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 DA173-5000-18

Average forward current	I_{FAV}	5000 A
Repetitive peak reverse voltage	V_{RRM}	1000 ÷ 1800 V

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 ÷ 175							

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{FAV}	Average forward current	A	5000 4480	T_c=87 °C; Double side cooled; T_c=100 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	7850	T_c=87 °C; Double side cooled; 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	60.0 69.0	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V;
			63.0 76.0	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	$A^2s\cdot10^3$	18000 23800	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V;
			16400 23900	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;	
$V_{(BR)}$	Breakdown voltage	V	1250÷2250	T_j=25 °C; I_{br}=100 mA; t_p = 10 ms; 5 Hz	
V_R	Reverse continuous voltages	V	$0.6\cdot V_{RRM}$	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 ÷ 175		
MECHANICAL					
F	Mounting force	kN	40.0 ÷ 50.0		
a	Acceleration	m/s^2	50	Device clamped	

CHARACTERISTICS

Symbols and parameters		Units	Values	Conditions	
ON-STATE					
V_{FM}	Peak forward voltage, max	V	2.00	T_j=25 °C; I_{FM}=12560 A	
$V_{F(TO)}$	Forward threshold voltage, max	V	0.60	$T_j=T_{j\ max}$; 0.5 π I_{FAV} < I_T < 1.5 π I_{FAV}	
r_T	Forward slope resistance, max	mΩ	0.125		
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	100	$T_j=T_{j\ max}$; $V_R=V_{RRM}$	
SWITCHING					
Q_{rr}	Total recovered charge, max	μC	5330	$T_j=T_{j\ max}$; I_{TM}=1500 A; di_R/dt=-10 A/μs; V_R=100 V;	
t_{rr}	Reverse recovery time, max	μs	41.0		
I_{rrM}	Peak reverse recovery current, max	A	260		
THERMAL					
R_{thjc}	Thermal resistance, junction to case, max	°C/W	0.0082	Direct current	Double side cooled
R_{thjc-A}			0.0187		Anode side cooled
R_{thjc-K}			0.0153		Cathode side cooled
R_{thck}	Thermal resistance, case to heatsink, max	°C/W	0.0020	Direct current	
MECHANICAL					
w	Weight, max	g	1500		
D_s	Surface creepage distance	mm (inch)	41.40 (1.630)		
D_a	Air strike distance	mm (inch)	23.10 (0.909)		

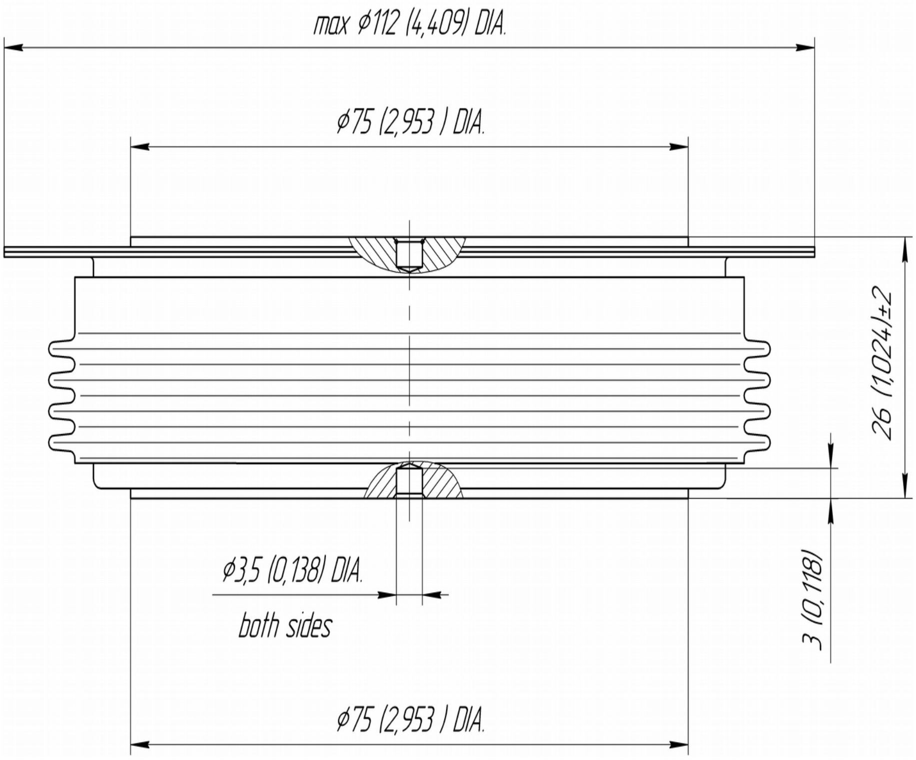
PART NUMBERING GUIDE

DA	173	5000	18	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.F1



All dimensions in millimeters (inches)

