Technische Information / technical information

eupec

IGBT-Module
IGBT-Modules

FS50R06YL4

vorläufige Daten
preliminary data

Höchstzulässige Werte / maximum rated values

Elektrische Eigenschaften / electrical properties

Kollektor Emitter Sperrspannung collector emitter voltage	T_{vj}= 25°C	V_{CES}	600	V
Kollektor Dauergleichstrom DC collector current	T_c= 55°C T_c= 25°C	$I_{C,nom.}$ I_C	50 55	A A
Periodischer Kollektor Spitzenstrom repetitive peak collector current	t_p= 1ms, T_c= 55°C	I_{CRM}	100	A
Gesamt Verlustleistung total power dissipation	T_c= 25°C, Transistor	P_{tot}	202	W
Gate Emitter Spitzenspannung gate emitter peak voltage		V_{GES}	±20	V
Dauergleichstrom DC forward current		I_F	50	A
Periodischer Spitzenstrom repetitive peak forward current	t_p= 1ms	I_{FRM}	100	A
Grenzlastintegral I²t value	V_R= 0V, t_p= 10ms, T_{vj}= 125°C	I²t	630	A²s
Isolations Prüfspannung insulation test voltage	RMS, f= 50Hz, t= 1min	V_{ISOL}	2,5	kV

Charakteristische Werte / characteristic values

Transistor Wechselrichter / transistor inverter

			min.	typ.	max.	
Kollektor Emitter Sättigungsspannung collector emitter saturation voltage	V_{GE}= 15V, T_{vj}= 25°C, I_C= $I_{C,nom}$ V_{GE}= 15V, T_{vj}= 125°C, I_C= $I_{C,nom}$	V_{CEsat}	- -	1,95 2,20	2,55 -	V V
Gate Schwellenspannung gate threshold voltage	V_{CE}= V_{GE}, T_{vj}= 25°C, I_C= 1mA	$V_{GE(th)}$	4,5	5,5	6,5	V
Gateladung gate charge	V_{GE}= -15V...+15V	Q_G	-	0,3	-	µC
Eingangskapazität input capacitance	f= 1MHz, T_{vj}= 25°C, V_{CE}= 25V, V_{GE}= 0V	C_{ies}	-	2,2	-	nF
Rückwirkungskapazität reverse transfer capacitance	f= 1MHz, T_{vj}= 25°C, V_{CE}= 25V, V_{GE}= 0V	C_{res}	-	0,2	-	nF
Kollektor Emitter Reststrom collector emitter cut off current	V_{CE}= 600V, V_{GE}= 0V, T_{vj}= 25°C	I_{CES}	-	-	5	mA
Gate Emitter Reststrom gate emitter leakage current	V_{CE}= 0V, V_{GE}= 20V, T_{vj}= 25°C	I_{GES}	-	-	400	nA

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Charakteristische Werte / characteristic values

Transistor Wechselrichter / transistor inverter

			min.	typ.	max.	
Einschaltverzögerungszeit (induktive Last) turn on delay time (inductive load)	I_C= 50A, V_{CC}= 300V V_{GE}= ±15V, R_G= 3,3Ω, T_{vj}= 25°C V_{GE}= ±15V, R_G= 3,3Ω, T_{vj}= 125°C	$t_{d,on}$	- -	42 43	- -	ns ns
Anstiegszeit (induktive Last) rise time (inductive load)	I_C= 50A, V_{CC}= 300V V_{GE}= ±15V, R_G= 3,3Ω, T_{vj}= 25°C V_{GE}= ±15V, R_G= 3,3Ω, T_{vj}= 125°C	t_r	- -	11 12	- -	ns ns
Abschaltverzögerungszeit (induktive Last) turn off delay time (inductive load)	I_C= 50A, V_{CC}= 300V V_{GE}= ±15V, R_G= 3,3Ω, T_{vj}= 25°C V_{GE}= ±15V, R_G= 3,3Ω, T_{vj}= 125°C	$t_{d,off}$	- -	120 130	- -	ns ns
Fallzeit (induktive Last) fall time (inductive load)	I_C= 50A, V_{CC}= 300V V_{GE}= ±15V, R_G= 3,3Ω, T_{vj}= 25°C V_{GE}= ±15V, R_G= 3,3Ω, T_{vj}= 125°C	t_f	- -	20 30	- -	ns ns
Einschaltverlustenergie pro Puls turn on energy loss per pulse	I_C= 50A, V_{CC}= 300V, V_{GE}= 15V R_G= 3,3Ω, T_{vj}= 125°C, L_σ= 15nH	E_{on}	-	0,5	-	mJ
Ausschaltverlustenergie pro Puls turn off energy loss per pulse	I_C= 50A, V_{CC}= 300V, V_{GE}= 15V R_G= 3,3Ω, T_{vj}= 125°C, L_σ= 15nH	E_{off}	-	1,35	-	mJ
Kurzschlussverhalten SC data	$t_P \leq$ 10µsec, $V_{GE} \leq$ 15V, T_{vj}= 125°C, V_{CC}=360V, V_{CEmax}=V_{CES} -$L_{\sigma CE}$ ·|di/dt|	I_{SC}	-	225	-	A
Modulinduktivität stray inductance module		$L_{\sigma CE}$	-	35	-	nH
Leitungswiderstand, Anschluss-Chip lead resistance, terminal-chip	T_c= 25°C	$R_{CC'/EE'}$	-	4	-	mΩ

