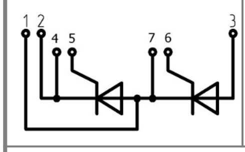
Double Thyristor Module For Phase Control
MTx-700-18-A2

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

Mean on-state current	I_{TAV}	700 A
Repetitive peak off-state voltage	V_{DRM}	1400...1800 V
Repetitive peak reverse voltage	V_{RRM}	
Turn-off time	t_q	250 µs

V_{DRM}, V_{RRM}, V	1400	1500	1600	1800
Voltage code	14	15	16	18
T_j, °C	–40...+130			

MT3



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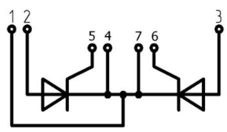
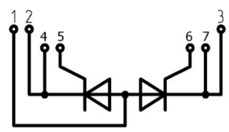
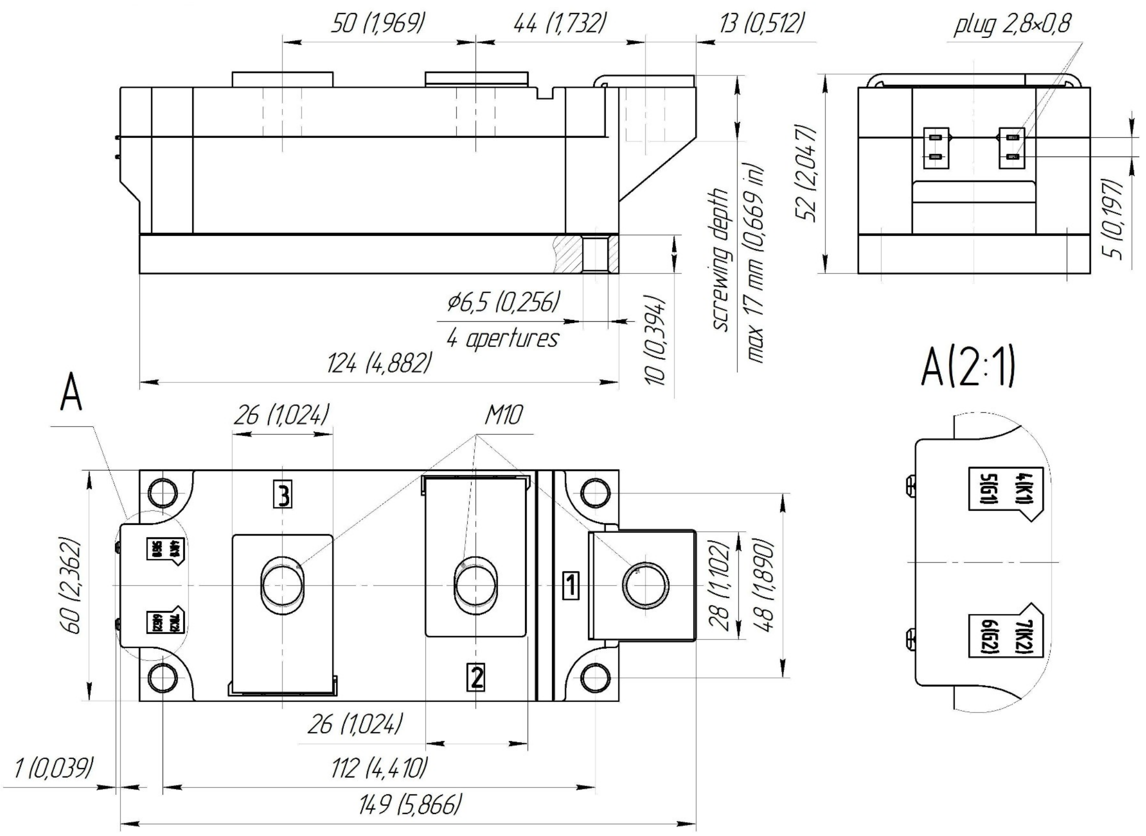
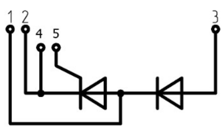


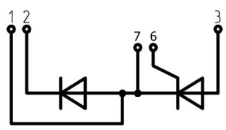
MT5



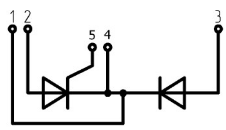




MT/D3



MD/T3



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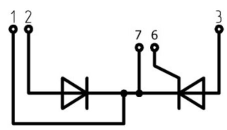
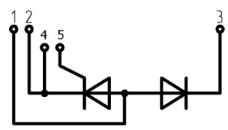
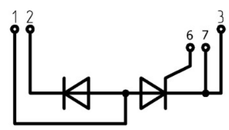


MD/T4



MT/D5



MD/T5

All dimensions in millimeters (inches)

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions	
ON-STATE					
I_{TAV}	Maximum allowable mean on-state current	A	700 650	T_c=80 °C; T_c=85 °C; 180° half-sine wave; 50 Hz	
I_{TRMS}	RMS on-state current	A	1099	T_c=80 °C; 180° half-sine wave; 50 Hz	
I_{TSM}	Surge on-state current	kA	20.0 23.0	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_D=V_R=0 V; Gate pulse: I_G=2 A; t_{GP}=50 µs; di_G/dt≥1 A/µs
			21.0 24.0	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=8.3 ms; single pulse; V_D=V_R=0 V; Gate pulse: I_G=2 A; t_{GP}=50 µs; di_G/dt≥1 A/µs
I^2t	Safety factor	$A^2s \cdot 10^3$	2000 2600	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=10 ms; single pulse; V_D=V_R=0 V; Gate pulse: I_G=2 A; t_{GP}=50 µs; di_G/dt≥1 A/µs
			1800 2300	T_j=$T_{j\ max}$ T_j=25 °C	180° half-sine wave; t_p=8.3 ms; single pulse; V_D=V_R=0 V; Gate pulse: I_G=2 A; t_{GP}=50 µs; di_G/dt≥1 A/µs
BLOCKING					
V_{DRM}, V_{RRM}	Repetitive peak off-state and Repetitive peak reverse voltages	V	1400...1800	$T_{j\ min}$< T_j <$T_{j\ max}$; 180° half-sine wave; 50 Hz; Gate open	
V_{DSM}, V_{RSM}	Non-repetitive peak off-state and Non-repetitive peak reverse voltages	V	1500...1900	$T_{j\ min}$< T_j <$T_{j\ max}$; 180° half-sine wave; single pulse; Gate open	
V_D, V_R	Direct off-state and Direct reverse voltages	V	$0.6 \cdot V_{DRM}$ $0.6 \cdot V_{RRM}$	T_j=$T_{j\ max}$; Gate open	
TRIGGERING					
I_{FGM}	Peak forward gate current	A	8	T_j=$T_{j\ max}$	
V_{RGM}	Peak reverse gate voltage	V	5		
P_G	Gate power dissipation	W	4	T_j=$T_{j\ max}$ for DC gate current	
SWITCHING					
$(di_T/dt)_{crit}$	Critical rate of rise of on-state current non-repetitive (f=1 Hz)	A/µs	1000	T_j=$T_{j\ max}$; V_D=1300 V; I_{TM}=1450 A; Gate pulse: I_G=2 A; t_{GP}=50 µs; di_G/dt≥2 A/µs	
THERMAL					
T_{stg}	Storage temperature	°C	–40...+50		
T_j	Operating junction temperature	°C	–40...+130		
$T_{c\ op}$	Operating temperature	°C	–40...+125		
MECHANICAL					
a	Acceleration under vibration	m/s^2	50		

