Avalanche Stud Diode
Type DA171-320X-18

Optimum power handling
Low on-state and switching losses
Optimized for line frequency rectifiers
Designed for traction and industrial applications

Mean on-state current						I_{TAV}	320 A							
Repetitive peak reverse voltage						V_{RRM}	400...1800 V							
V_{RRM}, V	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1800
Voltage code	4	5	6	7	8	9	10	11	12	13	14	15	16	18
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	320 461	T_c=119 °C; T_c=100 °C; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	502	T_c=119 °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^2t	Safety factor	$A^2s\cdot10^3$	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	400...1800	$T_{j\,min}< T_j <T_{j\,max}$; 180° half-sine wave; 50 Hz;	
V_{RSM}	Non-repetitive peak reverse voltages	V	500...1900	$T_{j\,min}< T_j <T_{j\,max}$; 180° half-sine wave; single pulse;	
$V_{(BR)}$	Breakdown voltage	V	500...2250	T_j = 25 °C; I_{br}=100 mA; 180° half-sine wave; 50 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	$T_j= T_{j\,max}$; tp = 100 μs; 180° half-sine wave, single pulse	
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	1.40	T_j=25 °C; I_{FM}=1005 A
$V_{F(TO)}$	Forward threshold voltage, max	V	0.853	$T_j=T_{j\ max}$; $0.5\ \pi\ I_{FAV} < I_T < 1.5\ \pi\ I_{FAV}$
r_T	Forward slope resistance, max	mΩ	0.524	
BLOCKING				
I_{RRM}	Repetitive peak reverse current, max	mA	25	$T_j=T_{j\ max}$; $V_R=V_{RRM}$
SWITCHING				
Q_r	Recovered charge, max	μC	1500	$T_j=T_{j\ max}$; I_{TM}=320 A; di_R/dt=-10 A/μs; V_R=100 V;
t_{rr}	Reverse recovery time, max	μs	23	
I_{rr}	Reverse recovery current, max	A	130	
THERMAL				
R_{thjc}	Thermal resistance, junction to case, max	°C/W	0.075	Direct current
MECHANICAL				
m	Weight, max	g	410	
D_s	Surface creepage distance	mm (inch)	12.4 (4.882)	
D_a	Air strike distance	mm (inch)	12.4 (4.882)	

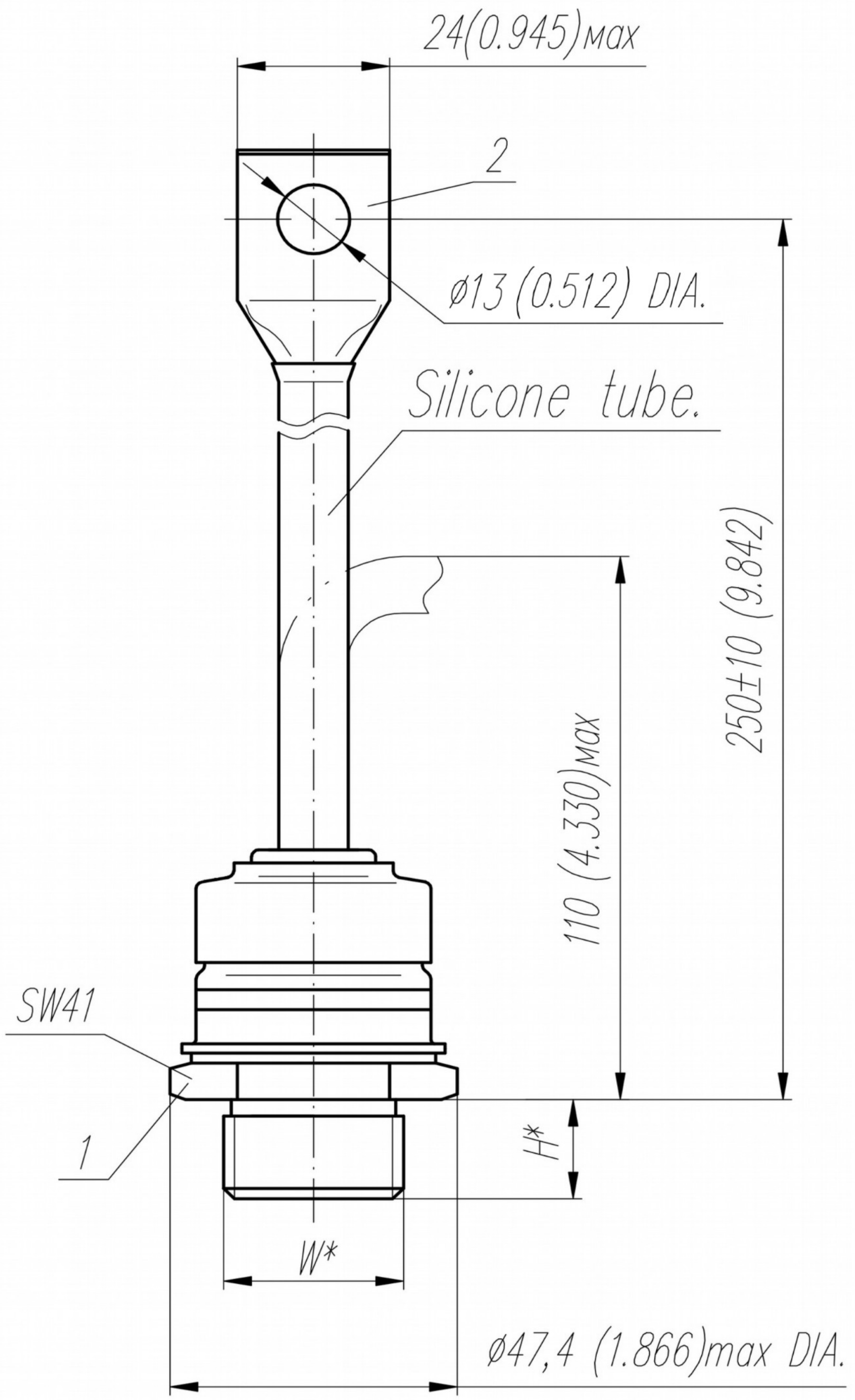
PART NUMBERING GUIDE

DA	171	320	X	18	N
1	2	3	4	5	6

1. DA — Avalanche Diode
2. Design version
3. Average forward current, A
4. Polarity: X – Cathode to Stud; Anode to Stud – no symbol
5. Voltage code
6. Ambient conditions: N – normal; T – tropical

OVERALL DIMENSIONS

Package type: D. SB1



Type of screw	W	H
Metric Screw	M24x1,5 – 8g	19

Polarity		**Example of code designation**	**Reference designation**	**Colors**	
				Anode	**Cathode**
Normal	Anode to stud	DA171-320**X**-18		Black tube	-

All dimensions in millimeters (inches)

