

FAST GATE TURN-OFF THYRISTORS

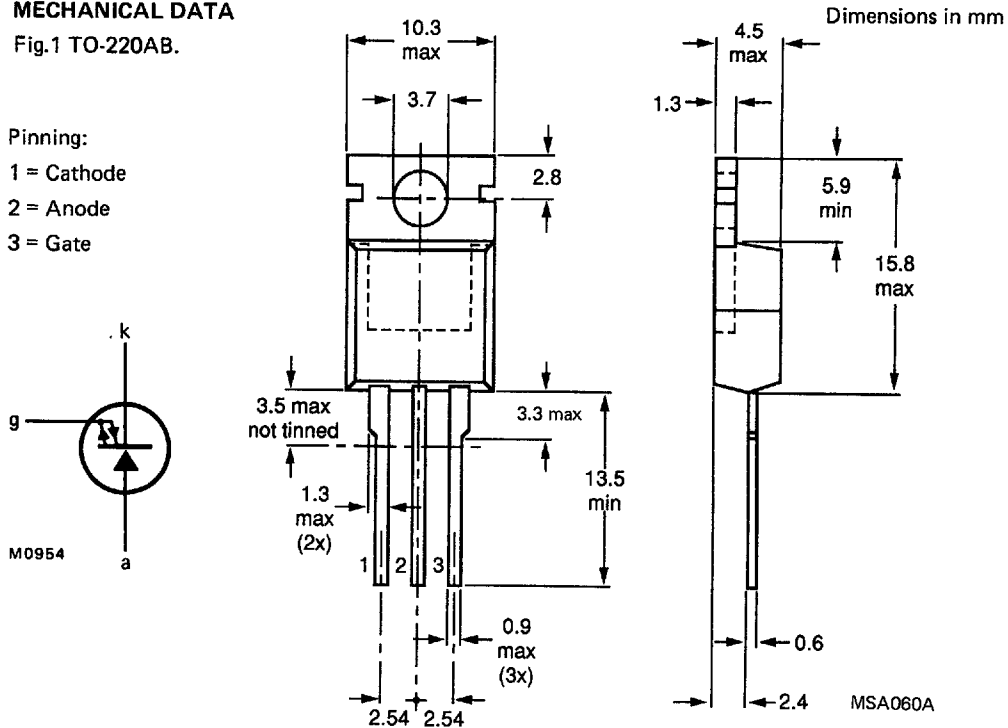
Thyristors in TO-220AB envelopes capable of being turned both on and off via the gate. They are suitable for use in high-frequency inverters, power supplies, motor control etc. The devices have no reverse blocking capability. For reverse blocking operation use with a series diode, for reverse conducting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

QUICK REFERENCE DATA

		BTV58-600R			850R			1000R			
Repetitive peak off-state voltage	V_{DRM} max.	600			850			1000			V
Non-repetitive peak on-state current	I_{TSM} max.				75						A
Controllable anode current	I_{TCRM} max.				25						A
Average on-state current	$I_{T(AV)}$ max.				10						A
Fall time	t_f max.				250						ns

MECHANICAL DATA

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 (IEC 134)

Anode to cathode		BTV58-600R	850R	1000R
Transient off-state voltage*	V_{DSM} max.	750	1000	1100 V
Repetitive peak off-state voltage*	V_{DRM} max.	600	850	1000 V
Working off-state voltage*	V_{DW} max.	400	600	800 V
Continuous off-state voltage*	V_D max.	400	500	650 V
Average on-state current (averaged over any 20 ms period) up to $T_{mb} = 80\text{ }^\circ\text{C}$		$I_{T(AV)}$ max.	10	A
Controllable anode current		I_{TCRM} max.	25	A
Non-repetitive peak on-state current $t = 10\text{ ms}$; half-sinewave; $T_j = 120\text{ }^\circ\text{C}$ prior to surge		I_{TSM} max.	75	A
I^2t for fusing; $t = 10\text{ ms}$		I^2t max.	28	A^2s
Total power dissipation up to $T_{mb} = 25\text{ }^\circ\text{C}$		P_{tot} max.	65	W
Gate to cathode				
Repetitive peak on-state current $T_j = 120\text{ }^\circ\text{C}$ prior to surge gate-cathode forward; $t = 10\text{ ms}$; half-sinewave gate-cathode reverse; $t = 20\text{ }\mu\text{s}$		I_{GFM} max.	25	A
		I_{GRM} max.	25	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	$^\circ\text{C}$
Operating junction temperature		T_j max.	120	$^\circ\text{C}$
THERMAL RESISTANCE				
From junction to mounting base		$R_{th\ j-mb} =$	1,5	K/W
From mounting base to heatsink with heatsink compound		$R_{th\ mb-h} =$	0,3	K/W
with 56367 alumina insulator and heatsink compound (clip-mounted)		$R_{th\ mb-h} =$	0,8	K/W

* Measured with gate connected to cathode.

