

$V_{DSM}$  = 1800 V  
 $I_{TAVM}$  = 3000 A  
 $I_{TRMS}$  = 4710 A  
 $I_{TSM}$  = 47000 A  
 $V_{TO}$  = 0.88 V  
 $r_T$  = 0.103 mW

# Phase Control Thyristor

## 5STP 27H1800

Doc. No. 5SYA1048-02 Aug.00

- 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 27H1800	5STP 27H1600	5STP 27H1200	Conditions
$V_{DRM}$	$V_{RRM}$	1800 V	1600 V	$f = 50 \text{ Hz}, t_p = 10\text{ms}$
$V_{RSM1}$		2000 V	1800 V	$t_p = 5 \text{ ms, single pulse}$
$I_{DRM}$		$\leq 200 \text{ mA}$		$V_{DRM}$
$I_{RRM}$		$\leq 200 \text{ mA}$		$V_{RRM}$
$dV/dt_{crit}$		1000 V/ $\mu$ s	@ Exp. to $0.67 \times V_{DRM}$	$T_j = 125^\circ\text{C}$

### Mechanical data

$F_M$	Mounting force	nom.	50 kN
		min.	45 kN
		max.	60 kN
a	Acceleration		
	Device unclamped		50 m/s <sup>2</sup>
	Device clamped		100 m/s <sup>2</sup>
m	Weight		0.9 kg
D <sub>S</sub>	Surface creepage distance		36 mm
D <sub>a</sub>	Air strike distance		15 mm

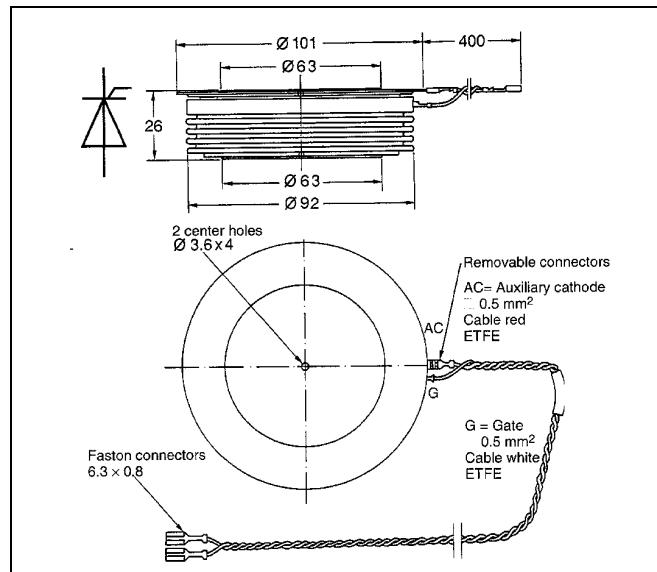


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## On-state

$I_{TAVM}$	Max. average on-state current	3000 A	Half sine wave, $T_C = 70^\circ\text{C}$		
$I_{TRMS}$	Max. RMS on-state current	4710 A			
$I_{TSM}$	Max. peak non-repetitive surge current	47000 A	$tp = 10 \text{ ms}$	$T_j = 125^\circ\text{C}$	After surge: $V_D = V_R = 0V$
		50000 A	$tp = 8.3 \text{ ms}$		
$I^2t$	Limiting load integral	11045 $\text{kA}^2\text{s}$	$tp = 10 \text{ ms}$	$I_T = 3000 \text{ A}$	$T_j = 125^\circ\text{C}$
		10375 $\text{kA}^2\text{s}$	$tp = 8.3 \text{ ms}$		
$V_T$	On-state voltage	1.21 V	$I_T = 3000 \text{ A}$	$I_T = 2000 - 6000 \text{ A}$	$T_j = 125^\circ\text{C}$
$V_{T0}$	Threshold voltage	0.88 V			
$r_T$	Slope resistance	0.103 mΩ			
$I_H$	Holding current	20-70 mA	$T_j = 25^\circ\text{C}$		
		15-60 mA	$T_j = 125^\circ\text{C}$		
$I_L$	Latching current	150-600 mA	$T_j = 25^\circ\text{C}$		
		50-200 mA	$T_j = 125^\circ\text{C}$		

