

### Description

The DFS300HF17DFC1 is a Half Bridge SiC MOSFET Power Module. It integrates high performance SiC MOSFET chips and SiC Diode designed for the applications such as Motor drives and Renewable energy.



### Features

- Blocking voltage:1700V
- $R_{ds(on)} = 6.4m\Omega$
- Low thermal resistance with Si<sub>3</sub>N<sub>4</sub> AMB
- 175°C maximum junction temperature
- 62mm half bridge module

### Applications

- Motor Drives
- Solar and Wind inverter Systems
- Renewable energy
- UPS

### Circuit diagram

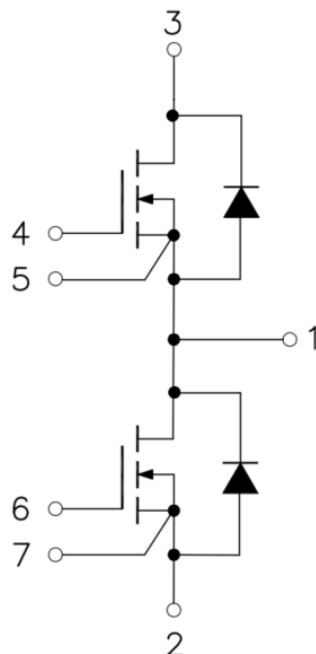


Figure 1. Out drawing & circuit diagram for DFS300HF17DFC1

### Pin Configuration and Marking Information

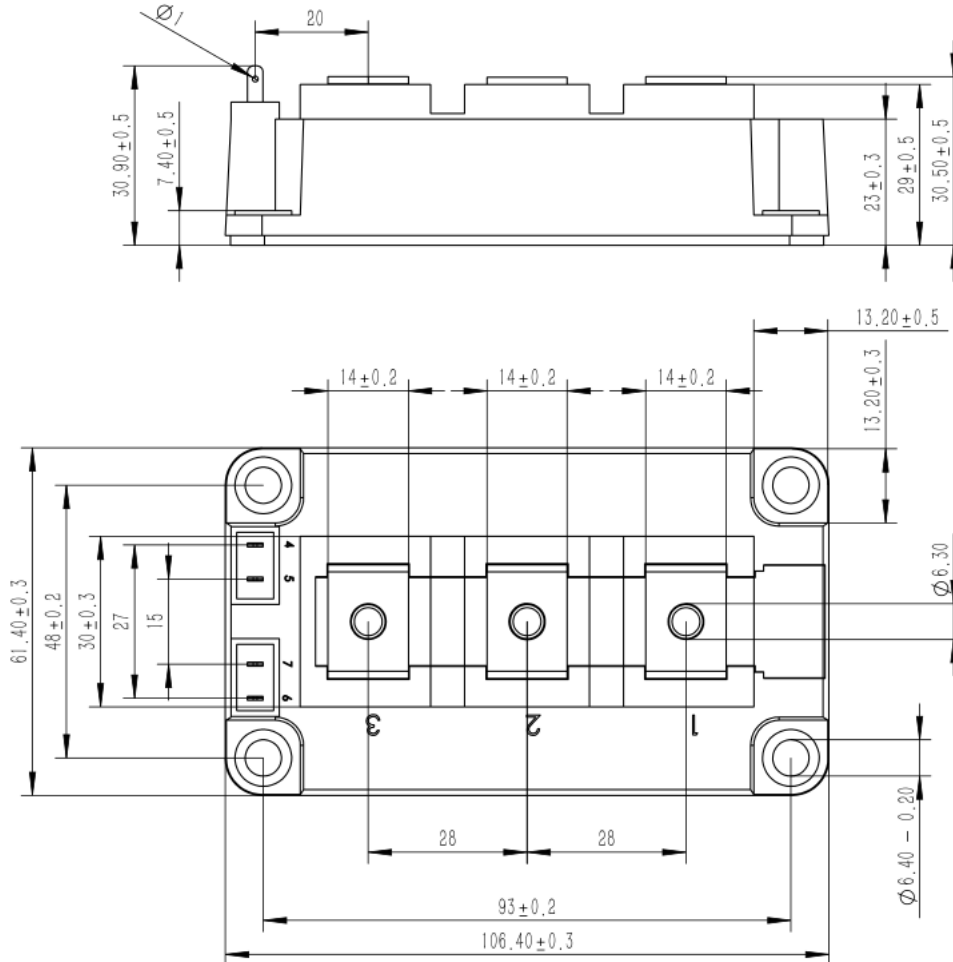


Figure 2. Pin configuration

### Module

Parameter	Condition	Value	Unit
Isolation Voltage	RMS, $f = 50\text{Hz}$ , $t = 1\text{min}$	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	-	>400	-
Module lead resistance, terminals – chip	$T_C = 25^\circ\text{C}$	0.6	m $\Omega$
Mounting torque for module mounting	M6	4 to 6	Nm
Weight	-	320	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, AC frequency ≥ 1Hz, Note1	-10 to 20	V
I <sub>DS</sub>	DC Continuous Drain Current	T <sub>C</sub> = 25°C, V <sub>GS</sub> = +15V	380	A
I <sub>DS</sub>	DC Continuous Drain Current	T <sub>C</sub> = 80°C, V <sub>GS</sub> = +15V	300	A
I <sub>SD</sub>	Source-Drain Current(diode)	T <sub>C</sub> = 25°C, with ON signal	380	A
