5STP 21H4200

Old part no. TV 989-2100-42

Phase Control Thyristor

Properties

- High operational capability
- Possibility of serial and parallel connection

Applications

- Controlled rectifiers
- AC drives

Key Parameters

V_{DRM}, V_{RRM}	=	4 200	V
I_{TAVm}	=	2 192	A
I_{TSM}	=	32 000	A
V_{TO}	=	1.249	V
r_T	=	0.191	mΩ

Types

	V_{RRM}, V_{DRM}
5STP 21H4200	**4 200 V**
5STP 21H3600	**3 600 V**
Conditions:	*T_j = -40 ÷ 125 °C, half sine waveform, f = 50 Hz, note 1*

Mechanical Data

F_m	**Mounting force**	50 ± 5 kN
m	**Weight**	0.93 kg
D_S	**Surface creepage distance**	36 mm
D_a	**Air strike distance**	15 mm

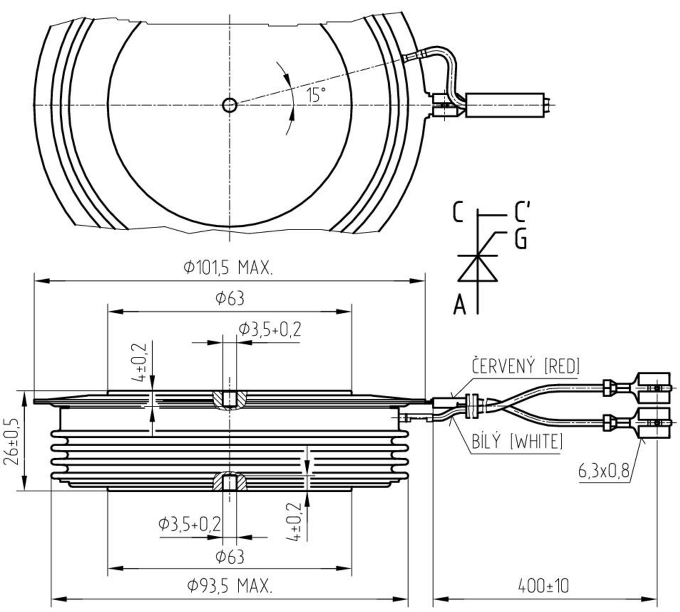

Fig. 1 Case

Maximum Ratings			Maximum Limits	Unit
V_{RRM} V_{DRM}	**Repetitive peak reverse and off-state voltage** *T_j = -40 ÷ 125 °C, note 1*	5STP 21H4200 5STP 21H3600	4 200 3 600	V
V_{RSM} V_{DSM}	**Non-repetitive peak reverse and off-state voltage** *T_j = 25 ÷ 125 °C*	5STP 21H4200 5STP 21H3600	4 300 3 700	V
I_{TRMS}	**RMS on-state current** *T_c = 70 °C, half sine waveform, f = 50 Hz*		3 443	A
I_{TAVm}	**Average on-state current** *T_c = 70 °C, half sine waveform, f = 50 Hz*		2 192	A
I_{TSM}	**Peak non-repetitive surge** *half sine pulse, V_R = 0 V*	t_p = 10 ms t_p = 8.3 ms	32 000 34 200	A
I^2t	**Limiting load integral** *half sine pulse, V_R = 0 V*	t_p = 10 ms t_p = 8.3 ms	5 120 000 4 850 000	A^2s
$(di_T/dt)_{cr}$	**Critical rate of rise of on-state current** *I_T = I_{TAVm}, half sine waveform, f = 50 Hz,* *V_D = 2/3 V_{DRM}, t_r = 0.3 µs, I_{GT} = 2 A*		150	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**		5	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 ÷ 125	°C
T_{stgmin} - T_{stgmax}	**Storage temperature range**		-40 ÷ 125	°C

Unless otherwise specified T_j = 125 °C
Note 1: De-rating factor of 0.13% V_{RRM} or V_{DRM} per °C is applicable for T_j below 25 °C

