


Netz-Thyristor
Phase Control Thyristor
T1930N
Vorläufige Daten
preliminary data
Elektrische Eigenschaften / Electrical properties
 Höchstzulässige Werte / Maximum rated values

| | | | | | |
|--|--|----------------------------------|--------------|----------------|--|
| Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltages | $T_{vj} = -40^{\circ}\text{C} \dots T_{vj \max}$ | $V_{\text{DRM}}, V_{\text{RRM}}$ | 3200 3400 | 3600 3800 | V V |
| Vorwärts-Stosspitzensperrspannung non-repetitive peak forward off-state voltage | $T_{vj} = -40^{\circ}\text{C} \dots T_{vj \max}$ | V_{DSM} | 3200 3400 | 3600 3800 | V V |
| Rückwärts-Stosspitzensperrspannung non-repetitive peak reverse voltage | $T_{vj} = +25^{\circ}\text{C} \dots T_{vj \max}$ | V_{RSM} | 3300 3500 | 3700 3900 | V V |
| Durchlassstrom-Grenzeffektivwert maximum RMS on-state current | | I_{TRMSM} | | 4200 | A |
| Dauergrenzstrom average on-state current | $T_{\text{C}} = 85^{\circ}\text{C}$ | I_{TAVM} | | 2180 | A |
| Dauergrenzstrom average on-state current | $T_{\text{C}} = 55^{\circ}\text{C}, \theta = 180^{\circ}\sin, t_{\text{p}} = 10 \text{ ms}$ | I_{TAVM} | | 3140 | A |
| Durchlaßstrom-Effektivwert RMS on-state current | | I_{TRMS} | | 4920 | A |
| Stossstrom-Grenzwert surge current | $T_{vj} = 25^{\circ}\text{C}, t_{\text{p}} = 10 \text{ ms}$ $T_{vj} = T_{vj \max}, t_{\text{p}} = 10 \text{ ms}$ | I_{TSM} | | 40000 37000 | A A |
| Grenzlastintegral I^2t -value | $T_{vj} = 25^{\circ}\text{C}, t_{\text{p}} = 10 \text{ ms}$ $T_{vj} = T_{vj \max}, t_{\text{p}} = 10 \text{ ms}$ | I^2t | | 8000 6850 | $10^3 \text{ A}^2\text{s}$ $10^3 \text{ A}^2\text{s}$ |
| Kritische Stromsteilheit critical rate of rise of on-state current | DIN IEC 60747-6 $f = 50 \text{ Hz}, i_{\text{GM}} = 1,6 \text{ A},$ $di_{\text{G}}/dt = 1,6 \text{ A}/\mu\text{s}$ | $(di_{\text{T}}/dt)_{\text{cr}}$ | | 150 | A/ μs |
| Kritische Spannungssteilheit critical rate of rise of off-state voltage | $T_{vj} = T_{vj \max}, V_{\text{D}} = 0,67 V_{\text{DRM}}$ 5.Kennbuchstabe / 5 th letter F | $(dv_{\text{D}}/dt)_{\text{cr}}$ | | 1000 | V/ μs |

Charakteristische Werte / Characteristic values

| | | | | | |
|---|---|------------------------------|--------------|---|---------------|
| Durchlassspannung on-state voltage | $T_{vj} = T_{vj \max}, i_{\text{T}} = 8 \text{ kA}$ $T_{vj} = T_{vj \max}, i_{\text{T}} = 2 \text{ kA}$ | v_{T} | max. max. | 2,90 1,60 | V V |
| Schleusenspannung threshold voltage | $T_{vj} = T_{vj \max}$ | $V_{(\text{TO})}$ | | 1,08 | V |
| Ersatzwiderstand slope resistance | $T_{vj} = T_{vj \max}$ | r_{T} | | 0,20 | m Ω |
| Durchlasskennlinie on-state characteristic $1000 \text{ A} \leq i_{\text{T}} \leq 11000 \text{ A}$ $v_{\text{T}} = A + B \cdot i_{\text{T}} + C \cdot \ln(i_{\text{T}} + 1) + D \cdot \sqrt{i_{\text{T}}}$ | $T_{vj} = T_{vj \max}$ | A= B= C= D= | | 2,085E+00 7,262E-05 -2,440E-01 2,706E-02 | |
| Zündstrom gate trigger current | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12 \text{ V}$ | I_{GT} | max. | 300 | mA |
| Zündspannung gate trigger voltage | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12 \text{ V}$ | V_{GT} | max. | 3 | V |
| Nicht zündender Steuerstrom gate non-trigger current | $T_{vj} = T_{vj \max}, V_{\text{D}} = 12 \text{ V}$ $T_{vj} = T_{vj \max}, V_{\text{D}} = 0,5 V_{\text{DRM}}$ | I_{GD} | max. max. | 10 5 | mA mA |
| Nicht zündende Steuerspannung gate non-trigger voltage | $T_{vj} = T_{vj \max}, V_{\text{D}} = 0,5 V_{\text{DRM}}$ | V_{GD} | max. | 0,25 | V |
| Haltestrom holding current | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12 \text{ V}$ | I_{H} | max. | 300 | mA |
| Einraststrom latching current | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12 \text{ V}, R_{\text{GK}} \geq 10 \Omega$ $i_{\text{GM}} = 1,6 \text{ A}, di_{\text{G}}/dt = 1,6 \text{ A}/\mu\text{s},$ $t_{\text{g}} = 20 \mu\text{s}$ | I_{L} | max. | 1500 | mA |
| Vorwärts- und Rückwärts-Sperrstrom forward off-state and reverse current | $T_{vj} = T_{vj \max}$ $V_{\text{D}} = V_{\text{DRM}}, V_{\text{R}} = V_{\text{RRM}}$ | $i_{\text{D}}, i_{\text{R}}$ | max. | 300 | mA |
| Zündverzug gate controlled delay time | DIN IEC 60747-6 $T_{vj} = 25^{\circ}\text{C}, i_{\text{GM}} = 1,6 \text{ A},$ $di_{\text{G}}/dt = 1,6 \text{ A}/\mu\text{s}$ | t_{gd} | max. | 3 | μs |

| | | | |
|--------------|-------------|----------------------|------------|
| prepared by: | H.Sandmann | date of publication: | 2008-03-06 |
| approved by: | J.Przybilla | revision: | 1.3 |


Netz-Thyristor
Phase Control Thyristor
T1930N
Vorläufige Daten
preliminary data
Elektrische Eigenschaften / Electrical properties
 Charakteristische Werte / Characteristic values

| | | | | |
|---|---|-------|----------|---------|
| Freiwerdezeit circuit commutated turn-off time | $T_{vj} = T_{vj\ max}, I_{TM} = I_{TAVM}$ $V_{RM} = 100\ V, V_{DM} = 0,67\ V_{DRM}$ $dv_D/dt = 20\ V/\mu s, -di_T/dt = 10\ A/\mu s$ 4.Kennbuchstabe / 4 th letter O | t_q | typ. 450 | μs |
|---|---|-------|----------|---------|

Thermische Eigenschaften / Thermal properties

| | | | | |
|--|--|---------------|--|--|
| Innerer Wärmewiderstand thermal resistance, junction to case | <u>Kühlfläche / cooling surface</u> beidseitig / two-sided, $\theta = 180^\circ\ sin$ beidseitig / two-sided, DC Anode / anode, $\theta = 180^\circ\ sin$ Anode / anode, DC Kathode / cathode, $\theta = 180^\circ\ sin$ Kathode / cathode, DC | R_{thJC} | max. 0,0085 max. 0,0078 max. 0,0152 max. 0,0146 max. 0,0183 max. 0,0169 | $^\circ C/W$ $^\circ C/W$ $^\circ C/W$ $^\circ C/W$ $^\circ C/W$ $^\circ C/W$ |
| Übergangs-Wärmewiderstand thermal resistance, case to heatsink | <u>Kühlfläche / cooling surface</u> beidseitig / two-sides einseitig / single-sides | R_{thCH} | max. 0,0025 max. 0,0050 | $^\circ C/W$ $^\circ C/W$ |
| Höchstzulässige Sperrschichttemperatur maximum junction temperature | | $T_{vj\ max}$ | 125 | $^\circ C$ |
| Betriebstemperatur operating temperature | | $T_{c\ op}$ | -40...+125 | $^\circ C$ |
| Lagertemperatur storage temperature | | T_{stg} | -40...+150 | $^\circ C$ |

Mechanische Eigenschaften / Mechanical properties

| | | | | |
|--|--|---|---|------------------|
| Gehäuse, siehe Anlage case, see annex | | | Seite 3 page 3 | |
| Si-Element mit Druckkontakt Si-pellet with pressure contact | | | | |
| Anpresskraft clamping force | | F | 42...95 | kN |
| Steueranschlüsse control terminals | Gate (flat) Gate (round, based on AMP 60598) Kathode / cathode | | A 2,8x0,5 \varnothing 1,5 A 4,8x0,5 | mm mm mm |
| Gewicht weight | | G | typ. 1200 | g |
| Kriechstrecke creepage distance | | | 25 | mm |
| Schwingfestigkeit vibration resistance | f = 50 Hz | | 50 | m/s ² |

N

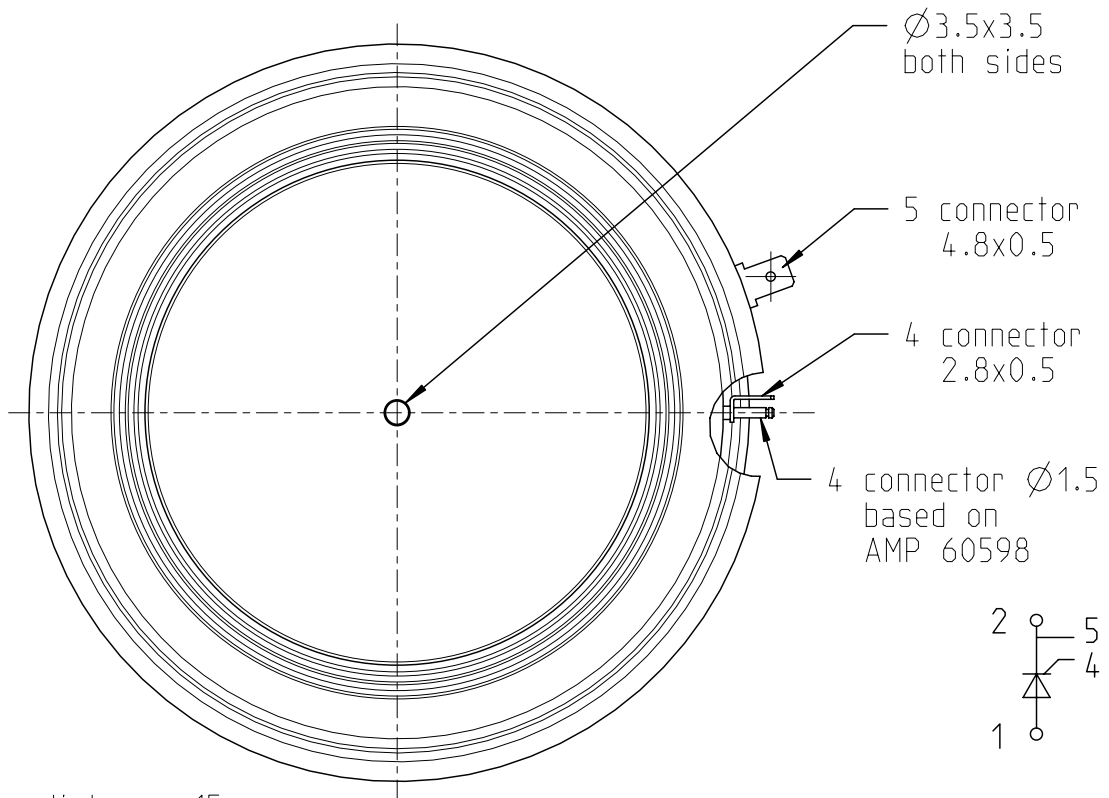
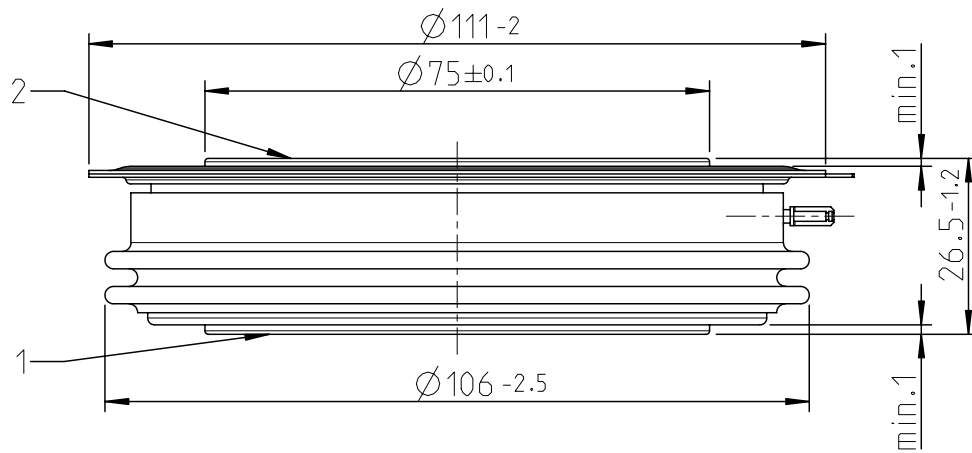
Datenblatt / Data sheet



Netz-Thyristor
Phase Control Thyristor

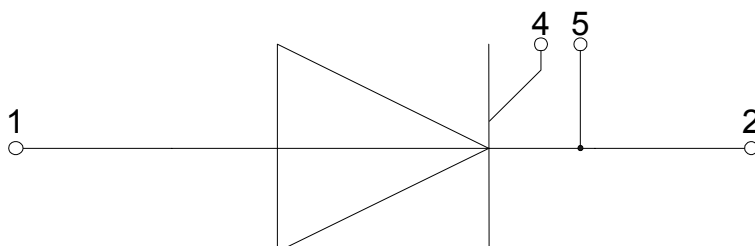
T1930N

Vorläufige Daten
preliminary data



strike distance: 15mm
creepage distance: 25mm

overall height based
on contact pressure



- 1: Anode / Anode**
- 2: Kathode / Cathode**
- 4: Gate**
- 5: Hilfskathode/
Auxiliary Cathode**



Netz-Thyristor
Phase Control Thyristor

T1930N

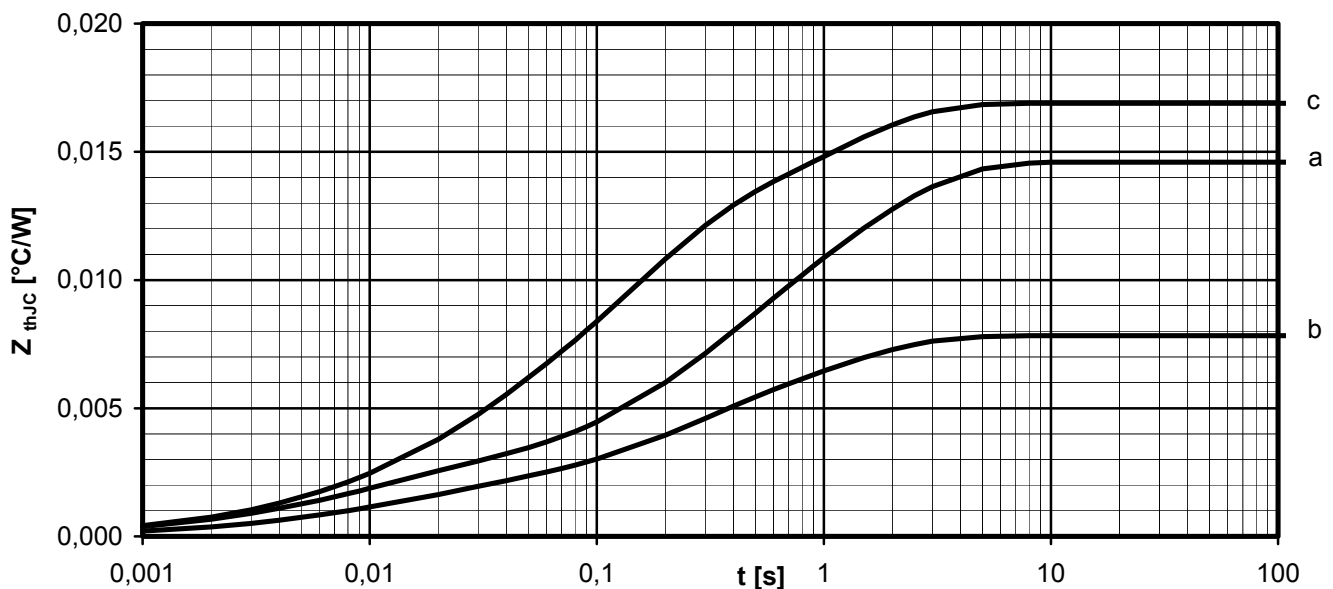
Vorläufige Daten
preliminary data

Analytische Elemente des transienten Wärmewiderstandes Z_{thJC} für DC
Analytical elements of transient thermal impedance Z_{thJC} for DC

