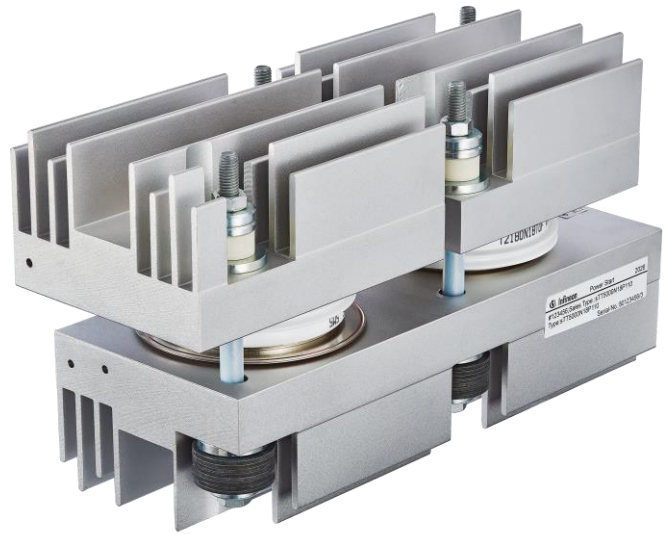


Key Parameters

| | |
|-------------------------|------------------|
| V_{DRM} / V_{RRM} | 1800 V |
| W1C start current (21s) | 4600 A |
| I_{TSM} | 44000 A |
| V_{T0} | 0,9 V |
| r_T | 0,106 m Ω |
| R_{thJA} (21s) | 0,031 K/W |



Merkmale

- Druckkontakt-Technologie für hohe Zuverlässigkeit
- Integrierter optimierter Kühlkörper

Features

- Pressure contact technology for high reliability
- Integrated optimized heatsink

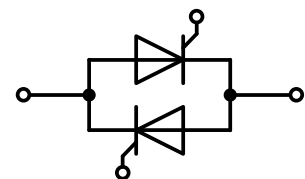
Typische Anwendungen

- Sanftanlasser
- Bypass-Schalter
- Leistungssteller
- Statischer Umschalter

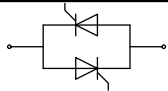
Typical Applications

- Soft starter
- Bypass switch
- Power controller
- Static switch

| content of customer DMX code | DMX code digit | DMX code digit quantity |
|----------------------------------|----------------|-------------------------|
| serial number | 1..5 | 5 |
| SAP material number | 6..12 | 7 |
| Internal production order number | 13..20 | 8 |
| datecode (production year) | 21..22 | 2 |
| datecode (production week) | 23..24 | 2 |



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**Sanftanlauf-Modul
Soft Starter Module**

sTT5000N18P110

Infineon Technologies Bipolar
GmbH & Co. KG

Elektrische Eigenschaften / Electrical properties

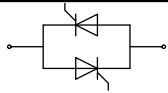
Höchstzulässige Werte / Maximum rated values

| | | | | |
|--|--|----------------------------------|------------------------|--|
| Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltages | $T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{max}}$ | $V_{\text{DRM}}, V_{\text{RRM}}$ | 1800 | V |
| Vorwärts- und Rückwärts Stoßspitzensperrspannung non-repetitive peak forward off-state and reverse voltage | $T_{vj} = +25^{\circ}\text{C} \dots T_{vj\text{max}}$ | $V_{\text{DSM}}, V_{\text{RSM}}$ | 1850 | V |
| W1C Startstrom W1C start current | $\sin.180^{\circ}; t_{\text{start}} = 21\text{s};$ $T_{vj\text{max st}}, T_{vj\text{st0}} = 40^{\circ}\text{C}$ | $I_{\text{RMS st}}$ | 4780 | A |
| Stoßstrom-Grenzwert surge current | $T_{vj} = 25^{\circ}\text{C}, t_p = 10\text{ms}$ $T_{vj} = T_{vj\text{max}}, t_p = 10\text{ms}$ | I_{TSM} | 44.000 38.000 | A A |
| Grenzlastintegral I^2t -value | $T_{vj} = 25^{\circ}\text{C}, t_p = 10\text{ms}$ $T_{vj} = T_{vj\text{max}}, t_p = 10\text{ms}$ | I^2t | 9.680.000 7.220.000 | A^2s A^2s |
| Kritische Stromsteilheit critical rate of rise of on-state current | DIN IEC 747-6 $f = 50\text{Hz}, i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$ | $(di_{\text{T}}/dt)_{\text{cr}}$ | 200 | $\text{A}/\mu\text{s}$ |
| Kritische Spannungssteilheit critical rate of rise of off-state voltage | $T_{vj} = T_{vj\text{max}}, V_{\text{D}} = 0,67 V_{\text{DRM}}$ | $(dv_{\text{D}}/dt)_{\text{cr}}$ | 1000 | $\text{V}/\mu\text{s}$ |

Charakteristische Werte / Characteristic values

| | | | | |
|---|--|-------------------------------|-------------------|---------------|
| Durchlaßspannung on-state voltage | $T_{vj} = T_{vj\text{max}}, I_{\text{T}} = 5000\text{A}$ | V_{T} | max. 1,43 | V |
| Schleusenspannung threshold voltage | $T_{vj} = T_{vj\text{max}}$ | $V_{(\text{TO})}$ | max. 0,9 | V |
| Ersatzwiderstand slope resistance | $T_{vj} = T_{vj\text{max}}$ | r_{T} | max. 0,106 | m Ω |
| Zündstrom gate trigger current | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{V}$ | I_{GT} | max. 250 | mA |
| Zündspannung gate trigger voltage | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{V}$ | V_{GT} | max. 2 | V |
| Nicht zündender Steuerstrom gate non-trigger current | $T_{vj} = T_{vj\text{max}}, V_{\text{D}} = 12\text{V}$ $T_{vj} = T_{vj\text{max}}, V_{\text{D}} = 0,5 V_{\text{DRM}}$ | I_{GD} | max. 10 max. 5 | mA mA |
| Nicht zündende Steuerspannung gate non-trigger voltage | $T_{vj} = T_{vj\text{max}}, V_{\text{D}} = 0,5 V_{\text{DRM}}$ | V_{GD} | max. 0,25 | V |
| Haltestrom holding current | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{V}, R_{\text{A}} = 1\Omega$ | I_{H} | max. 300 | mA |
| Einraststrom latching current | $T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{V}, R_{\text{GK}} \geq 10\Omega$ $i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}, t_{\text{g}} = 20\mu\text{s}$ | I_{L} | max. 1500 | mA |
| Vorwärts- und Rückwärts-Sperrstrom W1C forward off-state and reverse current W1C | $T_{vj} = T_{vj\text{max}}$ $V_{\text{D}} = V_{\text{DRM}}, V_{\text{R}} = V_{\text{RRM}}$ | $i_{\text{D}} + i_{\text{R}}$ | max. 400 | mA |
| Zündverzug gate controlled delay time | DIN IEC 747-6 $T_{vj} = 25^{\circ}\text{C}, i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$ | t_{gd} | max. 4 | μs |

| | | |
|-----------------|--|---------------------------------|
| prepared by: JS | | date of publication: 2021-03-23 |
| approved by: ML | | revision: 3.4 |



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**Sanftanlauf-Modul
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Elektrische Eigenschaften / Electrical properties Charakteristische Werte / Characteristic values

| | | | | | |
|---|--|-------|------|-----|---------------|
| Freiwerdezeit circuit commutated turn-off time | $T_{vj} = T_{vj\max}$, $i_{TM} = I_{TAVM}$ $V_{RM} = 100\text{ V}$, $v_{DM} = 0,67 V_{DRM}$ $dv_D/dt = 20\text{ V}/\mu\text{s}$, $-di_T/dt = 10\text{ A}/\mu\text{s}$ | t_q | typ. | 250 | μs |
|---|--|-------|------|-----|---------------|

