

# Gate Commutated Turn-Off Thyristors

## AFGC 4000-90-BX-DS



### Key Parameters

$I_{TQRM}$	=	4000 A
$I_{T(AV)}$	=	1200 A
$V_{DRM}$	=	4500 V

### Application

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

### MAXIMUM RATINGS

Symbols and parameters		Voltage class	Unit
$V_{RRM}$	Repetitive peak reverse voltage	21	V
$V_{RSM}$	Non-repetitive peak reverse voltage	21	V
$V_{R(DC)}$	DC reverse voltage	21	V
$V_{DRM}$	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

Symbols and parameters			Value	Unit
$I_{TQRM}$	Repetitive controllable on-state current	$V_{DM} = 4500V, V_D = 2250V, L_C = 0.2\mu H, V_{RG} = 21V, di_{GQ}/dt = 6000A/\mu s, T_j = 25/125^\circ C$	4000	A
$I_{T(RMS)}$	RMS on-state current	Applied for all conduction angles $f = 60Hz, \text{sinewave}$ $\theta = 180^\circ, T_f = 70^\circ C$	1880	A
$I_{T(AV)}$	Average on-state current		1200	A
$I_{TSM}$	Surge (non-repetitive) on-state current	One half cycle at 60Hz, $T_j = 125^\circ C$	25	kA
$I^2t$	Current-squared, time integration		$2.6 \times 10^6$	$A^2s$
$di_T/dt$	Critical rate of rise of on-state current	$V_D = 2250V, I_{TM} = 4000A, I_{GM} = 200A, T_j = 125^\circ C, di_G/dt = 100A/\mu s$	1000	$A/\mu s$
$V_{FGM}$	Peak forward gate voltage		10	V
$V_{RGM}$	Peak reverse gate voltage		21	V

Symbols and parameters			Value	Unit
$I_{FGM}$	Peak forward gate current		1000	A
$I_{RGM}$	Max. RMS on-state current		4000	A
$P_{FGM}$	Peak forward gate power dissipation		10	kW
$P_{RGM}$	Peak reverse gate power dissipation		120	kW
$P_{FG(AV)}$	Max. peak non-repetitive surge current		200	W
$P_{RG(AV)}$	Limiting load integral		6300	W

#### ELECTRICAL CHARACTERISTICS

Symbols and parameters			Value			Unit
			min	typ	max	
$V_{TM}$	On-state voltage	$I_T = 4000A, T_j = 125^\circ C$			4.0	V
$I_{RRM}$	Repetitive peak reverse current	$V_{RM} = 21V, T_j = 125^\circ C$			100	mA
$I_{DRM}$	Repetitive peak off-state current	$V_{DM} = 4500V, V_{GK} = -2V, T_j = 125^\circ C$			150	mA
$I_{GRM}$	Reverse gate current	$V_{RG} = 21V, T_j = 125^\circ C$			100	mA
$dv/dt$	Critical rate of rise of off-state voltage	$V_D = 2250V, V_{GK} = -2V, T_j = 125^\circ C$ (Expo. wave)	3000			V/ $\mu s$
$t_d$	Turn-on delay	$I_T = 4000A, V_D = 2250V, I_{GM} = 200A, T_j = 125^\circ C, di/dt = 1000A/ms, di_G/dt = 100A/ms$			3	$\mu s$
$t_s$	Storage time	$I_T = 4000A, V_{DM} = 4500V, V_D = 2250V,$			3	$\mu s$
$I_{GQ}$	Peak gate turn-off current	$di_{GQ}/dt = 6000A/ms,$			-	A
$I_{GT}$	Gate trigger voltage	DC METHOD : $V_D = 24V,$			4	A
$V_{GT}$	Gate trigger current	$R_L = 0.1W, T_j = 25^\circ C$			1.5	V

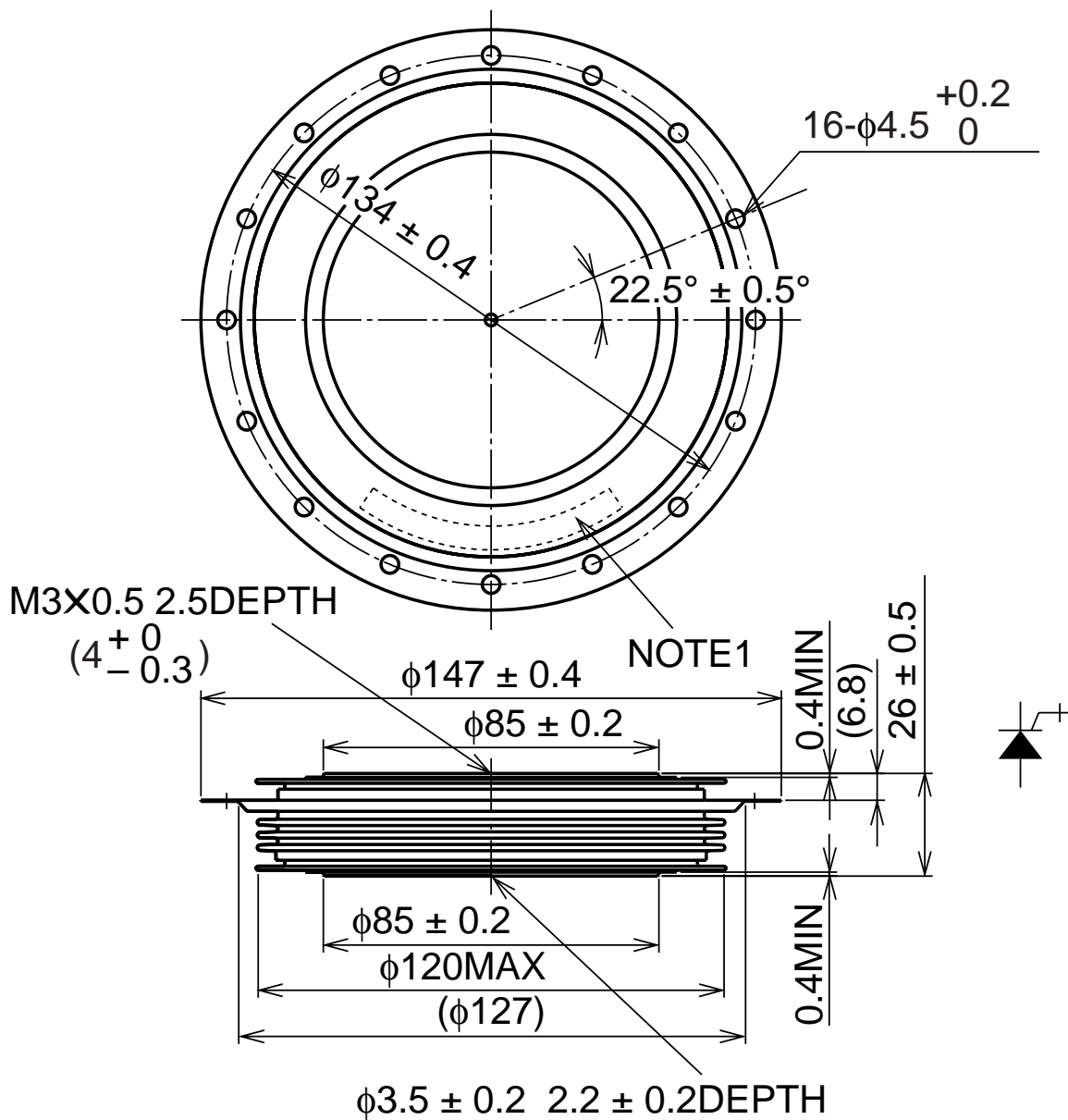
**THERMAL**

Symbols and parameters			Value	Unit
$T_j$	Junction operating temperature		-20 ... 125	°C
$T_{stg}$	Storage temperature range		-20 ... 150	°C
$R_{th(j-f)}$	Thermal resistance, max	Junction to fin	0.011	°C/W

**MECHANICAL**

Symbols and parameters			Value	Unit
$M$	Mounting force required	Recommended value 40	32 ... 48	kN
$w$	Weight		1500	g

DIMENSIONES



All dimensions in millimeters

Fig.1 TURN-ON SWITCHING WAVEFORM AND TEST CIRCUIT

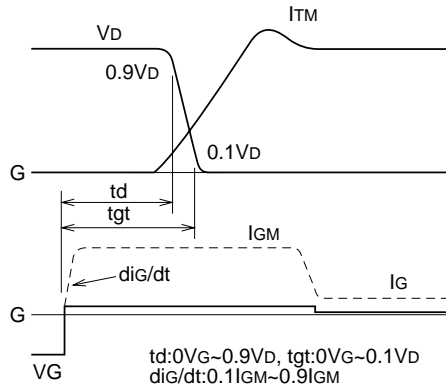
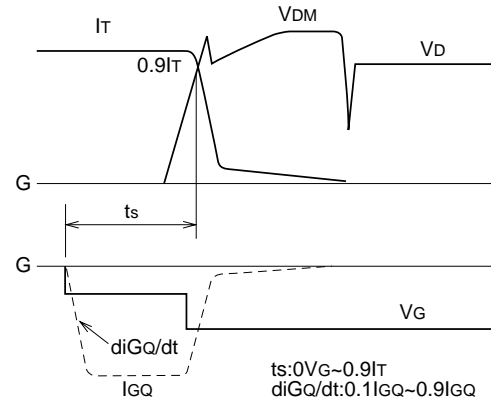
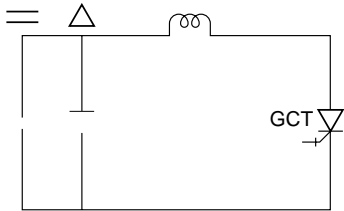


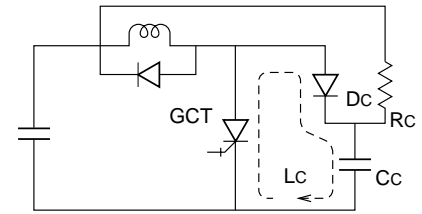
Fig.1 TURN-OFF SWITCHING WAVEFORM AND TEST CIRCUIT



(1) TURN-ON SWITCHING WAVEFORM



(1) TURN-OFF SWITCHING WAVEFORM



(2) TURN-OFF TEST CIRC

(2) TURN-ON TEST CIRCUIT

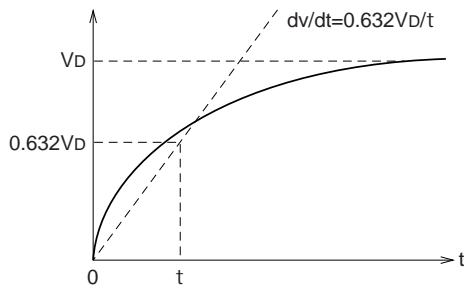
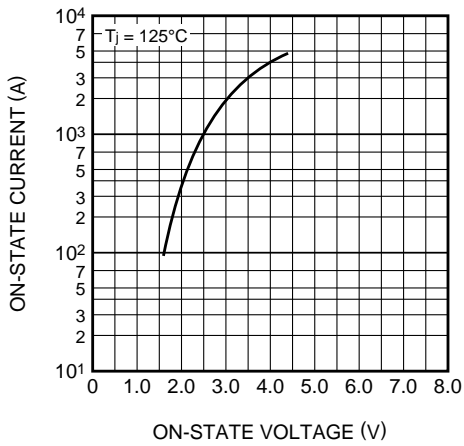
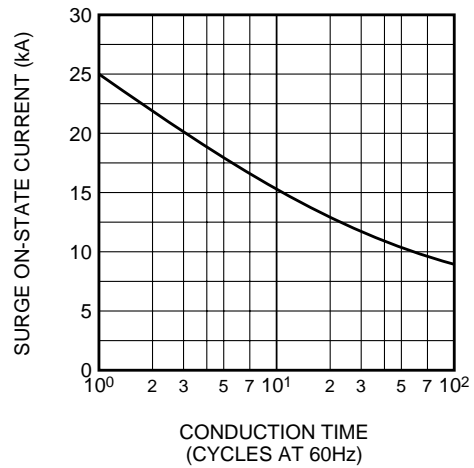


