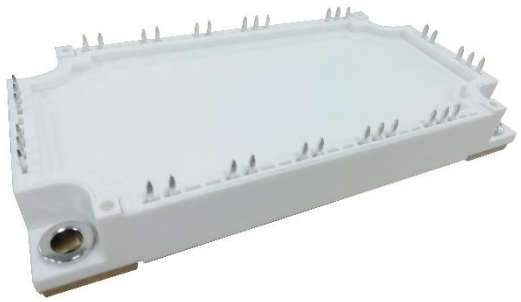
DFI100PM12P4D1

1200V/100A PIM IGBT Module

Description

The DFI100PM12P4D1 offer lower losses and higher energy for application such as motor drive, inverter and other soft switching applications.



Features

- 1200V100A, VCE (sat) (typ.) = 2.10V
- Lower losses and higher energy
- Excellent short circuit ruggedness
- 62mm module

Applications

- Inverter
- Power supply
- Motion/servo control

Circuit diagram

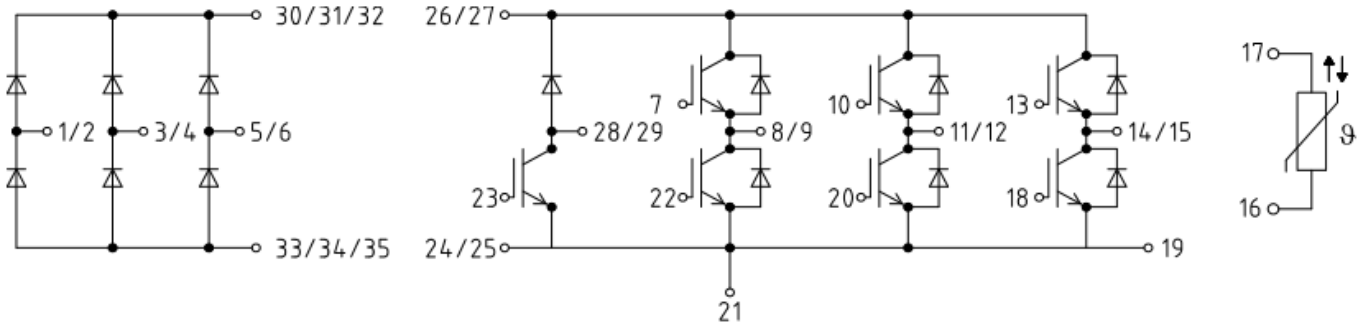


Figure 1. Out drawing & circuit diagram for DFI100PM12P4D1

Pin Configuration and Marking Information

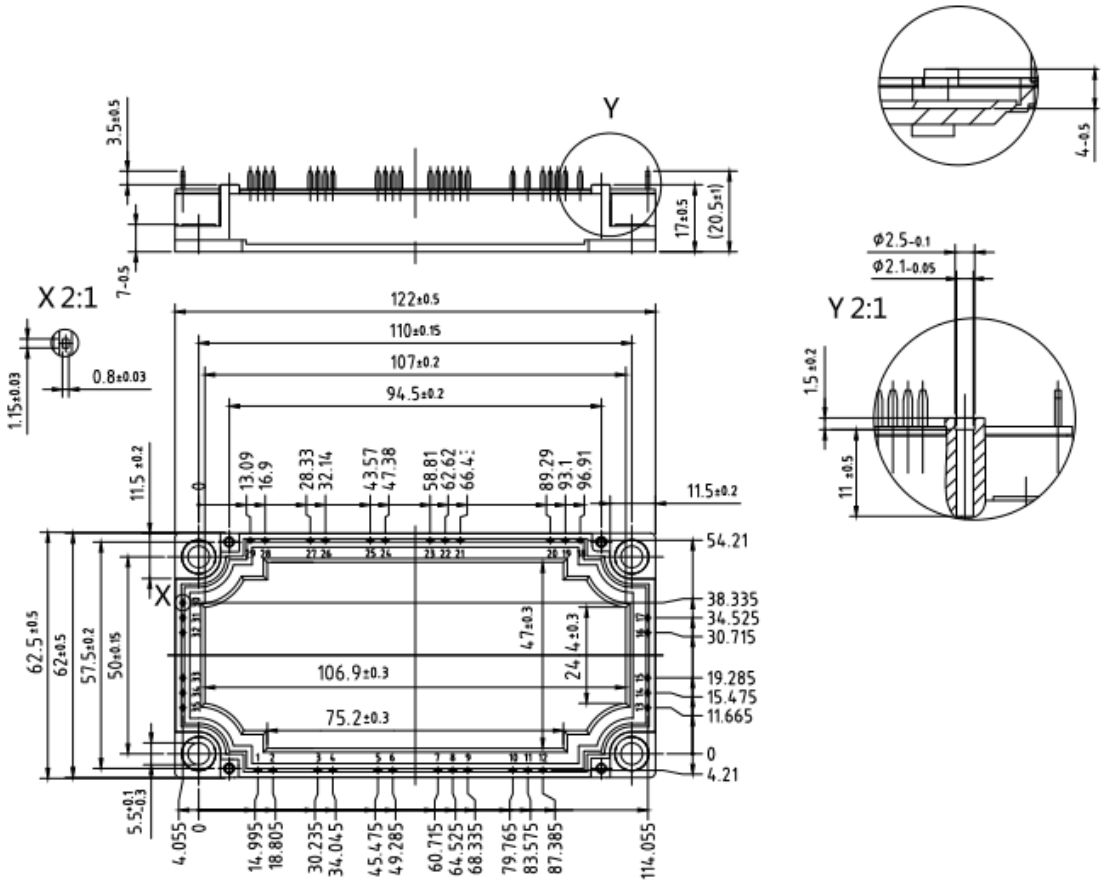


Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f =50Hz, t =1min	2.5	KV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink terminal to terminal	14.5 13	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	>200	-
Module lead resistance, terminals – chip	T_C =25°C	0.8	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	300	g

Maximum Ratings (IGBT, T_j=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V_{RRM}	Peak Repetitive Revers Voltage	-	1200	V
V_{GES}	Gate-Emitter Voltage	C-E Short	±30V	V
I_C	DC Continuous Collector Current	T_C=100°C	100	A
I_{CM}	Pulse Collector Current	t_p=1ms, Note1	200	A
P_C	Maximum Power Dissipation		670	W
T_j	junction temperature	-	-40 to 150	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

