# THYRISTORS

**Also available to BS9341-F001 to F009**

*Silicon thyristors in metal envelopes, intended for use in power control circuits (e.g. light and motor control) and power switching systems.*

The series consists of reverse polarity types (anode to stud) identified by a suffix R: BTY79-400R to 1000R.

## QUICK REFERENCE DATA

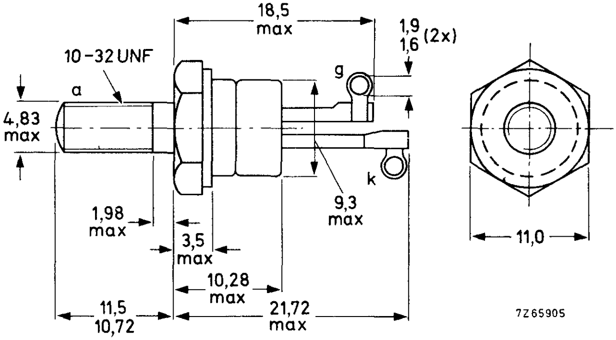
| | | BTY79-400R | 500R | 600R | 800R | 1000R | |
|---|---|---|---|---|---|---|---|
| Repetitive peak voltages $V_{DRM}/V_{RRM}$ | max. | 400 | 500 | 600 | 800 | 1000 | V |

| | | | | |
|---|---|---|---|---|
| Average on-state current | $I_{T(AV)}$ | max. | 10 | A |
| R.M.S. on-state current | $I_{T(RMS)}$ | max. | 16 | A |
| Non-repetitive peak on-state current | $I_{TSM}$ | max. | 150 | A |

## MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-64: with 10-32 UNF stud ($\phi$ 4,83 mm).



Net mass: 7 g
Diameter of clearance hole: max. 5,2 mm
Accessories supplied on request:
  56295 (PTFE bush, 2 mica washers, plain washer, tag)
  56262A (mica washer, insulating ring, plain washer)

Torque on nut: min. 0,9 Nm
(9 kg cm)
max. 1,7 Nm
(17 kg cm)

Supplied with device: 1 nut, 1 lock washer
Nut dimensions: across the flats: 9,5 mm

## RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

**Anode to cathode**

| | | | BTY79–400R | 500R | 600R | 800R | 1000R | |
|---|---|---|---|---|---|---|---|---|
| Non-repetitive peak off-state voltage ($t \leqslant 10$ ms) | $V_{DSM}$** | max. | 500 | 1100 | 1100 | 1100 | 1100 | V |
| Non-repetitive peak reverse voltage ($t \leqslant 5$ ms) | $V_{RSM}$ | max. | 500 | 600 | 720 | 960 | 1100 | V |
| Repetitive peak voltages | $V_{DRM}/V_{RRM}$ | max. | 400 | 500 | 600 | 800 | 1000 | V |
| Crest working voltages | $V_{DWM}/V_{RWM}$ | max. | 400 | 500 | 600 | 800 | 1000 | V* |

| | | | | |
|---|---|---|---|---|
| Average on-state current (averaged over any 20 ms period) up to $T_{mb} = 85$ °C | $I_{T(AV)}$ | max. | 10 | A |
| R.M.S. on-state current | $I_{T(RMS)}$ | max. | 16 | A |
| Repetitive peak on-state current | $I_{TRM}$ | max. | 75 | A |
| Non-repetitive peak on-state current; $t = 10$ ms; half sine-wave; $T_j = 125$ °C prior to surge; with reapplied $V_{RWMmax}$ | $I_{TSM}$ | max. | 150 | A |
| $I^2t$ for fusing ($t = 10$ ms) | $I^2t$ | max. | 112 | $A^2s$ |
| Rate of rise of on-state current after triggering with $I_G = 150$ mA to $I_T = 30$ A; $dI_G/dt = 0{,}25$ A/µs | $dI_T/dt$ | max. | 50 | A/µs |

**Gate to cathode**

| | | | | |
|---|---|---|---|---|
| Average power dissipation (averaged over any 20 ms period) | $P_{G(AV)}$ | max. | 0,5 | W |
| Peak power dissipation | $P_{GM}$ | max. | 5 | W |

