MITSUBISHI REVERSE-CONDUCTING GTO THYRISTORS

FGR3000FX-90DA

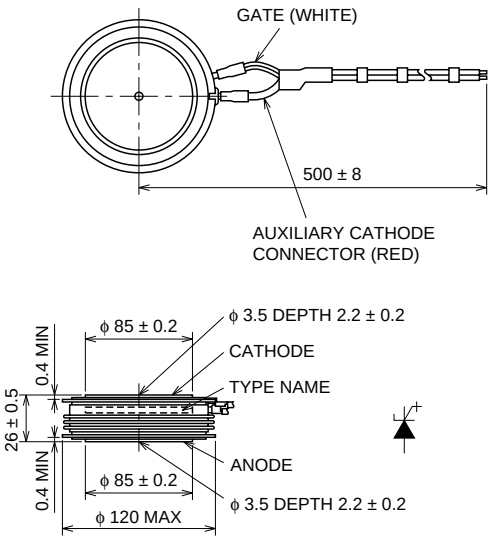
HIGH POWER INVERTER USE
PRESS PACK TYPE

FGR3000FX-90DA

- I_{TQRM} Repetitive controllable on-state current 3000A
- $I_{T(AV)}$ Average on-state current 780A
- V_{DRM} Repetitive peak off state voltage 4500V
- Reverse conducting type

OUTLINE DRAWING

Dimensions in mm



APPLICATION

Inverters, D.C. choppers, Induction heaters, D.C. to D.C. converters.

MAXIMUM RATINGS

Symbol	Parameter	Voltage class	Unit
		90DA	
V_{DRM}	Repetitive peak off-state voltage*	4500	V
V_{DSM}	Non-repetitive peak off-state voltage*	4500	V
$V_{D(DC)}$	DC off-state voltage*	3600	V
V_{LTDS}	Long term DC stability voltage*	3000	V

* : V_{GK} = –2V

Symbol	Parameter	Conditions	Ratings	Unit
I_{TQRM}	Repetitive controllable on-state current	V_{DM} = 4500V, T_j = 125°C, C_S = 6.0μF, L_S = 0.2μH	3000	A
$I_{T(RMS)}$	RMS on-state current		1220	A
$I_{T(AV)}$	Average on-state current	f = 60Hz, sine wave θ = 180°, T_f = 70°C	780	A
I_{TSM}	Surge (non-repetitive) on-state current	One half cycle at 60Hz	16	kA
$I_T{}^2t$	I^2t for fusing	One cycle at 60Hz	1.0×10^6	A^2s
$I_{R(RMS)}$	RMS Reverse current		940	A
$I_{R(AV)}$	Average reverse current	f = 60Hz, sine wave θ = 180°C, T_f = 75°C	600	A
I_{RSM}	Surge (non-repetitive) reverse current	One half cycle at 60Hz	16	kA
$I_R{}^2t$	Current-squared, time integration	One cycle at 60Hz	1.0×10^6	A^2s
di_T/dt	Critical rate of rise of on-state current	V_D = 3000V, I_{GM} = 75A, T_j = 75°C	500	A/μs
V_{FGM}	Peak forward gate voltage		10	V
V_{RGM}	Peak reverse gate voltage		18	V
I_{FGM}	Peak forward gate current		100	A
I_{RGM}	Peak gate reverse current		900	A
P_{FGM}	Peak forward gate power dissipation		400	W
P_{RGM}	Peak reverse gate power dissipation		27	kW
$P_{FG(AV)}$	Average forward gate power dissipation		100	W
$P_{RG(AV)}$	Average reverse gate power dissipation		230	W
T_j	Junction temperature		–40 ~ +125	°C
T_{stg}	Storage temperature		–40 ~ +150	°C
—	Mounting force required	Recommended value 37	31 ~ 43	kN
—	Weight	Standard value	1450	g

