HCS800FH120D4B3

1200V/800A Half Bridge SiC MOSFET Module

Description

The HCS800FH120D4B3 is a half bridge IGBT Power Module. It integrates high performance IGBT chips designed for the applications such as High Power supply and Motor control.

Features

- 1200V/1.7mΩ @T_j =25℃ ,V_{GS} =18V
- Low thermal resistance with Si3N4 AMB
- 175°C maximum junction temperature
- Low Inductive Design
- Thermistor inside

Applications

- xEV Applications
- Motor Drives
- Vehicle Fast Chargers
- Smart-Grid / Grid-Tied Distributed Generation

Circuit diagram

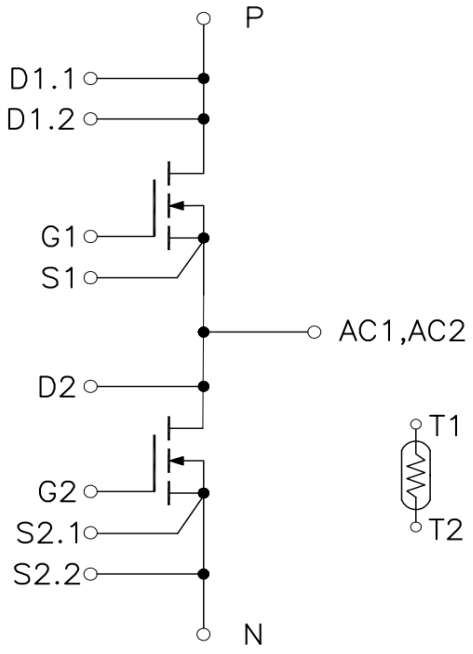

Figure 1. Out drawing & circuit diagram for HCS800FH120D4B3

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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Pin Configuration and Marking Information

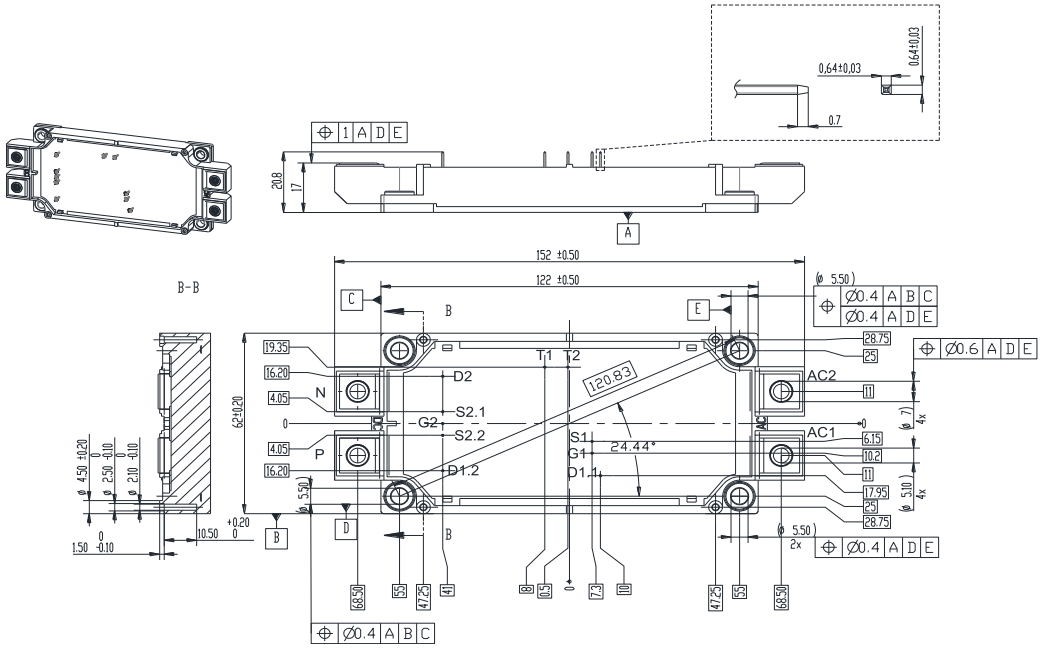

Figure2. Pin configuration

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Module

Parameter	Conditions	Value	Unit
Isolation voltage	RMS, f =50Hz, t =1min	3.4	kV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink terminal to terminal	14.5 13	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	>400	-
Module lead resistance, terminals – chip	T_C = 25°C	0.2	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	350	g

