DG648BH45

GATE TURN-OFF THYRISTOR

APPLICATIONS

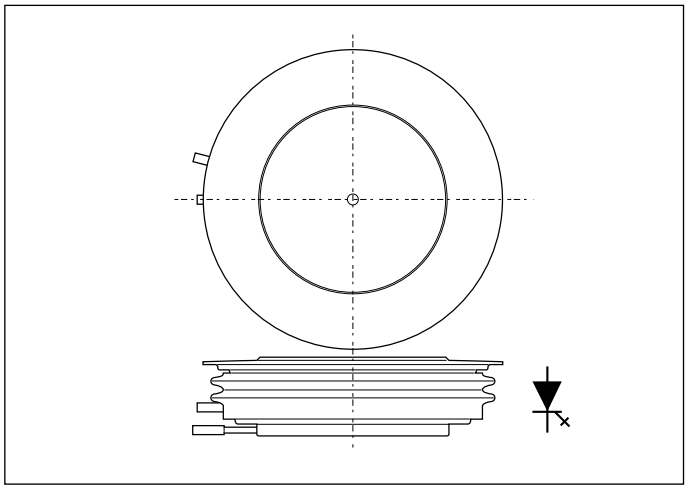
- Variable speed A.C. motor drive inverters (VSD-AC).
- Uninterruptable Power Supplies
- High Voltage Converters.
- Choppers.
- Welding.
- Induction Heating.
- DC/DC Converters.

KEY PARAMETERS

I_{TCM}	2000A
V_{DRM}	4500V
$I_{T(AV)}$	745A
dV_D/dt	1000V/μs
di_T/dt	300A/μs

FEATURES

- Double Side Cooling.
- High Reliability In Service.
- High Voltage Capability.
- Fault Protection Without Fuses.
- High Surge Current Capability.
- Turn-off Capability Allows Reduction In Equipment Size And Weight. Low Noise Emission Reduces Acoustic Cladding Necessary For Environmental Requirements.



Outline type code: H. Turn to page 18 for further information.

VOLTAGE RATINGS

Type Number	Repetitive Peak Off-state Voltage V_{DRM} V	Repetitive Peak Reverse Voltage V_{RRM} V	Conditions
DG648BH45	4500	16	T_{vj} = 125°C, I_{DM} = 50mA, I_{RRM} = 50mA

CURRENT RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TCM}	Repetitive peak controllable on-state current	$V_D = V_{DRM}$, T_j = 125°C, di_{GQ}/dt = 40A/μs, Cs = 2.0μF	2000	A
$I_{T(AV)}$	Mean on-state current	T_{HS} = 80°C. Double side cooled. Half sine 50Hz.	745	A
$I_{T(RMS)}$	RMS on-state current	T_{HS} = 80°C. Double side cooled. Half sine 50Hz.	1170	A

SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine. T_j = 125°C	16.0	kA
I^2t	I^2t for fusing	10ms half sine. T_j =125°C	1.28×10^6	A^2s
di_T/dt	Critical rate of rise of on-state current	V_D = 4500V, I_T = 2000A, T_j = 125°C, I_{FG} > 30A, Rise time > 1.0µs	300	A/µs
dV_D/dt	Rate of rise of off-state voltage	To 66% V_{DRM}; $R_{GK} \leq 1.5\Omega$, T_j = 125°C	175	V/µs
		To 66% V_{DRM}; V_{RG} = -2V, T_j = 125°C	1000	V/µs
L_S	Peak stray inductance in snubber circuit	I_T = 2000A, V_{DM} = 4500V, T_j = 125°C, di_{GQ}/dt = 40A/µs, Cs = 2.0µF	200	nH

GATE RATINGS

Symbol	Parameter	Conditions	Min.	Max.	Units
V_{RGM}	Peak reverse gate voltage	This value maybe exceeded during turn-off	-	16	V
I_{FGM}	Peak forward gate current		20	100	A
$P_{FG(AV)}$	Average forward gate power		-	15	W
P_{RGM}	Peak reverse gate power		-	19	kW
di_{GQ}/dt	Rate of rise of reverse gate current		30	60	A/µs
$t_{ON(min)}$	Minimum permissable on time		50	-	µs
$t_{OFF(min)}$	Minimum permissable off time		100	-	µs

THERMAL RATINGS AND MECHANICAL DATA

Symbol	Parameter	Conditions		Min.	Max.	Units
$R_{th(j-hs)}$	DC thermal resistance - junction to heatsink surface	Double side cooled		-	0.018	°C/W
		Anode side cooled		-	0.03	°C/W
		Cathode side cooled		-	0.045	°C/W
$R_{th(c-hs)}$	Contact thermal resistance	Clamping force 20.0kN With mounting compound	per contact	-	0.006	°C/W
T_{vj}	Virtual junction temperature			-	125	°C
T_{OP}/T_{stg}	Operating junction/storage temperature range			-40	125	°C
-	Clamping force			18.0	22.0	kN

CHARACTERISTICS

T_j = 125°C unless stated otherwise					
Symbol	**Parameter**	**Conditions**	**Min.**	**Max.**	**Units**
V_{TM}	On-state voltage	At 2000A peak, $I_{G(ON)}$ = 7A d.c.	-	3.2	V
I_{DM}	Peak off-state current	V_{DRM} = 4500V, V_{RG} = 0V	-	100	mA
I_{RRM}	Peak reverse current	At V_{RRM}	-	50	mA
V_{GT}	Gate trigger voltage	V_D = 24V, I_T = 100A, T_j = 25°C	-	1.0	V
I_{GT}	Gate trigger current	V_D = 24V, I_T = 100A, T_j = 25°C	-	3.0	A
I_{RGM}	Reverse gate cathode current	V_{RGM} = 16V, No gate/cathode resistor	-	50	mA
E_{ON}	Turn-on energy	V_D = 3000V	-	3170	mJ
t_d	Delay time	I_T = 2000A, dI_T/dt = 300A/µs	-	1.35	µs
t_r	Rise time	I_{FG} = 30A, rise time < 1.0µs	-	3.2	µs
E_{OFF}	Turn-off energy	I_T = 2000A, V_{DM} = V_{DRM} Snubber Cap Cs = 2.0µF, di_{GQ}/dt = 40A/µs	-	10000	mJ
t_{gs}	Storage time		-	20.0	µs
t_{gf}	Fall time		-	2.0	µs
t_{gq}	Gate controlled turn-off time		-	22.0	µs
Q_{GQ}	Turn-off gate charge		-	6000	µC
Q_{GQT}	Total turn-off gate charge		-	12000	µC
I_{GQM}	Peak reverse gate current		-	690	A

CURVES

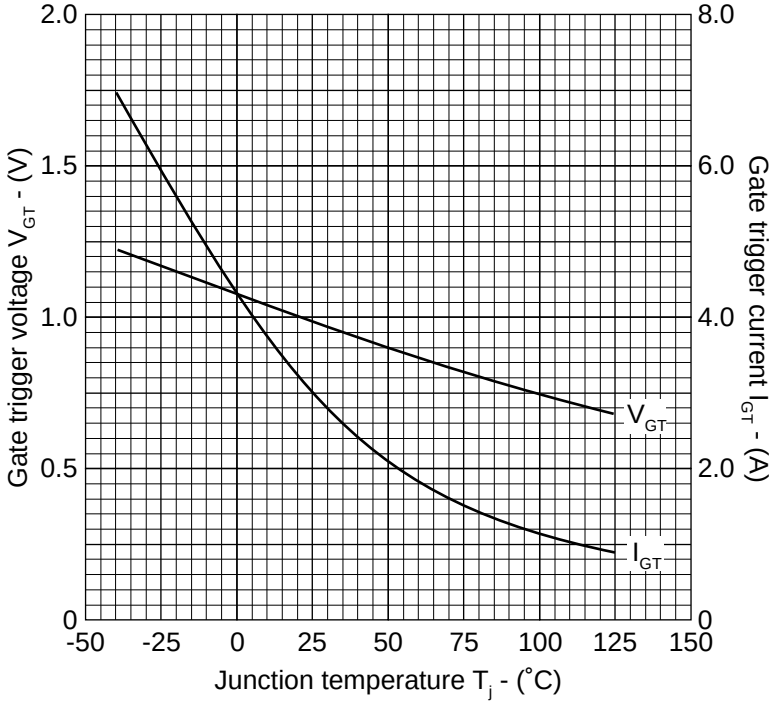


FIG. 1 MAXIMUM GATE TRIGGER VOLTAGE/CURRENT vs JUNCTION TEMPERATURE

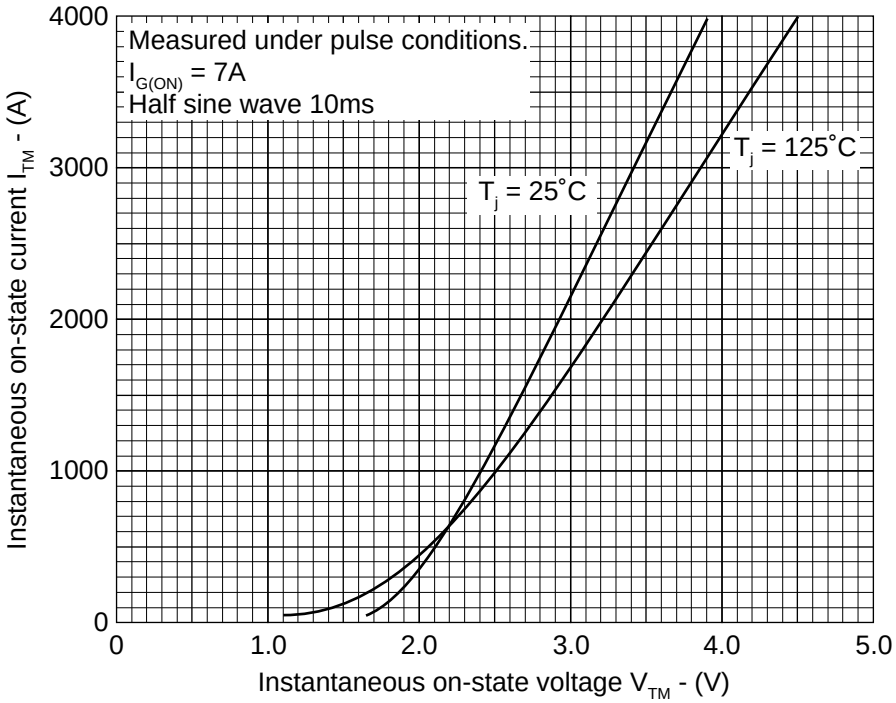


FIG. 2 ON-STATE CHARACTERISTICS

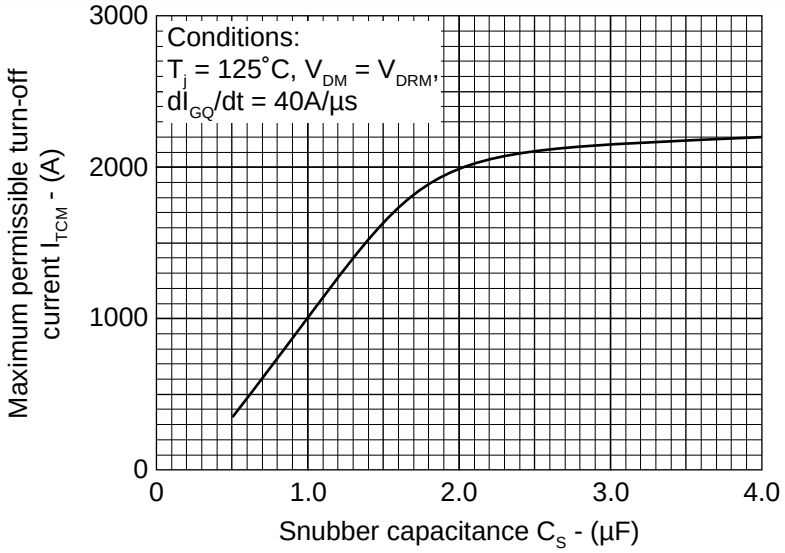


FIG. 3 MAXIMUM DEPENDENCE OF I_{TCM} ON C_S

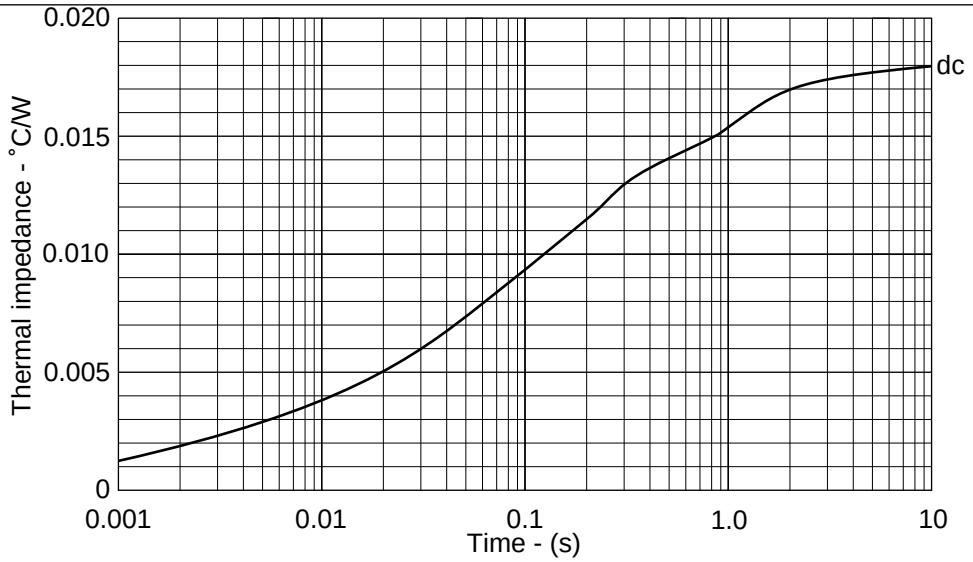


FIG. 4 MAXIMUM (LIMIT) TRANSIENT THERMAL IMPEDANCE - DOUBLE SIDE COOLED

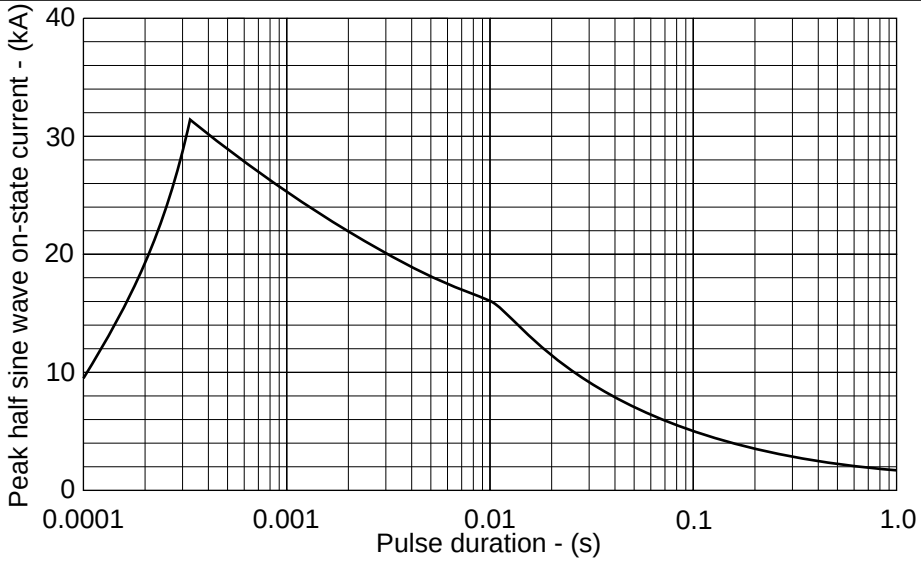


FIG. 5 SURGE (NON-REPETITIVE) ON-STATE CURRENT vs TIME

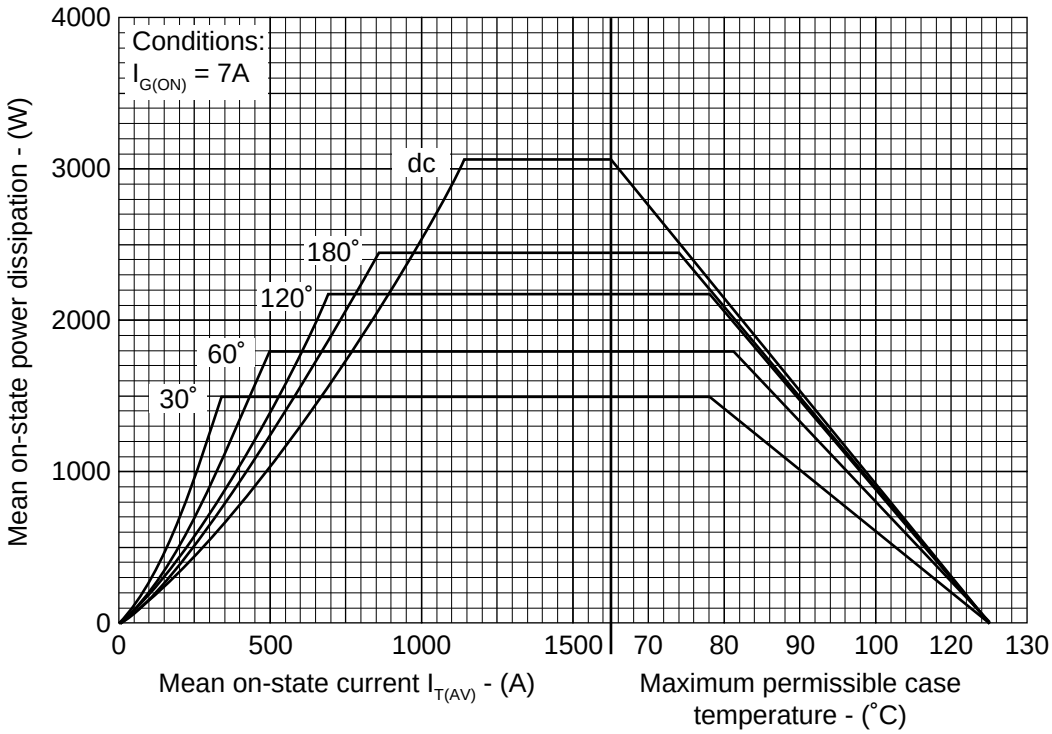


FIG. 6 STEADY STATE RECTANGULAR WAVE CONDUCTION LOSS - DOUBLE SIDE COOLED

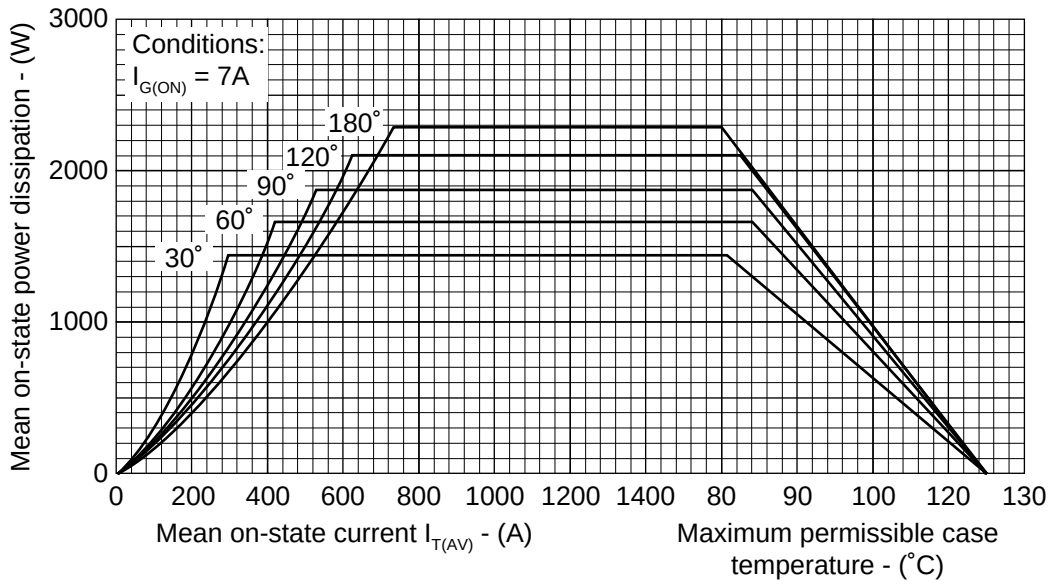


FIG. 7 STEADY STATE SINUSOIDAL WAVE CONDUCTION LOSS - DOUBLE SIDE COOLED

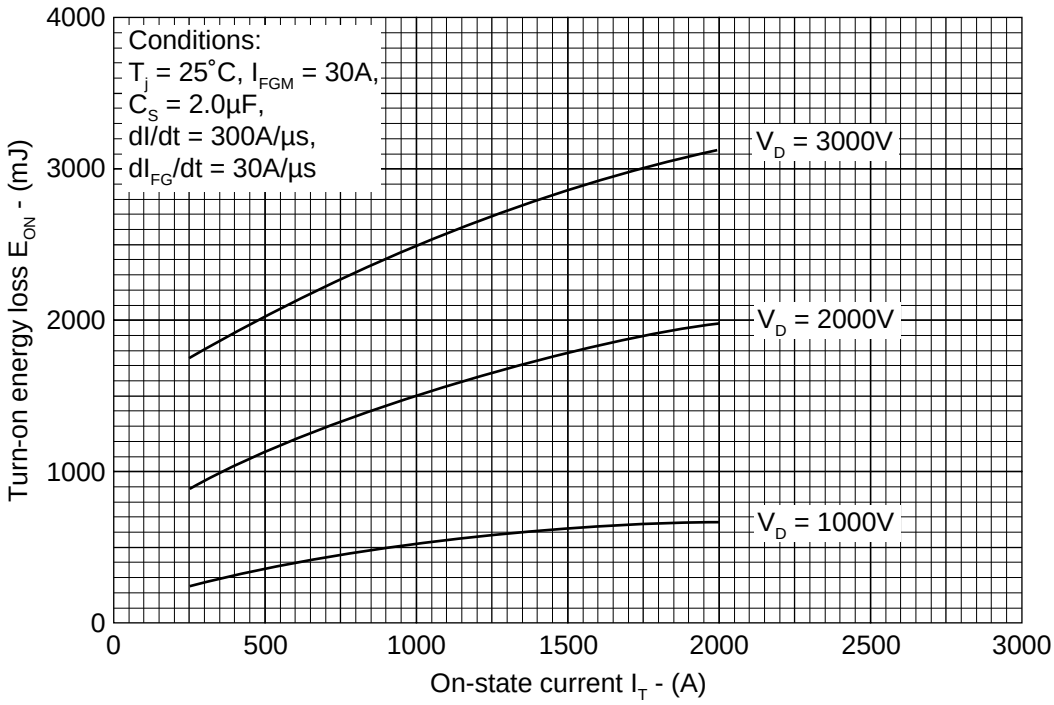


FIG. 8 TURN-ON ENERGY vs ON-STATE CURRENT

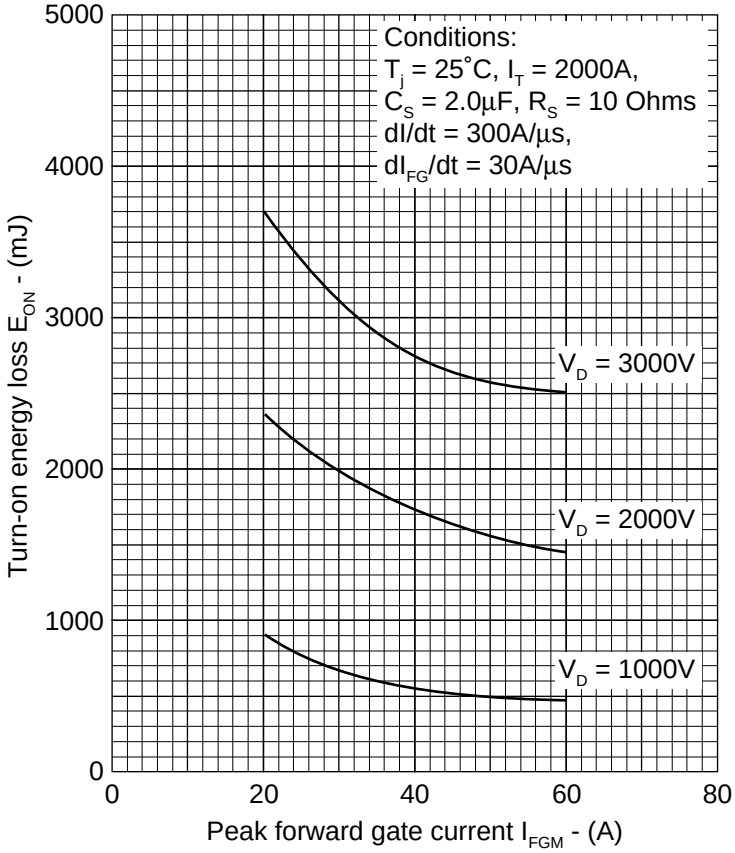


FIG. 9 TURN-ON ENERGY vs PEAK FORWARD GATE CURRENT

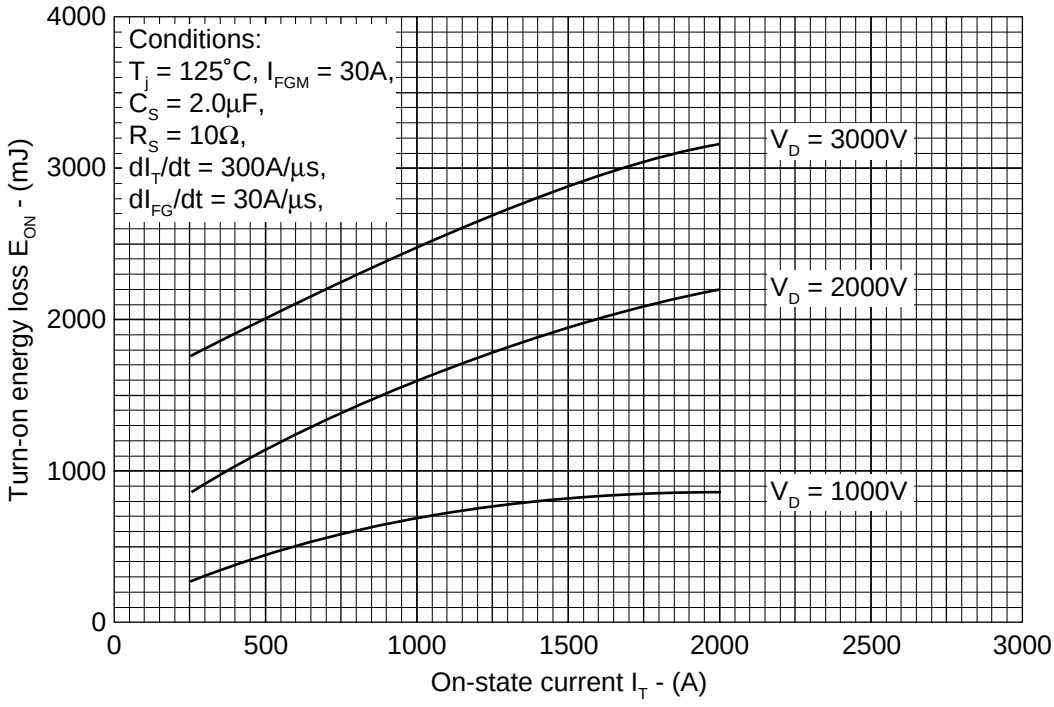


FIG. 10 TURN-ON ENERGY vs ON-STATE CURRENT

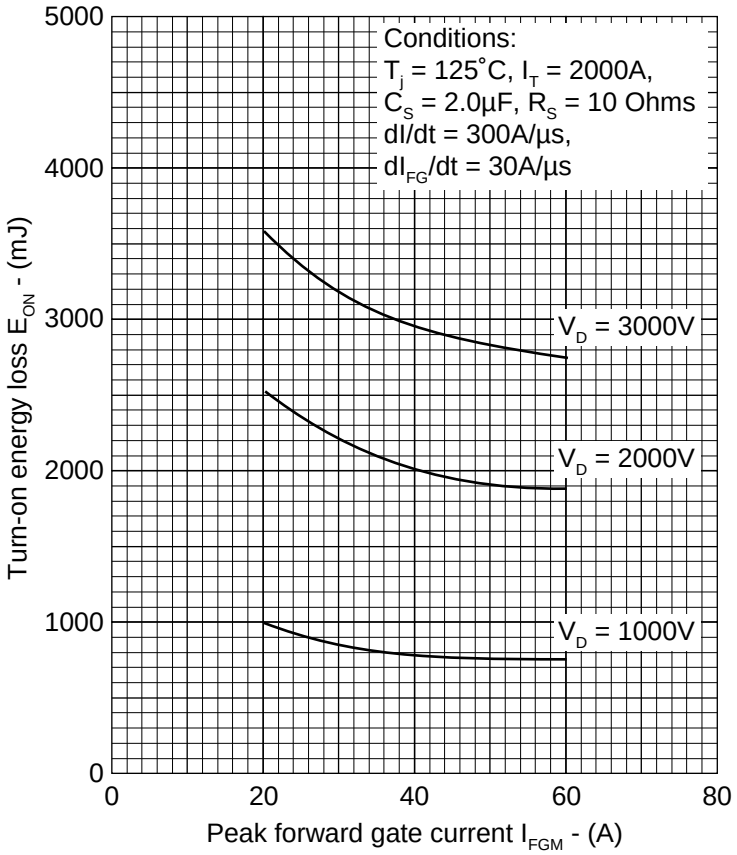


FIG. 11 TURN-ON ENERGY vs PEAK FORWARD GATE CURRENT

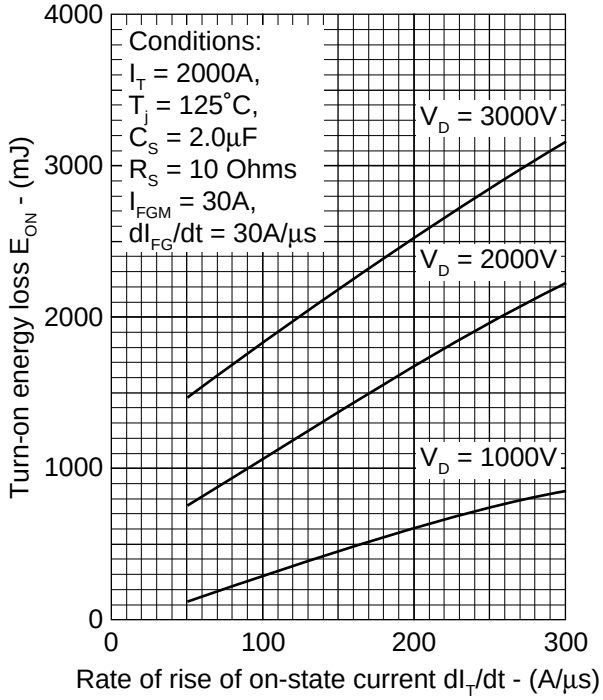


FIG. 12 TURN-ON ENERGY vs RATE OF RISE OF ON-STATE CURRENT

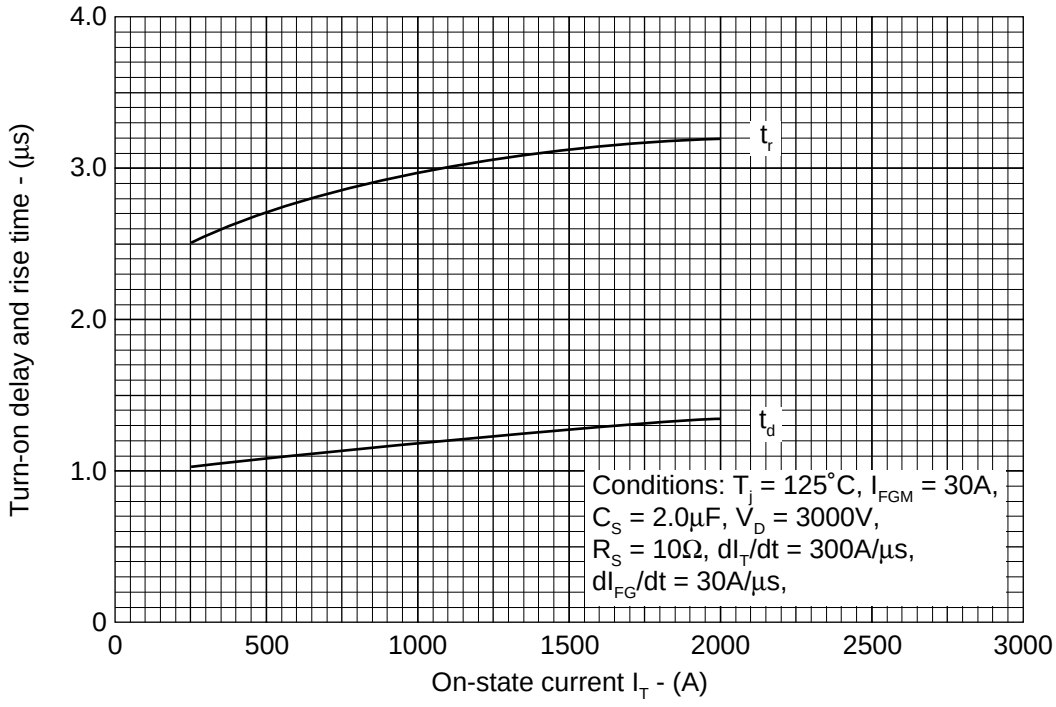


FIG. 13 DELAY & RISE TIME vs TURN-ON CURRENT

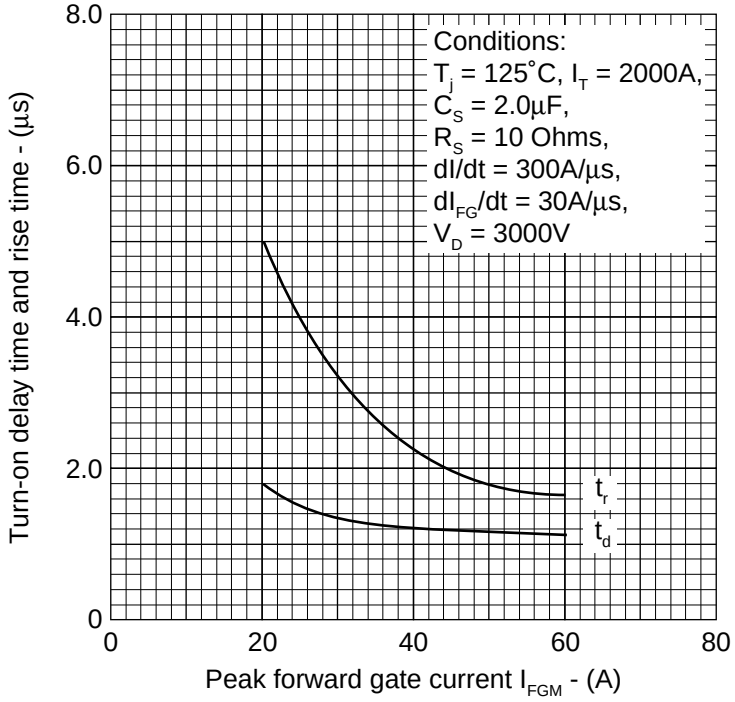


FIG. 14 DELAY TIME & RISE TIME vs PEAK FORWARD GATE CURRENT

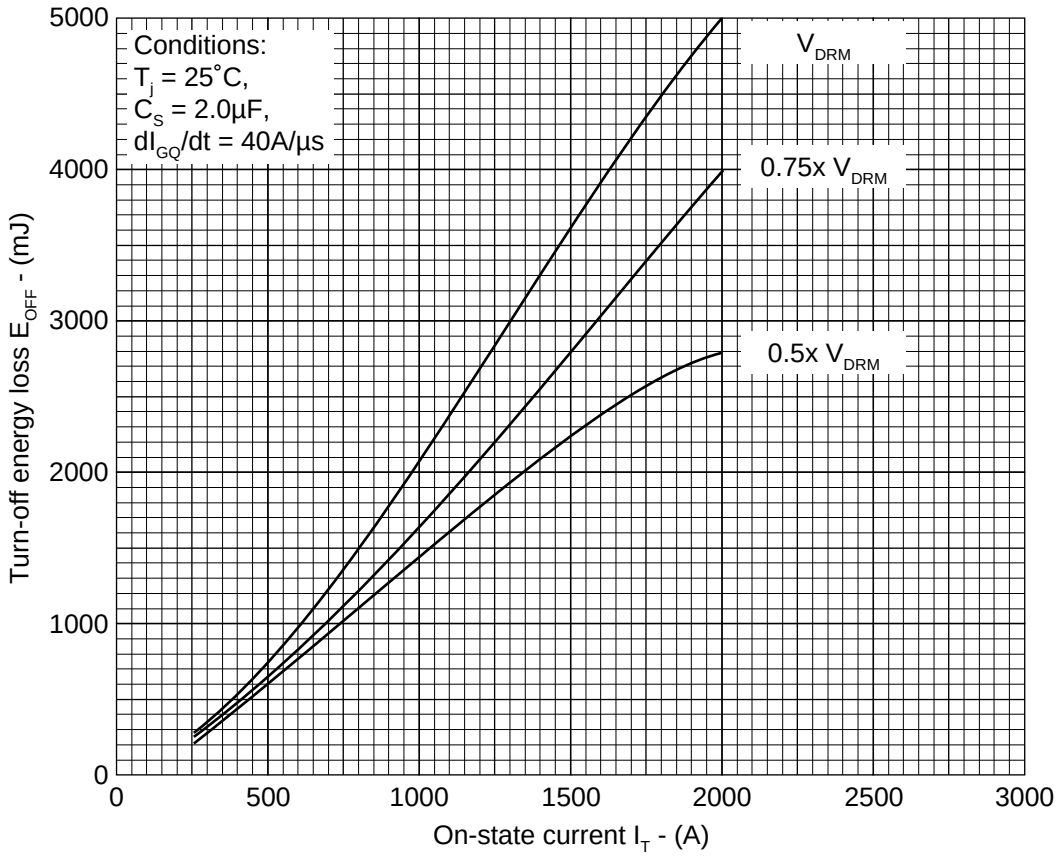


FIG. 15 TURN-OFF ENERGY vs ON-STATE CURRENT

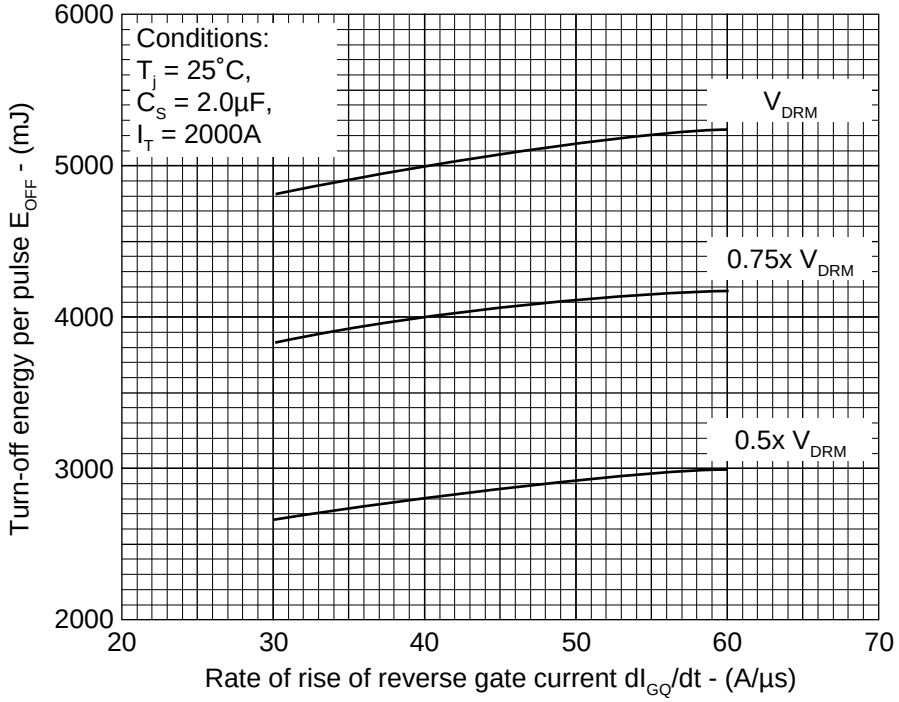


FIG. 16 TURN-OFF ENERGY vs RATE OF RISE OF REVERSE GATE CURRENT

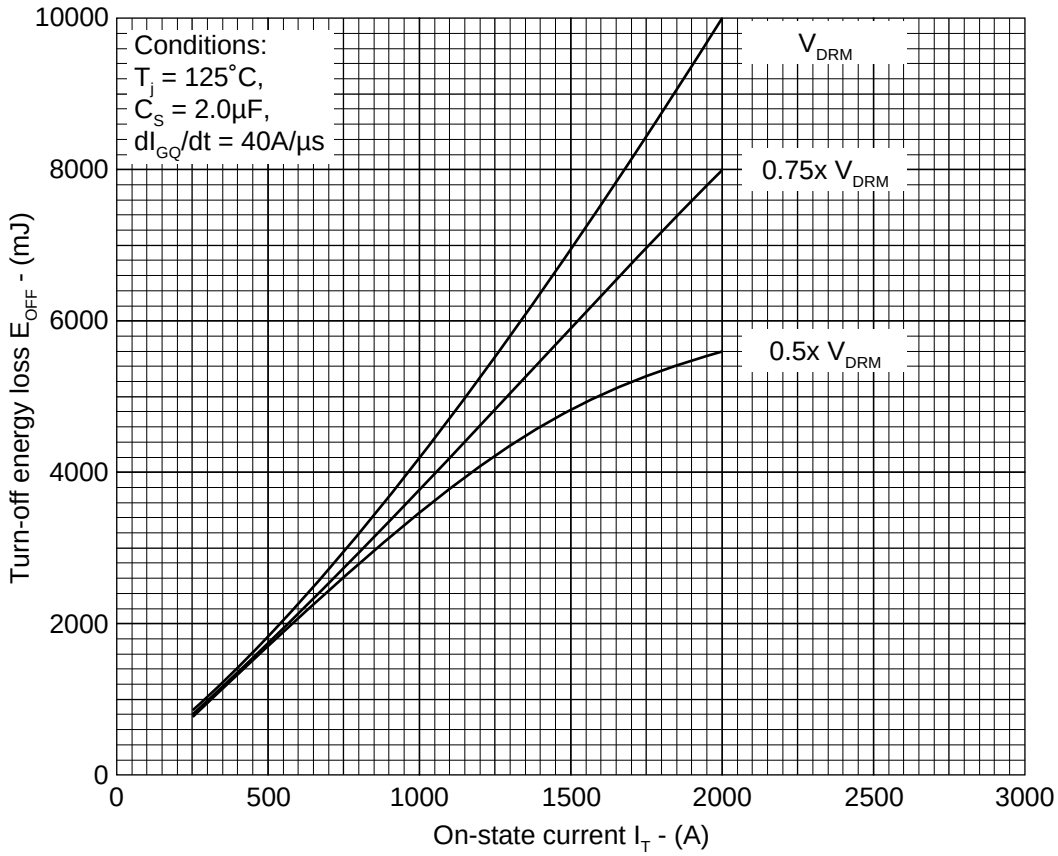


FIG. 17 TURN-OFF ENERGY vs ON-STATE CURRENT

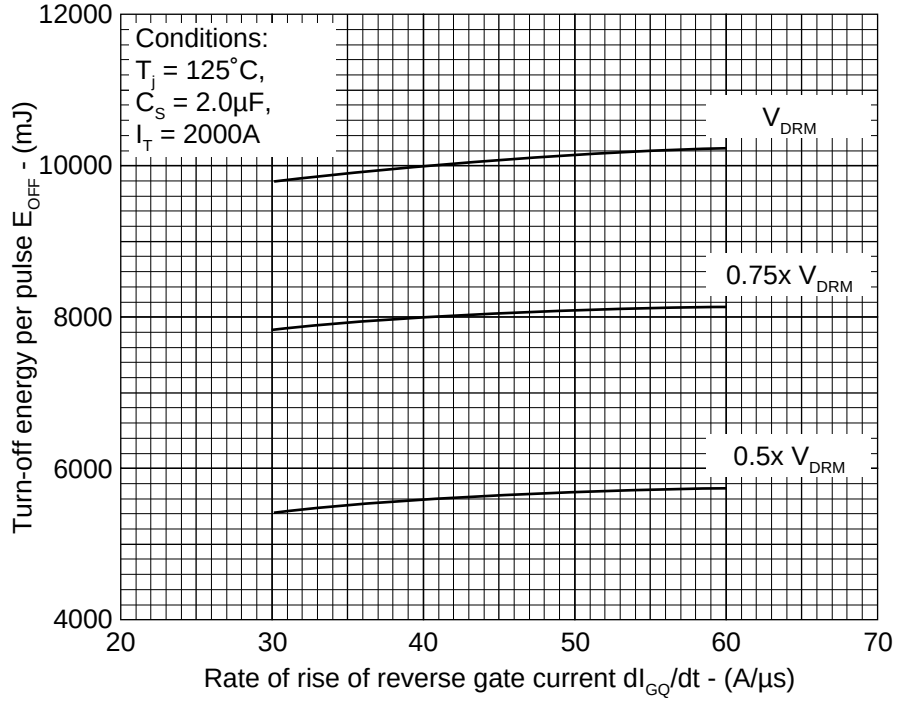


FIG. 18 TURN-OFF ENERGY LOSS vs RATE OF RISE OF REVERSE GATE CURRENT

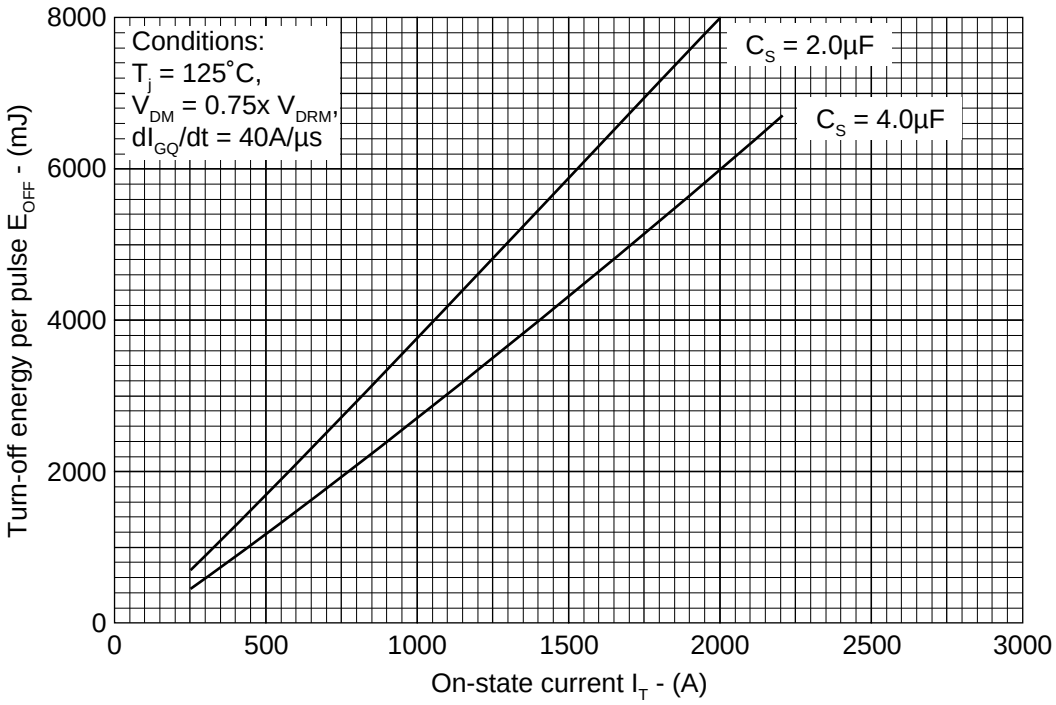


FIG. 19 TURN-OFF ENERGY vs ON-STATE CURRENT

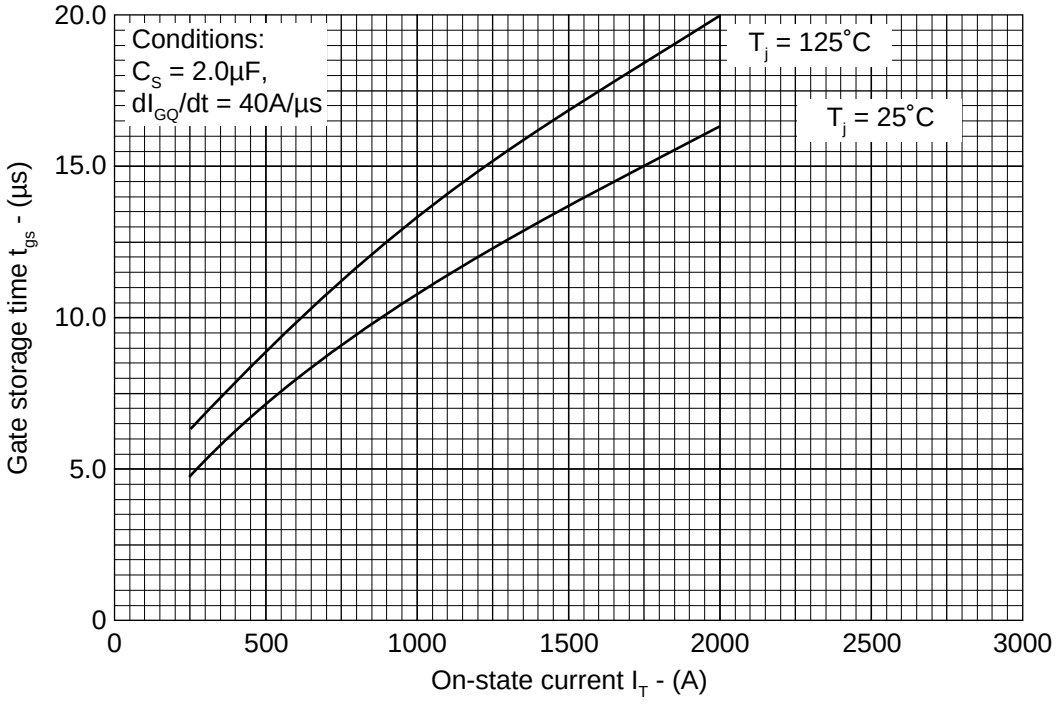


FIG. 20 GATE STORAGE TIME vs ON-STATE CURRENT

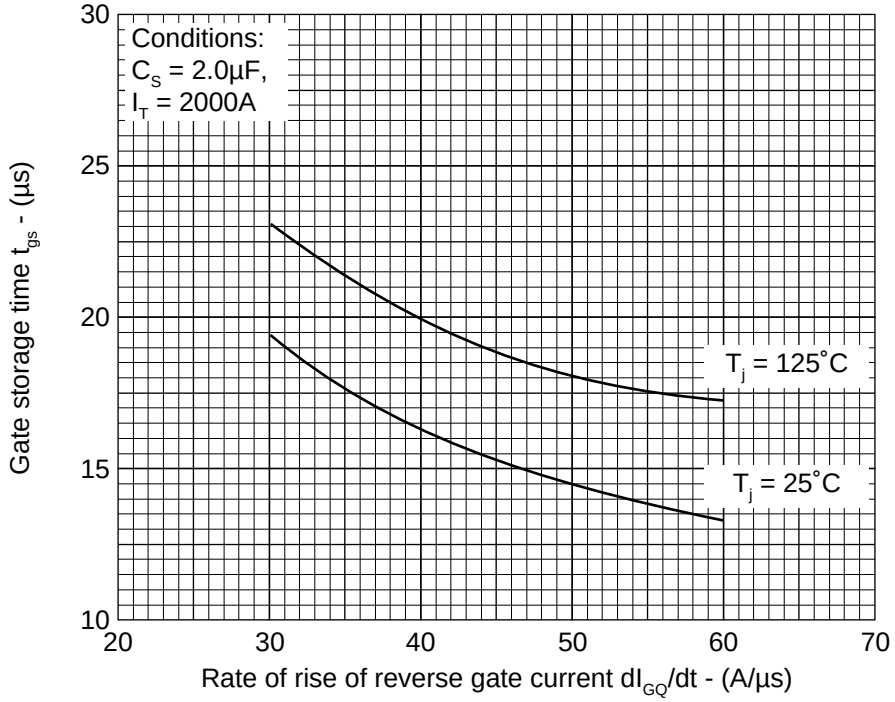


FIG. 21 GATE STORAGE TIME vs RATE OF RISE OF REVERSE GATE CURRENT

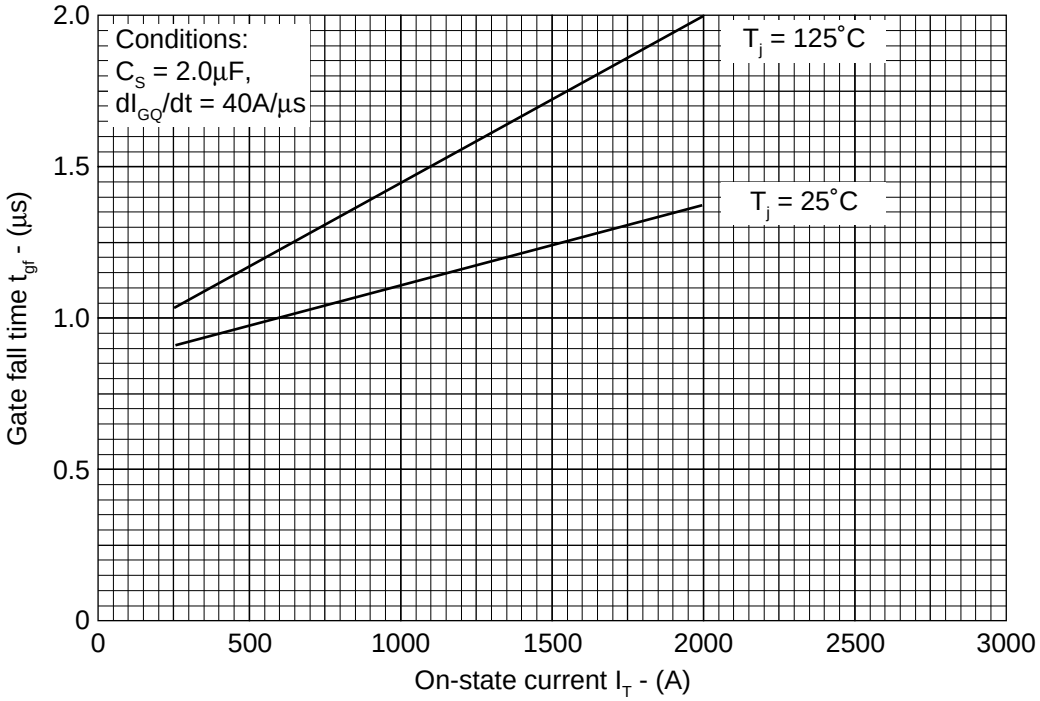


FIG. 22 GATE FALL TIME vs ON-STATE CURRENT

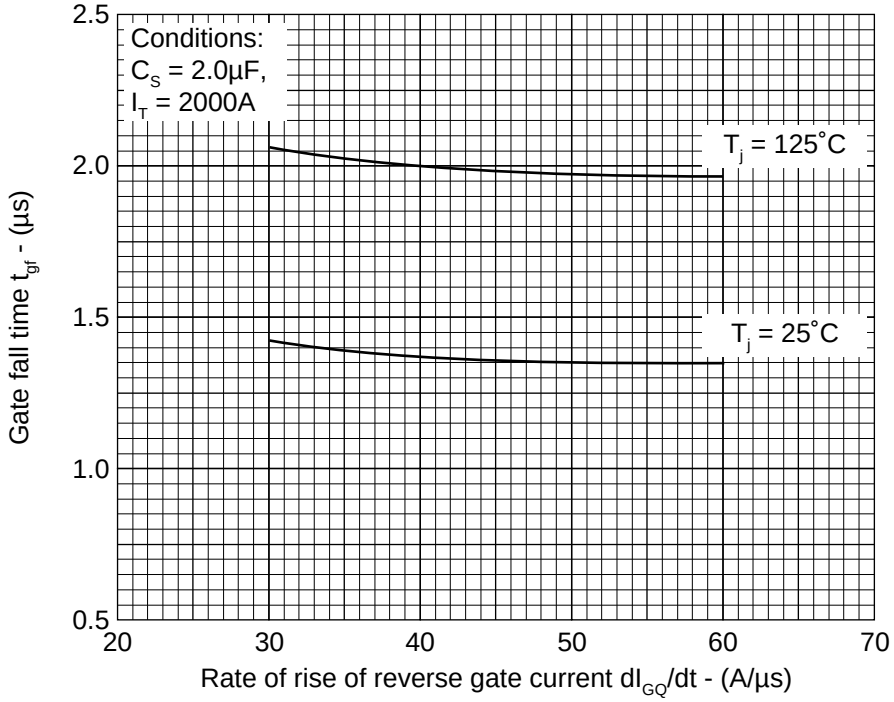


FIG. 23 GATE FALL TIME vs RATE OF RISE OF REVERSE GATE CURRENT

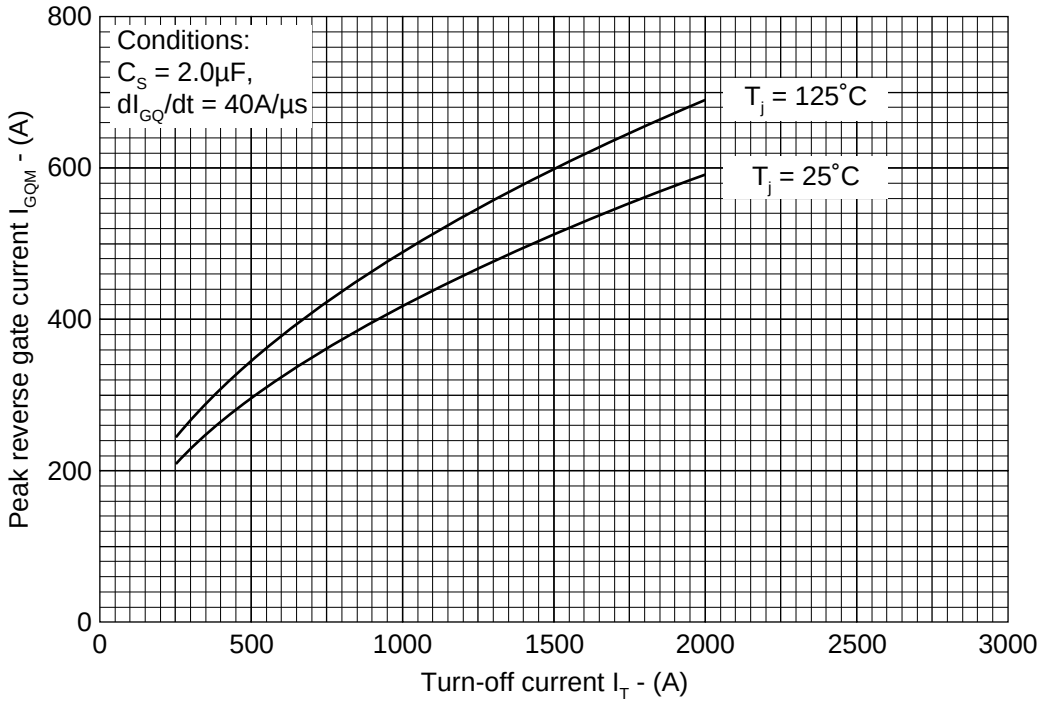


FIG. 24 PEAK REVERSE GATE CURRENT vs TURN-OFF CURRENT

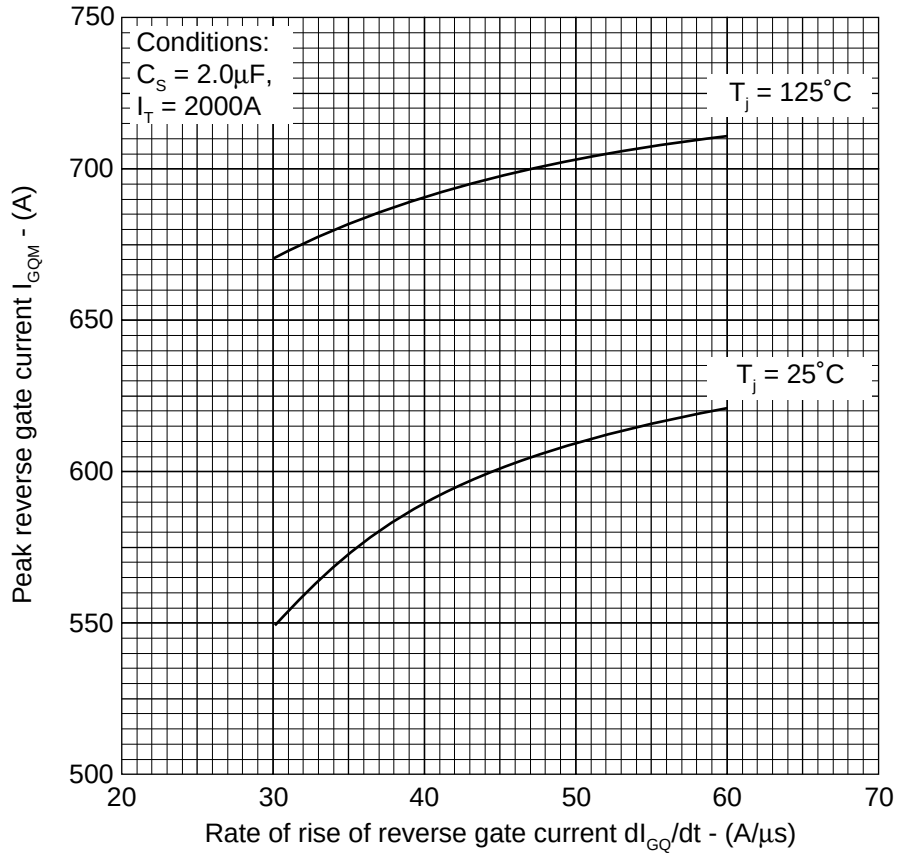


FIG. 25 PEAK REVERSE GATE CURRENT vs RATE OF RISE OF REVERSE GATE CURRENT

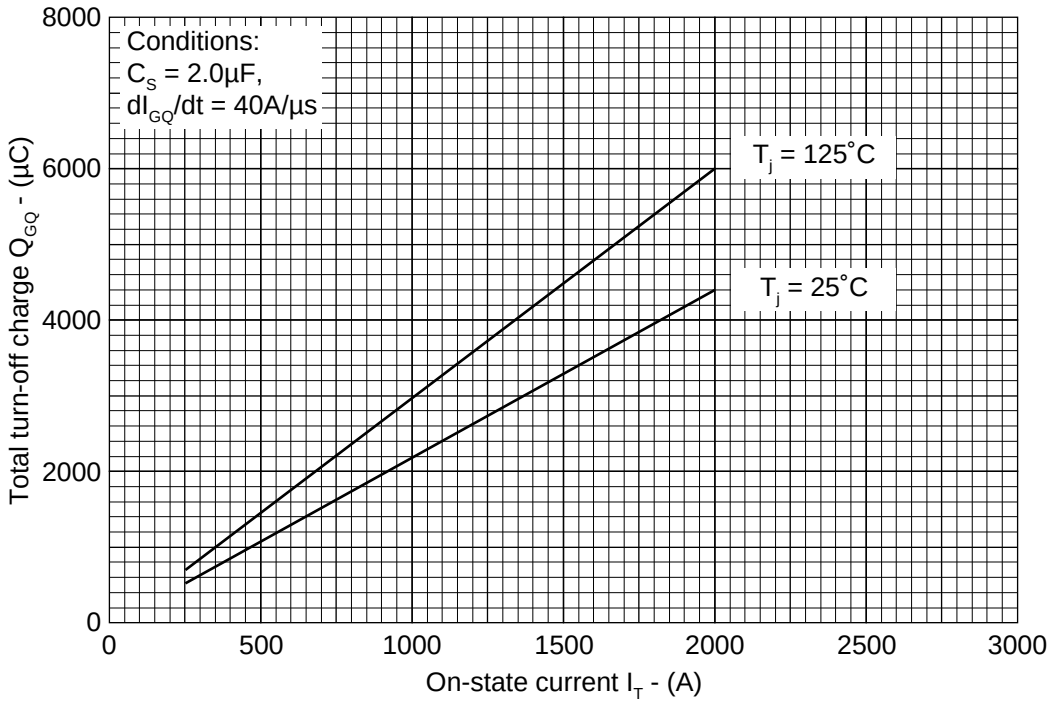


FIG. 26 TURN-OFF GATE CHARGE vs ON-STATE CURRENT

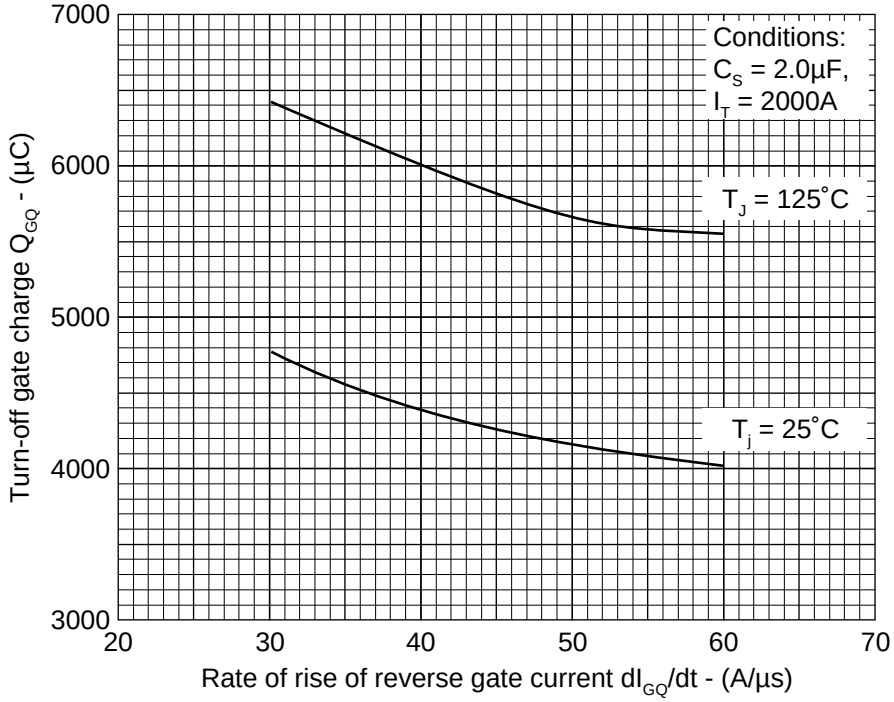


FIG. 27 TURN-OFF GATE CHARGE vs RATE OF RISE OF REVERSE GATE CURRENT

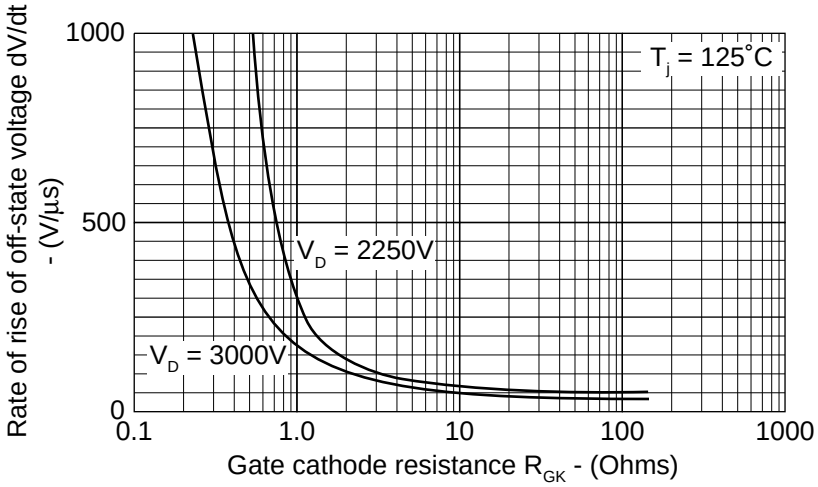
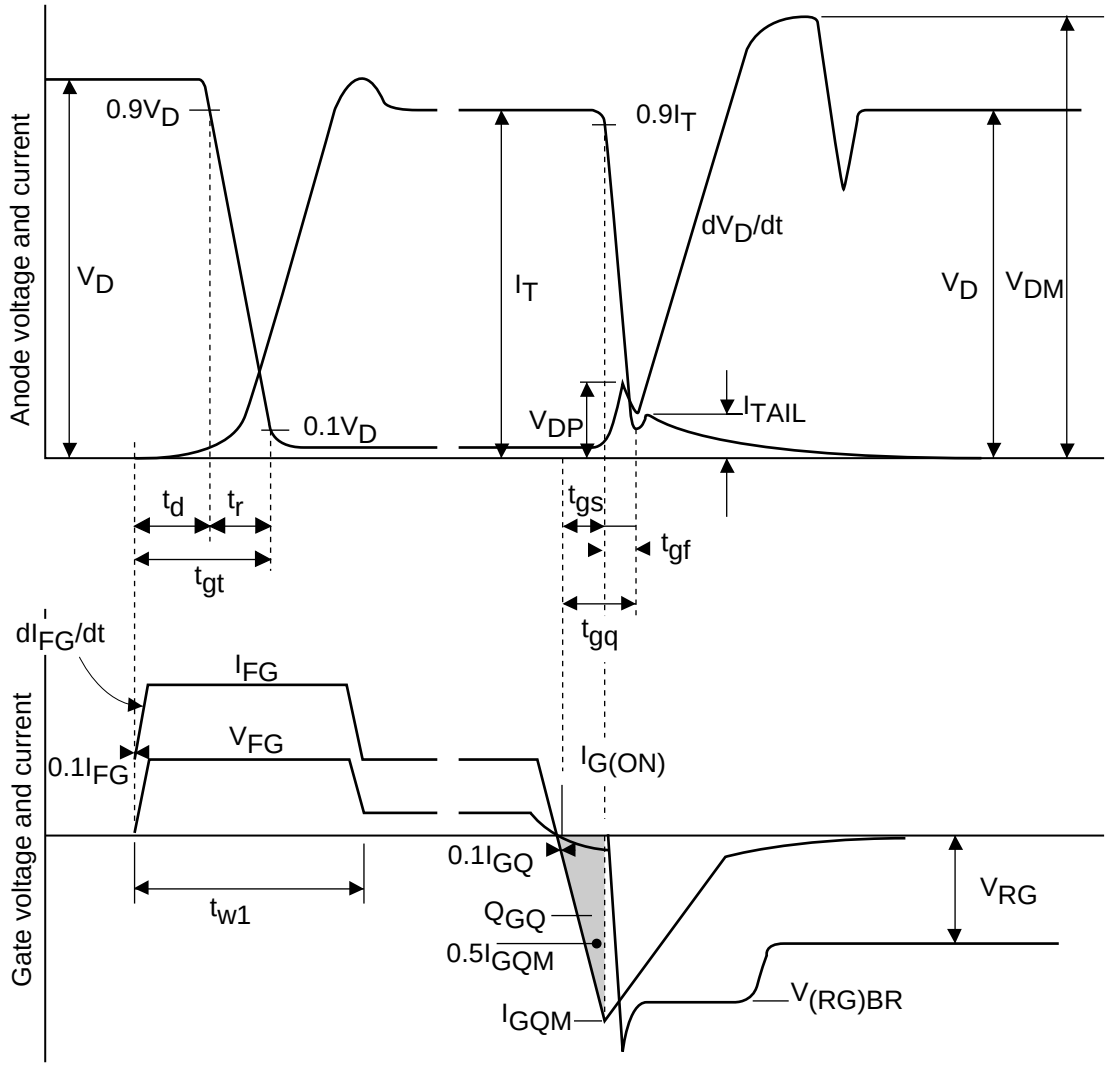


FIG. 28 RATE OF RISE OF OFF-STATE VOLTAGE vs GATE CATHODE RESISTANCE



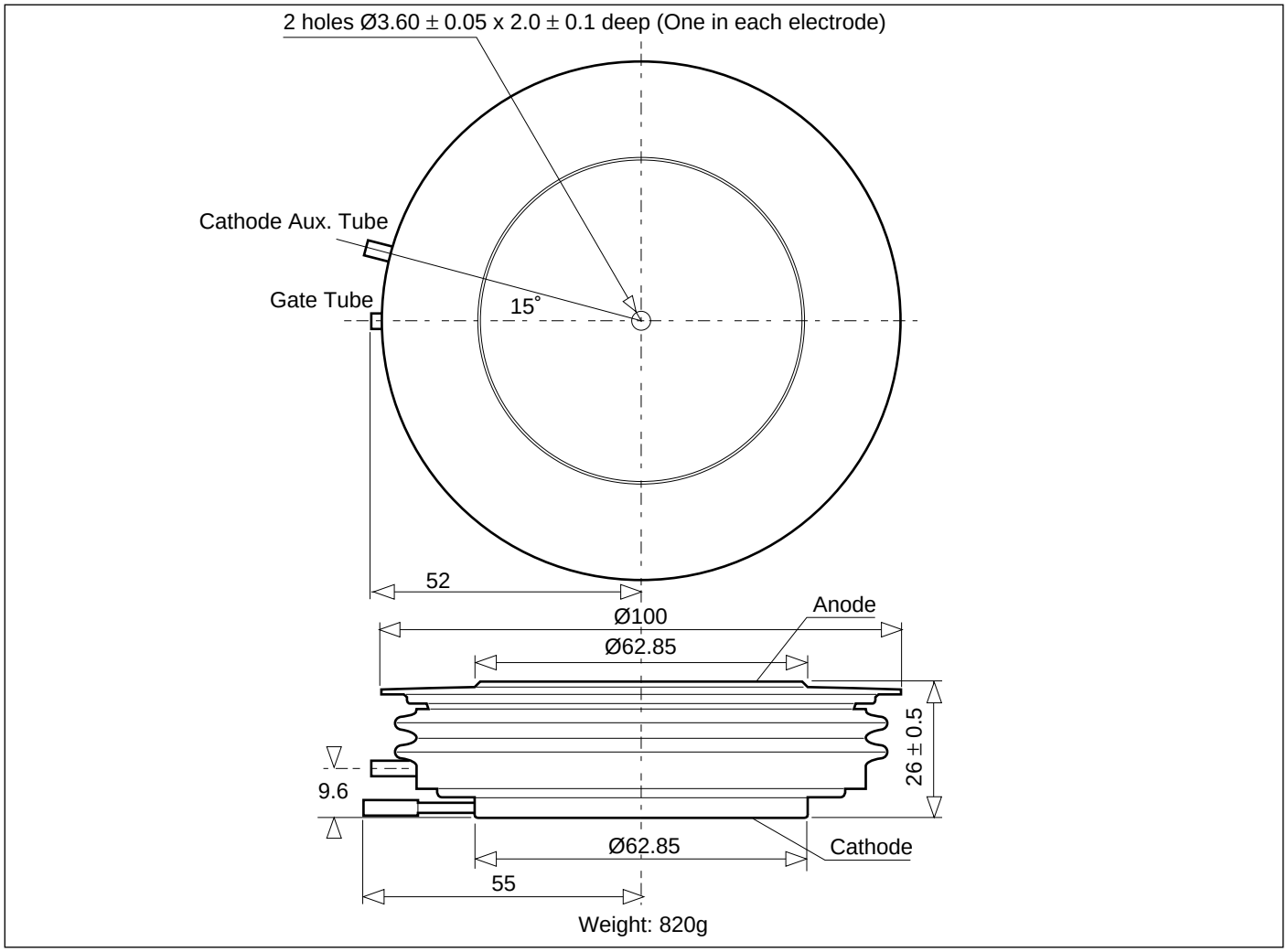
Recommended gate conditions:
I_{TCM} = 2000A
I_{FG} = 30A
$I_{G(ON)}$ = 7A d.c.
$t_{w1(min)}$ = 20µs
I_{GQM} = 690A
di_{GQ}/dt = 40A/µs
Q_{GQ} = 6000µC
$V_{RG(min)}$ = 2V
$V_{RG(max)}$ = 16V

These are recommended GEC Plessey Semiconductor conditions. Other conditions are permitted according to users gate drive specifications.

FIG. 29 GENERAL SWITCHING WAVEFORMS

PACKAGE DETAILS - H

For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



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