DG858BW45

Gate Turn-off Thyristor

DS4096-5 July 2014 (LN31733)

FEATURES

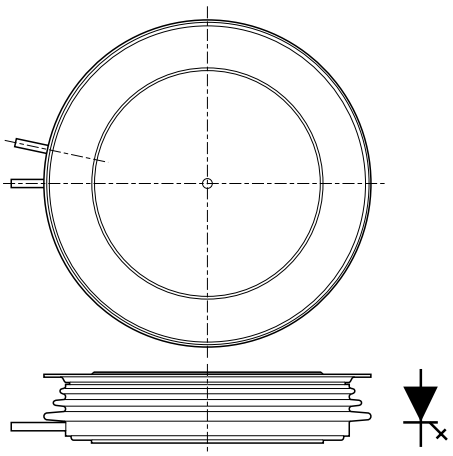
- Double Side Cooling
- High Reliability In Service
- High Voltage Capability
- Fault Protection Without Fuses
- High Surge Current Capability
- Turn-off Capability Allows Reduction In Equipment Size And Weight. Low Noise Emission Reduces Acoustic Cladding Necessary For Environmental Requirements

KEY PARAMETERS

I_{TCM}	3000A
V_{DRM}	4500V
$I_{T(AV)}$	1180A
dV_D/dt	1000V/µs
di_T/dt	300A/µs

APPLICATIONS

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



Package outline type code: W.
See Package Details for further information.

Figure 1. Package outline

VOLTAGE RATINGS

Type Number	Repetitive Peak Off-state Voltage V_{DRM} V	Repetitive Peak Reverse Voltage V_{RRM} V	Conditions
DG858BW45	4500	16	T_{vj} = 125°C, I_{DM} = 100mA, 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, Cs = 3µF	3000	A
$I_{T(AV)}$	Mean on-state current	T_{HS} = 80°C. Double side cooled, half sine 50Hz	1180	A
$I_{T(RMS)}$	RMS on-state current	T_{HS} = 80°C. Double side cooled, half sine 50Hz	1850	A

SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine. T_j = 125°C	20.0	kA
I^2t	I^2t for fusing	10ms half sine. T_j =125°C	2.0×10^6	A^2s
di_T/dt	Critical rate of rise of on-state current	V_D = 3000V, I_T = 3000A, T_j = 125°C, I_{FG} > 40A, 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	130	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 = 3000A, V_D = V_{DRM}, T_j = 125°C, $dI/_{GQ}$ = 40A/µs, Cs = 3.0µF	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		-	20	W
P_{RGM}	Peak reverse gate power		-	24	kW
di_{GQ}/dt	Rate of rise of reverse gate current		20	60	A/µs
$t_{ON(min)}$	Minimum permissable on time		50	-	µs
$t_{OFF(min)}$	Minimum permissable off time		100	-	µs

THERMAL AND MECHANICAL DATA

Symbol	Parameter	Conditions		Min.	Max.	Units
$R_{th(j-hs)}$	DC thermal resistance - junction to heatsink surface	Double side cooled		-	0.011	°C/W
		Anode side cooled		-	0.017	°C/W
		Cathode side cooled		-	0.03	°C/W
$R_{th(c-hs)}$	Contact thermal resistance	Clamping force 40.0kN With mounting compound	per contact	-	0.0021	°C/W
T_{vj}	Virtual junction temperature			-40	125	°C
T_{OP}/T_{stg}	Operating junction/storage temperature range			-40	125	°C
-	Clamping force			36.0	44.0	kN

CHARACTERISTICS

T_j = 125°C unless stated otherwise

Symbol	Parameter	Conditions	Min.	Max.	Units
V_{TM}	On-state voltage	At 4000A peak, $I_{G(ON)}$ = 10A d.c.	-	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	-	1.2	V
I_{GT}	Gate trigger current	V_D = 24V, I_T = 100A, T_j = 25°C	-	4.0	A
I_{RGM}	Reverse gate cathode current	V_{RGM} = 16V, No gate/cathode resistor	-	50	mA
E_{ON}	Turn-on energy	V_D = 2000V	-	2700	mJ
t_d	Delay time	I_T = 3000A, dI_T/dt = 300A/µs	-	2.0	µs
t_r	Rise time	I_{FG} = 40A, rise time < 1.0µs	-	6.0	µs
E_{OFF}	Turn-off energy	I_T = 3000A, V_{DM} = V_{DRM} Snubber Cap Cs = 3.0µF, di_{GQ}/dt = 40A/µs	-	13500	mJ
t_{gs}	Storage time		-	25.0	µs
t_{gf}	Fall time		-	2.5	µs
t_{gq}	Gate controlled turn-off time		-	27.5	µs
Q_{GQ}	Turn-off gate charge		-	12000	µC
Q_{GQT}	Total turn-off gate charge		-	24000	µC
I_{GQM}	Peak reverse gate current		-	950	A