Maximum Ratings (T_j =25℃ unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{DSS}	Drain-Source Voltage	G-S Short	1200	V
V_{GSS}	Gate-Source Voltage	D-S Short, AC frequency ≥1Hz, Note1	-11V/+23V	V
I_{DS}	DC Continuous Drain Current	T_f=25°C	720	A
I_{DS}	DC Continuous Drain Current	T_f =65C	620	A
I_{SD}	Source (Body Diode) Current	T_f =25°C, with ON signal	720	A
I_{SD}	Source (Body Diode) Current	T_f =65°C, with ON signal	620	A
I_{DP}	Drain Pulse Current, Peak	Less than 1us, Note2	1600	A
P_{tot}	Maximum Power Dissipation	T_C =25°C	2885	W
T_{jmax}	Max junction temperature	-	175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

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

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 R100	T_C =100°C, R_{100} =493Ω	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

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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 =8mA		1200	-	-	V
I_{DSS}	Zero gate voltage drain current	V_{DS} =1200V, V_{GS} =0V		-	-	80	μA
$V_{GS(th)}$	Gate-source threshold voltage	I_D =80mA,V_{DS} =V_{GS}		2.1	-	5.8	V
I_{GSS}	Gate-Source Leakage Current	V_{GS} =20V, V_{DS} =0V, T_j =25°C		-	-	10	μA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D =800A V_{GS} =18V	T_j =25°C	1.1	1.7	2.3	mΩ
			T_j =175°C	2.6	4.0	5.4	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state voltage	I_D =800A V_{GS} =18V	T_j =25°C	1.1	1.7	2.3	V
			T_j =175°C	2.6	4.0	5.4	V
C_{iss}	Input capacitance	V_{DS} =850V V_{GS} =0V f =1MHz		-	32	-	nF
C_{oss}	Output capacitance			-	1.84	-	nF
C_{rss}	Reverse transfer capacitance			-	0.176	-	nF
Q_G	Total gate charge	V_{DD} =850V, I_D =800A, V_{GS} =-5/+18V		-	1520	-	nC
R_{Gint}	Internal Gate Resistance	f =10MHz, V_{AC} =25		-	0.12	-	Ω
$t_{d(on)}$	Turn-on delay time	V_{DD} =600V I_D =800A V_{GS} =+15/-4V $R_{G(ON)}$ =5☒ $R_{G(OFF)}$ =5☒ Inductive load switching operation	T_j =25°C	-	158	-	ns
			T_j =150°C	-	143	-	
t_r	Rise time		T_j =25°C	-	127	-	ns
			T_j =150°C	-	115	-	
$t_{d(off)}$	Turn-odd delay time		T_j =25°C	-	335	-	ns
			T_j =150°C	-	372	-	
t_f	Fall time		T_j =25°C	-	81	-	ns
			T_j =150°C	-	99	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	41.1	-	mJ
			T_j =150°C	-	34.5	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	52.5	-	mJ
			T_j =150°C	-	54.2	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case/MOSFET		-	0.052	-	K/W
$R_{th(c-f)}$	Contact Thermal Resistance	With thermal conductive grease /MOSFET		-	0.02	-	K/W

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

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_{SD}	Body Diode Forward Voltage	V_{GS} =-4V I_{SD} =800A	T_j=25°C	3.9	4.9	5.6	V
			T_j=175°C	3.1	4.2	5.2	
T_{rr}	Reverse recovery time	V_{DD} =600V I_{SD} =800A V_{GS} =+15/-4V $R_{G(ON)}$ =$R_{G(OFF)}$ =5Ω Inductive load switching operation	T_j=25°C	-	38	-	ns
			T_j=150°C	-	55	-	
Q_{rr}	Reverse recovery charge		T_j=25°C	-	2.72	-	uC
			T_j=150°C	-	7.45	-	
E_{rr}	Diode switching power dissipation		T_j=25°C	-	0.68	-	mJ
			T_j=150°C	-	1.87	-	