**Temperatures**

| | | | | |
|---|---|---|---|---|
| Storage temperature | $T_{stg}$ | | −55 to +125 | °C |
| Junction temperature | $T_j$ | max. | 125 | °C |

## THERMAL RESISTANCE

| | | | | |
|---|---|---|---|---|
| From junction to mounting base | $R_{th\ j\text{-}mb}$ | = | 1,8 | °C/W |
| From mounting base to heatsink with heatsink compound | $R_{th\ mb\text{-}h}$ | = | 0,5 | °C/W |
| From junction to ambient in free air | $R_{th\ j\text{-}a}$ | = | 45 | °C/W |
| Transient thermal impedance ($t = 1$ ms) | $Z_{th\ j\text{-}mb}$ | = | 0,1 | °C/W |

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* To ensure thermal stability: $R_{th\ j\text{-}a} < 4$ °C/W (d.c. blocking) or $< 8$ °C/W (a.c.). For smaller heatsinks $T_{j\ max}$ should be derated. For a.c. see Fig. 3.

** Although not recommended, higher off-state voltages may be applied without damage, but the thyristor may switch into the on-state. The rate of rise of on-state current should not exceed 100 A/µs.

## CHARACTERISTICS

### Anode to cathode

| | | | |
|---|---|---|---|
| On-state voltage<br>$I_T$ = 20 A; $T_j$ = 25 °C | $V_T$ | < | 2 V* |
| Rate of rise of off-state voltage that will not trigger any device;<br>exponential method; $V_D$ = 2/3 $V_{DRMmax}$; $T_j$ = 125 °C | $dV_D/dt$ | < | 50 V/µs |
| Reverse current<br>$V_R$ = $V_{RWMmax}$; $T_j$ = 125 °C | $I_R$ | < | 3 mA |
| Off-state current<br>$V_D$ = $V_{DWMmax}$; $T_j$ = 125 °C | $I_D$ | < | 3 mA |
| Latching current; $T_j$ = 25 °C | $I_L$ | < | 150 mA |
| Holding current; $T_j$ = 25 °C | $I_H$ | < | 75 mA |

### Gate to cathode

| | | | |
|---|---|---|---|
| Voltage that will trigger all devices<br>$V_D$ = 6 V; $T_j$ = 25°C | $V_{GT}$ | > | 1,5 V |
| Voltage that will not trigger any device<br>$V_D$ = $V_{DRMmax}$; $T_j$ = 125 °C | $V_{GD}$ | < | 200 mV |
| Current that will trigger all devices<br>$V_D$ = 6 V; $T_j$ = 25 °C | $I_{GT}$ | > | 30 mA |
| On request (see ordering note on page 4) | $I_{GT}$ | > | 20 mA |

### Switching characteristics

| | | | |
|---|---|---|---|
| Gate-controlled turn-on time ($t_{gt} = t_d + t_r$) when switched<br>from $V_D$ = 800 V to $I_T$ = 25 A; $I_{GT}$ = 250 mA;<br>$dI_G/dt$ = 0,25 A/µs; $T_j$ = 25 °C | $t_{gt}$<br>$t_r$ | <<br>typ. | 1,5 µs<br>0,2 µs |

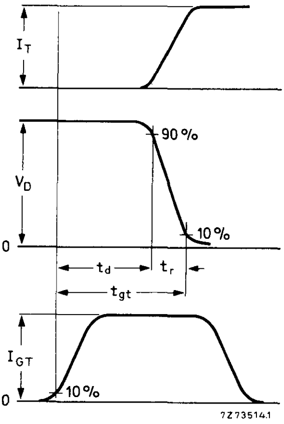

Fig. 2 Gate-controlled turn-on time definitions.

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* Measured under pulse conditions to avoid excessive dissipation.

## OPERATING NOTE

The terminals should neither be bent nor twisted; they should be soldered into the circuit so that there is no strain on them.
During soldering the heat conduction to the junction should be kept to a minimum.

## ORDERING NOTE

Types with low gate trigger current, $I_{GT} > 20$ mA, are available on request. Add suffix A to the type number when ordering: e.g. BTY79A-400R.

