

Fast Thyristor

AT509S

Key Parameters

$I_{TAV(M)}$	=	510	A
V_{DRM}/V_{RRM}	=	600 - 1200	V
I_{TSM}	=	8400	A
V_{TO}	=	1.3	V
r_T	=	0.65	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		600	V
V_{RRM}	Repetitive peak reverse voltage		800	V
			1000	V
			1200	V
I_{TAVM}	Average on-state current	$t_C = 85\text{ °C}$	510	A
		$t_C = 22\text{ °C}$	960	A
I_{TRMSM}	RMS on-state current		1500	A
I_{TSM}	Surge current	$t_{vj} = 45\text{ °C}, t_P = 10\text{ ms}$	9500	A
		$t_{vj} = t_{vj\text{ max}}, t_P = 10\text{ ms}$	8400	A
I^2t	I^2t -value	$t_{vj} = 45\text{ °C}, t_P = 10\text{ ms}$	451	kA ² s
		$t_{vj} = t_{vj\text{ max}}, t_P = 10\text{ ms}$	353	kA ² s
$(dv/dt)_{cr}$	Critical rate of rise of off-state voltage	$t_{vj} = t_{vj\text{ max}}$ $V_D = 0.67 V_{DRM}$		
			1)	2)
		B:	50	50
		C*:	400	400
		L:	400	50
		M*:	1000	400
$(di/dt)_{cr}$	Critical rate of rise of on-state current	non rep. rep., $di_G/dt = 1\text{ A}/\mu\text{s}$ $I_{TM} = 2.5\text{ kA}$ $I_G = 1\text{ A}$	1500 500	A/ μs A/ μs

CHARACTERISTICS

Symbols and parameters			Value			Unit
			min	typ	max	
V_T	On-state voltage	$t_{vj} = t_{vj \max}, I_T = 2500 \text{ A}$			3.05	V
$V_{(TO)}$	Threshold voltage	$t_{vj} = t_{vj \max}$	1.3			V
r_T	Slope resistance	$t_{vj} = t_{vj \max}$	0.65			mΩ
I_{GT}	Gate trigger current	$t_{vj} = 25^\circ\text{C}, v_D = 6 \text{ V}, R_A = 5 \Omega$ $t_{vj} = t_{vj \max}, v_D = 6 \text{ V}, R_A = 5 \Omega$			250 10	mA mA
V_{GT}	Gate trigger voltage	$t_{vj} = 25^\circ\text{C}, v_D = 6 \text{ V}, R_A = 5 \Omega$			2.2	V
I_H	Holding current	$t_{vj} = 25^\circ\text{C}, v_D = 6 \text{ V}, R_A = 5 \Omega$			250	mA
I_L	Latching current	$t_{vj} = 25^\circ\text{C}, v_D = 6 \text{ V}$ $R_{GK} \geq 10 \Omega, I_G = 1 \text{ A}$ $di_G/dt = 1 \text{ A}/\mu\text{s}$ $t_g = 20 \mu\text{s}$			1.5	A
i_D, i_R	Forward off-state and reverse currents	$t_{vj} = t_{vj \max}$ $v_D = V_{DRM}, v_R = V_{RRM}$			100	mA
t_{gd}	Gate controlled delay time	$I_G = 1 \text{ A}, di_G/dt = 1 \text{ A}/\mu\text{s}$			1.2	μs
t_q	Turn-off time	See Techn. Inf.			C*: 12 D: 15 S: 18 E: 20	μs μs μs μs
Q_s	Stored charge	$t_{vj} = t_{vj \max}, I_{TM} = 800 \text{ A}$ $-di_T/dt = 20 \text{ A}/\mu\text{s}$			80	μAs
C_{null}	Null capacitance	$t_{vj} = 25^\circ\text{C}, f = 10 \text{ kHz}$			8.5	nF

