DG306AE25

Gate Turn-off Thyristor

DS4099-5 January 2014 (LN31739)

APPLICATIONS

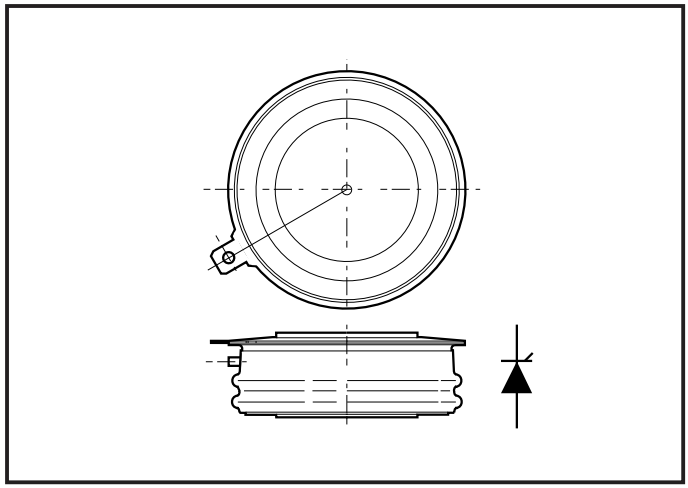
- Variable speed A.C. motor drive inverters (VSD-AC)
- Uninterruptable Power Supplies
- High Voltage Converters
- Choppers
- Welding
- Induction Heating
- DC/DC Converters

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	I_T =600A, V_{DM} = 2000V Snubber Cap Cs = 1.0µF, di_{GQ}/dt = 15A/µs	-	1000	mJ
t_{gs}	Storage time		-	11.4	µs
t_{gf}	Fall time		-	1.5	µs
t_{gq}	Gate controlled turn-off time		-	12.9	µs
Q_{GQ}	Turn-off gate charge		-	1300	µC
Q_{GQT}	Total turn-off gate charge		-	2600	µC
I_{GQM}	Peak reverse gate current		-	190	A

