

Technische Information / technical information

IGBT-Module
IGBT-modules

FS75R12KT3

power electronics in motion
eupec

EconoPACK™2 Modul mit schnellem Trench/Feldstop IGBT3 und High Efficiency Diode
EconoPACK™2 with fast trench/fieldstop IGBT3 and EmCon High Efficiency 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	$T_C = 80^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$	$I_{C\text{ nom}}$ I_C	75 105	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	150	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$	P_{tot}	355	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	$I_C = 75\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 75\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,70 1,90	2,15	V V
Gate-Schwellenspannung gate threshold voltage	$I_C = 3,00\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,0	5,8	6,5 V
Gateladung gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		Q_G	0,70		μC
Interner Gatewiderstand internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	10		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}	5,30		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}	0,20		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)	$I_C = 75\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 4,7\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{ on}}$	0,26 0,29		μs μs
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 75\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 4,7\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_r	0,03 0,05		μs μs
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	$I_C = 75\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 4,7\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{ off}}$	0,42 0,52		μs μs
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 75\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 4,7\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_f	0,07 0,09		μs μs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 75\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}, L_s = 70\text{ nH}$ $R_{Gon} = 4,7\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{on}	7,00		mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 75\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}, L_s = 70\text{ nH}$ $R_{Goff} = 4,7\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{off}	8,10		mJ mJ
Kurzschlussverhalten SC data	$t_P \leq 10\ \mu\text{s}, V_{GE} \leq 15\text{ V}$ $T_{vj} = 125^{\circ}\text{C}, V_{CC} = 900\text{ V}, V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$		I_{SC}	300		A
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT		R_{thJC}		0,35	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}	0,19		K/W

prepared by: Martin Knecht

date of publication: 2004-11-16

approved by: Robert Severin

revision: 2.1

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Vorläufige Daten preliminary data

Diode-Wechselrichter / diode-inverter

Höchstzulässige Werte / maximum rated values

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

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Durchlassspannung forward voltage	$I_F = 75 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 75 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_F	1,65 1,65	2,15	V V
Rückstromspitze peak reverse recovery current	$I_F = 75 \text{ A}, -di_F/dt = 2200 \text{ A}/\mu\text{s}$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}	90,0 96,0		A A
Sperrverzögerungsladung recovered charge	$I_F = 75 \text{ A}, -di_F/dt = 2200 \text{ A}/\mu\text{s}$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r	7,40 13,5		μC μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 75 \text{ A}, -di_F/dt = 2200 \text{ A}/\mu\text{s}$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}	3,00 5,50		mJ mJ
Innerer Wärmewiderstand thermal resistance, junction to case	pro Diode per diode		R_{thJC}		0,58	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}	0,32		K/W

NTC-Widerstand / NTC-thermistor

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Nennwiderstand rated resistance	$T_C = 25^{\circ}\text{C}$	R_{25}		5,00		k Ω
Abweichung von R_{100} deviation of R_{100}	$T_C = 100^{\circ}\text{C}, R_{100} = 493 \Omega$	$\Delta R/R$	-5		5	%
Verlustleistung power dissipation	$T_C = 25^{\circ}\text{C}$	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

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Modul / module

Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min	Visol	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		10,0	mm
Luftstrecke clearance distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		7,5	mm
Vergleichszahl der Kriechwegbildung comparative tracking index		CTI	> 225	
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module $\lambda_{\text{Paste}} = 1 \text{ W/(m}\cdot\text{K)} / \lambda_{\text{grease}} = 1 \text{ W/(m}\cdot\text{K)}$	R _{thCH}	min. 0,02	typ. max. K/W
Modulinduktivität stray inductance module		L _{sCE}	19	nH
Modulleitungswiderstand, Anschlüsse - Chip module lead resistance, terminals - chip	T _C = 25°C, pro Schalter / per switch	R _{CC'+EE'}	2,50	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 M5	M	3,00	- 6,00 Nm
Gewicht weight		G	180	g

