

HCS540FH120A2A1

1200V/540A Half Bridge SiC MOSFET Module

Description

The HCS540FH120A2A1 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.



Features

- Blocking Voltage: 1700V
- $R_{ds(on)}=6.4m\Omega$
- Low Thermal Resistance with Si_3N_4 AMB
- 175°C Maximum Junction Temperature
- 62mm Half Bridge Module

Applications

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

Circuit Diagram

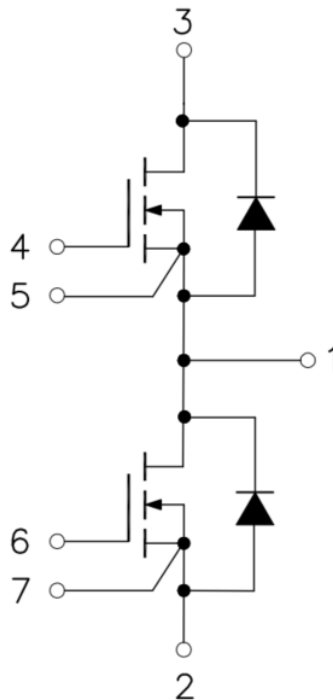


Figure 1. Out Drawing & Circuit Diagram HCS540FH120A2A1

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Pin Configuration and Marking Information

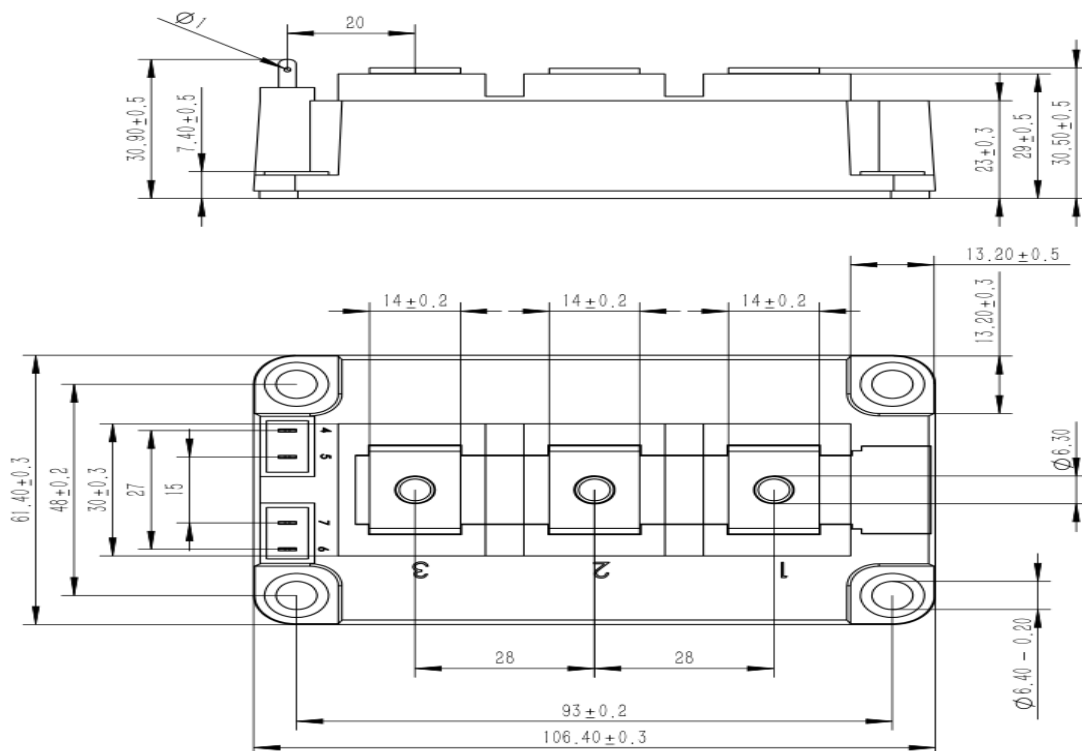


Figure 2. Pin Configuration

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 ($T_j=25^{\circ}\text{C}$ Unless Otherwise Specified)

