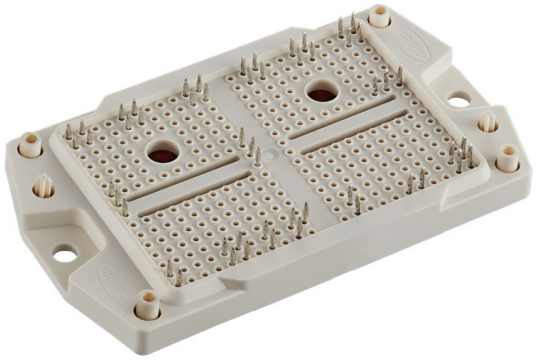
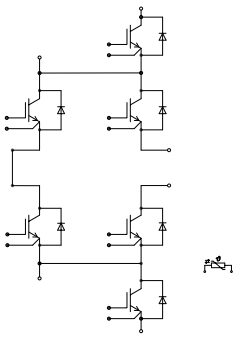
EasyPACK™ Modul mit TRENCHSTOP™ IGBT7 und CoolSiC™ Schottky Diode und PressFIT / NTC
EasyPACK™ module with TRENCHSTOP™ IGBT7 and CoolSiC™ Schottky diode and PressFIT / NTC





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

Potentielle Anwendungen
- 3-Level-Applikationen
- Solar Anwendungen

Potential Applications
- 3-level-applications
- Solar applications

Elektrische Eigenschaften
- CoolSiC™ Schottky Diode Gen 5
- Niederinduktives Design
- Niedrige Schaltverluste
- Trenchstop™ IGBT7

Electrical Features
- CoolSiC™ Schottky diode gen 5
- Low inductive design
- Low switching losses
- Trenchstop™ IGBT7

Mechanische Eigenschaften
- Gehäuse mit CTI > 400
- Integrierter NTC Temperatur Sensor
- PressFIT Verbindungstechnik

Mechanical Features
- Package with CTI > 400
- Integrated NTC temperature sensor
- PressFIT contact technology

Module Label Code

Barcode Code 128

DMX - 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°C	V_{CES}	950	V
Implementierter Kollektor-Strom Implemented collector current		I_{CN}	400	A
Kollektor-Dauergleichstrom Continuous DC collector current	T_H = 65°C, $T_{vj\,max}$ = 175°C	I_{CDC}	220	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	t_P = 1 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 A, V_{GE} = 15 V I_C = 150 A, V_{GE} = 15 V I_C = 150 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$V_{CE\,sat}$		1,40 1,48 1,50	1,60	V V V
Gate-Schwellenspannung Gate threshold voltage	I_C = 6,50 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	4,35	5,10	5,85	V
Gateladung Gate charge	V_{GE} = -15 / 15 V, V_{CE} = 600 V		Q_G		0,90		µC
Interner Gatewiderstand Internal gate resistor	T_{vj} = 25°C		R_{Gint}		0,75		Ω
Eingangskapazität Input capacitance	f = 100 kHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		25,2		nF
Rückwirkungskapazität Reverse transfer capacitance	f = 100 kHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		0,078		nF
Kollektor-Emitter-Reststrom Collector-emitter cut-off current	V_{CE} = 950 V, V_{GE} = 0 V	T_{vj} = 25°C	I_{CES}			0,071	mA
Gate-Emitter-Reststrom Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			100	nA
Einschaltverzögerungszeit, induktive Last Turn-on delay time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,on}$		0,094 0,094 0,094		µs µs µs
Anstiegszeit, induktive Last Rise time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		0,033 0,033 0,033		µs µs µs
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 20 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 20 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 20 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,off}$		0,74 0,81 0,82		µs µs µs
Fallzeit, induktive Last Fall time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 20 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 20 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 20 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		0,033 0,057 0,07		µs µs µs
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, di/dt = 4200 A/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, di/dt = 4200 A/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, di/dt = 4200 A/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		4,30 4,30 4,30		mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, du/dt = 4600 V/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Goff} = 20 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, du/dt = 4600 V/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Goff} = 20 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, du/dt = 4600 V/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Goff} = 20 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		5,00 6,60 7,30		mJ mJ mJ
Kurzschlußverhalten SC data	V_{GE} ≤ 15 V, V_{CC} = 600 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt	t_P ≤ 0 µs, T_{vj} = 150°C	I_{SC}		1200		A
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro IGBT / per IGBT		R_{thJH}		0,240		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\,op}$	-40		150	°C

IGBT, T2 / T3 / IGBT, T2 / T3

Höchstzulässige Werte / Maximum Rated Values

Kollektor-Emitter-Sperrspannung Collector-emitter voltage	T_{vj} = 25°C	V_{CES}	950	V
Implementierter Kollektor-Strom Implemented collector current		I_{CN}	400	A
Kollektor-Dauergleichstrom Continuous DC collector current	T_H = 65°C, $T_{vj\,max}$ = 175°C	I_{CDC}	295	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	t_P = 1 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 A, V_{GE} = 15 V I_C = 150 A, V_{GE} = 15 V I_C = 150 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$V_{CE\,sat}$		1,07 1,04 1,02	1,15	V V V
Gate-Schwellenspannung Gate threshold voltage	I_C = 6,50 mA, V_{CE} = 20 V, T_{vj} = 25°C		V_{GEth}	4,15	4,90	5,65	V
Gateladung Gate charge	V_{GE} = -15 / 15 V, V_{CE} = 600 V		Q_G		4,10		µC
Interner Gatewiderstand Internal gate resistor	T_{vj} = 25°C		R_{Gint}		0,75		Ω
Eingangskapazität Input capacitance	f = 100 kHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		49,2		nF
Rückwirkungskapazität Reverse transfer capacitance	f = 100 kHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		0,228		nF
Kollektor-Emitter-Reststrom Collector-emitter cut-off current	V_{CE} = 950 V, V_{GE} = 0 V	T_{vj} = 25°C	I_{CES}			0,071	mA
Gate-Emitter-Reststrom Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			100	nA
Einschaltverzögerungszeit, induktive Last Turn-on delay time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,on}$		0,21 0,19 0,18		µs µs µs
Anstiegszeit, induktive Last Rise time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		0,034 0,038 0,039		µs µs µs
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,off}$		0,85 0,96 0,98		µs µs µs
Fallzeit, induktive Last Fall time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		0,24 0,45 0,50		µs µs µs
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, di/dt = 4500 A/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, di/dt = 4500 A/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, di/dt = 4500 A/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		3,35 3,46 3,49		mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, du/dt = 1350 V/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Goff} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, du/dt = 1350 V/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Goff} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, du/dt = 1350 V/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Goff} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		24,8 35,6 37,9		mJ mJ mJ
Kurzschlußverhalten SC data	$V_{GE} \leq$ 15 V, V_{CC} = 600 V, $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$	$t_P \leq$ 0 µs, T_{vj} = 150°C	I_{SC}		1200		A
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro IGBT / per IGBT		R_{thJH}		0,280		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\,op}$	-40		150	°C

IGBT, T5 / T6 / IGBT, T5 / T6

Höchstzulässige Werte / Maximum Rated Values

Kollektor-Emitter-Sperrspannung Collector-emitter voltage	T_{vj} = 25°C	V_{CES}	950	V
Implementierter Kollektor-Strom Implemented collector current		I_{CN}	200	A
Kollektor-Dauergleichstrom Continuous DC collector current	T_H = 65°C, $T_{vj\,max}$ = 175°C	I_{CDC}	115	A
Periodischer Kollektor-Spitzenstrom Repetitive peak collector current	t_P = 1 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 A, V_{GE} = 15 V I_C = 150 A, V_{GE} = 15 V I_C = 150 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$V_{CE\,sat}$		1,68 1,88 1,92	2,00	V V V
Gate-Schwellenspannung Gate threshold voltage	I_C = 3,25 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	4,35	5,10	5,85	V
Gateladung Gate charge	V_{GE} = -15 / 15 V, V_{CE} = 600 V		Q_G		0,45		µC
Interner Gatewiderstand Internal gate resistor	T_{vj} = 25°C		R_{Gint}		1,5		Ω
Eingangskapazität Input capacitance	f = 100 kHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		12,6		nF
Rückwirkungskapazität Reverse transfer capacitance	f = 100 kHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		0,039		nF
Kollektor-Emitter-Reststrom Collector-emitter cut-off current	V_{CE} = 950 V, V_{GE} = 0 V	T_{vj} = 25°C	I_{CES}			0,1	mA
Gate-Emitter-Reststrom Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			100	nA
Einschaltverzögerungszeit, induktive Last Turn-on delay time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,on}$		0,086 0,093 0,094		µs µs µs
Anstiegszeit, induktive Last Rise time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		0,027 0,03 0,03		µs µs µs
Abschaltverzögerungszeit, induktive Last Turn-off delay time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 30 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 30 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 30 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,off}$		0,57 0,615 0,625		µs µs µs
Fallzeit, induktive Last Fall time, inductive load	I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 30 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 30 Ω I_C = 150 A, V_{CE} = 500 V, V_{GE} = -15 / 15 V, R_{Goff} = 30 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		0,024 0,052 0,073		µs µs µs
Einschaltverlustenergie pro Puls Turn-on energy loss per pulse	I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, di/dt = 4000 A/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, di/dt = 4000 A/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, di/dt = 4000 A/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Gon} = 5,0 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		6,35 7,60 8,00		mJ mJ mJ
Abschaltverlustenergie pro Puls Turn-off energy loss per pulse	I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, du/dt = 5800 V/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Goff} = 30 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, du/dt = 5800 V/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Goff} = 30 Ω I_C = 150 A, V_{CE} = 500 V, Lσ = 35 nH, du/dt = 5800 V/µs (T_{vj} = 150°C), V_{GE} = -15 / 15 V, R_{Goff} = 30 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		5,00 6,30 6,80		mJ mJ mJ
Kurzschlußverhalten SC data	V_{GE} ≤ 15 V, V_{CC} = 600 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt	t_P ≤ 0 µs, T_{vj} = 150°C	I_{SC}		600		A
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro IGBT / per IGBT		R_{thJH}		0,451		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\,op}$	-40		150	°C

Diode, D1 / D4 / Diode, D1 / D4

Höchstzulässige Werte / Maximum Rated Values

Periodische Spitzensperrspannung Repetitive peak reverse voltage	T_{vj} = 25°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 ms	I_{FRM}	400	A
Grenzlastintegral I²t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C V_R = 0 V, t_P = 10 ms, T_{vj} = 150°C	I²t	1620 1530	A²s A²s

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Durchlassspannung Forward voltage	I_F = 150 A, V_{GE} = 0 V I_F = 150 A, V_{GE} = 0 V I_F = 150 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	V_F		2,33 2,12 2,08	2,54	V V V
Rückstromspitze Peak reverse recovery current	I_F = 150 A, - di_F/dt = 4000 A/µs (T_{vj}=150°C) V_R = 500 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		90,0 130 140		A A A
Sperrverzögerungsladung Recovered charge	I_F = 150 A, - di_F/dt = 4000 A/µs (T_{vj}=150°C) V_R = 500 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	Q_r		5,50 10,0 12,5		µC µC µC
Abschaltenergie pro Puls Reverse recovery energy	I_F = 150 A, - di_F/dt = 4000 A/µs (T_{vj}=150°C) V_R = 500 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		1,50 3,30 3,95		mJ mJ mJ
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode		R_{thJH}		0,570		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\,op}$	-40		150	°C

Diode, D2 / D3 / Diode, D2 / D3

Höchstzulässige Werte / Maximum Rated Values

Periodische Spitzensperrspannung Repetitive peak reverse voltage	T_{vj} = 25°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 ms	I_{FRM}	400	A
Grenzlastintegral I²t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C V_R = 0 V, t_P = 10 ms, T_{vj} = 150°C	I²t	1620 1530	A²s A²s

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Durchlassspannung Forward voltage	I_F = 150 A, V_{GE} = 0 V I_F = 150 A, V_{GE} = 0 V I_F = 150 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	V_F		2,33 2,12 2,06	2,54	V V V
Rückstromspitze Peak reverse recovery current	I_F = 150 A, - di_F/dt = 4500 A/µs (T_{vj}=150°C) V_R = 500 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		133 180 195		A A A
Sperrverzögerungsladung Recovered charge	I_F = 150 A, - di_F/dt = 4500 A/µs (T_{vj}=150°C) V_R = 500 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	Q_r		6,00 13,0 15,5		µC µC µC
Abschaltenergie pro Puls Reverse recovery energy	I_F = 150 A, - di_F/dt = 4500 A/µs (T_{vj}=150°C) V_R = 500 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		2,40 5,70 6,80		mJ mJ mJ
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode		R_{thJH}		0,570		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\,op}$	-40		150	°C