| Kühlung / Cooling | Pos. n | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------------------------------|------------------|---------|---------|---------|---------|---------|---------|---|
| beidseitig two-sided | R_{thn} [°C/W] | 0,00003 | 0,00039 | 0,00123 | 0,00280 | 0,00338 | - | - |
| | τ_n [s] | 0,00006 | 0,00392 | 0,01520 | 0,20680 | 1,09140 | - | - |
| anodenseitig anode-sided | R_{thn} [°C/W] | 0,00001 | 0,00037 | 0,00190 | 0,00130 | 0,00434 | 0,00668 | - |
| | τ_n [s] | 0,00001 | 0,00182 | 0,00951 | 0,13500 | 0,34700 | 1,54000 | - |
| kathodenseitig cathode-sided | R_{thn} [°C/W] | 0,00003 | 0,00073 | 0,00302 | 0,00802 | 0,00510 | - | - |
| | τ_n [s] | 0,00004 | 0,00341 | 0,02150 | 0,13500 | 1,11000 | - | - |

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 for DC
 $Z_{thJC} = f(t)$

- a - Anodenseitige Kühlung / Anode-sided cooling
b - Beidseitige Kühlung / Two-sided cooling
c - Kathodenseitige Kühlung / Cathode-sided cooling



Netz-Thyristor
Phase Control Thyristor

T1930N

Vorläufige Daten
preliminary data

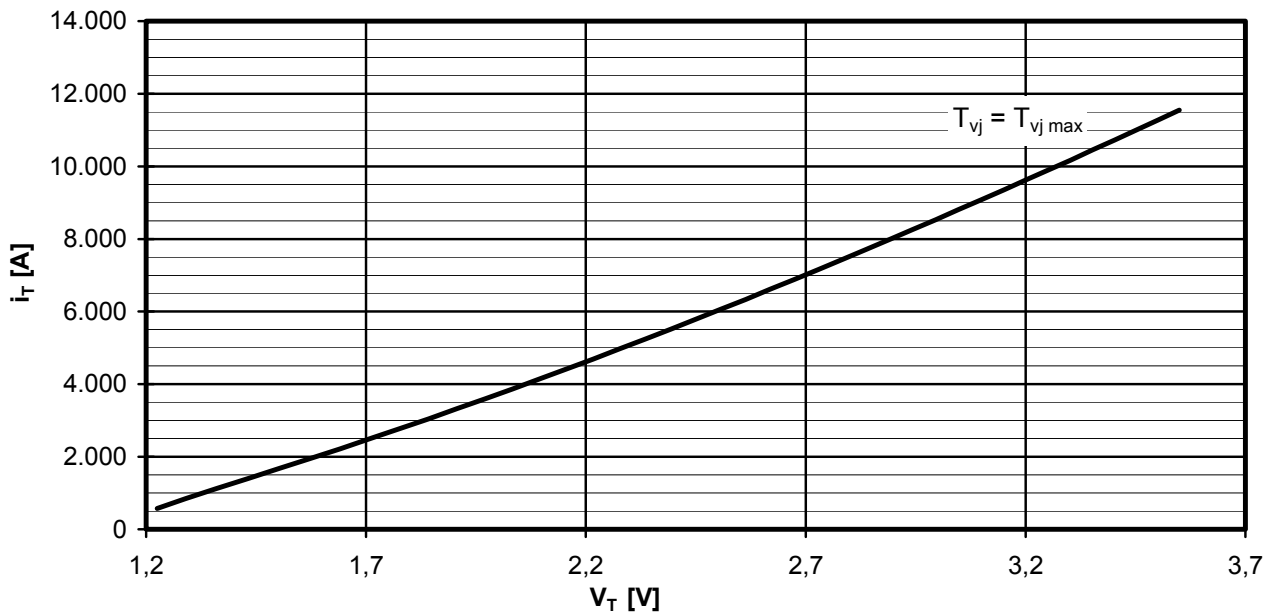
Erhöhung des $Z_{th DC}$ bei Sinus und Rechteckströmen mit unterschiedlichen Stromflusswinkeln Θ
Rise of $Z_{th DC}$ for sinewave and rectangular current with different current conduction angles Θ

$\Delta Z_{th \Theta rec} / \Delta Z_{th \Theta sin}$

| Kühlung / Cooling | | $\Theta = 180^\circ$ | $\Theta = 120^\circ$ | $\Theta = 90^\circ$ | $\Theta = 60^\circ$ | $\Theta = 30^\circ$ |
|---------------------------------|--------------------------------------|----------------------|----------------------|---------------------|---------------------|---------------------|
| beidseitig two-sided | $\Delta Z_{th \Theta rec}$ [°C/W] | 0,00084 | 0,00000 | 0,00161 | 0,00201 | 0,00259 |
| | $\Delta Z_{th \Theta sin}$ [°C/W] | 0,00069 | 0,00093 | 0,00120 | 0,00156 | 0,00208 |
| anodenseitig anode-sided | $\Delta Z_{th \Theta rec}$ [°C/W] | 0,00143 | 0,00228 | 0,00288 | 0,00371 | 0,00492 |
| | $\Delta Z_{th \Theta sin}$ [°C/W] | 0,00112 | 0,00154 | 0,00208 | 0,00289 | 0,00425 |
| kathodenseitig cathode-sided | $\Delta Z_{th \Theta rec}$ [°C/W] | 0,00170 | 0,00261 | 0,00322 | 0,00399 | 0,00506 |
| | $\Delta Z_{th \Theta sin}$ [°C/W] | 0,00144 | 0,00191 | 0,00246 | 0,00321 | 0,00430 |