CURVES

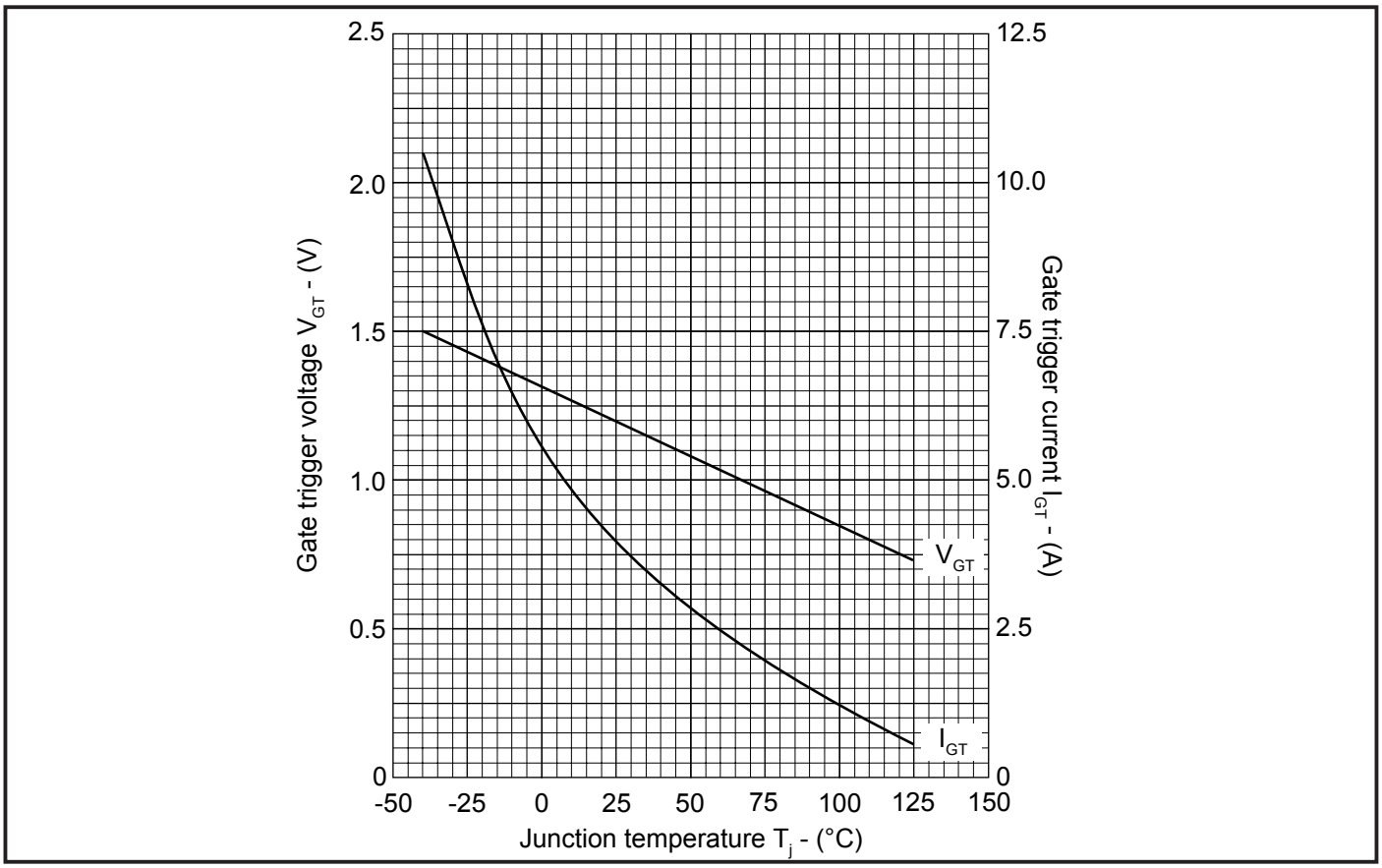


Figure 2. Maximum gate trigger voltage/current vs junction temperature

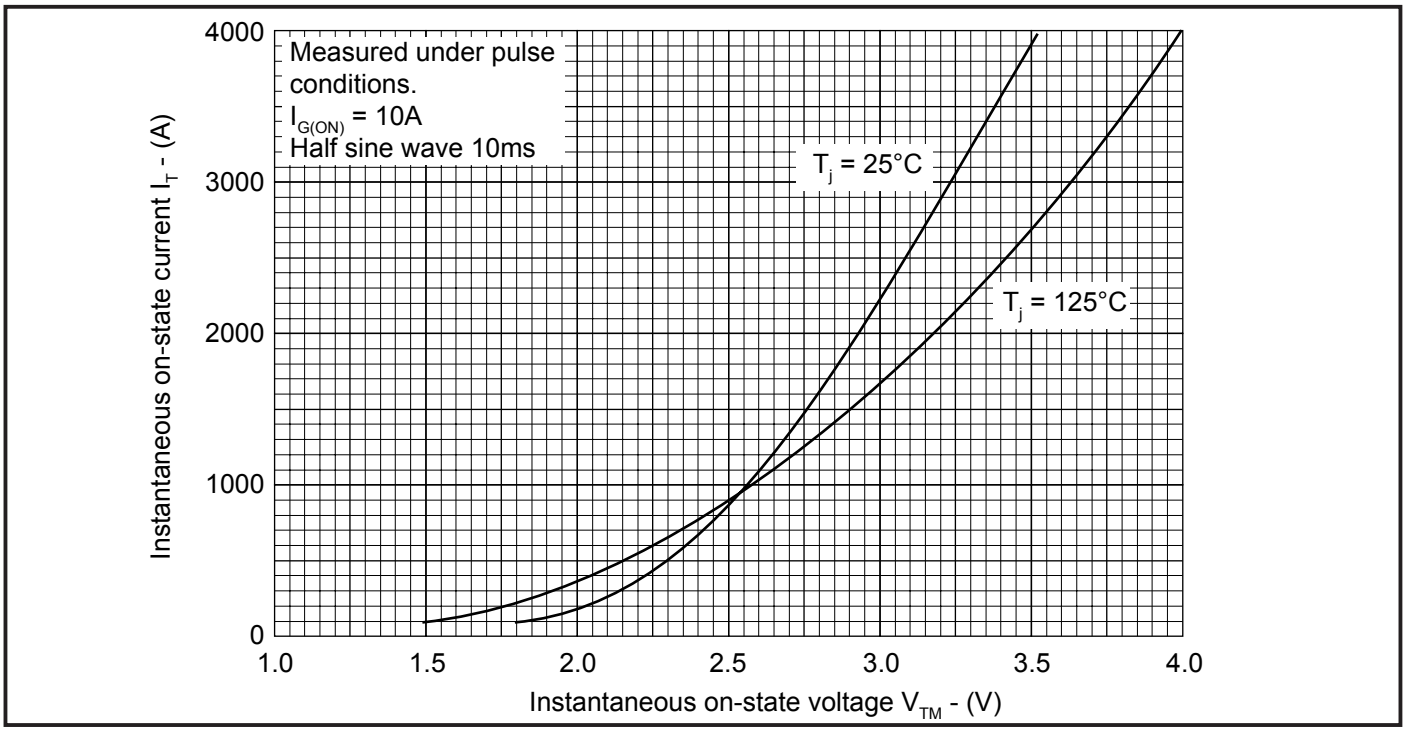


Figure 3. On-state characteristics

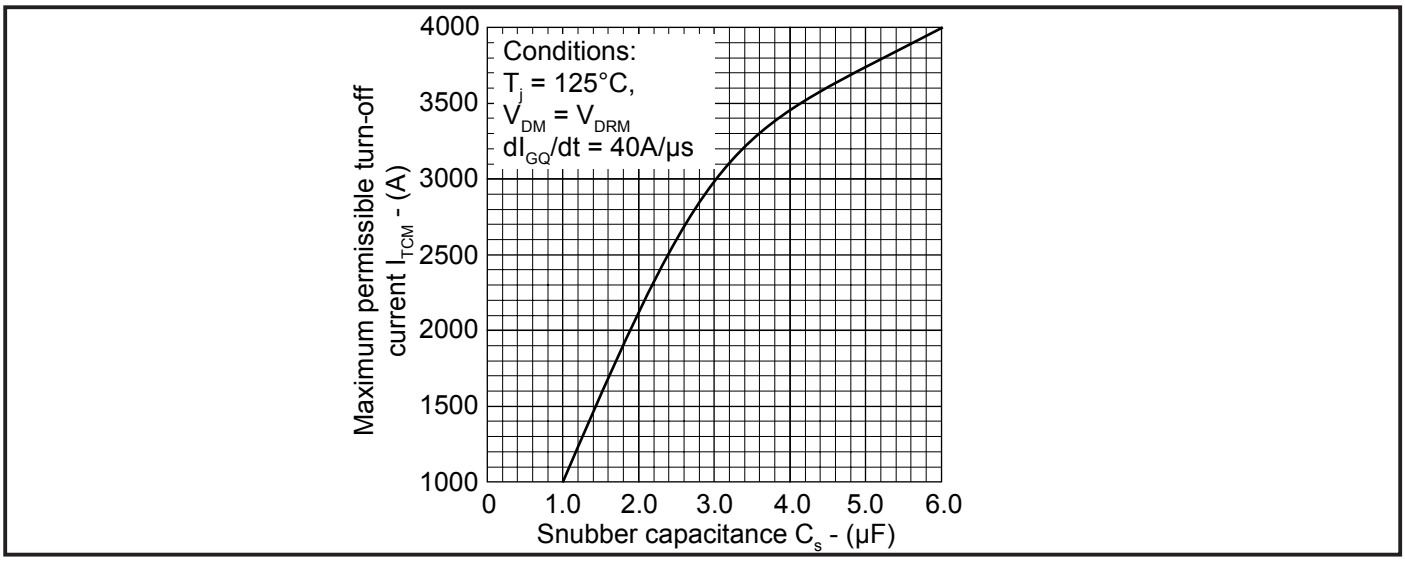


Figure 4. Maximum dependence of I_{TCM} on Cs

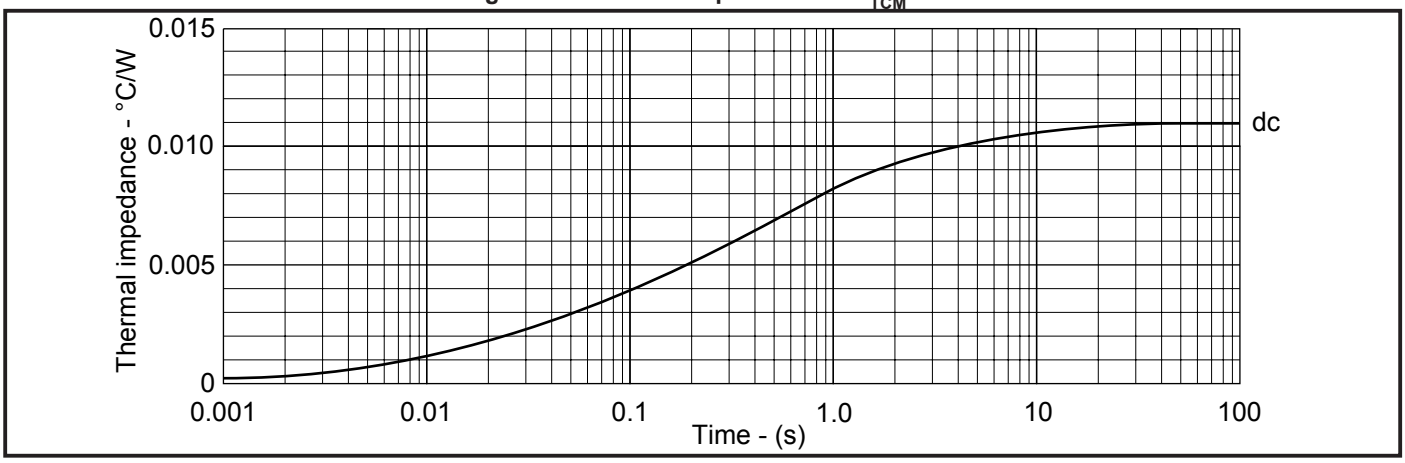


Figure 5. Maximum (limit) transient thermal impedance - double side cooled

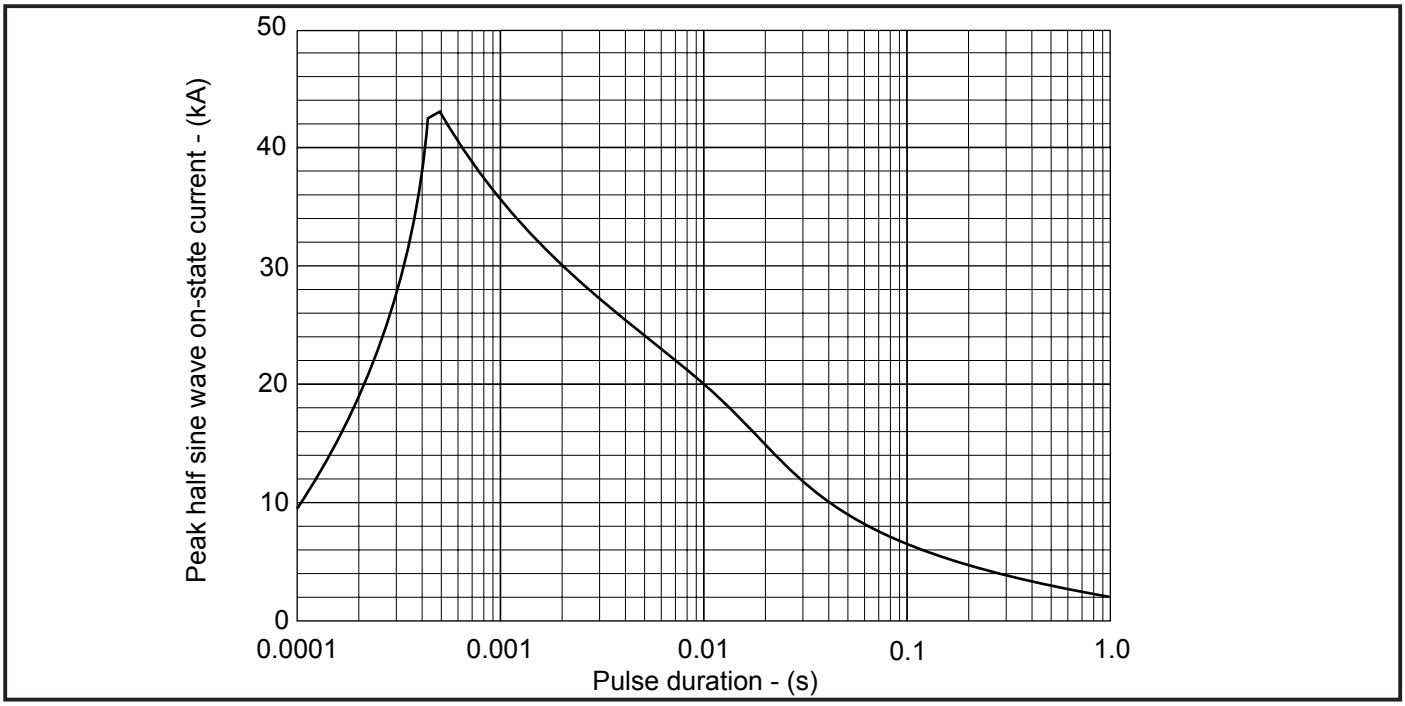


Figure 6. Surge (non-repetitive) on-state current vs time