## Switching

$di/dt_{crit}$	Critical rate of rise of on-state current	150 A/μs	Cont.	$V_D \leq 0.67 \cdot V_{DRM} \quad T_j = 125^\circ\text{C}$
		300 A/μs	60 sec.	$I_{TRM} = 3000 \text{ A} \quad f = 50 \text{ Hz}$ $I_{FG} = 2.0 \text{ A} \quad t_r = 0.5 \mu\text{s}$
$t_d$	Delay time	$\leq 3.0 \mu\text{s}$	$V_D = 0.4 \cdot V_{DRM}$	$I_{FG} = 2.0 \text{ A} \quad t_r = 0.5 \mu\text{s}$
$t_q$	Turn-off time	$\leq 400 \mu\text{s}$	$V_D \leq 0.67 \cdot V_{DRM}$ $dv_D/dt = 20 \text{ V/}\mu\text{s}$	$I_{TRM} = 3000 \text{ A} \quad T_j = 125^\circ\text{C}$ $V_R > 200 \text{ V}$
$Q_{rr}$	Recovery charge	min	1800 μAs	$di_T/dt = -20 \text{ A}/\mu\text{s}$
		max	4500 μAs	

## Triggering

$V_{GT}$	Gate trigger voltage	2.6 V	$T_j = 25^\circ\text{C}$
$I_{GT}$	Gate trigger current	400 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	
$P_G$	Maximum gate power loss	3 W	

## Thermal

$T_{j\max}$	Max. junction temperature	125°C	
$T_{j\text{stg}}$	Storage temperature range	-40...150°C	
$R_{\text{thJC}}$	Thermal resistance junction to case	20 K/kW	Anode side cooled
		20 K/kW	Cathode side cooled
		10 K/kW	Double side cooled
$R_{\text{thCH}}$	Thermal resistance case to heat sink	4 K/kW	Single side cooled
		2 K/kW	Double side cooled

Analytical function for transient thermal impedance:

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

i	1	2	3	4
$R_i(\text{K/kW})$	6.52	1.55	1.67	0.49
$\tau_i(\text{s})$	0.4562	0.0792	0.0088	0.0037

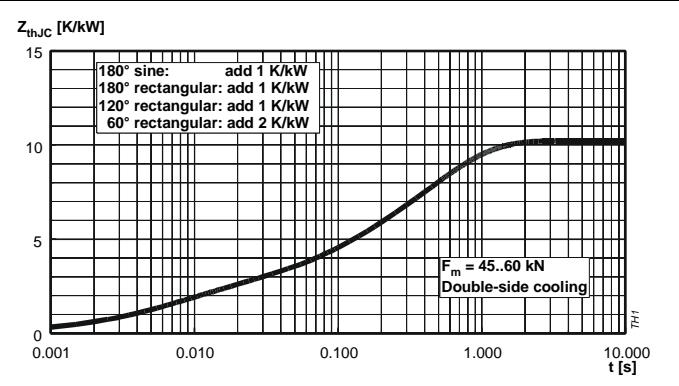


Fig. 1 Transient thermal impedance junction to case.

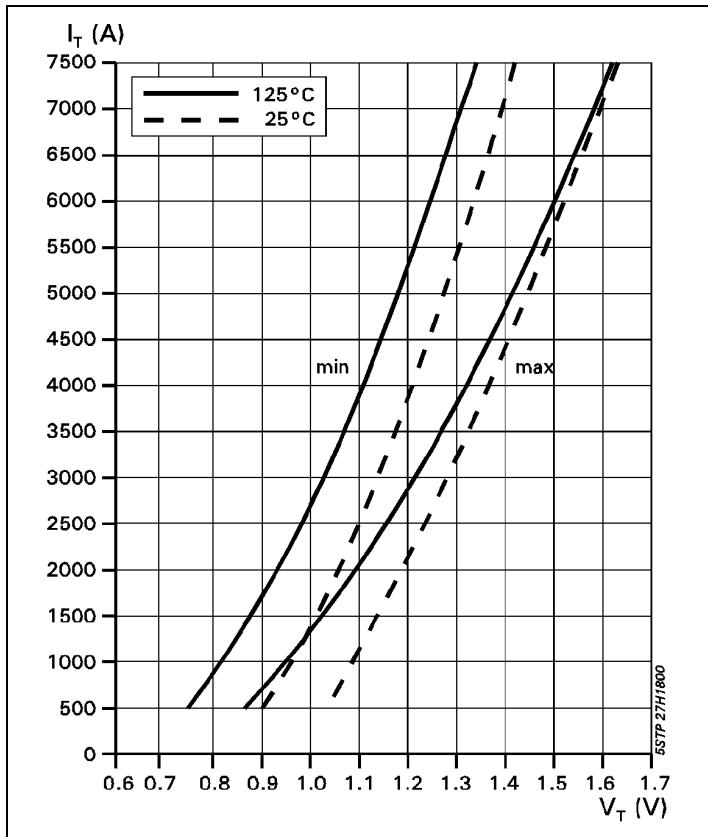


Fig. 2 On-state characteristics.

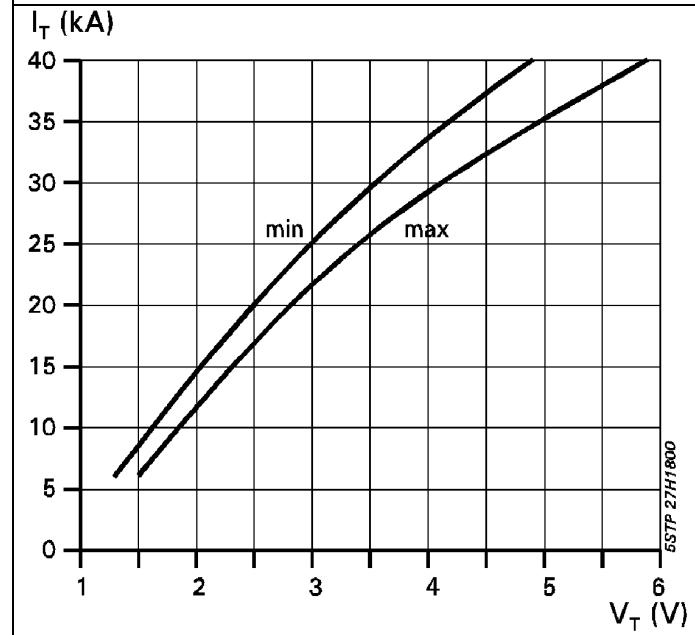
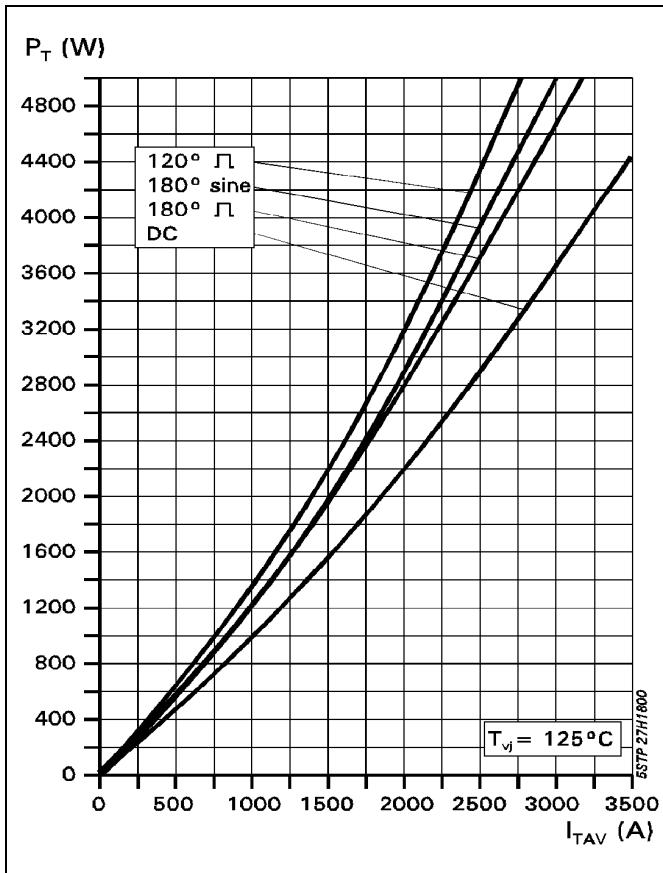
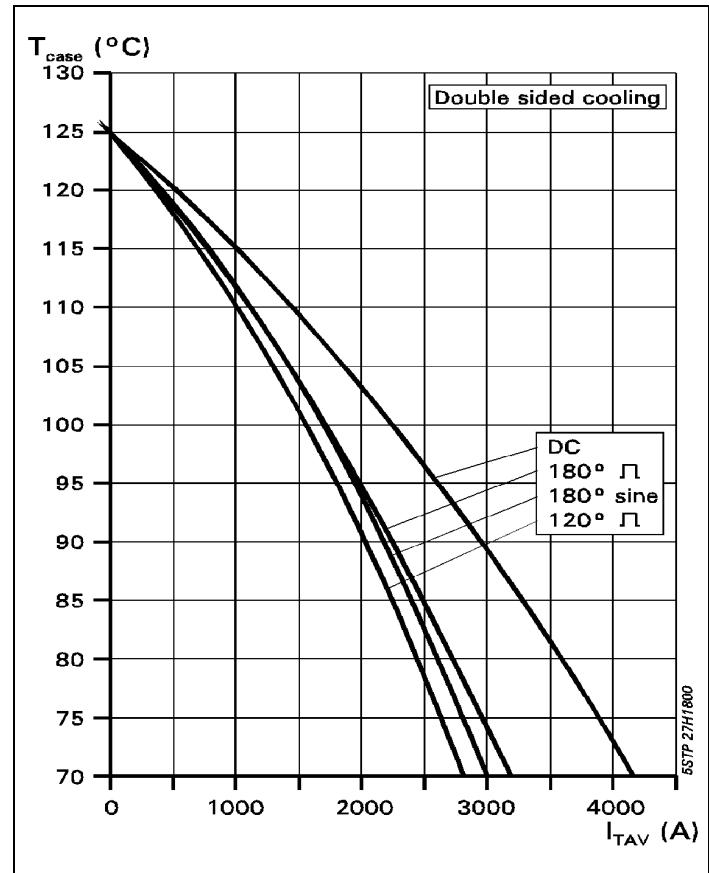


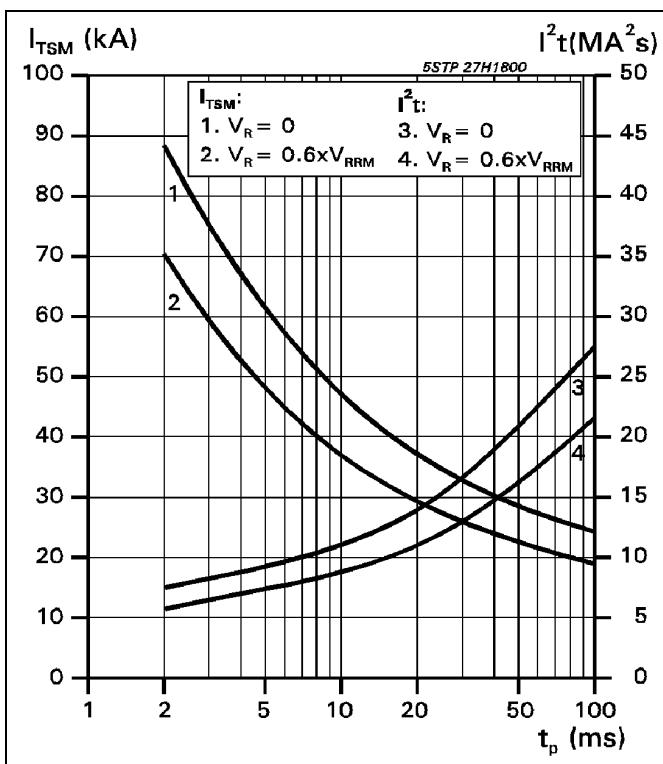
Fig. 3 On state characteristics.



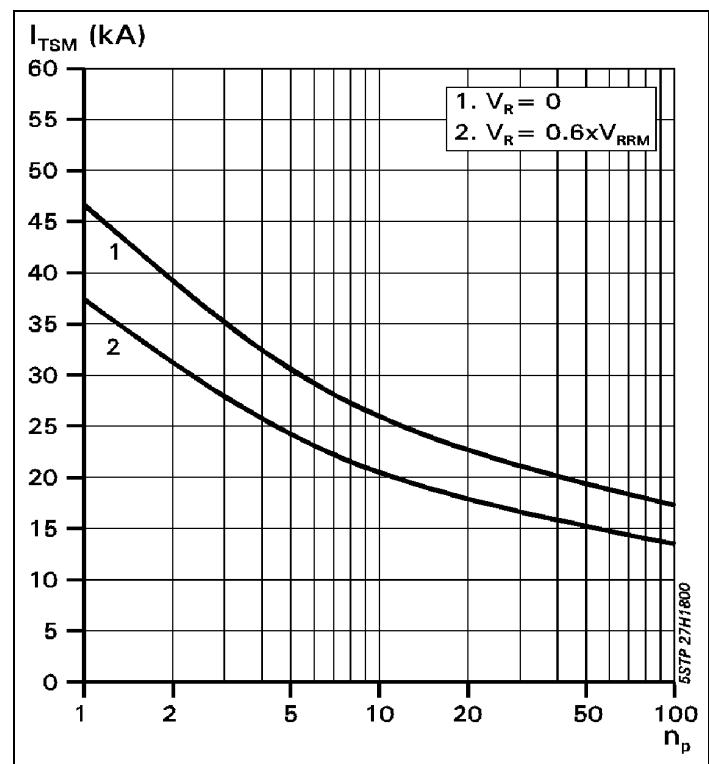
**Fig. 4** On-state power dissipation vs. mean on-state current. Turn-on losses excluded.