I <sub>SD</sub>	Source-Drain Current(diode)	T <sub>C</sub> = 80°C, with ON signal	300	A
I <sub>DSM</sub>	Pulse Drain 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	1578	W
T <sub>jmax</sub>	Max Junction Temperature	-	175	°C
T <sub>stg</sub>	Storage Temperature	-	-40 to 125	°C

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

Note2: Pulse width limited by maximum junction temperature

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

Symbol	Item	Condition	Value			Unit	
			Min.	Typ.	Max		
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 300A, V <sub>GS</sub> = 0V	T <sub>j</sub> = 25°C	-	1.75	-	V
			T <sub>j</sub> = 175°C	-	2.75	-	
t <sub>rr</sub>	Diode Reverse Recovery Time	(Switch side) V <sub>DD</sub> = 900V, I <sub>D</sub> = 300A	T <sub>j</sub> = 25°C	-	22	-	ns
			T <sub>j</sub> = 150°C	-	34	-	
I <sub>RM</sub>	Peak reverse recovery Current	V <sub>GS</sub> = +15V/-4V R <sub>gon</sub> /R <sub>goff</sub> = 2.2Ω/2.2Ω	T <sub>j</sub> = 25°C	-	57	-	A
			T <sub>j</sub> = 150°C	-	129	-	
Q <sub>rr</sub>	Recovered charge	(FRD side) V <sub>RR</sub> = 900V, I <sub>F</sub> = 300A	T <sub>j</sub> = 25°C	-	0.78	-	uC
			T <sub>j</sub> = 150°C	-	2.59	-	
E <sub>rr</sub>	Reverse recovered energy	V <sub>GE</sub> = +15V/-4V Inductive load switching operation	T <sub>j</sub> = 25°C	-	0.1	-	mJ
			T <sub>j</sub> = 150°C	-	0.4	-	
R <sub>th(j-c)</sub>	Thermal Resistance, Junction to Case (Diode)		-	0.068	-	°C/W	

