V_{SM} = 2800 V
I_{TAVM} = 2630 A
I_{TRMS} = 4130 A
I_{TSM} = 43000 A
V_{T0} = 0.85 V
r_T = 0.160 mΩ

Bi-Directional Control Thyristor

5STB 24Q2800

Doc. No. 5SYA1053-01 Sep. 01

- **Two thyristors integrated into one wafer**
- **Patented free-floating silicon technology**
- **Designed for traction, energy and industrial applications**
- **Optimum power handling capability**
- **Interdigitated amplifying gate.**

The electrical and thermal data are valid for one thyristor half of the device.

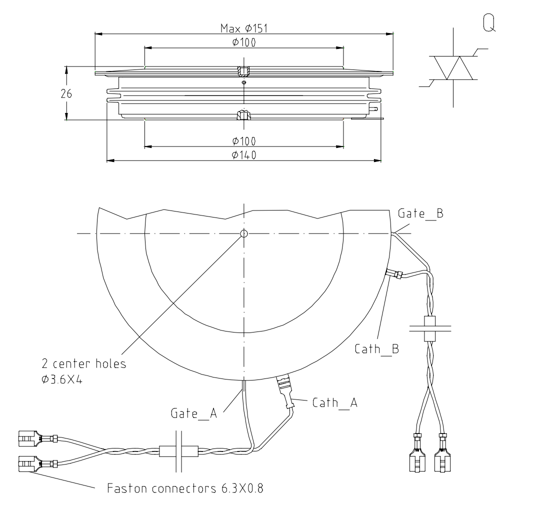
Blocking

Part Number	5STB 24Q2800	5STB 24Q2600	5STB 24Q2200	Conditions	
V_{SM}	3000 V	2800 V	2400 V	f = 5 Hz, t_p = 10ms	
V_{RM}	2800 V	2600 V	2200 V	f = 50 Hz,t_p = 10ms	
I_{SM}	≤ 400 mA			V_{SM}	T_j = 125°C
I_{RM}	≤ 400 mA			V_{RM}	
dV/dt_{crit}	1000 V/µs		@ Exp. to $0.67xV_{SM}$		

V_{RM} is equal to V_{SM} up to T_j = 110°C

Mechanical data

F_M	Mounting force	nom.	90	kN
		min.	81	kN
		max.	108	kN
a	Acceleration			
	Device unclamped		50	m/s^2
	Device clamped		100	m/s^2
m	Weight		2.1	kg
D_S	Surface creepage distance		36	mm
D_a	Air strike distance		15	mm



On-state

I_{TAVM}	Max. average on-state	2630 A	Half sine wave, T_C = 70°C	
I_{TRMS}	Max. RMS on-state current	4130 A		
I_{TSM}	Max. peak non-repetitive surge current	43000 A	tp = 10 ms	T_j = 125°C
		46000 A	tp = 8.3 ms	After surge:
I^2t	Limiting load integral	9245 kA^2s	tp = 10 ms	$V_D = V_R$ = 0V
		8781 kA^2s	tp = 8.3 ms	
V_T	On-state voltage	1.35 V	I_T = 3000 A	T_j = 125°C
V_{T0}	Threshold voltage	0.85 V	I_T = 1500 - 4500 A	
r_T	Slope resistance	0.160 mΩ		
I_H	Holding current	50-250 mA	T_j = 25°C	
		25-150 mA	T_j = 125°C	
I_L	Latching current	100-500 mA	T_j = 25°C	
		50-300 mA	T_j = 125°C	

Switching

di/dt_{crit}	Critical rate of rise of on-state current	250 A/µs	Cont. f = 50 Hz	$V_D \leq 0.67 \cdot V_{DRM}$, T_j = 125°C
		500 A/µs	60 sec. f = 50Hz	I_{TRM} = 3000 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	≤ 400 µs	$V_D \leq 0.67 \cdot V_{DRM}$ dv_D/dt = 20V/µs	I_{TRM} = 3000 A, T_j = 125°C V_R > 200 V, di_T/dt = -1.5 A/µs
Q_{rr}	Recovery charge min	1100 µAs		
	max	2000 µAs		

