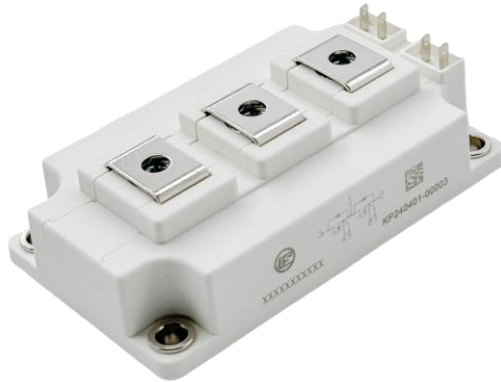


### Description

The DFS200HF12DFC1 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:1200V
- $R_{ds(on)} = 9.1m\Omega$
- Low thermal resistance with  $Si_3N_4$  AMB
- 175°C maximum junction temperature
- 62mm half bridge module

### Applications

- Motor Drives
- Vehicle Fast Chargers
- Renewable energy
- UPS

### Circuit diagram

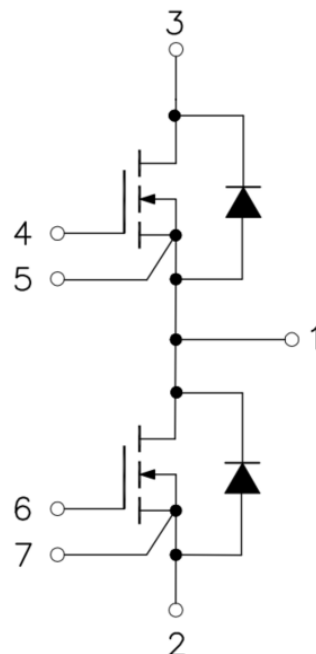


Figure 1. Out drawing & circuit diagram for DFS200HF12DFC1

### Pin Configuration and Marking Information

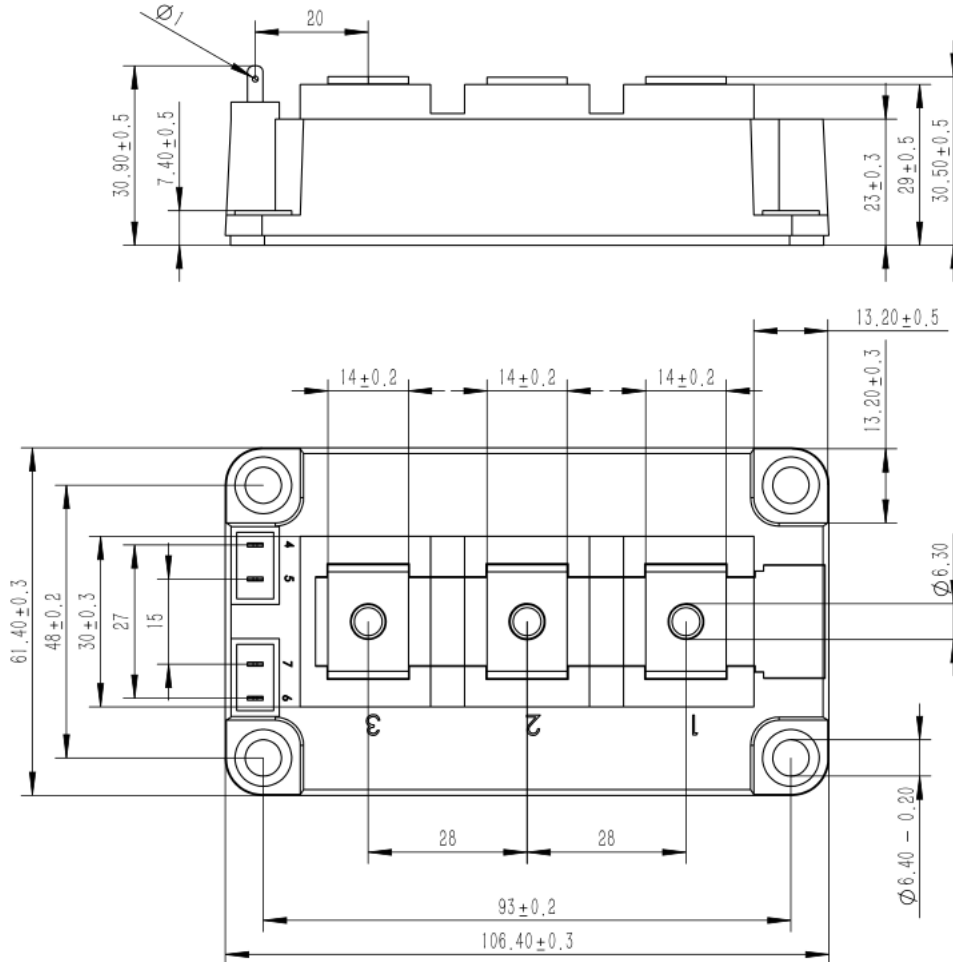


Figure 2. Pin configuration

### 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	-	>400	-
Module lead resistance, terminals – chip	T <sub>C</sub> =25°C	0.6	mΩ
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	Conditions	Ratings	Unit
V <sub>DSS</sub>	Drain-Source Voltage	G-S Short	1200	V
V <sub>GSS</sub>	Gate-Source Voltage	D-S Short, AC frequency ≥ 1Hz, Note1	-10 to 22	V
I <sub>DS</sub>	DC Continuous Drain Current	T <sub>C</sub> = 25°C, V <sub>GS</sub> = 18V	245	A
I <sub>DS</sub>	DC Continuous Drain Current	T <sub>C</sub> = 80°C, V <sub>GS</sub> = 18V	200	A
I <sub>SD</sub>	Source-Drain Current(diode)	T <sub>C</sub> = 25°C, with ON signal	245	A
I <sub>SD</sub>	Source-Drain Current(diode)	T <sub>C</sub> = 80°C, with ON signal	200	A
I <sub>DSM</sub>	Pulse Drain Current	T <sub>C</sub> = 25°C, Pulse width = 1ms, V <sub>GS</sub> = 18V, Note2	400	A
P <sub>tot</sub>	Total Power Dissipation	T <sub>C</sub> = 25°C	785	W
T <sub>jmax</sub>	Max Junction Temperature	-	175	°C
T <sub>stg</sub>	Storage Temperature	-	-40 to 125	°C

