



**Description**

The PRXS600HF17I3C2 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
- $R_{DS(on)} = 3.4m\Omega @ T_j = 25^\circ C, V_{GS} = 15V$
- Low thermal resistance with Si<sub>3</sub>N<sub>4</sub> 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**

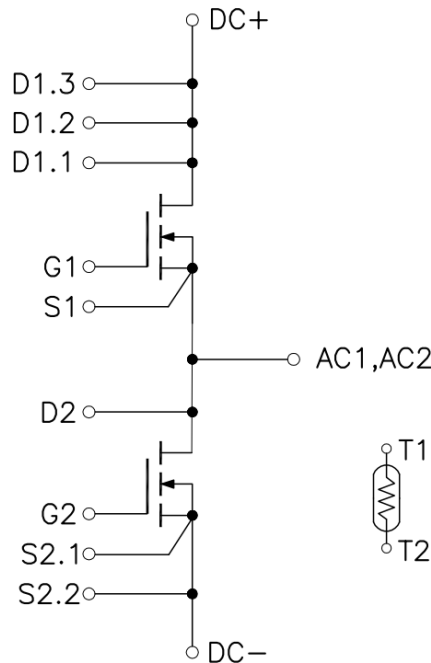


Figure 1. Out drawing & circuit diagram for PRXS600HF17I3C2

Note: Please use **S2.1** for the low side drive signal and do not connect it to **S2.2** which is power terminal