CHARACTERISTICS

Symbols and parameters		Units	Values	Conditions
ON-STATE				
V_{TM}	Peak on-state voltage, max	V	1.65	T_j=25 °C; I_{TM}= 2198 A
$V_{T(TO)}$	On-state threshold voltage, max	V	0.80	T_j=$T_{j\,max}$; 0.5 π I_{TAV} < I_T < 1.5 π I_{TAV}
r_T	On-state slope resistance, max	mΩ	0.35	
I_L	Latching current, max	mA	1000	T_j=25 °C; V_D=12 V; Gate pulse: I_G=2 A; t_{GP}=50 μs; di_G/dt≥1 A/μs
I_H	Holding current, max	mA	300	T_j=25 °C; V_D=12 V; Gate open
BLOCKING				
I_{DRM}, I_{RRM}	Repetitive peak off-state and Repetitive peak reverse currents, max	mA	70 3.00	T_j=$T_{j\,max}$ T_j= 25 °C V_D=V_{DRM}; V_R=V_{RRM}
$(dv_D/dt)_{crit}$	Critical rate of rise of off-state voltage[1], min	V/μs	200, 320, 500, 1000, 1600, 2000, 2500	T_j=$T_{j\,max}$; V_D=0.67·V_{DRM}; Gate open
TRIGGERING				
V_{GT}	Gate trigger direct voltage, max	V	2.00 1.50 1.00	T_j= $T_{j\,min}$ T_j=25 °C T_j= $T_{j\,max}$ V_D=12 V; I_D=3 A; Direct gate current
I_{GT}	Gate trigger direct current, max	mA	300 200 100	T_j= $T_{j\,min}$ T_j= 25 °C T_j= $T_{j\,max}$
V_{GD}	Gate non-trigger direct voltage, min	V	0.25	T_j=$T_{j\,max}$; V_D=0.67·V_{DRM}; Direct gate current
I_{GD}	Gate non-trigger direct current, min	mA	10.00	
SWITCHING				
t_{gd}	Delay time, max	μs	1.00	T_j=25 °C; V_D=600 V; I_{TM}=I_{TAV}; di/dt=200 A/μs; Gate pulse: I_G=2 A; V_G=20 V; t_{GP}=50 μs; di_G/dt=2 A/μs
t_{gt}	Turn-on time, max	μs	3.00	
t_q	Turn-off time[2], max	μs	250	dv_D/dt=50 V/μs; T_j=$T_{j\,max}$; I_{TM}= I_{TAV}; di_R/dt=10 A/μs; V_R=100V; V_D=0.67 V_{DRM};
Q_{rr}	Recovered charge, max	μC	1790	T_j=$T_{j\,max}$; I_{TM}=630 A; 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	143	
THERMAL				
R_{thjc}	Thermal resistance, junction to case			
	per module	°C/W	0.0255	180° half-sine wave, 50 Hz
	per arm	°C/W	0.0510	
	per module	°C/W	0.0245	DC
	per arm	°C/W	0.0490	
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)[3]	Nm	6.00	Tolerance ± 15%
M_2	Terminal connection torque (M10)[3]	Nm	12.00	Tolerance ± 15%
m	Weight, max	g	1500	

PART NUMBERING GUIDE

MT	3	-	700	-	18	-	A2	M2	-	A2	-	N
1	2		3		4		5	6		7		8

1. Thyristor module (MT)
   Thyristor – Diode module (MT/D)
   Diode – Thyristor module (MD/T)
2. Circuit Schematic:
   3 – serial connection
   4 – common Cathode
   5 – common Anode
3. Average On-state Current, A
4. Voltage Code
5. Critical rate of rise of off-state voltage
6. Group of turn-off time (dv_D/dt=50 V/μs)
7. Package Type (M.A2)
8. Ambient Conditions:
   N – Normal

NOTES

1) Critical rate of rise of off-state voltage

Symbol of Group	P2	K2	E2	A2	T1	P1	M1
$(dv_D/dt)_{crit}$, V/μs	200	320	500	1000	1600	2000	2500

2) Turn-off time (dv_D/dt=50 V/μs)

Symbol of Group	M2
t_q, μs	250

3) The screws must be lubricated

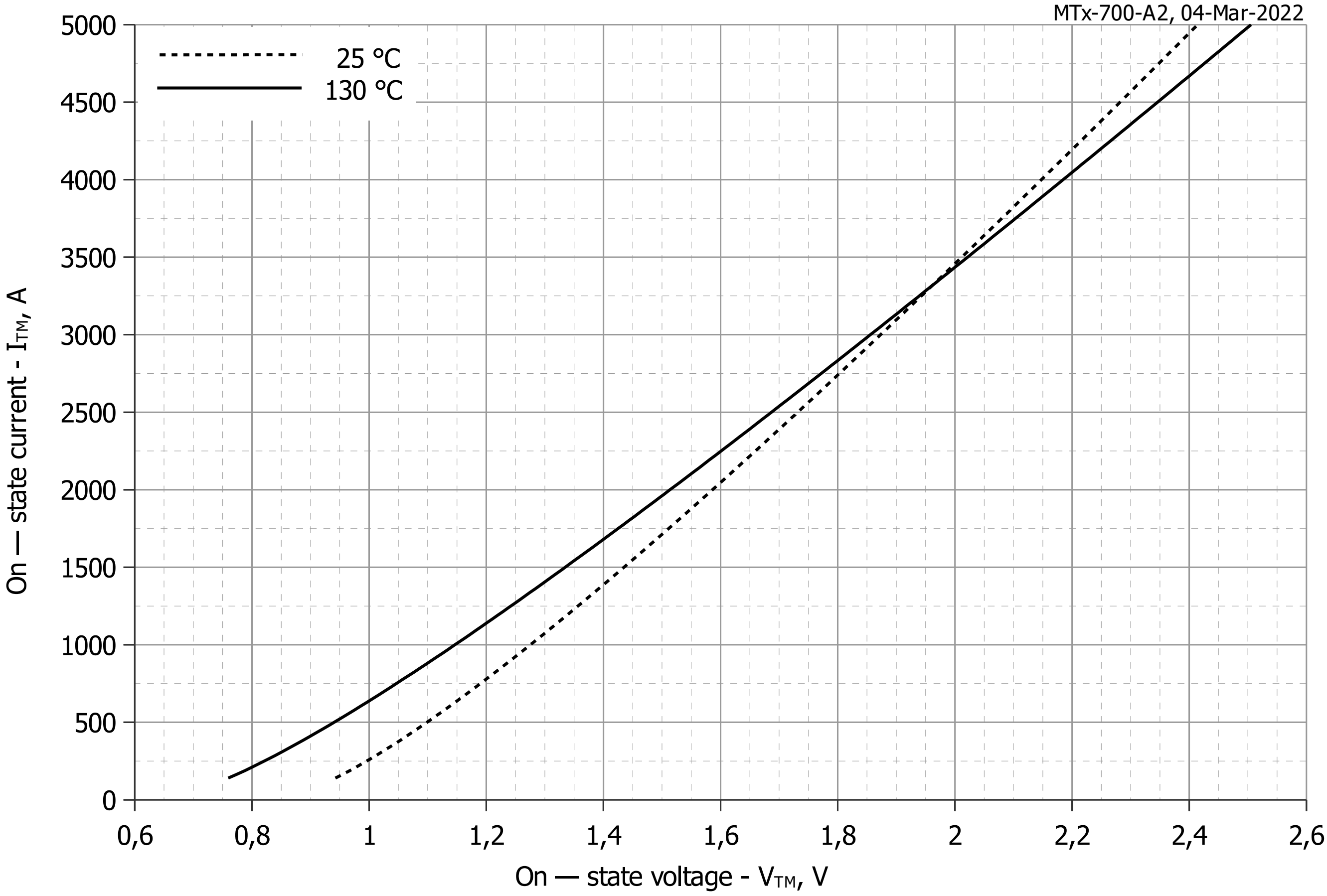


Fig 1 – On-state characteristics of Limit device

Analytical function for On-state characteristic:

$$V_T = A + B \cdot i_T + C \cdot \ln(i_T + 1) + D \cdot \sqrt{i_T}$$

	Coefficients for max curves	
	T_j = 25°C	$T_j = T_{j\,max}$
A	0.82882988	0.62107012
B	0.00020724	0.00025945
C	-0.00207891	0.00108671
D	0.00801973	0.00817388

On-state characteristic model (see Fig. 1)