### 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> =1200V, V <sub>GS</sub> =0V	-	3	-	μA	
V <sub>GS(th)</sub>	Gate-source threshold Voltage	I <sub>D</sub> =180mA, V <sub>DS</sub> =V <sub>GS</sub>	T <sub>j</sub> =25°C	1.8	2.7	-	V
			T <sub>j</sub> =175°C	-	1.9	-	V
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =20V, V <sub>DS</sub> =0V	T <sub>j</sub> =25°C	-	20	-	nA
R <sub>DS(on)</sub> (Chip)	Static drain-source	I <sub>D</sub> =300A	T <sub>j</sub> =25°C	-	6.4	-	mΩ
	On-state resistance	V <sub>GS</sub> =15V	T <sub>j</sub> =175°C	-	10.5	-	mΩ
V <sub>DS(on)</sub> (Chip)	Static drain-source	I <sub>D</sub> =300A	T <sub>j</sub> =25°C	-	1.9	-	V
	On-state Voltage	V <sub>GS</sub> =15V	T <sub>j</sub> =175°C	-	3.1	-	V
C <sub>iss</sub>	Input Capacitance	V <sub>D</sub> =1000V, V <sub>GS</sub> =0V f =1MHz, V <sub>AC</sub> =25mV	-	22860	-	pF	
C <sub>oss</sub>	Output Capacitance		-	615	-	pF	
C <sub>rss</sub>	Reverse transfer Capacitance		-	113	-	pF	
R <sub>Gint</sub>	Internal gate resistor	f =1MHz, V <sub>AC</sub> =25mV	-	2.3	-	Ω	
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> =1000V, I <sub>D</sub> =225A, V <sub>GS</sub> =+15/-4V	-	780	-	nC	
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> =900V I <sub>D</sub> =300A V <sub>GS</sub> =+15/-4V R <sub>gon</sub> /R <sub>goff</sub> =2.2Ω/2.2Ω Inductive load switching operation	T <sub>j</sub> =25°C	-	102	-	ns
			T <sub>j</sub> =150°C	-	96	-	
t <sub>r</sub>	Rise time		T <sub>j</sub> =25°C	-	59	-	ns
			T <sub>j</sub> =150°C	-	50	-	
t <sub>d(off)</sub>	Turn-off delay time		T <sub>j</sub> =25°C	-	174	-	ns
			T <sub>j</sub> =150°C	-	196	-	
t <sub>f</sub>	Fall time		T <sub>j</sub> =25°C	-	54	-	ns
			T <sub>j</sub> =150°C	-	58	-	
E <sub>on</sub>	Turn-on power dissipation		T <sub>j</sub> =25°C	-	20.1	-	mJ
			T <sub>j</sub> =150°C	-	16.6	-	
E <sub>off</sub>	Turn-off power dissipation	T <sub>j</sub> =25°C	-	7.4	-	mJ	
		T <sub>j</sub> =150°C	-	7.6	-		
R <sub>th(j-c)</sub>	FET Thermal Resistance	Junction to Case	-	0.095	-	°C/W	

