JIANGSU YANGJIE RUNAU SEMICONDUCTOR CO.,LTD

High-end Power Semiconductor Manufacturer

CSG20H4500

Gate Turn-off Thyristor

APPLICATION

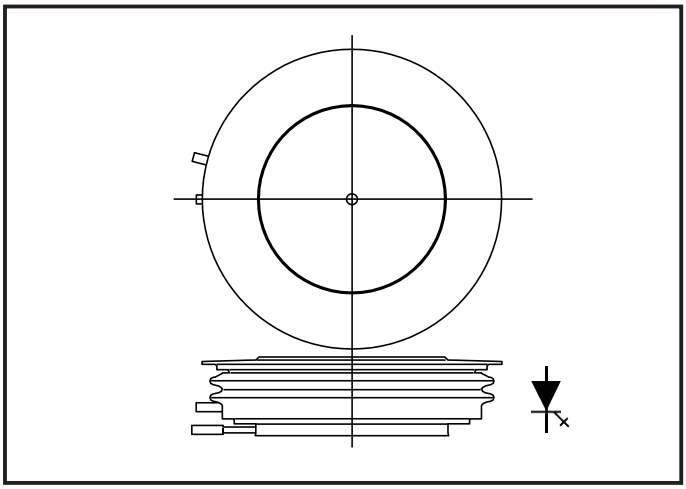
- Variable Speed AC Motor Drive Inverter (VSD-AC)
- UPS
- High Voltage Converter
- Chopper
- Welder
- Induction Heating
- DC / DC Converter

KEY PARAMETERS

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

FEATURES

- Double Sides Cooled
- High Reliability
- High Voltage Capability
- Fast Fuse Protection Not Required
- High Surge Current Capacity
- Excellent Turn-off performance
- Reduce Equipment Size and Weight, Low noise



Outline type code: H.
See Package Details for further information.

VOLTAGE RATINGS

Mode	Repetitive Peak Off-state Voltage V_{DRM}	Repetitive Peak Reverse Voltage V_{RRM}	Test Conditions
CSG20H4500	4500	16	T_{vj} = 125°C, I_{DM} = 50mA, I_{RRM} = 50mA

CURRENT RATINGS

Symbol	Parameter	Test Conditions	Max.	Unit
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	Test Conditions	Max.	Unit
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 = 125°C, di_{GQ}/dt = 40A/μs, Cs = 2.0μF	200	nH

GATE RATINGS

Symbol	Parameter	Test Conditions	Min.	Max.	Unit
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 AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions		Min.	Max.	Unit
$R_{th(j-hs)}$	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

GTO CHARACTERISTICS

T_j = 125°C unless stated otherwise					
Symbol	Parameters	Test Conditions	**Min.**	**Max.**	Unit
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 I_T = 2000A, dI_T/dt = 300A/μs I_{FG} = 30A, rise time < 1.0μs	-	3170	mJ
t_d	Delay time		-	1.35	μs
t_r	Rise time		-	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

