

Technische Information / technical information

IGBT-Module
IGBT-modules

BSM150GAL120DLC



62mm C-Serien Modul mit low loss IGBT2 und EmCon Diode
62mm C-series module with low loss IGBT2 and EmCon diode

IGBT-Wechselrichter / IGBT-inverter

Vorläufige Daten / preliminary data

Höchstzulässige Werte / maximum rated values

Kollektor-Emitter-Sperrspannung collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1200	V
Kollektor-Dauergleichstrom DC-collector current	$T_C = 80^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$	$I_{C\ nom}$ I_C	150 300	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\ \text{ms}$	I_{CRM}	300	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$	P_{tot}	1250	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	$I_C = 150\ \text{A}, V_{GE} = 15\ \text{V}$ $I_C = 150\ \text{A}, V_{GE} = 15\ \text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\ sat}$	2,10 2,40	2,60 2,90	V V	
Gate-Schwellenspannung gate threshold voltage	$I_C = 6,00\ \text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	4,5	5,5	6,5	V
Gateladung gate charge	$V_{GE} = -15\ \text{V} \dots +15\ \text{V}$		Q_G	1,60		μC	
Interner Gatewiderstand internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	2,5		Ω	
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}	11,0		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}	0,70		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}		5,0	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}		400	nA	
Einschaltverzögerungszeit (ind. Last) turn-on delay time (inductive load)	$I_C = 150\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Gon} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\ on}$	0,11 0,12		μs μs	
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 150\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Gon} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_r	0,06 0,07		μs μs	
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	$I_C = 150\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Goff} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\ off}$	0,55 0,57		μs μs	
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 150\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Goff} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_f	0,07 0,08		μs μs	
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 150\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}, L_s = 60\ \text{nH}$ $R_{Gon} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{on}	17,0		mJ mJ	
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 150\ \text{A}, V_{CE} = 600\ \text{V}$ $V_{GE} = \pm 15\ \text{V}, L_s = 60\ \text{nH}$ $R_{Goff} = 5,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{off}	18,0		mJ mJ	
Kurzschlußverhalten SC data	$t_p \leq 10\ \mu\text{s}, V_{GE} \leq 15\ \text{V}$ $T_{vj} = 125^{\circ}\text{C}, V_{CC} = 900\ \text{V}, V_{CEmax} = V_{CES} - L_s \cdot di/dt$		I_{SC}	950		A	
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT		R_{thJC}		0,10	K/W	
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro IGBT / per IGBT $\lambda_{Paste} = 1\ \text{W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\ \text{W}/(\text{m}\cdot\text{K})$		R_{thCH}	0,03		K/W	

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**Vorläufige Daten
preliminary data**

Diode-Wechselrichter / diode-inverter

Höchstzulässige Werte / maximum rated values

Periodische Spitzensperrspannung repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
Dauergleichstrom DC forward current		I_F	150	A
Periodischer Spitzenstrom repetitive peak forward current	$t_p = 1\text{ ms}$	I_{FRM}	300	A
Grenzlastintegral I^2t - value	$V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$	I^2t	4800	A^2s

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Durchlassspannung forward voltage	$I_F = 150\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 150\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_F	1,80 1,70	2,30 2,20	V V
Rückstromspitze peak reverse recovery current	$I_F = 150\text{ A}, -di_F/dt = 3100\text{ A}/\mu\text{s}$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}	180 220		A A
Sperrverzögerungsladung recovered charge	$I_F = 150\text{ A}, -di_F/dt = 3100\text{ A}/\mu\text{s}$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r	17,0 32,0		μC μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 150\text{ A}, -di_F/dt = 3100\text{ A}/\mu\text{s}$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}	4,00 10,0		mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode		R_{thJC}		0,25	K/W
Übergangs-Wärmewiderstand 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_{thCH}	0,06		K/W

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**Diode-Brems-Chopper / Diode-brake-chopper
Höchstzulässige Werte / maximum rated values**

