HCS300FH170D4C2

1700V/300A Half Bridge SiC MOSFET Module

Description

The HCS300FH170D4C2 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

- Blocking Voltage 1700V
- $R_{DS(ON)}$=6.7mΩ@T_j=25°C, V_{GS}=15V
- 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

- Motor Drives
- Servo Drives
- UPS Systems
- Smart-Grid/Grid-Tied Distributed Generation

Circuit Diagram

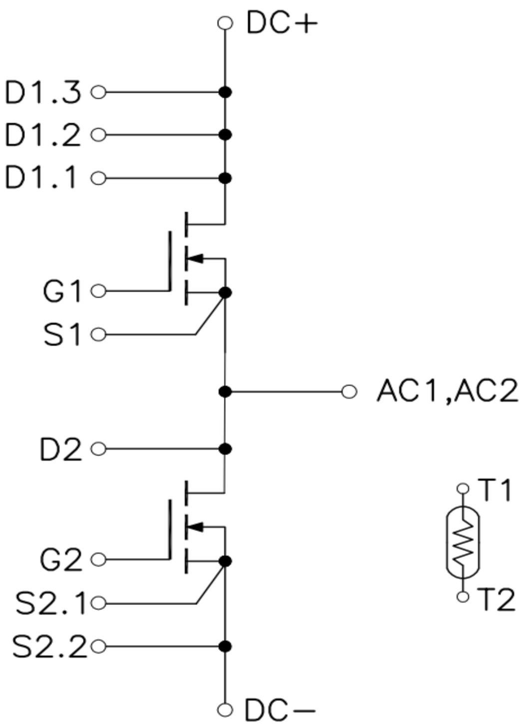

Figure 1. Out Drawing & Circuit Diagram HCS300FH170D4C2

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

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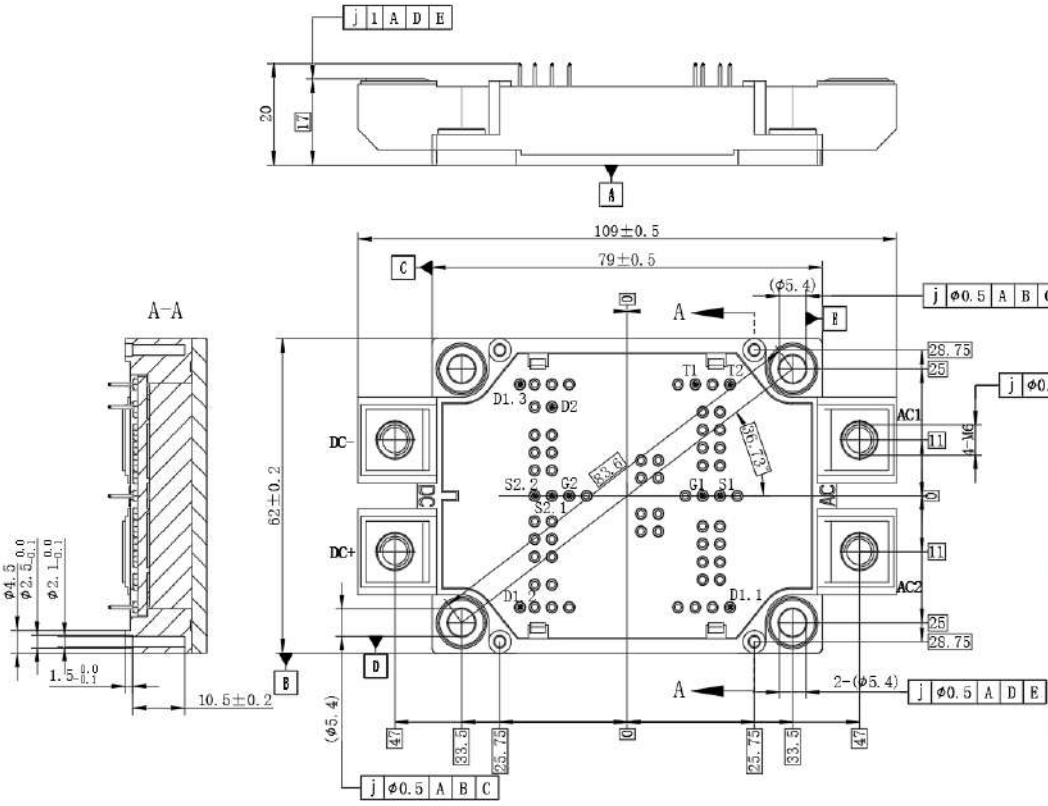
Physical Dimensions



