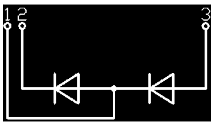
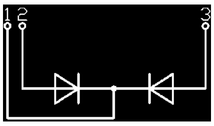
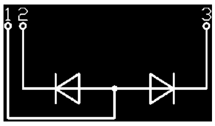
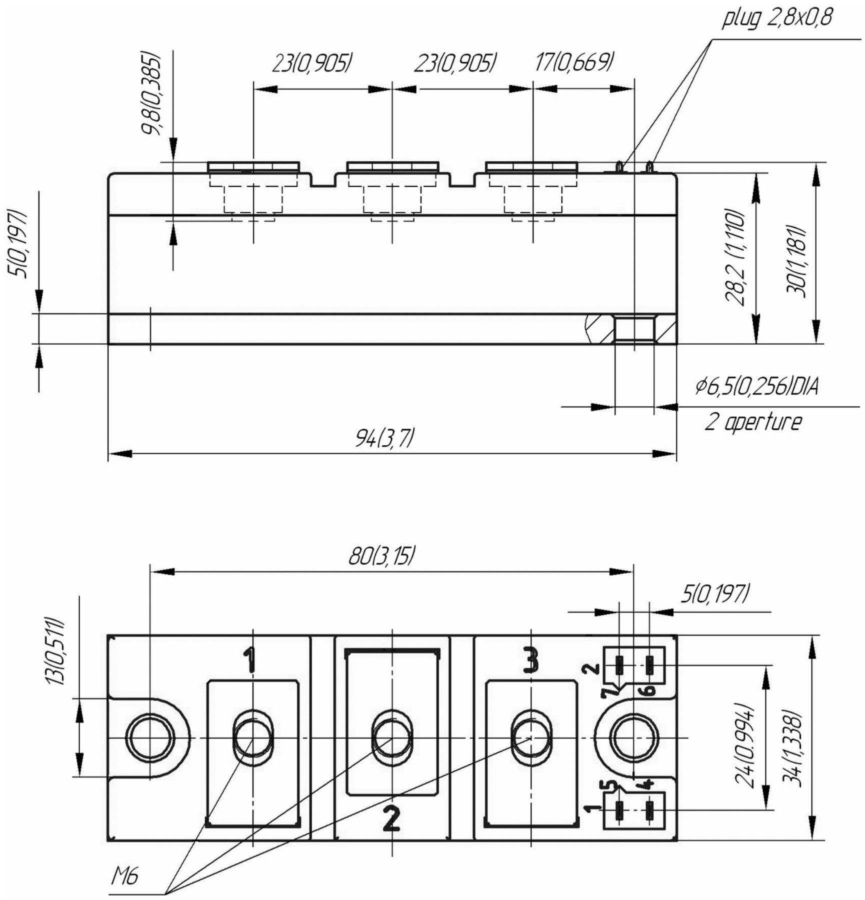
AS ENERGI

Diode Modules
MDx-215-22-F

Average forward current	I_{FAV}	215 A
Repetitive peak reverse voltage	V_{RRM}	2000...2200 V

V_{RRM}, V	2000	2200
Voltage code	20	22
T_j, °C	–40...+150	

MD3		MD4		MD5	
					



MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{FAV}	Maximum allowable average forward current	A	215 198	T_c=94 °C; T_c=100 °C; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	337	T_c=94 °C; 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	6.4 7.5	$T_j=T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V
			6.5 7.5	$T_j=T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=8.3 ms; single pulse; V_R=0 V
I^2t	Safety factor	$A^2s\cdot10^3$	200 280	$T_j=T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V
			170 230	$T_j=T_{j\ max}$ 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...2200	$T_{j\ min} < T_j < T_{j\ max}$; 180° half-sine wave; 50 Hz	
V_{RSM}	Non-repetitive peak reverse voltages	V	2100...2300	$T_{j\ min} < T_j < T_{j\ max}$; 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	–40...+50		
T_j	Operating junction temperature	°C	–40...+150		
$T_{c\ op}$	Operating temperature	°C	–40...+125		
MECHANICAL					
a	Acceleration under vibration	m/s^2	50		

CHARACTERISTICS

Symbols and parameters		Units	Values	Conditions	
ON-STATE					
V_{FM}	Peak forward voltage, max	V	1.40	T_j=25 °C; I_{FM}=500 A	
$V_{F(TO)}$	Forward threshold voltage, max	V	0.958	$T_j=T_{j\ max}$; $0.5\ \pi\ I_{FAV} < I_T < 1.5\ \pi\ I_{FAV}$	
r_T	Forward slope resistance, max	mΩ	1.076		
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	20 2.50	$T_j=T_{j\ max}$ T_j=25 °C	$V_R=V_{RRM}$
SWITCHING					
Q_r	Recovered charge, max	μC	1350	$T_j=T_{j\ max}$; $I_{FM}=I_{FAV}$; di_R/dt=-10 A/μs; V_R=100 V	
t_{rr}	Reverse recovery time, max	μs	25		
I_{rr}	Reverse recovery current, max	A	108		
THERMAL					
R_{thjc}	Thermal resistance, junction to case				
	per module	°C/W	0.0850	180° half-sine wave, 50 Hz	
	per arm	°C/W	0.1700		
	per module	°C/W	0.0800	DC	
	per arm	°C/W	0.1600		
R_{thch}	Thermal resistance, case to heatsink				
	per module	°C/W	0.0300		
	per arm	°C/W	0.0600		

INSULATION					
V_{ISOL}	Insulation test voltage	kV	3.00	Sine wave, 50 Hz; RMS	t=60 sec
			3.60		t=1 sec
MECHANICAL					
M_1	Mounting torque (M6)[1)]	Nm	6.00	Tolerance ± 15%	
M_2	Terminal connection torque (M6)[1)]	Nm	6.00	Tolerance ± 15%	
m	Weight, max	g	350		

PART NUMBERING GUIDE	NOTES
MD 3 - 215 - 22 - F - N 1 2 3 4 5 6 1. MD - Rectifier Diode 2. Circuit Schematic 3. Average Forward Current, A 4. Voltage Code 5. Package Type (M.F) 6. Ambient Conditions: N – Normal	[1)] The screws must be lubricated

