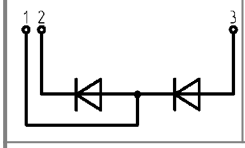
Double Diode Module
For Phase Control
MDx-630-18-A2

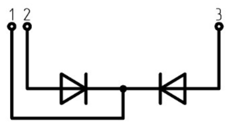
Electrically isolated base plate
Industrial standard package
Simplified mechanical design, rapid assembly
Pressure contact

Average forward current				I_{FAV}	630 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	–40...+150							

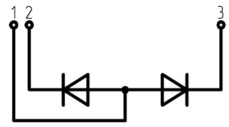
MD3

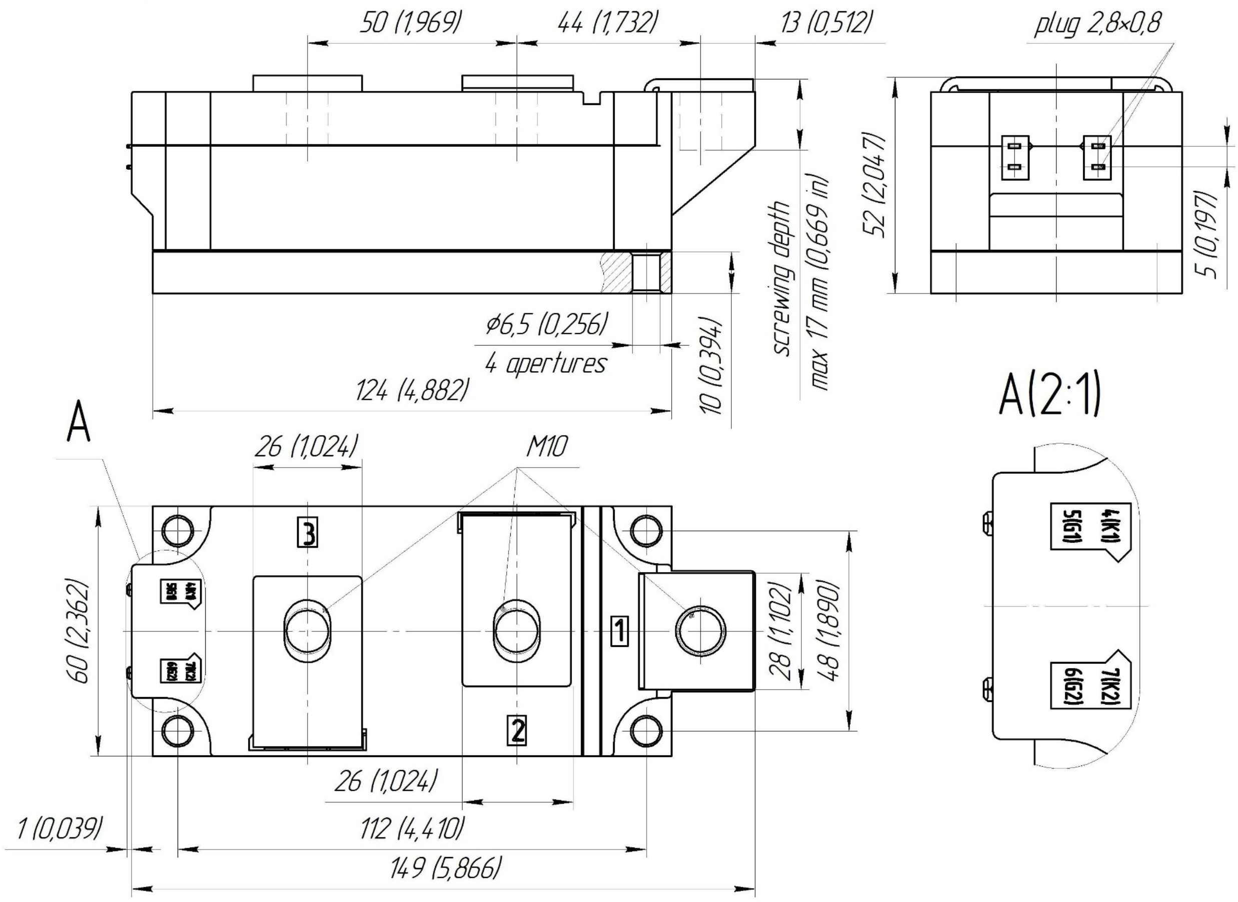


MD4



MD5





All dimensions in millimeters (inches)

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{FAV}	Maximum allowable average forward current	A	670 630	T_c=100 °C; T_c=104 °C; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	989	T_c=104 °C; 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	20.5 24.0	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V;
			22.0 25.0	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	$A^2s \cdot 10^3$	2100 2800	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V;
			2000 2500	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_{RSM}	Non-repetitive peak reverse voltages	V	1100...1900	$T_{j\ min}$< 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}=1978 A	
$V_{F(TO)}$	Forward threshold voltage, max	V	0.865	T_j=$T_{j\ max}$; $0.5\ \pi\ I_{FAV} < I_T < 1.5\ \pi\ I_{FAV}$	
r_T	Forward slope resistance, max	mΩ	0.299		
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	50 3.00	T_j=$T_{j\ max}$ T_j=25 °C	U_R=U_{RRM}
SWITCHING					
Q_r	Recovered charge, max	μC	1880	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	150		
THERMAL					
R_{thjc}	Thermal resistance, junction to case				
	per module	°C/W	0.0275	180° half-sine wave, 50 Hz	
	per arm	°C/W	0.0550		
	per module	°C/W	0.0265	DC	
	per arm	°C/W	0.0530		
R_{thch}	Thermal resistance, case to heatsink				
	per module	°C/W	0.0100		
	per arm	°C/W	0.0200		
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 (M10)[1)]	Nm	12.00	Tolerance ± 15%
m	Weight, max	g	1500	

PART NUMBERING GUIDE

MD	3	-	630	-	18	-	A2	-	N
1	2		3		4		5		6

1. MD - Rectifier Diode
2. Circuit Schematic:
   3 – serial connection
   4 – common Cathode
   5 – common Anode
3. Average Forward Current, A
4. Voltage Code
5. Package Type (M.A2)
6. Ambient Conditions:
   N – Normal

