



High power cycling capability
Low on-state and switching losses
Designed for traction and industrial applications

Phase Control Thyristor Type T243-800-18

Mean on-state current				I_{TAV}		800 A			
Repetitive peak off-state voltage				V_{DRM}		1000 ÷ 1800 V			
Repetitive peak reverse voltage				V_{RRM}					
Turn-off time				t_q		160, 200, 250, 320, 400, 500 μ s			
V_{DRM}, V_{RRM}, V	1000	1100	1200	1300	1400	1500	1600	1800	
Voltage code	10	11	12	13	14	15	16	18	
$T_j, ^\circ C$	-60 ÷ 125								

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions
ON-STATE				
I_{TAV}	Mean on-state current	A	800 833	$T_c=87^\circ C$, Double side cooled $T_c=85^\circ C$, Double side cooled 180° half-sine wave; 50 Hz
I_{TRMS}	RMS on-state current	A	1256	$T_c=87^\circ C$, Double side cooled 180° half-sine wave; 50 Hz
I_{TSM}	Surge on-state current	kA	14.0 16.0	$T_j=T_{j\ max}$ $T_j=25^\circ C$ 180° half-sine wave; $t_p=10\ ms$; single pulse; $V_D=V_R=0\ V$; Gate pulse: $I_G=2\ A$; $t_{GP}=50\ \mu s$; $di_G/dt \geq 1\ A/\mu s$
			15.0 17.0	$T_j=T_{j\ max}$ $T_j=25^\circ C$ 180° half-sine wave; $t_p=8.3\ ms$; single pulse; $V_D=V_R=0\ V$; Gate pulse: $I_G=2\ A$; $t_{GP}=50\ \mu s$; $di_G/dt \geq 1\ A/\mu s$
I^2t	Safety factor	$A^2s \cdot 10^3$	980 1280	$T_j=T_{j\ max}$ $T_j=25^\circ C$ 180° half-sine wave; $t_p=10\ ms$; single pulse; $V_D=V_R=0\ V$; Gate pulse: $I_G=2\ A$; $t_{GP}=50\ \mu s$; $di_G/dt \geq 1\ A/\mu s$
			930 1190	$T_j=T_{j\ max}$ $T_j=25^\circ C$ 180° half-sine wave; $t_p=8.3\ ms$; single pulse; $V_D=V_R=0\ V$; Gate pulse: $I_G=2\ A$; $t_{GP}=50\ \mu s$; $di_G/dt \geq 1\ A/\mu s$
BLOCKING				
V_{DRM}, V_{RRM}	Repetitive peak off-state and Repetitive peak reverse voltages	V	1000 ÷ 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	1100 ÷ 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

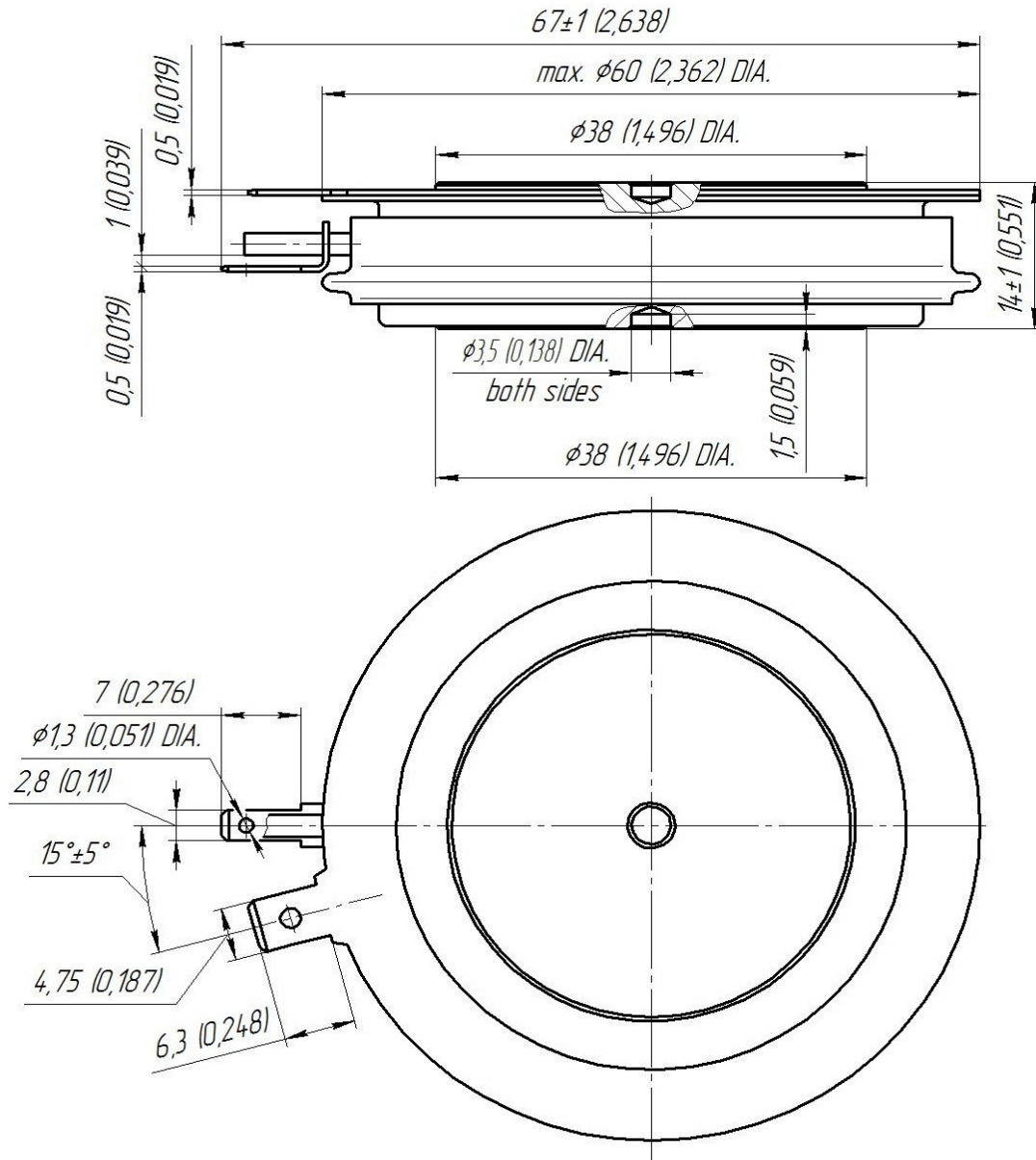
TRIGGERING				
I_{FGM}	Peak forward gate current	A	8	$T_j = T_{j\ max}$
V_{RGM}	Peak reverse gate voltage	V	5	
P_G	Gate power dissipation	W	4	$T_j = T_{j\ max}$ for DC gate current
SWITCHING				
$(di_T/dt)_{crit}$	Critical rate of rise of on-state current non-repetitive (f=1 Hz)	A/ μ s	1250	$T_j = T_{j\ max}$; $V_D = 0.67 \cdot V_{DRM}$; $I_{TM} = 2000$ A; Gate pulse: $I_G = 2$ A; $t_{GP} = 50$ μ s; $di_G/dt \geq 2$ A/ μ s
THERMAL				
T_{stg}	Storage temperature	$^{\circ}$ C	-60÷50	
T_j	Operating junction temperature	$^{\circ}$ C	-60÷125	
MECHANICAL				
F	Mounting force	kN	14.0÷16.0	
a	Acceleration	m/s ²	50	Device clamped

CHARACTERISTICS

Symbols and parameters		Units	Values	Conditions	
ON-STATE					
V_{TM}	Peak on-state voltage, max	V	1.70	$T_j = 25$ $^{\circ}$ C; $I_{TM} = 2512$ A	
$V_{T(TO)}$	On-state threshold voltage, max	V	0.939	$T_j = T_{j\ max}$;	
r_T	On-state slope resistance, max	m Ω	0.324	$0.5 \pi I_{TAV} < I_T < 1.5 \pi I_{TAV}$	
I_L	Latching current, max	mA	1000	$T_j = 25$ $^{\circ}$ C; $V_D = 12$ V; Gate pulse: $I_G = 2$ A; $t_{GP} = 50$ μ s; $di_G/dt \geq 1$ A/ μ s	
I_H	Holding current, max	mA	300	$T_j = 25$ $^{\circ}$ C; $V_D = 12$ V; Gate open	
BLOCKING					
I_{DRM}, I_{RRM}	Repetitive peak off-state and Repetitive peak reverse currents, max	mA	100	$T_j = T_{j\ max}$; $V_D = V_{DRM}$; $V_R = V_{RRM}$	
$(dv_D/dt)_{crit}$	Critical rate of rise of off-state voltage ¹⁾ , min	V/ μ s	200, 320, 500, 1000, 1600, 2000, 2500	$T_j = T_{j\ max}$; $V_D = 0.67 \cdot V_{DRM}$; Gate open	
TRIGGERING					
V_{GT}	Gate trigger direct voltage, max	V	3.00 2.50 1.50	$T_j = T_{j\ min}$ $T_j = 25$ $^{\circ}$ 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	400 250 150	$T_j = T_{j\ min}$ $T_j = 25$ $^{\circ}$ C $T_j = T_{j\ max}$	
V_{GD}	Gate non-trigger direct voltage, min	V	0.30	$T_j = T_{j\ max}$;	
I_{GD}	Gate non-trigger direct current, min	mA	35.00	$V_D = 0.67 \cdot V_{DRM}$; Direct gate current	
SWITCHING					
t_{gd}	Delay time, max	μ s	0.80	$T_j = 25$ $^{\circ}$ C; $V_D = 1000$ V; $I_{TM} = I_{TAV}$; $di/dt = 200$ A/ μ s;	
t_{gt}	Turn-on time	μ s	3.00	Gate pulse: $I_G = 2$ A; $V_G = 20$ V; $t_{GP} = 50$ μ s; $di_G/dt = 2$ A/ μ s	
t_q	Turn-off time ²⁾ , max	μ s	160, 200, 250, 320, 400, 500	$dv_D/dt = 50$ V/ μ s; $T_j = T_{j\ max}$; $I_{TM} = I_{TAV}$; $di_R/dt = -10$ A/ μ s; $V_R = 100$ V; $V_D = 0.67 \cdot V_{DRM}$	
Q_{rr}	Total recovered charge, max	μ C	1750	$T_j = T_{j\ max}$; $I_{TM} = 800$ A;	
t_{rr}	Reverse recovery time, max	μ s	26	$di_R/dt = -10$ A/ μ s;	
I_{rrM}	Peak reverse recovery current, max	A	135	$V_R = 100$ V	

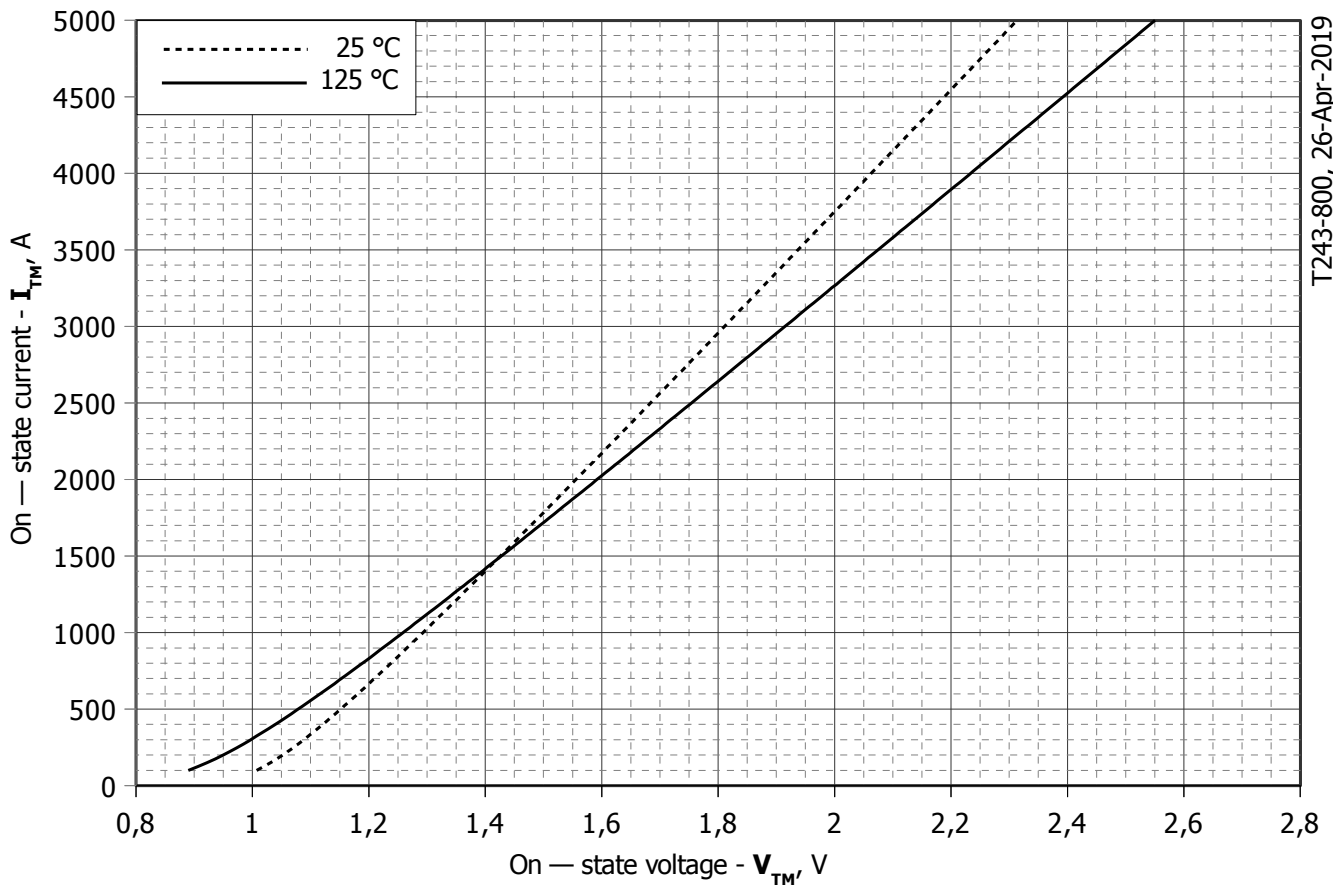
THERMAL					
R_{thjc}	Thermal resistance, junction to case, max	°C/W	0.0300	Direct current	Double side cooled
R_{thjc-A}			0.0660		Anode side cooled
R_{thjc-K}			0.0540		Cathode side cooled
R_{thck}	Thermal resistance, case to heatsink, max	°C/W	0.0060	Direct current	
MECHANICAL					
w	Weight, max	g	210		
D_s	Surface creepage distance	mm (inch)	7.86 (0.309)		
D_a	Air strike distance	mm (inch)	6.10 (0.240)		

PART NUMBERING GUIDE							NOTES																																				
T	243	800	18	A2	T2	N																																					
1	2	3	4	5	6	7																																					
1. Phase Control Thyristor 2. Design version 3. Mean on-state current, A 4. Voltage code 5. Critical rate of rise of off-state voltage, V/μs 6. Turn-off time ($dv_D/dt=50$ V/μs) 7. Ambient conditions: N – normal; T – tropical							1) Critical rate of rise of off-state voltage <table border="1"> <thead> <tr> <th>Symbol of Group</th> <th>P2</th> <th>K2</th> <th>E2</th> <th>A2</th> <th>T1</th> <th>P1</th> <th>M1</th> </tr> </thead> <tbody> <tr> <td>$(dv_D/dt)_{crit}$, V/μs</td> <td>200</td> <td>320</td> <td>500</td> <td>1000</td> <td>1600</td> <td>2000</td> <td>2500</td> </tr> </tbody> </table> 2) Turn-off time ($dv_D/dt=50$ V/μs) <table border="1"> <thead> <tr> <th>Symbol of Group</th> <th>T2</th> <th>P2</th> <th>M2</th> <th>K2</th> <th>H2</th> <th>E2</th> </tr> </thead> <tbody> <tr> <td>t_q, μs</td> <td>160</td> <td>200</td> <td>250</td> <td>320</td> <td>400</td> <td>500</td> </tr> </tbody> </table>							Symbol of Group	P2	K2	E2	A2	T1	P1	M1	$(dv_D/dt)_{crit}$, V/μs	200	320	500	1000	1600	2000	2500	Symbol of Group	T2	P2	M2	K2	H2	E2	t_q , μs	160	200	250	320	400	500
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All dimensions in millimeters (inches)

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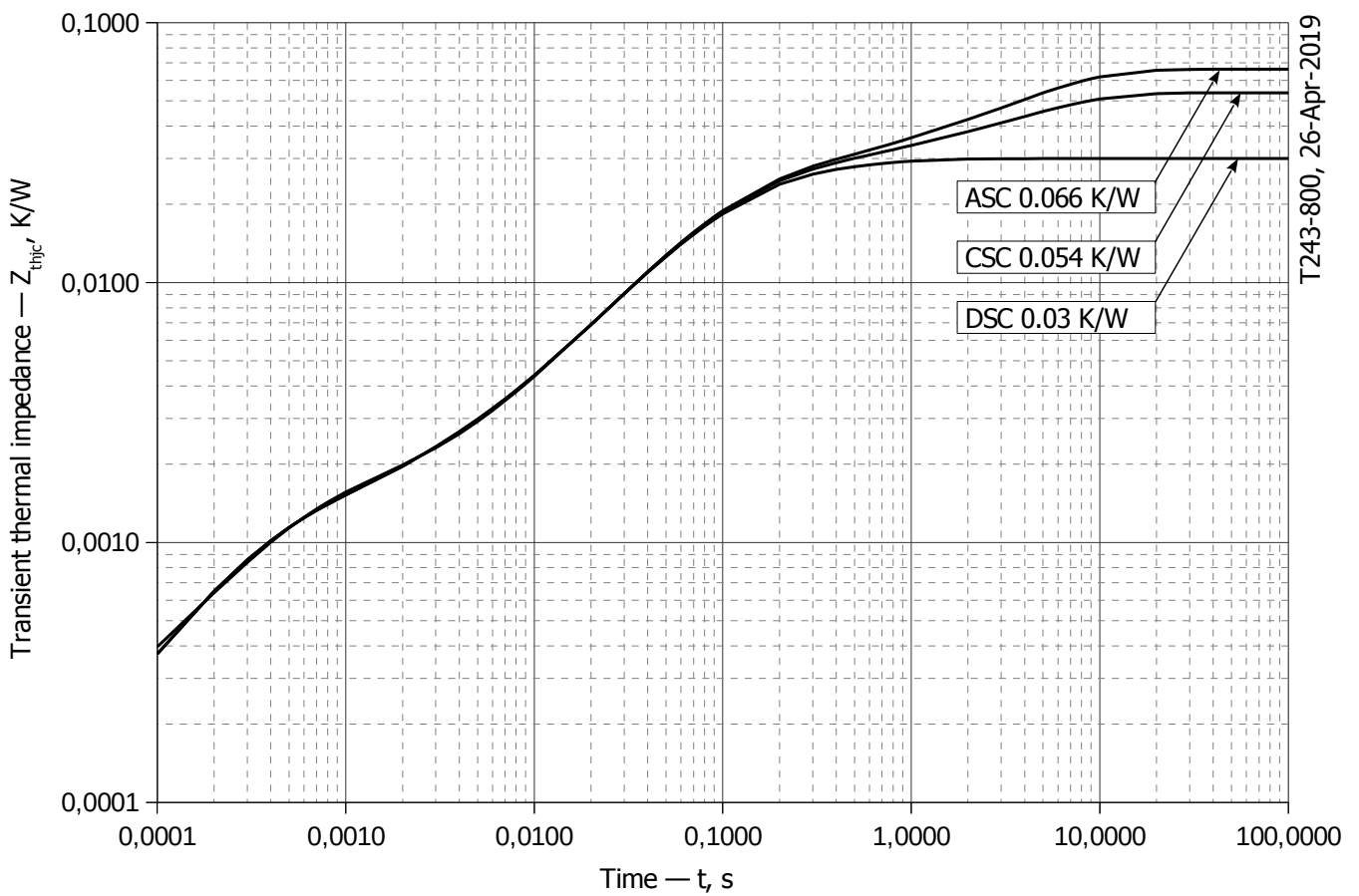
Fig 1 – On-state characteristics of Limit device

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	
	$T_j = 25^\circ\text{C}$	$T_j = T_{j\text{max}}$
A	0.84006000	0.64987000
B	0.00024659	0.00031431
C	0.03187700	0.04759300
D	-0.00044098	-0.00107920

On-state characteristic model (see Fig. 1)



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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.

DC Double side cooled

i	1	2	3	4	5	6
R_i , K/W	0.0007052	0.01986	0.001443	0.006652	0.001253	0.00009733
τ_i , s	1.200	0.083	0.0205	0.350	0.0004173	0.000001

DC Anode side cooled

i	1	2	3	4	5	6
R_i , K/W	0.03615	0.006266	0.0178	0.004365	0.0004912	0.001067
τ_i , s	4.713	0.5062	0.09497	0.04557	0.002123	0.0002807

DC Cathode side cooled

i	1	2	3	4	5	6
R_i , K/W	0.001065	0.0004934	0.004583	0.01764	0.006202	0.0237
τ_i , s	0.0002798	0.002114	0.04598	0.09501	0.4891	4.712

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

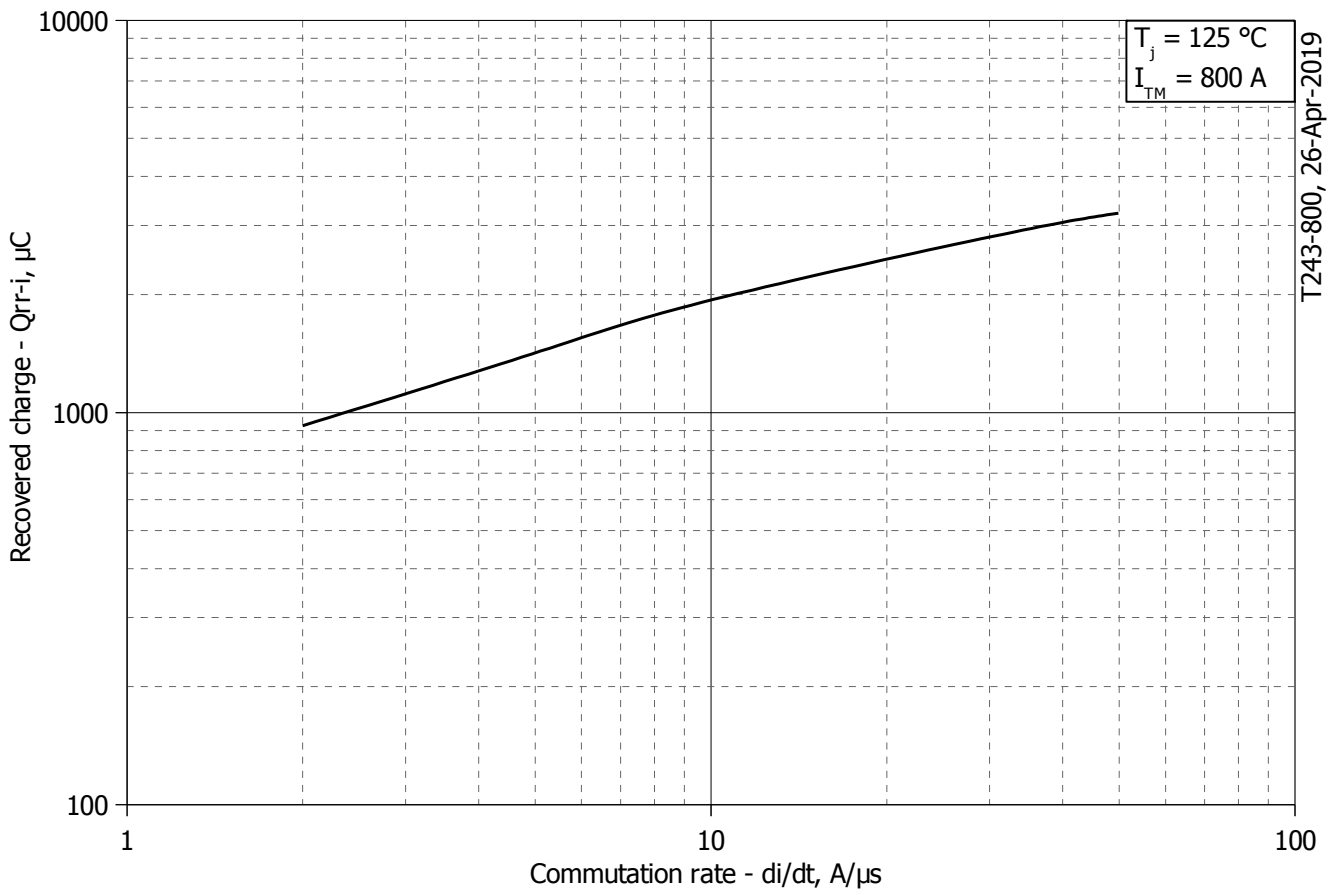


Fig 3 – Maximum recovered charge Q_{rr-i} (integral) vs. commutation rate di_R/dt

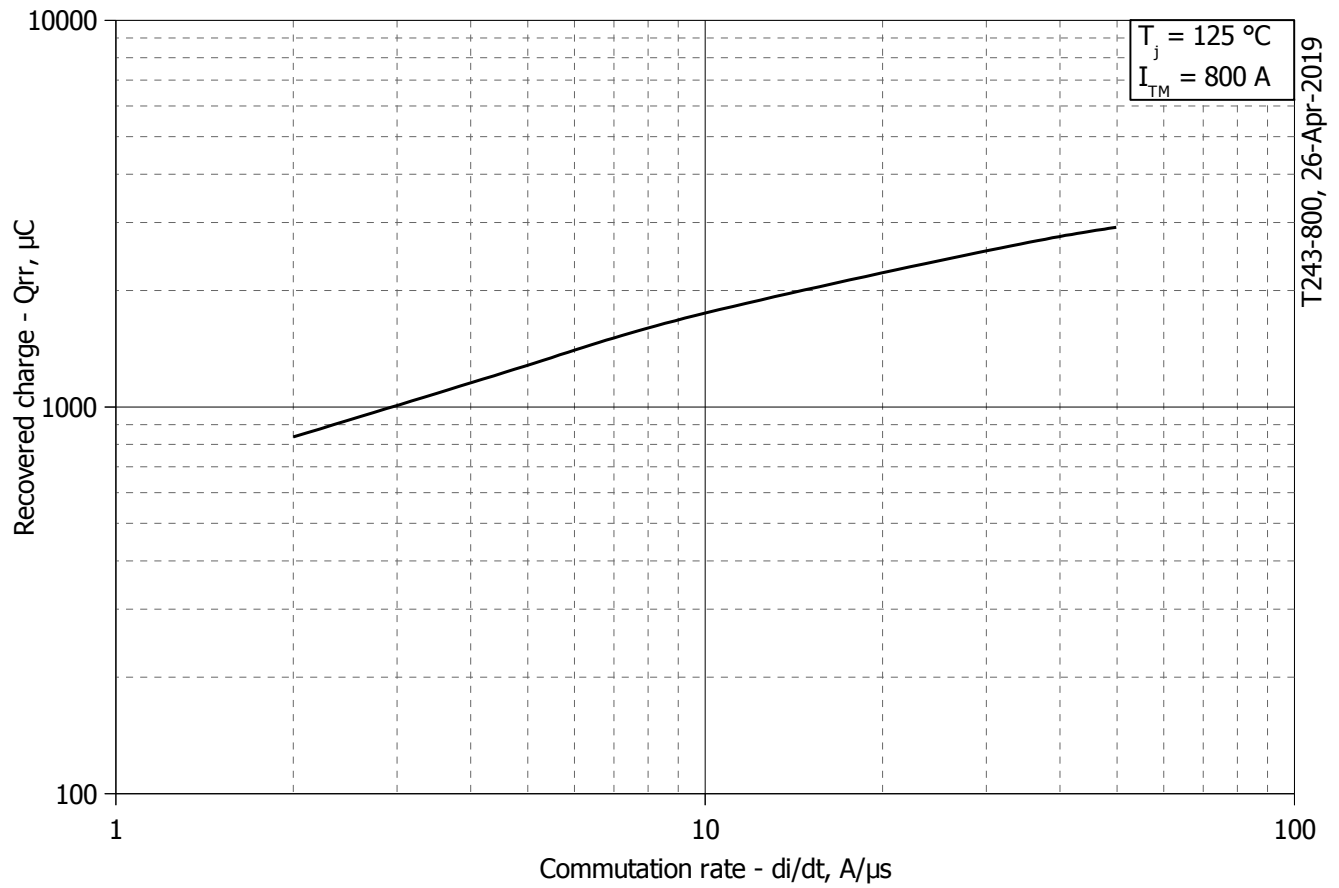


Fig 4 – Maximum recovered charge Q_{rr} vs. commutation rate di_R/dt (25% chord)

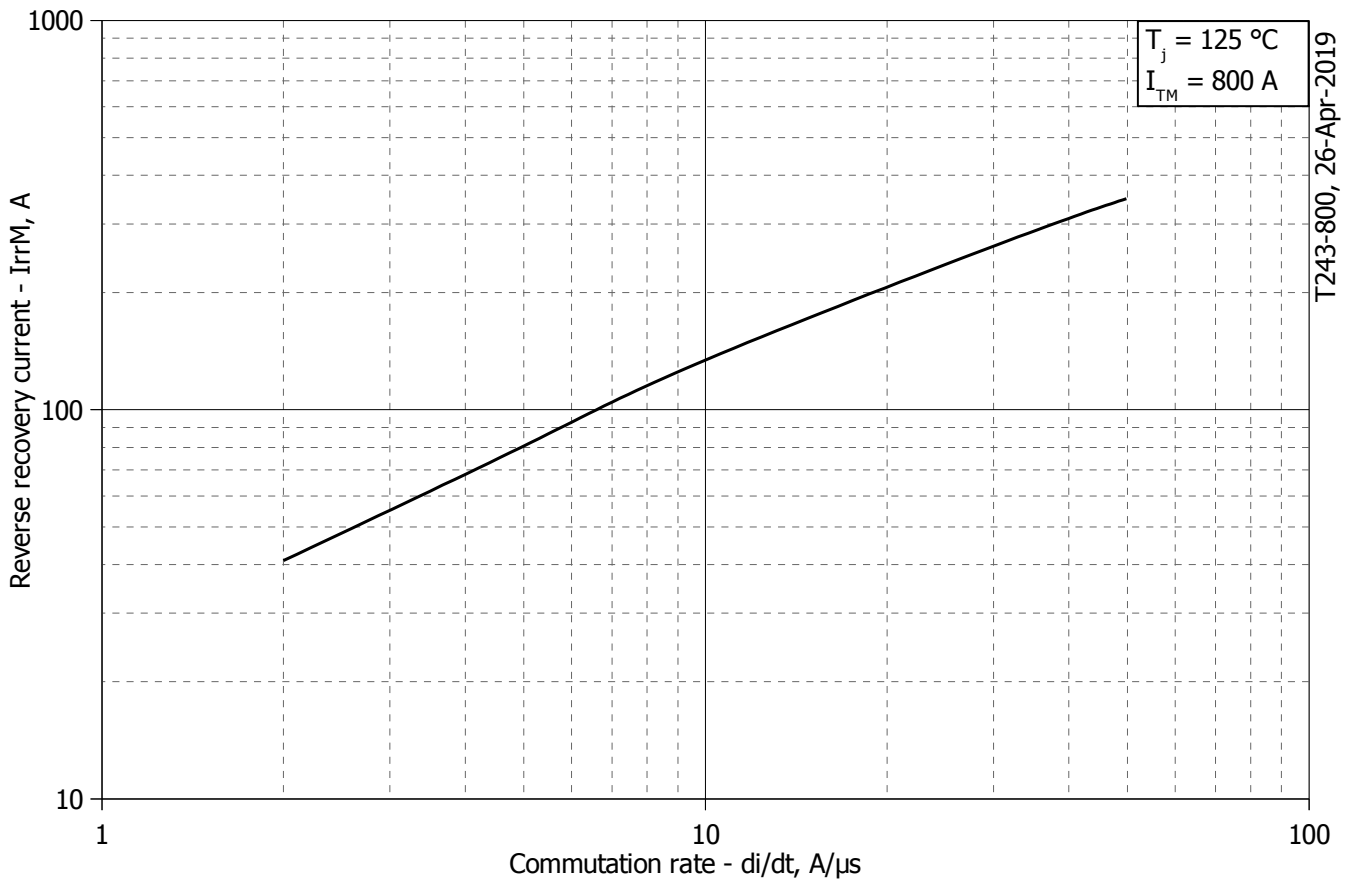


Fig 5 – Maximum reverse recovery current I_{rrM} vs. commutation rate di_R/dt

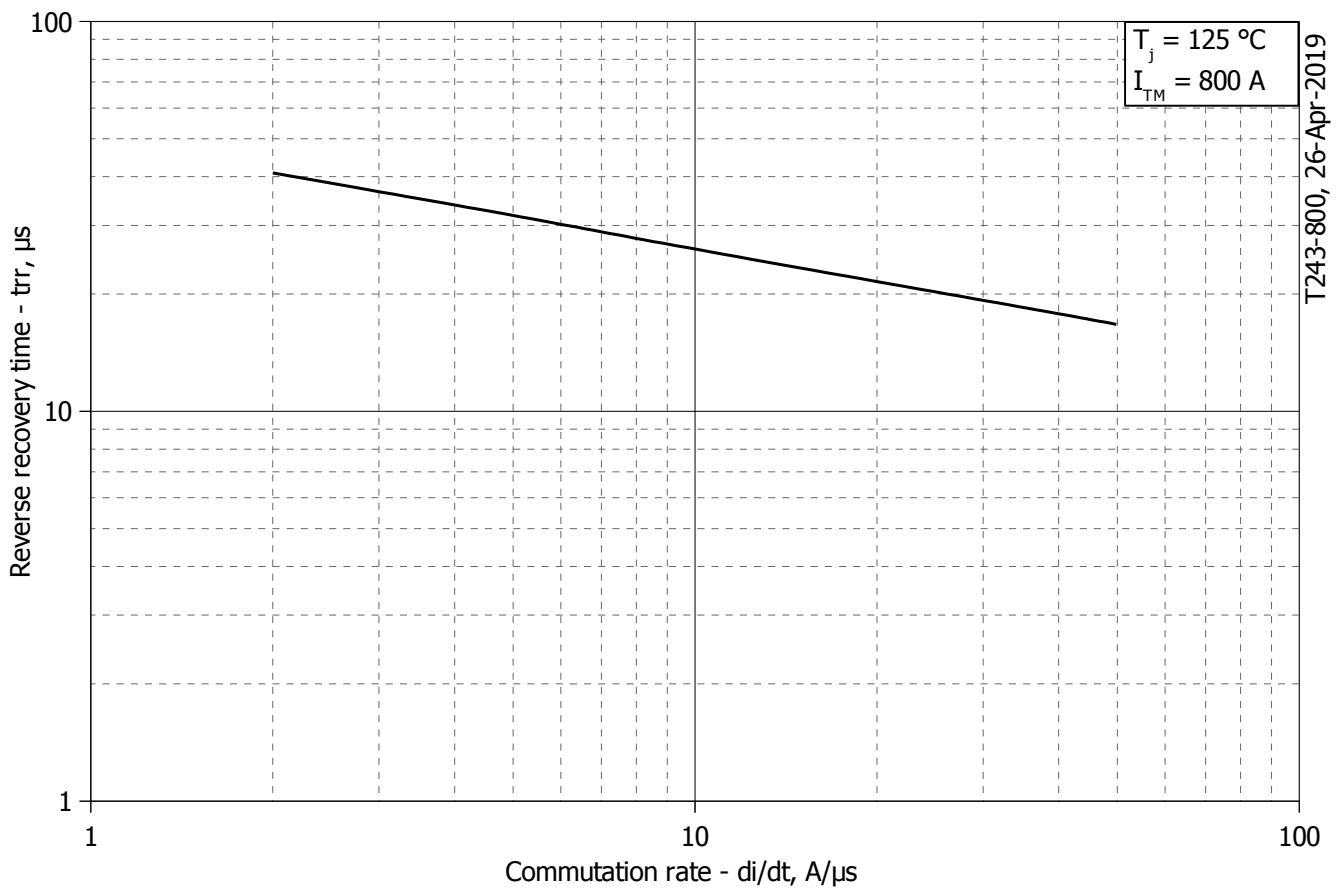
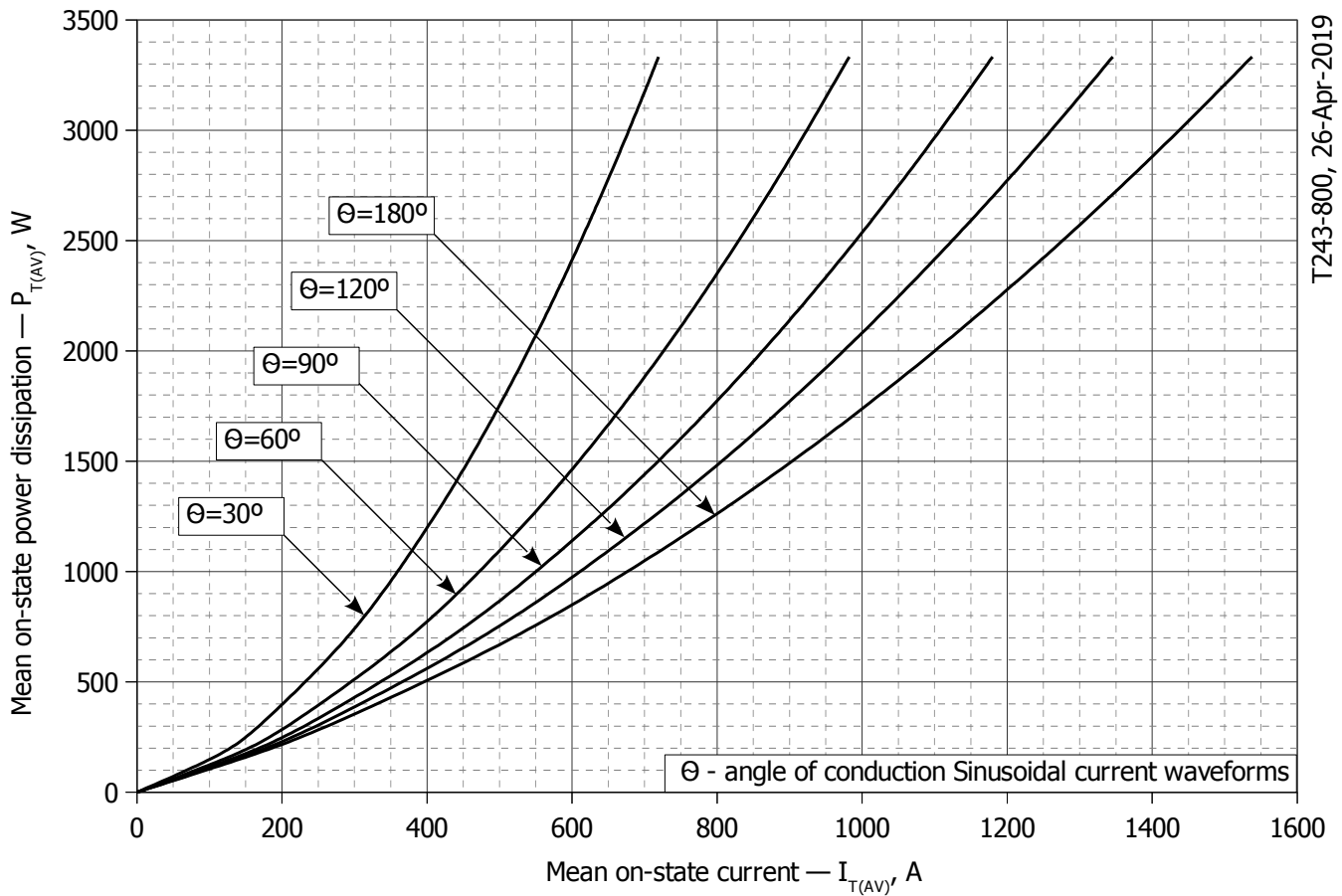
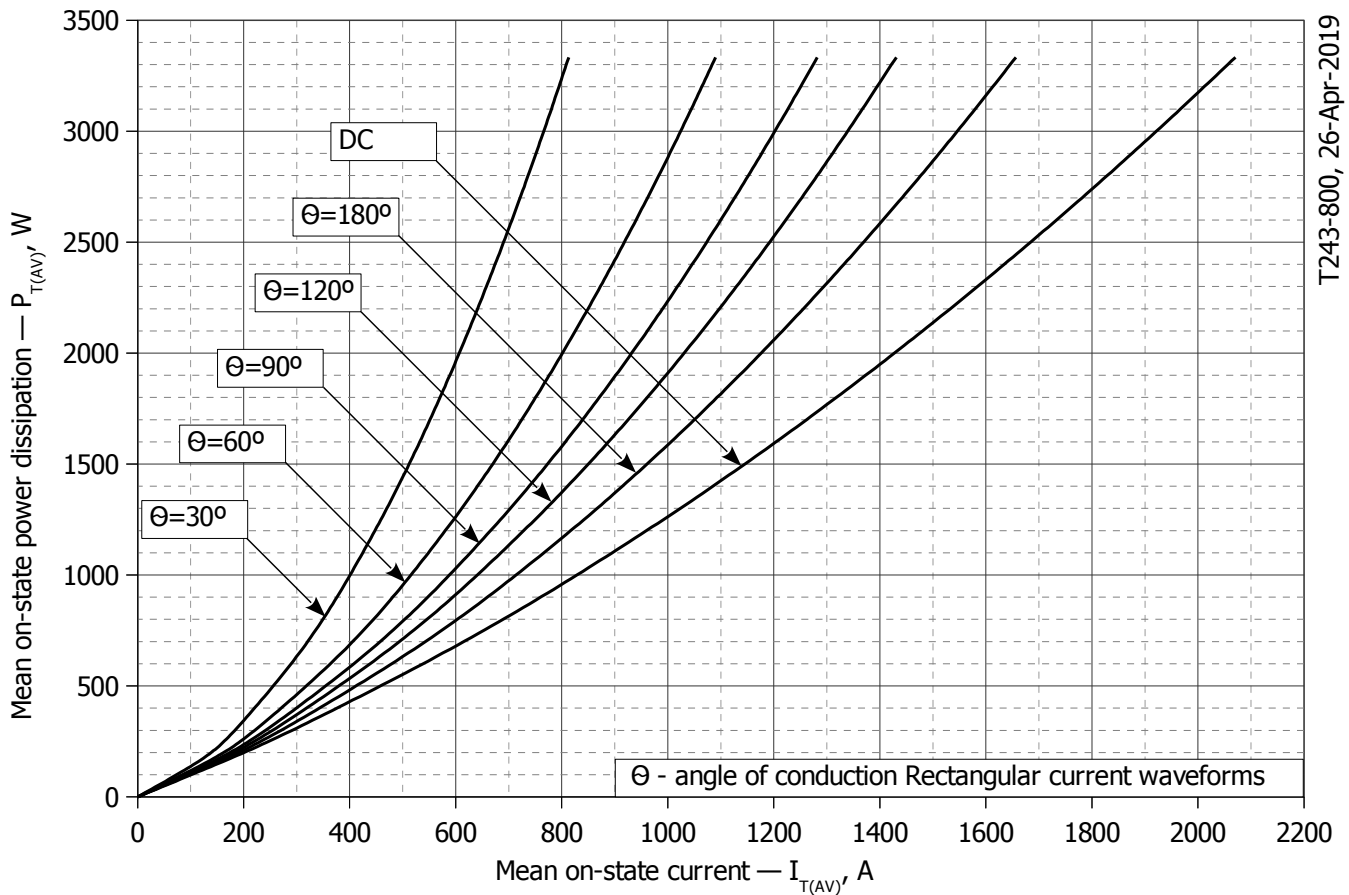


Fig 6 – Maximum recovery time t_{rr} vs. commutation rate di_R/dt (25% chord)



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Fig. 7 - Mean on-state power dissipation P_{TAV} vs. mean on-state current I_{TAV} for sinusoidal current waveforms at different conduction angles (f=50Hz, DSC)



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Fig. 8 – 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, DSC)

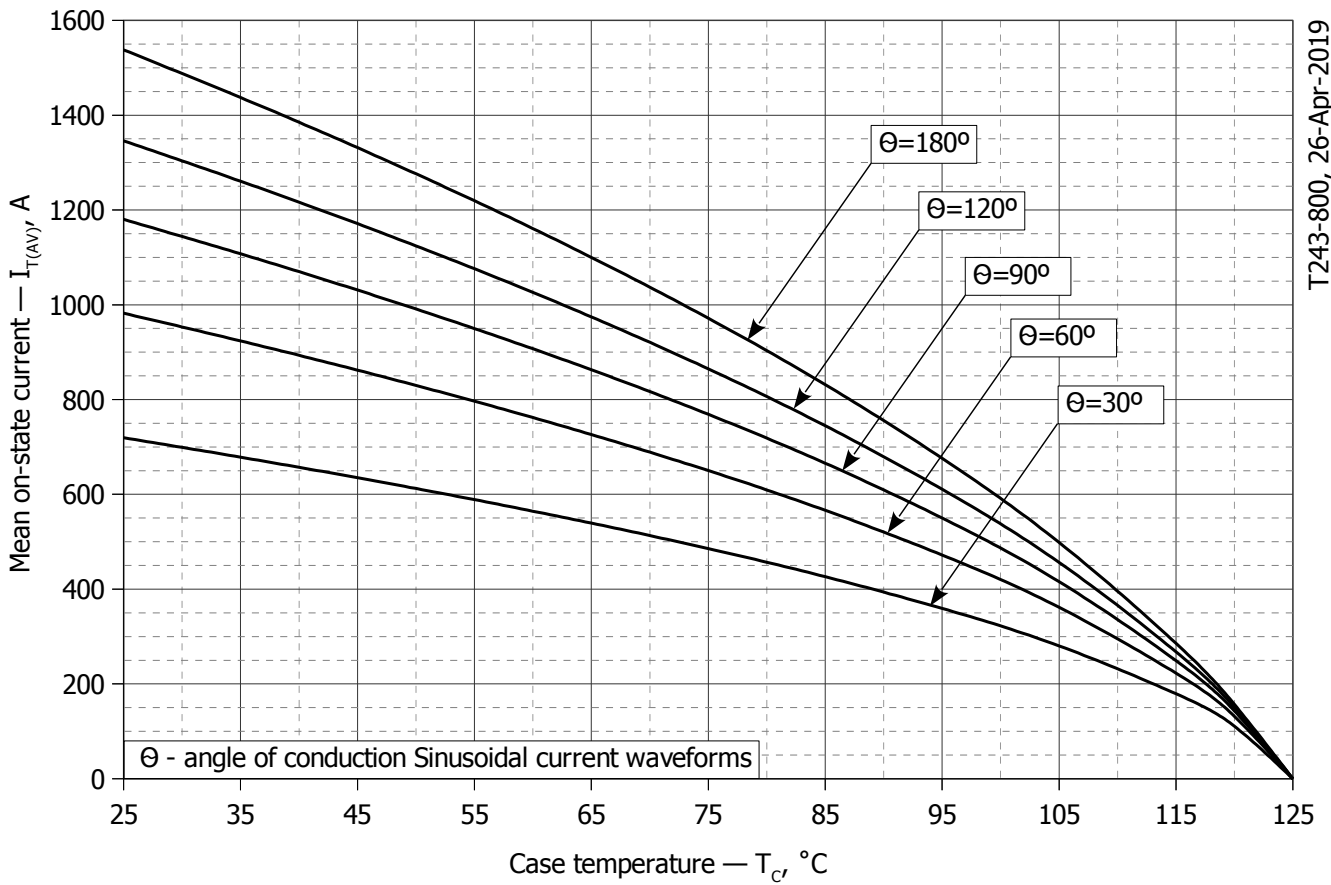


Fig. 9 – Mean on-state current I_{TAV} vs. case temperature T_c for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$, DSC)

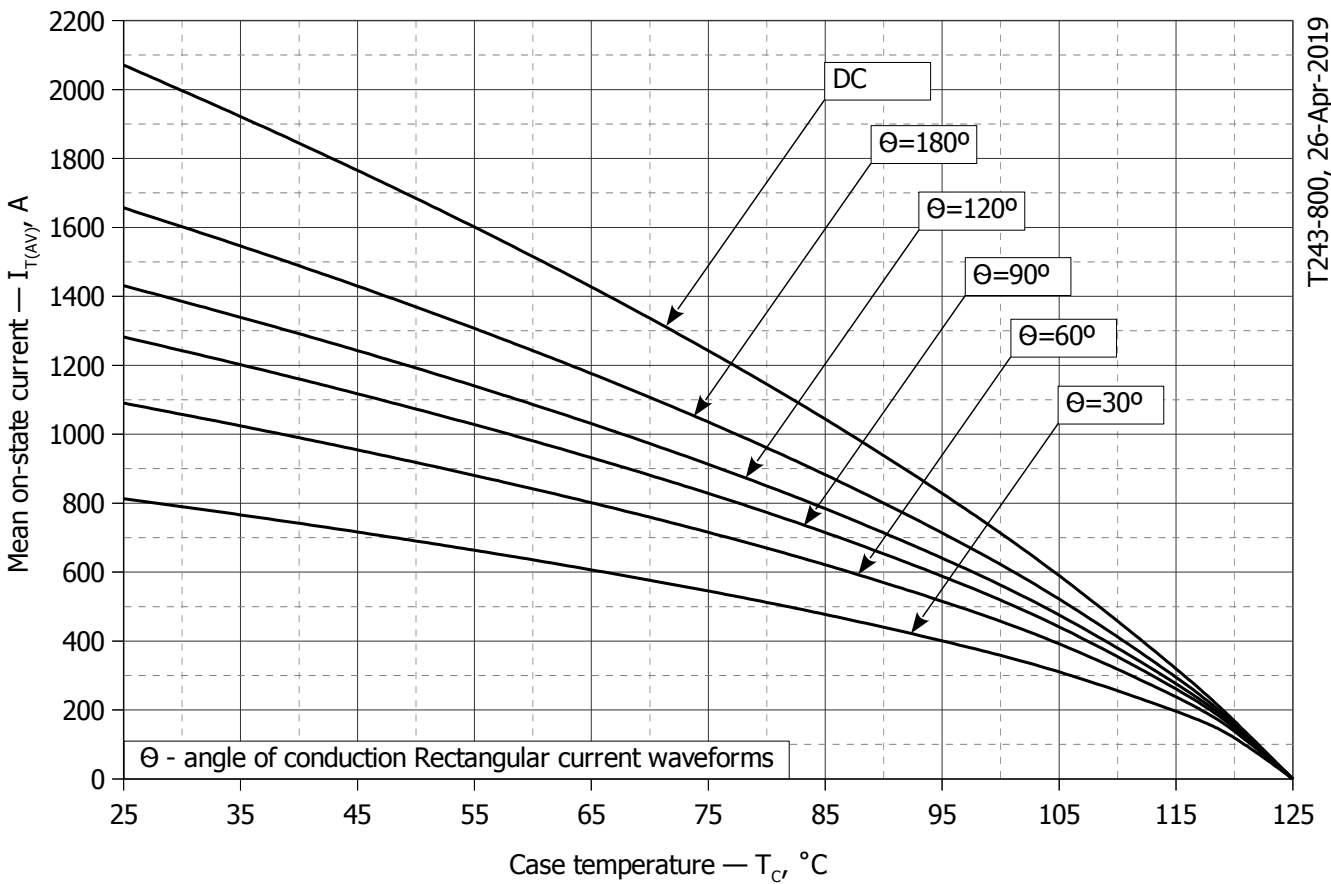


Fig. 10 - Mean on-state current I_{TAV} vs. case temperature T_c for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$, DSC)

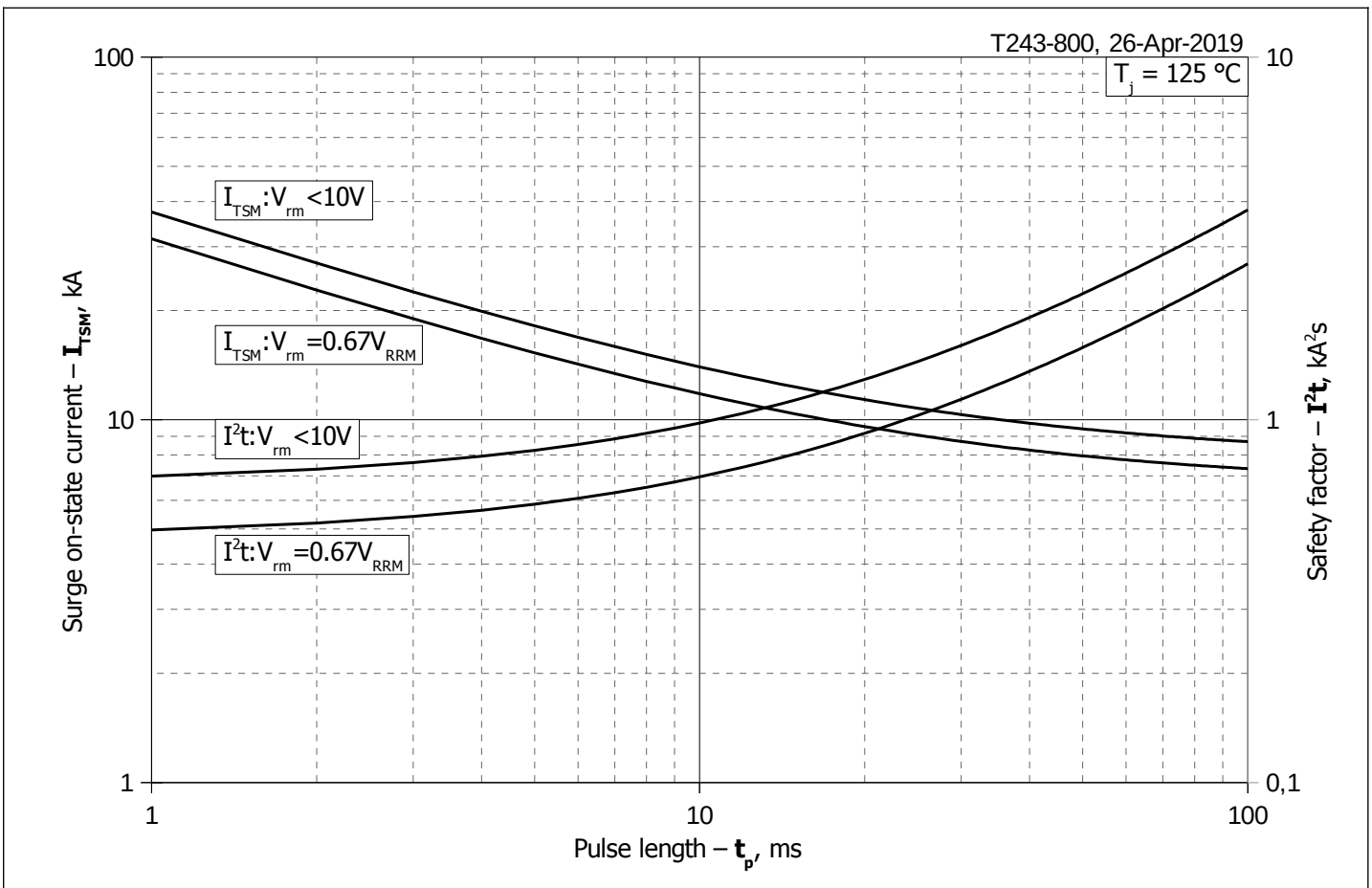


Fig. 11 – Maximum surge on-state current I_{TSM} and safety factor I^2t vs. pulse length t_p

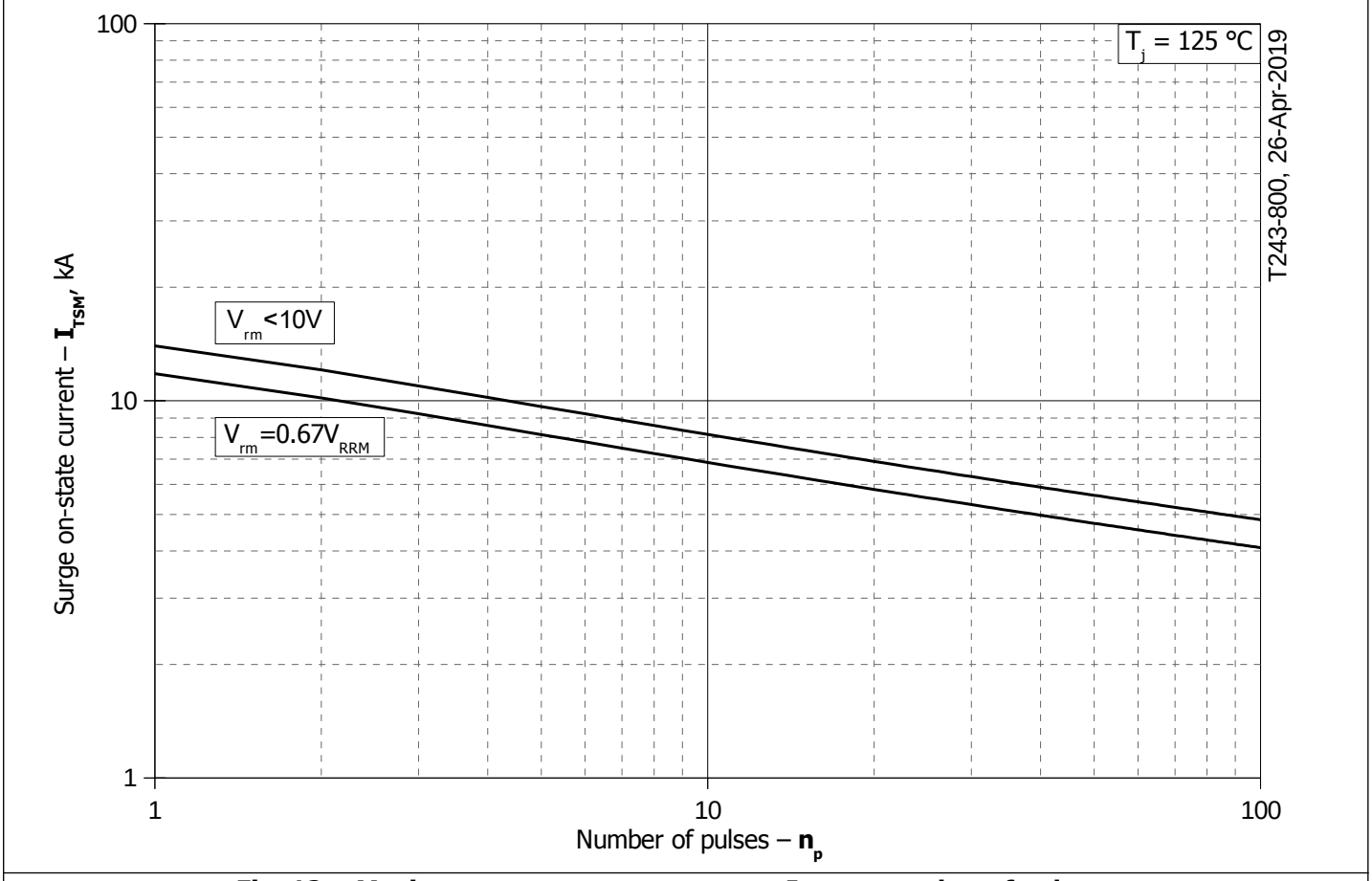


Fig. 12 - Maximum surge on-state current I_{TSM} vs. number of pulses n_p