Periodische Spitzensperrspannung repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
Dauergleichstrom DC forward current		I_F	200	A
Periodischer Spitzenstrom repetitive peak forw. current	$t_p = 1\text{ ms}$	I_{FRM}	400	A
Grenzlastintegral I^2t - value	$V_R = 0\text{ V}, t_p = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$	I^2t	6900	A ² s

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Durchlaßspannung forward voltage	$I_F = 200\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 200\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_F	1,80 1,70	2,30 2,20	V V
Rückstromspitze peak reverse recovery current	$I_F = 200\text{ A}, -di_F/dt = 4000\text{ A}/\mu\text{s}$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}	240 300		A A
Sperrverzögerungsladung recovered charge	$I_F = 200\text{ A}, -di_F/dt = 4000\text{ A}/\mu\text{s}$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r	23,0 42,0		μC μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 200\text{ A}, -di_F/dt = 4000\text{ A}/\mu\text{s}$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}	6,00 14,0		mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode		R_{thJC}		0,18	K/W
Übergangs-Wärmewiderstand 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}	0,06		K/W

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Modul / module

Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	2,5		kV
Material Modulgrundplatte material of module baseplate			Cu		
Material für innere Isolation material for internal insulation			Al ₂ O ₃		
Kriechstrecke creepage distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		20,0		mm
Luftstrecke clearance distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		11,0		mm
Vergleichszahl der Kriechwegbildung comparative tracking index		CTI	> 425		
			min.	typ.	max.
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$	R _{thCH}		0,01	K/W
Modulinduktivität stray inductance module		L _{sCE}		20	nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	T _C = 25°C, pro Schalter / per switch	R _{CC'+EE'}		0,70	mΩ
Höchstzulässige Sperrschichttemperatur maximum junction temperature	Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper	T _{vj max}			150 °C
Temperatur im Schaltbetrieb temperature under switching conditions	Wechselrichter, Brems-Chopper / Inverter, Brake-Chopper	T _{vj op}	-40		125 °C
Lagertemperatur storage temperature		T _{stg}	-40		125 °C
Anzugsdrehmoment f. mech. Befestigung mounting torque	Schraube / screw M6	M	3,00	-	6,00 Nm
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	Schraube / screw M6	M	2,5	-	5,0 Nm
Gewicht weight		G		340	g

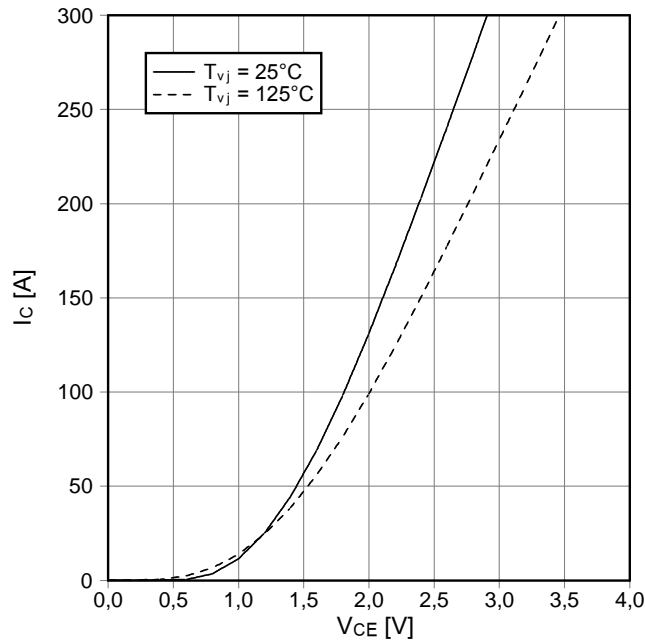
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This technical information specifies semiconductor devices but guarantees no characteristics. It is valid with the appropriate technical explanations.

