DYNEX SEMICONDUCTOR

DG646BH25

Gate Turn-off Thyristor

Replaces March 1998 version, DS4092-2.3

DS4092-3.0 January 2000

APPLICATIONS

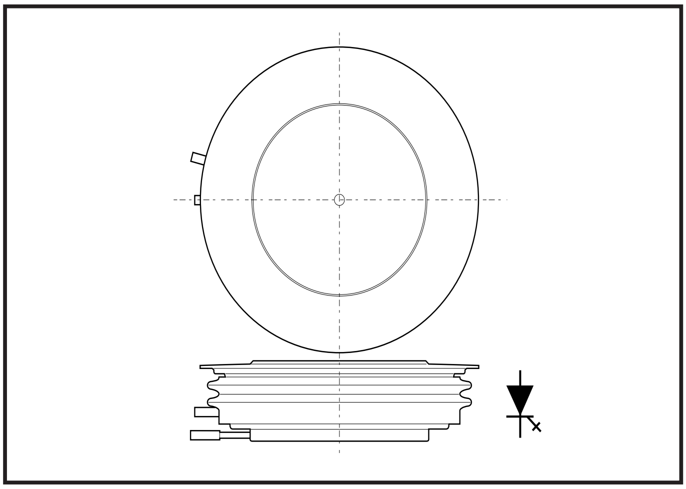
- Variable speed A.C. motor drive inverters (VSD-AC)
- Uninterruptable Power Supplies
- High Voltage Converters
- Choppers
- Welding
- Induction Heating
- DC/DC Converters

KEY PARAMETERS

I_{TCM}	2000A
V_{DRM}	2500V
$I_{T(AV)}$	867A
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.
See Package Details for further information.

VOLTAGE RATINGS

Type Number	Repetitive Peak Off-state Voltage V_{DRM} V	Repetitive Peak Reverse Voltage V_{RRM} V	Conditions
DG646BH25	2500	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.	867	A
$I_{T(RMS)}$	RMS on-state current	T_{HS} = 80°C. Double side cooled. Half sine 50Hz.	1360	A

SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine. $T_j = 125^oC$	18.0	kA
I^2t	I^2t for fusing	10ms half sine. $T_j = 125^oC$	1.62×10^6	A^2s
di_T/dt	Critical rate of rise of on-state current	$V_D = 1500V$, $I_T = 2000A$, $T_j = 125^oC$, $I_{FG} > 30A$, Rise time > 1.0µs	300	A/µs
dV_D/dt	Rate of rise of off-state voltage	To 66% V_{DRM}; $R_{GK} \leq 1.5\Omega$, $T_j = 125^oC$	135	V/µs
		To 66% V_{DRM}; $V_{RG} = -2V$, $T_j = 125^oC$	1000	V/µs
L_S	Peak stray inductance in snubber circuit	$I_T = 2000A$, $V_{DM} = 2500V$, $T_j = 125^\circ C$, $di_{GQ}/dt = 40A/\mu s$, $Cs = 2.0\mu F$	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	$^oC/W$
		Anode side cooled		-	0.03	$^oC/W$
		Cathode side cooled		-	0.045	$^oC/W$
$R_{th(c-hs)}$	Contact thermal resistance	Clamping force 20.0kN With mounting compound	per contact	-	0.006	$^oC/W$
T_{vj}	Virtual junction temperature			-	125	^oC
T_{OP}/T_{stg}	Operating junction/storage temperature range			-40	125	^oC
-	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.	-	2.6	V
I_{DM}	Peak off-state current	V_{DRM} = 2500V, 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 = 15000V I_T = 2000A, dI_T/dt = 300A/µs I_{FG} = 30A, rise time < 1.0µs	-	1188	mJ
t_d	Delay time		-	1.2	µs
t_r	Rise time		-	3.0	µs
E_{OFF}	Turn-off energy	I_T = 2000A, V_{DM} = 2500V Snubber Cap Cs = 2.0µF, di_{GQ}/dt = 40A/µs	-	4000	mJ
t_{gs}	Storage time		-	17.0	µs
t_{gf}	Fall time		-	2.0	µs
t_{gq}	Gate controlled turn-off time		-	19.0	µs
Q_{GQ}	Turn-off gate charge		-	6600	µC
Q_{GQT}	Total turn-off gate charge		-	13200	µC
I_{GQM}	Peak reverse gate current		-	650	A

