FAST GATE TURN-OFF THYRISTORS

Thyristors in TO-220AB envelopes capable of being turned both on and off via the gate. They are suitable for use in high-frequency inverters, power supplies, horizontal deflection systems etc.
The devices have no reverse blocking capability. For reverse blocking operation use with a series diode, for reverse conducting operation use with an anti parallel diode.

QUICK REFERENCE DATA

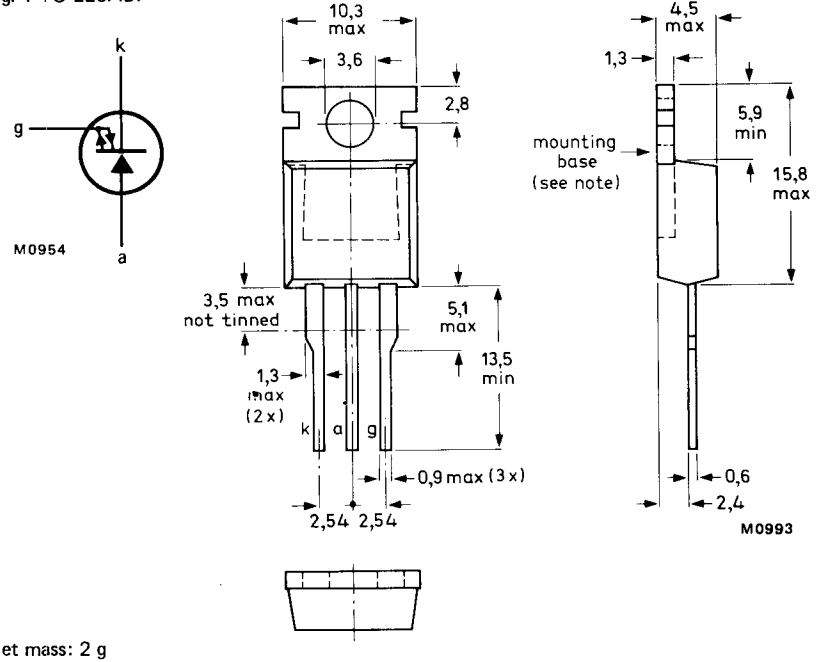
			BT157–1300R | 1500R	
Repetitive peak off-state voltage	V_{DRM}	max.	1300 | 1500	V
Controllable anode current	I_{TCRM}	max.	12	A
Average on-state current	$I_{T(AV)}$	max.	3.2	A
Fall time	t_f	max.	200	ns

MECHANICAL DATA

Dimensions in mm

blue binder, tab 9

Fig. 1 TO-220AB.



Net mass: 2 g

Note: The exposed metal mounting base is directly connected to the anode.

Accessories supplied on request: see data sheets Mounting instructions and accessories for TO-220 envelopes.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

			BT157–1300R	1500R	
Anode to cathode					
Transient off-state voltage	V_{DSM}	max.	1500	1650	V*
Repetitive peak off-state voltage	V_{DRM}	max.	1300	1500	V*
Working off-state voltage	V_{DW}	max.	1200	1300	V*
Continuous off-state voltage	V_D	max.	750	800	V*
Average on-state current (averaged over any 20 ms period) up to T_{mb} = 80 °C	$I_{T(AV)}$	max.	3.2		A
Controllable anode current	I_{TCRM}	max.	12		A
Non-repetitive peak on-state current t = 10 ms; half-sinewave; T_j = 120 °C prior to surge	I_{TSM}	max.	20		A
I^2t for fusing; t = 10 ms	I^2t	max.	2		A^2s
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	47.5		W
Gate to cathode					
Repetitive peak on-state current T_j = 120 °C prior to surge gate-cathode forward; t = 1 ms; half-sinewave	I_{GFM}	max.	25		A
gate-cathode reverse; t = 20 μs	I_{GRM}	max.	15		A
Average power dissipation (averaged over any 20 ms period)	$P_{G(AV)}$	max.	2.5		W
Temperatures					
Storage temperature	T_{stg}		−40 to +150		°C
Operating junction temperature	T_j	max.	120		°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	2.0	°C/W
From mounting base to heatsink with heatsink compound	$R_{th\ mb\text{-}h}$	=	0.3	°C/W
with 56367 alumina insulator and heatsink compound (clip-mounted)	$R_{th\ mb\text{-}h}$	=	0.8	°C/W
From junction to ambient in free air, mounted on a printed circuit board	$R_{th\ j\text{-}a}$	=	60	°C/W

* Measured with gate-cathode connected together.

