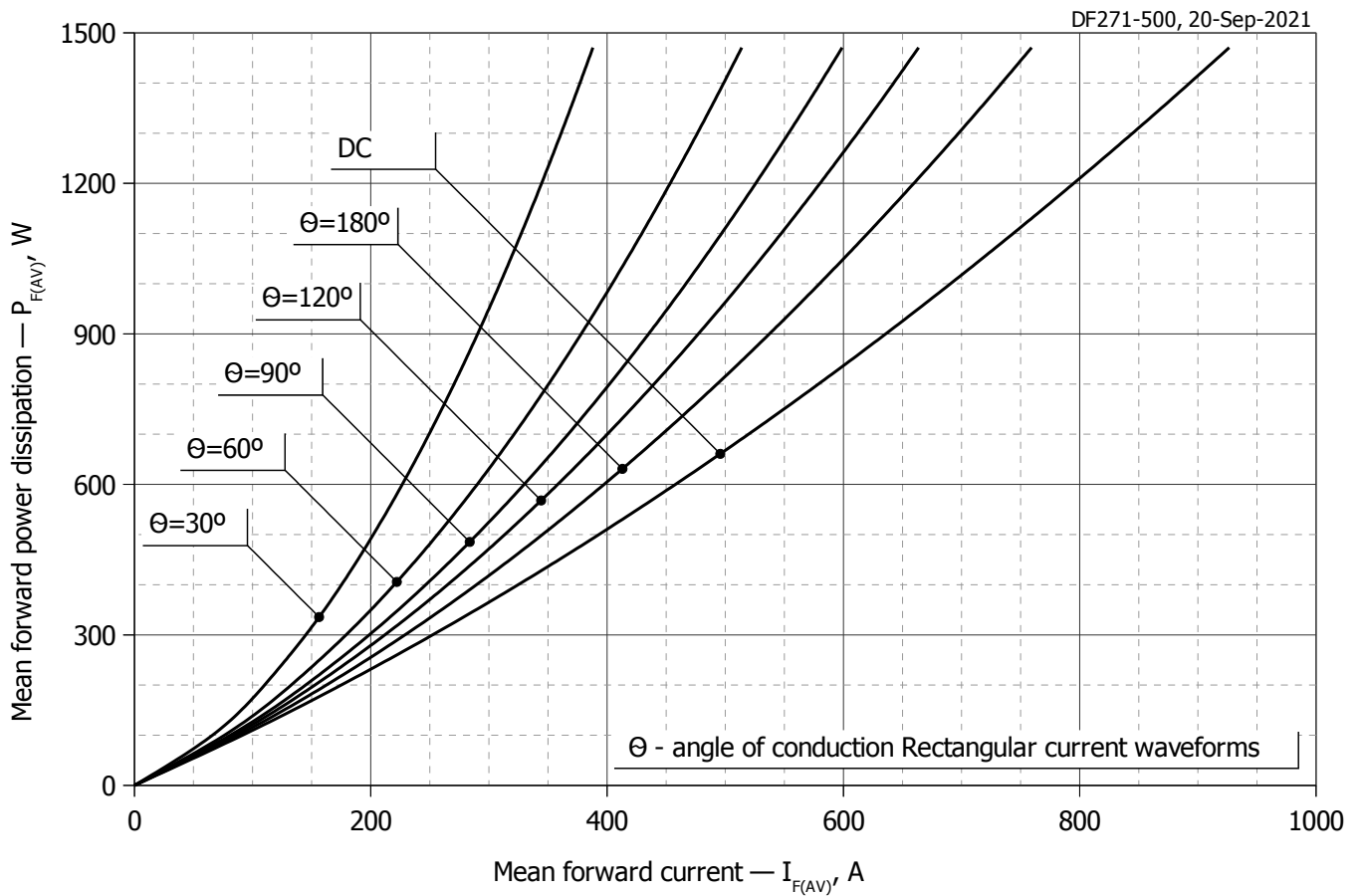


Fig. 8 - Mean forward power dissipation $P_{F(AV)}$ vs. mean forward current $I_{F(AV)}$ for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$)

