	Technische Information / technical information	Infineon Technologies Bipolar GmbH & Co. KG
Netz-Thyristor-Modul Phase Control Thyristor Module	**TT600N16KOF**	

Key Parameters

V_{DRM} / V_{RRM}	1600V
I_{TAVM}	600A (T_C=85°C)
I_{TSM}	21000A
V_{T0}	0,8V
r_T	0,23mΩ
R_{thJC}	0,055K/W
Base plate	60mm

For type designation please refer to actual short form catalog

http://www.ifbip.com/catalog

Merkmale

- Druckkontakt-Technologie für hohe Zuverlässigkeit
- Advanced Medium Power Technology (AMPT)
- Industrie-Standard-Gehäuse
- Elektrisch isolierte Bodenplatte
- Optional: Thermisches Interface Material (TIM) bereits aufgetragen

Features

- Pressure contact technology for high reliability
- Advanced Medium Power Technology (AMPT)
- Industrial standard package
- Electrically insulated base plate
- Option: Pre-applied thermal interface material (TIM)

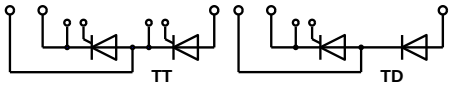
Typische Anwendungen

- Sanftanlasser
- Gleichrichter für Antriebsapplikationen
- Kurzschließer-Applikationen
- Leistungssteller
- Gleichrichter für UPS
- Batterieladegleichrichter
- Statische Umschalter
- Bypass-Schalter

Typical Applications

- Soft starter
- Rectifier for drives applications
- Crowbar applications
- Power controllers
- Rectifiers for UBS
- Battery chargers
- Static switches
- Bypass swich

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



www.ifbip.com
support@infineon-bip.com

TT600N16KOF... **TD600N16KOF...**
TT600N16KOF_TIM **TD600N16KOF_TIM**

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°C... $T_{vj\,max}$	V_{DRM},V_{RRM}	1600	V
Vorwärts-Stoßspitzensperrspannung non-repetitive peak forward off-state voltage	T_{vj} = -40°C... $T_{vj\,max}$	V_{DSM}	1600	V
Rückwärts-Stoßspitzensperrspannung non-repetitive peak reverse voltage	T_{vj} = +25°C... $T_{vj\,max}$	V_{RSM}	1700	V
Durchlaßstrom-Grenzeffektivwert maximum RMS on-state current		I_{TRMSM}	1050	A
Dauergrenzstrom average on-state current	T_C = 85°C	I_{TAVM}	600	A
Stoßstrom-Grenzwert surge current	T_{vj} = 25°C, t_P = 10ms T_{vj} = $T_{vj\,max}$, t_P = 10ms	I_{TSM}	21000 17500	A A
Grenzlastintegral I²t-value	T_{vj} = 25°C, t_P = 10ms T_{vj} = $T_{vj\,max}$, t_P = 10ms	I²t	2205000 1531250	A²s A²s
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 747-6 f = 50Hz, i_{GM} = 1A, di_G/dt = 1A/µs	$(di_T/dt)_{cr}$	200	A/µs
Kritische Spannungssteilheit critical rate of rise of off-state voltage	T_{vj} = $T_{vj\,max}$, v_D = 0,67 V_{DRM} 6.Kennbuchstabe / 6th letter C	$(dv_D/dt)_{cr}$	1000	V/µs

Charakteristische Werte / Characteristic values

Durchlaßspannung on-state voltage	T_{vj} = $T_{vj\,max}$, i_T = 1500 A	v_T	max.	1,27	V
Schleusenspannung threshold voltage	T_{vj} = $T_{vj\,max}$	$V_{(TO)}$	max.	0,8	V
Ersatzwiderstand slope resistance	T_{vj} = $T_{vj\,max}$	r_T	max.	0,23	mΩ
Durchlasskennlinie $i_T \le 6000$ A on-state characteristic $v_T = A(T_{vj}) + B(T_{vj}) \cdot i_T + C(T_{vj}) \cdot \ln(i_T + 1) + D(T_{vj}) \cdot \sqrt{i_T}$	$A = \alpha_A * T_{vj} + \beta_A$ $B = \alpha_B * T_{vj} + \beta_B$ $C = \alpha_C * T_{vj} + \beta_C$ $D = \alpha_D * T_{vj} + \beta_D$		α A= B= C= D=	β -3,305E-03 5,582E-07 5,033E-04 -5,552E-05	 8,309E-01 8,826E-05 -8,143E-03 8,169E-03
Zündstrom gate trigger current	T_{vj} = 25°C, v_D = 12V	I_{GT}	max.	250	mA
Zündspannung gate trigger voltage	T_{vj} = 25°C, v_D = 12V	V_{GT}	max.	2	V
Nicht zündender Steuerstrom gate non-trigger current	T_{vj} = $T_{vj\,max}$, v_D = 12V T_{vj} = $T_{vj\,max}$, v_D = 0,5 V_{DRM}	I_{GD}	max. max.	10 5	mA mA
Nicht zündende Steuerspannung gate non-trigger voltage	T_{vj} = $T_{vj\,max}$, v_D = 0,5 V_{DRM}	V_{GD}	max.	0,25	V
Haltestrom holding current	T_{vj} = 25°C, v_D = 12V, R_A = 1Ω	I_H	max.	300	mA
Einraststrom latching current	T_{vj} = 25°C, v_D = 12V, R_{GK} ≥ 10Ω i_{GM} = 1A, di_G/dt = 1A/µs, t_g = 20µs	I_L	max.	1500	mA
Vorwärts- und Rückwärts-Sperrstrom forward off-state and reverse current	T_{vj} = $T_{vj\,max}$ v_D = V_{DRM}, v_R = V_{RRM}	i_D, i_R	max.	100	mA
Zündverzug gate controlled delay time	DIN IEC 747-6 T_{vj} = 25°C, i_{GM} = 1A, di_G/dt = 1A/µs	t_{gd}	max.	4	µs

