

Description

The DFS300HF12I3B2 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

- 1200V/5.8mΩ
- Low thermal resistance with Si₃N₄ AMB
- 175°C maximum junction temperature
- Low inductive design
- Thermistor inside
- Pressfit terminal
- Copper base size: 79mm*62mm

Applications

- xEV Applications
- Motor Drive
- Vehicle Fast Chargers
- Renewable energy

Circuit diagram

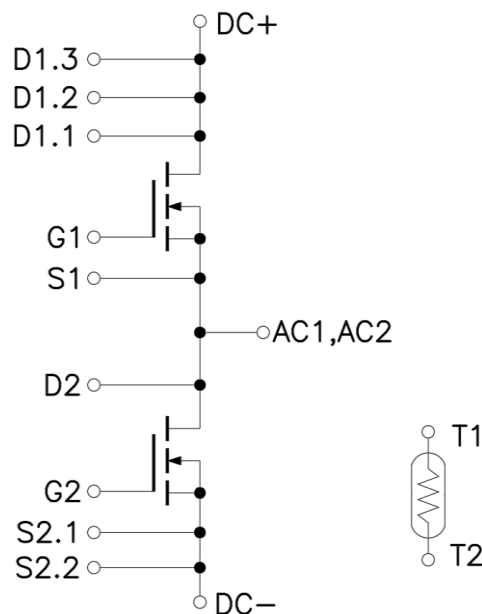


Figure 1. Out drawing & circuit diagram for DFS300HF12I3B2

Pin Configuration and Marking Information

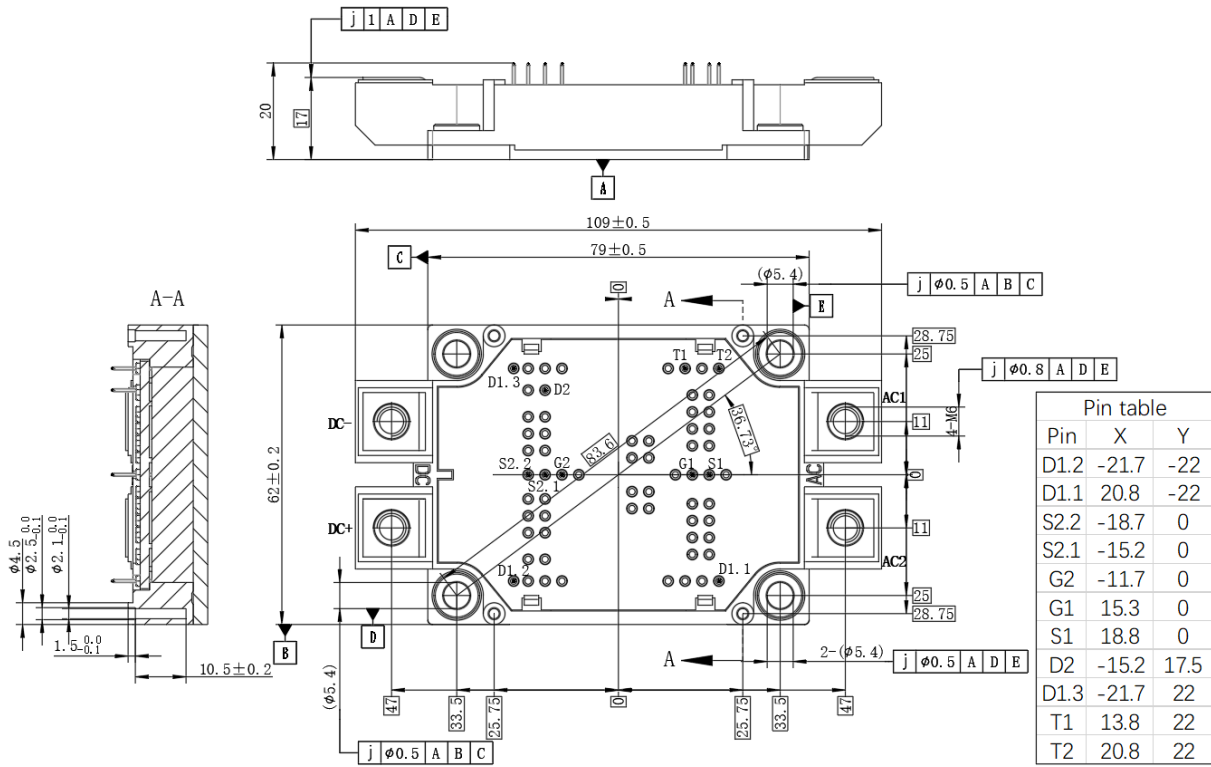


Figure 2. Pin configuration

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 10	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	>400	-
Module lead resistance, terminals – chip	T _c =25°C	0.3	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	250	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 _{GS,max}	Gate-Source Voltage	D-S Short, Note1	-8/+22	V
V _{GS,op}	Gate-Source Voltage	-	-4/+18	V
I _{DS}	DC Continuous Drain Current	T _f = 25°C, V _{GS} = 18V	350	A
I _{DS}	DC Continuous Drain Current	T _f = 65°C, V _{GS} = 18V	300	A
I _{SD}	Source (Body diode) Current	T _f = 25°C, with ON signal	350	A
I _{SD}	Source (Body diode) Current	T _f = 65°C, with ON signal	300	A
I _{DSM}	Pulse Drain Current	T _C = 65°C, Pulse width = 1ms, V _{GS} = 18V, Note2	600	A
P _{tot}	Total Power Dissipation	T _C = 25°C	1579	W
T _{jmax}	Max Junction Temperature	-	175	°C
T _{jop}	Operating junction Temperature	-	-40 to 150	°C
T _{stg}	Storage Temperature	-	-40 to 125	°C

