

Fast Thyristor

AT188F

Key Parameters

$I_{TAV(M)}$	=	188	A
V_{DRM}/V_{RRM}	=	800 - 1300	V
I_{TSM}	=	2900	A
V_{TO}	=	1.2	V
r_T	=	1.35	mΩ

Properties

- International standard package
- Metal case with ceramic insulator
- Low on-state and switching losses
- High operation reliability
- Optimum power handling capability

MAXIMUM ALLOWABLE RATINGS

Symbols and parameters			Maximum Limits		Unit	
V_{DRM}	Repetitive peak forward voltage	t _{vj} = -40 °C ... t _{vj max}	800	1000	V	
V_{RRM}	Repetitive peak reverse voltage		1100	1200	V	
			1300*		V	
V_{DSM}	Non-repetitive peak forward off-state voltage	t _{vj} = -40 °C ... t _{vj max}	800	1000	V	
			1100	1200	V	
			1300		V	
V_{RSM}	Non-repetitive peak reverse voltage	t _{vj} = +25 °C ... t _{vj max}	900	1100	V	
			1200	1300	V	
			1400		V	
I_{TAVM}	Average on-state current	t _C = 85 °C	188		A	
		t _C = 64 °C	254		A	
I_{TRMSM}	RMS on-state current		400		A	
I_{TSM}	Surge current	t _{vj} = 25 °C, t _p = 10 ms	3300		A	
		t _{vj} = t _{vj max} , t _p = 10 ms	2900		A	
I²t	I ² t-value	t _{vj} = 25 °C, t _p = 10 ms	54 500		A ² s	
		t _{vj} = t _{vj max} , t _p = 10 ms	42 000		A ² s	
(dv/dt)_{cr}	Critical rate of rise of off-state voltage	t _{vj} = t _{vj max} V _D = 0.67 V _{DRM}		1)	2)	V/μs V/μs V/μs V/μs
			B:	50	50	
			C*:	500	500	
			L:	500	50	
			M*:	1000	500	
(di/dt)_{cr}	Critical rate of rise of on-state current	f = 50 Hz, I _{GM} = 0.6 A di _G /dt = 0.6 A/μs V _D ≤ 0.67 V _{DRM}	160		A/μs	

CHARACTERISTICS

Symbols and parameters			Value			Unit
			min	typ	max	
V_T	On-state voltage	$t_{vj} = t_{vj \max}, I_T = 600 \text{ A}$			2.44	V
$V_{(TO)}$	Threshold voltage	$t_{vj} = t_{vj \max}$	1.2			V
r_T	Slope resistance	$t_{vj} = t_{vj \max}$	1.35			mΩ
I_{GT}	Gate trigger current	$t_{vj} = 25 \text{ °C}, V_D = 12 \text{ V}$			150	mA
V_{GT}	Gate trigger voltage	$t_{vj} = 25 \text{ °C}, V_D = 12 \text{ V}$			2	V
I_{GD}	Gate non-trigger current	$t_{vj} = t_{vj \max}, V_D = 12 \text{ V}$			10	mA
V_{GD}	Gate non-trigger voltage	$t_{vj} = t_{vj \max}, V_D = 0.5 V_{DRM}$			0.25	V
I_H	Holding current	$t_{vj} = 25 \text{ °C}, V_D = 12 \text{ V}$ $R_A = 10 \text{ Ω}$			250	mA
I_L	Latching current	$t_{vj} = 25 \text{ °C}, V_D = 12 \text{ V}$ $R_{GK} \geq 10 \text{ Ω}, I_{GM} = 0.6 \text{ A}$ $di_G/dt = 0.6 \text{ A}/\mu\text{s}$ $t_g = 20 \text{ μs}$			1	A
i_D, i_R	Forward off-state and reverse currents	$t_{vj} = t_{vj \max}$ $V_D = V_{DRM}, V_R = V_{RRM}$			30	mA
t_{gd}	Gate controlled delay time	$t_{vj} = 25 \text{ °C}, I_{GM} = 0.6 \text{ A}$ $di_G/dt = 0.6 \text{ A}/\mu\text{s}$			1.4	μs
t_q	Turn-off time	See Techn. Inf.			s: 18 E: 20 F: 25	μs μs μs