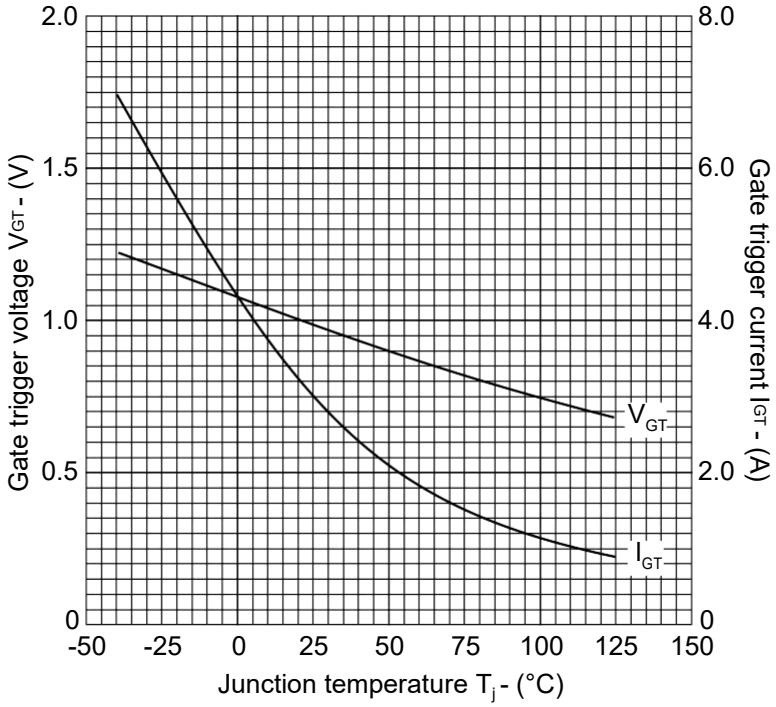


Fig.1 Maximum gate trigger voltage/current vs junction temperature

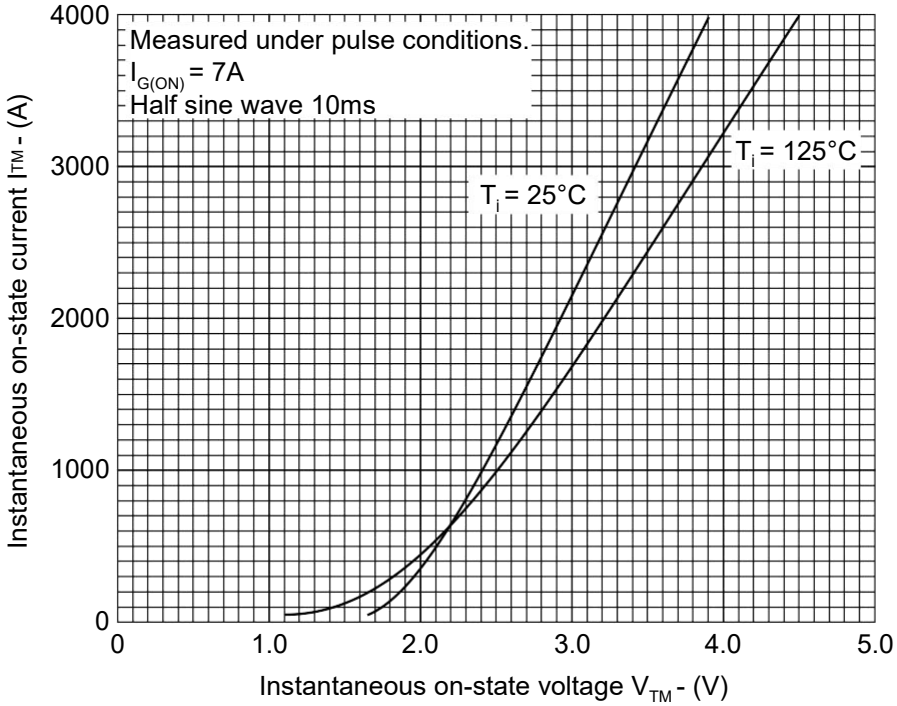


Fig.2 On-state characteristics

CURVES

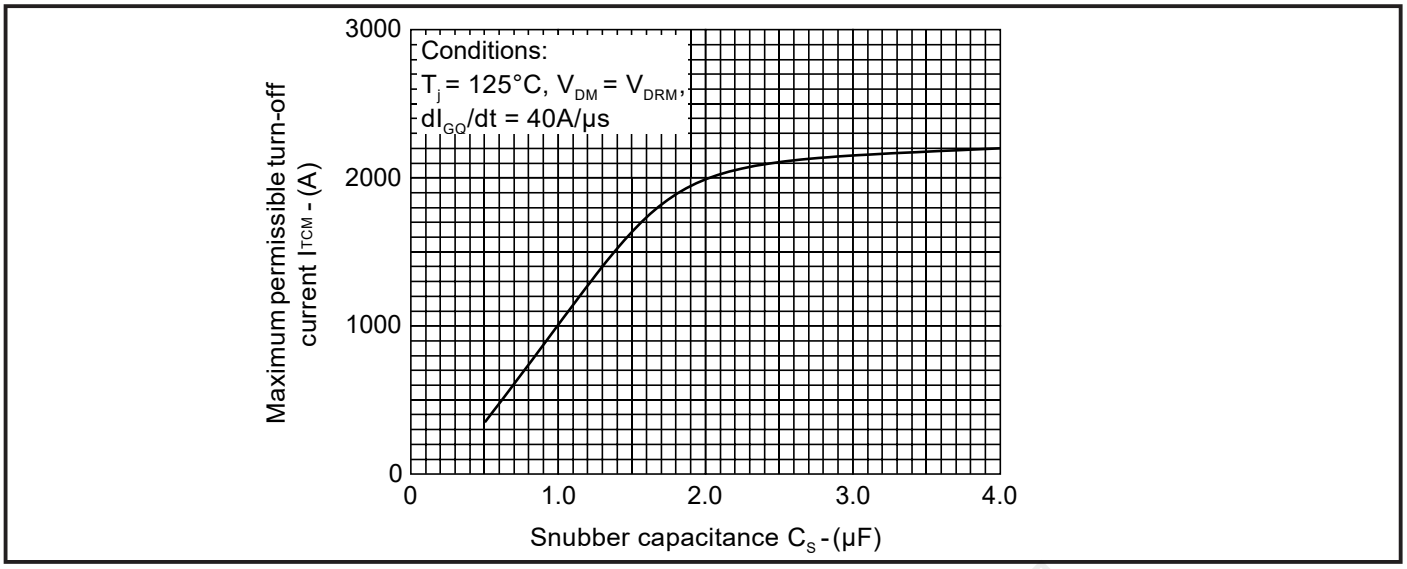


Fig.3 Maximum dependence of I_{TCM} on C_S

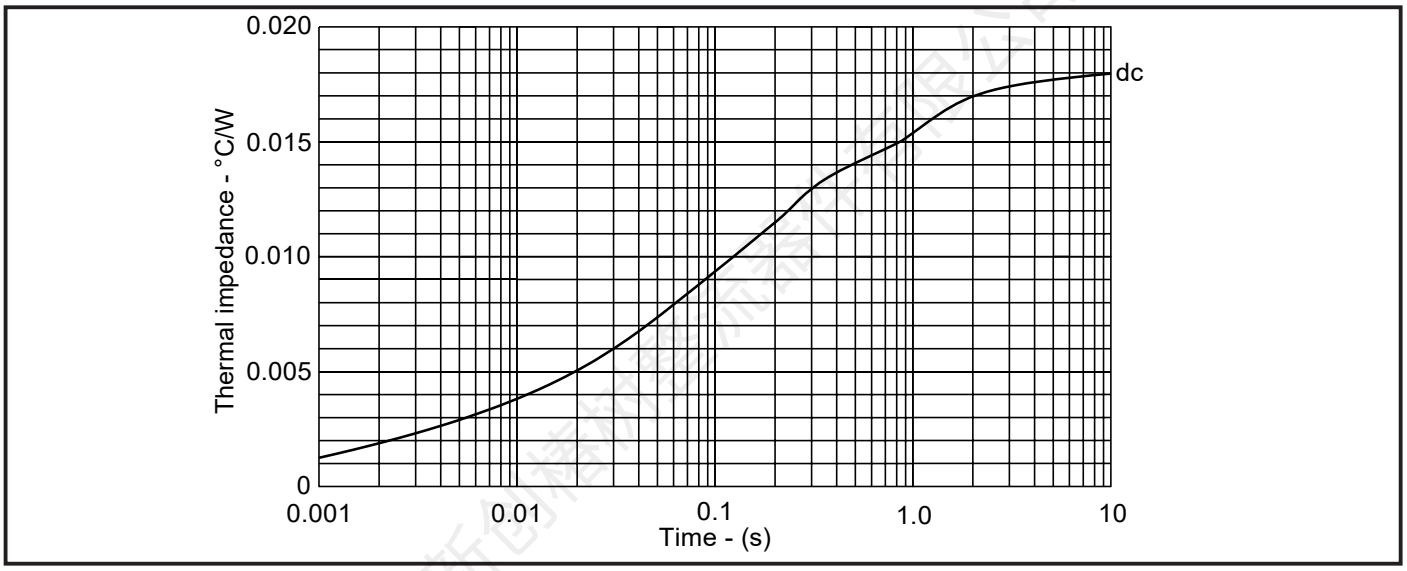


Fig.4 Maximum (limit) transient thermal impedance - double side cooled

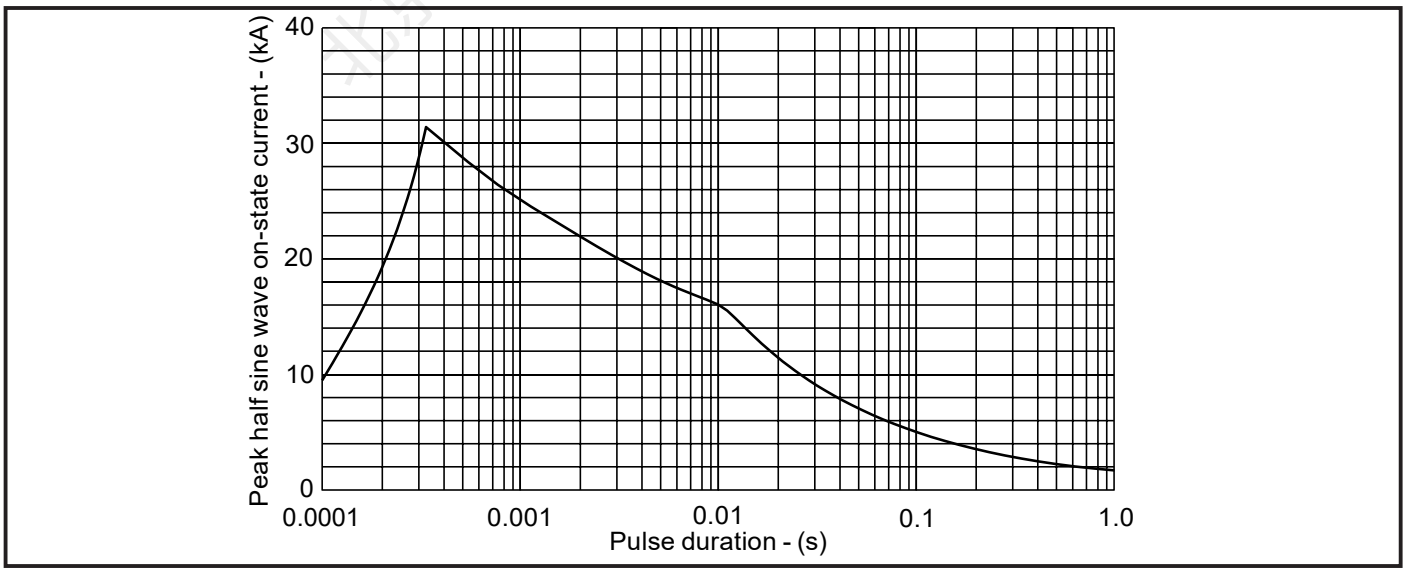


Fig.5 Surge (non-repetitive) on-state current vs time