**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.

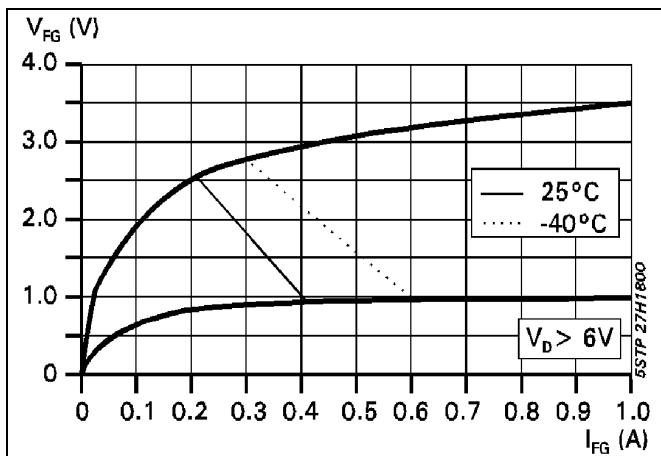


Fig. 8 Gate trigger characteristics.

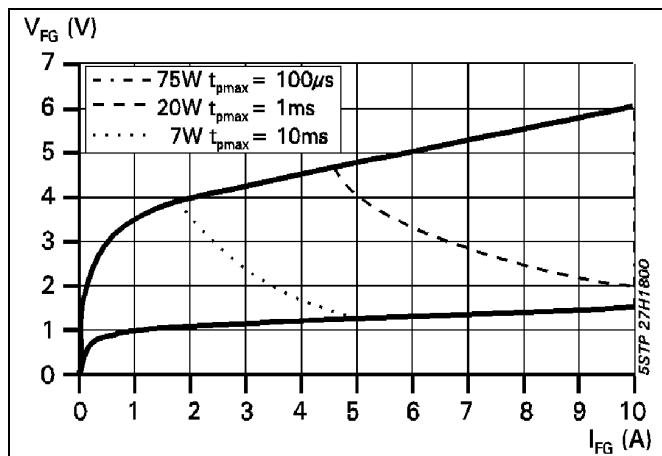


Fig. 9 Max. peak gate power loss.

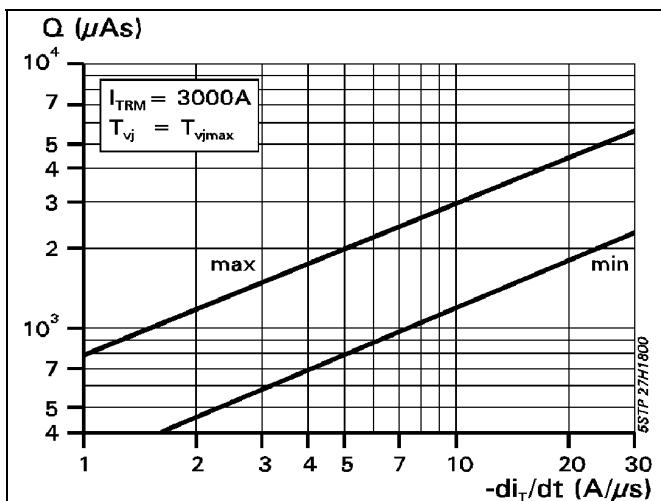


Fig. 10 Recovery charge vs. decay rate of on-state current.

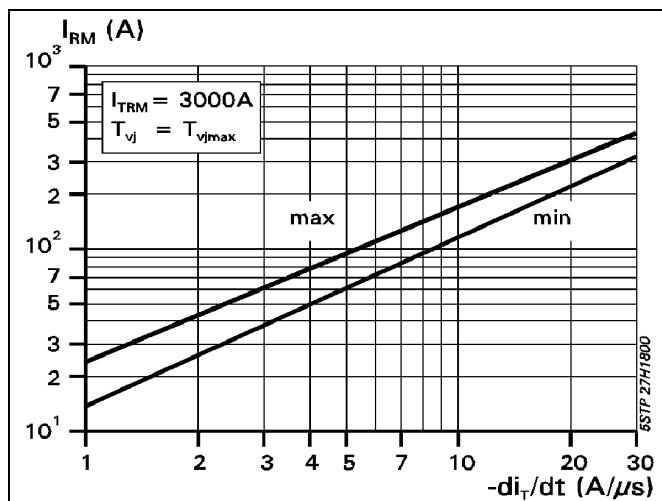


Fig. 11 Peak reverse recovery current vs. decay rate of on-state current.

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