DG306AE25

Gate Turn-off Thyristor

Supersedes July 1996 version, DS4089 - 3.1

DS4089 - 3.2 March 1998

APPLICATIONS

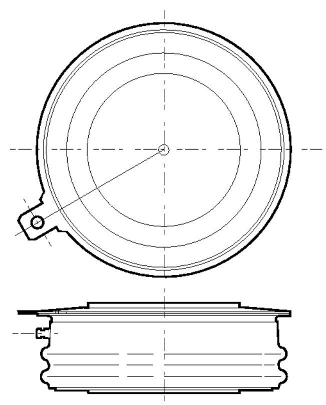
- Variable speed A.C. motor drive inverters (VSD-AC).
- Uninterruptable Power Supplies
- High Voltage Converters.
- Choppers.
- Welding.
- Induction Heating.
- DC/DC Converters.

KEY PARAMETERS

I_{TCM}	600A
V_{DRM}	2500V
$I_{T(AV)}$	225A
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: E. 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
DG306AE25	2500	16	T_{vj} = 125°C, I_{DM} = 50mA, I_{RRM} = 50mA, V_{RG} = 2V

CURRENT RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TCM}	Repetitive peak controllable on-state current	V_D = 67%V_{DRM}, T_j = 125°C, di_{GQ}/dt =15A/µs, Cs = 1.0µF	600	A
$I_{T(AV)}$	Mean on-state current	T_{HS} = 80°C. Double side cooled. Half sine 50Hz.	225	A
$I_{T(RMS)}$	RMS on-state current	T_{HS} = 80°C. Double side cooled. Half sine 50Hz.	350	A

SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine. T_j = 125°C	3.5	kA
I^2t	I^2t for fusing	10ms half sine. T_j =125°C	61250	A^2s
di_T/dt	Critical rate of rise of on-state current	V_D = 2000V, I_T = 600A, T_j = 125°C, I_{FG} > 20A, 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	500	V/μs
		To 66% V_{DRM}; V_{RG} = -2V, T_j = 125°C	1000	V/μs
L_S	Peak stray inductance in snubber circuit	-	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		-	50	A
$P_{FG(AV)}$	Average forward gate power		-	10	W
P_{RGM}	Peak reverse gate power		-	6	kW
di_{GQ}/dt	Rate of rise of reverse gate current		10	50	A/μs
$t_{ON(min)}$	Minimum permissable on time		20	-	μs
$t_{OFF(min)}$	Minimum permissable off time		40	-	μs

THERMAL RATINGS

Symbol	Parameter	Conditions		Min.	Max.	Units
$R_{th(j-hs)}$	DC thermal resistance - junction to heatsink surface	Double side cooled		-	0.075	°C/W
		Anode side cooled		-	0.12	°C/W
		Cathode side cooled		-	0.20	°C/W
$R_{th(c-hs)}$	Contact thermal resistance	Clamping force 6.0kN With mounting compound	per contact	-	0.018	°C/W
T_{vj}	Virtual junction temperature			-	125	°C
T_{OP}/T_{stg}	Operating junction/storage temperature range			-40	125	°C
-	Clamping force			5.0	6.0	kN

CHARACTERISTICS

T_j = 125°C unless stated otherwise					
Symbol	**Parameter**	**Conditions**	**Min.**	**Max.**	**Units**
V_{TM}	On-state voltage	At 600A peak, $I_{G(ON)}$ = 2A d.c.	-	2.75	V
I_{DM}	Peak off-state current	V_{DRM} = 2500V, V_{RG} = 0V	-	50	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	-	0.9	V
I_{GT}	Gate trigger current	V_D = 24V, I_T = 100A, T_j = 25°C	-	1.0	A
I_{RGM}	Reverse gate cathode current	V_{RGM} = 16V, No gate/cathode resistor	-	50	mA
E_{ON}	Turn-on energy	V_D = 2000V	-	515	mJ
t_d	Delay time	I_T = 600A, dI_T/dt = 300A/µs	-	1.5	µs
t_r	Rise time	I_{FG} = 20A, rise time < 1.0µs	-	3.0	µs
E_{OFF}	Turn-off energy		-	1000	mJ
t_{gs}	Storage time		-	11.4	µs
t_{gf}	Fall time	I_T =600A, V_{DM} = 2000V	-	1.5	µs
t_{gq}	Gate controlled turn-off time	Snubber Cap Cs = 1.0µF,	-	12.9	µs
Q_{GQ}	Turn-off gate charge	di_{GQ}/dt = 15A/µs	-	1300	µC
Q_{GQT}	Total turn-off gate charge		-	2600	µC
I_{GQM}	Peak reverse gate current		-	190	A

