DFS200X2CU12I3B2

1200V/200A dual Chopper SiC MOSFET Module

Description

The DFS200X2CU12I3B2 is a dual chopper SiC MOSFET Power Module. It integrates high performance SiC MOSFET chips designed for the applications such as Converter and Renewable energy.

Features

- 1200V/6.7mΩ
- Low thermal resistance with Si_3N_4 AMB
- 175°C maximum junction temperature
- Low Inductive Design
- Thermistor inside
- Copper base size: 79mm*62mm

Applications

- xEV Applications
- Converter
- Vehicle Fast Chargers
- Renewable energy

Circuit diagram

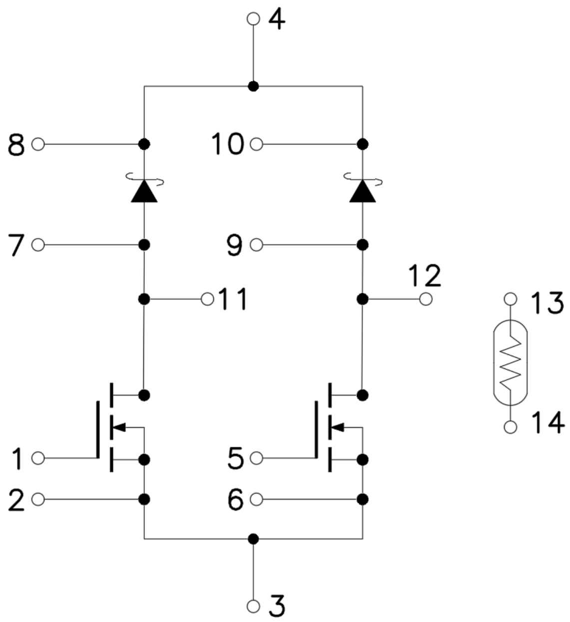

Figure 1. Out drawing & circuit diagram for DFS200X2CU12I3B2

Pin Configuration and Marking Information

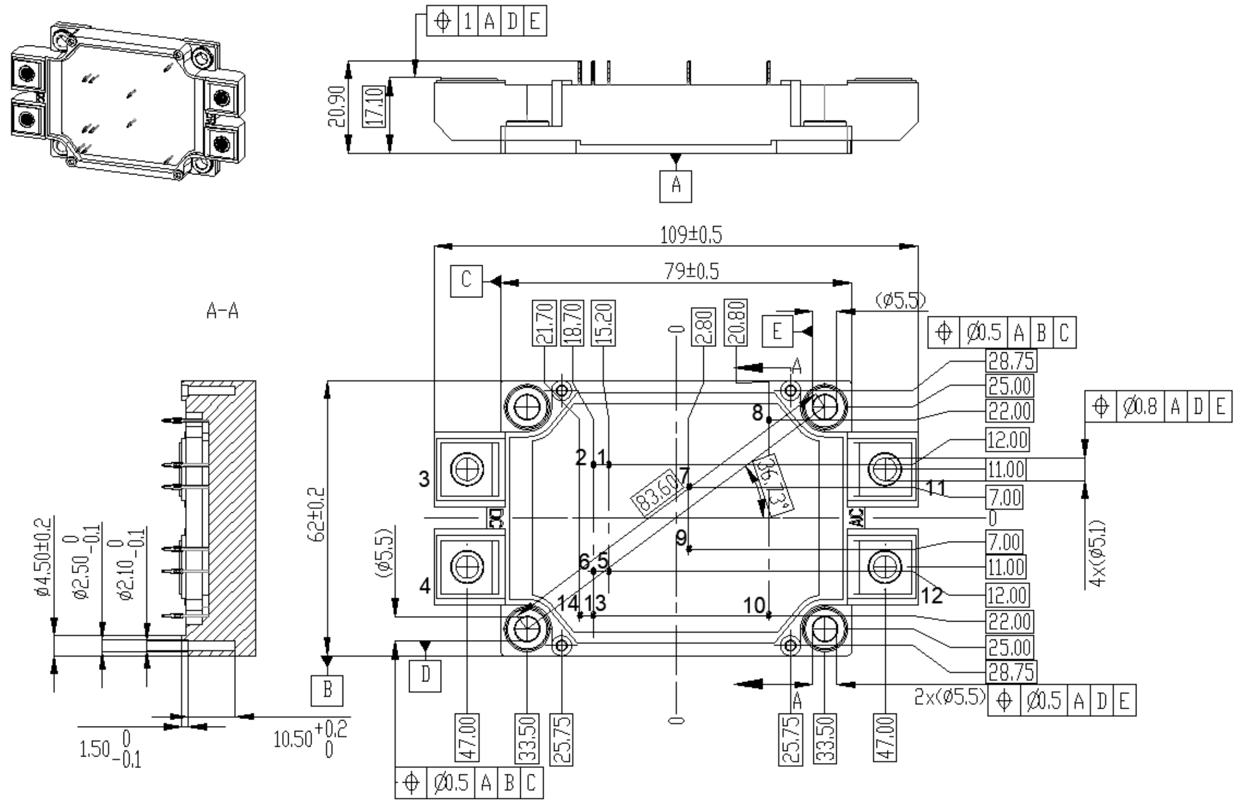

Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f =50Hz, t =1min	3.4	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°C	0.3	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	250	g

Maximum Ratings (T_j =25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{DSS}	Drain-Source Voltage	G-S Short	1200	V
V_{RRM}	Repetitive Reverse Voltage	Clamp Diode	1200	V
