HCH50DF120F0H1

1200V Dual Boost Hybrid Power Module

Description

The HCH50DF120F0H1 is a Dual Boost Power Module. It integrates high performance IGBT chips and SiC Diodes designed for the applications such as Solar Inverter, UPS, Fuel cell-DC/DC converter, Energy storage Systems.

Features

- Blocking voltage :1200V
- low saturation voltage $V_{CE(sat)}$
- SiC Diode
- 1600V Bypass and Anti-parallel Diodes
- Low Inductive Design
- Low thermal resistance
- Thermistor inside

Applications

- Solar Inverter
- Fuel cell-DC/DC converter
- Uninterruptible Power Supplier
- Energy Storage Systems

Circuit diagram

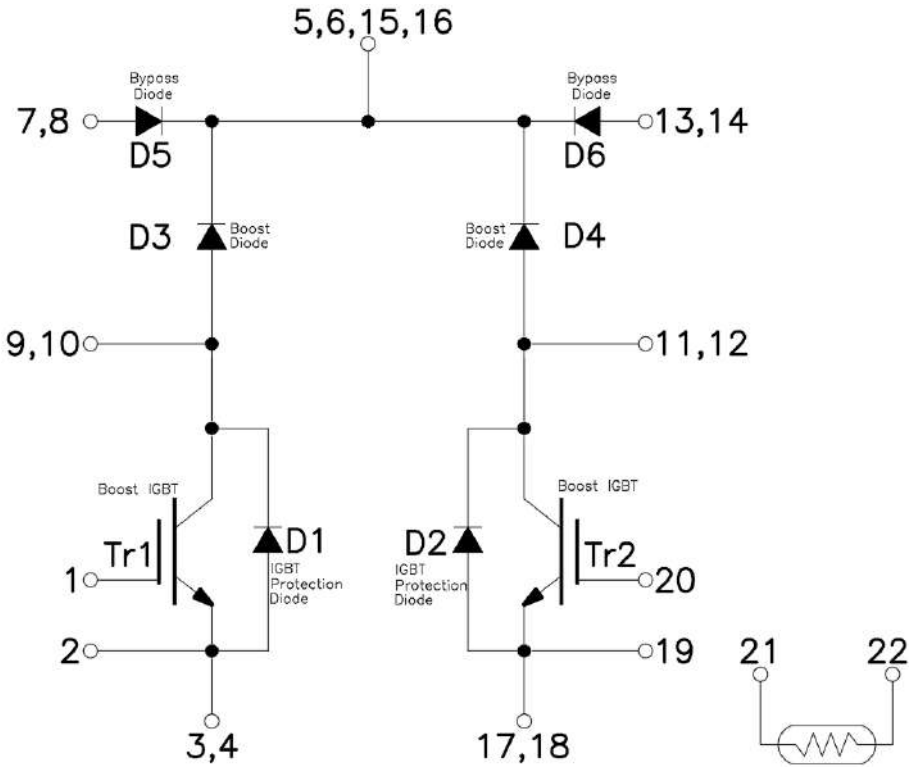

Figure 1. Out drawing & circuit diagram for DFH50CU12F0H1

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Pin Configuration and Marking Information

