

## Technische Information / technical information



**Sanftanlauf-Modul  
Soft Starter Module**

# sTT1900N16P55

Infineon Technologies Bipolar  
GmbH & Co. KG

### Key Parameters

$V_{DRM} / V_{RRM}$	1600 V
$I_{\text{overload}(21s)}$	1900 A
$I_{TSM}$	17000 A
$V_{T0}$	0,9 V
$r_T$	0,28 m $\Omega$
$R_{\text{thJA}(21s)}$	0,084 K/W



### Merkmale

- Druckkontakt-Technologie für hohe Zuverlässigkeit
- Advanced Medium Power Technology (AMPT)
- Integrierter optimierter Kühlkörper

### Features

- Pressure contact technology for high reliability
- Advanced Medium Power Technology (AMPT)
- Integrated optimized heatsink

### Typische Anwendungen

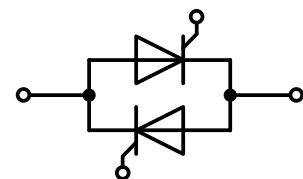
- Sanftanlasser
- Bypass-Schalter
- Leistungssteller
- Statischer Umschalter

### Typical Applications

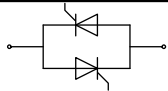
- Soft starter
- Bypass switch
- Power controller
- Static switch



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



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### Elektrische Eigenschaften / Electrical properties

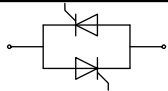
Höchstzulässige Werte / Maximum rated values

Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltages	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{ max}}$	$V_{\text{DRM}}, V_{\text{RRM}}$	1600	V
Vorwärts-Stoßspitzensperrspannung non-repetitive peak forward off-state voltage	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{ max}}$	$V_{\text{DSM}}$	1600	V
Rückwärts-Stoßspitzensperrspannung non-repetitive peak reverse voltage	$T_{vj} = +25^{\circ}\text{C} \dots T_{vj\text{ max}}$	$V_{\text{RSM}}$	1700	V
Überlaststrom overload current	W1C; $\sin.180^{\circ}; t_{\text{overload}} = 21\text{s}$ $T_{vj} = 155^{\circ}\text{C}; T_{vj\text{ start}} = 40^{\circ}\text{C}$	$I_{\text{overload}}$	1900	A
Stoßstrom-Grenzwert surge current	$T_{vj} = 25^{\circ}\text{C}, t_p = 10\text{ms}$ $T_{vj} = T_{vj\text{ max}}, t_p = 10\text{ms}$	$I_{\text{TSM}}$	17000 14000	A A
Grenzlastintegral $I^2t$ -value	$T_{vj} = 25^{\circ}\text{C}, t_p = 10\text{ms}$ $T_{vj} = T_{vj\text{ max}}, t_p = 10\text{ms}$	$I^2t$	1445000 980000	$\text{A}^2\text{s}$ $\text{A}^2\text{s}$
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 747-6 $f = 50\text{Hz}, i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$	$(di_{\text{T}}/dt)_{\text{cr}}$	250	$\text{A}/\mu\text{s}$
Kritische Spannungssteilheit critical rate of rise of off-state voltage	$T_{vj} = T_{vj\text{ max}}, v_{\text{D}} = 0,67 V_{\text{DRM}}$ 6.Kennbuchstabe / 6 <sup>th</sup> letter F	$(dv_{\text{D}}/dt)_{\text{cr}}$	1000	$\text{V}/\mu\text{s}$