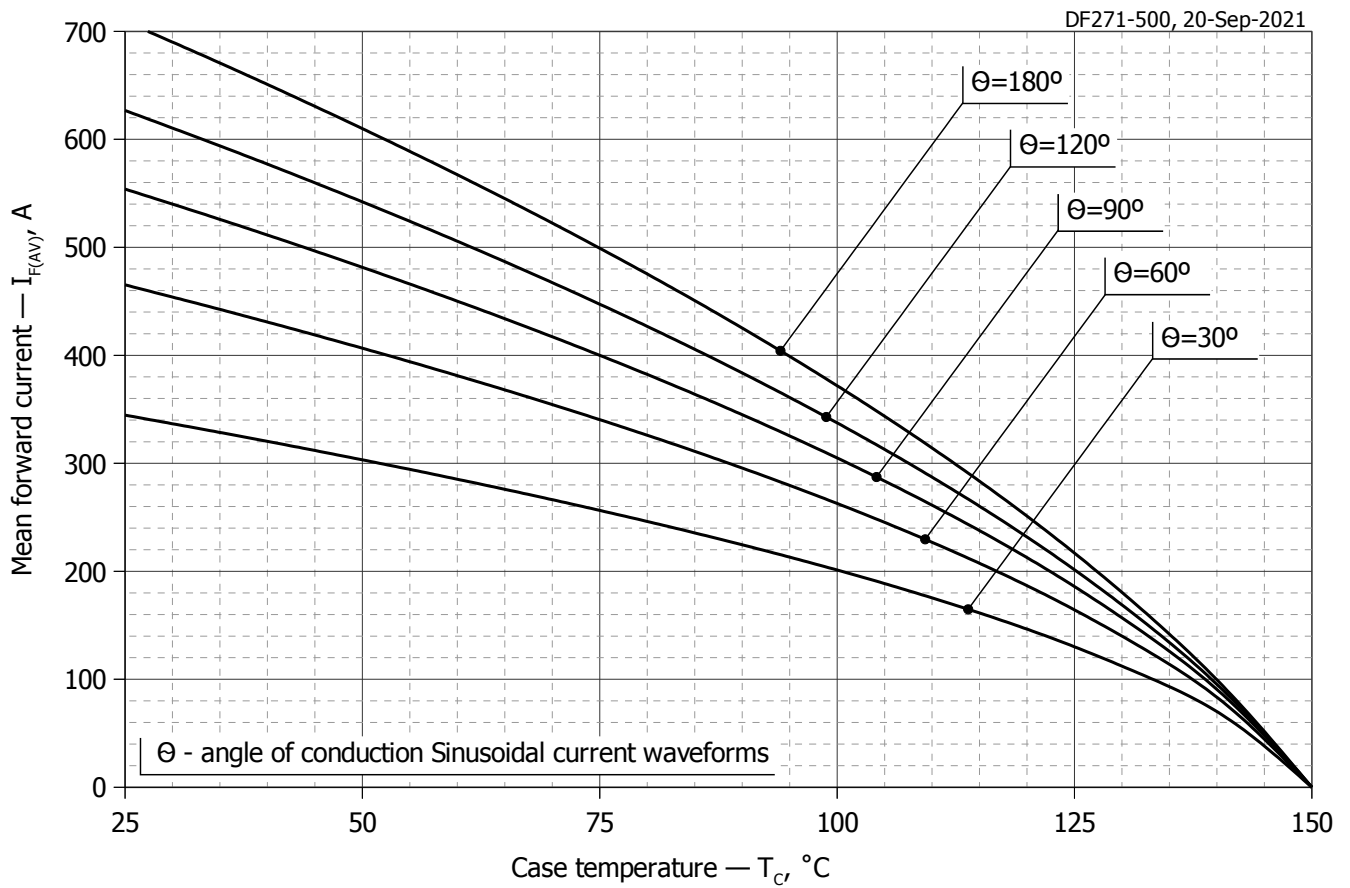


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$)

