

### FEATURES

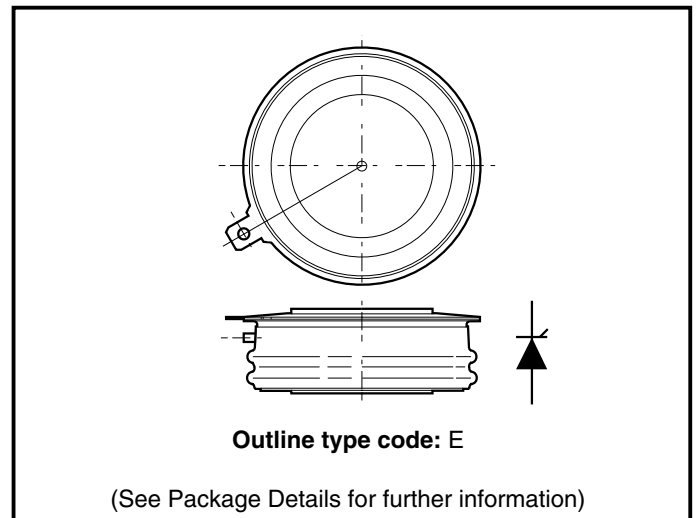
- Double Side Cooling
- Reverse Blocking Capability
- High Reliability In Service
- High Voltage Capability
- Fault Protection Without Fuses
- High Surge Current Capability
- Turn-off Capability Allows Reduction In Equipment Size And Weight. Low Noise Emission Reduces Acoustic Cladding Necessary For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

### 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

$I_{TCM}$	<b>700A</b>
$V_{DRM}$	<b>1800V</b>
$I_{T(AV)}$	<b>240A</b>
$dV_D/dt$	<b>500V/μs</b>
$di_T/dt$	<b>500A/μs</b>



**Fig. 1 Package outline**

### VOLTAGE RATINGS

Type Number	Repetitive Peak Off-state Voltage $V_{DRM}$ V	Repetitive Peak Reverse Voltage $V_{RRM}$ V	Conditions
DGT305SE18	1800	1800	$T_{vj} = 125^{\circ}C, I_{DM} = 50mA,$ $I_{RRM} = 50mA, V_{RG} = 2V$

### CURRENT RATINGS

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

## SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
$I_{TSM}$	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	$\text{A}^2\text{s}$
$di_T/dt$	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	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	$\text{A}/\mu\text{s}$
$t_{ON(min)}$	Minimum permissible on time		20	-	$\mu\text{s}$
$t_{OFF(min)}$	Minimum permissible off time		40	-	$\mu\text{s}$

## THERMAL RATINGS

Symbol	Parameter	Conditions	Min.	Max.	Units	
$R_{th(j-hs)}$	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	

**CHARACTERISTICS**

<b><math>T_j = 125^\circ\text{C}</math> unless stated otherwise</b>					
<b>Symbol</b>	<b>Parameter</b>	<b>Conditions</b>	<b>Min.</b>	<b>Max.</b>	<b>Units</b>
$V_{TM}$	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	$V_D = 1200\text{V}$ , $I_T = 600\text{A}$ ,	-	160	mJ
$t_d$	Delay time	$I_{FG} = 20\text{A}$ , rise time $< 1.0\mu\text{s}$	-	1.1	$\mu\text{s}$
$t_r$	Rise time	$R_L = (\text{Residual inductance } 2.75\mu\text{H})$	-	2.5	$\mu\text{s}$
$E_{OFF}$	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	$\mu\text{s}$
$t_{gs}$	Storage time		-	12	$\mu\text{s}$
$t_{gf}$	Fall time		-	1.5	$\mu\text{s}$
$t_{gq}$	Gate controlled turn-off time		-	13.5	$\mu\text{s}$
$Q_{GQ}$	Turn-off gate charge		-	900	$\mu\text{C}$
$Q_{GQT}$	Total turn-off gate charge		-	1800	$\mu\text{C}$

