HCS06FF120E2A2

1200V/6.0mΩ Half Bridge SiC MOSFET Module

Description

The HCS06FF120E2A2 is a Half Bridge SiC MOSFET half bridge Power Module. It integrates high performance SiC MOSFET chipsdesigned for the applications such as Solar Inverter, UPS, Fuel cell-DC/DC converter, Energy storage Systems.

Features

- Blocking voltage:1200V
- $R_{ds(on)}$=6.0mΩ
- Low Switching Losses
- 175℃maximum junction
- temperature Thermistor inside

Applications

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

Circuit diagram

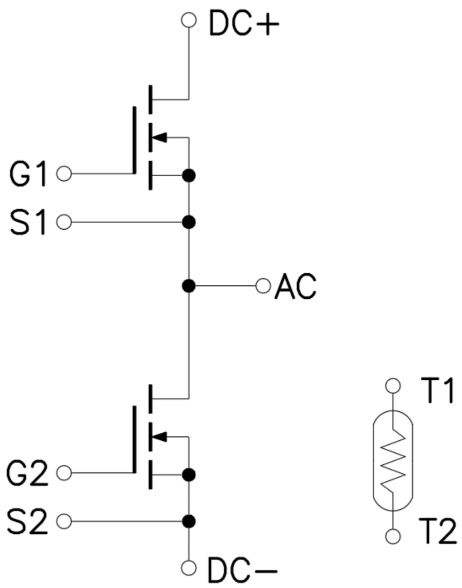

Figure 1. Out drawing & circuit diagramfor HCS06FF120E2A2

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Pin Configuration and Function Description

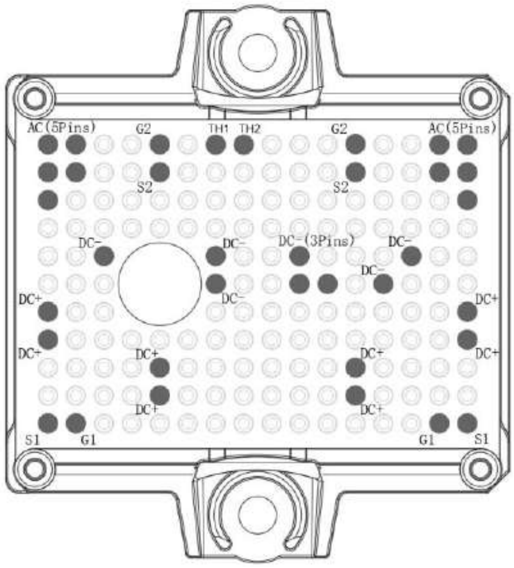

Figure 2. Pin configuration

PIN No.	Symbol	Description
1-5(5pins)	AC	Output terminal of half bridge
6	S2	Low side source signal terminal
7	G2	Low side gate signal terminal
8	TH1	Thermistor connection 1
9	TH2	Thermistor connection 2
10	S2	Low side source signal terminal
11	G2	Low side gate signal terminal
12-16(5pins)	AC	Output terminal of half bridge
17-24(8pins)	DC –	DC – Bus connection
25-32(8pins)	DC +	DC + Bus connection
33	S1	High side source signal terminal
34	G1	High side gate signal terminal
35	G1	High side gate signal terminal
36	S1	High side source signal terminal

Module

Parameter	Condition	Value	Unit
Isolation voltage	RMS, f =50Hz, t =1min	3.4	kV
Clearance	Terminal to Terminal	5	mm
	Terminal to Heatsink	10	mm
Creepage distance	Terminal to Terminal	6.3	mm
	Terminal to Heatsink	12.7	mm
Comparative Tracking Index	-	600	-

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Maximum Ratings (T_j=25• unless otherwise specified)

Symbol	Parameter	Condition	Ratings	Unit
V_{DSS}	Drain-Source Voltage	G-S Short	1200	V
V_{GSS}	Gate - Source Voltage (dynamic), T_{surge} <100ns	D-S Short, Note1	-8 to 19	V
V_{GSOP}	Gate - Source Voltage (static)	D-S Short, Note1	-4 to 15	
I_{DS}	DC Continuous Drain Current	T_f =90°C	200	A
I_{SD}	Source (Body diode) Current	T_f =90°C, with ON signal	200	A
I_{DP}	Drain Pulse Current, Peak	Less than 1ms, Note2	400	A
P_{tot}	Total Power Dissipation	T_C =25°C	1500	W
T_{jmax}	Max Junction Temperature	-	175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Recommended Operating Value, -4V/+15V

