



## Technische Information / technical information



**Netz-Thyristor  
Phase Control Thyristor**

# T1081N

Infineon Technologies Bipolar  
GmbH & Co. KG

### Key Parameters

|                   |                                  |
|-------------------|----------------------------------|
| $V_{DRM}/V_{RRM}$ | 6000V ... 7000V                  |
| $I_{TAVM}$        | 1300A ( $T_C=85^\circ\text{C}$ ) |
| $I_{TSM}$         | 35000A                           |
| $V_{TO}$          | 1,18V                            |
| $r_T$             | 0,759m $\Omega$                  |
| $R_{thJC}$        | 8,0K/kW                          |
| Clamping Force    | 36 ... 52kN                      |
| Max. Diameter     | 121mm                            |
| Contact Diameter  | 86mm                             |
| Height            | 26mm                             |



For type designation please refer to actual shortform catalog

<http://www.ifbip.com/catalog>

### Merkmale

- Volle Sperrfähigkeit 50/60Hz über einen weiten Temperaturbereich
- Hohe DC Sperrstabilität
- Hohe Stoßstrombelastbarkeit
- Hoher Gehäusebruchstrom
- Hohe Einschalt di/dt Fähigkeit

### Features

- Full blocking 50/60Hz over a wide range temperature range
- High DC blocking stability
- High surge current capability
- High case non-rupture current
- High di/dt capability

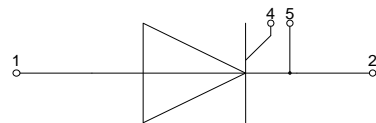
### Typische Anwendungen

- Mittelspannungssanftanlasser
- Statische Kompensation SVC
- Gleichrichter für Antriebsapplikationen
- Mittelspannungsumrichter
- Kurzschließer-Applikationen

### Typical Applications

- Medium Voltage Softstarter
- Static Var Compensation SVC
- Rectifier for Drives Applications
- Medium Voltage Drives
- Crowbar Applications

| content of customer DMX code | DMX code digit | DMX code digit quantity |
|------------------------------|----------------|-------------------------|
| serial number                | 1..7           | 7                       |
| SP material number           | 8..16          | 9                       |
| datecode (production day)    | 17..18         | 2                       |
| datecode (production year)   | 19..20         | 2                       |
| datecode (production month)  | 21..22         | 2                       |
| vT class                     | 23..26         | 4                       |
| QR class                     | 27..30         | 4                       |



[www.ifbip.com](http://www.ifbip.com)  
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#### Elektrische Eigenschaften / electrical properties Höchstzulässige Werte / maximum rated values

|   |  |                                  |  |
|---|--|----------------------------------|--|
| Periodische Vorwärts- und Rückwärts-Spitzensperrspannung<br>repetitive peak forward off-state and reverse voltage | $T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{ max}}$   | $V_{\text{DRM}}, V_{\text{RRM}}$ | 6000 V<br>6500 V<br>7000 V                                       |
| Durchlaßstrom-Grenzeffektivwert<br>maximum RMS on-state current   | $T_C = 85^{\circ}\text{C}$   | $I_{\text{TRMSM}}$               | 2040 A   |
| Dauergrenzstrom<br>average on-state current   | $T_C = 85^{\circ}\text{C}$<br>$T_C = 70^{\circ}\text{C}$<br>$T_C = 55^{\circ}\text{C}$                         | $I_{\text{TAVM}}$                | 1300 A<br>1560 A<br>1800 A                                       |
| Stoßstrom-Grenzwert<br>surge current  | $T_{vj} = 25^{\circ}\text{C}, t_p = 10\text{ ms}$<br>$T_{vj} = T_{vj\text{ max}}, t_p = 10\text{ ms}$          | $I_{\text{TSM}}$                 | 35000 A<br>34000 A   |
| Grenzlastintegral<br>$I^2t$ -value  | $T_{vj} = 25^{\circ}\text{C}, t_p = 10\text{ ms}$<br>$T_{vj} = T_{vj\text{ max}}, t_p = 10\text{ ms}$          | $I^2t$                           | 6120 $10^3\text{ A}^2\text{s}$<br>5780 $10^3\text{ A}^2\text{s}$ |
| Kritische Stromsteilheit<br>critical rate of rise of on-state current   | DIN IEC 60747-6<br>$f = 50\text{ Hz}, i_{\text{GM}} = 3\text{ A}, di_{\text{G}}/dt = 6\text{ A}/\mu\text{s}$   | $(di_{\text{T}}/dt)_{\text{cr}}$ | 300 $\text{A}/\mu\text{s}$                                       |
| Kritische Spannungssteilheit<br>critical rate of rise of off-state voltage  | $T_{vj} = T_{vj\text{ max}}, V_{\text{D}} = 0,67 V_{\text{DRM}}$<br>5.Kennbuchstabe / 5 <sup>th</sup> letter H | $(dv_{\text{D}}/dt)_{\text{cr}}$ | 2000 $\text{V}/\mu\text{s}$                                      |