V_{GSS}	Gate-Sourse Voltage	D-S Short, AC frequency ≥1Hz, Note1	-11 to 23	V
I_{DS}	DC Continuous Drain Current	T_C =25°C , V_{GS} =18V	195	A
I_{DS}	DC Continuous Drain Current	T_C =85°C , V_{GS} =18V	150	A
I_{DSM}	Pulse Drain Current	T_C =85°C, Pulse width =1ms, V_{GS} =18V, Note2	400	A
I_F	Forward Current (Diode)	T_C =25°C	300	A
I_F	Forward Current (Diode)	T_C =85°C	220	A
I_{FRM}	Pulse Forward Current (Diode)	T_C =85°C, Pulse width =1ms, Note2	400	A
$P_{tot(MOS)}$	Total Power Dissipation (MOS)	T_C =25°C	630	W
$P_{tot(SBD)}$	Total Power Dissipation (SBD)	T_C =25°C	1070	W
T_{jmax}	Max Junction Temperature	-	175	°C
T_{jop}	Operating junction Temperature	-	-40 to 150	°C
T_{stg}	Storage Temperature	-	-40 to 125	°C

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

Note2: Pulse width limited by maximum junction temperature

PTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
T_{CMAX}	Temperature	Continuous operation	-40	-	175	°C
R	Resistance	T_C =0°C	999.7	1000	1000.3	Ω
		T_C =150°C	1576.5	1577.5	1578.5	Ω
T_{CR}	Temperature coefficient	-	-	0.385	-	%/K
T_{SH}	Self heating	T_C =0°C, I_m =0.1...0.3mA	-	0.4	-	K/mW

