HCS200FF120A2C1

1200V/200A Half Bridge SiC MOSFET Module

Description

The HCS200FF120A2C1 is a Half Bridge SiC MOSFET Power Module. It integrates high performance SiC MOSFET chips and SiC Diode designed for the applications such as Motor drives and Renewable energy

Features

- Blocking voltage1200V
- $R_{ds(on)}$=9.1mΩ
- Low thermal resistance with Si_3N_4 AMB
- 175°C maximum junction temperature
- 62mm half bridge module

Applications

- Motor Drives
- VehicleFast Chargers
- Renewable energy
- UPS

Circuit diagram

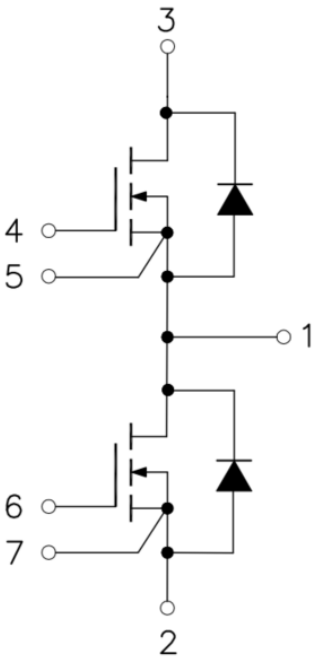

Figure 1. Out drawing & circuit diagram for HCS200FF120A2C1

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Pin Configuration and Marking Information

