V_{DSM}	=	4200 V
I_{TAVM}	=	1150 A
I_{TRMS}	=	1800 A
I_{TSM}	=	15000 A
V_{T0}	=	0.95 V
r_T	=	0.575 mΩ

Phase Control Thyristor

5STP 12F4200

Doc. No. 5SYA1021-03 Sep. 01

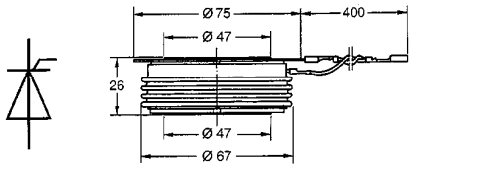
- **Patented free-floating silicon technology**
- **Low on-state and switching losses**
- **Designed for traction, energy and industrial applications**
- **Optimum power handling capability**

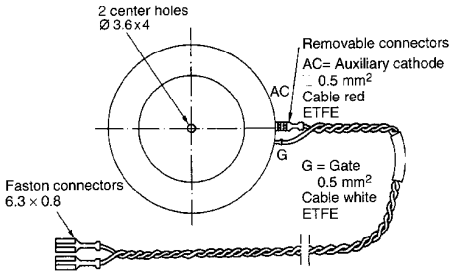
Blocking

Part Number	**5STP 12F4200**	**5STP 12F4000**	**5STP 12F3600**	Conditions	
V_{DRM} V_{RRM}	4200 V	4000 V	3600 V	f = 50 Hz, t_p = 10ms	
V_{RSM1}	4600 V	4400 V	4000 V	t_p = 5ms, single pulse	
I_{DRM}	≤ 200 mA			V_{DRM}	T_j = 125°C
I_{RRM}	≤ 200 mA			V_{RRM}	
dV/dt_{crit}	1000 V/µs			Exp. to 0.67 x V_{DRM}, T_j = 125°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		25 mm
D_a	Air strike distance		14 mm





On-state

I_{TAVM}	Max. average on-state current	1150 A	Half sine wave, T_C = 70°C	
I_{TRMS}	Max. RMS on-state current	1800 A		
I_{TSM}	Max. peak non-repetitive	15000 A	tp = 10 ms	T_j = 125°C
	surge current	16000 A	tp = 8.3 ms	After surge:
I^2t	Limiting load integral	1125 kA^2s	tp = 10 ms	$V_D = V_R$ = 0V
		1062 kA^2s	tp = 8.3 ms	
V_T	On-state voltage	2.10 V	I_T = 2000 A	
V_{T0}	Threshold voltage	0.95 V	I_T = 600 - 1800 A	T_j = 125°C
r_T	Slope resistance	0.575 mΩ		
I_H	Holding current	30-80 mA	T_j = 25°C	
		15-60 mA	T_j = 125°C	
I_L	Latching current	100- 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		≤ 2.0 µs	$V_D = 0.4 \cdot V_{DRM}$	I_{FG} = 2 A, t_r = 0.5 µs
t_q	Turn-off time		≤ 600 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 = -5 A/µs
Q_{rr}	Recovery charge	min	2500 µAs		
		max	4000 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	33 K/kW	Anode side cooled
		35 K/kW	Cathode side cooled
		17 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)	10.35	3.76	2.29	0.67
τ_i(s)	0.3723	0.0525	0.0057	0.0023

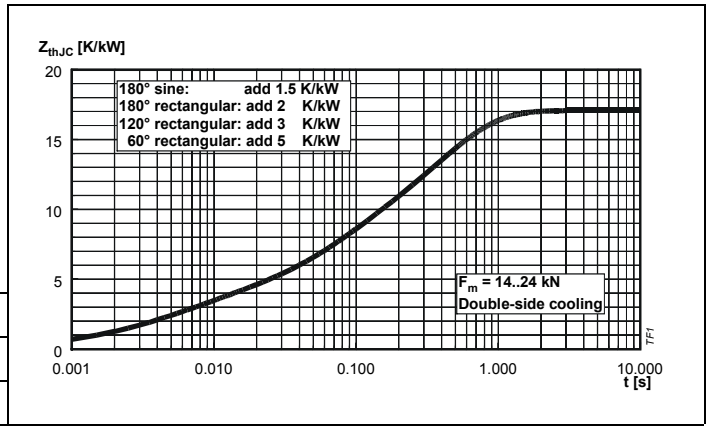


Fig. 1 Transient thermal impedance junction to case.