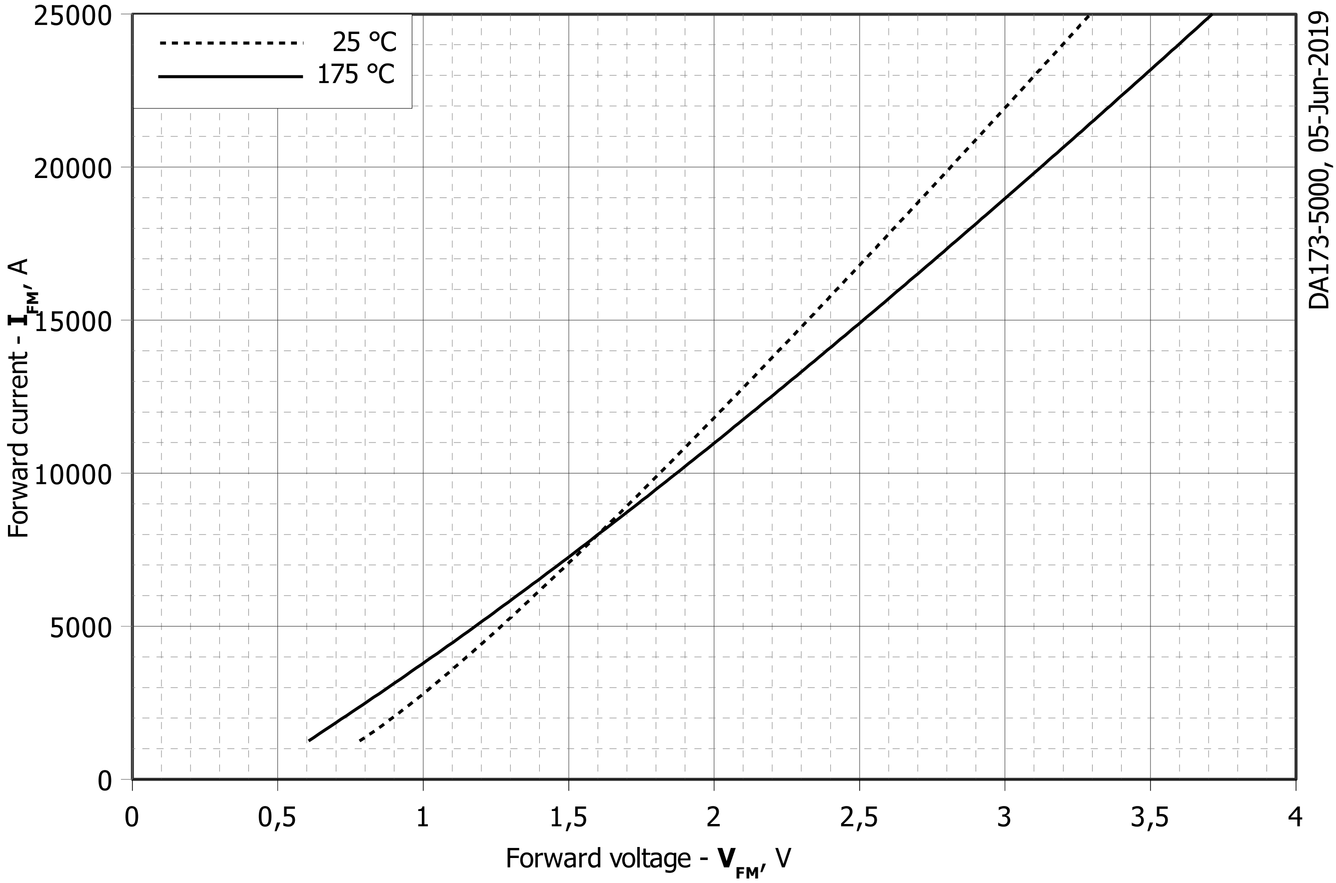


Fig 1 – Forward characteristics of Limit device

$$V_F = A + B \cdot i_F + C \cdot \ln(i_F + 1) + D \cdot \sqrt{i_F}$$

	Coefficients for max curves	
	T_j = 25ºC	$T_j = T_{j\,max}$
A	0.359550000	1.098000000
B	0.000080721	0.000078731
C	0.023879000	-0.150930000
D	0.004262300	0.013756000

Forward characteristic model (see Fig. 1).

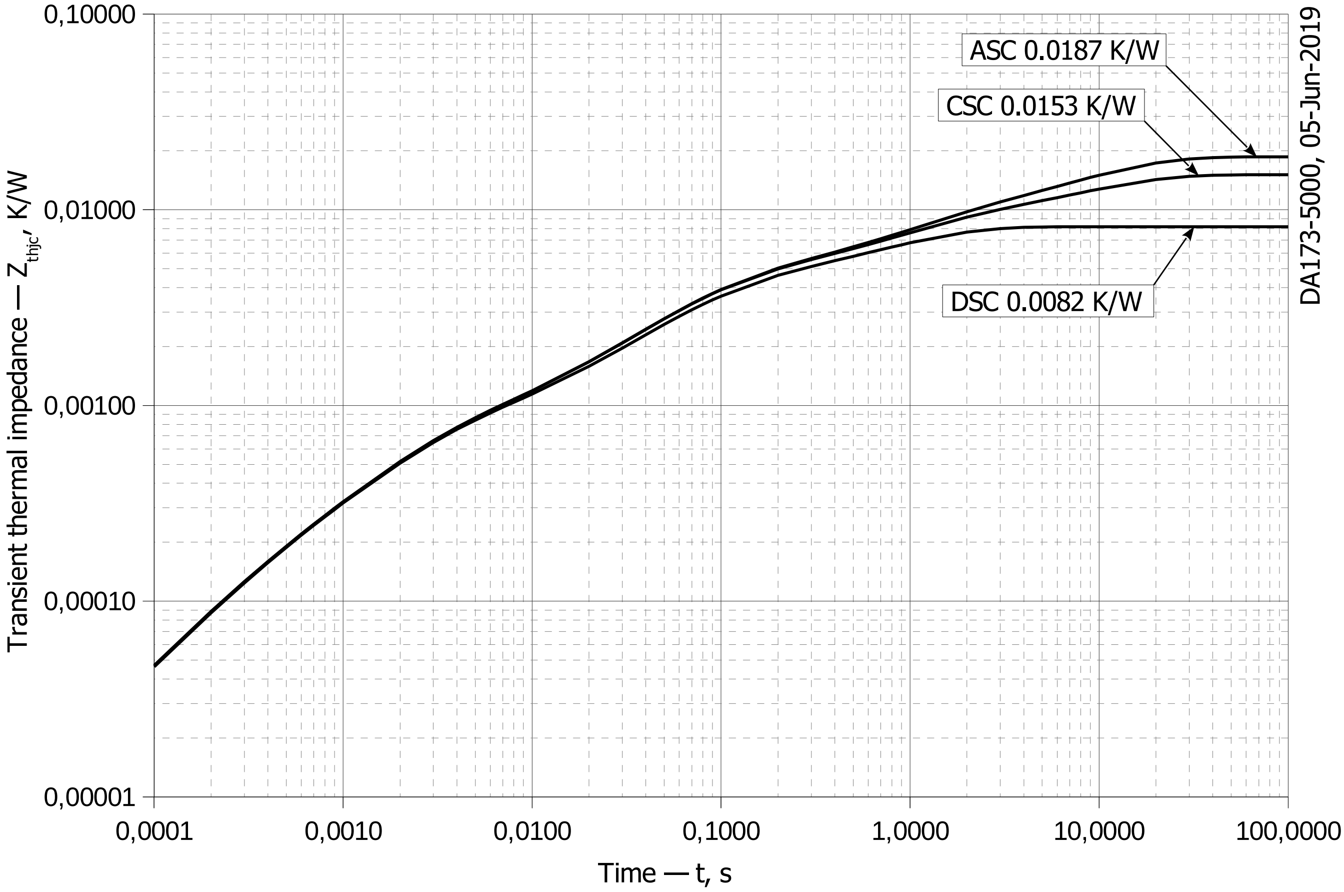


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

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	0.00007989	0.002673	0.0005936	0.000846	0.00005975	0.003948
τ_i, s	1.688	0.06219	0.002329	0.138	0.0003243	0.9533

