

EconoPACK™+ Modul mit Trench/Feldstop IGBT³ und EmCon3 Diode
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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}	1700	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	450 605	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	$t_p = 1\ \text{ms}$	I_{CRM}	900	A
Gesamt-Verlustleistung total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj} = 150^{\circ}\text{C}$	P_{tot}	2250	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	$I_C = 450\ \text{A}, V_{GE} = 15\ \text{V}$ $I_C = 450\ \text{A}, V_{GE} = 15\ \text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\ sat}$	2,00 2,40	2,45	V V	
Gate-Schwellenspannung gate threshold voltage	$I_C = 18,0\ \text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,2	5,8	6,4	V
Gateladung gate charge	$V_{GE} = -15\ \text{V} \dots +15\ \text{V}$		Q_G	5,10			μC
Interner Gatewiderstand internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	1,7			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}	40,5			nF
Rückwirkungskapazität reverse transfer capacitance	$f = 1\ \text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\ \text{V}, V_{GE} = 0\ \text{V}$		C_{res}	1,30			nF
Kollektor-Emitter Reststrom collector-emitter cut-off current	$V_{CE} = 1700\ \text{V}, V_{GE} = 0\ \text{V}, T_{vj} = 25^{\circ}\text{C}$		I_{CES}		3,0		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)	$I_C = 450\ \text{A}, V_{CE} = 900\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Gon} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\ on}$	0,28 0,30			μs μs
Anstiegszeit (induktive Last) rise time (inductive load)	$I_C = 450\ \text{A}, V_{CE} = 900\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Gon} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_r	0,08 0,10			μs μs
Abschaltverzögerungszeit (ind. Last) turn-off delay time (inductive load)	$I_C = 450\ \text{A}, V_{CE} = 900\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Goff} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\ off}$	0,81 1,00			μs μs
Fallzeit (induktive Last) fall time (inductive load)	$I_C = 450\ \text{A}, V_{CE} = 900\ \text{V}$ $V_{GE} = \pm 15\ \text{V}$ $R_{Goff} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_f	0,18 0,30			μs μs
Einschaltverlustenergie pro Puls turn-on energy loss per pulse	$I_C = 450\ \text{A}, V_{CE} = 900\ \text{V}$ $V_{GE} = \pm 15\ \text{V}, L_s = 80\ \text{nH}$ $R_{Gon} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{on}	96,5 140			mJ mJ
Abschaltverlustenergie pro Puls turn-off energy loss per pulse	$I_C = 450\ \text{A}, V_{CE} = 900\ \text{V}$ $V_{GE} = \pm 15\ \text{V}, L_s = 80\ \text{nH}$ $R_{Goff} = 3,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{off}	96,0 140			mJ mJ
Kurzschlussverhalten SC data	$t_p \leq 10\ \mu\text{s}, V_{GE} \leq 15\ \text{V}$ $T_{vj} = 125^{\circ}\text{C}, V_{CC} = 1000\ \text{V}, V_{CEmax} = V_{CES} - L_s \cdot di/dt$		I_{SC}	1800			A
Innerer Wärmewiderstand thermal resistance, junction to case	pro IGBT per IGBT		R_{thJC}		0,055		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}	0,047			K/W

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Diode-Wechselrichter / diode-inverter

Höchstzulässige Werte / maximum rated values

Periodische Spitzensperrspannung repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1700	V
Dauergleichstrom DC forward current		I_F	450	A
Periodischer Spitzenstrom repetitive peak forward current	$t_p = 1 \text{ ms}$	I_{FRM}	900	A
Grenzlastintegral I^2t - value	$V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$	I^2t	20000	A^2s

Charakteristische Werte / characteristic values

			min.	typ.	max.	
Durchlassspannung forward voltage	$I_F = 450 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 450 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_F	1,80 1,90	2,20	V V
Rückstromspitze peak reverse recovery current	$I_F = 450 \text{ A}, -di_F/dt = 4450 \text{ A}/\mu\text{s}$ $V_R = 900 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}	525 570		A A
Sperrverzögerungsladung recovered charge	$I_F = 450 \text{ A}, -di_F/dt = 4450 \text{ A}/\mu\text{s}$ $V_R = 900 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r	115 195		μC μC
Abschaltenergie pro Puls reverse recovery energy	$I_F = 450 \text{ A}, -di_F/dt = 4450 \text{ A}/\mu\text{s}$ $V_R = 900 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}	60,5 110		mJ mJ
Innere Wärmewiderstand thermal resistance, junction to case	pro Diode per diode		R_{thJC}		0,10	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}	0,085		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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Technische Information / technical information