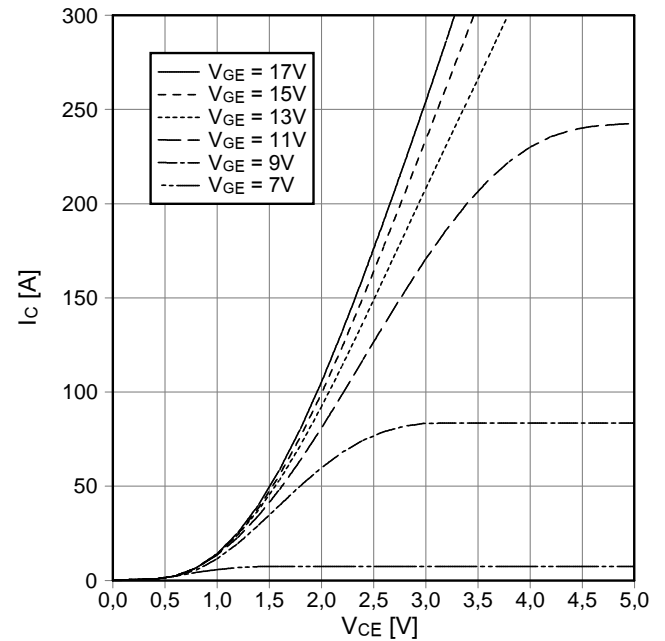
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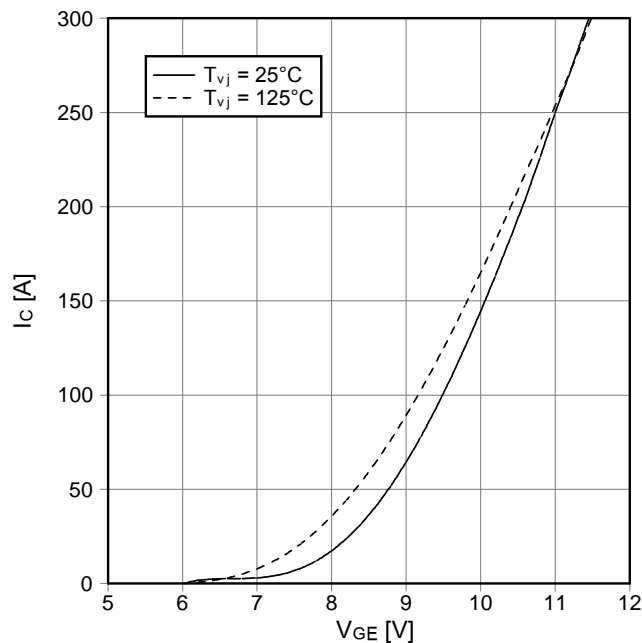
Ausgangskennlinie IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
 $I_c = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



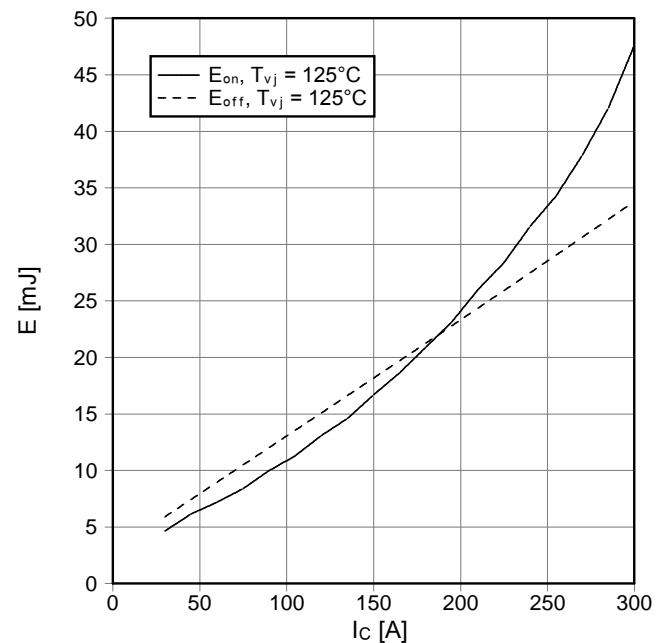
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)
 $I_c = f(V_{CE})$
 $T_{vj} = 125^\circ\text{C}$



Übertragungscharakteristik IGBT-Wechselr. (typisch)
transfer characteristic IGBT-inverter (typical)
 $I_c = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