THERMAL PARAMETERS

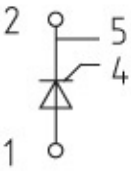
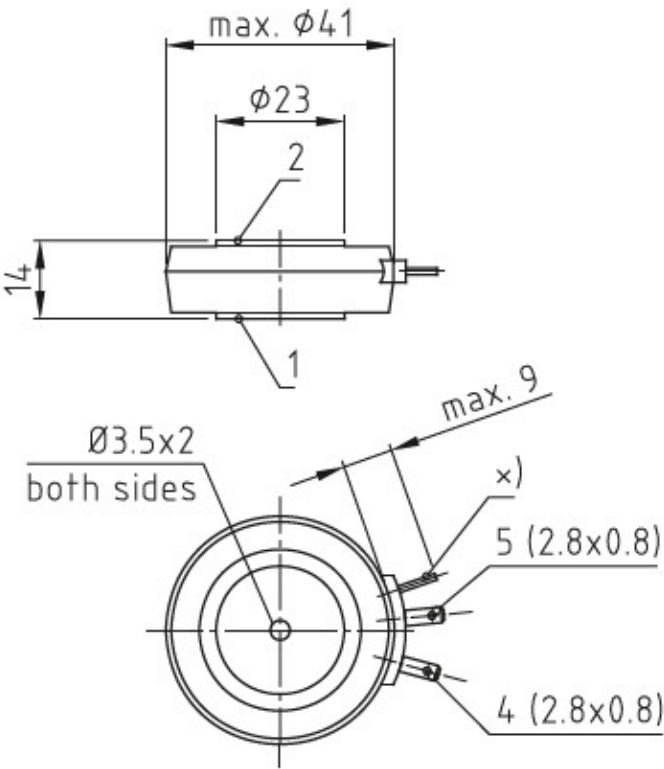
Symbols and parameters			Value	Unit
$R_{th(j-c)}$	Thermal resistance, junction to case	Two-sided cooling, $\theta = 180^\circ \text{ el, sin}$	0.117	$^\circ\text{C}/\text{W}$
		Two-sided cooling, DC	0.103	
		Anode-sided cooling, $\theta = 180^\circ \text{ el, sin}$	0.18	
		Anode-sided cooling, DC	0.166	
		Cathode-sided cooling, $\theta = 160^\circ \text{ el, sin}$	0.28	
		Cathode-sided cooling, DC	0.266	
$R_{th(c-h)}$	Thermal resistance, case to heatsink	Two-sided	0.015	$^\circ\text{C}/\text{W}$
		Single-sided	0.03	
$t_{j \max}$	Maximum junction temperature		+125	$^\circ\text{C}$
$t_{c \text{ op}}$	Operating temperature range		-40 ... +125	$^\circ\text{C}$
t_{stg}	Storage temperature range		-40 ... +140	$^\circ\text{C}$

MECHANICAL PARAMETERS

Symbols and parameters			Value	Unit
F	Clamping force		3 – 6	kN
W	Weight		70	g
D	Creepage distance		17	mm
a	Vibration resistance	f = 50 Hz	50	m/s ²

* - Delivery for larger quantities on request
1) - Values to DIN IEC 747-6 (without prior commutation)
2) - Immediately after circuit commutated turn-off time, see Parameters t_q

