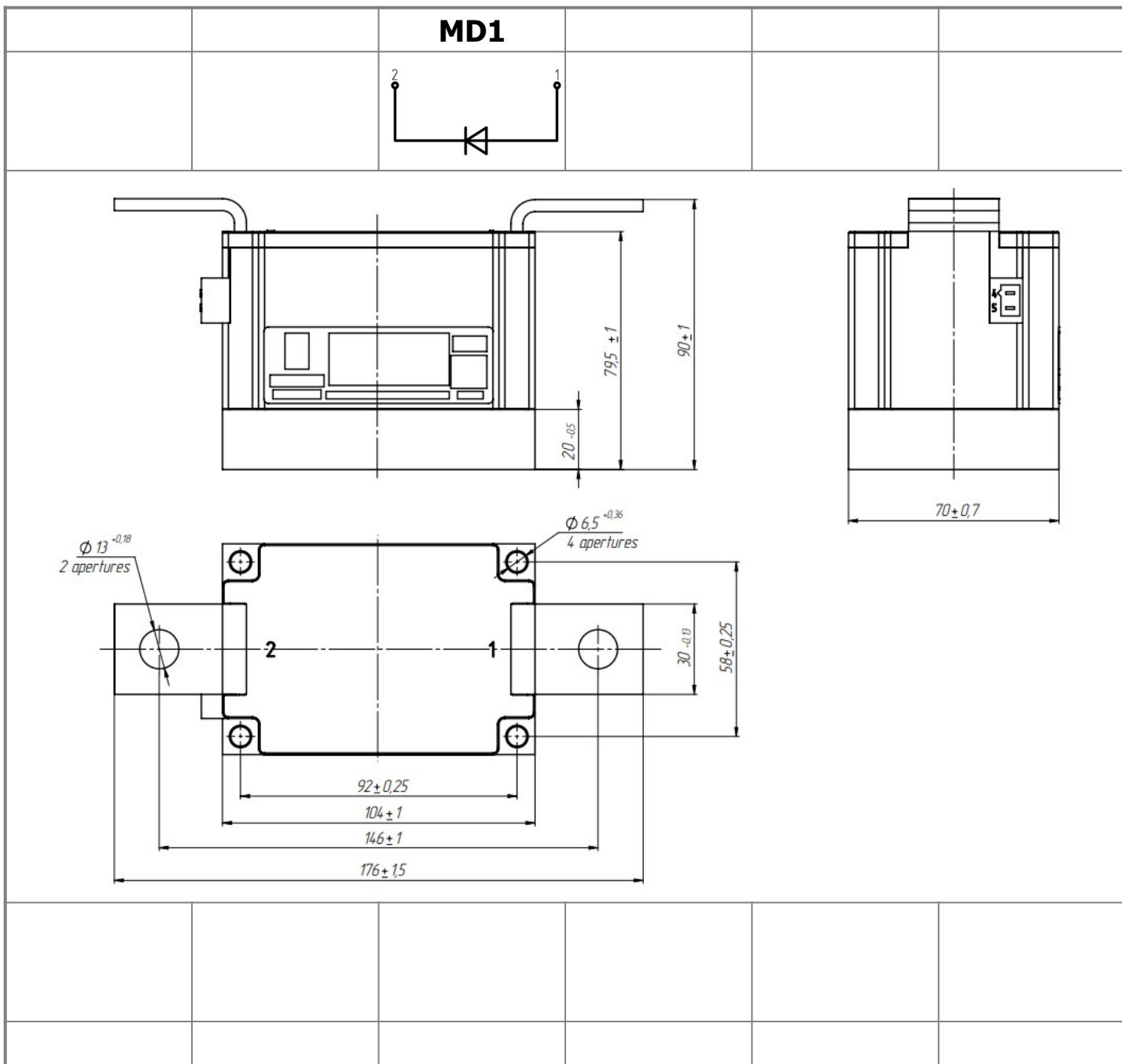




Single Diode Module
For Phase Control
MD1-950-44-E

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

Average forward current		I_{FAV}	950 A
Repetitive peak reverse voltage		V_{RRM}	4000...4400 V
V_{RRM}, V	4000	4200	4400
Voltage code	40	42	44
$T_j, ^\circ C$	-40...+160		



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	950	T _c = 100 °C; 180° half-sine wave; 50 Hz	
I _{FRMS}	RMS forward current	A	1491	T _c = 100 °C; 180° half-sine wave; 50 Hz	
I _{FSM}	Surge forward current	kA	34.0 41.0	T _j =T _{j max} T _j =25 °C	180° half-sine wave; t _p =10 ms; single pulse; V _R =0 V;
			36.0 43.0	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 ² t	Safety factor	A ² s·10 ³	5700 8400	T _j =T _{j max} T _j =25 °C	180° half-sine wave; t _p =10 ms; single pulse; V _R =0 V;
			5300 7600	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	4000...4400	T _{j min} < T _j < T _{j max} ; 180° half-sine wave; 50 Hz;	
V _{RSM}	Non-repetitive peak reverse voltages	V	4100...4500	T _{j min} < T _j < T _{j max} ; 180° half-sine wave; single pulse;	
V _R	Reverse continuous voltages	V	0.6·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	1.50	T _j =25 °C; I _{FM} =2512 A	
V _{F(TO)}	Forward threshold voltage, max	V	0.855	T _j =T _{j max} ;	
r _T	Forward slope resistance, max	mΩ	0.308	0.5 π I _{FAV} < I _T < 1.5 π I _{FAV}	
BLOCKING					
I _{RRM}	Repetitive peak reverse current, max	mA	100 4.00	T _j =T _{j max} T _j =25 °C	V _R =V _{RRM}
SWITCHING					
Q _r	Recovered charge, max	μC	7820	T _j =T _{j max} ; I _{FM} =I _{FAV} ; di _{FM} /dt=-5 A/μs; V _R =100 V	
t _{rr}	Reverse recovery time, max	μS	93		
I _{rr}	Reverse recovery current, max	A	168		
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 ± 15%	
m	Weight, max	g	2250		

PART NUMBERING GUIDE										NOTES
MD	1	-	950	-	44	-	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										

