

Description

The DFS300HF17I3C2 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
- $R_{DS(on)} = 6.7m\Omega @ T_j = 25^\circ C, V_{GS} = 15V$
- Low thermal resistance with Si₃N₄ AMB
- 175°C maximum junction temperature
- Low Inductive Design
- Thermistor inside
- Pressfit terminal
- Copper base size: 79mmx62mm

Applications

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

Circuit diagram

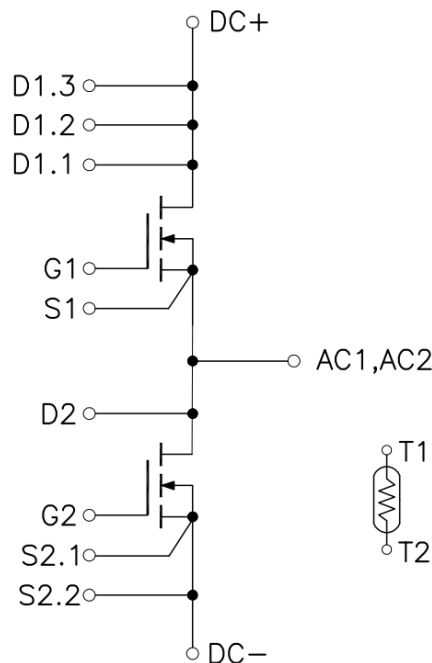


Figure 1. Out drawing & circuit diagram for DFS300HF17I3C2

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

Pin Configuration and Marking Information

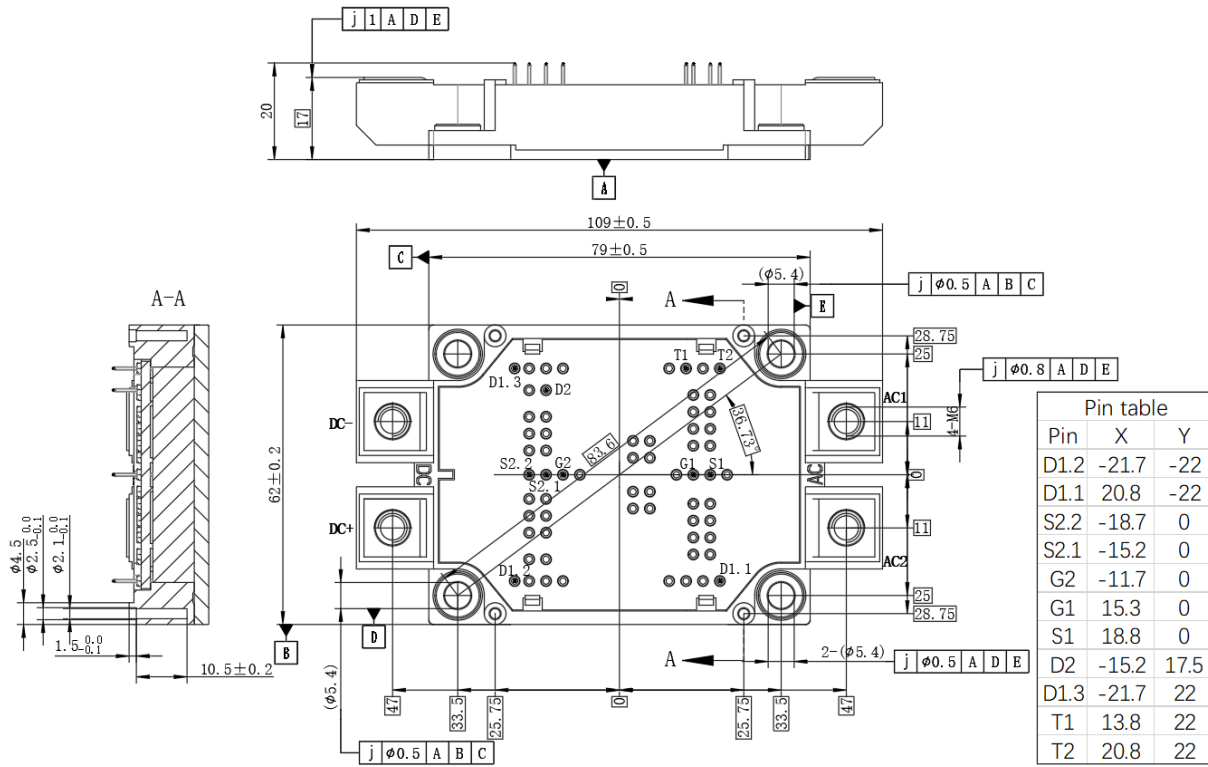


Figure 2. Pin configuration

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	T _c =25°C	0.5	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	250	g

Maximum Ratings ($T_j = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	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($t_{surge} < 300\text{nsec}$)	D-S Short, Note1	-10 to 20	V
I_{DS}	DC Continuous Drain Current	$T_f = 25^\circ\text{C}$, $V_{GS} = 15\text{V}$	320	A
I_{DS}	DC Continuous Drain Current	$T_f = 80^\circ\text{C}$, $V_{GS} = 15\text{V}$	255	A
I_{SD}	Source (Body diode) Current	$T_f = 25^\circ\text{C}$, with ON signal	320	A
I_{SD}	Source (Body diode) Current	$T_f = 80^\circ\text{C}$, with ON signal	255	A
I_{DSM}	Pulse Forward Current	$T_C = 25^\circ\text{C}$, Pulse width = 1ms, $V_{GS} = 15\text{V}$, Note2	600	A
P_{tot}	Total Power Dissipation	$T_C = 25^\circ\text{C}$	1920	W
T_{jmax}	Max Junction Temperature	-	175	$^\circ\text{C}$
T_{jop}	Operating junction Temperature	-	-40 to 150	$^\circ\text{C}$
T_{stg}	Storage Temperature	-	-40 to 125	$^\circ\text{C}$

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

Note2: Pulse width limited by maximum junction temperature