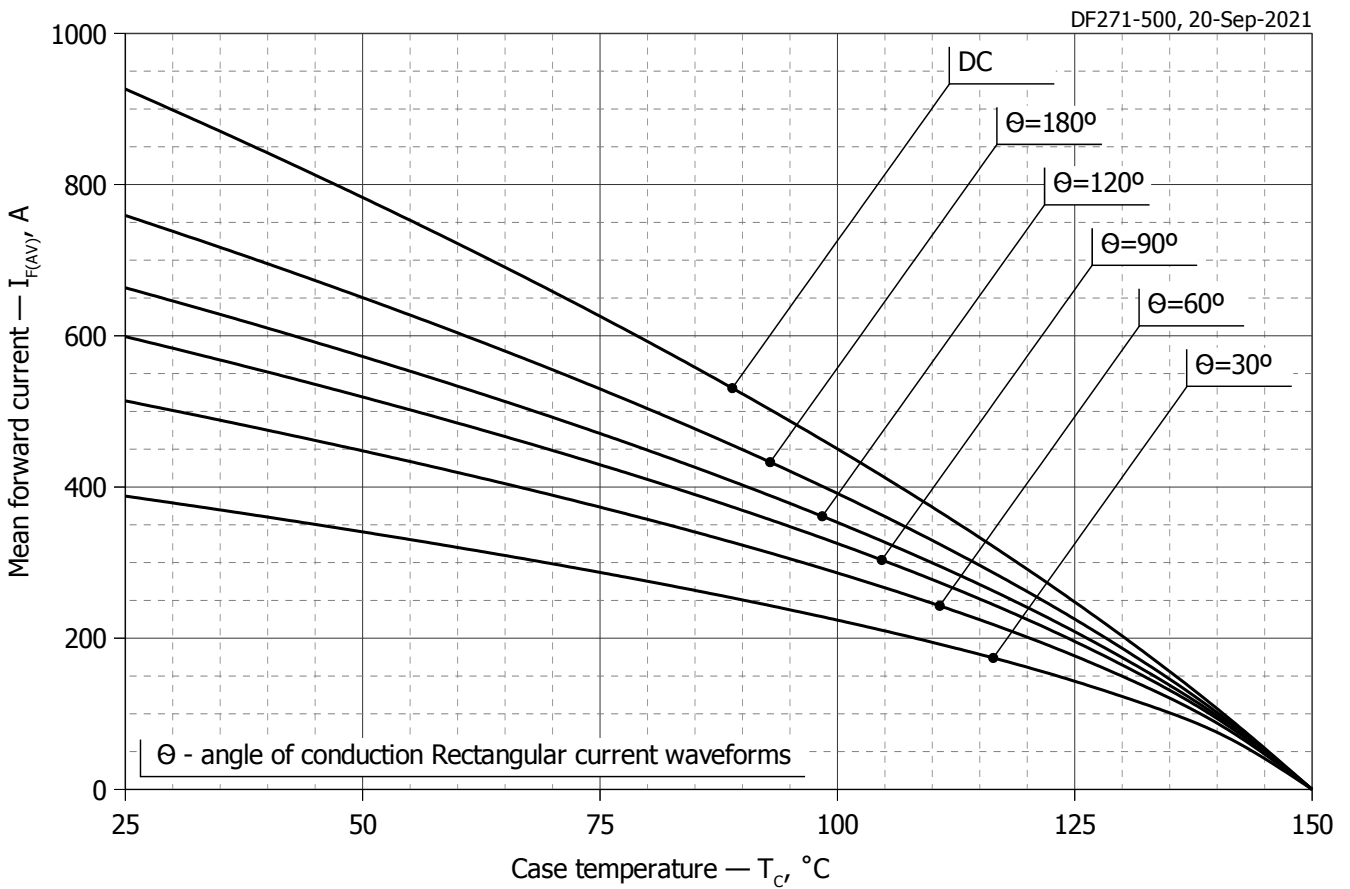


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$)