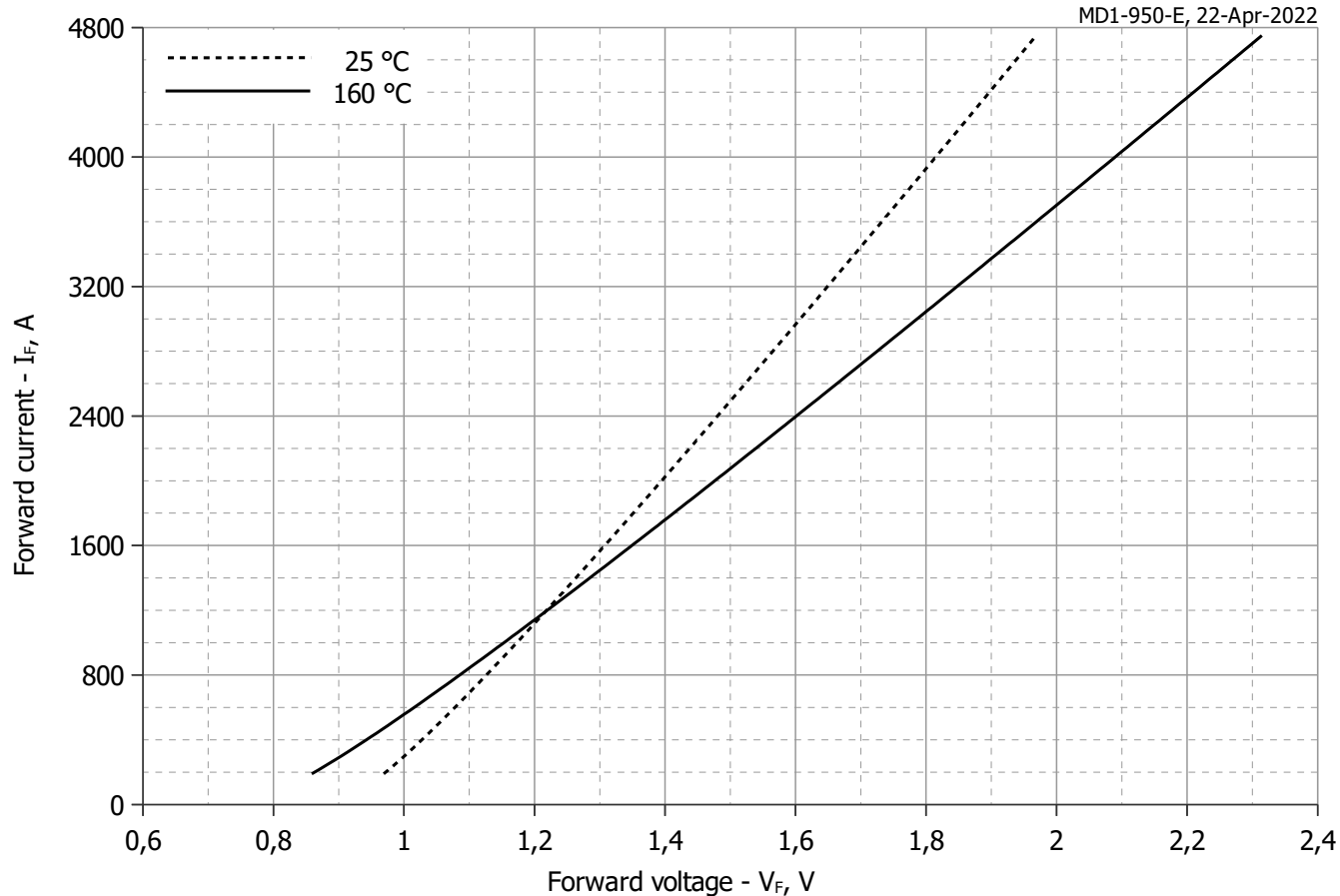


Fig 1 – Forward characteristics of Limit device

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	0.87298716	0.73259434
B	0.00018391	0.00026906
C	0.00464252	0.00398307
D	0.00265264	0.00391969

Forward characteristic model (see Fig. 1)

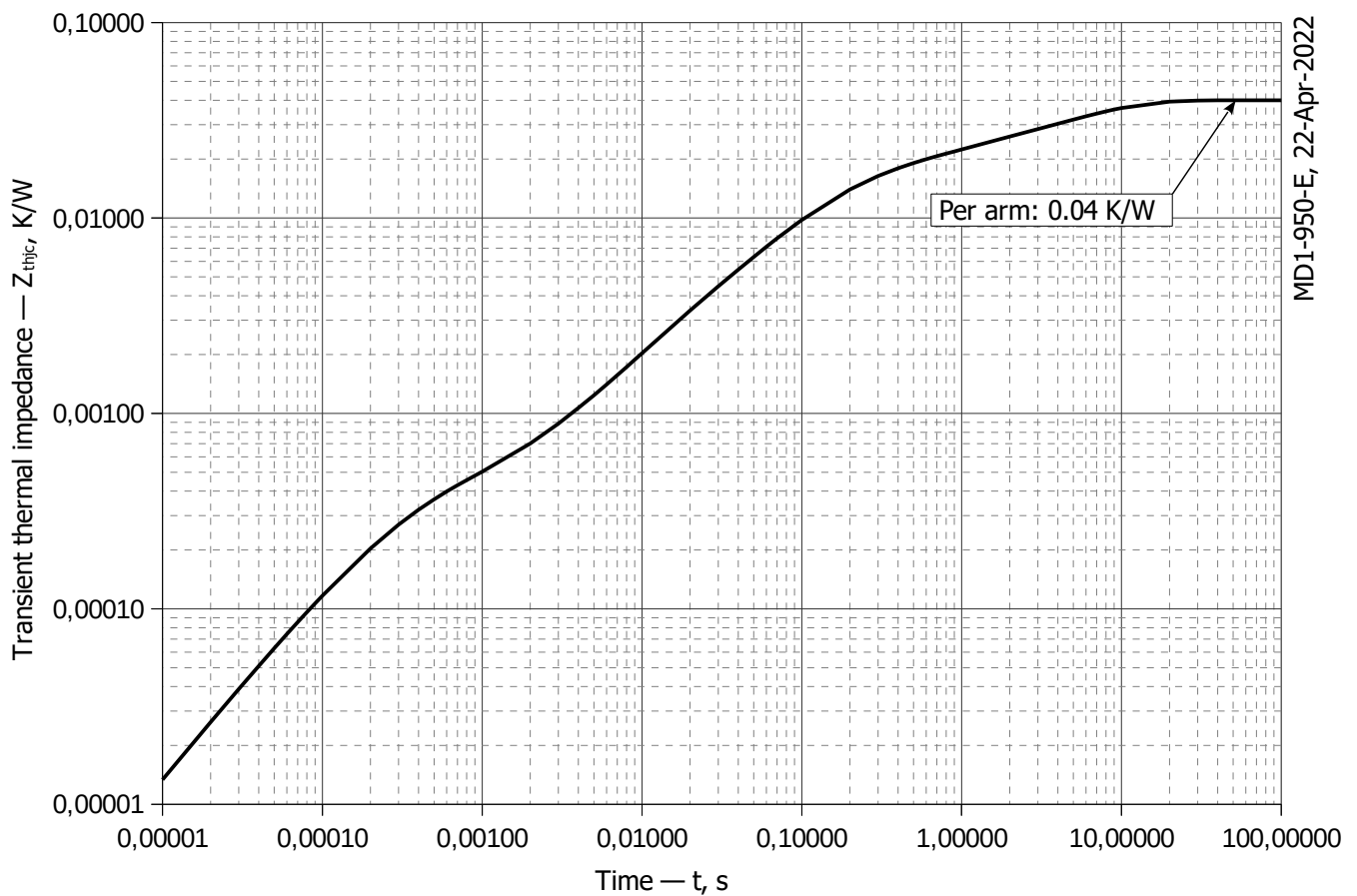


Fig 2 – Transient thermal impedance

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.