CURVES

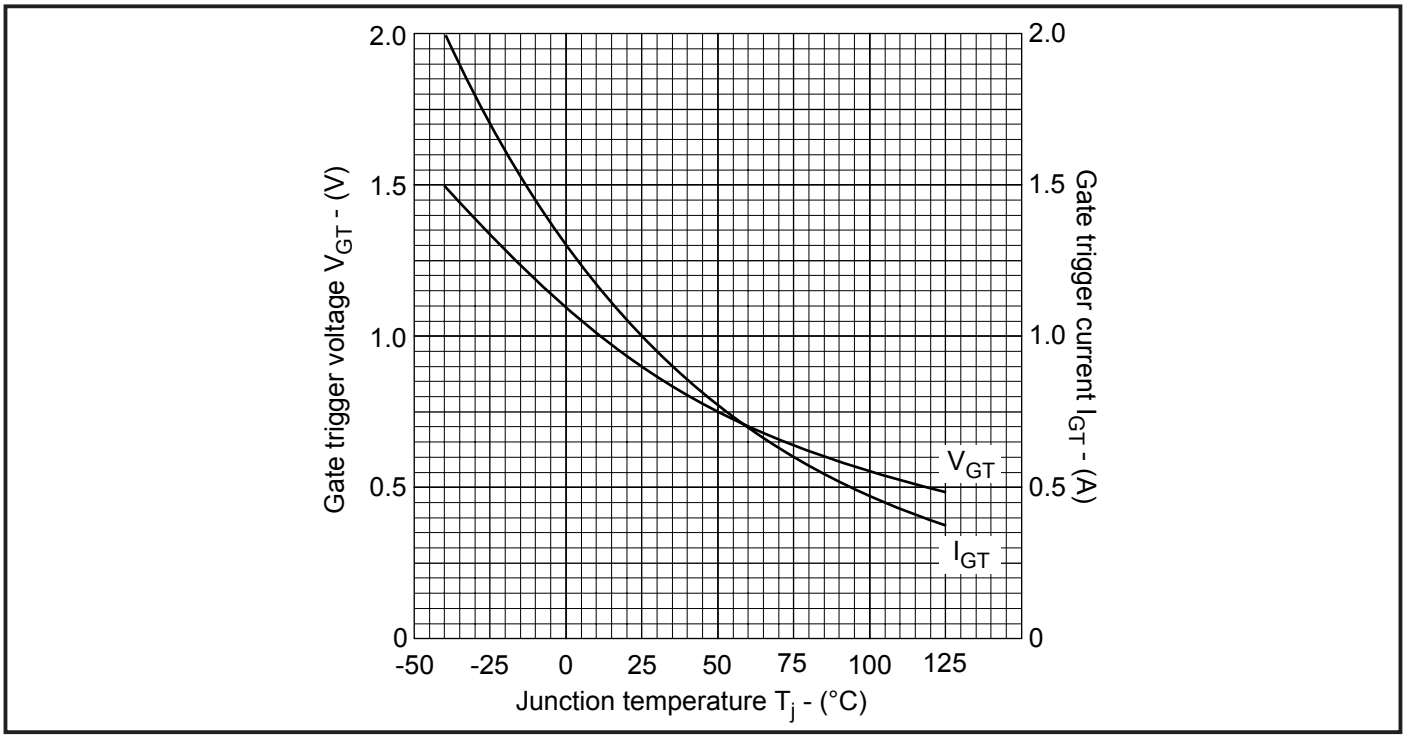


Fig.1 Gate trigger voltage/curremt vs junction temperature

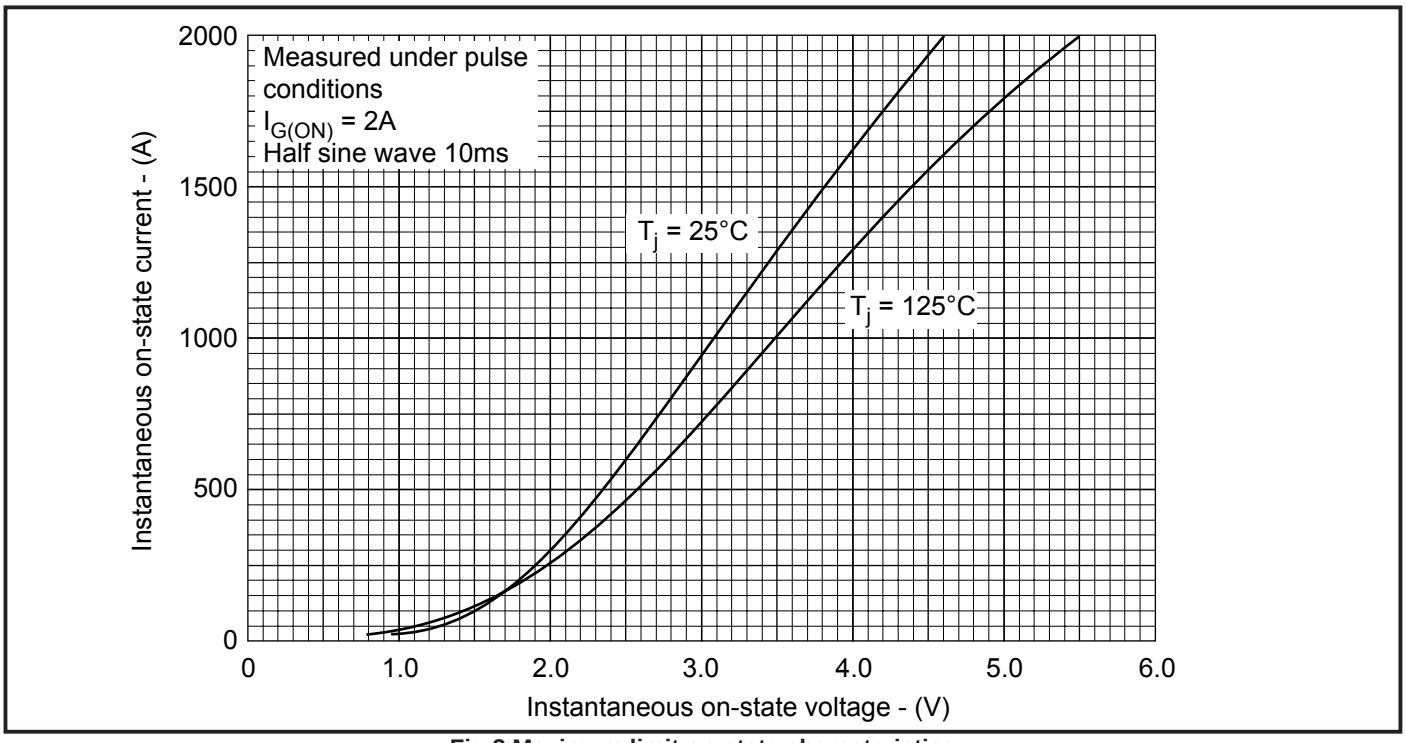


Fig.2 Maximum limit on-state characteristics

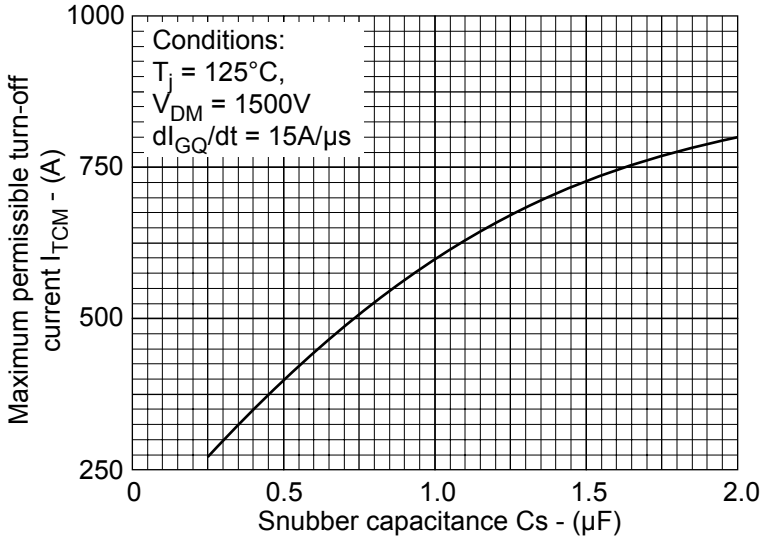


Fig.3 Dependence of I_{TCM} on Cs

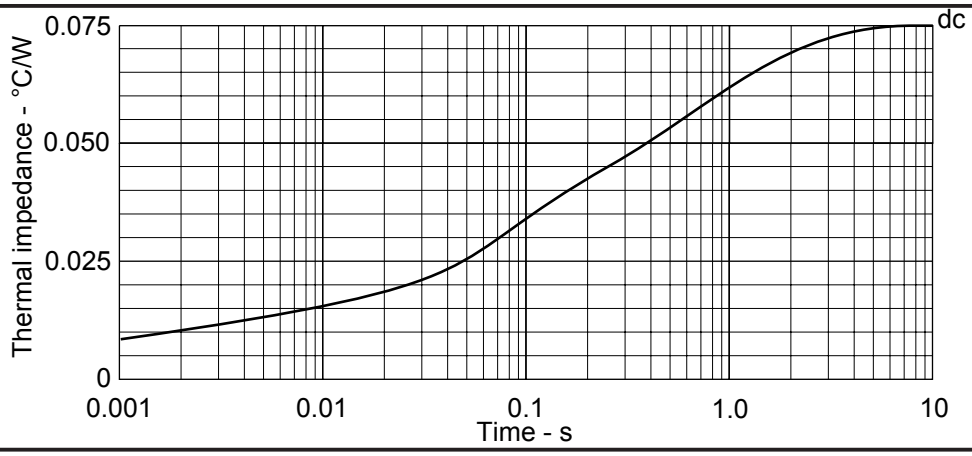


Fig.4 Maximum (limit) transient thermal impedance - double side cooled

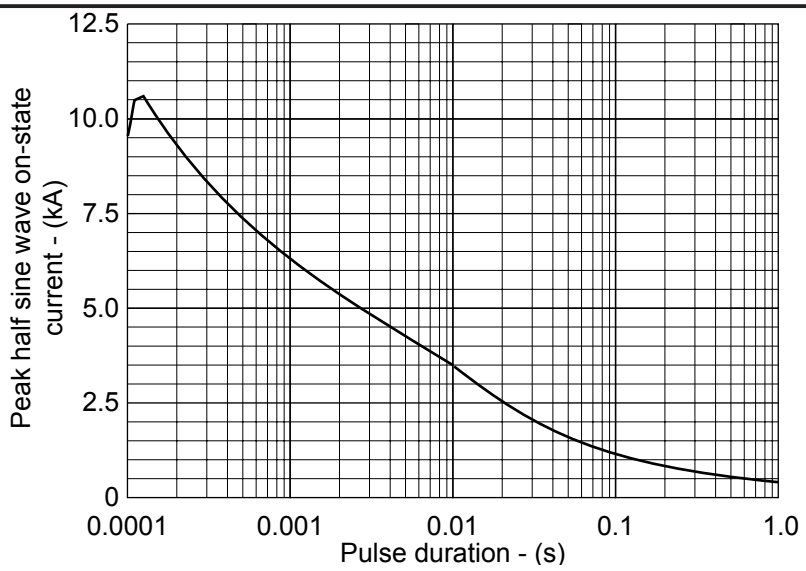


Fig.5 Surge (non-repetitive) on-state current vs time

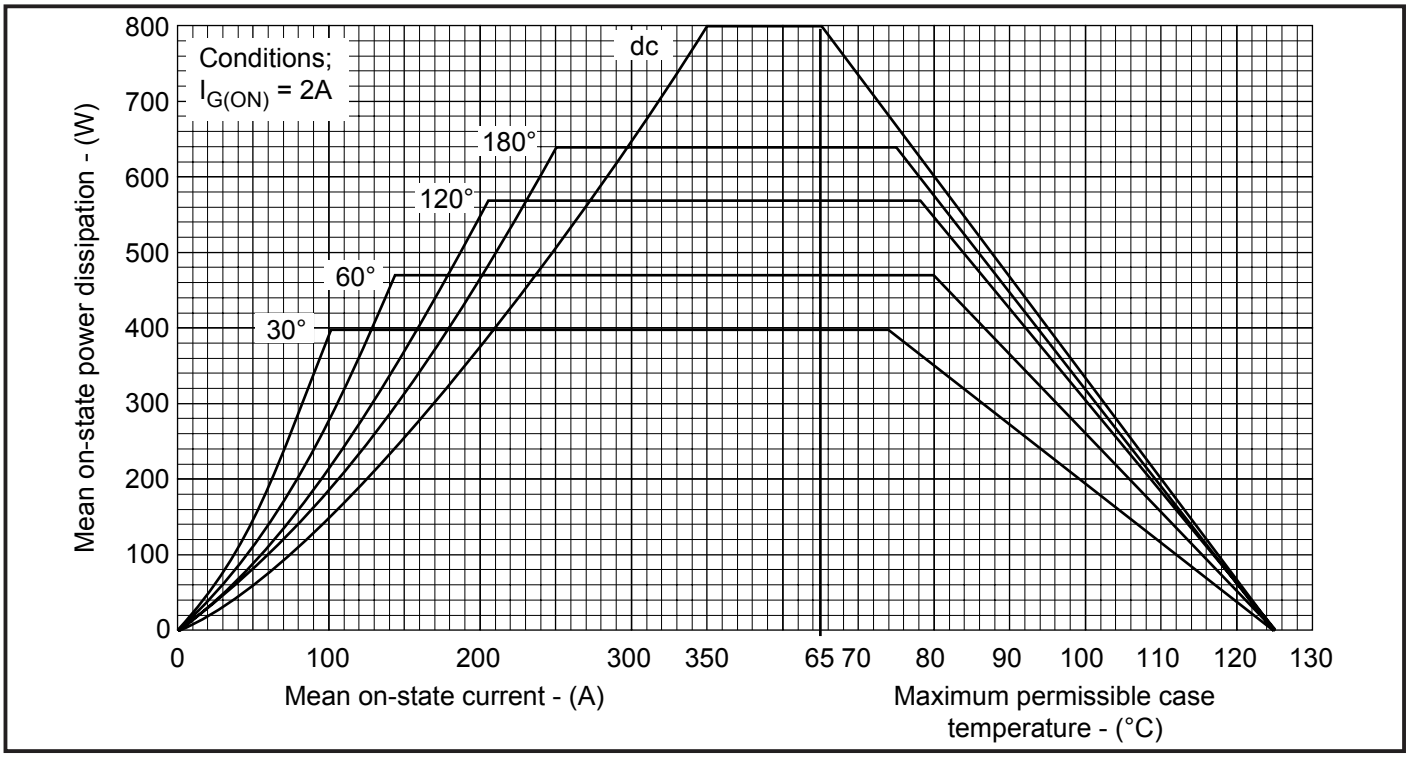


