



CSG07E1700 Gate Turn-off Thyristor

High-end Power Semiconductor Manufacturer

APPLICATION

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

KEY PARAMETERS

I_{TCM}	700A
V_{DRM}	1800V
$I_{T(AV)}$	240A
dV_D/dt	500V/ μ s
di_T/dt	500A/ μ s

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

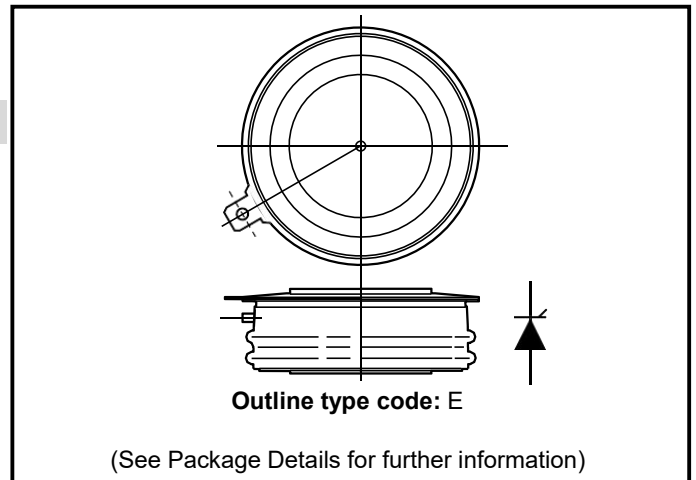


Fig. 1 Package outline

VOLTAGE RATINGS

Mode	Repetitive Peak Off-state Voltage V_{DRM}	Repetitive Peak Reverse Voltage V_{RRM}	Test Conditions
CSG07E1700	1800	16	$T_{vj} = 125^{\circ}\text{C}$, $I_{DM} = 50\text{mA}$, $I_{RRM} = 50\text{mA}$, $V_{RG} = 2\text{V}$

CURRENT RATINGS

Symbol	Parameter	Test Conditions	Max.	Unit
I_{TCM}	Repetitive peak controllable on-state current	$V_D = 67\%V_{DRM}$, $T_j = 125^{\circ}\text{C}$, $di_{GQ}/dt = 15\text{A}/\mu\text{s}$, $C_s = 1.5\mu\text{F}$	700	A
$I_{T(AV)}$	Mean on-state current	$T_{HS} = 80^{\circ}\text{C}$. Double side cooled. Half sine 50Hz.	240	A
$I_{T(RMS)}$	RMS on-state current	$T_{HS} = 80^{\circ}\text{C}$. Double side cooled. Half sine 50Hz.	373	A



SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Unit
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine. $T_j = 125^{\circ}\text{C}$	4.0	kA
I^2t	I^2t for fusing	10ms half sine. $T_j = 125^{\circ}\text{C}$	80000	A^2s
di_T/dt	Critical rate of rise of on-state current	$V_D = 67\% V_{DRM}$, $I_T = 700\text{A}$, $T_j = 125^{\circ}\text{C}$, $I_{FG} > 20\text{A}$, Rise time $< 1.0\mu\text{s}$	500	$\text{A}/\mu\text{s}$
dV_D/dt	Rate of rise of off-state voltage	To $80\% V_{DRM}$; $R_{GK} \leq 1.5\Omega$, $T_j = 125^{\circ}\text{C}$	500	$\text{V}/\mu\text{s}$
V_{DP}	Peak forward transient voltage during current fall time	$V_D = 67\% V_{DRM}$, $I_T = 700\text{A}$, $T_j = 125^{\circ}\text{C}$, $di_{GQ}/dt = 15\text{A}/\mu\text{s}$, $C_s = 1.5\mu\text{F}$	400	V

GATE RATINGS

Symbol	Parameter	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		-	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	$\text{A}/\mu\text{s}$
$t_{ON(min)}$	Minimum permissable on time		20	-	μs
$t_{OFF(min)}$	Minimum permissable off time		40	-	μs

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions		Min.	Max.	Unit
$R_{th(j-hs)}$	DC thermal resistance - junction to heatsink surface	Double side cooled		-	0.075	$^{\circ}\text{C}/\text{W}$
		Anode side cooled		-	0.12	$^{\circ}\text{C}/\text{W}$
		Cathode side cooled		-	0.20	$^{\circ}\text{C}/\text{W}$
$R_{th(c-hs)}$	Contact thermal resistance	Clamping force 5.5kN With mounting compound	per contact	-	0.018	$^{\circ}\text{C}/\text{W}$
T_{vj}	Virtual junction temperature			-	125	$^{\circ}\text{C}$
T_{OP}/T_{stg}	Operating junction/storage temperature range			-40	125	$^{\circ}\text{C}$
-	Clamping force			5.0	6.0	kN



GTO CHARACTERISTICS

$T_j = 125^{\circ}\text{C}$ unless stated otherwise					
Symbol	Parameters	Test Conditions	Min.	Max.	Unit
V_{TM}	On-state voltage	At 600A peak, $I_{G(ON)} = 2\text{A d.c.}$	-	2.5	V
I_{DM}	Peak off-state current	At V_{DRM} , $V_{RG} = 2\text{V}$	-	50	mA
I_{RRM}	Peak reverse current	At V_{RRM}	-	50	mA
V_{GT}	Gate trigger voltage	$V_D = 24\text{V}$, $I_T = 100\text{A}$, $T_j = 25^{\circ}\text{C}$	-	0.75	V
I_{GT}	Gate trigger current	$V_D = 24\text{V}$, $I_T = 100\text{A}$, $T_j = 25^{\circ}\text{C}$	-	1.2	A
I_{RGM}	Reverse gate cathode current	$V_{RGM} = 16\text{V}$, No gate/cathode resistor	-	50	mA
E_{ON}	Turn-on energy	$V_D = 1200\text{V}$, $I_T = 600\text{A}$, $I_{FG} = 20\text{A}$, rise time $< 1.0\mu\text{s}$ $R_L = (\text{Residual inductance } 2.75\mu\text{H})$	-	160	mJ
t_d	Delay time		-	1.1	μs
t_r	Rise time		-	2.5	μs
E_{OFF}	Turn-off energy	$I_T = 600\text{A}$, $V_D = 1200\text{V}$, Snubber Cap $C_s = 1.5\mu\text{F}$, $di_{GQ}/dt = 15\text{A}/\mu\text{s}$ $R_L = (\text{Residual inductance } 2.75\mu\text{H})$	-	550	mJ
t_{tail}	Tail time		-	30	μs
t_{gs}	Storage time		-	12	μs
t_{gf}	Fall time		-	1.5	μs
t_{gq}	Gate controlled turn-off time		-	13.5	μs
Q_{GQ}	Turn-off gate charge		-	900	μC
Q_{GQT}	Total turn-off gate charge		-	1800	μC