CURVES

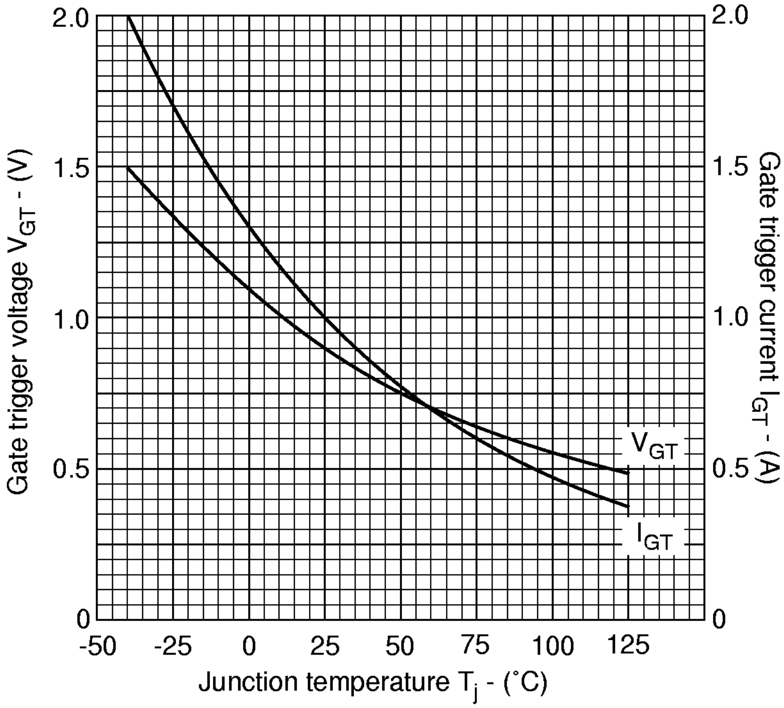


Fig.1 Gate trigger voltage/curremt vs junction temperature

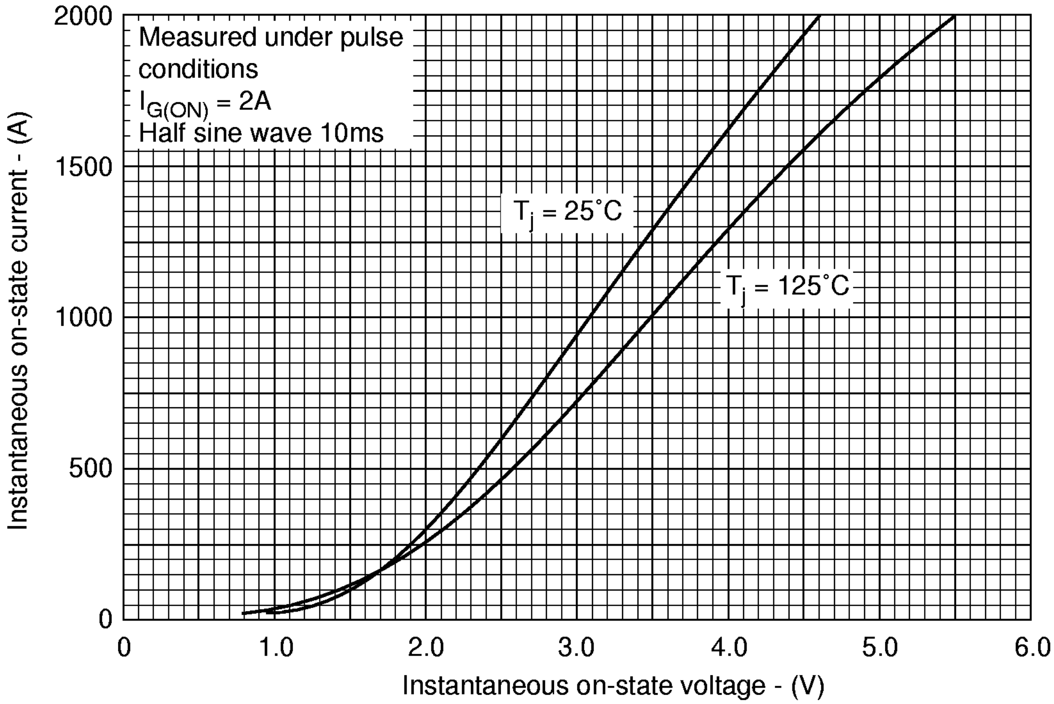


Fig.2 Maximum limit on-state characteristics

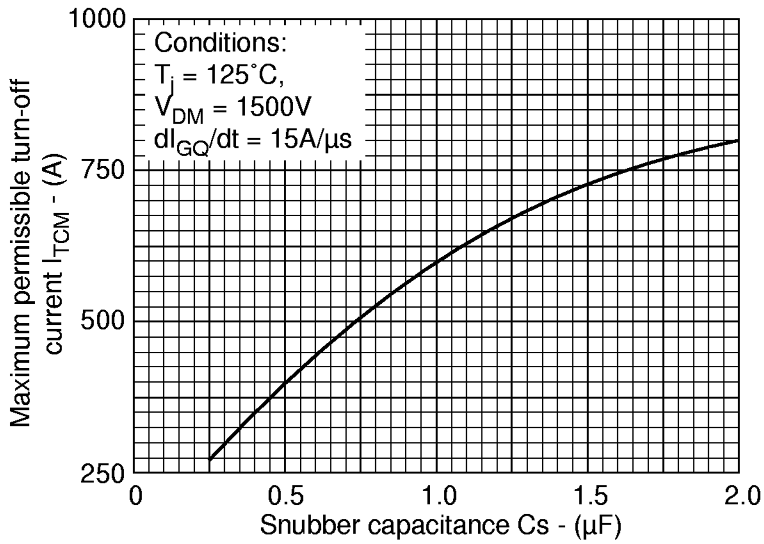


Fig.3 Dependence of I_{TCM} on Cs

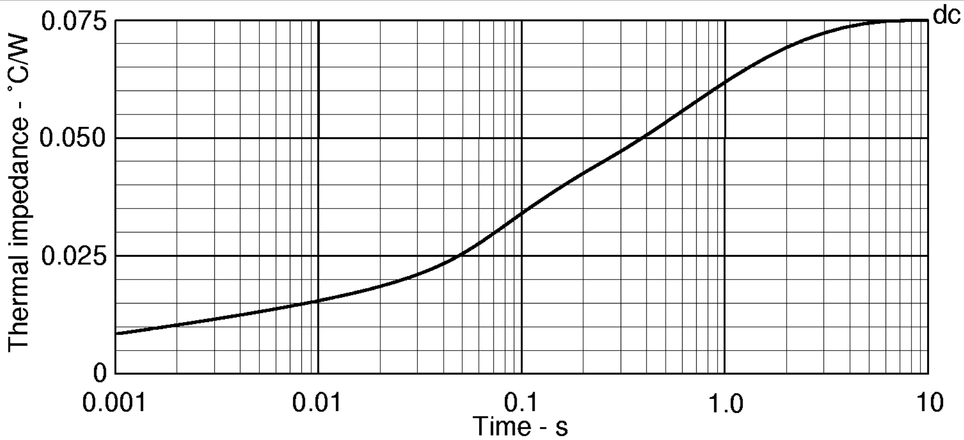


Fig.4 Maximum (limit) transient thermal impedance - double side cooled

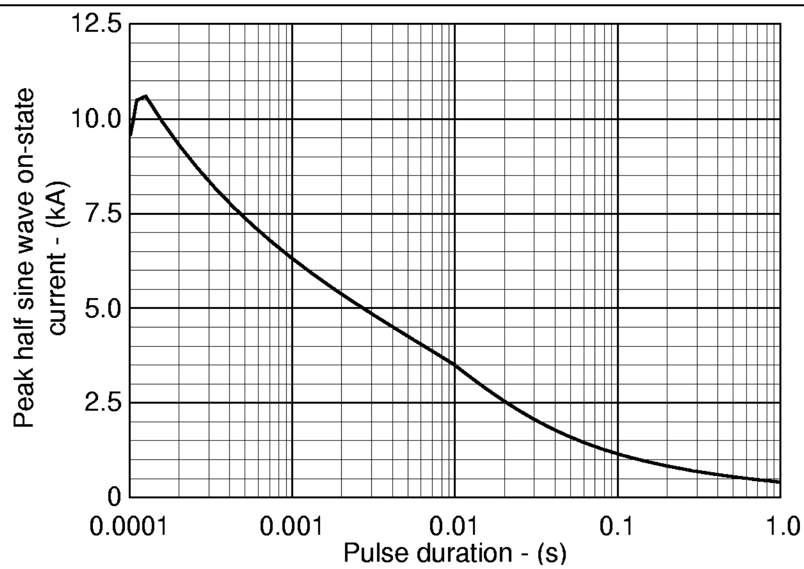


Fig.5 Surge (non-repetitive) on-state current vs time