Triggering

V_{GT}	Gate trigger voltage	≤ 2.6 V	T_j = 25°C	
I_{GT}	Gate trigger current	≤ 400 mA	T_j = 25°C	
V_{GD}	Gate non-trigger voltage	≥ 0.3 V	$V_D = 0.4 \cdot V_{RM}$	T_j = 125°C
I_{GD}	Gate non-trigger current	≥ 10 mA	$V_D = 0.4 \cdot V_{RM}$	T_j = 125°C
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	Maximum gate power loss	3 W		

Thermal

T_j	Operating junction temperature range	-40…125 °C	
T_{stg}	Storage temperature range	-40…150 °C	
R_{thJC}	Thermal resistance junction to case	20 K/kW	Anode side cooled
		20 K/kW	Cathode side cooled
		10 K/kW	Double side cooled
R_{thCH}	Thermal resistance case to heat sink	4 K/kW	Single side cooled
		2 K/kW	Double side cooled

Analytical function for transient thermal impedance:

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

i	1	2	3	4
R_i(K/kW)	6.5	1.47	1.31	0.71
τ_i(s)	0.5205	0.1075	0.0194	0.0073

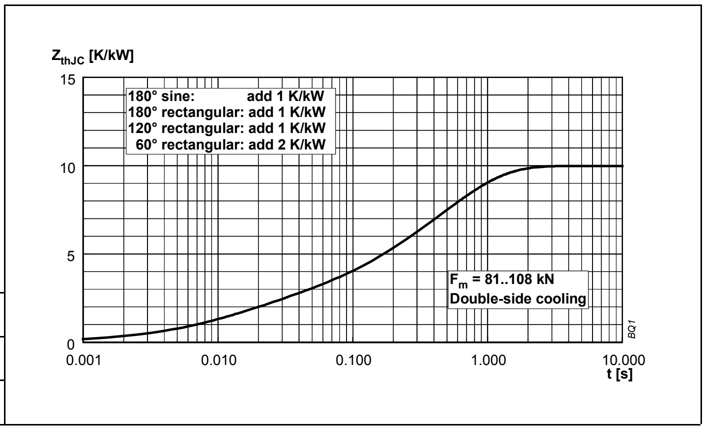


Fig. 1 Transient thermal impedance junction to case.

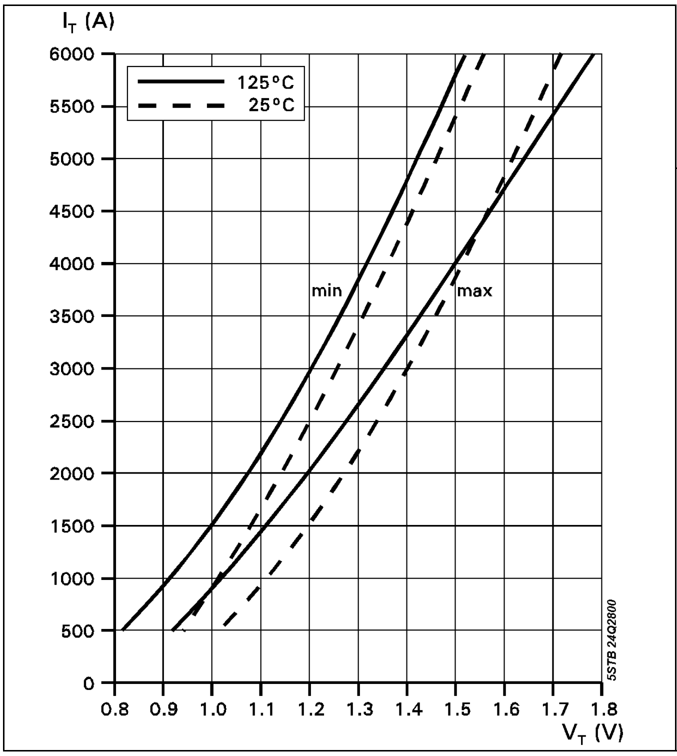


Fig. 2 On-state characteristics.