Note1: Recommended Operating Value, +18V/-5V, +18V/-4V, +15V/-4V

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> = 200A, V <sub>GS</sub> = 0V	T <sub>j</sub> = 25°C	-	1.93	-	V
			T <sub>j</sub> = 150°C	-	3.05	-	
t <sub>rr</sub>	Diode Reverse Recovery Time	(Switch side) V <sub>DD</sub> = 600V, I <sub>D</sub> = 200A	T <sub>j</sub> = 25°C		29		ns
			T <sub>j</sub> = 150°C		31		
I <sub>RM</sub>	Peak reverse recovery Current	V <sub>GS</sub> = +18V/-4V R <sub>gon</sub> /R <sub>goff</sub> = 3.3Ω/3.3Ω	T <sub>j</sub> = 25°C	-	83	-	A
			T <sub>j</sub> = 150°C	-	105	-	
Q <sub>rr</sub>	Recovered charge	(FRD side) V <sub>RR</sub> = 600V, I <sub>F</sub> = 200A	T <sub>j</sub> = 25°C	-	1.5	-	uC
			T <sub>j</sub> = 150°C	-	2.1	-	
E <sub>rr</sub>	Reverse recovered energy	V <sub>GS</sub> = +18V/-4V Inductive load switching operation	T <sub>j</sub> = 25°C	-	0.6	-	mJ
			T <sub>j</sub> = 150°C	-	1.1	-	
R <sub>th(j-c)</sub>	Thermal Resistance, Junction to Case (Diode)		-	0.18	-	°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> =200uA	1200	-	-	V	
I <sub>DSS</sub>	Zero gate voltage drain Current	V <sub>DS</sub> =1200V, V <sub>GS</sub> =0V	-	2	-	μA	
V <sub>GS(th)</sub>	Gate-source threshold Voltage	I <sub>D</sub> =70mA, 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	-	2.05	-	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	-	-	200	nA
R <sub>DS(on)</sub> (Chip)	Static drain-source On-state resistance	I <sub>D</sub> =200A V <sub>GS</sub> =+15V	T <sub>j</sub> =25°C	-	10.4	-	mΩ
			T <sub>j</sub> =175°C	-	14.4	-	mΩ
	On-state resistance	I <sub>D</sub> =200A V <sub>GS</sub> =+18V	T <sub>j</sub> =25°C	-	9.1	-	mΩ
			T <sub>j</sub> =175°C	-	12.7	-	mΩ
V <sub>DS(on)</sub> (Chip)	Static drain-source On-state Voltage	I <sub>D</sub> =200A V <sub>GS</sub> =+15V	T <sub>j</sub> =25°C	-	2.08	-	V
			T <sub>j</sub> =175°C	-	2.88	-	V
	On-state Voltage	I <sub>D</sub> =200A V <sub>GS</sub> =+18V	T <sub>j</sub> =25°C	-	1.82	-	V
			T <sub>j</sub> =175°C	-	2.54	-	V
C <sub>iss</sub>	Input Capacitance	V <sub>D</sub> =800V, V <sub>GS</sub> =0V, f =100kHz, V <sub>AC</sub> =25mV	-	11628	-	pF	
C <sub>oss</sub>	Output Capacitance		-	354	-	pF	
C <sub>rss</sub>	Reverse transfer Capacitance		-	29	-	pF	
R <sub>Gint</sub>	Internal gate resistor	f =100kHz, V <sub>AC</sub> =25mV	-	3.2	-	Ω	
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> =800V, I <sub>D</sub> =120A, V <sub>GS</sub> =+18/-4V	-	420	-	nC	
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> =600V I <sub>D</sub> =200A V <sub>GS</sub> =+18/-4V R <sub>gon</sub> /R <sub>goff</sub> =3.3Ω/3.3Ω Inductive load switching operation	T <sub>j</sub> =25°C	-	75	-	ns
			T <sub>j</sub> =150°C	-	71	-	
t <sub>r</sub>	Rise time		T <sub>j</sub> =25°C	-	48	-	ns
			T <sub>j</sub> =150°C	-	43	-	
t <sub>d(off)</sub>	Turn-off delay time		T <sub>j</sub> =25°C	-	162	-	ns
			T <sub>j</sub> =150°C	-	189	-	
t <sub>f</sub>	Fall time		T <sub>j</sub> =25°C	-	49	-	ns
			T <sub>j</sub> =150°C	-	55	-	
E <sub>on</sub>	Turn-on power dissipation		T <sub>j</sub> =25°C	-	3.6	-	mJ
			T <sub>j</sub> =150°C	-	2.5	-	
E <sub>off</sub>	Turn-off power dissipation	T <sub>j</sub> =25°C	-	4.6	-	mJ	
		T <sub>j</sub> =150°C	-	5.1	-		
R <sub>th(j-c)</sub>	FET Thermal Resistance	Junction to Case	-	0.19	-	°C /W	