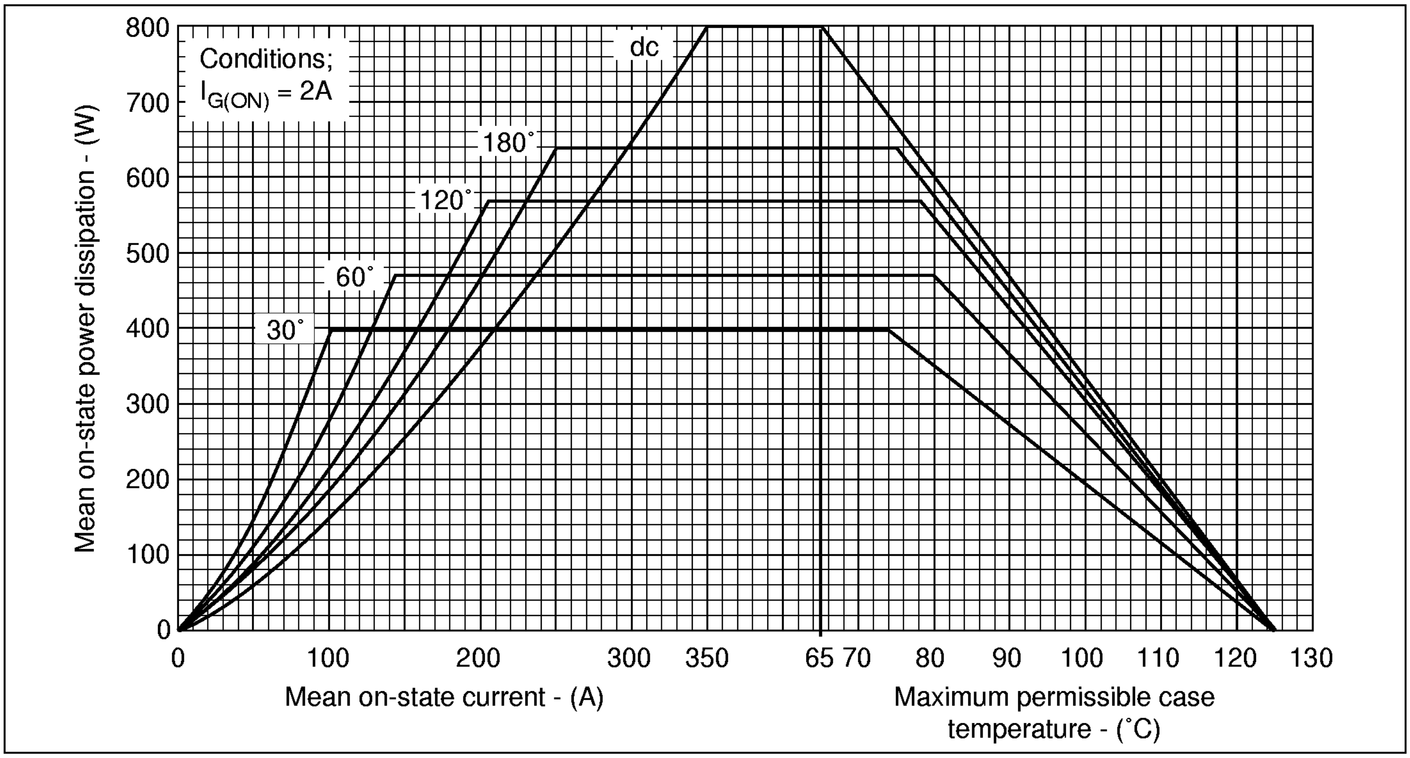


Fig.6 Steady state rectangular wave conduction loss - double side cooled

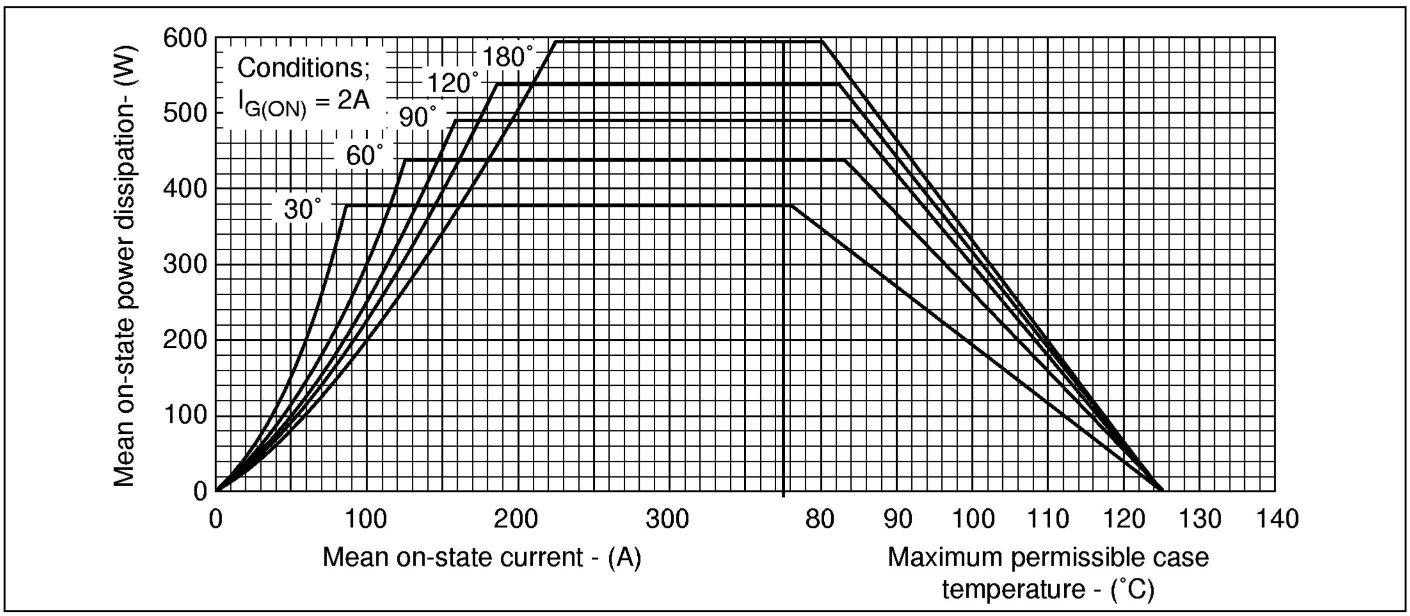


Fig.7 Steady state sinusoidal wave conduction loss - double side cooled

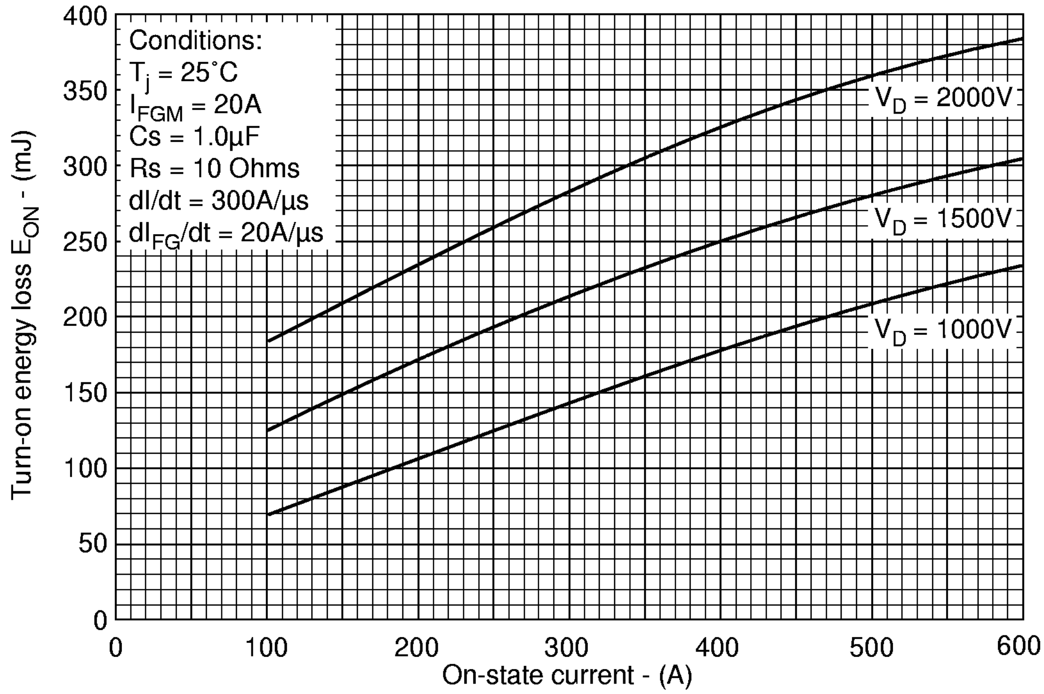


Fig.8 Turn-on energy vs on-state current

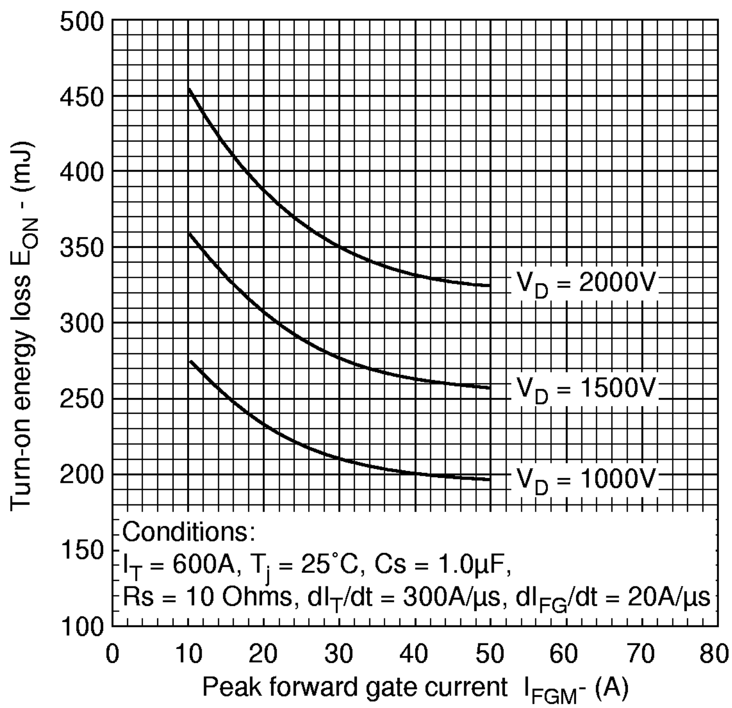


Fig.9 Turn-on energy vs peak forward gate current

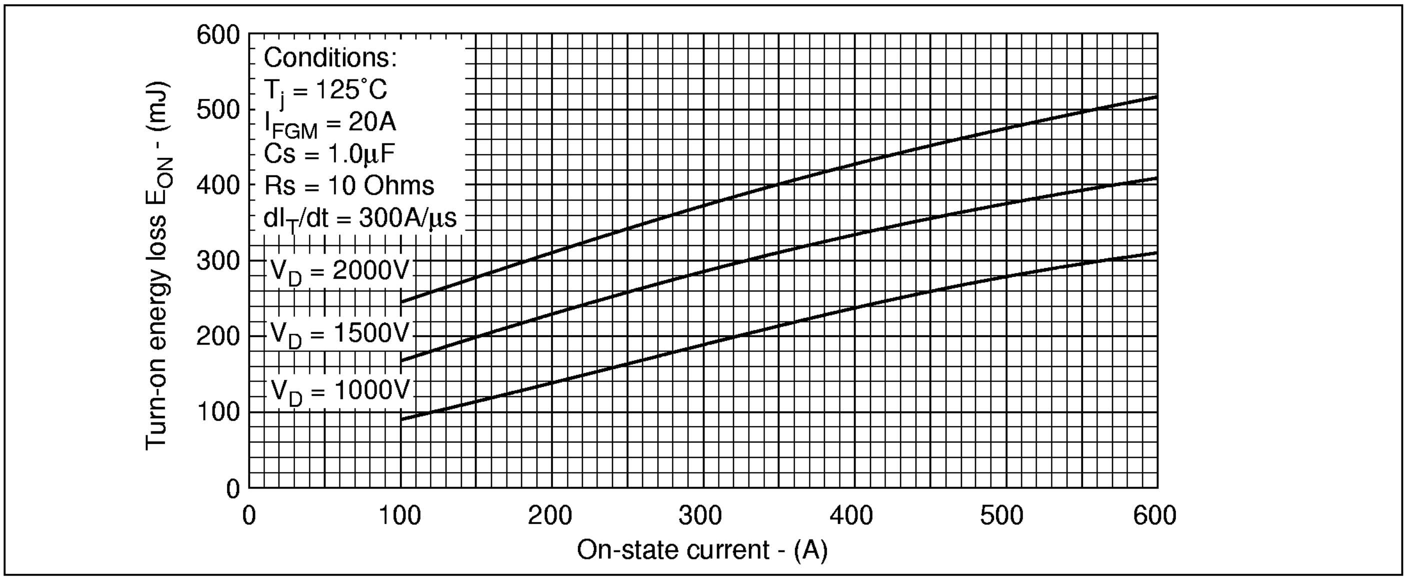