CURVES

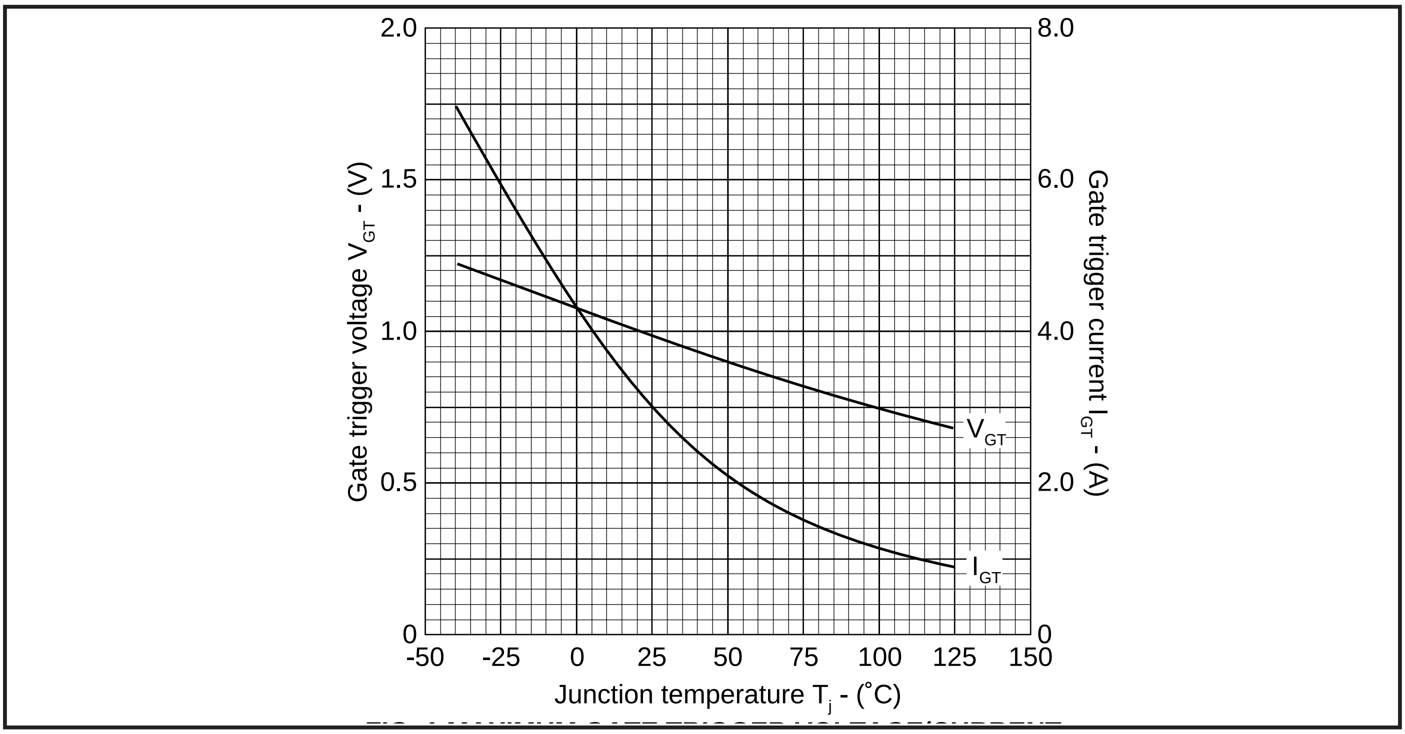


Fig.1 Maximum gate trigger voltage/current vs junction temperature

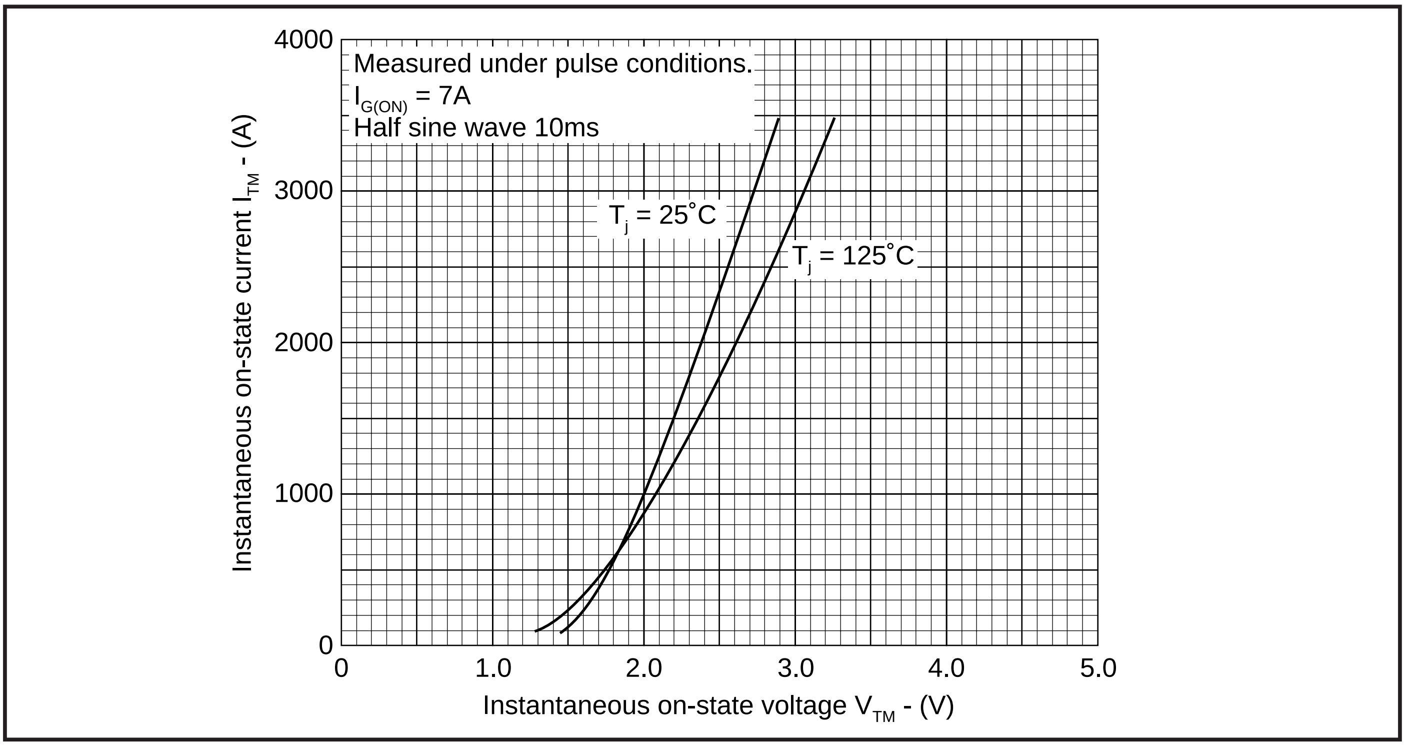


Fig.2 On-state characteristics

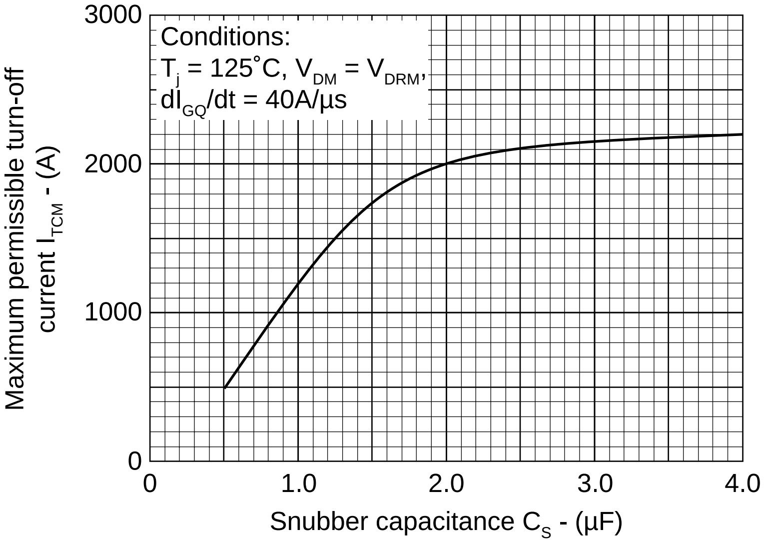


Fig.3 Maximum dependence of I_{TCM} on C_S

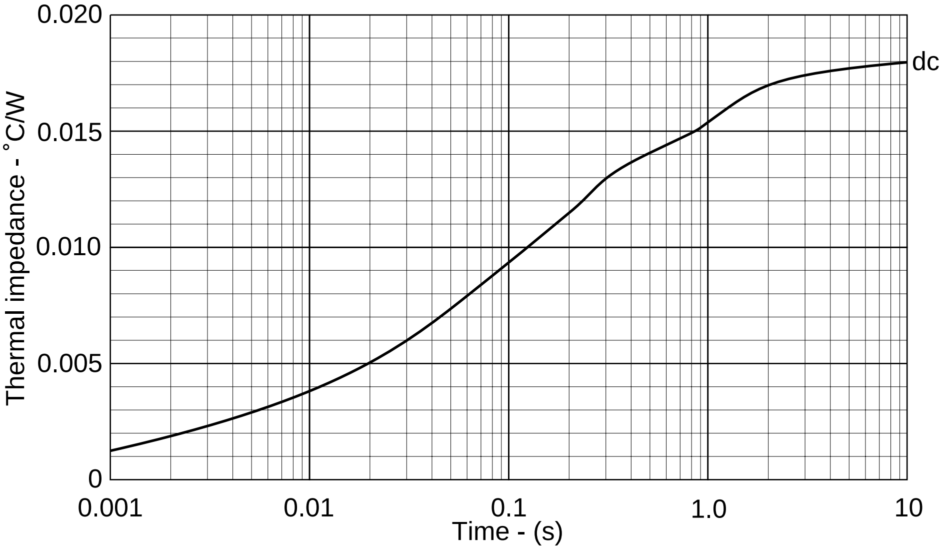


Fig.4 Maximum (limit) transient thermal impedance - double side cooled

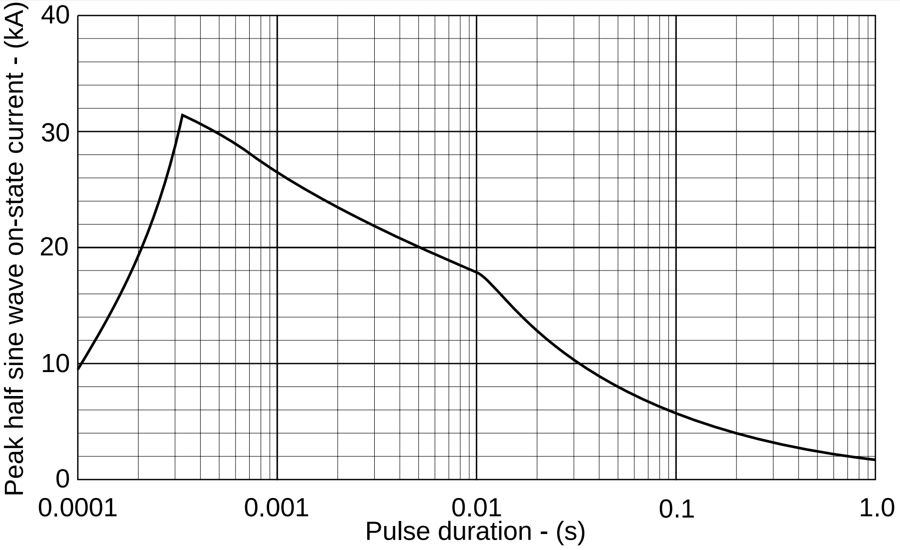


Fig.5 Surge (non-repetitive) on-state current vs time

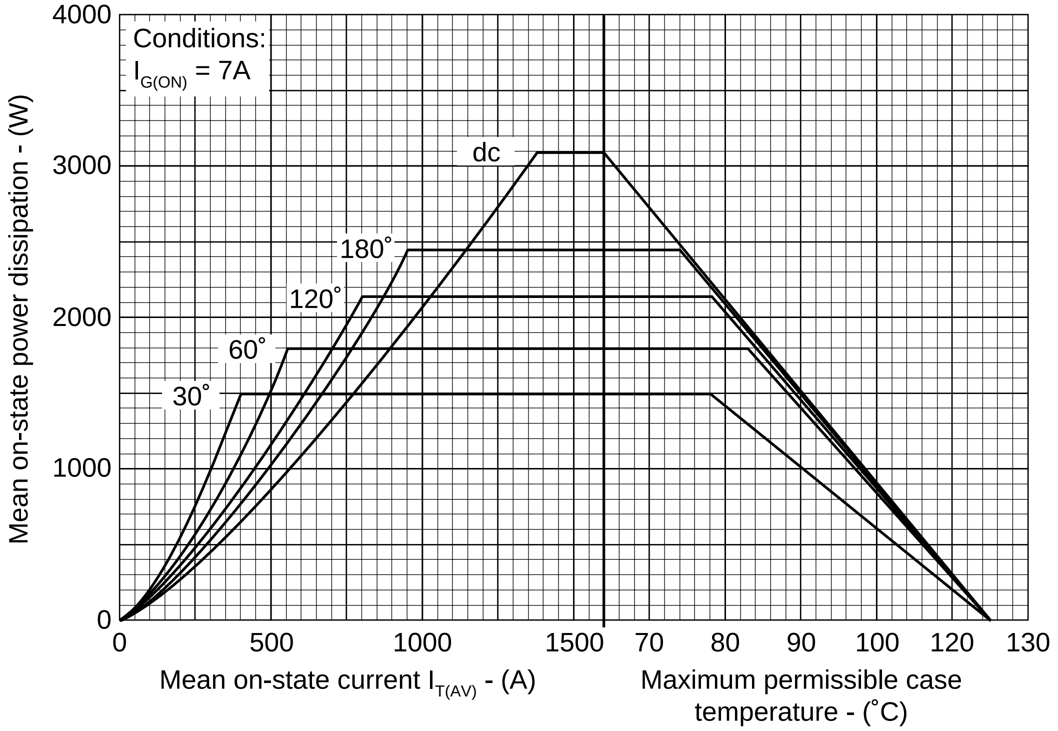


Fig.6 Steady state rectangluar wave conduction loss - double side cooled

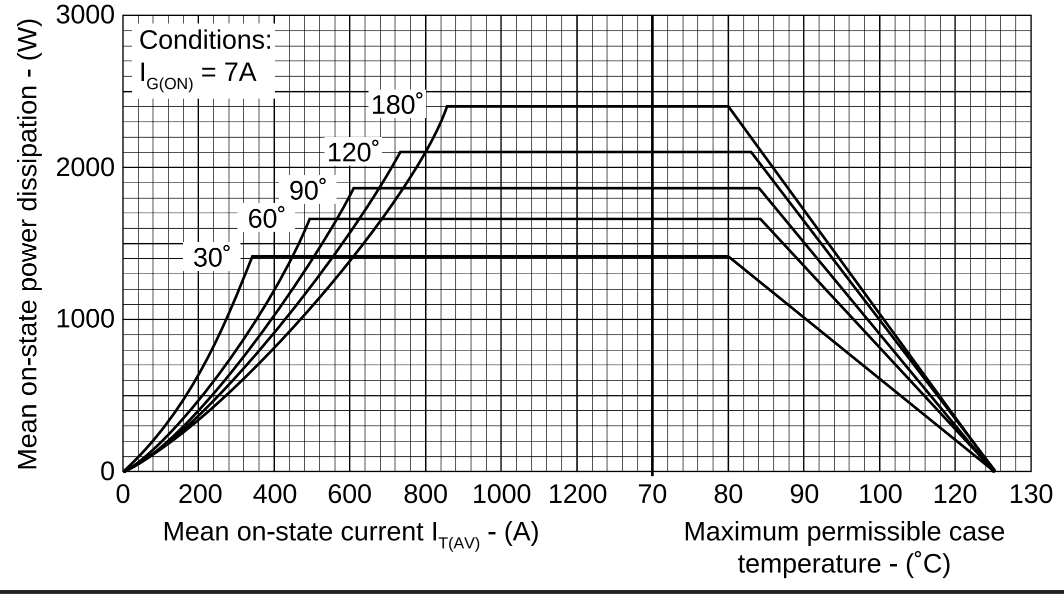


Fig.7 Steady state sinusoidal wave conduction loss - double side cooled

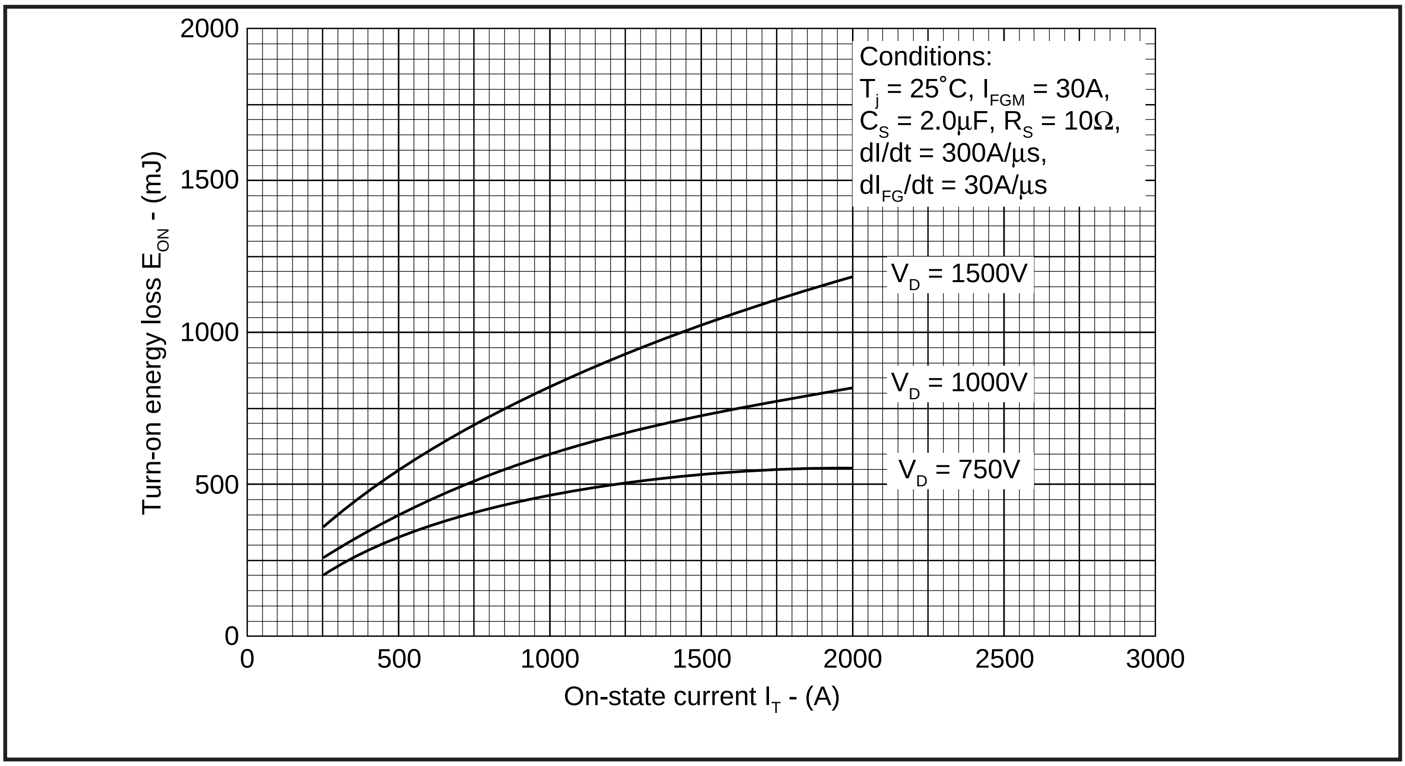