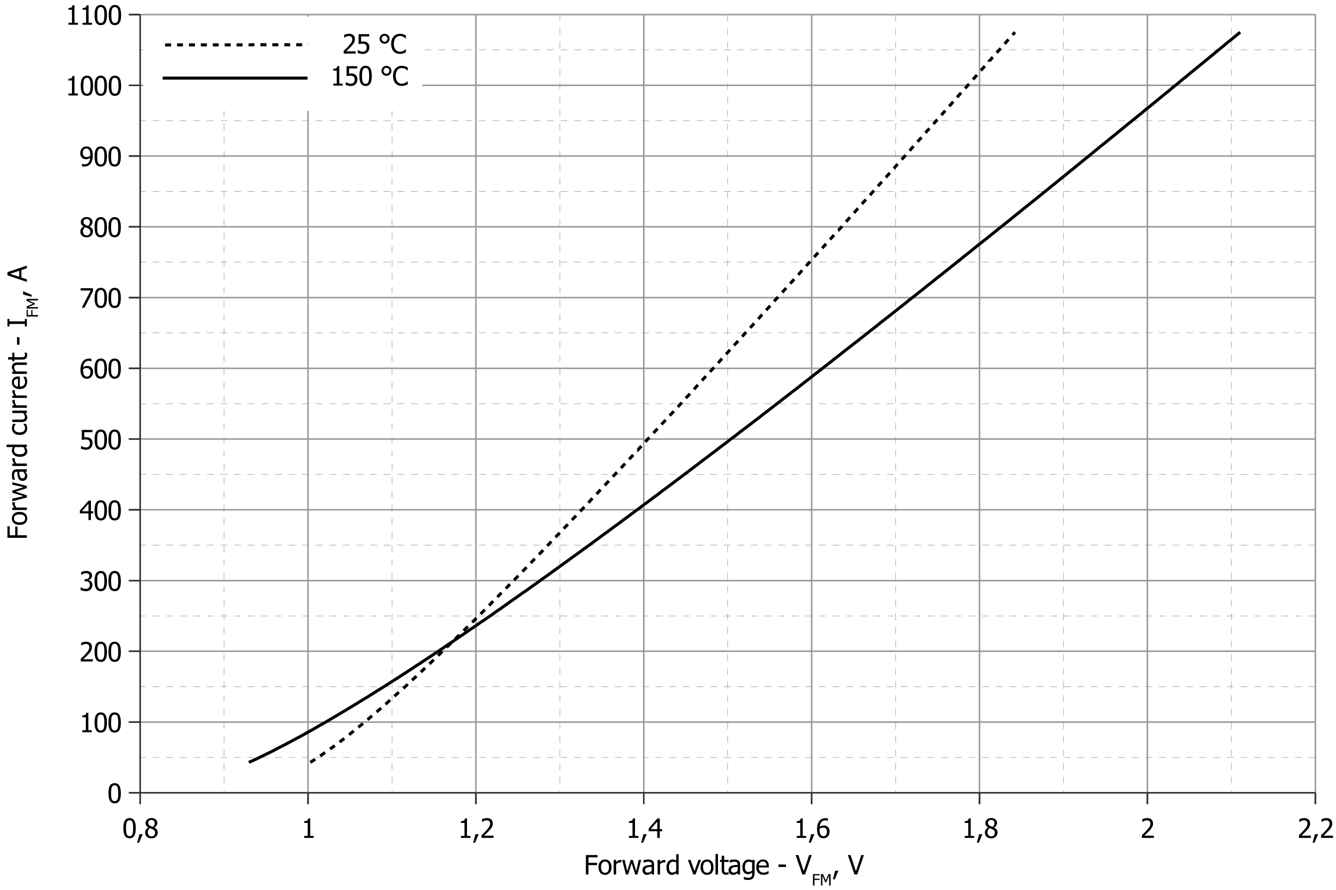


Fig 1 – Forward characteristics of Limit device

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	0.87407359	0.78795905
B	0.00069914	0.00086624
C	0.02312669	0.01091874
D	0.00167861	0.00960920

Forward characteristic model (see Fig. 1).

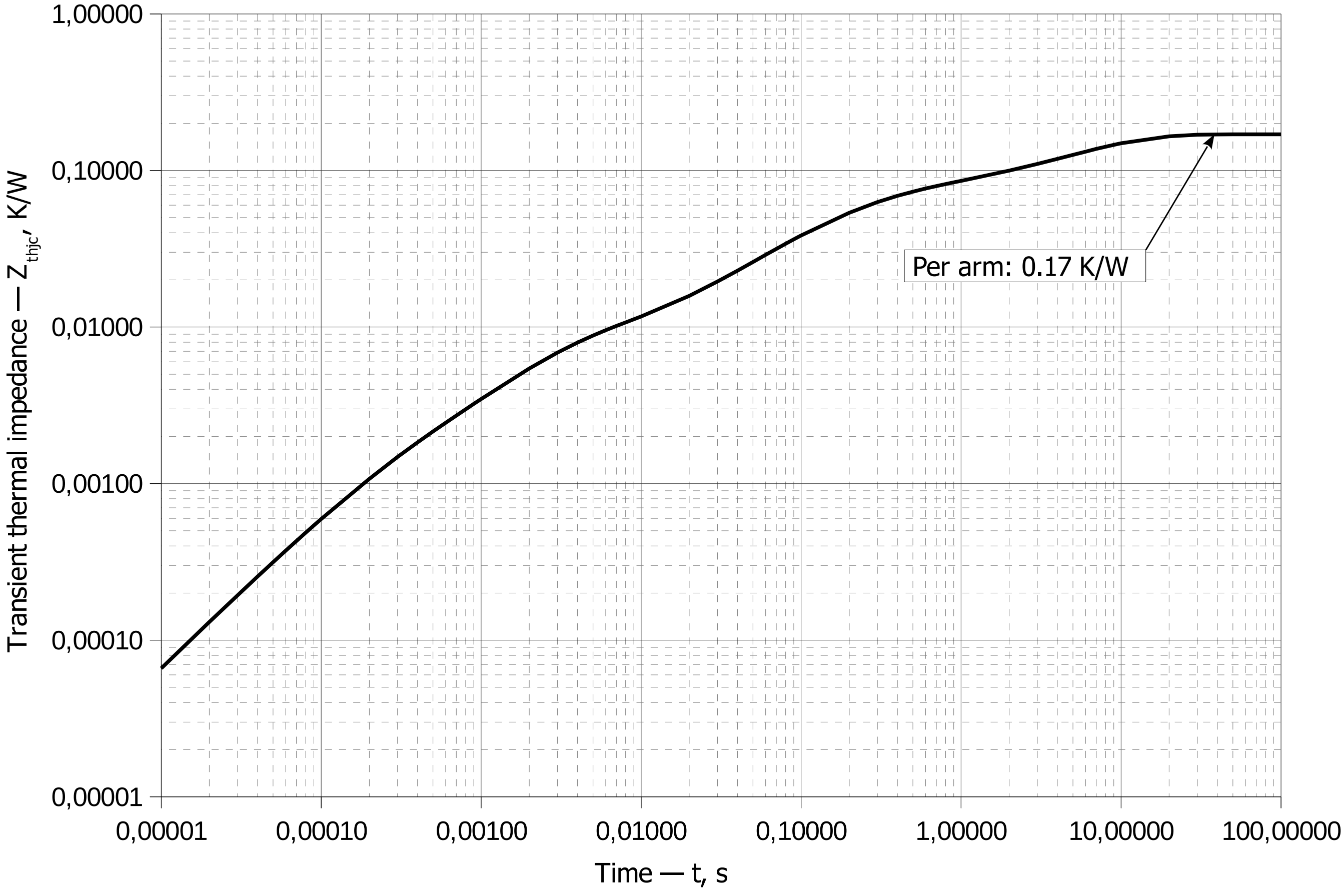


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

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.