Charakteristische Werte / characteristic values

Diode Wechselrichter / diode inverter

Durchlassspannung forward voltage	I_F= 50A, V_{GE}= 0V, T_{vj}= 25°C I_F= 50A, V_{GE}= 0V, T_{vj}= 125°C	V_F	- -	1,25 1,20	1,7 -	V V
Rückstromspitze peak reverse recovery current	I_F= 50A, -di_F/dt= 2600 A/µs V_R= 300V, V_{GE}= -10V, T_{vj}= 25°C V_R= 300V, V_{GE}= -10V, T_{vj}= 125°C	I_{RM}	- -	88 94	- -	A A
Sperrverzögerungsladung recovered charge	I_F= 50A, -di_F/dt= 2600 A/µs V_R= 300V, V_{GE}= -10V, T_{vj}= 25°C V_R= 300V, V_{GE}= -10V, T_{vj}= 125°C	Q_r	- -	3,2 5,4	- -	µC µC
Ausschaltenergie pro Puls reverse recovery energy	I_F= 50A, -di_F/dt= 2600 A/µs V_R= 300V, V_{GE}= -10V, T_{vj}= 25°C V_R= 300V, V_{GE}= -10V, T_{vj}= 125°C	E_{rec}	- -	1,05 1,50	- -	mJ mJ

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Charakteristische Werte / characteristic values

NTC-Widerstand / NTC-thermistor

			min.	typ.	max.	
Nennwiderstand rated resistance	T_c= 25°C	R_{25}	-	5	-	kΩ
Abweichung von R_{100} deviation of R_{100}	T_c= 100°C, R_{100}= 493Ω	ΔR/R	-5	-	5	%
Verlustleistung power dissipation	T_c= 25°C	P_{25}	-	-	20	mW
B-Wert B-value	$R_2= R_1 \exp[B(1/T_2 - 1/T_1)]$	$B_{25/50}$	-	3375	-	K

Thermische Eigenschaften / thermal properties

Innerer Wärmewiderstand; DC thermal resistance, juncton to case; DC	Transistor Wechelr. / transistor inverter	R_{thJC}	-	-	0,62	K/W
	Diode Wechselrichter / diode inverter		-	-	1,20	K/W
Wärmewiderstand; DC thermal resistance, junction to heatsink, DC	Transistor Wechelr. / transistor inverter	R_{thJH}	-	0,95	-	K/W
	Diode Wechselrichter / diode inverter		-	1,50	-	K/W
	λ_{Paste} = 1 W / m*K / λ_{grease} = 1 W / m*K					
Übergangs-Wärmewiderstand, DC thermal resistance, case to heatsink; DC	Transistor Wechelr. / transistor inverter	R_{thCH}	-	0,35	-	K/W
	Diode Wechselrichter / diode inverter		-	0,45	-	K/W
	λ_{Paste} = 1 W / m*K / λ_{grease} = 1 W / m*K					
Höchstzulässige Sperrschichttemp. maximum junction temperature		T_{vjmax}	-	-	150	°C
Betriebstemperatur operation temperature		T_{op}	-40	-	125	°C
Lagertemperatur storage temperature		T_{stg}	-40	-	125	°C

Mechanische Eigenschaften / mechanical properties

Innere Isolation internal insulation			Al_2O_3	
CTI comperative tracking index			225	
Anpresskraft pro Feder mounting force per clamp		F	40..80	N
Gewicht weight		G	36	g
Kriechstrecke creepage distance	Anschluss - Kühlkörper terminal to heatsink		13,5	mm
	Anschluss - Anschluss terminal to terminal		5,0	mm
Luftstrecke clearance distance	Anschluss - Kühlkörper terminal to heatsink		12,0	mm
	Anschluss - Anschluss terminal to terminal		5,0	mm

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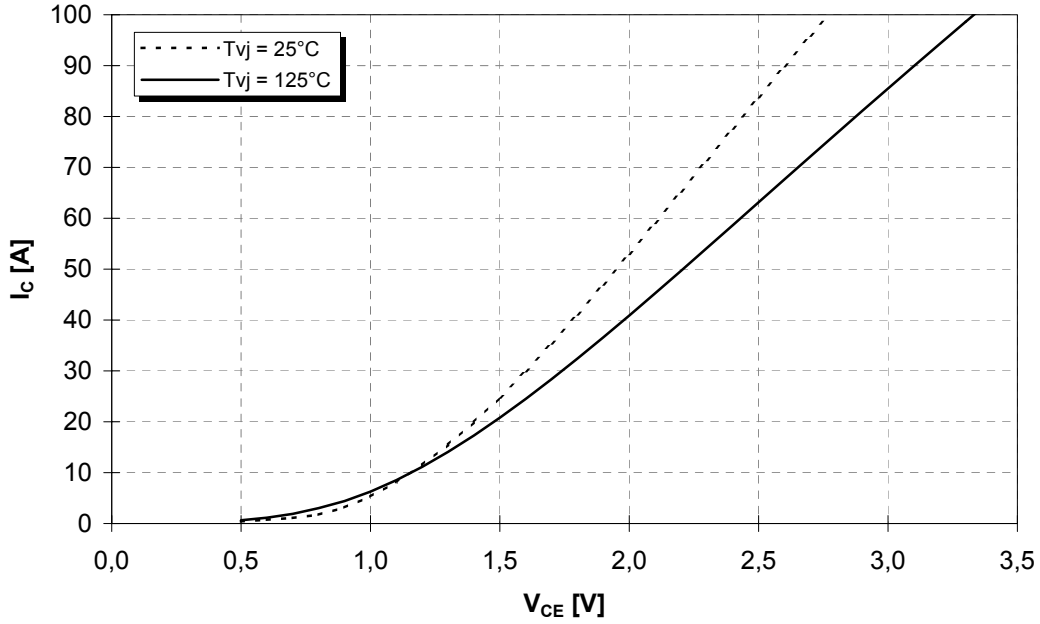
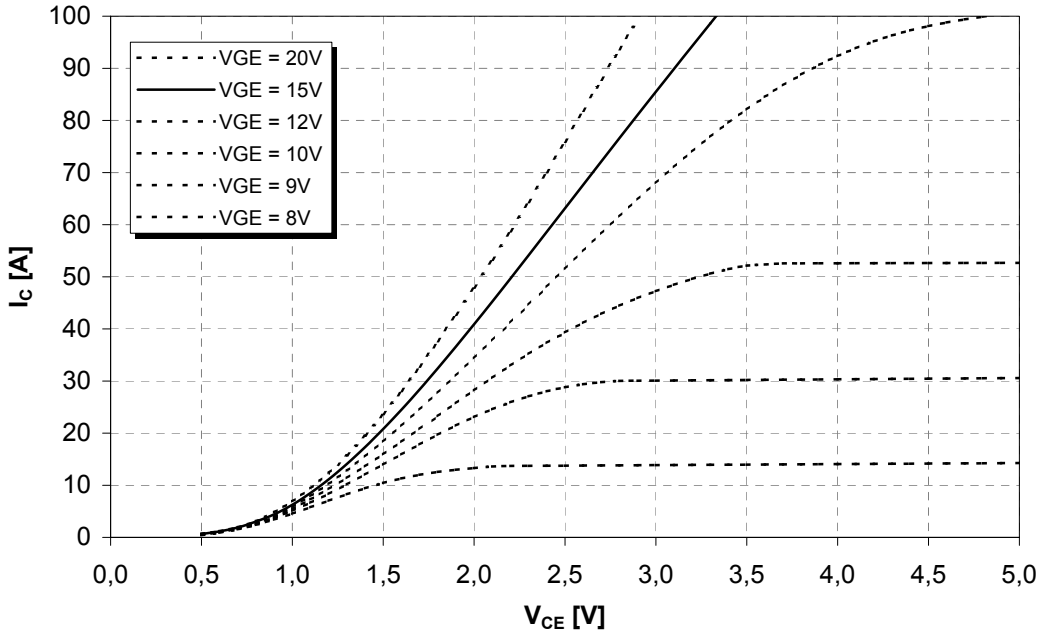
Ausgangskennlinie (typisch) $I_C = f(V_{CE})$
output characteristic (typical) $V_{GE} = 15V$