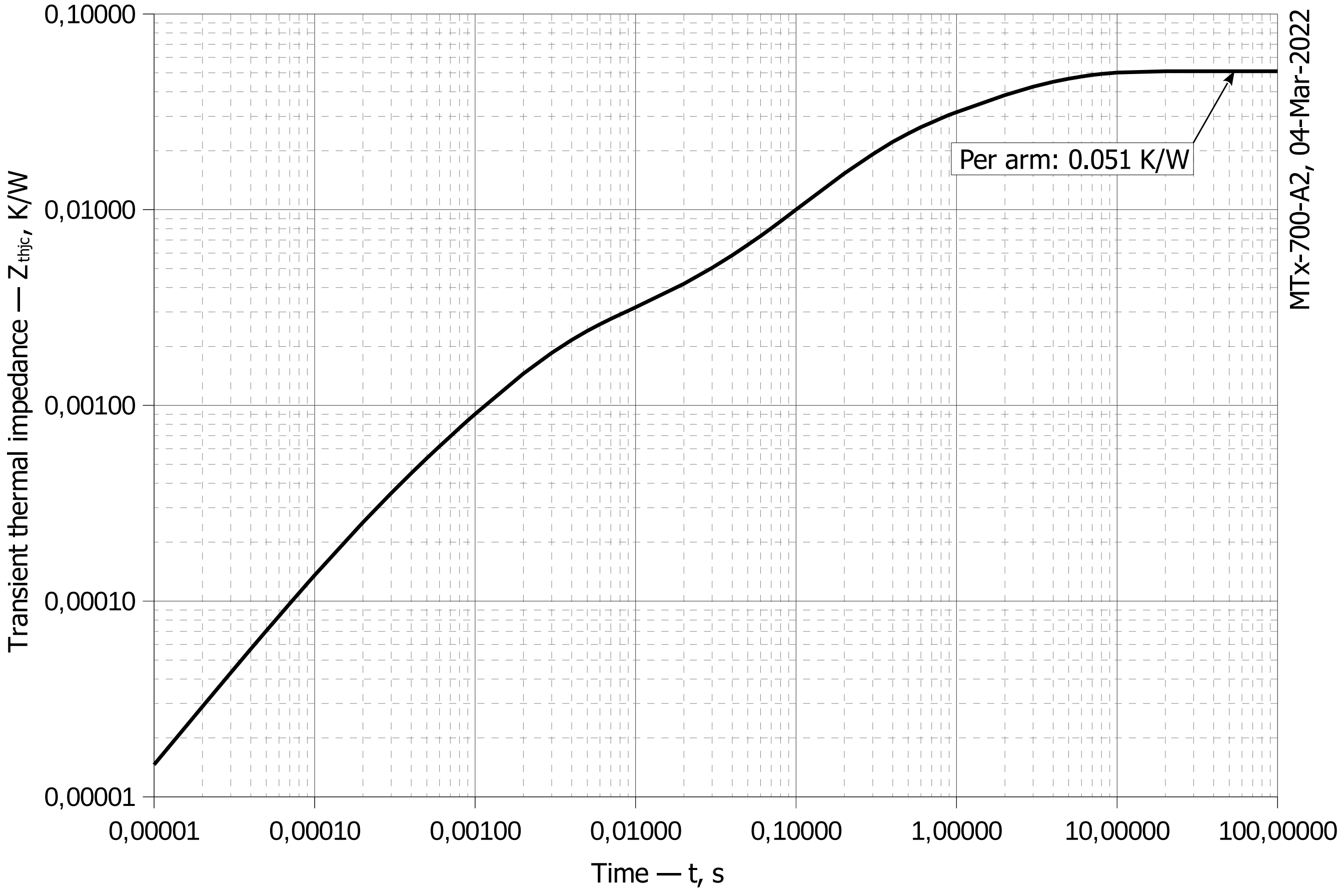


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

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	0.0209	0.0112	0.01635	0.0006528	0.001791	0.0001363
τ_i, s	3.132	1.000	0.2335	0.01038	0.002348	0.0002448