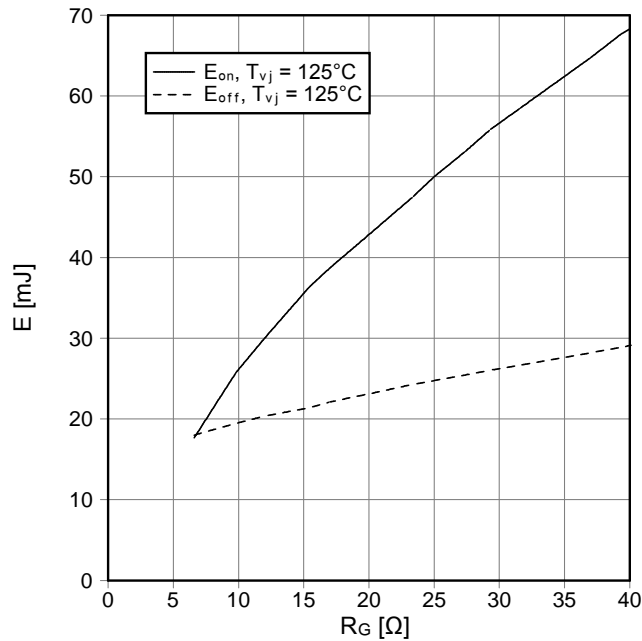
Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-inverter (typical)
 $E_{on} = f(I_c)$, $E_{off} = f(I_c)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 5,6\ \Omega$, $R_{Goff} = 5,6\ \Omega$, $V_{CE} = 600\text{ V}$



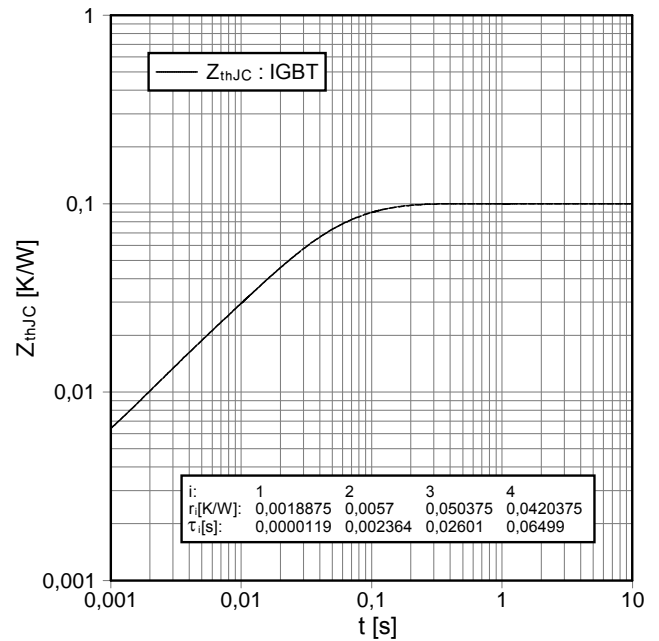
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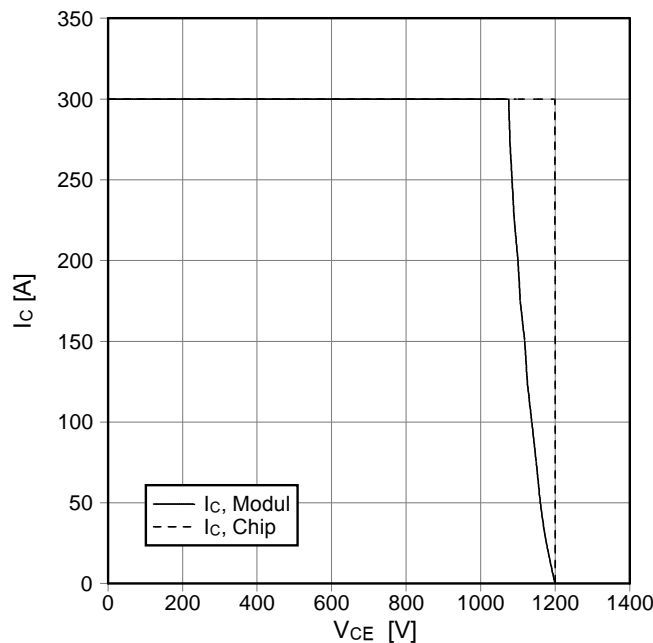
Schaltverluste IGBT-Wechsel. (typisch)
switching losses IGBT-inverter (typical)
 $E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 150\text{ A}$, $V_{CE} = 600\text{ V}$



