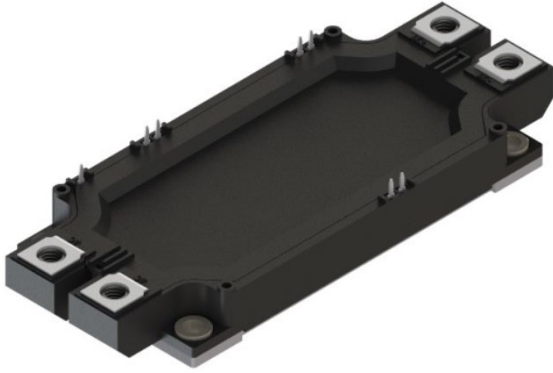


PRXS900HF12I4C1**Description**

The PRXS900HF12I4C1 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 Blocking voltage 1200V
- $R_{DS(on)} = 2.0m\Omega$
- Low thermal resistance with Si₃N₄ AMB
- 175°C maximum junction temperature
- Thermistor inside
- Low Switching Losses

Applications

- xEV Applications
- Motor Drives
- Vehicle Fast Chargers
- Smart-Grid/Grid-Tied Distributed Generation

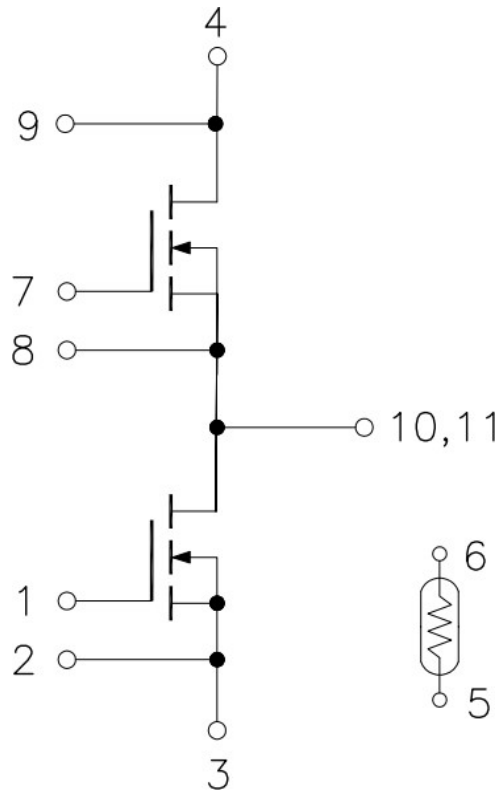
Circuit Diagram

Figure 1. Out drawing & circuit diagram for PRXS900HF12I4C1

PRXS900HF12I4C1
1200V/900A Half Bridge SiC MOSFET Module

Pin Configuration and Marking Information

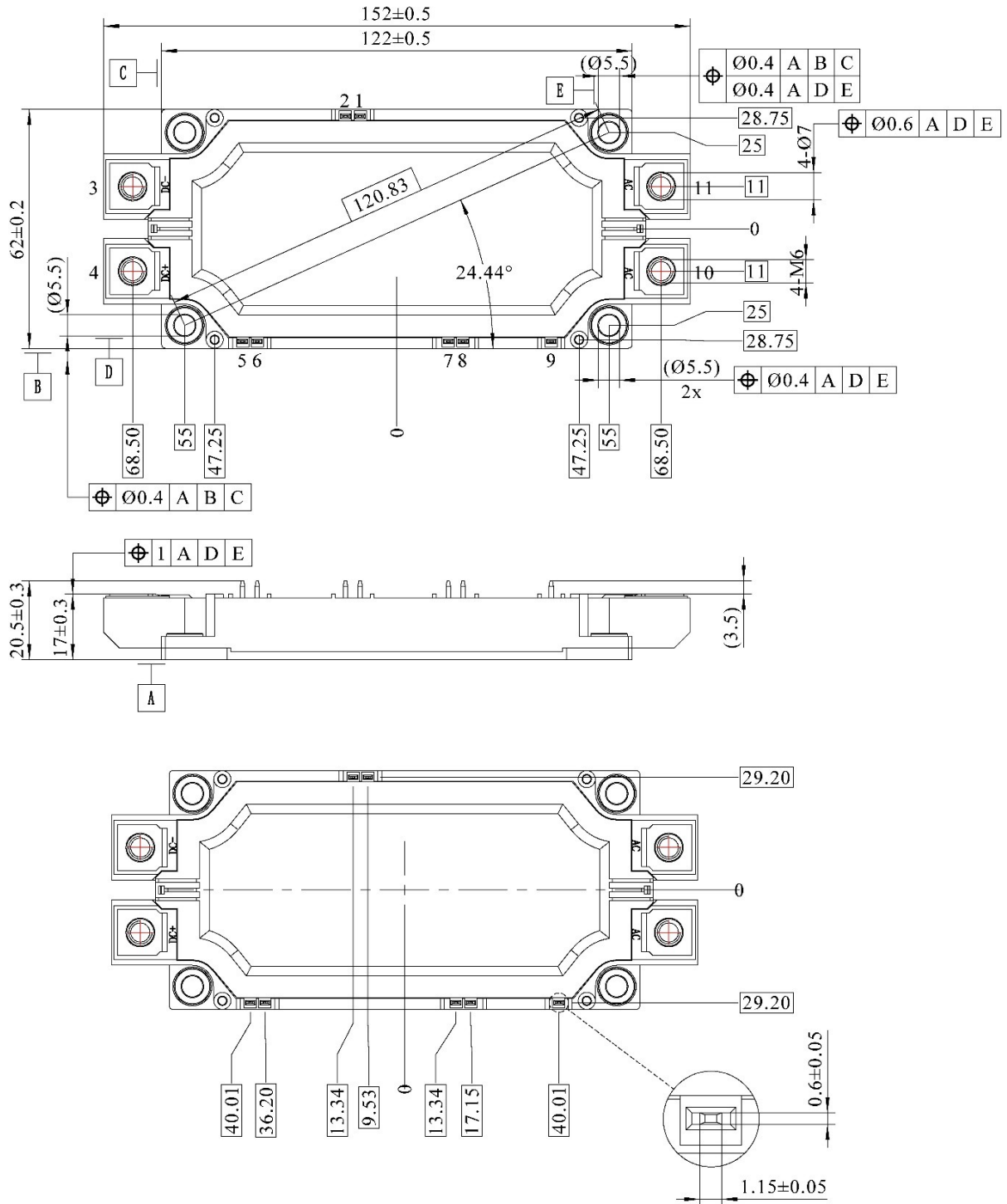


Figure 2. Pin configuration

PRXS900HF12I4C1
1200V/900A Half Bridge SiC MOSFET Module

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 13	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	>400	-
Module lead resistance, terminals–chip	T _C =25° C	0.5	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	340	g

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

Symbol	Parameter	Condition	Ratings	Unit