Characteristics			*Value*			*Unit*
			min.	*typ.*	*max.*	
V_{TM}	**Maximum peak on-state voltage** I_{TM} = 4 000 A				**2.030**	**V**
V_{T0} r_T	**Threshold voltage** **Slope resistance** I_{T1} = 3 299 A, I_{T2} = 9 896 A				**1.249** **0.191**	**V** **mΩ**
I_{DM}	**Peak off-state current** $V_D = V_{DRM}$				**200**	**mA**
I_{RM}	**Peak reverse current** $V_R = V_{RRM}$				**200**	**mA**
t_{gd}	**Delay time** T_j = 25 °C, V_D = 0.4 V_{DRM}, $I_{TM} = I_{TAVm}$, t_r = 0.3 µs, I_{GT} = 2 A				**3**	**µs**
t_q	**Turn-off time** I_T = 2 000 A, di_T/dt = 12.5 A/µs, V_D = 2/3 V_{DRM}, dv_D/dt = 50 V/µs			**700**		**µs**
Q_{rr}	**Recovery charge** *the same conditions as at* t_q			**3 400**		**µC**
I_H	**Holding current**	T_j = 25 °C T_j = 125 °C		**170** **90**		**mA**
I_L	**Latching current**	T_j = 25 °C T_j = 125 °C		**1 500** **1 000**		**mA**
V_{GT}	**Gate trigger voltage** V_D = 12V, I_T = 4 A	T_j = - 40 °C T_j = 25 °C T_j = 125 °C	 **0.25**		**4** **3** **2**	**V**
I_{GT}	**Gate trigger current** V_D = 12V, I_T = 4 A	T_j = - 40 °C T_j = 25 °C T_j = 125 °C	 **10**		**500** **300** **200**	**mA**

Unless otherwise specified T_j *= 125 °C*

Thermal Parameters		*Value*	*Unit*
R_{thjc}	**Thermal resistance junction to case** *double side cooling*	**10.0**	**K/kW**
	anode side cooling	**16.0**	
	cathode side cooling	**26.5**	
R_{thch}	**Thermal resistance case to heatsink** *double side cooling*	**3.0**	**K/kW**
	single side cooling	**6.0**	

Transient Thermal Impedance

Analytical function for transient thermal impedance

$$Z_{thjc} = \sum_{i=1}^{5} R_i (1 - \exp(-t/\tau_i))$$

Conditions:

F_m = 50 ± 5 kN, Double side cooled

Correction for periodic waveforms

180°	**sine:**	**add 1.0 K/kW**
180°	**rectangular:**	**add 1.0 K/kW**
120°	**rectangular:**	**add 1.5 K/kW**
60°	**rectangular:**	**add 3.0 K/kW**

i	1	2	3	4	5
τ_i (s)	**0.4871**	**0.1468**	**0.0677**	**0.0079**	**0.0021**
R_i(K/kW)	**6.73**	**1.44**	**0.65**	**0.84**	**0.32**