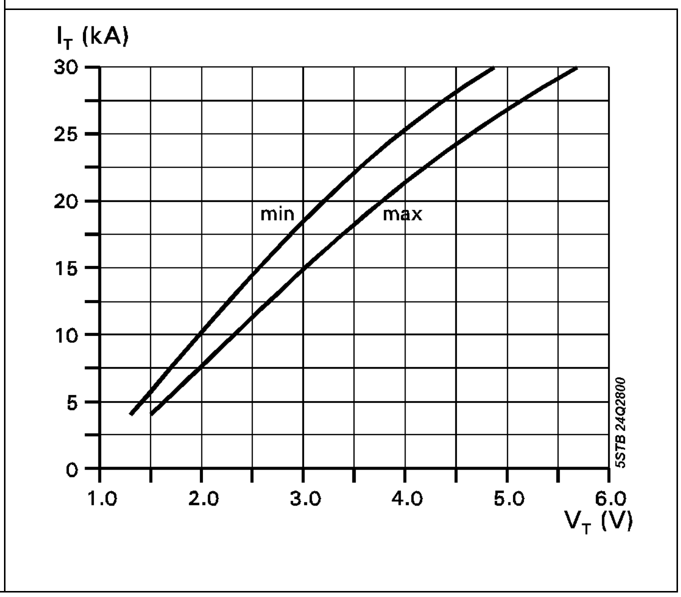


Fig. 3 On-state characteristics.

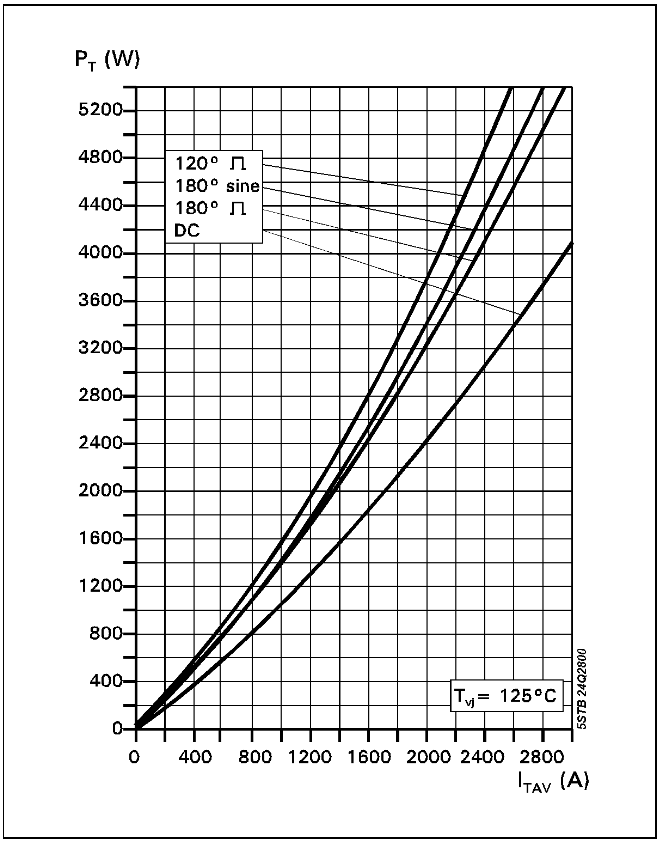


Fig. 4 On-state power dissipation vs. mean on-state current. Turn - on losses excluded.

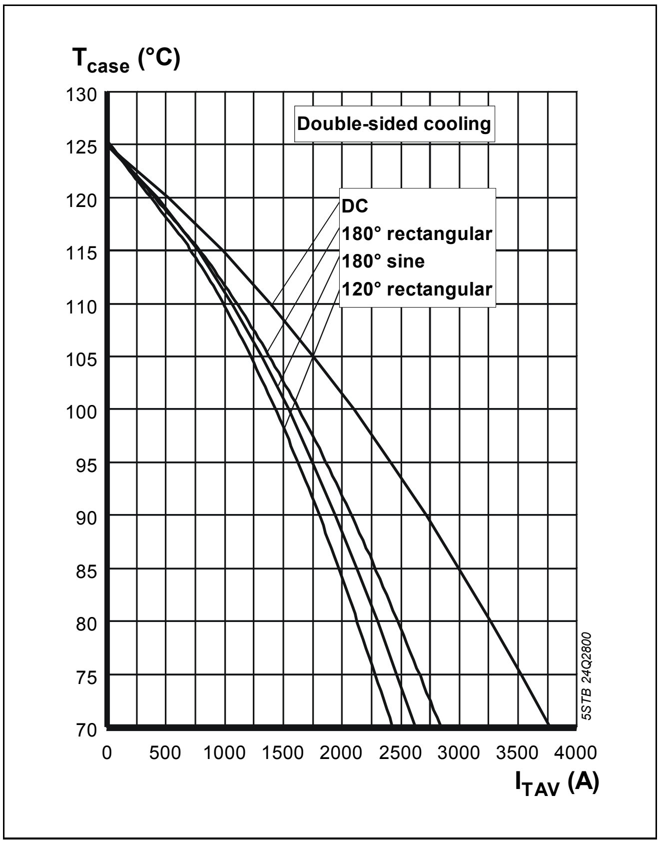


Fig. 5 Max. permissible case temperature vs. mean on-state current.

