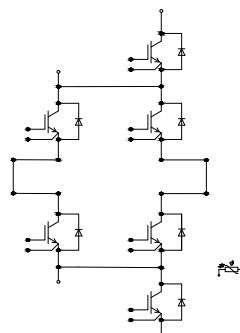
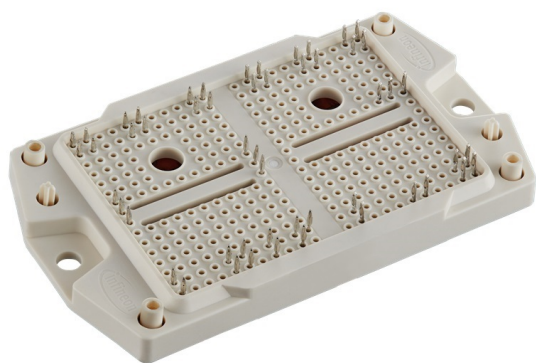


EasyPACK™ Modul mit TRENCHSTOP™ IGBT7 und Emitter Controlled 7 Diode und PressFIT / NTC
 EasyPACK™ module with TRENCHSTOP™ IGBT7 and Emitter Controlled 7 diode and PressFIT / NTC



$V_{CES} = 950V$
 $I_{C\ nom} = 400A / I_{CRM} = 800A$

Potentielle Anwendungen

- 3-Level-Applikationen
- Solar Anwendungen

Elektrische Eigenschaften

- Hohe Stromdichte
- Niedrige Schaltverluste
- Trenchstop™ IGBT7

Mechanische Eigenschaften

- Integrierter NTC Temperatur Sensor
- PressFIT Verbindungstechnik

Potential Applications

- 3-level-applications
- Solar applications

Electrical Features

- High current density
- Low switching losses
- Trenchstop™ IGBT7

Mechanical Features

- Integrated NTC temperature sensor
- 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, T1 / T4 / IGBT, T1 / T4

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}	400	A
Kollektor-Dauergleichstrom Continuous DC collector current	$T_H = 65^{\circ}\text{C}, T_{vj\text{max}} = 175^{\circ}\text{C}$	I_{CDC}	235	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_p = 1\text{ ms}$	I_{CRM}	800	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	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,40 1,48 1,50	1,61 V V V
Gate-Schwellenspannung Gate threshold voltage	$I_C = 6,50\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GETH}	4,35	5,10 5,85
Gateladung Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 600\text{ V}$		Q_G	0,90	μC
Interner Gatewiderstand Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	0,75	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}	25,2	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}	0,078	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}		0,07 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	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	0,089 0,092 0,093	μs μs μs
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,022 0,026 0,027	μs μs μs
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	0,27 0,34 0,36	μs μs μs
Fallzeit, induktive Last Fall time, inductive load	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,041 0,075 0,088	μs μs μs
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}, L_{\sigma} = 35\text{ nH}$ $di/dt = 5800\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	5,00 7,05 7,50	mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}, L_{\sigma} = 35\text{ nH}$ $du/dt = 4000\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	4,30 7,16 8,00	mJ mJ mJ
Kurzschlußverhalten SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 600\text{ V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$	$t_p \leq 0\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	I_{SC}	1200	A
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro IGBT / per IGBT		R_{thJH}	0,224	K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\text{op}}$	-40	150 $^{\circ}\text{C}$

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}	950	V
Implementierter Kollektor-Strom Implemented collector current		I_{CN}	400	A
Kollektor-Dauergleichstrom Continuous DC collector current	$T_H = 65^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	I_{CDC}	380	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_p = 1\text{ ms}$	I_{CRM}	800	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	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,07 1,04 1,02	1,14 V V V
Gate-Schwellenspannung Gate threshold voltage	$I_C = 6,50\text{ mA}, V_{CE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$		V_{GETH}	4,15 4,90 5,65	V
Gateladung Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 600\text{ V}$		Q_G	4,10	μC
Interner Gatewiderstand Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	0,75	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}	49,2	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}	0,228	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}		0,07 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	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	0,189 0,191 0,192	μs μs μs
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,026 0,032 0,034	μs μs μs
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	0,76 0,92 0,94	μs μs μs
Fallzeit, induktive Last Fall time, inductive load	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,23 0,44 0,49	μs μs μs
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}, L\sigma = 35\text{ nH}$ $di/dt = 5200\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	3,10 4,00 4,30	mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}, L\sigma = 35\text{ nH}$ $du/dt = 1200\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	24,5 35,3 37,9	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}	1200	A
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro IGBT / per IGBT		R_{thJH}	0,200	K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150 $^{\circ}\text{C}$

IGBT, T5 / T6 / IGBT, T5 / T6

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}	200	A
Kollektor-Dauergleichstrom Continuous DC collector current	$T_H = 65^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	I_{CDC}	140	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	$t_p = 1\text{ ms}$	I_{CRM}	400	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	$I_C = 150\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,68 1,88 1,92	1,98 V V V
Gate-Schwellenspannung Gate threshold voltage	$I_C = 3,25\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		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	0,45	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}	12,6	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}	0,039	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}		0,05 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	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	0,086 0,095 0,096	μs μs μs
Anstiegszeit, induktive Last Rise time, inductive load	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,02 0,022 0,023	μs μs μs
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	0,18 0,22 0,23	μs μs μs
Fallzeit, induktive Last Fall time, inductive load	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,032 0,089 0,112	μs μs μs
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}, L\sigma = 35\text{ nH}$ $di/dt = 5300\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	5,00 6,43 6,79	mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	$I_C = 150\text{ A}, V_{CE} = 500\text{ V}, L\sigma = 35\text{ nH}$ $du/dt = 6000\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	3,73 6,35 7,26	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}	600	A
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro IGBT / per IGBT		R_{thJH}	0,340	K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150 $^{\circ}\text{C}$

Diode, D1 / D4 / Diode, D1 / D4

Höchstzulässige Werte / Maximum Rated Values

Periodische Spitzenspannung Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	950	V
Implementierter Durchlassstrom Implemented forward current		I_{FN}	200	A
Dauergleichstrom Continuous DC forward current		I_F	150	A
Periodischer Spitzenstrom Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	400	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	1620 1530	A^2s A^2s

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Durchlassspannung Forward voltage	$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$		2,33	2,58	V
	$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	V_F	2,12		V
	$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		2,08		V
Rückstromspitze Peak reverse recovery current	$I_F = 150\text{ A}, -di_F/dt = 5300\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		119		A
	$V_R = 500\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	I_{RM}	173		A
	$V_{GE} = -15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		189		A
Sperrverzögerungsladung Recovered charge	$I_F = 150\text{ A}, -di_F/dt = 5300\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		5,84		μC
	$V_R = 500\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	Q_r	11,6		μC
	$V_{GE} = -15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		14,0		μC
Abschaltenergie pro Puls Reverse recovery energy	$I_F = 150\text{ A}, -di_F/dt = 5300\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		1,70		mJ
	$V_R = 500\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	E_{rec}	3,62		mJ
	$V_{GE} = -15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		4,53		mJ
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode	R_{thJH}		0,460		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

Diode, D2 / D3 / Diode, D2 / D3

Höchstzulässige Werte / Maximum Rated Values

Periodische Spitzenspannung Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	950	V
Implementierter Durchlassstrom Implemented forward current		I_{FN}	200	A
Dauergleichstrom Continuous DC forward current		I_F	150	A
Periodischer Spitzenstrom Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	400	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	1620 1530	A^2s A^2s

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Durchlassspannung Forward voltage	$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$		2,33	2,58	V
	$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	V_F	2,12		V
	$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		2,08		V
Rückstromspitze Peak reverse recovery current	$I_F = 150\text{ A}, -di_F/dt = 5200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		154		A
	$V_R = 500\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	I_{RM}	189		A
	$V_{GE} = -15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		200		A
Sperrverzögerungsladung Recovered charge	$I_F = 150\text{ A}, -di_F/dt = 5200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		6,65		μC
	$V_R = 500\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	Q_r	14,9		μC
	$V_{GE} = -15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		20,0		μC
Abschaltenergie pro Puls Reverse recovery energy	$I_F = 150\text{ A}, -di_F/dt = 5200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		2,39		mJ
	$V_R = 500\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	E_{rec}	6,24		mJ
	$V_{GE} = -15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		7,49		mJ
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode	R_{thJH}		0,552		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

Diode, D5-D6 / Diode, D5-D6

Höchstzulässige Werte / Maximum Rated Values

Periodische Spitzensperrspannung Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	950	V
Implementierter Durchlassstrom Implemented forward current		I_{FN}	200	A
Dauergleichstrom Continuous DC forward current		I_F	150	A
Periodischer Spitzenstrom Repetitive peak forward current	$t_p = 1\text{ ms}$	I_{FRM}	400	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	1620 1530	A^2s A^2s

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Durchlassspannung Forward voltage	$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$		2,33	2,58	V
	$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	V_F	2,12		V
	$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		2,08		V
Rückstromspitze Peak reverse recovery current	$I_F = 150\text{ A}, -di_F/dt = 5800\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		145		A
	$V_R = 500\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	I_{RM}	189		A
	$V_{GE} = -15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		205		A
Sperrverzögerungsladung Recovered charge	$I_F = 150\text{ A}, -di_F/dt = 5800\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		7,70		μC
	$V_R = 500\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	Q_r	15,0		μC
	$V_{GE} = -15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		18,7		μC
Abschaltenergie pro Puls Reverse recovery energy	$I_F = 150\text{ A}, -di_F/dt = 5800\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		2,59		mJ
	$V_R = 500\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	E_{rec}	5,01		mJ
	$V_{GE} = -15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		6,44		mJ
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode	R_{thJH}		0,490		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

NTC-Widerstand / NTC-Thermistor

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Nennwiderstand Rated resistance	$T_{NTC} = 25^{\circ}\text{C}$	R_{25}		5,00		$\text{k}\Omega$
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		9,6 5,8		mm
Luftstrecke Clearance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		8,8 4,7		mm
Vergleichszahl der Kriechwegbildung Comperative tracking index		CTI	> 400		
Relativer Temperaturindex (elektr.) RTI Elec.	Gehäuse housing	RTI	140		°C
			min.	typ.	max.
Modulstreuintduktivität Stray inductance module		L _{sCE}		15	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

Der Strom im Dauerbetrieb ist auf 25 A effektiv pro Anschlusspin begrenzt.

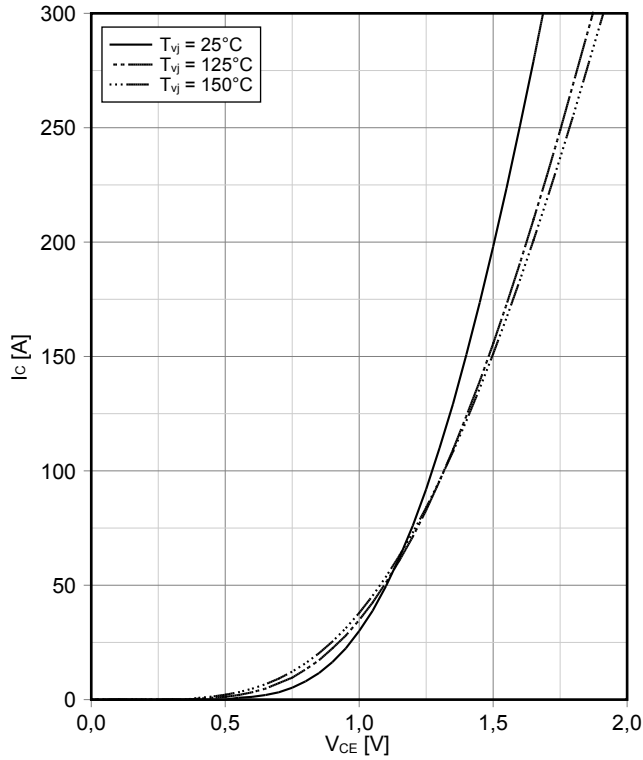
The current under continuous operation is limited to 25 A rms per connector pin.

