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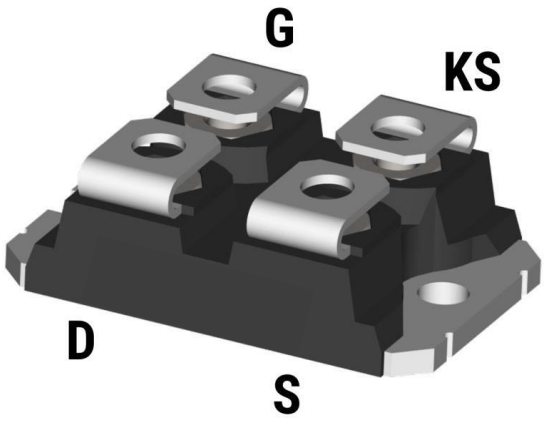
1200V/17mΩ Single Unit SiC MOSFET Module

PRXS17SU12Z7C1



Description

The PRXS17SU12Z7C1 is a Single Unit SiC MOSFET Power Module. It integrates high performance SiC MOSFET chips designed for the applications such as Motor drives and EV charging.

Features

- 1200V/17mΩ @T_j = 25°C, V_{GS} = 18V
- 175°C maximum junction temperature
- Low Device Capacitances (Coss,Crss)
- Faster and More Efficient Switching

Applications

- UPS
- Motor Drive
- EV Charging
- High Voltage DC-DC Converters
- Induction Heating and Welding
- Smart Grid Transmission and Distribution