CURVES

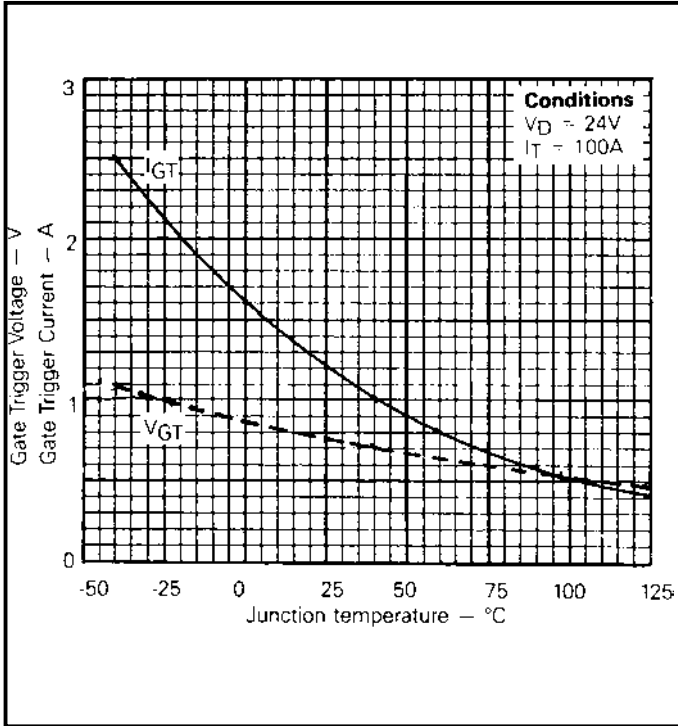


Fig.2 Gate characteristics

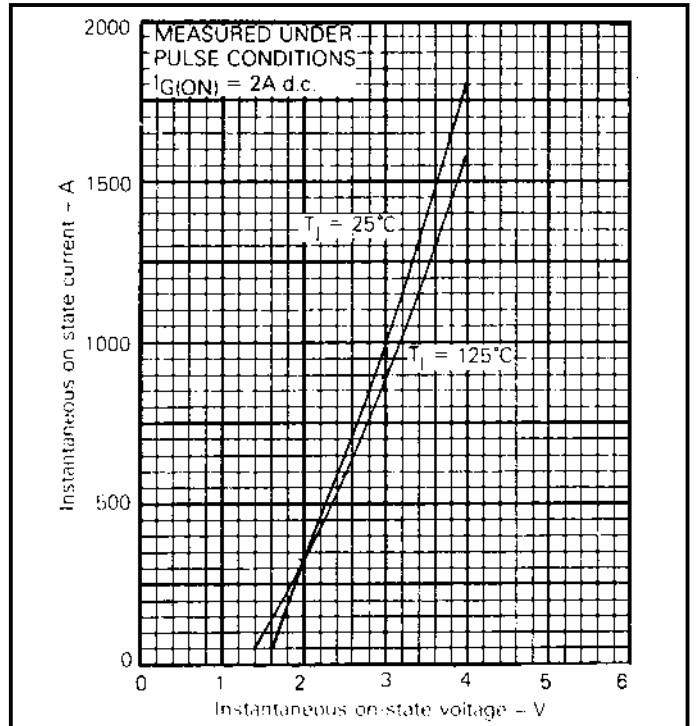


Fig.3 Maximum (limit) on-state characteristics

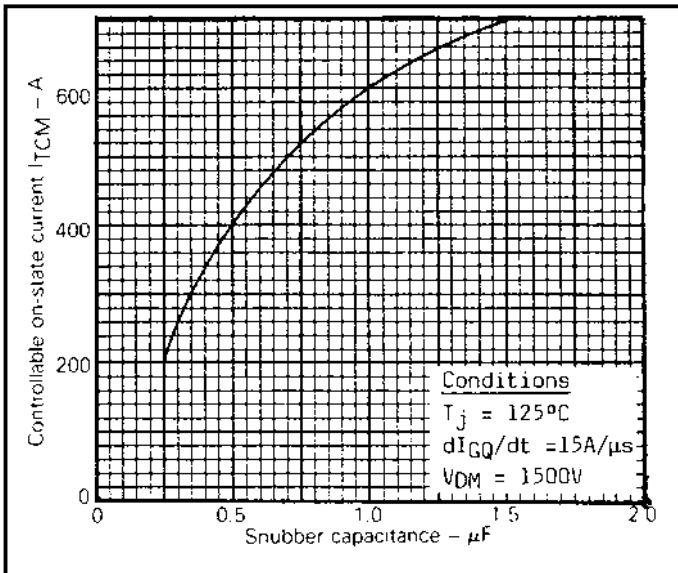


Fig.4 Dependence of  $I_{TCM}$  on  $C_s$

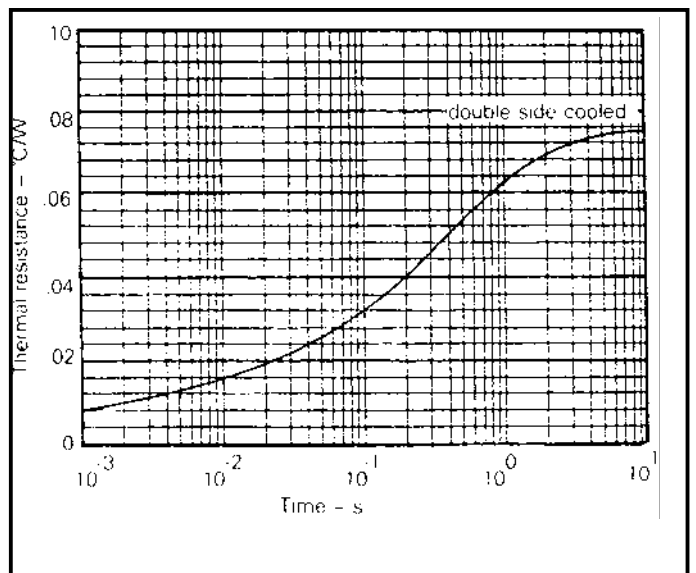
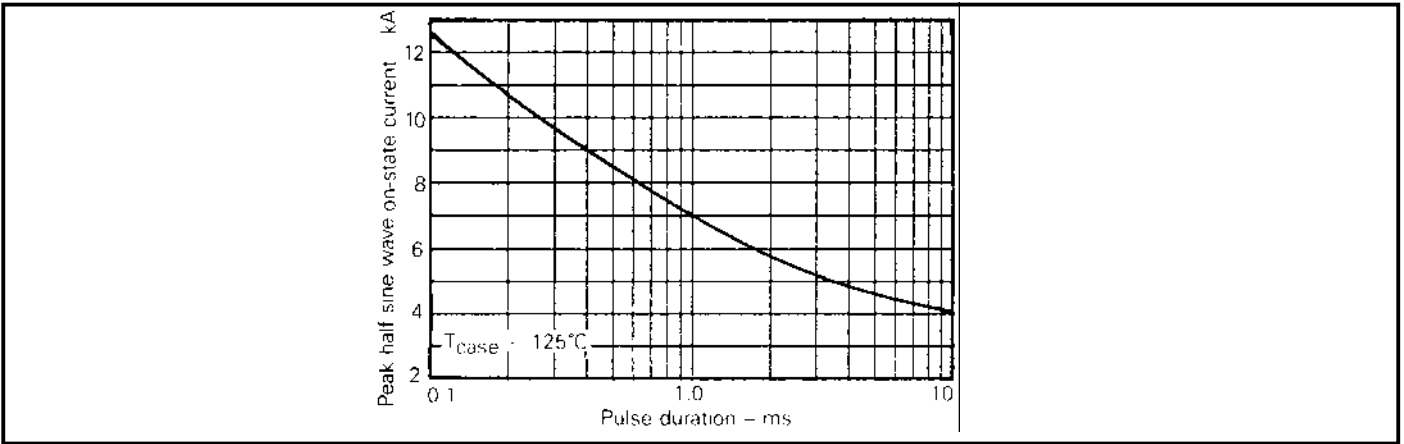
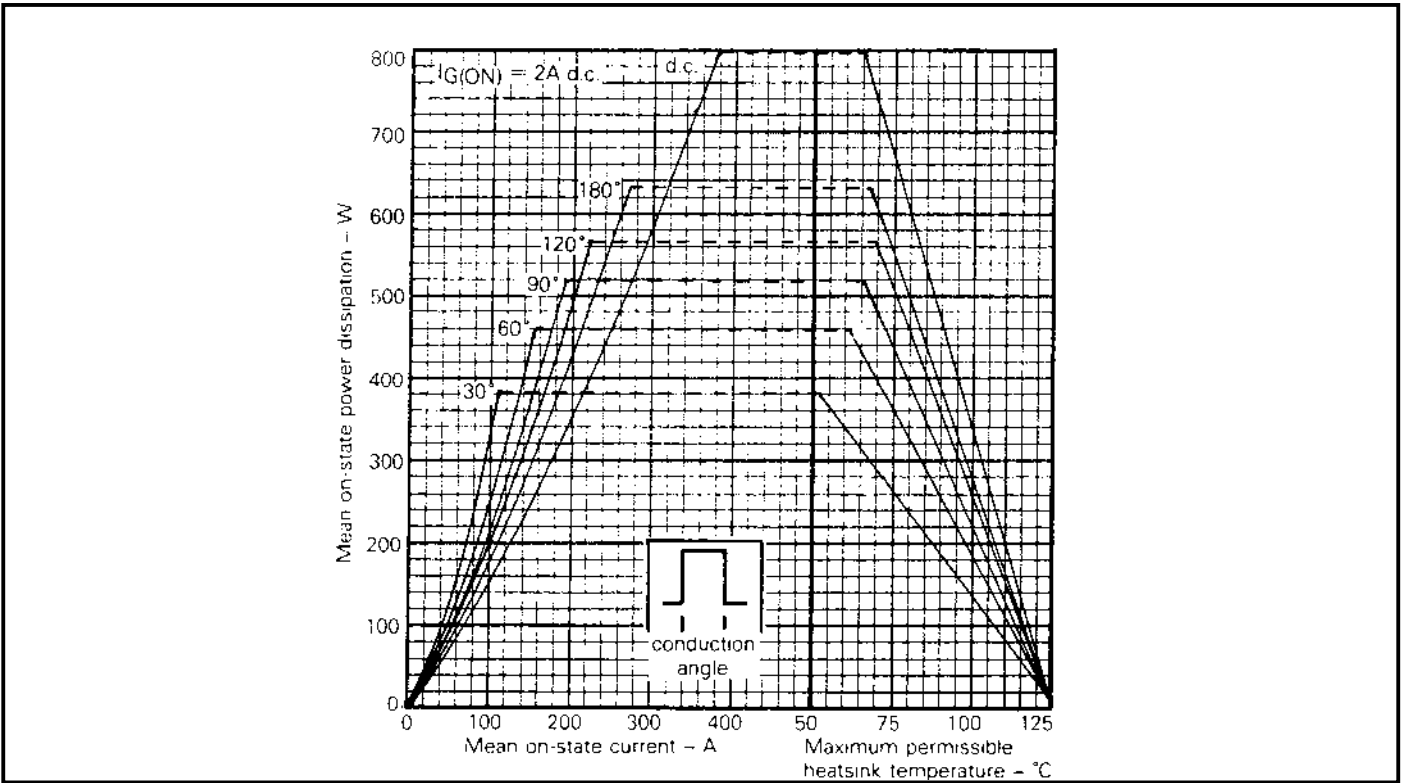