Symbol	Parameter	Conditions	Value	Unit
V_{DS}	Drain-Source Voltage	G-S Short	1200	V
V_{GS}	Gate-Source Voltage	D-S Short, AC frequency 1Hz, Note1	-8 to 19	V
I_{DS}	DC Continuous Drain Current	$T_c=25^{\circ}\text{C}$, $V_{GS}=15\text{V}$	610	A
I_{DS}	DC Continuous Drain Current	$T_c=80^{\circ}\text{C}$, $V_{GS}=15\text{V}$	480	A
I_{SD}	Source-Drain Current (Diode)	$T_c=25^{\circ}\text{C}$, with ON signal	630	A
I_{SD}	Source-Drain Current (Diode)	$T_c=80^{\circ}\text{C}$, with ON signal	500	A
I_{DSM}	Pulse Drain Current	$T_c=65^{\circ}\text{C}$, Pulse Width=1ms, $V_{GS}=18\text{V}$, Note 2	1200	A
P_{tot}	Total Power Dissipation	$T_c=25^{\circ}\text{C}$	2205	W
T_{jmax}	Max Junction temperature	-	175	$^{\circ}\text{C}$
T_{stg}	Storage temperature	-	-40 to 125	$^{\circ}\text{C}$

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

Note2: Pulse width limited by maximum junction temperature

Diode Electrical Characteristics $T_j=25^{\circ}\text{C}$ Unless Otherwise Specified, Chip)

Symbol	Item	Conditions		Value			Unit
				Min.	Typ.	Max.	
V _F	Diode Forward Voltage	I _F =540A, V _{GS} =0V	T _j =25°C	-	1.85	-	V
			T _j =175°C	-	3.10	-	
T _{rr}	Diode Reverse Recovery Time	(Switch Side) V _{DD} =600V, I _D =540A V _{GS} =+15V/-4V R _{G(ON)} =R _{G(OFF)} =2.2Ω	T _j =25°C	-	27	-	ns
			T _j =150°C	-	29	-	
I _{RM}	Peak Reverse Recovery Current	(FRD Side) V _{RR} =600V, I _F =540A V _{GE} =+15V/-4V Inductive load Switching operation	T _j =25°C	-	285	-	A
			T _j =150°C	-	317	-	
Q _{rr}	Recovered Charge	(FRD Side) V _{RR} =600V, I _F =540A V _{GE} =+15V/-4V Inductive load Switching operation	T _j =25°C	-	3.4	-	μC
			T _j =150°C	-	4.6	-	
E _{rr}	Reverse Recovered Energy	(FRD Side) V _{RR} =600V, I _F =540A V _{GE} =+15V/-4V Inductive load Switching operation	T _j =25°C	-	1.3	-	mJ
			T _j =150°C	-	2.4	-	
R _{th(j-c)}	Thermal Resulance, Junction to Case(Diode)			-	0.065	-	°C/W

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MOSFET Electrical Characteristics ($T_j=25^{\circ}\text{C}$ Unless Otherwise Specified, Chip)

