POWEREX

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PRXS300HF17I3C2

1700V/300A Half Bridge
SiC MOSFET Module

PRXS300HF17I3C2

Description

The PRXS300HF17I3C2 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
- □ $R_{DS(on)}$ = 6.7mΩ @T_j = 25°C, V_{GS} = 15V
- □ Low thermal resistance with Si_3N_4 AMB
- □ 175°C maximum junction temperature
- □ Low Inductive Design
- □ Thermistor inside
- □ Pressfit terminal
- □ Copper base size: 79mmx62mm

Applications

- □ Motor Drives
- □ Servo Drives
- □ UPS Systems
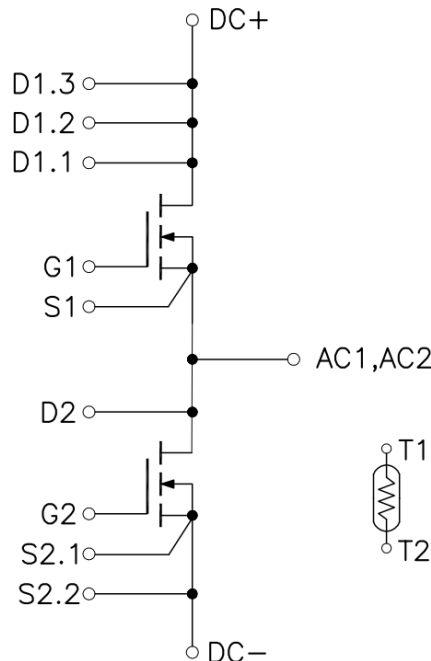- □ Smart-Grid/Grid-Tied Distributed Generation

Circuit Diagram

Figure 1. Out drawing & circuit diagram for PRXS300HF17I3C2
Note: Please use **S2.1** for the low side drive signal and do not connect it to **S2.2** which is power terminal

Information presented is based upon manufacturers testing and projected capabilities. This information is subject to change without notice. The manufacturer makes no claim as to the suitability of use, reliability, capability, or future availability of this product.

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Pin Configuration and Marking Information

Pin table		
Pin	X	Y
D1.2	-21.7	-22
D1.1	20.8	-22
S2.2	-18.7	0
S2.1	-15.2	0
G2	-11.7	0
G1	15.3	0
S1	18.8	0
D2	-15.2	17.5
D1.3	-21.7	22
T1	13.8	22
T2	20.8	22
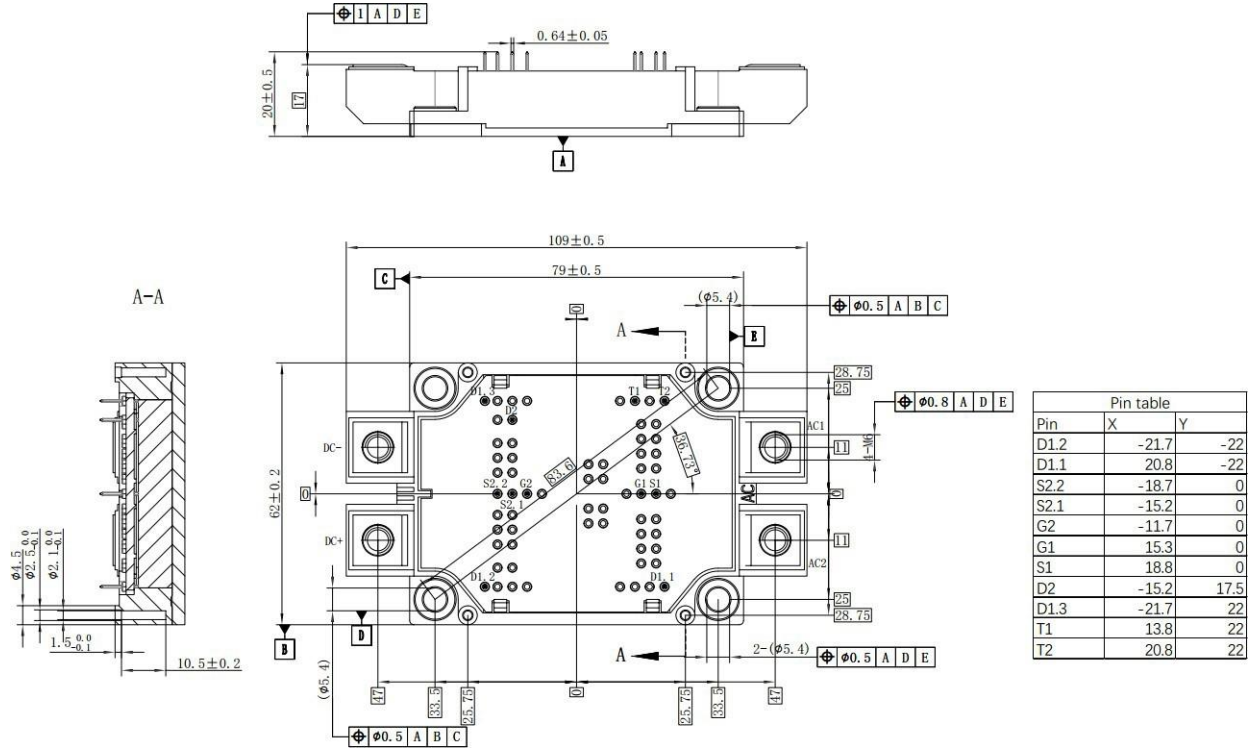
Figure 2. Pin configuration