Fig.10 Turn-on energy vs on-state current

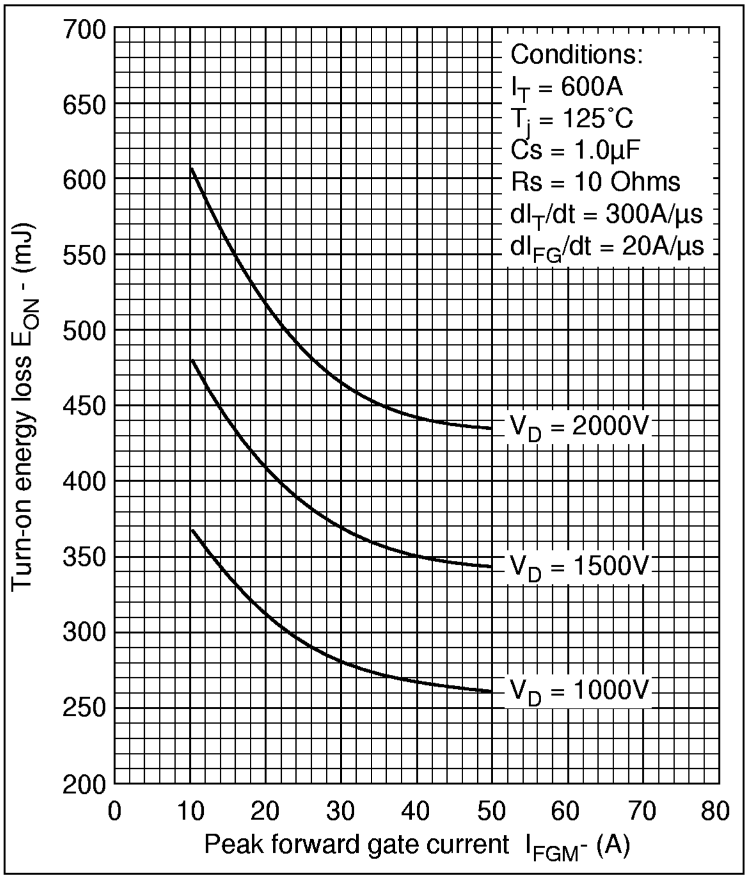


Fig.11 Turn-on energy vs peak forward gate current

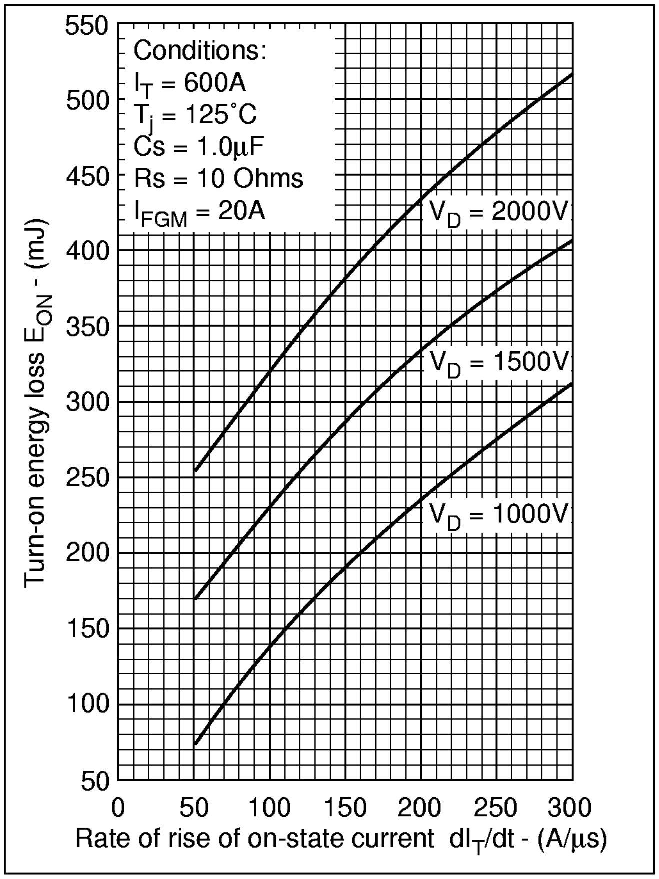


Fig.12 Turn-on energy vs rate of rise of on-state current

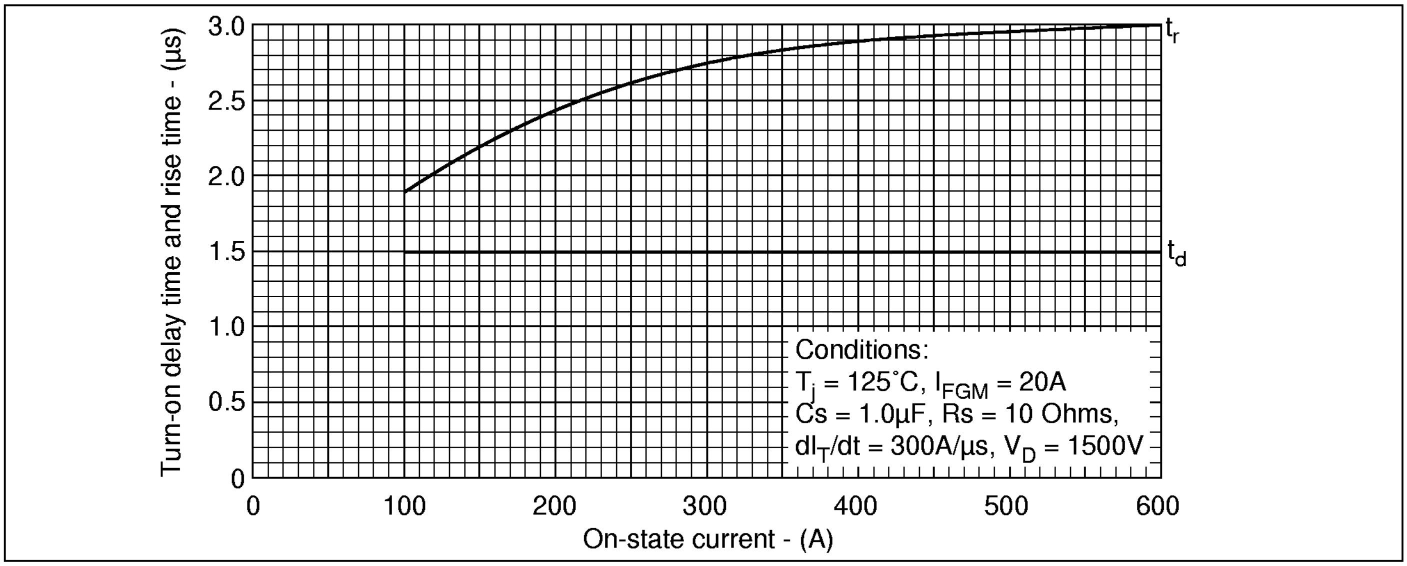


Fig.13 Delay & rise time vs turn-on current

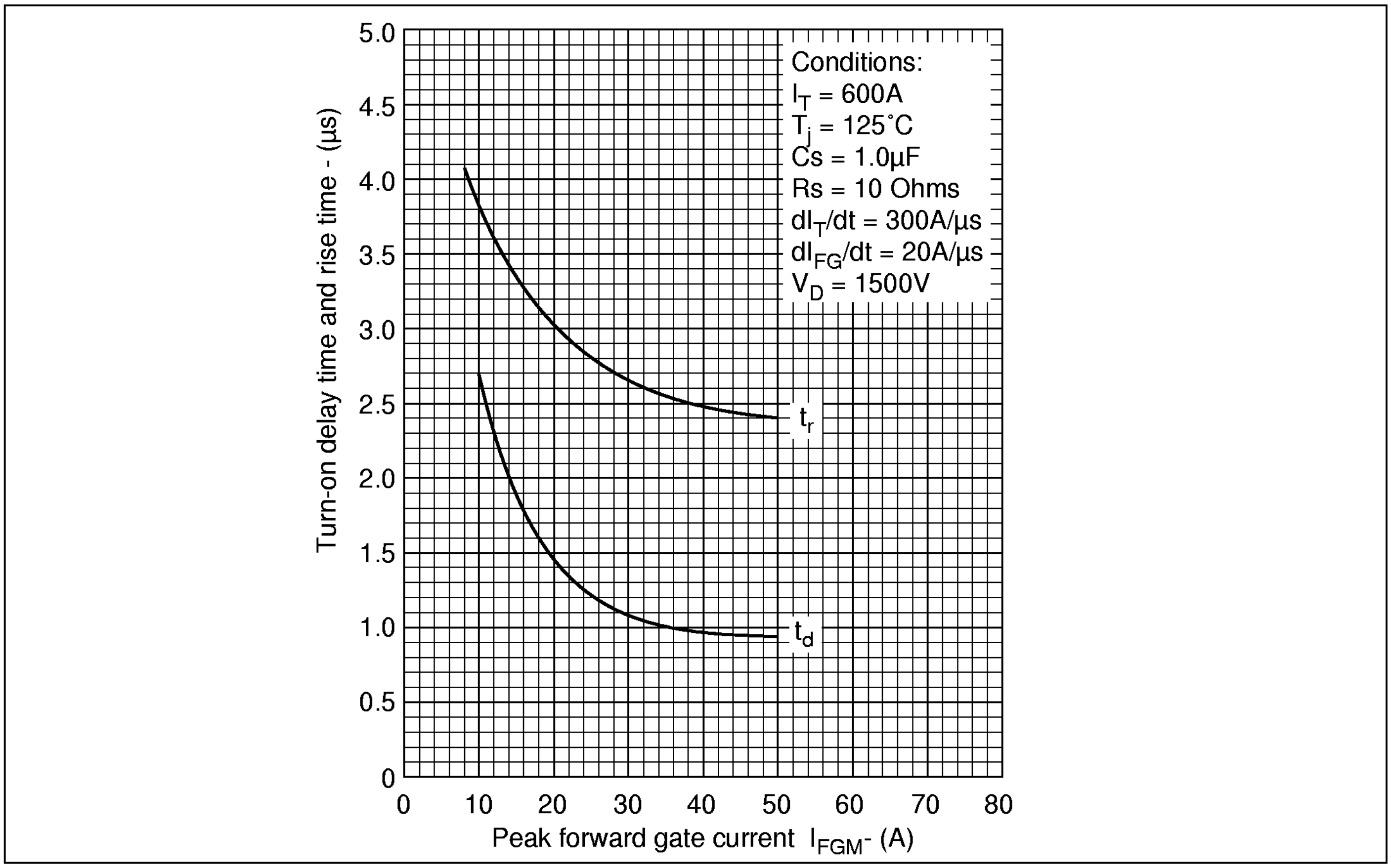


Fig.14 Delay time & rise time vs peak forward gate current

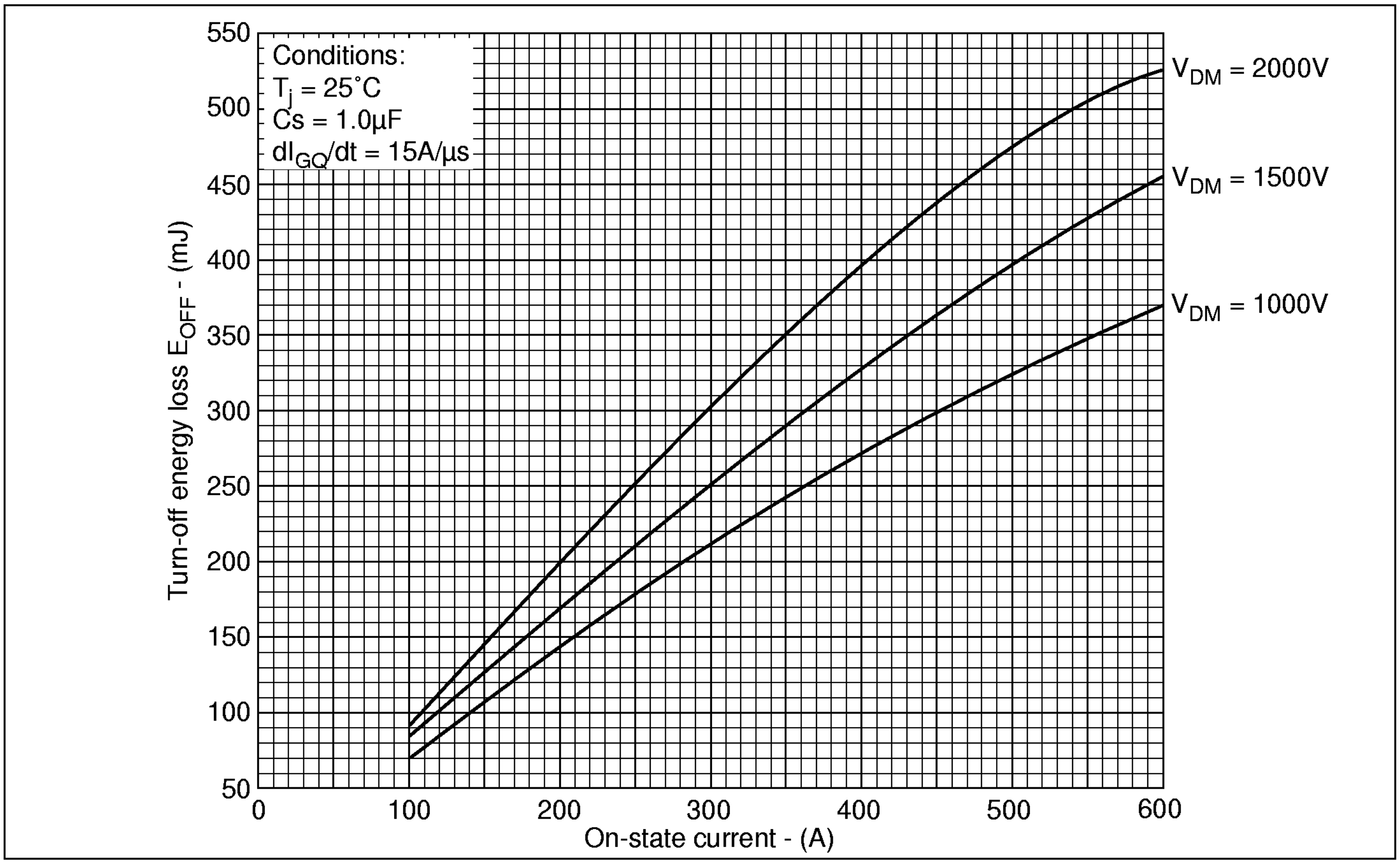


