V_{DSM}	=	6500 V
I_{TAVM}	=	760 A
I_{TRMS}	=	1200 A
I_{TSM}	=	11600 A
V_{T0}	=	1.22 V
r_T	=	0.970 mΩ

Phase Control Thyristor

5STP 08G6500

Doc. No. 5SYA1006-03 Sep. 01

- **Patented free-floating silicon technology**
- **Low on-state and switching losses**
- **Designed for traction, energy and industrial applications**
- **Optimum power handling capability**

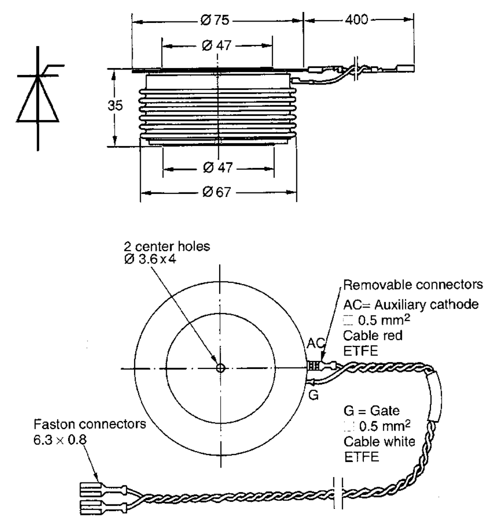
Blocking

Part Number	**5STP**	**5STP 08G6200**	**5STP 08G5800**	Conditions	
V_{DSM} V_{RSM}	6500 V	6200 V	5800 V	f = 5 Hz, t_p = 10ms	
V_{DRM} V_{RRM}	5600 V	5300 V	4900 V	f = 50 Hz, t_p = 10ms	
V_{RSM1}	7000 V	6700 V	6300 V	t_p = 5ms, single pulse	
I_{DSM}	≤ 200 mA			V_{DSM}	T_j = 125°C
I_{RSM}	≤ 200 mA			V_{RSM}	
dV/dt_{crit}	2000 V/µs			Exp. to 0.67 x V_{DRM}, T_j = 125°C	

V_{DRM}/ V_{RRM} are equal to V_{DSM}/ V_{RSM} values up to T_j = 110°C

Mechanical data

F_M	Mounting force	nom.	22 kN
		min.	14 kN
		max.	24 kN
a	Acceleration Device unclamped Device clamped		 50 m/s^2 100 m/s^2
m	Weight		0.6 kg
D_S	Surface creepage distance		38 mm
D_a	Air strike distance		21 mm



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On-state

I_{TAVM}	Max. average on-state current	760 A	Half sine wave, T_C = 70°C	
I_{TRMS}	Max. RMS on-state current	1200 A		
I_{TSM}	Max. peak non-repetitive	11600 A	tp = 10 ms	T_j = 125°C
	surge current	12300 A	tp = 8.3 ms	After surge:
I^2t	Limiting load integral	673 kA^2s	tp = 10 ms	$V_D = V_R$ = 0V
		628 kA^2s	tp = 8.3 ms	
V_T	On-state voltage	2.25 V	I_T = 1000 A	
V_{T0}	Threshold voltage	1.22 V	I_T = 600 - 1800 A	T_j = 125°C
r_T	Slope resistance	0.970 mΩ		
I_H	Holding current	40-90 mA	T_j = 25°C	
		15-60 mA	T_j = 125°C	
I_L	Latching current	100-500 mA	T_j = 25°C	
		50-200 mA	T_j = 125°C	

Switching

di/dt_{crit}	Critical rate of rise of on-state current		100 A/µs	Cont. f = 50 Hz	$V_D \leq 0.67 \cdot V_{DRM}$, T_j = 125°C
			200 A/µs	60 sec. f = 50Hz	I_{TRM} = 2000 A I_{FG} = 2 A, t_r = 0.5 µs
t_d	Delay time		≤ 3.0 µs	$V_D = 0.4 \cdot V_{DRM}$	I_{FG} = 2 A, t_r = 0.5 µs
t_q	Turn-off time		≤ 700 µs	$V_D \leq 0.67 \cdot V_{DRM}$ dv_D/dt = 20V/µs	I_{TRM} = 2000 A, T_j = 125°C V_R > 200 V, di_T/dt = -1 A/µs
Q_{rr}	Recovery charge	min	1600 µAs		
		max	2700 µAs		

