

Preliminary

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 voltage6500V
- V_{RRM} : Repetitive peak reverse voltage6500V
- T_j : Operation junction temperature.....125deg

APPLICATION

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

Symbol	Parameter	Condition	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	$V_{GK}=-2V, \lambda=100Fit$	3600	V

Symbol	Parameter	Condition	Ratings	Unit
I_{TQRM}	Repetitive controllable on state current	$V_{DM}=4000V, V_D=3000V, T_j=25/125deg$ $L_c=0.3\mu H, V_{RG}=20V, di_{GQ}/dt=600A/\mu s$ (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	$f=60Hz, \text{sinewave } \theta=180^\circ, T_f=55deg$	180	A
I_{TSM}	Surge on-state current	One half cycle at 60Hz, $T_j=125deg$ start	2800	A
I^2t	Current squared, time integration		3.3×10^4	A^2s
di_T/dt	Critical rate of rise of on state current	$I_T=400A, V_D=3000V, T_j=25/125deg$ $C_s=0.06\mu F, R_s=15ohm, f=60Hz$ $I_{GM}=50A, di_G/dt=50A/\mu s$ (See Fig.1,2)	1000	$A/\mu s$
di_R/dt	Critical rate of rise of reverse recovery current	$I_T=400A, V_R=3000V, T_j=25/125deg$ $C_s=0.06\mu F, R_s=15ohm$ (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		-20~125	$^\circ C$
T_{stg}	Storage temperature		-20~150	$^\circ C$
—	Mounting force required	(Recommended value 8.6 kN)	7.3 ~ 11	kN
—	Weight	Typical value 470g	—	g



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Symbol	Parameter	Condition	Limits			Unit
			Min	Typ	Max	
V_{TM}	On-state voltage	$I_T=400A$, $T_j=125deg$	—	—	7.5	V
I_{RRM}	Repetitive peak reverse current	$V_{RM}=6500V$, $T_j=125deg$	—	—	150	mA
I_{DRM}	Repetitive peak off state current	$V_{DM}=6500V$, $V_{GK}=-2V$, $T_j=125deg$	—	—	100	mA
I_{GRM}	Reverse gate current	$V_{RG}=21V$, $T_j=125deg$	—	—	50	mA
dv/dt	Critical rate of rise of off state voltage	$V_D=3000V$, $V_{GK}=-2V$, $T_j=125deg$ (Expo. wave)	3000	—	—	V/ μs
tgt	Turn-on time	$I_T=400A$, $V_D=3000V$, $di/dt=1000A/\mu s$	—	—	5	μs
td	Turn-on delay time	$C_s=0.06\mu F$, $R_s=15ohm$, $T_j=125deg$	—	—	1	μs
Eon	Turn-on switching energy	$I_{GM}=50A$, $di_G/dt=50A/\mu s$ (See Fig.1,2)	—	—	0.7	J/P
ts	Storage time	$I_T=400A$, $V_{DM}=4000V$, $V_D=3000V$ $C_s=0.06\mu F$, $R_s=15ohm$, $T_j=125deg$	—	—	3	μs
Eoff	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
Erec	Reverse recovery energy	$C_s=0.06\mu F$, $R_s=15ohm$, $T_j=125deg$ (See Fig.4,5)	—	—	4.1	J/P
I_{GT}	Gate trigger current	$V_D=24V$, $R_L=0.1ohm$, $T_j=25deg$	—	—	0.35	A
V_{GT}	Gate trigger voltage	DC method	—	—	1.5	V
$R_{th(j-f)}$	Thermal resistance	Junction to Fin	—	—	0.04	K/W



