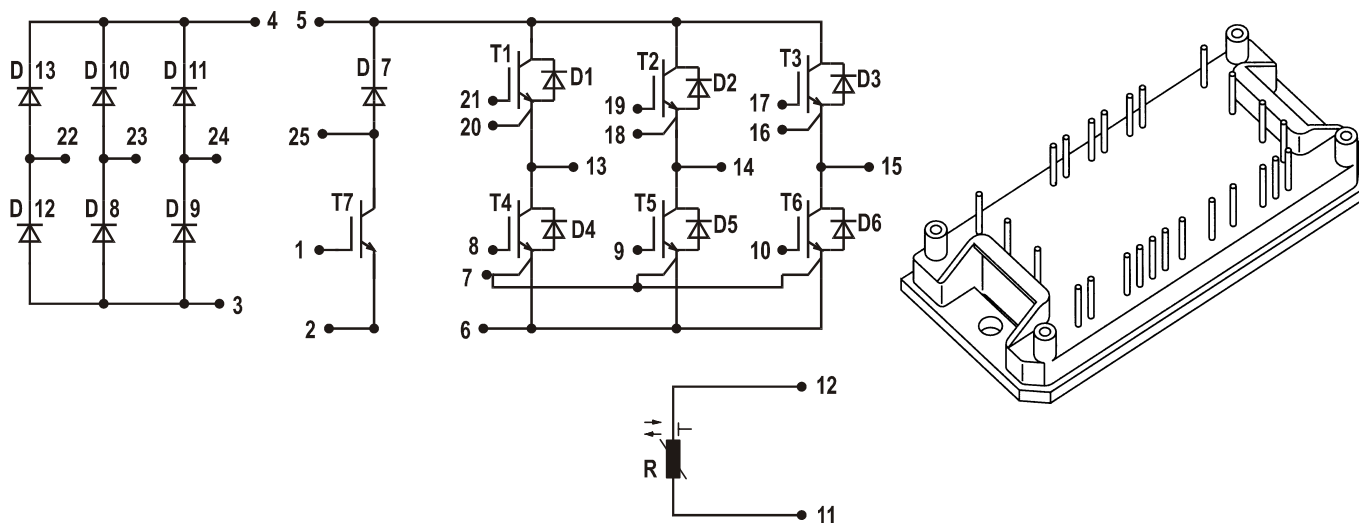


Converter - Brake - Inverter Module (CBI1)



Rectifier	Brake	Inverter
$V_{RRM} = 1200V$	$V_{CES} = 600V$	$V_{CES} = 600V$
$I_{FAVM} = 11A$	$I_{C25} = 7A$	$I_{C25} = 7A$
$I_{FSM} = 250A$	$V_{CE(sat)} = 2.0V$	$V_{CE(sat)} = 2.0V$

Input Rectifier Bridge D8 - D13

Symbol	Conditions	Maximum Ratings	
V_{RRM}		1200	V
I_F	$T_{VJ} = 25^{\circ}C$	36	A
I_{FAVM}	$T_{VJ} = 150^{\circ}C$; $T_K = 70^{\circ}C$	11	A
I_{FSM}	$T_{VJ} = 45^{\circ}C$; $t = 10$ ms sine 50 Hz	250	A
i^2t	$T_{VJ} = 125^{\circ}C$	310	A ² s
T_{VJ}		+150	$^{\circ}C$

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^{\circ}C$, unless otherwise specified)		
		min.	typ.	max.
I_R	$V_{RRM} = 1200V$; $T_{VJ} = 25^{\circ}C$ $T_{VJ} = 125^{\circ}C$			10 μA 3 mA
V_F	$I_F = 36A$		1.15	1.4 V
R_{thJC}	per die		1.4	$^{\circ}C/W$

Features

- NPT IGBT technology
- Square RBSOA, no latchup
- Free wheeling diodes with Hiperfast and soft recovery behaviour
- Isolation voltage 2500 V~
- Built in temperature sense
- High level of integration: one module for complete drive system
- Direct Copper Bonded Al_2O_3 ceramic base plate

Applications

- AC motor control
- AC servo and robot drives

Advantages

- No need of external isolation
- Easy to mount with two screws
- Package designed for wave soldering
- High temperature and power cycling capability

IXYS reserves the right to change limits, test conditions and dimensions.