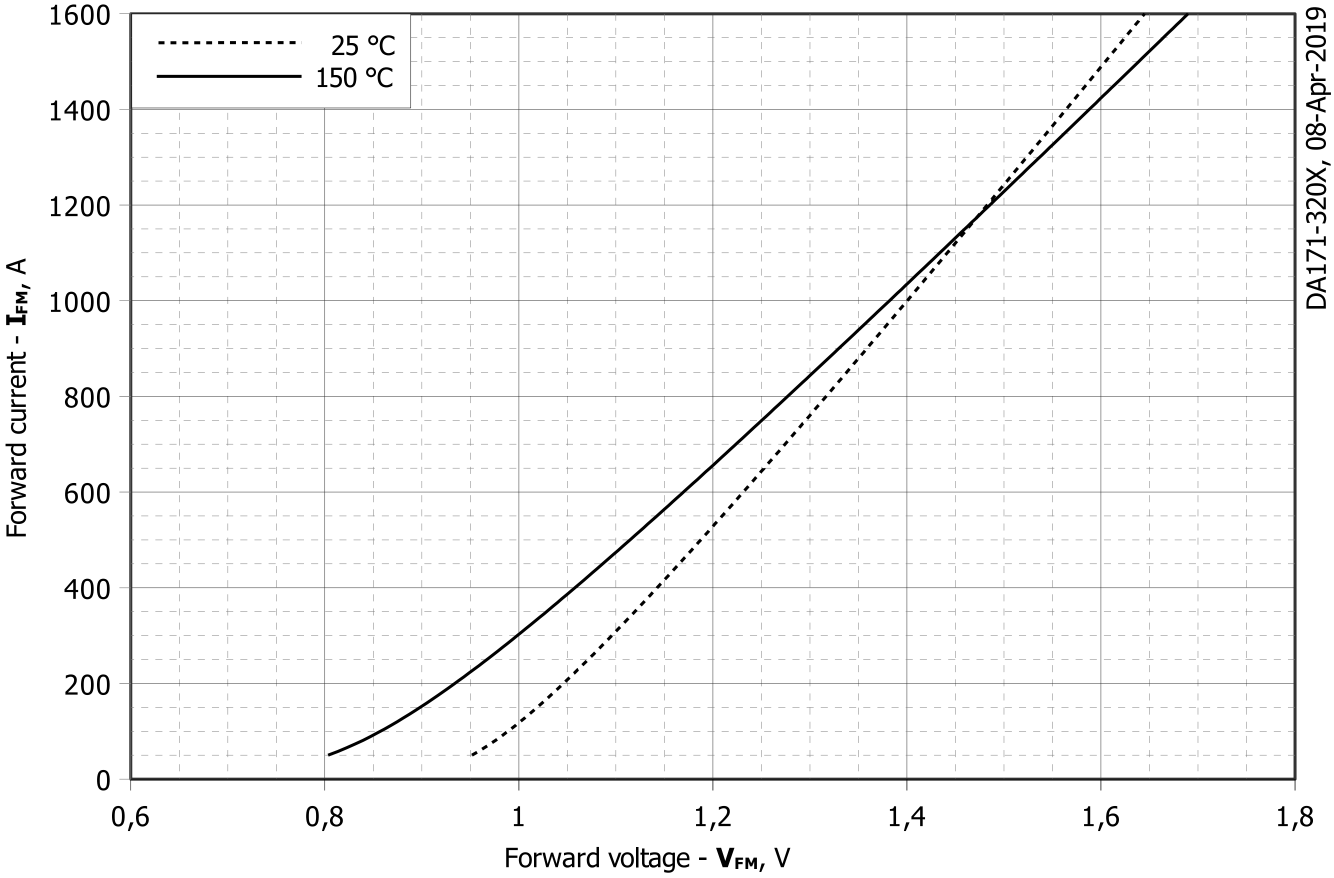


Fig 1 – Forward characteristics of Limit device

Analytical function for Forward characteristic:

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

	Coefficients for max curves	
	T_j = 25°C	$T_j = T_{j\,max}$
A	0.83590000	0.59430000
B	0.00037767	0.00049998
C	0.02307000	0.05019300
D	0.00086456	-0.00186790

Forward characteristic model (see Fig. 1).