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

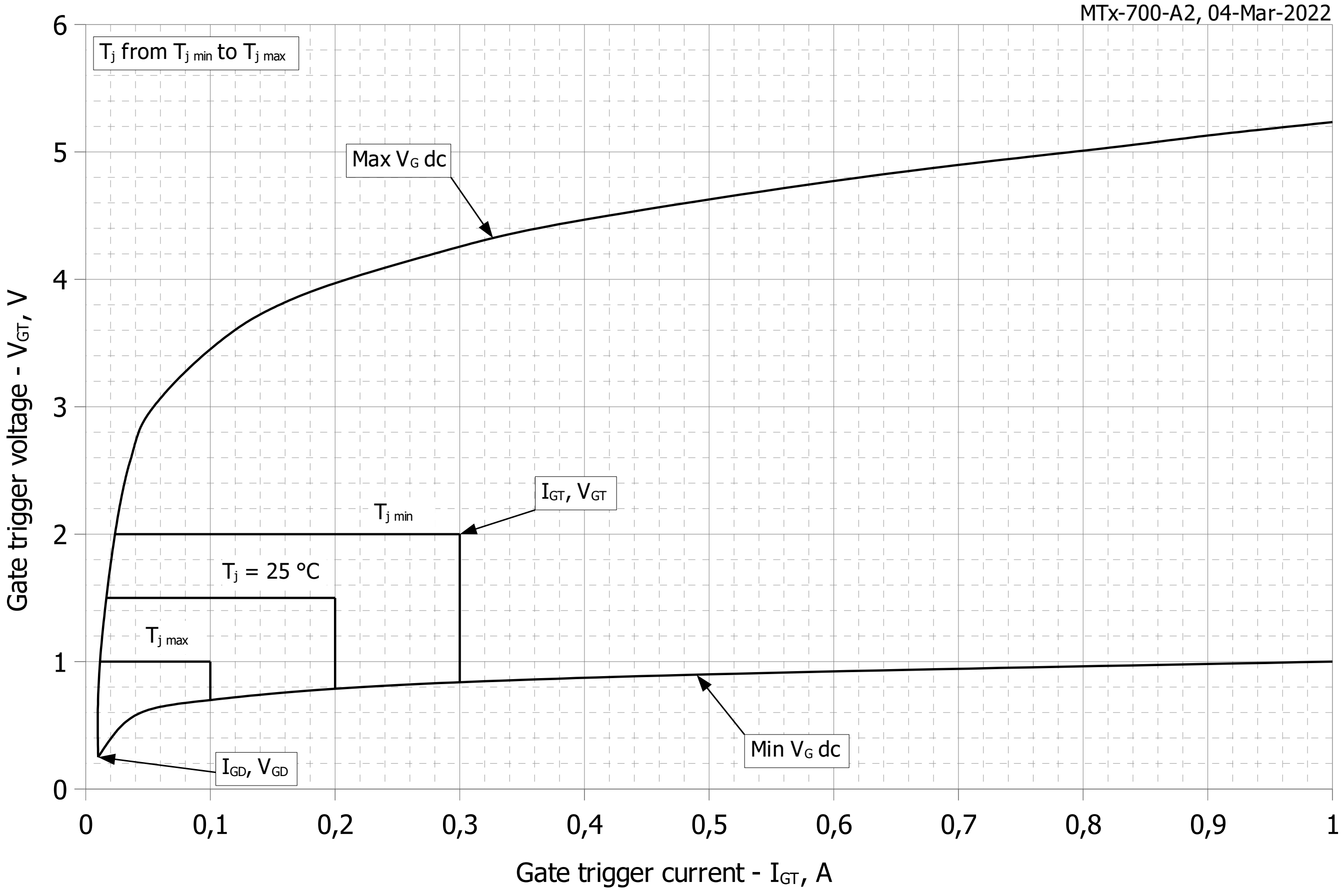


Fig 3 – Gate characteristics – Trigger limits

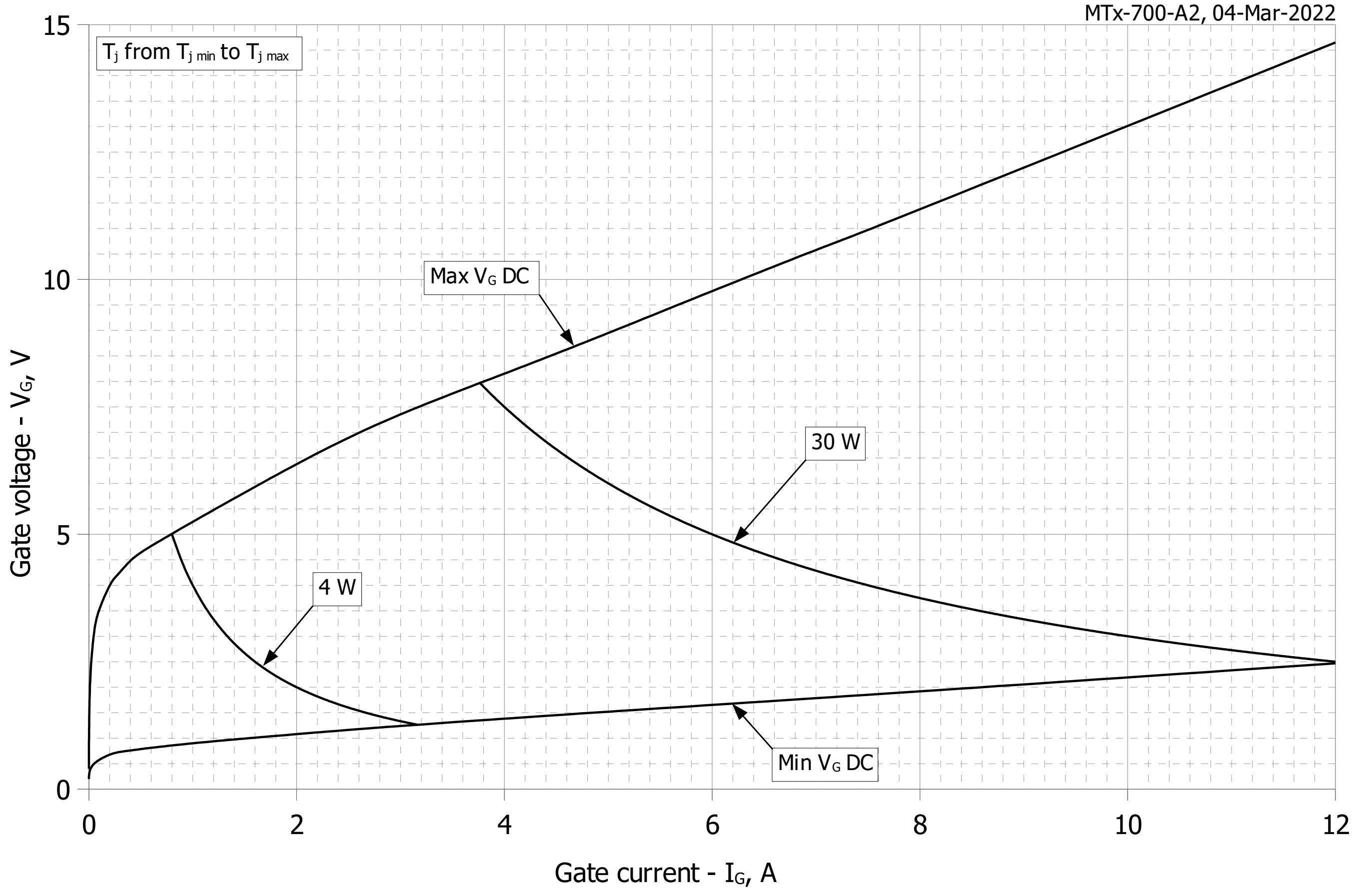


Fig 4 - Gate characteristics – Power curves

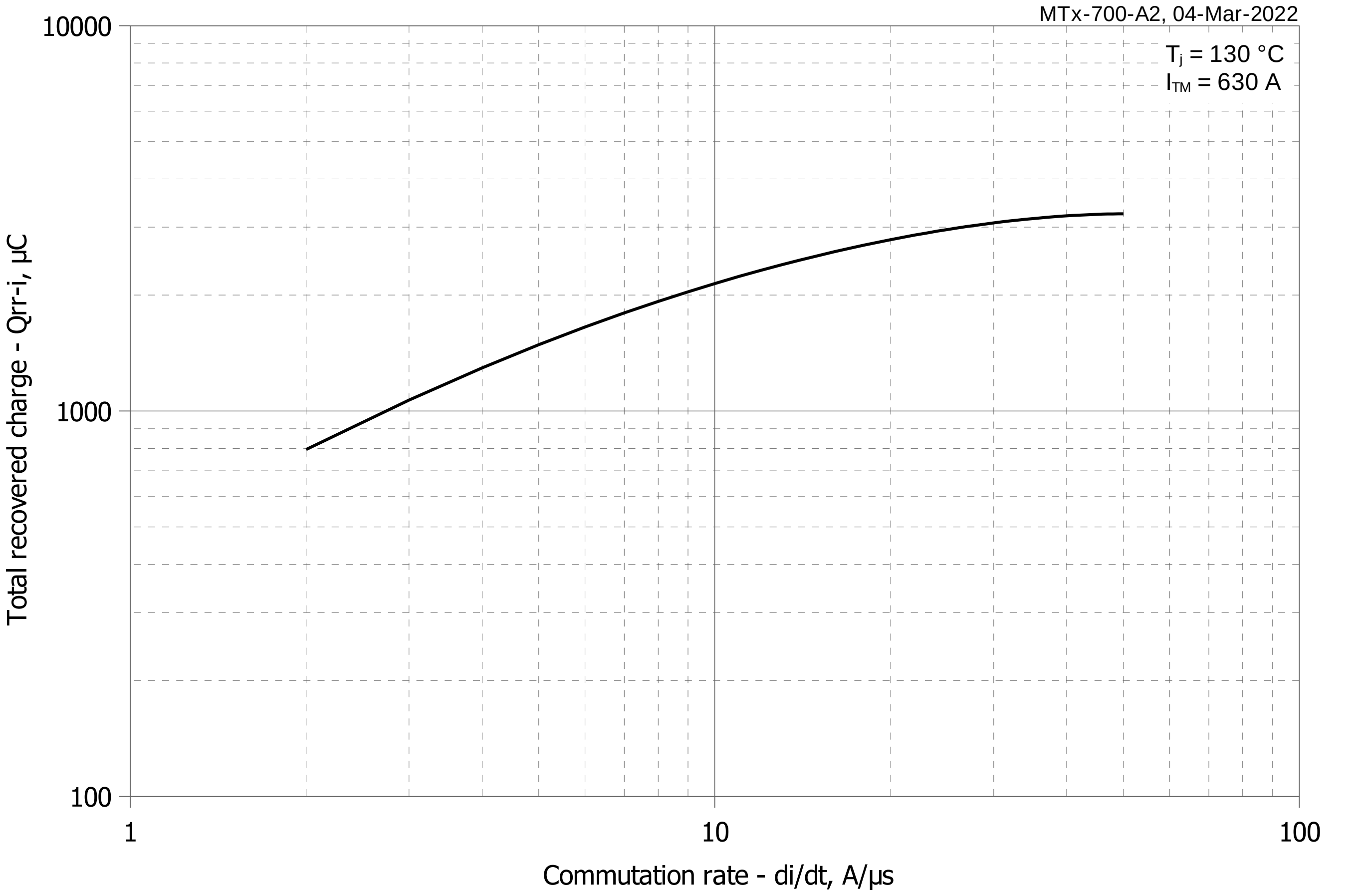


Fig 5 – Maximum recovered charge $Q_{rr\text{-}i}$ (integral) vs. commutation rate di_R/dt