Triggering

V_{GT}	Gate trigger voltage	2.6 V	T_j = 25°
I_{GT}	Gate trigger current	400 mA	T_j = 25°
V_{GD}	Gate non-trigger voltage	0.3 V	V_D =0.4 x V_{DRM}
I_{GD}	Gate non-trigger current	10 mA	V_D = 0.4 x V_{DRM}
V_{FGM}	Peak forward gate voltage	12 V	
I_{FGM}	Peak forward gate current	10 A	
V_{RGM}	Peak reverse gate voltage	10 V	
P_G	Gate power loss	3 W	

Thermal

T_{jmax}	Max. operating junction temperature range	125 °C	
T_{stg}	Storage temperature range	-40…140 °C	
R_{thJC}	Thermal resistance junction to case	43 K/kW	Anode side cooled
		45 K/kW	Cathode side cooled
		22 K/kW	Double side cooled
R_{thCH}	Thermal resistance case to heat sink	8 K/kW	Single side cooled
		4 K/kW	Double side cooled

Analytical function for transient thermal impedance:

$$Z_{thJC}(t) = \sum_{i=1}^{n} R_i(1 - e^{-t/\tau_i})$$

i	1	2	3	4
R_i(K/kW)	13.62	5.23	1.52	1.46
τ_i(s)	0.6894	0.0824	0.017	0.0077

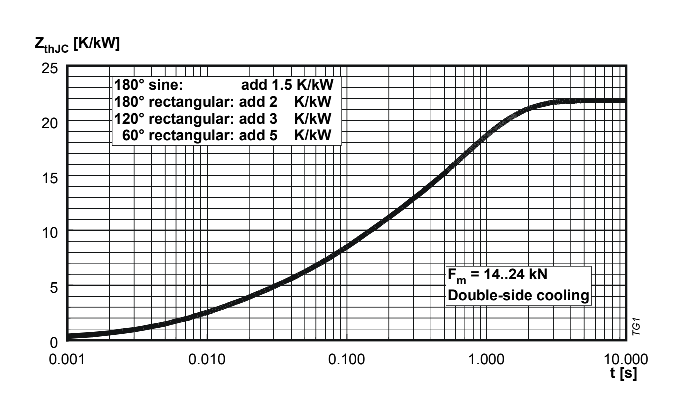

Fig. 1 Transient thermal impedance junction to case.

On-state characteristic model:

$$VT = A + B \cdot iT + C \cdot \ln(iT + 1) + D \cdot \sqrt{IT}$$

Valid for i_T = 400 – 3000 A

A	B	C	D
-2.676495	0.00153	0.922004	-0.09435

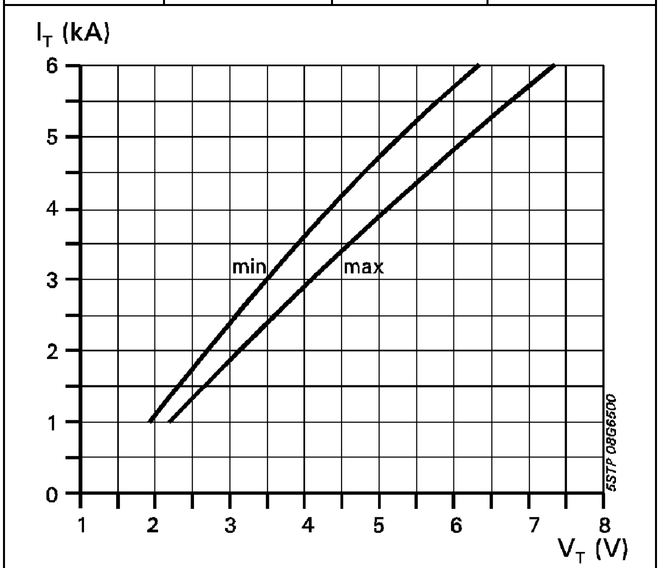

Fig. 2 On-state characteristics.
T_j=125°C, 10ms half sine

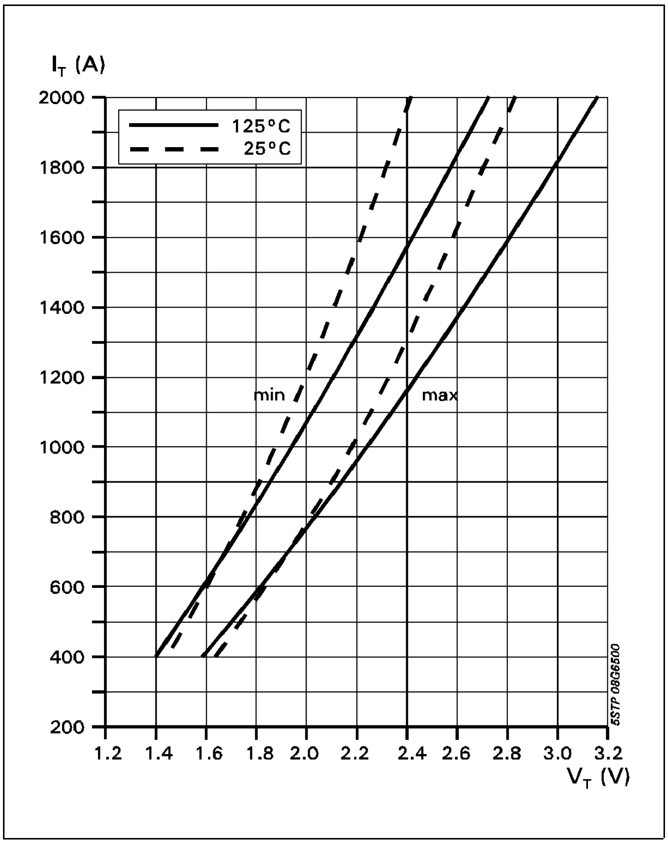

Fig. 3 On-state characteristics.

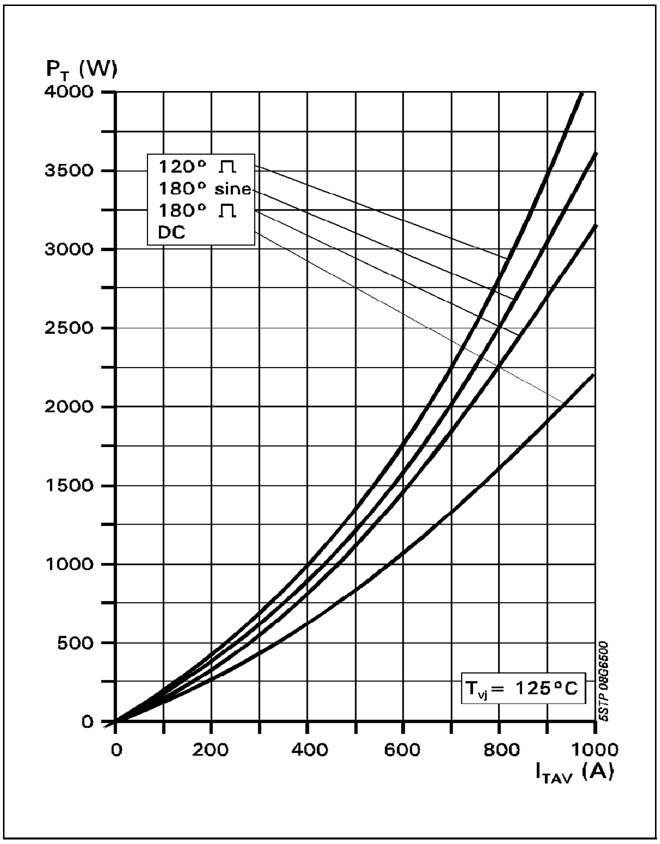

Fig. 4 On-state power dissipation vs. mean on-state current. Turn - on losses excluded.