CHARACTERISTICS

Anode to cathode

On-state voltage

$I_T = 5 \text{ A}; I_G = 0.2 \text{ A}; T_j = 120 \text{ }^\circ\text{C}$ $V_T < 1.8 \text{ V}^*$

Rate of rise of off-state voltage that will not trigger any off-state device; exponential method

$V_D = 2/3 V_{Dmax}; V_{GR} = 5 \text{ V}; T_j = 120 \text{ }^\circ\text{C}$ $dV_D/dt < 10 \text{ kV}/\mu\text{s}$

Rate of rise of off-state voltage that will not trigger any device following conduction, linear method

$I_T = 5 \text{ A}; V_D = V_{DRMmax}; V_{GR} = 10 \text{ V}; T_j = 120 \text{ }^\circ\text{C}$ $dV_D/dt < 1.5 \text{ kV}/\mu\text{s}$

Off-state current

$V_D = V_{Dmax}; T_j = 120 \text{ }^\circ\text{C}$ $I_D < 3.0 \text{ mA}$

Latching current; $T_j = 25 \text{ }^\circ\text{C}$

I_L typ. 1.0 A**

Gate to cathode

Voltage that will trigger all devices

$V_D = 12 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ $V_{GT} > 1.5 \text{ V}$

Current that will trigger all devices

$V_D = 12 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ $I_{GT} > 200 \text{ mA}$

Minimum reverse breakdown voltage

$I_{GR} = 1.0 \text{ mA}$ $V_{(BR)GR} > 10 \text{ V}$

Switching characteristics (resistive load)

Turn-on when switched to $I_T = 5 \text{ A}$ from $V_D = 250 \text{ V}$
with $I_{GF} = 0.5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$

delay time $t_d < 0.25 \mu\text{s}$

rise time $t_r < 1.0 \mu\text{s}$

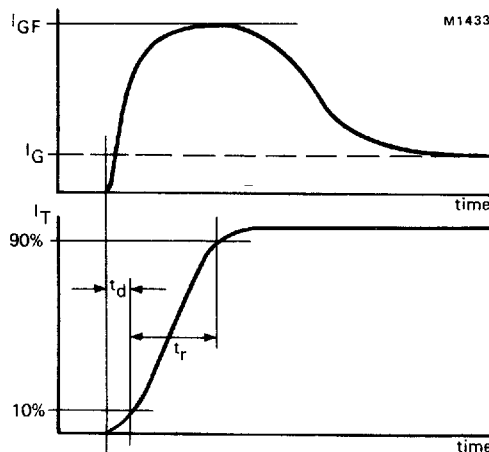


Fig.2 Waveforms

* Measured under pulse conditions to avoid excessive dissipation.

** Below latching level the device behaves like a transistor with a gain dependent on current.

Switching characteristics (inductive load)

Turn-off when switched from $I_T = 5 \text{ A}$ to $V_D = V_{D\text{max}}$:

$V_{GR} = 10 \text{ V}$; $L_G \leq 1.0 \mu\text{H}$; $L_S \leq 0.25 \mu\text{H}$; $T_j = 25 \text{ }^\circ\text{C}$

storage time	t_s	<	0.5	μs
fall time	t_f	<	0.25	μs
peak reverse gate current	I_{GR}	<	6	A

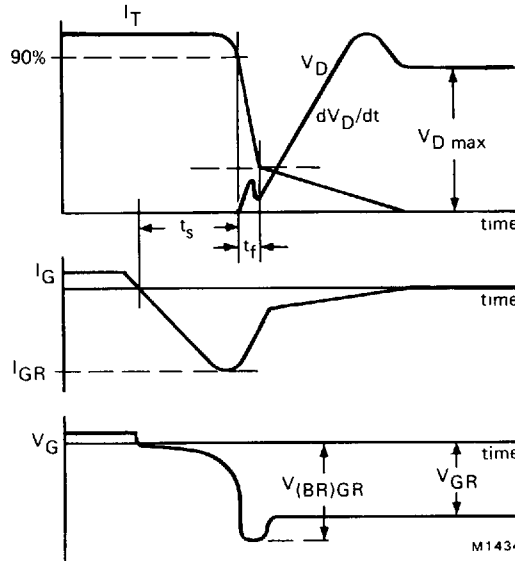


Fig.3 Waveforms.

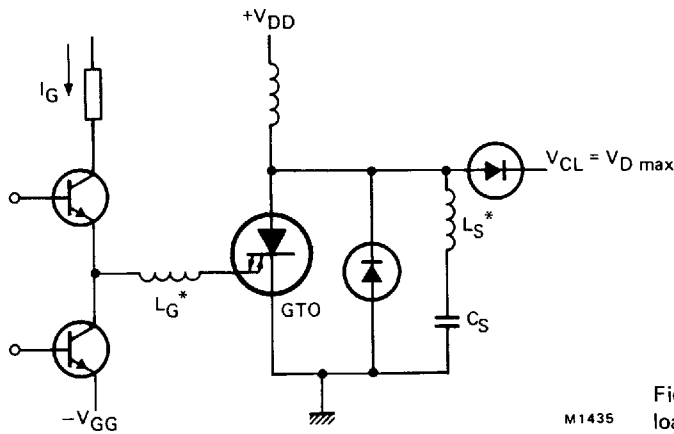


Fig.4 Inductive load test circuit.

