

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_3N_4 AMB
- 175°C maximum junction temperature
- 62mm half bridge module

Applications

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

Circuit diagram

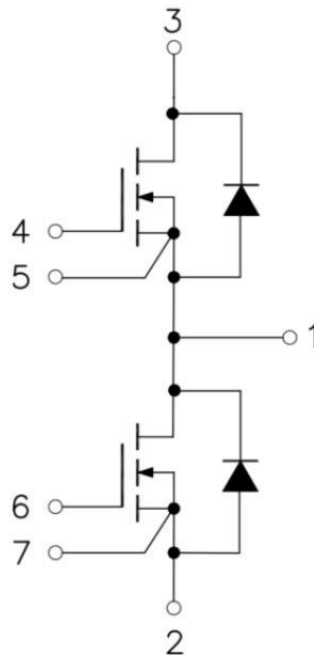


Figure 1. Out drawing & circuit diagram for DFS300HF17DFC1

Pin Configuration and Marking Information

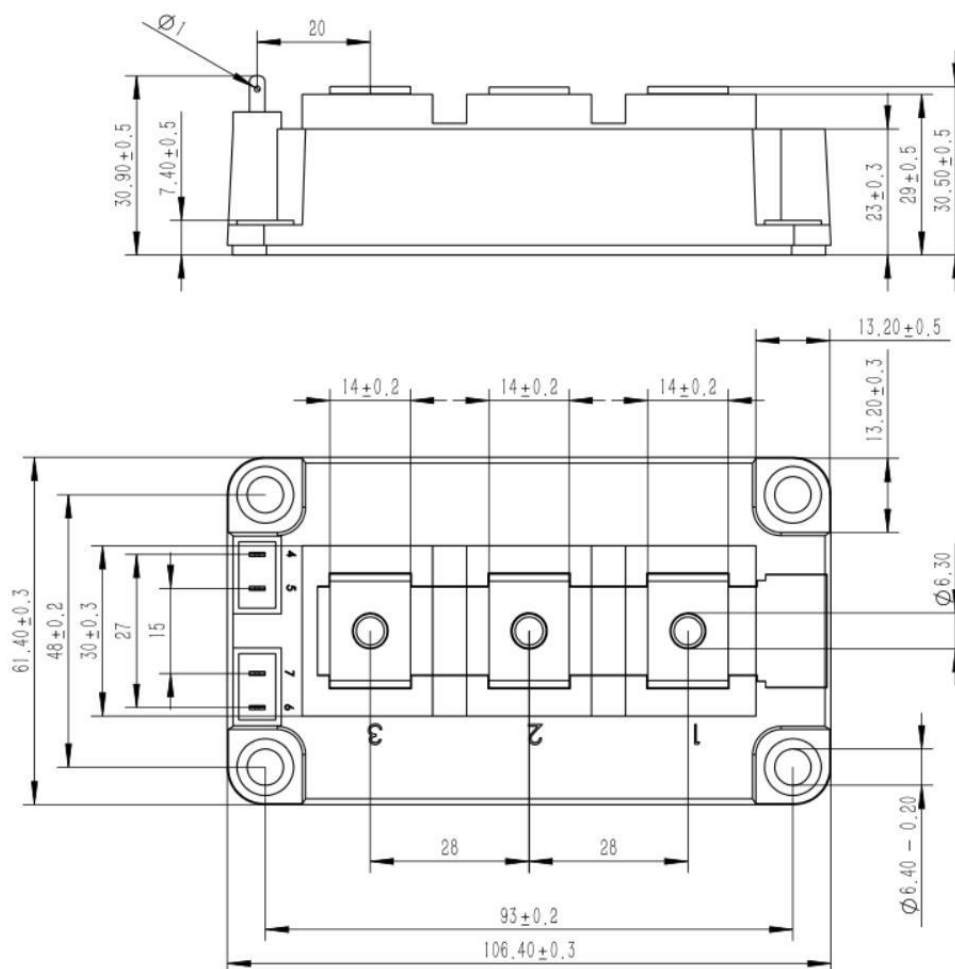


Figure 2. Pin configuration

Module

Parameter	Condition	Value	Unit
Isolation Voltage	RMS, f=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	-	200	-
Module lead resistance, terminals - chip	T _C =25°C	0.6	mΩ
Mounting torque for module mounting	M6	4 to 6	Nm
Weight	-	320	g