Test Conditions

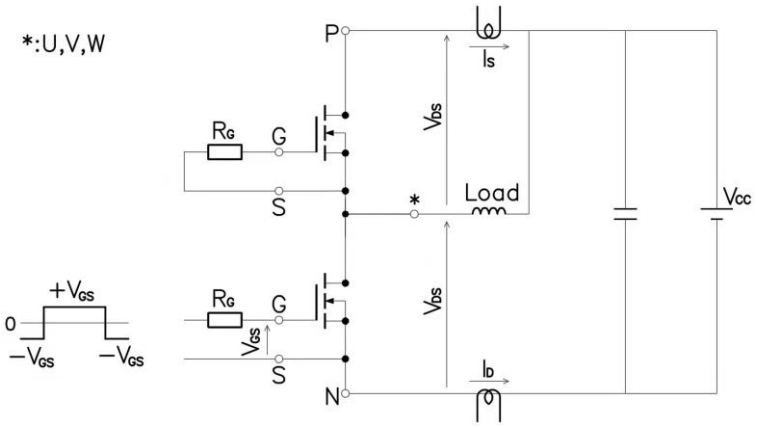

Figure 3. Switching time measure circuit

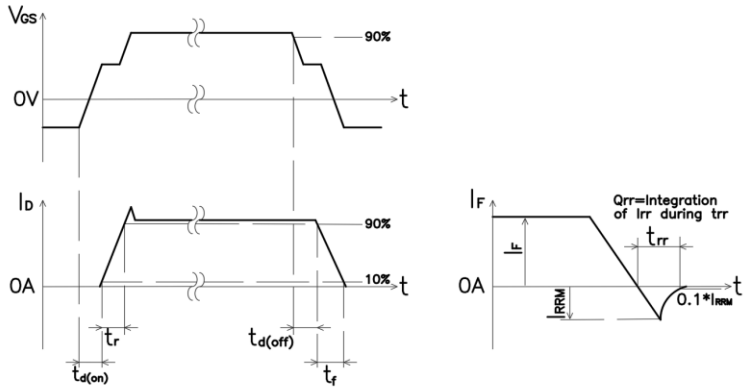

Figure 4. Switching time definition

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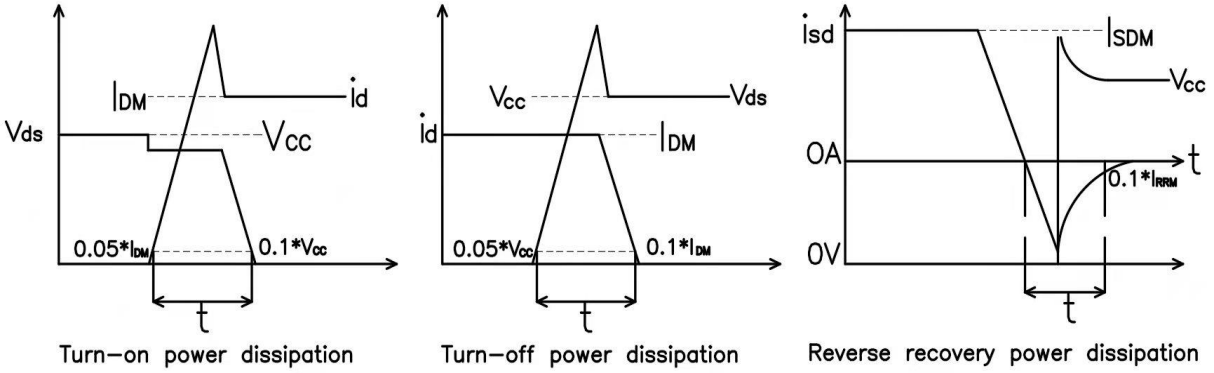

