

### 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
- $R_{DS(on)} = 6.7m\Omega$
- Low thermal resistance with Si<sub>3</sub>N<sub>4</sub> AMB
- Low Inductive Design
- Thermistor inside

### Applications

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

### Circuit diagram

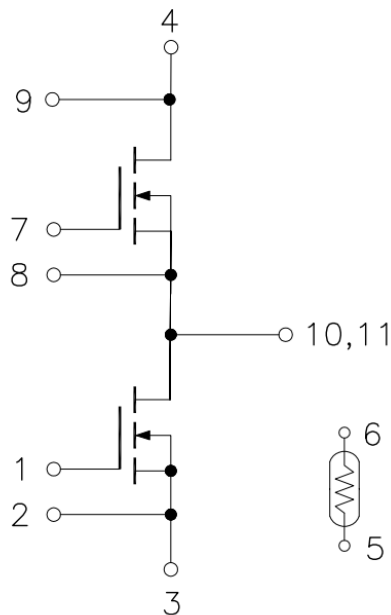


Figure 1. Out drawing & circuit diagram for DFS300HF17I4C1

## Pin Configuration and Marking Information

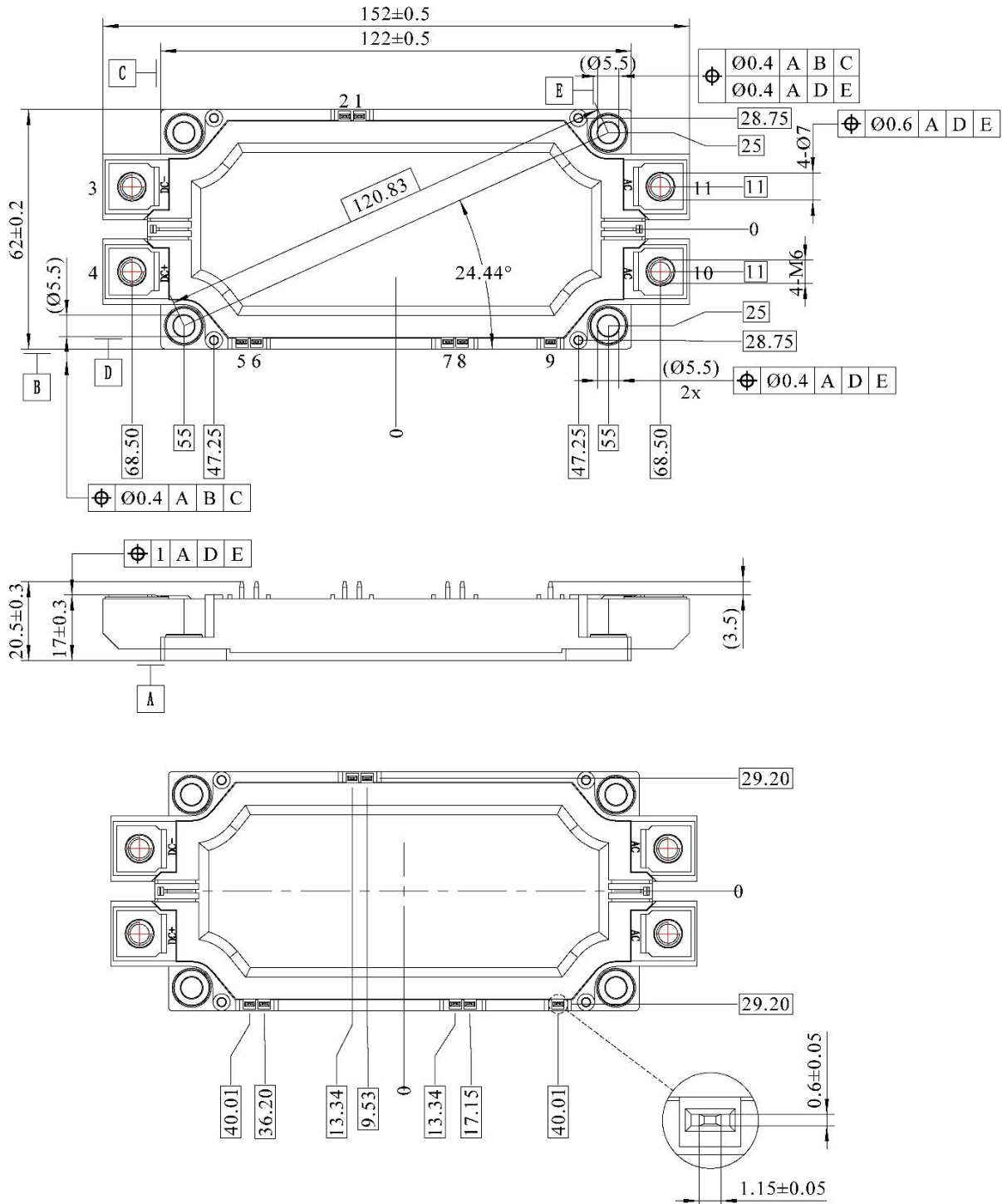


Figure 2. Pin configuration

### 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 <sub>C</sub> =25°C	0.5	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	340	g

### Maximum Ratings (T<sub>j</sub> =25°C unless otherwise specified)

Symbol	Parameter	Condition	Ratings	Unit
V <sub>DSS</sub>	Drain-Source Voltage	G-S Short	1700	V
V <sub>GSS</sub>	Gate-Source Voltage (+)	D-S Short	20	V
V <sub>GSS</sub>	Gate-Source Voltage (-)	D-S Short	-10	V
V <sub>GSSSurge</sub>	G-S Voltage(t <sub>surge</sub> <300nsec)	D-S Short, Note1	-10 to 20	V
I <sub>DS</sub>	DC Continuous Drain Current	T <sub>C</sub> =25°C, V <sub>GS</sub> =15V	315	A
I <sub>DS</sub>	DC Continuous Drain Current	T <sub>C</sub> =60°C, V <sub>GS</sub> =15V	275	A