Diode, D5-D6 / Diode, D5-D6

Höchstzulässige Werte / Maximum Rated Values

Periodische Spitzensperrspannung Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1200	V
Dauergleichstrom Continuous DC forward current		I_F	100	A
Periodischer Spitzenstrom Repetitive peak forward current	t_P = 1 ms	I_{FRM}	200	A
Grenzlastintegral I²t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C V_R = 0 V, t_P = 10 ms, T_{vj} = 150°C	I²t	1650 1550	A²s A²s

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Durchlassspannung Forward voltage	I_F = 100 A, V_{GE} = 0 V I_F = 100 A, V_{GE} = 0 V I_F = 100 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	V_F		1,45 1,75 1,85	1,75	V V V
Rückstromspitze Peak reverse recovery current	I_F = 100 A, - di_F/dt = 3200 A/µs (T_{vj}=150°C) V_R = 500 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		60,0 60,0 60,0		A A A
Sperrverzögerungsladung Recovered charge	I_F = 100 A, - di_F/dt = 3200 A/µs (T_{vj}=150°C) V_R = 500 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	Q_r		1,85 1,85 1,85		µC µC µC
Abschaltenergie pro Puls Reverse recovery energy	I_F = 100 A, - di_F/dt = 3200 A/µs (T_{vj}=150°C) V_R = 500 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		0,68 0,68 0,68		mJ mJ mJ
Wärmewiderstand, Chip bis Kühlkörper Thermal resistance, junction to heatsink	pro Diode / per diode		R_{thJH}		0,474		K/W
Temperatur im Schaltbetrieb Temperature under switching conditions			$T_{vj\,op}$	-40		150	°C

NTC-Widerstand / NTC-Thermistor

Charakteristische Werte / Characteristic Values

			min.	typ.	max.	
Nennwiderstand Rated resistance	T_{NTC} = 25°C	R_{25}		5,00		kΩ
Abweichung von R100 Deviation of R100	T_{NTC} = 100°C, R_{100} = 493 Ω	ΔR/R	-5		5	%
Verlustleistung Power dissipation	T_{NTC} = 25°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

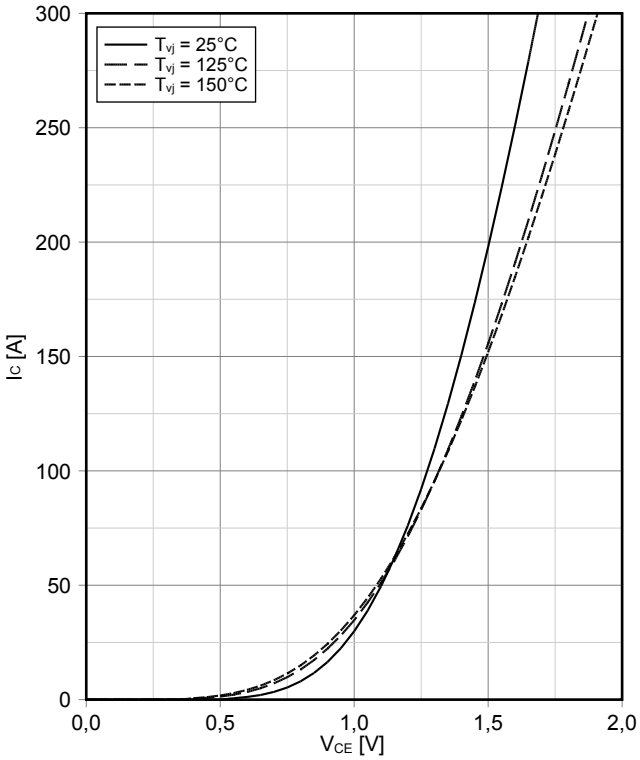
Angaben gemäß gültiger Application Note.
Specification according to the valid application note.

Modul / Module

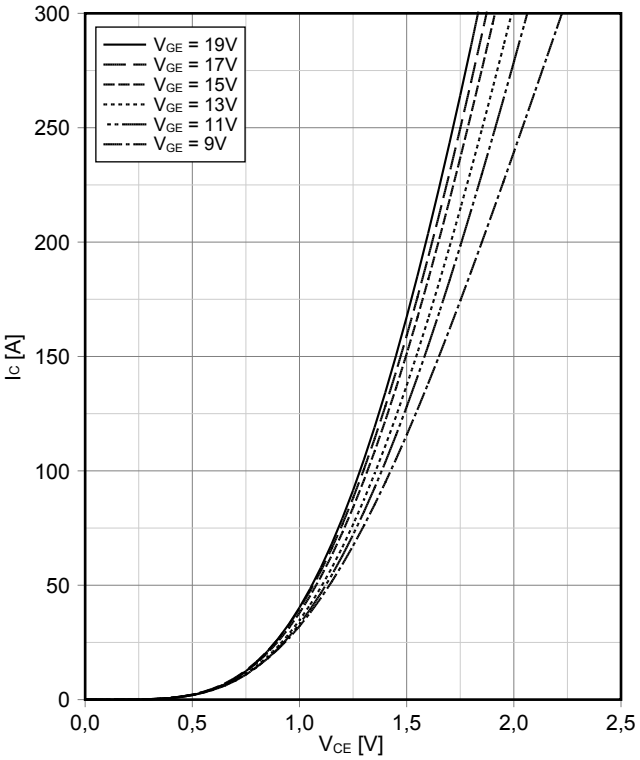
Isolations-Prüfspannung Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}		3,2		kV
Innere Isolation Internal isolation	Basisisolierung (Schutzklasse 1, EN61140) basic insulation (class 1, IEC 61140)			Al_2O_3		
Kriechstrecke Creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal			11,5 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}		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 λ_{Paste} = 3.3 W/(m·K) gemessen
IGBT- and diode- RthJH parameters measured with thermal grease of λ_{Paste} = 3.3 W/(m·K)

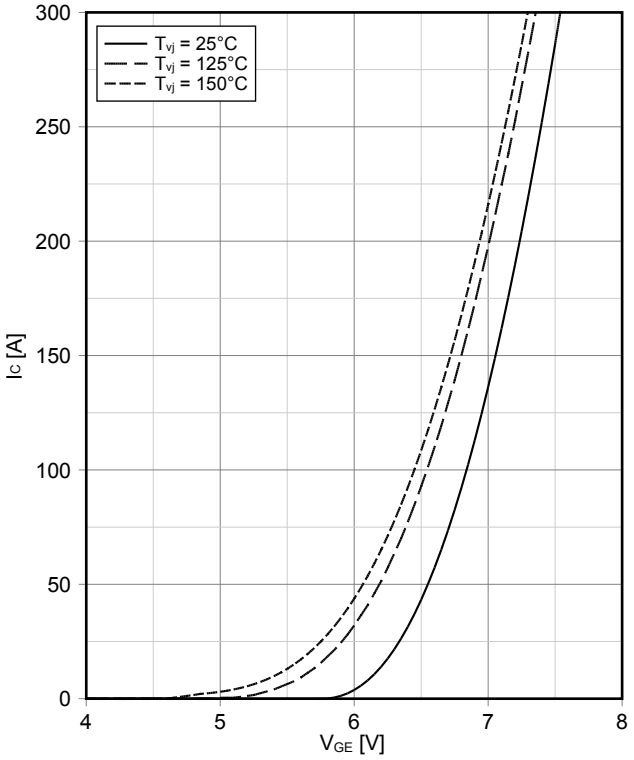
Ausgangskennlinie IGBT, T1 / T4 (typisch)
output characteristic IGBT, T1 / T4 (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



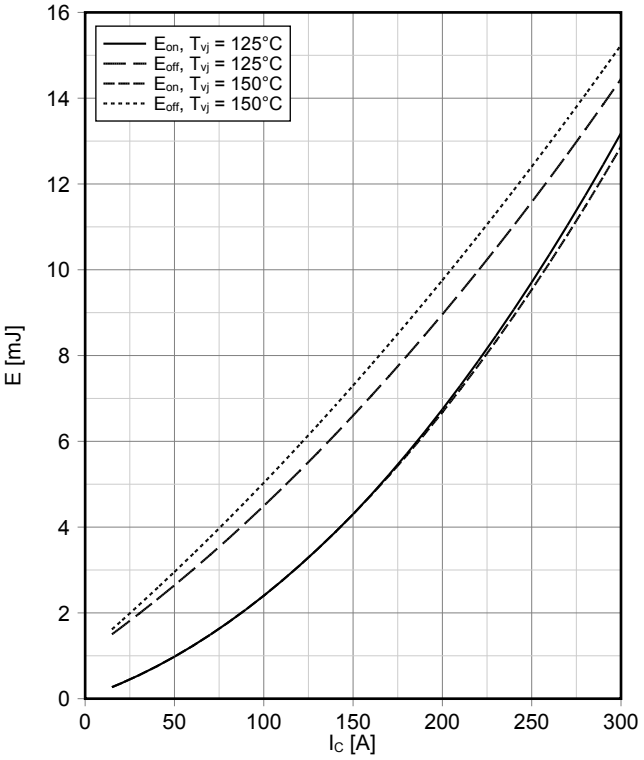
Ausgangskennlinienfeld IGBT, T1 / T4 (typisch)
output characteristic IGBT, T1 / T4 (typical)
$I_C = f(V_{CE})$
T_{vj} = 150°C



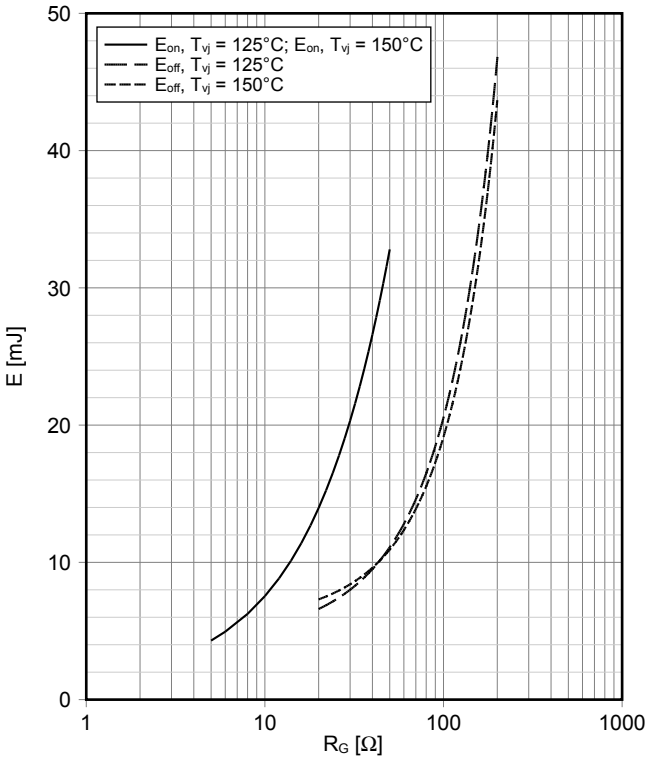
Übertragungscharakteristik IGBT, T1 / T4 (typisch)
transfer characteristic IGBT, T1 / T4 (typical)
$I_C = f(V_{GE})$
V_{CE} = 20 V



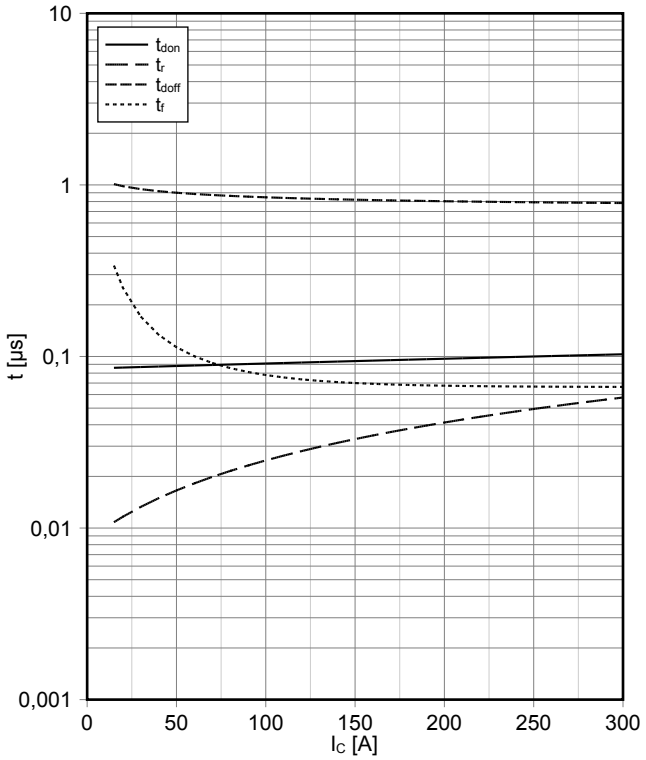
Schaltverluste IGBT, T1 / T4 (typisch)
switching losses IGBT, T1 / T4 (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 5 Ω, R_{Goff} = 20 Ω, V_{CE} = 500 V



