

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

Applications

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

Circuit diagram

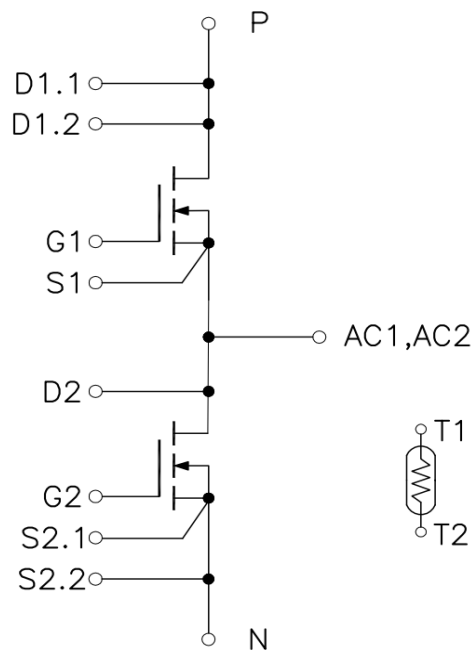


Figure 1. Out drawing & circuit diagram for HCS800FH120D4B3

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

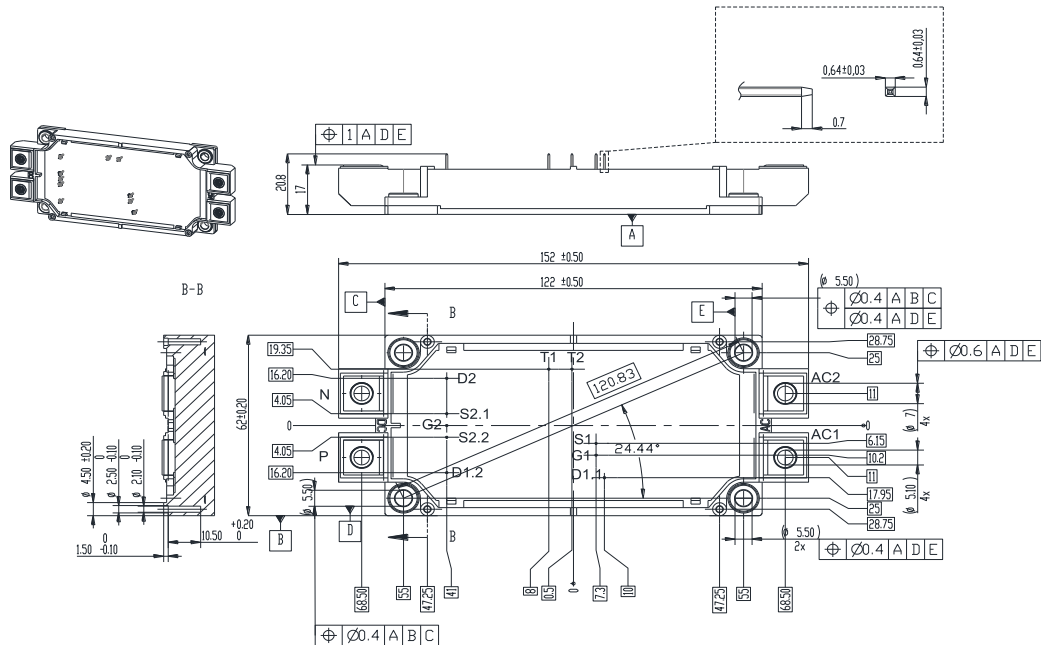


Figure2. Pin configuration

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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°C 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 =65°C	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
ΔR/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	R ₂ =R ₂₅ exp [B _{25/50} (1/T ₂ - 1/(298,15 K))]	-	3375	-	K
B _{25/80}	B-value	R ₂ =R ₂₅ exp [B _{25/80} (1/T ₂ - 1/(298,15 K))]	-	3411	-	K
B _{25/100}	B-value	R ₂ =R ₂₅ exp [B _{25/100} (1/T ₂ - 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	I _D =800A	T _j =25°C	1.1	1.7	2.3	mΩ