Thermische Eigenschaften / Thermal properties

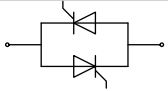
| | | | | | |
|--|--|-----------------------|------|------------|------------------|
| Innerer Wärmewiderstand, Sperrschicht zum Referenzpunkt thermal resistance, junction to reference point | pro Modul / per Module, DC pro Zweig / per arm, DC pro Modul / per Module, $\Theta = 180^\circ \sin$ pro Zweig / per arm, $\Theta = 180^\circ \sin$ | $R_{thJR(21s)}^{1)}$ | max. | 0,013 | K/W |
| | | | max. | 0,027 | K/W |
| | | | max. | 0,014 | K/W |
| | | | max. | 0,028 | K/W |
| Innerer Wärmewiderstand, Sperrschicht zur Umgebung thermal resistance, junction to ambient | pro Modul / per Module, DC pro Zweig / per arm, DC pro Modul / per Module, $\Theta = 180^\circ \sin$ pro Zweig / per arm, $\Theta = 180^\circ \sin$ | $R_{thJA(21s)}$ | max. | 0,015 | K/W |
| | | | max. | 0,031 | K/W |
| | | | max. | 0,016 | K/W |
| | | | max. | 0,032 | K/W |
| Höchstzulässige Sperrschichttemperatur maximum junction temperature | | $T_{vj\max}$ | | 125 | $^\circ\text{C}$ |
| Höchstzulässige Sperrschichttemperatur nach Start maximum junction temperature after start | $V_R/V_D < 80\% V_{RRM}/V_{DRM}$ | $T_{vj\max\text{st}}$ | | 140 | $^\circ\text{C}$ |
| Betriebstemperatur operating temperature | Dauerbetrieb continuous operation | $T_{c\text{op}}$ | | -40...+125 | $^\circ\text{C}$ |
| Lagertemperatur storage temperature | | T_{stg} | | -40...+130 | $^\circ\text{C}$ |

Mechanische Eigenschaften / Mechanical properties

| | | | | | |
|---|--|----|------|---|----------------|
| Gehäuse, siehe Anlage case, see annex | | | | Seite 4 page 4 | |
| Si-Element mit Druckkontakt Si-pellet with pressure contact | | | | | |
| Anzugsdrehmoment für elektrische Anschlüsse terminal connection torque | Toleranz / tolerance $\pm 10\%$ | M8 | | 25 | Nm |
| 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. | 8900 | g |
| Kriechstrecke creepage distance | | | | 25 | mm |
| Schwingfestigkeit vibration resistance | $f = 50\text{ Hz}$ | | | 50 | m/s^2 |

Die Werte der obigen Tabellen sind immer bezogen auf das Einzelelement, falls nicht anders erwähnt.
The values of the above tables are always based on the single element, if not otherwise mentioned.

¹⁾ Referenzpunkt für R_{thJR} befindet sich stirnseitig an den Modulen (siehe Zeichnung)
Reference point for R_{thJR} is located on the front side of the modules (see drawing)



