



Double Diode Module For Phase Control MDx-320-65-A2

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	366 320	$T_c=100\text{ }^{\circ}\text{C};$ $T_c=107\text{ }^{\circ}\text{C};$ 180° half-sine wave; 50 Hz	
I_{FRMS}	RMS forward current	A	502	$T_c=107\text{ }^{\circ}\text{C};$ 180° half-sine wave; 50 Hz	
I_{FSM}	Surge forward current	kA	10.0 11.5	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^{\circ}\text{C}$	180° half-sine wave; $t_p=10\text{ ms}$; single pulse; $V_R=0\text{ V}$
			10.5 12.0	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^{\circ}\text{C}$	180° half-sine wave; $t_p=8.3\text{ ms}$; single pulse; $V_R=0\text{ V}$
I^2t	Safety factor	$A^2s\cdot 10^3$	500 660	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^{\circ}\text{C}$	180° half-sine wave; $t_p=10\text{ ms}$; single pulse; $V_R=0\text{ V}$
			450 590	$T_j=T_{j\text{ max}}$ $T_j=25\text{ }^{\circ}\text{C}$	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	4600...6500	$T_{j\text{ min}} < T_j < T_{j\text{ max}};$ 180° half-sine wave; 50 Hz	
V_{RSM}	Non-repetitive peak reverse voltages	V	4700...6600	$T_{j\text{ min}} < T_j < T_{j\text{ max}};$ 180° half-sine wave; single pulse	
V_R	Reverse continuous voltages	V	$0.6\cdot V_{RRM}$	$T_j=T_{j\text{ max}}$	
THERMAL					
T_{stg}	Storage temperature	$^{\circ}\text{C}$	−40...+50		
T_j	Operating junction temperature	$^{\circ}\text{C}$	−40...+140		
$T_{c\text{ op}}$	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	2.40	T _j =25 °C; I _{FM} =1570 A	
V _{F(TO)}	Forward threshold voltage, max	V	0.948	T _j =T _{j max} ;	
r _T	Forward slope resistance, max	mΩ	1.154	0.5 π I _{FAV} < I _T < 1.5 π I _{FAV}	
BLOCKING					
I _{RRM}	Repetitive peak reverse current, max	mA	100 3.00	T _j =T _{j max} T _j =25 °C	V _R =V _{RRM}
SWITCHING					
Q _r	Recovered charge, max	μC	3910	T _j =T _{j max} ; I _{FM} =I _{FAV} ;	
t _{rr}	Reverse recovery time, max	μS	71	di _R /dt=-5 A/μS;	
I _{rr}	Reverse recovery current, max	A	110	V _R =100 V	
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 3.60	Sine wave, 50 Hz; RMS	t=60 sec 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										NOTES
MD	3	-	320	-	65	-	A2	-	N	1) The screws must be lubricated
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										

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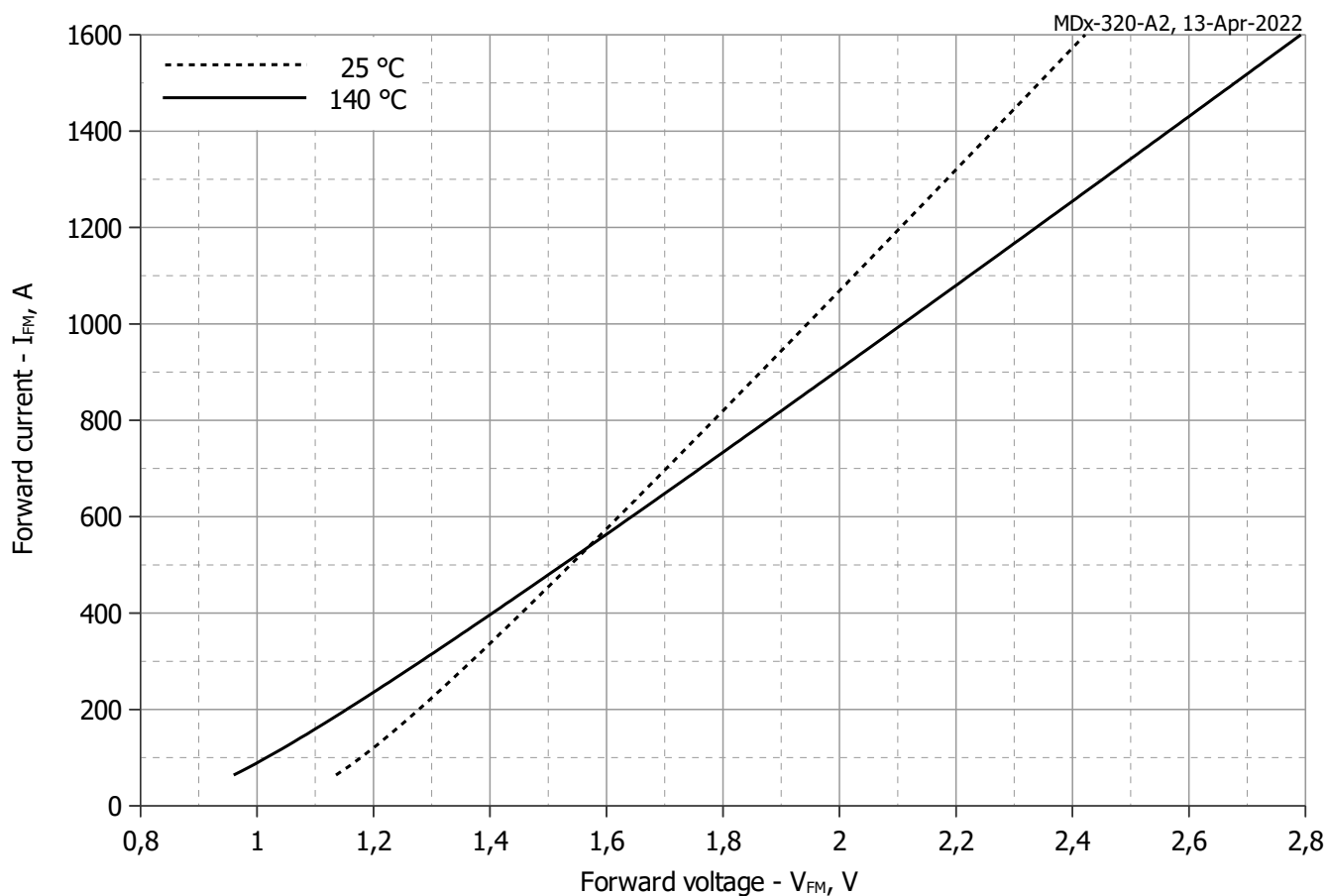


Fig 1 – Forward characteristics of Limit device

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	
	$T_j = 25^\circ\text{C}$	$T_j = T_{j \max}$
A	0.94125382	0.75666454
B	0.00077510	0.00108196
C	0.03581952	0.02716998
D	-0.00059606	0.00259785

Forward characteristic model (see Fig. 1).

