

Description

The DFS400HF17I3C2 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
- $R_{DS(on)} = 5.2m\Omega @ T_j = 25^\circ C, V_{GS} = 15V$
- 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

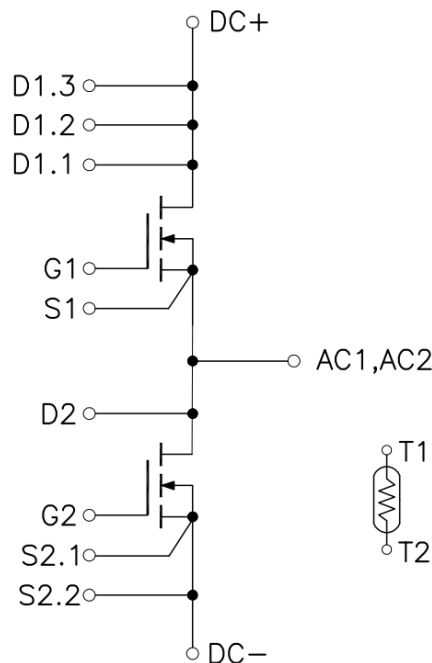


Figure 1. Out drawing & circuit diagram for DFS400HF17I3C2

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

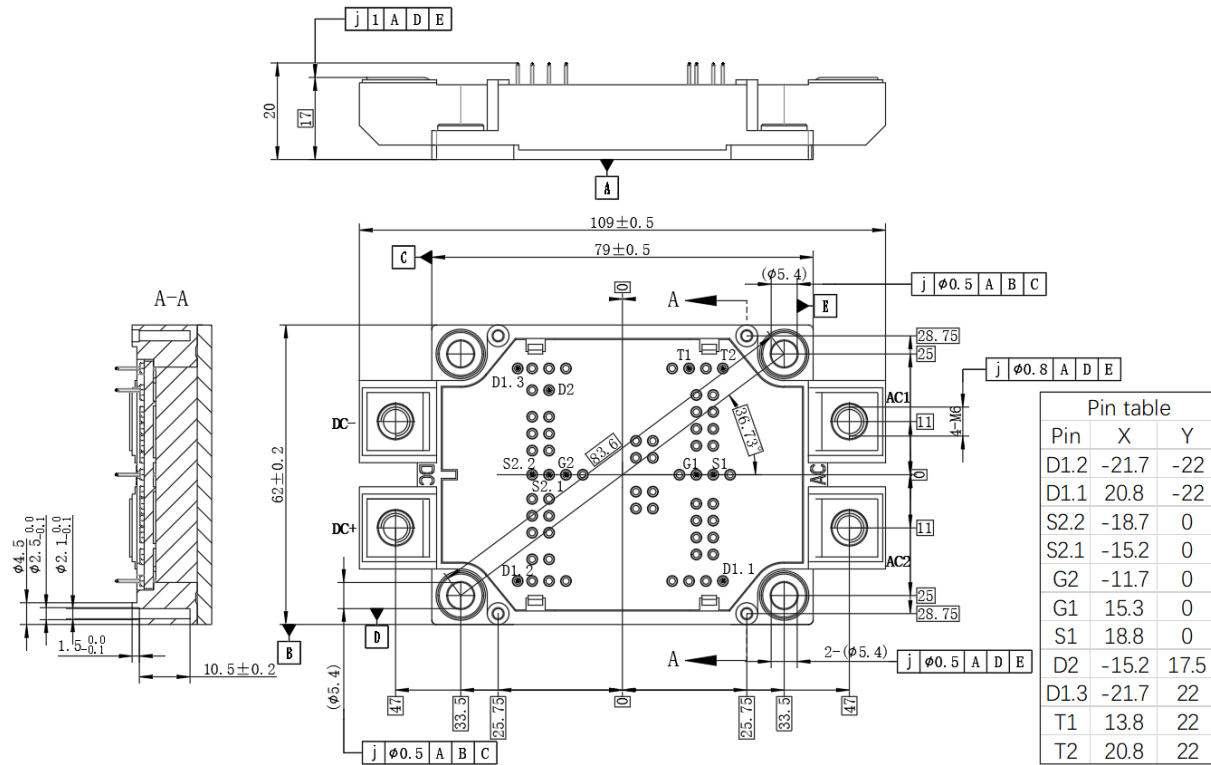


Figure 2. Pin configuration

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	$T_f = 25^\circ\text{C}, V_{GS} = 15\text{V}$	420	A
I_{DS}	DC Continuous Drain Current	$T_f = 80^\circ\text{C}, V_{GS} = 15\text{V}$	330	A
I_{SD}	Source (Body diode) Current	$T_f = 25^\circ\text{C}$, with ON signal	420	A
I_{SD}	Source (Body diode) Current	$T_f = 80^\circ\text{C}$, with ON signal	330	A
I_{DSM}	Pulse Forward Current	$T_C = 25^\circ\text{C}$, Pulse width = 1ms, $V_{GS} = 15\text{V}$, Note2	800	A
P_{tot}	Total Power Dissipation	$T_C = 25^\circ\text{C}$	2585	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 = 160μA	1700	-	-	V	
I _{DSS}	Zero gate voltage drain Current	V _{DS} = 1700V, V _{GS} = 0V	-	4	160	μA	
V _{GS(th)}	Gate-source threshold Voltage	I _D = 240mA 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	-	-	1000	nA	