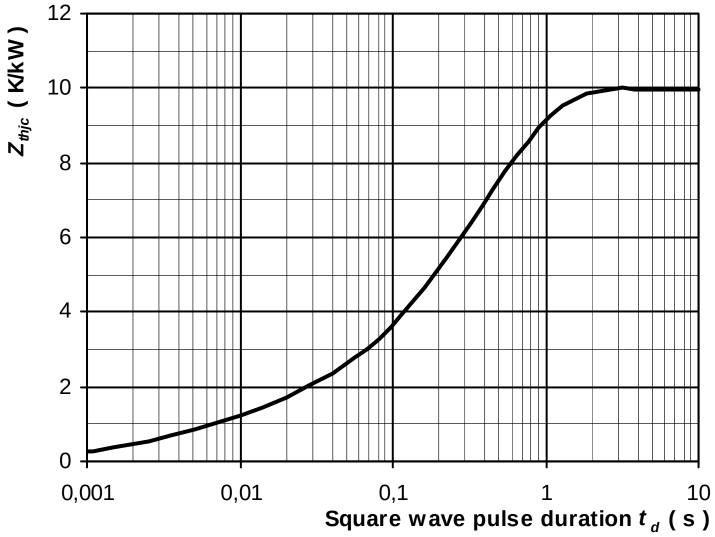

Fig. 2 Dependence transient thermal impedance junction to case on square pulse

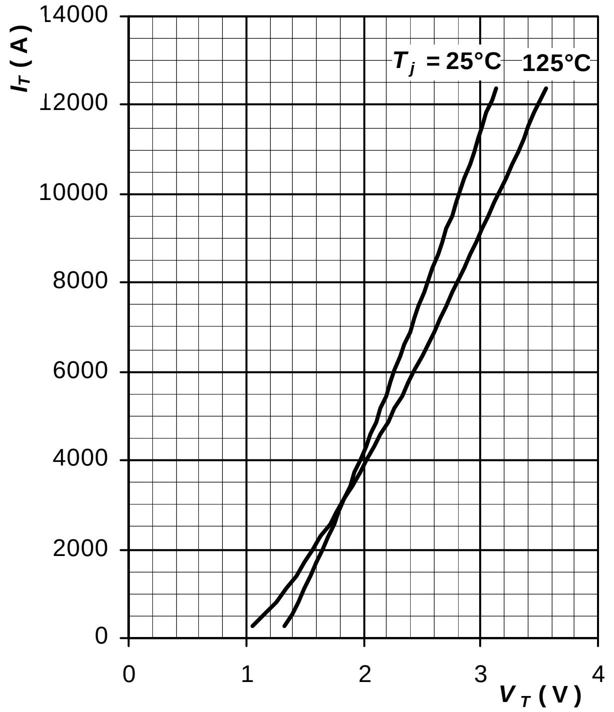

Fig. 3 Maximum on-state characteristics

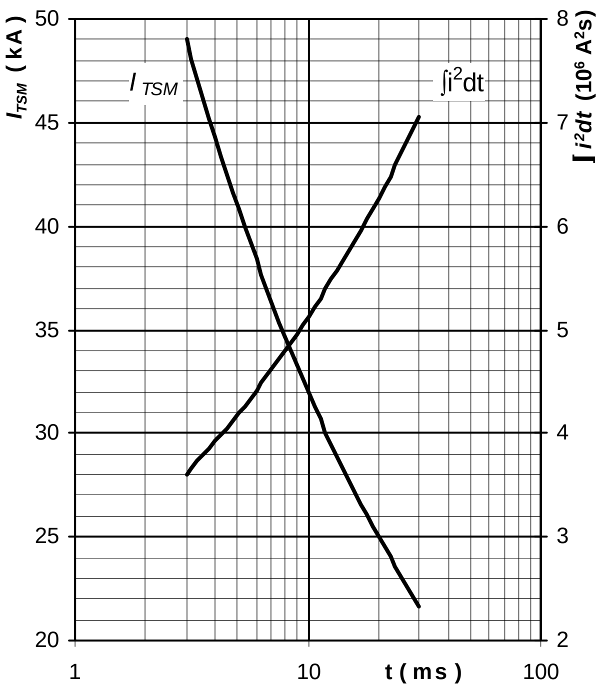

Fig. 4 Surge on-state current vs. pulse length, half sine wave, single pulse, V_R = 0 V, $T_j = T_{jmax}$

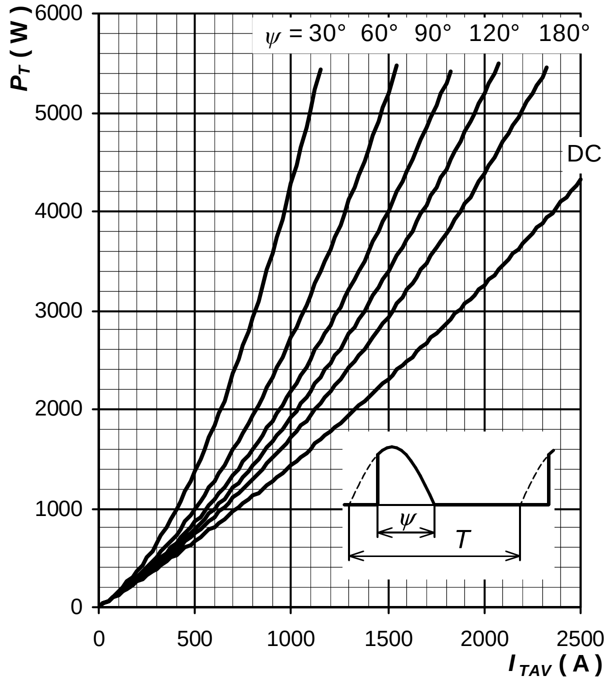

Fig. 5 On-state power loss vs. average on-state current, sine waveform, f = 50 Hz, T = 1/f