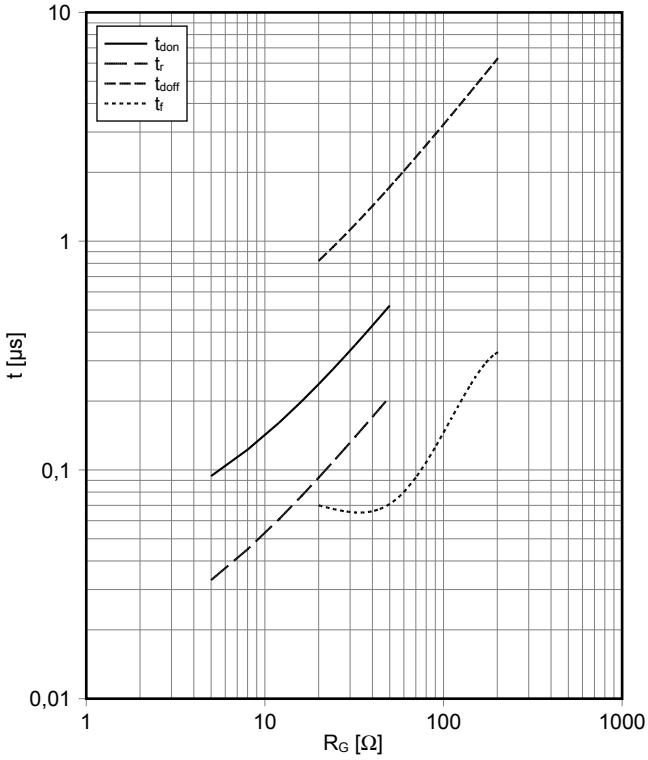
Schaltverluste IGBT, T1 / T4 (typisch)
switching losses IGBT, T1 / T4 (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
V_{GE} = ±15 V, I_C = 150 A, V_{CE} = 500 V



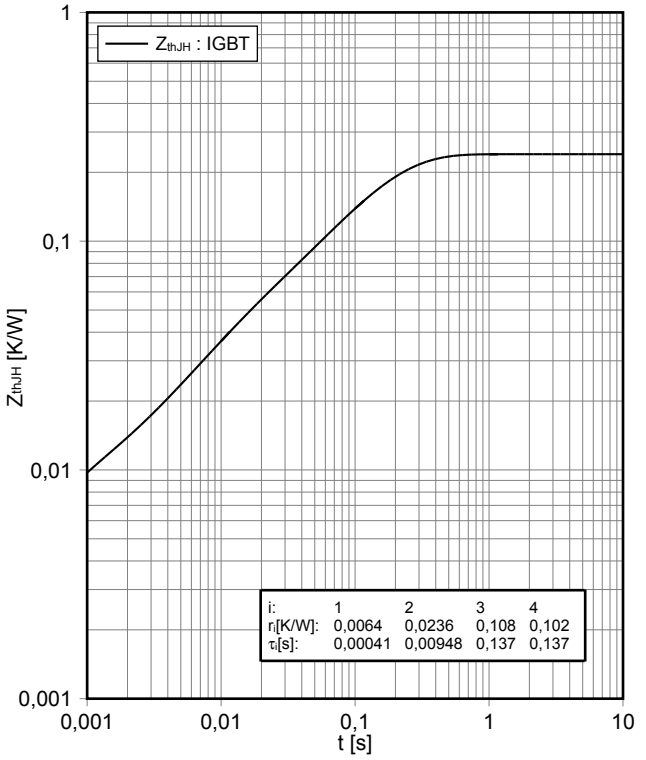
Schaltzeiten IGBT, T1 / T4 (typisch)
switching times IGBT, T1 / T4 (typical)
$t_{don} = f(I_C)$, $t_r = f(I_C)$, $t_{doff} = f(I_C)$, $t_f = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 5 Ω, R_{Goff} = 20 Ω, V_{CE} = 500 V, Tvj = 150°C



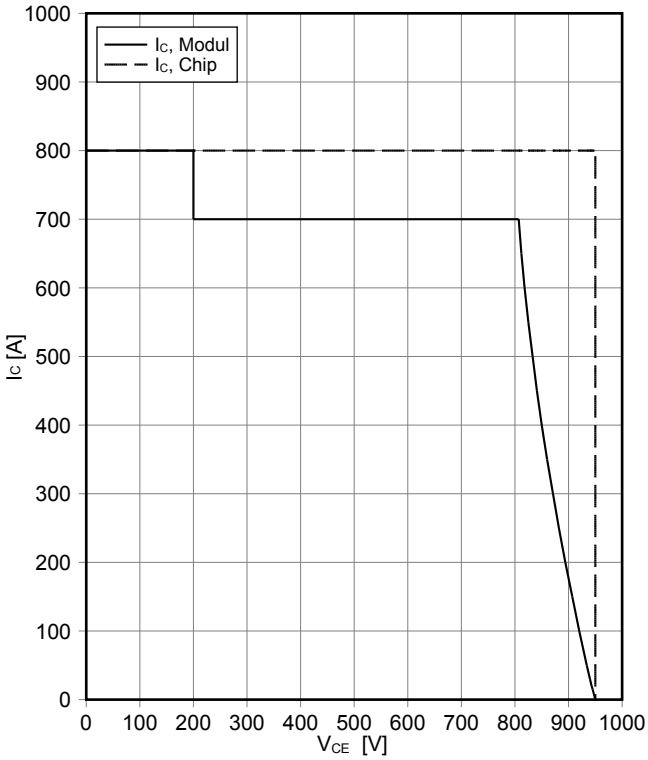
Schaltzeiten IGBT, T1 / T4 (typisch)
switching times IGBT, T1 / T4 (typical)
$t_{don} = f(R_G)$, $t_r = f(R_G)$, $t_{doff} = f(R_G)$, $t_f = f(R_G)$
V_{GE} = ±15 V, I_C = 150 A, V_{CE} = 500, Tvj = 150°C



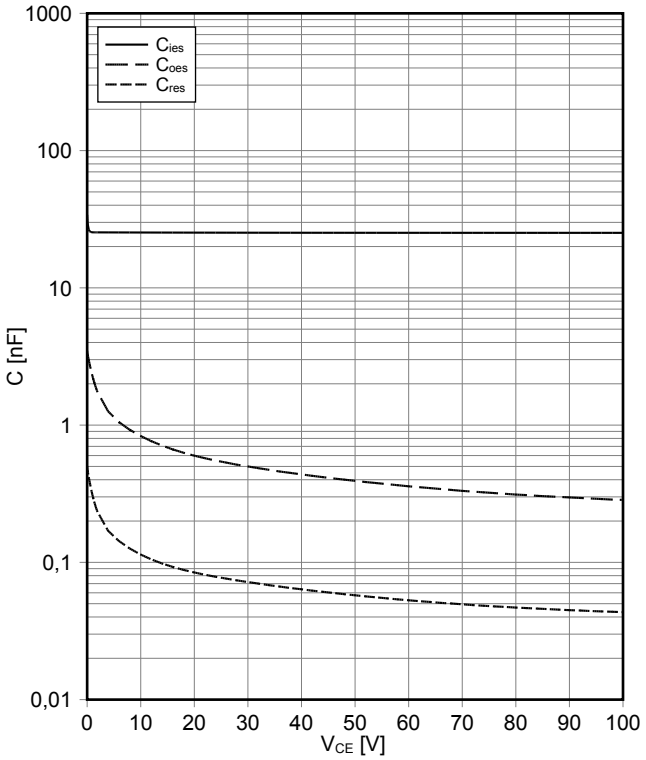
Transienter Wärmewiderstand IGBT, T1 / T4
transient thermal impedance IGBT, T1 / T4
$Z_{thJH} = f(t)$



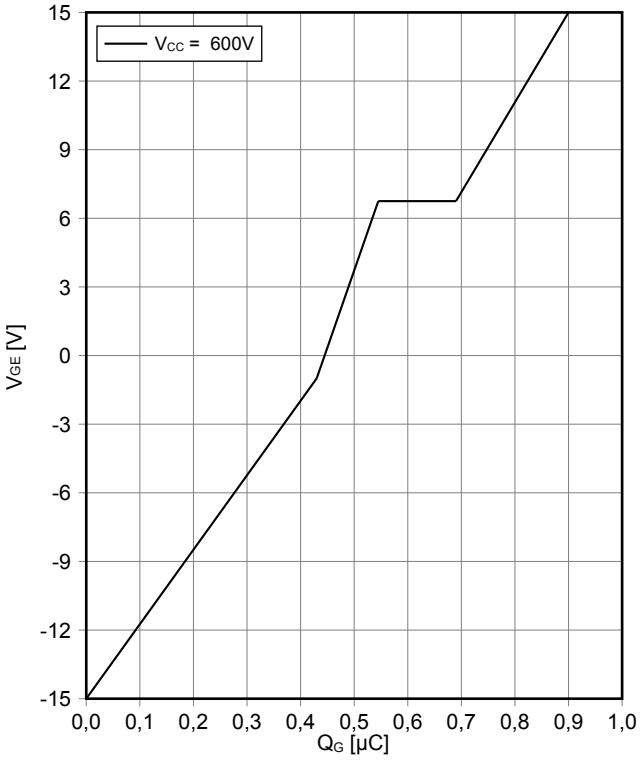
Sicherer Rückwärts-Arbeitsbereich IGBT, T1 / T4 (RBSOA)
reverse bias safe operating area IGBT, T1 / T4 (RBSOA)
$I_C = f(V_{CE})$
V_{GE} = ±15 V, R_{Goff} = 20 Ω, T_{vj} = 150°C



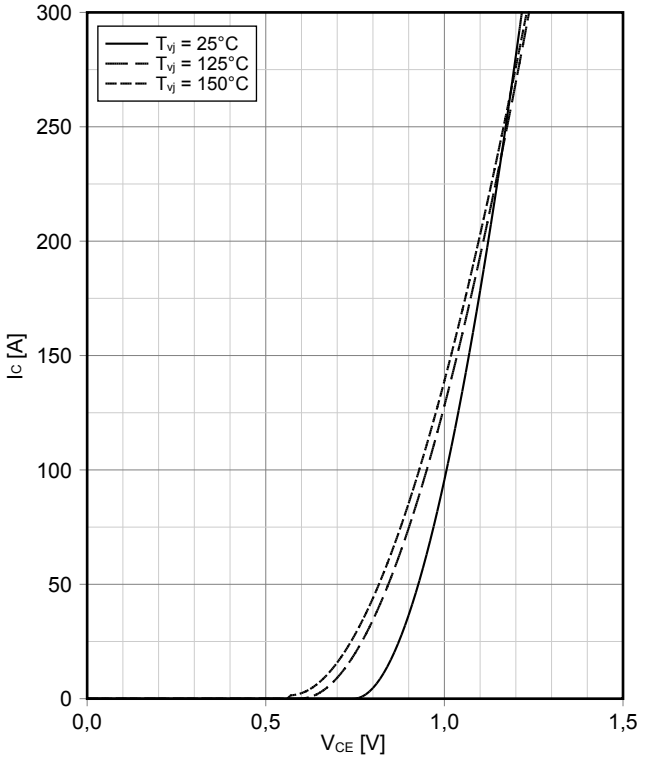
Kapazitäts Charakteristik IGBT, T1 / T4 (typisch)
capacity characteristic IGBT, T1 / T4 (typical)
$C = f(V_{CE})$
V_{GE} = 0 V, T_{vj} = 25°C, f = 100kHz



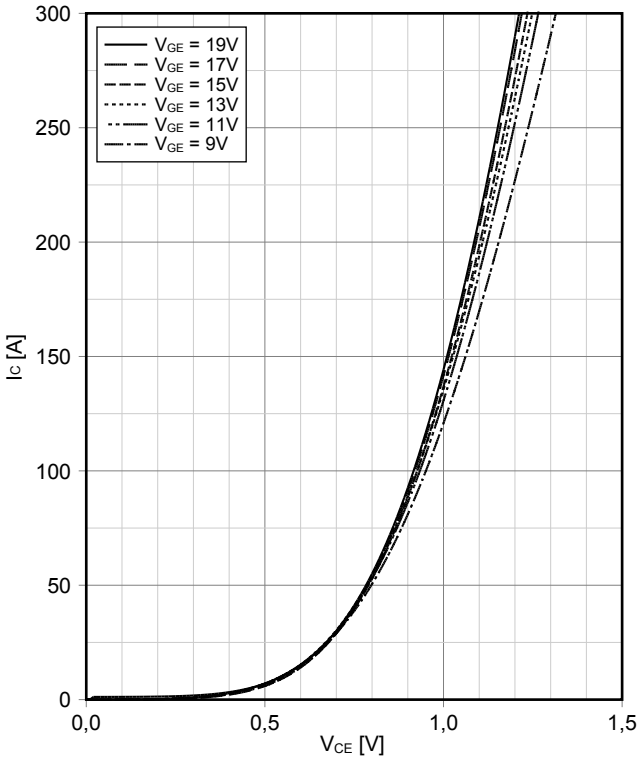
Gateladungs Charakteristik IGBT, T1 / T4 (typisch)
gate charge characteristic IGBT, T1 / T4 (typical)
$V_{GE} = f(Q_G)$
I_C = 400 A, T_{vj} = 25°C