Fig.5 Maximum (limit) transient thermal resistance



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



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

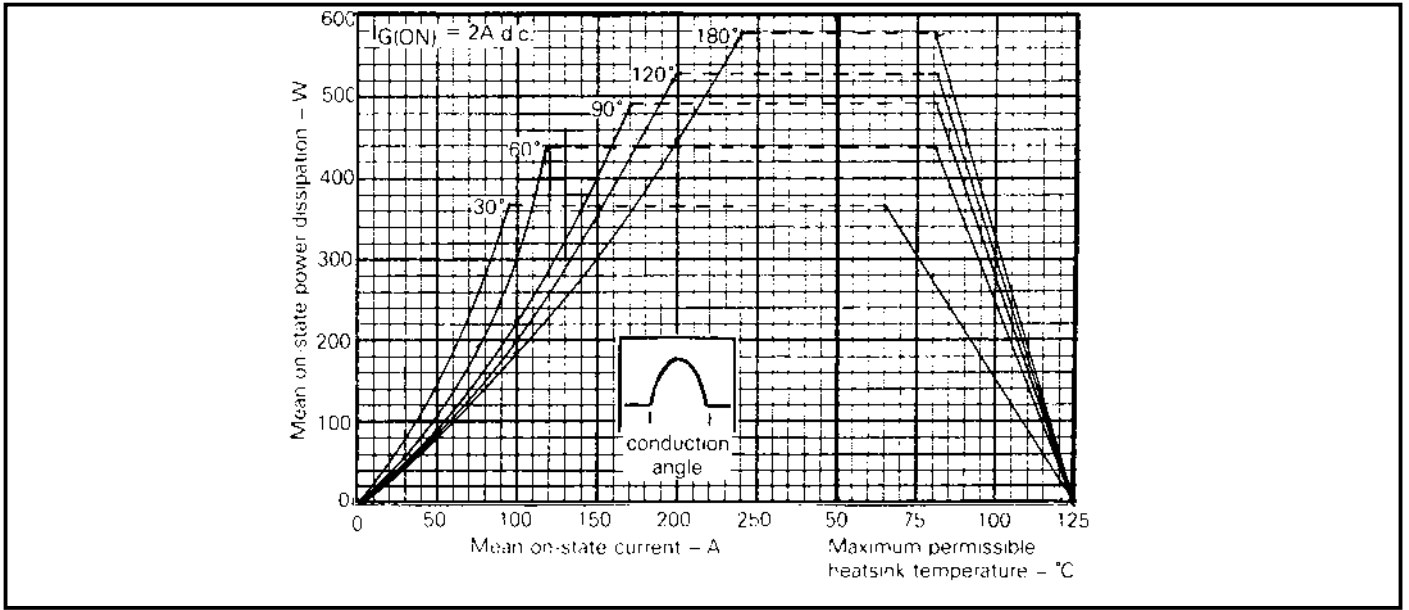


Fig.8 Steady state sinusoidal wave conduction loss - double side cooled

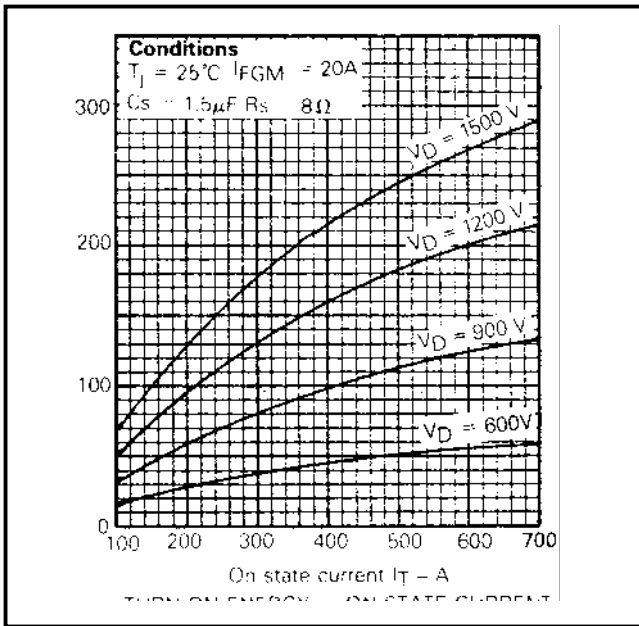


Fig.9 Turn-on energy vs on-state current

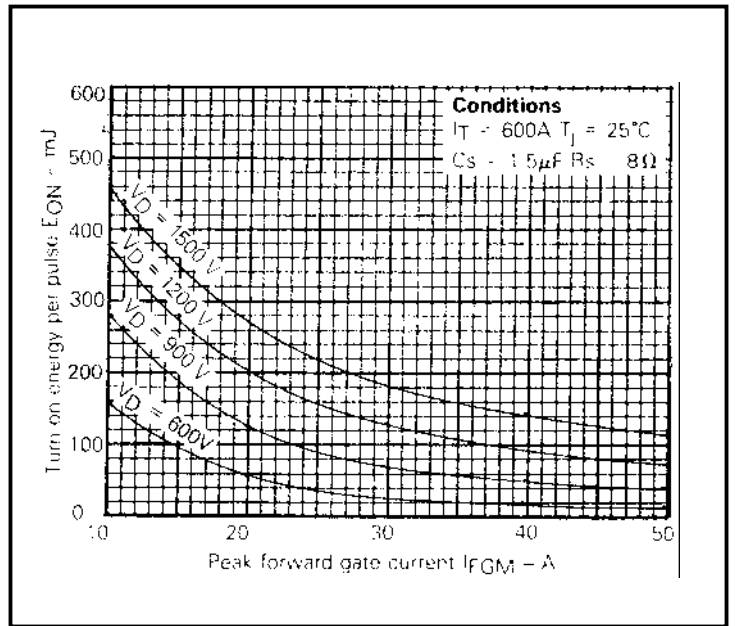
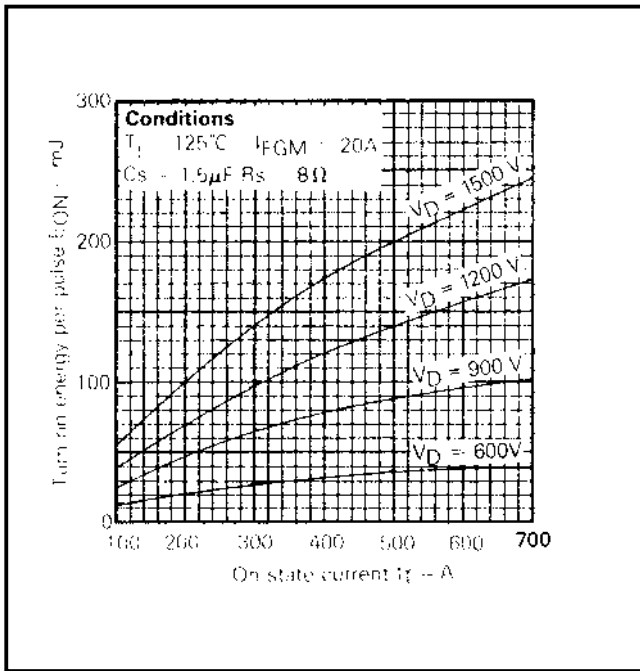
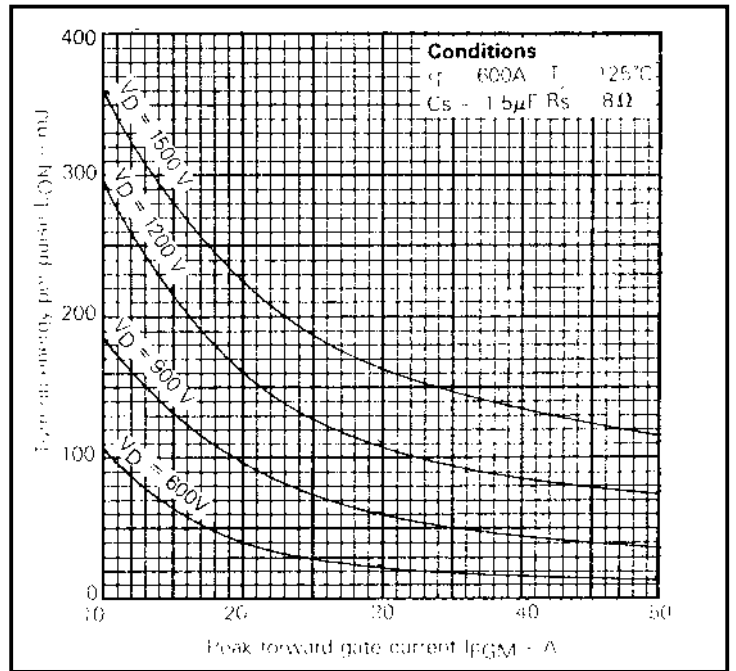