**PRXS600HF17I3C2**  
**1700V/600A Half Bridge SiC MOSFET Module**

**Pin Configuration and Marking Information**

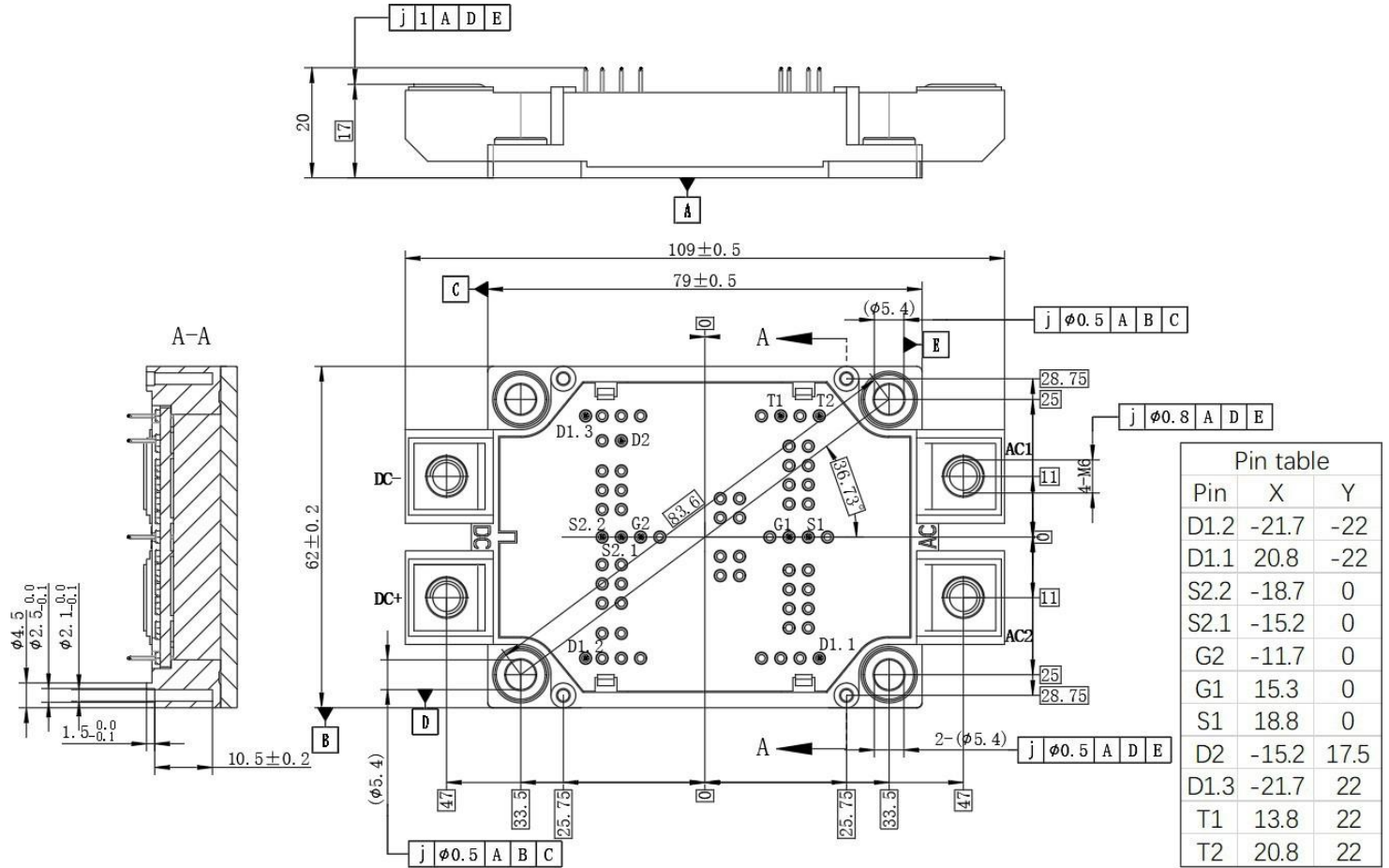


Figure 2. Pin configuration

**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	-	600	-
Module lead resistance, terminals–chip	T <sub>c</sub> =25°C	0.5	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	250	g

**PRXS600HF17I3C2**  
**1700V/600A Half Bridge SiC MOSFET Module**

**Maximum Ratings** ( $T_j = 25^\circ\text{C}$  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 ( $t_{surge} < 300\text{nsec}$ )	D-S Short, Note1	-10 to 20	V
$I_{DS}$	DC Continuous Drain Current	$T_f = 25^\circ\text{C}$ , $V_{GS} = 15\text{V}$	600	A
$I_{DS}$	DC Continuous Drain Current	$T_f = 80^\circ\text{C}$ , $V_{GS} = 15\text{V}$	475	A
$I_{SD}$	Source (Body diode) Current	$T_f = 25^\circ\text{C}$ , with ON signal	600	A
$I_{SD}$	Source (Body diode) Current	$T_f = 80^\circ\text{C}$ , with ON signal	475	A
$I_{DSM}$	Pulse Forward Current	$T_C = 25^\circ\text{C}$ , Pulse width = 1ms, $V_{GS} = 15\text{V}$ , Note2	1200	A
$P_{tot}$	Total Power Dissipation	$T_C = 25^\circ\text{C}$	3750	W
$T_{jmax}$	Max Junction Temperature	-	175	$^\circ\text{C}$
$T_{jop}$	Operating junction Temperature	-	-40 to 150	$^\circ\text{C}$
$T_{stg}$	Storage Temperature	-	-40 to 125	$^\circ\text{C}$

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

Note2: Pulse width limited by maximum junction temperature

**NTC Characteristics**

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
$R_{25}$	Resistance	$T_C = 25^\circ\text{C}$	-	5	-	$\text{k}\Omega$
$\Delta R/R$	Deviation of R100	$T_C = 100^\circ\text{C}$ , $R_{100} = 493\Omega$	5	-	5	%
$P_{25}$	Power dissipation	$T_C = 25^\circ\text{C}$	-	-	20	mW
$B_{25/50}$	B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3375	-	K
$B_{25/80}$	B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3411	-	K
$B_{25/100}$	B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3433	-	K