CURVES

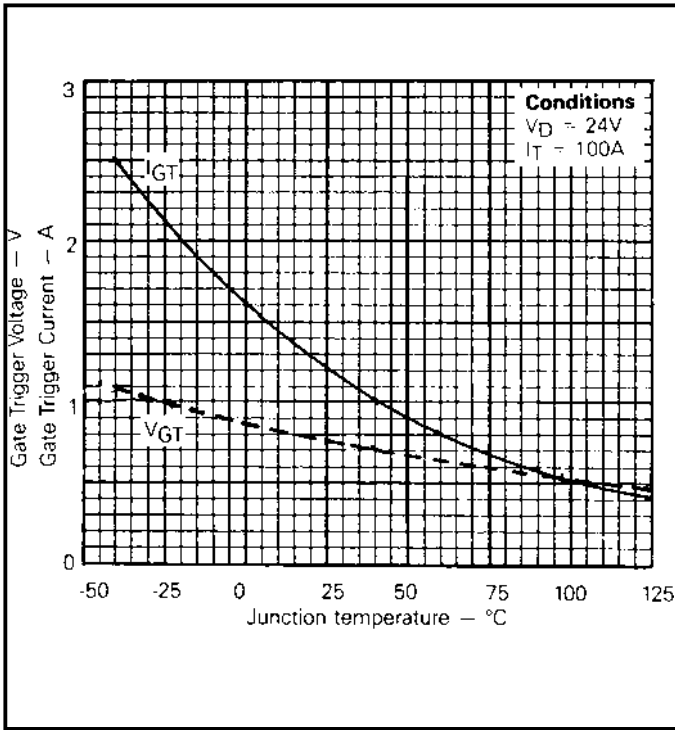


Fig.2 Gate characteristics

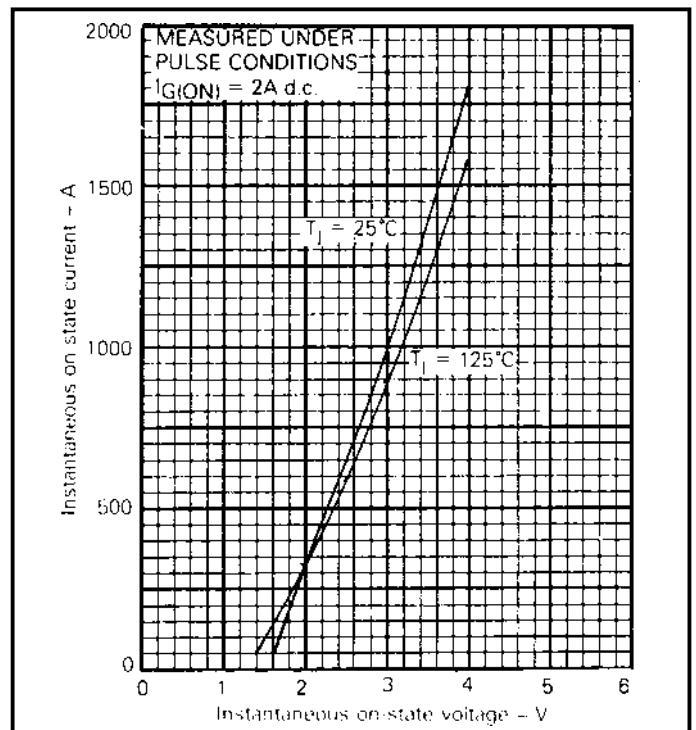


Fig.3 Maximum (limit) on-state characteristics

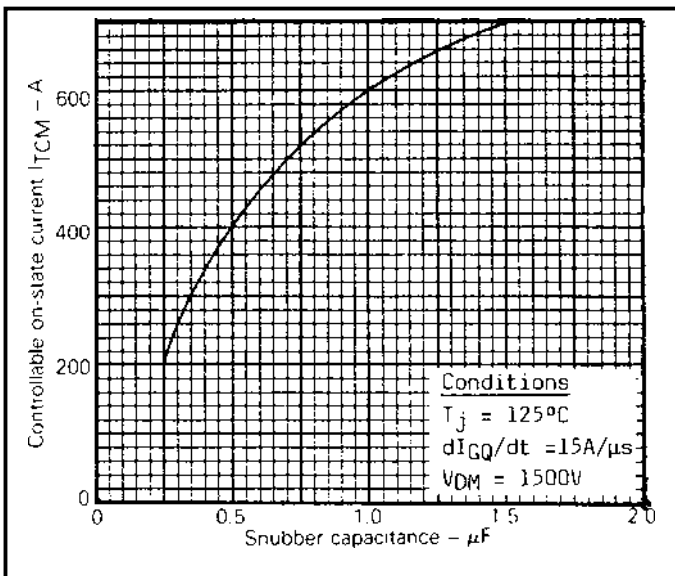


Fig.4 Dependence of I_{TCM} on C_s

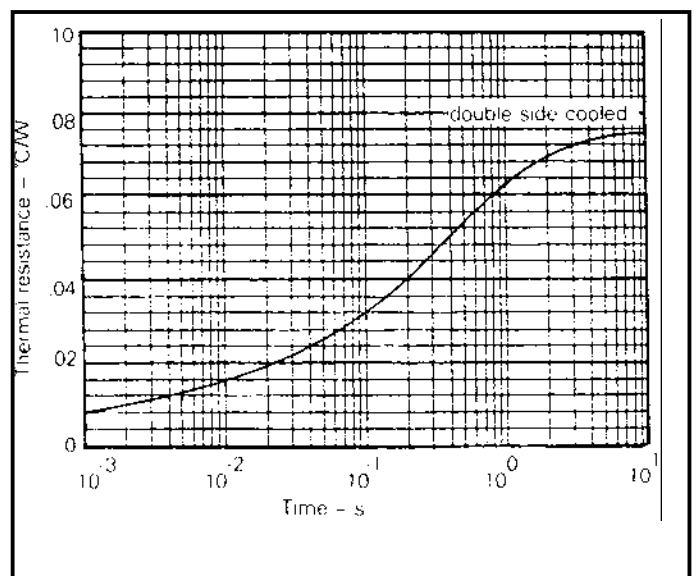


Fig.5 Maximum (limit) transient thermal resistance



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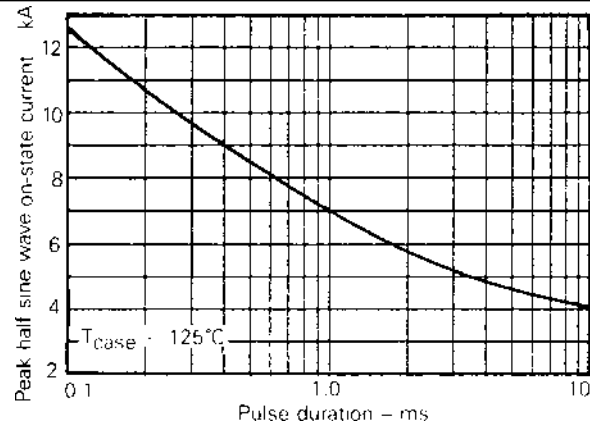