i	1	2	3	4	5	6
R_i, K/W	0.0007228424	0.006639986	0.0153862565	0.0389709604	0.0142906115	0.09398934
τ_i, s	0.0002111	0.002366	0.06905	0.1909	0.6646	6.64

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

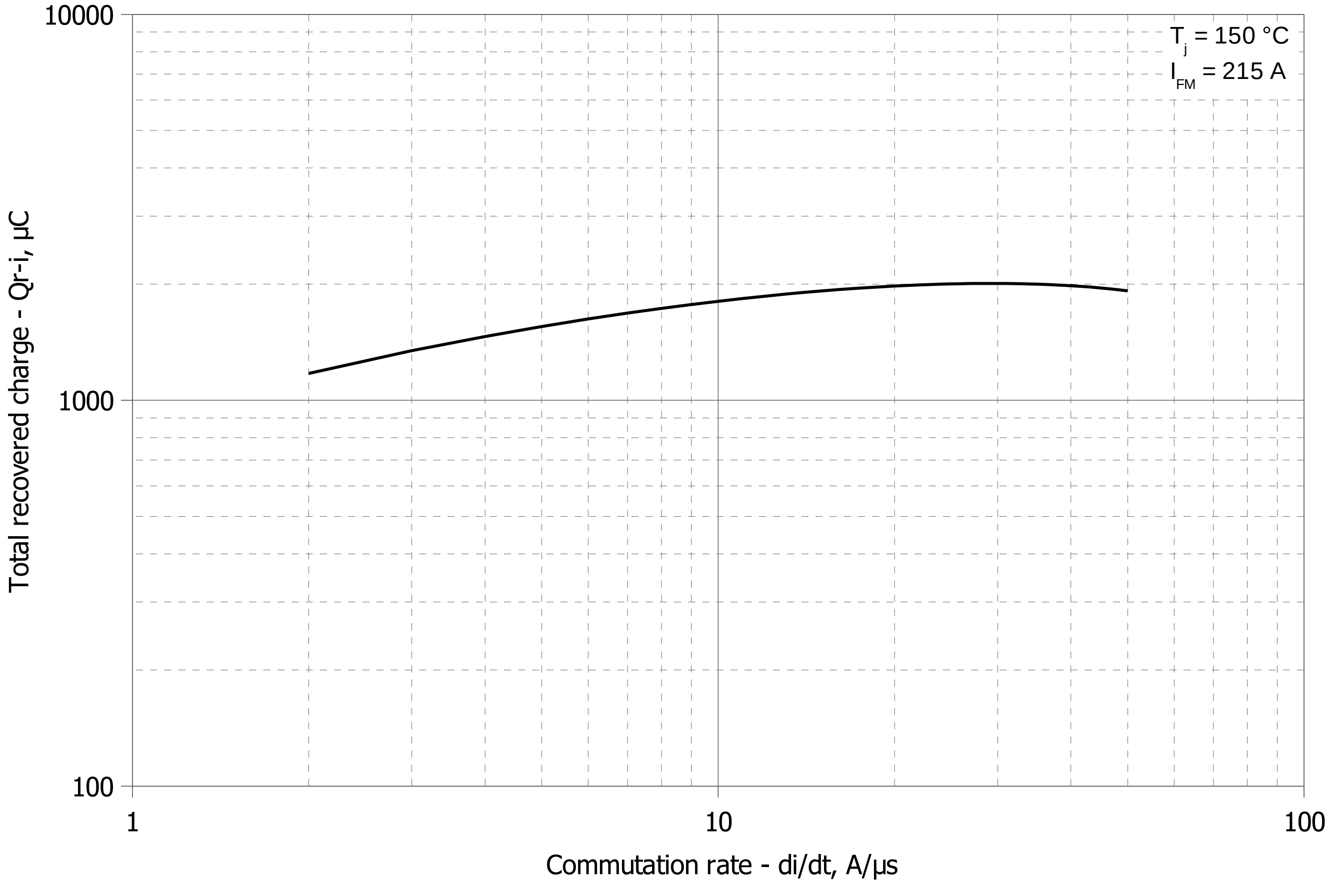


Fig 3 - Maximum recovered charge Q_{r-i} (integral) vs. commutation rate di_R/dt

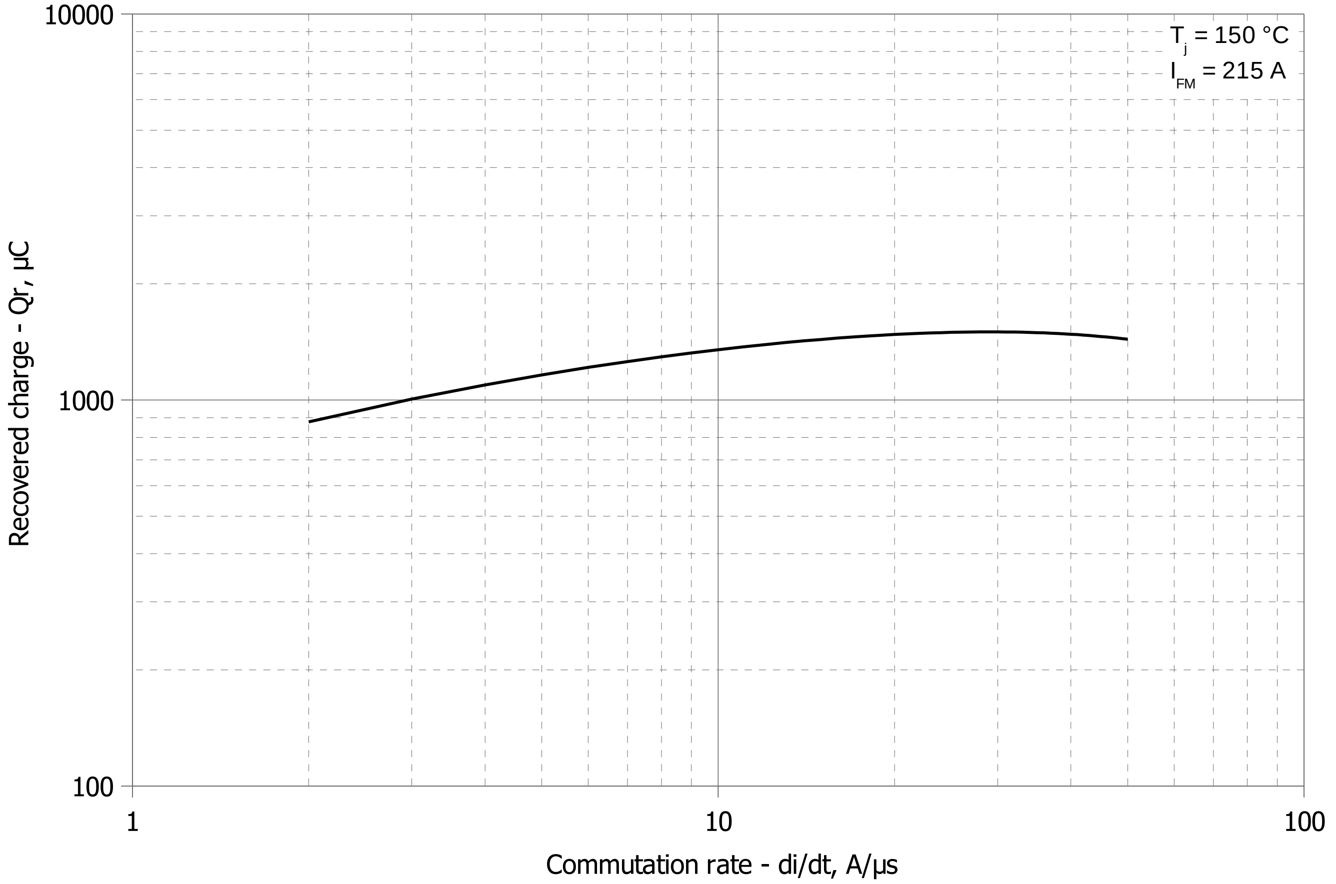


Fig 4 - Maximum recovered charge Q_r vs. commutation rate di_R/dt (25% chord)