V _{DSS}	Drain-Source Voltage	G-S Short	1200	V
V _{GSS}	Gate-Source Voltage	D-S Short, AC frequency ≥1Hz, Note1	-10 to 22	V
I _{DS}	DC Continuous Drain Current	T _C =25°C, V _{GS} =18V	1000	A
I _{DS}	DC Continuous Drain Current	T _C =60° C, V _{GS} =18V	900	A
I _{SD}	Source (Body diode) Current	T _C =25°C, with ON signal	1000	A
I _{SD}	Source (Body diode) Current	T _C =60°C, with ON signal	900	A
I _{DSM}	Pulse Forward Current	T _C =25°C, Pulse width =1ms, V _{GS} =20V, Note2	1800	A
P _{tot}	Total Power Dissipation	T _C =25°C	3000	W
T _{jmax}	Max Junction Temperature	-	175	° C
T _{stg}	Storage Temperature	-	-40 to 125	° C

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

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
ΔR/R	Deviation of R ₁₀₀	T _C =100° C, R ₁₀₀ =493Ω	-5	-	5	%
P ₂₅	Power dissipation	T _C =25° C	-	-	20	mW
B _{25/50}	B-value	R ₂ =R ₂₅ exp [B _{25/50} (1/T ₂ - 1/(298,15 K))]	-	3375	-	K
B _{25/80}	B-value	R ₂ =R ₂₅ exp [B _{25/80} (1/T ₂ - 1/(298,15 K))]	-	3411	-	K
B _{25/100}	B-value	R ₂ =R ₂₅ exp [B _{25/100} (1/T ₂ - 1/(298,15 K))]	-	3433	-	K