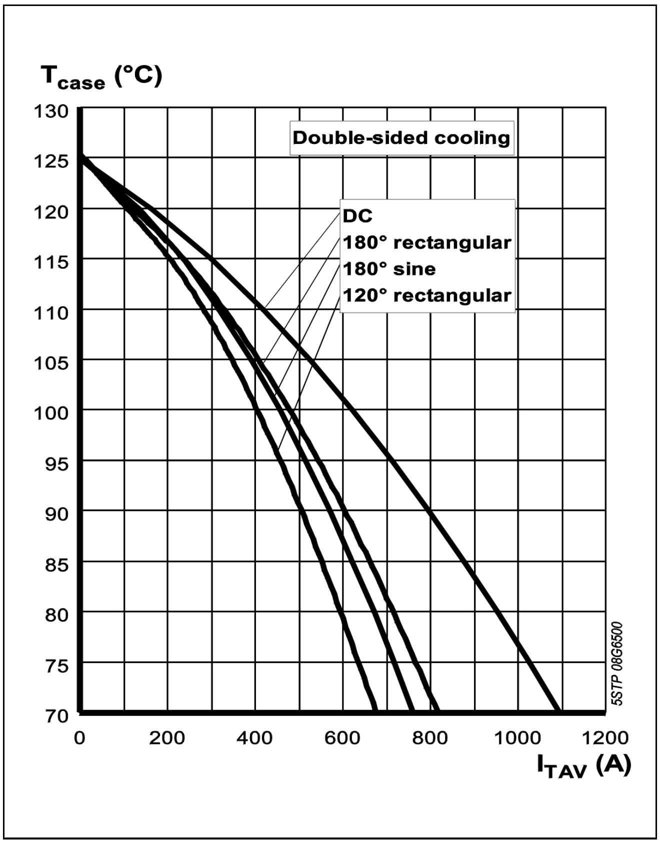

Fig. 5 Max. permissible case temperature vs. mean on-state current.

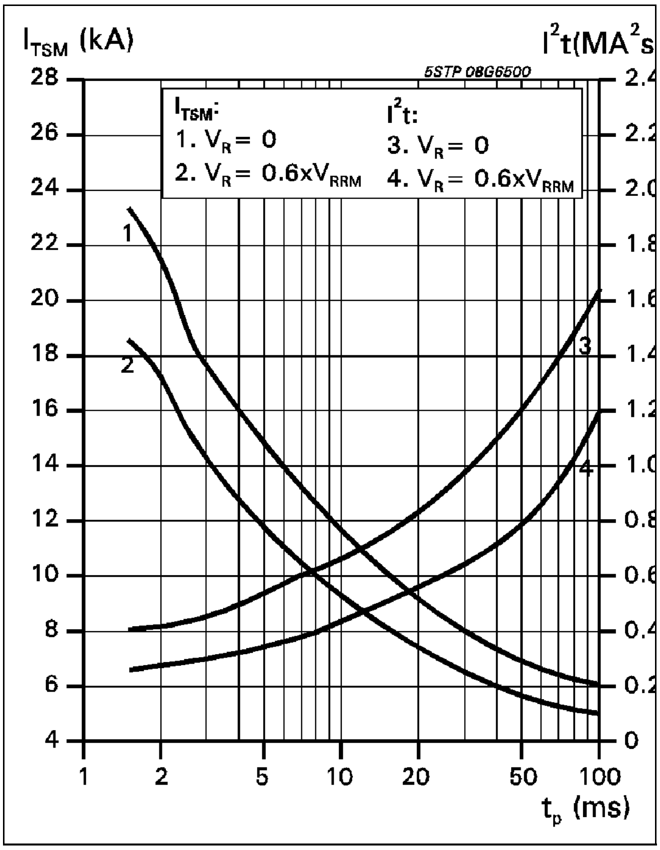

Fig. 6 Surge on-state current vs. pulse length. Half-sine wave.

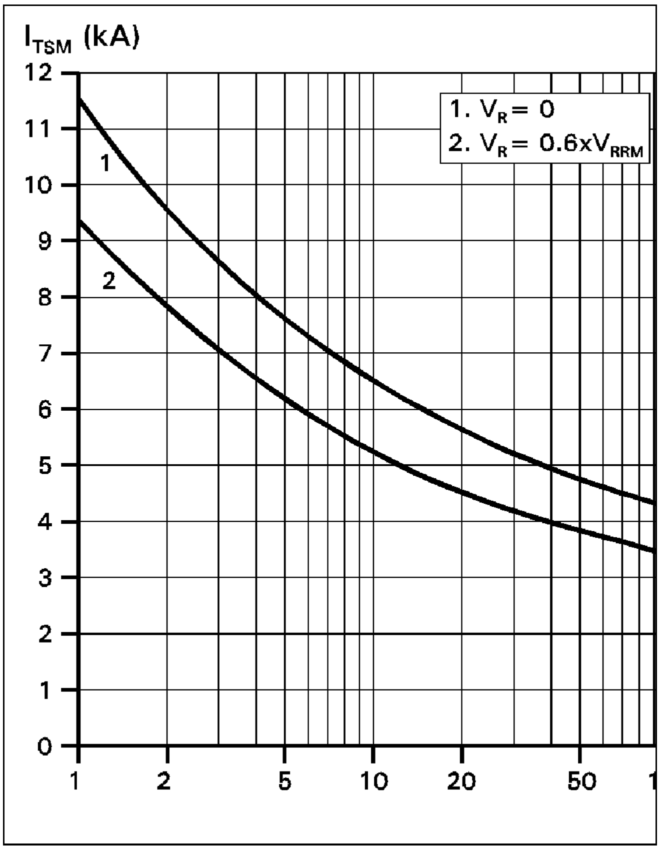

Fig. 7 Surge on-state current vs. number of pulses. Half-sine wave, 10 ms, 50Hz.

