JIANGSU YANGJIE RUNAU SEMICONDUCTOR CO.,LTD

High-end Power Semiconductor Manufacturer

CSG40L4500

Gate Turn-off Thyristor

APPLICATION

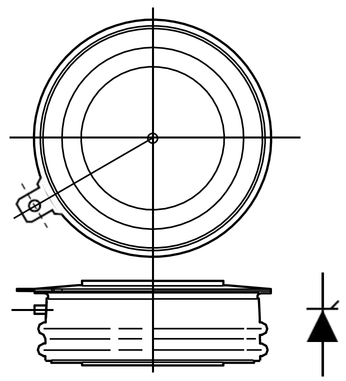
- Variable Speed AC Motor Drive Inverter (VSD-AC)
- High Voltage Converter
- Chopper
- DC / DC Converter

KEY PARAMETERS

I_{TCM}	4000A
V_{DRM}	4500V
$I_{T(AV)}$	1180A
dV_D/dt	1000V/µs
di_T/dt	300A/µs

FEATURES

- Double Sides Cooled
- High Reliability
- High Voltage Capability
- Fast Fuse Protection Not Required
- High Surge Current Capacity
- Excellent Turn-off performance
- Reduce equipment size and weight, low noise



Outline type code: L.
See Package Details for further information.

VOLTAGE RATINGS

Mode	Repetitive Peak Off-state Voltage V_{DRM}	Repetitive Peak Reverse Voltage V_{RRM}	Test Conditions
CSG40L4500	4500	16	T_{vj} = 125°C, I_{DM} = 100mA, I_{RRM} = 50mA

CURRENT RATINGS

Symbol	Parameter	Test Conditions	Max.	Unit
I_{TGQM}	Peak controllable off-state current	V = 66% V_{DRM} , T_j = 125°C, dI_{GQ}/dt = 40A/µs ,Cs = 3µF	4000	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		1850	A

SURGE RATINGS

Symbol	Parameters	Test Conditions	Max.	Unit
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 x 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} ≤ 1.5Ω, 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	Parameters	Test Conditions	Min.	Max.	Unit
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 RATINGS

Symbol	Parameters	Test Conditions		Min.	Max.	Unit
R_{thJC}	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_{thCH}	Contact thermal resistance	Clamping force 40.0kN With mounting compound	per contact	-	0.0021	°C/W
T_{VJM}	Virtual junction temperature			-40	125	°C
T_{OP}/T_{stg}	Operating junction/storage temperature range			-40	125	°C
F	Clamping force			36.0	44.0	kN

GTO CHARACTERISTICS

Symbol	Parameters	Test Conditions	Max.	Unit
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 = 110A, T_j = 25°C	1.2	V
I_{GT}	Gate trigger current	V_D = 24V, I_T = 110A, 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		13500	mJ
t_{gs}	Storage time		25.0	µs
t_{gf}	Fall time	I_T = 3000A, V_{DM} = V_{DRM}	2.5	µs
t_{gq}	Gate controlled turn-off time	Snubber Cap Cs = 3.0µF,	27.5	µs
Q_{GQ}	Turn-off gate charge	di_{GQ}/dt = 40A/µs	12000	µC
Q_{GQT}	Total turn-off gate charge		24000	µC
I_{GQM}	Peak reverse gate current		950	A

CURVES

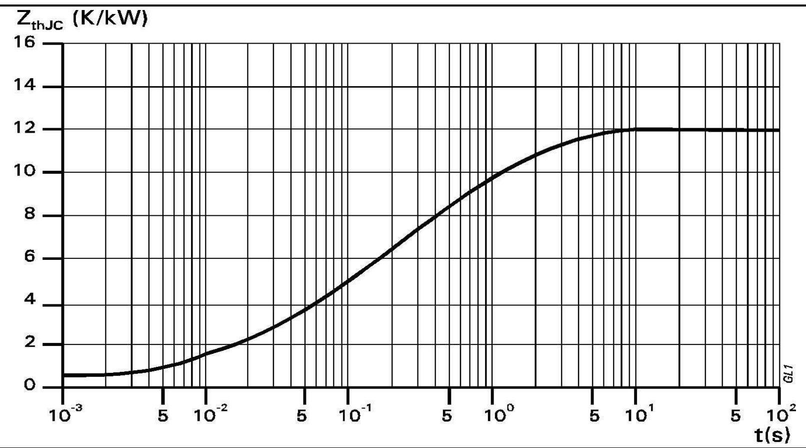


Fig. 1 Transient thermal impedance, junction to case.