Symbol	Item	Conditions		Value			Unit
				Min.	Typ.	Max.	
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	200	μA
V _{GS(Th)}	Gate-source threshold voltage	I _D =108mA, V _{DS} =V _{GS}	T _J =25°C	2.0	2.8	-	V
			T _J =175°C	-	2.1	-	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 =540A, V _{GS} =+15V	T _J =25°C	-	3.5	-	mΩ
			T _J =175°C	-	5.8	-	mΩ
V _{DS(on)} (Chip)	Static drain-source On-state resistance	I _D =540A, V _{GS} =+15V	T _J =25°C	-	1.90	-	V
			T _J =175°C	-	3.15	-	V
C _{iss}	Input capacitance	V _D =1000V, V _{GS} =0V, f=100kHz, V _{AC} =25mV		-	25540	-	pF
C _{oss}	Output capacitance			-	1020	-	pF
C _{rss}	Reverse transfer capacitance			-	68	-	pF
R _{Gint}	Internal ate resistor	f=100kHz, V _{AC} =25mV		-	1.5	-	Ω
Q _g	Total gate charge	V _{DD} =800V, I _D =320A, V _{GS} =+15/-4V		-	1020	-	nC
t _{d(on)}	Turn-on delay time	V _{DD} =600V I _D =540A V _{GS} =+15/-4V R _{G(ON)} =2.2Ω R _{G(OFF)} =2.2Ω Inductive load Switching operation	T _J =25°C	-	67	-	ns
			T _J =150°C	-	61	-	
t _r	Rise time		T _J =25°C	-	37	-	ns
			T _J =150°C	-	32	-	
t _{d(off)}	Turn-off delay time		T _J =25°C	-	112	-	ns
			T _J =150°C	-	135	-	
t _f	Fall time		T _J =25°C	-	29	-	ns
			T _J =150°C	-	46	-	
E _{on}	Turn-on power dissipation		T _J =25°C	-	8.9	-	mJ
			T _J =150°C	-	7.2	-	
E _{off}	Turn-off power dissipation		T _J =25°C	-	6.5	-	mJ
			T _J =150°C	-	6.9	-	
R _{th(j-c)}	FET Thermal Resistance	Junction to Case		-	0.068	-	K/W