I <sub>SD</sub>	Source (Body diode) Current	T <sub>C</sub> =25°C, with ON signal	315	A
I <sub>SD</sub>	Source (Body diode) Current	T <sub>C</sub> =60°C, with ON signal	275	A
I <sub>DSM</sub>	Pulse Forward Current	T <sub>C</sub> =25°C, Pulse width =1ms, V <sub>GS</sub> =15V, Note2	600	A
P <sub>tot</sub>	Total Power Dissipation	T <sub>C</sub> =25°C	1570	W
T <sub>jmax</sub>	Max Junction Temperature	-	-55 to 200	°C
T <sub>stg</sub>	Storage Temperature	-	-55 to 150	°C

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

Note2: Pulse width limited by maximum junction temperature

### NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R <sub>25</sub>	Resistance	T <sub>C</sub> =25°C	-	5	-	kΩ
ΔR/R	Deviation of R <sub>100</sub>	T <sub>C</sub> =100°C, R <sub>100</sub> =493Ω	-5	-	5	%
P <sub>25</sub>	Power dissipation	T <sub>C</sub> =25°C	-	-	20	mW
B <sub>25/50</sub>	B-value	R <sub>2</sub> =R <sub>25</sub> exp [B <sub>25/50</sub> (1/T <sub>2</sub> - 1/(298,15 K))]	-	3375	-	K
B <sub>25/80</sub>	B-value	R <sub>2</sub> =R <sub>25</sub> exp [B <sub>25/80</sub> (1/T <sub>2</sub> - 1/(298,15 K))]	-	3411	-	K
B <sub>25/100</sub>	B-value	R <sub>2</sub> =R <sub>25</sub> exp [B <sub>25/100</sub> (1/T <sub>2</sub> - 1/(298,15 K))]	-	3433	-	K