DIMENSIONS



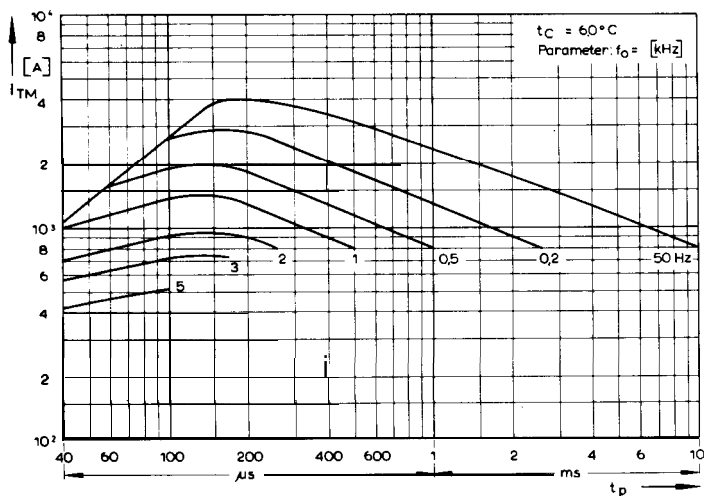


Fig. 1

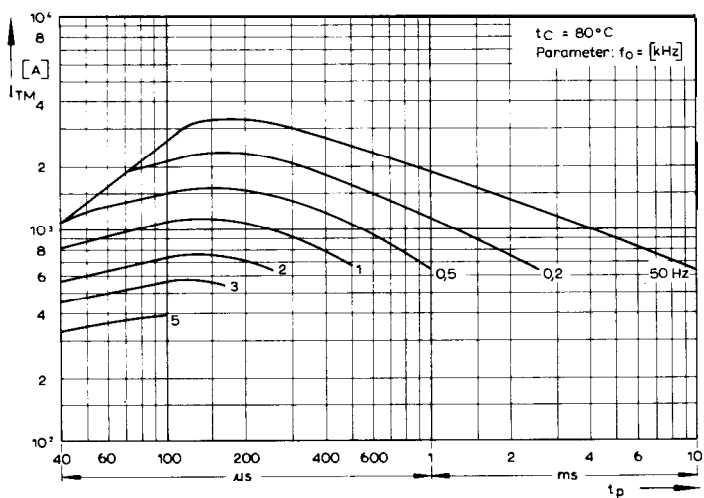


Fig. 2

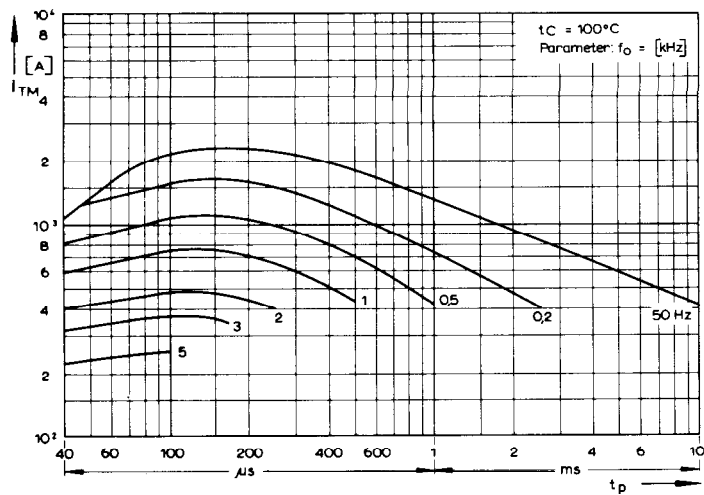


Fig. 3

Fig. 1, 2, 3
Pulse generator:
 $i_G = 0.6 \text{ A}$, $di_G/dt = 0.6 \text{ A}/\mu\text{s}$

RC-network:
 $R [\Omega] \geq 0.02 V_{DM} [\text{V}]$
 $C \leq 0.22 \mu\text{F}$
 $V_{DM} \leq 0.67 V_{DRM}$

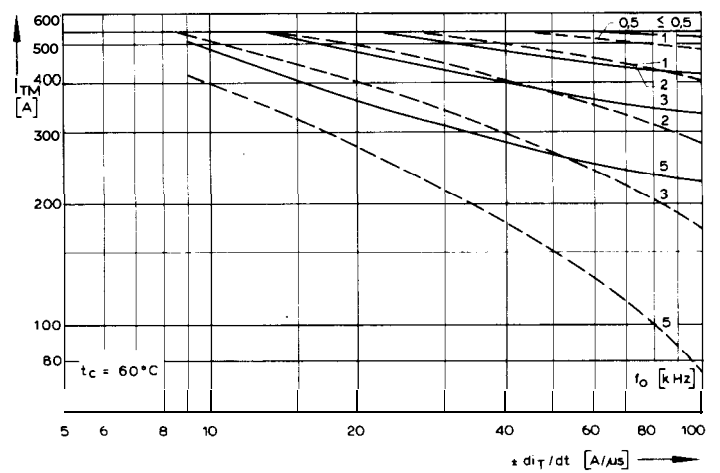
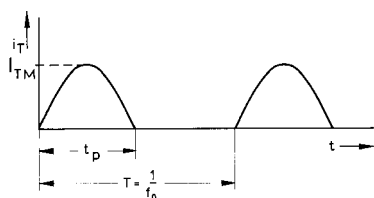