PRXS900HF12I4C1
1200V/900A 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	$V_{GS}=0V, I_D=900\mu A$	1200	-	-	V	
I_{DSS}	Zero gate voltage drain Current	$V_{DS}=1200V, V_{GS}=0V$	-	30	-	μA	
$V_{GS(th)}$	Gate-source threshold Voltage	$I_D=315mA$ $V_{DS}=V_{GS}$	$T_j=25^\circ C$	1.8	2.7	-	V
			$T_j=175^\circ C$	-	2.1	-	V
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=20V, V_{DS}=0V, T_j=25^\circ C$	-	-	900	nA	
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	$I_D=900A$ $V_{GS}=+15V$	$T_j=25^\circ C$	-	2.5	3.3	m Ω
			$T_j=175^\circ C$	-	3.5	-	m Ω
		$I_D=900A$ $V_{GS}=+18V$	$T_j=25^\circ C$	-	2.0	-	m Ω
			$T_j=175^\circ C$	-	2.8	-	m Ω
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	$I_D=900A$ $V_{GS}=+15V$	$T_j=25^\circ C$	-	2.25	2.97	V
			$T_j=175^\circ C$	-	3.15	-	V
		$I_D=900A$ $V_{GS}=+18V$	$T_j=25^\circ C$	-	1.80	-	V
			$T_j=175^\circ C$	-	2.52	-	V
C_{iss}	Input Capacitance		-	52.2	-	nF	
C_{oss}	Output Capacitance	$V_D=1000V, V_{GS}=0V$ $f=200kHz, V_{AC}=25mV$	-	1.60	-	nF	
C_{rss}	Reverse transfer Capacitance		-	0.13	-	nF	
R_{Gint}	Internal gate resistor	-	-	0.7	-	Ω	
Q_G	Total gate charge	$V_{DD}=800V, I_D=540A, V_{GS}=+18/-5V$	-	1890	-	nC	
$t_{d(on)}$	Turn-on delay time	$V_{DD}=600V$ $I_D=900A$ $V_{GS}=+18/-4V$ $R_{gon}/R_{goff}=3.3/2.2\Omega$ Inductive load switching operation	$T_j=25^\circ C$	-	51	-	ns
			$T_j=150^\circ C$	-	47	-	
t_r	Rise time		$T_j=25^\circ C$	-	29	-	ns
			$T_j=150^\circ C$	-	27	-	
$t_{d(off)}$	Turn-off delay time		$T_j=25^\circ C$	-	116	-	ns
			$T_j=150^\circ C$	-	132	-	
t_f	Fall time		$T_j=25^\circ C$	-	25	-	ns
			$T_j=150^\circ C$	-	42	-	
E_{on}	Turn-on power dissipation		$T_j=25^\circ C$	-	35.5	-	mJ
			$T_j=150^\circ C$	-	41.7	-	
E_{off}	Turn-off power dissipation	$T_j=25^\circ C$	-	18.5	-	mJ	
		$T_j=150^\circ C$	-	21.8	-		
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case	-	0.05	-	K/W	
$R_{th(c-f)}$	Contact thermal Resistance	With thermal conductive grease, Note3	-	0.015	-	K/W	

Note3: Assumes Thermal Conductivity of grease is 0.9W/m²·K and thickness is 50um.

PRXS900HF12I4C1
1200V/900A 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	$V_{GS} = -5\text{V}$ $I_{SD} = 900\text{A}$	$T_j = 25^\circ\text{C}$	-	6.3	-	V
			$T_j = 175^\circ\text{C}$	-	5.6	-	
T_{rr}	Reverse recovery time	$V_{DD} = 600\text{V}$ $I_D = 900\text{A}$	$T_j = 25^\circ\text{C}$	-	29	-	ns
			$T_j = 150^\circ\text{C}$	-	47	-	
Q_{rr}	Reverse recovery charge	$V_{GS} = +18/-4\text{V}$ $R_{gon}/R_{goff} = 3.3/2.2\Omega$ Inductive load switching operation	$T_j = 25^\circ\text{C}$	-	3.5	-	uC
			$T_j = 150^\circ\text{C}$	-	13.2	-	
E_{rr}	Diode switching power dissipation	Inductive load switching operation	$T_j = 25^\circ\text{C}$	-	1.82	-	mJ
			$T_j = 150^\circ\text{C}$	-	5.65	-	