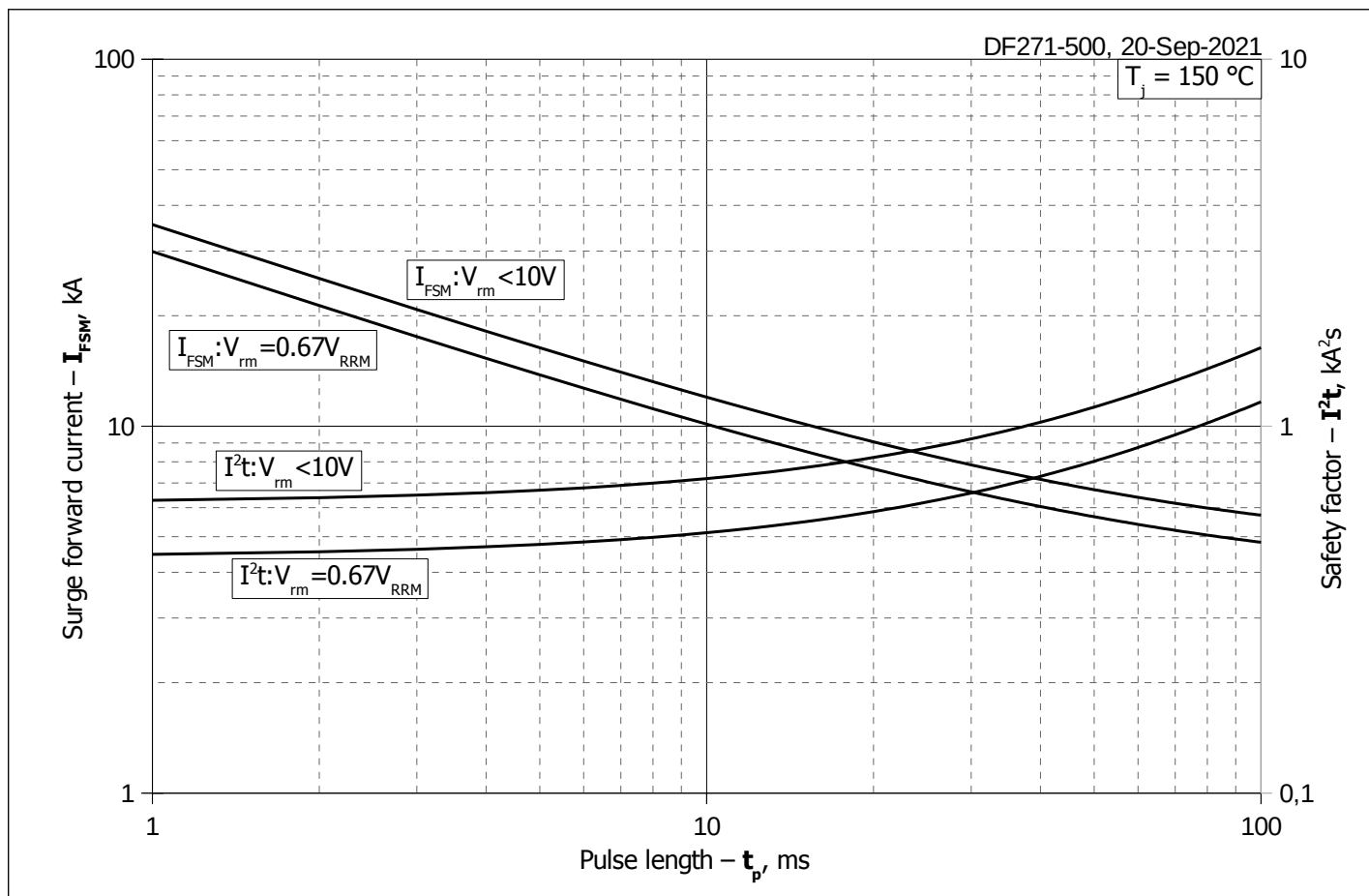


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