Pin	X	Y
D1.2	-21.7	-22
D1.1	20.8	-22
S2.2	-18.7	0
S2.1	-15.2	0
G2	-11.7	0
G1	15.3	0
S1	18.8	0
D2	-15.2	17.5
D1.3	-21.7	22
T1	13.8	22
T2	20.8	22

Figure 2. Physical Dimensions

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	-	600	-
Module lead resistance, terminals – chip	Tc=25°C	0.5	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	250	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	1700	V
V_{GSS}	Gate-Source Voltage(+)	D-S Short	20	V
V_{GSS}	Gate-Source Voltage(-)	D-S Short	-10	V
$V_{GSSSurge}$	G-S Voltage (tsurge• •300nsec)	D-S Short, Note1	-10 to 20	V
I_{DS}	DC Continuous Drain Current	T_f=25°C, V_{GS}=15V	320	A
I_{DS}	DC Continuous Drain Current	T_f=80°C, V_{GS}=15V	255	A
I_{SD}	Source (Body Diode) Current	T_f=25°C,with ON signal	320	A
I_{SD}	Source (Body Diode) Current	T_f=80°C,with ON signal	255	A
I_{DSM}	Pulse Forward Current	T_C =25°C, Pulse width =1ms, V_{GS} =15V, Note2	600	A
P_{tot}	Total Power Dissipation	T_c=25°C	1920	W
T_{jmax}	Max Junction Temperature	-	175	°C
T_j	Junction temperature	-	-40 to 175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

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

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

Symbol	Parameter	Conditions		Value Min.	Value Typ.	Value Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS} =0V, I_D =300μA		1700	-	-	V
I_{DSS}	Zero gate voltage drain current	V_{DS}=1200V, V_{GS}=0V		-	3	120	μA
$V_{GS(Th)}$	Gate-source threshold voltage	I_D=105mA, V_{DS}=V_{GS}	T_j=25°C	1.8	2.7	-	V
			T_j=175°C	-	1.90	-	V
I_{GSS}	Gate-Source Leakage Current	V_{GS}=15V, V_{DS}=0V	T_j=25°C	-	-	800	nA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D=300A, V_{GS}=15V	T_j=25°C	-	6.7	10.3	mΩ
			T_j=175°C	-	15.5	-	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D=300A, V_{GS}=15V	T_j=25°C	-	2.01	3.09	V
			T_j=175°C	-	4.65	-	V
C_{iss}	Input capacitance	V_{DS}=1000V, V_{GS}=0V f=1MHz, V_{AC}=25mV		-	22.9	-	nF
C_{oss}	Output capacitance			-	0.62	-	nF
C_{rss}	Reverse transfer capacitance			-	0.110	-	nF
Q_g	Total gate charge	V_{DD}=800V, I_D=255A, V_{GS}=-5/+15V		-	748	-	nC
R_{gint}	Internal gate resistance	T_j=25°C		-	0.16	-	Ω
$t_{d(on)}$	Turn-on delay time	V_{DD}=900V I_D=300A V_{GS}=+15/-4V $R_{G(ON)}$=6.8Ω $R_{G(OFF)}$=6.8Ω Inductive load Switching operation	T_j=25°C	-	157	-	ns
			T_j=150°C	-	119	-	
t_r	Rise time		T_j=25°C	-	116	-	ns
			T_j=150°C	-	97	-	
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	497	-	ns
			T_j=150°C	-	596	-	
t_f	Fall time		T_j=25°C	-	71	-	ns
			T_j=150°C	-	93	-	
E_{on}	Turn-on power dissipation		T_j=25°C	-	45.1	-	mJ
			T_j=150°C	-	38.50	-	
E_{off}	Turn-off power dissipation		T_j=25°C	-	40.2	-	mJ
			T_j=150°C	-	43.6	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.078	-	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.