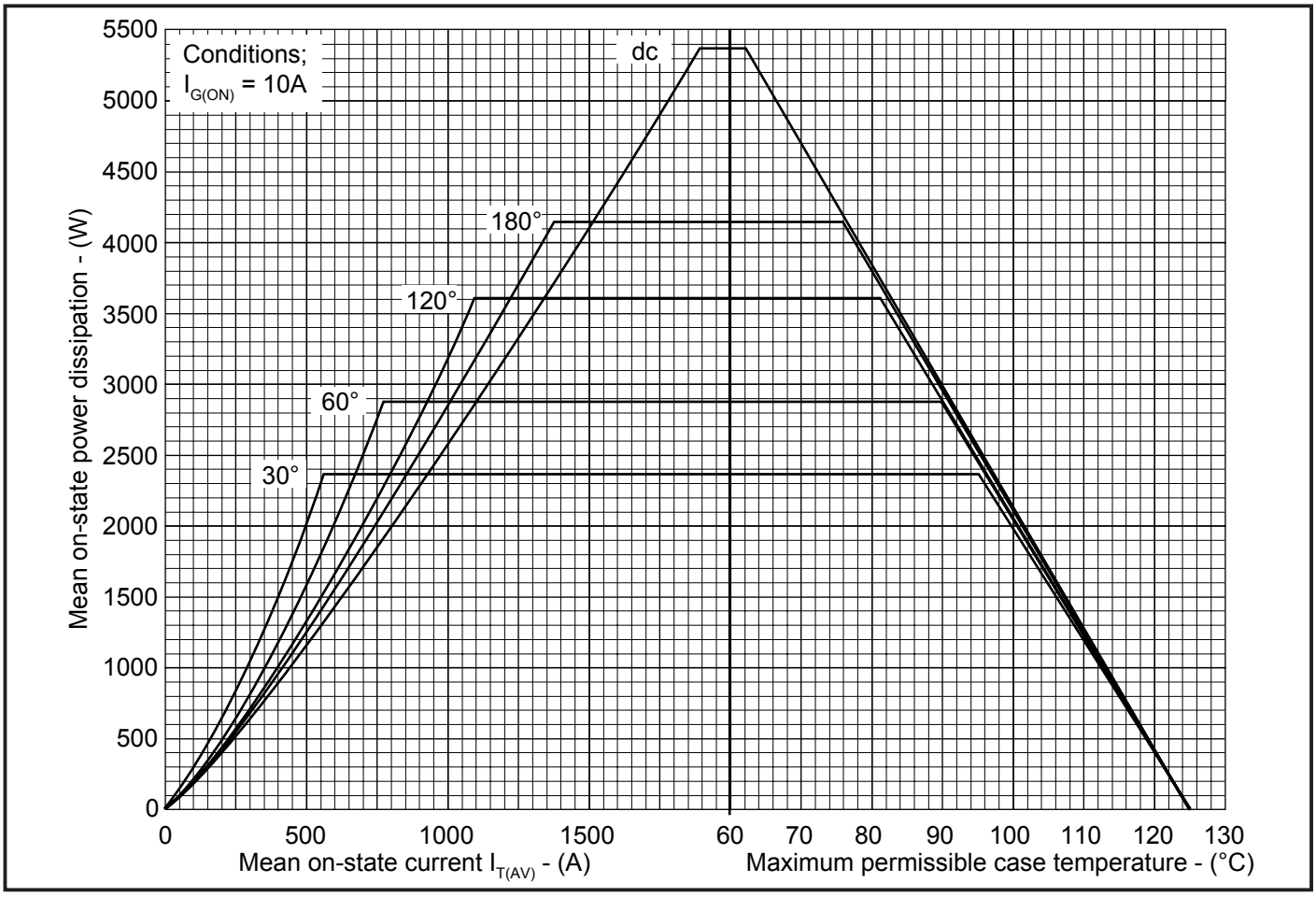


Figure 7. Steady state rectangular wave conduction loss - double side cooled

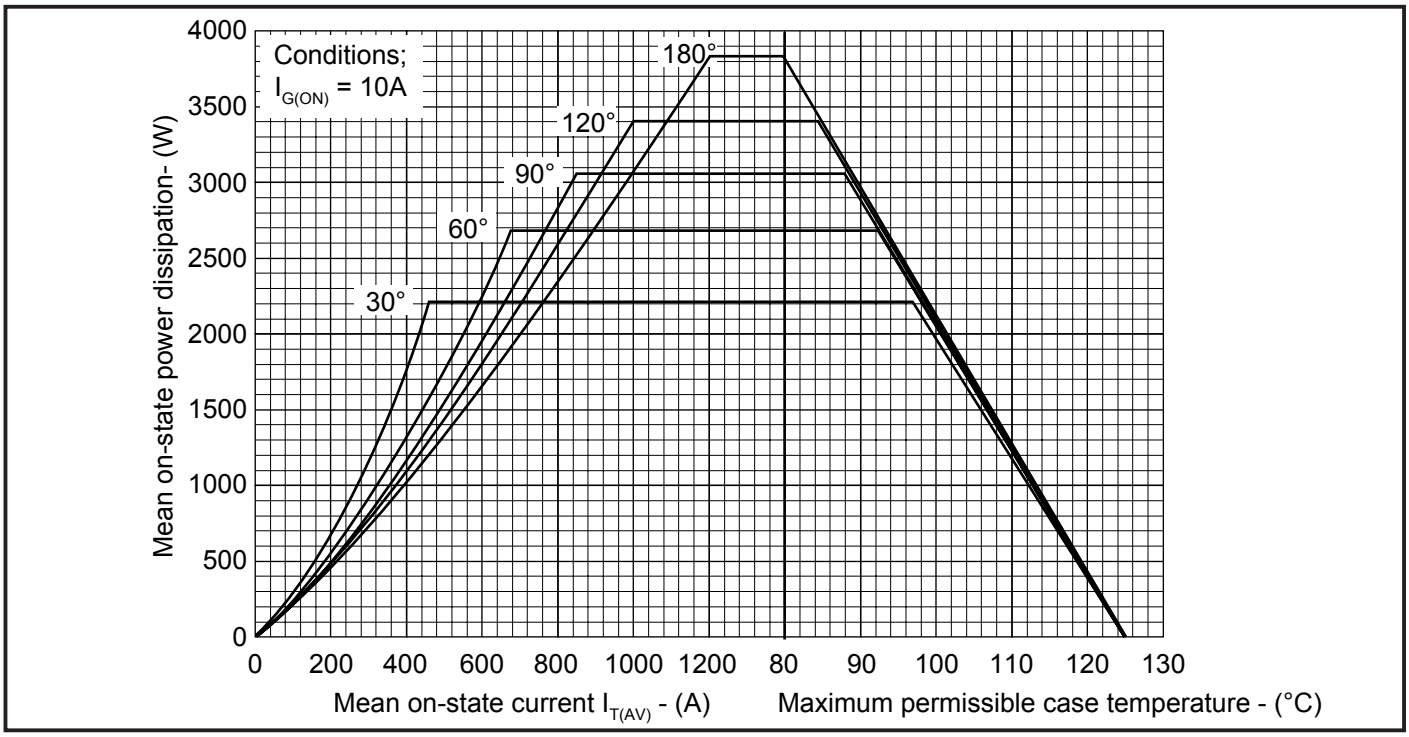


Figure 8. Steady state sinusoidal wave conduction loss - double side cooled

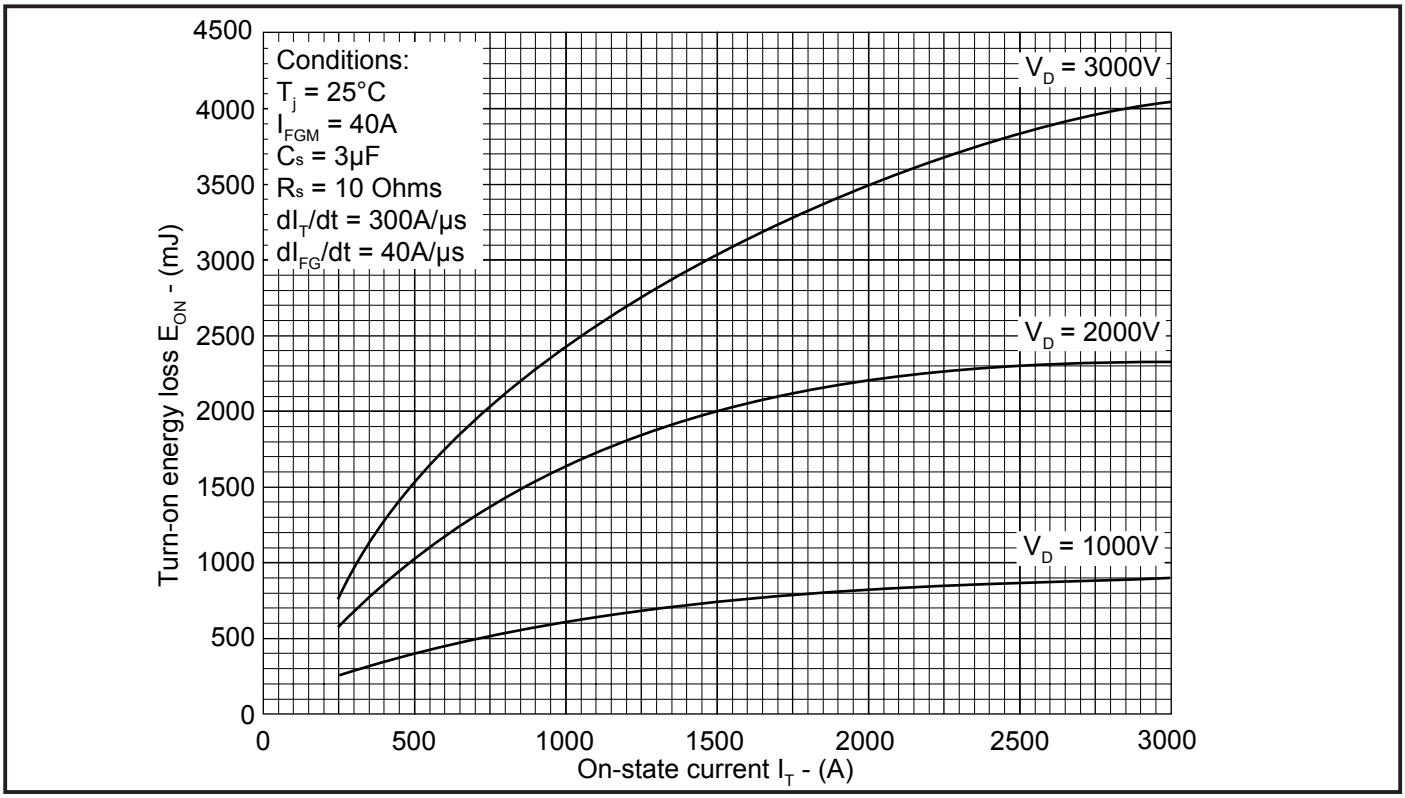


Figure 9. Turn-on energy vs on-state current

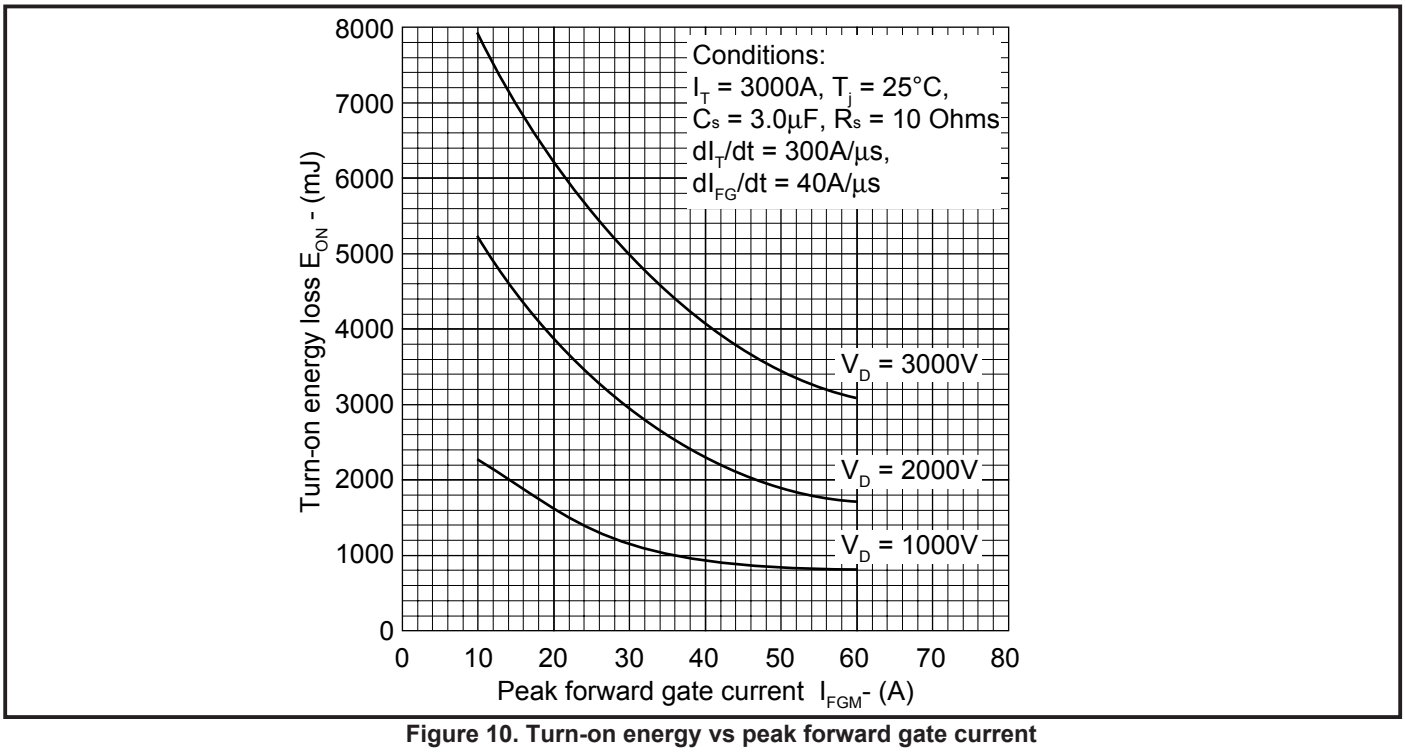


Figure 10. Turn-on energy vs peak forward gate current

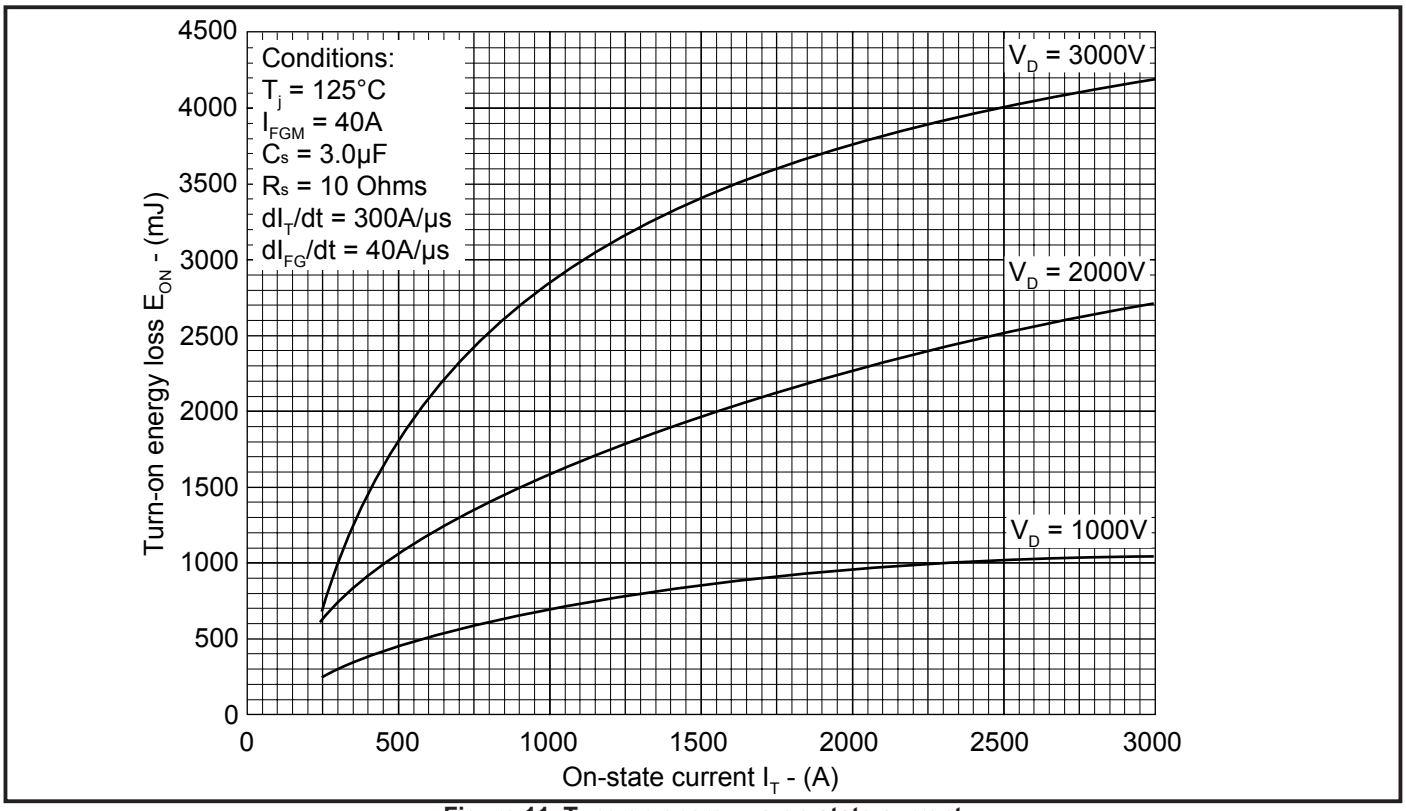


