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Data sheet TS-MT/340/21 Jun 22

5SEE 0540T1830

60Pak rectifier diode / phase control thyristor module

- V_{DRM}, V_{RRM} = 1800 V
- I_{TAVm} = 522 A
- I_{TSM} = 14000 A
- V_{T0} = 0.867 V
- r_T = 0.420 mΩ
- Insulated baseplate by AIN ceramic
- Precision pressure contacts for high reliability
- Industry standard housing

Maximum rated values [1)]

Parameter	Symbol	Conditions		Min.	Max.	Unit
Repetitive peak off-state and reverse voltage	V_{DRM}, V_{RRM}	T_j = -40 ÷ 135 °C [2)]			1800	V
Peak off-state current	I_{DM}	$V_D = V_{DRM}$			100	mA
Peak reverse current	I_{RM}	$V_R = V_{RRM}$			100	mA
Average on-state current	I_{TAVm}	half sine waveform, f = 50 Hz	T_c = 70 °C		630	A
			T_c = 85 °C		522	A
			T_c = 100 °C		401	A
RMS on-state current	I_{TRMS}	half sine waveform, f = 50 Hz	T_c = 70 °C		989	A
			T_c = 85 °C		821	A
			T_c = 100 °C		631	A
Non repetitive peak surge current	I_{TSM}	half sine pulse, $V_D = V_R$ = 0 V	t_p = 8.3 ms		15000	A
			t_p = 10 ms		14000	A
Limiting load integral	I^2t	half sine pulse, $V_D = V_R$ = 0 V	t_p = 8.3 ms		928000	A^2s
			t_p = 10 ms		980000	A^2s
Critical rate of rise of on-state current	$(di_T/dt)_{cr}$	$I_T = I_{TAVm}$, half sine waveform, f = 50 Hz, V_D = 2/3 V_{DRM}, I_{GM} = 2 A, t_r = 0.3 µs			200	A/µs
Critical rate of rise of off-state voltage	$(dv_D/dt)_{cr}$	V_D = 2/3 V_{DRM}			1000	V/µs
Isolation voltage	V_{isol}	RMS (base – terminals), sine waveform, f = 50 Hz, T_j = 25 °C, t = 1 min			3600	V
Operating temperature range	T_{jmin} - T_{jmax}			-40	135	°C
Storage temperature range	T_{STG}			-40	125	°C

Unless otherwise specified T_j = 135 °C

[1)] Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747

[2)] De-rating factor of 0.13% V_{RRM} or V_{DRM} per °C is applicable for T_j below 25 °C

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Maximum rated values [1)]

Parameter	Symbol	Conditions	Min.	Max.	Unit
Maximum average gate power losses	P_{GAVm}			3	W
Peak gate current	I_{FGM}			10	A
Peak gate voltage	V_{FGM}			12	V
Reverse peak gate voltage	V_{RGM}			10	V

Unless otherwise specified T_j = 135 °C

[1)] Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747

Characteristic values

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Threshold voltage	V_{T0}					0.867	V
Slope resistance	r_T	I_{T1} = 848 A, I_{T2} = 2545 A				0.420	mΩ
Maximum peak on-state voltage	V_{TM}		I_{TM} = 1 000 A			1.290	V
			I_{TM} = 1 500 A			1.520	V
Holding current	I_H		T_j = 25 °C		120		mA
			T_j = 135 °C		100		mA
Latching current	I_L		T_j = 25 °C		700		mA
			T_j = 135 °C		400		mA
Gate trigger voltage	V_{GT}	V_D = 12V, I_T = 4 A	T_j = -40 °C			4	V
			T_j = 25 °C			3	V
			T_j = 135 °C	0.25		2	V
Gate trigger current	I_{GT}	V_D = 12V, I_T = 4 A	T_j = -40 °C			1000	mA
			T_j = 25 °C			500	mA
			T_j = 135 °C	10		300	mA
Delay time	t_{gd}	T_j = 25 °C, V_D = 0.4 V_{DRM}, I_{TM} = I_{TAVm}, I_{GM} = 2 A, t_r = 0.3 µs				2.0	µs
Turn-off time	t_q	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
Recovered charge	Q_{rr}	the same conditions as at t_q			2000		µC
Reverse recovery maximum current	I_{rrM}	the same conditions as at t_q			180		A