Preliminary datasheet_Ver.D EN

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Maximum Ratings ($T_j = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Condition	Ratings	Unit
V_{DS}	Drain-Source Voltage	G-S Short	1700	V
V_{GS}	Gate-Source Voltage	D-S Short, AC frequency $\geq 1\text{Hz}$, Note1	-10 to 20	V
I_{DS}	DC Continuous Drain Current	$T_c = 25^\circ\text{C}$, $V_{GS} = +15\text{V}$	380	A
I_{DS}	DC Continuous Drain Current	$T_c = 80^\circ\text{C}$, $V_{GS} = +15\text{V}$	300	A
I_{SD}	Source-Drain Current(diode)	$T_c = 25^\circ\text{C}$, with ON signal	380	A
I_{SD}	Source-Drain Current(diode)	$T_c = 80^\circ\text{C}$, with ON signal	300	A
I_{DSM}	Pulse Drain Current	$T_c = 25^\circ\text{C}$, Pulse width = 1ms, $V_{GS} = +15\text{V}$, Note2	600	A
P_{tot}	Total Power Dissipation	$T_c = 25^\circ\text{C}$	1578	W
T_{jmax}	Max Junction Temperature	-	175	$^\circ\text{C}$
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

Diode Electrical characteristics ($T_j = 25^\circ\text{C}$ unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_F	Diode Forward Voltage	$I_F = 300\text{A}$, $V_{GS} = 0\text{V}$	$T_j = 25^\circ\text{C}$	-	1.75	-	V
			$T_j = 175^\circ\text{C}$	-	2.75	-	
t_{rr}	Diode Reverse Recovery Time	(Switch side) $V_{DD} = 900\text{V}$, $I_D = 300\text{A}$ $V_{GS} = +15\text{V}/-4\text{V}$	$T_j = 25^\circ\text{C}$		22		ns
			$T_j = 150^\circ\text{C}$		34		
I_{RM}	Peak reverse recovery Current	$R_{gon}/R_{goff} = 2.2\Omega/2.2\Omega$ (FRD side) $V_{RR} = 900\text{V}$, $I_F = 300\text{A}$	$T_j = 25^\circ\text{C}$	-	57	-	A
			$T_j = 150^\circ\text{C}$	-	129	-	
Q_{rr}	Recovered charge	$V_{GE} = +15\text{V}/-4\text{V}$ Inductive load	$T_j = 25^\circ\text{C}$	-	0.78	-	μC
			$T_j = 150^\circ\text{C}$	-	2.59	-	
		switching operation	$T_j = 25^\circ\text{C}$	-	0.1	-	

E_{rr}	Reverse recovered energy		$T_j=150^{\circ}\text{C}$	-	0.4	-	mJ
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.068	-	$^{\circ}\text{C}/\text{W}$

