

Technische Information / technical information



Infineon Technologies Bipolar
GmbH & Co. KG

**Netz-Thyristor
Phase Control Thyristor**

T1620N

Key Parameters

V_{DRM} / V_{RRM}	6500 V
I_{TAVM}	1613 A ($T_C=85^\circ\text{C}$)
I_{TSM}	32000 A
V_{TO}	1,35 V
r_T	0,43 m Ω
R_{thJC}	7,4 K/kW
Clamping Force	40...65 kN
Max. Diameter	111 mm
Contact Diameter	75 mm
Height	26,5 mm



For type designation please refer to actual shortform catalog

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

Merkmale

- Volle Sperrfähigkeit 50/60Hz über einen weiten Temperaturbereich
- Hohe Stoßstrombelastbarkeit
- Hermetisch dichtes Keramikgehäuse
- Hohe dv/dt Fähigkeit
- Hohe Einschaltfähigkeit di/dt

Features

- Full blocking 50/60Hz over a wide range temperature range
- High surge current capability
- Hermetically sealed ceramic package
- High dv/dt capability
- High di/dt turn on capability

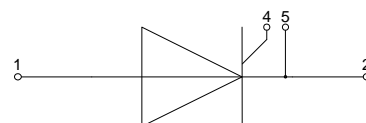
Typische Anwendungen

- Mittelspannungssanftanlasser
- Gleichrichter für Antriebsapplikationen
- Mittelspannungsumrichter

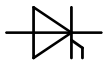
Typical Applications

- Medium Voltage Softstarter
- Rectifier for Drives Applications
- Medium voltage converters

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

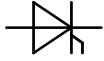
Höchstzulässige Werte / maximum rated values

Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltage	$T_{vj} = 25^{\circ}\text{C} \dots T_{vj\text{max}}$	$V_{\text{DRM}}, V_{\text{RRM}}$	6500	V
Durchlaßstrom-Grenzeffektivwert maximum RMS on-state current	$T_C = 85^{\circ}\text{C}$	I_{TRMSM}	2530	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}	1613 1973 2288	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}	32000 32000	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	5120 5120	$10^3\text{ A}^2\text{s}$ $10^3\text{ A}^2\text{s}$
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 60747-6 $f = 50\text{ Hz}, i_{\text{GM}} = 3\text{ A}, di_{\text{G}}/dt = 6\text{ A}/\mu\text{s}$	$(di_{\text{T}}/dt)_{\text{cr}}$	150	$\text{A}/\mu\text{s}$
Kritische Spannungssteilheit critical rate of rise of off-state voltage	$T_{vj} = T_{vj\text{max}}, V_{\text{D}} = 0,67 V_{\text{DRM}}$ 5. Kennbuchstabe / 5 th letter F	$(dv_{\text{D}}/dt)_{\text{cr}}$	1000	$\text{V}/\mu\text{s}$

Charakteristische Werte / characteristic values

Durchlaßspannung on-state voltage	$T_{vj} = T_{vj\text{max}}, i_{\text{T}} = 2000\text{ A}$ $T_{vj} = T_{vj\text{max}}, i_{\text{T}} = 4500\text{ A}$	V_{T}	max. 2,05 max. 3,30	V V
Schleusenspannung threshold voltage	$T_{vj} = T_{vj\text{max}}$	$V_{(\text{TO})}$	max. 1,35	V
Ersatzwiderstand slope resistance	$T_{vj} = T_{vj\text{max}}$	r_{T}	max. 0,43	m Ω
Durchlaßkennlinie on-state characteristic $v_{\text{T}} = A + B \cdot i_{\text{T}} + C \cdot \ln(i_{\text{T}} + 1) + D \cdot \sqrt{i_{\text{T}}}$	$400\text{ A} \leq i_{\text{F}} \leq 8100\text{ A}$ $T_{vj} = T_{vj\text{max}}$	max	A 1,585908 B 0,000244 C -0,113787 D 0,023413	
Zündstrom gate trigger current	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{ V}$	I_{GT}	max. 350	mA
Zündspannung gate trigger voltage	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{ V}$	V_{GT}	max. 2,5	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. 20 max. 10	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. 0,4	V
Haltestrom holding current	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{ V}$	I_{H}	max. 350	mA
Einraststrom latching current	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{ V}, R_{\text{GK}} \geq 10\ \Omega$ $i_{\text{GM}} = 3\text{ A}, di_{\text{G}}/dt = 6\text{ A}/\mu\text{s}, t_{\text{g}} = 20\ \mu\text{s}$	I_{L}	max. 3	A
Vorwärts- und Rückwärts-Sperrstrom forward off-state and reverse current	$T_{vj} = T_{vj\text{max}}$ $V_{\text{D}} = V_{\text{DRM}}, V_{\text{R}} = V_{\text{RRM}}$	$i_{\text{D}}, i_{\text{R}}$	max. 600	mA
Zündverzug gate controlled delay time	DIN IEC 60747-6 $T_{vj} = 25^{\circ}\text{C}, i_{\text{GM}} = 3\text{ A}, di_{\text{G}}/dt = 6\text{ A}/\mu\text{s}$	t_{gd}	max. 3	μs

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Elektrische Eigenschaften / electrical properties

Charakteristische Werte / characteristic values

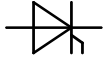
Freiwerdezeit circuit commutated turn-off time	$T_{vj} = T_{vj\max}$, $i_{TM} = I_{TAVM}$ $V_{RM} = 100\text{ V}$, $V_{DM} = 0,67 V_{DRM}$ $dv_D/dt = 20\text{ V}/\mu\text{s}$, $-di_T/dt = 10\text{ A}/\mu\text{s}$ 4. Kennbuchstabe / 4 th letter O	t_q	typ.	1000	μs
Sperrverzögerungsladung recovered charge	$T_{vj} = T_{vj\max}$, $i_{TM} = 1000\text{ A}$, $-di_T/dt = 10\text{ A}/\mu\text{s}$, $V_R = 100\text{ V}$	Q_r	max.	6,8	mAs
Rückstromspitze peak reverse recovery current	$T_{vj} = T_{vj\max}$, $i_{TM} = 1000\text{ A}$, $-di_T/dt = 10\text{ A}/\mu\text{s}$, $V_R = 100\text{ V}$	I_{RM}	max.	265	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, $\theta = 180^\circ\text{sin}$ Anode / anode, DC Kathode / cathode, $\theta = 180^\circ\text{sin}$ Kathode / cathode, DC	R_{thJC}	max.	8,1	K/kW
			max.	7,4	K/kW
			max.	13,9	K/kW
			max.	13,2	K/kW
			max.	17,6	K/kW
			max.	16,9	K/kW
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	<u>Kühlfläche / cooling surface</u> beidseitig / two-sided einseitig / single-sided	R_{thCH}	max.	2,5	K/kW
			max.	5,0	K/kW
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj\max}$		125	$^\circ\text{C}$
Betriebstemperatur operating temperature		$T_{c\text{op}}$		-40...+125	$^\circ\text{C}$
Lagertemperatur storage temperature		T_{stg}		-40...+150	$^\circ\text{C}$

Mechanische Eigenschaften / mechanical properties

Gehäuse, siehe Anlage case, see annex				Seite 3 page 3	
Si-Element mit Druckkontakt Si-pellet with pressure contact					
Anpresskraft clamping force		F		40...65	kN
Steueranschlüsse control terminals	Gate (flat) Gate (round, based on AMP 60598) Kathode / Cathode			A 4,8x0,5 $\varnothing 1,5$ A 2,8x0,5	mm mm mm
Gewicht weight		G	typ.	1200	G
Kriechstrecke creepage distance				25	mm
Schwingfestigkeit vibration resistance	f = 50 Hz			50	m/s ²



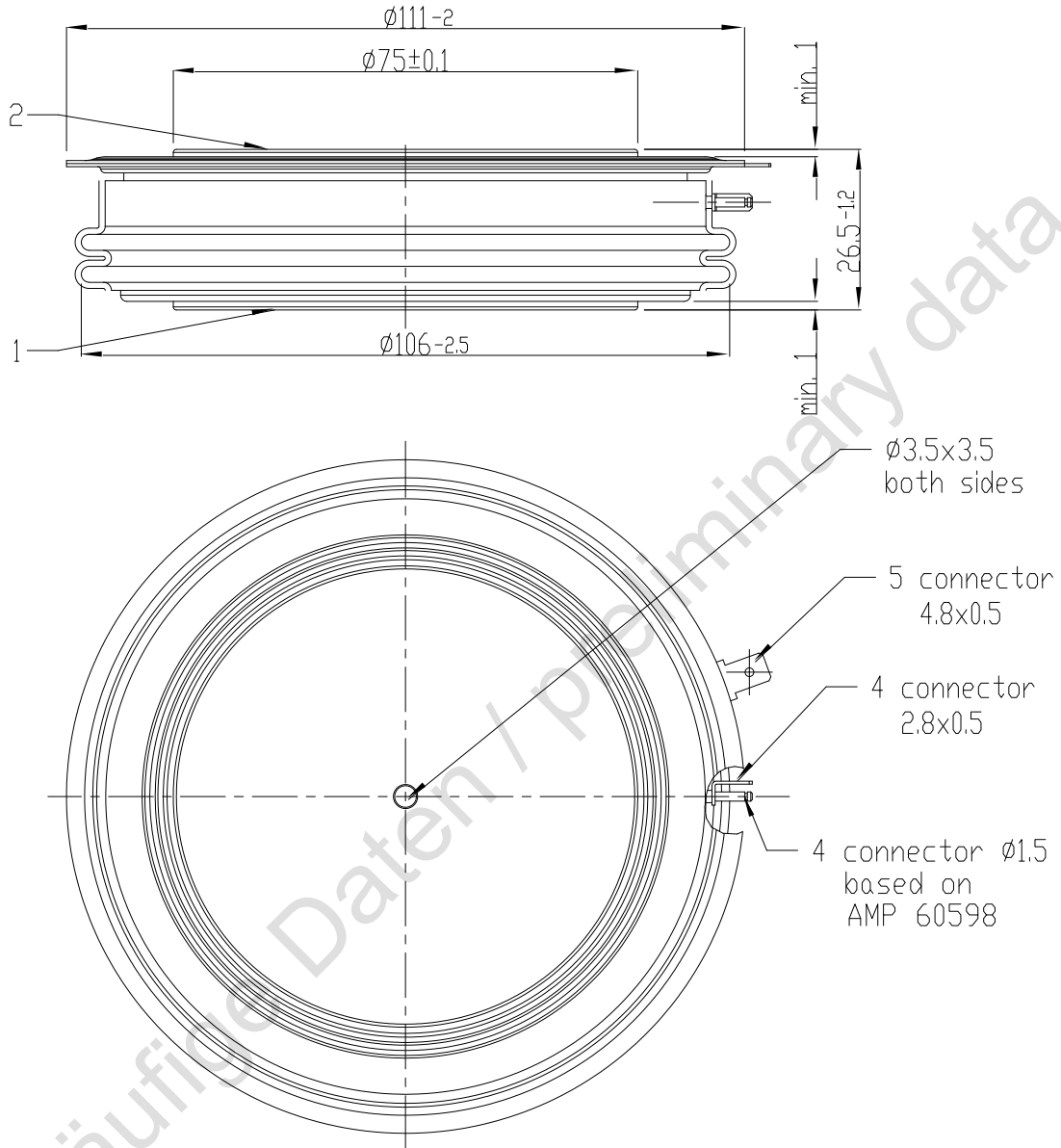
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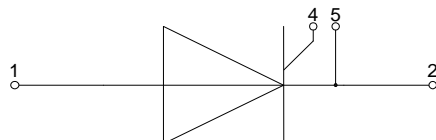
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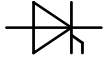


strike distance: 15mm
creepage distance: 25mm

overall height based
on contact pressure



- 1: Anode/anode
- 2: Kathode/cathode
- 4: Gate
- 5: Hilfskathode/
cathode (control terminal)

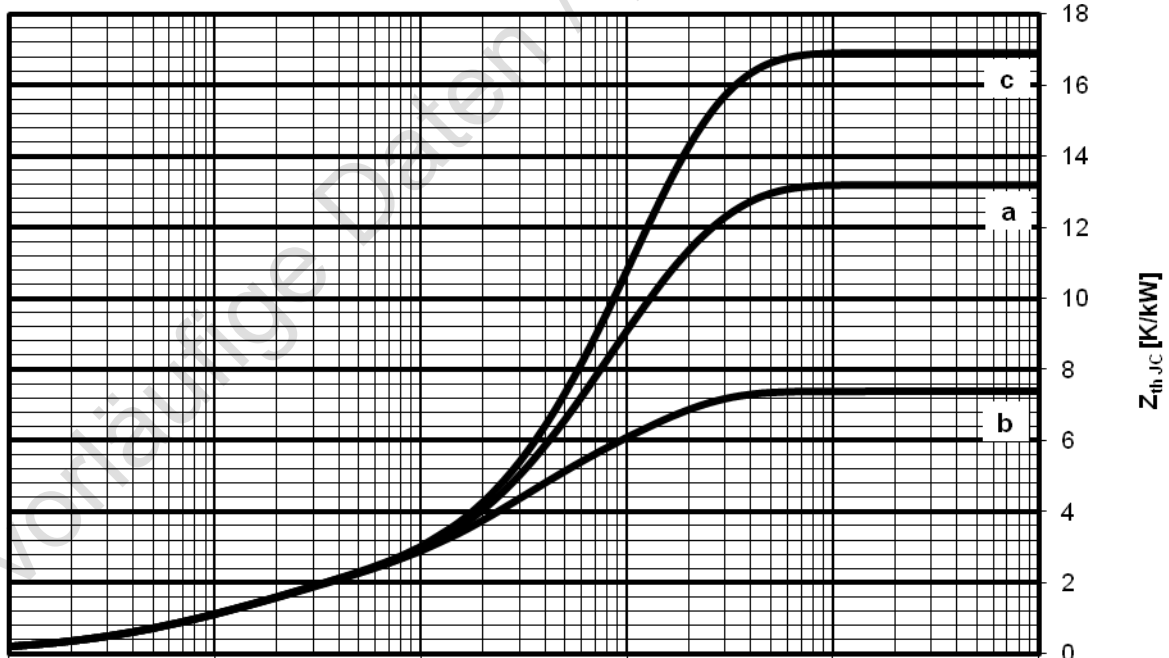


Analytische Elemente des transienten Wärmewiderstandes Z_{thJC} /
analytical elements of transient thermal impedance Z_{thJC}

	Pos. n	1	2	3	4	5	6	7
beidseitig two-sided	R_{thn} [K/kW]	3,18	2,57	1,23	0,39	0,03		
	τ_n [s]	1,0914	0,2068	0,0152	0,00392	0,000055		
anodenseitig anode-sided	R_{thn} [K/kW]	6,58	4,97	1,23	0,39	0,03		
	τ_n [s]	1,4914	0,5168	0,0152	0,00392	0,000055		
kathodenseitig cathode-sided	R_{thn} [K/kW]	7,23	8,02	1,23	0,39	0,03		
	τ_n [s]	1,4914	0,8268	0,0152	0,00392	0,000055		

Analytische Funktion / analytical function:

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

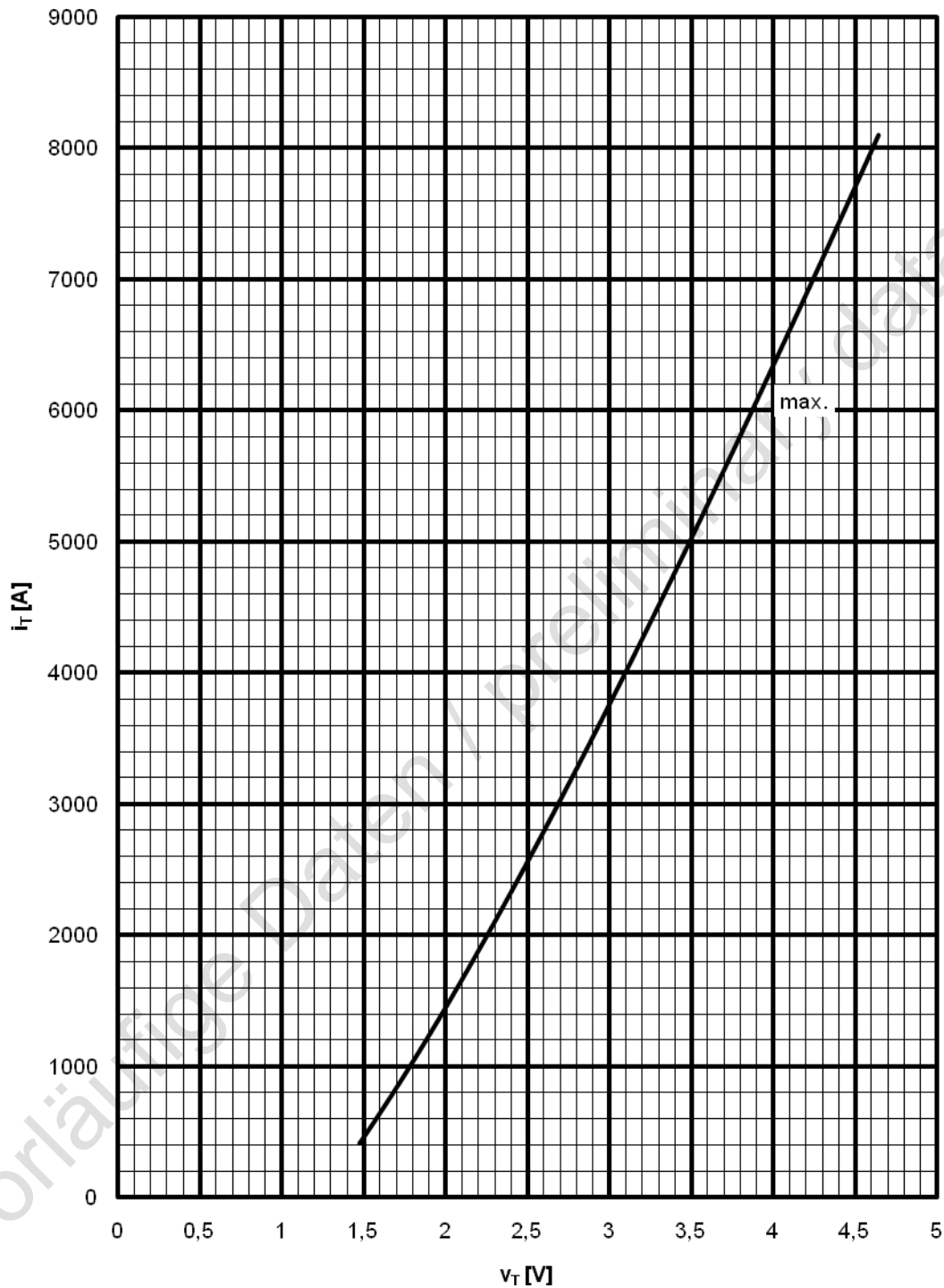
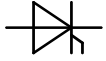


Transienter innerer Wärmewiderstand für DC / transient thermal impedance $Z_{thJC} = f(t)$ for DC

a : Anodenseitige Kühlung / anode-sided cooling

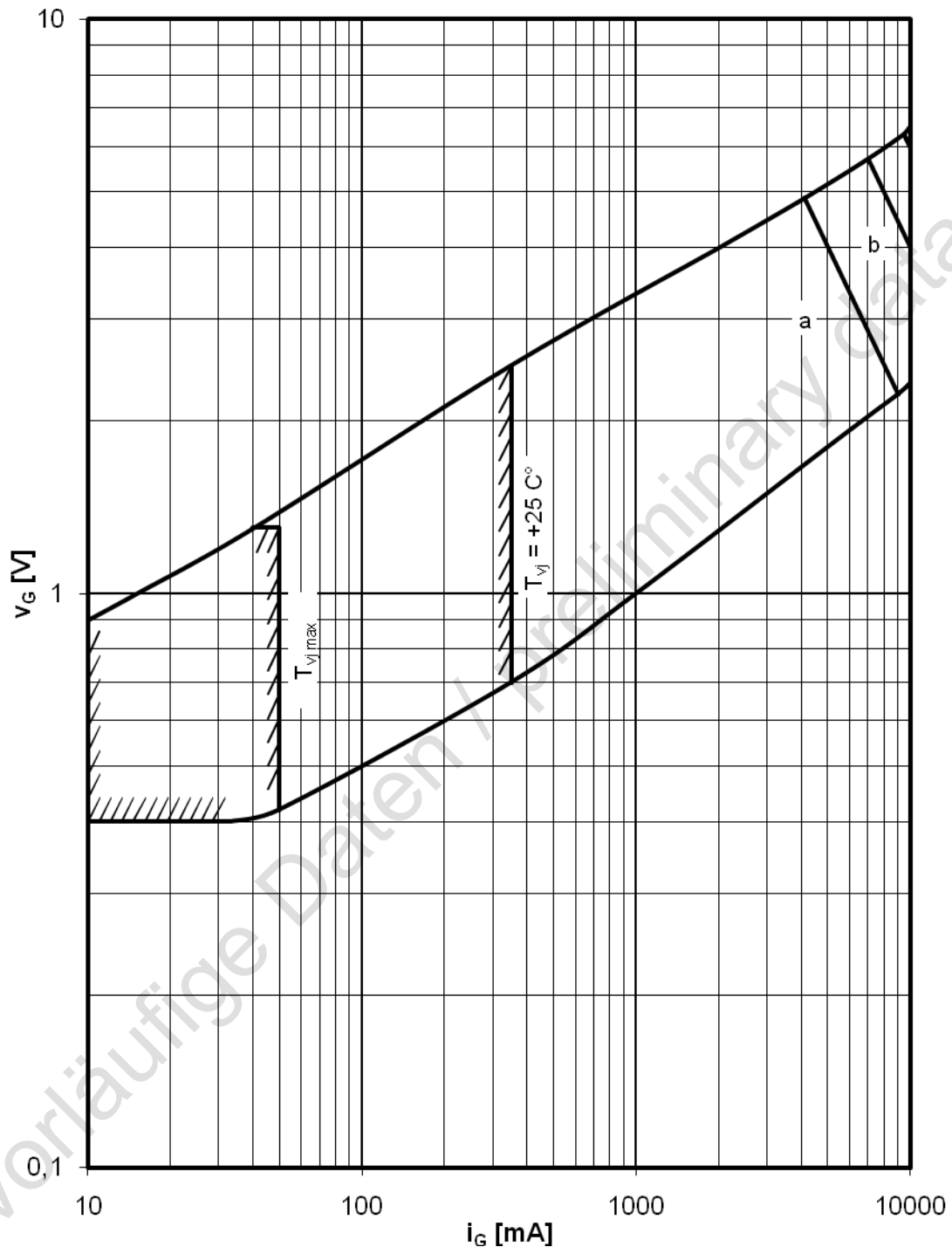
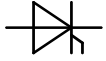
b : Beidseitige Kühlung / two-sided cooling

c : Kathodenseitige Kühlung / cathode-sided cooling



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

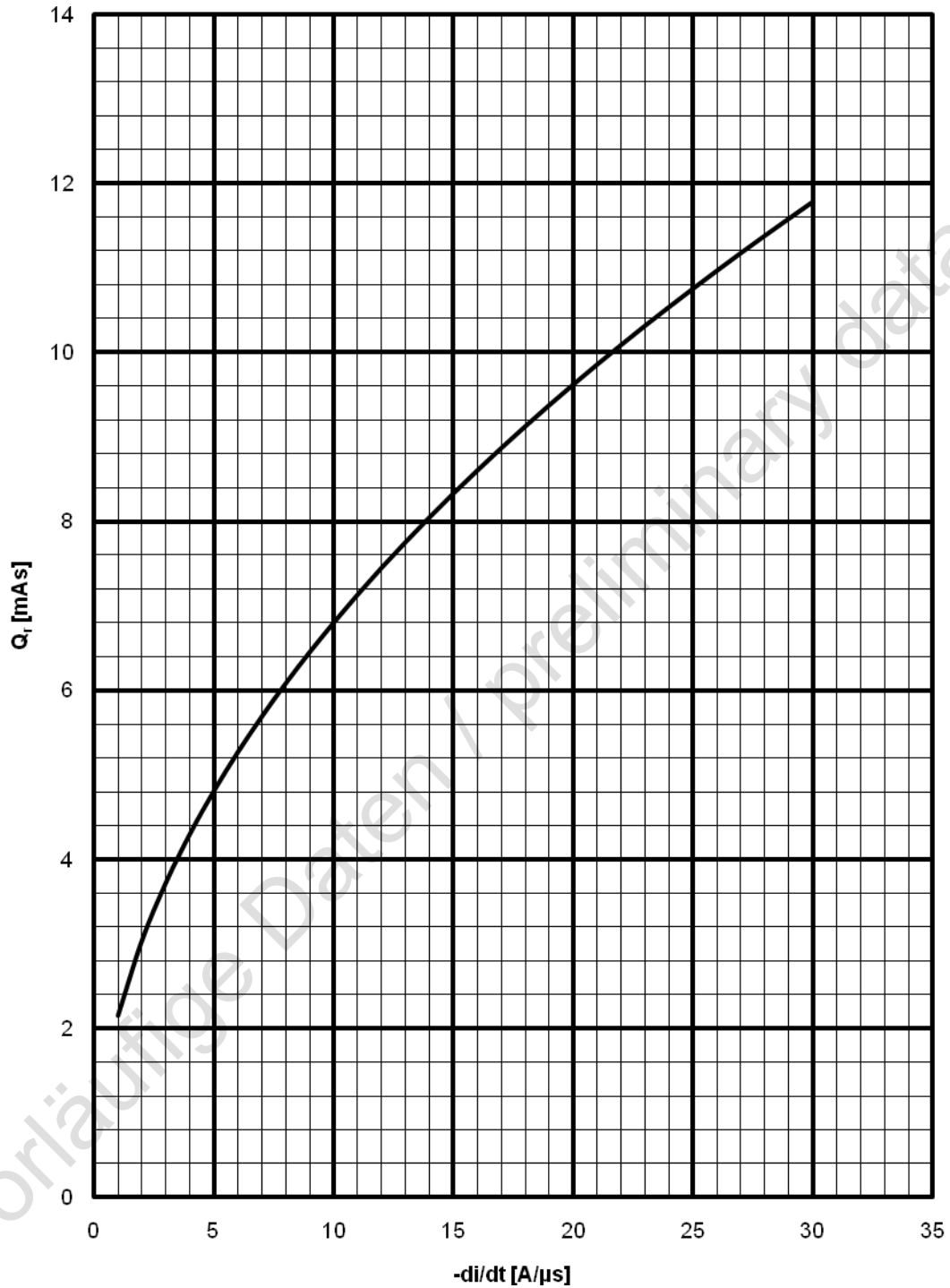
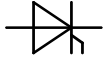
$$T_{vj} = T_{vj \text{ max}}$$



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

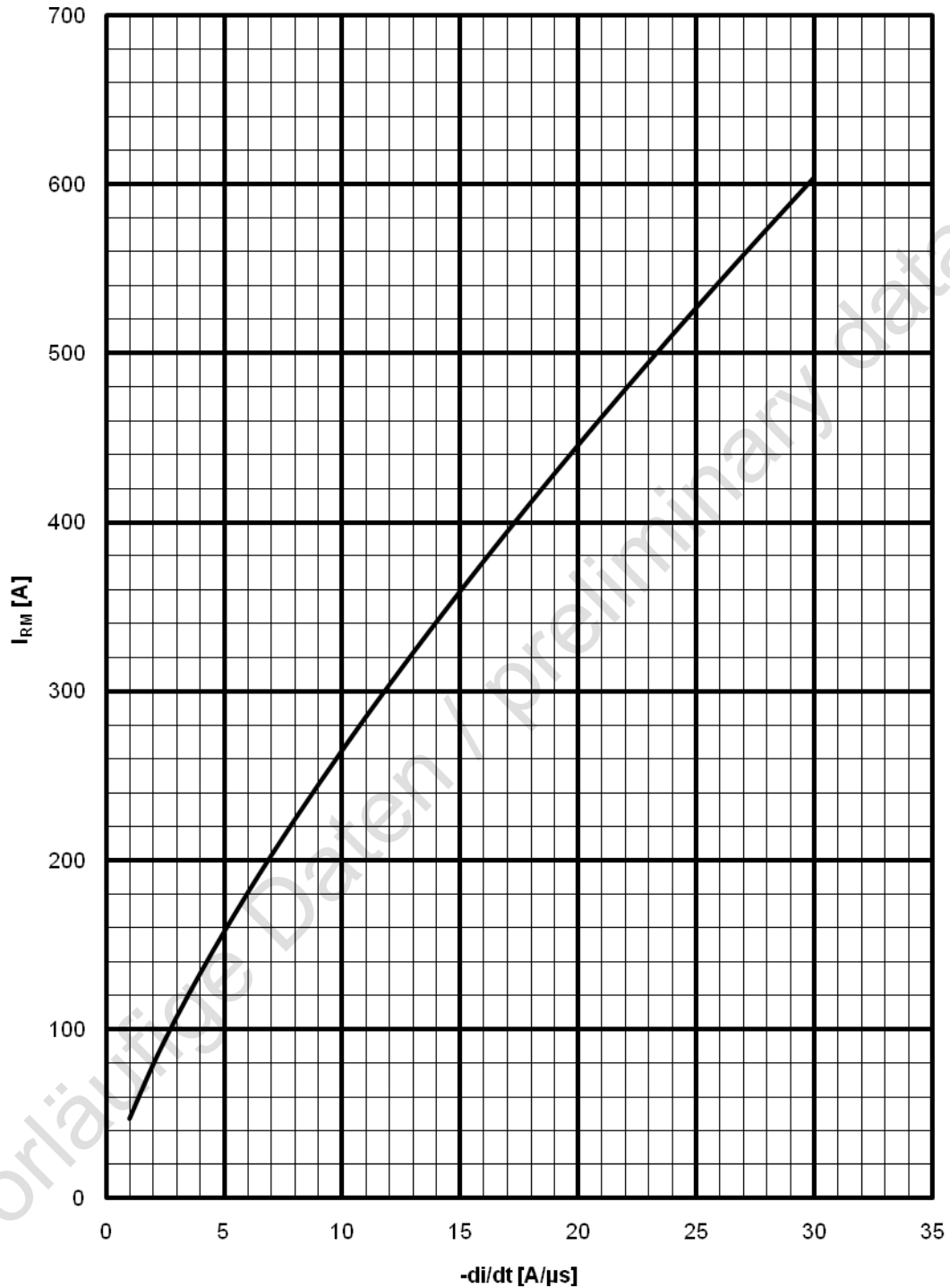
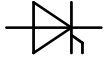
Höchstzulässige Spitzensteuerverlustleistung / maximum rated peak gate power dissipation $P_{GM} = f(t_g)$:

a - 20 W/10ms b - 40 W/1ms



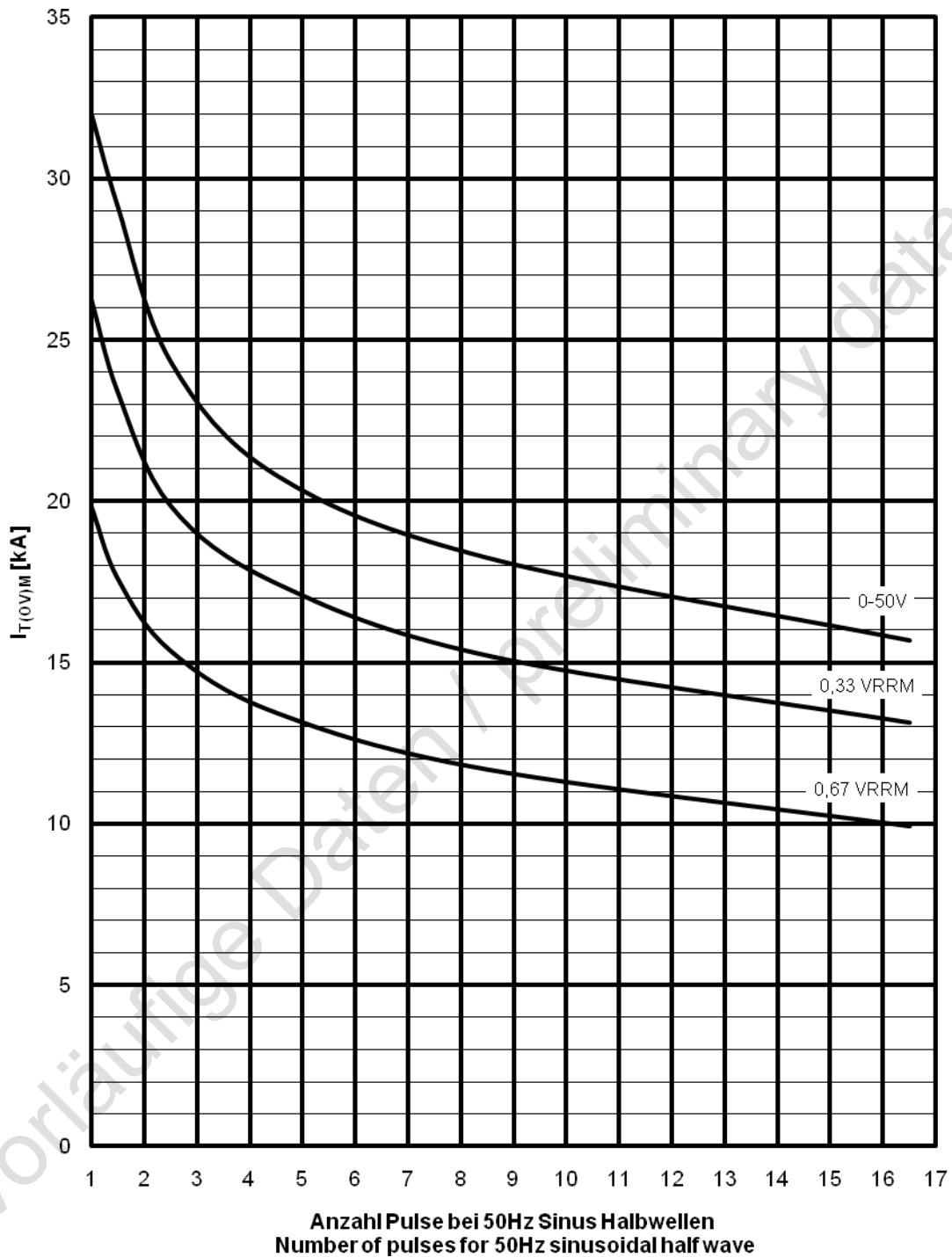
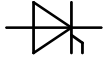
Sperrverzögerungsladung / recovered charge $Q_r = f(-di/dt)$

$T_{vj} = T_{vjmax}$, $I_{TM} = 1000$ A, $V_R = 100$ V



Rückstromspitze / peak reverse recovery current $I_{RM} = f(-di/dt)$

$T_{vj} = T_{vjmax}$, $V_R = 100$ V, $i_{TM} = 1000$ A



Typische Abhängigkeit des Grenzstromes $I_{T(OV)M}$ von der Anzahl für eine Folge von Sinus Halwellen 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}

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