**PRXS600HF1713C2**  
**1700V/600A Half Bridge SiC MOSFET Module**

**MOSFET Electrical Characteristics** ( $T_j = 25^\circ\text{C}$  unless otherwise specified, chip)

Symbol	Item	Condition	Value			Unit	
			Min.	Typ.	Max		
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=160\mu A$	1700	-	-	V	
$I_{DSS}$	Zero gate voltage drain Current	$V_{DS}=1700V, V_{GS}=0V$	-	4	160	$\mu A$	
$V_{GS(th)}$	Gate-source threshold Voltage	$I_D=240mA$ $V_{DS}=V_{GS}$	$T_j=25^\circ\text{C}$	1.8	2.70	-	V
			$T_j=175^\circ\text{C}$	-	1.90	-	V
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=15V, V_{DS}=0V, T_j=25^\circ\text{C}$	-	-	1200	nA	
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	$I_D=600A$ $V_{GS}=15V$	$T_j=25^\circ\text{C}$	-	3.4	5.2	$m\Omega$
			$T_j=175^\circ\text{C}$	-	7.7	-	$m\Omega$
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	$I_D=600A$ $V_{GS}=15V$	$T_j=25^\circ\text{C}$	-	2.04	3.12	V
			$T_j=175^\circ\text{C}$	-	4.62	-	V
$C_{iss}$	Input Capacitance	$V_D=1000V, V_{GS}=0V$ $f=1MHz, V_{AC}=25mV$	-	45.7	-	nF	
$C_{oss}$	Output Capacitance		-	1.23	-	nF	
$C_{rss}$	Reverse transfer Capacitance		-	0.22	-	nF	
$Q_G$	Total gate charge	$V_{DD}=1000V, I_D=450A, V_{GS}=-5/+15V$	-	1536	-	nC	
$R_{Gint}$	Internal Gate Resistance	$T_j=25^\circ\text{C}$	-	0.32	-	$\Omega$	
$t_{d(on)}$	Turn-on delay time	$V_{DD}=900V$ $I_D=600A$ $V_{GS}=+15/-4V$ $R_{G(on)}=6.8\Omega$ $R_{G(off)}=6.8\Omega$ Inductive load switching operation	$T_j=25^\circ\text{C}$	-	229	-	ns
			$T_j=150^\circ\text{C}$	-	183	-	
$t_r$	Rise time		$T_j=25^\circ\text{C}$	-	169	-	ns
			$T_j=150^\circ\text{C}$	-	138	-	
$t_{d(off)}$	Turn-off delay time		$T_j=25^\circ\text{C}$	-	766	-	ns
			$T_j=150^\circ\text{C}$	-	922	-	
$t_f$	Fall time		$T_j=25^\circ\text{C}$	-	125	-	ns
			$T_j=150^\circ\text{C}$	-	156	-	
$E_{on}$	Turn-on power dissipation		$T_j=25^\circ\text{C}$	-	92.4	-	mJ
			$T_j=150^\circ\text{C}$	-	84.2	-	
$E_{off}$	Turn-off power dissipation	$T_j=25^\circ\text{C}$	-	99.8	-	mJ	
		$T_j=150^\circ\text{C}$	-	107.9	-		
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case	-	0.040	-	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  $0.9W/m \cdot K$  and thickness is 50um.

**PRXS600HF17I3C2**  
**1700V/600A Half Bridge SiC MOSFET Module**

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

Symbol	Item	Condition	Value			Unit	
			Min.	Typ.	Max		
$V_{SD}$	Body Diode Forward Voltage	$V_{GS} = -4\text{V}$ $I_{SD} = 600\text{A}$	$T_j = 25^\circ\text{C}$	-	5.6	-	V
			$T_j = 150^\circ\text{C}$	-	5.1	-	
$T_{rr}$	Reverse recovery time	$V_{RR} = 900\text{V}, I_D = 600\text{A}$ MOSFET side:	$T_j = 25^\circ\text{C}$	-	58	-	ns
			$T_j = 150^\circ\text{C}$	-	191	-	
$Q_{rr}$	Reverse recovery charge	$V_{GS} = +15/-4\text{V}$ $R_{G(on)} = R_{G(off)} = 6.8\Omega$	$T_j = 25^\circ\text{C}$	-	3.37	-	uC
			$T_j = 150^\circ\text{C}$	-	19.38	-	
$E_{rr}$	Diode switching power dissipation	Inductive load switching operation	$T_j = 25^\circ\text{C}$	-	0.68	-	mJ
			$T_j = 150^\circ\text{C}$	-	7.96	-	