Fig.8 Turn-on energy vs on-state current

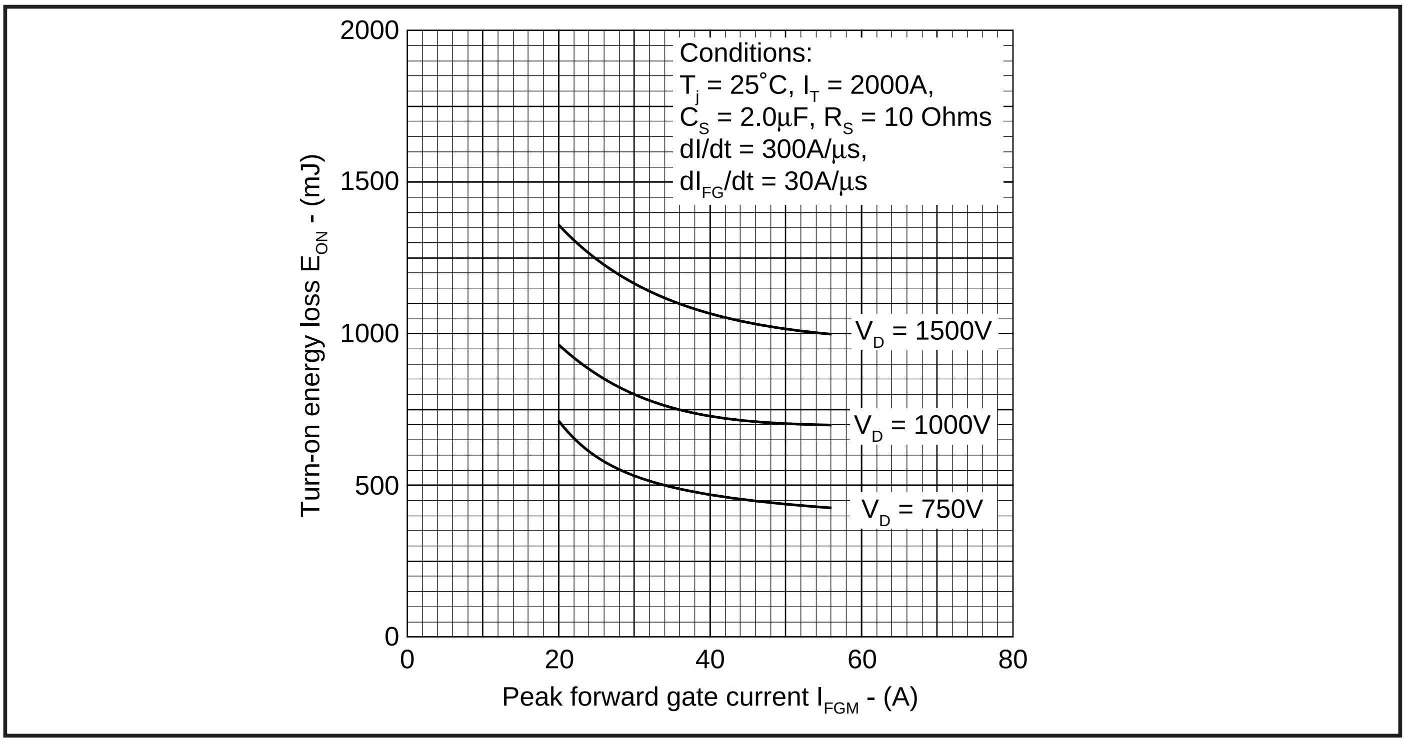


Fig.9 Turn-on energy vs peak forward gate current

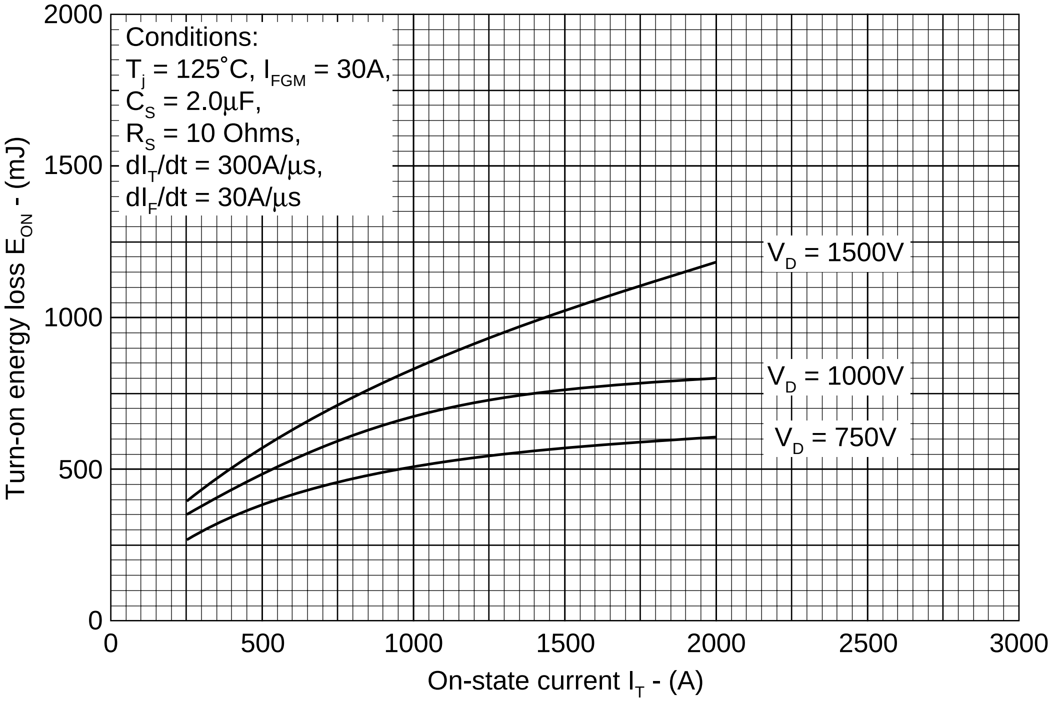


Fig.10 Turn-on energy vs on-state current

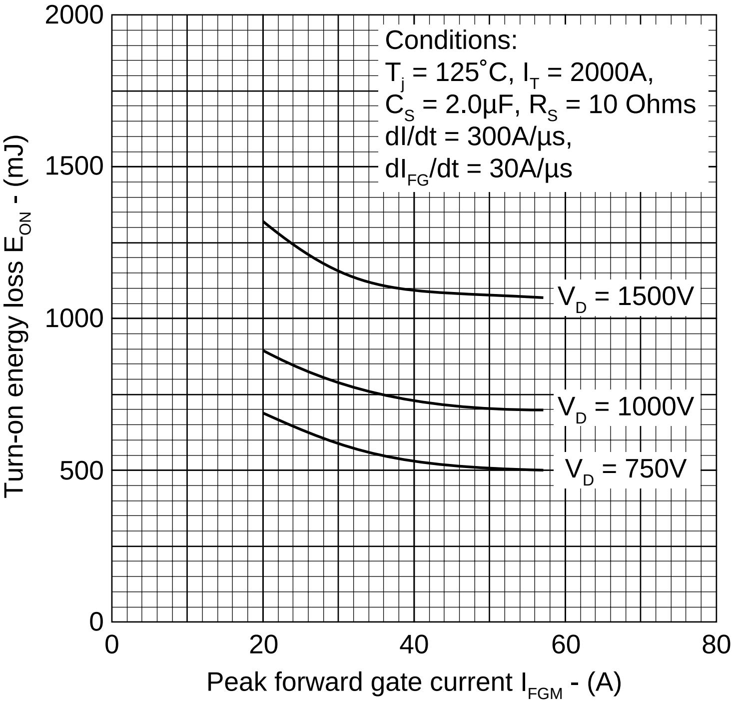


Fig.11 Turn-on energy vs peak forward gate current

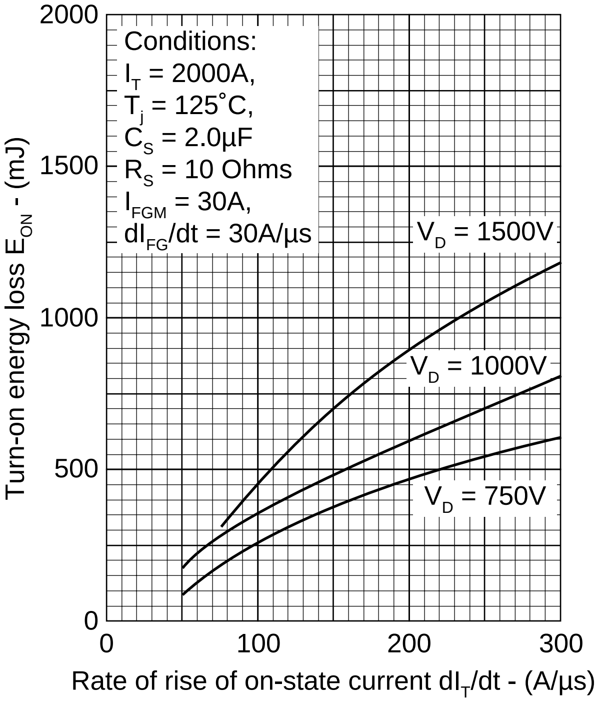


Fig.12 Turn-on energy vs rate of rise of on-state current

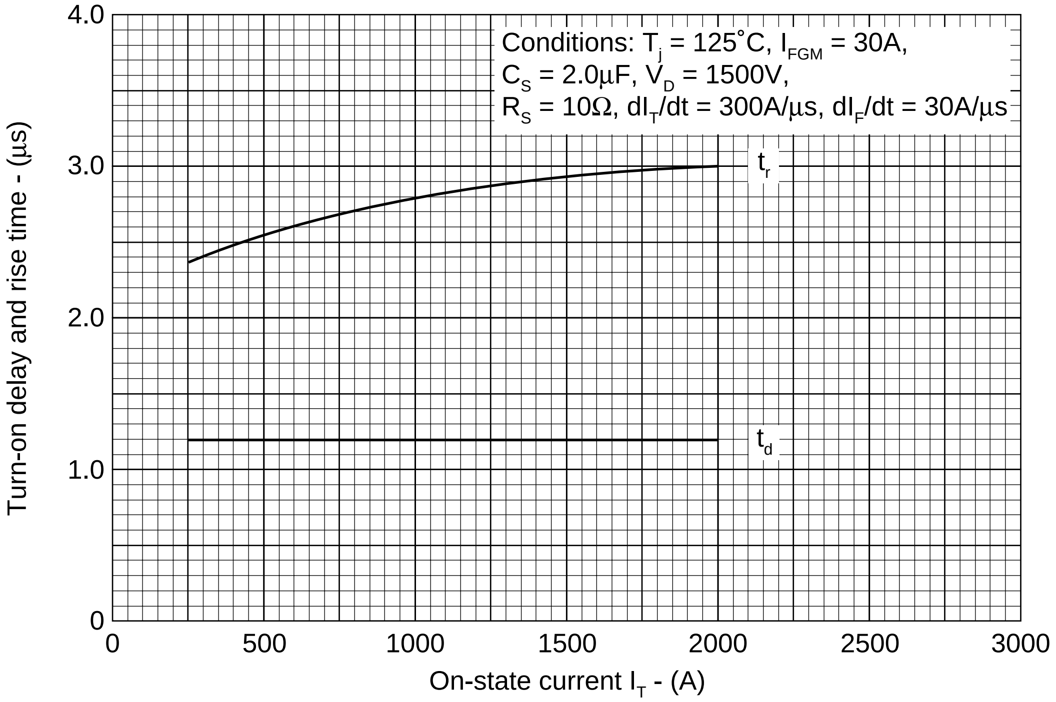


Fig.13 Delay time & rise time vs turn-on current

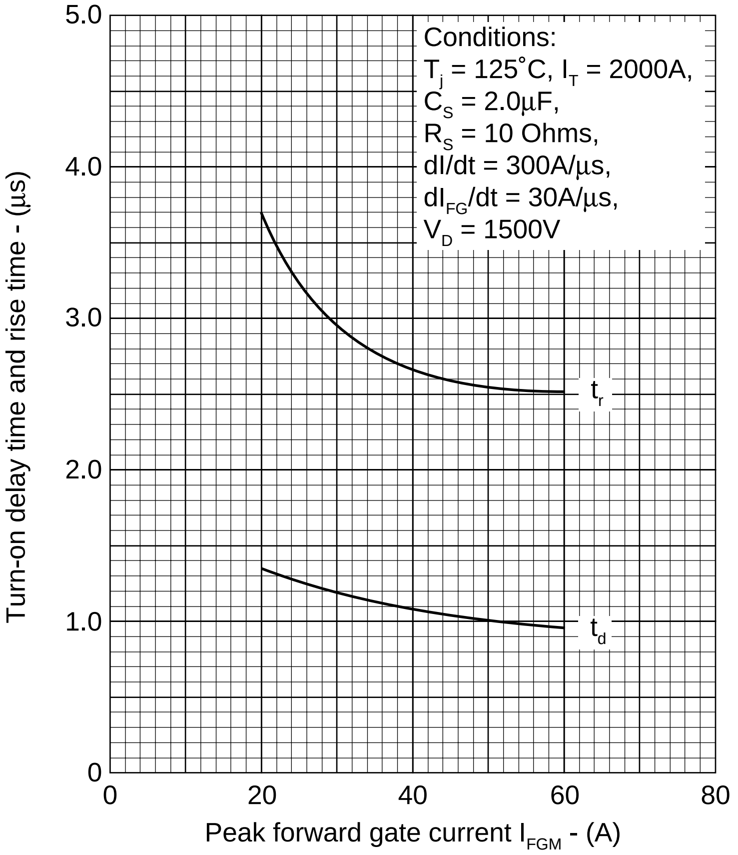


Fig.14 Delay time & rise time vs peak forward gate current

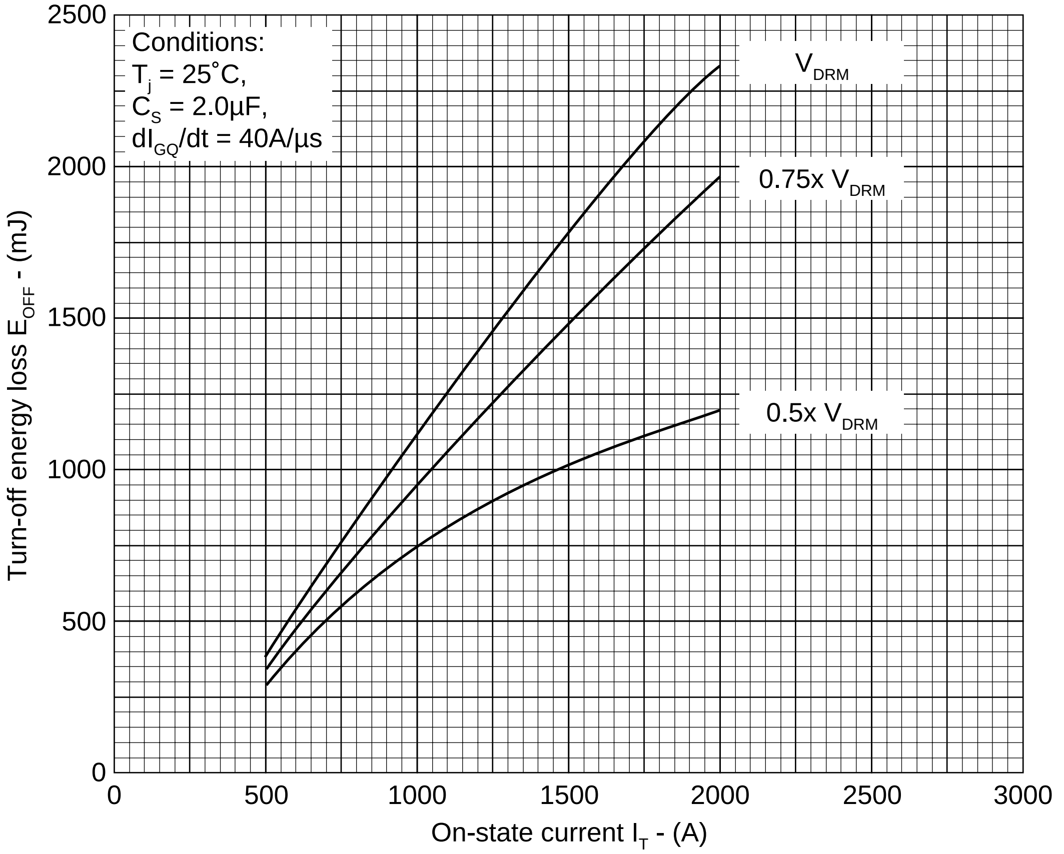


Fig.15 Turn-off energy vs on-state current

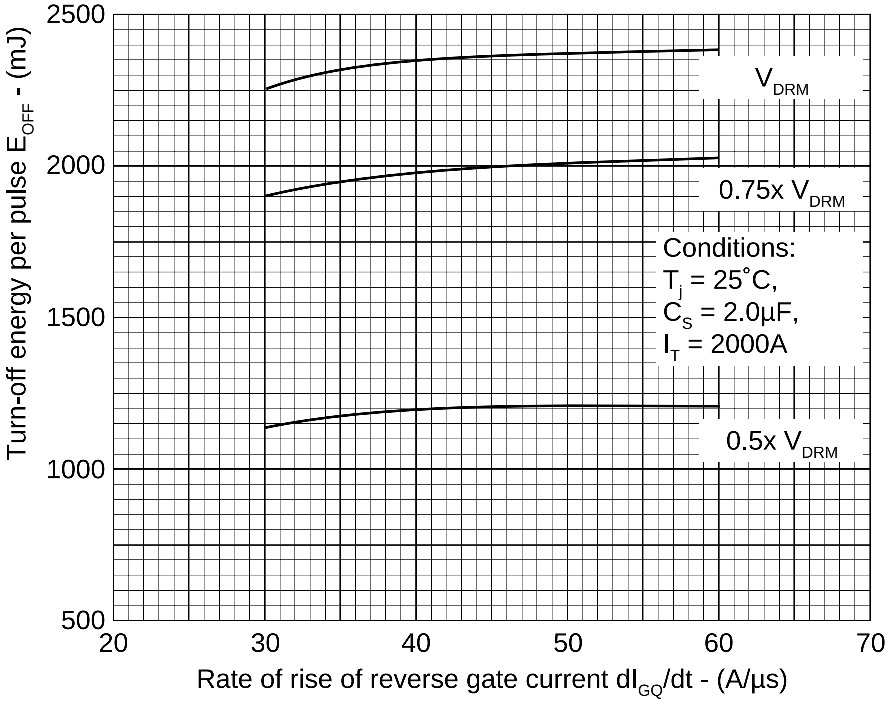


