

Technische Information / technical information



**Netz-Thyristor
Phase Control Thyristor**

T533N

Infineon Technologies Bipolar
GmbH & Co. KG

Key Parameters

V_{BO} / V_{RRM}	7500V / 8000V
I_{TAVM}	540A ($T_C=85^\circ\text{C}$)
I_{TSM}	10500A
V_{TO}	1,26V
r_T	1,47m Ω
R_{thJC}	20,0K/kW
Clamping Force	15 ... 24kN
Max. Diameter	76mm
Contact Diameter	50mm
Height	35mm



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
- Hohe Stoßstrombelastbarkeit
- Hoher Gehäusebruchstrom

Features

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

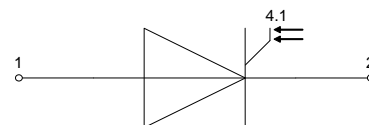
Typische Anwendungen

- Mittelspannungssanftanlasser
- Statische Kompensation SVC
- Lastgeführte Umrichter
- Kurzschließer-Applikationen
- Pulsed Power Applikationen

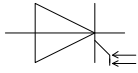
Typical Applications

- Medium Voltage Softstarter
- Static Var Compensation SVC
- Load Commutating Inverter
- Crowbar Applications
- Pulsed Power Applications

content of customer DMX code	QR 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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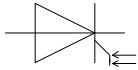
Elektrische Eigenschaften / electrical properties Höchstzulässige Werte / maximum rated values

Periodische Rückwärts-Spitzensperrspannung repetitive peak and reverse voltage	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{ max}}$	V_{RRM}	8000	V
Durchlaßstrom-Effektivwert RMS on-state current	$T_C = 85^{\circ}\text{C}$	I_{TRMSM}	864	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}	540 675 790	A A 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}	t.b.d. 10500	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	t.b.d. 551	$10^3\text{ A}^2\text{s}$ $10^3\text{ A}^2\text{s}$
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 60747-6 $f = 50\text{ Hz}, P_{LM} = 40\text{mW}, t_{rise} = 0,5\mu\text{s}$	$(di_T/dt)_{cr}$	300	$\text{A}/\mu\text{s}$
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	$\text{V}/\mu\text{s}$

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 $T_{vj} = 0^{\circ}\text{C} \dots 25^{\circ}\text{C}$ Typical de-rating factor of 0,16%/K is applicable for $T_{vj} = 0^{\circ}\text{C} \dots 25^{\circ}\text{C}$	V_{BO}	min.	7500	V
Durchlaßspannung on-state voltage	$T_{vj} = T_{vj\text{ max}}, i_T = 1000\text{A}, V_D = 40\text{V}$	V_T	typ. max.	2,6 2,75	V V
Schleusenspannung threshold voltage	$T_{vj} = T_{vj\text{ max}}$	$V_{(TO)}$	typ. max.	1,19 1,26	V V
Ersatzwiderstand slope resistance	$T_{vj} = T_{vj\text{ max}}$	r_T	typ. max.	1,38 1,47	$\text{m}\Omega$ $\text{m}\Omega$
Durchlaßkennlinie on-state characteristic	$100\text{A} \leq i_F \leq 1200\text{A}$ $v_T = A + B \cdot i_T + C \cdot \ln(i_T + 1) + D \cdot \sqrt{i_T}$	$T_{vj} = T_{vj\text{ max}}$	typ. max.	A -3,59185 B 0,00234 C 1,21129 D -0,14343 A -3,77547 B 0,00247 C 1,27455 D -0,15035	
minimale Zündlichtleistung minimum gate trigger light power	$T_{vj} = 25^{\circ}\text{C}, V_D = 40\text{V}$	P_{LM}	max.	40	mW
Haltestrom holding current	$T_{vj} = 25^{\circ}\text{C}$	I_H	max.	100	mA
Einraststrom latching current	$T_{vj} = 25^{\circ}\text{C}, V_D = 40\text{V},$ $P_{LM} = 40\text{mW}, t_{rise} = 0,5\mu\text{s}$	I_L	max.	1	A
Rückwärts-Sperrstrom reverse blocking current	$T_{vj} = T_{vj\text{ max}}$ $V_R = V_{RRM}$	i_R	max.	200	mA
Zündverzögerung 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

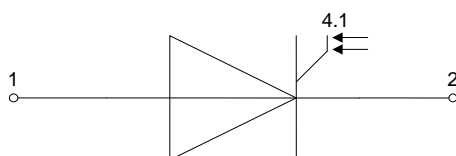
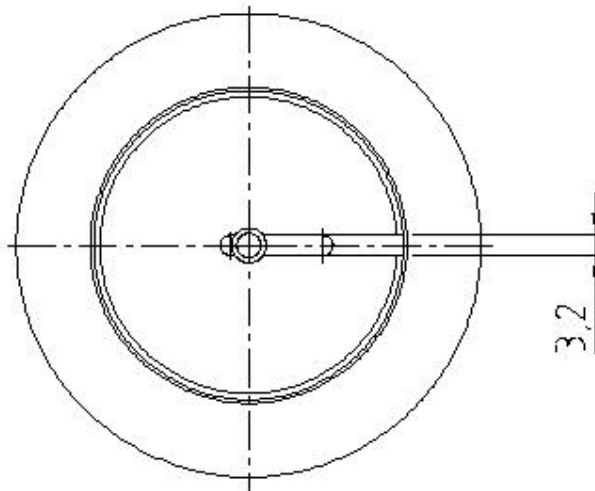
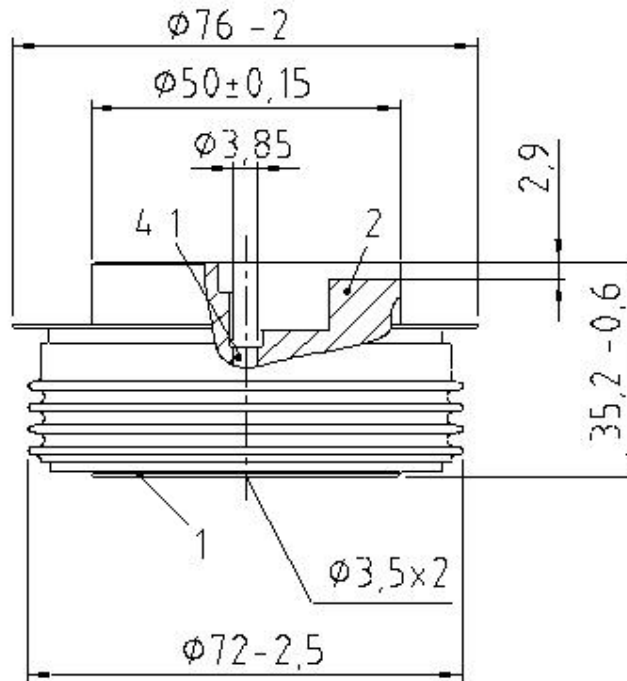
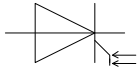
Freiwerdezeit circuit commutated turn-off time	$T_{vj} = T_{vj\max}$, $i_{TM} = I_{TAVM}$ $V_{RM} = 100\text{ V}$, $v_{DM} = 0,67 V_{DRM}$ $dv_D/dt = 20\text{ V}/\mu\text{s}$, $-di_T/dt = 10\text{ A}/\mu\text{s}$ 4.Kennbuchstabe / 4 th letter O	t_q	typ.	650	μs
Sperrverzögerungsladung recovered charge	$T_{vj} = T_{vj\max}$ $i_{TM} = I_{TAVM}$, $-di_T/dt = 10\text{ A}/\mu\text{s}$ $V_R = 0,5V_{RRM}$, $V_{RM} = 0,8V_{RRM}$	Q_r	max.	10	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.	300	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.	20	K/kW
			max.	19	K/kW
			max.	30,5	K/kW
			max.	50	K/kW
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	<u>Kühlfläche / cooling surface</u> beidseitig / two-sided einseitig / single-sided	R_{thCH}	max.	5	K/kW
			max.	10	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

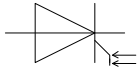
Gehäuse, siehe Anlage case, see annex				Seite 4 page 4	
Si-Element mit Druckkontakt Si-pellet with pressure contact					
Anpresskraft clamping force		F		15...24	kN
Gewicht weight		G	typ.	650	g
Kriechstrecke creepage distance				25	mm
Schwingfestigkeit vibration resistance	$f = 50\text{ Hz}$			50	m/s^2



1: Anode/anode

2: Kathode/cathode

4.1: Gate

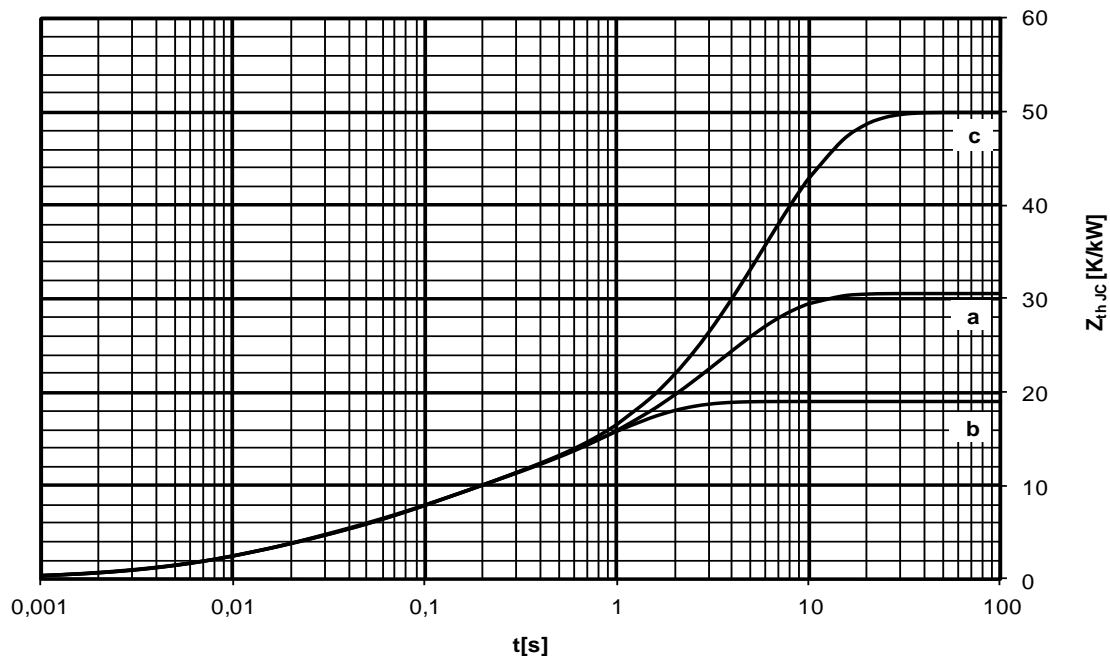


Analytische Elemente des transienten Wärmewiderstandes Z_{thJC} /
analytical elements of transient thermal impedance Z_{thJC}

	Pos. n	1	2	3	4	5	6	7
beidseitig two-sided	R_{thn} [K/kW]	10,48	2,43	3,04	2,72	0,33		
	τ_n [s]	0,84	0,132	0,062	0,0134	0,0019		
anodenseitig anode-sided	R_{thn} [K/kW]	19,17	2,32	2,8	3,66	2,55		
	τ_n [s]	3,5	0,45	0,154	0,061	0,01		
kathodenseitig cathode-sided	R_{thn} [K/kW]	39,6	1,06	4,87	2,37	2,1		
	τ_n [s]	5,82	0,45	0,126	0,037	0,009		