*indicates stray series inductance only.

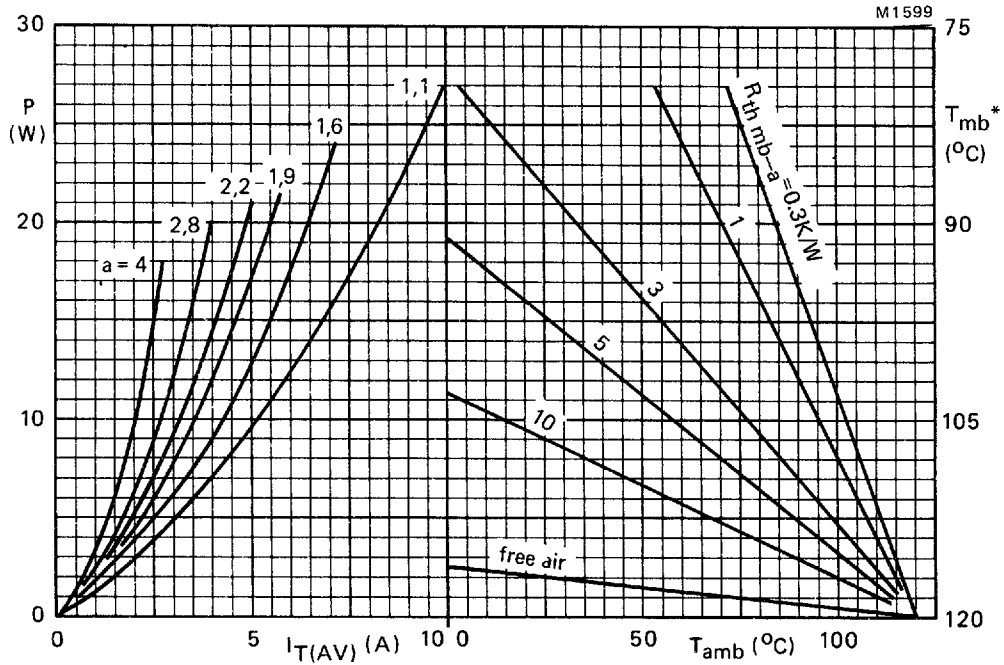


Fig.5 The right-hand part shows the interrelationship between the power (derived from the left-hand part) and the maximum permissible temperatures.

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

P = power excluding switching losses.

* Mounting-base temperature scale is for comparison purposes and is correct only for $R_{th\ mb-a} < 9.6\ K/W$.

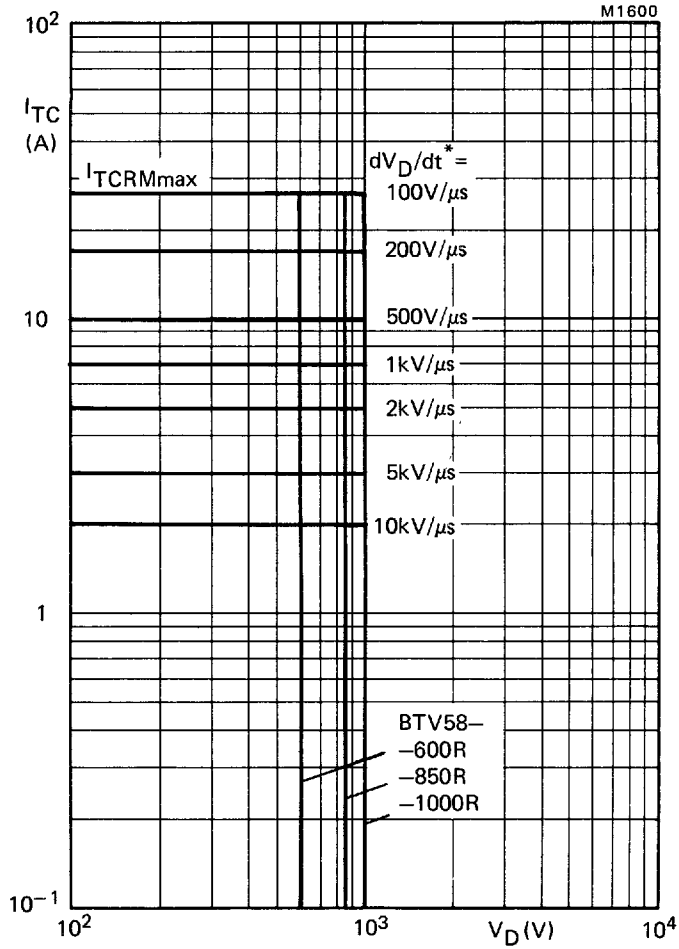


Fig.6 Anode current which can be turned off versus anode voltage; inductive load; $V_{GR} = 10$ V; $L_G \leq 1.0 \mu H$; $L_S \leq 0.25 \mu H$; $T_j = 85$ °C.
* dV_D/dt is calculated from I_T/C_S .