Note3: Calculate T =(R-R0)/T_{CR}/10

Example: When R =1385Ω, Then T =(R-R0)/T_{CR}/10 =(1385-1000)/0.385/10 =100°C

MOSFET Electrical characteristics (T_j =25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value Min.	Value Typ.	Value Max	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS} =0V, I_D =2mA		1200	-	-	V
I_{DSS}	Zero gate voltage drain Current	V_{DS} =1200V, V_{GS} =0V		-	-	20	µA
$V_{GS(th)}$	Gate-source threshold Voltage	I_D =20mA, V_{DS} =V_{GS}	T_j =25°C	2.1	3.2	5.8	V
I_{GSS}	Gate-Source Leakage Current	V_{GS} =20V, V_{DS} =0V	T_j =25°C	-	-	200	nA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D =200A V_{GS} =18V	T_j =25°C	4.3	6.7	9.0	mΩ
			T_j =175°C	10.4	16.0	21.6	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	I_D =200A V_{GS} =18V	T_j =25°C	-	1.34	1.84	V
			T_j =175°C	-	3.24	4.33	V
C_{iss}	Input Capacitance	V_D =850V, V_{GS} =0V, f =1MHz		-	8	-	nF
C_{oss}	Output Capacitance			-	0.46	-	nF
C_{rss}	Reverse transfer Capacitance			-	0.045	-	nF
Q_g	Total gate charge	V_{DD} =850V, I_D =200A, V_{GS} =--5/+18V		-	380	-	nC
$t_{d(on)}$	Turn-on delay time	V_{DD} =600V I_D =200A V_{GS} =+15/-4V $R_{G(on)}$ =6.8Ω $R_{G(off)}$ =6.8Ω Inductive load switching operation	T_j =25°C	-	81	-	ns
			T_j =150°C	-	70	-	
t_r	Rise time		T_j =25°C	-	64	-	ns
			T_j =150°C	-	61	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	210	-	ns
			T_j =150°C	-	221	-	
t_f	Fall time		T_j =25°C	-	45	-	ns
			T_j =150°C	-	51	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	3.42	-	mJ
			T_j =150°C	-	3.54	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	2.93	-	mJ
			T_j =150°C	-	3.75	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.24	-	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 50um.

SiC SBD Electrical characteristics (T$_j$ =25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
I_{RRM}	Reverse Current	V_{RRM} =1200V	-	-	-	300	uA
V_F	Forward Voltage	I_F =200A	T_j =25°C	-	1.8	2.3	V
			T_j =175°C	-	2.9	-	
T_{rr}	Reverse recovery time	V_{RR} =600V, I_F =200A MOSFET side: V_{GS} =+15/-4V $R_{G(on)}$ = $R_{G(off)}$ =6.8Ω Inductive load switching operation	T_j =25°C	-	31	-	ns
			T_j =150°C	-	33	-	
Q_{rr}	Reverse recovery charge		T_j =25°C	-	0.89	-	uC
			T_j =150°C	-	0.97	-	
E_{rr}	Diode switching power dissipation		T_j =25°C	-	0.29	-	mJ
			T_j =150°C	-	0.31	-	
$R_{th(j-c)}$	SiC SBD Thermal Resistance	Junction to Case		-	0.14	-	K/W
$R_{th(c-f)}$	Contact thermal Resistance	With thermal conductive grease, Note5		-	0.015	-	K/W

Note5: Assumes Thermal Conductivity of grease is 0.9W/m･K and thickness is 50um.