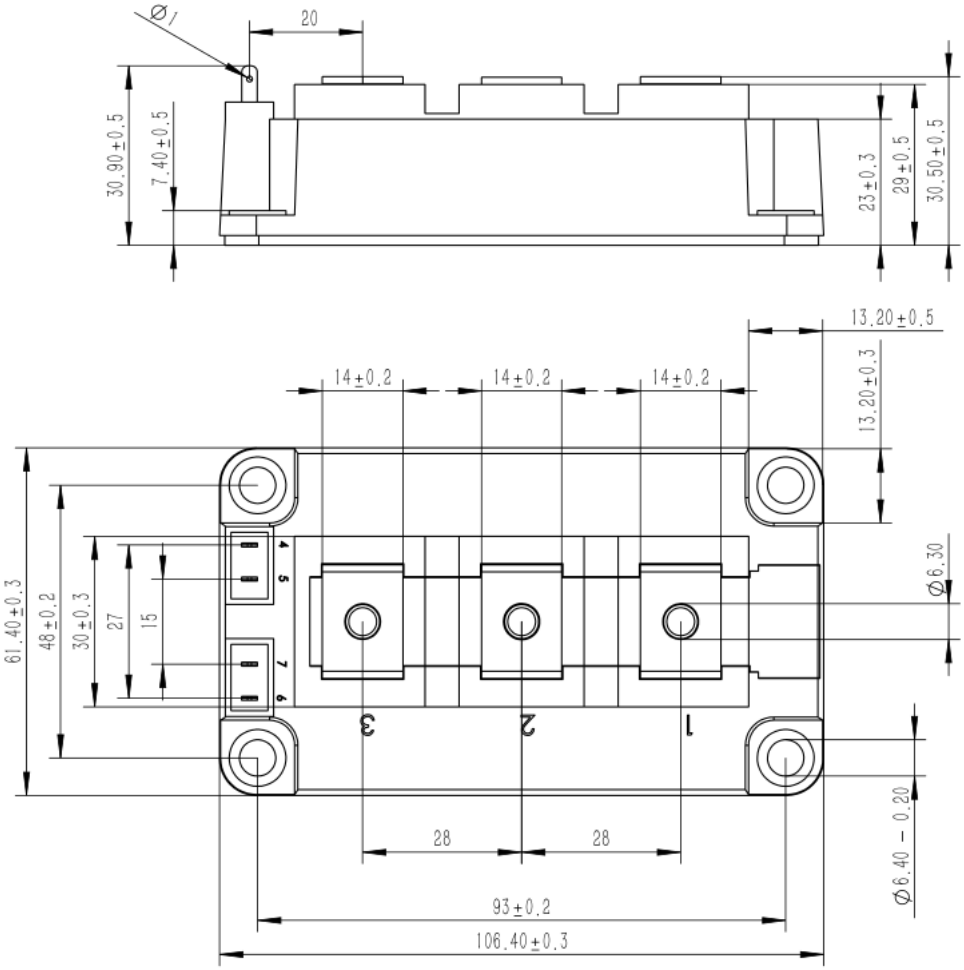

Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f =50Hz, t =1min	4.0	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	-	200	-
Module lead resistance, terminals – chip	T_C =25°C	0.6	mΩ
Mounting torque for module mounting	M6	4 to 6	Nm
Weight	-	320	g

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

Symbol	Parameter	Conditions	Ratings	Unit
V_{DSS}	Drain-Source Voltage	G-S Short	1200	V
V_{GSS}	Gate-Sourse Voltage	D-S Short, AC frequency ⩾1Hz, Note1	-10 to 22	V
I_{DS}	DC Continuous Drain Current	T_C =25°C , V_{GS} =18V	245	A
I_{DS}	DC Continuous Drain Current	T_C =80°C , V_{GS} =18V	200	A
I_{SD}	Source-Drain Current(diode)	T_C =25°C, with ON signal	245	A
I_{SD}	Source-Drain Current(diode)	T_C =80°C, with ON signal	200	A
I_{DSM}	Pulse Drain Current	T_C =25°C, Pulse width =1ms, V_{GS} =18V, Note2	400	A
P_{tot}	Total Power Dissipation	T_C =25°C	785	W
T_{jmax}	Max Junction Temperature	-	175	°C
T_{stg}	Storage Temperature	-	-40 to 125	°C

Note1: Recommended Operating Value, +18V/-5V, +18V/-4V, +15V/-4V

Note2: Pulse width limited by maximum junction temperature

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 =200A, V_{GS} =0V	T_j =25°C	-	1.93	-	V
			T_j =150°C	-	3.05	-	
t_{rr}	Diode Reverse Recovery Time	(Switch side) V_{DD} =600V, I_D =200A V_{GS} =+18V/-4V R_{gon}/R_{goff} =3.3Ω/3.3Ω (FRD side) V_{RR}=600V, I_F=200A V_{GS}=+18V/-4V Inductive load switching operation	T_j =25°C		29		ns
			T_j =150°C		31		
I_{RM}	Peak reverse recovery Current		T_j =25°C	-	83	-	A
			T_j =150°C	-	105	-	
Q_{rr}	Recovered charge		T_j=25°C	-	1.5	-	uC
			T_j =150°C	-	2.1	-	
E_{rr}	Reverse recovered energy		T_j =25°C	-	0.6	-	mJ
			T_j =150°C	-	1.1	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.18	-	°C/W

