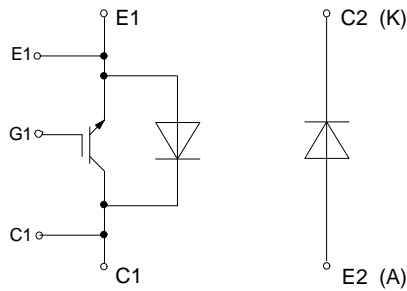
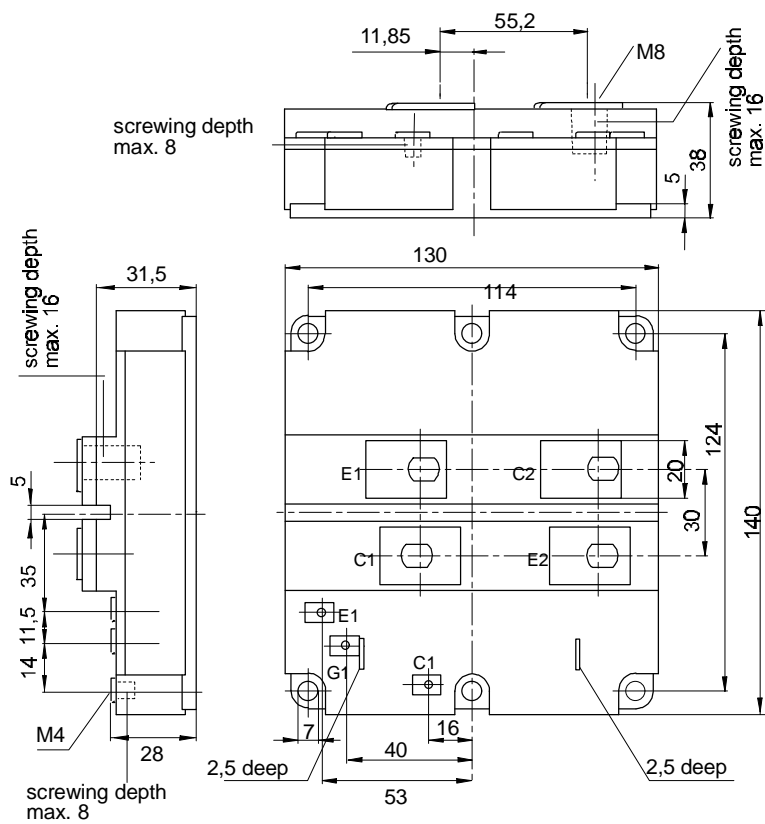




European Power-Semiconductor and Electronics Company GmbH + Co. KG

Marketing Information

FD 400 R 12 KF4



FD 400 R 12 KF 4

Höchstzulässige Werte / Maximum rated values

Elektrische Eigenschaften / Electrical properties

Kollektor-Emitter-Sperrspannung	collector-emitter voltage		V_{CES}	1200 V
Kollektor-Dauergleichstrom	DC-collector current		I_C	400 A
Periodischer Kollektor Spitzenstrom	repetitive peak collector current	$t_p=1$ ms	I_{CRM}	800 A
Gesamt-Verlustleistung	total power dissipation	$t_C=25^\circ\text{C}$, Transistor /transistor	P_{tot}	2700 W
Gate-Emitter-Spitzenspannung	gate-emitter peak voltage		V_{GE}	± 20 V
Dauergleichstrom	DC forward current		I_F	400 A
Periodischer Spitzenstrom	repetitive peak forw. current	$t_p=1$ ms	I_{FRM}	800 A
Isolations-Prüfspannung	insulation test voltage	RMS, f=50 Hz, t= 1 min.	V_{ISOL}	2,5 kV