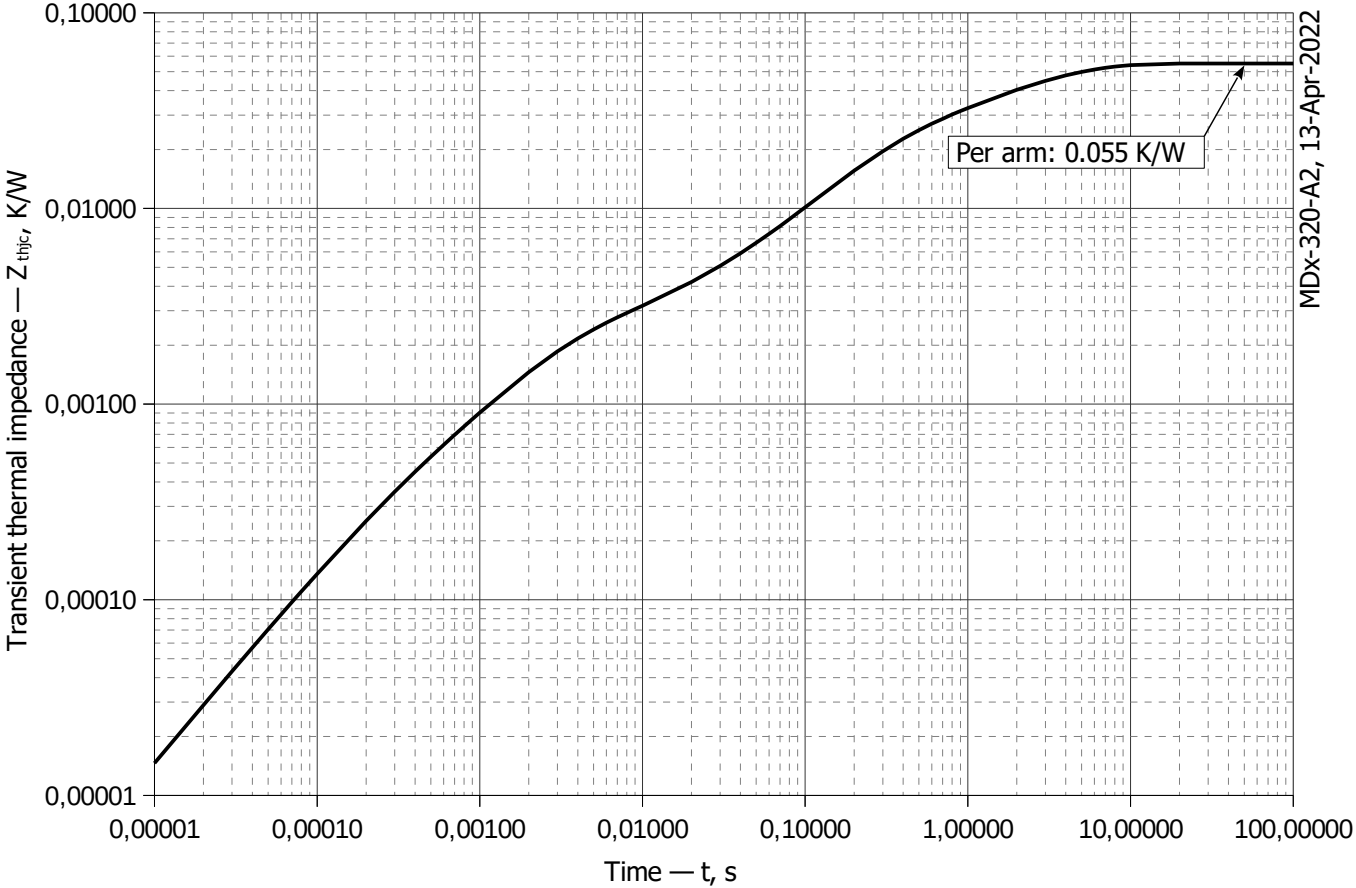


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

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.

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
$R_i, K/W$	0.0249	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)

