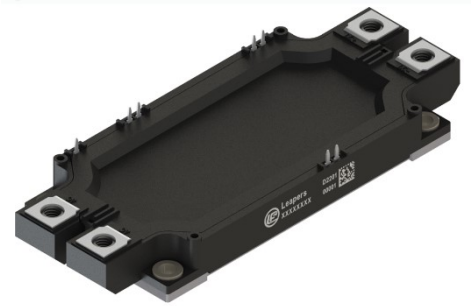
DFS300HF17I4C1

1700V/300A Half Bridge SiC MOSFET Module

Description

The DFS300HF17I4C1 is a Half Bridge SiC MOSFET Power Module. It integrates high performance SiC MOSFET chips designed for the applications such as Motor drives and Renewable energy.



Features

- Blocking voltage:1700V
- $R_{DS(on)}$ =6.7mΩ @ T_j =25°C
- Low thermal resistance with Si_3N_4 AMB
- Low Inductive Design
- Thermistor inside

Applications

- xEV Applications
- Motor Drives
- Servo Drives
- Smart-Grid/Grid-Tied Distributed Generation

Circuit diagram

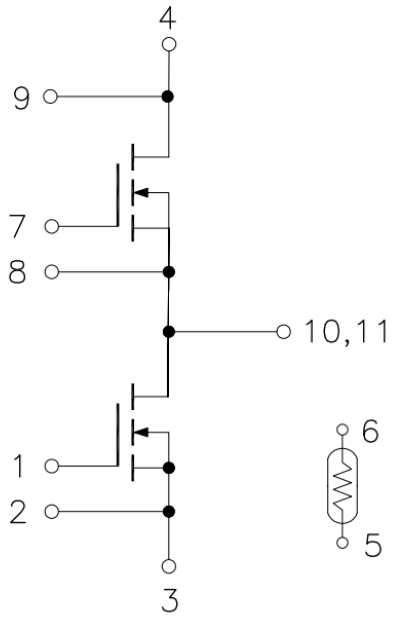


Figure 1. Out drawing & circuit diagram for DFS300HF17I4C1

Pin Configuration and Marking Information

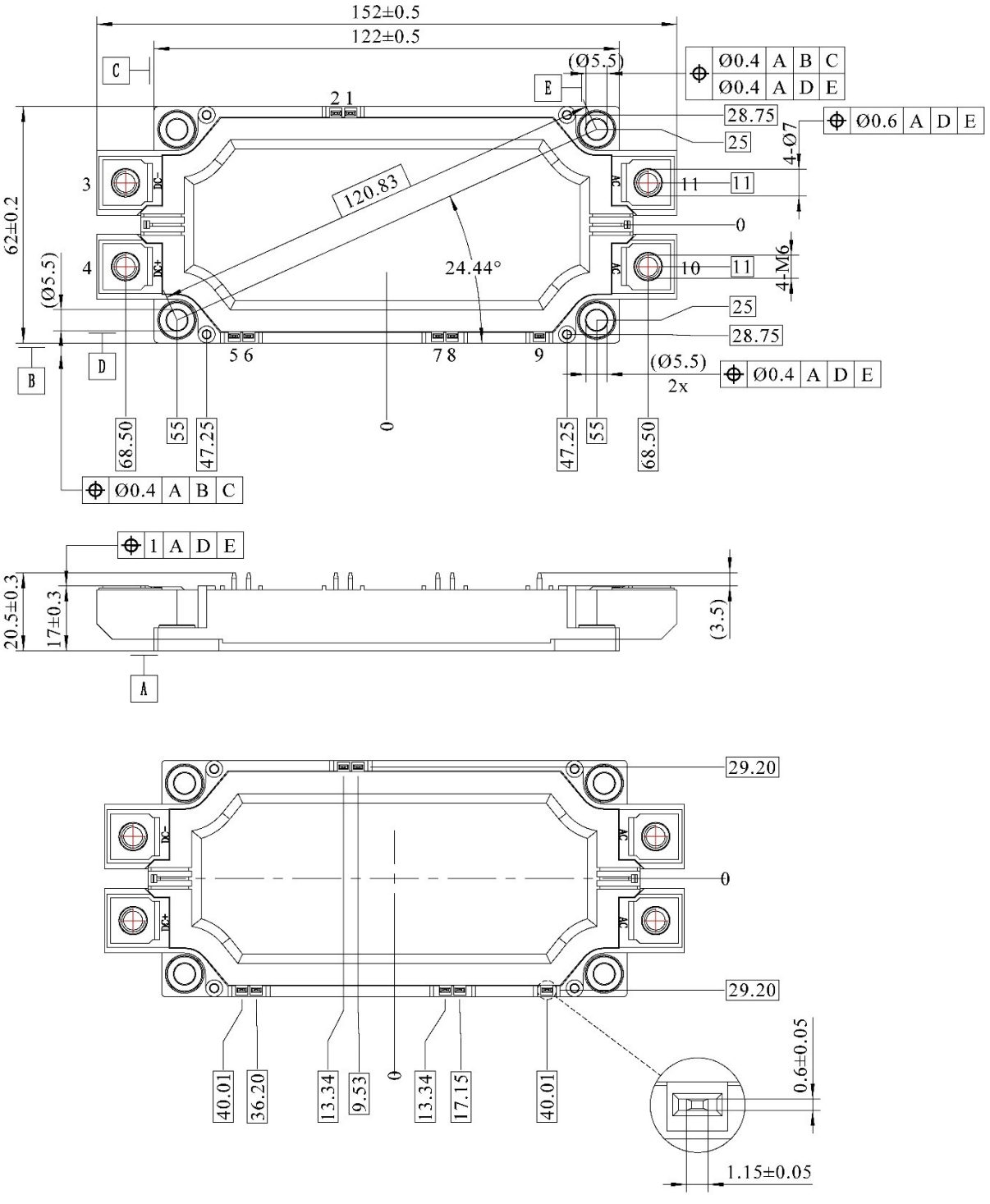


Figure 2. Pin configuration

Module

Parameter	Condition	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	T_C =25°C	0.5	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	385	g

Maximum Ratings (T_j =25°C unless otherwise specified)

Symbol	Parameter	Condition	Ratings	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(t_{surge} <300nsec)	D-S Short, Note1	-10 to 20	V
I_{DS}	DC Continuous Drain Current	T_C =25°C, V_{GS} =15V	315	A
I_{DS}	DC Continuous Drain Current	T_C =60°C, V_{GS} =15V	275	A
I_{SD}	Source (Body diode) Current	T_C =25°C, with ON signal	315	A
I_{SD}	Source (Body diode) Current	T_C =60°C, with ON signal	275	A
I_{DSM}	Pulse Forward Current	T_C =25°C, Pulse width =1ms, Note2	600	A
P_{tot}	Total Power Dissipation	T_C =25°C	1579	W
T_{jmax}	Max Junction Temperature	-	-55 to 175	°C
T_{stg}	Storage Temperature	-	-55 to 125	°C

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