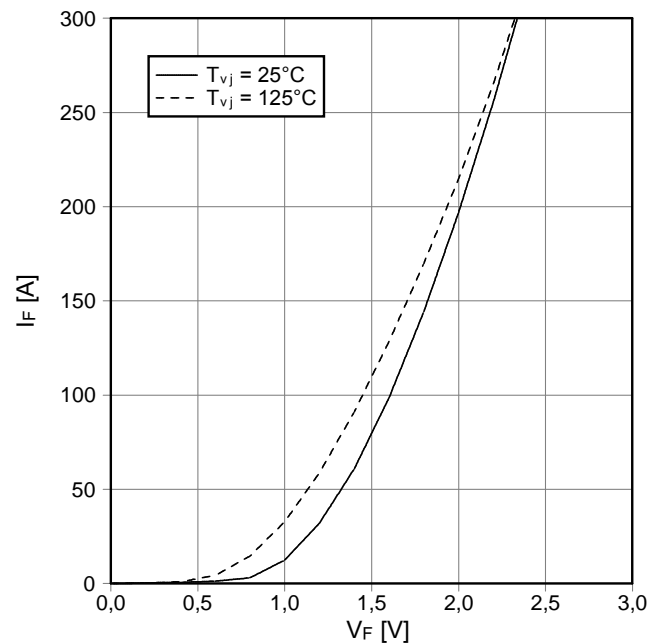
Transienter Wärmewiderstand IGBT-Wechsel.
transient thermal impedance IGBT-inverter
 $Z_{thJC} = f(t)$



Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)
reverse bias safe operating area IGBT-inv. (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 5,6\ \Omega$, $T_{vj} = 125^\circ\text{C}$



Durchlaßkennlinie der Diode-Wechsel. (typisch)
forward characteristic of diode-inverter (typical)
 $I_F = f(V_F)$