### MOSFET Electrical characteristics (T<sub>j</sub>=25°C unless otherwise specified, chip)

Symbol	Item	Condition	Value			Unit	
			Min.	Typ.	Max		
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =300μA	1700	-	-	V	
I <sub>DSS</sub>	Zero gate voltage drain Current	V <sub>DS</sub> =1700V, V <sub>GS</sub> =0V	-	3	300	μA	
V <sub>GS(th)</sub>	Gate-source threshold Voltage	I <sub>D</sub> =180mA	T <sub>j</sub> =25°C	1.8	2.7	-	V
		V <sub>DS</sub> =V <sub>GS</sub>	T <sub>j</sub> =175°C	-	1.9	-	V
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =15V, V <sub>DS</sub> =0V	-	-	300	nA	
R <sub>DS(on)</sub> (Chip)	Static drain-source	I <sub>D</sub> =300A	T <sub>j</sub> =25°C	-	6.7	-	mΩ
	On-state resistance	V <sub>GS</sub> =15V	T <sub>j</sub> =175°C	-	15.5	-	mΩ
V <sub>DS(on)</sub> (Chip)	Static drain-source	I <sub>D</sub> =300A	T <sub>j</sub> =25°C	-	2.01	-	V
	On-state Voltage	V <sub>GS</sub> =15V	T <sub>j</sub> =175°C	-	4.65	-	V
C <sub>iss</sub>	Input Capacitance	V <sub>D</sub> =1000V, V <sub>GS</sub> =0V f =1MHz, V <sub>ac</sub> =25mV	-	22.9	-	nF	
C <sub>oss</sub>	Output Capacitance		-	0.62	-	nF	
C <sub>rss</sub>	Reverse transfer Capacitance		-	0.11	-	nF	
Q <sub>G</sub>	Total gate charge	V <sub>DD</sub> =1000V, I <sub>D</sub> =225A, V <sub>GS</sub> =-5/+15V	-	758	-	nC	
R <sub>Gint</sub>	Internal Gate Resistance	T <sub>j</sub> =25°C	-	0.6	-	Ω	
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> =900V I <sub>D</sub> =300A V <sub>GS</sub> =+15/-5V R <sub>G(on)</sub> =5.1Ω R <sub>G(off)</sub> =5.1Ω Inductive load switching operation	T <sub>j</sub> =25°C	-	137	-	ns
			T <sub>j</sub> =150°C	-	106	-	
t <sub>r</sub>	Rise time		T <sub>j</sub> =25°C	-	101	-	ns
			T <sub>j</sub> =150°C	-	85	-	
t <sub>d(off)</sub>	Turn-off delay time		T <sub>j</sub> =25°C	-	497	-	ns
			T <sub>j</sub> =150°C	-	596	-	
t <sub>f</sub>	Fall time		T <sub>j</sub> =25°C	-	71	-	ns
			T <sub>j</sub> =150°C	-	93	-	
E <sub>on</sub>	Turn-on power dissipation		T <sub>j</sub> =25°C	-	27.3	-	mJ
			T <sub>j</sub> =150°C	-	25.4	-	
E <sub>off</sub>	Turn-off power dissipation	T <sub>j</sub> =25°C	-	30.1	-	mJ	
		T <sub>j</sub> =150°C	-	33.2	-		
R <sub>th(j-c)</sub>	FET Thermal Resistance	Junction to Case	-	0.095	-	K/W	
R <sub>th(c-f)</sub>	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 ( $T_j=25^\circ\text{C}$ unless otherwise specified, chip)

Symbol	Item	Condition	Value			Unit	
			Min.	Typ.	Max.		
$V_{SD}$	Body Diode Forward Voltage	$V_{GS} = -5\text{V}$ $I_{SD} = 300\text{A}$	$T_j = 25^\circ\text{C}$	-	5.7	-	V
			$T_j = 175^\circ\text{C}$	-	5.3	-	
$T_{rr}$	Reverse recovery time	$V_{RR} = 900\text{V}, I_D = 300\text{A}$ MOSFET side:	$T_j = 25^\circ\text{C}$	-	33	-	ns
			$T_j = 150^\circ\text{C}$	-	112	-	
$Q_{rr}$	Reverse recovery charge	$V_{GS} = +15/-5\text{V}$ $R_{G(on)} = R_{G(off)} = 5.1\Omega$	$T_j = 25^\circ\text{C}$	-	1.91	-	uC
			$T_j = 150^\circ\text{C}$	-	9.15	-	
$E_{rr}$	Diode switching power dissipation	Inductive load switching operation	$T_j = 25^\circ\text{C}$	-	0.5	-	mJ
			$T_j = 150^\circ\text{C}$	-	4.2	-	