IGBT- und Dioden-RthJH-Parameter mit einer Wärmeleitpaste $\lambda_{\text{Paste}} = 3.3 \text{ W/(m}\cdot\text{K)}$ gemessen

IGBT- and diode- RthJH parameters measured with thermal grease of $\lambda_{\text{paste}} = 3.3 \text{ W/(m}\cdot\text{K)}$

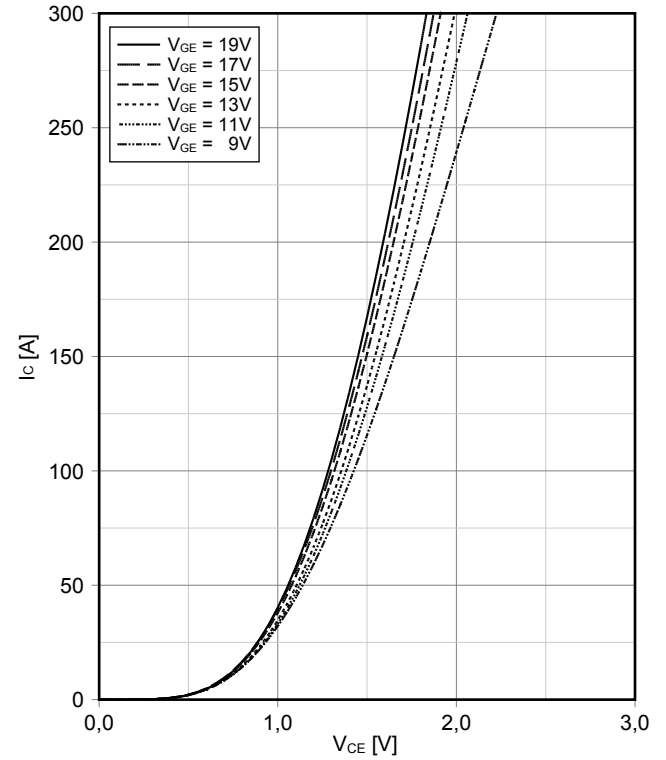
Ausgangskennlinie IGBT, T1 / T4 (typisch)
output characteristic IGBT, T1 / T4 (typical)

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



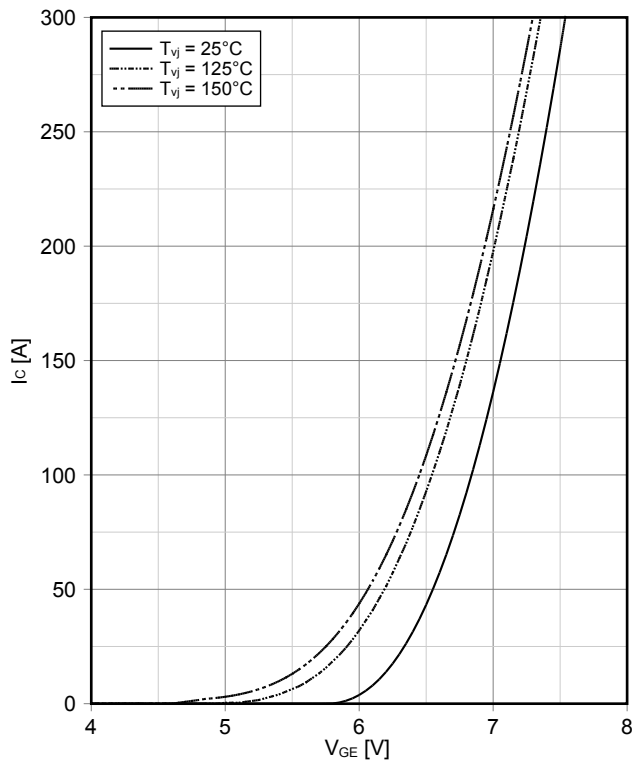
Ausgangskennlinienfeld IGBT, T1 / T4 (typisch)
output characteristic IGBT, T1 / T4 (typical)

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



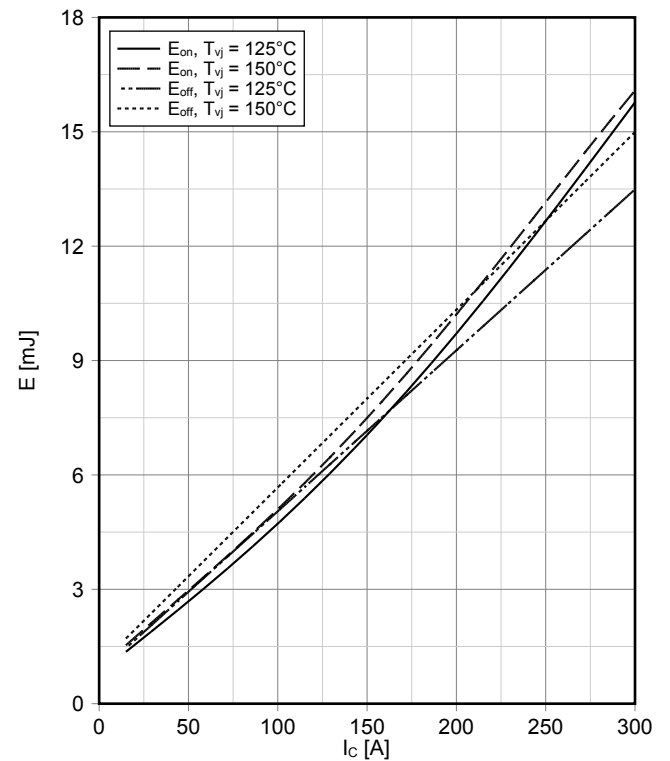
Übertragungscharakteristik IGBT, T1 / T4 (typisch)
transfer characteristic IGBT, T1 / T4 (typical)

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



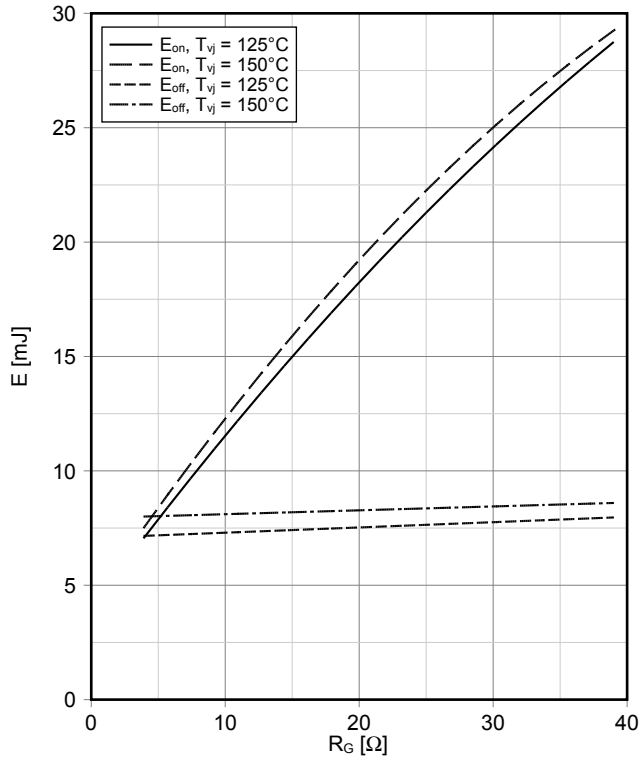
Schaltverluste IGBT, T1 / T4 (typisch)
switching losses IGBT, T1 / T4 (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 3,9\ \Omega$, $R_{Goff} = 3,9\ \Omega$, $V_{CE} = 500\text{ V}$



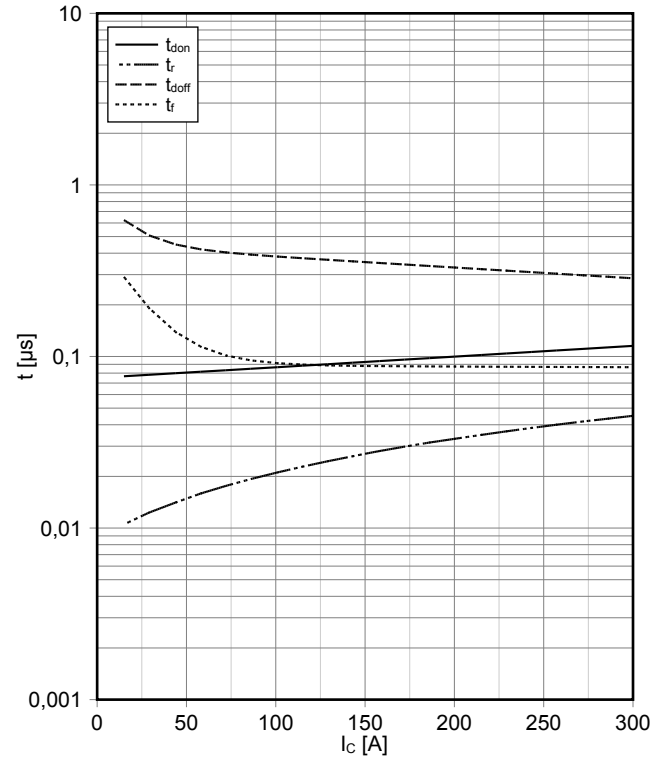
Schaltverluste IGBT, T1 / T4 (typisch)
switching losses IGBT, T1 / T4 (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}, I_C = 150 \text{ A}, V_{CE} = 500 \text{ V}$



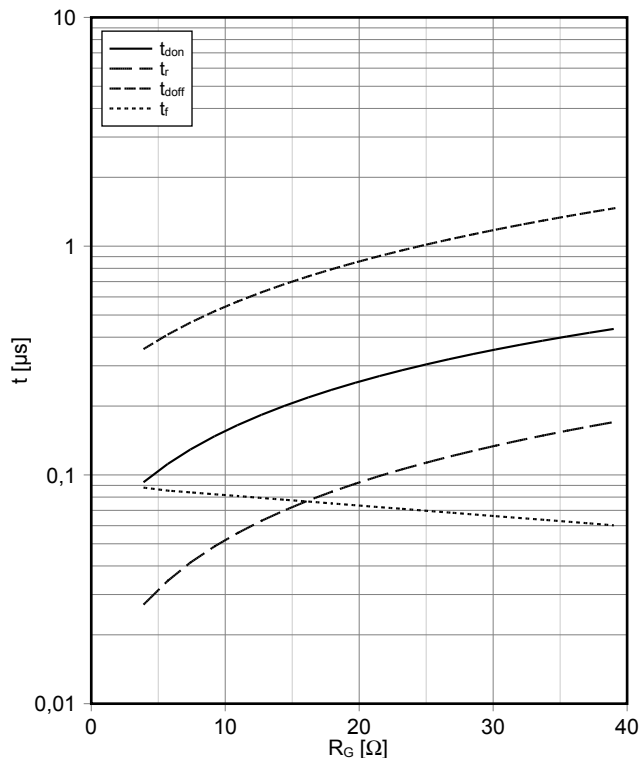
Schaltzeiten IGBT, T1 / T4 (typisch)
switching times IGBT, T1 / T4 (typical)

$t_{don} = f(I_C), t_r = f(I_C), t_{doff} = f(I_C), t_f = f(I_C)$
 $V_{GE} = \pm 15 \text{ V}, R_{Gon} = 3,9 \Omega, R_{Goff} = 3,9 \Omega, V_{CE} = 500 \text{ V}, T_{vj} = 150 \text{ °C}$



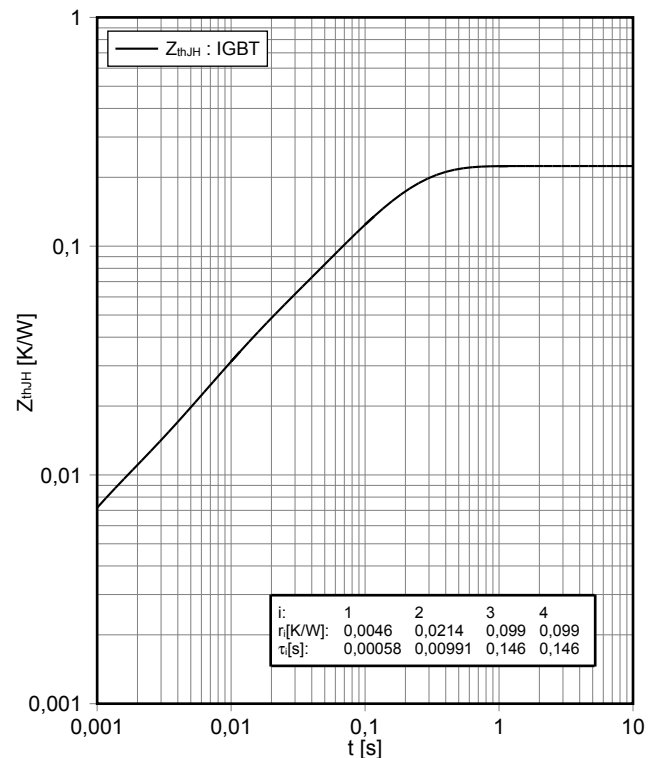
Schaltzeiten IGBT, T1 / T4 (typisch)
switching times IGBT, T1 / T4 (typical)