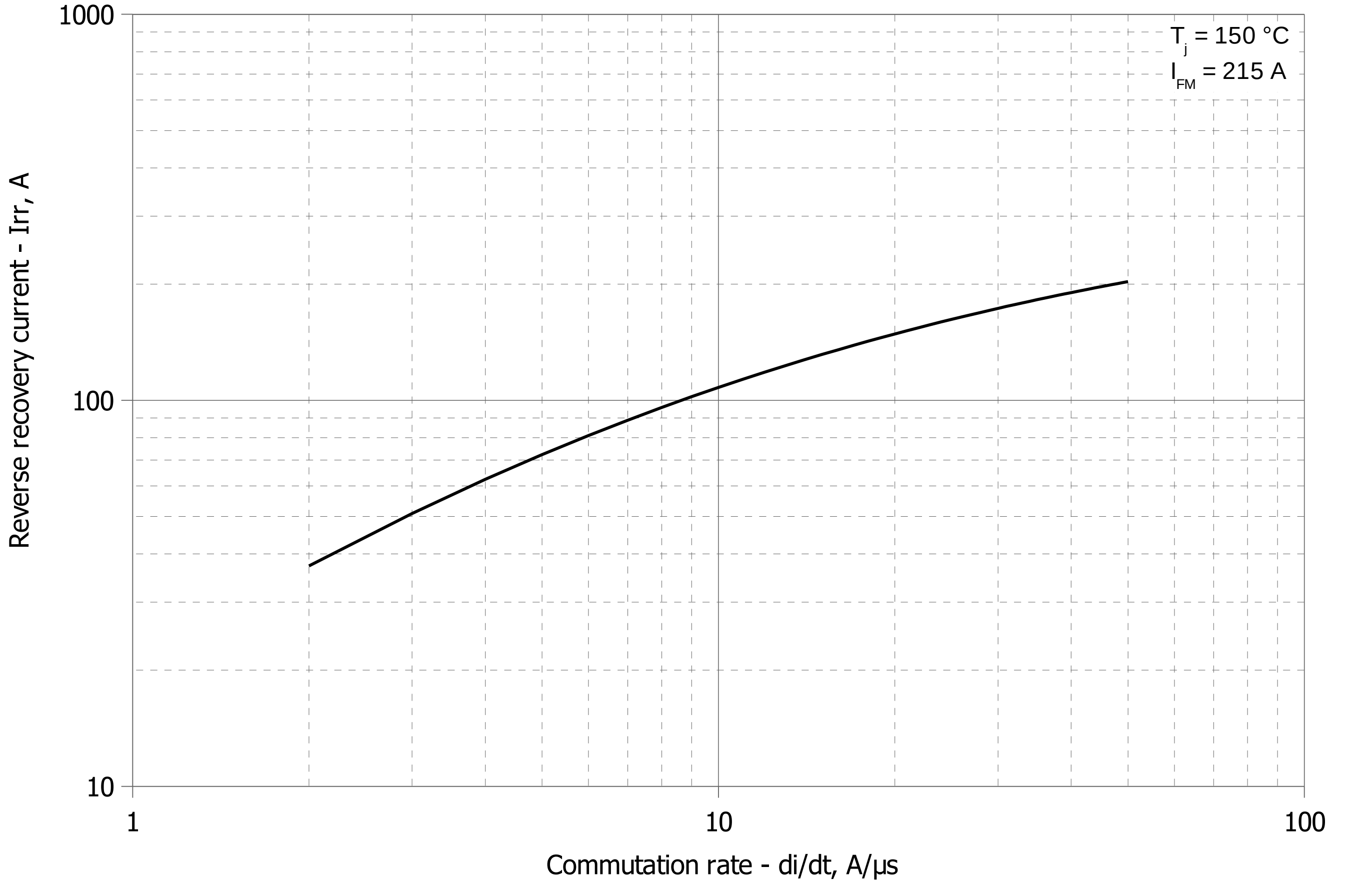


Fig 5 - Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

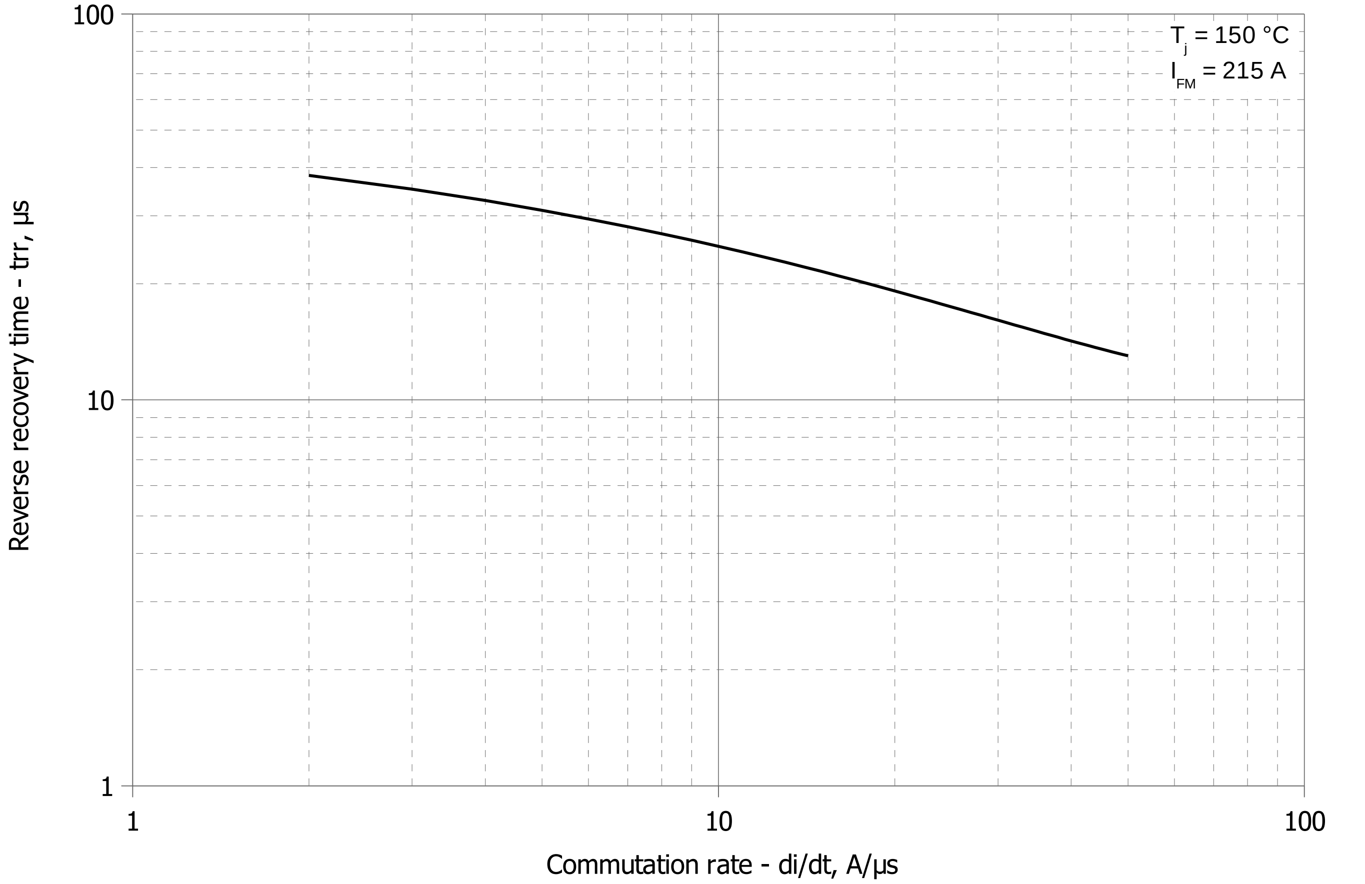