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Resistance	$T_C = 25^\circ\text{C}$	-	5	-	$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$T_C = 100^\circ\text{C}$, $R_{100} = 493\Omega$	5	-	5	%
P_{25}	Power dissipation	$T_C = 25^\circ\text{C}$	-	-	20	mW
$B_{25/50}$	B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3375	-	K
$B_{25/80}$	B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3411	-	K
$B_{25/100}$	B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$	-	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 = 300uA	1700	-	-	V	
I _{DSS}	Zero gate voltage drain Current	V _{DS} = 1700V, V _{GS} = 0V	-	3	120	μA	
V _{GS(th)}	Gate-source threshold Voltage	I _D = 180mA V _{DS} = V _{GS}	T _j = 25°C	1.8	2.70	-	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	I _D = 300A	T _j = 25°C	-	6.7	10.3	mΩ
	On-state resistance	V _{GS} = 15V	T _j = 175°C	-	15.5	-	mΩ
V _{DS(on)} (Chip)	Static drain-source	I _D = 300A	T _j = 25°C	-	2.01	3.09	V
	On-state Voltage	V _{GS} = 15V	T _j = 175°C	-	4.65	-	V
C _{iss}	Input Capacitance	V _D = 1000V, V _{GS} = 0V f = 1MHz, V _{AC} = 25mV	-	22.9	-	nF	
C _{oss}	Output Capacitance		-	0.62	-	nF	
C _{rss}	Reverse transfer Capacitance		-	0.11	-	nF	
Q _G	Total gate charge	V _{DD} = 1000V, I _D = 225A, V _{GS} = -5/+15V	-	758	-	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	-	38.5	-	
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, Note4	-	0.015	-	K/W	

Note4: 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} = -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 MOSFET side:	T _j = 25°C	-	41	-	ns
			T _j = 150°C	-	138	-	
Q _{rr}	Reverse recovery charge	V _{GS} = +15/-4V R _{G(on)} = R _{G(off)} = 6.8Ω	T _j = 25°C	-	2.11	-	uC
			T _j = 150°C	-	9.25	-	
E _{rr}	Diode switching power dissipation	Inductive load switching operation	T _j = 25°C	-	0.45	-	mJ
			T _j = 150°C	-	3.52	-	