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Test Conditions

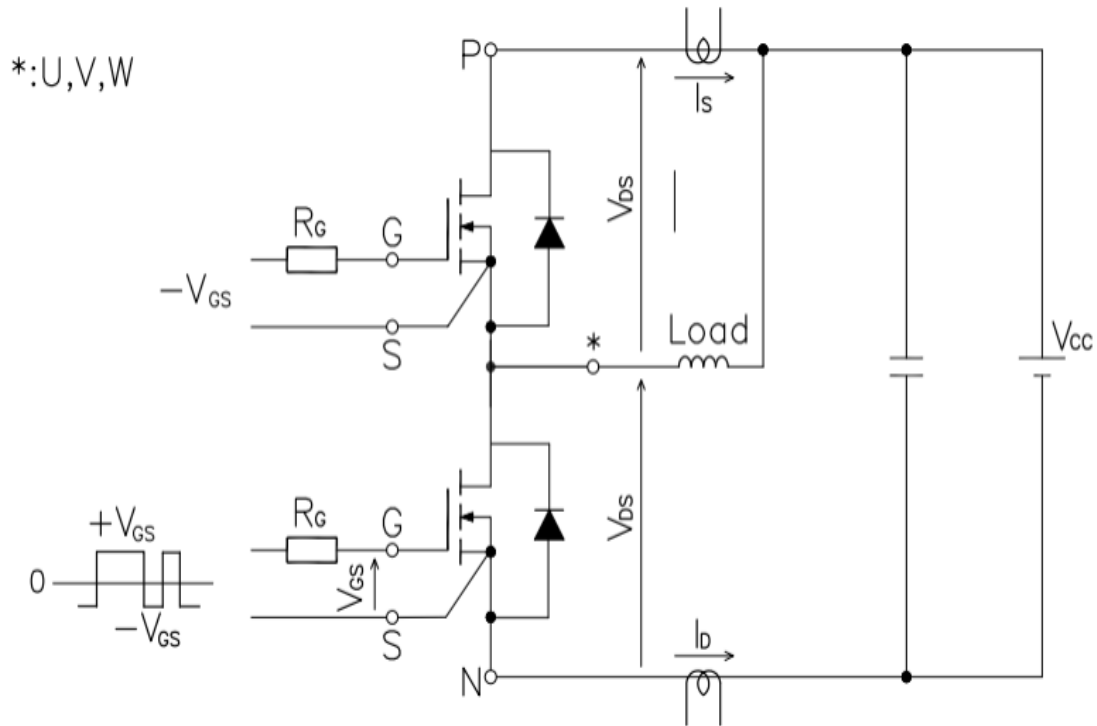


Figure 3. Switching Time Measure Circuit

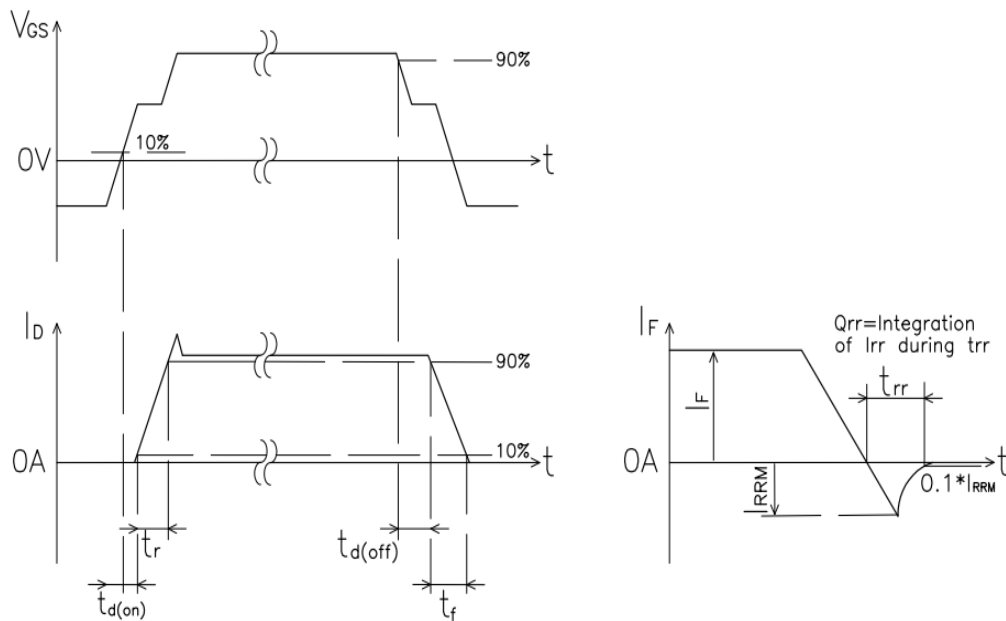


Figure 4. Switching Time Definition

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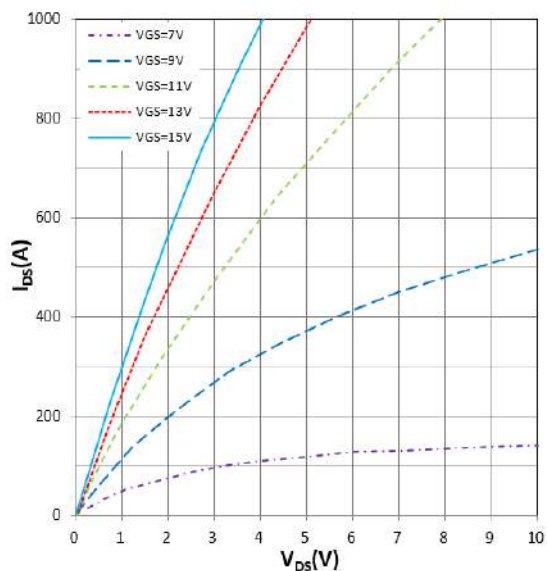