THERMAL PARAMETERS

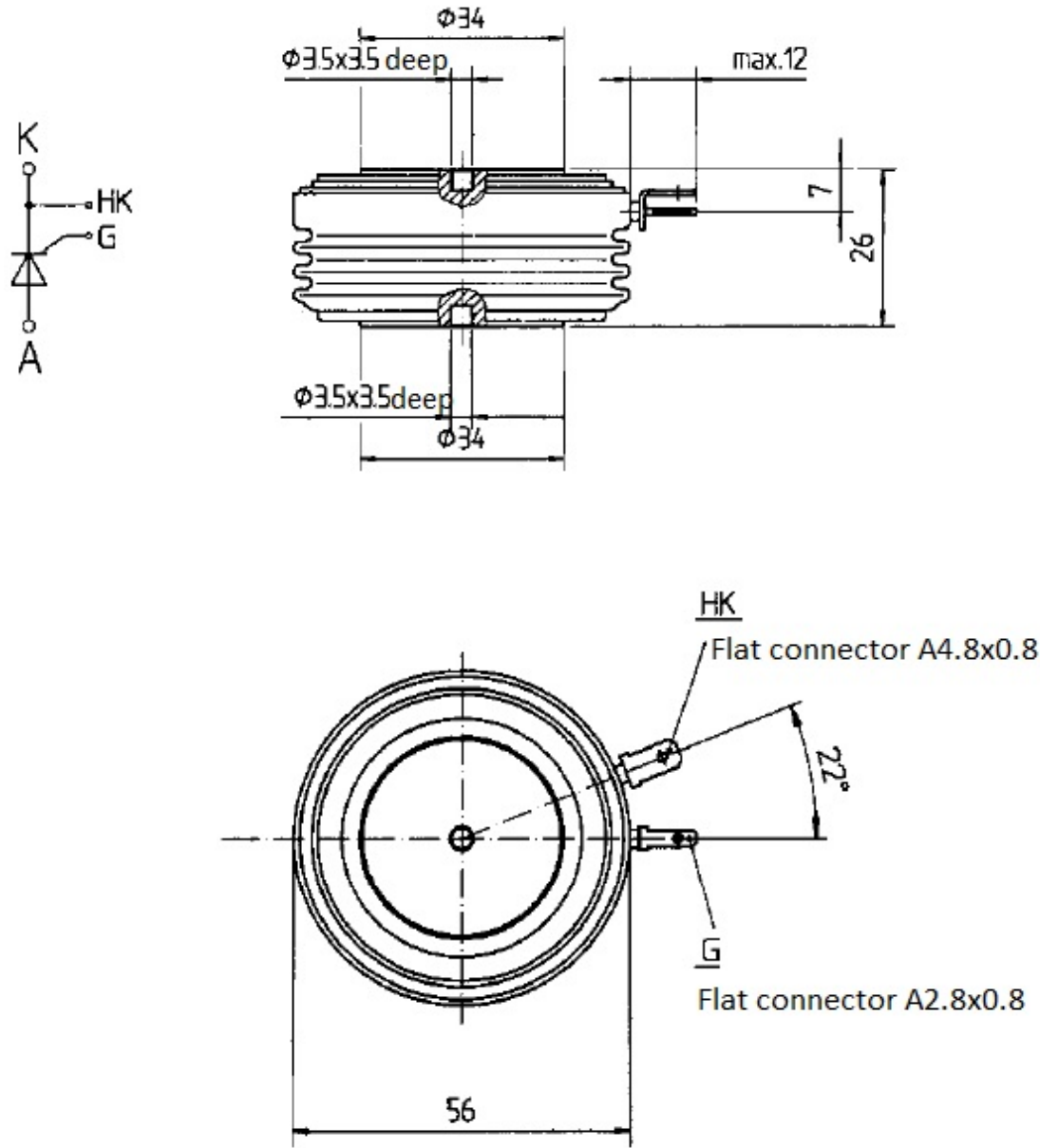
Symbols and parameters			Value	Unit
$R_{th(j-c)}$	Thermal resistance, junction to case	Two-sided cooling, $\theta = 180^\circ \text{ el, sin}$ Two-sided cooling, DC Anode-sided cooling, $\theta = 180^\circ \text{ el, sin}$ Anode-sided cooling, DC Cathode-sided cooling, $\theta = 180^\circ \text{ el, sin}$ Cathode-sided cooling, DC	0.038 0.036 0.0675 0.065 0.082 0.08	$^\circ\text{C}/\text{W}$
$R_{th(c-h)}$	Thermal resistance, case to heatsink		0.01	$^\circ\text{C}/\text{W}$
$t_{vj \max}$	Maximum junction temperature		+125	$^\circ\text{C}$
$t_{vj \text{ op}}$	Operating temperature range		-40 ... +125	$^\circ\text{C}$
t_{stg}	Storage temperature range		-40 ... +150	$^\circ\text{C}$