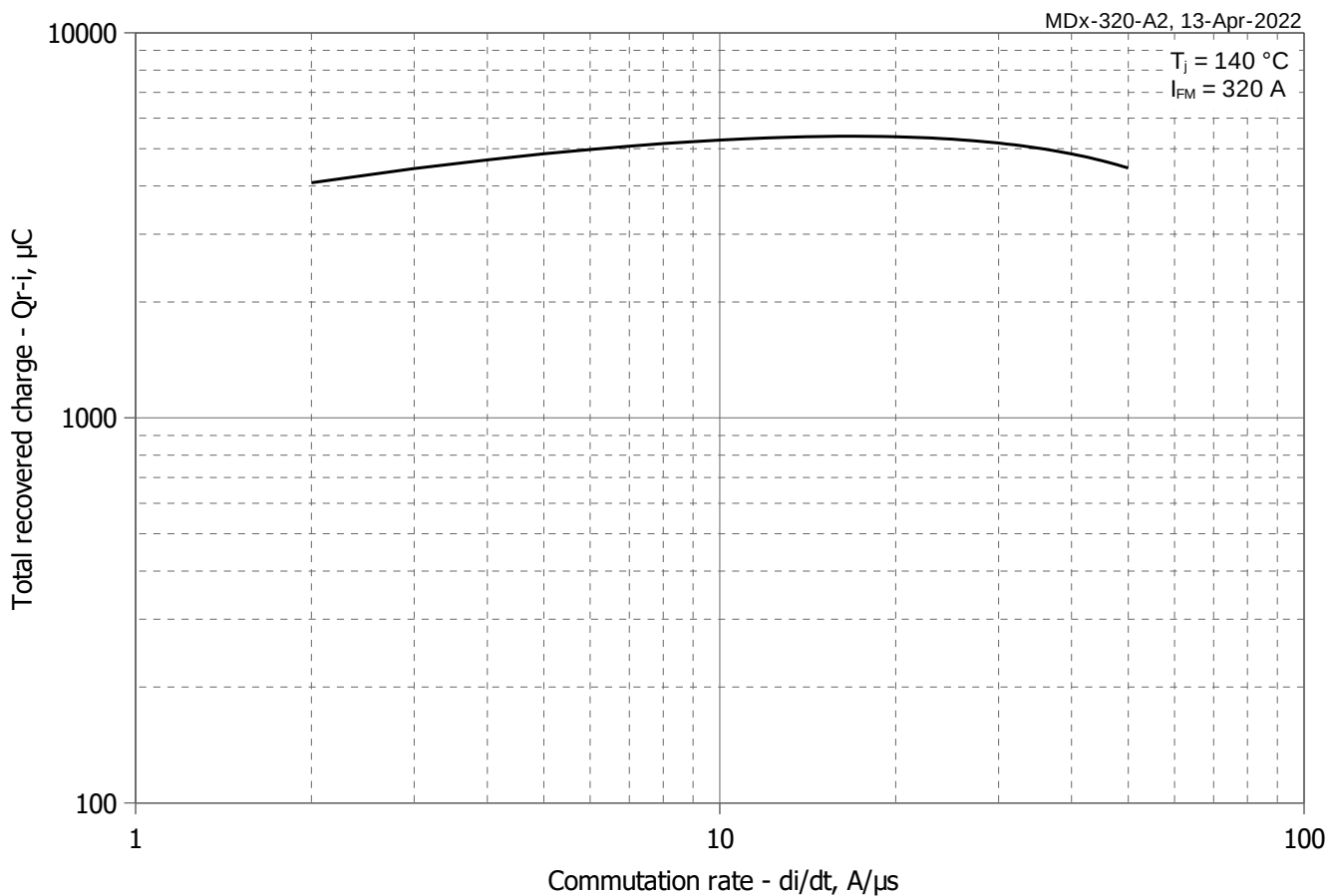


Fig 3 - Maximum recovered charge Q_{r-i} (integral) vs. commutation rate di_R/dt

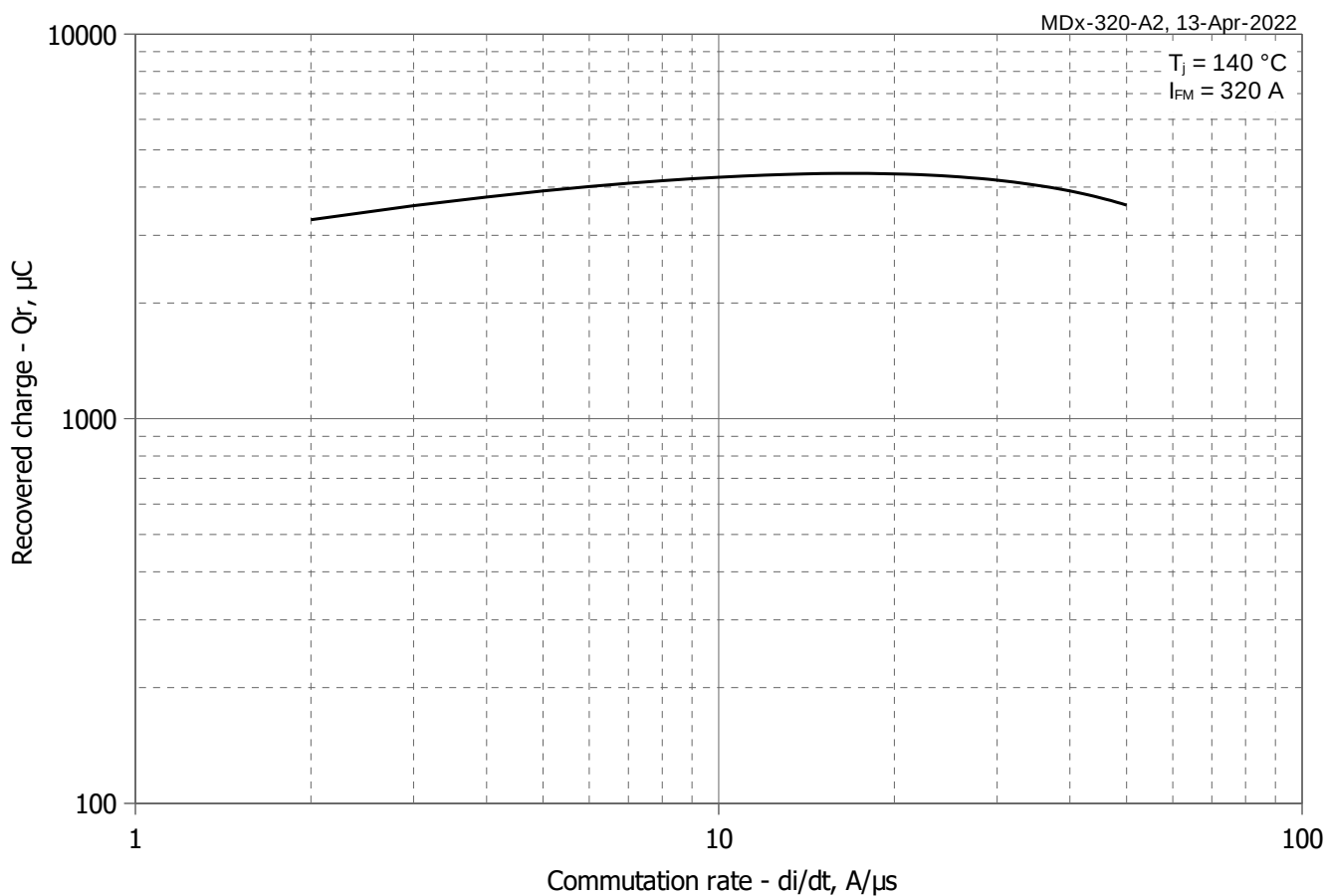


Fig 4 - Maximum recovered charge Q_r vs. commutation rate di_R/dt (25% chord)