CURVES

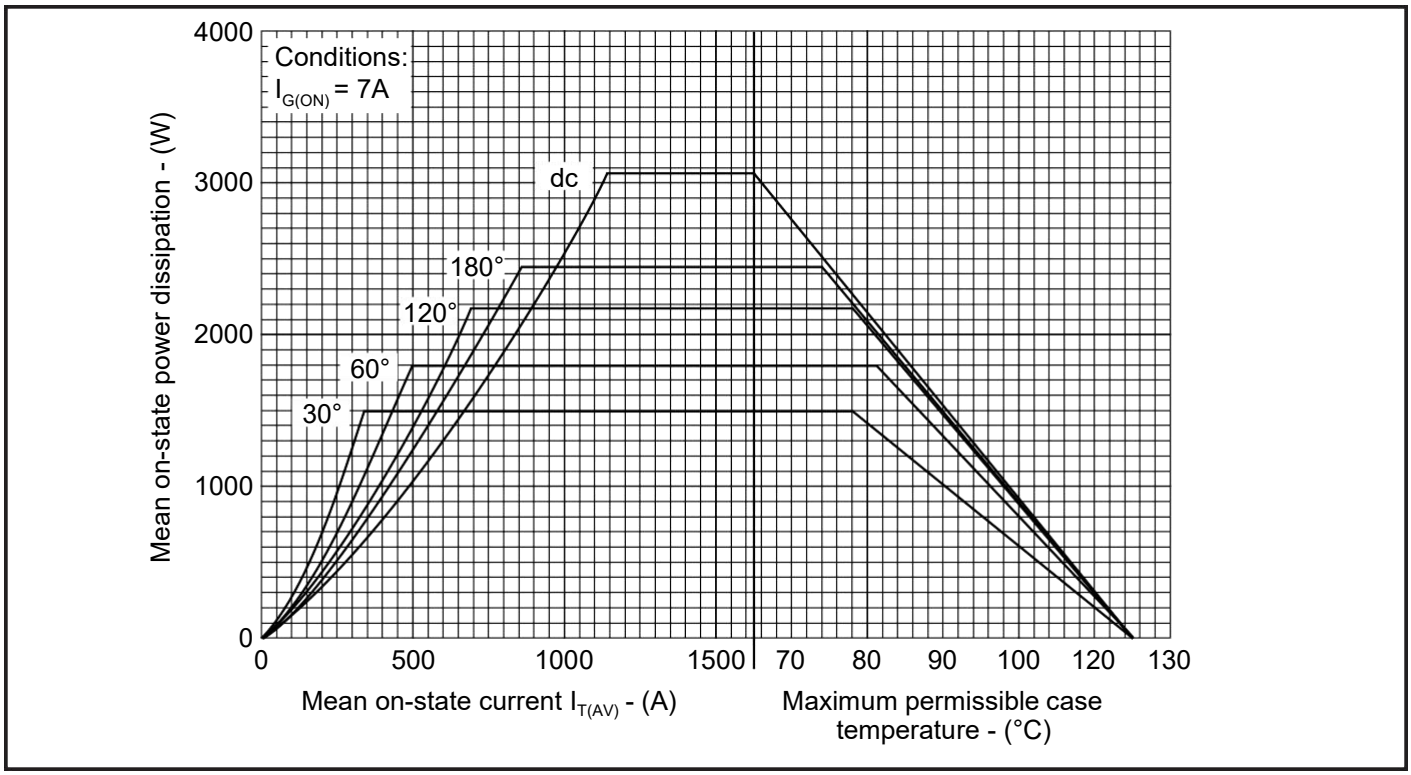


Fig.6 Steady state rectangluar wave conduction loss - double side cooled

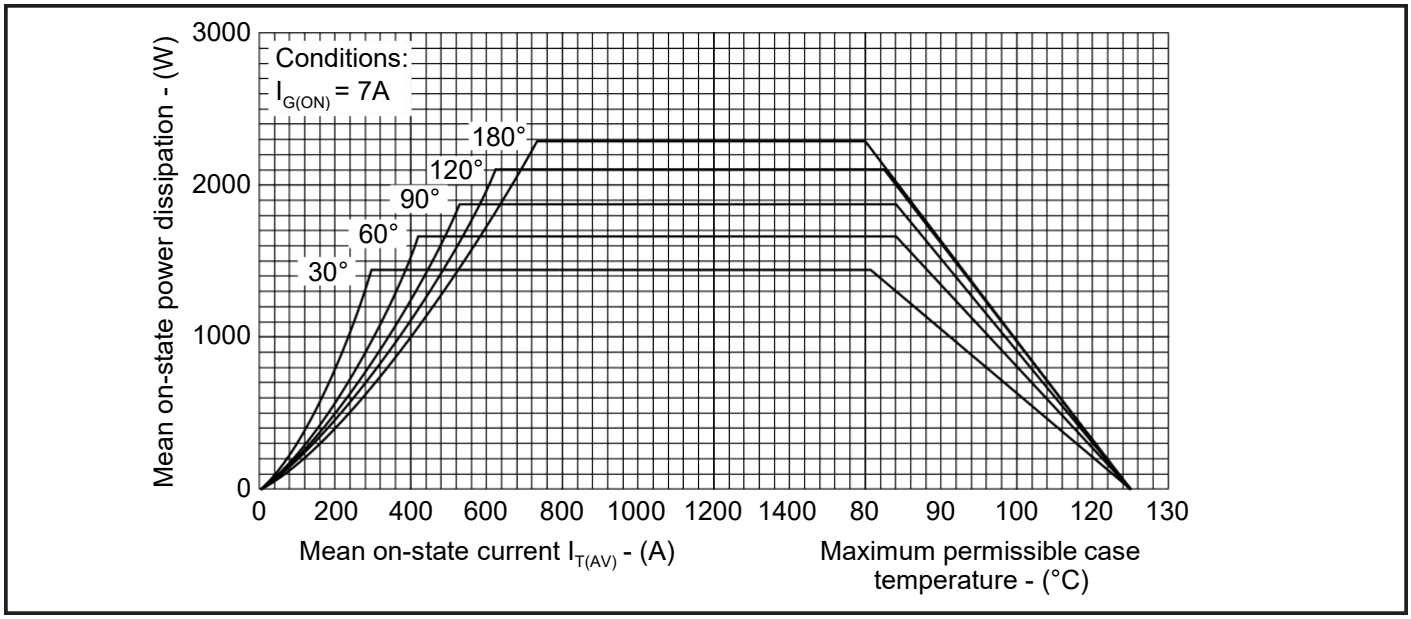


Fig.7 Steady state sinusoidal wave conduction loss - double side cooled

CURVES

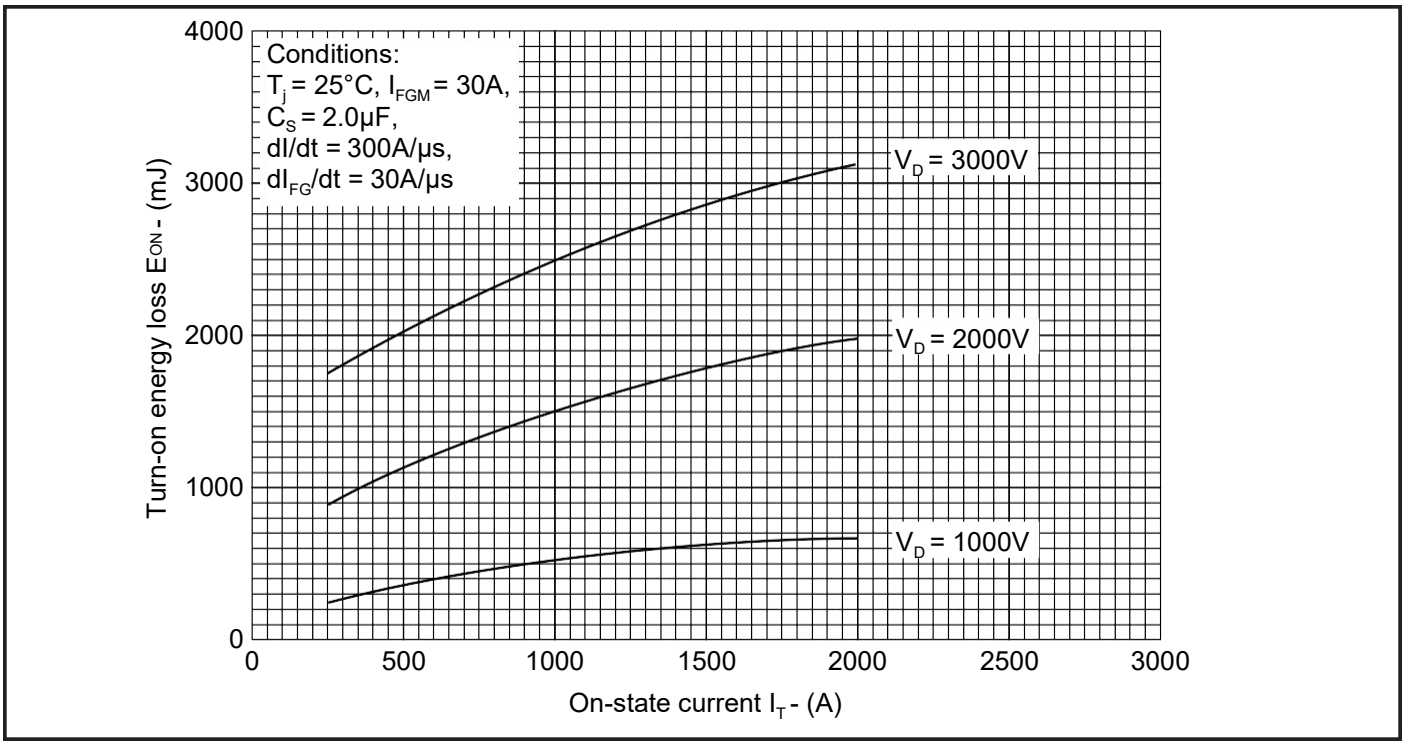


Fig.8 Turn-on energy vs on-state current

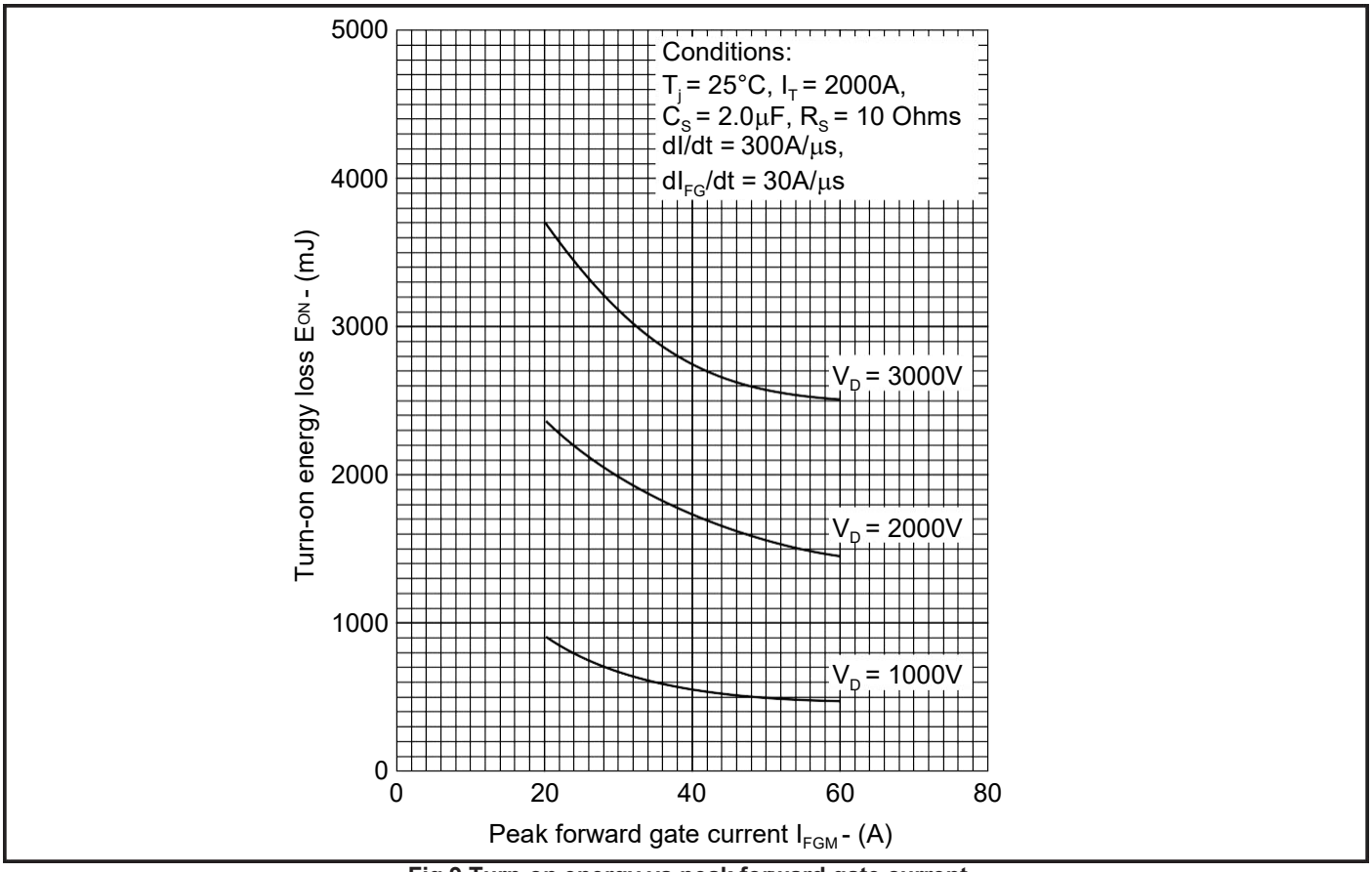


Fig.9 Turn-on energy vs peak forward gate current

CURVES

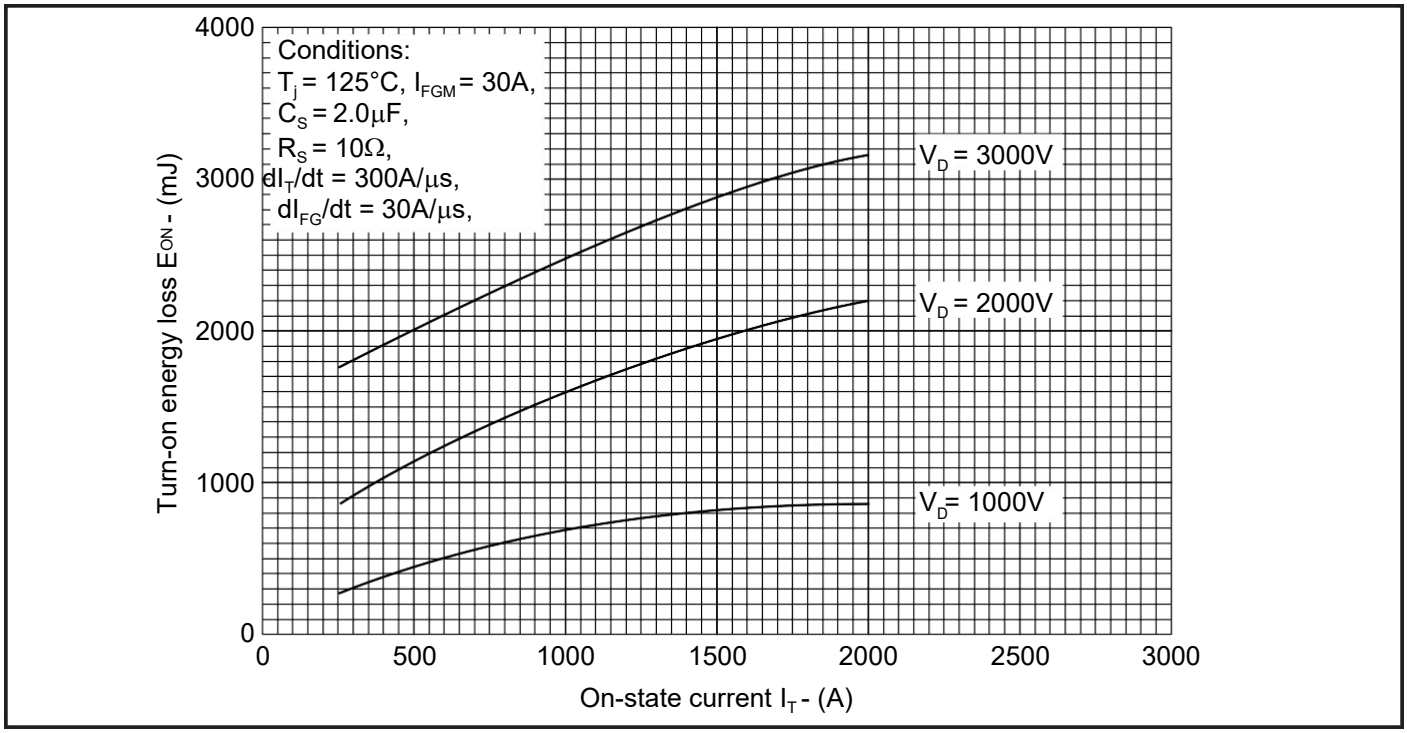


