

Technische Information / technical information



Infineon Technologies Bipolar
GmbH & Co. KG

**Netz-Thyristor
Phase Control Thyristor**

T1503N

Key Parameters

V_{BO} / V_{RRM}	7500V / 8000V
I_{TAVM}	1770A ($T_C=85^\circ\text{C}$)
I_{TSM}	57000A
V_{T0}	1,24V
r_T	0,44m Ω
R_{thJC}	6,0K/kW
Clamping Force	63 ... 91kN
Max. Diameter	151,5mm
Contact Diameter	100mm
Height	40mm



For type designation please refer to actual shortform catalog

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

Merkmale

- Direkt lichtgezündeter Thyristor mit integrierter Schutzfunktion
- Volle Sperrfähigkeit 50/60Hz über einen weiten Temperaturbereich
- Hohe DC Sperrstabilität
- Hoher Gehäusebruchstrom
- Hohe Einschalt di/dt Fähigkeit

Features

- Light triggered thyristor with internal Break over Diode
- Full blocking 50/60Hz over a wide range temperature range
- High DC blocking stability
- High case non-rupture current
- High di/dt capability

Typische Anwendungen

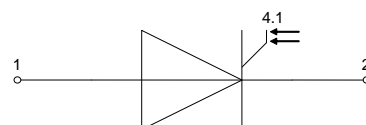
- Hochspannungs-Gleichstrom- Übertragung HGÜ
- Statische Kompensation SVC
- Gleichrichter für Antriebsapplikationen
- Lastgeführte Umrichter
- Kurzschließer-Applikationen

Typical Applications

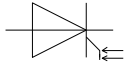
- High Voltage Direct Current Transmission HVDC
- Static Var Compensation SVC
- Rectifier for Drives Applications
- Load Commutating Inverter
- Crowbar Applications



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



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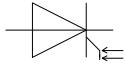
Elektrische Eigenschaften / electrical properties Höchstzulässige Werte / maximum rated values

Periodische Rückwärts-Spitzensperrspannung repetitive peak and reverse voltage	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{ max}}$	V_{RRM}	7500 V 8000 V
Durchlaßstrom-Effektivwert maximum RMS on-state current	$T_C = 85^{\circ}\text{C}$	I_{TRMSM}	2770 A
Dauergrenzstrom average on-state current	$T_C = 85^{\circ}\text{C}$ $T_C = 70^{\circ}\text{C}$ $T_C = 55^{\circ}\text{C}$	I_{TAVM}	1770 A 2190 A 2560 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}	60000 A 58000 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	18000 $10^3\text{ A}^2\text{s}$ 16820 $10^3\text{ A}^2\text{s}$
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 60747-6 $f = 50\text{ Hz}, P_{LM} = 40\text{ mW}, t_{rise} = 0,5\mu\text{s}$	$(di_T/dt)_{cr}$	300 A/ μs
Kritische Spannungssteilheit critical rate of rise of off-state voltage	$T_{vj} = T_{vj\text{ max}}, V_D = 0,67 V_{DRM}$ 5.Kennbuchstabe / 5 th letter H	$(dv_D/dt)_{cr}$	2000 V/ μs

Charakteristische Werte / characteristic values

Schutzzündspannung (statisch) protective break over voltage	$T_{vj} = 25^{\circ}\text{C} \dots T_{vj\text{ max}}$ Typischer Degradationsfaktor ist 0,16%/K für $T_{vj} = 0^{\circ}\text{C}..25^{\circ}\text{C}$ Typical de-rating factor of 0,16%/K is applicable for $T_{vj} = 0^{\circ}\text{C}..25^{\circ}\text{C}$	V_{BO}	min. 7500 V
Durchlaßspannung on-state voltage	$T_{vj} = T_{vj\text{ max}}, i_T = 4000\text{ A}, V_D = 150\text{ V}$	V_T	typ. 2,8 V max. 3,0 V
Schleusenspannung threshold voltage	$T_{vj} = T_{vj\text{ max}}$	$V_{(TO)}$	typ. 1,20 V max. 1,24 V
Ersatzwiderstand slope resistance	$T_{vj} = T_{vj\text{ max}}$	r_T	typ. 0,4 m Ω max. 0,44 m Ω
Durchlaßkennlinie on-state characteristic $v_T = A + B \cdot i_T + C \cdot \ln(i_T + 1) + D \cdot \sqrt{i_T}$	$T_{vj} = T_{vj\text{ max}}$ $400\text{ A} \leq i_F \leq 5000\text{ A}$	typ. max.	A 0,616 B 0,000219 C 0,0342 D 0,0161 A -0,0864 B 0,000343 C 0,2021 D 0,000614
minimale Zündlichtleistung minimum gate trigger light power	$T_{vj} = 25^{\circ}\text{C}, V_D = 150\text{ V}$	P_{LM}	max. 40 mW
Haltestrom holding current	$T_{vj} = 25^{\circ}\text{C}$	I_H	max. 100 mA
Einraststrom latching current	$T_{vj} = 25^{\circ}\text{C}, V_D = 150\text{ V},$ $P_{LM} = 40\text{ mW}, t_{rise} = 0,5\mu\text{s}$	I_L	max. 1 A
Rückwärts-Sperrstrom reverse blocking current	$T_{vj} = T_{vj\text{ max}}$ $V_R = V_{RRM}$	i_R	max. 600 mA
Zündverzug gate controlled delay time	DIN IEC 60747-6 $T_{vj} = 25^{\circ}\text{C}, V_D = 1000\text{ V},$ $P_{LM} = 40\text{ mW}, t_{rise} = 0,5\mu\text{s}$	t_{gd}	max. 5 μs

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Elektrische Eigenschaften / electrical properties Charakteristische Werte / characteristic values

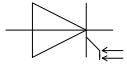
Freiwerdezeit circuit commutated turn-off time	$T_{vj} = T_{vj\max}$, $i_{TM} = I_{TAVM}$ $V_{RM} = 100\text{ V}$, $v_{DM} = 0,67 V_{DRM}$ $dv_D/dt = 20\text{ V}/\mu\text{s}$, $-di_T/dt = 10\text{ A}/\mu\text{s}$ 4.Kennbuchstabe / 4 th letter O	t_q	typ.	550	μs
Sperrverzögerungsladung recovered charge	$T_{vj} = T_{vj\max}$ $i_{TM} = I_{TAVM}$, $-di_T/dt = 10\text{ A}/\mu\text{s}$ $V_R = 0,5V_{RRM}$, $V_{RM} = 0,8V_{RRM}$	Q_f	max.	15	mAs
Rückstromspitze peak reverse recovery current	$T_{vj} = T_{vj\max}$ $i_{TM} = I_{TAVM}$, $-di_T/dt = 10\text{ A}/\mu\text{s}$ $V_R = 0,5V_{RRM}$, $V_{RM} = 0,8V_{RRM}$	I_{RM}	max.	350	A

Thermische Eigenschaften / thermal properties

Innerer Wärmewiderstand thermal resistance, junction to case	<u>Kühlfläche / cooling surface</u> beidseitig / two-sided, $\theta = 180^\circ\text{sin}$ beidseitig / two-sided, DC Anode / anode, DC Kathode / cathode, DC	R_{thJC}	max.	6,3	K/kW
			max.	6,0	K/kW
			max.	10,6	K/kW
			max.	13,8	K/kW
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	<u>Kühlfläche / cooling surface</u> beidseitig / two-sided einseitig / single-sided	R_{thCH}	max.	1,5	K/kW
			max.	3,0	K/kW
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj\max}$		120	$^\circ\text{C}$
Betriebstemperatur operating temperature		$T_{c\text{ op}}$		-40...+120	$^\circ\text{C}$
Lagertemperatur storage temperature		T_{stg}		-40...+150	$^\circ\text{C}$

Mechanische Eigenschaften / mechanical properties

Gehäuse, siehe Anlage case, see annex				Seite 4 page 4	
Si-Element mit Druckkontakt Si-pellet with pressure contact					
Anpresskraft clamping force		F		63...91	kN
Gewicht weight		G	typ.	3200	g
Kriechstrecke creepage distance				49	mm
Schwingfestigkeit vibration resistance	f = 50 Hz			50	m/s ²



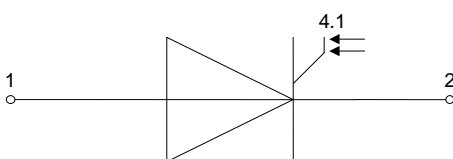
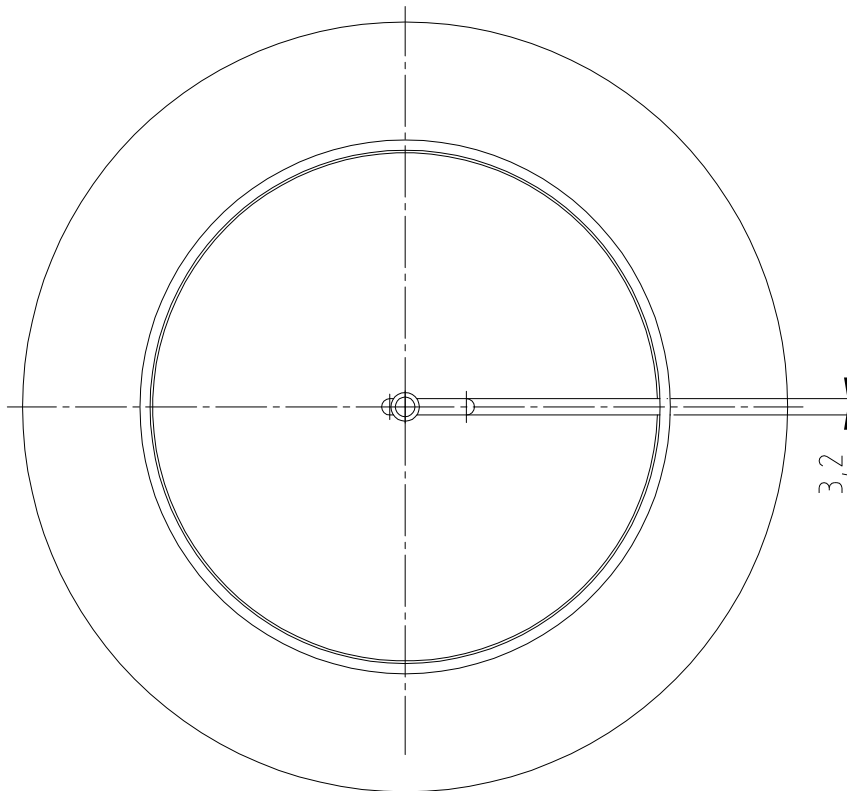
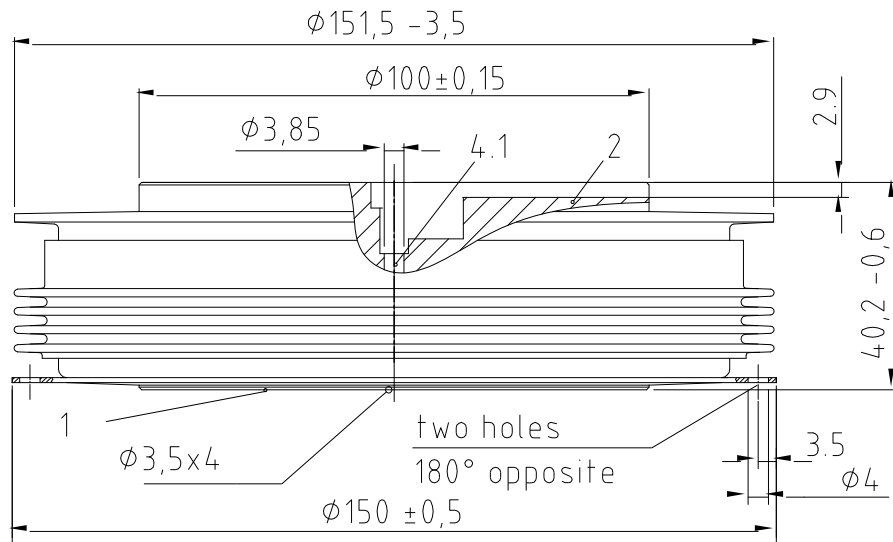
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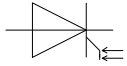
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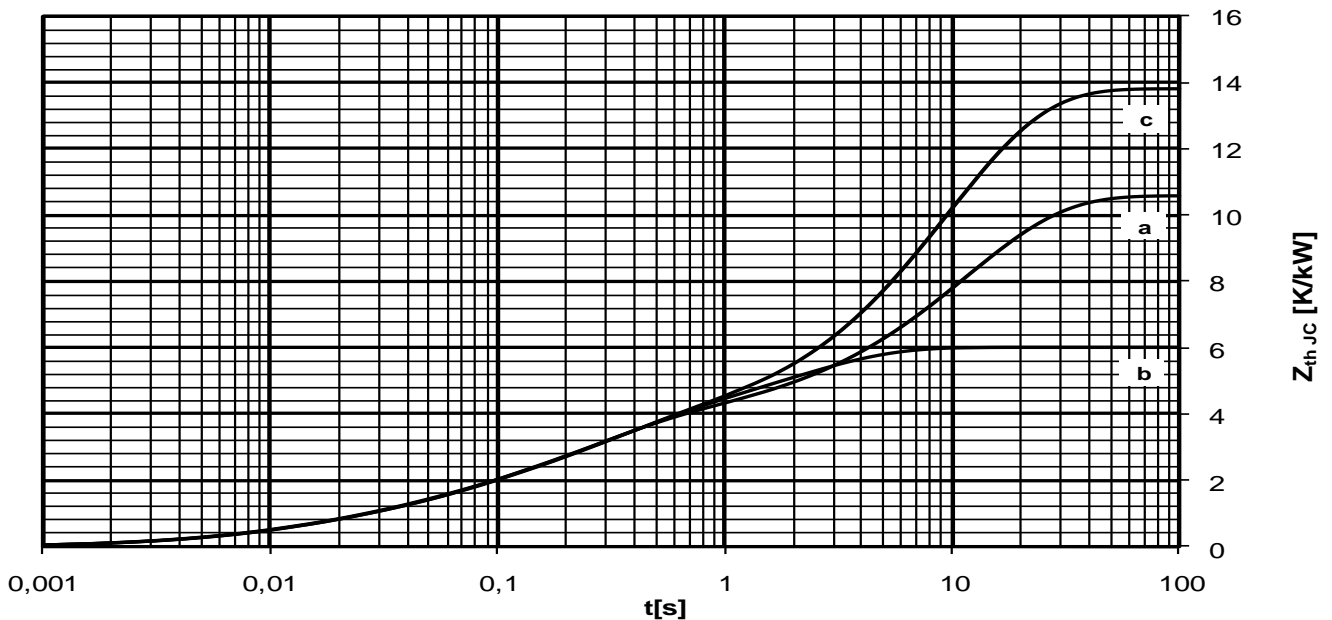
- 1: Anode/anode
- 2: Kathode/cathode
- 4.1: Gate



**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 two-sided	R_{thn} [K/kW]	2,38	2,02	1,10	0,500	0		
	τ_n [s]	2,06	0,301	0,0674	0,0122	1		
anodenseitig anode-sided	R_{thn} [K/kW]	6,62	0,43	2,48	0,81	0,26		
	τ_n [s]	11,600	0,946	0,21900	0,03100	0,00761		
kathodenseitig cathode-sided	R_{thn} [K/kW]	10,20	2,24	0,92	0,44	0		
	τ_n [s]	9,6200	0,2680	0,0532	0,0107	1		

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

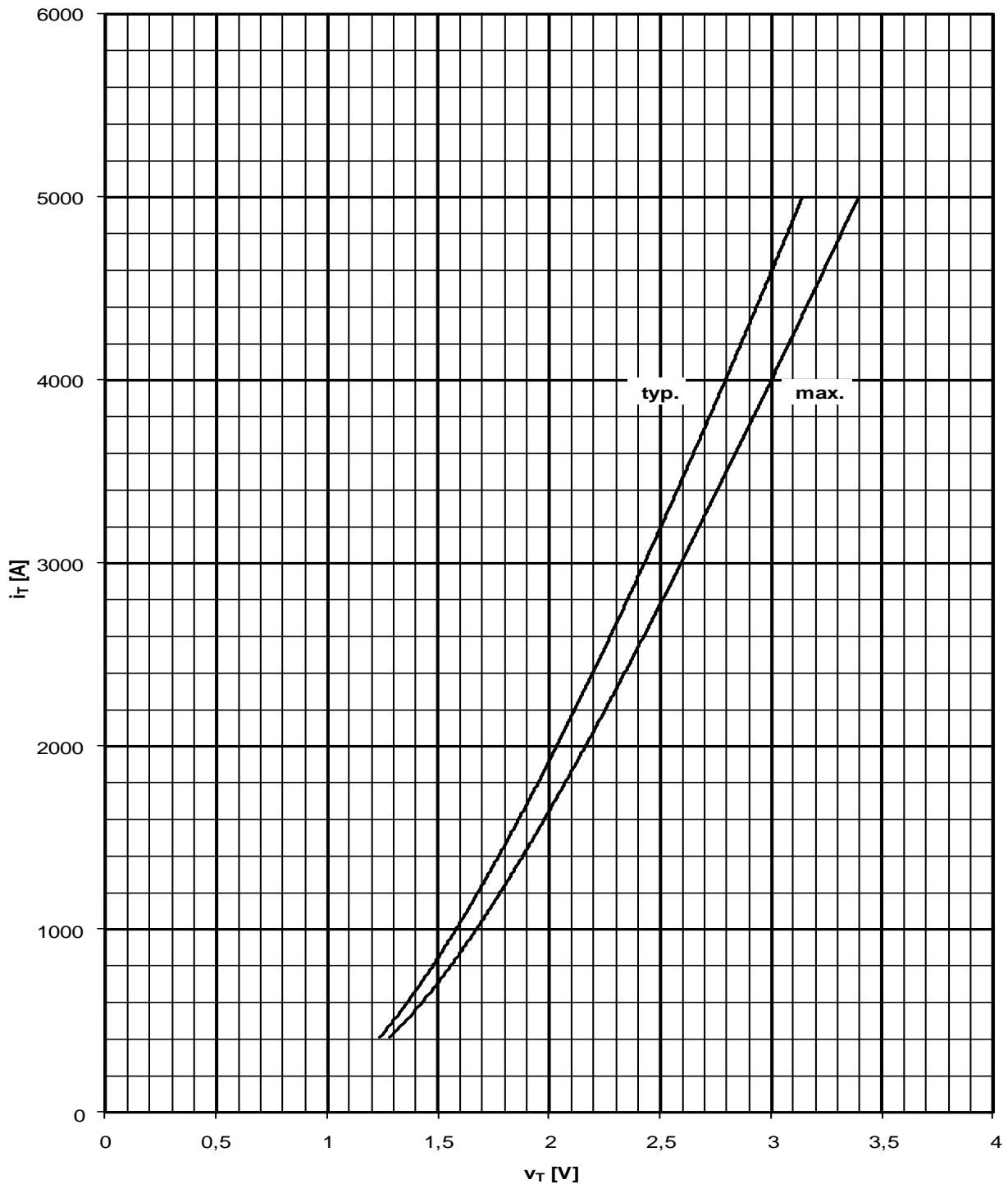
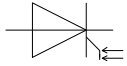