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

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 = 6mA		1200	-	-	V	
I _{DSS}	Zero gate voltage drain Current	V _{DS} = 1200V, V _{GS} = 0V, T _j = 25°C		-	1.5	300	μA	
V _{GS(th)}	Gate-source threshold Voltage	I _D = 60mA, V _{DS} = V _{GS}	T _j = 25°C	1.9	2.6	3.5	V	
I _{GSS}	Gate-Source Leakage Current	V _{GS} = 18V, V _{DS} = 0V		-	-	400	nA	
R _{DS(on)} (Chip)	Static drain-source	I _D = 300A	T _j = 25°C	-	5.8	-	mΩ	
	On-state resistance	V _{GS} = 18V		-	10.0	-	mΩ	
V _{DS(on)} (Chip)	Static drain-source	I _D = 300A	T _j = 25°C	-	1.74	-	V	
	On-state Voltage	V _{GS} = 18V		-	3.00	-	V	
C _{iss}	Input Capacitance	V _D = 1000V, V _{GS} = 0V, f = 1MHz		-	14.1	-	nF	
C _{oss}	Output Capacitance			-	0.60	-	nF	
C _{rss}	Reverse transfer Capacitance			-	0.06	-	nF	
Q _g	Total gate charge	V _{DD} = 800V, I _D = 150A, V _{GS} = 0/+18V		-	645	-	nC	
t _{d(on)}	Turn-on delay time	V _{DD} = 600V I _D = 300A V _{GS} = +15/-4V R _{G(on)} = 5.1Ω R _{G(off)} = 5.1Ω Inductive load switching operation		T _j = 25°C	-	140	-	ns
				T _j = 150°C	-	119	-	ns
t _r	Rise time			T _j = 25°C	-	104	-	ns
				T _j = 150°C	-	89	-	ns
t _{d(off)}	Turn-off delay time			T _j = 25°C	-	278	-	ns
				T _j = 150°C	-	302	-	ns
t _f	Fall time			T _j = 25°C	-	67	-	ns
				T _j = 150°C	-	89	-	ns
E _{on}	Turn-on power dissipation			T _j = 25°C	-	11.12	-	mJ
				T _j = 150°C	-	9.31	-	mJ
E _{off}	Turn-off power dissipation	T _j = 25°C	-	13.02	-	mJ		
		T _j = 150°C	-	13.22	-	mJ		
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, Note3		-	0.015	-	K/W	