CURVES

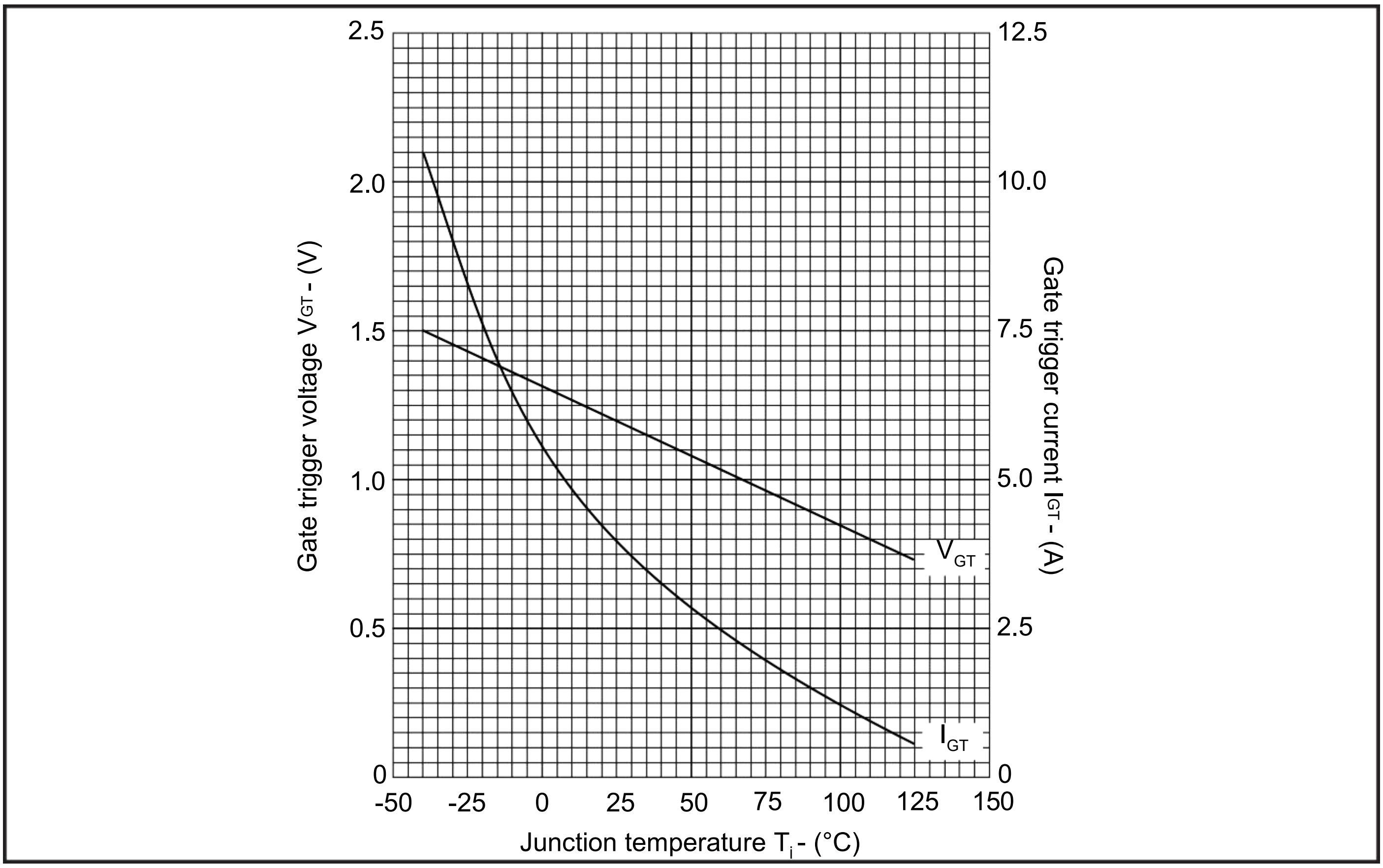


Figure 2. Maximum gate trigger voltage/current vs junction temperature

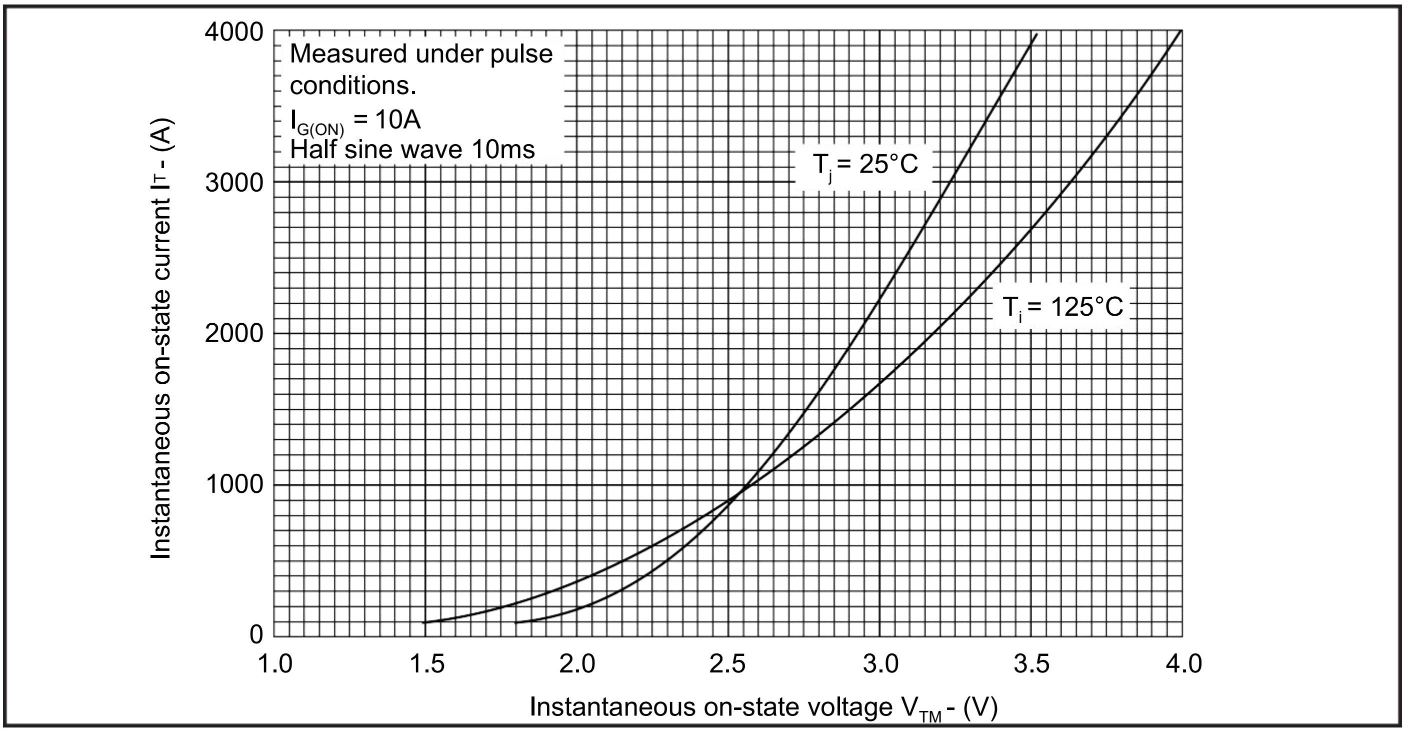


Figure 3. On-state characteristics

CURVES

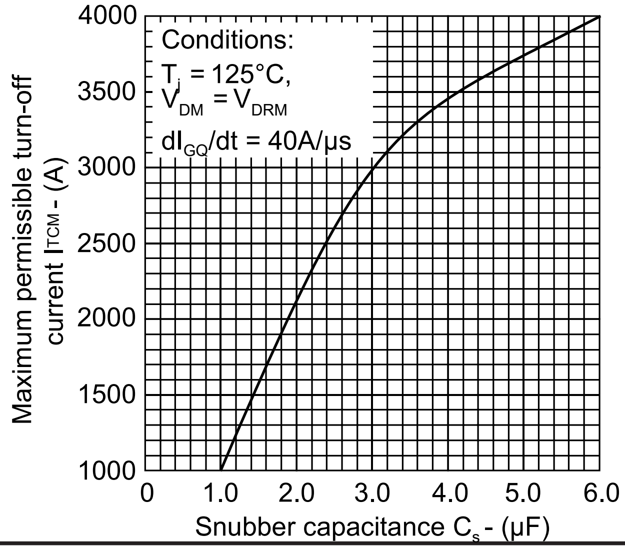


Figure 4. Maximum dependence of I_{TCM} on Cs

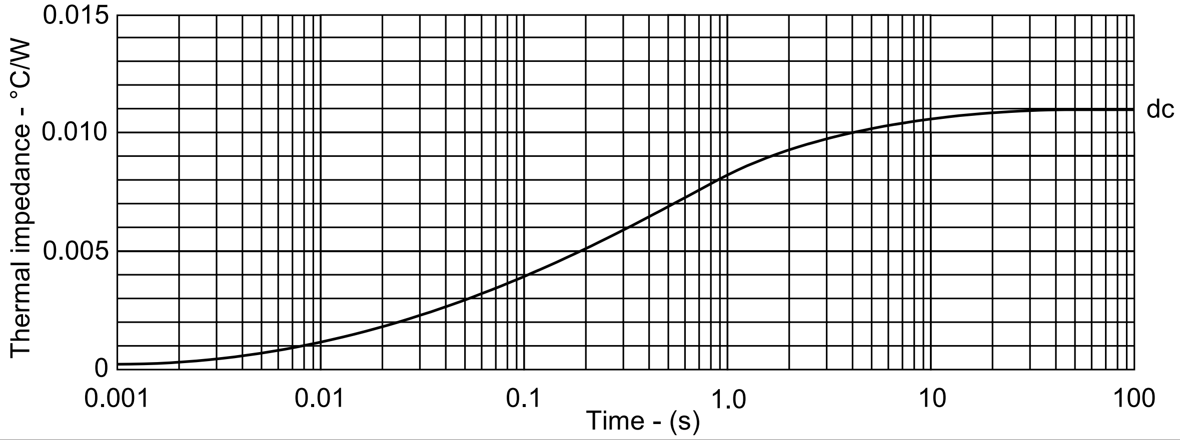


Figure 5. Maximum (limit) transient thermal impedance - double side cooled