CHARACTERISTICS

Anode to cathode

On-state voltage I_T = 2.5 A; I_G = 0.2 A; T_j = 120 °C	V_T	<	3.4	V*
Rate of rise of off-state voltage that will not trigger any off-state device; exponential method V_D = 2/3 V_{Dmax}; V_{GR} = 5 V; T_j = 120 °C	dV_D/dt	<	10	kV/μs
Rate of rise of off-state voltage that will not trigger any device following conduction; linear method; I_T = 1.8 A; V_D = V_{Dmax}; V_{GR} = 10 V; T_j = 120 °C	dV_D/dt	<	1.5	kV/μs
Off-state current V_D = V_{Dmax}; T_j = 120 °C	I_D	<	2.0	mA
Latching current; T_j = 25 °C	I_L	<	1.5	A**

Gate to cathode

Voltage that will trigger all devices V_D = 12 V; T_j = 25 °C	V_{GT}	>	1.5	V
Current that will trigger all devices V_D = 12 V; T_j = 25 °C	I_{GT}	>	200	mA
Minimum reverse breakdown voltage I_{GRM} = 1.0 mA	$V_{(BR)GR}$	>	10	V

*Measured under pulse conditions to avoid excessive dissipation.

**Below latching the device behaves as a transistor, with a gain dependent on current.

Switching characteristics ; T_{mb} = 25 °C

Turn-on when switched to I_T = 2.5 A from V_D = 250 V with I_{GF} = 400 mA				
delay time	t_d	<	0.25	μs
rise time	t_r	<	1.0	μs
Turn-off when switched from I_T = 2.5 A to V_D = 250 V with $-V_{GG}$ = 10 V; L_G = 0.8 μH (including stray series gate inductance)				
storage time	t_s	<	0.5	μs
fall time	t_f	<	0.2	μs

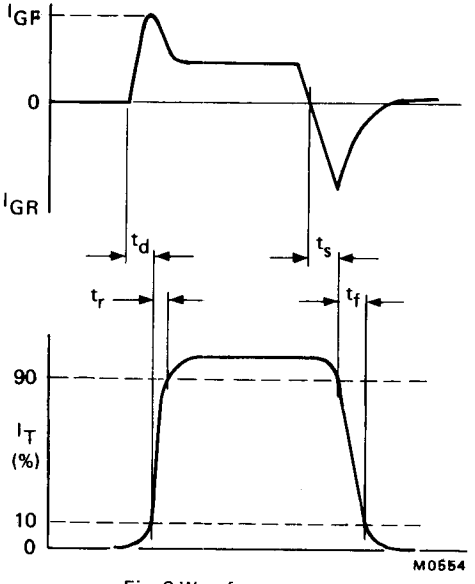


Fig. 2 Waveform.

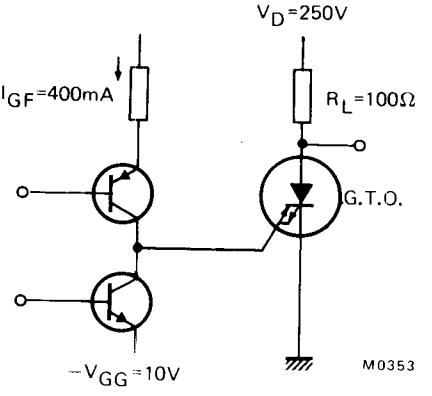


Fig. 3 Test circuit.