$$Z_{th \Theta rec} = Z_{th DC} + \Delta Z_{th \Theta rec}$$

$$Z_{th \Theta sin} = Z_{th DC} + \Delta Z_{th \Theta sin}$$



Grenzdurchlasskennlinie / Limiting on-state characteristic $i_T = f(v_T)$

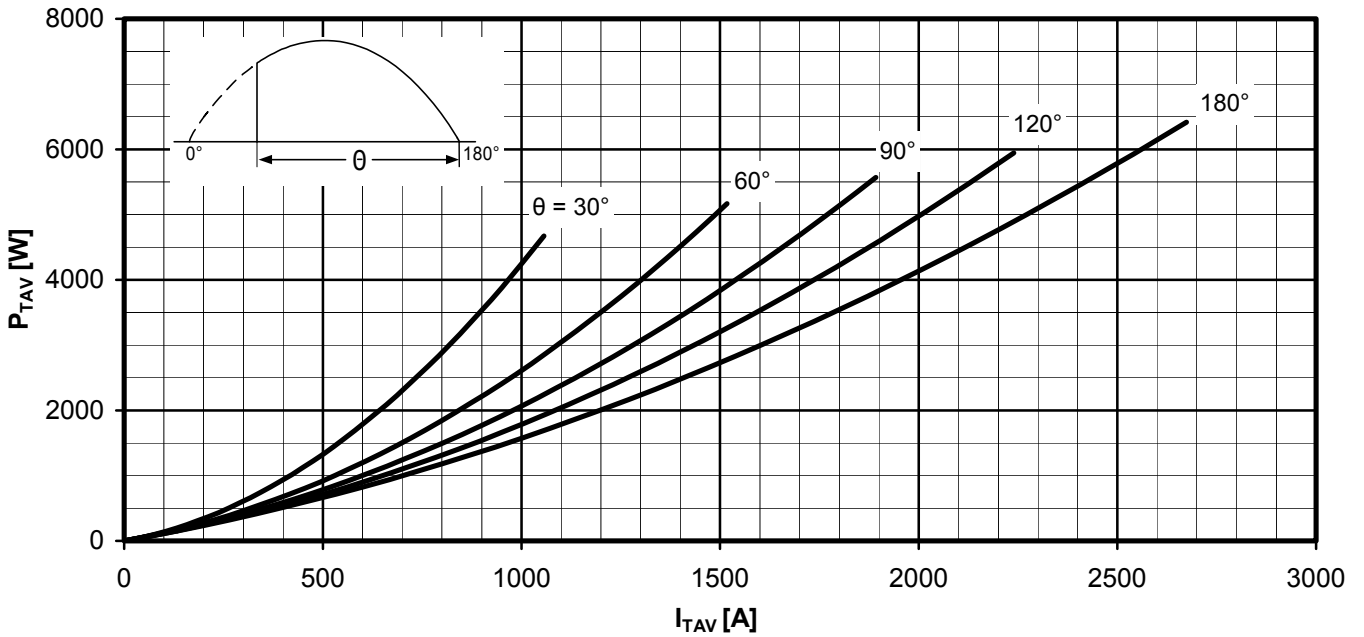
$$T_{vj} = T_{vj max}$$



Netz-Thyristor
Phase Control Thyristor

T1930N

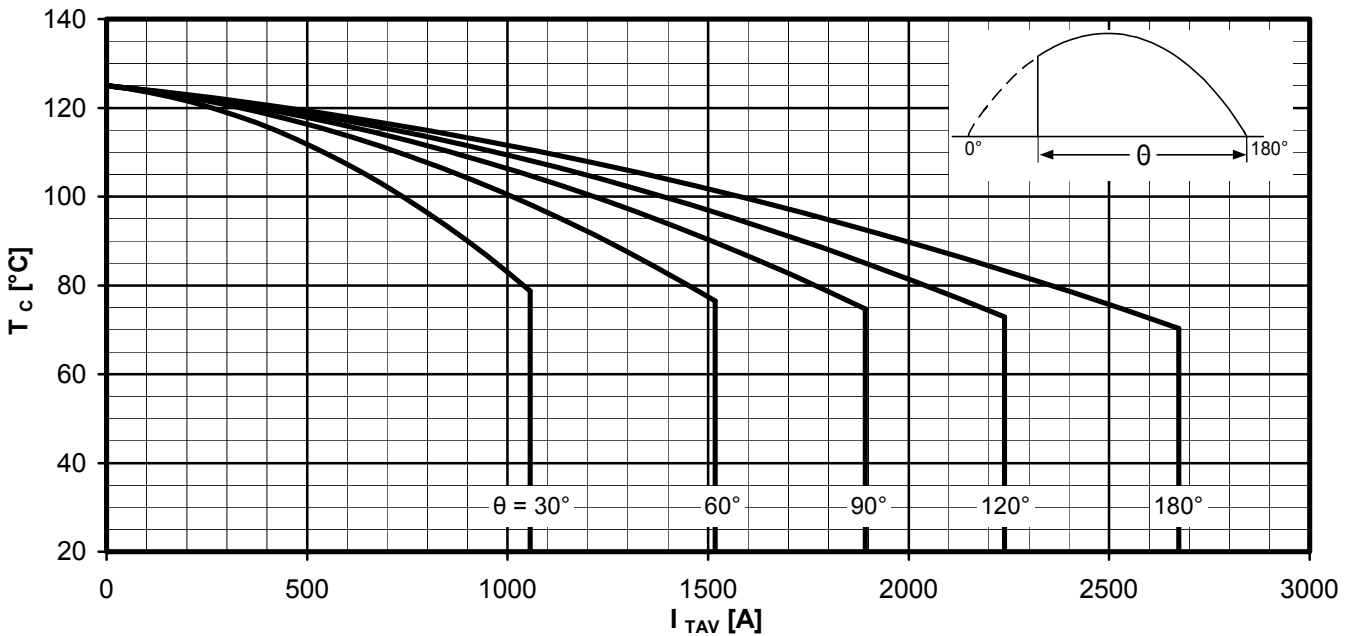
Vorläufige Daten
preliminary data



Durchlassverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$

Sinusförmiger Strom / Sinusoidal current

Parameter: Stromflusswinkel Θ / Current conduction angle Θ

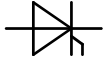


Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_c = f(I_{TAV})$

Sinusförmiger Strom / Sinusoidal current

Beidseitige Kühlung / Two-sided cooling

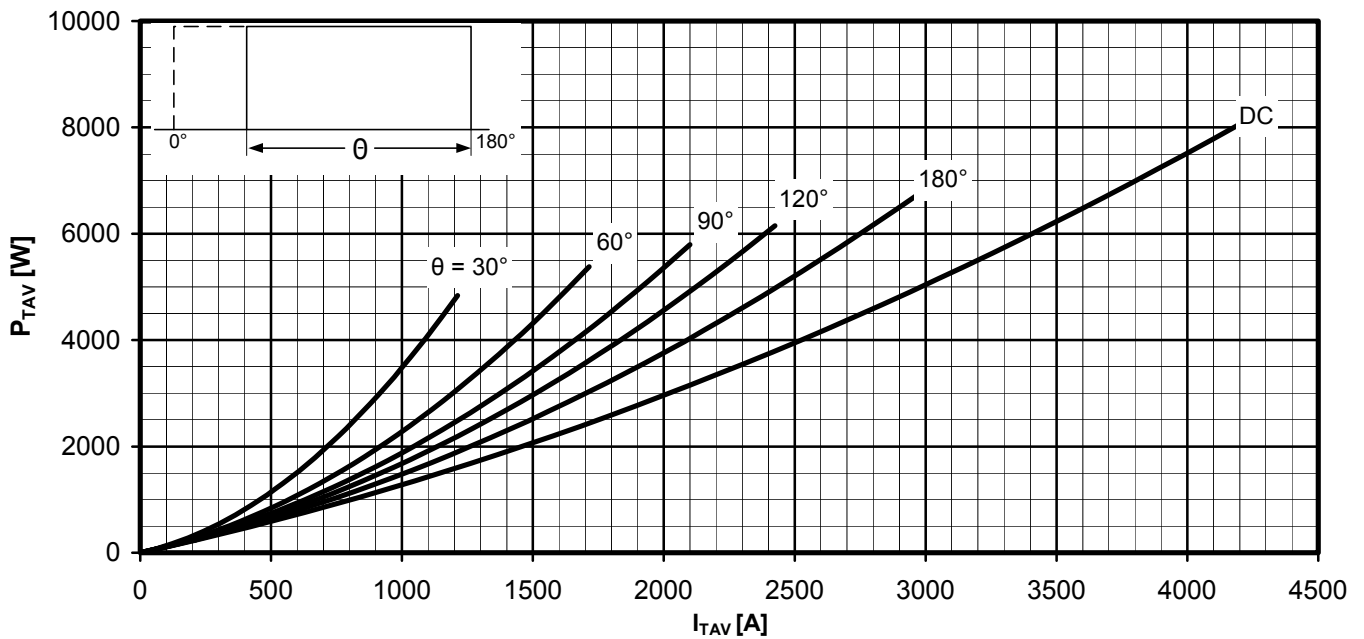
Parameter: Stromflusswinkel Θ / Current conduction angle Θ