#### Charakteristische Werte / characteristic values

|   |   |                              |   |
|---|---|------------------------------|---|
| Durchlaßspannung<br>on-state voltage  | $T_{vj} = T_{vj\text{ max}}, i_{\text{T}} = 2000\text{ A}$  | $V_{\text{T}}$               | typ. 2,55 V<br>Max. 2,7 V   |
| Schleusenspannung<br>threshold voltage  | $T_{vj} = T_{vj\text{ max}}$  | $V_{(\text{TO})}$            | typ. 1,12 V<br>max. 1,18 V  |
| Ersatzwiderstand<br>slope resistance  | $T_{vj} = T_{vj\text{ max}}$  | $r_{\text{T}}$               | typ. 0,714 m $\Omega$<br>Max. 0,759 m $\Omega$  |
| Durchlaßkennlinie<br>on-state characteristic<br><br>$v_{\text{T}} = A + B \cdot i_{\text{T}} + C \cdot \ln(i_{\text{T}} + 1) + D \cdot \sqrt{i_{\text{T}}}$ | $T_{vj} = T_{vj\text{ max}}$  | typ.<br>max.                 | A 0,00017<br>B 0,000408<br>C 0,159<br>D 0,0117<br><br>A 0,00016<br>B 0,000509<br>C 0,184<br>D 0,00634 |
| Zündstrom<br>gate trigger current   | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{ V}$   | $I_{\text{GT}}$              | max. 350 mA   |
| Zündspannung<br>gate trigger voltage  | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{ V}$   | $V_{\text{GT}}$              | max. 2,5 V  |
| Nicht zündender Steuerstrom<br>gate non-trigger current   | $T_{vj} = T_{vj\text{ max}}, V_{\text{D}} = 12\text{ V}$<br>$T_{vj} = T_{vj\text{ max}}, V_{\text{D}} = 0,5 V_{\text{DRM}}$   | $I_{\text{GD}}$              | max. 20 mA<br>max. 10 mA  |
| Nicht zündende Steuerspannung<br>gate non-trigger voltage   | $T_{vj} = T_{vj\text{ max}}, V_{\text{D}} = 0,5 V_{\text{DRM}}$   | $V_{\text{GD}}$              | max. 0,4 V  |
| Haltestrom<br>holding current   | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{ V}$   | $I_{\text{H}}$               | max. 350 mA   |
| Einraststrom<br>latching current  | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{ V}, R_{\text{GK}} \geq 10\ \Omega$<br>$i_{\text{GM}} = 3\text{ A}, di_{\text{G}}/dt = 6\text{ A}/\mu\text{s}, t_{\text{g}} = 20\ \mu\text{s}$ | $I_{\text{L}}$               | max. 3 A  |
| Vorwärts- und Rückwärts-Sperrstrom<br>forward off-state and reverse current   | $T_{vj} = T_{vj\text{ max}}$<br>$V_{\text{D}} = V_{\text{DRM}}, V_{\text{R}} = V_{\text{RRM}}$  | $i_{\text{D}}, i_{\text{R}}$ | max. 400 mA   |
| Zündverzug<br>gate controlled delay time  | DIN IEC 60747-6<br>$T_{vj} = 25^{\circ}\text{C}, i_{\text{GM}} = 3\text{ A}, di_{\text{G}}/dt = 6\text{ A}/\mu\text{s}$   | $t_{\text{gd}}$              | max. 2 $\mu\text{s}$  |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: TM | date of publication: 2011-05-02 |
| approved by: JP | revision: 8.0                   |



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#### Elektrische Eigenschaften / electrical properties Charakteristische Werte / characteristic values

|   |  |          |      |     |               |
|---|--|----------|------|-----|---------------|
| Freiwerdezeit<br>circuit commutated turn-off time | $T_{vj} = T_{vj\max}$ , $i_{TM} = I_{TAVM}$<br>$V_{RM} = 100\text{ V}$ , $V_{DM} = 0,67 V_{DRM}$<br>$dv_D/dt = 20\text{ V}/\mu\text{s}$ , $-di_T/dt = 10\text{ A}/\mu\text{s}$<br>4.Kennbuchstabe / 4 <sup>th</sup> letter O | $t_q$    | typ. | 600 | $\mu\text{s}$ |
| Sperrverzögerungsladung<br>recovered charge       | $T_{vj} = T_{vj\max}$<br>$i_{TM} = I_{TAVM}$ , $-di_T/dt = 10\text{ A}/\mu\text{s}$<br>$V_R = 0,5V_{RRM}$ , $V_{RM} = 0,8V_{RRM}$  | $Q_r$    | max. | 10  | mAs           |
| Rückstromspitze<br>peak reverse recovery current  | $T_{vj} = T_{vj\max}$<br>$i_{TM} = I_{TAVM}$ , $-di_T/dt = 10\text{ A}/\mu\text{s}$<br>$V_R = 0,5V_{RRM}$ , $V_{RM} = 0,8V_{RRM}$  | $I_{RM}$ | max. | 250 | A             |