**Test Conditions**

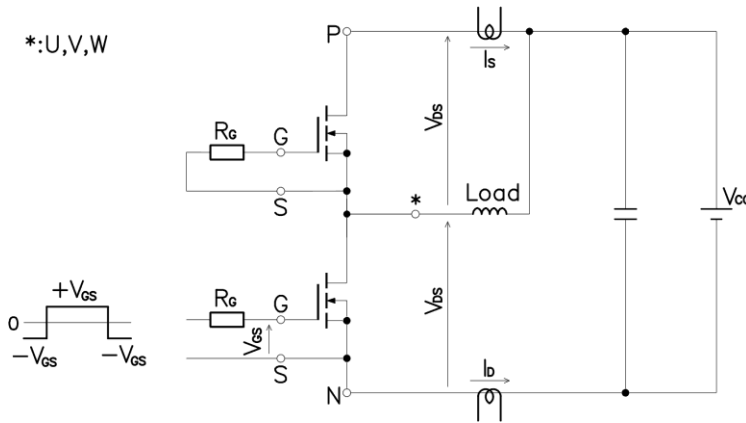


Figure 3. Switching time measure circuit

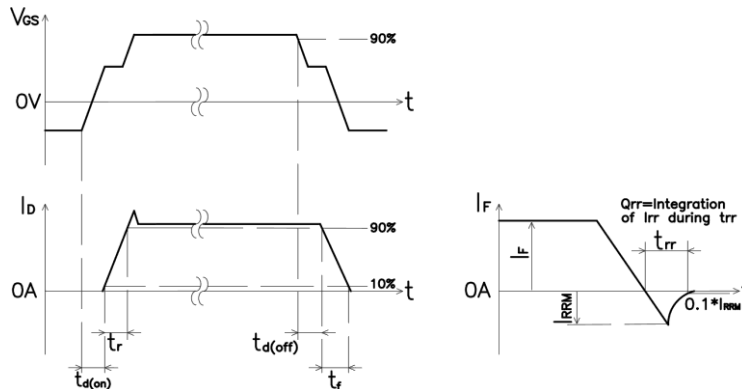


Figure 4. Switching time definition

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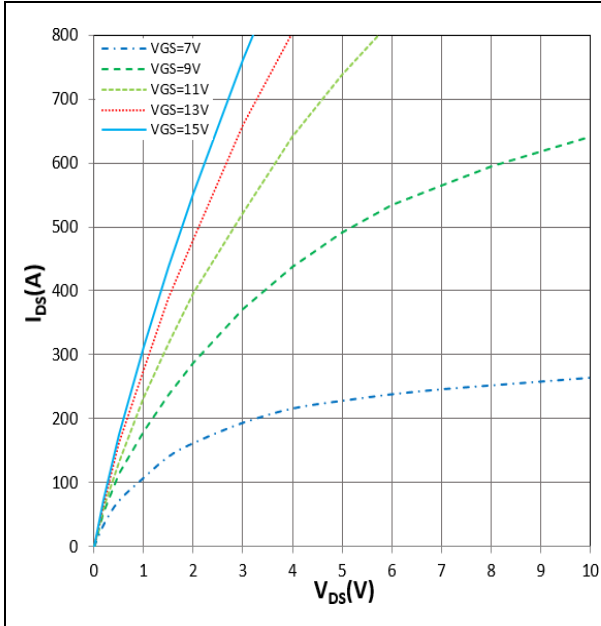


Figure 5.  $I_{DS}$  vs  $V_{DS}$   
 $T_j=25^\circ C$ ,  $V_{GS}$  parameter

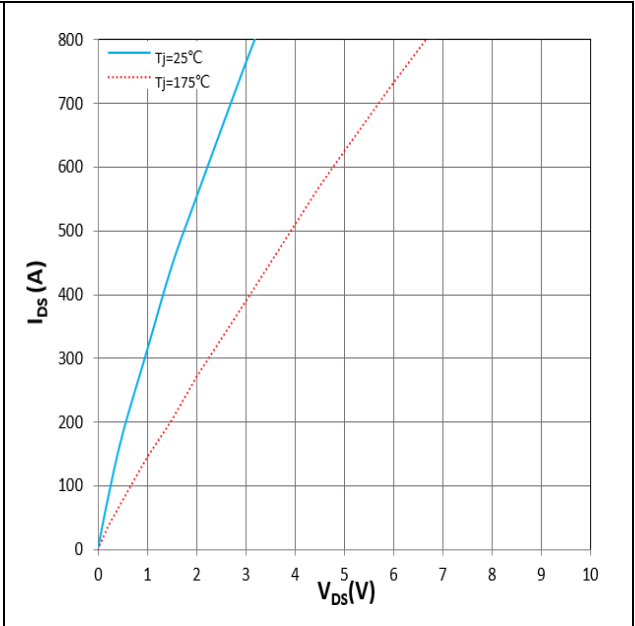


Figure 6.  $I_{DS}$  vs  $V_{DS}$   
 $V_{GS}=15V$ ,  $T_j$  parameter

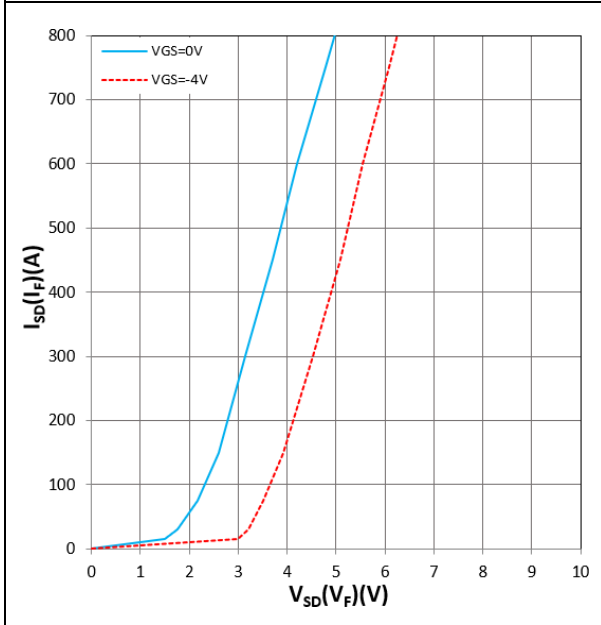


Figure 7.  $I_{SD}(I_F)$  vs  $V_{SD}(V_F)$   
 $T_j=25^\circ C$ ,  $V_{GS}$  parameter

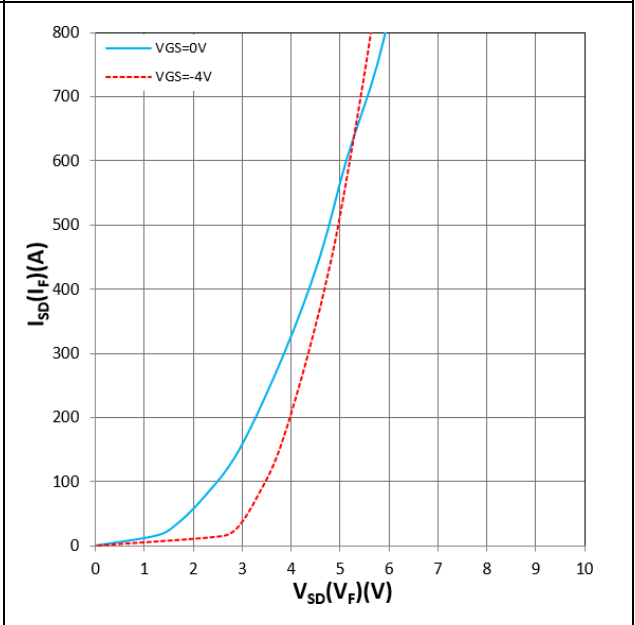


Figure 8.  $I_{SD}(I_F)$  vs  $V_{SD}(V_F)$   
 $T_j=175^\circ C$ ,  $V_{GS}$  parameter

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**1700V/600A Half Bridge SiC MOSFET Module**