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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=200uA		1200	-	-	V
I_{DSS}	Zero gate voltage drain Current	V_{DS}=1200V, V_{GS}=0V		-	2	-	μA
$V_{GS(th)}$	Gate-source threshold Voltage	I_D=70mA, V_{DS}=V_{GS}	T_j=25°C	1.8	2.7	-	V
			T_j=175°C	-	2.05	-	V
I_{GSS}	Gate-Source Leakage Current	V_{GS}=20V, V_{DS}=0V	T_j=25°C	-	-	200	nA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D=200A, V_{GS}=+15V	T_j=25°C	-	10.4	-	mΩ
			T_j=175°C	-	14.4	-	mΩ
		I_D=200A, V_{GS}=+18V	T_j=25°C	-	9.1	-	mΩ
			T_j=175°C	-	12.7	-	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	I_D=200A, V_{GS}=+15V	T_j=25°C	-	2.08	-	V
			T_j=175°C	-	2.88	-	V
		I_D=200A, V_{GS}=+18V	T_j=25°C	-	1.82	-	V
			T_j=175°C	-	2.54	-	V
C_{iss}	Input Capacitance	V_D=800V, V_{GS}=0V, f=100kHz, V_{AC}=25mV		-	11628	-	pF
C_{oss}	Output Capacitance			-	354	-	pF
C_{rss}	Reverse transfer Capacitance			-	29	-	pF
R_{Gint}	Internal gate resistor	f=100kHz, V_{AC}=25mV		-	3.2	-	Ω
Q_g	Total gate charge	V_{DD}=800V, I_D=120A, V_{GS}=+18/-4V		-	420	-	nC
$t_{d(on)}$	Turn-on delay time	V_{DD}=600V, I_D=200A, V_{GS}=+18/-4V, R_{gon}/R_{goff}=3.3Ω/3.3Ω, Inductive load switching operation	T_j=25°C	-	75	-	ns
			T_j=150°C	-	71	-	
t_r	Rise time		T_j=25°C	-	48	-	ns
			T_j=150°C	-	43	-	
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	162	-	ns
			T_j=150°C	-	189	-	
t_f	Fall time		T_j=25°C	-	49	-	ns
			T_j=150°C	-	55	-	
E_{on}	Turn-on power dissipation		T_j=25°C	-	3.6	-	mJ
			T_j=150°C	-	2.5	-	
E_{off}	Turn-off power dissipation		T_j=25°C	-	4.6	-	mJ
			T_j=150°C	-	5.1	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.19	-	°C /W

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Test Conditions

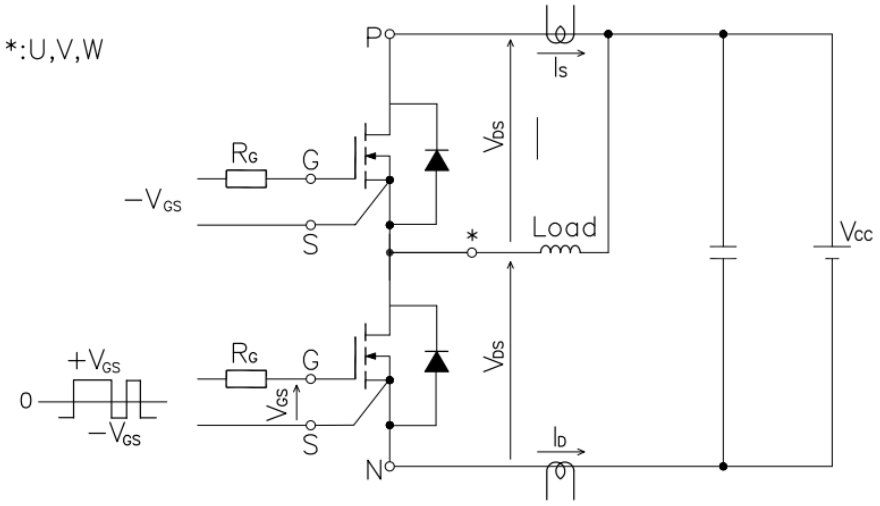

Figure 3. Switching time measure circuit

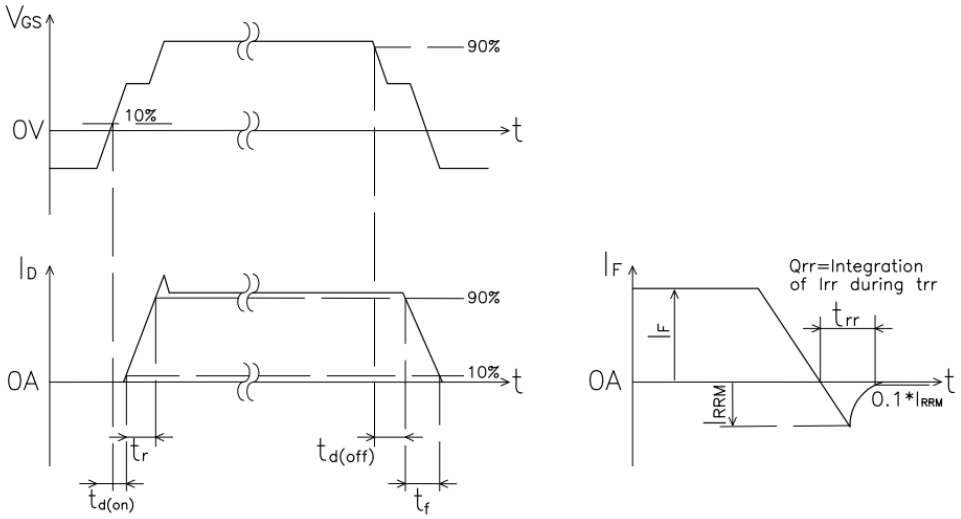

Figure 4. Switching time definition

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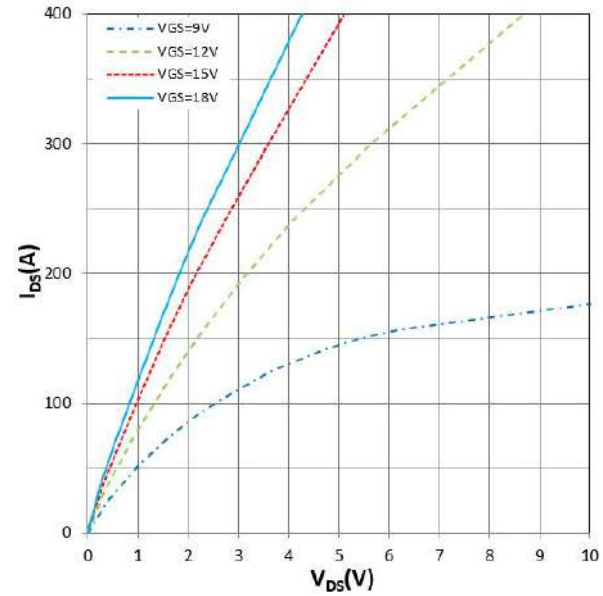

Figure 5. I_{DS} vs V_{DS}
T_j =25°C

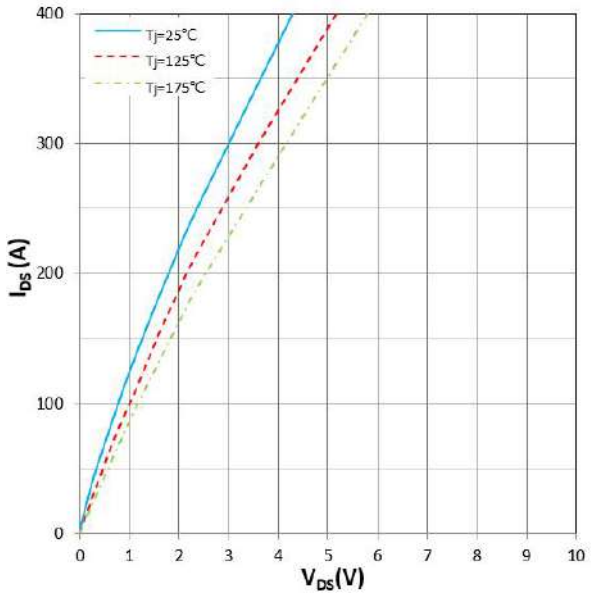

Figure 6. I_{DS} vs V_{DS}
V_{GS} =+18V

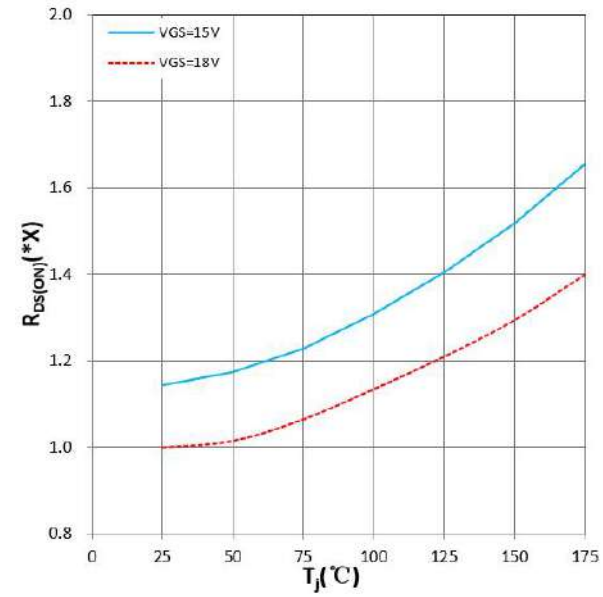

Figure 7. $R_{DS(ON)}$ vs T_j
V_{GS} =+15V/+18V, I_D =200A, 1.0X =9.1mΩ

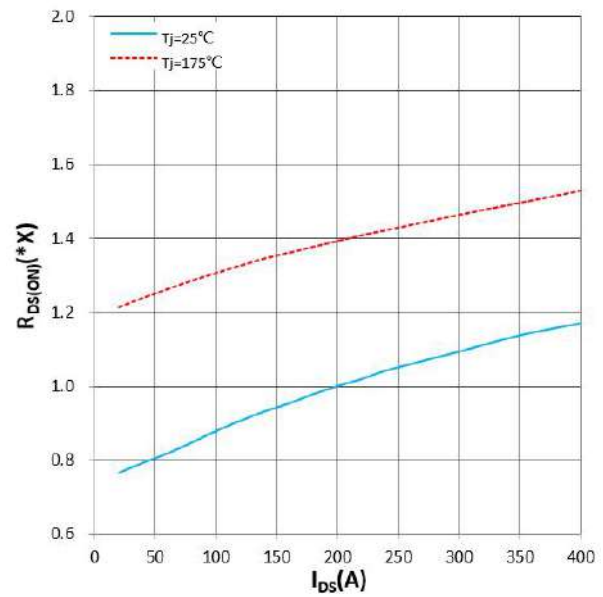

Figure 8. $R_{DS(ON)}$ vs I_{DS}
V_{GS} =+18V , 1.0X =9.1 mΩ

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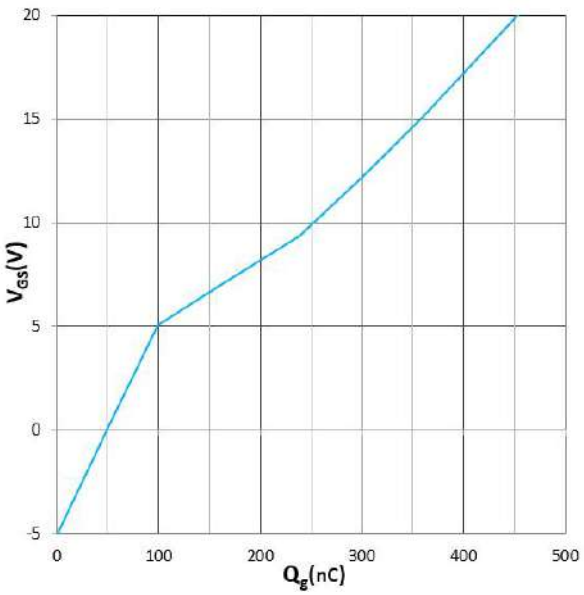

Figure 9. V_{GS} vs Q_g
V_{DS} =800V, I_D =120A, T_j =25℃

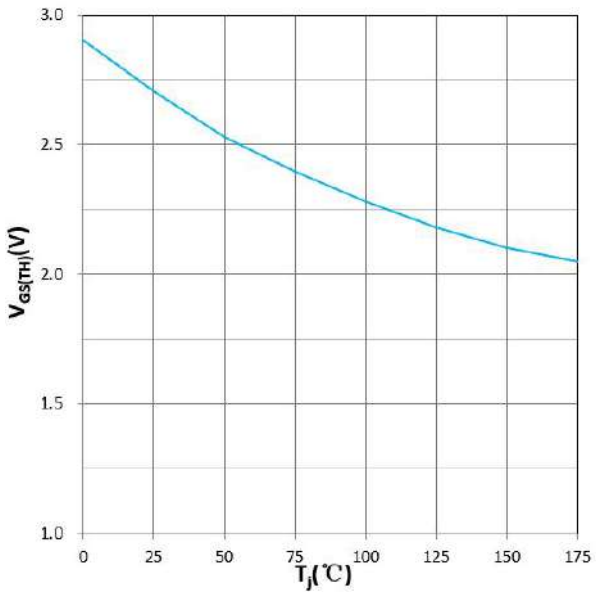

Figure 10. $V_{GS(TH)}$ vs T_j
V_{GS} =V_{DS}, I_D =70mA

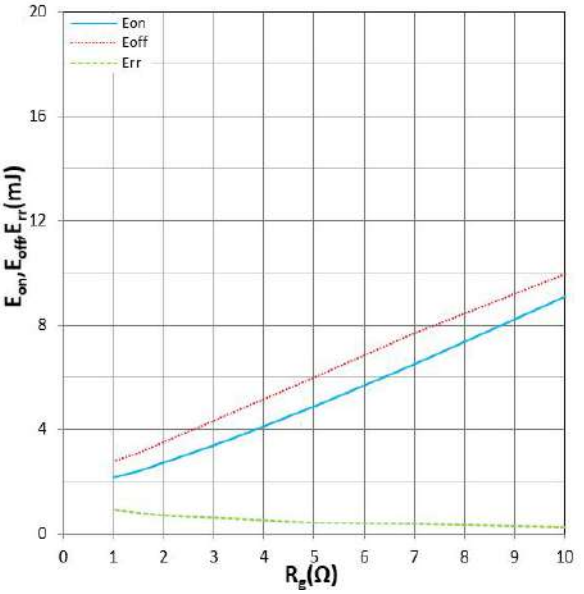

Figure 11. E_{on}, E_{off}, E_{rr} vs R_g
T_j =25°C, V_{DD} =600V, V_{GS} =+18V/-4V, I_D =200A
Inductive Load

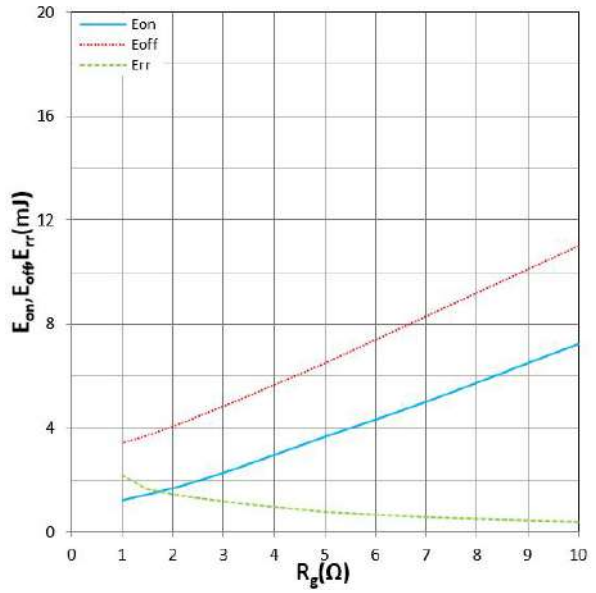

Figure 12. E_{on}, E_{off}, E_{rr} vs R_g
T_j =150°C, V_{DD} =600V, V_{GS} =+18V/-4V, I_D =200A
Inductive Load

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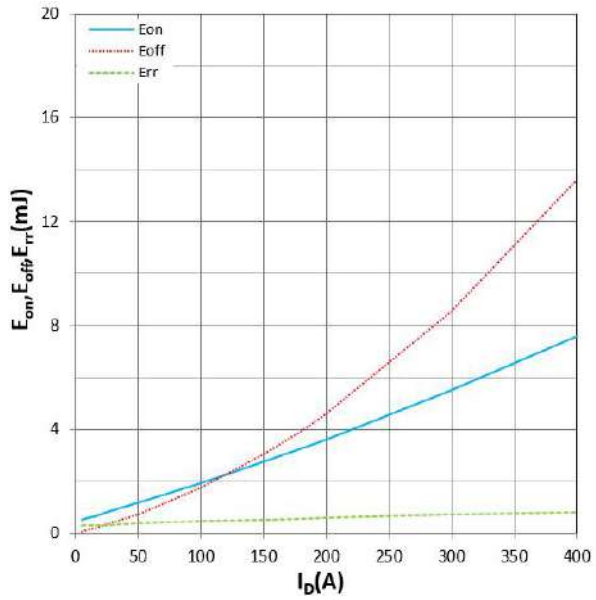

Figure 13. E_{on}, E_{off}, E_{rr} vs I_{DS}
T_j =25°C, V_{DD} =600V, V_{GS} =+18V/-4V
R_{gon}/R_{goff} =3.3Ω/3.3Ω, Inductive Load

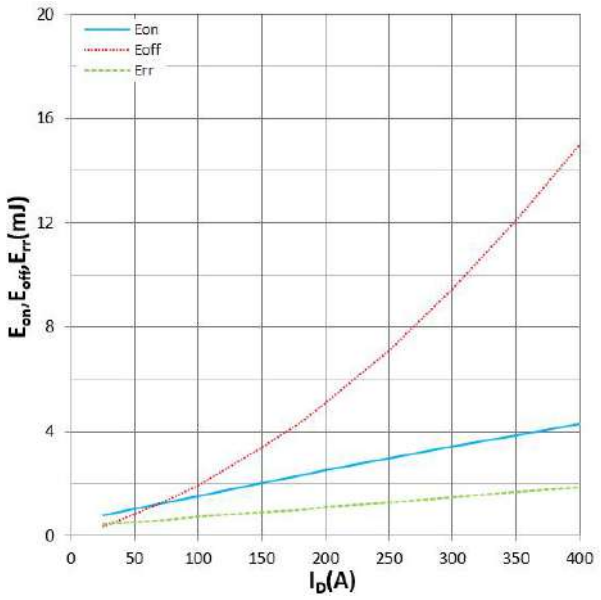

Figure 14. E_{on}, E_{off}, E_{rr} vs I_{DS}
T_j =150°C, V_{DD} =600V, V_{GS} =+18V/-4V
R_{gon}/R_{goff} =3.3Ω/3.3Ω, Inductive Load

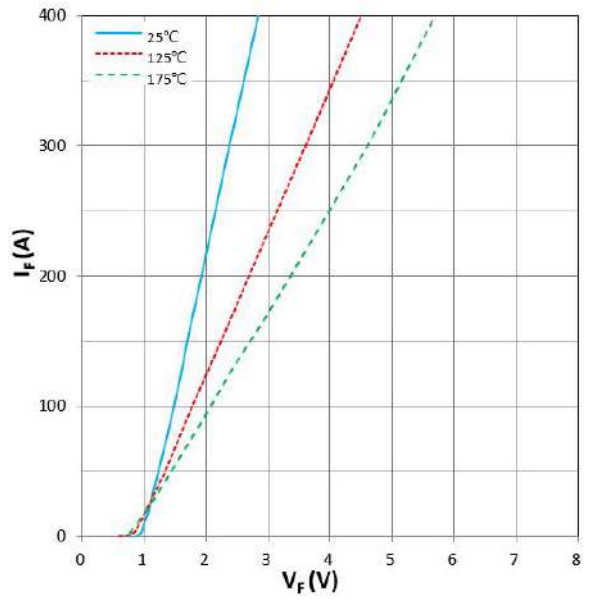

Figure 15. I_F vs V_F
V_{GS} =0V

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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	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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