	On-state resistance	V _{GS} =18V	T _j =175°C	2.6	4.0	5.4	mΩ
V _{DS(on)} (Chip)	Static drain-source	I _D =800A	T _j =25°C	1.1	1.7	2.3	V
	On-state voltage	V _{GS} =18V	T _j =175°C	2.6	4.0	5.4	V
C _{iss}	Input capacitance	V _{DS} =850V		-	32	-	nF
C _{oss}	Output capacitance	V _{GS} =0V		-	1.84	-	nF
C _{rss}	Reverse transfer capacitance	f =1MHz		-	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	T _J =25°C	-	38	-	ns
			T _J =150°C	-	55	-	
Q _{rr}	Reverse recovery charge	V _{GS} =+15/-4V R _{G(ON)} =R _{G(OFF)} =5Ω	T _J =25°C	-	2.72	-	uC
			T _J =150°C	-	7.45	-	
E _{rr}	Diode switching power dissipation	Inductive load switching operation	T _J =25°C	-	0.68	-	mJ
			T _J =150°C	-	1.87	-	

Test Conditions

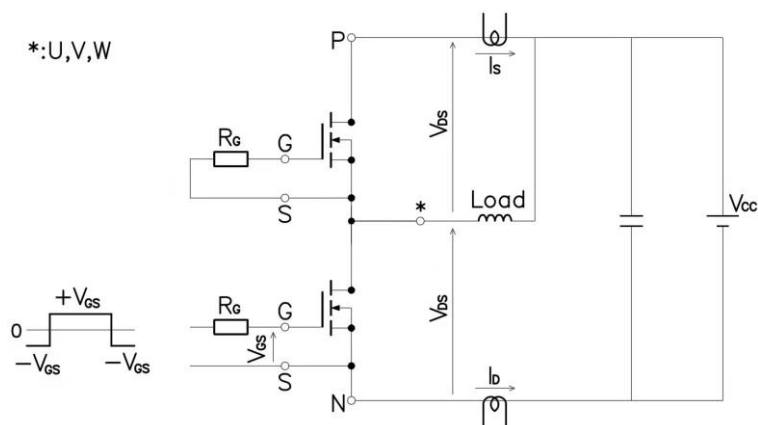


Figure 3. Switching time measure circuit

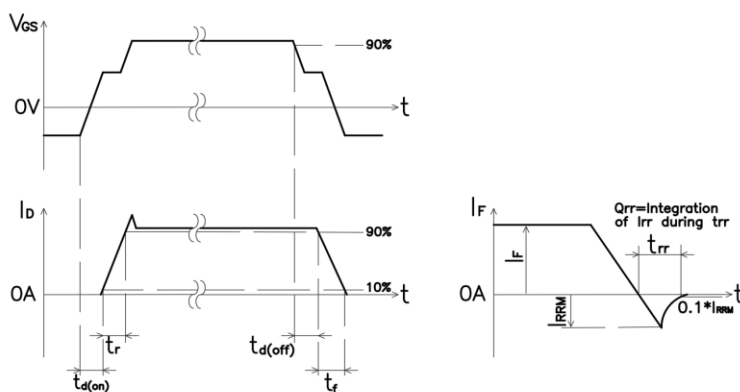


Figure 4. Switching time definition

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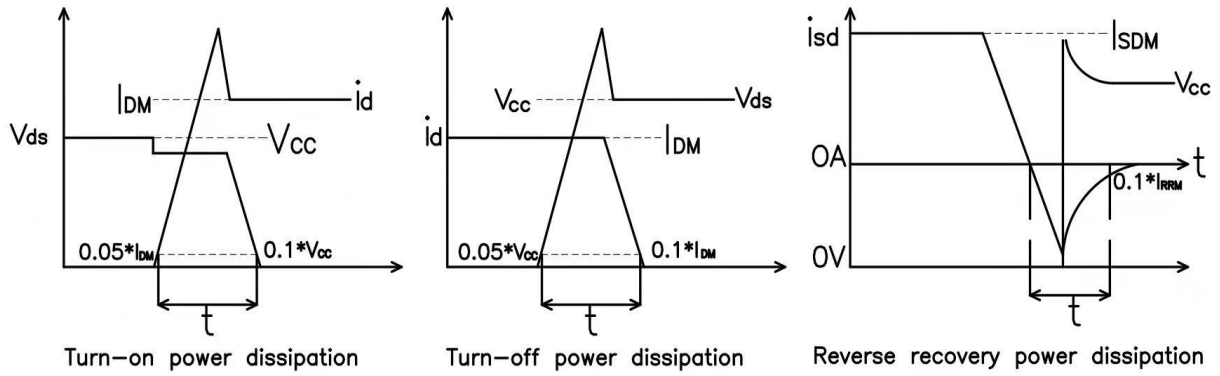