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	-	600	-
Module lead resistance, terminals–chip	T_C =25°C	0.5	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	250	g

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

Symbol	Parameter	Conditions	Ratings	Unit
V_{DSS}	Drain-Source Voltage	G-S Short	1700	V
V_{GSS}	Gate-Source Voltage (+)	D-S Short	20	V
V_{GSS}	Gate-Source Voltage (-)	D-S Short	-10	V
$V_{GSSSurge}$	G-S Voltage(t_{surge} <300nsec)	D-S Short, Note1	-10 to 20	V
I_{DS}	DC Continuous Drain Current	T_f =25°C, V_{GS} =15V	320	A
I_{DS}	DC Continuous Drain Current	T_f =80°C, V_{GS} =15V	255	A
I_{SD}	Source (Body diode) Current	T_f =25°C, with ON signal	320	A
I_{SD}	Source (Body diode) Current	T_f =80°C, with ON signal	255	A
I_{DSM}	Pulse Forward Current	T_C =25°C, Pulse width =1ms, V_{GS} =15V, Note2	600	A
P_{tot}	Total Power Dissipation	T_C =25°C	1920	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/+15V
Note2: Pulse width limited by maximum junction temperature

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Resistance	T_c =25°C	-	5	-	kΩ
$\Delta R/R$	Deviation of R100	T_c =100°C, R_{100} =493Ω	5	-	5	%
P_{25}	Power dissipation	T_c =25°C	-	-	20	mW
$B_{25/50}$	B-value	$R2 = R25 \exp [B_{25/50}(1/T2 - 1/(298,15 K))]$	-	3375	-	K
$B_{25/80}$	B-value	$R2 = R25 \exp [B_{25/80}(1/T2 - 1/(298,15 K))]$	-	3411	-	K
$B_{25/100}$	B-value	$R2 = R25 \exp [B_{25/100}(1/T2 - 1/(298,15 K))]$	-	3433	-	K

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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 =300uA		1700	-	-	V
I_{DSS}	Zero gate voltage drain Current	V_{DS} =1700V, V_{GS} =0V		-	3	120	μA
$V_{GS(th)}$	Gate-source threshold Voltage	I_D =180mA	T_j =25°C	1.8	2.70	-	V
		V_{DS} =V_{GS}	T_j =175°C	-	1.90	-	V
I_{GSS}	Gate-Source Leakage Current	V_{GS} =15V, V_{DS} =0V, T_j =25°C		-	-	800	nA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D =300A V_{GS} =15V	T_j =25°C	-	6.7	10.3	mΩ
			T_j =175°C	-	15.5	-	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	I_D =300A V_{GS} =15V	T_j =25°C	-	2.01	3.09	V
			T_j =175°C	-	4.65	-	V
C_{iss}	Input Capacitance	V_D =1000V, V_{GS} =0V f =1MHz, V_{AC} =25mV		-	22.9	-	nF
C_{oss}	Output Capacitance			-	0.62	-	nF
C_{rss}	Reverse transfer Capacitance			-	0.11	-	nF
Q_G	Total gate charge	V_{DD} =1000V, I_D =225A, V_{GS} =-5/+15V		-	758	-	nC
R_{Gint}	Internal Gate Resistance	T_j =25°C		-	0.16	-	Ω
$t_{d(on)}$	Turn-on delay time		T_j =25°C	-	157	-	ns
			T_j =150°C	-	119	-	
t_r	Rise time	V_{DD} =900V I_D =300A V_{GS} =+15/-4V $R_{G(on)}$ =6.8Ω $R_{G(off)}$ =6.8Ω Inductive load switching operation	T_j =25°C	-	116	-	ns
			T_j =150°C	-	97	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	497	-	ns
			T_j =150°C	-	596	-	
t_f	Fall time		T_j =25°C	-	71	-	ns
			T_j =150°C	-	93	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	45.1	-	mJ
			T_j =150°C	-	38.5	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	40.2	-	mJ
			T_j =150°C	-	43.6	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.078	-	K/W
$R_{th(c-f)}$	Contact thermal Resistance	With thermal conductive grease, Note4		-	0.015	-	K/W