**Test Conditions**

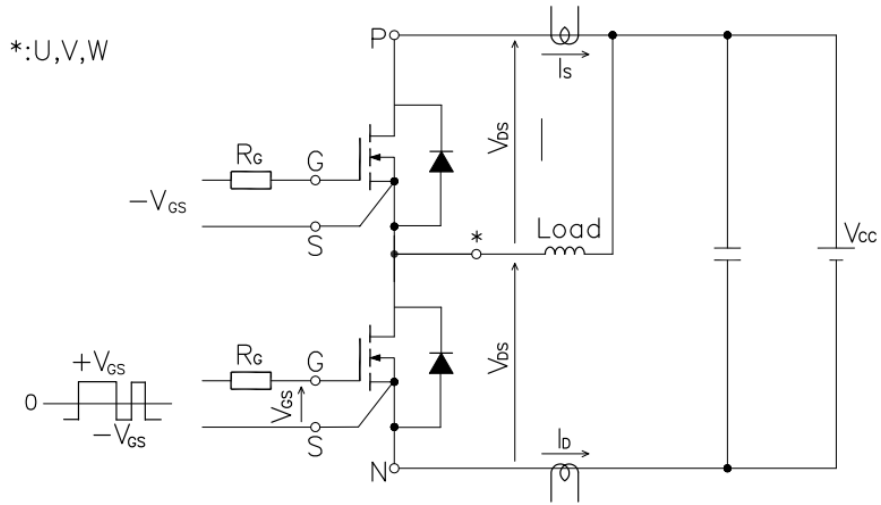


Figure 3. Switching time measure circuit

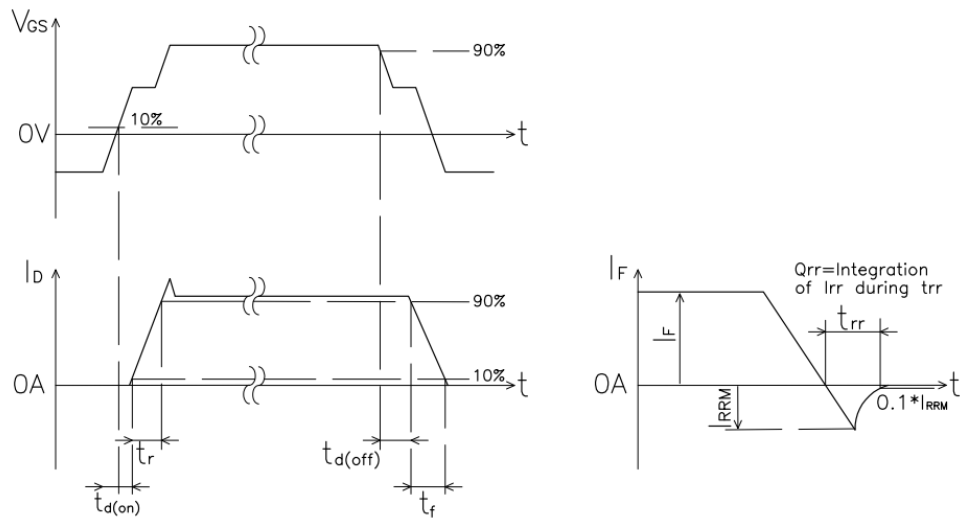


Figure 4. Switching time definition

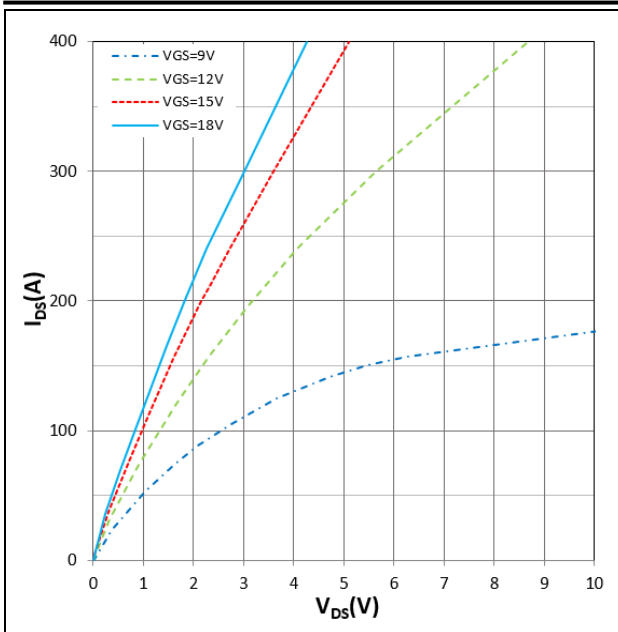


Figure 5.  $I_{DS}$  vs  $V_{DS}$   
 $T_j = 25^\circ\text{C}$