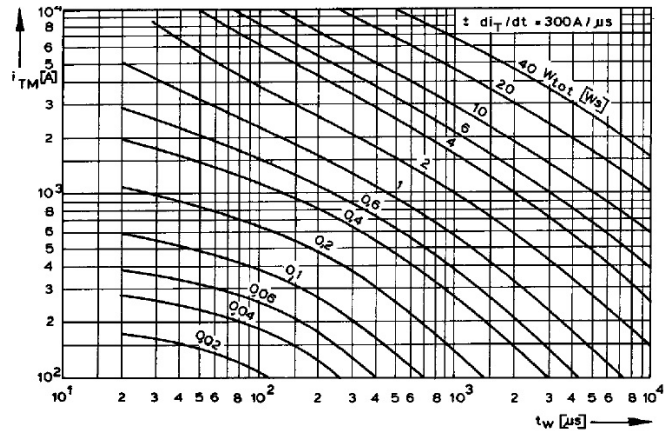
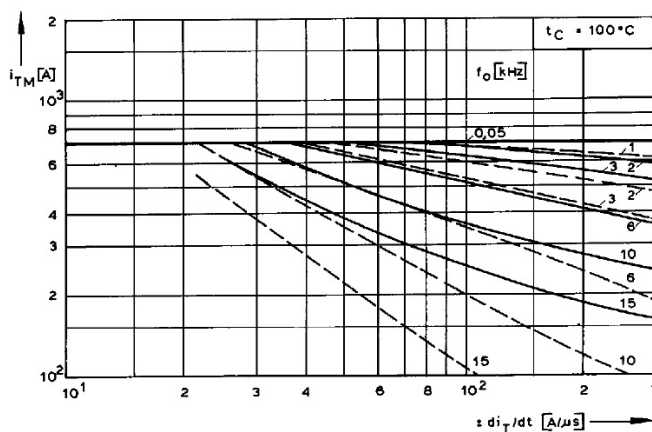
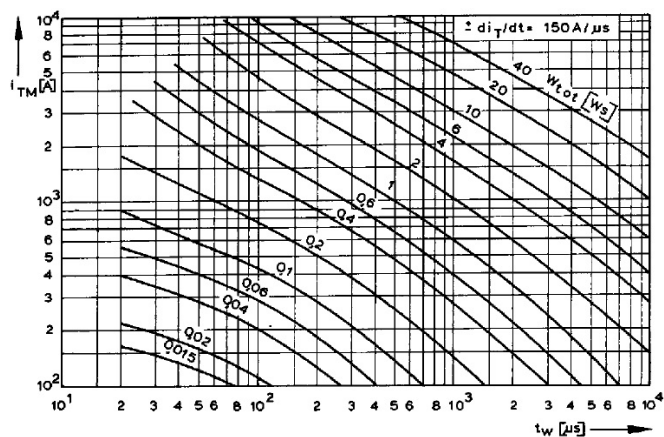
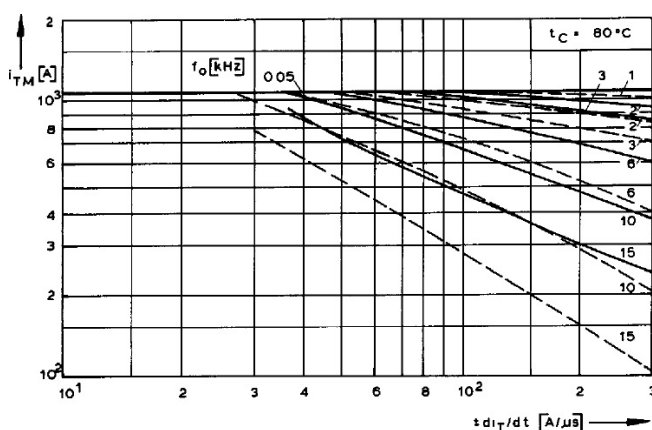
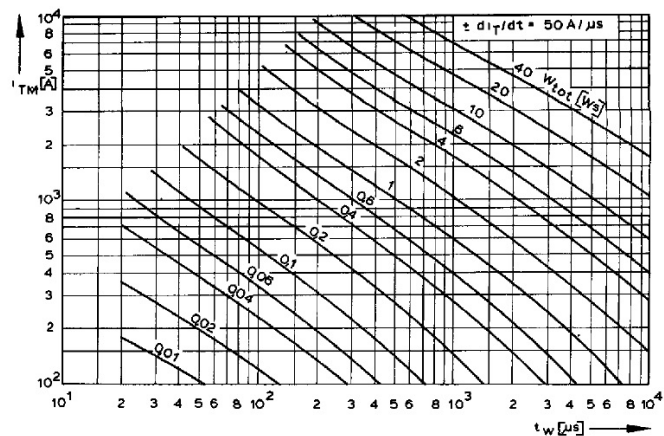
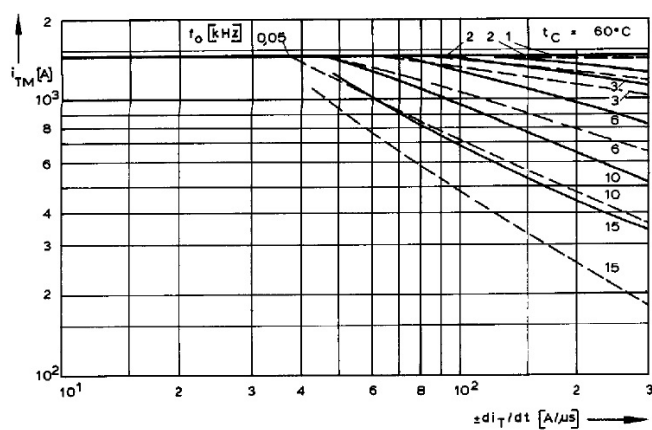
MECHANICAL PARAMETERS