Note3: Assumes Thermal Conductivity of grease is 0.9W/m・ K and thickness is 50um.

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

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_{SD}	Body Diode Forward Voltage	V_{GS} = -4V	T_j =25°C	-	5.5	-	V
		I_{SD} =300A	T_j =150°C	-	5.2	-	
T_{rr}	Reverse recovery time	V_{RR} =900V, I_D =300A MOSFET side:	T_j =25°C	-	41	-	ns
			T_j =150°C	-	138	-	
Q_{rr}	Reverse recovery charge	V_{GS} =+15/-4V	T_j =25°C	-	2.11	-	uC
		$R_{G(on)}$ = $R_{G(off)}$ = 6.8Ω	T_j =150°C	-	9.25	-	
E_{rr}	Diode switching power dissipation	Inductive load	T_j =25°C	-	0.45	-	mJ
		switching operation	T_j =150°C	-	3.52	-	

Test Conditions
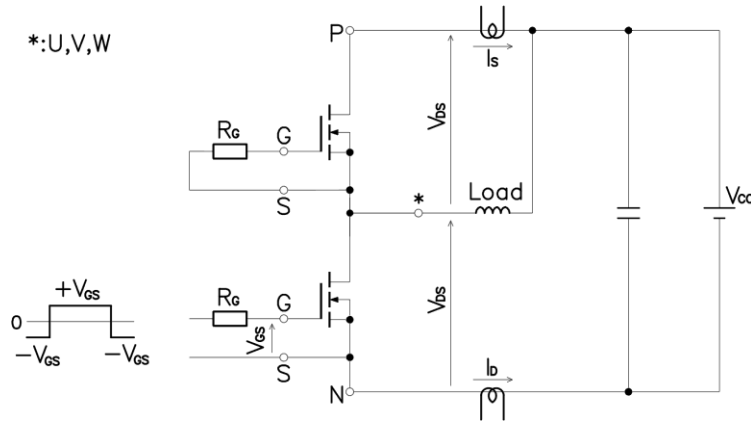
Figure 3. Switching time measure circuit
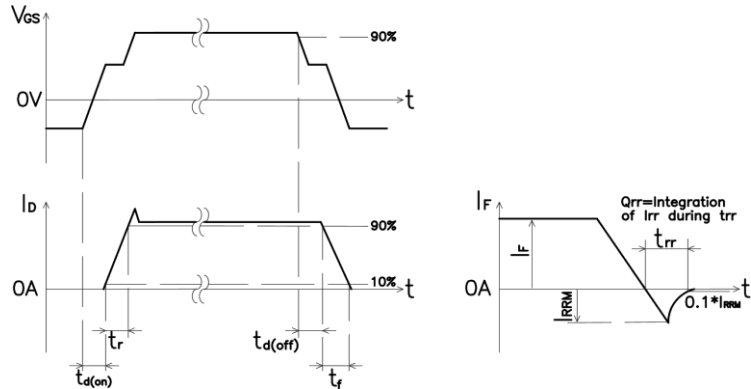
Figure 4. Switching time definition

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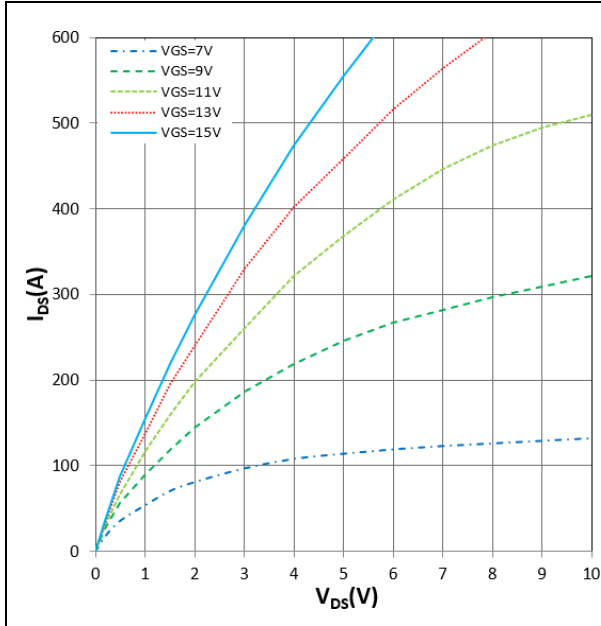
Figure 5. I_{DS} vs V_{DS}

T_j=25°C, V_{GS} parameter
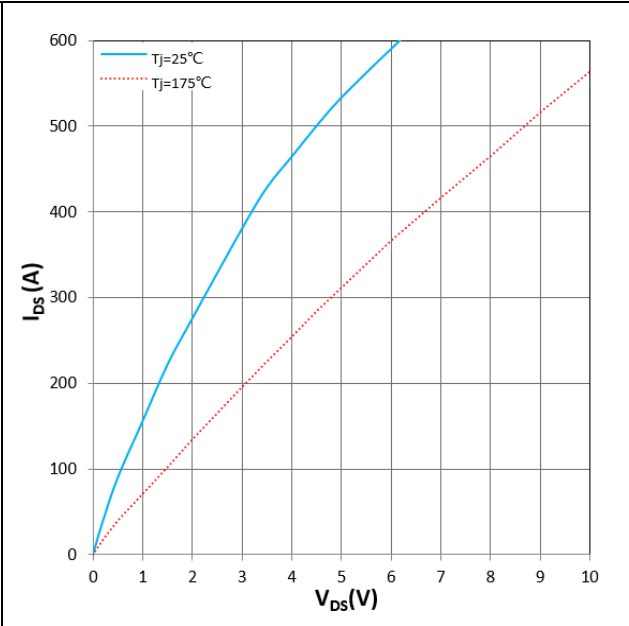
Figure 6. I_{DS} vs V_{DS}

V_{GS}=15V, T_j parameter
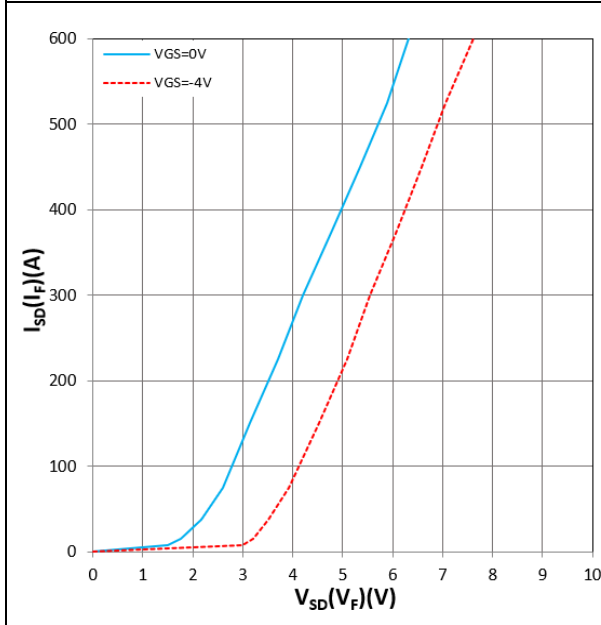
Figure 7. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$

T_j=25°C, V_{GS} parameter
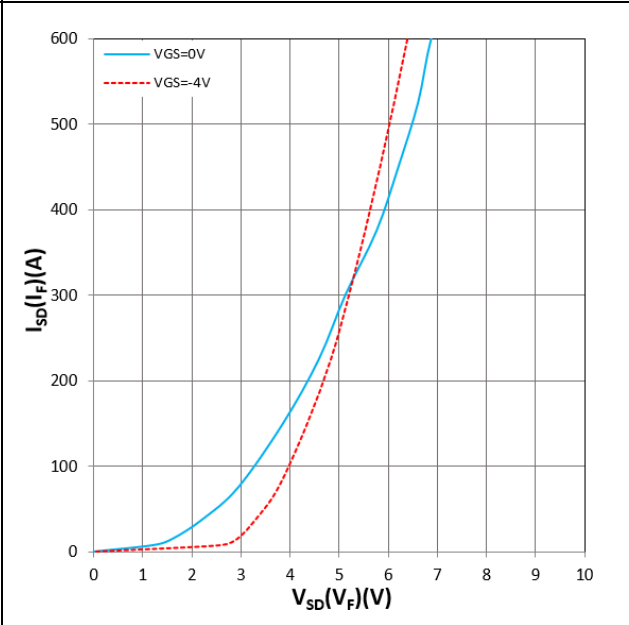
Figure8. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$

T_j=175°C, V_{GS} parameter

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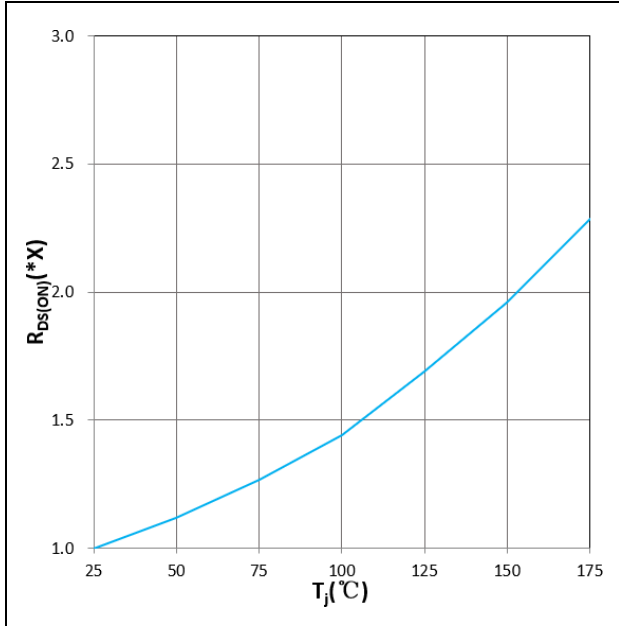**PRXS300HF17I3C2**
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Figure 9. $R_{DS(ON)}$ vs T_j
$V_{GS} = +15V, I_D = 300A, 1.0X = 6.7m\Omega$
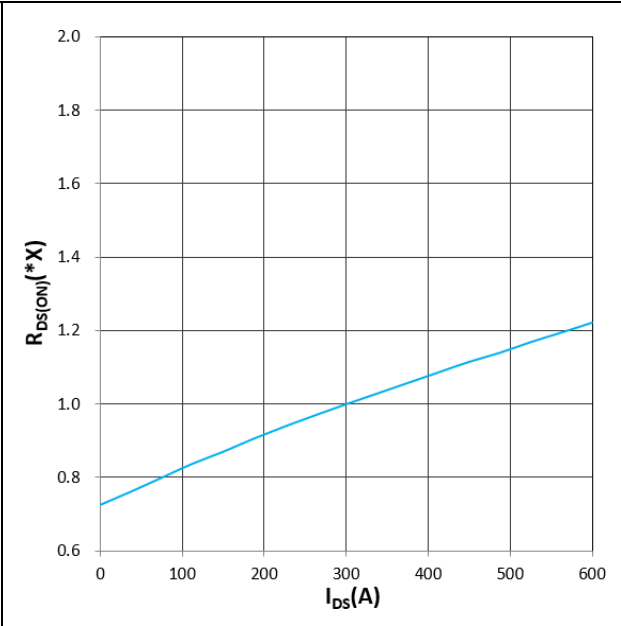
Figure 10. $R_{DS(ON)}$ vs I_{DS}
$T_j = 25°C, V_{GS} = +15V, 1.0X = 6.7m\Omega$
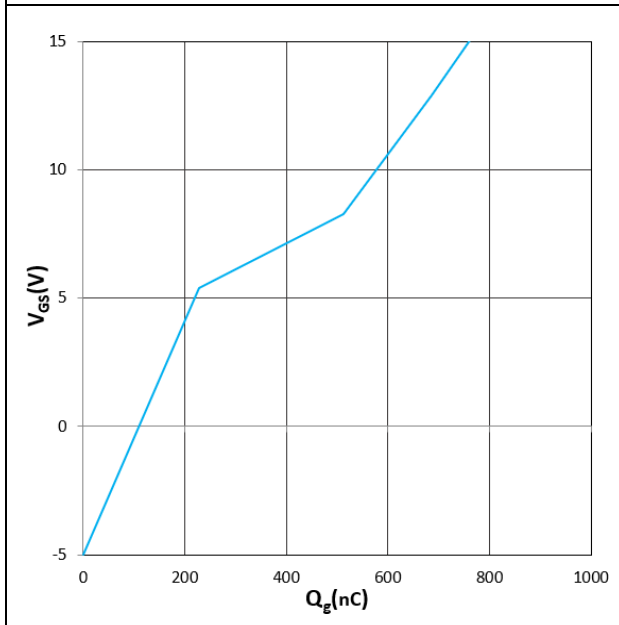
Figure 11. V_{GS} vs Q_g
$T_j = 25°C, V_{DS} = 1000V, I_D = 225A$
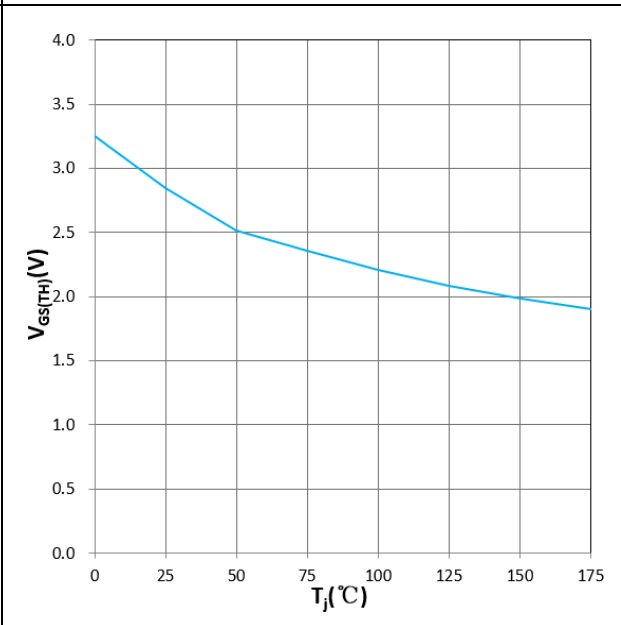
Figure 12. $V_{GS(TH)}$ vs T_j
$V_{GS} = V_{DS} , I_D = 180mA$