#### Thermische Eigenschaften / thermal properties

|  |   |                   |      |            |                  |
|--|---|-------------------|------|------------|------------------|
| Innerer Wärmewiderstand<br>thermal resistance, junction to case        | <u>Kühlfläche / cooling surface</u><br>beidseitig / two-sided, $\theta = 180^\circ\text{sin}$<br>beidseitig / two-sided, DC<br>Anode / anode, DC<br>Kathode / cathode, DC | $R_{thJC}$        | max. | 8,6        | K/kW             |
|  |   |                   | max. | 8,0        | K/kW             |
|  |   |                   | max. | 15,0       | K/kW             |
|  |   |                   | max. | 17,0       | K/kW             |
| Übergangs-Wärmewiderstand<br>thermal resistance, case to heatsink      | <u>Kühlfläche / cooling surface</u><br>beidseitig / two-sided<br>einseitig / single-sided   | $R_{thCH}$        | max. | 2,5        | K/kW             |
|  |   |                   | max. | 5,0        | K/kW             |
| Höchstzulässige Sperrschichttemperatur<br>maximum junction temperature |   | $T_{vj\max}$      |      | 125        | $^\circ\text{C}$ |
| Betriebstemperatur<br>operating temperature                            |   | $T_{c\text{ op}}$ |      | -40...+125 | $^\circ\text{C}$ |
| Lagertemperatur<br>storage temperature                                 |   | $T_{stg}$         |      | -40...+150 | $^\circ\text{C}$ |

#### Mechanische Eigenschaften / mechanical properties

|  |           |                          |   |                        |                     |
|--|-----------|--------------------------|---|------------------------|---------------------|
| Gehäuse, siehe Anlage<br>case, see annex                       |           |                          |   | Seite 4<br>page 4      |                     |
| Si-Element mit Druckkontakt<br>Si-pellet with pressure contact |           |                          |   |                        |                     |
| Anpresskraft<br>clamping force                                 |           | F                        |   | 36...52                | kN                  |
| Steueranschlüsse<br>control terminals                          | DIN 46244 | Gate<br>Kathode /Cathode |   | A 4,8x0,8<br>A 6,3x0,8 |                     |
| Gewicht<br>weight  |           |                          | G | typ.                   | 1500 g              |
| Kriechstrecke<br>creepage distance                             |           |                          |   |                        | 33 mm               |
| Schwingfestigkeit<br>vibration resistance                      | f = 50 Hz |                          |   |                        | 50 m/s <sup>2</sup> |



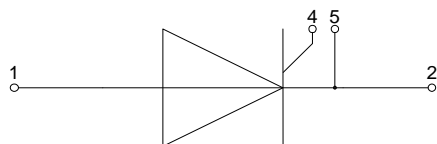
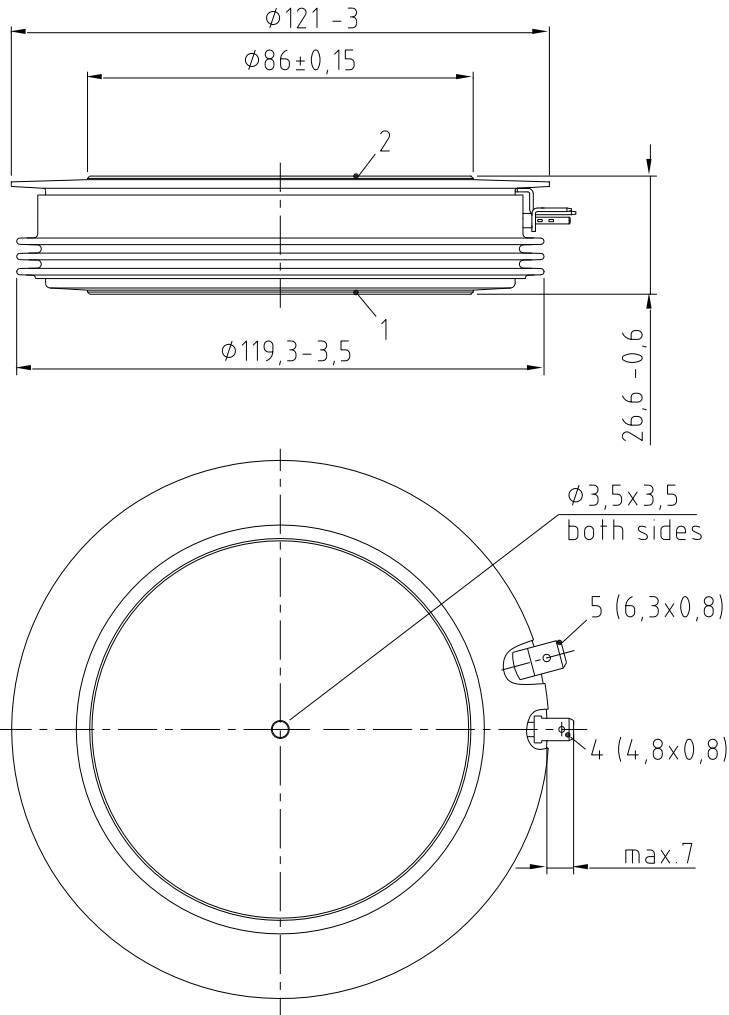
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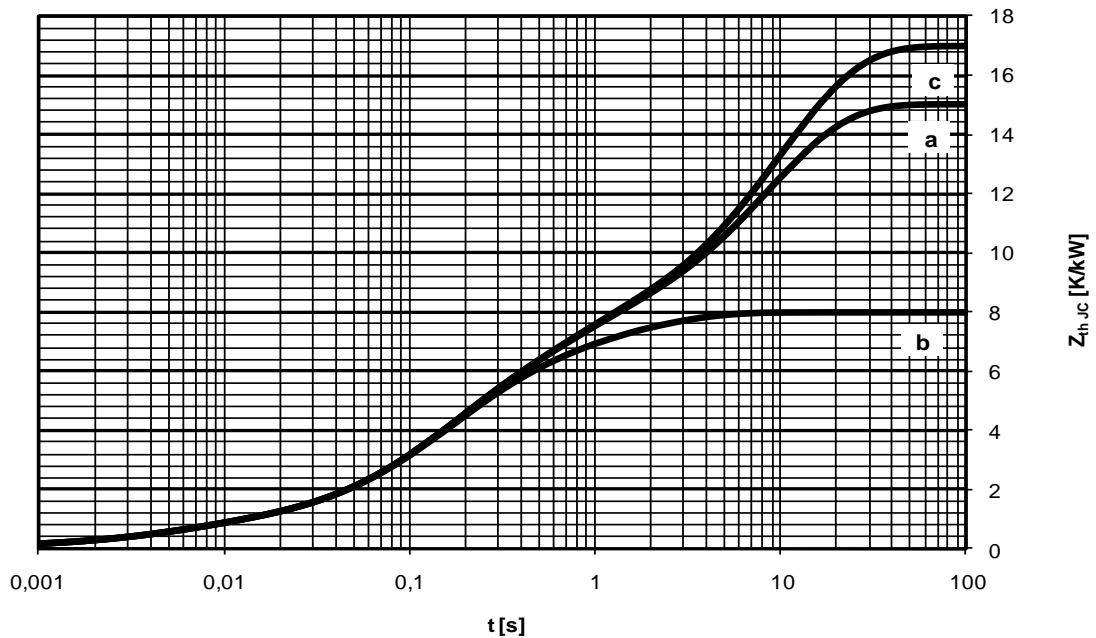
- 1: Anode/anode
- 2: Kathode/cathode
- 4: Gate
- 5: Hilfskathode/  
cathode (control terminal)



**Analytische Elemente des transienten Wärmewiderstandes  $Z_{thJC}$  /  
analytical elements of transient thermal impedance  $Z_{thJC}$**

|                                 | Pos. n           | 1    | 2    | 3    | 4    | 5     | 6 | 7 |
|---------------------------------|------------------|------|------|------|------|-------|---|---|
| beidseitig<br>two-sided         | $R_{thn}$ [K/kW] | 1,6  | 2,2  | 0,8  | 2,8  | 0,6   |   |   |
|                                 | $\tau_n$ [s]     | 1,72 | 0,39 | 0,16 | 0,12 | 0,005 |   |   |
| anodenseitig<br>anode-sided     | $R_{thn}$ [K/kW] | 8    | 2,8  | 0,8  | 2,8  | 0,6   |   |   |
|                                 | $\tau_n$ [s]     | 8,5  | 0,5  | 0,16 | 0,12 | 0,005 |   |   |
| kathodenseitig<br>cathode-sided | $R_{thn}$ [K/kW] | 10   | 2,8  | 0,8  | 2,8  | 0,6   |   |   |
|                                 | $\tau_n$ [s]     | 10   | 0,5  | 0,16 | 0,12 | 0,005 |   |   |

Analytische Funktion / analytical function: 
$$Z_{thJC} = \sum_{n=1}^{n_{max}} R_{thn} \left( 1 - e^{-\frac{t}{\tau_n}} \right)$$