### Test Conditions

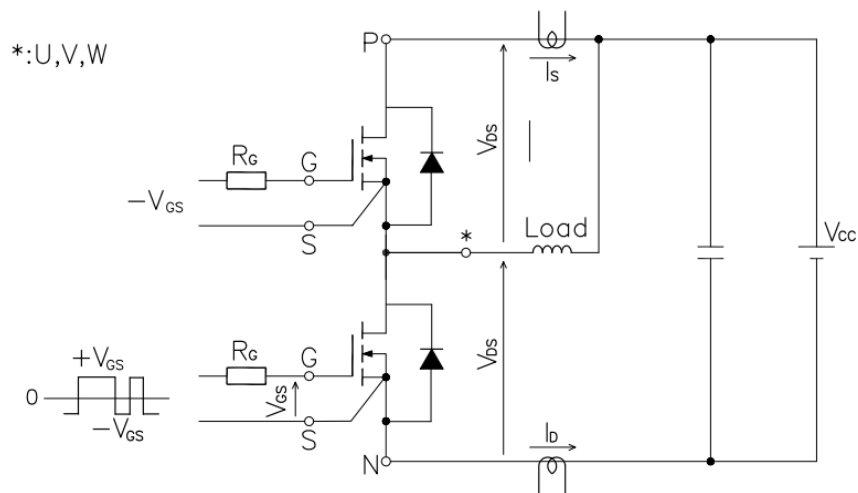


Figure 3. Switching time measure circuit

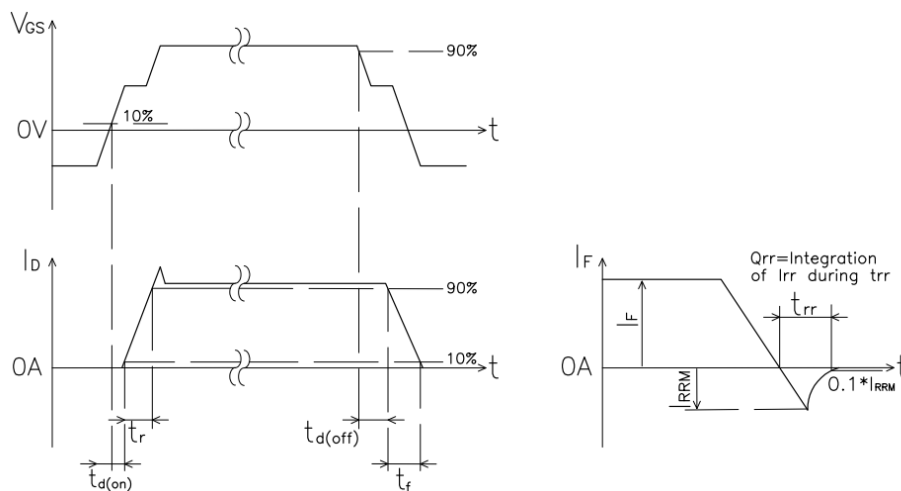


Figure 4. Switching time definition

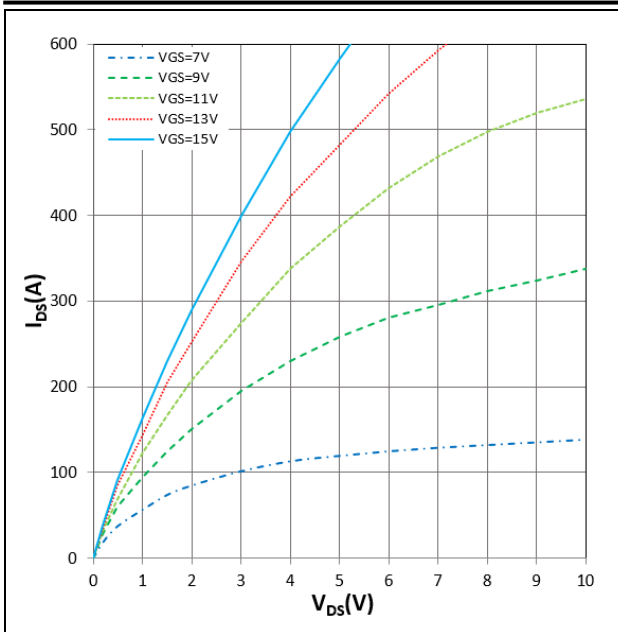


Figure 5.  $I_{DS}$  vs  $V_{DS}$   
 $T_j=25^\circ\text{C}$ ,  $V_{GS}$  parameter

