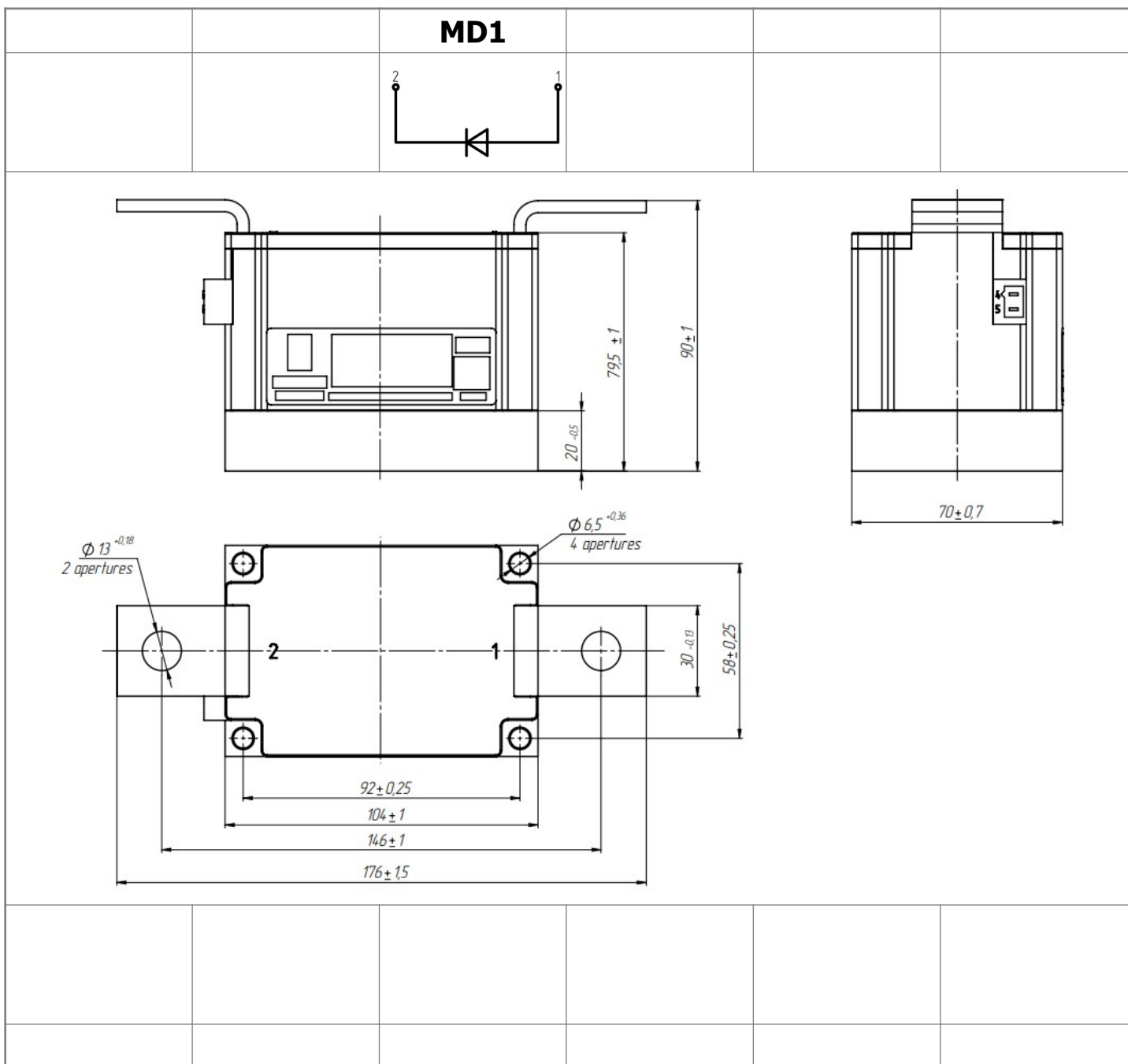




Electrically isolated base plate
Industrial standard package
Simplified mechanical design, rapid assembly
Pressure contact

Single Diode Module
For Phase Control
MD1-1250-28-E

Average forward current			I_{FAV}	1250 A	
Repetitive peak reverse voltage			V_{RRM}	2000...2800 V	
V_{RRM}, V	2000	2200	2400	2600	2800
Voltage code	20	22	24	26	28
$T_j, ^\circ C$	-40...+160				



All dimensions in millimeters

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{FAV}	Maximum allowable average forward current	A	1250 1133	$T_c=91\text{ }^{\circ}\text{C}$; $T_c=100\text{ }^{\circ}\text{C}$; 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	1962	$T_c=91\text{ }^{\circ}\text{C}$; 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	40.0 48.0	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^{\circ}\text{C}$	180° half-sine wave; $t_p=10\text{ ms}$; single pulse; $V_R=0\text{ V}$;
			42.0 50.0	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^{\circ}\text{C}$	180° half-sine wave; $t_p=8.3\text{ ms}$; single pulse; $V_R=0\text{ V}$;
I^2t	Safety factor	$\text{A}^2\text{s}\cdot 10^3$	8000 11500	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^{\circ}\text{C}$	180° half-sine wave; $t_p=10\text{ ms}$; single pulse; $V_R=0\text{ V}$;
			7300 10300	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^{\circ}\text{C}$	180° half-sine wave; $t_p=8.3\text{ ms}$; single pulse; $V_R=0\text{ V}$;
BLOCKING					
V_{RRM}	Repetitive peak reverse voltages	V	2000...2800	$T_{j\text{ min}}<T_j<T_{j\text{ max}}$; 180° half-sine wave; 50 Hz;	
V_{RSM}	Non-repetitive peak reverse voltages	V	2100...2900	$T_{j\text{ min}}<T_j<T_{j\text{ max}}$; 180° half-sine wave; single pulse;	
V_R	Reverse continuous voltages	V	$0.6V_{RRM}$	$T_j=T_{j\text{ max}}$;	
THERMAL					
T_{stg}	Storage temperature	$^{\circ}\text{C}$	−40...+50		
T_j	Operating junction temperature	$^{\circ}\text{C}$	−40...+160		
$T_{\text{c op}}$	Operating temperature	$^{\circ}\text{C}$	−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	1.38	T _j =25 °C; I _{FM} = 3140 A	
V _{F(TO)}	Forward threshold voltage, max	V	0.803	T _j =T _{j max} ; 0.5 π I _{FAV} < I _T < 1.5 π I _{FAV}	
r _T	Forward slope resistance, max	mΩ	0.187		
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}	Recovered charge, max	μC	5620	T _j =T _{j max} ; I _{FM} =I _{FAV} ; dI _{FM} /dt=-10 A/μs; V _R =100 V	
t _{rr}	Reverse recovery time, max	μs	48		
I _{rr}	Reverse recovery current, max	A	234		
THERMAL					
R _{thjc}	Thermal resistance, junction to case			180° half-sine wave, 50 Hz	
	per module	°C/W	0.0400		
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; 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 (M12) ¹⁾	Nm	18.00	Tolerance ± 10%	
m	Weight, max	g	2750		

PART NUMBERING GUIDE										NOTES
MD	1	-	1250	-	28	-	E	-	N	1) The screws must be lubricated
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										

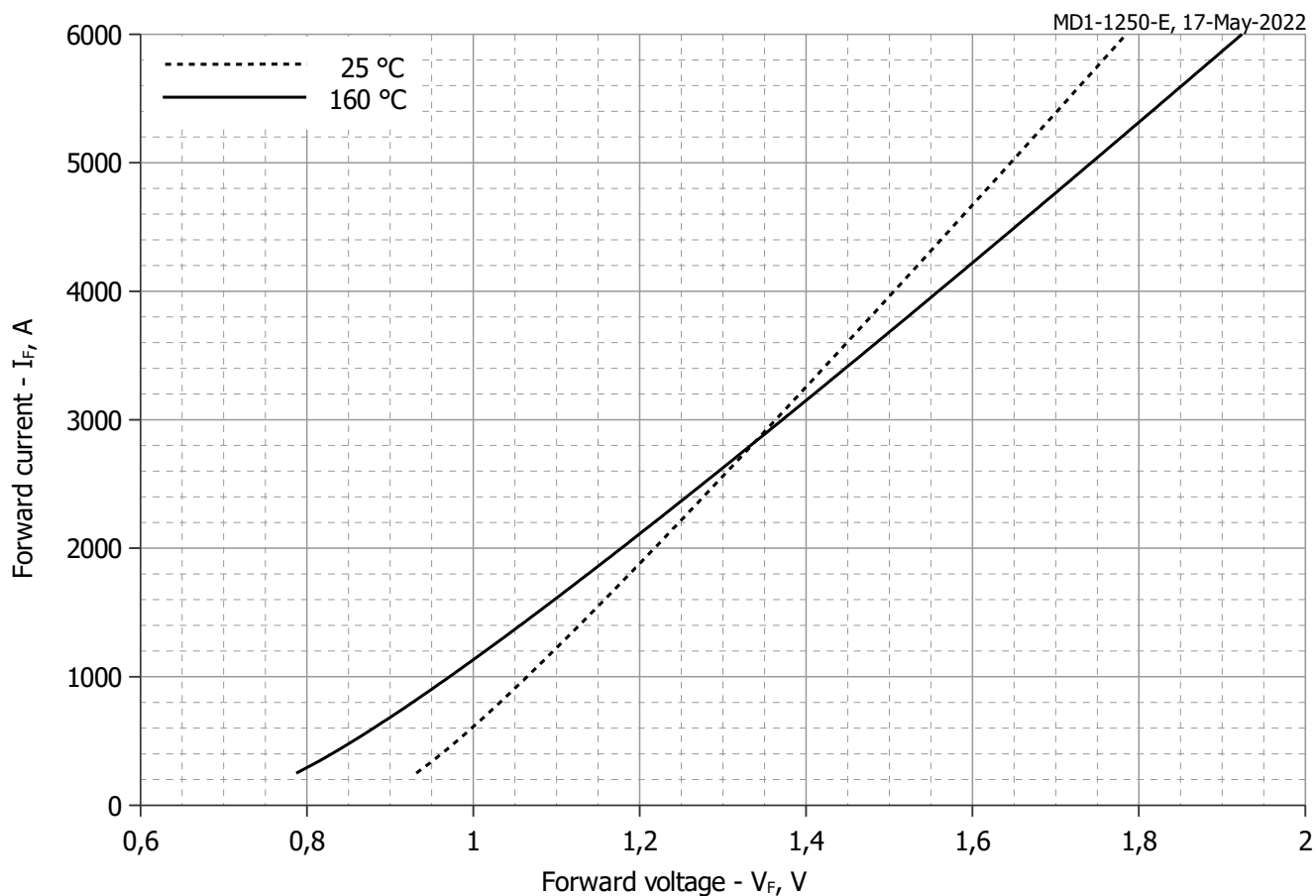


Fig 1 – Forward characteristics of Limit device

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	
	$T_j = 25^\circ\text{C}$	$T_j = T_{j\text{ max}}$
A	0.81011790	0.62566890
B	0.00012818	0.00015912
C	0.01261474	0.01380854
D	0.00123635	0.00288304

Forward characteristic model (see Fig. 1).

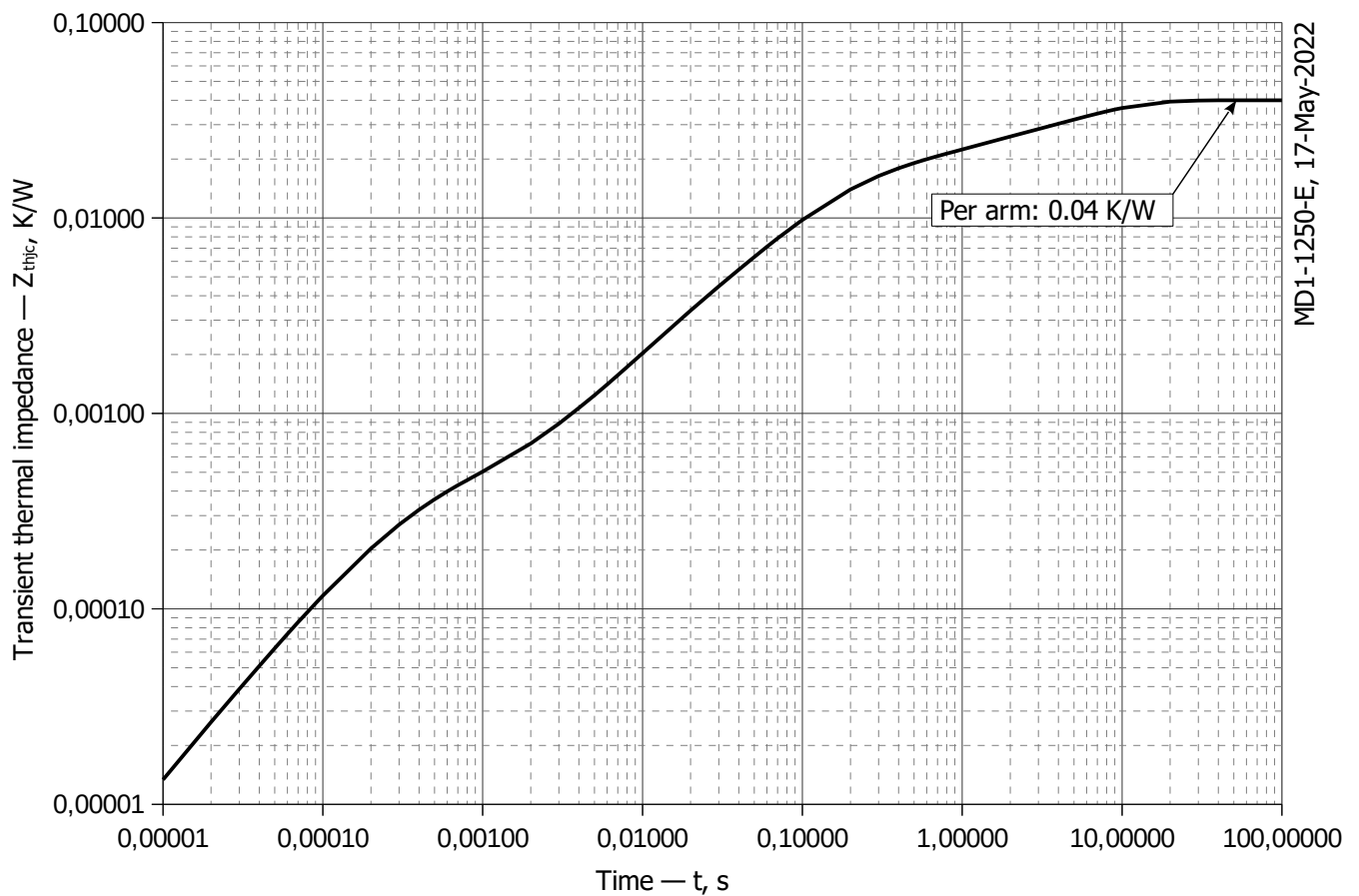


Fig 2 – Transient thermal impedance

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.

τ_i = Time constant 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
τ_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)

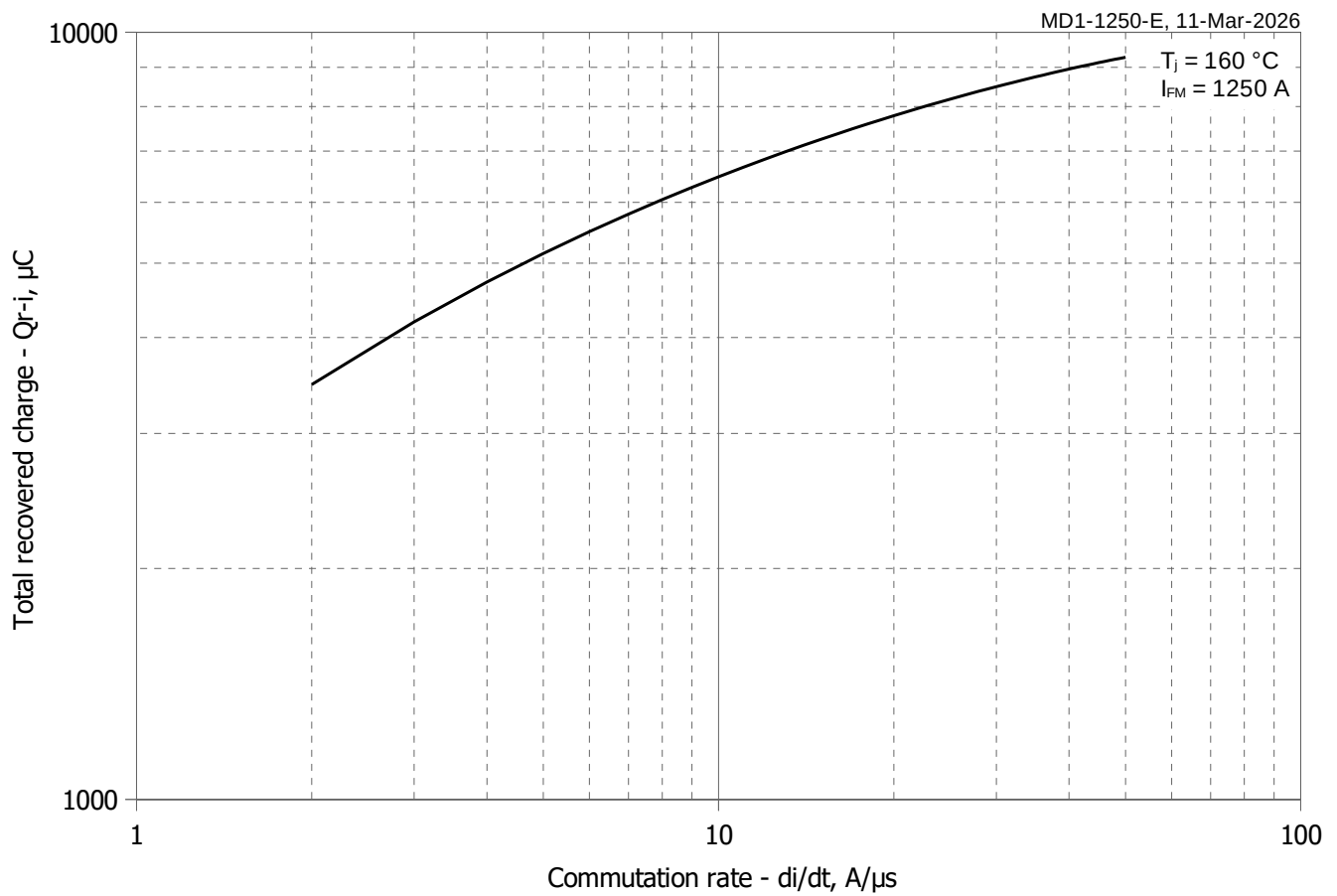


Fig 3 - Maximum recovered charge Q_{r-i} (integral) vs. commutation rate di_R/dt

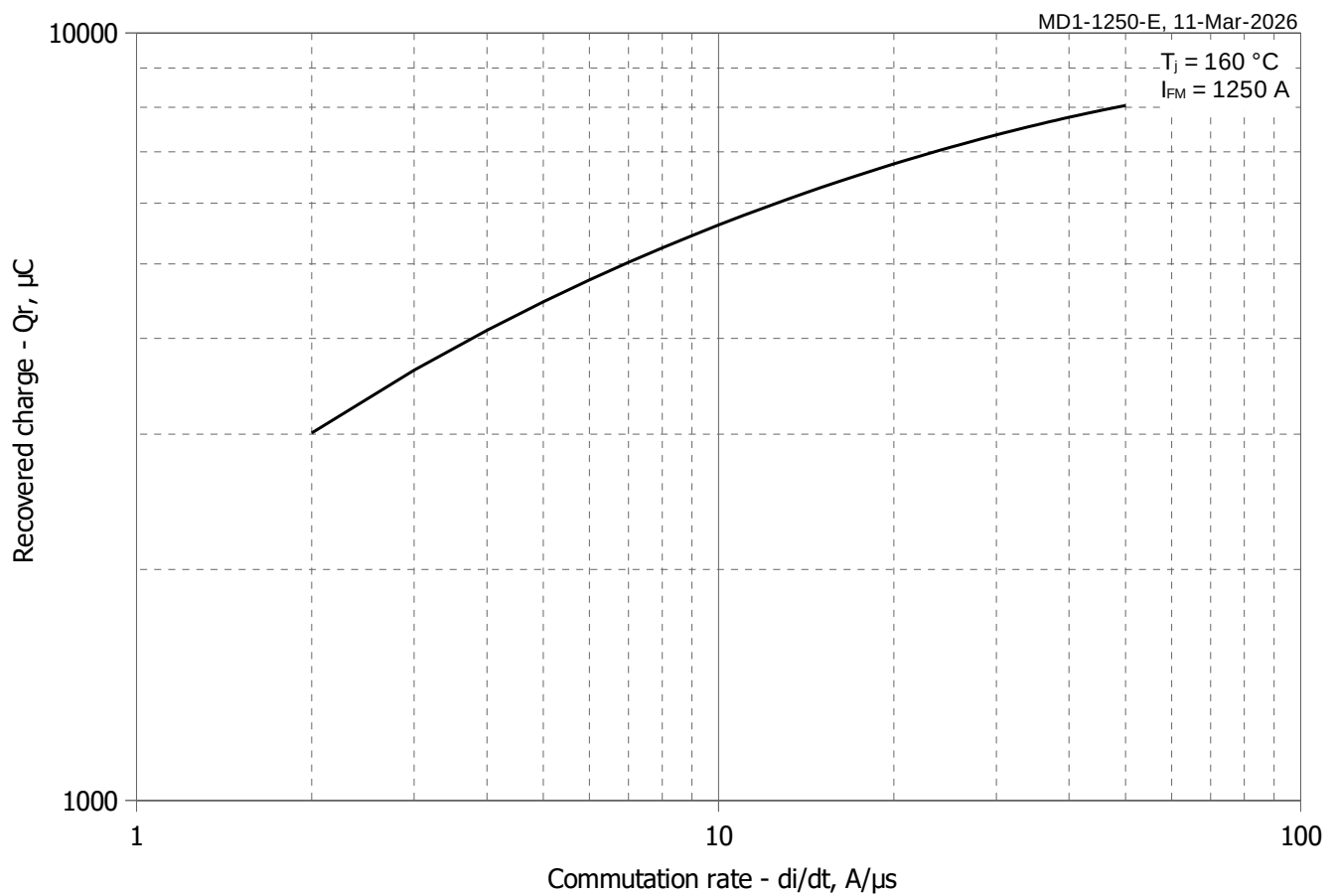


Fig 4 - Maximum recovered charge Q_r vs. commutation rate di_R/dt (25% chord)

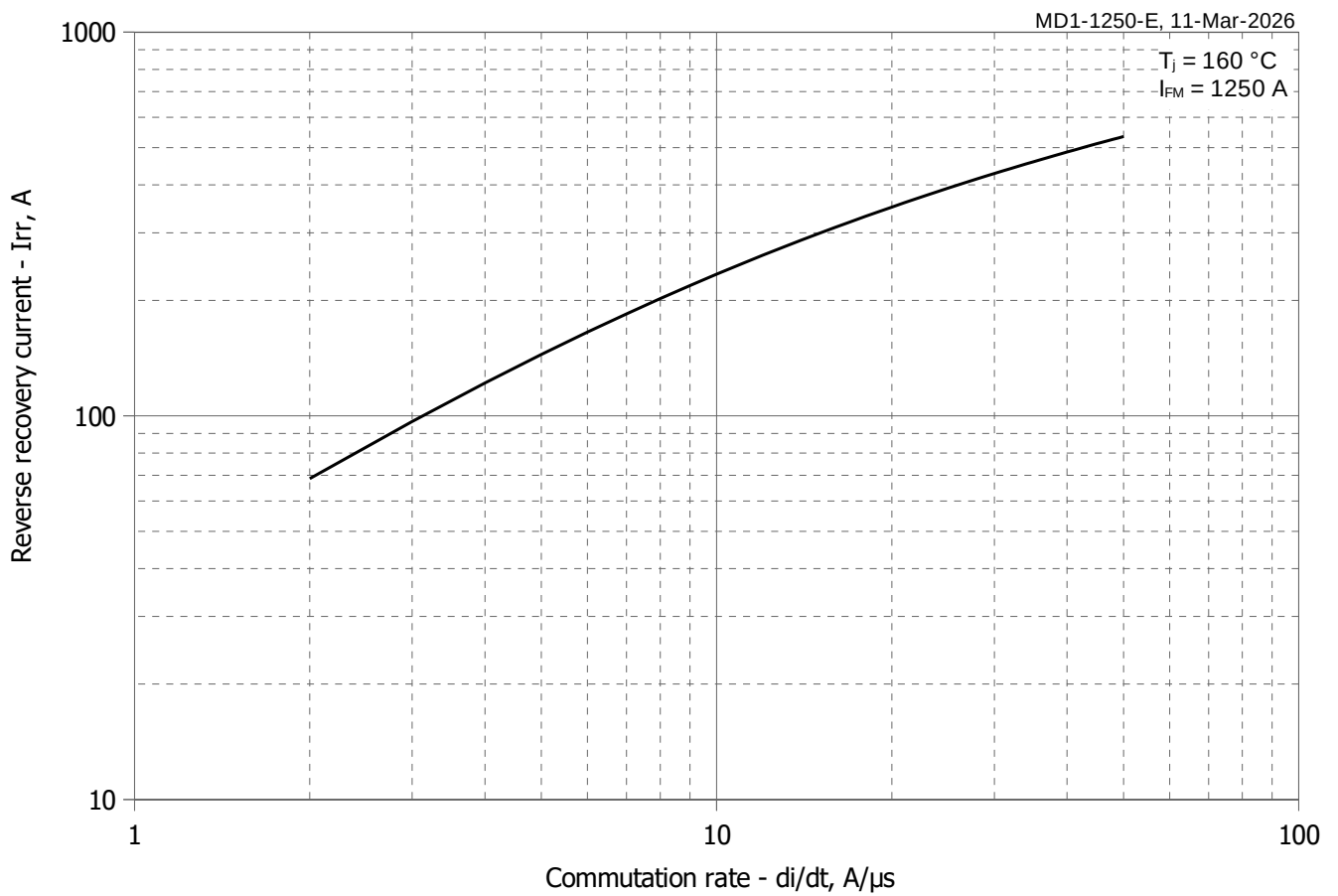


Fig 5 - Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

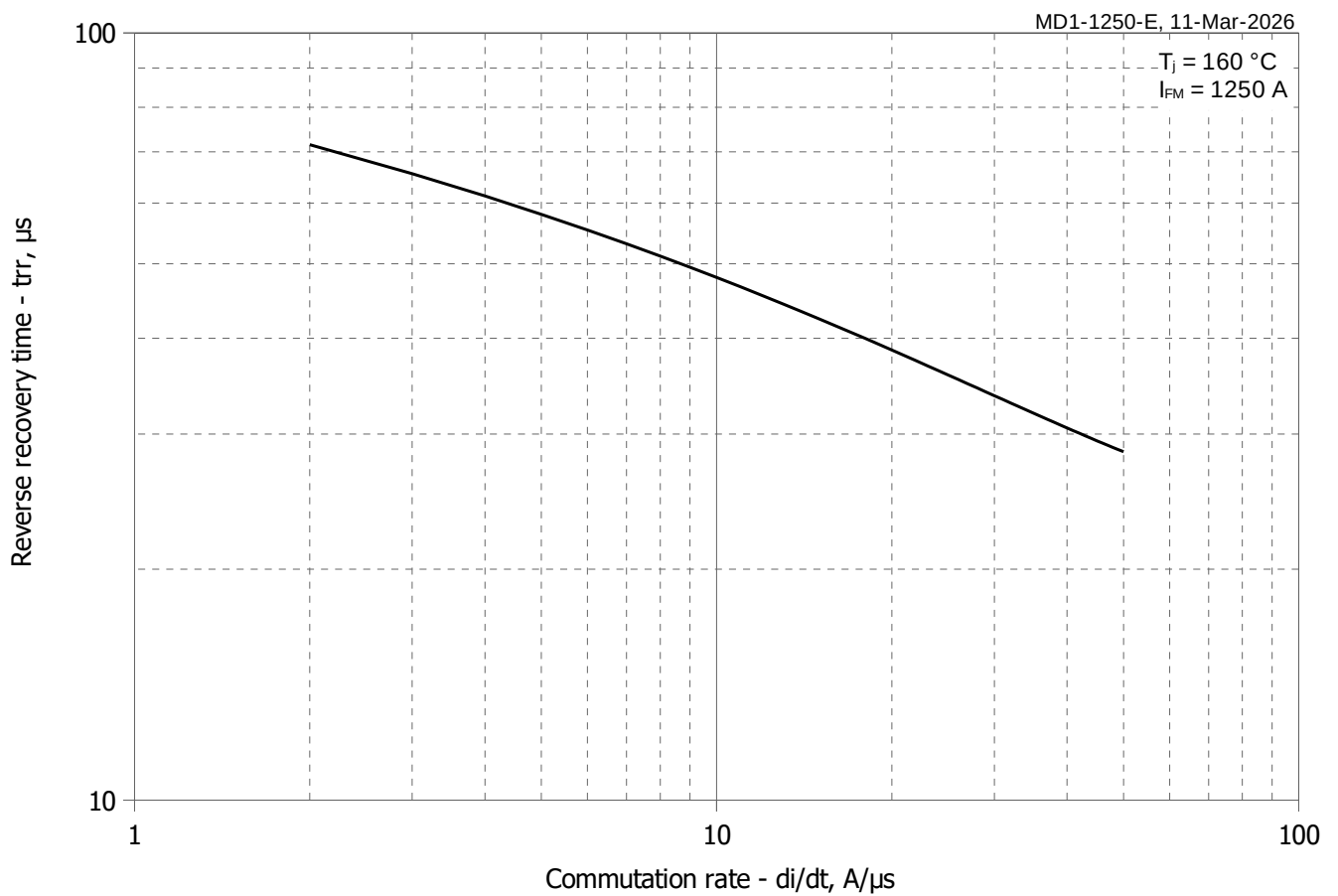


Fig 6 - Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

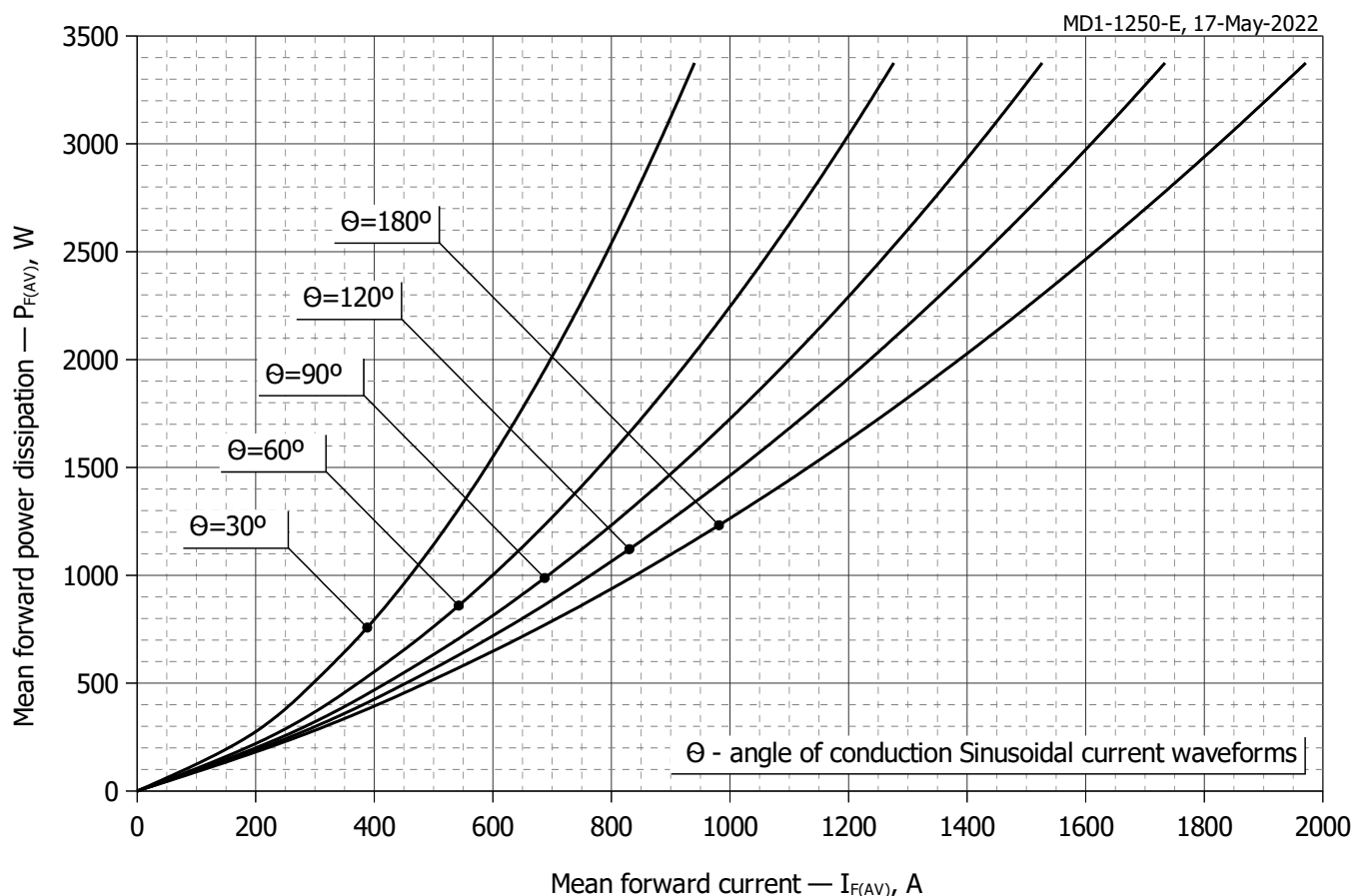


Fig. 7 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$)

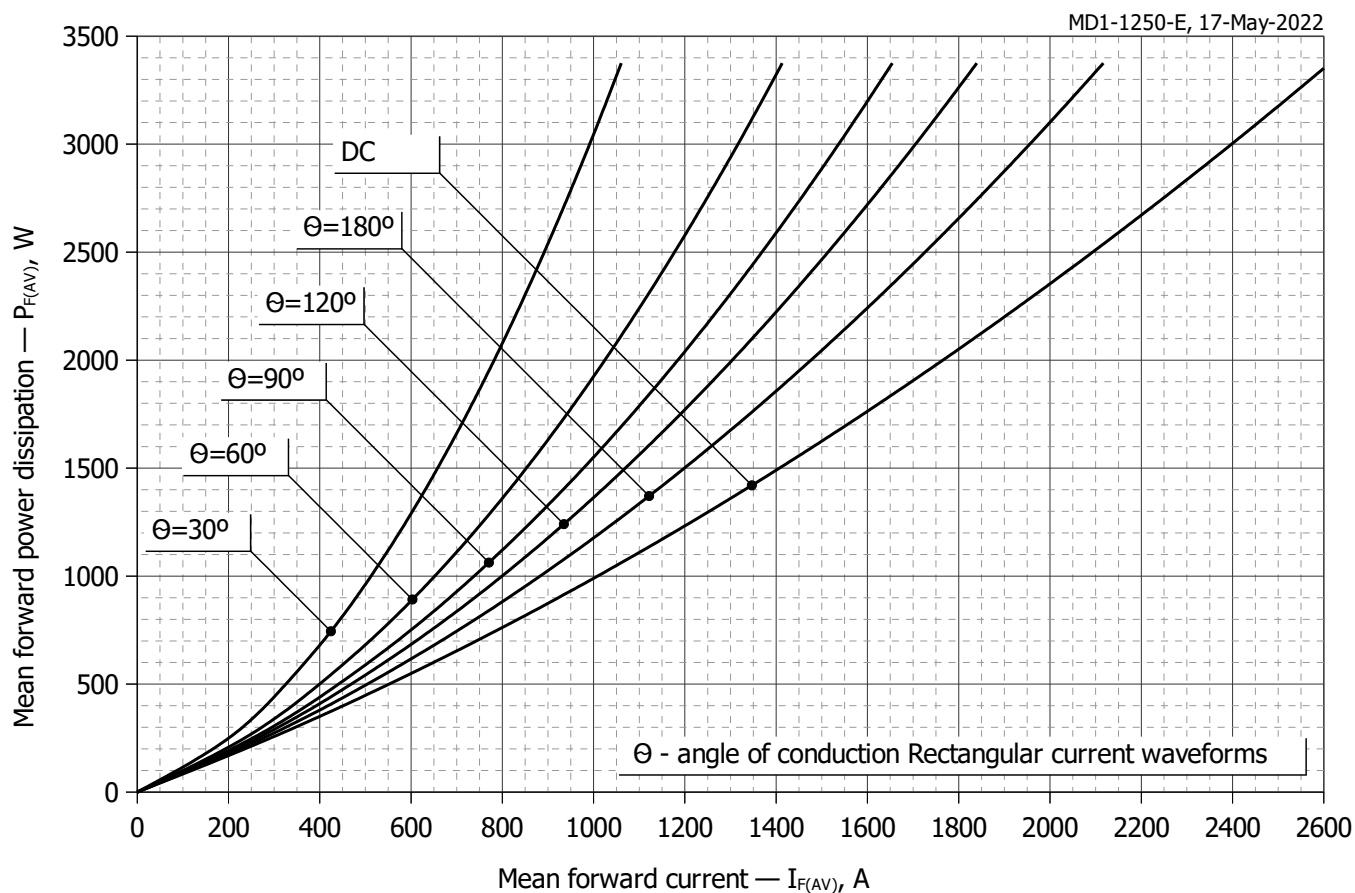


Fig. 8 – Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$)

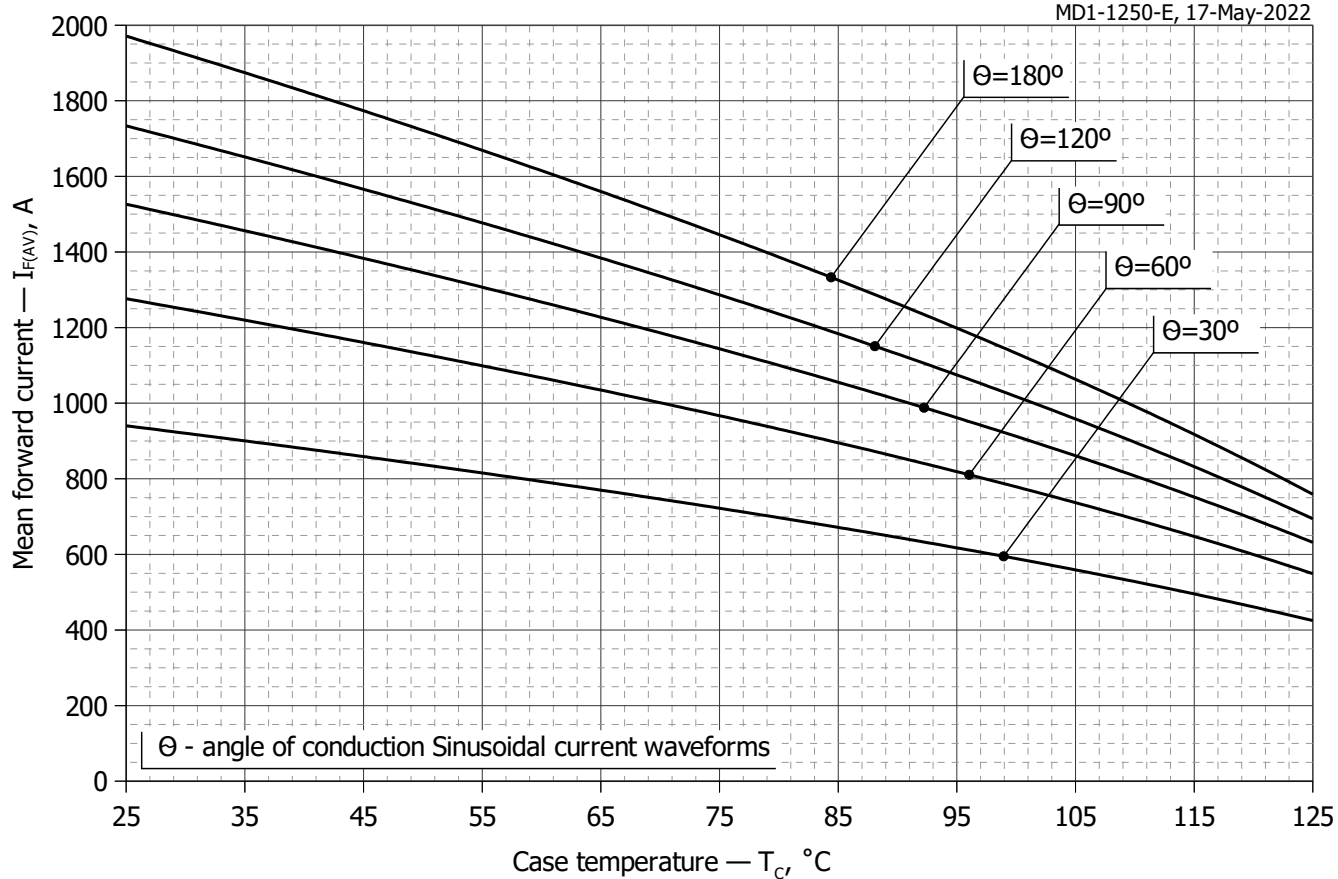


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$)

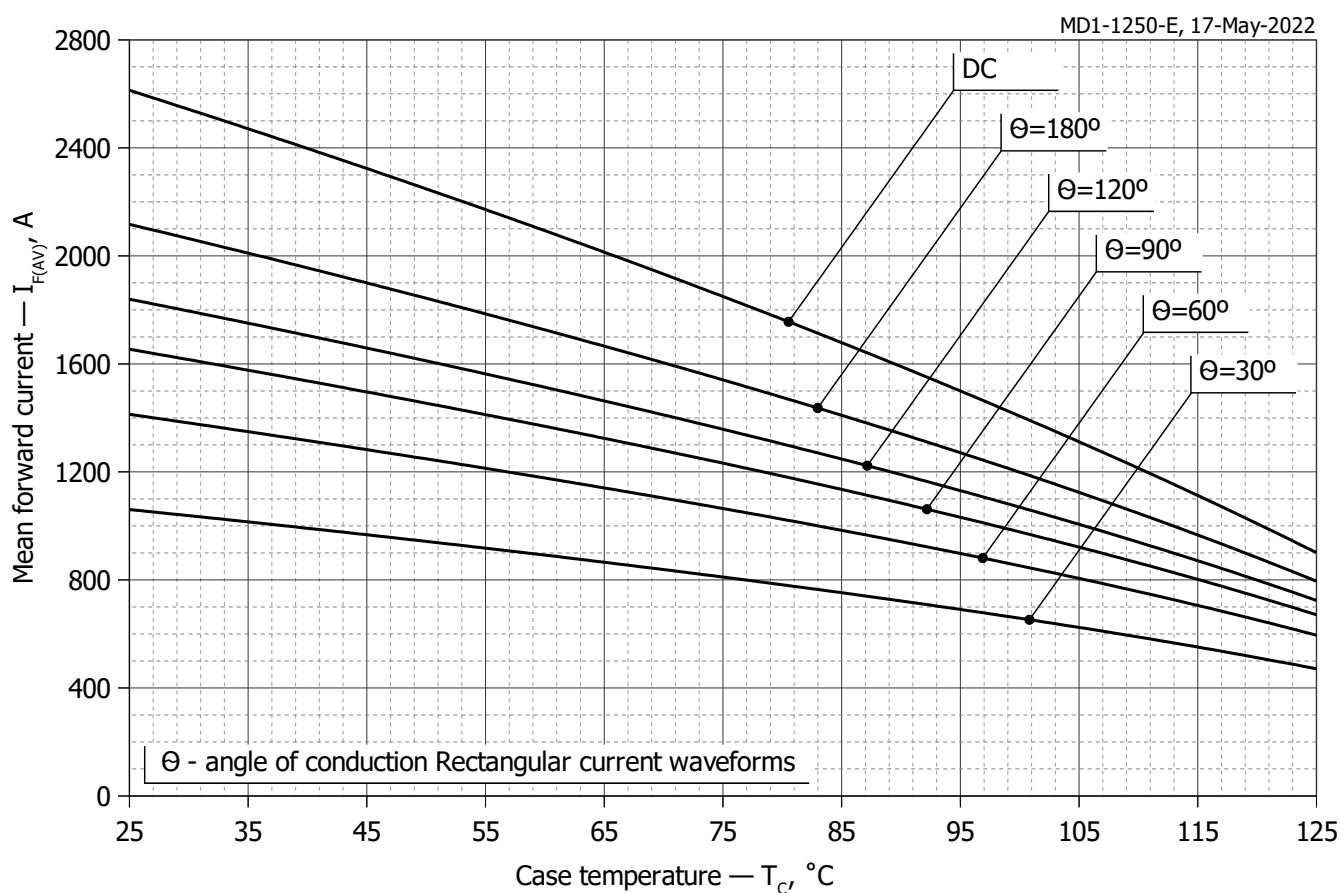


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$)

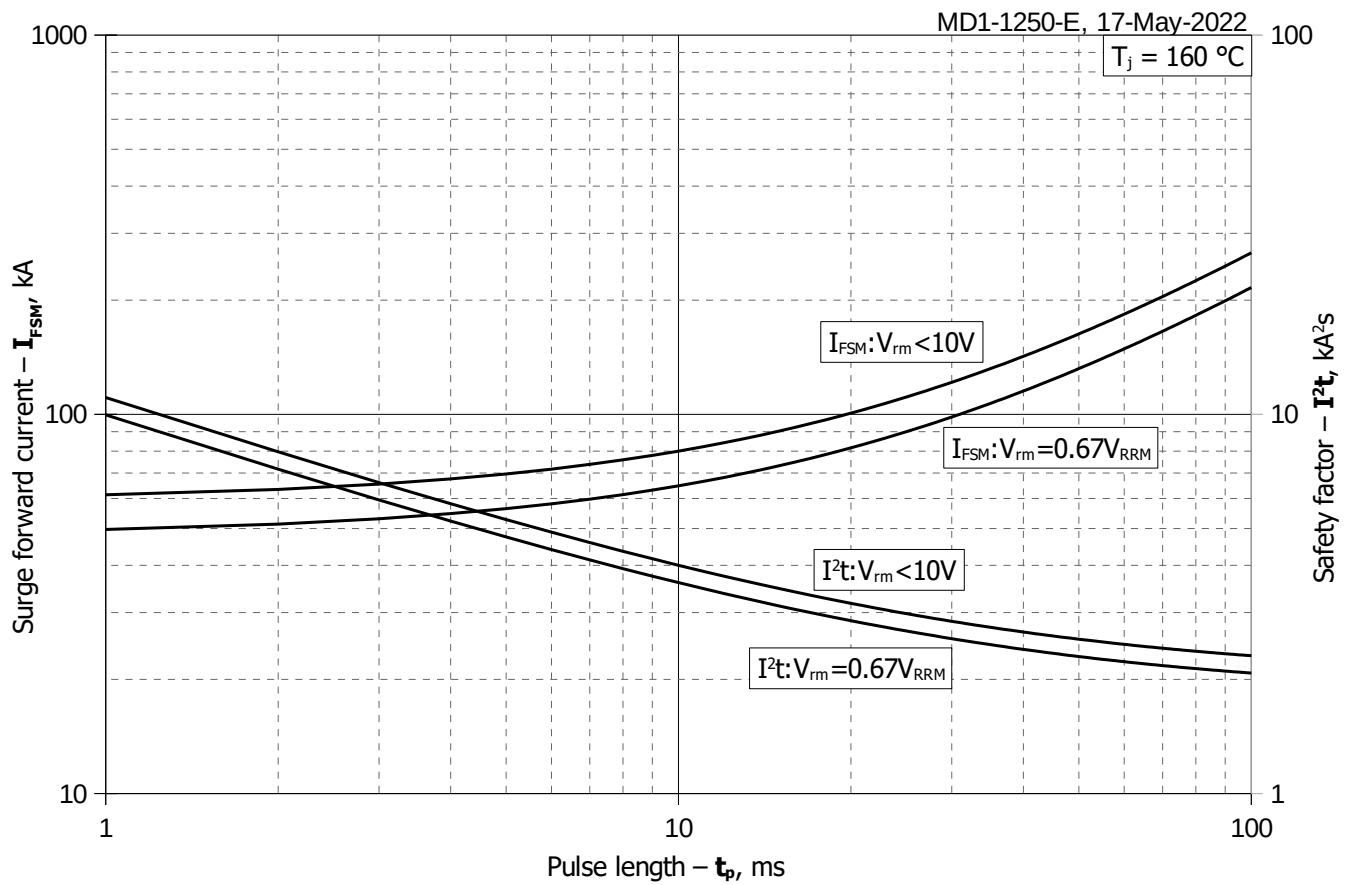


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

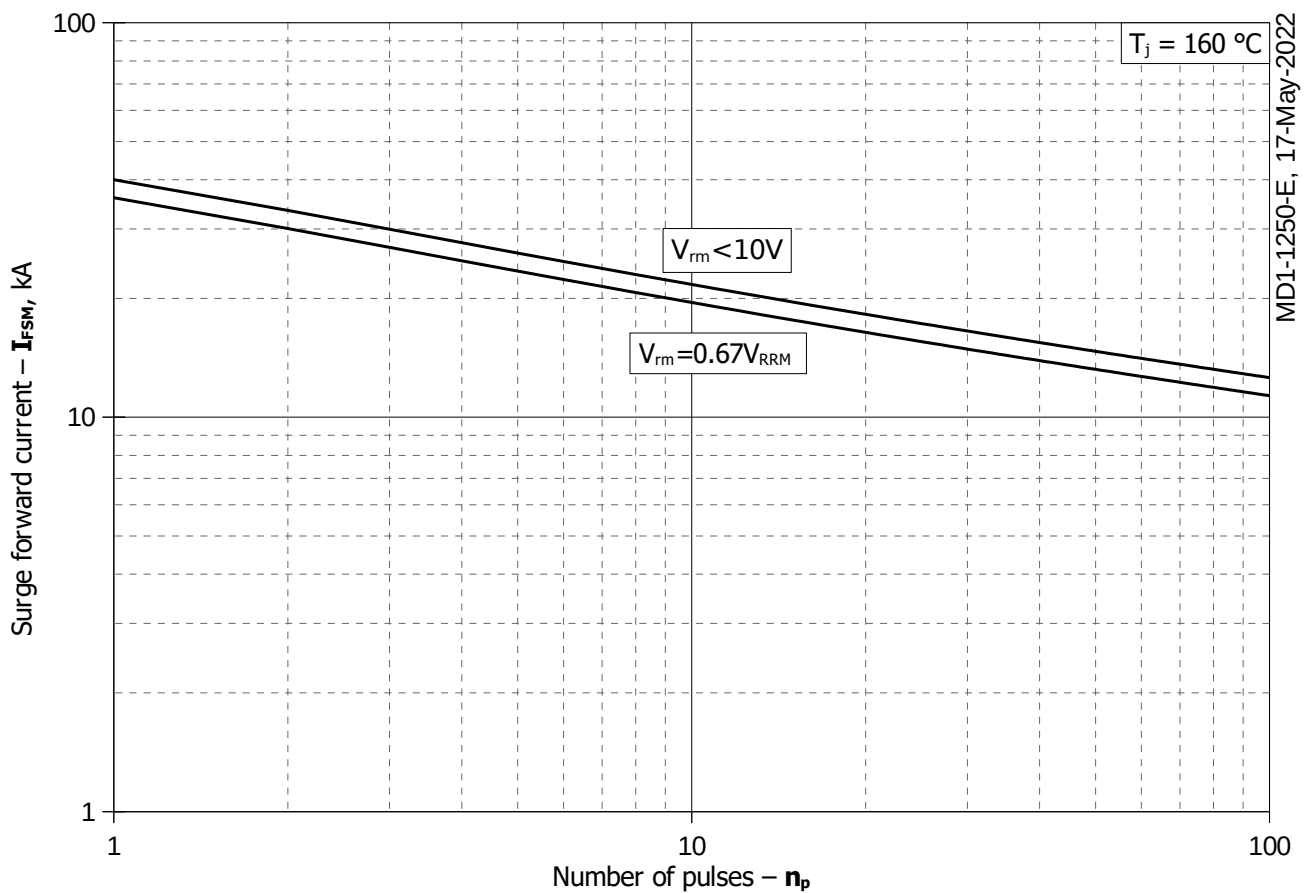


Fig. 12 – Maximum surge forward current I_{FSM} vs. number of pulses n_p