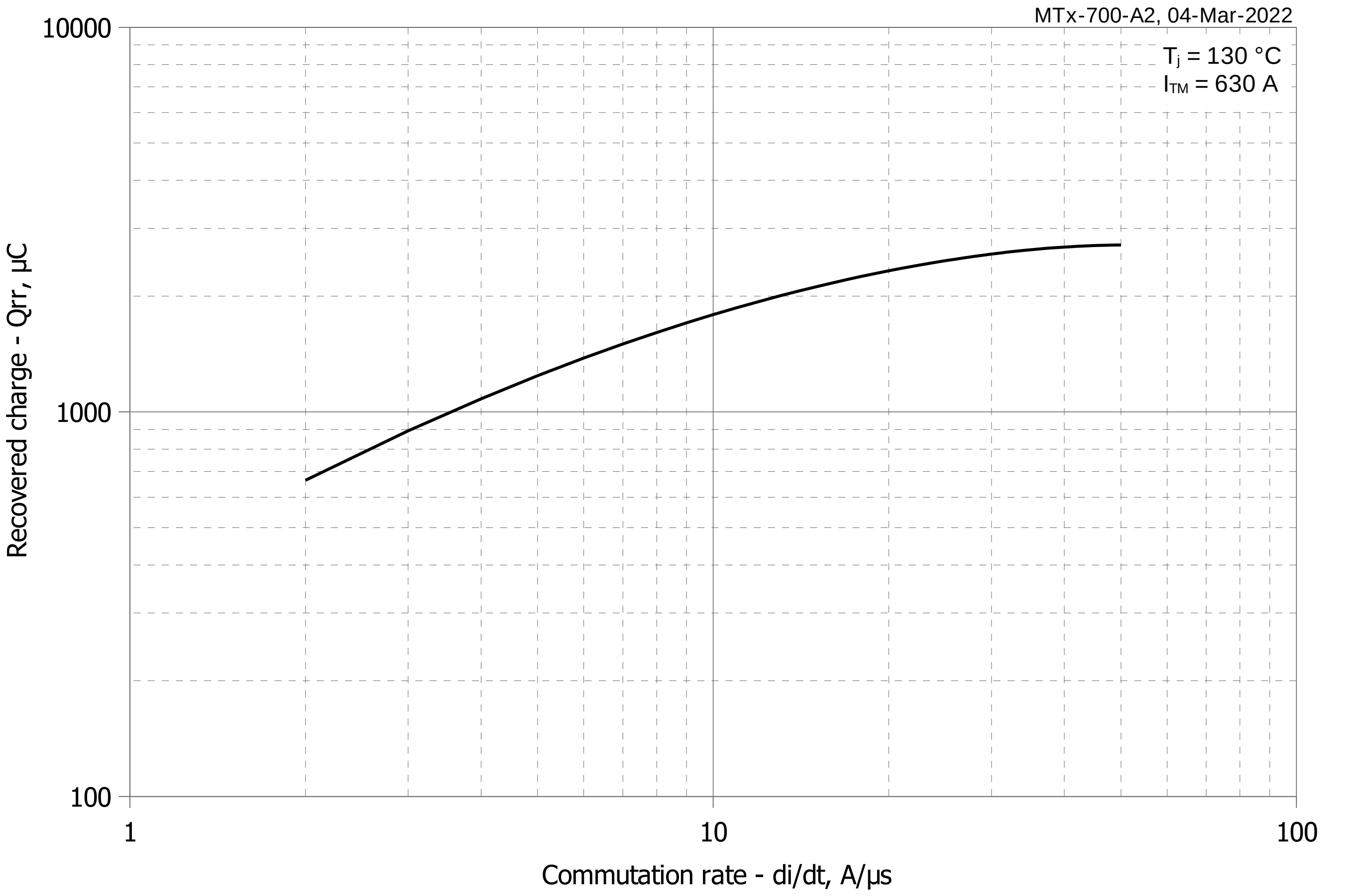


Fig 6 – Maximum recovered charge Q_{rr} vs. commutation rate di_R/dt (25% chord)