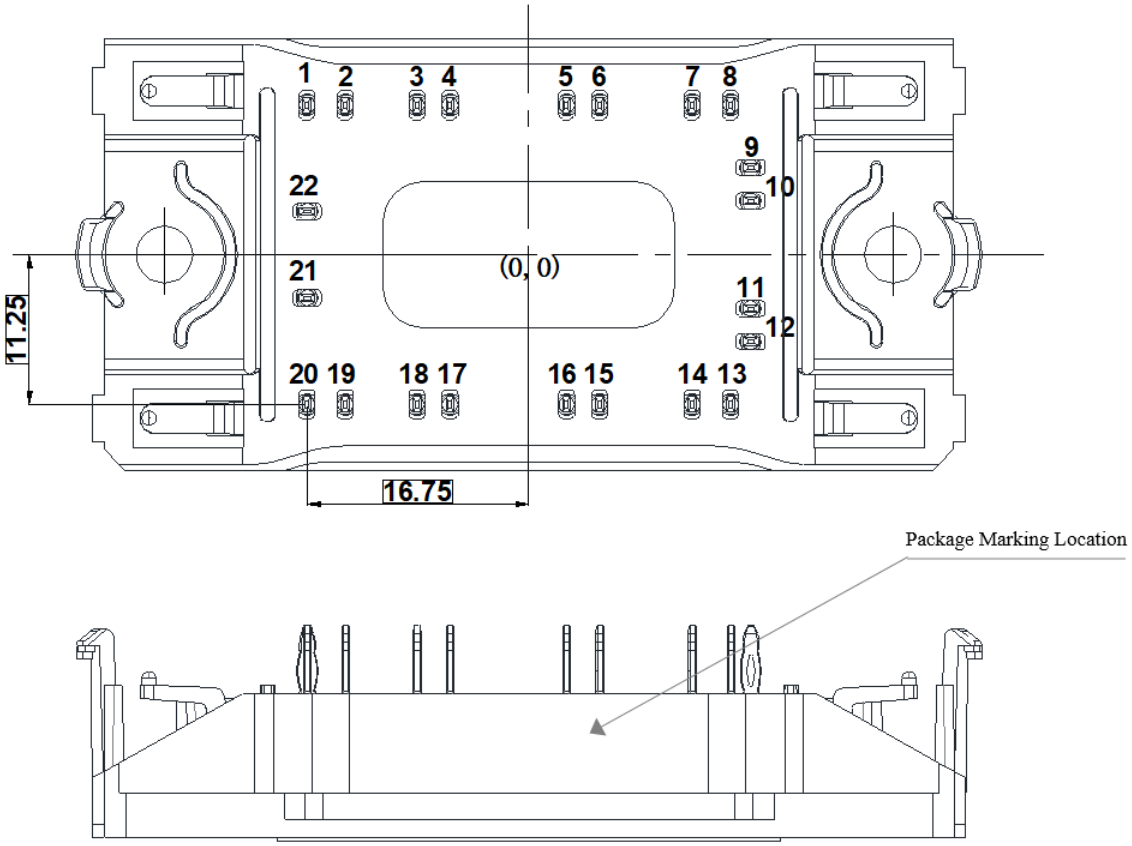

Figure 2. Pin configuration

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Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f =50Hz, t =1min	2.5	kV
Creepage distance	-	12.7	mm
Clearance	Press-fit pin	9.15	mm
Comparative Tracking Index	-	>200	-
Module lead resistance, terminals–chip	T_C = 25°C	0.8	mΩ
Weight	-	26.5	g

Thermistor Electrical characteristics

Symbol	Item	Condition	Value			Unit
			Min.	Typ.	Max	
R25	Nominal resistance	-	-	22	-	kΩ
R100	Nominal resistance	T =100°C	-	-	-	Ω
ΔR/R	Deviation of R25	-	-5	-	5	%
-	B-value	B(25/50) , tolerance ±3%	-	3950	-	K
-	B-value	B(25/100) , tolerance ±3%	-	3998	-	K
P_D	Power Dissipation	-	-	200	-	mW

Maximum Ratings (T_j =25℃unless otherwise specified) Boost IGBT

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V_{GES}	Gate-Emitter Voltage	C-E Short	±20	V
I_C	DC Continuous Collector Current	T_S =80°C	60	A
		T_C =80°C	75	A
I_{CM}	Pulse Collector Current	T_C =80°C, Note1	150	A
P_{tot}	Maximum Power Dissipation	T_S =80°C, T_j =175°C	190	W
		T_C =80°C, T_j =175°C	271	W
T_j	Junction temperature	-	-40 to 175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

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Boost Diode

Symbol	Parameter	Conditions	Ratings	Unit
V_{RRM}	Peak Repetitive Revers Voltage	-	1200	V
I_F	Continuous Forward Current	$T_j = T_{jmax}$, T_S <80°C	33	A
		$T_j = T_{jmax}$, T_C <80°C	37	A
I_{FSM}	Surge Forward Current	T_S =25°C	185	A
I^2t	Surge Current Capability	(60Hz single half-sine wave)	142	A^2s
P_{tot}	Total Power Dissipation	$T_j = T_{jmax}$, T_S <80°C	100	W
		$T_j = T_{jmax}$, T_C <80°C	118	W
T_{jmax}	Maximum Junction temperature	-	175	°C

