PRELIMINARY DATASHEET JUNE 2021

5SEG 0540T1820

Phase control thyristor / rectifier diode module

- Insulated baseplate by AIN ceramic
- Precision pressure contacts for high reliability
- Industry standard housing

Applications

- Controlled line frequency bridge arm
- AC motor soft starters
- DC motor drives

Key parameters

- V_{DRM}, V_{RRM} = 1800 V
- I_{TAVm} = 542 A
- I_{TSM} = 14 000 A
- V_{TO} = 0.845 V
- r_T = 0.380 mΩ

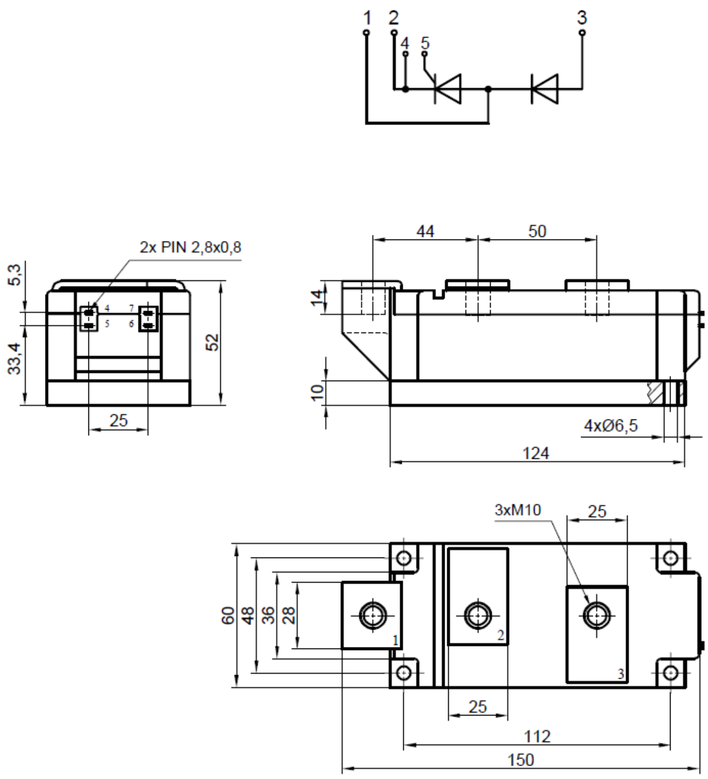
Types

	V_{RRM}
5SEG 0540T1820	1 800 V
Conditions	T_j = -40 ÷ 135 °C, half sine waveform, f = 50 Hz, note 1

Mechanical data

M_s	Mounting torque (base - heatsink)	6 ± 15 %	Nm
M_t	Mounting torque (main terminals)	12 ± 15 %	Nm
m	Weight	1.4	kg
a	Acceleration resistance	50	m/s^2
	UL recognized, file no.	E500543	

Fig. 1 Case



HITACHI ABB POWER GRIDS

Maximum ratings			Maximum limits	Unit
V_{DRM}, V_{RRM}	**Repetitive peak reverse and off-state voltage** T_j = -40 ÷ 135 °C, note 1		**1800**	V
I_{DM}	**Peak off-state current**	$V_D = V_{DRM}$	**100**	mA
I_{RM}	**Peak reverse current**	$V_R = V_{RRM}$	**100**	mA
I_{TAVm}	**Average on-state current** half sine waveform, f = 50 Hz	T_c = 70 °C	**654**	A
		T_c = 85 °C	**542**	
		T_c = 100 °C	**416**	
I_{TRMS}	**RMS on-state current** half sine waveform, f = 50 Hz	T_c = 70 °C	**1028**	A
		T_c = 85 °C	**852**	
		T_c = 100 °C	**654**	
I_{TSM}	**Non repetitive peak surge current** half sine pulse, $V_D = V_R$ = 0 V	t_p = 8.3 ms	**15,000**	A
		t_p = 10 ms	**14,000**	
I^2t	**Limiting load integral** half sine pulse, $V_D = V_R$ = 0 V	t_p = 8.3 ms	**928,000**	A^2s
		t_p = 10 ms	**980,000**	
$(di_T/dt)_{cr}$	**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		**200**	A/µs
$(dv_D/dt)_{cr}$	**Critical rate of rise of off-state voltage** V_D = 2/3 V_{DRM}		**1000**	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 ÷ 135**	°C
T_{STG}	**Storage temperature range**		**-40 ÷ 125**	

