

**Netz-Dioden-Modul**
Rectifier Diode Module**DD104N**

DD104N

DD104N..K...-K

ND104N

Elektrische Eigenschaften / Electrical properties

Höchstzulässige Werte / Maximum rated values

Periodische Spitzensperrspannung repetitive peak reverse voltages	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj \max}$	V_{RRM}	1200 1600	1400 1800	V V
Stoßspitzensperrspannung non-repetitive peak reverse voltage	$T_{vj} = +25^{\circ}\text{C} \dots T_{vj \max}$	V_{RSM}	1300 1700	1500 1900	V V
Durchlaßstrom-Grenzeffektivwert maximum RMS on-state current		I_{FRMSM}		160	A
Dauergrenzstrom average on-state current	$T_C = 100^{\circ}\text{C}$	I_{FAVM}		104	A
Stoßstrom-Grenzwert surge current	$T_{vj} = 25^{\circ}\text{C}, t_p = 10 \text{ ms}$ $T_{vj} = T_{vj \max}, t_p = 10 \text{ ms}$	I_{FSM}		2.900 2.500	A A
Grenzlastintegral I^2t -value	$T_{vj} = 25^{\circ}\text{C}, t_p = 10 \text{ ms}$ $T_{vj} = T_{vj \max}, t_p = 10 \text{ ms}$	I^2t		42.000 31.250	A ² s A ² s

Charakteristische Werte / Characteristic values

Durchlaßspannung on-state voltage	$T_{vj} = T_{vj \max}, i_F = 300 \text{ A}$	v_F	max.	1,4	V
Schleusenspannung threshold voltage	$T_{vj} = T_{vj \max}$	$V_{(TO)}$		0,7	V
Ersatzwiderstand slope resistance	$T_{vj} = T_{vj \max}$	r_T		2,1	mΩ
Sperrstrom reverse current	$T_{vj} = T_{vj \max}, V_R = V_{RRM}$	i_R	max.	20	mA
Isolations-Prüfspannung insulation test voltage	RMS, $f = 50 \text{ Hz}, t = 1 \text{ sec}$ RMS, $f = 50 \text{ Hz}, t = 1 \text{ min}$	V_{ISOL}		3,0 2,5	kV kV

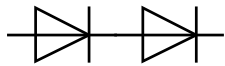
Thermische Eigenschaften / Thermal properties

Innerer Wärmewiderstand thermal resistance, junction to case	pro Modul / per Module, $\Theta = 180^{\circ} \sin$ pro Zweig / per arm, $\Theta = 180^{\circ} \sin$ pro Modul / per Module, DC pro Zweig / per arm, DC	R_{thJC}	max.	0,195	°C/W
			max.	0,390	°C/W
			max.	0,185	°C/W
			max.	0,370	°C/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per Module pro Zweig / per arm	R_{thCH}	max.	0,05	°C/W
			max.	0,10	°C/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj \max}$		150	°C
Betriebstemperatur operating temperature		$T_{C \text{ op}}$		- 40...+150	°C
Lagertemperatur storage temperature		T_{stg}		- 40...+150	°C

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approved by:	M. Leifeld	revision:	1