Circuit Diagram

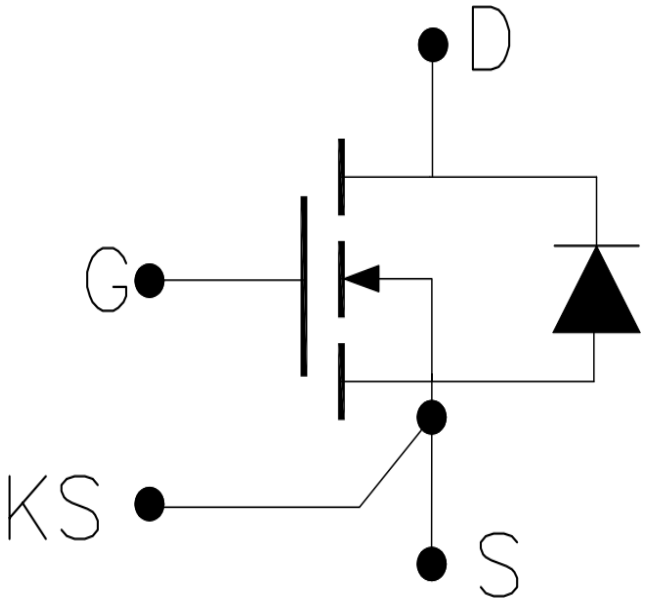


Figure 1. Out drawing & circuit diagram for PRXS17SU12Z7C1

Pin Configuration and Marking Information

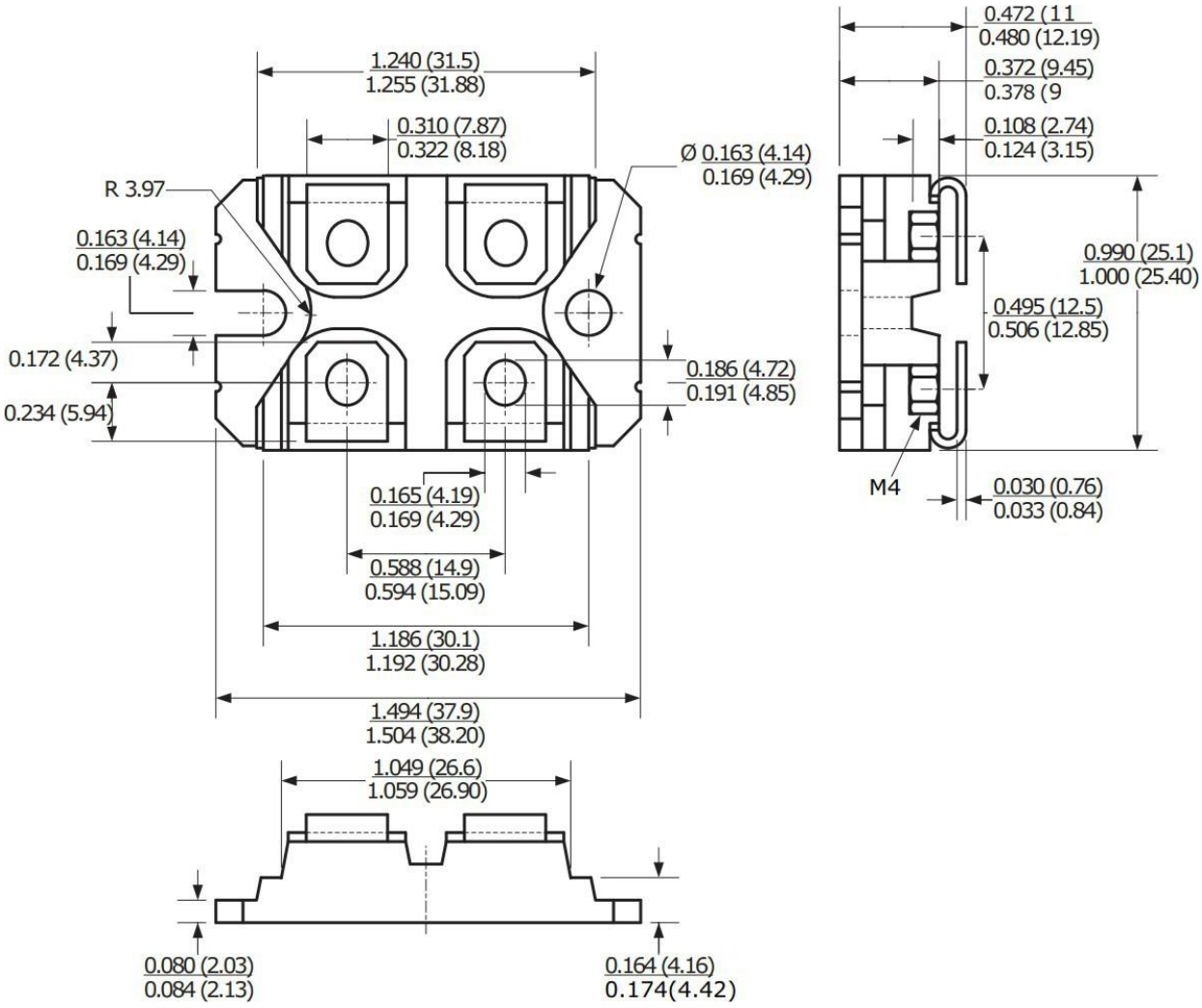


Figure 2. Pin configuration

PRXS17SU12Z7C1
1200V/17mΩ Single Unit SiC MOSFET Module

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f =50Hz, t =1min	3.4	KV
CTI	-	>400	-
Mounting torque for module mounting	M4	1.5	Nm
Weight	-	28	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_{GSS}	Gate-Sourse Voltage	D-S Short, AC frequency ≥1Hz, Note1		-10 to +22	V
I_{DS}	DC Continuous Drain Current	V_{GS} =+15V	Tc =25°C	105	A
I_{DS}	DC Continuous Drain Current		T_c=100°C	75	A
I_{DS}	DC Continuous Drain Current	V_{GS} =+18V	Tc =25°C	110	A
I_{DS}	DC Continuous Drain Current		T_c=100°C	80	A
I_{DSM}	Pulse Drain Current	Pulse width≤3μs, V_{GS} =+15V, Note2		313	A
P_{tot}	Total Power Dissipation	T_C =25°C		350	W
T_{jmax}	Max Junction Temperature	-		175	°C
T_{stg}	Storage Temperature	-		-50 to 175	°C

Note1: Recommended Operating Value, +18V/-5V, +15V/-4V
Note2: Pulse width limited by maximum junction temperature

