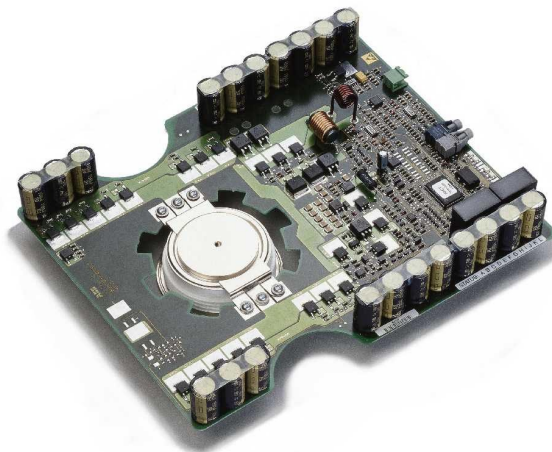


V_{DRM}	=	6000 V
V_{RRM}	=	6000 V
I_{TGQM}	=	800 A
V_{T0}	=	3.25 V
r_T	=	6.4 m Ω

Reverse Blocking Integrated Gate-Commutated Thyristor 5SHZ 08F6000

Doc. No. 5SYA1231-01 Sep. 01

- Optimized for current source inverter (CSI)
- Fast response ($t_{don} < 3 \mu s$, $t_{doff} < 7 \mu s$)
- Precise timing ($\Delta t_{doff} < 400 ns$)
- Direct fiber optic control
- Status feedback
- Cosmic radiation withstand rating
- Very high EMI immunity



Blocking

V_{DRM}	Repetitive peak off-state voltage	6000 V	
V_{RRM}	Reverse repetitive peak off-state voltage	6000 V	
I_{DRM}	Repetitive peak off-state current	≤ 50 mA	$V_D = V_{DRM}$
I_{RRM}	Reverse repetitive peak off-state current	≤ 50 mA	$V_R = V_{RRM}$
V_{AC}	Max. AC voltage for 100 FIT failure rate	3600 V	$0 \leq T_{jop} \leq 125$ °C. Ambient cosmic radiation at sea level in open air.

Mechanical data (see Fig. 8)

F_m	Mounting force	min.	12 kN	
		max.	16 kN	
D_p	Pole-piece diameter		47 mm	± 0.1 mm
H	Housing thickness		26 mm	± 0.5 mm
m	Weight IGCT		1.00 kg	
D_s	Surface creepage distance	\geq	33 mm	
D_a	Air strike distance	\geq	13 mm	
l	Length IGCT		250 mm	+0/-0.5 mm
h	Height IGCT		44 mm	± 1.0 mm
w	Width IGCT		208 mm	+0/-0.5 mm

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On-state (see Fig. 2)

I_{TAVM}	Max. average on-state current	290 A	Half sine wave, $T_C = 85\text{ °C}$	
I_{TRMS}	Max. RMS on-state current	450 A		
V_T	On-state voltage	$\leq 8.40\text{ V}$	$I_T = 800\text{ A}$	$T_j = 125\text{ °C}$
V_{T0}	Threshold voltage	3.25 V	$I_T = 200 - 800\text{ A}$	
r_T	Slope resistance	6.4 m Ω		

Self commutation ($V_D > 0\text{ V}$)**Turn-on switching** (see Fig. 3, 10, 11)

di/dt_{crit}	Max. rate of rise of on-state current	1300 A/ μ s	$T_j = 0...125\text{ °C}$	
$t_{on(min)}$	Min. on-time	10 μ s		
t_{don}	Turn-on delay time	$\leq 3\text{ }\mu$ s	$V_D = 3000\text{ V}$	$T_j = 125\text{ °C}$
t_r	Rise time	$\leq 1.5\text{ }\mu$ s	$I_T = 800\text{ A}$	$di/dt = 500\text{ A}/\mu$ s
E_{on}	Turn-on energy per pulse	$\leq 0.8\text{ J}$	$R_S = 10\text{ }\Omega$	$L_{comm} = 6\text{ }\mu$ H
			$C_S = 0.1\text{ }\mu$ F	$L_S = 350\text{ nH}$

Turn-off switching (see Fig. 4, 6, 10, 11)