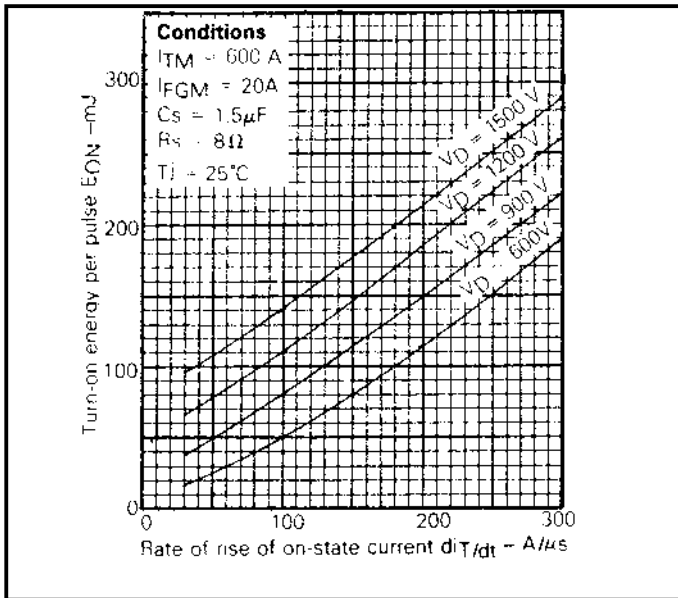
Fig.10 Turn-on energy vs peak forward gate current



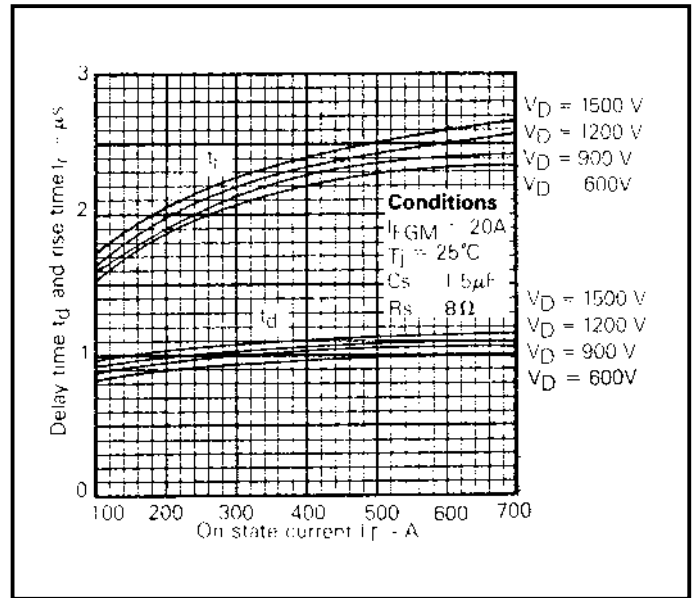
**Fig.11 Turn-on energy vs on-state current**