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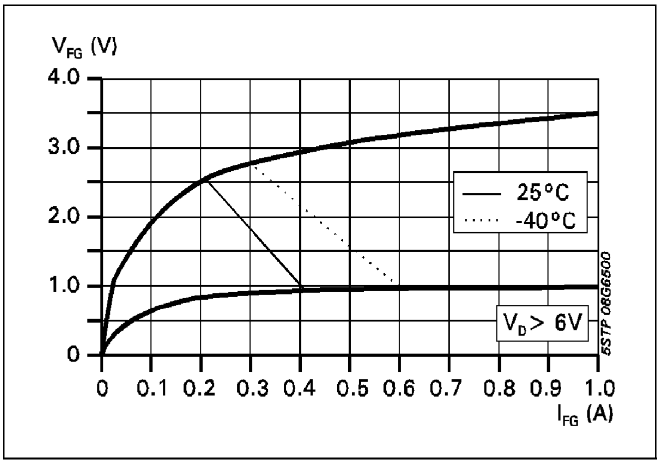


Fig. 8 Gate trigger characteristics.

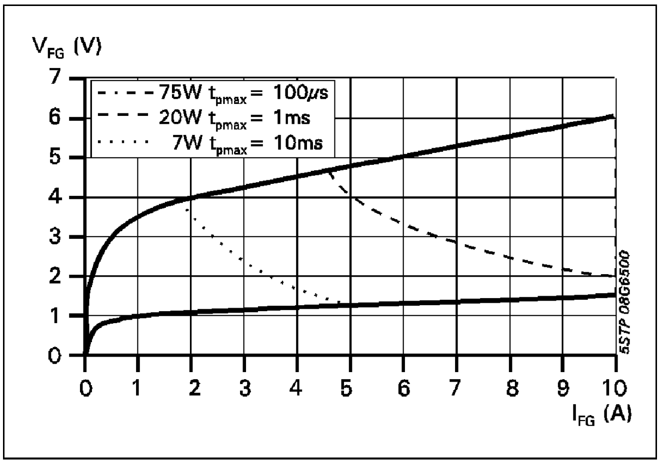


Fig. 9 Max. peak gate power loss.

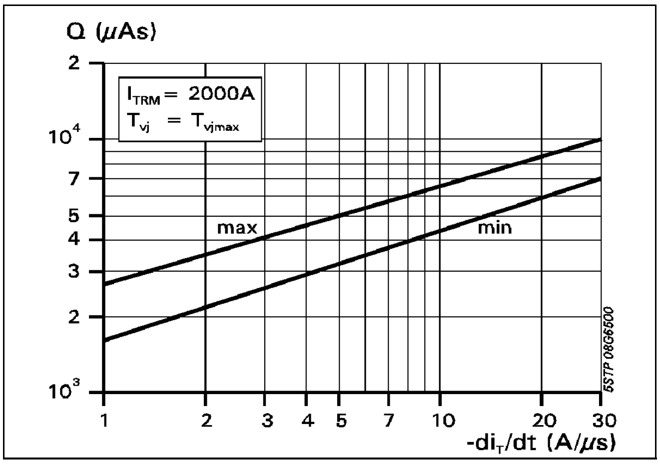


Fig. 10 Recovery charge vs. decay rate of on-state current.