**Netz-Dioden-Modul**
Rectifier Diode Module**DD104N****Mechanische Eigenschaften / Mechanical properties**

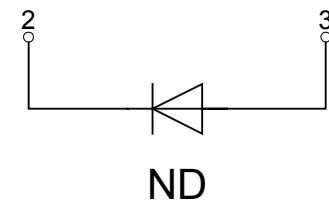
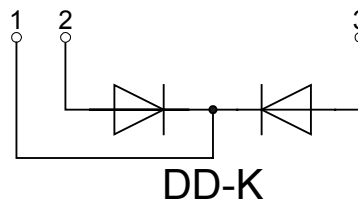
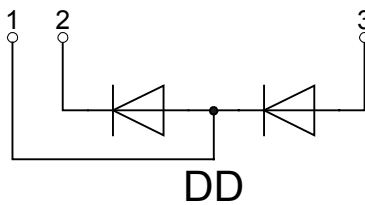
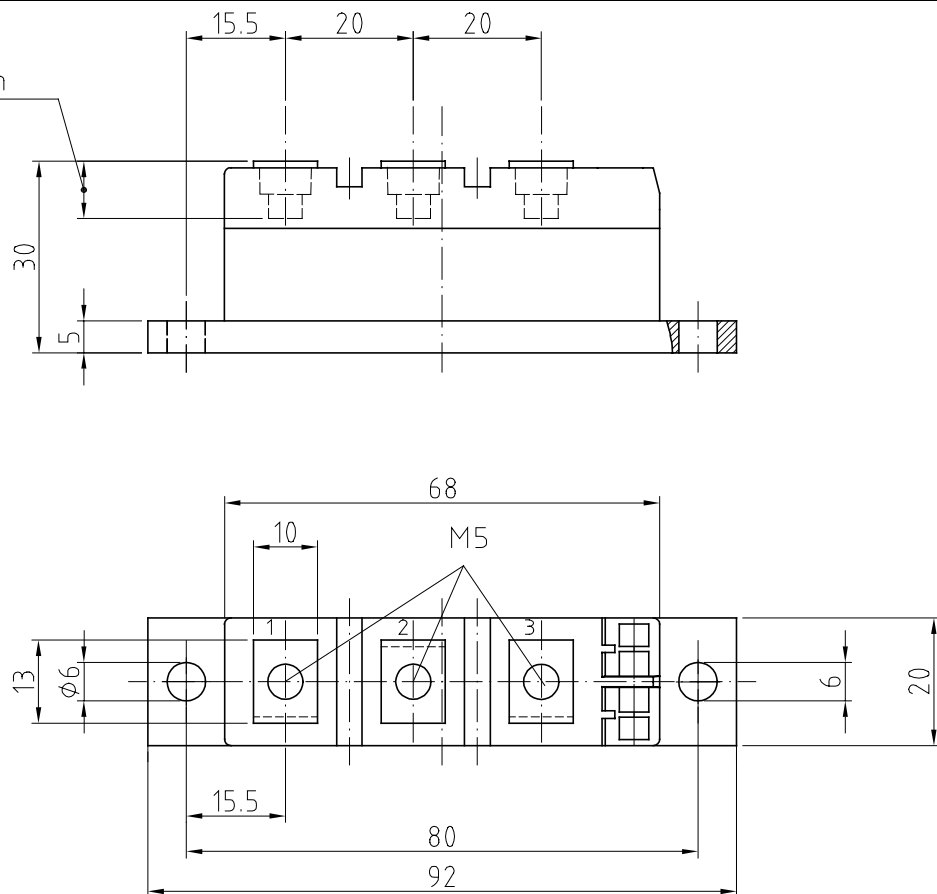
Gehäuse, siehe Anlage case, see annex			Seite 3 page 3	
Si-Element mit Druckkontakt Si-pellet with pressure contact				
Innere Isolation internal insulation			AIN	
Anzugsdrehmoment für mechanische Anschlüsse mounting torque	Toleranz $\pm 15\%$	M1	4	Nm
Anzugsdrehmoment für elektrische Anschlüsse terminal connection torque	Toleranz $\pm 10\%$	M2	4	Nm
Gewicht weight		G	typ. 160	g
Kriechstrecke creepage distance			15	mm
Schwingfestigkeit vibration resistance	f = 50 Hz		50	m/s ²
	file-No.		E 83336	

