DG758BX45

Gate Turn-off Thyristor

DS4905-7 July 2014 (LN31734)

FEATURES

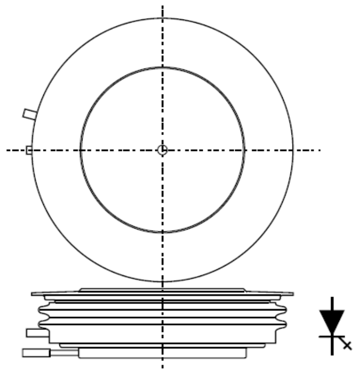
- Double Side Cooling
- High Reliability In Service
- High Voltage Capability
- Fault Protection Without Fuses
- High Surge Current Capability
- Turn-off Capability Allows Reduction in Equipment Size and Weight. Low Noise Emission Reduces Acoustic Cladding Necessary For Environmental Requirements

APPLICATIONS

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

KEY PARAMETERS

V_{DRM}	**4500V**
$I_{T(AV)}$	**870A**
I_{TCM}	**3000A**
dV_D/dt	**1000V/µs**
dI_T/dt	**300A/µs**



Outline type code: X

(See Package Details for further information)

Fig. 1 Package outline

VOLTAGE RATINGS

Type Number	Repetitive Peak Off-state Voltage V_{DRM} (V)	Repetitive Peak Reverse Voltage V_{RRM} (V)	Conditions
DG758BX45	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 = 66%V_{DRM}, T_j = 125°C, dI_{GQ}/dt = 40A/µs, C_S =6.0 µF	3000	A
$I_{T(AV)}$	Mean on-state current	T_{HS} = 80°C, Double side cooled. Half sine 50Hz	870	A
$I_{T(RMS)}$	RMS on-state current	T_{HS} = 80°C, Double side cooled. Half sine 50Hz	1365	A

SURGE RATINGS

Symbol	Parameter	Test 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	MA^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 > 1.0 μs	300	A/μs
dV_D/dt	Rate of rise of off-state voltage	To 66% V_{DRM}; R_{GK} ≤ 1.5Ω, T_j = 125°C	100	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, C_S = 2.0μF	200	nH

GATE RATINGS

Symbol	Parameter	Test Conditions	Min.	Max.	Units
V_{RGM}	Peak reverse gate voltage	This value may be exceeded during turn-off	-	16	V
I_{FGM}	Peak forward gate current			100	A
$P_{FG(AV)}$	Average forward gate power		-	20	W
P_{RGM}	Peak reverse gate power		-	24	kW
di_{GQ}/dt	Rate of rise of reverse gate current		30	60	A/μs
$t_{ON(min)}$	Minimum permissible on time		50	-	μs
$t_{OFF(min)}$	Minimum permissible off time		100	-	μs

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions		Min.	Max.	Units
$R_{th(j-hs)}$	Thermal resistance – junction to heatsink surface	Double side cooled	DC	-	0.0146	°C/W
		Single side cooled	Anode DC	-	0.0233	°C/W
			Cathode DC	-	0.0392	°C/W
$R_{th(c-hs)}$	Contact thermal resistance	Clamping force 20.0kN With mounting compound	Per contact	-	0.0036	°C/W
T_{vj}	Virtual junction temperature	On-state (conducting)		-	125	°C
T_{OP}/T_{stg}	Operating junction/storage temperature range			-40	125	°C
F_m	Clamping force			33.0	37.0	kN

CHARACTERISTICS

T_j = 125°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min.	Max.	Units
V_{TM}	On-state voltage	At 3000A peak, $I_{G(ON)}$ = 7A dc	-	4.0	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	-	3.5	A
I_{RGM}	Reverse gate cathode current	V_{RGM} = 16V, No gate/cathode resistor	-	50	mA
E_{ON}	Turn-on energy	V_D = 2250V I_T = 3000A, dI_T/dt = 300A/μs I_{FG} = 40A, rise time < 1.0μs	-	3000	mJ
t_d	Delay time		-	1.5	μs
t_r	Rise time		-	3.0	μs
E_{OFF}	Turn-off energy	I_T = 2000A, V_{DM} = 3000V, Snubber capacitor C_S = 6.0μF, di_{GQ}/dt = 40A/μs	-	6300	mJ
t_{gs}	Storage time		-	20.6	μs
t_{gf}	Fall time		-	2.2	μs
t_{gq}	Gate controlled turn-off time		-	22.8	μs
Q_{GQ}	Turn-off gate charge		-	10000	μC
Q_{GQT}	Total turn-off gate charge		-	20000	μC
I_{GQM}	Peak reverse gate current		-	830	A

