

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 V 2,5 V
Rückstromspitze	peak reverse recovery current	$i_F=400\text{A}$, $V_{RM}=600\text{V}$, $V_{EG}=10\text{V}$ $-di_F/dt = 2,0$ kA/ μs , $t_{vj} = 25^\circ\text{C}$ $-di_F/dt = 2,0$ kA/ μs , $t_{vj} = 125^\circ\text{C}$	I_{RM}	-	140 240	- A - A
Sperrverzögerungsladung	recovered charge	$i_F=400\text{A}$, $V_{RM}=600\text{V}$, $V_{EG}=10\text{V}$ $-di_F/dt = 3,0$ kA/ μs , $t_{vj} = 25^\circ\text{C}$ $-di_F/dt = 3,0$ kA/ μs , $t_{vj} = 125^\circ\text{C}$	Q_r	-	18 50	- μAs - 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 $^\circ\text{C/W}$ 0,046 $^\circ\text{C/W}$ 0,044 $^\circ\text{C/W}$ 0,088 $^\circ\text{C/W}$
Übergangs-Wärmewiderstand	thermal resistance, case to heatsink	pro Modul / per Module pro Zweig / per arm	R_{thCK}		0,01 $^\circ\text{C/W}$ 0,02 $^\circ\text{C/W}$
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

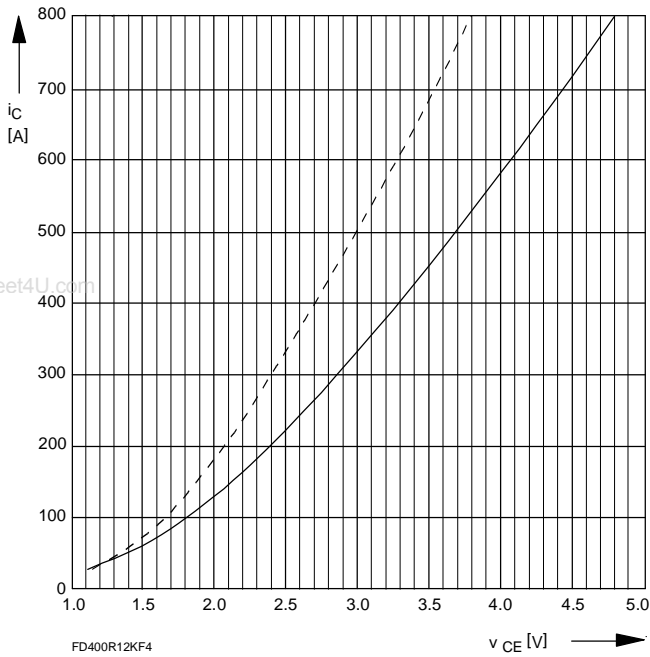
Gehäuse, siehe Anlage	case, see appendix			Seite / page	1
Innere Isolation	internal insulation				Al_2O_3
Anzugsdrehmoment f. mech. Befestigung	mounting torque	terminals M6 / tolerance +/-15%	M1		5 Nm
Anzugsdrehmoment f. elektr. Anschlüsse	terminal connection torque	terminals M4 / tolerance +/-15%	M2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