Charakteristische Werte / Characteristic values: Transistor

				min.	typ.	max.
Kollektor-Emitter Sättigungsspannung	collector-emitter saturation voltage	$i_C=400\text{A}, V_{GE}=15\text{V}, t_{vj}=25^\circ\text{C}$ $i_C=400\text{A}, V_{GE}=15\text{V}, t_{vj}=125^\circ\text{C}$	$V_{CE\text{ sat}}$	-	2,7 3,3	3,2 3,9 V
Gate-Schwellenspannung	gate threshold voltage	$i_C=16\text{mA}, V_{CE}=V_{GE}, t_{vj}=25^\circ\text{C}$	$V_{GE(th)}$	4,5	5,5	6,5 V
Eingangskapazität	input capacity	$f_i=1\text{MHz}, t_{vj}=25^\circ\text{C}, V_{CE}=25\text{V}, V_{GE}=0\text{V}$	C_{ies}	-	28	- nF
Kollektor-Emitter Reststrom	collector-emitter cut-off current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, t_{vj}=25^\circ\text{C}$ $V_{CE}=1200\text{V}, V_{GE}=0\text{V}, t_{vj}=125^\circ\text{C}$	i_{CES}	-	8 32	- mA
Gate-Emitter Reststrom	gate leakage current	$V_{CE}=0\text{V}, V_{EG}=20\text{V}, t_{vj}=25^\circ\text{C}$	i_{GES}	-	-	400 nA
Emitter-Gate Reststrom	gate leakage current	$V_{CE}=0\text{V}, V_{EG}=20\text{V}, t_{vj}=25^\circ\text{C}$	i_{EGS}	-	-	400 nA
Einschaltzeit (induktive Last)	turn-on time (inductive load)	$i_C=400\text{A}, V_{CE}=600\text{V}, V_L=\pm 15\text{V}, R_G=3,6\Omega, t_{vj}=25^\circ\text{C}$ $i_C=400\text{A}, V_{CE}=600\text{V}, V_L=\pm 15\text{V}, R_G=3,6\Omega, t_{vj}=125^\circ\text{C}$	t_{on}	-	0,7 0,8	- μs
Speicherzeit (induktive Last)	storage time (inductive load)	$i_C=400\text{A}, V_{CE}=600\text{V}, V_L=\pm 15\text{V}, R_G=3,6\Omega, t_{vj}=25^\circ\text{C}$ $i_C=400\text{A}, V_{CE}=600\text{V}, V_L=\pm 15\text{V}, R_G=3,6\Omega, t_{vj}=125^\circ\text{C}$	t_s	-	0,9 1,0	- μs
Fallzeit (induktive Last)	fall time (inductive load)	$i_C=400\text{A}, V_{CE}=600\text{V}, V_L=\pm 15\text{V}, R_G=3,6\Omega, t_{vj}=25^\circ\text{C}$ $i_C=400\text{A}, V_{CE}=600\text{V}, V_L=\pm 15\text{V}, R_G=3,6\Omega, t_{vj}=125^\circ\text{C}$	t_f	-	0,10 0,15	- μs
Einschaltverlustenergie pro puls	turn-on energie per pulse	$i_C=400\text{A}, V_{CE}=600\text{V}, L_s=70\text{nH}$ $V_L=\pm 15\text{V}, R_G=3,6\Omega, t_{vj}=125^\circ\text{C}$	E_{on}	-	70	- mWs
Abschaltverlustenergie pro Puls	turn-off energie loss per pulse	$i_C=400\text{A}, V_{CE}=600\text{V}, L_s=70\text{nH}$ $V_L=\pm 15\text{V}, R_G=3,6\Omega, t_{vj}=125^\circ\text{C}$	E_{off}	-	60	- mWs

Charakteristische Werte / Characteristic values

Inversdiode / Inverse diode						
Durchlaßspannung	forward voltage	$i_F=400\text{A}, V_{GE}=0\text{V}, t_{vj}=25^\circ\text{C}$ $i_F=400\text{A}, V_{GE}=0\text{V}, t_{vj}=125^\circ\text{C}$	V_F	-	2,2 2,0	2,7 2,5 V
Rückstromspitze	peak reverse recovery current	$i_F=400\text{A}, V_{RM}=600\text{V}, V_{EG}=10\text{V}$ $-di_F/dt = 2,0 \text{ kA}/\mu\text{s}, t_{vj} = 25^\circ\text{C}$ $-di_F/dt = 2,0 \text{ kA}/\mu\text{s}, t_{vj} = 125^\circ\text{C}$	I_{RM}	-	140 240	- A
Sperrverzögerungsladung	recovered charge	$i_F=400\text{A}, V_{RM}=600\text{V}, V_{EG}=10\text{V}$ $-di_F/dt = 3,0 \text{ kA}/\mu\text{s}, t_{vj} = 25^\circ\text{C}$ $-di_F/dt = 3,0 \text{ kA}/\mu\text{s}, t_{vj} = 125^\circ\text{C}$	Q_r	-	18 50	- μAs