**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**

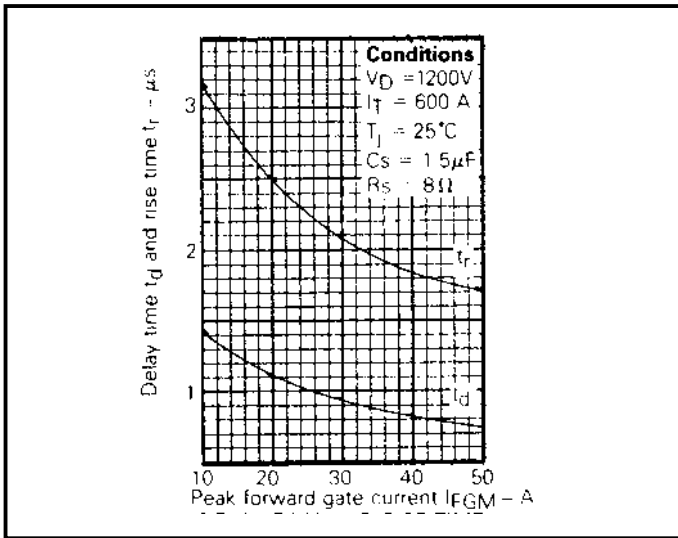


Fig.15 Delay time and rise time vs peak forward gate current

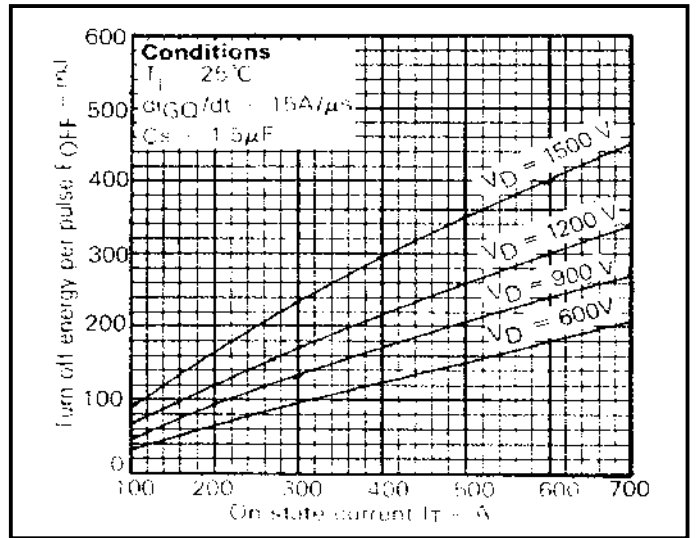


Fig.16 Turn-off energy vs on-state current

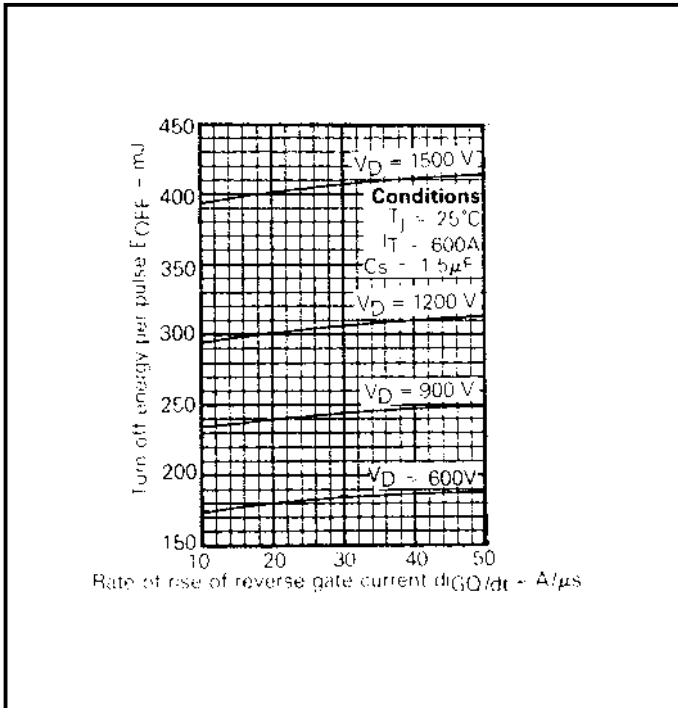


Fig.17 Turn-off energy vs rate of rise of reverse gate current

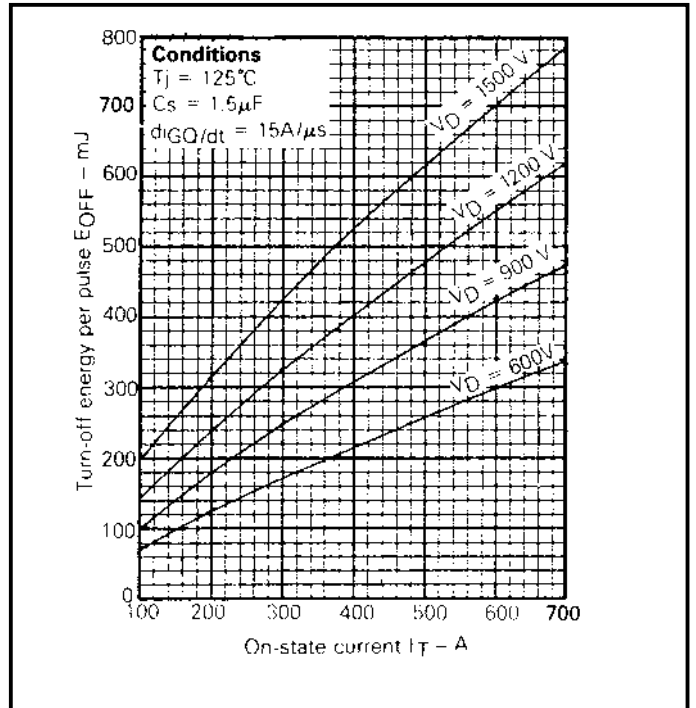


Fig.18 Turn-off energy vs on-state current