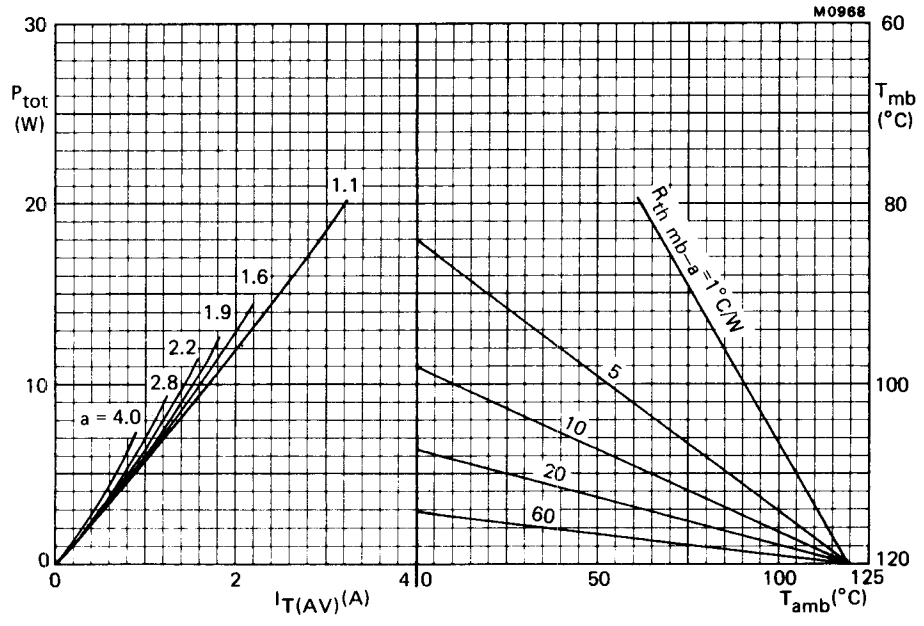


Fig. 4 The right-hand part shows the interrelationship between the power (derived from the left-hand part) and the maximum permissible temperatures.

$$a = \text{form factor} = \frac{I_{T(RMS)}}{I_{T(AV)}}$$

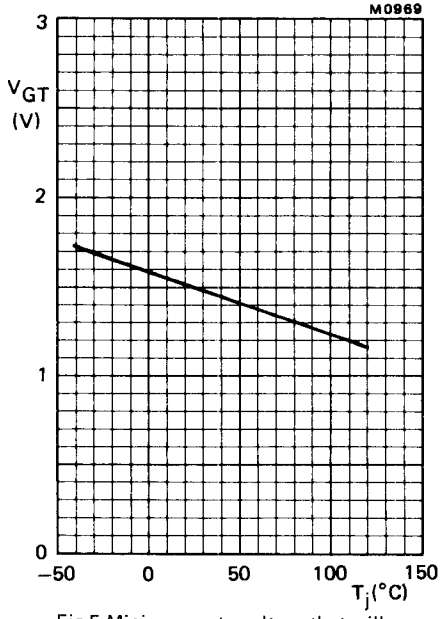


Fig.5 Minimum gate voltage that will trigger all devices as a function of junction temperature; V_D = 12 V.

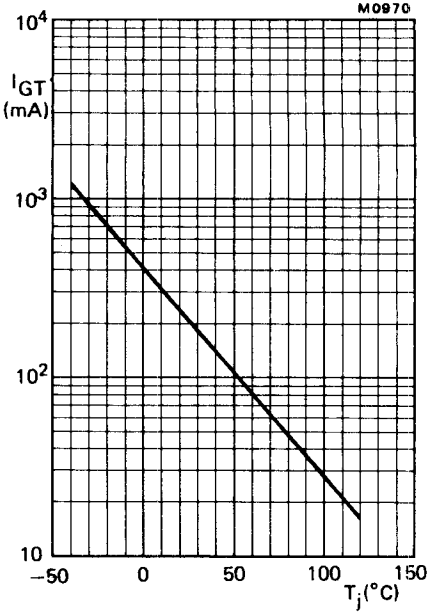


Fig.6 Minimum gate current that will trigger all devices as a function of junction temperature; V_D = 12 V.