Fig.6 Steady state rectangular wave conduction loss - double side cooled

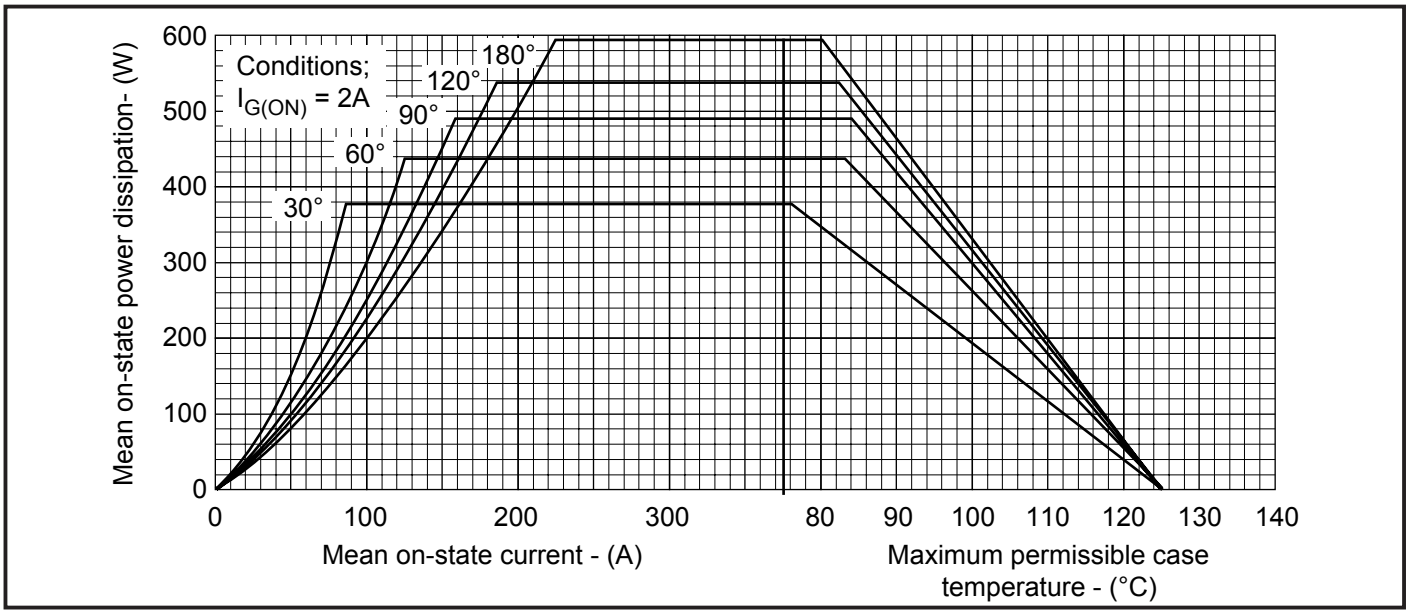


Fig.7 Steady state sinusoidal wave conduction loss - double side cooled

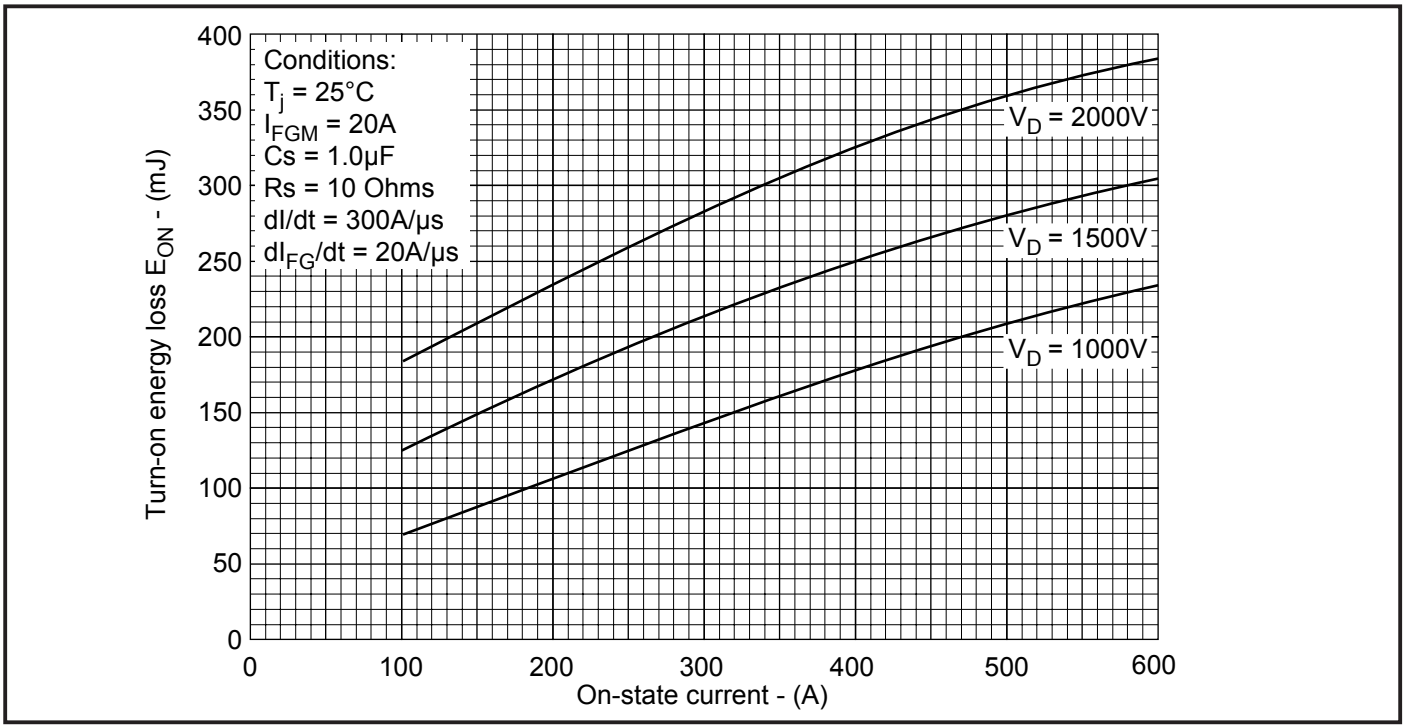


Fig.8 Turn-on energy vs on-state current

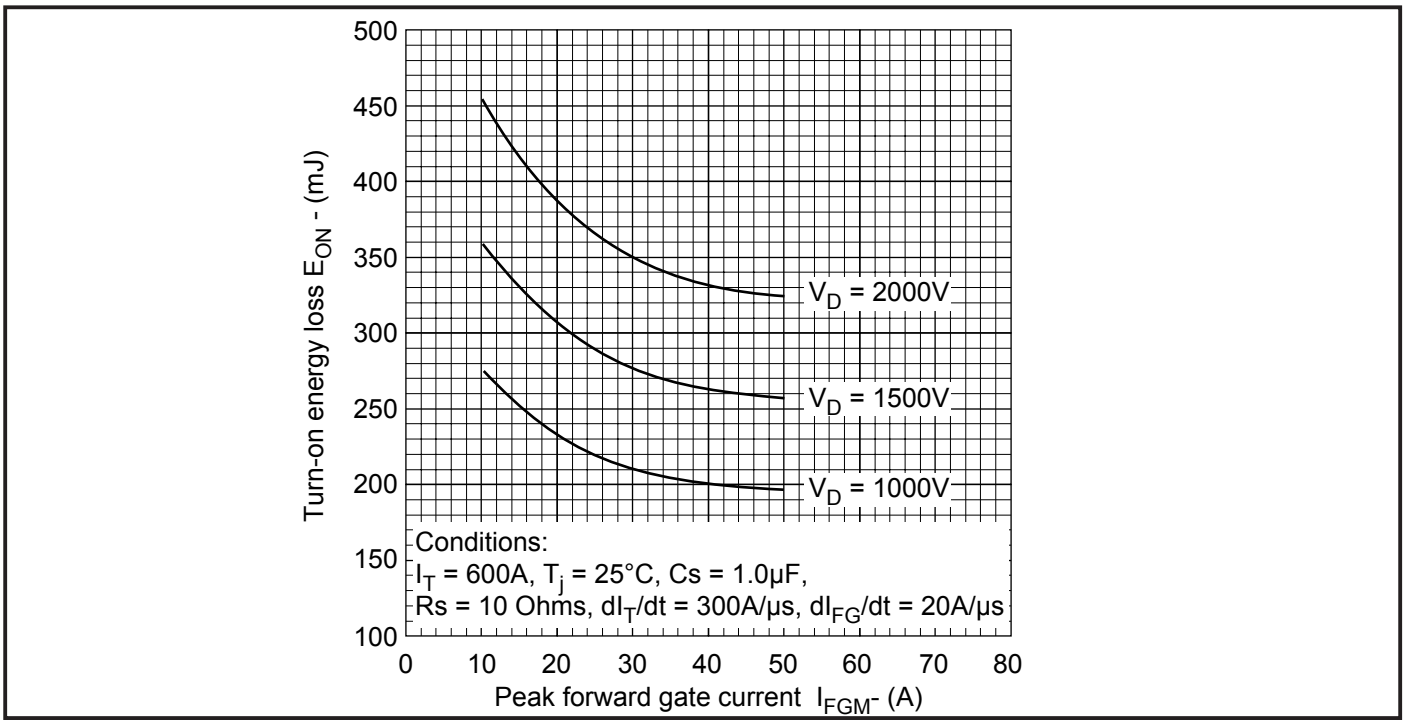


Fig.9 Turn-on energy vs peak forward gate current

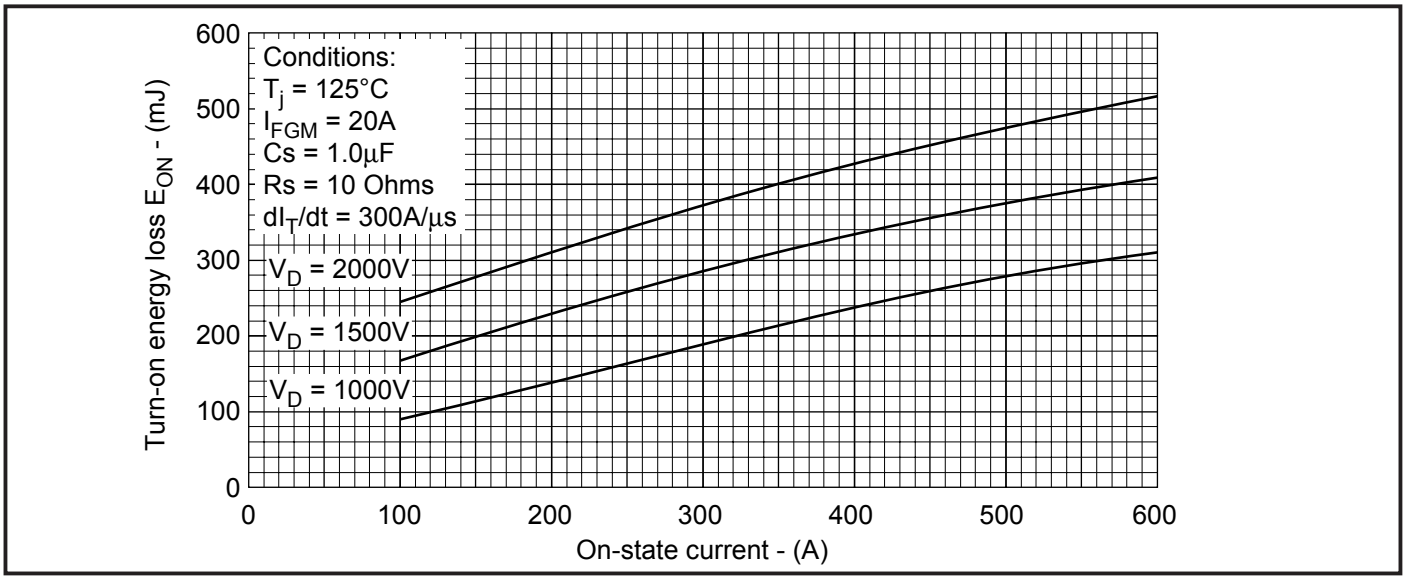


Fig.10 Turn-on energy vs on-state current

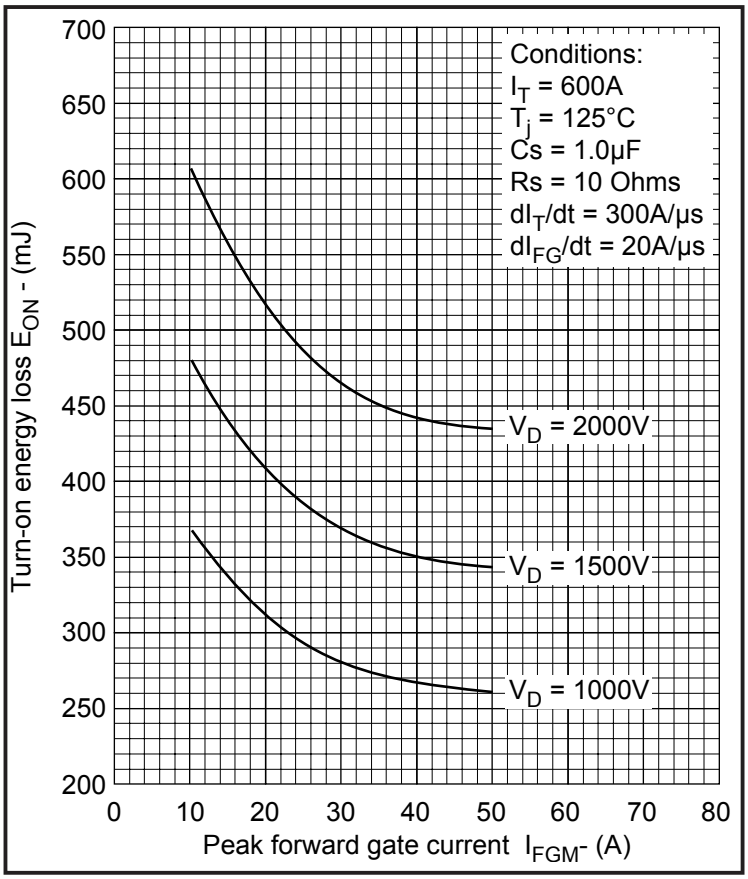


Fig.11 Turn-on energy vs peak forward gate current