Thermische Eigenschaften / Thermal properties

Innerer Wärmewiderstand	thermal resistance, junction to case	Transistor / transistor, DC Transistor,DC, pro Zweig/per arm Diode, DC, pro Modul/per module Diode, DC, pro Zweig/per arm	R_{thJC}		0,023 $^\circ\text{C}/\text{W}$ 0,046 $^\circ\text{C}/\text{W}$ 0,044 $^\circ\text{C}/\text{W}$ 0,088 $^\circ\text{C}/\text{W}$
Übergangs-Wärmewiderstand	thermal resistance, case to heatsink	pro Modul / per Module pro Zweig / per arm	R_{thCK}		0,01 $^\circ\text{C}/\text{W}$ 0,02 $^\circ\text{C}/\text{W}$
Höchstzul. Sperrschichttemperatur	max. junction temperature	pro Modul / per Module	$t_{vj\text{ max}}$		150 $^\circ\text{C}$
Betriebstemperatur	operating temperature	Transistor / transistor	$t_{c\text{ op}}$		-40...+150 $^\circ\text{C}$
Lagertemperatur	storage temperature		t_{stg}		-40...+125 $^\circ\text{C}$

Mechanische Eigenschaften / Mechanical properties

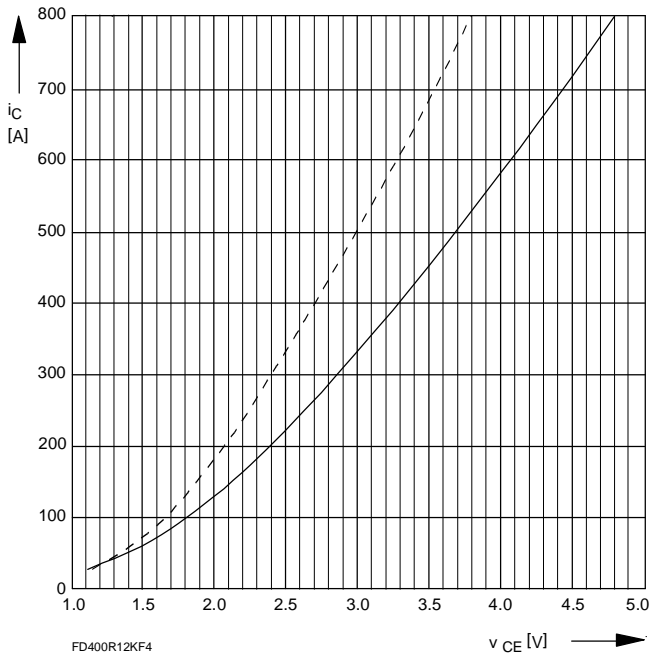
Gehäuse, siehe Anlage	case, see appendix			Seite / page	1
Innere Isolation	internal insulation				Al_2O_3
Anzugsdrehmoment f. mech. Befestigung	mounting torque	terminals M6 / tolerance +/-15%	M1		5 Nm
Anzugsdrehmoment f. elektr. Anschlüsse	terminal connection torque	terminals M4 / tolerance +/-15%	M2		2 Nm
		terminals M8			8...10 Nm
Gewicht	weight		G		ca. 1500 g