NOTES

[1)] The screws must be lubricated

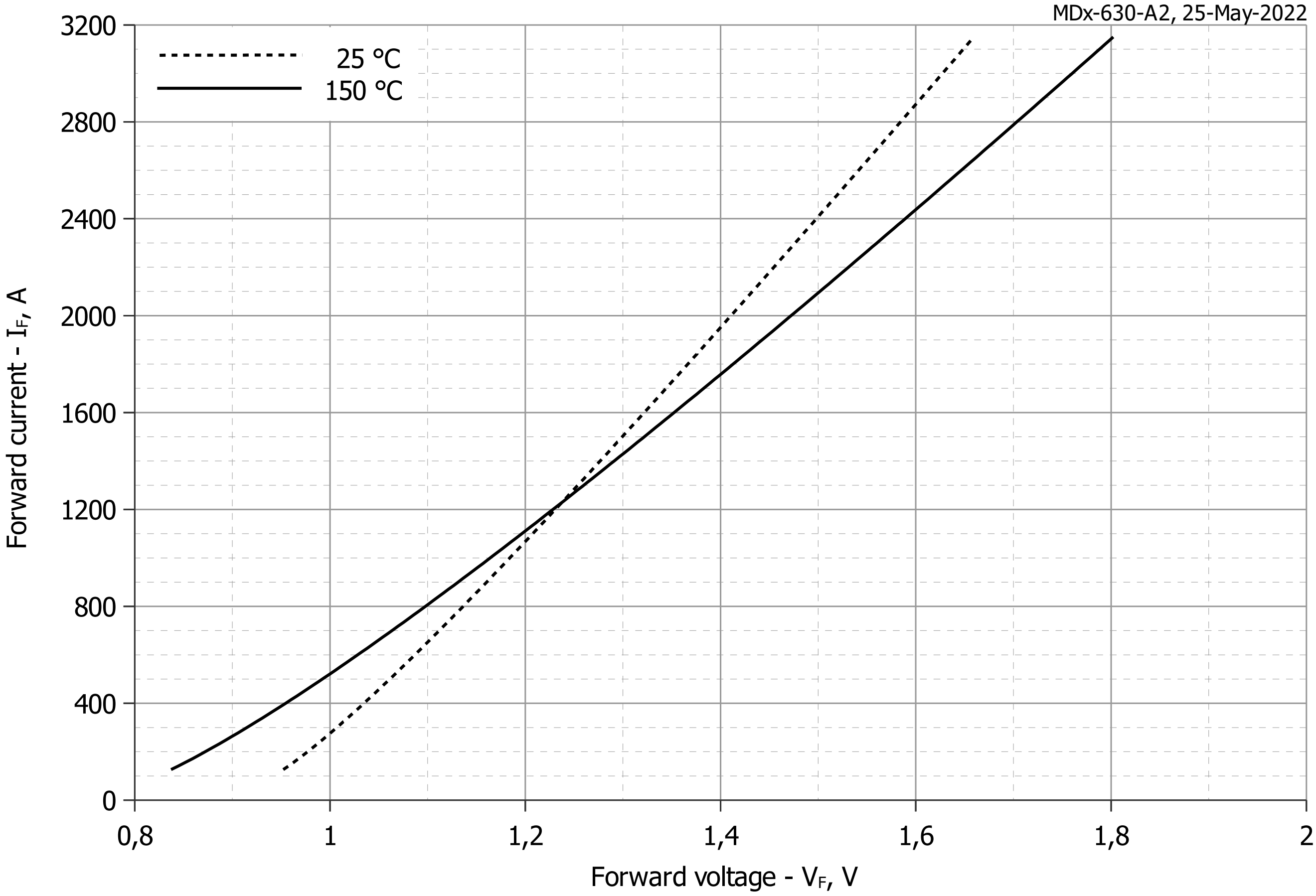


Fig 1 – Forward characteristics of Limit device

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 = 25ºC	$T_j = T_{j\,max}$
A	0.86290497	0.74932466
B	0.00018793	0.00021850
C	0.00763440	-0.00388544
D	0.00254713	0.00705431

Forward characteristic model (see Fig. 1).

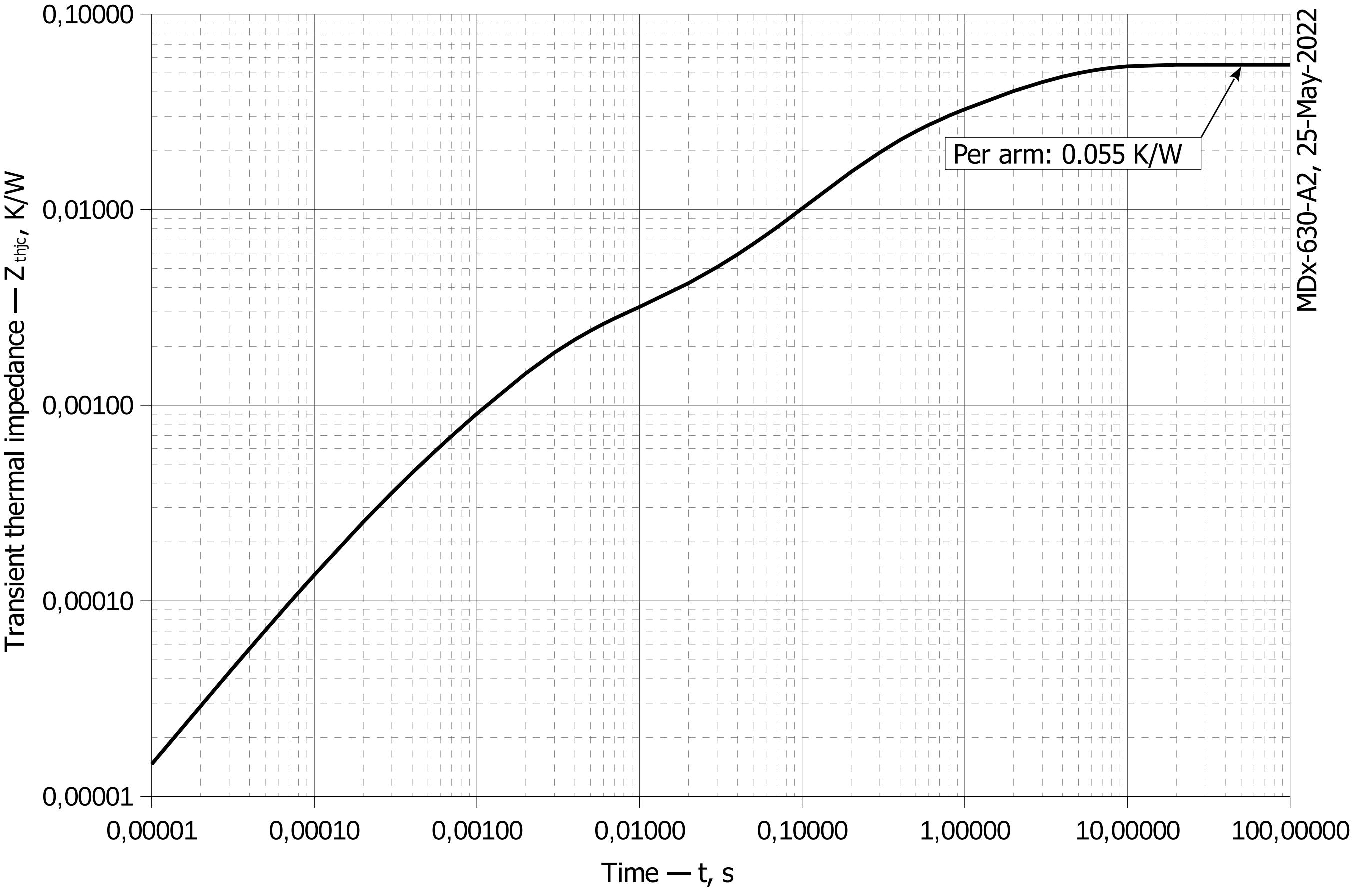


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

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	0.0249	0.0112	0.01635	0.0006528	0.00179	0.000136
τ_i, s	3.132	1	0.2335	0.01038	0.002348	0.0002448