Netz-Thyristor
Phase Control Thyristor

T1930N

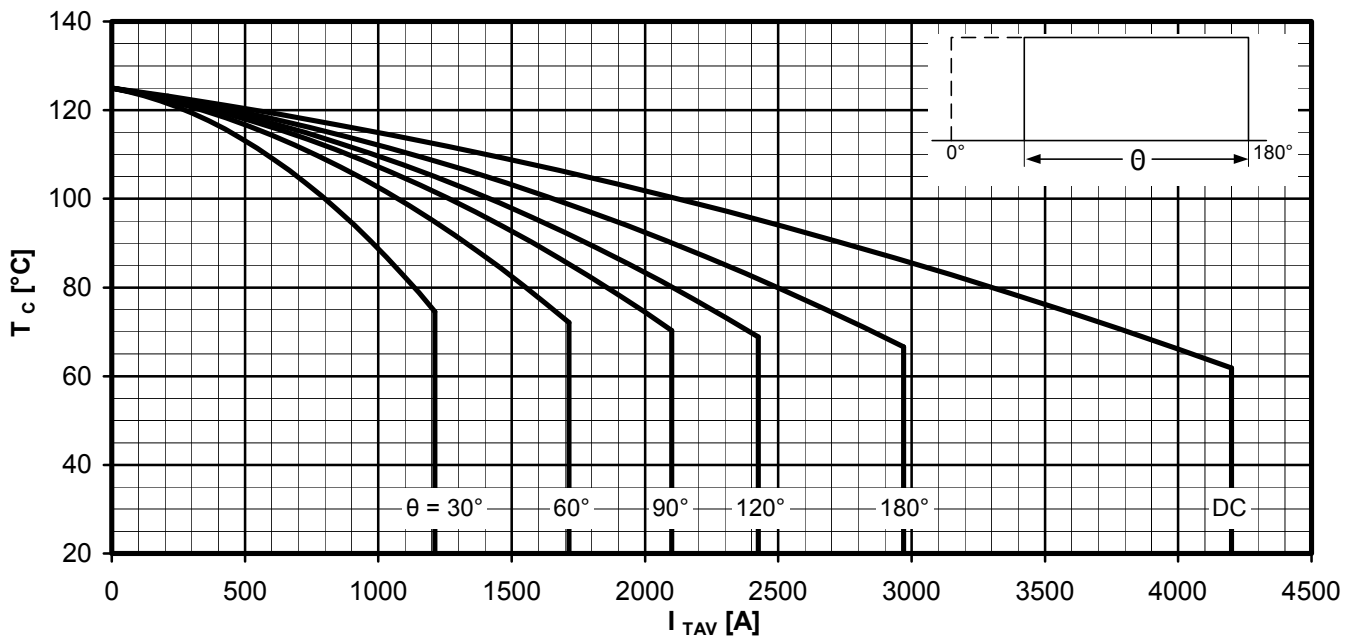
Vorläufige Daten
preliminary data



Durchlassverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$

Rechteckförmiger Strom / Rectangular current

Parameter: Stromflusswinkel Θ / Current conduction angle Θ



Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_c = f(I_{TAV})$

Rechteckförmiger Strom / Rectangular current

Beidseitige Kühlung / Two-sided cooling

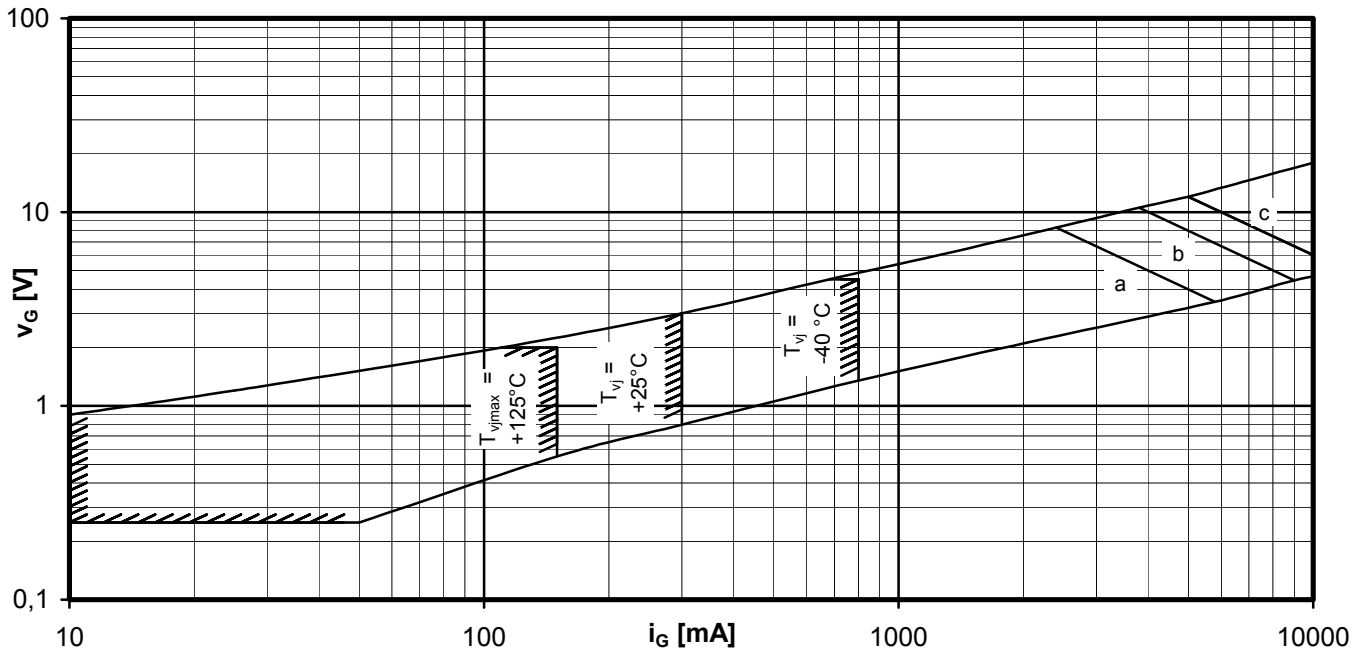
Parameter: Stromflusswinkel Θ / Current conduction angle Θ