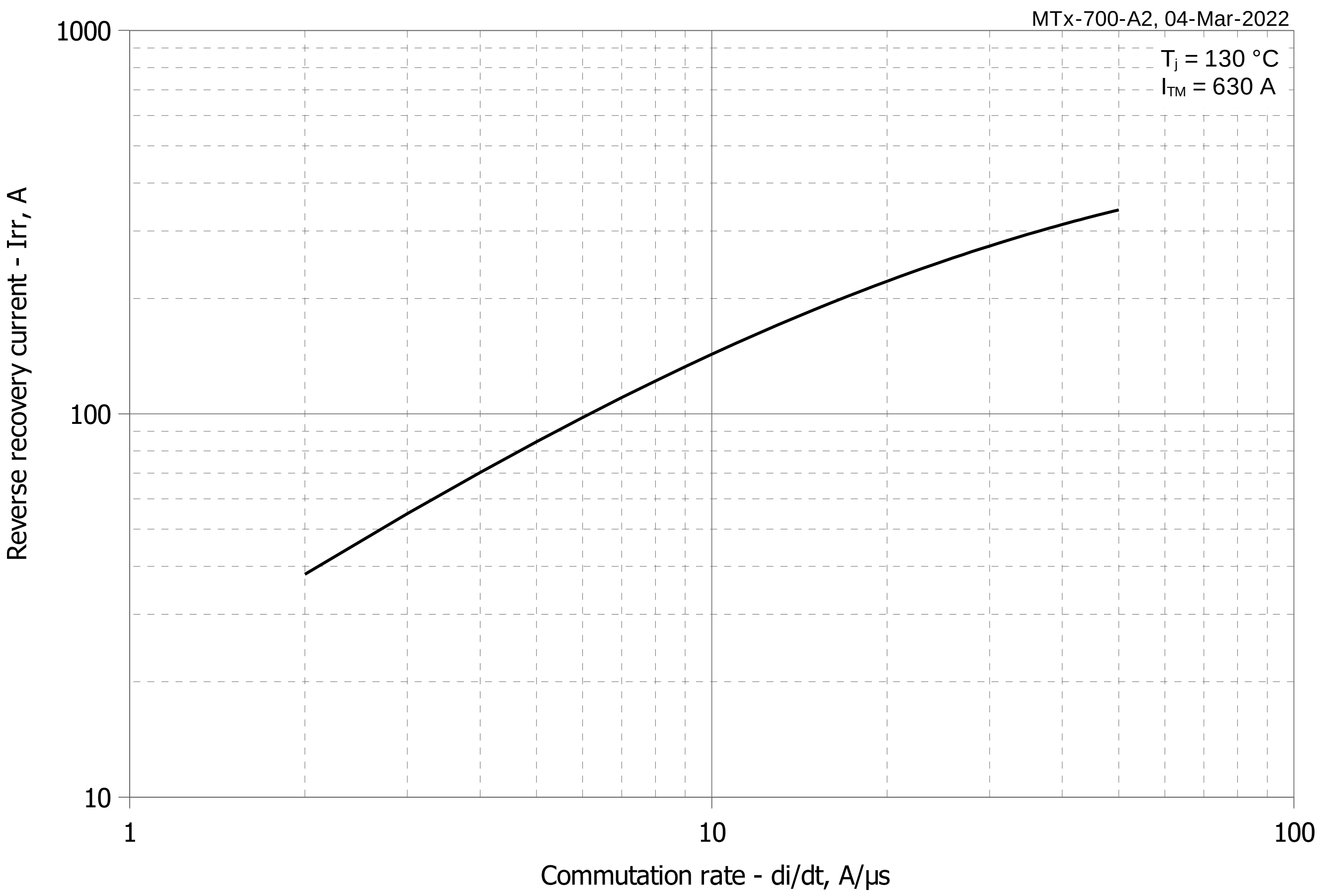


Fig 7 – Maximum reverse recovery current I_{rr} vs. commutation rate di_R/dt

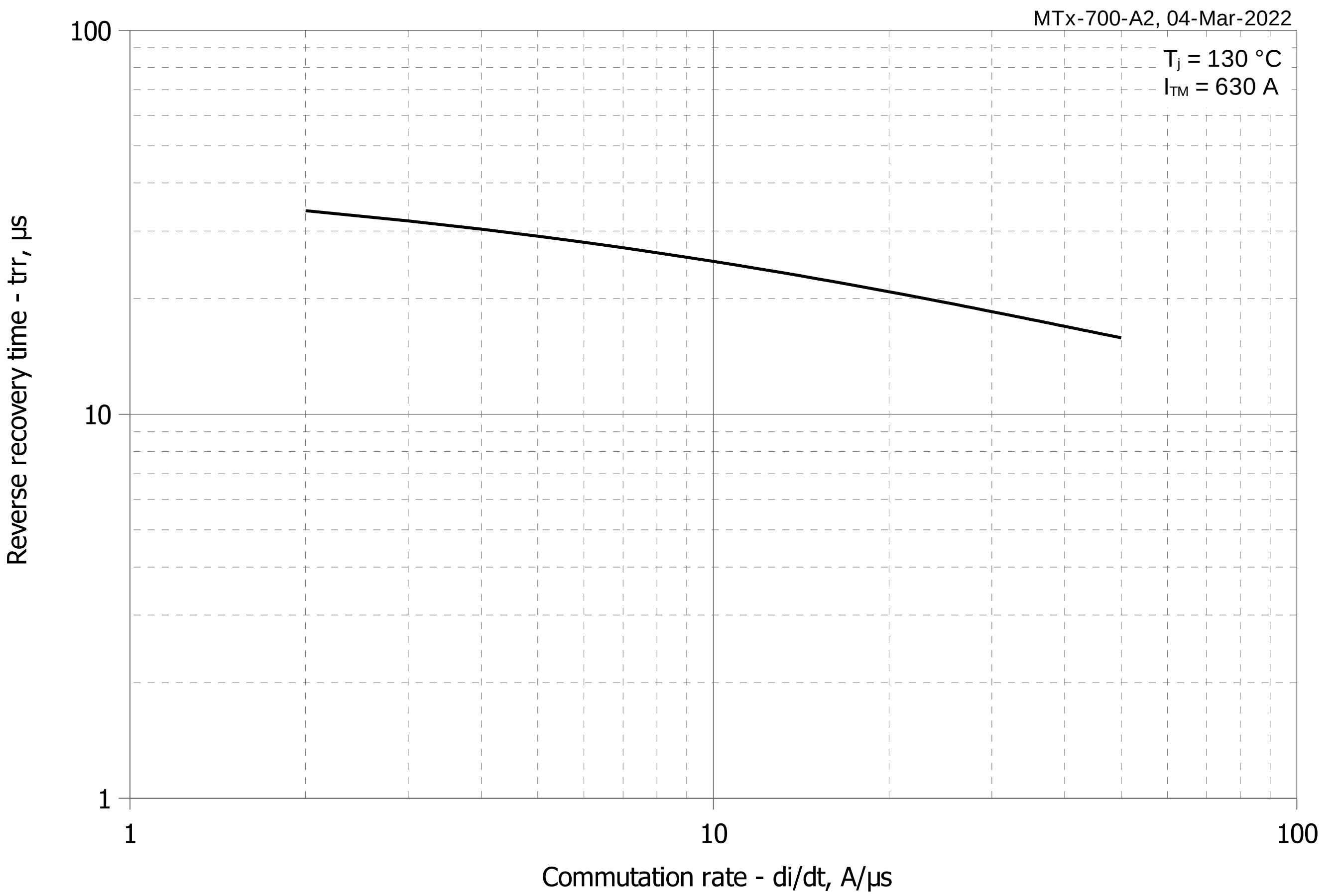


Fig 8 – Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)

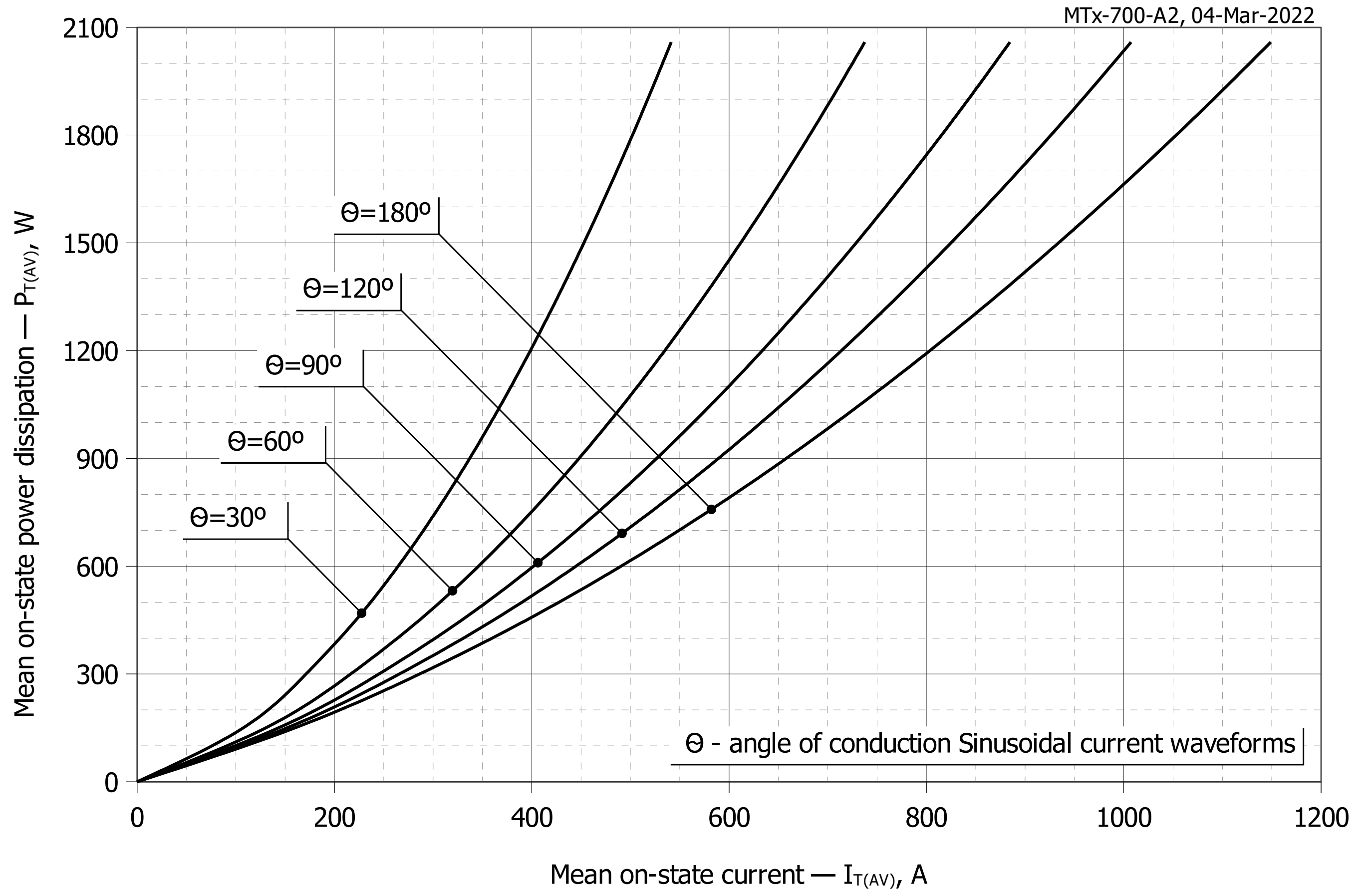


Fig. 9 - Mean on-state power dissipation P_{TAV} vs. mean on-state current I_{TAV} for sinusoidal current waveforms at different conduction angles (f=50Hz)

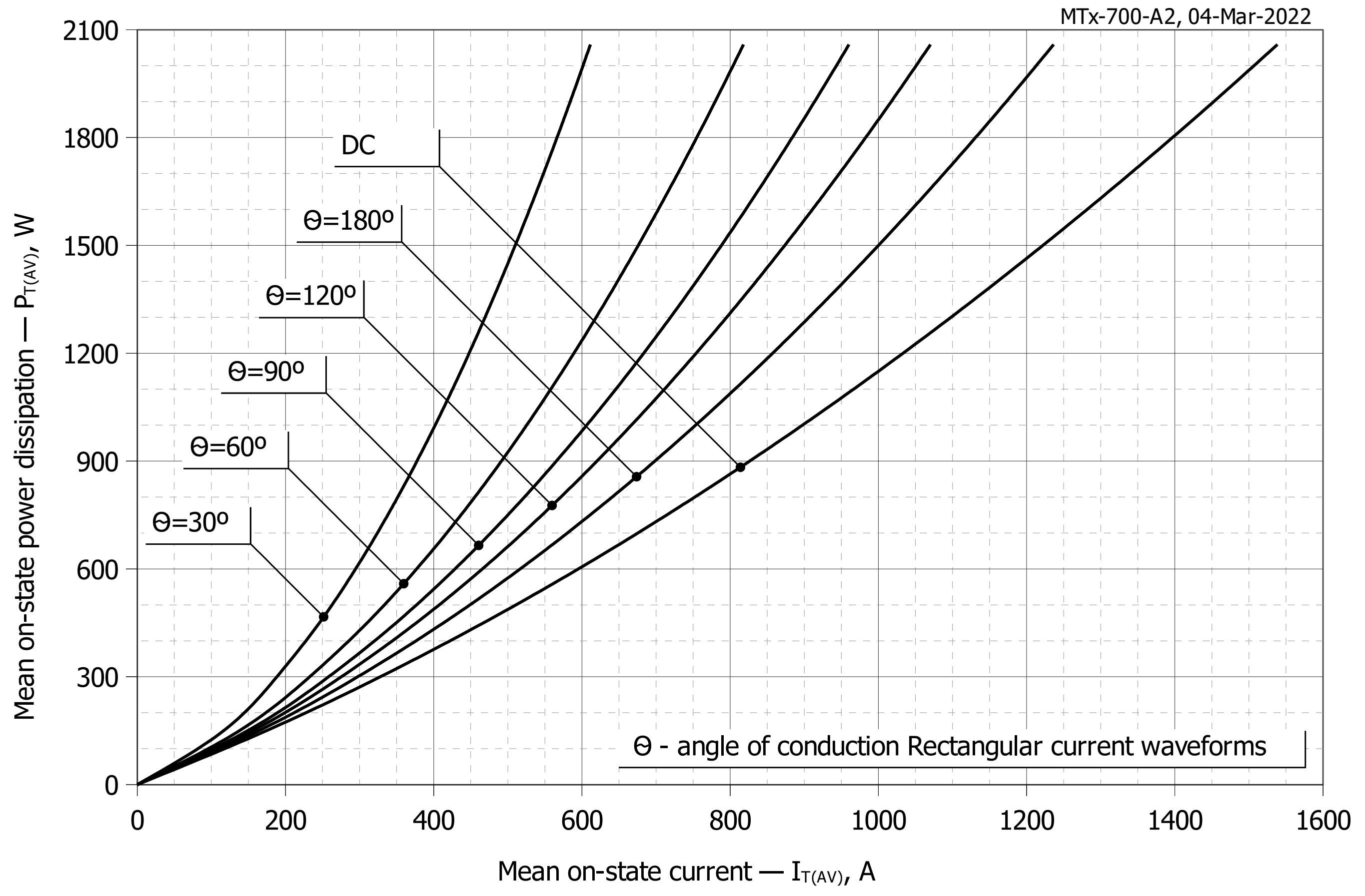


Fig. 10 – Mean on-state power dissipation P_{TAV} vs. mean on-state current I_{TAV} for rectangular current waveforms at different conduction angles and for DC (f=50Hz)

