



**Fast Thyristor
Type TFI233-400-24**

Low switching losses
Low reverse recovery charge
Distributed amplified gate for high di_T/dt

Mean on-state current	I_{TAV}	400 A	
Repetitive peak off-state voltage	V_{DRM}	2000 ÷ 2400 V	
Repetitive peak reverse voltage	V_{RRM}		
Turn-off time	t_q	50.0 μ s	
V_{DRM}, V_{RRM}, V	2000	2200	2400
Voltage code	20	22	24
$T_{j}, ^\circ C$	- 60 ÷ 125		

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters		Units	Values	Test conditions
ON-STATE				
I_{TAV}	Mean on-state current	A	400 545	$T_c = 80^\circ C$; Double side cooled; $T_c = 55^\circ C$; Double side cooled; 180° half-sine wave; 50 Hz
I_{TRMS}	RMS on-state current	A	628	$T_c = 80^\circ C$; Double side cooled; 180° half-sine wave; 50 Hz
I_{TSM}	Surge on-state current	kA	6.6 7.6	180° half-sine wave; 50 Hz ($t_p = 10$ ms); single pulse; $V_D = V_R = 0$ V; Gate pulse: $I_G = I_{FGM}$; $V_G = 20$ V; $t_{GP} = 50 \mu$ s; $di_G/dt = 1$ A/ μ s
			7.0 8.1	180° half-sine wave; 60 Hz ($t_p = 8.3$ ms); single pulse; $V_D = V_R = 0$ V; Gate pulse: $I_G = I_{FGM}$; $V_G = 20$ V; $t_{GP} = 50 \mu$ s; $di_G/dt = 1$ A/ μ s
I^2t	Safety factor	$A^2s \cdot 10^3$	215 285	180° half-sine wave; 50 Hz ($t_p = 10$ ms); single pulse; $V_D = V_R = 0$ V; Gate pulse: $I_G = I_{FGM}$; $V_G = 20$ V; $t_{GP} = 50 \mu$ s; $di_G/dt = 1$ A/ μ s
			200 270	180° half-sine wave; 60 Hz ($t_p = 8.3$ ms); single pulse; $V_D = V_R = 0$ V; Gate pulse: $I_G = I_{FGM}$; $V_G = 20$ V; $t_{GP} = 50 \mu$ s; $di_G/dt = 1$ A/ μ s
BLOCKING				
V_{DRM}, V_{RRM}	Repetitive peak off-state and Repetitive peak reverse voltages	V	2000÷2400	$T_{j \min} < T_j < T_{j \max}$; 180° half-sine wave; 50 Hz; Gate open
V_{DSM}, V_{RSM}	Non-repetitive peak off-state and Non-repetitive peak reverse voltages	V	2100÷2500	$T_{j \min} < T_j < T_{j \max}$; 180° half-sine wave; 50 Hz; single pulse; Gate open
V_D, V_R	Direct off-state and Direct reverse voltages	V	0.75· V_{DRM} 0.75· V_{RRM}	$T_j = T_{j \max}$; Gate open

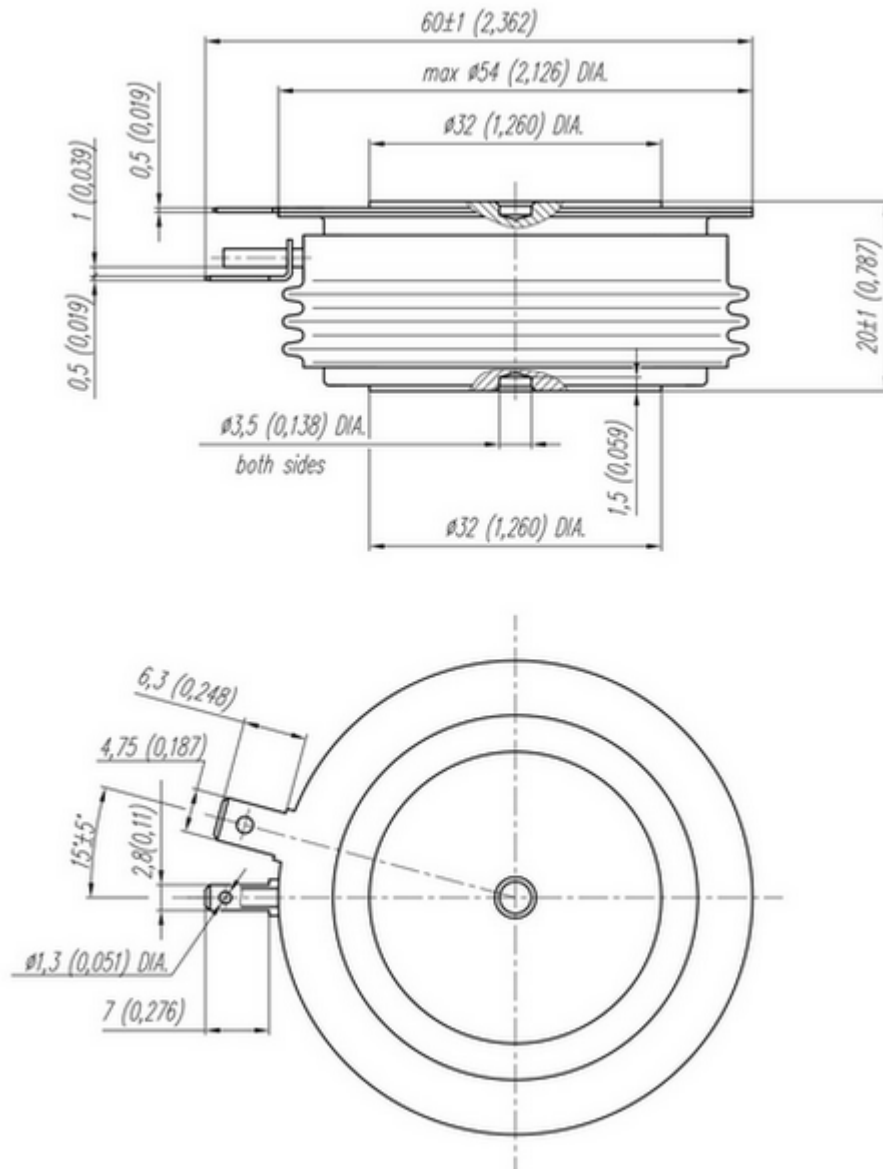
TRIGGERING				
I_{FGM}	Peak forward gate current	A	6	$T_j = T_{j\ max}$
V_{RGM}	Peak reverse gate voltage	V	5	
P_G	Gate power dissipation	W	3	$T_j = T_{j\ max}$ for DC gate current
SWITCHING				
$(di_T/dt)_{crit}$	Critical rate of rise of on-state current non-repetitive (f=1 Hz)	A/ μ s	1600	$T_j = T_{j\ max}$; $V_D = 0.67 \cdot V_{DRM}$; $I_{TM} = 2 I_{TAV}$; Gate pulse: $I_G = I_{FGM}$; $V_G = 20$ V; $t_{GP} = 50$ μ s; $di_G/dt = 1$ A/ μ s
THERMAL				
T_{stg}	Storage temperature	$^{\circ}$ C	-60 ÷ 125	
T_j	Operating junction temperature	$^{\circ}$ C	-60 ÷ 125	
MECHANICAL				
F	Mounting force	kN	9.0 ÷ 11.0	
a	Acceleration	m/s ²	50 100	Device unclamped Device clamped

CHARACTERISTICS

Symbols and parameters		Units	Values	Conditions	
ON-STATE					
V_{TM}	Peak on-state voltage, max	V	2.10	$T_j = 25$ $^{\circ}$ C; $I_{TM} = 1256$ A	
$V_{T(TO)}$	On-state threshold voltage, max	V	1.40	$T_j = T_{j\ max}$; $0.5 \pi I_{TAV} < I_T < 1.5 \pi I_{TAV}$	
r_T	On-state slope resistance, max	m Ω	0.870		
I_H	Holding current, max	mA	500	$T_j = 25$ $^{\circ}$ C; $V_D = 12$ V; Gate open	
BLOCKING					
I_{DRM} , I_{RRM}	Repetitive peak off-state and Repetitive peak reverse currents, max	mA	50	$T_j = T_{j\ max}$; $V_D = V_{DRM}$; $V_R = V_{RRM}$	
$(dv_D/dt)_{crit}$	Critical rate of rise of off-state voltage ¹⁾ , min	V/ μ s	1000	$T_j = T_{j\ max}$; $V_D = 0.67 \cdot V_{DRM}$; Gate open	
TRIGGERING					
V_{GT}	Gate trigger direct voltage, max	V	4.00 2.50 2.00	$T_j = T_{j\ min}$ $T_j = 25$ $^{\circ}$ C $T_j = T_{j\ max}$	$V_D = 12$ V; $I_D = 3$ A; Direct gate current
I_{GT}	Gate trigger direct current, max	mA	500 300 200	$T_j = T_{j\ min}$ $T_j = 25$ $^{\circ}$ C $T_j = T_{j\ max}$	
V_{GD}	Gate non-trigger direct voltage, min	V	0.25	$T_j = T_{j\ max}$; $V_D = 0.67 \cdot V_{DRM}$;	
I_{GD}	Gate non-trigger direct current, min	mA	10.00	Direct gate current	
SWITCHING					
t_{gd}	Delay time	μ s	2.50	$T_j = 25$ $^{\circ}$ C; $V_D = 0.4 \cdot V_{DRM}$; $I_{TM} = I_{TAV}$; Gate pulse: $I_G = I_{FGM}$; $V_G = 20$ V; $t_{GP} = 50$ μ s; $di_G/dt = 1$ A/ μ s	
t_q	Turn-off time ²⁾ , max	μ s	50.0	$dv_D/dt = 50$ V/ μ s	$T_j = T_{j\ max}$; $I_{TM} = I_{TAV}$; $di_R/dt = -10$ A/ μ s; $V_R = 100$ V; $V_D = 0.67 V_{DRM}$
			63.0	$dv_D/dt = 200$ V/ μ s	
Q_{rr}	Total recovered charge, max	μ C	400	$T_j = T_{j\ max}$; $I_{TM} = 400$ A;	
t_{rr}	Reverse recovery time, typ	μ s	5.0	$di_R/dt = -50$ A/ μ s;	
I_{rrM}	Peak reverse recovery current, max	A	160	$V_R = 100$ V	

THERMAL					
R_{thjc}	Thermal resistance, junction to case, max	°C/W	0.0500	Direct current	Double side cooled
R_{thjc-A}			0.1100		Anode side cooled
R_{thjc-K}			0.0900		Cathode side cooled
R_{thck}	Thermal resistance, case to heatsink, max	°C/W	0.0060	Direct current	
MECHANICAL					
w	Weight, typ	g	180		
D_s	Surface creepage distance	mm (inch)	19.44 (0.765)		
D_a	Air strike distance	mm (inch)	12.10 (0.476)		

NOTES		PART NUMBERING GUIDE										
¹⁾ Critical rate of rise of off-state voltage <table border="1"> <tr> <td>Symbol of group</td> <td>A2</td> </tr> <tr> <td>$(dv_D/dt)_{crit}$, V/μs</td> <td>1000</td> </tr> </table>		Symbol of group	A2	$(dv_D/dt)_{crit}$, V/ μ s	1000	TFI	233	400	24	A2	E3	N
Symbol of group	A2											
$(dv_D/dt)_{crit}$, V/ μ s	1000											
		1	2	3	4	5	6	7				
²⁾ Turn-off time ($dv_D/dt=50$ V/ μ s) <table border="1"> <tr> <td>Symbol of group</td> <td>E3</td> </tr> <tr> <td>t_q, μs</td> <td>50.0</td> </tr> </table>		Symbol of group	E3	t_q , μ s	50.0	1. TFI — Fast Thyristor TFIS — Fast Thyristor with Distributed Amplified Gate 2. Design version 3. Mean on-state current, A 4. Voltage code 5. Critical rate of rise of off-state voltage 6. Group of turn-off time ($dv_D/dt=50$ V/ μ s) 7. Ambient conditions: N – normal; T – tropical						
Symbol of group	E3											
t_q , μ s	50.0											



All dimensions in millimeters (inches)