I_{TGQM}	Max. contr. turn-off current	800 A	$T_j = 0...125\text{ °C}$	
$t_{off(min)}$	Min. off-time	10 μ s		
t_f	Fall time	$\leq 4.0\text{ }\mu$ s	$V_D = 3000\text{ V}$	$T_j = 125\text{ °C}$
t_{doff}	Turn-off delay time	$\leq 7.0\text{ }\mu$ s	$I_{TGQ} = 800\text{ A}$	$V_{DM} \leq V_{DRM}$
E_{off}	Turn-off energy per pulse	$\leq 7.2\text{ J}$	$R_S = 10\text{ }\Omega$	$L_{comm} = 6\text{ }\mu$ H
			$C_S = 0.1\text{ }\mu$ F	$L_S = 350\text{ nH}$

Load commutation ($V_D < 0\text{ V}$)**Turn-off switching** (see Fig. 5, 6, 10, 11)

di/dt_{crit}	Max. rate of rise of on-state current	1300 A/ μ s	$T_j = 0...125\text{ °C}$	
I_{rr}	Reverse recovery current	$\leq 750\text{ A}$	$V_D = -3000\text{ V}$	$T_j = 125\text{ °C}$
Q_{rr}	Reverse recovery charge	$\leq 1500\text{ }\mu$ C	$I_T = 800\text{ A}$	$di/dt = 500\text{ A}/\mu$ s
E_{rr}	Turn off energy per pulse	$\leq 6.0\text{ J}$	$R_S = 10\text{ }\Omega$	$L_{comm} = 6\text{ }\mu$ H
			$C_S = 0.1\text{ }\mu$ F	$L_S = 350\text{ nH}$
				$V_{RM} \leq V_{RRM}$

Gate Unit

Gate Unit

Power supply (see Fig. 7 to 10)			
V_{GDC}	Gate Unit supply voltage	$20 \pm 0.5 V_{DC}$	Without galvanic isolation to power circuit.
P_{Gin}	Gate Unit power consumption	$\leq 58 W$	$f_S = 750 Hz$, $I_{TGQ} = 400 A$, $\delta = 0.33$
X1	Gate Unit power connector	Phoenix, Type MSTB 2.5/2-G-5.08 Au ^{Note 1}	
Optical control input/output (see Fig. 8 to 10)			
$P_{on CS}$	Optical input power	$> -20 dBm$	Valid for 1mm plastic optical fibre (POF)
$P_{off CS}$	Optical noise power	$< -45 dBm$	
$P_{on SF}$	Optical output power	$> -15 dBm$	
$P_{off SF}$	Optical noise power	$< -50 dBm$	
t_{GLITCH}	Pulse width threshold	$\leq 400 ns$	Max. pulse width without response
CS	Receiver for command signal	Agilent, Type HFBR-2528 ^{Note 2}	
SF	Transmitter for status feedback	Agilent, Type HFBR-1528 ^{Note 2}	
Visual feedback (see Fig. 8, 9)			
LED1 (green)	Power supply voltage ok	"Light" when power supply is within specified rang	
LED2 (green)	Gate-cathode interface ok	"Light" when no short circuit, no open and mouning force is applied.	
LED3 (yellow)	Off gated	"Light" when gate-current is flowing	
LED4 (red)	Off gated	"Light" when GCT is off	
LED5 (red)	Not ready (failure)	(optional)	

Note 1: Phoenix Contact, www.phoenixcontact.com

Note 2: Agilent Technologies, www.semiconductor.agilent.com

Thermal

T_j	Operating junction temperature range	0...125 °C	
T_{stg}	Storage temperature range	-40...60 °C	
T_{amb}	Ambient operational temperature range	0...60 °C	
R_{thJC}	Thermal resistance junction to case	≤ 23 K/kW	Double side cooled
R_{thCH}	Thermal resistance case to heatsink	≤ 7.5 K/kW	Double side cooled

Analytical function for transient thermal impedance:

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

i	1	2	3	4
R_i (K/kW)	15.5	3.35	2.92	1.17
τ_i (s)	0.57	0.087	0.013	0.0035

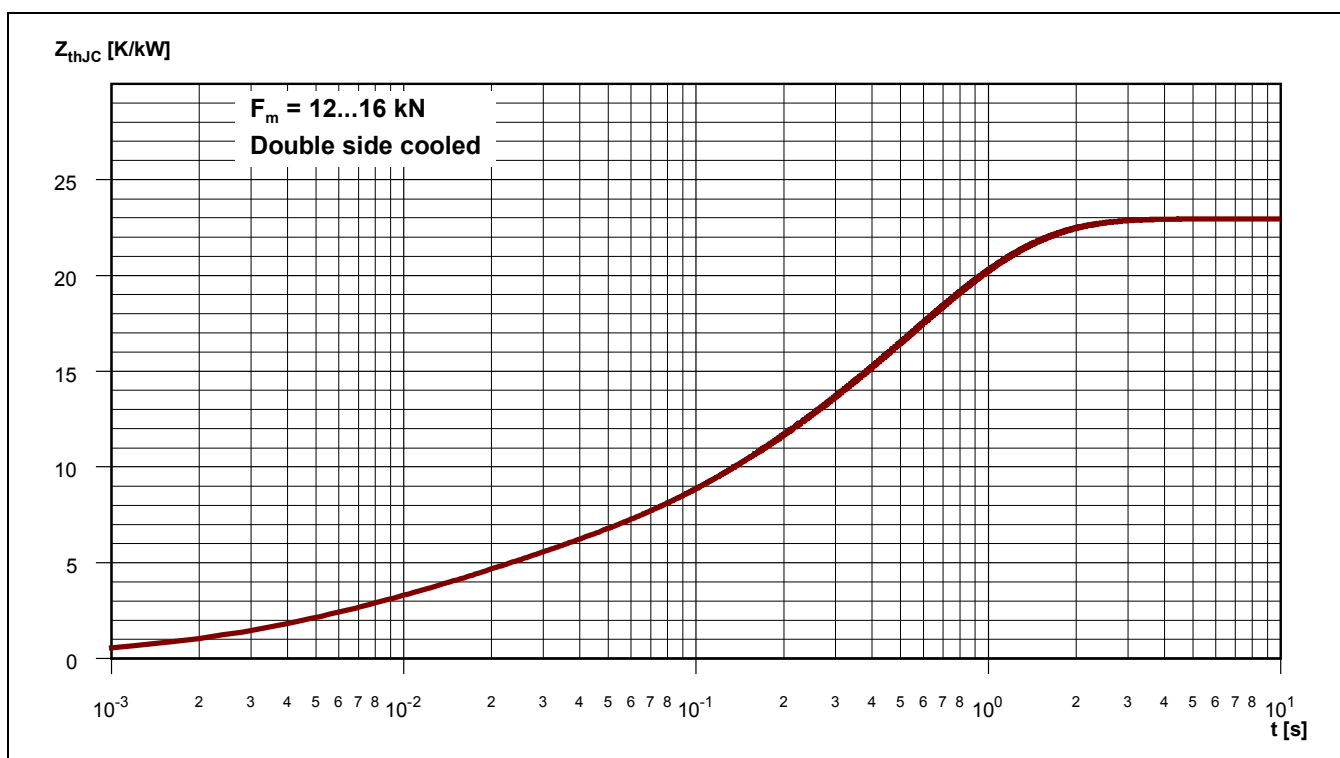


Fig. 1 Transient thermal impedance (junction-to-case) vs. time (max. values).

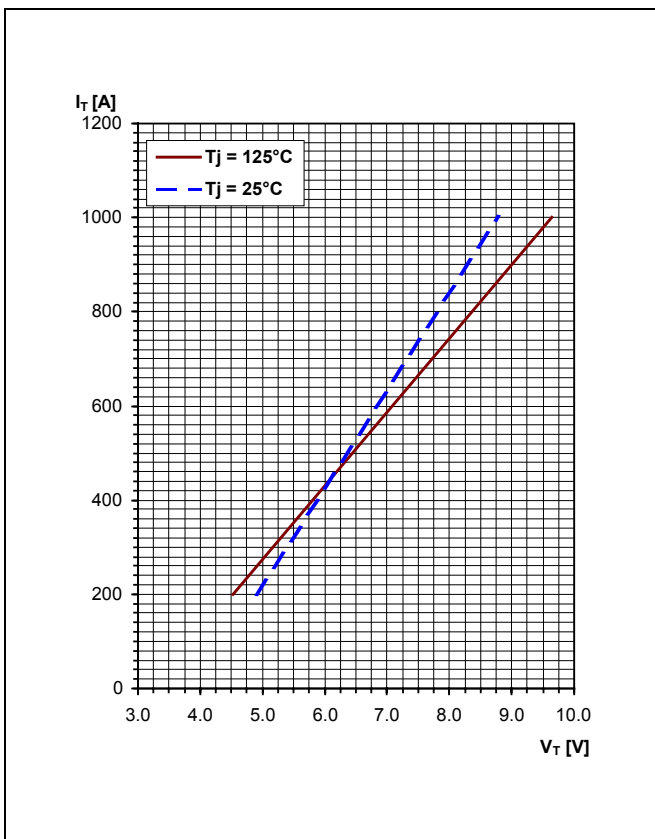


Fig. 2 On-state characteristics.