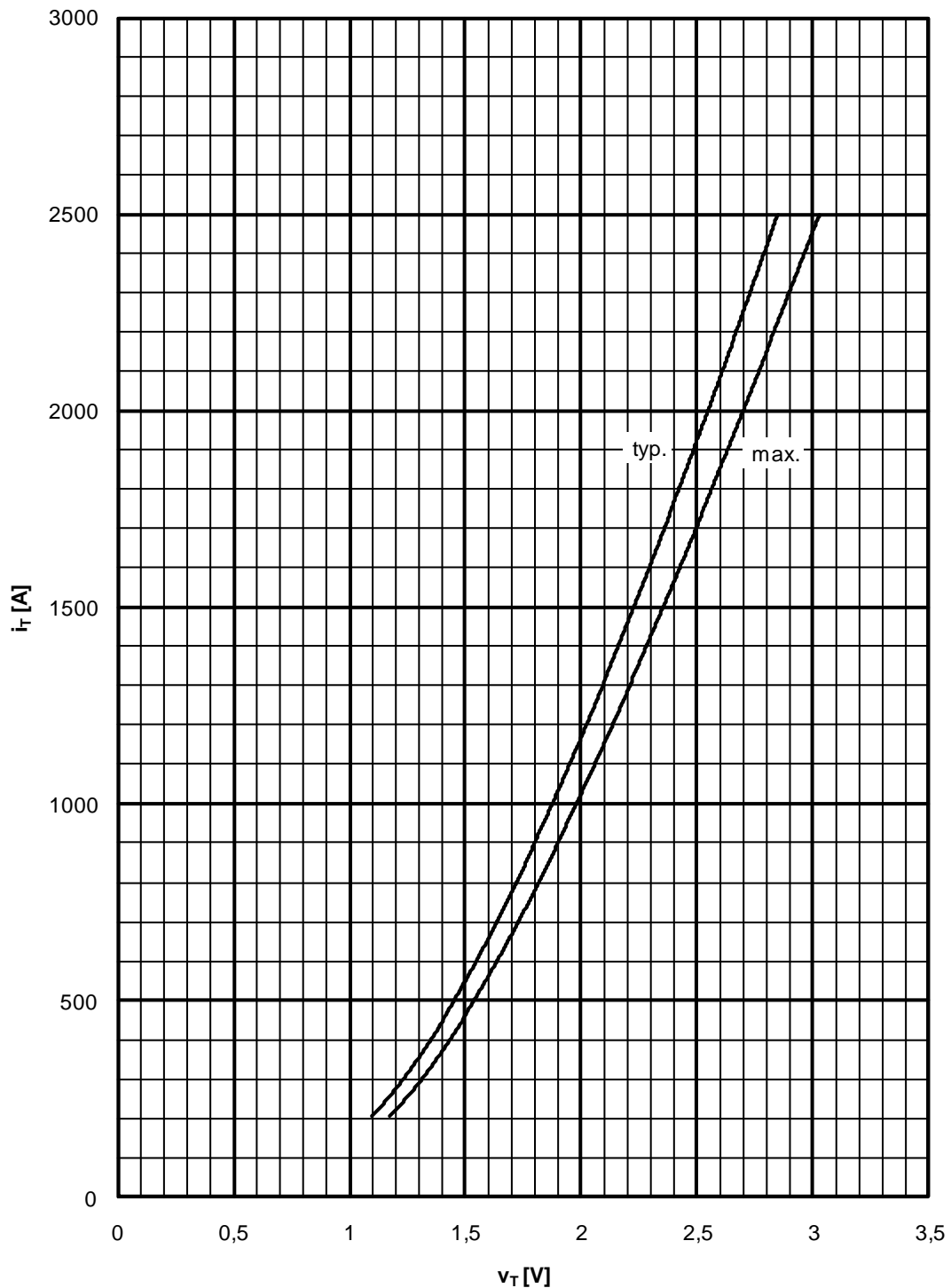


**Transienter innerer Wärmewiderstand für DC / transient thermal impedance  $Z_{thJC} = f(t)$  for DC**

**a** : Anodenseitige Kühlung / anode-sided cooling

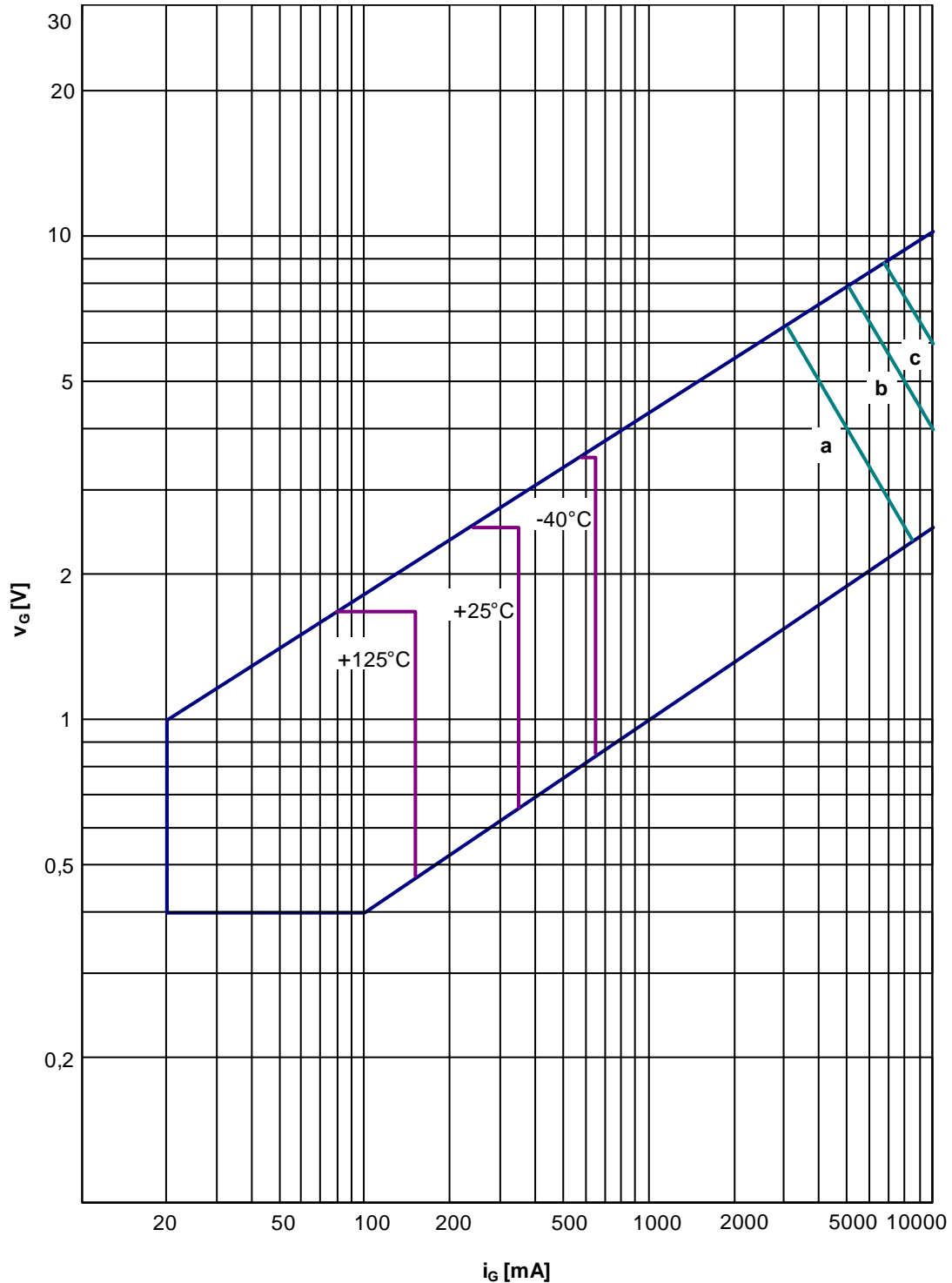
**b** : Beidseitige Kühlung / two-sided cooling