Fig.6 Surge (non-repetitive) on-state current vs time

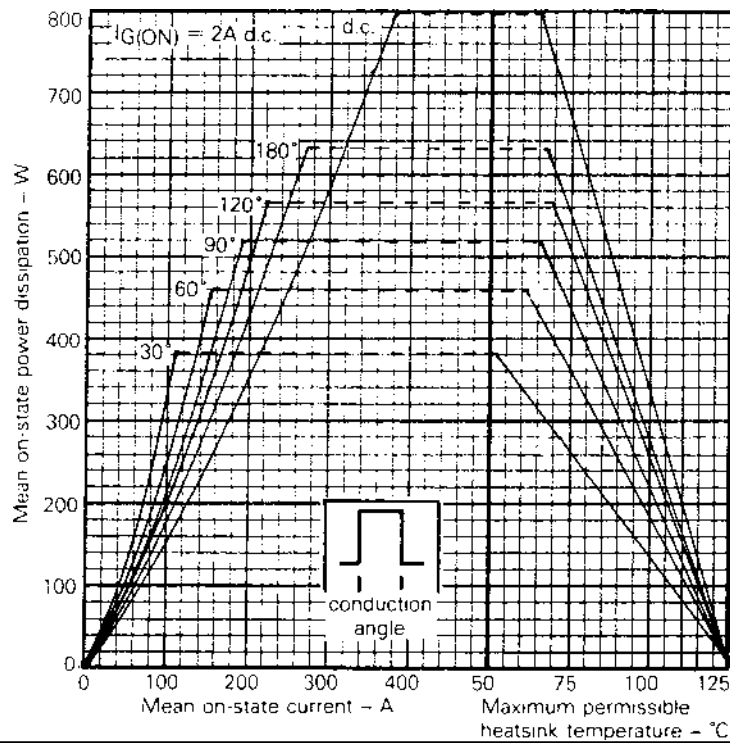


Fig.7 Steady state rectangular wave conduction loss - double side cooled



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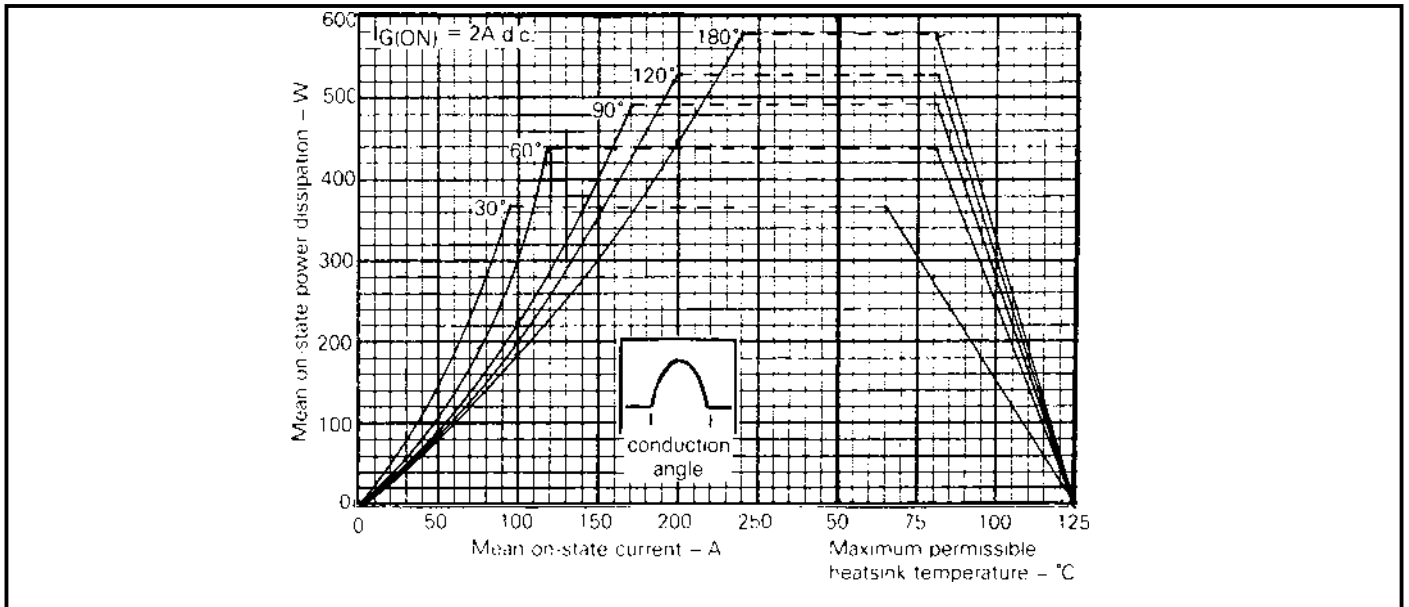


Fig.8 Steady state sinusoidal wave conduction loss - double side cooled

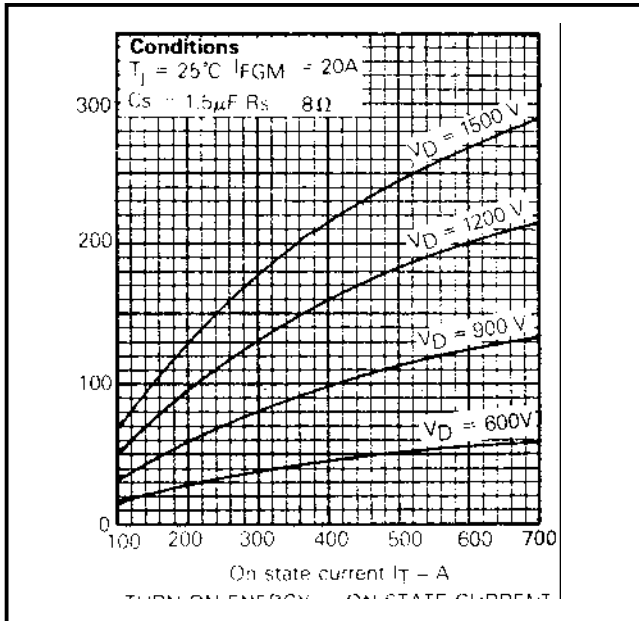


Fig.9 Turn-on energy vs on-state current

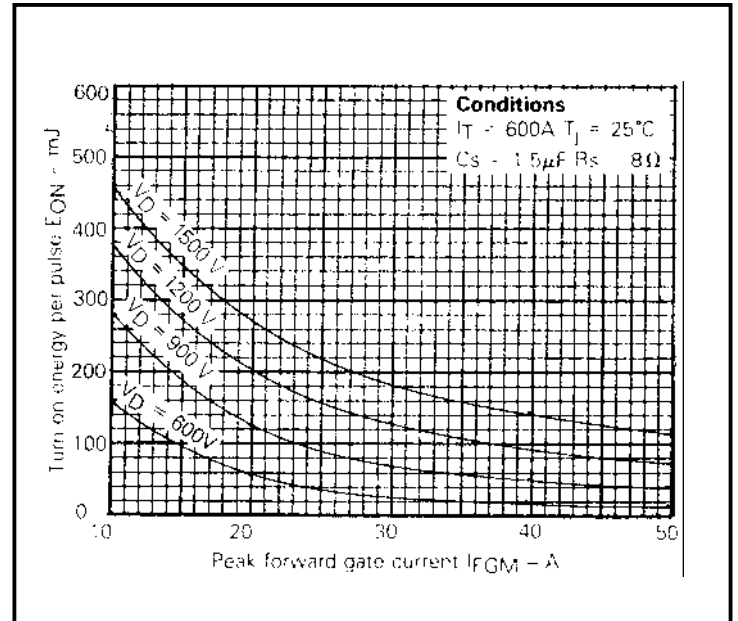


Fig.10 Turn-on energy vs peak forward gate current



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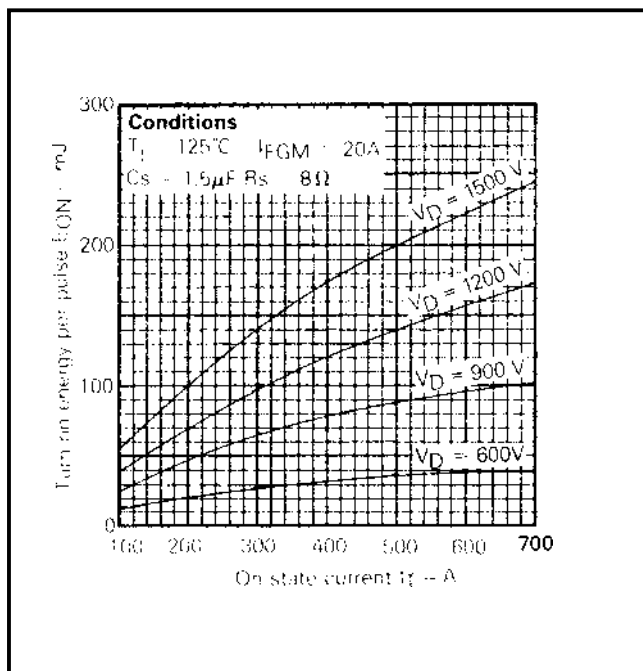