Fig 6 - Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

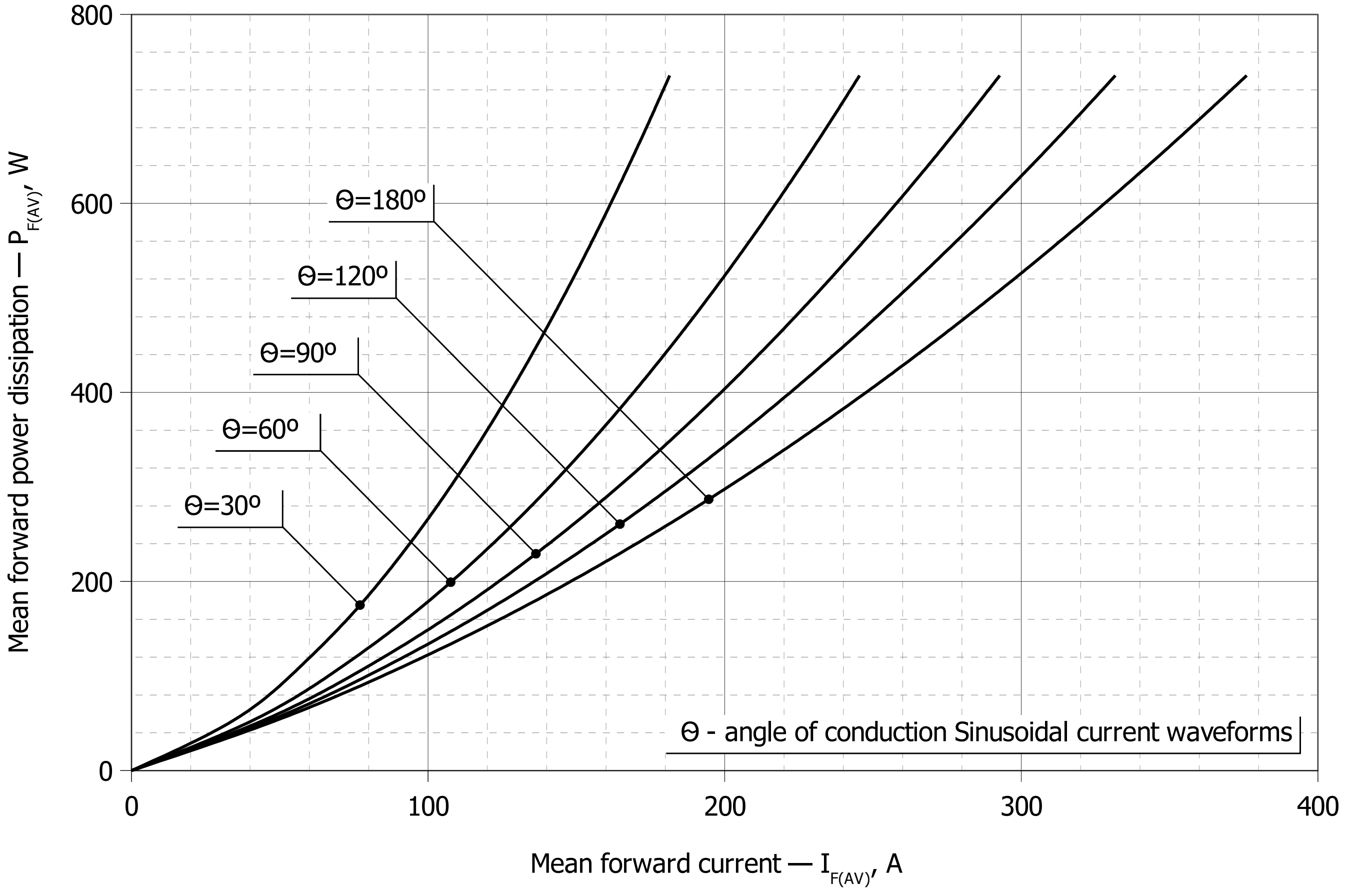


Fig. 7 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles (f=50Hz)

