



5STP 20F1601

Old part no. T 918-2010-16

Phase Control Thyristor

Properties

- High operational capability
- Possibility of serial and parallel connection

Applications

- Controlled rectifiers
- AC drives

Key Parameters

V_{DRM}, V_{RRM}	= 1 600	V
I_{TAVm}	= 1 901	A
I_{TSM}	= 27 300	A
V_{TO}	= 0.948	V
r_T	= 0.152	mΩ

Types

	V_{RRM}, V_{DRM}
5STP 20F1601	1 600 V
Conditions:	$T_j = -40 \div 125 \text{ }^\circ\text{C}$, half sine waveform, $f = 50 \text{ Hz}$

Mechanical Data

F_m	Mounting force	22 ± 2 kN
m	Weight	0.48 kg
D_s	Surface creepage distance	25 mm
D_a	Air strike distance	13 mm

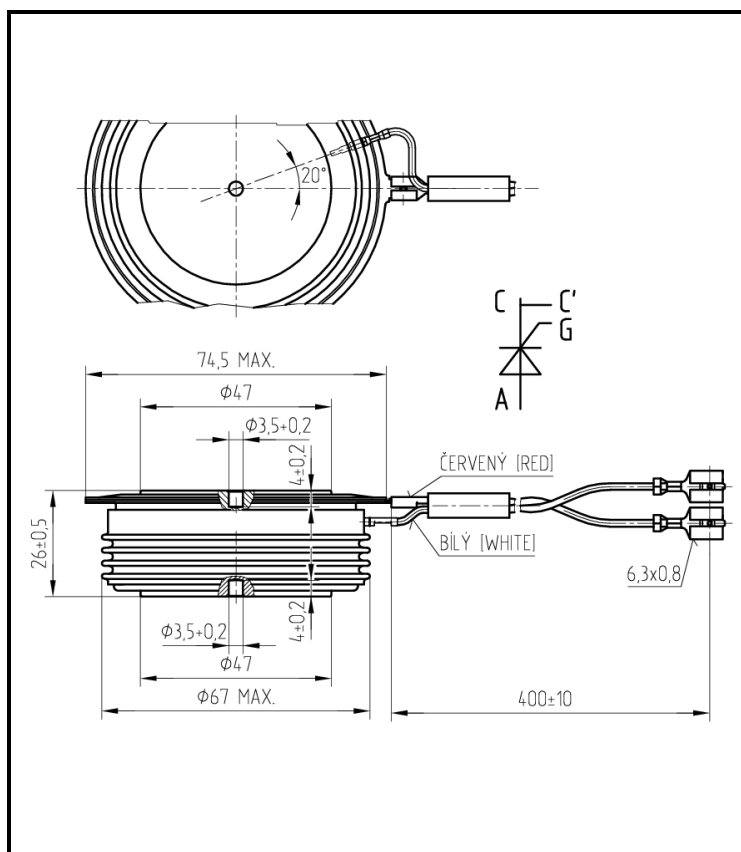


Fig. 1 Case



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Maximum Ratings		Maximum Limits	Unit
V_{RRM} V_{DRM}	Repetitive peak reverse and off-state voltage $T_j = -40 \div 125 \text{ }^\circ\text{C}$	1 600	V
I_{TRMS}	RMS on-state current $T_c = 70 \text{ }^\circ\text{C}$, half sine waveform, $f = 50 \text{ Hz}$	2 987	A
I_{TAVm}	Average on-state current $T_c = 70 \text{ }^\circ\text{C}$, half sine waveform, $f = 50 \text{ Hz}$	1 901	A
I_{TSM}	Peak non-repetitive surge half sine pulse, $V_R = 0 \text{ V}$	$t_p = 10 \text{ ms}$ 27 300 $t_p = 8.3 \text{ ms}$ 29 200	A
$I^2 t$	Limiting load integral half sine pulse, $V_R = 0 \text{ V}$	$t_p = 10 \text{ ms}$ 3 730 000 $t_p = 8.3 \text{ ms}$ 3 540 000	A²s
$(di_T/dt)_{cr}$	Critical rate of rise of on-state current $I_T = I_{TAVm}$, half sine waveform, $f = 50 \text{ Hz}$, $V_D = 2/3 V_{DRM}$, $t_r = 0.3 \text{ } \mu\text{s}$, $I_{GT} = 2 \text{ A}$	200	A/μs
$(dv_D/dt)_{cr}$	Critical rate of rise of off-state voltage $V_D = 2/3 V_{DRM}$	1 000	V/μs
P_{GAVm}	Maximum average gate power losses	3	W
I_{FGM}	Peak gate current	10	A
V_{FGM}	Peak gate voltage	12	V
V_{RGM}	Reverse peak gate voltage	10	V