Fig.11 Turn-on energy vs on-state current

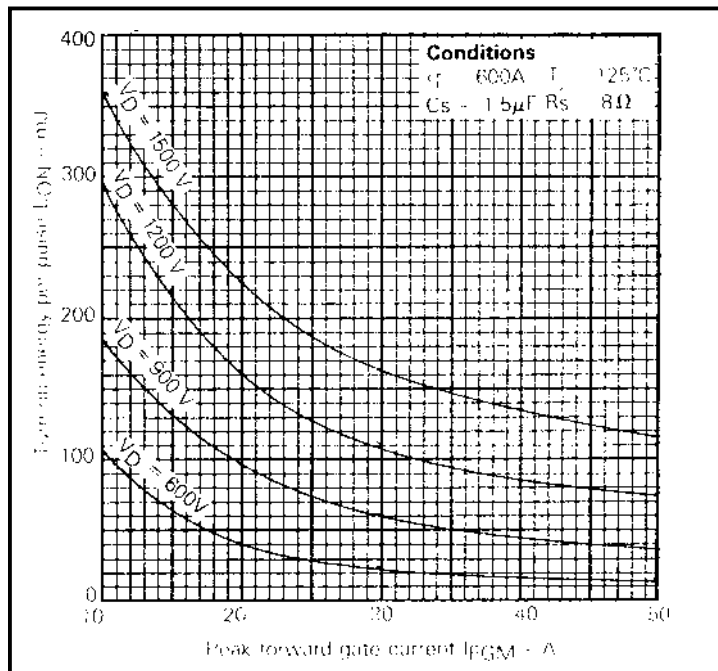


Fig.12 Turn-on energy vs peak forward gate current

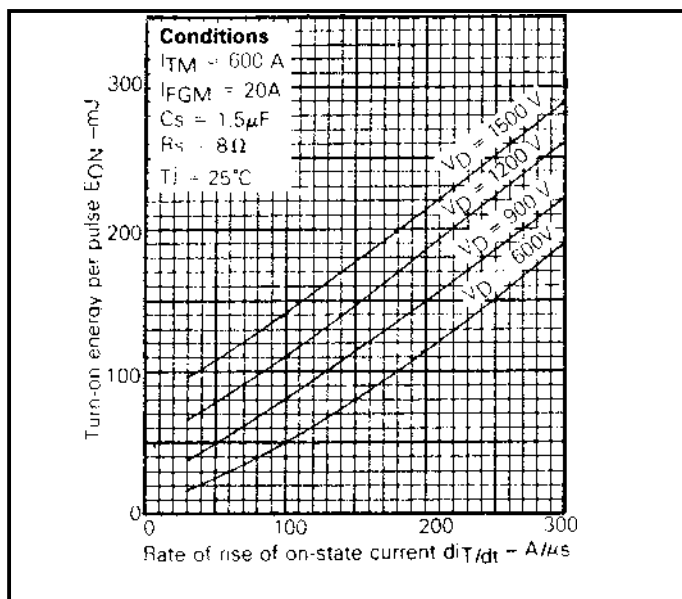


Fig.13 Turn-on energy vs rate of rise of on-state current

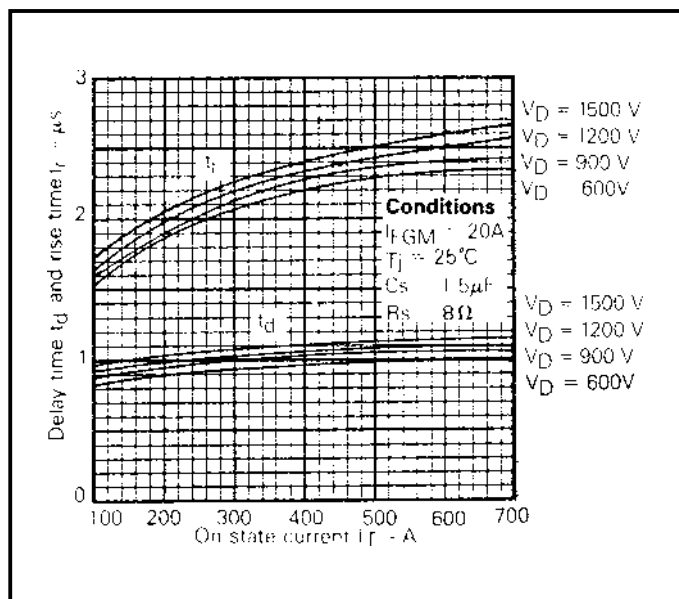


Fig.14 Delay time and rise time vs on-state current



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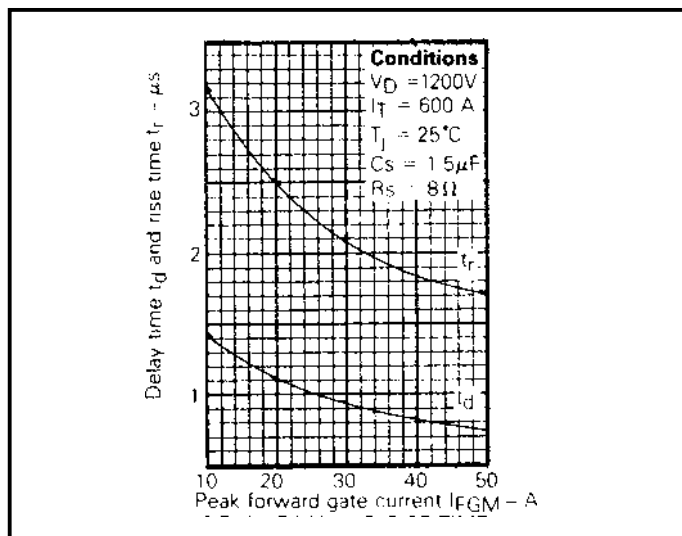