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 =300μA		1700	-	-	V
I _{DSS}	Zero gate voltage drain Current	V _{DS} =1200V, V _{GS} =0V		-	3	-	μA
V _{GS(th)}	Gate-source threshold Voltage	I _D =180mA, V _{DS} =V _{GS}	T _j =25°C	1.8	2.7	-	V
			T _j =175°C	-	1.9	-	V
I _{GSS}	Gate-Source Leakage Current	V _{GS} =20V, V _{DS} =0V	T _j =25°C	-	20	-	nA
R _{DS(on)} (Chip)	Static drain-source	I _D =300A	T _j =25°C	-	6.4	-	mΩ
	On-state resistance	V _{GS} =15V	T _j =175°C	-	10.5	-	mΩ
V _{DS(on)} (Chip)	Static drain-source	I _D =300A	T _j =25°C	-	1.9	-	V
	On-state Voltage	V _{GS} =15V	T _j =175°C	-	3.1	-	V
C _{iss}	Input Capacitance	V _D =1000V, V _{GS} =0V f=1MHz, V _{AC} =25mV		-	22860	-	pF
C _{oss}	Output Capacitance			-	615	-	pF
C _{rss}	Reverse transfer Capacitance			-	113	-	pF
R _{Gint}	Internal gate resistor	f=1MHz, V _{AC} =25mV		-	2.3	-	Ω
Q _g	Total gate charge	V _{DD} =1000V, I _D =225A, V _{GS} =+15/-4V		-	780	-	nC
t _{d(on)}	Turn-on delay time	V _{DD} =900V I _D =300A V _{GS} =+15/-4V R _{gon} /R _{goff} =2.2Ω/2.2Ω Inductive load switching operation	T _j =25°C	-	102	-	ns
			T _j =150°C	-	96	-	
t _r	Rise time		T _j =25°C	-	59	-	ns
			T _j =150°C	-	50	-	
t _{d(off)}	Turn-off delay time		T _j =25°C	-	174	-	ns
			T _j =150°C	-	196	-	
t _f	Fall time		T _j =25°C	-	54	-	ns
			T _j =150°C	-	58	-	
E _{on}	Turn-on power dissipation		T _j =25°C	-	20.1	-	mJ
			T _j =150°C	-	16.6	-	
E _{off}	Turn-off power dissipation		T _j =25°C	-	7.4	-	mJ

			$T_j = 150^{\circ}\text{C}$	-	7.6	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.095	-	$^{\circ}\text{C} / \text{W}$

Test Conditions

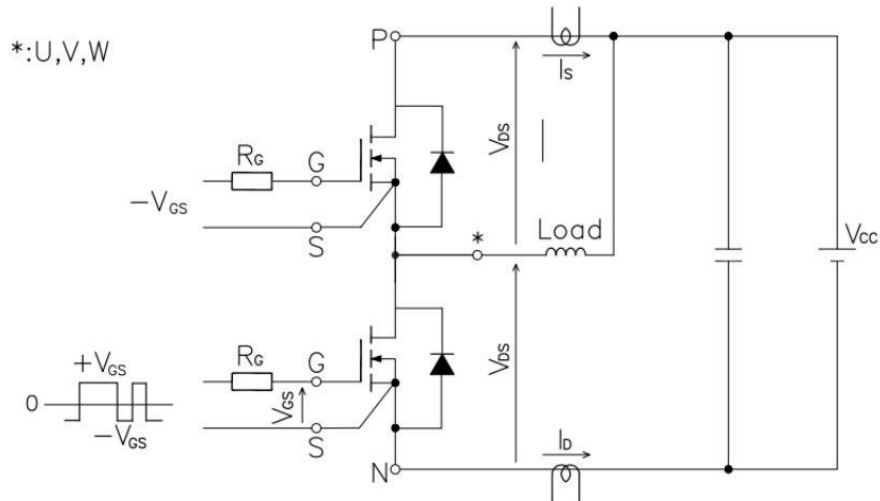


Figure 3. Switching time measure circuit

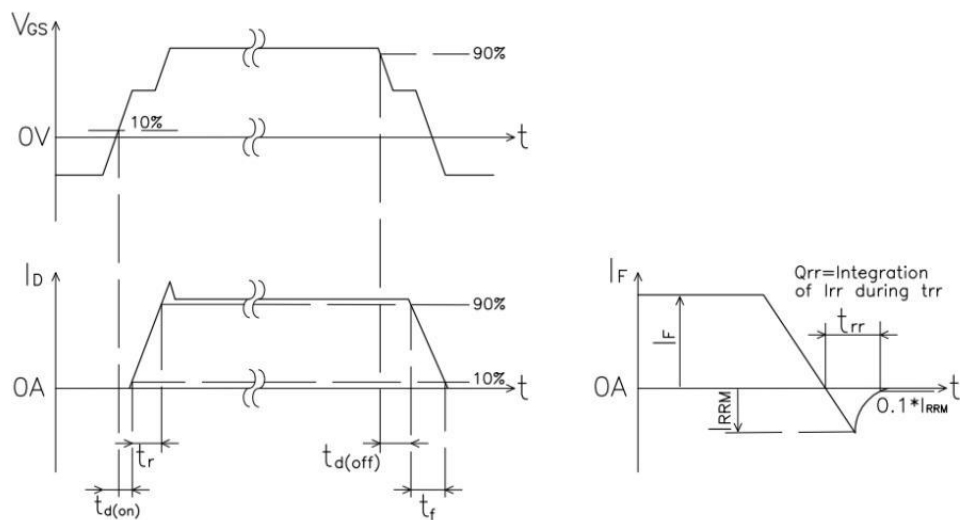


Figure 4. Switching time definition

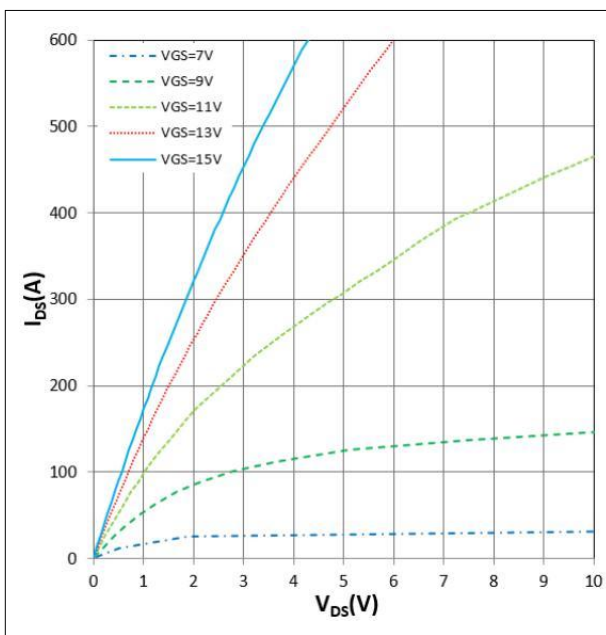


Figure 5. I_{DS} vs V_{DS}

$T_j = 25^\circ\text{C}$

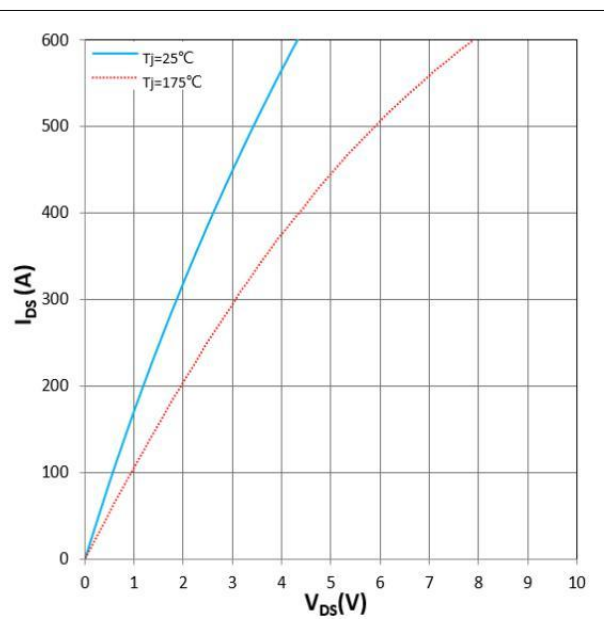


Figure 6. I_{DS} vs V_{DS}

$V_{GS} = +15\text{V}$

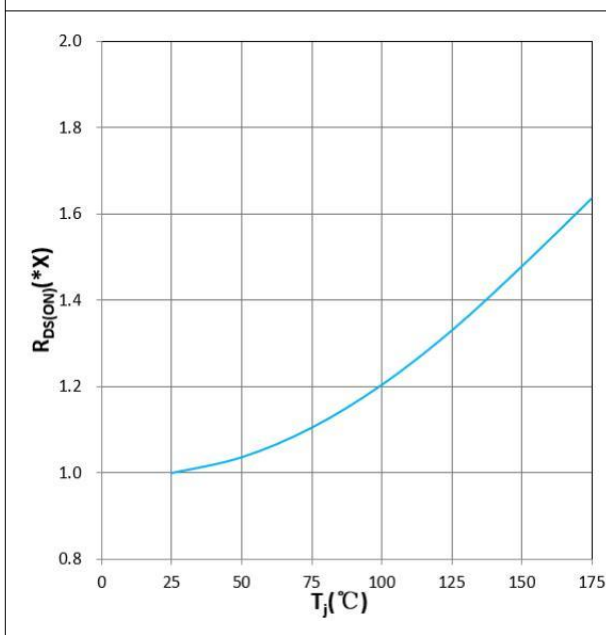


Figure 7. $R_{DS(on)}$ vs T_j

