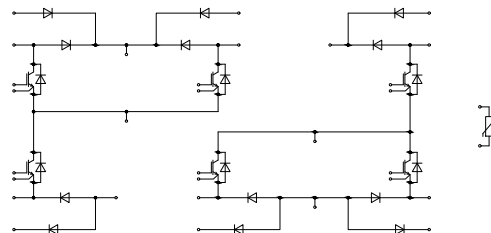
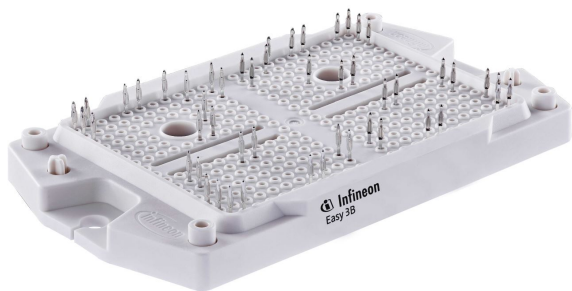


EasyPACK™ Modul mit TRENCHSTOP™ IGBT7 und CoolSiC™ Schottky Diode und PressFIT / NTC
 EasyPACK™ module with TRENCHSTOP™ IGBT7 and CoolSiC™ Schottky diode and PressFIT / NTC



$V_{CES} = 950V$
 $I_{C\ nom} = 100A / I_{CRM} = 200A$

Potentielle Anwendungen

- 3-Level-Applikationen
- Solar Anwendungen
- USV-Systeme

Potential Applications

- 3-level-applications
- Solar applications
- UPS systems

Elektrische Eigenschaften

- CoolSiC™ Schottky Diode Gen 5
- Niedrige Schaltverluste
- Trenchstop™ IGBT7

Electrical Features

- CoolSiC™ Schottky diode gen 5
- Low switching losses
- Trenchstop™ IGBT7

Mechanische Eigenschaften

- Al₂O₃ Substrat mit kleinem thermischen Widerstand
- Integrierter NTC Temperatur Sensor
- Kompaktes Design
- PressFIT Verbindungstechnik

Mechanical Features

- Al₂O₃ substrate with low thermal resistance
- Integrated NTC temperature sensor
- Compact design
- PressFIT contact technology

Module Label Code

Barcode Code 128



DMX - Code



Content of the Code

Content of the Code	Digit
Module Serial Number	1 - 5
Module Material Number	6 - 11
Production Order Number	12 - 19
Datecode (Production Year)	20 - 21
Datecode (Production Week)	22 - 23

IGBT, Hochsetzsteller / IGBT, Boost Höchstzulässige Werte / Maximum Rated Values

Kollektor-Emitter-Sperrspannung Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	950	V
Implementierter Kollektor-Strom Implemented collector current		I_{CN}	100	A
Kollektor-Dauergleichstrom Continuous DC collector current	$T_H = 65^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	I_{CDC}	70	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_p = 1\text{ ms}$	I_{CRM}	200	A
Gate-Emitter-Spitzenspannung Gate-emitter peak voltage		V_{GES}	+/-20	V

Charakteristische Werte / Characteristic Values

		min.	typ.	max.	
Kollektor-Emitter-Sättigungsspannung Collector-emitter saturation voltage	$I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,27 1,33 1,33	1,55 V V V
Gate-Schwellenspannung Gate threshold voltage	$I_C = 1,67\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GETH}	4,35	5,10 5,85 V
Gateladung Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 600\text{ V}$		Q_G	0,23	μC
Interner Gatewiderstand Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	1,5	Ω
Eingangskapazität Input capacitance	$f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{ies}	6,48	nF
Rückwirkungskapazität Reverse transfer capacitance	$f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{res}	0,02	nF
Kollektor-Emitter-Reststrom Collector-emitter cut-off current	$V_{CE} = 950\text{ V}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	I_{CES}		0,031 mA
Gate-Emitter-Reststrom Gate-emitter leakage current	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$		I_{GES}		100 nA
Einschaltverzögerungszeit, induktive Last Turn-on delay time, inductive load	$I_C = 25\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 10\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	0,074 0,071 0,062	μs μs μs
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 25\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 10\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,013 0,015 0,015	μs μs μs
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 25\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 10\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	0,178 0,275 0,308	μs μs μs
Fallzeit, induktive Last Fall time, inductive load	$I_C = 25\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 10\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,107 0,139 0,161	μs μs μs
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 25\text{ A}, V_{CE} = 500\text{ V}, L_{\sigma} = 35\text{ nH}$ $di/dt = 880\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 10\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	0,575 0,589 0,596	mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 25\text{ A}, V_{CE} = 500\text{ V}, L_{\sigma} = 35\text{ nH}$ $du/dt = 2700\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 10\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	1,05 1,62 1,79	mJ mJ mJ
Kurzschlußverhalten SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 600\text{ V}$ $V_{CE\max} = V_{CES} - L_{sCE} \cdot di/dt$	$t_p \leq 0\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	I_{SC}	300	A
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro IGBT / per IGBT		R_{thJH}	0,673	K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150 $^{\circ}\text{C}$

Diode, Hochsetzsteller / Diode, Boost

Höchstzulässige Werte / Maximum Rated Values

Periodische Spitzensperrspannung Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
Implementierter Durchlassstrom Implemented forward current		I_{FN}	30	A
Dauergleichstrom Continuous DC forward current		I_F	25	A
Periodischer Spitzenstrom Repetitive peak forward current	$t_p = 1 \text{ ms}$	I_{FRM}	60	A
Grenzlastintegral I^2t - value	$V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$	I^2t	88,4 66,0	A^2s A^2s

Charakteristische Werte / Characteristic Values

				min.	typ.	max.	
Durchlassspannung Forward voltage	$I_F = 25 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	V_F		1,32	1,85	V
	$I_F = 25 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$			1,55		V
	$I_F = 25 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 150^{\circ}\text{C}$			1,70		V
Rückstromspitze Peak reverse recovery current	$I_F = 25 \text{ A}, -di_F/dt = 880 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	I_{RM}		16,4		A
		$T_{vj} = 125^{\circ}\text{C}$			16,4		A
		$T_{vj} = 150^{\circ}\text{C}$			16,4		A
Sperrverzögerungsladung Recovered charge	$I_F = 25 \text{ A}, -di_F/dt = 880 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	Q_r		0,74		μC
		$T_{vj} = 125^{\circ}\text{C}$			0,74		μC
		$T_{vj} = 150^{\circ}\text{C}$			0,74		μC
Abschaltenergie pro Puls Reverse recovery energy	$I_F = 25 \text{ A}, -di_F/dt = 880 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	E_{rec}		0,249		mJ
		$T_{vj} = 125^{\circ}\text{C}$			0,249		mJ
		$T_{vj} = 150^{\circ}\text{C}$			0,249		mJ
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode	R_{thJH}		0,894		K/W	
Temperatur im Schaltbetrieb Temperature under switching conditions		$T_{vj op}$	-40		150	$^{\circ}\text{C}$	

Bypass-Diode / Bypass-Diode

Höchstzulässige Werte / Maximum Rated Values

Periodische Spitzensperrspannung Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
Durchlassstrom Grenzeffektivwert pro Chip Maximum RMS forward current per chip	$T_H = 75^{\circ}\text{C}$	I_{FRMSM}	50	A
Gleichrichter Ausgang Grenzeffektivstrom Maximum RMS current at rectifier output	$T_H = 75^{\circ}\text{C}$	I_{RMSM}	50	A
Stoßstrom Grenzwert Surge forward current	$t_p = 10 \text{ ms}, T_{vj} = 25^{\circ}\text{C}$	I_{FSM}	1070	A
	$t_p = 10 \text{ ms}, T_{vj} = 110^{\circ}\text{C}$		957	A
Grenzlastintegral I^2t - value	$t_p = 10 \text{ ms}, T_{vj} = 25^{\circ}\text{C}$	I^2t	5770	A^2s
	$t_p = 10 \text{ ms}, T_{vj} = 110^{\circ}\text{C}$		4580	A^2s

Charakteristische Werte / Characteristic Values

				min.	typ.	max.	
Durchlassspannung Forward voltage	$T_{vj} = 150^{\circ}\text{C}, I_F = 45 \text{ A}$	V_F		0,85		V	
Sperrstrom Reverse current	$T_{vj} = 150^{\circ}\text{C}, V_R = 1200 \text{ V}$	I_R		1,00		mA	
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode	R_{thJH}		0,870		K/W	
Temperatur im Schaltbetrieb Temperature under switching conditions		$T_{vj op}$	-40		110	$^{\circ}\text{C}$	

Verpolschutz Diode A / Inverse-polarity protection diode A

Höchstzulässige Werte / Maximum Rated Values

Periodische Spitzensperrenspernung Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
Durchlassstrom Grenzeffektivwert pro Chip Maximum RMS forward current per chip	$T_H = 70^{\circ}\text{C}$	I_{FRMSM}	30	A
Gleichrichter Ausgang Grenzeffektivstrom Maximum RMS current at rectifier output	$T_H = 70^{\circ}\text{C}$	I_{RMSM}	30	A
Stoßstrom Grenzwert Surge forward current	$t_p = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$ $t_p = 10\text{ ms}, T_{vj} = 110^{\circ}\text{C}$	I_{FSM}	378 326	A A
Grenzlastintegral I^2t - value	$t_p = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$ $t_p = 10\text{ ms}, T_{vj} = 110^{\circ}\text{C}$	I^2t	714 531	A^2s A^2s

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Durchlassspannung Forward voltage	$T_{vj} = 150^{\circ}\text{C}, I_F = 15\text{ A}$	V_F		0,89		V
Sperrstrom Reverse current	$T_{vj} = 150^{\circ}\text{C}, V_R = 1200\text{ V}$	I_R		1,00		mA
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode	R_{thJH}		1,31		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions		$T_{vj\text{ op}}$	-40		110	$^{\circ}\text{C}$

NTC-Widerstand / NTC-Thermistor

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Nennwiderstand Rated resistance	$T_{NTC} = 25^{\circ}\text{C}$	R_{25}		5,00		k Ω
Abweichung von R100 Deviation of R100	$T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493\ \Omega$	$\Delta R/R$	-5		5	%
Verlustleistung Power dissipation	$T_{NTC} = 25^{\circ}\text{C}$	P_{25}			20,0	mW
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/50}$		3375		K
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/80}$		3411		K
B-Wert B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/100}$		3433		K

Angaben gemäß gültiger Application Note.
Specification according to the valid application note.

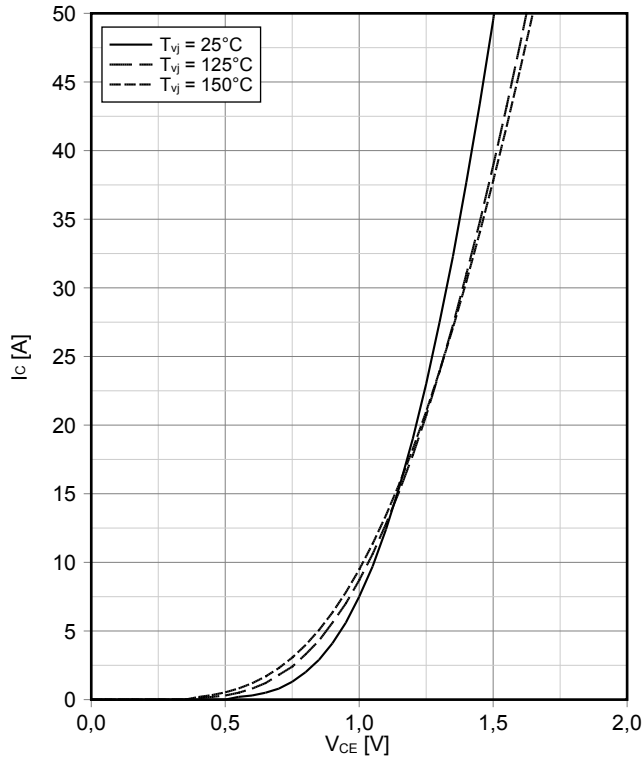
Modul / Module

Isolations-Prüfspannung Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	3,2		kV
Innere Isolation Internal isolation	Basisisolierung (Schutzklasse 1, EN61140) basic insulation (class 1, IEC 61140)		Al ₂ O ₃		
Kriechstrecke Creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		11,2 6,8		mm
Luftstrecke Clearance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		9,4 5,5		mm
Vergleichszahl der Kriechwegbildung Comperative tracking index		CTI	> 400		
Relativer Temperaturindex (elektr.) RTI Elec.	Gehäuse housing	RTI	140		°C
			min.	typ.	max.
Modulstreuinduktivität Stray inductance module		L _{sCE}		20	nH
Lagertemperatur Storage temperature		T _{stg}	-40		125 °C
Anzugsdrehmoment f. Modulmontage Mounting torque for modul mounting	Schraube - Montage gem. gültiger Applikationsschrift Screw - Mounting according to valid application note	M	1,30		1,50 Nm
Gewicht Weight		G		78	g

IGBT- and diode- R_{thJH} parameters measured with thermal grease of $\lambda_{paste} = 3.3 \text{ W/(m}\cdot\text{K)}$
 The current under continuous operation is limited to 25 A rms per connector pin.

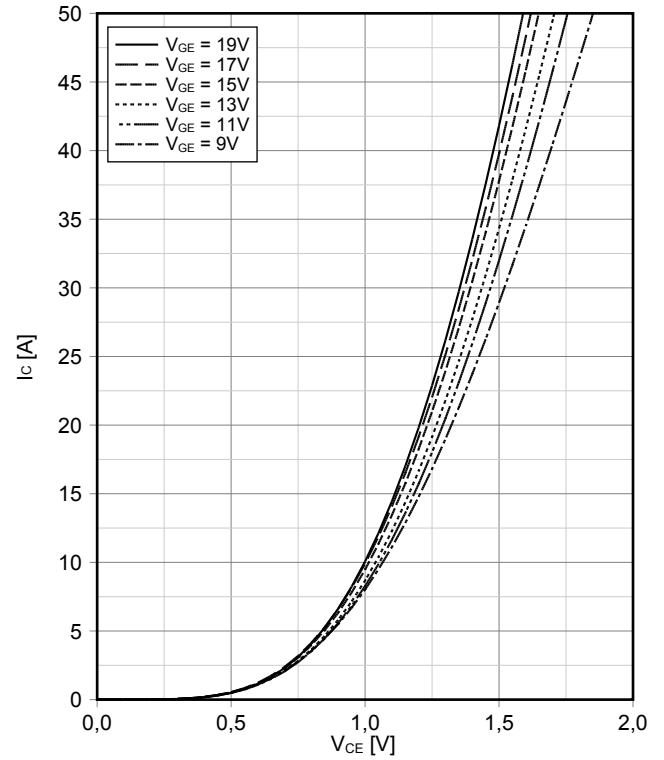
Ausgangskennlinie IGBT, Hochsetzsteller (typisch)
output characteristic IGBT, Boost (typical)

$I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



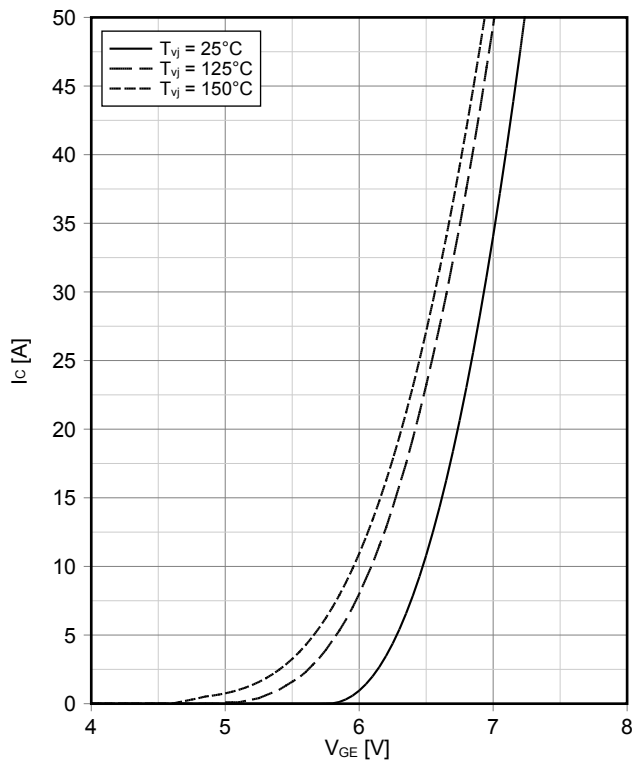
Ausgangskennlinienfeld IGBT, Hochsetzsteller (typisch)
output characteristic IGBT, Boost (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 150^\circ\text{C}$



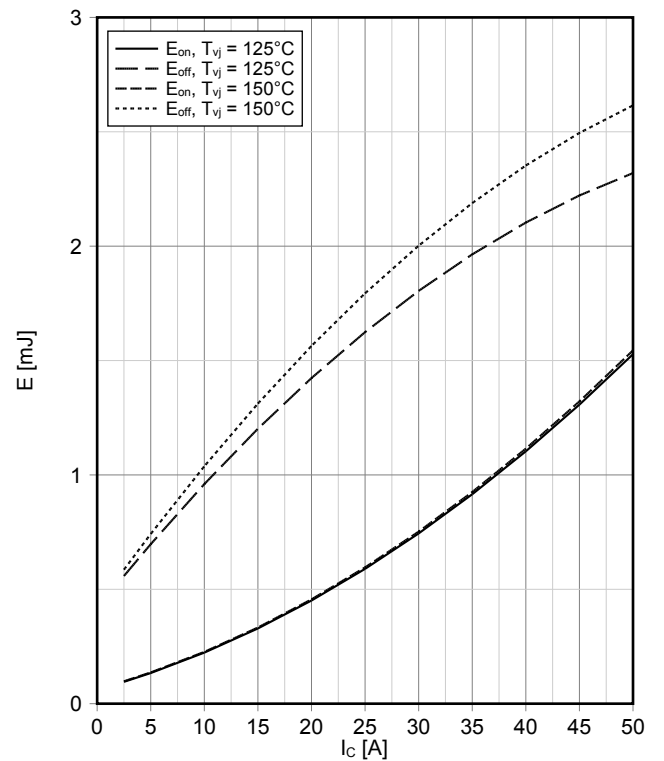
Übertragungscharakteristik IGBT, Hochsetzsteller (typisch)
transfer characteristic IGBT, Boost (typical)

$I_C = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



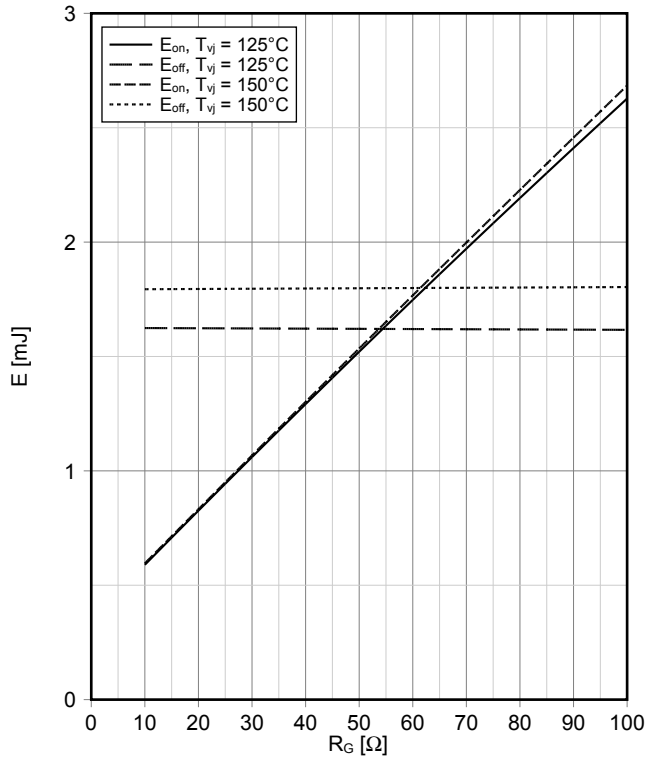
Schaltverluste IGBT, Hochsetzsteller (typisch)
switching losses IGBT, Boost (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 10\ \Omega$, $R_{Goff} = 10\ \Omega$, $V_{CE} = 500\text{ V}$



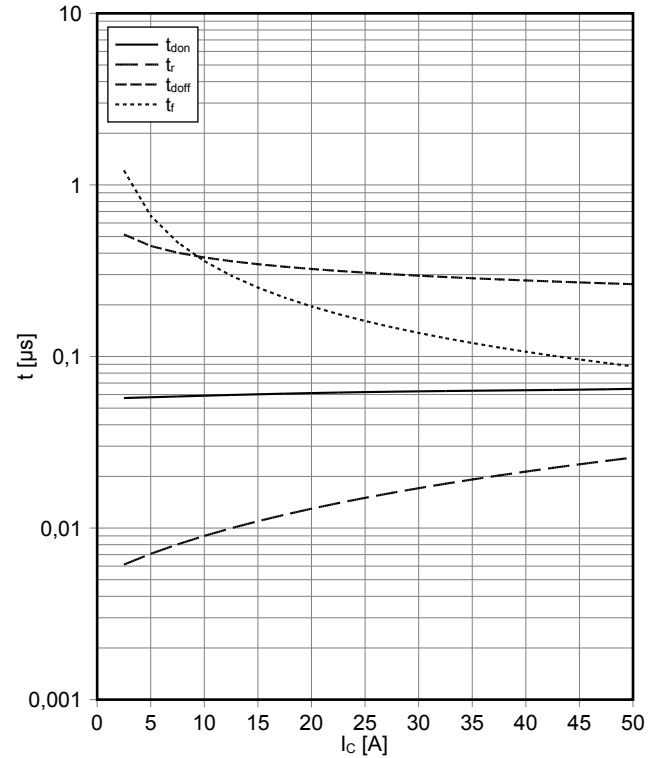
Schaltverluste IGBT, Hochsetzsteller (typisch) switching losses IGBT, Boost (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $V_{CE} = 500\text{ V}$, $I_C = 25\text{ A}$



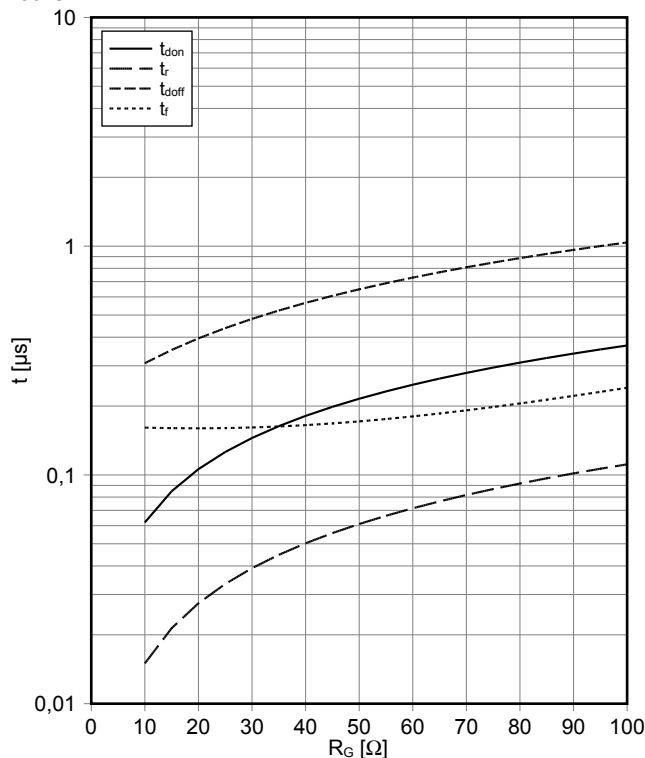
Schaltzeiten IGBT, Hochsetzsteller (typisch) switching times IGBT, Boost (typical)

$t_{don} = f(I_C)$, $t_r = f(I_C)$, $t_{doff} = f(I_C)$, $t_f = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 10\ \Omega$, $R_{Goff} = 10\ \Omega$, $V_{CE} = 500\text{ V}$, $T_{vj} = 150^\circ\text{C}$



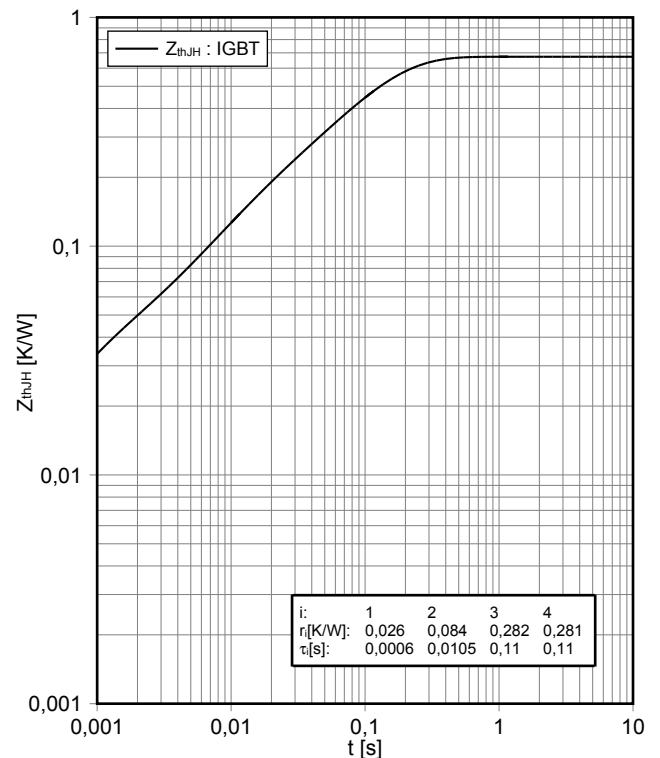
Schaltzeiten IGBT, Hochsetzsteller (typisch) switching times IGBT, Boost (typical)

$t_{don} = f(R_G)$, $t_r = f(R_G)$, $t_{doff} = f(R_G)$, $t_f = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 10\ \Omega$, $R_{Goff} = 10\ \Omega$, $V_{CE} = 500\text{ V}$, $I_C = 25\text{ A}$, $T_{vj} = 150^\circ\text{C}$



Transienter Wärmewiderstand IGBT, Hochsetzsteller transient thermal impedance IGBT, Boost

$Z_{thJH} = f(t)$

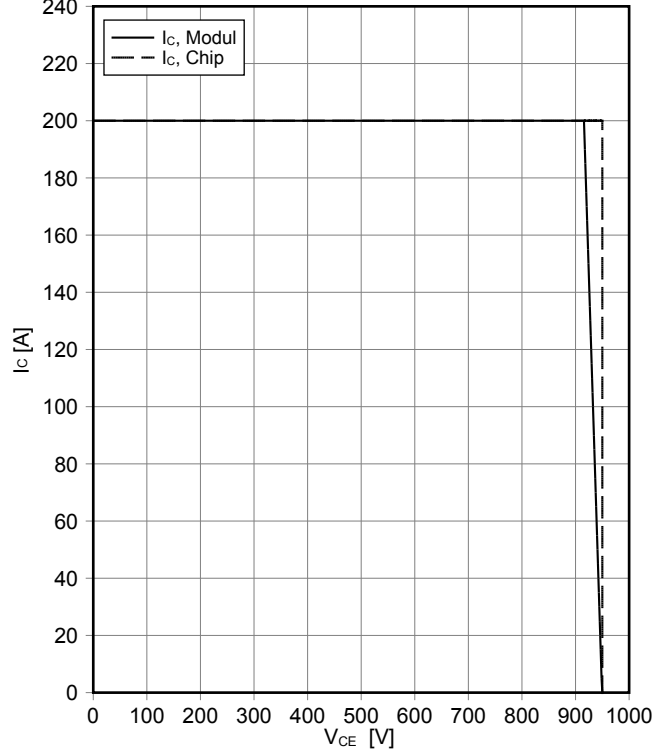


Sicherer Rückwärts-Arbeitsbereich IGBT, Hochsetzsteller (RBSOA)

reverse bias safe operating area IGBT, Boost (RBSOA)

$I_C = f(V_{CE})$

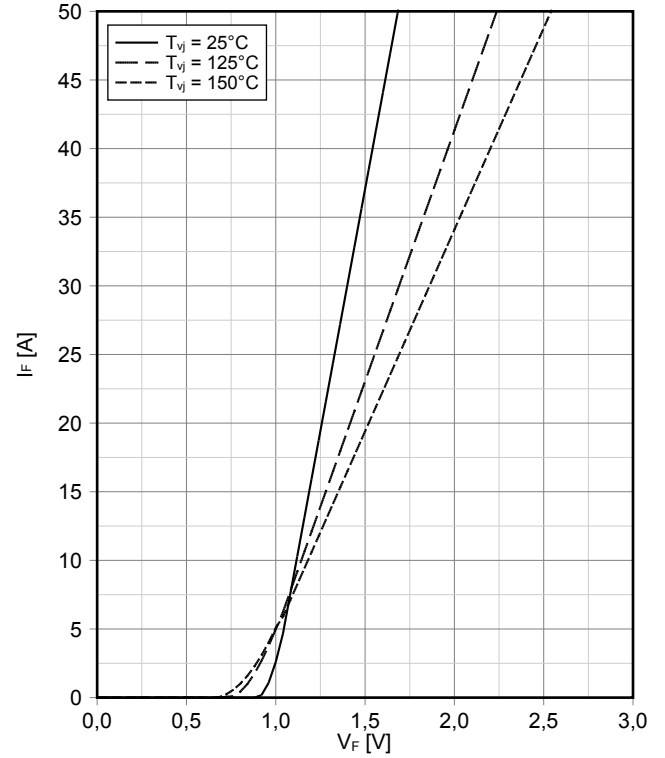
$V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 10\ \Omega$, $T_{vj} = 150^\circ\text{C}$



Durchlasskennlinie der Diode, Hochsetzsteller (typisch)

forward characteristic of Diode, Boost (typical)

$I_F = f(V_F)$

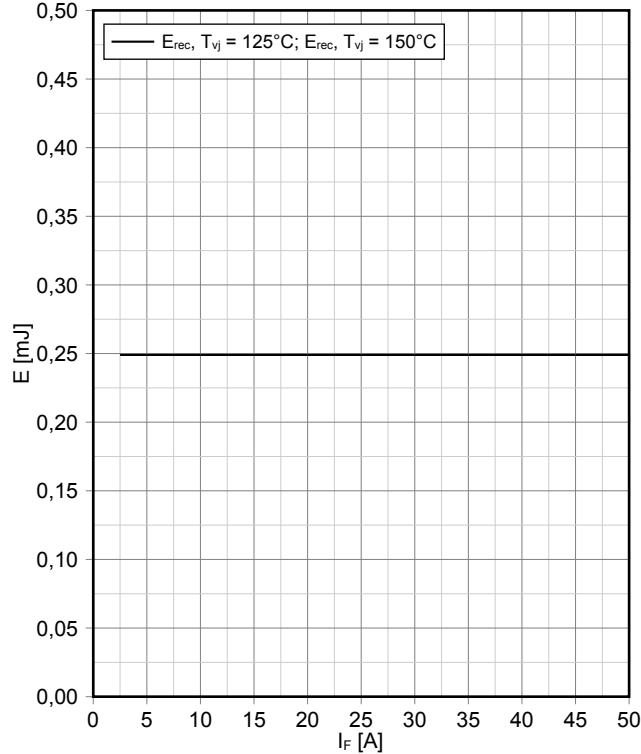


Schaltverluste Diode, Hochsetzsteller (typisch)

switching losses Diode, Boost (typical)

$E_{rec} = f(I_F)$

$R_{Gon} = 10\ \Omega$, $V_{CE} = 600\text{ V}$

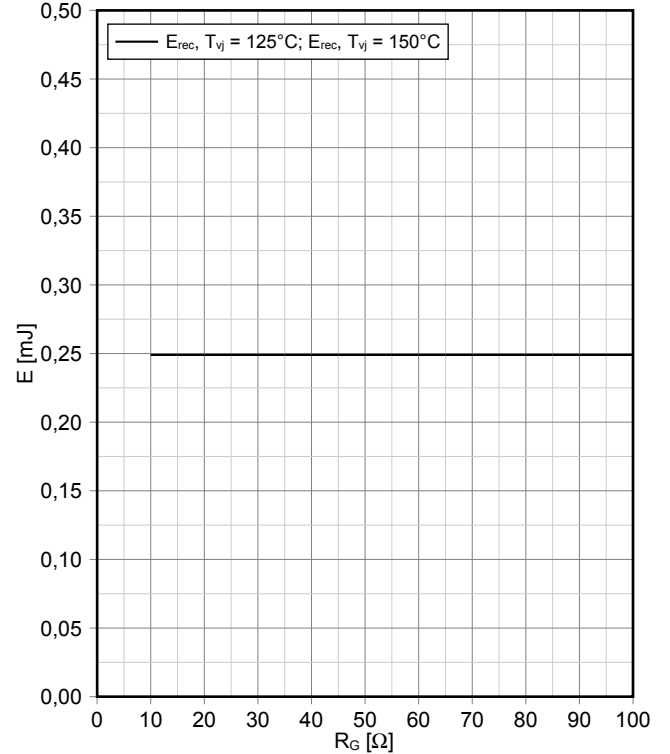


Schaltverluste Diode, Hochsetzsteller (typisch)

switching losses Diode, Boost (typical)

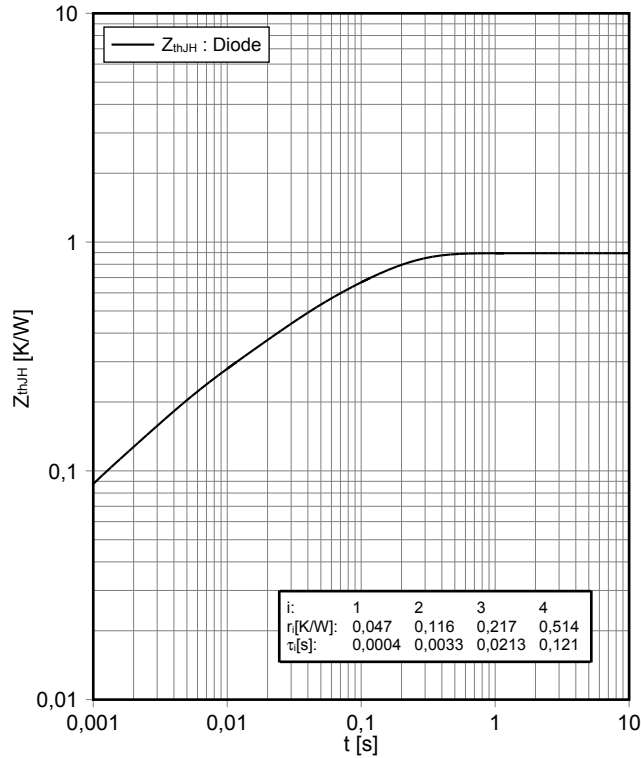
$E_{rec} = f(R_G)$

$I_F = 25\text{ A}$, $V_{CE} = 600\text{ V}$



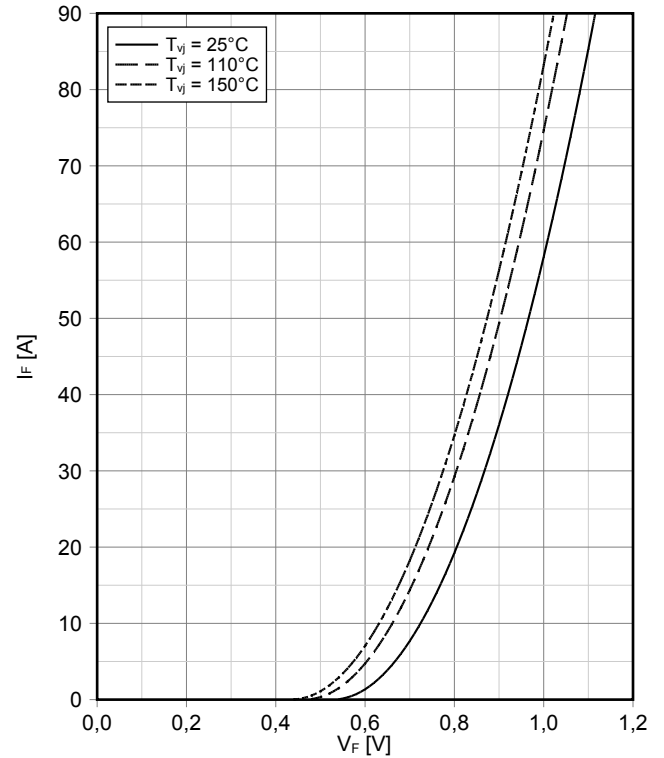
Transienter Wärmewiderstand Diode, Hochsetzsteller
transient thermal impedance Diode, Boost

$$Z_{thJH} = f(t)$$



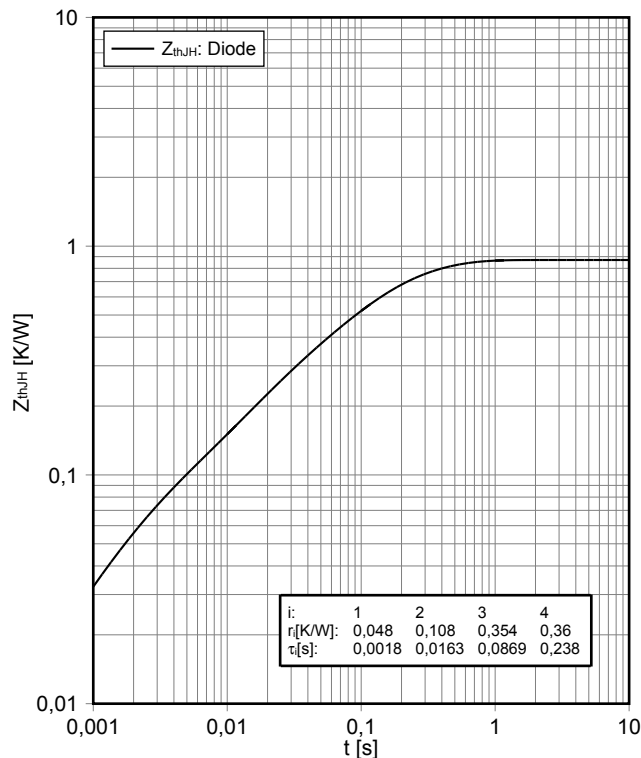
Durchlasskennlinie der Bypass-Diode (typisch)
forward characteristic of Bypass-Diode (typical)

$$I_F = f(V_F)$$



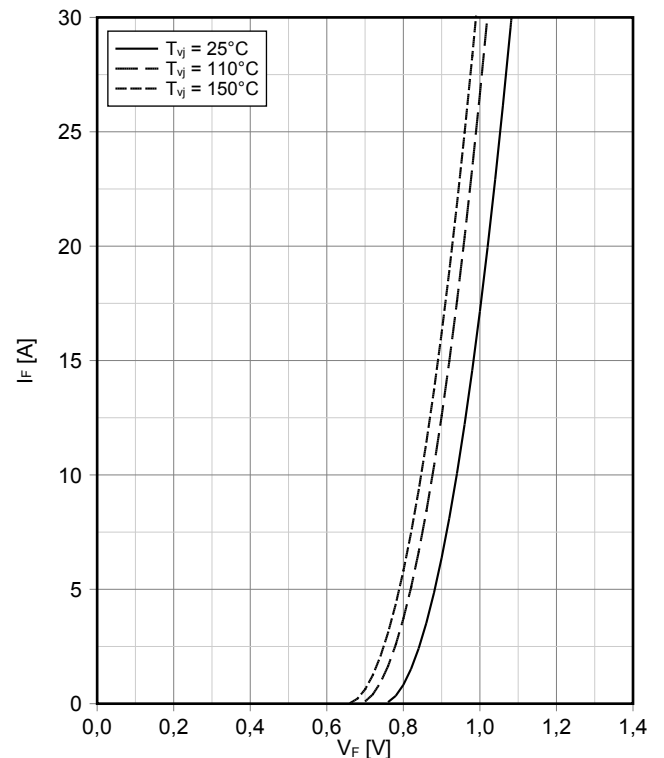
Transienter Wärmewiderstand Bypass-Diode
transient thermal impedance Bypass-Diode