Figure 11. Turn-on energy vs on-state current

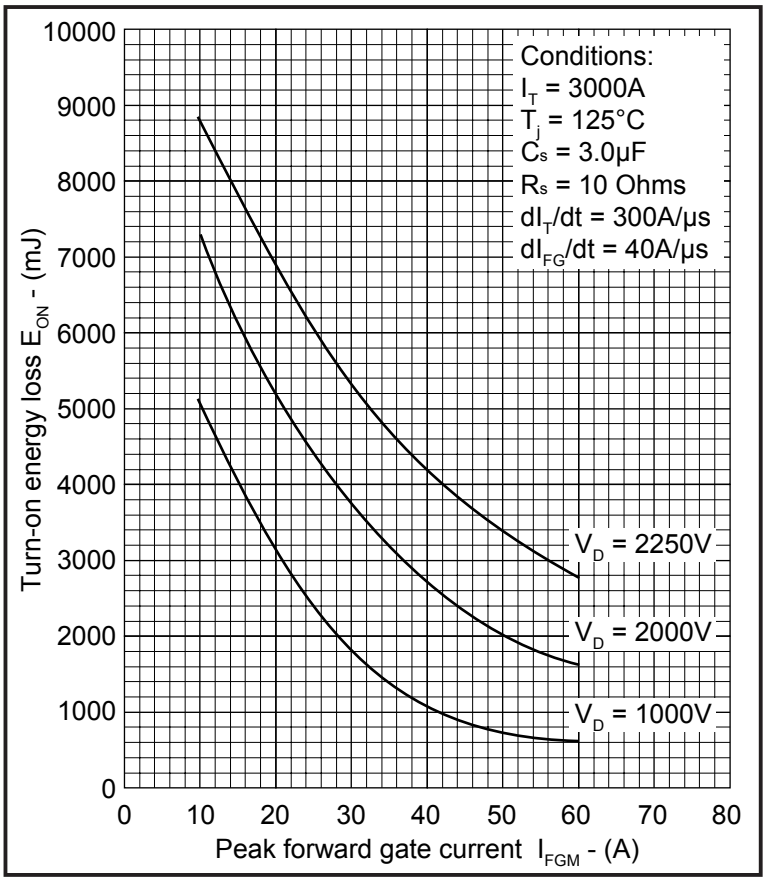


Figure 12. Turn-on energy vs peak forward gate current

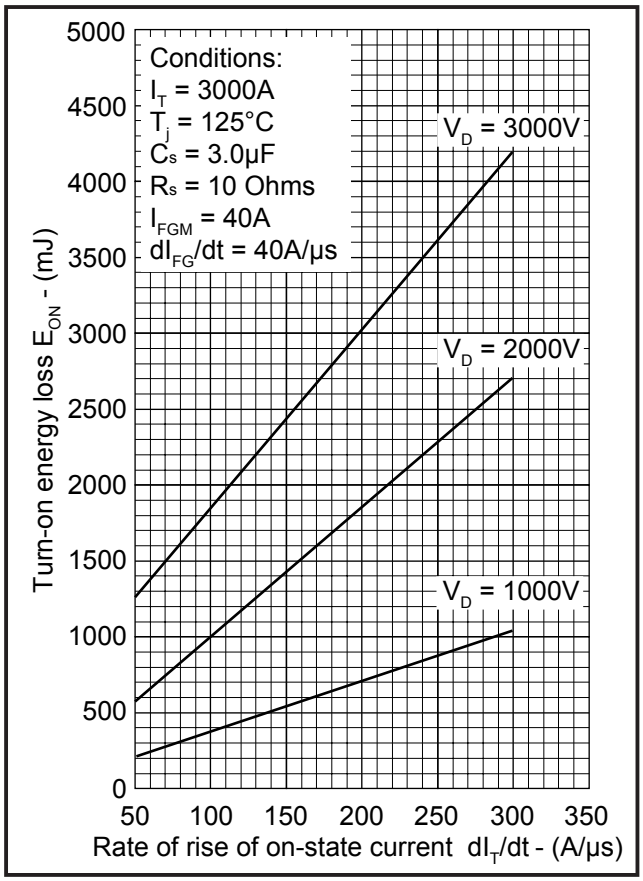


Figure 13. Turn-on energy vs rate of rise of on-state current

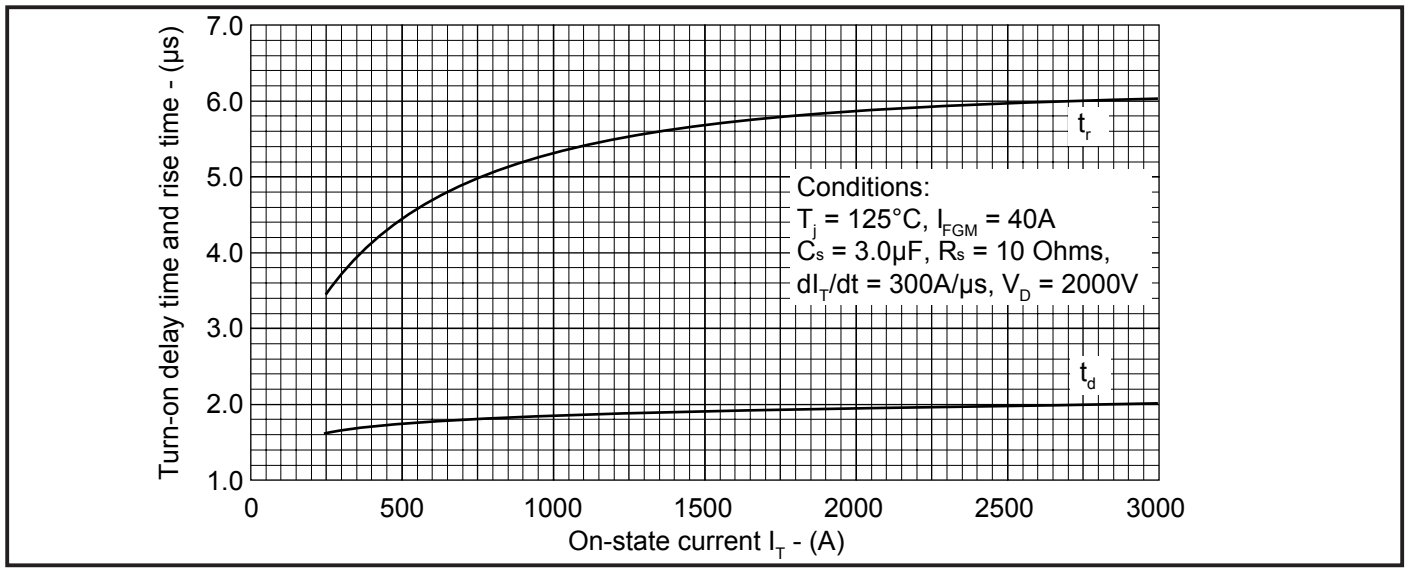


Fig.ure 14. Delay and rise time vs on-state current

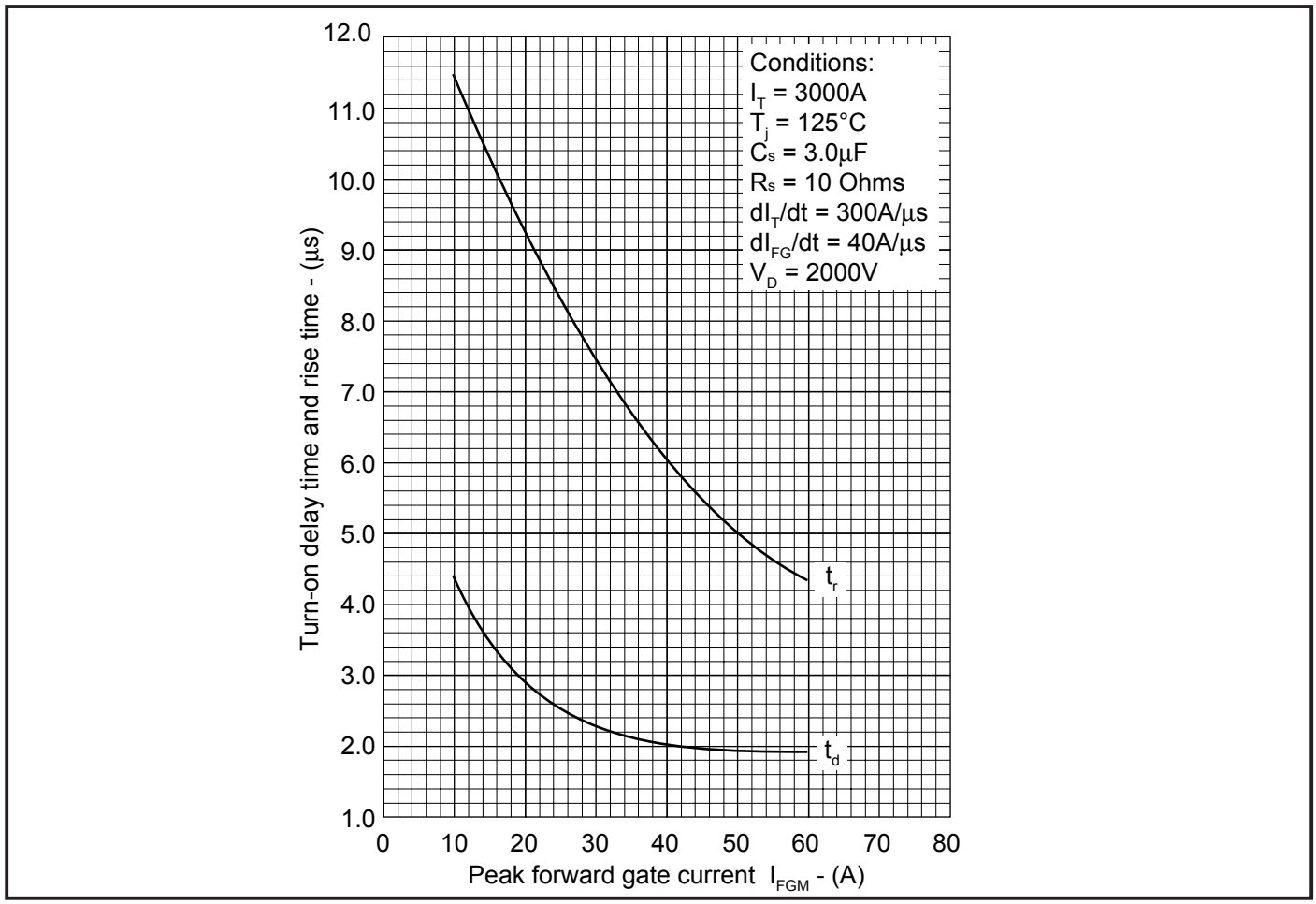


Figure 15. Delay and rise time vs peak forward gate current

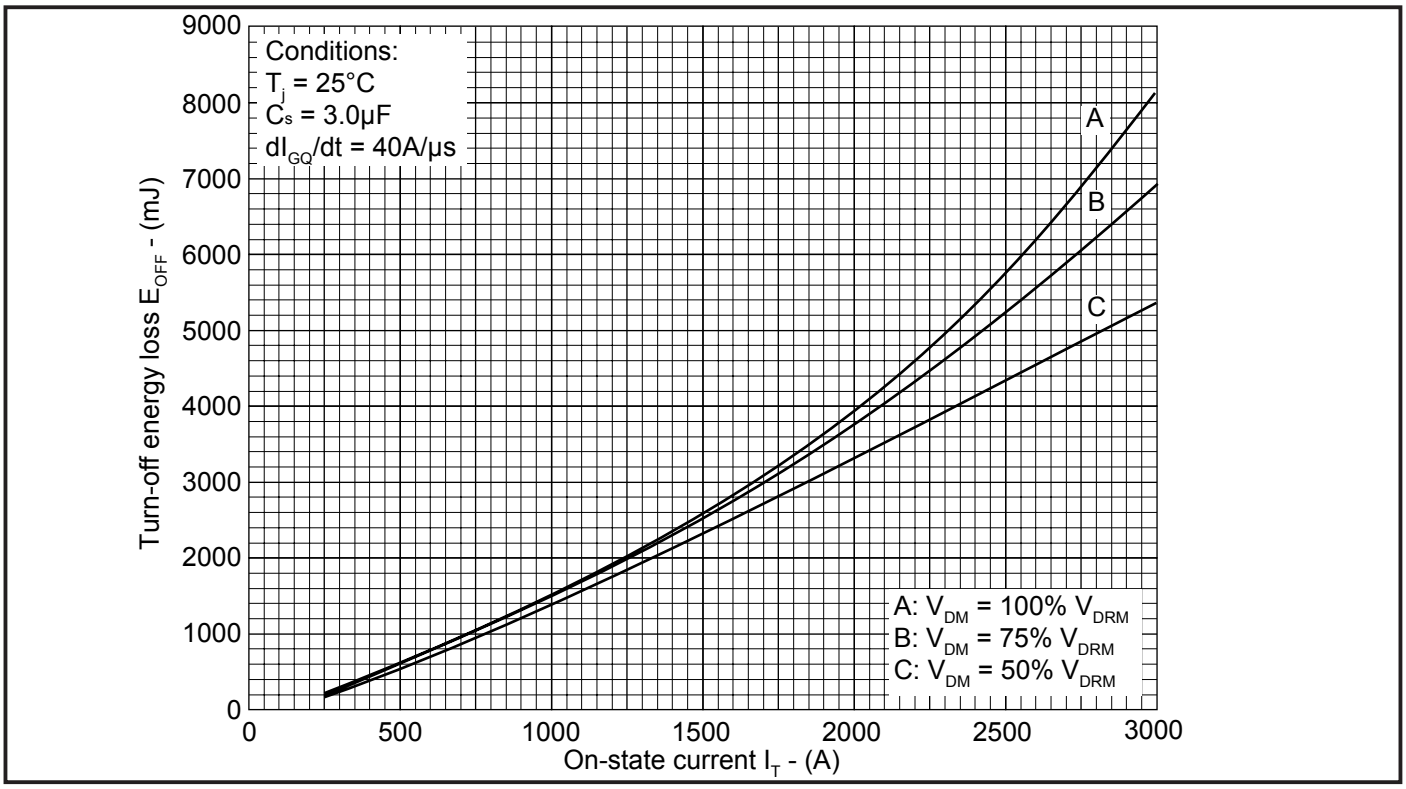


Figure 16. Turn-off energy loss vs on-state current