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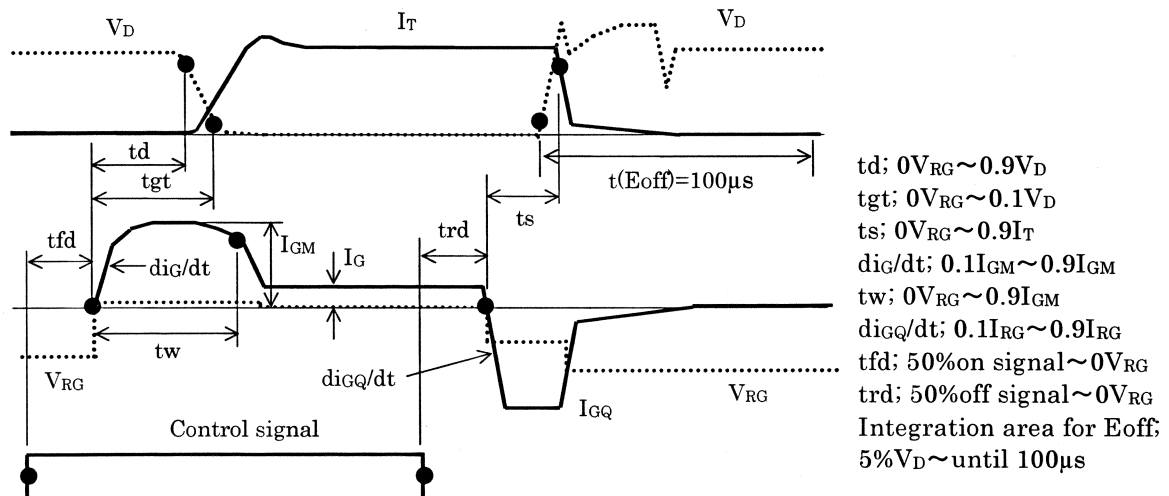


Fig.1:Turn on and turn off waveform

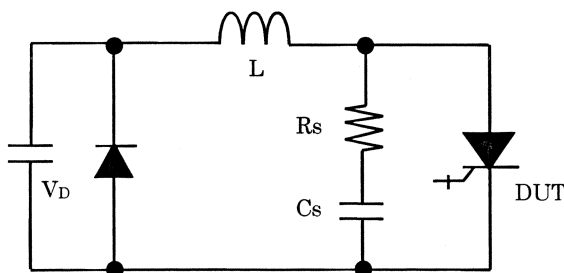


Fig.2:Turn-on test circuit

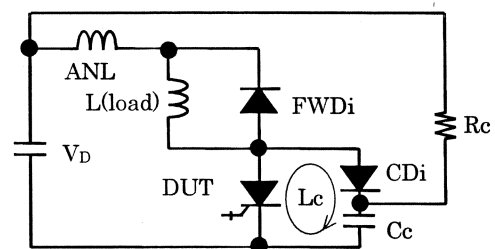


Fig.3:Turn-off test circuit (With clamp circuit)