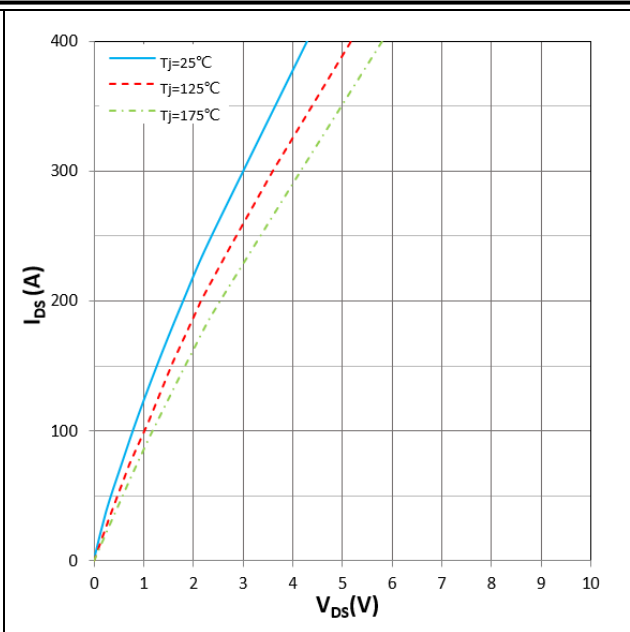


Figure 6.  $I_{DS}$  vs  $V_{DS}$   
 $V_{GS} = +18\text{V}$

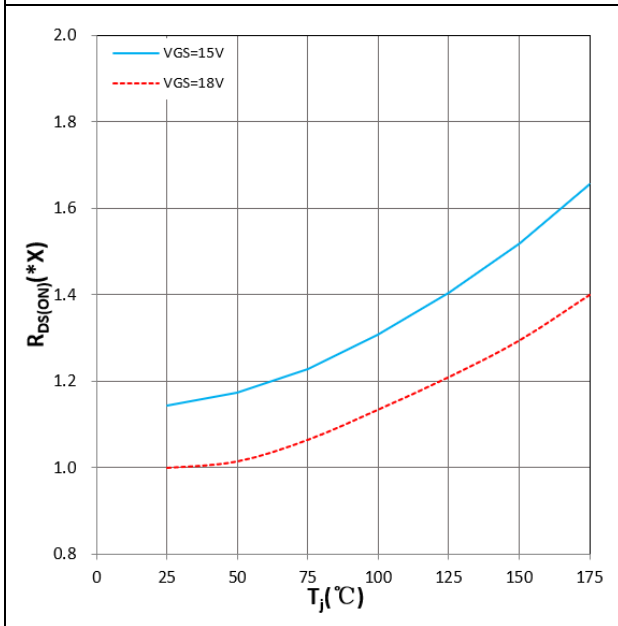


Figure 7.  $R_{DS(ON)}$  vs  $T_j$   
 $V_{GS} = +15\text{V}/+18\text{V}$ ,  $I_D = 200\text{A}$ ,  $1.0X = 9.1\text{m}\Omega$