$V_{GS} = +15\text{V}$, $I_D = 300\text{A}$, $1.0X = 6.4\text{m}\Omega$

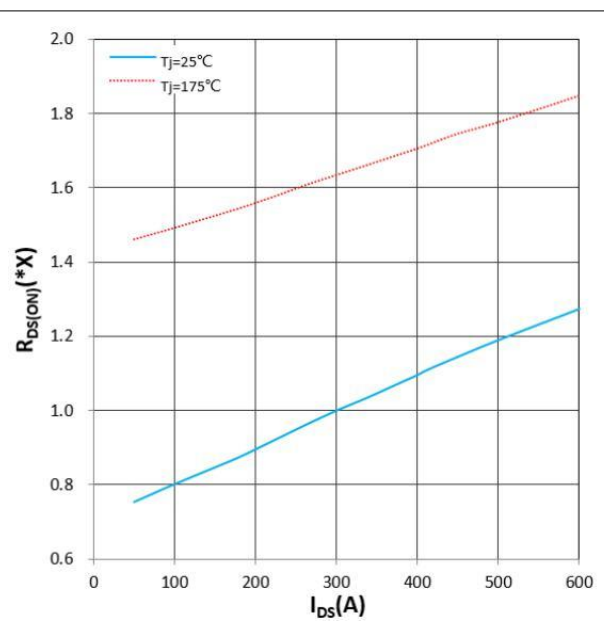


Figure 8. $R_{DS(on)}$ vs I_{DS}

$V_{GS} = +15\text{V}$, $1.0X = 6.4\text{m}\Omega$

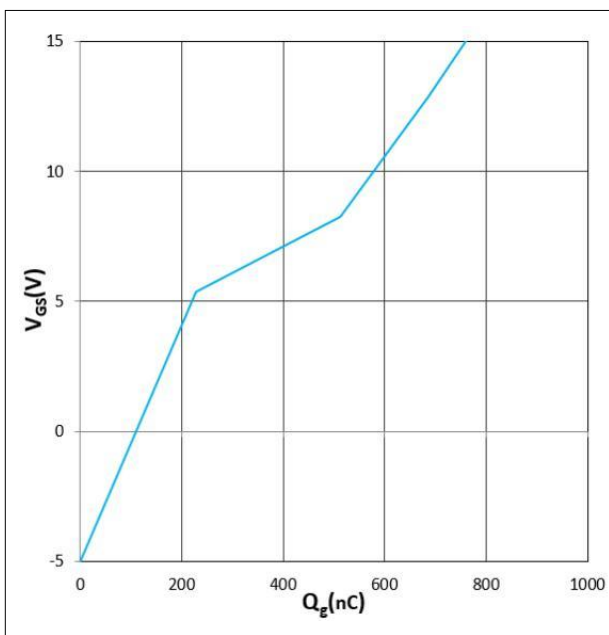


Figure 9. V_{GS} vs Q_g

$V_{DS} = 1000V$, $I_D = 225A$, $T_j = 25^\circ C$

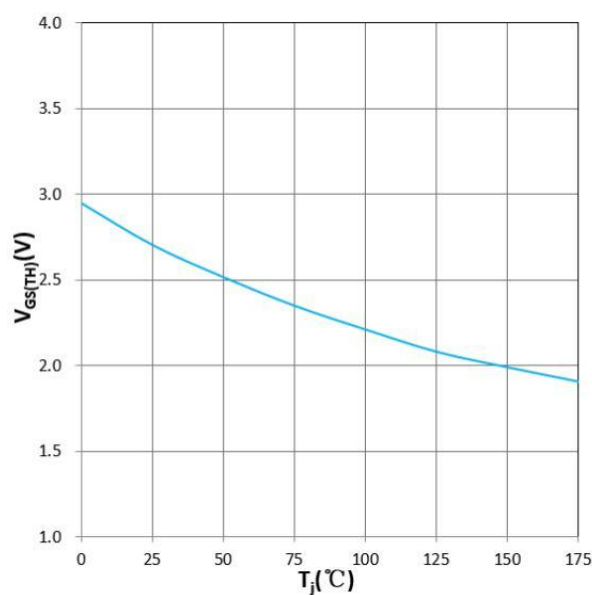


Figure 10. $V_{GS(TH)}$ vs T_j

$V_{GS} = V_{DS}$, $I_D = 180mA$

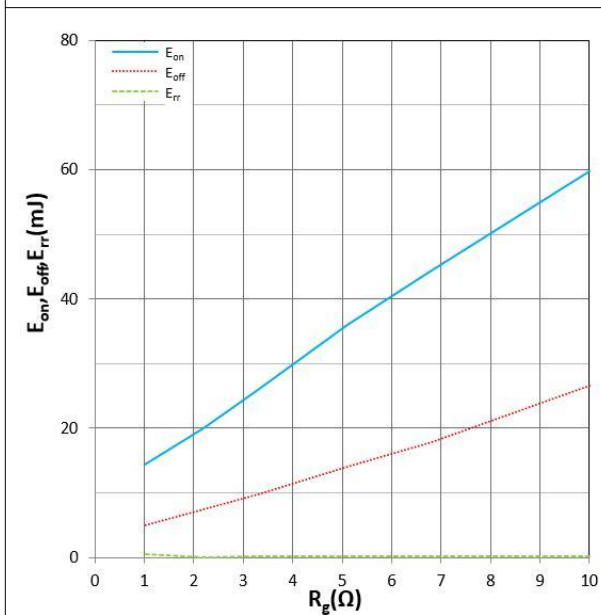