Fig.15 Turn-off energy loss vs on-state current

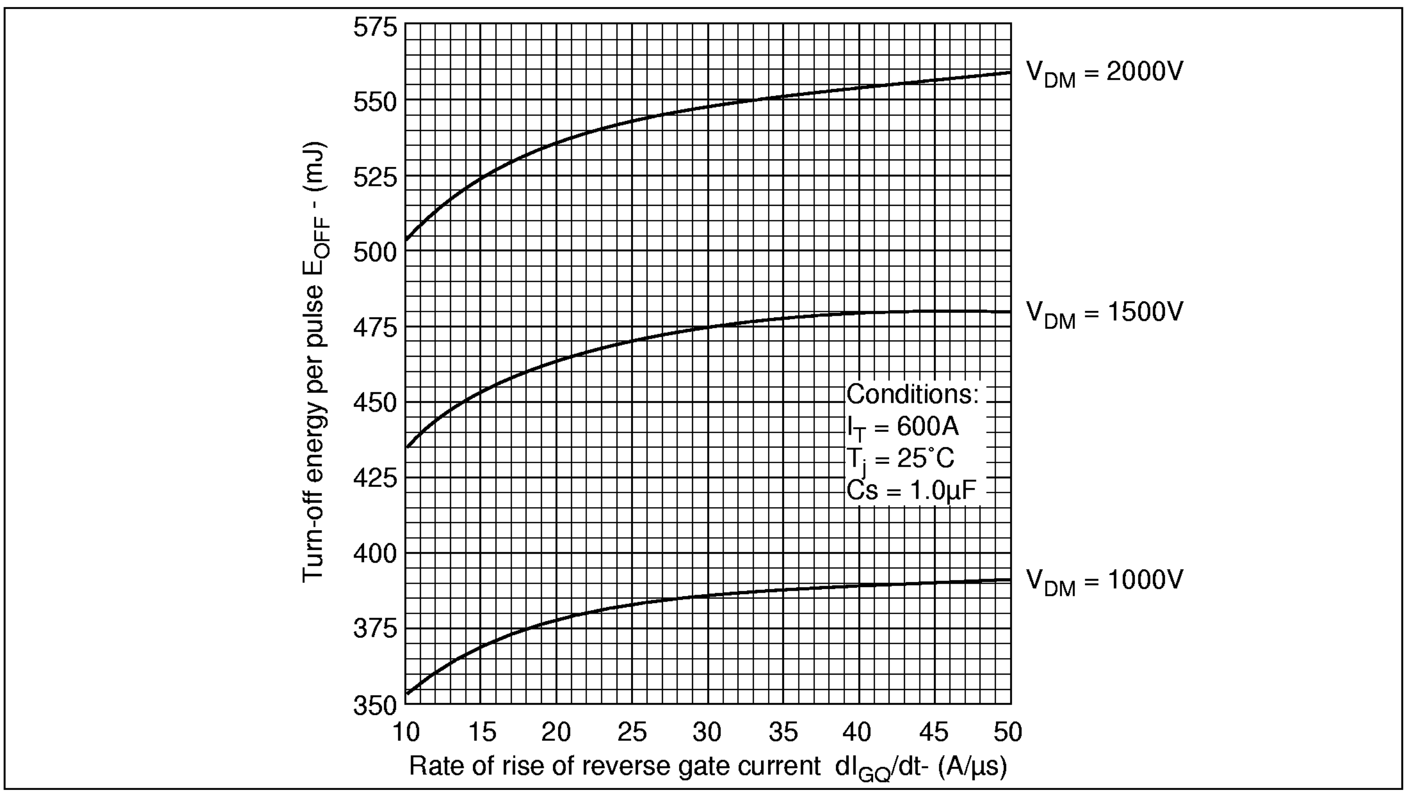


Fig.16 Turn-off energy vs rate of rise of reverse gate current

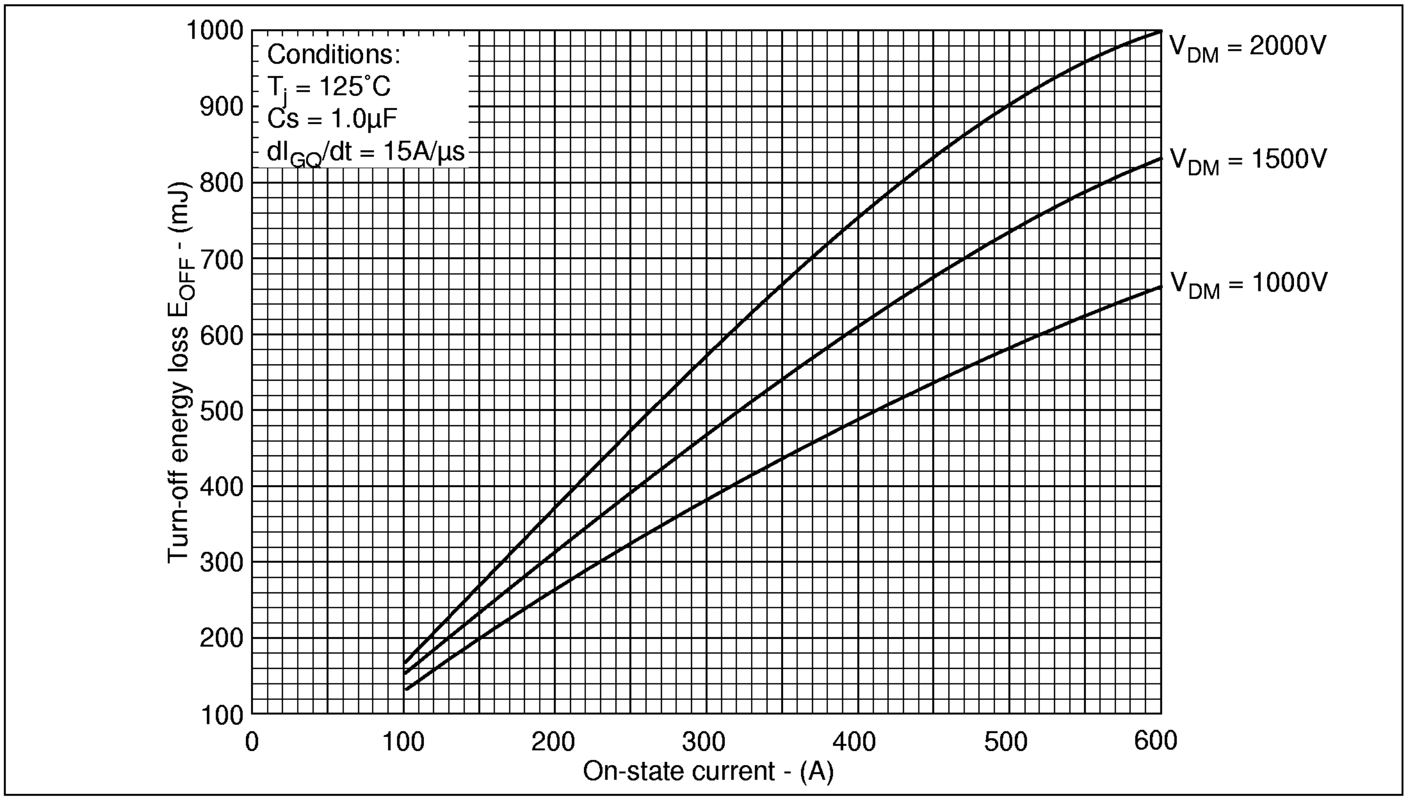


Fig.17 Turn-off energy vs on-state current

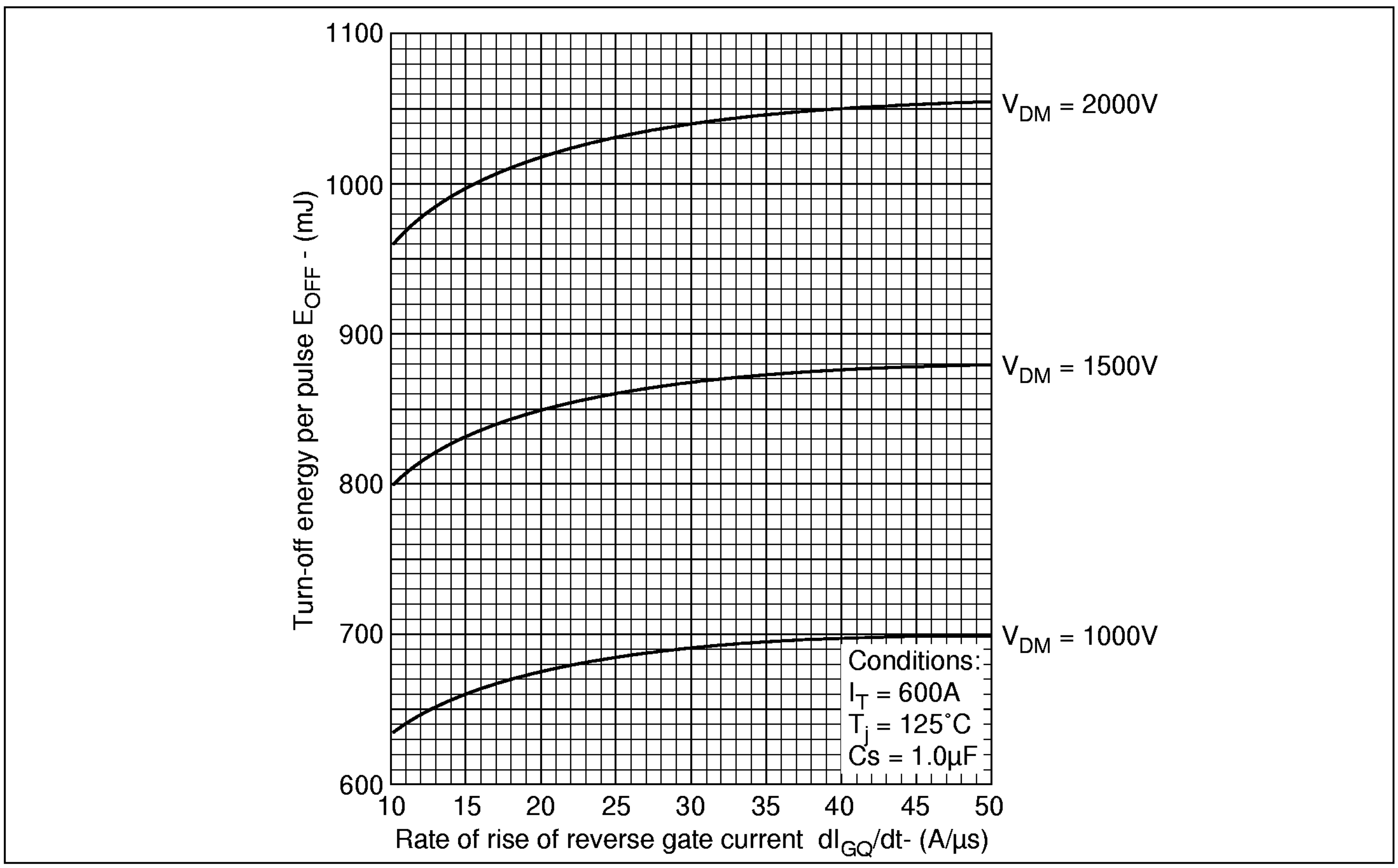


Fig.18 Turn-off energy loss vs rate of rise of reverse gate current

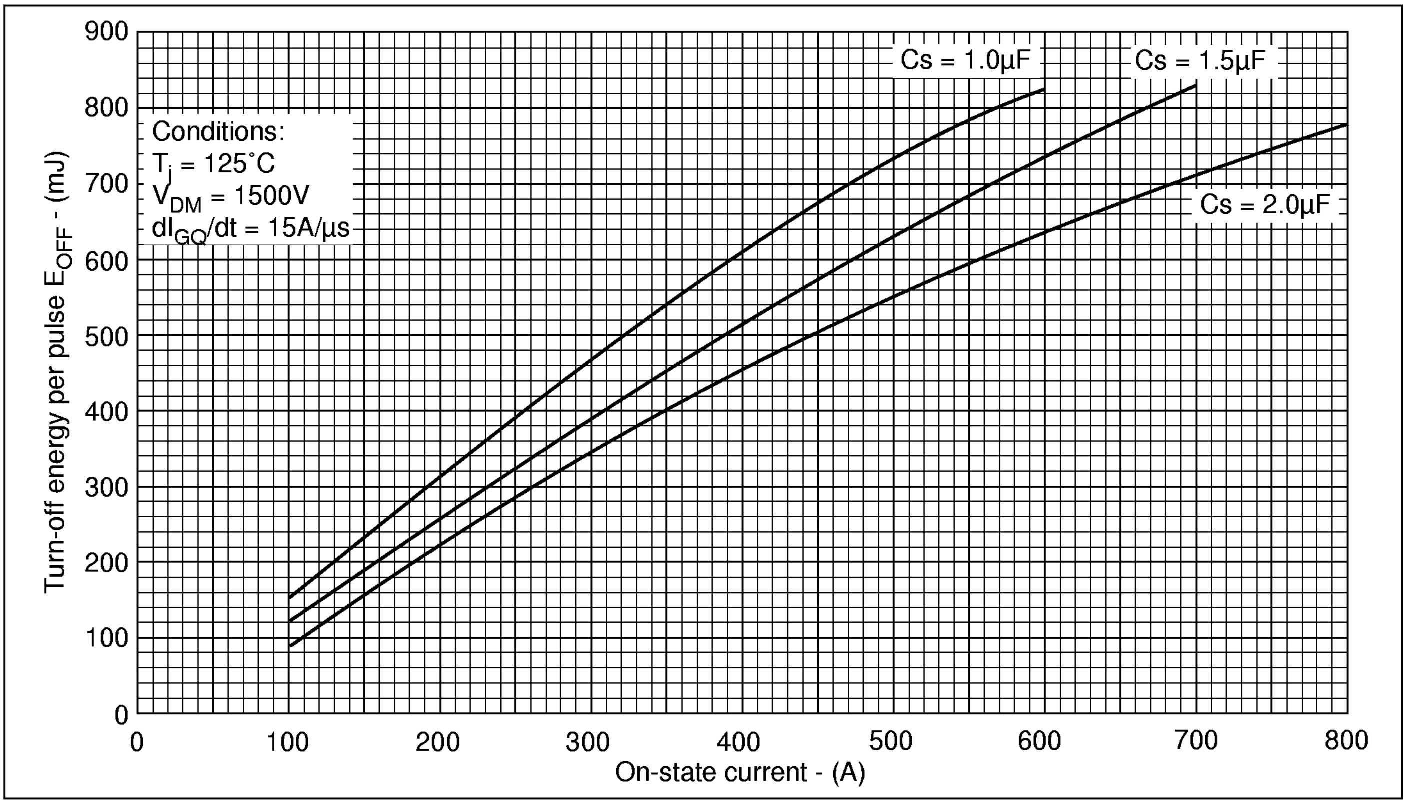


Fig.19 Turn-off energy vs on-state current

