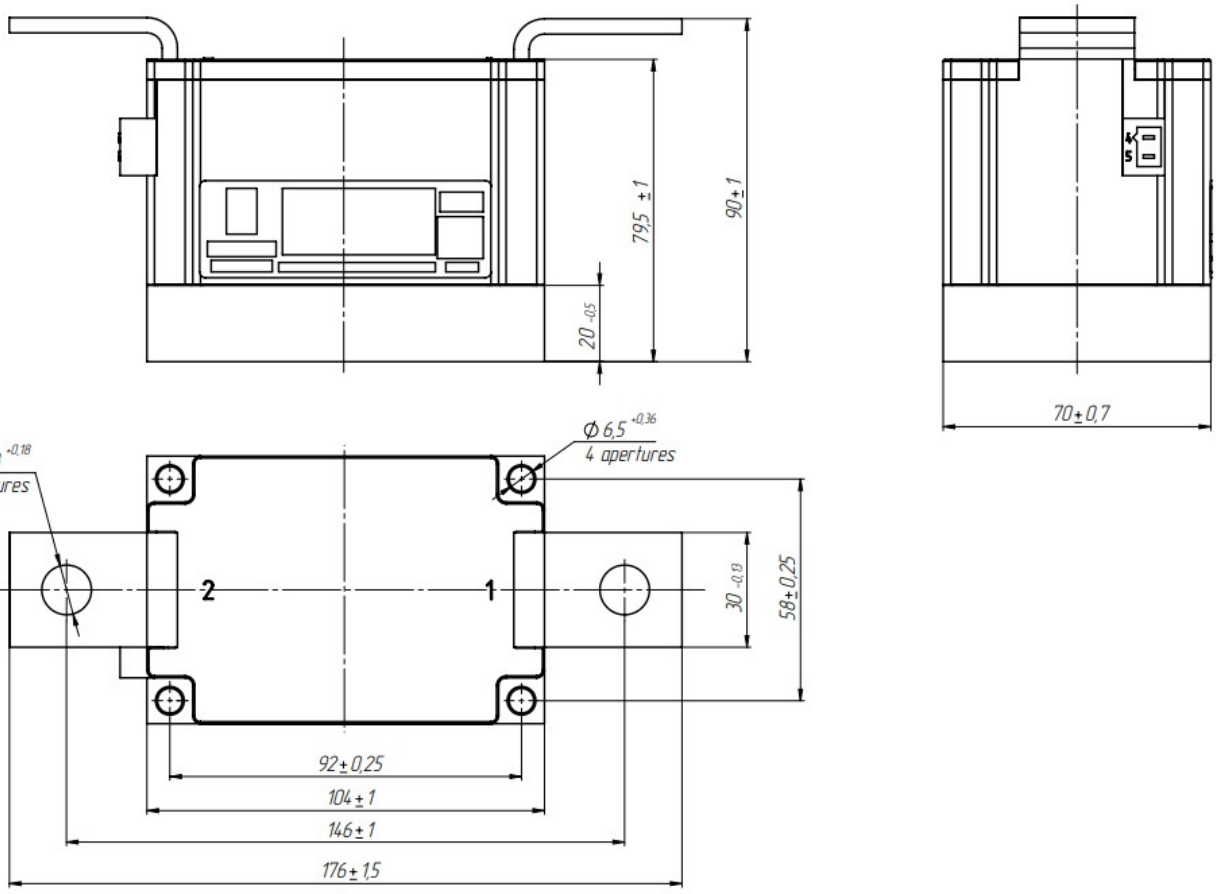
Electrically isolated base plate
Industrial standard package
Simplified mechanical design, rapid assembly
Pressure contact

Single Diode Module For Phase Control MD1-1280-22-E

Average forward current		I_{FAV}	1280 A
Repetitive peak reverse voltage		V_{RRM}	2000...2200 V
V_{RRM}, V	2000		2200
Voltage code	20		22
T_j, °C	–40...+160		

MD1



All dimensions in millimeters

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{FAV}	Maximum allowable average forward current	A	1280 1272	T_c= 99 °C; T_c= 100 °C; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	2010	T_c= 99 °C; 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	45.0 54.0	T_j=$T_{j\,max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V;
			47.0 56.0	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	$A^2s\cdot10^3$	10100 14500	T_j=$T_{j\,max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_R=0 V;
			9100 13000	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...+160		
$T_{c\,op}$	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	1.30	T_j=25 °C; I_{FM}= 3140 A	
$V_{F(TO)}$	Forward threshold voltage, max	V	0.793	T_j=$T_{j\,max}$;	
r_T	Forward slope resistance, max	mΩ	0.124	0.5 π I_{FAV} < I_T < 1.5 π I_{FAV}	
BLOCKING					
I_{RRM}	Repetitive peak reverse current, max	mA	70 4.00	T_j=$T_{j\,max}$ T_j=25 °C	V_R=V_{RRM}
SWITCHING					
Q_{rr}	Total recovered charge, max	µC	4280	T_j=$T_{j\,max}$; I_{FM}=I_{FAV};	
t_{rr}	Reverse recovery time, max	µs	38	di_R/dt=-10 A/µs;	
I_{rr}	Reverse recovery current, max	A	225	V_R=100 V	
THERMAL					
R_{thjc}	Thermal resistance, junction to case				
	per module	°C/W	0.0400	180° half-sine wave, 50 Hz	
R_{thch}	Thermal resistance, case to heatsink				
	per module	°C/W	0.0100		
INSULATION					
V_{ISOL}	Insulation test voltage	kV	3.00	Sine wave, 50 Hz;	t=60 sec
			3.60	RMS	t=1 sec
MECHANICAL					
M_1	Mounting torque (M6)[1)]	Nm	6.00	Tolerance ± 15%	
M_2	Terminal connection torque (M12)[1)]	Nm	18.00	Tolerance ± 10%	
m	Weight, max	g	2750		

PART NUMBERING GUIDE	NOTES
MD 1 - 1280 - 22 - E - 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.E) 6. Ambient Conditions: N – Normal	[1)] The screws must be lubricated