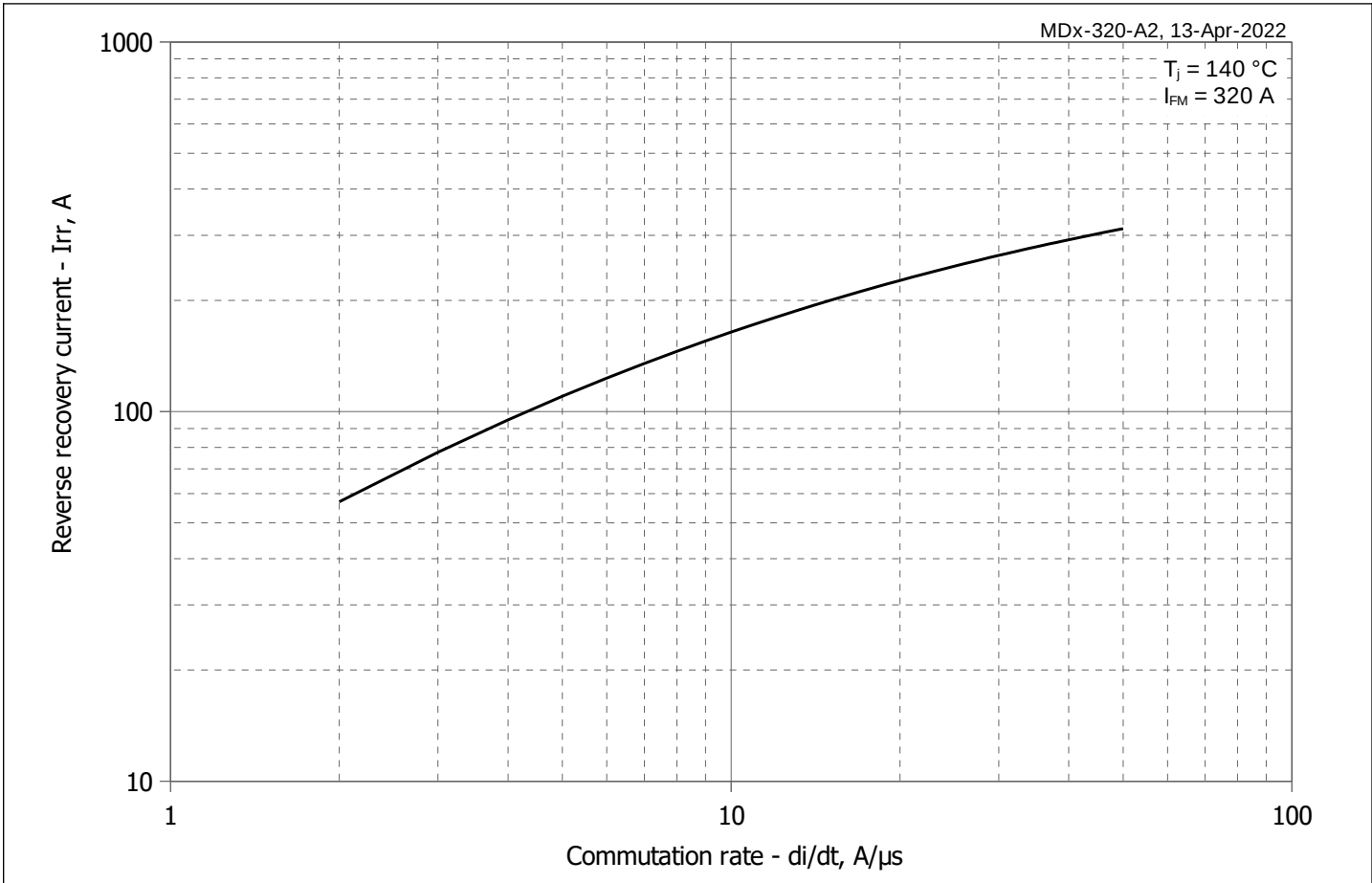


Fig 5 - Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

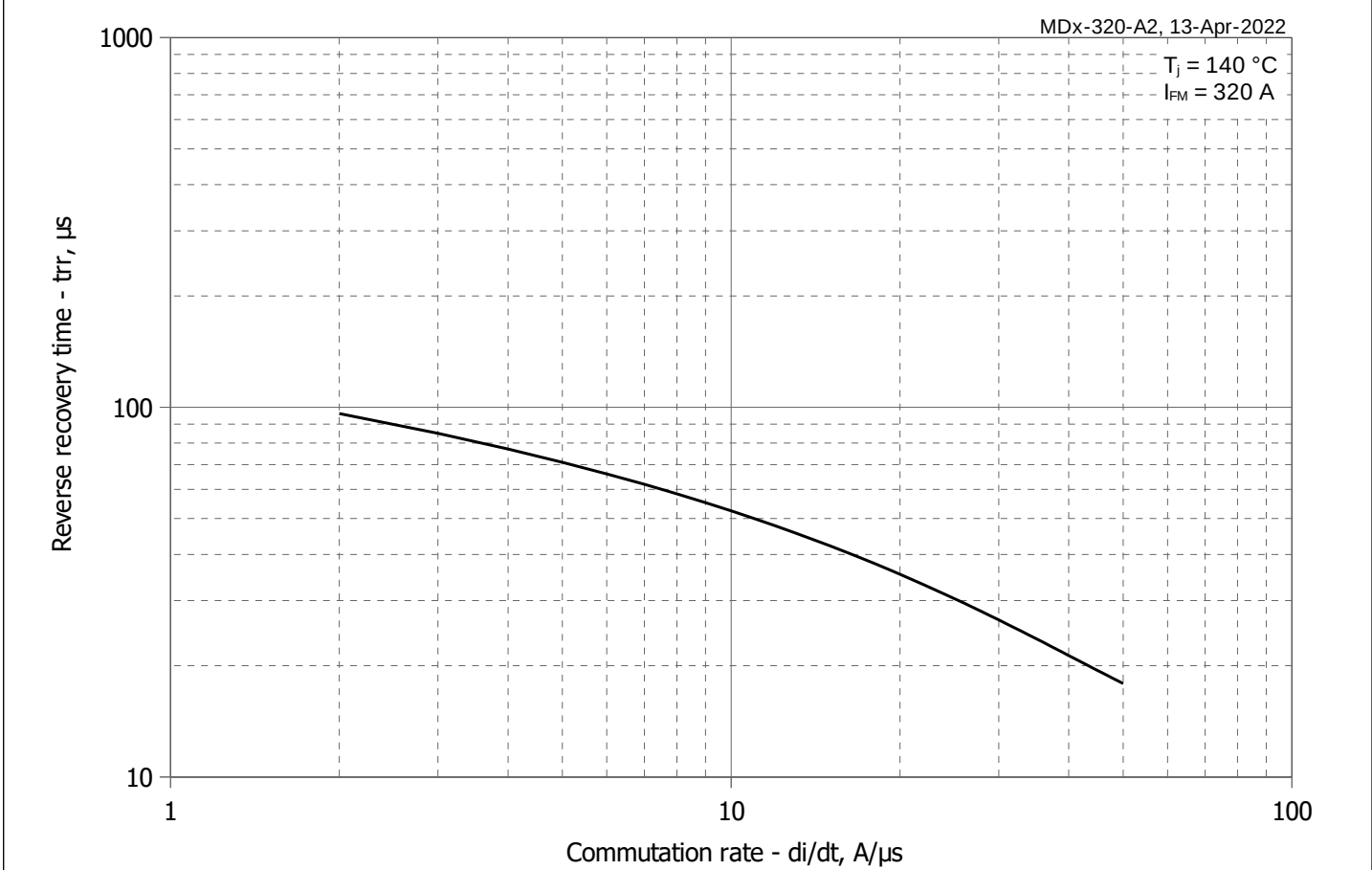