$t_{don} = f(R_G), t_r = f(R_G), t_{doff} = f(R_G), t_f = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}, I_C = 150 \text{ A}, V_{CE} = 500 \text{ V}, T_{vj} = 150 \text{ °C}$



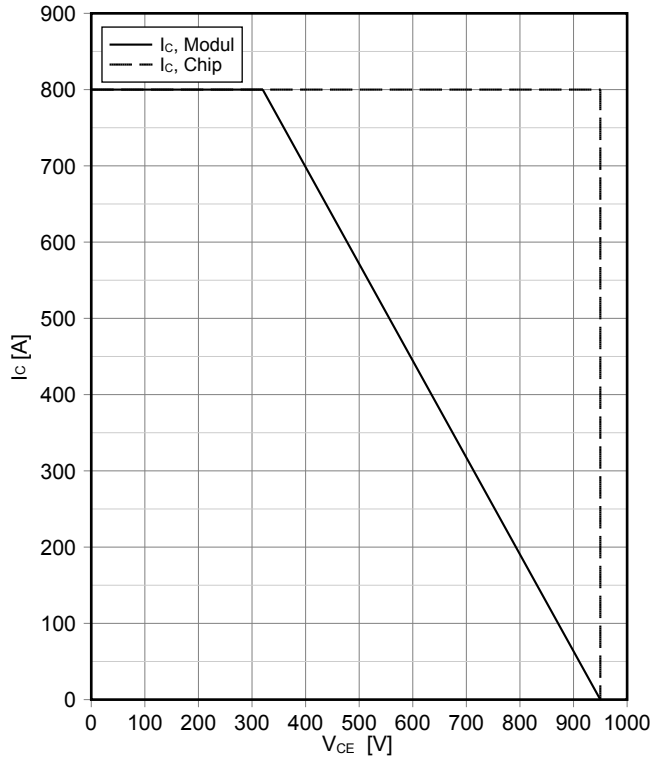
Transienter Wärmewiderstand IGBT, T1 / T4
transient thermal impedance IGBT, T1 / T4

$Z_{thJH} = f(t)$



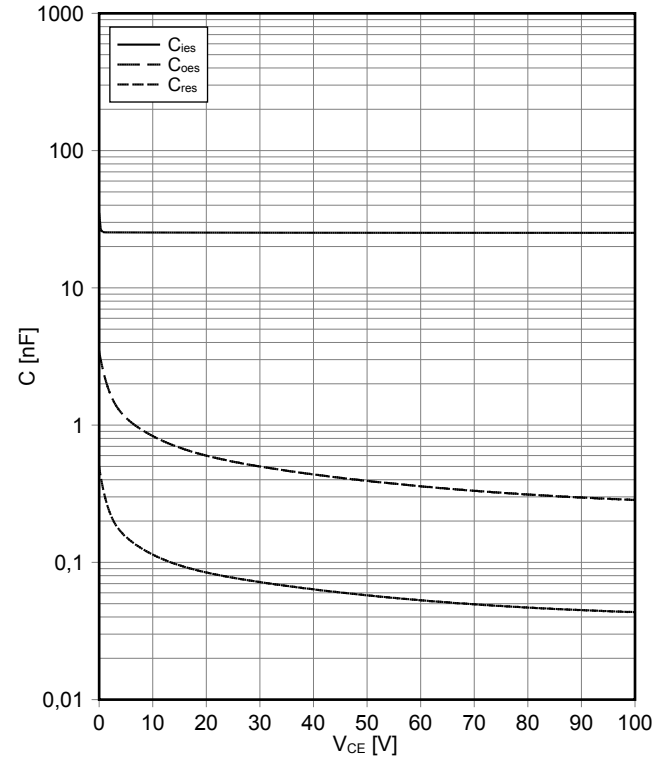
Sicherer Rückwärts-Arbeitsbereich IGBT, T1 / T4 (RBSOA)
reverse bias safe operating area IGBT, T1 / T4 (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 3,9\ \Omega$, $T_{vj} = 150^\circ\text{C}$



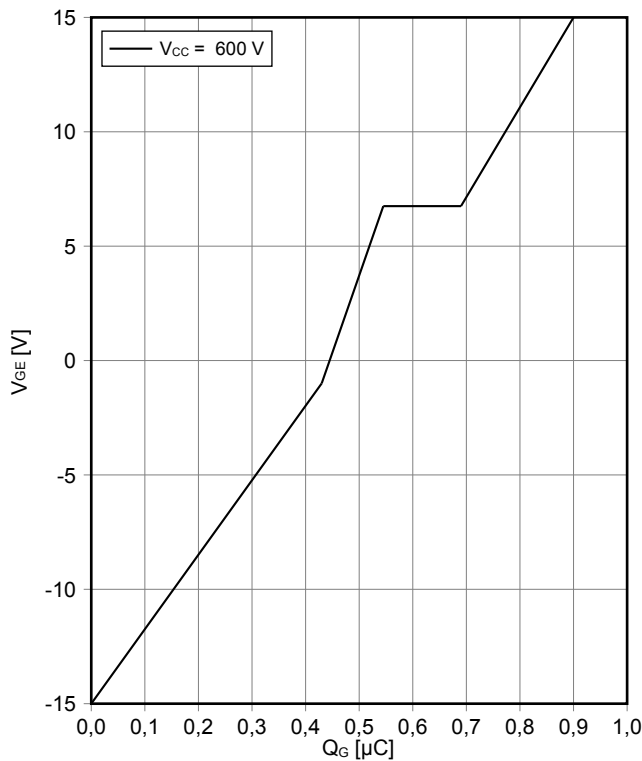
Kapazitäts Charakteristik IGBT, T1 / T4 (typisch)
capacity characteristic IGBT, T1 / T4 (typical)

$C = f(V_{CE})$
 $V_{GE} = 0\text{ V}$, $T_{vj} = 25^\circ\text{C}$, $f = 100\text{kHz}$



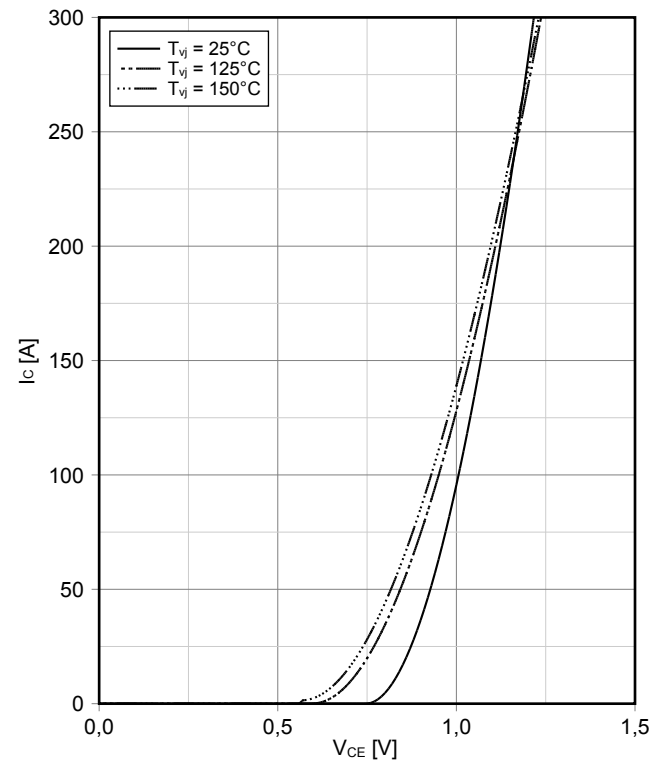
Gateladungs Charakteristik IGBT, T1 / T4 (typisch)
gate charge characteristic IGBT, T1 / T4 (typical)

$V_{GE} = f(Q_G)$
 $I_C = 400\text{ A}$, $T_{vj} = 25^\circ\text{C}$



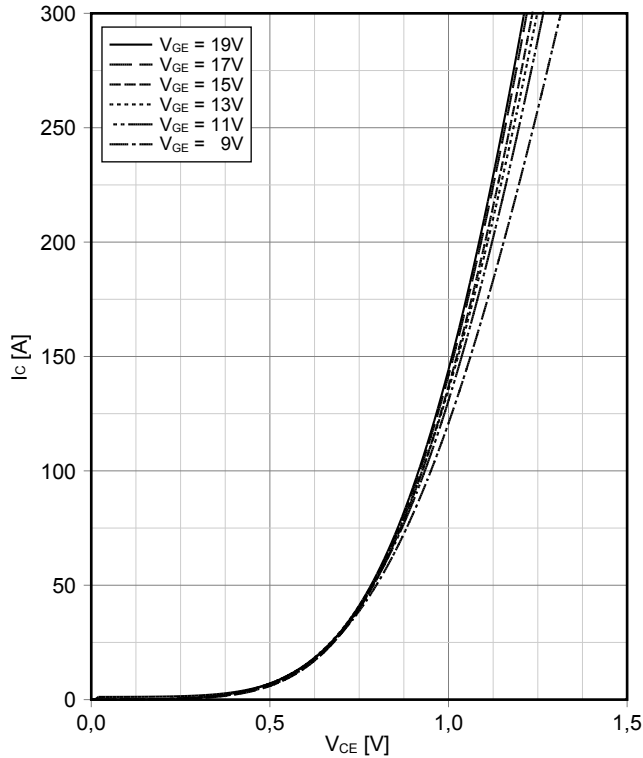
Ausgangskennlinie IGBT, T2 / T3 (typisch)
output characteristic IGBT, T2 / T3 (typical)

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



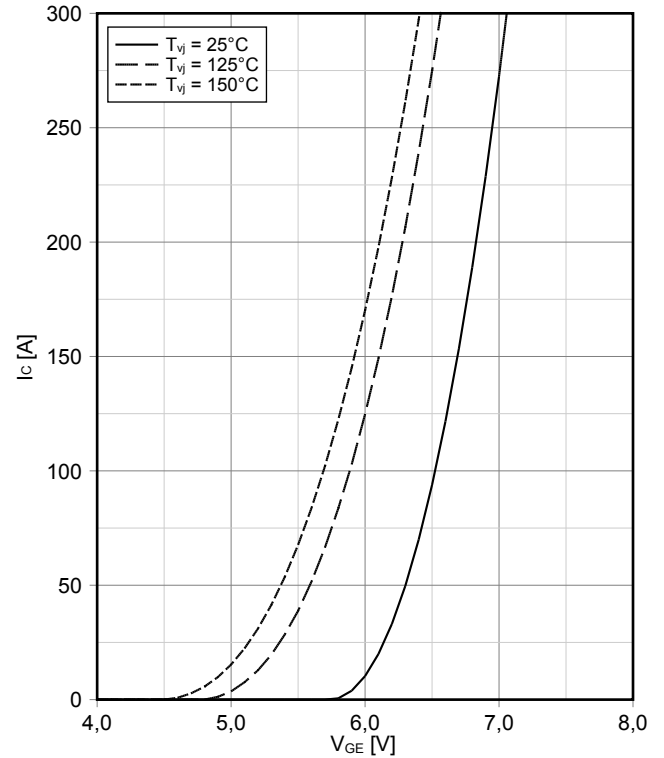
Ausgangskennlinienfeld IGBT, T2 / T3 (typisch)
output characteristic IGBT, T2 / T3 (typical)