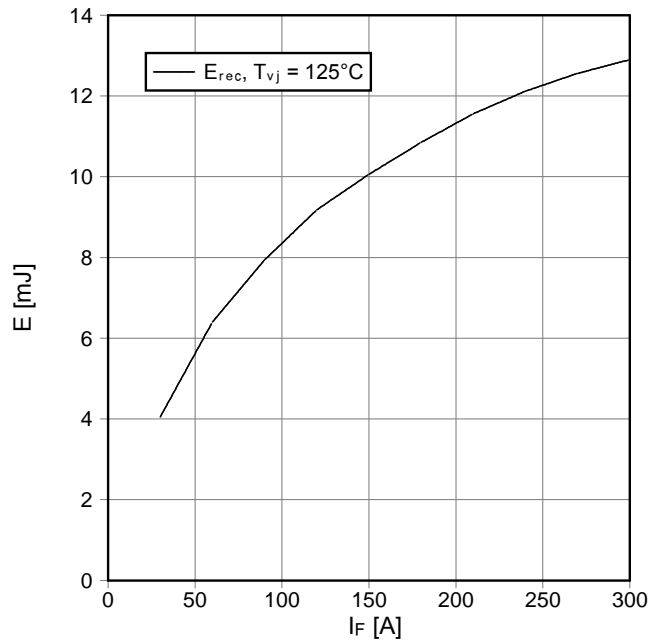


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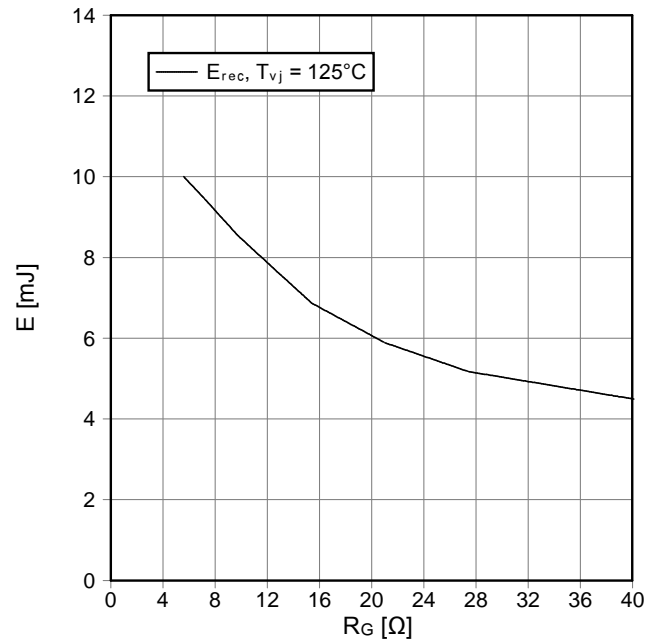
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 5,6 \Omega, V_{CE} = 600 V$



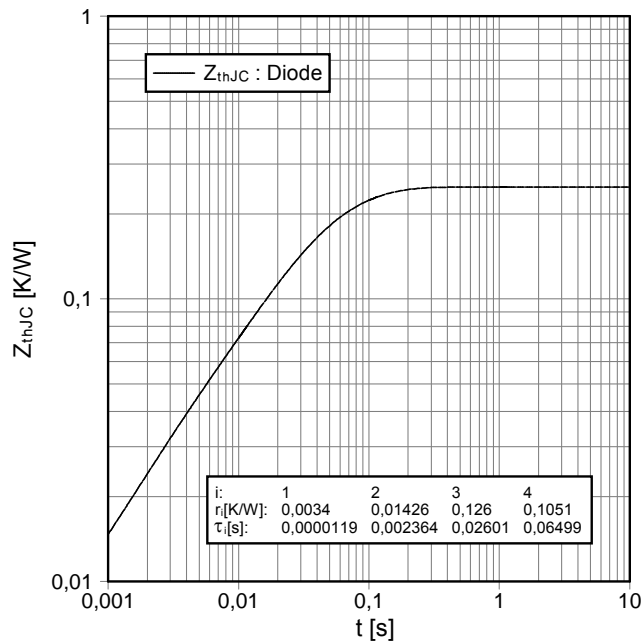
Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 150 A, V_{CE} = 600 V$



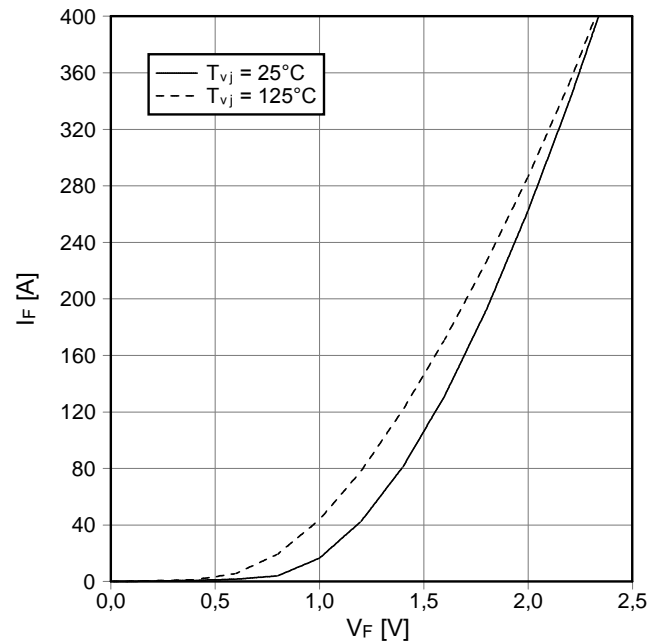
Transienter Wärmewiderstand Diode-Wechselr.
transient thermal impedance diode-inverter

$Z_{thJC} = f(t)$



Durchlaßkennlinie der Diode-Brems-Chopper (typisch)
forward characteristic of diode-brake-chopper (typical)