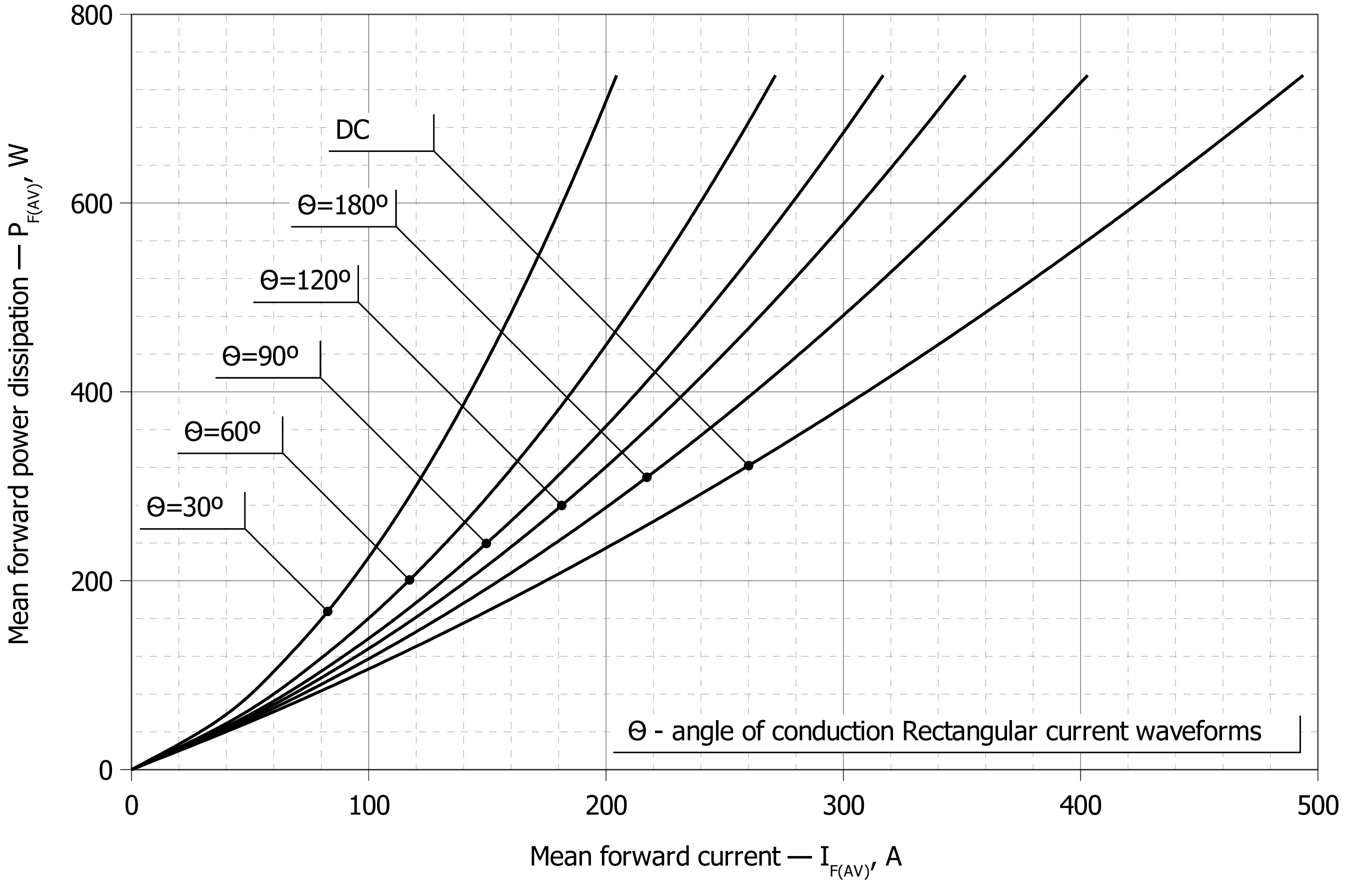


Fig. 8 – Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC (f=50Hz)