Maximum Ratings (Freewheeling diode, T_j=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{RRM}	Peak Repetitive Revers Voltage	-	1200	V
I_F	Diode forward Current	-	100	A
I_{FRM}	Repetitive peak forward Current	t_p=1ms, Note1	200	A
T_j	junction temperature	-	-40 to 150	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

Maximum Ratings (IGBT, Brake-chopper, T_j=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V_{RRM}	Peak Repetitive Revers Voltage	-	1200	V
V_{GES}	Gate-Emitter Voltage	C-E Short	±30V	V
I_C	DC Continuous Collector Current	T_C=100°C	50	A
I_{CM}	Pulse Collector Current	t_p=1ms, Note1	100	A
P_C	Maximum Power Dissipation		365	W
T_j	junction temperature	-	-40 to 150	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

Maximum Ratings (diode, Brake-chopper, T_j=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{RRM}	Peak Repetitive Revers Voltage	-	1200	V
I_F	Diode forward Current	-	50	A
I_{FRM}	Repetitive peak forward Current	t_p=1ms, Note1	100	A
T_j	junction temperature	-	-40 to 150	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Resistance	T_C =25°C	-	5	-	kΩ
ΔR/R	Deviation of R100	T_C =100°C, R_{100} =493Ω	5	-	5	%
P_{25}	Power dissipation	T_C =25°C	-	-	20	mW
$B_{25/50}$	B-value	R2 = R25 exp [$B_{25/50}$(1/T2 - 1/(298,15 K))]	-	3375	-	K
$B_{25/80}$	B-value	R2 = R25 exp [$B_{25/80}$(1/T2 - 1/(298,15 K))]	-	3410	-	K
$B_{25/100}$	B-value	R2 = R25 exp [$B_{25/100}$(1/T2 - 1/(298,15 K))]	-	3433	-	K