$T_{jmin} - T_{jmax}$	Operating temperature range	-40 \div 125	$^\circ\text{C}$
T_{stgmin} - T_{stgmax}	Storage temperature range	-40 \div 125	$^\circ\text{C}$

Unless otherwise specified $T_j = 125 \text{ }^\circ\text{C}$

Characteristics		Value			Unit
		min.	typ.	max.	
V_{TM}	Maximum peak on-state voltage $I_{TM} = 2\ 000\ A$			1.250	V
V_{TO}	Threshold voltage			0.948	V
r_T	Slope resistance $I_{T1} = 2\ 380\ A, I_{T2} = 7\ 139\ A$			0.152	mΩ
I_{DM}	Peak off-state current $V_D = V_{DRM}$			150	mA
I_{RM}	Peak reverse current $V_R = V_{RRM}$			150	mA
t_{gd}	Delay time $T_j = 25\ ^\circ C, V_D = 0.4\ V_{DRM}, I_{TM} = I_{TAVM},$ $t_r = 0.3\ \mu s, I_{GT} = 2\ A$			2	μs
t_q	Turn-off time $I_T = 2\ 000\ A, di_T/dt = 12.5\ A/\mu s,$ $V_D = 2/3\ V_{DRM}, dv_D/dt = 50\ V/\mu s$		150		μs
Q_{rr}	Recovery charge <i>the same conditions as at t_q</i>		2 200		μC
I_H	Holding current	$T_j = 25\ ^\circ C$ $T_j = 125\ ^\circ C$		170 90	mA
I_L	Latching current	$T_j = 25\ ^\circ C$ $T_j = 125\ ^\circ C$		450 350	mA
V_{GT}	Gate trigger voltage $V_D = 12\ V, I_T = 4\ A$	$T_j = -40\ ^\circ C$ $T_j = 25\ ^\circ C$ $T_j = 125\ ^\circ C$	0.25	4 3 2	V
I_{GT}	Gate trigger current $V_D = 12\ V, I_T = 4\ A$	$T_j = -40\ ^\circ C$ $T_j = 25\ ^\circ C$ $T_j = 125\ ^\circ C$	10	500 250 150	mA

Unless otherwise specified $T_j = 125\ ^\circ C$

Thermal Parameters		Value	Unit
R_{thjc}	Thermal resistance junction to case <i>double side cooling</i>	16.0	K/kW
	<i>anode side cooling</i>	25.0	
	<i>cathode side cooling</i>	45.0	
R_{thch}	Thermal resistance case to heatsink <i>double side cooling</i>	4.0	K/kW
	<i>single side cooling</i>	8.0	

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Transient Thermal Impedance

Analytical function for transient thermal impedance

$$Z_{thjc} = \sum_{i=1}^4 R_i (1 - \exp(-t / \tau_i))$$

Conditions:

$F_m = 22 \pm 2$ kN, Double side cooled

Correction for periodic waveforms

180° sine:	add 1.3 K/kW
180° rectangular:	add 1.8 K/kW
120° rectangular:	add 3.0 K/kW
60° rectangular:	add 5.1 K/kW

i	1	2	3	4
τ_i (s)	0.4653	0.1533	0.0375	0.0034
R_i (K/k)	5.50	7.24	2.00	1.34

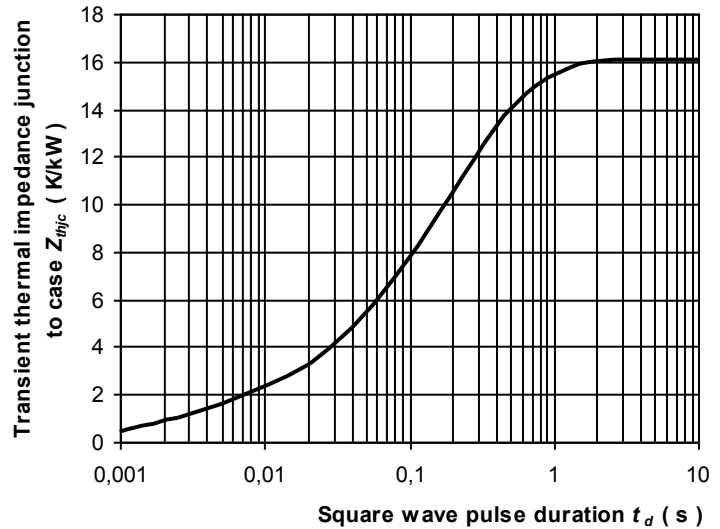


Fig. 2 Dependence transient thermal impedance junction to case on square pulse

On-State Characteristics