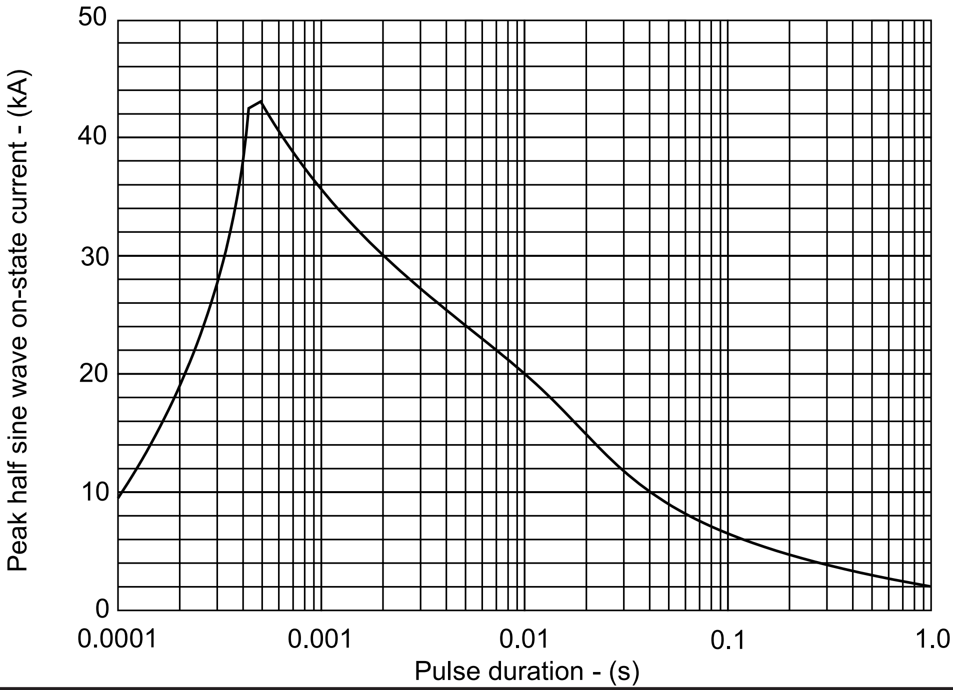


Figure 6. Surge (non-repetitive) on-state current vs time

CURVES

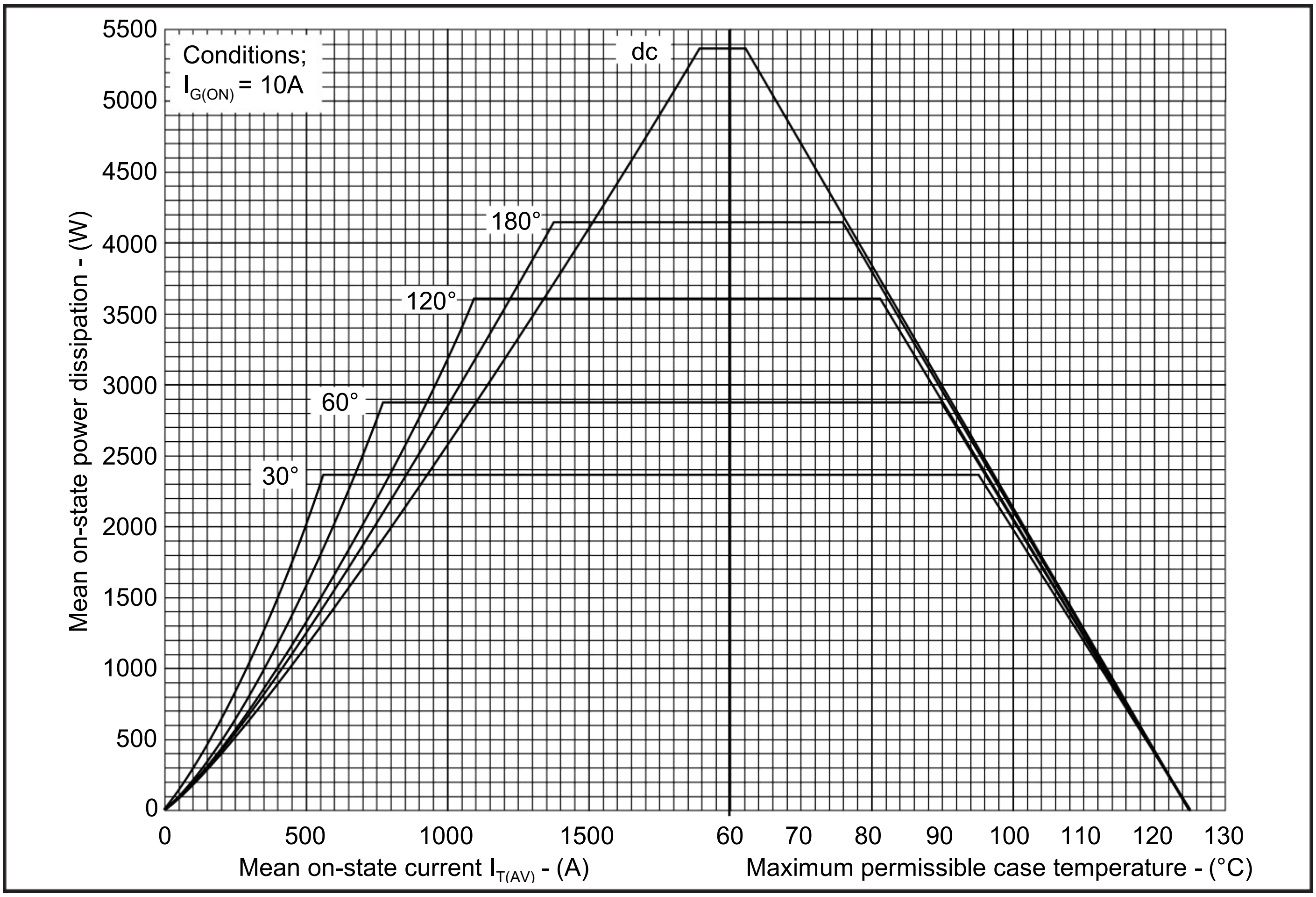


Figure 7. Steady state rectangular wave conduction loss - double side cooled

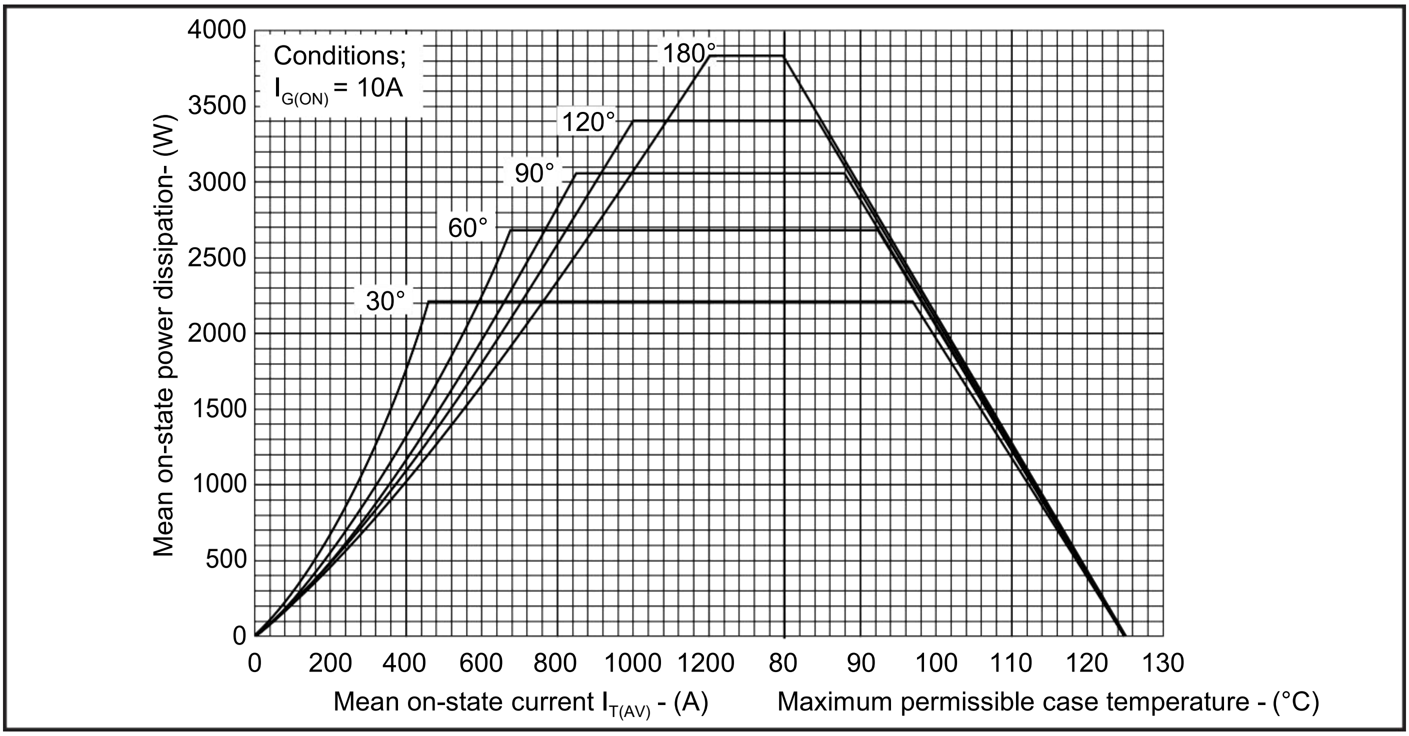


Figure 8. Steady state sinusoidal wave conduction loss - double side cooled

CURVES

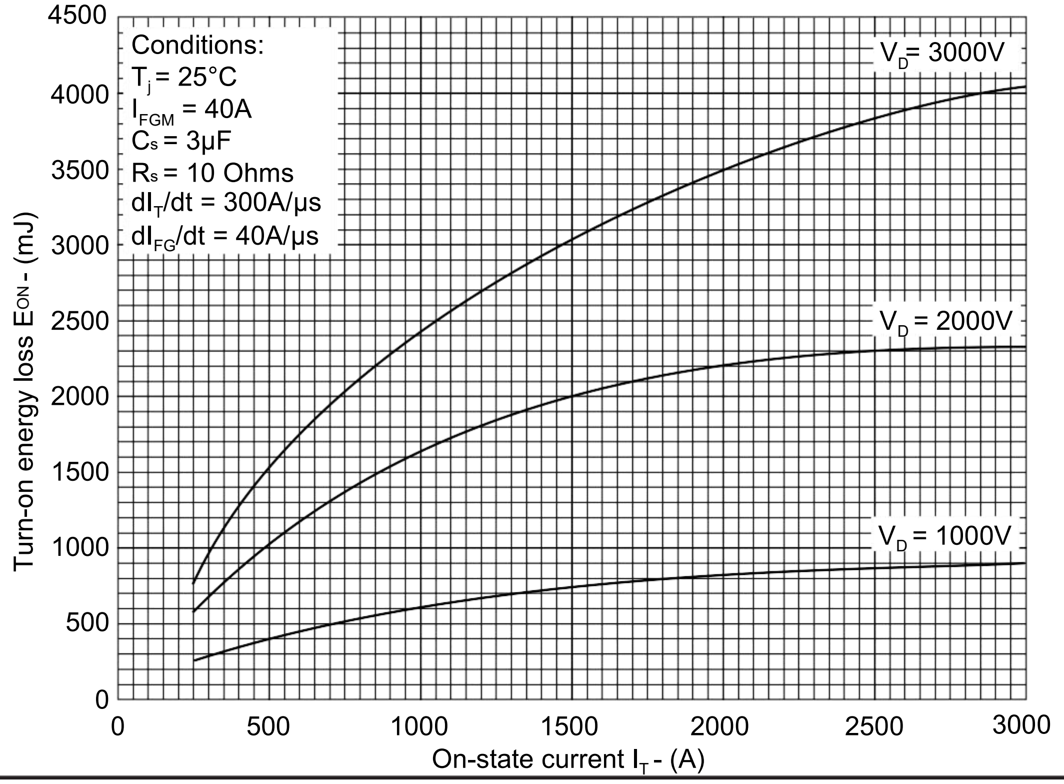


Figure 9. Turn-on energy vs on-state current