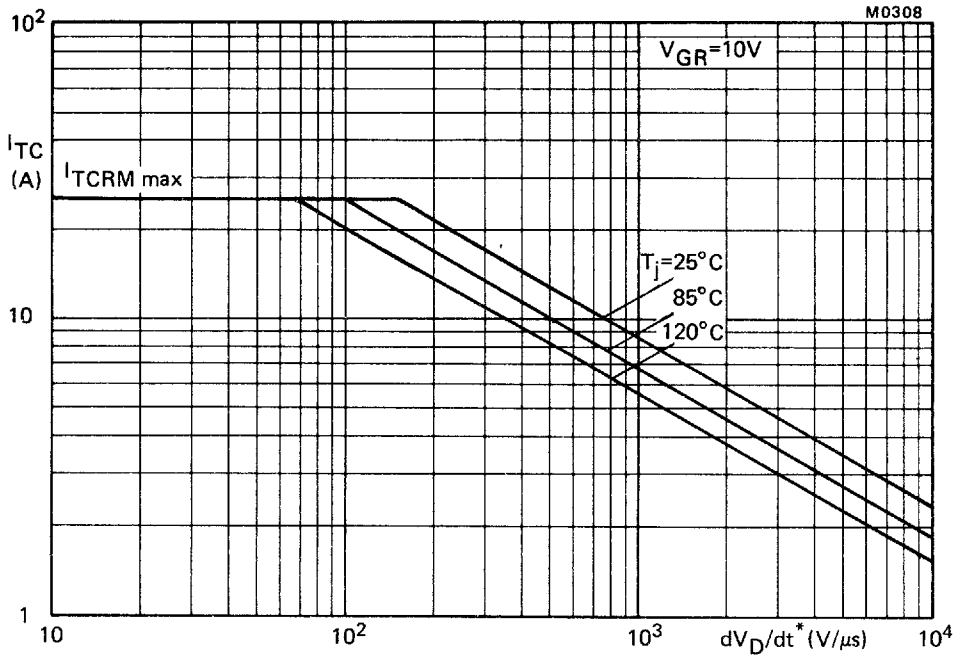


Fig.7 Anode current which can be turned off versus applied dV_D/dt^* ; inductive load; $V_{GR} = 10 V$.
 $L_G \leq 1.0 \mu H$; $L_S \leq 0.25 \mu H$. * dV_D/dt is calculated from I_T/C_S .

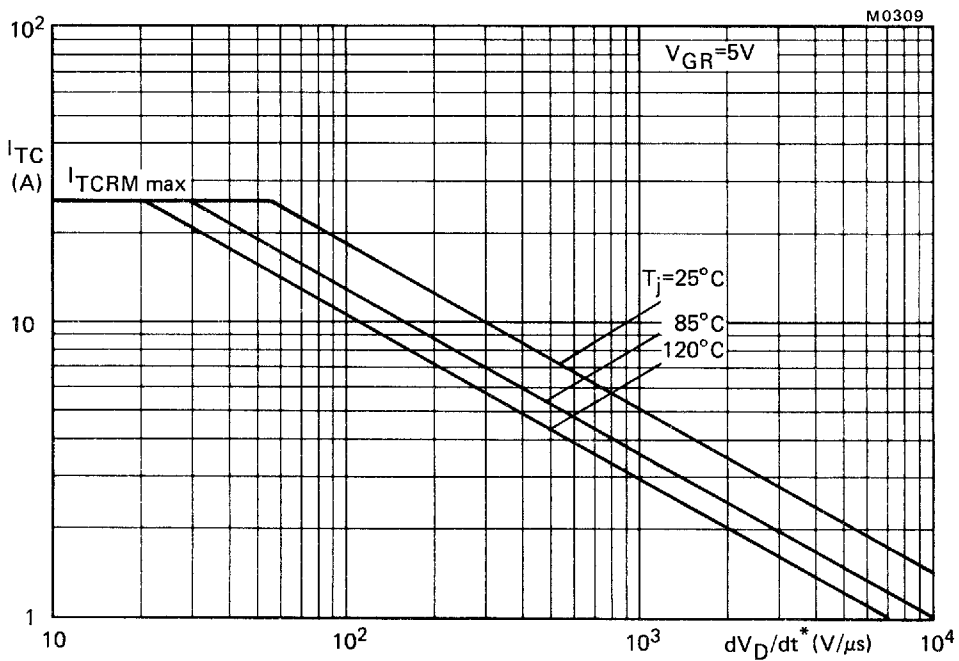


Fig.8 Anode current which can be turned off versus applied dV_D/dt^* ; inductive load; $V_{GR} = 5 V$.
 $L_G \leq 1.0 \mu H$; $L_S \leq 0.25 \mu H$; * dV_D/dt is calculated from I_T/C_S .