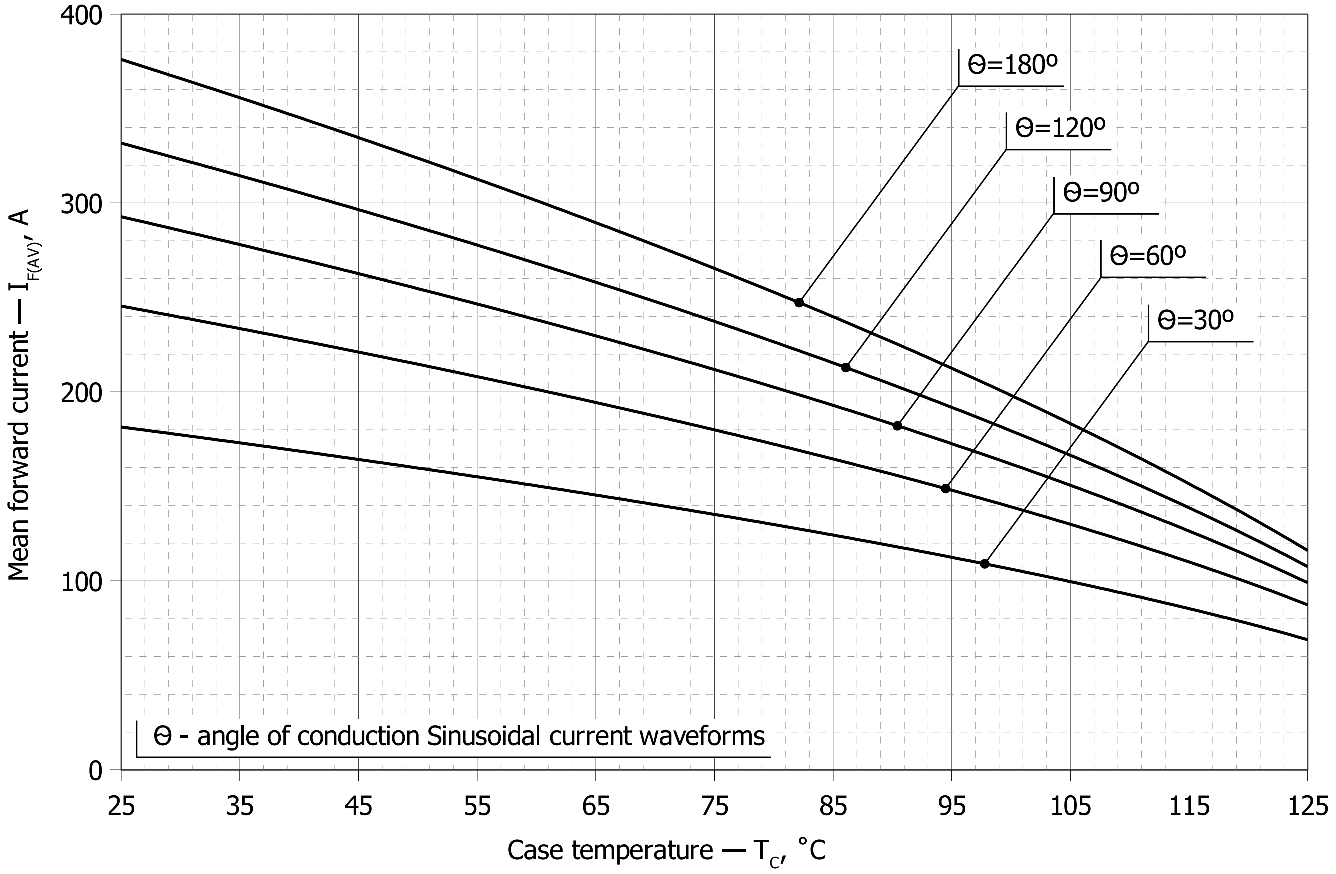


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles (f=50Hz)

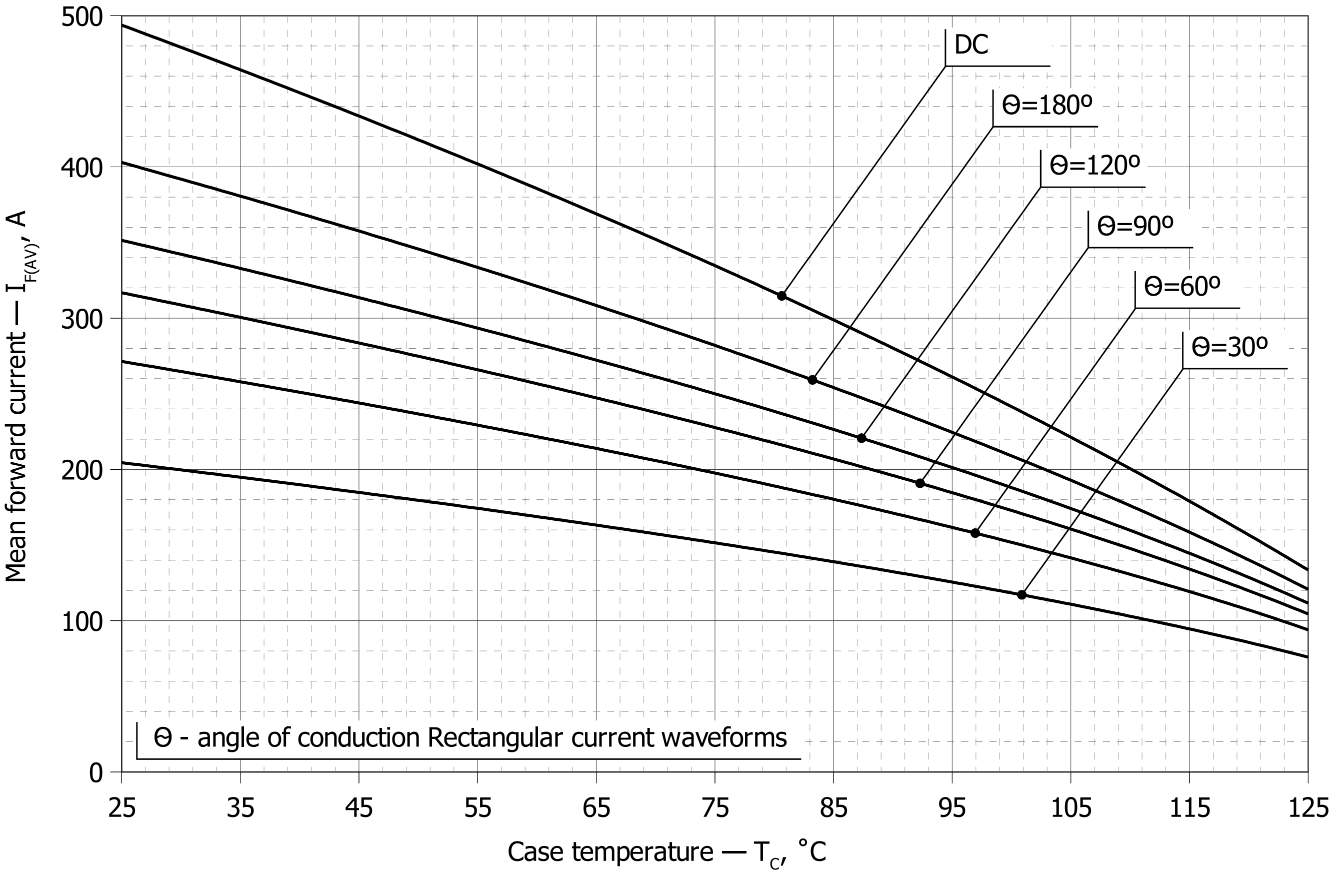


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC (f=50Hz)