Unless otherwise specified Tj = 135 °C
Note 1: De-rating factor of 0.13% VRRM or VDRM per °C is applicable for Tj below 25 °C

Insulation characteristics		Value			Unit
		min	typ	max	
V_{ISOL}	**Isolation voltage** (base – terminals) RMS, sine waveform, f = 50 Hz, T_j = 25 °C, t = 1 min			**3600**	V

On-state characteristics			Value			Unit
			min	typ	max	
V_{T0}	**Threshold voltage**				**0.845**	V
r_T	**Slope resistance** I_{T1} = 848 A, I_{T2} = 2545 A				**0.380**	mΩ
V_{TM}	**Maximum peak on-state voltage**	I_{TM} = 1 000 A			**1.230**	V
		I_{TM} = 1 500 A			**1.440**	

Unless otherwise specified Tj = 135 °C

Characteristics			Value			Unit
			min	typ	max	
t_{gd}	**Delay time** T_i = 25 °C, V_D = 0.4 V_{DRM}, I_{TM} = I_{TAVm}, t_r = 0.3 µs, I_{GT} = 2 A				**2.0**	µs
t_q	**Turn-off time** I_T = 1 000 A, di_T/dt = -10 A/µs, V_R = 100 V, V_D = 2/3 V_{DRM}, dv_D/dt = 50 V/µs			**250**		µs
Q_{rr}	**Recovered charge** the same conditions as at t_q			**2000**		µC
I_{rrM}	**Reverse recovery maximum current** the same conditions as at t_q			**160**		A
I_H	**Holding current**	T_j = 25 °C		**150**		mA
		T_j = 135 °C		**100**		
I_L	**Latching current**	T_j = 25 °C		**400**		mA
		T_j = 135 °C		**350**		
V_{GT}	**Gate trigger voltage** V_D = 12V, I_T = 4 A	T_j = -40 °C			**4**	V
		T_j = 25 °C			**3**	
		T_j = 135 °C	**0.25**		**2**	
I_{GT}	**Gate trigger current** V_D = 12V, I_T = 4 A	T_j = -40 °C			**1000**	mA
		T_j = 25 °C			**500**	
		T_j = 135 °C	**10**		**300**	

Unless otherwise specified Tj = 135 °C

Thermal parameters			Value	Unit
R_{thjc}	**Thermal resistance junction to case**	per arm	**65.0**	K/kW
		per module	**32.5**	
R_{thch}	**Thermal resistance case to heatsink**	per arm	**20.0**	K/kW
		per module	**10.0**	