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 =100uA		1200	-	-	V
I_{DSS}	Zero gate voltage drain Current	V_{DS} =1200V, V_{GS} =0V		-	1	-	μA
$V_{GS(th)}$	Gate-source threshold Voltage	I_D =35mA, V_{DS} =V_{GS}	T_j =25°C	1.8	2.7	–	V
			T_j =175°C	–	2.05	–	
I_{GSS}	Gate-Source Leakage Current	V_{GS} =22V, V_{DS} =0V	T_j =25°C	-	-	100	nA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D =60A, V_{GS} =+15V	T_j =25°C	-	20	–	mΩ
			T_j =175°C	–	29	–	mΩ
		I_D =60A, V_{GS} =+18V	T_j =25°C	–	17	22.5	mΩ
			T_j =175°C	–	25	–	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	I_D =60A, V_{GS} =+15V	T_j =25°C	–	1.20	–	V
			T_j =175°C	–	1.74	–	V
		I_D =60A, V_{GS} =+18V	T_j =25°C	–	1.02	1.35	V
			T_j =175°C	–	1.50	–	V
C_{iss}	Input Capacitance	V_D =800V, V_{GS} =0V, f =1MHz, V_{AC}=25mV		-	5814	-	pF
C_{oss}	Output Capacitance			-	177	-	pF
C_{rss}	Reverse transfer Capacitance			-	14.2	-	pF
Q_g	Total gate charge	V_{DD} =800V, I_D =60A, V_{GS} =+15/−5V		-	180	-	nC
R_{Gint}	Internal Gate Resistance	T_j =25°C		-	1.3	-	Ω
$t_{d(on)}$	Turn-on delay time	V_{DD} =800V, I_D =60A, V_{GS} =+15/-4V, R_{gon}=R_{goff} =1.0Ω, Inductive load switching operation	T_j =25°C	-	45	-	ns
			T_j =150°C	-	39	-	
t_r	Rise time		T_j =25°C	-	18	-	ns
			T_j =150°C	-	16	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	20	-	ns
			T_j =150°C	-	25	-	
t_f	Fall time		T_j =25°C	-	11	-	ns
			T_j =150°C	-	35	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	492	-	μJ
			T_j =150°C	-	662	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	205	-	μJ
			T_j =150°C	-	200	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.36	0.48	K/W

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} = -5V I_{SD} =30A	T_j =25°C	-	4.6	-	V
			T_j =175°C	-	4.2	-	
T_{rr}	Reverse recovery time	V_{DD} =800V, I_D =60A V_{GS} =+15/-4V R_{gon}=R_{goff} =1.0Ω Inductive load switching operation	T_j =25°C	-	35	-	ns
			T_j =150°C	-	47	-	
Q_{rr}	Reverse recovery charge		T_j =25°C	-	240	-	nC
			T_j =150°C	-	475	-	
Irrm	Reverse recovery current		T_j =25°C	-	14	-	A
			T_j =150°C	-	21	-	A