Unless otherwise specified T_j = 135 °C

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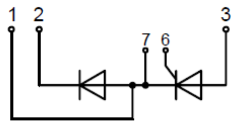
Mechanical properties

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dimensions	L x W x H	Typical		150 x 60 x 52		mm
Mass	m			1.4		kg
Acceleration resistance	a				50	m/s^2
Mounting torques	M_s	Mounting torque (base - heatsink), M6 screws	5	6	7	Nm
	M_t	Mounting torque (main terminals), M10 screws	10	12	14	Nm
UL recognized		file no. E500543				

Electrical configuration, mechanical drawing



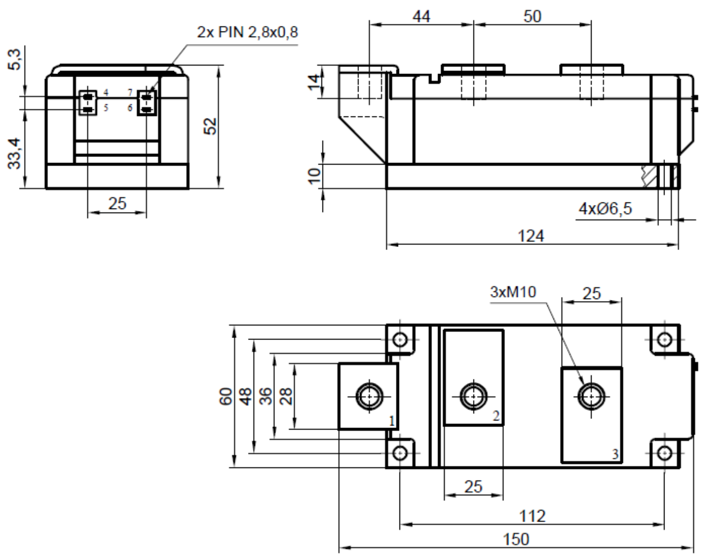


Fig. 1 Case

Note: all dimensions are shown in millimeters

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Thermal properties

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal resistance junction to case	R_{thjc}	per arm			65.0	K/kW
		per module			32.5	K/kW
Thermal resistance case to heatsink	R_{thch}	per arm			20.0	K/kW
		per module			10.0	K/kW

Analytical function for transient thermal impedance

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

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

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

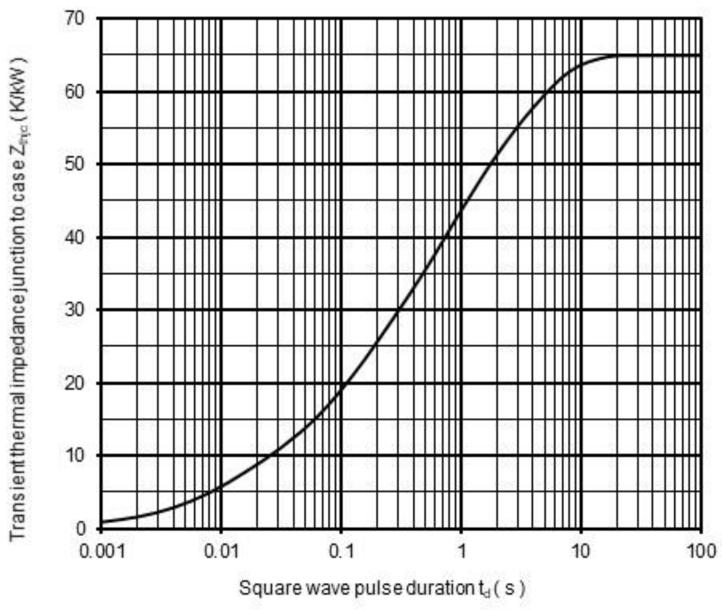

Fig. 2 Dependence transient thermal impedance junction to case on square pulse

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On-state and surge characteristics