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 R_{100}	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

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 =300μA		1700	-	-	V
I_{DSS}	Zero gate voltage drain Current	V_{DS} =1700V, V_{GS} =0V		-	-	1	mA
I_{GSS}	Gate-Source Leakage Current	V_{GS} =20V, V_{DS} =0V		-	-	300	nA
		V_{GS} =-10V, V_{DS} =0V		-	-	-300	nA
$V_{GS(th)}$	Gate-source threshold Voltage	I_D =180mA V_{DS} =V_{GS}	T_j =25°C	1.80	2.70	-	V
			T_j =175°C	-	1.90	-	V
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D =300A V_{GS} =15V	T_j =25°C	-	6.70	-	mΩ
			T_j =175°C	-	15.5	-	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	I_D =300A V_{GS} =15V	T_j =25°C	-	2.01	-	V
			T_j =175°C	-	4.65	-	V
C_{iss}	Input Capacitance	V_D =1000V, V_{GS} =0V f =1MHz, Vac =25mV		-	22.9	-	nF
C_{oss}	Output Capacitance			-	0.62	-	nF
C_{rss}	Reverse transfer Capacitance			-	0.11	-	nF
Q_g	Total gate charge	V_{DD}=1000V I_D =225A V_{GS} =+15/-5V		-	768	-	nC
Q_{gd}	Gate-Drain Charge			-	270	-	nC
Q_{gs}	Gate-Source Charge			-	231	-	nC
R_{Gint}	Internal Gate Resistance	T_j =25°C		-	1.6	-	Ω
$t_{d(on)}$	Turn-on delay time	V_{DD} =900V I_D =300A V_{GS} =+15/-5V $R_{G(on)}$ =5.1Ω $R_{G(off)}$ =5.1Ω Inductive load switching operation	T_j =25°C	-	137	-	ns
			T_j =150°C	-	106	-	
t_r	Rise time		T_j =25°C	-	101	-	ns
			T_j =150°C	-	85	-	
$t_{d(off)}$	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	-	27.3	-	mJ
			T_j =150°C	-	25.4	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	30.1	-	mJ
			T_j =150°C	-	33.2	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.095	-	K/W
$R_{th(c-f)}$	Contact thermal Resistance	With thermal conductive grease, Note1		-	0.015	-	K/W

