

PRELIMINARY
 Notice: This is not a final specification.
 Some parametric limits are subject to change.

MITSUBISHI GCT (Gate Commutated Turn-off) THYRISTOR

FGC400A-130DS

HIGH POWER INVERTER USE
 PRESS PACK TYPE

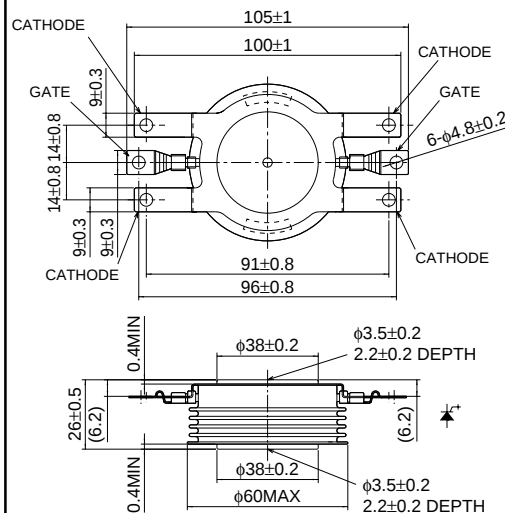
FGC400A-130DS



- Symmetrical GCT Thyristor
- I_{TQRM} Repetitive controllable on-state current 400A
- $I_T(AV)$ Average on-state current 180A
- V_{DRM} Repetitive peak off-state voltage 6500V
- V_{RRM} Repetitive peak reverse voltage 6500V
- T_j Operation junction temperature 125°C

OUTLINE DRAWING

Dimensions in mm



APPLICATION

Current source inverters, DC choppers, Induction heaters, DC to DC converter.

MAXIMUM RATINGS

Symbol	Parameter	Conditions	Voltage class	Unit
V_{RRM}	Repetitive peak reverse voltage	—	6500	V
V_{RSM}	Non-repetitive peak reverse voltage	—	6500	V
V_{DRM}	Repetitive peak off-state voltage	$V_{GK} = -2V$	6500	V
V_{DSM}	Non-repetitive peak off-state voltage	$V_{GK} = -2V$	6500	V
V_{LTDS}	Long term DC stability voltage	$V_{GK} = -2V, \lambda = 100 \text{ Fit}$	3600	V

Symbol	Parameter	Conditions	Ratings	Unit
I_{TQRM}	Repetitive controllable on-state current	$V_{DM} = 4000V, V_D = 3000V, L_C = 0.3\mu H, V_{RG} = 20V$ $T_j = 25/125^\circ C, diG/dt = 600A/\mu s$ (see Fig. 1, 3)	400	A
$I_{T(RMS)}$	RMS on-state current	Applied for all condition angles	280	A
$I_T(AV)$	Average on-state current	$f = 60\text{Hz}, \text{sinewave } \theta = 180^\circ, T_r = 55^\circ C$	180	A
I_{TSM}	Surge on-state current	One half cycle at 60Hz, $T_j = 125^\circ C$ start	2800	A
I^2t	Current-squared, time integration		3.3×10^4	A^2s
diT/dt	Critical rate of rise of on-state current	$V_D = 3000V, I_T = 400A, C_s = 0.06\mu F, R_s = 15\Omega$ $T_j = 25/125^\circ C, f = 60\text{Hz}, I_{GM} = 50A, diG/dt = 50A/\mu s$ (see Fig. 1, 2)	1000	$A/\mu s$
diR/dt	Critical rate of rise of reverse recovery current	$I_T = 400A, V_R = 3000V, T_j = 25/125^\circ C$ $C_s = 0.06\mu F, R_s = 15\Omega$ (see Fig. 4, 5)	1000	$A/\mu s$
V_{FGM}	Peak forward gate voltage		10	V
V_{RGM}	Peak reverse gate voltage		21	V
I_{FGM}	Peak forward gate current		250	A
I_{RGM}	Peak reverse gate current		400	A
P_{FGM}	Peak forward gate power dissipation		3	kW
P_{RGM}	Peak reverse gate power dissipation		9	kW
$P_{FG(AV)}$	Average forward gate power dissipation		50	W
$P_{RG(AV)}$	Average reverse gate power dissipation		60	W
T_j	Operation Junction temperature		$-20 \sim 125$	$^\circ C$
T_{stg}	Storage temperature		$-20 \sim 150$	$^\circ C$
—	Mounting force required	(Recommended value 8.6kN)	7.3 ~ 11	kN
—	Weight	Typical value 470g	—	g