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)

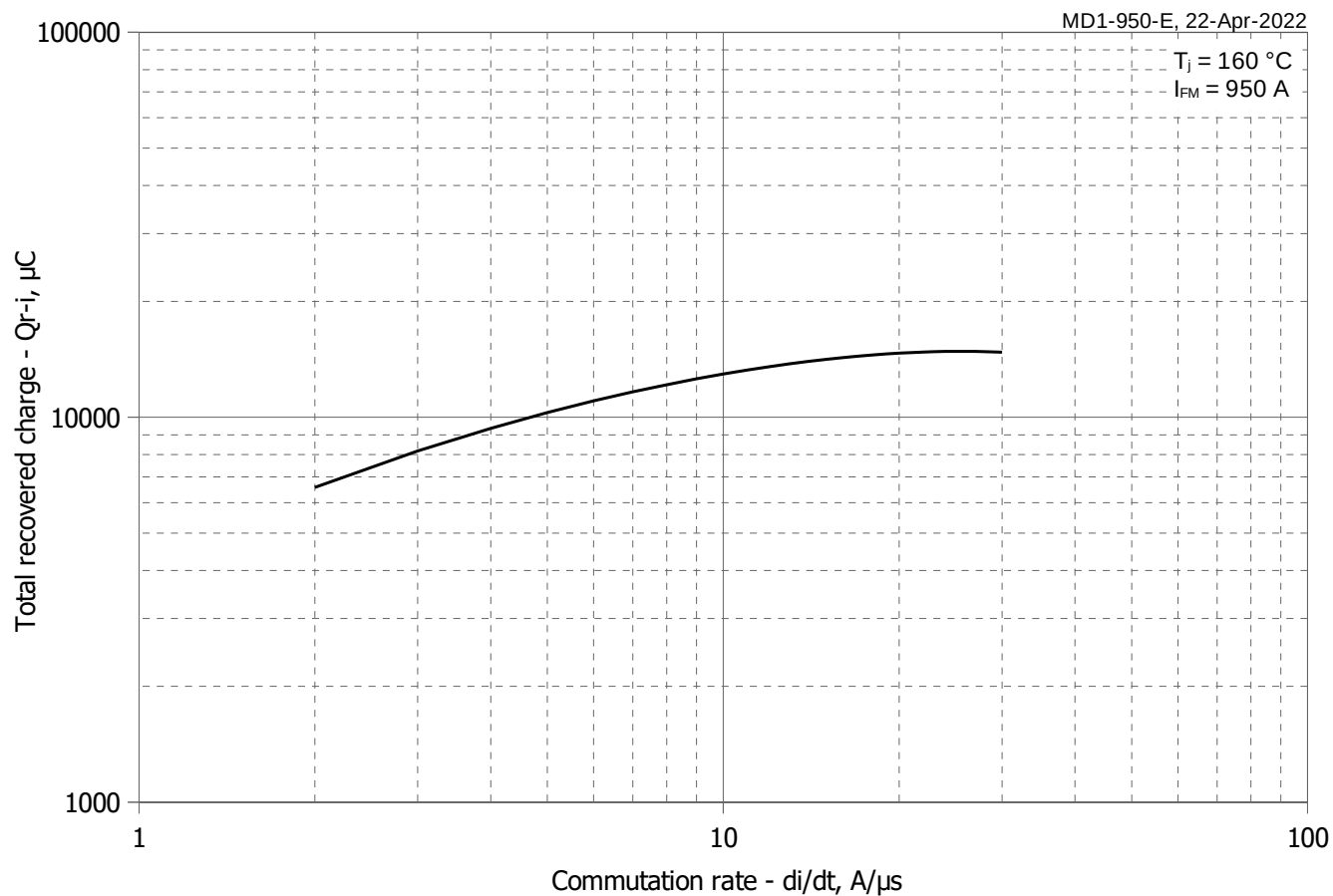


Fig 3 - Maximum recovered charge Q_{r-i} (integral) vs. commutation rate di_R/dt

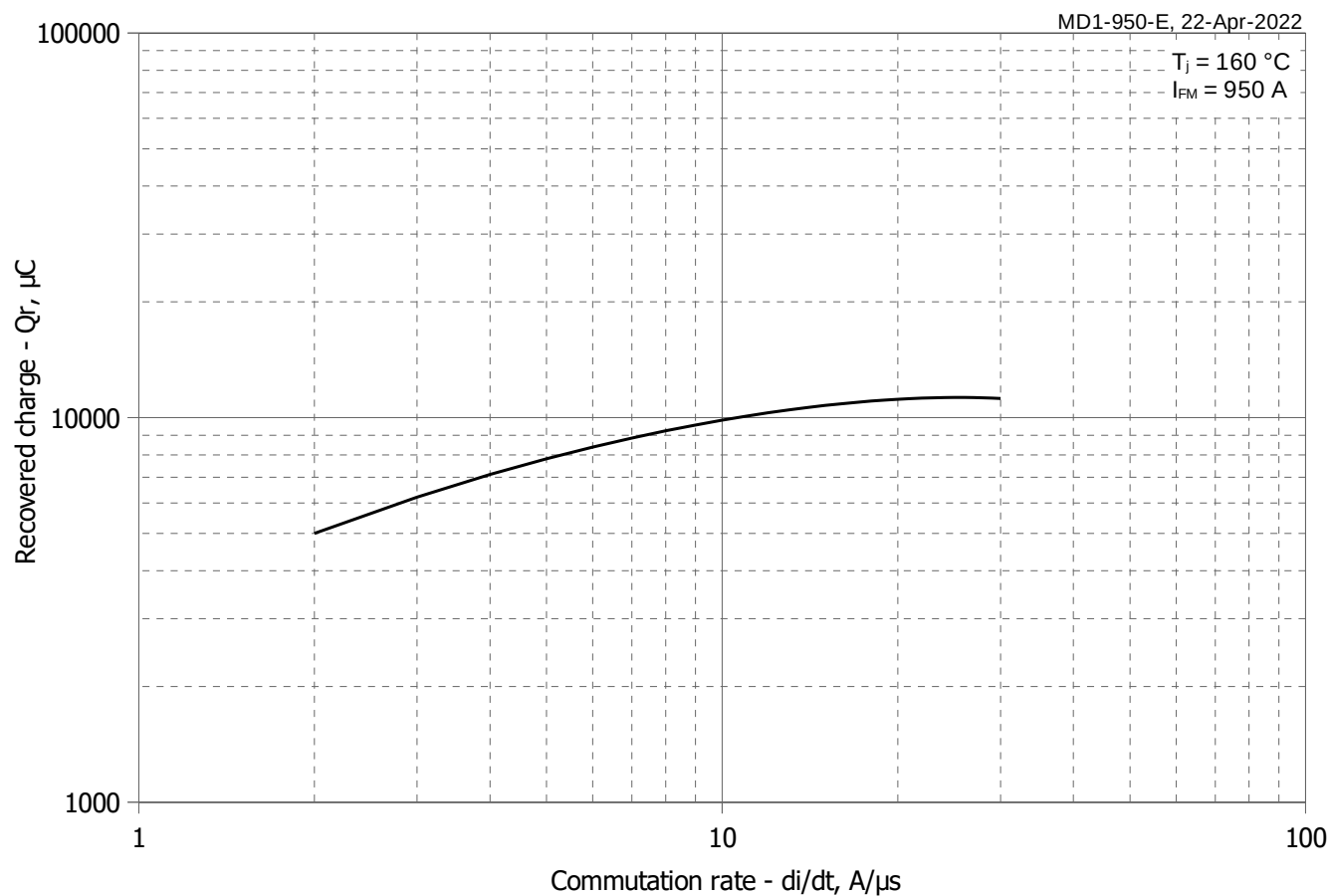


Fig 4 - Maximum recovered charge Q_r vs. commutation rate di_R/dt (25% chord)