FGR3000FX-90DA

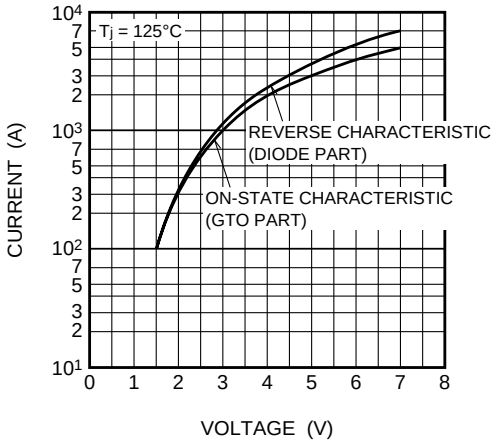
HIGH POWER INVERTER USE
PRESS PACK TYPE

ELECTRICAL CHARACTERISTICS

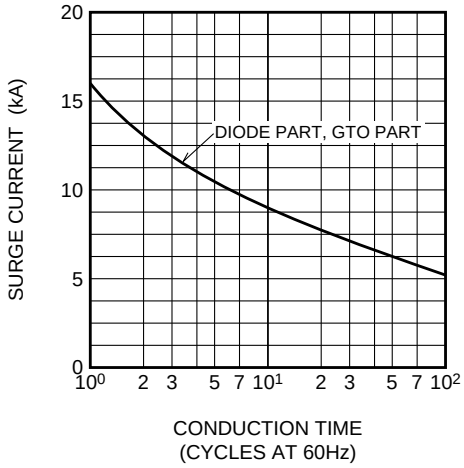
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{TM}	On-state voltage	T_j = 125°C, I_{TM} = 3000A, Instantaneous measurment	—	—	5.0	V
V_{RM}	Peak reverse voltage drop	T_j = 125°C, I_{RM} = 3000A, Instantaneous measurment	—	—	4.5	V
I_{DRM}	Repetitive peak off-state current	T_j = 125°C, V_{DRM} Applied, V_{GK} = –2V	—	—	250	mA
I_{RG}	Reverse gate current	T_j = 125°C, V_{RG} = 17V	—	—	500	mA
dv/dt	Critical rate of rise of off-state voltage	T_j = 125°C, V_D = 3000V, V_{GK} = –2V	1000	—	—	V/µs
t_{gt}	Turn-on time	T_j = 125°C, I_{TM} = 3000A, I_{GM} = 75A, V_D = 3000V	—	—	10	µs
t_{gq}	Turn-off time	T_j = 125°C, I_{TM} = 3000A, V_{DM} = 4500V, di_{GQ}/dt = –30A/µs V_{RG} = 17V, C_S = 6.0µF, L_S = 0.2µH	—	—	30	µs
I_{GQM}	Peak gate turn-off current		—	720	—	A
V_{GT}	Gate trigger voltage	DC METHOD : V_D = 24V, R_L = 0.1Ω, T_j = 25°C	—	—	1.5	V
I_{GT}	Gate trigger current		—	—	3000	mA
$R_{th(j-f)}$	Thermal resistance	GTO Side (Junction to fin)	—	—	0.016	°C/W
		Diode Side (Junction to fin)			0.025	

PERFORMANCE CURVES

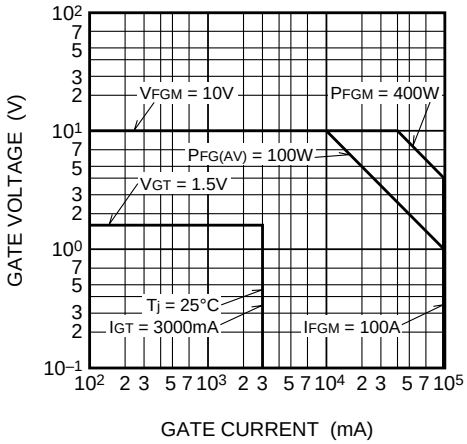
MAXIMUM ON-STATE AND MAXIMUM REVERSE CHARACTERISTICS



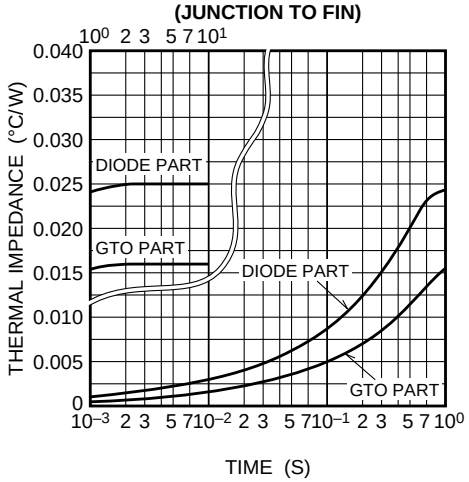
RATED ON-STATE AND REVERSE SURGE CURRENT



GATE CHARACTERISTICS

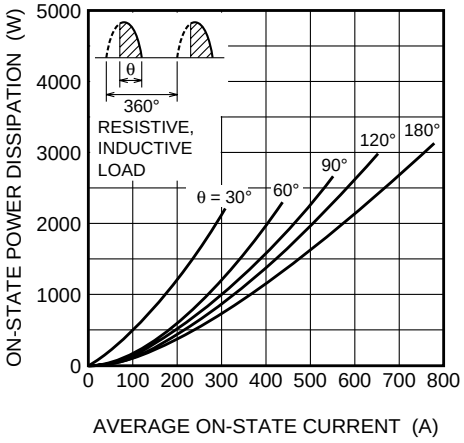


MAXIMUM THERMAL IMPEDANCE CHARACTERISTICS (JUNCTION TO FIN)

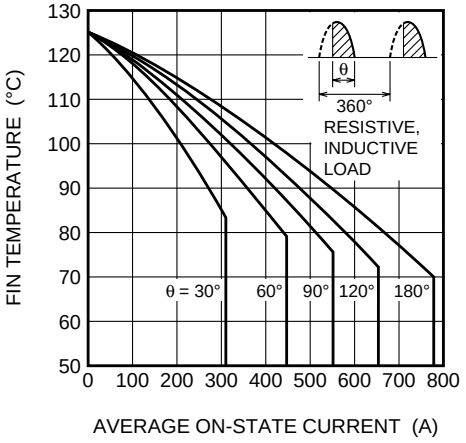


MITSUBISHI ELECTRIC

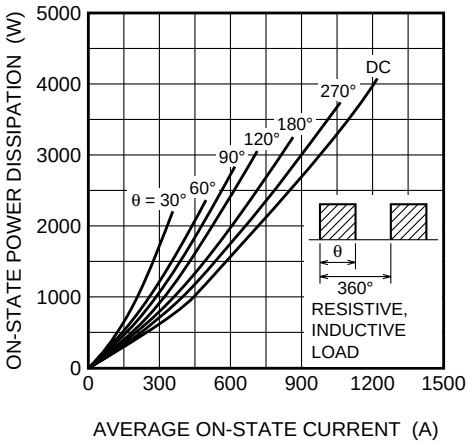
MAXIMUM ON-STATE POWER DISSIPATION CHARACTERISTICS (GTO PART, SINGLE-PHASE HALF WAVE)



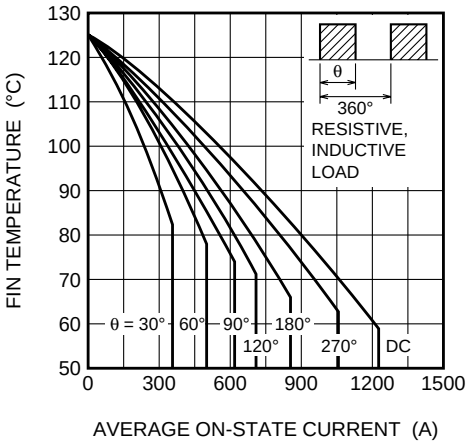
ALLOWABLE FIN TEMPERATURE VS. AVERAGE ON-STATE CURRENT (GTO PART, SINGLE-PHASE HALF WAVE)



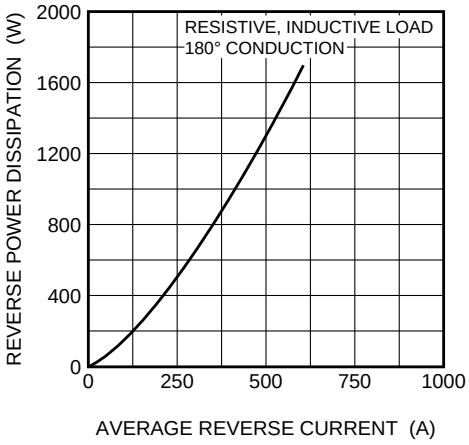
MAXIMUM ON-STATE POWER DISSIPATION CHARACTERISTICS (GTO PART, RECTANGULAR WAVE)



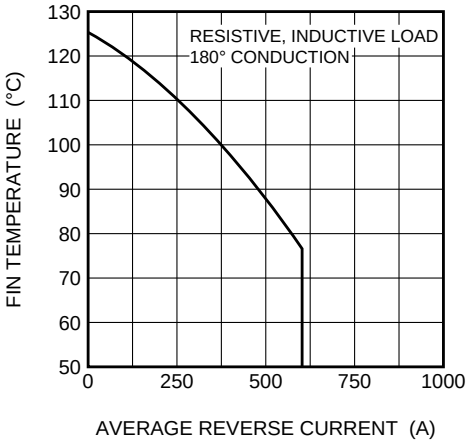
ALLOWABLE FIN TEMPERATURE VS. AVERAGE ON-STATE CURRENT (GTO PART, RECTANGULAR WAVE)



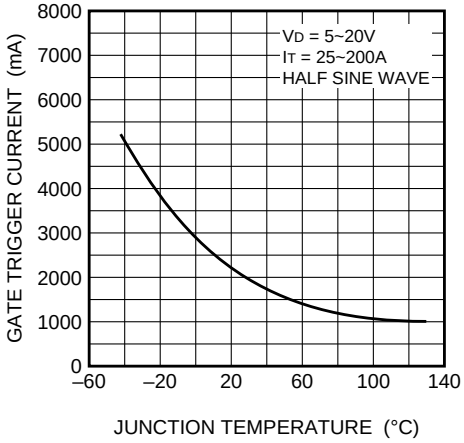
MAXIMUM REVERSE POWER DISSIPATION CHARACTERISTICS (DIODE PART, SINGLE PHASE WAVE)



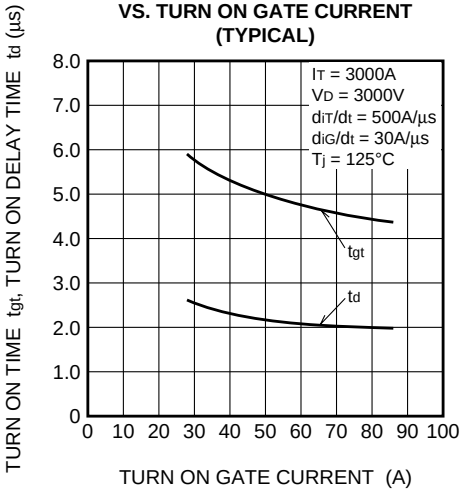
ALLOWABLE FIN TEMPERATURE VS. AVERAGE REVERSE CURRENT (DIODE PART, SINGLE PHASE HALF WAVE)



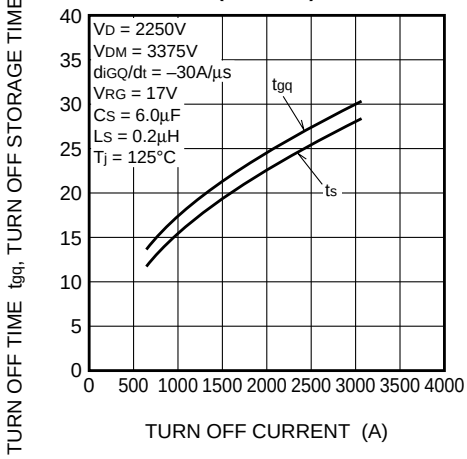
GATE TRIGGER CURRENT VS. JUNCTION TEMPERATURE (TYPICAL)