prepared by:	AG		date of publication:	2023-03-24
approved by:	MS		revision:	3.5

Elektrische Eigenschaften / Electrical properties

Charakteristische Werte / Characteristic values

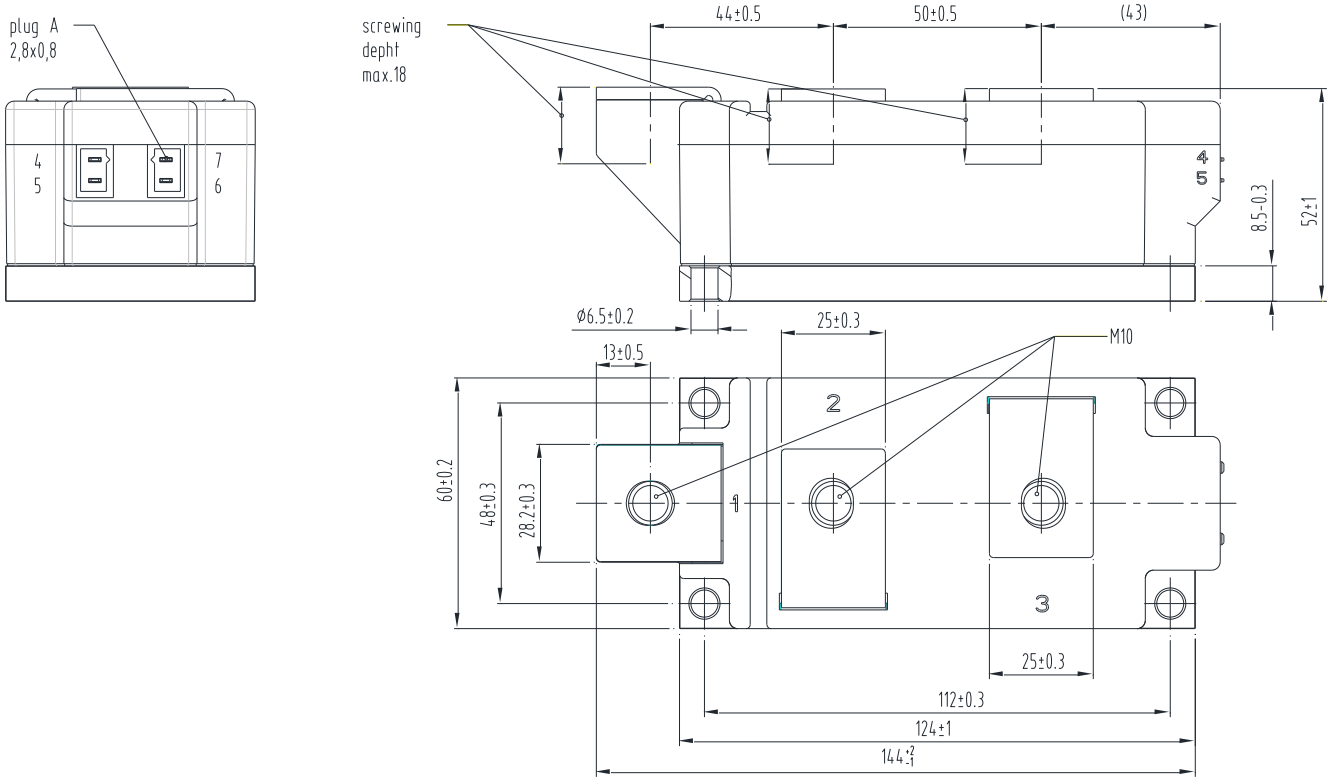
Freiwerdezeit circuit commutated turn-off time	$T_{vj} = T_{vj\,max}$, $i_{TM} = I_{TAVM}$ v_{RM} = 100 V, v_{DM} = 0,67 V_{DRM} dv_D/dt = 20 V/µs, $-di_T/dt$ = 10 A/µs 5.Kennbuchstabe / 5th letter O	t_q	typ. 250	µs
Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1min RMS, f = 50 Hz, t = 1sec	V_{ISOL}	3,0 3,6	kV kV

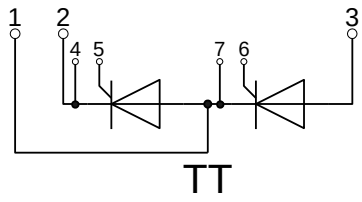
Thermische Eigenschaften / Thermal properties

Innerer Wärmewiderstand thermal resistance, junction to case	pro Modul / per Module, Θ = 180° sin pro Zweig / per arm, Θ = 180° sin pro Modul / per Module, DC pro Zweig / per arm, DC	R_{thJC}	max. 0,0290 max. 0,0580 max. 0,0275 max. 0,0550	K/W K/W K/W K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per Module pro Zweig / per arm	R_{thCH}	max. 0,01 max. 0,02	K/W K/W
Übergangs-Wärmewiderstand mit TIM thermal resistance, case to heatsink, with TIM	pro Modul / per Module pro Zweig / per arm		max. 0,0075 max. 0,0150	K/W K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj\,max}$	125	°C
Betriebstemperatur operating temperature		$T_{c\,op}$	-40...+125	°C
Lagertemperatur storage temperature		T_{stg}	-40...+125	°C
Lagertemperatur mit TIM storage temperature with TIM			+5…+40	°C

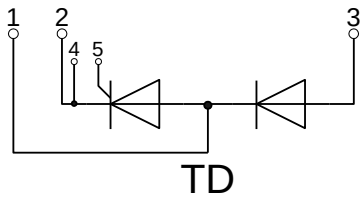
Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see annex			Seite 4 page 4	
Si-Element mit Druckkontakt Si-pellet with pressure contact				
Innere Isolation internal insulation	Basisisolierung (Schutzklasse 1, EN61140) Basic insulation (class 1, IEC61140)		AlN	
Anzugsdrehmoment für mechanische Anschlüsse mounting torque	Toleranz / Tolerance ± 15%	M1	6	Nm
Anzugsdrehmoment für elektrische Anschlüsse terminal connection torque	Toleranz / Tolerance ± 10%	M2	12	Nm
Steueranschlüsse control terminals	DIN 46 244		A 2,8 x 0,8	
Gewicht weight		G	typ. 1450	g
Kriechstrecke creepage distance			19	mm
Schwingfestigkeit vibration resistance	f = 50 Hz		50	m/s²
	file-No.		E 83335	


plug A
2,8x0,8
screwing
depht
max.18
44±0.5
50±0.5
(43)
4
5
7
6
8.5-0.3
52±1
Ø6.5±0.2
25±0.3
13±0.5
M10
60±0.2
48±0.3
28.2±0.3
1
2
3
25±0.3
112±0.3
124±1
144 +2 -1


1
2
3
4
5
7
6

TT


1
2
3
4
5

TD

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

Pos. n	1	2	3	4	5	6	7
R_{thn} [K/W]	0,019	0,019	0,0111	0,00486	0,00137		
τ_n [s]	3,12	0,56	0,101	0,0086	0,00076		

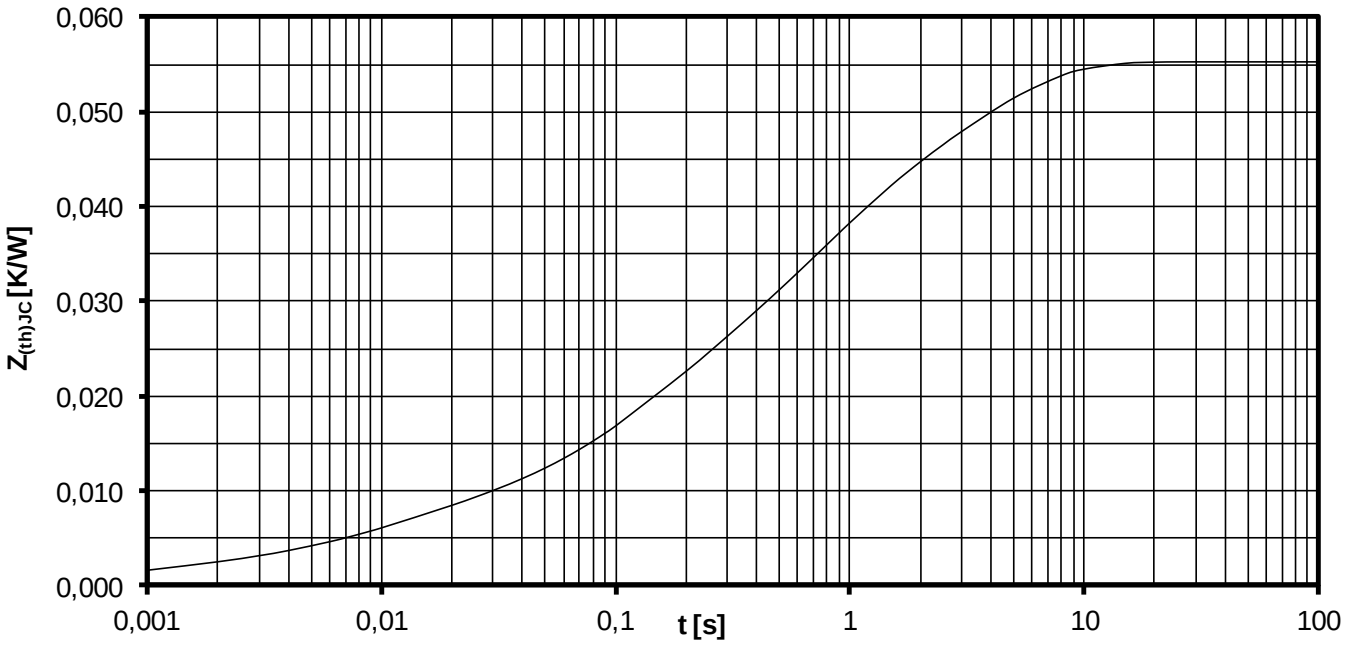
Analytische Funktion / Analytical function:

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

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

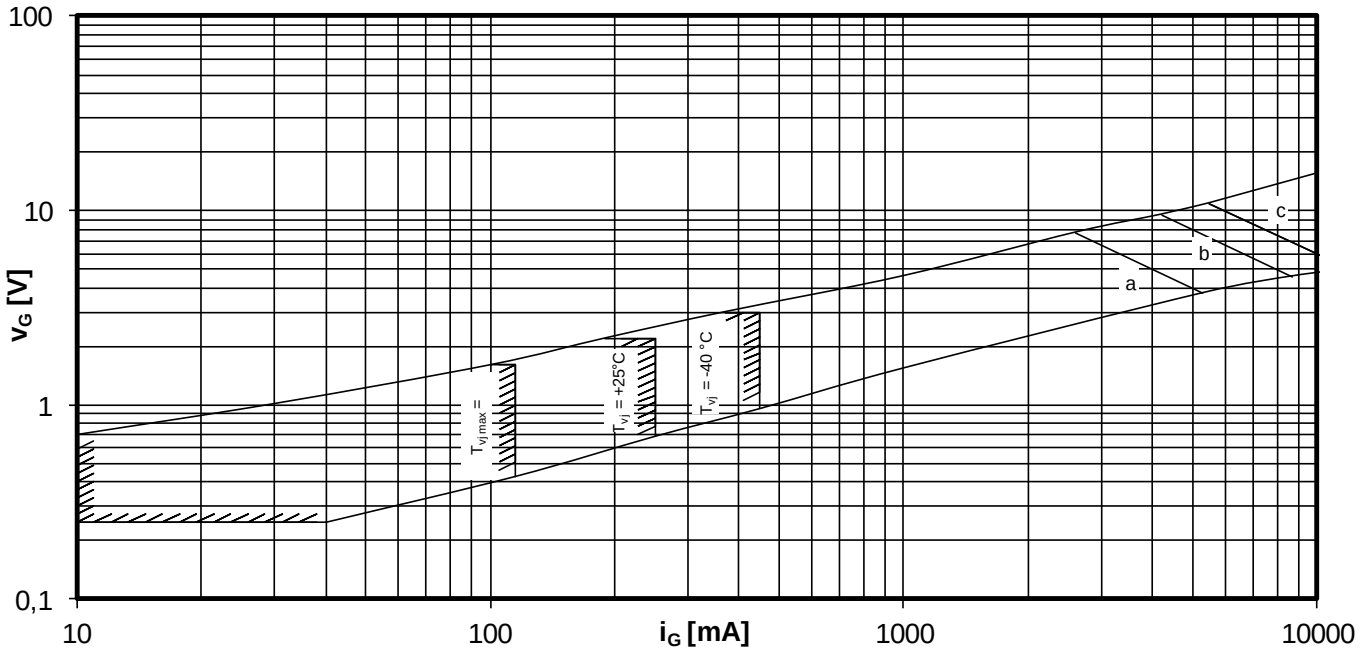
	Θ = 180°	Θ = 120°	Θ = 90°	Θ = 60°	Θ = 30°
$\Delta Z_{th\ \Theta\ rec}$ [K/W]	0,00466	0,00760	0,00988	0,01362	0,02118
$\Delta Z_{th\ \Theta\ sin}$ [K/W]	0,00272	0,00390	0,00547	0,00833	0,01577

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



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

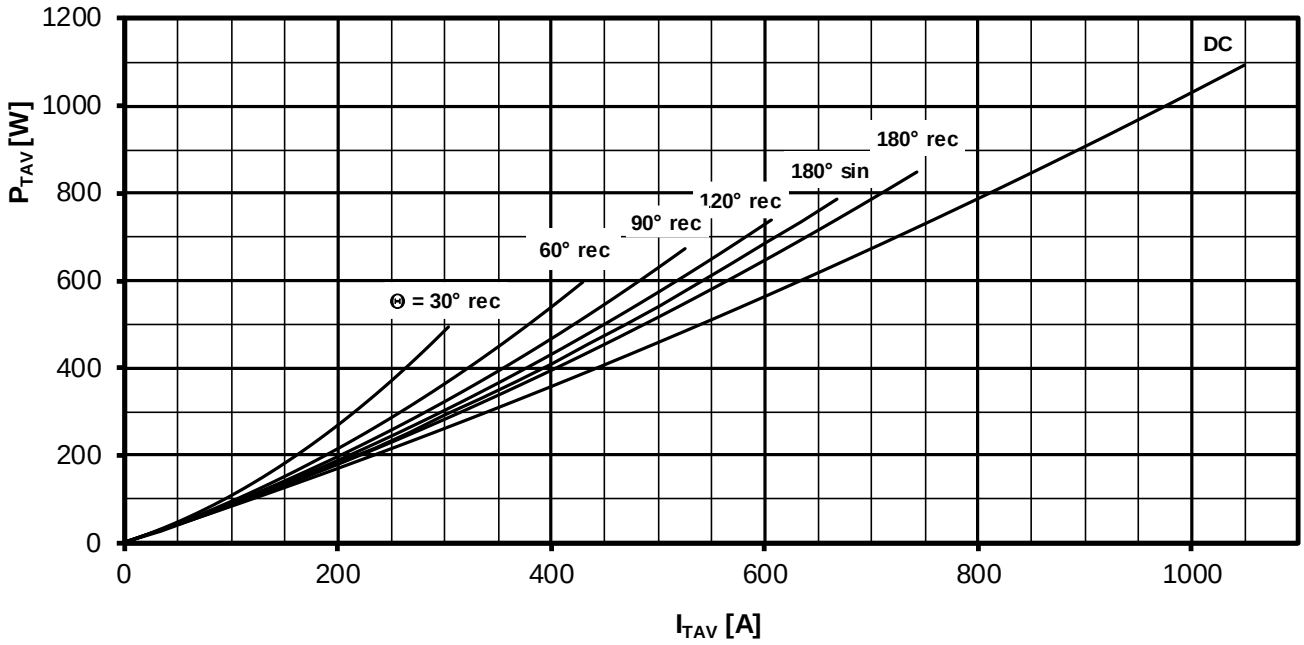
Parameter: Stromflußwinkel Θ / Current conduction angle Θ



Steuercharakteristik $v_G = f(i_G)$ mit Zündbereichen für V_D = 12 V
Gate characteristic $v_G = f(i_G)$ with triggering area for V_D = 12 V

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

a - 40 W/10ms b - 80 W/1ms c - 100 W/0,5ms

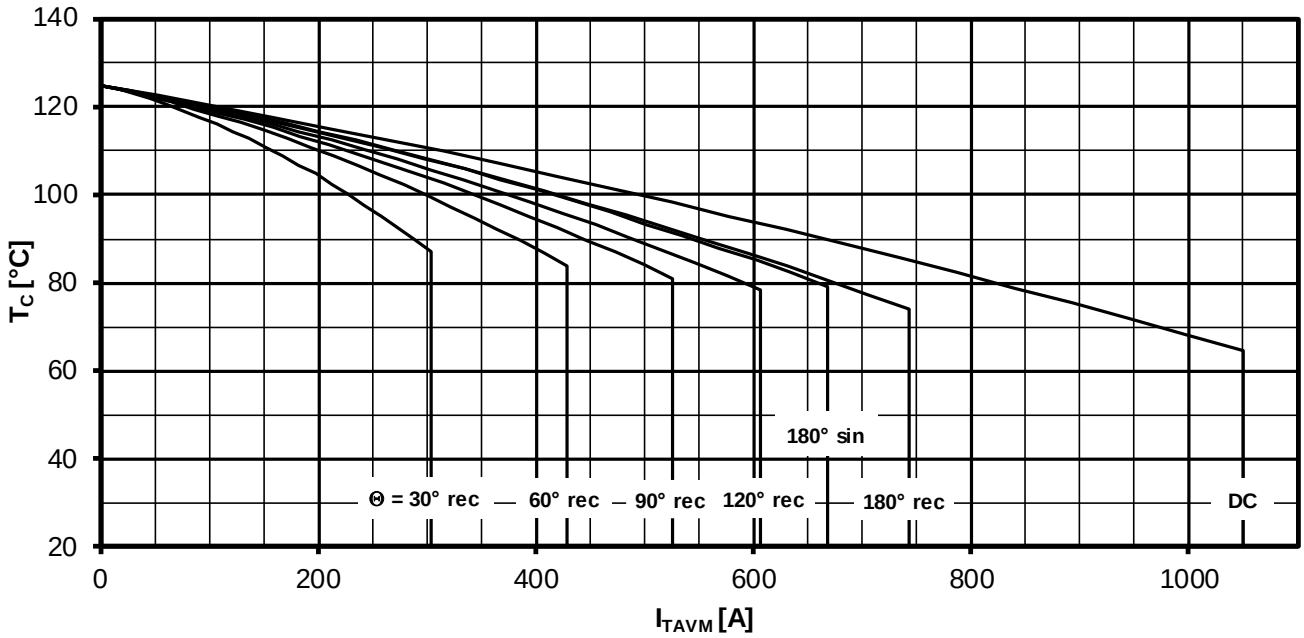


Durchlassverlustleistung je Zweig / On-state power loss per arm $P_{TAV} = f(I_{TAV})$

Strombelastung je Zweig / Current load per arm

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)
Calculation base P_{TAV} (switching losses should be considered separately)

Parameter: Stromflußwinkel / Current conduction angle Θ

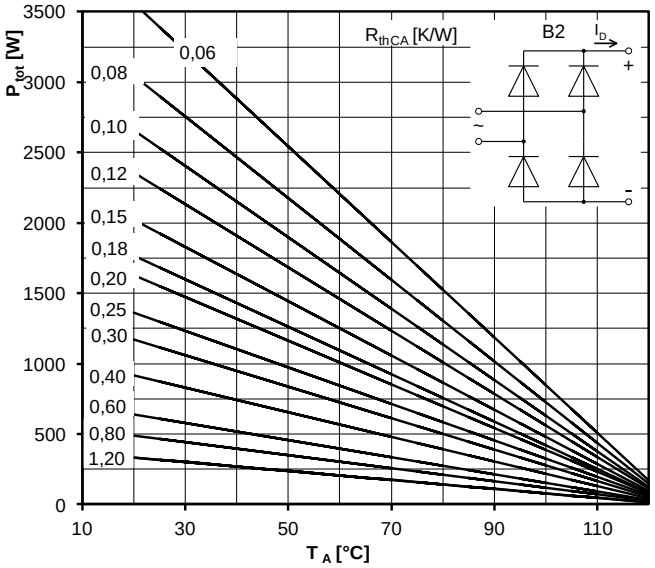


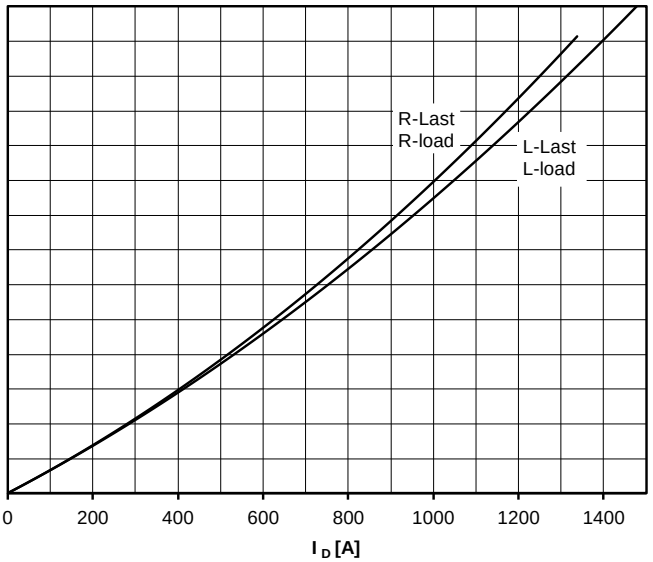
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$