Fig.10 Turn-on energy vs on-state current

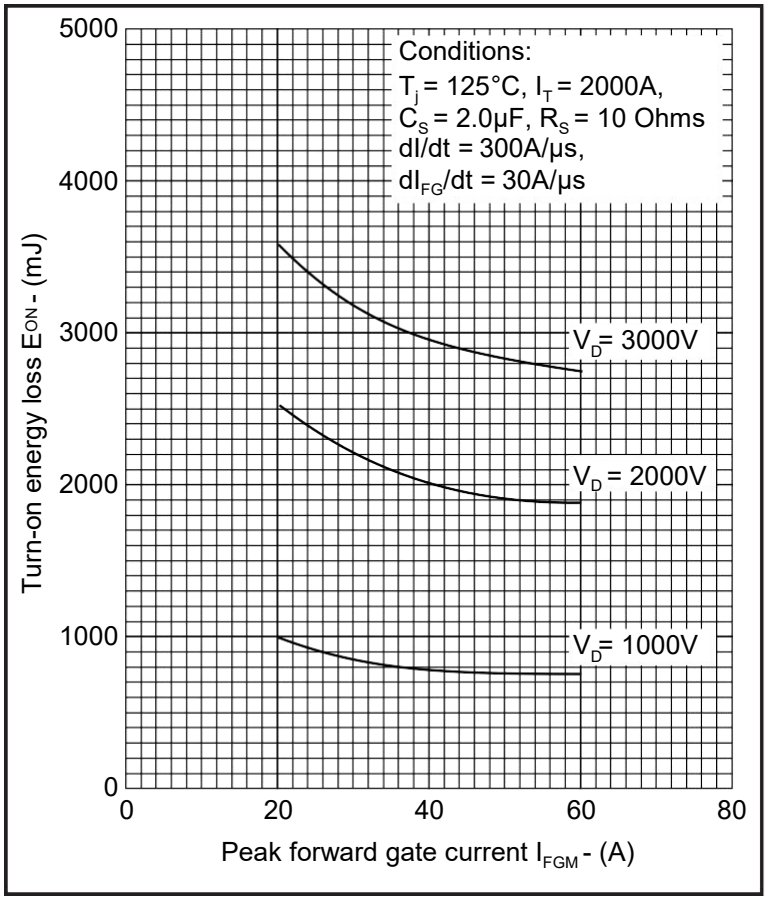


Fig.11 Turn-on energy vs peak forward gate current

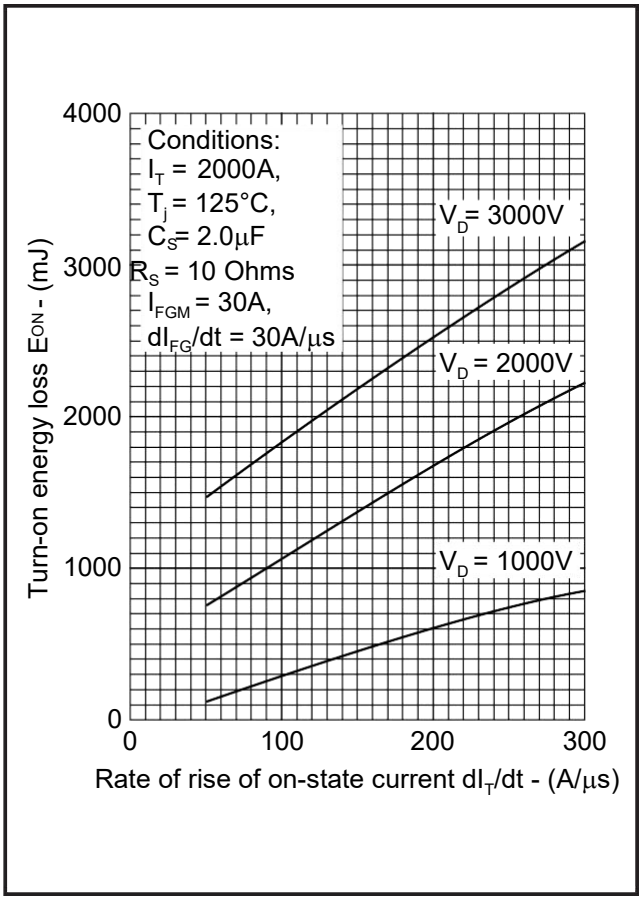


Fig.12 Turn-on energy vs rate of rise of on-state current

CURVES

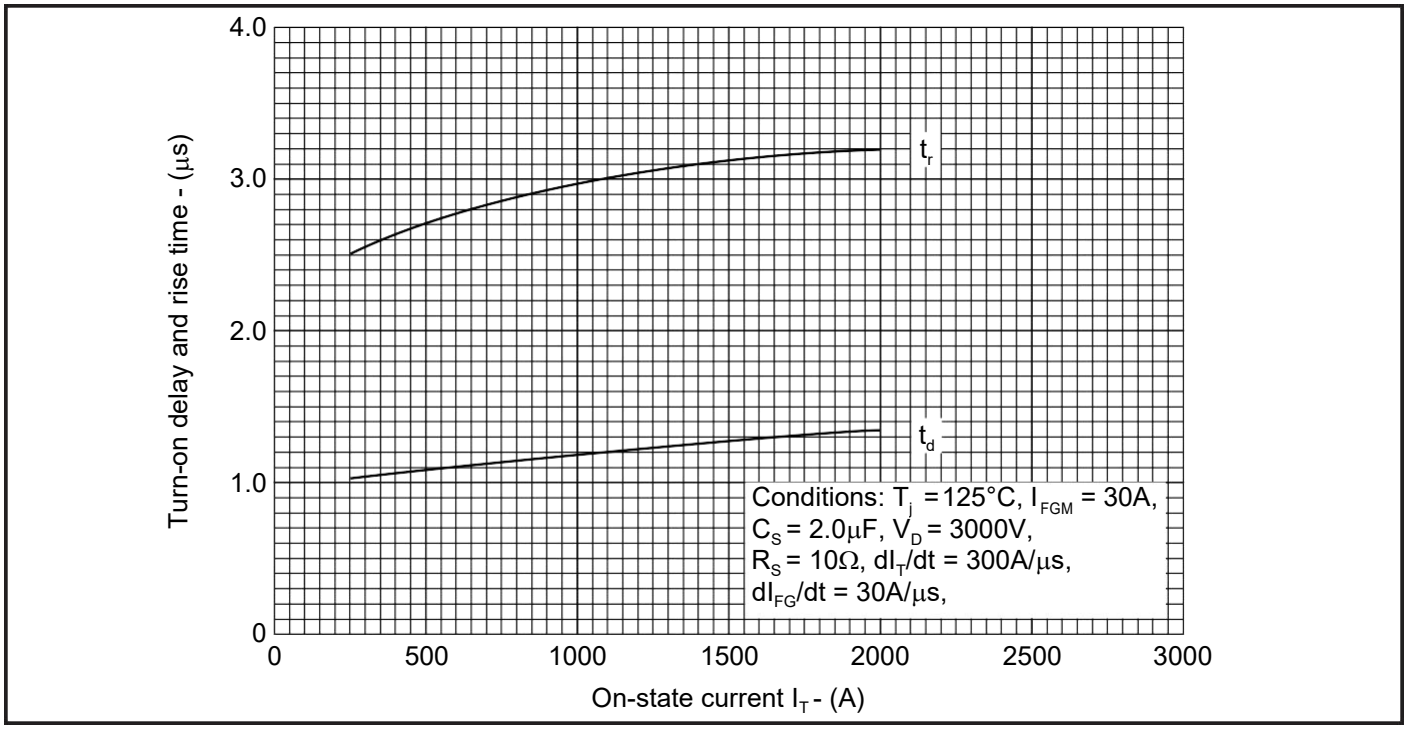


Fig.13 Delay time & rise time vs turn-on current

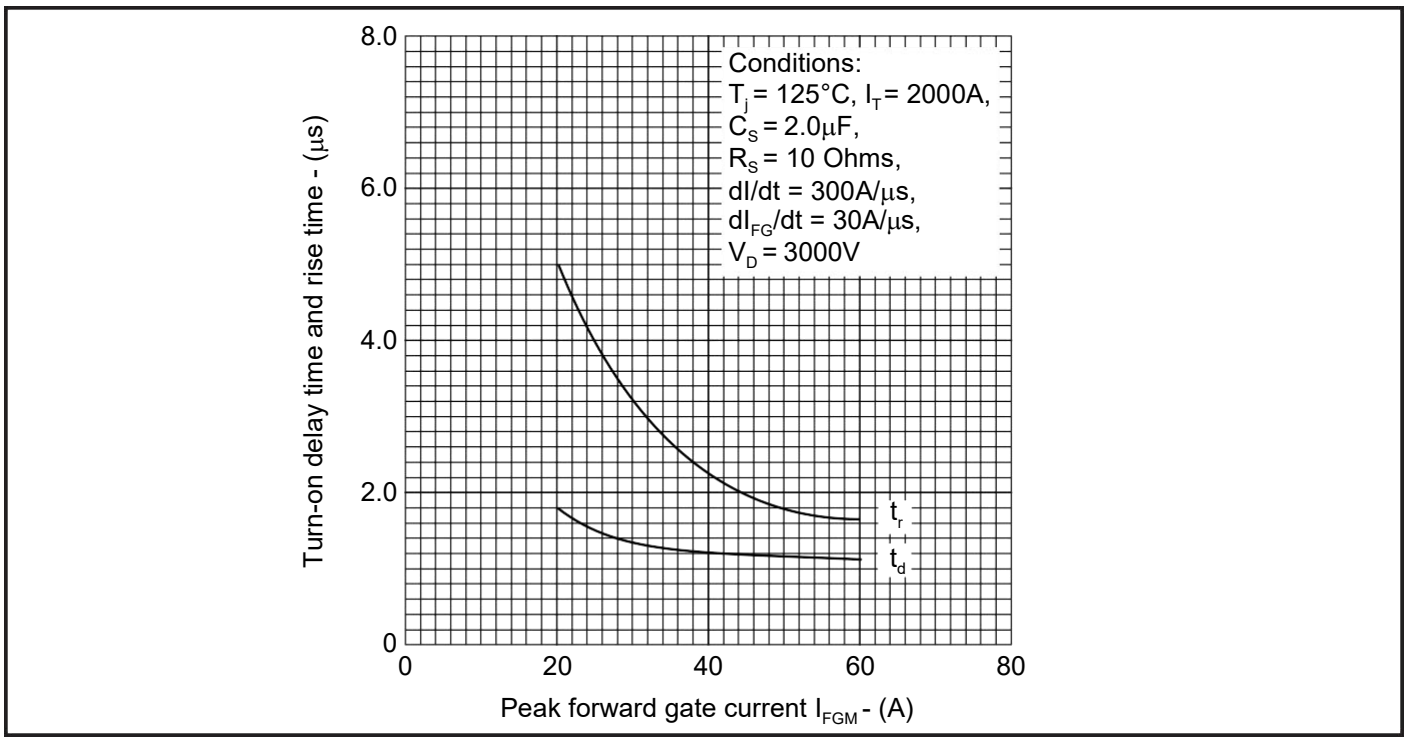


Fig.14 Delay time & rise time vs peak forward gate current

CURVES