**Test Conditions**

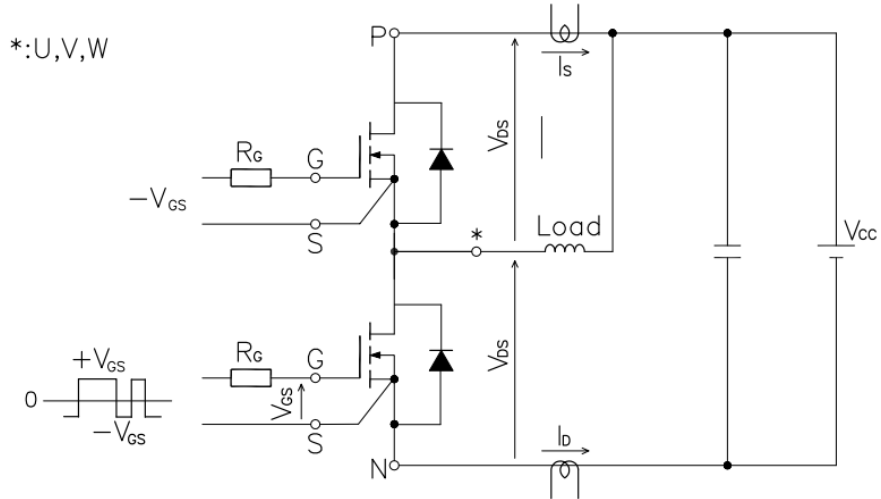


Figure 3. Switching time measure circuit

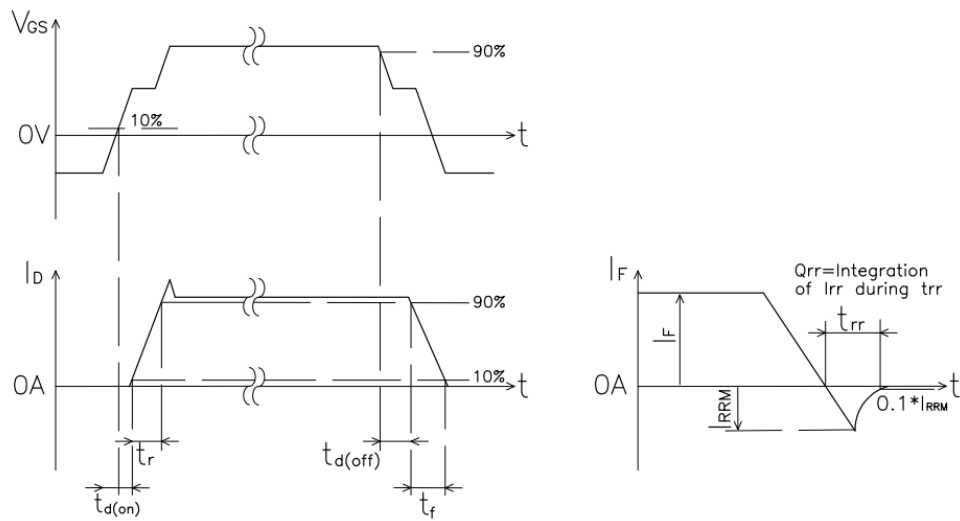


Figure 4. Switching time definition

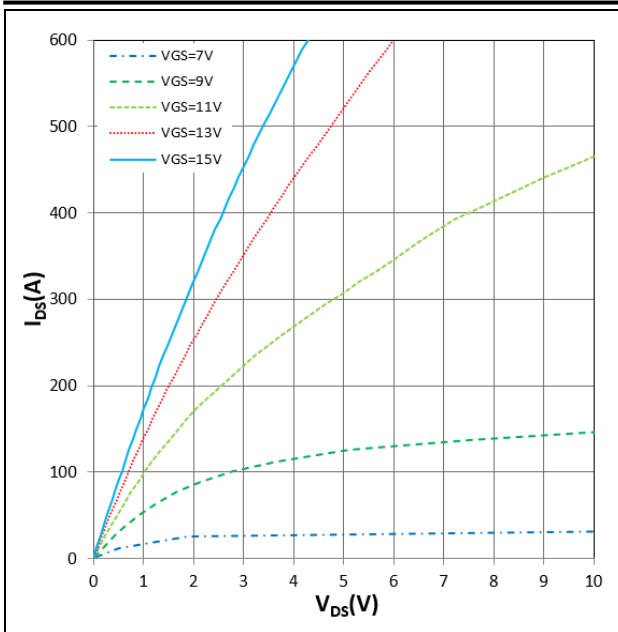


Figure 5.  $I_{DS}$  vs  $V_{DS}$   
 $T_j = 25^\circ\text{C}$

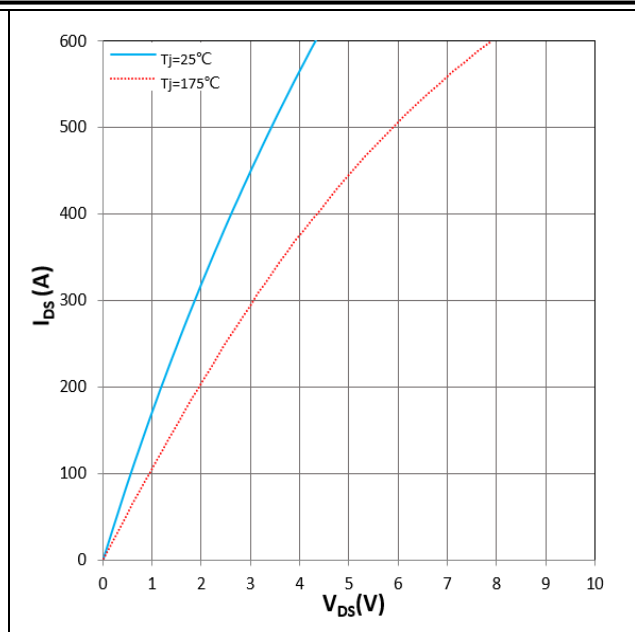


Figure 6.  $I_{DS}$  vs  $V_{DS}$   
 $V_{GS} = +15\text{V}$