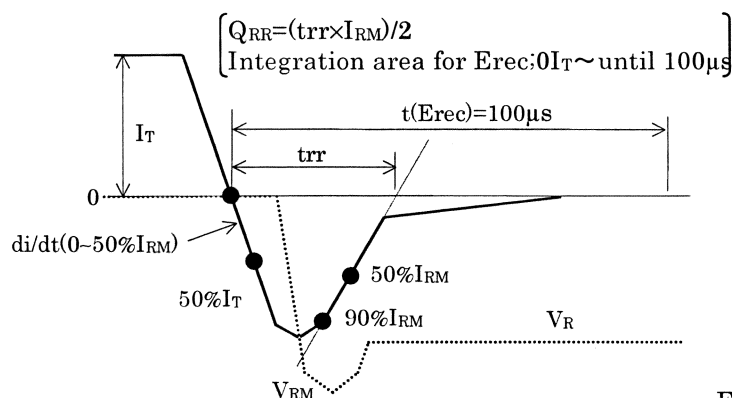


Fig.4:Reverse recovery waveform

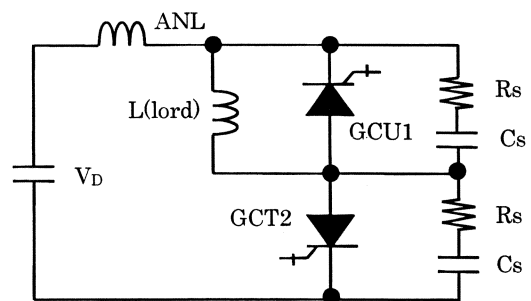


Fig.5:Turn off and Reverse recovery test circuit

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



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ELECTRIC

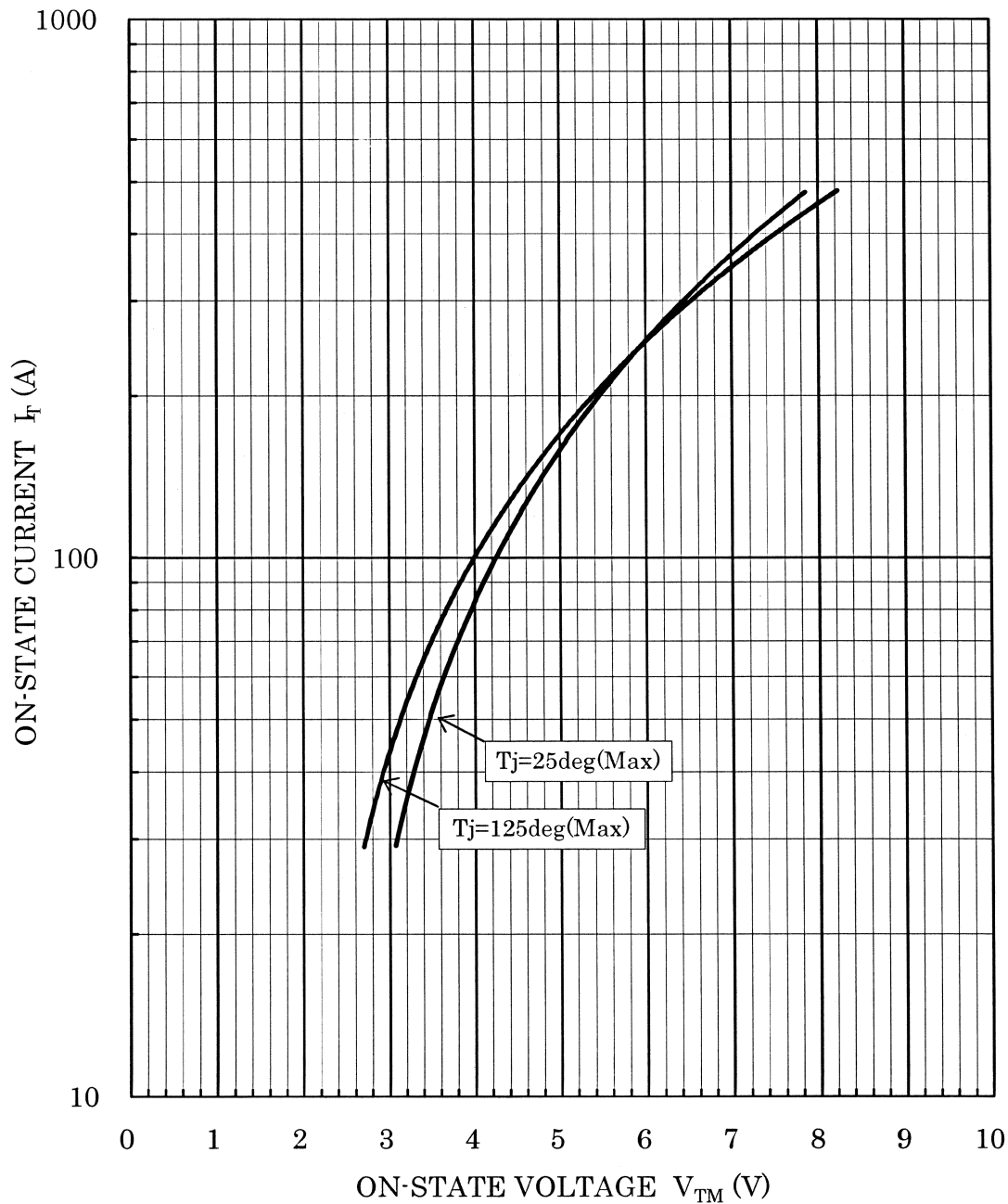
TSH-402 (3/9)