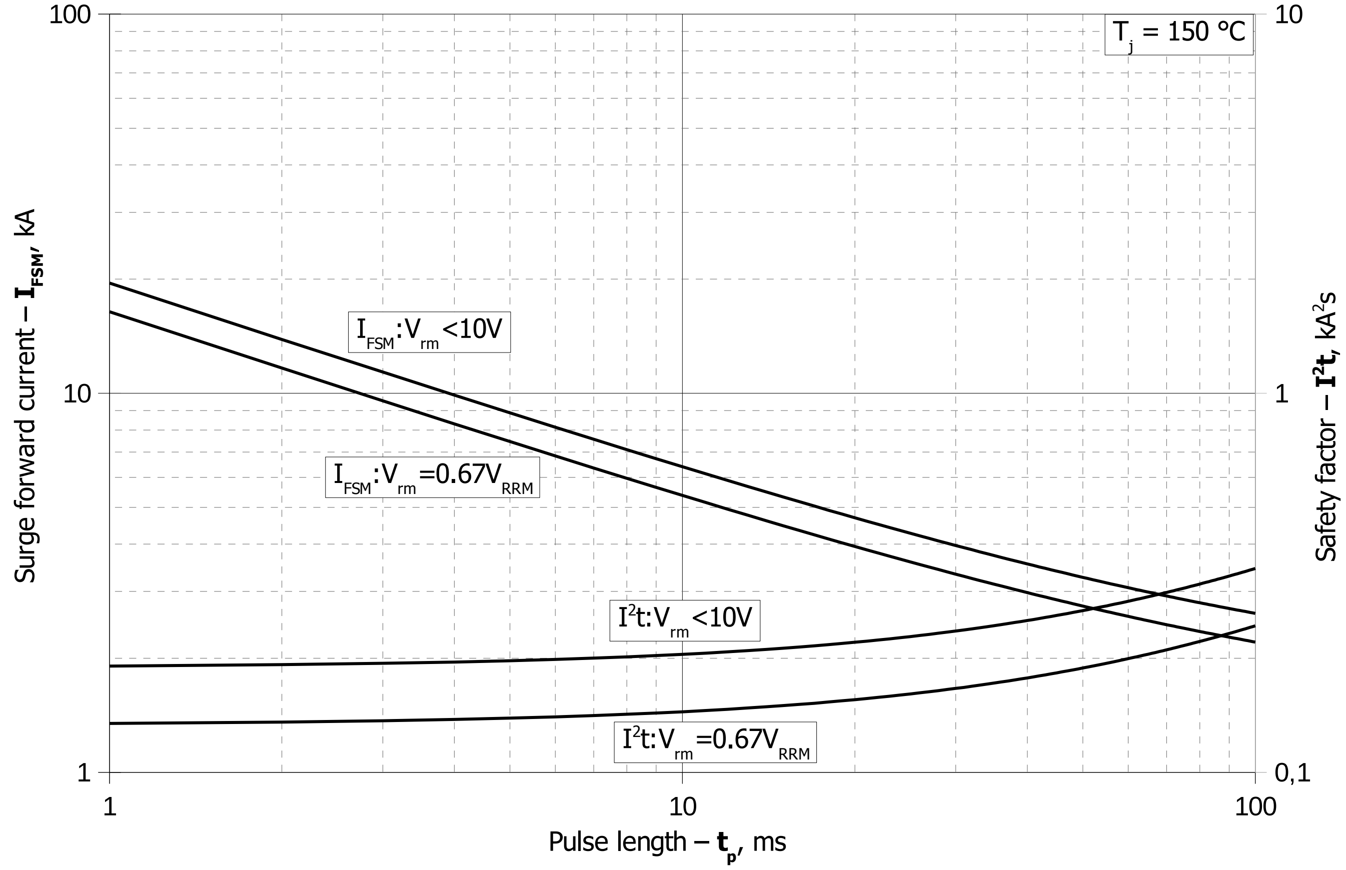


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

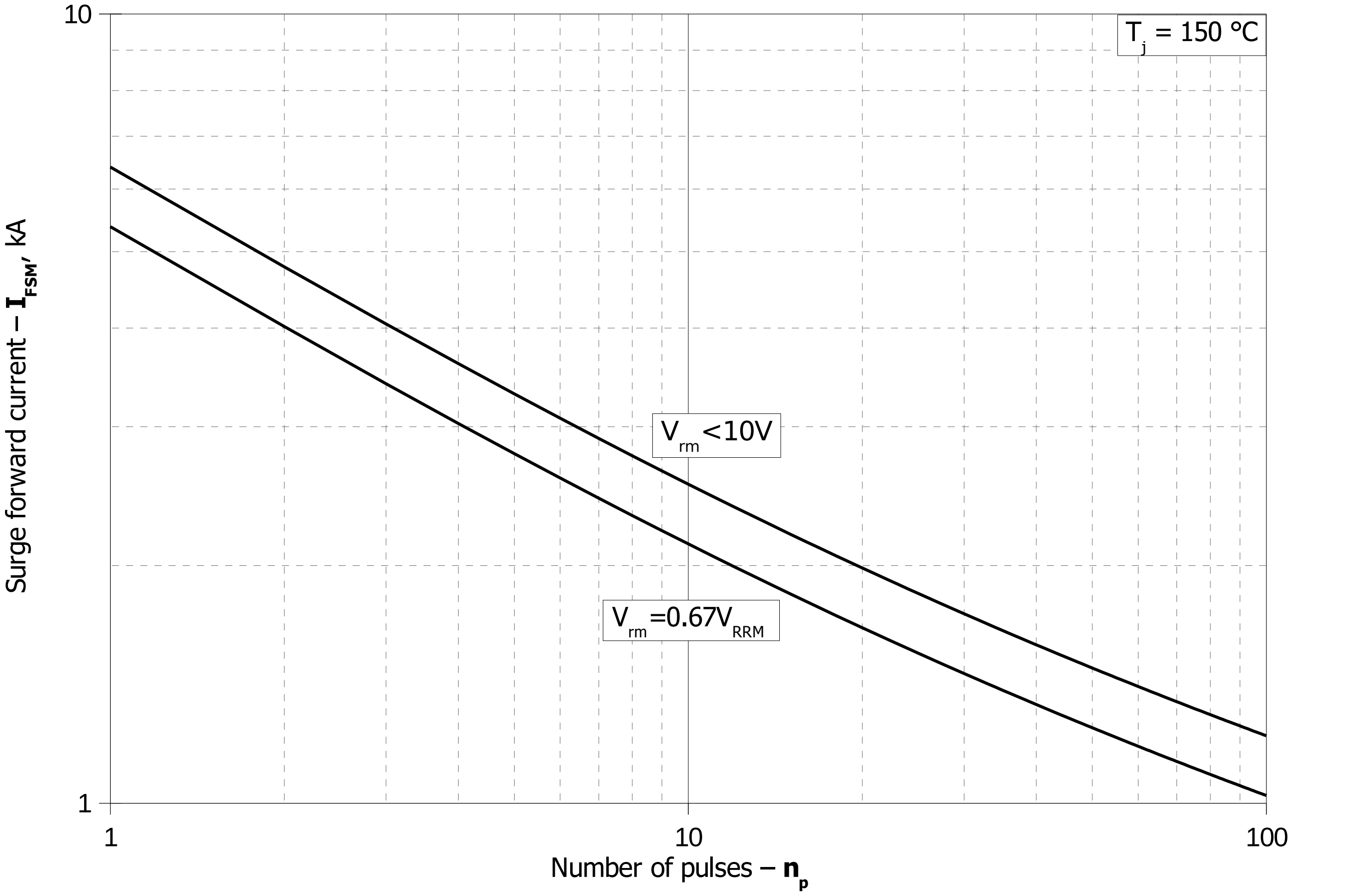


Fig. 12 – Maximum surge forward current I_{FSM} vs. number of pulses n_p