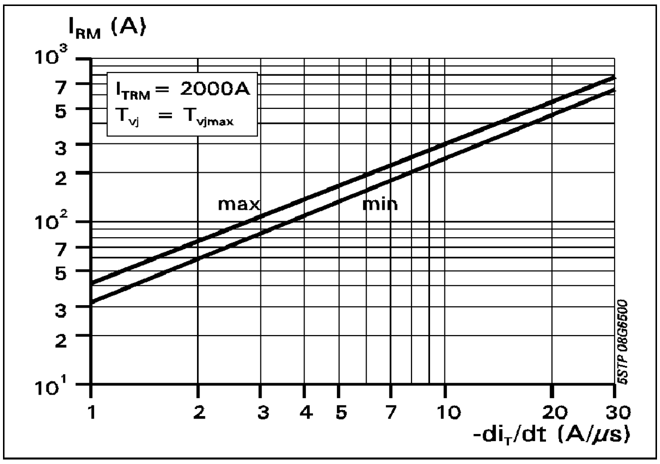


Fig. 11 Peak reverse recovery current vs. decay rate of on-state current.

Turn - off time, typical parameter relationship.

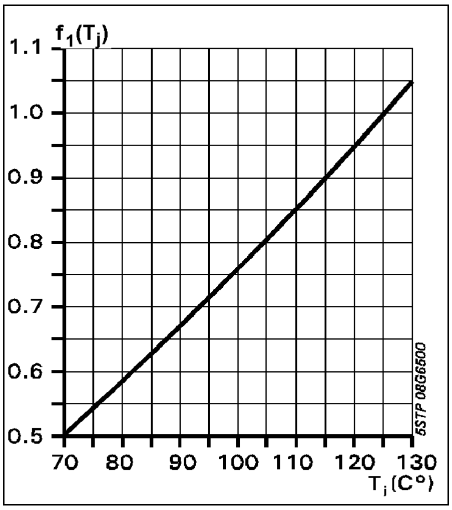


Fig. 12 $t_q/t_{q1} = f_1(T_j)$

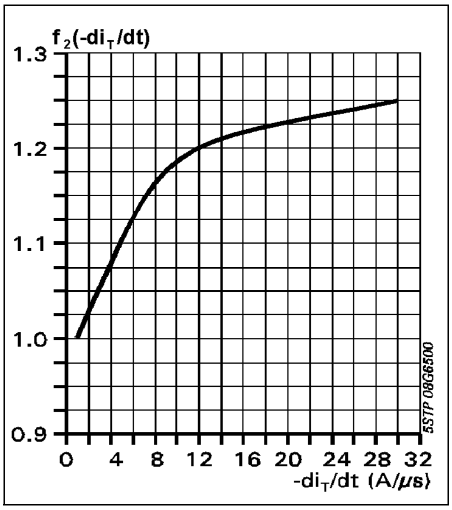


Fig. 13 $t_q/t_{q1} = f_2(-di_T/dt)$

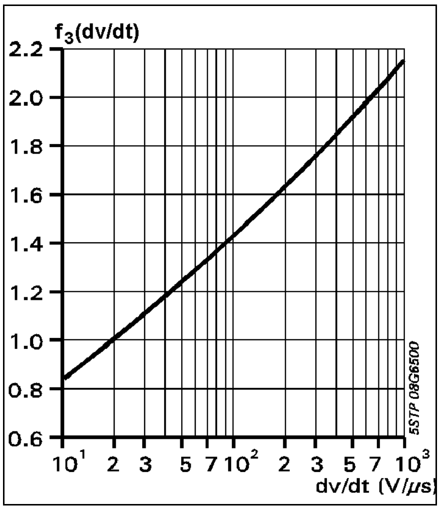


Fig. 14 $t_q/t_{q1} = f_3(dv/dt)$

$t_q = t_{q1} \bullet f_1(T_j) \bullet f_2(-di_T/dt) \bullet f_3(dv/dt)$

t_{q1} :at normalized values (see page 2)

t_q : at varying conditions

Turn-on and Turn-off losses

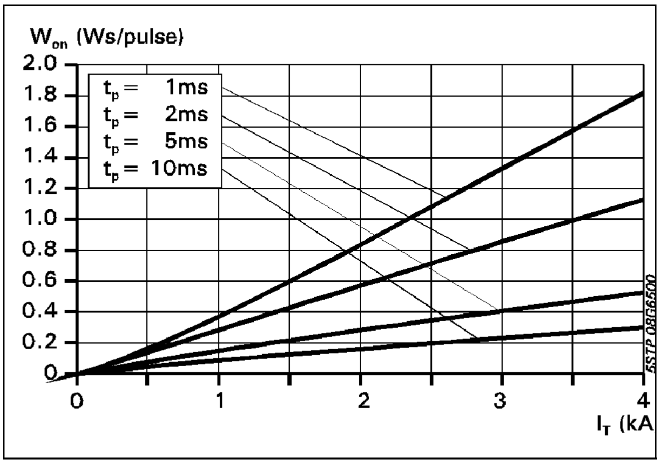


Fig. 15 $W_{on} = f(I_T, t_P)$, T_j = 125°C. Half sinusoidal waves.