Fig. 4

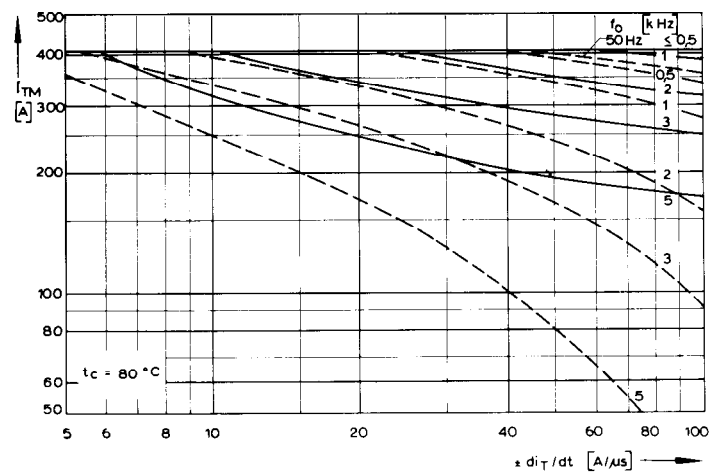


Fig. 5

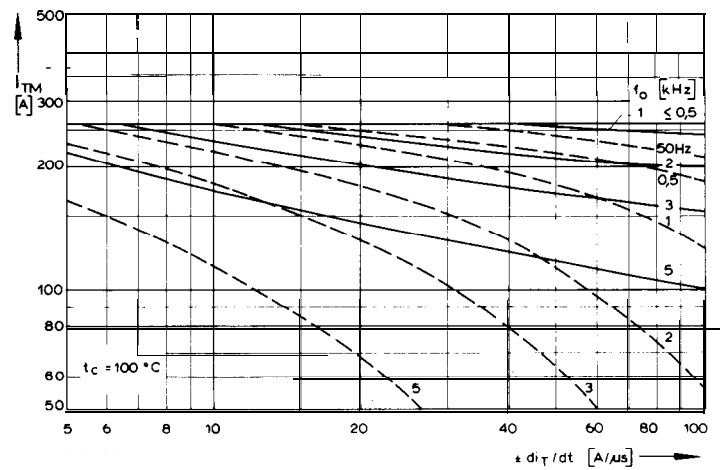
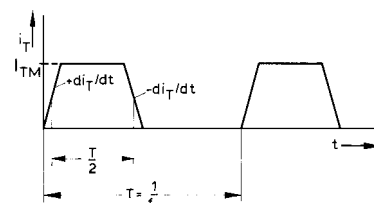


Fig. 6

Fig. 4, 5, 6
Pulse generator:
 $i_G = 0.6 \text{ A}$, $di_G/dt = 0.6 \text{ A}/\mu\text{s}$

RC-network:
 $R [\Omega] \geq 0.02 V_{DM} [\text{V}]$
 $C \leq 0.33 \mu\text{F}$
 $V_{DM} \leq 0.67 V_{DRM}$
 $dv_R/dt \leq 600 \text{ V}/\mu\text{s}$
 $V_{RM} \leq 0.67 V_{RRM}$