Test Conditions

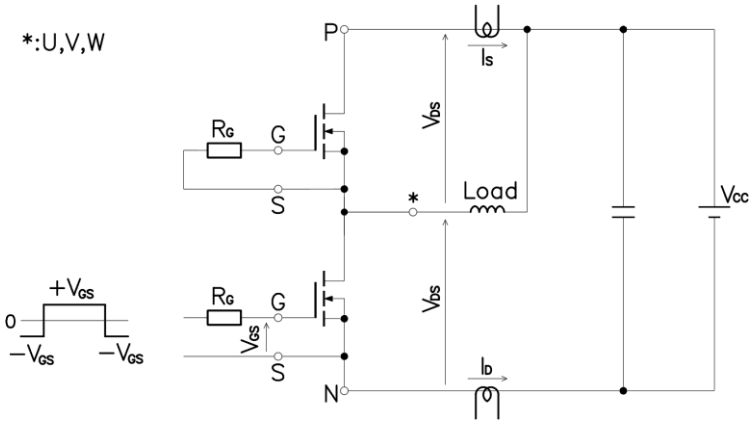


Figure 3. Switching time measure circuit

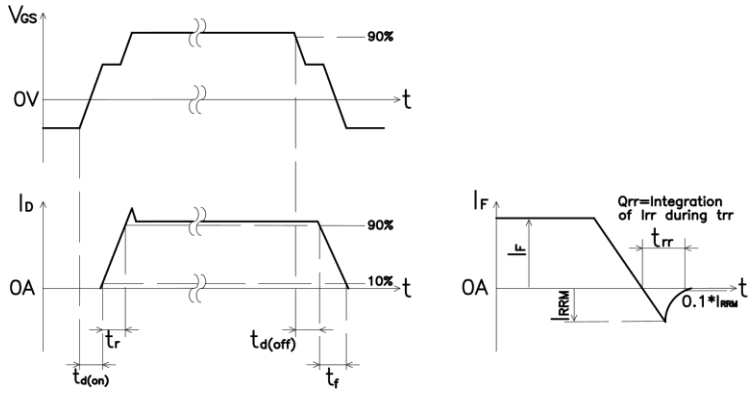


Figure 4. Switching time definition

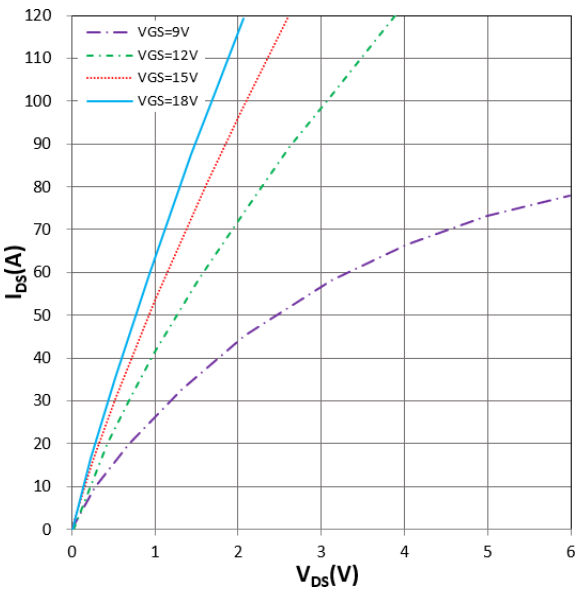


Figure 5. I_{DS} vs V_{DS}
T_j =25°C

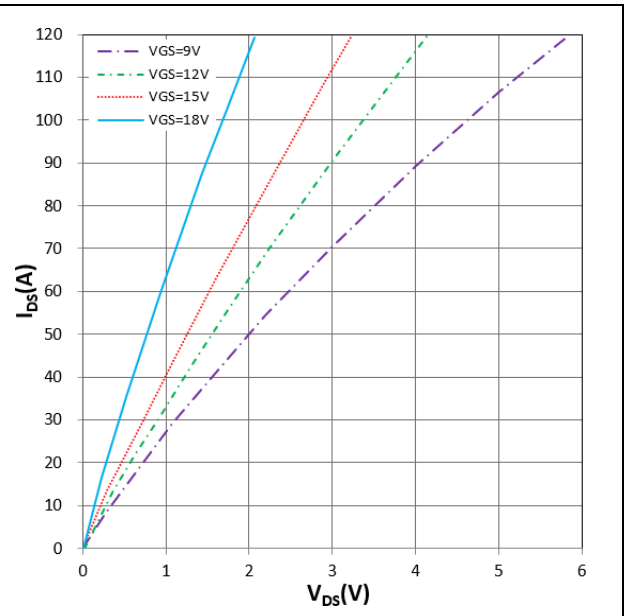


Figure 6. I_{DS} vs V_{DS}
T_j =175°C