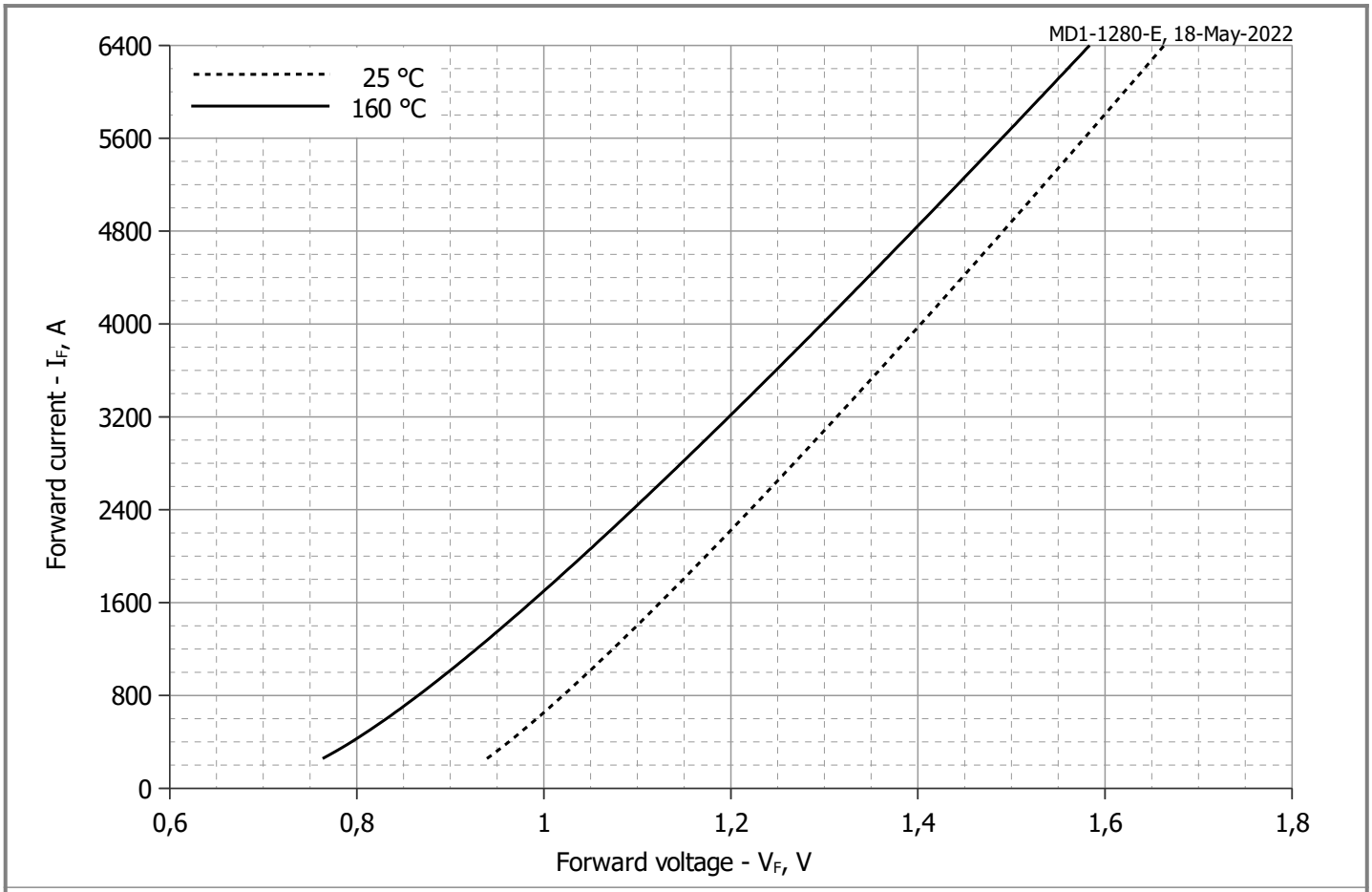


Fig 1 – Forward characteristics of Limit device

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	0.89010834	0.63581424
B	0.00008716	0.00009452
C	-0.00429484	0.00919237
D	0.00316274	0.00327835

Forward characteristic model (see Fig. 1).

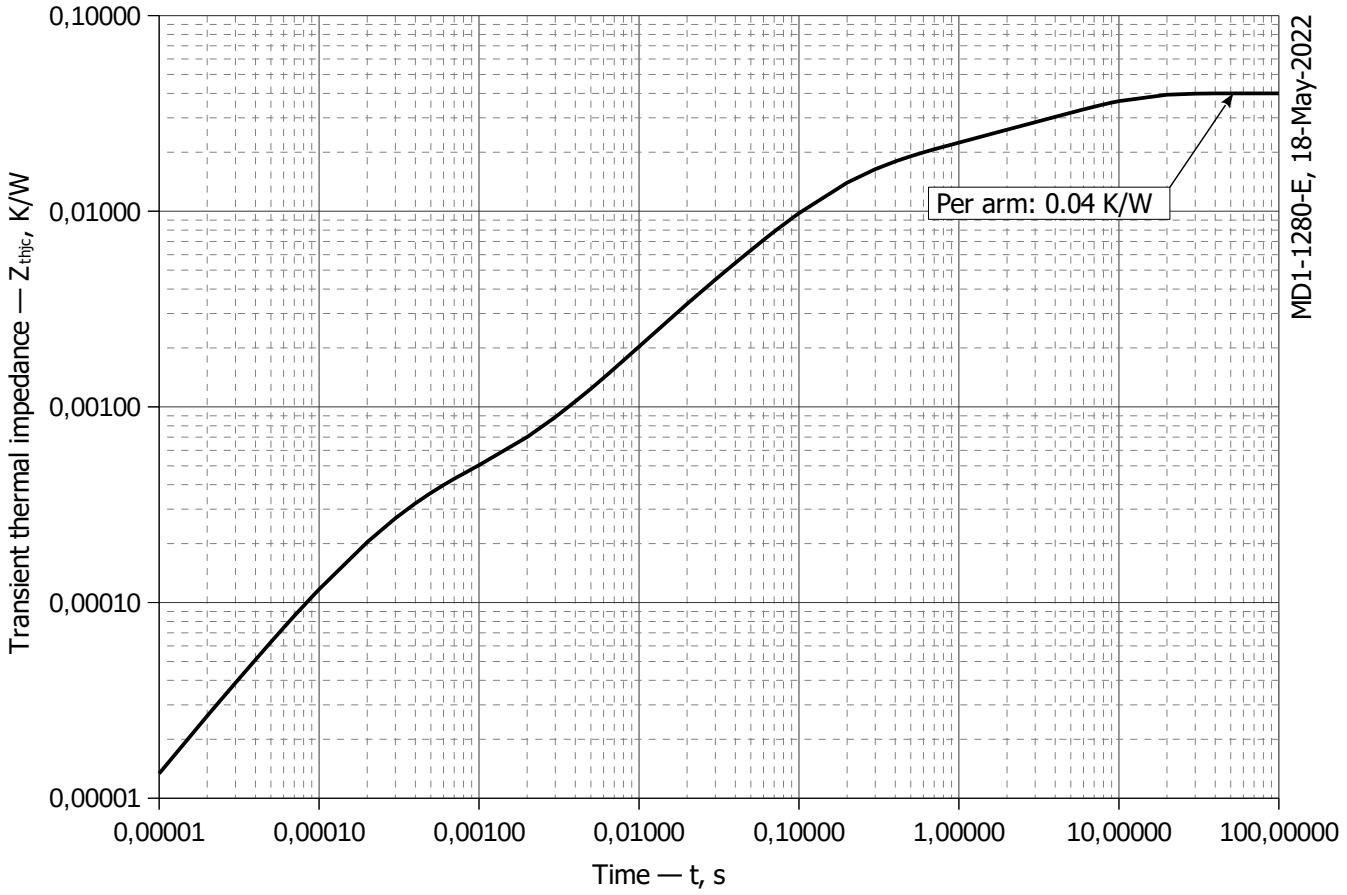


Fig 2 – Transient thermal impedance

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.

t_i = Time constatnt of r_{th} term.