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



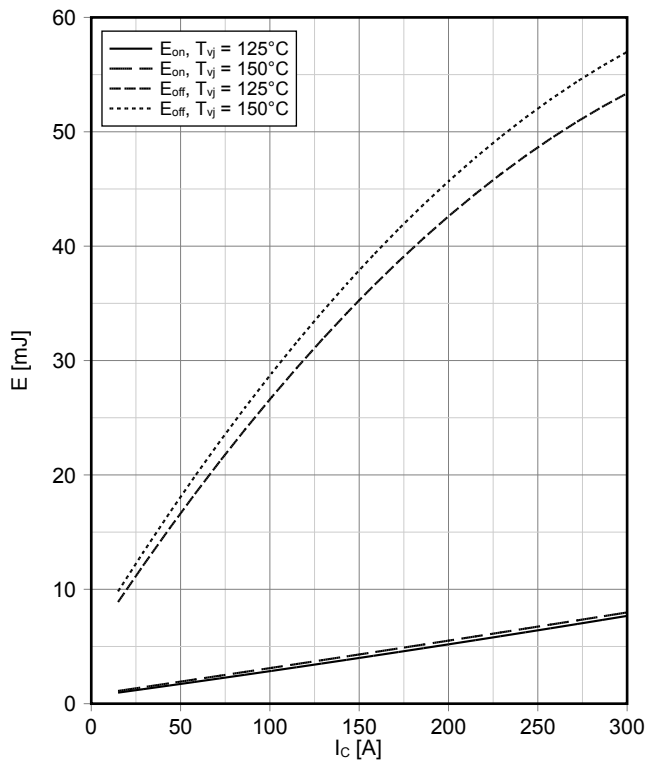
Übertragungscharakteristik IGBT, T2 / T3 (typisch)
transfer characteristic IGBT, T2 / T3 (typical)

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



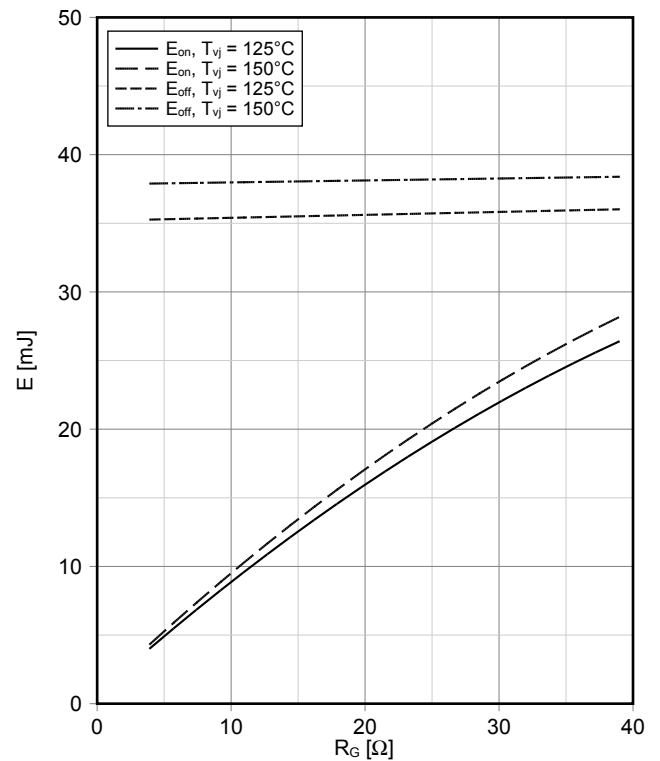
Schaltverluste IGBT, T2 / T3 (typisch)
switching losses IGBT, T2 / T3 (typical)

$E_{on} = f(I_C), E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 3,9\ \Omega, R_{Goff} = 3,9\ \Omega, V_{CE} = 500\text{ V}$



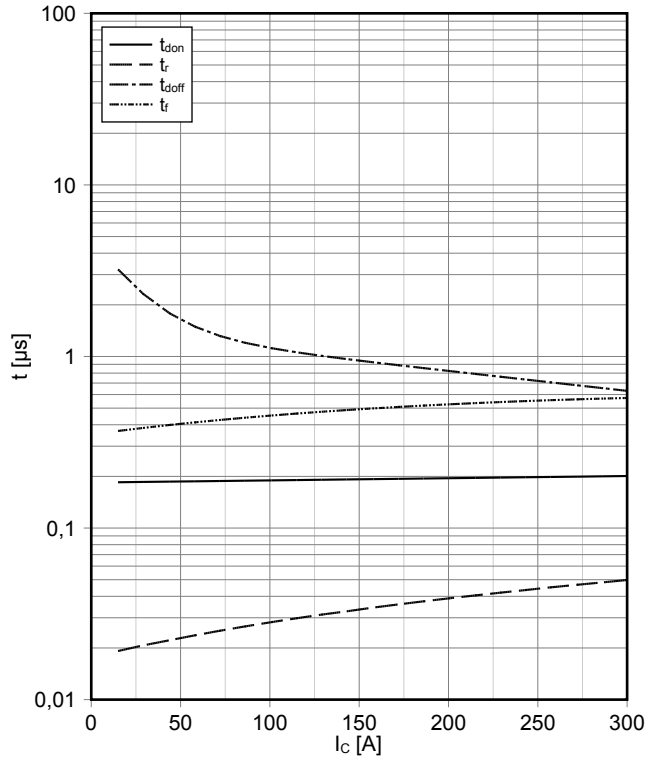
Schaltverluste IGBT, T2 / T3 (typisch)
switching losses IGBT, T2 / T3 (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 150\text{ A}, V_{CE} = 500\text{ V}$



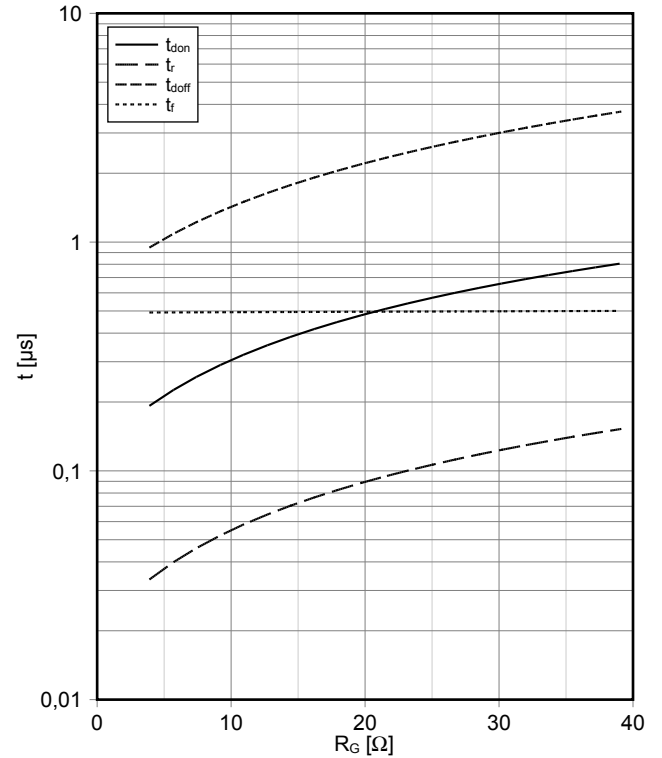
Schaltzeiten IGBT, T2 / T3 (typisch)
switching times IGBT, T2 / T3 (typical)

$t_{don} = f(I_C)$, $t_r = f(I_C)$, $t_{doff} = f(I_C)$, $t_f = f(I_C)$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 3,9 \Omega$, $R_{Goff} = 3,9 \Omega$, $V_{CE} = 500 \text{ V}$, $T_{vj} = 150 \text{ }^\circ\text{C}$



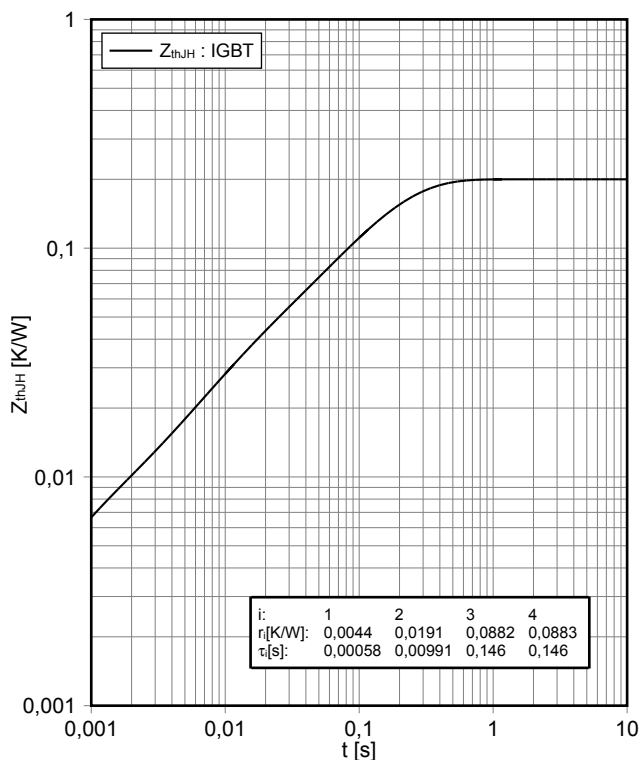
Schaltzeiten IGBT, T2 / T3 (typisch)
switching times IGBT, T2 / T3 (typical)

$t_{don} = f(R_G)$, $t_r = f(R_G)$, $t_{doff} = f(R_G)$, $t_f = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 300 \text{ A}$, $V_{CE} = 500 \text{ V}$, $T_{vj} = 150 \text{ }^\circ\text{C}$



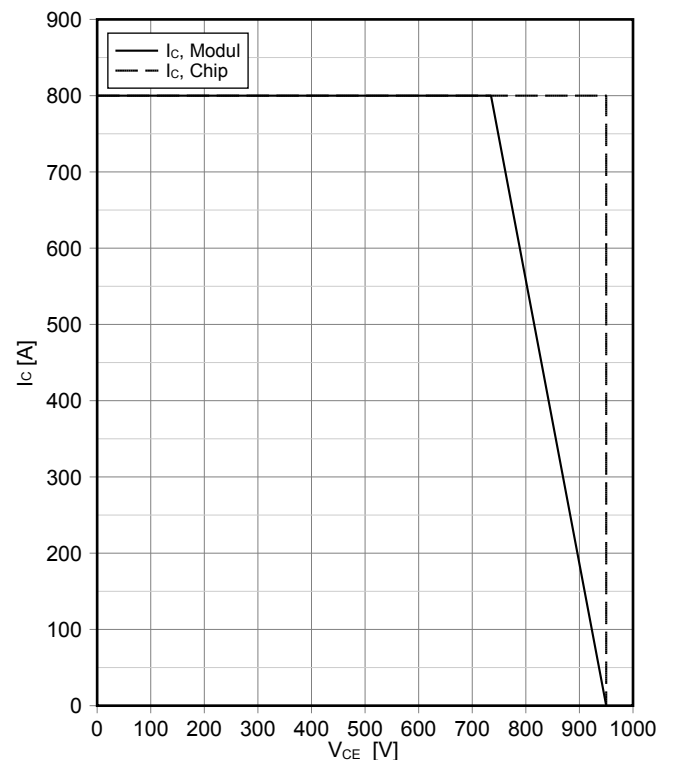
Transienter Wärmewiderstand IGBT, T2 / T3
transient thermal impedance IGBT, T2 / T3

$Z_{thJH} = f(t)$



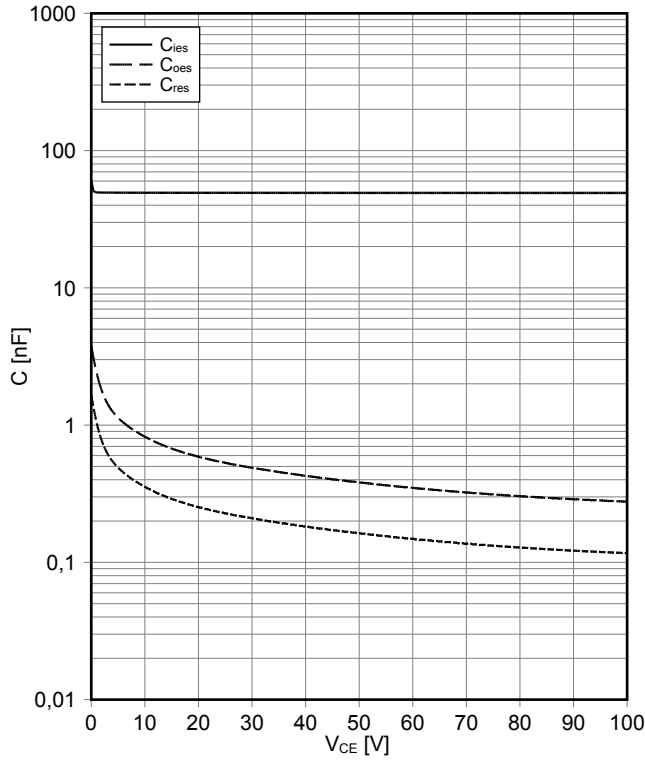
Sicherer Rückwärts-Arbeitsbereich IGBT, T2 / T3 (RBSOA)
reverse bias safe operating area IGBT, T2 / T3 (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 3,9 \Omega$, $T_{vj} = 150 \text{ }^\circ\text{C}$