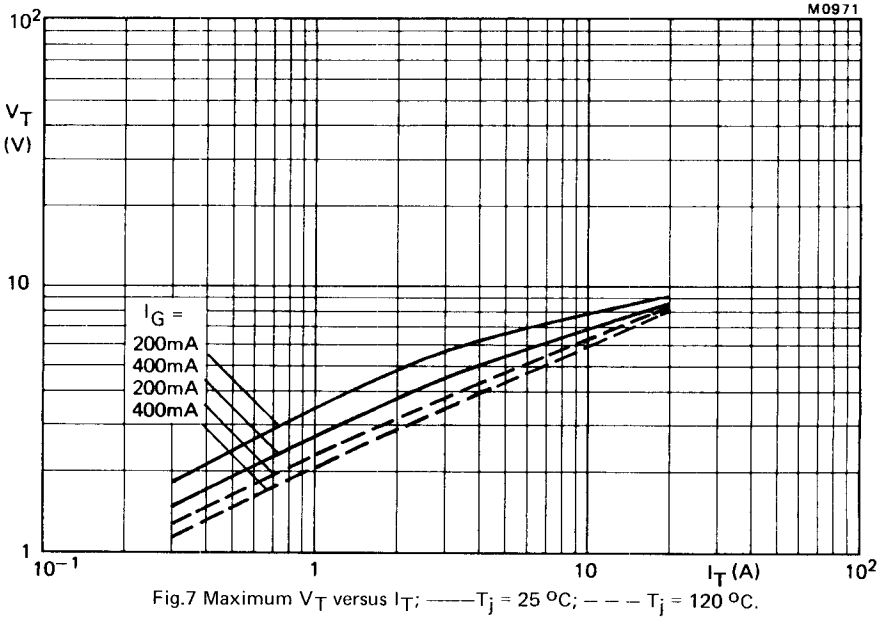


Fig.7 Maximum V_T versus I_T; ——T_j = 25 °C; — — — T_j = 120 °C.

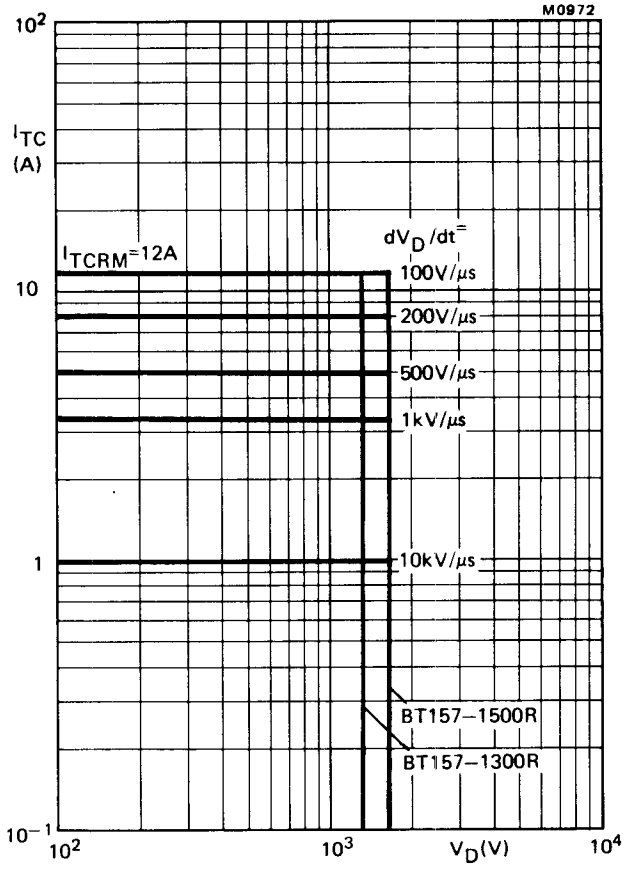


Fig.8 Anode current which can be turned off versus anode voltage; inductive load, V_{GR} = 10 V; T_j = 85 °C