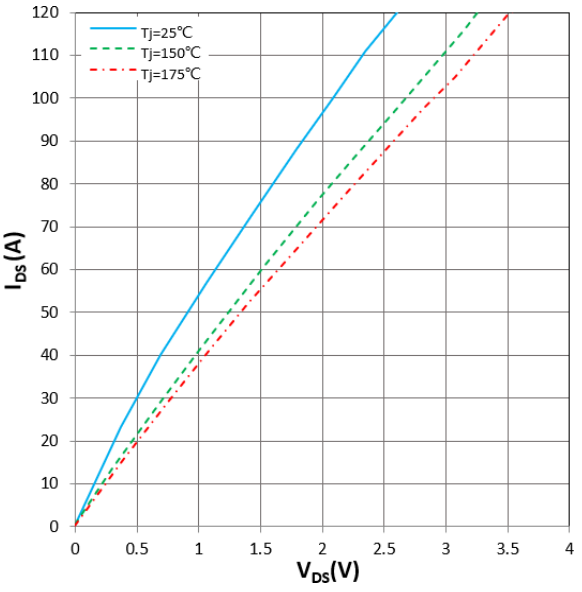


Figure 7. I_{DS} vs V_{DS}
V_{GS} =+15V

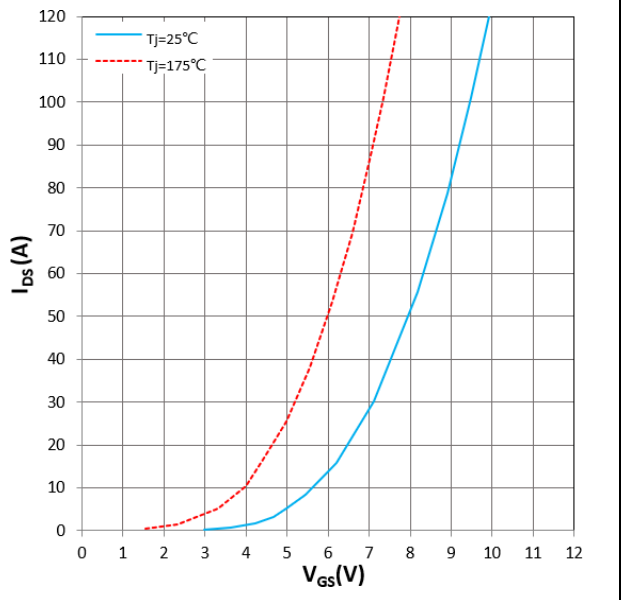


Figure 8. I_{DS} vs V_{GS}
V_{DS} =+10V

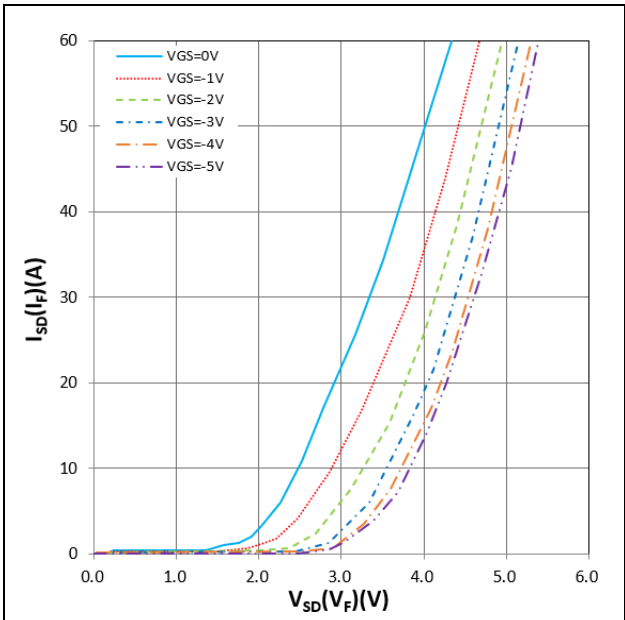


Figure 9. I_{SD} vs V_{SD} (V_F)
T_j =25°C

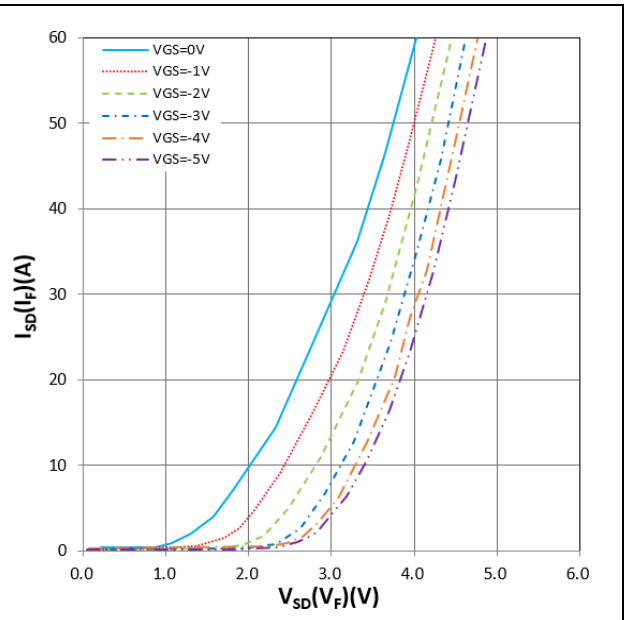


Figure 10. I_{SD} vs V_{SD} (V_F)