Bedingung für den Kurzschlußschutz / Conditions for short-circuit protection

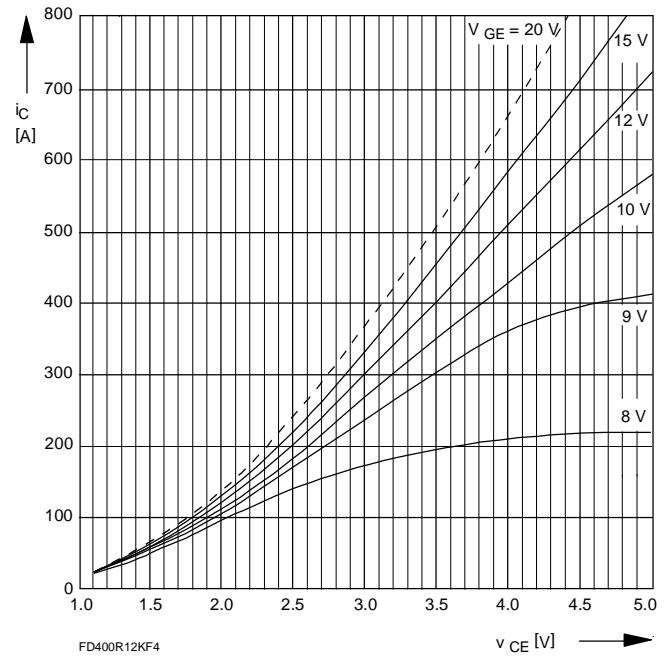
$t_{ig} = 10 \mu\text{s}$	$V_{CC} = 750 \text{ V}$
$V_L = \pm 15 \text{ V}$	$V_{CEM} = 900 \text{ V}$
$R_{GF} = R_{GR} = 3,6 \Omega$	$i_{CMK1} \gg 3500 \text{ A}$
$t_{vj} = 125^\circ\text{C}$	$i_{CMK2} \gg 3000 \text{ A}$

Unabhängig davon gilt bei abweichenden Bedingungen / with regard to other conditions $v_{CEM} = V_{CES} - 20\text{nH} \times |di/dt|$

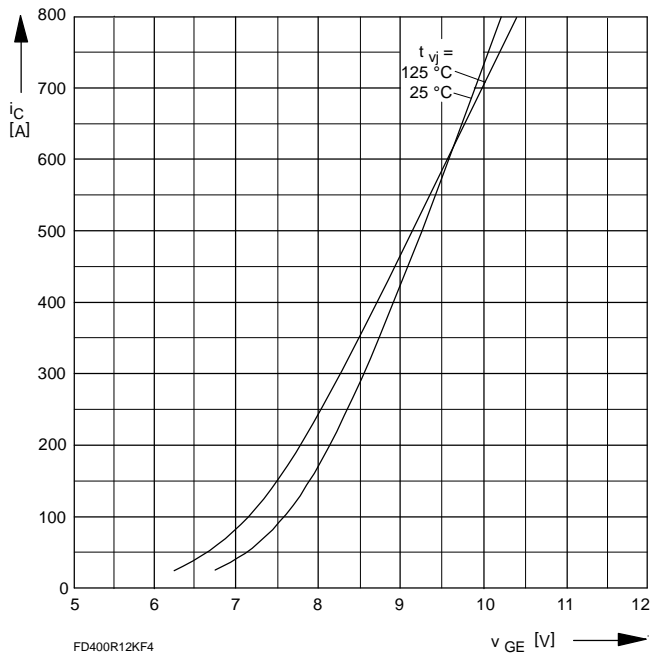
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen. This technical information specifies semiconductor devices but promises no characteristics. It is valid in combination with the belonging technical notes.



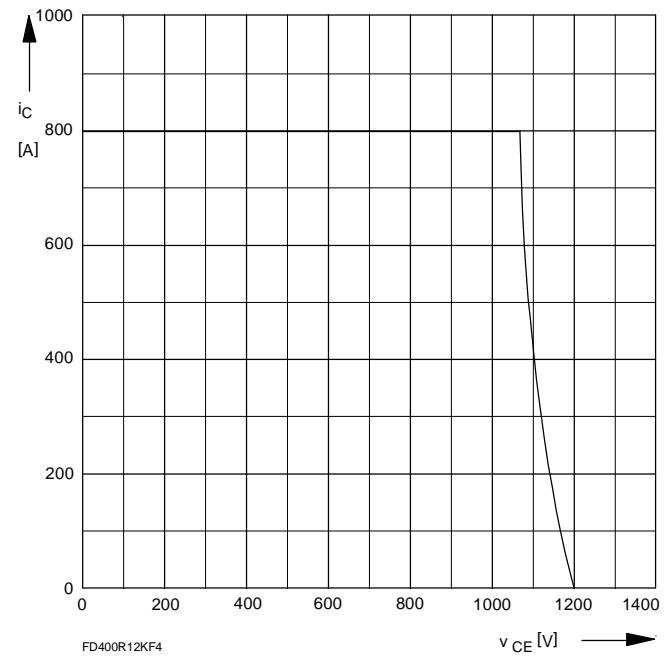
Bild/Fig. 1
 Kollektor-Emitter-Spannung im Sättigungsbereich (typisch)
 Collector-emitter-voltage in saturation region (typical)
 $V_{GE} = 15V$
 ----- $T_{vj} = 25^\circ C$
 ——— $T_{vj} = 125^\circ C$