Ausgangskennlinienfeld (typisch) $I_C = f(V_{CE})$
output characteristic (typical) $T_{vj} = 125°C$



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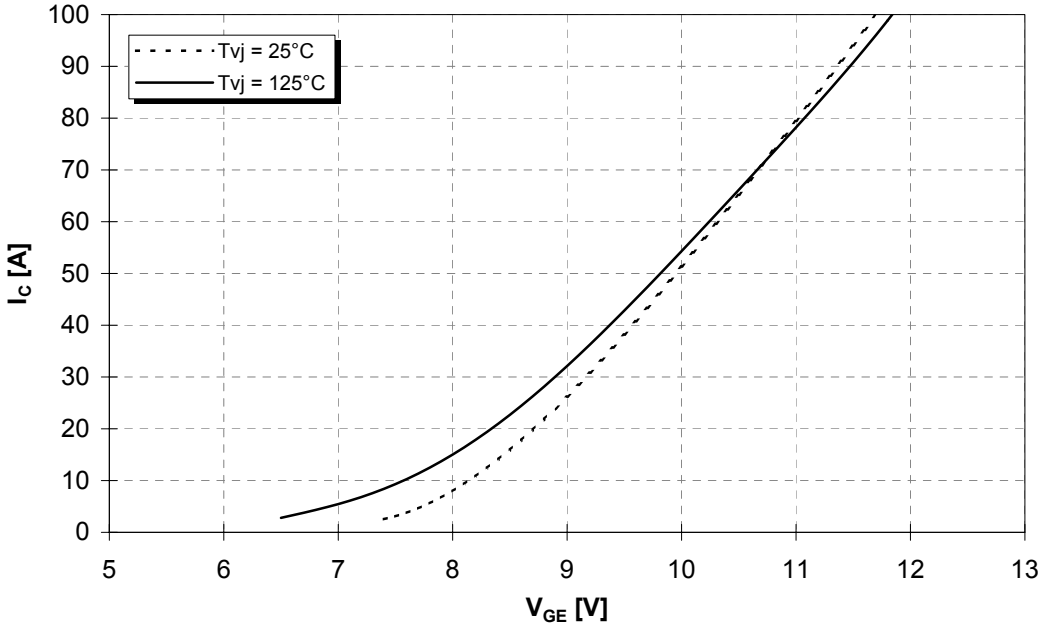
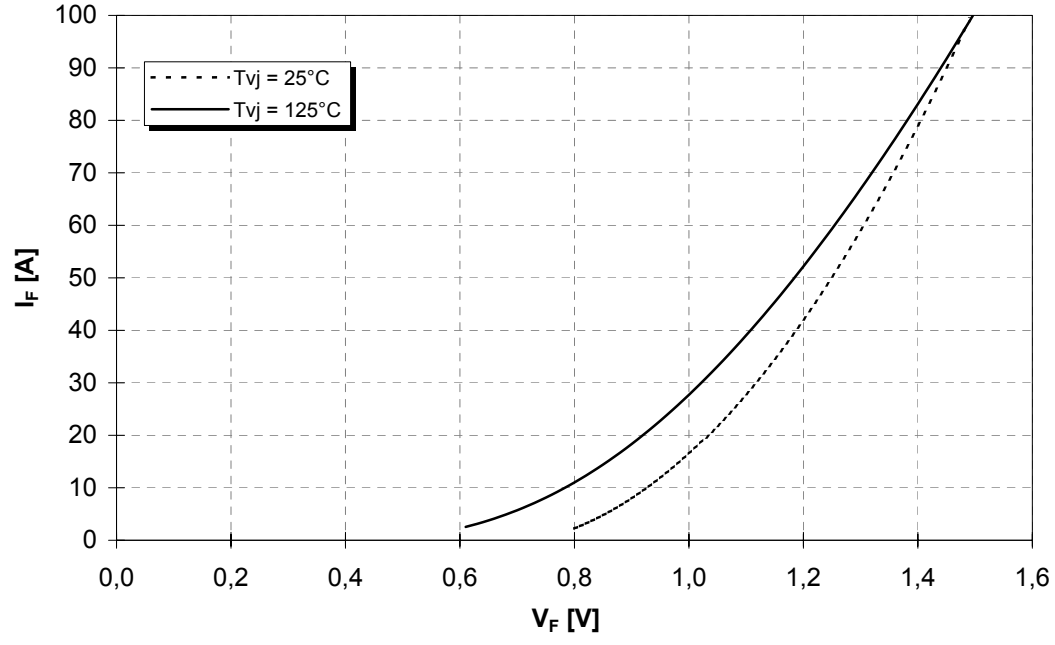
Übertragungscharakteristik (typisch) $I_C = f(V_{GE})$
transfer characteristic (typical) $V_{CE} = 20V$



Durchlasskennlinie der Inversdiode (typisch) $I_F = f(V_F)$
forward characteristic of inverse diode (typical)



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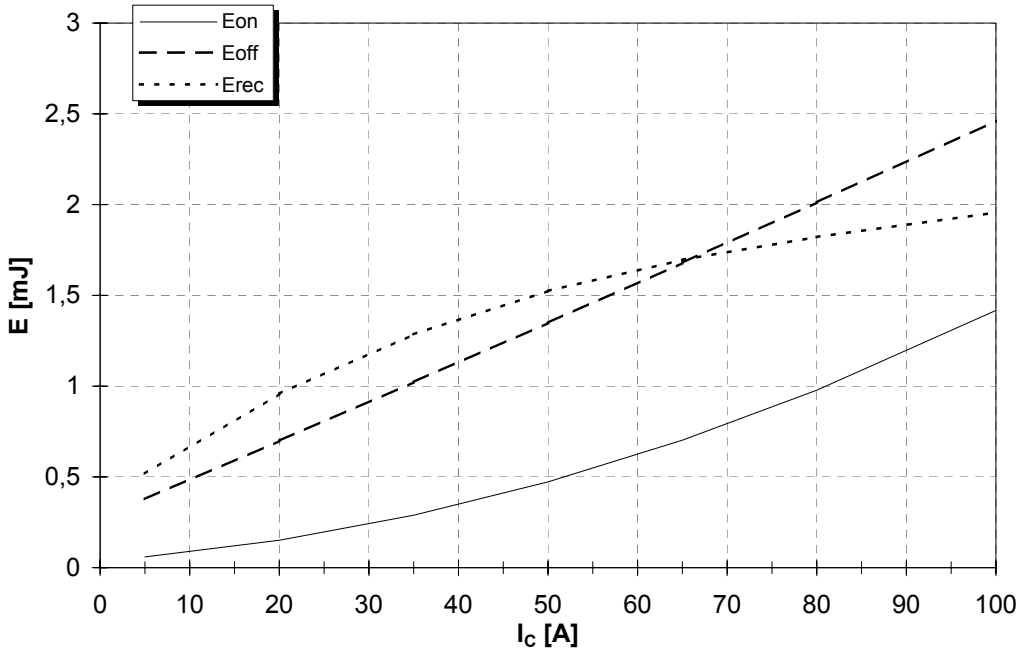
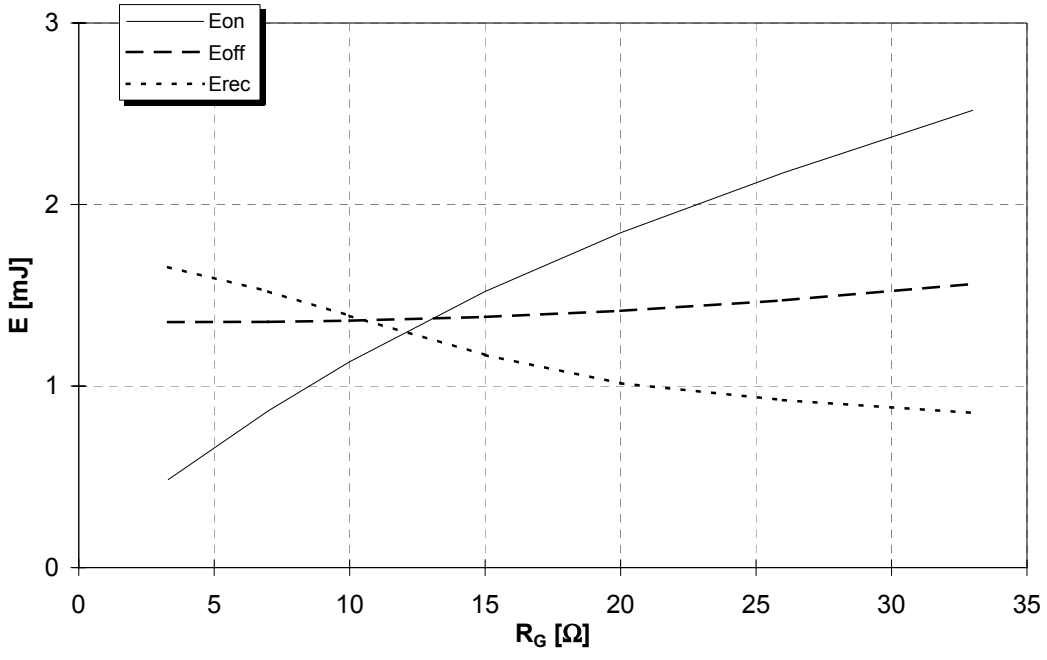
Schaltverluste (typisch)
switching losses (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$, $E_{rec} = f(I_C)$
V_{GE}= ±15V, R_G= 3,3Ω, V_{CE}= 300V, T_{vj}= 125°C



