V_{DRM}	=	2500	V
I_{TGQM}	=	3000	A
I_{TSM}	=	30	kA
V_{T0}	=	1.5	V
r_T	=	0.33	mW
V_{DClink}	=	1400	V

Gate turn-off Thyristor

5SGA 30J2501

Doc. No. 5SYA1213-02 Jan. 05

- **Patented free-floating silicon technology**
- **Low on-state and switching losses**
- **Annular gate electrode**
- **Industry standard housing**
- **Cosmic radiation withstand rating**

Blocking

Symbol	Parameter		Value	Unit	Conditions	
V_{DRM}	Repetitive peak off-state voltage		2500	V	$V_{GR} \geq 2V$	
V_{RRM}	Repetitive peak reverse voltage		17	V		
I_{DRM}	Repetitive peak off-state current	≤	100	mA	$V_D = V_{DRM}$	$V_{GR} \geq 2V$
I_{RRM}	Repetitive peak reverse current	≤	50	mA	$V_R = V_{RRM}$	$R_{GK} = \infty$
V_{DClink}	Permanent DC voltage for 100 FIT failure rate		1400	V	Ambient cosmic radiation at sea level in open air.	

Mechanical data (see Fig. 3)

Symbol	Parameter			Value	Unit
F_m	Mounting force	min.		36	kN
		max.		44	kN
A	Acceleration: Device unclamped Device clamped			 50 200	 m/s^2 m/s^2
M	Weight			1.3	kg
D_S	Surface creepage distance		≥	33	mm
D_a	Air strike distance		≥	15	mm

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GTO Data

On-state

Symbol	Parameter	Value	Unit	Conditions		
I_{TAVM}	Max. average on-state current	1300	A	Half sine wave, T_C = 85 °C		
I_{TRMS}	Max. RMS on-state current	2040	A			
I_{TSM}	Max. peak non-repetitive surge current	30	kA	t_P = 10 ms		T_j = 125°C
		51	kA	t_P = 1 ms		After surge:
I^2t	Limiting load integral	4.5×10^6	A^2s	t_P = 10 ms		$V_D = V_R$ = 0V
		1.3×10^6	A^2s	t_P = 1 ms		
V_T	On-state voltage	2.5	V	I_T = 3000 A		
V_{T0}	Threshold voltage	1.5	V	I_T = 400 - 4000 A		T_j = 125 °C
r_T	Slope resistance	0.33	mΩ			
I_H	Holding current	100	A	T_j = 25 °C		

Gate

Symbol	Parameter	Value	Unit	Conditions	
V_{GT}	Gate trigger voltage	1.2	V	V_D = 24 V	T_j = 25 °C
I_{GT}	Gate trigger current	4	A	R_A = 0.1 W	
V_{GRM}	Repetitive peak reverse voltage	17	V		
I_{GRM}	Repetitive peak reverse current	50	mA	V_{GR} = V_{GRM}	

Turn-on switching

Symbol	Parameter	Value	Conditions			
di/dt_{crit}	Max. rate of rise of on-state current	500 A/µs	f = 200Hz	I_T = 3000 A, T_j = 125 °C		
		1000 A/µs	f = 1Hz	I_{GM} = 30 A, $di_G dt$ = 20 A/µs		
t_d	Delay time	2.5 µs	V_D = 0.5 V_{DRM}	T_j = 125 °C		
t_r	Rise time	5 µs	I_T = 3000 A	di/dt = 300 A/µs		
$t_{on(min)}$	Min. on-time	100 µs	I_{GM} = 30 A	di_G/dt = 20 A/µs		
E_{on}	Turn-on energy per pulse	2 Ws	C_S = 5 µF	R_S = 5 Ω		