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

Symbol	Parameter	Conditions		Value			Unit
				Min.	Typ.	Max.	
V_{SD}	Body Diode Forward Voltage	V_{GS}=-4V I_{SD}=300A	T_j=25°C	-	5.5	-	V
			T_j=150°C	-	5.2	-	
T_{rr}	Reverse Recovery Time	V_{RR}=900V I_D=300A V_{GS}=+15/-4V $R_{G(ON)}$=$R_{G(OFF)}$=6.8Ω Inductive loads Switching operation	T_j=25°C	-	41	-	ns
			T_j=150°C	-	138	-	
Q_{rr}	Reverse Recovery Charge		T_j=25°C	-	2.11	-	μC
			T_j=150°C	-	9.25	-	
E_{rr}	Diode Switching Power Dissipation		T_j=25°C	-	0.45	-	mJ
			T_j=150°C	-	3.52	-	

Test Conditions

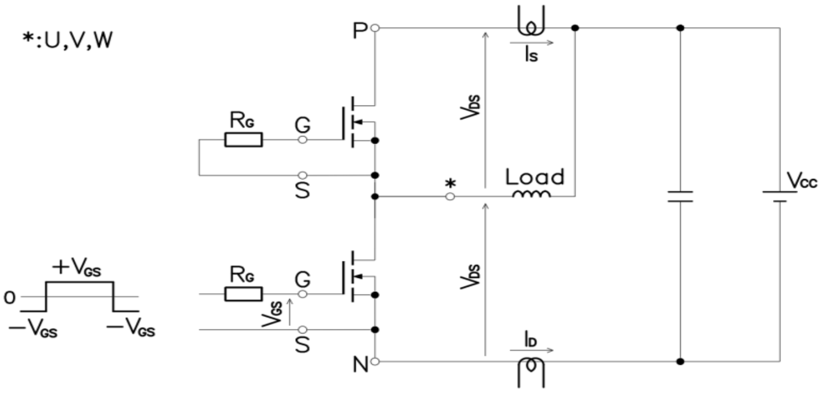

Figure 3. Switching Time Measure Circuit

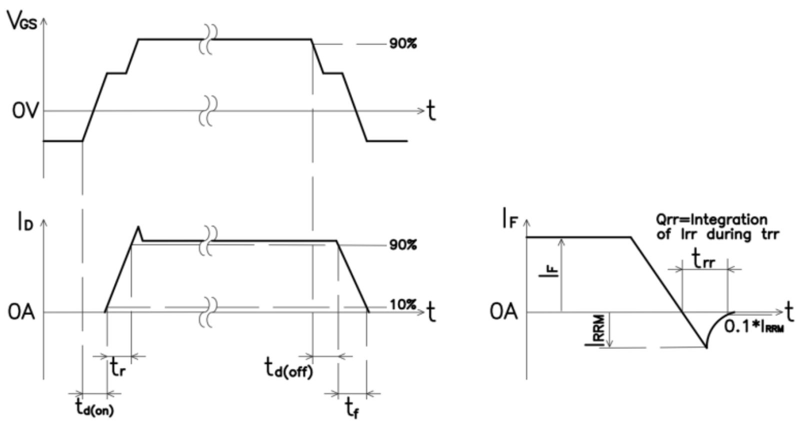

Figure 4. Switching Time Definition

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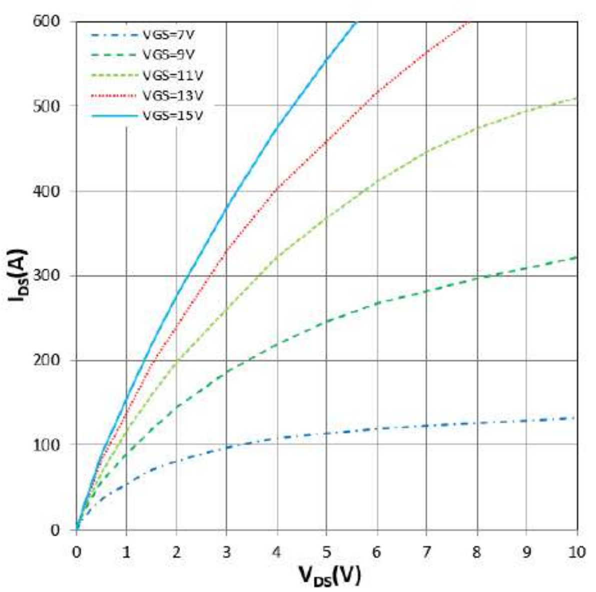