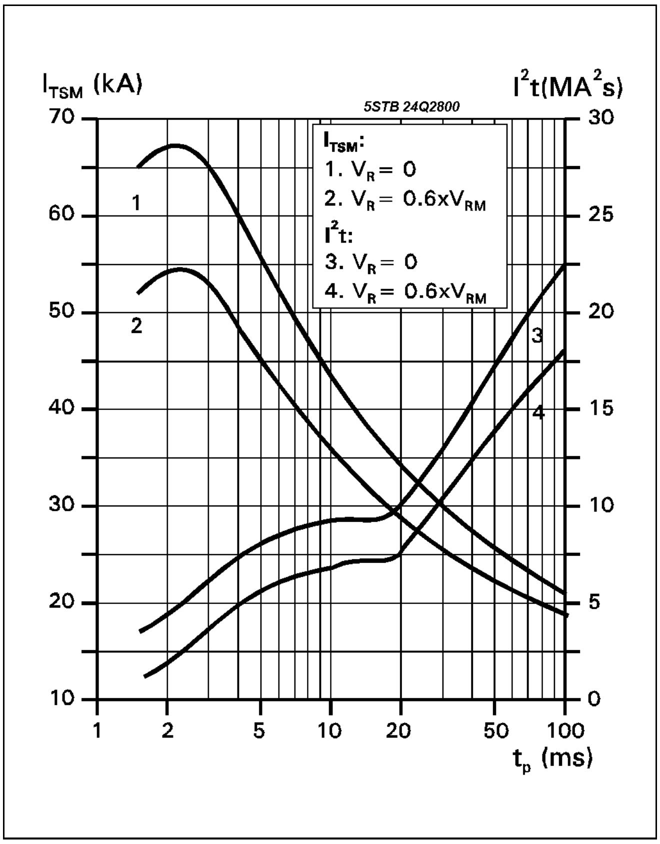


Fig. 6 Surge on-state current vs. pulse length. Half-sine wave.

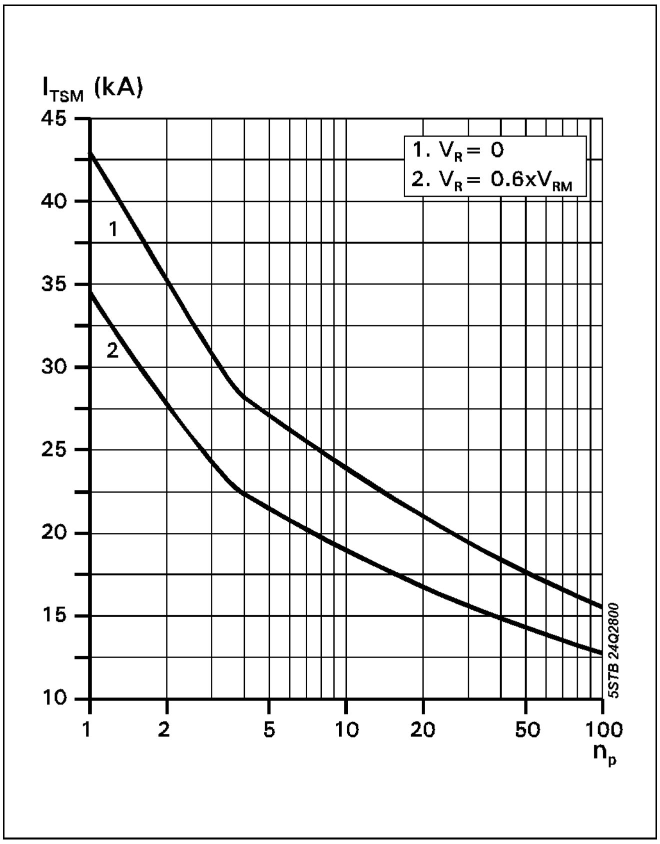


Fig. 7 Surge on-state current vs. number of pulses. Half-sine wave, 10 ms, 50Hz.