Symbols and parameters			Value	Unit
F	Clamping force		12 – 15	kN
W	Weight		270	g
D	Creepage distance		25	mm

- * - Delivery for larger quantities on request
 1) - Values to DIN 41787 (without prior commutation)
 2) - Immediately after turn-off time

DIMENSIONS



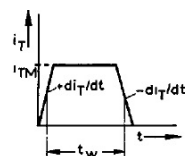
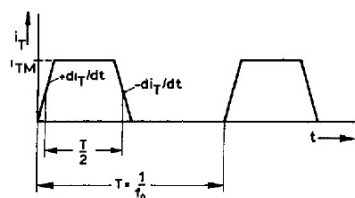


Pulse generator:
 $i_G = 1 \text{ A}$, $t_a = 1 \mu\text{s}$

RC-network:
 $R [\Omega] \geq 0.02 v_{DM} [V]$
 $C \leq 0.33 \mu F$
 $dv_R/dt \leq 600 V/\mu s$

Pulse generator:
 $i_G = 1 \text{ A}$, $t_a = 1 \mu\text{s}$

RC-network:
 $R [\Omega] \geq 0.02 v_{DM} [V]$
 $C \leq 0.33 \mu F$



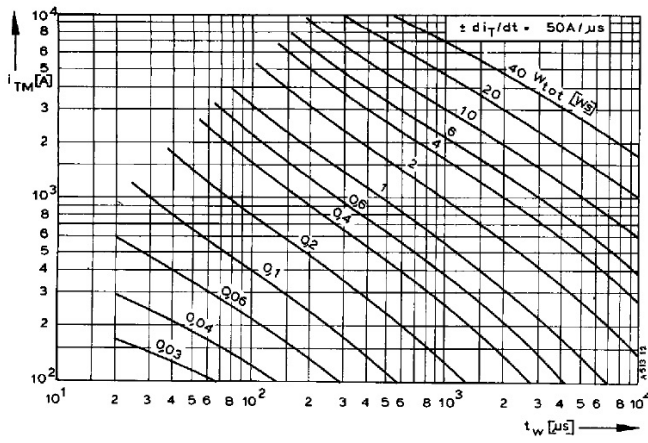


Fig. 7

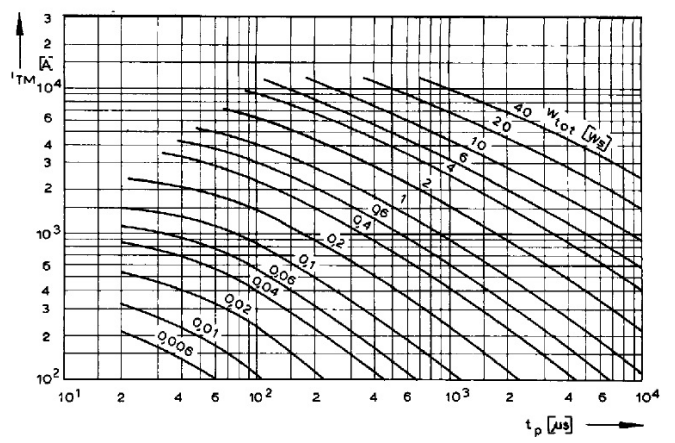


Fig. 10

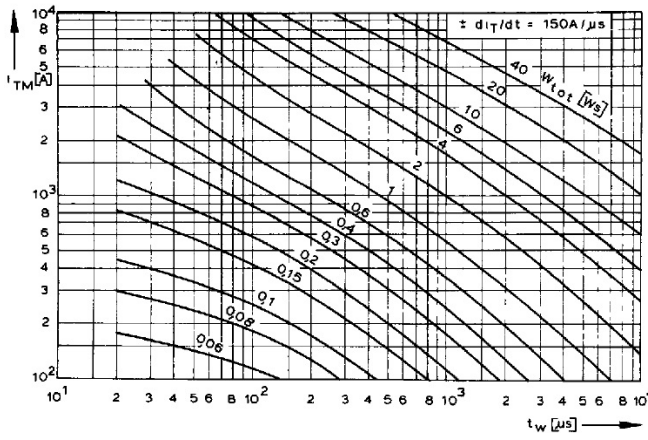


Fig. 8

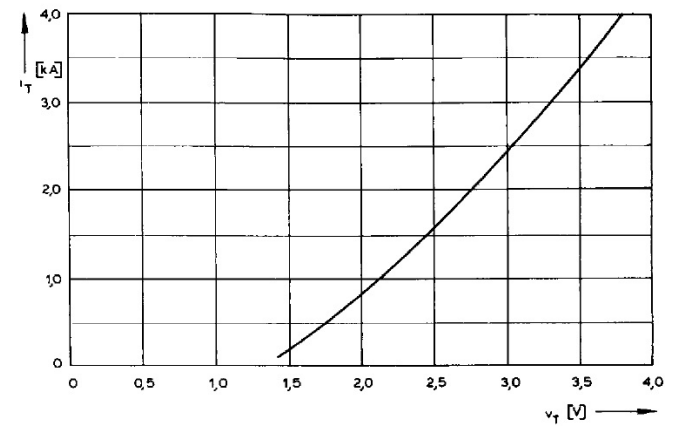


Fig. 11

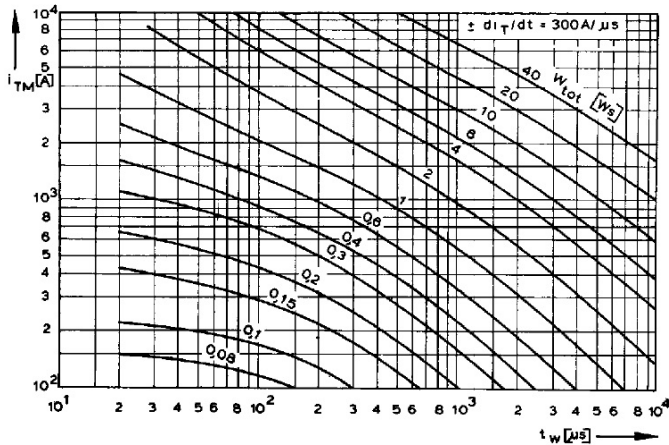


Fig. 9

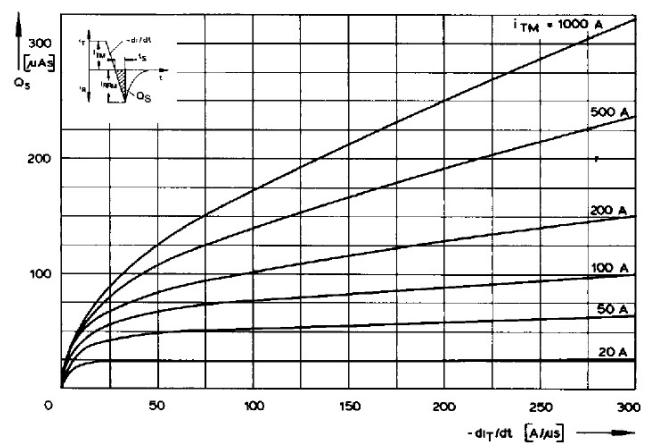


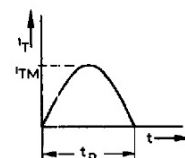
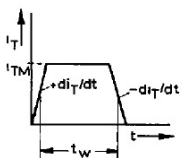
Fig. 12

Pulse generator:
 $I_G = 1 \text{ A}$, $t_a = 1 \text{ μs}$

RC-network:
 $R [\Omega] \geq 0.02 v_{DM} [\text{V}]$
 $C \leq 0.33 \text{ μF}$
 $dv_R/dt \leq 600 \text{ V/μs}$

Pulse generator:
 $I_G = 1 \text{ A}$, $t_a = 1 \text{ μs}$