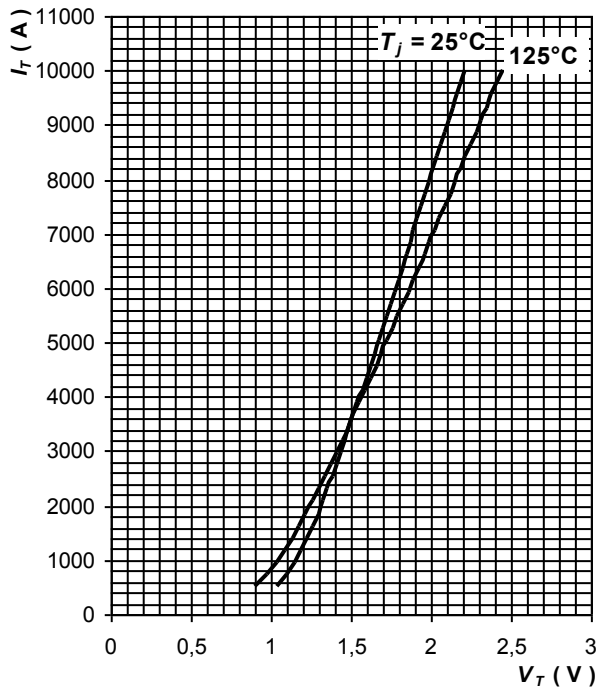


Fig. 3 Maximum on-state characteristics

Gate Trigger Characteristics

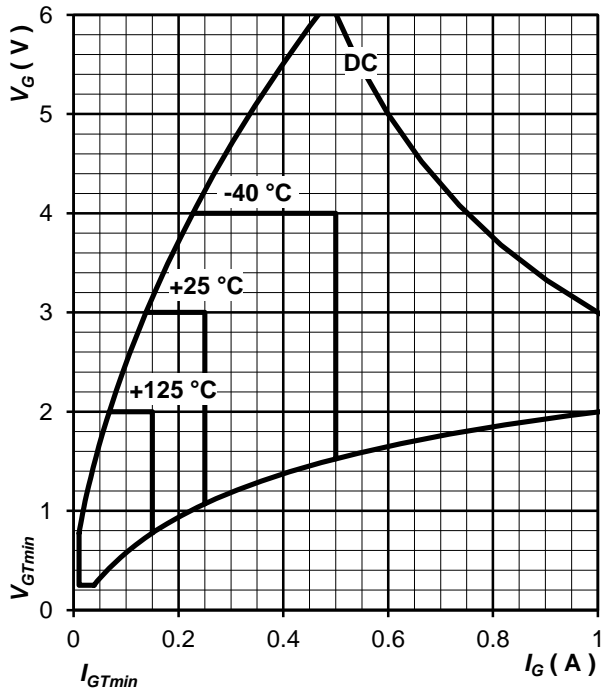


Fig. 4 Gate trigger characteristics

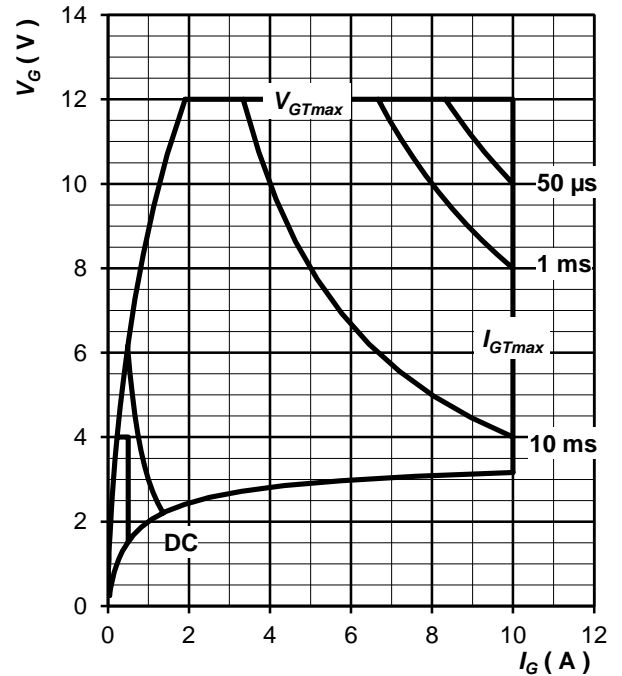


Fig. 5 Maximum peak gate power loss

Surge Characteristics

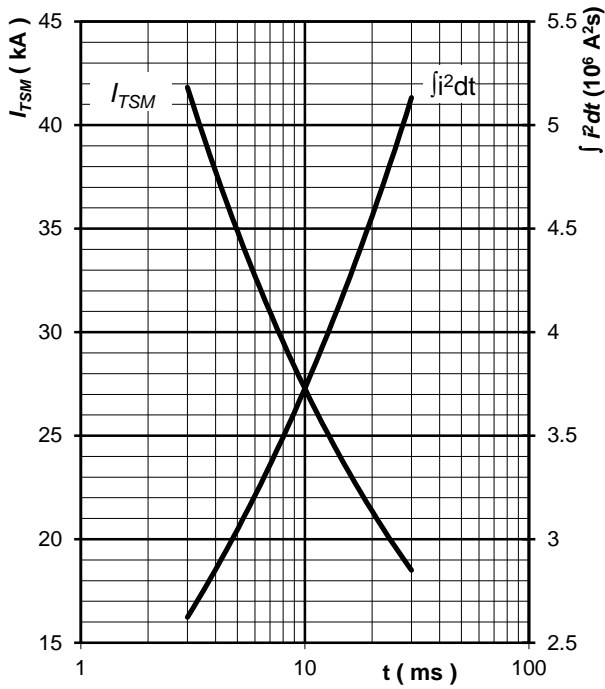


Fig. 6 Surge on-state current vs. pulse length, half sine wave, single pulse, $V_R = 0 V$, $T_j = T_{jmax}$