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

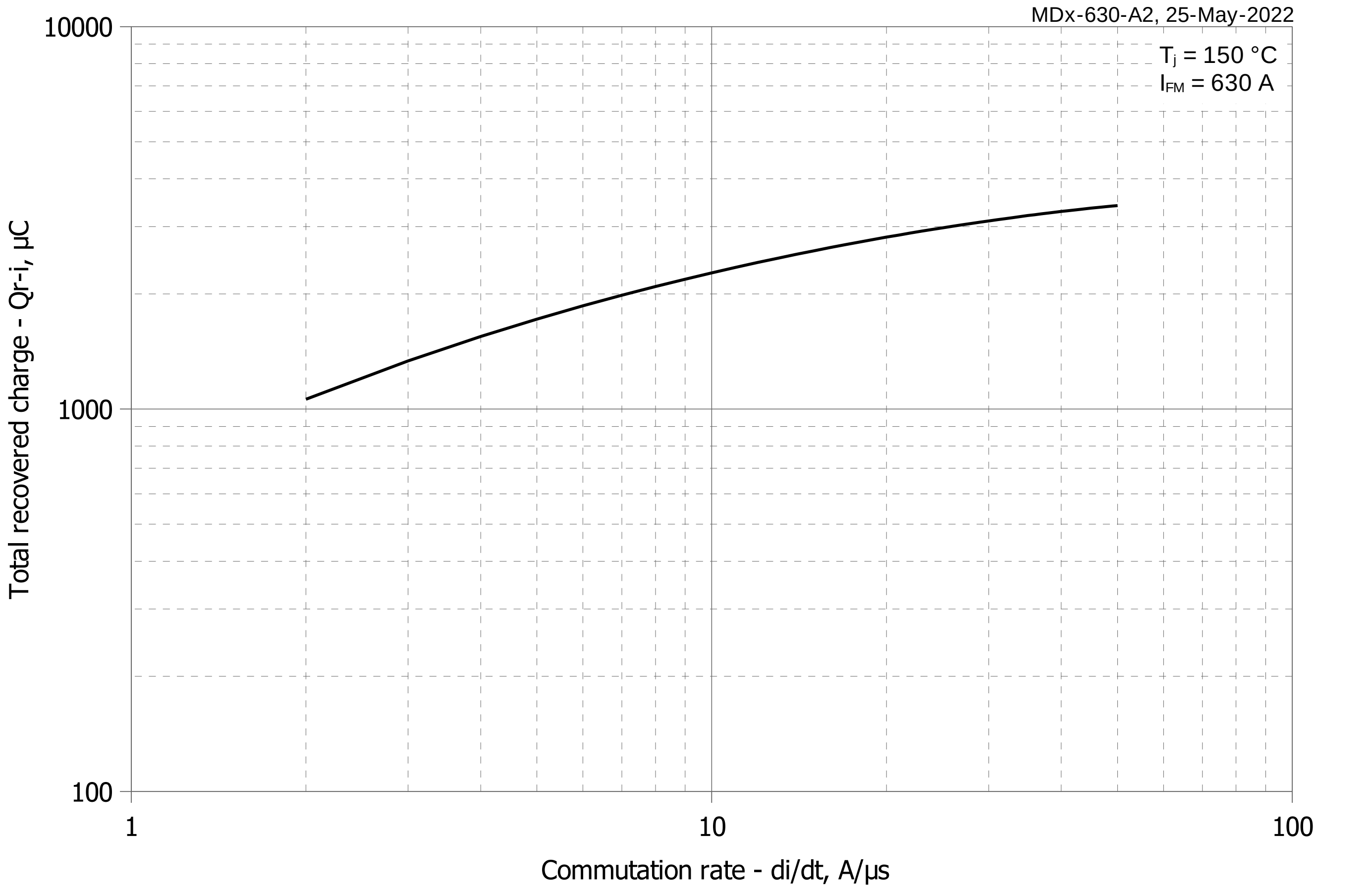


Fig 3 - Maximum recovered charge Q_{r-i} (integral) vs. commutation rate di_R/dt

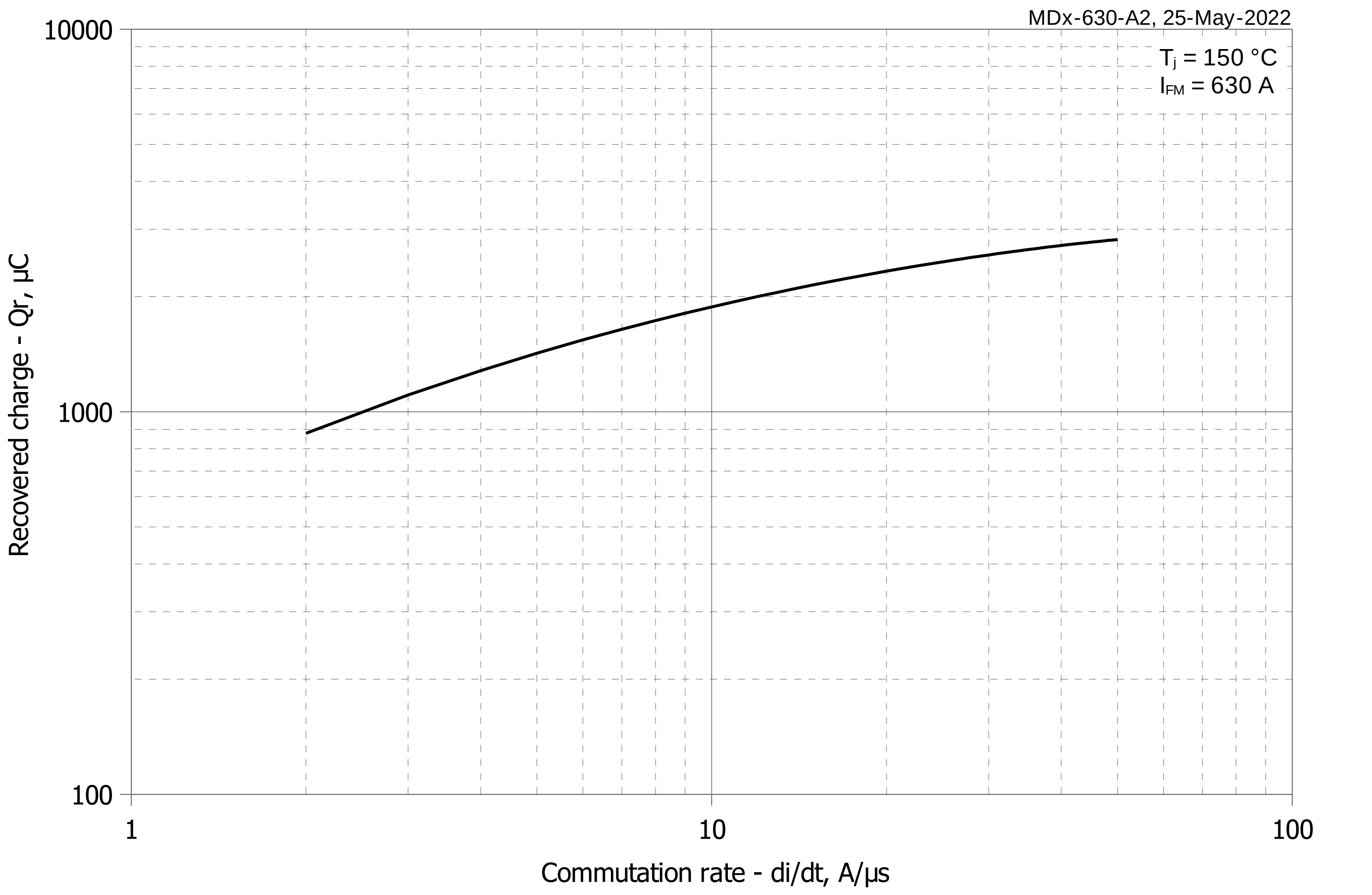


Fig 4 - Maximum recovered charge Q_r vs. commutation rate di_R/dt (25% chord)