Note3: 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	-	6.1	-	V
			T _j = 175°C	-	5.3	-	
T _{rr}	Reverse recovery time	V _{DD} = 600V, I _D = 300A V _{GS} = -4/+15V	T _j = 25°C	-	39	-	ns
			T _j = 150°C	-	56	-	
Q _{rr}	Reverse recovery charge	R _{G(on)} = 5.1Ω R _{G(off)} = 5.1Ω	T _j = 25°C	-	1.06	-	μC
			T _j = 150°C	-	2.74	-	
E _{rr}	Diode switching power dissipation	Inductive load switching operation	T _j = 25°C	-	0.31	-	mJ
			T _j = 150°C	-	1.09	-	

Test Conditions

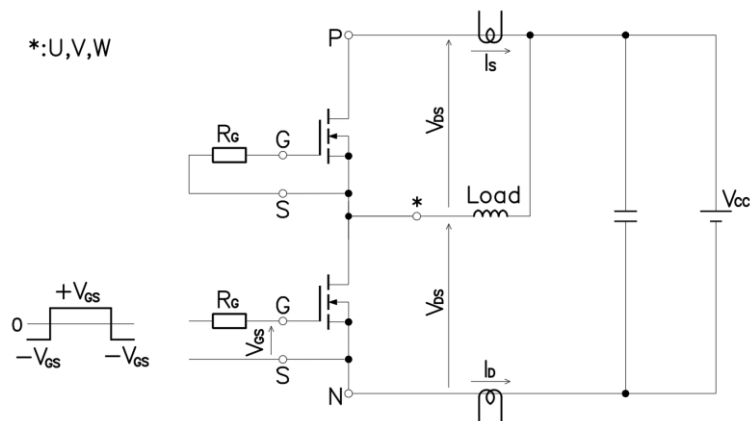


Figure 3. Switching time measure circuit

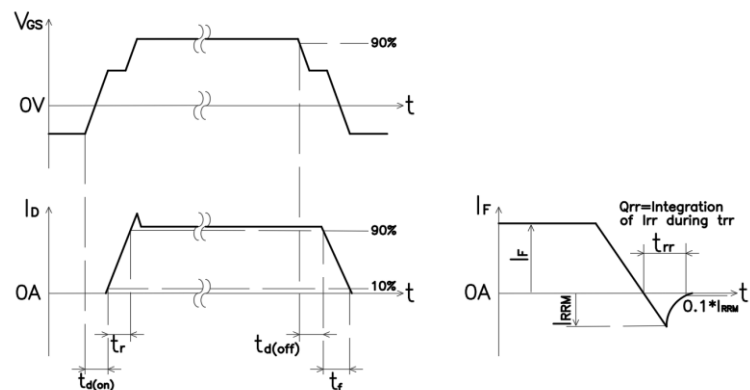


Figure 4. Switching time definition

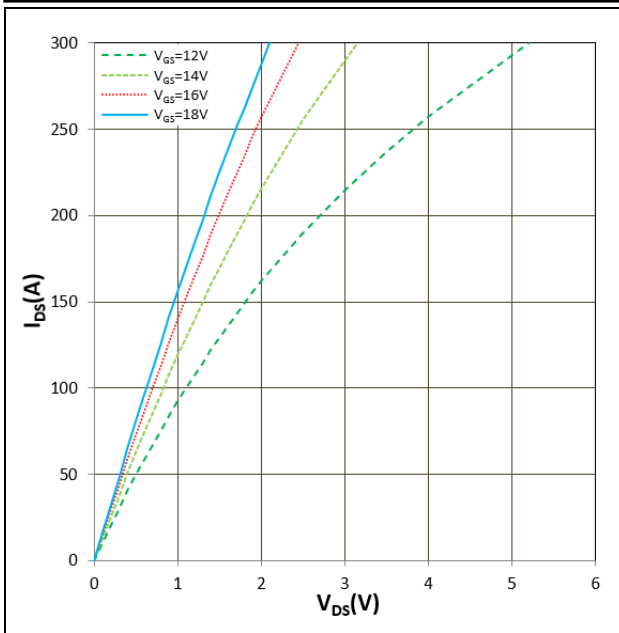


Figure 1. I_{DS} vs V_{DS}
 $T_j = 25^\circ\text{C}$, V_{GS} parameter

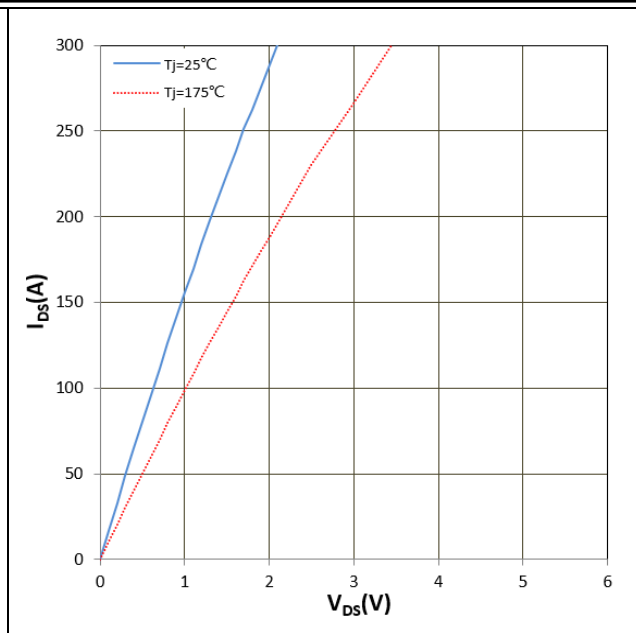


Figure 2. I_{DS} vs V_{DS}
 $V_{GS} = 18\text{V}$, T_j parameter

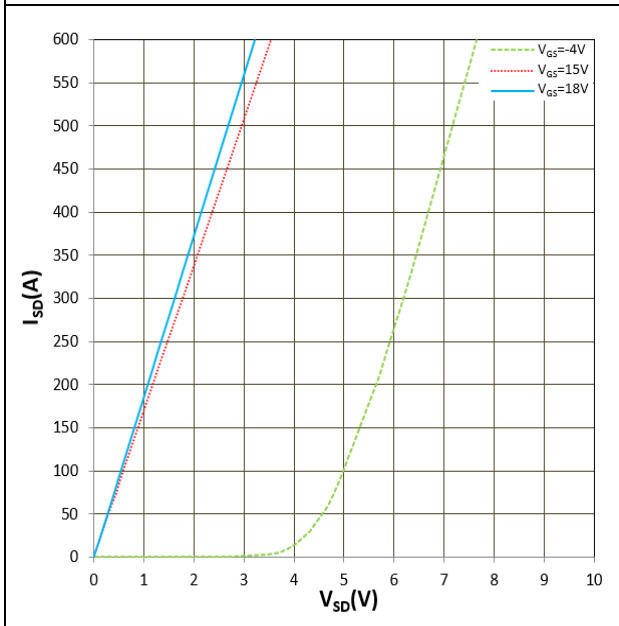


Figure 3. I_{SD} vs V_{SD} (V_F)
 $T_j = 25^\circ\text{C}$, V_{GS} parameter

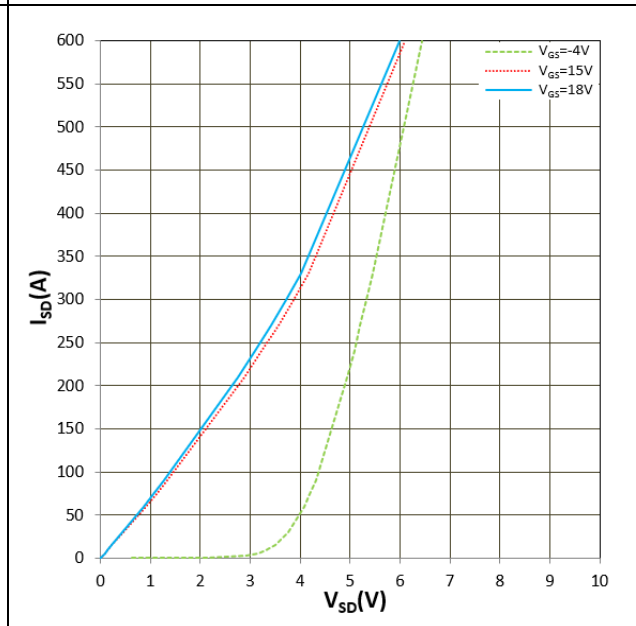


Figure 4. I_{SD} vs V_{SD} (V_F)
 $T_j = 175^\circ\text{C}$, V_{GS} parameter

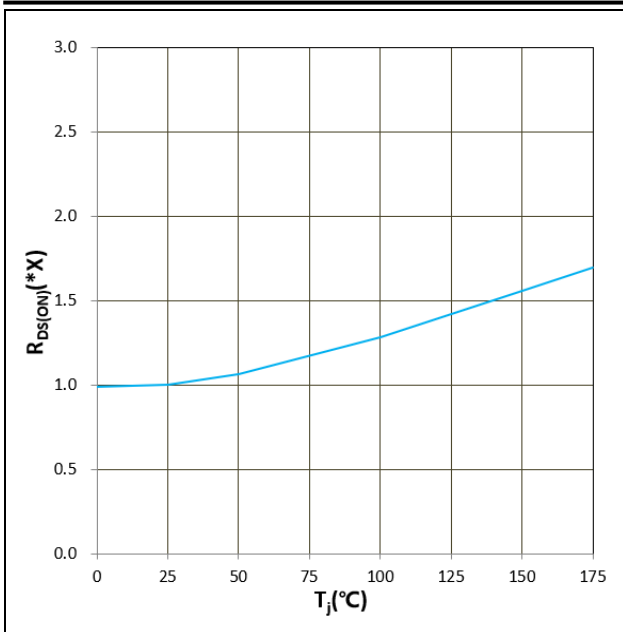


Figure 5. $R_{DS(ON)}$ vs T_j
 $V_{GS} = +18V$, $I_D = 300A$, $1.0X = 5.8m\Omega$