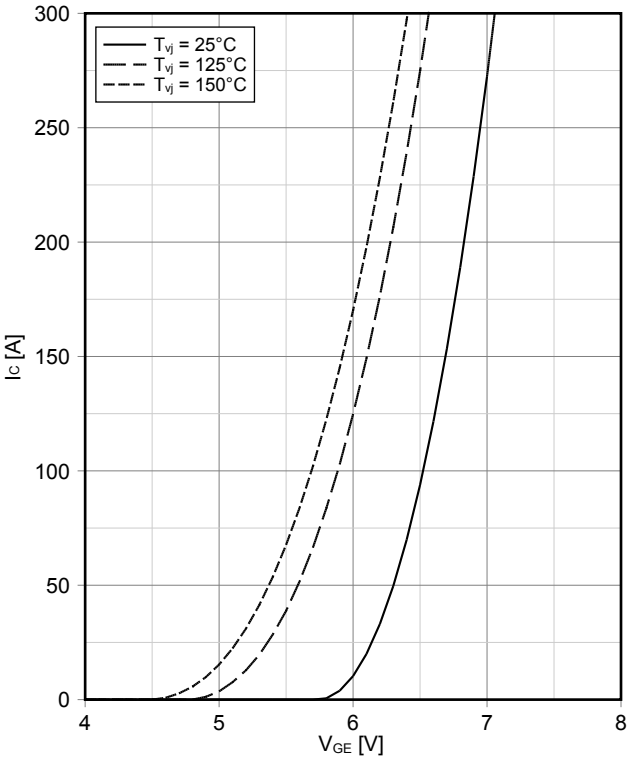
Ausgangskennlinie IGBT, T2 / T3 (typisch)
output characteristic IGBT, T2 / T3 (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



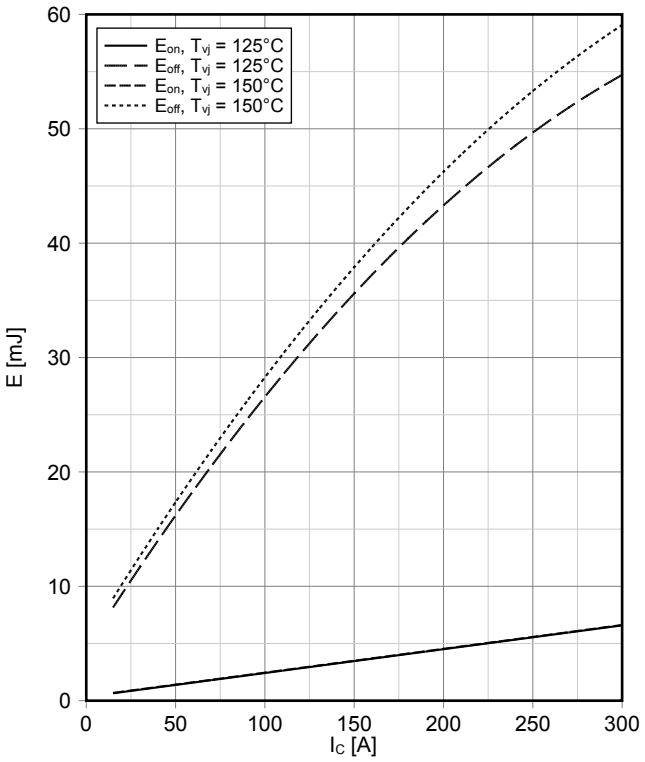
Ausgangskennlinienfeld IGBT, T2 / T3 (typisch)
output characteristic IGBT, T2 / T3 (typical)
$I_C = f(V_{CE})$
$T_{vj} = 150°C$



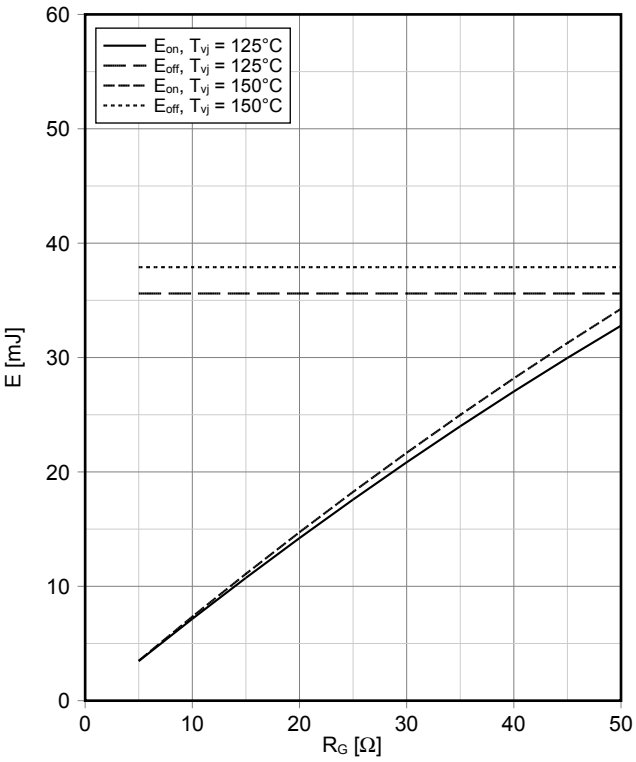
Übertragungscharakteristik IGBT, T2 / T3 (typisch)
transfer characteristic IGBT, T2 / T3 (typical)
$I_C = f(V_{GE})$
$V_{CE} = 20\ V$



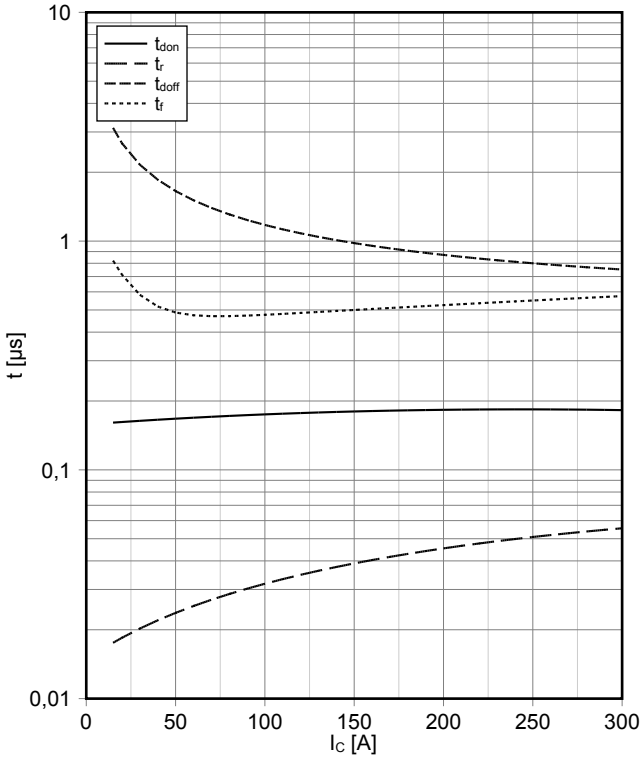
Schaltverluste IGBT, T2 / T3 (typisch)
switching losses IGBT, T2 / T3 (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
$V_{GE} = \pm 15\ V$, $R_{Gon} = 5\ \Omega$, $R_{Goff} = 5\ \Omega$, $V_{CE} = 500\ V$



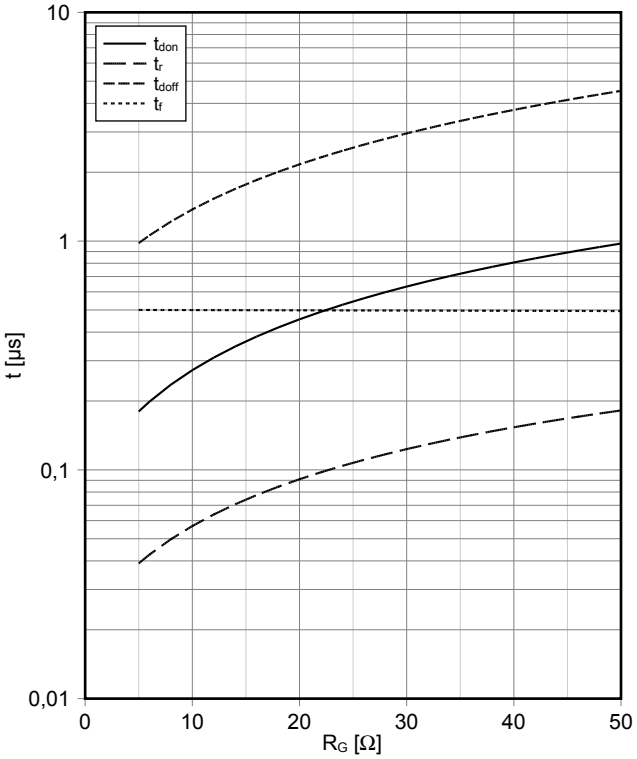
Schaltverluste IGBT, T2 / T3 (typisch)
switching losses IGBT, T2 / T3 (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$V_{GE} = \pm 15\ V$, $I_C = 150\ A$, $V_{CE} = 500\ V$



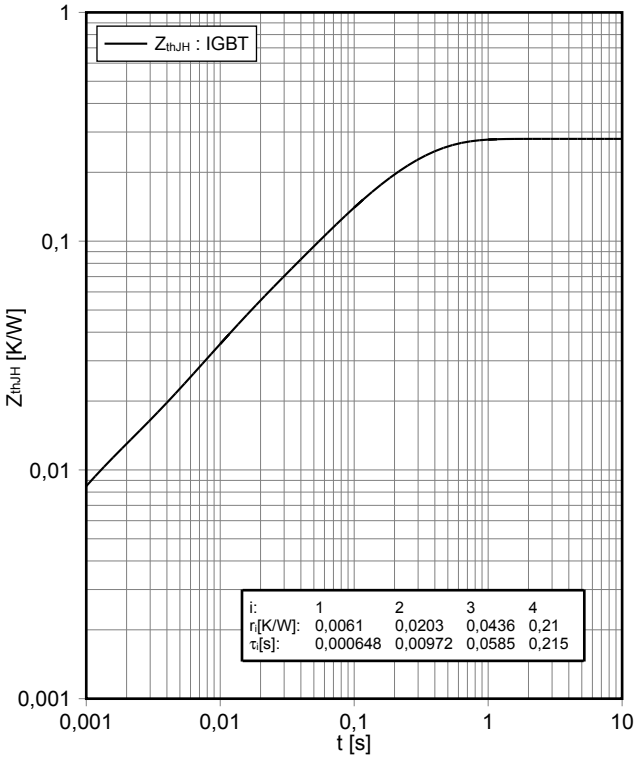
Schaltzeiten IGBT, T2 / T3 (typisch)
switching times IGBT, T2 / T3 (typical)
$t_{don} = f(I_C)$, $t_r = f(I_C)$, $t_{doff} = f(I_C)$, $t_f = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 5 Ω, R_{Goff} = 5 Ω, V_{CE} = 500 V, Tvj = 150°C



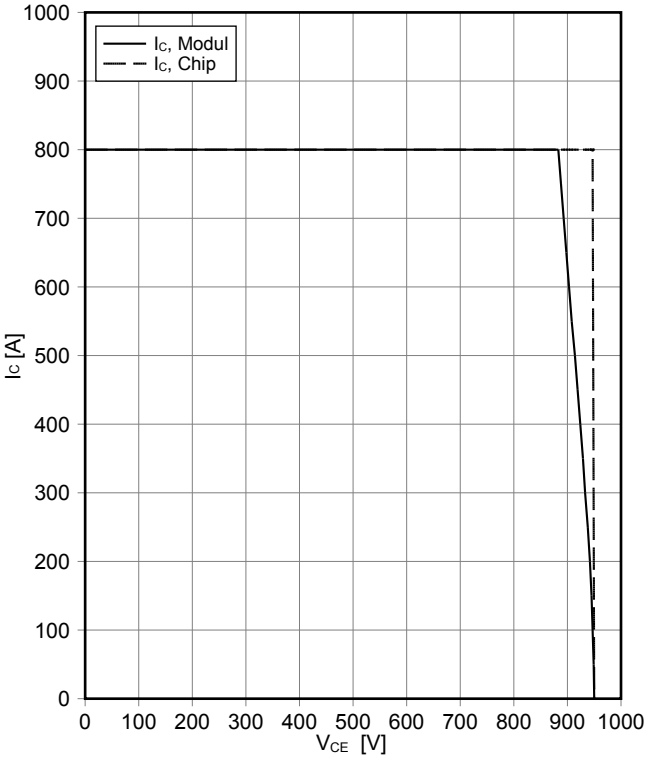
Schaltzeiten IGBT, T2 / T3 (typisch)
switching times IGBT, T2 / T3 (typical)
$t_{don} = f(R_G)$, $t_r = f(R_G)$, $t_{doff} = f(R_G)$, $t_f = f(R_G)$
V_{GE} = ±15 V, I_C = 150 A, V_{CE} = 500 V, Tvj = 150°C



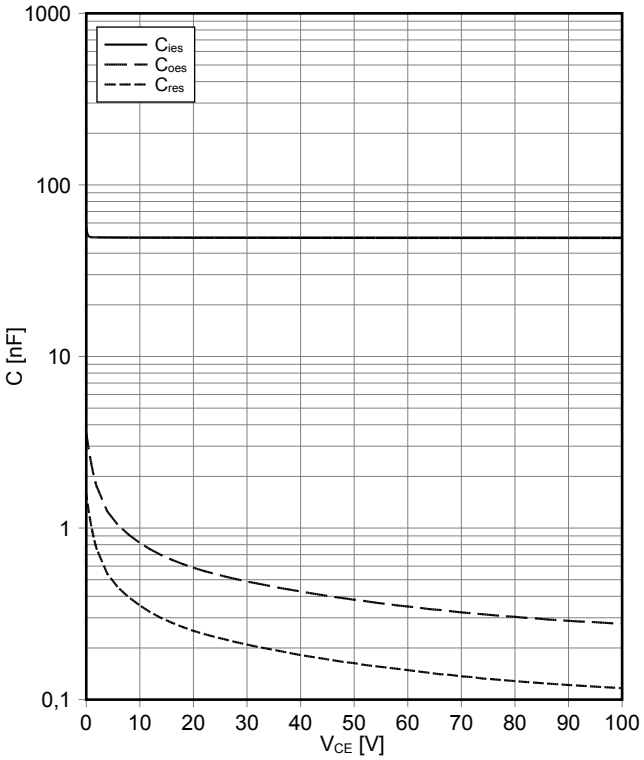
Transienter Wärmewiderstand IGBT, T2 / T3
transient thermal impedance IGBT, T2 / T3
$Z_{thJH} = f(t)$



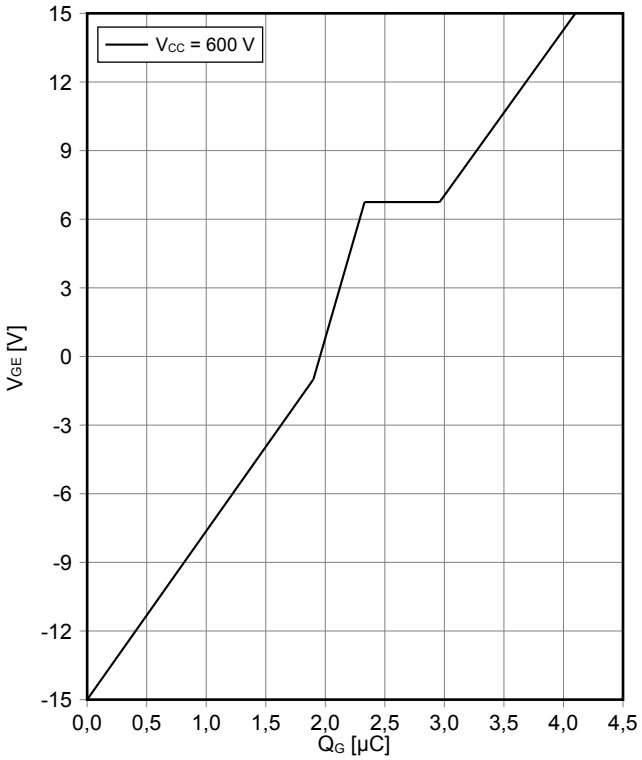
Sicherer Rückwärts-Arbeitsbereich IGBT, T2 / T3 (RBSOA)
reverse bias safe operating area IGBT, T2 / T3 (RBSOA)
$I_C = f(V_{CE})$
V_{GE} = ±15 V, R_{Goff} = 5 Ω, T_{vj} = 150°C



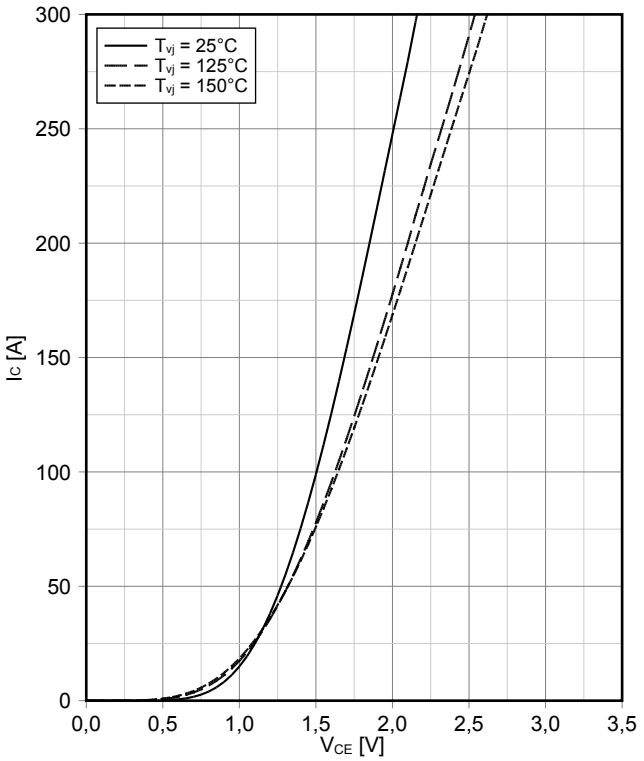
Kapazitäts Charakteristik IGBT, T2 / T3 (typisch)
capacity characteristic IGBT, T2 / T3 (typical)
$C = f(V_{CE})$
V_{GE} = 0 V, T_{vj} = 25°C, f = 100kHz



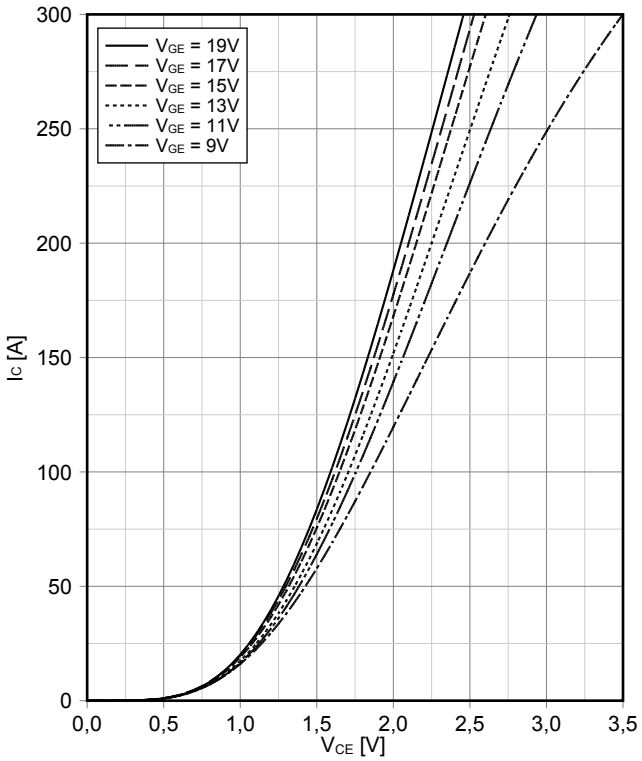
Gateladungs Charakteristik IGBT, T2 / T3 (typisch)
gate charge characteristic IGBT, T2 / T3 (typical)
$V_{GE} = f(Q_G)$
I_C = 400 A, T_{vj} = 25°C



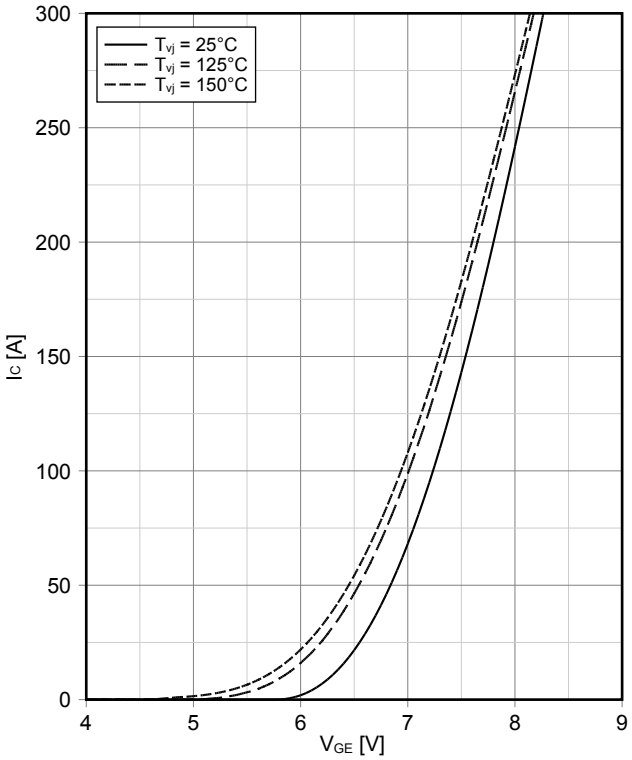
Ausgangskennlinie IGBT, T5 / T6 (typisch)
output characteristic IGBT, T5 / T6 (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



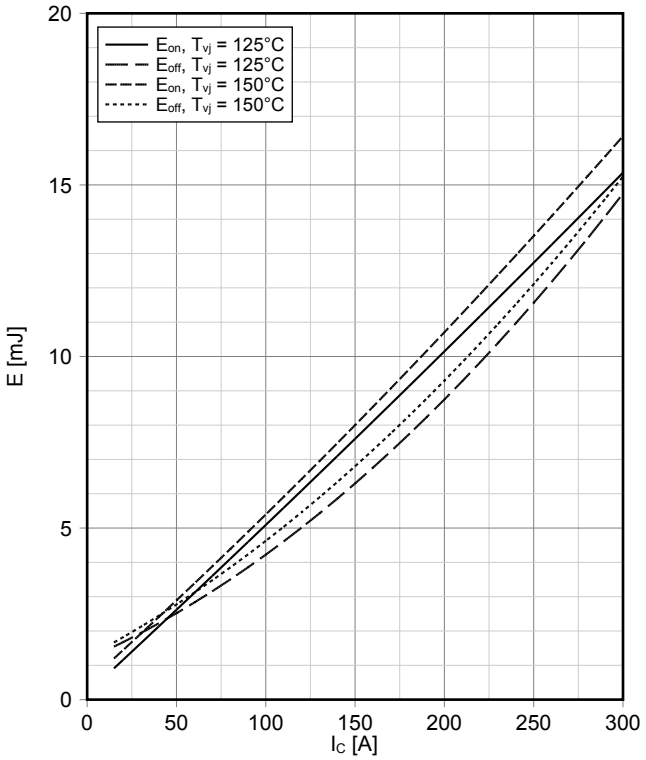
Ausgangskennlinienfeld IGBT, T5 / T6 (typisch)
output characteristic IGBT, T5 / T6 (typical)
$I_C = f(V_{CE})$
T_{vj} = 150°C



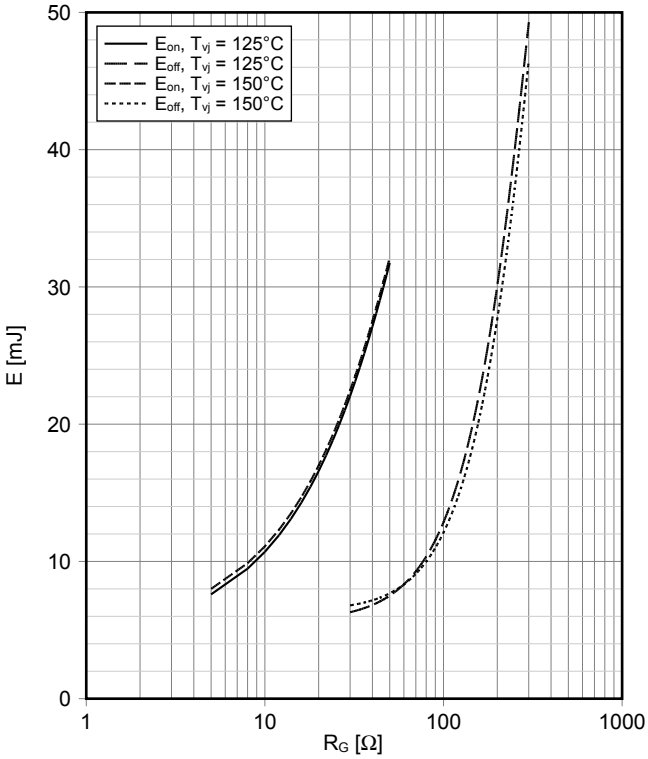
Übertragungscharakteristik IGBT, T5 / T6 (typisch)
transfer characteristic IGBT, T5 / T6 (typical)
$I_C = f(V_{GE})$
V_{CE} = 20 V