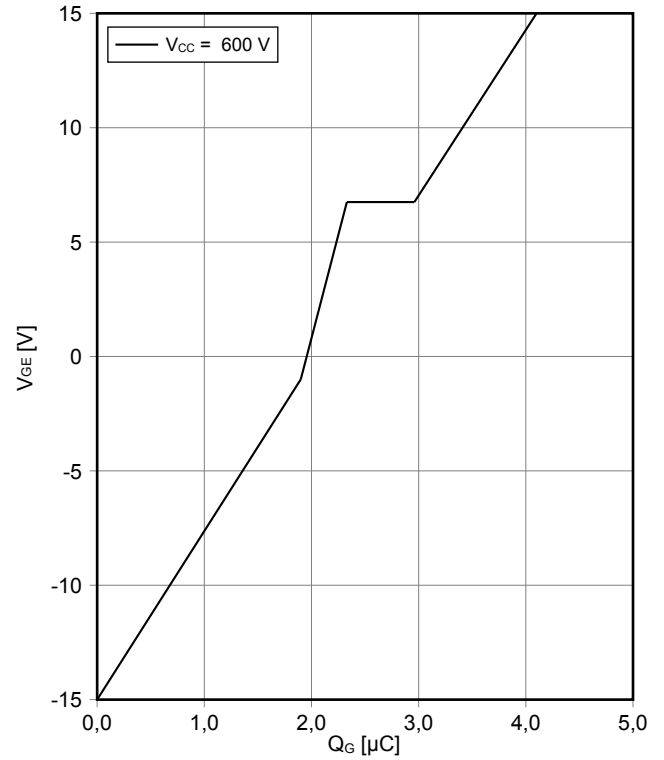
Kapazitäts Charakteristik IGBT, T2 / T3 (typisch)
capacity characteristic IGBT, T2 / T3 (typical)

$C = f(V_{CE})$
 $V_{GE} = 0\text{ V}$, $T_{vj} = 25^\circ\text{C}$, $f = 100\text{kHz}$



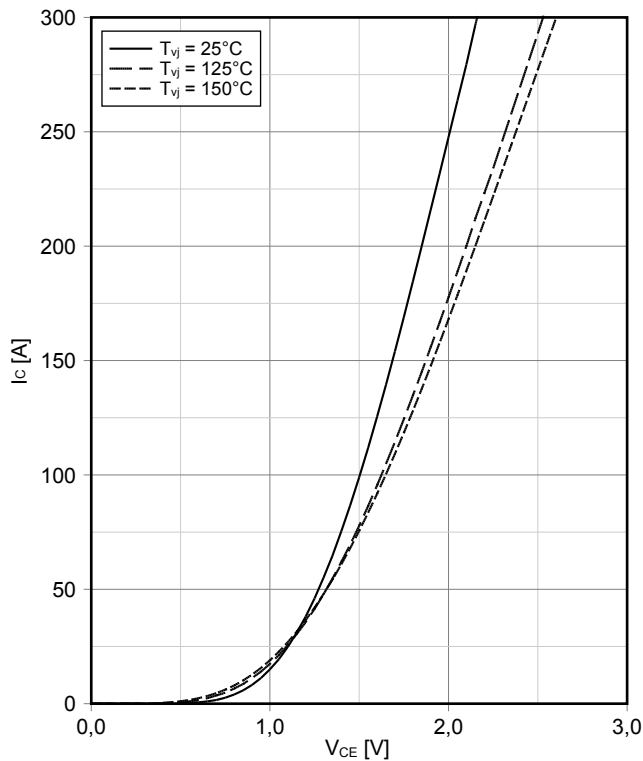
Gateladungs Charakteristik IGBT, T2 / T3 (typisch)
gate charge characteristic IGBT, T2 / T3 (typical)

$V_{GE} = f(Q_G)$
 $I_C = 400\text{ A}$, $T_{vj} = 25^\circ\text{C}$



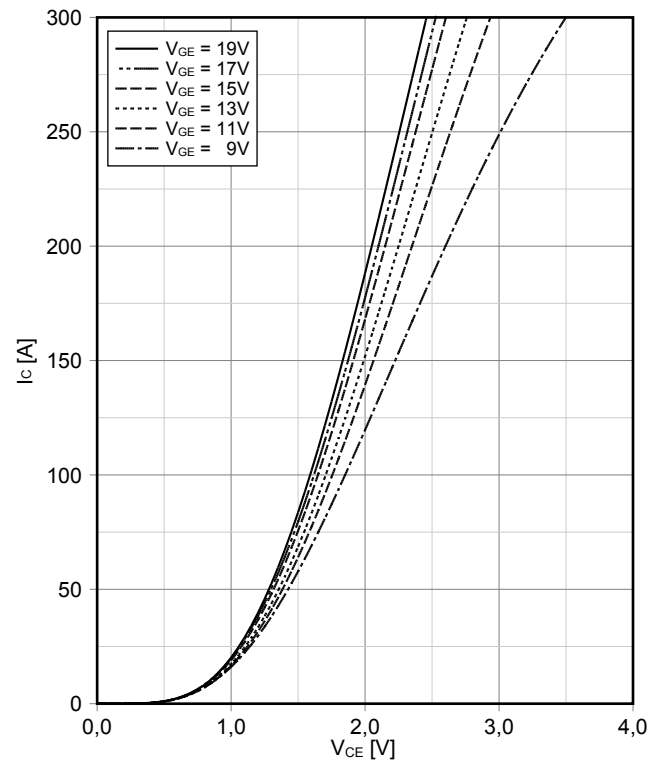
Ausgangskennlinie IGBT, T5 / T6 (typisch)
output characteristic IGBT, T5 / T6 (typical)

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



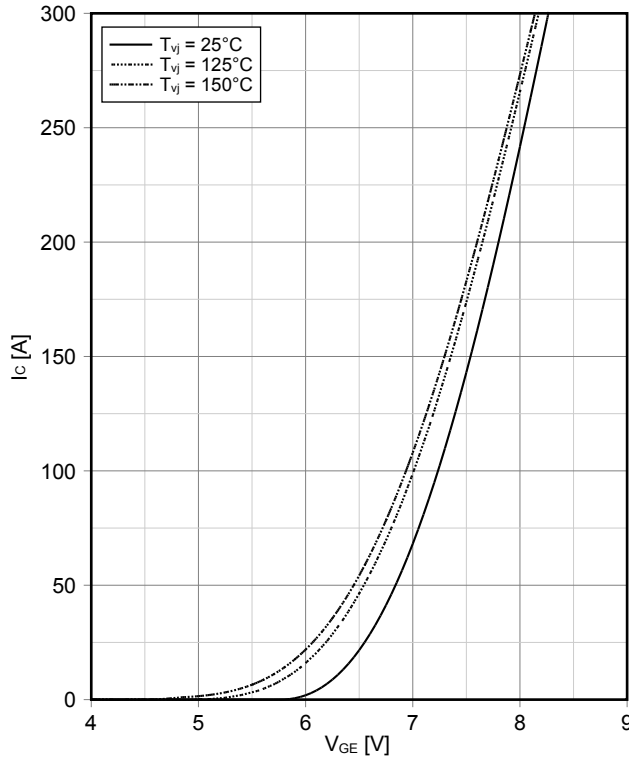
Ausgangskennlinienfeld IGBT, T5 / T6 (typisch)
output characteristic IGBT, T5 / T6 (typical)

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



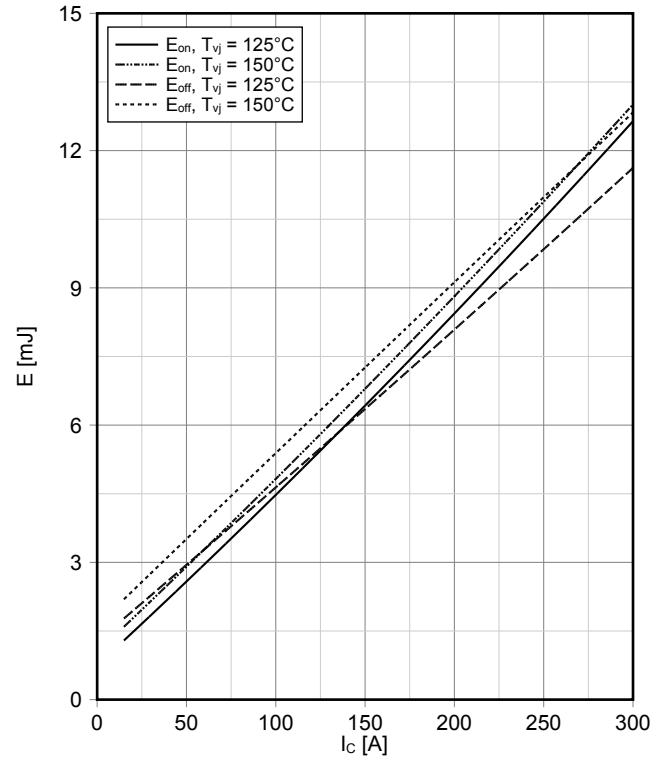
Übertragungscharakteristik IGBT, T5 / T6 (typisch)
transfer characteristic IGBT, T5 / T6 (typical)

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



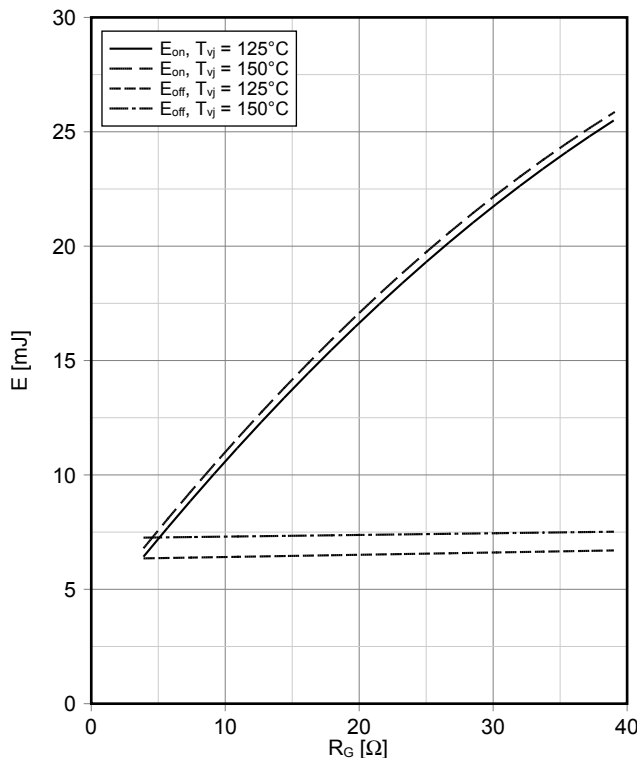
Schaltverluste IGBT, T5 / T6 (typisch)
switching losses IGBT, T5 / T6 (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 3,9\ \Omega$, $R_{Goff} = 3,9\ \Omega$, $V_{CE} = 500\text{ V}$