R _{DS(on)} (Chip)	Static drain-source	I _D = 400A V _{GS} = 15V	T _j = 25°C	-	5.2	7.5	mΩ
	On-state resistance		T _j = 175°C	-	11.6	-	mΩ
V _{DS(on)} (Chip)	Static drain-source	I _D = 400A V _{GS} = 15V	T _j = 25°C	-	2.08	3.0	V
	On-state Voltage		T _j = 175°C	-	4.64	-	V
C _{iss}	Input Capacitance	V _D = 1000V, V _{GS} = 0V f = 1MHz, V _{AC} = 25mV	-	30.5	-	nF	
C _{oss}	Output Capacitance		-	0.82	-	nF	
C _{rss}	Reverse transfer Capacitance		-	0.15	-	nF	
Q _G	Total gate charge	V _{DD} = 1000V, I _D = 300A, V _{GS} = -5/+15V	-	1022	-	nC	
R _{Gint}	Internal Gate Resistance	T _j = 25°C	-	0.48	-	Ω	
t _{d(on)}	Turn-on delay time	V _{DD} = 900V I _D = 400A V _{GS} = +15/-4V R _{G(on)} = 6.8Ω R _{G(off)} = 6.8Ω Inductive load switching operation	T _j = 25°C	-	165	-	ns
			T _j = 150°C	-	129	-	
t _r	Rise time		T _j = 25°C	-	123	-	ns
			T _j = 150°C	-	93	-	
t _{d(off)}	Turn-off delay time		T _j = 25°C	-	515	-	ns
			T _j = 150°C	-	646	-	
t _f	Fall time		T _j = 25°C	-	80	-	ns
			T _j = 150°C	-	102	-	
E _{on}	Turn-on power dissipation		T _j = 25°C	-	48.4	-	mJ
			T _j = 150°C	-	40.7	-	
E _{off}	Turn-off power dissipation	T _j = 25°C	-	46.1	-	mJ	
		T _j = 150°C	-	49.6	-		
R _{th(j-c)}	FET Thermal Resistance	Junction to Case	-	0.058	-	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 50μm.