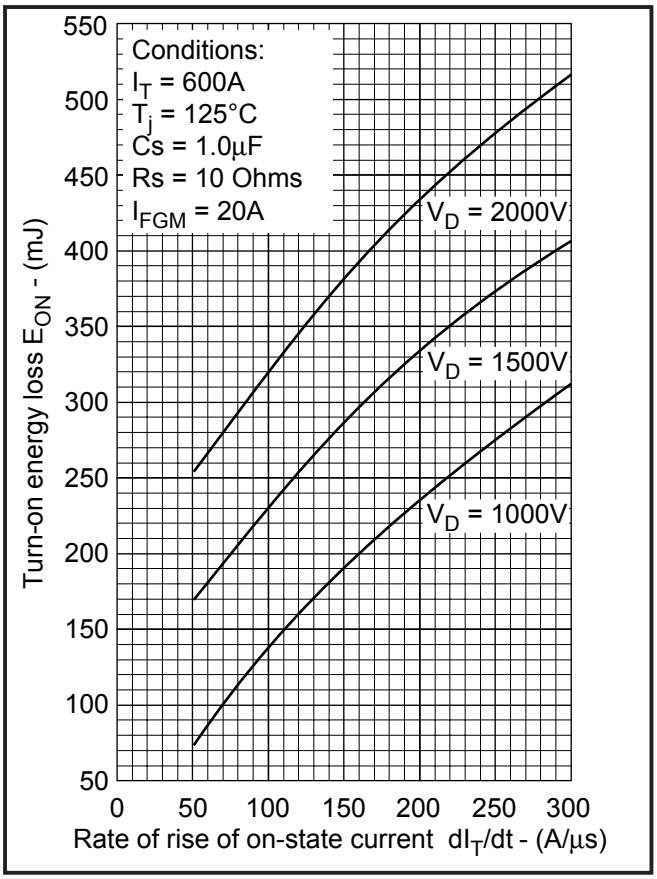


Fig.12 Turn-on energy vs rate of rise of on-state current

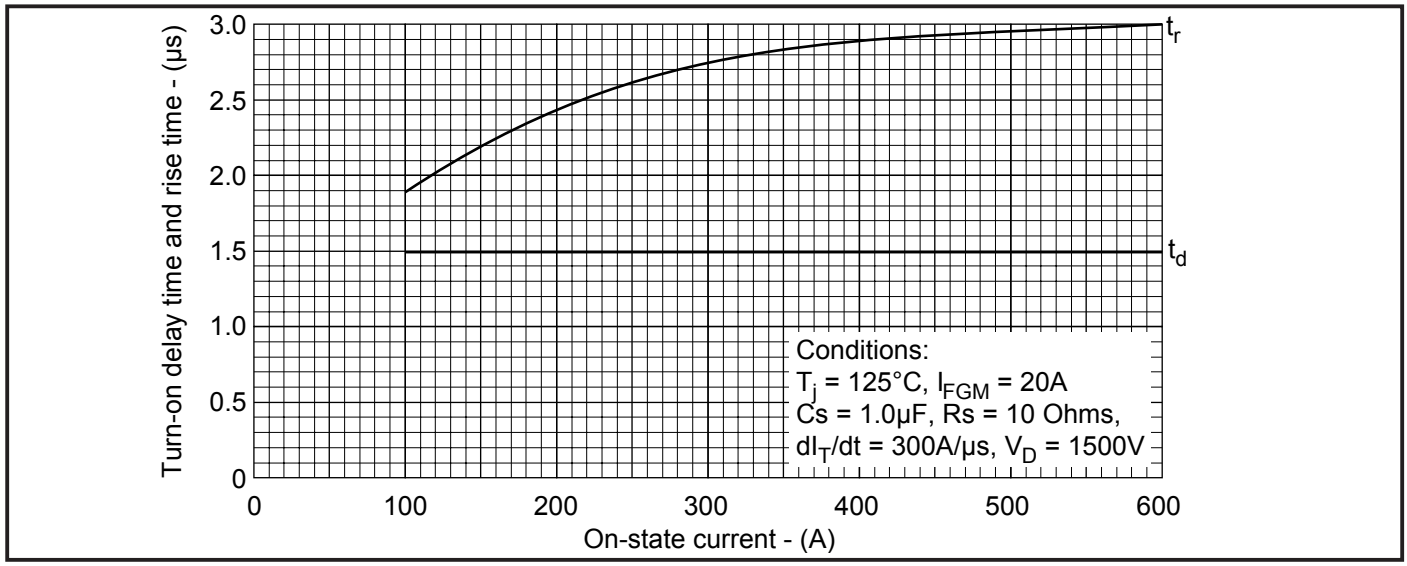


Fig.13 Delay & rise time vs turn-on current

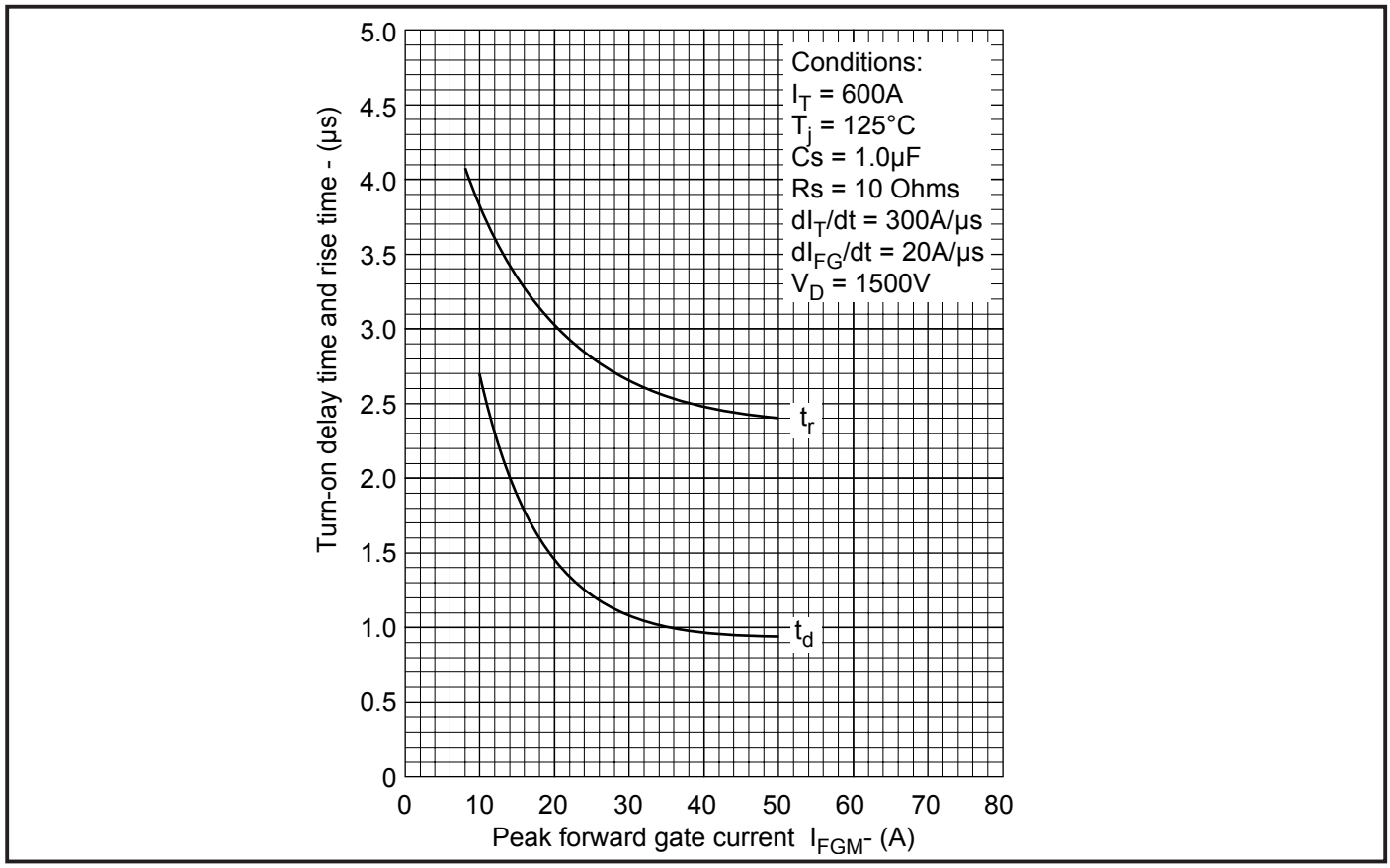


Fig.14 Delay time & rise time vs peak forward gate current

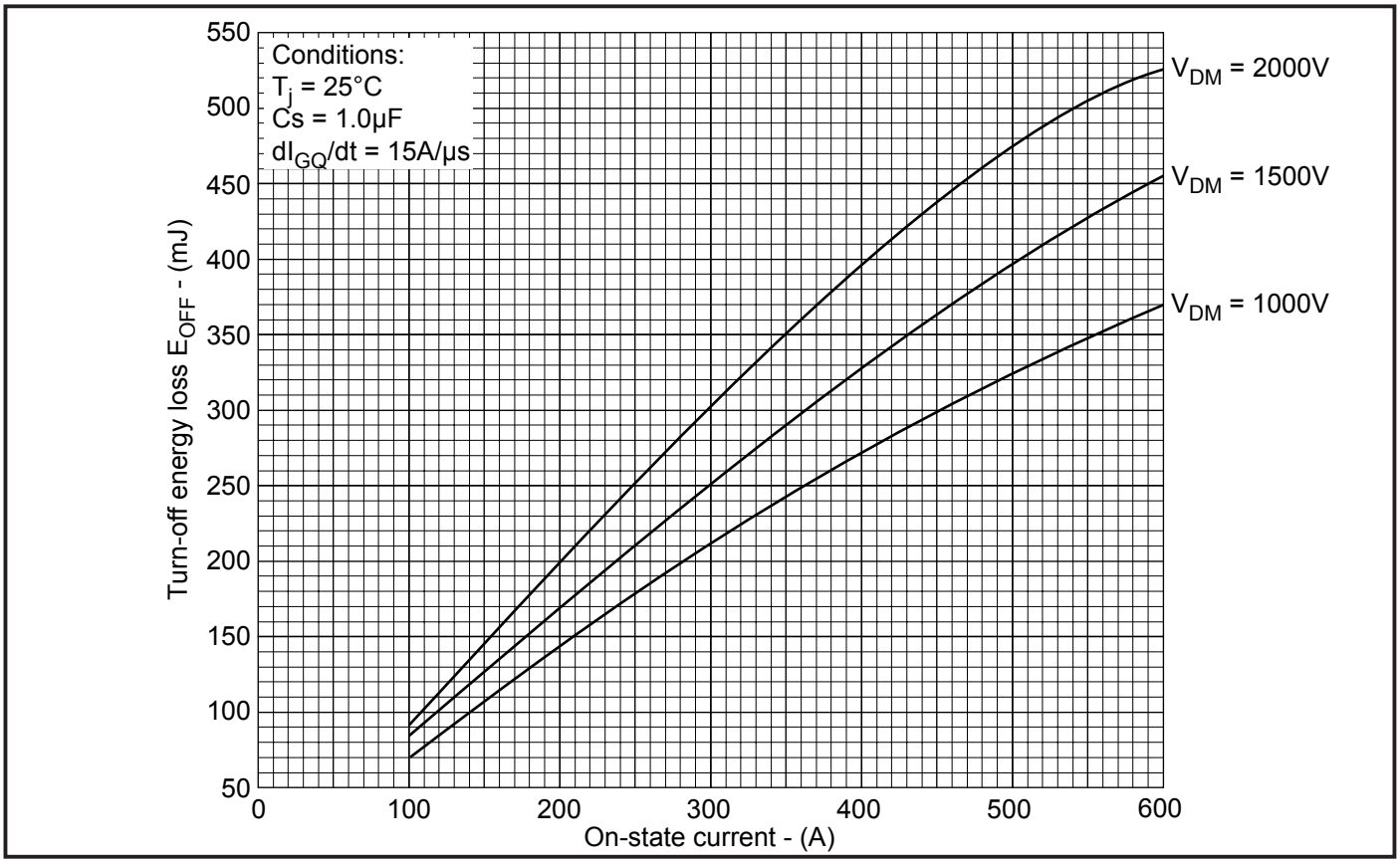


Fig.15 Turn-off energy loss vs on-state current

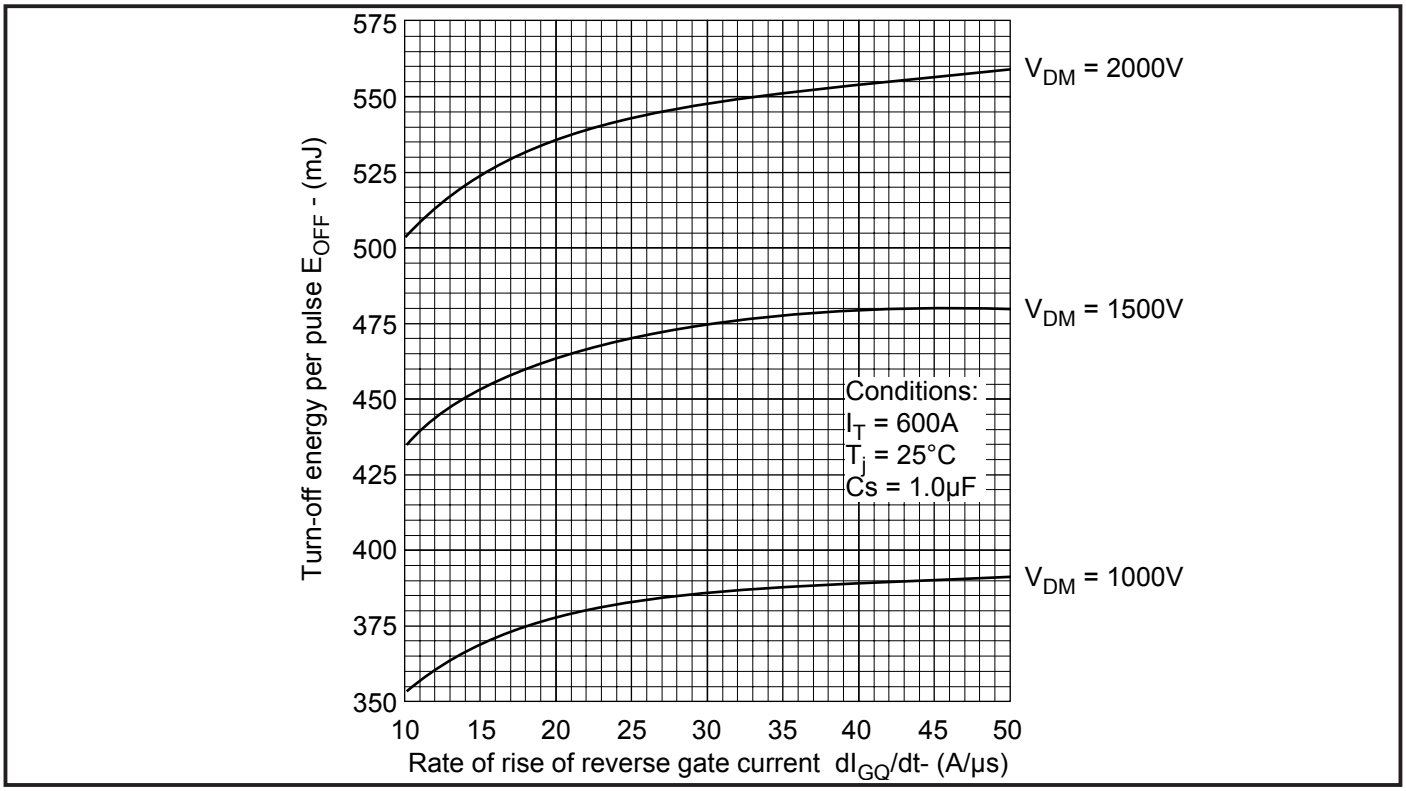


Fig.16 Turn-off energy vs rate of rise of reverse gate current

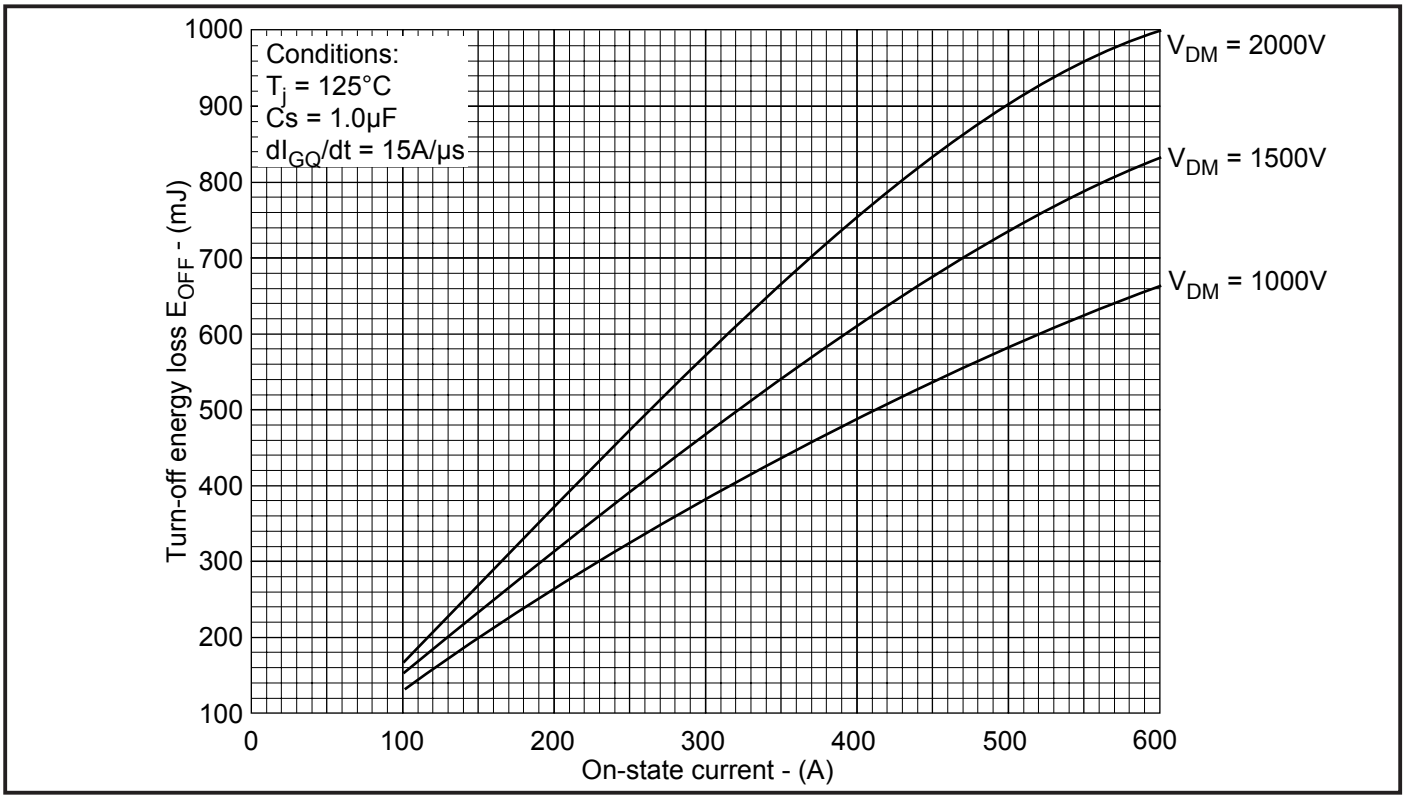


Fig.17 Turn-off energy vs on-state current

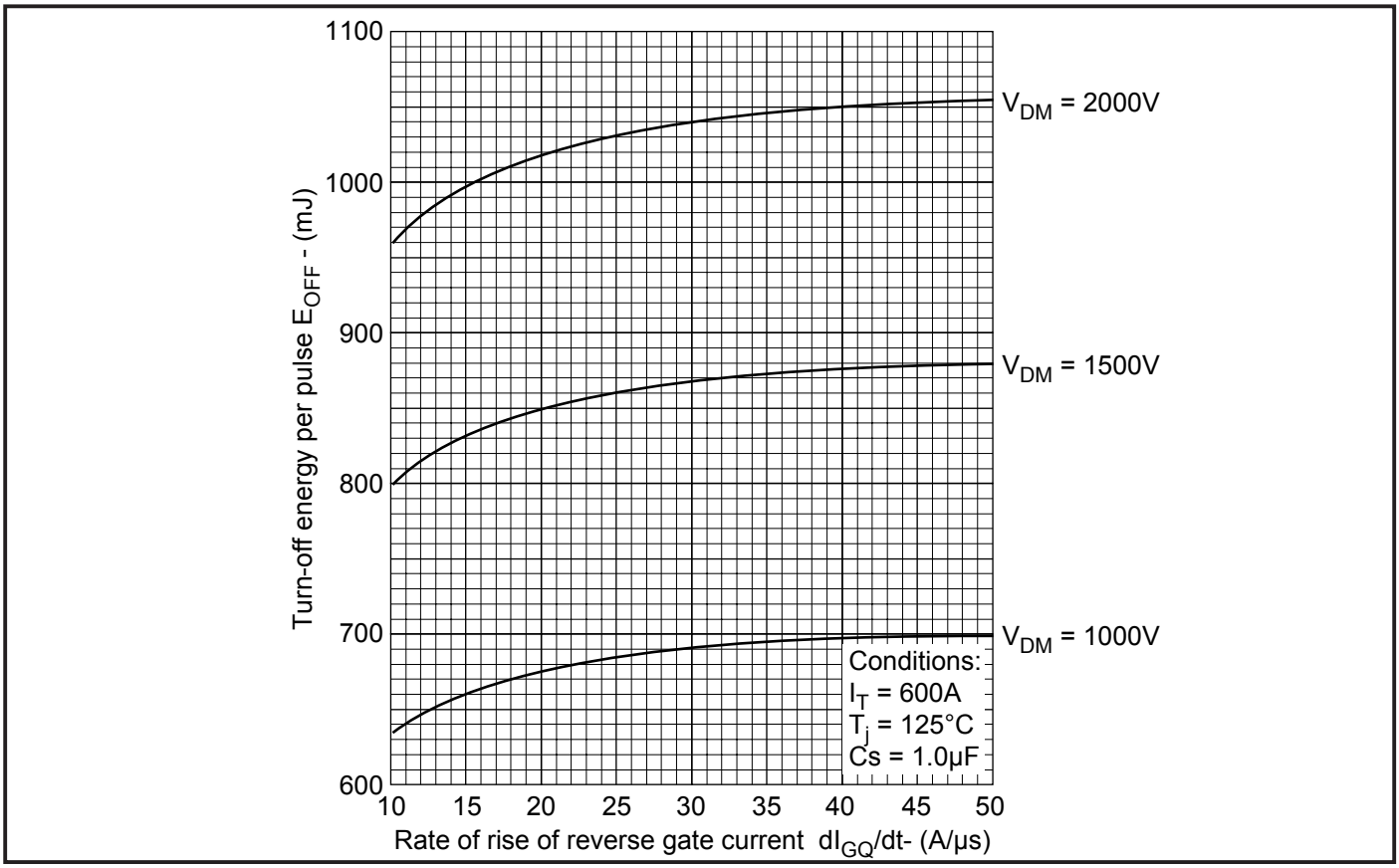


Fig.18 Turn-off energy loss vs rate of rise of reverse gate current

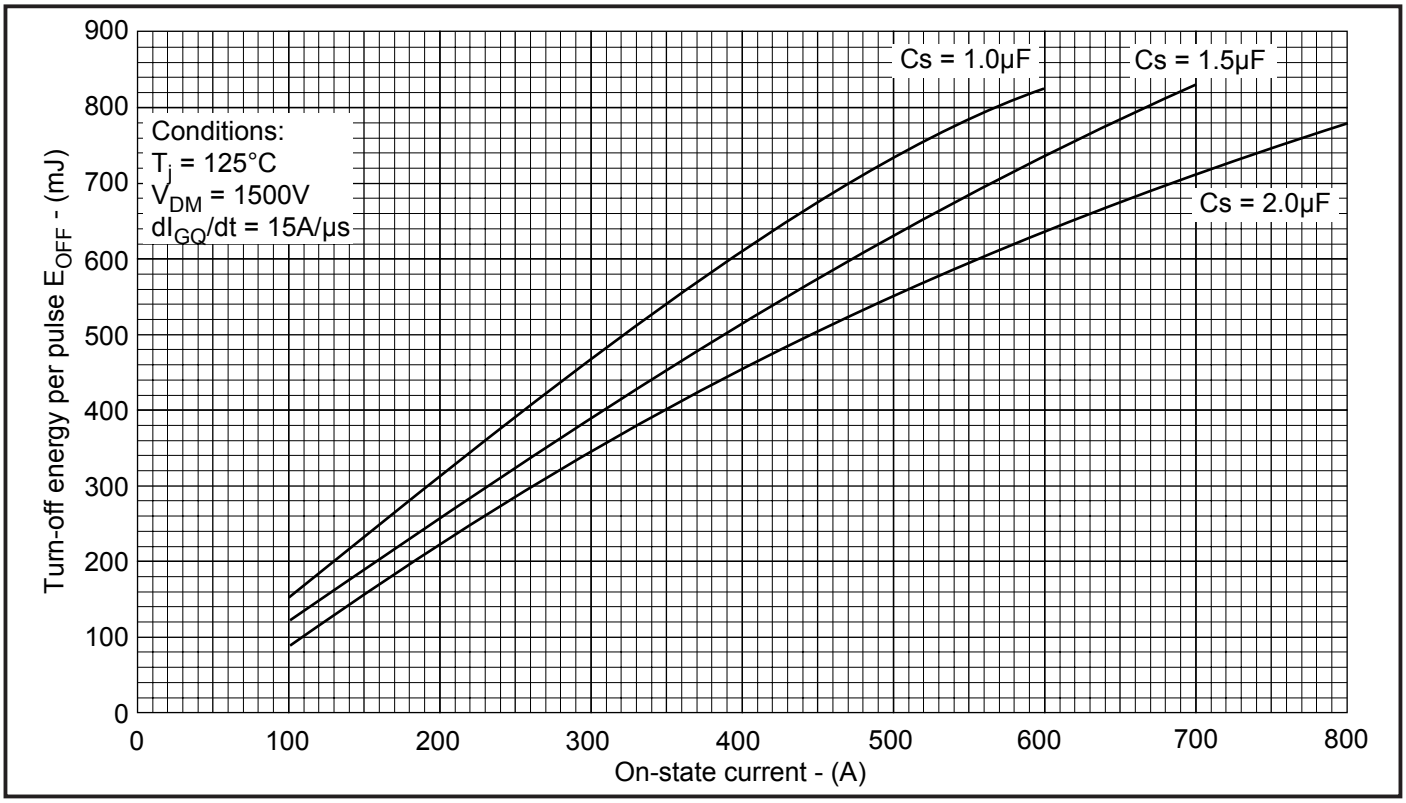


Fig.19 Turn-off energy vs on-state current

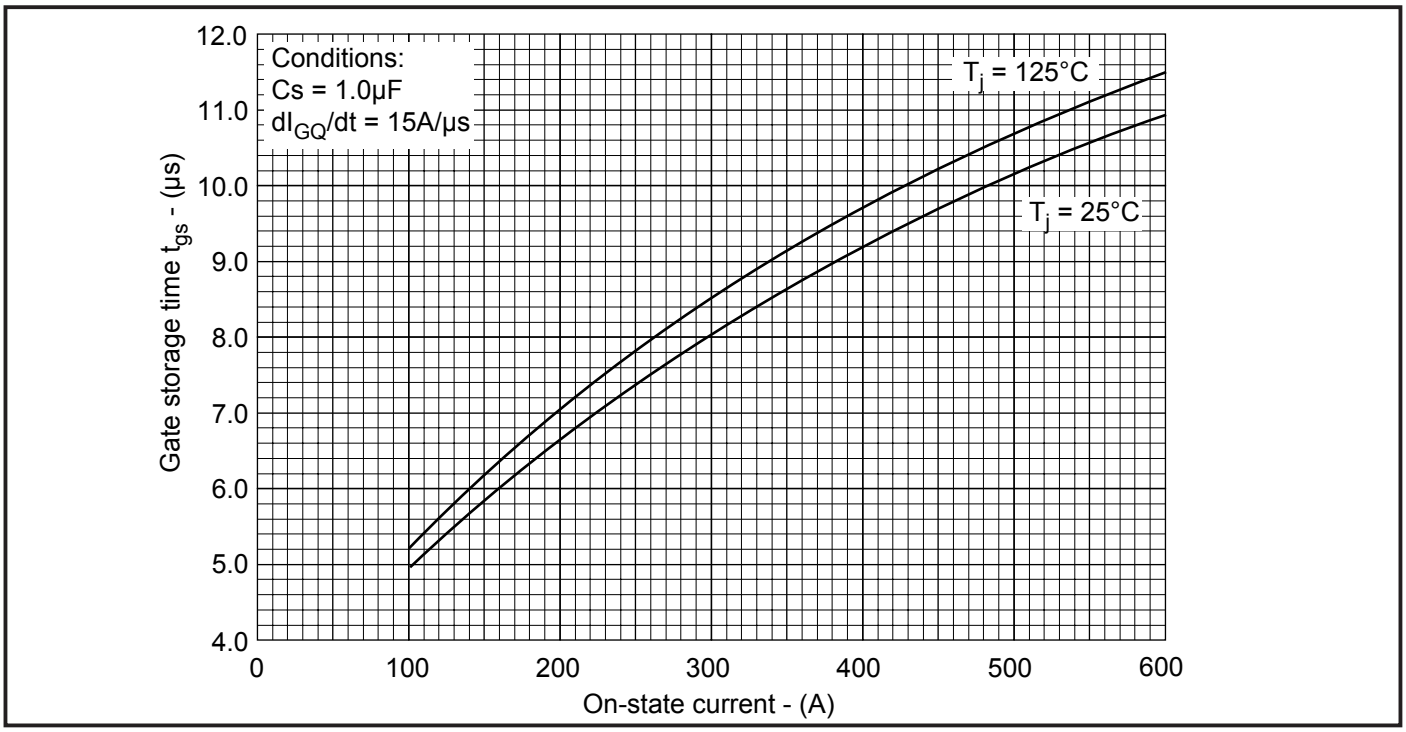


Fig.20 Gate storage time vs on-state current

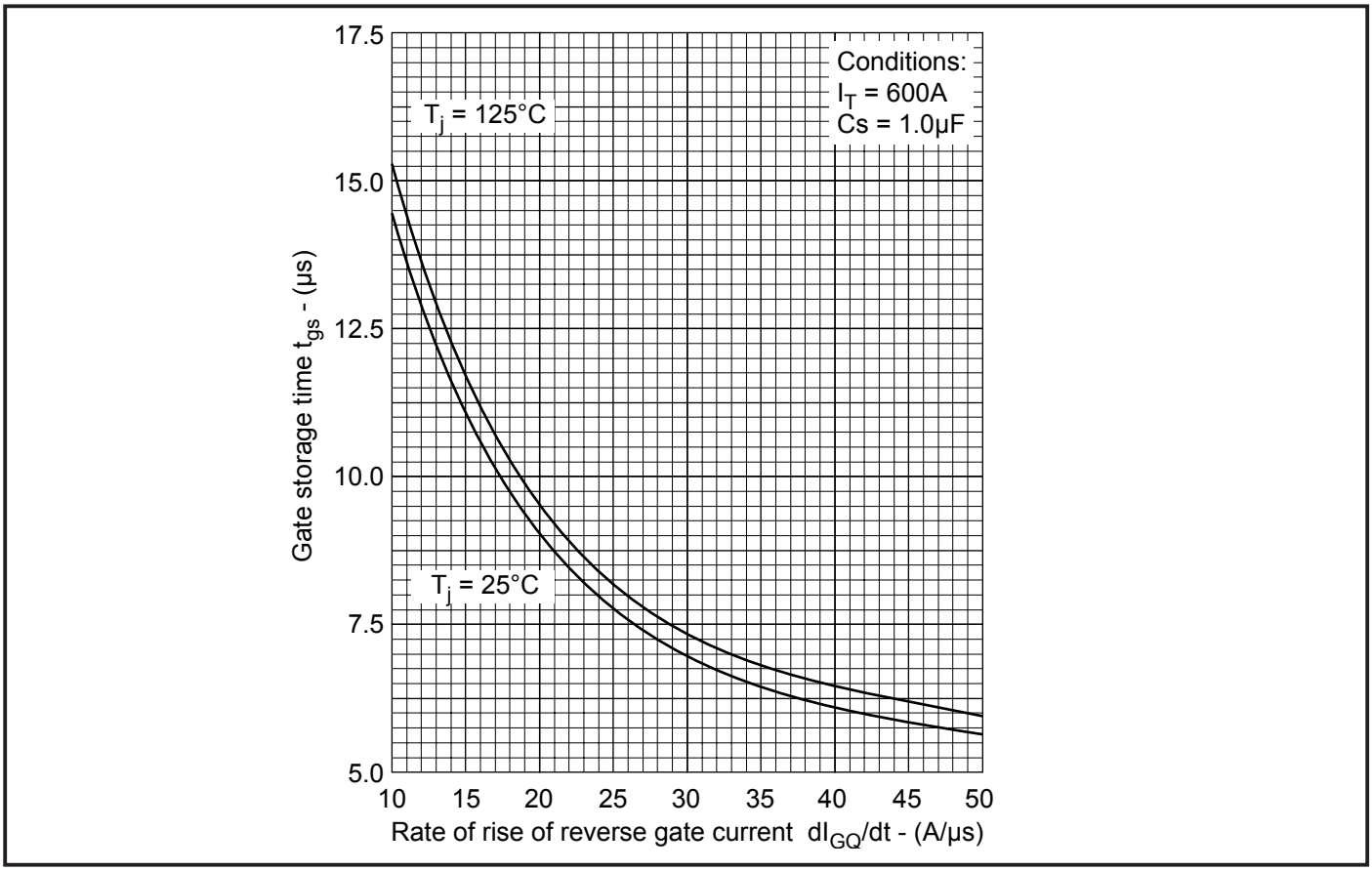


Fig.21 Gate storage time vs rate of rise of reverse gate current

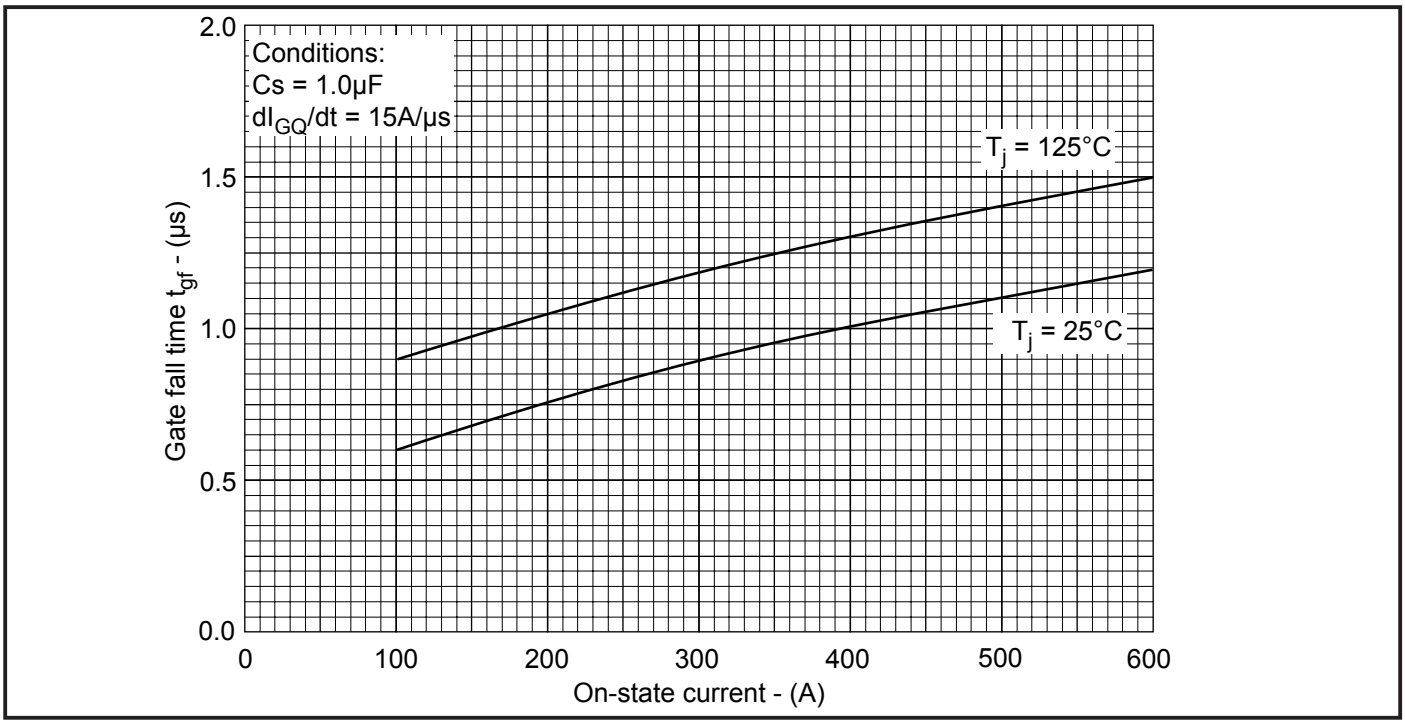


Fig.22 Gate fall time vs on-state current

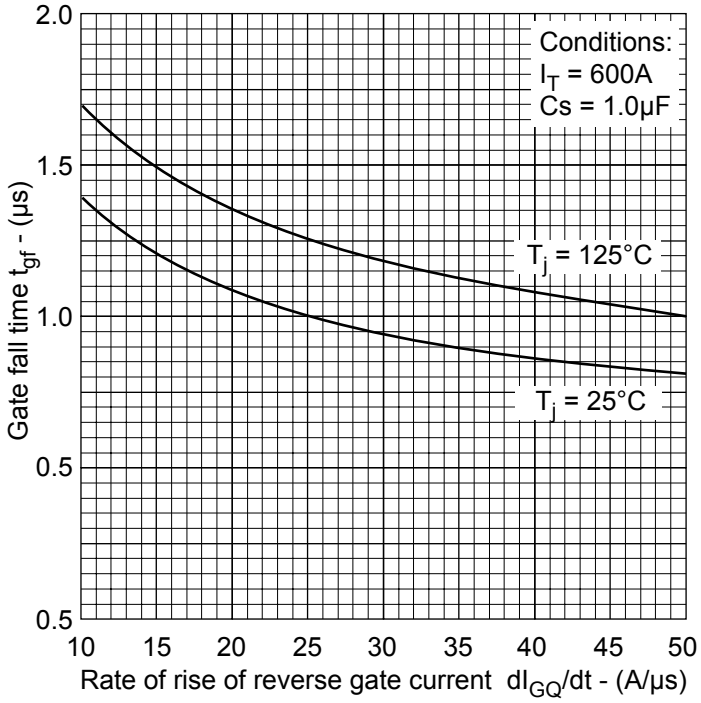


Fig.23 Gate fall time vs rate of rise of revese gate current

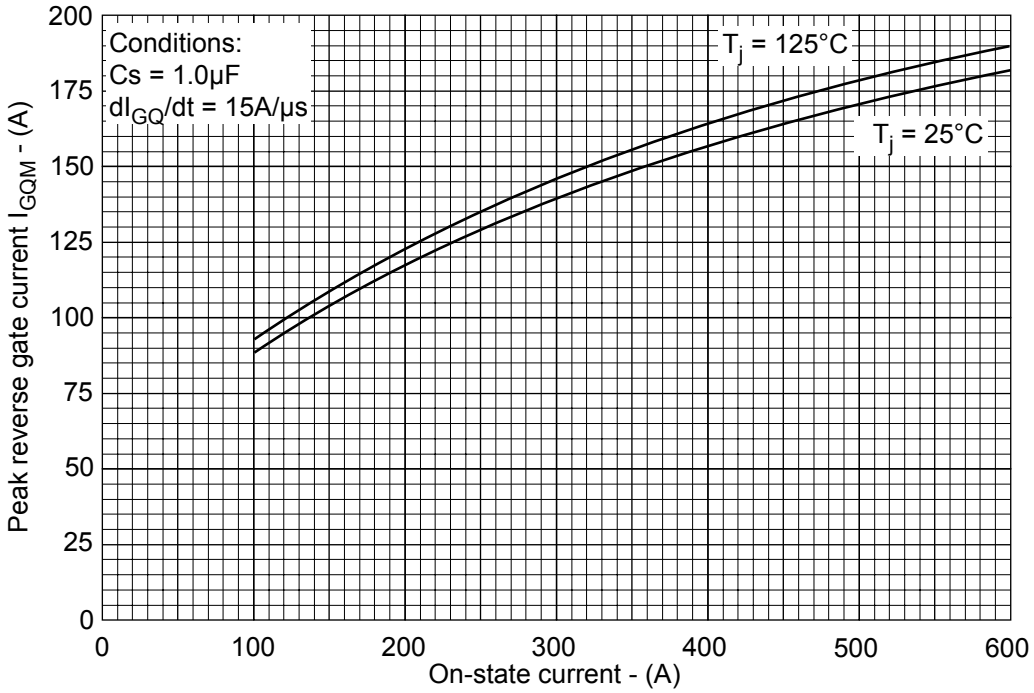


Fig.24 Peak reverse gate current vs on-state voltage

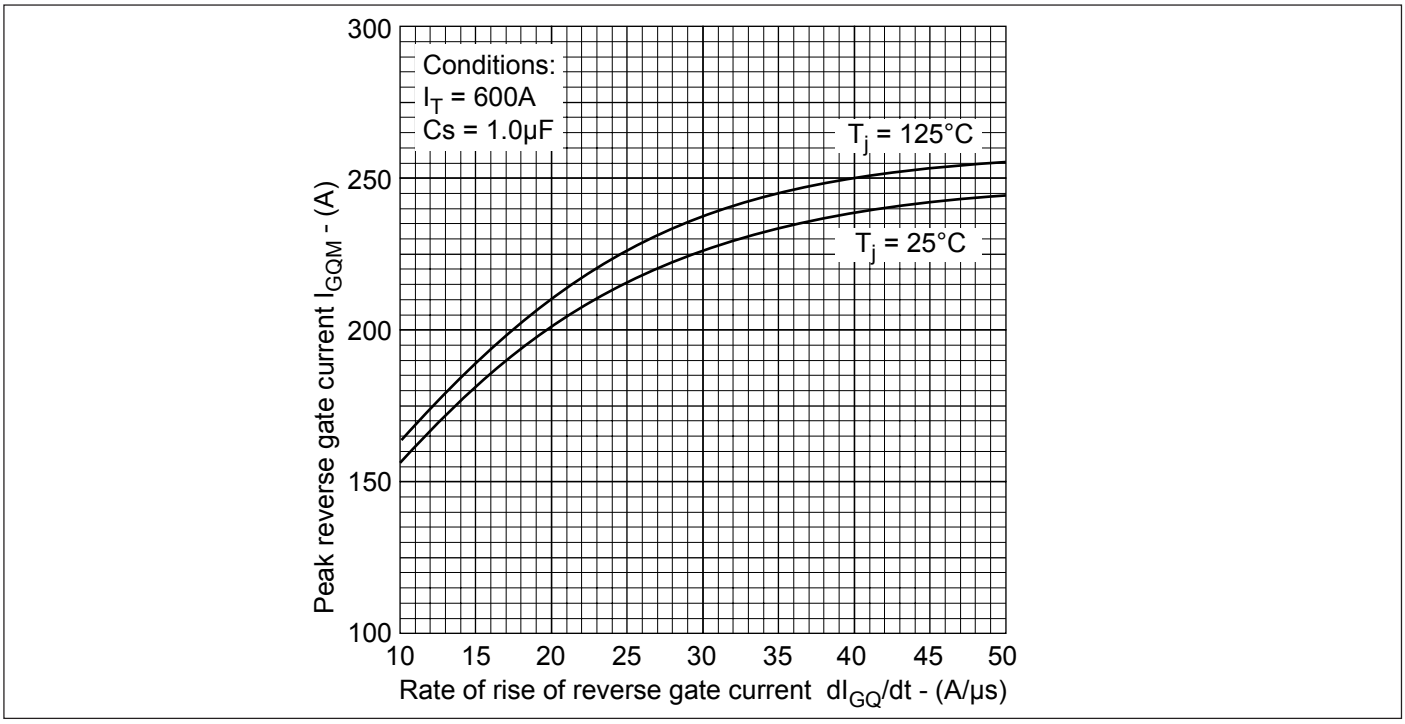


Fig.25 Reverse gate current vs rate of rise of reverse gate current

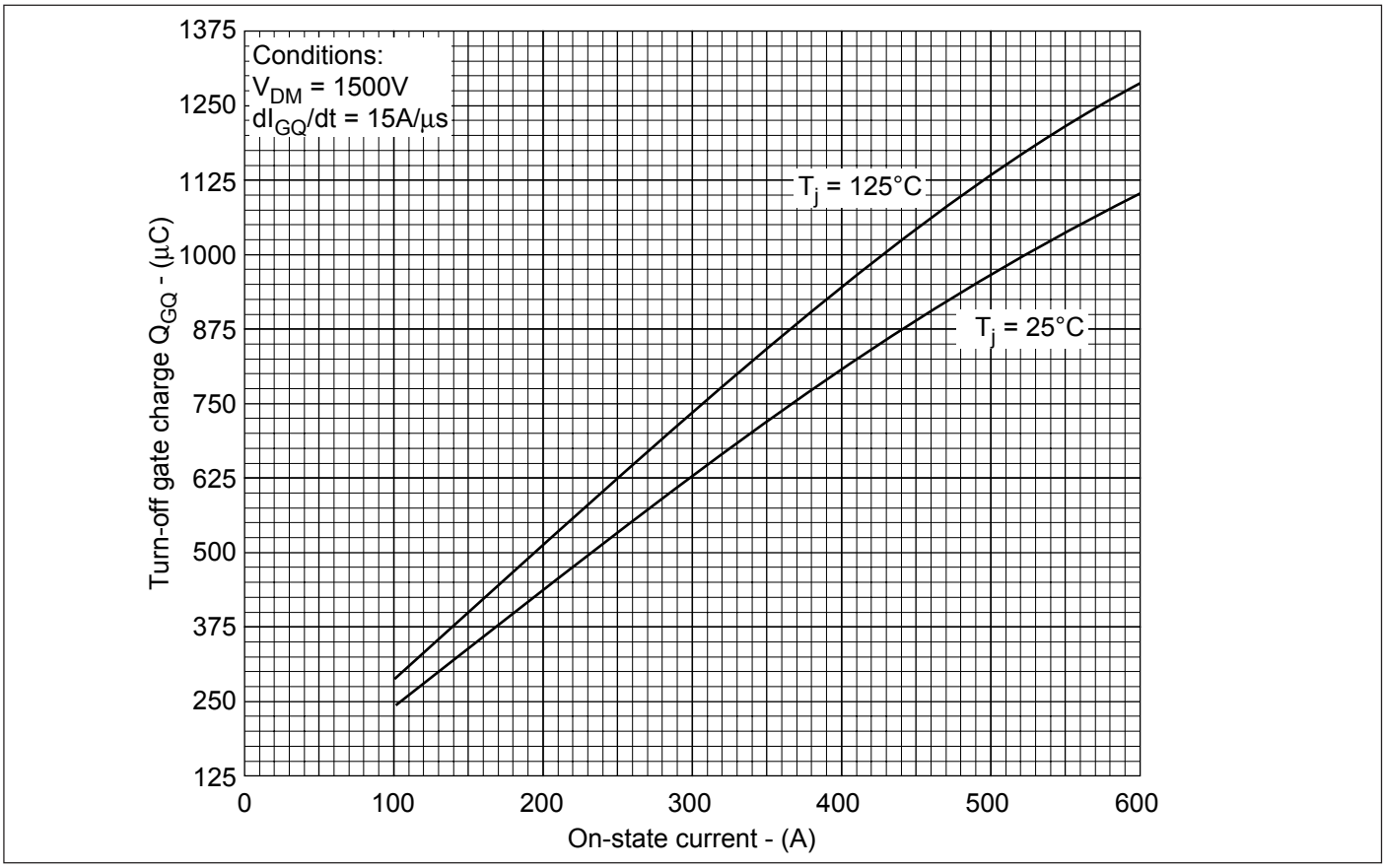


Fig.26 Turn-off gatecharge vs on-state voltage

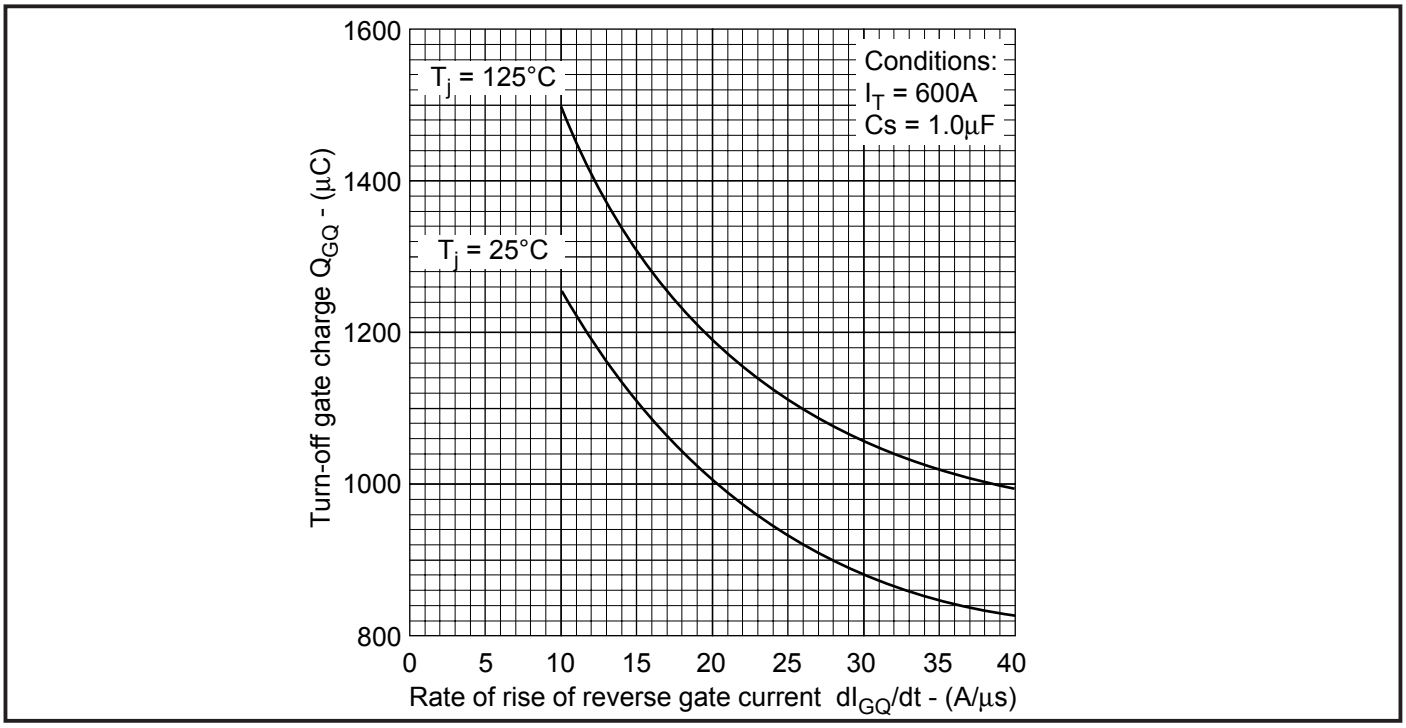


Fig.27 Turn-off gate charge vs rate of rise or reverse gate current