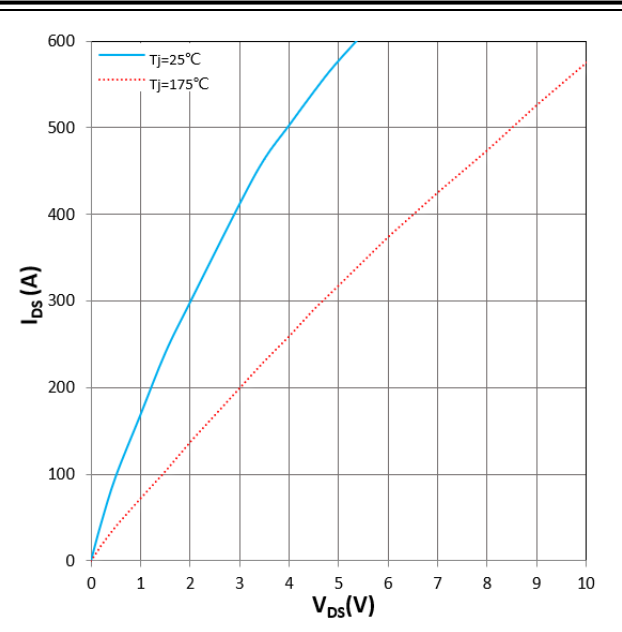


Figure 6.  $I_{DS}$  vs  $V_{DS}$   
 $V_{GS} = 15\text{V}$ ,  $T_j$  parameter

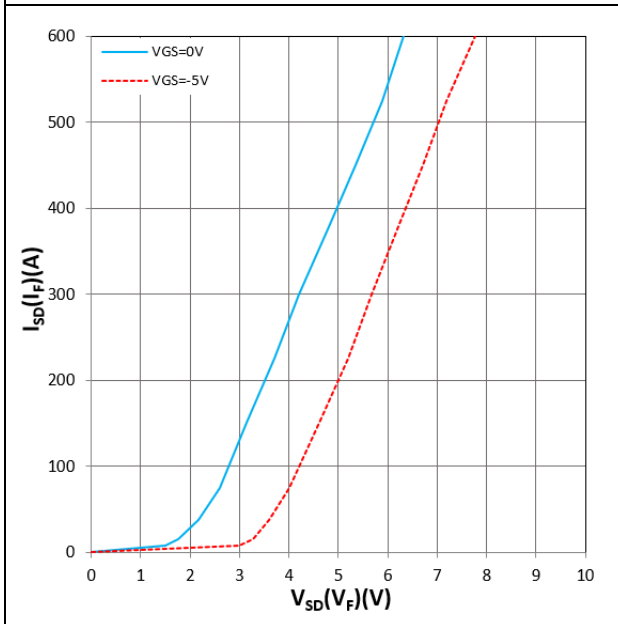


Figure 7.  $I_{SD}(I_F)$  vs  $V_{SD}(V_F)$   
 $T_j=25^\circ\text{C}$ ,  $V_{GS}$  parameter

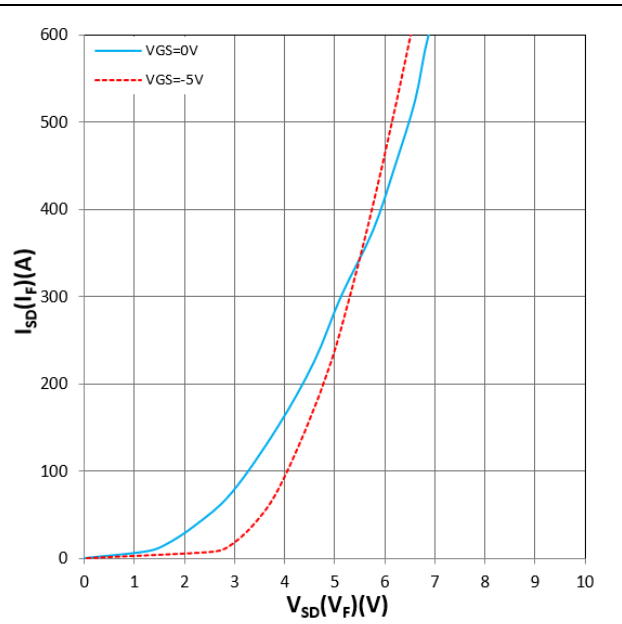


Figure 8.  $I_{SD}(I_F)$  vs  $V_{SD}(V_F)$   
 $T_j=175^\circ\text{C}$ ,  $V_{GS}$  parameter