T_j =175°C

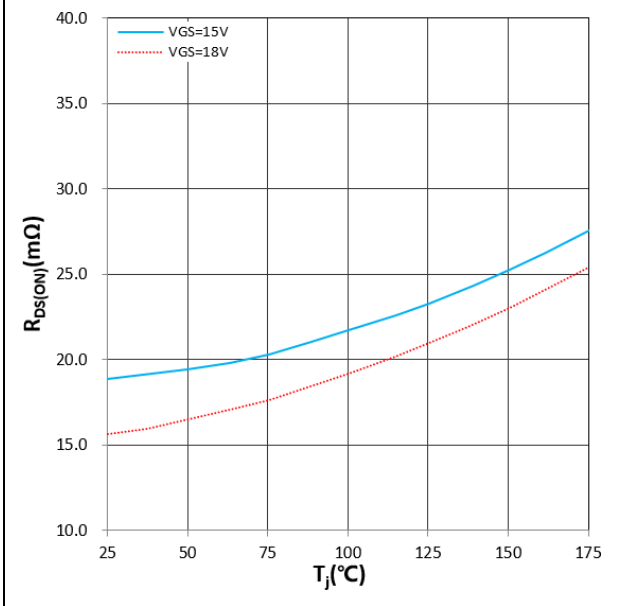


Figure 11. $R_{DS(ON)}$ vs T_j
I_D =60A

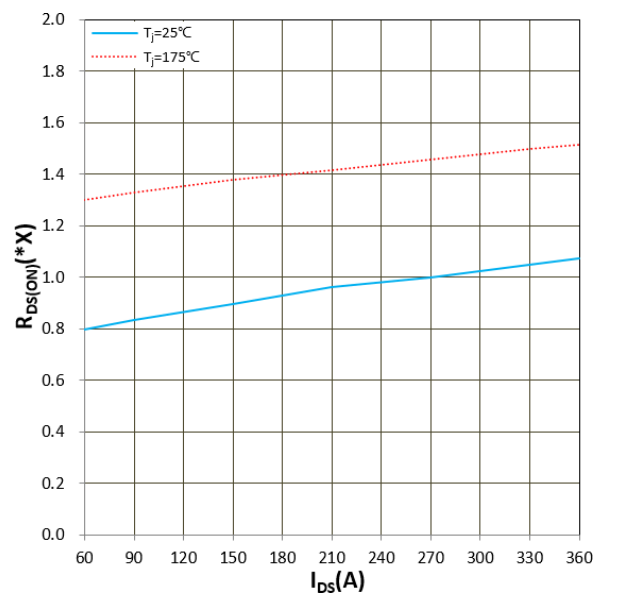


Figure 12. $R_{DS(ON)}$ vs I_{DS}
V_{GS} =+15V

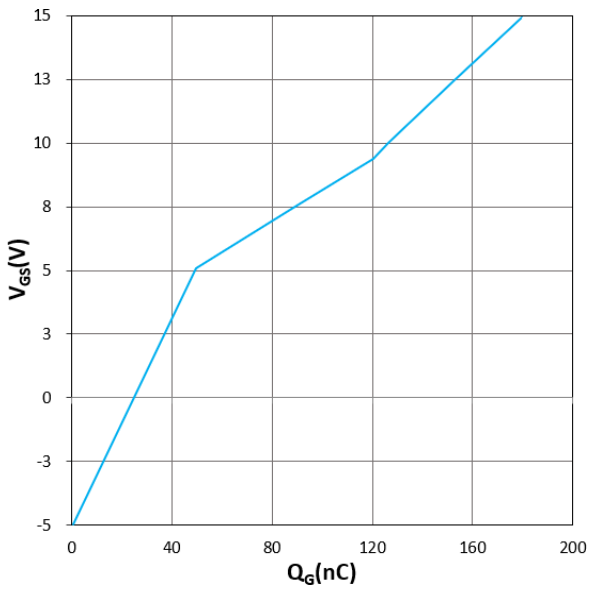


Figure 13. V_{GS} vs Q_g
V_{DS} =800V, I_D =60A, T_j =25℃

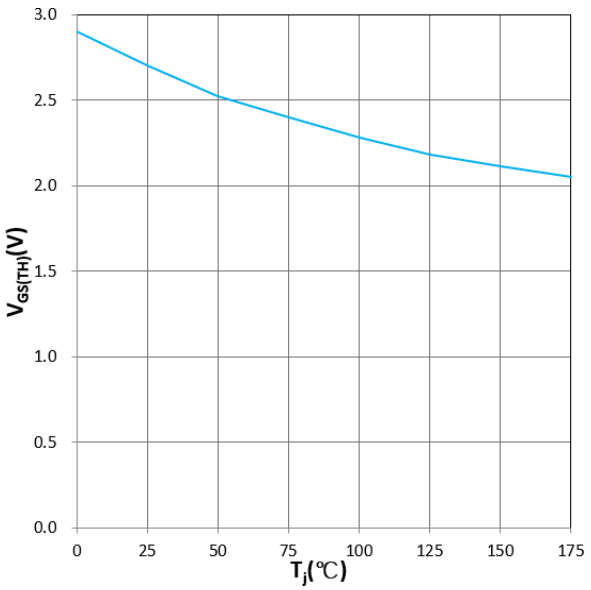