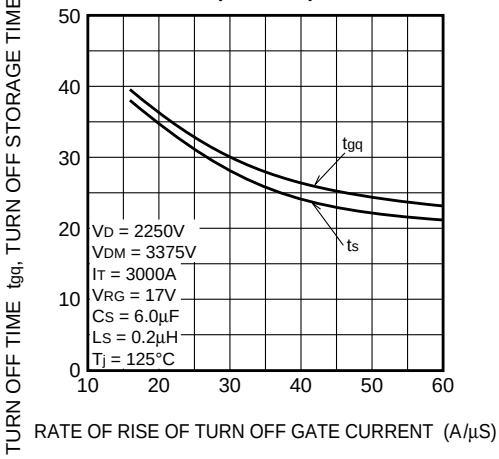
TURN ON TIME, TURN ON DELAY TIME VS. TURN ON GATE CURRENT (TYPICAL)



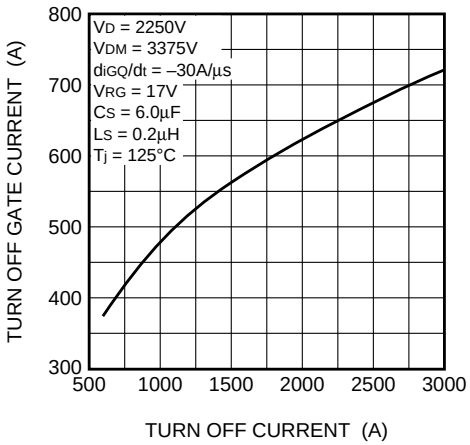
TURN OFF TIME, TURN OFF STORAGE TIME VS. TURN OFF GATE CURRENT (TYPICAL)



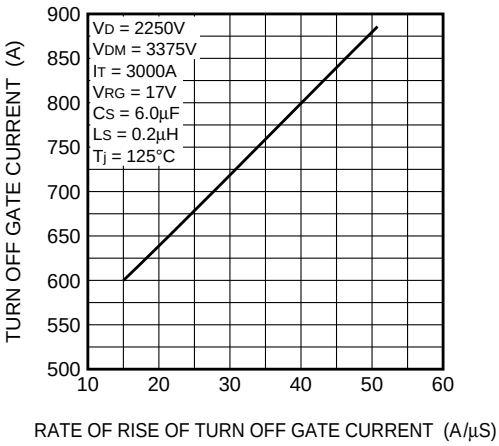
TURN OFF TIME, TURN OFF STORAGE TIME VS. RATE OF RISE OF TURN OFF GATE CURRENT (TYPICAL)



TURN OFF GATE CURRENT VS. TURN OFF CURRENT (TYPICAL)



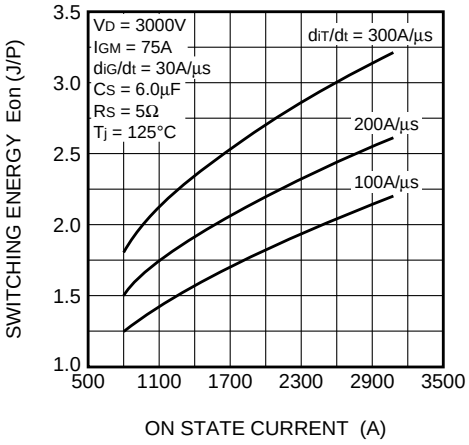
TURN OFF GATE CURRENT VS. RATE OF RISE OF GATE CURRENT (TYPICAL)



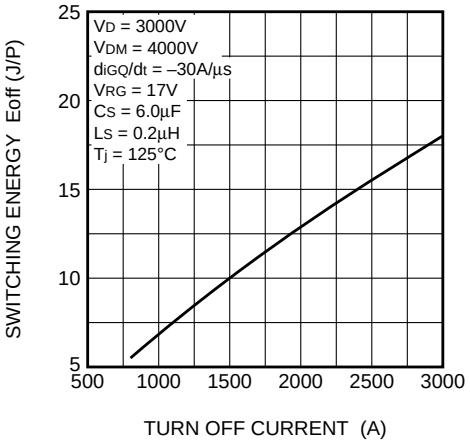
FGR3000FX-90DA

HIGH POWER INVERTER USE
PRESS PACK TYPE

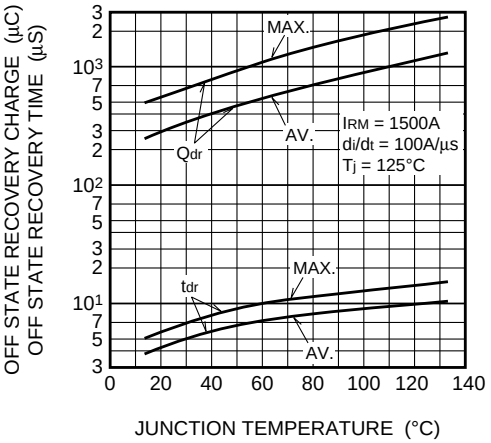
TURN ON SWITCHING ENERGY (MAXIMUM)



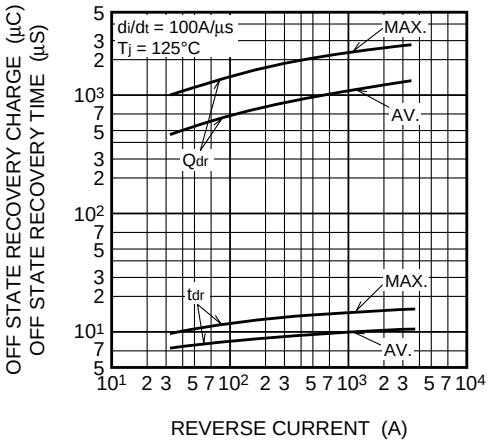
TURN OFF SWITCHING ENERGY (MAXIMUM)



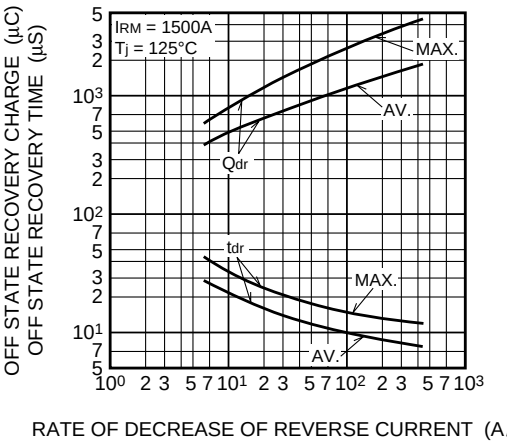
OFF STATE RECOVERY CHARGE, OFF STATE RECOVERY TIME VS. JUNCTION TEMPERATURE



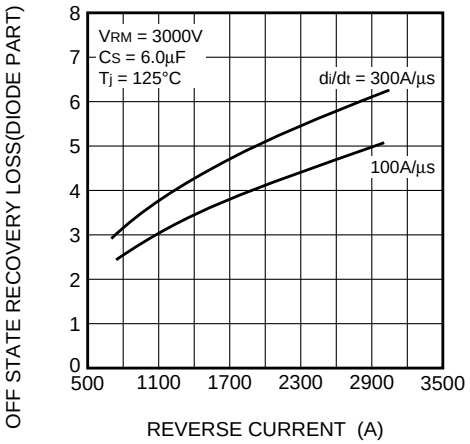
OFF STATE RECOVERY CHARGE, OFF STATE RECOVERY TIME VS. REVERSE CURRENT



OFF STATE RECOVERY CHARGE, OFF STATE RECOVERY TIME VS. RATE OF DECREASE OF REVERSE CURRENT



OFF STATE RECOVERY LOSS(DIODE PART) VS. REVERSE CURRENT (TYPICAL)



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