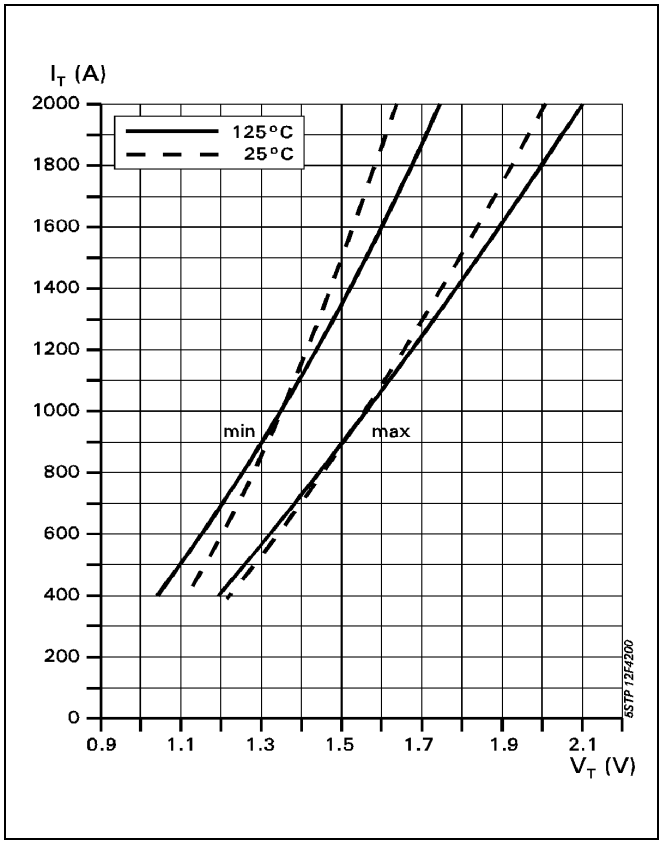


Fig. 2 On-state characteristics.