Transienter innerer Wärmewiderstand für DC / transient thermal impedance $Z_{thJC} = f(t)$ for DC

a : Anodenseitige Kühlung / anode-sided cooling

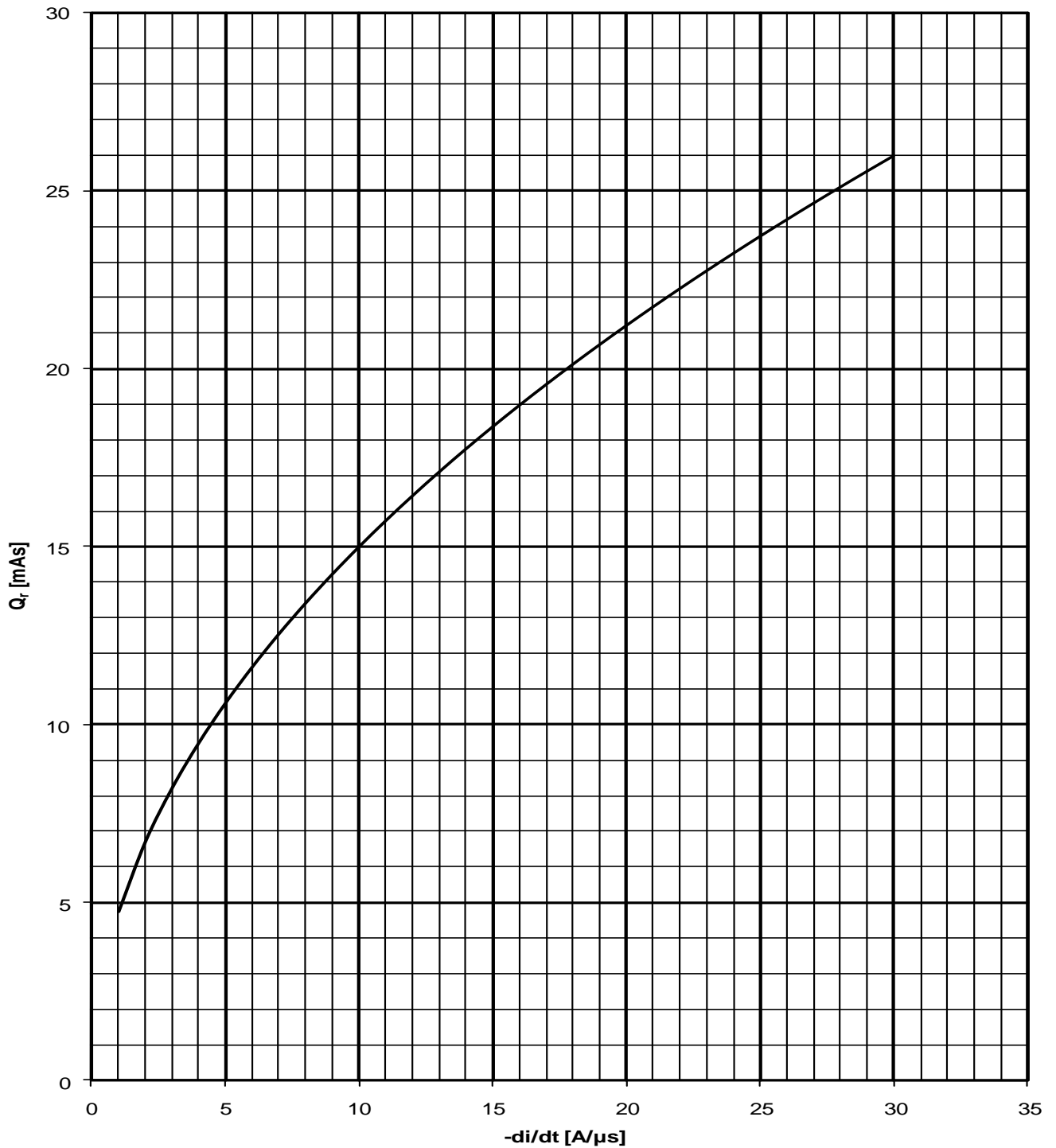
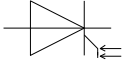
b : Beidseitige Kühlung / two-sided cooling

c : Kathodenseitige Kühlung / cathode-sided cooling



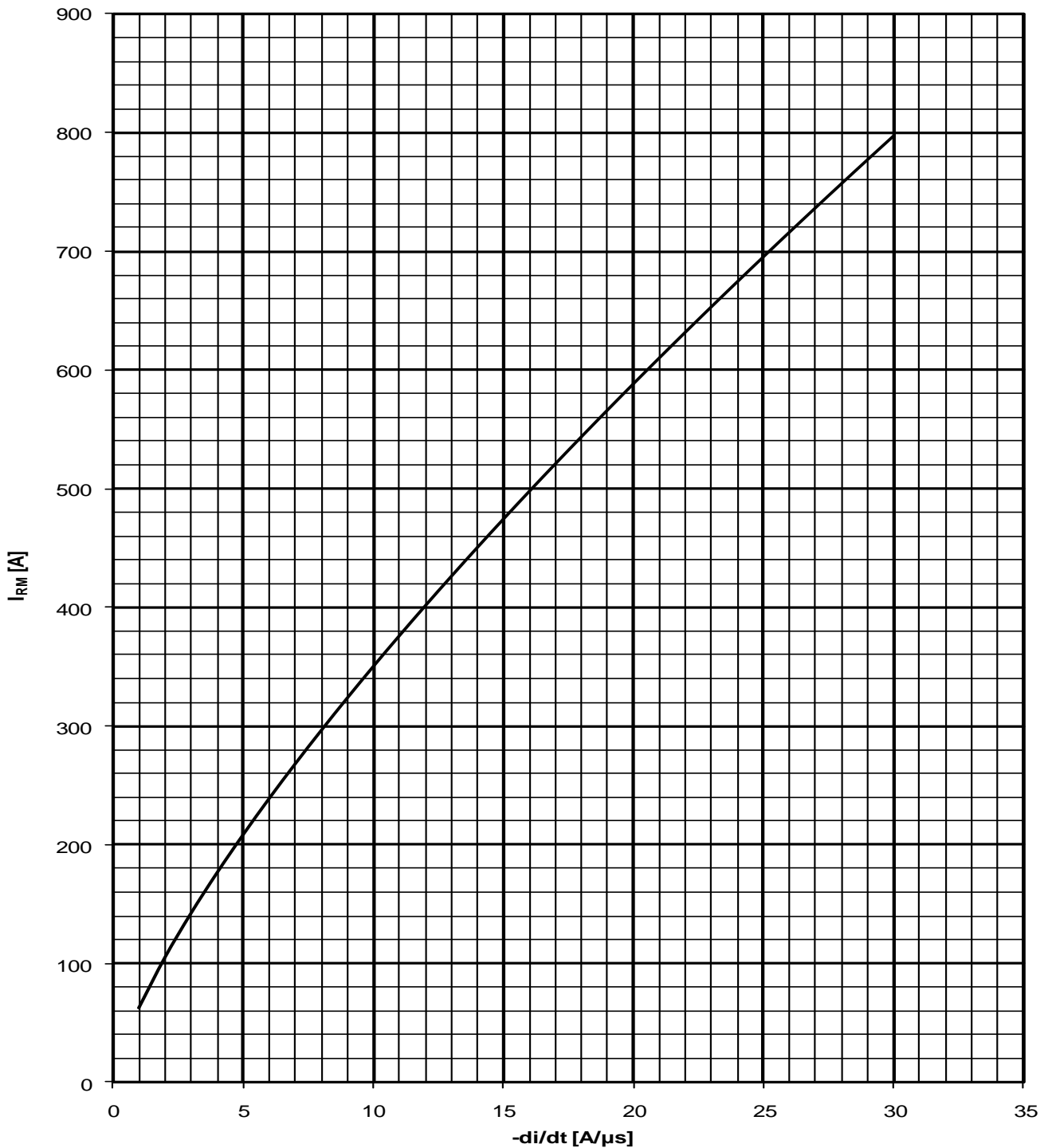
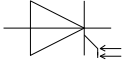
Grenzdurchlaßkennlinie / limiting on-state characteristic $i_T = f(v_T)$

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



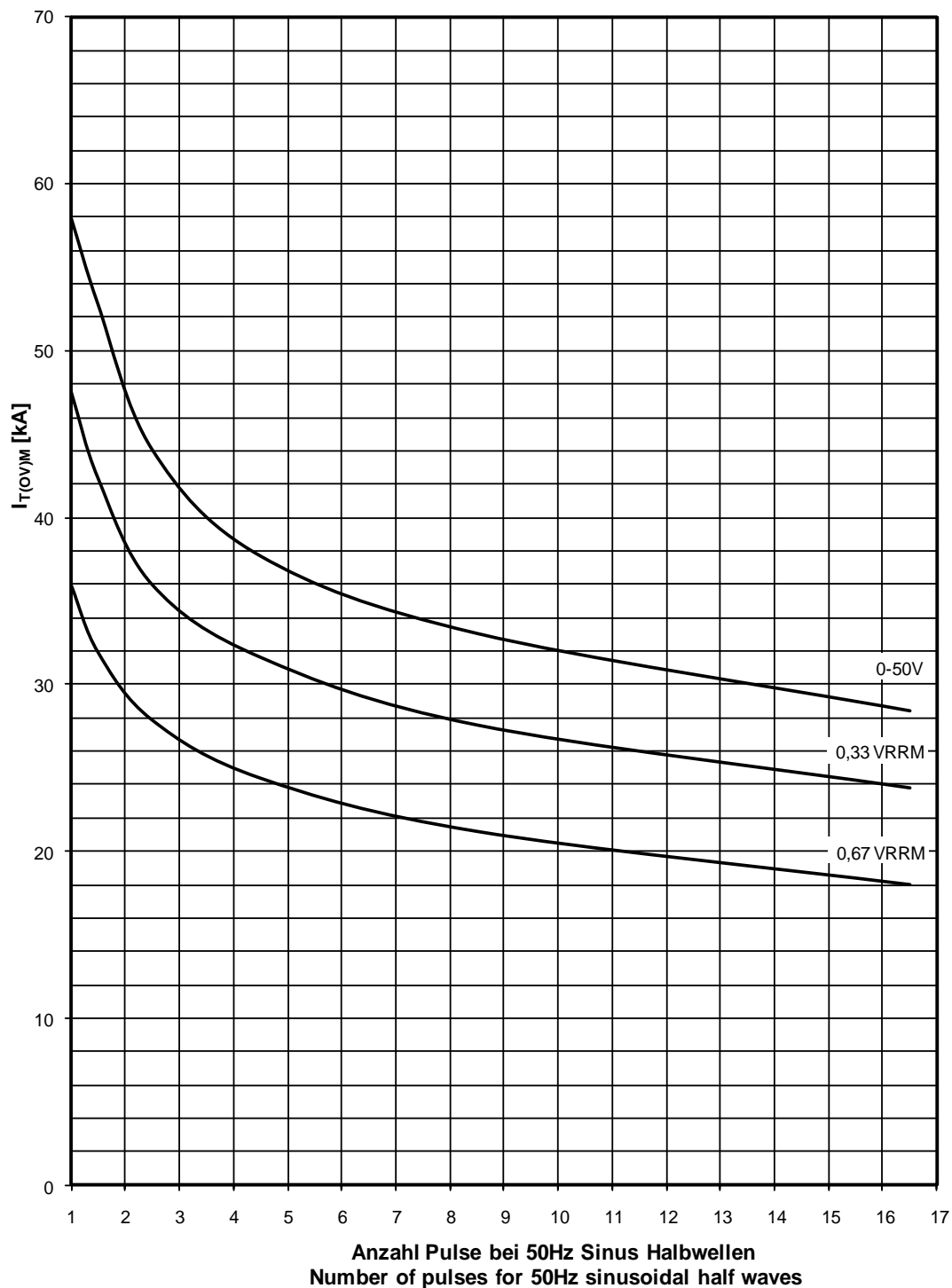
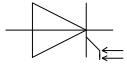
Sperrverzögerungsladung / recovered charge $Q_r = f(-di/dt)$

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



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}

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