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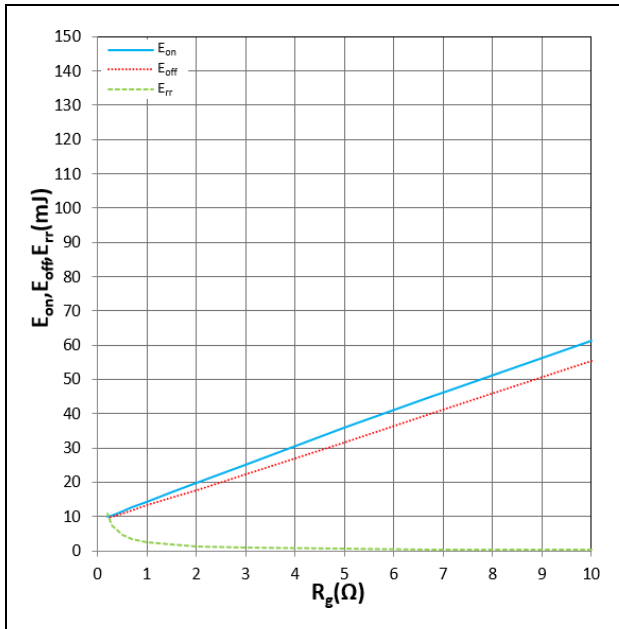
Figure 13. E_{on}, E_{off}, E_{rr} vs R_g