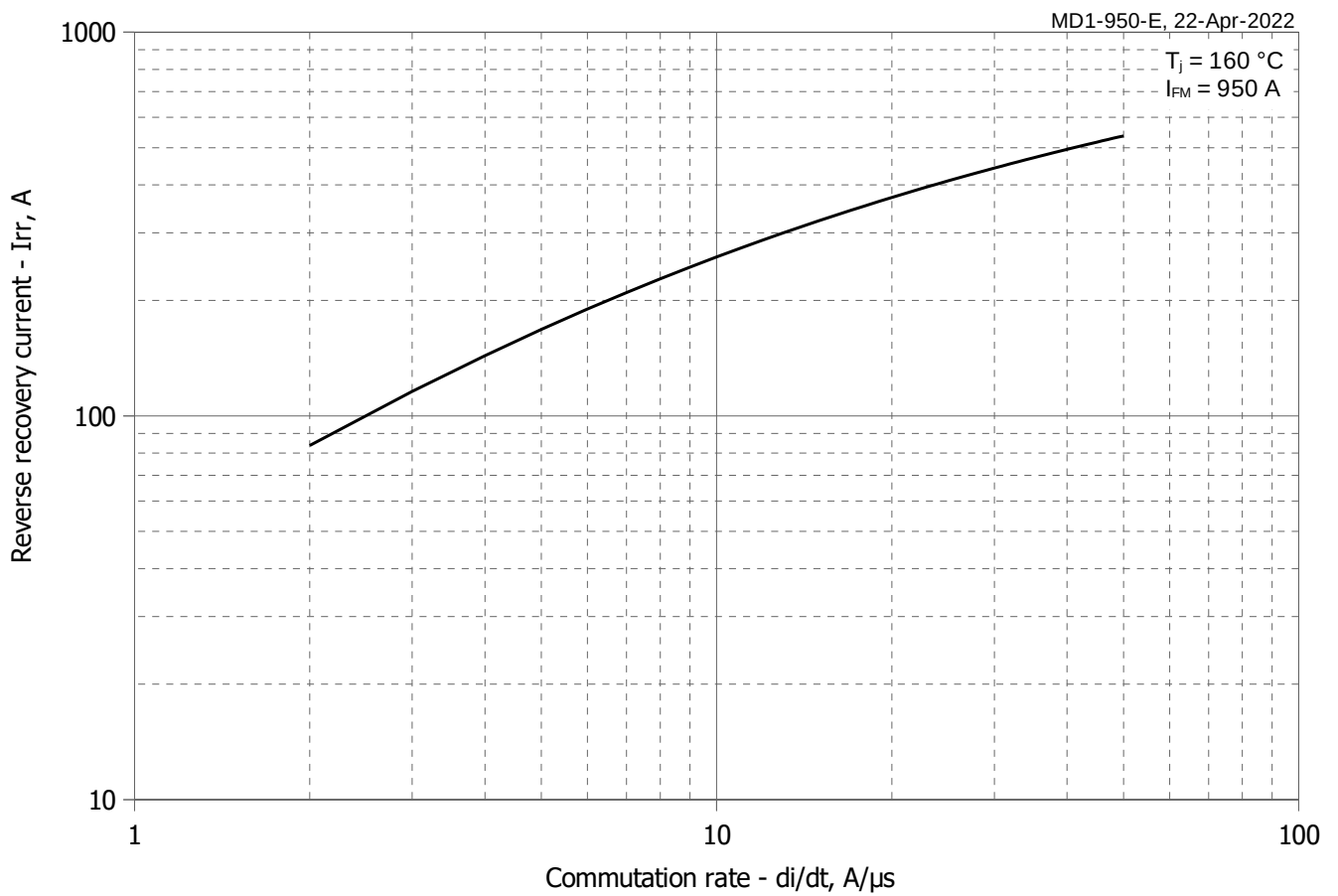


Fig 5 - Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

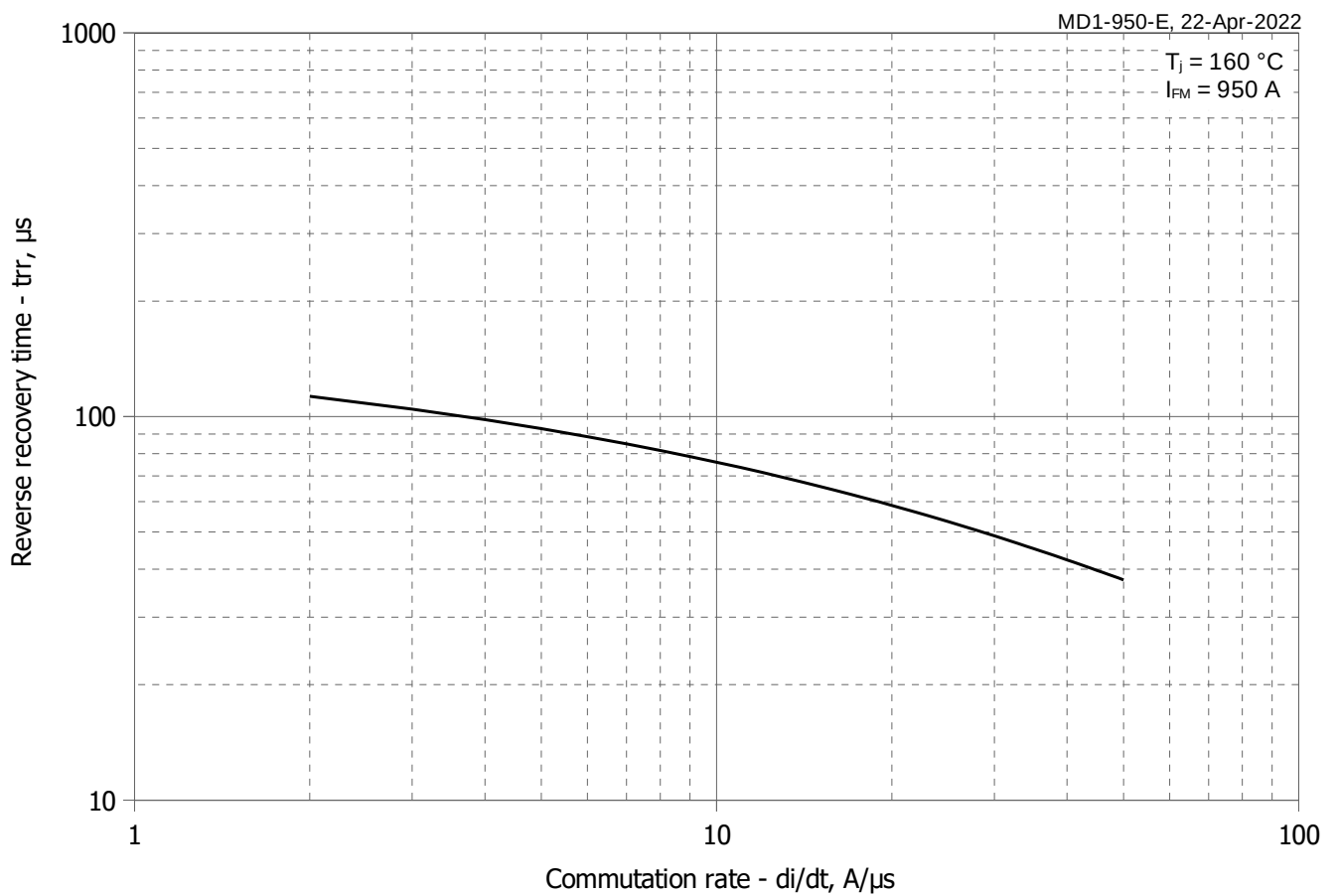