Fig.15 Delay time and rise time vs peak forward gate current

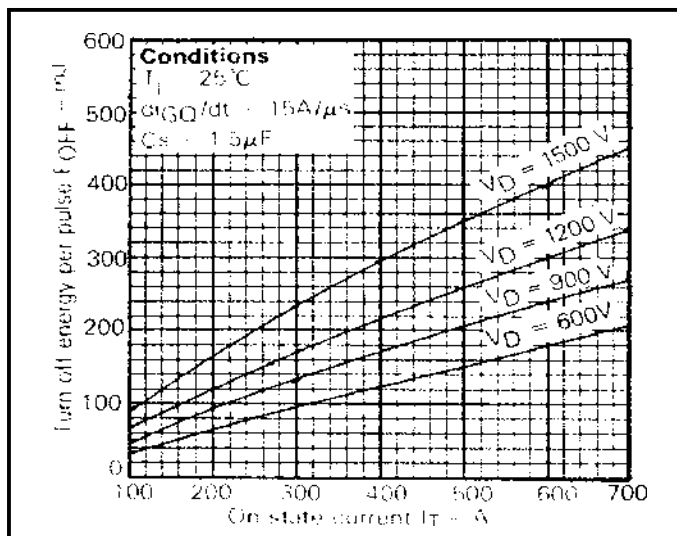


Fig.16 Turn-off energy vs on-state current

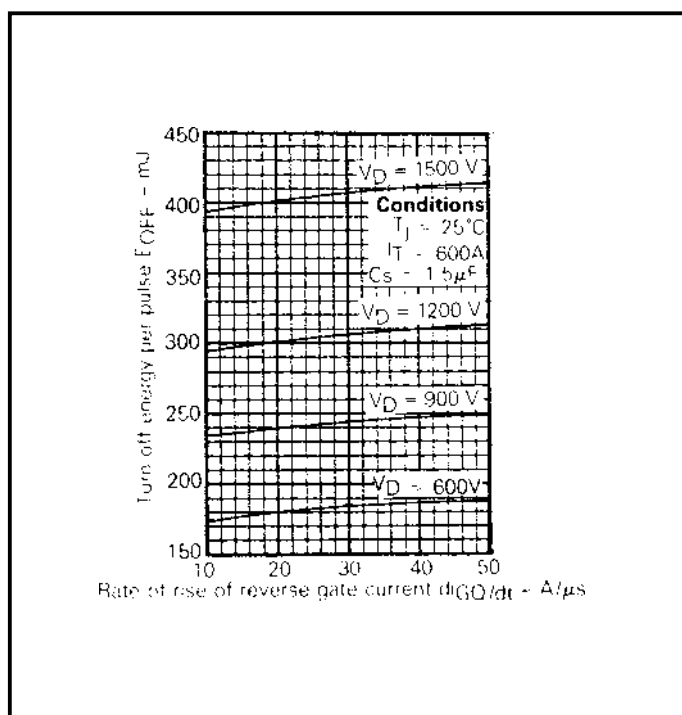


Fig.17 Turn-off energy vs rate of rise of reverse gate current

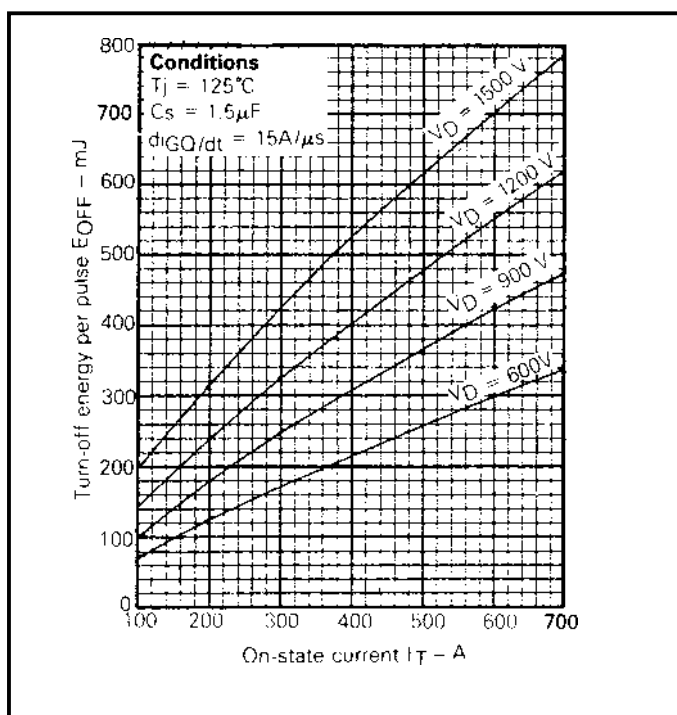
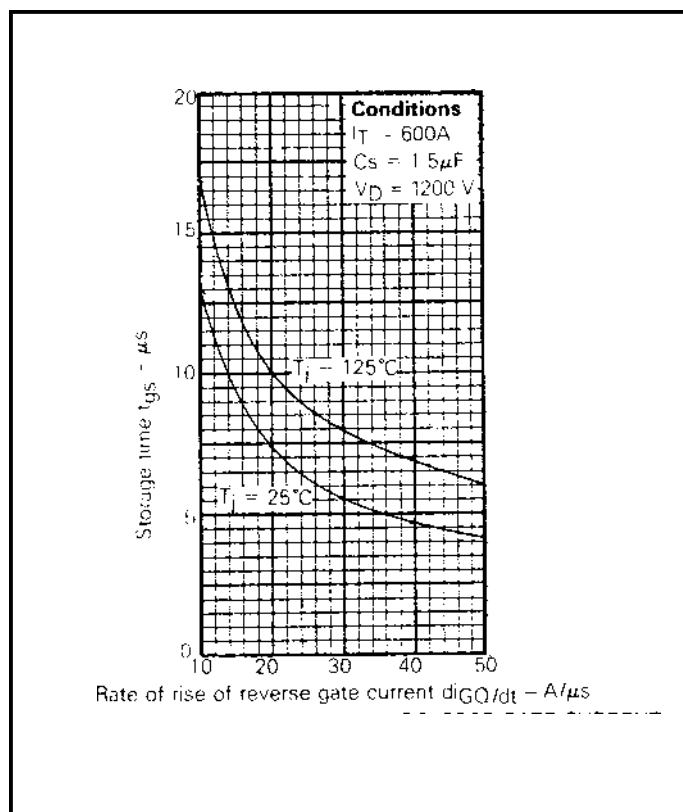
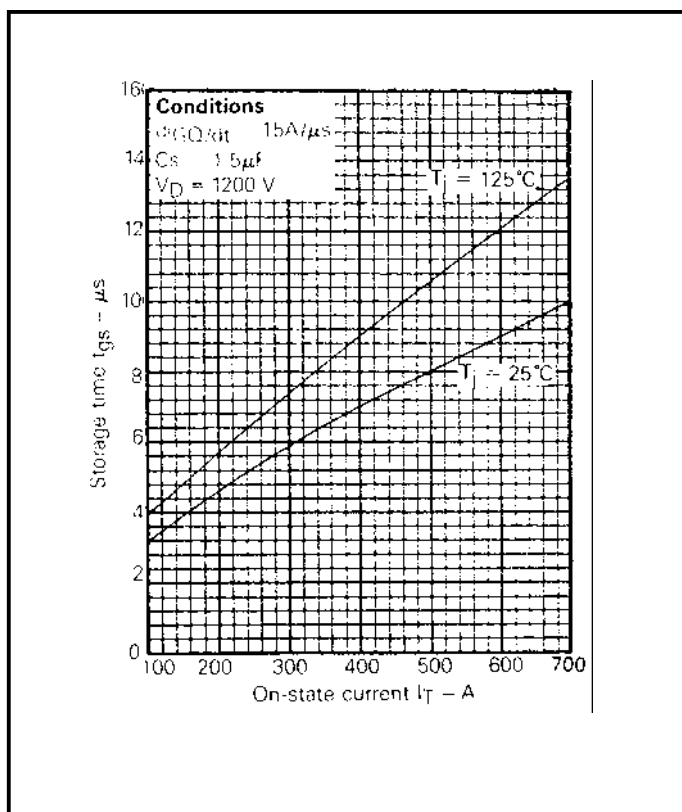
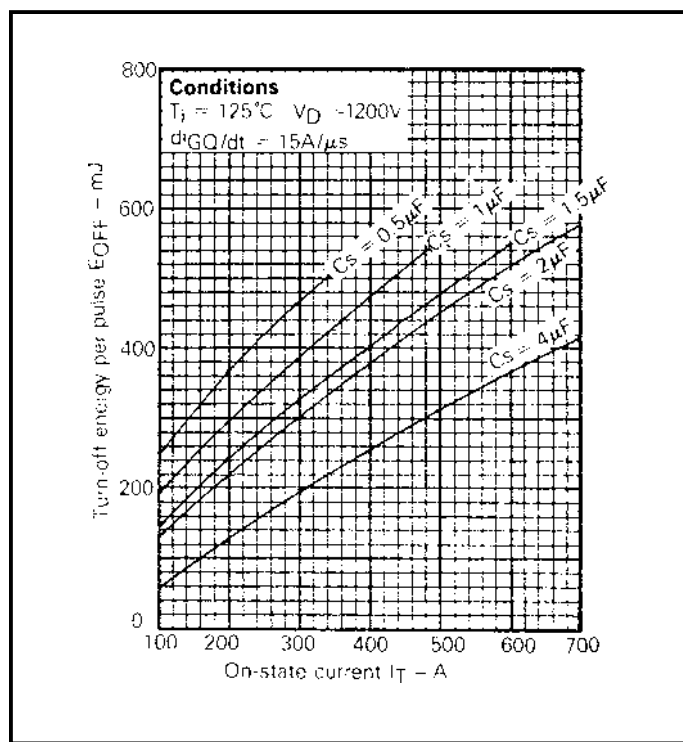
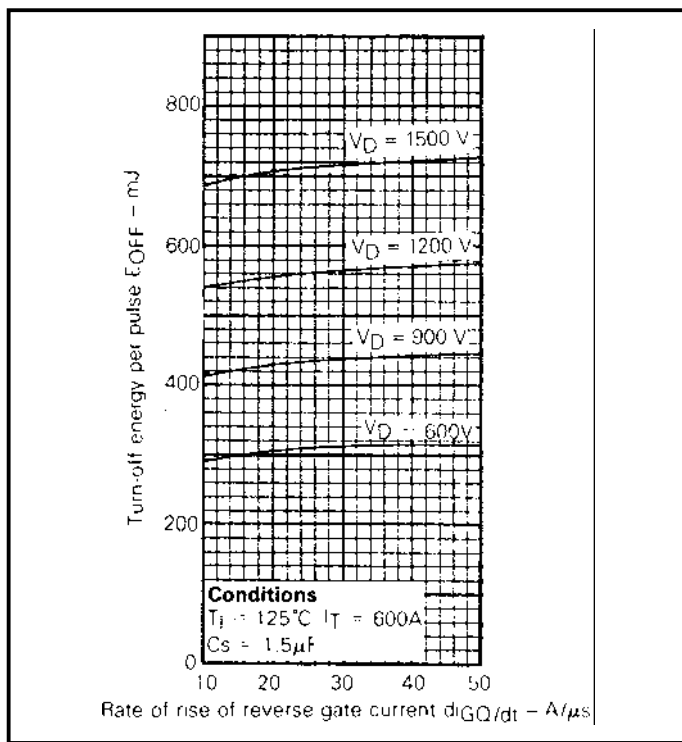