Test Conditions

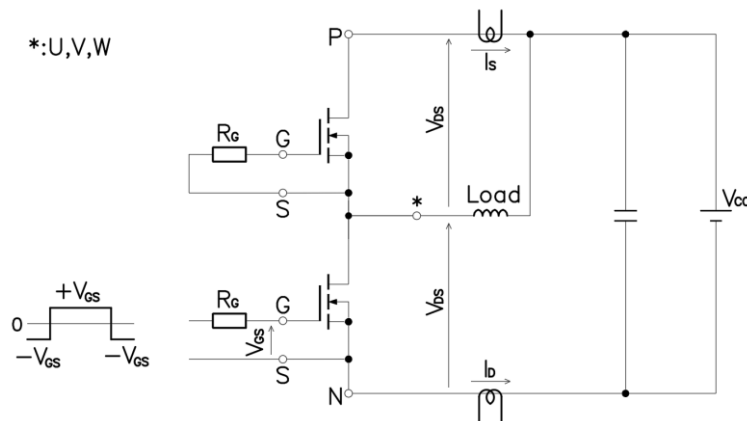


Figure 3. Switching time measure circuit

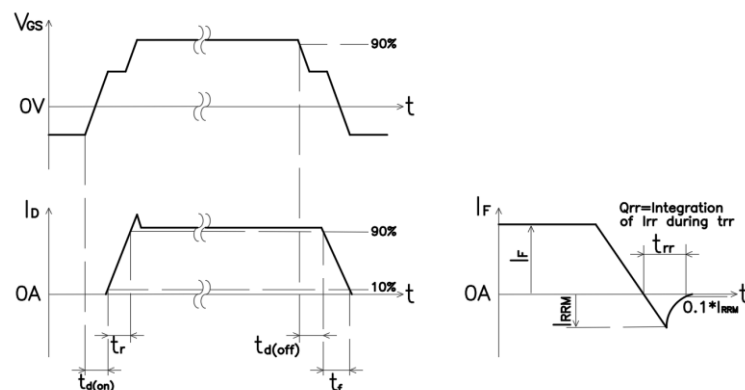


Figure 4. Switching time definition

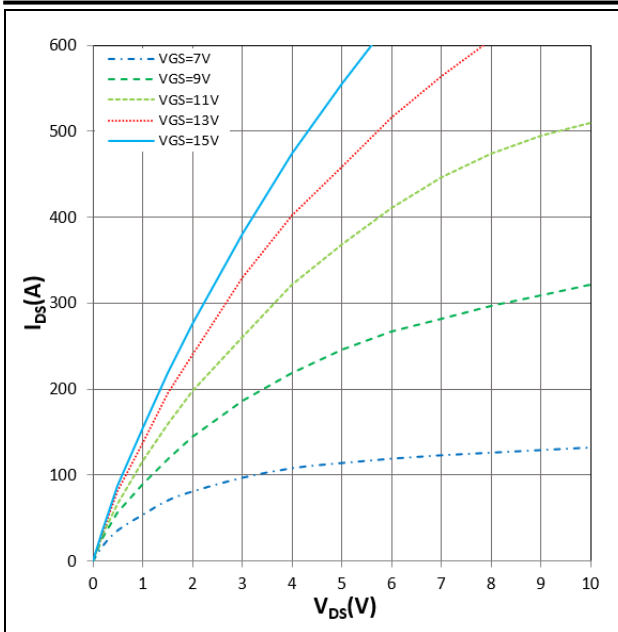


Figure 5. I_{DS} vs V_{DS}
 $T_j=25^\circ\text{C}$, V_{GS} parameter

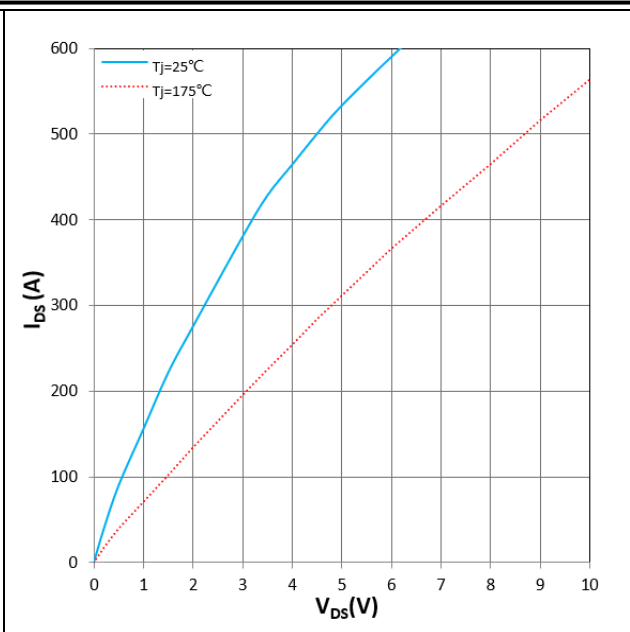


Figure 6. I_{DS} vs V_{DS}
 $V_{GS}=15\text{V}$, T_j parameter

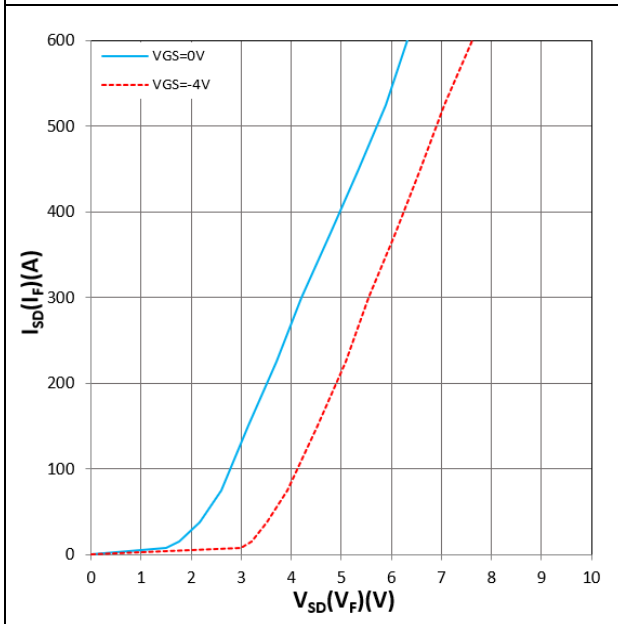


Figure 7. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$
 $T_j=25^\circ\text{C}$, V_{GS} parameter

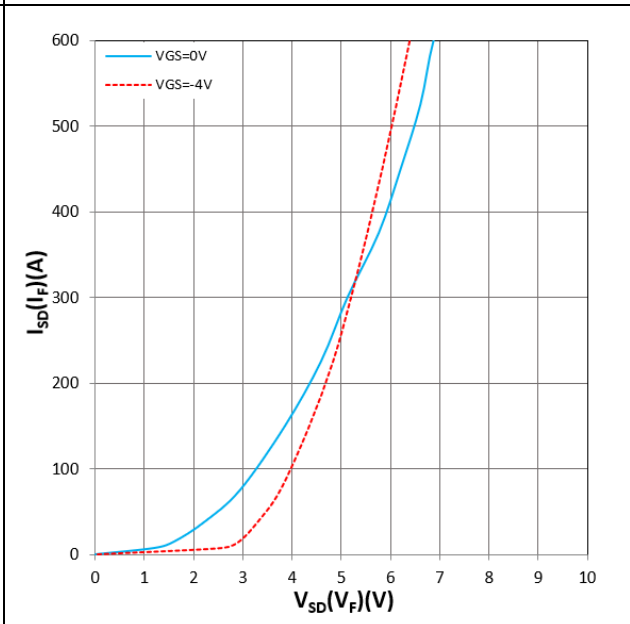


Figure 8. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$
 $T_j=175^\circ\text{C}$, V_{GS} parameter