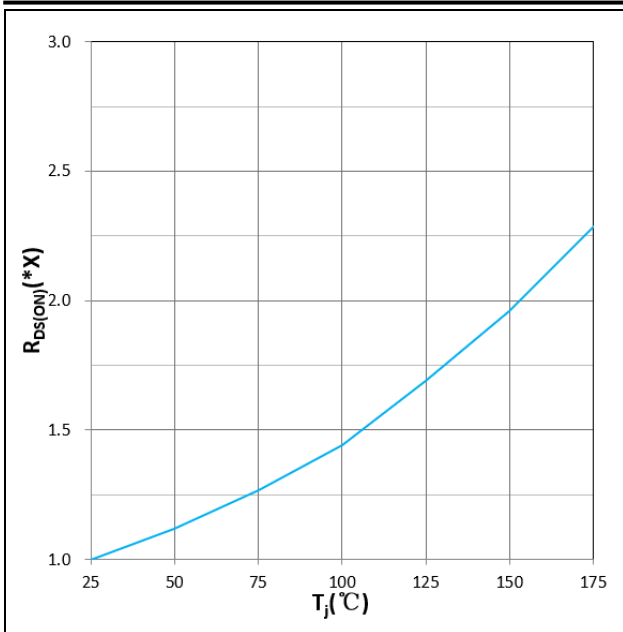


Figure 9.  $R_{DS(ON)}$  vs  $T_j$   
 $V_{GS}=+15V$ ,  $I_D=300A$ ,  $1.0X=6.7m\Omega$

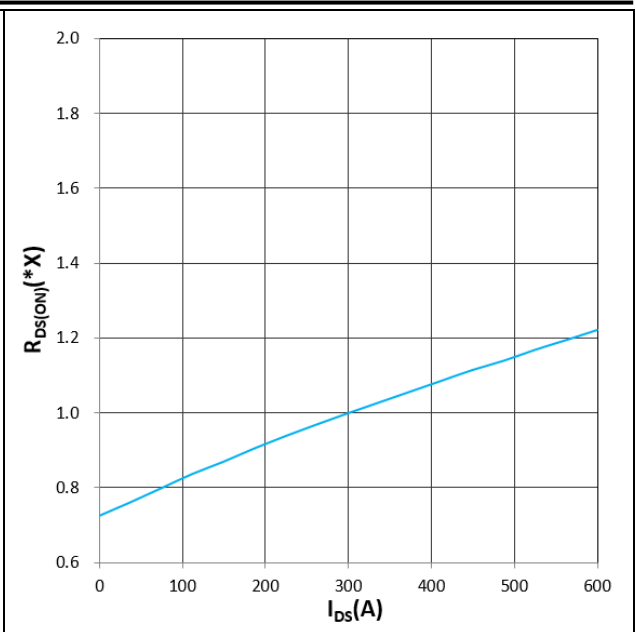


Figure 10.  $R_{DS(ON)}$  vs  $I_{DS}$   
 $T_j=25^\circ C$ ,  $V_{GS}=+15V$ ,  $1.0X=6.7m\Omega$

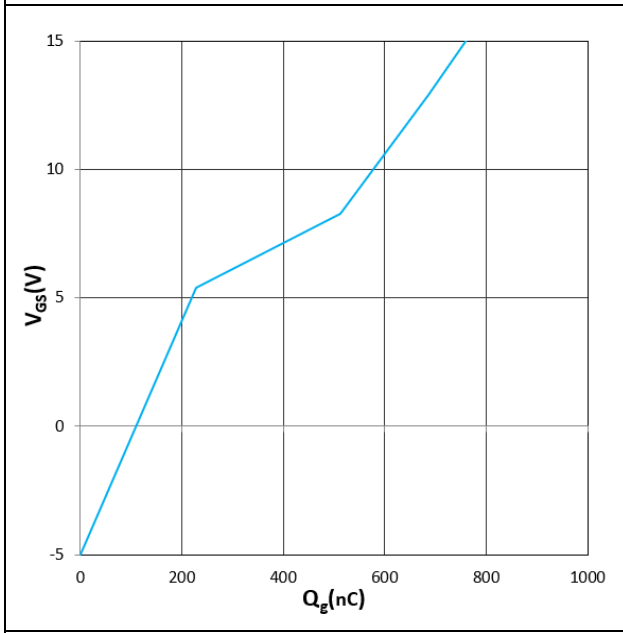


Figure 11.  $V_{GS}$  vs  $Q_g$   
 $T_j=25^\circ C$ ,  $V_{DS}=1000V$ ,  $I_D=225A$