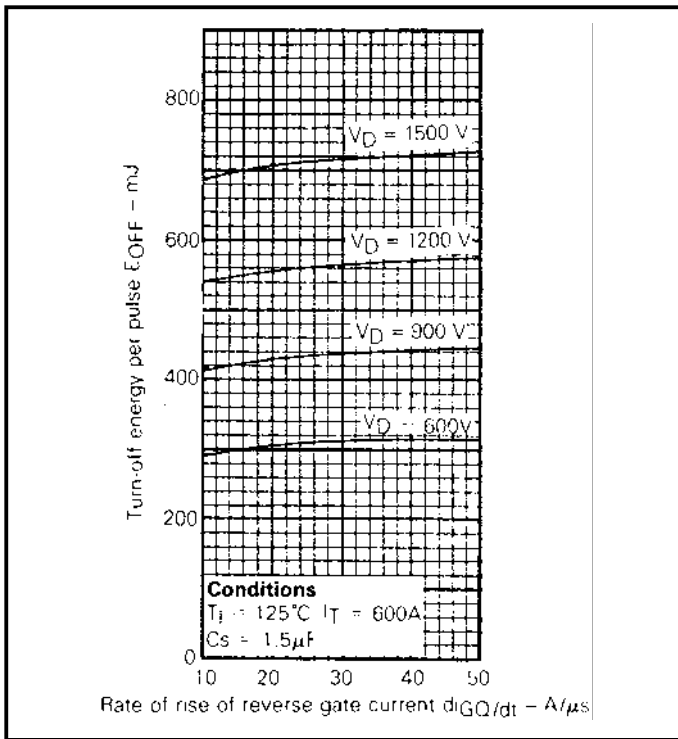


Fig.19 Turn-off energy vs rate of rise of reverse gate current

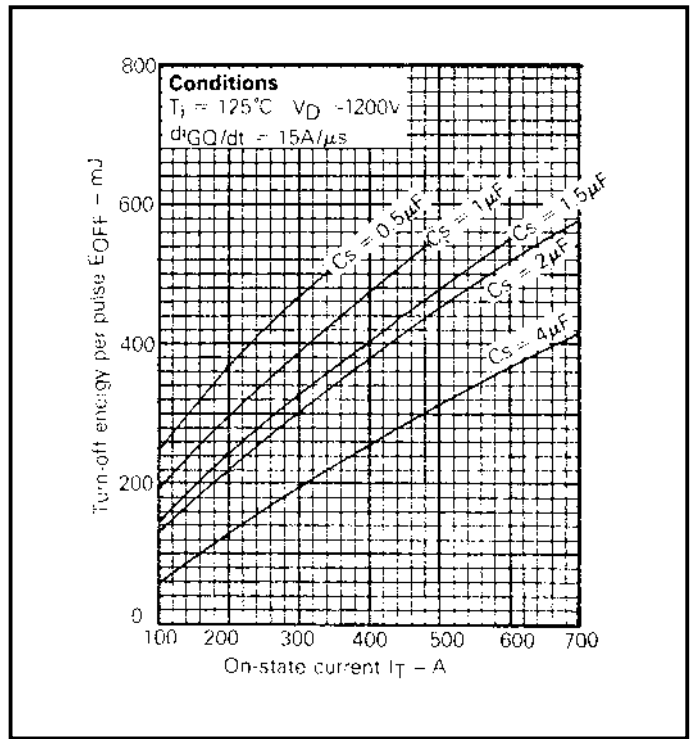


Fig.20 Turn-off energy vs on-state current with  $C_s$  as parameter

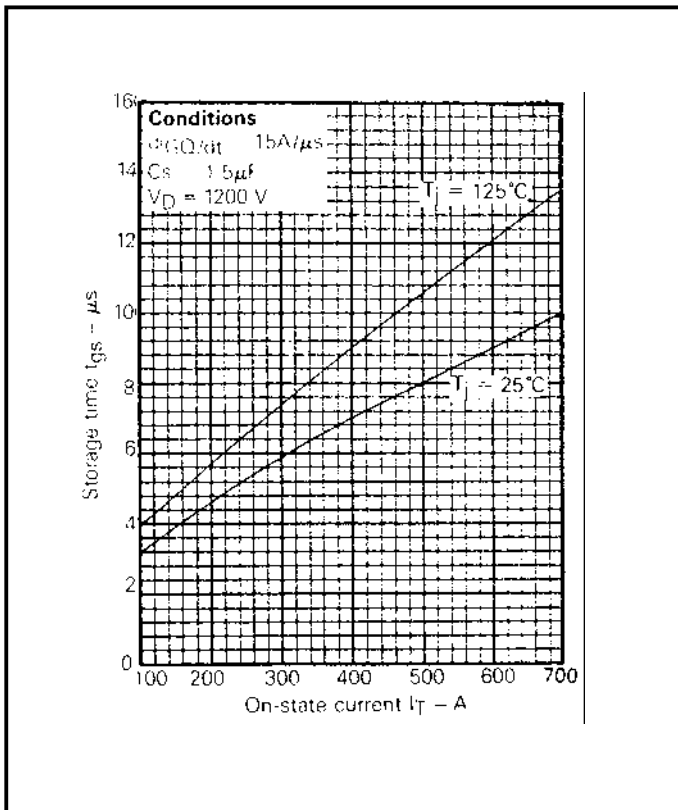


Fig.21 Storage time vs on-state current

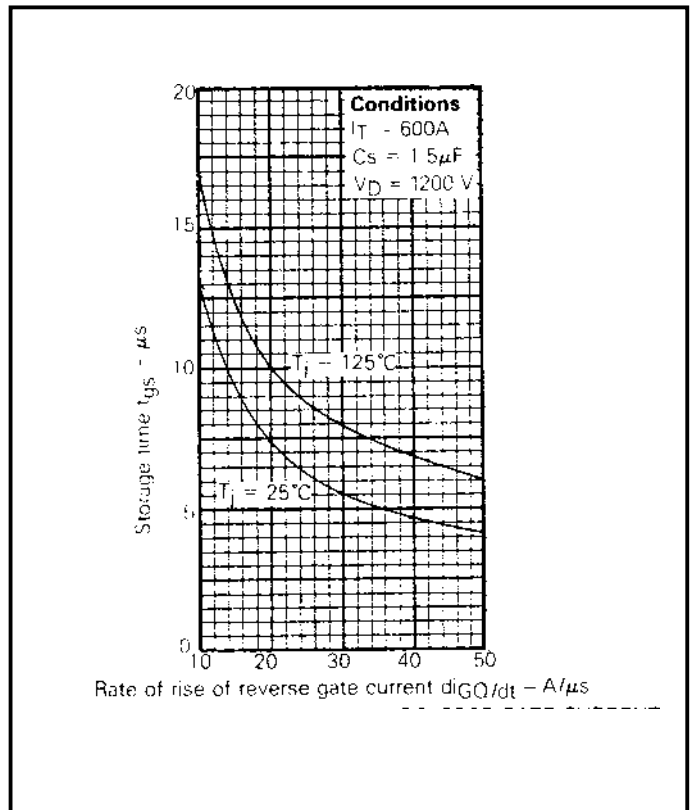


Fig.22 Storage time vs rate of rise of reverse gate current

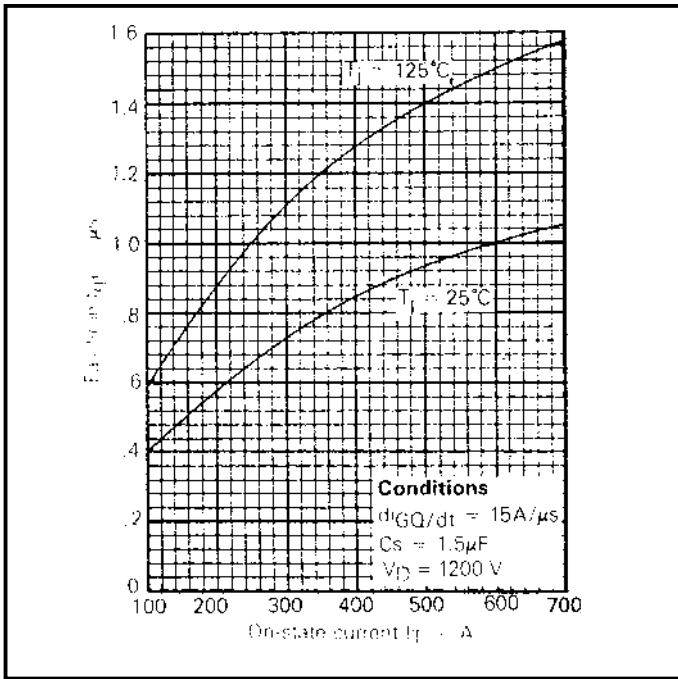


Fig.23 Fall time vs on-state current

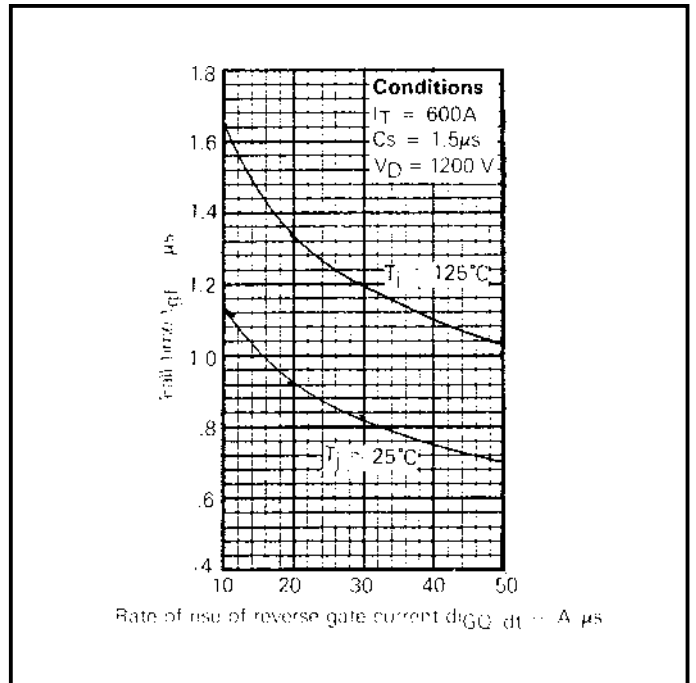


Fig.24 Fall time vs rate of rise of reverse gate current

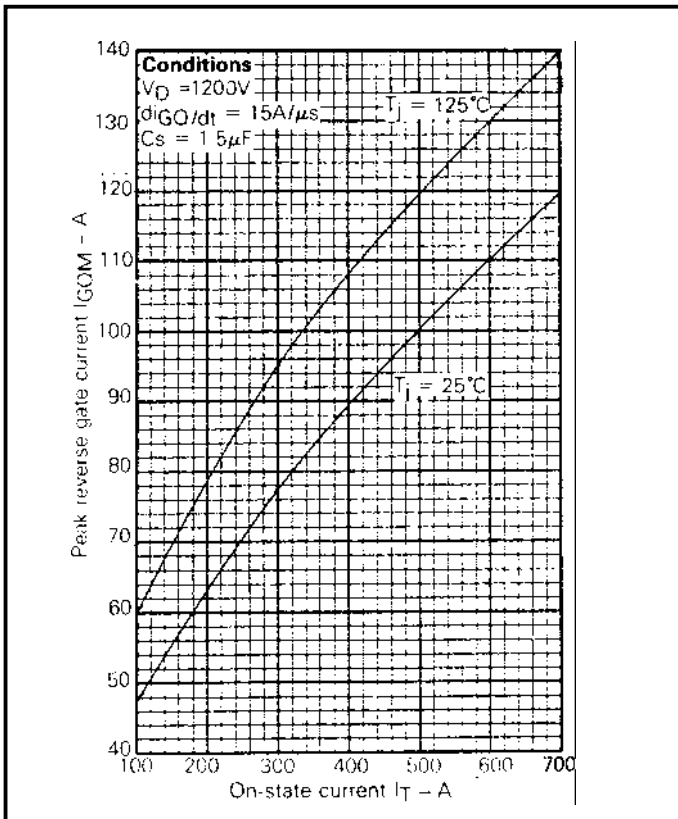


Fig.25 Peak reverse gate current vs on-state current

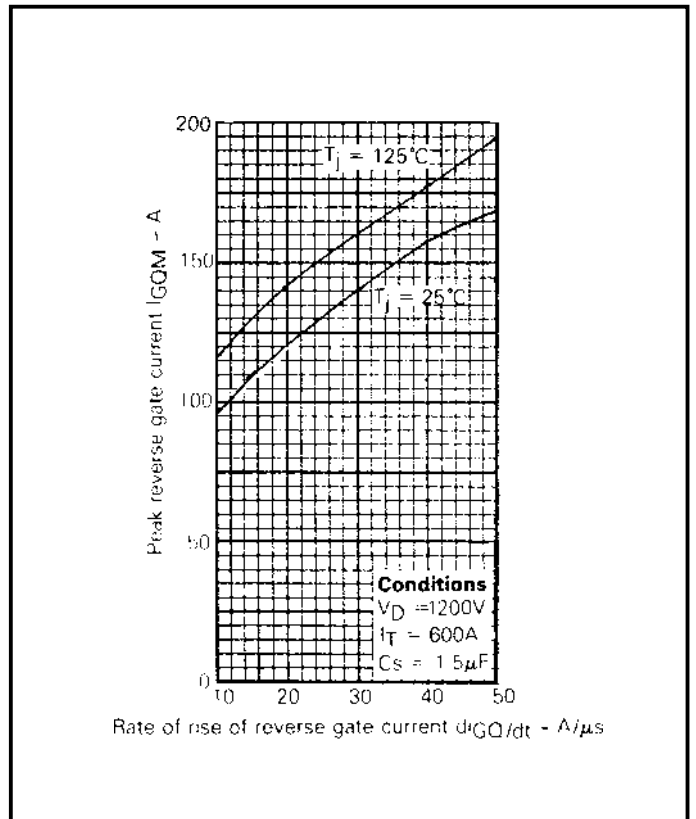
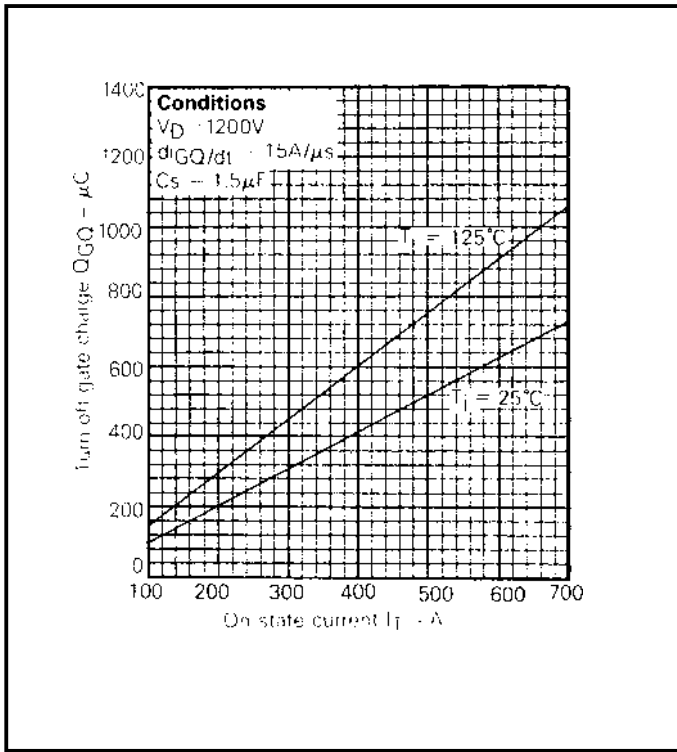
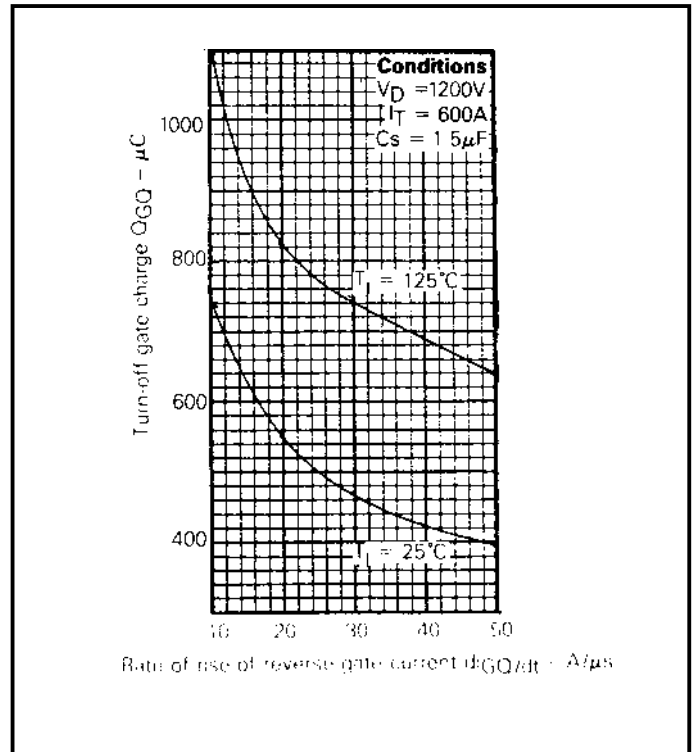


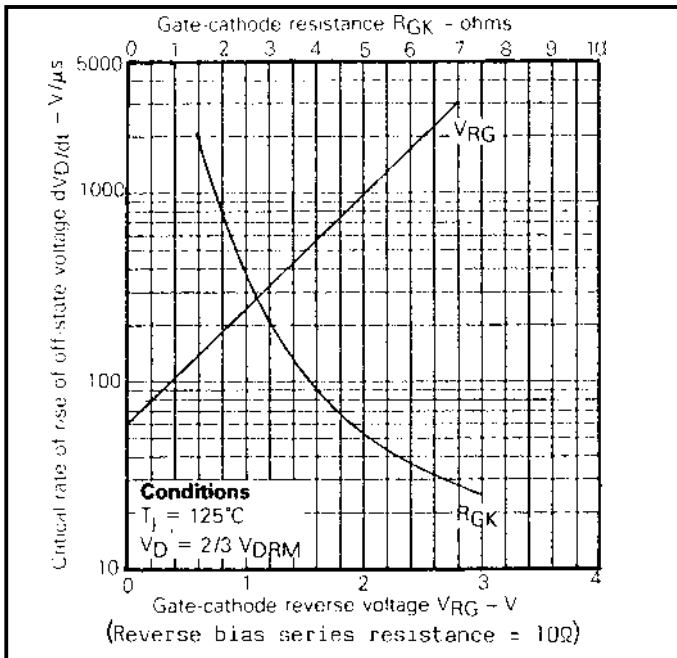
Fig.26 Peak reverse gate current vs rate of rise of reverse gate current