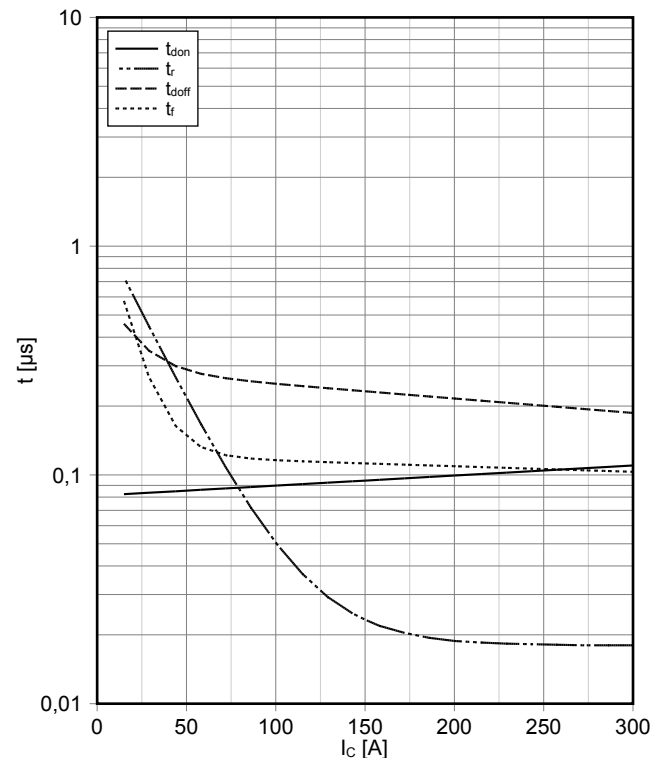
Schaltverluste IGBT, T5 / T6 (typisch)
switching losses IGBT, T5 / T6 (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 150\text{ A}$, $V_{CE} = 500\text{ V}$



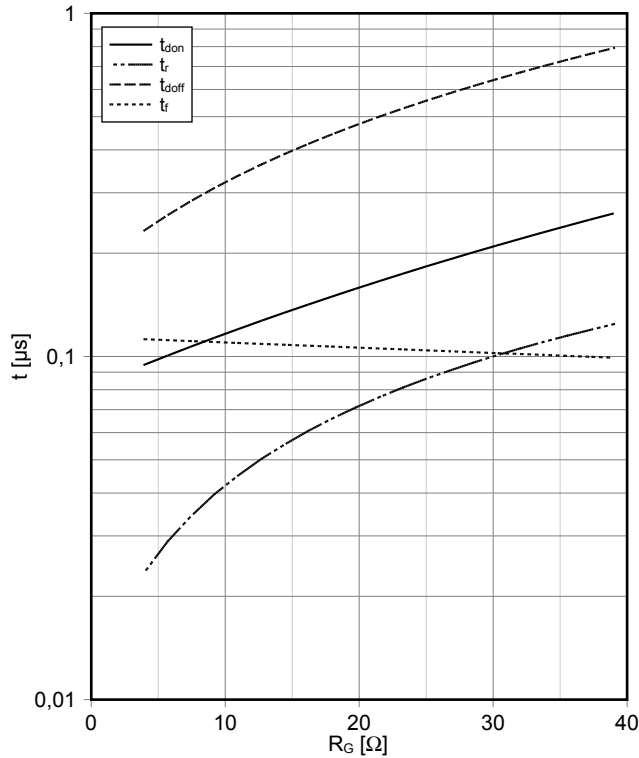
Schaltzeiten IGBT, T5 / T6 (typisch)
switching times IGBT, T5 / T6 (typical)

$t_{don} = f(I_C)$, $t_r = f(I_C)$, $t_{doff} = f(I_C)$, $t_f = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 3,9\ \Omega$, $R_{Goff} = 3,9\ \Omega$, $V_{CE} = 500\text{ V}$, $T_{vj} = 150\ ^\circ\text{C}$



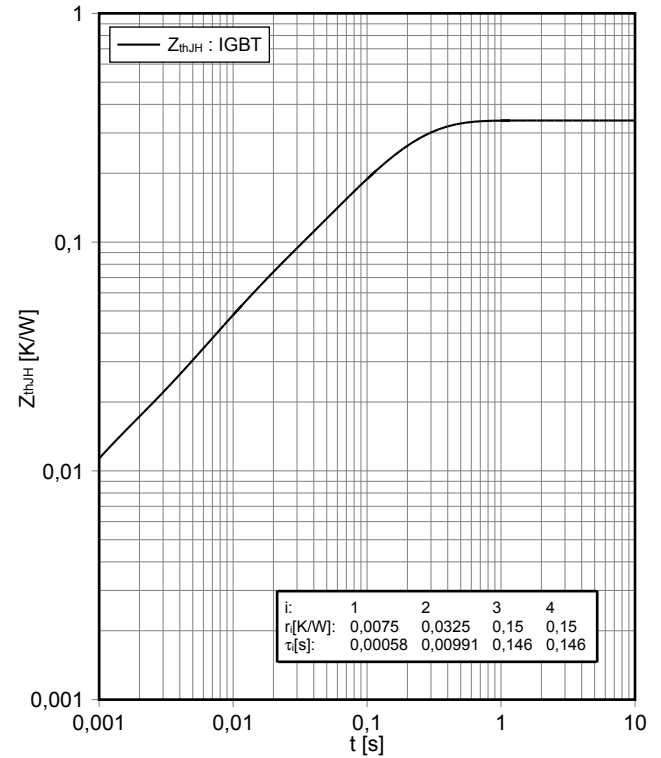
Schaltzeiten IGBT, T5 / T6 (typisch) switching times IGBT, T5 / T6 (typical)

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



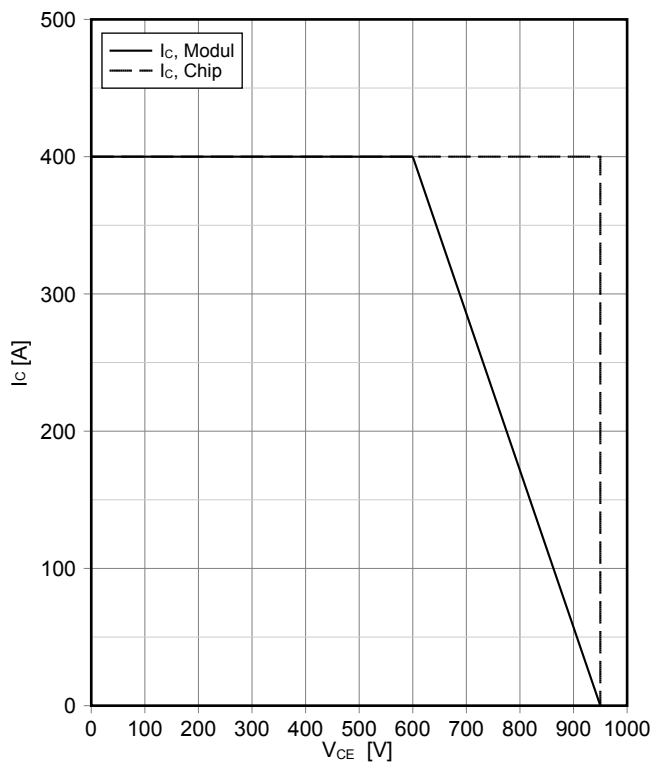
Transienter Wärmewiderstand IGBT, T5 / T6 transient thermal impedance IGBT, T5 / T6

$Z_{thJH} = f(t)$



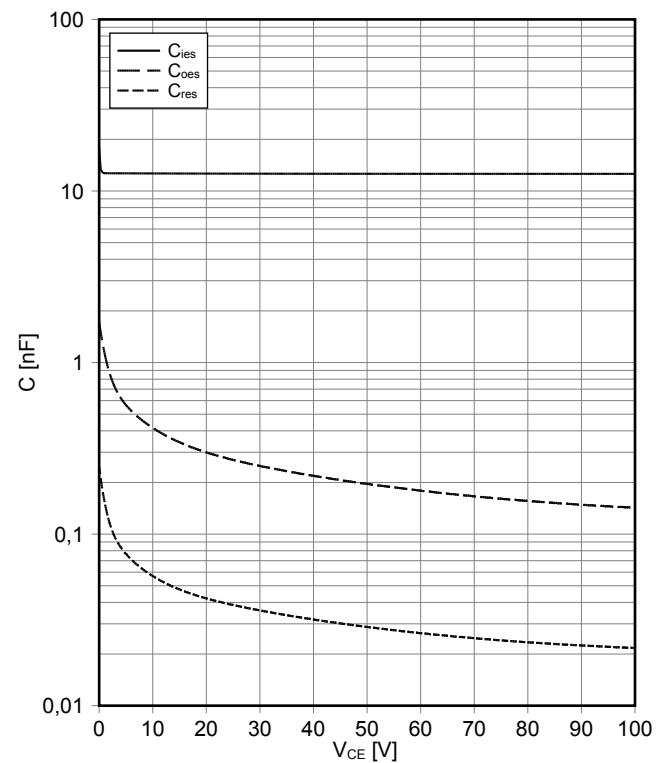
Sicherer Rückwärts-Arbeitsbereich IGBT, T5 / T6 (RBSOA) reverse bias safe operating area IGBT, T5 / T6 (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 3,9\ \Omega$, $T_{vj} = 150\text{ }^\circ\text{C}$



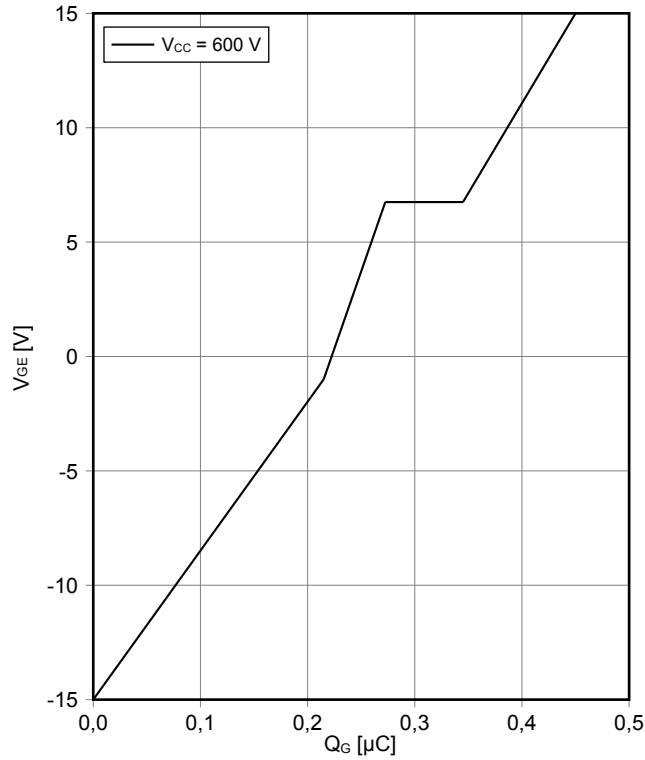
Kapazitäts Charakteristik IGBT, T5 / T6 (typisch) capacity characteristic IGBT, T5 / T6 (typical)

$C = f(V_{CE})$
 $V_{GE} = 0\text{ V}$, $T_{vj} = 25\text{ }^\circ\text{C}$, $f = 100\text{ kHz}$



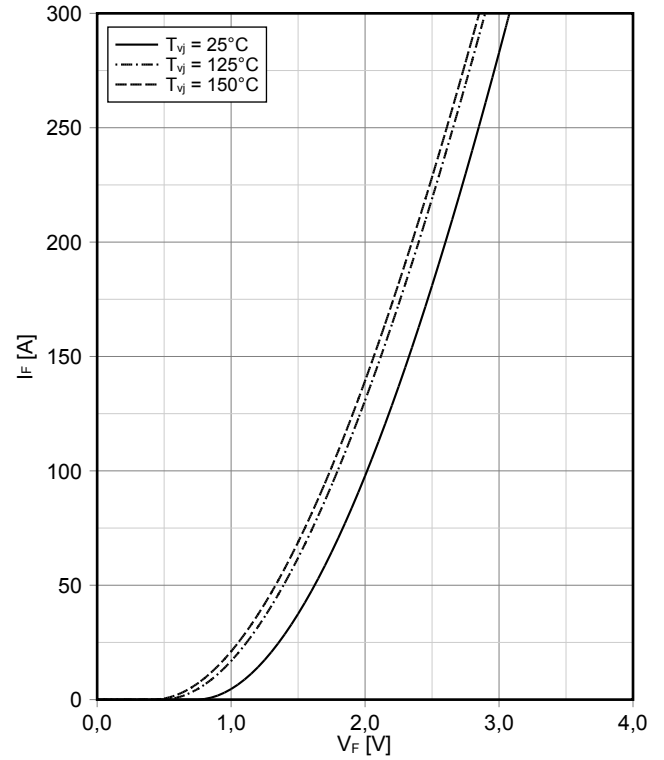
Gateladungs Charakteristik IGBT, T5 / T6 (typisch)
gate charge characteristic IGBT, T5 / T6 (typical)