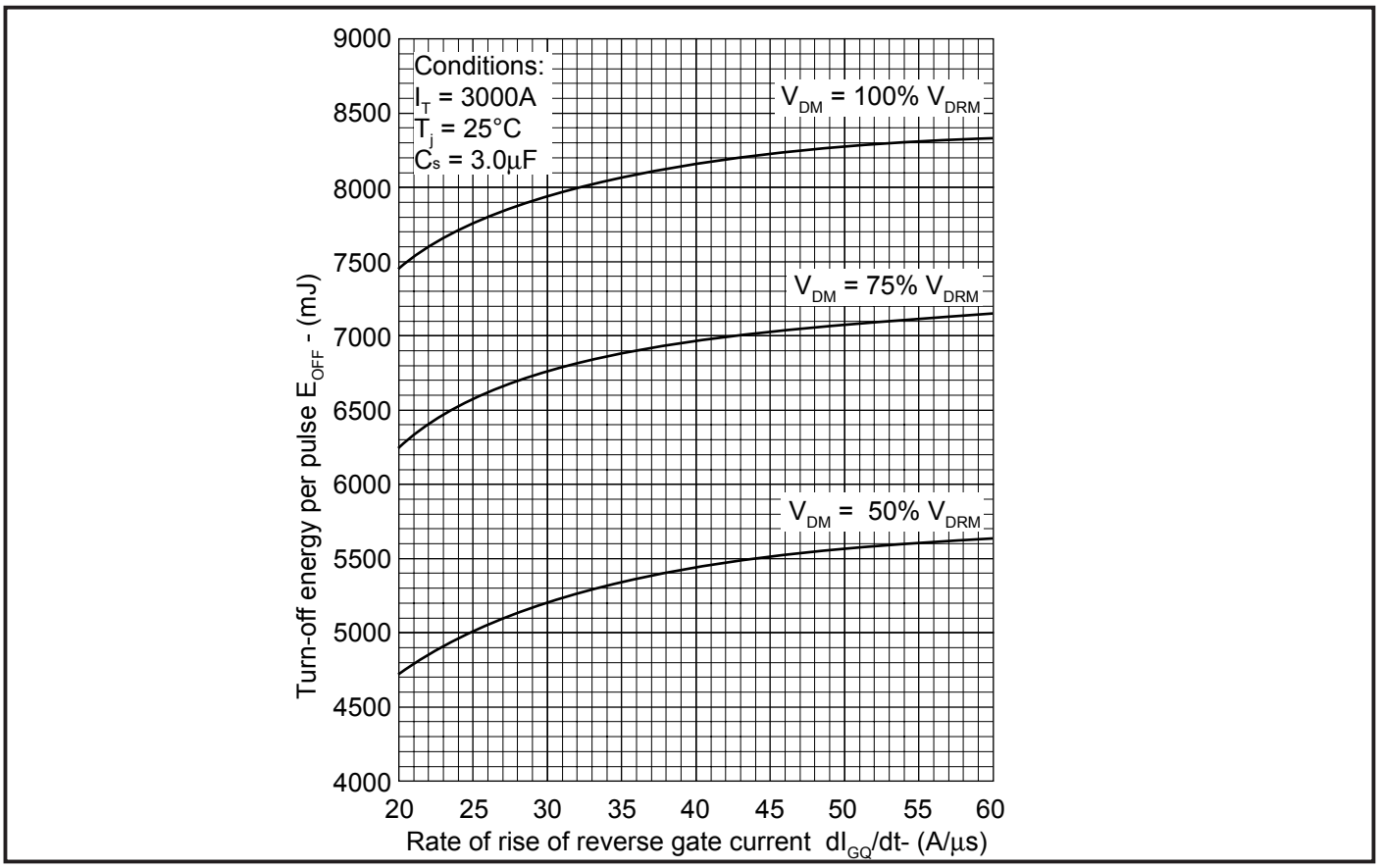


Figure 17. Turn-off energy vs rate of rise of reverse gate current

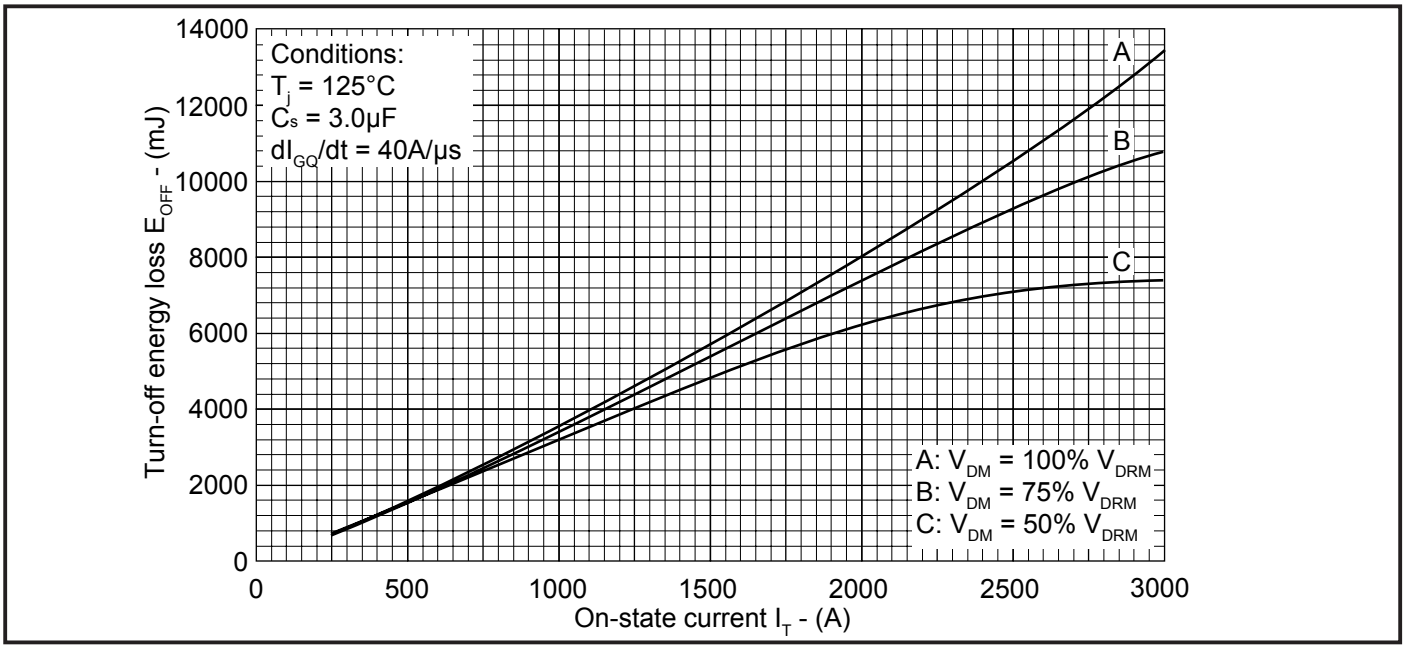


Figure 18. Turn-off energy vs on-state current

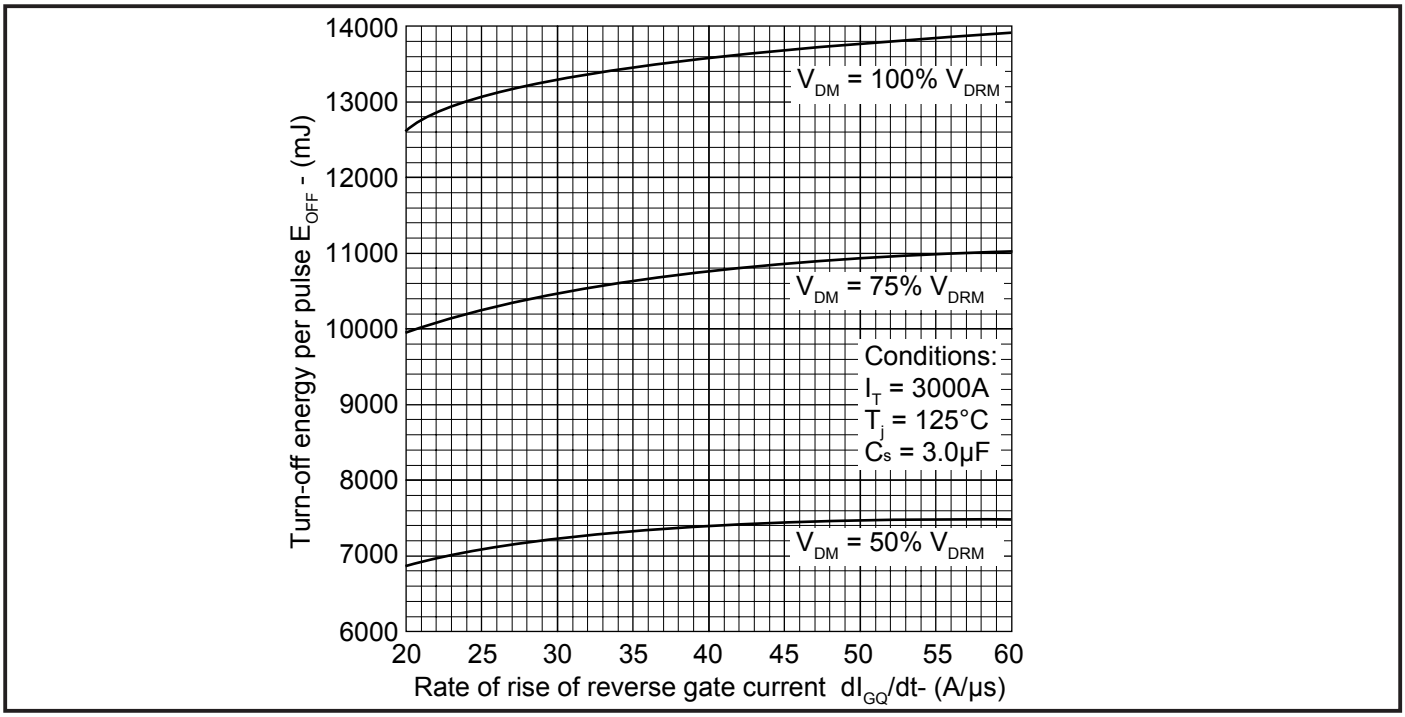


Figure 19. Turn-off energy loss vs rate of rise of reverse gate current

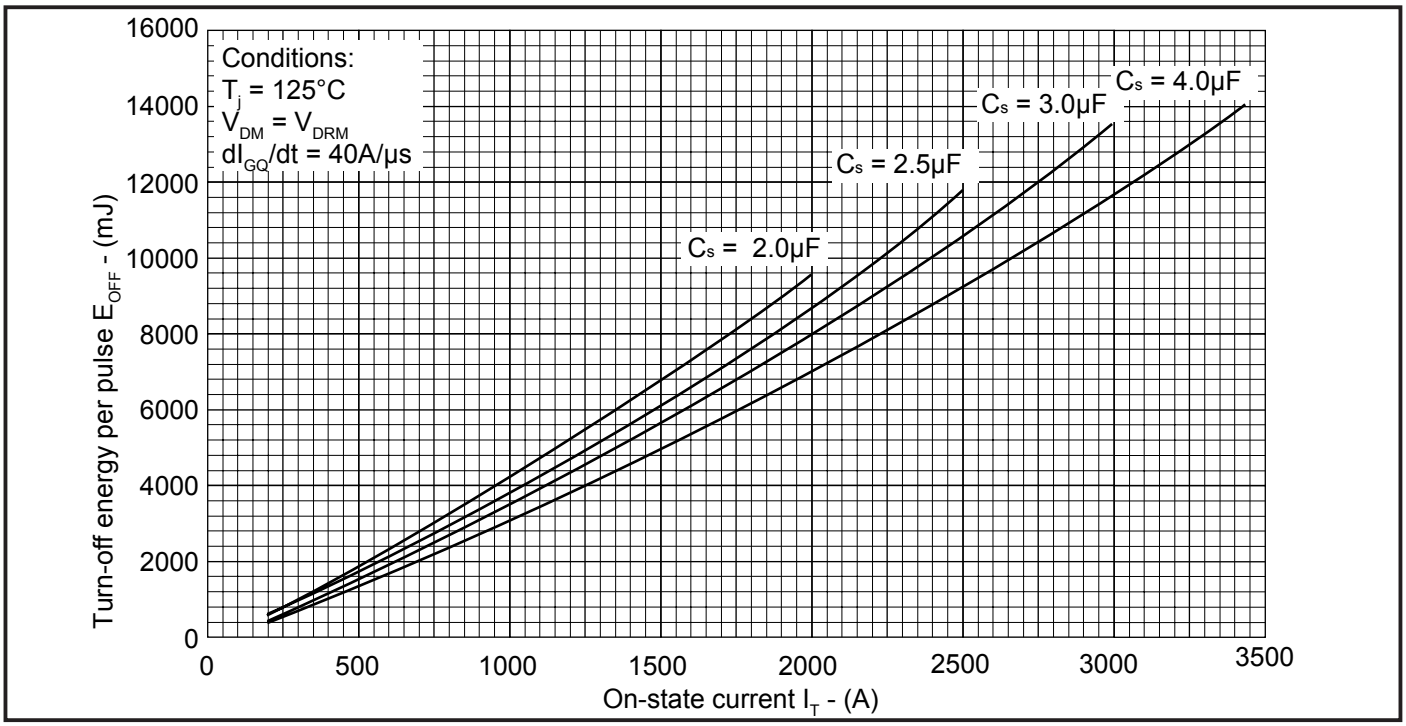


Figure 20. Turn-off energy vs on-state current

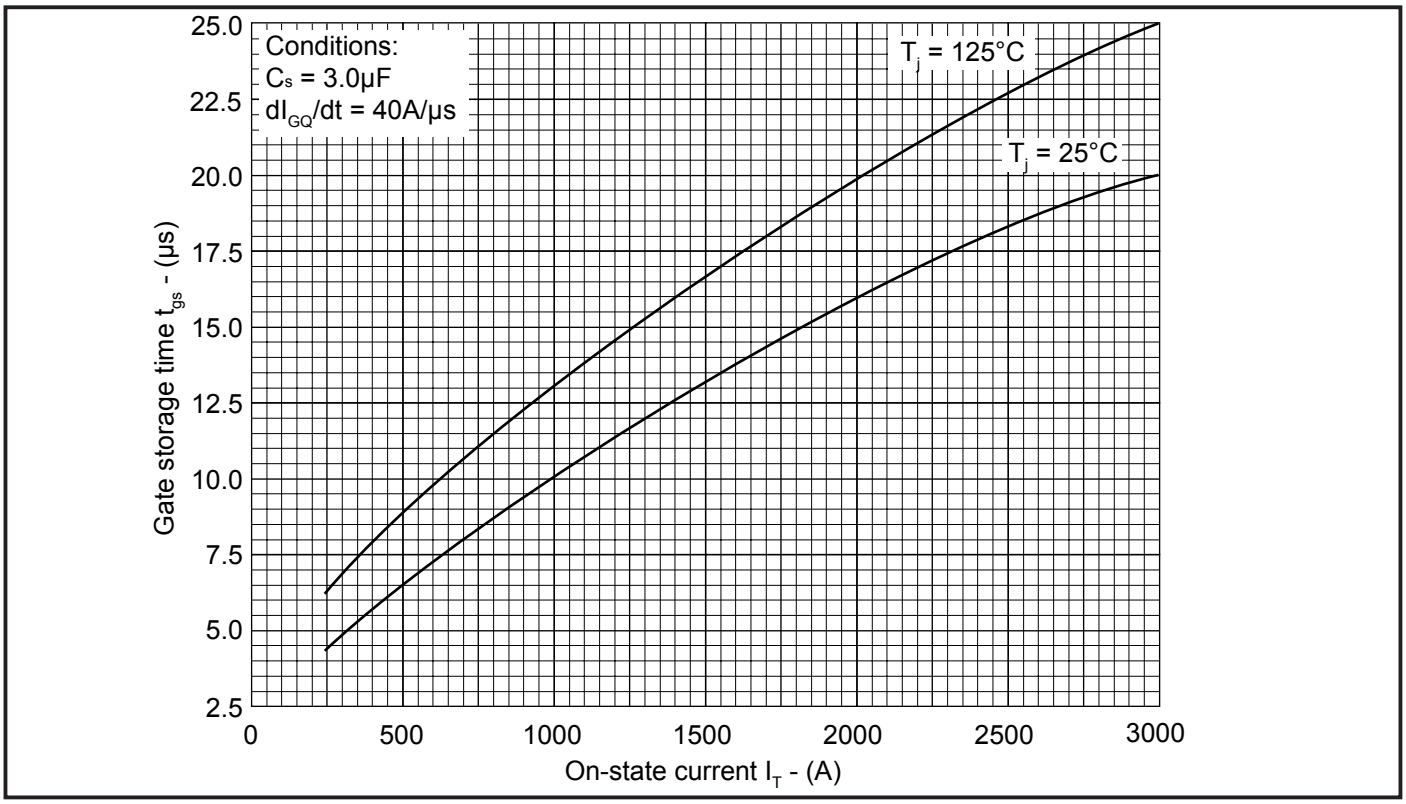


Figure 21. Gate storage time vs on-state current