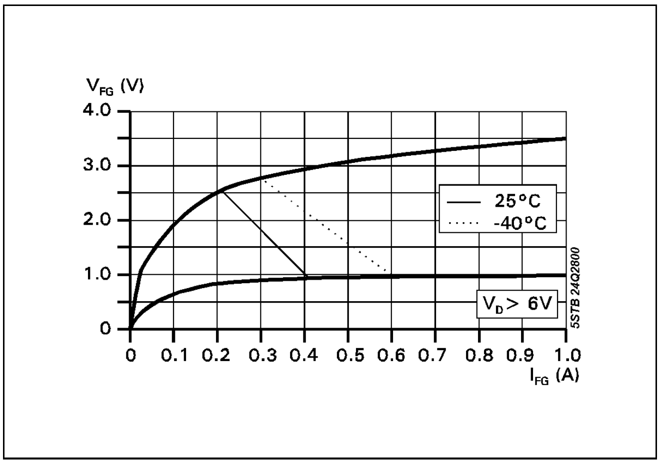


Fig. 8 Gate trigger characteristics.

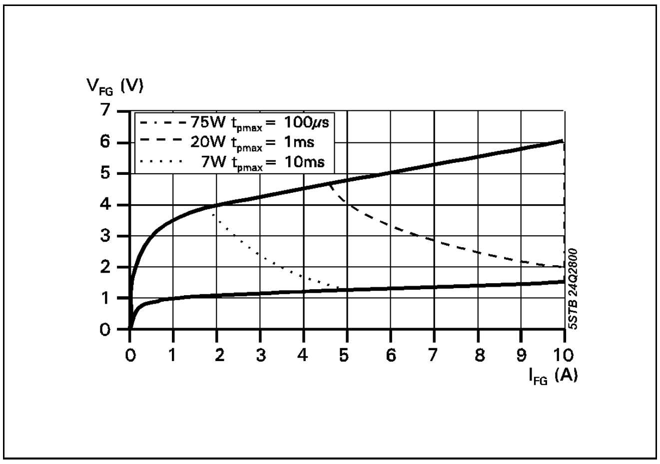


Fig. 9 Max. peak gate power loss.

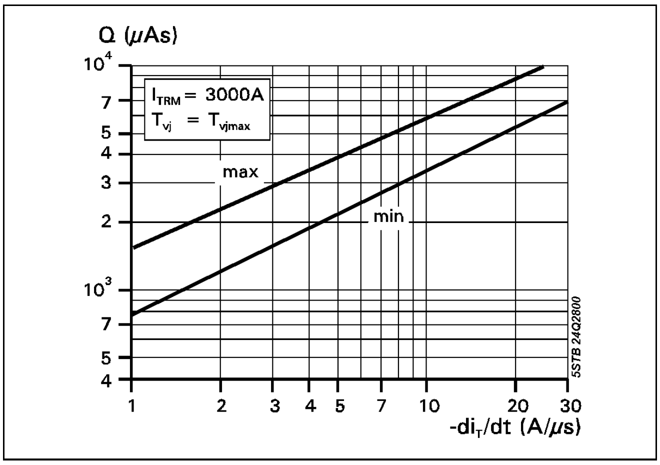


Fig. 10 Recovery charge vs. decay rate of on-state current.

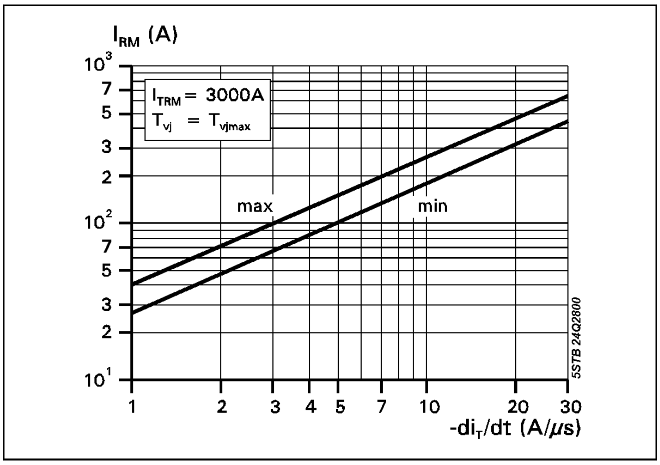


Fig. 11 Peak reverse recovery current vs. decay rate of on-state current.

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. 5SYA1053-01 Sep. 01