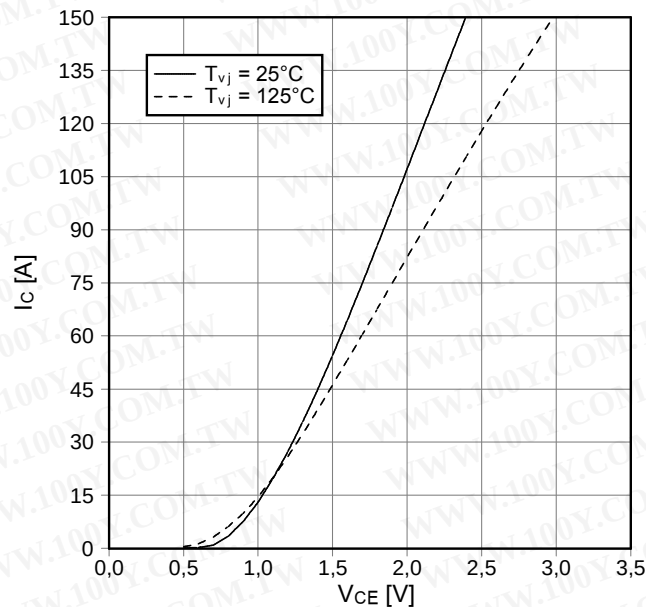
prepared by: Martin Knecht	date of publication: 2004-11-16
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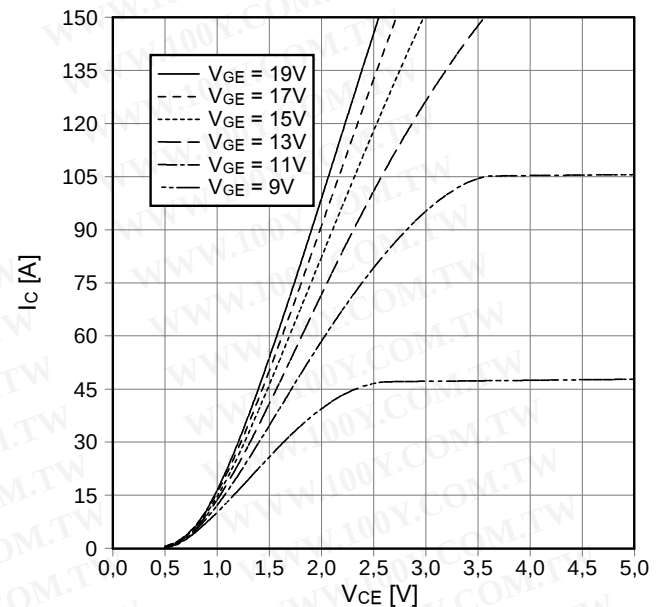
Ausgangskennlinie IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)

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



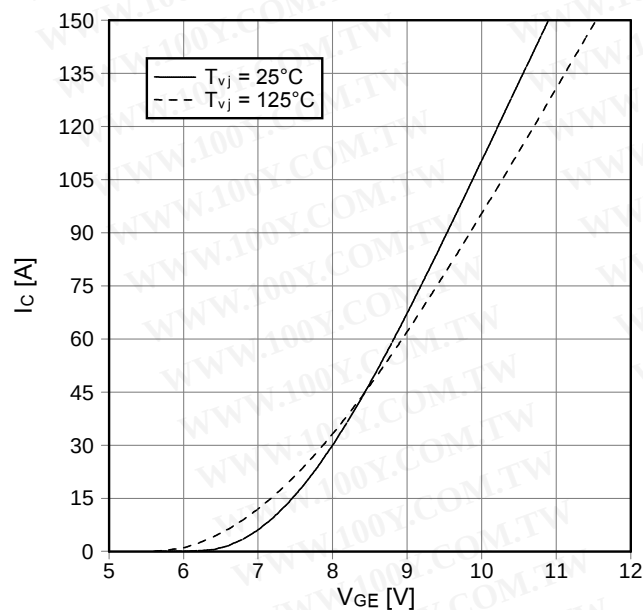
Ausgangskennlinienfeld IGBT-Wechselr. (typisch)
output characteristic IGBT-inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 125^\circ\text{C}$



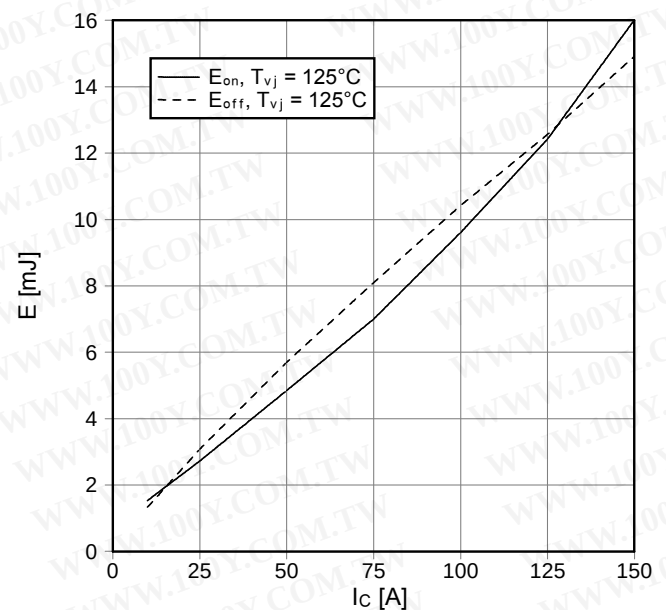
Übertragungscharakteristik IGBT-Wechselr. (typisch)
transfer characteristic IGBT-inverter (typical)

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



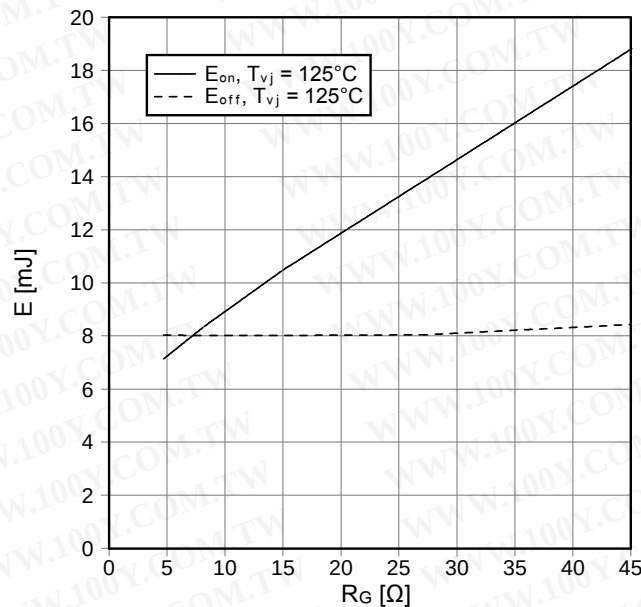
Schaltverluste IGBT-Wechselr. (typisch)
switching losses IGBT-inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 4,7 \text{ } \Omega$, $R_{Goff} = 4,7 \text{ } \Omega$, $V_{CE} = 600 \text{ V}$