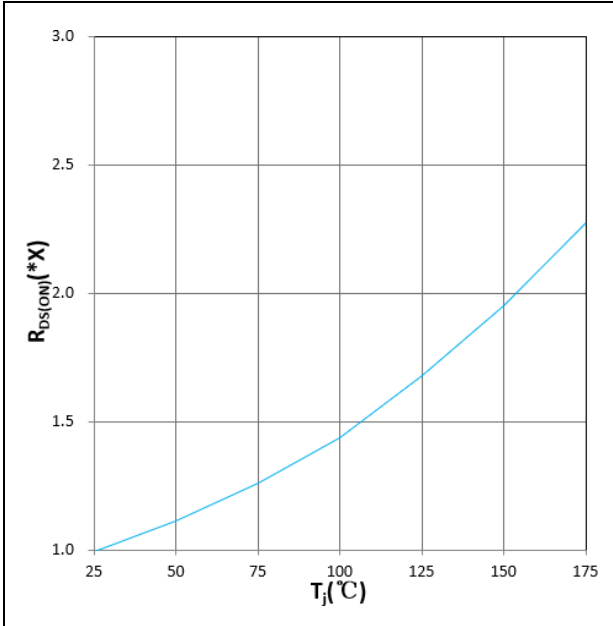


Figure 9.  $R_{DS(ON)}$  vs  $T_j$   
 $V_{GS}=+15V, I_D=600A, 1.0X=3.4m\Omega$

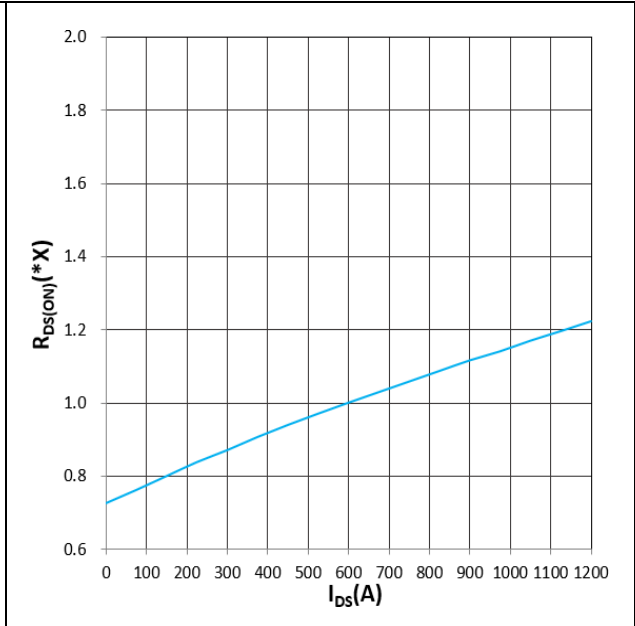


Figure 10.  $R_{DS(ON)}$  vs  $I_{DS}$   
 $T_j=25^\circ C, V_{GS}=+15V, 1.0X=3.4m\Omega$