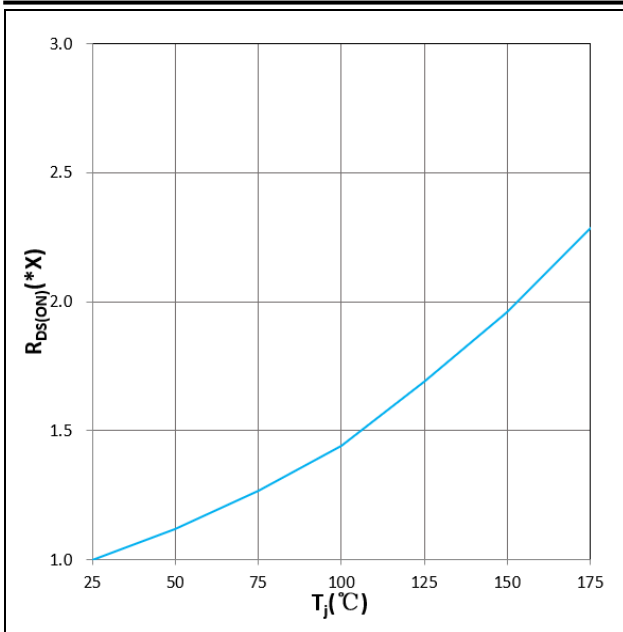


Figure 9. $R_{DS(ON)}$ vs T_j
 $V_{GS}=+15V, I_D=300A, 1.0X=6.7m\Omega$

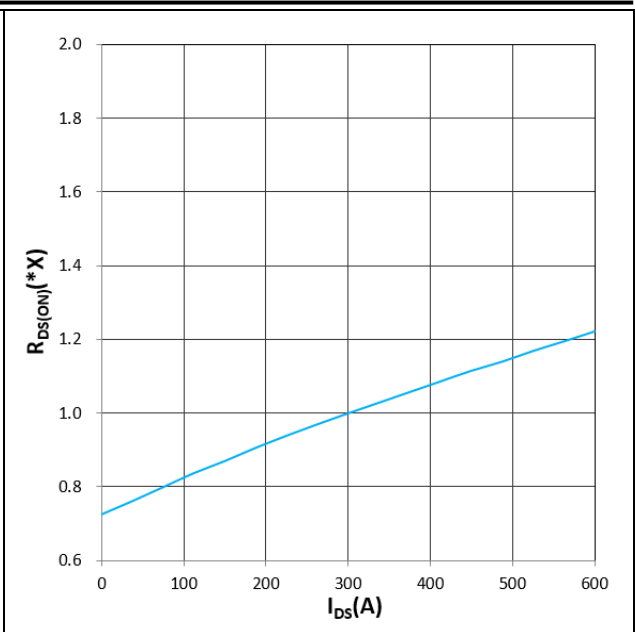


Figure 10. $R_{DS(ON)}$ vs I_{DS}
 $T_j=25^\circ C, V_{GS}=+15V, 1.0X=6.7m\Omega$