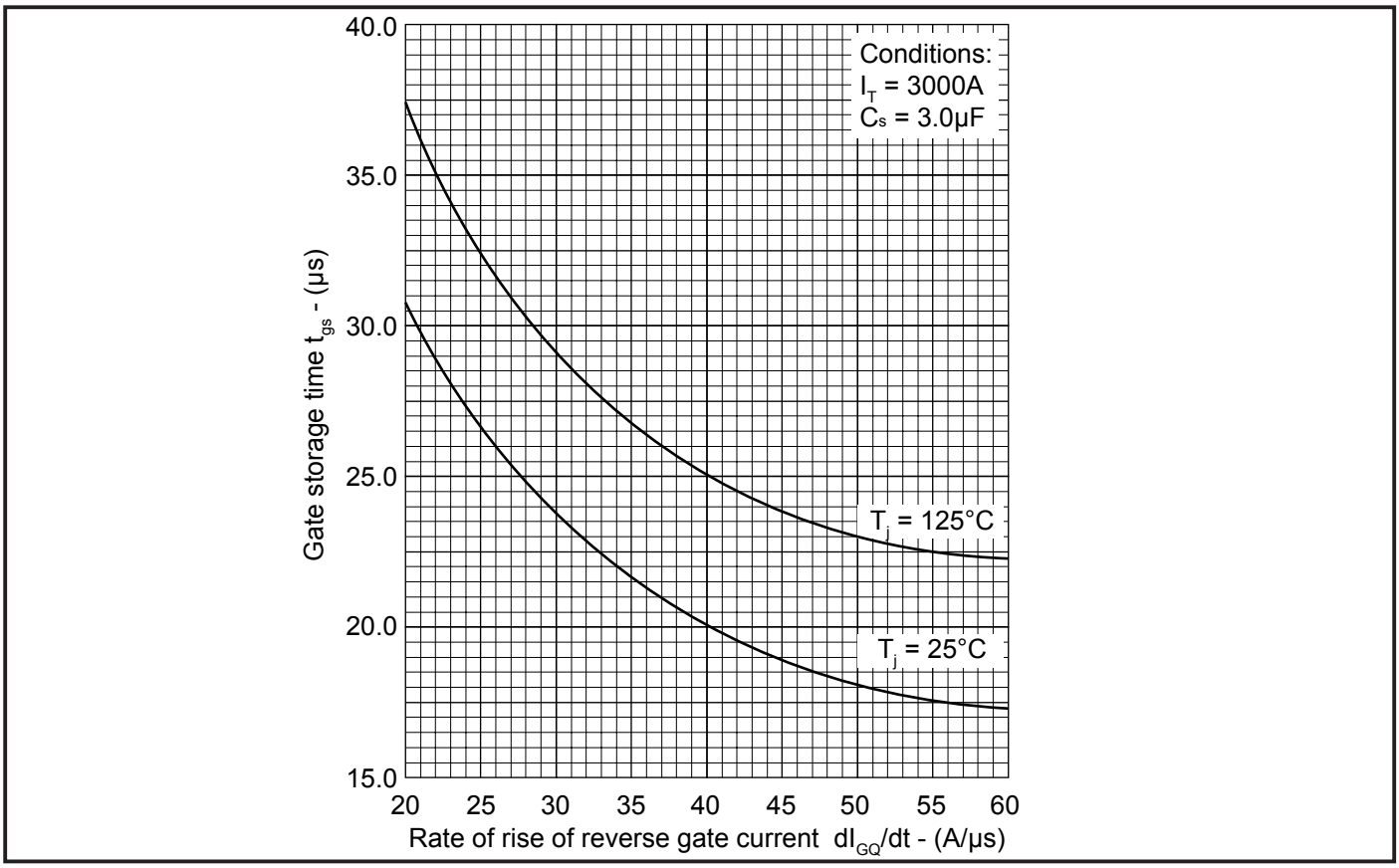


Figure 22. Gate storage time vs rate of rise of reverse gate current

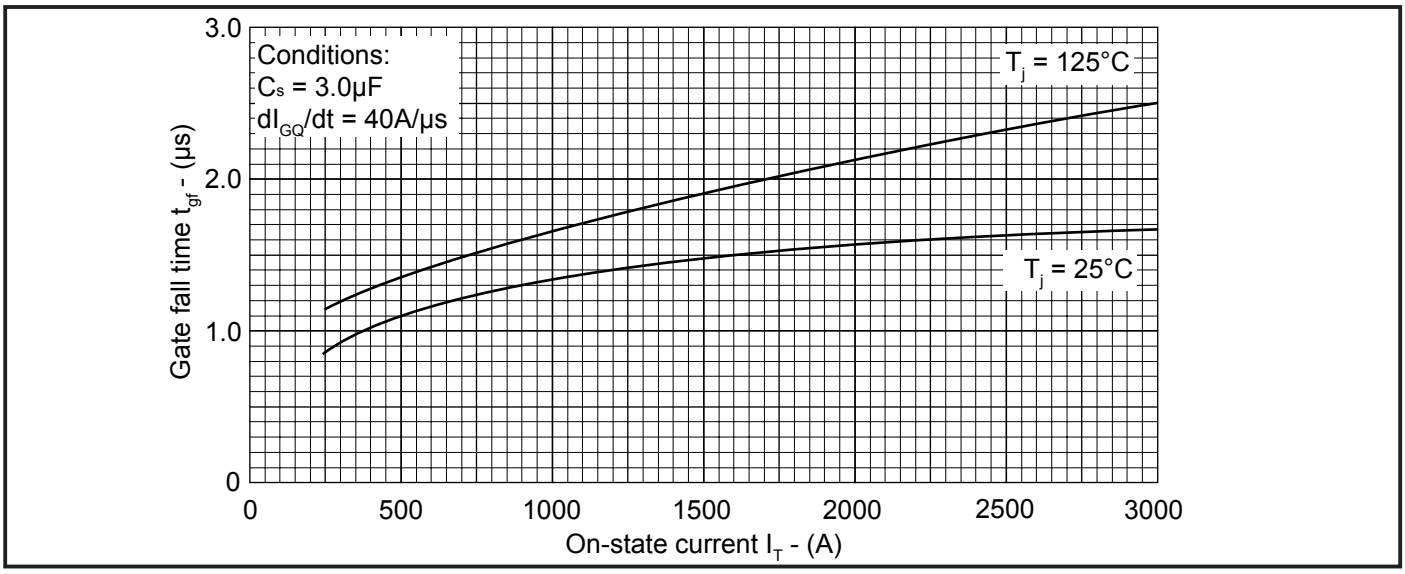


Figure 23. Gate fall time vs on-state current

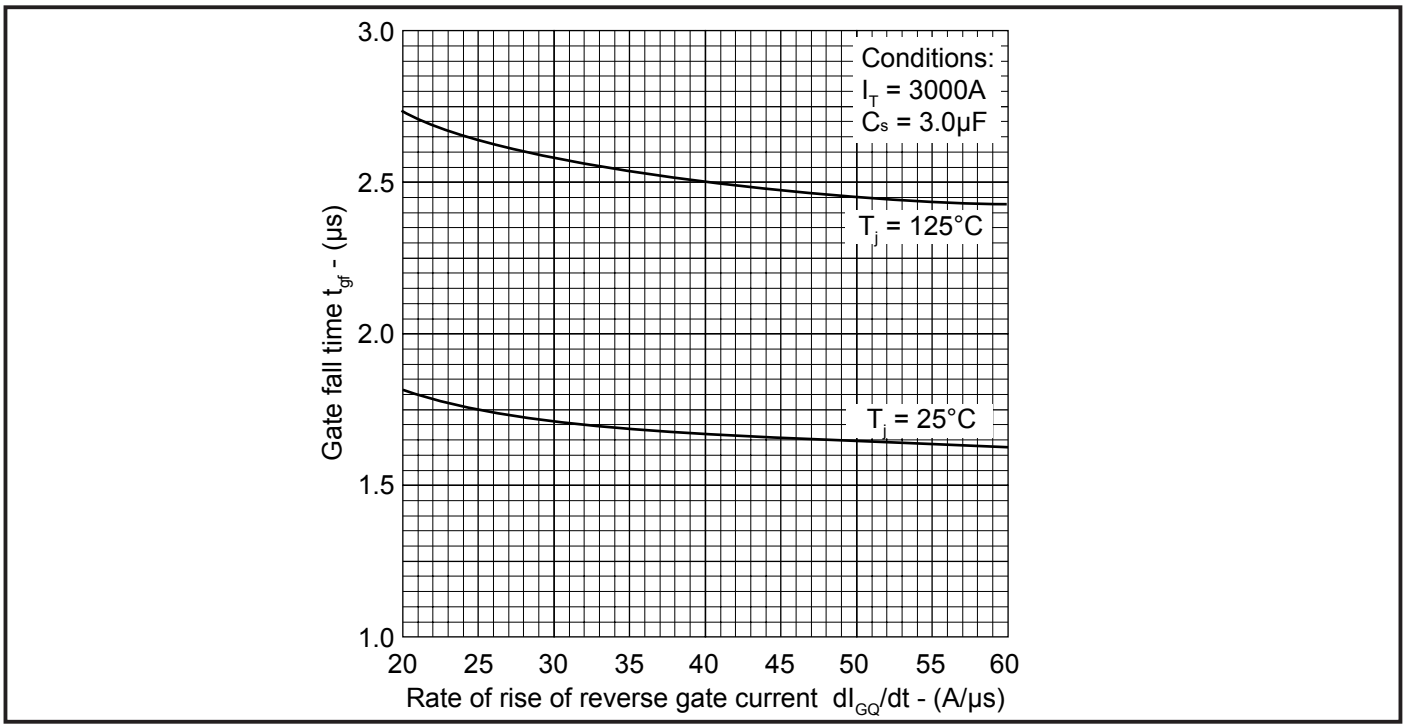


Figure 24. Gate fall time vs rate of rise of reverse gate current

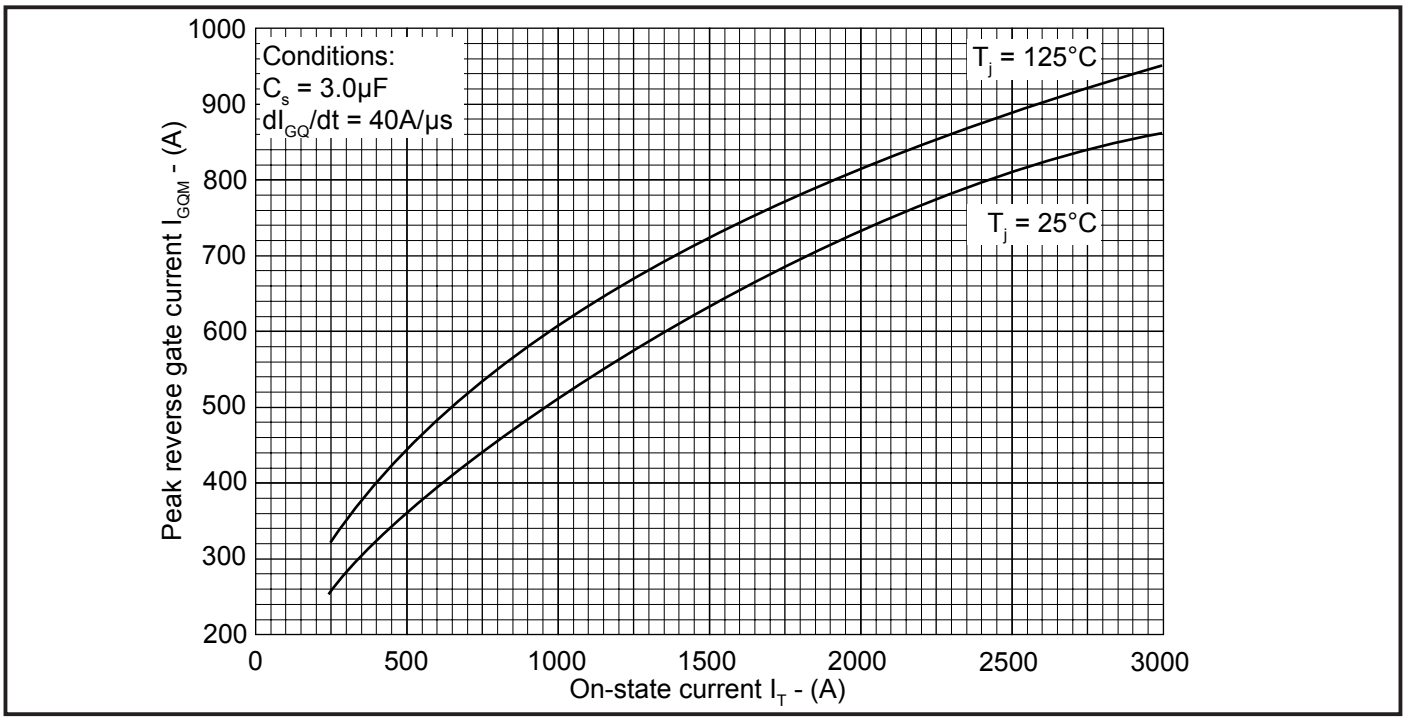


Figure 25. Peak reverse gate current vs on-state current

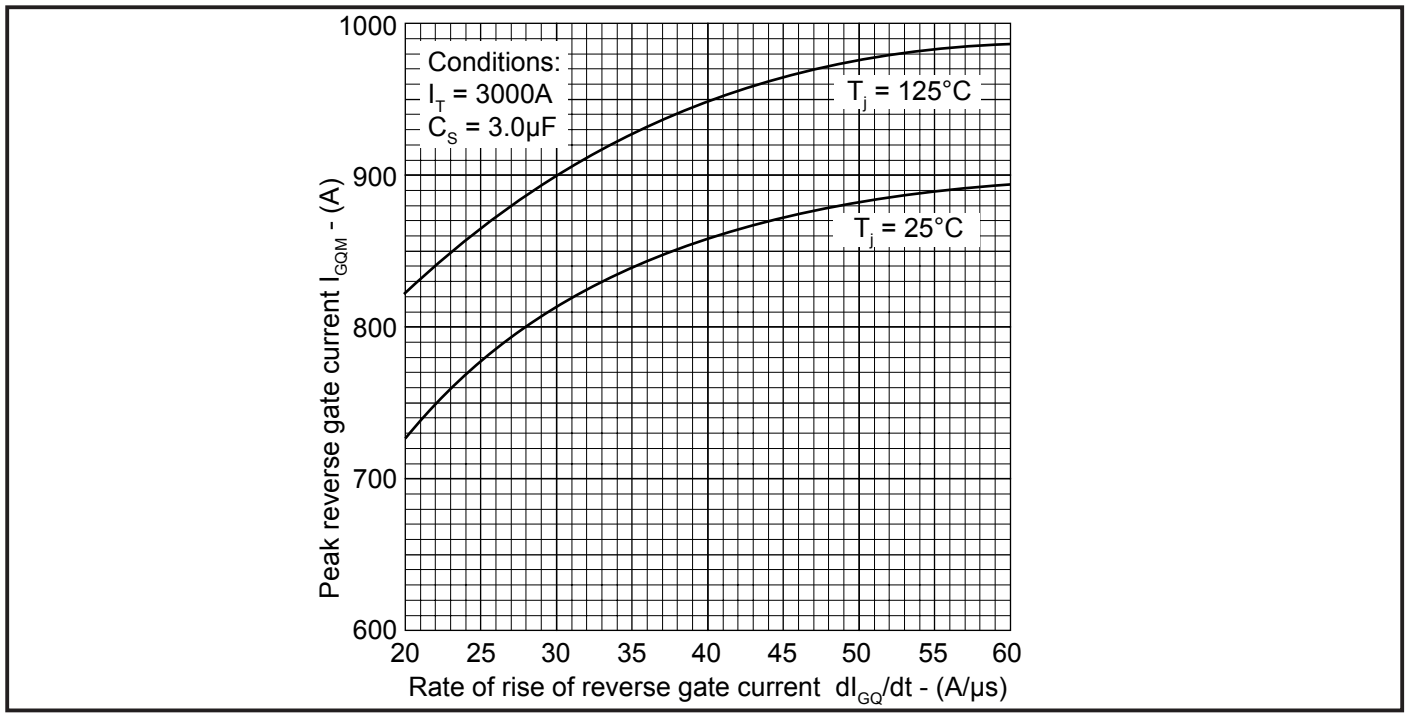