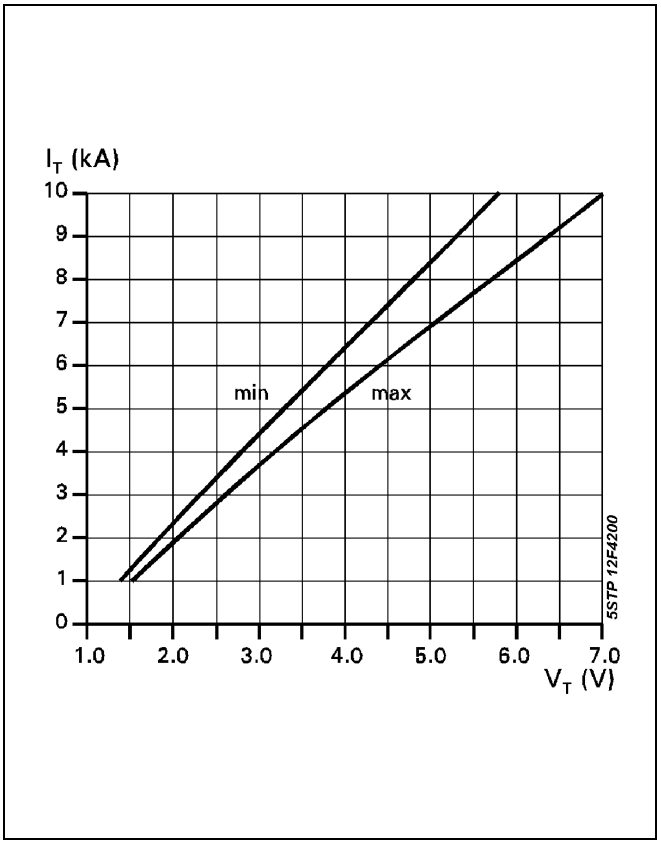


Fig. 3 On-state characteristics. T_j=125°C, 10ms half sine

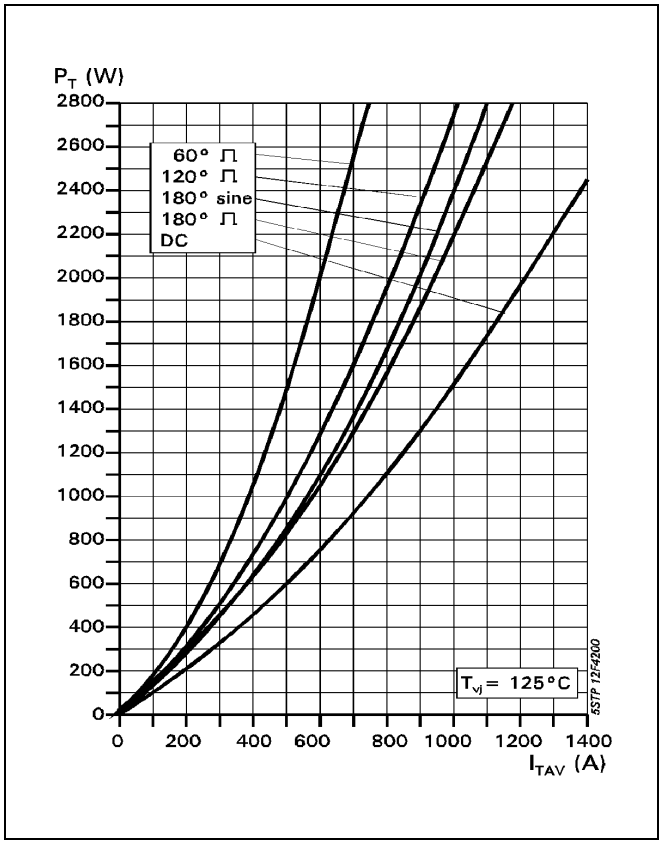


Fig. 4 On-state power dissipation vs. mean on-state current. Turn - on losses excluded.

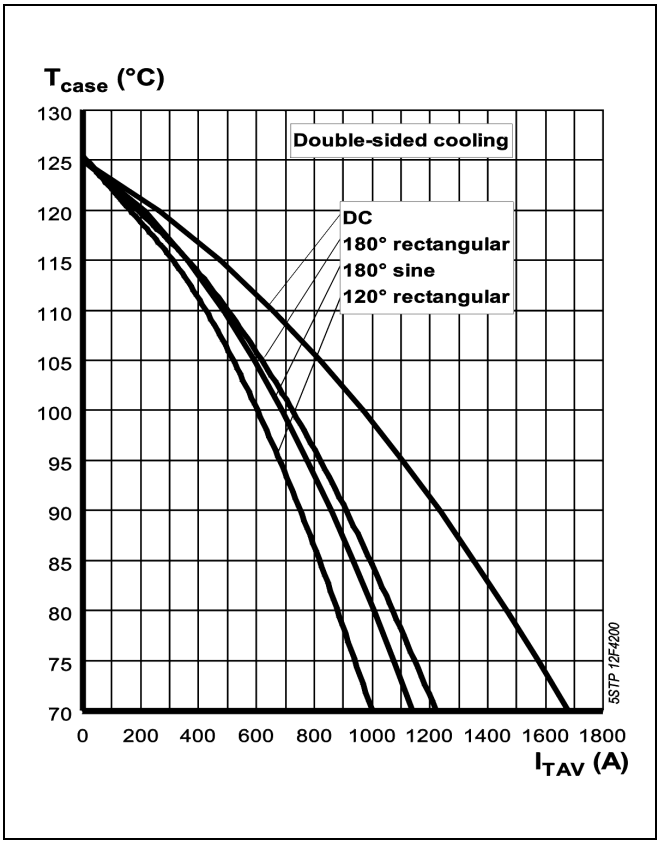


Fig. 5 Max. permissible case temperature vs. mean on-state current.