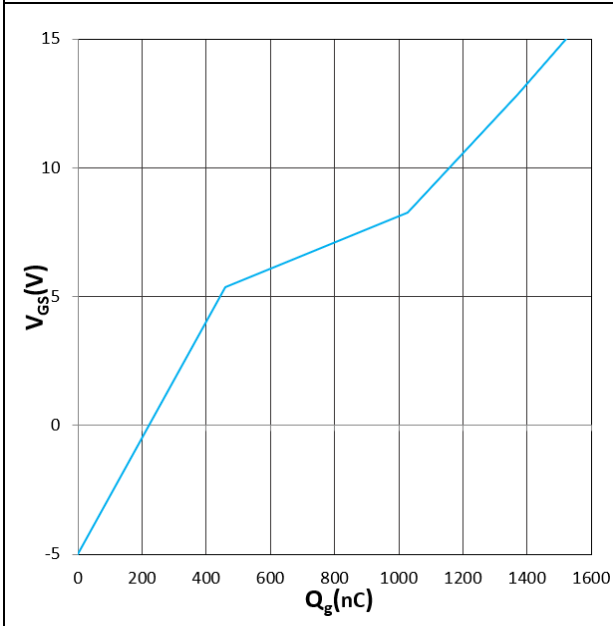


Figure 11.  $V_{GS}$  vs  $Q_g$   
 $T_j=25^\circ C, V_{DS}=1000V, I_D=450A$

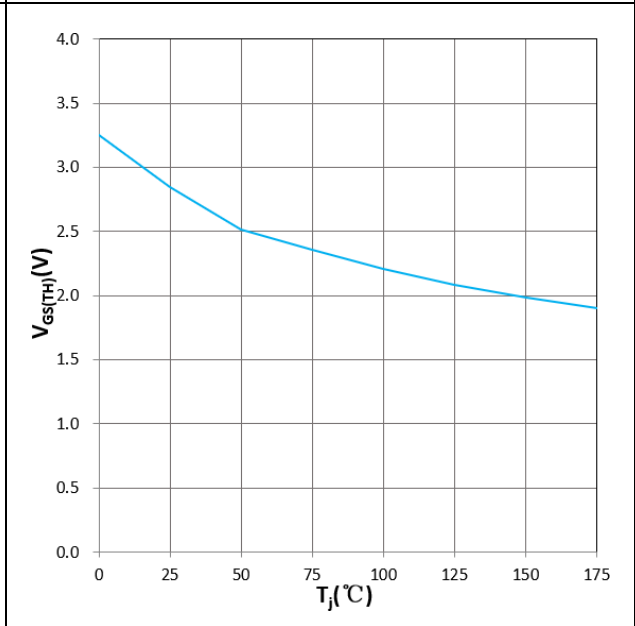


Figure 12.  $V_{GS(TH)}$  vs  $T_j$   
 $V_{GS}=V_{DS}, I_D=240mA$

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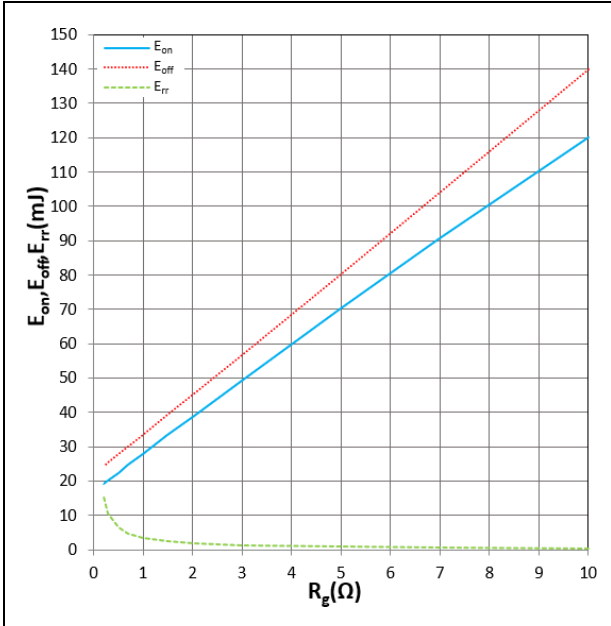


Figure 13.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $R_g$   
 $T_j=25^\circ\text{C}$ ,  $V_{CC}=900\text{V}$ ,  $V_{GS}=+15\text{V}/-4\text{V}$ ,  $I_D=600\text{A}$   
 Inductive Load