IGBT Electrical characteristics (T_j =25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
$V_{CE(sat)}$ (Chip)	Collector-Emitter Saturation Voltage	I_C =100A, V_{GE} =15V	T_j =25°C	-	2.1	2.3	V
			T_j =125°C	-	2.5	-	V
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C =1mA, V_{CE} =V_{GE}		4.5	-	5.5	V
Q_G	Gate charge	V_{GE} =-15V to +15V		-	1000	-	nC
R_{Gint}	Internal gate resistor	-	T_j =25°C	-	1.9	-	Ω
C_{ies}	Input Capacitance	V_{CE} =25V, V_{GE} =0V, f =1MHz	T_j =25°C	-	8.00	-	nF
C_{oes}	Output Capacitance				1.35		nF
C_{res}	Reverse transfer Capacitance			-	0.81	-	nF
I_{CES}	Collector- Emitter Cut off Current	V_{CE} =1200V, V_{GE} =0V	T_j =25°C	-	-	1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} =30V, V_{CE} =0V	T_j =25°C	-	-	200	nA
$t_{d(on)}$	Turn-on delay time	V_{CC} =600V, I_C = 100A, V_{GE} =+15V/-15V, R_G =5.6Ω, Inductive load	T_j =25°C	-	90	-	ns
			T_j =125°C	-	100	-	
t_r	Rise time		T_j =25°C	-	60	-	ns
			T_j =125°C	-	65	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	460	-	ns
			T_j =125°C	-	470	-	
t_f	Fall time		T_j =25°C	-	220	-	ns
			T_j=125°C	-	300	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	5.3	-	mJ
			T_j =125°C	-	5.8	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	7.1	-	mJ
			T_j =125°C	-	9.0	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-		-0.186	°C/W

Freewheeling Diode Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_F	Diode Forward Voltage	I_F=100A, V_{GE}=0V	T_j=25°C	-	1.90	2.2	V
			T_j=125°C	-	1.9	-	
t_{rr}	Reverse recovery time	(Switch side) V_{rr}=600V, I_F=100A di/dt=1500A/μs	T_j=25°C	-	120	-	ns
			T_j=125°C	-	145	-	
I_{rr}	Peak reverse recovery Current		T_j=25°C	-	90	-	A
			T_j=125°C	-	110	-	
Q_{rr}	Recovered charge		T_j=25°C	-	6.5	-	uC
			T_j=125°C	-	8.7	-	
E_{rr}	Reverse recovered energy		T_j=25°C	-	1.8	-	mJ
			T_j=125°C	-	2.5	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-		0.301	°C/W

IGBT, Brake-chopper Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
$V_{CE(sat)}$ (Chip)	Collector-Emitter Saturation Voltage	I_C=50A V_{GE}=15V	T_j=25°C	-	2.1	2.3	V
			T_j=125°C	-	2.5	-	V
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C=1mA, V_{CE}=V_{GE}		4.5	-	5.7	V
Q_G	Gate charge	V_{GE}=-15V to +15V		-	430	-	nC
R_{Gint}	Internal gate resistor	-	T_j=25°C	-	2.2	-	Ω
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V f=1MHz	T_j=25°C	-	3.80	-	nF
C_{oes}	Output Capacitance				0.51		nF
C_{res}	Reverse transfer Capacitance			-	0.33	-	nF
I_{CES}	Collector- Emitter Cut off Current	V_{CE}=1200V, V_{GE}=0V	T_j=25°C	-	-	1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=30V, V_{CE}=0V	T_j=25°C	-	-	200	nA
$t_{d(on)}$	Turn-on delay time	V_{CC}=600V I_C=50A V_{GE}=+15V/-15V R_G=5.6Ω Inductive load	T_j=25°C	-	20	-	ns
			T_j=125°C	-	25	-	
t_r	Rise time		T_j=25°C	-	40	-	ns
			T_j=125°C	-	45	-	
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	300	-	ns
			T_j=125°C	-	330	-	
t_f	Fall time		T_j=25°C	-	160	-	ns
			T_j=125°C	-	180	-	
E_{on}	Turn-on power dissipation		T_j=25°C	-	4.5	-	mJ
			T_j=125°C	-	6.5	-	
E_{off}	Turn-off power dissipation		T_j=25°C	-	4.2	-	mJ

			T_j=125°C	-	6.1	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-		0.343	°C/W