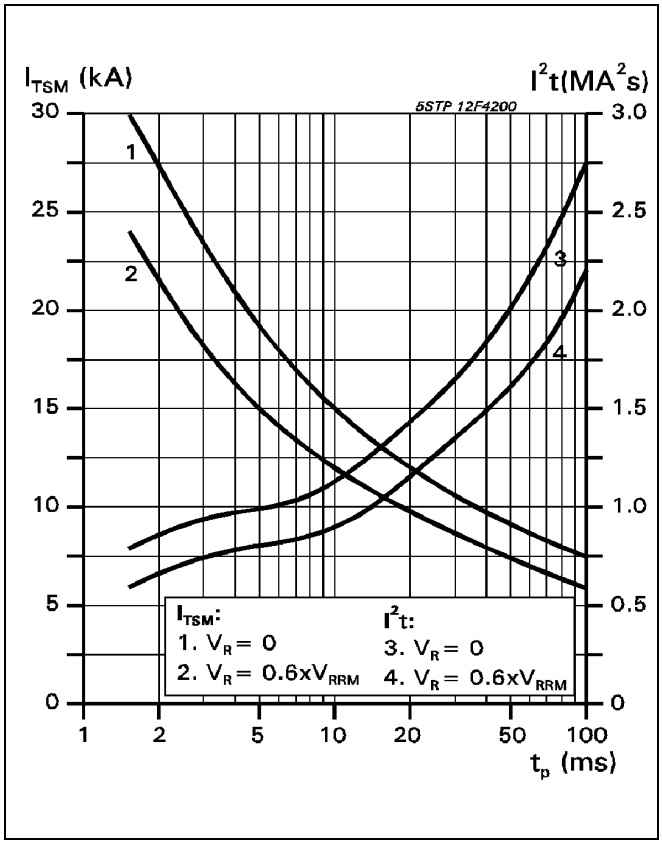


Fig. 6 Surge on-state current vs. pulse length. Half-sine wave.

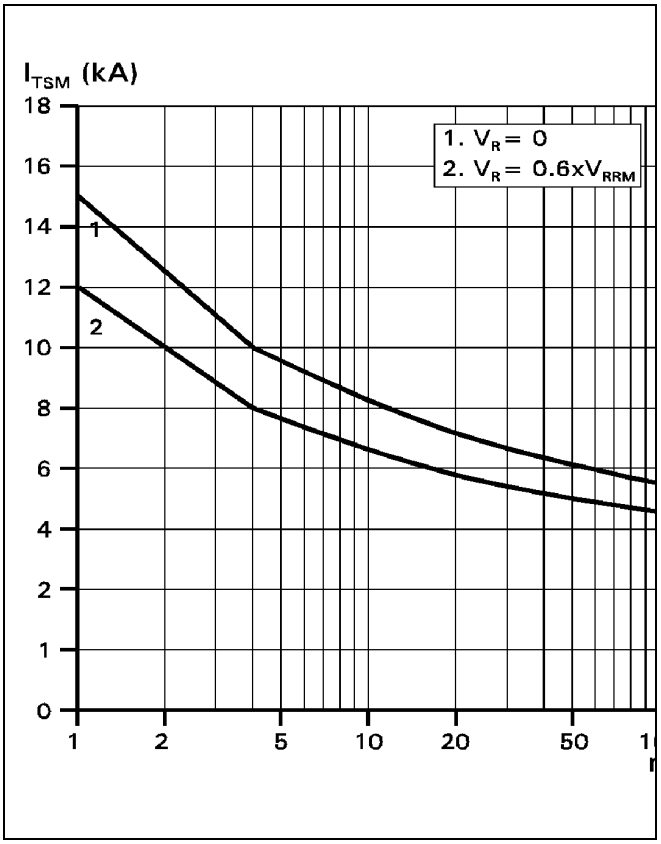


Fig. 7 Surge on-state current vs. number of pulses. Half-sine wave, 10 ms, 50Hz.