Fig 6 - Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

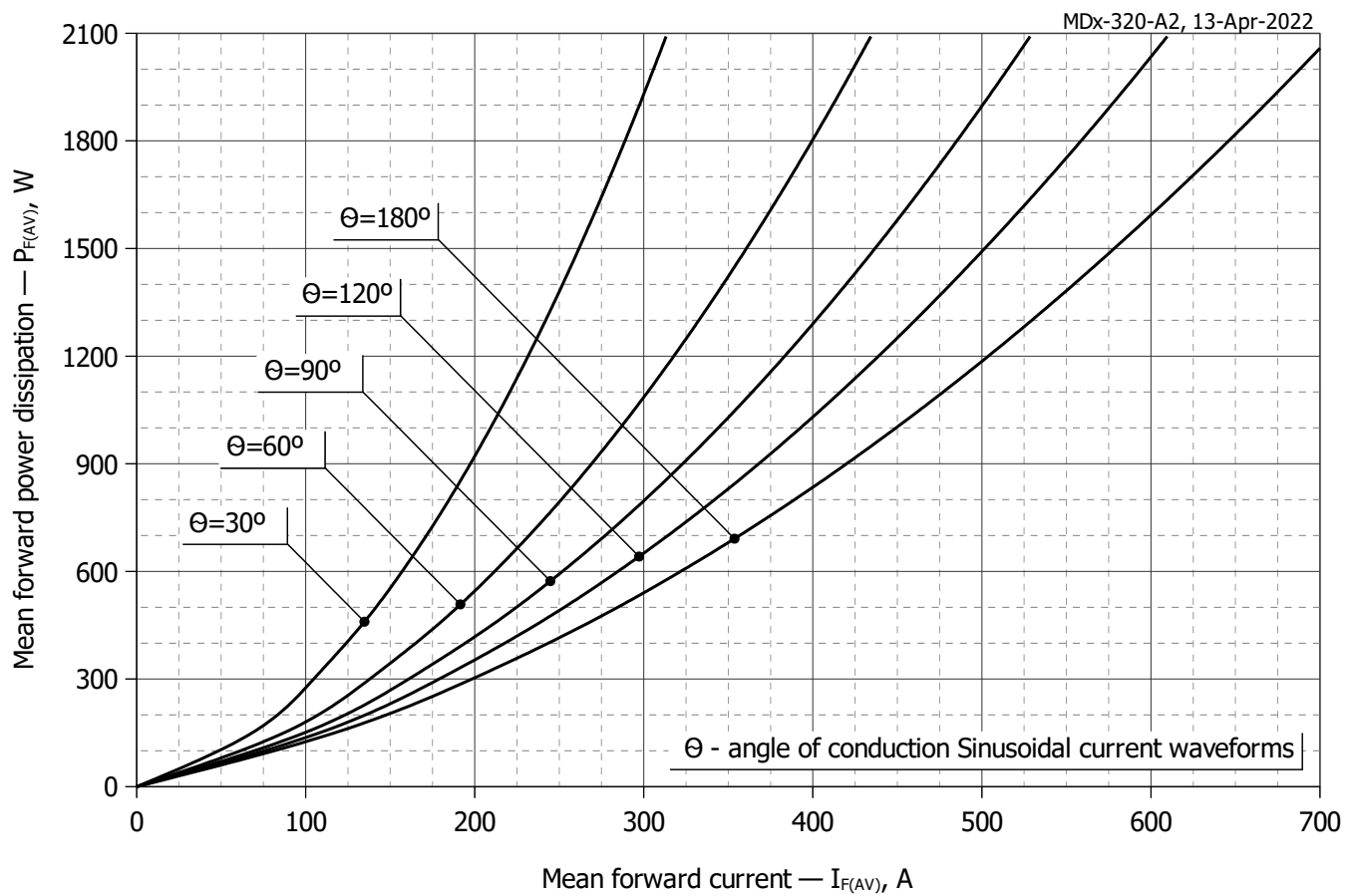


Fig. 7 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$)