Test Conditions

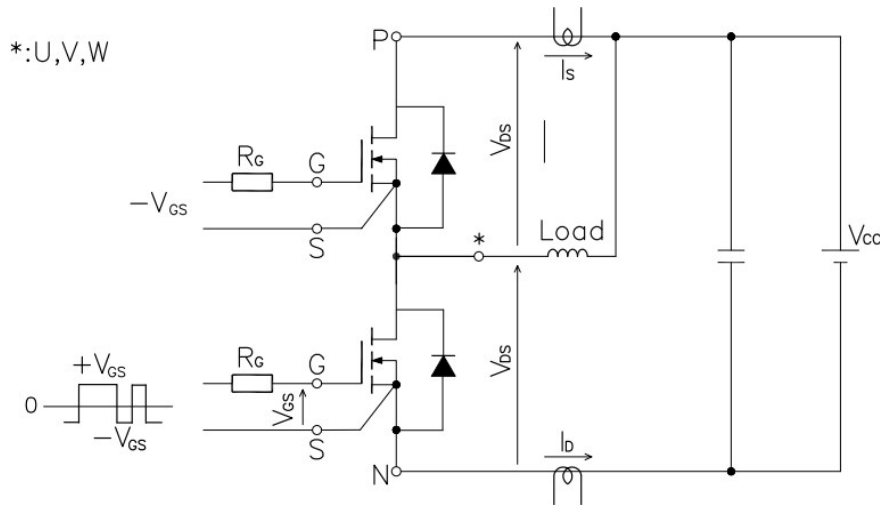


Figure 3. Switching time measure circuit

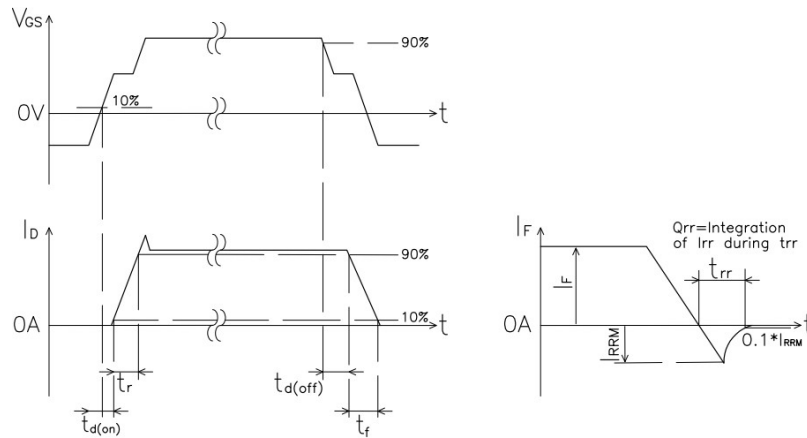


Figure 4. Switching time definition

PRXS900HF12I4C1
1200V/900A Half Bridge SiC MOSFET Module

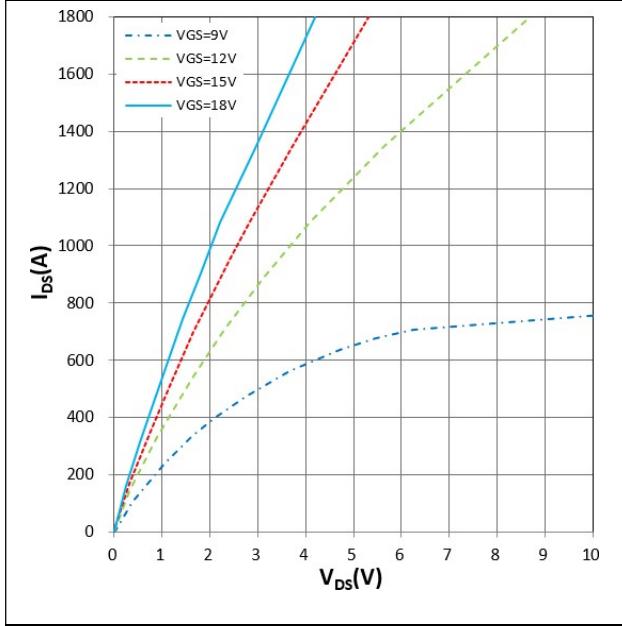


Figure 5. I_{DS} vs V_{DS}
 $T_j=25^\circ C$, V_{GS} parameter