Note2: 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
$\Delta R/R$	Deviation of R_{100}	T_C =100°C, R_{100} =493 Ω	-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))]	-	3411	-	K
$B_{25/100}$	B-value	R2 =R25 exp [$B_{25/100}$(1/T2 - 1/(298,15 K))]	-	3433	-	K

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MOSFET Electrical characteristics(T_j=25• unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS} =0V, I_D =0.5mA		1200	-	-	V
I_{DSS}	Zero gate voltage drain Current	V_{DS} =1200V, V_{GS} =0V, T_j =25°C		-	5	250	μA
$V_{GS(th)}$	Gate-source threshold Voltage	I_D =67.5mA, V_{DS} =V_{GS}	T_j =25°C	1.8	2.8	3.7	V
			T_j 150°C	-	2.1	-	
			T_j 175°C	-	2.0	-	
I_{GSS+}	Gate-Source Leakage Current	V_{GS} =15V, V_{DS} =0V	T_j 25°C	-	5	1000	nA
I_{GSS-}		V_{GS} =-4V, V_{DS} =0V	T_j 25°C	-1000	-5	-	
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D =200A V_{GS} =15V	T_j 25°C	-	6.0	-	mΩ
			T_j =150°C	-	8.6	-	
			T_j =175°C	-	9.4	-	
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	I_D =200A V_{GS} =15V	T_j =25°C	-	1.20	-	V
			T_j =150°C	-	1.72	-	
			T_j =175°C	-	1.88	-	
C_{iss}	Input Capacitance	V_D =1000V, V_{GS} =0V, f =100KHz		-	15.35	-	nF
C_{oss}	Output Capacitance			-	0.65	-	nF
C_{rss}	Reverse transfer Capacitance			-	0.05	-	nF
Q_g	Total gate charge	V_{DD} =800V, I_D =200A, V_{GS} =-4/+15V		-	670	-	nC
Q_{GS}	Gate-source charge			-	210	-	
Q_{GD}	Gate-drain charge			-	265	-	
R_{Gint}	Internal Gate Resistance	f =1MHz		-	1.2	-	⊠
$t_{d(on)}$	Turn-on delay time	V_{DD} =600V I_D =200A V_{GS} =-4/+15V $R_{G(on)}$ =2.2Ω $R_{G(off)}$ =2.2Ω Inductive load switching operation	T_j =25°C=	-	23	-	ns
			T_j 150°C=	-	19	-	
t_r	Rise time		T_j 25°C=	-	28	-	ns
			T_j 150°C=	-	24	-	
$t_{d(off)}$	Turn-off delay time		T_j 25°C=	-	42	-	ns
			T_j 150°C=	-	46	-	
t_f	Fall time		T_j 25°C=	-	14	-	ns
			T_j 150°C=	-	11	-	
E_{on}	Turn-on power dissipation		T_j 25°C=	-	6.15	-	mJ
			T_j 150°C=	-	7.26	-	
E_{off}	Turn-off power dissipation		T_j 25°C=	-	1.03	-	mJ
			T_j 150°C	-	0.78	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.10	-	K/W
$R_{th(c-f)}$	Contact thermal Resistance	With thermal conductive grease, Note3		-	0.12	-	K/W

Note3:Assumes Thermal Conductivity of grease is 2.8 W/m・K and thickness is 50um.