Netz-Thyristor
Phase Control Thyristor

T1930N

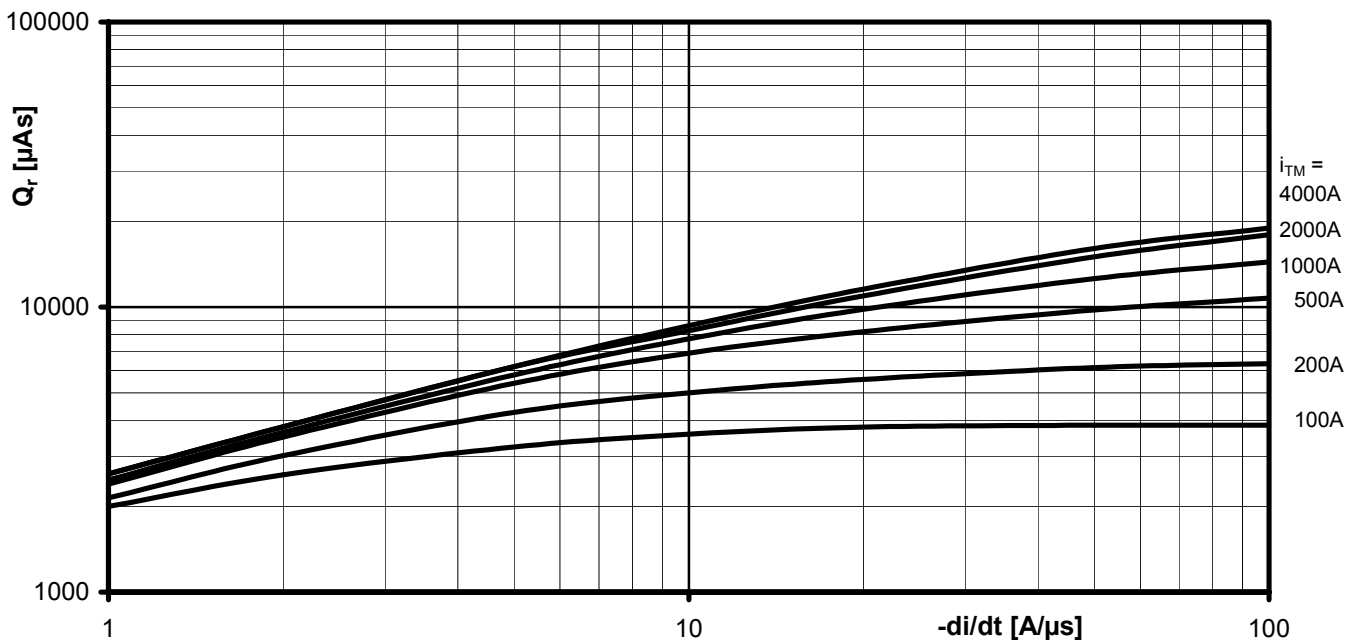
Vorläufige Daten
preliminary data



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



Sperrverzögerungsladung / Recovered charge $Q_r = f(di/dt)$

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

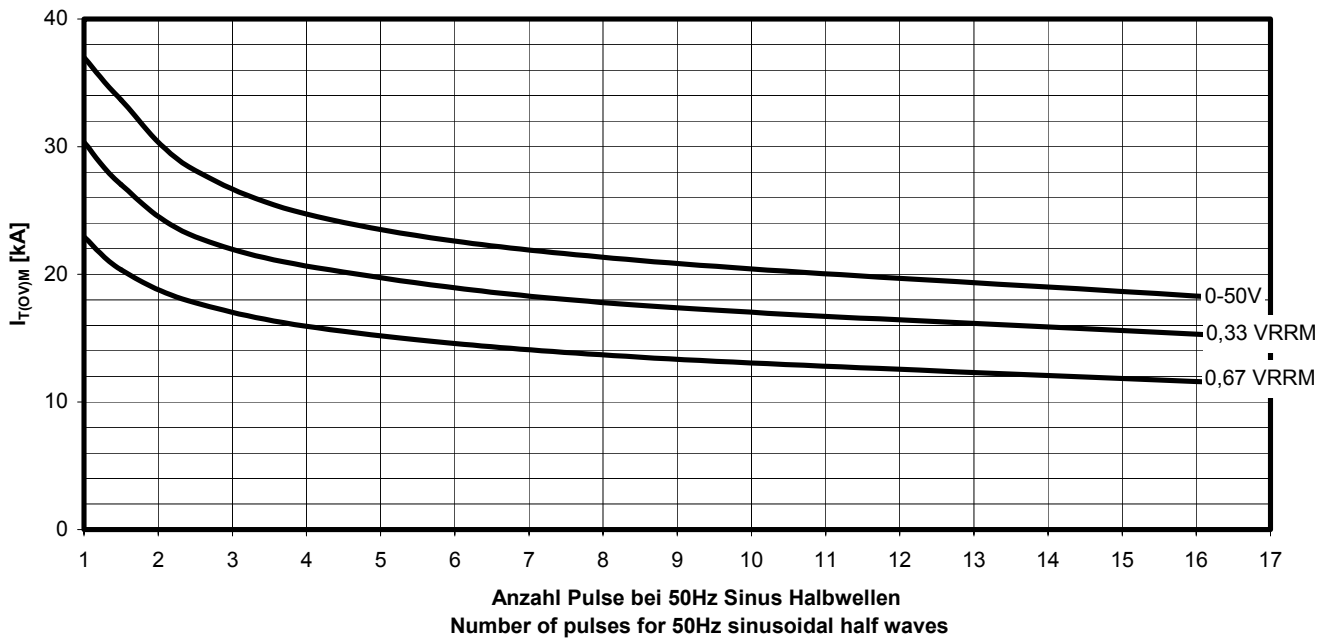
Parameter: Durchlassstrom / On-state current i_{TM}



Netz-Thyristor
Phase Control Thyristor

T1930N

Vorläufige Daten
preliminary data



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