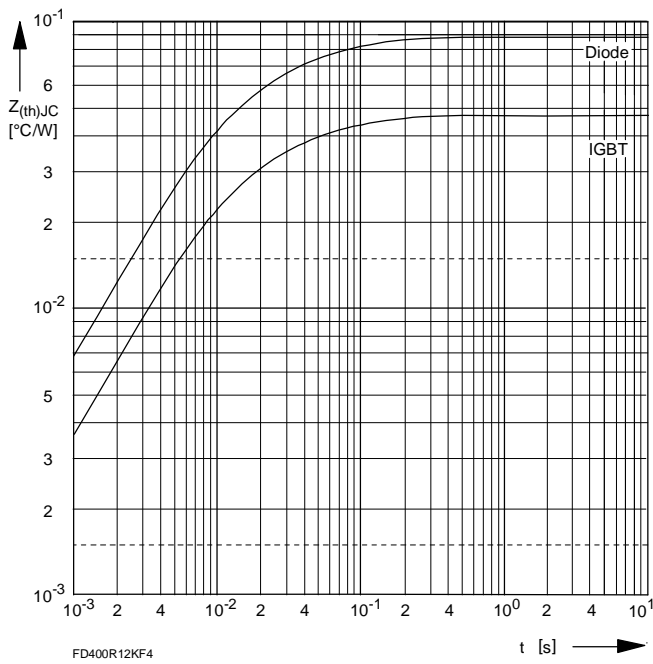
Bild/Fig. 2
 Kollektor-Emitter-Spannung im Sättigungsbereich (typisch)
 Collector-emitter-voltage in saturation region (typical)
 $t_{vj} = 125^\circ C$



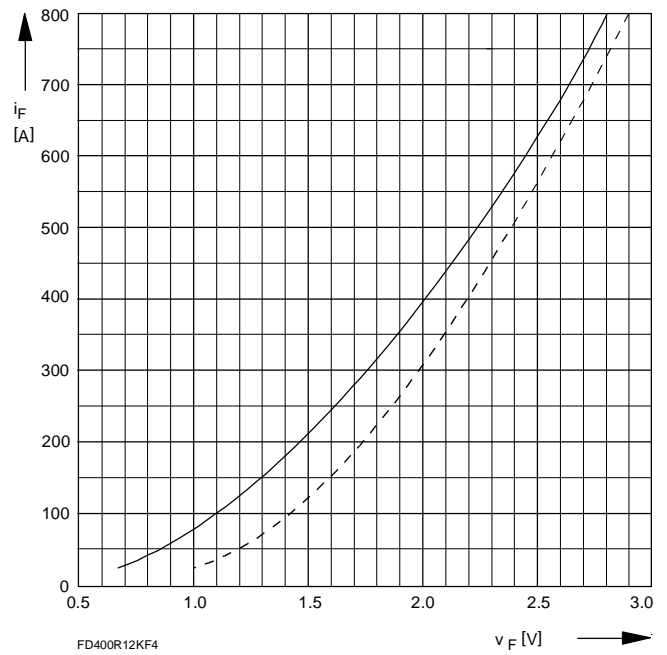
Bild/Fig. 3
 Übertragungscharakteristik (typisch)
 Transfer characteristic (typical)
 $V_{CE} = 20V$



Bild/Fig. 4
 Rückwärts-Arbeitsbereich
 Reverse biased safe operating area
 $t_{vj} = 125^\circ C$, $v_{LF} = v_{LR} = 15V$, $R_G = 3.6W$



Bild/Fig. 5
 Transienter innerer Wärmewiderstand je Zweig (DC)
 Transient thermal impedance per arm (DC)



Bild/Fig. 6
 Durchlaßkennlinie der Inversdiode (typisch)
 Forward characteristic of the inverse diode (typical)
 $t_{vj} = 25^{\circ}C$
 — $t_{vj} = 125^{\circ}C$

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