Note1: Assumes Thermal Conductivity of grease is 0.9W/m·K and thickness is 50um.

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} = -5V I_{SD} =300A	T_j=25°C	-	5.6	-	V
			T_j=175°C	-	5.3	-	
T_{rr}	Reverse recovery time	V_{RR}=900V, I_D=300A MOSFET side: V_{GS}=+15/-5V $R_{G(on)}$ = $R_{G(off)}$ =5.1Ω Inductive load switching operation	T_j=25°C	-	33	-	ns
			T_j=150°C	-	112	-	
Q_{rr}	Reverse recovery charge		T_j=25°C	-	1.91	-	μC
			T_j=150°C	-	9.15	-	
E_{rr}	Diode switching power dissipation		T_j=25°C	-	0.5	-	mJ
			T_j=150°C	-	4.2	-	

Test Conditions

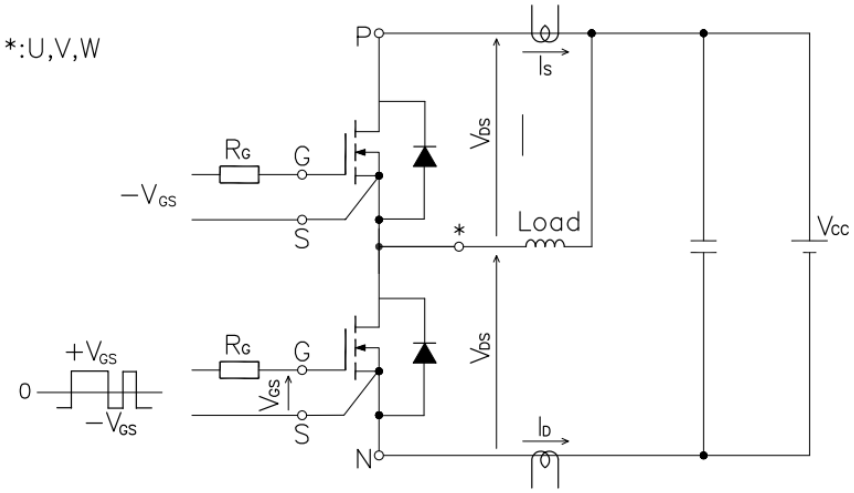


Figure 3. Switching time measure circuit

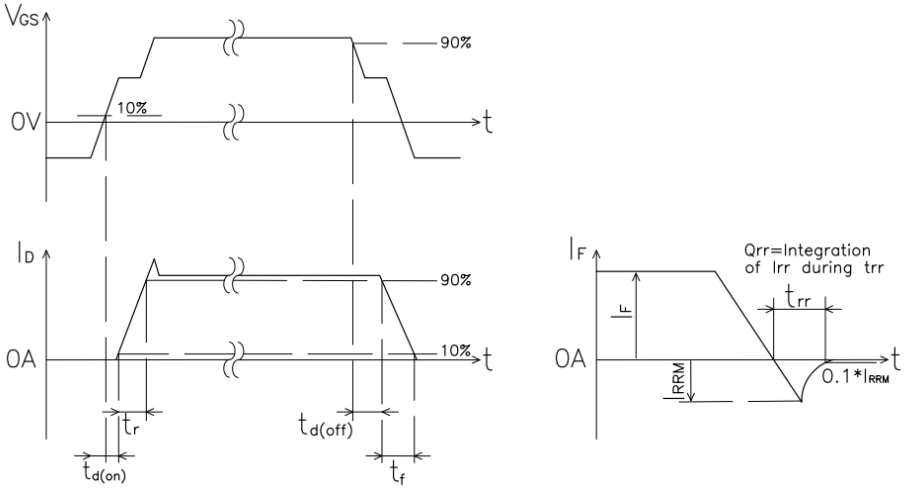


Figure 4. Switching time definition

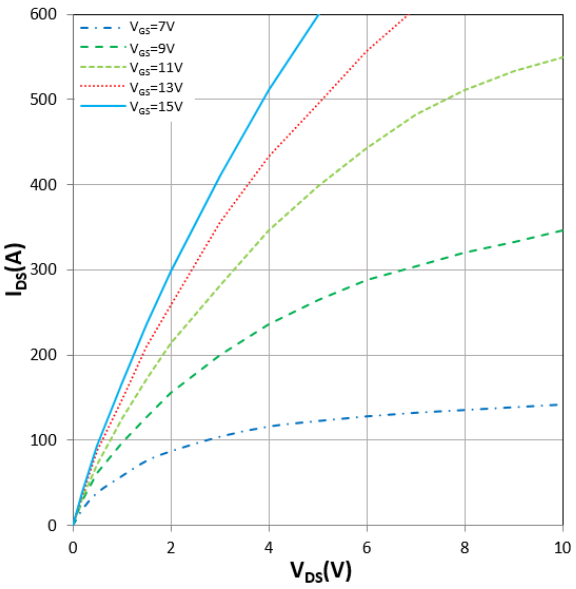


Figure 5. I_{DS} vs V_{DS}
T_j=25°C, V_{GS} parameter

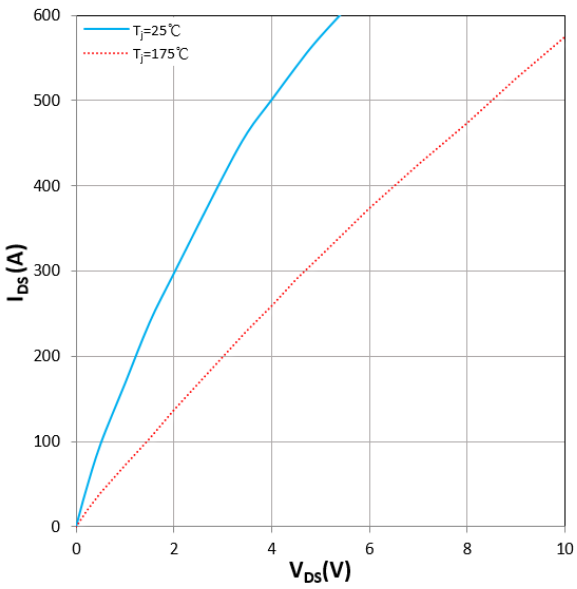


Figure 6. I_{DS} vs V_{DS}
V_{GS} =15V, T_j parameter

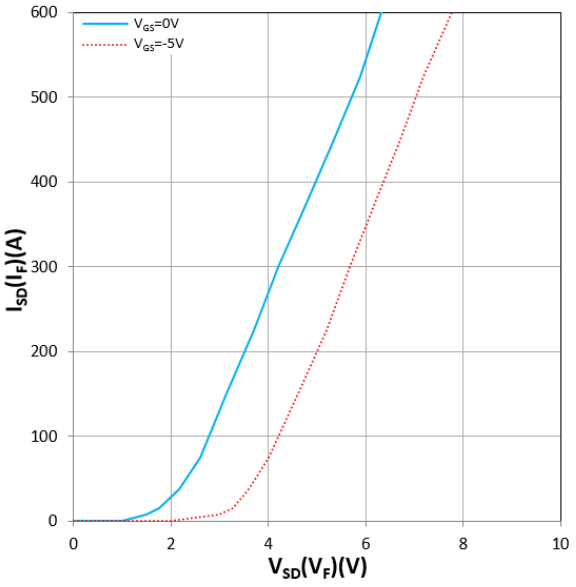


Figure 7. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$
T_j=25°C, V_{GS} parameter