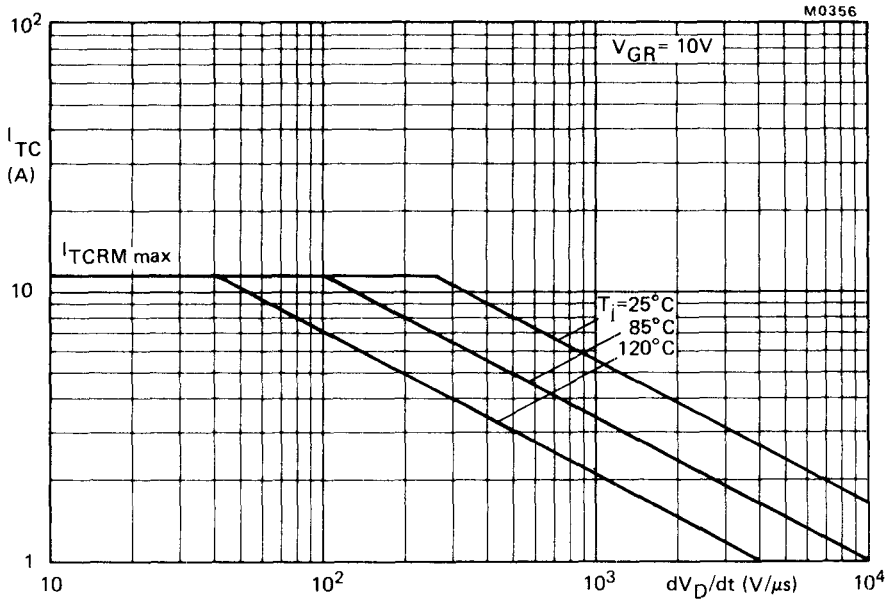


Fig.9 Anode current which can be turned off versus applied dV_D/dt; inductive load; V_{GR} = 10 V.

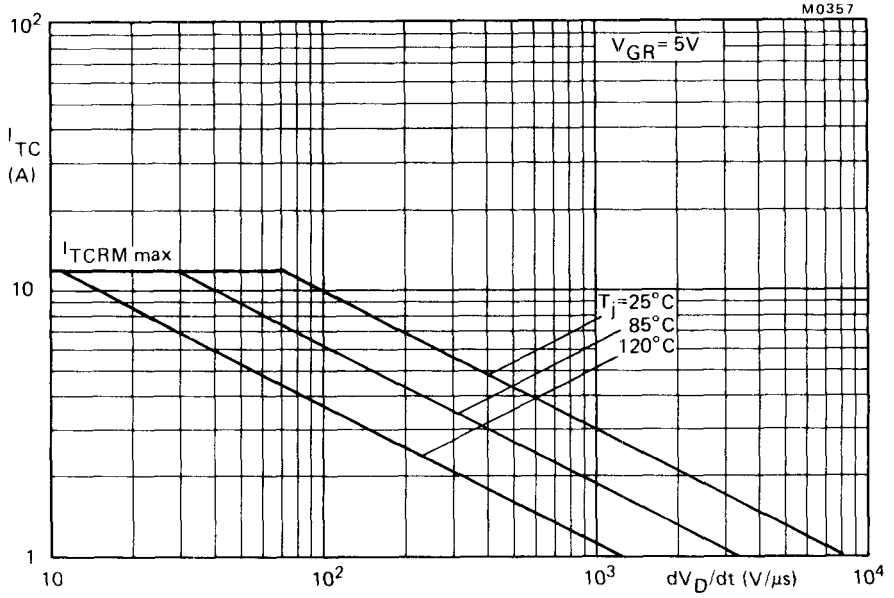


Fig.10 Anode current which can be turned off versus applied dV_D/dt; inductive load; V_{GR} = 5 V.

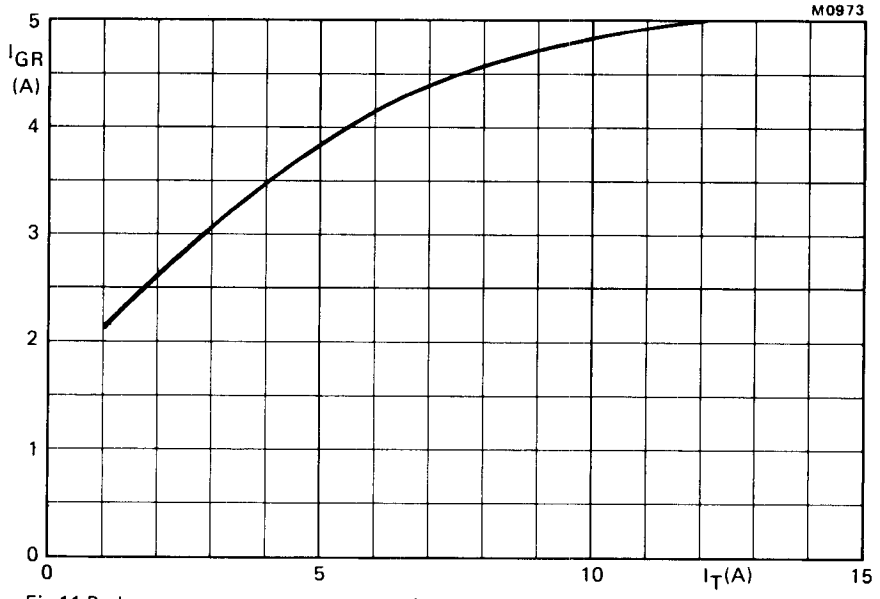


Fig.11 Peak reverse gate current versus anode current at turn-off; inductive load; V_{GR} = 10 V; I_G = 200 mA; L_G = 0.8 μH; R_G = 0; T_{mb} = 120 °C; maximum values.