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



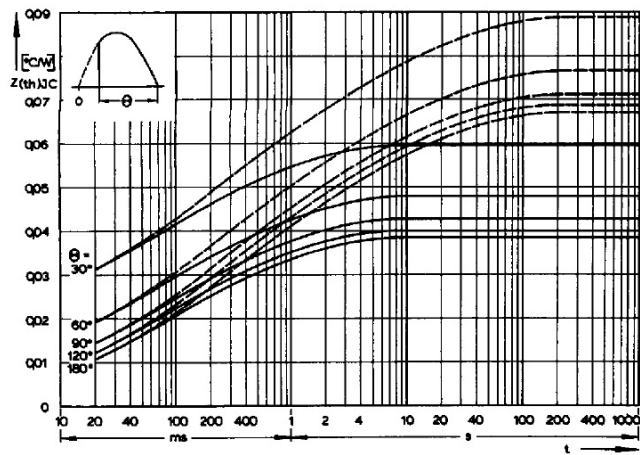


Fig. 13
Transient thermal impedance, junction to case, $Z_{(th)JC}$
-- Anode sided cooling
— Two-sided cooling

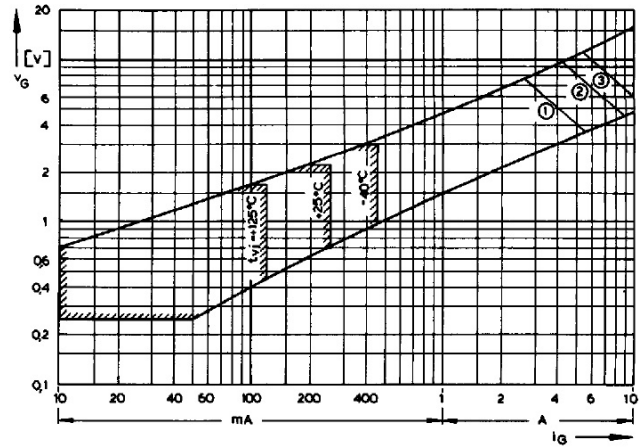


Fig. 15
Gate characteristic and peak gate power dissipation at $V_D \geq 6$ V
Parameter: Pulse duration t_g [ms]: a - 10; b - 1; c - 0.5
Maximum allowable peak gate power [W]: a - 20; b - 40; c - 60

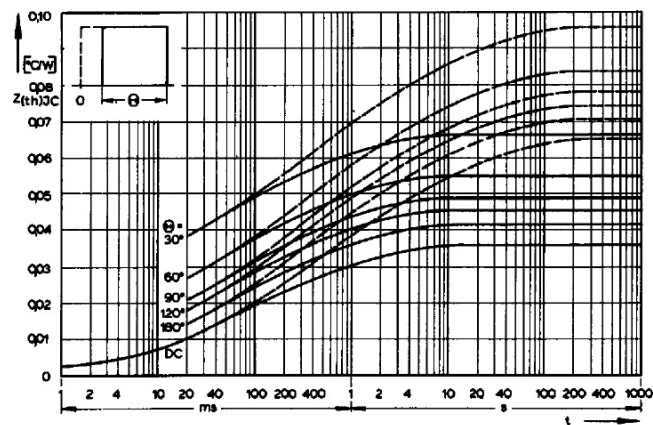


Fig. 14
Transient thermal impedance, junction to case, $Z_{(th)JC}$
-- Anode sided cooling
— Two-sided cooling

