

**FEATURES**

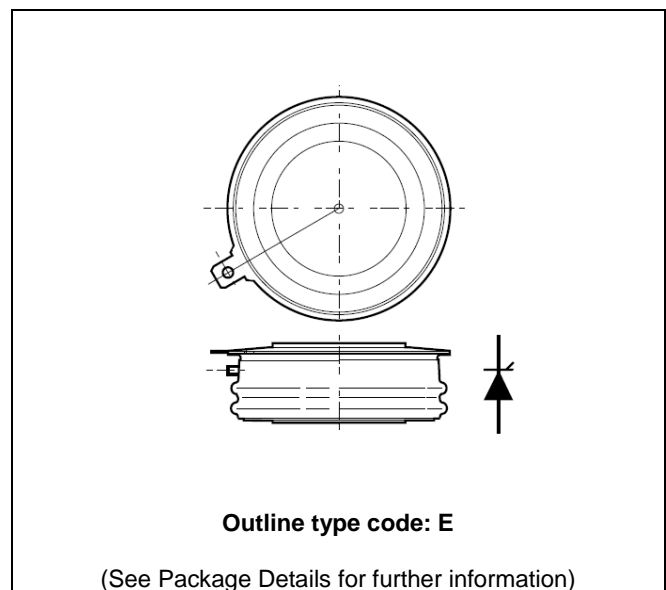
- Double Side Cooling
- High Reliability In Service
- High Voltage Capability
- Fault Protection Without Fuses
- High Surge Current Capability
- Turn-off Capability Allows Reduction in Equipment Size and Weight. Low Noise Emission Reduces Acoustic Cladding Necessary For Environmental Requirements

**APPLICATIONS**

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

**KEY PARAMETERS**

$V_{DRM}$	<b>1300V</b>
$I_{T(AV)}$	<b>250</b>
$I_{TCM}$	<b>700A</b>
$dV_D/dt$	<b>500V/<math>\mu</math>s</b>
$dl_T/dt$	<b>500A/<math>\mu</math>s</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
DGT304SE13	1300	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	Conditions	Max.	Units
$I_{TCM}$	Repetitive peak controllable on-state current	$V_D = 60\%V_{DRM}$ , $T_j = 125^{\circ}\text{C}$ , $dl_{GQ}/dt = 15\text{A}/\mu\text{s}$ , $C_S = 2.0 \mu\text{F}$	700	A
$I_{T(AV)}$	Mean on-state current	$T_{HS} = 80^{\circ}\text{C}$ , Double side cooled. Half sine 50Hz	250	A
$I_{T(RMS)}$	RMS on-state current	$T_{HS} = 80^{\circ}\text{C}$ , Double side cooled. Half sine 50Hz	390	A

**SURGE RATINGS**

Symbol	Parameter	Test 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. $T_j = 125^\circ\text{C}$	80	$\text{kA}^2\text{s}$
$di_T/dt$	Critical rate of rise of on-state current	$V_D = 60\% V_{DRM}$ , $I_T = 700\text{A}$ , $T_j = 125^\circ\text{C}$ , $I_{FG} > 20\text{A}$ , 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	$\text{V}/\mu\text{s}$

**GATE RATINGS**

Symbol	Parameter	Test Conditions	Min.	Max.	Units
$V_{RGM}$	Peak reverse gate voltage	This value may be 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	-	$\mu\text{s}$

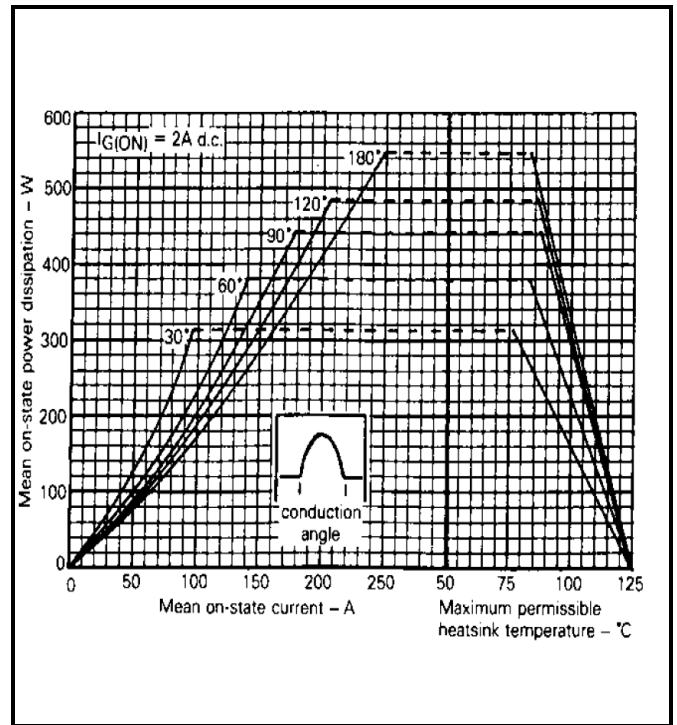
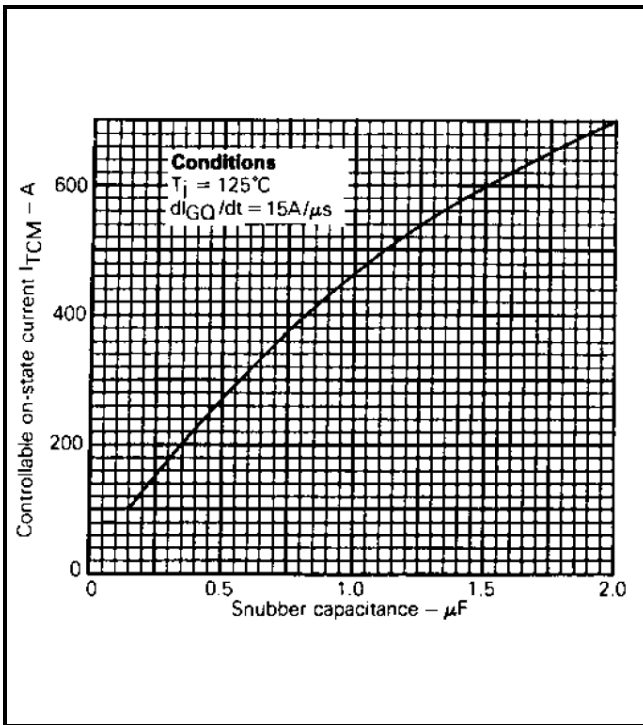
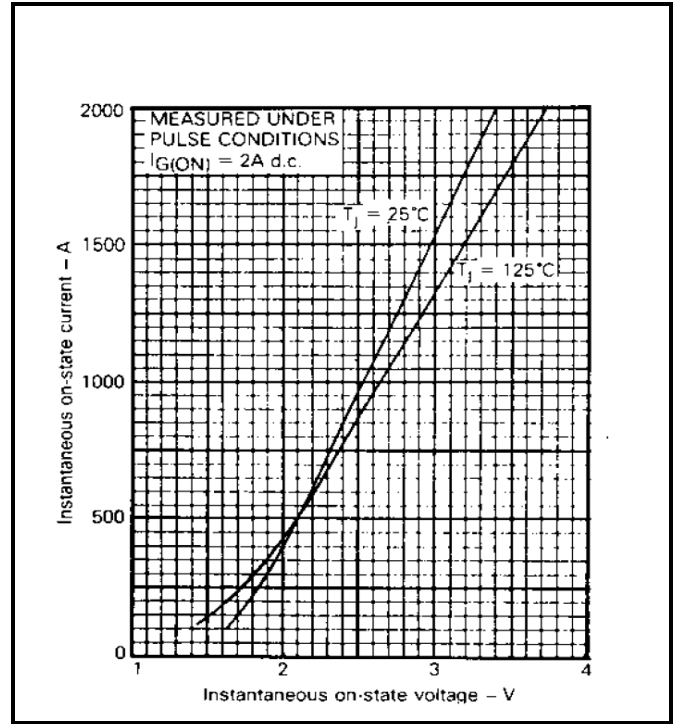
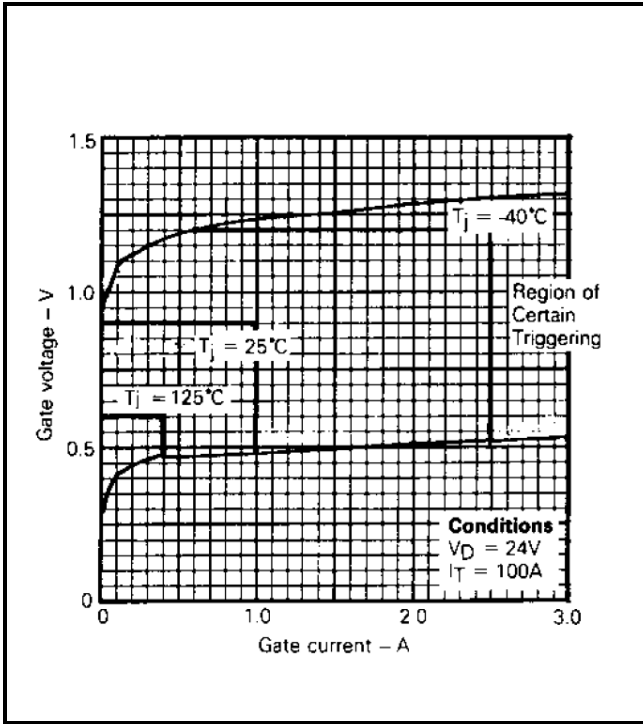
**THERMAL AND MECHANICAL RATINGS**

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

## CHARACTERISTICS

 $T_j = 125^\circ\text{C}$  unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Max.	Units
$V_{TM}$	On-state voltage	At 600A peak, $I_{G(ON)} = 2\text{A dc}$	-	2.2	V
$I_{DM}$	Peak off-state current	$V_{DRM} = 2500\text{V}$ , $V_{RG} = 0\text{V}$	-	25	mA
$I_{RRM}$	Peak reverse current	At $V_{RRM}$	-	50	mA
$V_{GT}$	Gate trigger voltage	$V_D = 24\text{V}$ , $I_T = 100\text{A}$ , $T_j = 25^\circ\text{C}$	-	0.9	V
$I_{GT}$	Gate trigger current	$V_D = 24\text{V}$ , $I_T = 100\text{A}$ , $T_j = 25^\circ\text{C}$	-	1.0	A
$I_{RGM}$	Reverse gate cathode current	$V_{RGM} = 16\text{V}$ , No gate/cathode resistor	-	50	mA
$E_{ON}$	Turn-on energy	$V_D = 900\text{V}$ , $I_T = 600\text{A}$ , $di_T/dt = 300\text{A}/\mu\text{s}$ $I_{FG} = 20\text{A}$ , rise time $< 1.0\mu\text{s}$ Residual inductance, $R_L = 3\mu\text{H}$	-	130	mJ
$t_d$	Delay time		-	1.5	$\mu\text{s}$
$t_r$	Rise time			3.0	$\mu\text{s}$
$E_{OFF}$	Turn-off energy	$I_T = 600\text{A}$ , $V_{DM} = 750\text{V}$ , Snubber capacitor $C_S = 1.5\mu\text{F}$ , $di_{GQ}/dt = 15\text{A}/\mu\text{s}$ Residual inductance, $R_L = 3\mu\text{H}$	-	350	mJ
$t_{gs}$	Storage time		-	11	$\mu\text{s}$
$t_{gf}$	Fall time		-	0.9	$\mu\text{s}$
$t_{gq}$	Gate controlled turn-off time		-	11.9	$\mu\text{s}$
$Q_{GQ}$	Turn-off gate charge				700
$Q_{GQT}$	Total turn-off gate charge			1400	$\mu\text{C}$



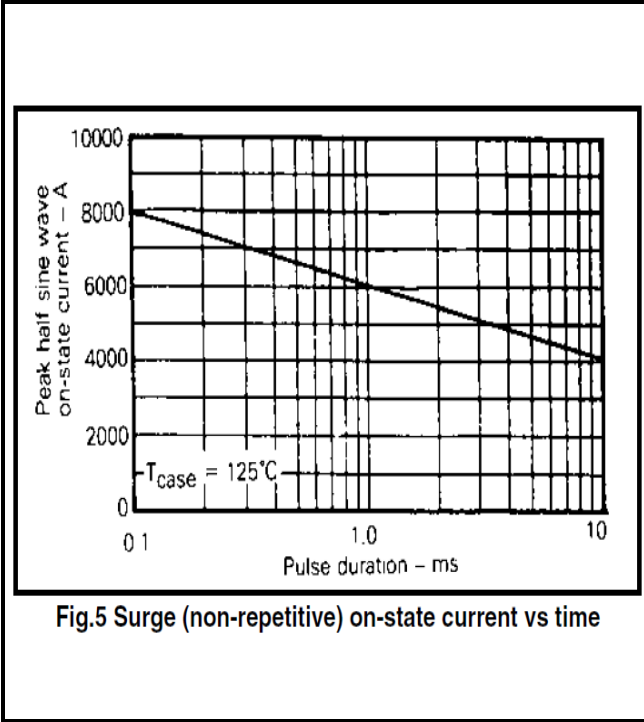


Fig.6 Surge (non-repetitive) on-state current vs time

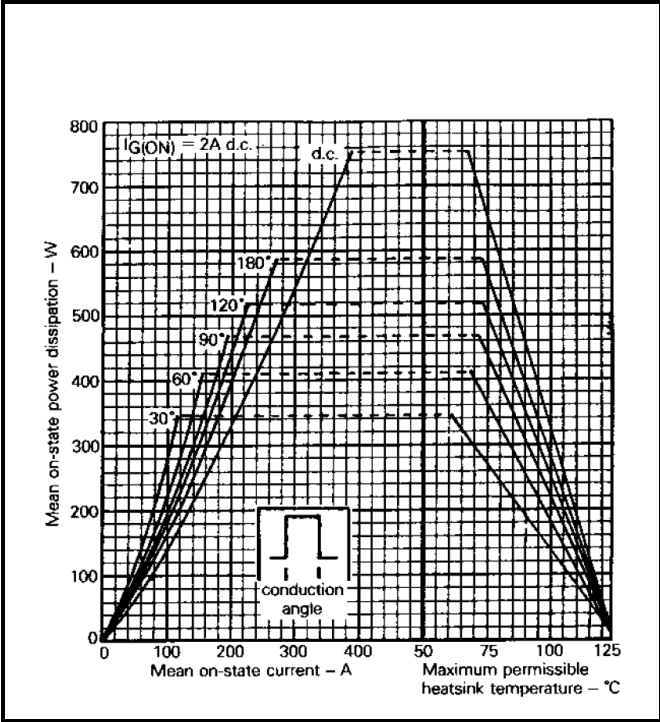


Fig.7 Steady state rectangular wave conduction loss - double side cooled

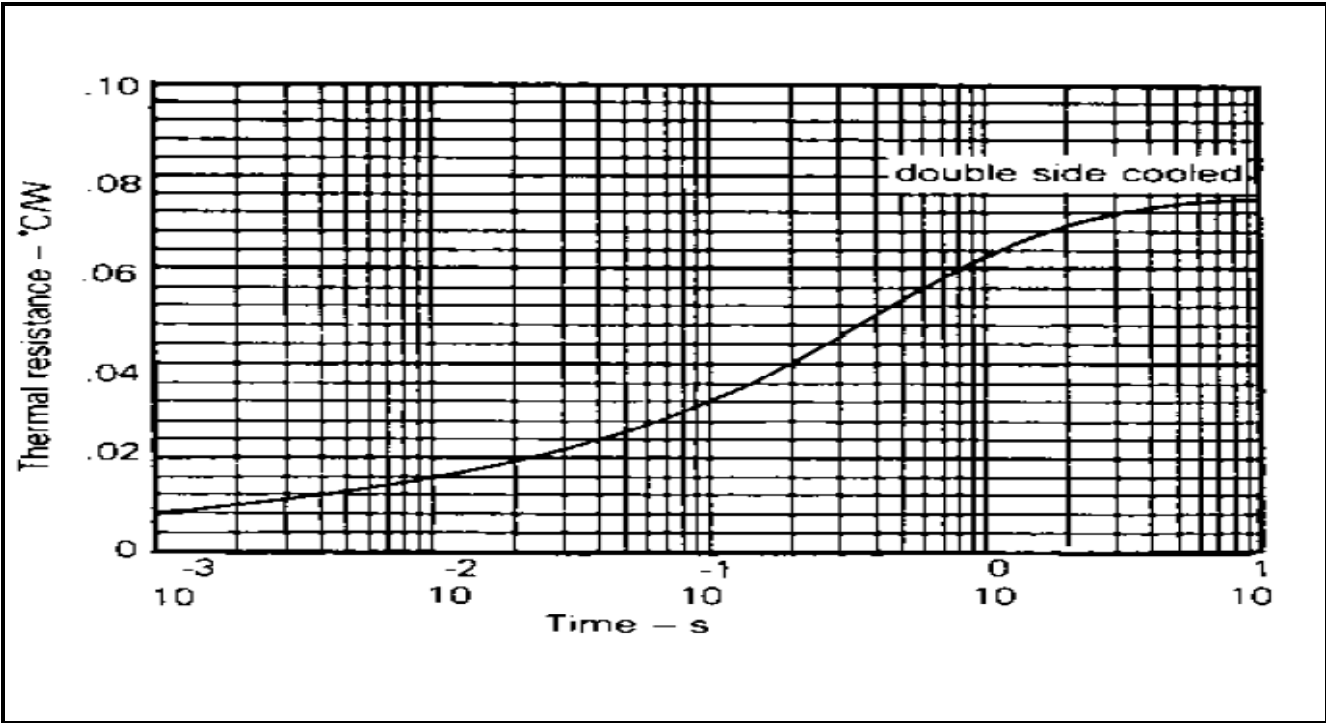


Fig.8 Maximum (limit) transient thermal impedance - junction to case (°C/kW) double side cooled

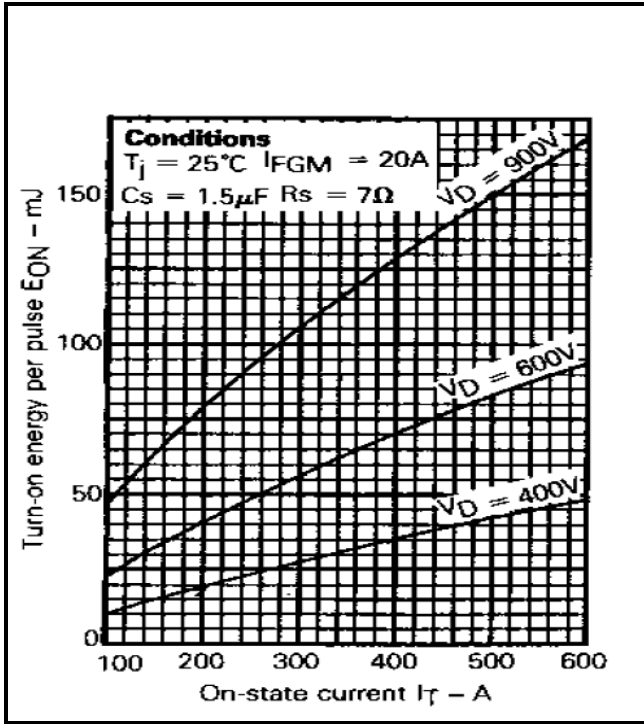


Fig.9 Turn-on energy vs on-state current

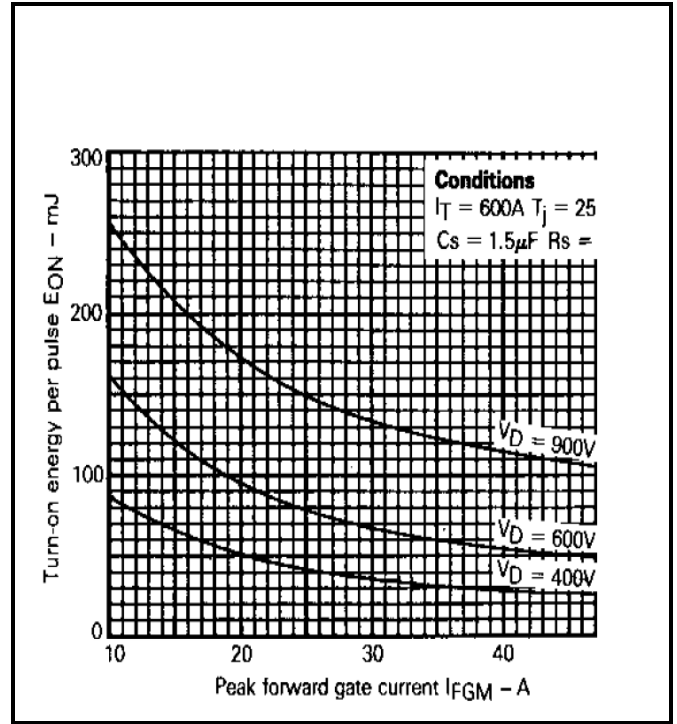


Fig.10 Turn-on energy vs peak forward gate current

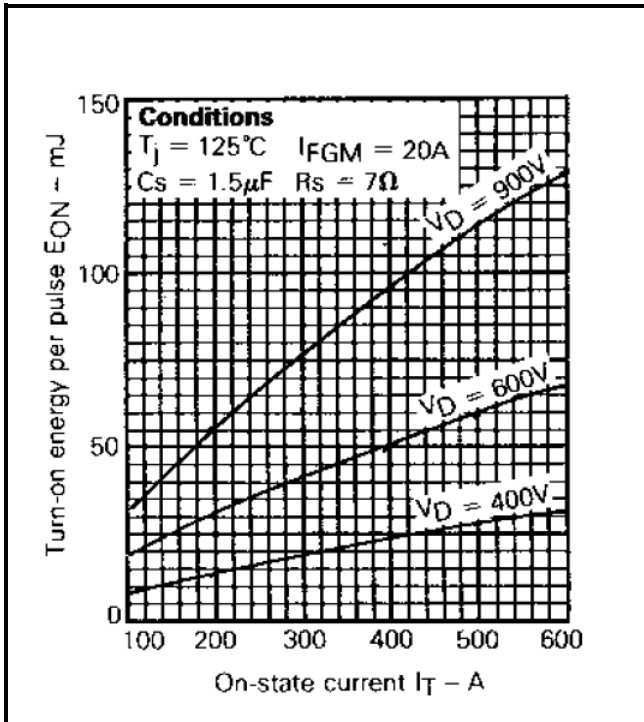


Fig.11 Turn-on energy vs on-state current

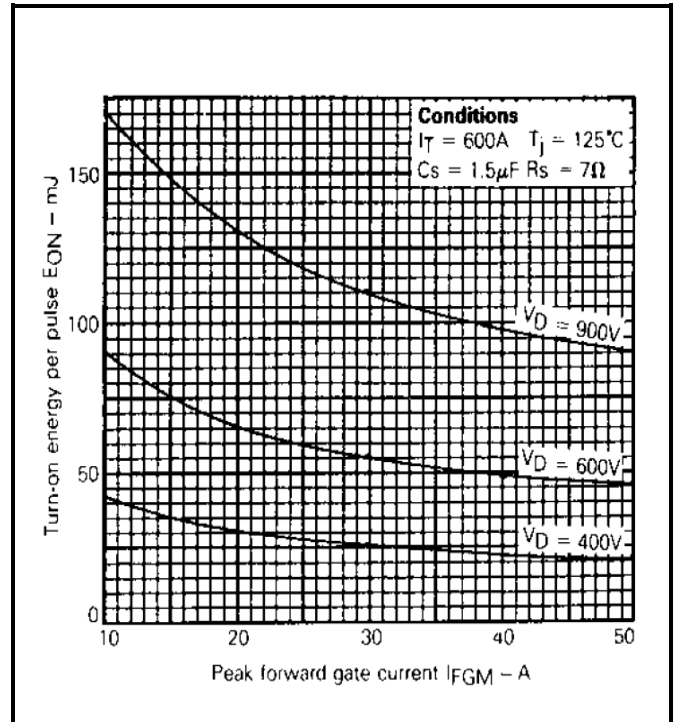


Fig.12 Turn-on energy vs peak forward gate current

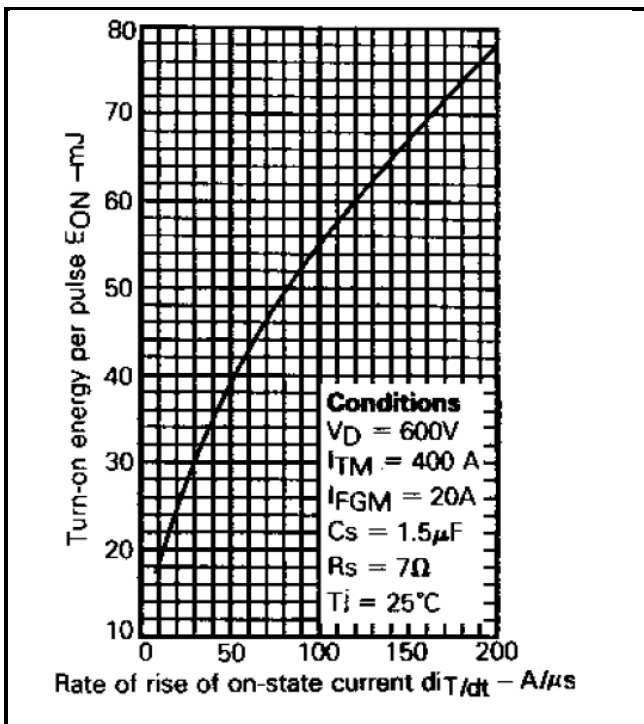


Fig.13 Turn-on energy vs rate of rise of on-state current

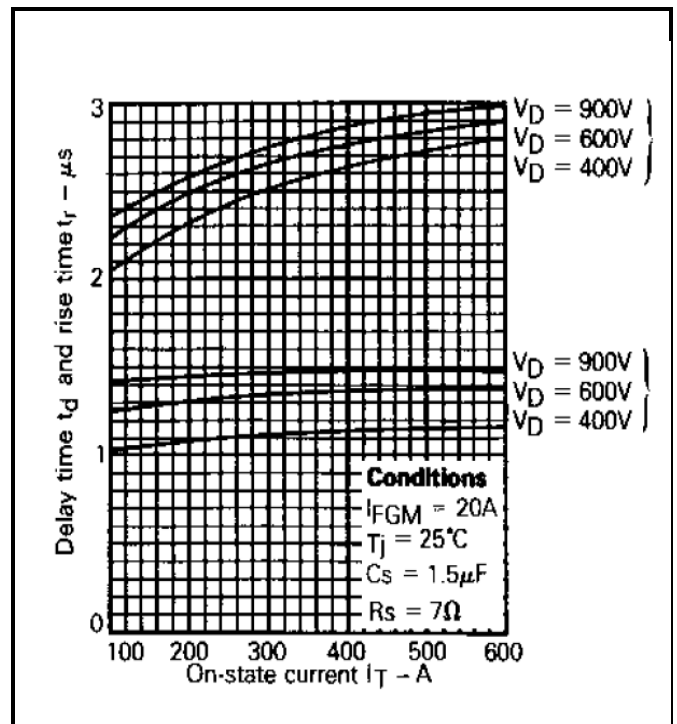


Fig.14 Delay time & rise time vs turn-on current

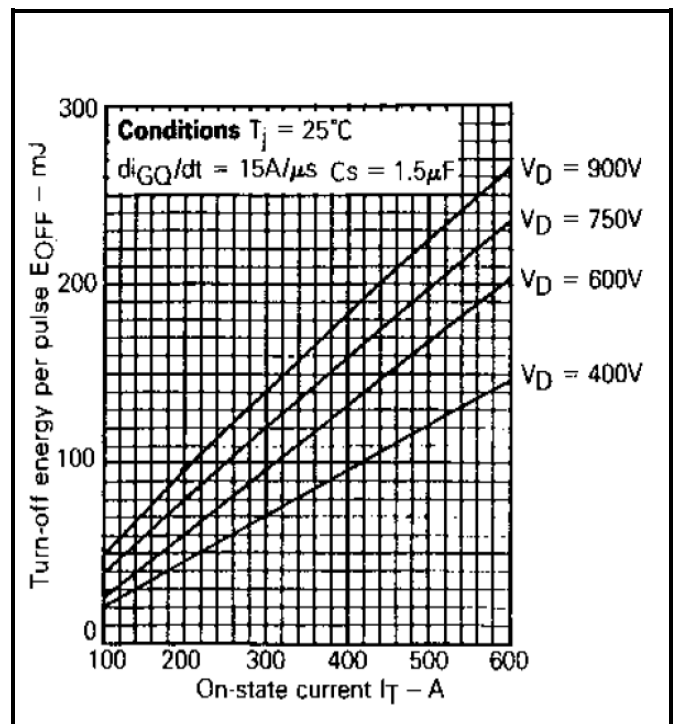
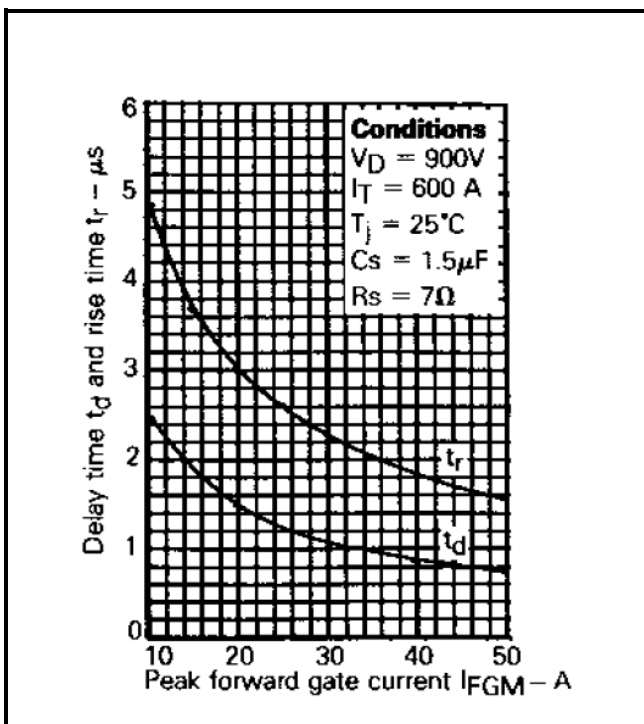




Fig.15 Delay time & rise time vs peak forward gate current

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

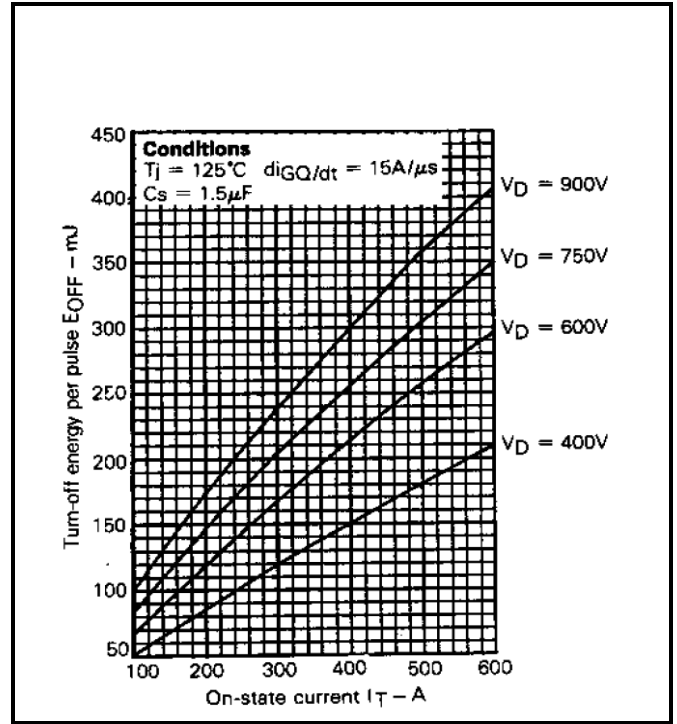
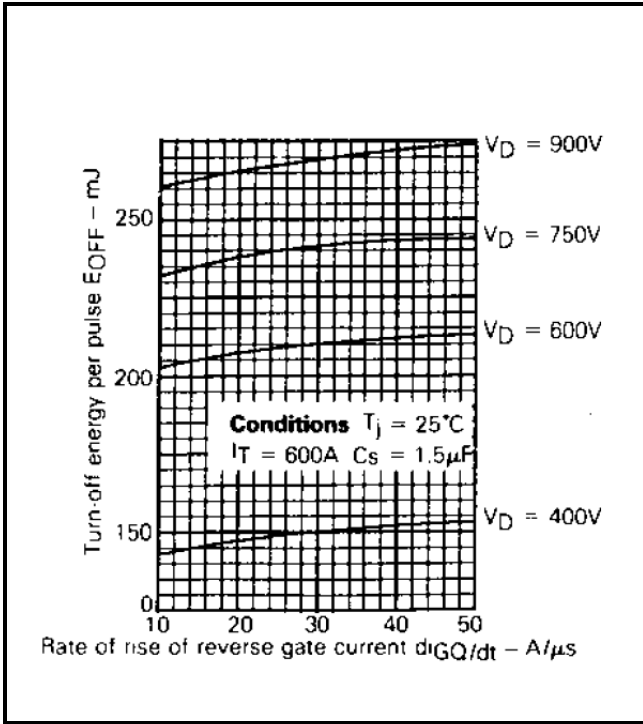


Fig.17 Turn-off energy vs rate of rise of reverse gate current

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

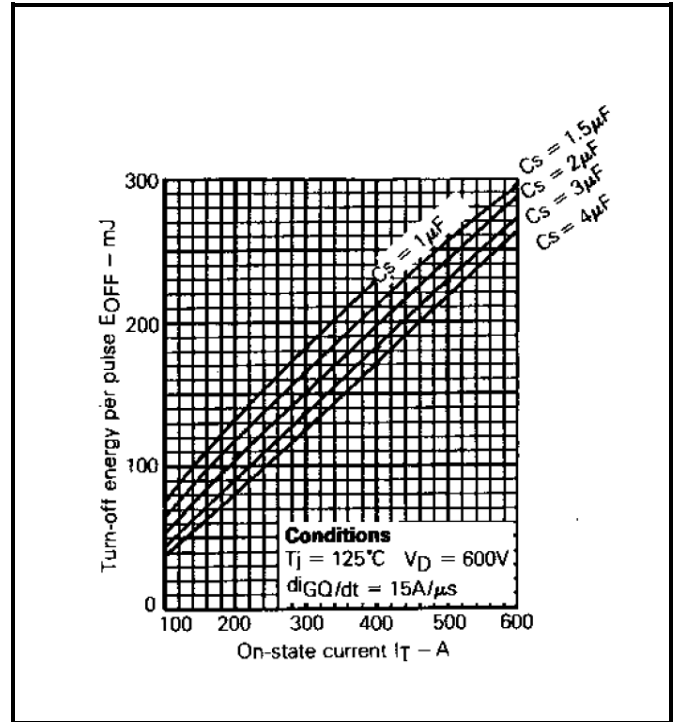
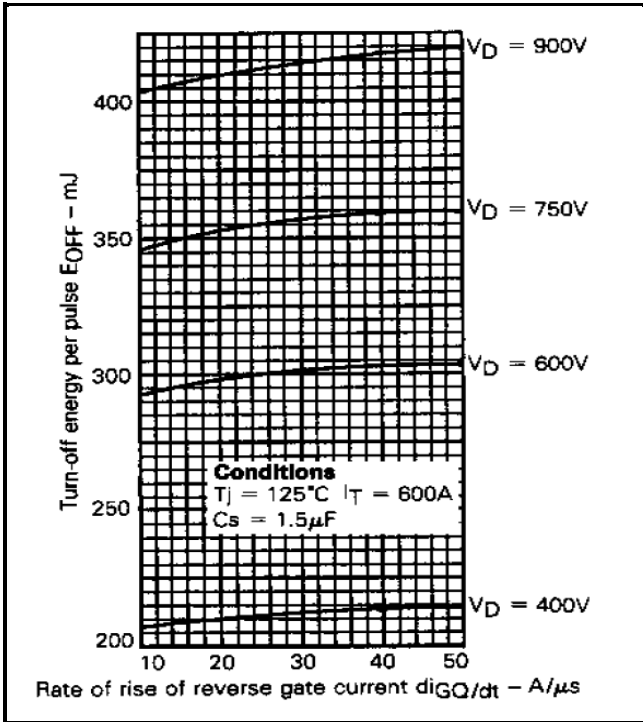