Fig.18 Turn-off energy vs on-state current



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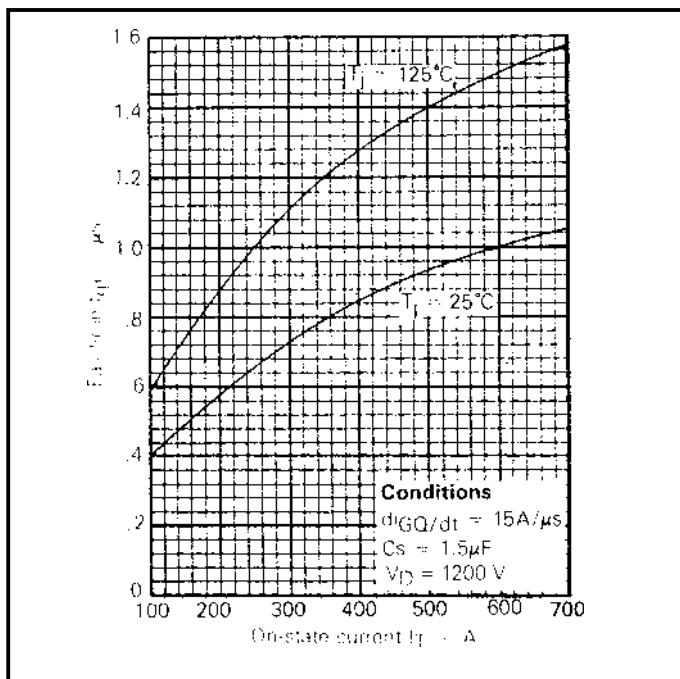