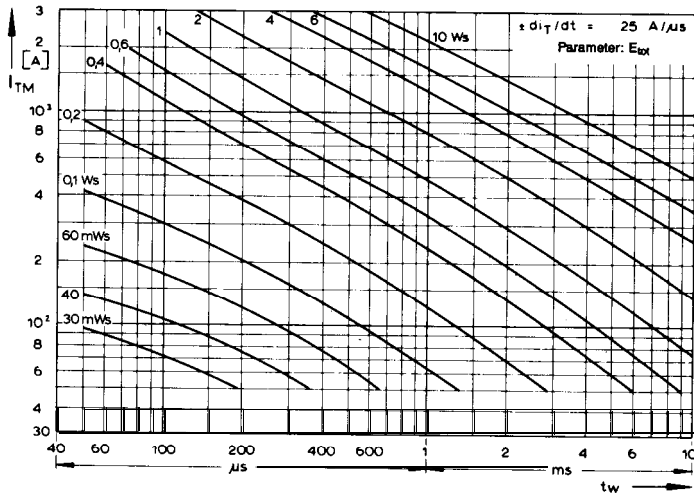


Fig. 7

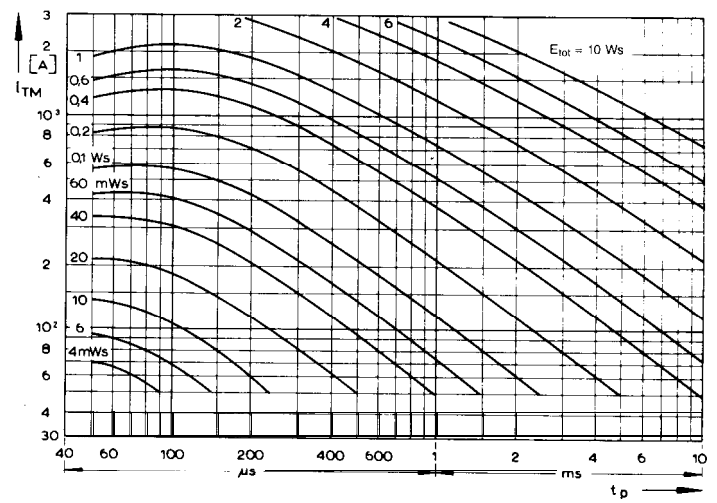


Fig. 10

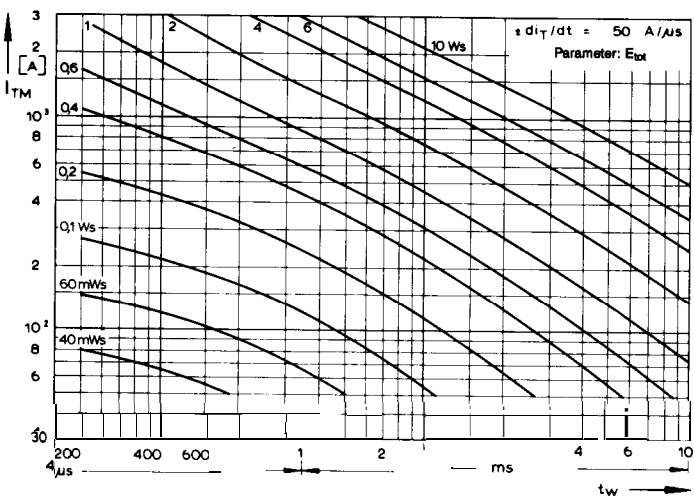


Fig. 8

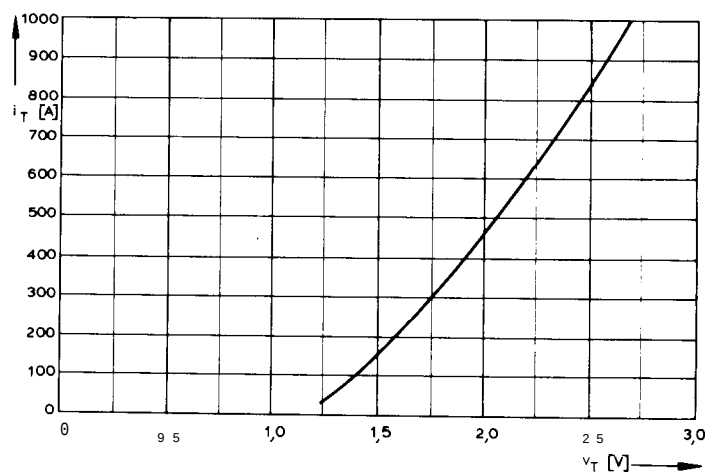


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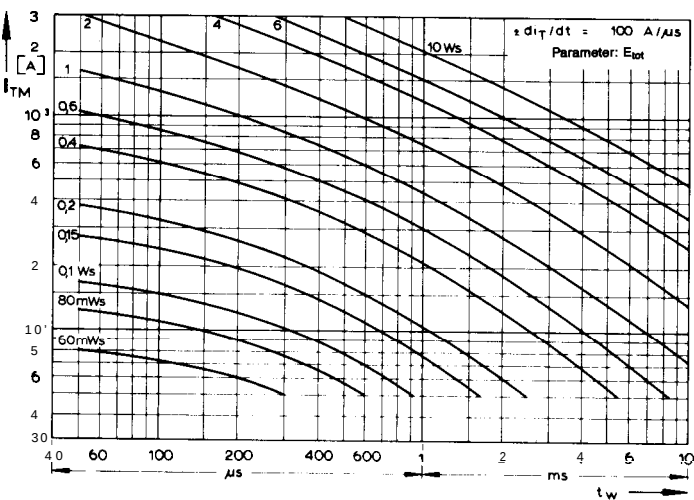


Fig. 9

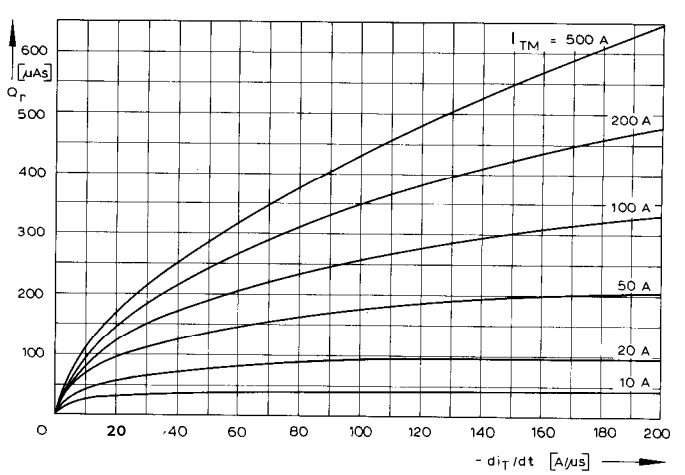


Fig. 12

Fig. 7, 8, 9
Pulse generator:
 $i_G = 0.6 \text{ A}$, $di_G/dt = 0.6 \text{ A}/\mu\text{s}$

RC-network:
 $R [\Omega] \geq 0.02 V_{DM} [\text{V}]$
 $C \leq 0.33 \mu\text{F}$
 $V_{DM} \leq 0.67 V_D$