Figure 5. Switching power dissipation definition

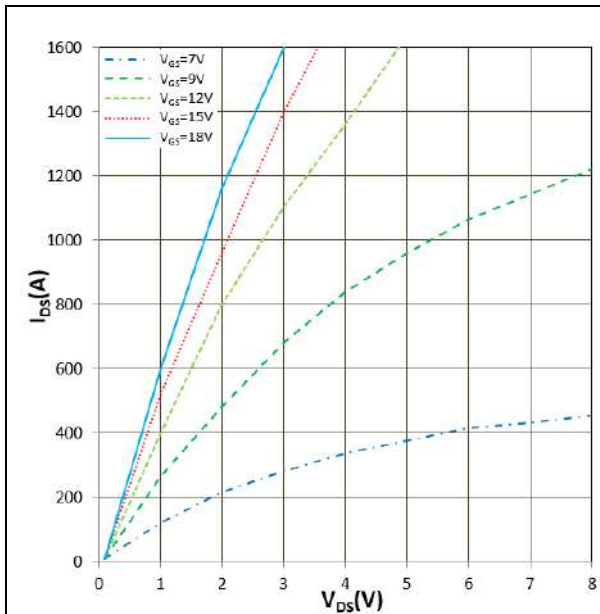


Figure 6. I_{DS} vs V_{DS}
 $T_j = 25^\circ\text{C}$, V_{GS} parameter

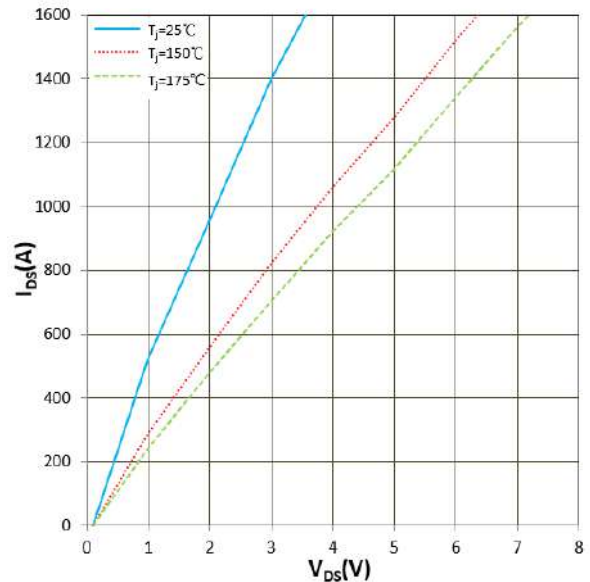


Figure 7. I_{DS} vs V_{DS}
 $V_{GS} = 15\text{V}$, T_j parameter

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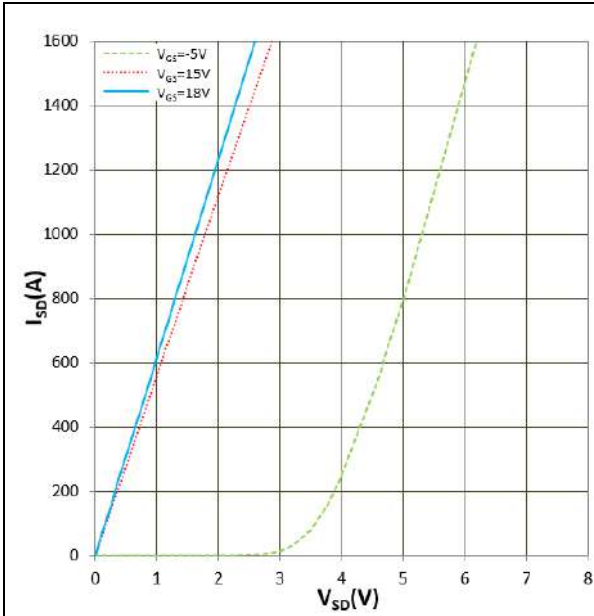


Figure 8. I_{SD} vs V_{SD}
 $T_j = 25^\circ\text{C}$, V_{GS} parameter

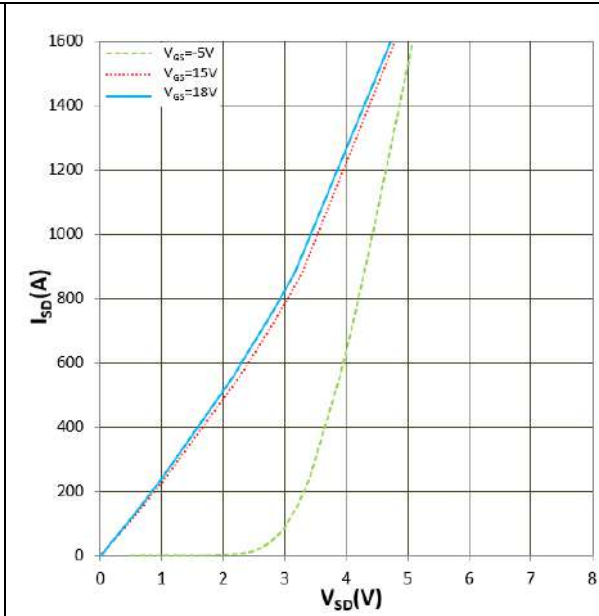


Figure 9. I_{SD} vs V_{SD}
 $T_j = 175^\circ\text{C}$, V_{GS} parameter

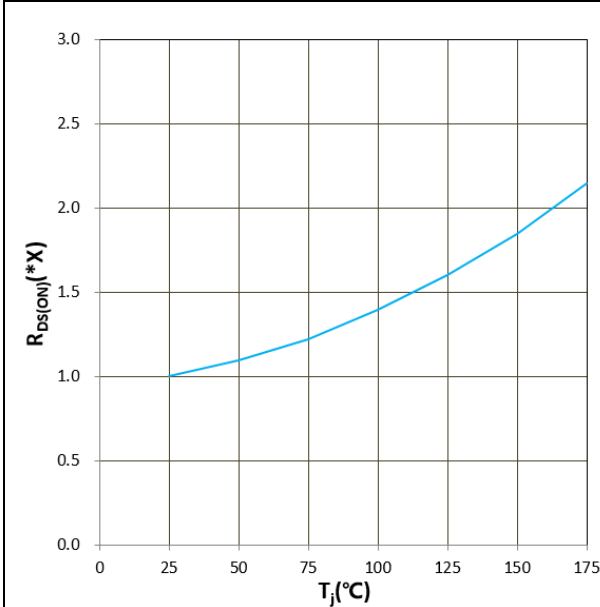


Figure 10. $R_{DS(ON)}$ vs T_j
 $V_{GS} = +15\text{V}$, $I_D = 800\text{A}$, $1.0x = 2.0\text{m}\Omega$

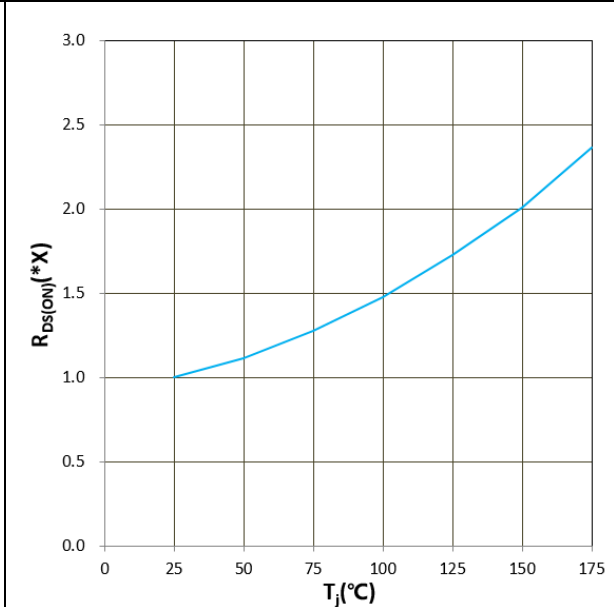


Figure 11. $R_{DS(ON)}$ vs I_{DS}
 $V_{GS} = +18\text{V}$, $I_D = 800\text{A}$, $1.0x = 1.7\text{m}\Omega$