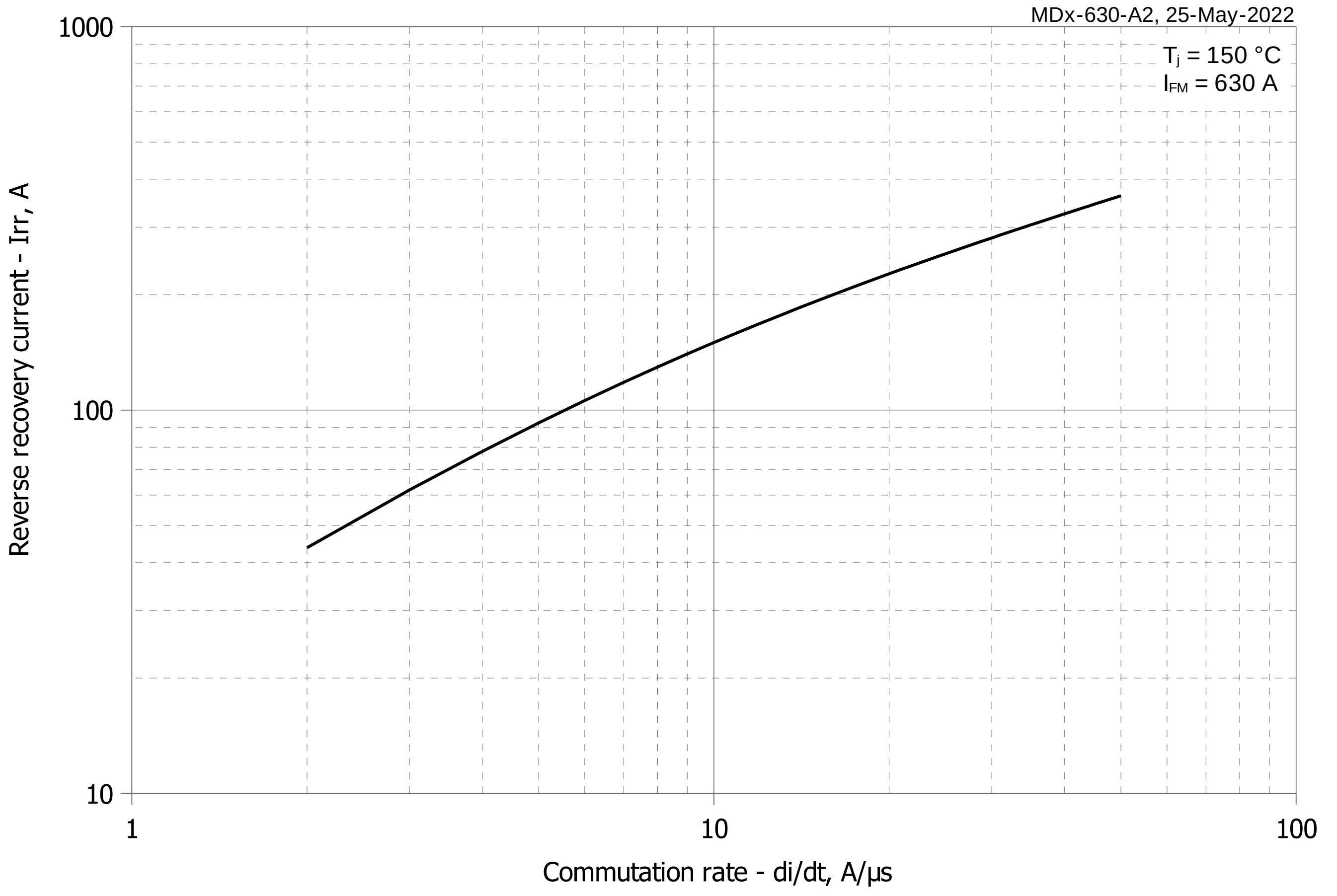


Fig 5 - Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

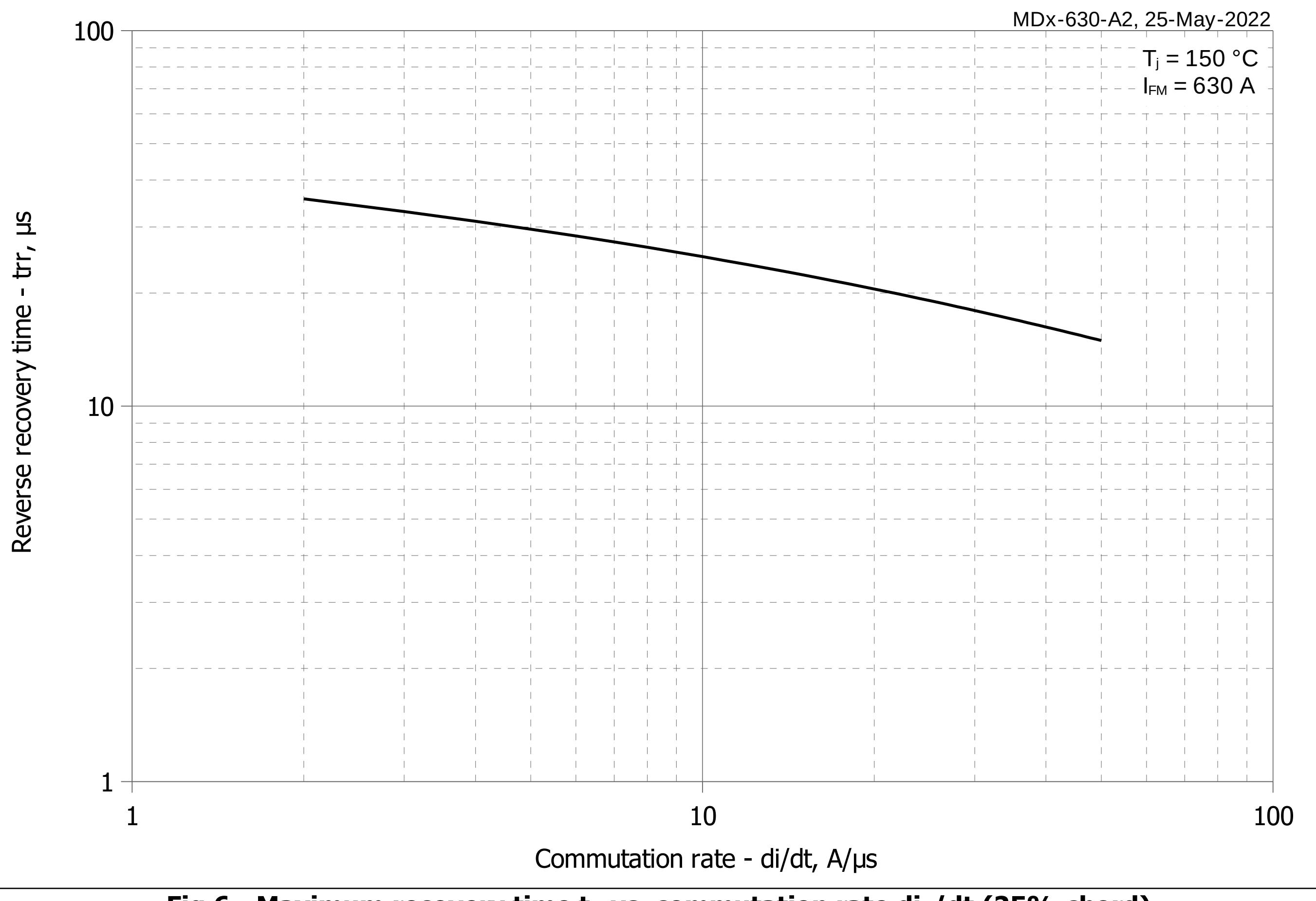


Fig 6 - Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

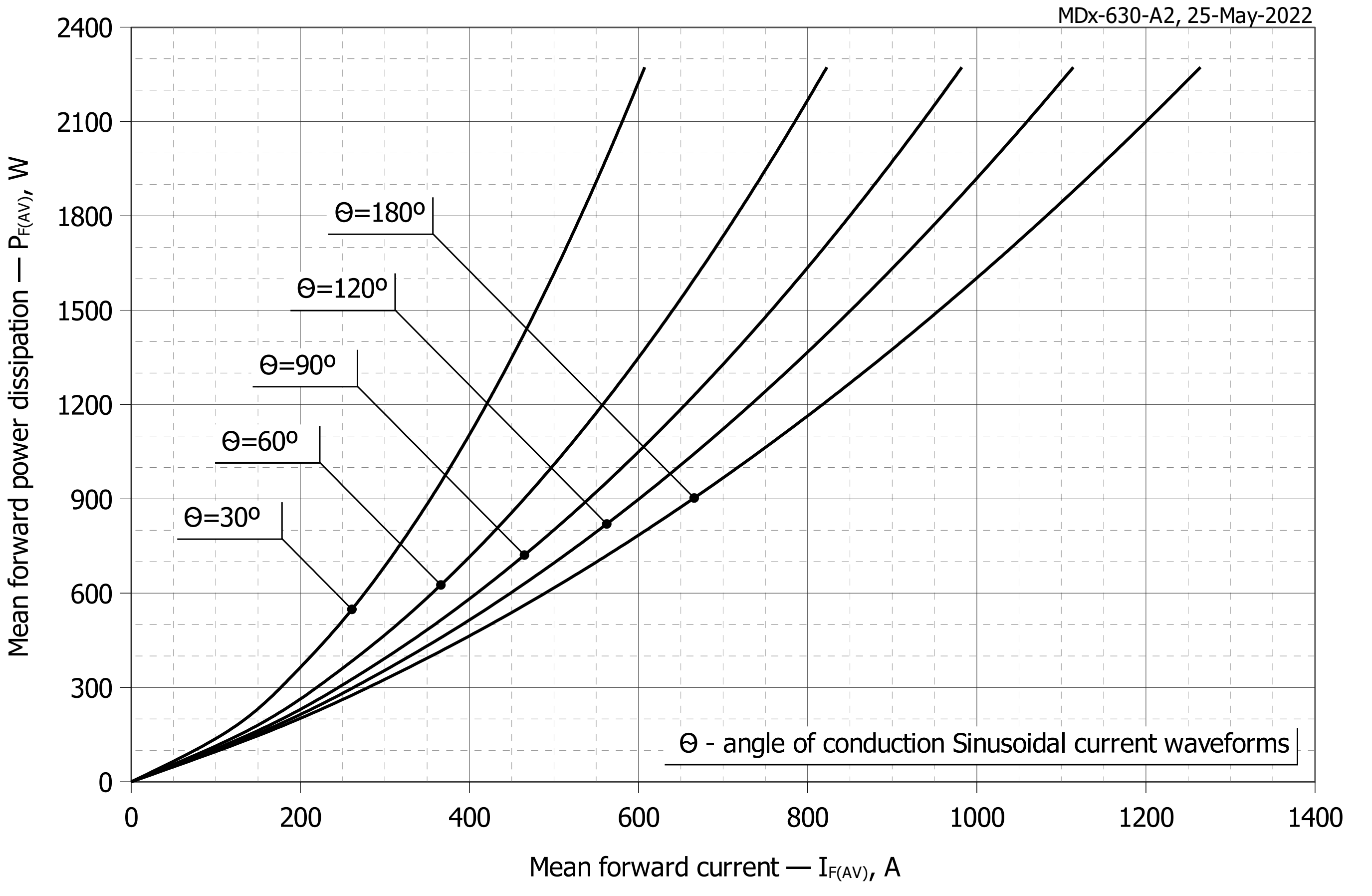


Fig. 7 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles (f=50Hz)

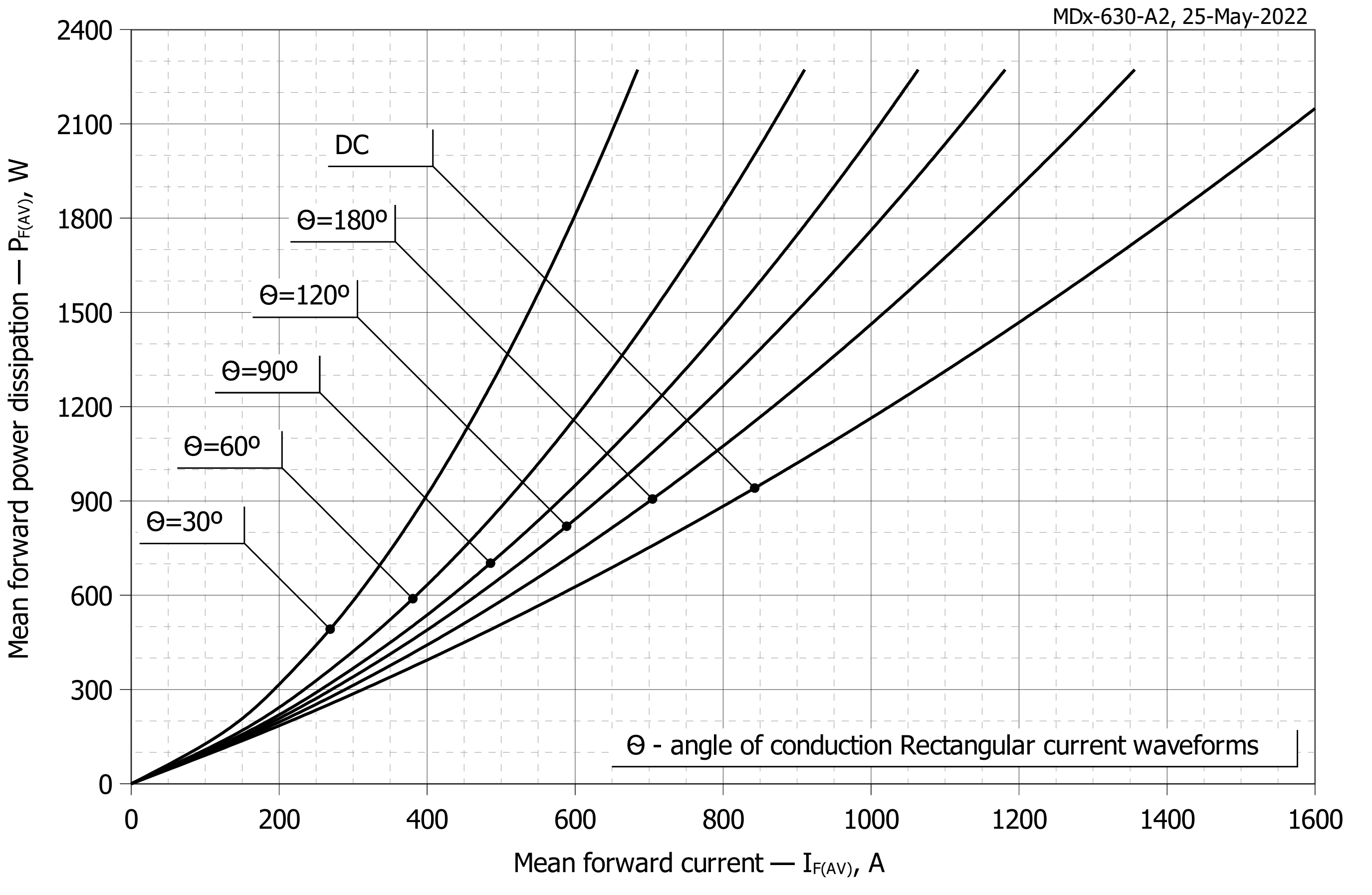


Fig. 8 – Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC (f=50Hz)

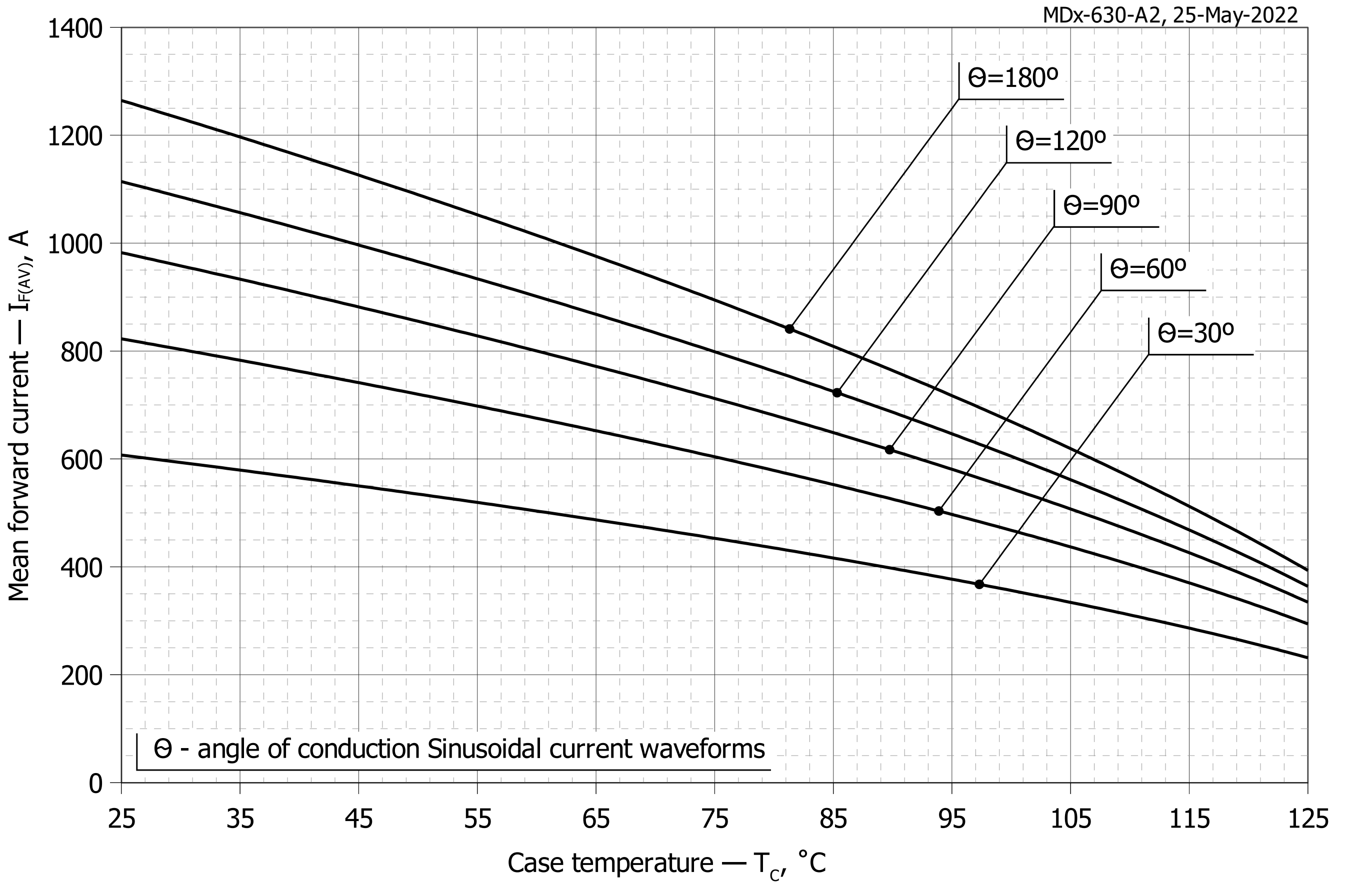


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles (f=50Hz)

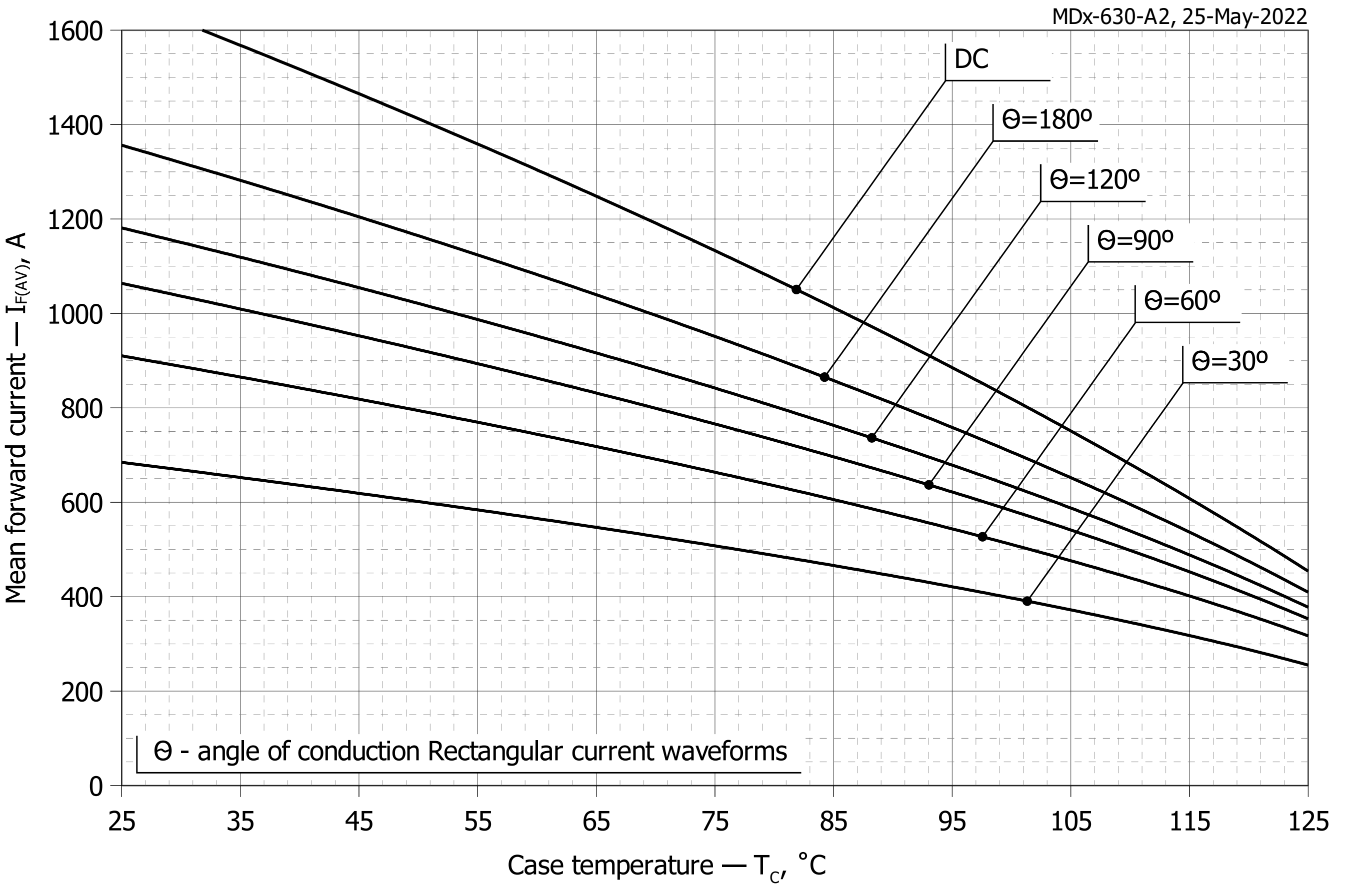


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC (f=50Hz)

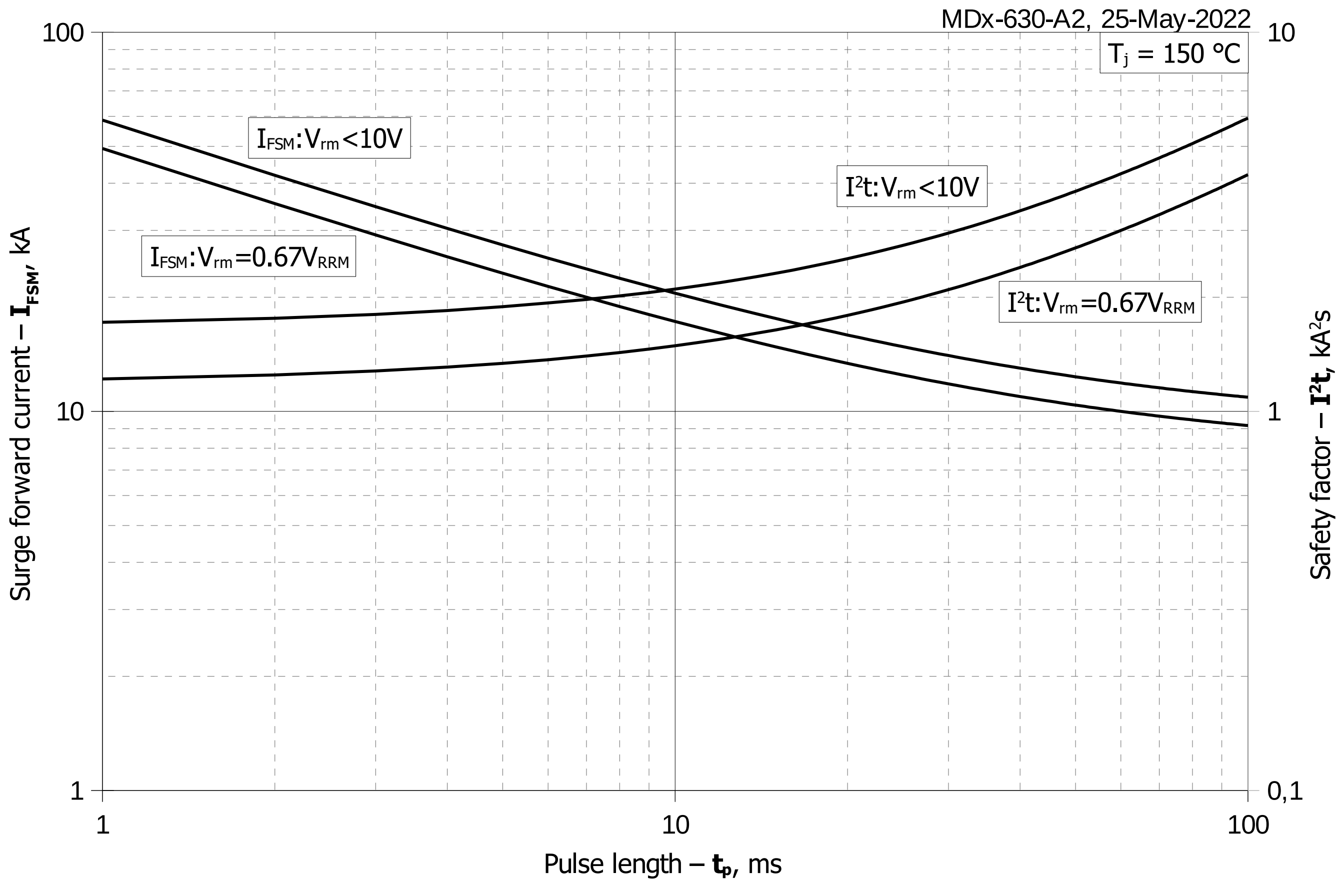


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

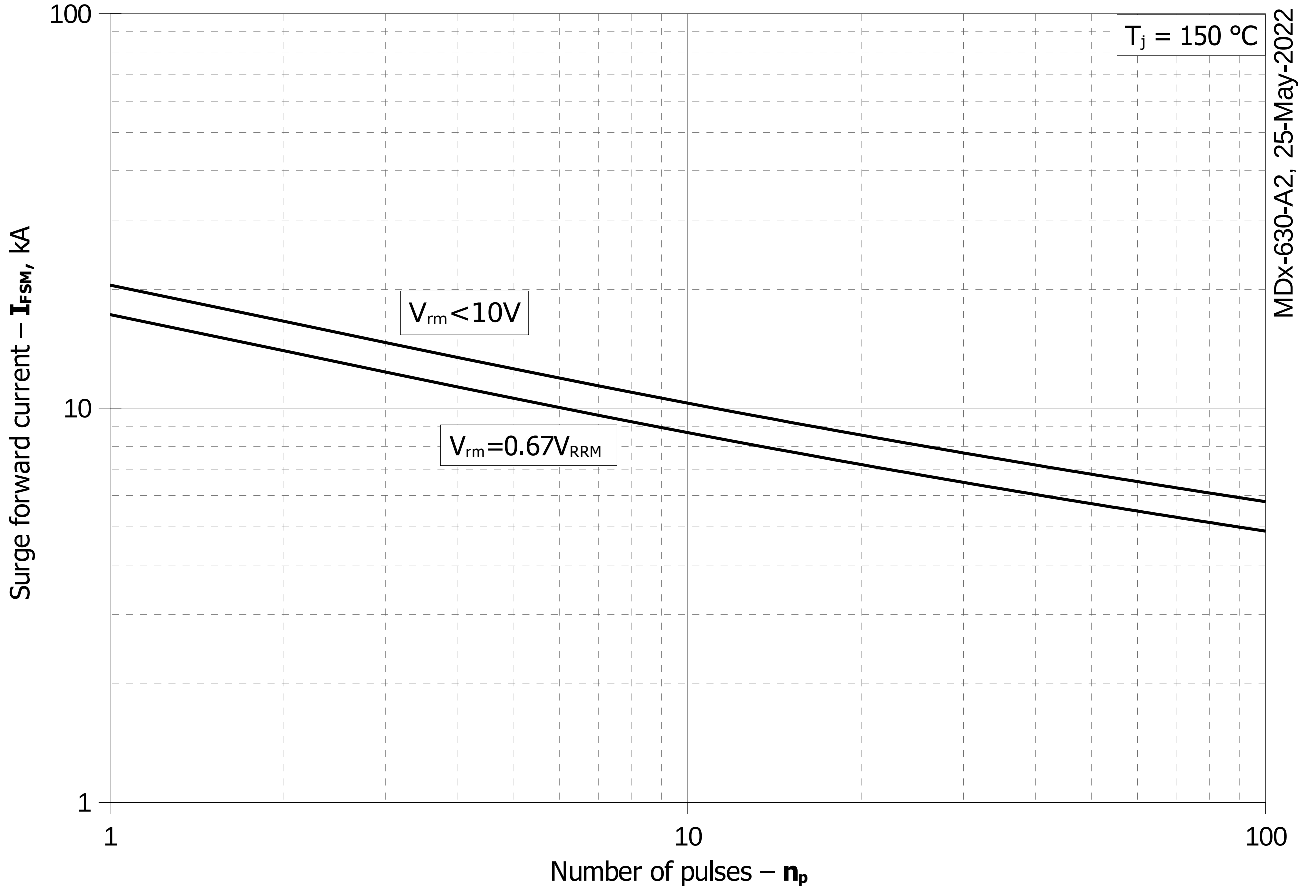


Fig. 12 – Maximum surge forward current I_{FSM} vs. number of pulses n_p