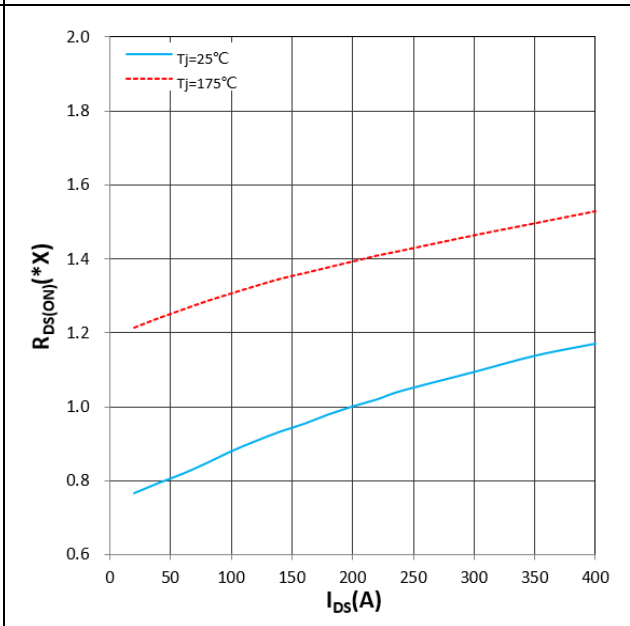


Figure 8.  $R_{DS(ON)}$  vs  $I_{DS}$   
 $V_{GS} = +18\text{V}$ ,  $I_D = 200\text{A}$ ,  $1.0X = 9.1\text{m}\Omega$

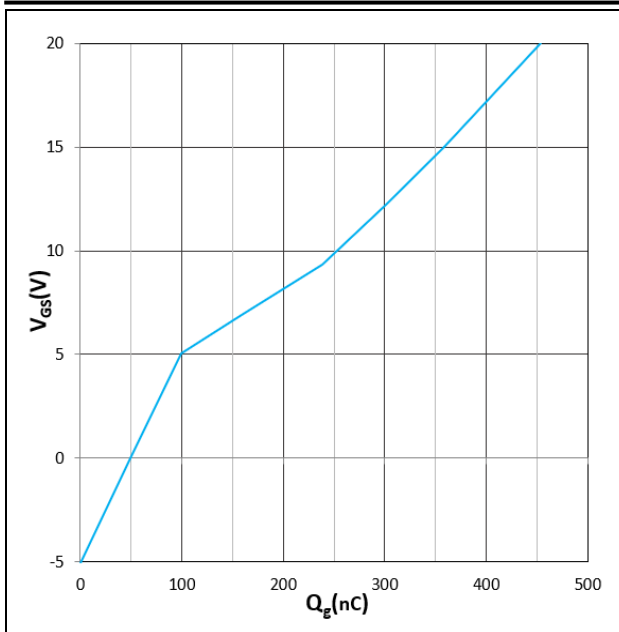


Figure 9.  $V_{GS}$  vs  $Q_g$   
 $V_{DS} = 800V$ ,  $I_D = 120A$ ,  $T_j = 25^\circ C$