Figure 5. Switching power dissipation definition

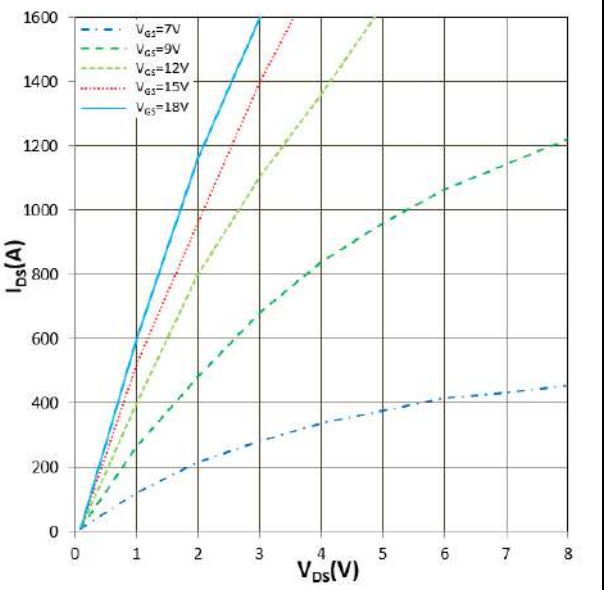

Figure 6. I_{DS} vs V_{DS}
T_j =25°C, V_{GS} parameter

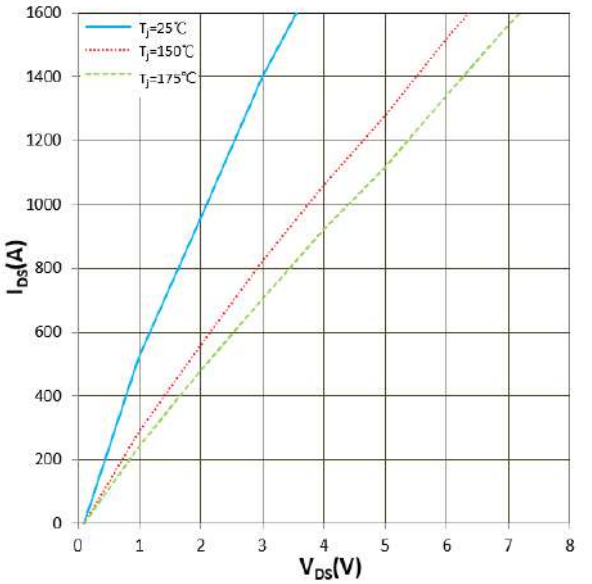

Figure 7. I_{DS} vs V_{DS}
V_{GS} =15V, T_j parameter

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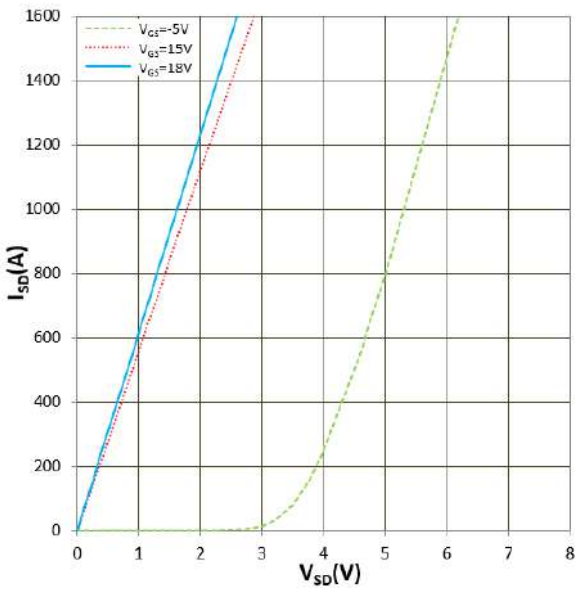

Figure 8. I_{SD} vs V_{SD}
T_j =25°C, V_{GS} parameter

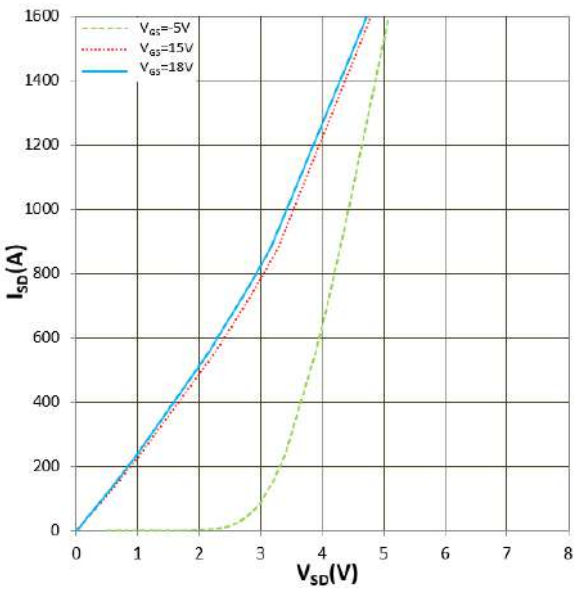

Figure 9. I_{SD} vs V_{SD}
T_j =175°C, V_{GS} parameter

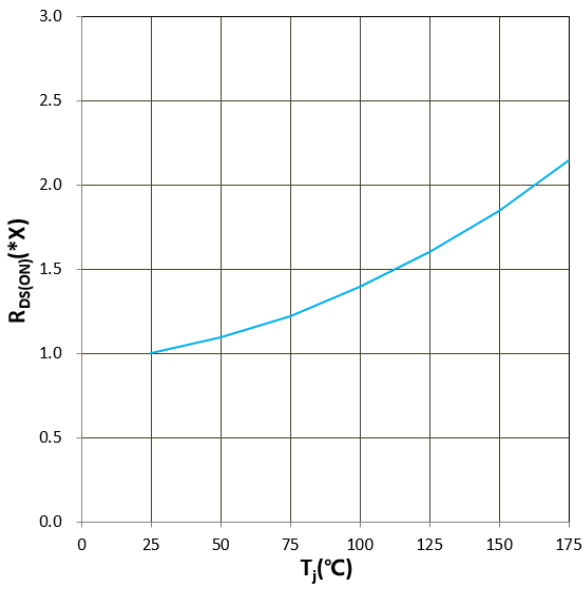

Figure 10. $R_{DS(ON)}$ vs T_j
V_{GS} =+15V, I_D =800A, 1.0x =2.0m☒

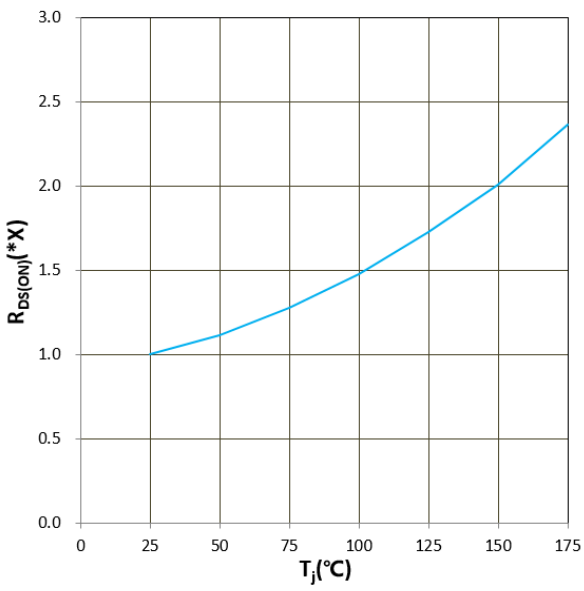

Figure 11. $R_{DS(ON)}$ vs I_{DS}
V_{GS} =+18V, I_D =800A, 1.0x =1.7m☒

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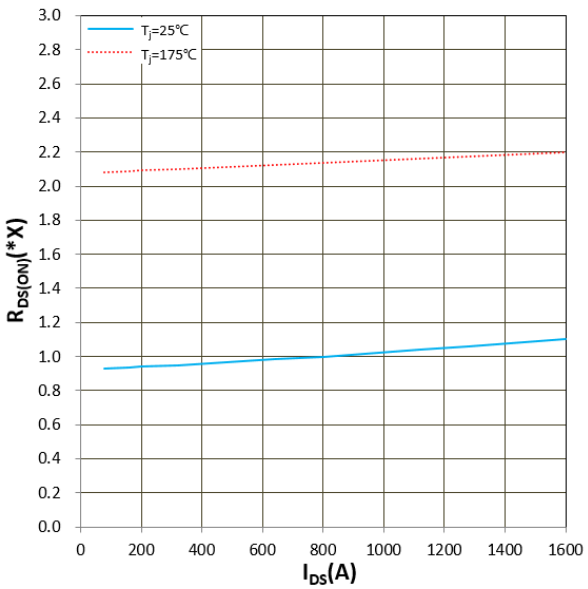

Figure 12. $R_{DS(ON)}$ vs I_{DS}
V_{GS} =+15V, 1.0x =2.0m☒

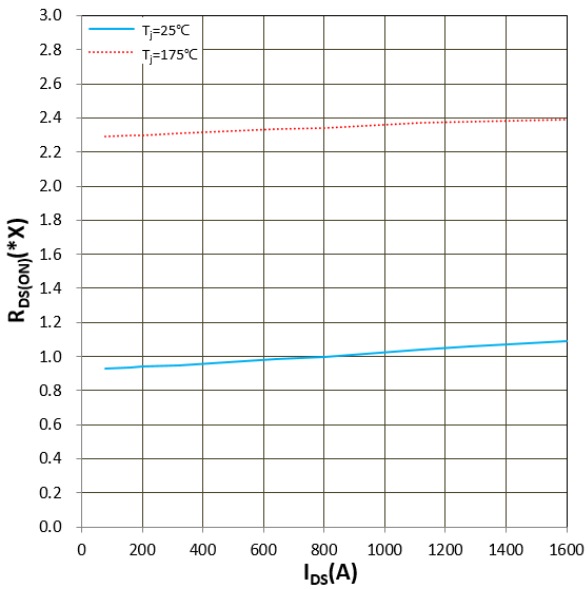

Figure 13. $R_{DS(ON)}$ vs I_{DS}
V_{GS} =+18V, 1.0x =1.7m☒

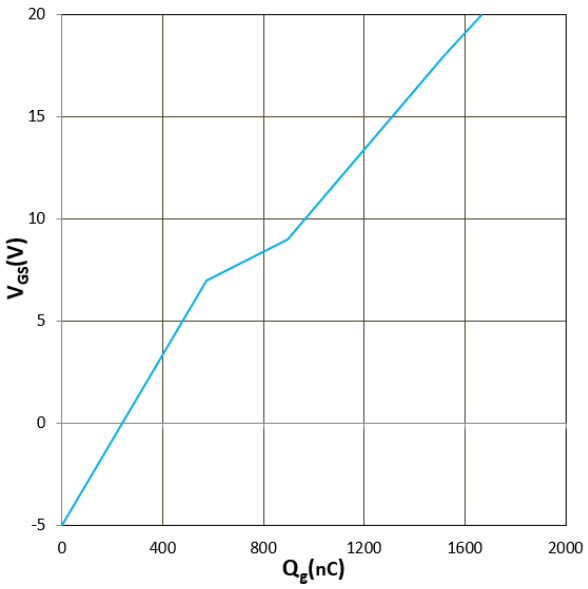

Figure 14. V_{GS} vs Q_g
T_j =25°C, I_{GS} =8mA

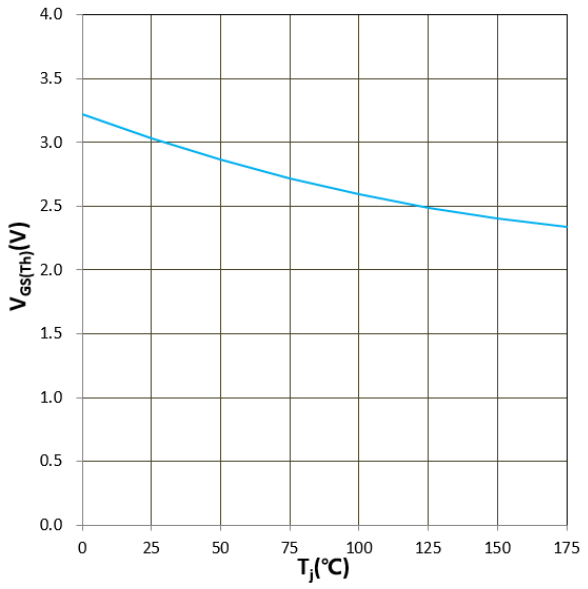

Figure 15. $V_{GS(TH)}$ vs T_j
V_{GS} =V_{DS}, I_D =80mA