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Body Diode Electrical characteristics (T_j=25• unless otherwise specified, chip:Target)

Symbol	Item	Condition		Value Min.	Value Typ.	Value Max	Unit
V_{SD}	Body Diode Forward Voltage	V_{GS} =-4V I_{SD} =200A	T_j=25°C	-	4.3	-	V
			T_j=150°C	-	3.9	-	
			T_j=175°C	-	3.8	-	
T_{rr}	Reverse recovery time	V_{DD} =600V I_D =200A V_{GS} =-4/+15V R_{GON} =R_{GOFF} =2.2 Ω Inductive load switching operation	T_j=25°C	-	30	-	ns
			T_j=150°C	-	33	-	
Q_{rr}	Reverse recovery charge		T_j=25°C	-	2.67	-	μC
			T_j=150°C	-	5.24	-	
E_{rr}	Diode switching power dissipation		T_j=25°C	-	1.24	-	mJ
			T_j=150°C	-	2.31	-	

Test Conditions

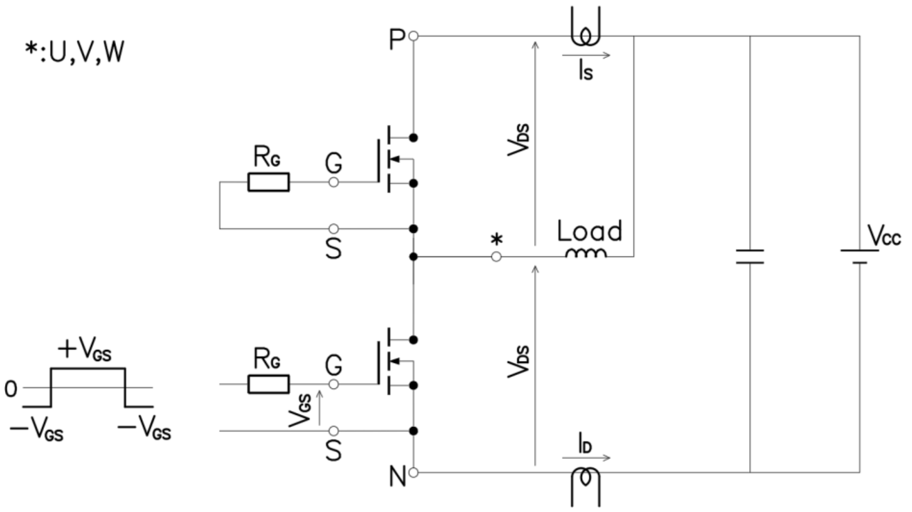

Figure 3. Switching time measure circuit

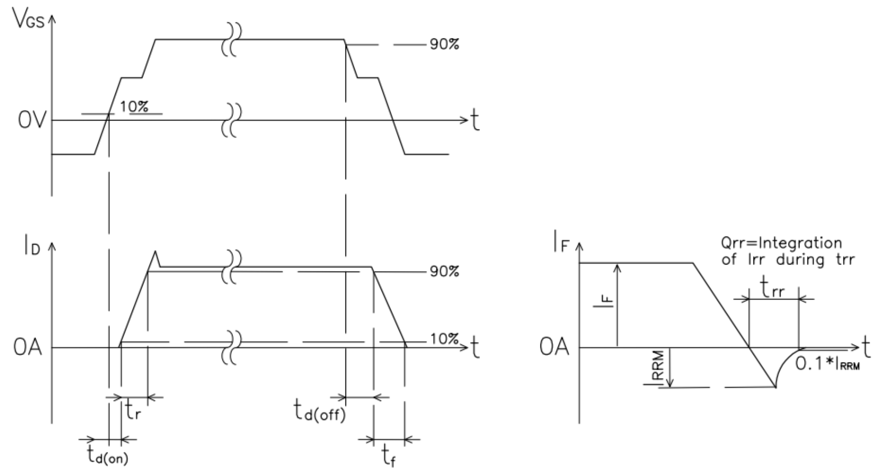

Figure 4. Switching time definition

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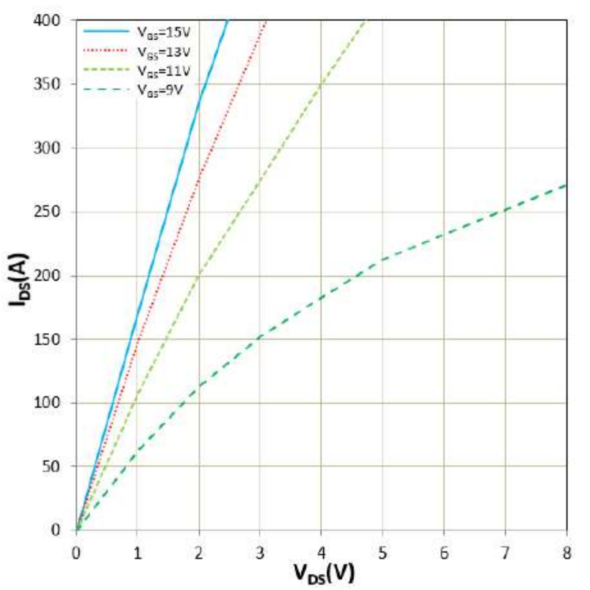