Fig.16 Turn-off energy vs rate of rise of reverse gate current

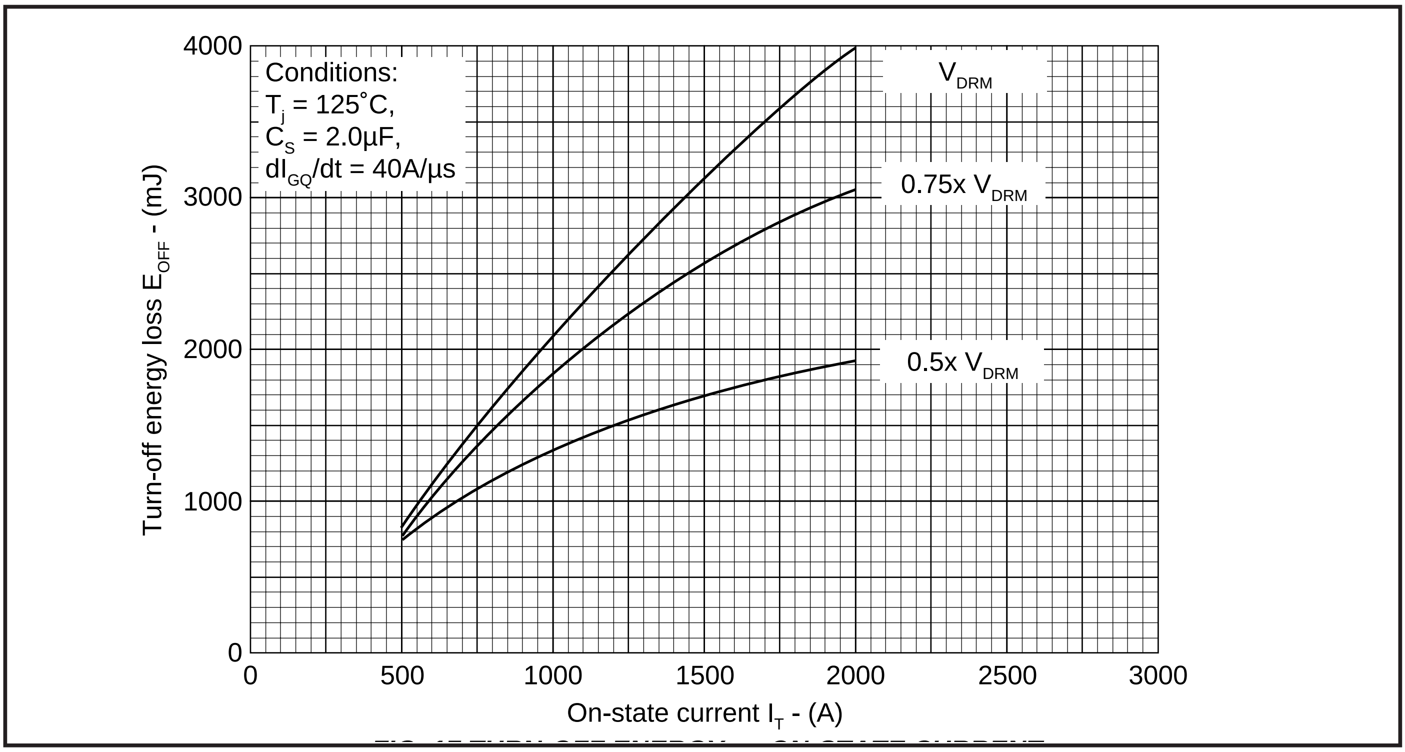


Fig.17 Turn-off energy vs on-state current

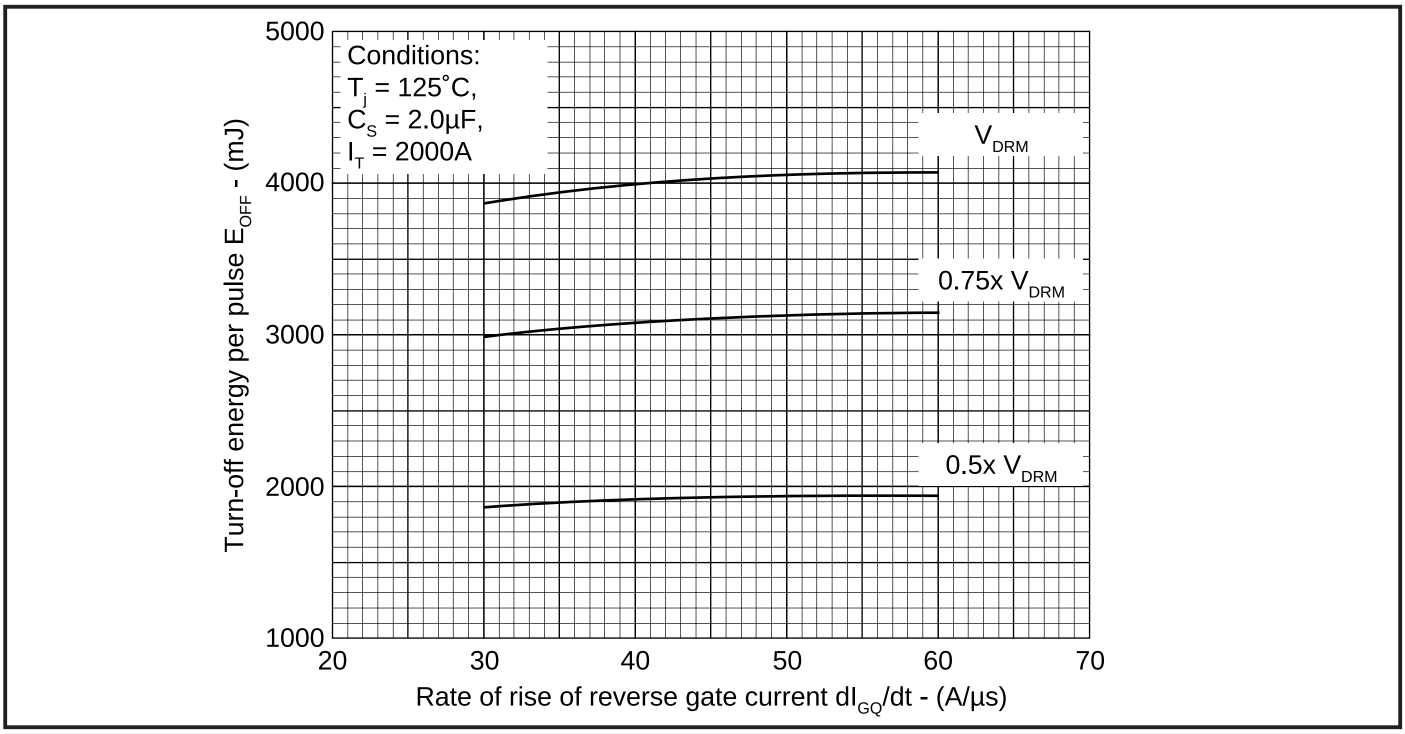


Fig.18 Turn-off energy loss vs rate of rise of reverse gate current

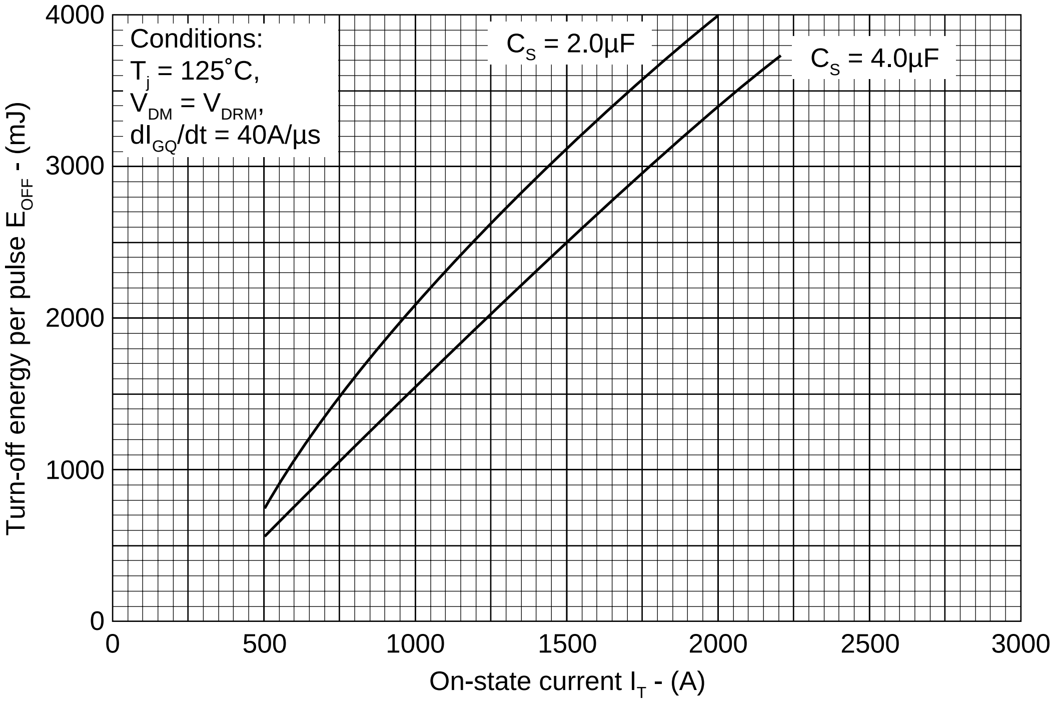


Fig.19 Turn-off energy vs on-state current

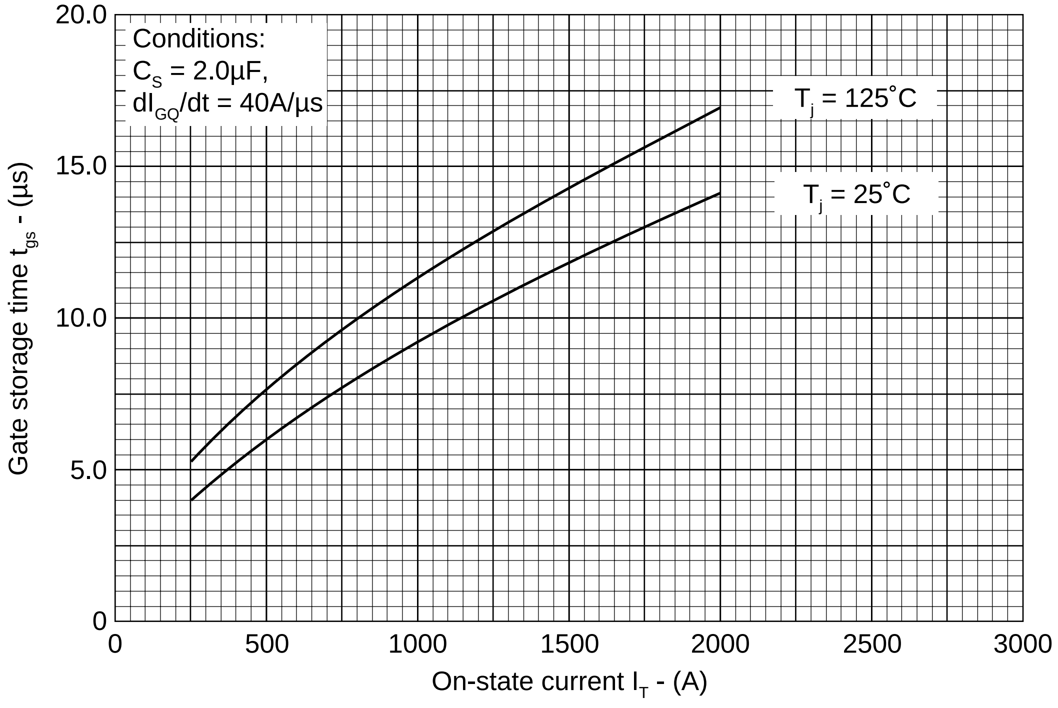


Fig.20 Gate storage time vs on-state current

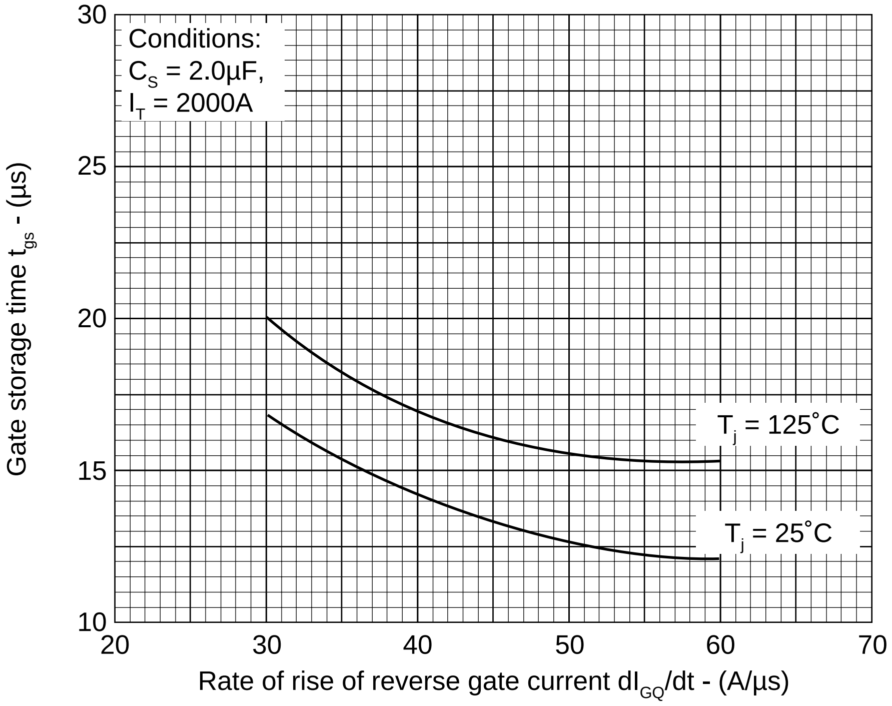


Fig.21 Gate storage time vs rate of rise of reverse gate current

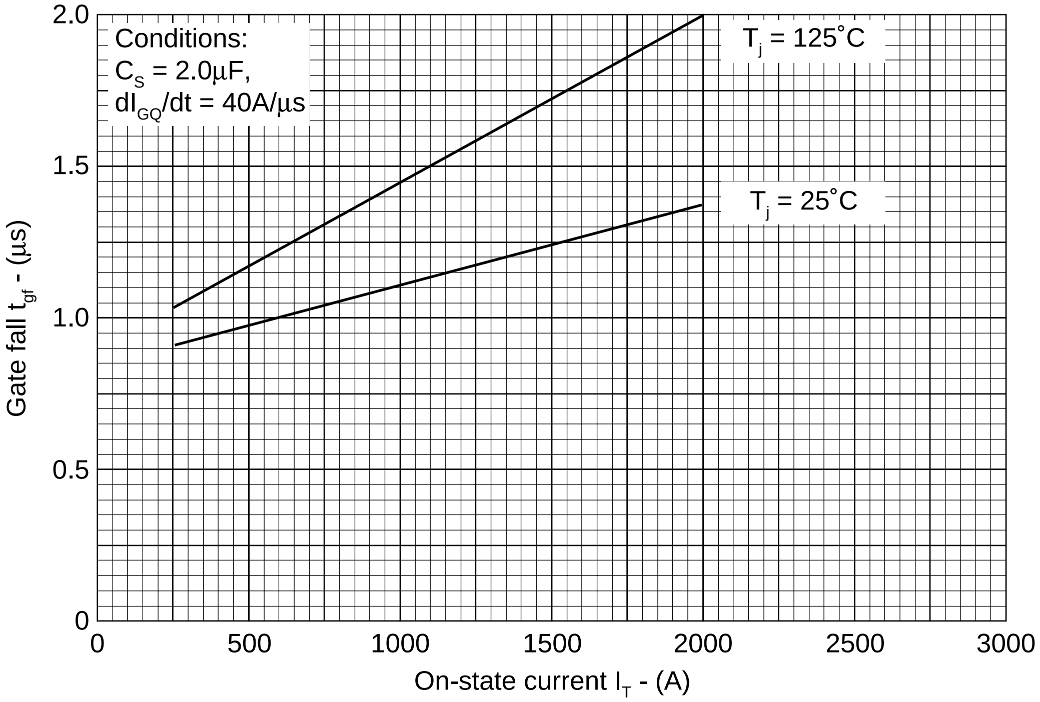


Fig.22 Gate fall time vs on-state current

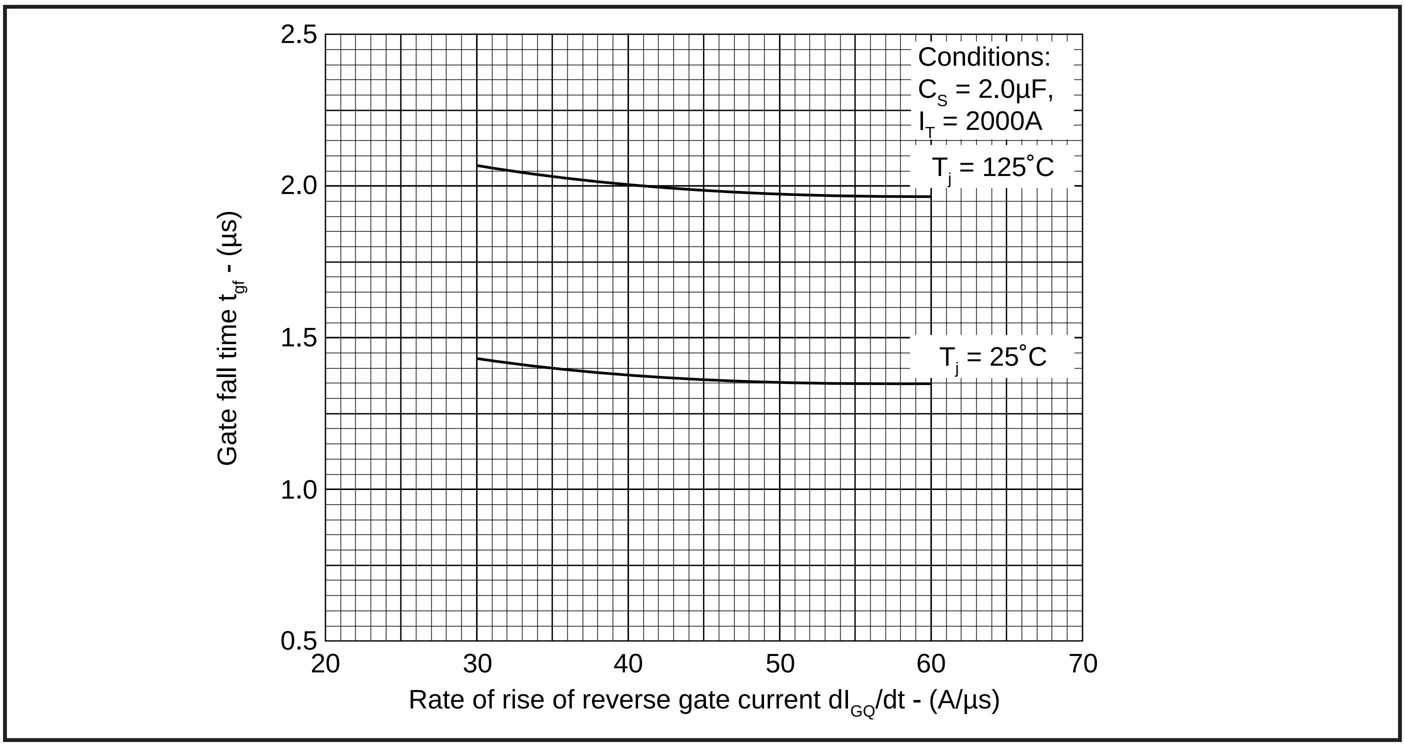


Fig.23 Gate fall time vs rate of rise of reverse gate current