Schaltverluste (typisch)
switching losses (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$, $E_{rec} = f(R_G)$
V_{GE}= ±15V, I_C= 50A, V_{CE}= 300V, T_{vj}= 125°C



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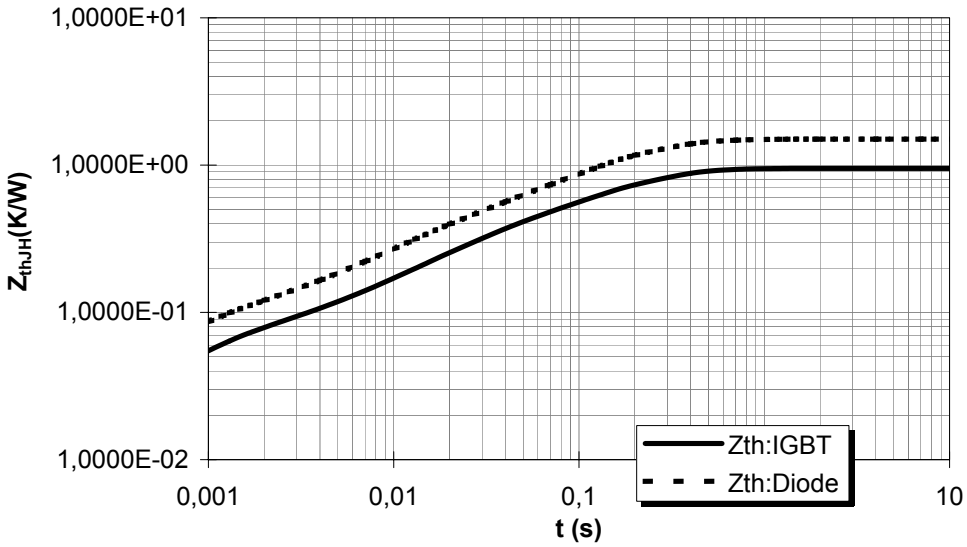
Transienter Wärmewiderstand
transient thermal impedance