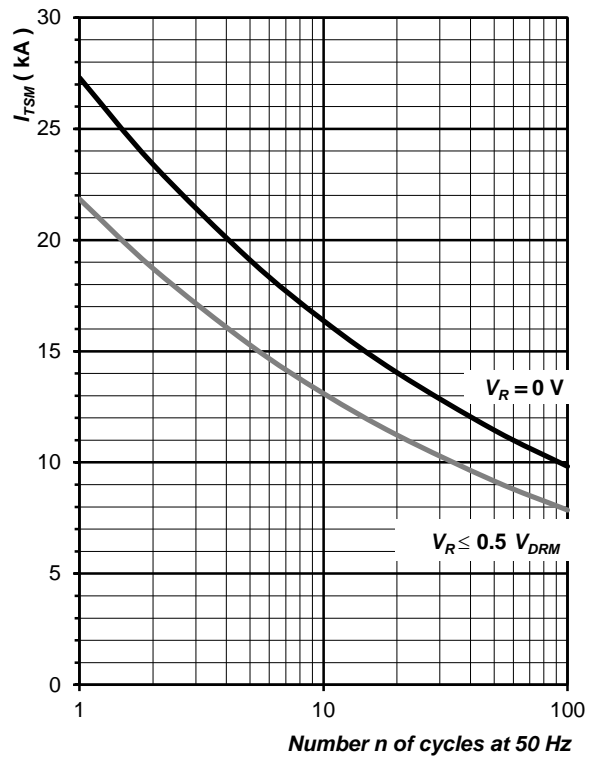


Fig. 7 Surge on-state current vs. number of pulses, half sine wave, $T_j = T_{jmax}$

Power Loss and Maximum Case Temperature Characteristics

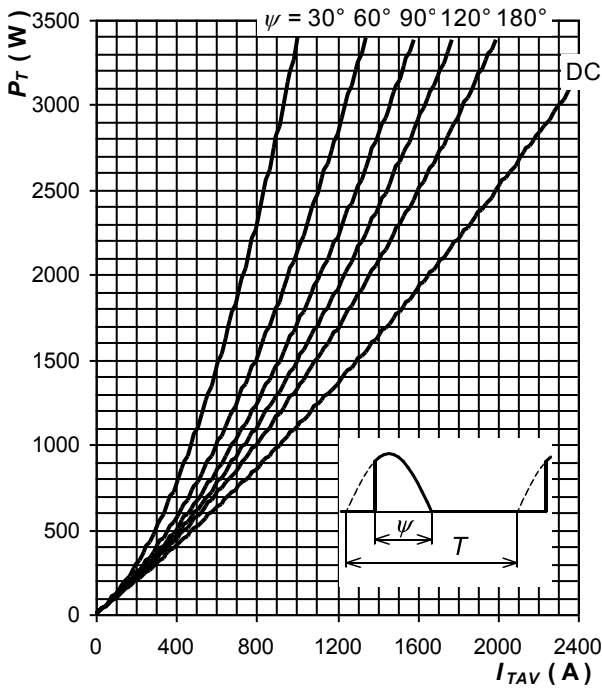


Fig. 8 On-state power loss vs. average on-state current, sine waveform, $f = 50 \text{ Hz}$, $T = 1/f$