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



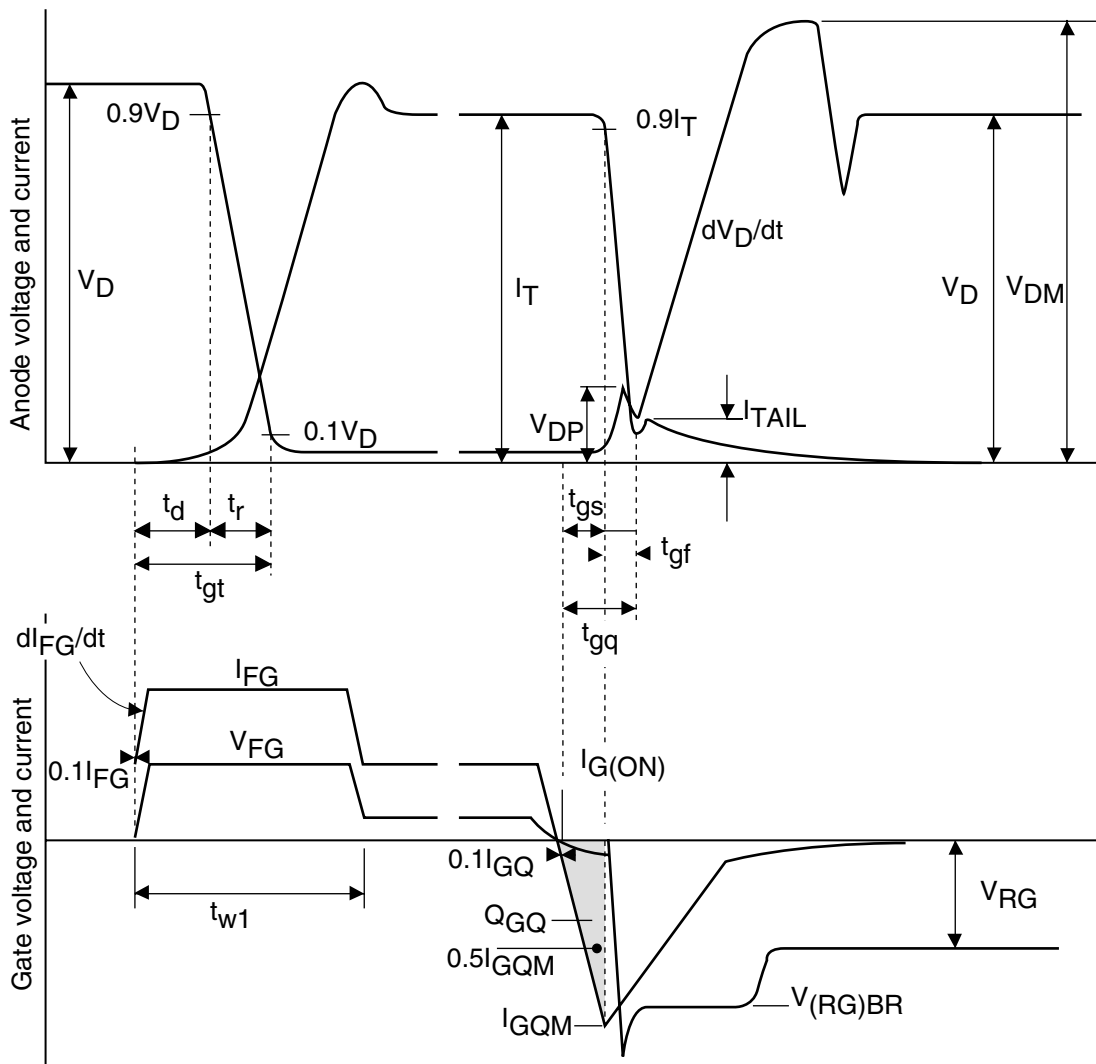
**Fig.28 Turn-off gate charge vs rate of rise of reverse gate current**



**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 ( $\mu s$ )
2	7	35
	5	30
15	7	26
	5	22
1	7	17
	5	15

**Table of snubber discharge time variation with snubber capacitor value.**



Recommended gate conditions:

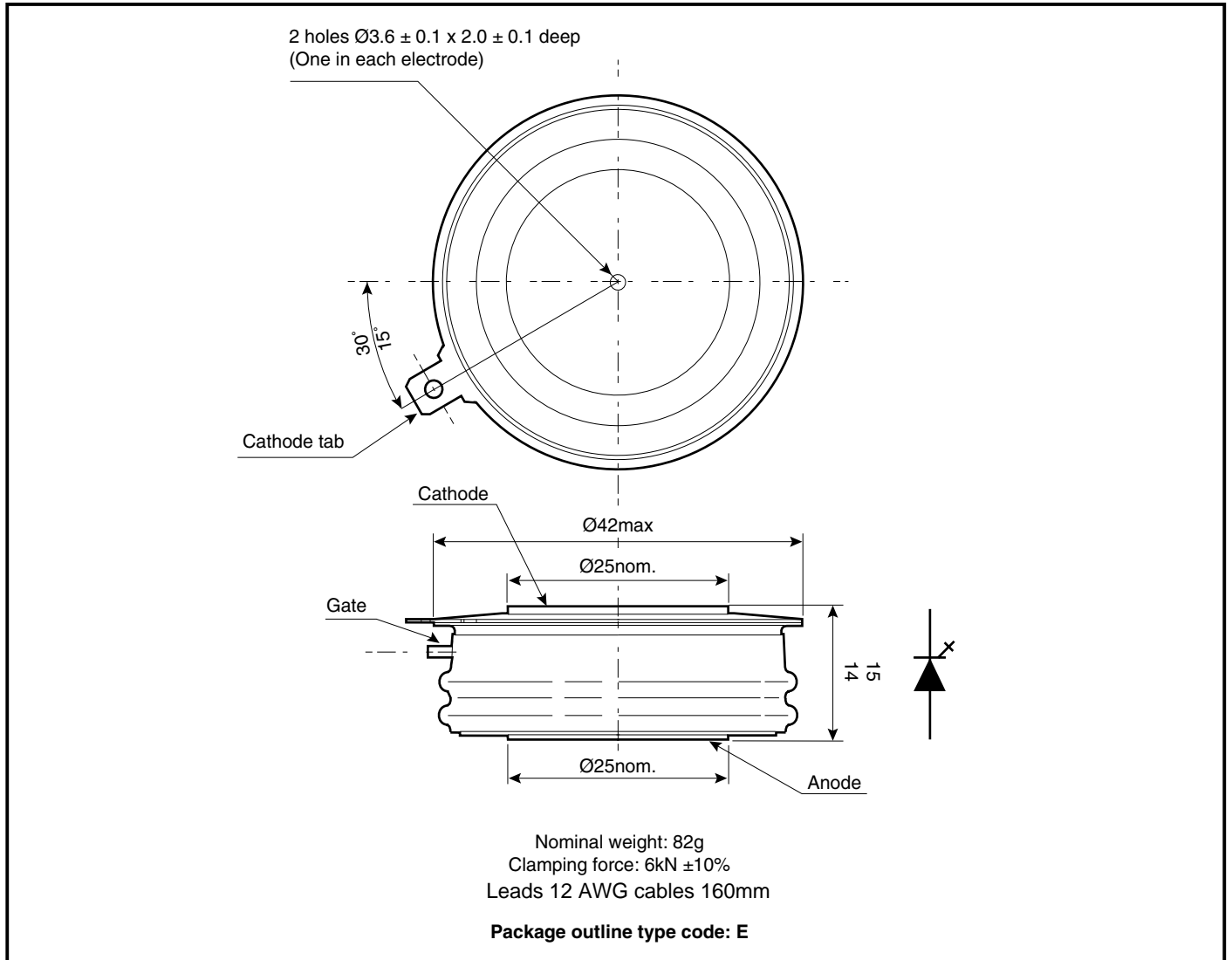
- $I_{TCM} = 600A$
- $I_{FG} = 20A$
- $I_{G(ON)} = 2A$  d.c.
- $t_{w1(min)} = 4.5\mu s$
- $I_{GQM} = 130A$
- $di_{GQ}/dt = 15A/\mu s$
- $Q_{GQ} = 900\mu C$
- $V_{RG(min)} = 2V$
- $V_{RG(max)} = 16V$

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

Fig.30 General switching waveforms

**PACKAGE DETAILS**

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





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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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<b>Target Information:</b>	This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.
<b>Preliminary Information:</b>	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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