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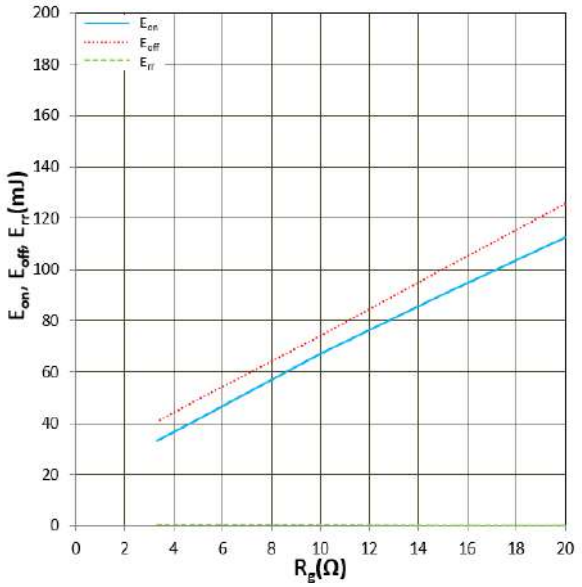

Figure 16. E_{on}, E_{off}, E_{rr} vs R_g
T_j =25℃, V_{CC} =600V, I_D =800A, V_{GS} =+15V/-4V
Inductive Load

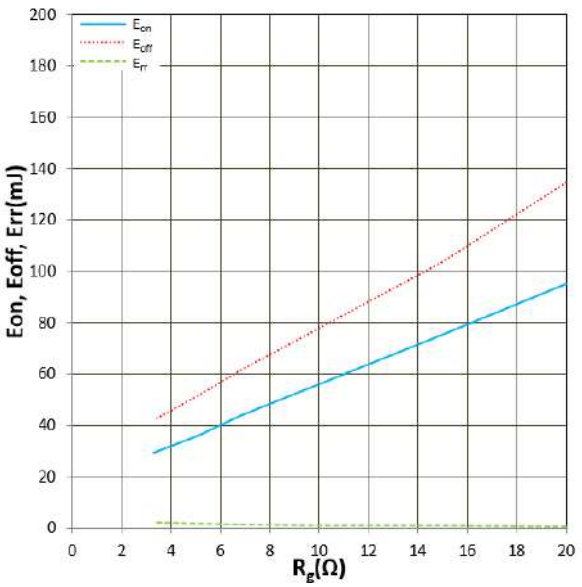

Figure 17. E_{on}, E_{off}, E_{rr} vs R_g
T_j =150℃, V_{CC} =600V, I_D =800A, V_{GS} =+15V/-4V
Inductive Load