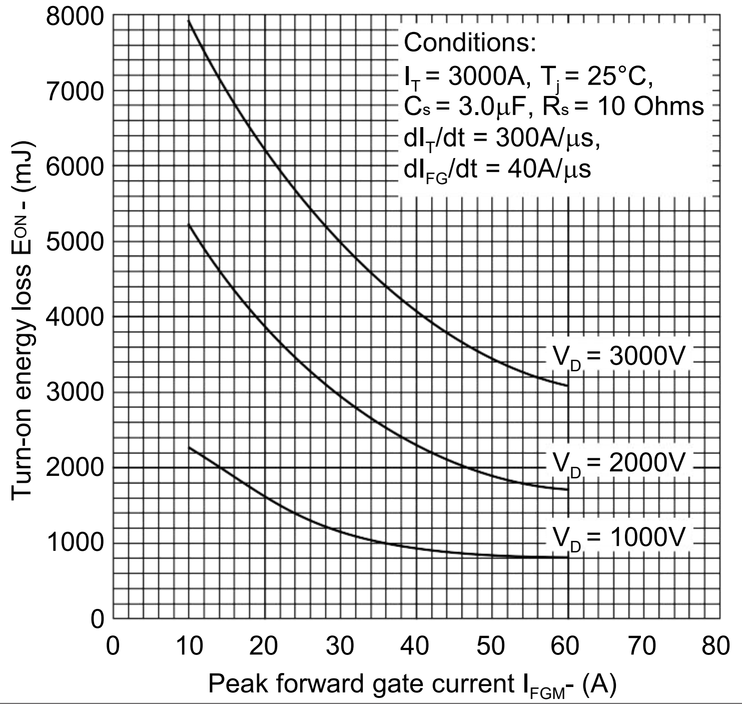


Figure 10. Turn-on energy vs peak forward gate current

CURVES

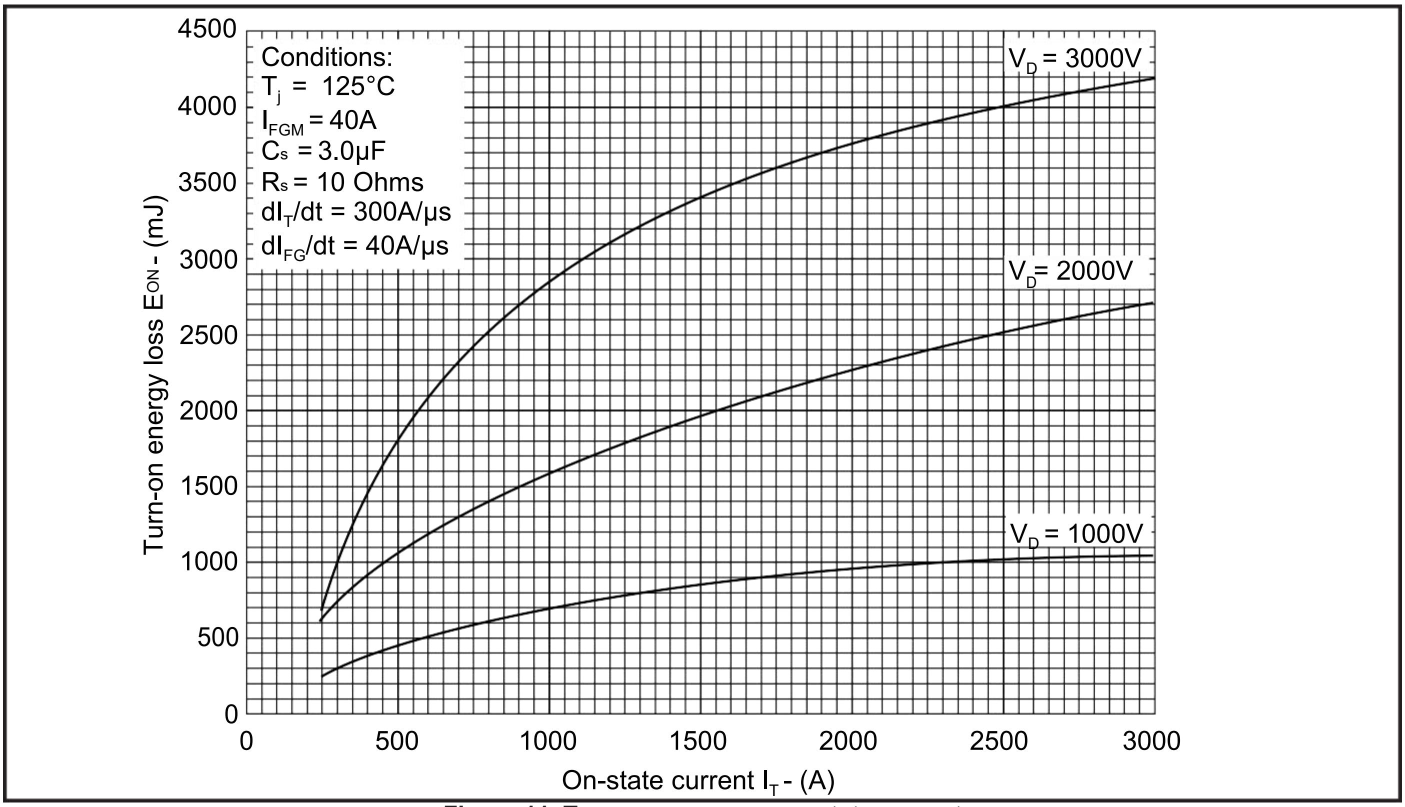


Figure 11. Turn-on energy vs on-state current

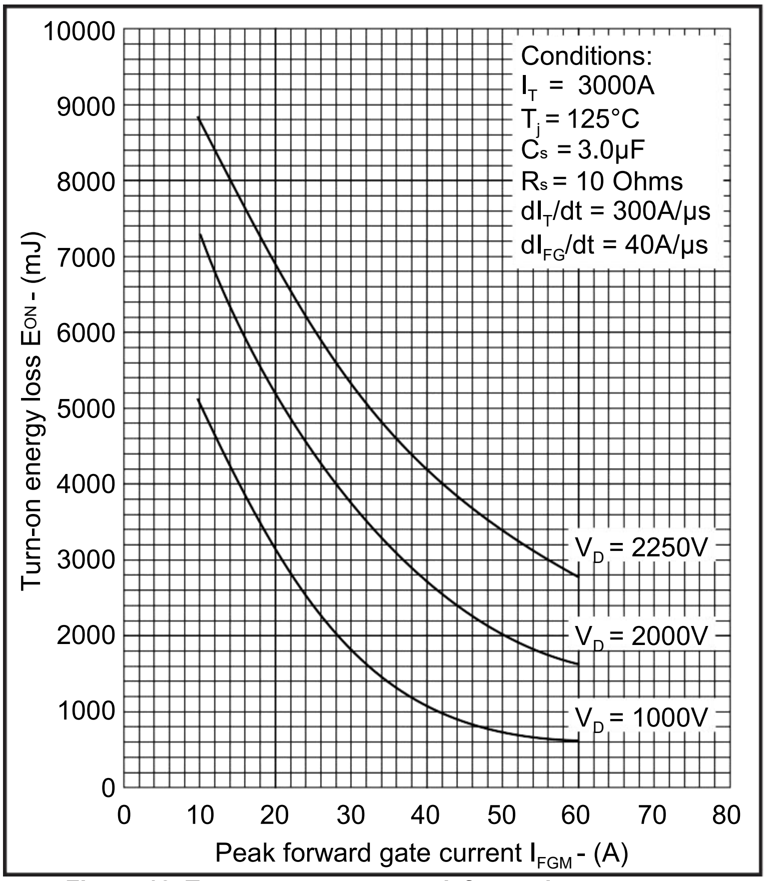


Figure 12. Turn-on energy vs peak forward gate current

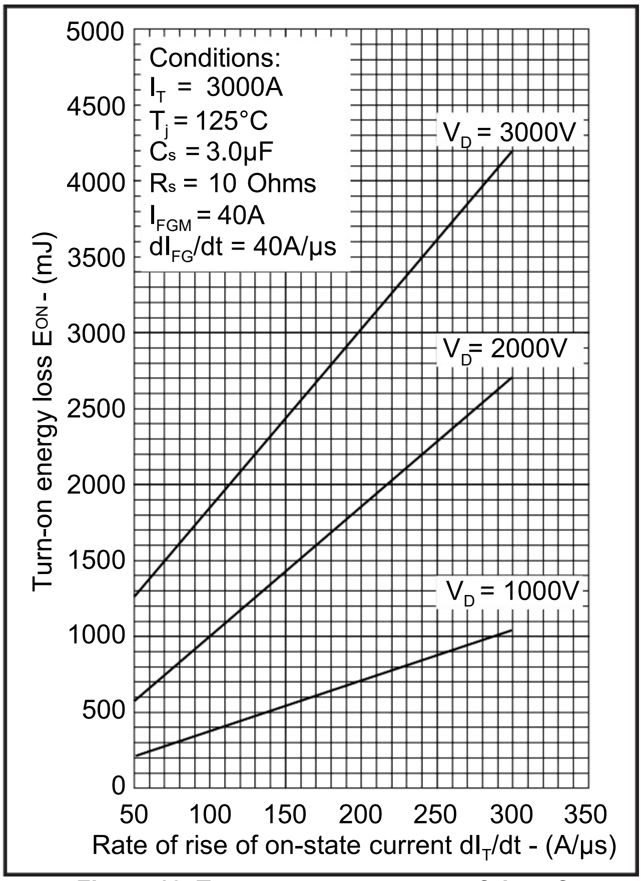


Figure 13. Turn-on energy vs rate of rise of on-state current

CURVES

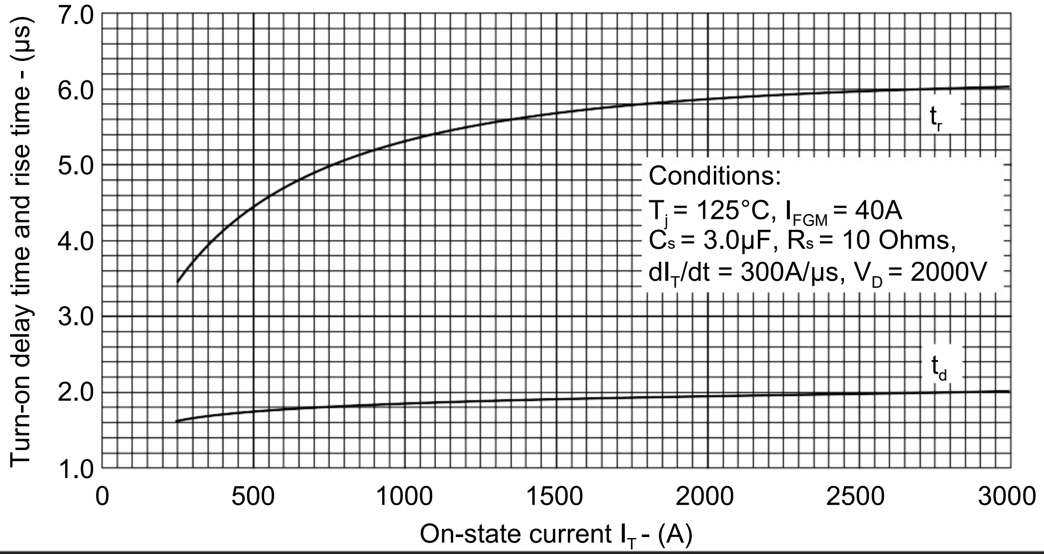