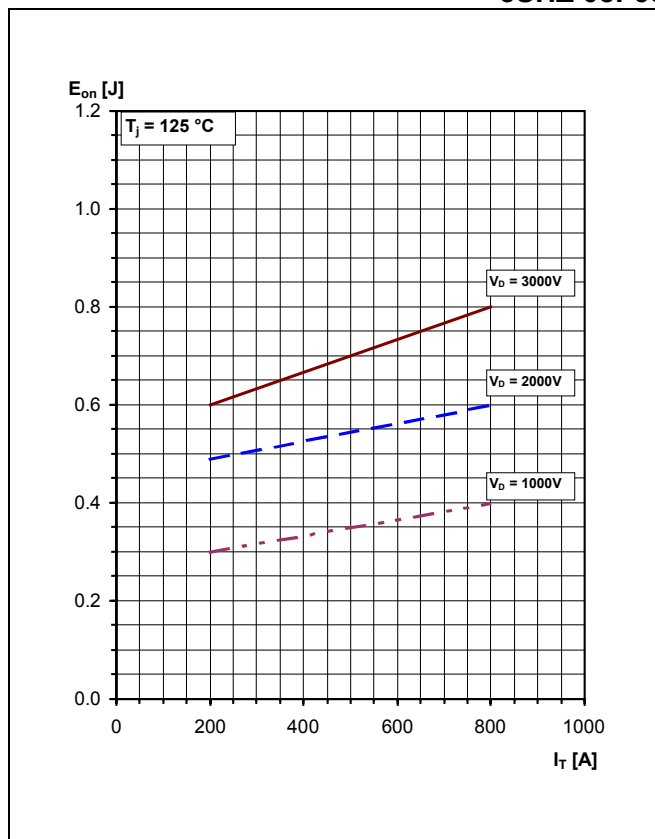


Fig. 3 Turn-on energy per pulse
Self commutation ($V_D > 0\text{ V}$)

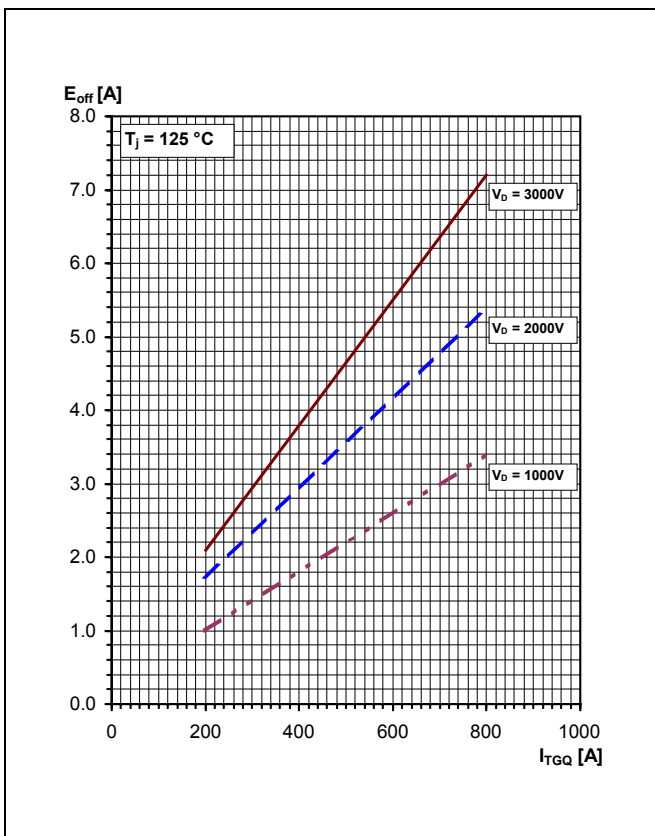


Fig. 4 Turn-off energy per pulse
Self commutation ($V_D > 0\text{ V}$).