Output Inverter T1 - T6, D1 - D6

Symbol	Conditions	Maximum Ratings	
V_{CES}	$T_{VJ} = 25^{\circ}\text{C}$	600	V
V_{CGR}	$T_{VJ} = 25^{\circ}\text{C}; R_{GE} = 20\text{k}\Omega$	600	V
V_{GE}	$T_{VJ} = 25^{\circ}\text{C}$	± 20	V
I_C	$T_C = 25^{\circ}\text{C}$	7	A
	$T_C = 90^{\circ}\text{C}$	4.5	A
I_{CM}	$t_p = 1\text{ ms} = 1\% \text{ duty cycle}; T_C = 25^{\circ}\text{C}$ $T_C = 90^{\circ}\text{C}$	14	A
		9	A
t_{SC}	IGBT $V_{CE} = 600\text{ V}; T_{VJ} = 125^{\circ}\text{C}$ non-repetitive	10	μs
P_{tot}	$T_C = 25^{\circ}\text{C}$	38	W
T_{VJ}	Free-Wheeling Diode	+150	$^{\circ}\text{C}$
T_{VJ}	IGBT	+150	$^{\circ}\text{C}$

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^{\circ}\text{C}$, unless otherwise specified)		
		min.	typ.	max.
I_{CES}	$V_{GE} = 0\text{ V}; V_{CE} = 600\text{ V}$			10 μA
I_{GES}	$V_{CE} = 0\text{ V}; V_{GE} = 25\text{ V}$			100 nA
$V_{GE(th)}$	$V_{GE} = V_{CE}; I_C = 0.2\text{ mA}$	3	4	5 V
$V_{(BR)CES}$	$V_{GE} = 0\text{ V}; I_C = 0.5\text{ mA}; T_{VJ} = -40^{\circ}\text{C}$	600		V
$V_{CE(sat)}$	$V_{GE} = 15\text{ V}; I_C = 4\text{ A}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$		2.0	2.5 V
			2.3	2.8 V
t_f	$\left. \begin{array}{l} \text{Inductive load, } T_{VJ} = 150^{\circ}\text{C} \\ V_{CC} = 400\text{ V}; I_C = 4\text{ A} \\ R_G = 50\ \Omega; V_{GE} = \pm 15\text{ V} \end{array} \right\}$		100	150 ns
t_r			20	30 ns
$t_{d(on)}$			20	30 ns
$t_{d(off)}$			260	390 ns
E_{off}			0.1	0.13 mJ
E_{on}			0.2	0.26 mJ
C_{iss}	$\left. \begin{array}{l} V_{GE} = 0\text{ V} \\ V_{CE} = 25\text{ V} \\ f = 1\text{ MHz} \end{array} \right\}$		270	340 pF
C_{oss}			30	40 pF
C_{rss}			18	23 pF
g_{fs}	$V_{CE} = 20\text{ V}; I_C = 4\text{ A}$	0.8	3.2	S
Q_g	$V_{CC} = 400\text{ V}; I_C = 6\text{ A pulse}; V_{GE} = 15\text{ V}$		24	nC
V_F	$I_F = 10\text{ A}; V_{GE} = 0\text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$		2	V
			1.8	V
t_{rr}	$I_F = 10\text{ A}; V_R = -300\text{ V}; V_{GE} = 0\text{ V}$ $di_F/dt = -350\text{ A}/\mu\text{s}; T_{VJ} = 100^{\circ}\text{C}$		0.2	μs
Q_r	$I_F = 10\text{ A}; V_R = -300\text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $di_F/dt = -350\text{ A}/\mu\text{s}; V_{GE} = 0\text{ V}; T_{VJ} = 125^{\circ}\text{C}$		0.3	μC
			0.9	μC
I_r				250 μA
R_{thJC}	IGBT (per die)		2.7	$^{\circ}\text{C}/\text{W}$
	Diode (per die)		2.3	$^{\circ}\text{C}/\text{W}$