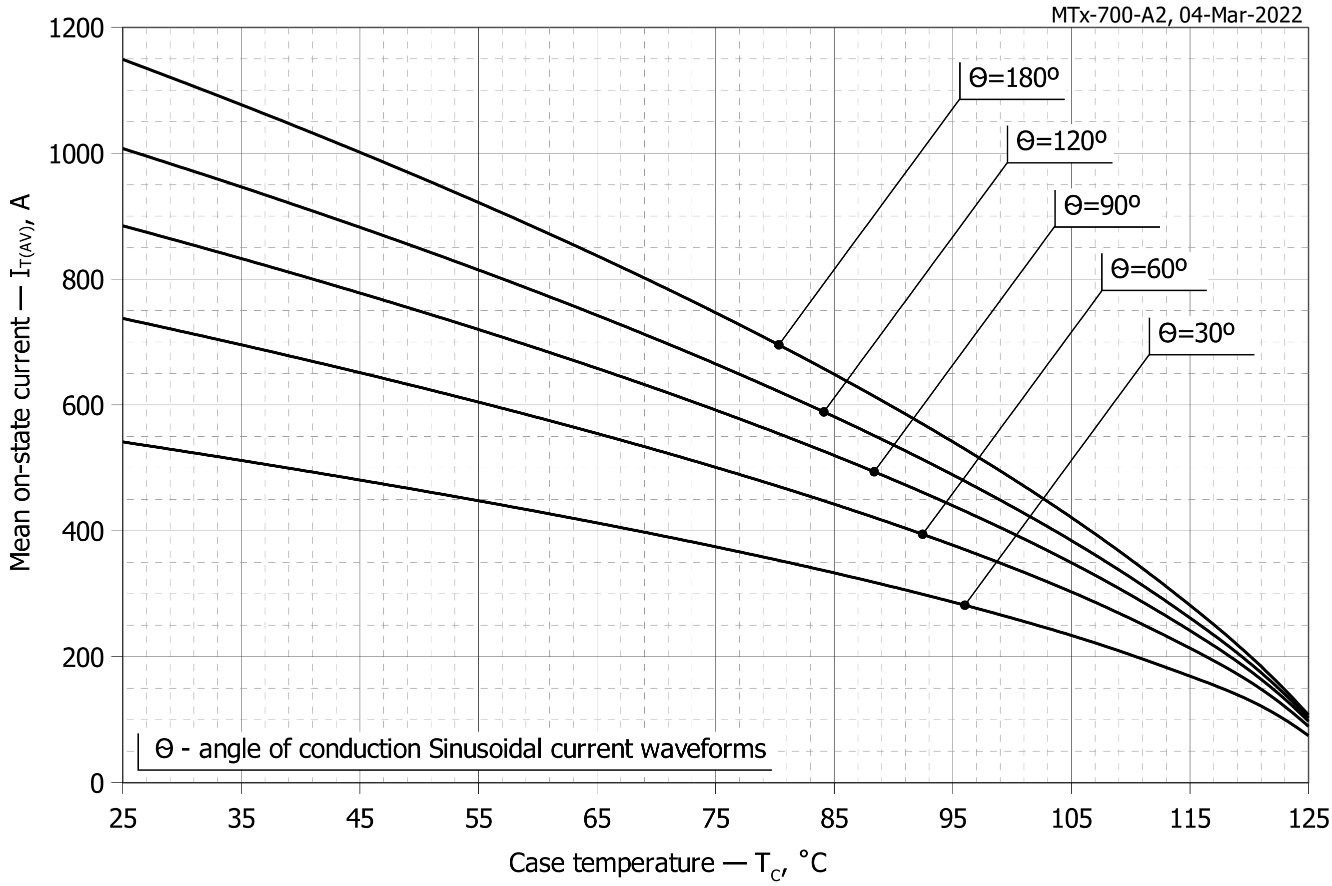


Fig. 11 – Mean on-state current I_{TAV} vs. case temperature T_C for sinusoidal current waveforms at different conduction angles (f=50Hz)

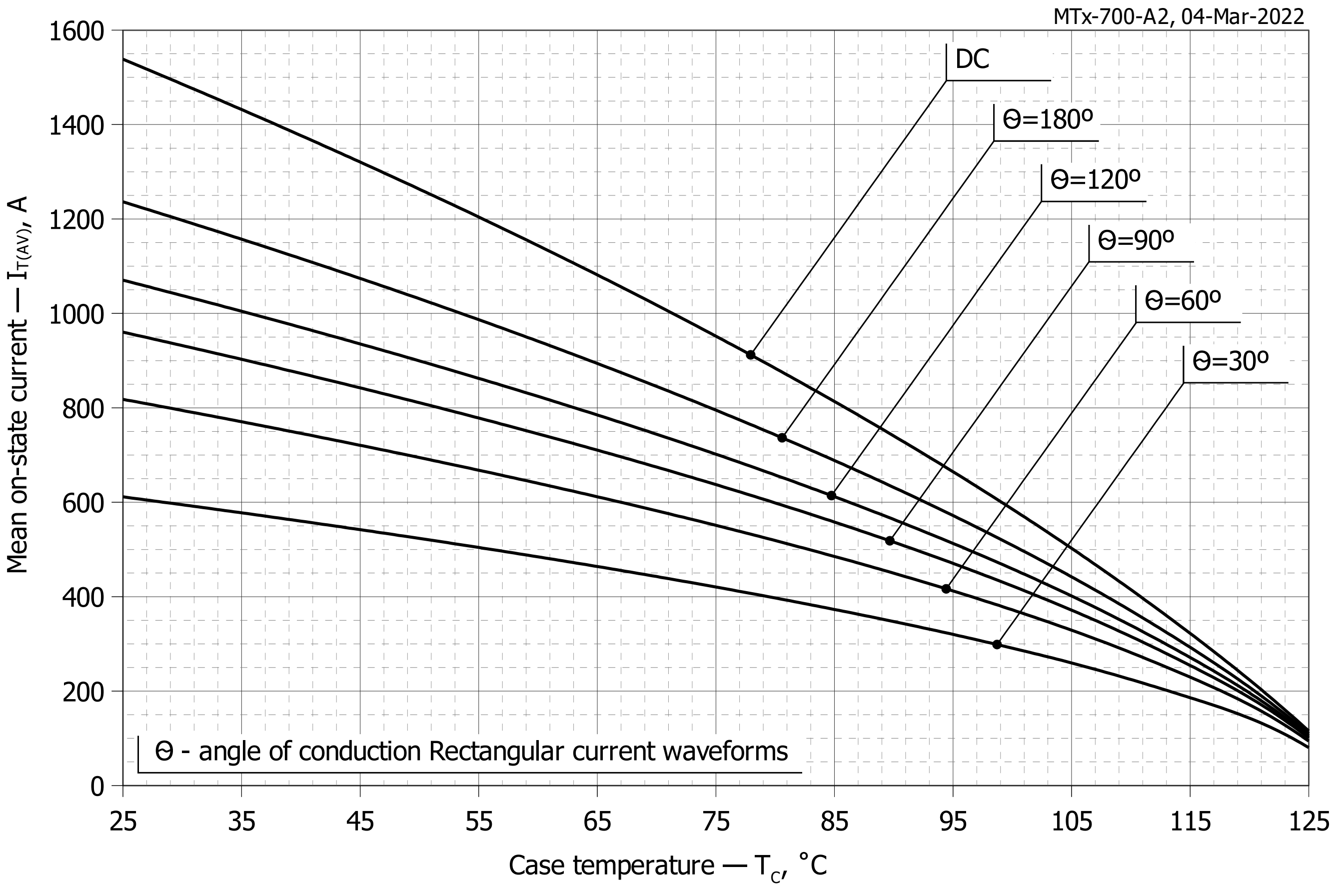


Fig. 12 - Mean on-state current I_{TAV} vs. case temperature T_C for rectangular current waveforms at different conduction angles and for DC (f=50Hz)

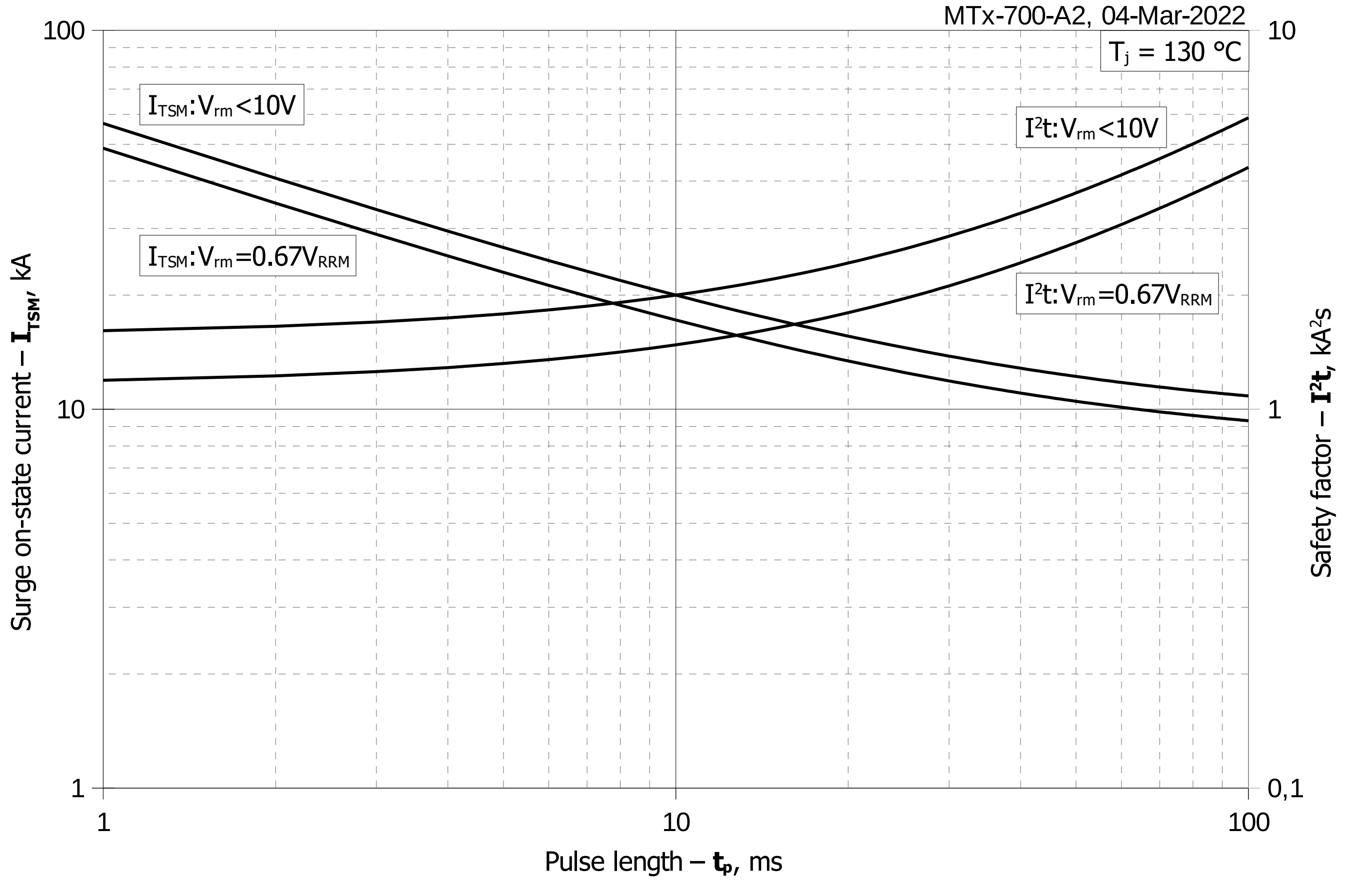


Fig. 13 – Maximum surge on-state current I_{TSM} and safety factor I^2t vs. pulse length t_p

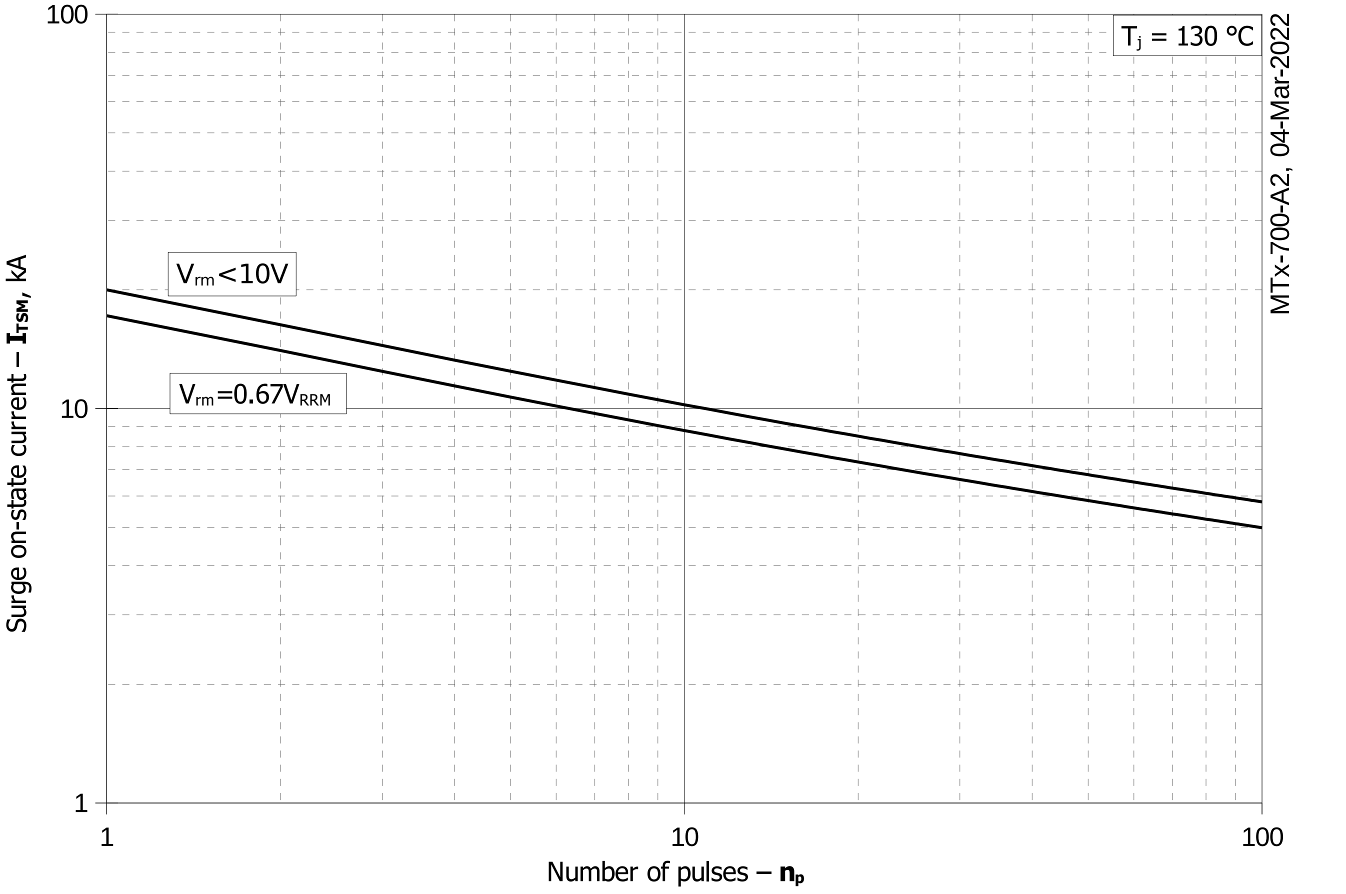


Fig. 14 - Maximum surge on-state current I_{TSM} vs. number of pulses n_p