Jul. 2002

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ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{TM}	On-state voltage	$I_T = 400A, T_J = 125^\circ C$	—	—	7.5	V
I_{RRM}	Repetitive peak reverse current	$V_{RM} = 6500V, T_J = 125^\circ C$	—	—	150	mA
I_{DRM}	Repetitive peak off-state current	$V_{DM} = 6500V, V_{GK} = -2V, T_J = 125^\circ C$	—	—	100	mA
I_{GRM}	Reverse gate current	$V_{RG} = 21V, T_J = 125^\circ C$	—	—	50	mA
dv/dt	Critical rate of rise of off-state voltage	$V_D = 3000V, V_{GK} = -2V, T_J = 125^\circ C$ (Expo. wave)	3000	—	—	V/ μs
t_{gt}	Turn-on time	$I_T = 400A, V_D = 3000V, di/dt = 1000A/\mu s$	—	—	5	μs
t_d	Turn-on delay time	$C_S = 0.06\mu F, R_S = 15\Omega, T_J = 125^\circ C$	—	—	1	μs
E_{on}	Turn-on switching energy	$I_{GM} = 50A, di_G/dt = 50A/\mu s$ (see Fig. 1, 2)	—	—	0.7	J/P
t_s	Storage time	$I_T = 400A, V_{DM} = 4000V, V_D = 3000V$ $C_S = 0.06\mu F, R_S = 15\Omega, T_J = 125^\circ C$	—	—	3	μs
E_{off}	Turn-off switching energy	$V_{RG} = 20V, di_{GQ}/dt = 600A/\mu s$ (see Fig. 1, 5)	—	—	2.9	J/P
Q_{RR}	Reverse recovery charge	$I_T = 400A, V_R = 3000V, di/dt = 1000A/\mu s$	—	—	1600	μC
E_{rec}	Reverse recovery energy	$C_S = 0.06\mu F, R_S = 15\Omega, T_J = 125^\circ C$ (see Fig. 4, 5)	—	—	4.1	J/P
I_{GT}	Gate trigger current	$V_D = 24V, R_L = 0.1\Omega, T_J = 25^\circ C, DC$ method	—	—	0.35	A
V_{GT}	Gate trigger voltage		—	—	1.5	V
$R_{th(j-f)}$	Thermal resistance	Junction to Fin	—	0.04	—	K/W

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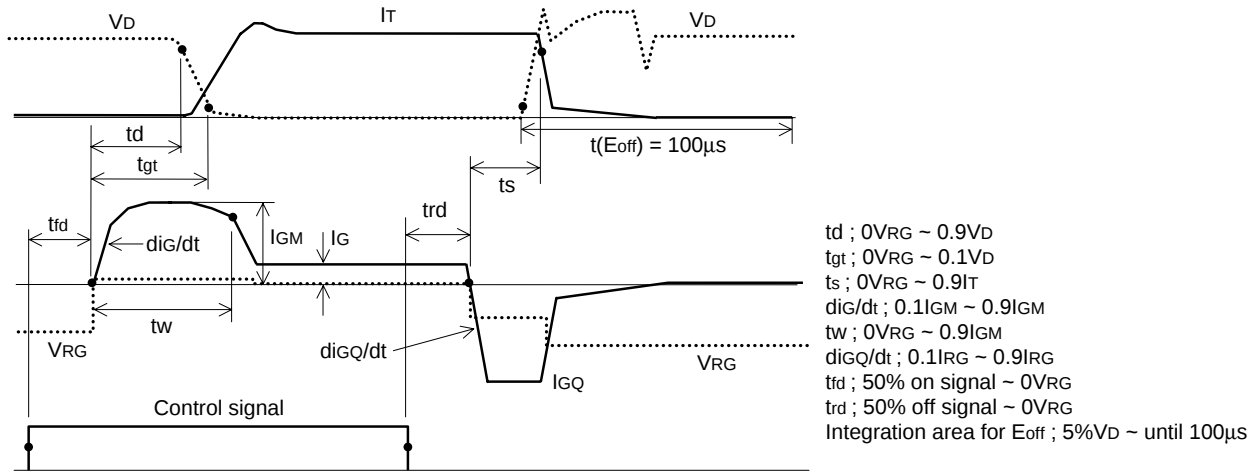


Fig. 1 Turn-on and Turn-off waveform

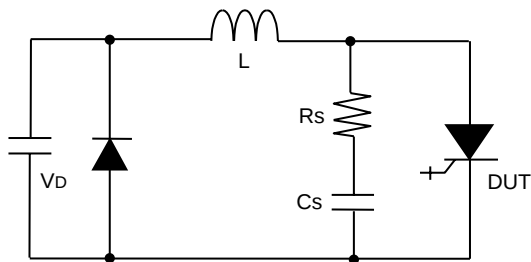


Fig. 2 Turn-on test circuit

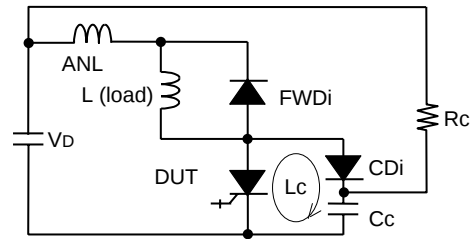


Fig. 3 Turn-off test circuit
 (With clamp circuit)