Diode, Brake-chopper **Electrical characteristics** (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_F	Diode Forward Voltage	I_F =50A, V_{GE} =0V	T_j=25°C	-	1.90	2.2	V
			T_j=125°C	-	1.9	-	
t_{rr}	Reverse recovery time	(Switch side) V_{rr}=600V, I_F=50A di/dt=1500A/μs	T_j=25°C	-	110	-	ns
			T_j=125°C	-	250	-	
I_{rr}	Peak reverse recovery Current		T_j=25°C	-	85	-	A
			T_j=125°C	-	100	-	
Q_{rr}	Recovered charge		T_j=25°C	-	5.5	-	uC
			T_j=125°C	-	9.5	-	
E_{rr}	Reverse recovered energy		T_j=25°C	-	1.8	-	mJ
			T_j=125°C	-	3.7	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-		0.652	°C/W

Maximum Ratings (Rectifier diode, T_j=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{RRM}	Peak Repetitive Revers Voltage	T_J = 25°C	1800	V
I_{FRMSM}	Maximum RMS forward current per chip	T_C =80°C	100	A
I_{RMSM}	Maximum RMS current at rectifier output	T_C =80°C	200	A
I_{FSM}	Surge Current @t_p=10 ms	T_J =25°C	1080	A
I^2t	I^2t - value	T_J =25°C	5832	A^2s
T_j	junction temperature	-	-40 to 150	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

Rectifier Diode Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_F	Diode Forward Voltage	I_F = 100A	T_J = 25°C		1.05		V
			T_J = 125°C		0.85		
I_R	Reverse current		T_J = 125°C		1.0		mA
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Diode)					0.40	°C/W

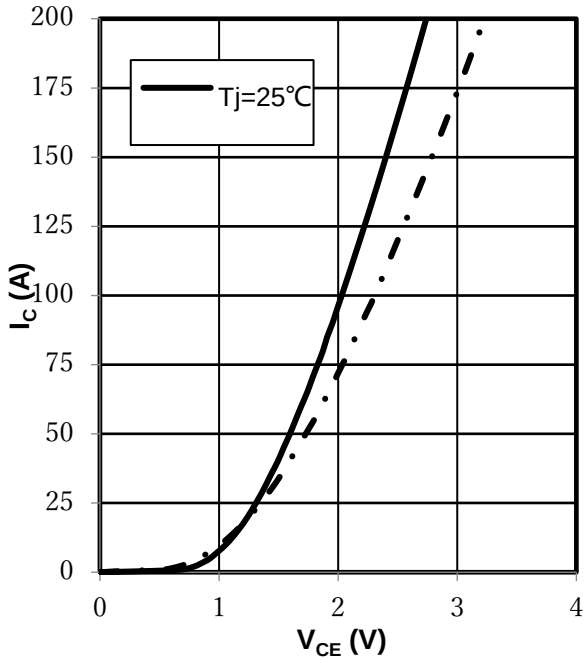


Fig 1. output characteristic IGBT，
$I_C=f(V_{CE})$, VGE=15V

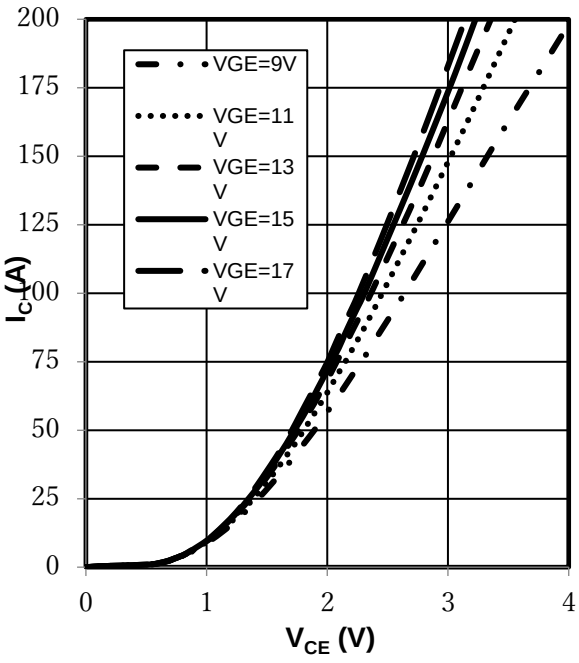


Fig 2. output characteristic IGBT，
$I_C=f(V_{CE})$,T_j=125℃

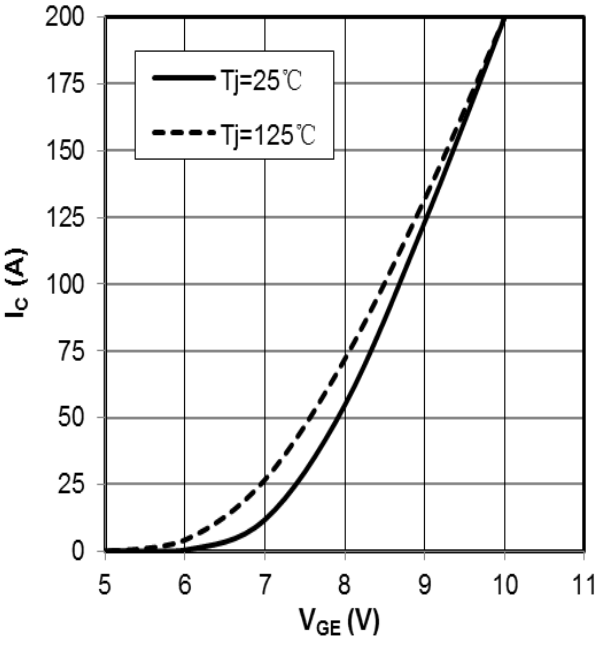


Fig 3. transfer characteristic IGBT，
$I_C=f(V_{GE})$, V_{CE}=20V

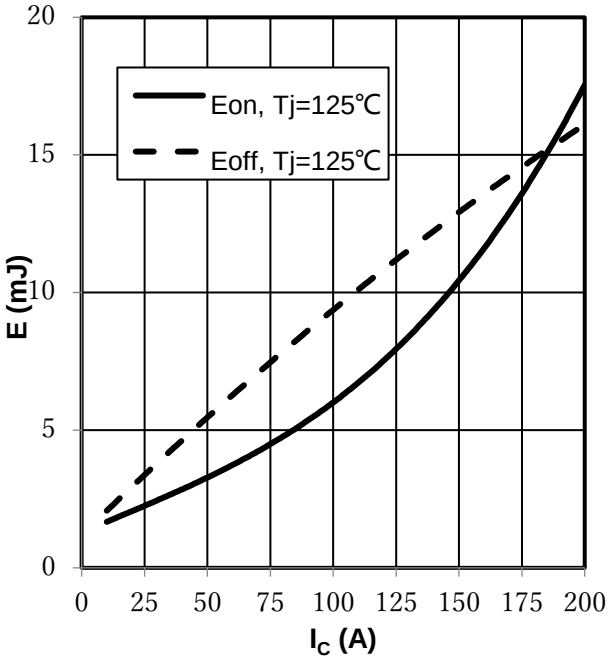


Fig 4. switching losses IGBT,
$E_{on}=f(Ic)$, $E_{off}=f(I_c)$,

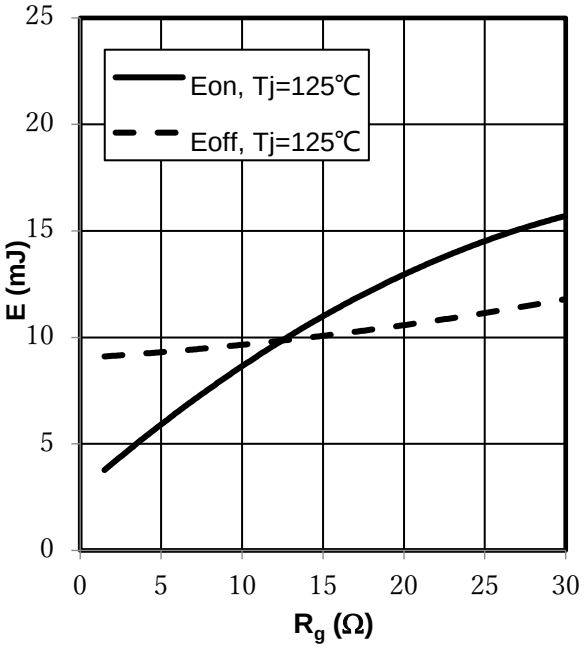


Fig 5. switching losses IGBT, $E_{on}=f(R_G)$,$E_{off}=f(R_G)$, $V_{GE}=\pm15V$,$I_C=100A$,$V_{CE}=600V$