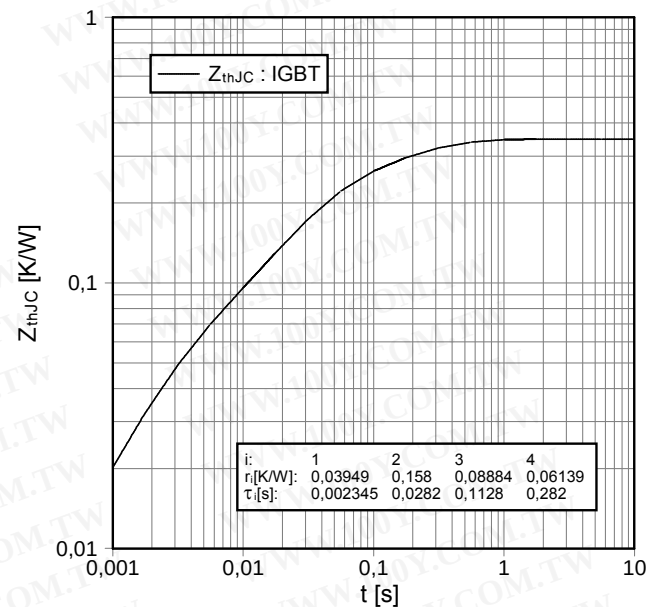


Vorläufige Daten
preliminary data

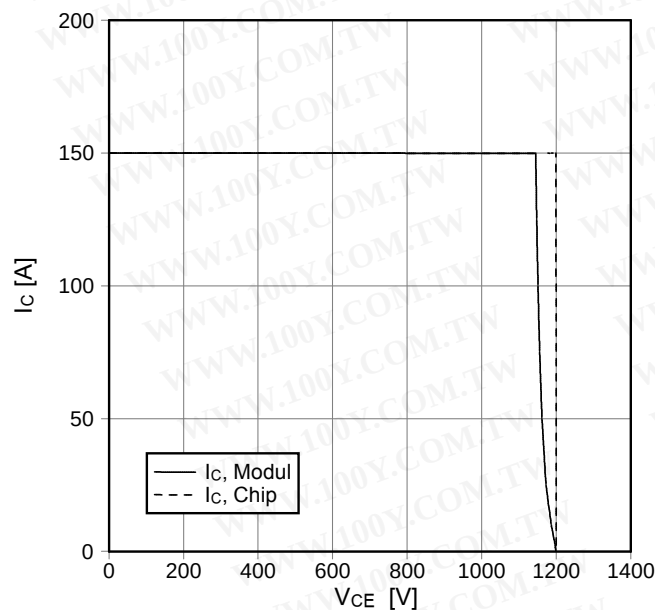
Schaltverluste IGBT-Wechsel. (typisch)
switching losses IGBT-Inverter (typical)
 $E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 75 \text{ A}$, $V_{CE} = 600 \text{ V}$



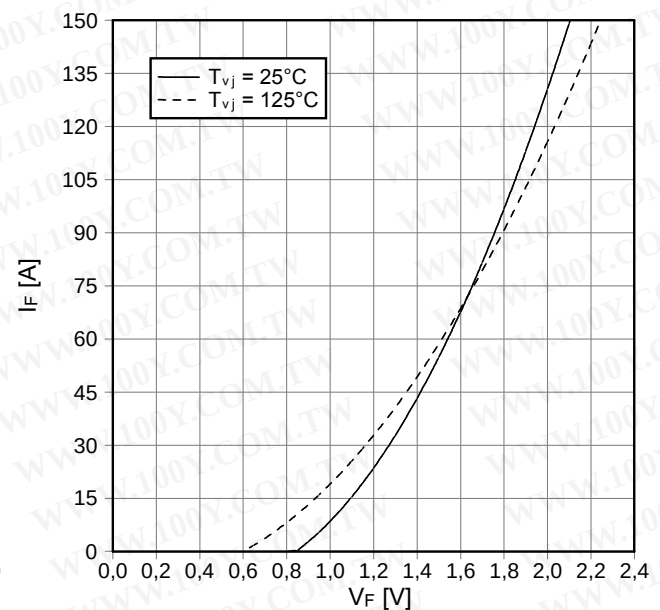
Transienter Wärmewiderstand IGBT-Wechsel.
transient thermal impedance IGBT-inverter
 $Z_{thJC} = f(t)$