Figure 14. $V_{GS(TH)}$ vs T_j
V_{GS} =V_{DS}, I_D =35mA

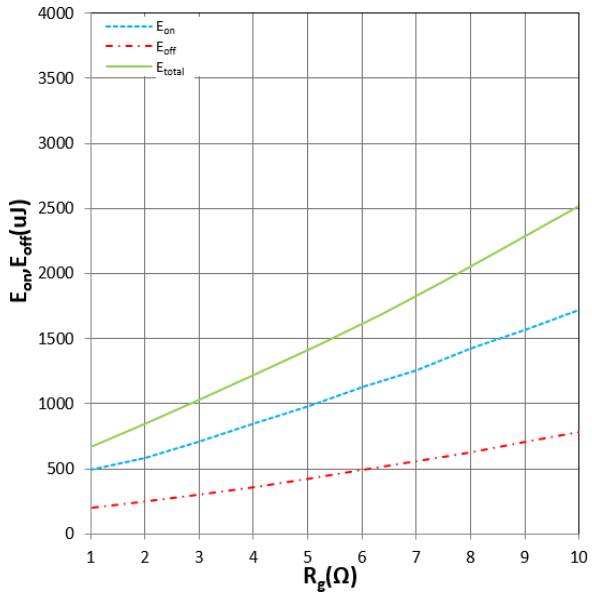


Figure 15. E_{on}, E_{off} vs R_g
T_j =25°C, V_{CC} =800V, V_{GS} =+15V/-4V, I_D =60A
Inductive Load

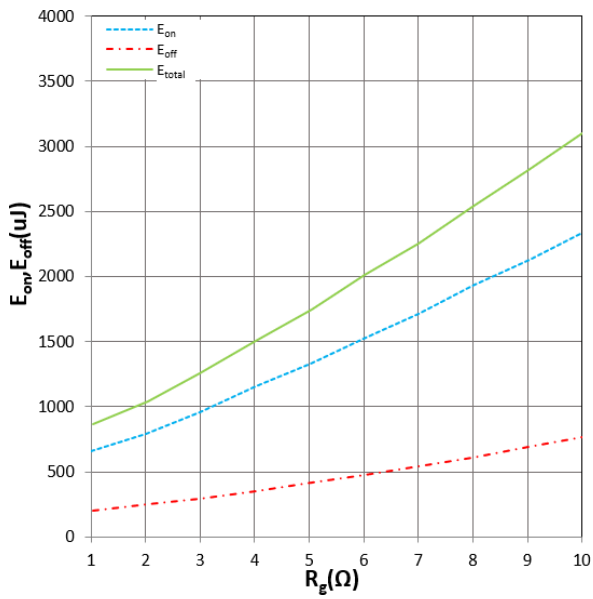


Figure 16. E_{on}, E_{off} vs R_g
T_j =150°C, V_{CC} =800V, V_{GS} =+15V/-4V, I_D =60A
Inductive Load