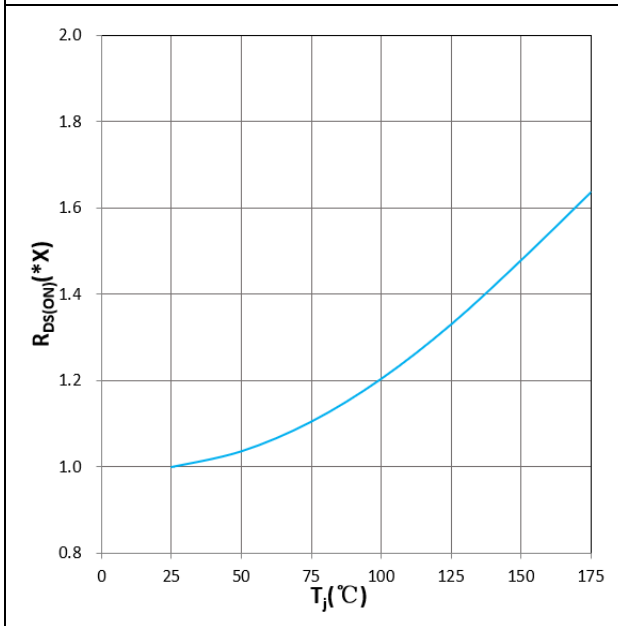


Figure 7.  $R_{DS(ON)}$  vs  $T_j$   
 $V_{GS} = +15\text{V}$ ,  $I_D = 300\text{A}$ ,  $1.0X = 6.4\text{m}\Omega$

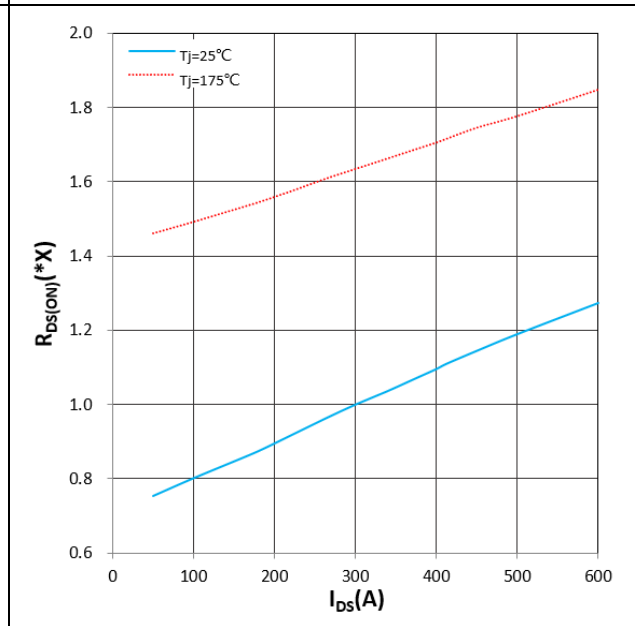


Figure 8.  $R_{DS(ON)}$  vs  $I_{DS}$   
 $V_{GS} = +15\text{V}$ ,  $1.0X = 6.4\text{m}\Omega$

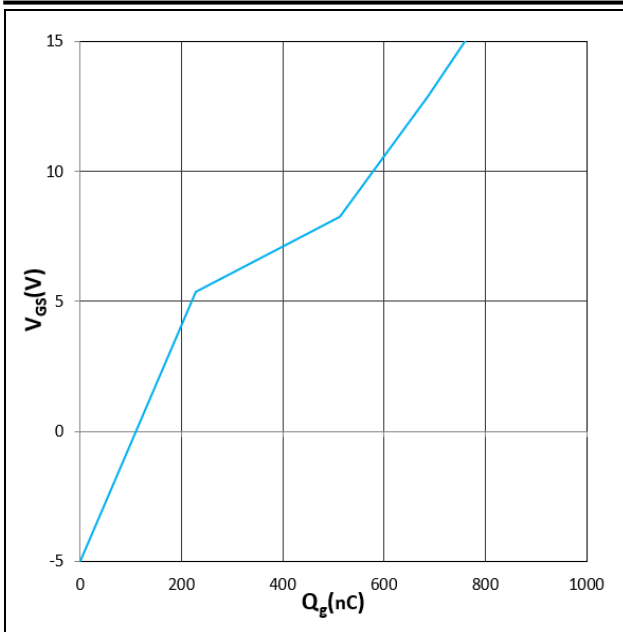


Figure 9.  $V_{GS}$  vs  $Q_g$   
 $V_{DS} = 1000V, I_D = 225A, T_j = 25^\circ C$