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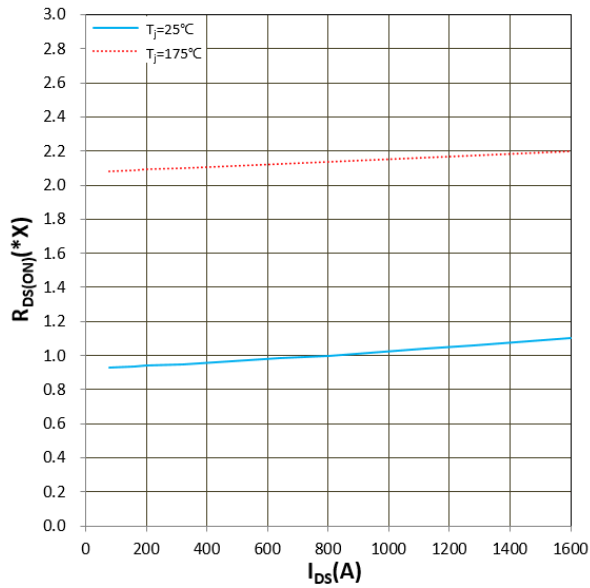


Figure 12. $R_{DS(ON)}$ vs I_{DS}
 $V_{GS} = +15\text{V}$, $1.0x = 2.0\text{m}$

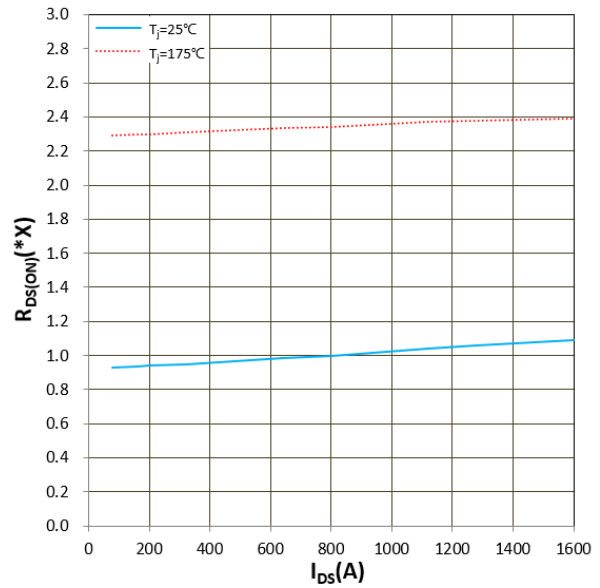


Figure 13. $R_{DS(ON)}$ vs I_{DS}
 $V_{GS} = +18\text{V}$, $1.0x = 1.7\text{m}$

