DGT409BCA

Reverse Blocking Gate Turn-off Thyristor

Replaces January 2000 version, DS4414-4.0

DS4414-4.1 February 2002

APPLICATIONS

The DGT409 BCA is a symmetrical GTO designed for applications which specifically require a reverse blocking capability, such as current source inverters (CSI). Reverse recovery ratings and characteristics are included.

KEY PARAMETERS

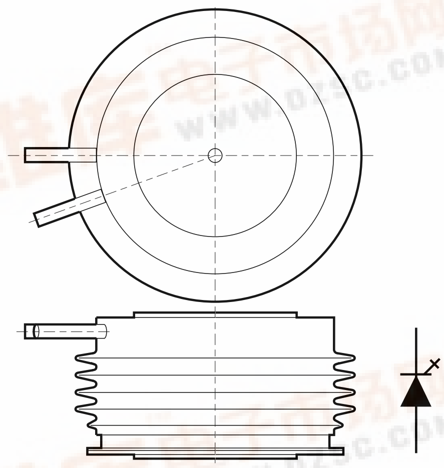
I_{TCM}	1500A
V_{DRM}/V_{DRM}	6500V
dV_D/dt	1000V/µs
di_T/dt	300A/µs

FEATURES

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

ORDERING INFORMATION

Order as: **DGT409BCA6565**



Outline type code: CA

See Package Details for further information

Fig. 1 Package outline

ABSOLUTE MAXIMUM RATINGS

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to Absolute Maximum Ratings for extended periods may affect device reliability.

T_j = 115°C unless staed otherwise

Symbol	Parameter	Conditions	Max.	Units
V_{DRM}	Repetitive peak off-state voltage	I_{DM} = 100mA	6500	V
V_{RRM}	Repetitive peak reverse voltage	I_{RRM} = 100mA	6500	V
I_{TCM}	Repetitive peak controllable on-state current	V_D = 4300V, di_{GQ}/dt = 20A/µs, C_S = 2.0µF	1500	A
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine.	3	kA
I^2t	I^2t for fusing	10ms half sine.	45 x 10^3	A^2s
di_T/dt	Critical rate of rise of on-state current	V_D = 3000V, I_T = 800A, I_{FG} > 20A, t_r > 1.5µs	300	A/µs
dV_D/dt	Rate of rise of off-state voltage	V_D = 3000V, $R_{GK} \leq 1.5\Omega$	175	V/µs
		V_D = 3000V, V_{RG} = –2V	1000	V/µs
L_S	Peak stray inductance in snubber circuit	I_T = 1500A, V_{DM} = 6000V, dI_{GQ}/dt = 20A/µs, C_S = 2µF	200	nH

GATE RATINGS

Symbol	Parameter	Conditions	Min.	Max.	Units
V_{RGM}	Peak reverse gate voltage	This value may be exceeded during turn-off	-	25	V
I_{FGM}	Peak forward gate current		20	70	A
$P_{FG(AV)}$	Average forward gate power		-	10	W
P_{RGM}	Peak reverse gate power		-	15	kW
di_{GQ}/dt	Rate of rise of reverse gate current		15	60	A/µs
$t_{ON(min)}$	Minimum permissable on time		50	-	µs
$t_{OFF(min)}$	Minimum permissable off time		150	-	µs
I_{RGM}	Continuous reverse gate-cathode current	V_{RGM} = 16V, No gate cathode resistor	-	50	mA

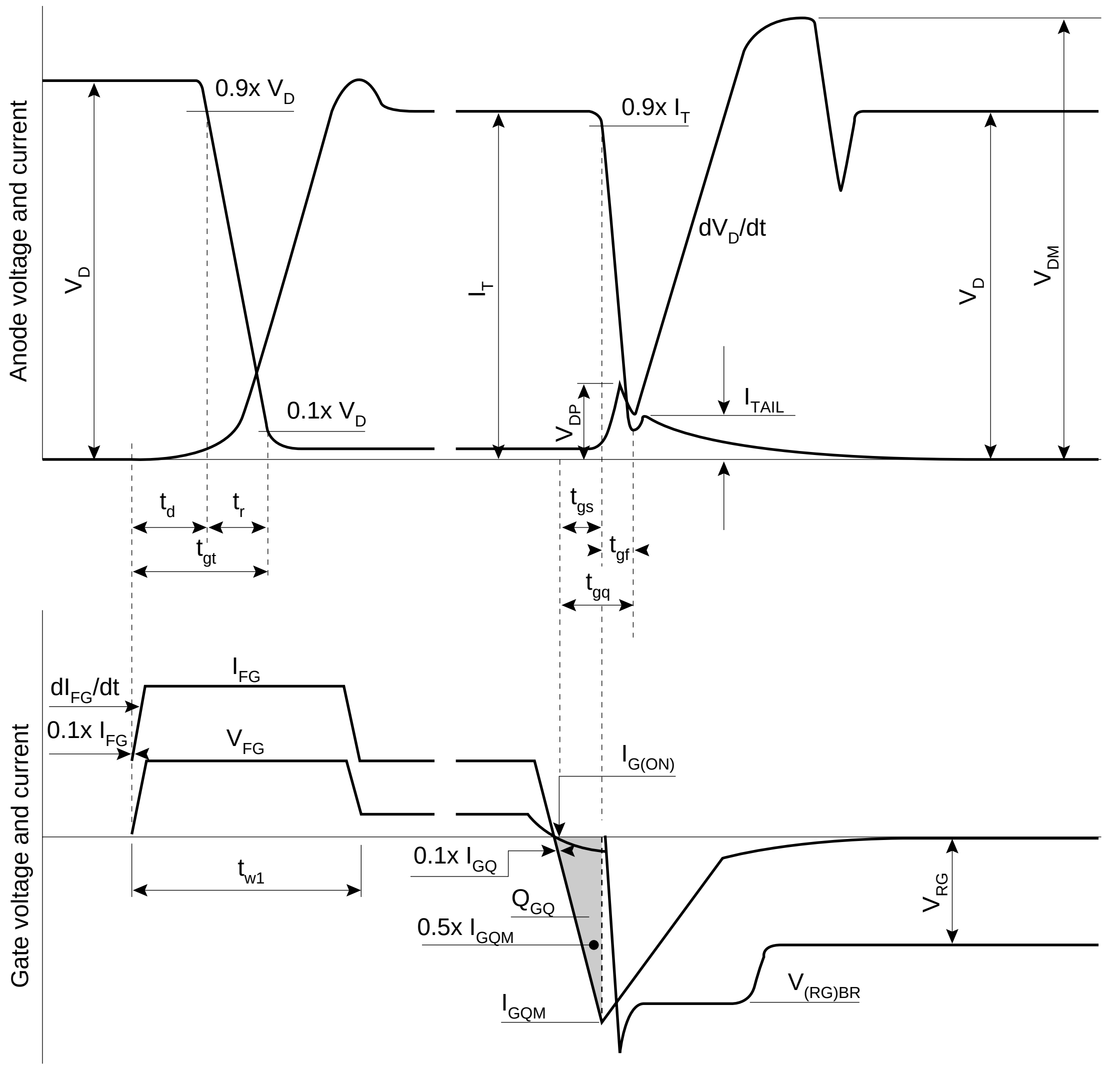
THERMAL RATINGS AND MECHANICAL DATA

Symbol	Parameter	Conditions		Min.	Max.	Units
$R_{th(j-hs)}$	DC thermal resistance - junction to heatsink surface	Double side cooled		-	0.046	°C/W
		Anode side cooled		-	0.073	°C/W
		Cathode side cooled		-	0.124	°C/W
$R_{th(c-hs)}$	Contact thermal resistance	Clamping force 12.0kN With mounting compound	per contact	-	0.009	°C/W
T_{vj}	Virtual junction temperature			-	115	°C
T_{OP}/T_{stg}	Operating junction/storage temperature range			-40	115	°C
-	Clamping force			11.0	15.0	kN

CHARACTERISTICS

T_j = 115°C unless stated otherwise

Symbol	Parameter	Conditions	Min.	Max.	Units
V_{TM}	On-state voltage	At 200A peak, $I_{G(ON)}$ = 4A d.c.	-	4	V
I_{DM}	Peak off-state current	V_{DRM} = 6500V, V_{RG} = 0V	-	100	mA
I_{RRM}	Peak reverse current	At V_{RRM} = 6500V	-	100	mA
V_{GT}	Gate trigger voltage	V_D = 24V, I_T = 100A, T_j = 25°C	-	1	V
I_{GT}	Gate trigger current	V_D = 24V, I_T = 100A, T_j = 25°C	-	2	A
I_{RGM}	Reverse gate cathode current	V_{RGM} = 16V, No gate/cathode resistor	-	50	mA
E_{ON}	Turn-on energy	V_D = 3000V	-	2500	mJ
t_d	Delay time	I_T = 400A, dI_T/dt = 150A/µs	-	3	µs
t_r	Rise time	I_{FG} = 20A, t_r < 1.5µs	-	7	µs
E_{OFF}	Turn-off energy	I_T = 800A, V_{DM} = 3000V Snubber Cap C_S = 2µF, di_{GQ}/dt = 20A/µs	-	2500	mJ
t_{gs}	Storage time		See Figs. 16 and 17		µs
t_{gf}	Fall time		See Figs. 16 and 17		µs
t_{gq}	Gate controlled turn-off time		See Figs. 16 and 17		µs
Q_{GQ}	Turn-off gate charge		-	3600	µC
Q_{GQT}	Total turn-off gate charge		-	7200	µC
I_{GQM}	Peak reverse gate current		-	350	A



Recommended gate conditions to switch off I_{TCM} = 800A:
I_{FG} = 30A
$I_{G(ON)}$ = 4A d.c.
$t_{w1(min)}$ = 20µs
I_{GQM} = 270A typical
di_{GQ}/dt = 30A/µs
Q_{GQ} = 2200µC
$V_{RG(min)}$ = 2V
$V_{RG(max)}$ = 15V

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

Fig.2 General switching waveforms

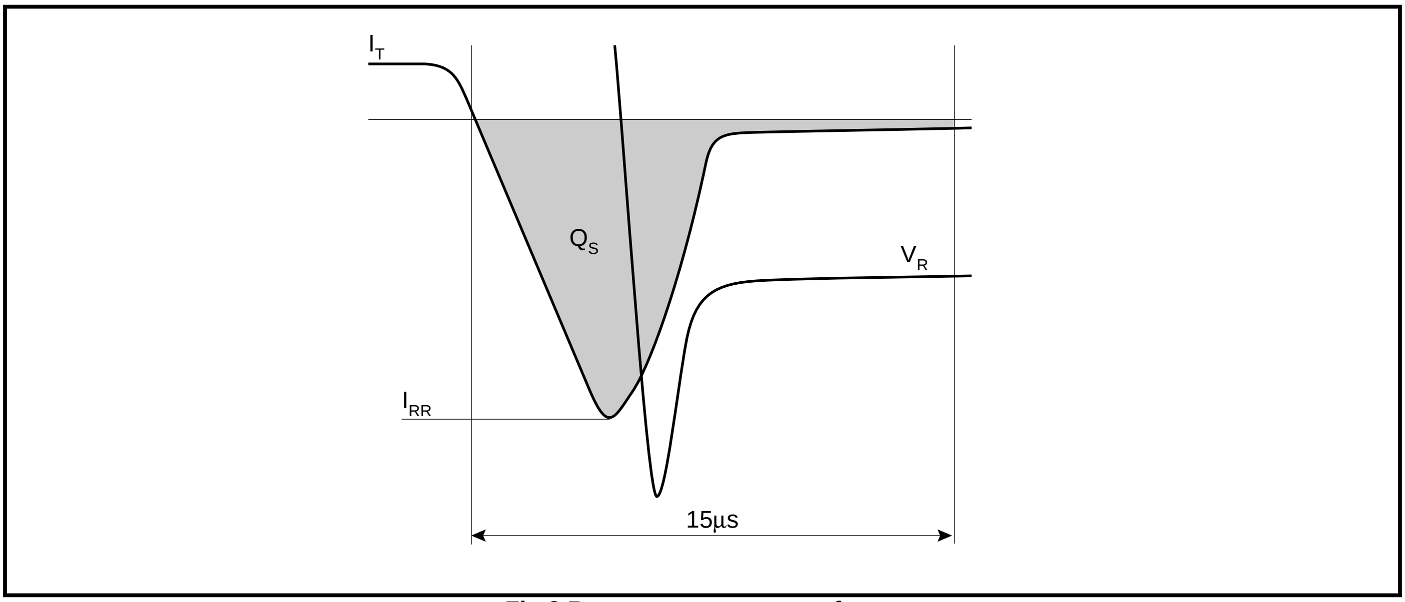


Fig.3 Reverse recovery waveforms

CURVES

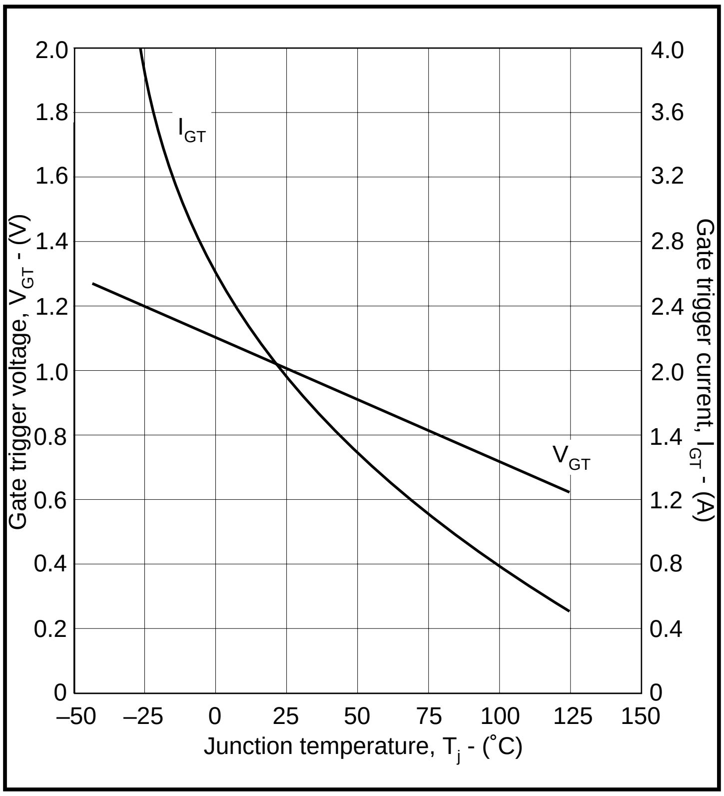


Fig.4 Maximum gate trigger voltage/current vs junction temperature

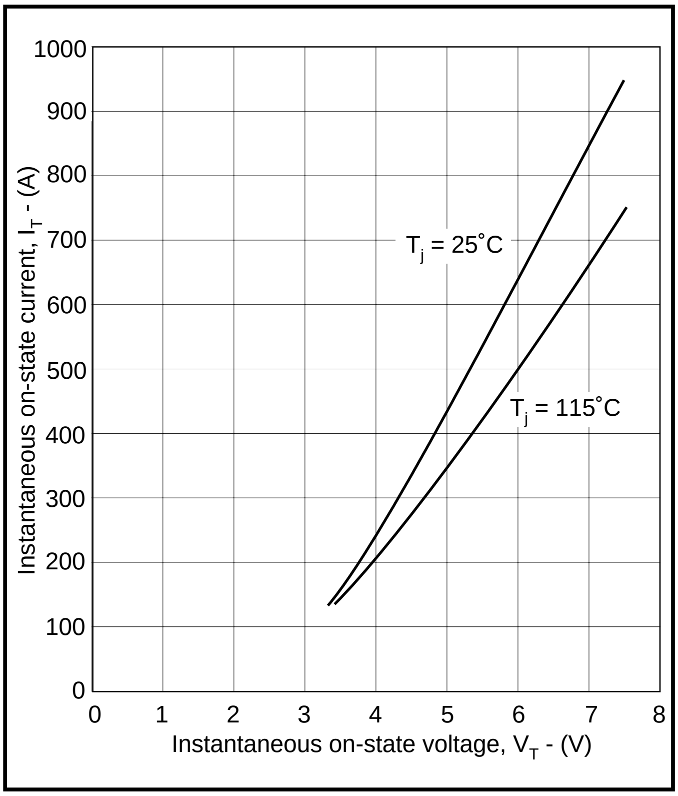


Fig.5 Maximum on-state characteristics

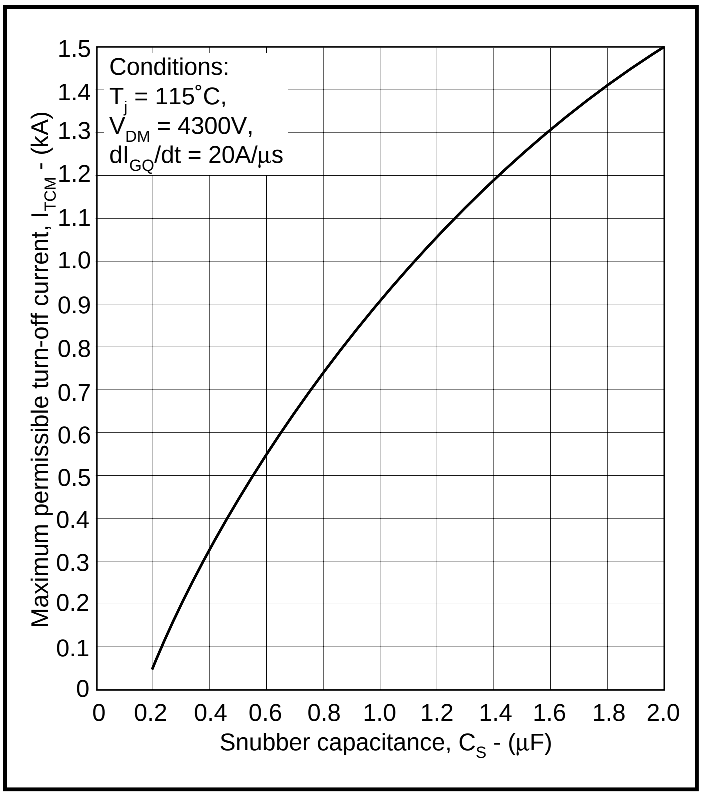


Fig.5 Maximum dependence of I_{TCM} on C_S

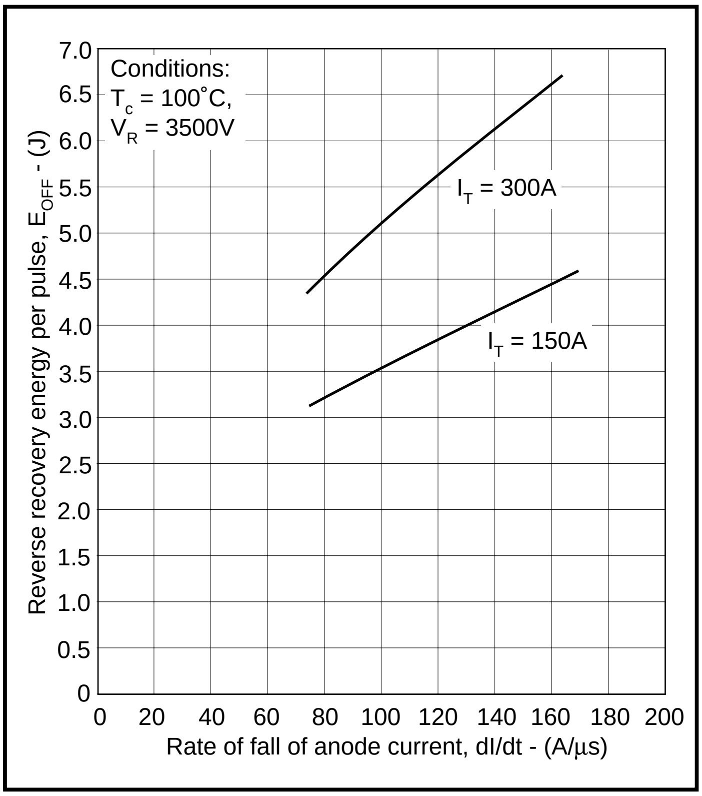


Fig.6 Maximum reverse recovery energy vs rate of fall of anode current

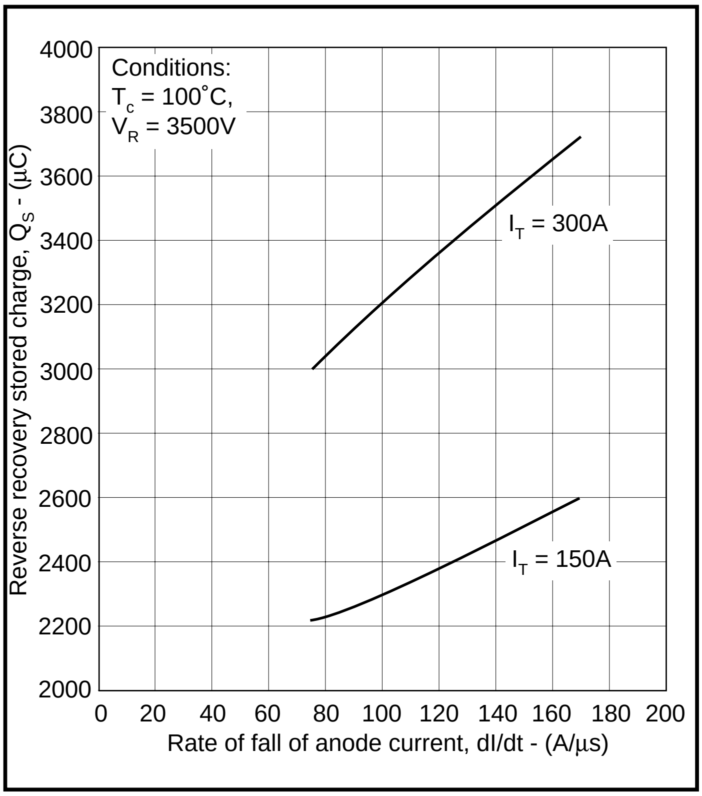


Fig.7 Maximum reverse recovery stored charge vs rate of fall of anode current

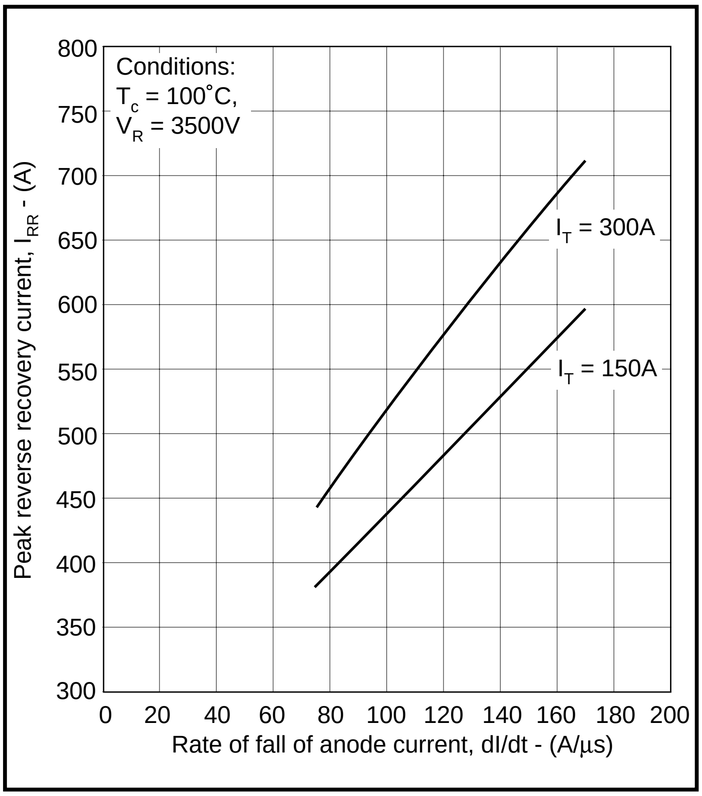


Fig.8 Maximum reverse recovery current vs rate of fall of anode current

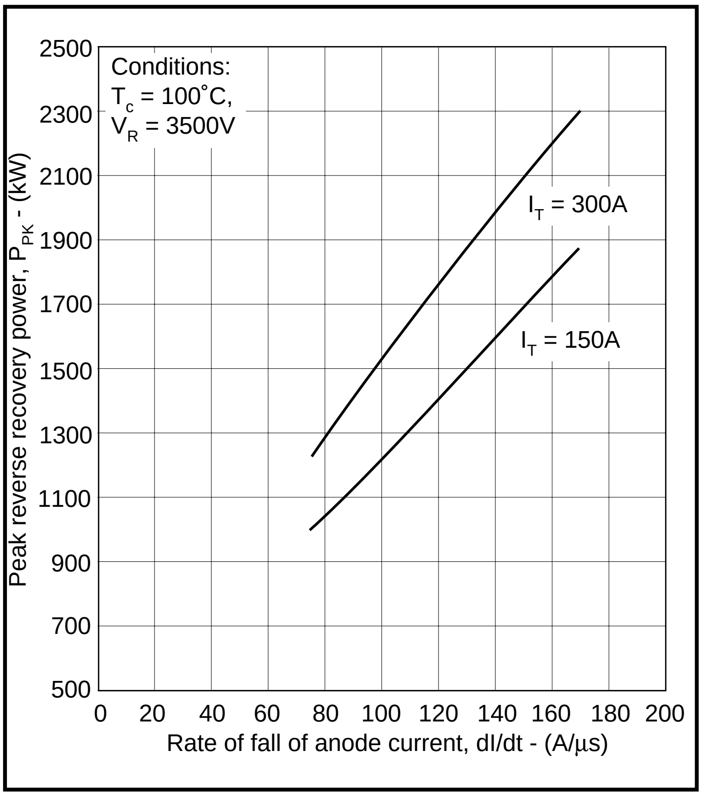


Fig.9 Maximum reverse recovery power vs rate of fall of anode current

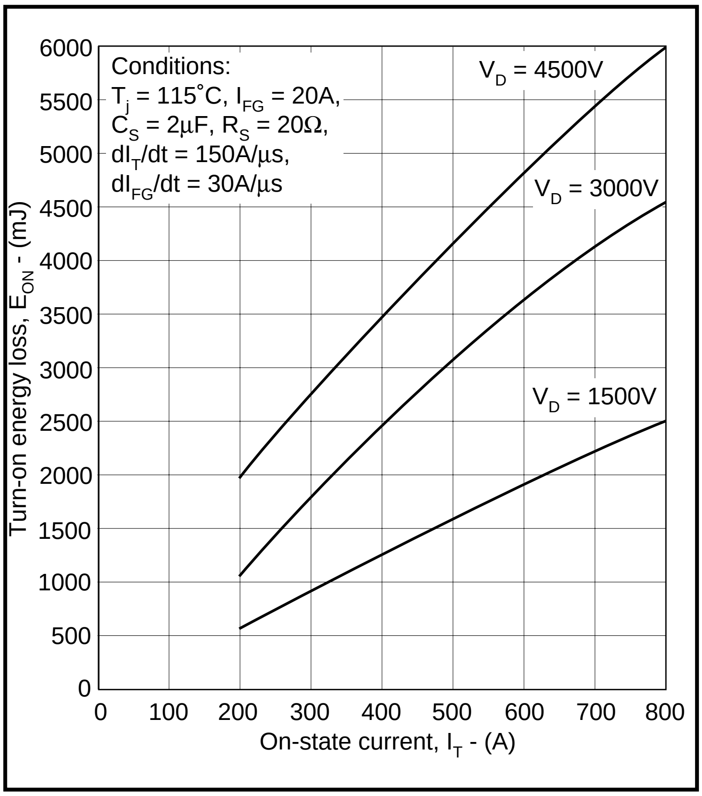


Fig.10 Turn-on energy vs on-state current

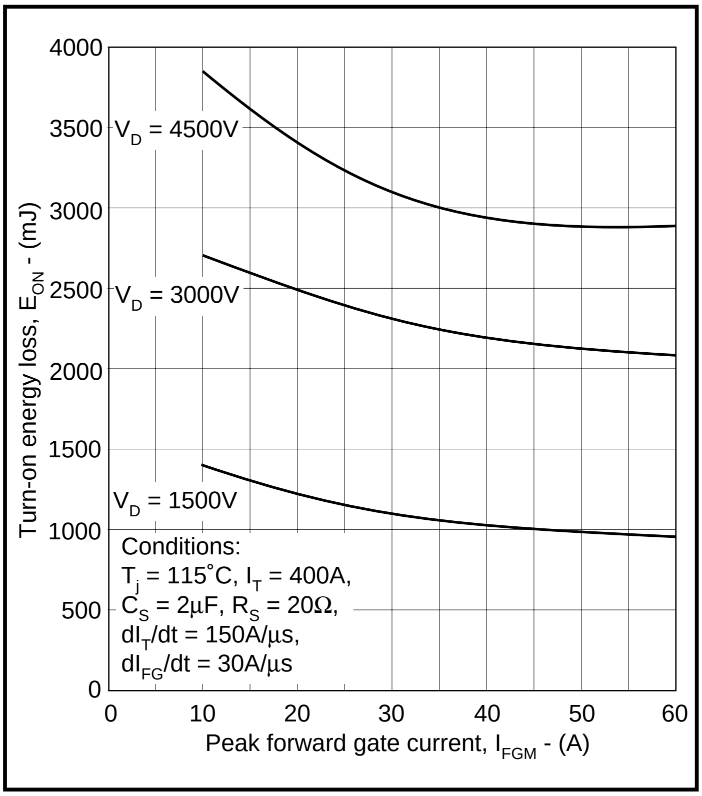


Fig.11 Turn-on energy vs peak forward gate current

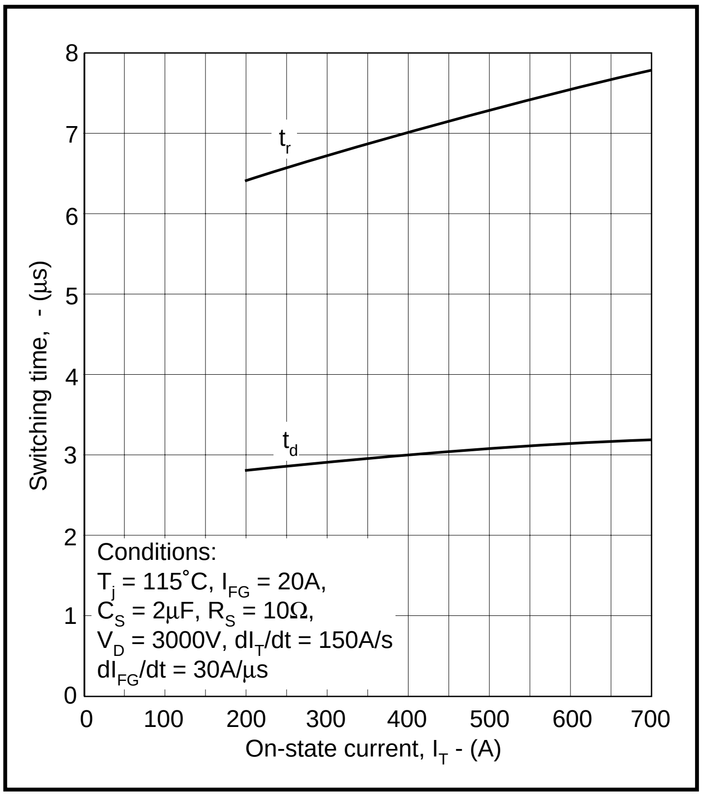


Fig.12 Delay time and rise time vs on-state current

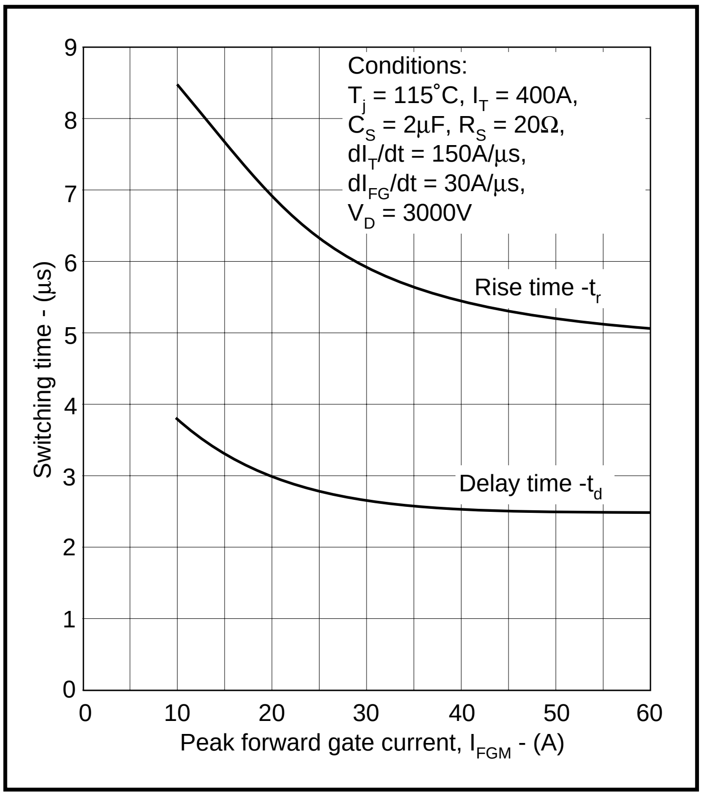


Fig.13 Switching times vs peak forward gate current

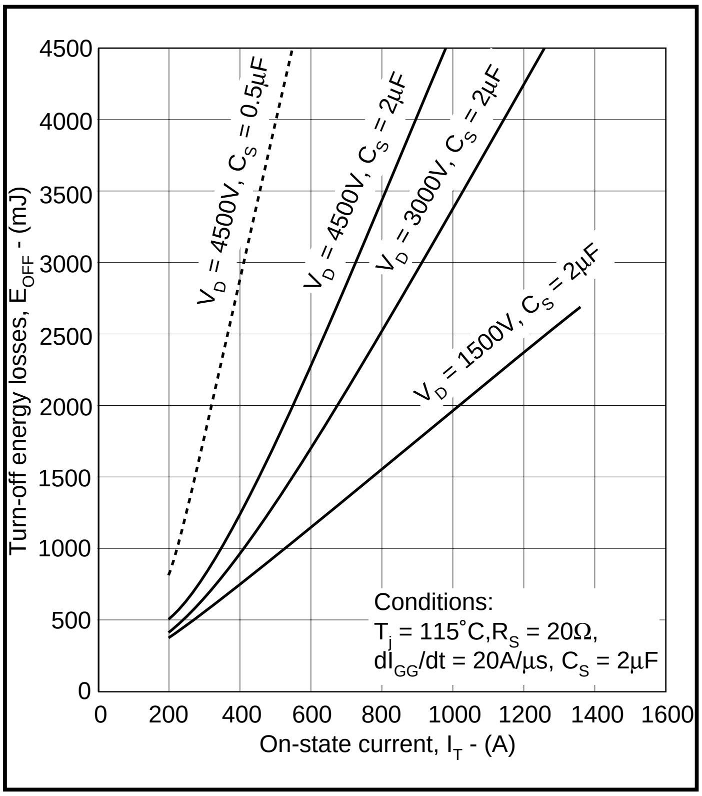


Fig.14 Maximum turn-off energy vs on-state current

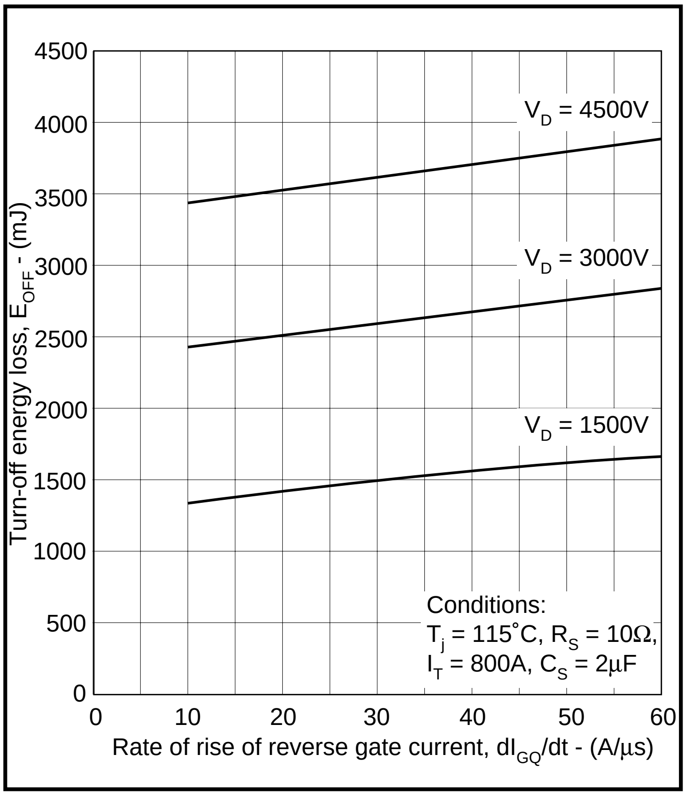


Fig.15 Turn-off energy vs rate of rise of reverse gate current

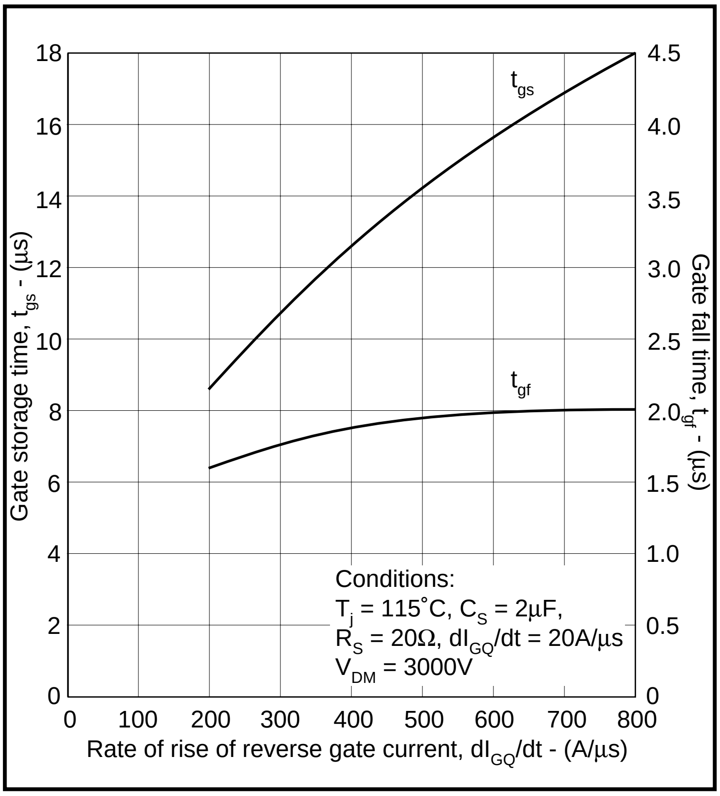


Fig.16 Gate storage time and fall time vs on-state current

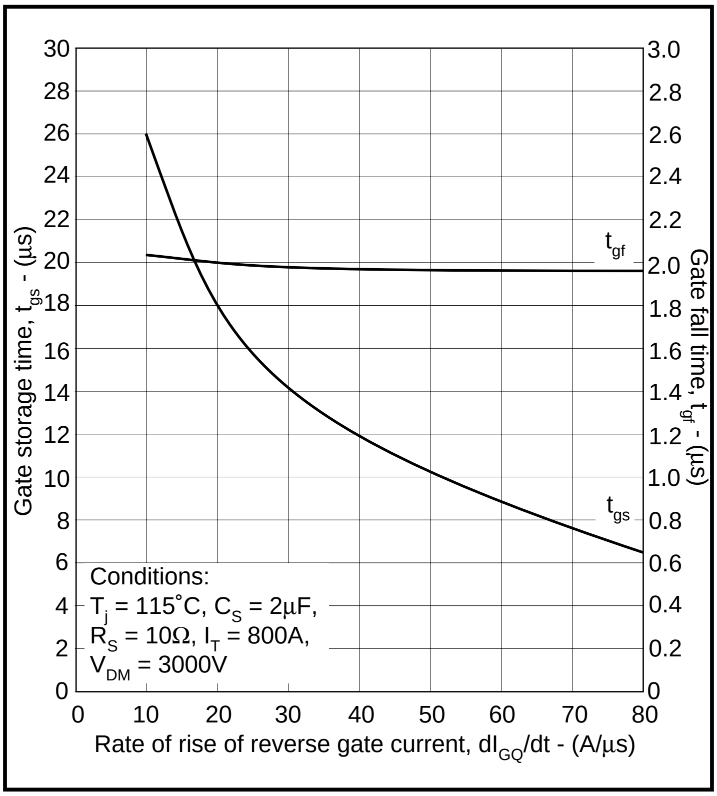


Fig.17 Gate storage time and fall time vs rate of rise of reverse gate current

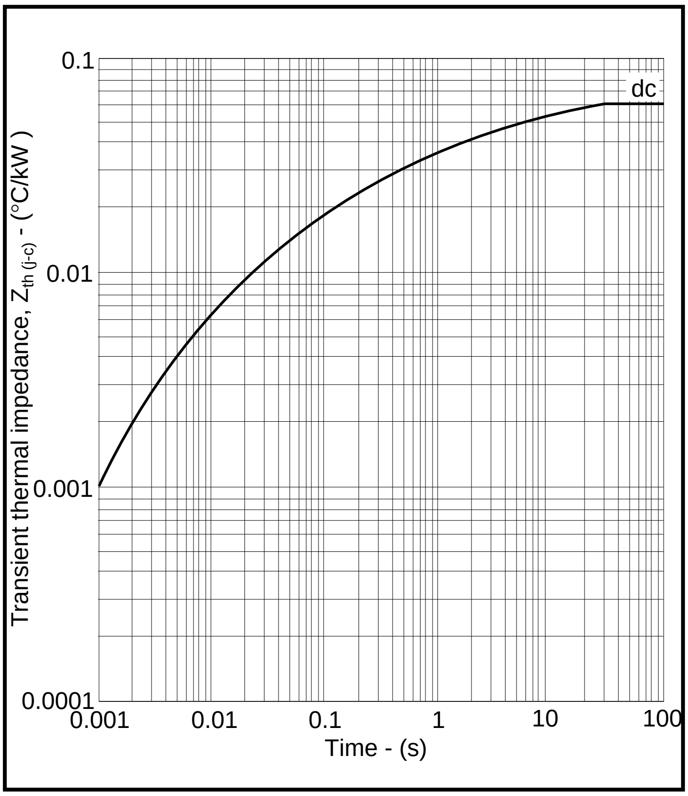
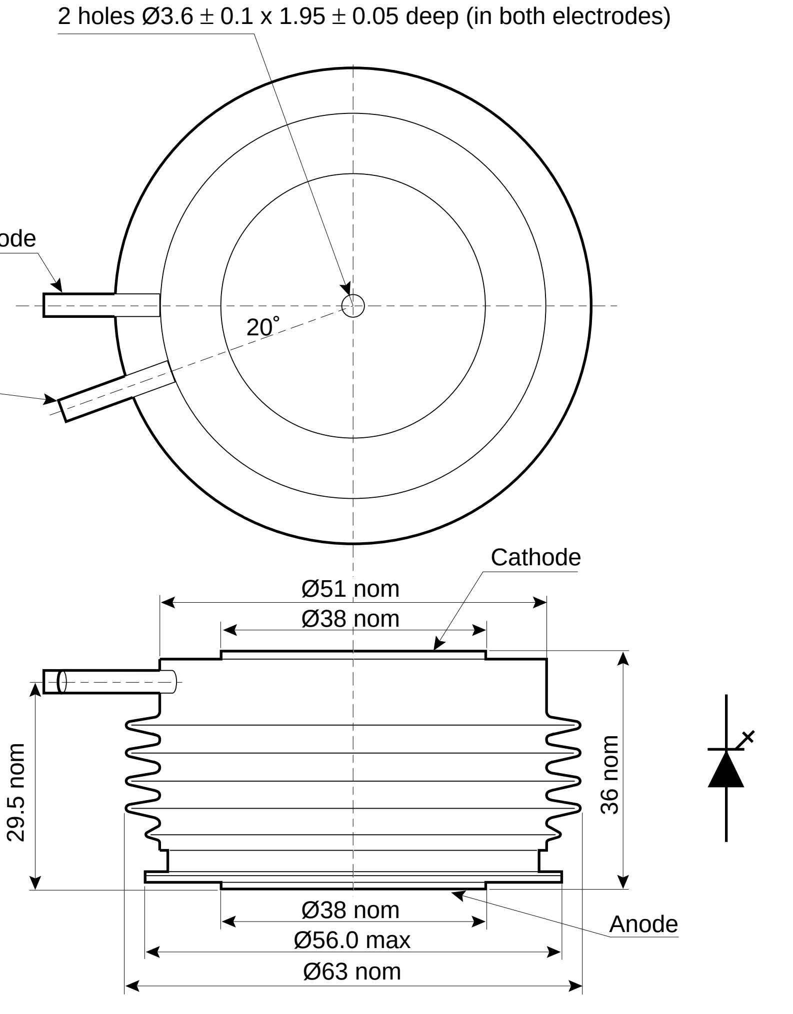


Fig.18 Maximum (limit) transient thermal impedance - double side cooled

PACKAGE DETAILS

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



Nominal weight: 350g
Clamping force: 12kN ±10%
Lead length: 505mm

Package outine type code: CA

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

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 continues to offer 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).

DEVICE CLAMPS

Disc devices require the correct clamping force to ensure their safe operation. The PACS range includes a varied selection of pre-loaded clamps to suit all of our manufactured devices. Types available include cube clamps for single side cooling of 'T' 23mm and 'E' 30mm discs, and bar clamps right up to 83kN for our 'Z' 100mm thyristors and diodes.

Clamps are available for single or double side cooling, with high insulation versions for high voltage assemblies.

Please refer to our application note on device clamping, AN4839

HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks. They 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.

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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.

Preliminary Information: The product is in design and development. The datasheet represents the product as it is understood but details may change.

Advance Information: The product design is complete and final characterisation for volume production is well in hand.

No Annotation: The product parameters are fixed and the product is available to datasheet specification.