Fig.ure 14. Delay and rise time vs on-state current

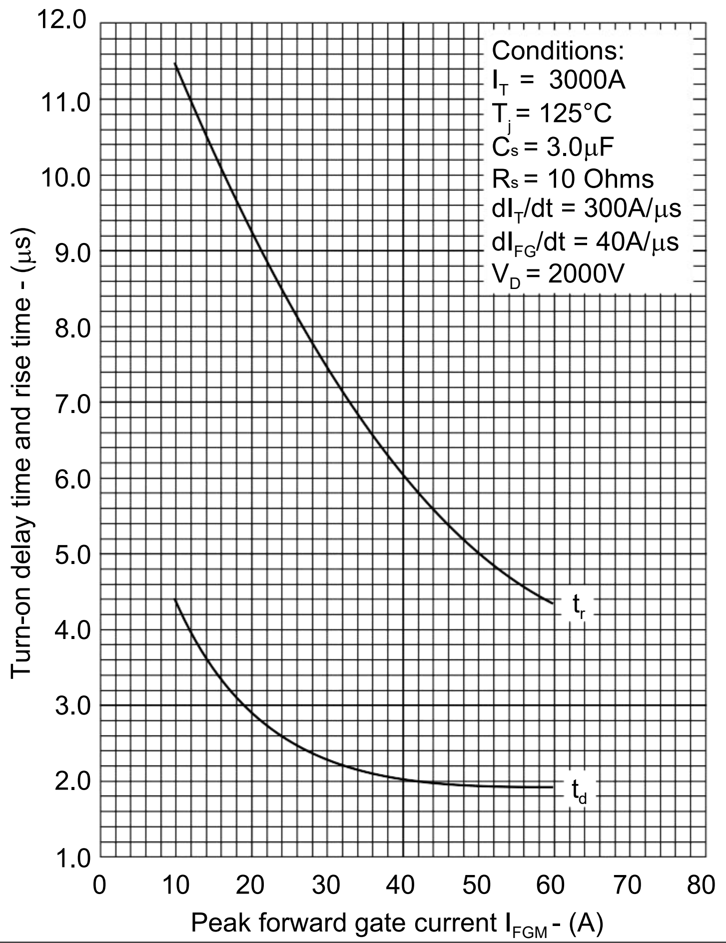


Figure 15. Delay and rise time vs peak forward gate current

CURVES

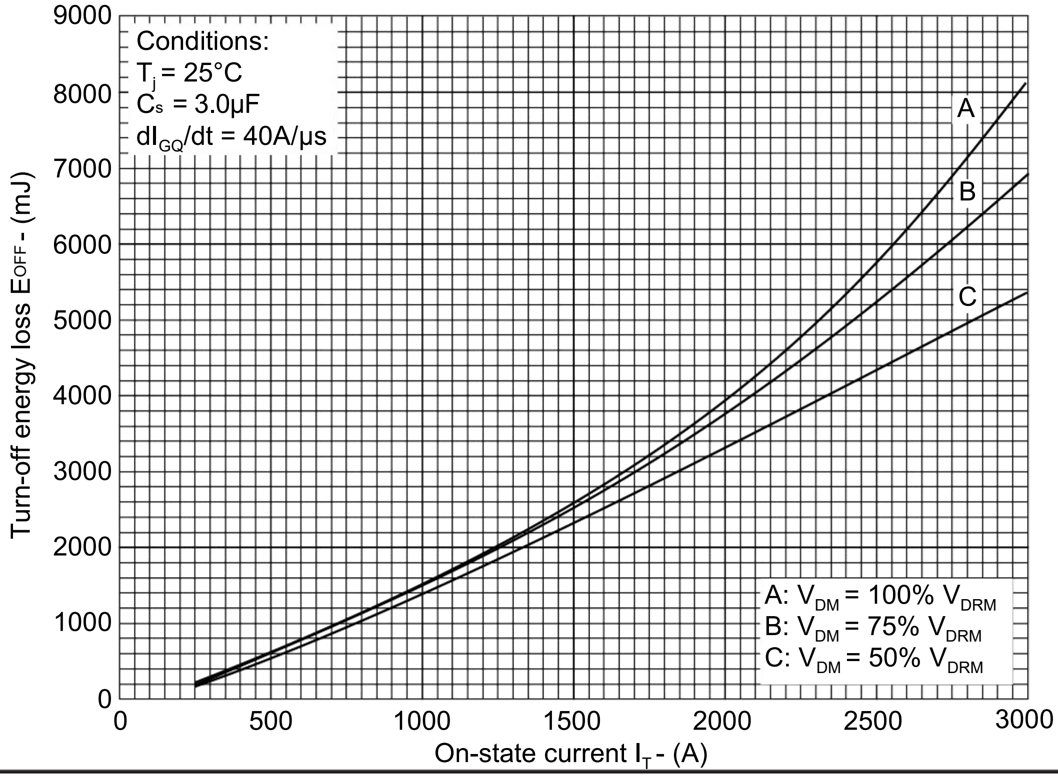


Figure 16. Turn-off energy loss vs on-state current

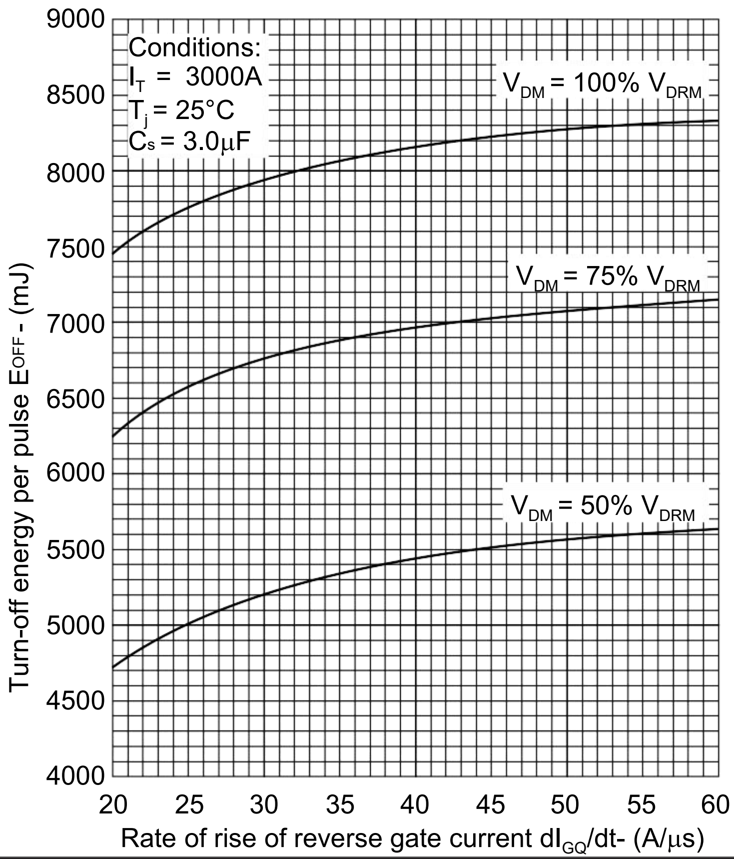


Figure 17. Turn-off energy vs rate of rise of reverse gate current

CURVES

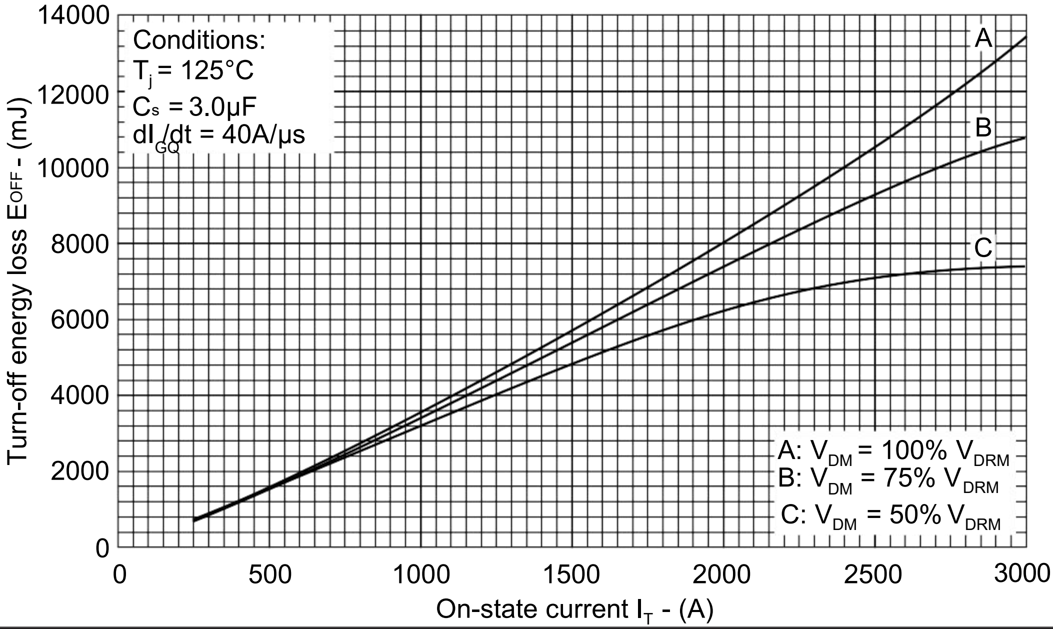