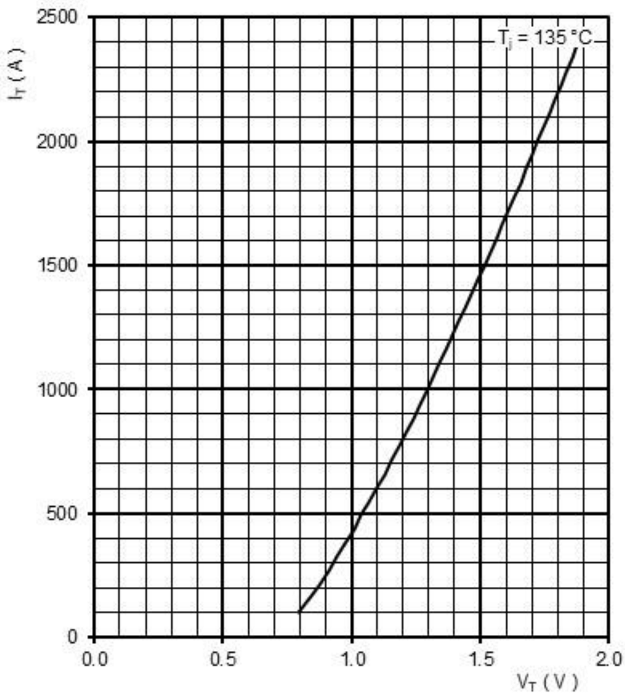

Fig. 3 Maximum on-state characteristics

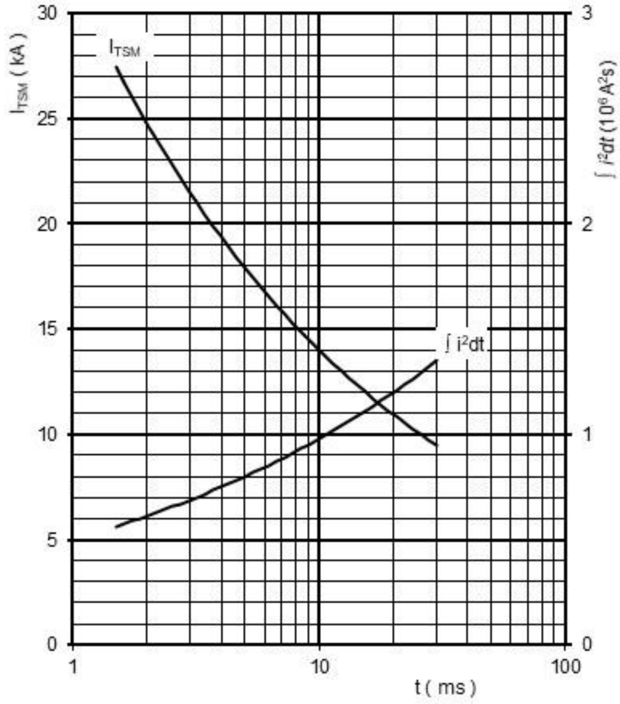

Fig. 4 Surge on-state current vs. pulse length, half sine wave, single pulse, $V_D = V_R = 0$ V, $T_j = T_{jmax}$