Figure 5. I_{DS} VS V_{DS}
 $T_J=25^{\circ}\text{C}$

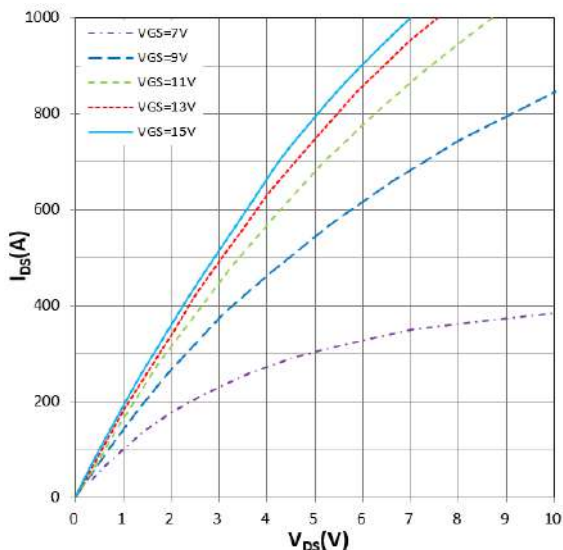


Figure 6. I_{DS} VS V_{DS}
 $T_J=175^{\circ}\text{C}$

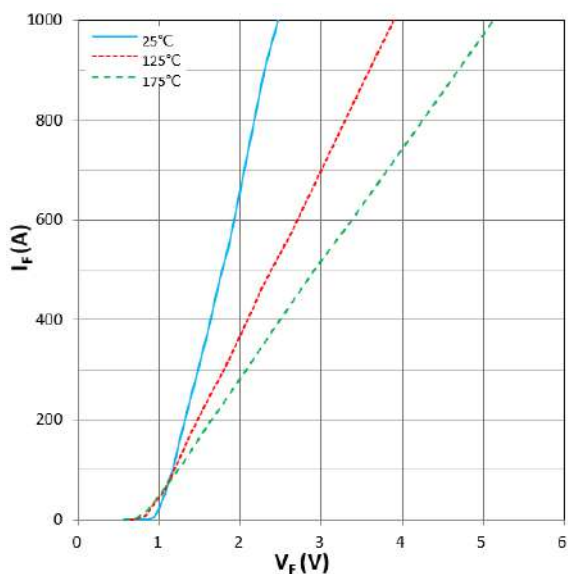


Figure 7. I_F VS V_F