Figure 18. Turn-off energy vs on-state current

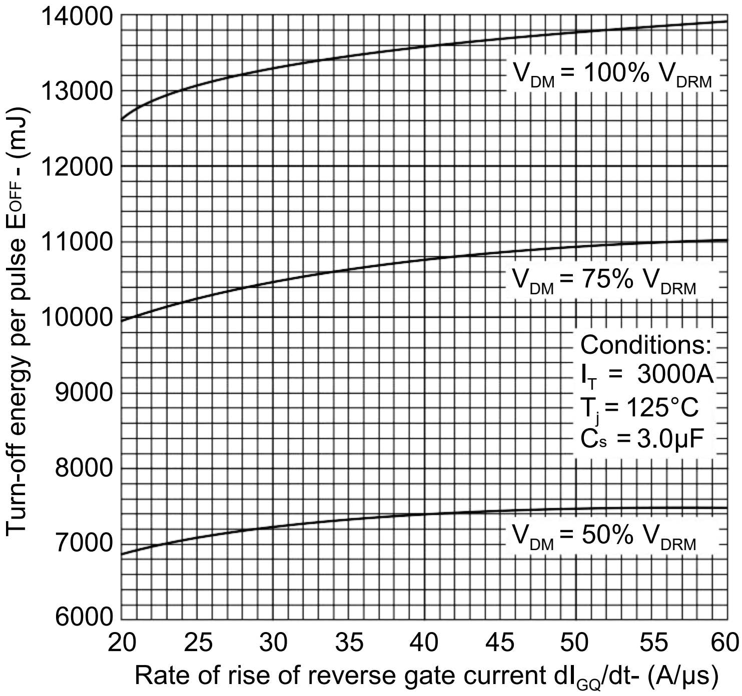


Figure 19. Turn-off energy loss vs rate of rise of reverse gate current

CURVES

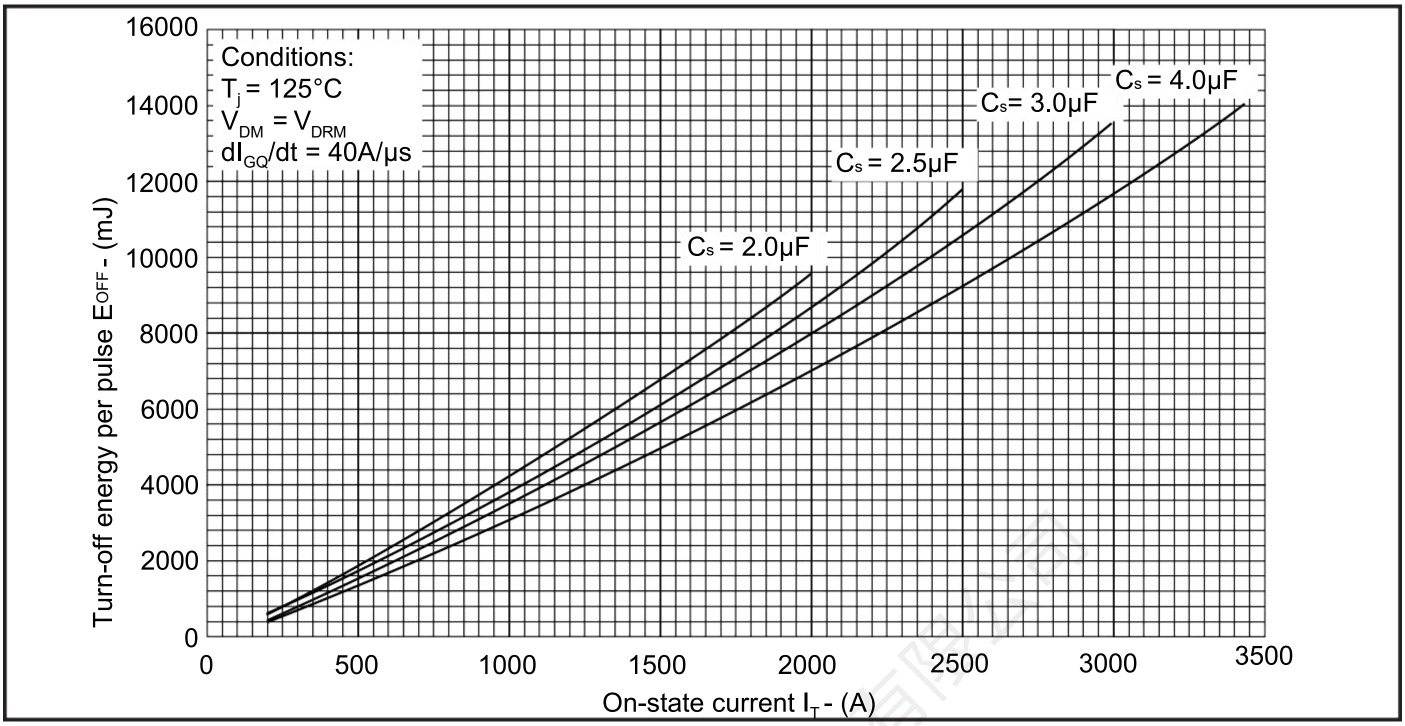


Figure 20. Turn-off energy vs on-state current

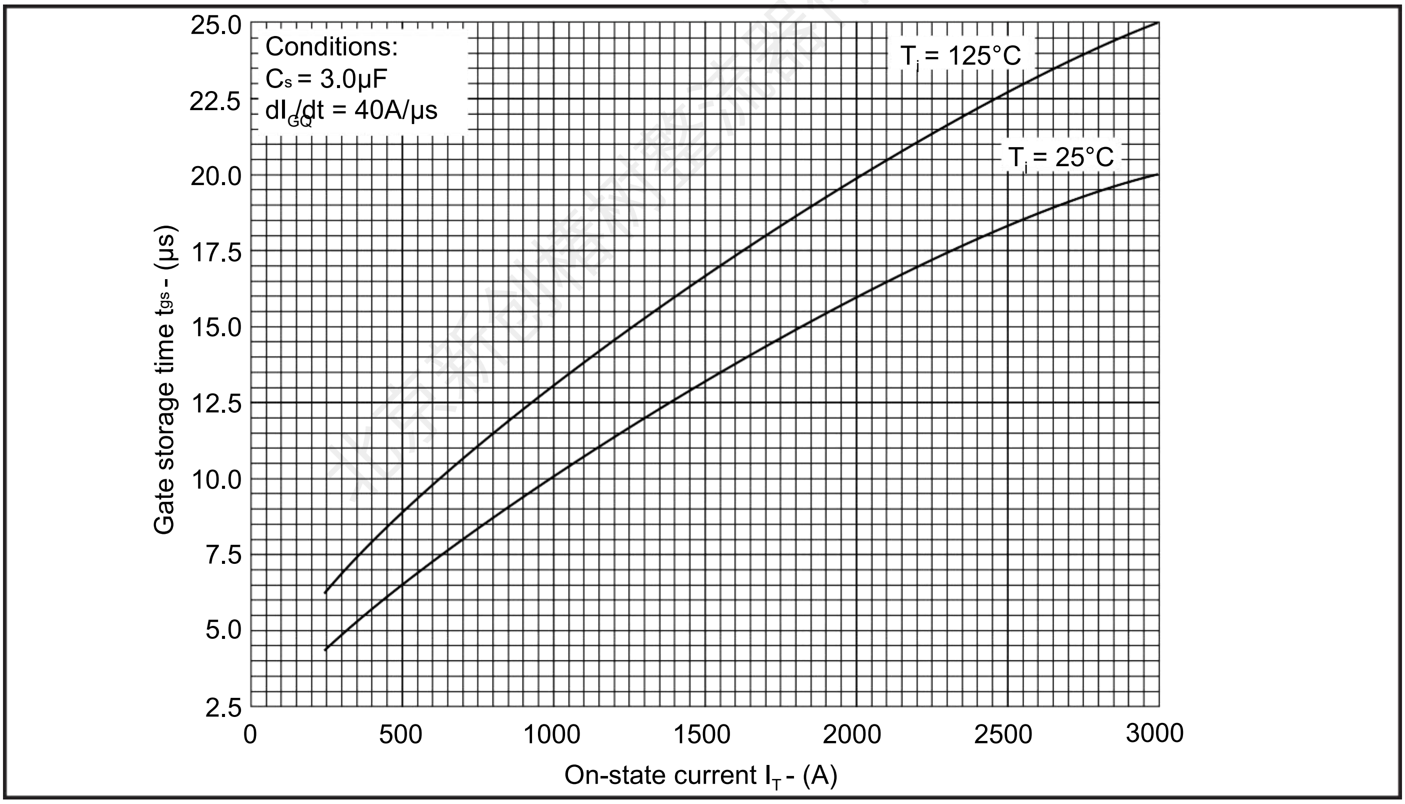


Figure 21. Gate storage time vs on-state current

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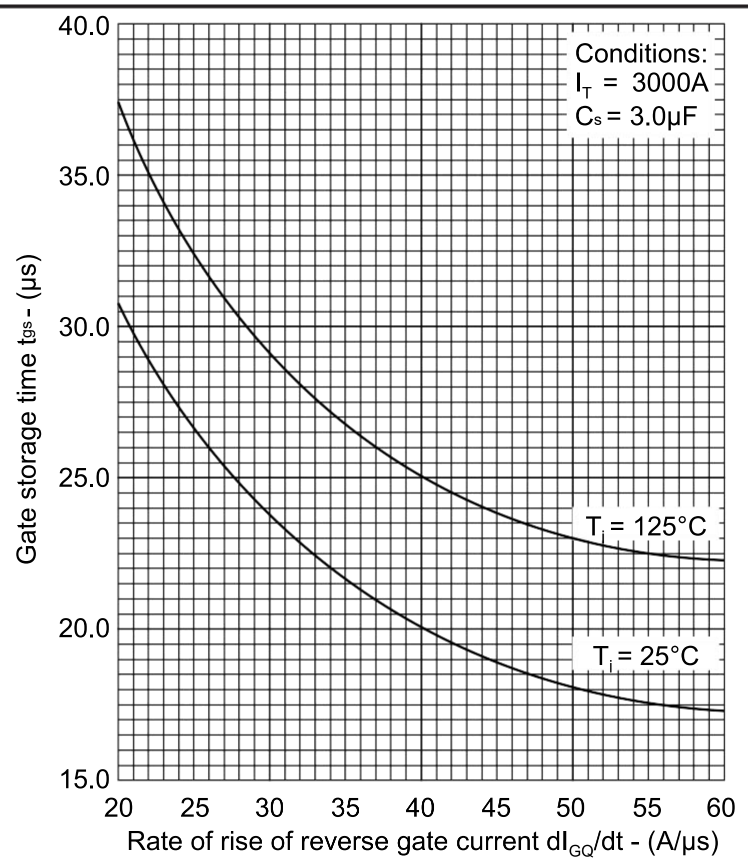