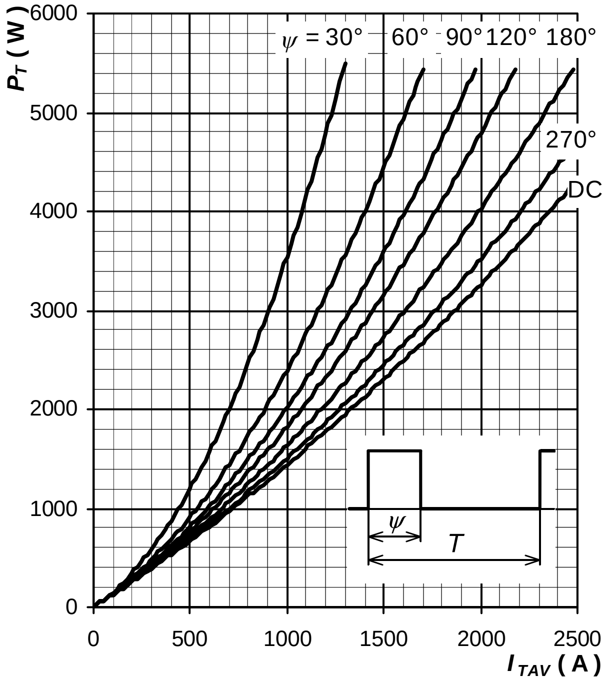

Fig. 6 On-state power loss vs. average on-state current, square waveform, f = 50 Hz, T = 1/f

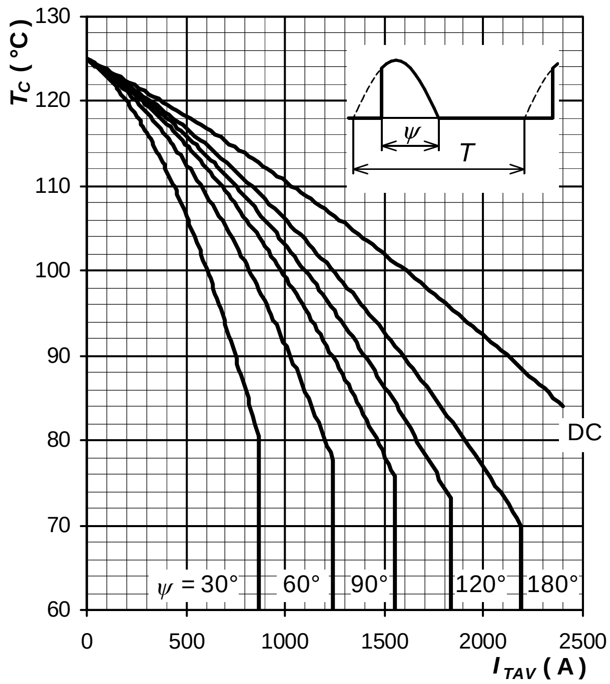

Fig. 7 Max. case temperature vs. aver. on-state current, sine waveform, f = 50 Hz, T = 1/f

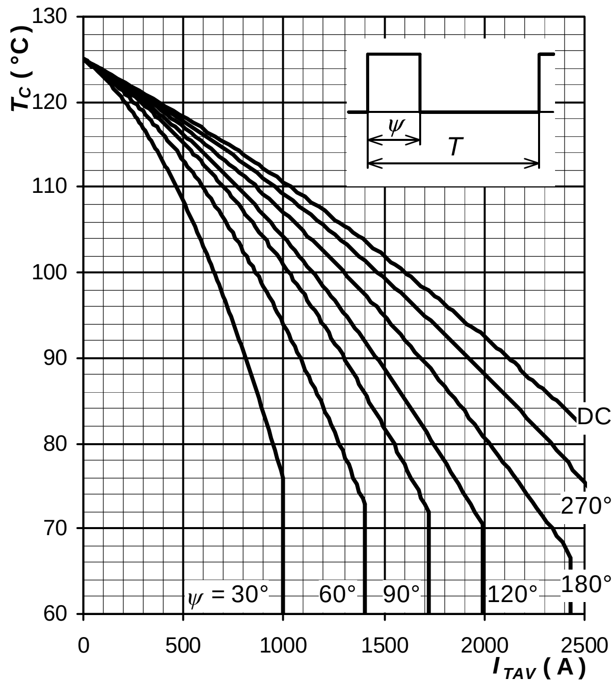

Fig. 8 Max. case temperature vs. aver. on-state current, square waveform, f = 50 Hz, T = 1/f

Notes: