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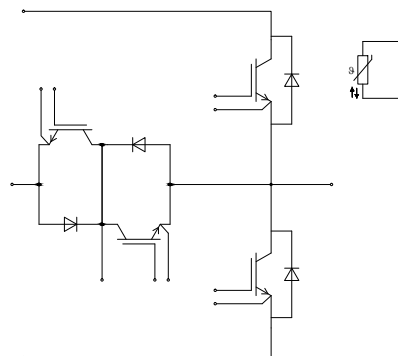
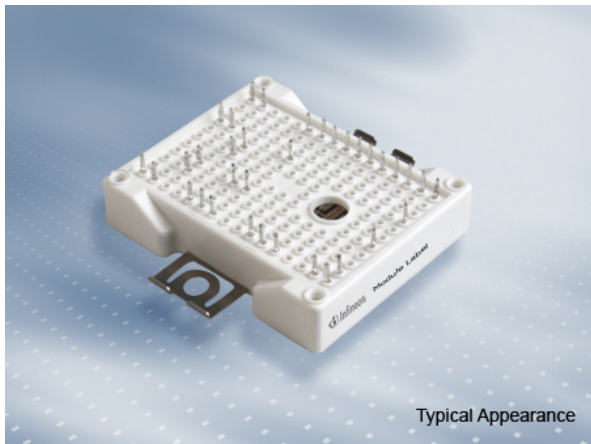
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EasyPACK Modul mit aktiver "Neutral Point Clamp 2" Topologie und PressFIT / NTC  
EasyPACK module with active "Neutral Point Clamp 2" topology and PressFIT / NTC



$V_{CES} = 1200V$   
 $I_{C\ nom} = 100A / I_{CRM} = 200A$

### Typische Anwendungen

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

### Typical Applications

- 3-level-applications
- Motor drives
- Solar applications
- UPS systems

### Elektrische Eigenschaften

- High Speed IGBT H3
- Niedrige Schaltverluste
- $T_{vj\ op} = 150^{\circ}C$

### Electrical Features

- High speed IGBT H3
- Low switching losses
- $T_{vj\ op} = 150^{\circ}C$

### Mechanische Eigenschaften

- 3 kV AC 1min Isolationsfestigkeit
- PressFIT Verbindungstechnik
- RoHS konform

### Mechanical Features

- 3 kV AC 1min insulation
- PressFIT contact technology
- RoHS compliant

### 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

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**IGBT, T1 / T4 / IGBT, T1 / T4**

**Höchstzulässige Werte / Maximum Rated Values**

Kollektor-Emitter-Sperrspannung Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{CES}$	1200	V
Implementierter Kollektor-Strom Implemented collector current		$I_{CN}$	200	A
Kollektor-Dauergleichstrom Continuous DC collector current	$T_C = 100^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$	100	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_P = 1\text{ ms}$	$I_{CRM}$	400	A
Gesamt-Verlustleistung Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$P_{\text{tot}}$	600	W
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	$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 100\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 100\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,55 1,70 1,75	1,75	V V V
Gate-Schwellenspannung Gate threshold voltage	$I_C = 7,60\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{G\text{Eth}}$	5,05	5,80	6,45 V
Gateladung Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		$Q_G$	1,60		$\mu\text{C}$
Interner Gatewiderstand Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{G\text{int}}$	3,8		$\Omega$
Eingangskapazität Input capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{\text{ies}}$	11,5		nF
Rückwirkungskapazität Reverse transfer capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{\text{res}}$	0,70		nF
Kollektor-Emitter-Reststrom Collector-emitter cut-off current	$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$		$I_{CES}$		1,0	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	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 1,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{d\text{on}}$	0,14 0,155 0,16		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 1,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_r$	0,025 0,03 0,03		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 1,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{d\text{off}}$	0,32 0,40 0,42		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
Fallzeit, induktive Last Fall time, inductive load	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 1,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_f$	0,03 0,055 0,06		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}, L_S = 25\text{ nH}$ $V_{GE} = \pm 15\text{ V}, di/dt = 3700\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{G\text{on}} = 1,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{\text{on}}$	1,20 2,00 2,25		mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}, L_S = 25\text{ nH}$ $V_{GE} = \pm 15\text{ V}, du/dt = 2700\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{G\text{off}} = 1,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{\text{off}}$	3,50 5,30 5,90		mJ mJ mJ
Kurzschlußverhalten SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CE\text{max}} = V_{CES} - L_{S\text{CE}} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$		$I_{SC}$	800		A
Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case	pro IGBT / per IGBT		$R_{\text{thJC}}$	0,200	0,250	K/W

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Wärmewiderstand, Gehäuse bis Kühlkörper Thermal resistance, case to heatsink	pro IGBT / per IGBT $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$	$R_{\text{thCH}}$		0,200		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions		$T_{\text{vj op}}$	-40		150	°C

**Diode, D2 / D3 / Diode, D2 / D3**

**Höchstzulässige Werte / Maximum Rated Values**

Periodische Spitzensperrspannung Repetitive peak reverse voltage	$T_{\text{vj}} = 25^\circ\text{C}$	$V_{\text{RRM}}$		650		V
Implementierter Durchlassstrom Implemented forward current		$I_{\text{FN}}$		125		A
Dauergleichstrom Continuous DC forward current		$I_{\text{F}}$		100		A
Periodischer Spitzenstrom Repetitive peak forward current	$t_{\text{p}} = 1 \text{ ms}$	$I_{\text{FRM}}$		250		A
Grenzlastintegral $I^2t$ - value	$V_{\text{R}} = 0 \text{ V}, t_{\text{p}} = 10 \text{ ms}, T_{\text{vj}} = 125^\circ\text{C}$ $V_{\text{R}} = 0 \text{ V}, t_{\text{p}} = 10 \text{ ms}, T_{\text{vj}} = 150^\circ\text{C}$	$I^2t$		1450 1400		A <sup>2</sup> s A <sup>2</sup> s

**Charakteristische Werte / Characteristic Values**

			min.	typ.	max.	
Durchlassspannung Forward voltage	$I_{\text{F}} = 100 \text{ A}, V_{\text{GE}} = 0 \text{ V}$ $I_{\text{F}} = 100 \text{ A}, V_{\text{GE}} = 0 \text{ V}$ $I_{\text{F}} = 100 \text{ A}, V_{\text{GE}} = 0 \text{ V}$	$T_{\text{vj}} = 25^\circ\text{C}$ $T_{\text{vj}} = 125^\circ\text{C}$ $T_{\text{vj}} = 150^\circ\text{C}$	$V_{\text{F}}$		1,55 1,50 1,45	1,70 V V V
Rückstromspitze Peak reverse recovery current	$I_{\text{F}} = 100 \text{ A}, -di_{\text{F}}/dt = 3700 \text{ A}/\mu\text{s} (T_{\text{vj}}=150^\circ\text{C})$ $V_{\text{R}} = 400 \text{ V}$ $V_{\text{GE}} = -15 \text{ V}$	$T_{\text{vj}} = 25^\circ\text{C}$ $T_{\text{vj}} = 125^\circ\text{C}$ $T_{\text{vj}} = 150^\circ\text{C}$	$I_{\text{RM}}$		90,0 100 100	A A A
Sperrverzögerungsladung Recovered charge	$I_{\text{F}} = 100 \text{ A}, -di_{\text{F}}/dt = 3700 \text{ A}/\mu\text{s} (T_{\text{vj}}=150^\circ\text{C})$ $V_{\text{R}} = 400 \text{ V}$ $V_{\text{GE}} = -15 \text{ V}$	$T_{\text{vj}} = 25^\circ\text{C}$ $T_{\text{vj}} = 125^\circ\text{C}$ $T_{\text{vj}} = 150^\circ\text{C}$	$Q_{\text{r}}$		3,25 5,90 6,40	$\mu\text{C}$ $\mu\text{C}$ $\mu\text{C}$
Abschaltenergie pro Puls Reverse recovery energy	$I_{\text{F}} = 100 \text{ A}, -di_{\text{F}}/dt = 3700 \text{ A}/\mu\text{s} (T_{\text{vj}}=150^\circ\text{C})$ $V_{\text{R}} = 400 \text{ V}$ $V_{\text{GE}} = -15 \text{ V}$	$T_{\text{vj}} = 25^\circ\text{C}$ $T_{\text{vj}} = 125^\circ\text{C}$ $T_{\text{vj}} = 150^\circ\text{C}$	$E_{\text{rec}}$		0,95 1,55 1,65	mJ mJ mJ
Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case	pro Diode / per diode		$R_{\text{thJC}}$		0,550 0,650	K/W K/W
Wärmewiderstand, Gehäuse bis Kühlkörper Thermal resistance, case to heatsink	pro Diode / per diode $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$		$R_{\text{thCH}}$		0,600	K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{\text{vj op}}$	-40		150 °C

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**IGBT, T2 / T3 / IGBT, T2 / T3**

**Höchstzulässige Werte / Maximum Rated Values**

Kollektor-Emitter-Sperrspannung Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{CES}$	650	V
Kollektor-Dauergleichstrom Continuous DC collector current	$T_C = 100^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$	100	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_P = 1\text{ ms}$	$I_{CRM}$	200	A
Gesamt-Verlustleistung Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$P_{\text{tot}}$	250	W
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	$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 100\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 100\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,45 1,60 1,70	1,90	V V V	
Gate-Schwellenspannung Gate threshold voltage	$I_C = 1,60\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{GEth}$	4,95	5,80	6,45	V
Gateladung Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		$Q_G$	1,00			$\mu\text{C}$
Interner Gatewiderstand Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{Gint}$	2,0			$\Omega$
Eingangskapazität Input capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{ies}$	6,20			nF
Rückwirkungskapazität Reverse transfer capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{res}$	0,19			nF
Kollektor-Emitter-Reststrom Collector-emitter cut-off current	$V_{CE} = 650\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$		$I_{CES}$			1,0	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	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{don}$	0,055 0,06 0,065			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_r$	0,025 0,03 0,03			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{doff}$	0,25 0,27 0,28			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
Fallzeit, induktive Last Fall time, inductive load	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_f$	0,035 0,05 0,06			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}, L_S = 25\text{ nH}$ $V_{GE} = \pm 15\text{ V}, di/dt = 3800\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{on}$	1,85 2,80 3,30			mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 100\text{ A}, V_{CE} = 400\text{ V}, L_S = 25\text{ nH}$ $V_{GE} = \pm 15\text{ V}, du/dt = 4600\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{off}$	3,10 4,10 4,60			mJ mJ mJ
Kurzschlußverhalten SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 8\ \mu\text{s}, T_{vj} = 25^{\circ}\text{C}$ $t_P \leq 6\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	$I_{SC}$	700 500			A A
Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case	pro IGBT / per IGBT		$R_{thJC}$	0,500	0,600		K/W
Wärmewiderstand, Gehäuse bis Kühlkörper Thermal resistance, case to heatsink	pro IGBT / per IGBT $\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	0,500			K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\text{op}}$	-40	150		$^{\circ}\text{C}$

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**Diode, D1 / D4 / Diode, D1 / D4**

**Höchstzulässige Werte / Maximum Rated Values**

Periodische Spitzensperrspannung Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{RRM}$	1200	V
Dauergleichstrom Continuous DC forward current		$I_F$	75	A
Periodischer Spitzenstrom Repetitive peak forward current	$t_P = 1\text{ ms}$	$I_{FRM}$	150	A
Grenzlastintegral $I^2t$ - value	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$	$I^2t$	1050 985	$\text{A}^2\text{s}$ $\text{A}^2\text{s}$

**Charakteristische Werte / Characteristic Values**

			min.	typ.	max.	
Durchlassspannung Forward voltage	$I_F = 75\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 75\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 75\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_F$	1,65 1,65 1,65	2,15	V V V
Rückstromspitze Peak reverse recovery current	$I_F = 75\text{ A}, -di_F/dt = 3500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 400\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$I_{RM}$	120 140 150		A A A
Sperrverzögerungsladung Recovered charge	$I_F = 75\text{ A}, -di_F/dt = 3500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 400\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$Q_r$	8,50 17,0 19,0		$\mu\text{C}$ $\mu\text{C}$ $\mu\text{C}$
Abschaltenergie pro Puls Reverse recovery energy	$I_F = 75\text{ A}, -di_F/dt = 3500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 400\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{rec}$	2,85 5,70 6,30		mJ mJ mJ
Wärmewiderstand, Chip bis Gehäuse Thermal resistance, junction to case	pro Diode / per diode		$R_{thJC}$	0,550	0,600	K/W
Wärmewiderstand, Gehäuse bis Kühlkörper Thermal resistance, case to heatsink	pro Diode / per diode $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	0,500		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150	$^{\circ}\text{C}$

**Modul / Module**

Isolations-Prüfspannung Isolation test voltage	RMS, $f = 50\text{ Hz}, t = 1\text{ min.}$	$V_{ISOL}$	3,0	kV		
Innere Isolation Internal isolation	Basisisolation (Schutzklasse 1, EN61140) basic insulation (class 1, IEC 61140)		$\text{Al}_2\text{O}_3$			
Kriechstrecke Creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		11,5 6,3	mm		
Luftstrecke Clearance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		10,0 5,0	mm		
Vergleichszahl der Kriechwegbildung Comperative tracking index		CTI	> 200			
Modulstreuintuktivität Stray inductance module		$L_{sCE}$	14	nH		
Lagertemperatur Storage temperature		$T_{stg}$	-40	125	$^{\circ}\text{C}$	
Anpresskraft für mech. Bef. pro Feder mounting force per clamp		F	40	-	80	N
Gewicht Weight		G	36		g	

Der Strom im Dauerbetrieb ist auf 25A effektiv pro Anschlusspin begrenzt.  
The current under continuous operation is limited to 25A rms per connector pin.

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**NTC-Widerstand / NTC-Thermistor**

**Charakteristische Werte / Characteristic Values**

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

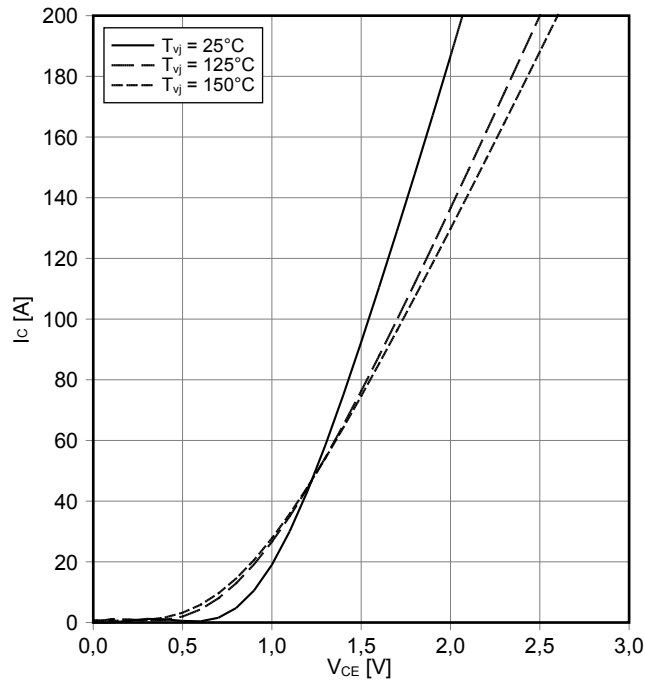
Angaben gemäß gültiger Application Note.  
Specification according to the valid application note.

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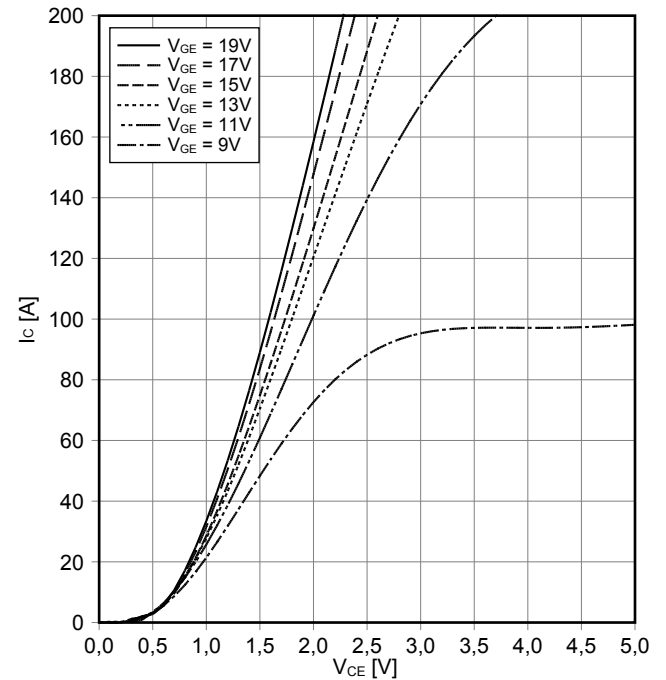
**Ausgangskennlinie IGBT, T1 / T4 (typisch)**  
**output characteristic IGBT, T1 / T4 (typical)**

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



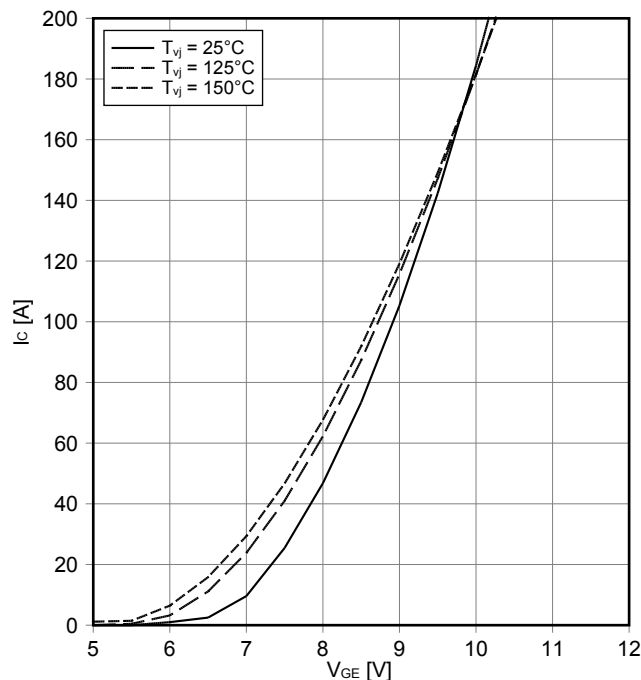
**Ausgangskennlinienfeld IGBT, T1 / T4 (typisch)**  
**output characteristic IGBT, T1 / T4 (typical)**

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



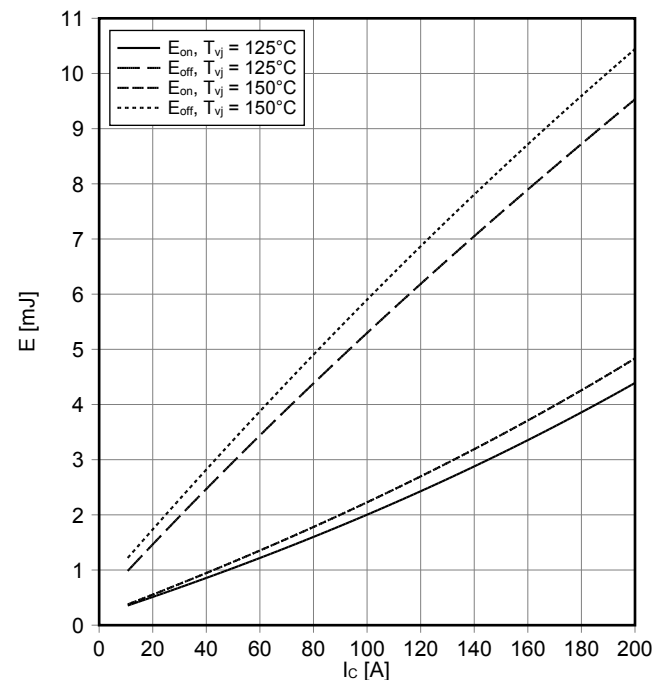
**Übertragungscharakteristik IGBT, T1 / T4 (typisch)**  
**transfer characteristic IGBT, T1 / T4 (typical)**

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



**Schaltverluste IGBT, T1 / T4 (typisch)**  
**switching losses IGBT, T1 / T4 (typical)**

$E_{on} = f(I_C), E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 1.1\ \Omega, R_{Goff} = 1.1\ \Omega, V_{CE} = 400\text{ V}$



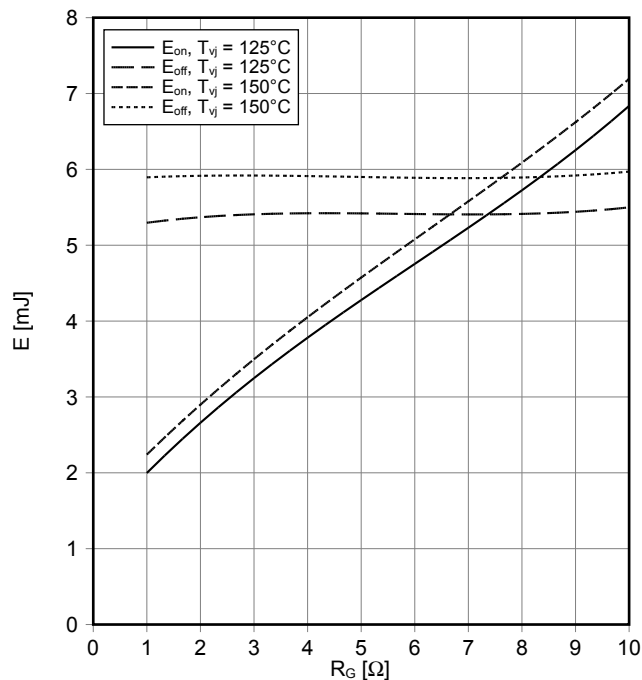
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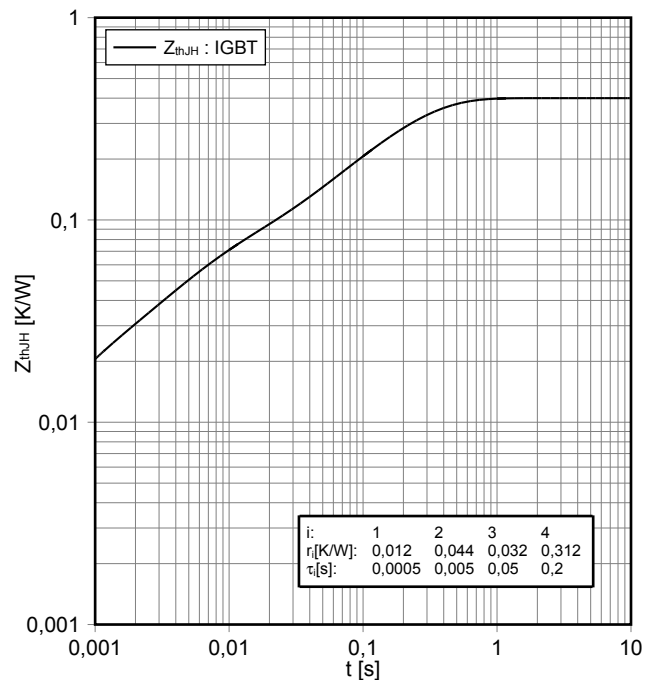
**Schaltverluste IGBT, T1 / T4 (typisch)**  
**switching losses IGBT, T1 / T4 (typical)**

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 100\text{ A}$ ,  $V_{CE} = 400\text{ V}$



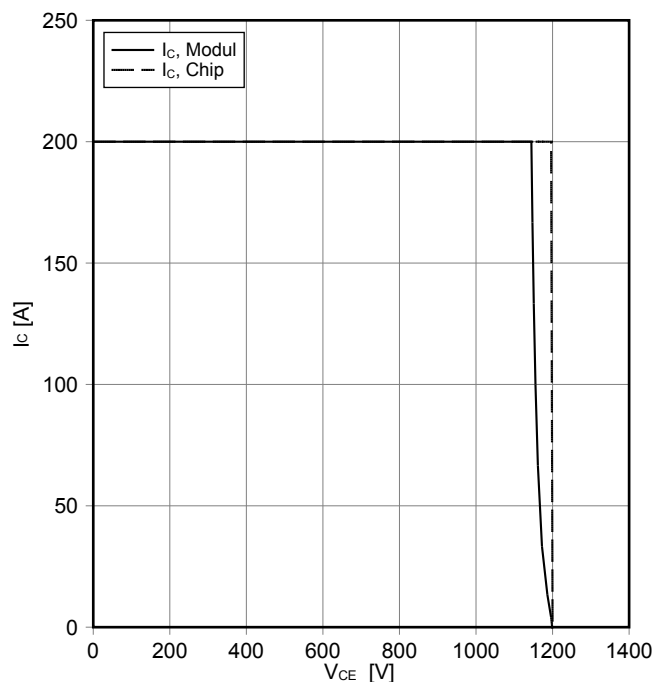
**Transienter Wärmewiderstand IGBT, T1 / T4**  
**transient thermal impedance IGBT, T1 / T4**

$Z_{thJH} = f(t)$



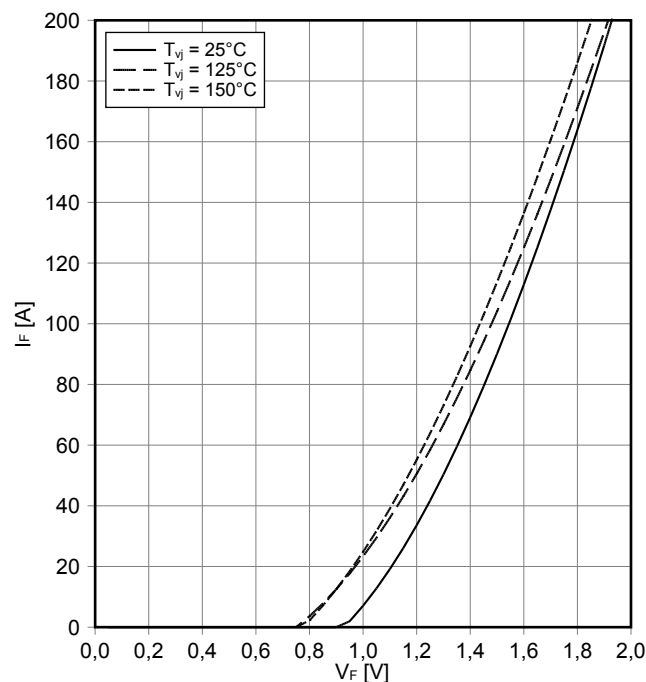
**Sicherer Rückwärts-Arbeitsbereich IGBT, T1 / T4 (RBSOA)**  
**reverse bias safe operating area IGBT, T1 / T4 (RBSOA)**

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 1.1\ \Omega$ ,  $T_{vj} = 150^\circ\text{C}$



**Durchlasskennlinie der Diode, D2 / D3 (typisch)**  
**forward characteristic of Diode, D2 / D3 (typical)**

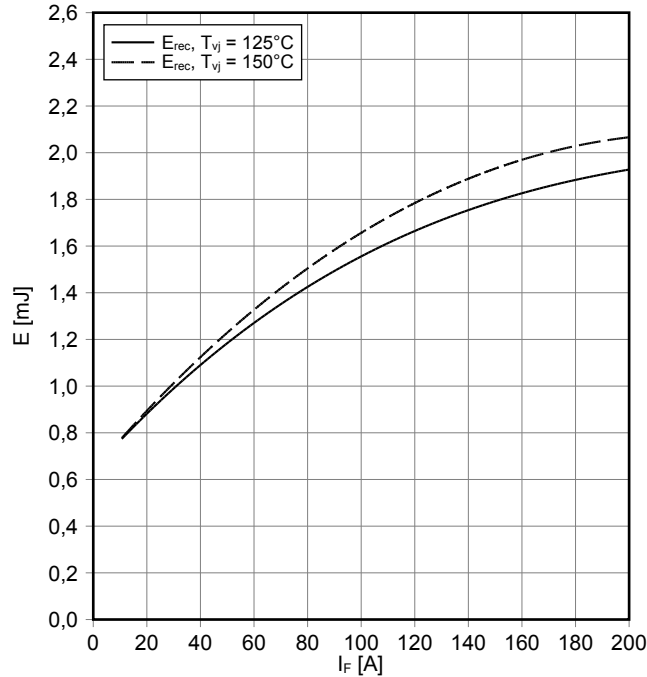
$I_F = f(V_F)$



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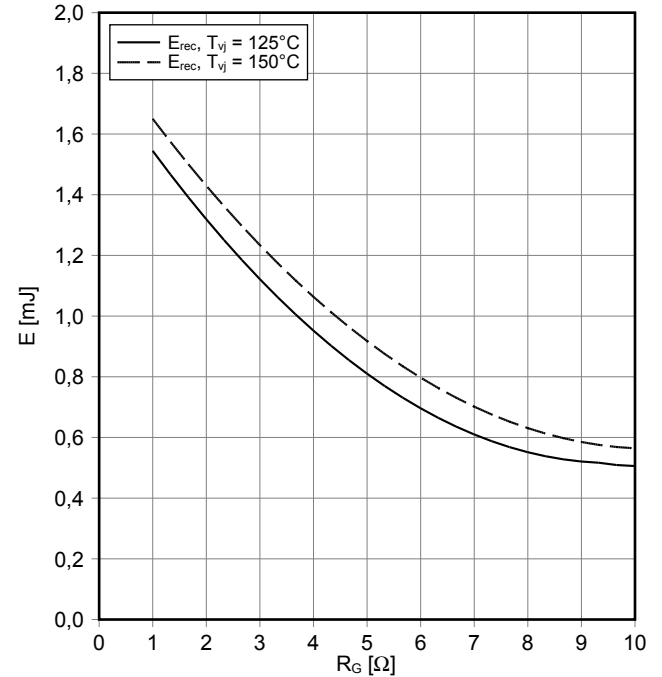
**Schaltverluste Diode, D2 / D3 (typisch)**  
**switching losses Diode, D2 / D3 (typical)**

$E_{rec} = f(I_F)$   
 $R_{Gon} = 1.1 \Omega, V_{CE} = 400 V$



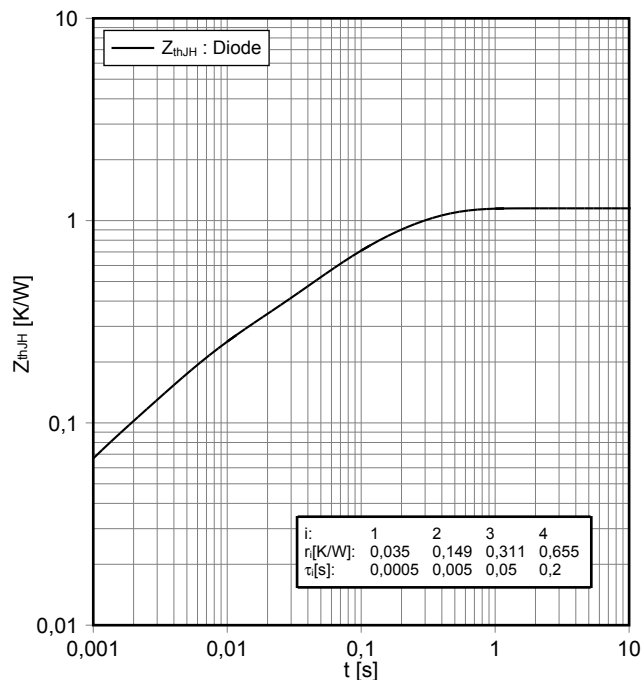
**Schaltverluste Diode, D2 / D3 (typisch)**  
**switching losses Diode, D2 / D3 (typical)**

$E_{rec} = f(R_G)$   
 $I_F = 100 A, V_{CE} = 400 V$



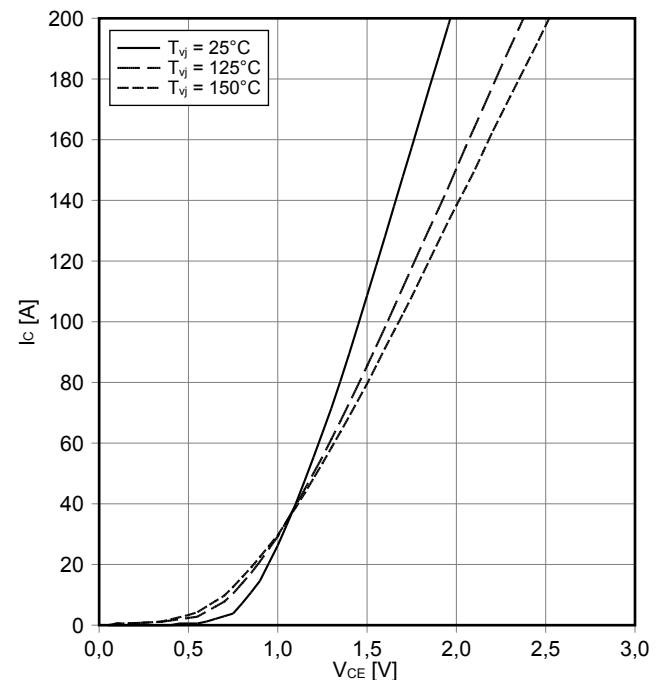
**Transienter Wärmewiderstand Diode, D2 / D3**  
**transient thermal impedance Diode, D2 / D3**

$Z_{thJH} = f(t)$



**Ausgangskennlinie IGBT, T2 / T3 (typisch)**  
**output characteristic IGBT, T2 / T3 (typical)**

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

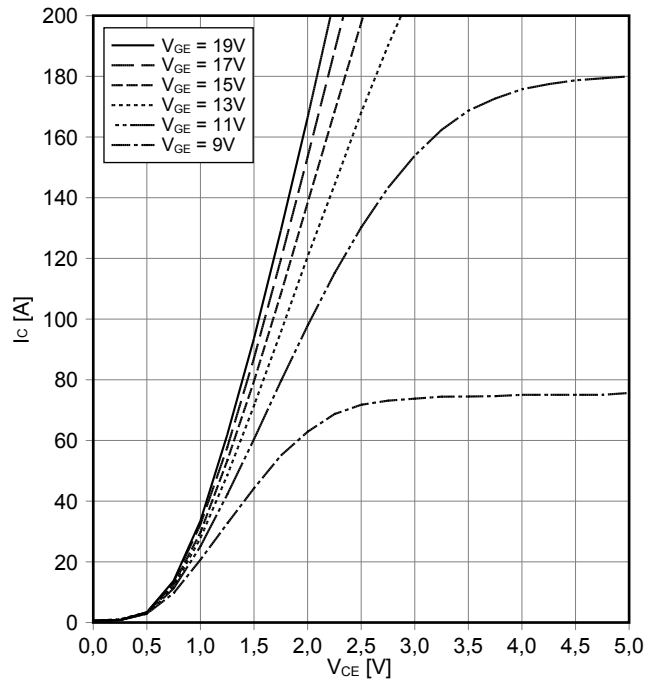


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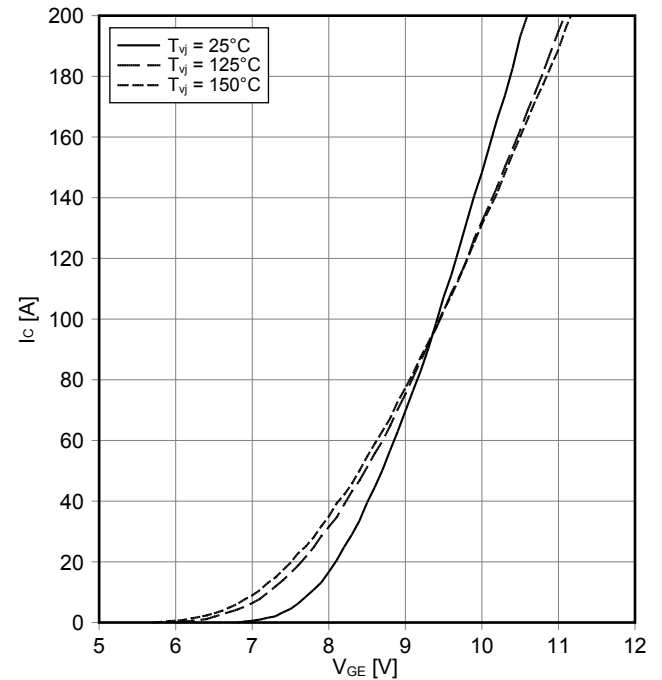
**Ausgangskennlinienfeld IGBT, T2 / T3 (typisch)**  
**output characteristic IGBT, T2 / T3 (typical)**

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



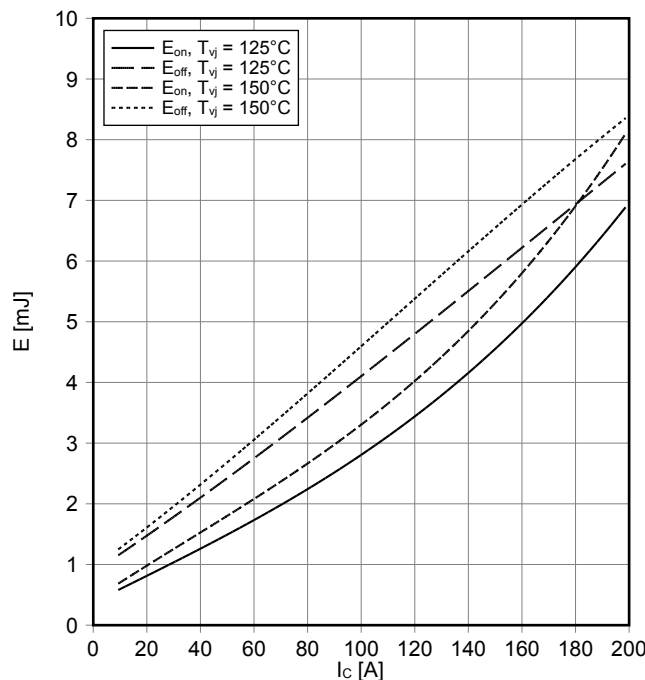
**Übertragungscharakteristik IGBT, T2 / T3 (typisch)**  
**transfer characteristic IGBT, T2 / T3 (typical)**

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



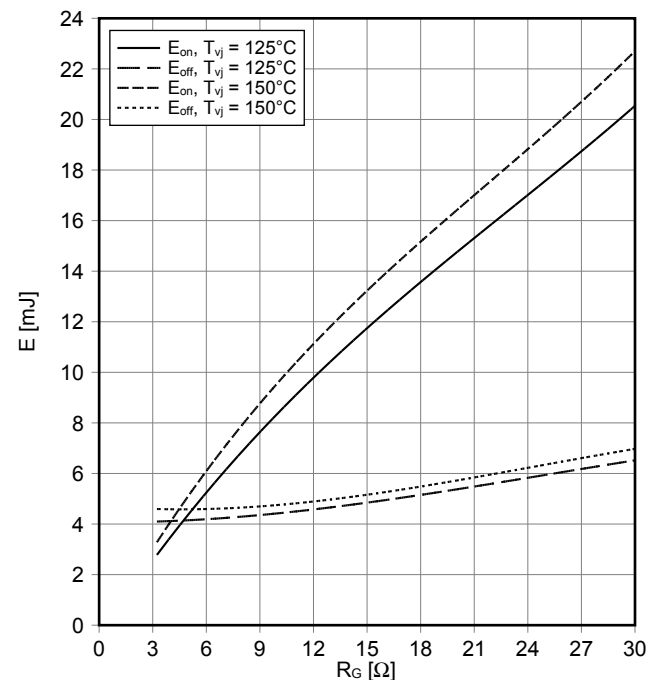
**Schaltverluste IGBT, T2 / T3 (typisch)**  
**switching losses IGBT, T2 / T3 (typical)**

$E_{on} = f(I_C), E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 3.3\ \Omega, R_{Goff} = 3.3\ \Omega, V_{CE} = 400\text{ V}$



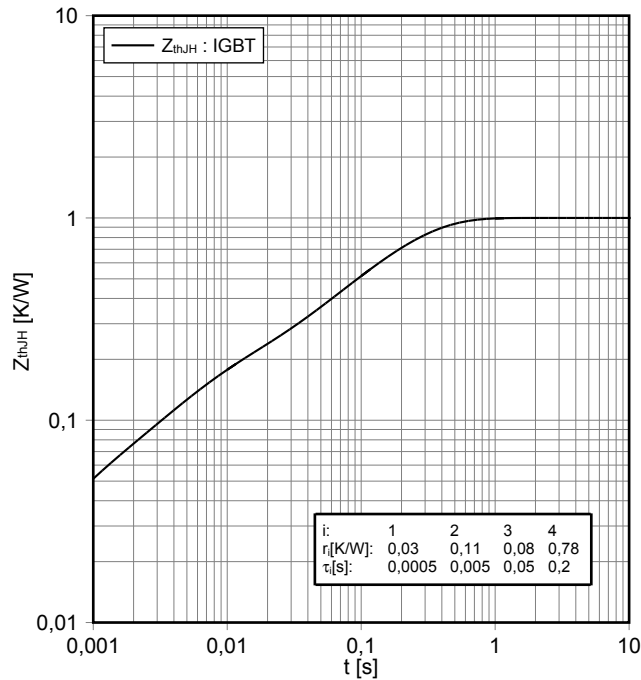
**Schaltverluste IGBT, T2 / T3 (typisch)**  
**switching losses IGBT, T2 / T3 (typical)**

$E_{on} = f(R_G), E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}, I_C = 100\text{ A}, V_{CE} = 400\text{ V}$

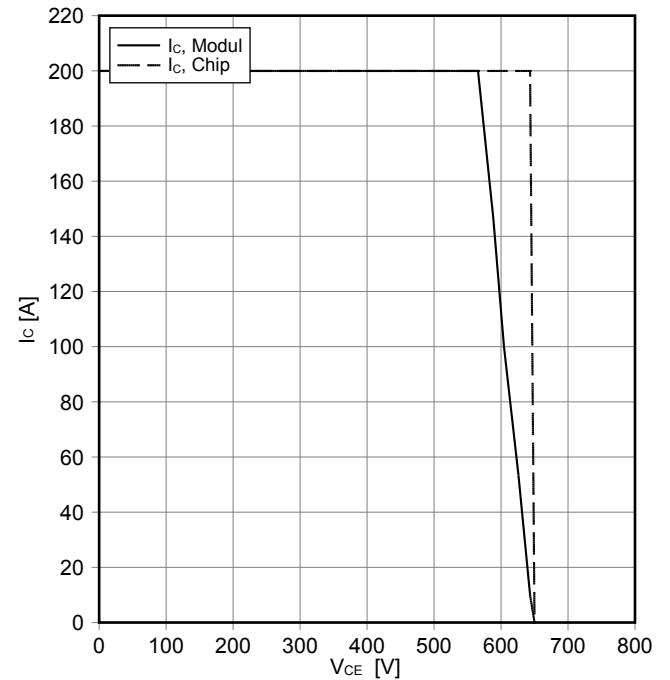


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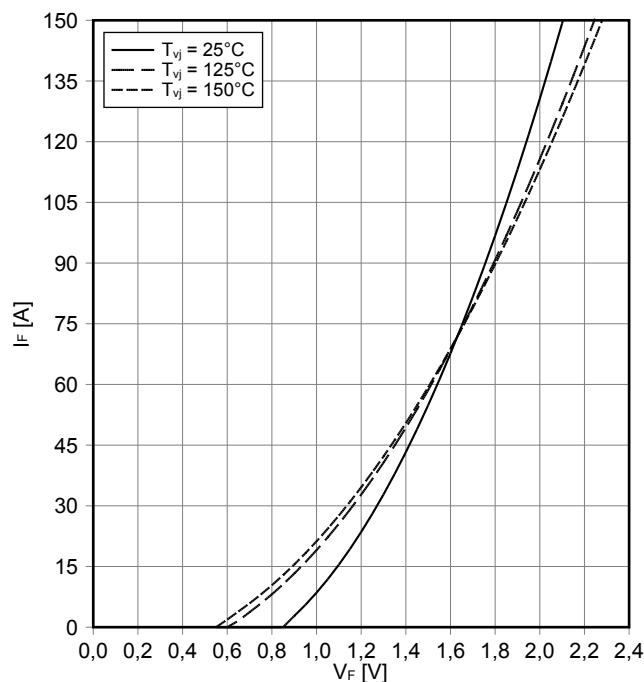
**Transienter Wärmewiderstand IGBT, T2 / T3**  
transient thermal impedance IGBT, T2 / T3  
 $Z_{thJH} = f(t)$



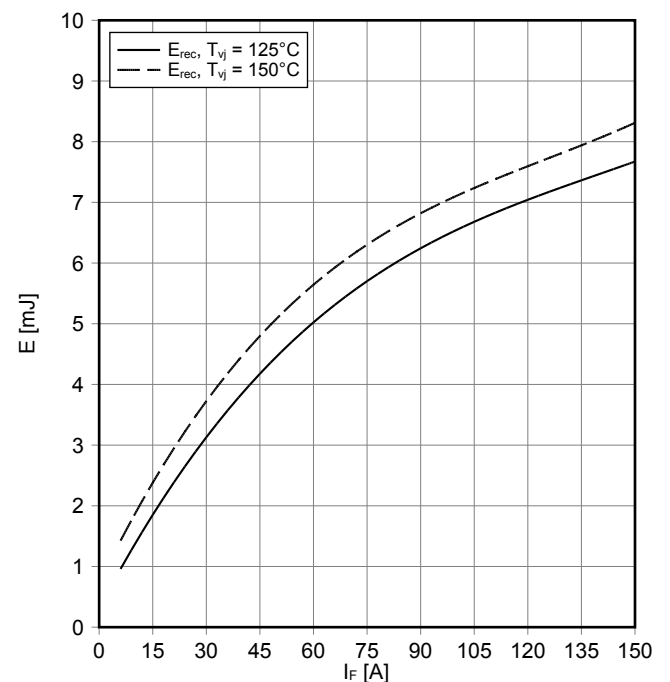
**Sicherer Rückwärts-Arbeitsbereich IGBT, T2 / T3 (RBSOA)**  
reverse bias safe operating area IGBT, T2 / T3 (RBSOA)  
 $I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 3.3\ \Omega$ ,  $T_{vj} = 150^\circ\text{C}$



**Durchlasskennlinie der Diode, D1 / D4 (typisch)**  
forward characteristic of Diode, D1 / D4 (typical)  
 $I_F = f(V_F)$



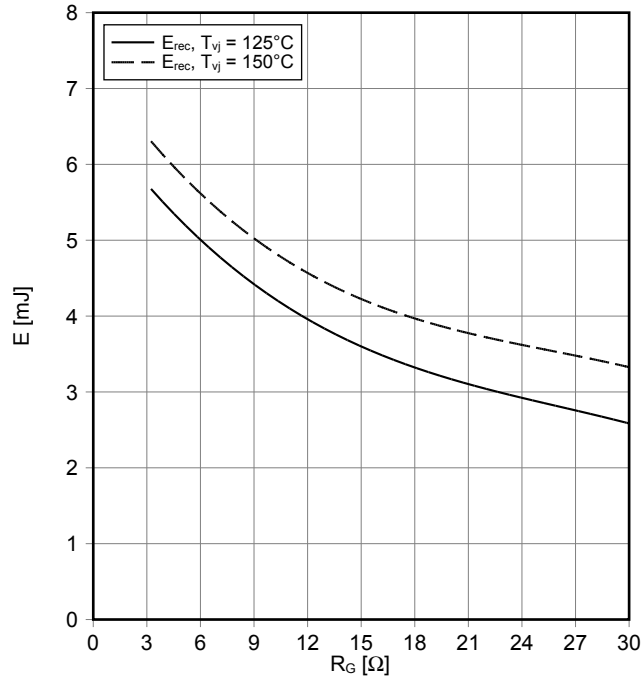
**Schaltverluste Diode, D1 / D4 (typisch)**  
switching losses Diode, D1 / D4 (typical)  
 $E_{rec} = f(I_F)$   
 $R_{Gon} = 3.3\ \Omega$ ,  $V_{CE} = 400\text{ V}$



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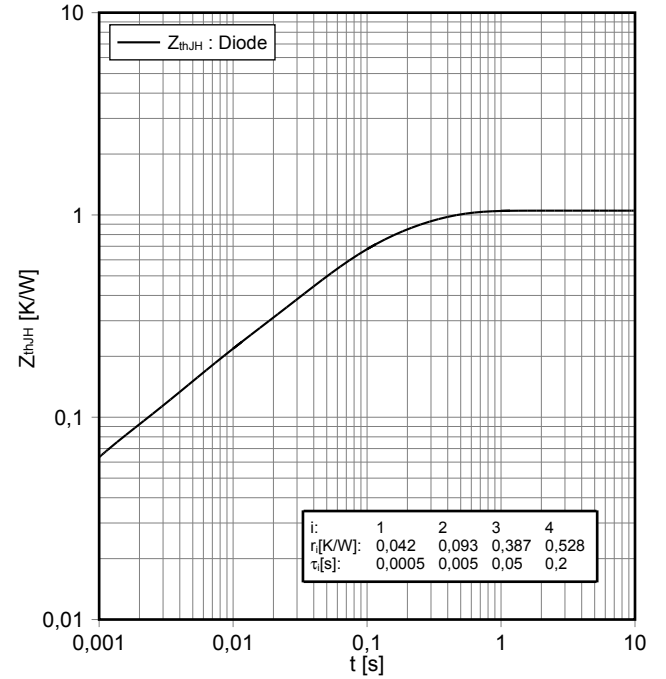
**Schaltverluste Diode, D1 / D4 (typisch)**  
**switching losses Diode, D1 / D4 (typical)**

$E_{rec} = f(R_G)$   
 $I_F = 75\text{ A}, V_{CE} = 400\text{ V}$



**Transienter Wärmewiderstand Diode, D1 / D4**  
**transient thermal impedance Diode, D1 / D4**

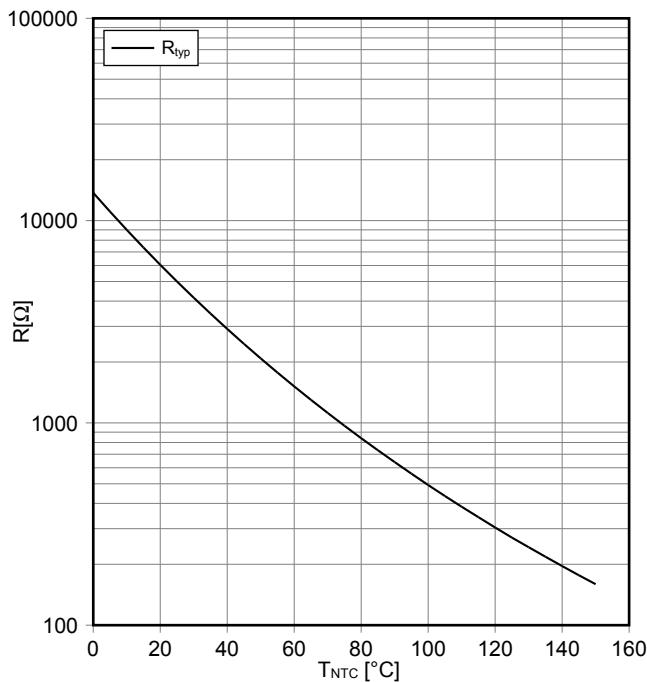
$Z_{thJH} = f(t)$



i:	1	2	3	4
r[K/W]:	0,042	0,093	0,387	0,528
τ[s]:	0,0005	0,005	0,05	0,2

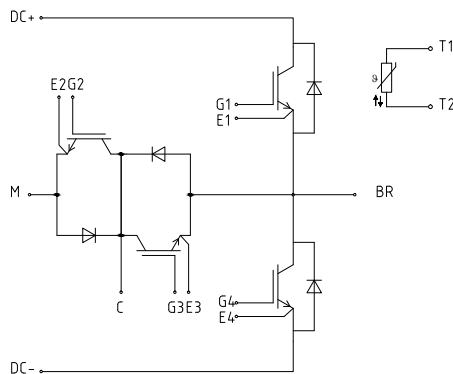
**NTC-Widerstand-Temperaturkennlinie (typisch)**  
**NTC-Thermistor-temperature characteristic (typical)**

$R = f(T)$

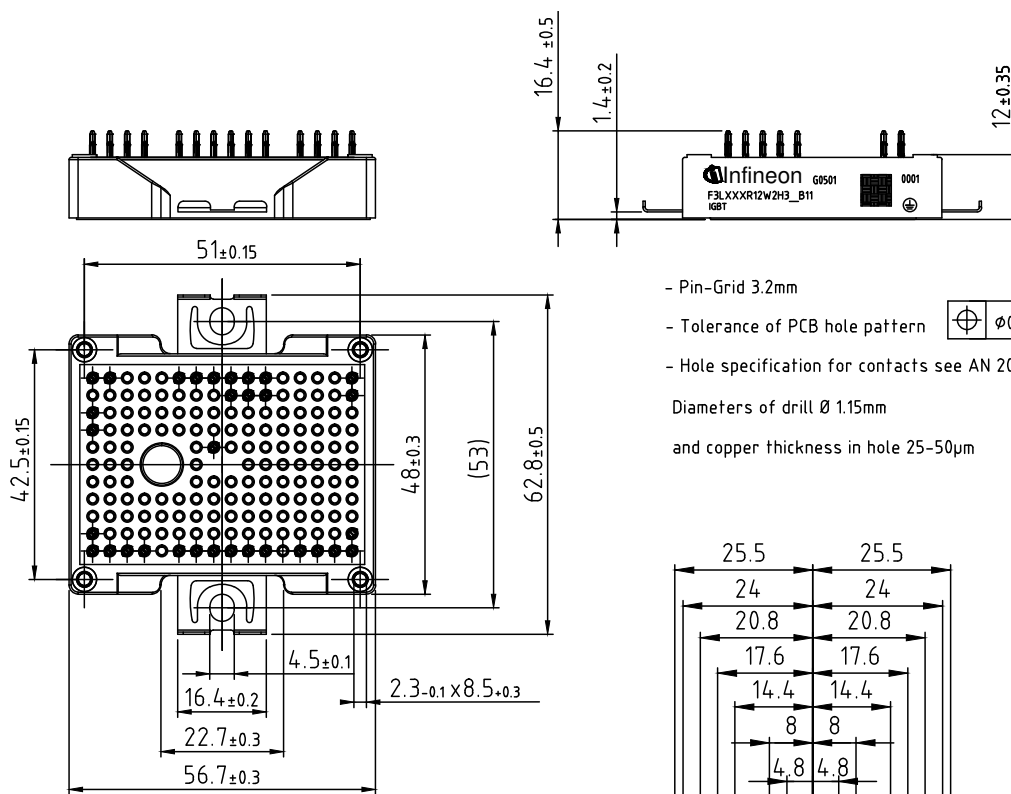


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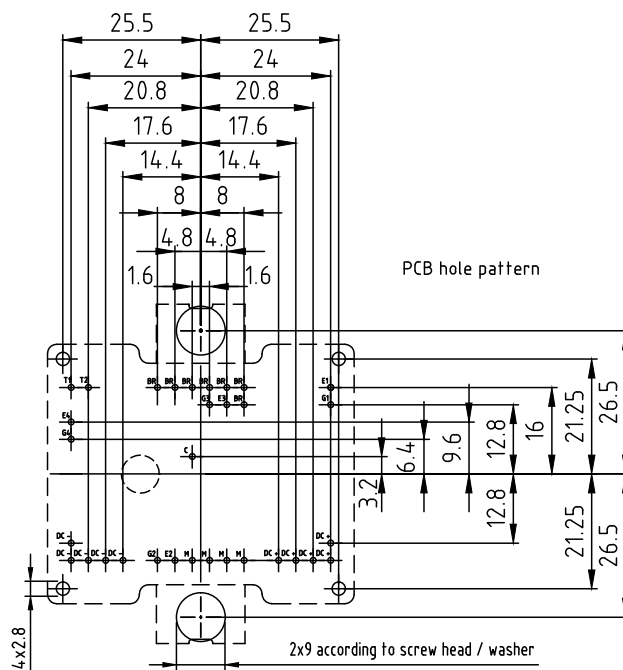
Schaltplan / Circuit diagram



Gehäuseabmessungen / Package outlines



- Pin-Grid 3.2mm
- Tolerance of PCB hole pattern  $\begin{matrix} \oplus \\ \ominus \end{matrix} \phi 0.1$
- Hole specification for contacts see AN 2009-01:  
Diameters of drill  $\phi 1.15\text{mm}$   
and copper thickness in hole 25-50 $\mu\text{m}$



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