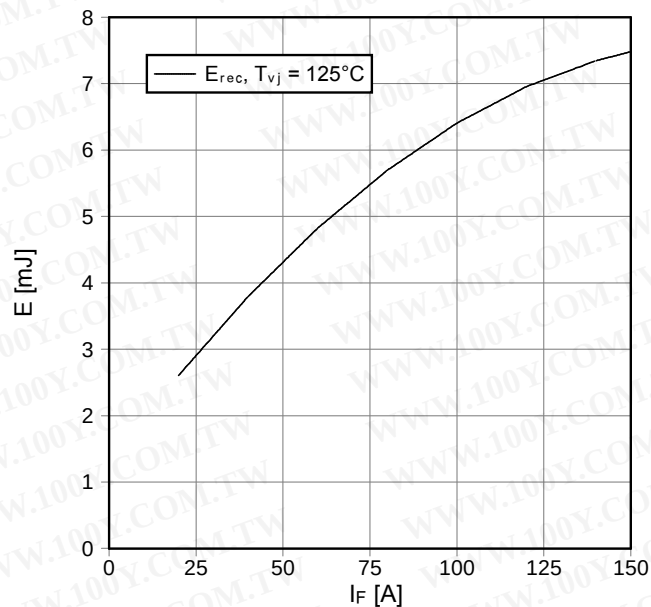
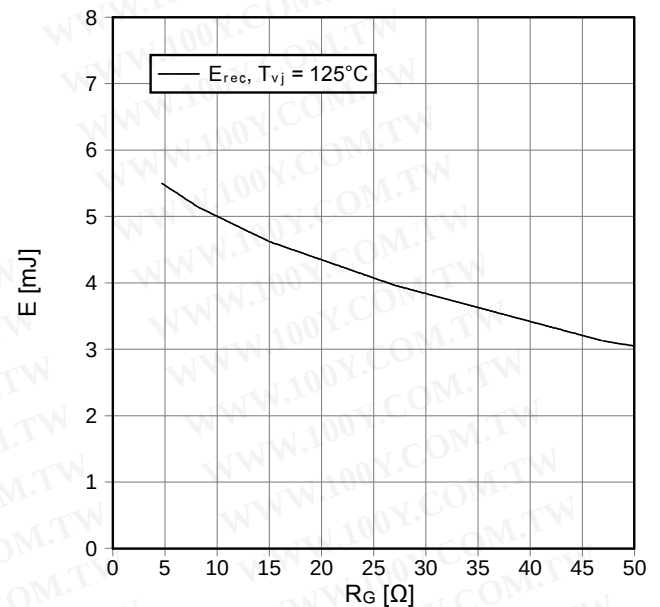
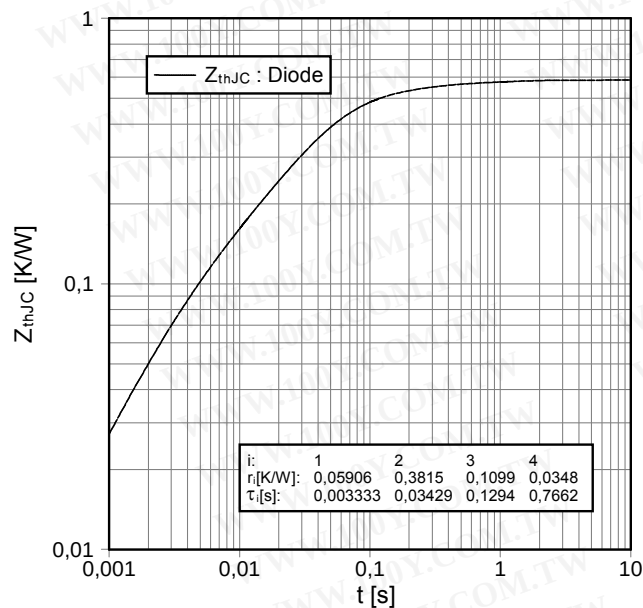


Sicherer Rückwärts-Arbeitsbereich IGBT-Wr. (RBSOA)
reverse bias safe operating area IGBT-inv. (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 4.7 \text{ Ω}$, $T_{vj} = 125^\circ\text{C}$

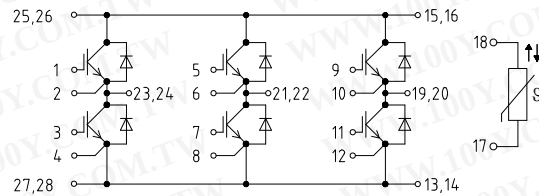


Durchlaßkennlinie der Diode-Wechsel. (typisch)
forward characteristic of diode-inverter (typical)
 $I_F = f(V_F)$