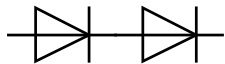


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screwing depth
max. 9,0



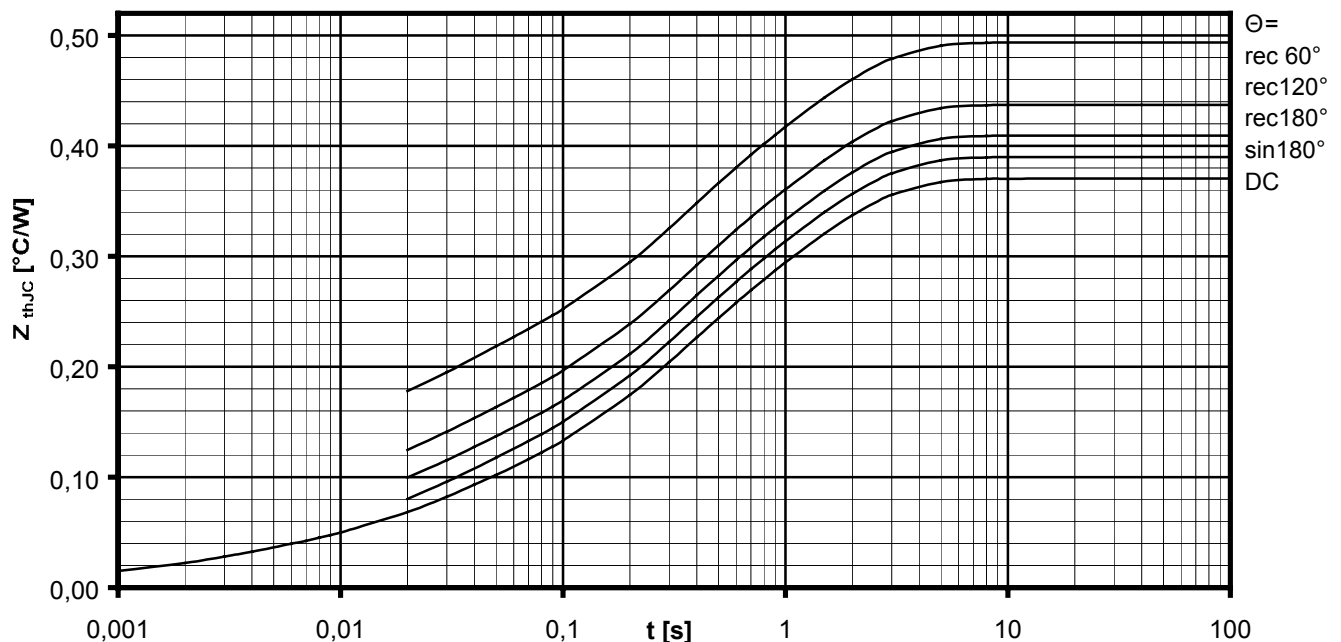


Analytische Elemente des transienten Wärmewiderstandes Z_{thJC} für DC
Analytical elements of transient thermal impedance Z_{thJC} for DC

Pos. n	1	2	3	4	5	6	7
$R_{thn} [^{\circ}C/W]$	0,005	0,0195	0,0518	0,128	0,166		
$T_n [s]$	0,00004	0,00223	0,022	0,235	1,24		

Analytische Funktion / Analytical function:

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



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

Parameter: Stromflußwinkel Θ / Current conduction angle Θ


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Natürliche Kühlung / Natural cooling
 3 Module pro Kühler / 3 modules per heatsink
 Kühler / Heatsink type: KM14 (50W)

Analytische Elemente des transienten Wärmewiderstandes Z_{thCA}
Analytical elements of transient thermal impedance Z_{thCA}

Pos. n	1	2	3	4	5	6	7
$R_{thn} [^{\circ}C/W]$	0,007	0,141	0,119	2,133			
$T_n [s]$	0,701	4,72	42,5	910			

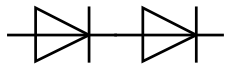
Verstärkte Kühlung / Forced cooling
 3 Module pro Kühler / 3 modules per heatsink
 Kühler / Heatsink type: KM14 (Papst 4650)

Analytische Elemente des transienten Wärmewiderstandes Z_{thCA}
Analytical elements of transient thermal impedance Z_{thCA}

Pos. n	1	2	3	4	5	6	7
$R_{thn} [^{\circ}C/W]$	0,007	0,141	0,119	0,583			
$T_n [s]$	0,701	4,72	42,5	249			

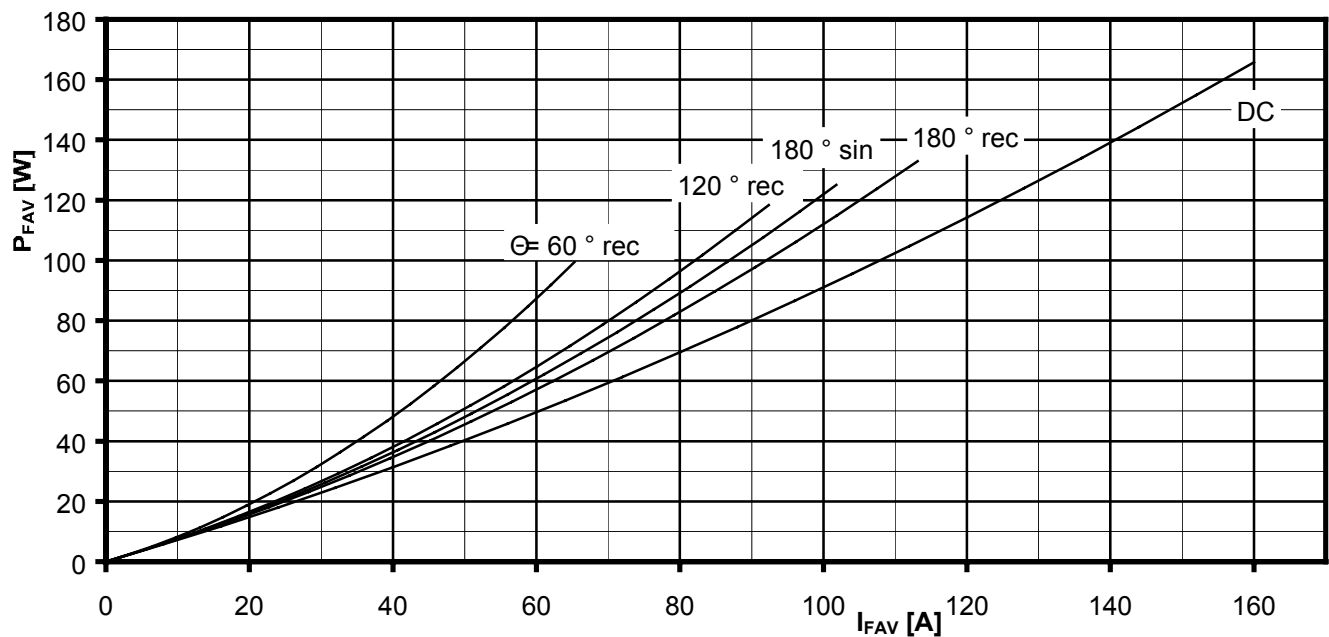
Analytische Funktion / Analytical function:

$$Z_{thCA} = \sum_{n=1}^{n_{max}} R_{thn} \left(1 - e^{-\frac{t}{T_n}} \right)$$



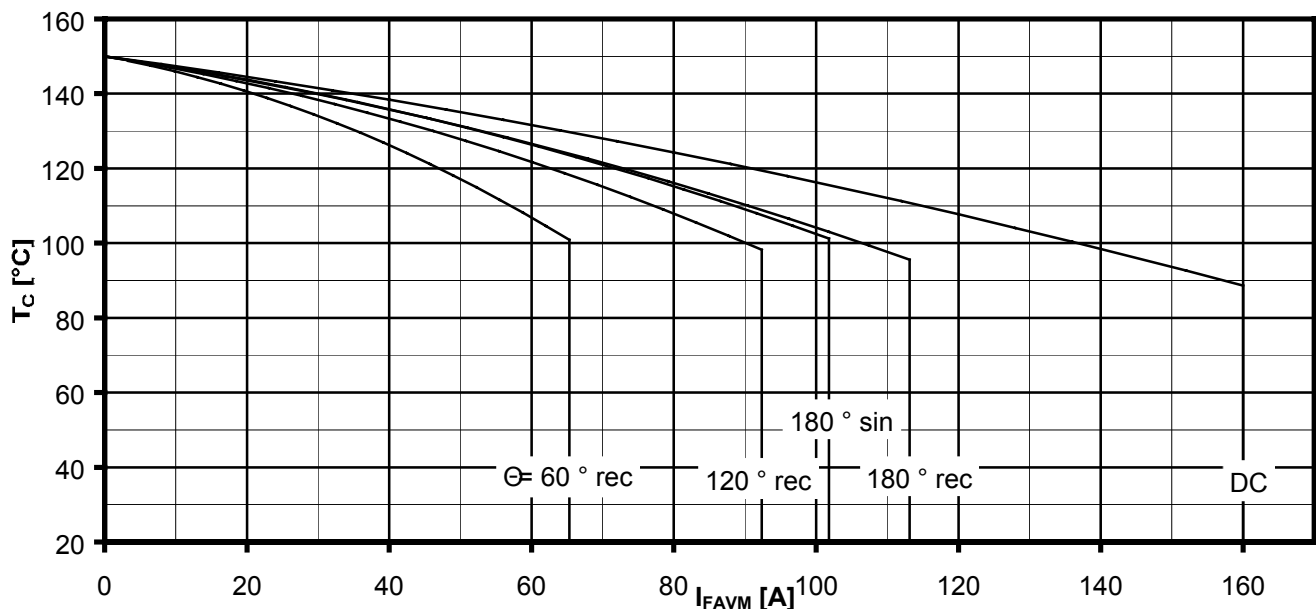
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Durchlassverlustleistung je Zweig / On-state power loss per arm $P_{FAV} = f(I_{FAV})$

Parameter: Stromflußwinkel / Current conduction angle Θ

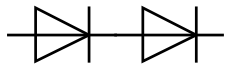
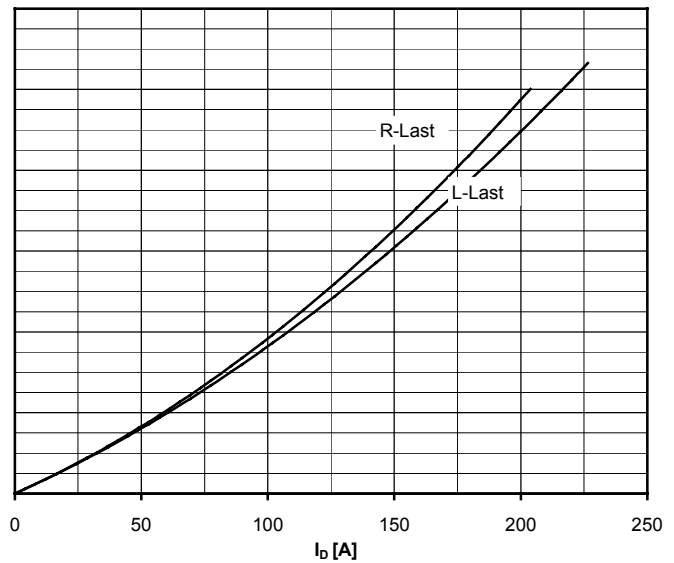
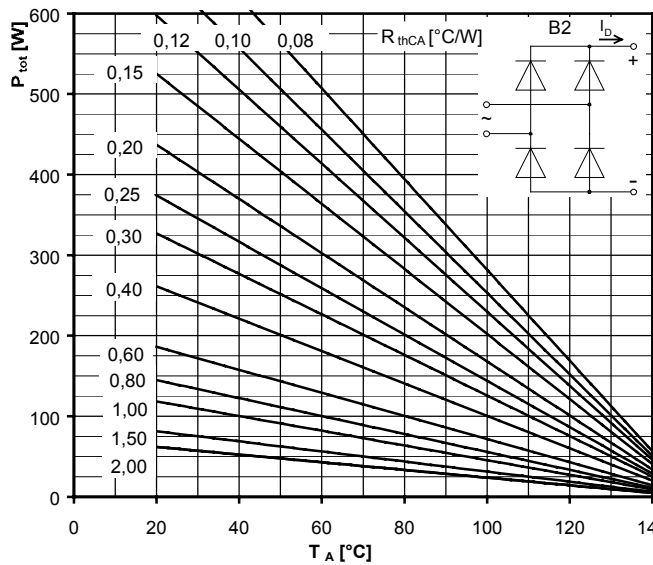


Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{FAVM})$

Strombelastung je Zweig / Current load per arm

Berechnungsgrundlage P_{TAV}
Calculation base P_{TAV}

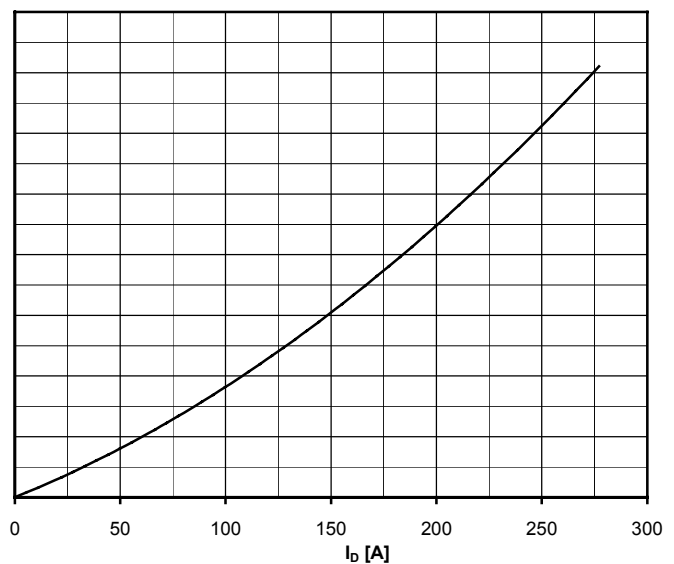
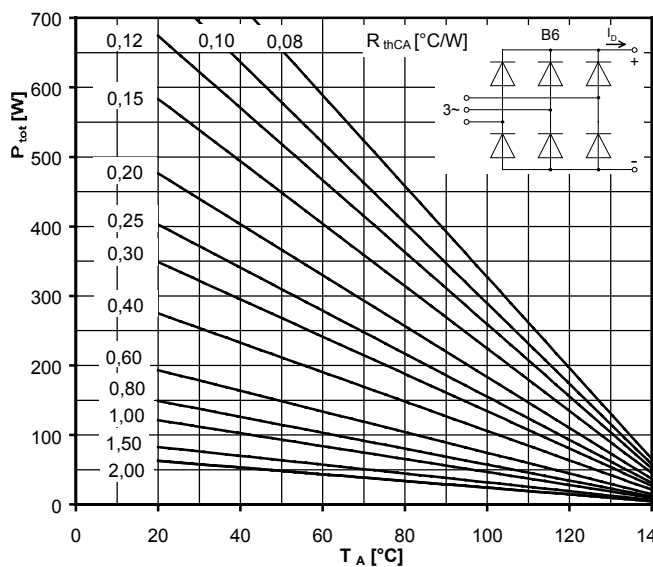
Parameter: Stromflußwinkel Θ / Current conduction angle Θ

**Netz-Dioden-Modul**
Rectifier Diode Module**DD104N****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:

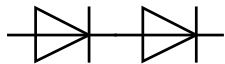
Wärmewiderstand zwischen den Gehäusen und Umgebung / Thermal resistance cases to ambient R_{thCA} **Höchstzulässiger Ausgangsstrom / Maximum rated output current I_D**

B6- Sechspuls-Brückenschaltung / Six-pulse bridge circuit

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

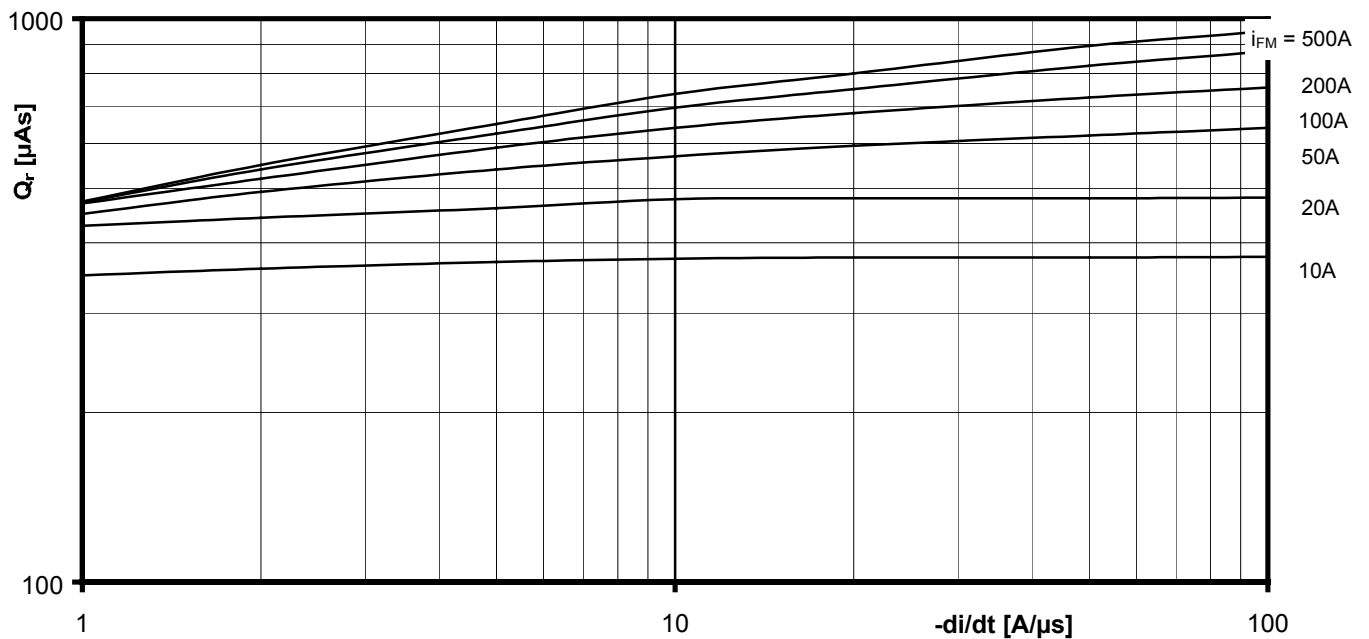
Parameter:

Wärmewiderstand zwischen den Gehäusen und Umgebung / Thermal resistance cases to ambient R_{thCA}



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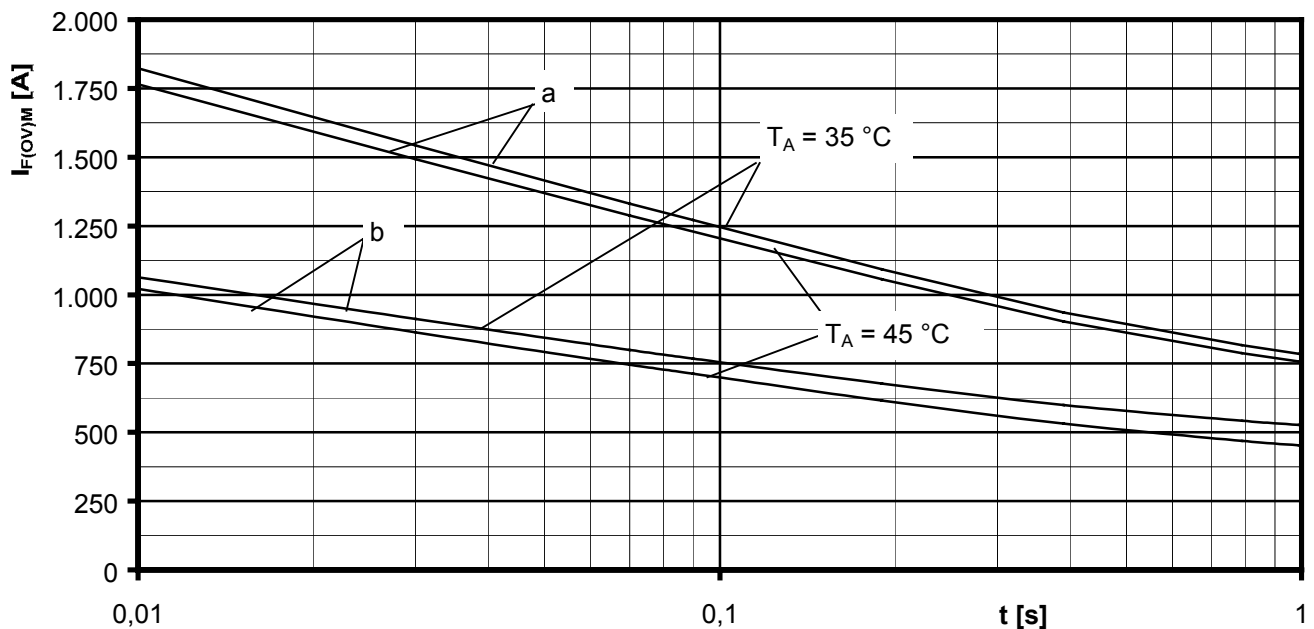
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Sperrverzögerungsladung / Recovered charge $Q_r = f(-di/dt)$

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

Parameter: Durchlaßstrom / On-state current i_{FM}



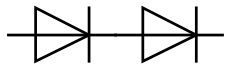
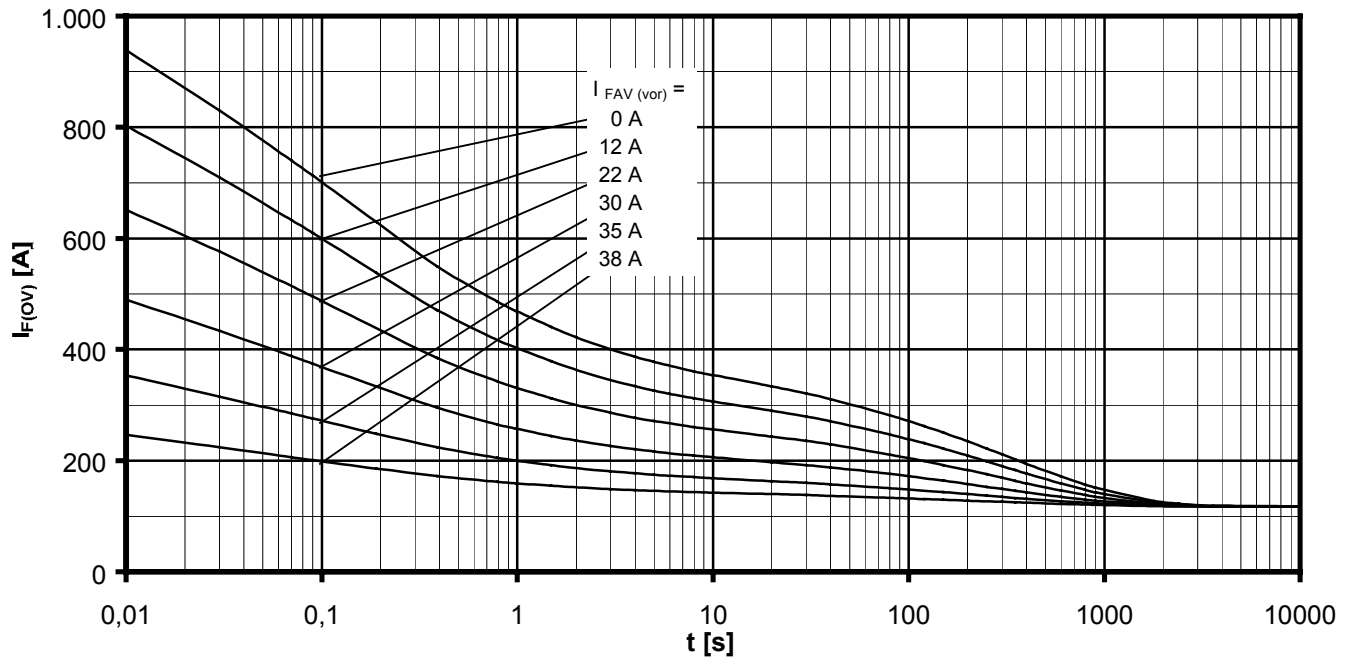
Grenzstrom je Zweig / Maximum overload on-state current per arm $I_{F(OV)M} = f(t), V_{RM} = 0,8 V_{RRM}$