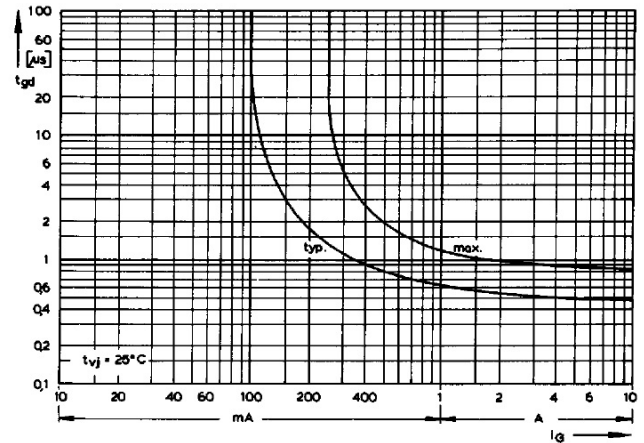


Fig. 16
Gate controlled delay time t_{gd}

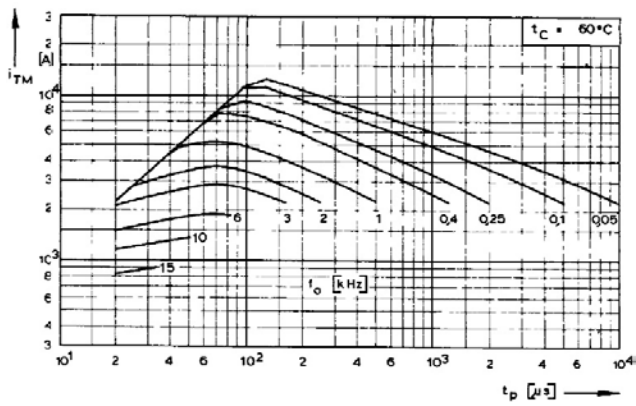


Fig. 17

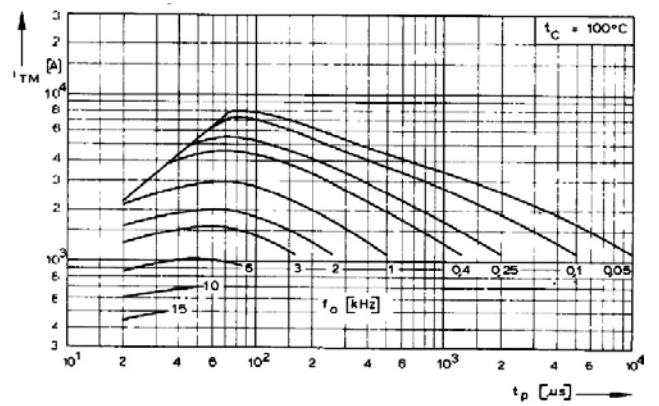


Fig. 19

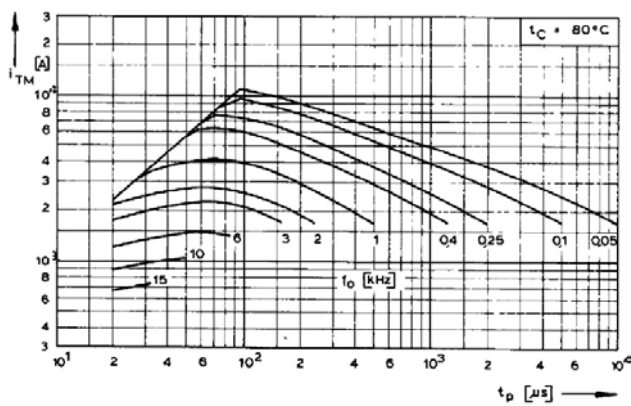


Fig. 18

Pulse generator:
 $i_G = 1 \text{ A}$, $t_a = 1 \mu\text{s}$

RC-network:
 $R [\Omega] \geq 0.02 v_{DM} [\text{V}]$
 $C \leq 0.22 \mu\text{F}$
 $dv_R/dt \leq 600 \text{ V}/\mu\text{s}$