DC Double side cooled

i	1	2	3	4	5	6
R_i, K/W	0.0189958	0.005931	0.009502	0.004252	0.001006	0.0003132
t_i, s	5.887	0.7389	0.1616	0.08215	0.01267	0.0002712

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

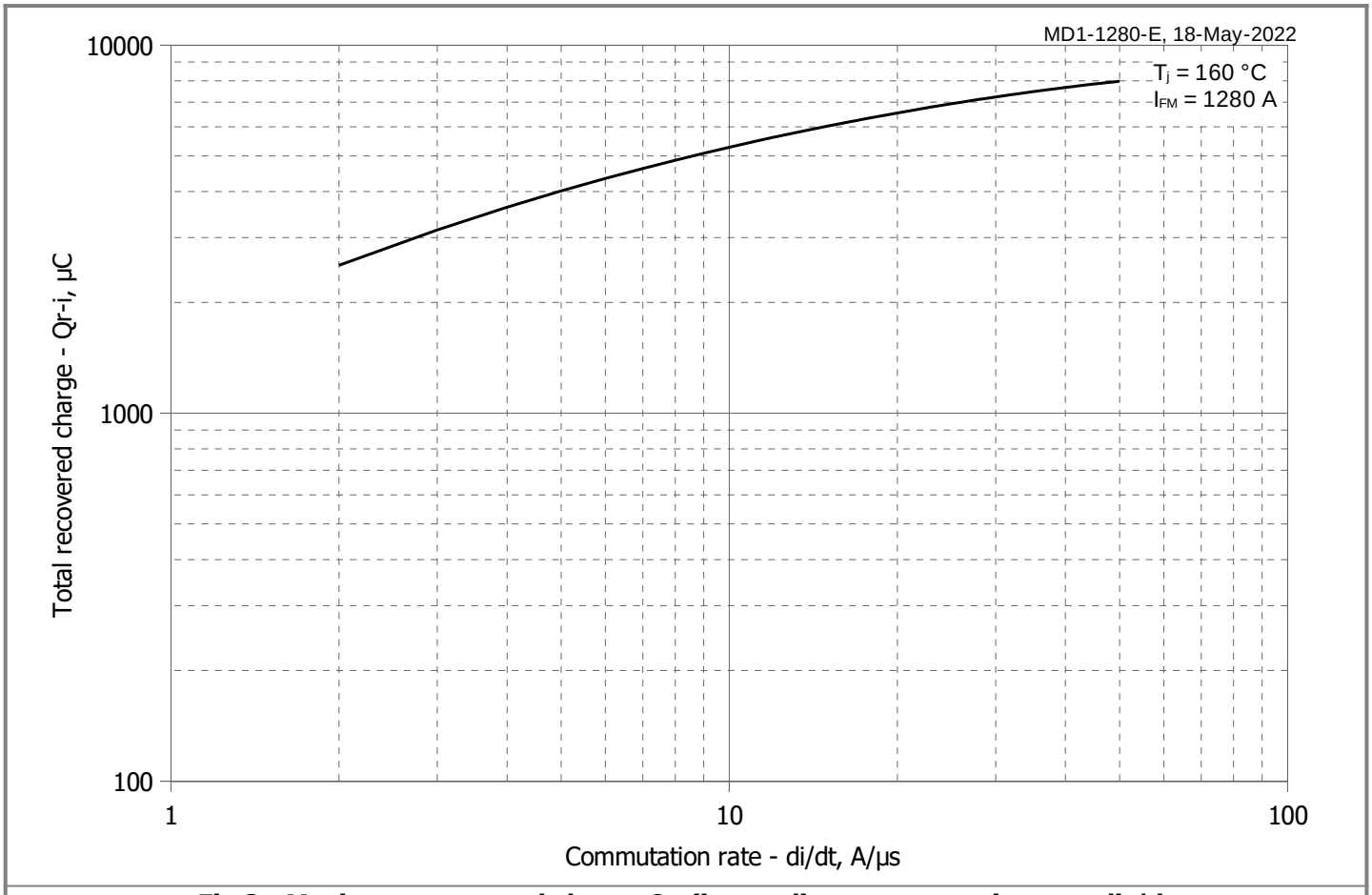


Fig 3 - Maximum recovered charge $Q_{r\text{-}i}$ (integral) vs. commutation rate di_R/dt