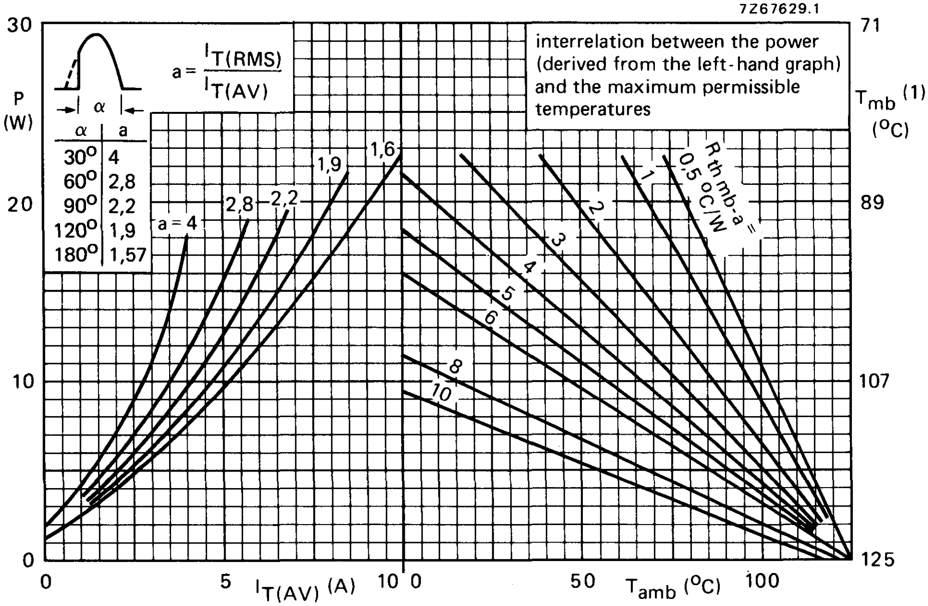


Fig. 3 (1) $T_{mb}$-scale is for comparison purposes only and is correct only for $R_{th\ mb\text{-}a} \leqslant 6$ °C/W.

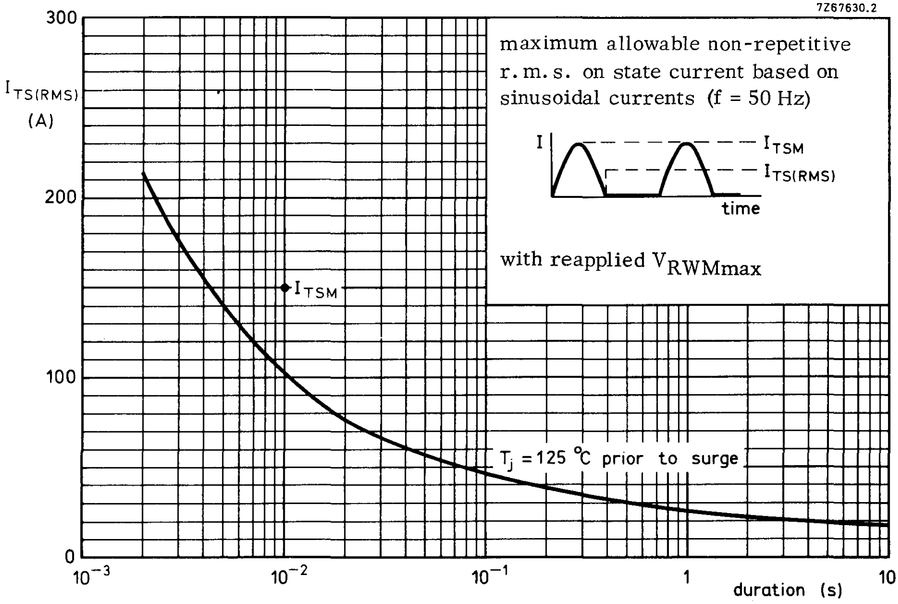

7Z67630.2
300
200
100
0
$I_{TS(RMS)}$
(A)
maximum allowable non-repetitive r.m.s. on state current based on sinusoidal currents (f = 50 Hz)
I
$I_{TSM}$
$I_{TS(RMS)}$
time
with reapplied $V_{RWMmax}$
$I_{TSM}$
$T_j$ = 125 °C prior to surge
$10^{-3}$
$10^{-2}$
$10^{-1}$
1
10
duration (s)

Fig. 4.