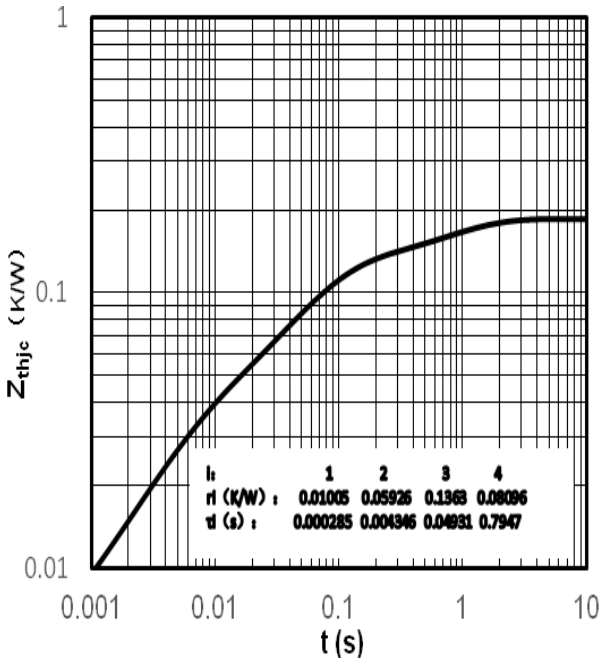


Fig 6. transient thermal impedance IGBT , Zthjc=f(t)

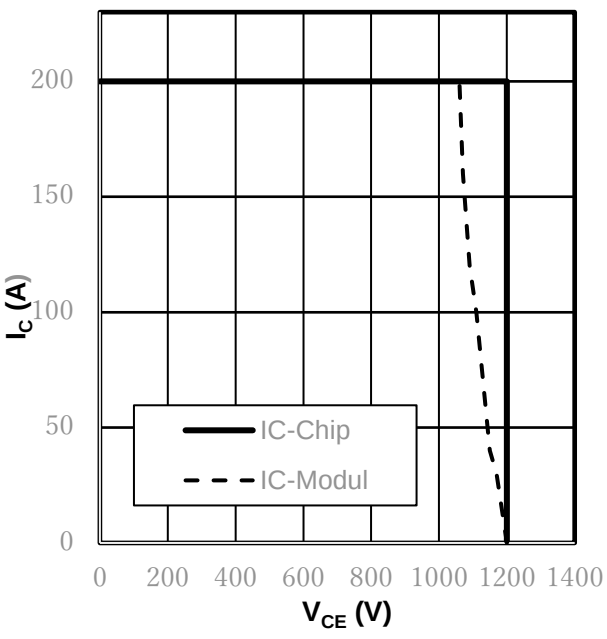


Fig 7. reverse bias safe operating area IGBT, $I_C=f(V_{CE})$,$V_{GE}=\pm15V$,$R_{Goff}=5.6\Omega$，Tvj=125℃

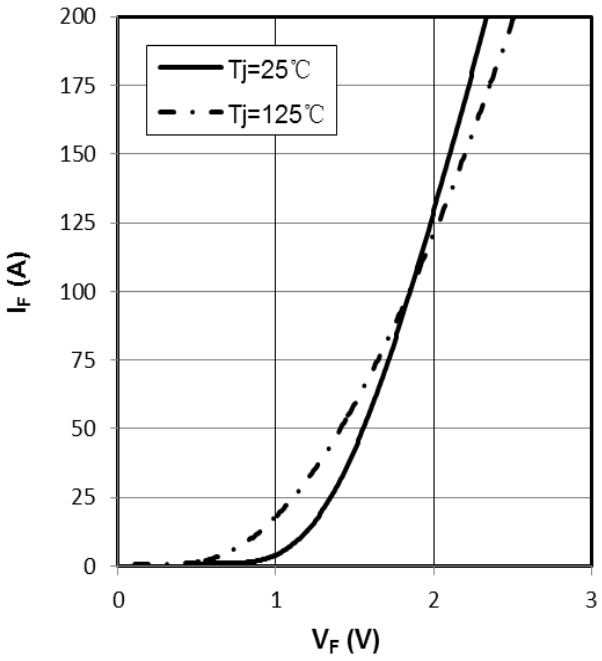


Fig 8. forward characteristic of Diode ， $I_F=f(V_F)$

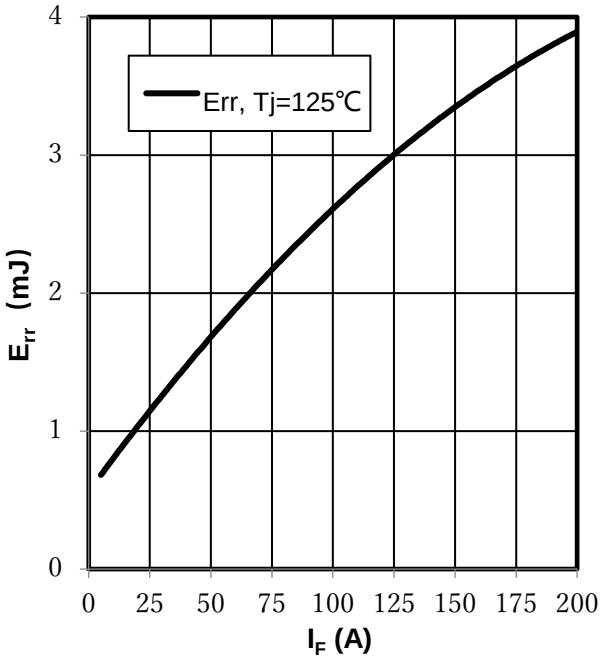


Fig9. switching losses Diode,
$E_{rr}=f(I_F)$,,$R_{Gon}=5.6\Omega$,$V_{CE}=600V$

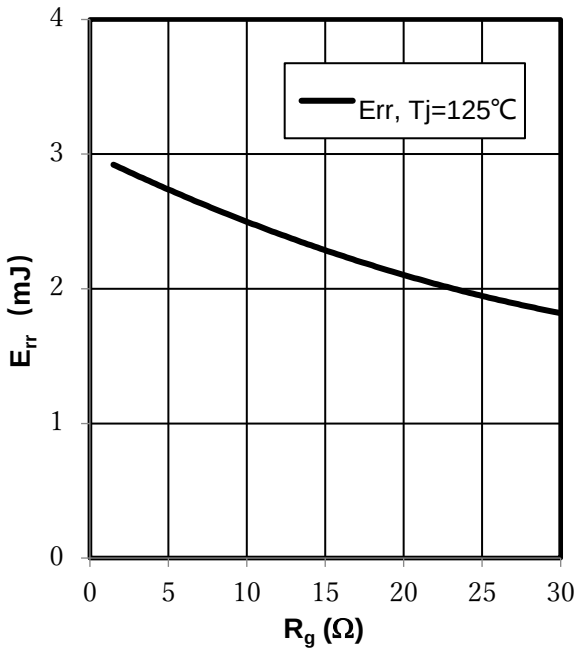


Fig 10. switching losses Diode,
$E_{rr}=f(R_G)$,$I_F=100A$,$V_{CE}=600V$

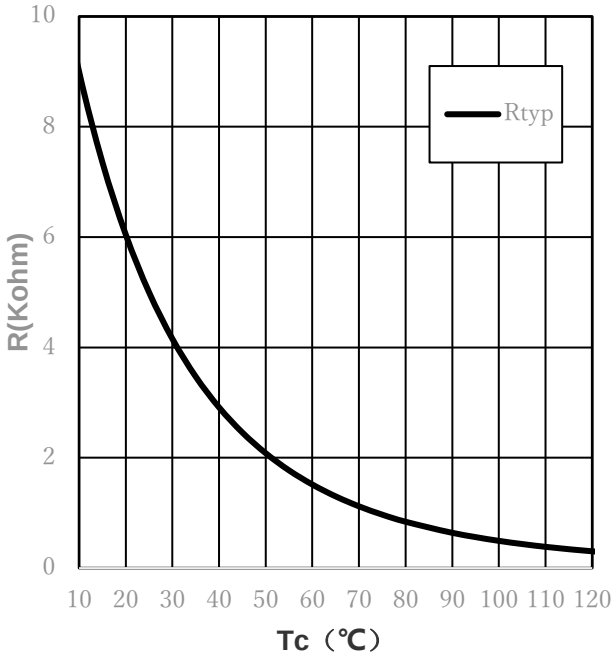


Fig11.NTC-Thermistor-temperature
characteristic(typical)

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This product data sheet describes the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively under the terms and conditions of the supply agreement. There will be no guarantee or of any kind for the product and its characteristics.

The data contained in this document is exclusively intended for technically trained staff. You and your technical departments will have to evaluate the product's suitability for the intended application and the completeness of the product data concerning such application.

Due to technical requirements, our product may contain dangerous substances. For information on the types in question, please contact the sales staff responsible for you.

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