Brake Chopper T7, D7

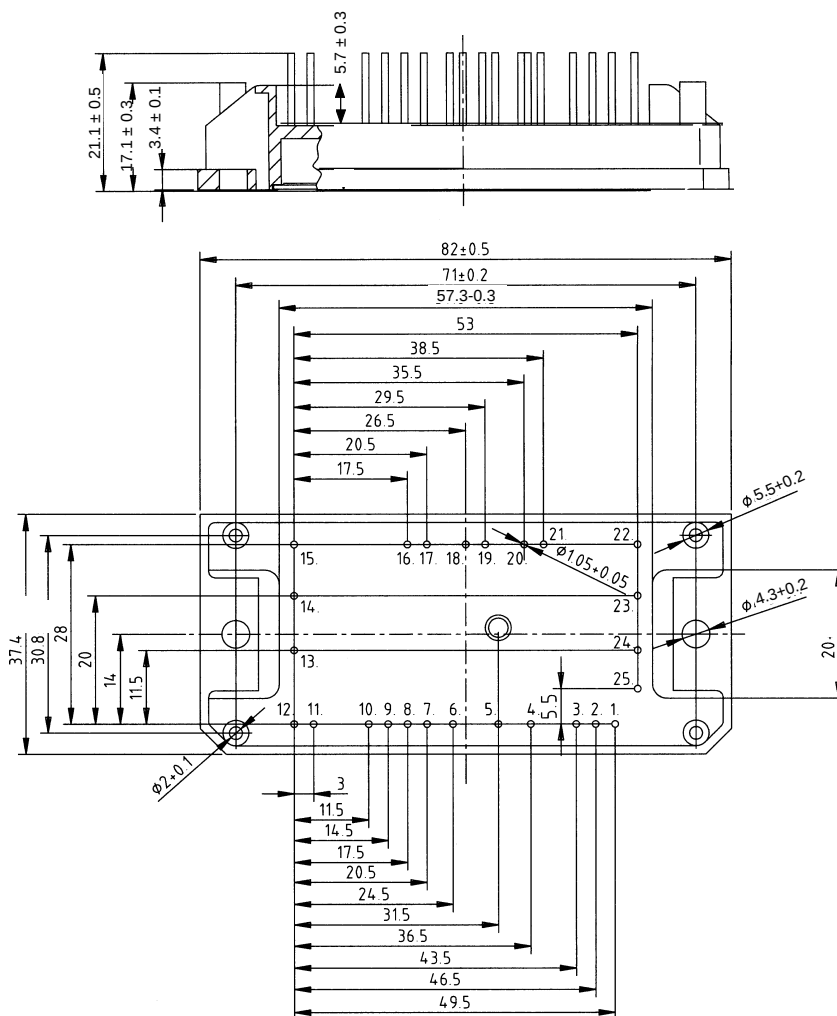
Symbol	Conditions	Maximum Ratings	
V_{CES}	$T_{VJ} = 25^{\circ}\text{C}$	600	V
V_{CGR}	$T_{VJ} = 25^{\circ}\text{C}; R_{GE} = 20\text{k}\Omega$	600	V
V_{GE}	$T_{VJ} = 25^{\circ}\text{C}$	± 20	V
I_C	$T_C = 25^{\circ}\text{C}$	7	A
	$T_C = 90^{\circ}\text{C}$	4.5	A
I_{CM}	$t_p = 1\text{ ms} = 1\% \text{ duty cycle}; T_C = 25^{\circ}\text{C}$ $T_C = 90^{\circ}\text{C}$	14	A
		9	A
t_{SC}	IGBT $V_{CE} = 600\text{ V}; T_{VJ} = 125^{\circ}\text{C}$ non-repetitive	10	μs
P_{tot}	$T_C = 25^{\circ}\text{C}$	38	W
T_{VJ}	Free-Wheeling Diode	+150	$^{\circ}\text{C}$
T_{VJ}	IGBT	+150	$^{\circ}\text{C}$

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^{\circ}\text{C}$, unless otherwise specified)		
		min.	typ.	max.
I_{CES}	$V_{GE} = 0\text{ V}; V_{CE} = 600\text{ V}$			20 μA
I_{GES}	$V_{CE} = 0\text{ V}; V_{GE} = 25\text{ V}$			100 nA
$V_{GE(th)}$	$V_{GE} = V_{CE}; I_C = 0.2\text{ mA}$	3	4	5 V
$V_{(BR)CES}$	$V_{GE} = 0\text{ V}; I_C = 0.5\text{ mA}; T_{VJ} = -40^{\circ}\text{C}$	600		V
$V_{CE(sat)}$	$V_{GE} = 15\text{ V}; I_C = 4\text{ A}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$		2.0	2.5 V
			2.3	2.8 V
t_f	} Inductive load, $T_{VJ} = 150^{\circ}\text{C}$ $V_{CC} = 400\text{ V}; I_C = 4\text{ A}$ $R_G = 50\ \Omega; V_{GE} = \pm 15\text{ V}$	100	150	ns
t_r		20	30	ns
$t_{d(on)}$		20	30	ns
$t_{d(off)}$		260	390	ns
E_{off}		0.1	0.13	mJ
E_{on}		0.2	0.26	mJ
C_{iss}	} $V_{GE} = 0\text{ V}$ $V_{CE} = 25\text{ V}$ $f = 1\text{ MHz}$	270	340	pF
C_{oss}		30	40	pF
C_{rss}		18	23	pF
g_{fs}	$V_{CE} = 20\text{ V}; I_C = 4\text{ A}$	0.8	3.2	S
Q_g	$V_{CC} = 400\text{ V}; I_C = 6\text{ A pulse}; V_{GE} = 15\text{ V}$	24		nC
V_F	$I_F = 10\text{ A}; V_{GE} = 0\text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$		2	V
			1.8	V
t_{rr}	$I_F = 10\text{ A}; V_R = -300\text{ V}; V_{GE} = 0\text{ V}$ $di_F/dt = -350\text{ A}/\mu\text{s}; T_{VJ} = 100^{\circ}\text{C}$	0.2		μs
Q_r	$I_F = 10\text{ A}; V_R = -300\text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $di_F/dt = -350\text{ A}/\mu\text{s}; V_{GE} = 0\text{ V}; T_{VJ} = 125^{\circ}\text{C}$		0.3	μC
			0.9	μC
I_r			250	μA
R_{thJC}	IGBT (per die)	2.7		$^{\circ}\text{C}/\text{W}$
	Diode (per die)	2.3		$^{\circ}\text{C}/\text{W}$

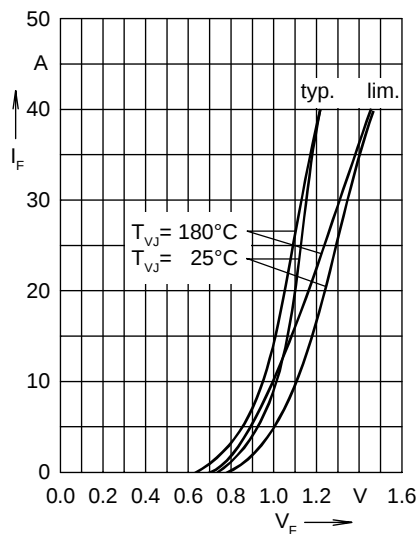
Symbol	Conditions	Maximum Ratings	
T_{stg}		-40...+125	°C
V_{ISOL}	I _{ISOL} ≤ 1 mA; 50/60 Hz; t = 1 min	2500	V~
M_d	Mounting torque (M4)	2.0 - 2.2 18 - 20	Nm lb.in.
d_s	Creepage distance on surface	12.7	mm
d_A	Strike distance in air	12.7	mm
Weight	typ.	42	g

Symbol	Conditions	Maximum Ratings	
R	T _{amb} = 20°C	4.7	kΩ

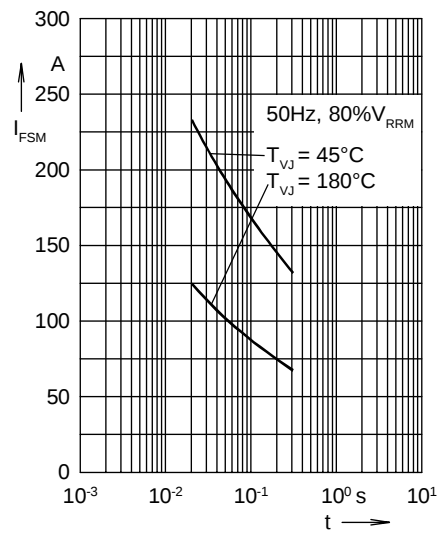
Dimensions in mm (1 mm = 0.0394")



Input Rectifier Bridge D8 - D13

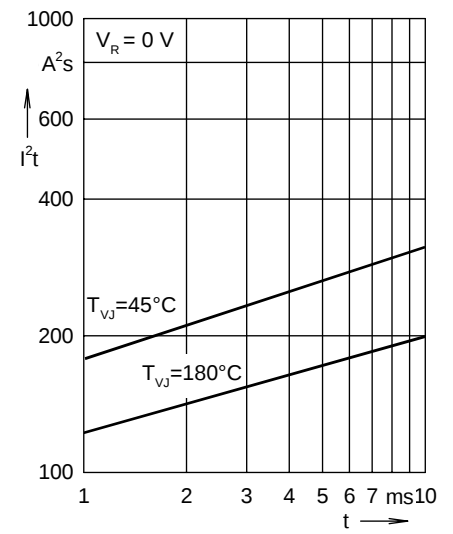


Forward characteristics

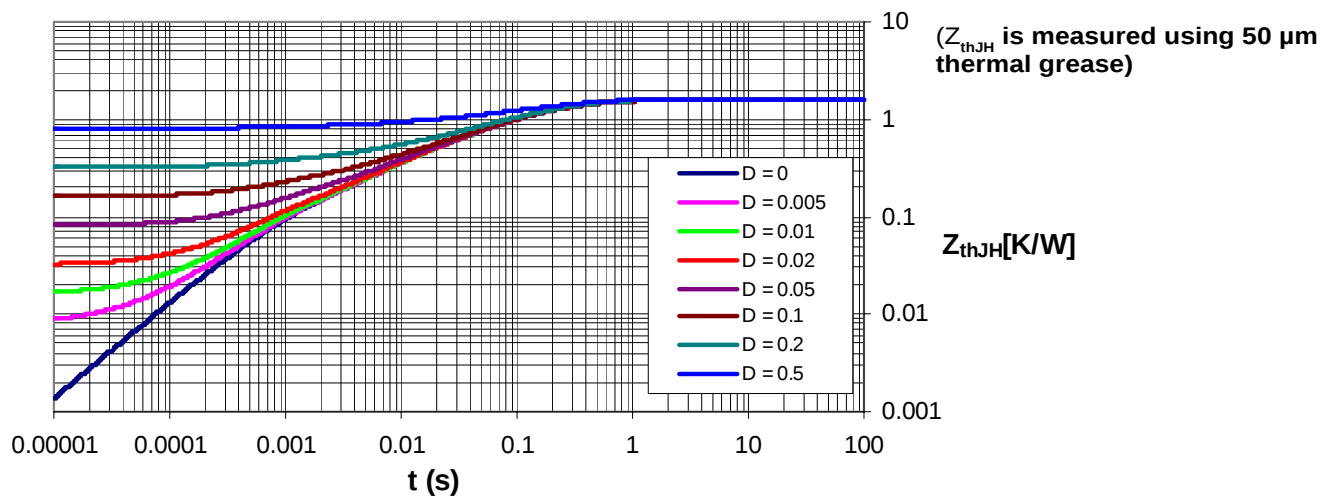


Surge overload current

I_{FSM} : crest value, t : duration



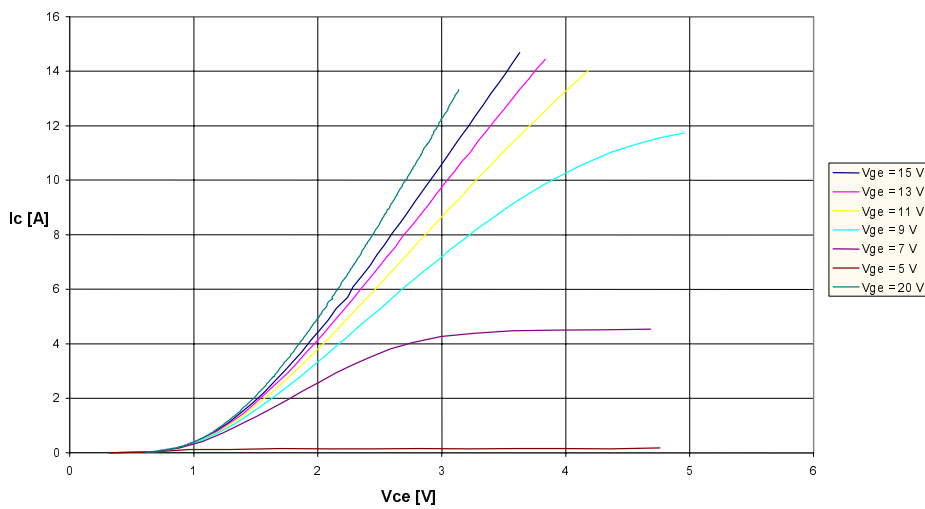
I^2t versus time (1-10 ms)



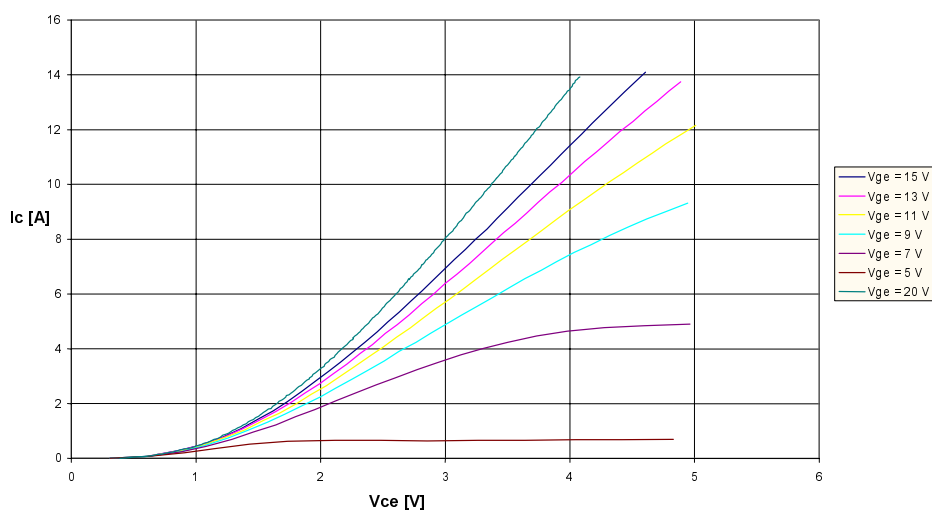
Transient thermal resistance junction to heatsink

Output Inverter T1 - T6, D1 - D6

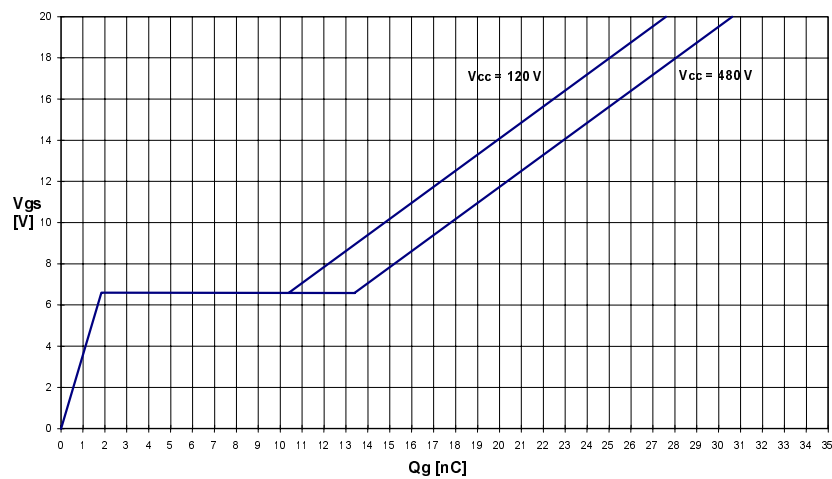
Typ. Output characteristics, 25°C



Typ. Output characteristics, 125°C

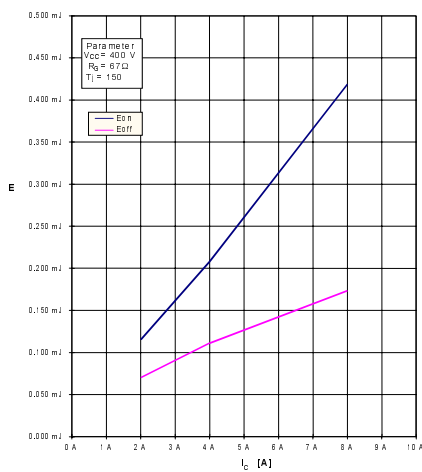


Typ. Gate-Charge

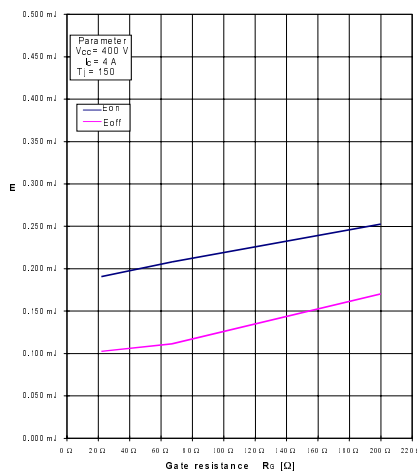


Output Inverter T1 - T6, D1 - D6

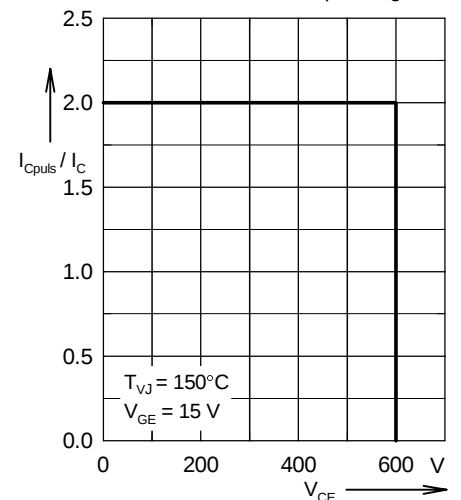
Typ. Switching losses $E=f(I_C)$



Typ. Switching losses $E=f(R_G)$

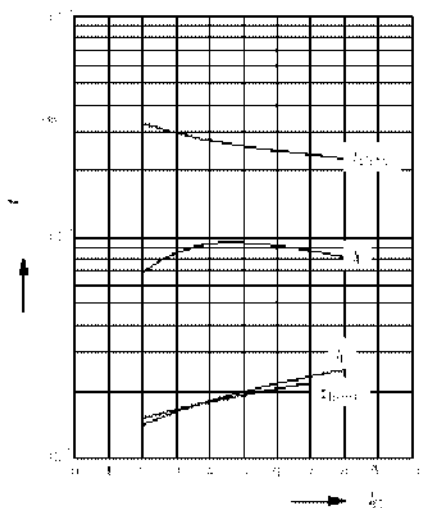


Reverse biased safe operating area