**c** : Kathodenseitige Kühlung / cathode-sided cooling



Grenzdurchlaßkennlinie / limiting on-state characteristic  $i_T = f(v_T)$

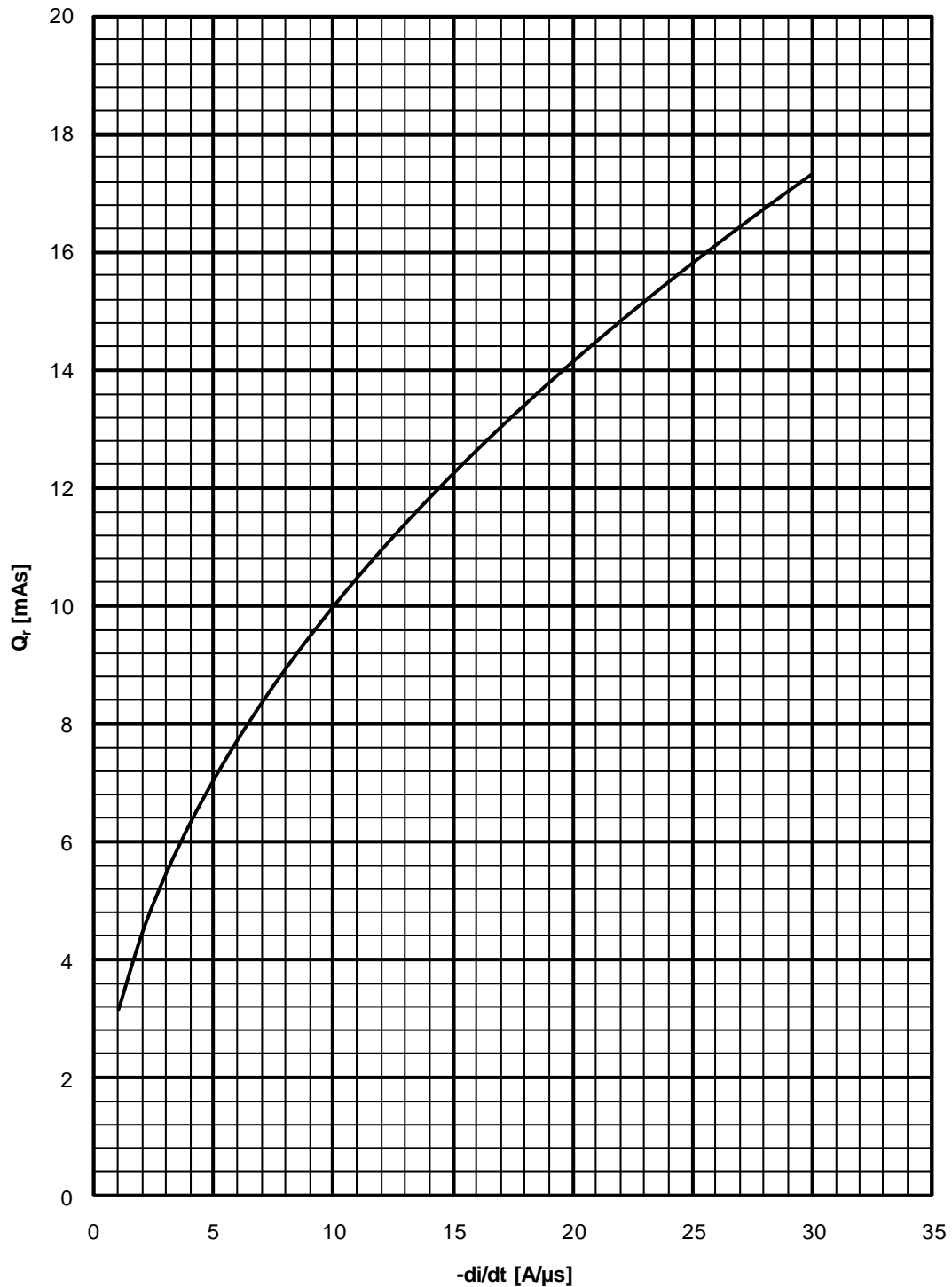
$$T_{vj} = T_{vj \text{ max}}$$



Steuercharakteristik  $v_G = f(i_G)$  mit Zündbereichen für  $V_D = 12\text{ V}$  /  