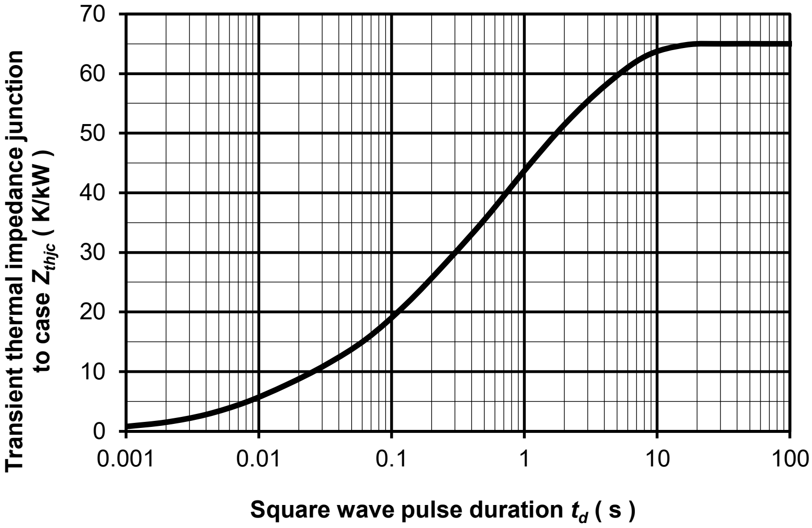
Transient thermal impedance

Analytical function for transient thermal impedance

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

i	1	2	3	4
τ_i (s)	3.40	0.60	0.10	0.01
R_i(K/kW)	23.00	22.00	13.70	6.30

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



Correction for periodic waveforms

180°	sine	3.0	K/kW
120°	sine	4.7	K/kW
60°	sine	7.0	K/kW
180°	rectangular	4.8	K/kW
120°	rectangular	7.4	K/kW
60°	rectangular	12.0	K/kW

On-state and surge characteristics

Fig. 3 Maximum on-state characteristics

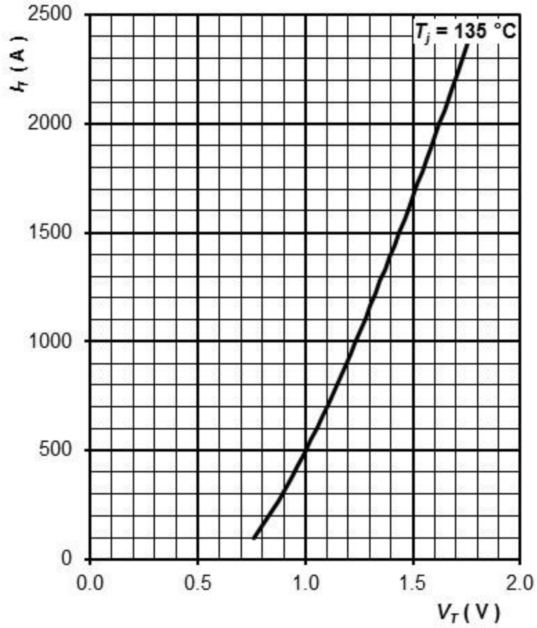
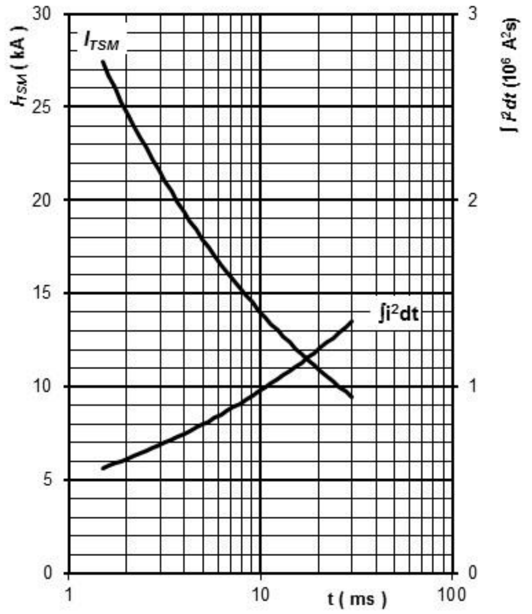


Fig. 4 Surge on-state current vs. pulse length, half sine wave, single pulse, $V_D = V_R = 0$ V, $T_j = T_j$max