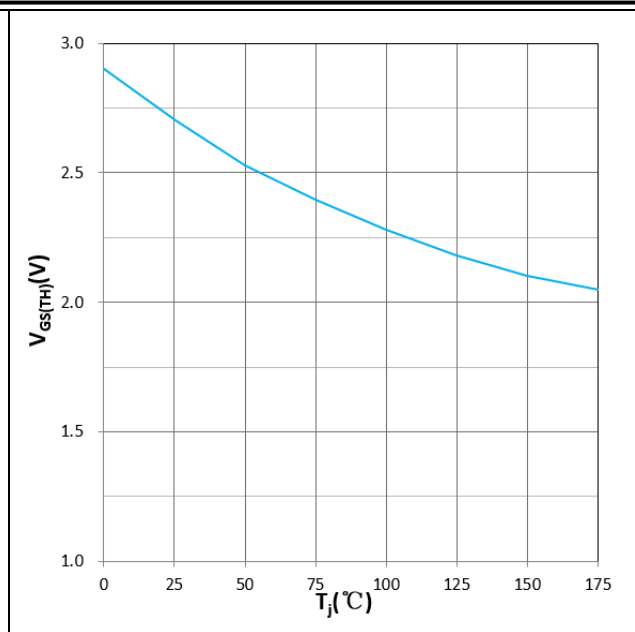


Figure 10.  $V_{GS(TH)}$  vs  $T_j$   
 $V_{GS} = V_{DS}$ ,  $I_D = 70mA$

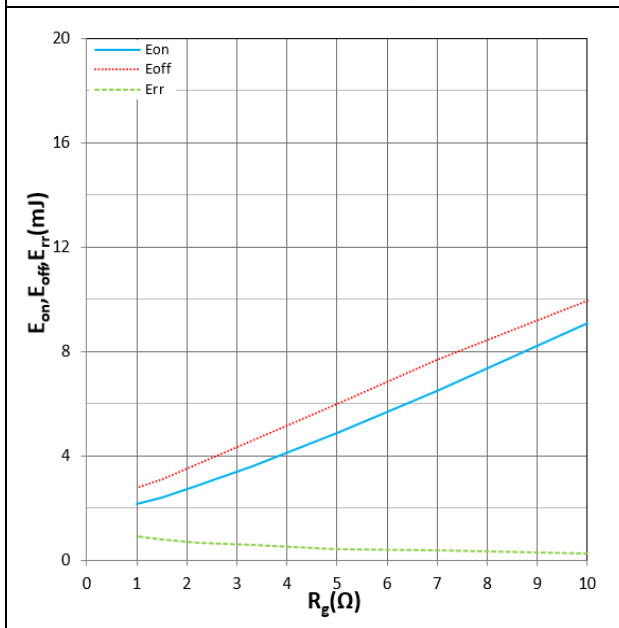


Figure 11.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $R_g$   
 $T_j = 25^\circ C$ ,  $V_{DD} = 600V$ ,  $V_{GS} = +18V/-4V$ ,  $I_D = 200A$   
 Inductive Load

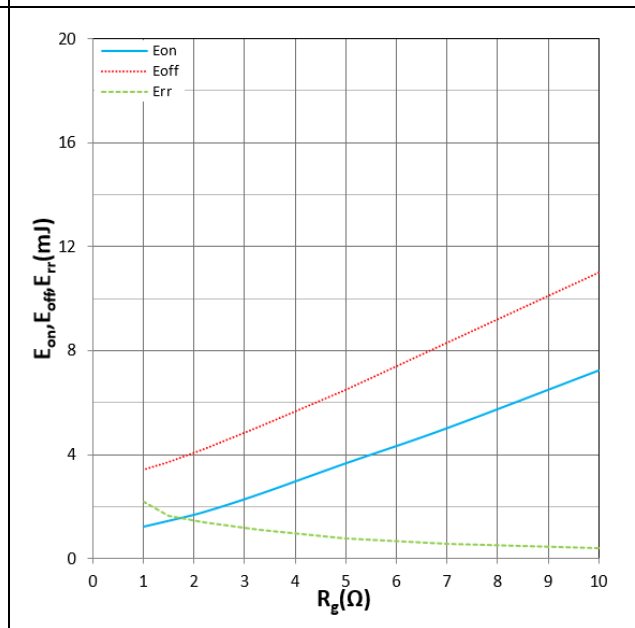


Figure 12.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $R_g$   
 $T_j = 150^\circ C$ ,  $V_{DD} = 600V$ ,  $V_{GS} = +18V/-4V$ ,  $I_D = 200A$   
 Inductive Load