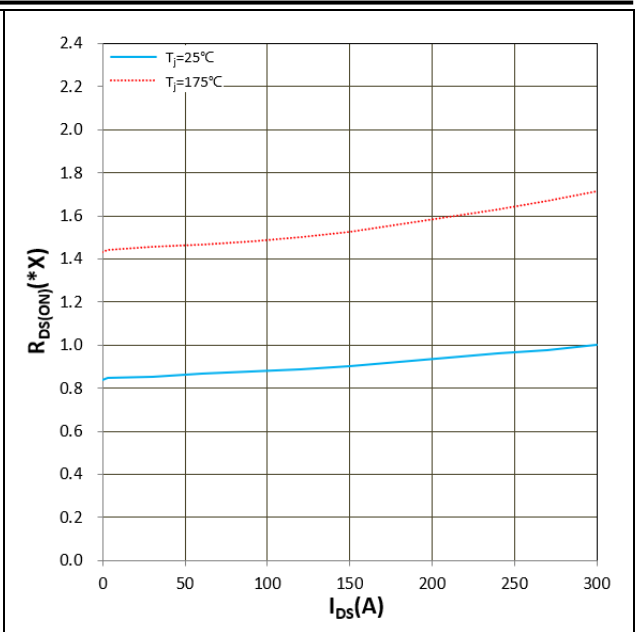


Figure 6. $R_{DS(ON)}$ vs I_{DS}
 $V_{GS} = +18V$, $1.0X = 5.8m\Omega$

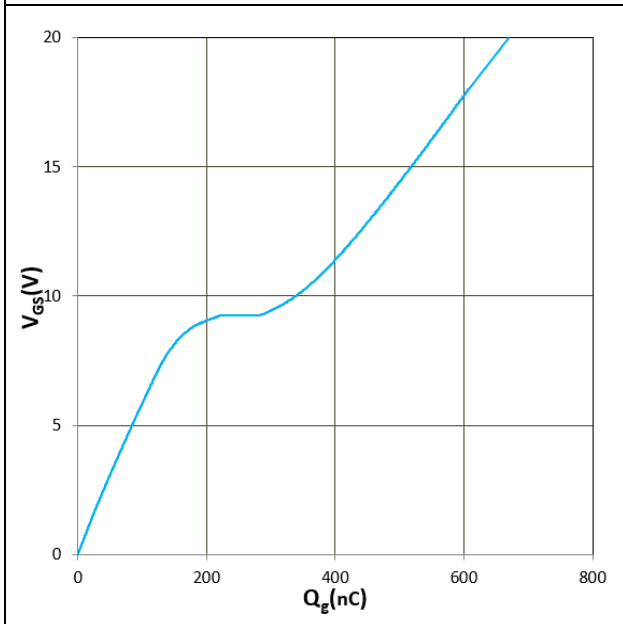


Figure 7. V_{GS} vs Q_g
 $T_j = 25^\circ C$, $I_{GS} = 300\mu A$

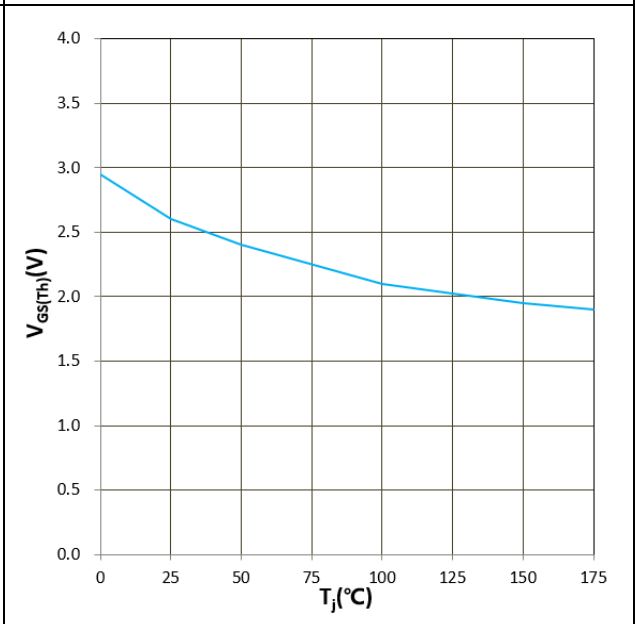