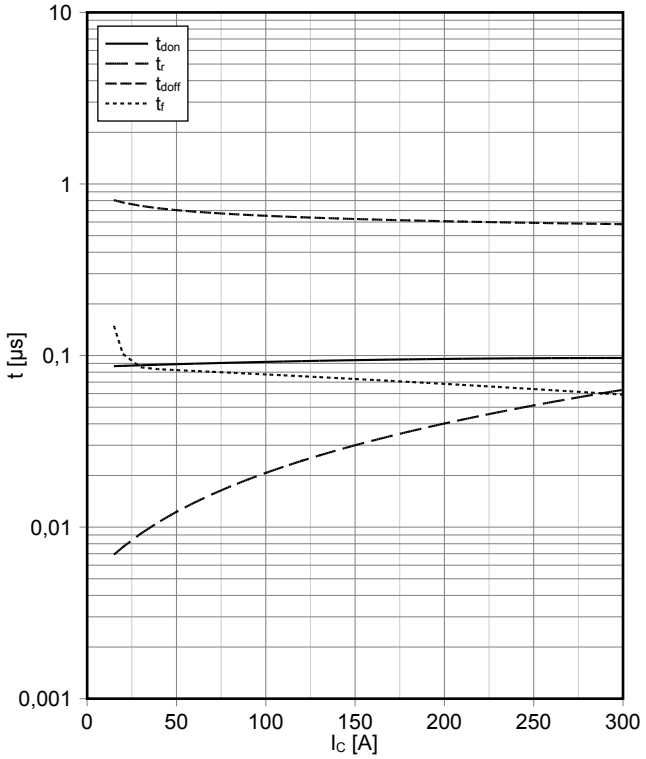
Schaltverluste IGBT, T5 / T6 (typisch)
switching losses IGBT, T5 / T6 (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 5 Ω, R_{Goff} = 30 Ω, V_{CE} = 500 V



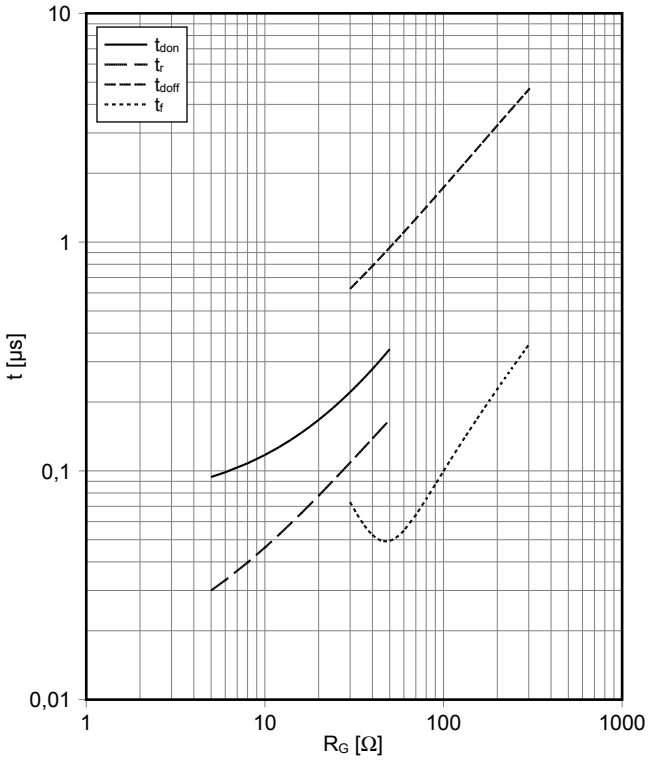
Schaltverluste IGBT, T5 / T6 (typisch)
switching losses IGBT, T5 / T6 (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
V_{GE} = ±15 V, I_C = 150 A, V_{CE} = 500 V



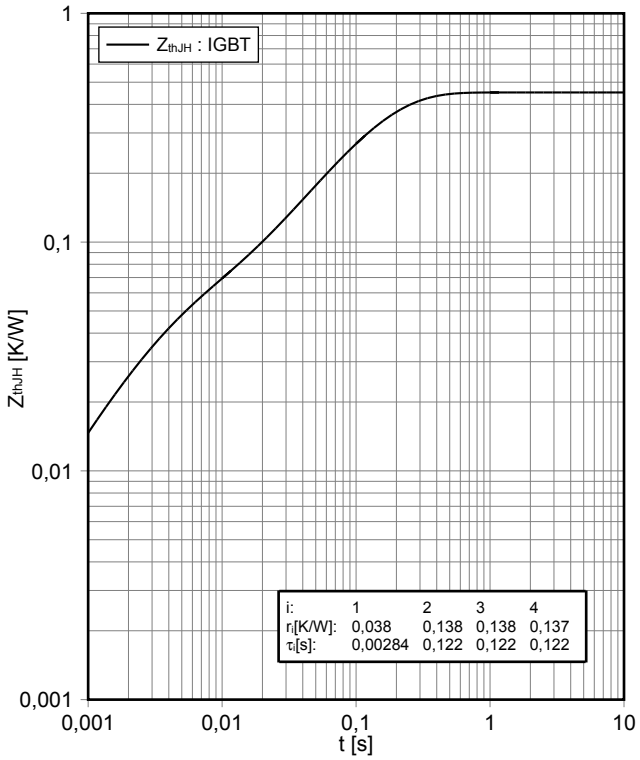
Schaltzeiten IGBT, T5 / T6 (typisch)
switching times IGBT, T5 / T6 (typical)
$t_{don} = f(I_C)$, $t_r = f(I_C)$, $t_{doff} = f(I_C)$, $t_f = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 5 Ω, R_{Goff} = 30 Ω, V_{CE} = 500 V, Tvj = 150°C



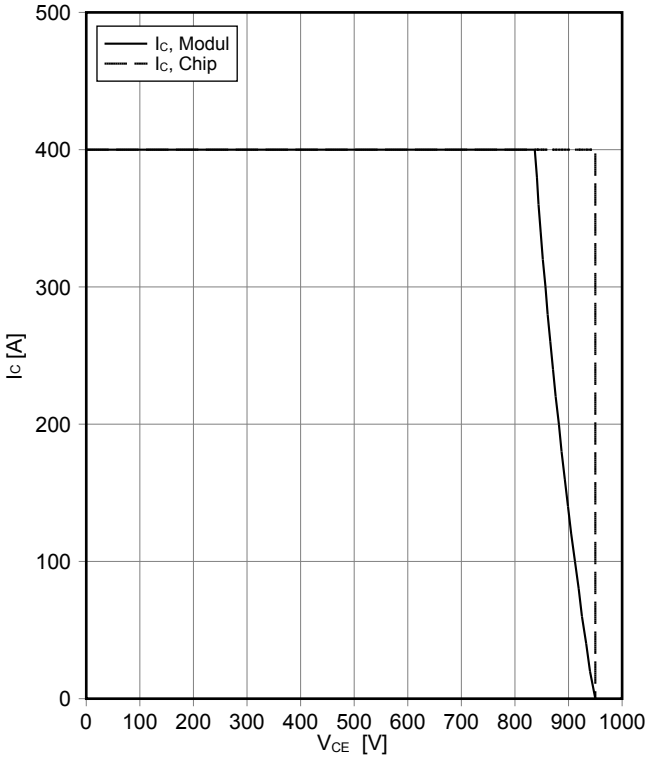
Schaltzeiten IGBT, T5 / T6 (typisch)
switching times IGBT, T5 / T6 (typical)
$t_{don} = f(R_G)$, $t_r = f(R_G)$, $t_{doff} = f(R_G)$, $t_f = f(R_G)$
V_{GE} = ±15 V, I_C = 150 A, V_{CE} = 500 V, Tvj = 150°C



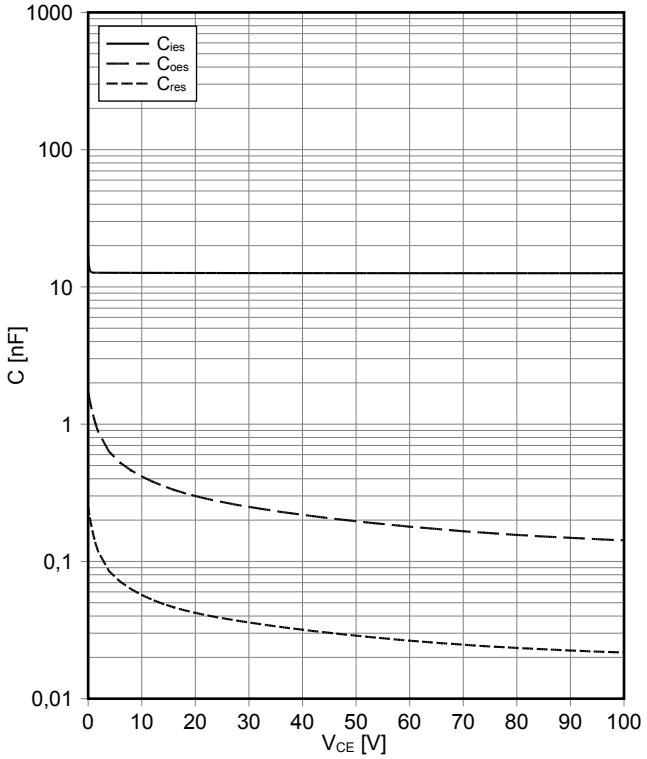
Transienter Wärmewiderstand IGBT, T5 / T6
transient thermal impedance IGBT, T5 / T6
$Z_{thJH} = f(t)$



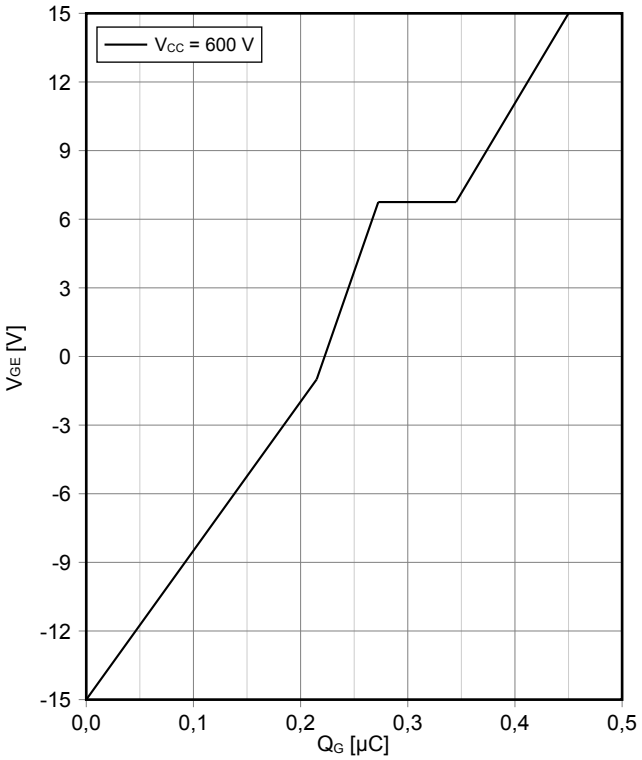
Sicherer Rückwärts-Arbeitsbereich IGBT, T5 / T6 (RBSOA)
reverse bias safe operating area IGBT, T5 / T6 (RBSOA)
$I_C = f(V_{CE})$
V_{GE} = ±15 V, R_{Goff} = 30 Ω, T_{vj} = 150°C