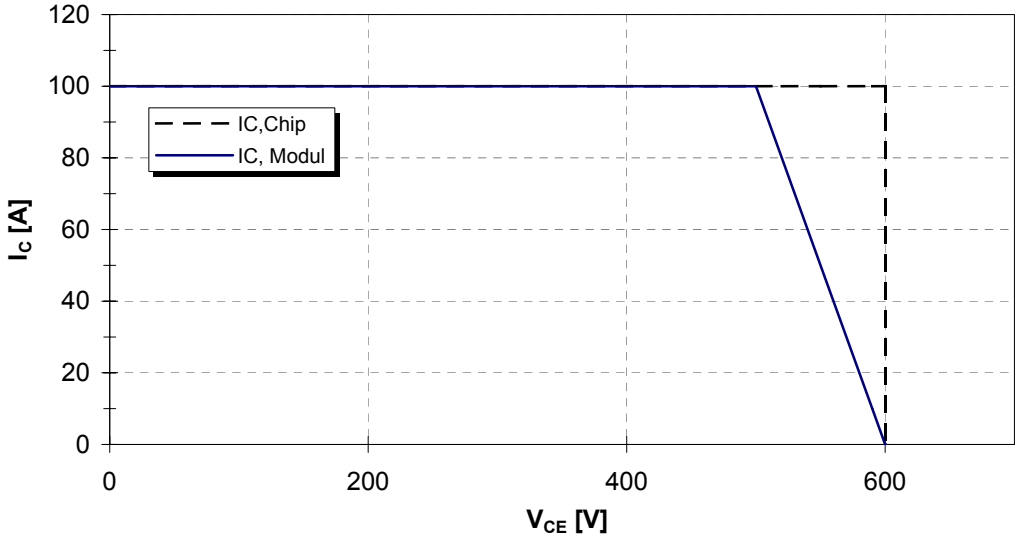
$Z_{thJH} = f(t)$



i	1	2	3	4
r_i [K/kW]: IGBT	57,0	190,0	532,0	171,0
τ_i [s]: IGBT	0,00075	0,02088	0,14800	0,25430
r_i [K/kW]: Diode	75,0	210,0	885,0	330,0
τ_i [s]: Diode	0,00056	0,01240	0,12800	0,25430

Sicherer Arbeitsbereich (RBSOA)
reverse bias safe operation area (RBSOA)

V_{GE}= ±15V, T_j=125°C



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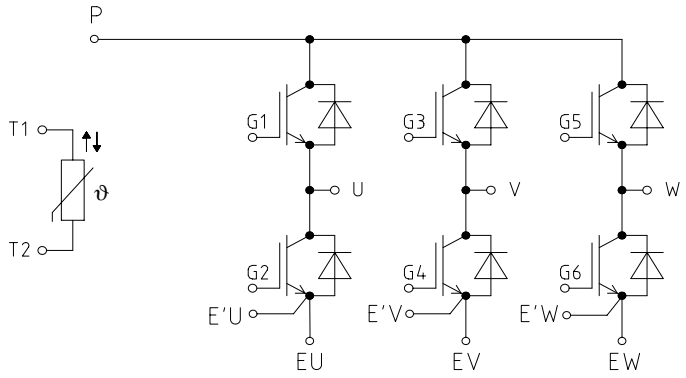
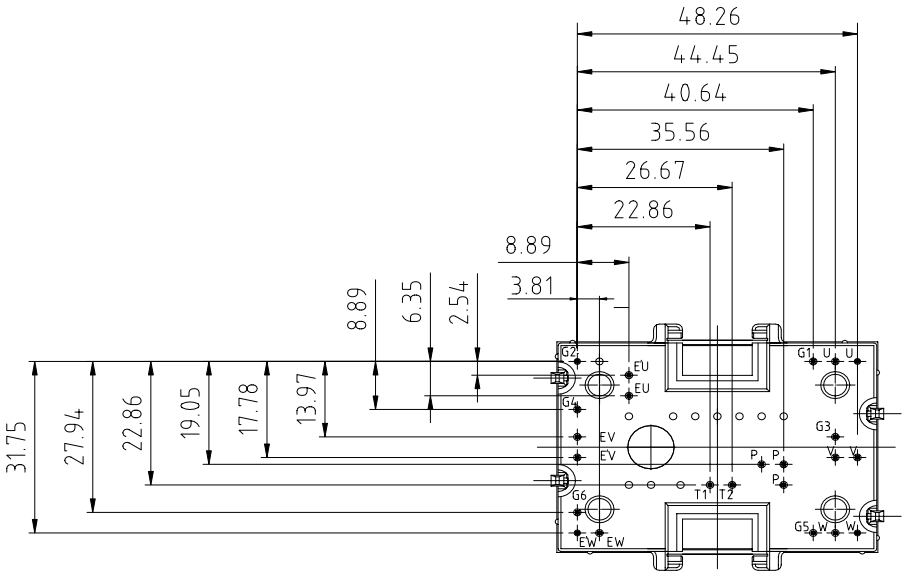
Schaltbild
circuit diagram



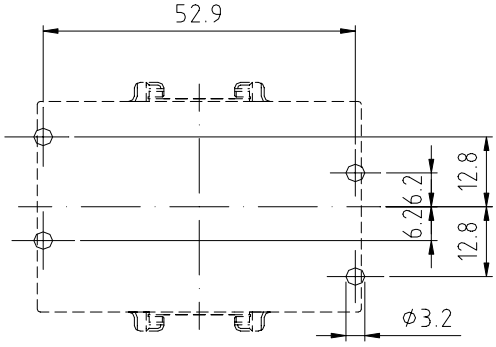
Gehäusemaße
package outline

Module only designed for mounting on PCB with 1.6 ±0.2 mm thickness

Pinpositions with tolerance ⌖ ⌀0.4



Bohrplan
drilling layout



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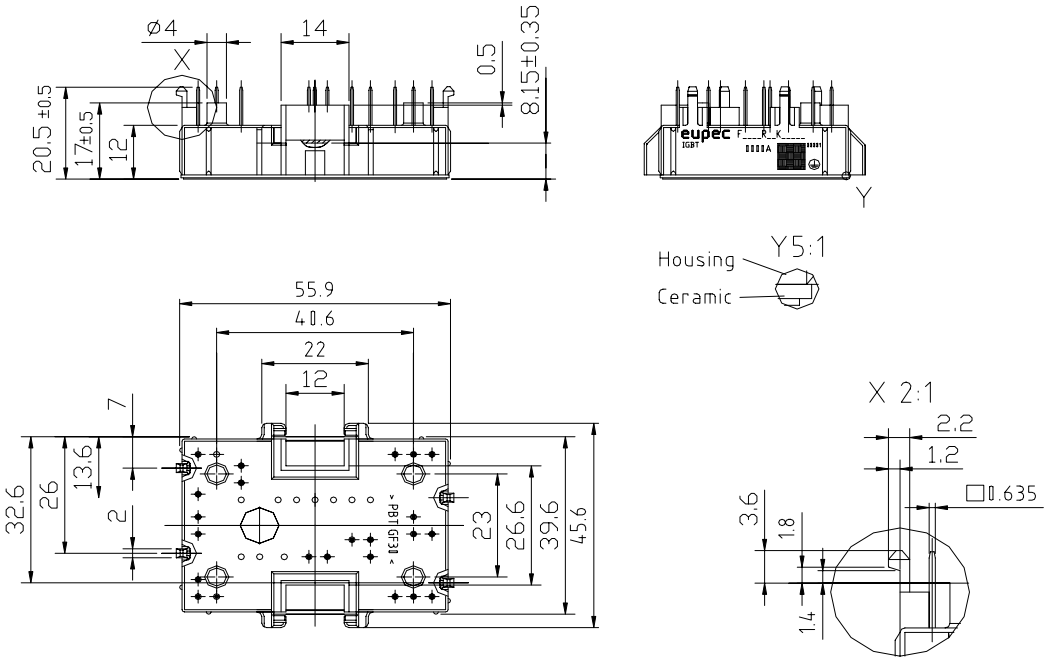
Gehäusemaße Fortsetzung
package outline contd.



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