gate characteristic  $v_G = f(i_G)$  with triggering area for  $V_D = 12\text{ V}$

Höchstzulässige Spitzensteuerverlustleistung / maximum rated peak gate power dissipation  $P_{GM} = f(t_g)$  :

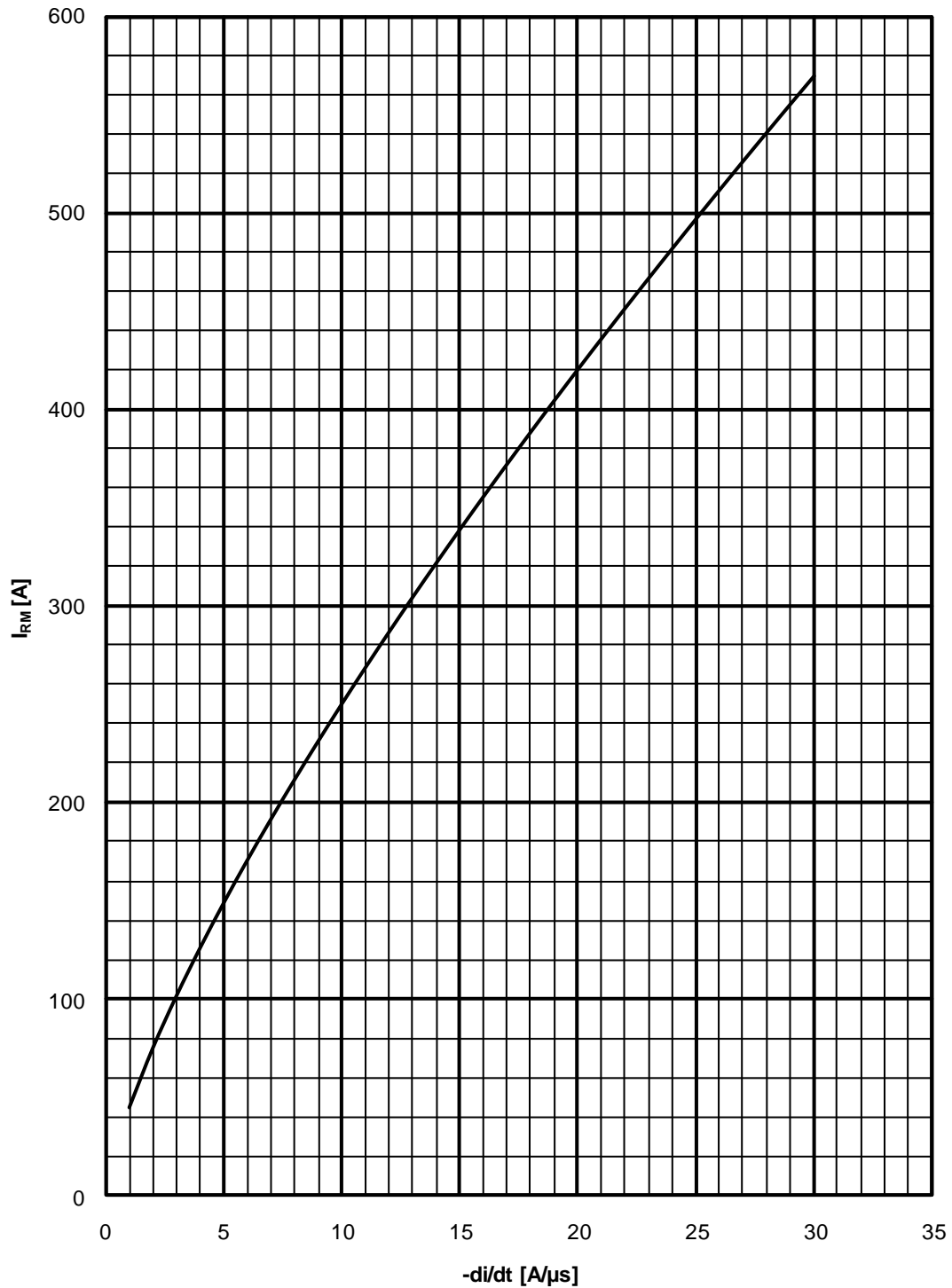
a - 20 W/10ms    b - 40 W/1ms    c - 60 W/0,5ms