Figure 22. Gate storage time vs rate of rise of reverse gate current

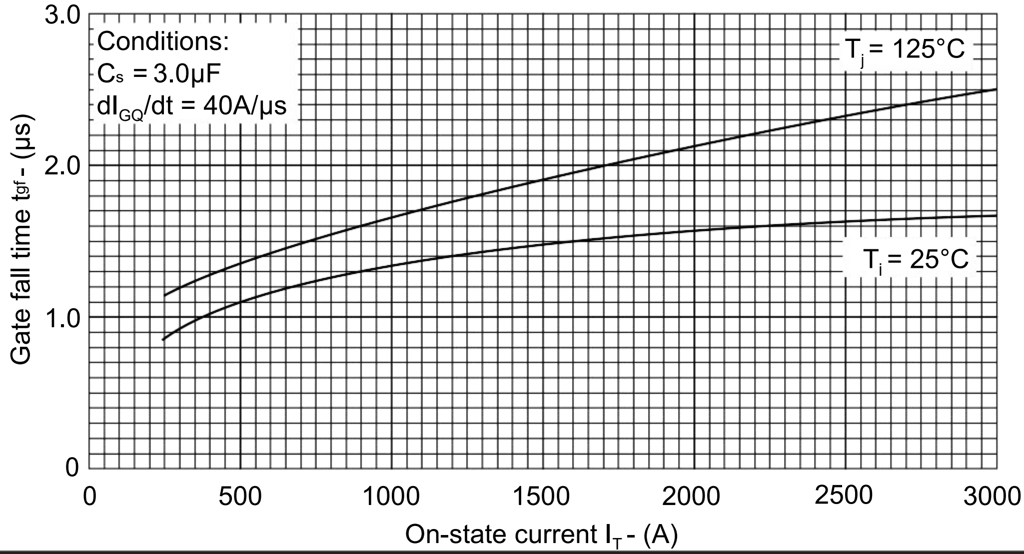

Figure 23. Gate fall time vs on-state current

CURVES

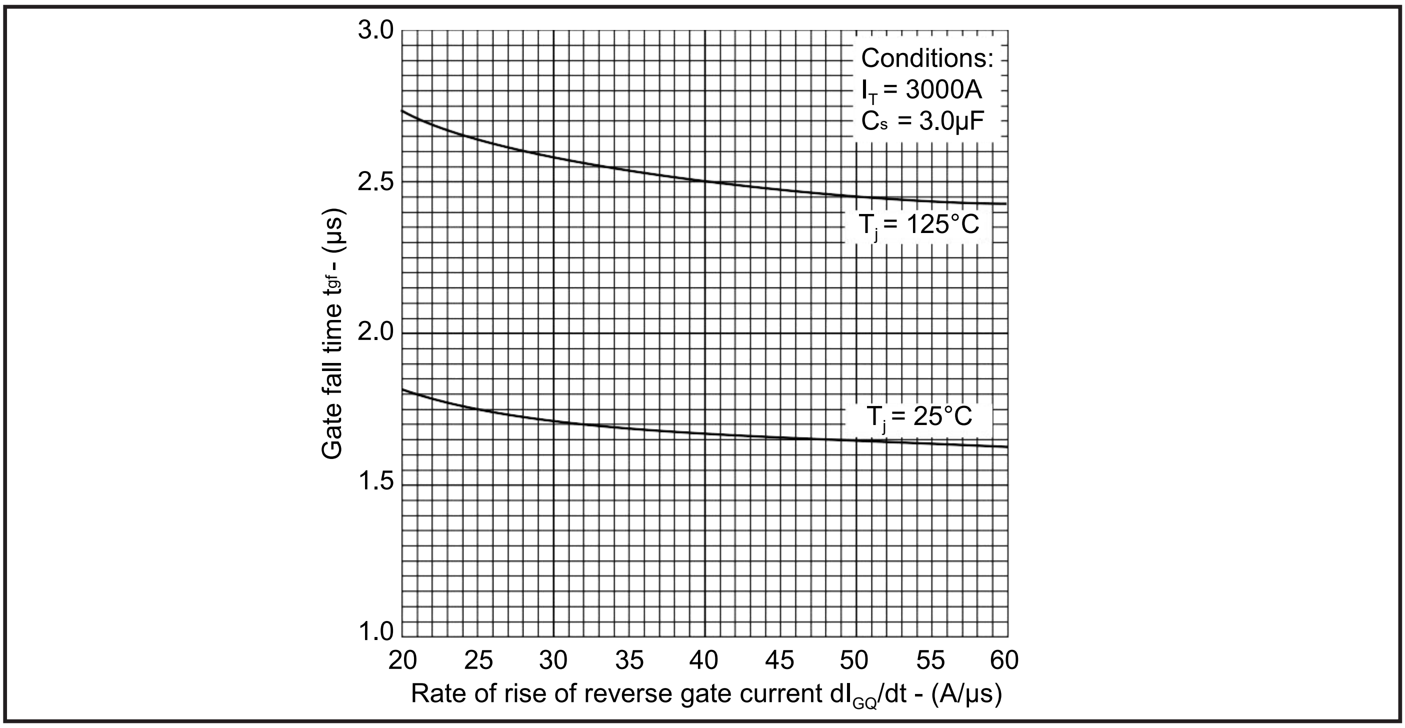

Figure 24. Gate fall time vs rate of rise of reverse gate current

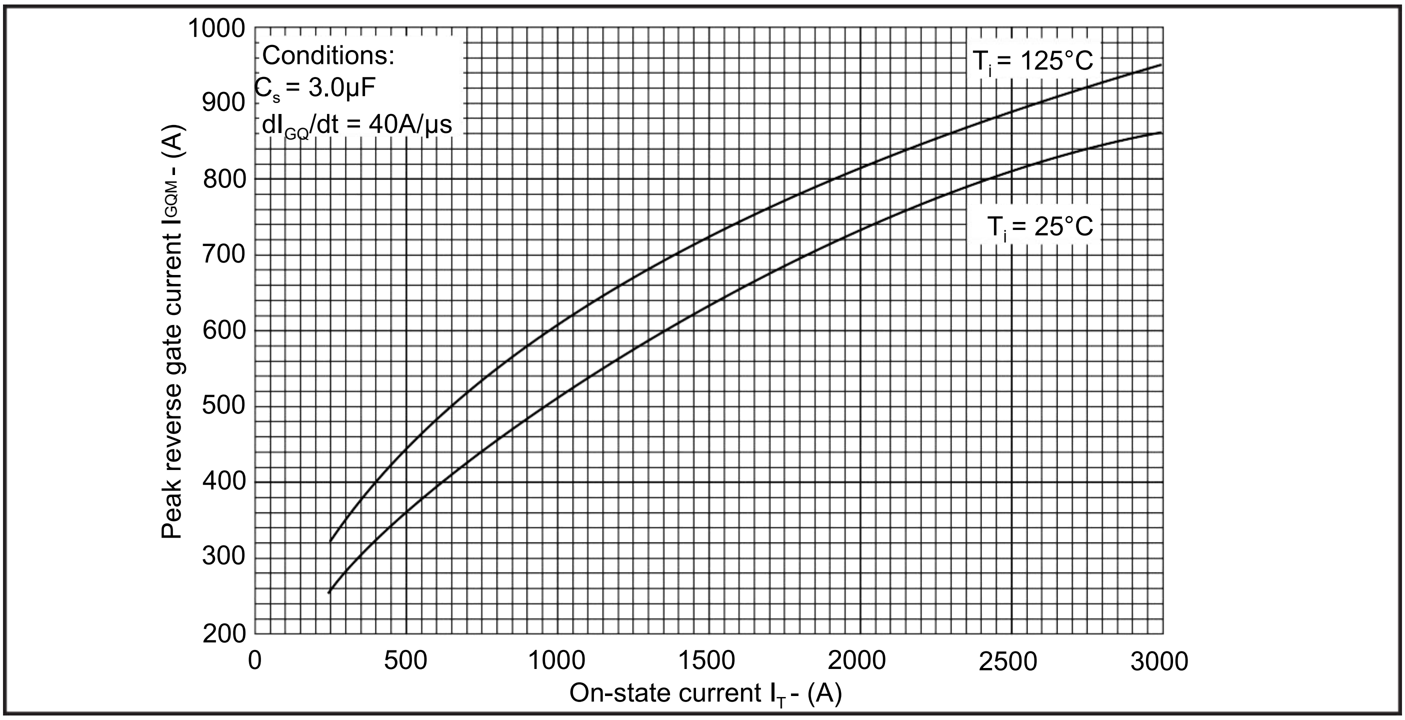

Figure 25. Peak reverse gate current vs on-state current

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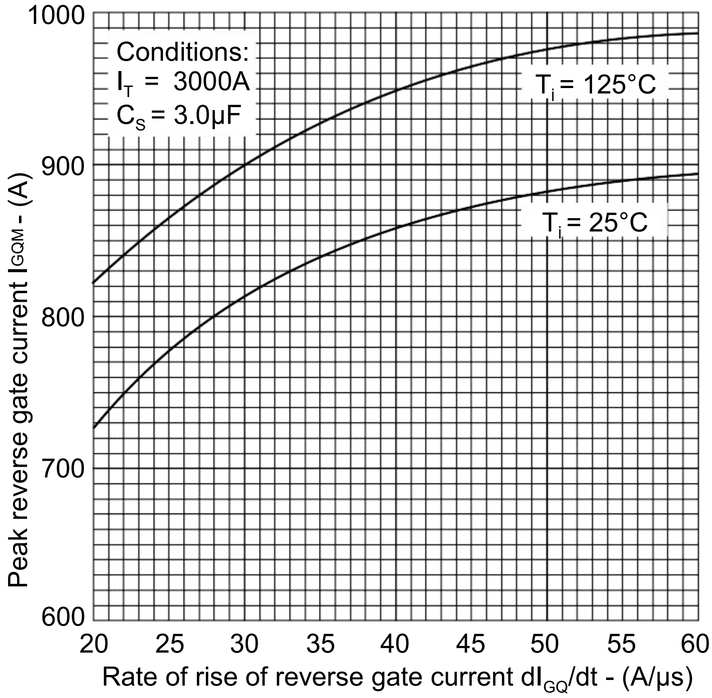

Figure 26. Reverse gate current vs rate of rise of reverse gate current

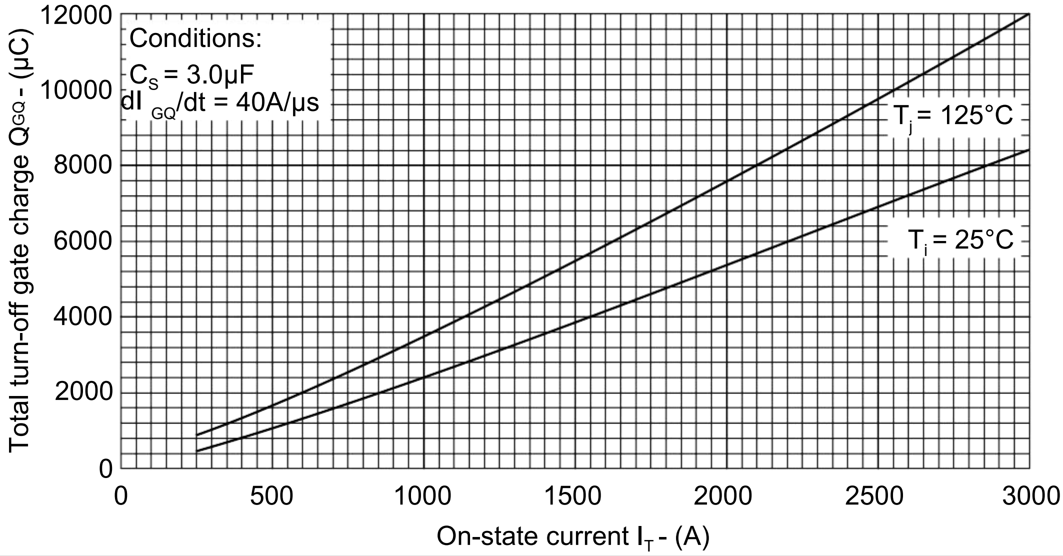

Figure 27. Turn-off gate charge vs on-state current

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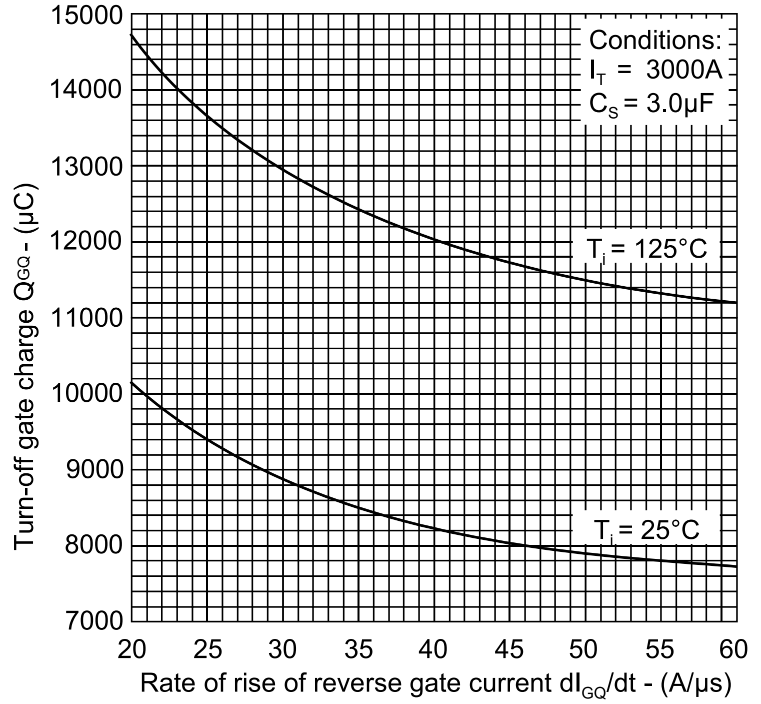