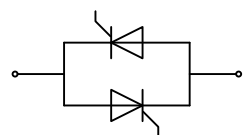
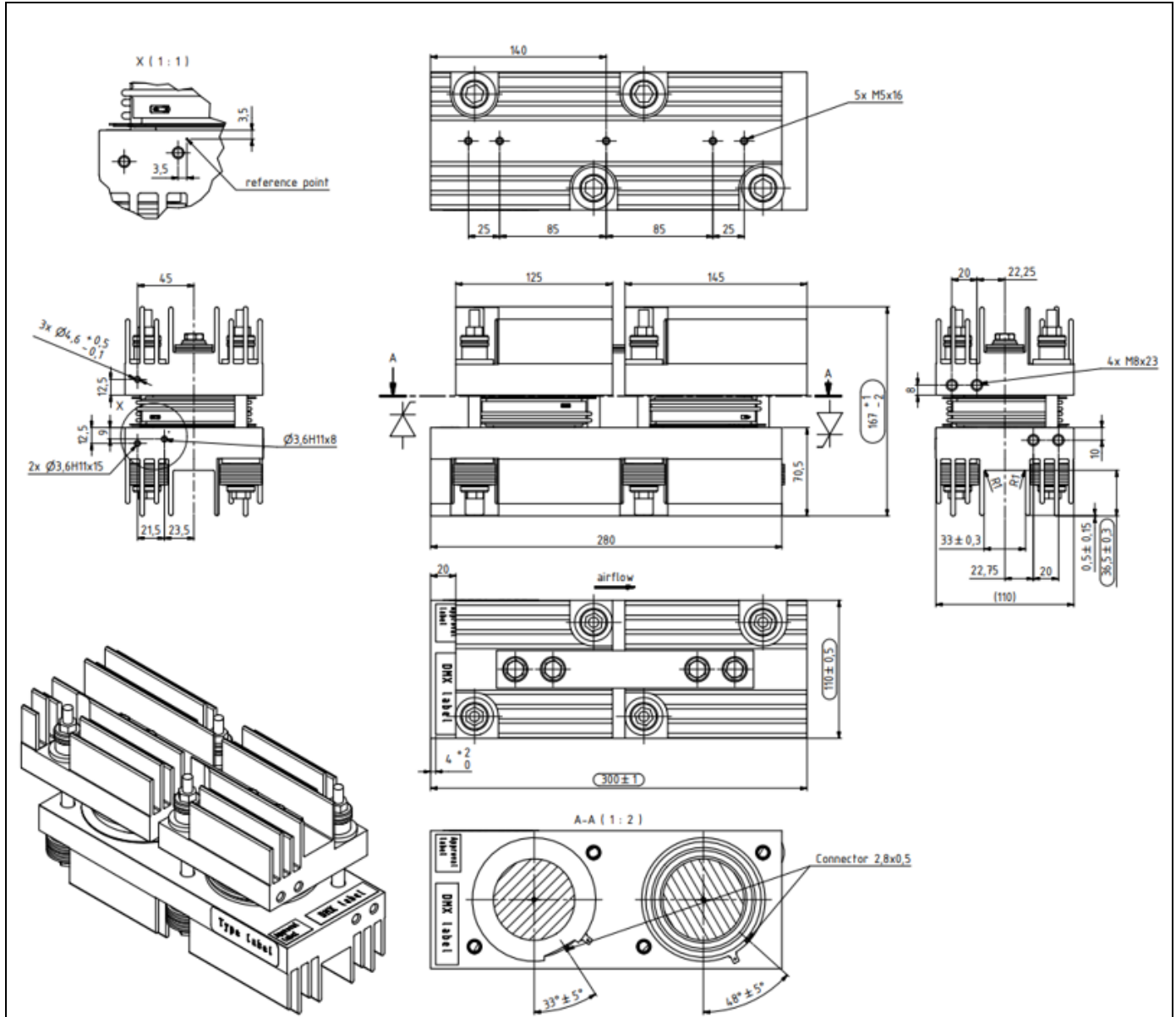
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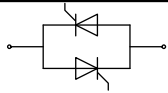
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W1C



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Analytische Elemente des transienten Wärmewiderstandes Z_{thJA} für DC und $v_{Luft} = 2m/s$
Analytical elements of transient thermal impedance Z_{thJA} for DC and $v_{Luft} = 2m/s$

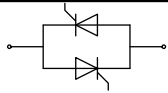
| Pos. n | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------|------|-------|-------|--------|---|---|---|
| R_{thn} [K/W] | 0,21 | 0,017 | 0,005 | 0,0015 | | | |
| τ_n [s] | 600 | 4 | 0,12 | 0,006 | | | |

Analytische Funktion / Analytical function:
$$Z_{thJA} = \sum_{n=1}^{n_{max}} R_{thn} \left[1 - e^{-\frac{t}{\tau_n}} \right]$$

Analytische Elemente des transienten Wärmewiderstandes Z_{thJA} für DC und $v_{Luft} = 5m/s$
Analytical elements of transient thermal impedance Z_{thJA} for DC and $v_{Luft} = 5m/s$

| Pos. n | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------|-------|-------|-------|--------|---|---|---|
| R_{thn} [K/W] | 0,133 | 0,017 | 0,005 | 0,0015 | | | |
| τ_n [s] | 350 | 4 | 0,12 | 0,006 | | | |

Analytische Funktion / Analytical function:
$$Z_{thJA} = \sum_{n=1}^{n_{max}} R_{thn} \left[1 - e^{-\frac{t}{\tau_n}} \right]$$



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

| Pos. n | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------|--------|--------|-------|--------|---|---|---|
| R_{thn} [K/W] | 0,0015 | 0,0205 | 0,005 | 0,0015 | | | |
| τ_n [s] | 300 | 4,5 | 0,12 | 0,006 | | | |

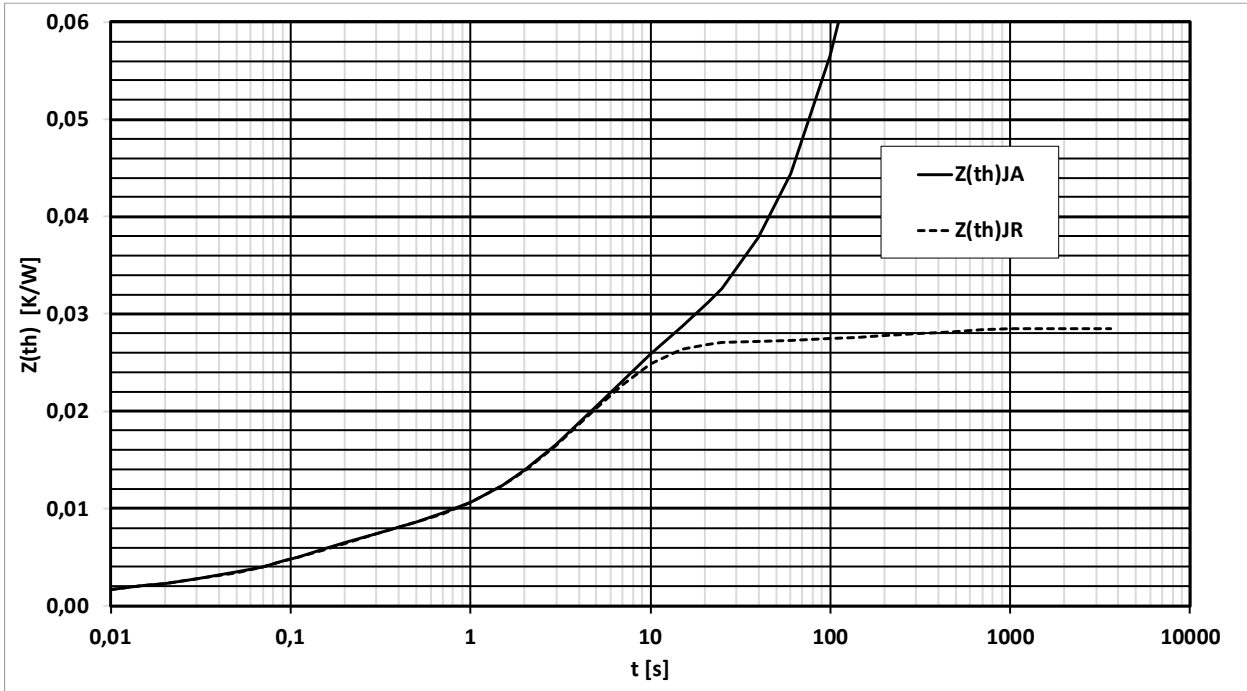
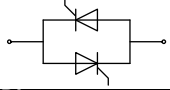
Analytische Funktion / Analytical function:

$$Z_{thJR} = \sum_{n=1}^{n_{max}} R_{thn} \left[1 - e^{-\frac{t}{\tau_n}} \right]$$

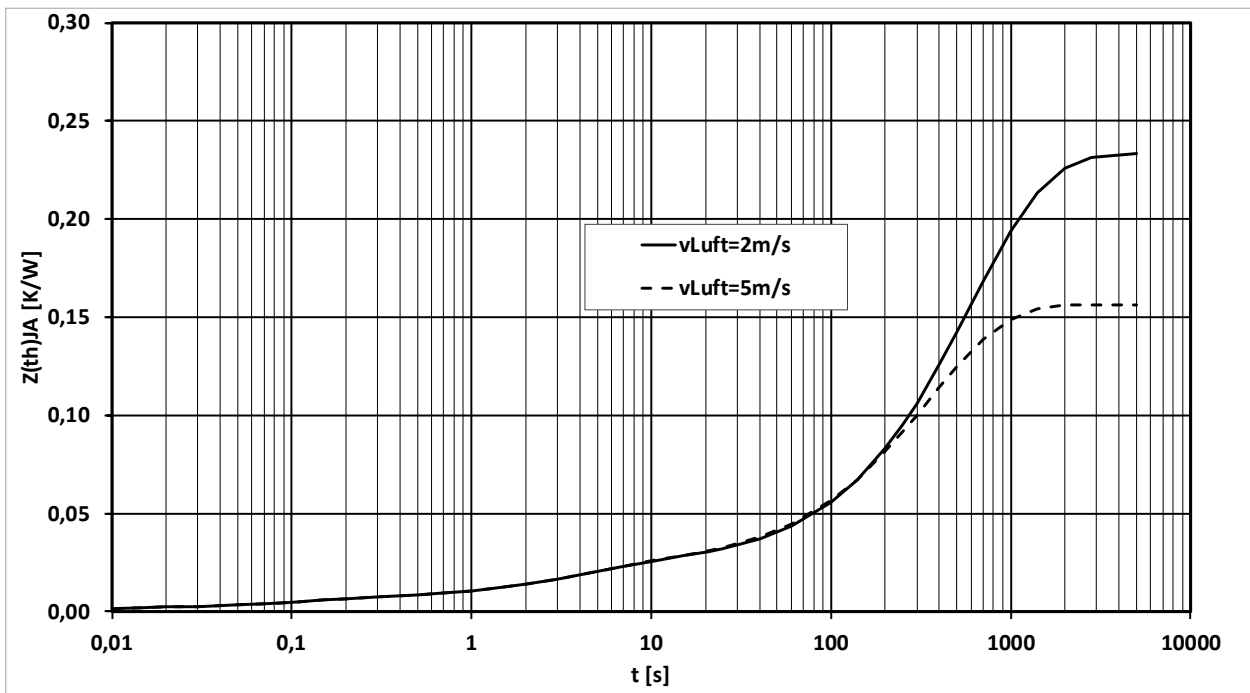
Erhöhung des Z_{thDC} bei Sinusströmen mit unterschiedlichen Stromflusswinkeln Θ
Rise of Z_{thDC} for sinewave current with different current conduction angles Θ
 $\Delta Z_{th \Theta \sin}$

| | $\Theta = 180^\circ$ | $\Theta = 120^\circ$ | $\Theta = 90^\circ$ | $\Theta = 60^\circ$ | $\Theta = 30^\circ$ |
|-----------------------------------|----------------------|----------------------|---------------------|---------------------|---------------------|
| $\Delta Z_{th \Theta \sin}$ [K/W] | 0,0011 | 0,0015 | 0,0019 | 0,0024 | 0,0033 |

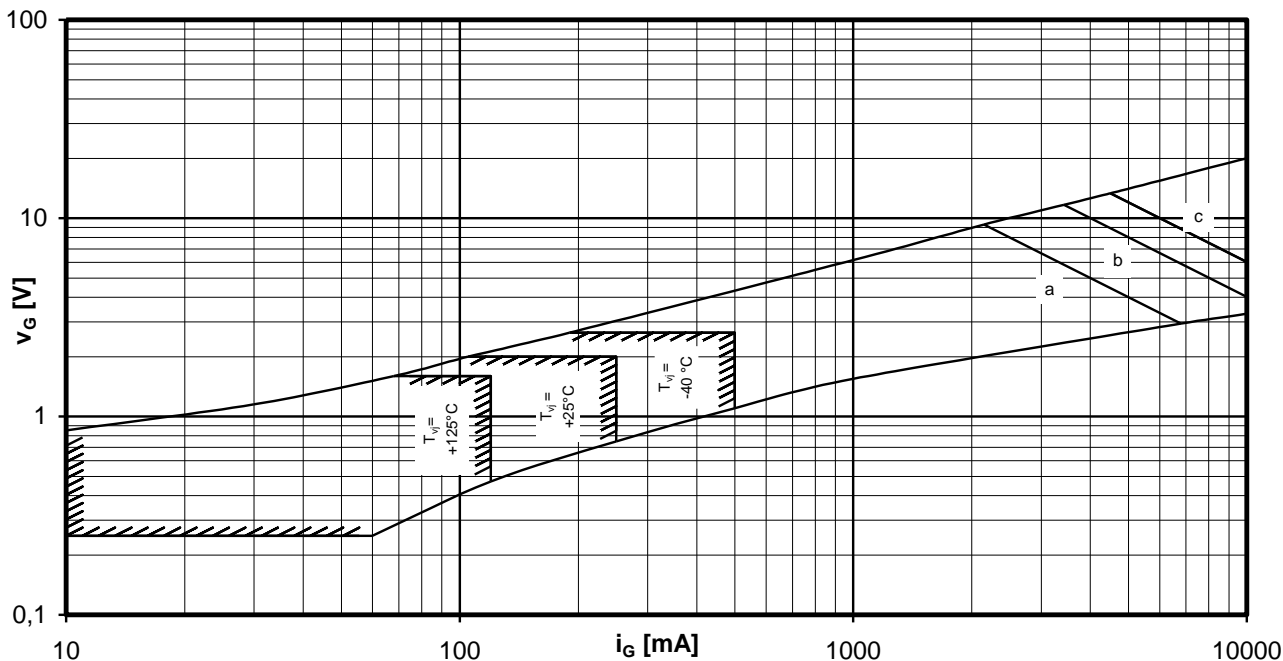
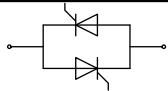
$$Z_{th \Theta \sin} = Z_{thDC} + \Delta Z_{th \Theta \sin}$$



Transienter Wärmewiderstand je Zweig / Transient thermal impedance per arm
 $Z_{thJR} = f(t)$; $Z_{thJA} = f(t)$



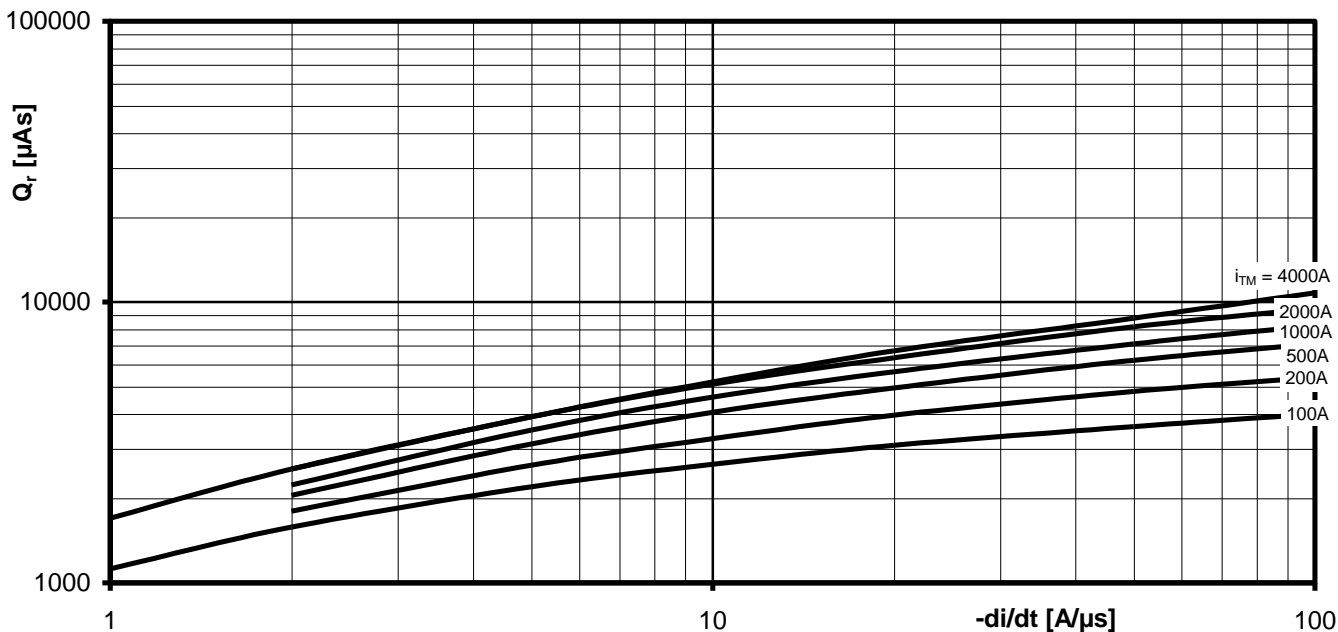
Transienter Wärmewiderstand je Zweig / Transient thermal impedance per arm $Z_{thJA} = f(t)$



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 $P_{GM} = f(t_g)$:

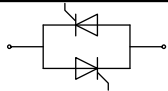
a - 20W / 10ms b - 40W / 1ms c - 60W / 0,5ms



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}



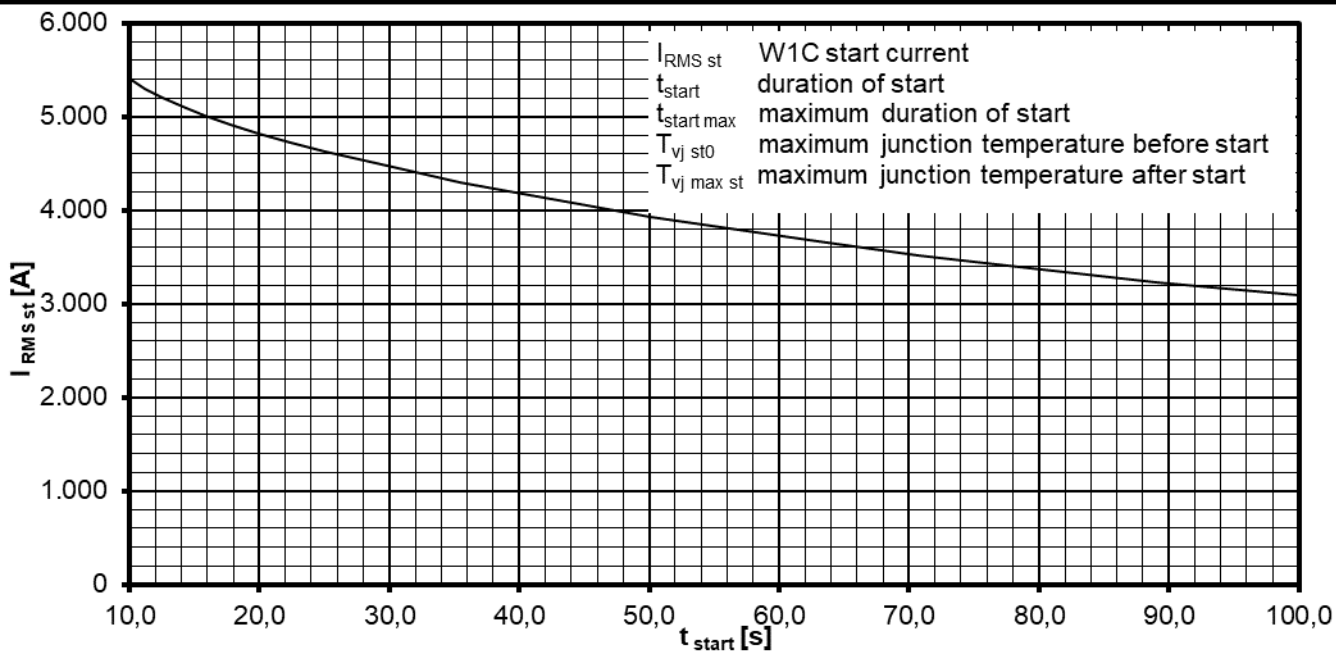
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W1C Start Strom $I_{RMS\ st} = f(t_{start})$
W1C Start Current $I_{RMS\ st} = f(t_{start})$

$T_{vj\ st0} = T_A \leq 40\ ^\circ C$, $T_{vj\ max\ st} = 140\ ^\circ C$, $t_{start\ max} = 100\ s$
 $V_R/V_D < 80\% V_{RRM}/V_{DRM}$