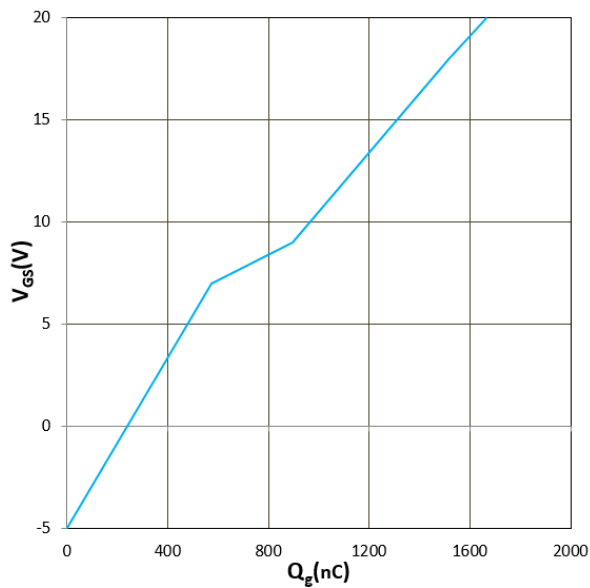


Figure 14. V_{GS} vs Q_g
 $T_J = 25^\circ\text{C}$, $I_{GS} = 8\text{mA}$

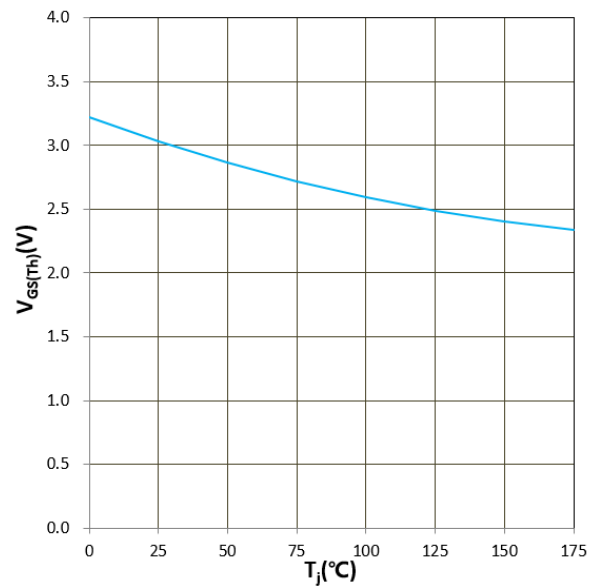
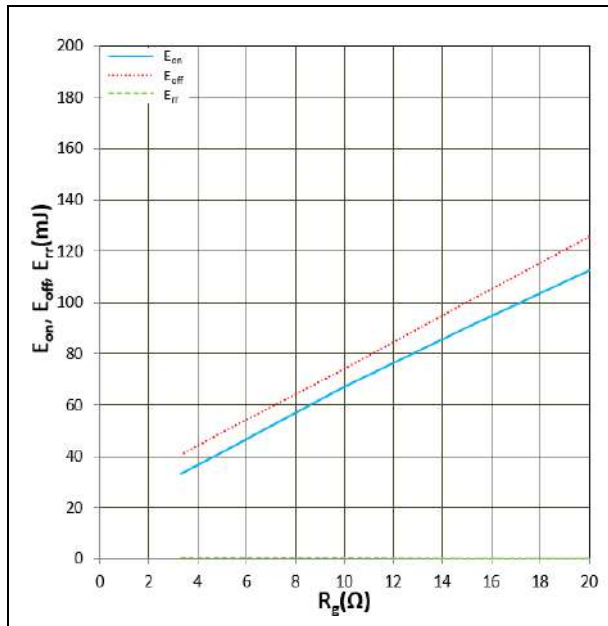
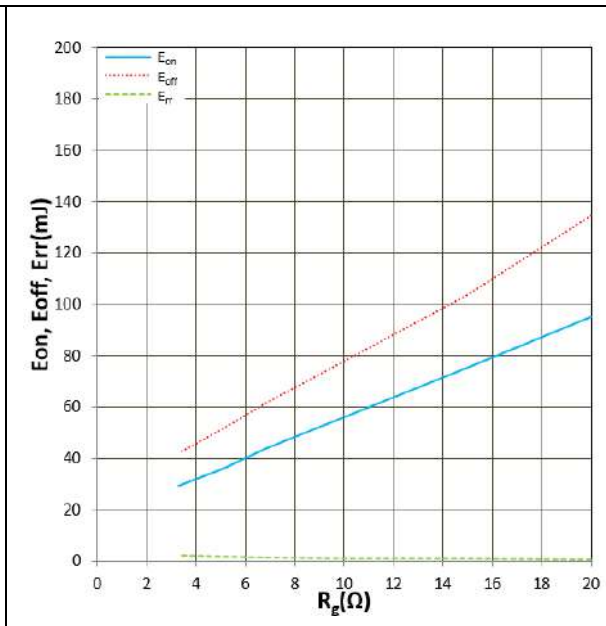
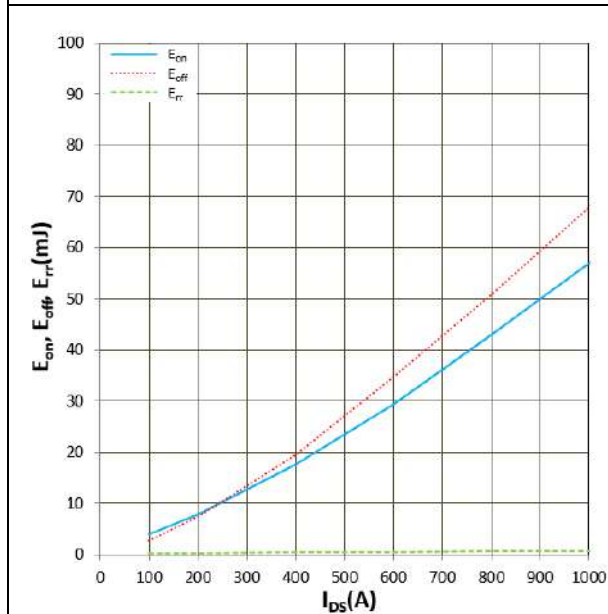
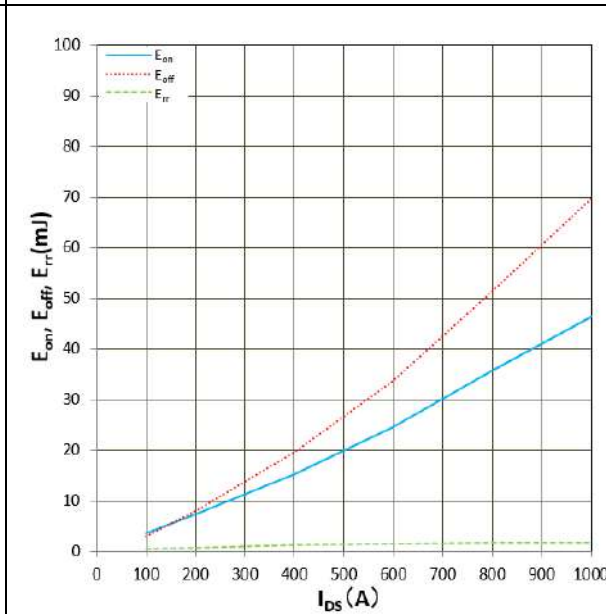