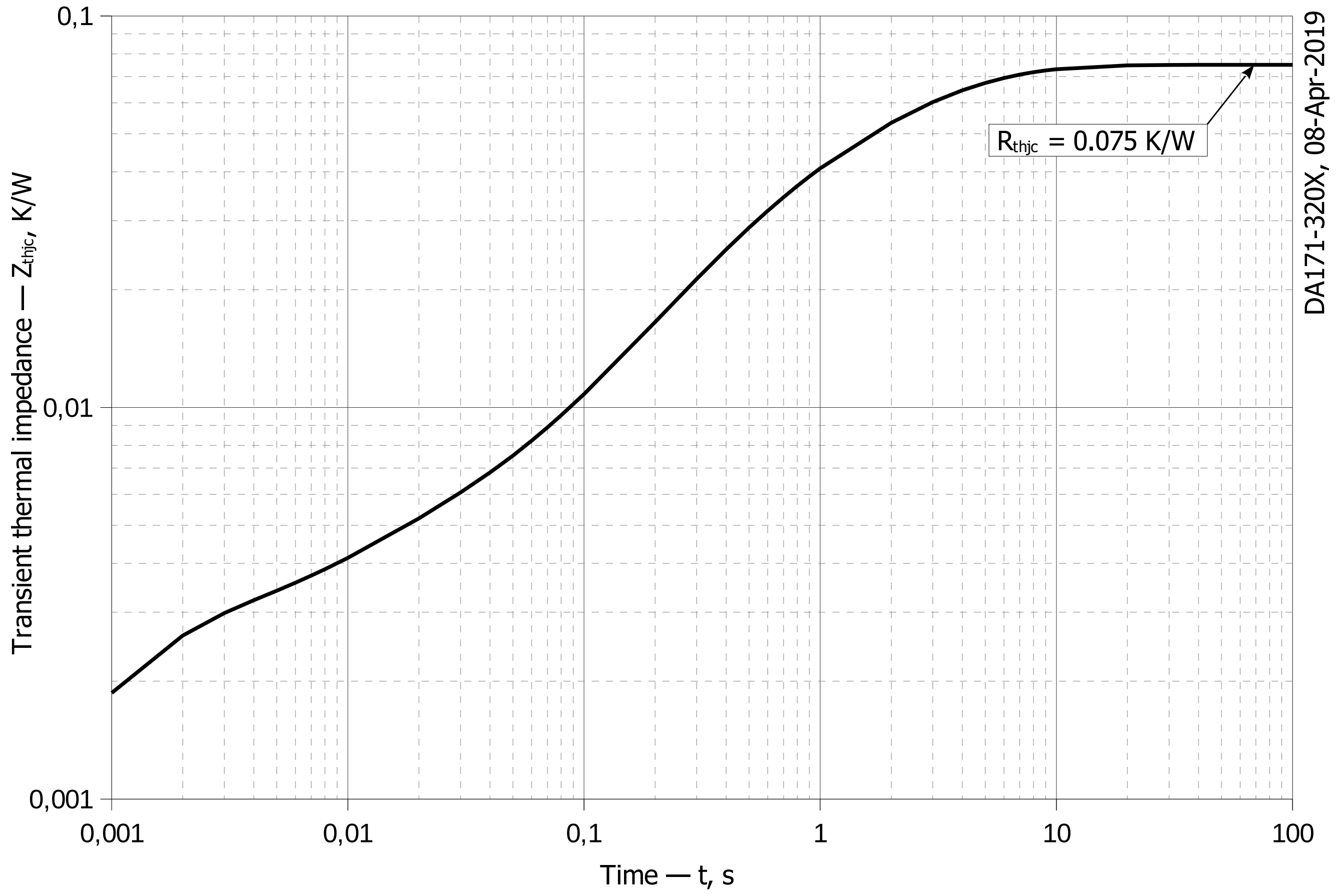


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

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

i	1	2	3	4	5	6
R_i, K/W	0.013357	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)

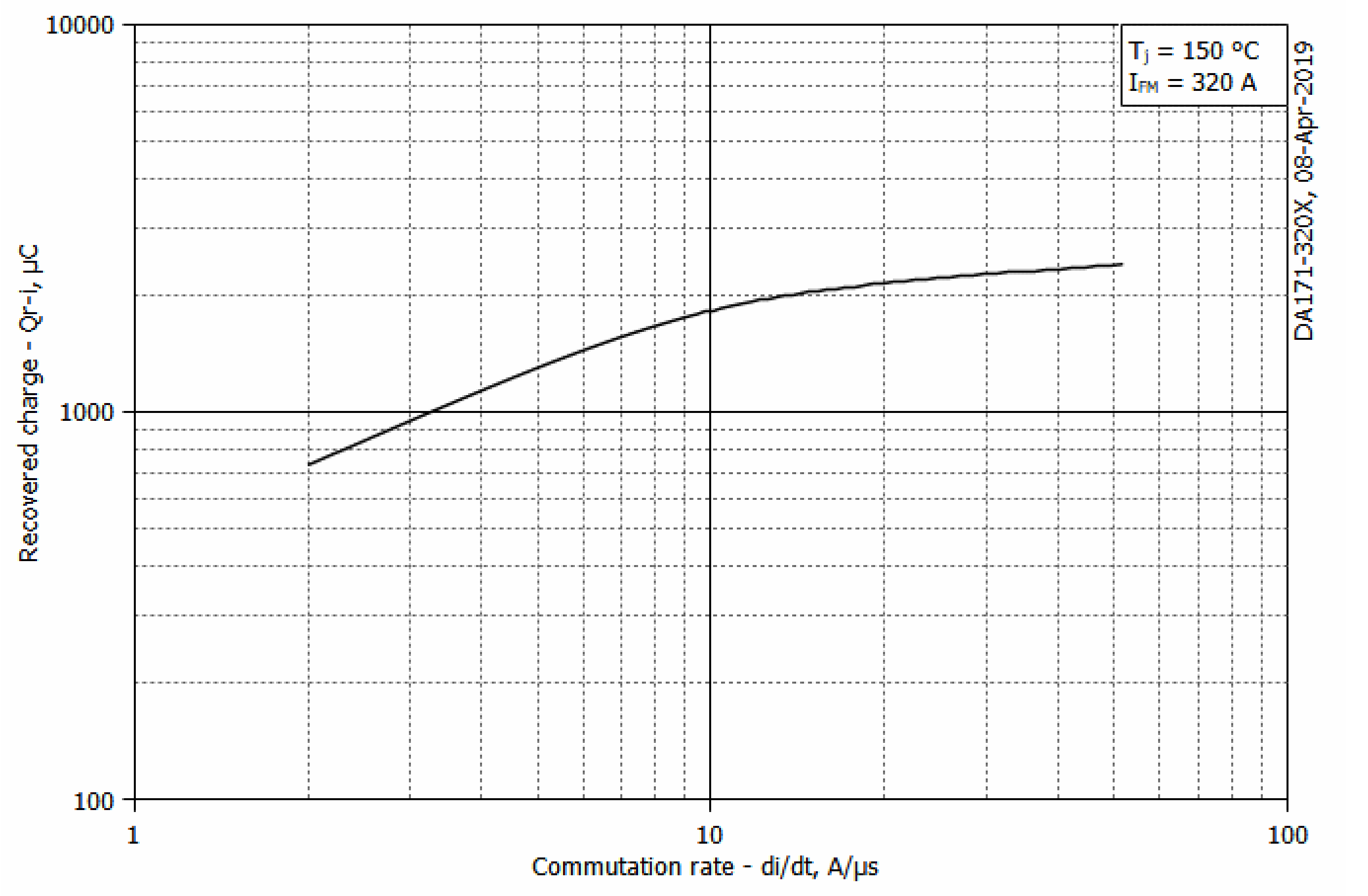


Fig 3 – Maximum recovered charge $Q_{r\text{-}i}$ (integral) vs. commutation rate di_R/dt