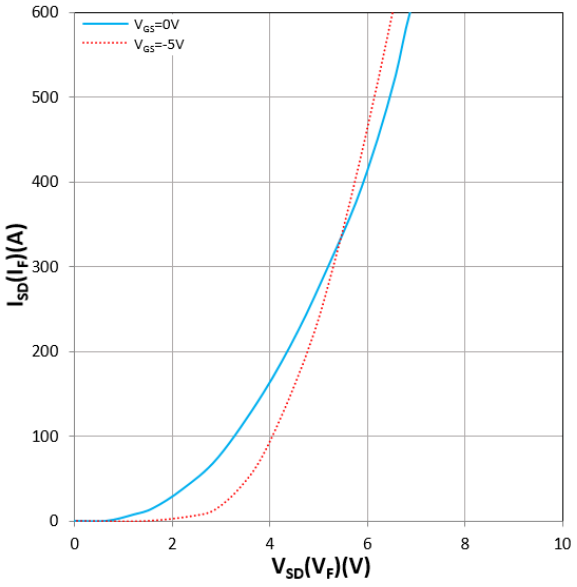


Figure8. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$
T_j=175°C, V_{GS} parameter

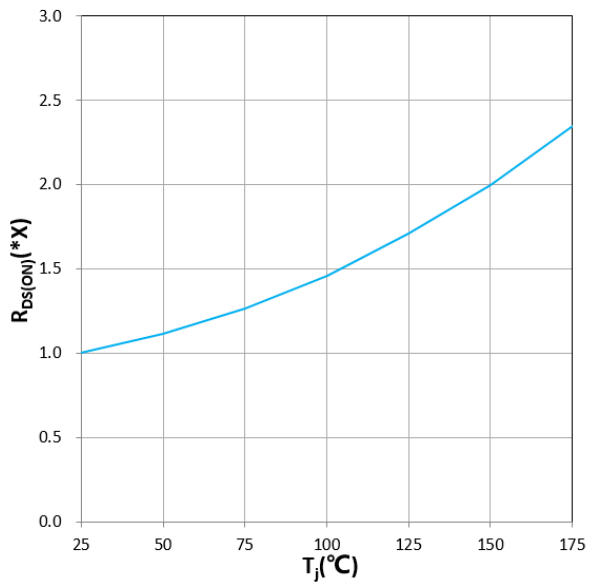


Figure 9. $R_{DS(ON)}$ vs T_j
V_{GS} =+15V, I_D =300A, 1.0X =6.70mΩ

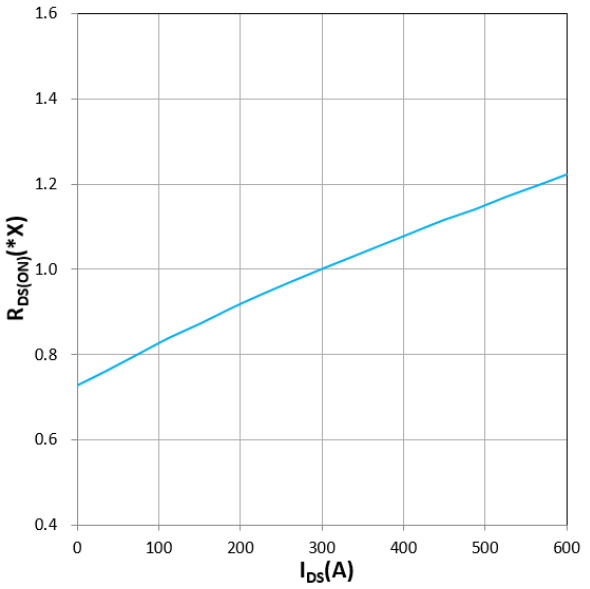


Figure 10. $R_{DS(ON)}$ vs I_{DS}
T_j =25°C, V_{GS} =+15V, 1.0X =6.70mΩ