$$Z_{thJH} = f(t)$$



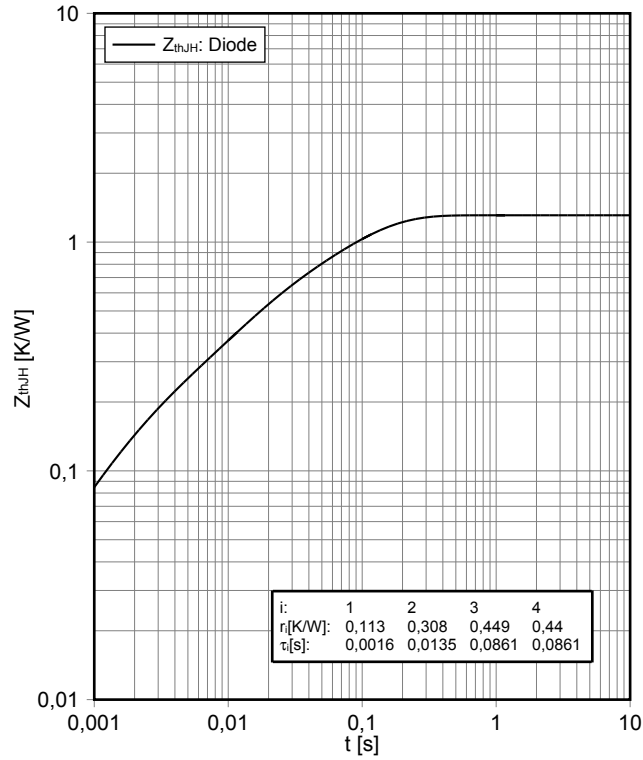
Durchlasskennlinie der Verpolschutz Diode A (typisch)
forward characteristic of Inverse-polarity protection diode A (typical)

$$I_F = f(V_F)$$



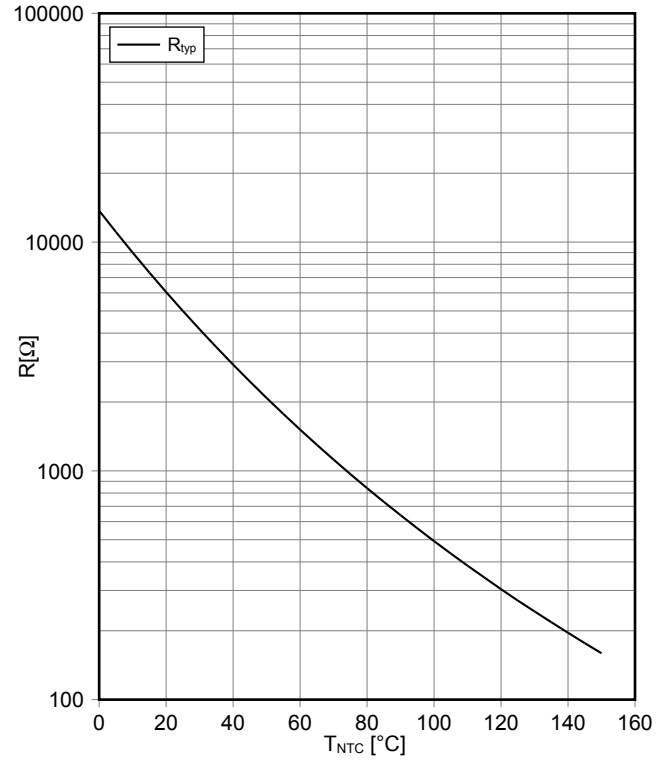
Transienter Wärmewiderstand Verpolschutz Diode A
transient thermal impedance Inverse-polarity protection diode A

$Z_{thJH} = f(t)$

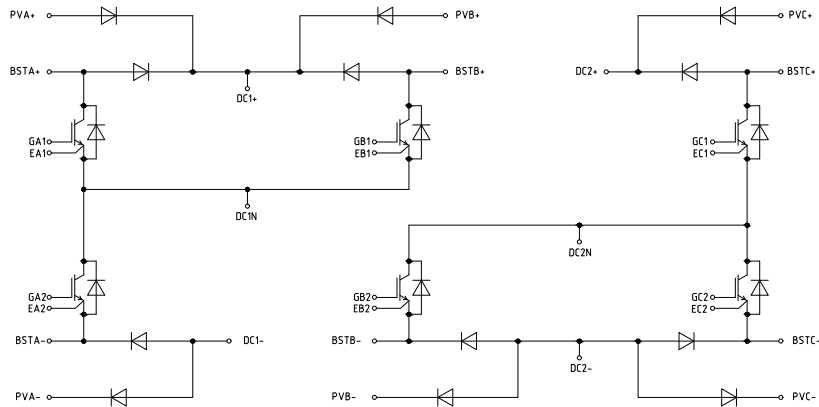


NTC-Widerstand-Temperaturkennlinie (typisch)
NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$



Schaltplan / Circuit diagram



Gehäuseabmessungen / Package outlines