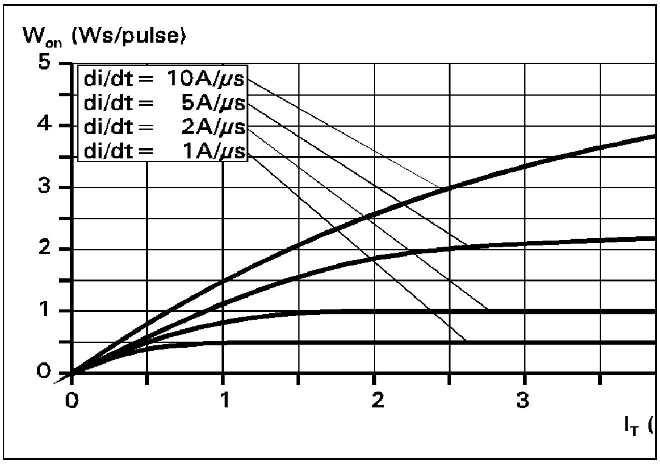


Fig. 16 $W_{on} = f(I_T, di/dt)$, T_j = 125°C. Rectangular waves.

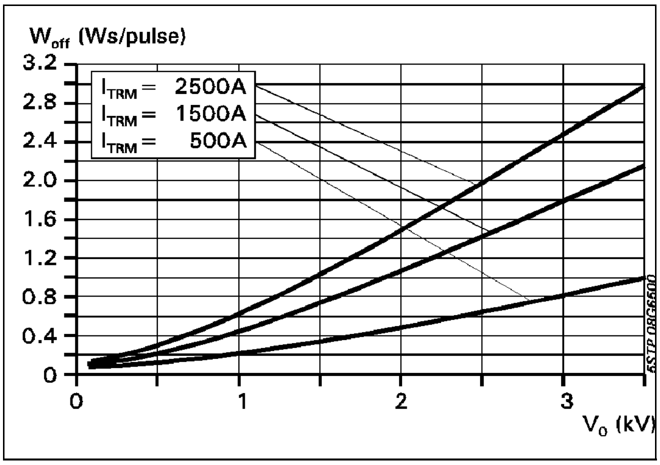


Fig. 17 $W_{off} = f(V_0, I_T)$, T_j = 125°C. Half sinusoidal waves. t_P = 10 ms.

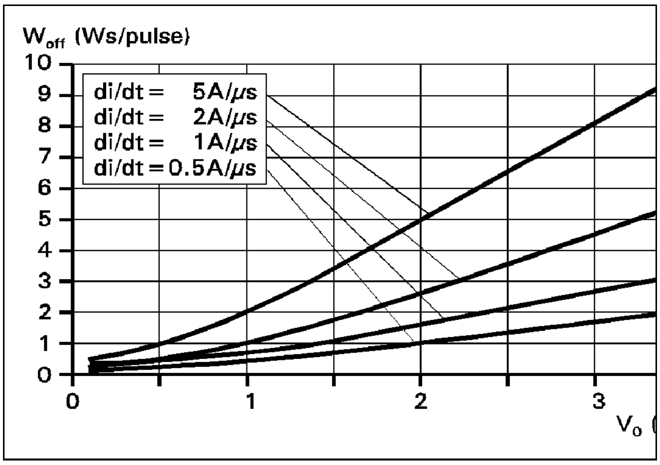
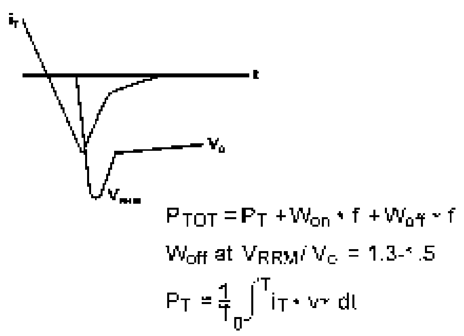


Fig. 18 $W_{off} = f(V_0, di/dt)$, T_j = 125°C. Rectangular waves.



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