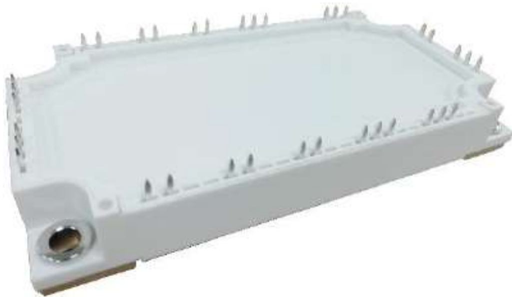
HCG50PM120E7D1

1200V/50A PIM IGBT Module

Description

The HCG50PM120E7D1 offer lower losses and higher energy for application such as motor drive, inverter and other soft switching applications.



Features

- 1200V 50A, VCE (sat) (typ.) = 2.10V
- Lower losses and higher energy
- Excellent short circuit ruggedness
- PIM module

Applications

- Inverter
- Power supply
- Motion/servo control

Circuit diagram

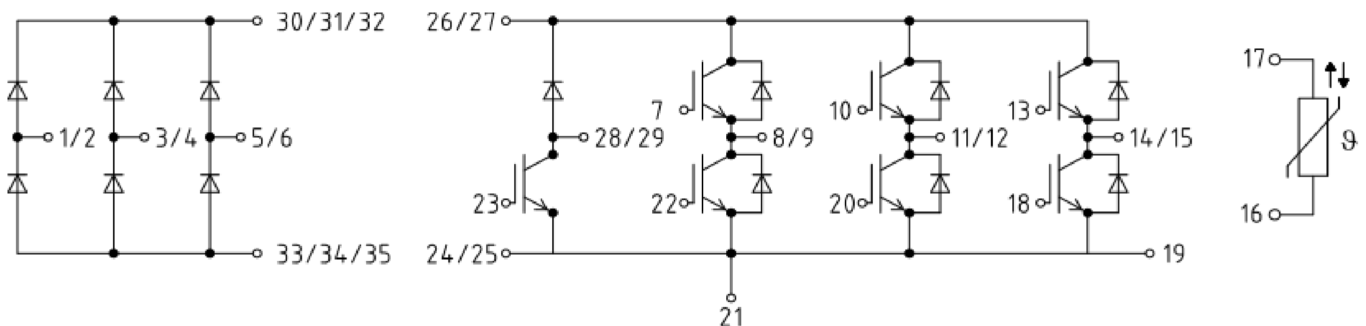


Figure 1. Out drawing & circuit diagram for HCG50PM120E7D1

HCG50PM120E7D1

1200V/50A PIM IGBT Module

Pin Configuration and Marking Information

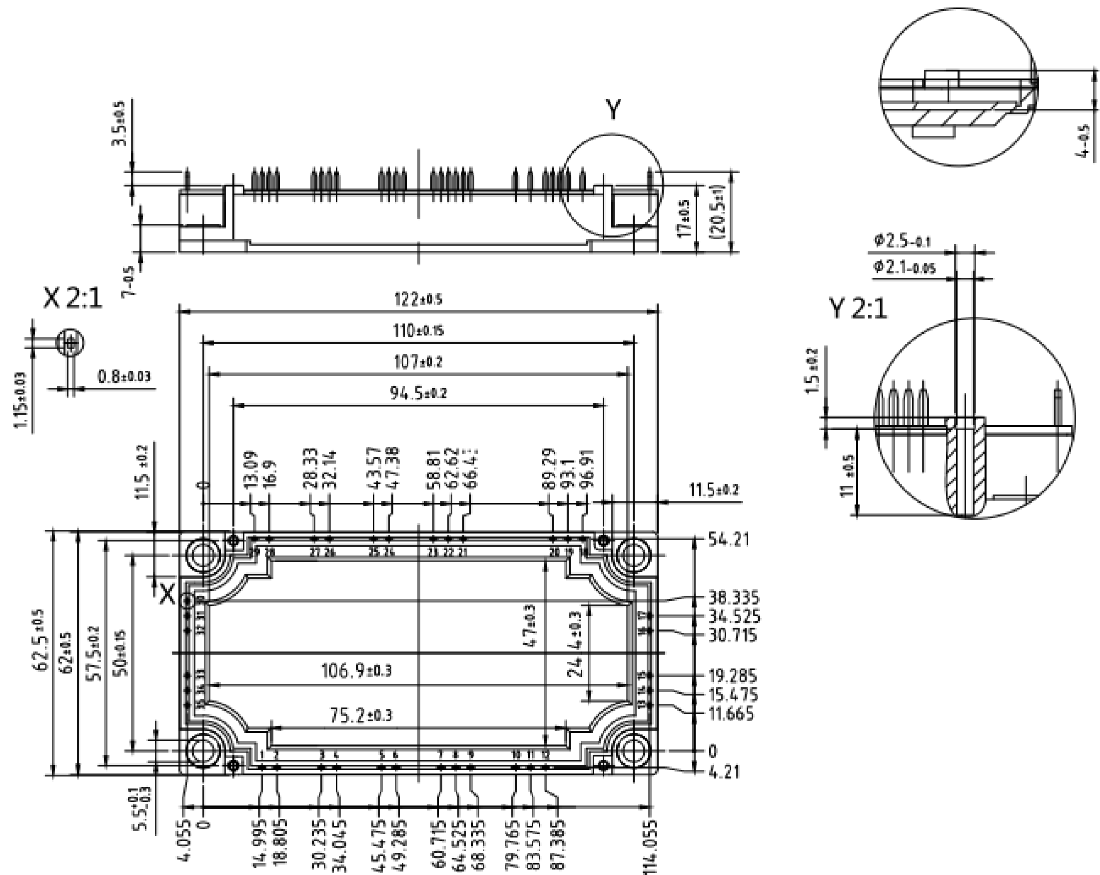


Figure 2. Pin configuration

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	17 3.81	mm
Clearance	terminal to heatsink terminal to terminal	17 3.81	mm
CTI	-	>200	-
Module lead resistance, terminals – chip	T_C =25°C	0.8	mΩ
Mounting torque for module mounting	M5	3 to 6	Nm
Weight	-	300	g

HCG50PM120E7D1

1200V/50A PIM IGBT Module

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	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 (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	-	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

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	25	A
I_{CM}	Pulse Collector Current	t_p=1ms, Note1	50	A
P_C	Maximum Power Dissipation		280	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	-	25	A
I_{FRM}	Repetitive peak forward Current	t_p=1ms, Note1	50	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

HCG50PM120E7D1

1200V/50A PIM IGBT Module

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Resistance	T_C=25°C	-	5	-	kΩ
R/R	Deviation of R100	T_C=100°C, R_{100}=493Ω	-5	-	5	%
P_{25}	Power dissipation	T_C=25°C	-	-	50	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=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	f=1M, Vpp=1V	T_j=25°C	-	2.2	-	Ω
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=1MHz	T_j=25°C	-	3.8	-	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	-	-	100	nA
$t_{d(on)}$	Turn-on delay time	V_{CC}=600V, I_C= 50A, V_{GE}=+15V/-15V, R_G=10☒, Inductive load	T_j=25°C	-	20	-	ns
t_r	Rise time		T_j=25°C	-	35	-	ns
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	250	-	ns
t_f	Fall time		T_j=25°C	-	330	-	ns
E_{on}	Turn-on power dissipation		T_j=25°C	-	3.9	-	mJ
E_{off}	Turn-off power dissipation		T_j=25°C	-	2.2	-	mJ
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	-	0.343	°C/W

HCG50PM120E7D1

1200V/50A PIM IGBT Module

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 =50A, V_{GE} =0V	T_j=25°C	-	1.90	2.20	V
			T_j=125°C	-	1.90	-	
t_{rr}	Reverse recovery time	(Switch side) V_{rr}=600V, I_F=50A di/dt=890A/µs	T_j=25°C	-	110	-	ns
I_{rr}	Peak reverse recovery Current		T_j=25°C	-	55	-	A
Q_{rr}	Recovered charge		T_j=25°C	-	3.00	-	uC
E_{rr}	Reverse recovered energy		T_j=25°C	-	0.80	-	mJ
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-		0.652	°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=25A 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		-	140	-	nC
R_{Gint}	Internal gate resistor	f=1M, Vpp=1V	T_j=25°C	-	8.0	-	Ω
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V f=1MHz	T_j=25°C	-	1.08	-	nF
C_{oes}	Output Capacitance			-	0.17	-	nF
C_{res}	Reverse transfer Capacitance			-	0.12	-	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	-	-	100	nA
$t_{d(on)}$	Turn-on delay time	V_{CC}=600V I_C= 25A V_{GE}=+15V/-15V R_G=13☒ Inductive load	T_j=25°C	-	20	-	ns
t_r	Rise time		T_j=25°C	-	40	-	ns
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	280	-	ns
t_f	Fall time		T_j=25°C	-	210	-	ns
E_{on}	Turn-on power dissipation		T_j=25°C	-	1.8	-	mJ
E_{off}	Turn-off power dissipation		T_j=25°C	-	1.7	-	mJ
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	-	0.45	°C/W

HCG50PM120E7D1

1200V/50A PIM IGBT Module

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 =25A, 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=25A di/dt=1200A/µs	T_j=25°C	-	120	-	ns
I_{rr}	Peak reverse recovery Current		T_j=25°C	-	17	-	A
Q_{rr}	Recovered charge		T_j=25°C	-	1.3	-	uC
E_{rr}	Reverse recovered energy		T_j=25°C	-	0.4	-	mJ
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-		1.31	°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	50	A
I_{RMSM}	Maximum RMS current at rectifier output	T_C =80°C	100	A
I_{FSM}	Surge Current @t_p=10 ms	T_J =25°C	420	A
I^2t	I^2t - value	T_J =25°C	880	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 = 50A	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)					0.85	°C/W

HCG50PM120E7D1

1200V/50A PIM IGBT Module

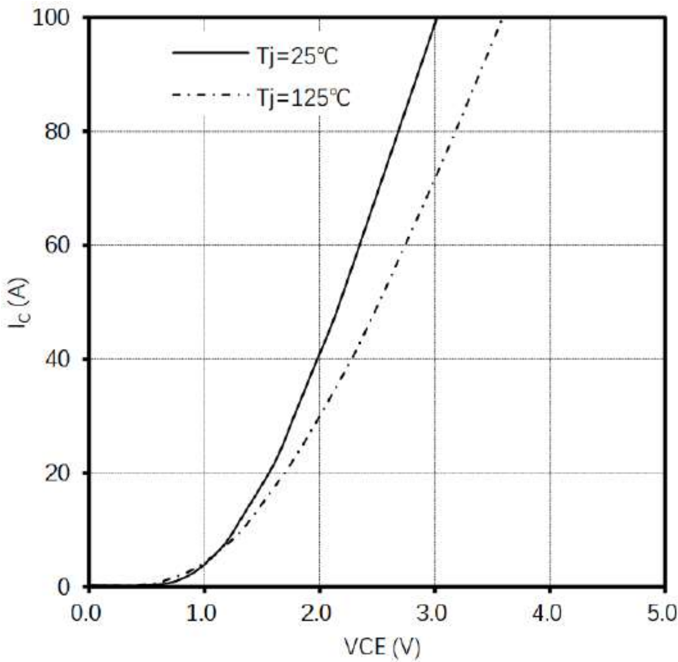


Fig 1. output characteristic IGBT，

$I_C=f(V_{CE})$, VGE=15V

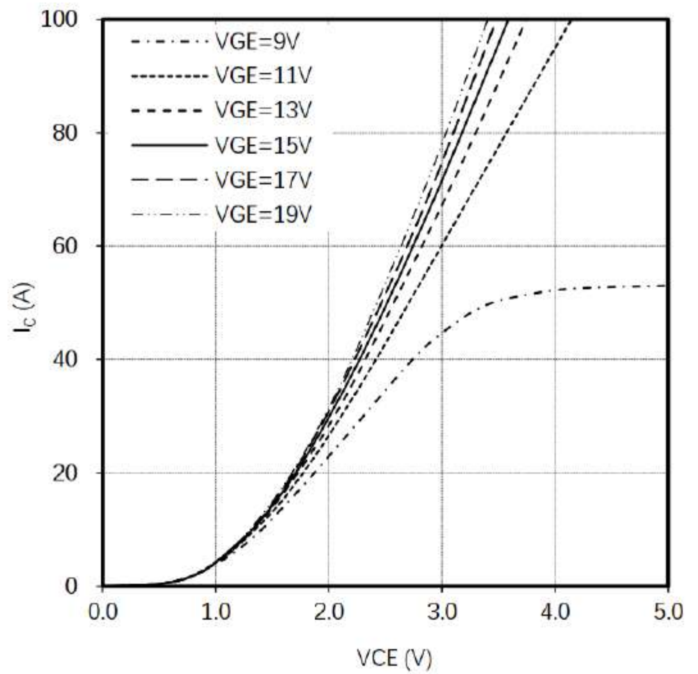


Fig 2. output characteristic IGBT，

$I_C=f(V_{CE}),T_j=125$℃

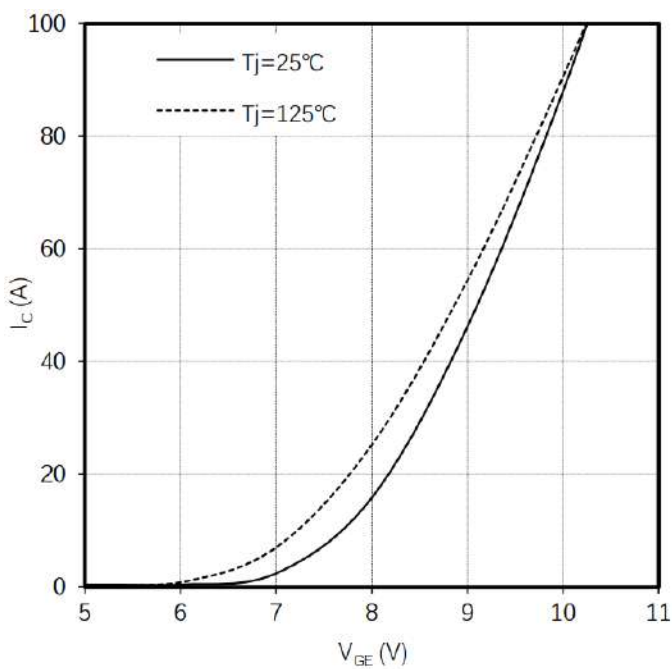


Fig 3. transfer characteristic IGBT，

$I_C=f(V_{GE})$, V_{CE}=20V

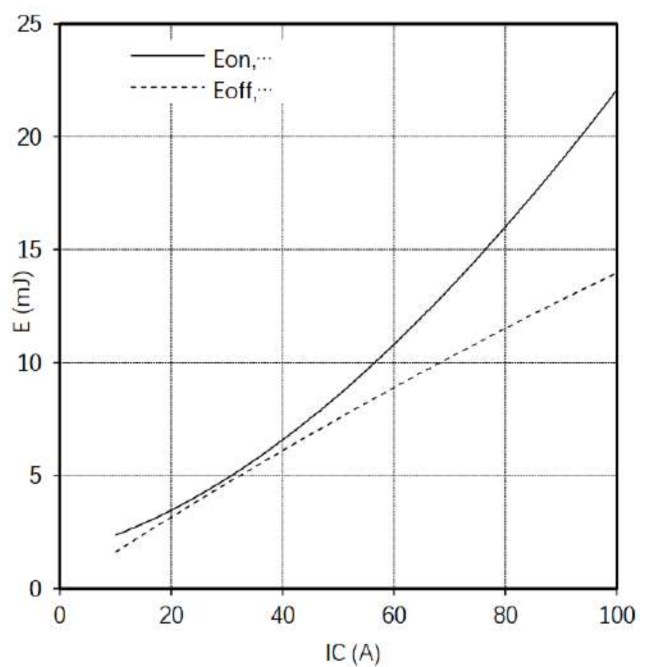


Fig 4. switching losses IGBT,

$E_{on}=f(I_C)$, $E_{off}=f(I_c)$,

VGE=±15V,RGon=18Ω,RGoff=18Ω,VCE=600V

HCG50PM120E7D1

1200V/50A PIM IGBT Module

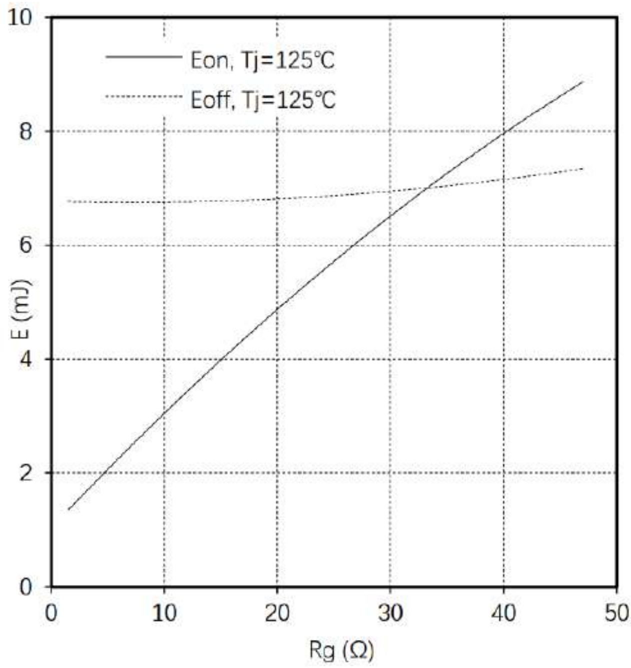


Fig 5. switching losses IGBT, $E_{on}=f(R_G)$,$E_{off}=f(R_G)$,

$V_{GE}=\pm15V$,$I_C=50A$,$V_{CE}=600V$

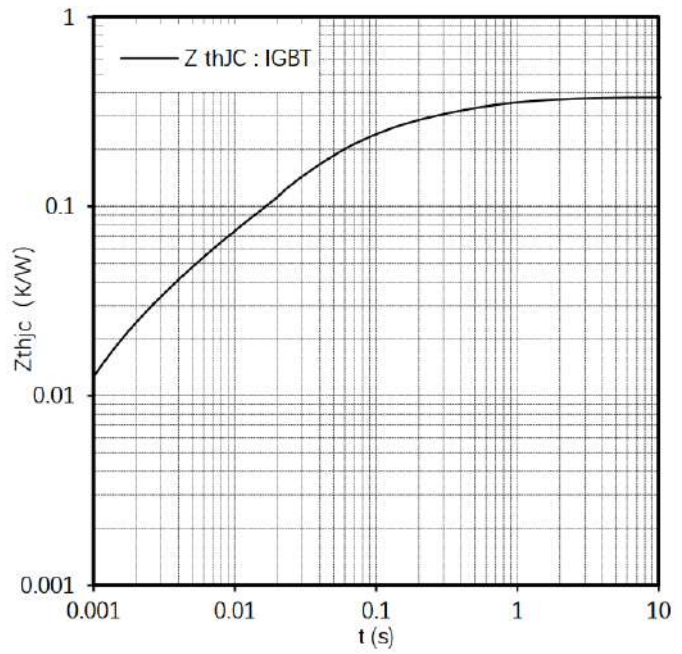


Fig 6. transient thermal impedance IGBT ,

Zthjc=f(t)

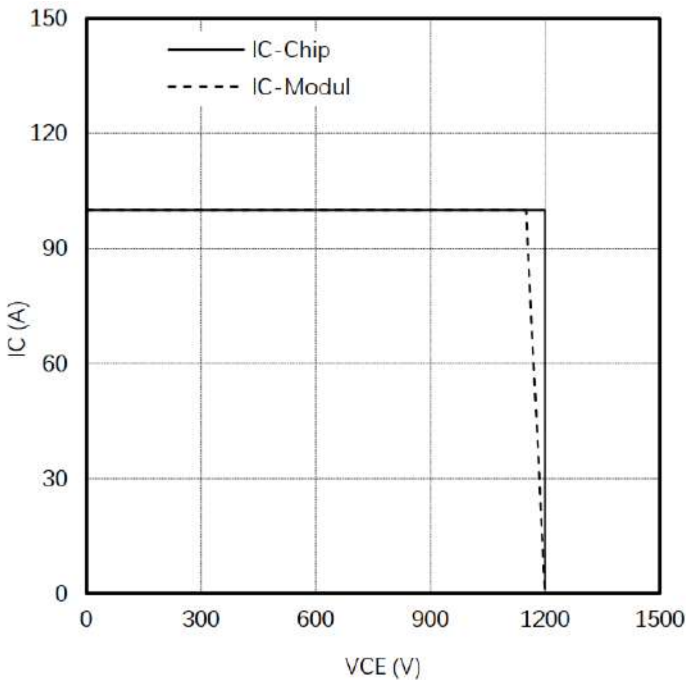


Fig 7. reverse bias safe operating area IGBT,

$I_C=f(V_{CE})$,$V_{GE}=\pm15V$,$R_{Goff}=18\Omega$，Tvj=125℃

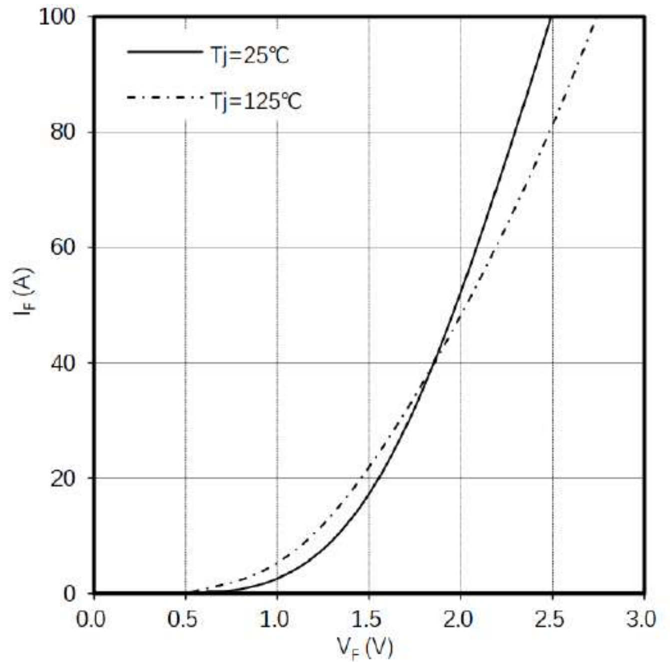


Fig 8. forward characteristic of Diode ，

$I_F=f(V_F)$

HCG50PM120E7D1

1200V/50A PIM IGBT Module

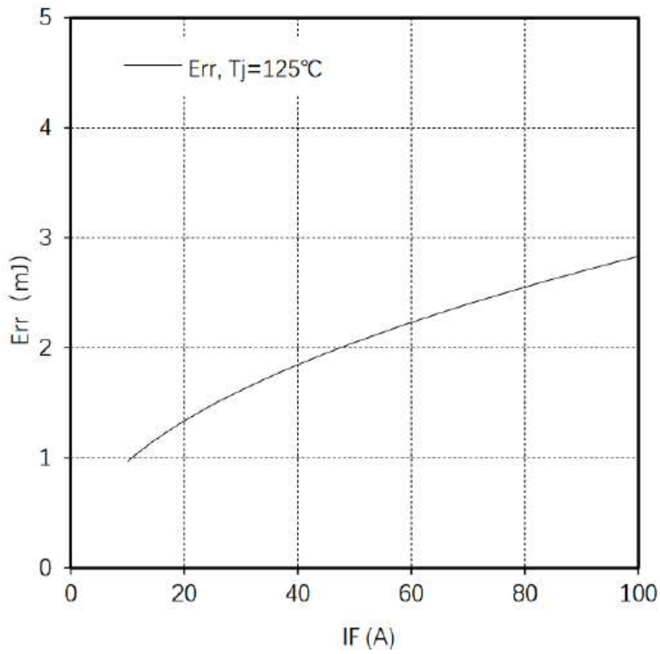


Fig9. switching losses Diode,

E_{rr}=f(I_F),,R_{Gon}=18Ω,V_{CE}=600V

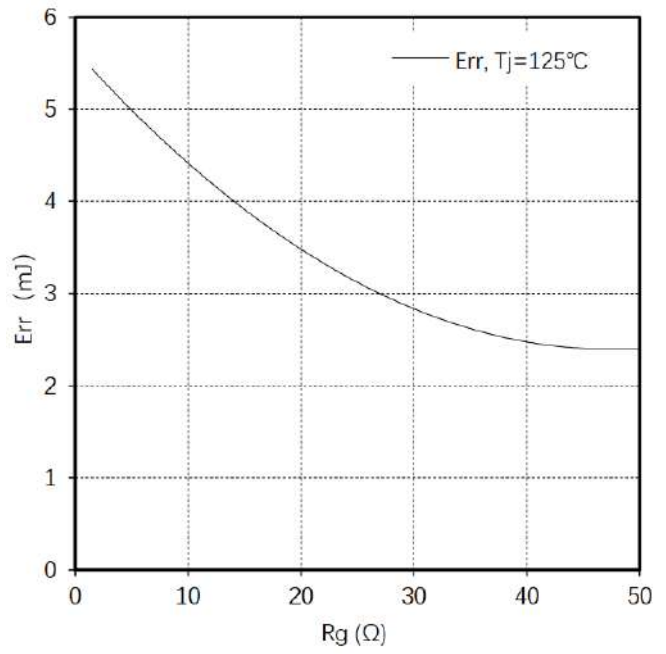


Fig 10. switching losses Diode,

E_{rr}=f(R_G),I_F=50A,V_{CE}=600V

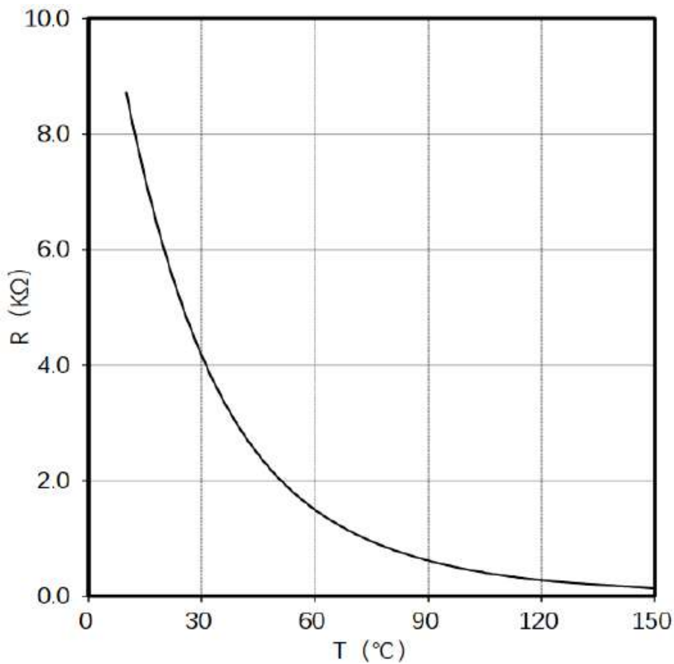


Fig11.NTC-Thermistor-temperature characteristic(typical)

HCG50PM120E7D1

1200V/50A PIM IGBT Module

IMPORTANT NOTICE：

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.

Changes to this product data sheet are reserved.

Please contact the sales staff (Email:sales@hiitio.com) for further information on the product, technology, delivery terms, conditions and prices.

Instruction note

Naming rules for power module product models（Industrial module）

Product Model

HC	G	100	FF	120	E3	A

Hecheng Code

Module type G : IGBT module
D : FRD module
S : SiC module
H : Si/SiC hybrid

Current level (A) 50~900

Topology structure FZ : A switch unit FF : Half bridge
FS : Three phase F4 : H Bridge
F3L : Three level DF : Boost Circuit
FD : Braking Circuit
FP : Rectification+Inverter+Control move
AL : ANPC CL : Chopper

Voltage level (x10)（V） 650~2200

Packaging form+features（A…Z）

A1： 34 mm	A2： 62 mm	
B1： Easy 1B	B1A	B1B…
B2： Easy 2B…	B3： Easy 3B…	
D1： Flow0	D2： Flow1	D3： Flow2
E0 : E0	E1： Econo 2…	E2： E2
E3： ED3	E4 : E4	E5 : ED3S
E6 : EPM2	E7 : EPM3	E8 : EconoPIM3
E9 : ED3H	F0 : F0	P2 : EPM2

Feature :A: Special Code Nil: Standard

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