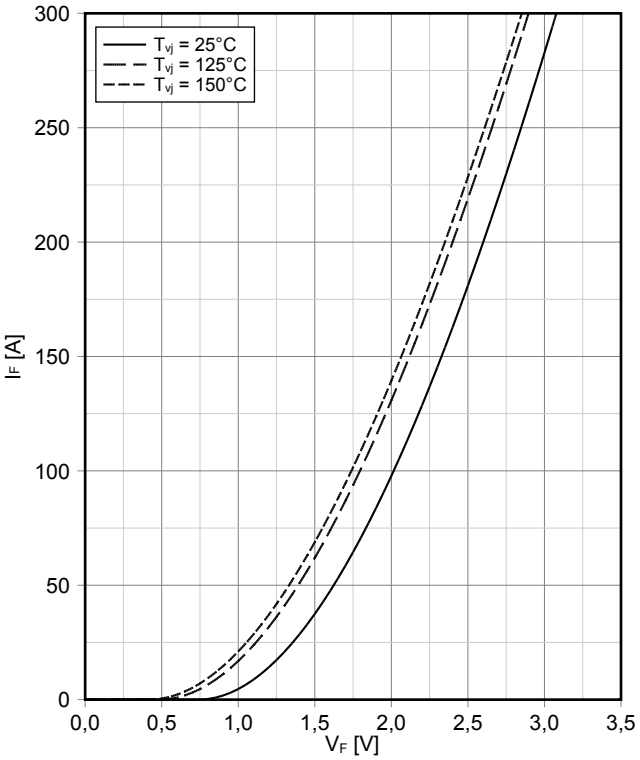
Kapazitäts Charakteristik IGBT, T5 / T6 (typisch)
capacity characteristic IGBT, T5 / T6 (typical)
$C = f(V_{CE})$
V_{GE} = 0 V, T_{vj} = 25°C, f = 100kHz



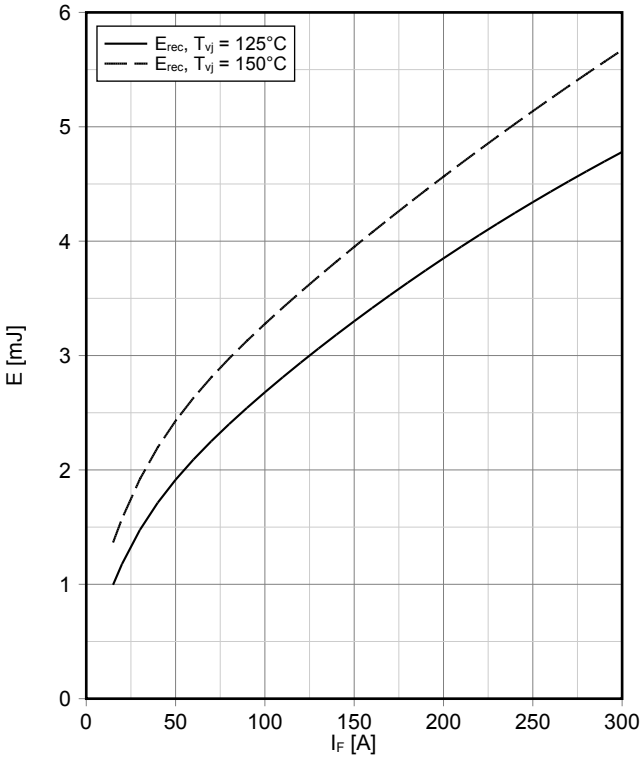
Gateladungs Charakteristik IGBT, T5 / T6 (typisch)
gate charge characteristic IGBT, T5 / T6 (typical)
$V_{GE} = f(Q_G)$
I_C = 200 A, T_{vj} = 25°C



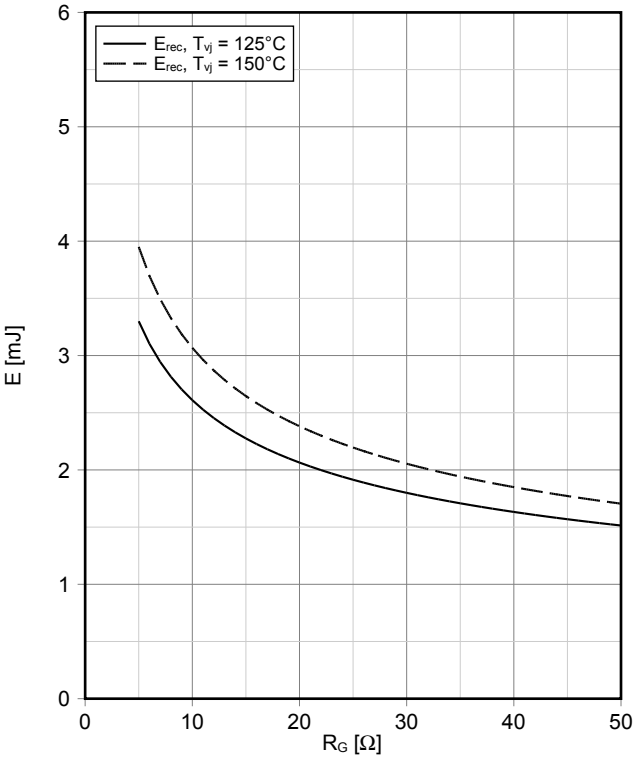
Durchlasskennlinie der Diode, D1 / D4 (typisch)
forward characteristic of Diode, D1 / D4 (typical)
$I_F = f(V_F)$



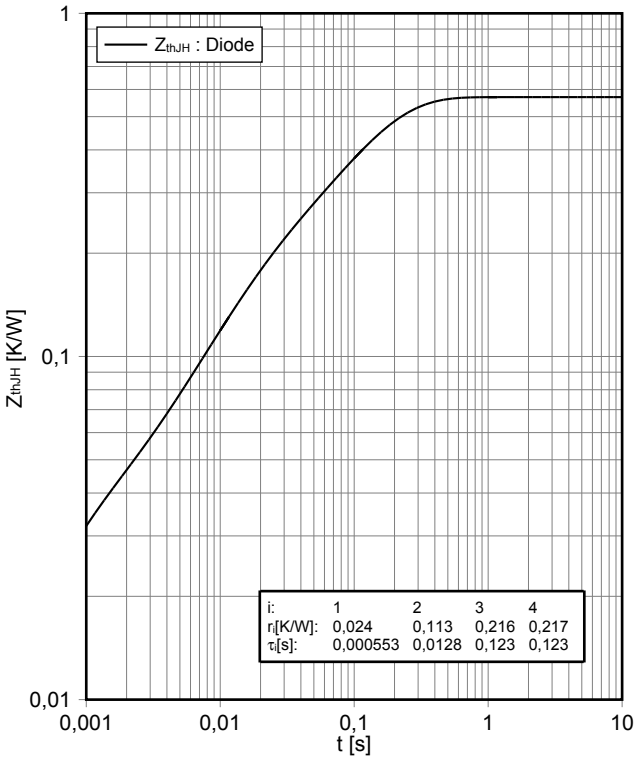
Schaltverluste Diode, D1 / D4 (typisch)
switching losses Diode, D1 / D4 (typical)
$E_{rec} = f(I_F)$
R_{Gon} = 5 Ω, V_{CE} = 500 V



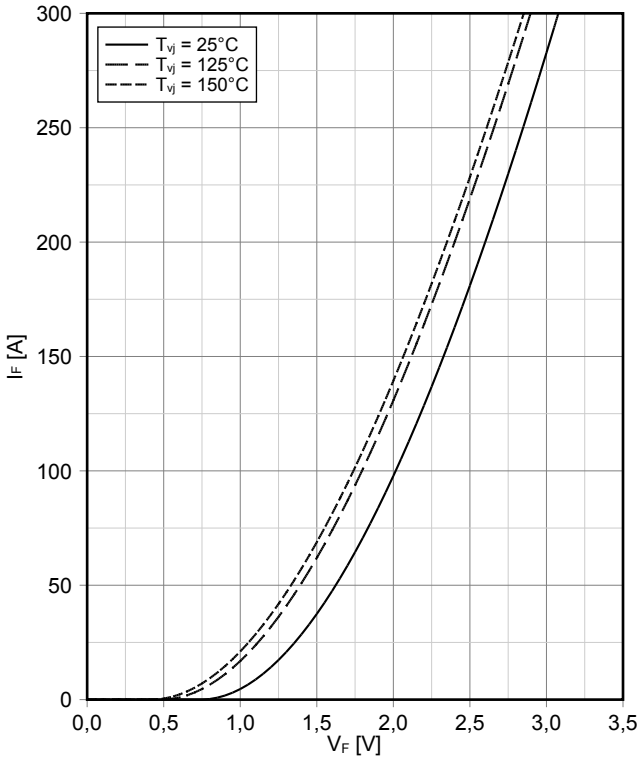
Schaltverluste Diode, D1 / D4 (typisch)
switching losses Diode, D1 / D4 (typical)
$E_{rec} = f(R_G)$
I_F = 150 A, V_{CE} = 500 V



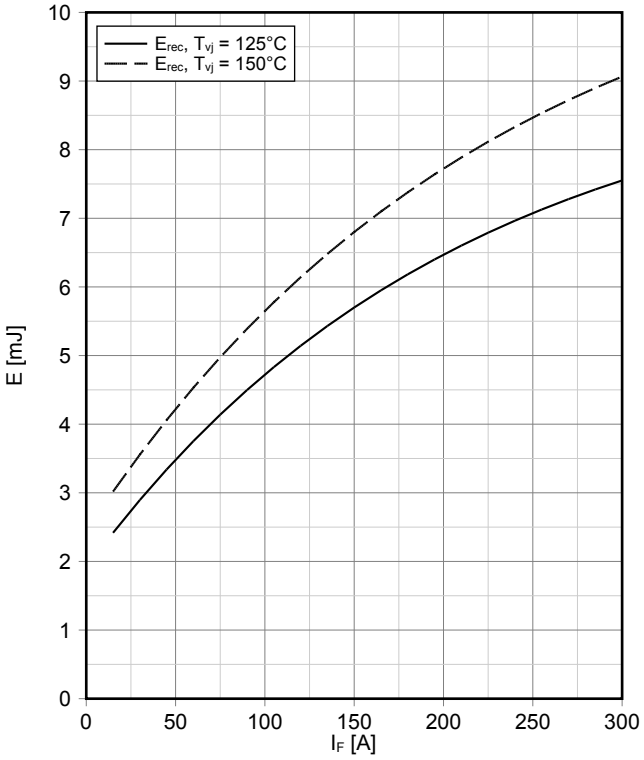
Transienter Wärmewiderstand Diode, D1 / D4
transient thermal impedance Diode, D1 / D4
$Z_{thJH} = f(t)$



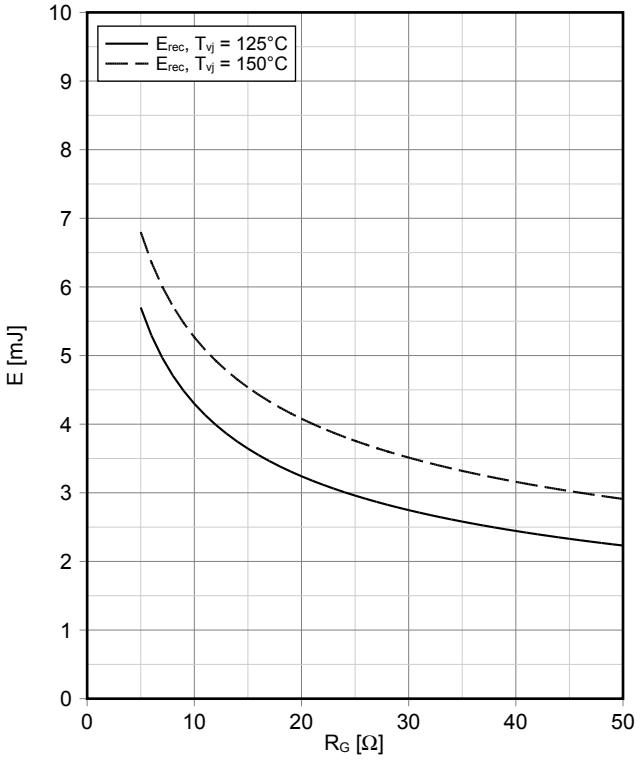
Durchlasskennlinie der Diode, D2 / D3 (typisch)
forward characteristic of Diode, D2 / D3 (typical)
$I_F = f(V_F)$



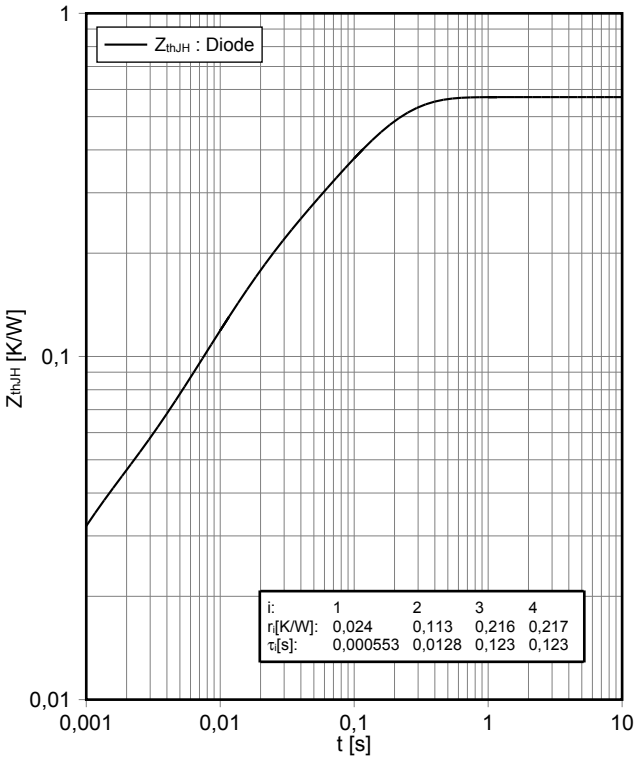
Schaltverluste Diode, D2 / D3 (typisch)
switching losses Diode, D2 / D3 (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 5\ \Omega$, $V_{CE} = 500$ V