Gate trigger characteristics

Fig. 5 Gate trigger characteristics

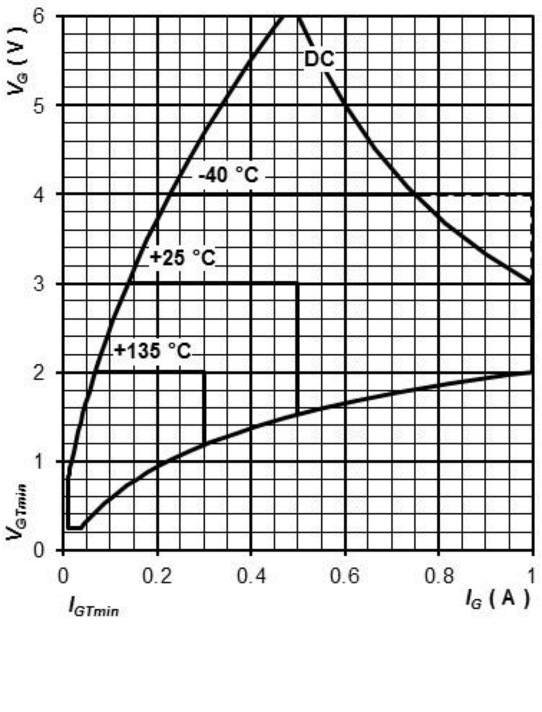
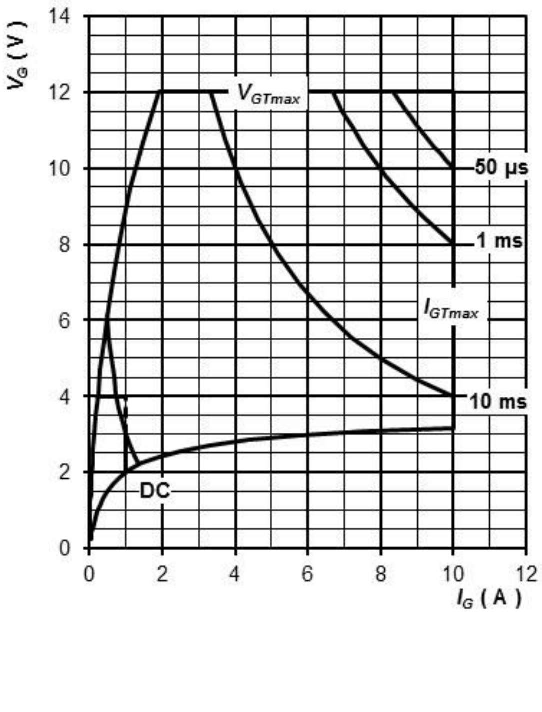


Fig. 6 Maximum peak gate power loss



Power loss and maximum case temperature characteristics per arm

Fig. 7 On-state power loss vs. average on-state current,
sine waveform, f = 50 Hz, T = 1/f

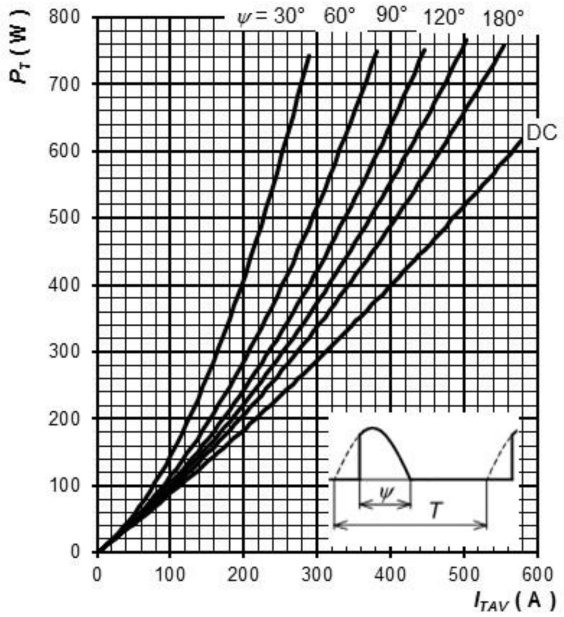


Fig. 8 On-state power loss vs. average on-state current,
square waveform, f = 50 Hz, T = 1/f