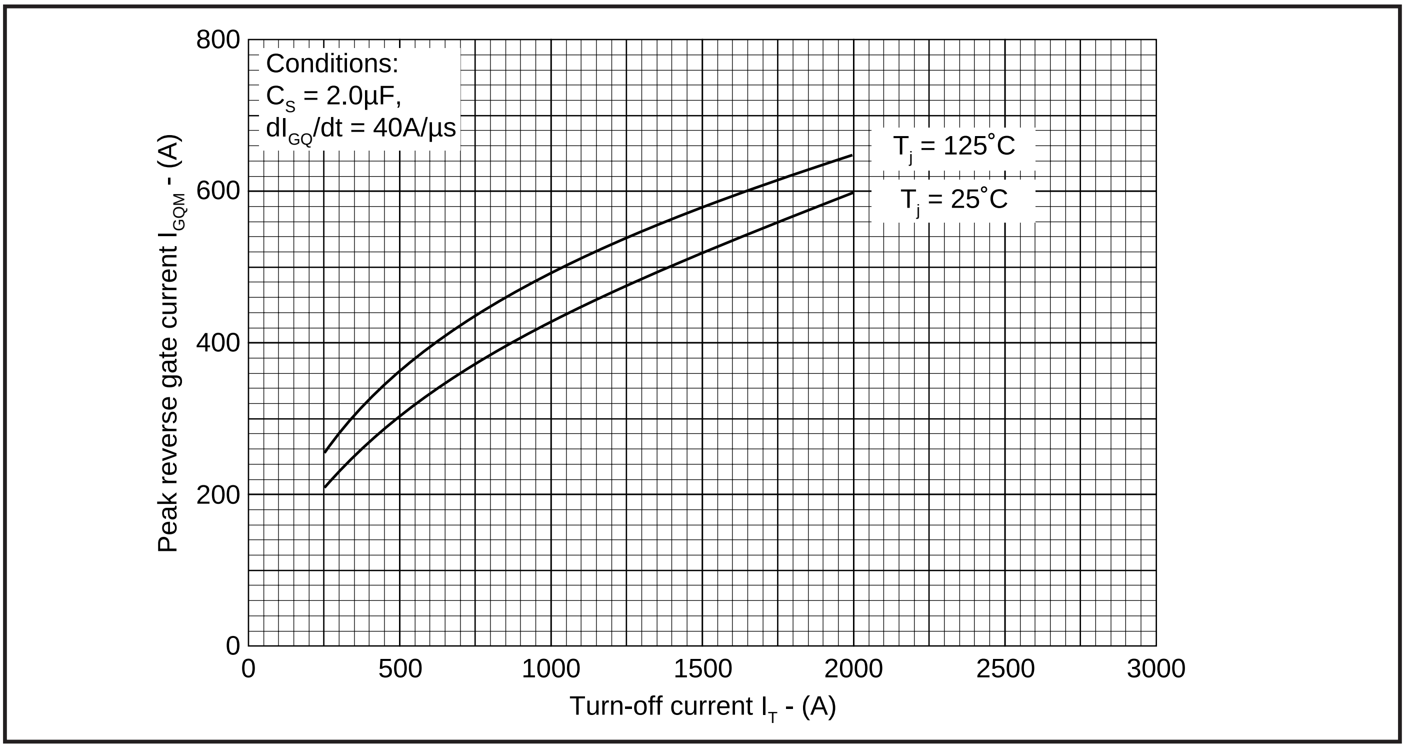


Fig.24 Peak reverse gate current vs turn-off current

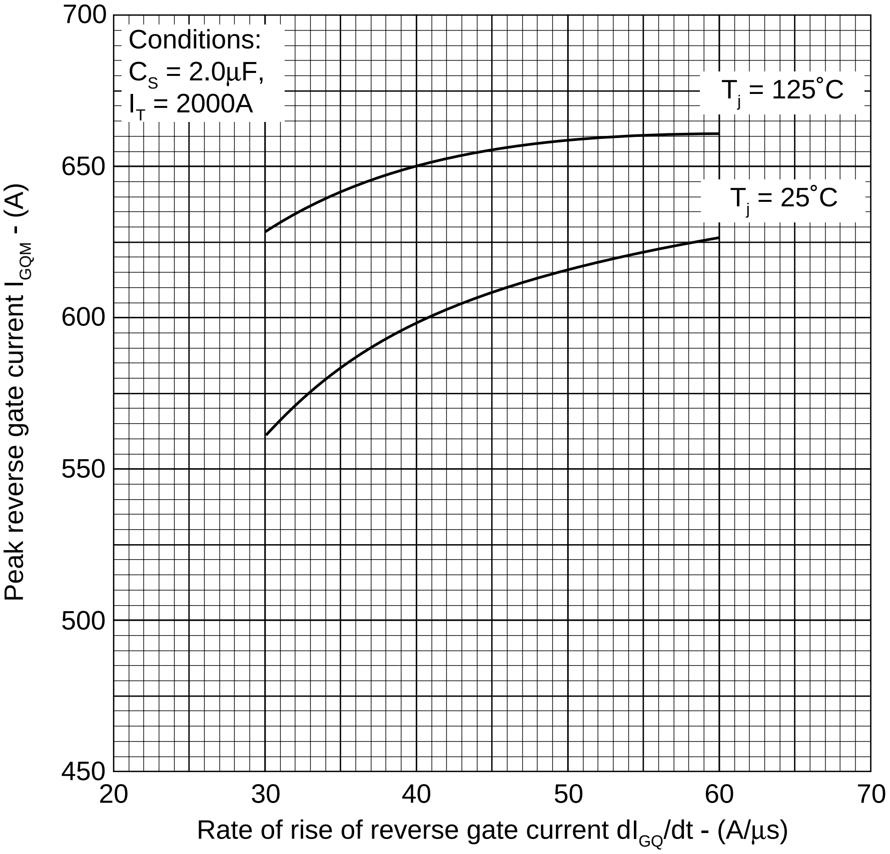


Fig.25 Peak reverse gate current vs rate of rise of reversegate current

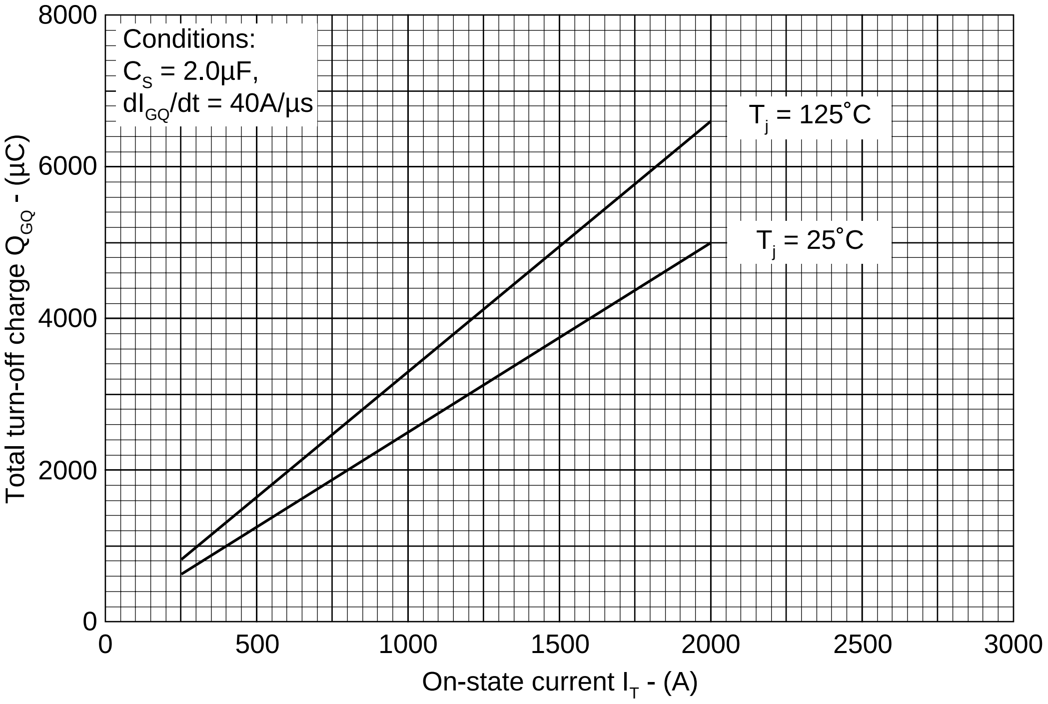


Fig.26 Turn-off gate charge vs on-state current

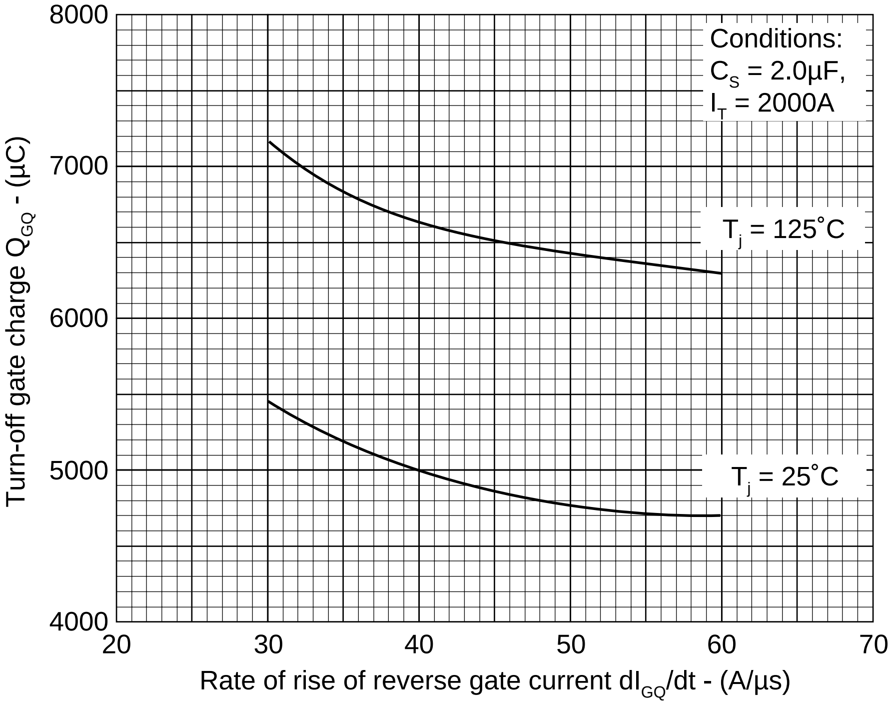


Fig.27 Turn-off gate charge vs rate of rise of reverse gate current

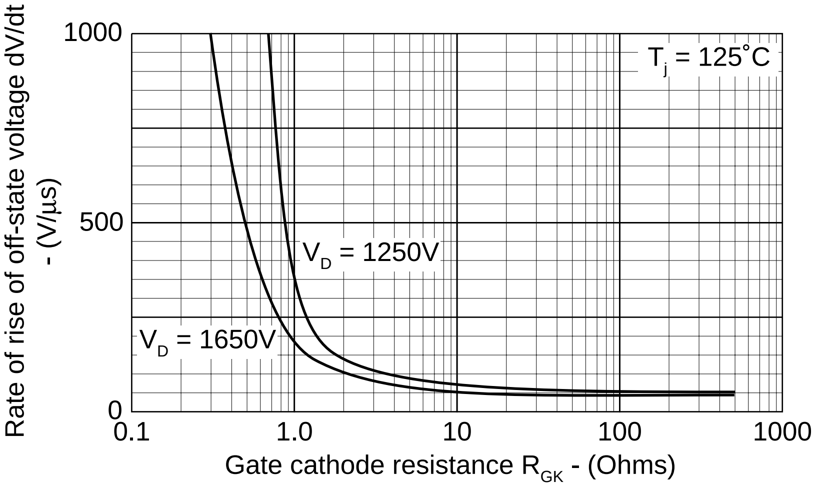
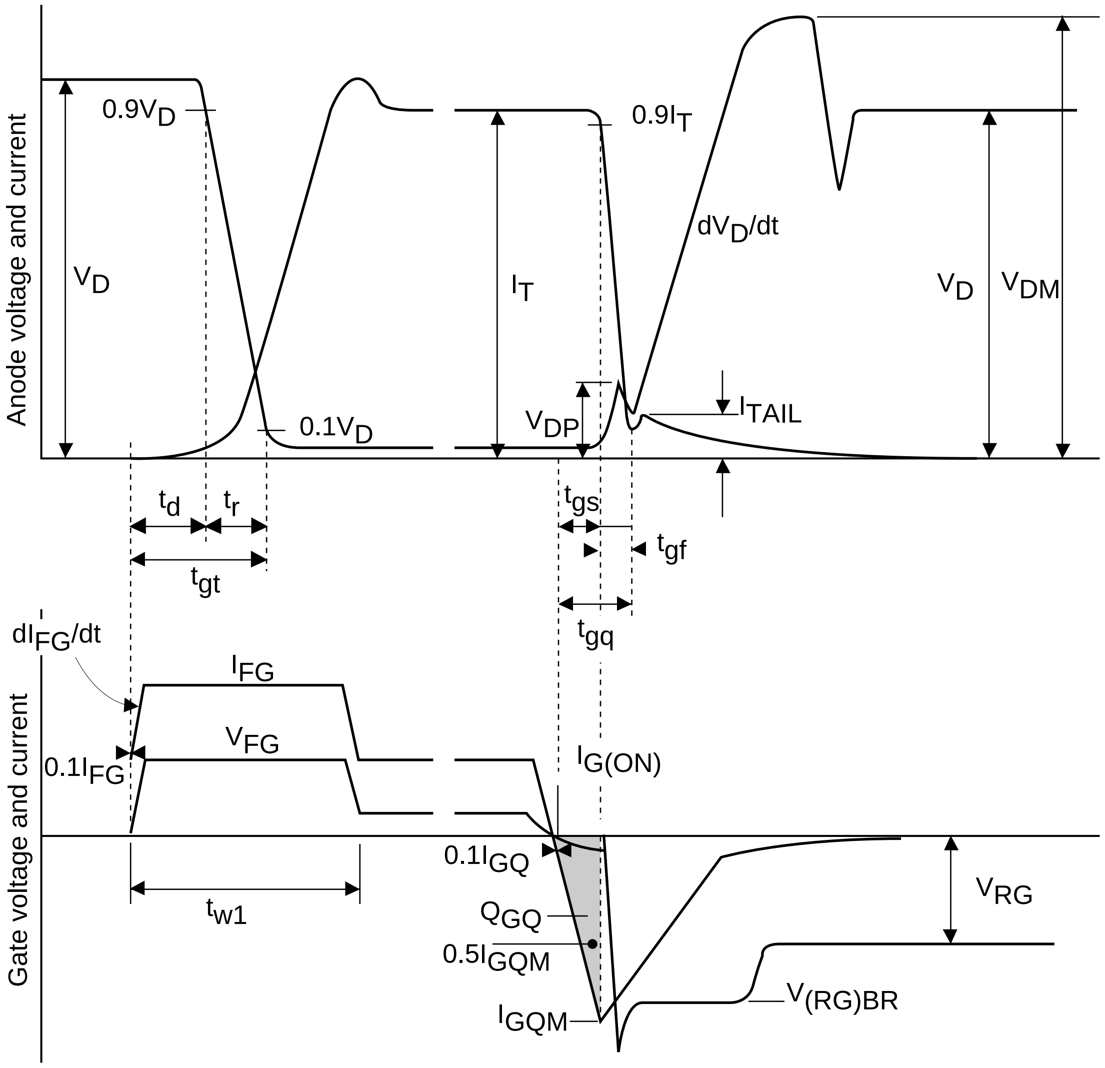


Fig.28 Rate of rise of off-state voltage vs gate cathode resistance



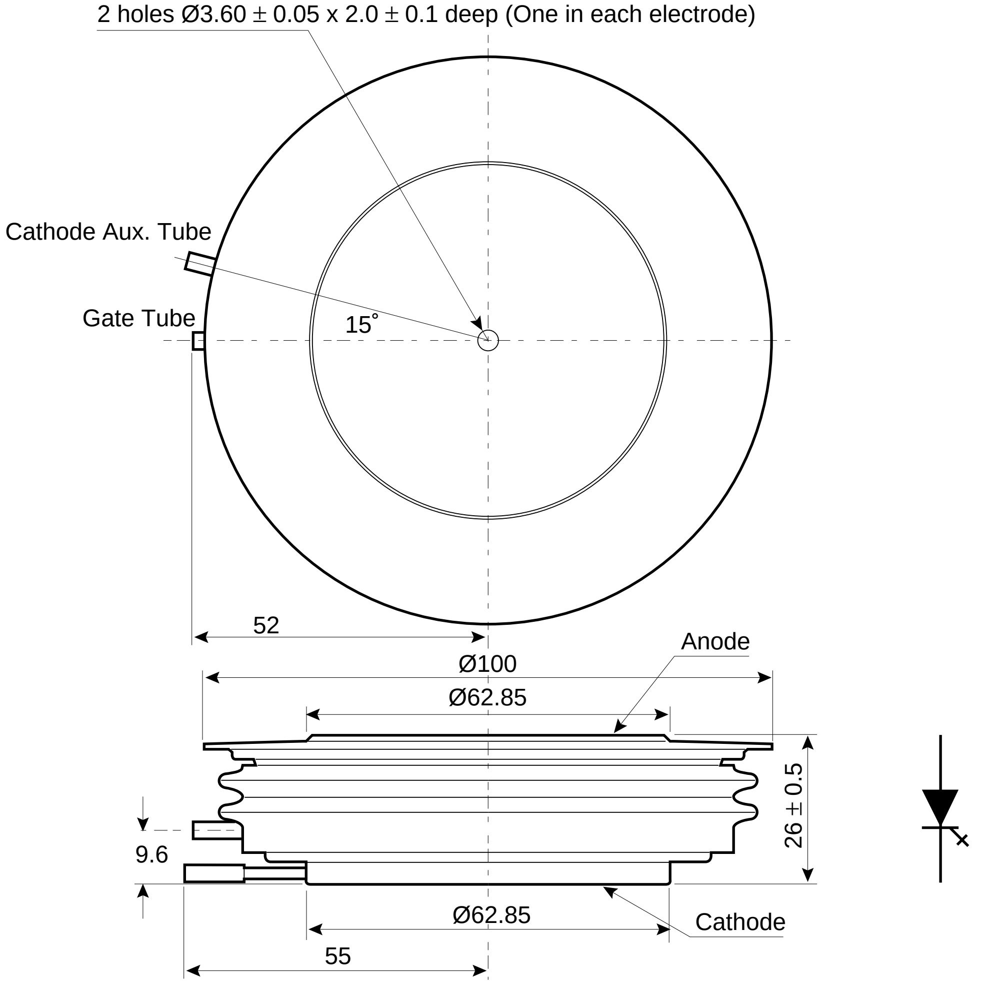
Recommended gate conditions:
I_{TCM} = 2000A
I_{FG} = 30A
$I_{G(ON)}$ = 7A d.c.
$t_{w1(min)}$ = 20µs
I_{GQM} = 650 A
di_{GQ}/dt = 40A/µs
Q_{GQ} = 6600µC
$V_{RG(min)}$ = 2V
$V_{RG(max)}$ = 16V

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

Fig.29 General switching waveforms

PACKAGE DETAILS

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 length: 505mm

Package outine type code: H

ASSOCIATED PUBLICATIONS

Title	Application Note Number
Calculating the junction temperature or power semiconductors	AN4506
GTO gate drive units	AN4571
Recommendations for clamping power semiconductors	AN4839
Use of V_{TO}, r_T on-state characteristic	AN5001
Impoved gate drive for GTO series connections	AN5177

POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink / clamping systems in line with advances in device types and the voltage and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group continues to offer high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the up to date CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete solution (PACs).

DEVICE CLAMPS

Disc devices require the correct clamping force to ensure their safe operation. The PACs range offers a varied selection of pre-loaded clamps to suit all of our manufactured devices. This include cube clamps for single side cooling of ‘T’ 22mm

Clamps are available for single or double side cooling, with high insulation versions for high voltage assemblies.

Please refer to our application note on device clamping, AN4839

HEATSINKS

Power Assembly has it’s own proprietary range of extruded aluminium heatsinks. They have been designed to optimise the performance or our semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest Sales Representative or the factory.

DYNEX
SEMICONDUCTOR

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Dynex Semiconductor annotate datasheets in the top right hard corner of the front page, to indicate product status. The annotations are as follows:-

Target Information: This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.

Preliminary Information: The product is in design and development. The datasheet represents the product as it is understood but details may change.

Advance Information: The product design is complete and final characterisation for volume production is well in hand.

No Annotation: The product parameters are fixed and the product is available to datasheet specification.