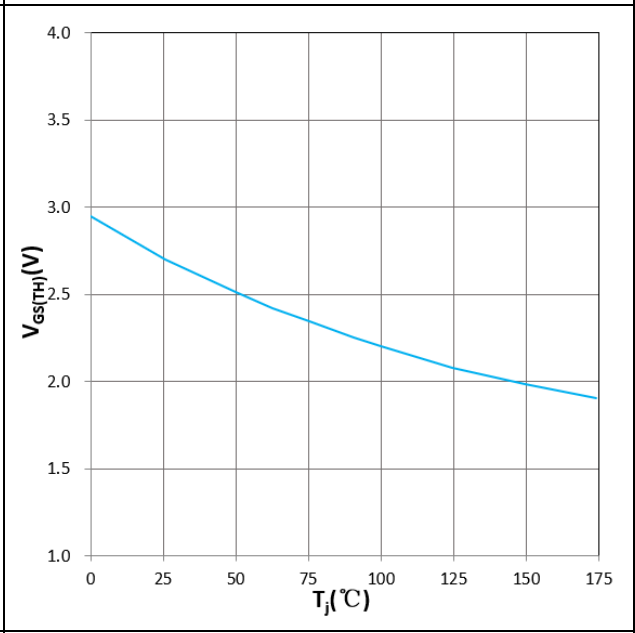


Figure 12.  $V_{GS(TH)}$  vs  $T_j$   
 $V_{GS}=V_{DS}$ ,  $I_D=180mA$

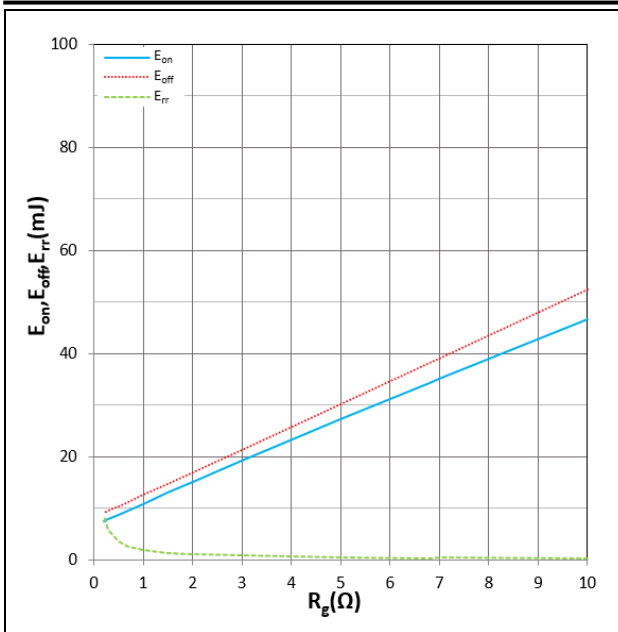


Figure 13.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $R_g$   
 $T_j=25^\circ\text{C}$ ,  $V_{DD}=900\text{V}$ ,  $V_{GS}=+15\text{V}/-5\text{V}$ ,  $I_D=300\text{A}$   
 Inductive Load

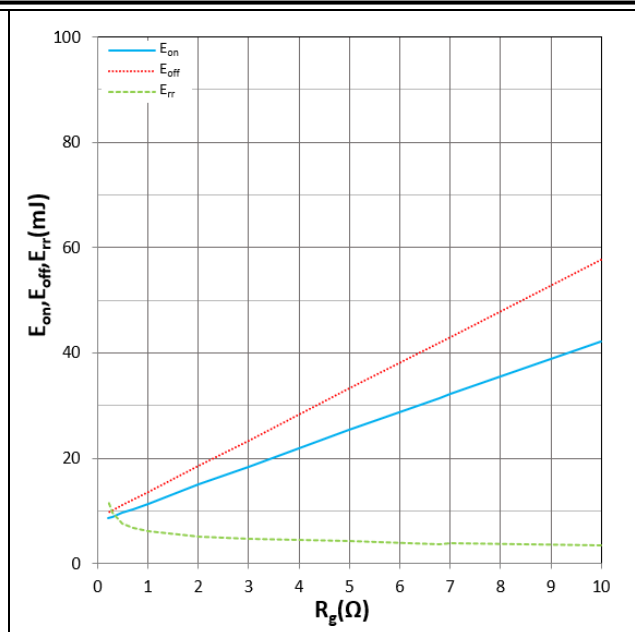


Figure 14.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $R_g$   
 $T_j=150^\circ\text{C}$ ,  $V_{DD}=900\text{V}$ ,  $V_{GS}=+15\text{V}/-5\text{V}$ ,  $I_D=300\text{A}$   
 Inductive Load

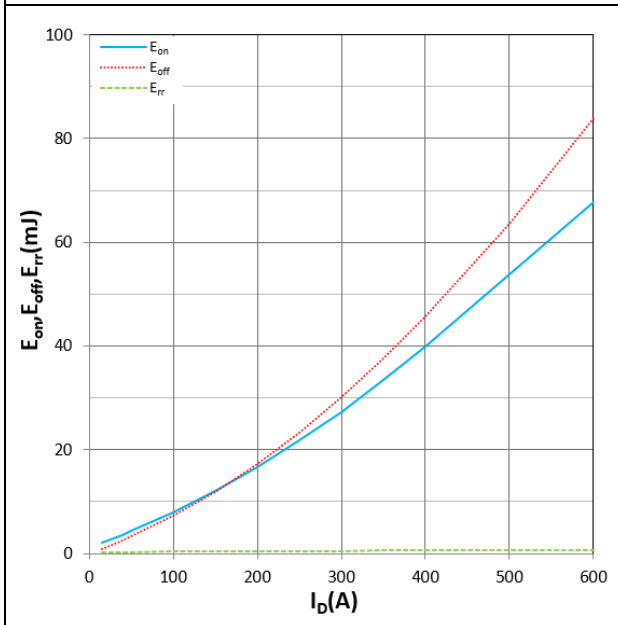


Figure 15.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $I_D$   
 $T_j=25^\circ\text{C}$ ,  $V_{DD}=900\text{V}$ ,  $V_{GS}=+15\text{V}/-5\text{V}$ ,  $R_g=5.1\Omega$   
 Inductive Load

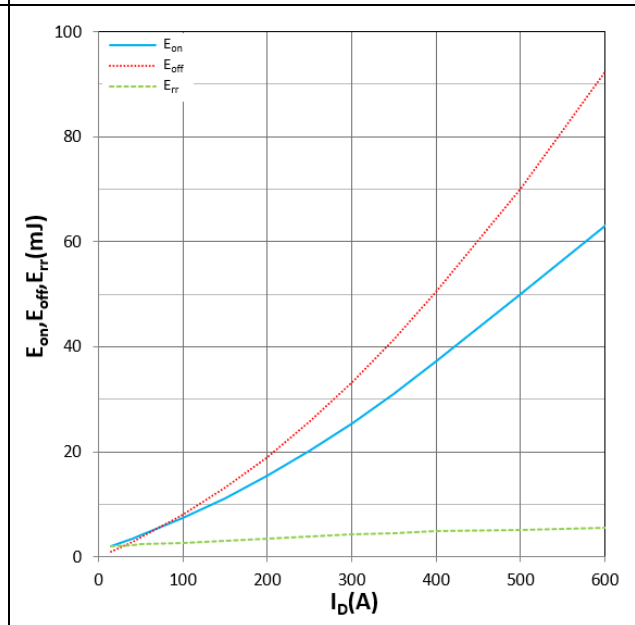


Figure 16.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $I_D$   
 $T_j=150^\circ\text{C}$ ,  $V_{DD}=900\text{V}$ ,  $V_{GS}=+15\text{V}/-5\text{V}$ ,  $R_g=5.1\Omega$   
 Inductive Load



### IMPORTANT NOTICE:

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