$V_{GE} = f(Q_G)$
 $I_C = 200 \text{ A}, T_{vj} = 25^\circ\text{C}$



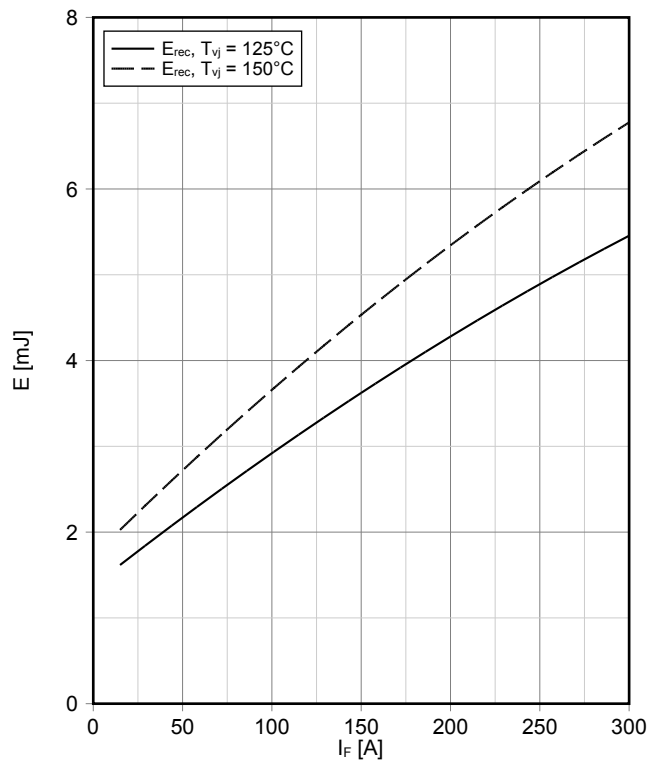
Durchlasskennlinie der Diode, D1 / D4 (typisch)
forward characteristic of Diode, D1 / D4 (typical)

$I_F = f(V_F)$



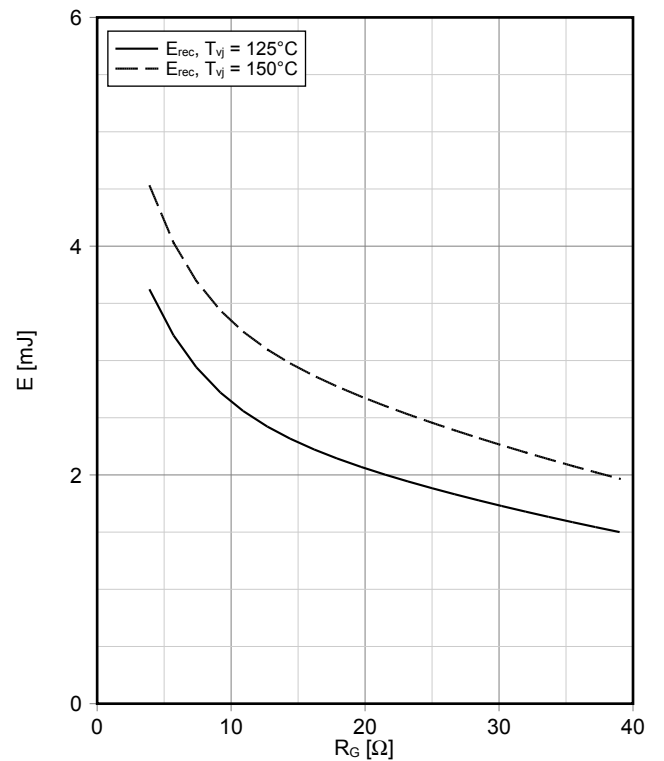
Schaltverluste Diode, D1 / D4 (typisch)
switching losses Diode, D1 / D4 (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 3,9 \Omega, V_{CE} = 500 \text{ V}$

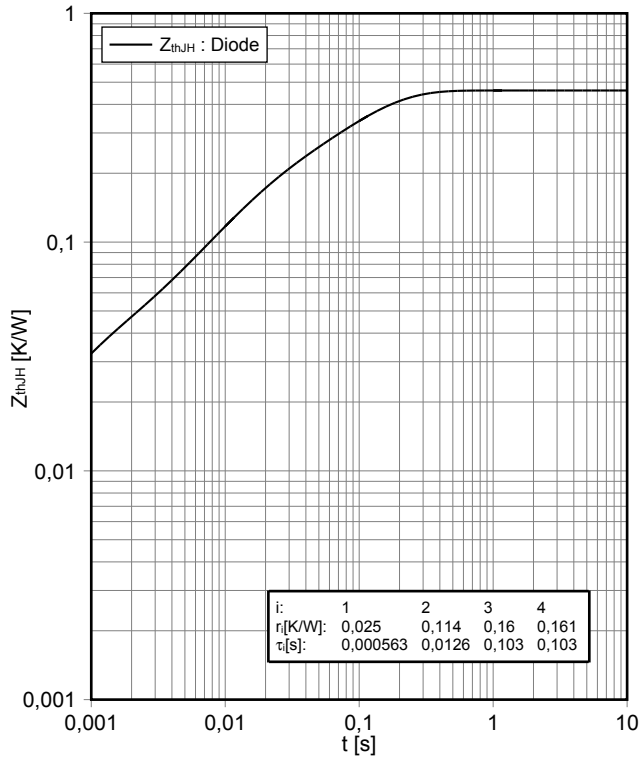


Schaltverluste Diode, D1 / D4 (typisch)
switching losses Diode, D1 / D4 (typical)

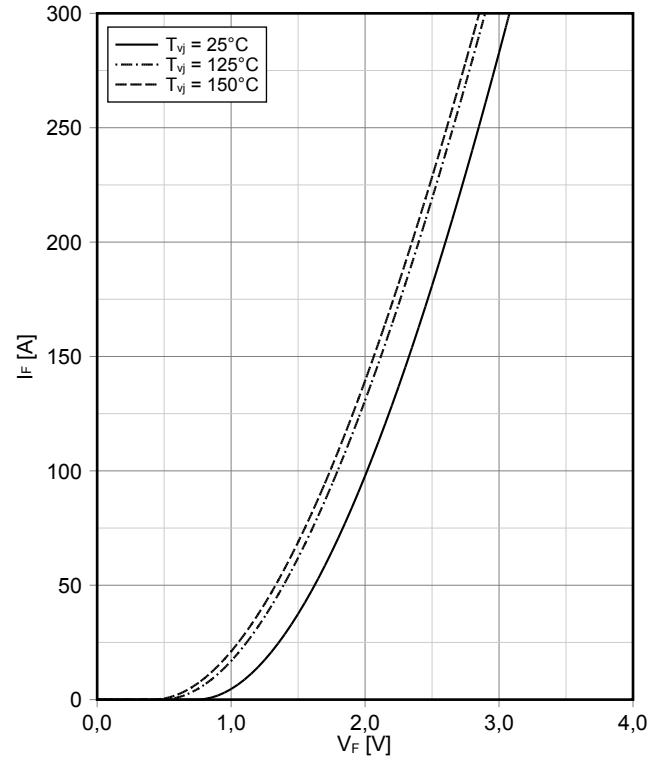
$E_{rec} = f(R_G)$
 $I_F = 150 \text{ A}, V_{CE} = 500 \text{ V}$



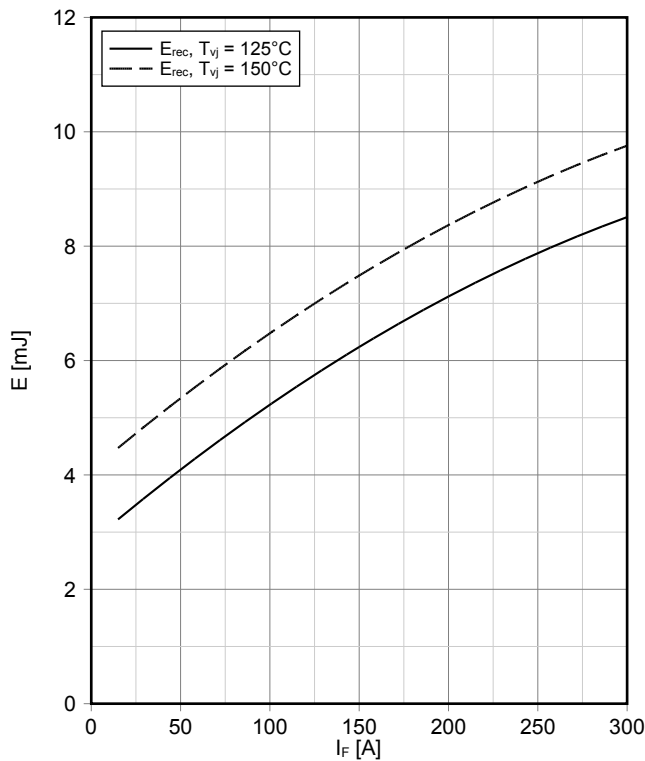
Transienter Wärmewiderstand Diode, D1 / D4
transient thermal impedance Diode, D1 / D4
 $Z_{thJH} = f(t)$



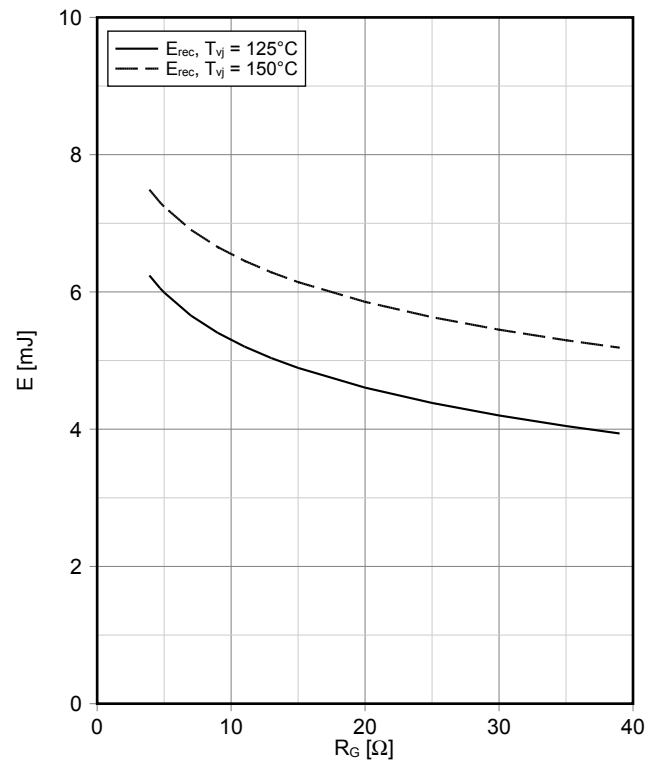
Durchlasskennlinie der Diode, D2 / D3 (typisch)
forward characteristic of Diode, D2 / D3 (typical)
 $I_F = f(V_F)$



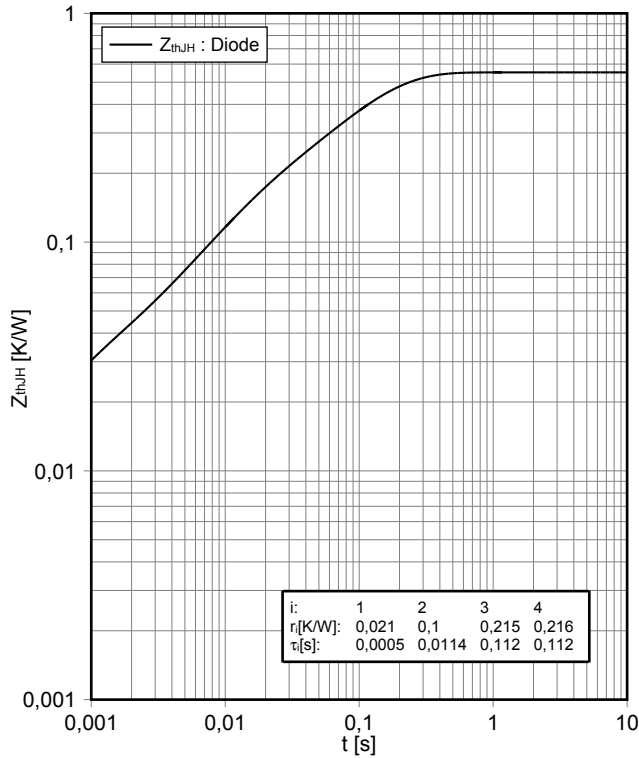
Schaltverluste Diode, D2 / D3 (typisch)
switching losses Diode, D2 / D3 (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 3,9 \Omega$, $V_{CE} = 500 V$



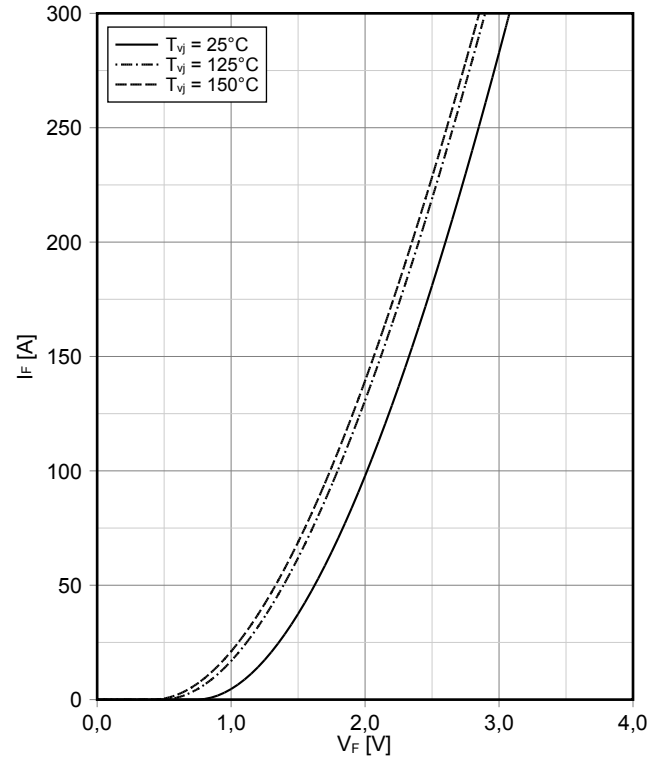
Schaltverluste Diode, D2 / D3 (typisch)
switching losses Diode, D2 / D3 (typical)
 $E_{rec} = f(R_G)$
 $I_F = 150 A$, $V_{CE} = 500 V$



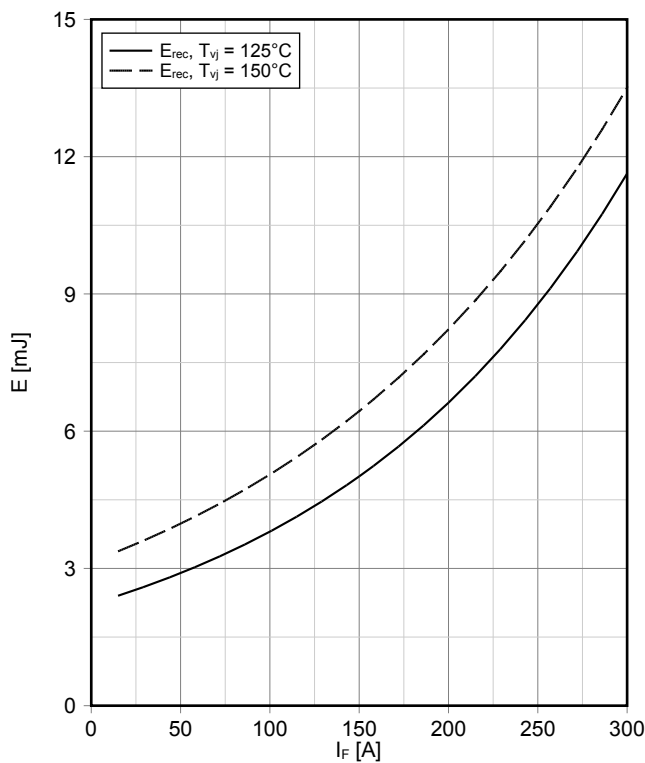
Transienter Wärmewiderstand Diode, D2 / D3
transient thermal impedance Diode, D2 / D3
 $Z_{thJH} = f(t)$



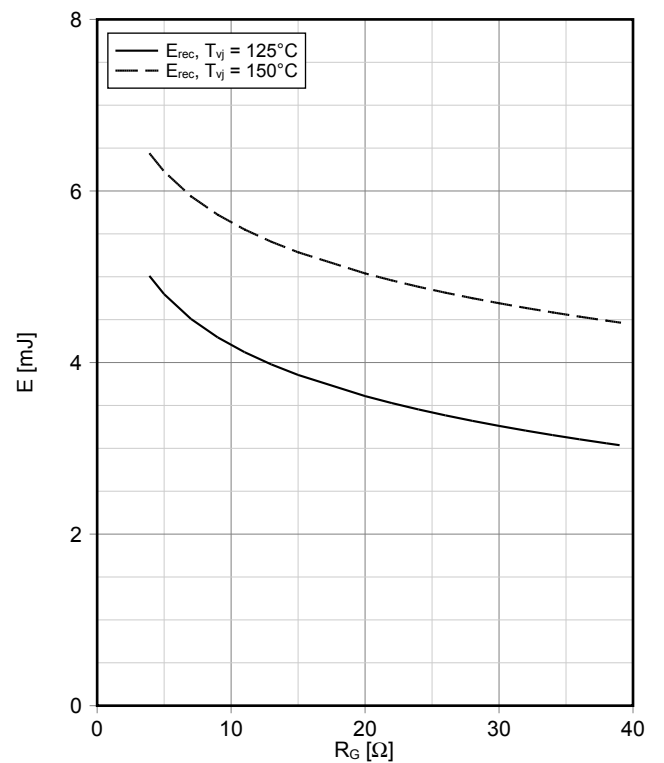
Durchlasskennlinie der Diode, D5-D6 (typisch)
forward characteristic of Diode, D5-D6 (typical)
 $I_F = f(V_F)$



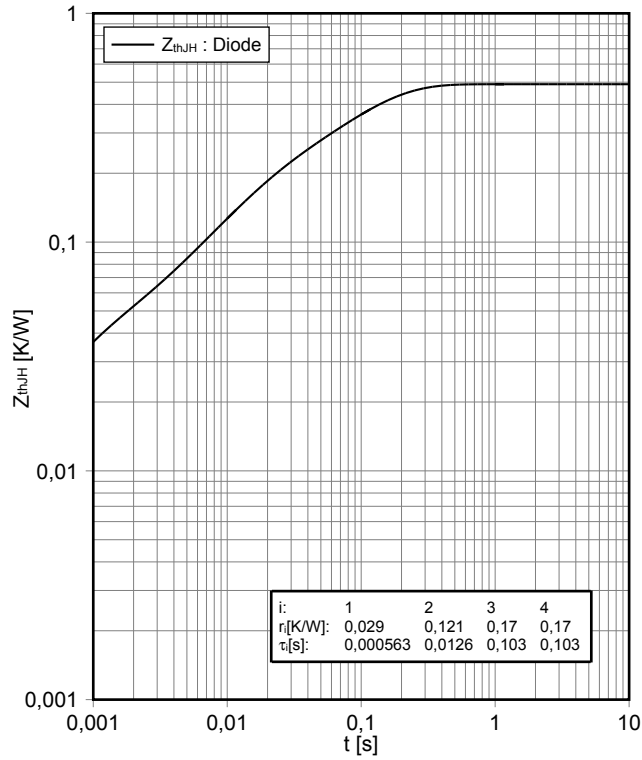
Schaltverluste Diode, D5-D6 (typisch)
switching losses Diode, D5-D6 (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 3,9 \Omega, V_{CE} = 500 V$



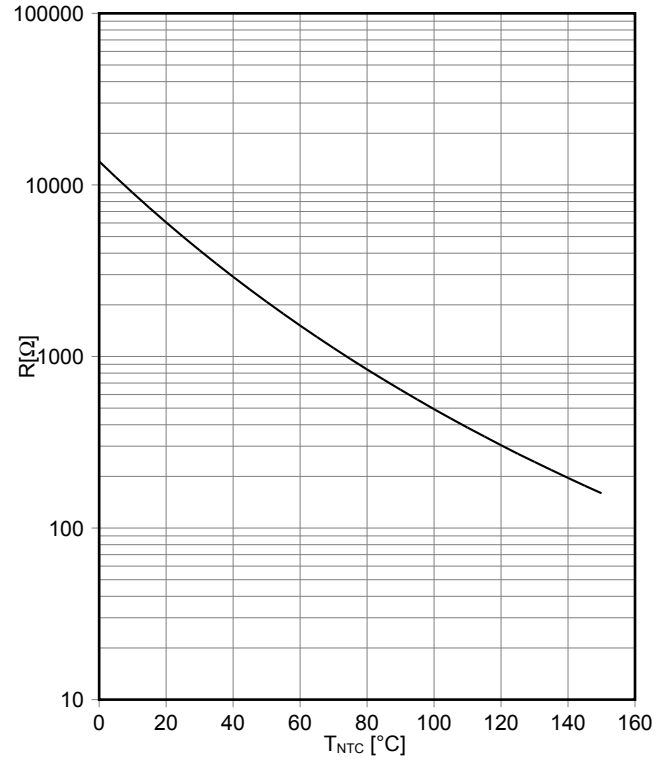
Schaltverluste Diode, D5-D6 (typisch)
switching losses Diode, D5-D6 (typical)
 $E_{rec} = f(R_G)$
 $I_F = 150 A, V_{CE} = 500 V$



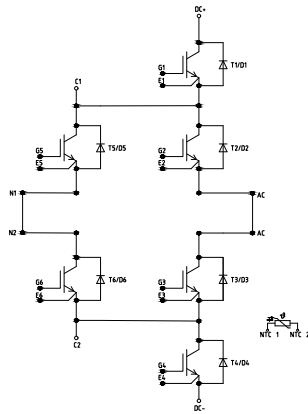
Transienter Wärmewiderstand Diode, D5-D6
transient thermal impedance Diode, D5-D6
 $Z_{thJH} = f(t)$



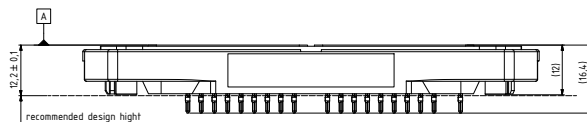
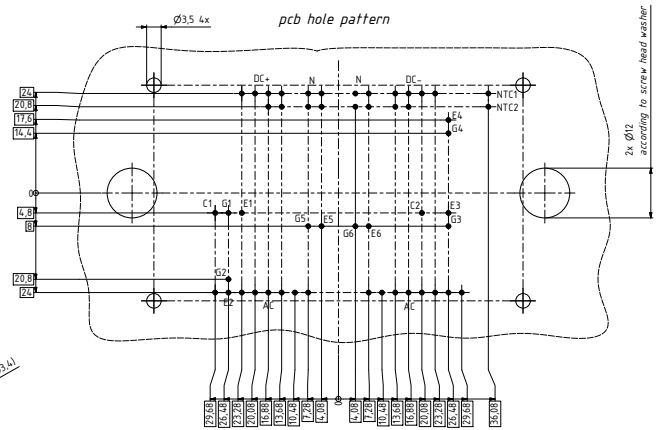
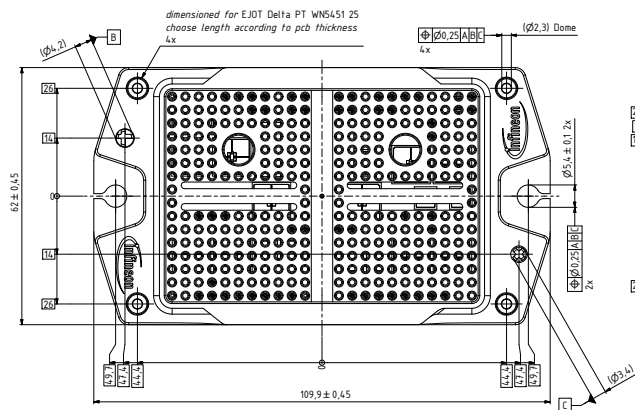
NTC-Widerstand-Temperaturkennlinie (typisch)
NTC-Thermistor-temperature characteristic (typical)
 $R = f(T_{NTC})$



Schaltplan / Circuit diagram



Gehäuseabmessungen / Package outlines



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