Fig 6 - Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

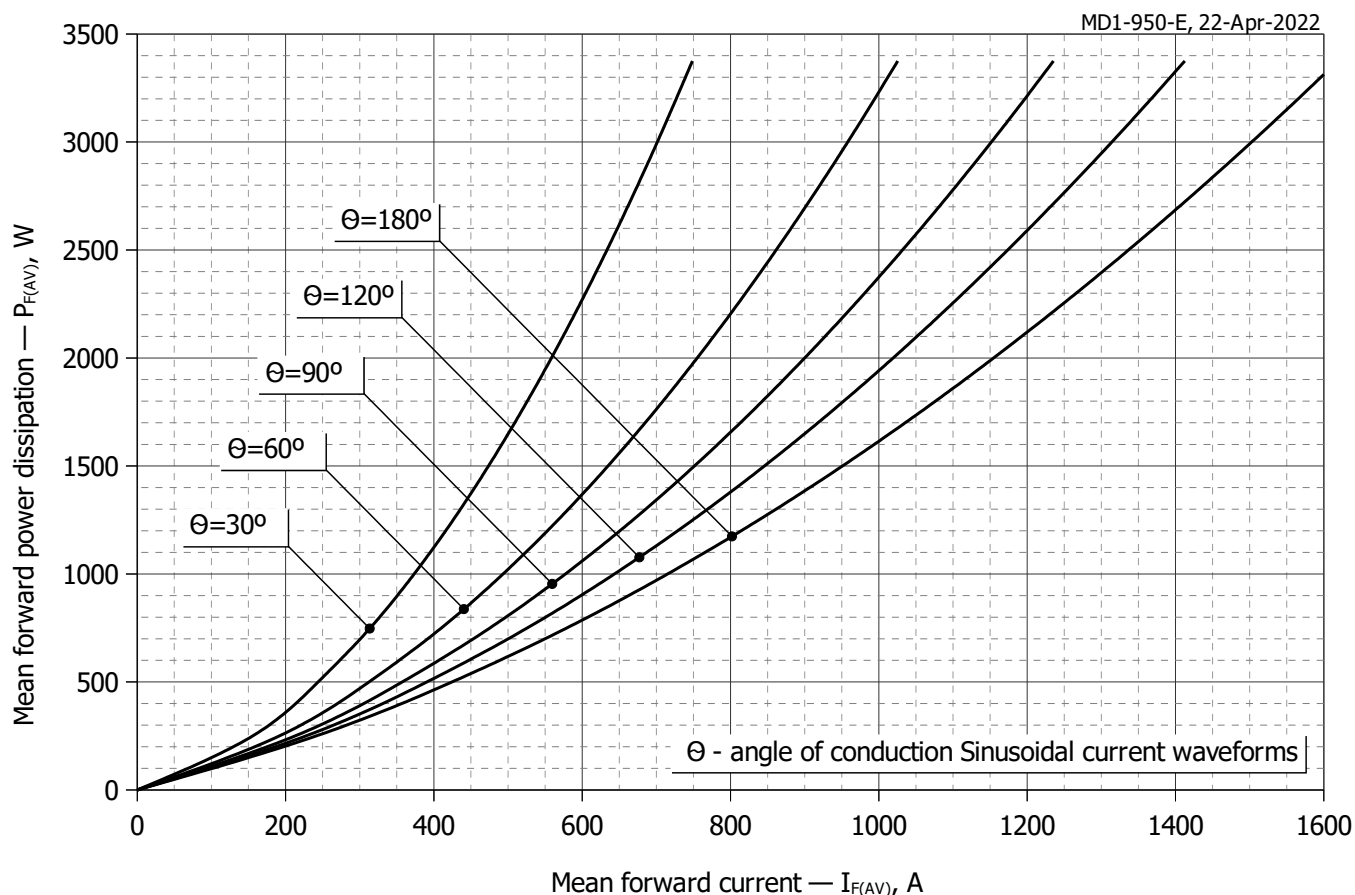


Fig. 7 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$)