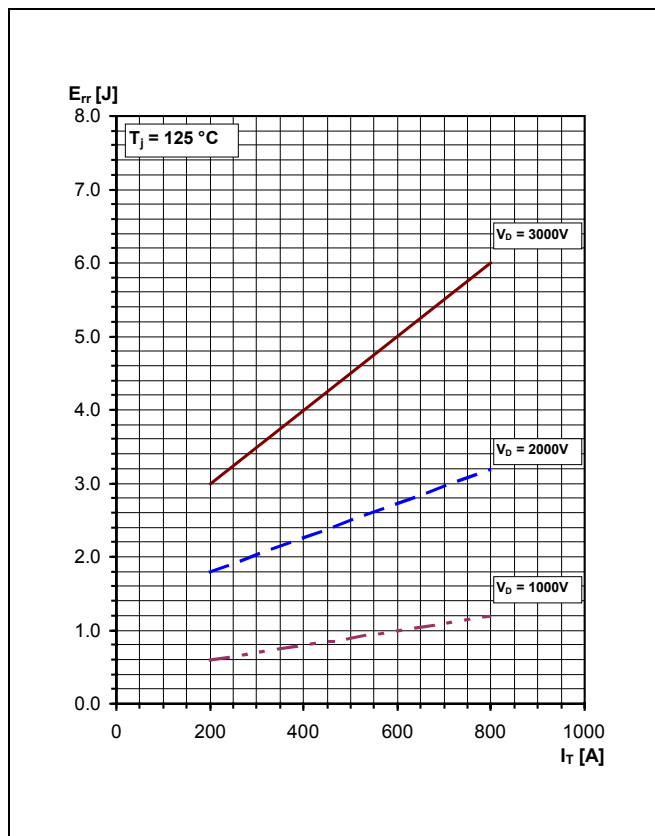


Fig. 5 Turn-off energy per pulse
Load commutation ($V_D < 0\text{ V}$).

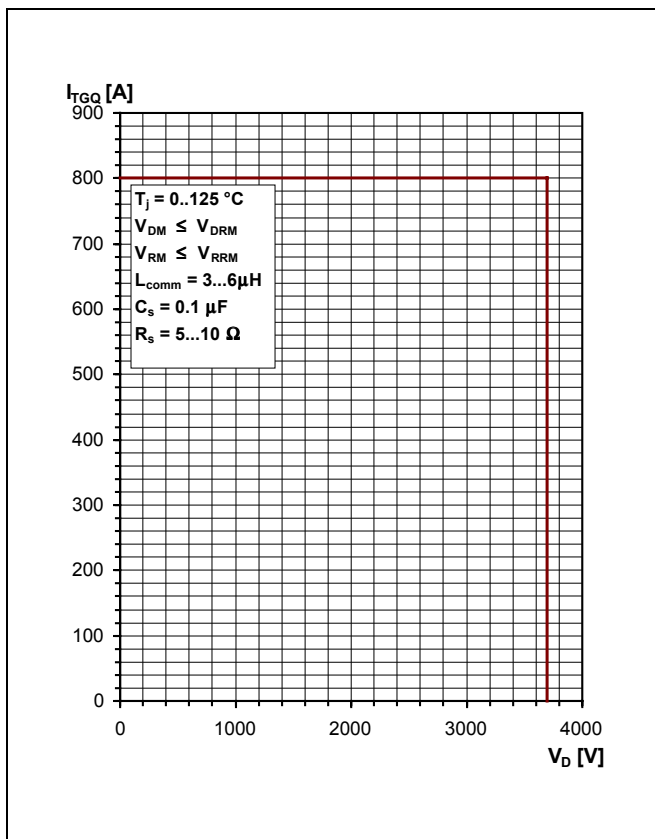


Fig. 6 Max. repetitive turn-off current.