Figure 8. $V_{GS(TH)}$ vs T_j
 $V_{GS} = V_{DS}$, $I_D = 60mA$

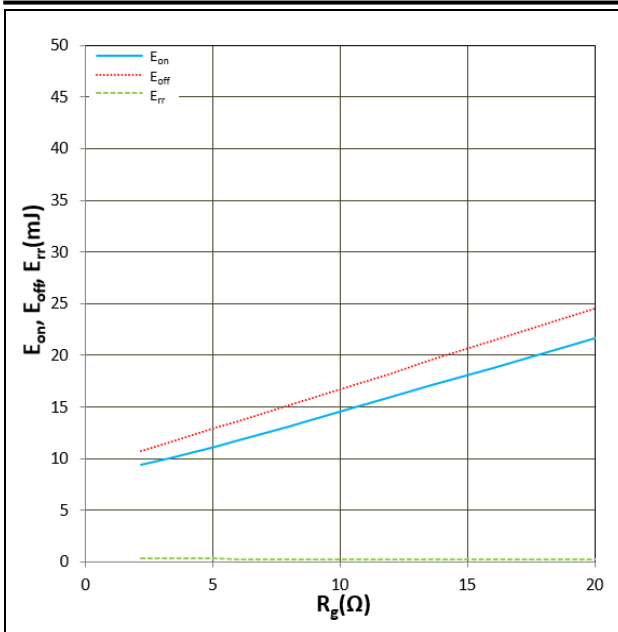


Figure 9. E_{on} , E_{off} , E_{rr} vs R_g
 $T_j=25^{\circ}\text{C}$, $V_{CC}=600\text{V}$, $I_D=300\text{A}$, $V_{GS}=+15\text{V}/-4\text{V}$
 Inductive Load