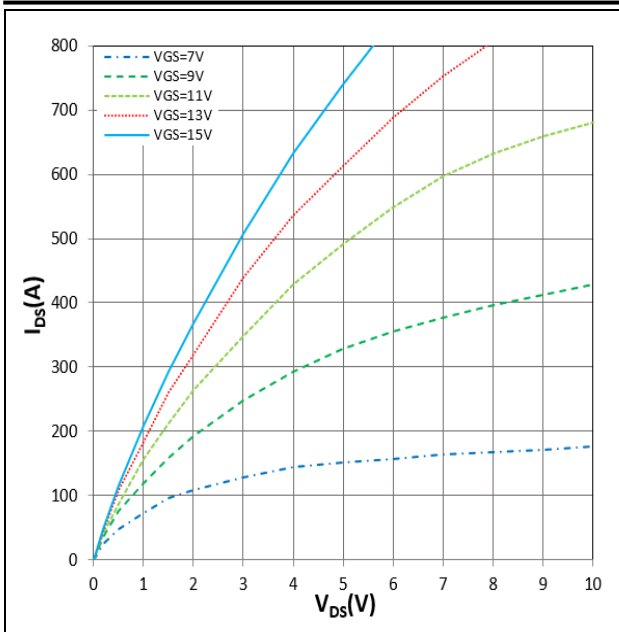


Figure 5. I_{DS} vs V_{DS}
 $T_j=25^\circ\text{C}$, V_{GS} parameter

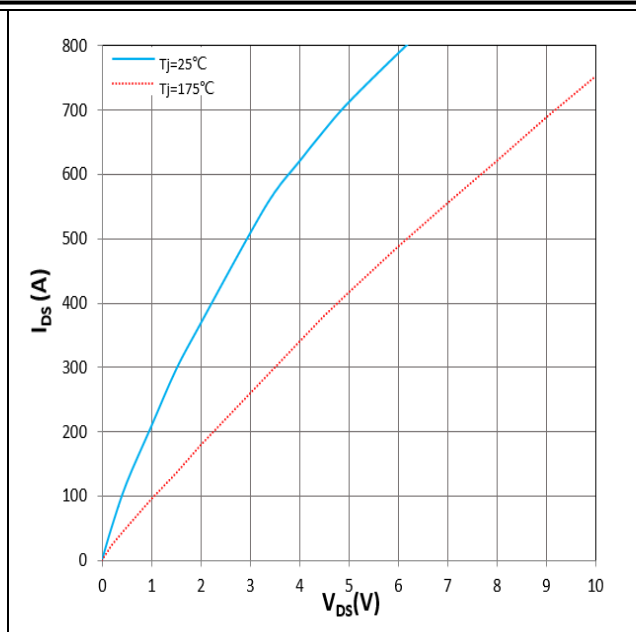


Figure 6. I_{DS} vs V_{DS}
 $V_{GS}=15V$, T_j parameter

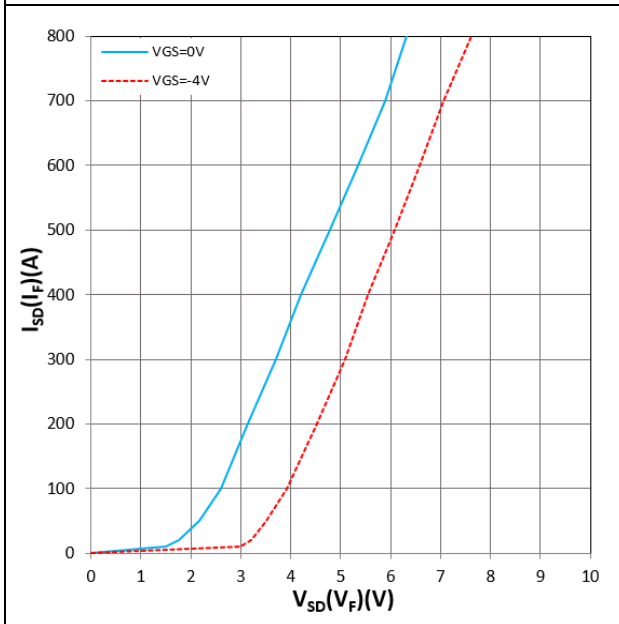


Figure 7. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$
 $T_j=25^\circ\text{C}$, V_{GS} parameter

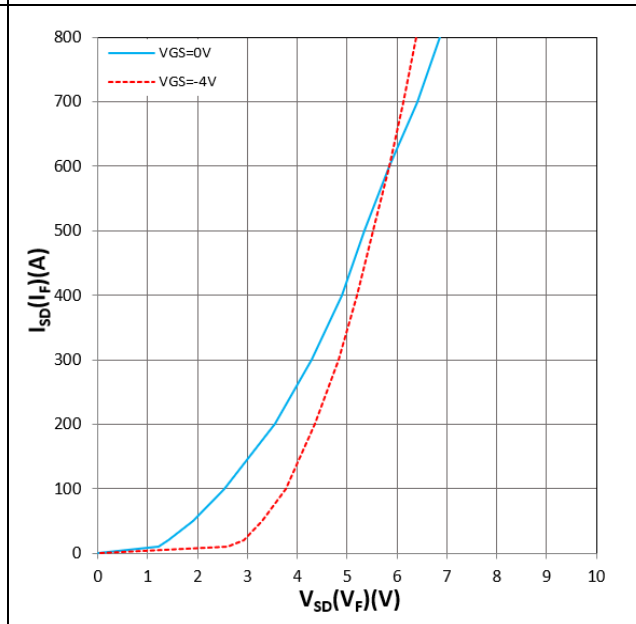


Figure 8. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$
 $T_j=175^\circ\text{C}$, V_{GS} parameter