### Charakteristische Werte / Characteristic values

Durchlaßspannung on-state voltage	$T_{vj} = T_{vj\text{ max}}, i_{\text{T}} = 1500\text{ A}$	$v_{\text{T}}$	max. 1,32	V
Schleusenspannung threshold voltage	$T_{vj} = T_{vj\text{ max}}$	$V_{(\text{TO})}$	max. 0,9	V
Ersatzwiderstand slope resistance	$T_{vj} = T_{vj\text{ max}}$	$r_{\text{T}}$	max. 0,28	$\text{m}\Omega$
Zündstrom gate trigger current	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 12\text{V}$	$i_{\text{GT}}$	max. 200	mA
Zündspannung gate trigger voltage	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 12\text{V}$	$V_{\text{GT}}$	max. 2	V
Nicht zündender Steuerstrom gate non-trigger current	$T_{vj} = T_{vj\text{ max}}, v_{\text{D}} = 12\text{V}$ $T_{vj} = T_{vj\text{ max}}, v_{\text{D}} = 0,5 V_{\text{DRM}}$	$i_{\text{GD}}$	max. 10 max. 5	mA mA
Nicht zündende Steuerspannung gate non-trigger voltage	$T_{vj} = T_{vj\text{ max}}, v_{\text{D}} = 0,5 V_{\text{DRM}}$	$V_{\text{GD}}$	max. 0,2	V
Haltestrom holding current	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 12\text{V}, R_{\text{A}} = 1\Omega$	$I_{\text{H}}$	max. 300	mA
Einraststrom latching current	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 12\text{V}, R_{\text{GK}} \geq 10\Omega$ $i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}, t_{\text{g}} = 20\mu\text{s}$	$I_{\text{L}}$	max. 1200	mA
Vorwärts- und Rückwärts-Sperrstrom W1C forward off-state and reverse current W1C	$T_{vj} = T_{vj\text{ max}}$ $v_{\text{D}} = V_{\text{DRM}}, v_{\text{R}} = V_{\text{RRM}}$	$i_{\text{D}} + i_{\text{R}}$	max. 130	mA
Zündverzug gate controlled delay time	DIN IEC 747-6 $T_{vj} = 25^{\circ}\text{C}, i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$	$t_{\text{gd}}$	max. 3	$\mu\text{s}$

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### Elektrische Eigenschaften / Electrical properties Charakteristische Werte / Characteristic values

Freiwerdezeit circuit commutated turn-off time	$T_{vj} = T_{vj\max}$ , $i_{TM} = I_{TAVM}$ $V_{RM} = 100\text{ V}$ , $v_{DM} = 0,67\text{ V}_{DRM}$ $dv_D/dt = 20\text{ V}/\mu\text{s}$ , $-di_T/dt = 10\text{ A}/\mu\text{s}$ 5.Kennbuchstabe / 5 <sup>th</sup> letter O	$t_q$	typ.	250	$\mu\text{s}$
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### Thermische Eigenschaften / Thermal properties

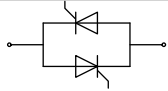
Innerer Wärmewiderstand, Sperrschicht zum Referenzpunkt thermal resistance, junction to reference point	pro Modul / per Module, DC pro Zweig / per arm, DC pro Modul / per Module, $\Theta = 180^\circ\text{ sin}$ pro Zweig / per arm, $\Theta = 180^\circ\text{ sin}$	$R_{thJR(21s)}^{1)}$	max.	0,029	K/W
			max.	0,058	K/W
			max.	0,031	K/W
			max.	0,061	K/W
Innerer Wärmewiderstand, Sperrschicht zur Umgebung thermal resistance, junction to ambient	pro Modul / per Module, DC pro Zweig / per arm, DC pro Modul / per Module, $\Theta = 180^\circ\text{ sin}$ pro Zweig / per arm, $\Theta = 180^\circ\text{ sin}$	$R_{thJA(21s)}$	max.	0,042	K/W
			max.	0,084	K/W
			max.	0,044	K/W
			max.	0,087	K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj\max}$		125 <sup>2)</sup>	$^\circ\text{C}$
Betriebstemperatur operating temperature		$T_{c\text{ op}}$		-40...+125 <sup>2)</sup>	$^\circ\text{C}$
Lagertemperatur storage temperature		$T_{stg}$		-40...+130	$^\circ\text{C}$

### Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see annex				Seite 4 page 4	
Si-Element mit Druckkontakt Si-pellet with pressure contact					
Anzugsdrehmoment für elektrische Anschlüsse terminal connection torque	Toleranz / tolerance $\pm 10\%$	M6		10	Nm
Steueranschlüsse control terminals	DIN 46 244			A 2,8 x 0,8	
Gewicht weight		G	typ.	1300	g
Kriechstrecke creepage distance				6,3	mm
Schwingfestigkeit vibration resistance	$f = 50\text{ Hz}$			50	$\text{m/s}^2$

Die Werte der obigen Tabellen sind immer bezogen auf das Einzelelement, falls nicht anders erwähnt.  
The values of the above tables are always based on the single element, if not otherwise mentioned.

- 1) Referenzpunkt für  $R_{thJR}$  befindet sich stirnseitig an den Modulen (siehe Zeichnung)  
Reference point for  $R_{thJR}$  is located front of the modules (see drawing)
- 2) Die  $T_{vj\max}$  bis  $155^\circ\text{C}$  ist für eine maximale Überlastzeit von 21s erlaubt ( $T_{vj\max}$  Kurzzeit)  
The  $T_{vj\max}$  up to  $155^\circ\text{C}$  is allowed for a maximum time of overload of 21s ( $T_{vj\max}$  short time)



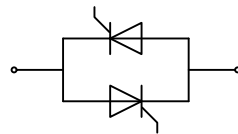
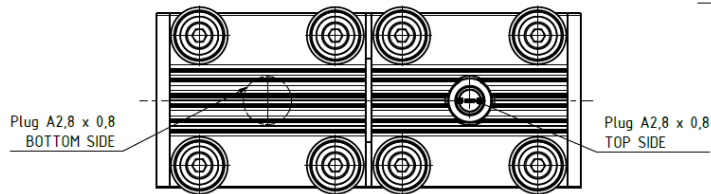
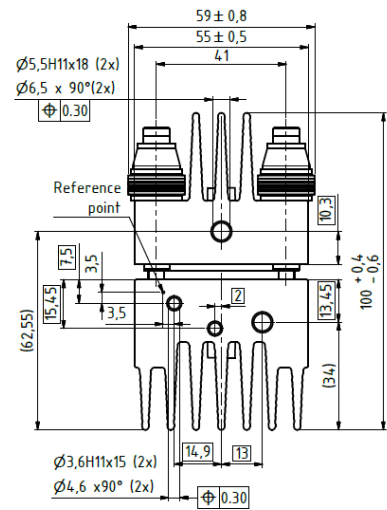
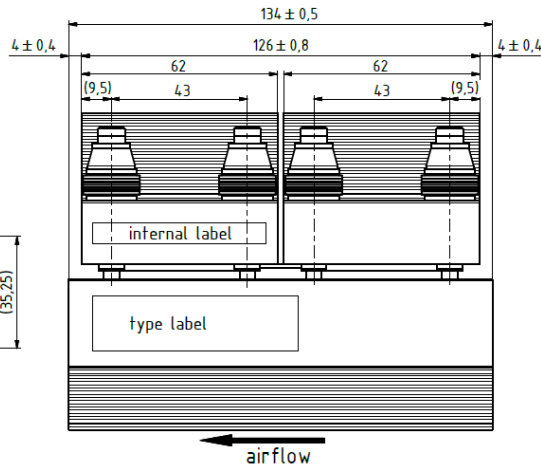
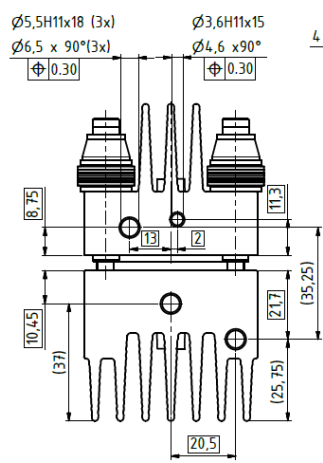
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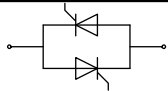
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**Analytische Elemente des transienten Wärmewiderstandes  $Z_{thJA}$  für DC und  $v_{Luft} = 3,6\text{m/s}$**   
**Analytical elements of transient thermal impedance  $Z_{thJA}$  for DC and  $v_{Luft} = 3,6\text{m/s}$**

Pos. n	1	2	3	4	5	6	7
$R_{thn}$ [K/W]	0,275	0,18	0,027	0,0135	0,004		
$\tau_n$ [s]	400	140	1,8	0,15	0,004		

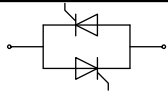
Analytische Funktion / Analytical function:

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

**Erhöhung des  $Z_{th DC}$  bei Sinusströmen mit unterschiedlichen Stromflusswinkeln  $\Theta$**   
**Rise of  $Z_{th DC}$  for sinewave current with different current conduction angles  $\Theta$**   
 **$\Delta Z_{th \Theta \sin}$**

	$\Theta = 180^\circ$	$\Theta = 120^\circ$	$\Theta = 90^\circ$	$\Theta = 60^\circ$	$\Theta = 30^\circ$
$\Delta Z_{th \Theta \sin}$ [K/W]	0,003206	0,0045	0,0062	0,0085	0,0123

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



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

Pos. n	1	2	3	4	5	6	7
$R_{thn}$ [K/W]	0,0105	0,018	0,02	0,0135	0,004		
$\tau_n$ [s]	60	5	1,5	0,15	0,004		

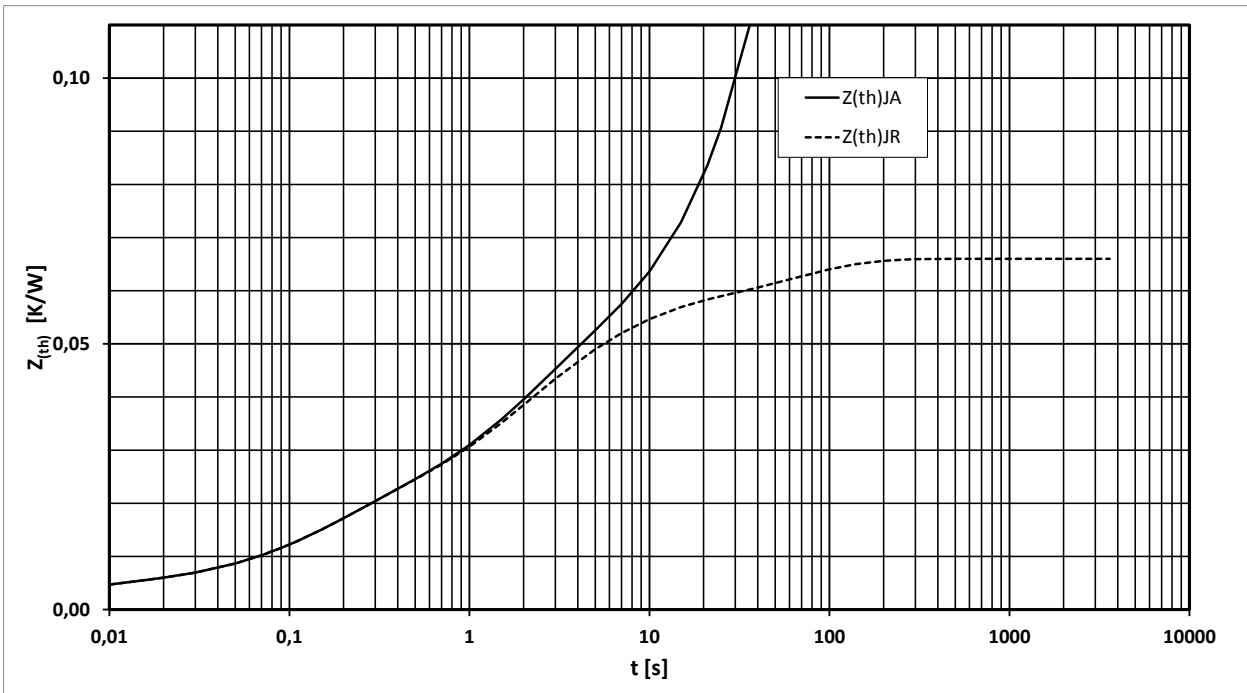
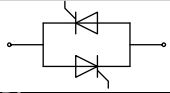
Analytische Funktion / Analytical function:

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

**Erhöhung des  $Z_{th DC}$  bei Sinusströmen mit unterschiedlichen Stromflusswinkeln  $\Theta$**   
**Rise of  $Z_{th DC}$  for sinewave current with different current conduction angles  $\Theta$**   
 **$\Delta Z_{th \Theta \sin}$**