a: Leerlauf / No-load conditions

b: Vorlaststrom je Zweig / Pre-load current per arm $I_{FAV(vor)} = I_{FAVM}$

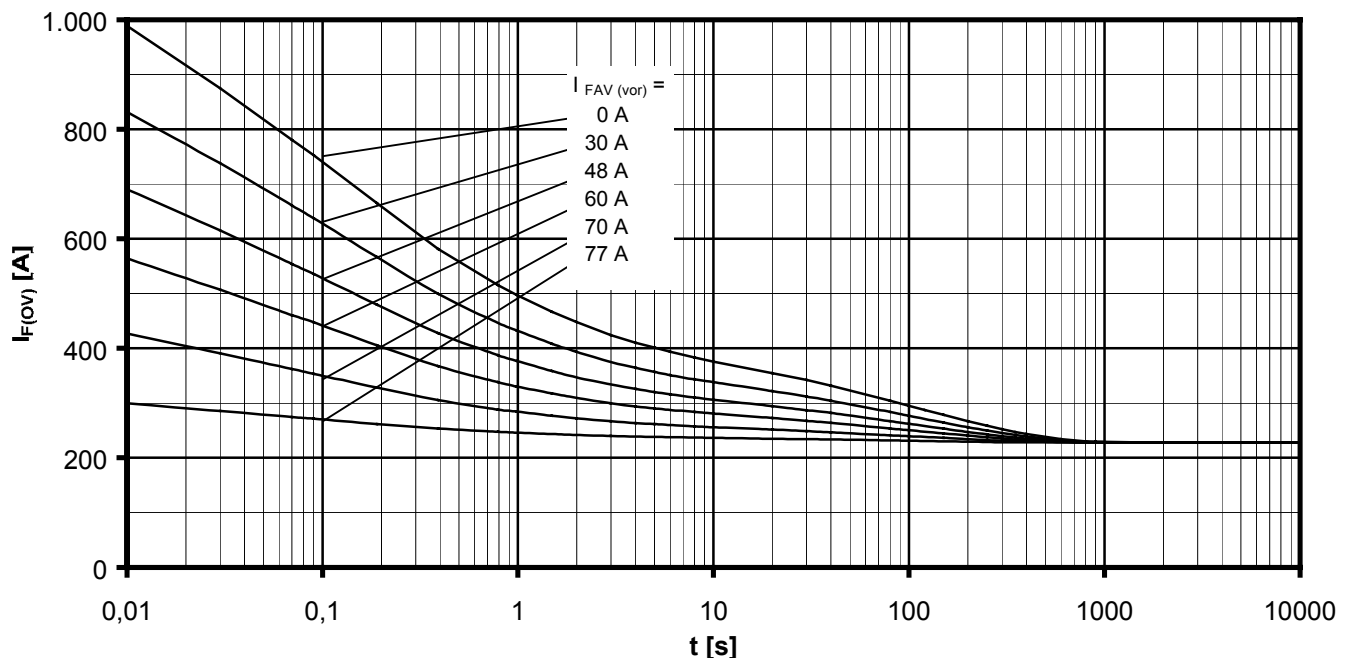
$T_A = 35^\circ\text{C}$, verstärkte Luftkühlung / Forced air cooling Kühlkörper / Heatsink type: KM14 (Papst 4650)

$T_A = 45^\circ\text{C}$, natürliche Luftkühlung / Natural air cooling Kühlkörper / Heatsink type: KM14 (50W)


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Überstrom je Zweig / Overload on-state current $I_{F(ov)}$

B6- Sechspuls-Brückenschaltung, 120° Rechteck / Six-pulse bridge circuit, 120° rectangular

 Kühlkörper / Heatsink type KM14 (50W) Natürliche Kühlung bei / Natural cooling at $T_A = 45^\circ\text{C}$

 Parameter: Vorlaststrom je Zweig / Pre-load current per arm $I_{FAV(vor)}$

Überstrom je Zweig / Overload on-state current $I_{F(ov)}$

B6- Sechspuls-Brückenschaltung, 120° Rechteck / Six-pulse bridge circuit 120° rectangular

 Kühlkörper / Heatsink type KM14 (Papst 4650) Verstärkte Kühlung bei / Forced cooling at $T_A = 35^\circ\text{C}$

 Parameter: Vorlaststrom je Zweig / Pre-load current per arm $I_{FAV(vor)}$