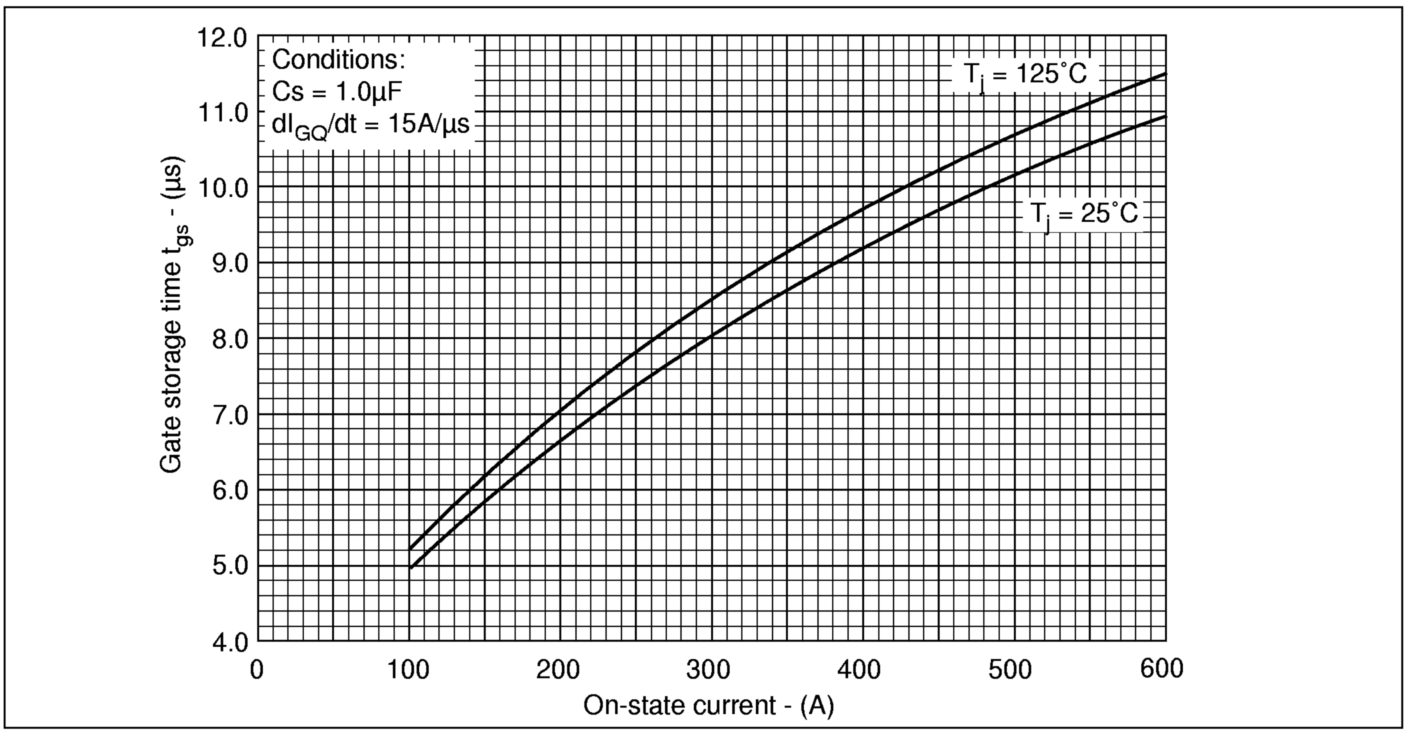


Fig.20 Gate storage time vs on-state current

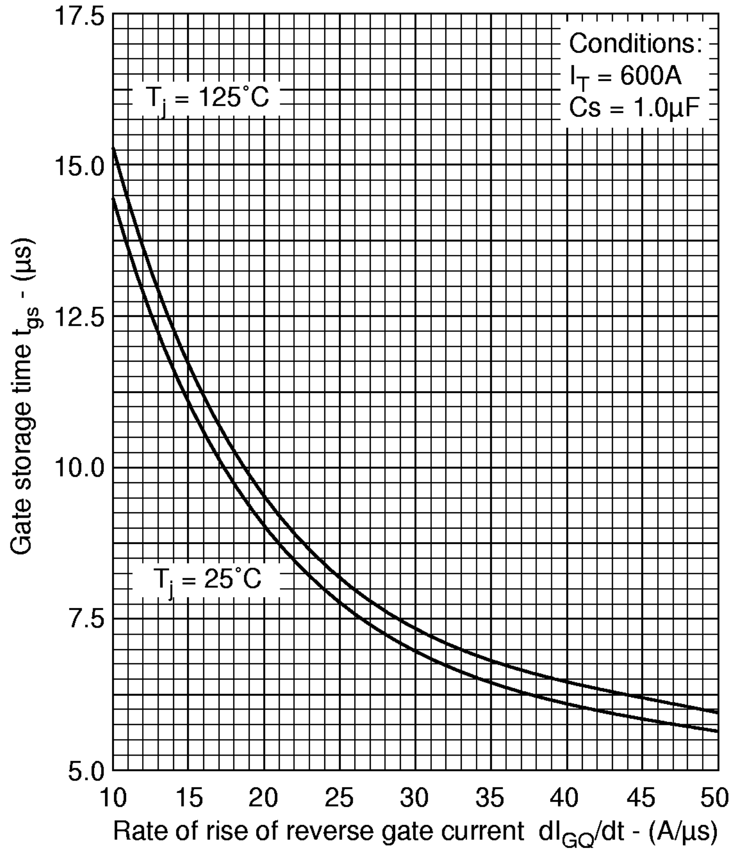


Fig.21 Gate storage time vs rate of rise of reverse gate current

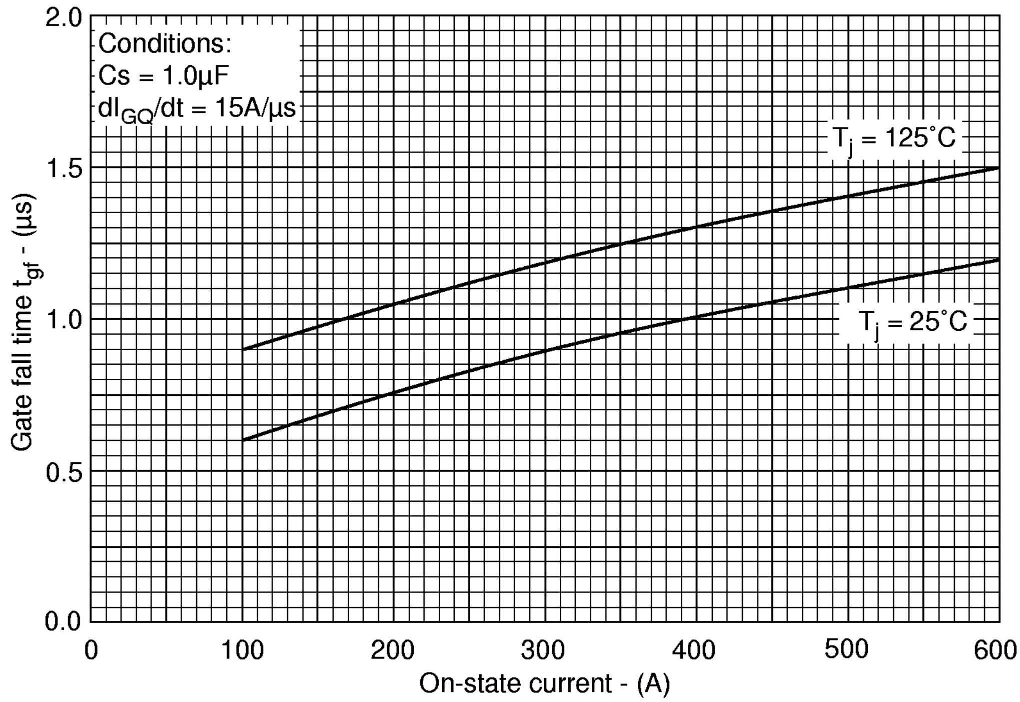


Fig.22 Gate fall time vs on-state current

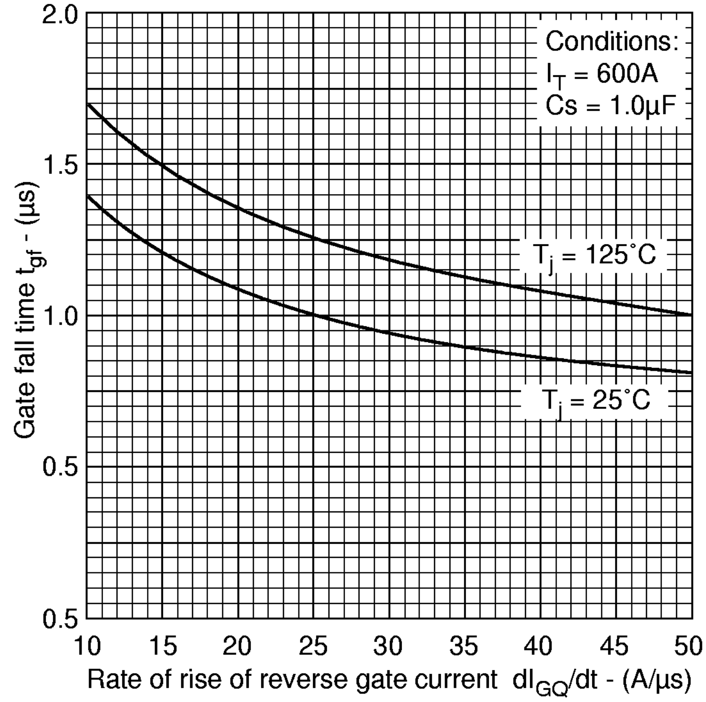


Fig.23 Gate fall time vs rate of rise of revese gate current

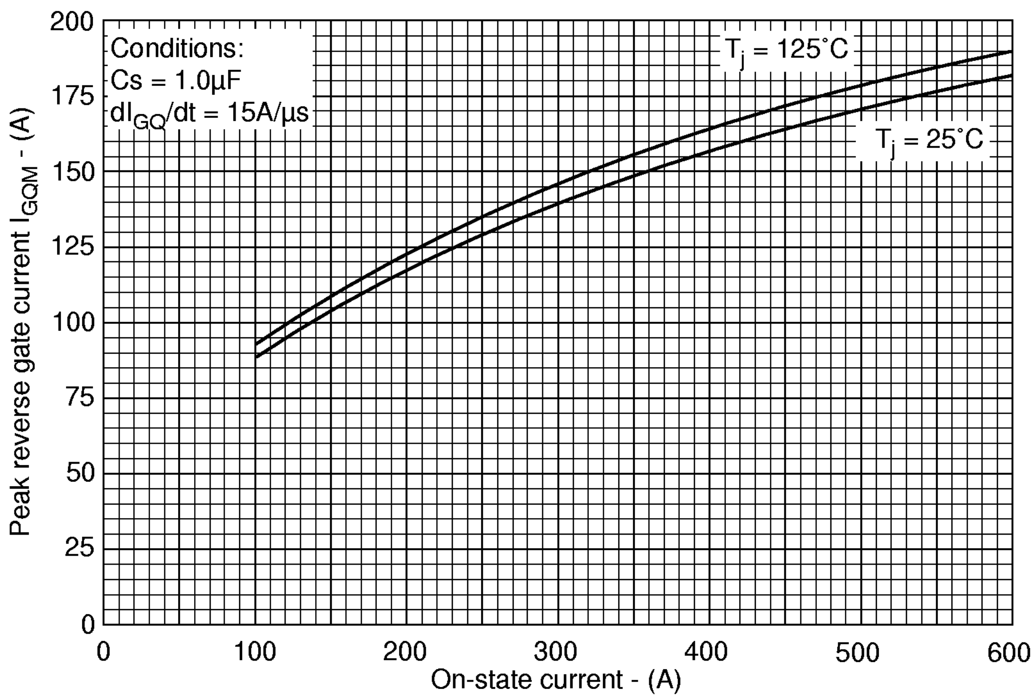


Fig.24 Peak reverse gate current vs on-state voltage

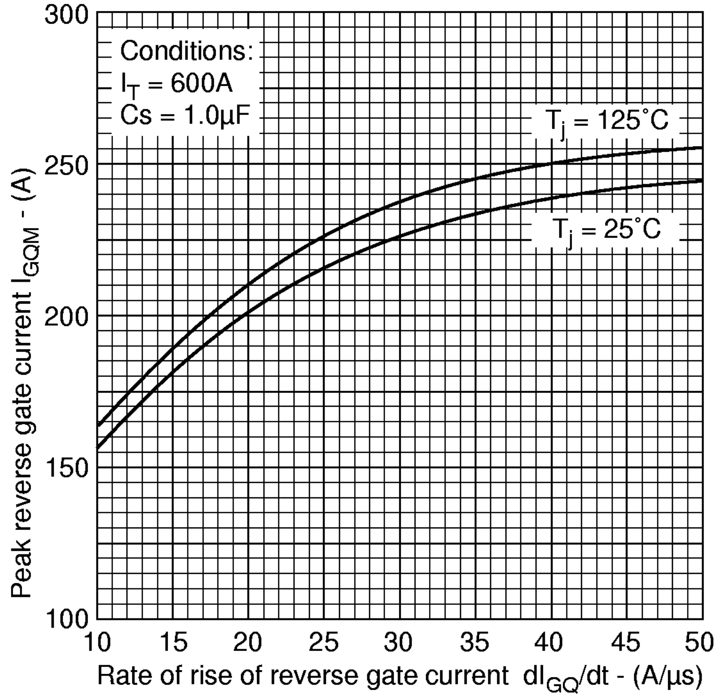


Fig.25 Reverse gate current vs rate of rise of reverse gate current

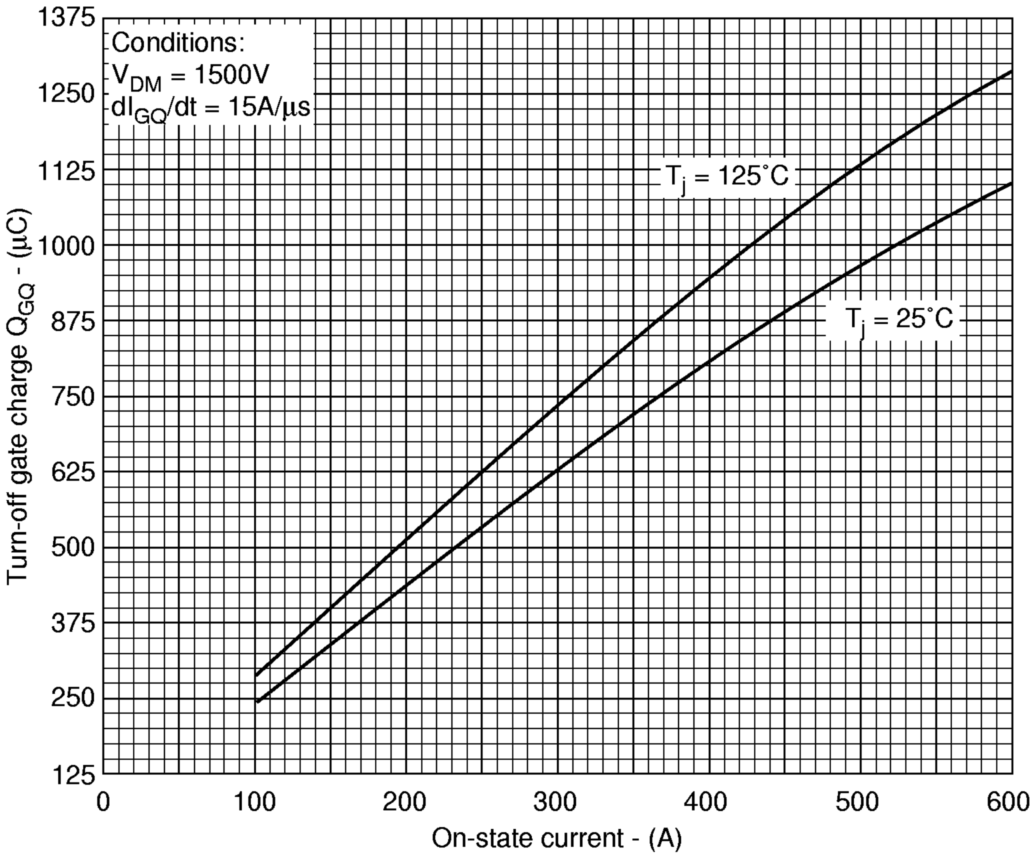


Fig.26 Turn-off gatecharge vs on-state voltage

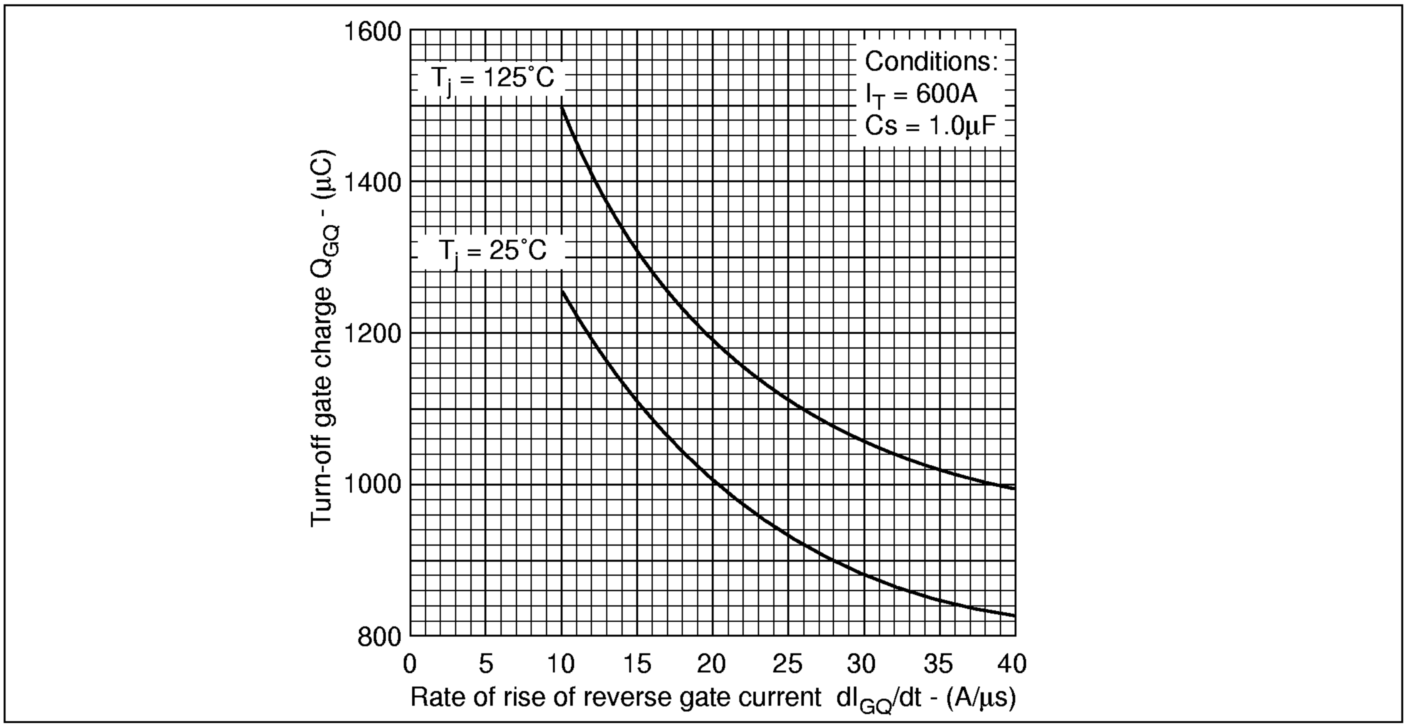


Fig.27 Turn-off gate charge vs rate of rise or reverse gate current

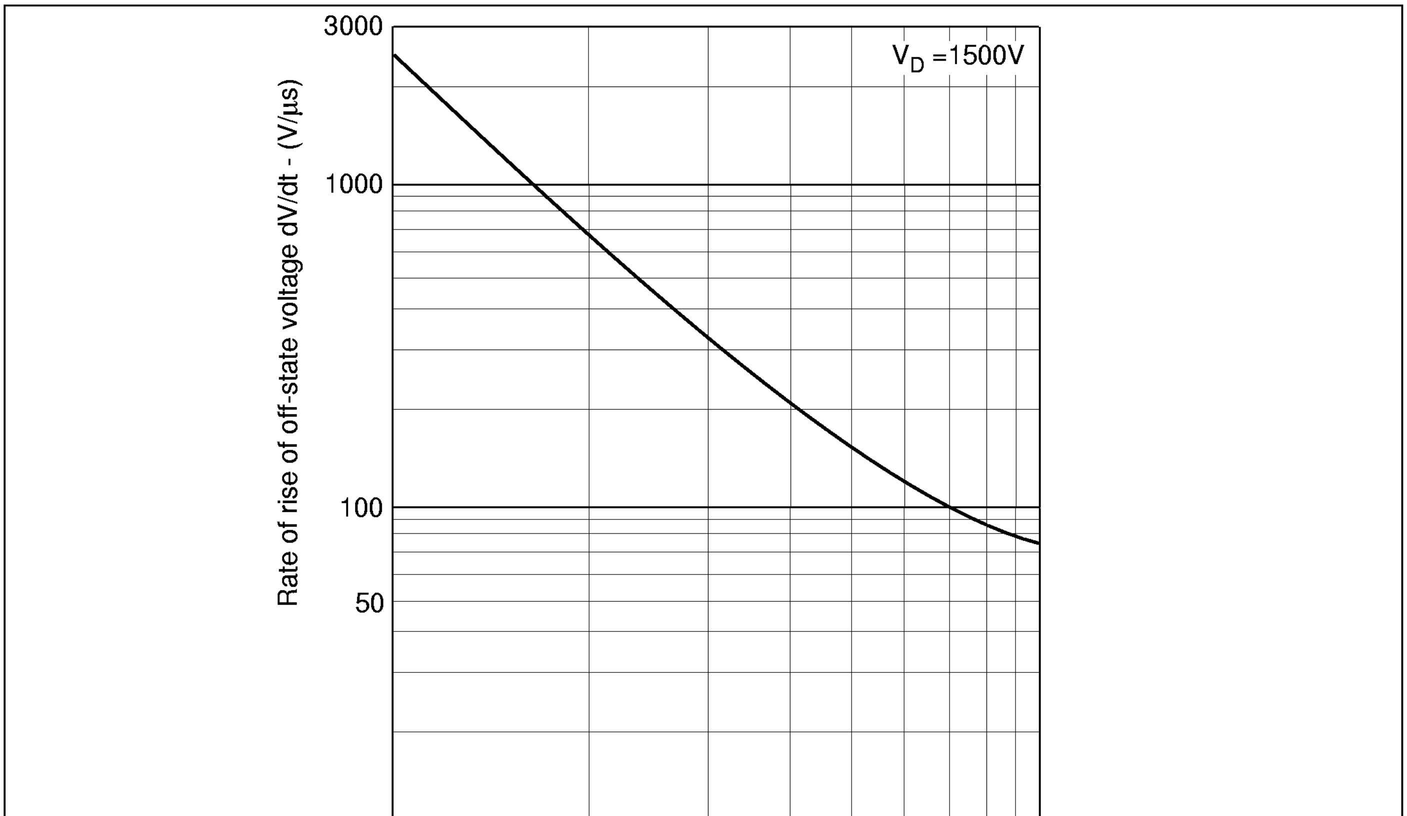
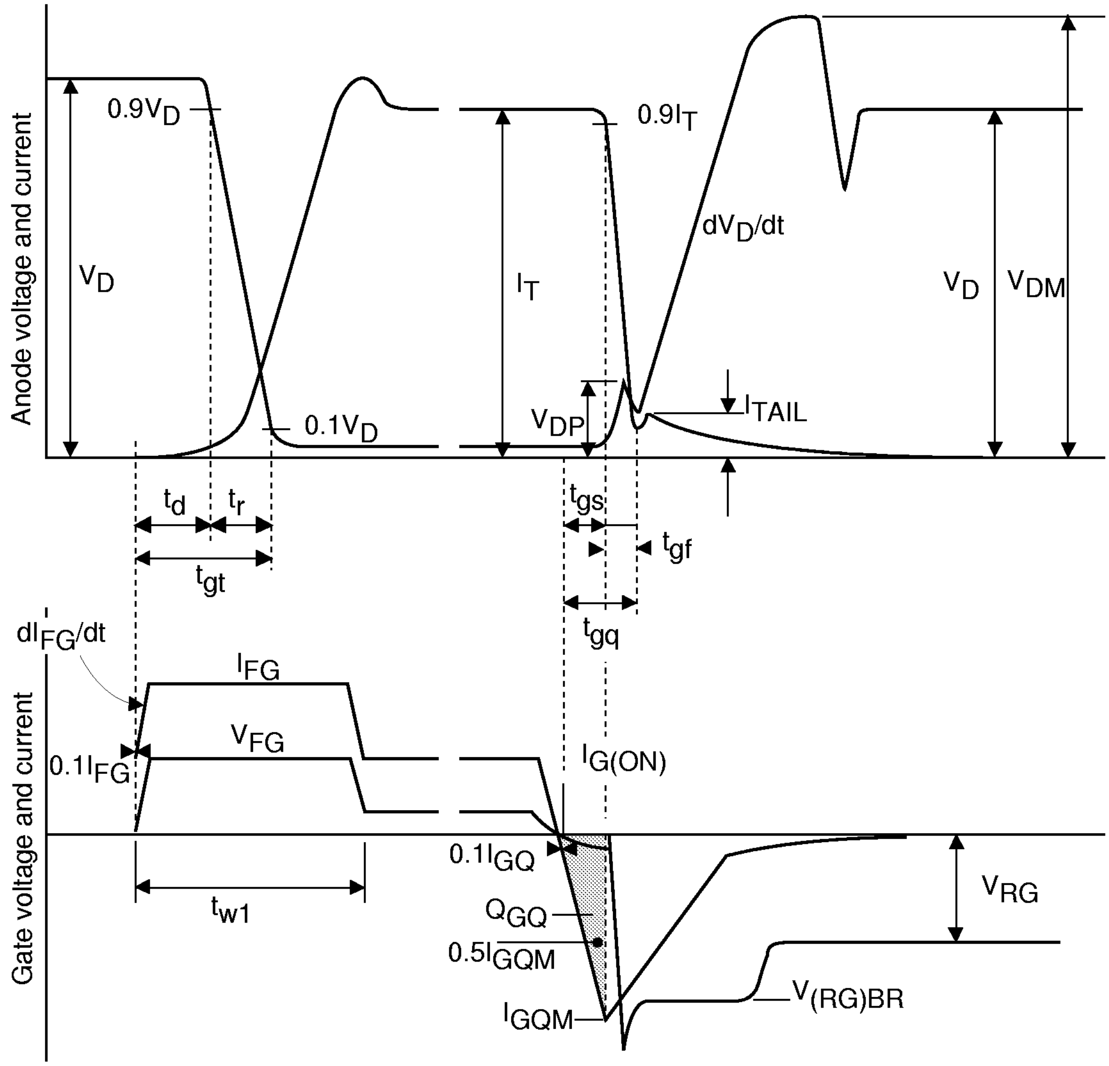


Fig.28 Typical rate of rise of off-state voltage vs gate cathode resistance