 $V_{GS}=0\text{V}$

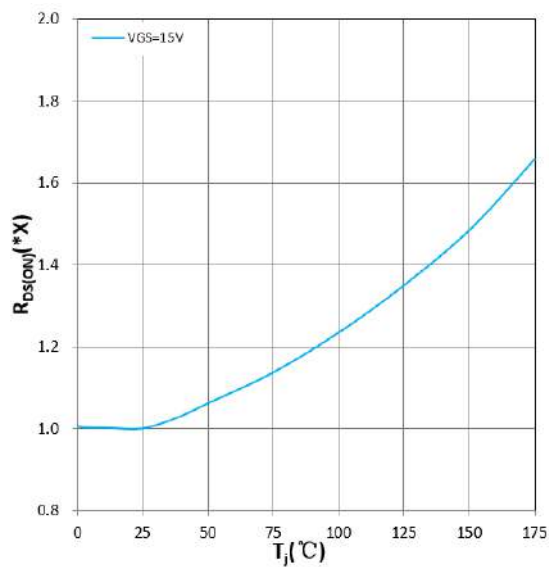
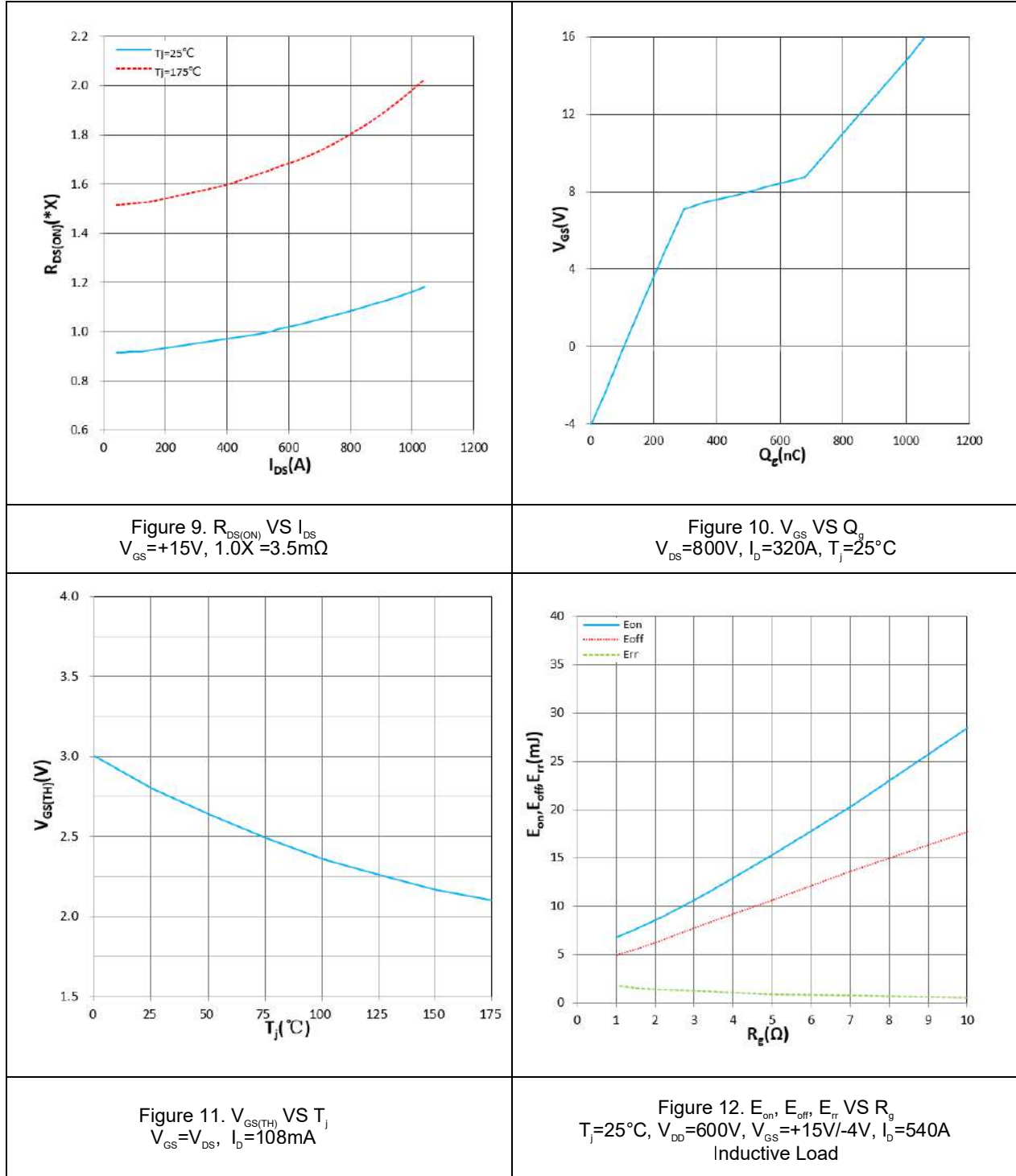


Figure 8. $R_{DS(ON)}$ VS T_J
 $V_{GS}=+15\text{V}$, $I_D=540\text{A}$, $1.0\text{X}=3.5\text{m}\Omega$