Test Conditions

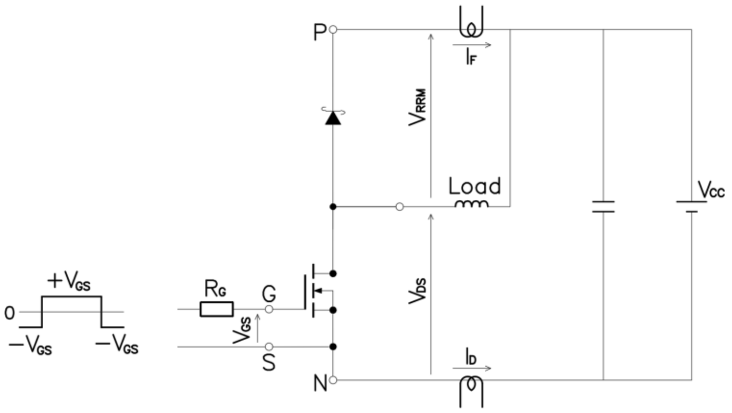

Figure 3. Switching time measure circuit

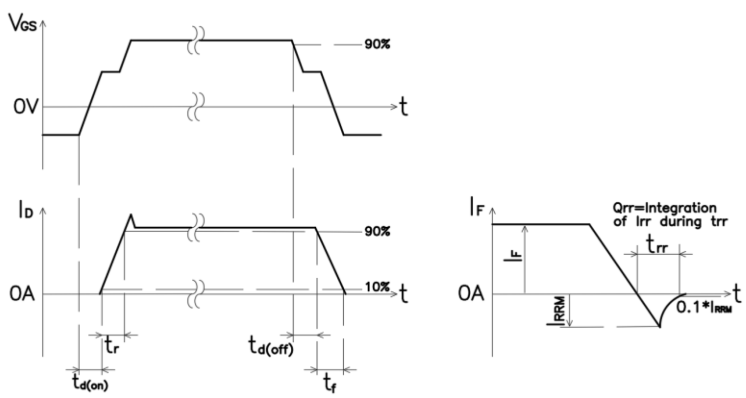

Figure 4. Switching time definition

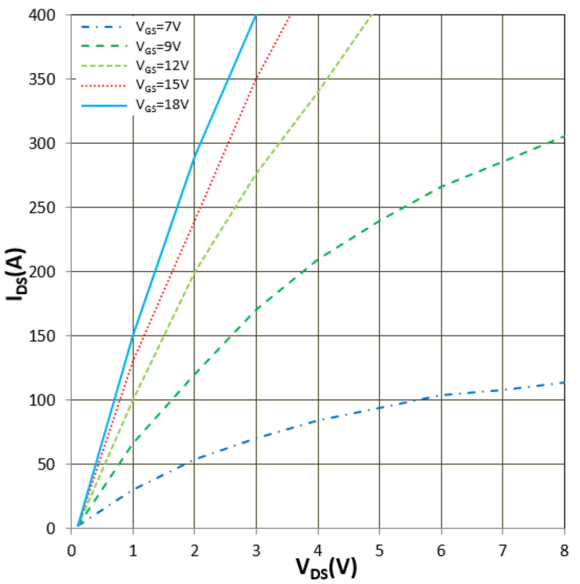

Figure 5. I_{DS} vs V_{DS}

T_j =25°C

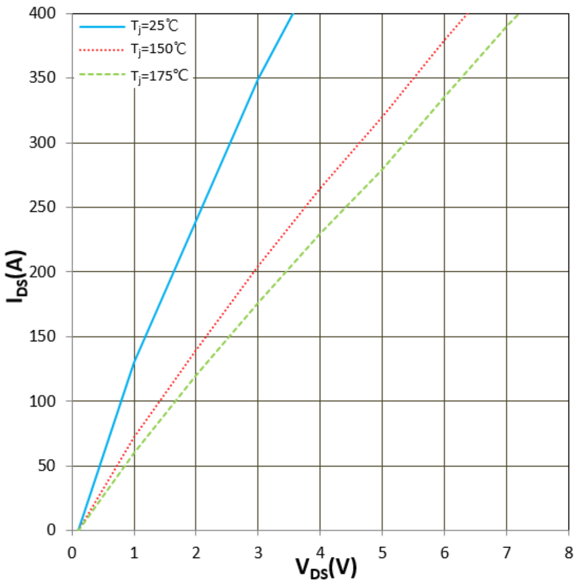

Figure 6. I_{DS} vs V_{DS}

V_{GS} =15V

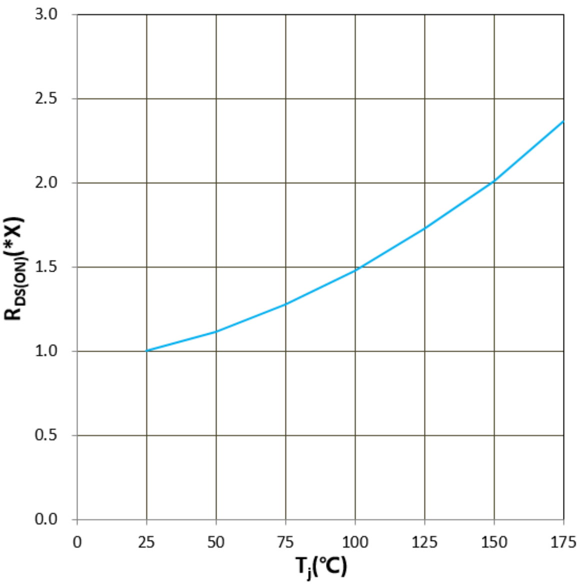

Figure 7. $R_{DS(ON)}$ vs T_j

V_{GS} =+18V, I_D =200A, 1.0X =6.7mΩ

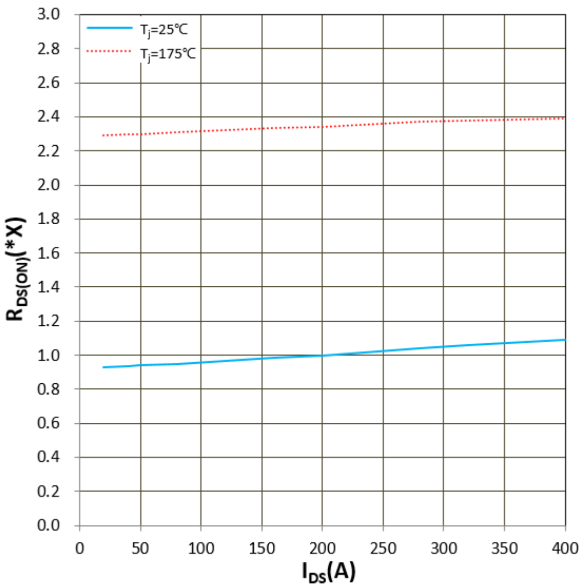