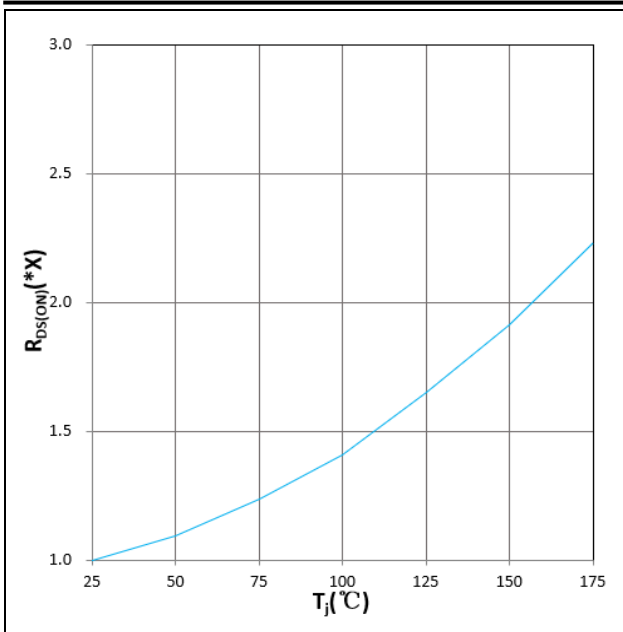


Figure 9. $R_{DS(ON)}$ vs T_j
 $V_{GS}=+15V, I_D=400A, 1.0X=5.2m\Omega$

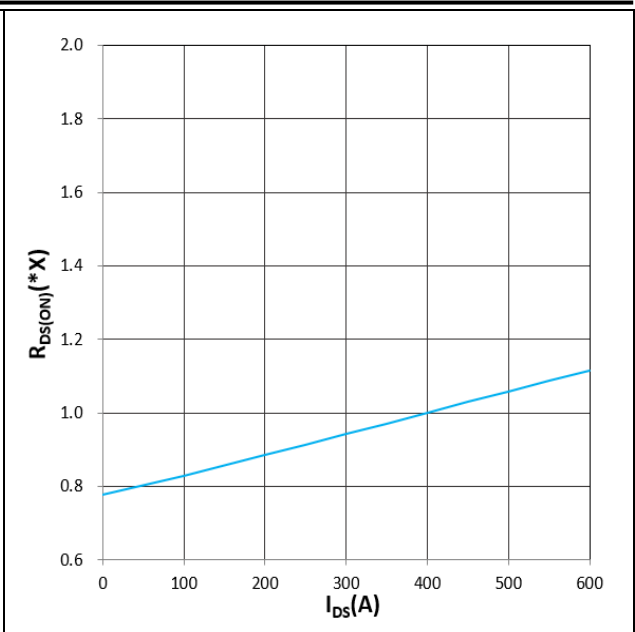


Figure 10. $R_{DS(ON)}$ vs I_{DS}
 $T_j=25^\circ C, V_{GS}=+15V, 1.0X=5.2m\Omega$