Gate trigger characteristics

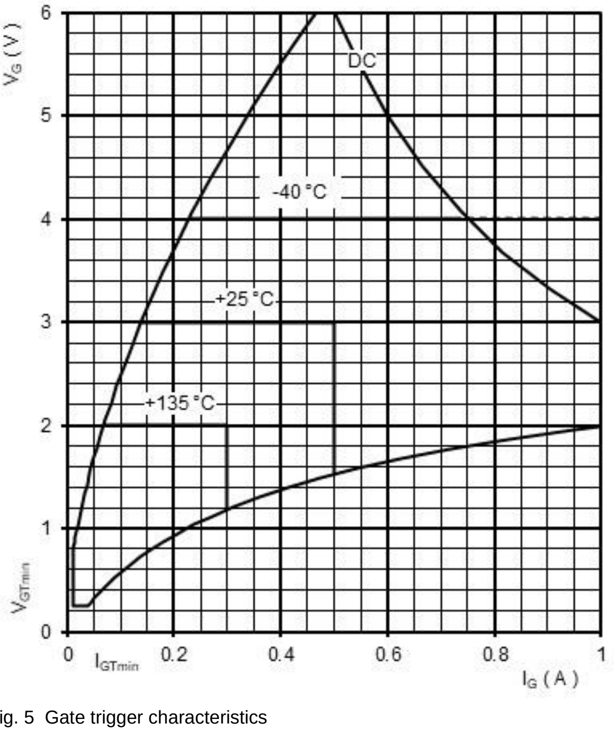

Fig. 5 Gate trigger characteristics

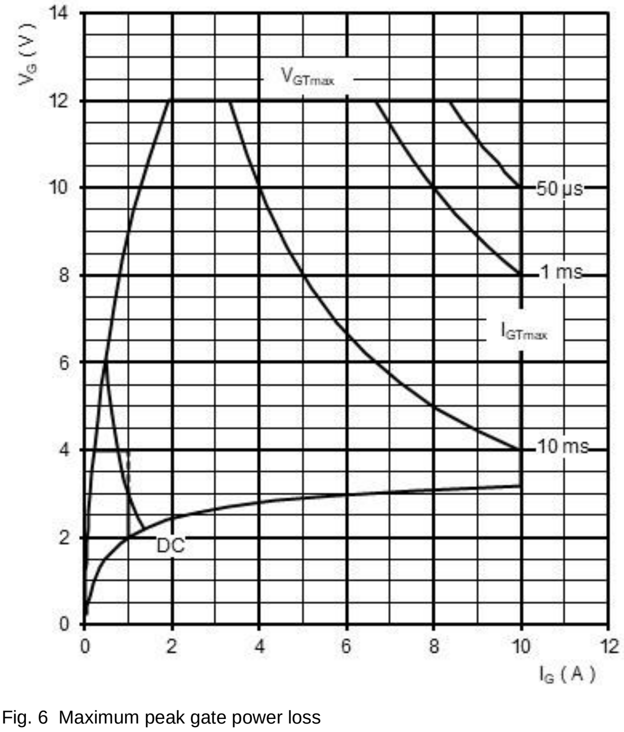

Fig. 6 Maximum peak gate power loss

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Power loss and maximum case temperature characteristics per arm

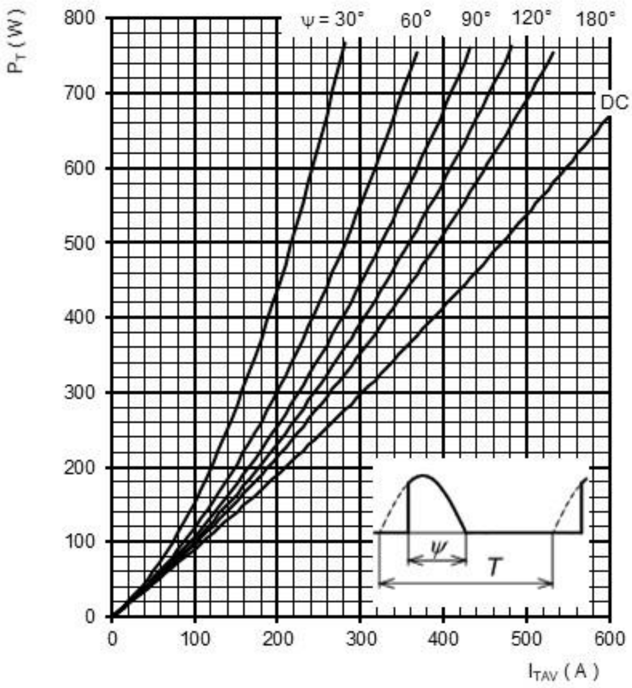

Fig. 7 On-state power loss vs. average on-state current,
sine waveform, f = 50 Hz, T = 1/f