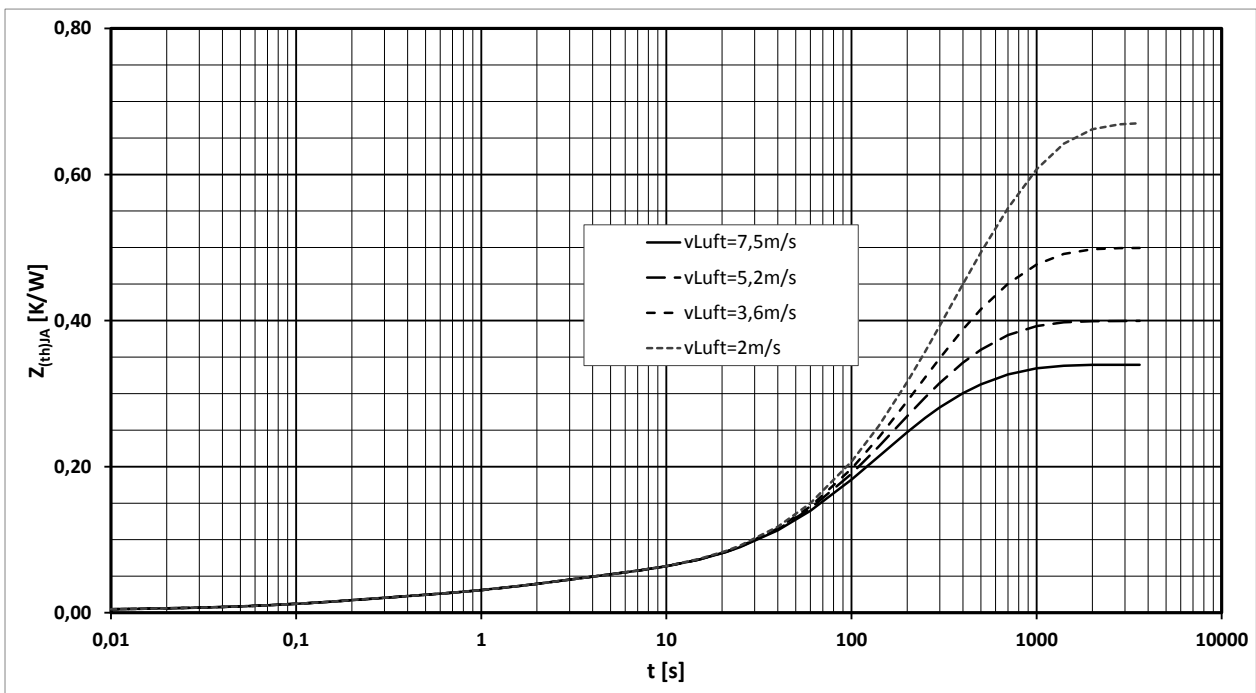
	$\Theta = 180^\circ$	$\Theta = 120^\circ$	$\Theta = 90^\circ$	$\Theta = 60^\circ$	$\Theta = 30^\circ$
$\Delta Z_{th \Theta \sin}$ [K/W]	0,003205	0,0045	0,0062	0,0086	0,0122

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



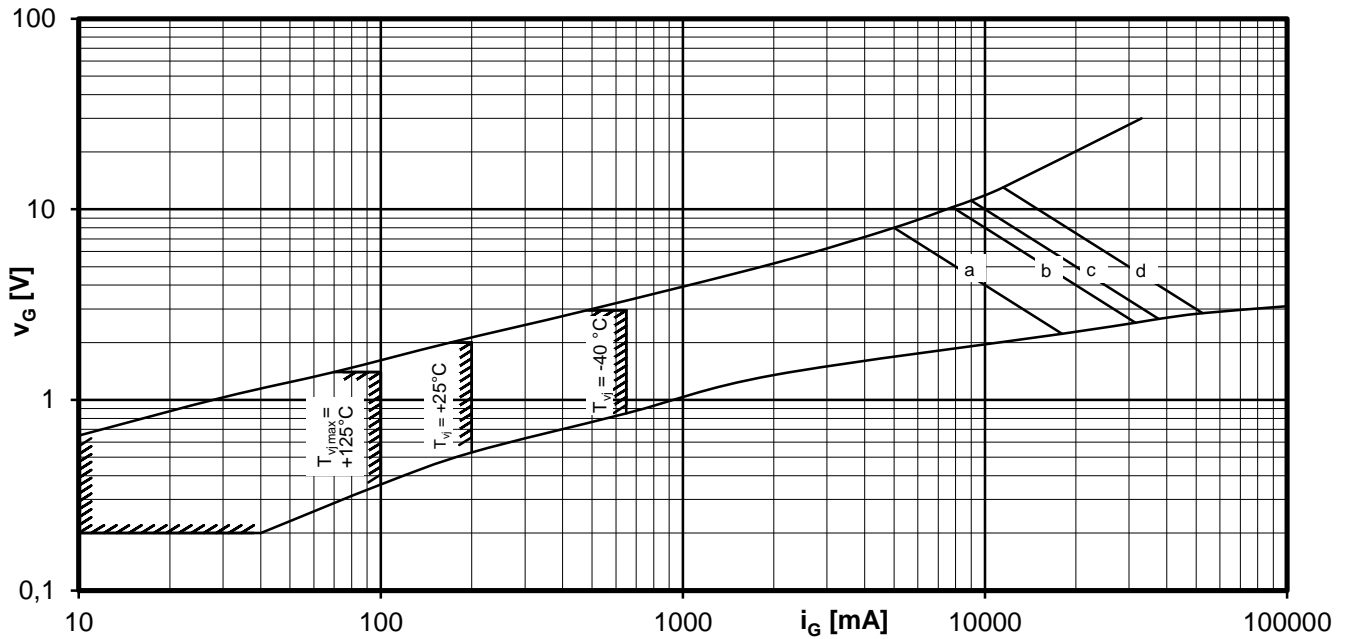
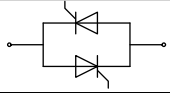
Transienter Wärmewiderstand je Zweig / Transient thermal impedance per arm  
 $Z_{thJR} = f(t)$ ;  $Z_{thJA} = f(t)$

Parameter: Stromflußwinkel  $\Theta$  / Current conduction angle  $\Theta$



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

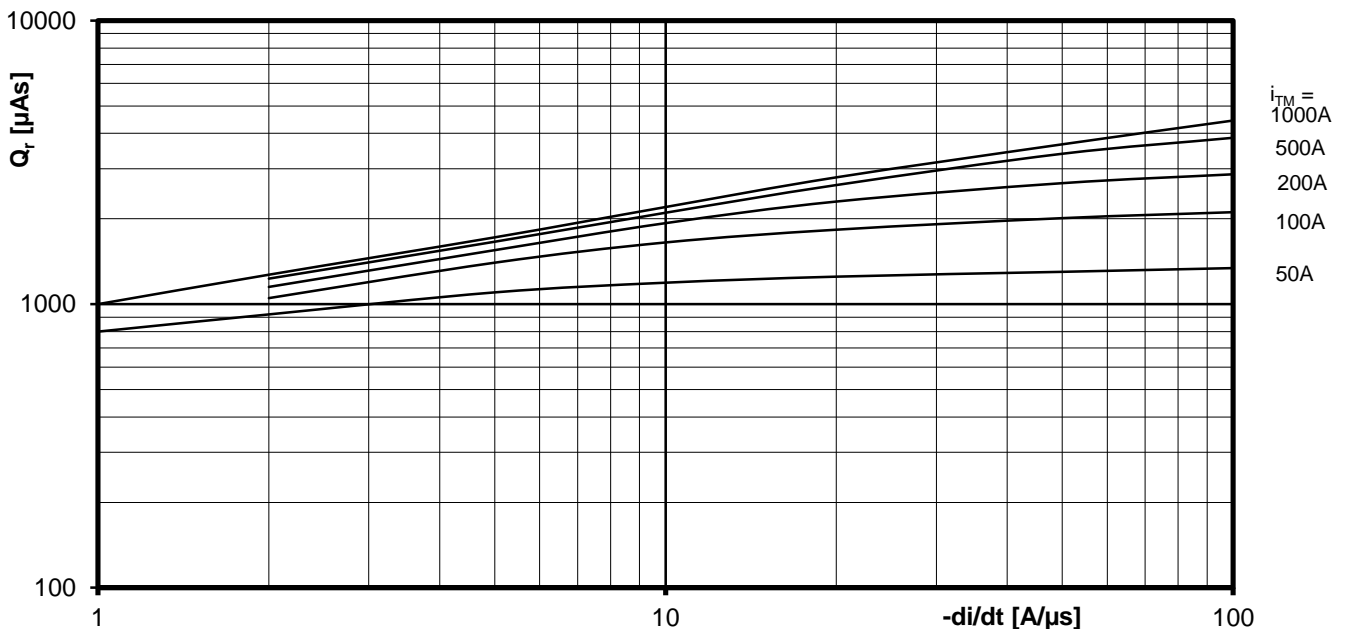
Parameter: Stromflußwinkel  $\Theta$  / Current conduction angle  $\Theta$



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

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

a - 40W/10ms b - 80W/1ms c - 100W/0,5ms d - 150W/0,1ms



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

$$T_{vj} = T_{vjmax}, V_R = 100V$$

Parameter: Durchlaßstrom / On-state current  $i_{TM}$