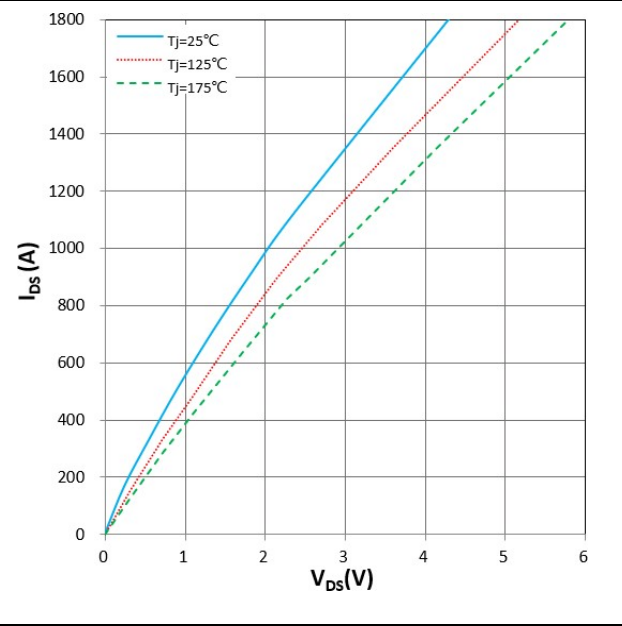


Figure 6. I_{DS} vs V_{DS}
 $V_{GS}=18V$, T_j parameter

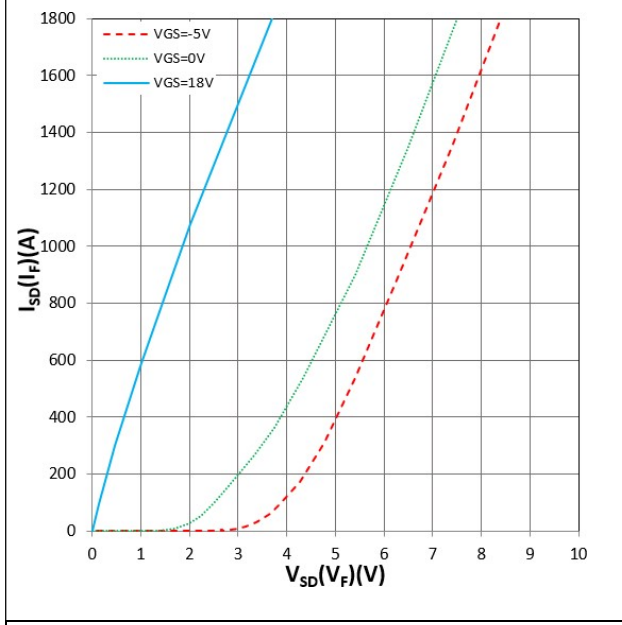


Figure 7. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$
 $T_j=25^\circ C$, V_{GS} parameter

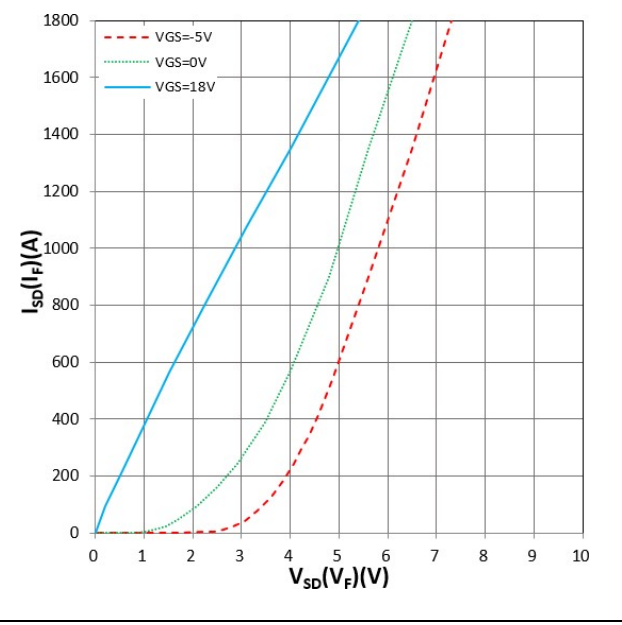


Figure 8. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$
 $T_j=175^\circ C$, V_{GS} parameter