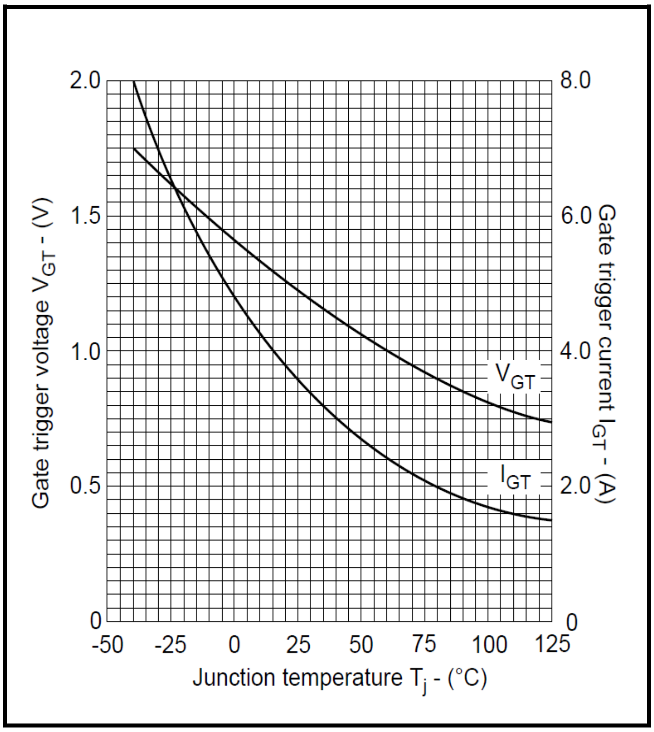


Fig.2 Maximum gate trigger voltage/current vs junction temperature

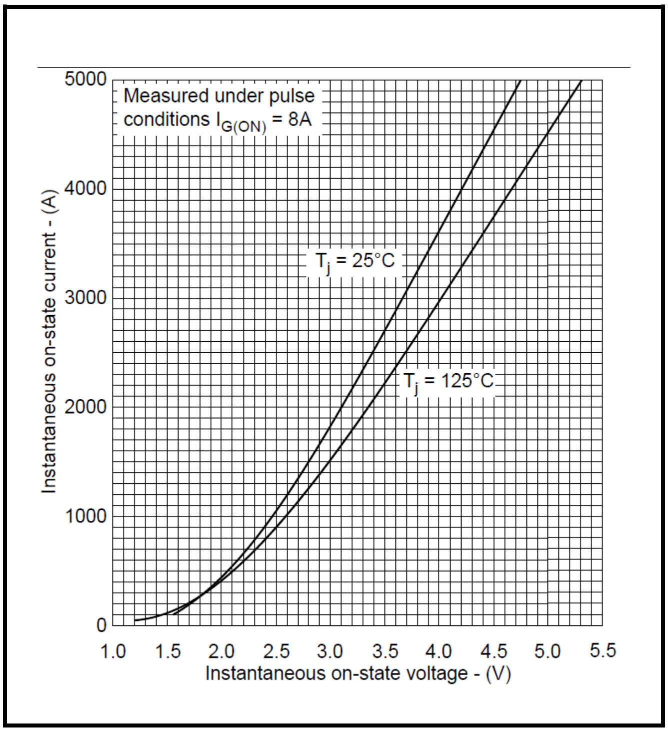


Fig.3 On-state characteristics

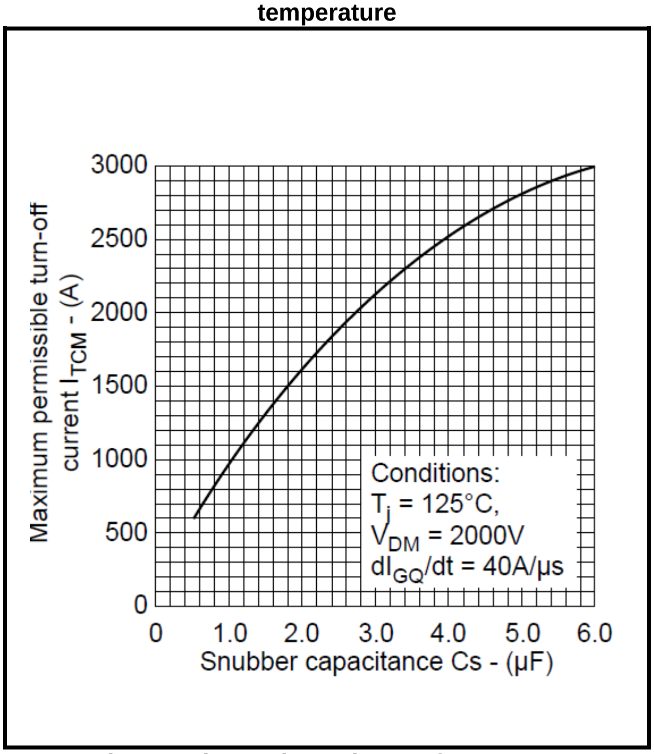


Fig.4 Maximum dependence of I_{TCM} on C_S

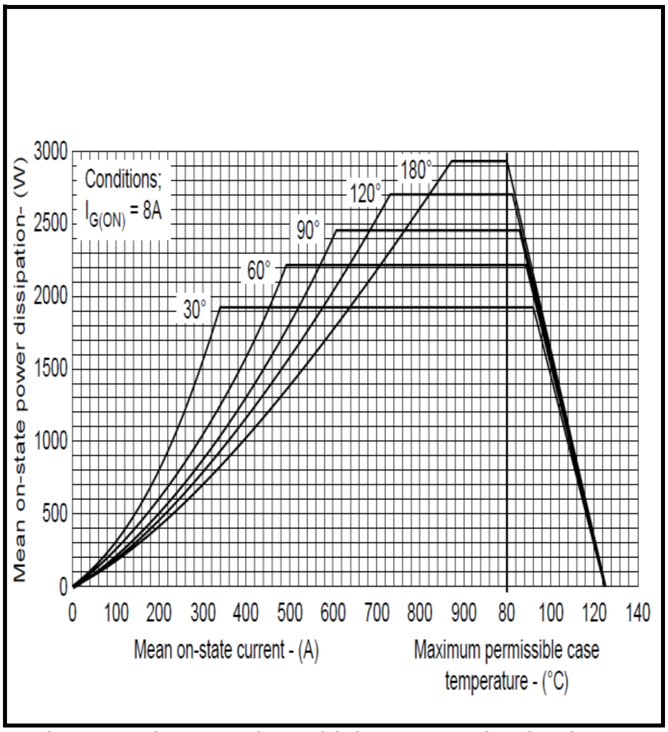


Fig.5 Steady state sinusoidal wave conduction loss – double side cooled

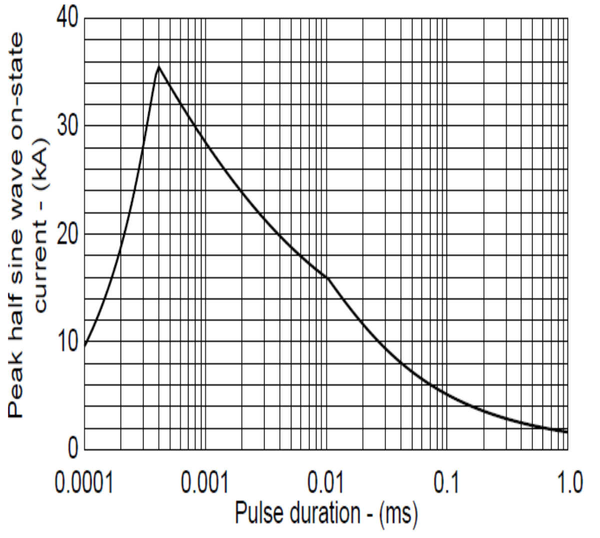


Fig.6 Surge (non-repetitive) on-state current vs time

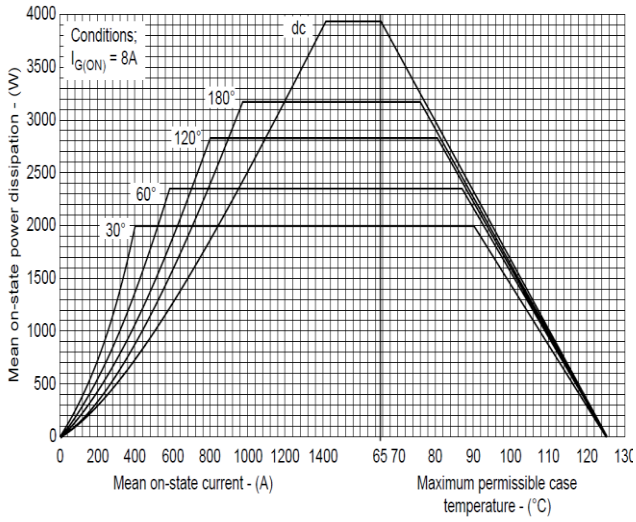


Fig.7 Steady state rectangular wave conduction loss – double side cooled

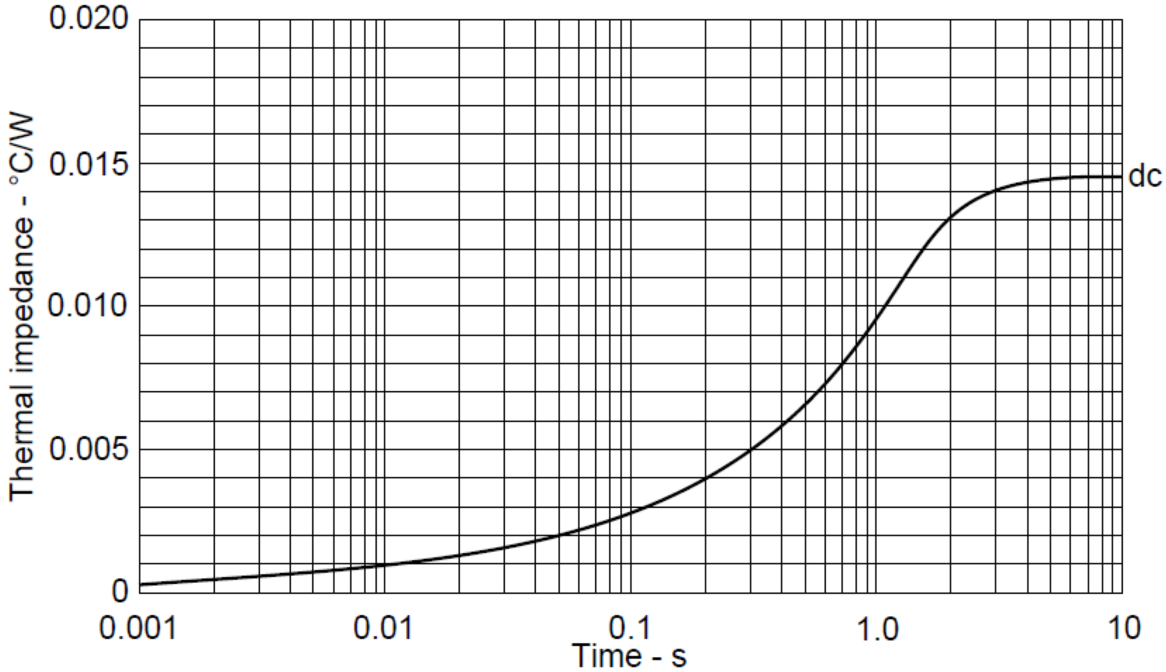


Fig.8 Maximum (limit) transient thermal impedance – junction to case (°C/kW)

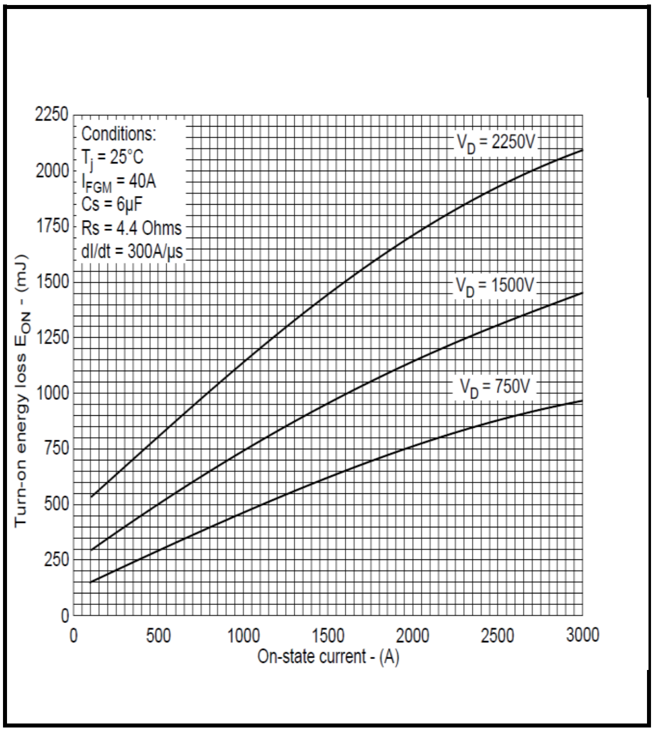


Fig.9 Turn-on energy vs on-state current

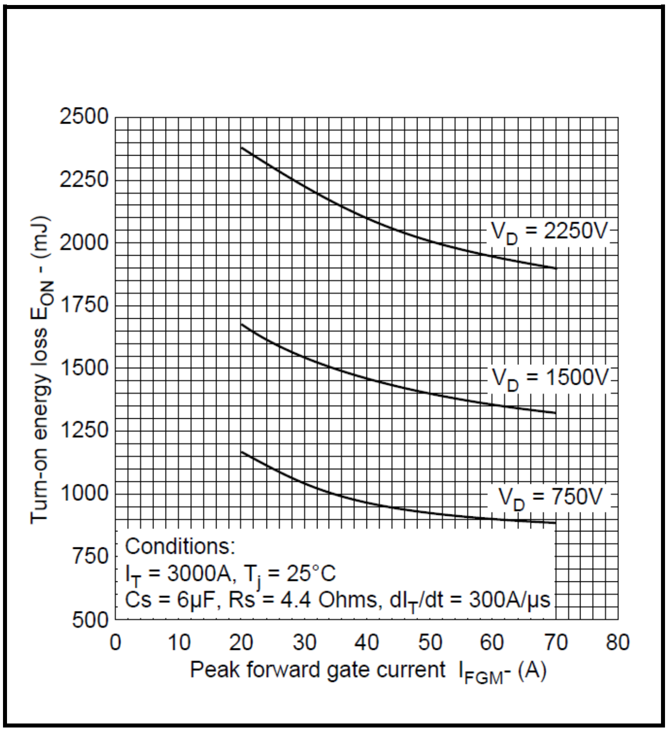


Fig.10 Turn-on energy vs peak forward gate current

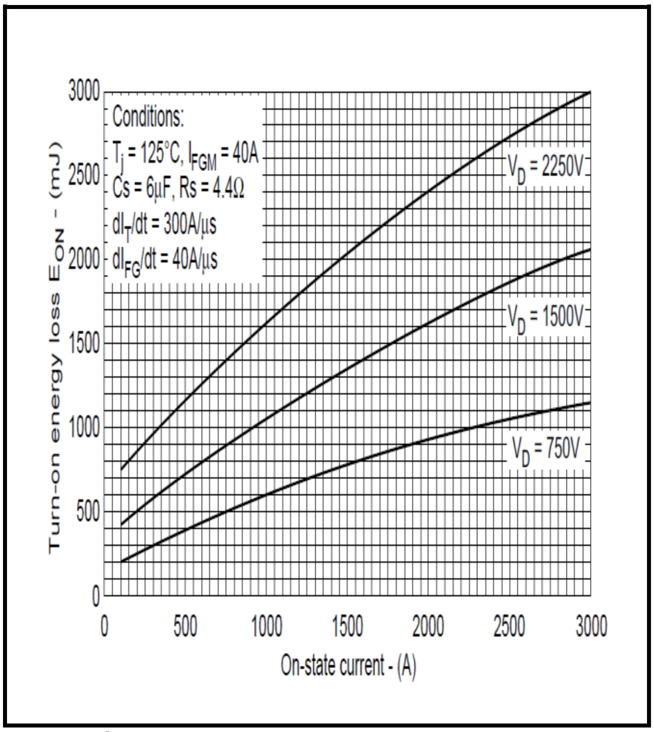


Fig.11 Turn-on energy vs on-state current

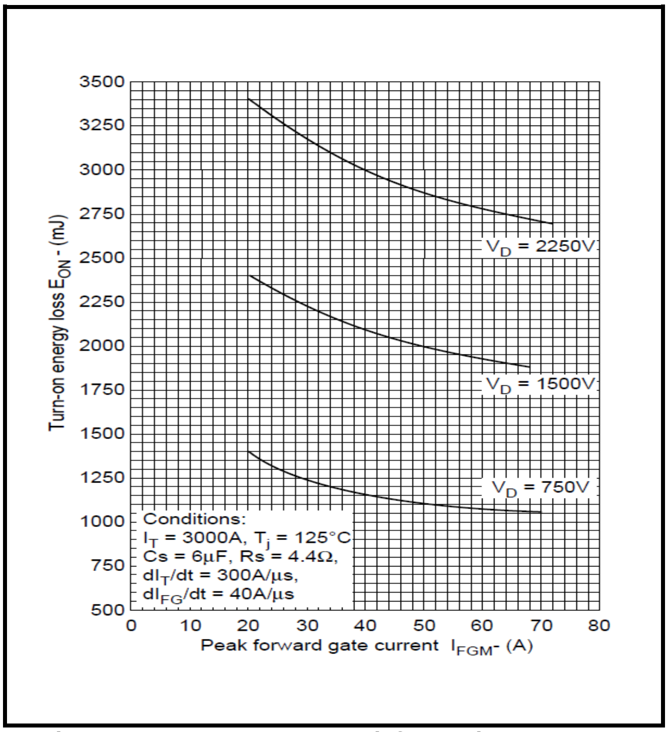


Fig.12 Turn-on energy vs peak forward gate current

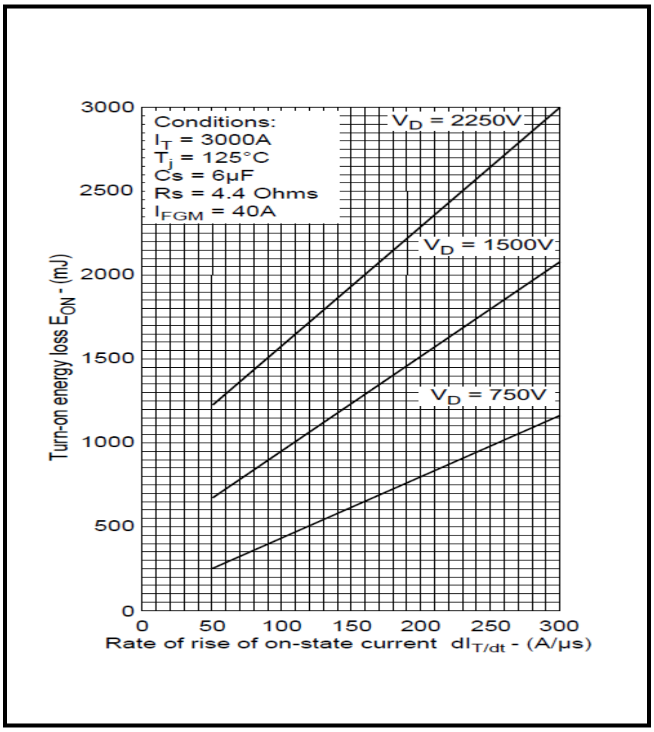


Fig.13 Turn-on energy vs rate of rise of on-state current

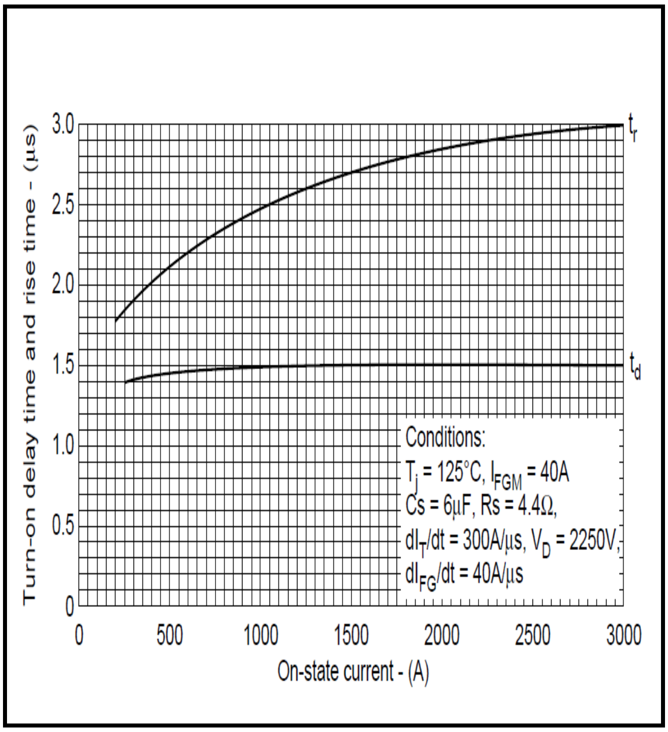


Fig.14 Delay time & rise time vs turn-on current

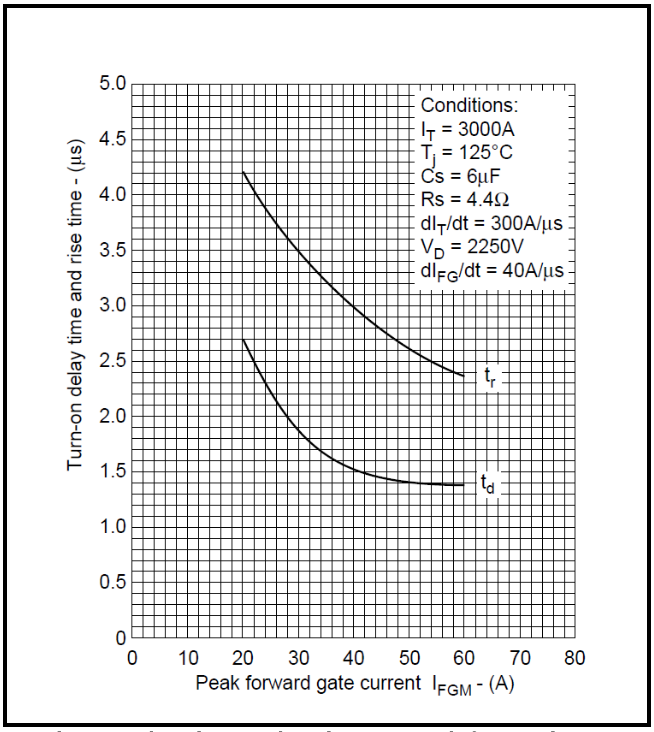


Fig.15 Delay time & rise time vs peak forward gate current

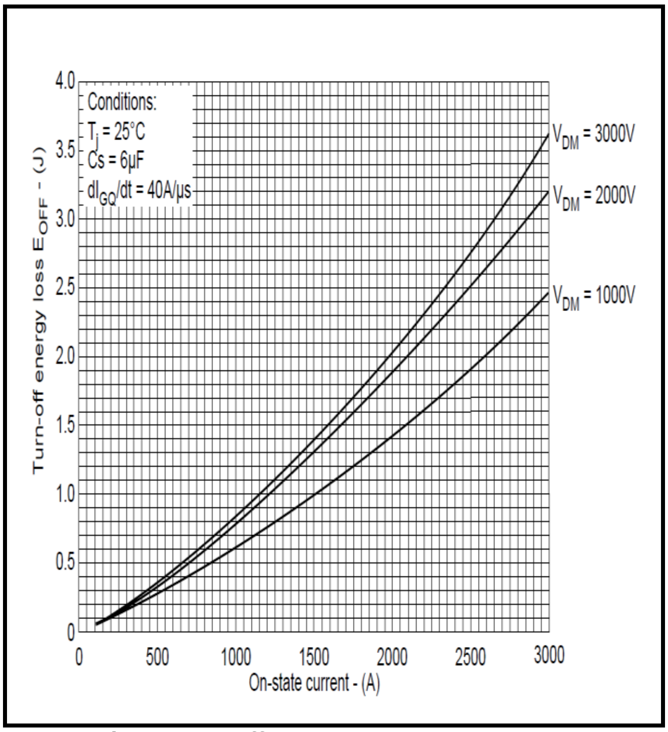


Fig.16 Turn-off energy vs on-state current

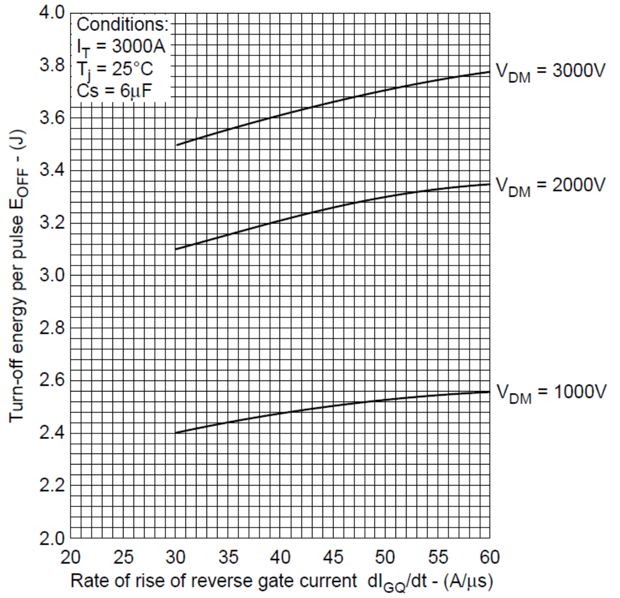


Fig.17 Turn-off energy vs rate of rise of reverse gate current

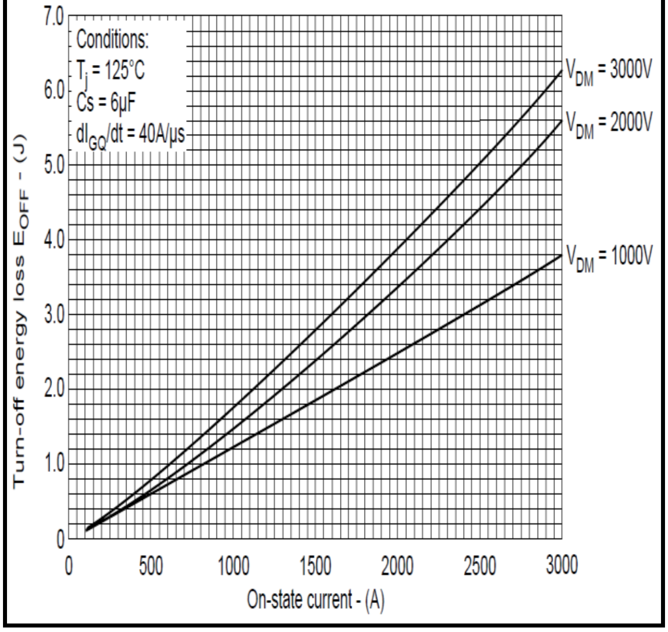


Fig.18 Turn-off energy vs on-state current

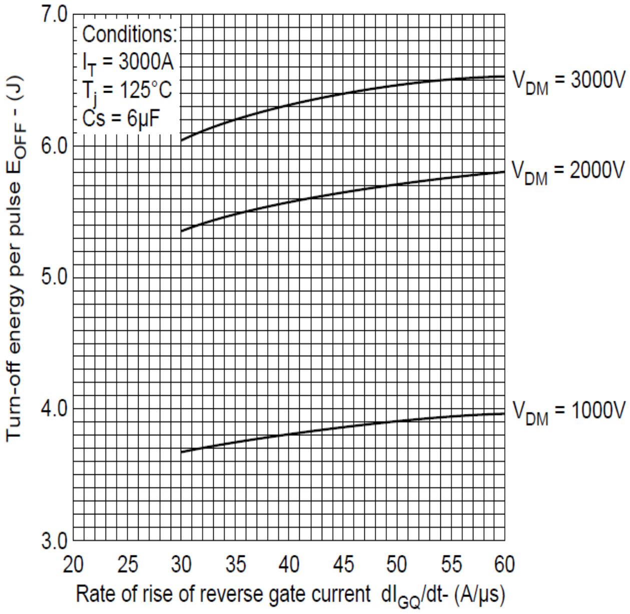


Fig.19 Turn-off energy vs rate of rise of reverse gate current

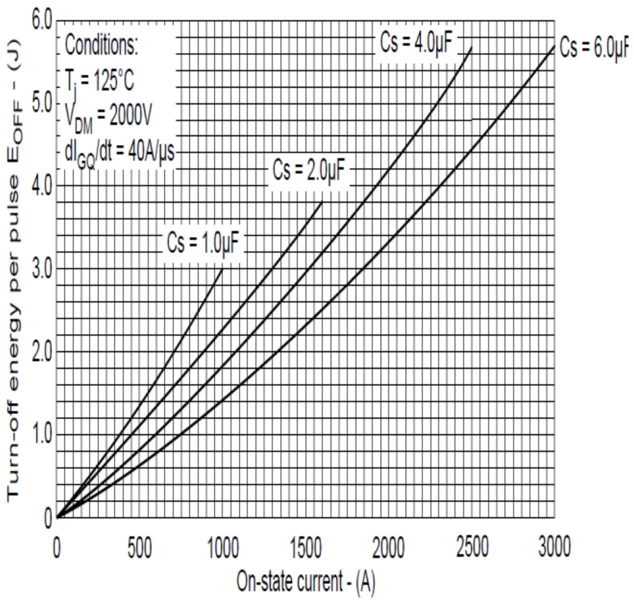


Fig.20 Turn-off energy vs on-state current

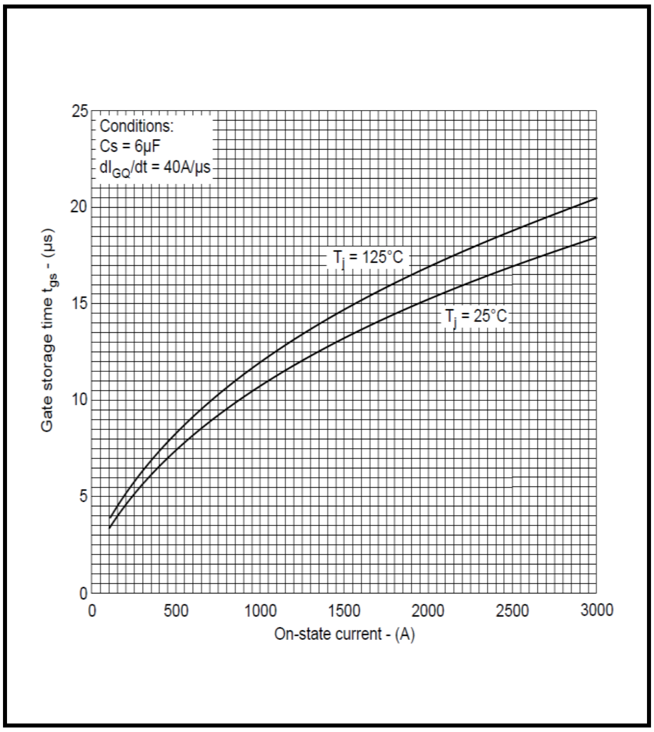


Fig.21 Gate storage time vs on-state current

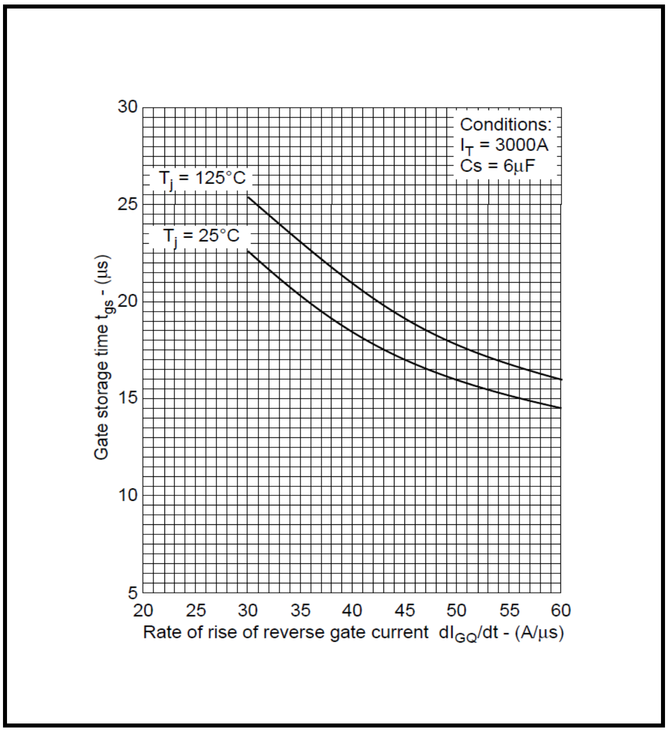


Fig.22 Gate storage time vs rate of rise of reverse gate current

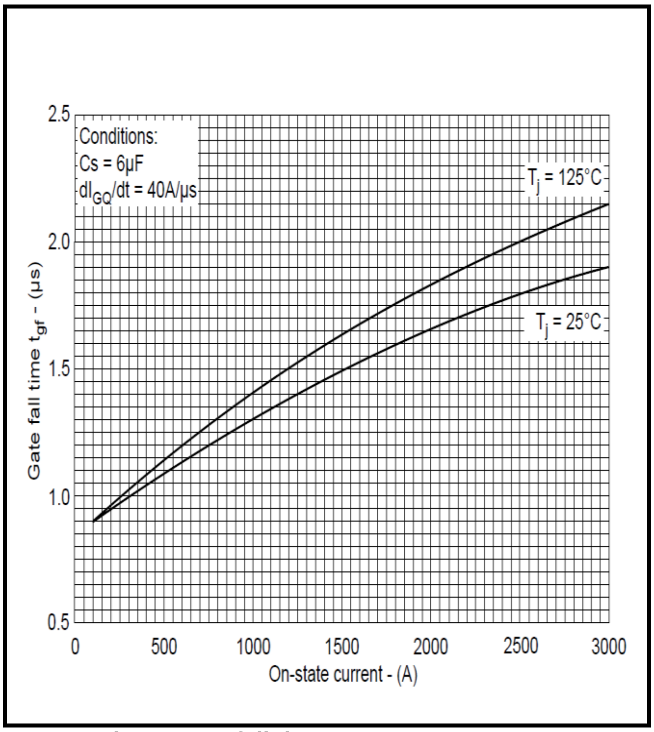


Fig.23 Gate fall time vs on-state current

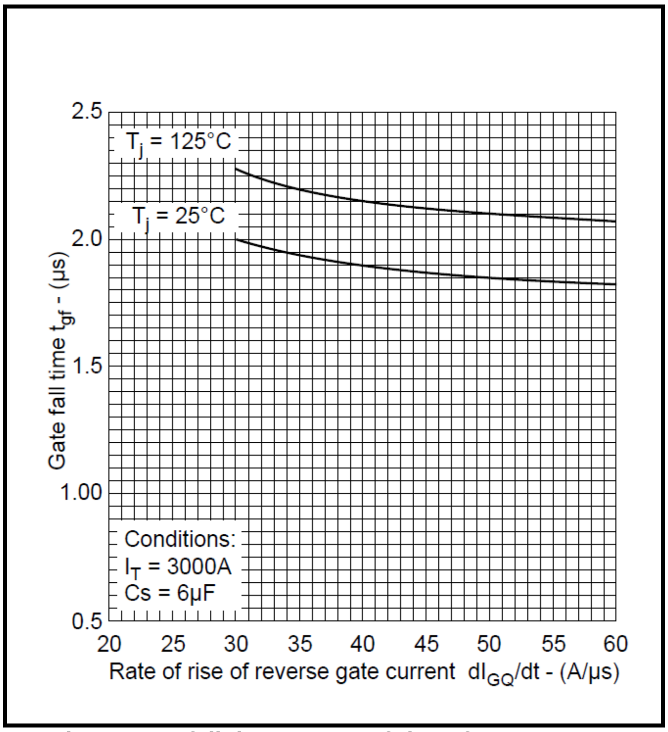


Fig.24 Gate fall time vs rate of rise of reverse gate current

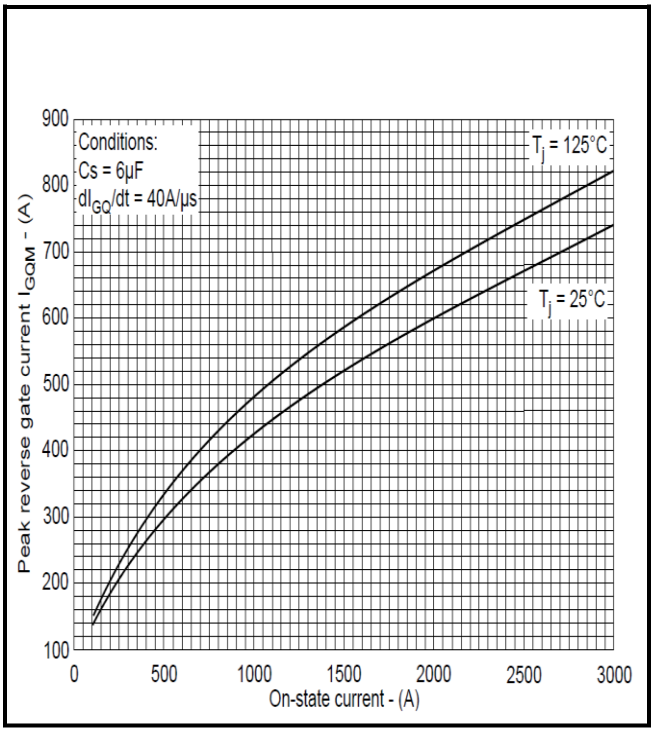


Fig.25 Peak reverse gate current vs turn-off current

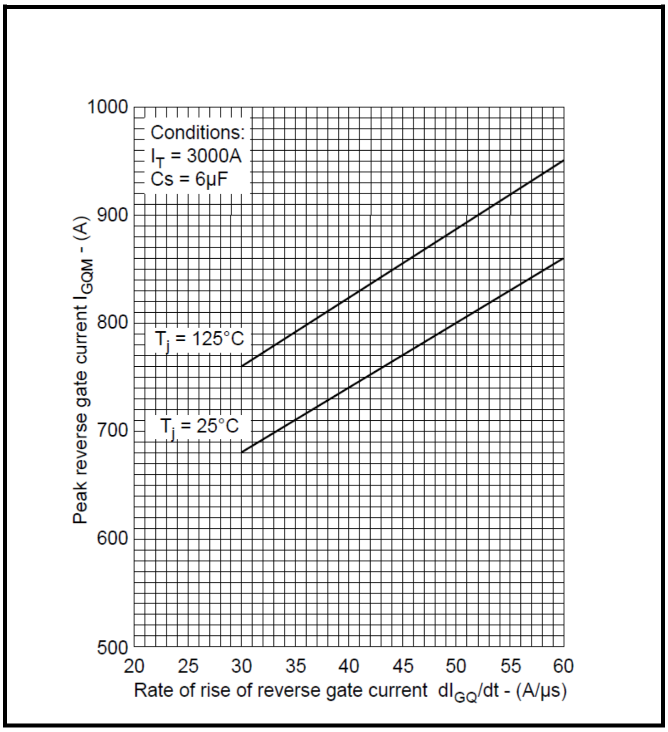


Fig.26 Peak reverse gate current vs rate of rise of reverse gate current

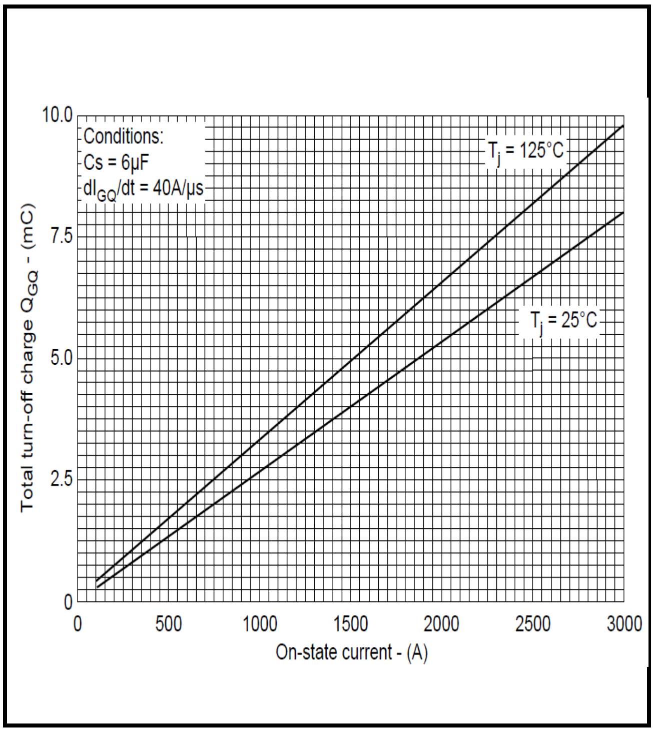


Fig.27 Turn-off gate charge vs on-state current

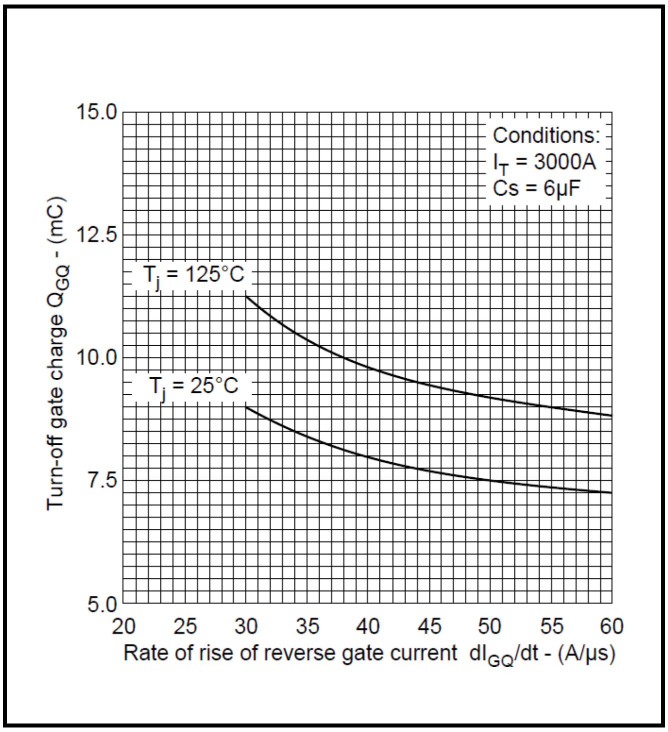


Fig.28 Turn-off gate charge vs rate of rise of reverse gate current

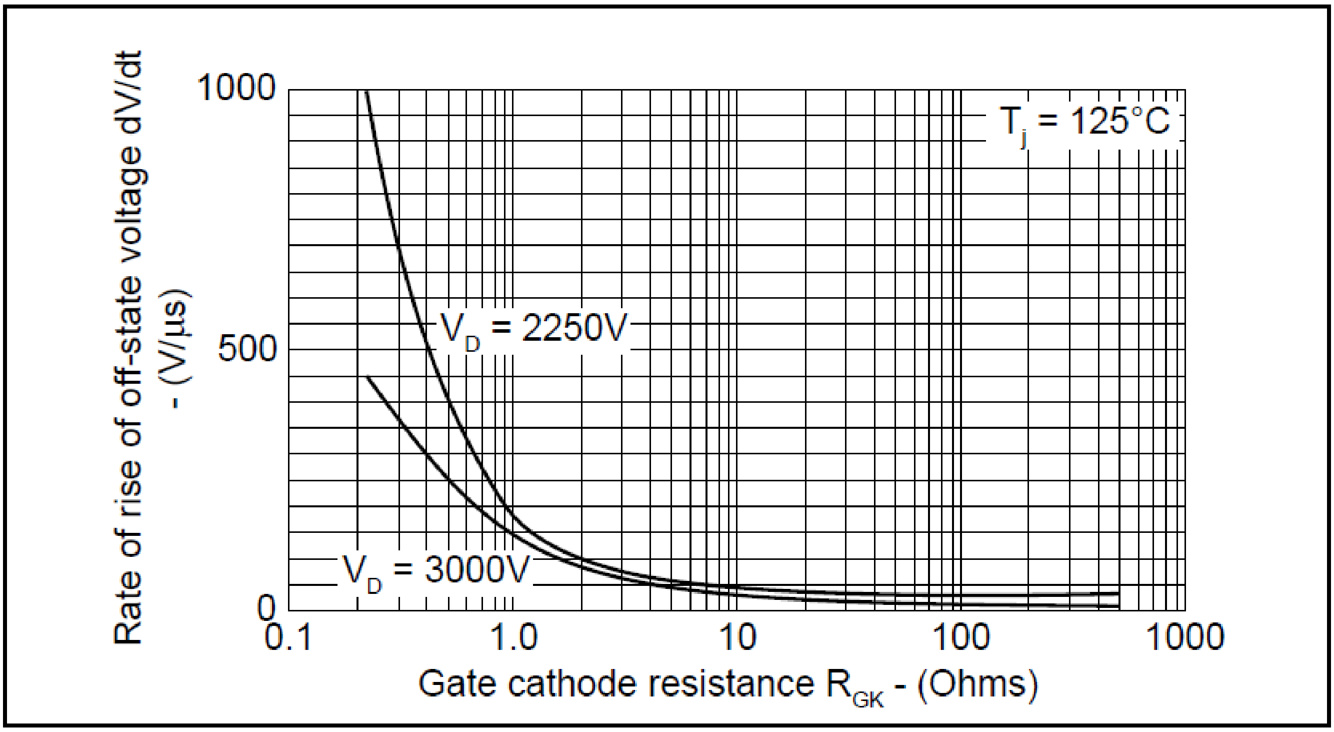
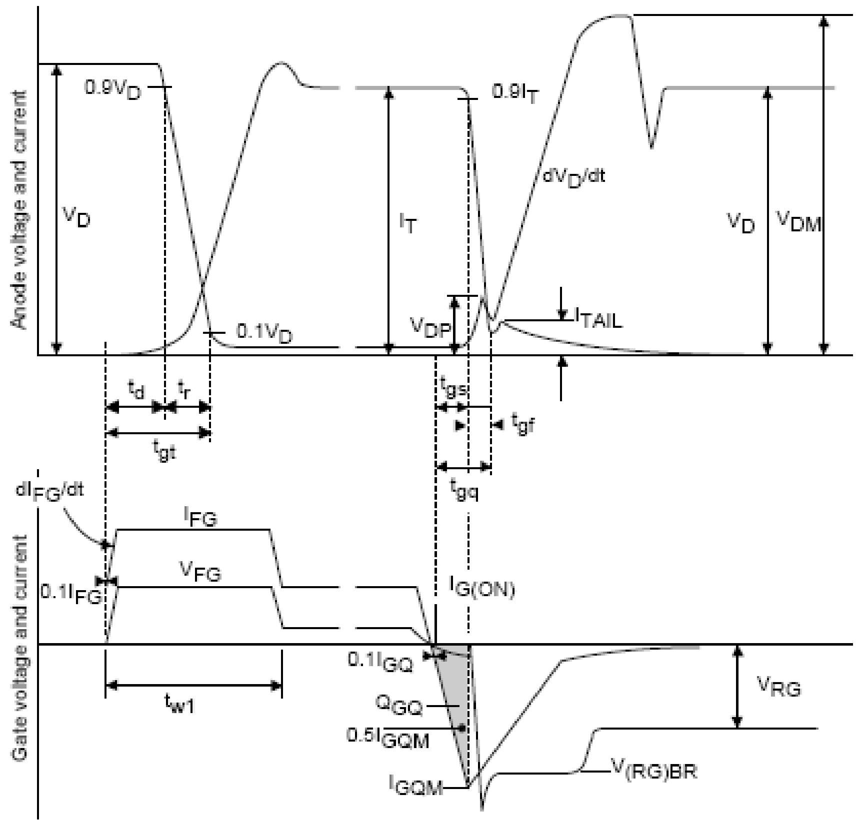


Fig.29 Rate of rise of off-state voltage vs gate cathode resistance



Recommended gate conditions:
I_{TCM} = 2000A
I_{FG} = 30A
$I_{G(ON)}$ = 7A d.c.
$t_{w1(min)}$ = 20µs
I_{GQM} = 650 A
di_{GQ}/dt = 40A/µs
Q_{GQ} = 6800µC
$V_{RG(min)}$ = 2V
$V_{RG(max)}$ = 16V

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

Fig.30 General switching waveforms

PACKAGE DETAILS

For further package information, please contact Customer Services. All dimensions in mm, unless stated otherwise. DO NOT SCALE.

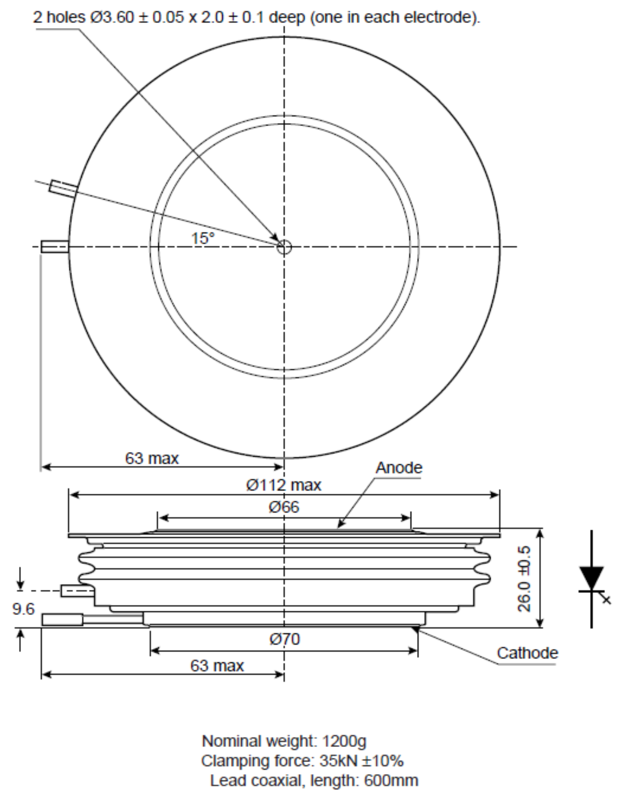


Fig.31 Package outline X

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The products must not be touched when operating because there is a danger of electrocution or severe burning. Always use protective safety equipment such as appropriate shields for the product and wear safety glasses. Even when disconnected any electric charge remaining in the product must be discharged and allowed to cool before safe handling using protective gloves.

Extended exposure to conditions outside the product ratings may affect reliability leading to premature product failure. Use outside the product ratings is likely to cause permanent damage to the product. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture, a large current to flow or high voltage arcing, resulting in fire or explosion. Appropriate application design and safety precautions should always be followed to protect persons and property.

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