DC Cathode side cooled

i	1	2	3	4	5	6
R_i, K/W	0.006619	0.004034	0.0008595	0.002956	0.0005965	0.00005689
τ_i, s	9.744	1.025	0.1394	0.06237	0.002318	0.0003037

DC Anode side cooled

i	1	2	3	4	5	6
R_i, K/W	0.01013	0.004062	0.0009401	0.002853	0.0005963	0.00005641
τ_i, s	9.747	1.058	0.1304	0.06179	0.002313	0.0003013

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

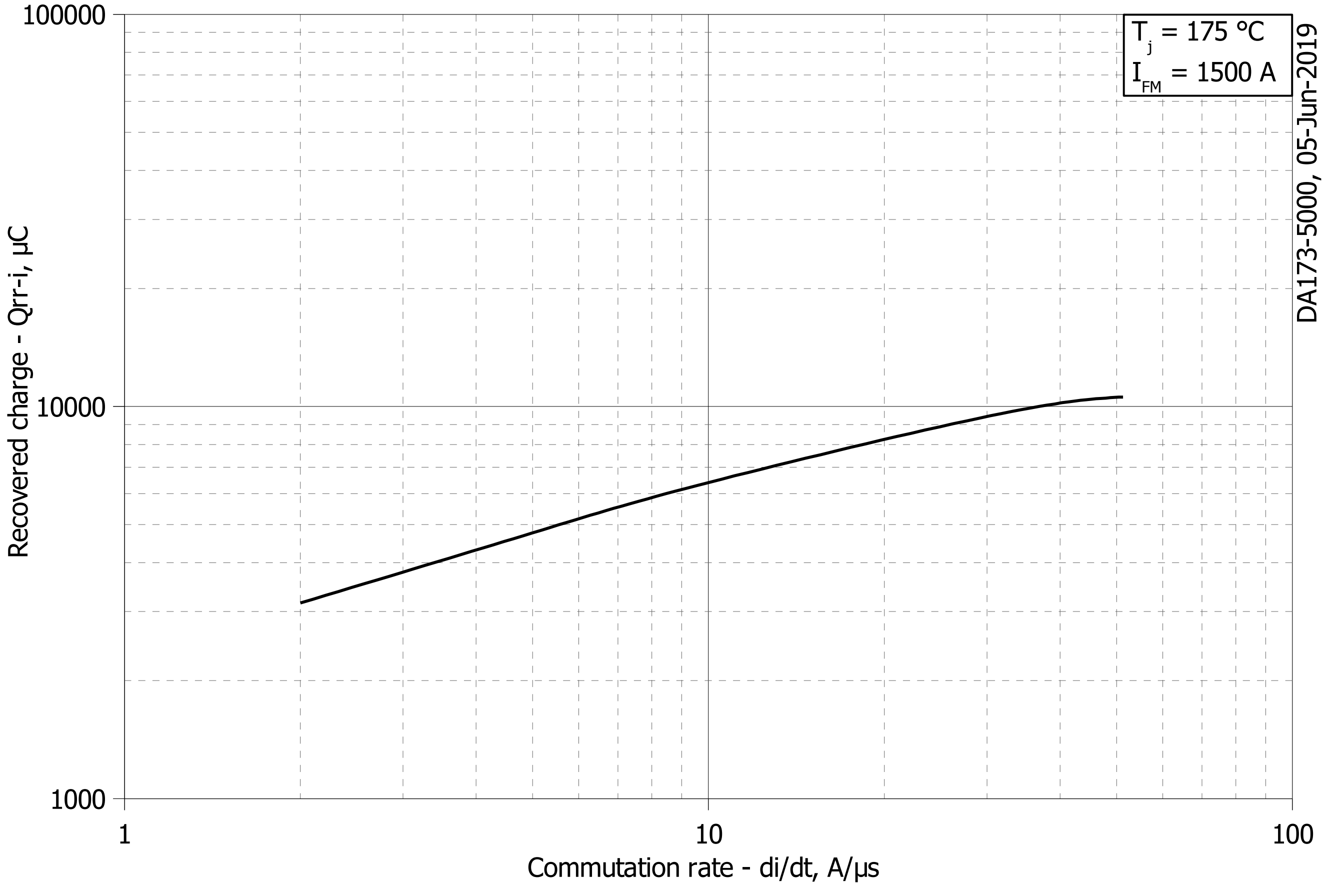


Fig 3 – Maximum recovered charge Q_{rr-i} (integral) vs. commutation rate di_R/dt