Figure 5. I_{DS} VS V_{DS}
T_j=25°C, V_{GS} Parameter

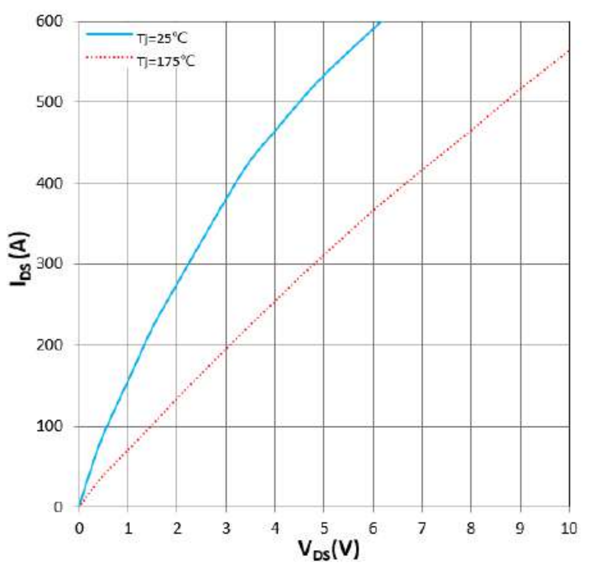

Figure 6. I_{DS} VS V_{DS}
V_{GS}=15V, T_j Parameter

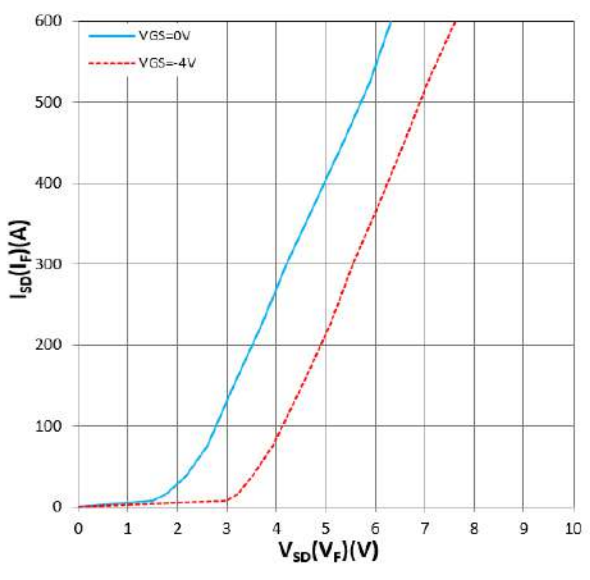

Figure 7. I_{SD} (I_F) VS V_{SD}(V_F)
T_j=25°C, V_{GS} Parameter

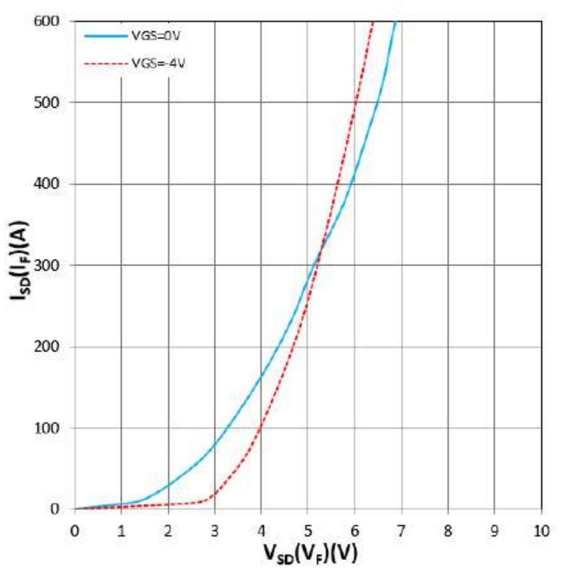

Figure 8.I_{SD} (I_F) VS V_{SD}(V_F)
T_j=175°C, V_{GS} Parameter

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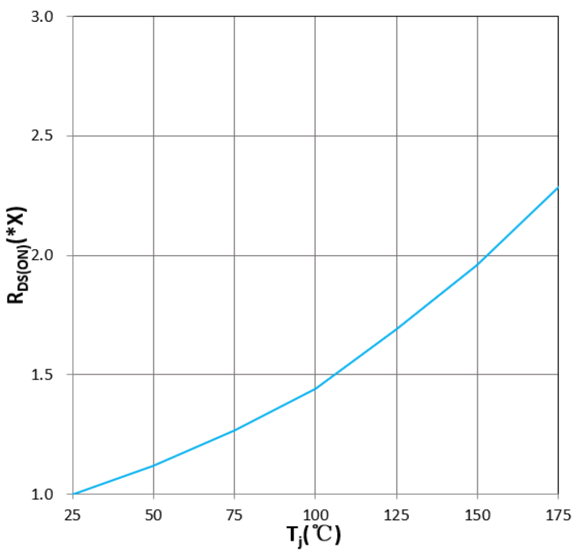