Figure 28. Turn-off gate charge vs rate of rise of reverse gate current

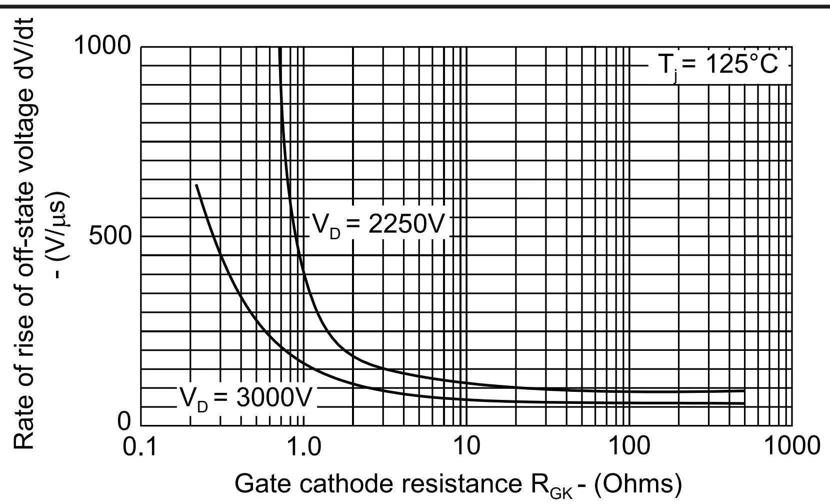

Figure 29. Rate of rise of off-state voltage vs gate cathode resistance

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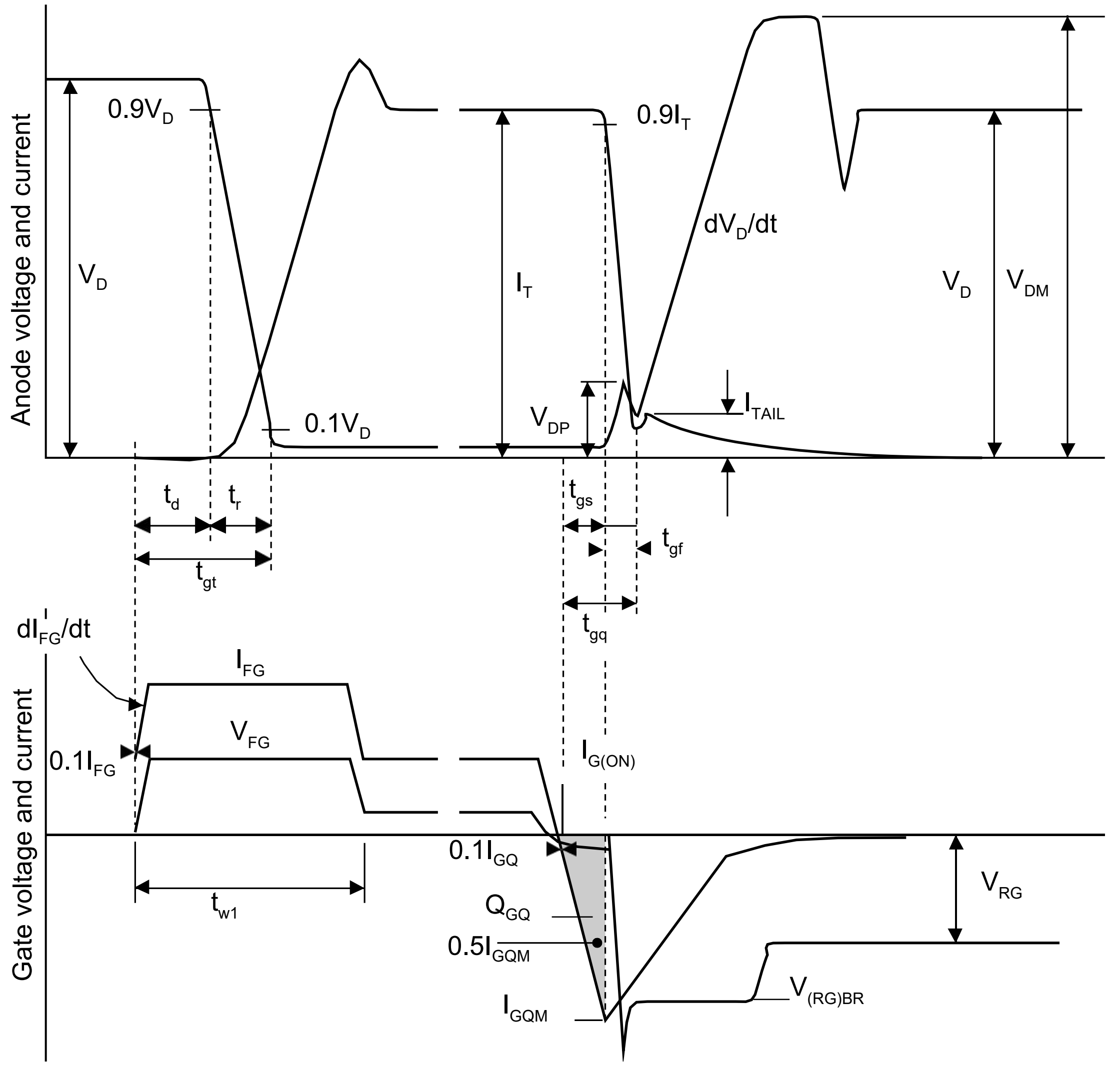
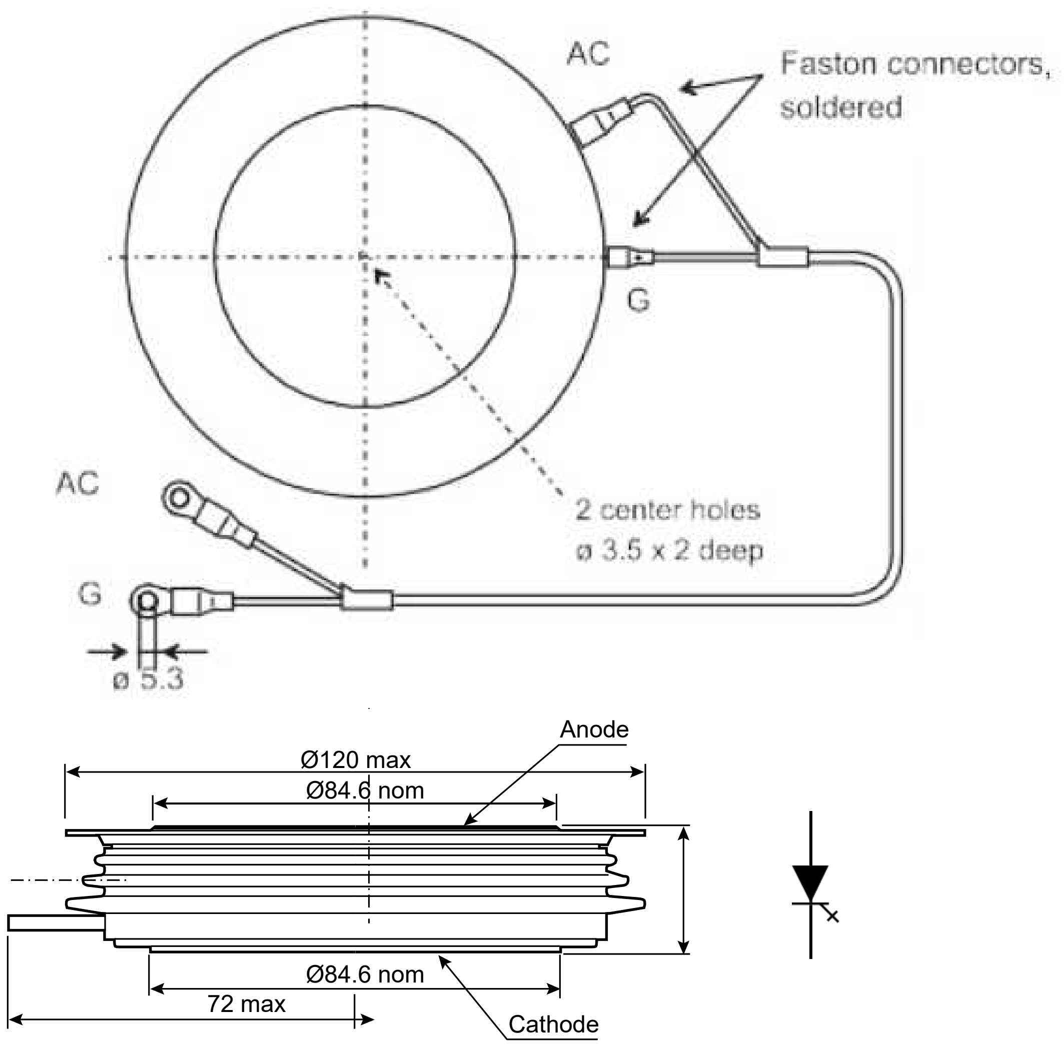


Recommended gate conditions:
I_{TCM} = 3000A
I_{FG} = 40A
$I_{G(ON)}$ = 10A d.c.
$t_{w1(min)}$ = 20µs
I_{GQM} = 950A
di_{GQ}/dt = 40A/µs
Q_{GQ} = 12000µC
$V_{RG(min)}$ = 2V
$V_{RG(max)}$ = 16V

Figure 30. General switching waveforms

OUTLINE AND DIMENSION

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



Package outine type code: L

Nominal weight: 1700g
Clamping force: 40±4kN
Lead double coax, length: 630mm
Leads and connectors can be customized by sample from user