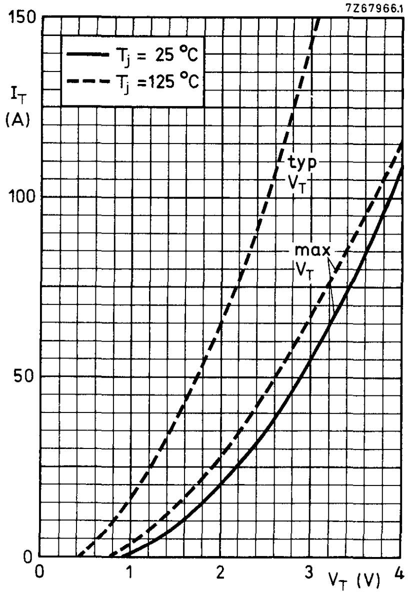

7Z67966.1
150
100
50
0
$I_T$
(A)
$T_j$ = 25 °C
$T_j$ =125 °C
typ
$V_T$
max
$V_T$
0
1
2
3
4
$V_T$ (V)

Fig. 5.

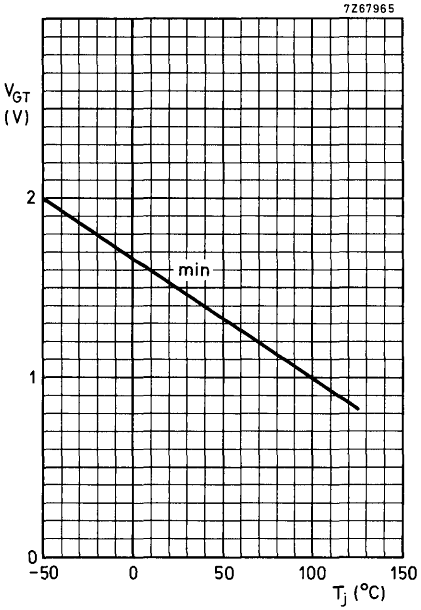


Fig. 6 Minimum gate voltage that will trigger all devices as a function of $T_j$.

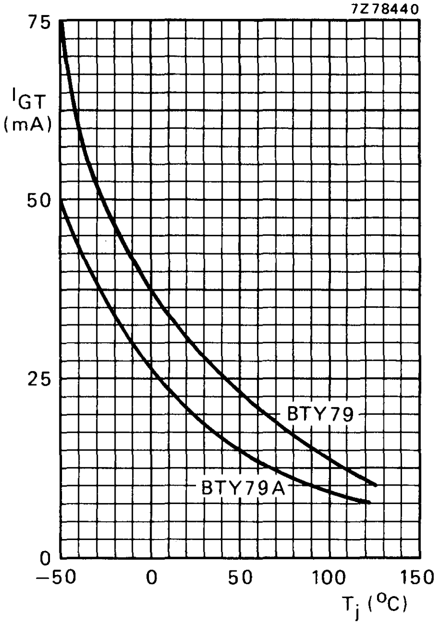


Fig. 7 Minimum gate current that will trigger all devices as a function of $T_j$.

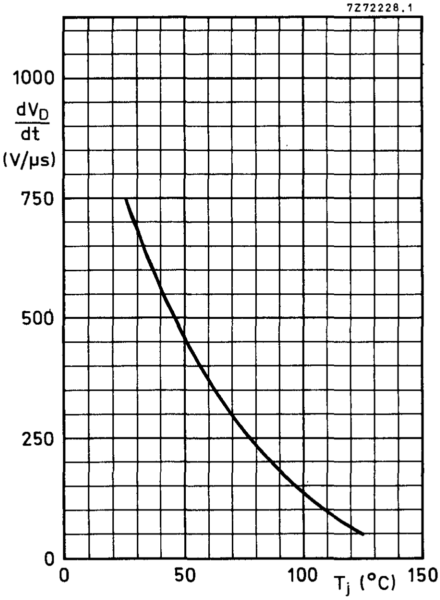


Fig. 8 Maximum rate of rise of off-state voltage that will not trigger any device (exponential method) as a function of $T_j$.

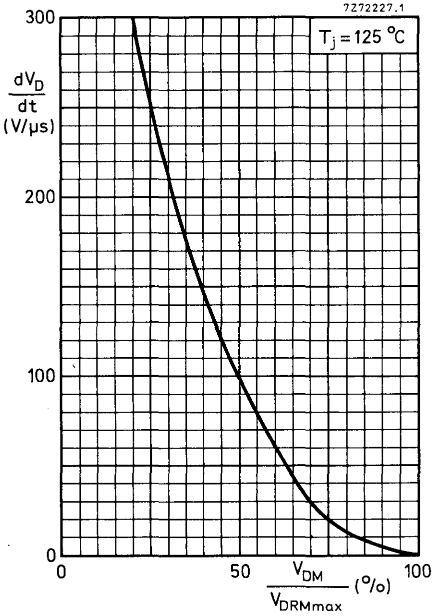
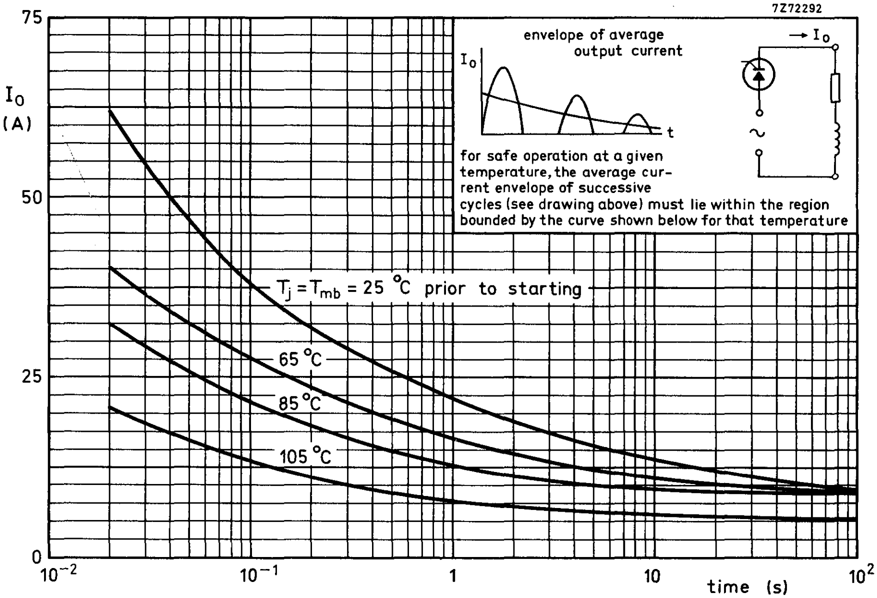
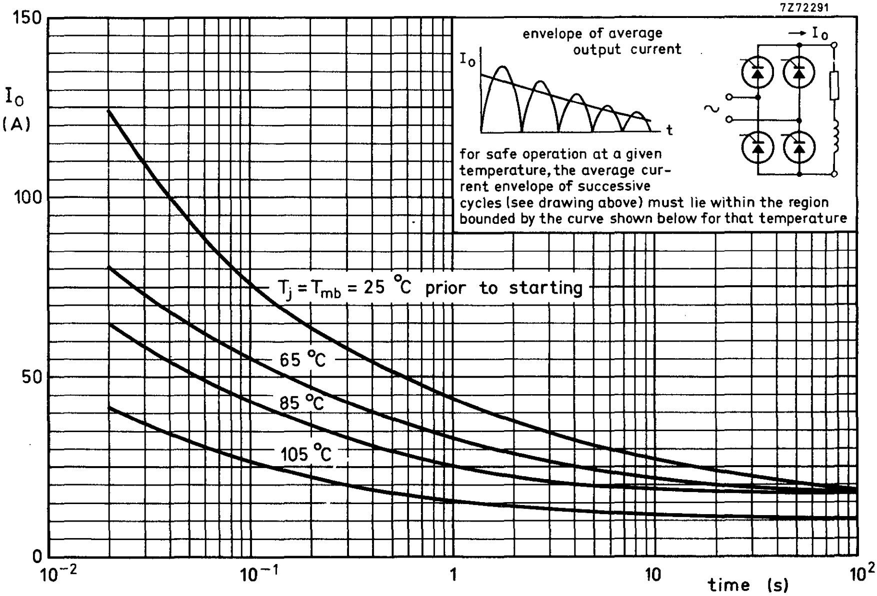


Fig. 9 Maximum rate of rise of off-state voltage that will not trigger any device (exponential method) as a function of applied voltage.