Bypass Diode/Boost IGBT Protection Diode

Symbol	Parameter	Conditions	Ratings	Unit
V_{RRM}	Peak Repetitive Revers Voltage	-	1600	V
I_F	Continuous Forward Current	$T_j = T_{jmax}$, T_S <80°C	43	A
		$T_j = T_{jmax}$, T_C <80°C	50	A
I_{FRM}	Repetitive Peak Forward Current	$T_j = T_{jmax}$	200	A
P_{tot}	Total Power Dissipation	$T_j = T_{jmax}$, T_S <80°C	82	W
		$T_j = T_{jmax}$, T_C <80°C	100	W
T_{jmax}	Maximum Junction temperature	-	150	°C

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IGBT Electrical characteristics (T_j=25℃ 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	-	1.88	2.25	V
			T_j=150°C	-	2.45	-	V
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C=18mA, V_{CE}=V_{GE}		5.0	5.8	6.8	V
C_{ies}	Input capacitance	V_{CE}=25V, V_{GE}=0V, f=1MHz	T_j=25°C	-	5.3	-	nF
C_{res}	Reverse transfer Capacitance		T_j=25°C	-	0.12	-	nF
I_{CES}	Collector- Emitter Cut off Current	V_{CE}=1200V, V_{GE}=0V	T_j=25°C	-	-	0.2	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=20V, V_{CE}=0V	T_j=25°C	-	-	0.8	uA
$t_{d(on)}$	Turn-on delay time	V_{CC}=700V, I_C=50A, V_{GE}=+15V/-8V, R_G=5.0Ω, Inductive load	T_j=25°C	-	50	-	ns
			T_j=125°C	-	44	-	
t_r	Rise time		T_j=25°C	-	12	-	ns
			T_j=125°C	-	15	-	
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	148	-	ns
			T_j=125°C	-	173	-	
t_f	Fall time		T_j=25°C	-	170	-	ns
			T_j=125°C	-	217	-	
E_{on}	Turn-on power dissipation		T_j=25°C	-	0.54	-	mJ
			T_j=125°C	-	0.76	-	
E_{off}	Turn-off power dissipation		T_j=25°C	-	3.09	-	mJ
			T_j=125°C	-	4.32	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	0.35	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.15	-	°C/W

Assumes Thermal Conductivity of grease is 2.8 W/m·K and thickness is 50um.

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Boost Diode Electrical characteristics (T_j =25℃ unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_R	Breakdown Voltage	I_R =1mA		1200	-	-	V
I_R	Reverse Leakage Current	V_R =1200V	T_j =25°C	-	3	40	uA
			T_j =150°C	-	93	-	uA
V_F	Diode Forward Voltage	I_F =20A V_{GE} =0V	T_j =25°C	-	1.46	1.6	V
			T_j =150°C	-	2.03	2.65	
t_{rr}	Reverse recovery time	V_{CC} =700V I_C =50A V_{GE} =+15V/-8V R_G =5.0Ω	T_j =25°C	-	0.012	-	us
			T_j =125°C	-	0.016	-	
I_{RM}	Peak reverse recovery Current		T_j =25°C	-	6.0	-	A
			T_j =125°C	-	12.0	-	
Q_{rr}	Recovered charge		T_j =25°C	-	0.048	-	uC
			T_j =125°C	-	0.118	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.8	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.15	-	°C/W

Assumes Thermal Conductivity of grease is 2.8 W/m·K and thickness is 50um.

Bypass/Protection Diode Electrical characteristics(T_j =25℃ unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_R	Breakdown Voltage	I_R =5uA		1600	-	-	V
I_R	Reverse Leakage Current	V_R =1600V	T_j =25°C	-	-	5	uA
			T_j =150°C	-	-	1	mA
V_F	Diode Forward Voltage	I_F =16A	T_j =25°C	-	1.0	1.4	V
		V_{GE} =0V	T_j =150°C	-	0.9	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.7	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.15	-	°C/W

Assumes Thermal Conductivity of grease is 2.8 W/m·K and thickness is 50um.

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Test Conditions

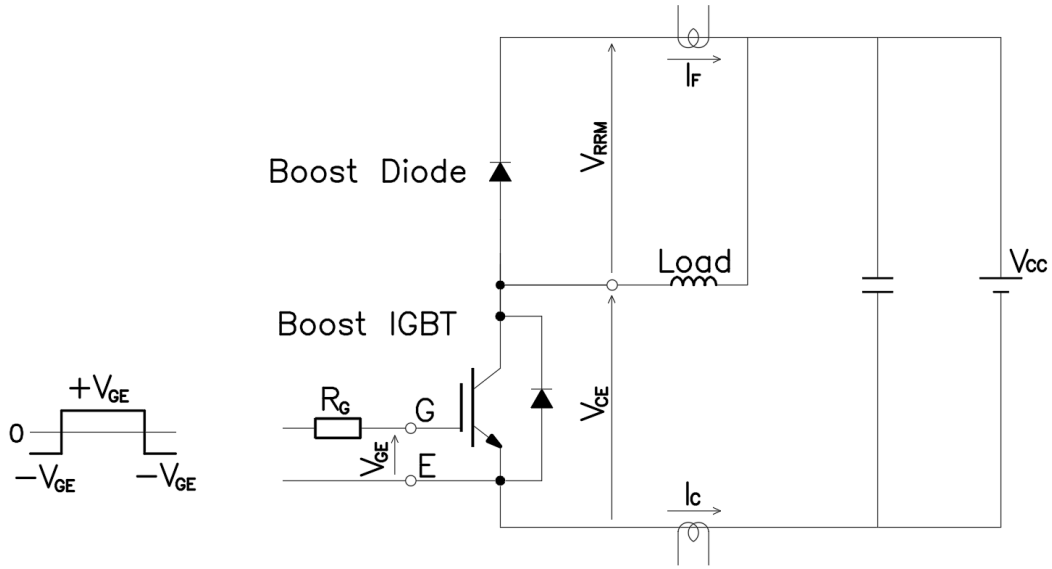

Figure 3. Switching time measure circuit

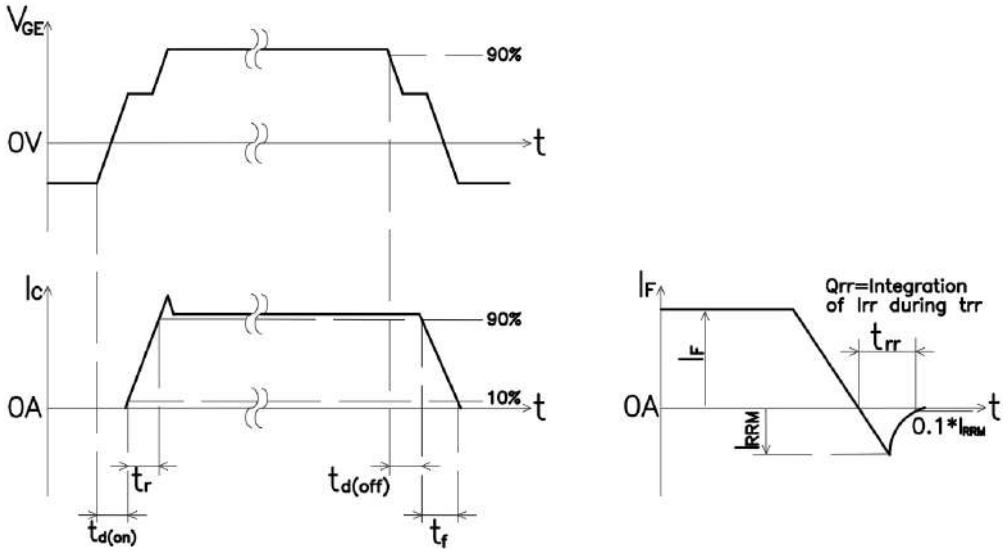

Figure 4. Switching time definition

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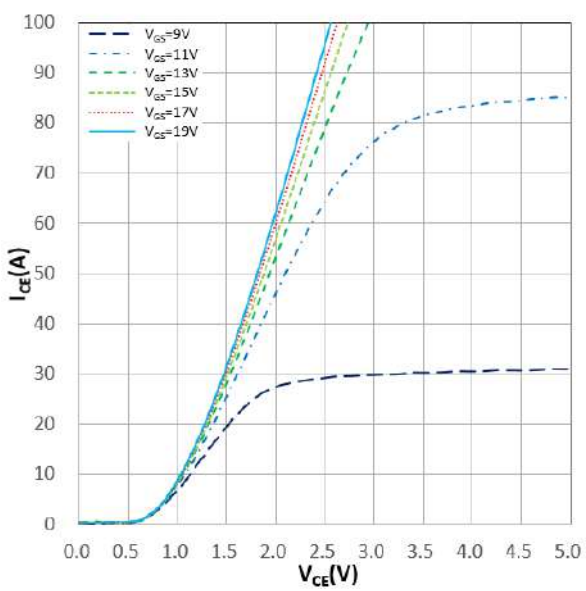

Figure 5. I_{CE} vs V_{CE}
T_j =25°C, V_{GE} parameter

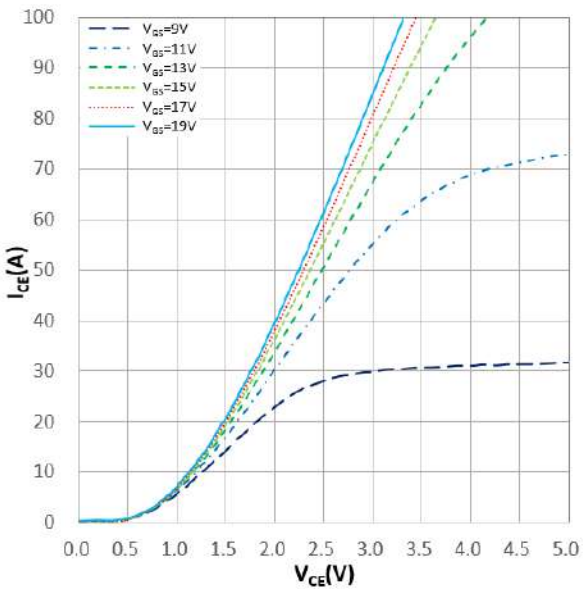

Figure 6. I_{CE} vs V_{CE}
T_j =125°C, V_{GE} parameter

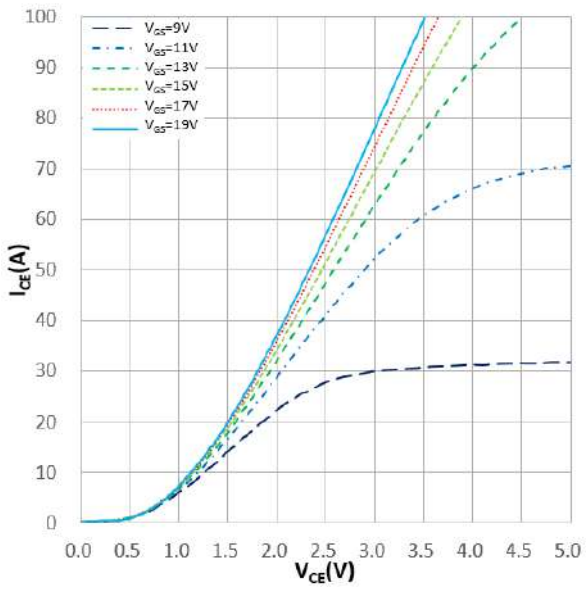

Figure 7. I_{CE} vs V_{CE}
T_j =150°C, V_{GE} parameter

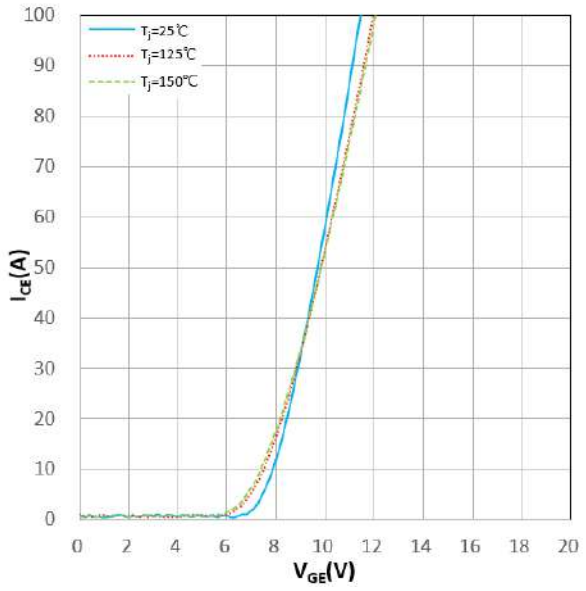

Figure8. I_{CE} vs V_{GE}
V_{CE} =10V, T_j parameter

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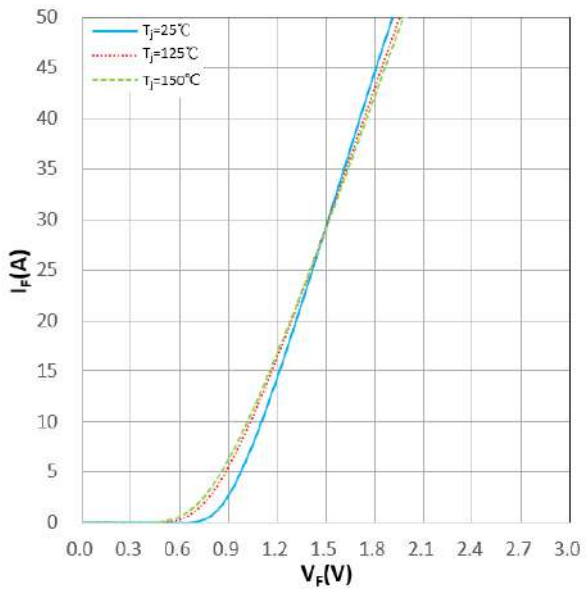

Figure9. I_F vs V_F for Bypass Diode

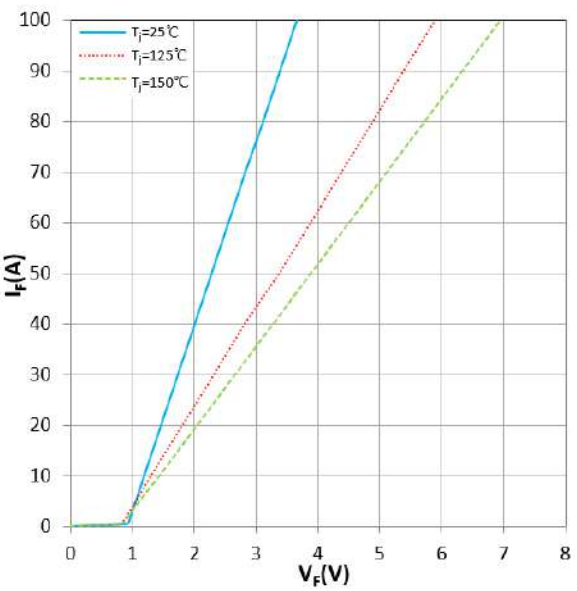

Figure10. I_F vs V_F for Boost Diode

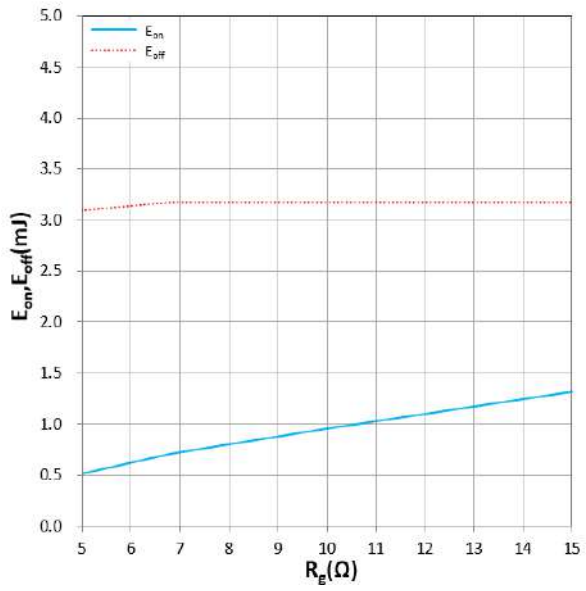

Figure 11. E_{on}, E_{off} vs R_g(Typ)
V_{CC}=700V, I_C=50A , V_{GE}=+15V/-8V, T_j=25°C
Inductive Load

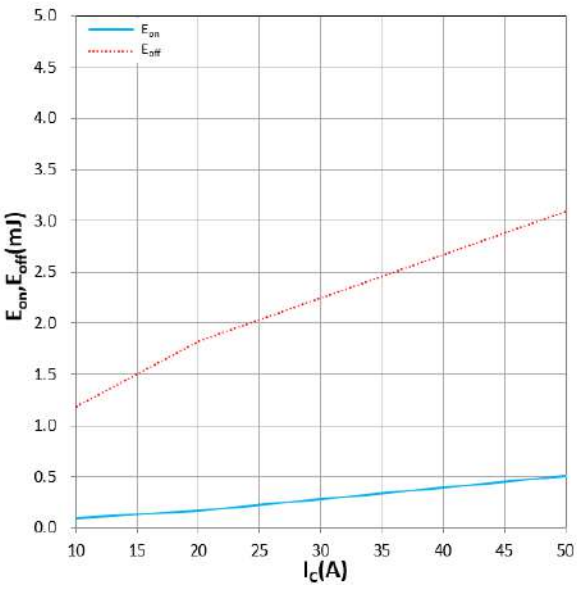

Figure 12. E_{on}, E_{off} vs I_C(Typ)
V_{CC}=700V, R_G=5Ω, V_{GE}=+15V/-8V, T_j=25°C
Inductive Load

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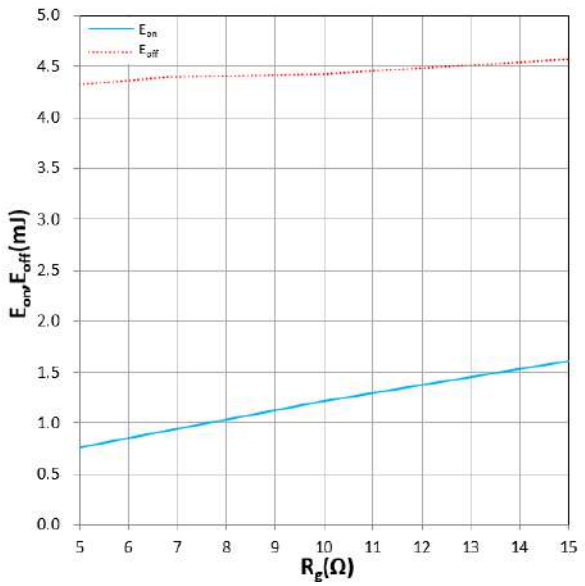

Figure 13. E_{on}, E_{off} vs R_g(Typ)
V_{CC}=700V, I_C=50A , V_{GE}=+15V/-8V, T_j=125°C
Inductive Load

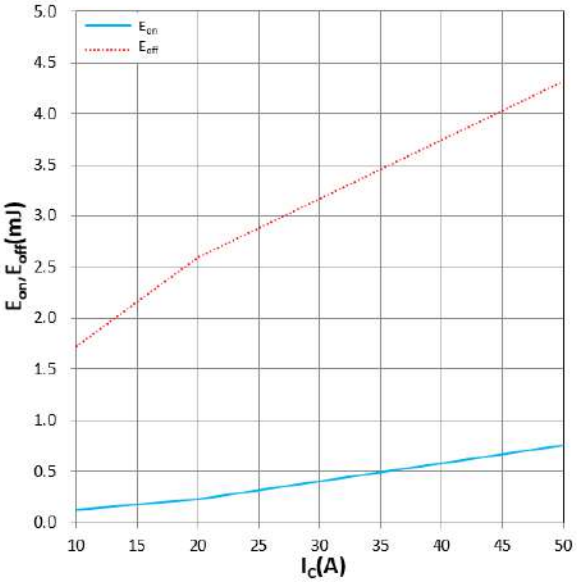

Figure 14. E_{on}, E_{off} vs I_C(Typ)
V_{CC}=700V, R_G=5Ω, V_{GE}=+15V/-8V, T_j=125°C
Inductive Load

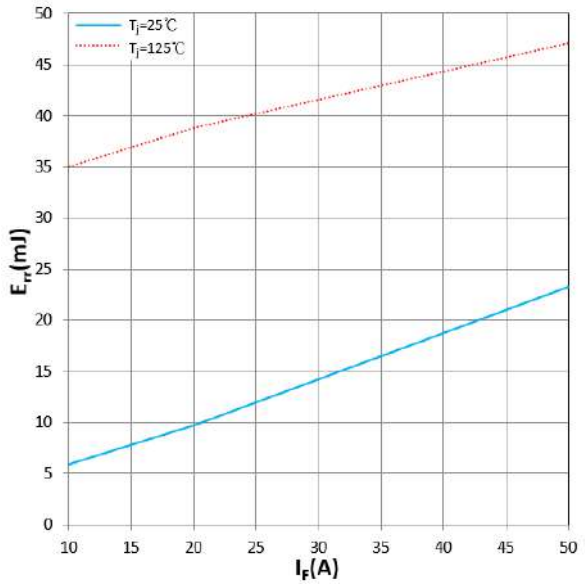

Figure 15. E_{rr} vs I_F
V_{RR}=700V, R_G=5Ω, V_{GE}=+15V/-8V
Inductive Load

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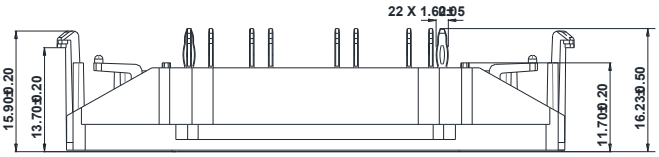
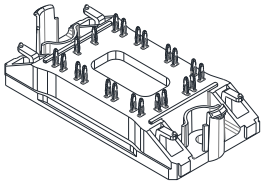
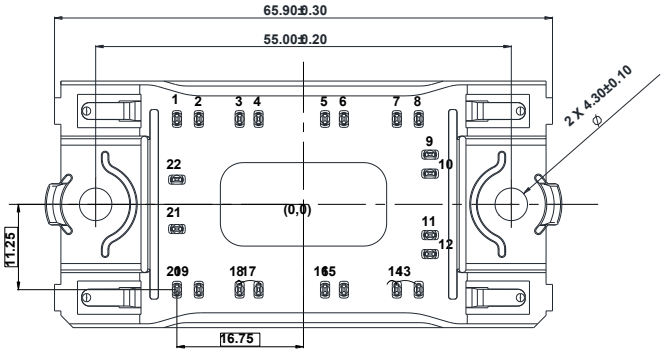
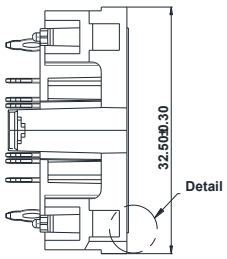
Package Dimensions

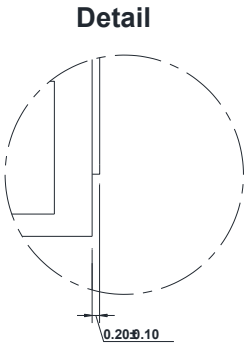
Pin Table		
Pin	X	Y
1	-16.75	11.25
2	-13.85	11.25
3	-8.45	11.25
4	-5.95	11.25
5	2.85	11.25
6	5.35	11.25
7	12.35	11.25
8	15.25	11.25
9	16.75	6.55
10	16.75	4.05
11	16.75	-4.05
12	16.75	-6.55
13	15.25	-11.25
14	12.35	-11.25
15	5.35	-11.25
16	2.85	-11.25
17	-5.95	-11.25
18	-8.45	-11.25
19	-13.85	-11.25
20	-16.75	-11.25
21	-16.75	-3.25
22	-16.75	3.25











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 (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
D0: Flow0 D1: Flow1 D2: Flow2
E1: Easy 1B E2: Easy 2B
E3: Econo Dual E4 : E4 E5 : ED3S
E6 : EconoPIM2 E7 : EconoPIM3
E9 : ED3H
F0 : F0

Feature :A: Special Code Nil: Standard

Zhejiang HIITIO New Energy Co., Ltd
ADD : NO.1125 Zhixing Road,Qiaonan District, Xiaoshan Economic and Technological Development Zone,Hangzhou,Zhejiang
TEL :400-667-9977