Turn-off switching

Symbol	Parameter	Value	Unit	Conditions	
I_{TGQM}	Max controllable turn-off current	3000	A	V_{DM} = V_{DRM}	di_{GQ}/dt = 40 A/µs
				C_S = 5 µF	L_S ≤ 0.3 µH
t_s	Storage time	25	µs	V_D = ½ V_{DRM}	V_{DM} = V_{DRM}
t_f	Fall time	3	µs	T_j = 125 °C	di_{GQ}/dt = 40 A/µs
$t_{off(min)}$	Min. off-time	100	µs	I_{TGQ} = I_{TGQM}	
E_{off}	Turn-off energy per pulse	4.7	Ws	C_S = 5 µF	R_S = 5 W
I_{GQM}	Peak turn-off gate current	1000	A	L_S ≤ 0.3 µH	

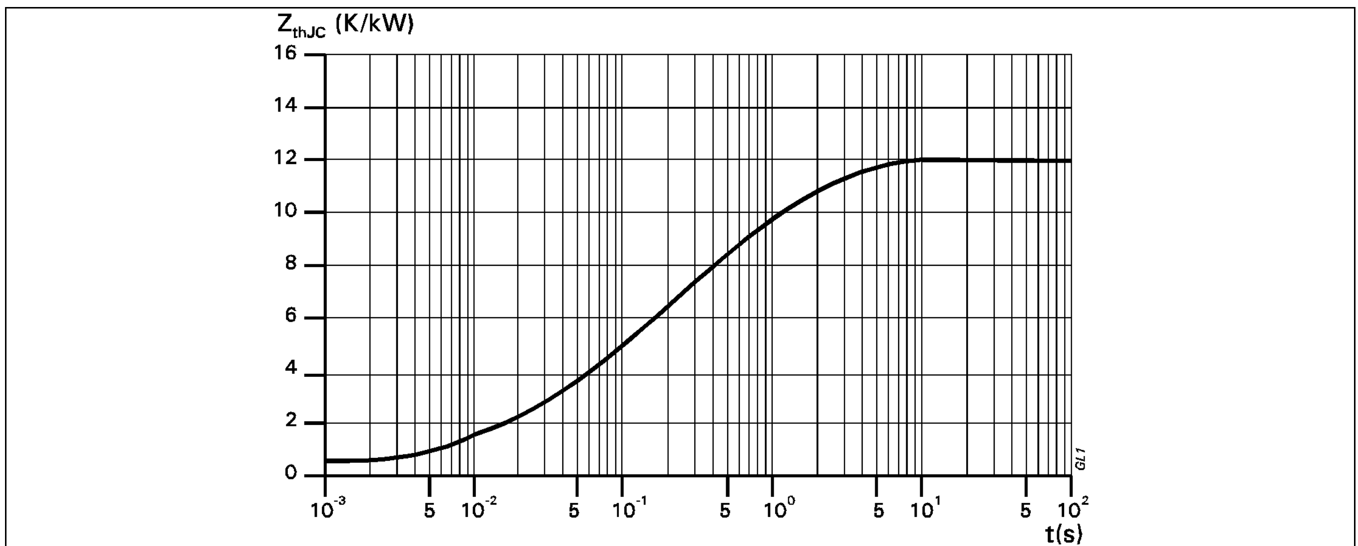
Thermal

T_j	Storage and operating junction temperature range	-40...125°C	
R_{thJC}	Thermal resistance junction to case	22 K/kW	Anode side cooled
		27 K/kW	Cathode side cooled
		12 K/kW	Double side cooled
R_{thCH}	Thermal resistance case to heat sink	6 K/kW	Single side cooled
		3 K/kW	Double side cooled