Bedingung für den Kurzschlußschutz / Conditions for short-circuit protection

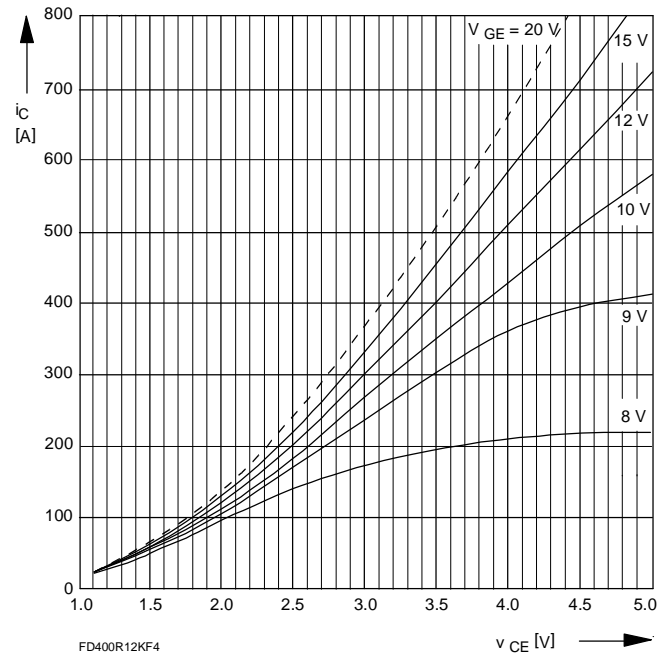
$t_{ig} = 10 \mu\text{s}$	$V_{CC} = 750 \text{ V}$
$V_L = \pm 15 \text{ V}$	$V_{CEM} = 900 \text{ V}$
$R_{GF} = R_{GR} = 3,6 \Omega$	$i_{CMK1} \gg 3500 \text{ A}$
$t_{vj} = 125^\circ\text{C}$	$i_{CMK2} \gg 3000 \text{ A}$

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

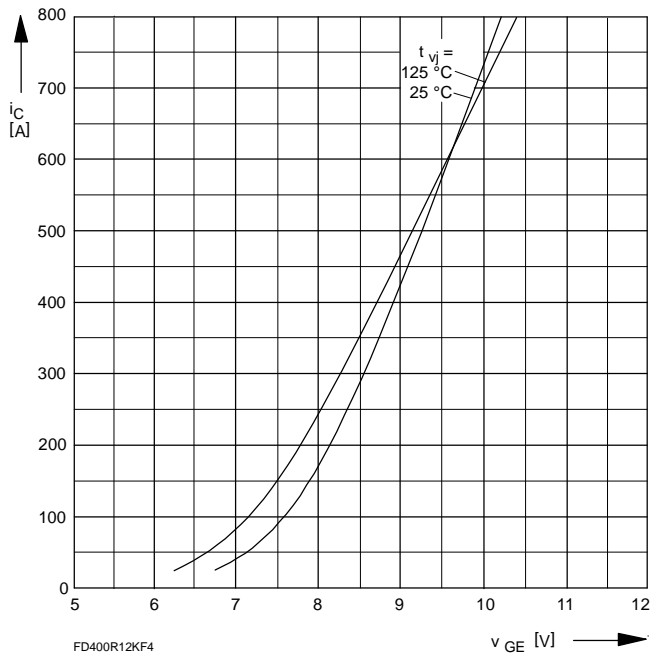
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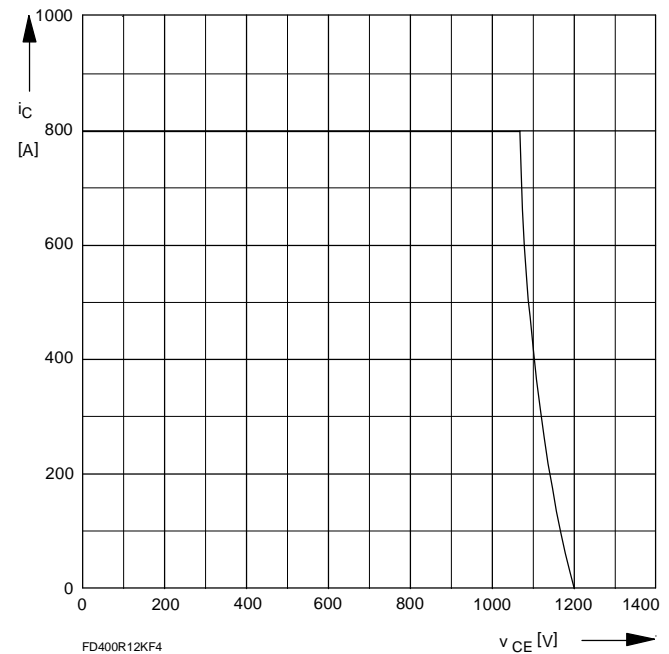
Bild/Fig. 1
 Kollektor-Emitter-Spannung im Sättigungsbereich (typisch)
 Collector-emitter-voltage in saturation region (typical)
 $V_{GE} = 15V$
 ----- $t_{vj} = 25^\circ C$
 ——— $t_{vj} = 125^\circ C$