PRXS900HF12I4C1
1200V/900A Half Bridge SiC MOSFET Module

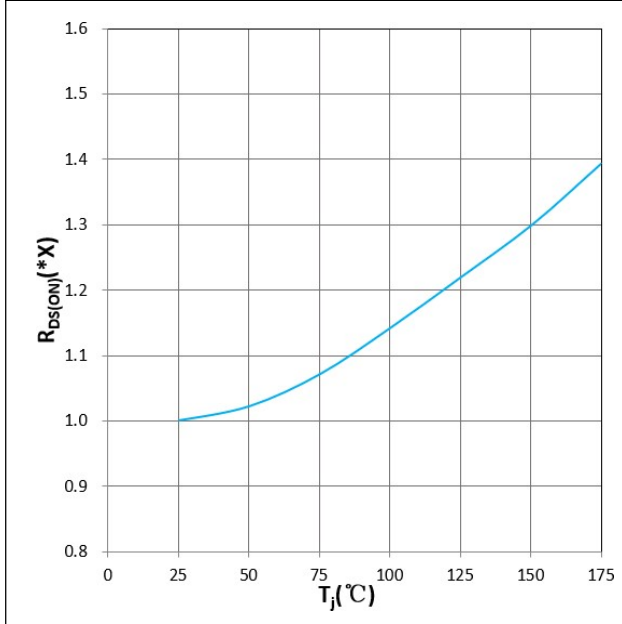


Figure 9. $R_{DS(ON)}$ vs T_j
 $V_{GS}=+18V, I_D=900A, 1.0X=2.0m\Omega$

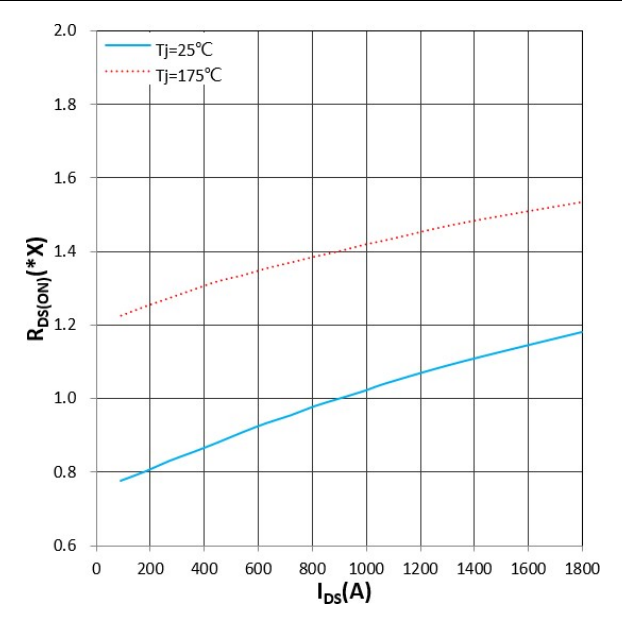


Figure 10. $R_{DS(ON)}$ vs I_{DS}
 $T_j=25^\circ C/175^\circ C, V_{GS}=+18V, 1.0X=2.0m\Omega$