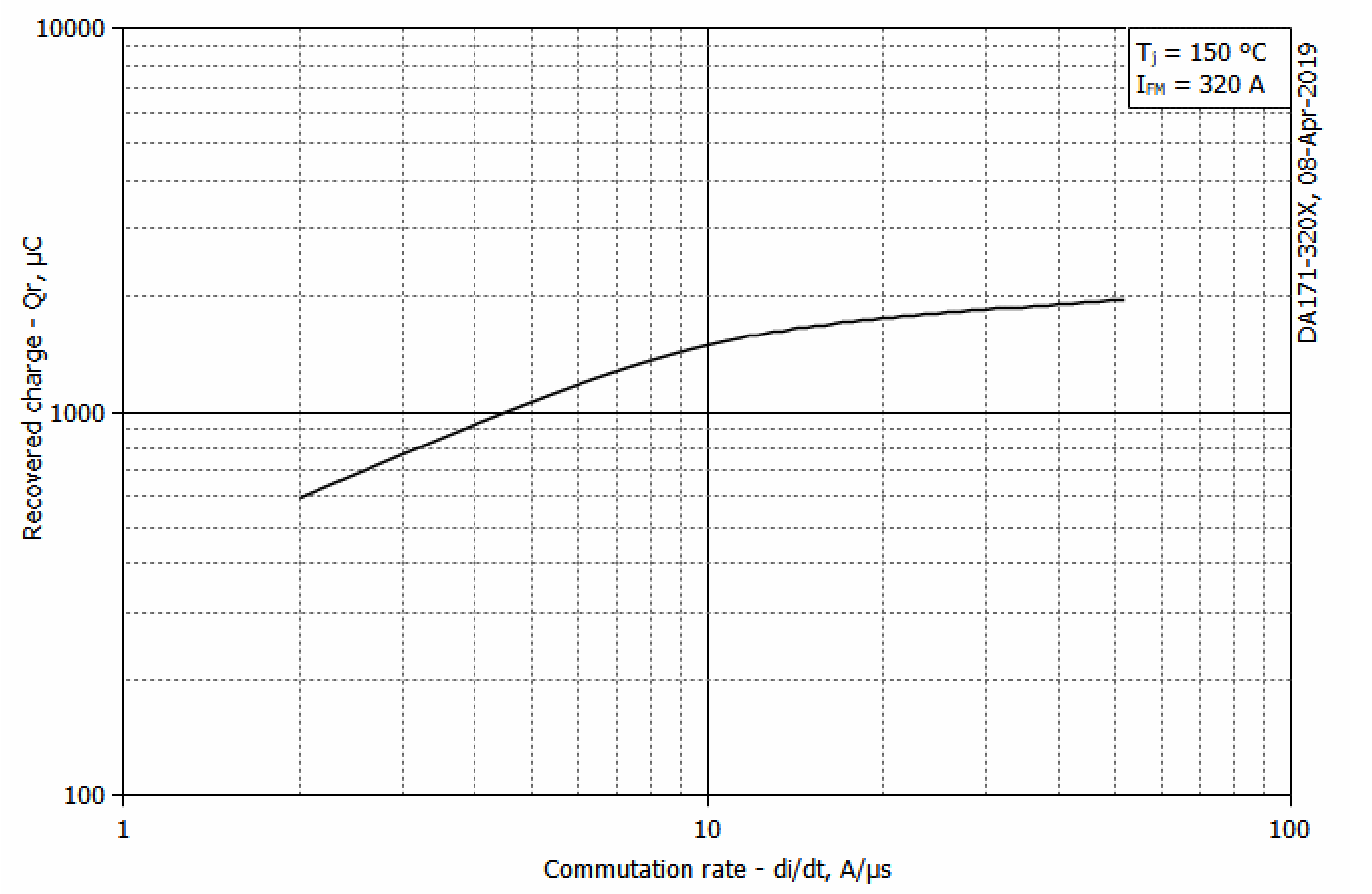


Fig 4 – Maximum recovered charge Q_r vs. commutation rate di_R/dt (25% chord)