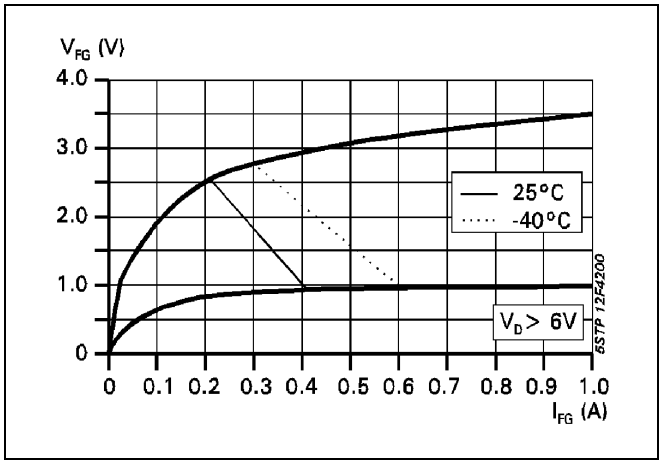


Fig. 8 Gate trigger characteristics.

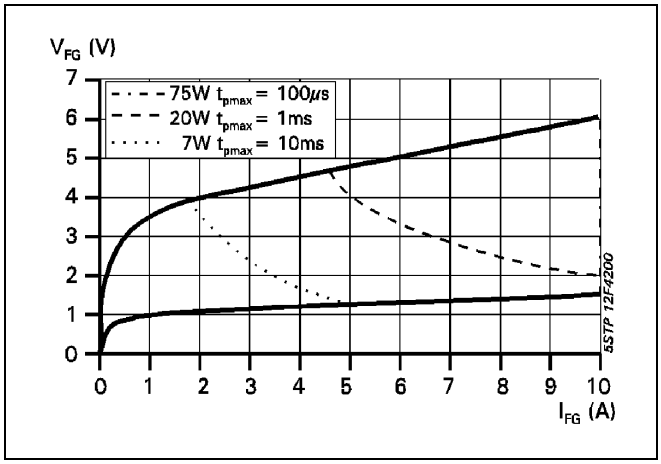


Fig. 9 Max. peak gate power loss.

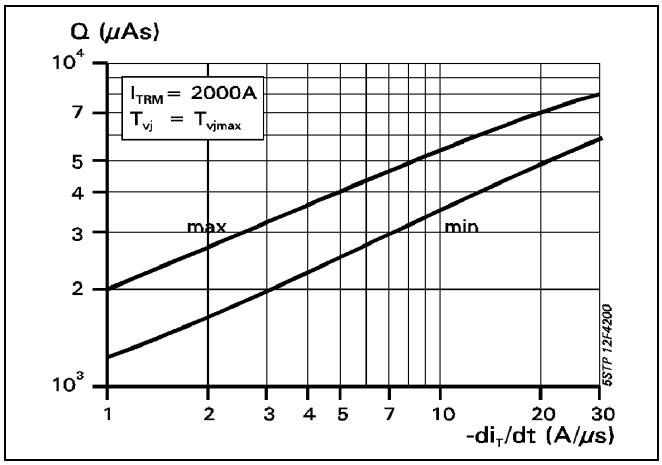


Fig. 10 Recovery charge vs. decay rate of on-state current.

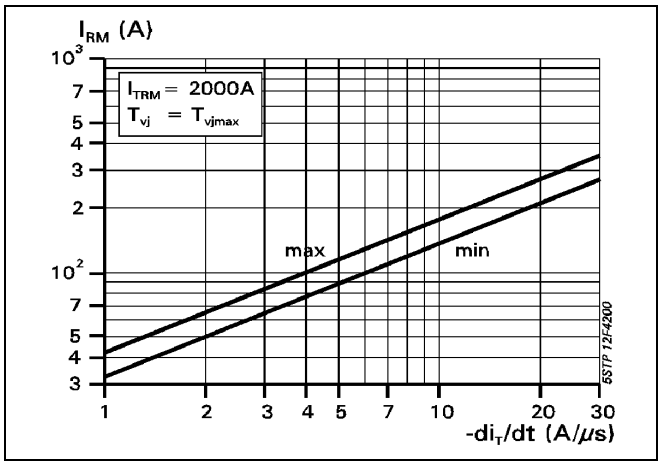


Fig. 11 Peak reverse recovery current vs. decay rate of on-state current.

ABB Semiconductors AG
Fabrikstrasse 3
CH-5600 Lenzburg, Switzerland

Telephone +41 (0)62 888 6419
Fax +41 (0)62 888 6306
Email abbsem@ch.abb.com
Internet www.abbsem.com

Doc. No. 5SYA1021-03 Sep. 01