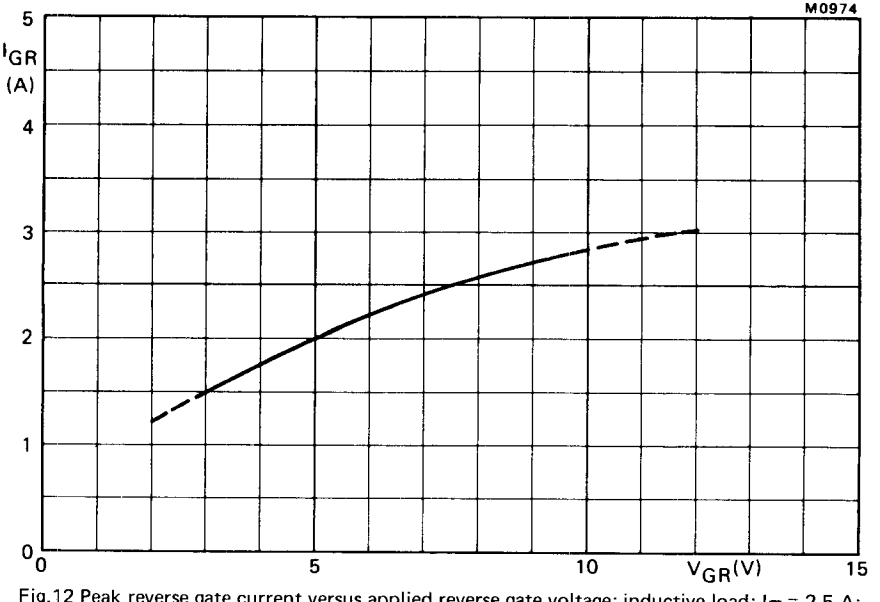


Fig.12 Peak reverse gate current versus applied reverse gate voltage; inductive load; I_T = 2.5 A; I_G = 200 mA; L_G = 0.8 μH; R_G = 0; T_{mb} = 120 °C; maximum values.

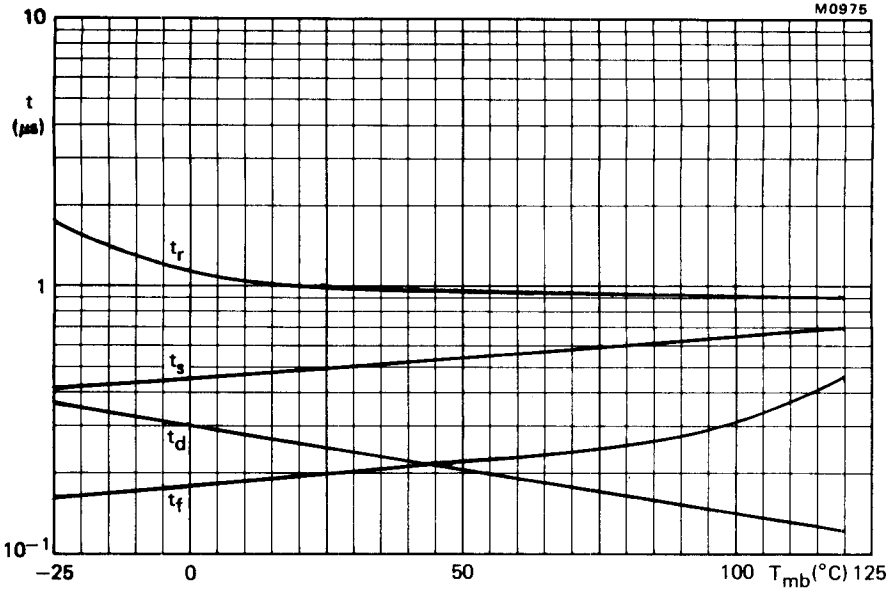


Fig.13 Resistive load; V_D = 250 V; I_T = 2.5 A; I_{GF} = 2 x I_{GT}; $-V_{GG}$ = 10 V; L_G = 0.8 μH; maximum values.