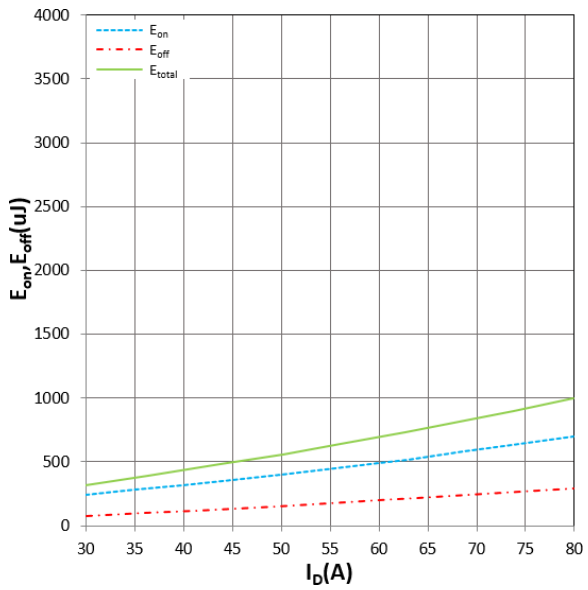


Figure 17. E_{on}, E_{off} vs I_{DS}
T_j=25°C, V_{CC} =800V, V_{GS} =+15V/-4V
R_{gon}=R_{goff} =1.0Ω, Inductive Load

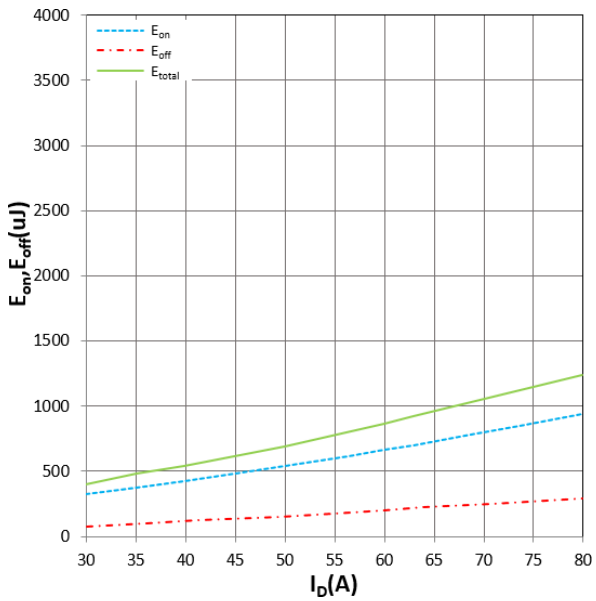


Figure 18. E_{on}, E_{off} vs I_{DS}
T_j=150°C, V_{CC} =800V, V_{GS} =+15V/-4V
R_{gon}=R_{goff} =1.0Ω, Inductive Load

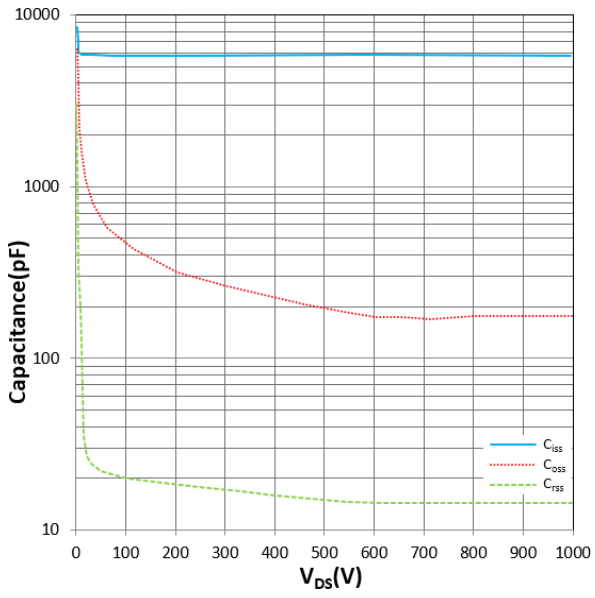


Figure 19. C_{ies},C_{oss},C_{rss} vs V_{DS}
T_j=25°C, f=1MHz, V_{AC} =25mV