Fig.3 dv/dt TEST WAVEFORM

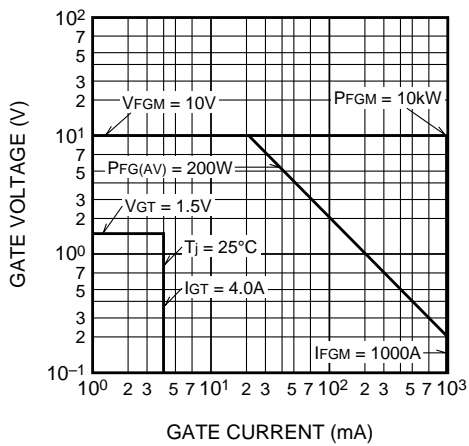
**MAXIMUM ON-STATE CHARACTERISTIC**



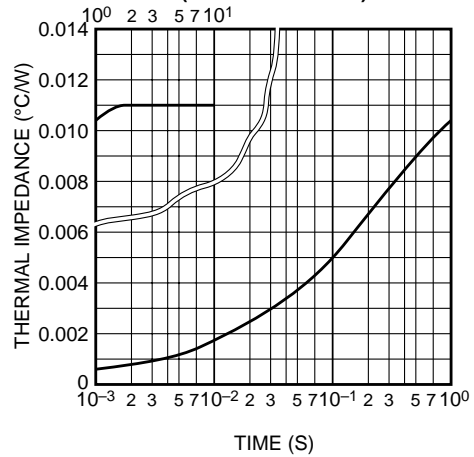
**RATED SURGE ON-STATE CURRENT**



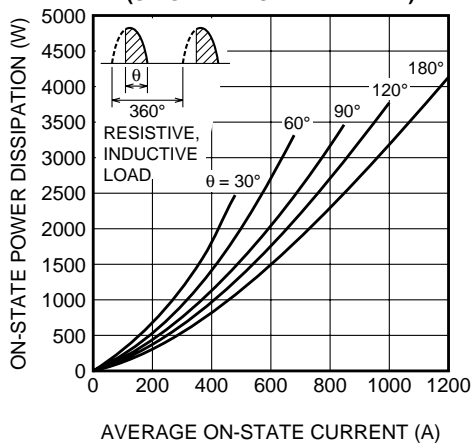
**GATE CHARACTERISTICS**



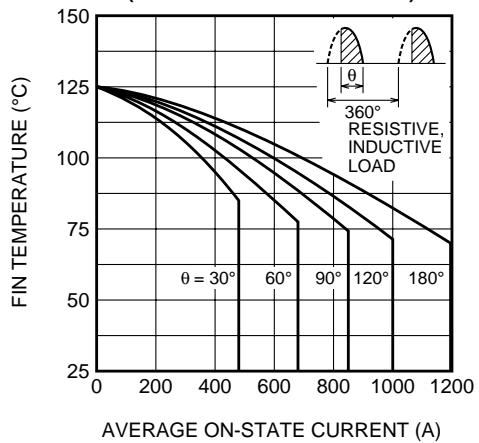
**MAXIMUM THERMAL IMPEDANCE CHARACTERISTIC (JUNCTION TO FIN)**



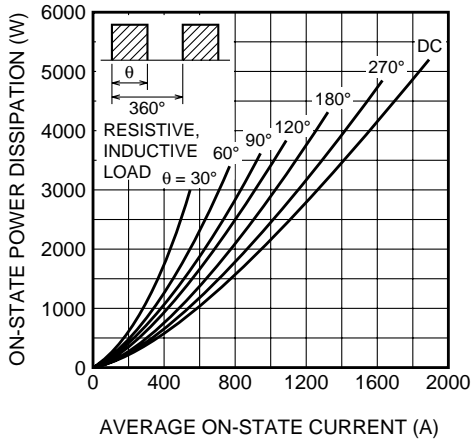
**MAXIMUM ON-STATE POWER DISSIPATION CHARACTERISTICS (SINGLE-PHASE HALF WAVE)**



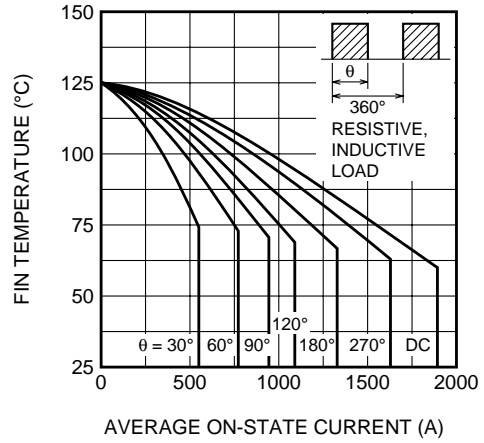
**ALLOWABLE FIN TEMPERATURE VS. AVERAGE ON-STATE CURRENT (SINGLE-PHASE HALF WAVE)**



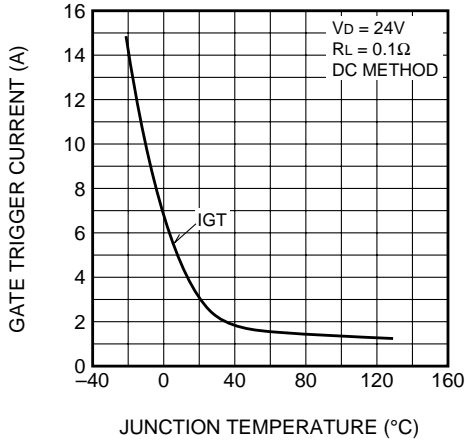
**MAXIMUM ON-STATE POWER DISSIPATION CHARACTERISTICS (RECTANGULAR WAVE)**



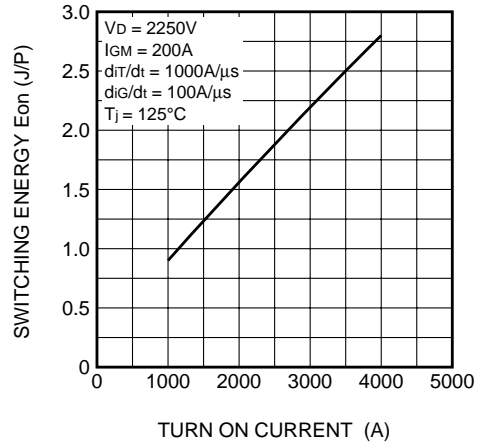
**ALLOWABLE FIN TEMPERATURE VS. AVERAGE ON-STATE CURRENT (RECTANGULAR WAVE)**



**GATE TRIGGER CURRENT VS. JUNCTION TEMPERATURE (MAXIMUM)**



**TURN ON SWITCHING ENERGY (MAXIMUM)**



**TURN OFF SWITCHING ENERGY (MAXIMUM)**