Figure 11. E_{on} , E_{off} , E_{rr} vs R_g

$T_j = 25^\circ C$, $V_{DD} = 900V$, $V_{GS} = +15V/-4V$, $I_D = 300A$

Inductive Load

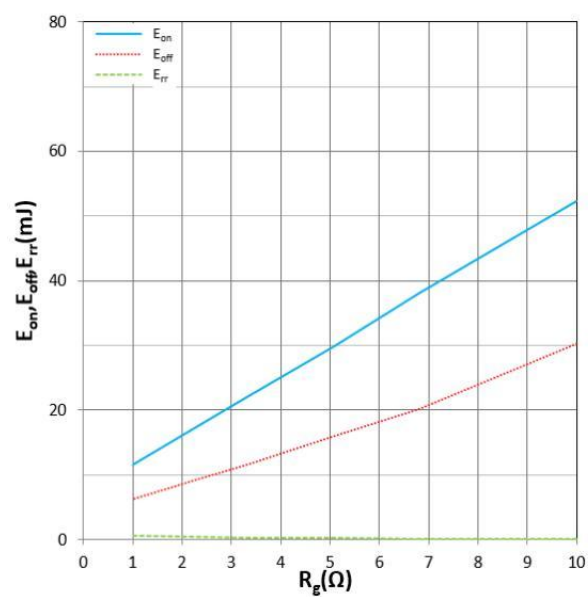


Figure 12. E_{on} , E_{off} , E_{rr} vs R_g

$T_j = 150^\circ C$, $V_{DD} = 900V$, $V_{GS} = +15V/-4V$, $I_D = 300A$

Inductive Load

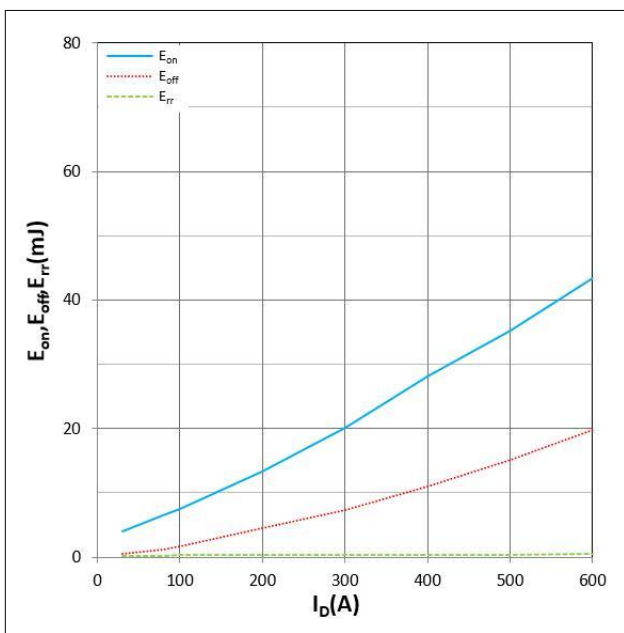


Figure 13. E_{on} , E_{off} , E_{rr} vs I_{DS}

$T_j = 25^\circ\text{C}$, $V_{DD} = 900\text{V}$, $V_{GS} = +15\text{V}/-4\text{V}$