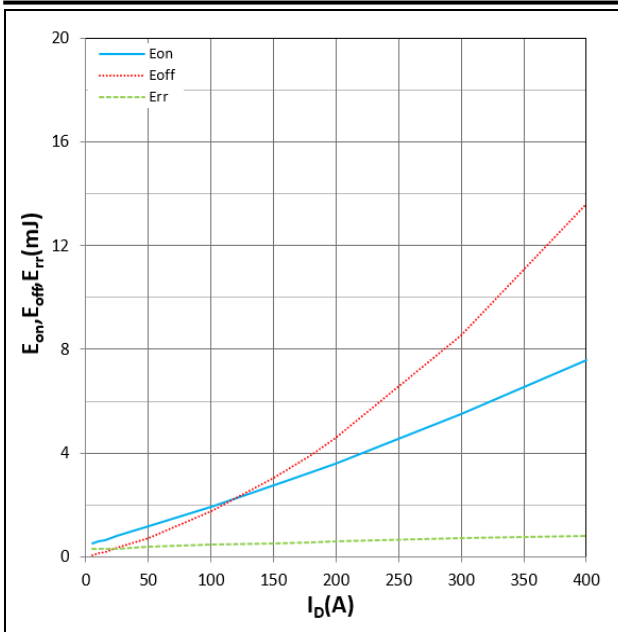


Figure 13.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $I_{DS}$   
 $T_j=25^\circ\text{C}$ ,  $V_{DD}=600\text{V}$ ,  $V_{GS}=+18\text{V}/-4\text{V}$   
 $R_{gon}/R_{goff}=3.3\Omega/3.3\Omega$ , Inductive Load

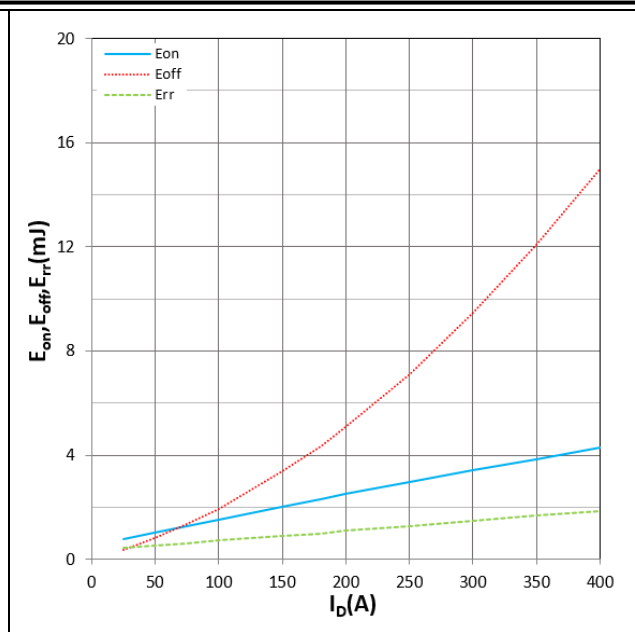


Figure 14.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $I_{DS}$   
 $T_j=150^\circ\text{C}$ ,  $V_{DD}=600\text{V}$ ,  $V_{GS}=+18\text{V}/-4\text{V}$   
 $R_{gon}/R_{goff}=3.3\Omega/3.3\Omega$ , Inductive Load

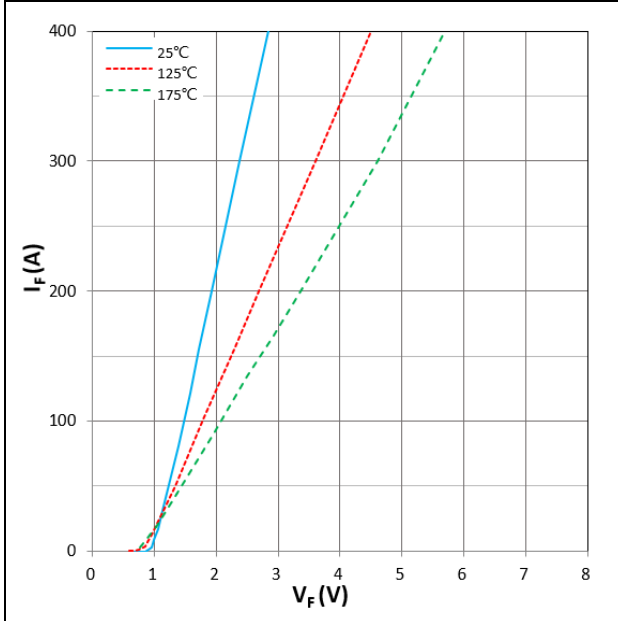


Figure 15.  $I_F$  vs  $V_F$   
 $V_{GS}=0\text{V}$



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