IGBT-Module
IGBT-modules

FS450R17KE3

power electronics in motion
eupec

Vorläufige Daten preliminary data

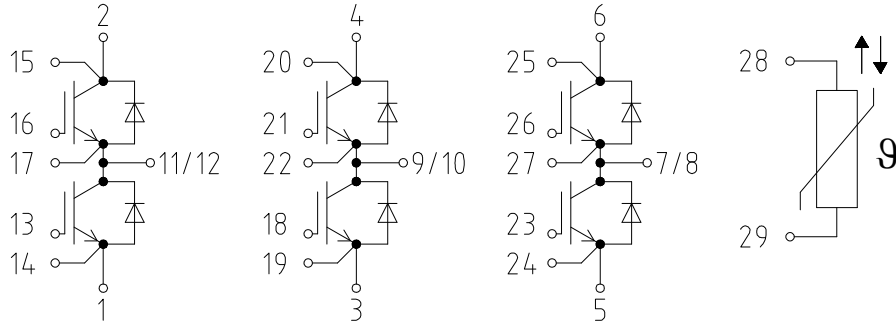
Modul / module

Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	3,4		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		14,5		mm
Luftstrecke clearance distance	Kontakt - Kühlkörper / terminal to heatsink Kontakt - Kontakt / terminal to terminal		10,0		mm
Vergleichszahl der Kriechwegbildung comparative tracking index		CTI	> 225		
			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}	0,005		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'}	1,10		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
Anzugsdrehmoment f. elektr. Anschlüsse terminal connection torque	Schraube / screw M6	M	3,0	-	6,0 Nm
Gewicht weight		G	916		g

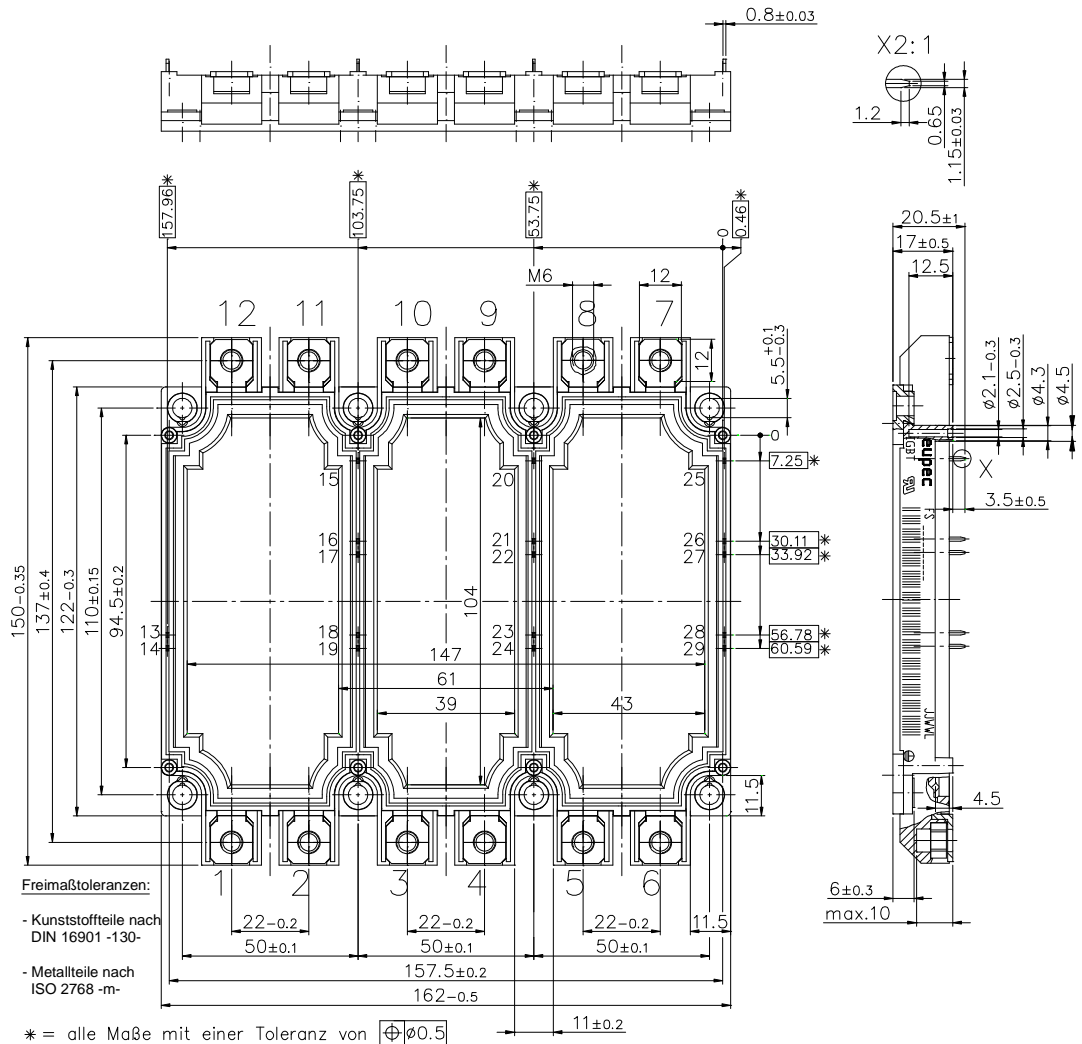
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Schaltplan / circuit diagram



Gehäuseabmessungen / package outlines



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