Fig.23 Fall time vs on-state current

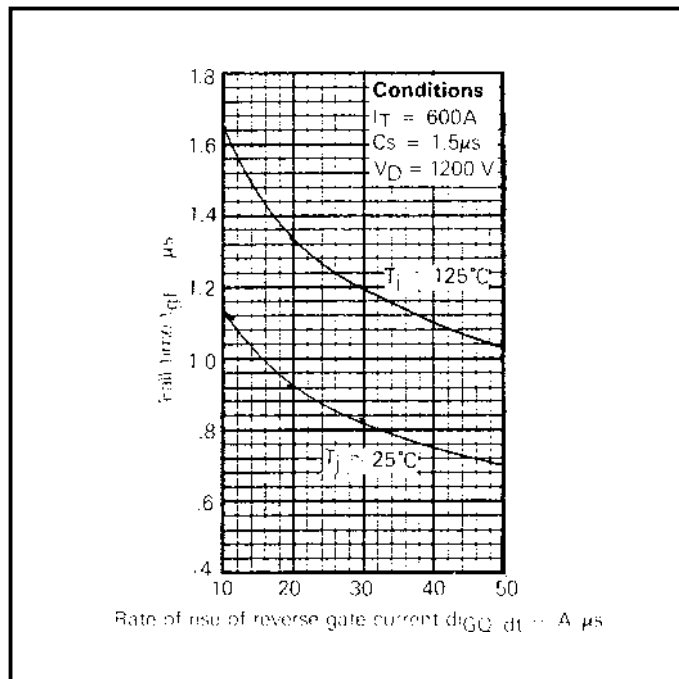


Fig.24 Fall time vs rate of rise of reverse gate current

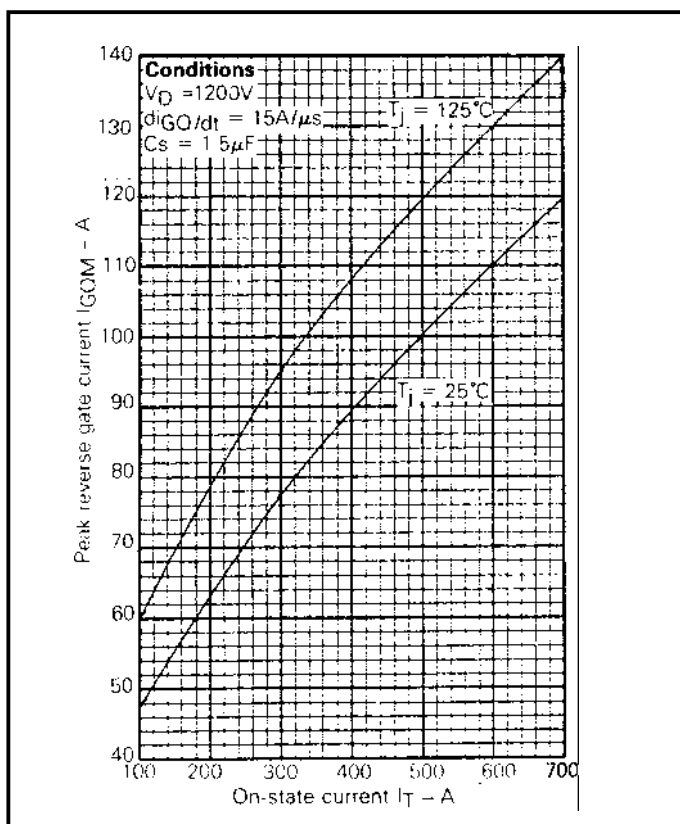


Fig.25 Peak reverse gate current vs on-state current

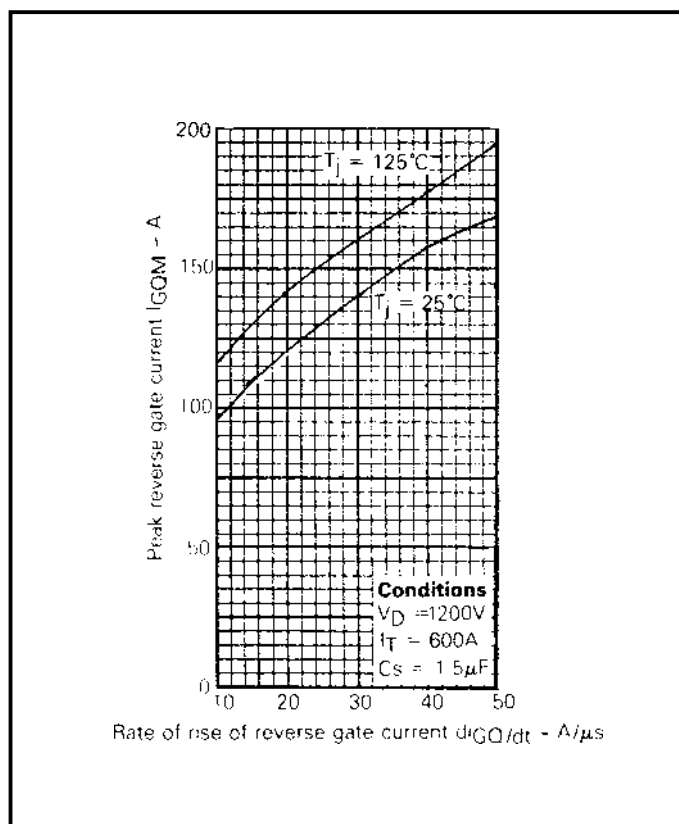


Fig.26 Peak reverse gate current vs rate of rise of reverse gate current



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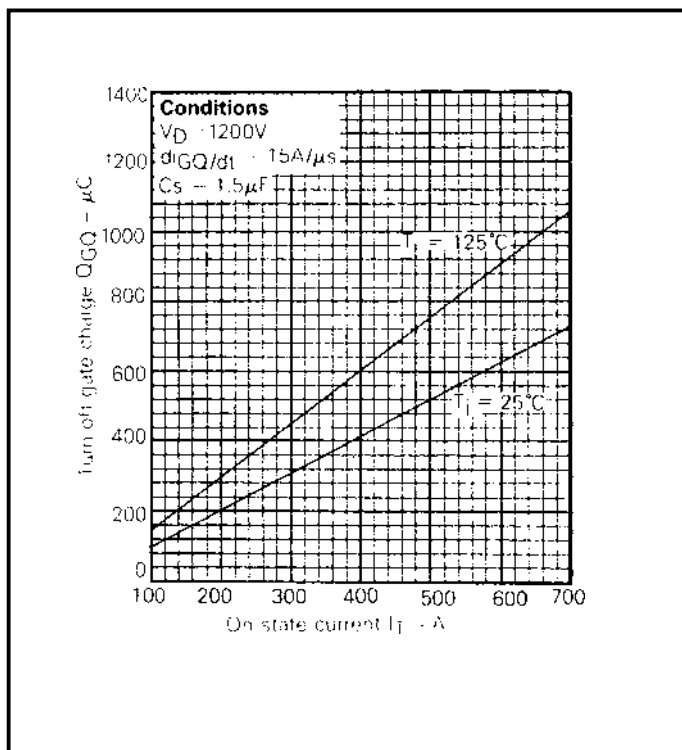