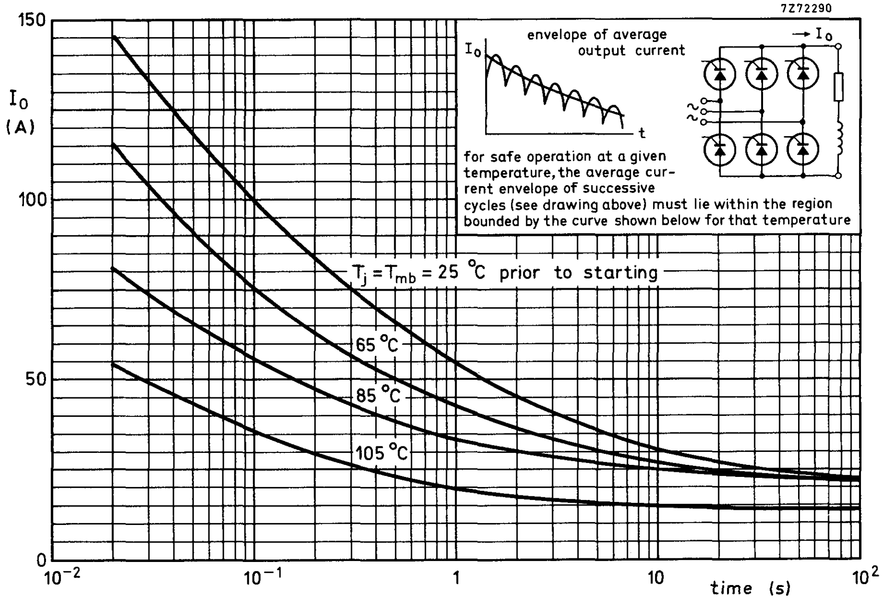


for safe operation at a given temperature, the average current envelope of successive cycles (see drawing above) must lie within the region bounded by the curve shown below for that temperature



for safe operation at a given temperature, the average current envelope of successive cycles (see drawing above) must lie within the region bounded by the curve shown below for that temperature

Fig. 10 Limits for starting or inrush currents.



for safe operation at a given temperature, the average current envelope of successive cycles (see drawing above) must lie within the region bounded by the curve shown below for that temperature

Fig. 11 Limits for starting or inrush currents.

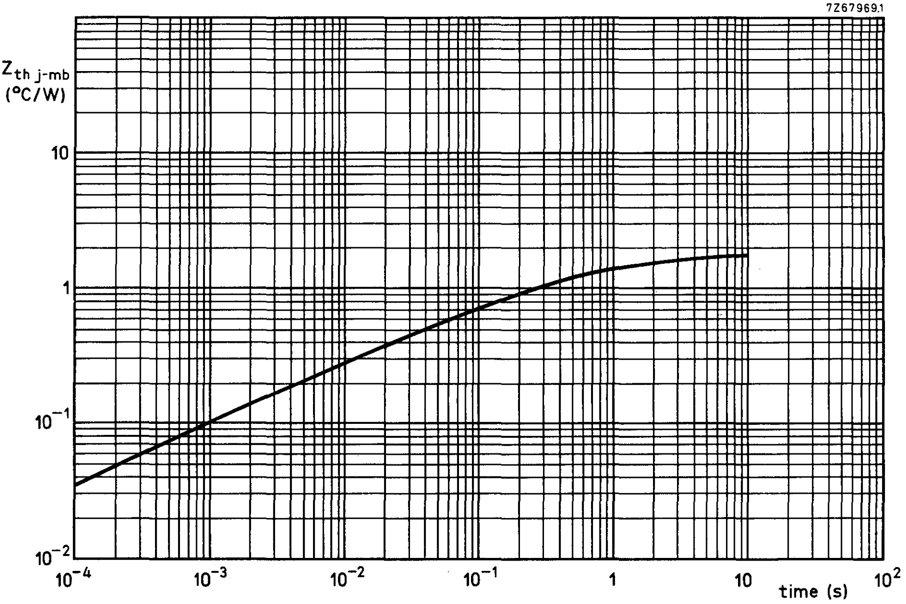


Fig. 12.