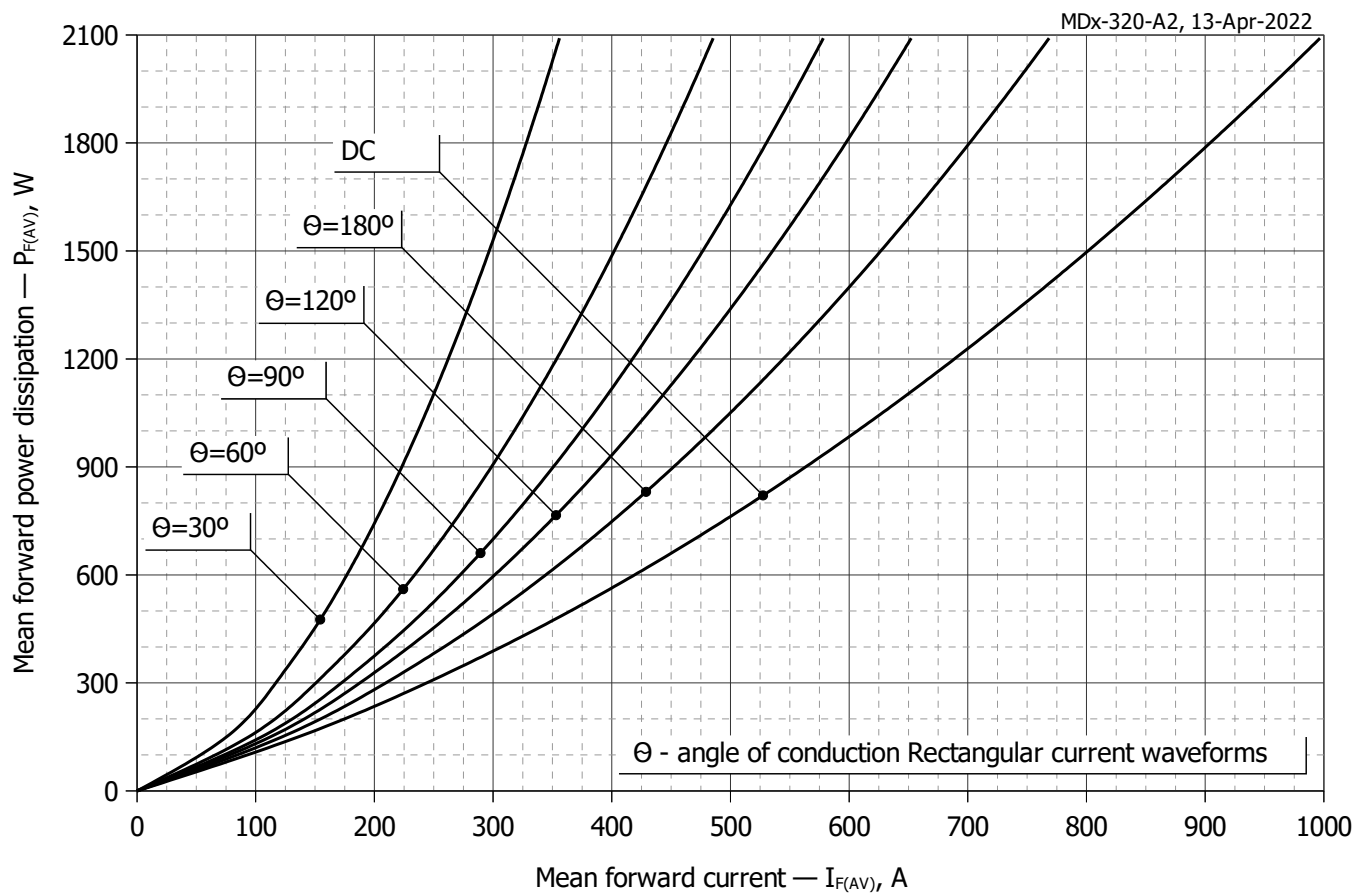


Fig. 8 - Mean forward power dissipation P_{FAV} vs. mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$)

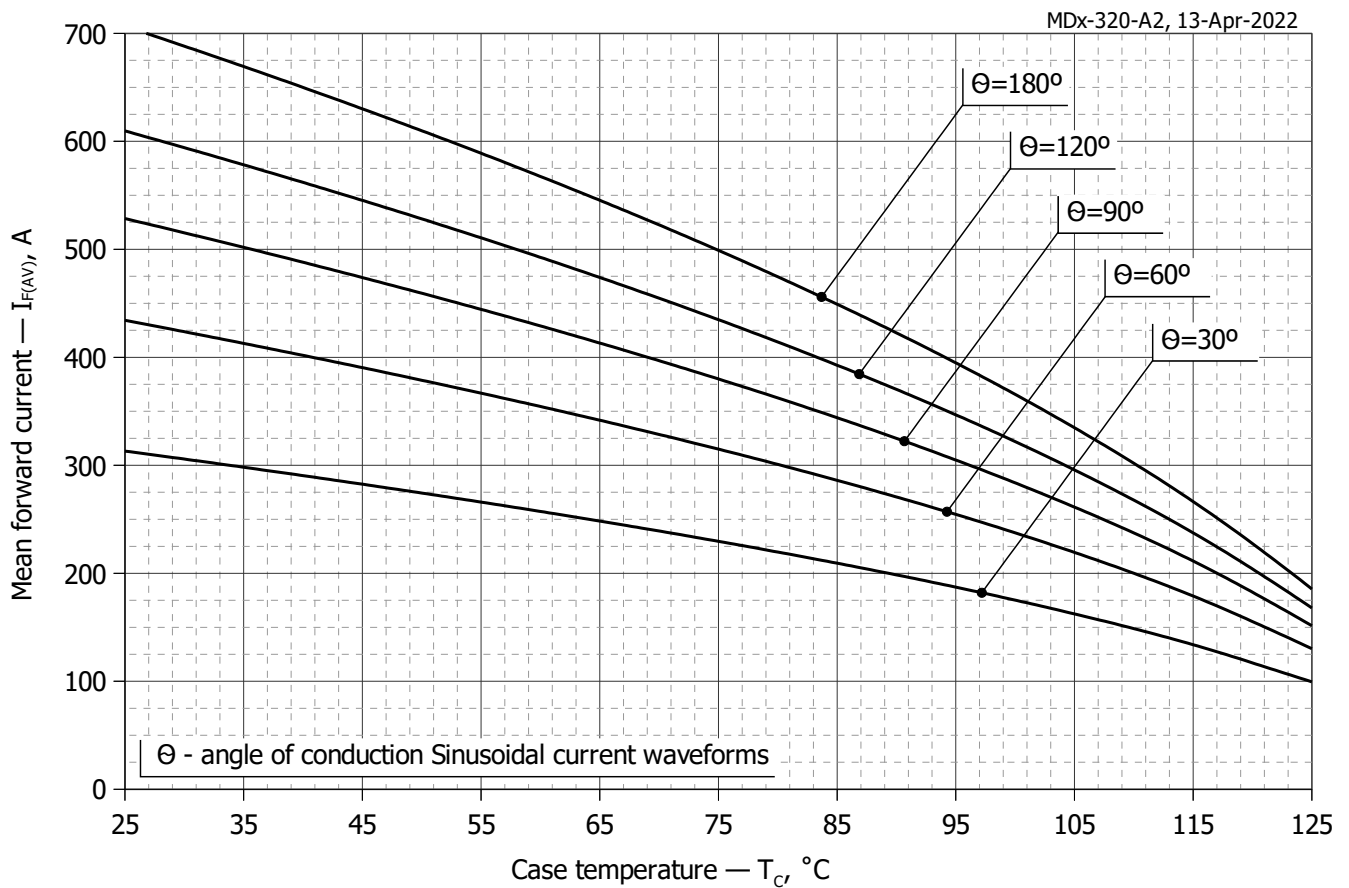


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$)