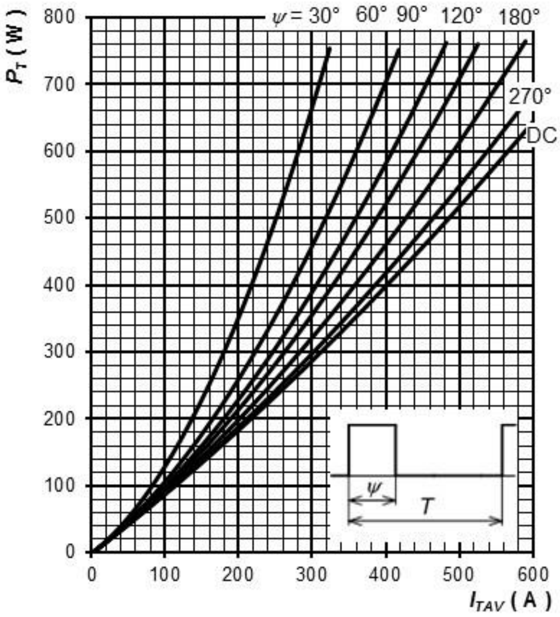


Fig. 9 Max. case temperature vs. aver. on-state current,
sine waveform, f = 50 Hz, T = 1/f

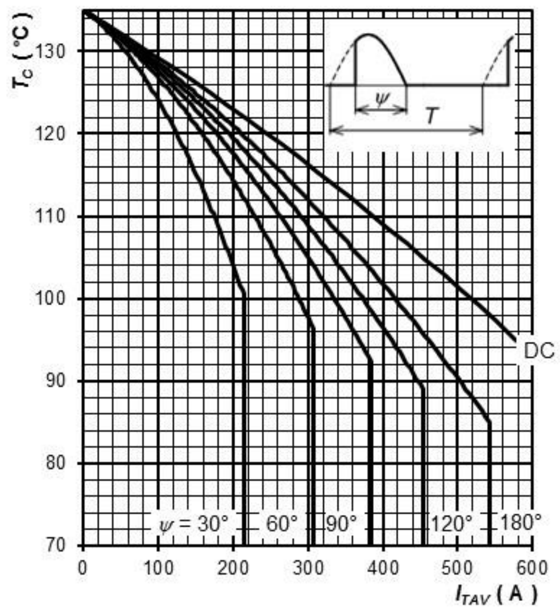
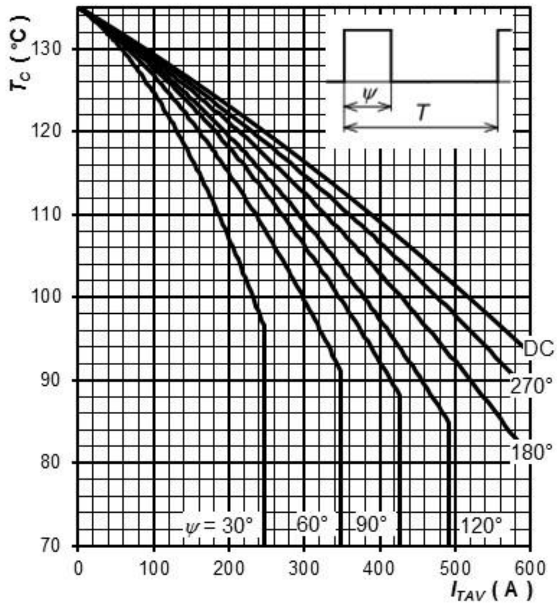


Fig. 10 Max. case temperature vs. aver. on-state current,
square waveform, f = 50 Hz, T = 1/f



Note 2: Figures number 7 ÷ 10 have been calculated without considering any turn-on and turn-off losses. They are valid for f = 50 or 60 Hz operation.

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