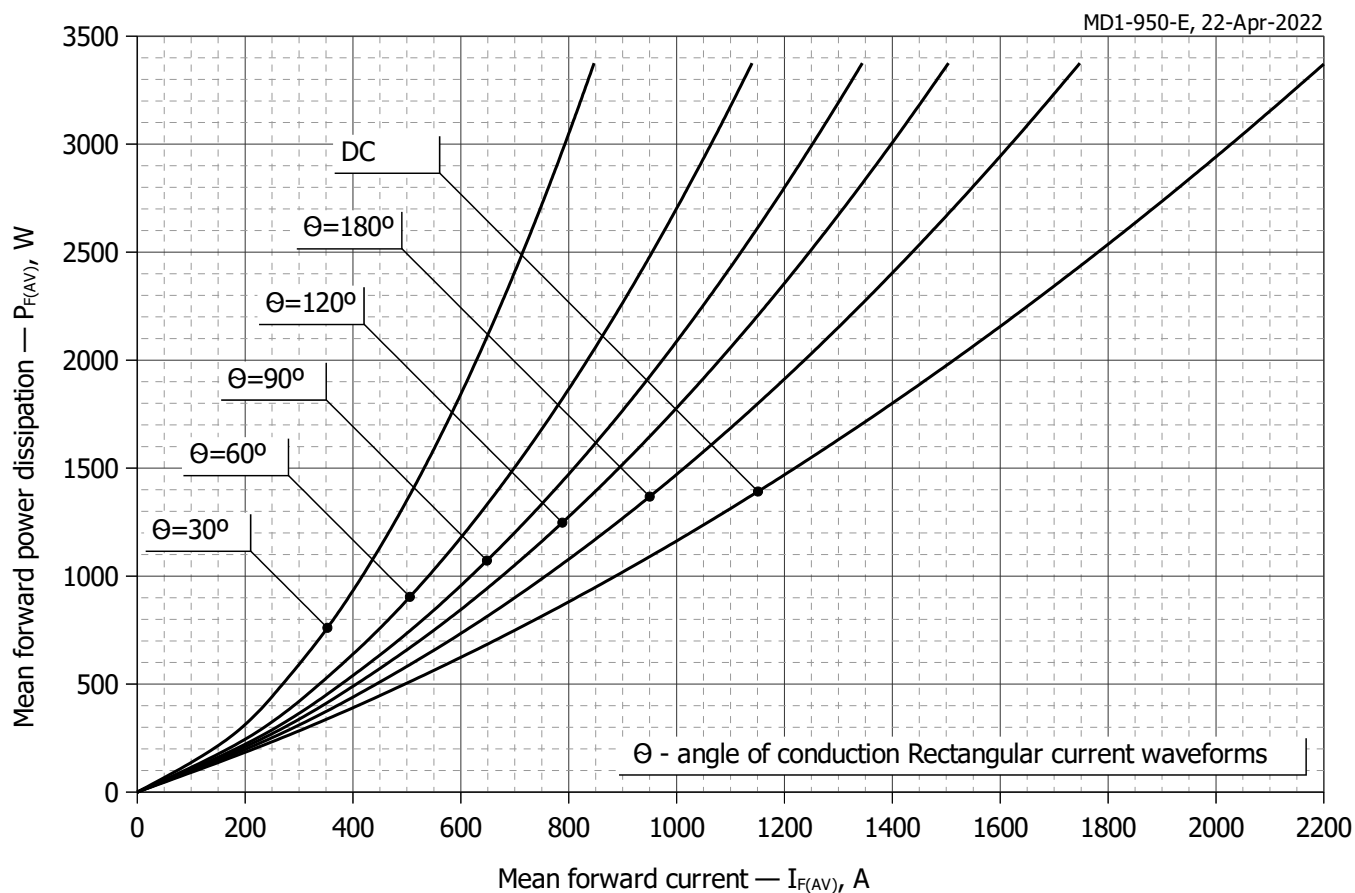


Fig. 8 – Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$)

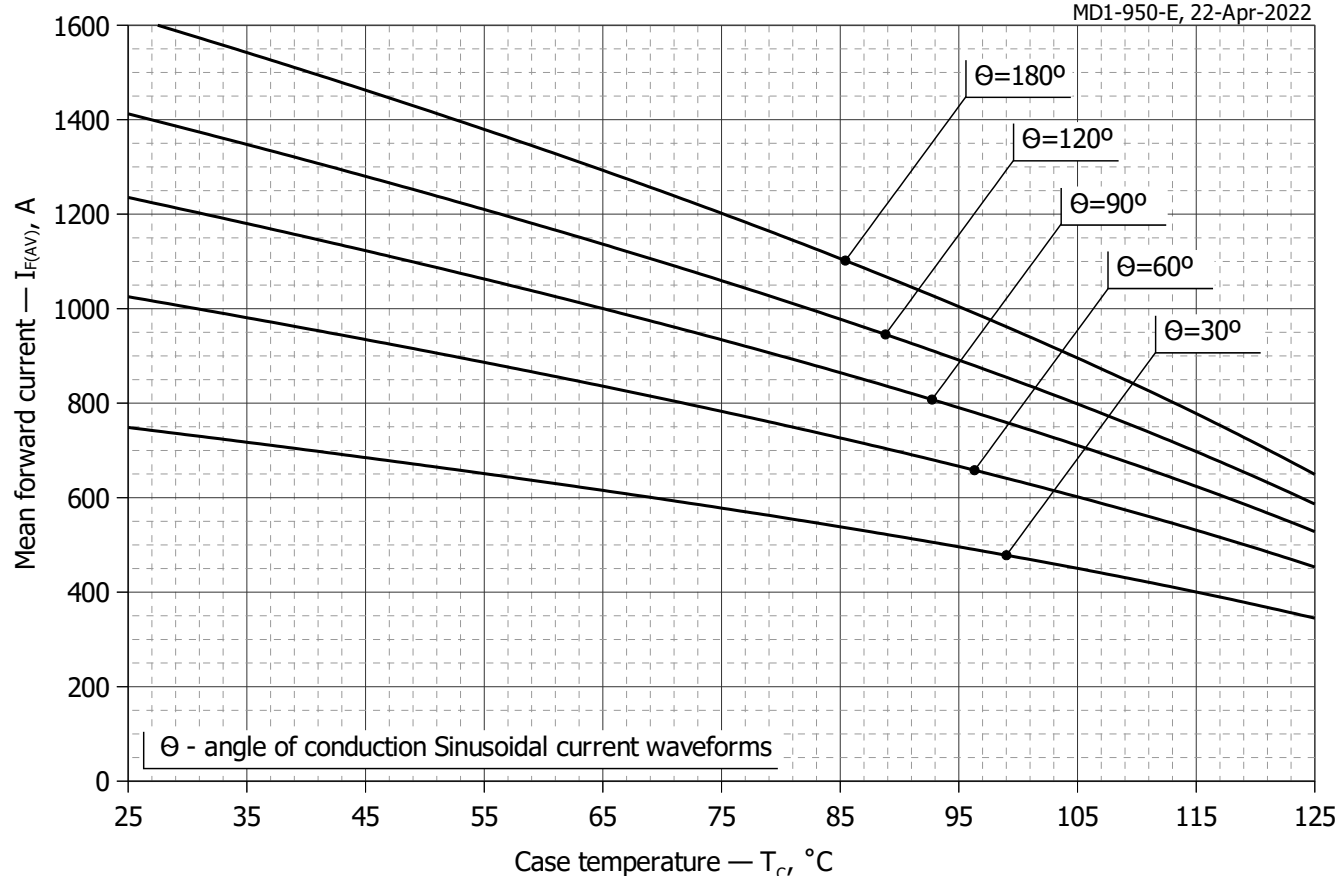


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$)

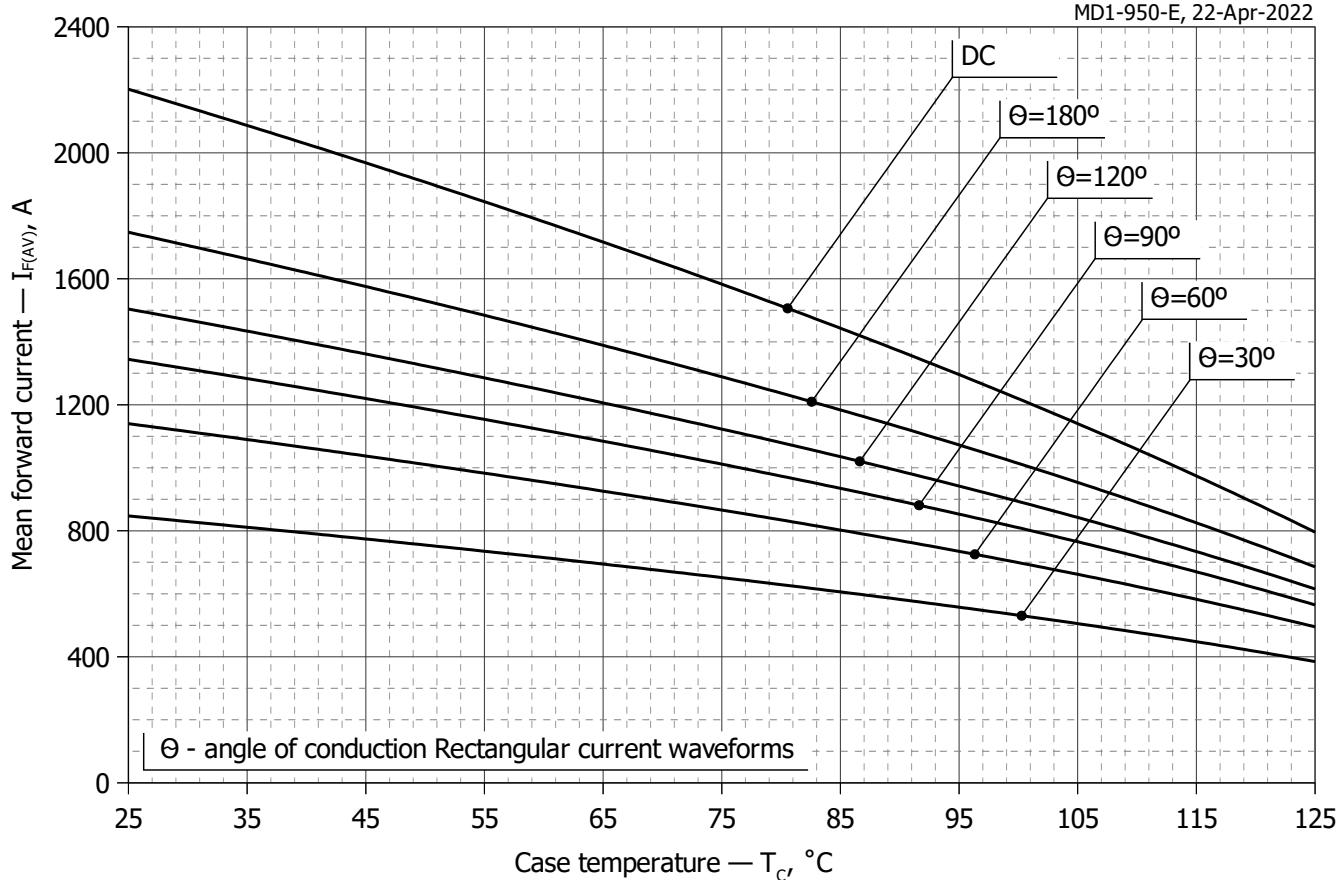


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$)

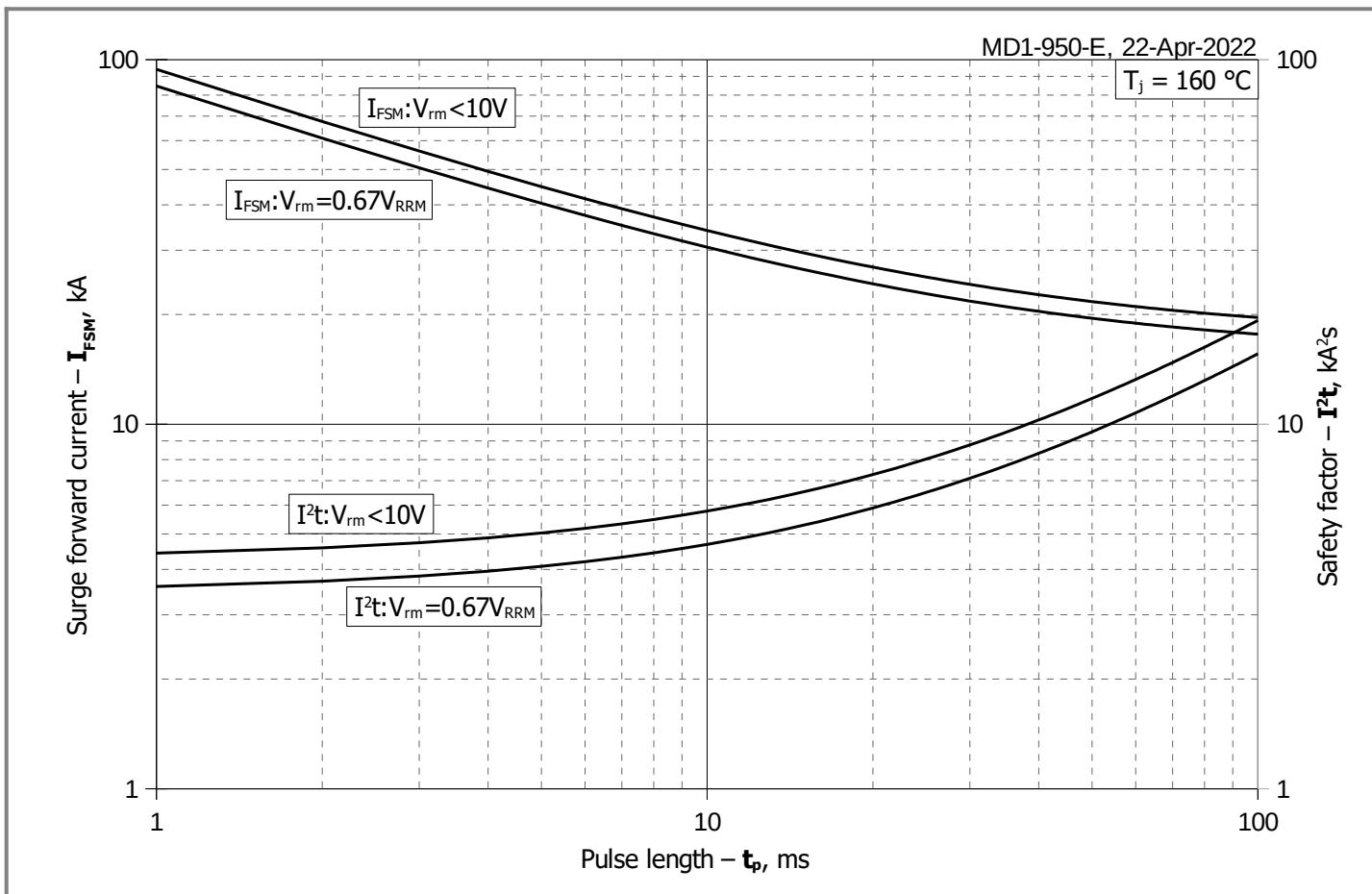


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

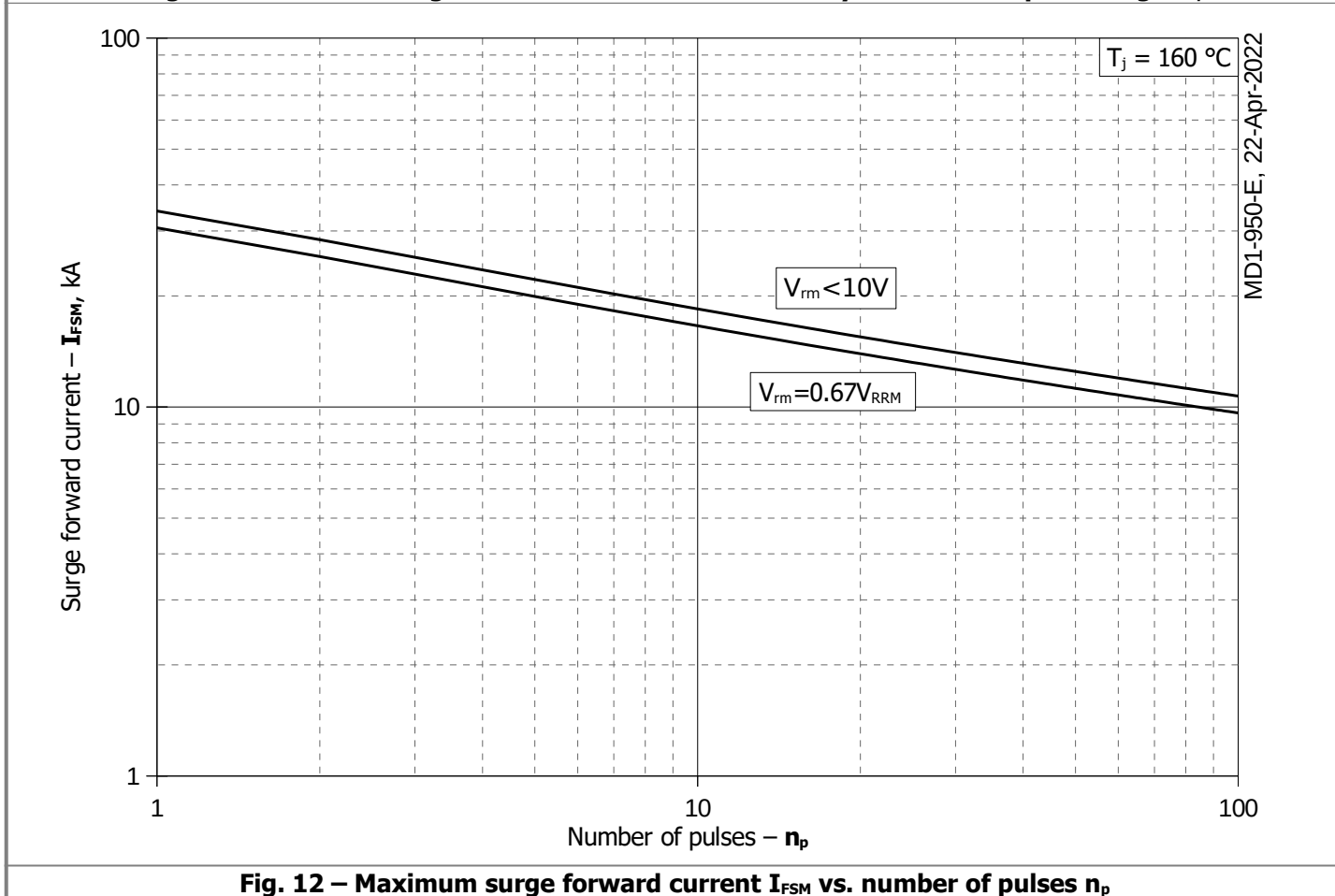


Fig. 12 – Maximum surge forward current I_{FSM} vs. number of pulses n_p