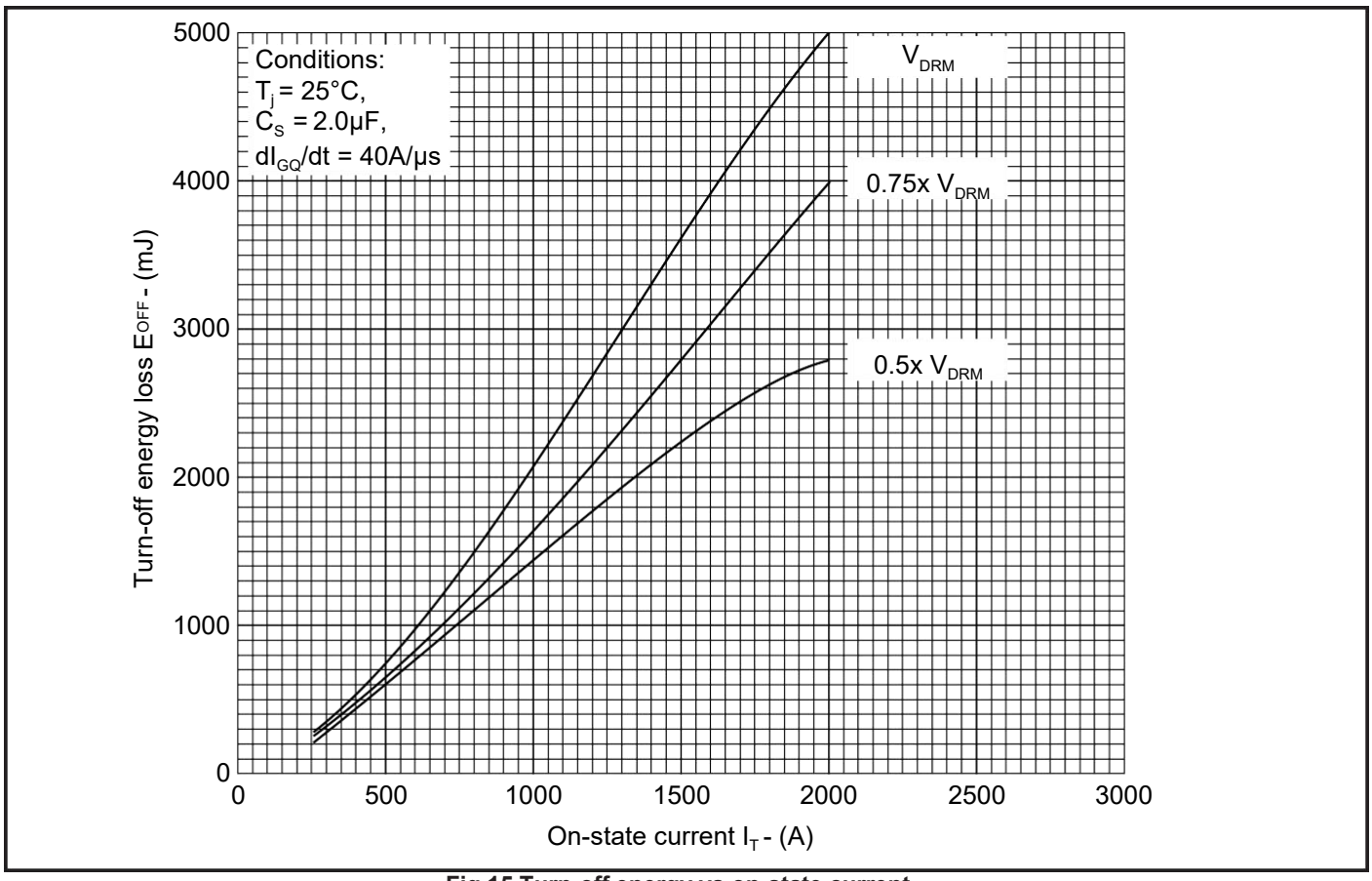


Fig.15 Turn-off energy vs on-state current

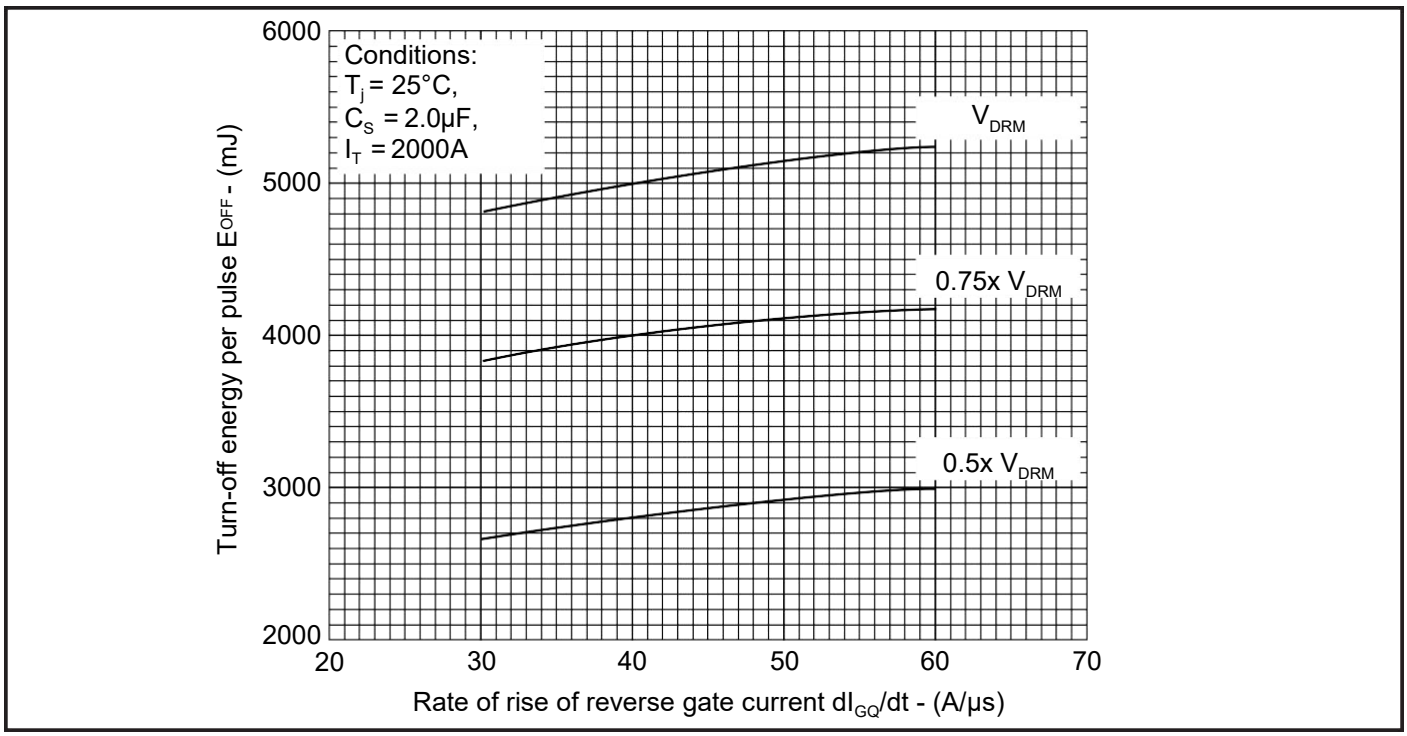


Fig.16 Turn-off energy vs rate of rise of reverse gate current

CURVES

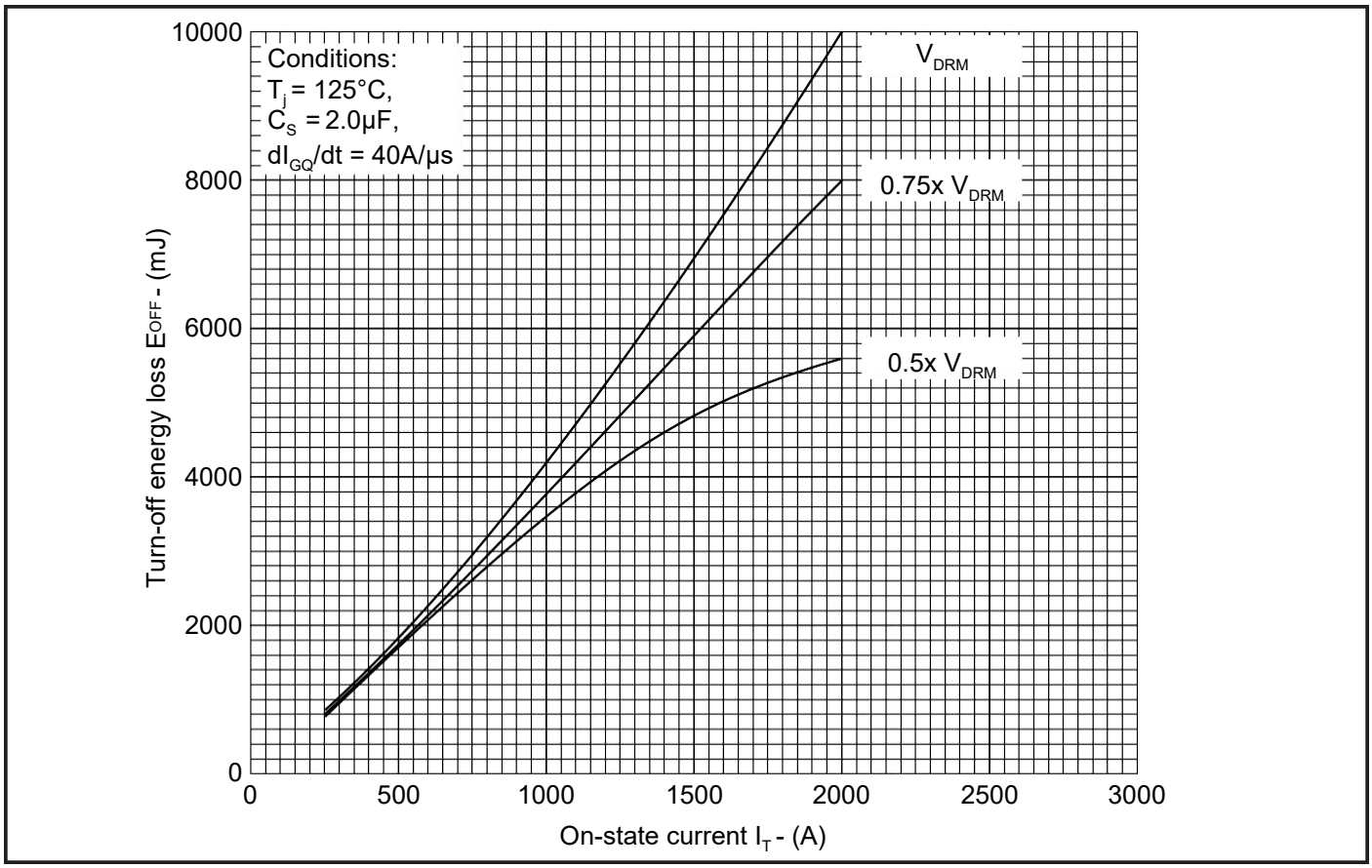


Fig.17 Turn-off energy vs on-state current

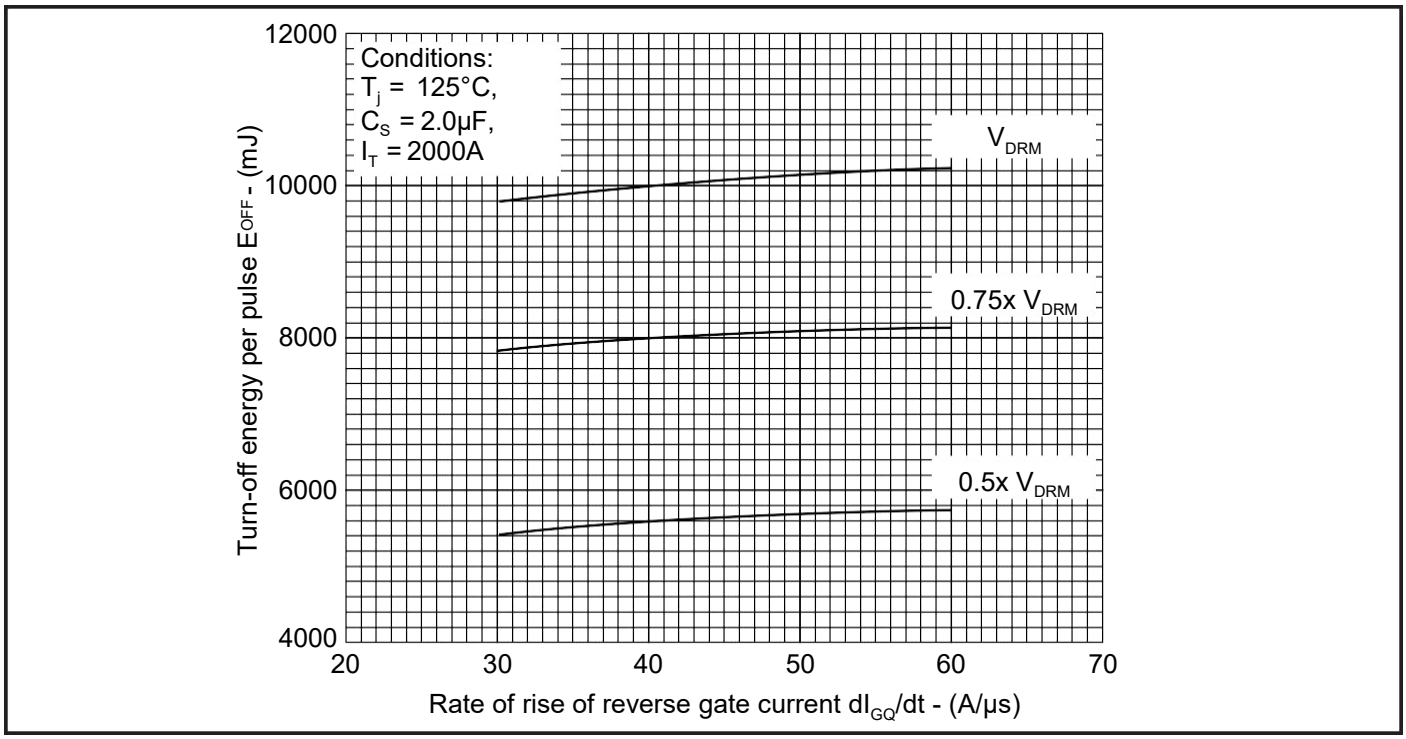


Fig.18 Turn-off energy loss vs rate of rise of reverse gate current

CURVES

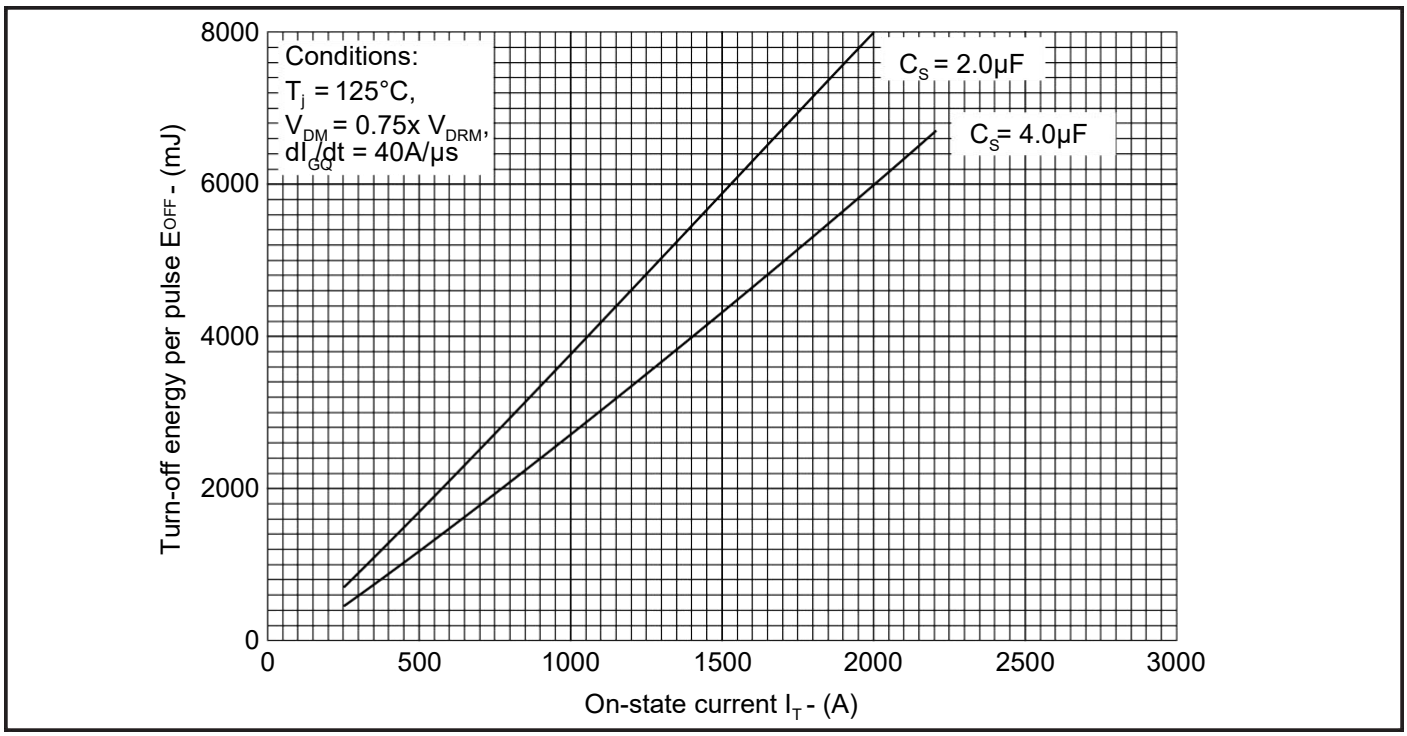


Fig.19 Turn-off energy vs on-state current

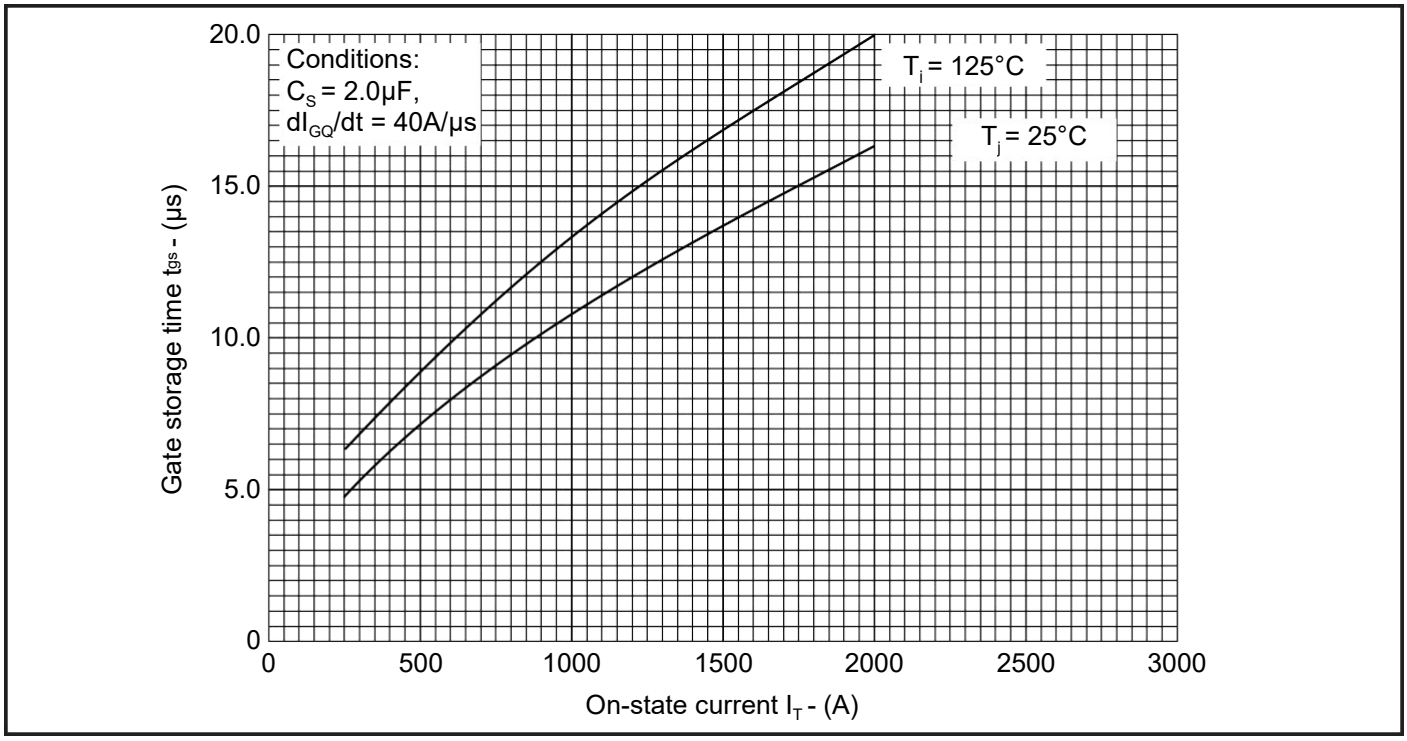


Fig.20 Gate storage time vs on-state current

CURVES

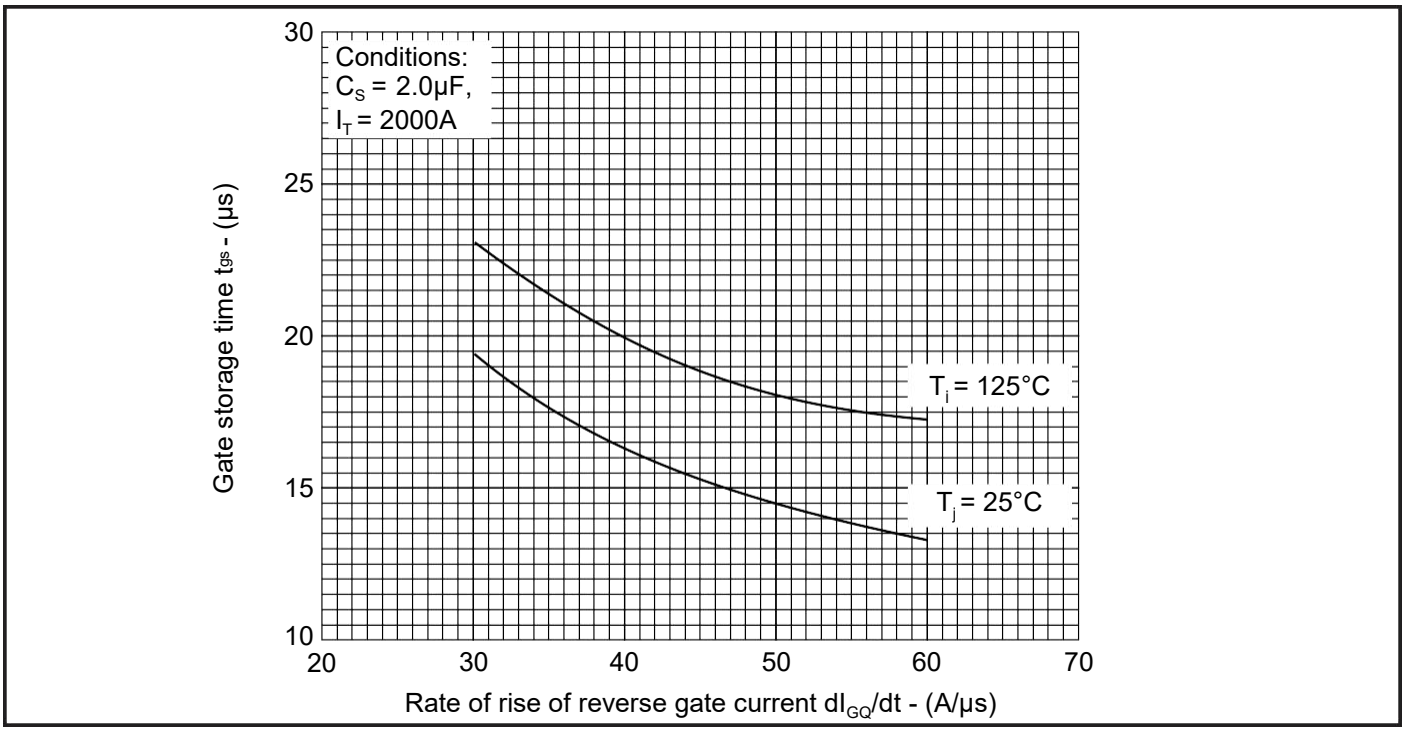


Fig.21 Gate storage time vs rate of rise of reverse gate current

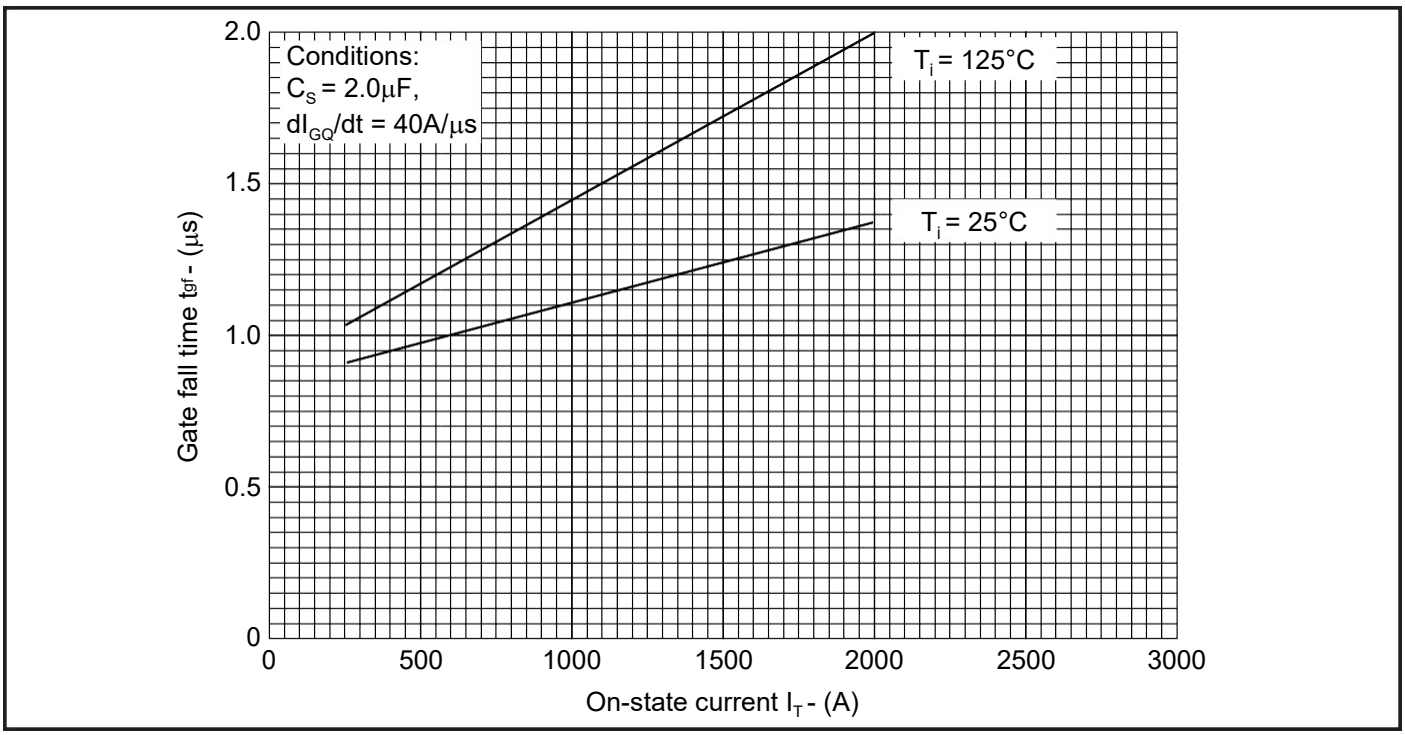


Fig.22 Gate fall time vs on-state current

CURVES

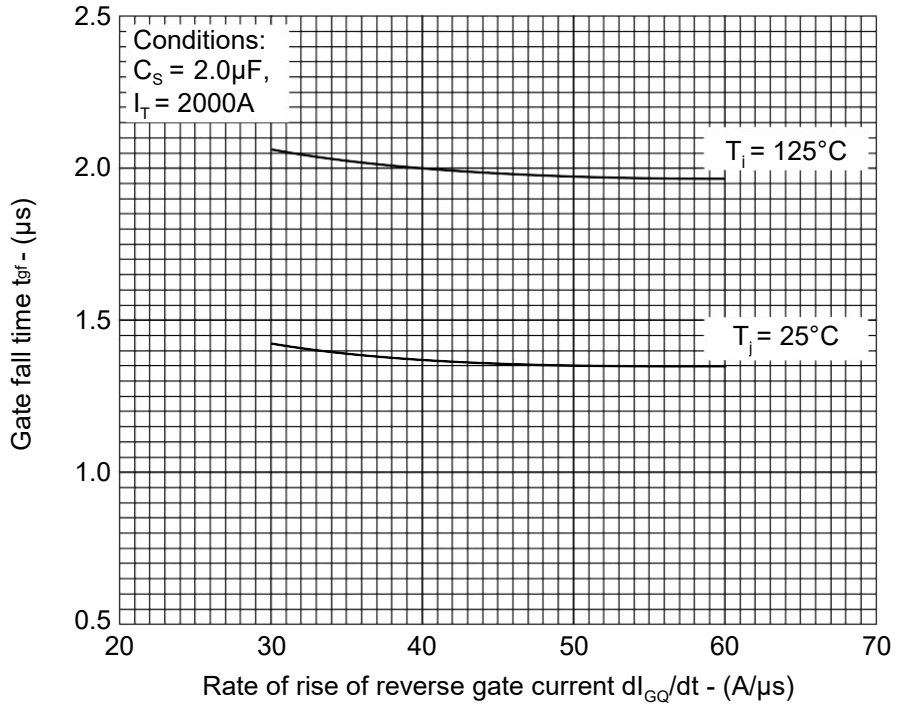


Fig.23 Gate fall time vs rate of rise of reverse gate current

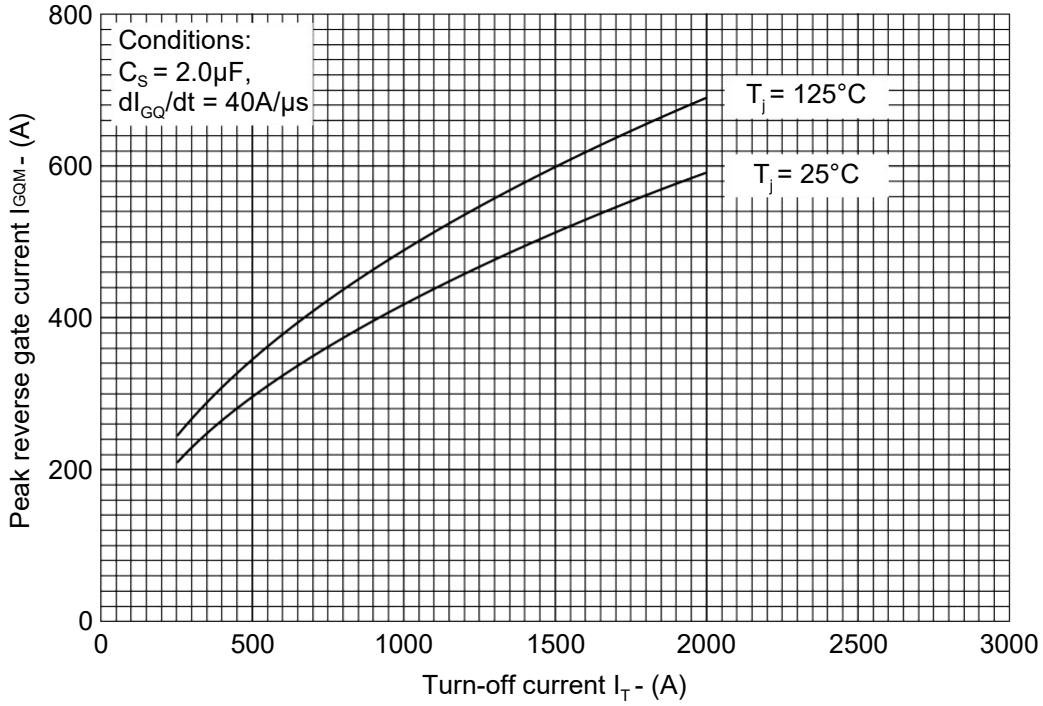


Fig.24 Peak reverse gate current vs turn-off current

CURVES

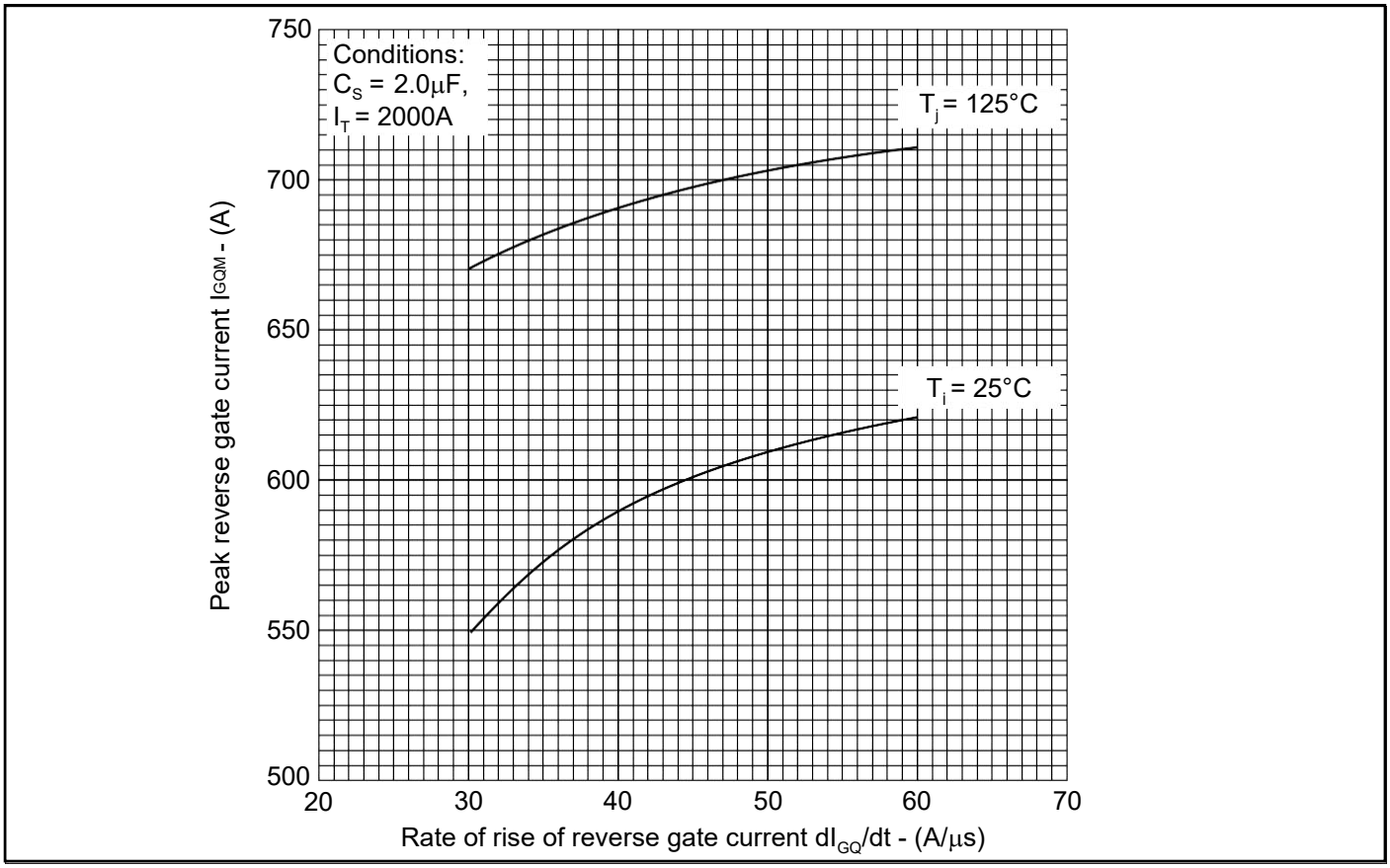


Fig.25 Peak reverse gate current vs rate of rise of reversegate current

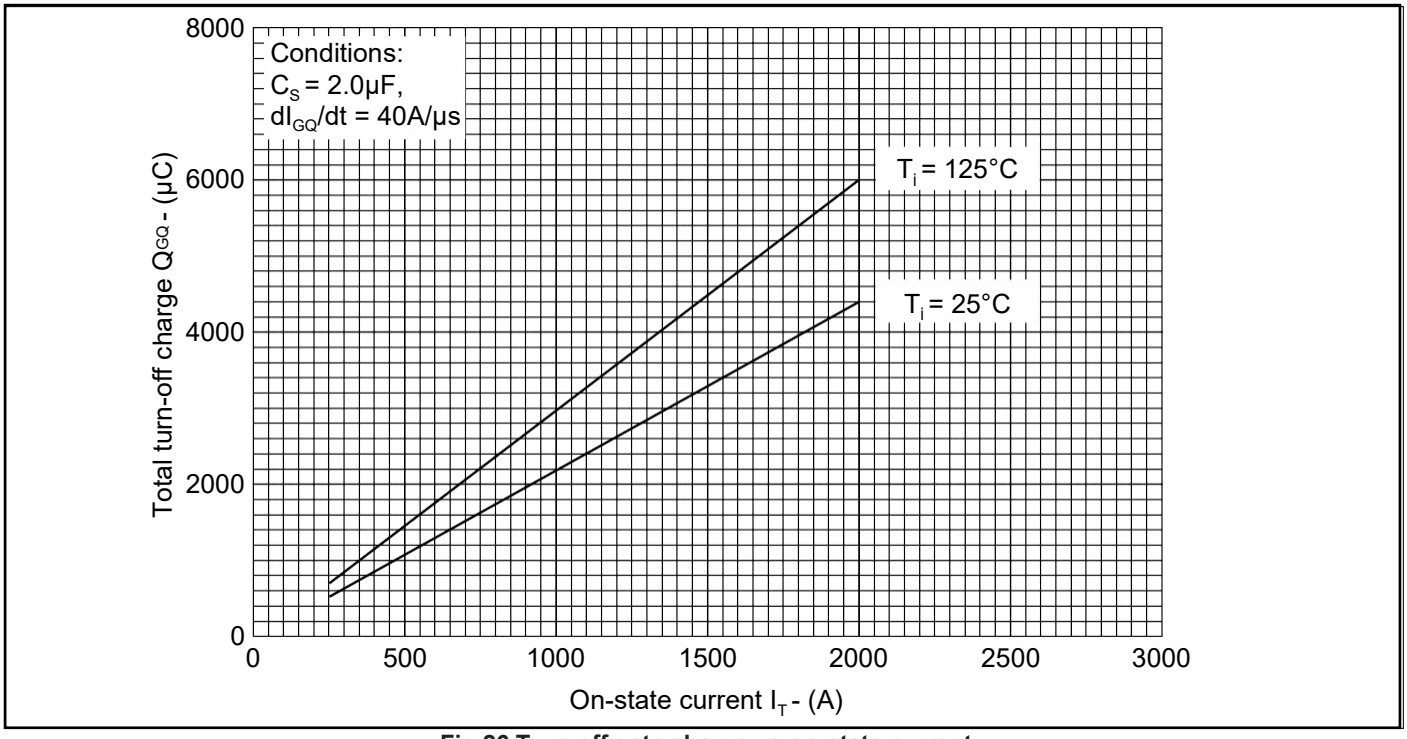


Fig.26 Turn-off gate charge vs on-state current

CURVES

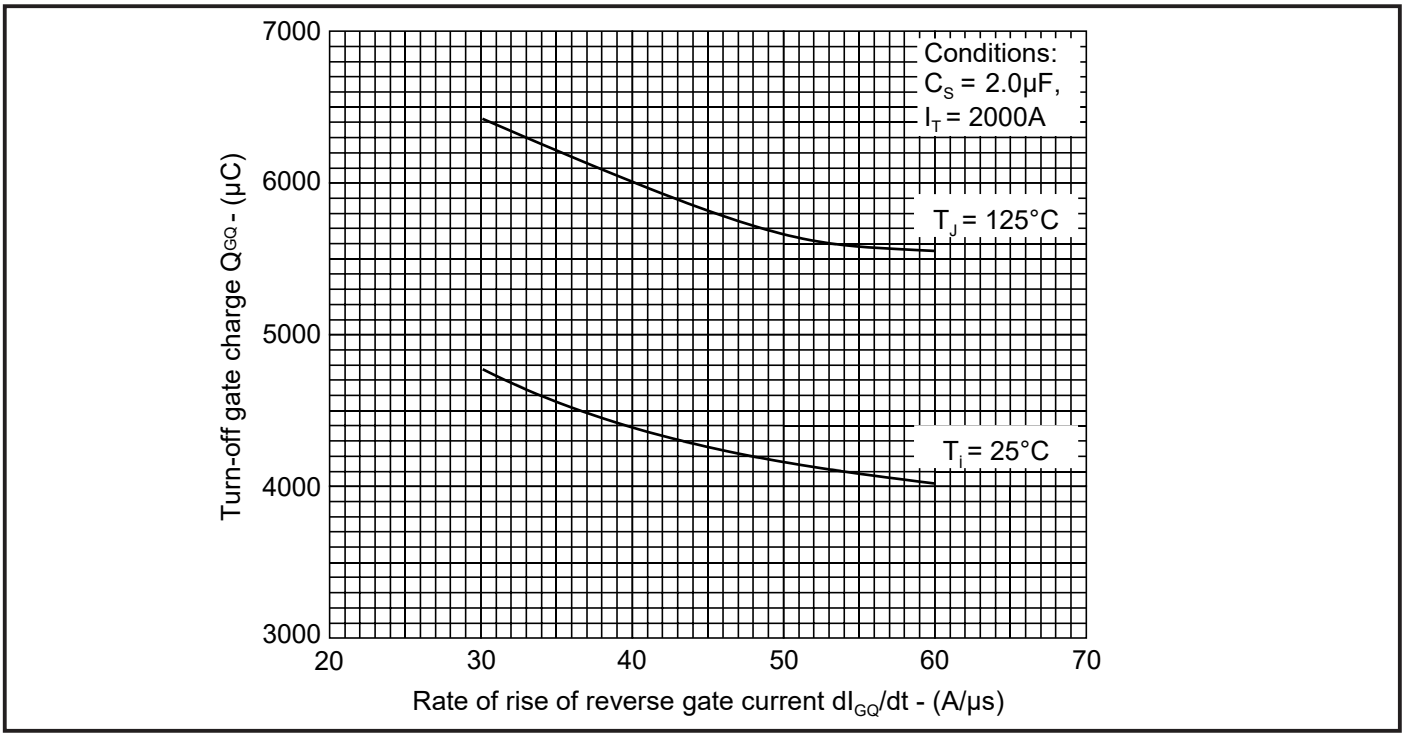


Fig.27 Turn-off gate charge vs rate of rise of reverse gate current

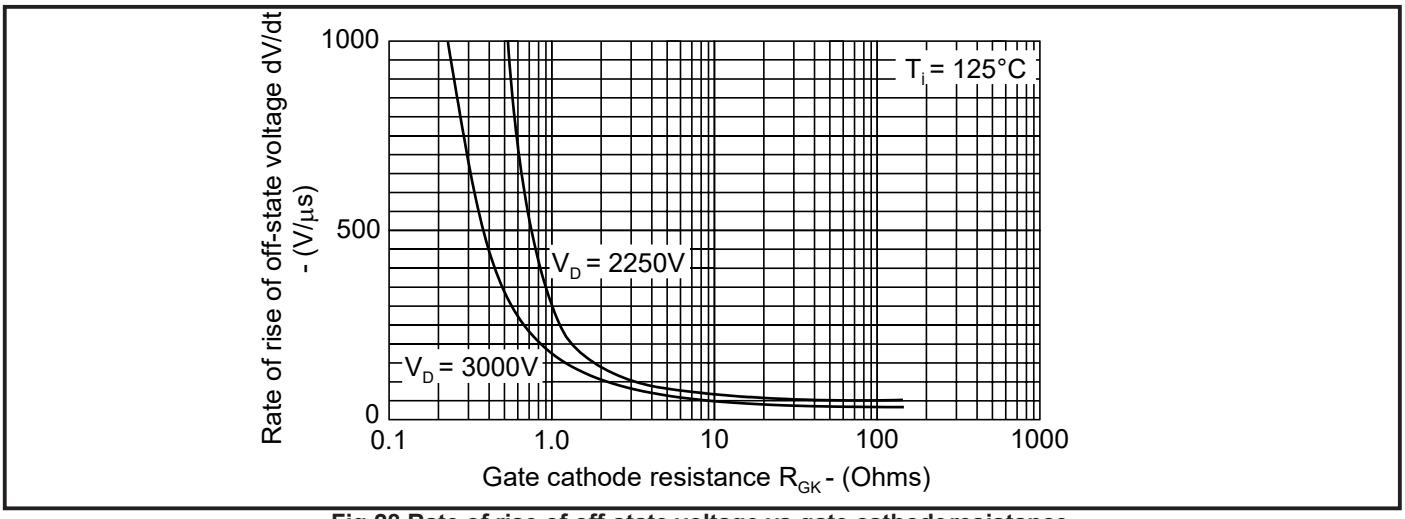
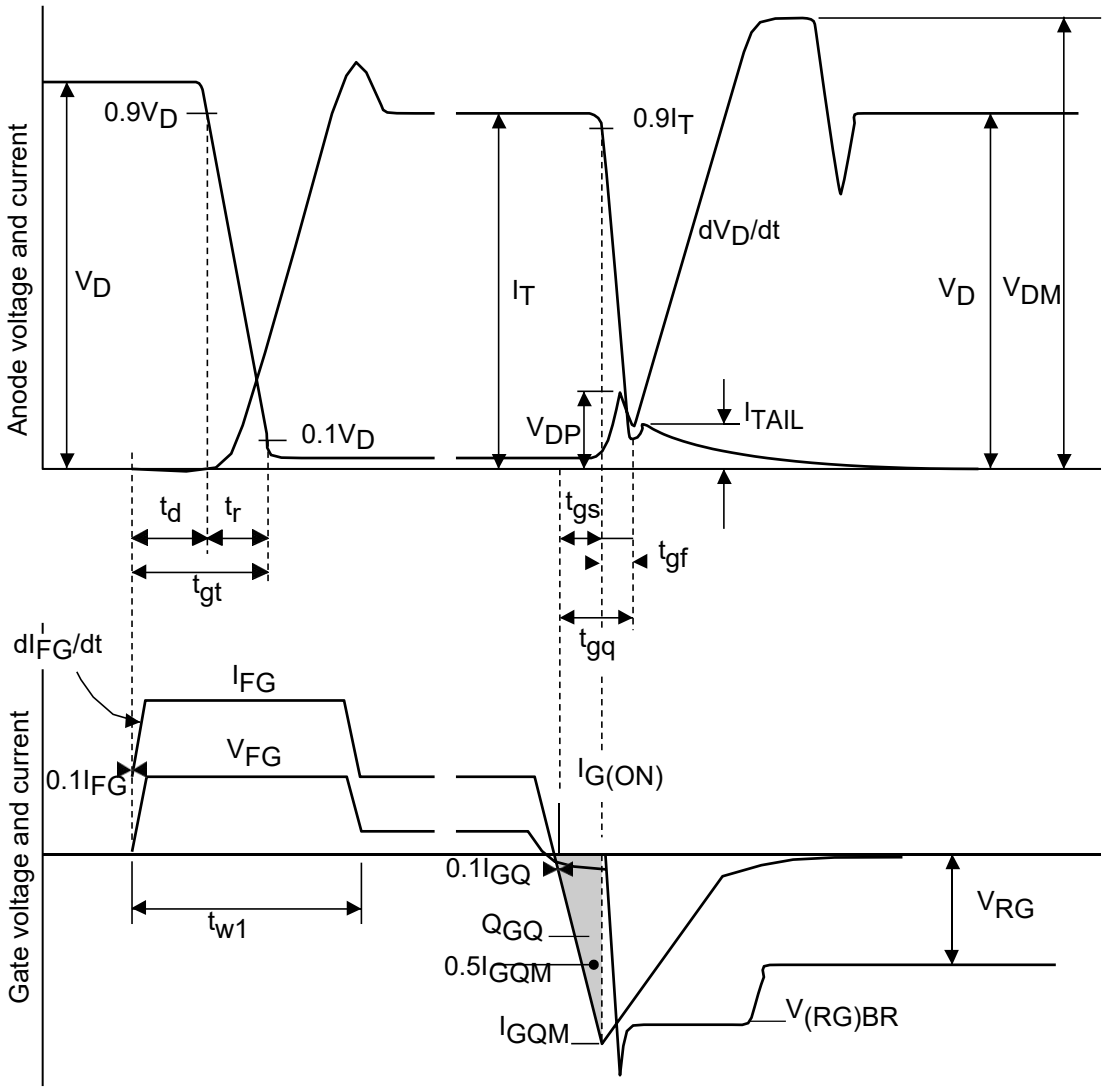


Fig.28 Rate of rise of off-state voltage vs gate cathode resistance

CURVES

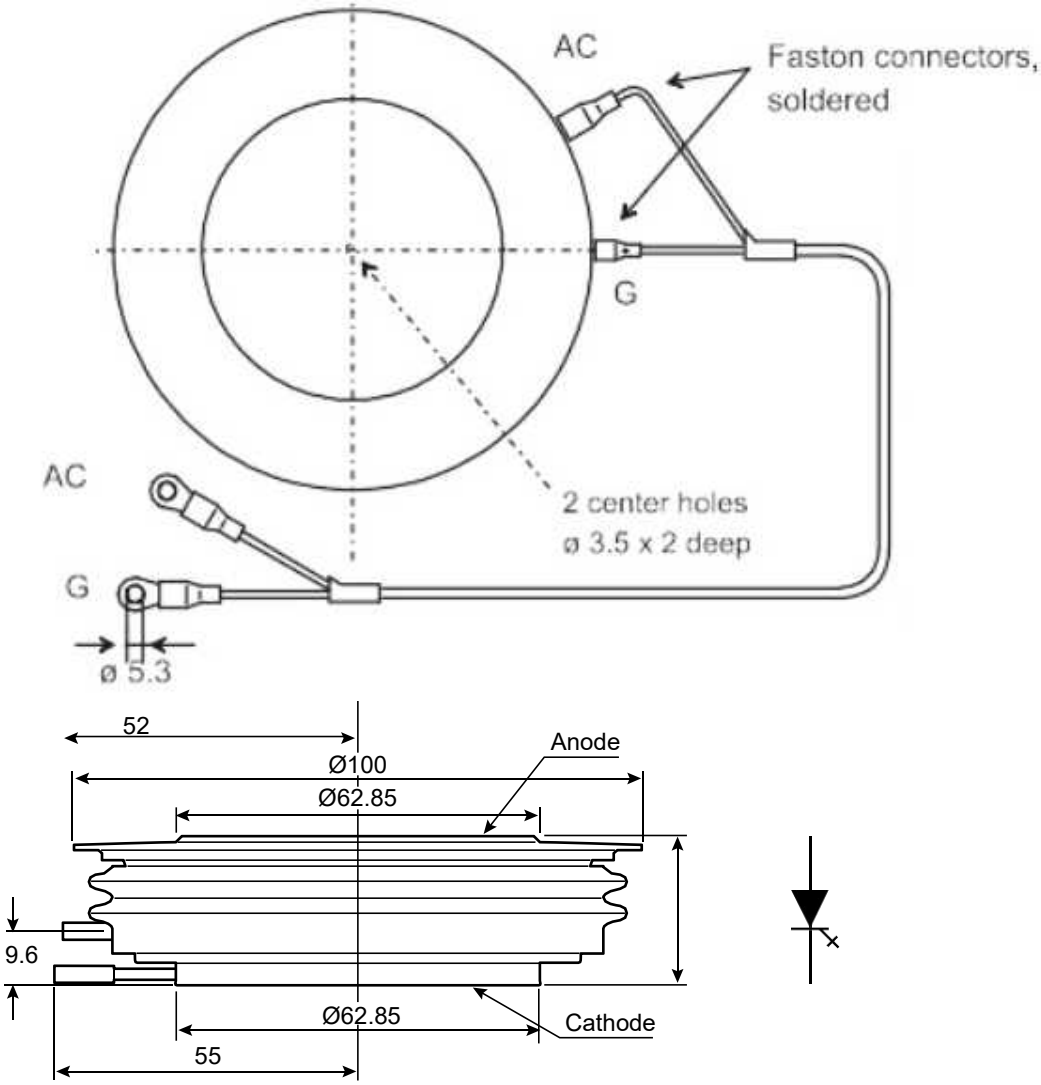


Recommended gate conditions:
I_{TCM} = 2000A
I_{FG} = 30A
$I_{G(ON)}$ = 7A d.c.
$t_{w1(min)}$ = 20μs
I_{GQM} = 690A
di_{GQ}/dt = 40A/μs
Q_{GQ} = 6000μC
$V_{RG(min)}$ = 2V
$V_{RG(max)}$ = 16V

Fig.29 General switching waveforms

OUTLINE AND DIMENSION

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



Nominal weight: 820g
Clamping force: 20kN ±10%
Lead coaxial length: 600mm

Package outine type code: H