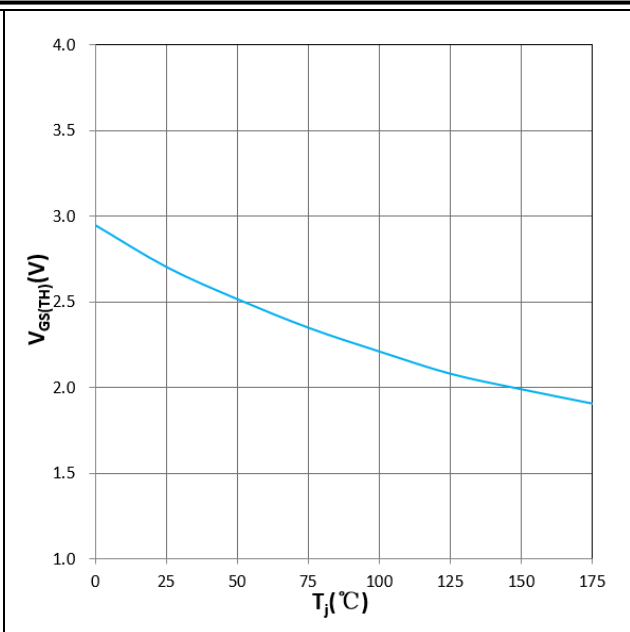


Figure 10.  $V_{GS(T_H)}$  vs  $T_j$   
 $V_{GS} = V_{DS}, I_D = 180mA$

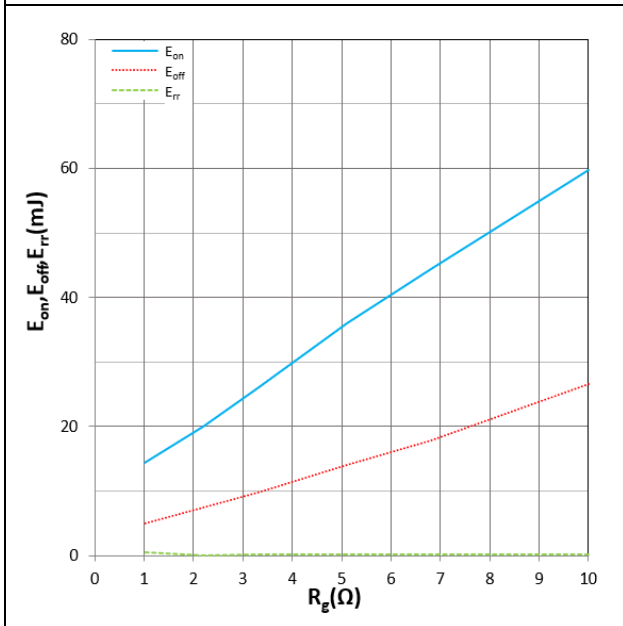


Figure 11.  $E_{on}, E_{off}, E_{rr}$  vs  $R_g$   
 $T_j = 25^\circ C, V_{DD} = 900V, V_{GS} = +15V/-4V, I_D = 300A$   
 Inductive Load

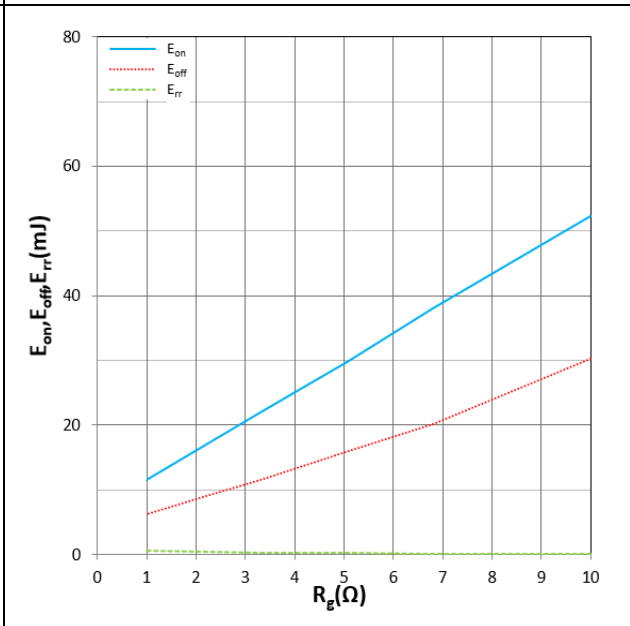


Figure 12.  $E_{on}, E_{off}, E_{rr}$  vs  $R_g$   
 $T_j = 150^\circ C, V_{DD} = 900V, V_{GS} = +15V/-4V, I_D = 300A$   
 Inductive Load