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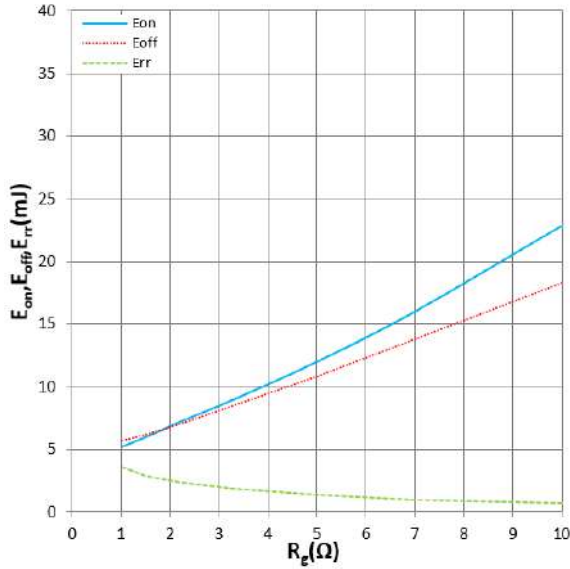


Figure 13. E_{on} , E_{off} , E_{rr} VS R_g
 $T_j=150^{\circ}\text{C}$, $V_{DD}=600\text{V}$, $V_{GS}=+15\text{V}/-4\text{V}$, $I_D=540\text{A}$
 Inductive Load

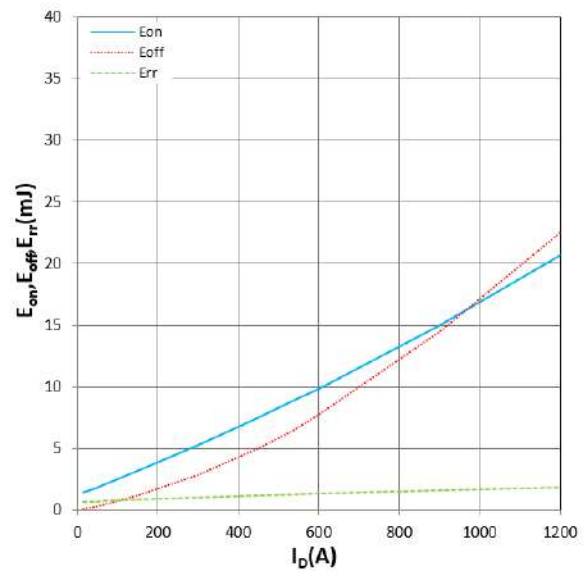


Figure 14. E_{on} , E_{off} , E_{rr} VS I_{DS}
 $T_j=25^{\circ}\text{C}$, $V_{DD}=600\text{V}$, $V_{GS}=+15\text{V}/-4\text{V}$
 $R_{G(ON)}/R_{G(OFF)}=2.2/2.2\Omega$, Inductive Load

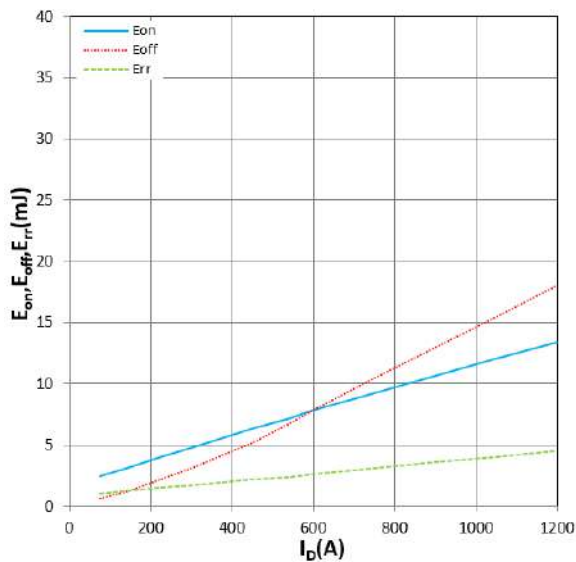


Figure 15. E_{on} , E_{off} , E_{rr} VS I_{DS}
 $T_j=150^{\circ}\text{C}$, $V_{DD}=600\text{V}$, $V_{GS}=+15\text{V}/-4\text{V}$
 $R_{G(ON)}/R_{G(OFF)}=2.2/2.2\Omega$, Inductive Load

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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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