T_j =25°C, V_{CC} =900V, V_{GS} =+15V/-4V, I_D =300A
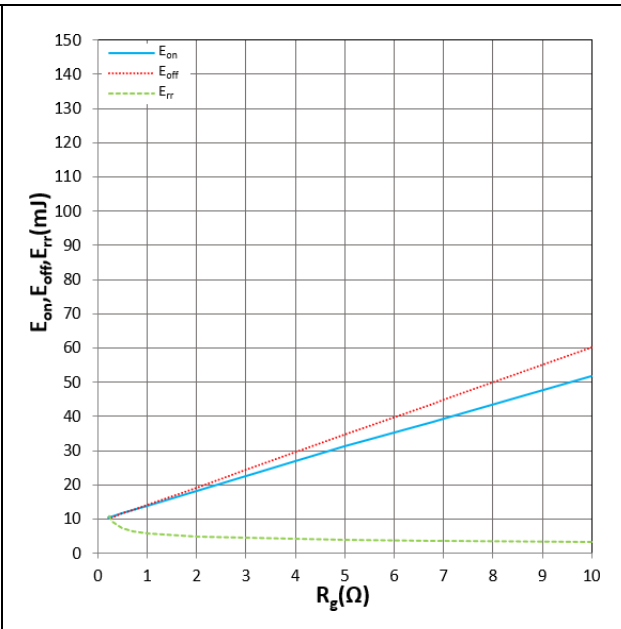
Inductive Load

Figure 14. E_{on}, E_{off} , E_{rr} vs R_g

T_j =150°C, V_{CC} =900V, V_{GS} =+15V/-4V, I_D =300A
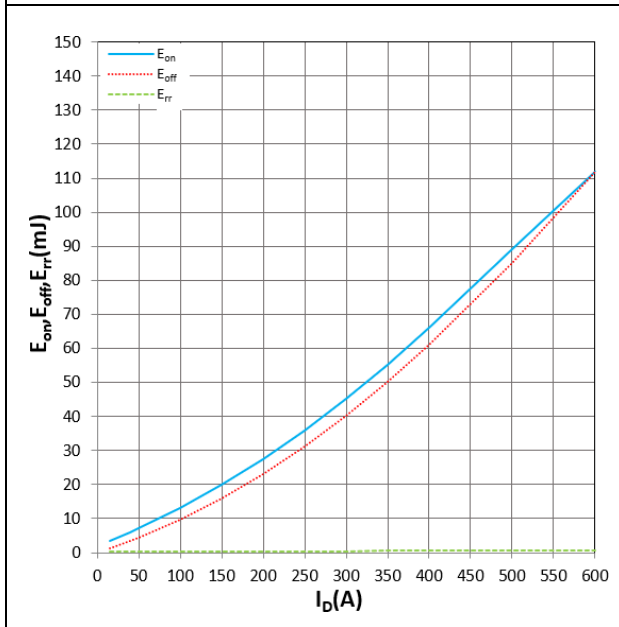
Inductive Load

Figure 15. E_{on}, E_{off}, E_{rr} vs I_D

T_j =25°C, V_{CC} =900V, V_{GS} =+15V/-4V, R_g =6.8Ω
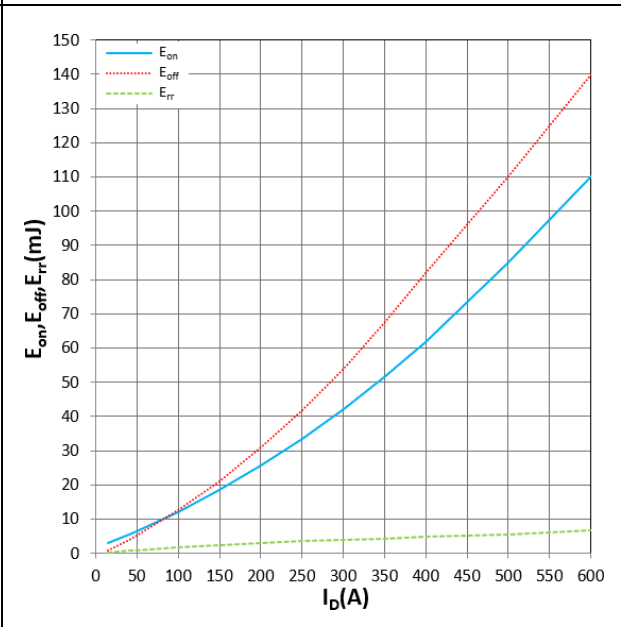
Inductive Load

Figure 16. E_{on}, E_{off}, E_{rr} vs I_D

T_j =150°C, V_{CC} =900V, V_{GS} =+15V/-4V, R_g =6.8Ω

Inductive Load

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