Figure 26. Reverse gate current vs rate of rise of reverse gate current

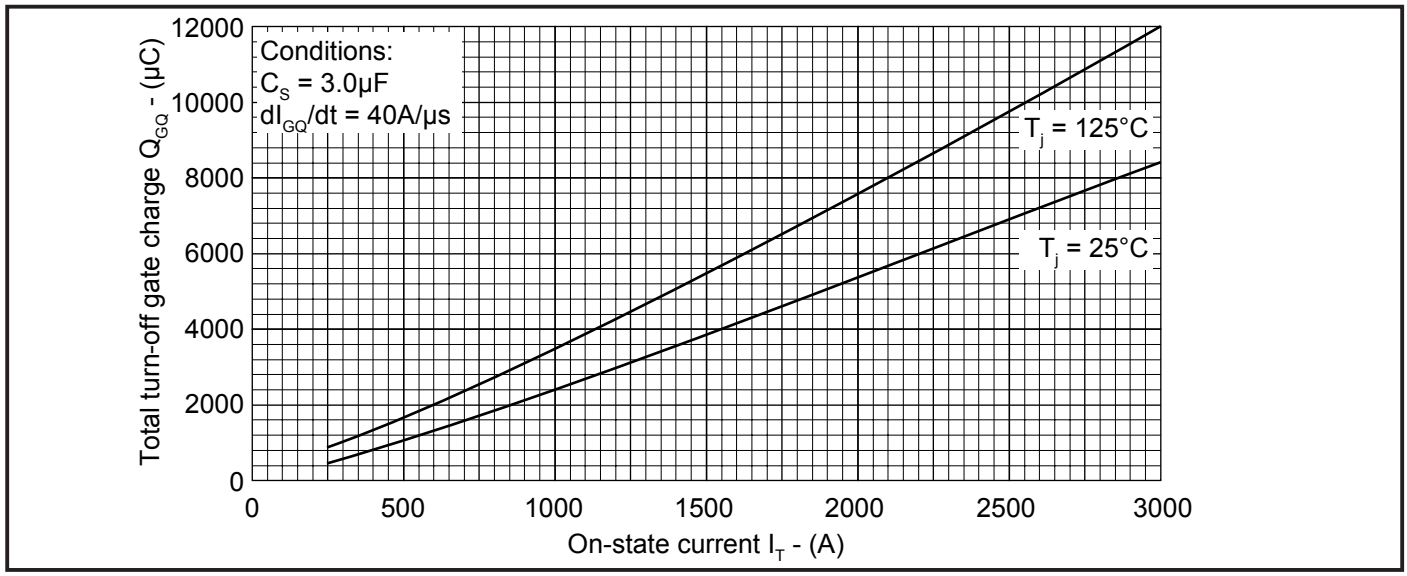


Figure 27. Turn-off gate charge vs on-state current

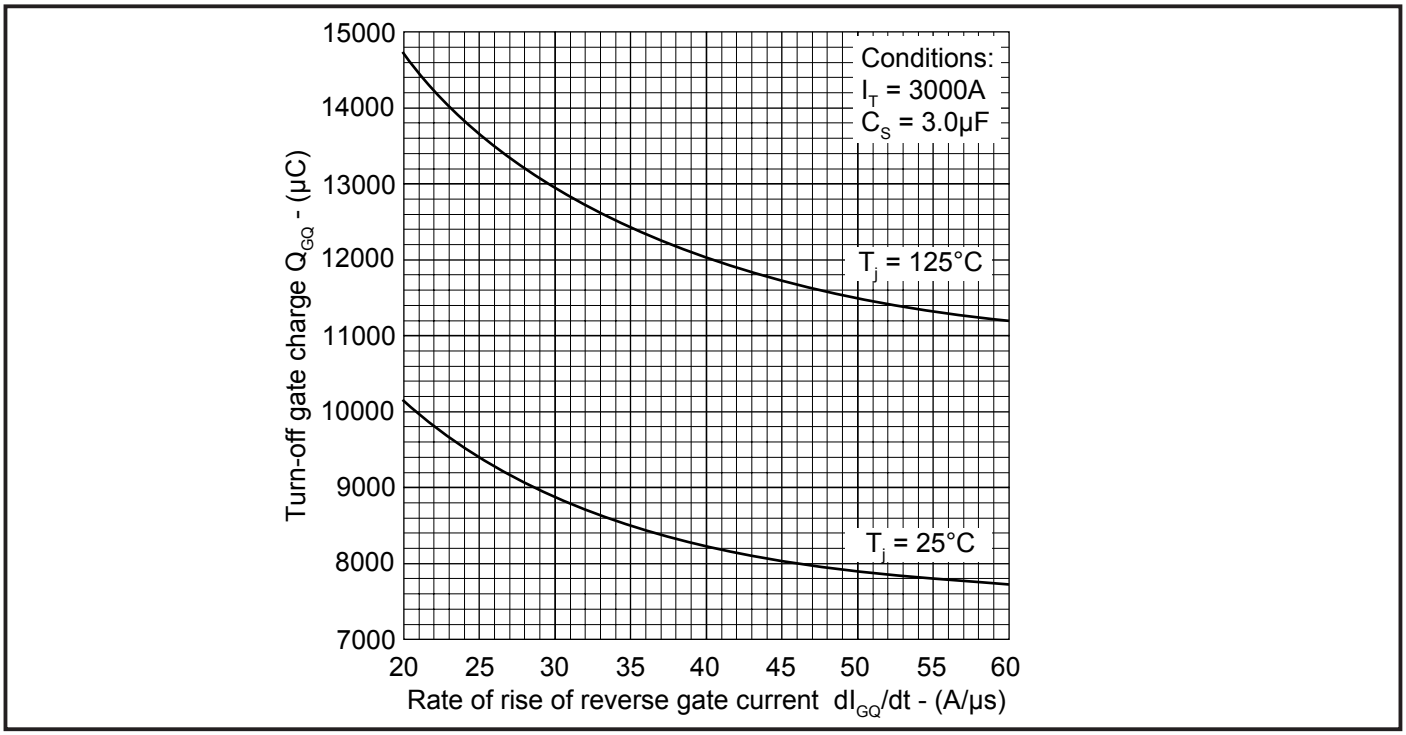


Figure 28. Turn-off gate charge vs rate of rise of reverse gate current

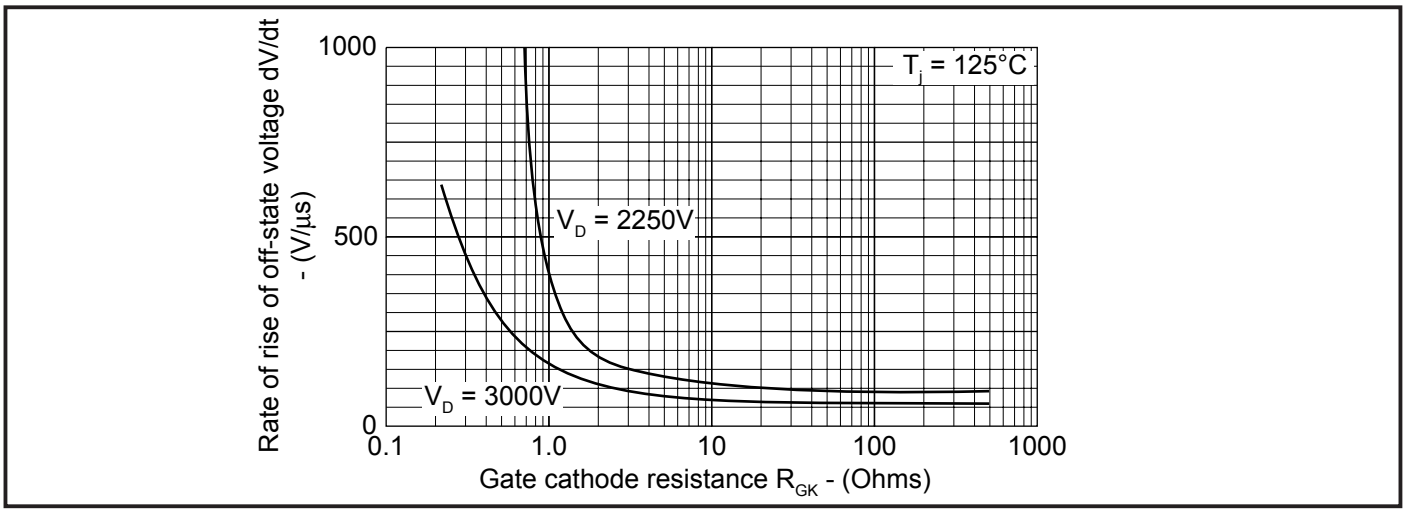
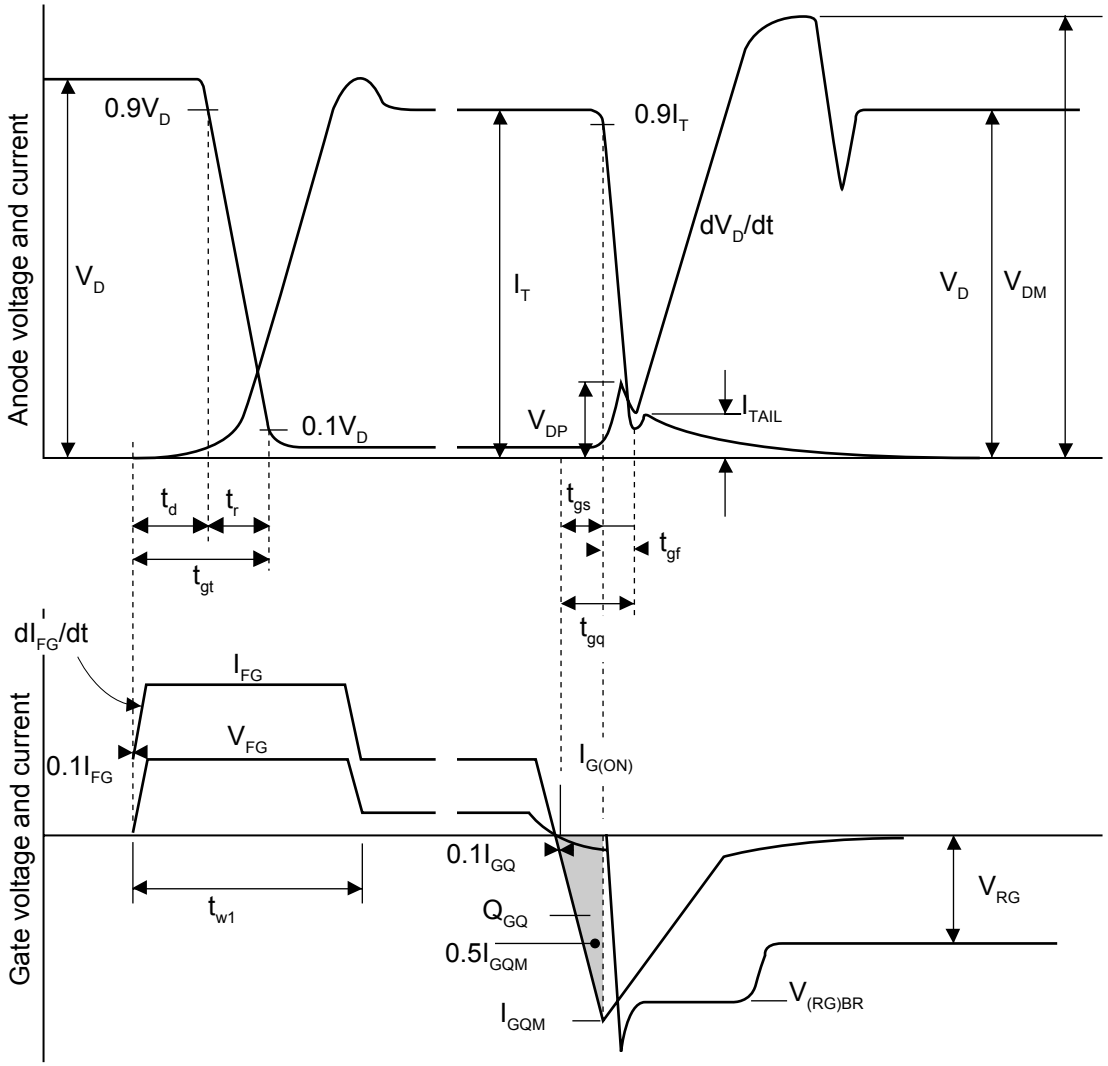


Figure 29. Rate of rise of off-state voltage vs gate cathode resistance



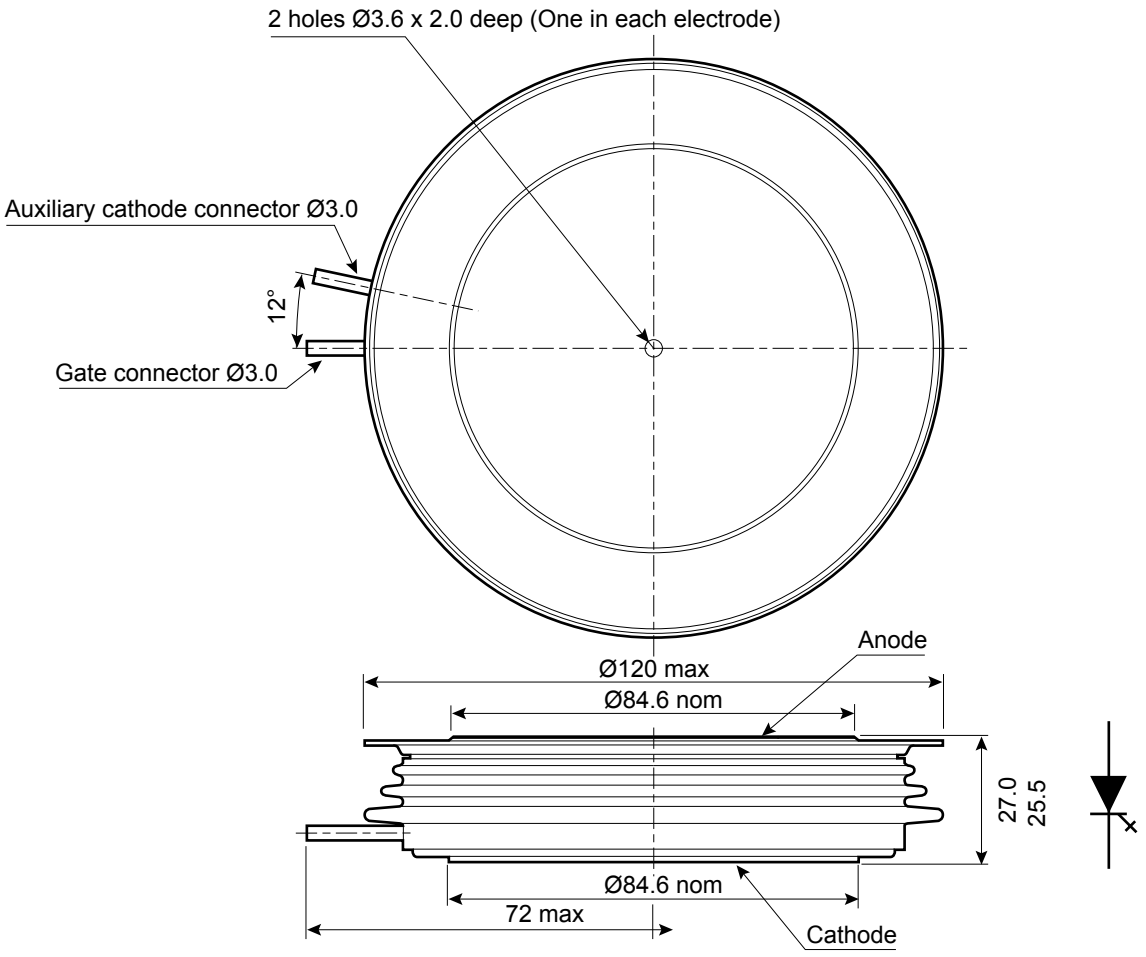
Recommended gate conditions:
I_{TCM} = 3000A
I_{FG} = 40A
$I_{G(ON)}$ = 10A d.c.
$t_{w1(min)}$ = 20µs
I_{GQM} = 950A
di_{GQ}/dt = 40A/µs
Q_{GQ} = 12000µC
$V_{RG(min)}$ = 2V
$V_{RG(max)}$ = 16V

These are recommended Dynex Semiconductor conditions. Other conditions are permitted

Figure 30. 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: 1700g
Clamping force: 40kN ±10%
Lead double coax, length: 630mm
Package outine type code: W

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.
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