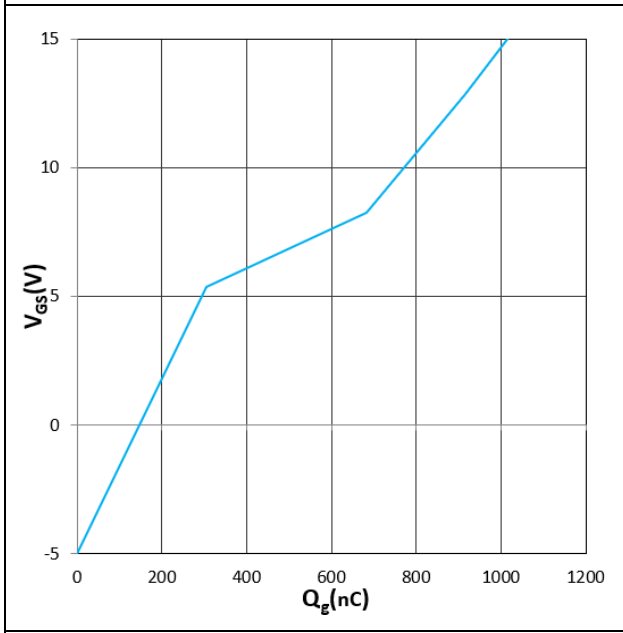


Figure 11. V_{GS} vs Q_g
 $T_j=25^\circ C, V_{DS}=1000V, I_D=300A$

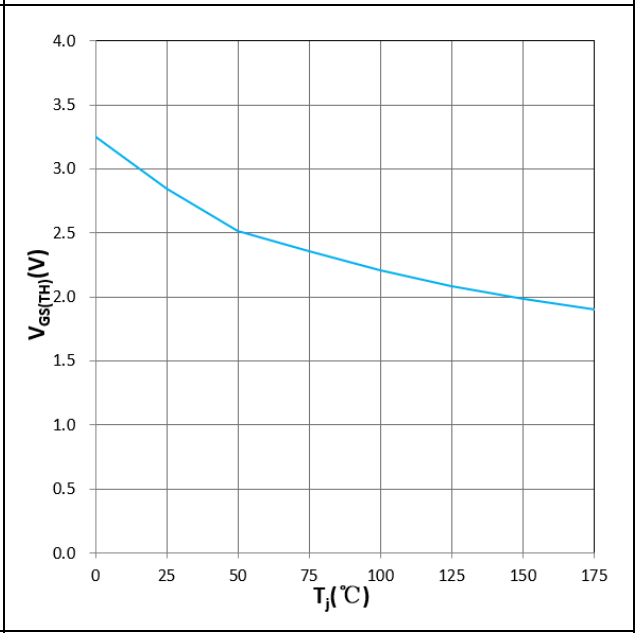


Figure 12. $V_{GS(th)}$ vs T_j
 $V_{GS}=V_{DS}, I_D=240mA$

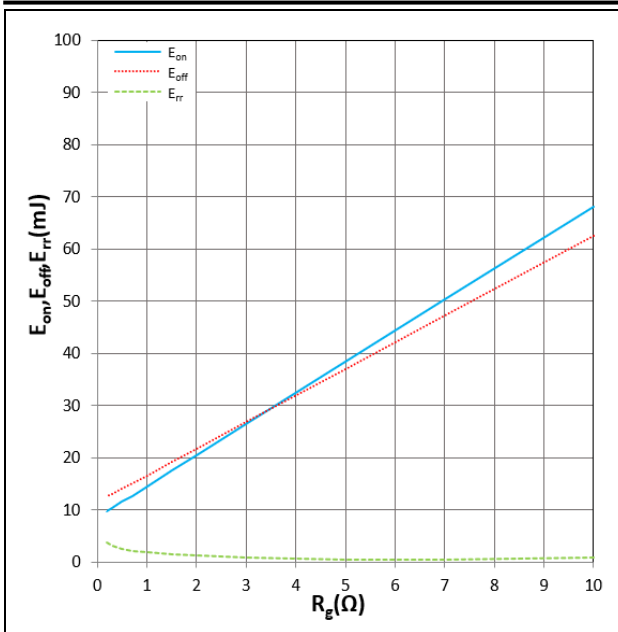


Figure 13. E_{on}, E_{off}, E_{rr} vs R_g
 T_j=25°C, V_{CC}=900V, V_{GS}=+15V/-4V, I_D=400A
 Inductive Load

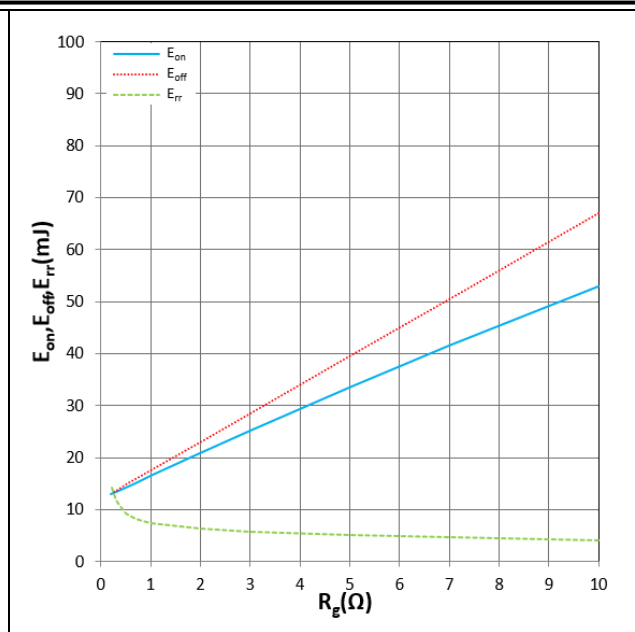


Figure 14. E_{on}, E_{off}, E_{rr} vs R_g
 T_j=150°C, V_{CC}=900V, V_{GS}=+15V/-4V, I_D=400A
 Inductive Load

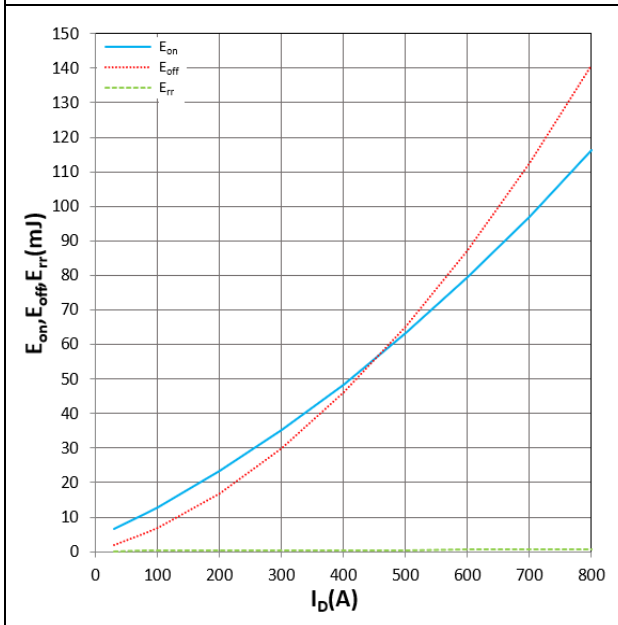


Figure 15. E_{on}, E_{off}, E_{rr} vs I_D
 T_j=25°C, V_{CC}=900V, V_{GS}=+15V/-4V, R_g=6.8Ω
 Inductive Load

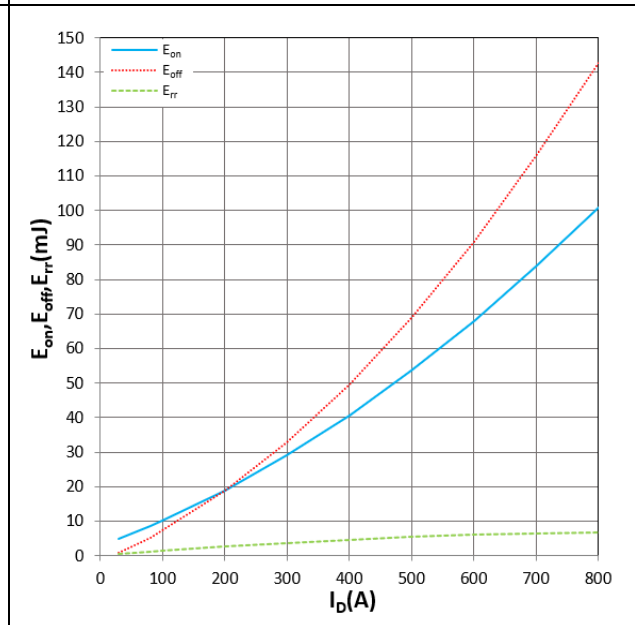


Figure 16. E_{on}, E_{off}, E_{rr} vs I_D
 T_j=150°C, V_{CC}=900V, V_{GS}=+15V/-4V, R_g=6.8Ω
 Inductive Load

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.

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