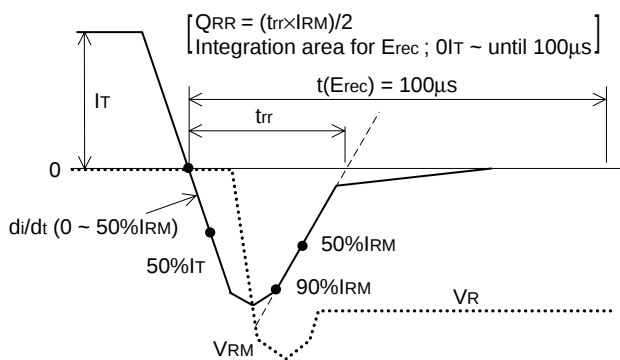


Fig. 4 Reverse recovery waveform

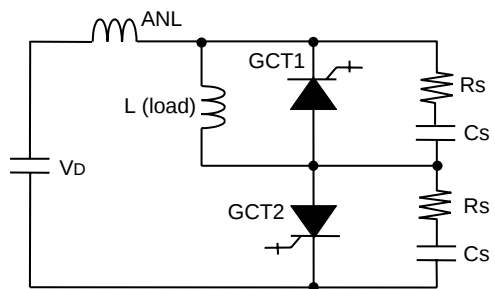


Fig. 5 Turn-off and Reverse recovery test circuit

[Without the GDU and $I_G = 0.35A$ (DC) is supplied to GCT]
 1 at reverse recovery test.

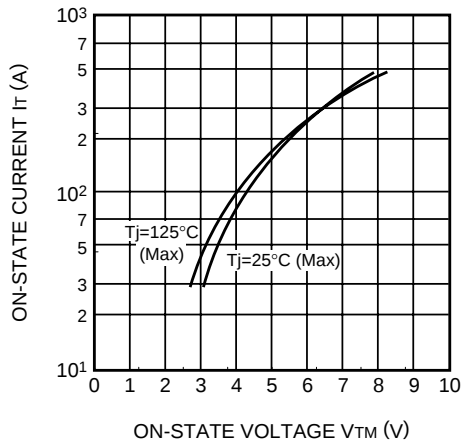
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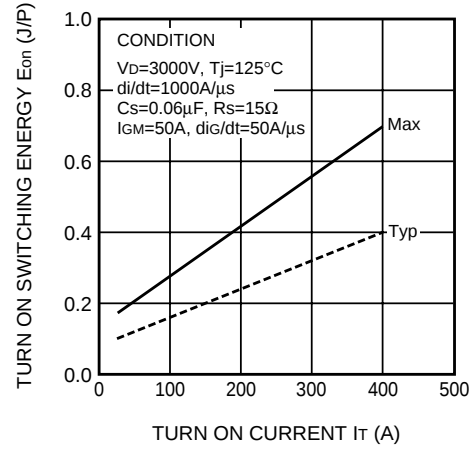
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PERFORMANCE CURVES

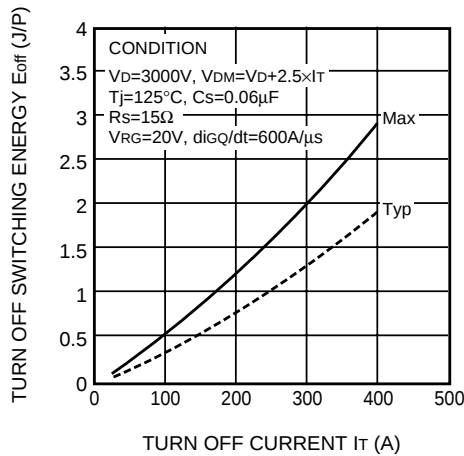
MAXIMUM ON-STATE CHARACTERISTIC



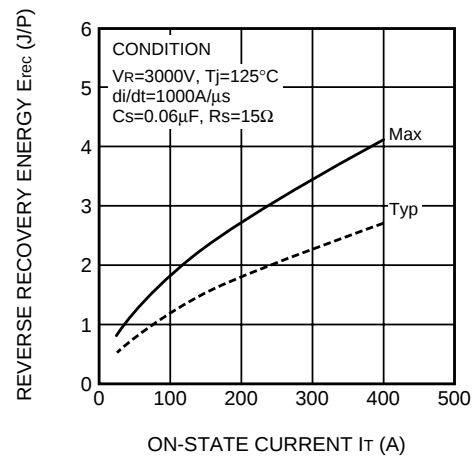
E_{on} VS I_T



E_{off} VS I_T



E_{rec} VS I_T



MAXIMUM THERMAL IMPEDANCE
 CHARACTERISTIC
 (JUNCTION TO FIN)