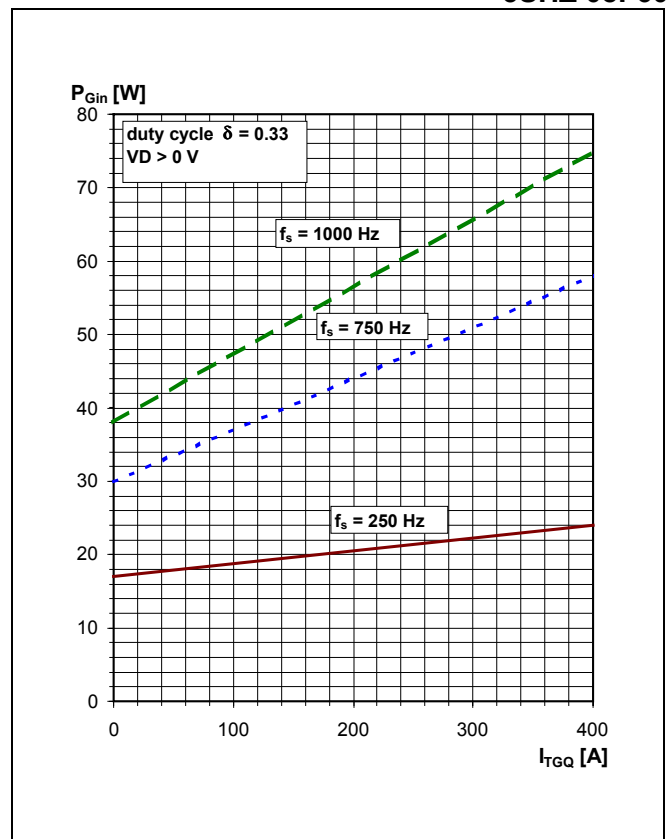


Fig. 7 Gate Unit power consumption.

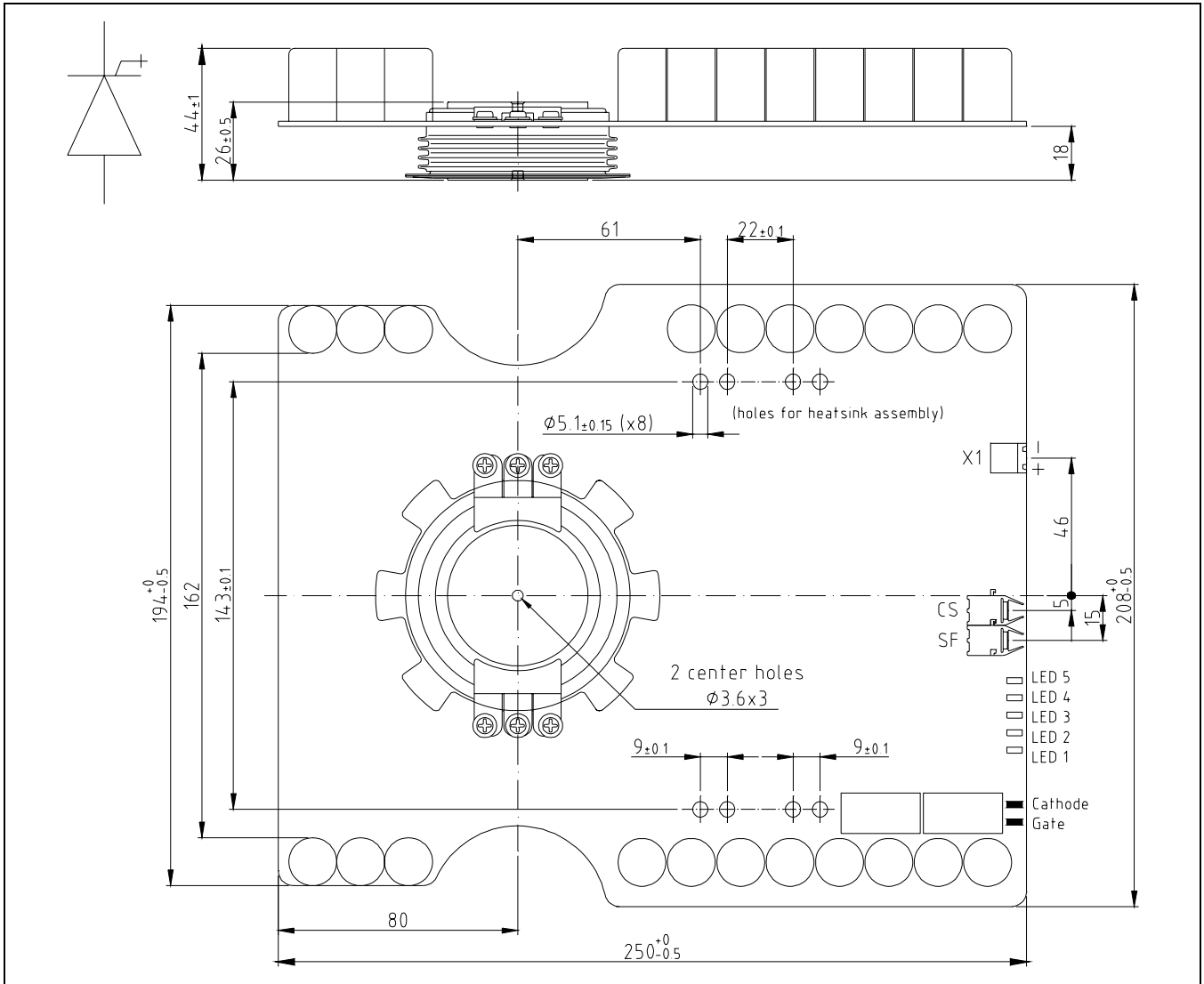


Fig. 8 Device Outline Drawing.

