

Key Parameters

V_{DSM}	=	1800 V
I_{TAVM}	=	325 A
I_{TRMS}	=	510 A
I_{TSM}	=	5000 A
V_{T0}	=	0.89 V
r_T	=	0.850 mΩ

Phase Control Thyristor 5STP 03A1800

Doc. No. 5SYA 1032-01 August, 00

Features

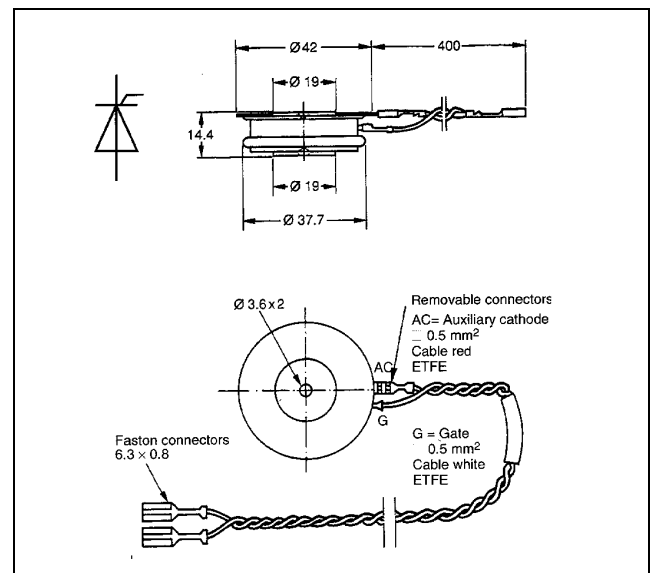
- Patented free-floating silicon technology
- Low on-state and switching losses
- Designed for traction, energy and industrial applications
- Optimum power handling capability
- Industry standard housing

Blocking

Part Number	5STP 03A1800	5STP 03A1600	5STP 03A1200	Conditions
V_{DRM} V_{RRM}	1800 V	1600 V	1200 V	$f = 50$ Hz, $t_p = 10$ ms
V_{RSM1}	2000 V	1800 V	1400 V	$t_p = 5$ ms, single pulse
I_{DRM}	≤ 50 mA			$T_j = 125^\circ\text{C}$
I_{RRM}	≤ 50 mA			
dV/dt_{crit}	1000 V/ μ s @ Exp. to $0.67 \times V_{DRM}$			

Mechanical data

F_M	Mounting force	nom.	4 kN
		min.	3.6 kN
		max.	4.8 kN
a	Acceleration	Device unclamped	50 m/s ²
		Device clamped	100 m/s ²
m	Weight	0.06 kg	
D_S	Surface creepage distance	7 mm	
D_a	Air strike distance	6 mm	



On-state

I_{TAVM}	Max. average on-state current	325 A	Half sine wave, $T_C = 70^\circ\text{C}$	
I_{TRMS}	Max. RMS on-state current	510 A		
I_{TSM}	Max. peak non-repetitive surge current	5000 A	$t_p = 10\text{ ms}$	$T_j = 125^\circ\text{C}$ After surge: $V_D = V_R = 0\text{V}$
		5400 A	$t_p = 8.3\text{ ms}$	
I^2t	Limiting load integral	125 kA^2s	$t_p = 10\text{ ms}$	
		121 kA^2s	$t_p = 8.3\text{ ms}$	
V_T	On-state voltage	1.40 V	$I_T = 600\text{ A}$	$T_j = 125^\circ\text{C}$
V_{T0}	Threshold voltage	0.89 V	$I_T = 200 - 600\text{ A}$	
r_T	Slope resistance	0.850 $\text{m}\Omega$		
I_H	Holding current	20-70 mA	$T_j = 25^\circ\text{C}$	
		15-60 mA	$T_j = 125^\circ\text{C}$	
I_L	Latching current	50-300 mA	$T_j = 25^\circ\text{C}$	
		30-275 mA	$T_j = 125^\circ\text{C}$	

Switching

di/dt_{crit}	Critical rate of rise of on-state current	150 $\text{A}/\mu\text{s}$	Cont.	$V_D \leq 0.67 \cdot V_{DRM}$ $T_j = 125^\circ\text{C}$ $I_{TRM} = 600\text{ A}$ $f = 50\text{ Hz}$ $I_{FG} = 1.5\text{ A}$ $t_r = 0.5\text{ }\mu\text{s}$
		300 $\text{A}/\mu\text{s}$	60 sec.	
t_d	Delay time	$\leq 3.0\text{ }\mu\text{s}$	$V_D = 0.4 \cdot V_{DRM}$	$I_{FG} = 1.5\text{ A}$ $t_r = 0.5\text{ }\mu\text{s}$
t_q	Turn-off time	$\leq 400\text{ }\mu\text{s}$	$V_D \leq 0.67 \cdot V_{DRM}$ $dv_D/dt = 20\text{V}/\mu\text{s}$	$I_{TRM} = 600\text{ A}$ $T_j = 125^\circ\text{C}$ $V_R > 200\text{ V}$
Q_{rr}	Recovery charge	min	400 μAs	$di_T/dt = -20\text{ A}/\mu\text{s}$
		max	1100 μAs	

Triggering

V_{GT}	Gate trigger voltage	2.4 V	$T_j = 25^\circ\text{C}$
I_{GT}	Gate trigger current	250 mA	$T_j = 25^\circ\text{C}$
V_{GD}	Gate non-trigger voltage	0.3 V	$V_D = 0.4 \cdot V_{DRM}$
I_{GD}	Gate non-trigger current	10 mA	$V_D = 0.4 \cdot V_{DRM}$
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 losses	3 W	

Thermal

$T_{j\max}$	Max. junction temperature	125°C	
$T_{j\text{stg}}$	Storage temperature range	-40...150°C	
R_{thJC}	Thermal resistance junction to case	130 K/kW	Anode side cooled
		160 K/kW	Cathode side cooled
		90 K/kW	Double side cooled
R_{thCH}	Thermal resistance case to heat sink	80 K/kW	Single side cooled
		40 K/kW	Double side cooled

Analytical function for transient thermal impedance:

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

i	1	2	3	4
$R_i(\text{K/kW})$	15.6	17.9	18.7	18.2
τ_i	1.4191	0.181	0.1614	0.0941

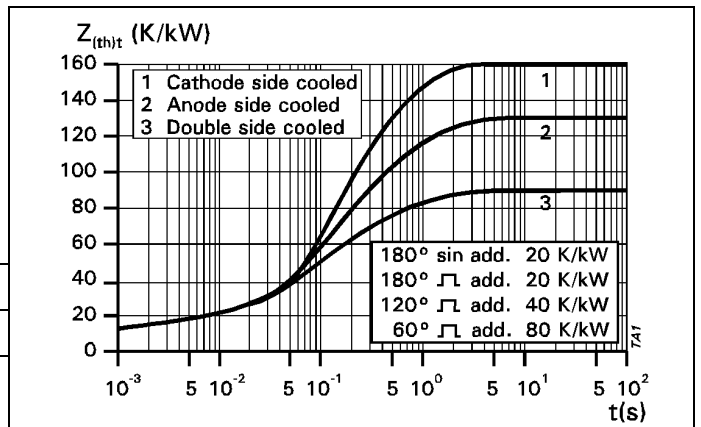


Fig. 1 Transient thermal impedance junction to case.

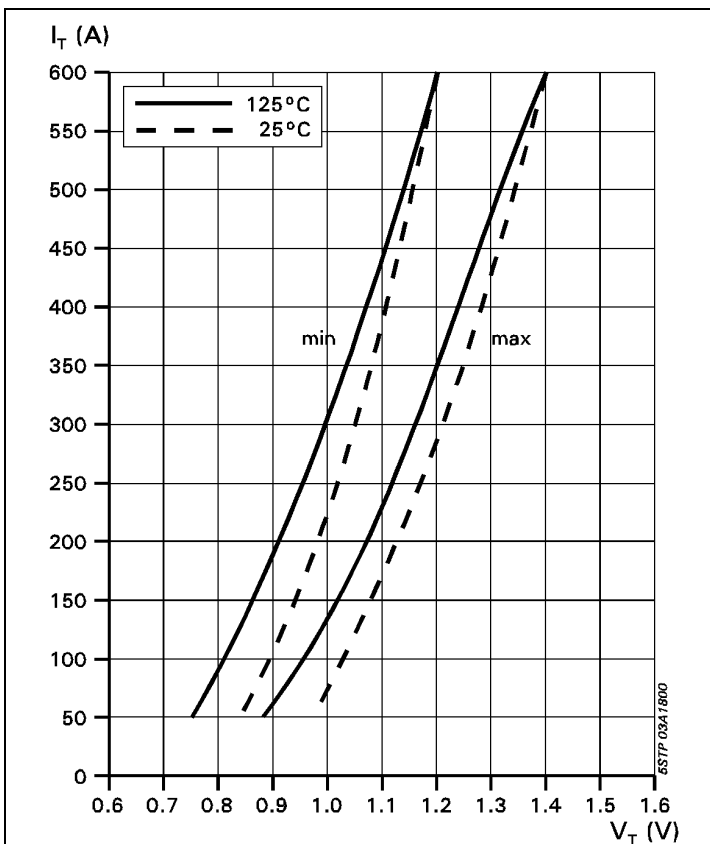


Fig. 2. On-state characteristics.

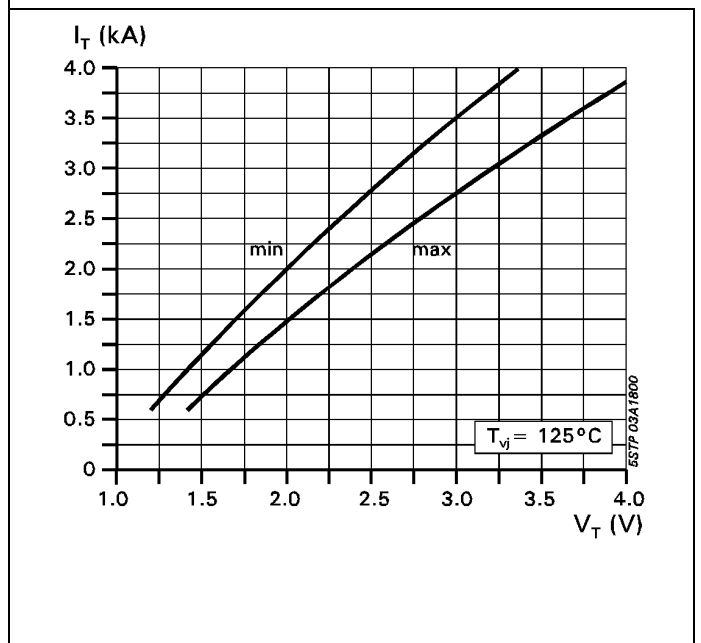


Fig. 3 On state characteristics.

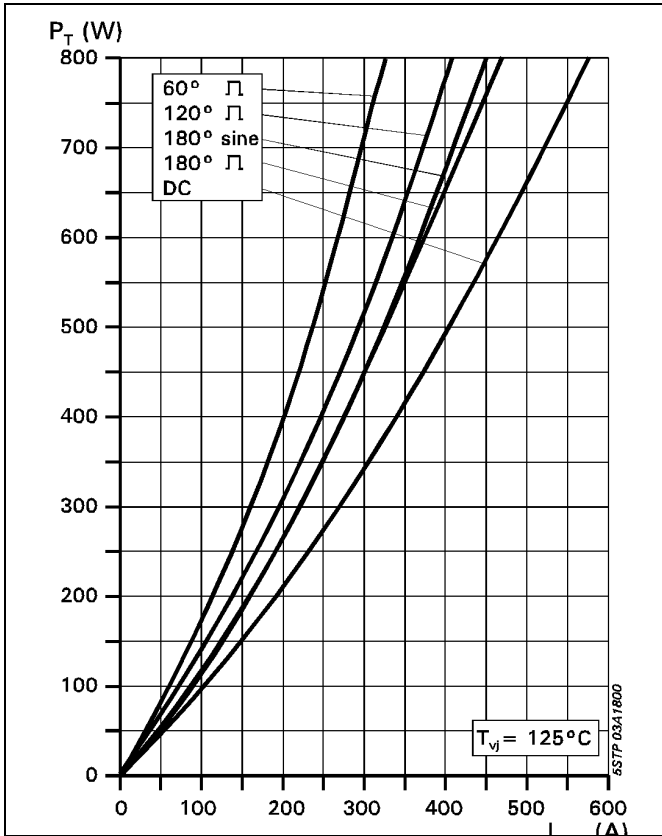


Fig. 4 On-state power dissipation vs. mean on-state current. Turn-on losses excluded.

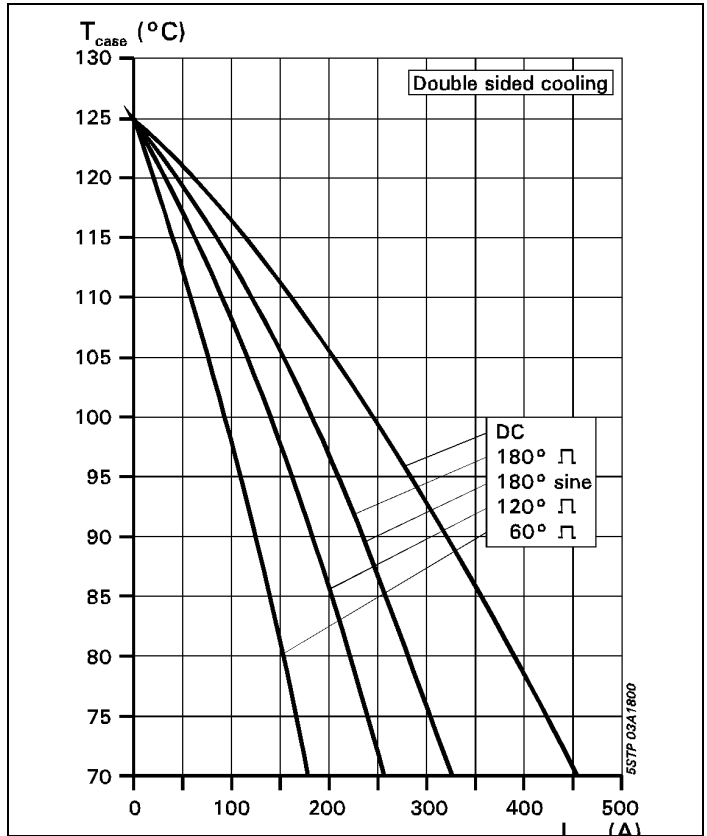


Fig. 5 Max. permissible case temperature vs. mean on-state current.

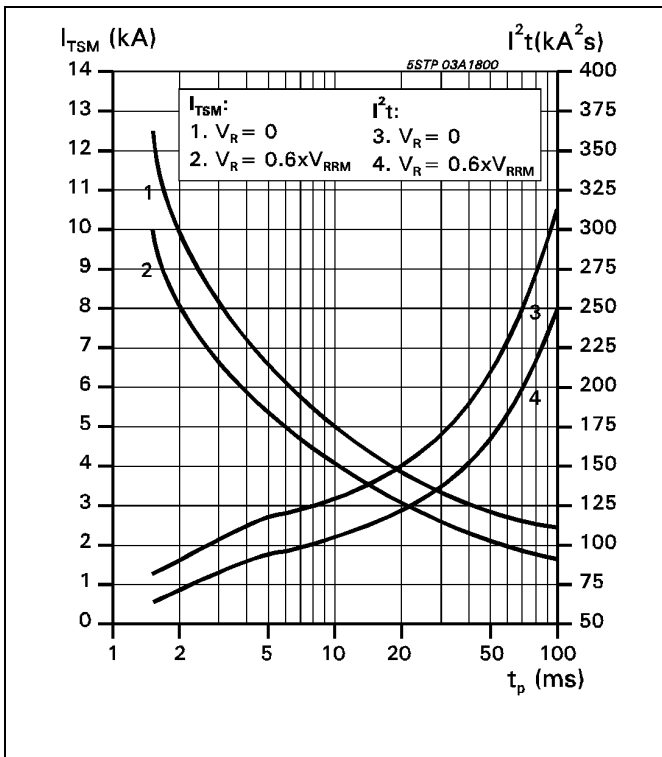


Fig. 6 Surge on-state current vs. pulse length. Half-sine wave.

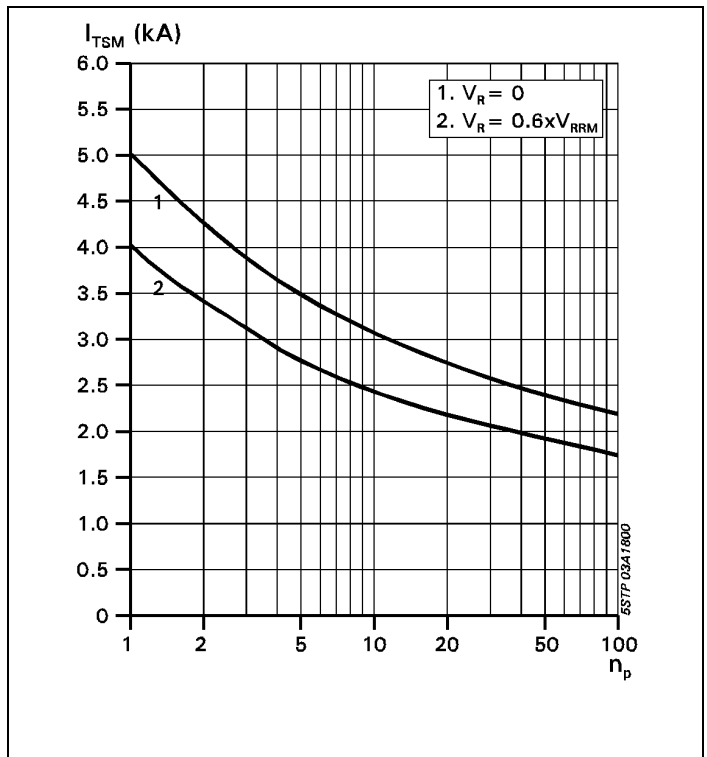


Fig. 7 Surge on-state current vs. number of pulses. Half-sine wave, 10 ms, 50Hz.

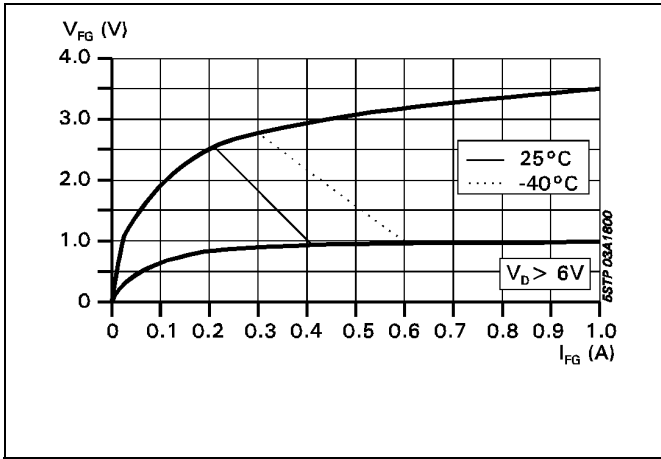


Fig. 8 Gate trigger characteristics.

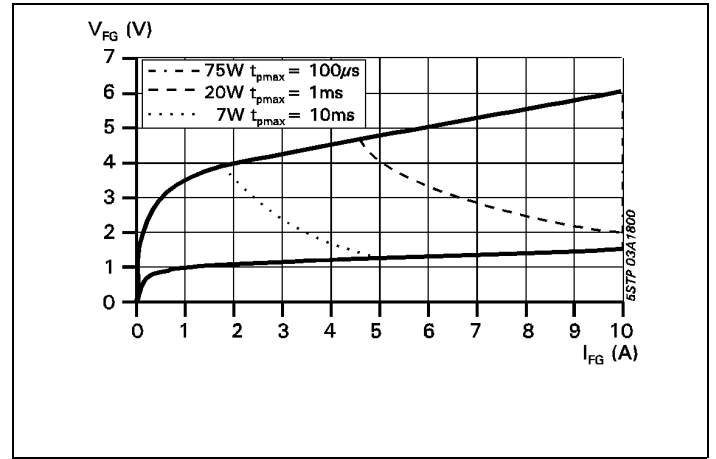


Fig. 9 Max. peak gate power loss.

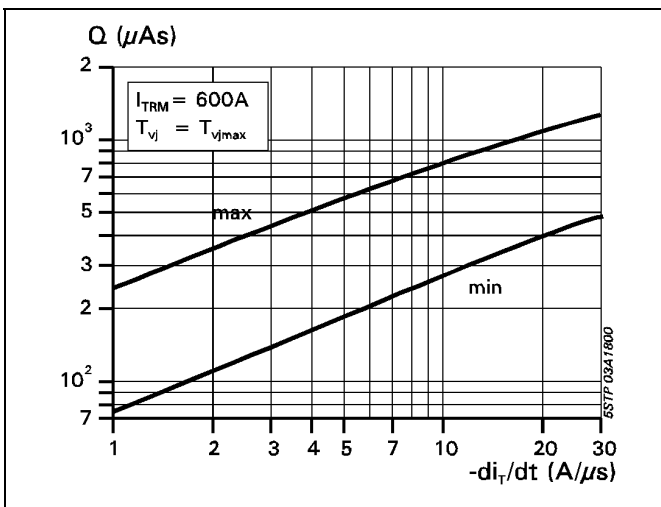


Fig. 10 Recovery charge vs. decay rate of on-state current.



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