HCS300FH120D4C2

1200V/300A Half Bridge SiC MOSFET Module

Description

The HCS300FH120D4C2 is a Half Bridge SiC MOSFET Power Module. It integrates high performance SiC MOSFET chips designed for applications such as the Motor drives and Renewable energy.

Fetures

- 1200V/7.2mΩ(V_{GS}=15V), 6.1mΩ(V_{GS}=18V)
- Low Thermal Resistance with Si_3N_4 AMB
- 175°C Maximum Junction Temperature
- Low Inductive Design
- Thermistor Inside
- Pressfit Terminal
- Copper Base Size: 79mm*62mm

Application

- xEV Applications
- Motor Drives
- Vehicle Fast Chargers
- Renewable Energy

Circuit Diagram

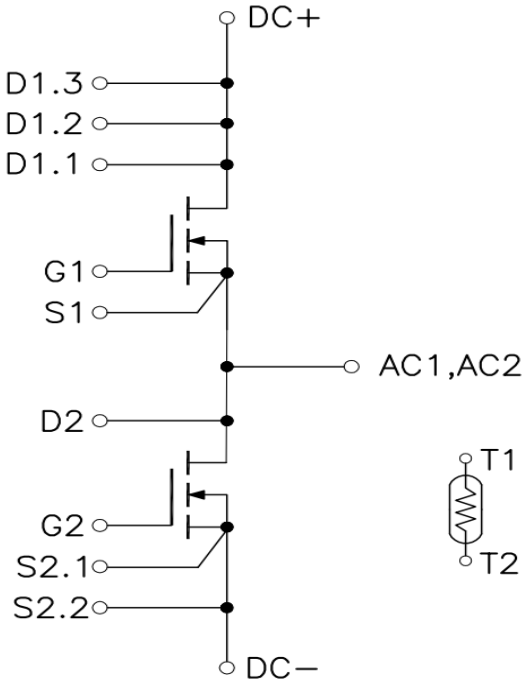

Figure 1. Out Drawing & Circuit Diagram HCS300FH120D4C2

Note: Please use **S2.1** for the low side drive signal and do not connect it to **S2.2** which is power terminal

HCS300FH120D4C2

1200V/300A Half Bridge SiC MOSFET Module

Physical Dimensions

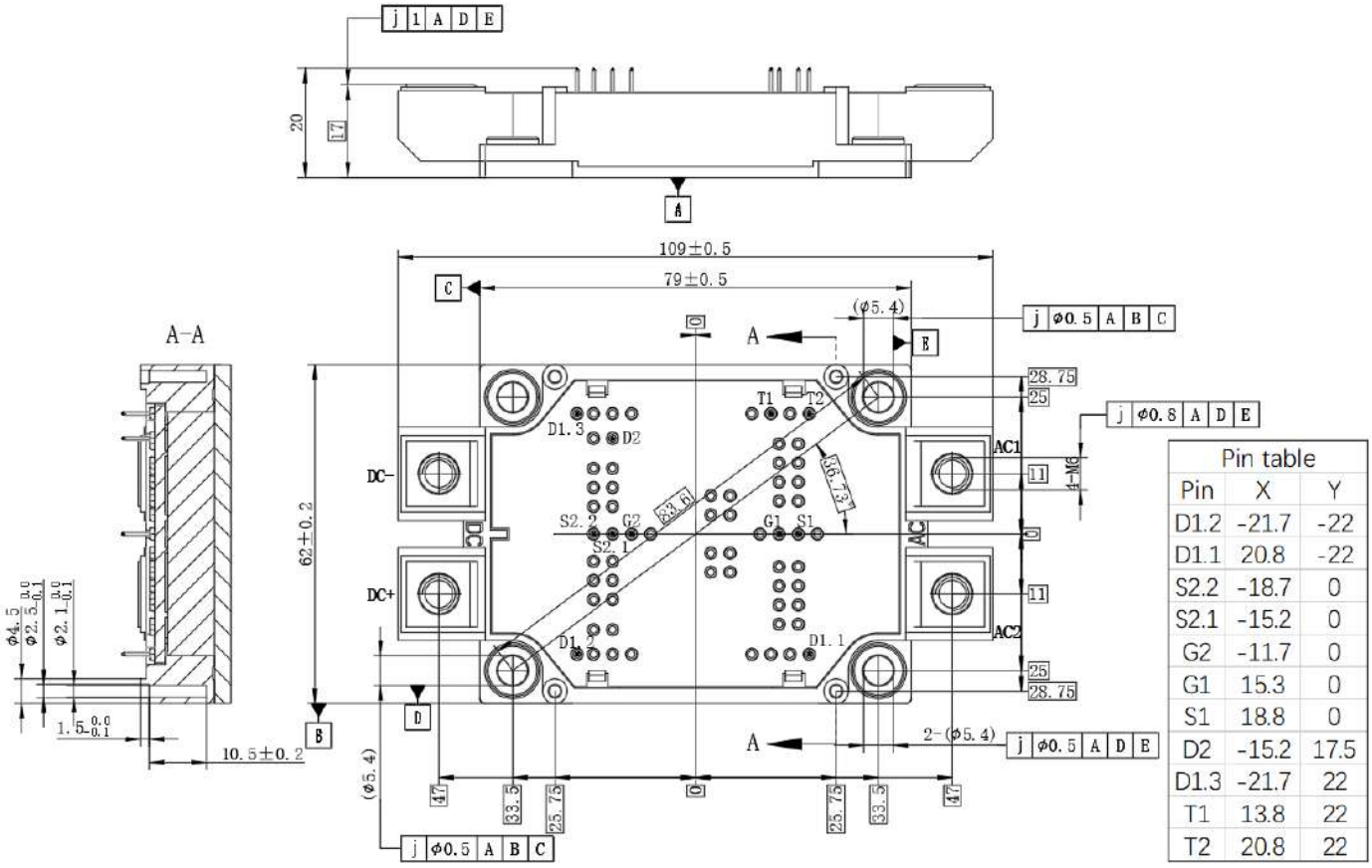

Figure 2. Physical Dimensions

Module

Parameter	Conditions	Value	Unit
Isolation voltage	RMS, f =0Hz, t =1min	3.5	kV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink terminal to terminal	14.5 10	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	>400	-
Module lead resistance, terminals – chip	Tc=25°C	0.3	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	250	g

HCS300FH120D4C2

1200V/300A Half Bridge SiC MOSFET Module

Maximum Ratings (T_j=25°C Unless Otherwise Specified)

Symbol	Parameter	Conditions	Value	Unit
V_{DSS}	Drain-Source Voltage	G-S Short	1200	V
V_{GSS}	Gate-Source Voltage	D-S Short, AC frequency • 1Hz, Note1	-10 to 22	V
I_{DS}	DC Continuous Drain Current	T_f=25°C, V_{GS}=+15V	320	A
I_{DS}	DC Continuous Drain Current	T_f=65°C, V_{GS}=+15V	280	A
I_{SD}	Source (Body Diode) Current	T_f=25°C,with ON signal	320	A
I_{SD}	Source (Body Diode) Current	T_f=65°C,with ON signal	280	A
I_{DSM}	Pulse Drain Current	T_c=65°C, Pulse Width=1ms, V_{GS}=+15V, Note 2	600	A
P_{tot}	Total Power Dissipation	T_c=25°C	1300	W
T_{jmax}	Max Junction temperature	-	175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Recommended Operating Value: +18V/-5V, +15V/-4V
Note2: Pulse width limited by maximum junction temperature

NTC Characteristics

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
R25	Resistance	Tc =25°C	-	5	-	kΩ
ΔR/R	Deviation of R_{100}	Tc =100°C, R_{100} =493Ω	-5	-	5	%
P_{25}	Power dissipation	Tc =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

HCS300FH120D4C2

1200V/300A Half Bridge SiC MOSFET Module

MOSFET Electrical Charateristics (T_j=25℃ Unless Otherwise Specified, Chip)

Symbol	Parameter	Conditions		Value			Unit
				Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=300μA		1200	-	-	V
I_{DSS}	Zero gate voltage drain current	V_{DS}=1200V, V_{GS}=0V		-	3	-	μA
$V_{GS(Th)}$	Gate-source threshold voltage	I_D=105mA, V_{DS}=V_{GS}	T_j=25°C	1.8	2.7	-	V
I_{GSS}	Gate-Source Leakage Current	V_{GS}=20V, V_{DS}=0V	T_j=25°C	-	-	300	nA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D=300A, V_{GS}=+15V	T_j=25°C	-	7.2	-	mΩ
			T_j=175°C	-	10.3	-	mΩ
		I_D=300A, V_{GS}=+18V	T_j=25°C	-	6.1	-	mΩ
			T_j=175°C	-	8.5	-	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D=300A, V_{GS}=+15V	T_j=25°C	-	2.16	3	V
			T_j=175°C	-	3.09	-	V
		I_D=300A, V_{GS}=+18V	T_j=25°C	-	1.83	-	V
			T_j=175°C	-	2.55	-	V
C_{iss}	Input capacitance	V_{DS}=800V, V_{GS}=0V, f=100kHz		-	17.4	-	nF
C_{oss}	Output capacitance			-	0.53	-	nF
C_{rss}	Reverse transfer capacitance			-	0.043	-	nF
Q_g	Total gate charge	V_{DS}=800V, I_D=300A, V_{GS}=+15/-5V		-	540	-	nC
R_{gint}	Internal gate resistance	f=1MHz		-	1.5	-	Ω
$t_{d(on)}$	Turn-on delay tim	V_{DD}=600V I_D=300A V_{GS}=+15/-4V $R_{G(ON)}$=5.1Ω $R_{G(OFF)}$=3.3Ω Inductive load Switching operation	T_j=25°C	-	41	-	ns
			T_j=150°C	-	39	-	
t_r	Rise time		T_j=25°C	-	23	-	ns
			T_j=150°C	-	18	-	
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	109	-	ns
			T_j=150°C	-	117	-	
t_f	Fall time		T_j=25°C	-	13	-	ns
			T_j=150°C	-	37	-	
E_{on}	Turn-on power dissipation		T_j=25°C	-	8.29	-	mJ
			T_j=150°C	-	8.50	-	
E_{off}	Turn-off power dissipation		T_j=25°C	-	3.23	-	mJ
			T_j=150°C	-	3.53	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.115	-	K/W
$R_{th(c-f)}$	Contact thermal Resistance	With thermal conductive grease, Note3		-	0.015	-	K/W

Note3: Assumes Thermal Conductivity of grease is 0.9W/m• K and thickness is 50um.

HCS300FH120D4C2

1200V/300A Half Bridge SiC MOSFET Module

Body Diode Electrical Characteristics (T_j=25°C Unless Otherwise Specified, Chip)

Symbol	Parameter	Conditions		Value			Unit
				Min.	Typ.	Max.	
V_{SD}	Body Diode Forward Voltage	V_{GS}=5V I_{SD}=300A	T_j=25°C	-	5.2	-	V
			T_j=175°C	-	4.3	-	
T_{rr}	Reverse Recovery Time	V_{DD}=600V I_D=300A V_{GS}=+15/-4V $R_{G(ON)}/R_{G(OFF)}$=5.1Ω/3.3Ω Inductive loads Switching operation	T_j=25°C	-	24	-	ns
			T_j=150°C	-	47	-	
Q_{rr}	Reverse Recovery Charge		T_j=25°C	-	1.1	-	μC
			T_j=150°C	-	4.7	-	
E_{rr}	Diode Switching Power Dissipation		T_j=25°C	-	0.82	-	mJ
			T_j=150°C	-	2.03	-	

Test Conditions

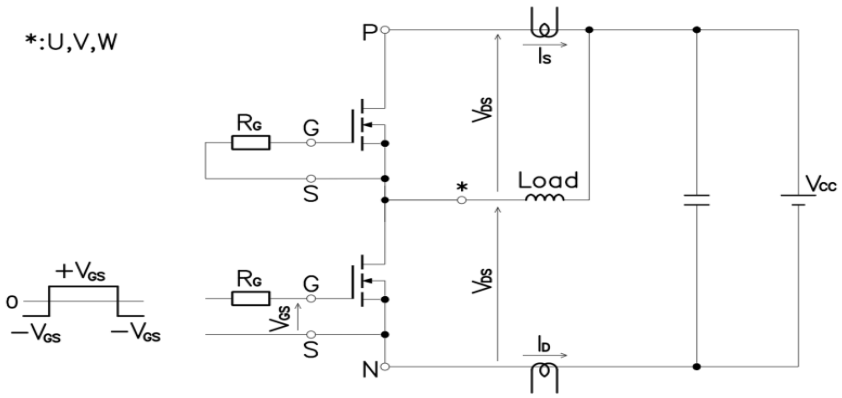

Figure 3. Switching Time Measure Circuit

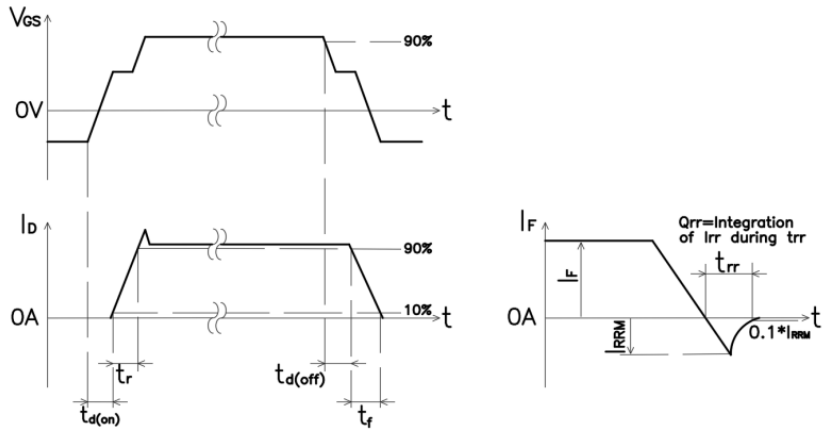

Figure 4. Switching Time Definition

HCS300FH120D4C2

1200V/300A Half Bridge SiC MOSFET Module

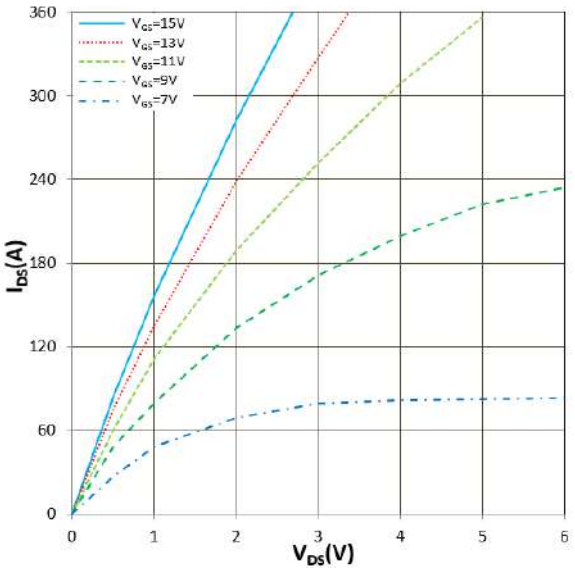

Figure 5. I_{DS} VS V_{DS}
T_j=25°C

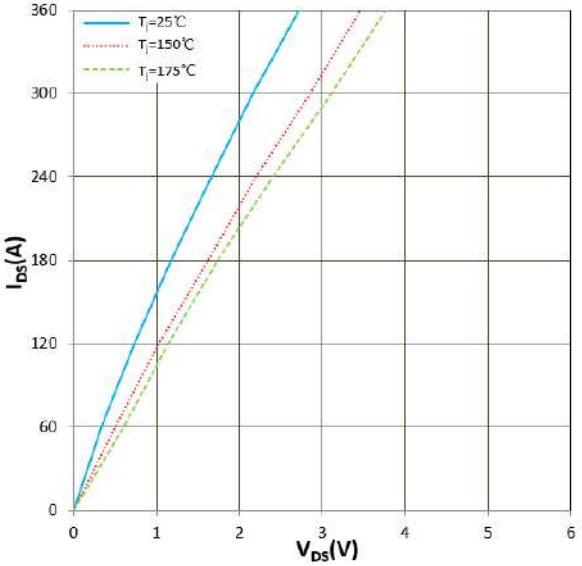

Figure 6. I_{DS} VS V_{DS}
V_{GS} =+15V

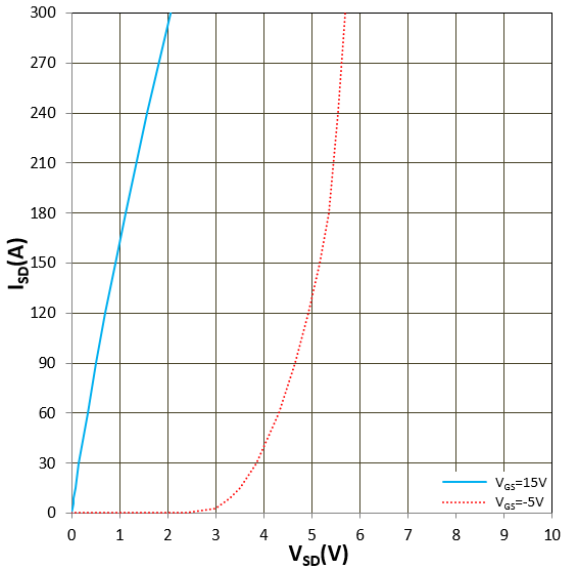

Figure 7. I_{SD} VS V_{SD}(V_F)
T_j=25°C

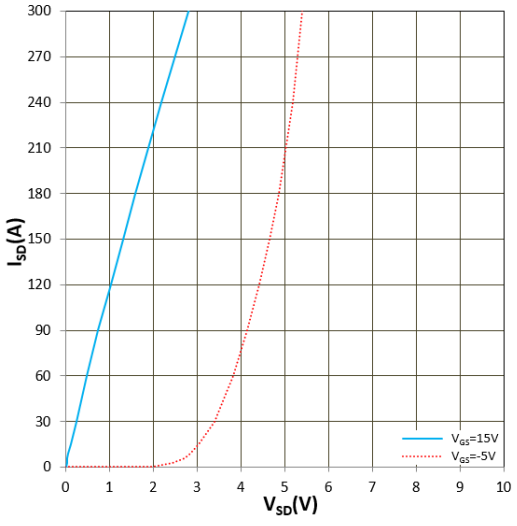

Figure 8. I_{SD} VS V_{SD}(V_F)
T_j=175°C

HCS300FH120D4C2

1200V/300A Half Bridge SiC MOSFET Module

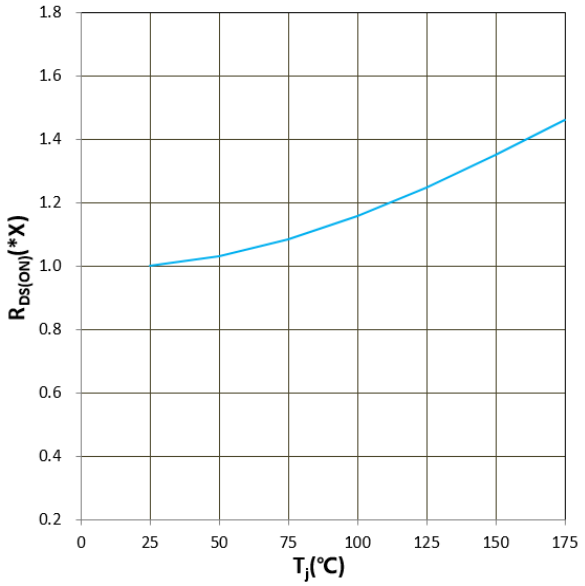

Figure 9. $R_{DS(ON)}$ VS T_j
V_{GS}=+15V, I_D=300A, 1.0X =7.2mΩ

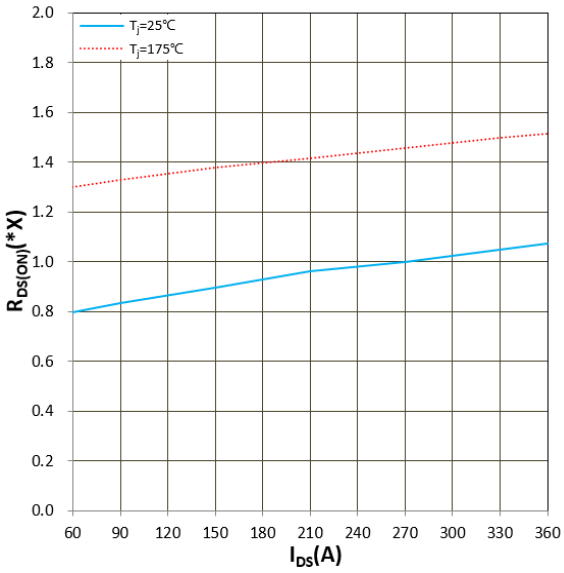

Figure 10. $R_{DS(ON)}$ VS I_{DS}
V_{GS}=+15V, I_D=300A, 1.0X =2.5mΩ

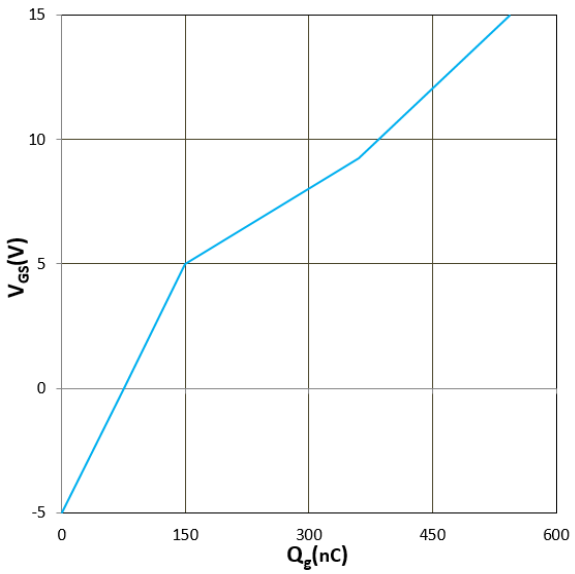

Figure 11. V_{GS} VS Q_g
T_j=25°C, I_D=180A, V_{DS}=800V

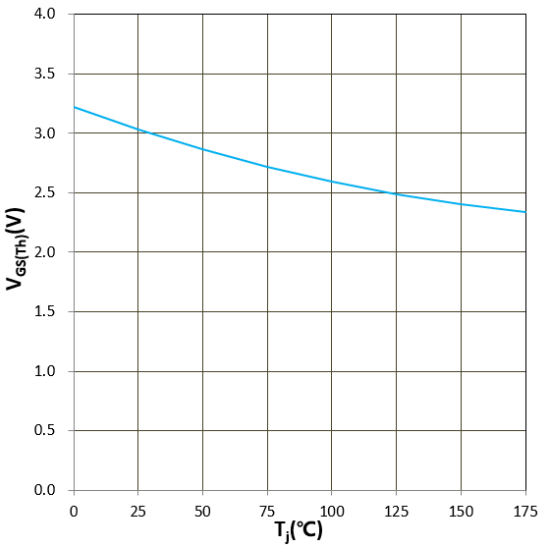

Figure 12. $V_{GS(Th)}$ VS T_j
V_{GS}=V_{DS}, I_D=105mA

HCS300FH120D4C2

1200V/300A Half Bridge SiC MOSFET Module

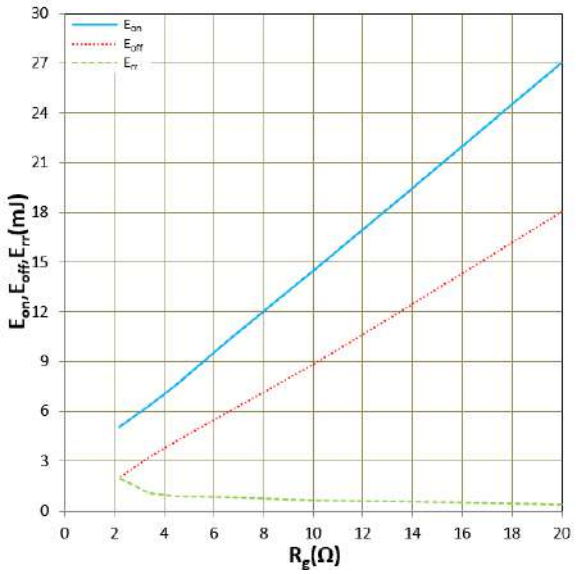

Figure 13. E_{on}, E_{off}, E_{rr} VS R_g
T_j=25°C, V_{CC}=600V, I_D=300A, V_{GS}=+15V/-4V
Inductive Load

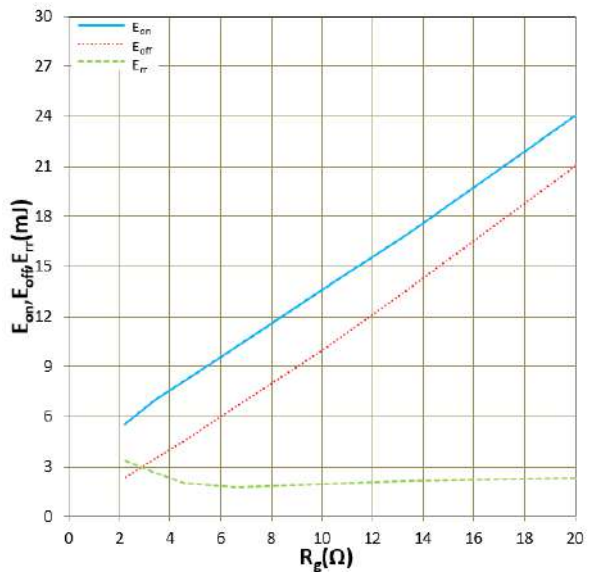

Figure14. E_{on}, E_{off}, E_{rr} VS R_g
T_j=150°C, V_{CC}=600V, I_D=300A, V_{GS}=+15V/-4V
Inductive Load

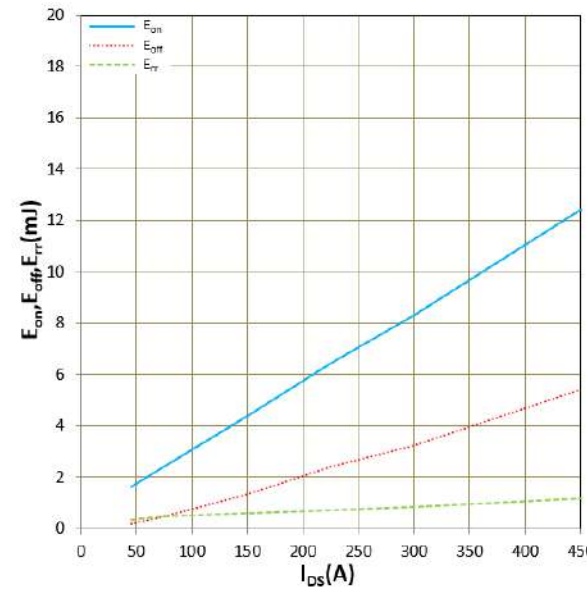

Figure 15.E_{on}, E_{off}, E_{rr} VS I_{DS}
T_j=25°C, V_{CC}=600V, V_{GS}=+15V/-4V
$R_{G(ON)}$/$R_{G(OFF)}$=5.1/3.3Ω, Inductive Load

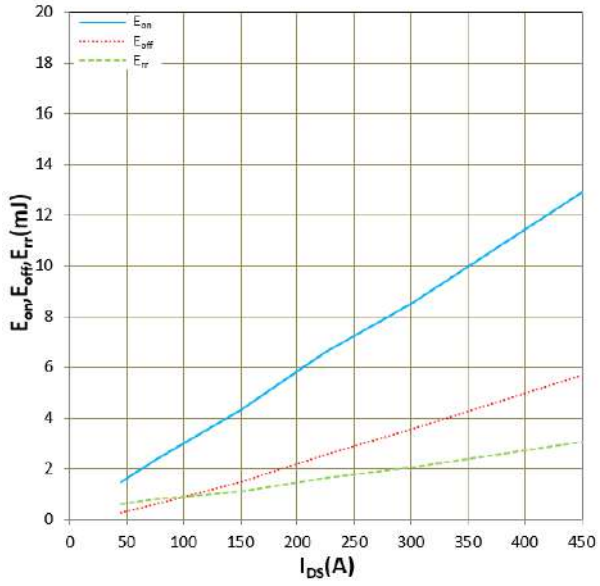

Figure 16.E_{on}, E_{off}, E_{rr} VS I_{DS}
T_j=150°C, V_{CC}=600V, V_{GS}=+15V/-4V
$R_{G(ON)}$/$R_{G(OFF)}$=5.1/3.3Ω, Inductive Load

HCS300FH120D4C2

1200V/300A Half Bridge SiC MOSFET 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 (sales@hiitio.com) for further information on the product, technology, delivery terms, conditions and prices.

Revision History

Document Version	Description of Changes
RevX.0.1	Released

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