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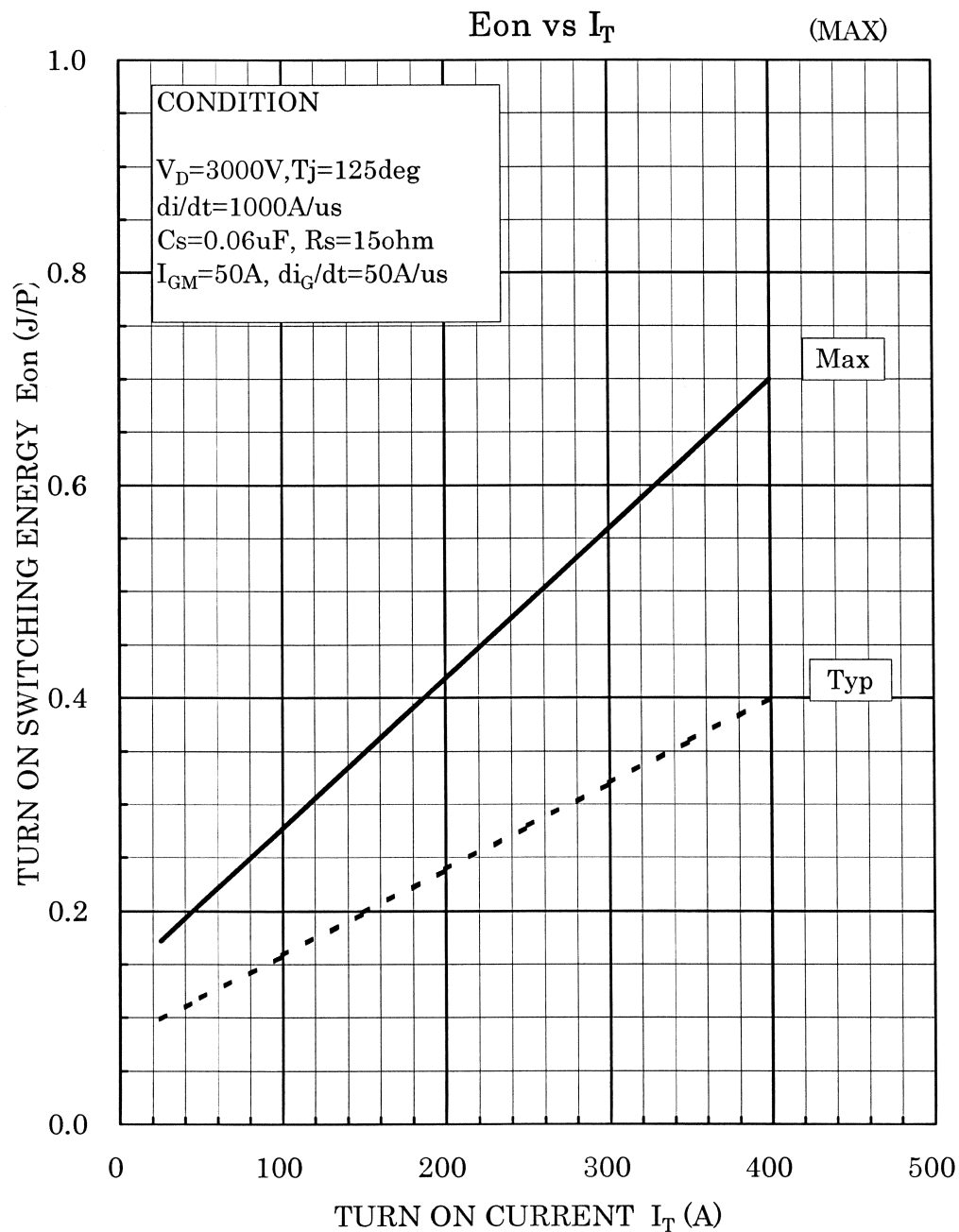
MAXIMUM ON STATE CHARACTERISTIC



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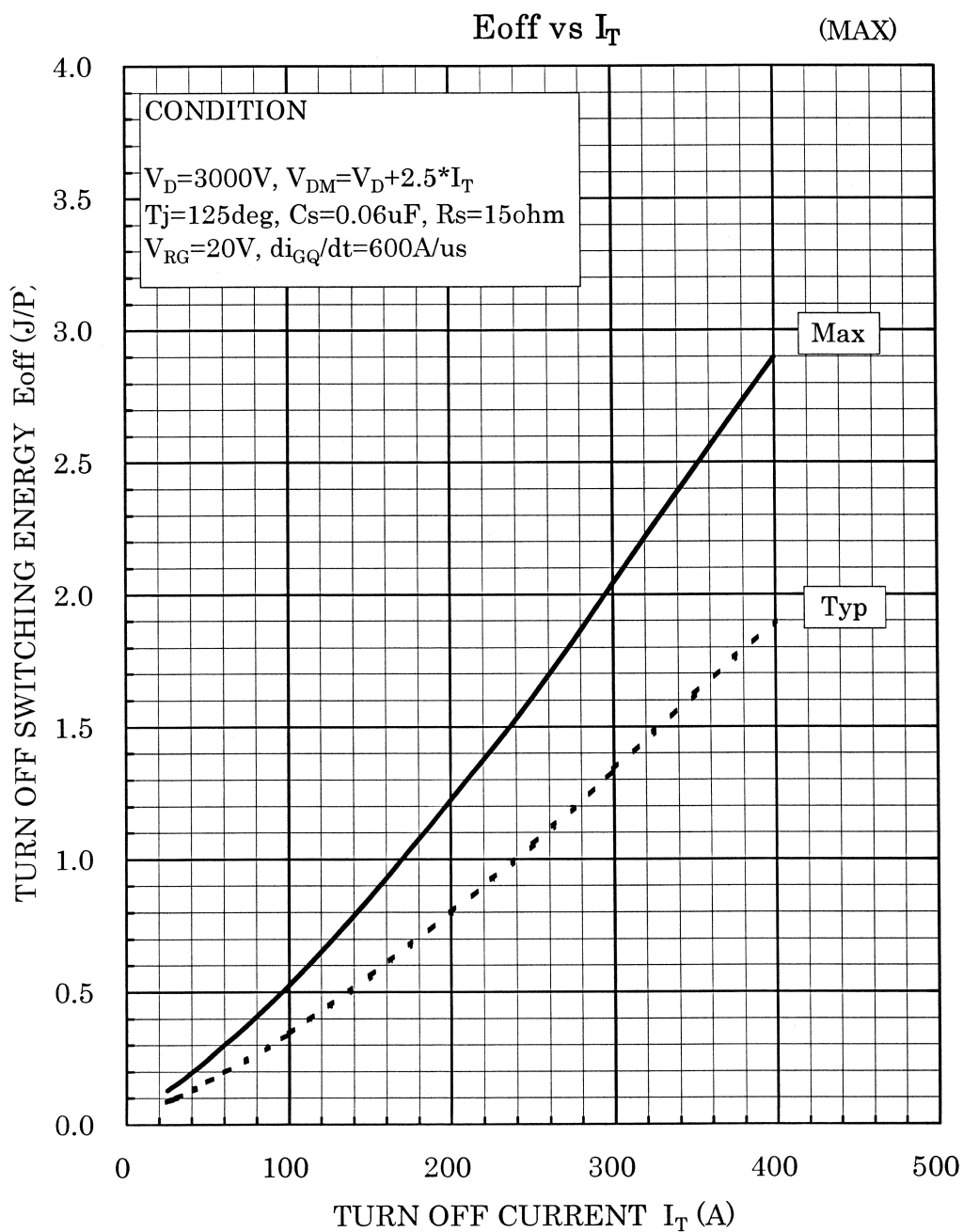
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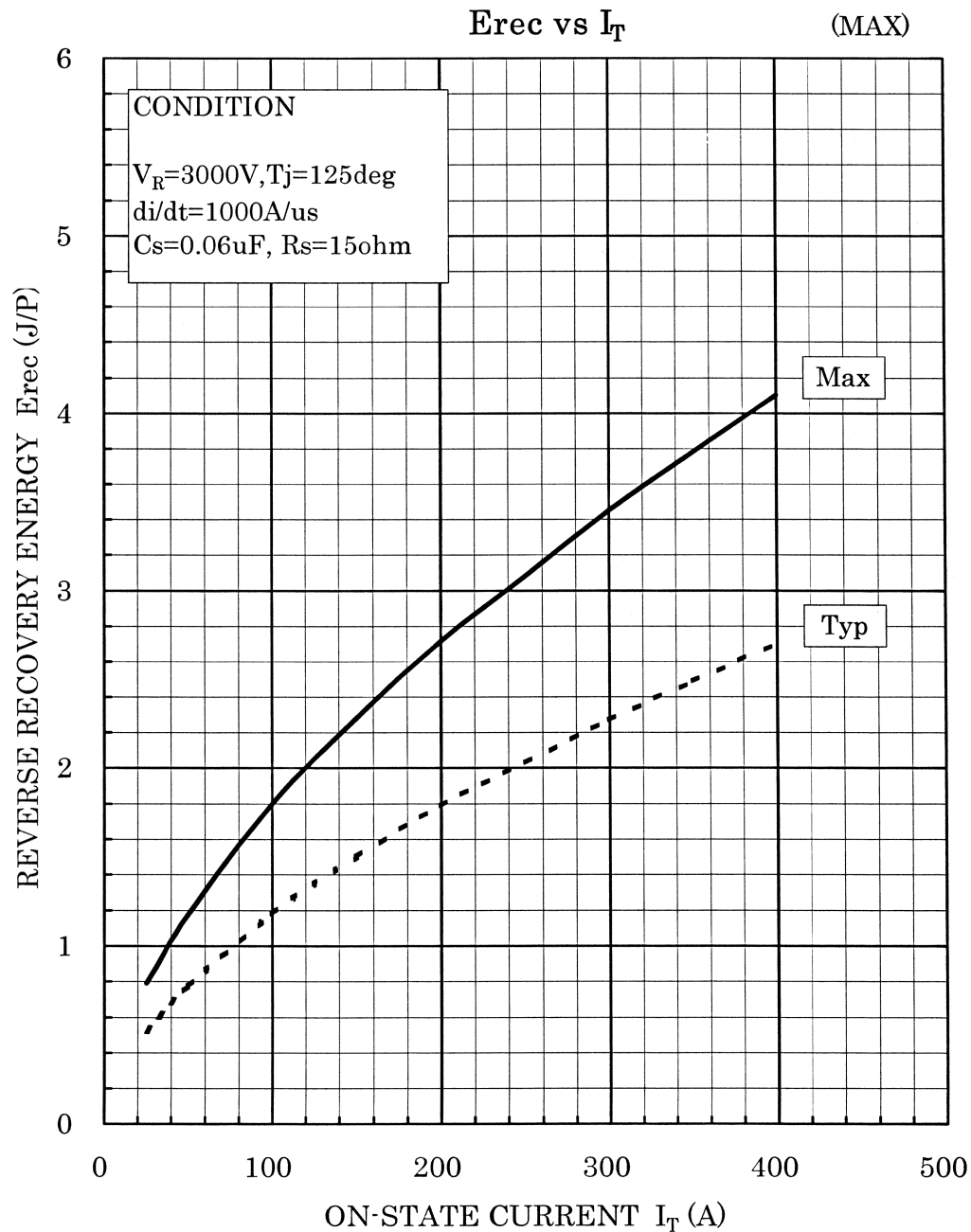
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