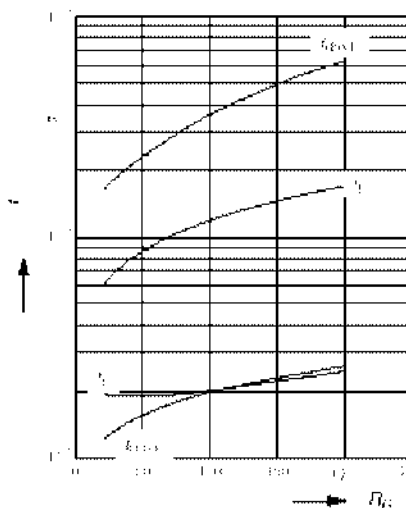
Typ. switching time

t_f (I_{RL}) inductive load, T_J 150 °C
par: V_{GE} 400 V V_{CE} 0-15 V R_G 67 Ω

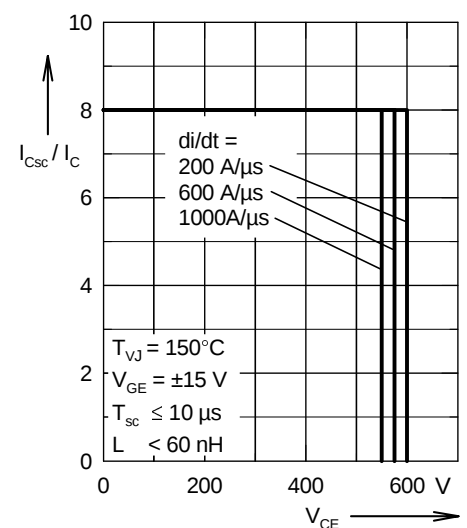


Typ. switching time

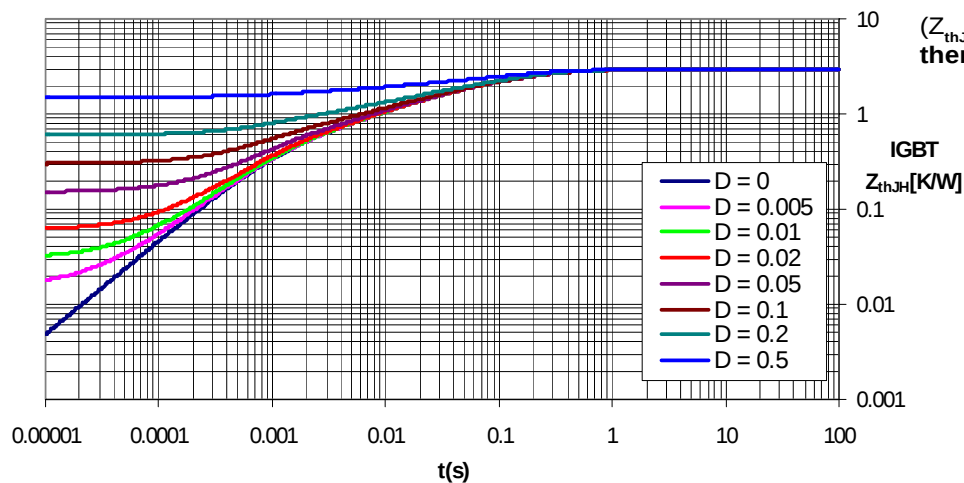
t_f (I_{RL}) inductive load, T_J 150 °C
par: V_{GE} 400 V V_{CE} 0-15 V I_C 4 A



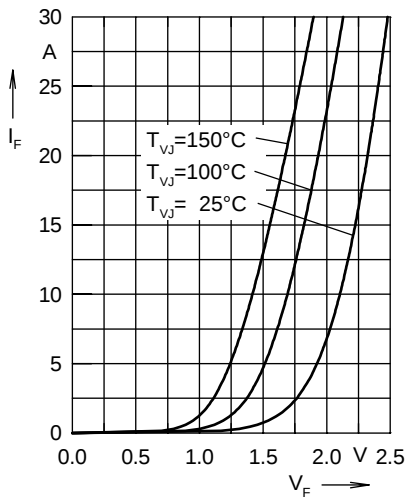
Short circuit safe operating area



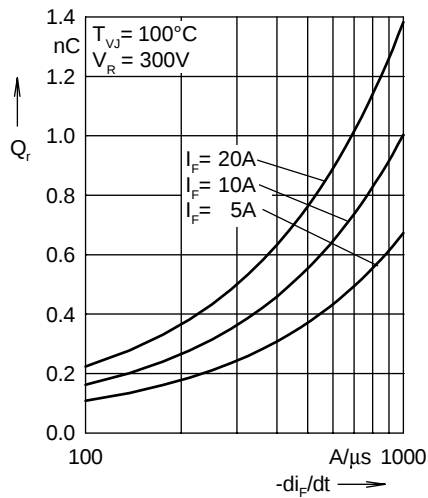
Transient thermal resistance junction to heatsink