 $dv_R/dt \leq 600 \text{ V}/\mu\text{s}$
 $V_{RM} \leq 0.67 V_{RRM}$

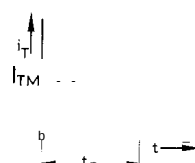
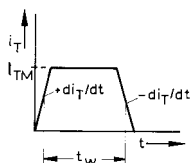


Fig. 10
Pulse generator:
 $i_G = 0.6 \text{ A}$, $di_G/dt = 0.6 \text{ A}/\mu\text{s}$

RC-network:
 $R [\Omega] \geq 0.02 V_{DM} [\text{V}]$
 $C \leq 0.22 \mu\text{F}$

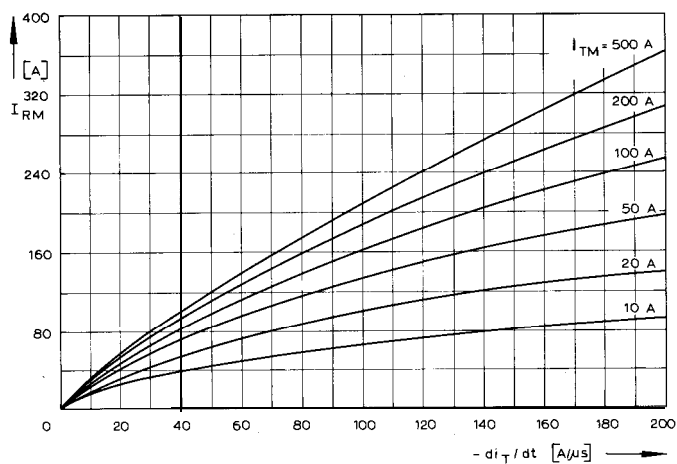


Fig. 13
Peak reverse recovery current
 $I_{RM} = f(-di_T/dt)$, $t_{vj} = t_{vj(max)}$, $v_R = 0.5 V_{RRM}$, $v_{RM} = 0.8 V_{RRM}$
Parameter: On-state current I_{TM}