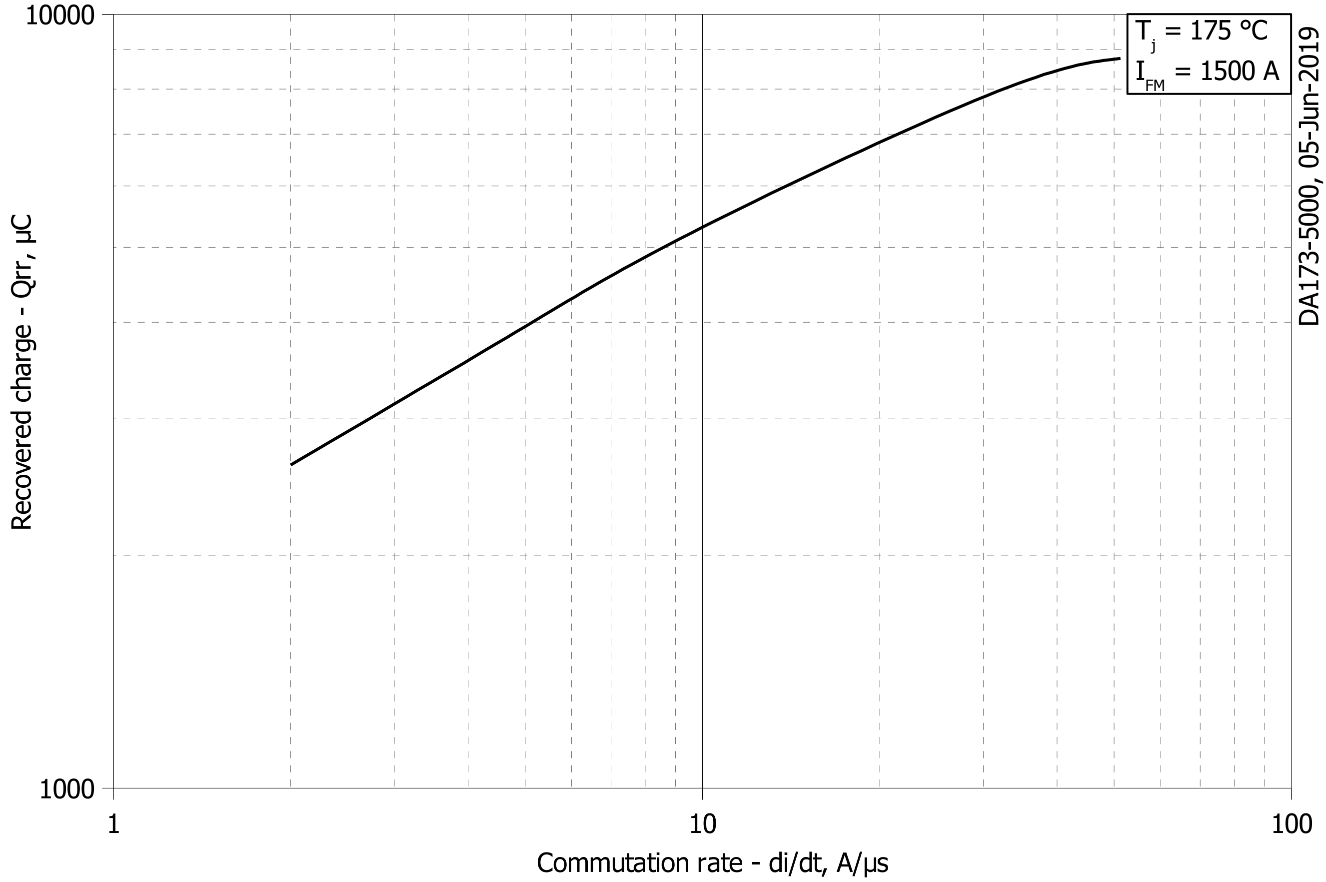


Fig 4 – Maximum recovered charge Q_{rr} vs. commutation rate di_R/dt (25% chord)