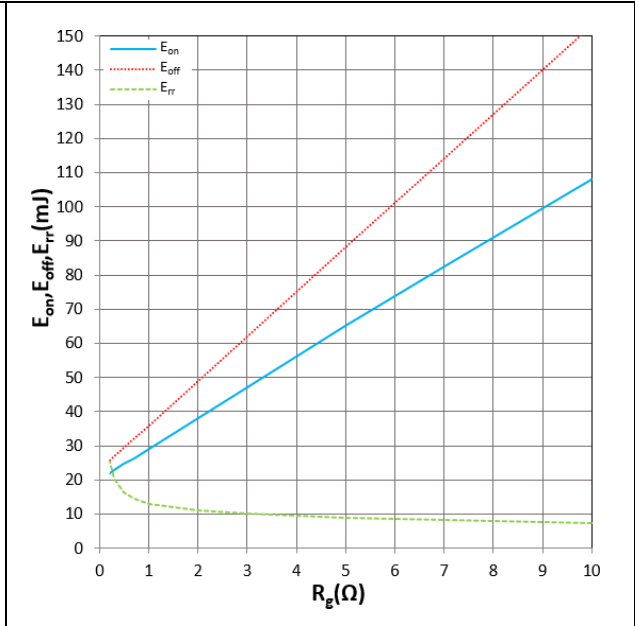


Figure 14.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $R_g$   
 $T_j=150^\circ\text{C}$ ,  $V_{CC}=900\text{V}$ ,  $V_{GS}=+15\text{V}/-4\text{V}$ ,  $I_D=600\text{A}$   
 Inductive Load

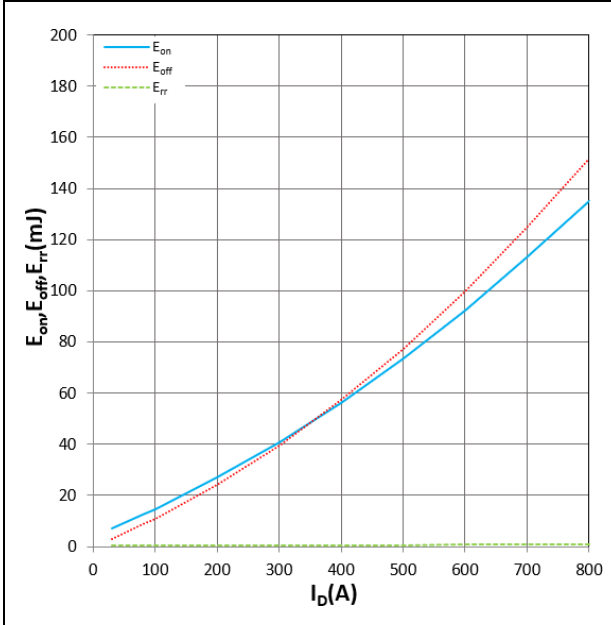


Figure 15.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $I_D$   
 $T_j=25^\circ\text{C}$ ,  $V_{CC}=900\text{V}$ ,  $V_{GS}=+15\text{V}/-4\text{V}$ ,  $R_g=6.8\Omega$   
 Inductive Load

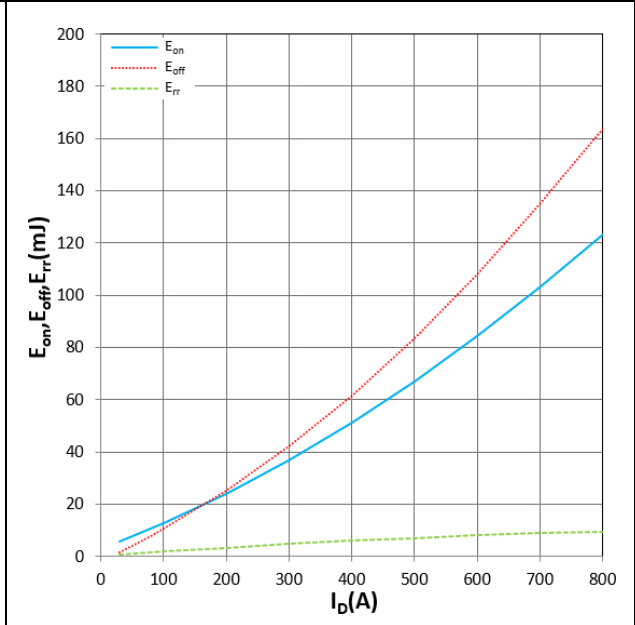


Figure 16.  $E_{on}$ ,  $E_{off}$ ,  $E_{rr}$  vs  $I_D$   
 $T_j=150^\circ\text{C}$ ,  $V_{CC}=900\text{V}$ ,  $V_{GS}=+15\text{V}/-4\text{V}$ ,  $R_g=6.8\Omega$   
 Inductive Load