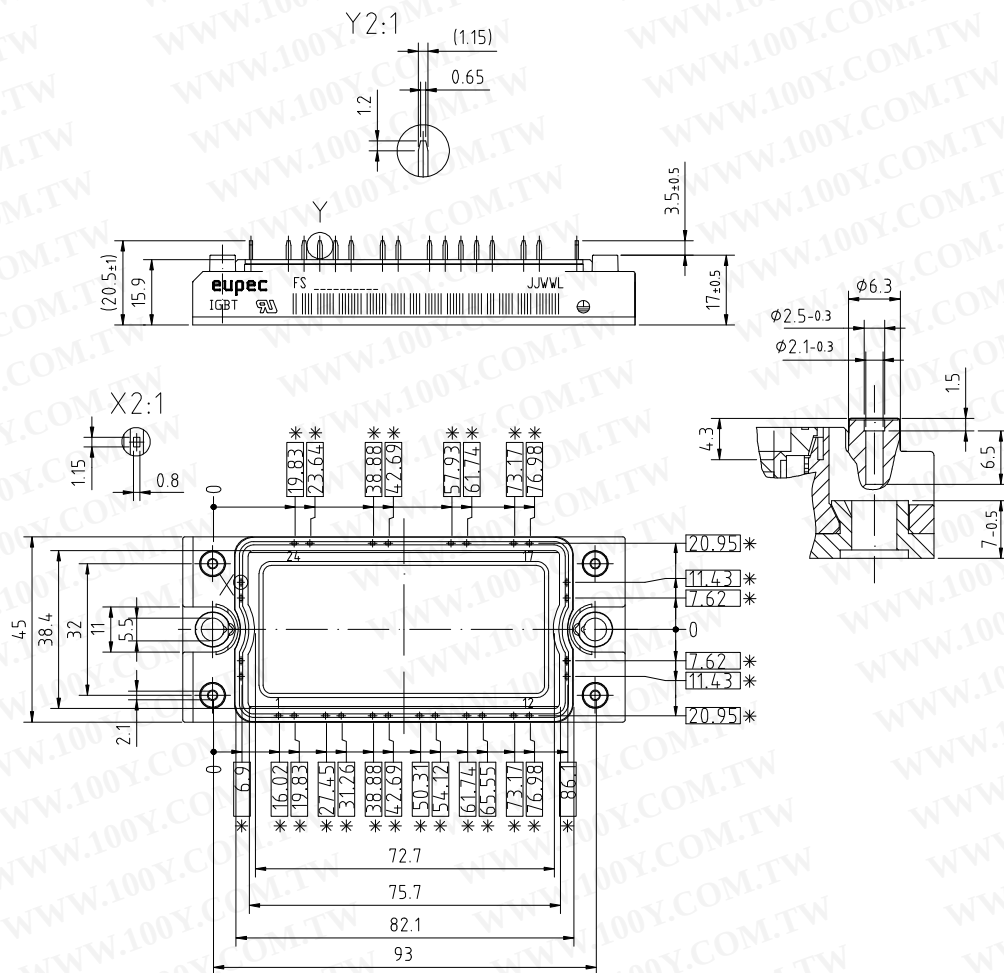


Vorläufige Daten
preliminary dataSchaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical) $E_{rec} = f(I_F)$
 $R_{Gon} = 4,7 \Omega$, $V_{CE} = 600 V$ Schaltverluste Diode-Wechselr. (typisch)
switching losses diode-inverter (typical) $E_{rec} = f(R_G)$
 $I_F = 75 A$, $V_{CE} = 600 V$ Transienter Wärmewiderstand Diode-Wechselr.
transient thermal impedance diode-inverter $Z_{thJC} = f(t)$ 

Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines



* = alle Maße mit einer Toleranz von ± 0.4