HCS360FF120A2C1

1200V/360A Half Bridge SiC MOSFET Module

Description

The HCS360FF120A2C1 is a Half Bridge SiC MOSFET Power Module. It integrates high performance SiC MOSFET chips and SiC Diode designed for applications such as the Motor drives and Renewable energy.

Fetures

- Blocking Voltage: 1200V
- Rds(on)=4.3mΩ
- Low Thermal Resistance with Si3N4 AMB
- 175°C Maximum Junction Temperature
- 62mm Half Bridge Module

Applications

- Motor Drives
- Solar and Wind Inverter Systems
- Vehicle Fast Chargers
- UPS

Circuit Diagram

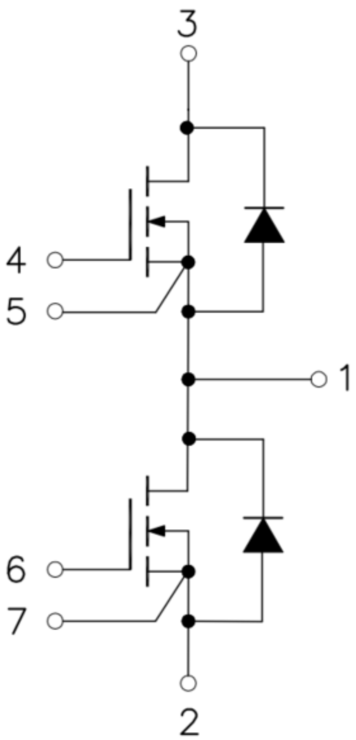

Figure 1. Out Drawing & Circuit Diagram HCS360FF120A2C1

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Pin Configuration and Marking Information

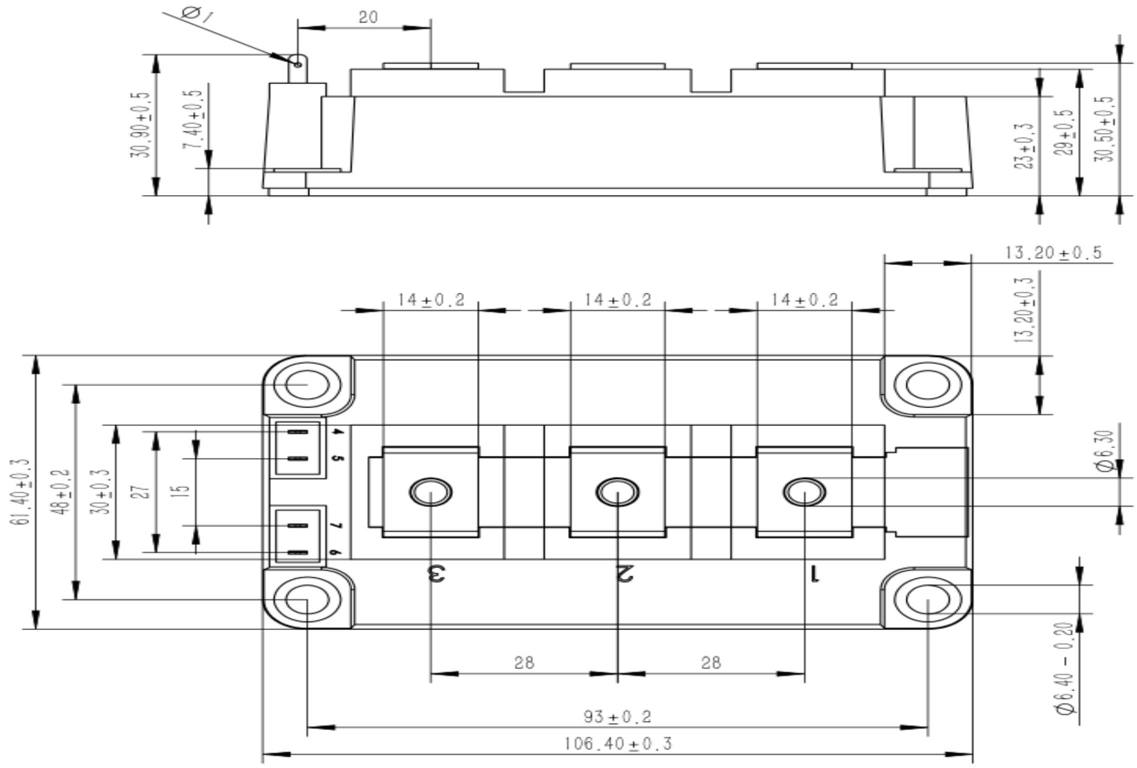

Figure 2. Pin Configuration

Module

Parameter	Conditions	Value	Unit
Isolation voltage	RMS, f =0Hz, 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	-	>400	-
Module lead resistance, terminals – chip	Tc=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	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_c=25°C, V_{GS}=18V	480	A
I_{DS}	DC Continuous Drain Current	T_c=80°C, V_{GS}=18V	360	A
I_{SD}	Source-Drain Current (Diode)	T_c=25°C,with ON signal	500	A
I_{SD}	Source-Drain Current (Diode)	T_c=80°C,with ON signal	380	A
I_{DSM}	Pulse Drain Current	T_c=65°C, Pulse Width=1ms, V_{GS}=+18V, Note 2	800	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: +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	Conditions		Value			Unit
				Min.	Typ.	Max.	
V_F	Diode Forward Voltage	I_F=300A, V_{GS}=0V	T_j=25°C	-	1.84	-	V
			T_j=175°C	-	2.82	-	
T_{rr}	Diode Reverse Recovery Time	(Switch Side) V_{DD}=900V, I_D=300A V_{GS}=+15V/-4V $R_{G(ON)}$=$R_{G(OFF)}$ =2.2Ω (FRD Side) V_{RR}=900V, I_F=300A V_{GE}=+15V/-4V Inductive load Switching operation	T_j=25°C	-	31	-	ns
			T_j=150°C	-	32	-	
I_{RM}	Peak Reverse Recovery Current		T_j=25°C	-	140	-	A
			T_j=150°C	-	166	-	
Q_{rr}	Recovered Charge		T_j=25°C	-	2.6	-	μC
			T_j=150°C	-	3.2	-	
E_{rr}	Reverse Recovered Energy		T_j=25°C	-	0.8	-	mJ
			T_j=150°C	-	1.4	-	
$R_{th(j-c)}$	Thermal Resustance, Junction to Case(Diode)			-	0.095	-	°C/W

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

Symbol	Item	Conditions		Value Min.	Value Typ.	Value Max.	Unit
$V_{(BR)DSS}$	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		-	4	-	μA
$V_{GS(Th)}$	Gate-source threshold voltage	I_D=140mA,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	-	-	400	nA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D=360A, V_{GS}=+15V	T_j=25°C	-	5.3	-	mΩ
			T_j=175°C	-	7.5	-	mΩ
		I_D=360A, V_{GS}=+18V	T_j=25°C	-	4.30	-	mΩ
			T_j=175°C	-	6.40	-	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D=360A, V_{GS}=+15V	T_j=25°C	-	1.91	-	V
			T_j=175°C	-	2.70	-	V
		I_D=360A, V_{GS}=+18V	T_j=25°C	-	1.55	-	V
			T_j=175°C	-	2.30	-	V
C_{iss}	Input capacitance	V_D=800V, V_{GS}=0V, f=1mHz, V_{AC}=25mV		-	23260	-	pF
C_{oss}	Output capacitance			-	708	-	pF
C_{rss}	Reverse transfer capacitance			-	57	-	pF
R_{Gint}	Internal ate resistor	f=1MHZ, V_{AC}=25mV		-	1.6	-	Ω
Q_g	Total gate charge	V_{DD}=800V, I_D=240A, V_{GS}=+18/-4V		-	780	-	nC
$t_{d(on)}$	Turn-on delay time	V_{DD}=600V I_D=360A V_{GS}=+18/-4V $R_{G(ON)}$=3.3Ω $R_{G(OFF)}$=3.3Ω Inductive load Switching operation	T_j=25°C	-	83	-	ns
			T_j=150°C	-	70	-	
t_r	Rise time		T_j=25°C	-	50	-	ns
			T_j=150°C	-	41	-	
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	170	-	ns
			T_j=150°C	-	198	-	
t_f	Fall time		T_j=25°C	-	55	-	ns
			T_j=150°C	-	58	-	
E_{on}	Turn-on power dissipation		T_j=25°C	-	6.5	-	mJ
			T_j=150°C	-	4.40	-	
E_{off}	Turn-off power dissipation		T_j=25°C	-	8.2	-	mJ
			T_j=150°C	-	8.7	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.1	-	K/W

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Test Conditions

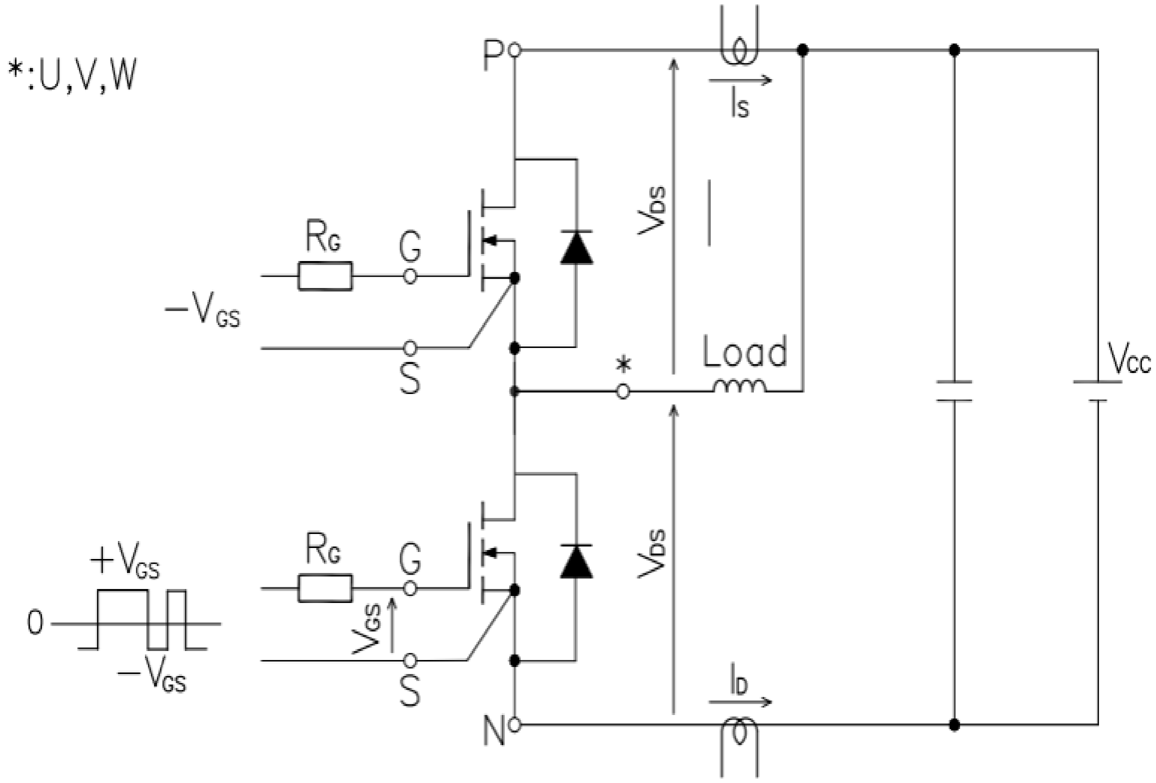

Figure 3. Switching Time Measure Circuit

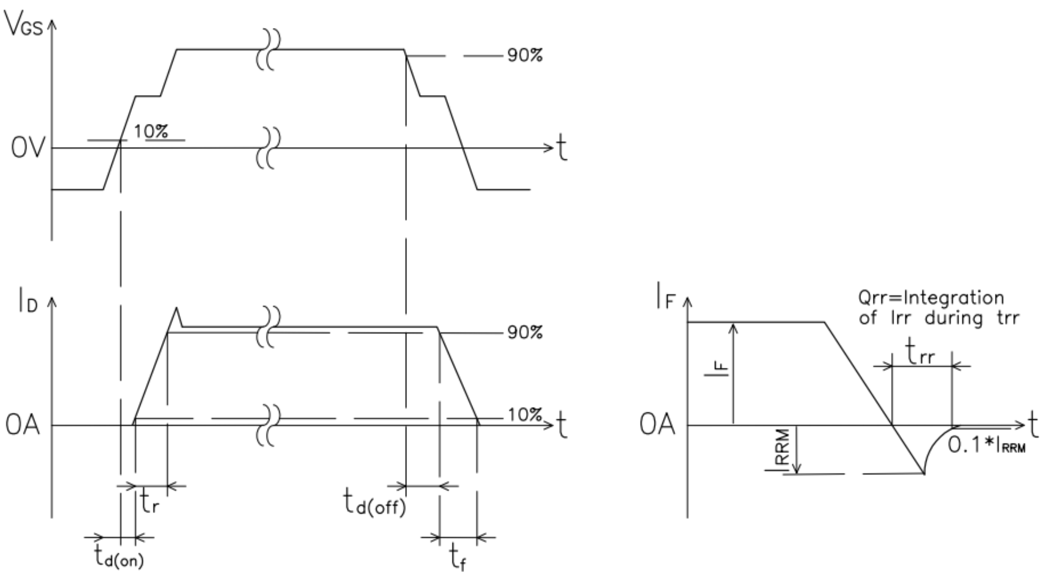

Figure 4. Switching Time Definition

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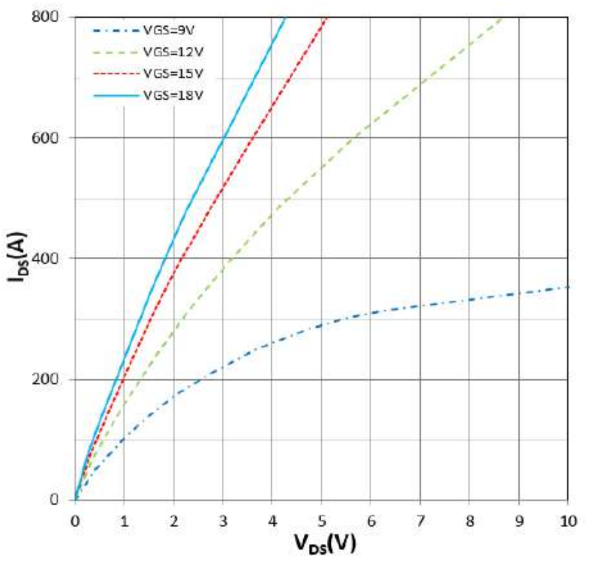

Figure 5. I_{DS} VS V_{DS}
T_j=25°C

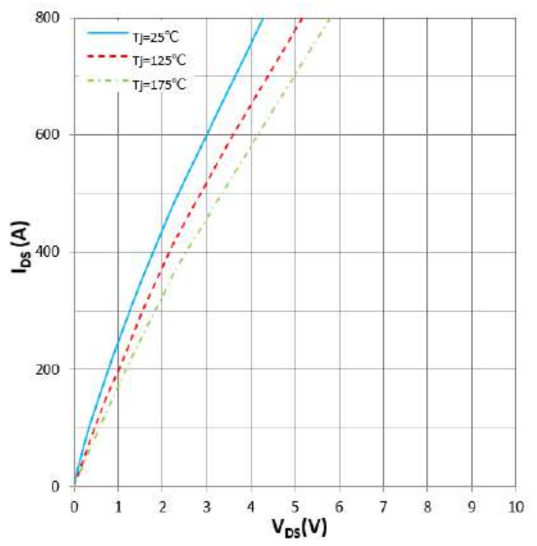

Figure 6. I_{DS} VS V_{DS}
V_{GS} =+18V

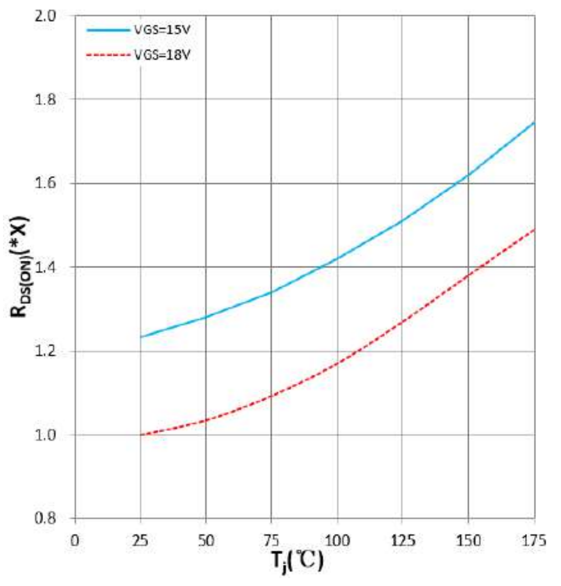

Figure 7. $R_{DS(ON)}$ VS T_j
V_{GS}=+15V/+18V, I_D=360A, 1.0X =4.3mΩ

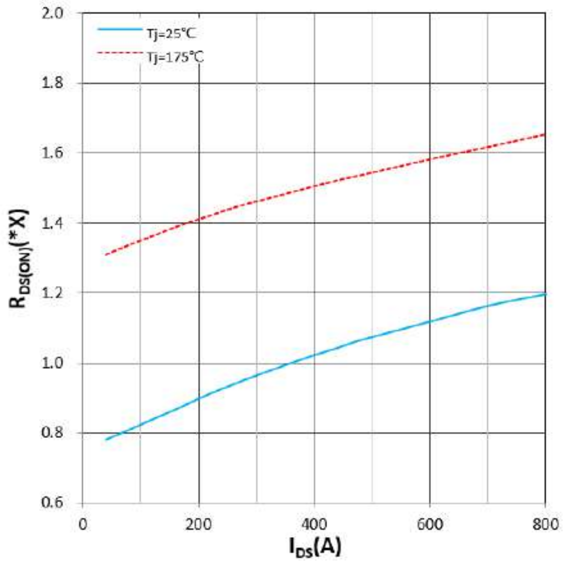

Figure 8. $R_{DS(ON)}$ VS T_j
V_{GS}=+18V, 1.0X =4.3mΩ

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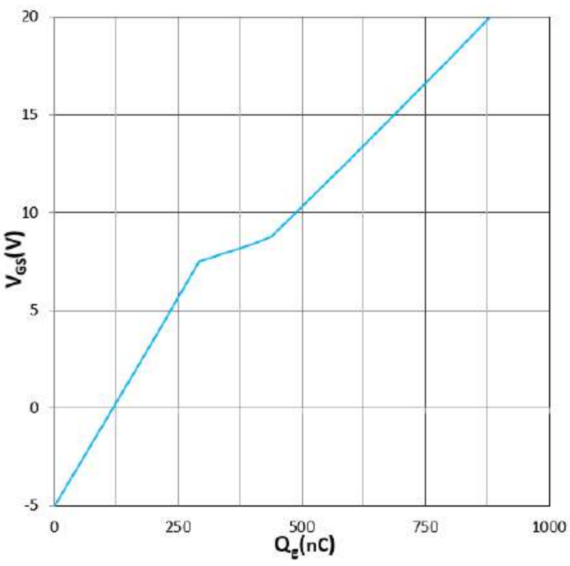

Figure 9. V_{GS} VS Q_g
V_{DS}=800V, I_D=240A, T_j=25°C

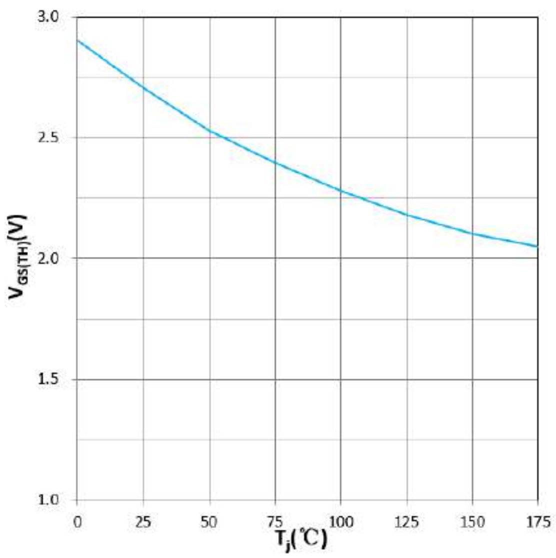

Figure 10. $V_{GS(TH)}$ VS T_j
V_{GS}=V_{DS}, I_D=140mA

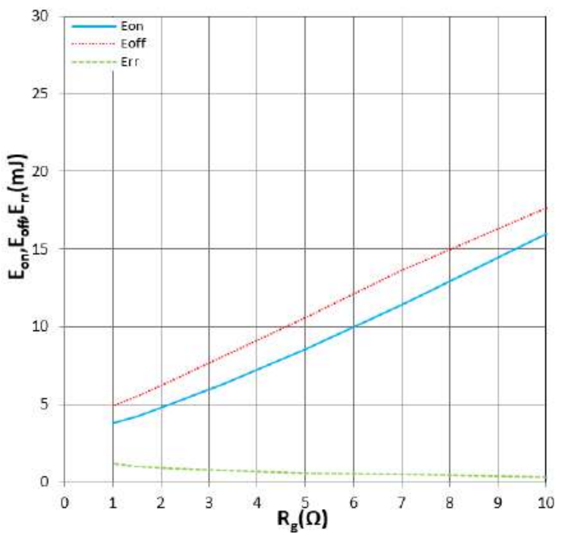

Figure 11. E_{on}, E_{off}, E_{rr} VS R_g
T_j=25°C, V_{DD}=600V, V_{GS}=+18V/-4V, I_D=360A
Inductive Load

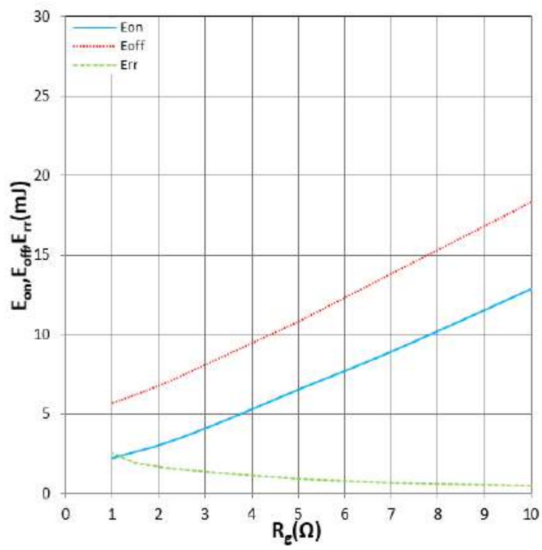

Figure 12. E_{on}, E_{off}, E_{rr} VS R_g
T_j=150°C, V_{DD}=600V, V_{GS}=+18V/-4V, I_D=360A
Inductive Load

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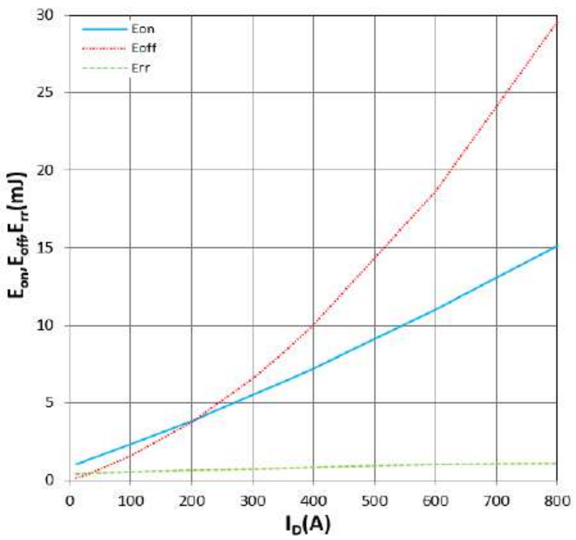	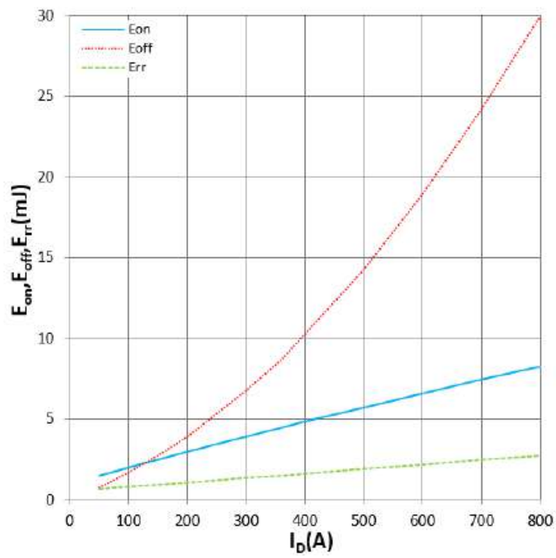
Figure 13. E_{on}, E_{off}, E_{rr} VS I_{DS} T_j=25°C, V_{DD}=600V, V_{GS}=+18V/-4V $R_{G(ON)}/R_{G(OFF)}$=3.3/3.3Ω, Inductive Load	Figure 14. E_{on}, E_{off}, E_{rr} VS I_{DS} T_j=150°C, V_{DD}=600V, V_{GS}=+18V/-4V $R_{G(ON)}/R_{G(OFF)}$=3.3/3.3Ω, Inductive Load
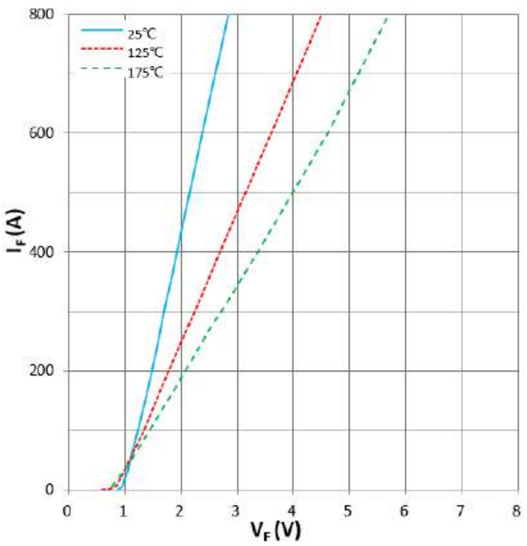	
Figure 15. I_F VS V_F V_{GS}=0V	

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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
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

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