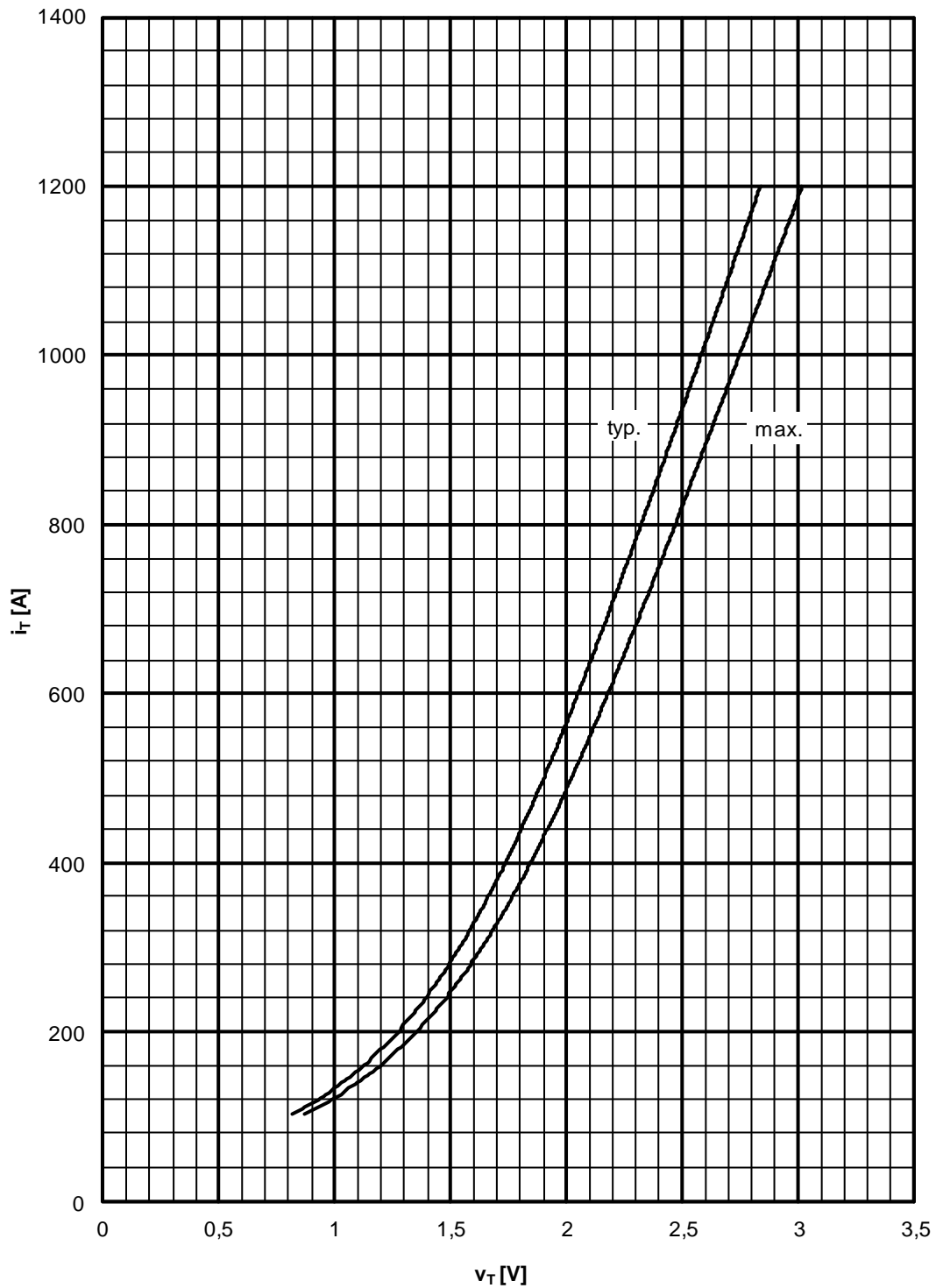
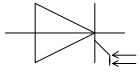
Analytische Funktion / analytical function:

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



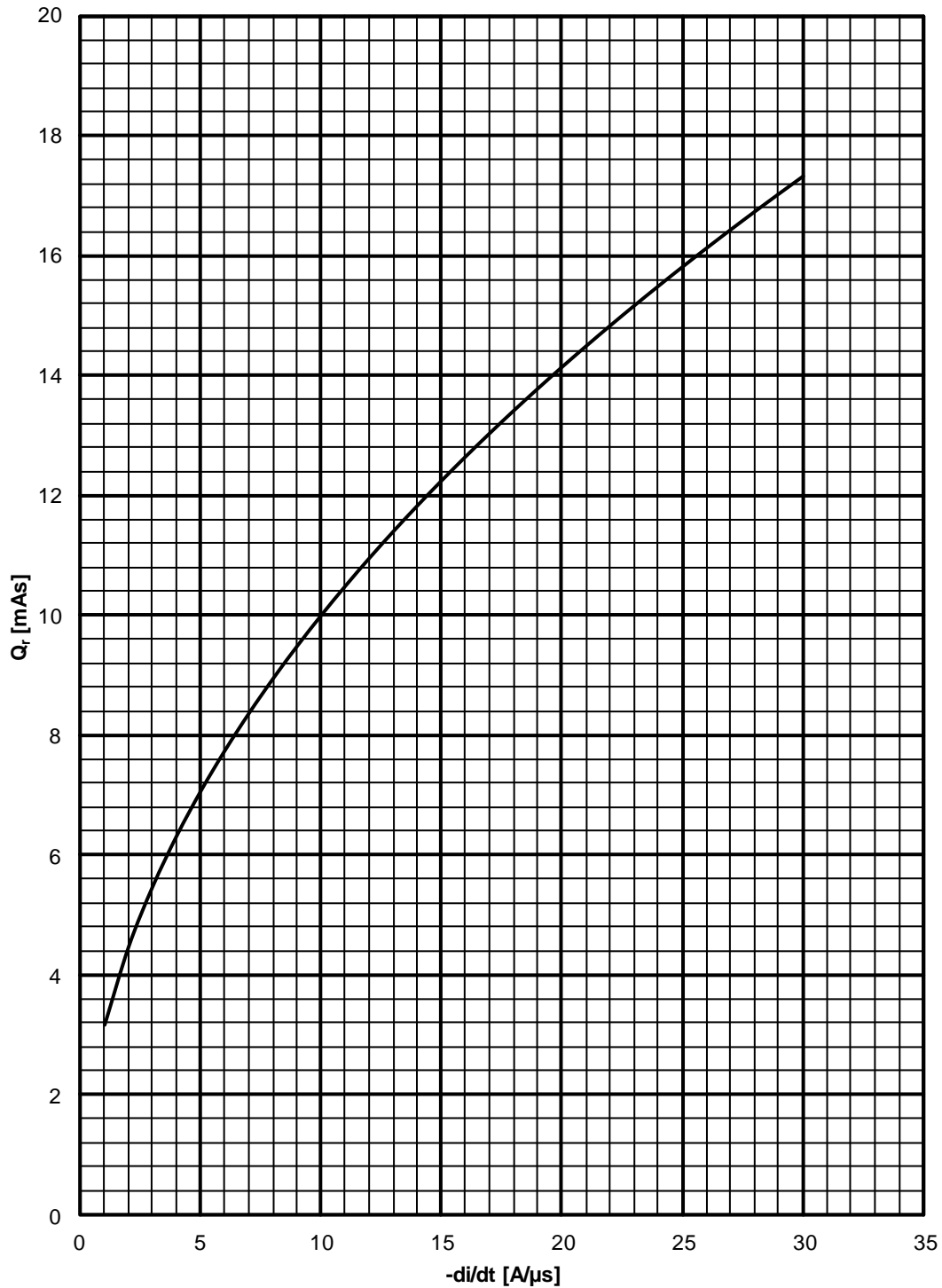
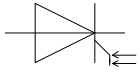
Transienter innerer Wärmewiderstand für DC/ transient thermal impedance $Z_{thJC} = f(t)$ for DC

- a : Anodenseitige Kühlung / anode-sided cooling
- b : Beidseitige Kühlung / two-sided cooling
- c : Kathodenseitige Kühlung / Cathode-sided cooling



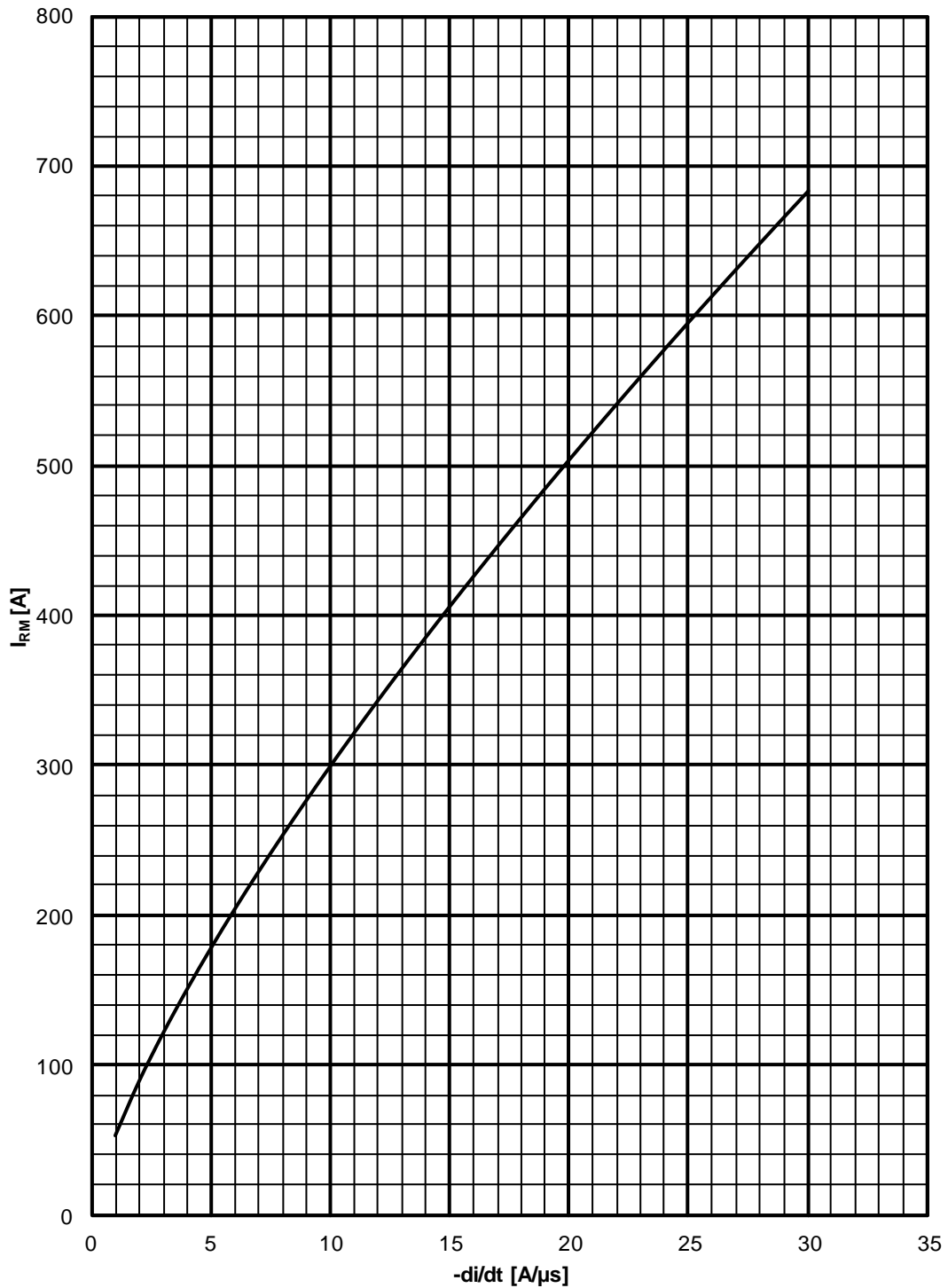
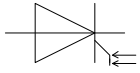
Grenzdurchlaßkennlinie / limiting on-state characteristic $i_T = f(v_T)$

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



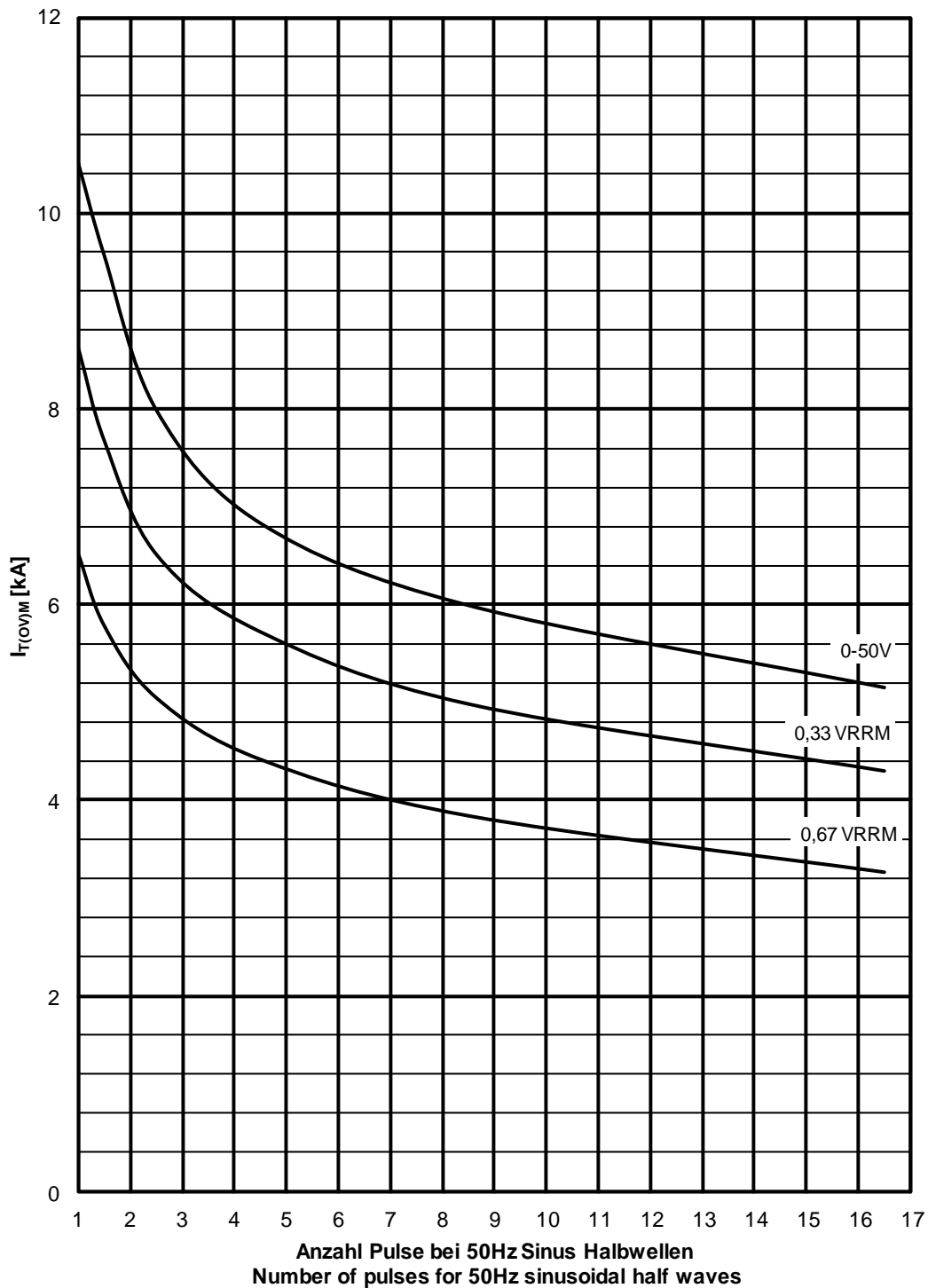
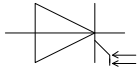
Sperrverzögerungsladung / recovered charge $Q_r = f(-di/dt)$

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



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}

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