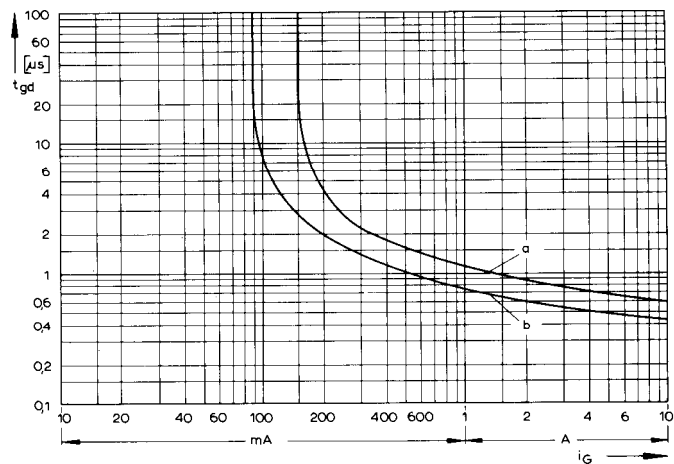


Fig. 15
Gate controlled delay time
 $t_{gd} = f(i_{GM})$, $t_{vj} = 25^\circ\text{C}$, $di_G/dt = i_{GM}/1\mu\text{s}$
a — Limiting characteristic
b — Typical characteristic

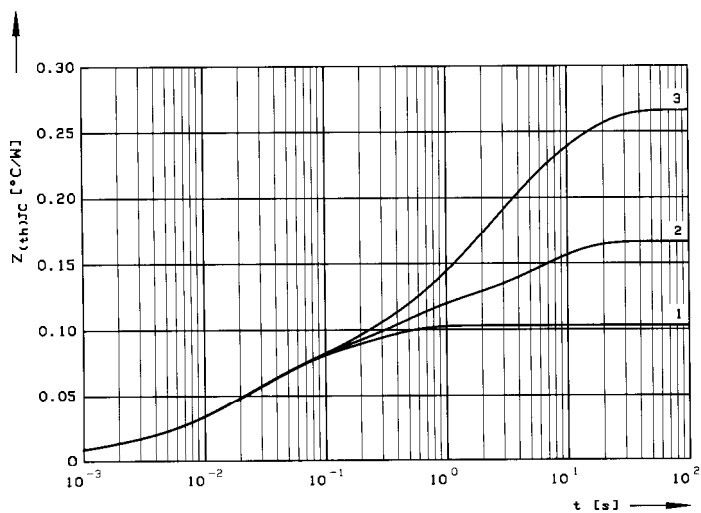


Fig. 14
Transient thermal impedance $Z_{(th)JC} = f(t)$, DC
1 — Two-sided cooling
2 — Anode side cooling
3 — Cathode side cooling

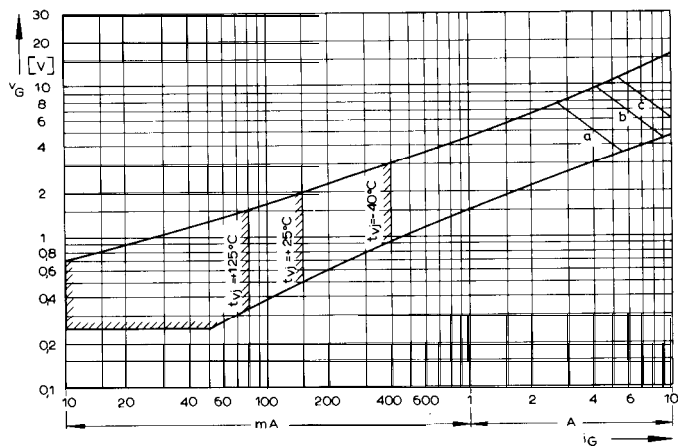


Fig. 16
Gate characteristic with triggering areas $v_G = f(i_G)$, $V_D = 12\text{ V}$
Parameter: Trigger pulse duration t_b [ms]: a - 10; b - 1; c - 0.5
Maximum rated peak gate power dissipation P_{GM} [W]:
a - 20; b - 40; c - 60