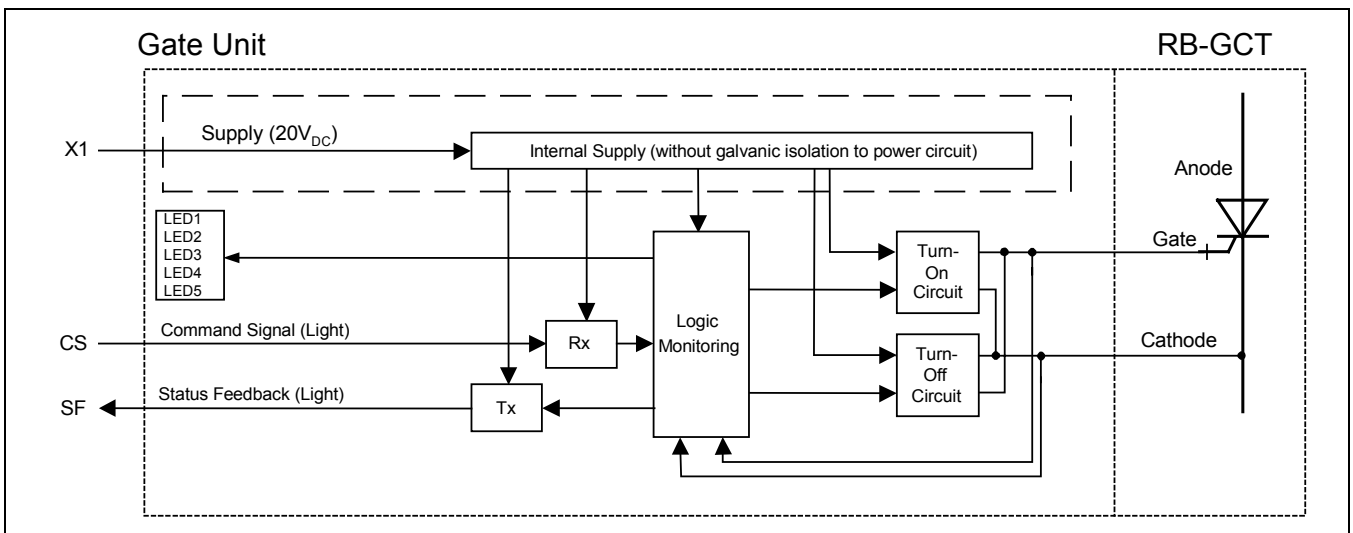


Fig. 9 Block diagram RB-IGCT.

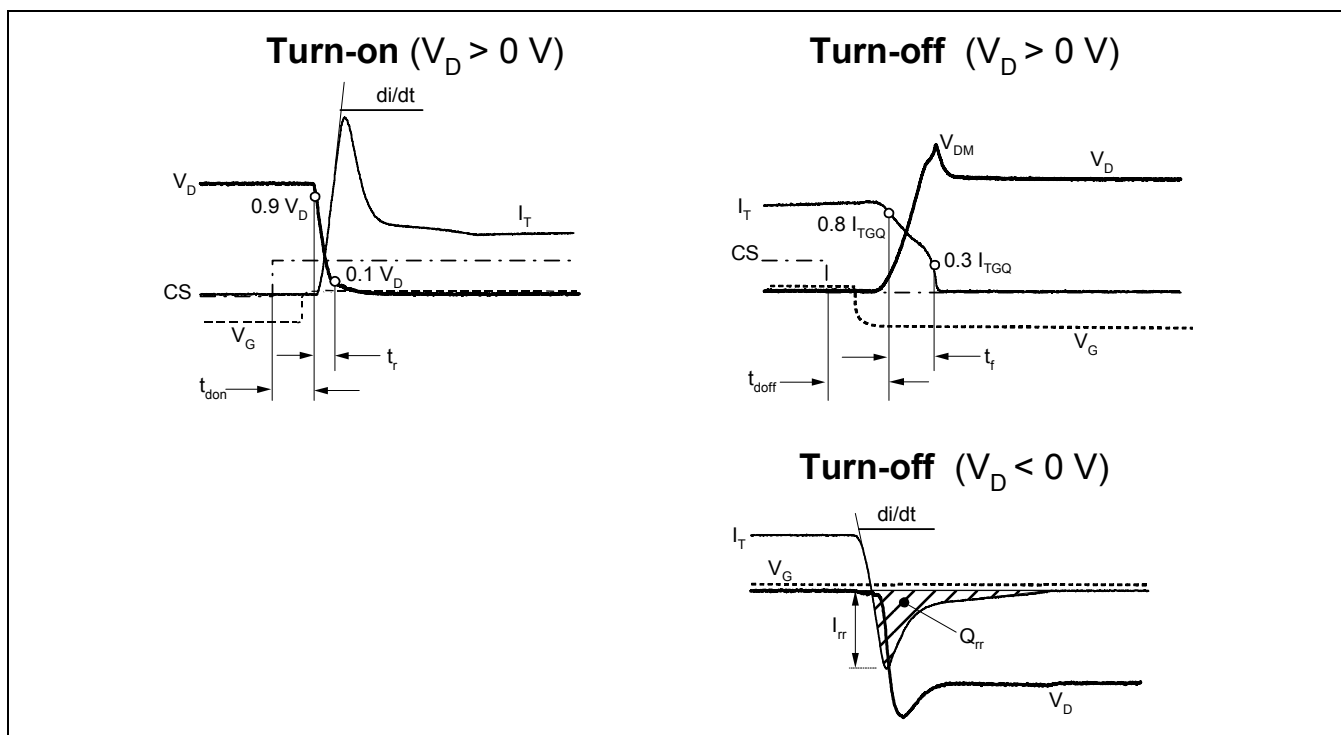


Fig. 10 General current and voltage waveforms with RB-IGCT specific symbols.

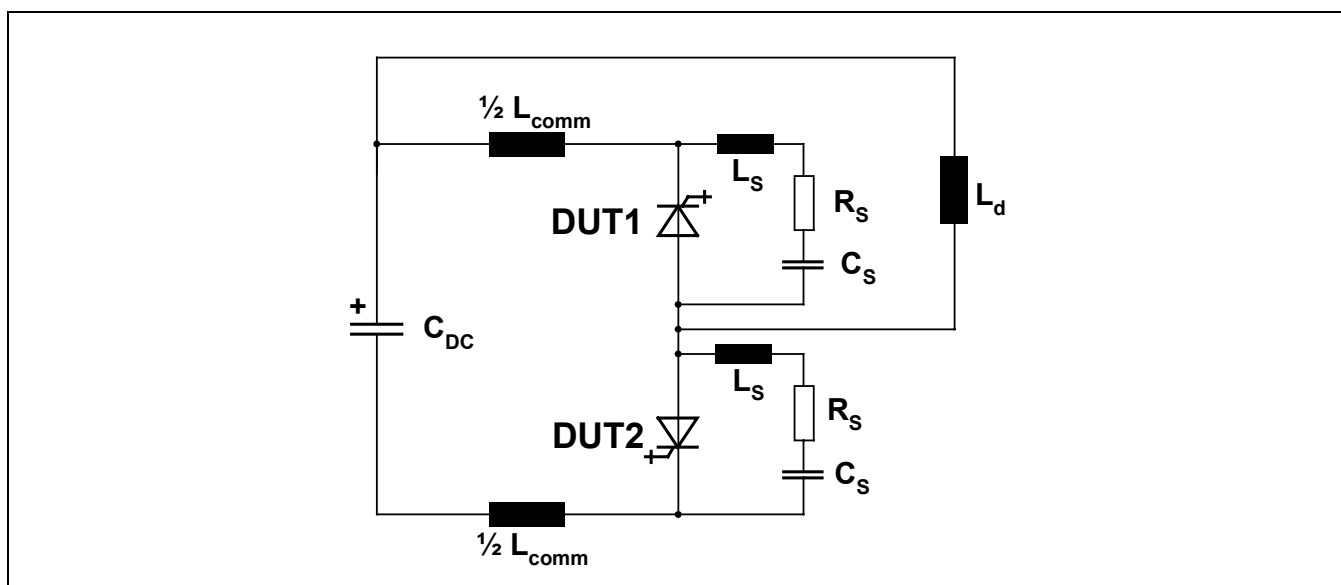


Fig. 11 Test circuit.

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