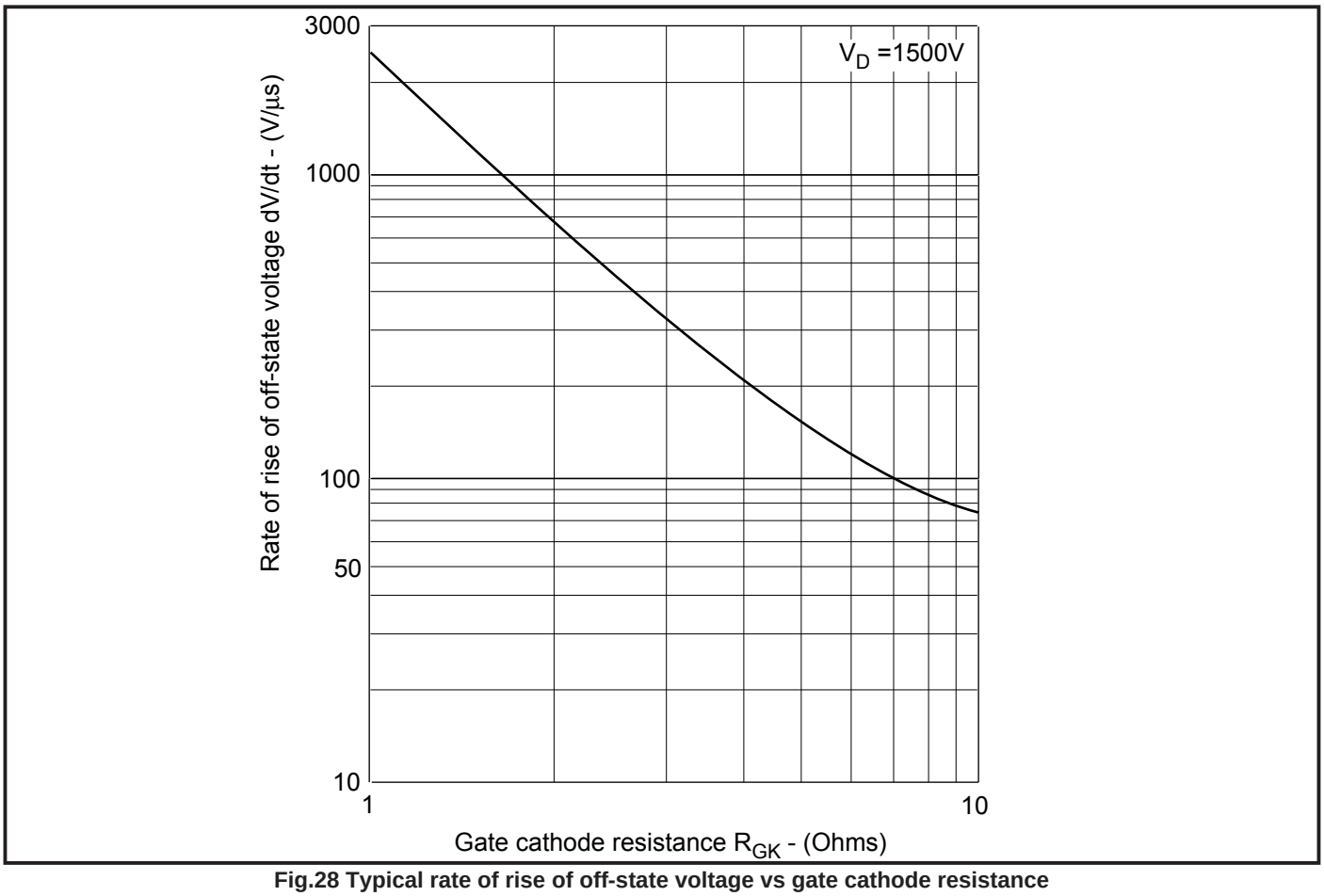
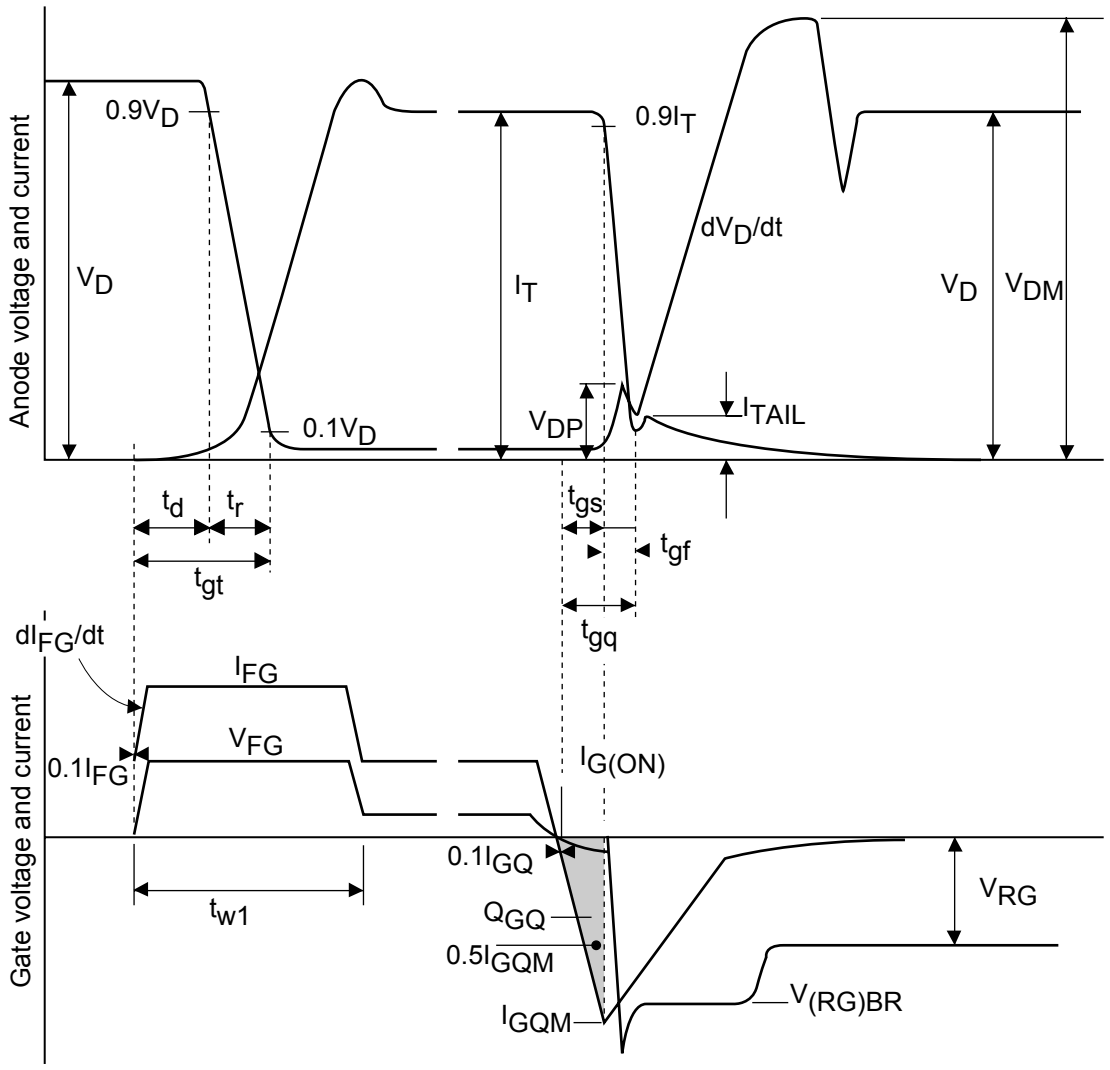


Fig.28 Typical rate of rise of off-state voltage vs gate cathode resistance



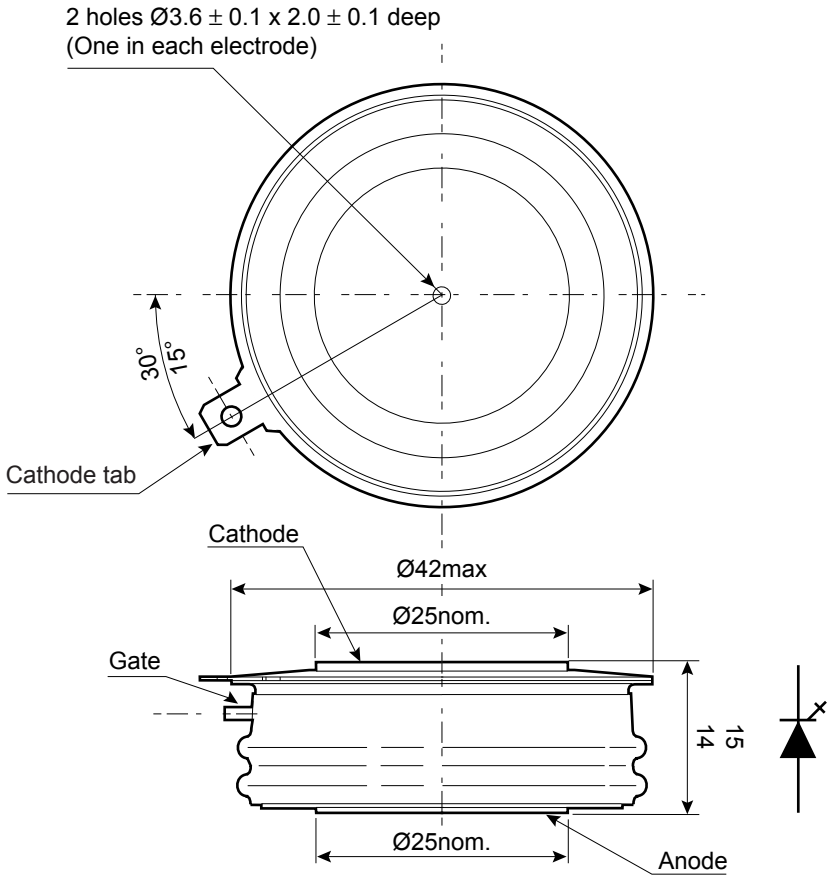
Recommended gate conditions:
I_{TCM} = 600A
I_{FG} = 20A
$I_{G(ON)}$ = 2A d.c.
$t_{w1(min)}$ = 10µs
I_{GQM} = 190A
di_{GQ}/dt = 15A/µs
Q_{GQ} = 1300µC
$V_{RG(min)}$ = 2.0V
$V_{RG(max)}$ = 16V

These are recommended 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: 82g
Clamping force: 6kN ±10%
Leads 12 AWG cables 160mm

Package outine type code: E

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

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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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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 design is complete and final characterisation for volume production is in progress.The datasheet represents the product as it is now understood but details may change.
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