Figure 9. $R_{DS(ON)}$ VS T_j
V_{GS}=+15V, I_D=300A, 1.0X =6.7mΩ

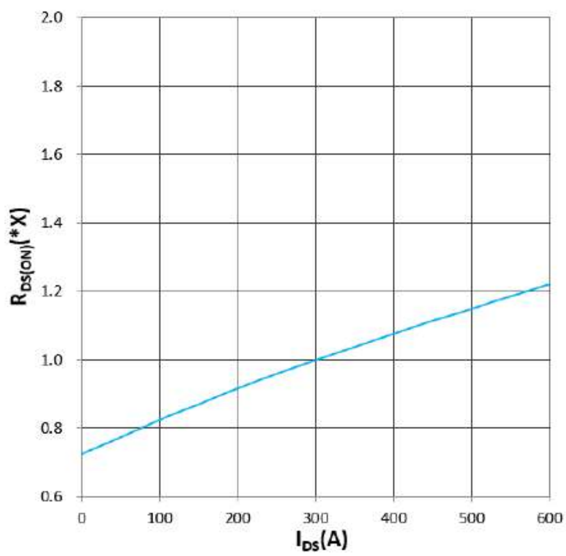

Figure 10. $R_{DS(ON)}$ VS I_{DS}
V_{GS}=+15V, Tj=25°C, 1.0X =6.7mΩ

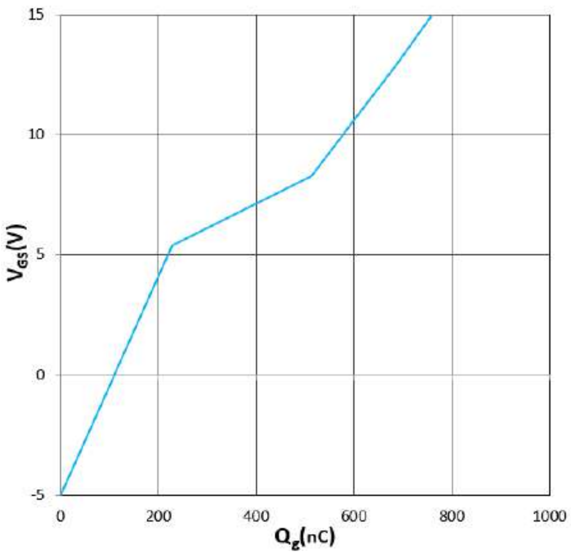

Figure 11. V_{GS} VS Q_g
T_j=25°C, I_D=225A, V_{DS}=1000V

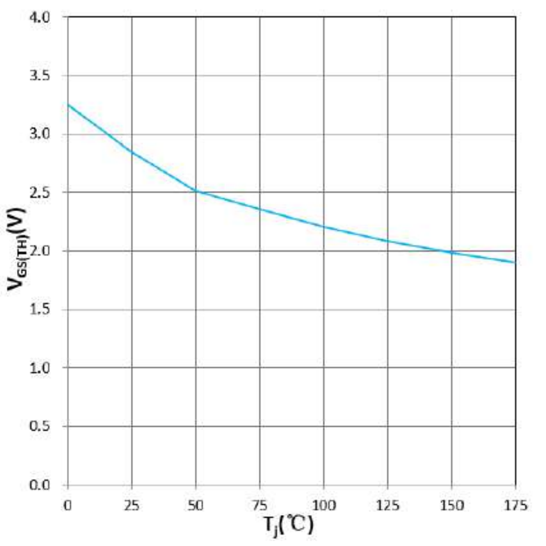

Figure 12. $V_{GS(Th)}$ VS T_j
V_{GS}=V_{DS}, I_D=180mA

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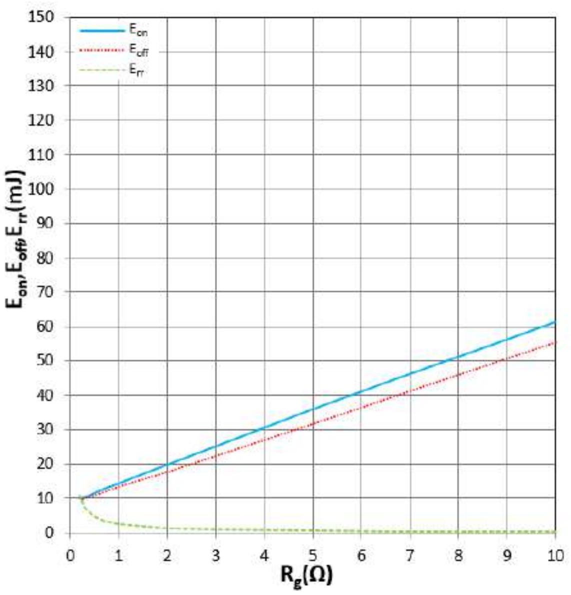

