HCS10FF120E0A2

1200V/10mΩ Half Bridge SiC MOSFET Module

Description

The HCS10FF120E0A2 is a Half Bridge SiC MOSFET Power Module. It integrates high performance SiC MOSFET chips designed for the applications such as Solar Inverter, UPS, Fuel cell-DC/DC converter,Energy storage Systems.

Features

- Blocking voltage:1200V
- $R_{ds(on)}$=10.1mΩ
- Low Switching Losses
- 175maximum junction temperature
- Thermistor inside

Applications

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

Circuit diagram

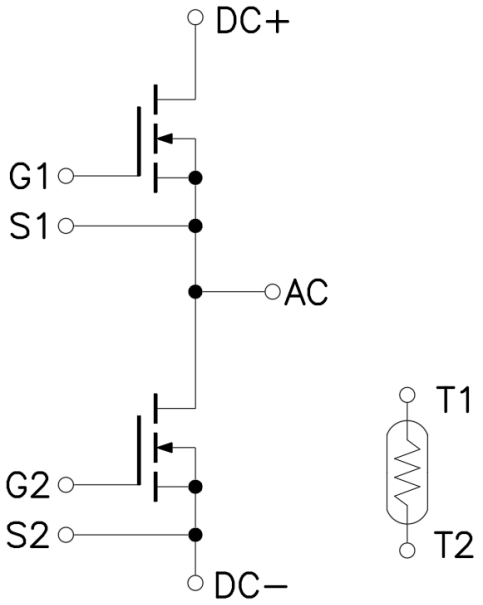


Figure 1. Out drawing & circuit diagramfor HCS10FF120E0A2

HCS10FF120E0A2

1200V/10mΩ Half Bridge SiC MOSFET Module

Pin Configuration and Marking Information

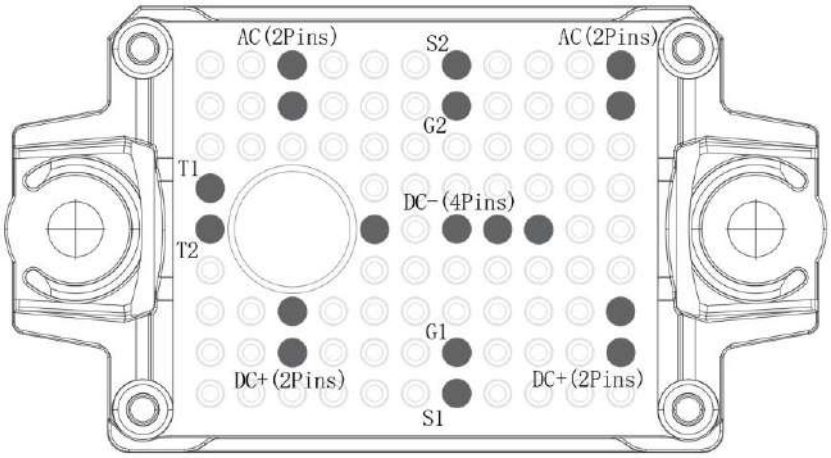


Figure 2. Pin configuration

Symbol	Description
AC	Output terminal of half bridge
S2	Low side source signal terminal
G2	Low side gate signal terminal
DC+	DC+ Bus connection
DC–	DC– Bus connection
S1	High side source signal terminal
G1	High side gate signal terminal
T1	Thermistor connection 1
T2	Thermistor connection 2

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	-	400	-
Weight	-	24	g

HCS10FF120E0A2

1200V/10mΩ Half Bridge SiC MOSFET Module

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

Symbol	Parameter	Condition	Ratings	Unit
V_{DSS}	Drain-Source Voltage	G-S Short	1200	V
$V_{GS,max}$	Gate-Sourse Voltage	D-S Short, Note1	-8/+19	V
I_{DS}	DC Continuous Drain Current	T_f =75°C , V_{GS} =18V	100	A
I_{SD}	Source (Body Diode) Current	T_f =75°C, with ON signal	100	A
I_{DSM}	Pulse Drain Current	T_C =100°C, Pulse width =1ms, V_{GS} =15V, Note2	200	A
P_{tot}	Total Power Dissipation	T_C =25°C	440	W
T_j	junction temperature	-	-40 to 175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

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

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
☒R/R	Deviation of R_{100}	T_C =100°C, R_{100} =493☒	-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

HCS10FF120E0A2

1200V/10mΩ Half Bridge SiC MOSFET Module

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

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS} =0V, I_D =400μA		1200	-	-	V
I_{DSS}	Zero gate voltage drain Current	V_{DS} =1200V, V_{GS} =0V		-	-2	200	μA
$V_{GS(th)}$	Gate-source threshold Voltage	I_D =40mA, V_{DS} =V_{GS}	T_j =25°C	1.8	.61	-	V
			T_j =175°C	-	.9	-	V
I_{GSS+}	Gate-Source Leakage Current	V_{GS} =15V, V_{DS} =0V, T_j =25°C		-	10	800	nA
I_{GSS-}		V_{GS} = -4V, V_{DS} =0V, T_j =25°C		-800	-10	-	nA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D =100A , V_{GS} =15V	T_j =25°C	-	10.1	-	mΩ
			T_j =175°C	-	18.8	-	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	I_D =100A , V_{GS} =15V	T_j =25°C	-	1.01	-	V
			T_j =175°C	-	1.88	-	V
C_{iss}	Input Capacitance	V_{DS} =1000V, V_{GS} =0V, f =100kHz, T_j =25°C		-	9200	-	pF
C_{oss}	Output Capacitance			-	475	-	pF
C_{rss}	Reverse transfer Capacitance			-	29	-	pF
Q_G	Total gate charge	V_{DD} =800V, I_D =100A, V_{GS} =-4/+15V		-	398	-	nC
R_{Gint}	Internal Gate Resistance	T_j =25°C		-	1.5	-	Ω
$t_{d(on)}$	Turn-on delay time	V_{DD} =600V I_D =100A V_{GS} =+15/-4V R_{gon} = R_{goff} =5.1Ω Inductive load switching operation	T_j =25°C	-	23	-	ns
			T_j =150°C	-	21	-	
t_r	Rise time		T_j =25°C	-	18	-	ns
			T_j =150°C	-	15	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	33	-	ns
			T_j =150°C	-	21	-	
t_f	Fall time		T_j =25°C	-	15	-	ns
			T_j =150°C	-	14	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	1050	-	μJ
			T_j =150°C	-	1455	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	245	-	μJ
			T_j =150°C	-	350	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case/MOSFET		-	0.34	-	K/W
$R_{th(c-f)}$	Contact thermal resistance	With thermal conductive grease /MOSFET		-	0.15	-	K/W

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

HCS10FF120E0A2

1200V/10mΩ Half Bridge SiC MOSFET Module

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

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_{SD}	Body Diode Forward Voltage	V_{GS} =-4V I_{SD} =100A	T_j=25°C	-	4.6	-	V
			T_j=175°C	-	4.1	-	
T_{rr}	Reverse recovery time	V_{RR}=600V, I_D=100A V_{GS}=+15/-4V R_{gon} = R_{goff}=5.1 Ω Inductive load switching operation	T_j=25°C	-	23	-	ns
			T_j=150°C	-	24	-	
Q_{rr}	Reverse recovery charge		T_j=25°C	-	0.44	-	μC
			T_j=150°C	-	0.76	-	
E_{rr}	Diode switching power dissipation		T_j=25°C	-	450	-	μJ
			T_j=150°C	-	890	-	

Test Conditions

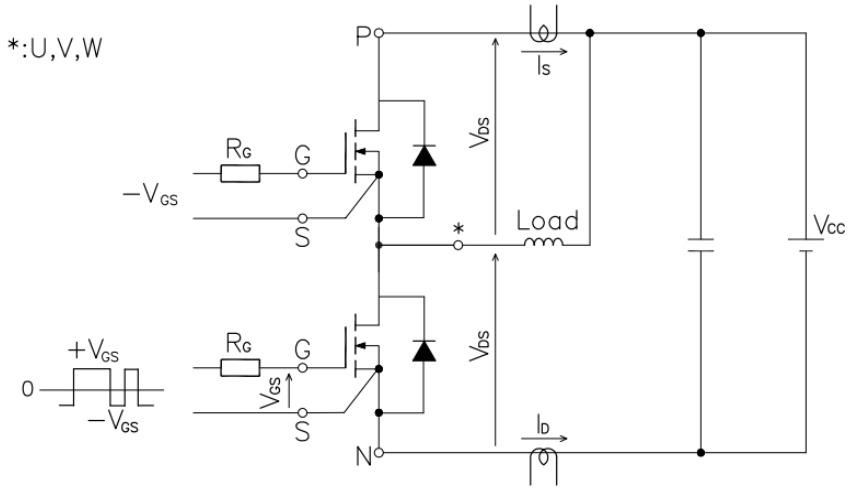


Figure 3. Switching time measure circuit

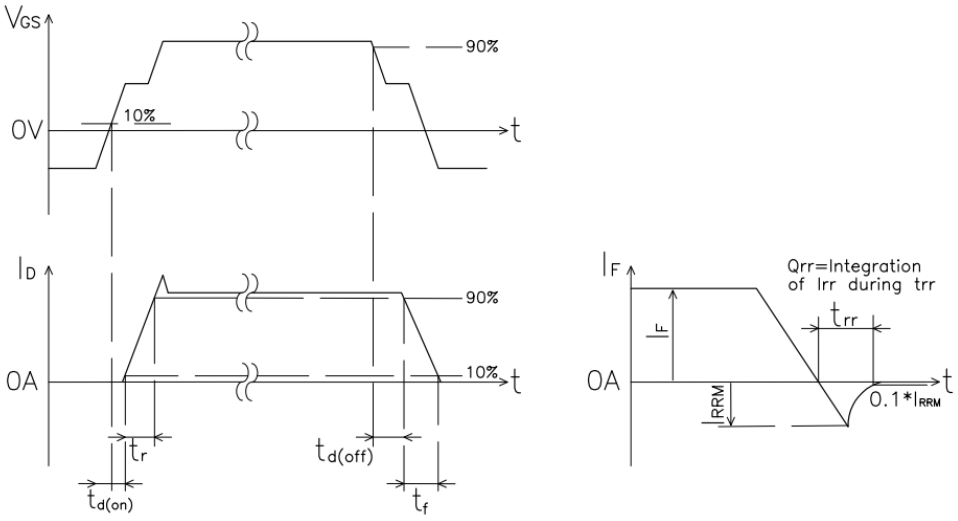


Figure 4. Switching time definition

HCS10FF120E0A2

1200V/10mΩ Half Bridge SiC MOSFET Module

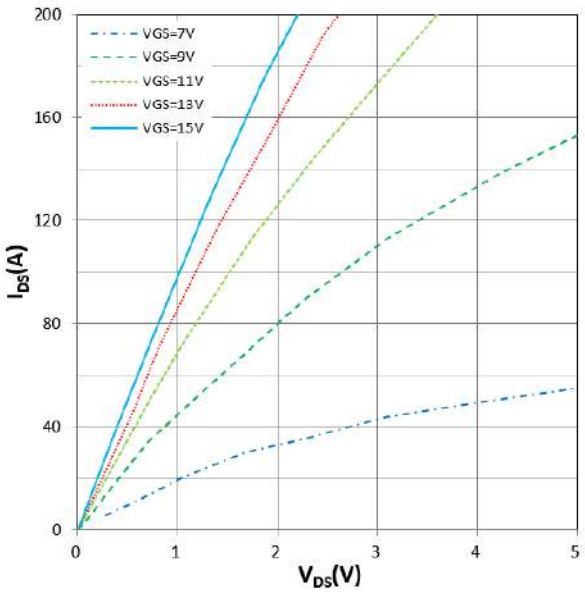


Figure 5. I_{DS} vs V_{DS}
T_j =25°C, V_{GS} parameter

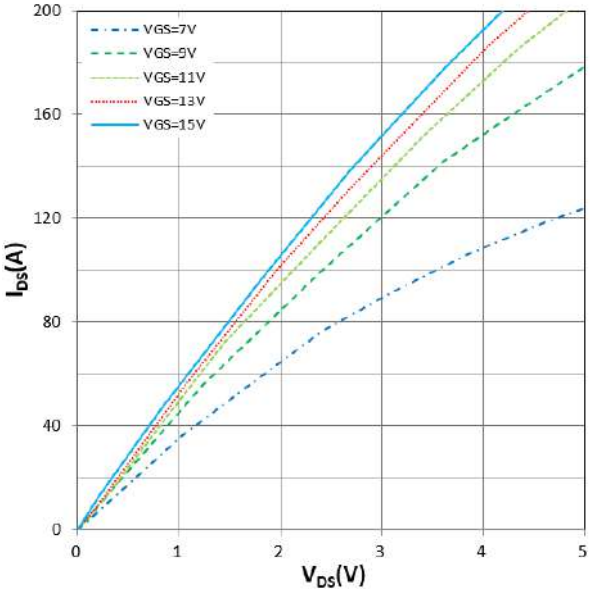


Figure 6. I_{DS} vs V_{DS}
T_j =175°C, V_{GS} parameter

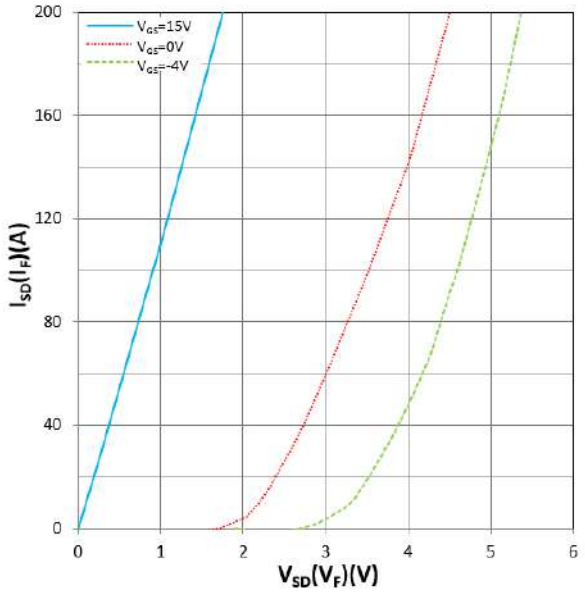


Figure 7. $I_{SD}(I_F)$ vs V_{SD} (V_F)
T_j =25°C, V_{GS} parameter

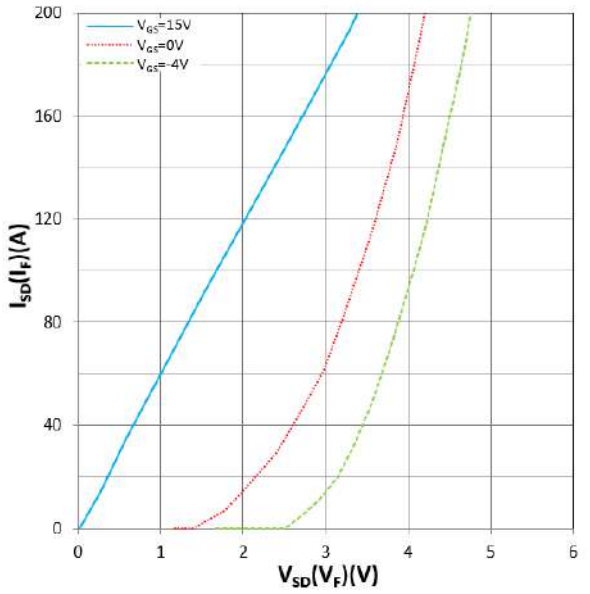


Figure 8. $I_{SD}(I_F)$ vs V_{SD} (V_F)
T_j =175°C, V_{GS} parameter

HCS10FF120E0A2

1200V/10mΩ Half Bridge SiC MOSFET Module

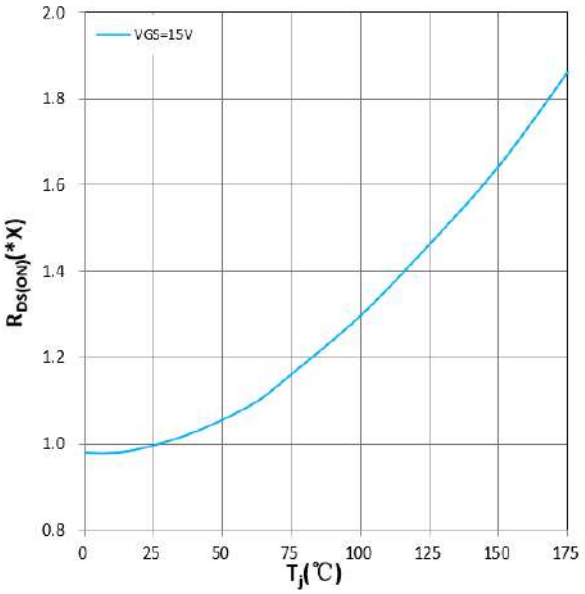


Figure 9. $R_{DS(ON)}$ vs T_j
V_{GS} =+15V, I_D =100A, 1.0X =10.1mΩ

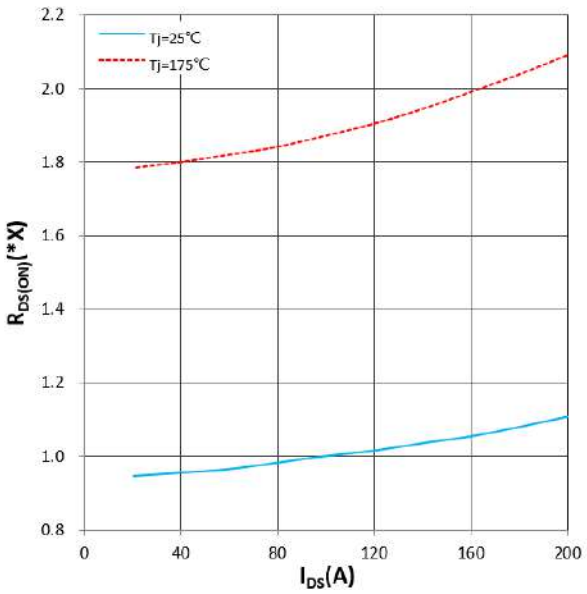


Figure 10. $R_{DS(ON)}$ vs I_{DS}
V_{GS} =+15V, 1.0X =10.1mΩ

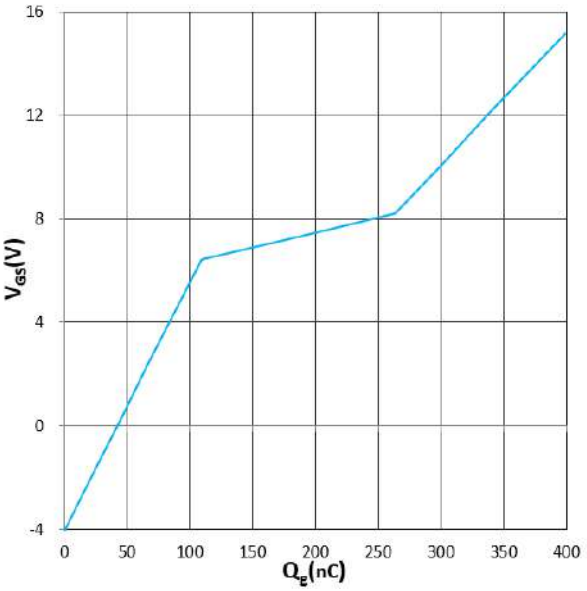


Figure 11. V_{GS} vs Q_g
V_{DS} =800V, I_D =100A, T_j =25°C

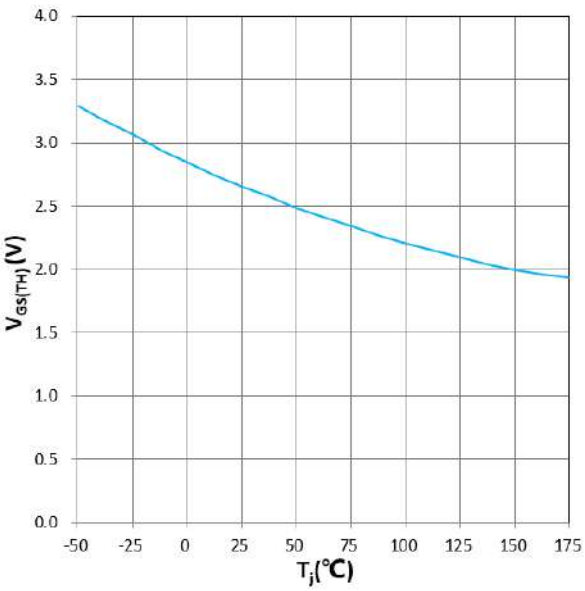


Figure 12. $V_{GS(TH)}$ vs T_j
V_{GS} =V_{DS}, I_D =40mA

HCS10FF120E0A2

1200V/10mΩ Half Bridge SiC MOSFET Module

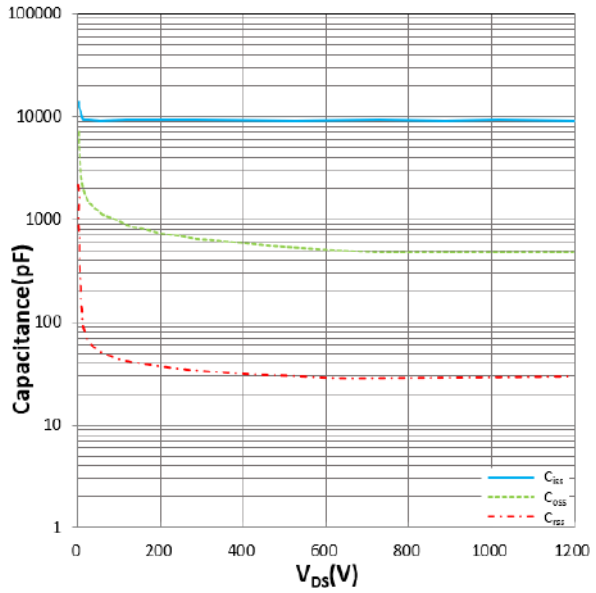


Figure 13. C_{iss}, C_{oss}, C_{rss} vs V_{DS}
T_j =25°C

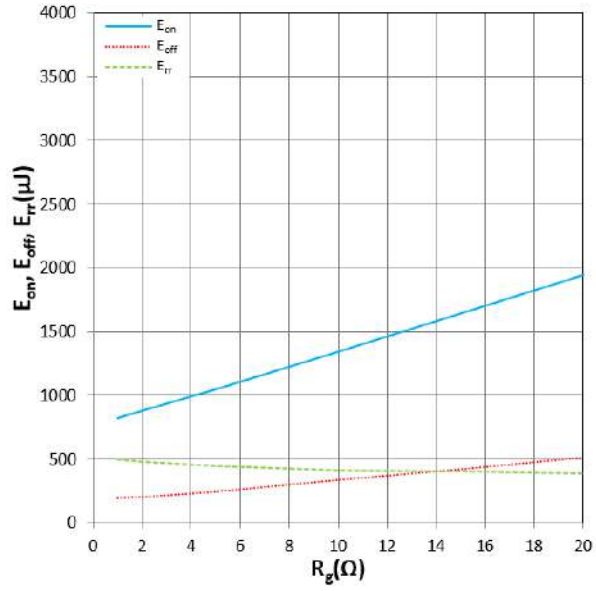


Figure 14. E_{on}, E_{off}, E_{rr} vs R_g
T_j =25°C, I_D =100A, V_{GS} =+15/-4V

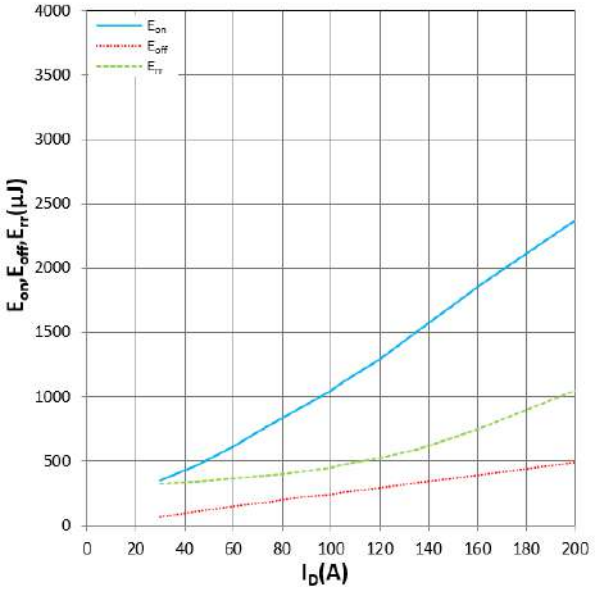


Figure 15. E_{on}, E_{off}, E_{rr} vs I_D
T_j =25°C, R_{gon} =R_{goff} =5.1Ω, V_{GS} =+15/-4V

HCS10FF120E0A2

1200V/10mΩ Half Bridge SiC MOSFET Module

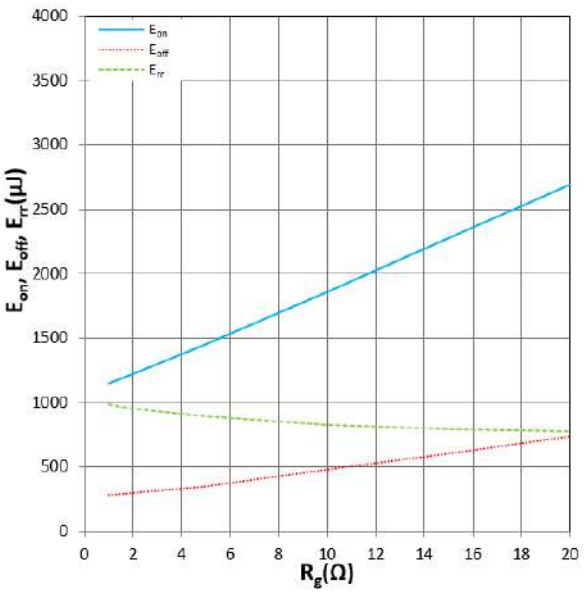


Figure 16. E_{on}, E_{off}, E_{rr} vs R_g
T_j =150°C, I_D =100A, V_{GS} =+15/-4V

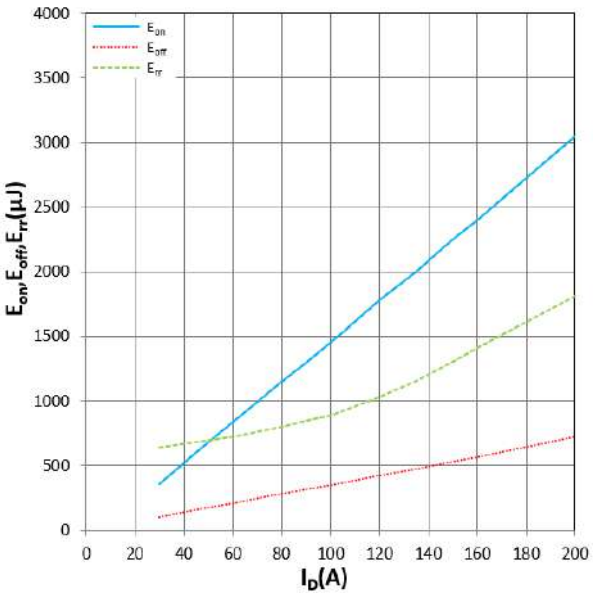
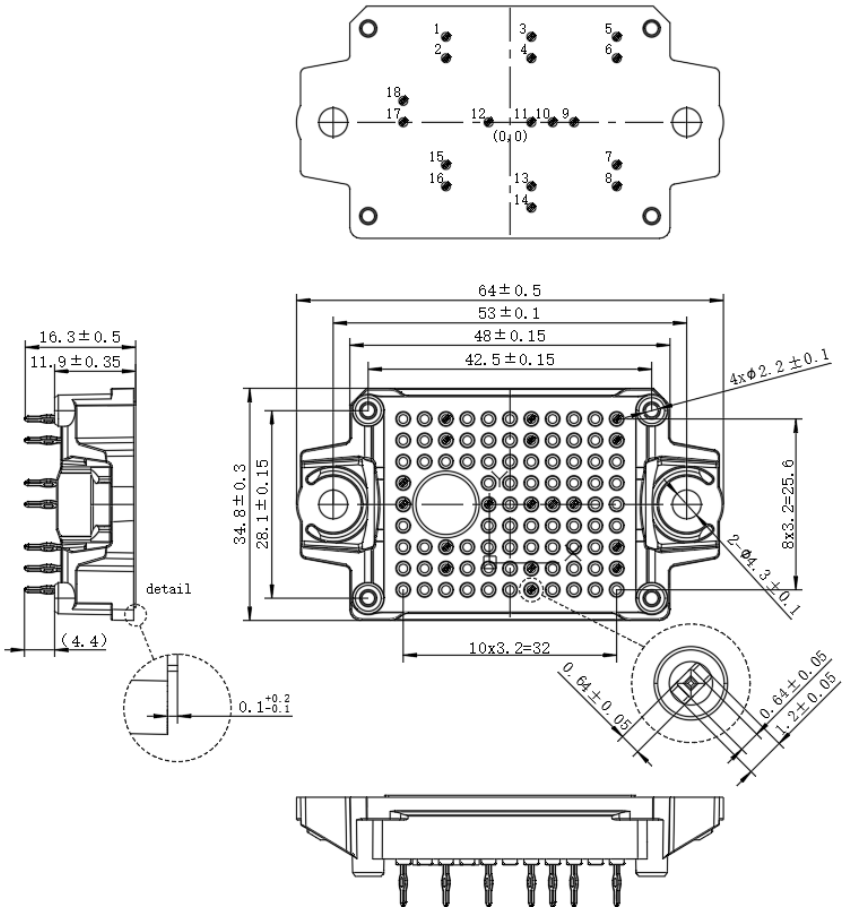


Figure 17. E_{on}, E_{off}, E_{rr} vs I_D
T_j =150°C, R_{gon} =R_{goff} =5.1☒ V_{GS} =+15/-4V

HCS10FF120E0A2

1200V/10mΩ Half Bridge SiC MOSFET Module

Package dimensions



Pin Table		
Pin	X	Y
1	-9.6	12.8
2	-9.6	9.6
3	3.2	12.8
4	3.2	9.6
5	16	12.8
6	16	9.6
7	16	-6.4
8	16	-9.6
9	9.6	0
10	6.4	0
11	3.2	0
12	-3.2	0
13	3.2	-9.6
14	3.2	-12.8
15	-9.6	-6.4
16	-9.6	-9.6
17	-16	0
18	-16	3.2

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	10	FF	120	E0	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

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