Figure 15. $V_{GS(TH)}$ vs T_J
 $V_{GS} = V_{DS}$, $I_D = 80\text{mA}$

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

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

Figure 18. E_{on} , E_{off} , E_{rr} vs I_{DS}
 $T_j = 25^\circ\text{C}$, $V_{CC} = 600\text{V}$, $R_g = 5\text{ }\mu\text{s}$, $V_{GS} = +15\text{V}/-4\text{V}$
Inductive Load

Figure 19. E_{on} , E_{off} , E_{rr} vs I_{DS}
 $T_j = 150^\circ\text{C}$, $V_{CC} = 600\text{V}$, $R_g = 5\text{ }\mu\text{s}$, $V_{GS} = +15\text{V}/-4\text{V}$
Inductive Load

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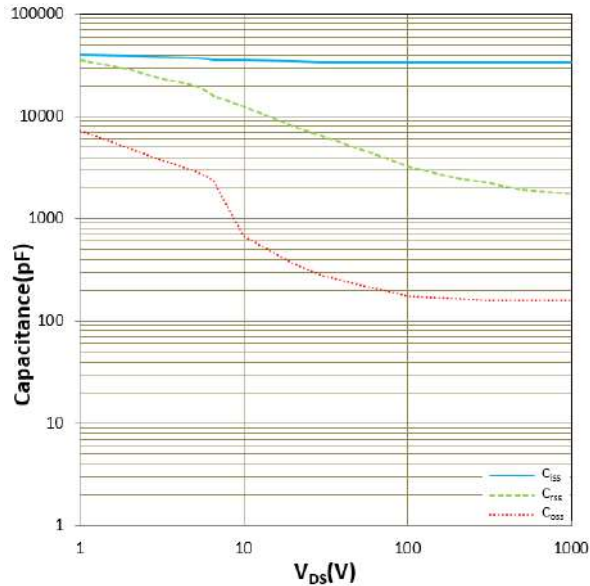


Figure 20. $C_{iss}, C_{oss}, C_{rss}$ vs V_{DS}
 $T_j = 25^\circ\text{C}$

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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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