$I_F = f(V_F)$

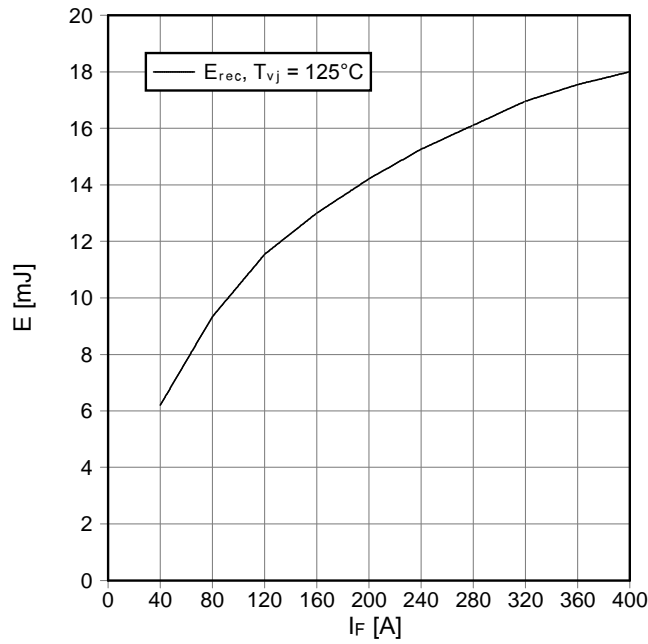


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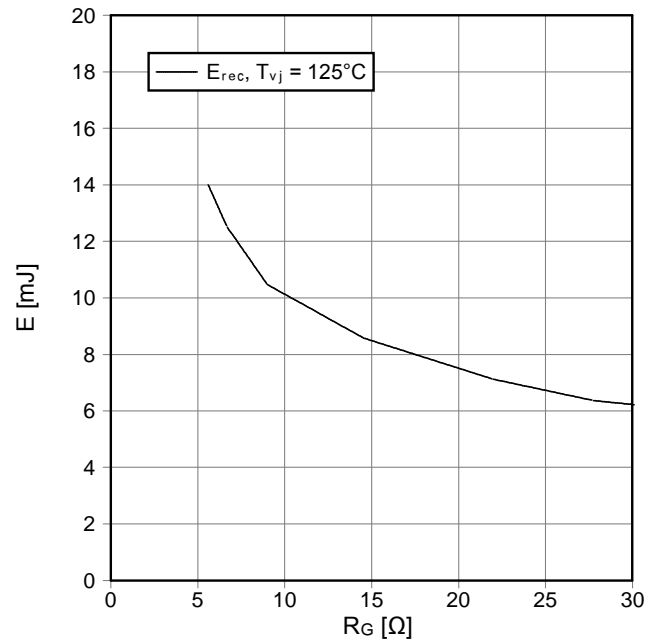
Schaltverluste Diode-Brems-Chopper (typisch)
switching losses diode-brake-chopper (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = \Omega, V_{CE} = 600 V$



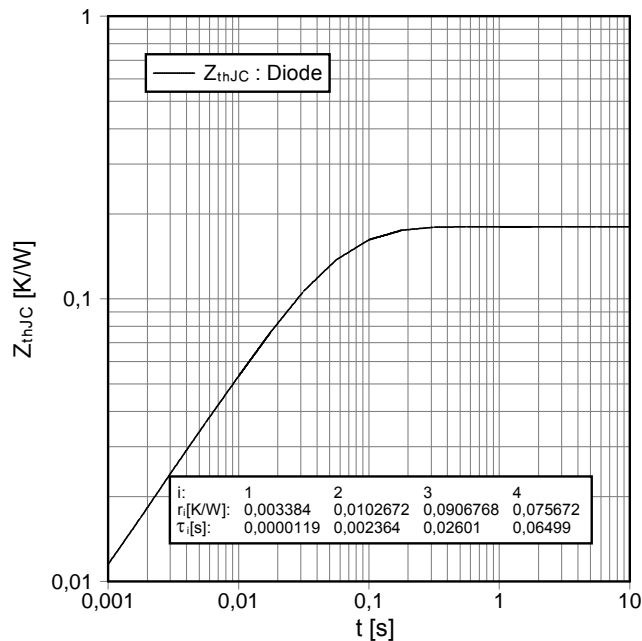
Schaltverluste Diode-Brems-Chopper (typisch)
switching losses diode-brake-chopper (typical)