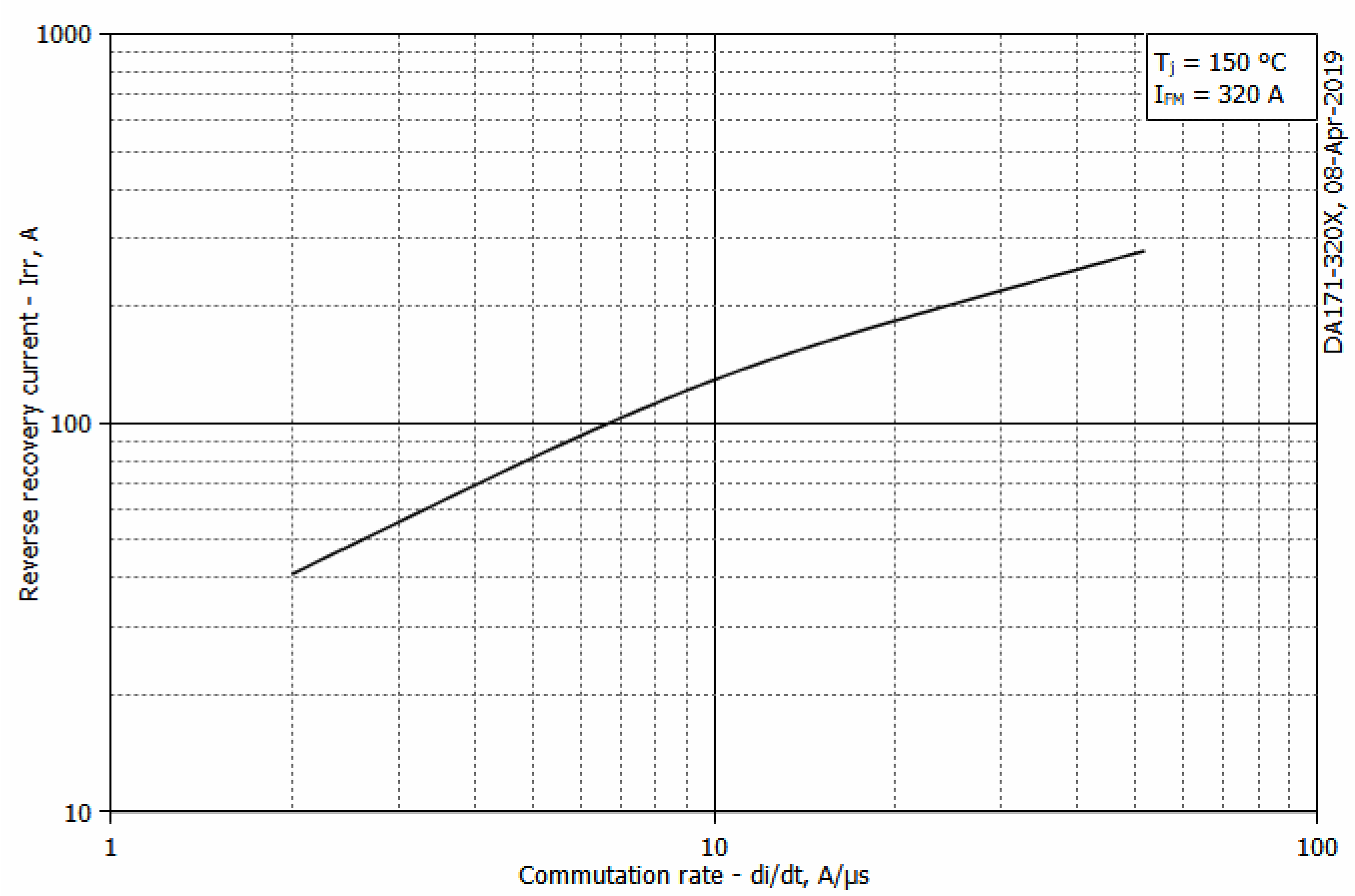


Fig 5 – Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

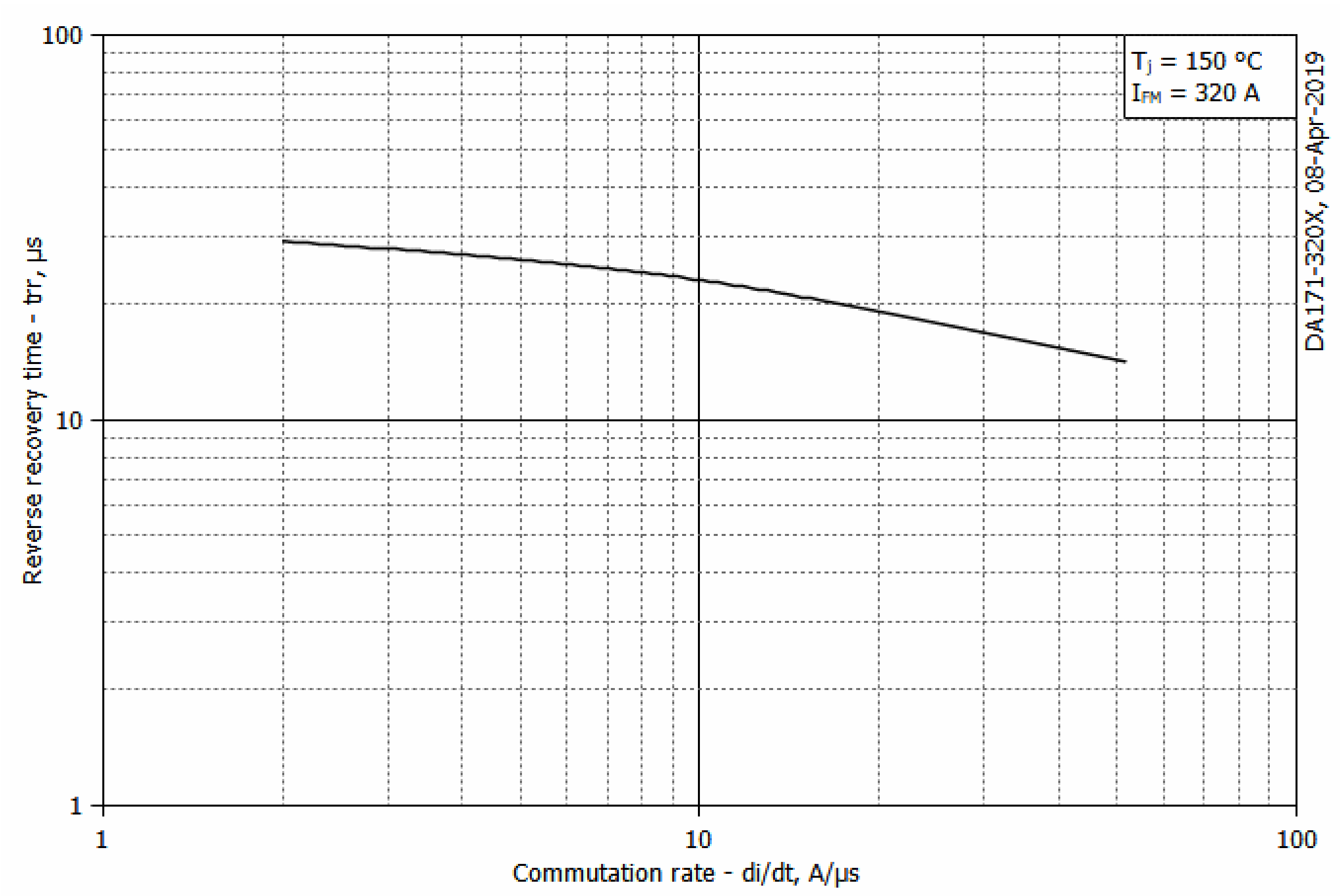


Fig 6 – Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

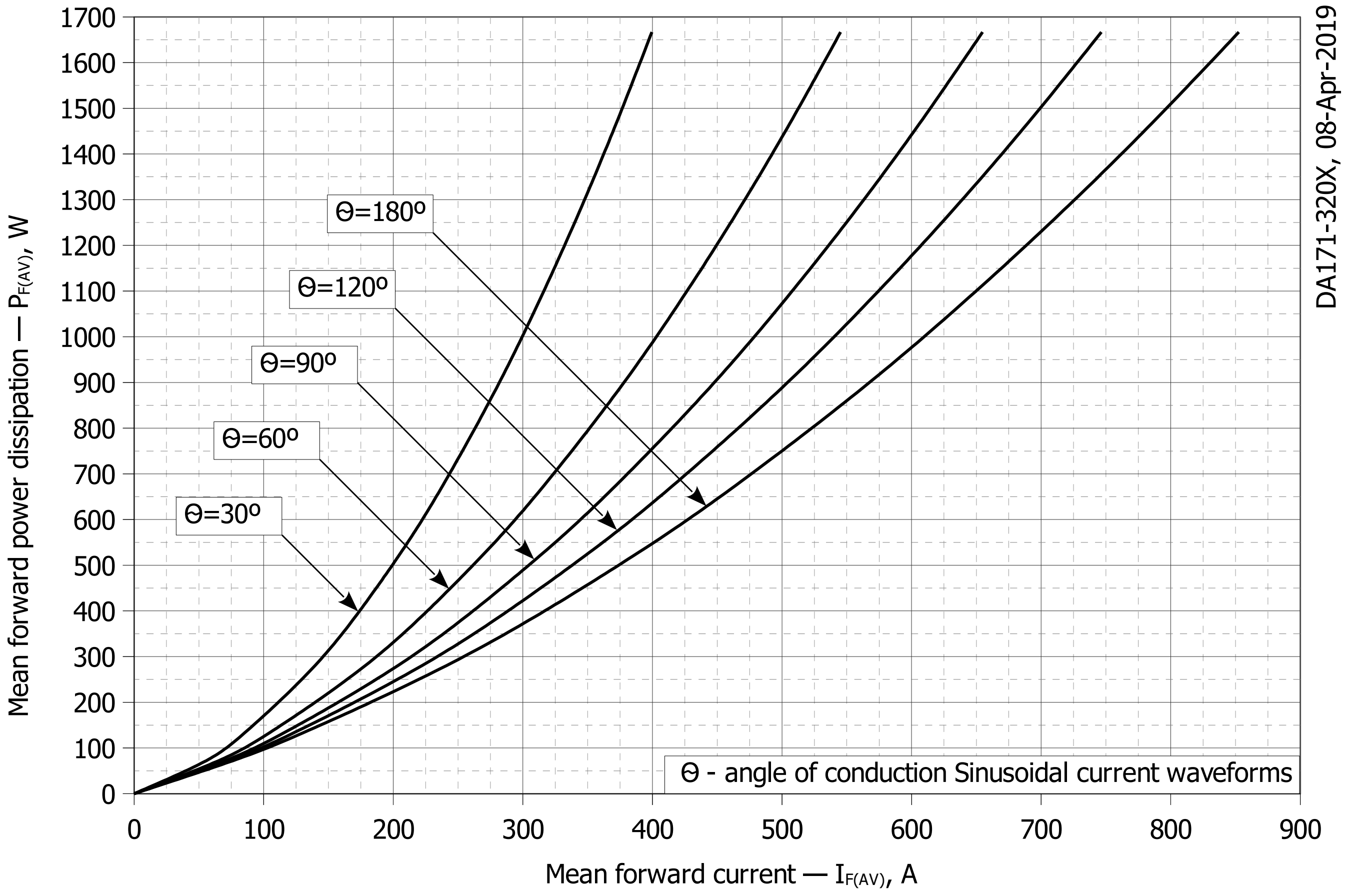


Fig. 7 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles (f=50Hz)