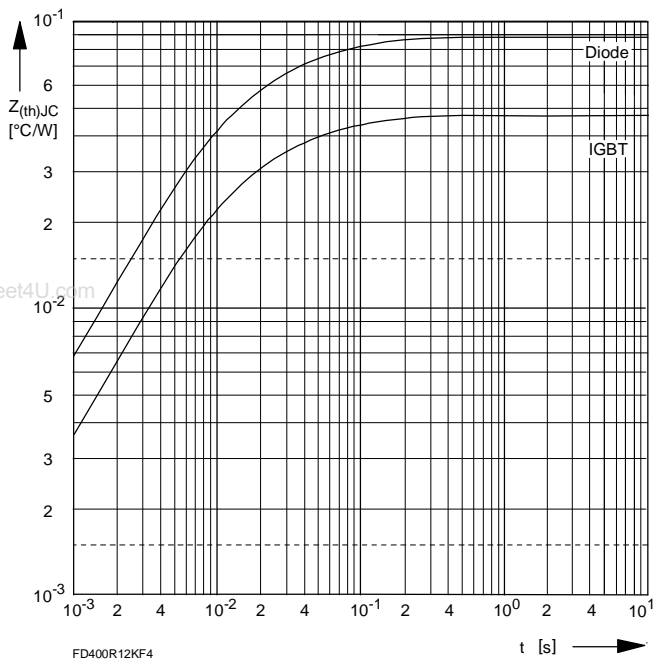
Bild/Fig. 2
 Kollektor-Emitter-Spannung im Sättigungsbereich (typisch)
 Collector-emitter-voltage in saturation region (typical)
 $t_{vj} = 125^\circ C$



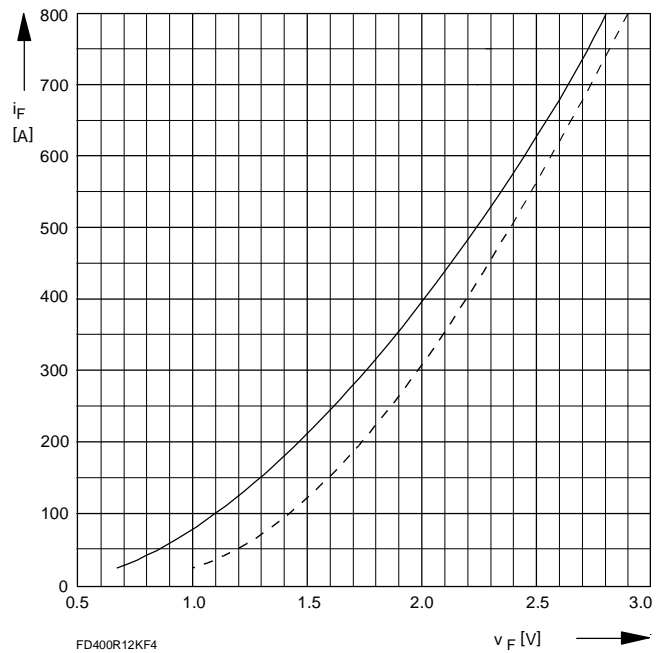
Bild/Fig. 3
 Übertragungscharakteristik (typisch)
 Transfer characteristic (typical)
 $V_{CE} = 20V$



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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