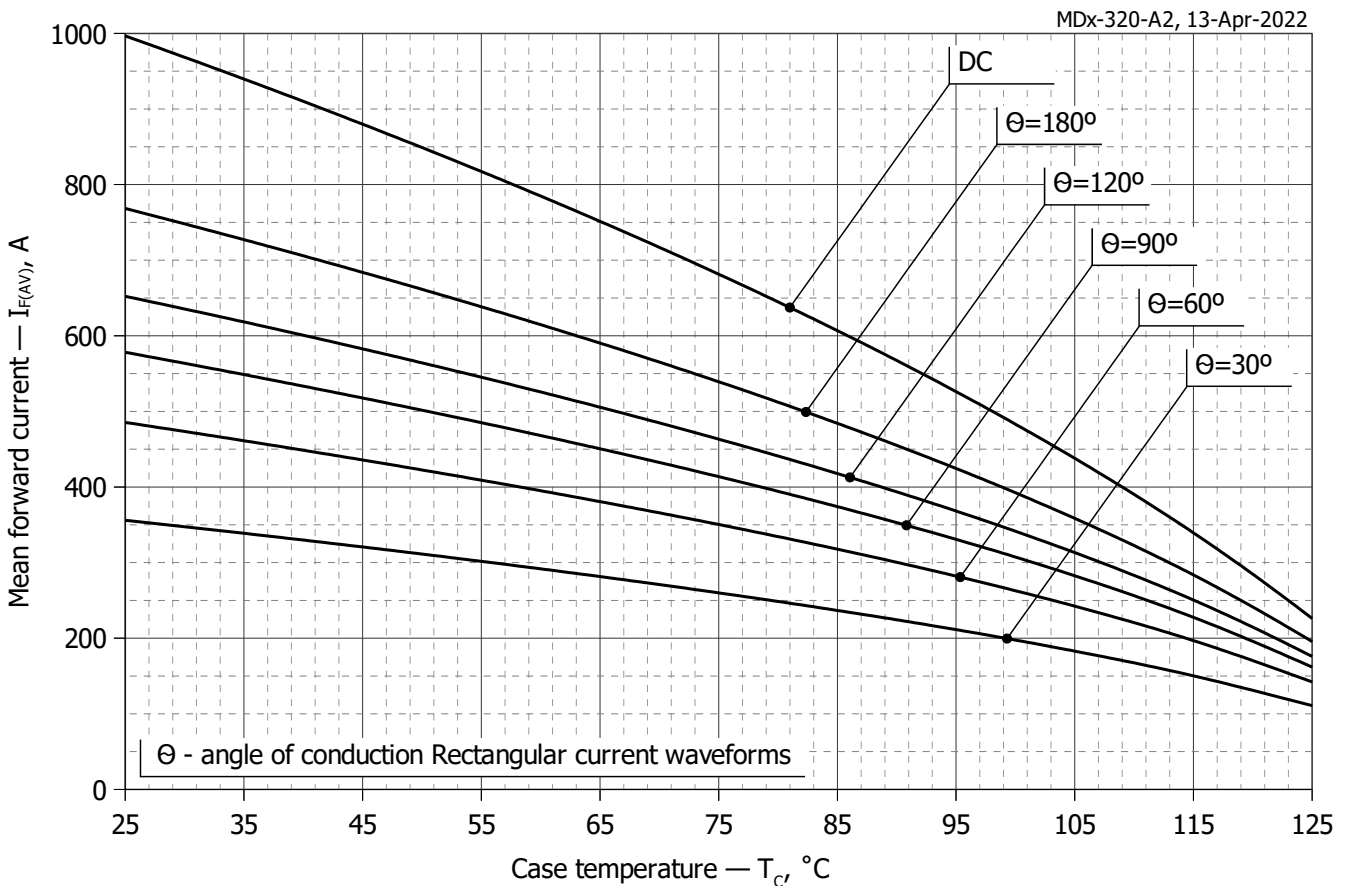


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$)