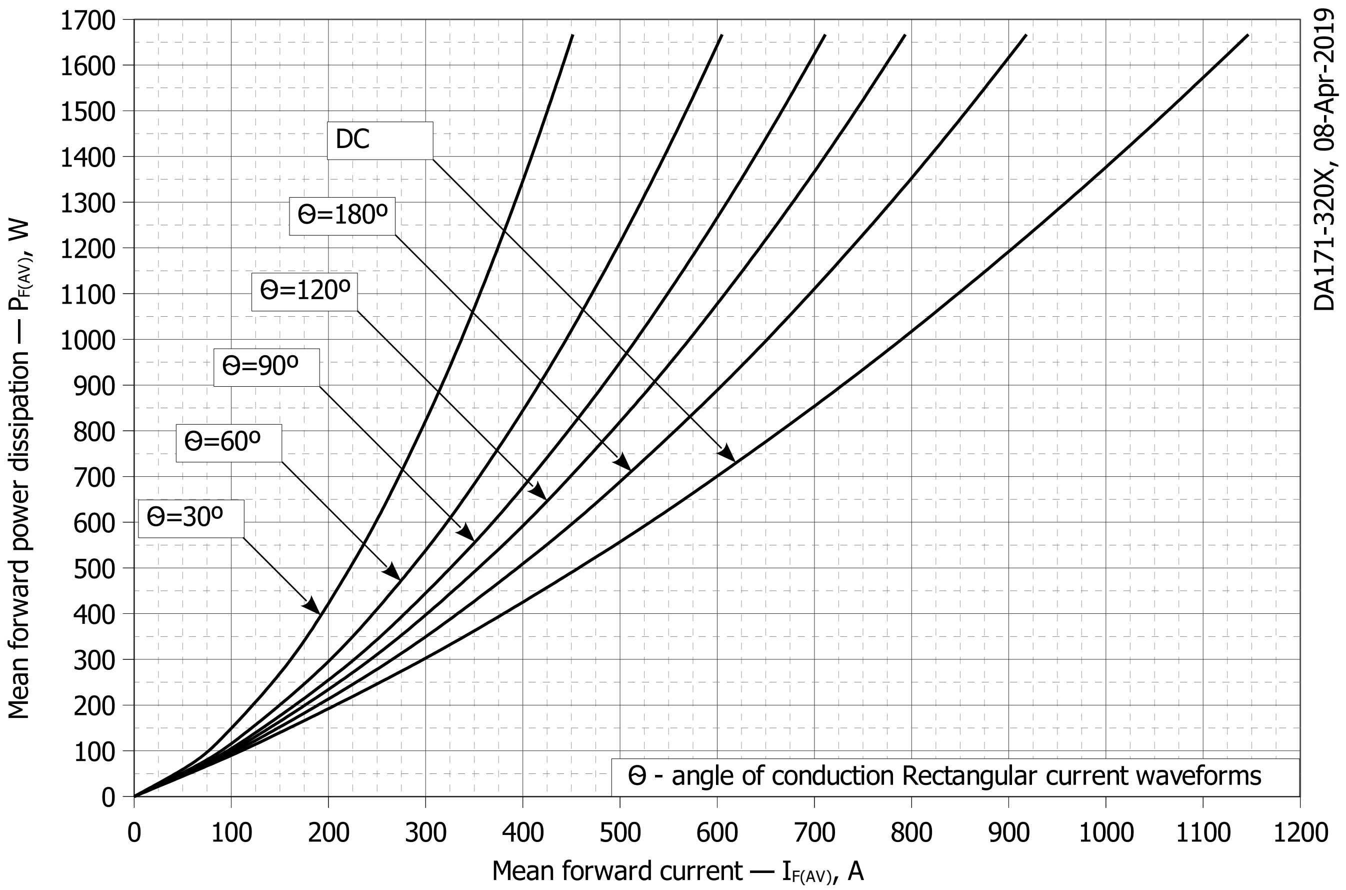


Fig. 8 – Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC (f=50Hz)