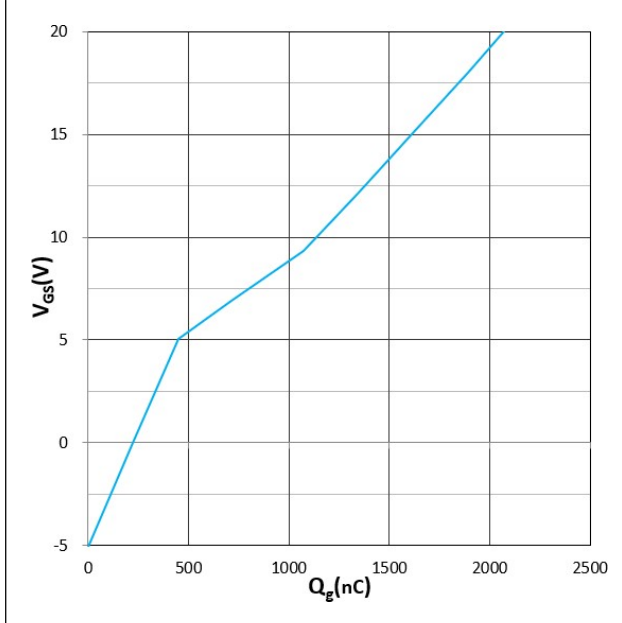


Figure 11. V_{GS} vs Q_g
 $T_j=25^\circ C, V_{DS}=800V, I_D=540A$

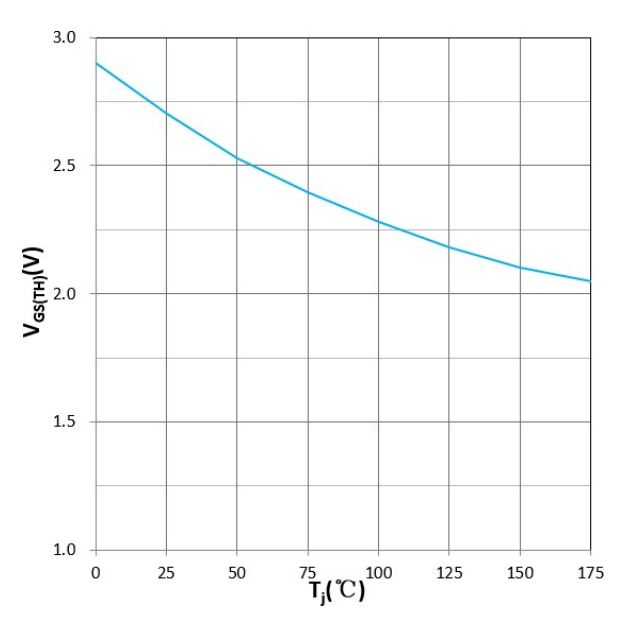


Figure 12. $V_{GS(TH)}$ vs T_j
 $V_{GS}=V_{DS}, I_D=315mA$

PRXS900HF12I4C1
1200V/900A Half Bridge SiC MOSFET Module

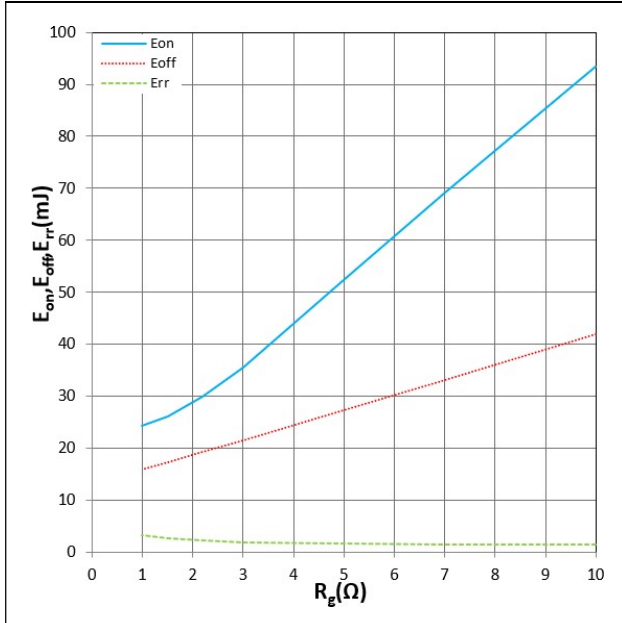


Figure 13. E_{on} , E_{off} , E_{rr} vs R_g
 $T_j=25^\circ\text{C}$, $V_{DD}=600\text{V}$, $V_{GS}=+18\text{V}/-4\text{V}$, $I_D=900\text{A}$
 Inductive Load