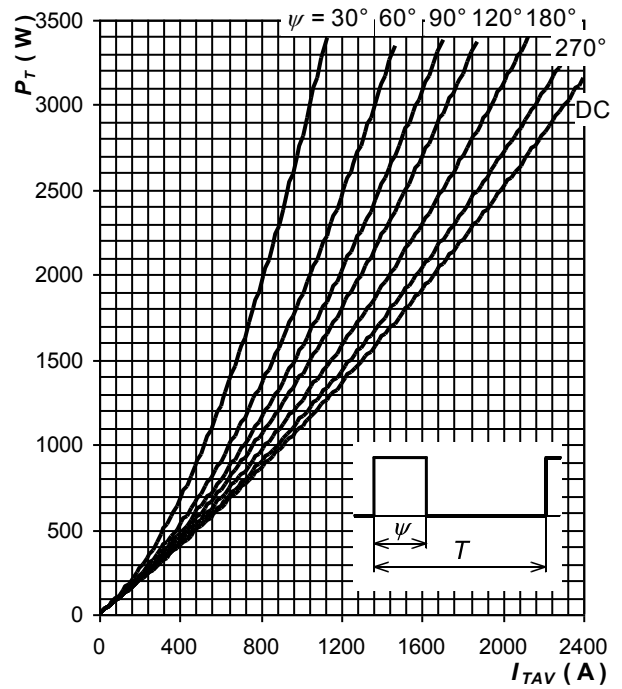


Fig. 9 On-state power loss vs. average on-state current, square waveform, $f = 50 \text{ Hz}$, $T = 1/f$

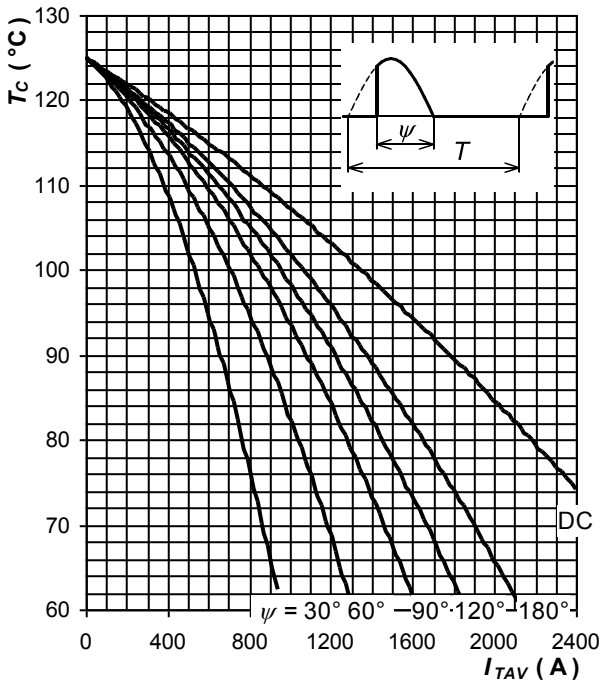


Fig. 10 Max. case temperature vs. aver. on-state current, sine waveform, $f = 50 \text{ Hz}$, $T = 1/f$

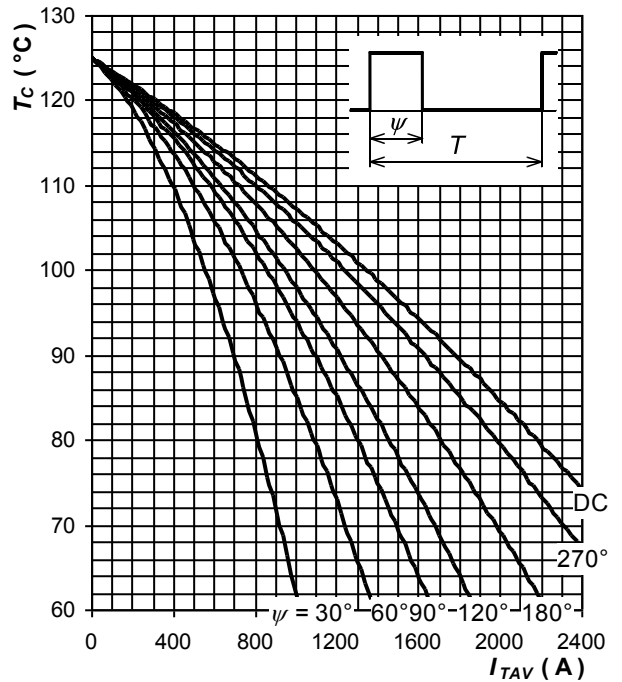


Fig. 11 Max. case temperature vs. aver. on-state current, square waveform, $f = 50 \text{ Hz}$, $T = 1/f$

Note 2: Figures number 8 ÷ 11 have been calculated without considering any turn-on and turn-off losses.

They are valid for $f = 50$ or 60 Hz operation.

Notes: