



DG858DW45

Gate Turn-Off Thyristor

Replaces July 1999 version, DS4334-4.0

DS4334-4.1 May 2000

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

KEY PARAMETERS

I_{TCM}	3000A
V_{DRM}	4500V
$I_{T(AV)}$	1100A
dV_D/dt	750V/ μ s
dI_T/dt	300A/ μ s

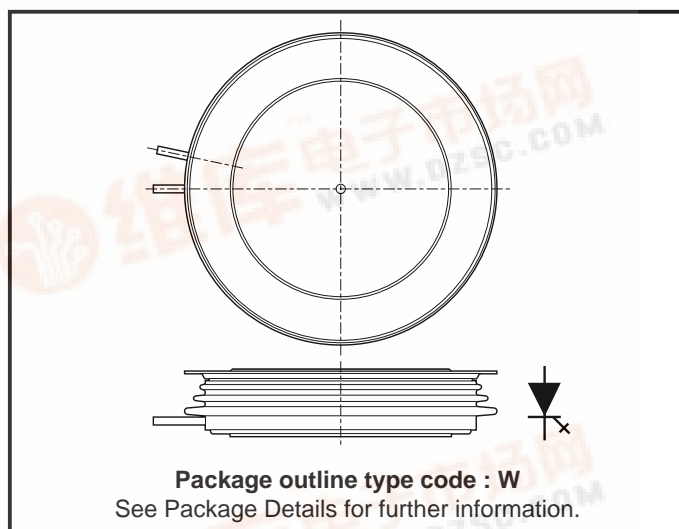


Fig.1 Package outline

VOLTAGE RATINGS

Type Number	Repetitive Peak Off-state Voltage V_{DRM} V	Repetitive Peak Reverse Voltage V_{RRM} V	Conditions
DG858DW45	4500	16	$T_{vj} = 125^{\circ}\text{C}$, $I_{DRM} = 100\text{mA}$, $I_{RRM} = 50\text{mA}$

CURRENT RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TCM}	Repetitive peak controllable on-state current	$V_D = V_{DRM}$, $T_j = 125^{\circ}\text{C}$, $di_{GQ}/dt = 40\text{A}/\mu\text{s}$, $C_s = 4.0\mu\text{F}$, $L_s \leq 200\text{nH}$	3000	A
$I_{T(AV)}$	Mean on-state current	$T_{HS} = 80^{\circ}\text{C}$. Double side cooled, half sine 50Hz.	1100	A
$I_{T(RMS)}$	RMS on-state current	$T_{HS} = 80^{\circ}\text{C}$. Double side cooled, half sine 50Hz.	1720	A

DG858DW45

SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine. $T_j = 125^\circ\text{C}$	20.0	kA
I^2t	I^2t for fusing	10ms half sine. $T_j = 125^\circ\text{C}$	2.0×10^6	A^2s
di_T/dt	Critical rate of rise of on-state current	$V_D = 3000\text{V}$, $I_T = 3000\text{A}$, $T_j = 125^\circ\text{C}$ $I_{FG} > 40\text{A}$, Rise time $< 1.0\mu\text{s}$	300	$\text{A}/\mu\text{s}$
dV_D/dt	Rate of rise of off-state voltage	To 66% V_{DRM} ; $R_{GK} \leq 22\Omega$, $T_j = 125^\circ\text{C}$	20	$\text{V}/\mu\text{s}$
		To 66% V_{DRM} ; $V_{RG} = -2\text{V}$, $T_j = 125^\circ\text{C}$	750	$\text{V}/\mu\text{s}$
L_S	Peak stray inductance in snubber circuit	$I_T = 3000\text{A}$, $V_D = V_{DRM}$, $T_j = 125^\circ\text{C}$, $di_{GQ}/dt = 40\text{A}/\mu\text{s}$, $C_s = 4.0\mu\text{F}$	200	nH

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		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	$\text{A}/\mu\text{s}$
$t_{ON(min)}$	Minimum permissable on time		50	-	μs
$t_{OFF(min)}$	Minimum permissable off time		100	-	μs

THERMAL AND MECHANICAL DATA

Symbol	Parameter	Conditions		Min.	Max.	Units
$R_{th(j-hs)}$	DC thermal resistance - junction to heatsink surface	Double side cooled		-	0.011	$^\circ\text{C}/\text{W}$
		Anode side cooled		-	0.017	$^\circ\text{C}/\text{W}$
		Cathode side cooled		-	0.03	$^\circ\text{C}/\text{W}$
$R_{th(c-hs)}$	Contact thermal resistance	Clamping force 40kN With mounting compound	per contact	-	0.0021	$^\circ\text{C}/\text{W}$
T_{vj}	Virtual junction temperature			-40	125	$^\circ\text{C}$
T_{OP}/T_{stg}	Operating junction/storage temperature range			-40	125	$^\circ\text{C}$
-	Clamping force			36.0	44.0	kN

CHARACTERISTICS

$T_j = 125^\circ\text{C}$ unless stated otherwise					
Symbol	Parameter	Conditions	Min.	Max.	Units
V_{TM}	On-state voltage	At 3000A peak, $I_{G(ON)} = 10\text{A d.c.}$	-	3.85	V
I_{DM}	Peak off-state current	$V_{DRM} = 4500\text{V}$, $V_{RG} = 2\text{V}$	-	100	mA
I_{RRM}	Peak reverse current	At V_{RRM}	-	50	mA
V_{GT}	Gate trigger voltage	$V_D = 24\text{V}$, $I_T = 100\text{A}$, $T_j = 25^\circ\text{C}$	-	1.2	V
I_{GT}	Gate trigger current	$V_D = 24\text{V}$, $I_T = 100\text{A}$, $T_j = 25^\circ\text{C}$	-	4.0	A
I_{RGM}	Reverse gate cathode current	$V_{RGM} = 16\text{V}$, No gate/cathode resistor	-	50	mA
E_{ON}	Turn-on energy	$V_D = 2000\text{V}$	-	4400	mJ
t_d	Delay time	$I_T = 3000\text{A}$, $dI_T/dt = 300\text{A}/\mu\text{s}$ $I_{FG} = 40\text{A}$, rise time $< 1.0\mu\text{s}$	-	2.0	μs
t_r	Rise time		-	6.0	μs
E_{OFF}	Turn-off energy	$I_T = 3000\text{A}$, $V_{DM} = 4200\text{V}$ Snubber Cap $C_s = 4.0\mu\text{F}$, $di_{GQ}/dt = 40/\mu\text{s}$	-	12500	mJ
t_{gs}	Storage time		-	26	μs
t_{gf}	Fall time		-	2.5	μs
t_{gq}	Gate controlled turn-off time		-	28.5	μs
Q_{GQ}	Turn-off gate charge		-	12500	μC
Q_{GQT}	Total turn-off gate charge		-	25000	μC
I_{GQM}	Peak reverse gate current		-	950	A

RELIABILITY

	Conditions	Limit	Units
DC blocking reliability	$V_{dc} = 3500\text{V}$, $T_j = -40$ to $+125^\circ\text{C}$, ambient cosmic radiation at sea level, in open air, 100% duty cycle.	100	FIT

DG858DW45

CURVES

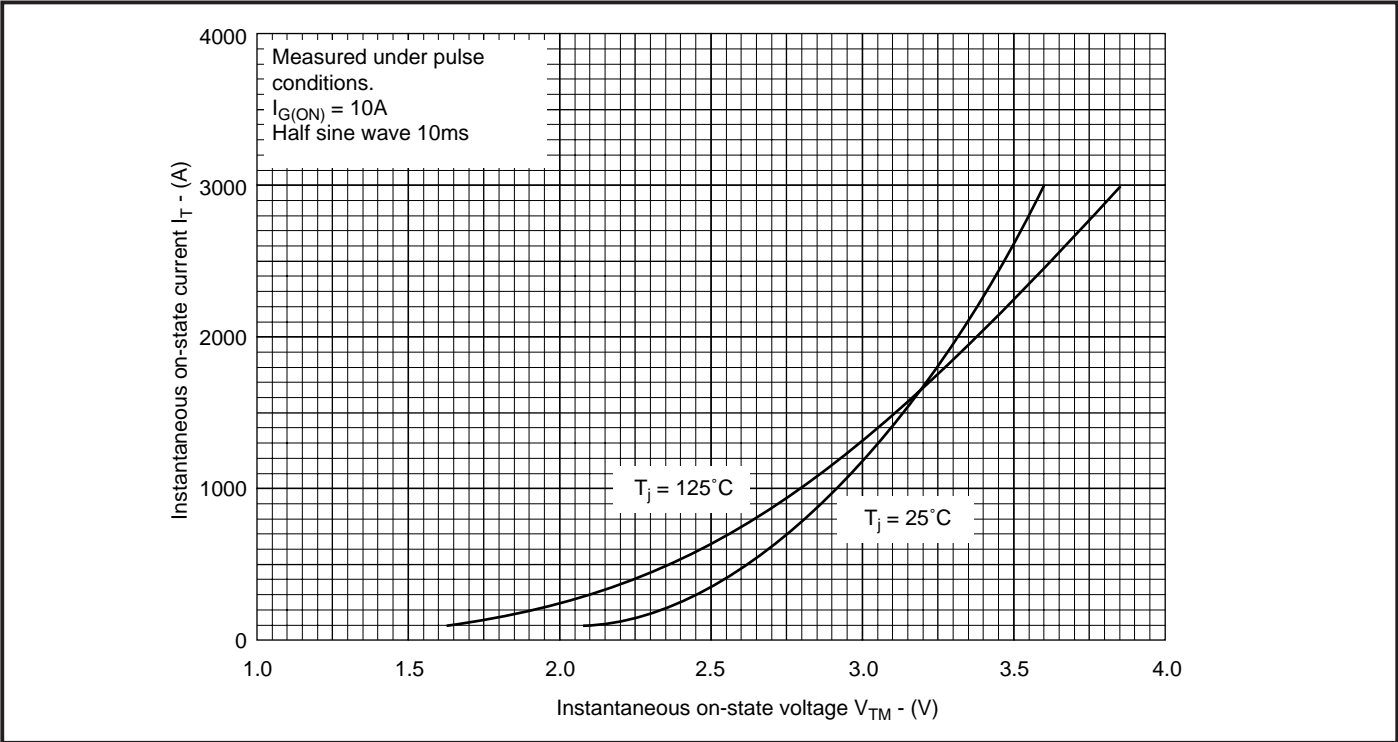
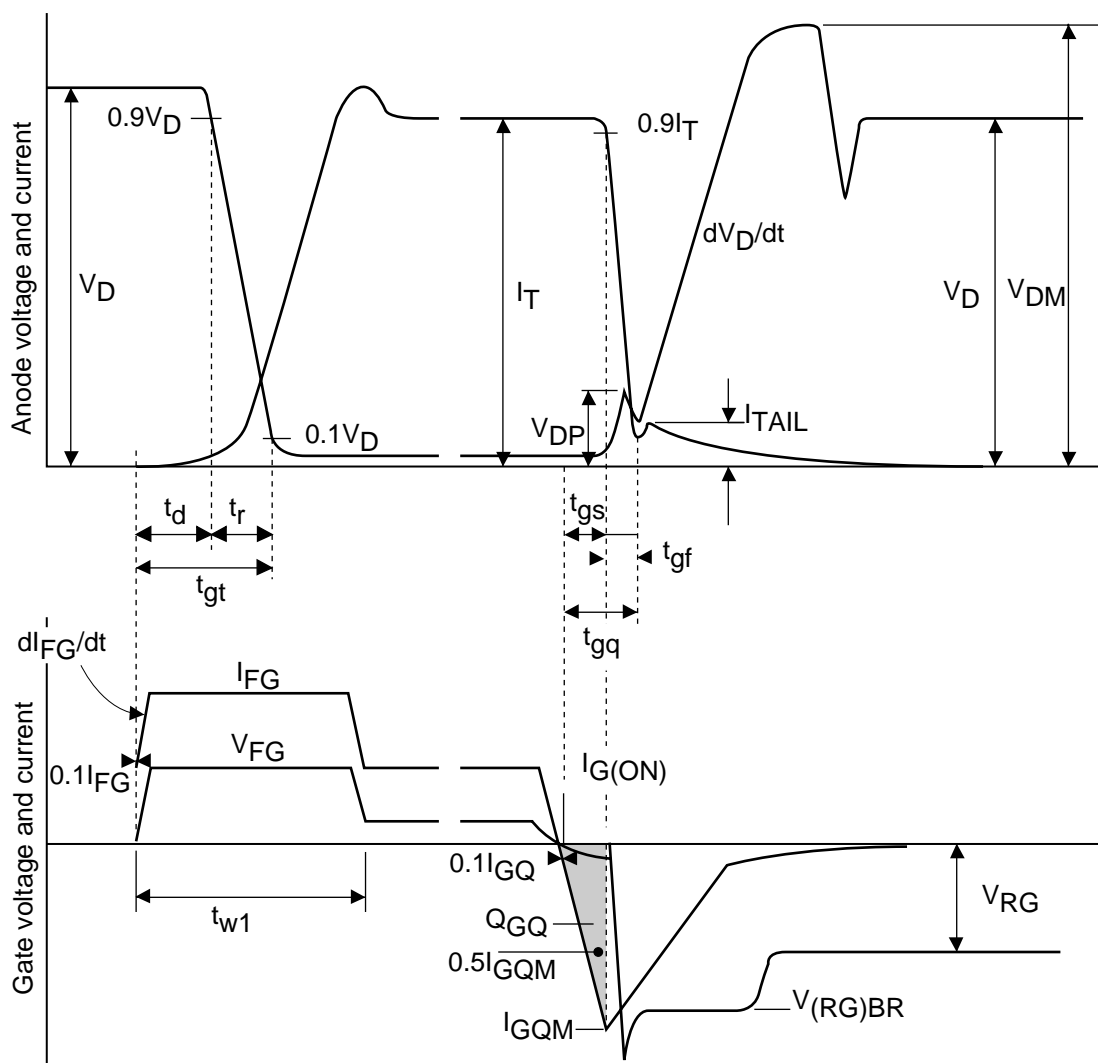


Figure 2. On-state characteristics



Recommended gate conditions:

$$I_{TCM} = 3000A$$
$$I_{FG} = 40A$$
$$I_{G(ON)} = 10A \text{ d.c.}$$
$$t_{w1(min)} = 20\mu s$$
$$I_{GQM} = 1200A$$
$$di_{GQ}/dt = 40A/\mu s$$
$$Q_{GQ} = 12500 \mu C$$
$$V_{RG(min)} = 2V$$
$$V_{RG(max)} = 18V$$

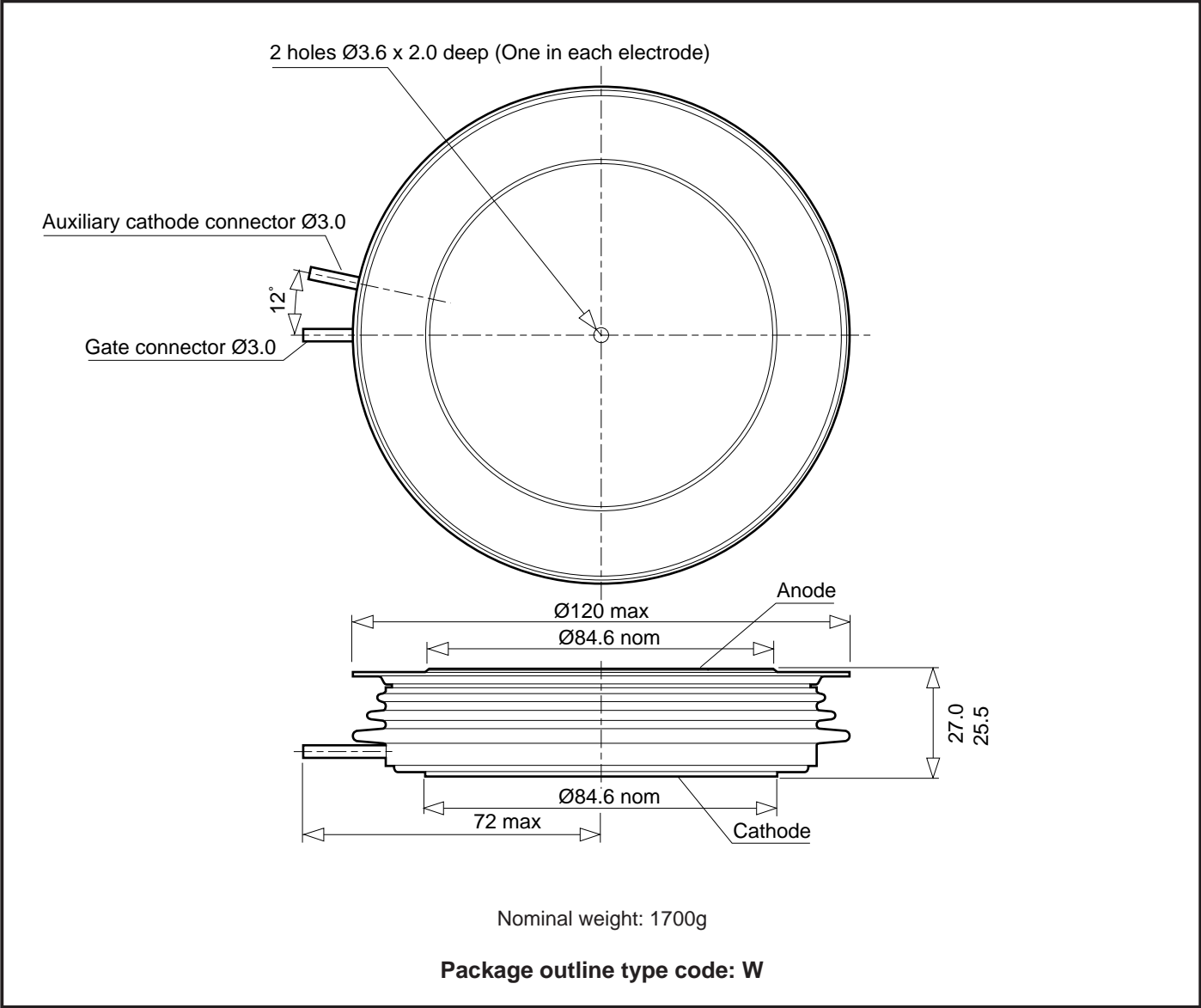
These are recommended Dynex Semiconductor conditions. Other conditions are permitted according to users gate drive specifications.

Figure 3. General switching waveforms

DG858DW45

PACKAGE DETAILS

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



Associated Literature/Products

Publication No. Title/Part Number

AN4571	Application note - GDU9X-XXXXX Series GTO gate drive units.
DS4567	GDU90-20721 GTO gate drive unit.
DS4568	GDU90-20722 GTO gate drive unit.
DS4150	DSF8045SK - Snubber diode.
DS4153	DSF21545SV - Antiparallel/freewheel diode.



<http://www.dynexsemi.com>

e-mail: power_solutions@dynexsemi.com

HEADQUARTERS OPERATIONS

DYNEX SEMICONDUCTOR LTD

Doddington Road, Lincoln.
Lincolnshire. LN6 3LF. United Kingdom.
Tel: 00-44-(0)1522-500500
Fax: 00-44-(0)1522-500550

DYNEX POWER INC.

Unit 7 - 58 Antares Drive,
Nepean, Ontario, Canada K2E 7W6.
Tel: 613.723.7035
Fax: 613.723.1518
Toll Free: 1.888.33.DYNEX (39639)

CUSTOMER SERVICE CENTRES

Central Europe Tel: +33 (0)1 69 18 90 00. Fax: +33 (0)1 64 46 54 50.
North America Tel: 011-800-5554-5554. Fax: 011-800-5444-5444.
UK, Scandinavia & Rest Of World Tel: +44 (0)1522 500500. Fax: +44 (0)1522 500020.

SALES OFFICES

Central Europe Tel: +33 (0)1 69 18 90 00. Fax: +33 (0)1 64 46 54 50.
North America Tel: (613) 723-7035. Fax: (613) 723-1518. Toll Free: 1.888.33.DYNEX (39639) /
Tel: (831) 440-1988. Fax: (831) 440-1989 / Tel: (949) 733-3005. Fax: (949) 733-2986.
UK, Scandinavia & Rest Of World Tel: +44 (0)1522 500500. Fax: +44 (0)1522 500020.
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