Figure 8. $R_{DS(ON)}$ vs I_{DS}

V_{GS} =+18V, I_D =200A, 1.0X =6.7mΩ

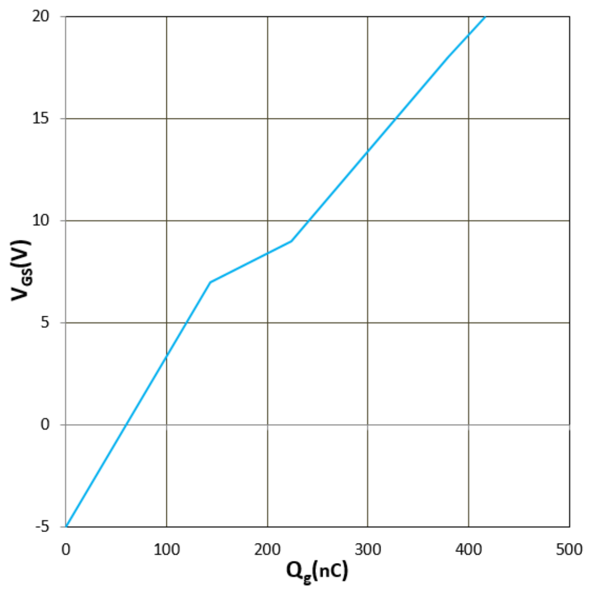

Figure 9. V_{GS} vs Q_g

T_j =25℃, I_{GS} =2mA

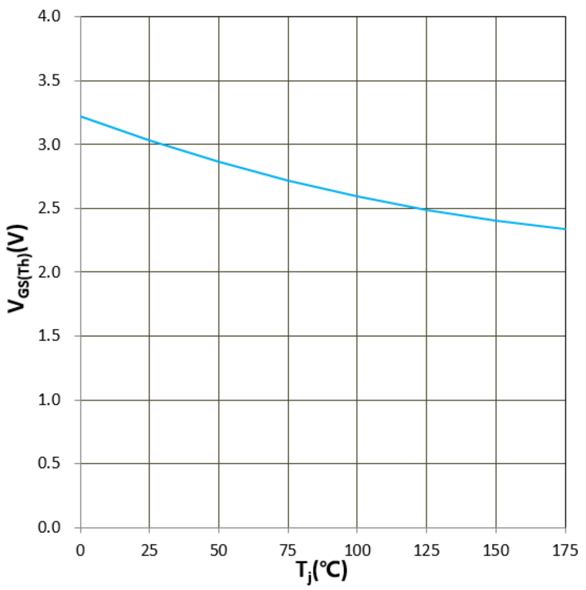

Figure 10. $V_{GS(TH)}$ vs T_j

V_{GS} =V_{DS}, I_D =20mA

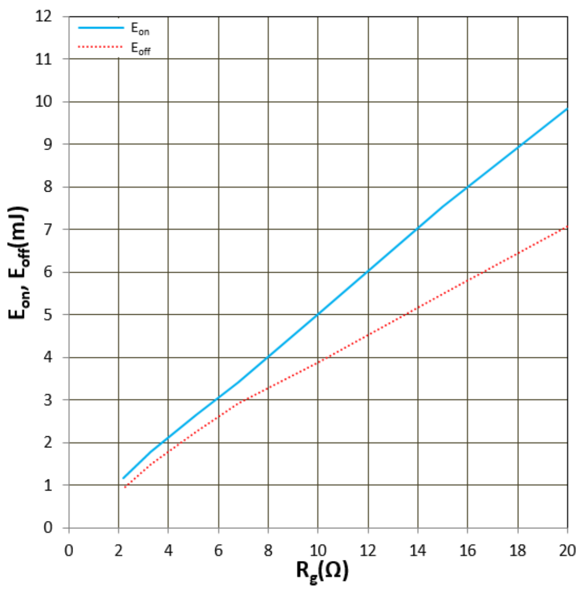

Figure 11. E_{on}, E_{off} vs R_g

T_j =25°C, V_{CC} =600V, V_{GS} =+15V/-4V, I_D =200A

Inductive Load

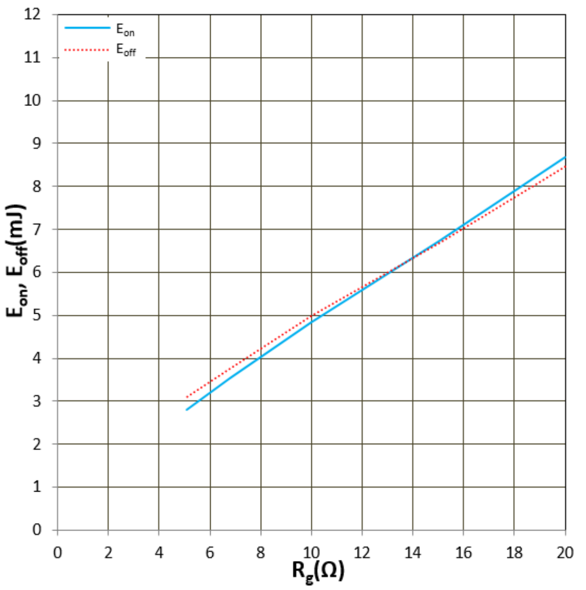

Figure 12. E_{on}, E_{off} vs R_g

T_j =150°C, V_{CC} =600V, V_{GS} =+15V/-4V, I_D =200A

Inductive Load

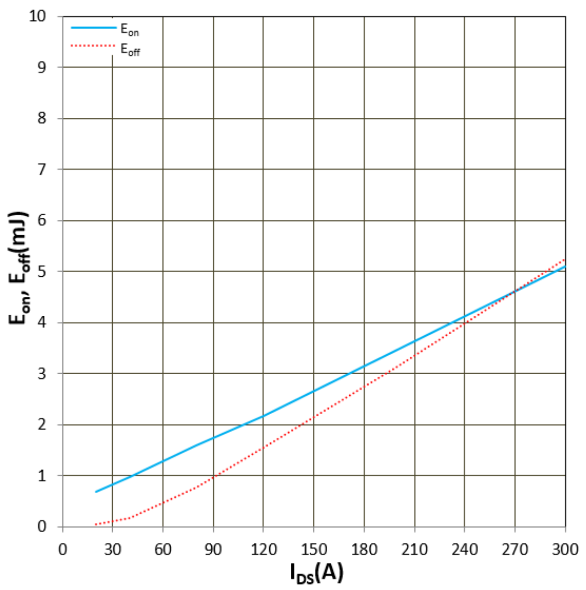

Figure 13. E_{on}, E_{off} vs I_{DS}

T_j =25°C, V_{CC} =600V, V_{GS} =+15V/-4V, R_g =6.8Ω

Inductive Load

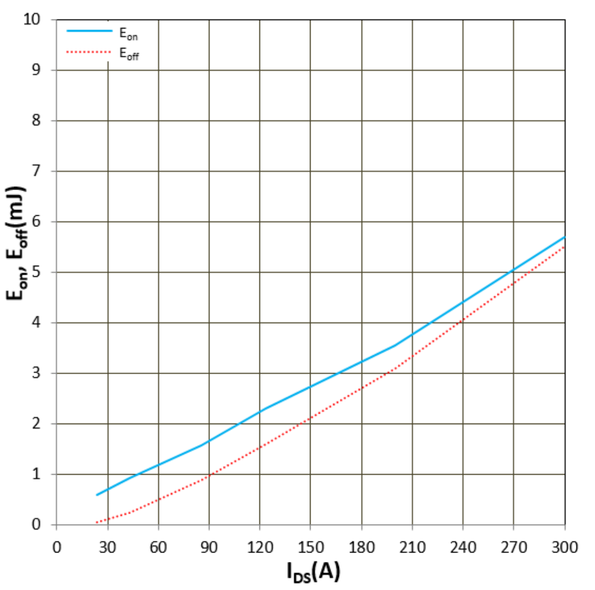

Figure14. E_{on}, E_{off} vs I_{DS}

T_j =150°C, V_{CC} =600V, V_{GS} =+15V/-4V, R_g =6.8Ω

Inductive Load

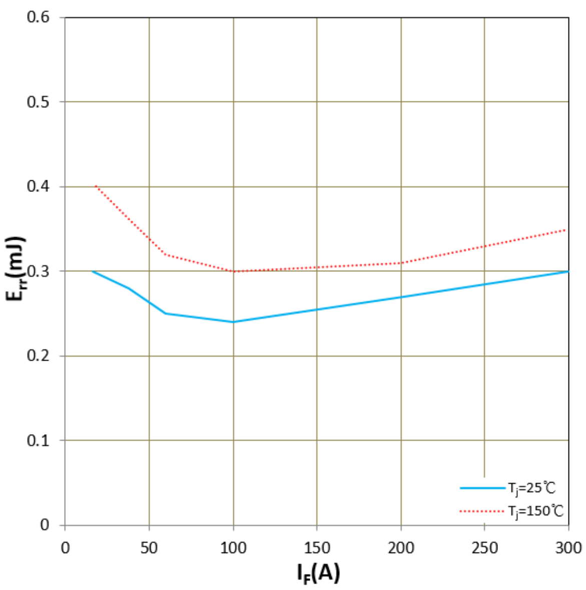

Figure 15. E_{rr} vs I_F

V_{CC} =600V, V_{GS} =+15V/-4V, R_g =6.8Ω

Inductive Load

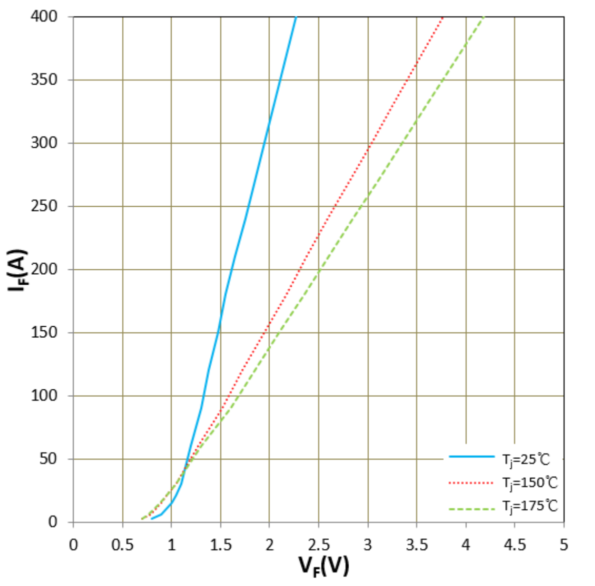

Figure 16. I_F vs V_F

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.

Due to technical requirements, our product may contain dangerous substances. For information on the types in question, please contact the sales staff responsible for you.

Changes to this product data sheet are reserved.

Please contact the sales staff (Sales@leapers-power.com) for further information on the product, technology, delivery terms, conditions and prices.