Figure 5. I_{DS} vs V_{DS}

T_j =25°C

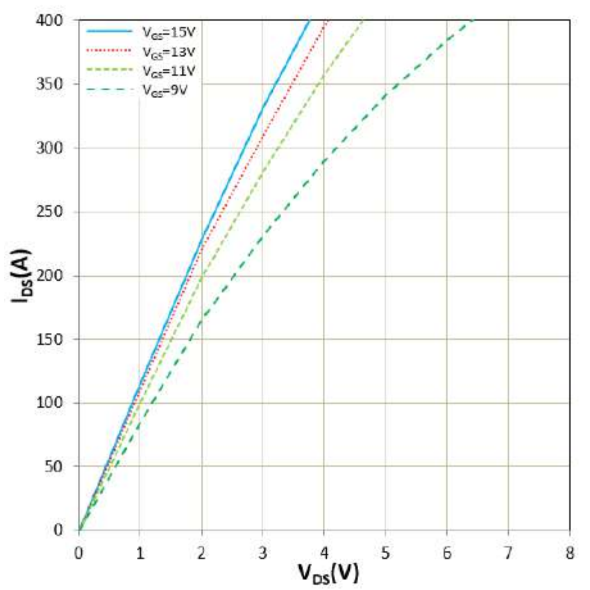

Figure 6. I_{DS} vs V_{DS}

T_j =175°C

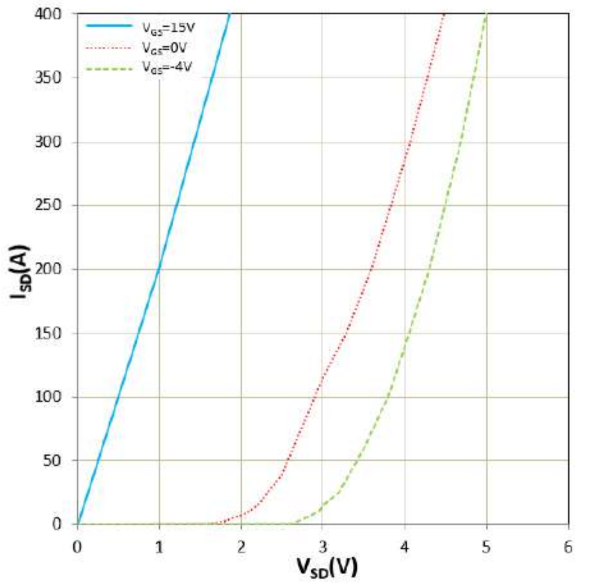

Figure 7. I_{SD} vs V_{SD}

T_j =25°C

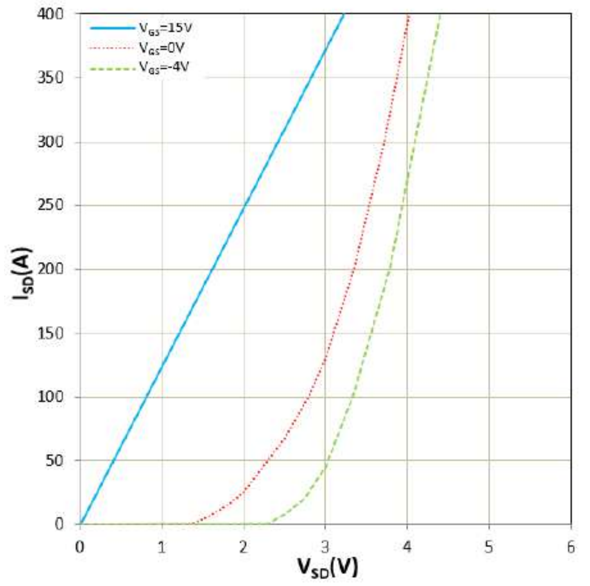

Figure8. I_{SD} vs V_{SD}

T_j =175°C

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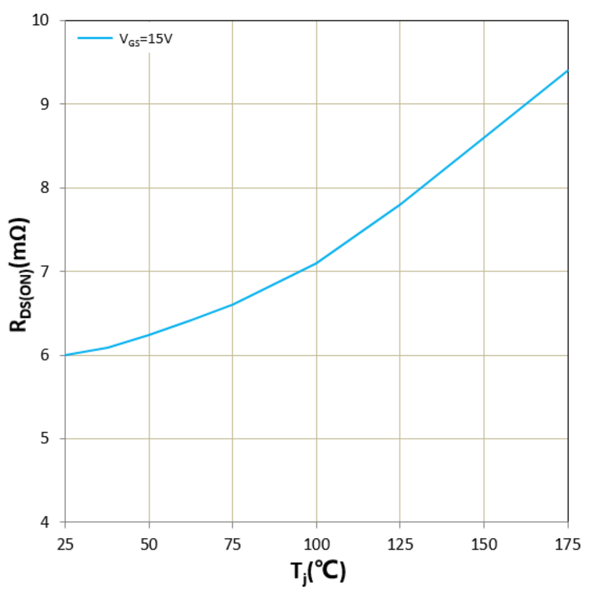

Figure 9. $R_{DS(ON)}$ vs T_j

I_D =200A

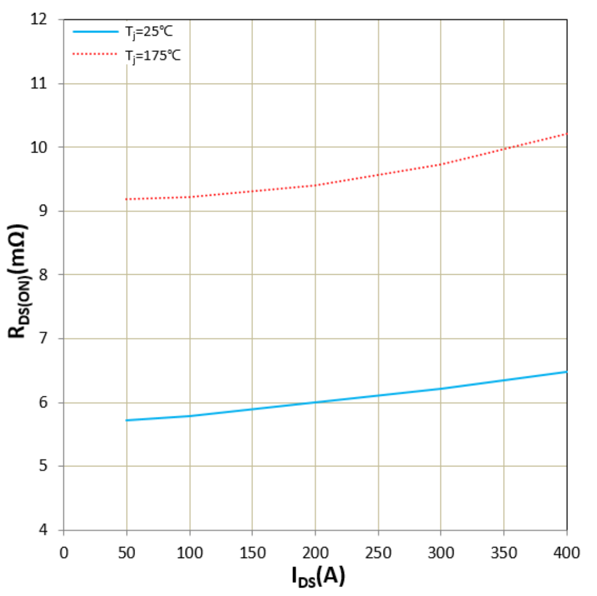

Figure 10. $R_{DS(ON)}$ vs I_{DS}

V_{GS} =+15V

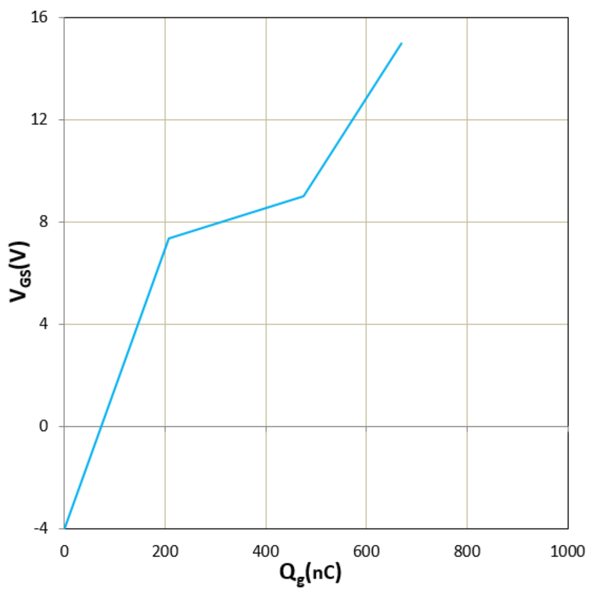

Figure 11. V_{GS} vs Q_g

T_j =25°C, V_{DS} =800V, I_D =200A

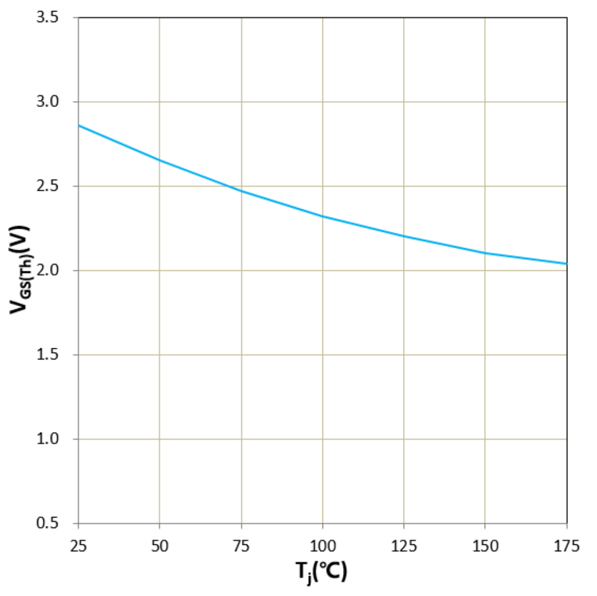

Figure 12. $V_{GS(TH)}$ vs T_j

V_{GS} =V_{DS}, I_D =67.5mA

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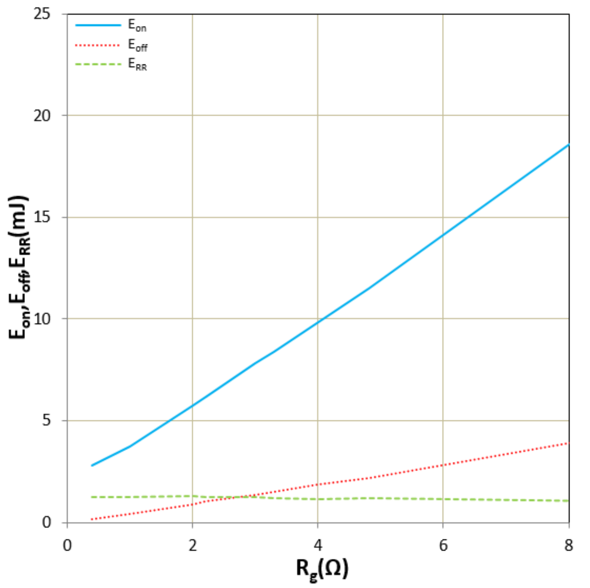

Figure 13. E_{on}, E_{off}, E_{rr} vs R_g
T_j =25°C, V_{DD} =600V, I_D =200A, V_{GS} =-4V/+15V
Inductive Load

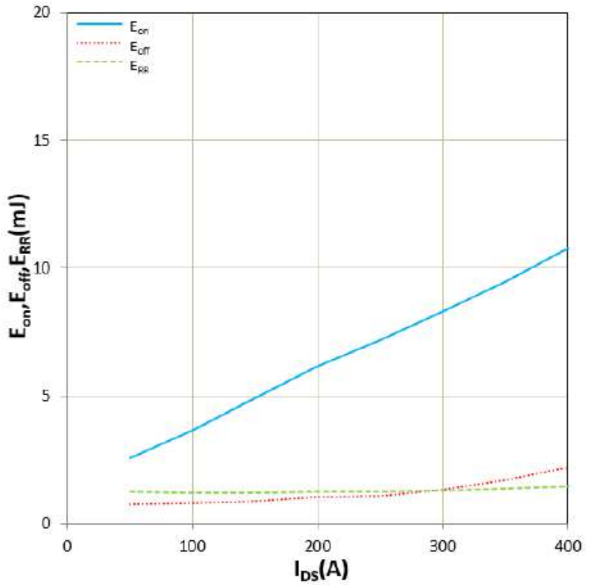

Figure 14. E_{on}, E_{off}, E_{rr} vs I_{DS}
T_j =25°C, V_{DD} =600V, R_g =2.2⊠ V_{GS} =-4V/+15V
Inductive Load

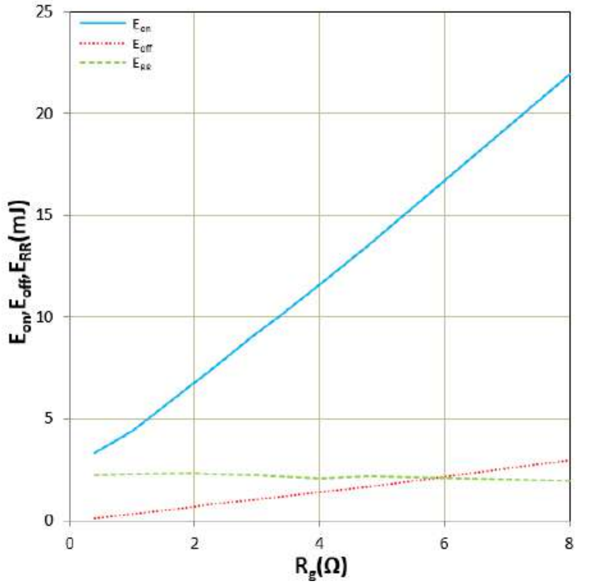

Figure 15. E_{on}, E_{off}, E_{rr} vs R_g
T_j =150°C, V_{DD} =600V, I_D =200A, V_{GS} =-4V/+15V
Inductive Load

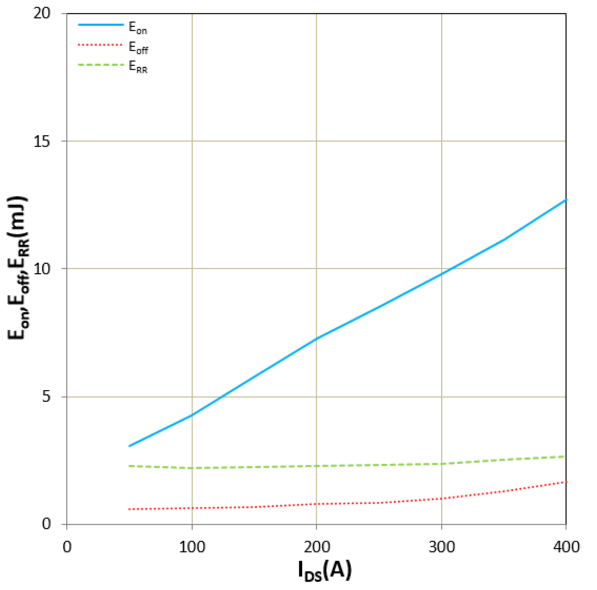

Figure 16. E_{on}, E_{off}, E_{rr} vs I_{DS}
T_j =150°C, V_{DD} =600V, R_g =2.2⊠ V_{GS} =-4V/+15V
Inductive Load

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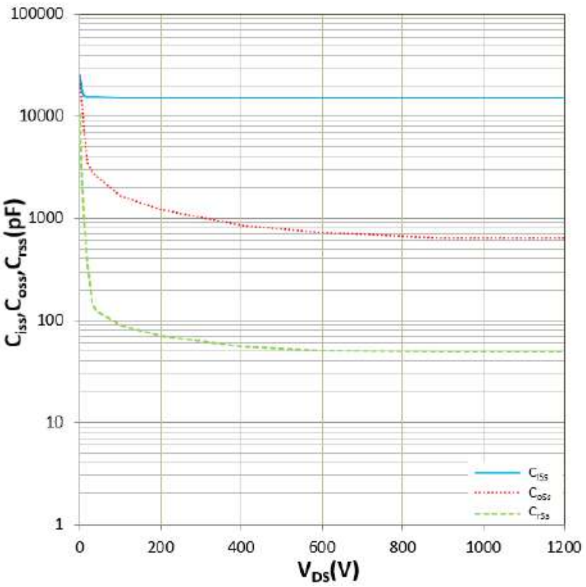	
Figure 17. C_{iss}, C_{oss}, C_{rss} vs V_{DS} V_{GS} =0V, f =100KHz, T_j =25°C	

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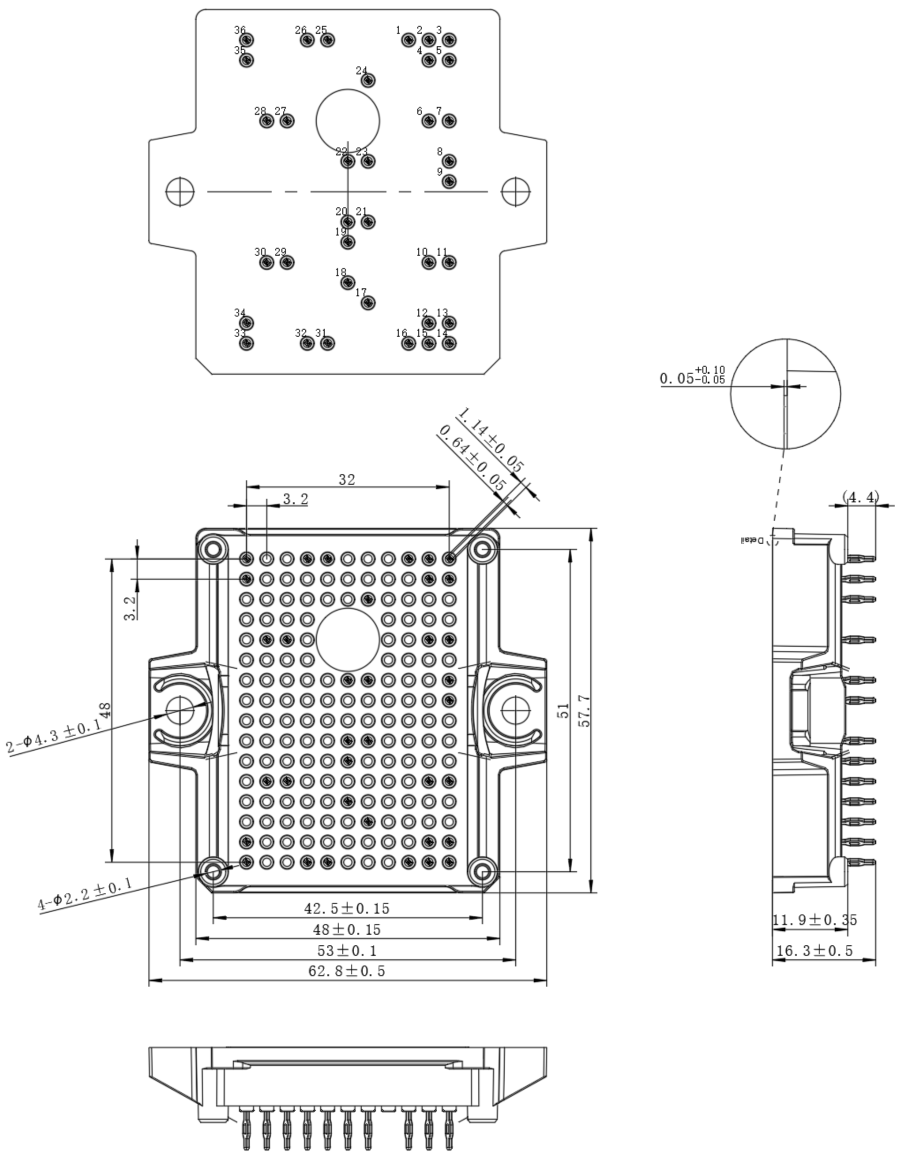
Package dimensions



Pin	X	Y
1	25,6	48
2	28,8	48
3	32	48
4	28,8	44,8
5	32	44,8
6	28,8	35,2
7	32	35,2
8	32	28,8
9	32	25,6
10	28,8	12,8
11	32	12,8
12	28,8	3,2
13	32	3,2
14	32	0
15	28,8	0
16	25,6	0
17	19,2	6,4
18	16	9,6
19	16	16
20	16	19,2
21	19,2	19,2
22	16	28,8
23	19,2	28,8
24	19,2	41,6
25	12,8	48
26	9,6	48
27	6,4	35,2
28	3,2	35,2
29	6,4	12,8
30	3,2	12,8
31	12,8	0
32	9,6	0
33	0	0
34	0	3,2
35	0	44,8
36	0	48

Unit: mm

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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	S	06	FF	120	E2	A2

Hecheng Code

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

On-state resistance (mΩ) 01~80

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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