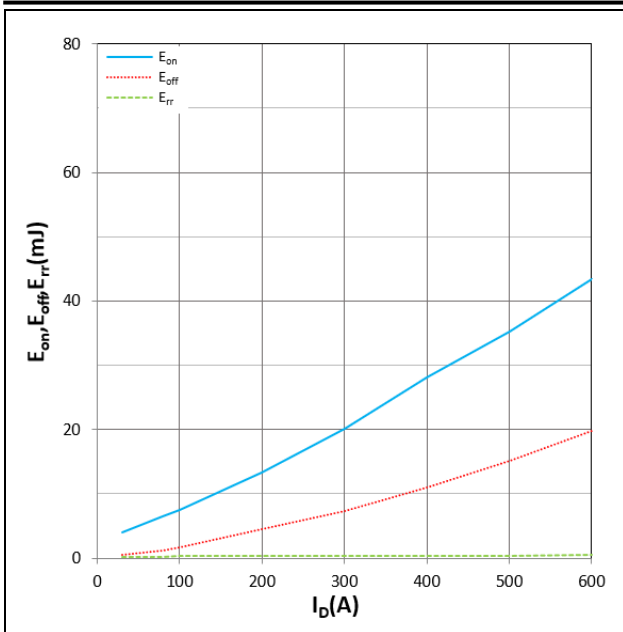


Figure 13.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $I_{DS}$   
 $T_j=25^\circ\text{C}$ ,  $V_{DD}=900\text{V}$ ,  $V_{GS}=+15\text{V}/-4\text{V}$   
 $R_{gon}/R_{goff}=2.2\Omega/2.2\Omega$ , Inductive Load

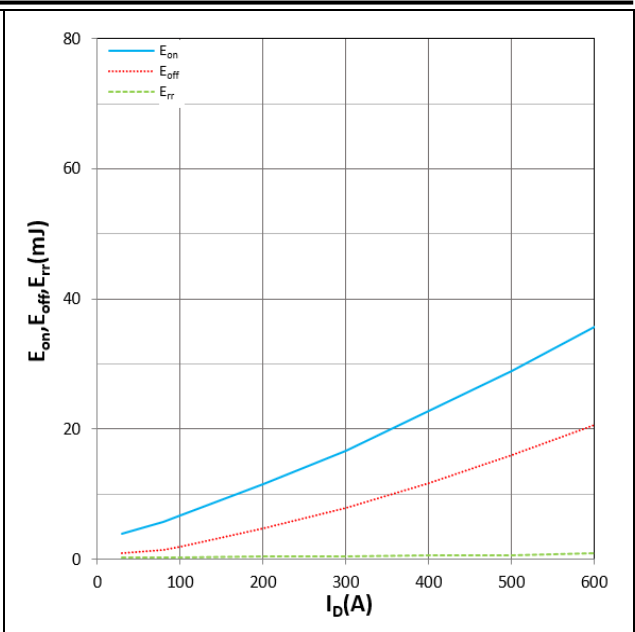


Figure 14.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $I_{DS}$   
 $T_j=150^\circ\text{C}$ ,  $V_{DD}=900\text{V}$ ,  $V_{GS}=+15\text{V}/-4\text{V}$   
 $R_{gon}/R_{goff}=2.2\Omega/2.2\Omega$ , Inductive Load

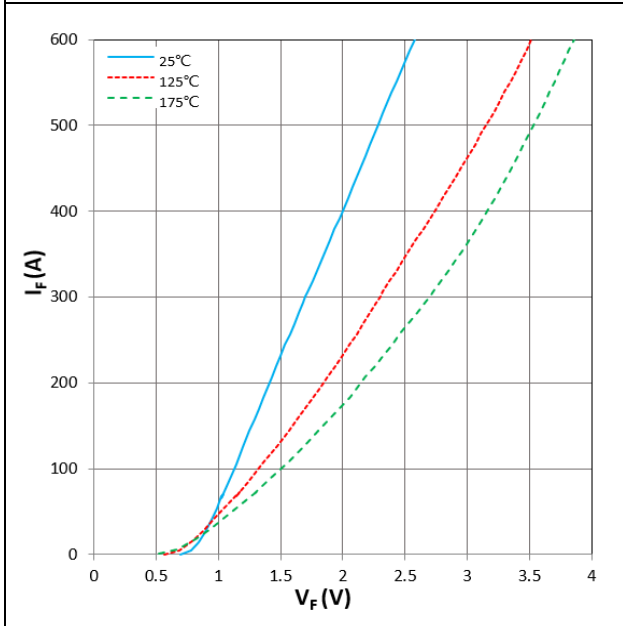


Figure 15.  $I_F$  vs  $V_F$   
 $V_{GS}=0\text{V}$



### IMPORTANT NOTICE:

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