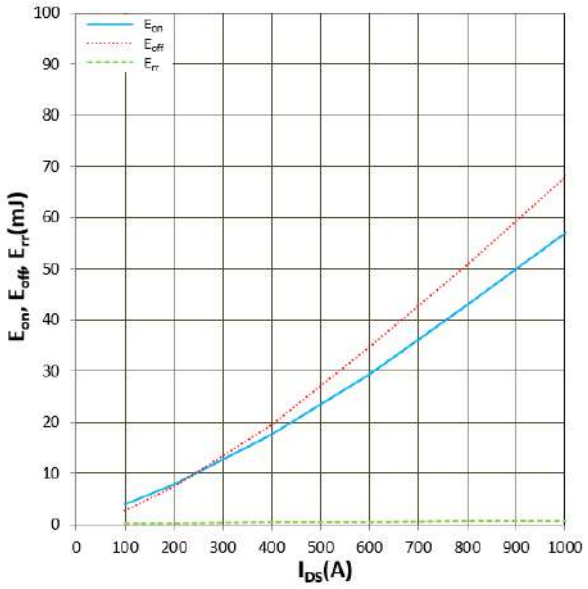

Figure 18. E_{on}, E_{off} , E_{rr} vs I_{DS}
T_j =25℃, V_{CC} =600V, R_G =5Ω, V_{GS} =+15V/-4V
Inductive Load

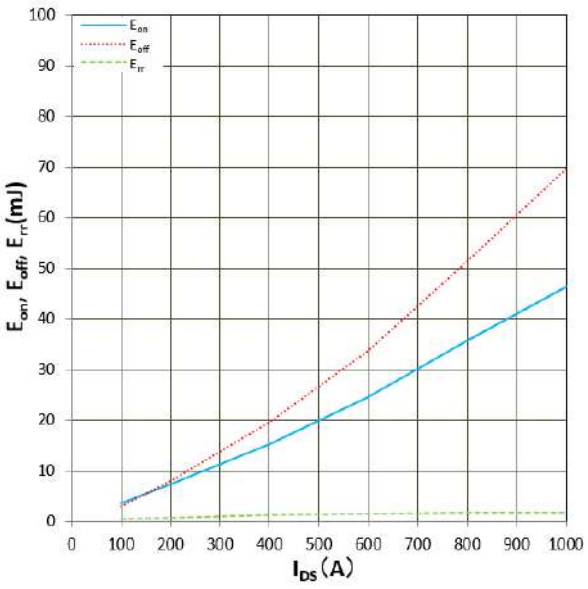

Figure 19. E_{on}, E_{off} , E_{rr} vs I_{DS}
T_j =150℃, V_{CC} =600V, R_G =5Ω, V_{GS} =+15V/-4V
Inductive Load

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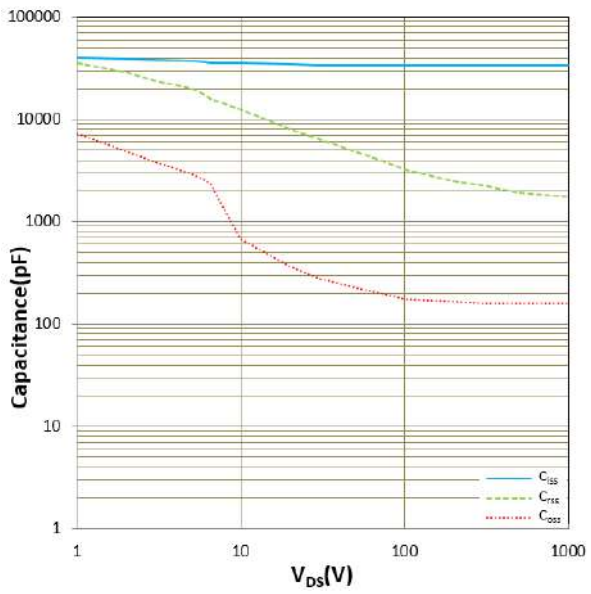

Figure 20. C_{ies},C_{oss},C_{rss} vs V_{DS}
T_j=25℃

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The data contained in this document is exclusively intended for technically trained staff. you and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales staff, which is responsible for you.

For further information on the product, technology, delivery terms and conditions and prices please contact the sales staff (sales@hiitio.com).

Changes of this product data sheet are reserved.

Revision History

Document Version	Description of Changes
RevX.0.1	Released

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