Sperrverzögerungsladung / recovered charge  $Q_r = f(-di/dt)$

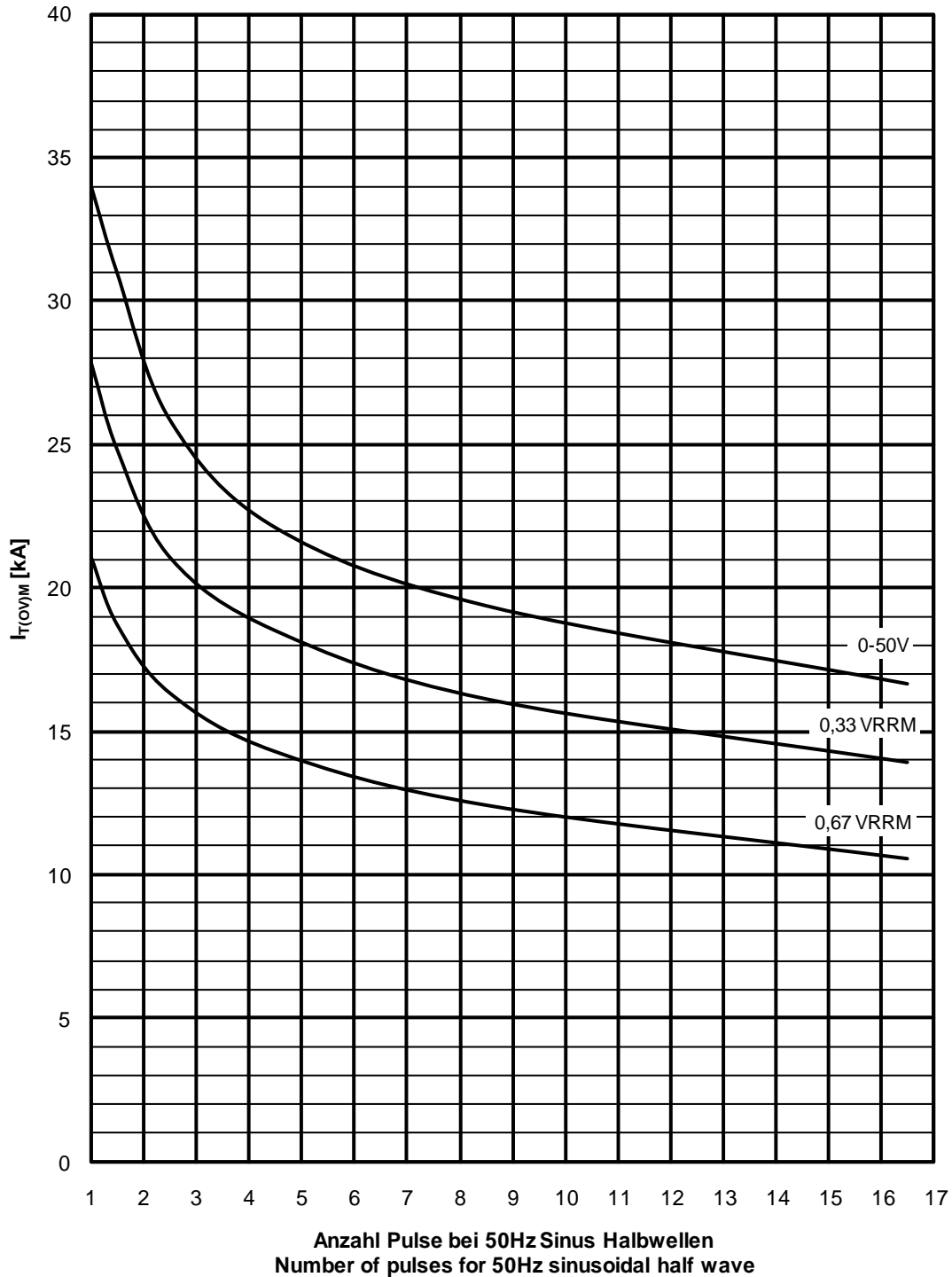
$$T_{vj} = T_{vjmax}, v_R = 0,5 V_{RRM}, V_{RM} = 0,8 V_{RRM}$$





Rückstromspitze / peak reverse recovery current  $I_{RM} = f(-di/dt)$

$T_{vj} = T_{vjmax}$ ,  $V_R = 0,5 V_{RRM}$ ,  $V_{RM} = 0,8 V_{RRM}$



Typische Abhängigkeit des Grenzstromes  $I_{T(OV)M}$  von der Anzahl für eine Folge von Sinus Halbwellen bei 50Hz.

Parameter: Rückwärtsspannung  $V_{RM}$

Typical dependency of maximum overload on-state current  $I_{T(OV)M}$  as a number of a sequence of sinusoidal half waves at 50Hz. Parameter: peak reverse voltage  $V_{RM}$

$I_{T(OV)M} = f(\text{pulses}, V_{RM}) ; T_{vj} = T_{vjmax}$