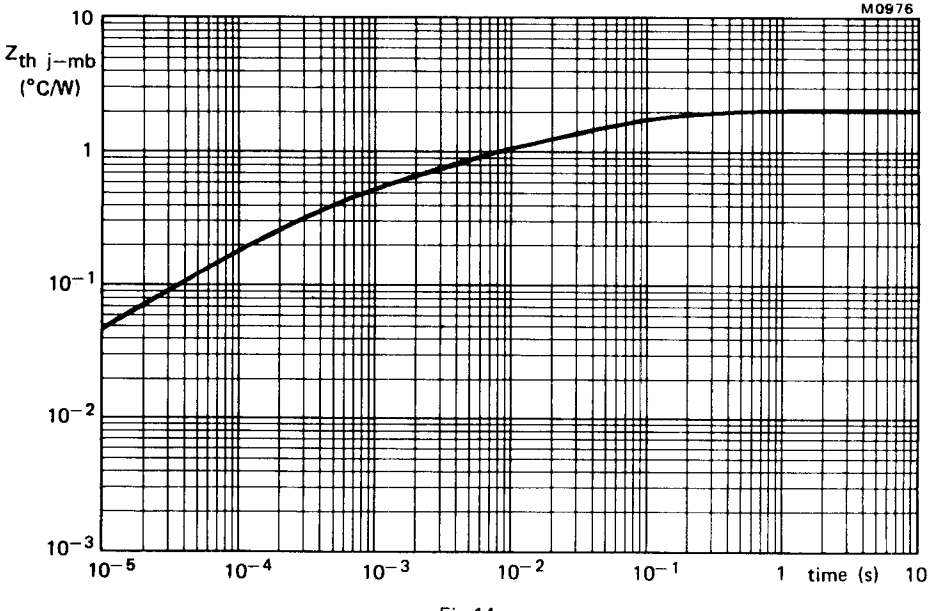


Fig.14

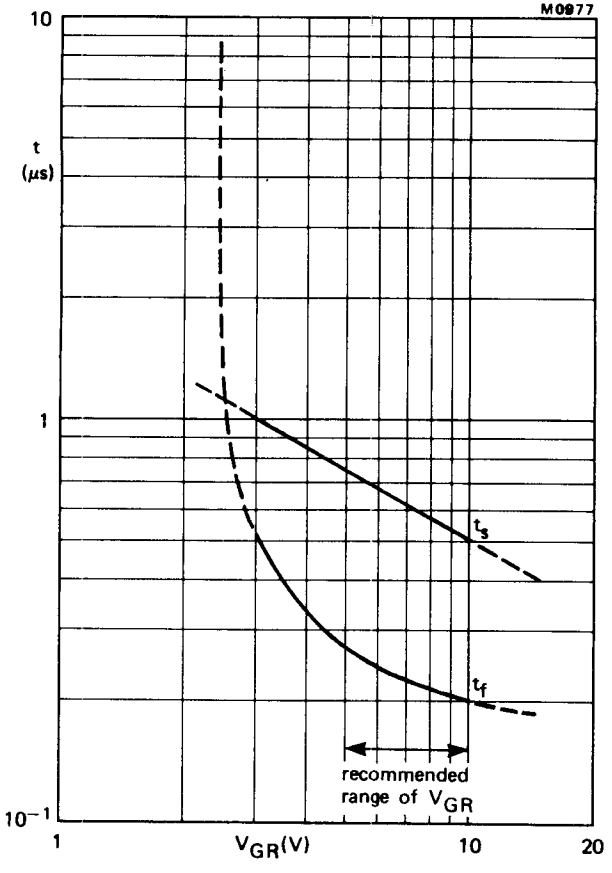


Fig.15 Storage and fall times versus applied reverse gate voltage; inductive load; I_T = 2.5 A; L_G = 0.8 μH; R_G = 0; T_{mb} = 25 °C; I_G = 0.2 A maximum values.