Recommended gate conditions:

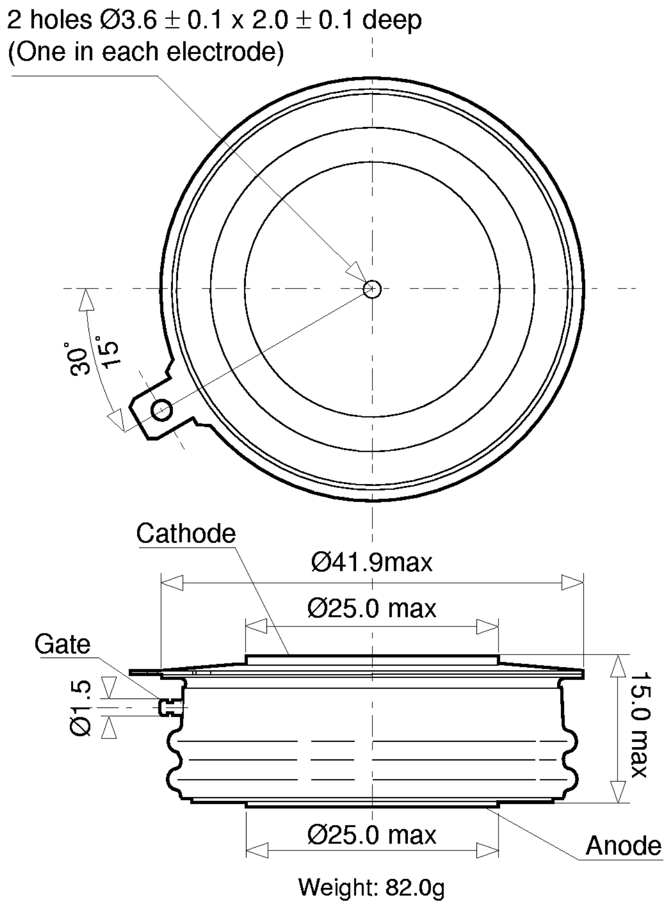
I_{TCM} = 600A
I_{FG} = 20A
$I_{G(ON)}$ = 2A d.c.
$t_{w1(min)}$ = 10μs
I_{GQM} = 190A
di_{GQ}/dt = 15A/μs
Q_{GQ} = 1300μC
$V_{RG(min)}$ = 2.0V
$V_{RG(max)}$ = 16V

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

Fig.29 General switching waveforms

PACKAGE DETAILS - E

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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