$E_{rec} = f(R_G)$
 $I_F = 200 A, V_{CE} = 600 V$



Transienter Wärmewiderstand Diode-Brems-Chopper
transient thermal impedance diode-brake-chopper

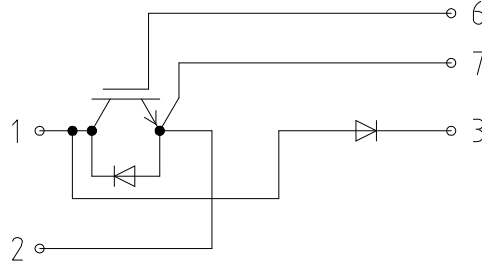
$Z_{thJC} = f(t)$



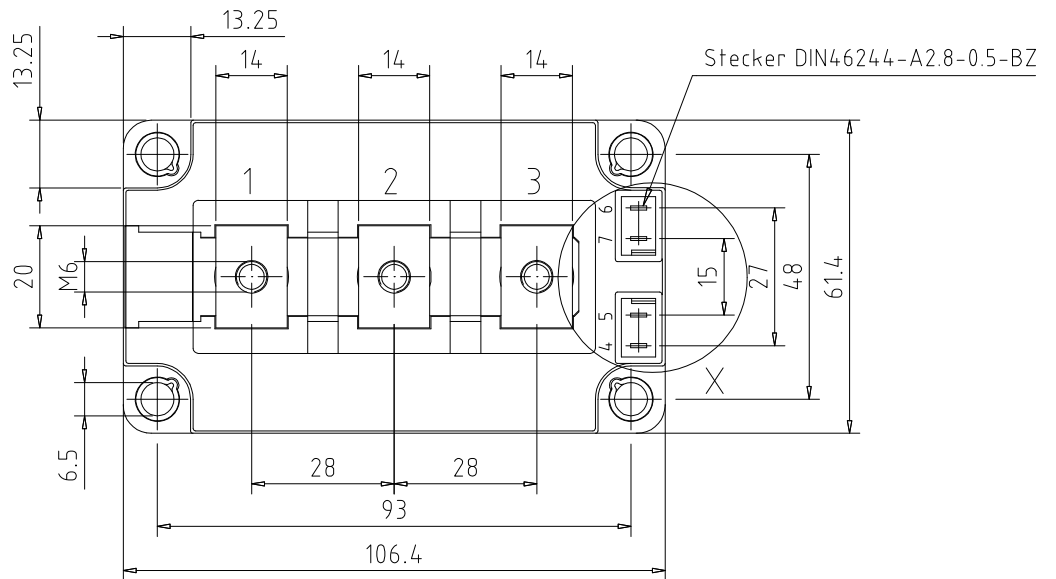
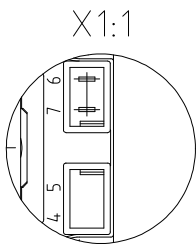
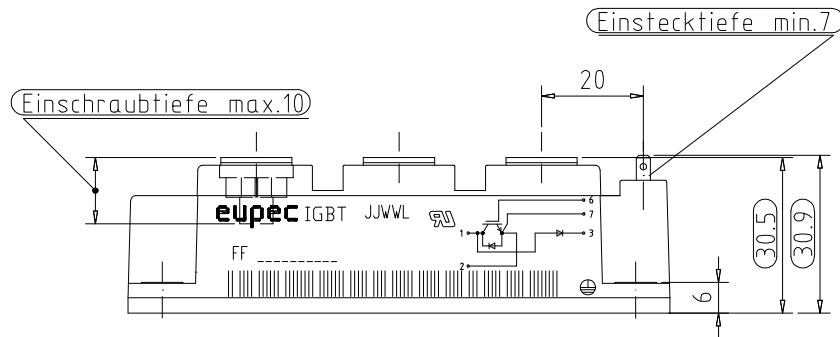
i:	1	2	3	4
r _i [K/W]:	0,003384	0,0102672	0,0906768	0,075672
τ _i [s]:	0,0000119	0,002364	0,02601	0,06499

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Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines



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