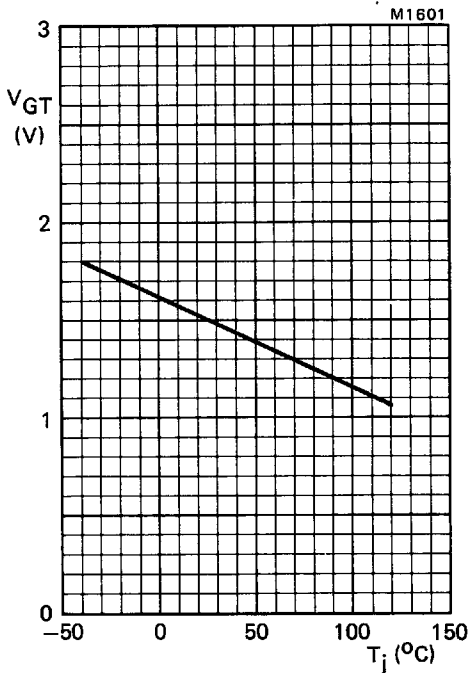


Fig.9 Minimum gate voltage that will trigger all devices as a function of junction temperature; $V_D = 12$ V.

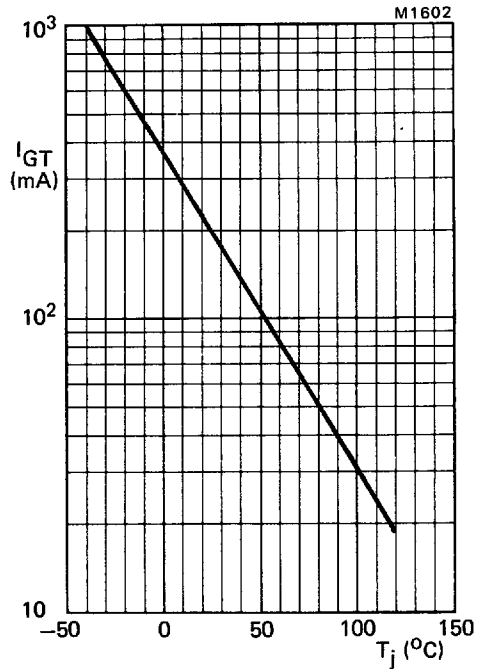


Fig.10 Minimum gate current that will trigger all devices as a function of junction temperature; $V_D = 12$ V.

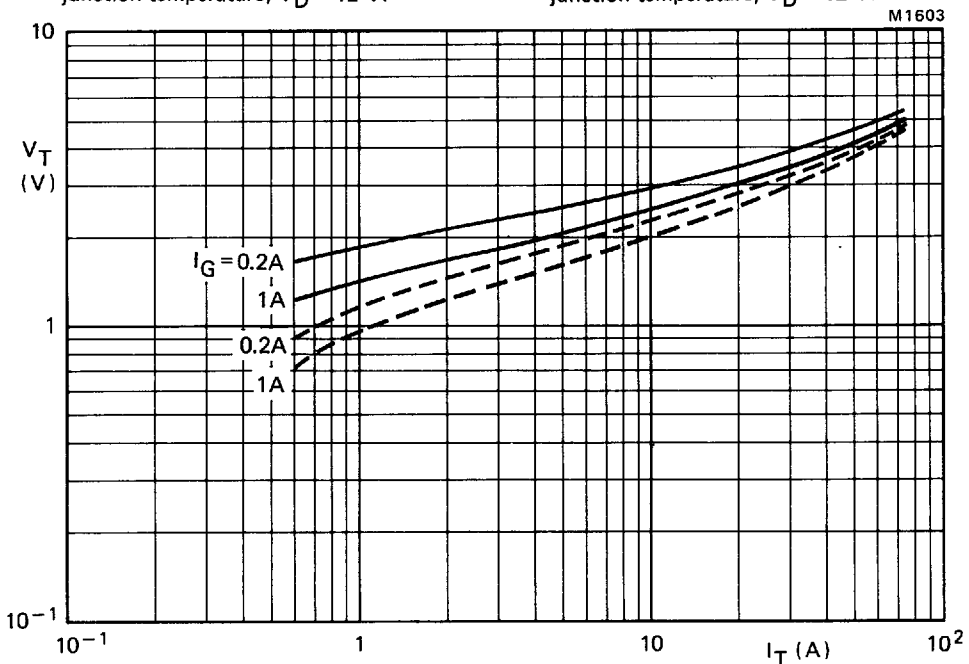


Fig.11 Maximum V_T versus I_T ; — $T_j = 25^{\circ}\text{C}$; - - - $T_j = 120^{\circ}\text{C}$.