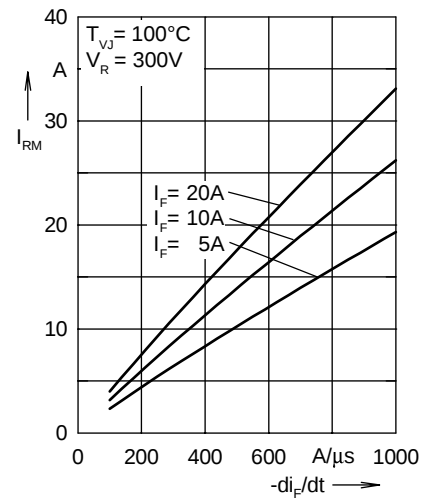
Output Inverter D1 - D6



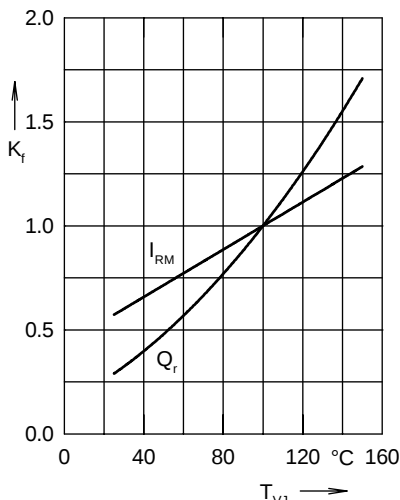
Forward current I_F versus V_F



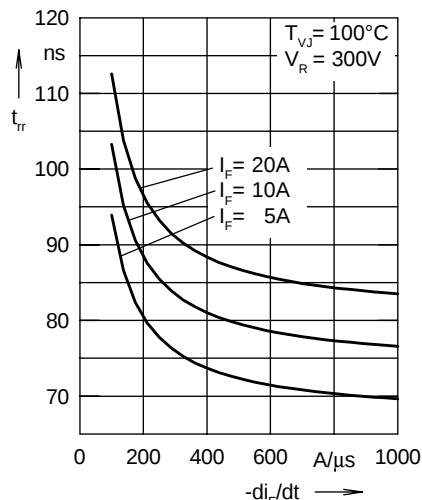
Reverse recovery charge Q_r versus $-di_F/dt$



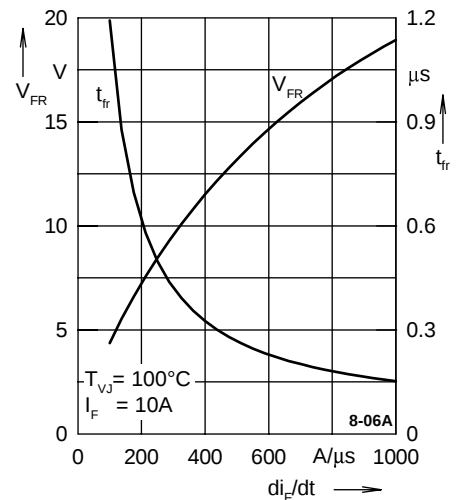
Peak reverse current I_{RM} versus $-di_F/dt$



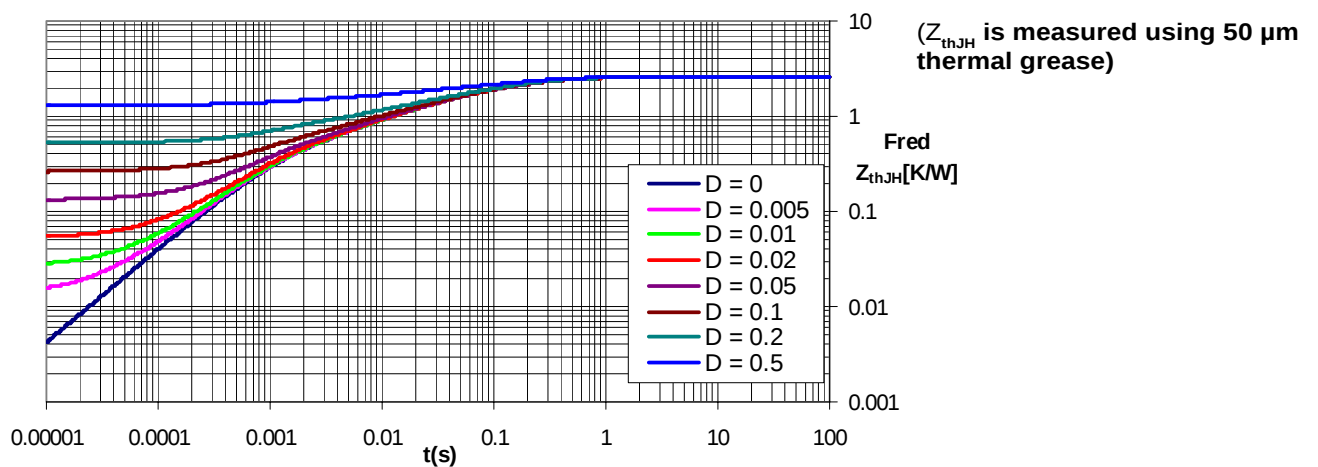
Dynamic parameters Q_r , I_{RM} versus T_{VJ}



Recovery time t_{rr} versus $-di_F/dt$



Peak forward voltage V_{FR} and t_{fr} versus di_F/dt



Transient thermal resistance junction to heatsink

(Z_{thJH} is measured using 50 μm thermal grease)

Fred
 $Z_{thJH}[K/W]$

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