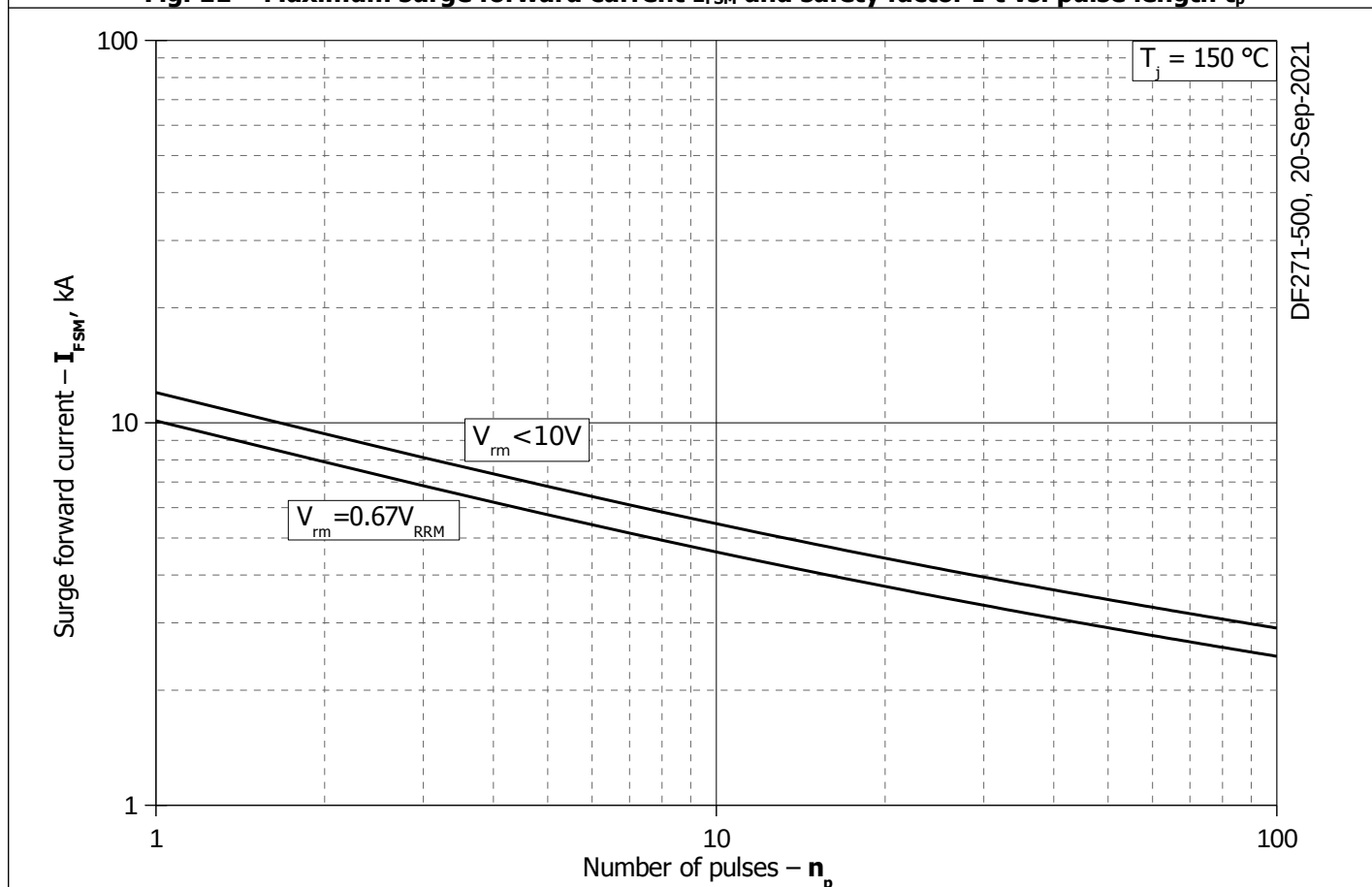


Fig. 12 - Maximum surge forward current I_{FSM} vs. number of pulses n_p