Fig.27 Turn-off gate charge vs on-state current

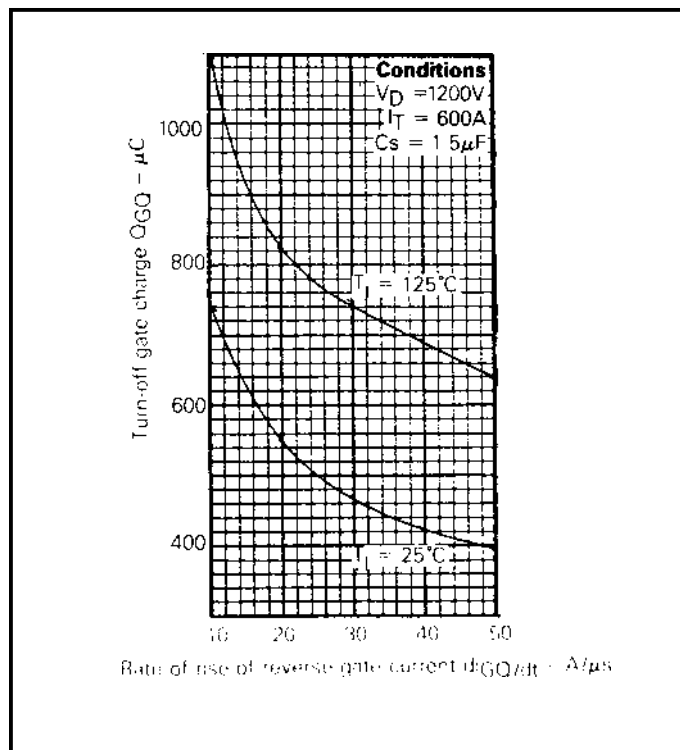


Fig.28 Turn-off gate charge vs rate of rise of reverse gate current

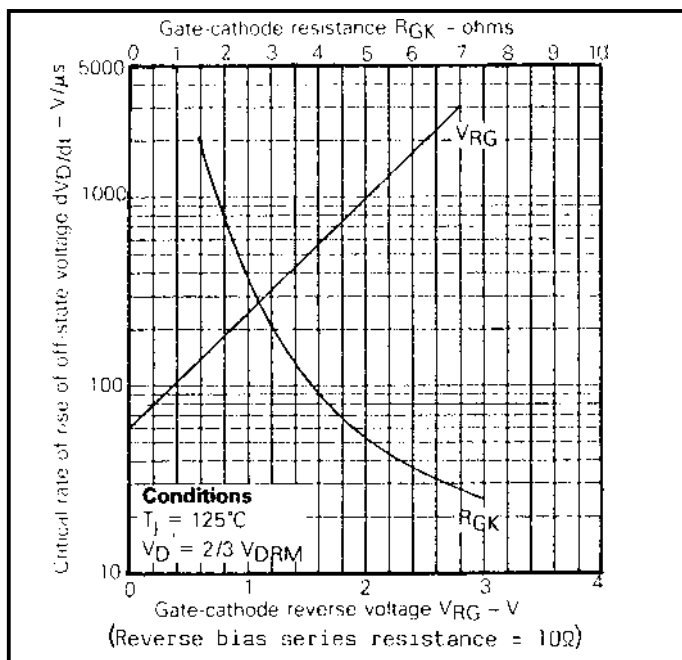


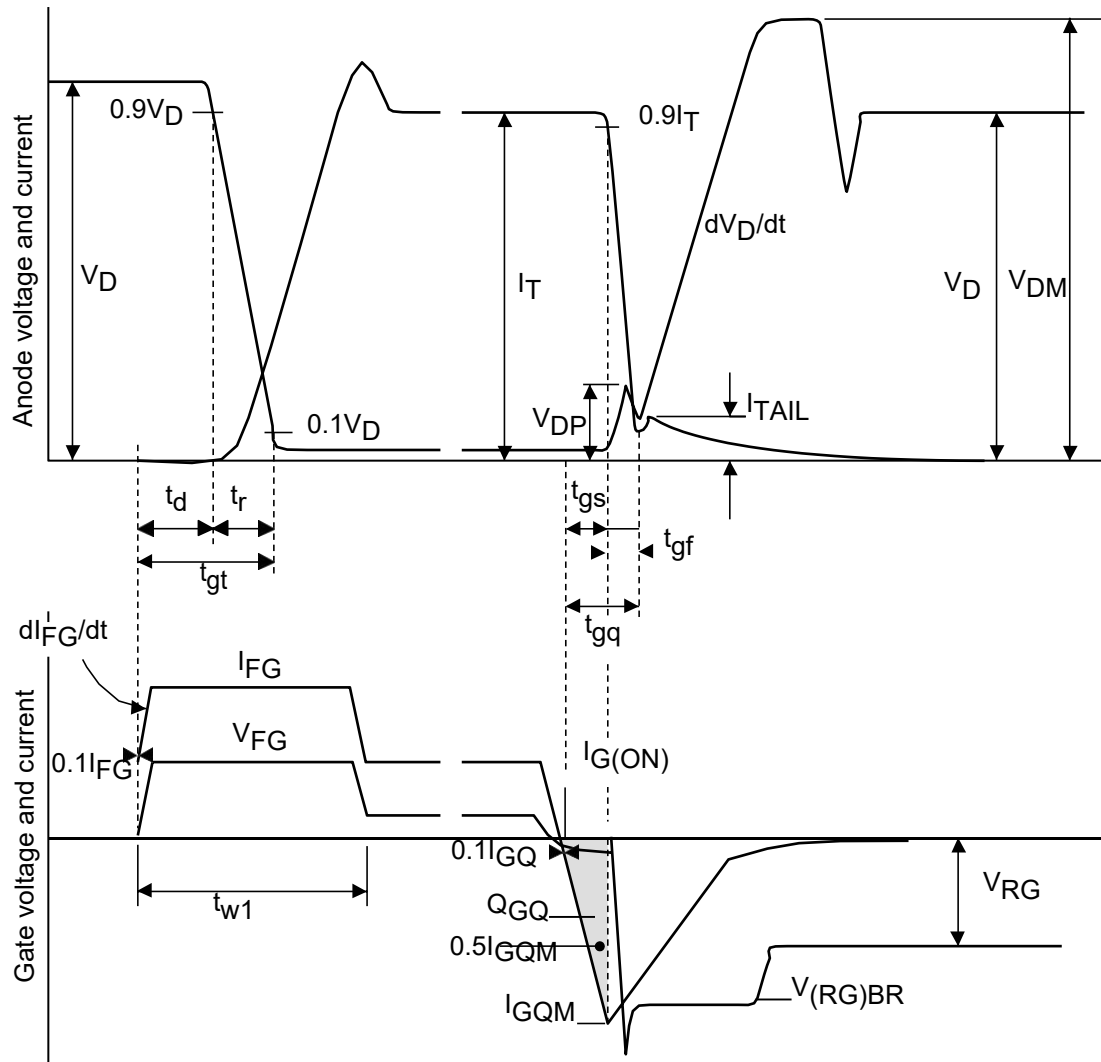
Fig.29 Dependence of critical dV_D/dt on gate-cathode resistance and gate-cathode reverse voltage

Snubber Capacitor $C_s (\mu F)$	Snubber Resistor $R_s (\Omega)$	Minimum Reset Time (μs)
2	7	35
	5	30
1.5	7	26
	5	22
1	7	17
	5	15

Table of snubber discharge time variation with snubber capacitor value.



CURVES



Recommended gate conditions:

$$I_{TCM} = 600A$$

$$I_{FG} = 20A \quad I_{G(ON)}$$

$$= 2A \text{ d.c.}$$

$$t_{w1(min)} = 4.5\mu s$$

$$I_{GQM} = 130A$$

$$di_{GQ}/dt = 15A/\mu s$$

$$Q_{GQ} = 900\mu C$$

$$V_{RG(min)} = 2V$$

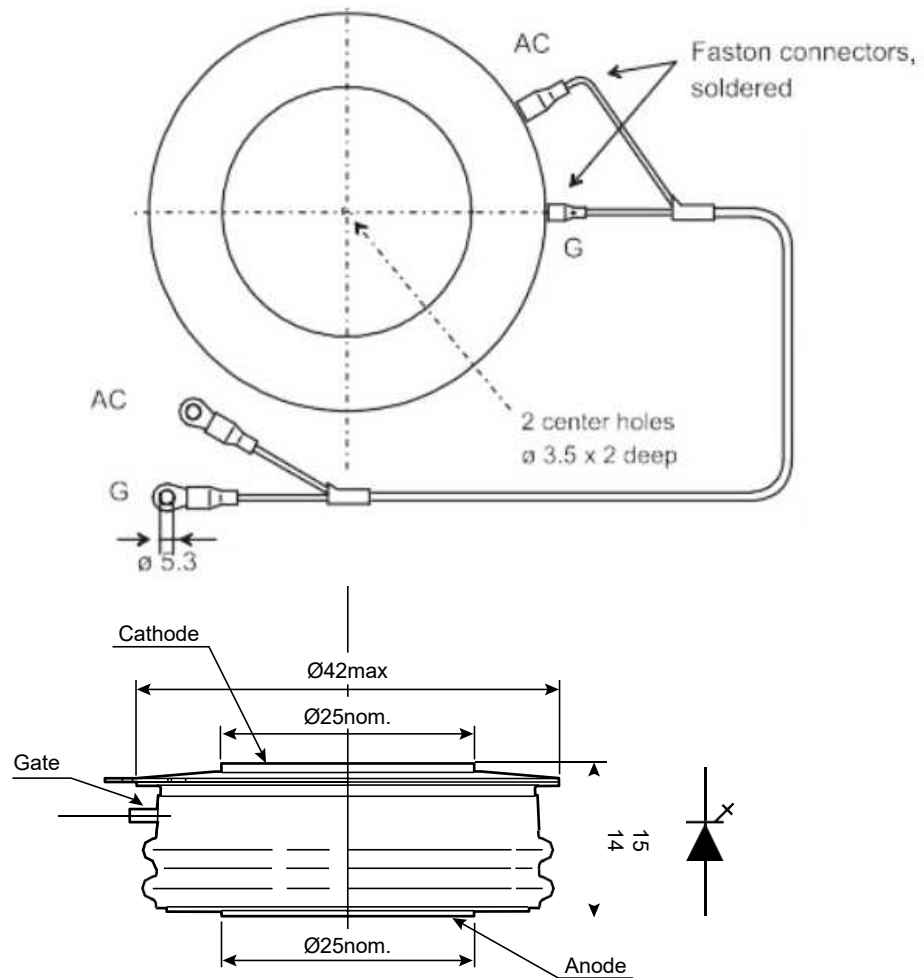
$$V_{RG(max)} = 16V$$

Fig.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



Nominal weight: 82g
Clamping force: 6kN $\pm 10\%$
Leads 12 AWG cables 160mm

Package outline type code: E