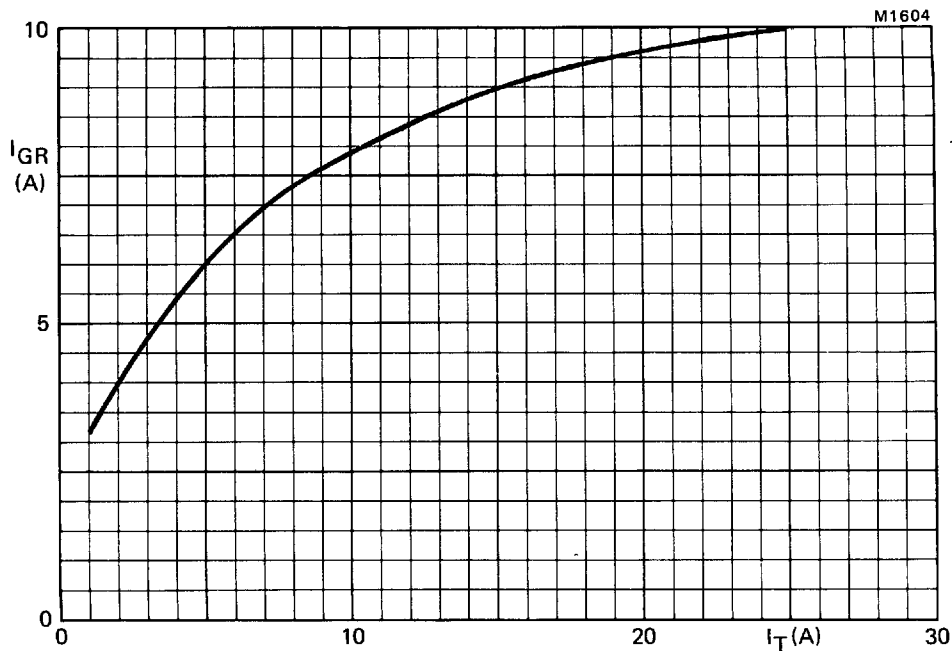


Fig.12 Peak reverse gate current versus anode current at turn-off; inductive load; $V_{GR} = 10$ V; $I_G = 0.2$ A; $L_G = 0.8 \mu\text{H}$; $T_j = 120$ °C; maximum values.

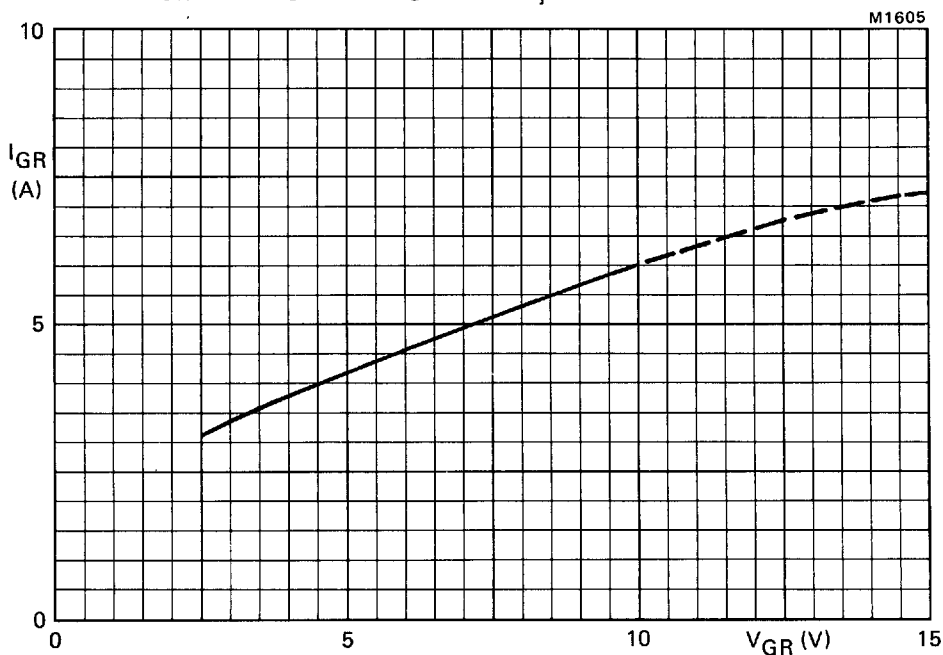


Fig.13 Peak reverse gate current versus applied reverse gate voltage; inductive load; $I_T = 5$ A; $I_G = 0.2$ A; $L_G = 0.8 \mu\text{H}$; $T_j = 120$ °C; maximum values.

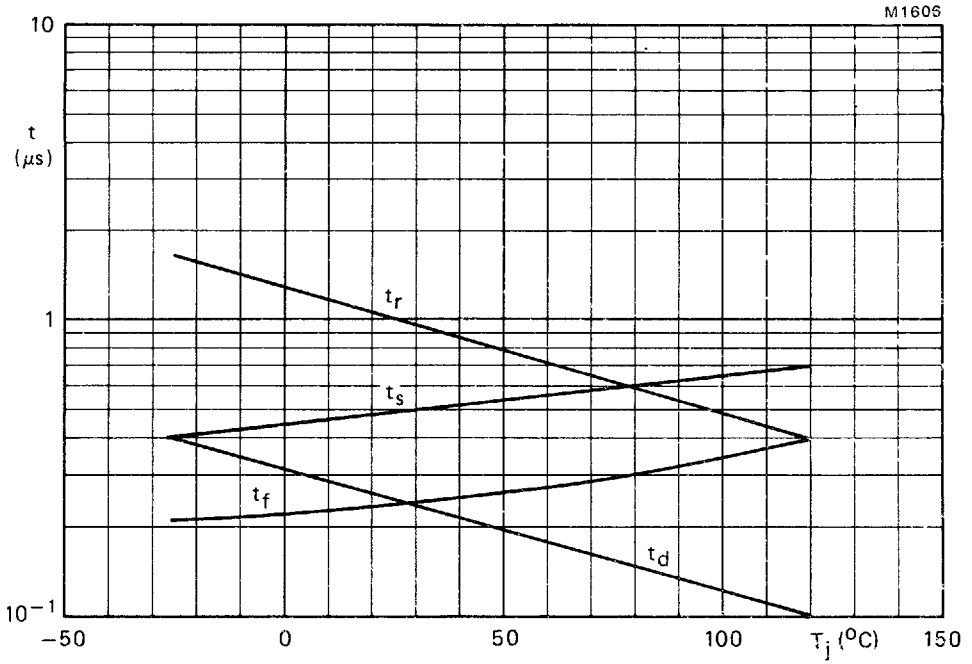


Fig.14 Switching times as a function of junction temperature; $V_D \geq 250$ V; $I_T = 5$ A; $I_{GF} = 0.5$ A; $V_{GR} = 10$ V; $I_G = 0.2$ A; $L_G = 0.8 \mu\text{H}$; maximum values.

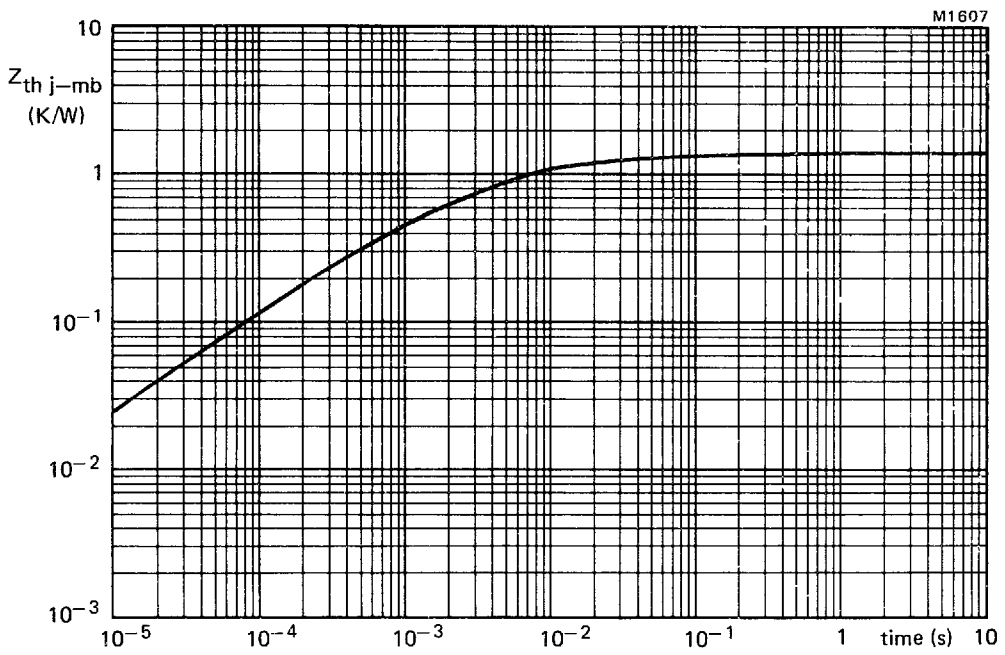


Fig.15 Transient thermal impedance.