Strombelastung je Zweig / Current load per arm

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)
Calculation base P_{TAV} (switching losses should be considered separately)

Parameter: Stromflußwinkel Θ / Current conduction angle Θ



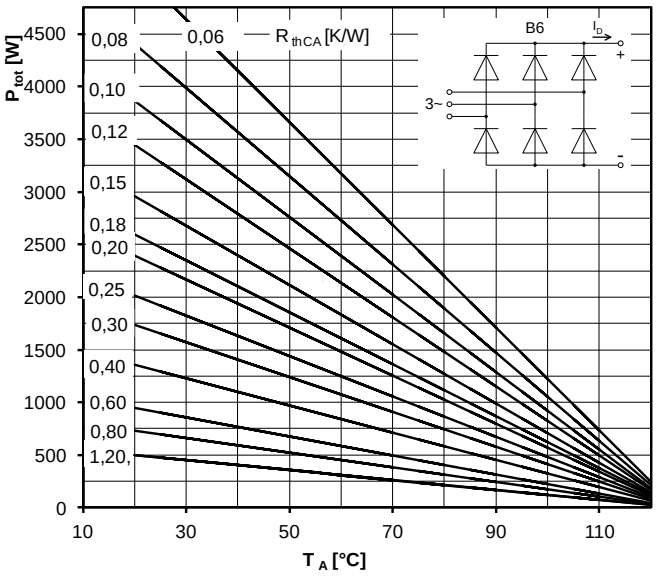


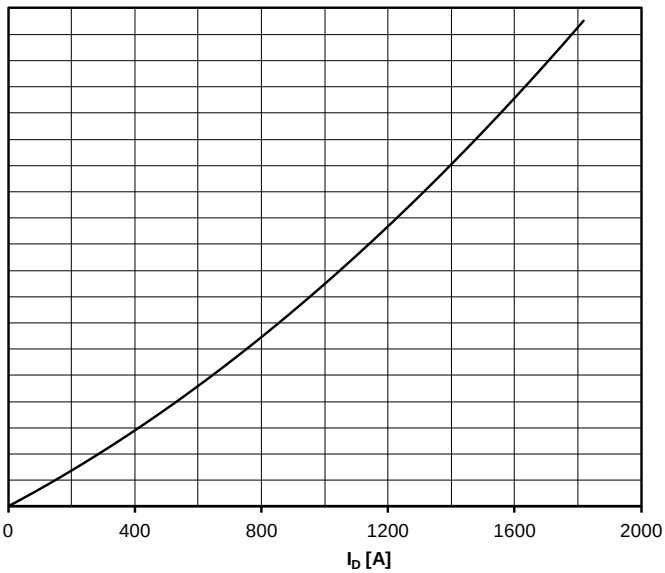
Höchstzulässiger Ausgangsstrom / Maximum rated output current I_D

B2- Zweipuls-Brückenschaltung / Two-pulse bridge circuit

Gesamtverlustleistung der Schaltung / Total power dissipation at circuit P_{tot}

Parameter:
Wärmewiderstand pro Element zwischen den Gehäusen und Umgebung /
Thermal resistance per chip cases to ambient R_{thCA}



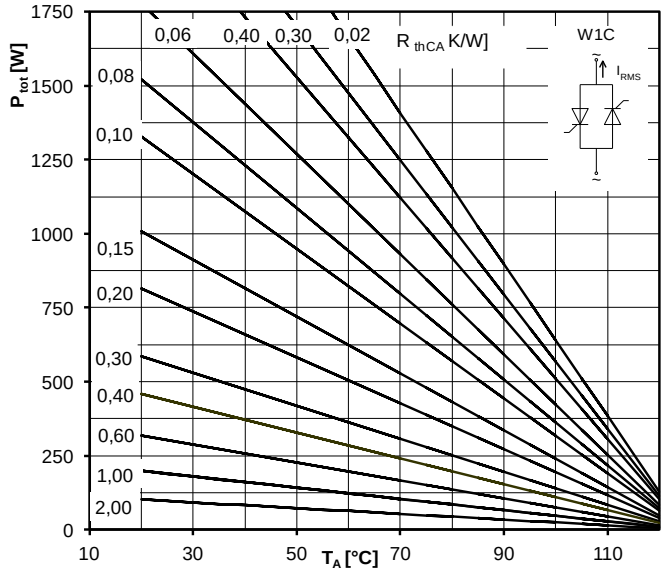


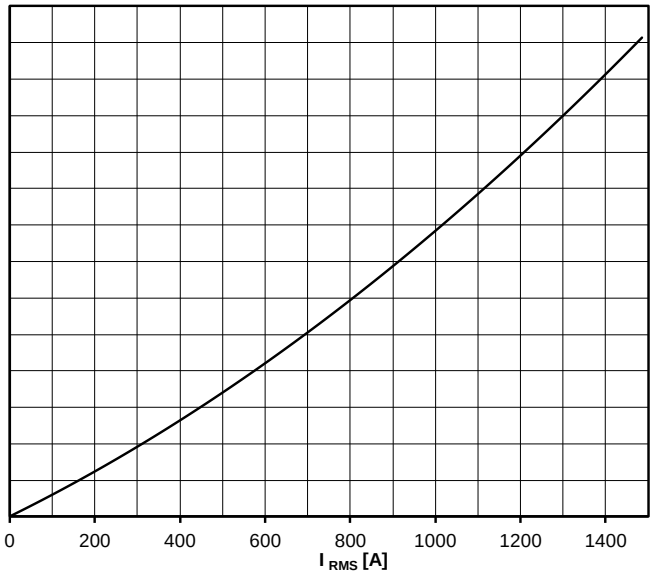
Höchstzulässiger Ausgangsstrom / Maximum rated output current I_D

B6- Sechspuls-Brückenschaltung / Six-pulse bridge circuit

Gesamtverlustleistung der Schaltung / Total power dissipation at circuit P_{tot}

Parameter:
Wärmewiderstand pro Element zwischen den Gehäusen und Umgebung /
Thermal resistance per chip cases to ambient R_{thCA}



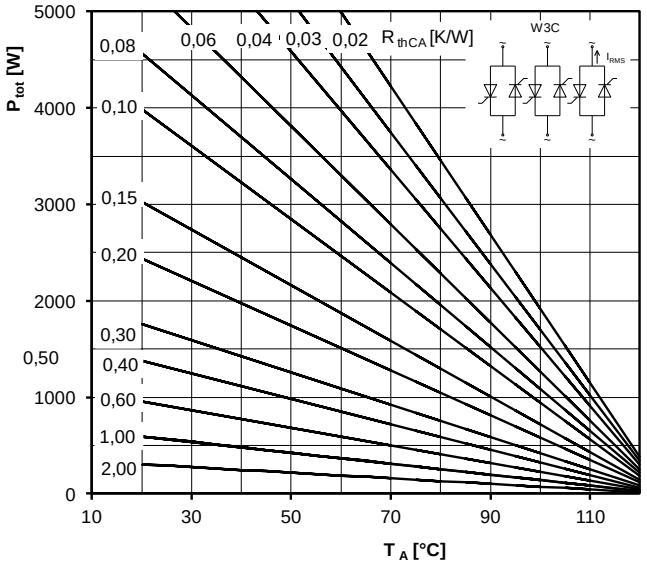


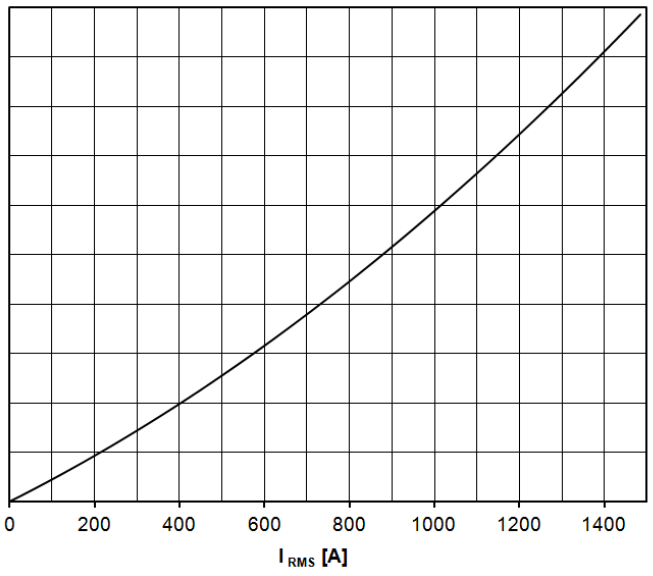
Höchstzulässiger Effektivstrom / Maximum rated RMS current I_{RMS}

W1C - Einphasen-Wechselwegschaltung / Single-phase inverse parallel circuit

Gesamtverlustleistung der Schaltung / Total power dissipation at circuit P_{tot}

Parameter:
Wärmewiderstand pro Element zwischen den Gehäusen und Umgebung /
Thermal resistance per chip cases to ambient R_{thCA}