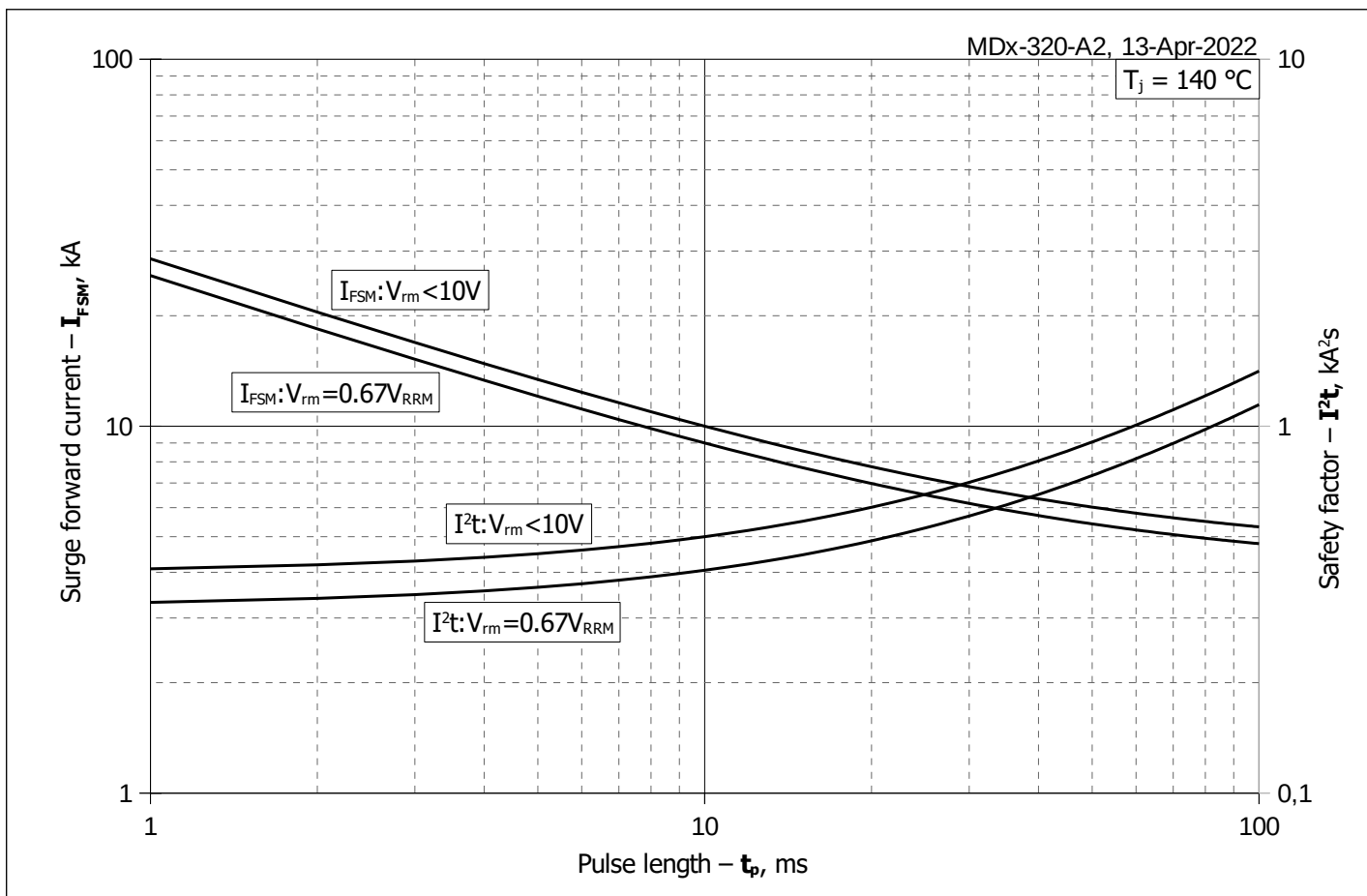


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

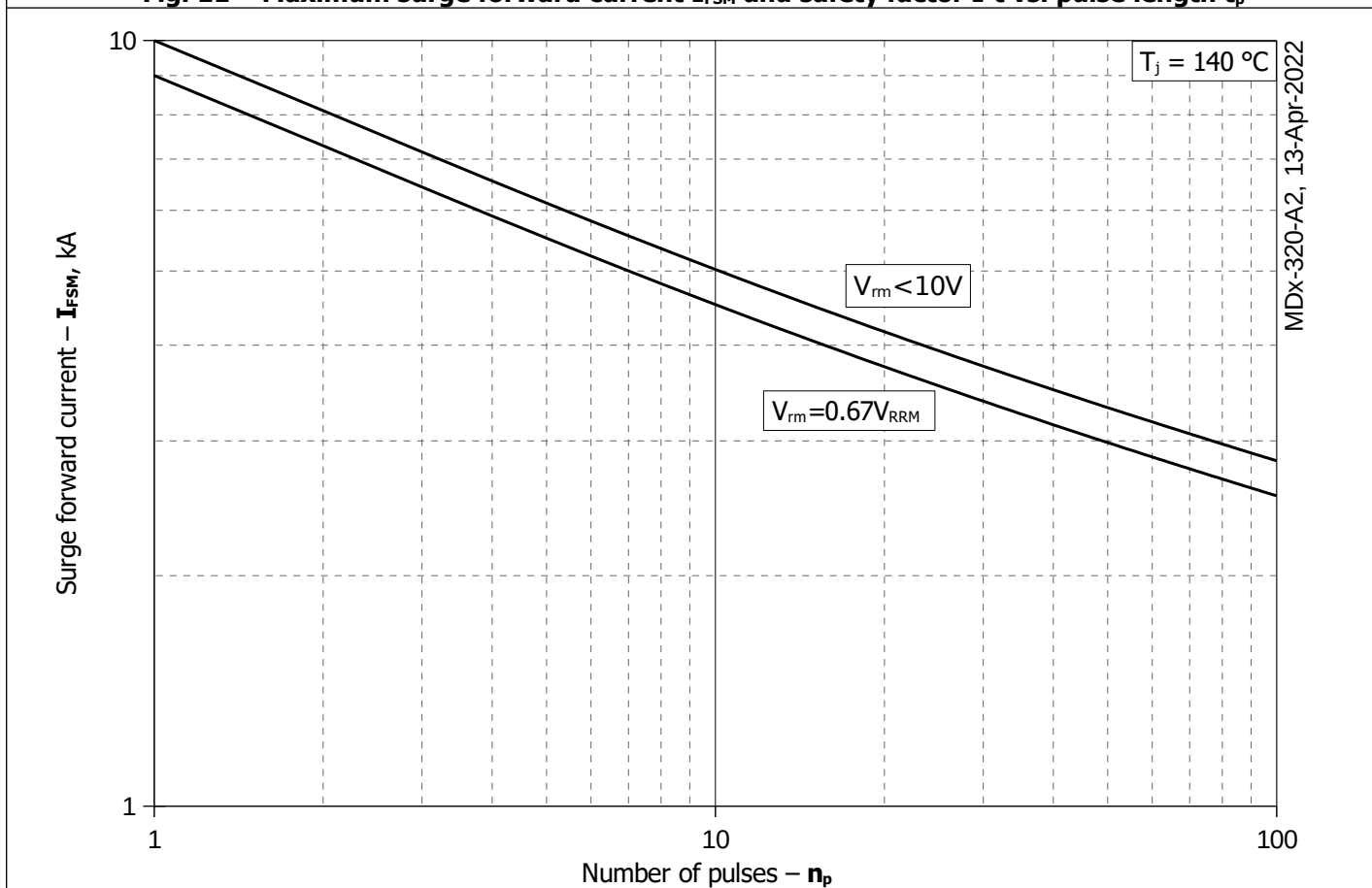


Fig. 12 - Maximum surge forward current I_{FSM} vs. number of pulses n_p