Fig.19 Turn-off energy vs rate of rise of reverse gate current

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



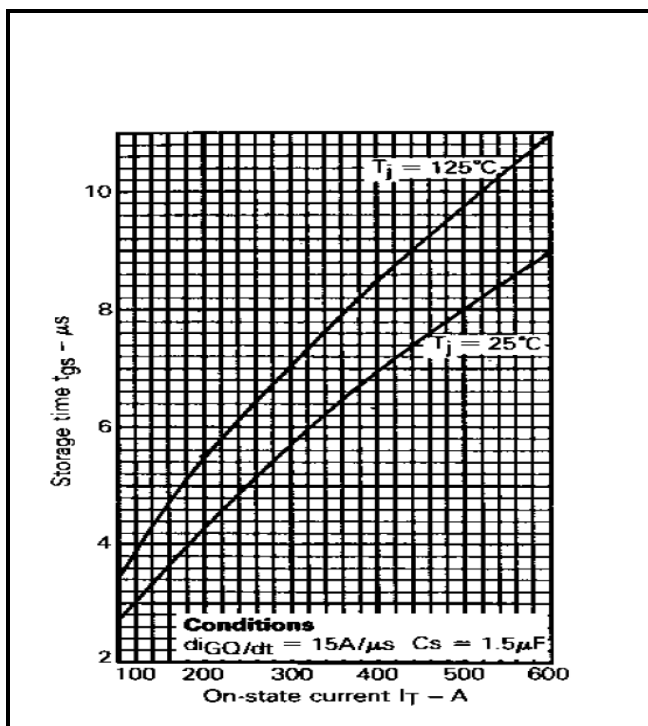


Fig.21 Gate storage time vs on-state current

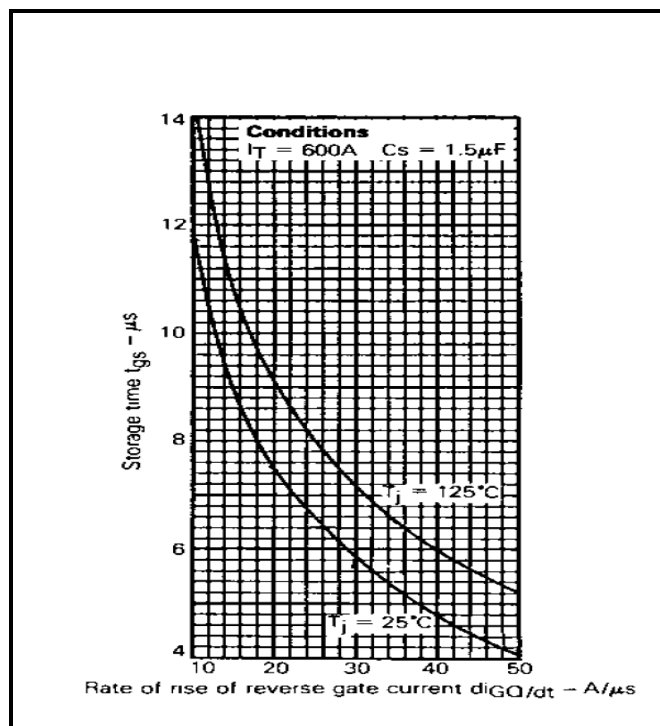


Fig.22 Gate storage time vs rate of rise of reverse gate current

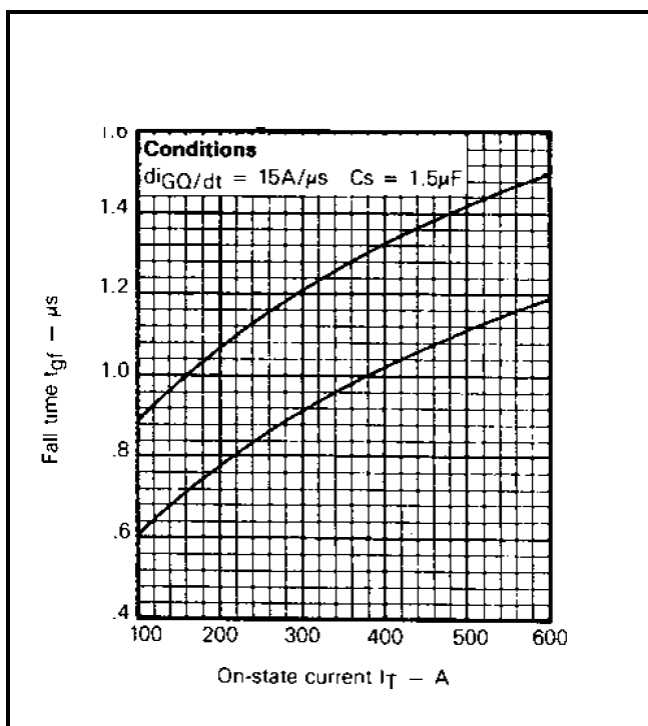


Fig.23 Gate fall time vs on-state current

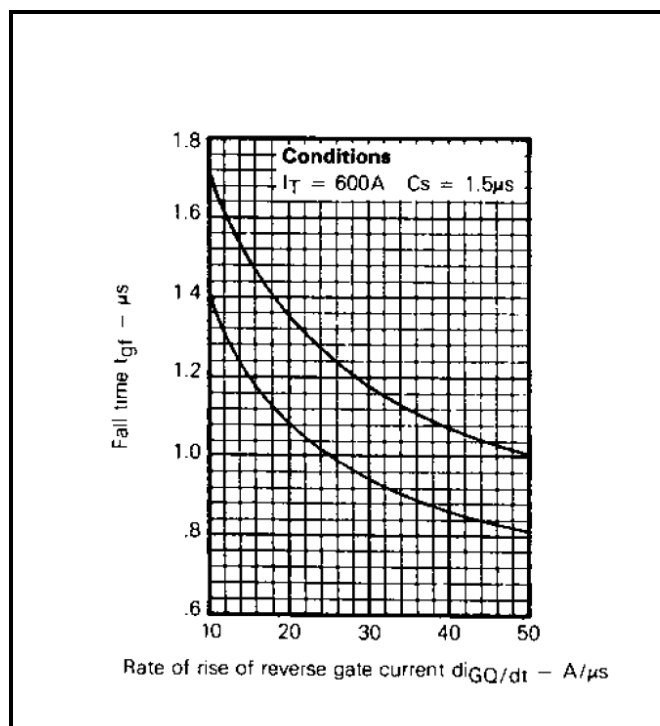


Fig.24 Gate fall time vs rate of rise of reverse gate current

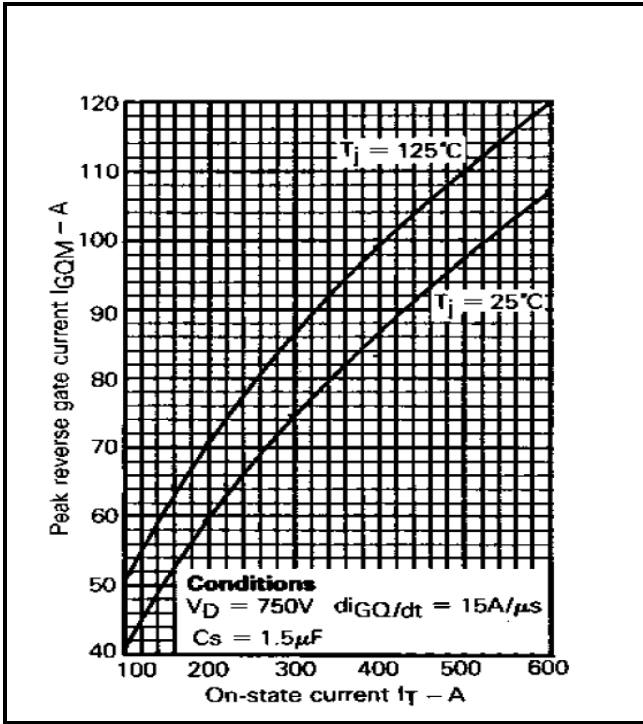


Fig.25 Peak reverse gate current vs turn-off current

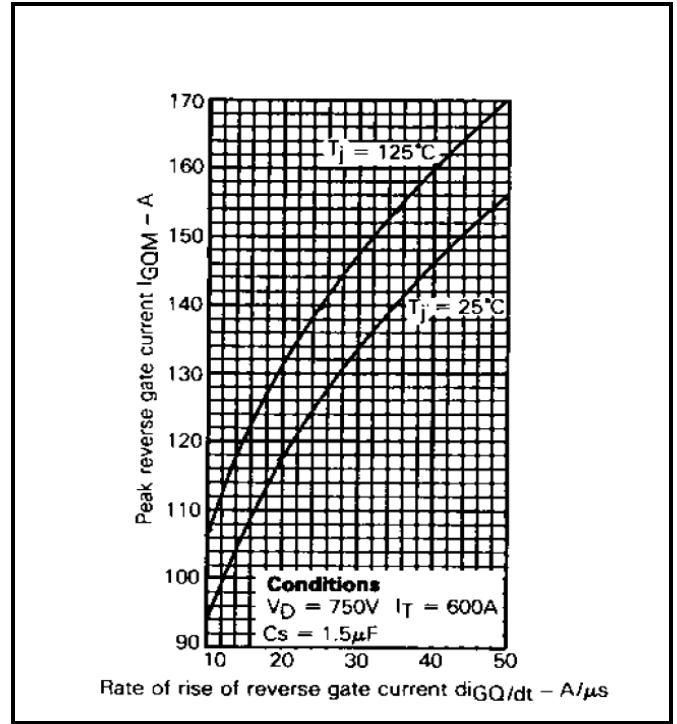


Fig.26 Peak reverse gate current vs rate of rise of reverse gate current

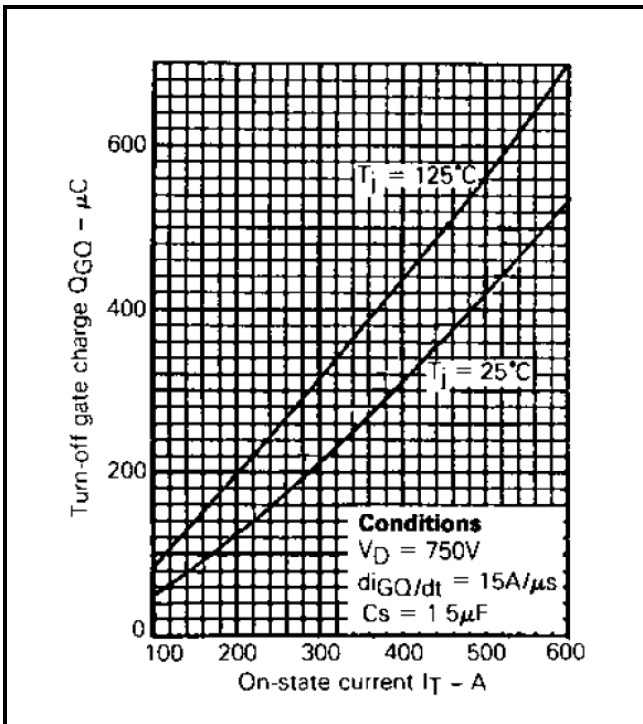


Fig.27 Turn-off gate charge vs on-state current

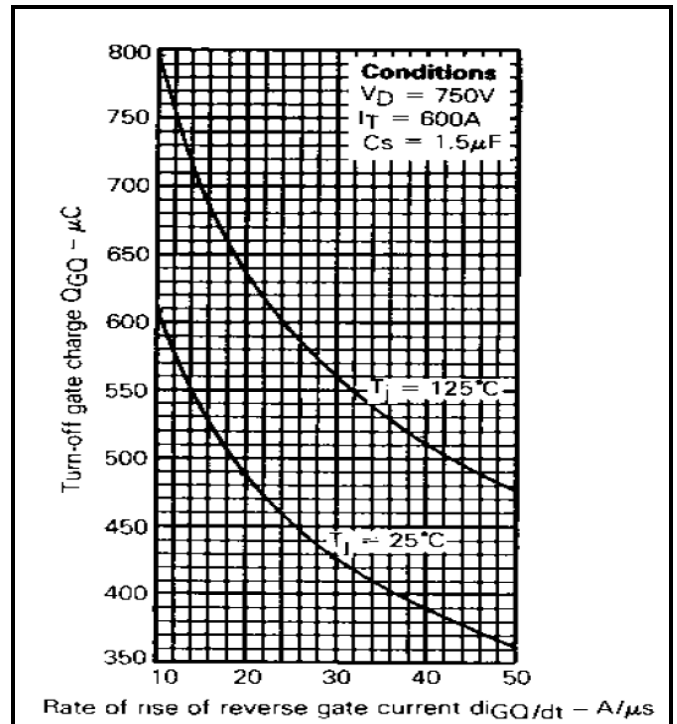
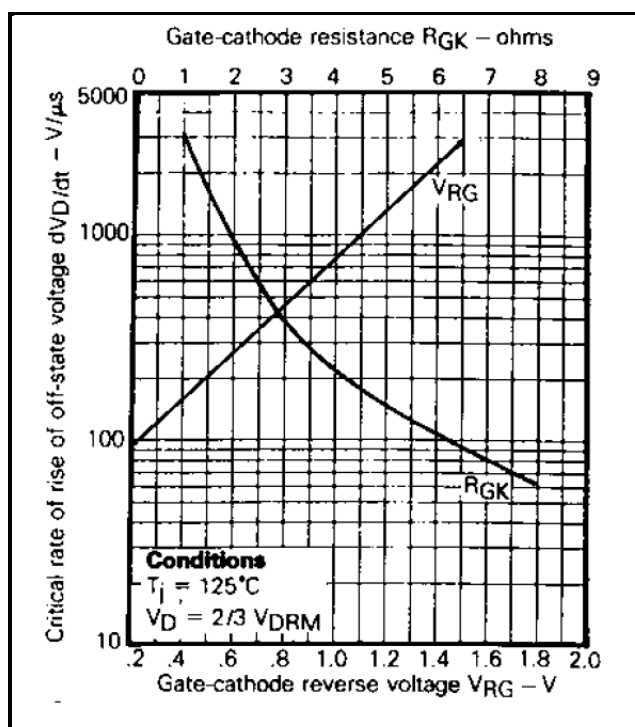


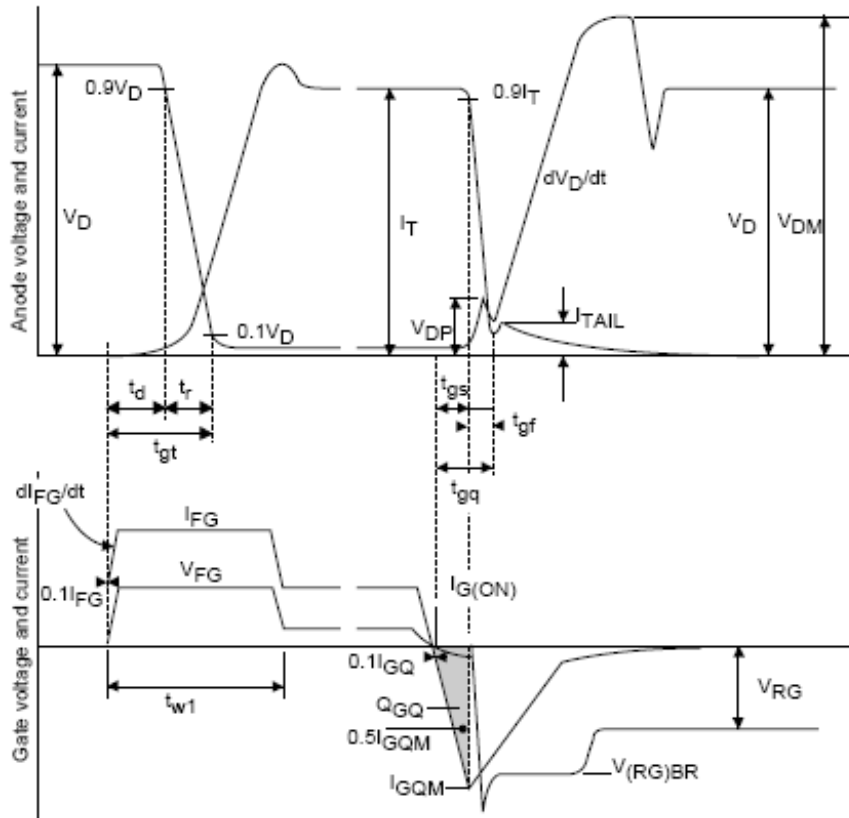
Fig.28 Turn-off gate charge vs rate of rise of reverse gate current



Snubber Capacitor $C_s$ ( $\mu F$ )	Snubber Resistor $R_s$ ( $\Omega$ )	Minimum Reset Time ( $\mu s$ )
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.

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



Recommended gate conditions:

- $I_{TCM} = 800A$
- $I_{FG} = 20A$
- $I_{G(ON)} = 2A$  d.c.
- $t_{w1(min)} = 10\mu s$
- $I_{GQM} = 190A$
- $di_{GQ}/dt = 15A/\mu s$
- $Q_{GQ} = 1300\mu C$
- $V_{RG(min)} = 2.0V$
- $V_{RG(max)} = 16V$

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

Fig.30 General switching waveforms

**PACKAGE DETAILS**

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

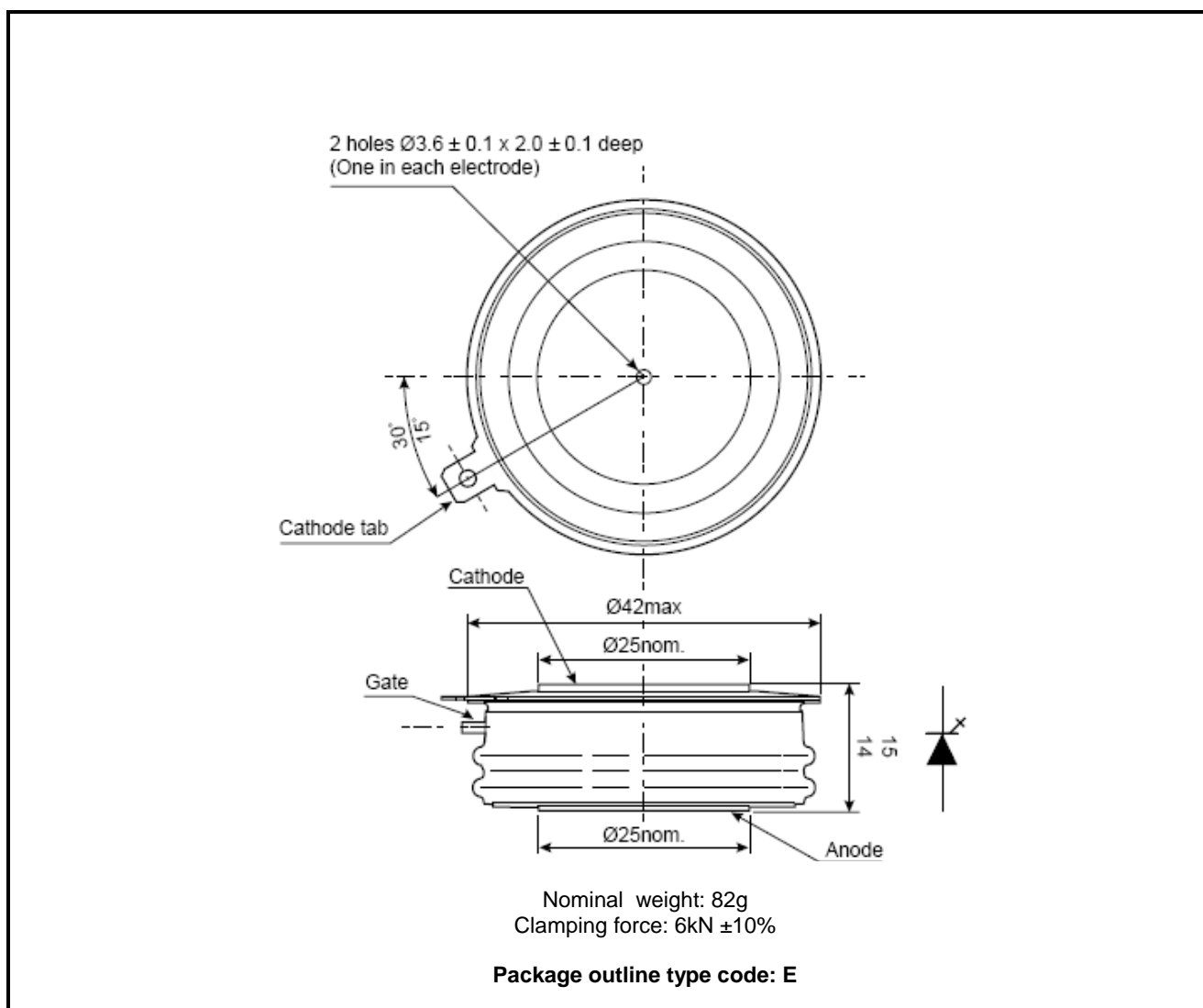


Fig.31 Package outline

### POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink and clamping systems in line with advances in device voltages and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group offers high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

### HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks which have been designed to optimise the performance of Dynex semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest sales representative or Customer Services.

Stresses above those listed in this data sheet may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed.



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