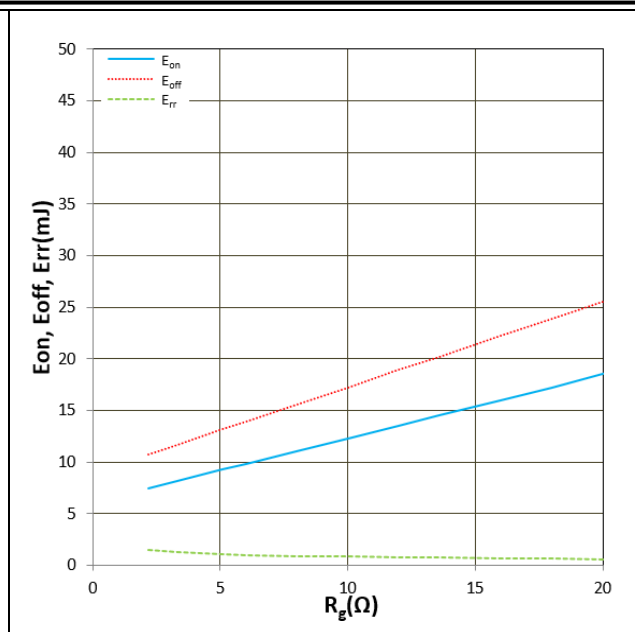


Figure 10. E_{on} , E_{off} , E_{rr} vs R_g
 $T_j=150^{\circ}\text{C}$, $V_{CC}=600\text{V}$, $I_D=300\text{A}$, $V_{GS}=+15\text{V}/-4\text{V}$
 Inductive Load

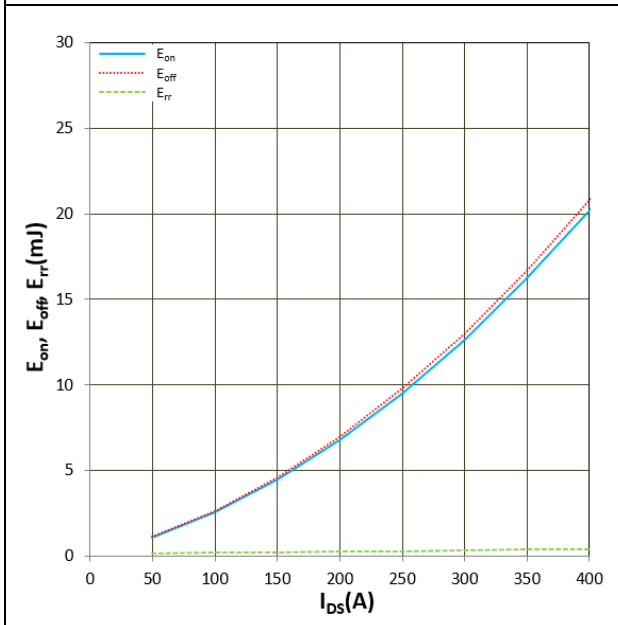


Figure 11. E_{on} , E_{off} , E_{rr} vs I_{DS}
 $T_j=25^{\circ}\text{C}$, $V_{CC}=600\text{V}$, $V_{GS}=+15\text{V}/-4\text{V}$
 $R_g=5.1\Omega$, Inductive Load

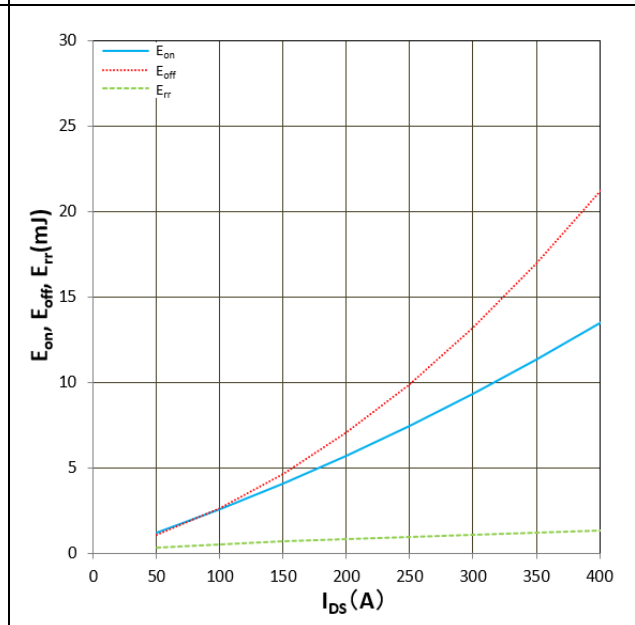


Figure 12. E_{on} , E_{off} , E_{rr} vs I_{DS}
 $T_j=150^{\circ}\text{C}$, $V_{CC}=600\text{V}$, $V_{GS}=+15\text{V}/-4\text{V}$
 $R_g=5.1\Omega$, Inductive Load

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