Analytical function for transient thermal impedance:

$$Z_{thJC}(t) = \sum_{i=1}^{4} R_i(1 - e^{-t/t_i})$$

i	1	2	3	4
R_I (K/kW)	5.4	4.5	1.7	0.4
τ_i (s)	1.2	0.17	0.01	0.001



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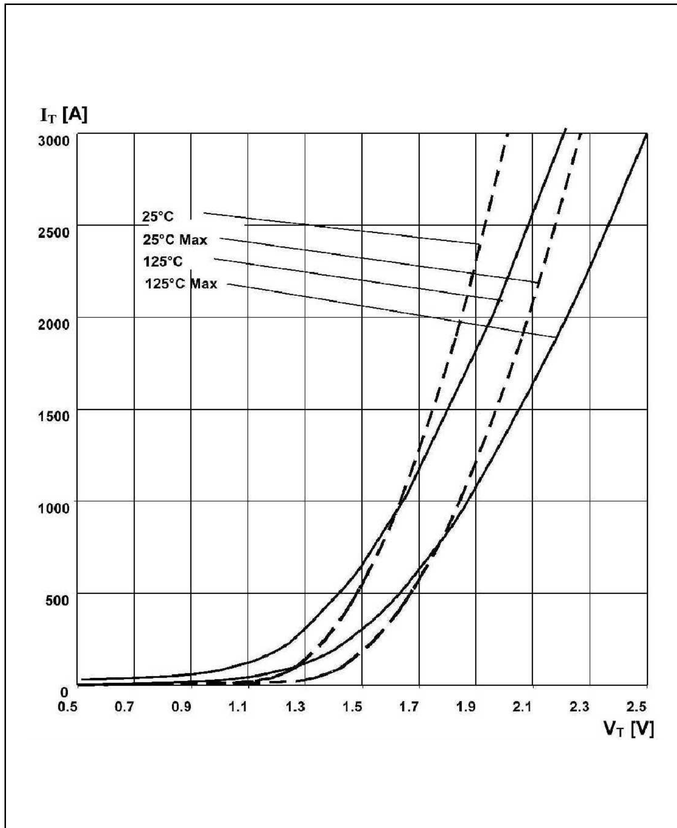

Fig. 1 On-state characteristics

Fig. 2 General current and voltage waveforms with GTO-specific symbols

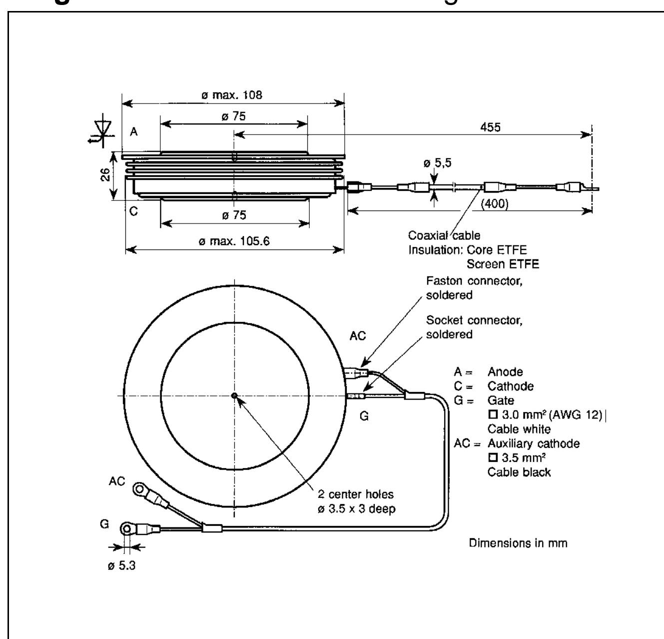

Fig. 3 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.

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Reverse avalanche capability

In operation with an antiparallel freewheeling diode, the GTO reverse voltage V_R may exceed the rate value V_{RRM} due to stray inductance and diode turn-on voltage spike at high di/dt. The GTO is then driven into reverse avalanche. This condition is not dangerous for the GTO provided avalanche time and current are below 10 µs and 1000 A respectively. However, gate voltage must remain negative during this time. Recommendation : V_{GR} = 10… 15 V.

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ABB Switzerland Ltd
Semiconductors
Fabrikstrasse 3
CH-5600 Lenzburg, Switzerland

Telephone +41 (0)58 586 1419
Fax +41 (0)58 586 1306
Email abbsem@ch.abb.com
Internet www.abbsem.com

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