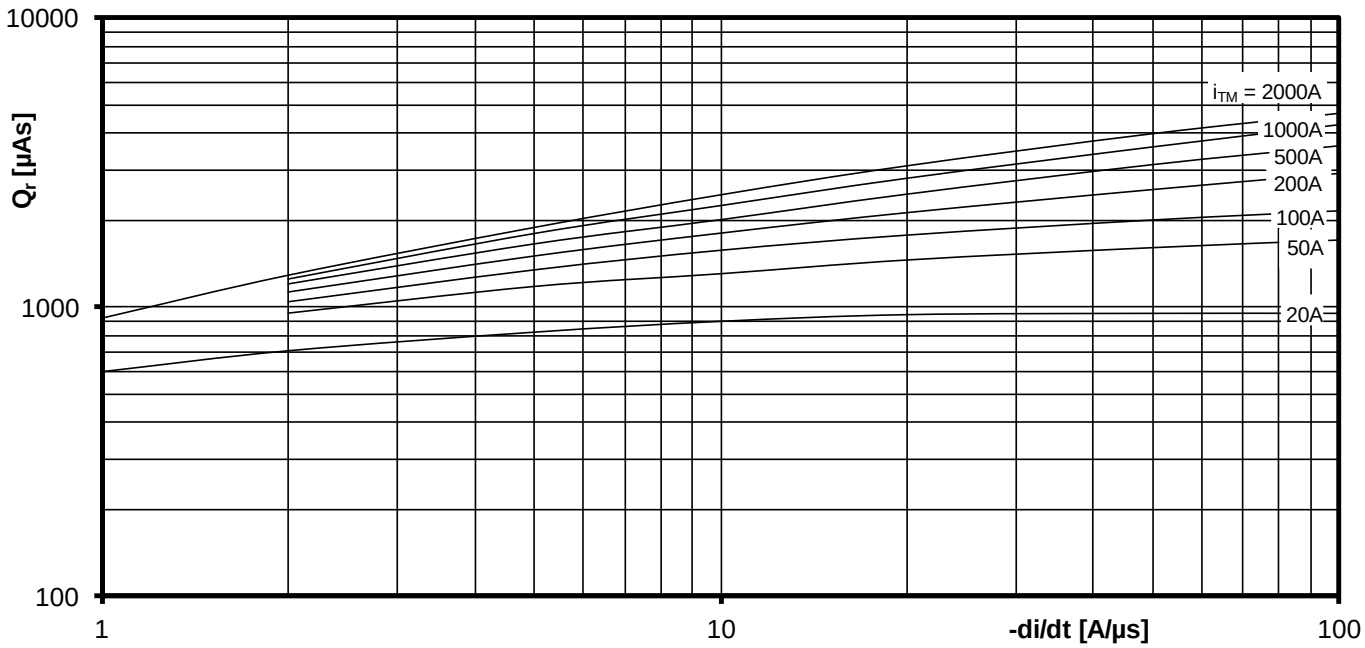


Höchstzulässiger Effektivstrom / Maximum rated RMS current I_{RMS}

W3C - Dreiphasen-Wechselwegschaltung / Three-phase inverse parallel circuit

Gesamtverlustleistung der Schaltung / Total power dissipation at circuit P_{tot}

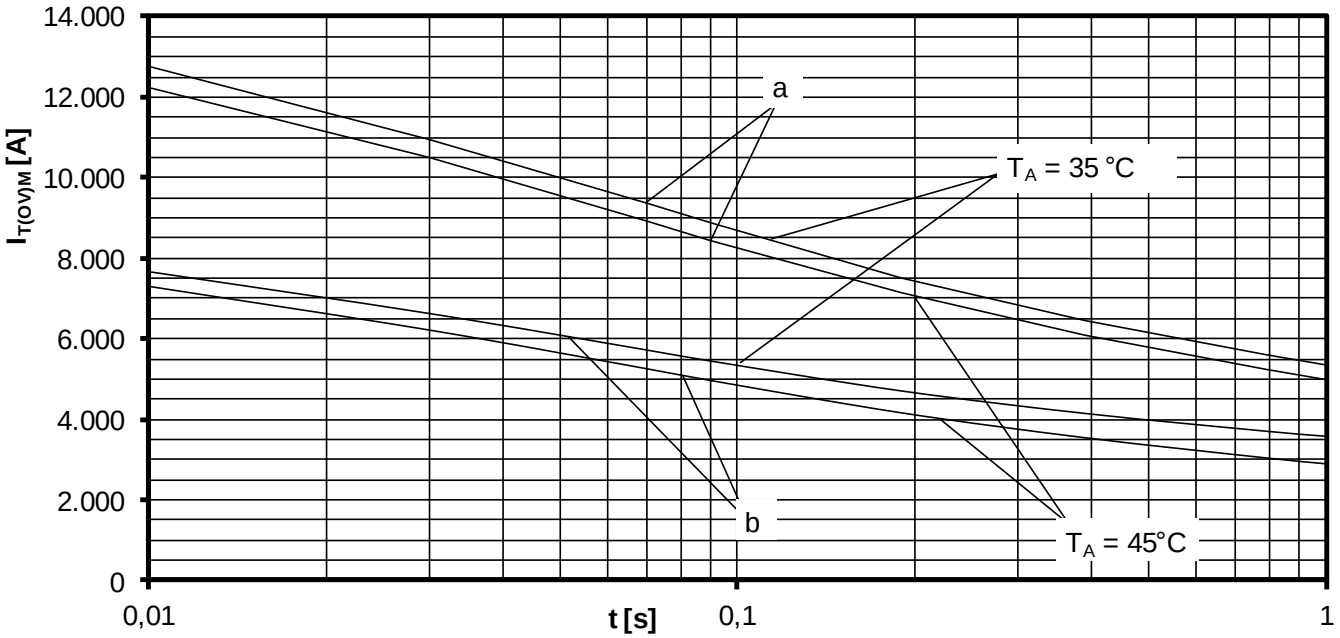
Parameter:
Wärmewiderstand pro Element zwischen den Gehäusen und Umgebung /
Thermal resistance per chip cases to ambient R_{thCA}



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}



Grenzstrom / Maximum overload on-state current $I_{T(OV)M} = f(t)$, $v_{RM} = 0{,}8\ V_{RRM}$

a: Leerlauf / No-load conditions
b: nach Belastung mit I_{TAVM} / after load with I_{TAVM}
T_A = 35°C, verstärkte Luftkühlung / Forced air cooling
T_A = 45°C, Luftselbstkühlung / Natural air cooling