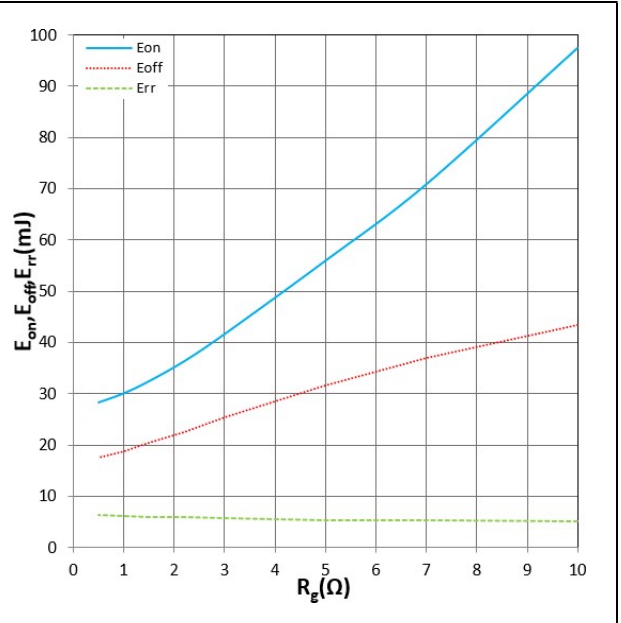


Figure 14. E_{on} , E_{off} , E_{rr} vs R_g
 $T_j=150^\circ\text{C}$, $V_{DD}=600\text{V}$, $V_{GS}=+18\text{V}/-4\text{V}$, $I_D=900\text{A}$
 Inductive Load

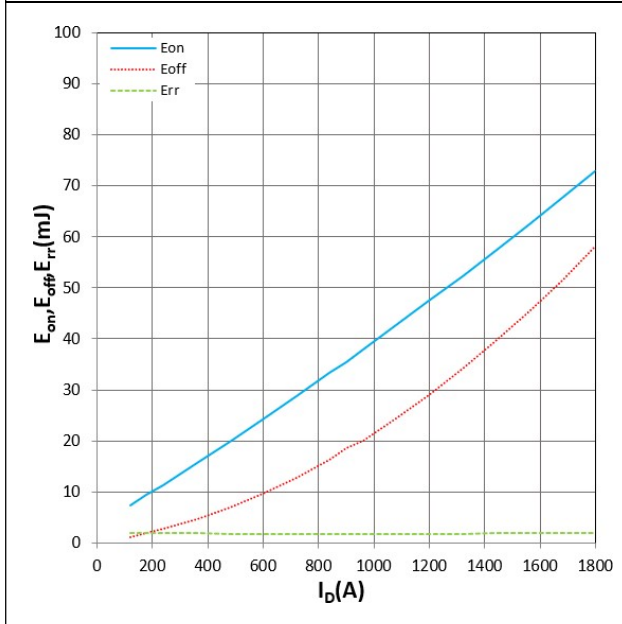


Figure 15. E_{on} , E_{off} , E_{rr} vs I_D
 $T_j=25^\circ\text{C}$, $V_{DD}=600\text{V}$, $V_{GS}=+18\text{V}/-4\text{V}$,
 $R_{gon}/R_{goff}=3.3/2.2\Omega$, Inductive Load

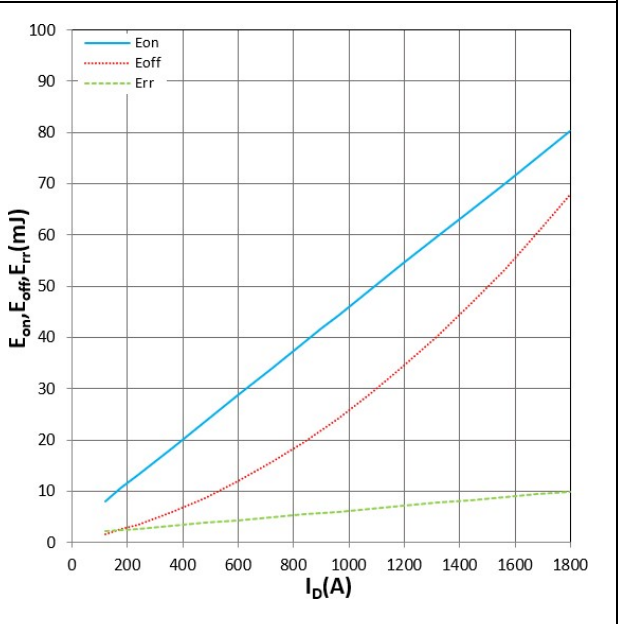


Figure 16. E_{on} , E_{off} , E_{rr} vs I_D
 $T_j=150^\circ\text{C}$, $V_{DD}=600\text{V}$, $V_{GS}=+18\text{V}/-4\text{V}$,
 $R_{gon}/R_{goff}=3.3/2.2\Omega$, Inductive Load