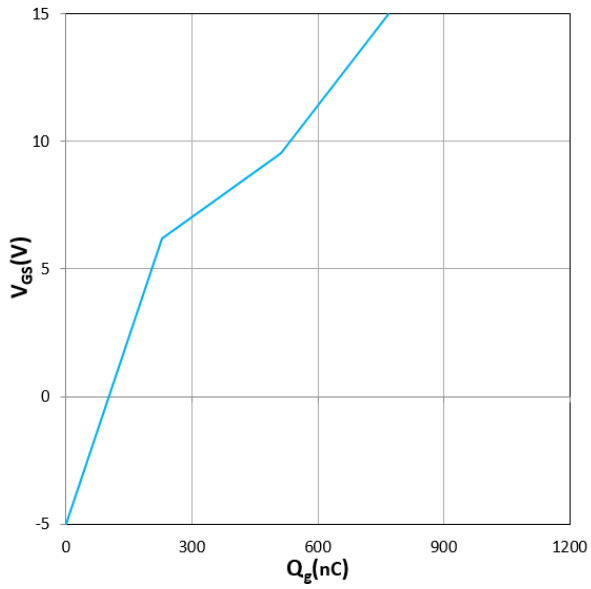


Figure 11. V_{GS} vs Q_g
T_j =25°C, V_{DS} =1000V, I_D =225A

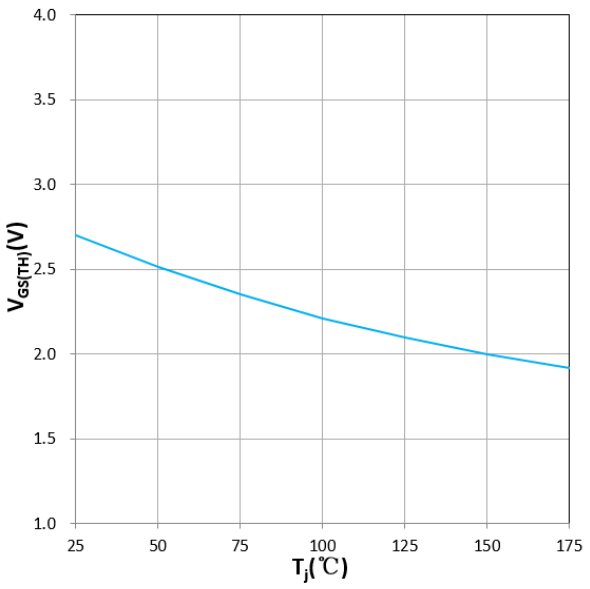


Figure 12. $V_{GS(TH)}$ vs T_j
V_{GS} =V_{DS} , I_D =180mA

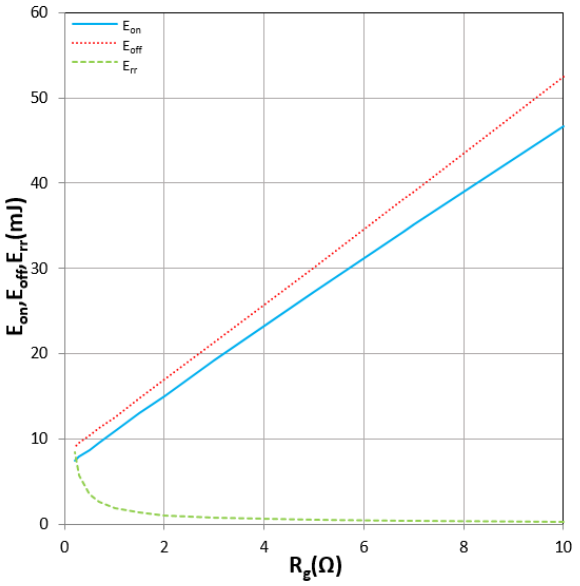


Figure 13. E_{on}, E_{off}, E_{rr} vs R_g
T_j =25°C, V_{DD} =900V, V_{GS} =+15V/-5V, I_D =300A
Inductive Load