 $R_{gon}/R_{goff} = 2.2\Omega/2.2\Omega$, Inductive Load

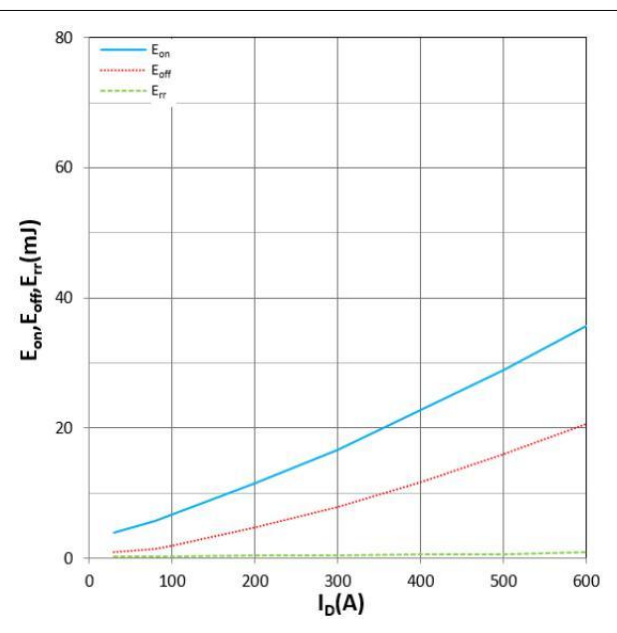


Figure 14. E_{on} , E_{off} , E_{rr} vs I_{DS}

$T_j = 150^\circ\text{C}$, $V_{DD} = 900\text{V}$, $V_{GS} = +15\text{V}/-4\text{V}$
 $R_{gon}/R_{goff} = 2.2\Omega/2.2\Omega$, Inductive Load

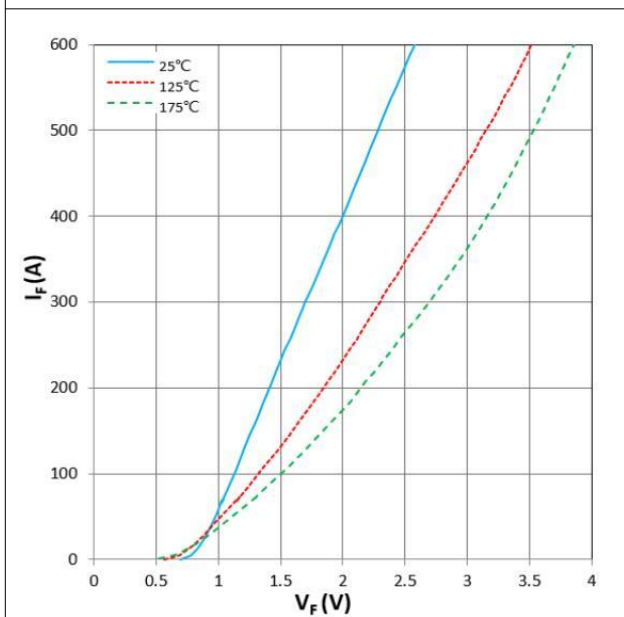


Figure 15. I_F vs V_F

$V_{GS} = 0\text{V}$

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