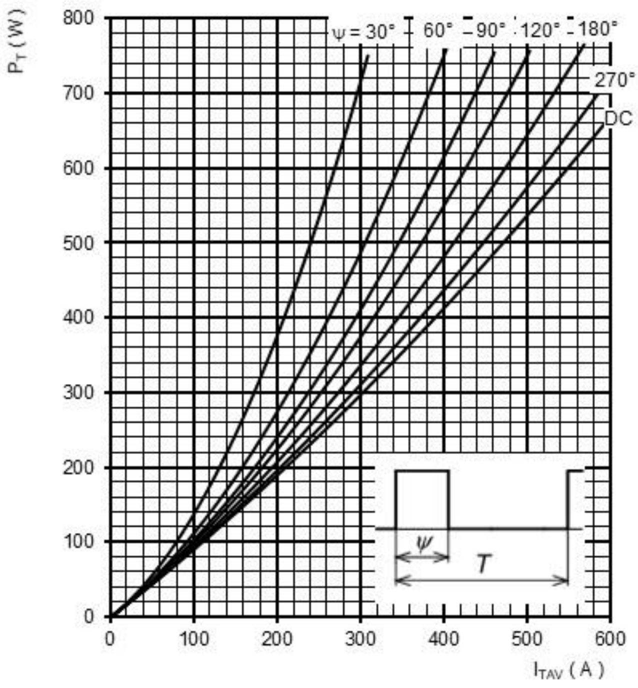

Fig. 8 On-state power loss vs. average on-state current,
square waveform, f = 50 Hz, T = 1/f

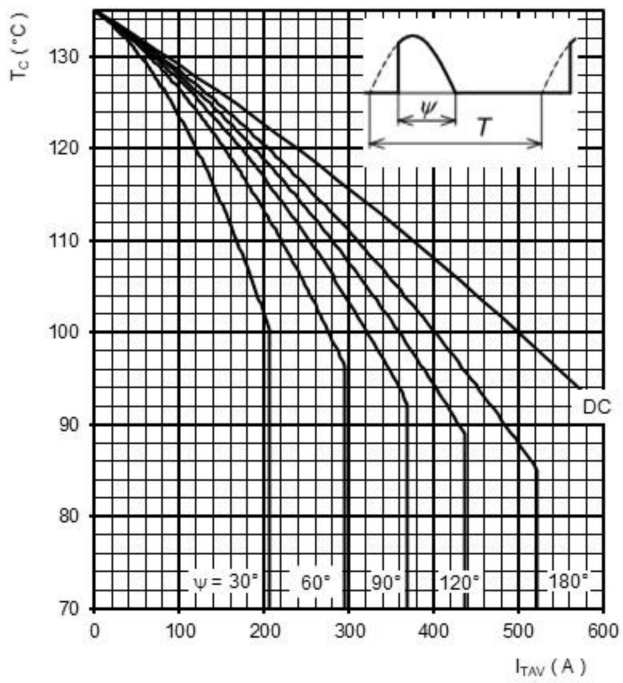

Fig. 9 Max. case temperature vs. aver. on-state current,
sine waveform, f = 50 Hz, T = 1/f

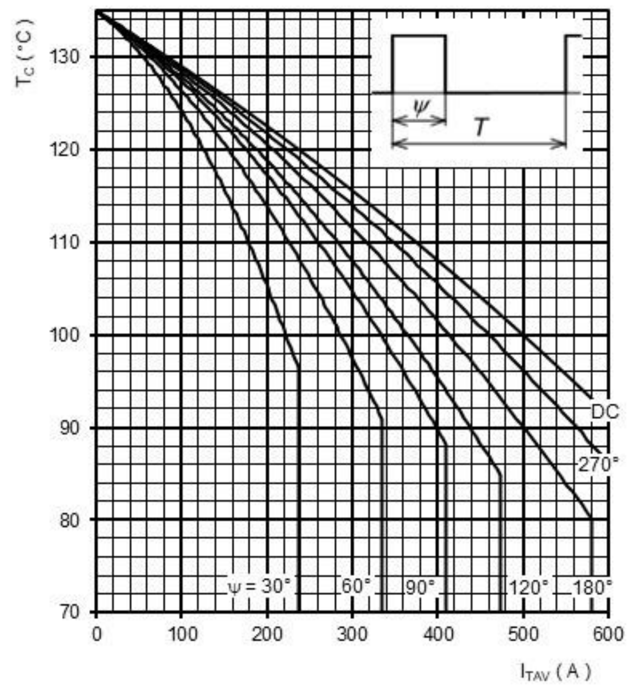

Fig. 10 Max. case temperature vs. aver. on-state current,
square waveform, f = 50 Hz, T = 1/f

Note: 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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