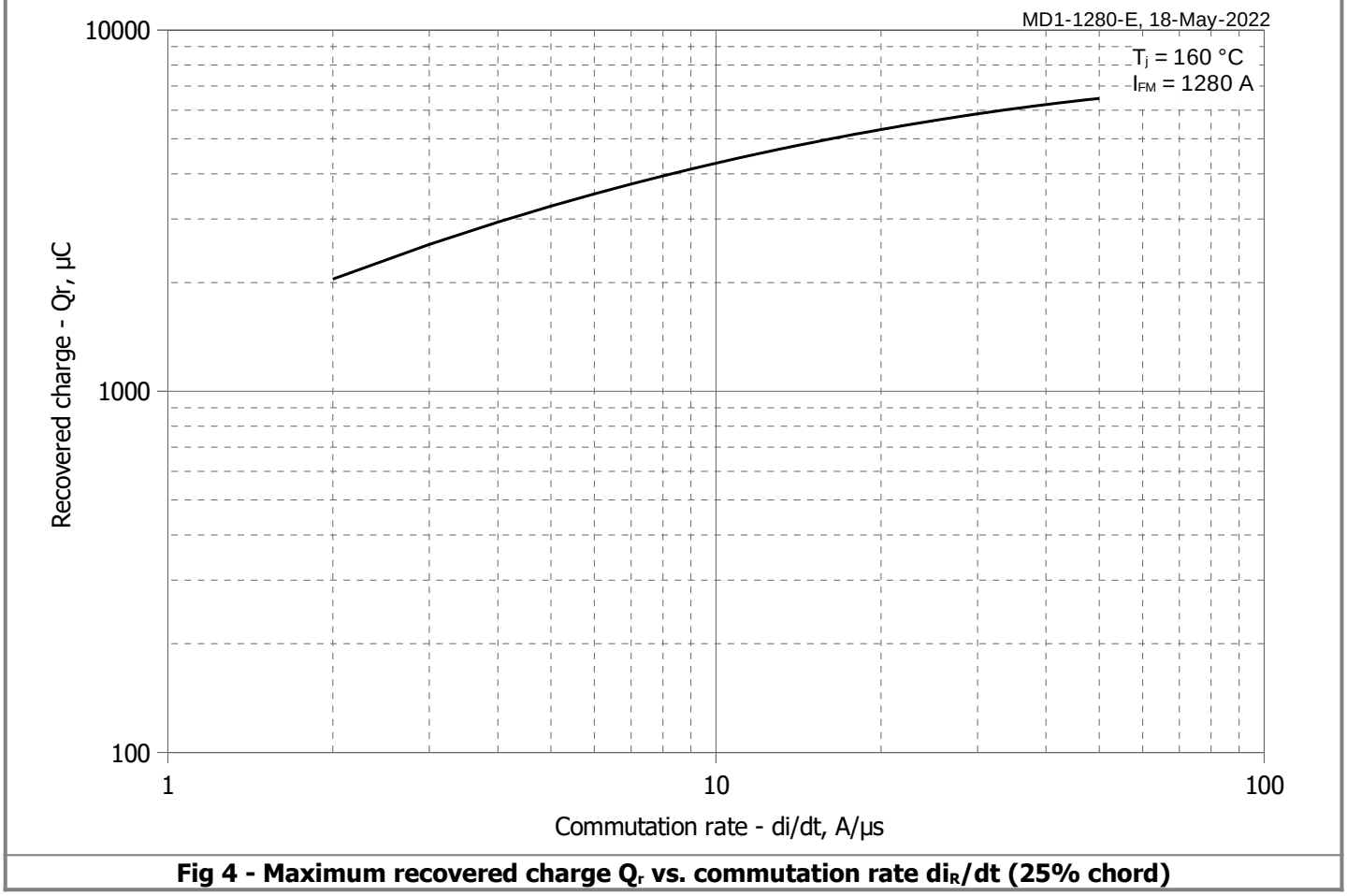


Fig 4 - Maximum recovered charge Q_r vs. commutation rate di_R/dt (25% chord)

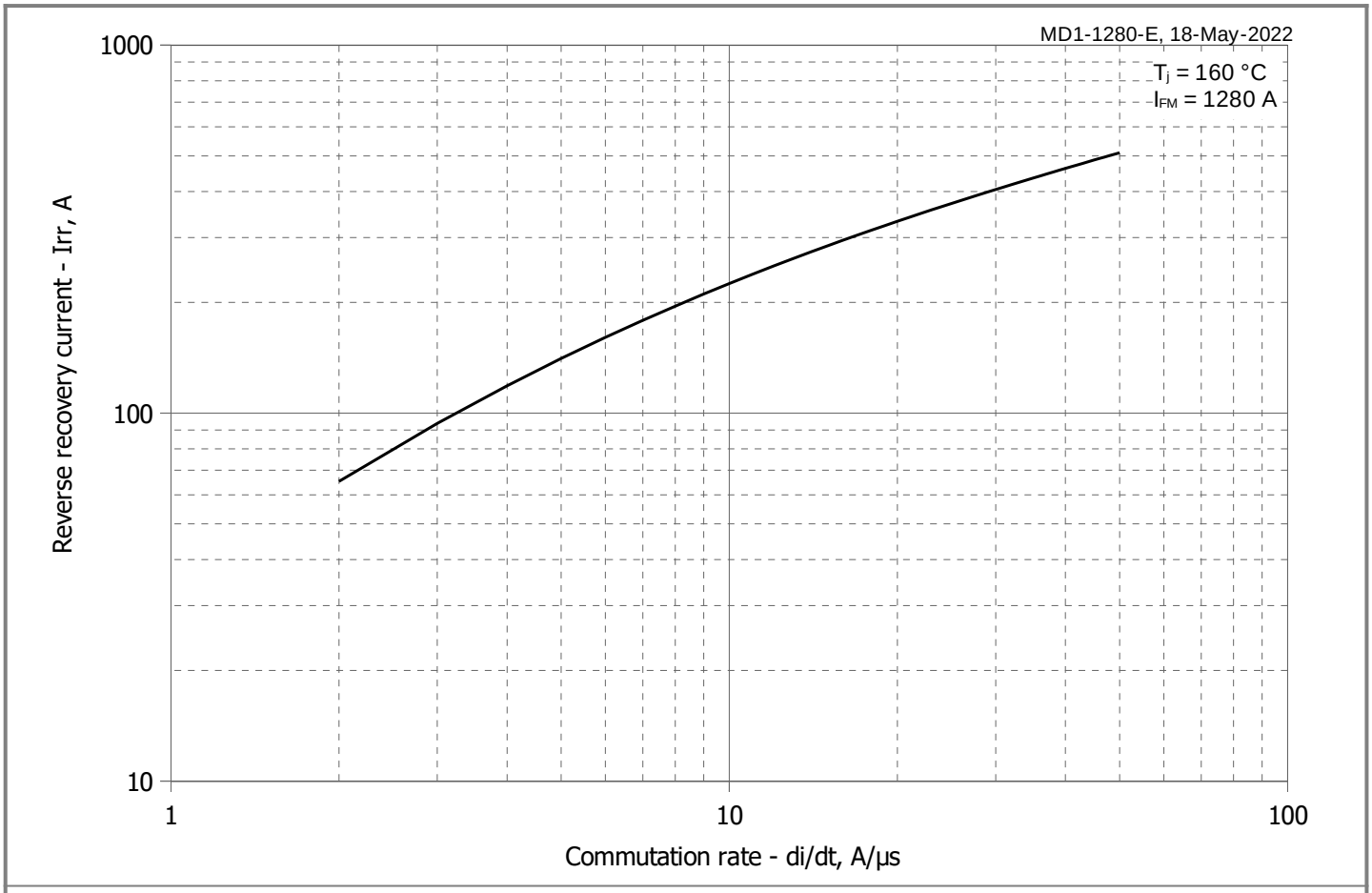


Fig 5 - Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

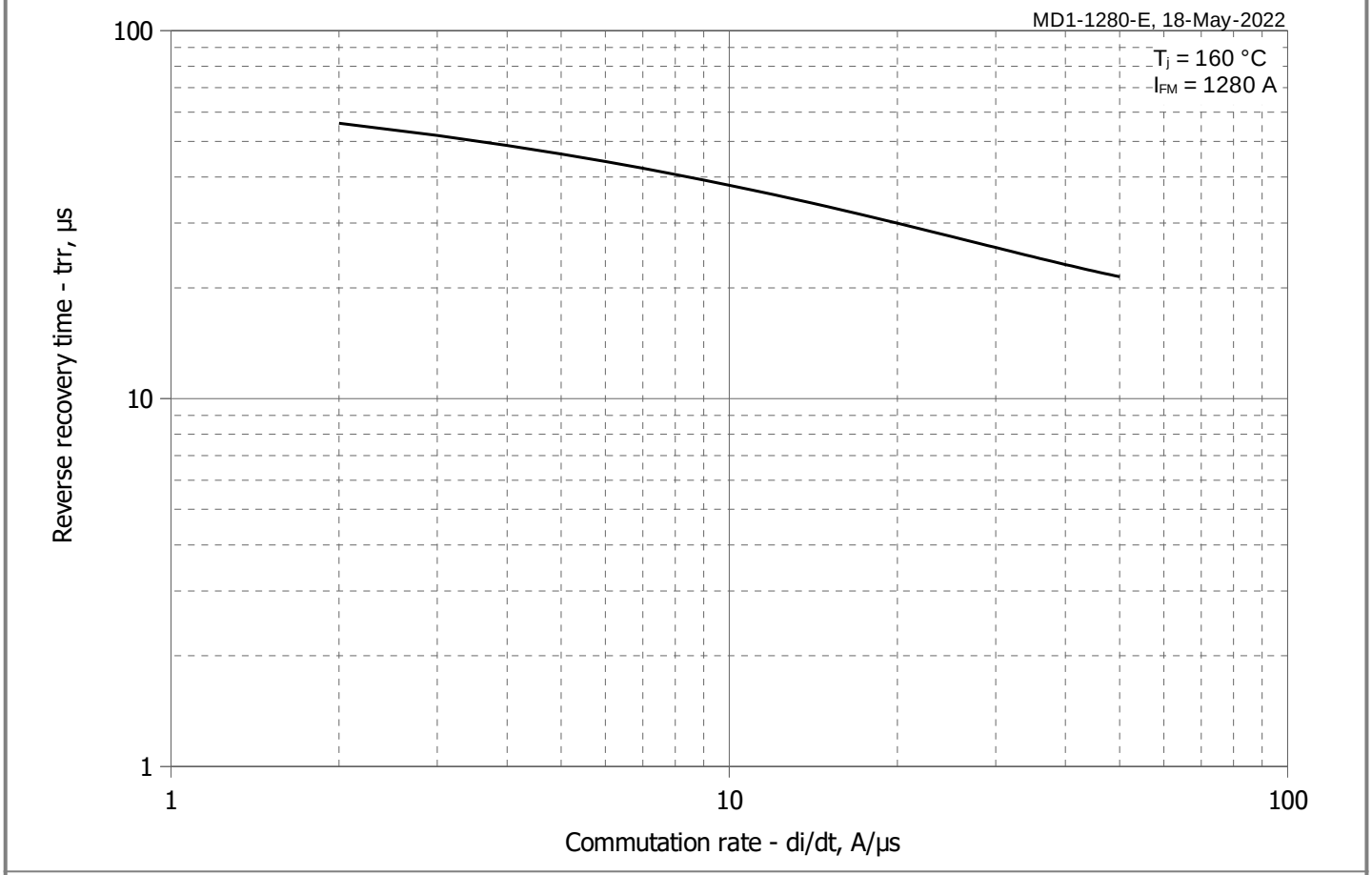


Fig 6 - Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

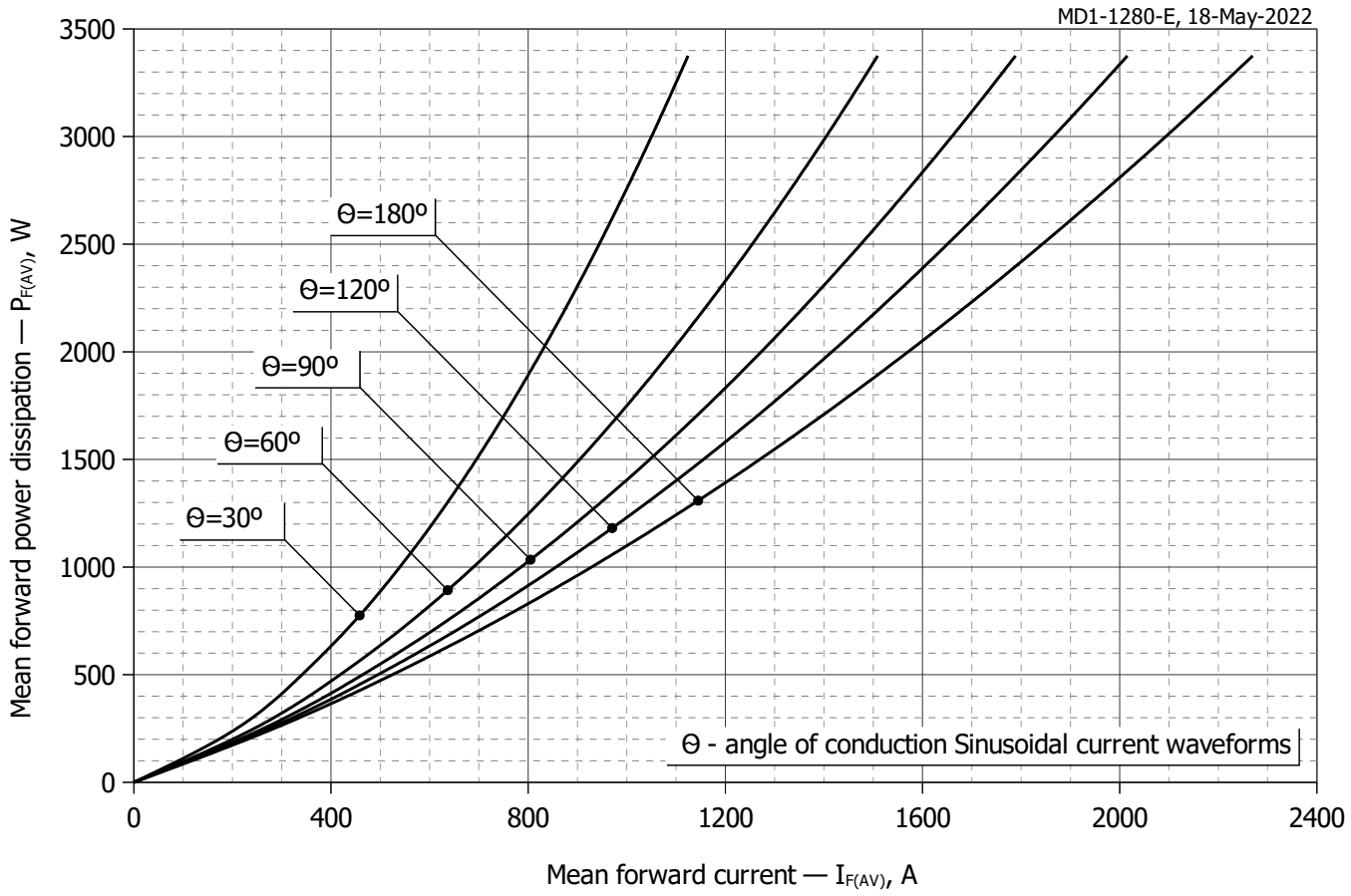


Fig. 7 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles (f=50Hz)

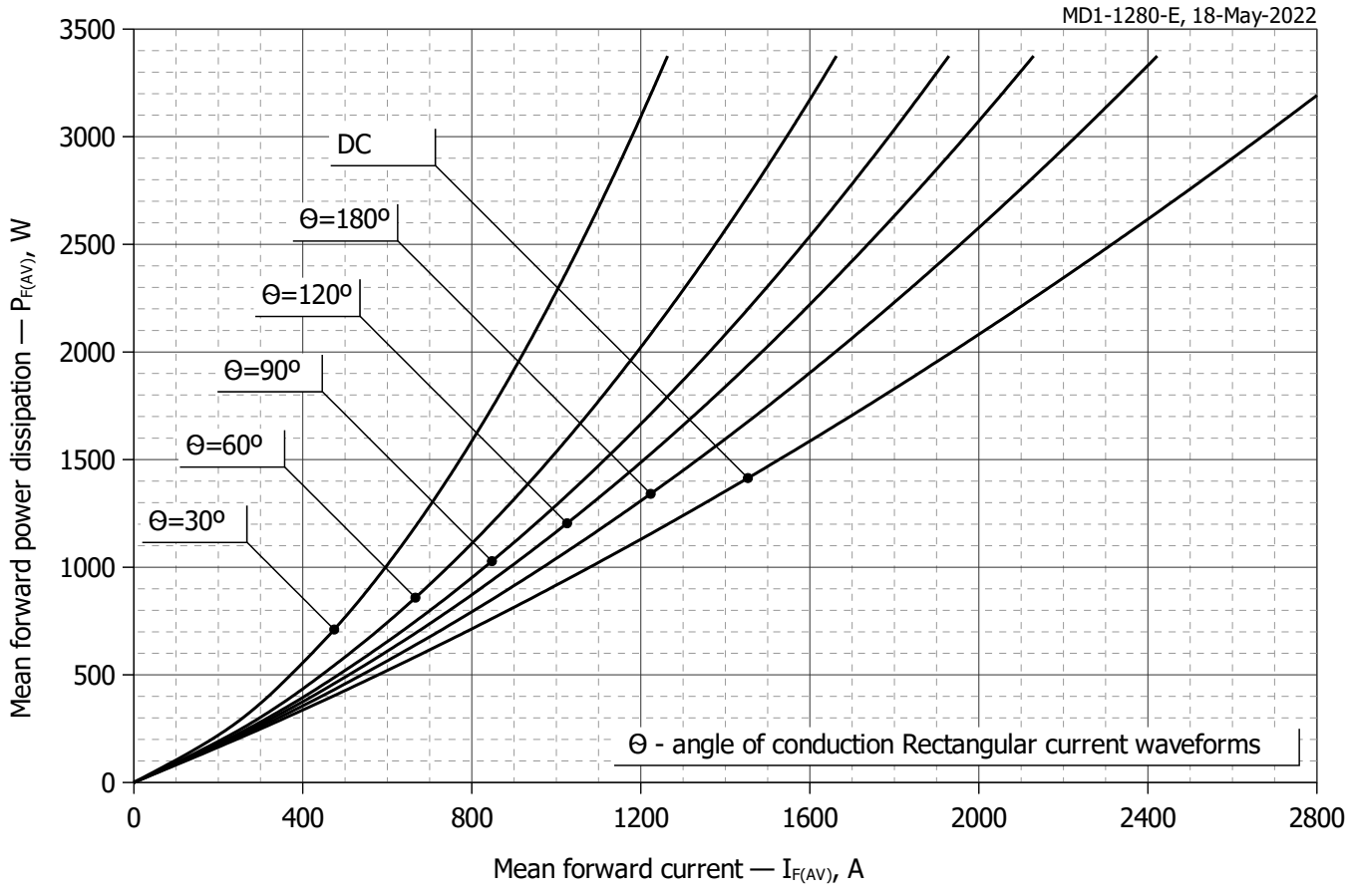


Fig. 8 – Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC (f=50Hz)

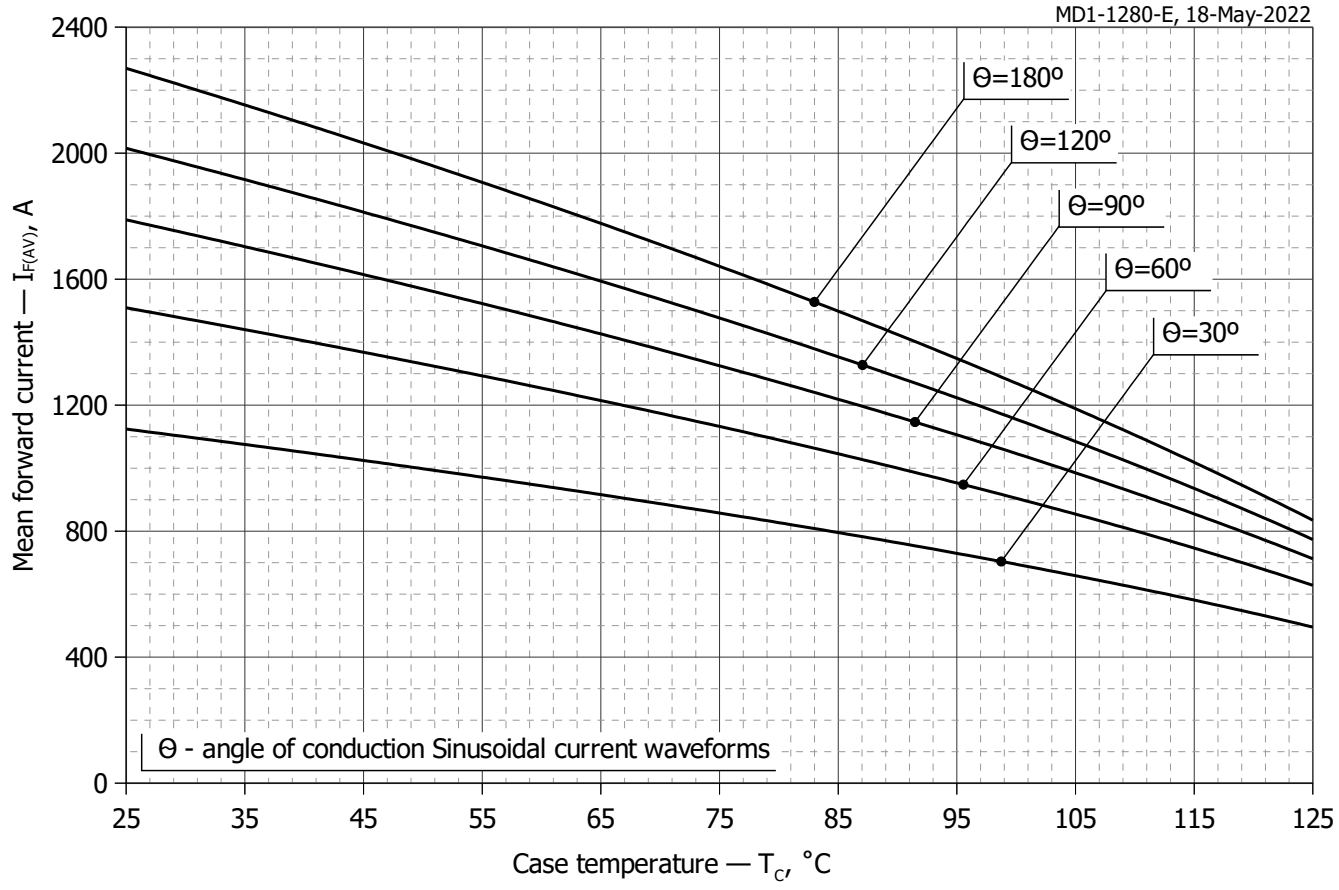


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles (f=50Hz)

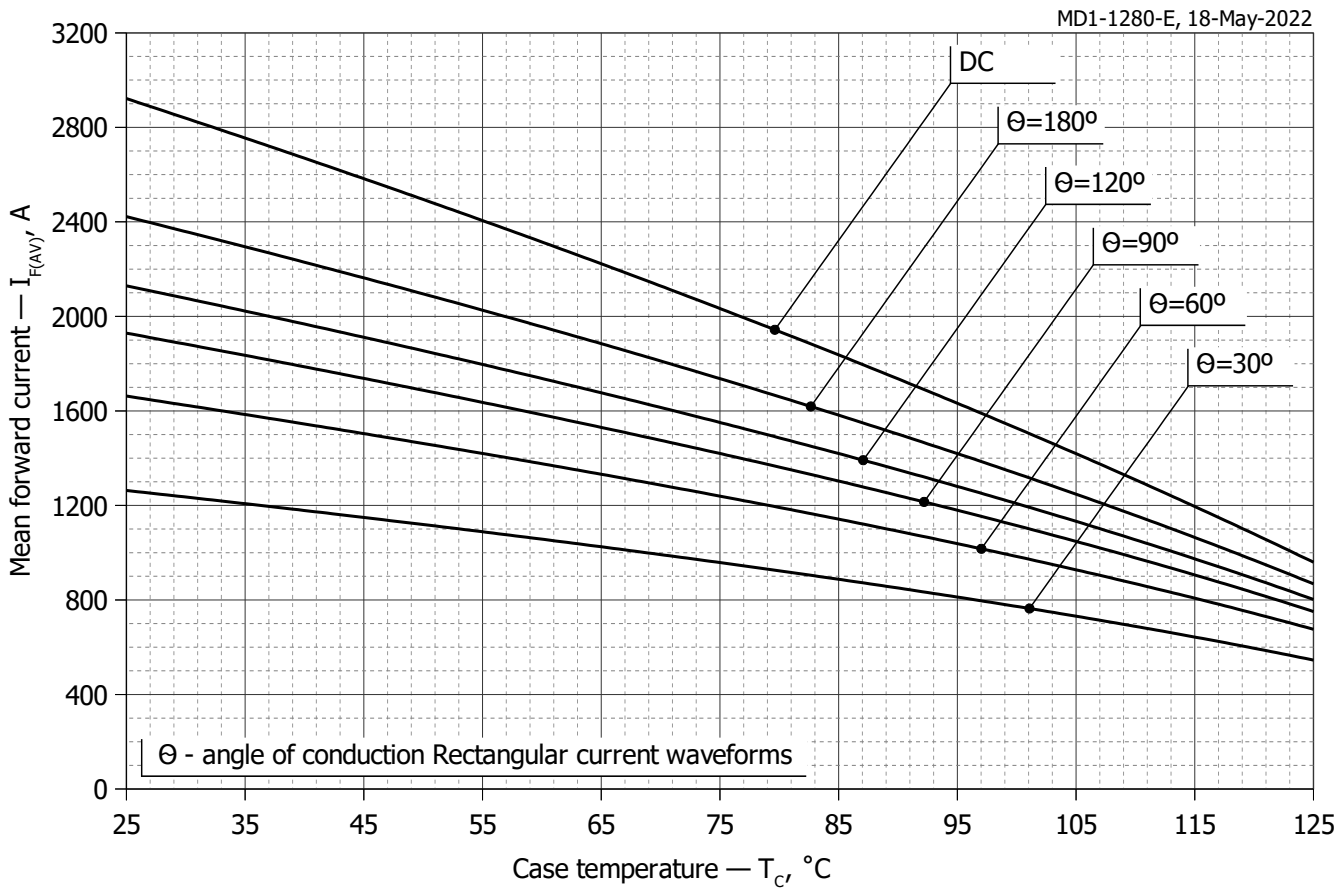


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC (f=50Hz)

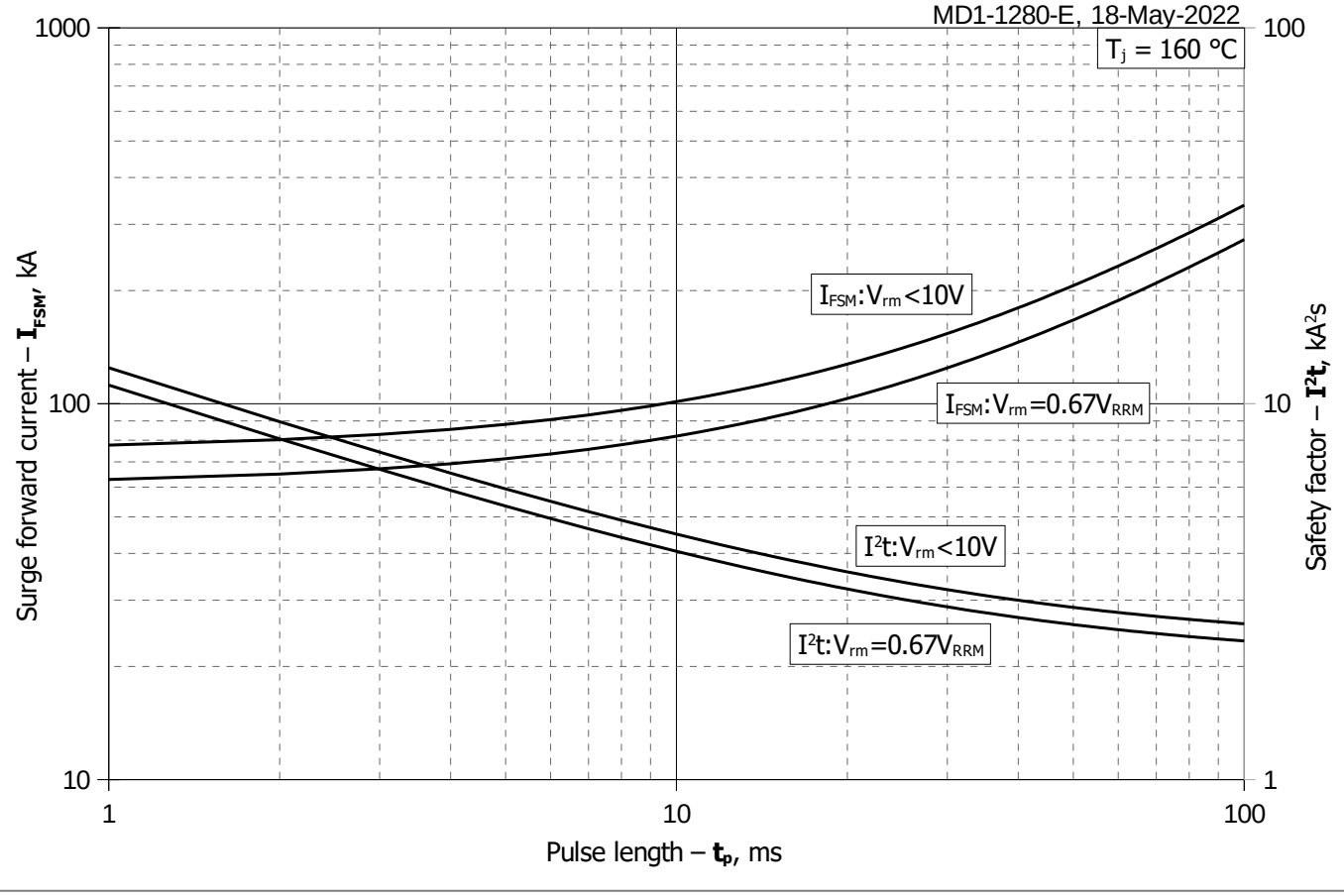


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

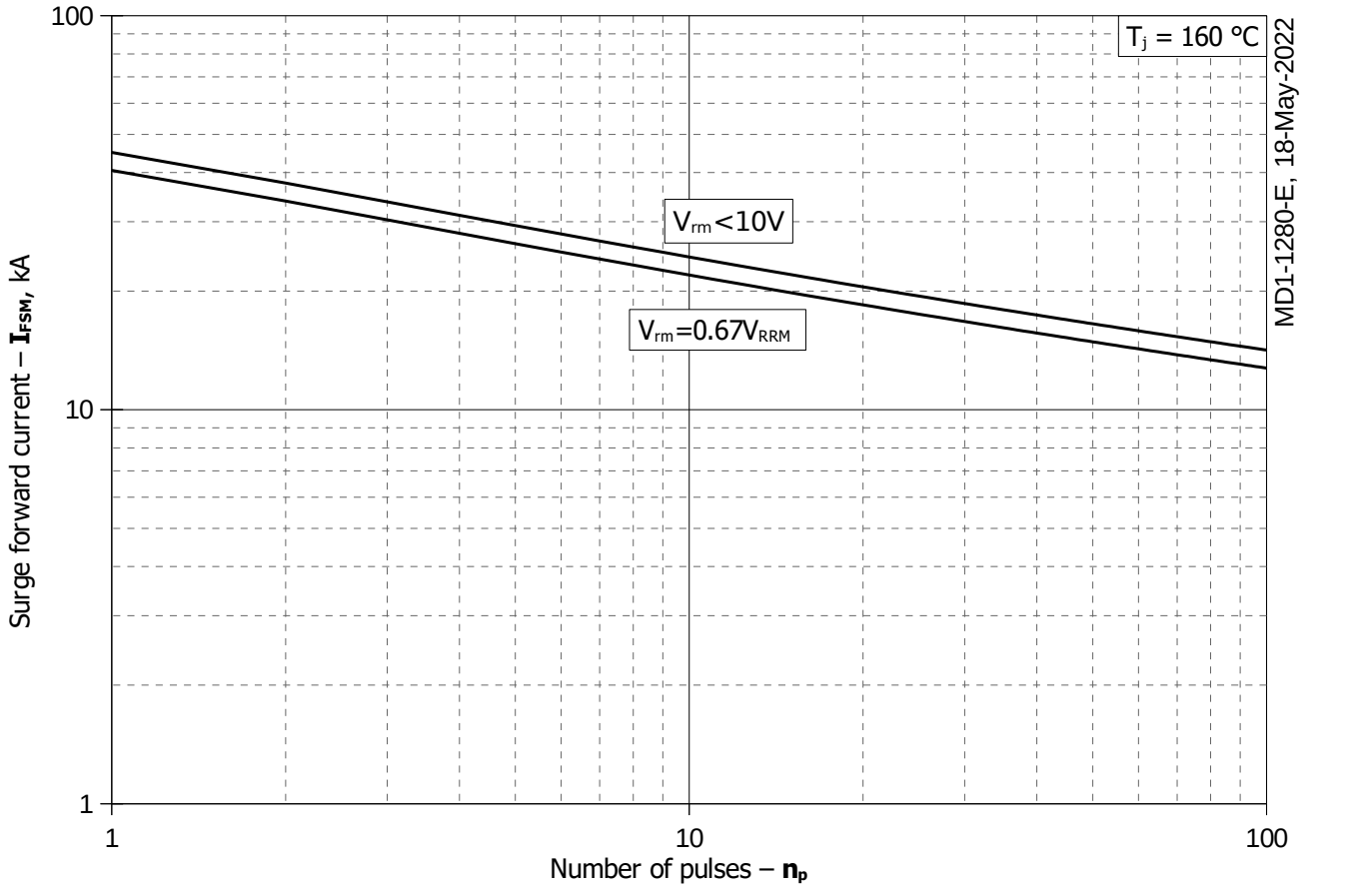


Fig. 12 – Maximum surge forward current I_{FSM} vs. number of pulses n_p