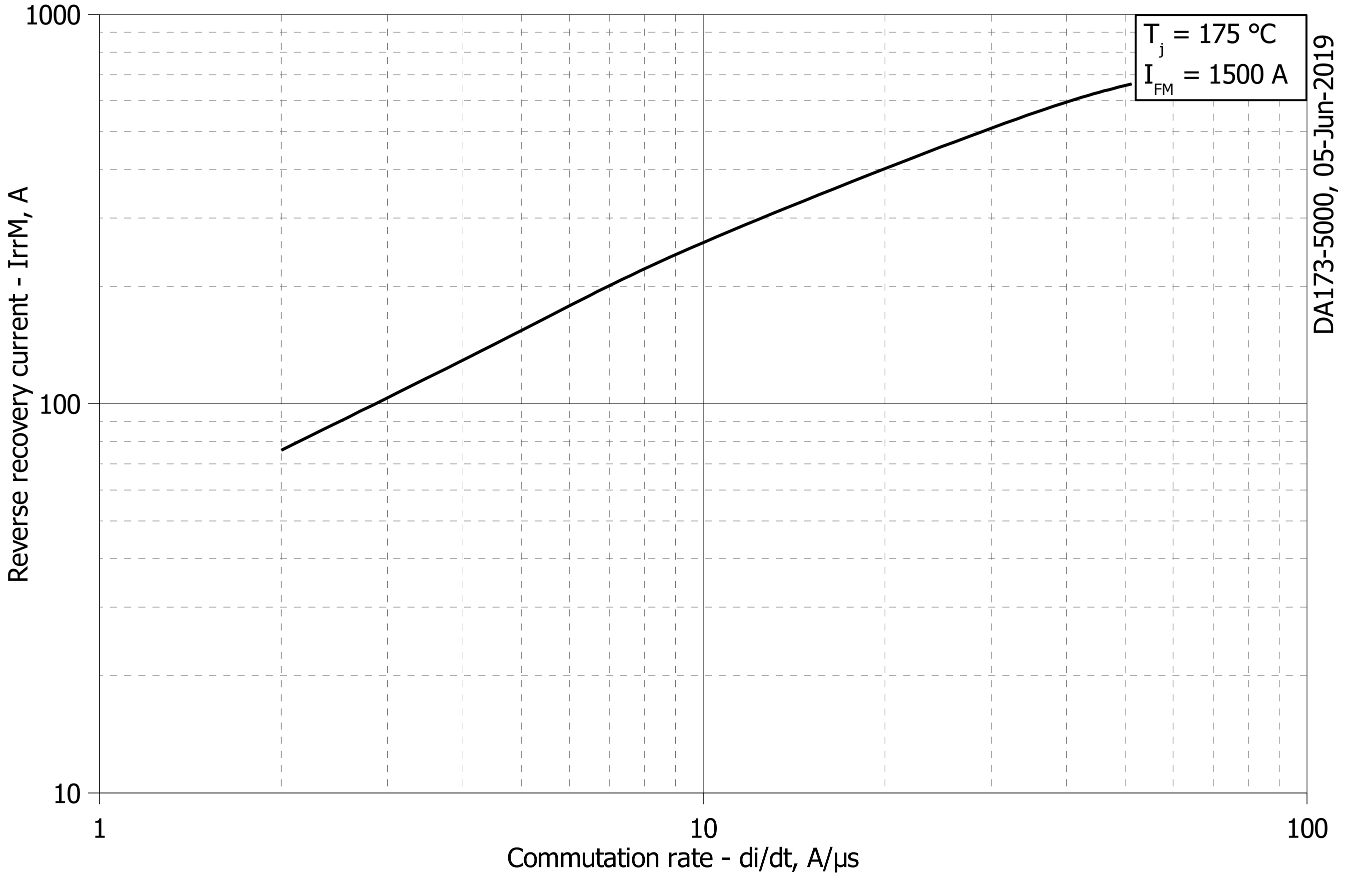


Fig 5 – Maximum reverse recovery current I_{rrM} vs. commutation rate di_R/dt

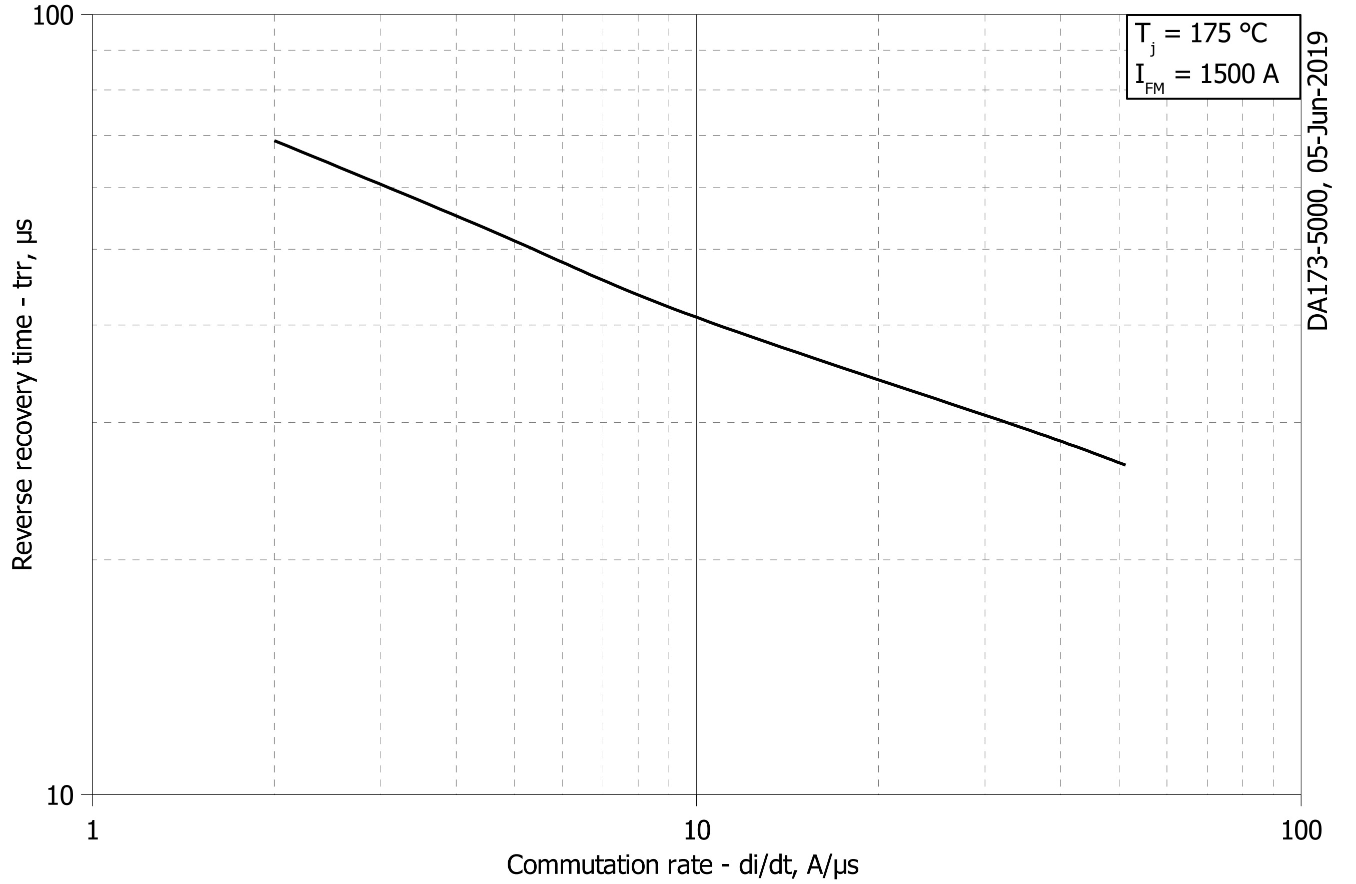


Fig 6 – Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

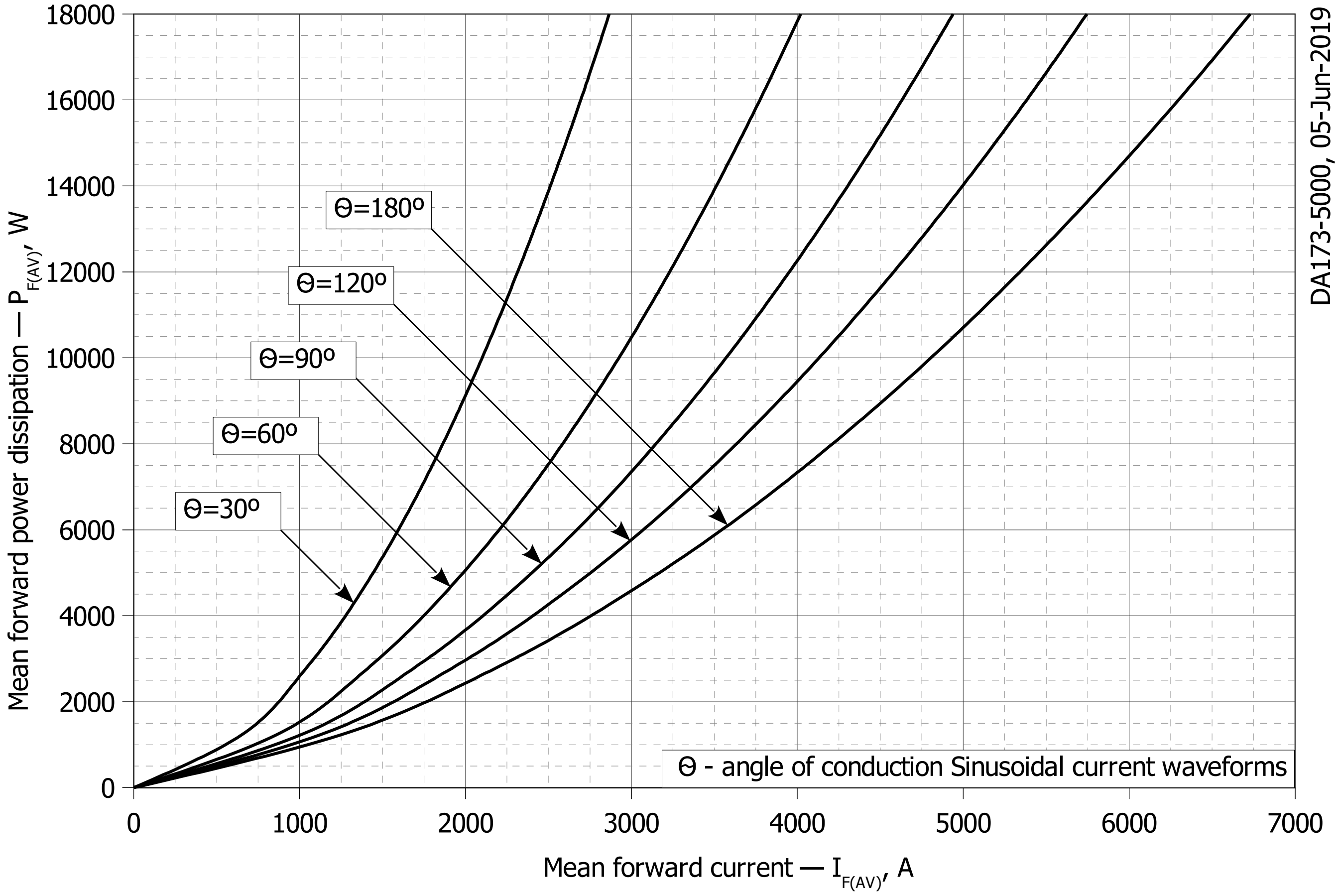


Fig. 7 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)