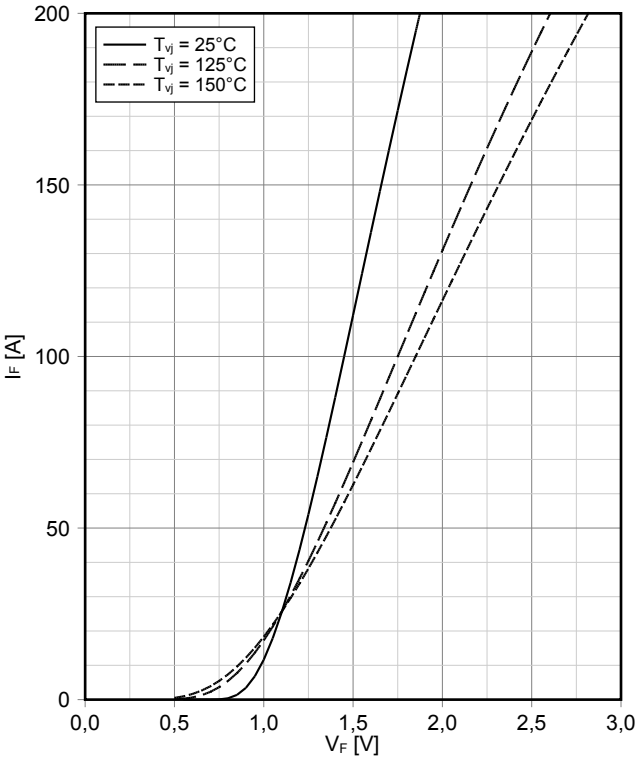
Schaltverluste Diode, D2 / D3 (typisch)
switching losses Diode, D2 / D3 (typical)
$E_{rec} = f(R_G)$
$I_F = 150$ A, $V_{CE} = 500$ V



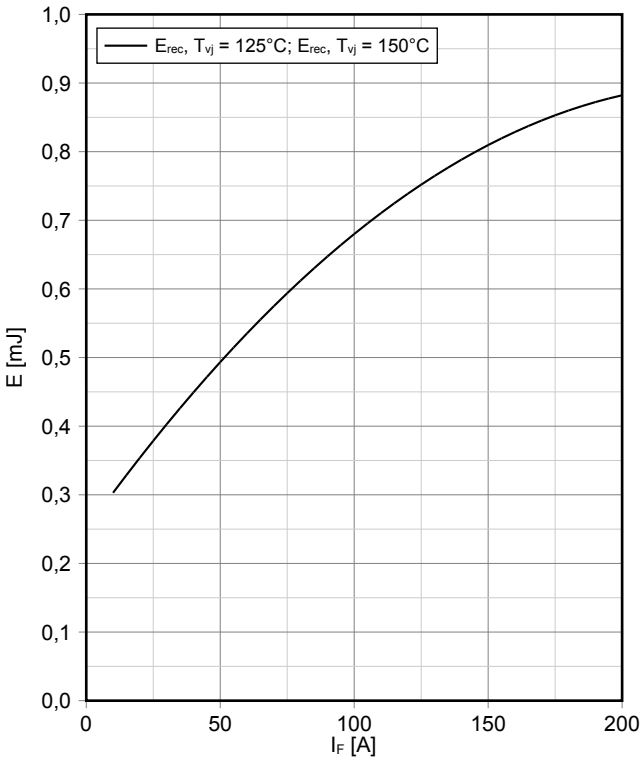
Transienter Wärmewiderstand Diode, D2 / D3
transient thermal impedance Diode, D2 / D3
$Z_{thJH} = f(t)$



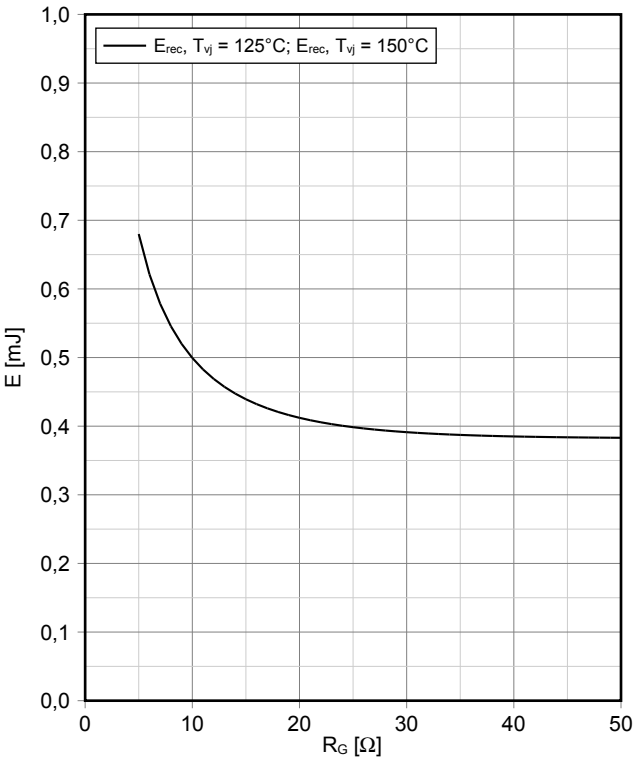
Durchlasskennlinie der Diode, D5-D6 (typisch)
forward characteristic of Diode, D5-D6 (typical)
$I_F = f(V_F)$



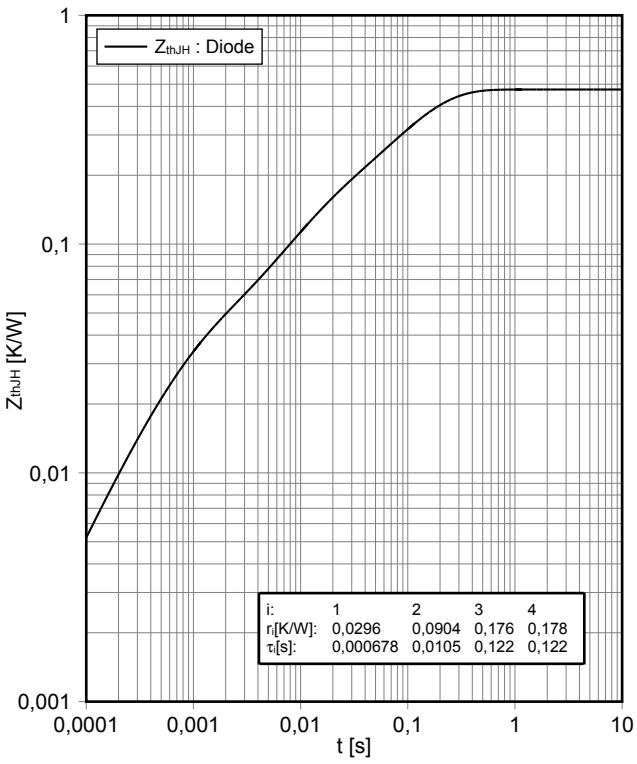
Schaltverluste Diode, D5-D6 (typisch)
switching losses Diode, D5-D6 (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 5\ \Omega$, $V_{CE} = 500$ V



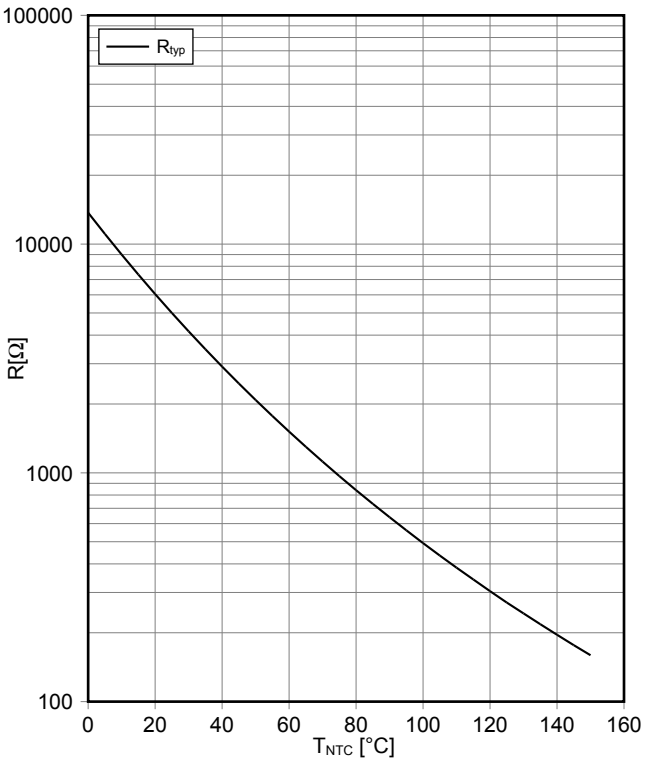
Schaltverluste Diode, D5-D6 (typisch)
switching losses Diode, D5-D6 (typical)
$E_{rec} = f(R_G)$
$I_F = 100$ A, $V_{CE} = 500$ V



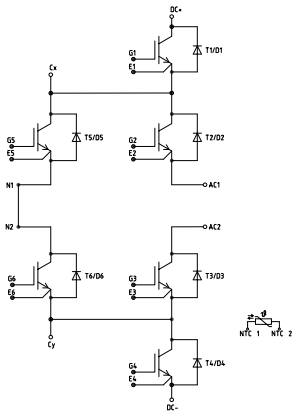
Transienter Wärmewiderstand Diode, D5-D6
transient thermal impedance Diode, D5-D6
$Z_{thJH} = f(t)$



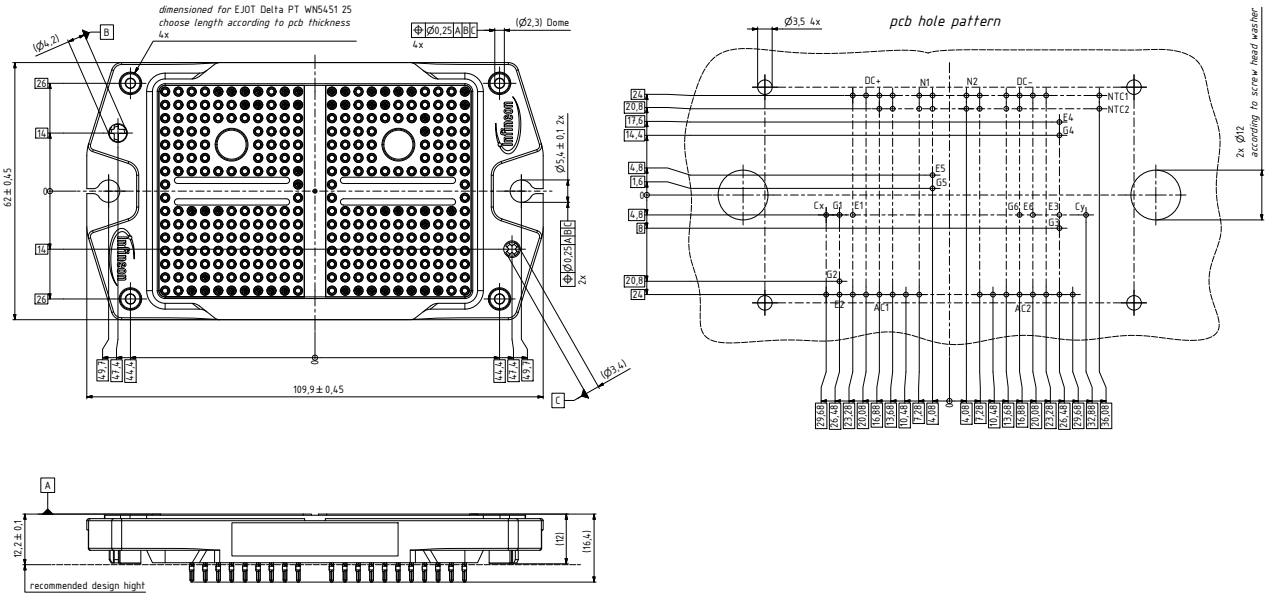
NTC-Widerstand-Temperaturkennlinie (typisch)
NTC-Thermistor-temperature characteristic (typical)
$R = f(T)$



Schaltplan / Circuit diagram



Gehäuseabmessungen / Package outlines



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