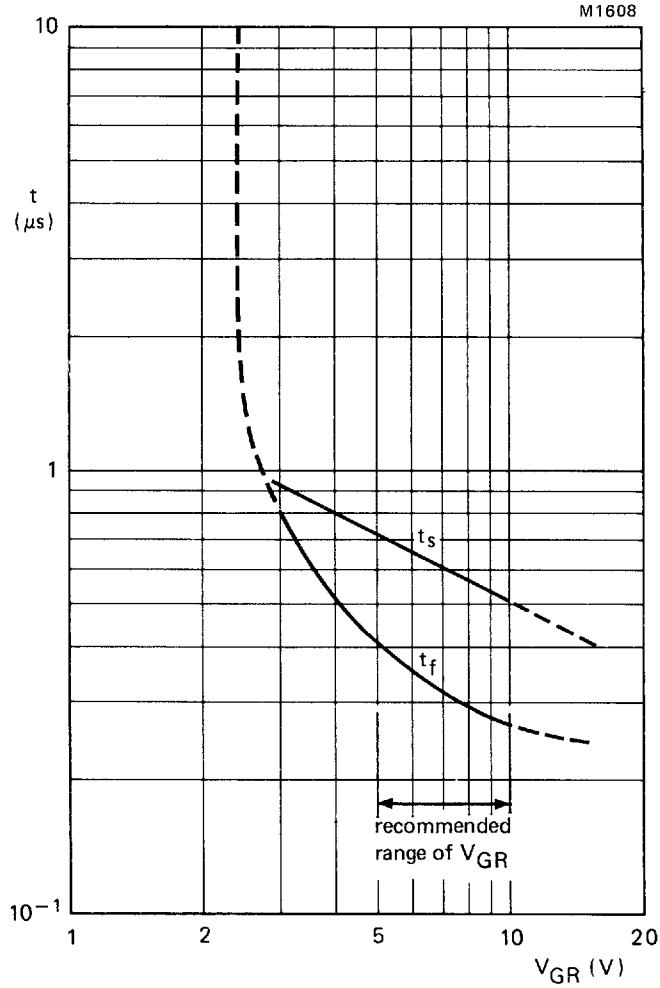


Fig. 16 Storage and fall times versus applied reverse gate voltage; inductive load; $I_T = 5$ A; $I_G = 0.2$ A; $L_G = 0.8$ μH ; $T_j = 25$ $^{\circ}C$; maximum values.

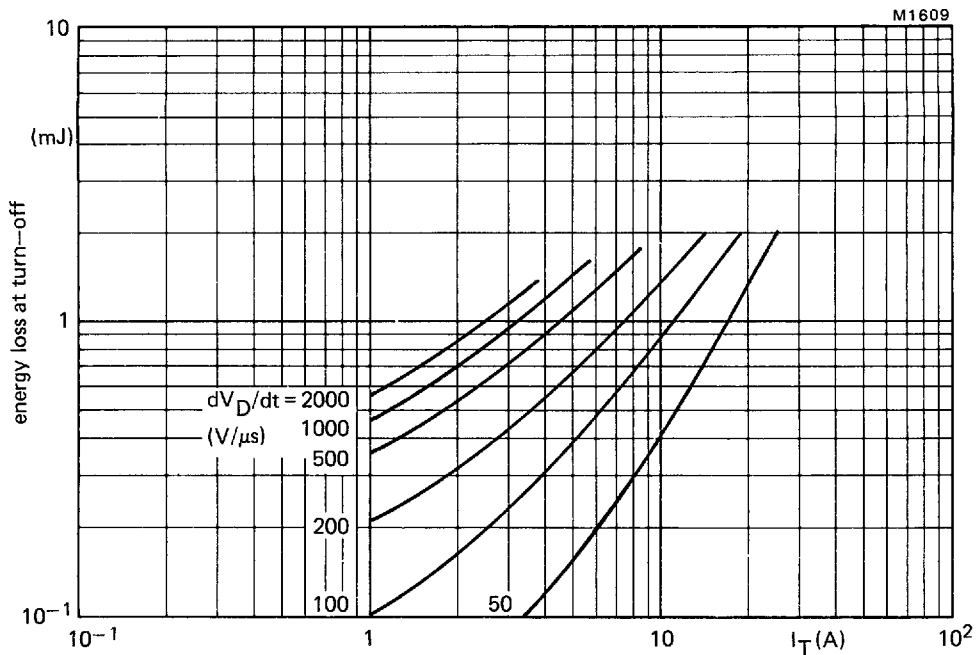


Fig.17 Maximum energy loss at turn-off (per cycle) as a function of anode current and applied dV_D/dt (calculated from I_T/C_S); dV_D/dt linear up to $V_{Dmax} = 600$ V; $V_{GR} = 10$ V; $I_G = 0.2$ A; $L_G \leq 1.0 \mu$ H; $L_S \leq 0.25 \mu$ H; $T_j = 120$ °C.

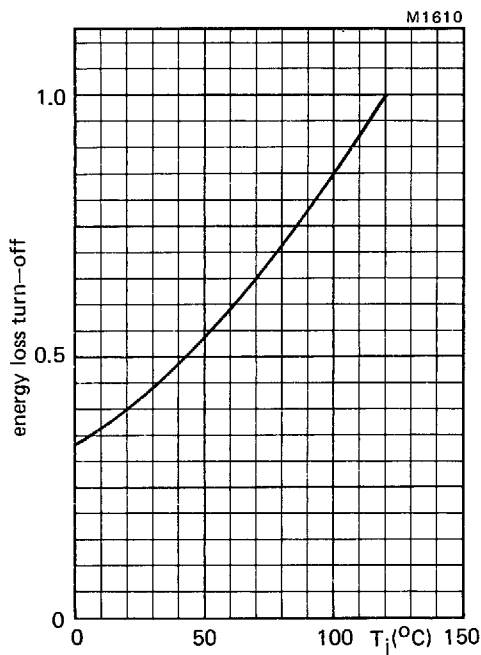


Fig.18 Energy loss at turn off as a function of junction temperature; $I_G = 0.2$ A; $V_{GR} = 10$ V. Normalised to $T_j = 120$ °C.