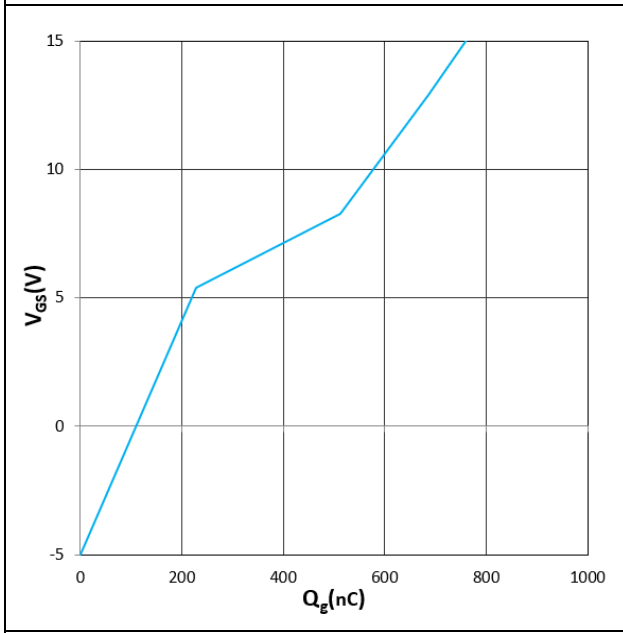


Figure 11. V_{GS} vs Q_g
 $T_j=25^\circ C, V_{DS}=1000V, I_D=225A$

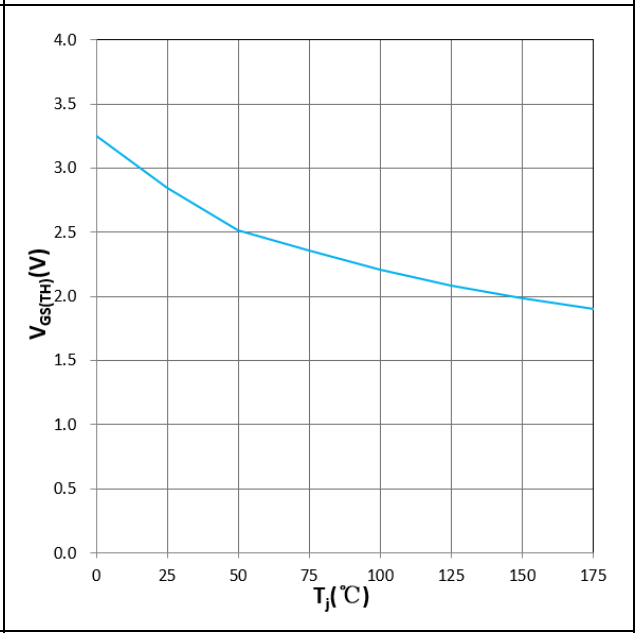


Figure 12. $V_{GS(TH)}$ vs T_j
 $V_{GS}=V_{DS}, I_D=180mA$

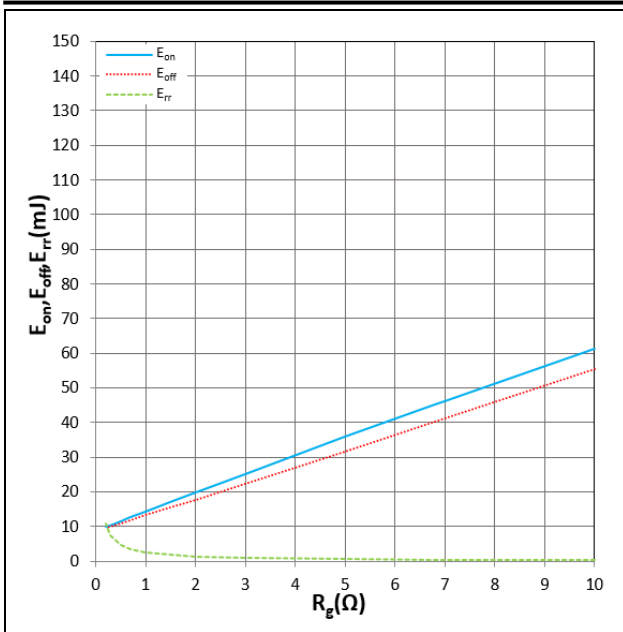


Figure 13. E_{on} , E_{off} , E_{rr} vs R_g
 $T_j=25^\circ\text{C}$, $V_{CC}=900\text{V}$, $V_{GS}=+15\text{V}/-4\text{V}$, $I_D=300\text{A}$
 Inductive Load

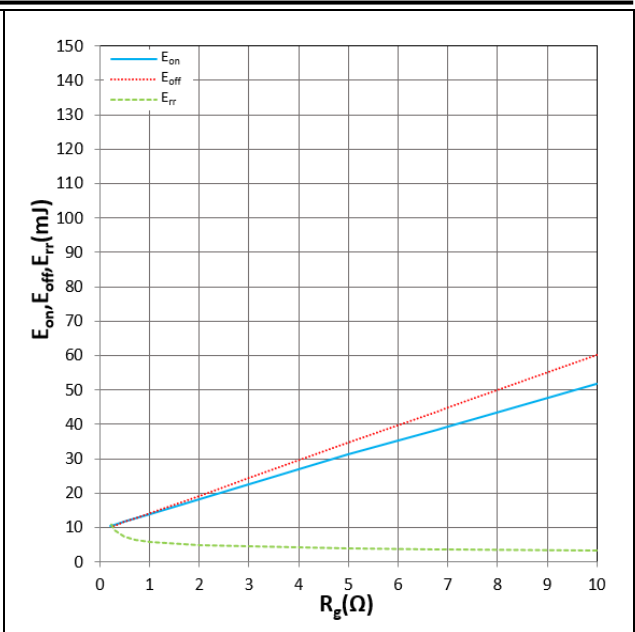


Figure 14. E_{on} , E_{off} , E_{rr} vs R_g
 $T_j=150^\circ\text{C}$, $V_{CC}=900\text{V}$, $V_{GS}=+15\text{V}/-4\text{V}$, $I_D=300\text{A}$
 Inductive Load

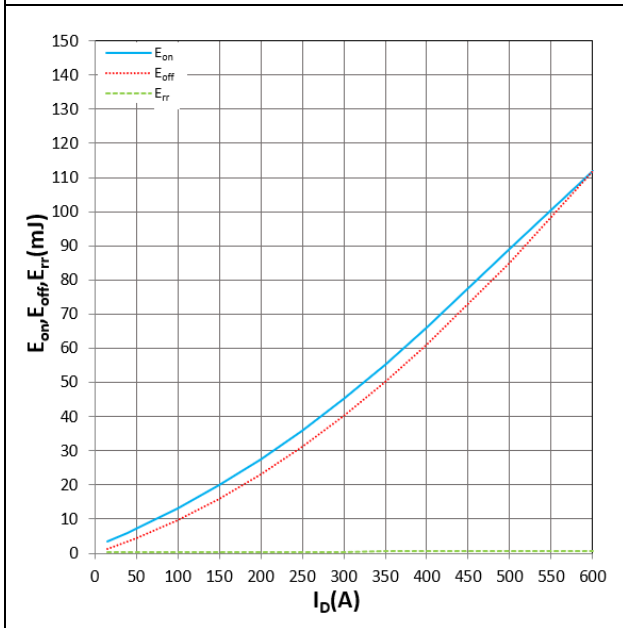


Figure 15. E_{on} , E_{off} , E_{rr} vs I_D
 $T_j=25^\circ\text{C}$, $V_{CC}=900\text{V}$, $V_{GS}=+15\text{V}/-4\text{V}$, $R_g=6.8\Omega$
 Inductive Load

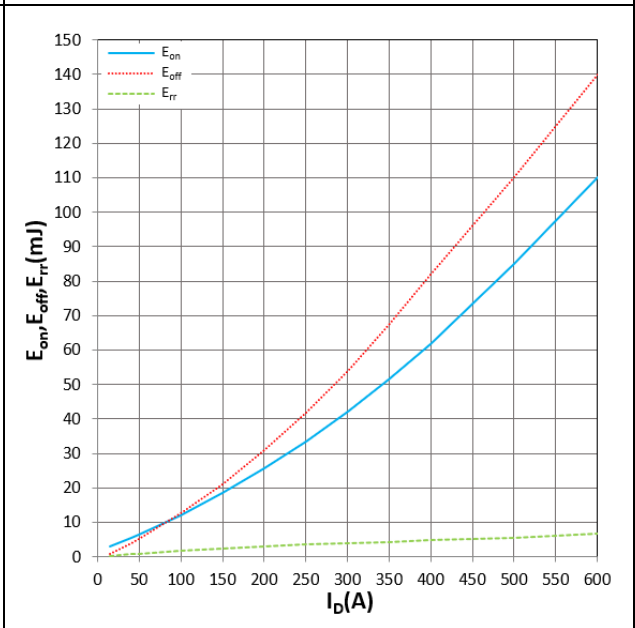


Figure 16. E_{on} , E_{off} , E_{rr} vs I_D
 $T_j=150^\circ\text{C}$, $V_{CC}=900\text{V}$, $V_{GS}=+15\text{V}/-4\text{V}$, $R_g=6.8\Omega$
 Inductive Load

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