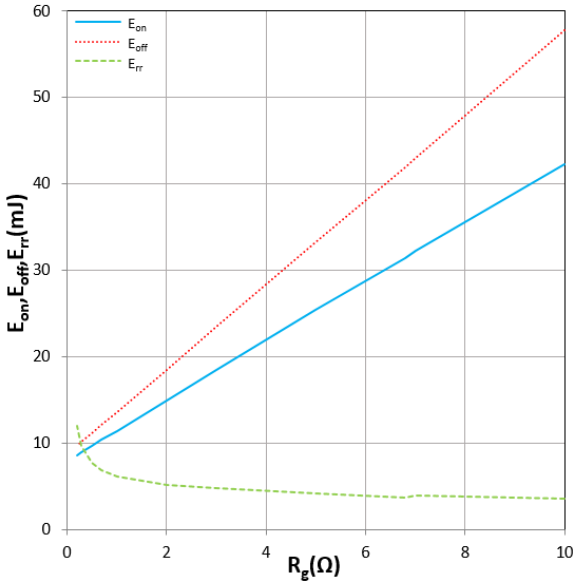


Figure 14. E_{on}, E_{off} , E_{rr} vs R_g
T_j =150°C, V_{DD} =900V, V_{GS} =+15V/-5V, I_D =300A
Inductive Load

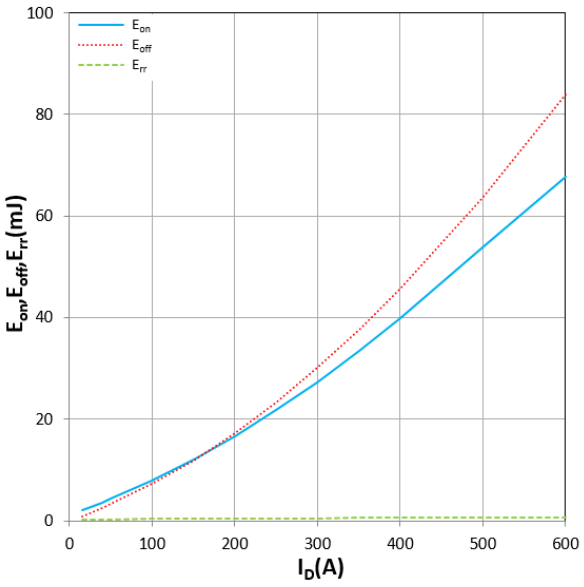


Figure 15. E_{on}, E_{off}, E_{rr} vs I_D
T_j =25°C, V_{DD} =900V, V_{GS} =+15V/-5V, R_g =5.1Ω
Inductive Load

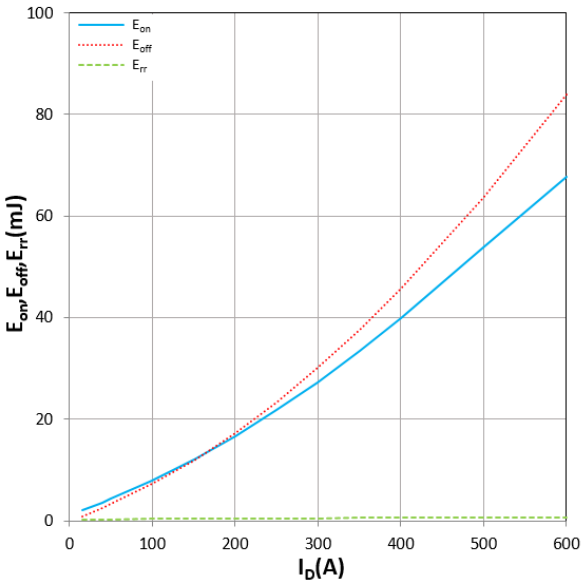


Figure 16. E_{on}, E_{off}, E_{rr} vs I_D
T_j =150°C, V_{DD} =900V, V_{GS} =+15V/-5V, R_g =5.1Ω
Inductive Load

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@leapers-power.com) for further information on the product, technology, delivery terms, conditions and prices.