Figure 13. E_{on}, E_{off}, E_{rr} VS R_g
T_j=25°C, V_{CC}=900V, I_D=300A, V_{GS}=+15V/-4V
Inductive Load

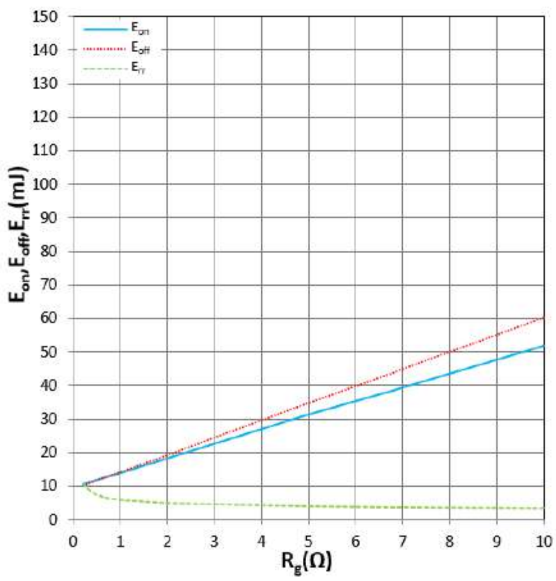

Figure14. E_{on}, E_{off}, E_{rr} VS R_g
T_j=150°C, V_{CC}=900V, I_D=300A, V_{GS}=+15V/-4V
Inductive Load

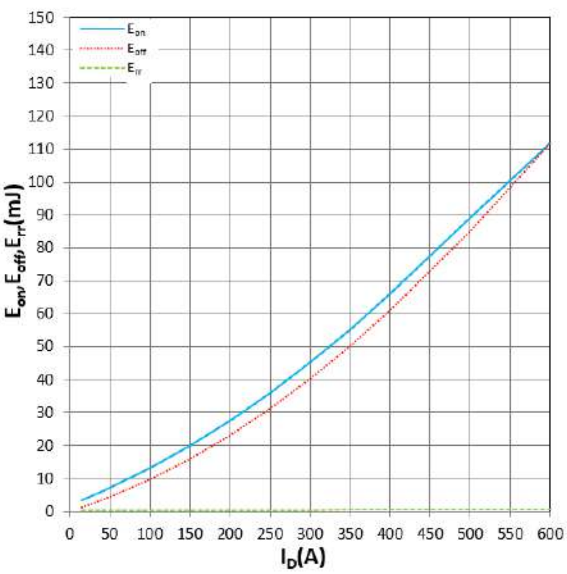

Figure 15. E_{on}, E_{off}, E_{rr} VS I_{DS}
T_j=25°C, V_{CC}=900V, V_{GS}=+15V/-4V, R_G=6.8Ω
Inductive Load

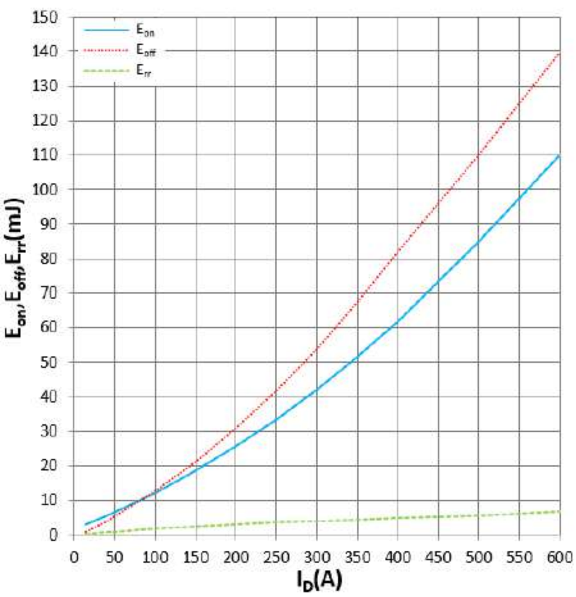

Figure 16.E_{on}, E_{off}, E_{rr} VS I_{DS}
T_j=150°C, V_{CC}=900V, V_{GS}=+15V/-4V, R_G=6.8Ω
Inductive Load

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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

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