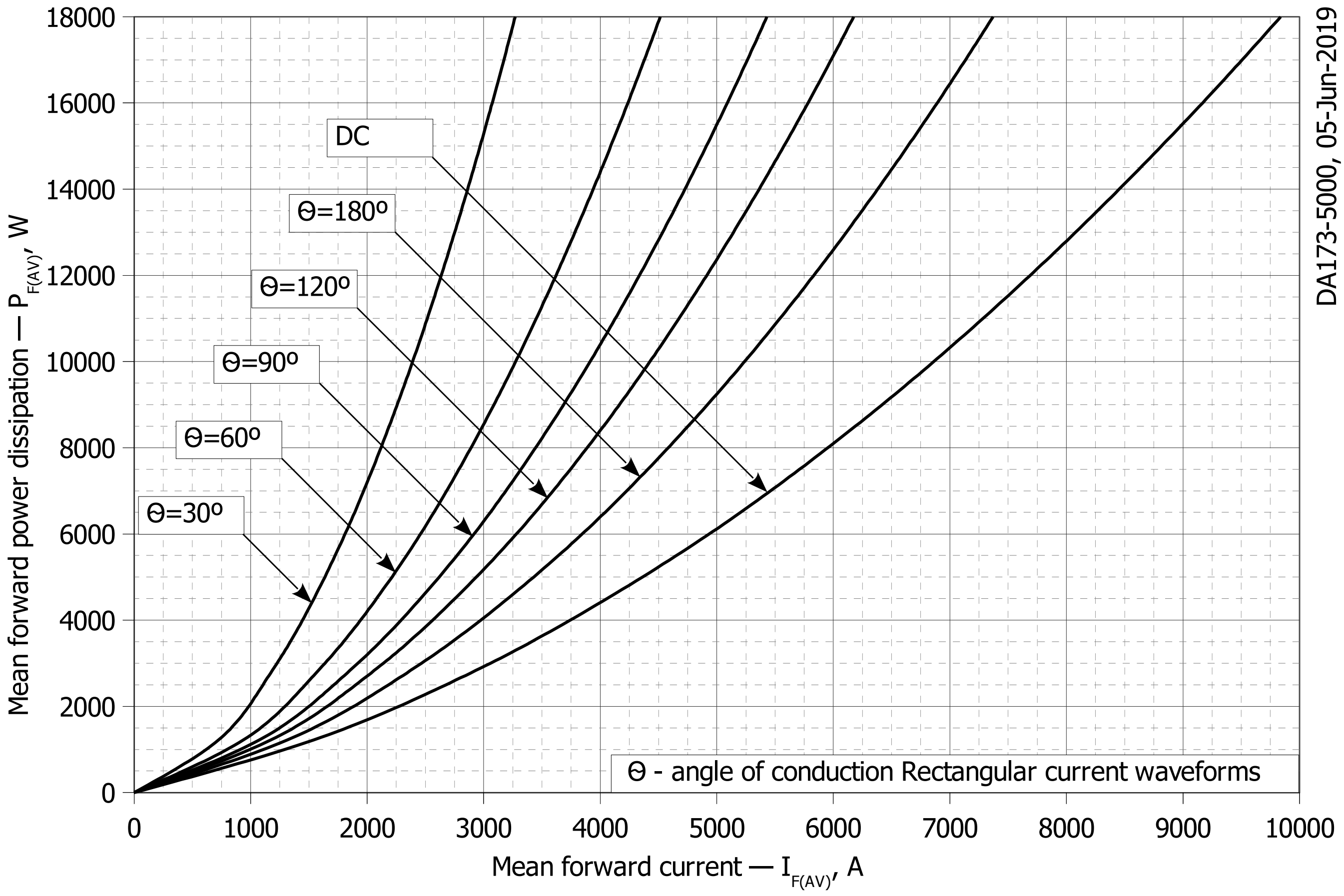


Fig. 8 – Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC (f=50Hz, DSC)

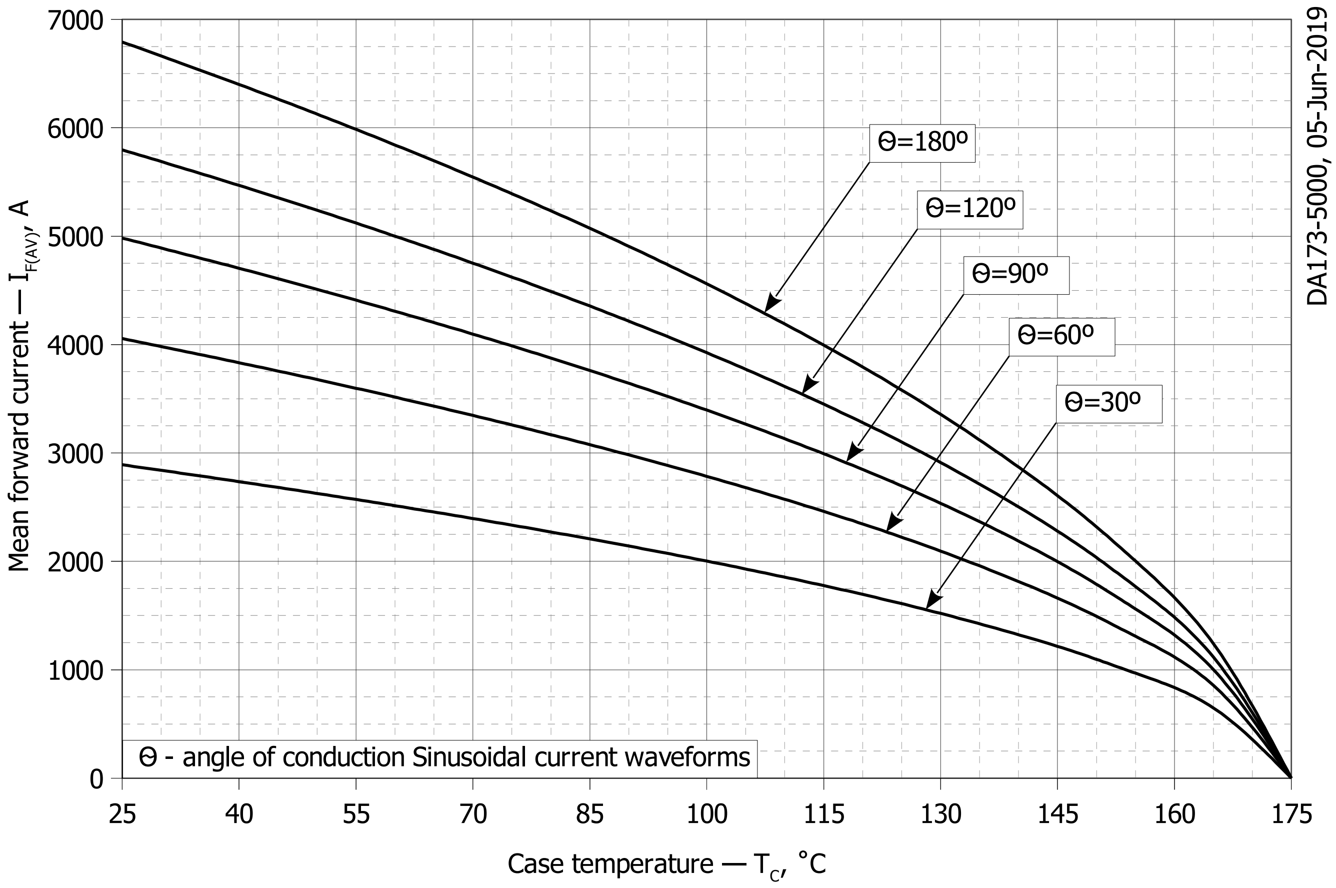


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)

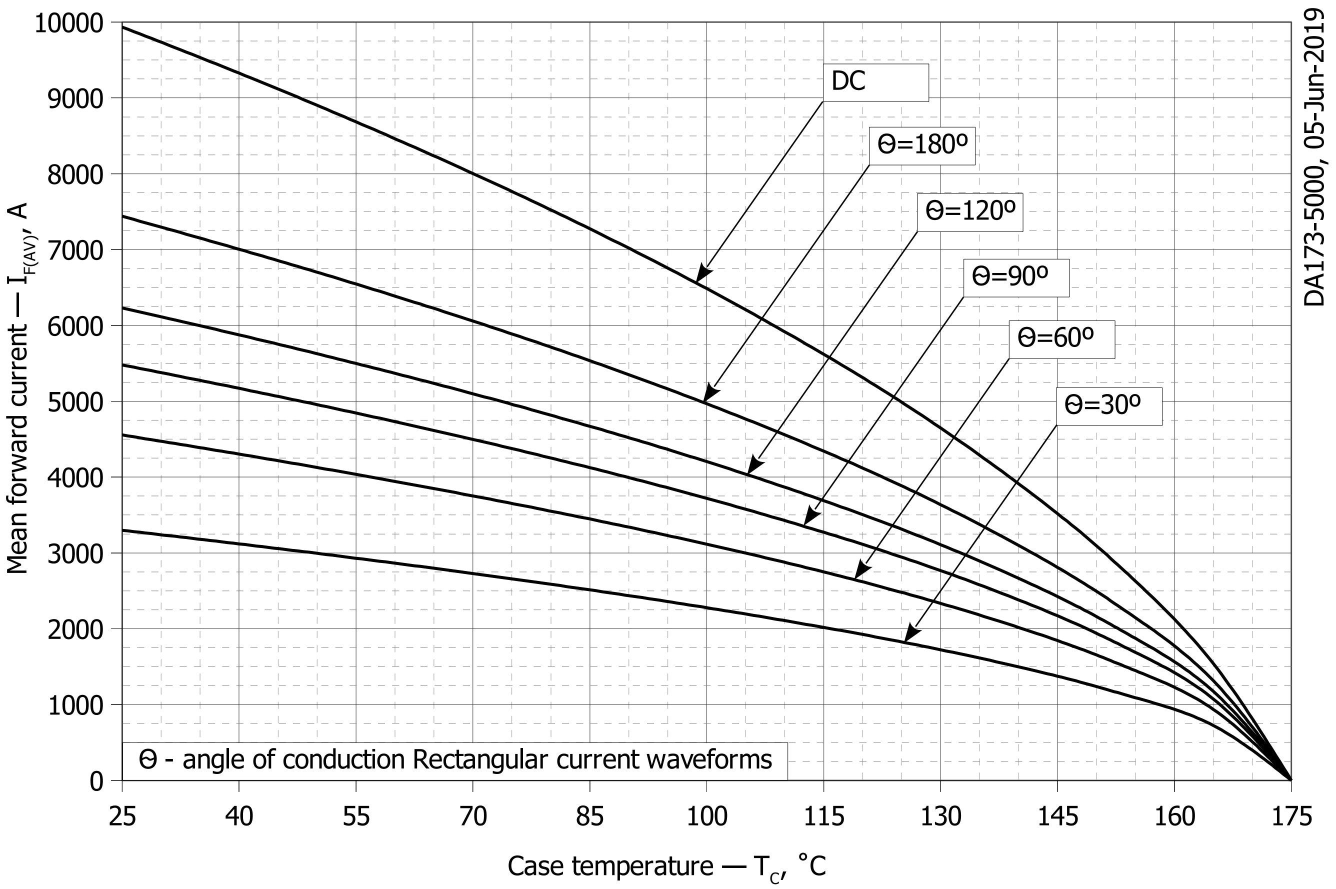


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC (f=50Hz, DSC)

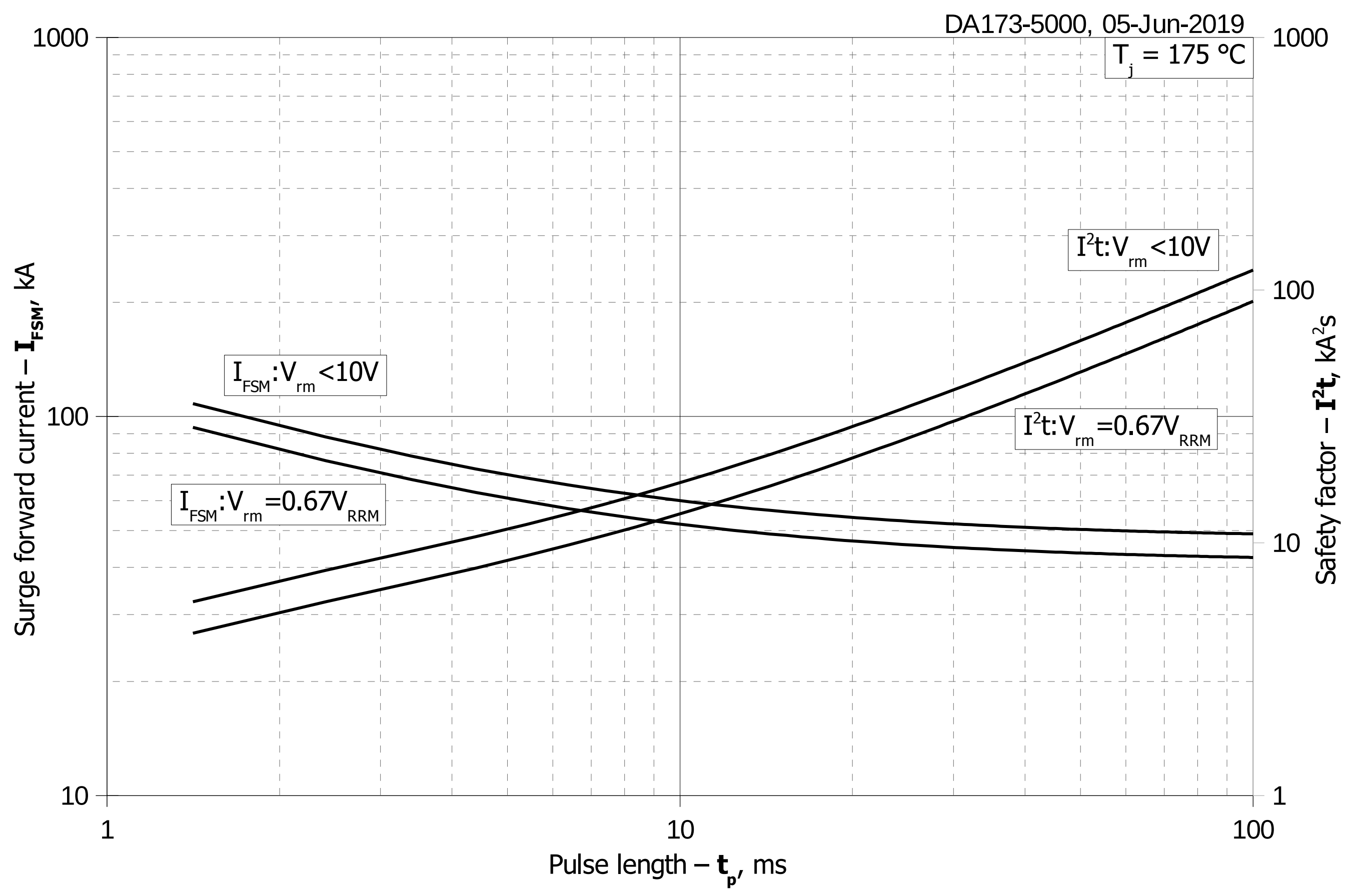


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

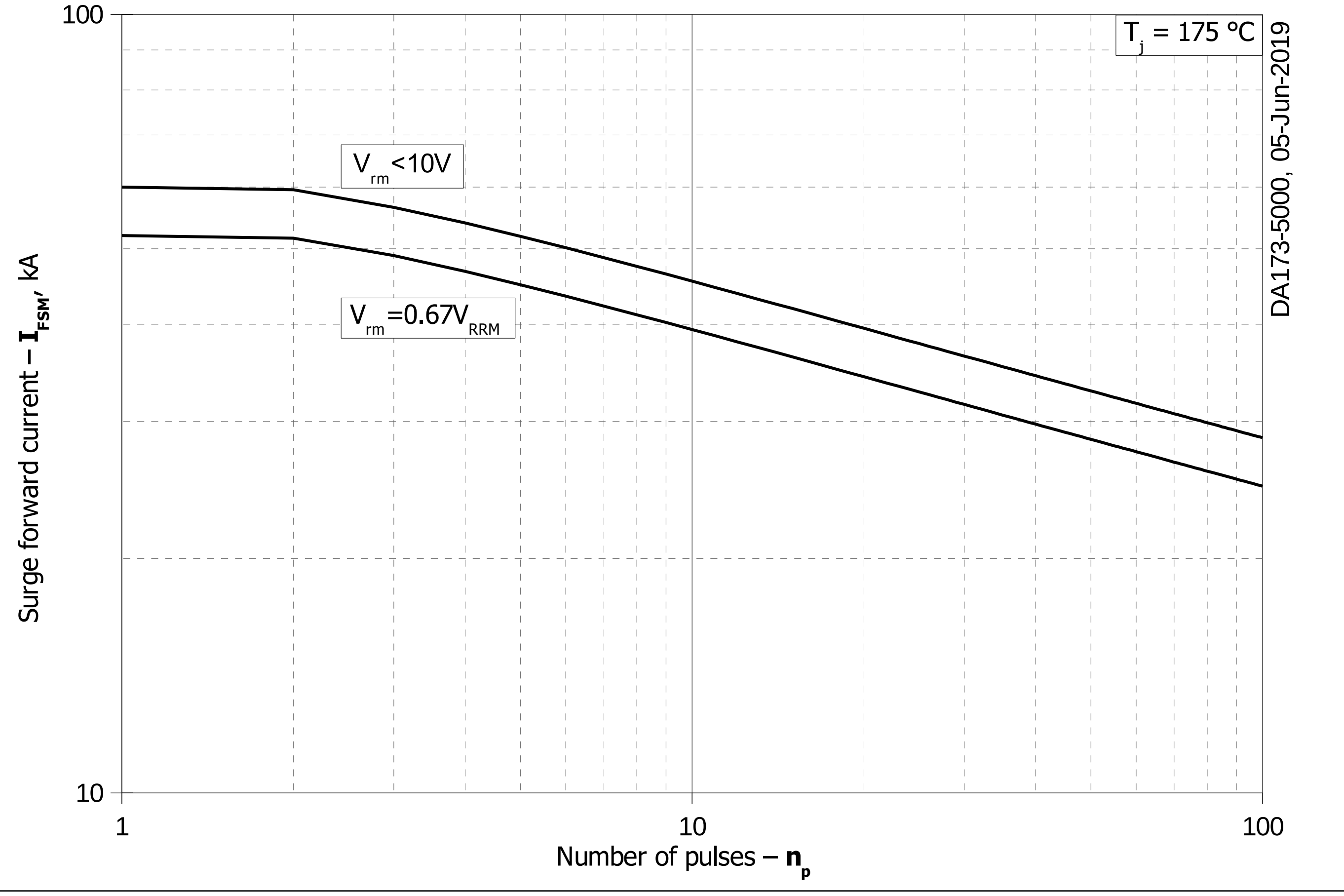


Fig. 12 - Maximum surge forward current I_{FSM} vs. number of pulses n_p