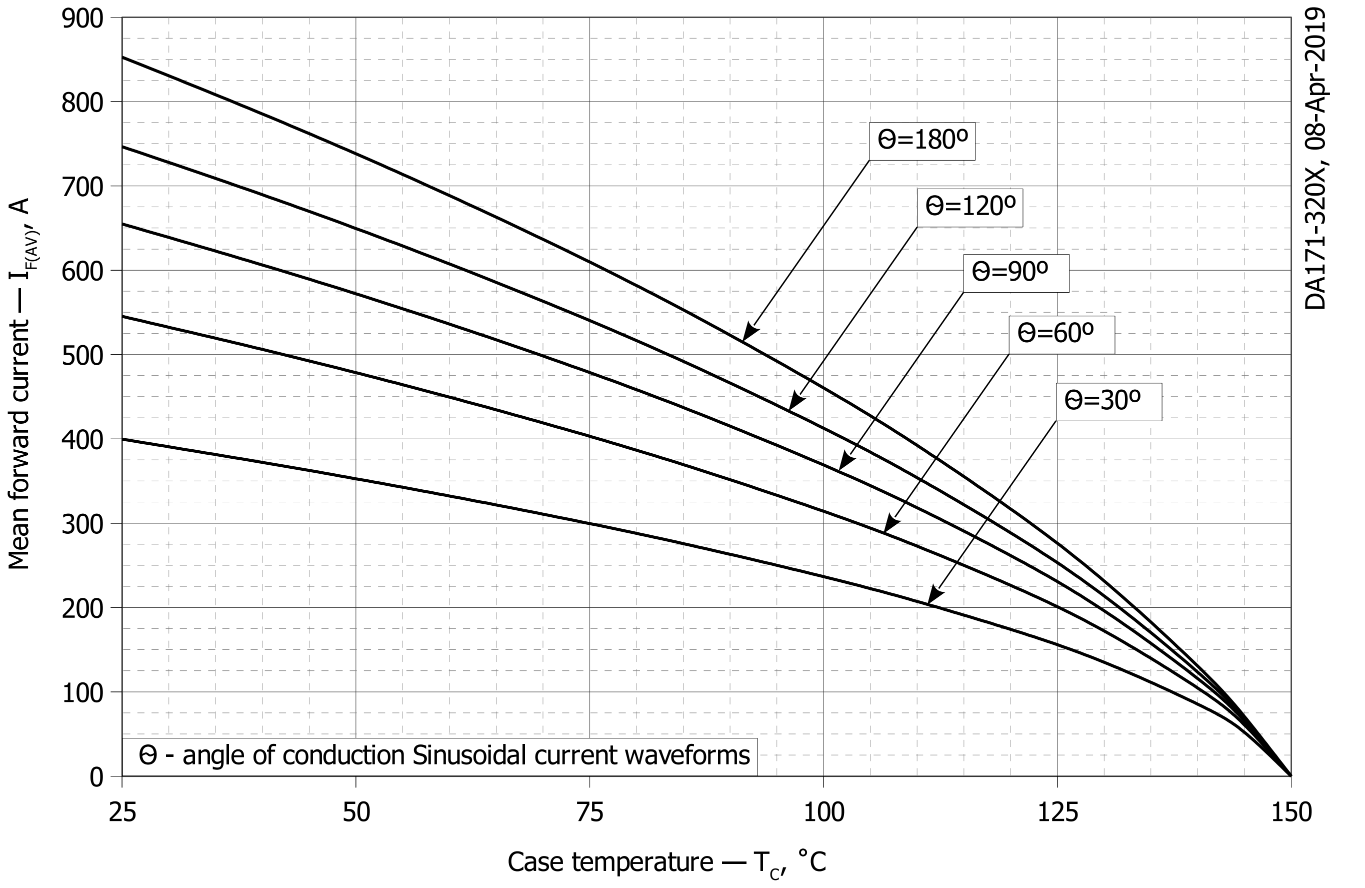


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles (f=50Hz)

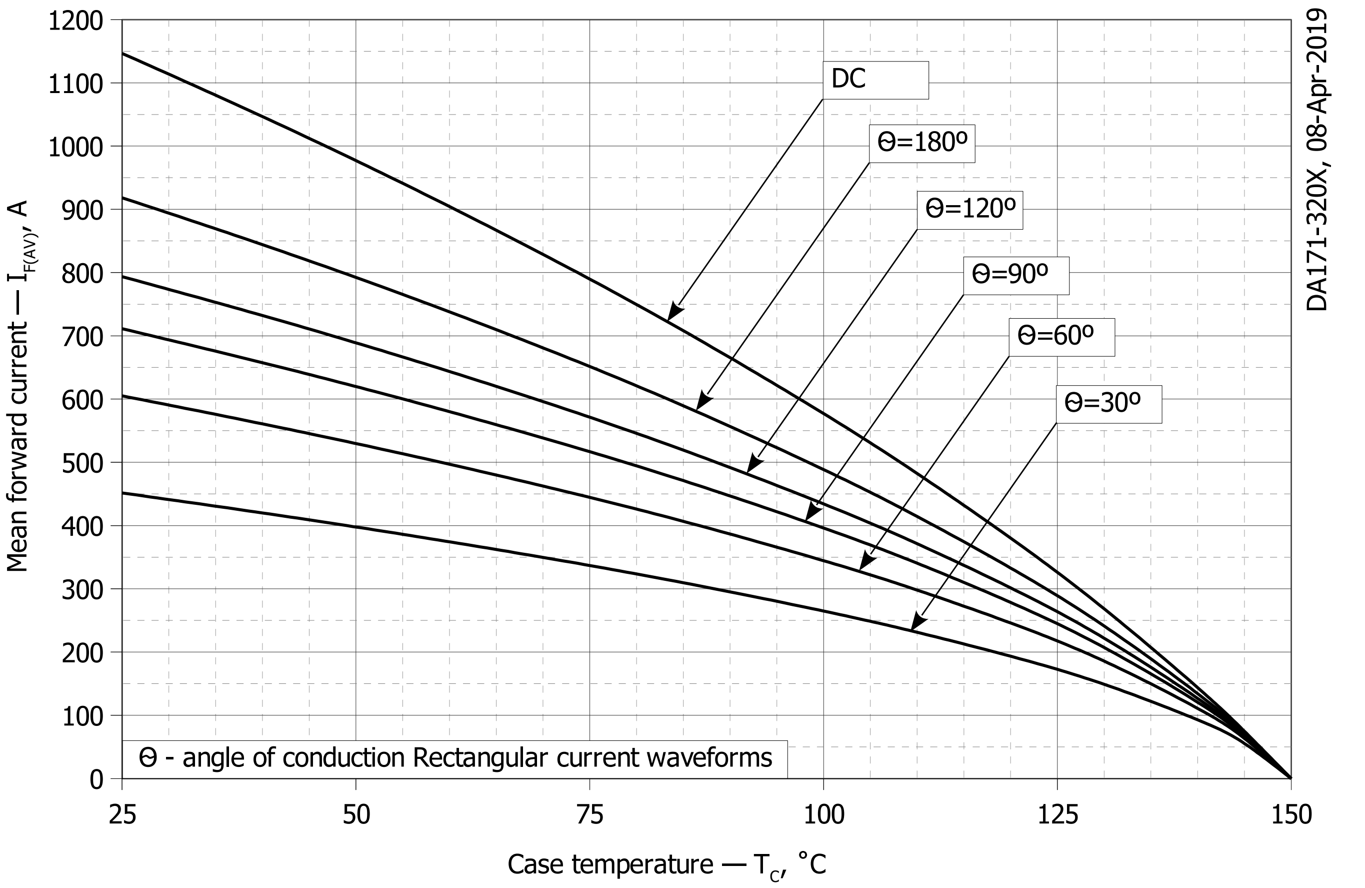


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC (f=50Hz)

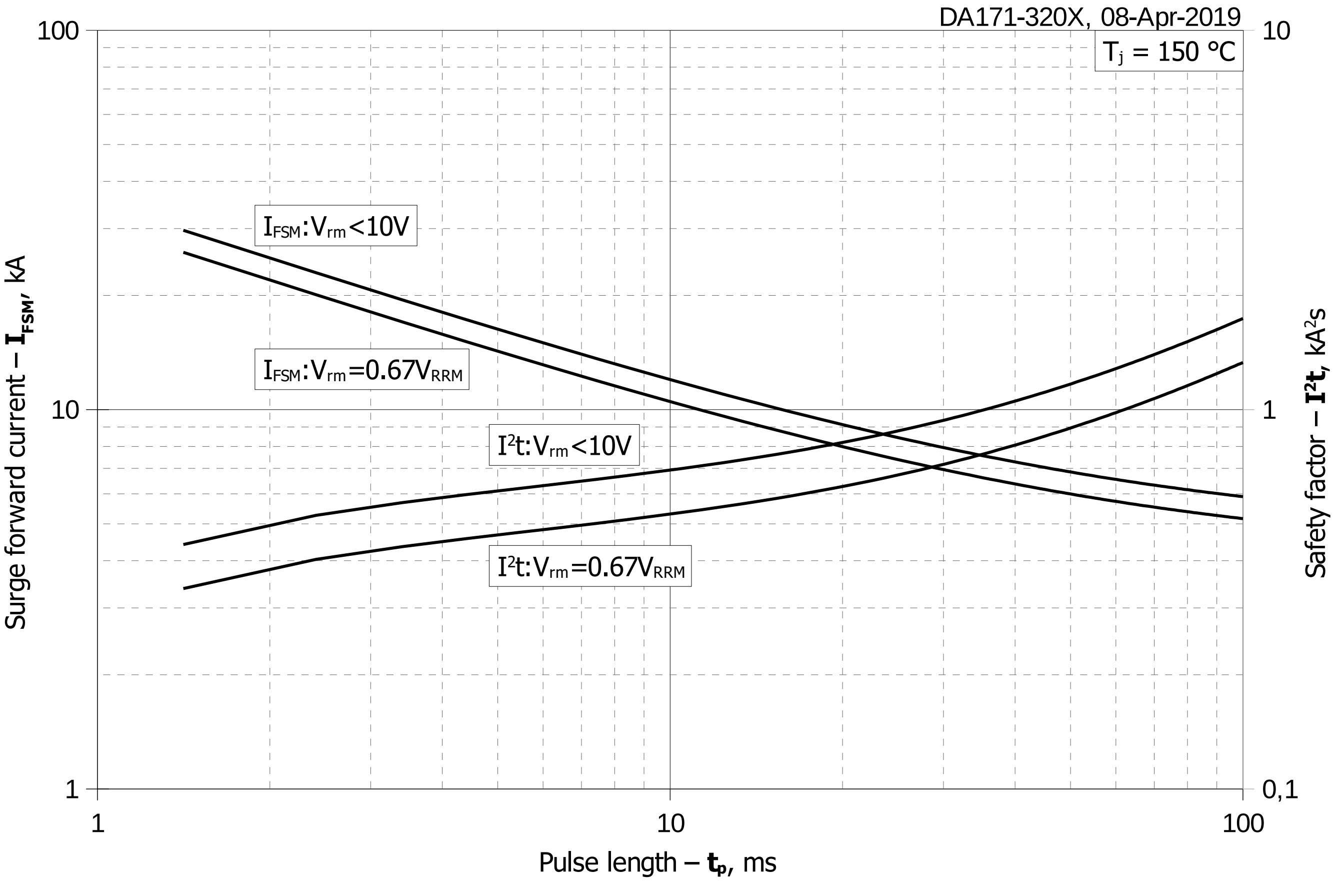


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

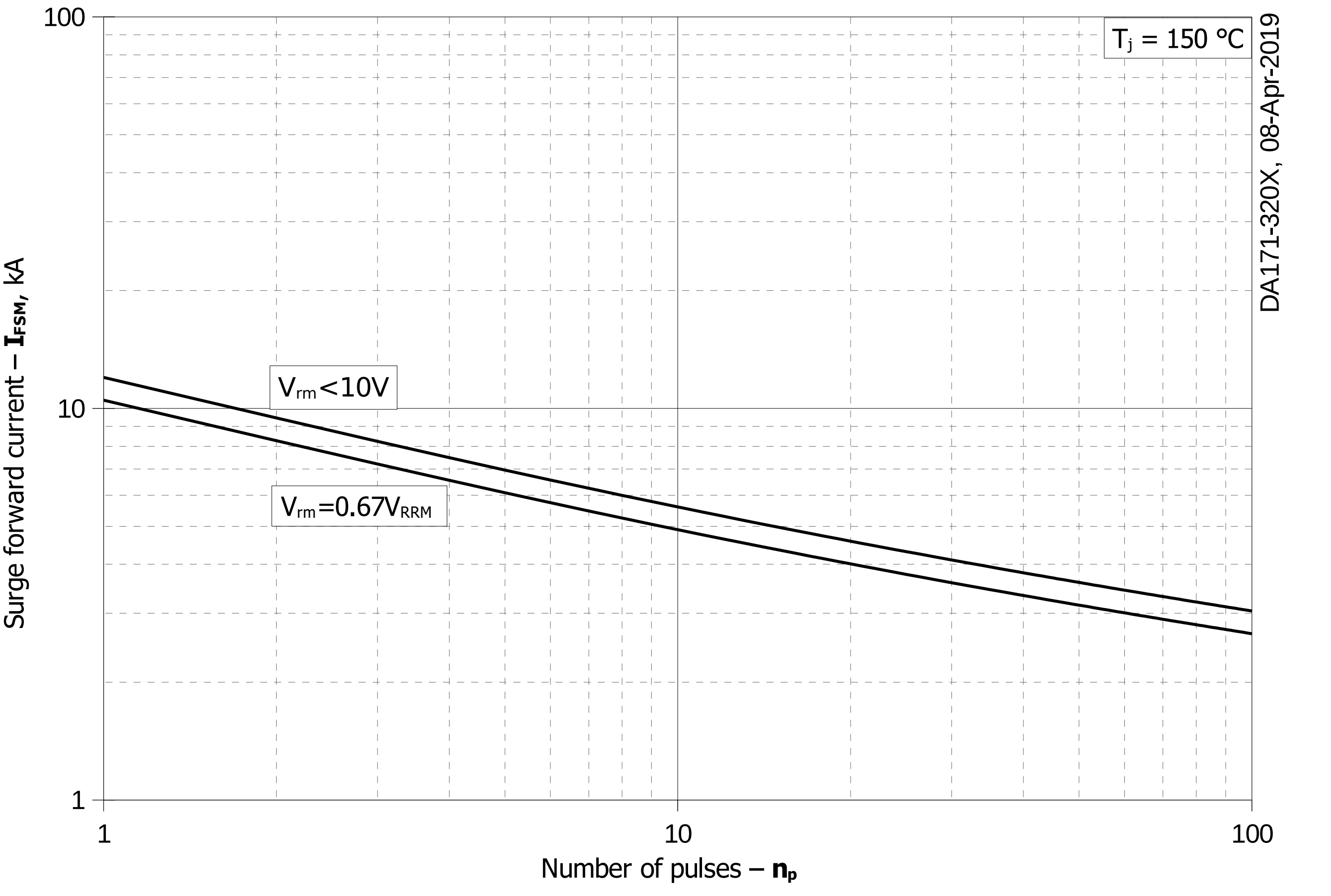


Fig. 12 - Maximum surge forward current I_{FSM} vs. number of pulses n_p