Silicon Carbide (SiC)
1700V 1.9 mohm Half-Bridge MOSFET Module Edual3
EDSC600X17

The EDSC600X17 is a power module containing 1.9 mΩ /1700 V SiC MOSFET half−bridge and a thermistor with Si_3N_4 AMB in an Edual3 package.

Features
- 1.9 mΩ / 1700 V SiC MOSFET Half−Bridge
- Si_3N_4 AMB
- NTC Thermistor
- Low Inductive Layout
- Solderable Pins
- Isolated Base Plate
- SwiftSiC™

Typical Applications
- Motor Drives
- Servo Drives
- Solar Drives
- Uninterruptible Power Supply Systems (UPS)

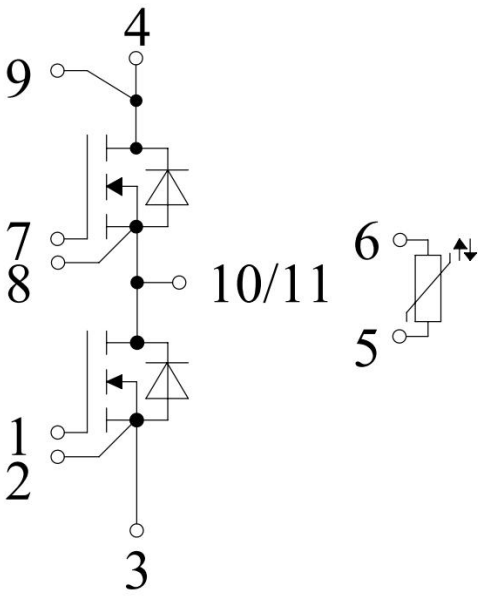
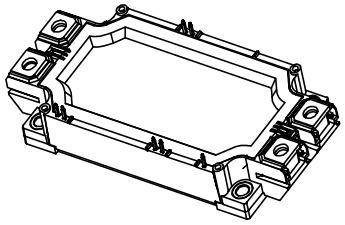
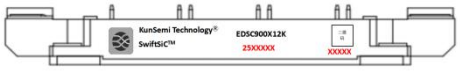


Figure 1. Schematic



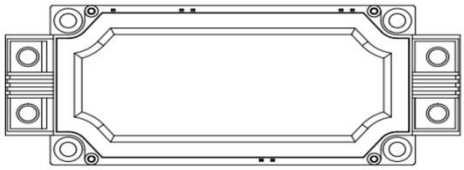
PIM11, 152.00 x 62.15 x 20.80
CASE 180HT

MARKING DIAGRAM



EDSC600X17 = Device Code
25XXXX = Year and Work Week Code

PIN ASSIGNMENTS



ORDERING INFORMATION

Device	Package
EDSC600X17	Edual3

PIN DESCRIPTION

Pin	Name	Description
1	G2	T2 Gate
2	S2	T2 Source
3	DC-	DC Negative Bus Connection
4	DC+	DC Positive Bus Connection
5	TH2	Thermistor Connection 2
6	TH1	Thermistor Connection 1
7	G1	T1 Gate
8	S1	T1 Source
9	DS1	T1 Drain Sensing
10	OUT	Center Point of Half Bridge
11	OUT	Center Point of Half Bridge

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
SiC MOSFET			
Drain−Source Voltage	V_{DSS}	1700	V
Gate−Source Voltage	V_{GS}	−4/+18	V
Continuous Drain Current @ T_c = 80°C (T_J = 175°C)	I_{DS}	600	A
Pulsed Drain Current (T_J = 175°C)	I_{DPulse}	1200	A
Maximum Power Dissipation @ T_c = 80°C (T_J = 175°C)	Ptot	3000	W
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	175	°C

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SiC MOSFET CHARACTERISTICS						
Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 1700V	I_{DSS}	-	-	1	mA
Drain−Source On Resistance	V_{GS} = 18V, I_{DS} = 600A, T_J = 25°C	$R_{DS(ON)}$	-	1.9	2.1	mΩ
	V_{GS} = 18V, I_{DS} = 600A, T_J = 175°C		-	3.7	-	
Gate−Source Threshold Voltage	V_{GS} = V_{DS}, I_{DS} = 360mA	$V_{GS(TH)}$	1.8	2.7	-	V
Gate Resistance	V_{GS} = 0V, f = 1MHz	R_g	-	0.8	-	Ω
Gate Leakage Current	V_{GS} = −10V / 20V, V_{DS} = 0V	I_{GSS}	-600	-	+600	nA
Input Capacitance	V_{DS} = 1000V, V_{GS} = 0V, f = 100MHz	C_{ISS}	-	45.7	-	nF
Reverse Transfer Capacitance		C_{OSS}	-	1.23	-	nF
Output Capacitance		C_{RSS}	-	0.22	-	nF

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SiC MOSFET CHARACTERISTICS						
Total Gate Charge	V_{DS} = 1000V, V_{GS} = −4V / 18V, I_D = 450A	Q_g	-	1536	-	nC
Gate−Source Charge		Q_{GS}	-	540	-	nC
Gate−Drain Charge		Q_{GD}	-	462	-	nC
Turn−on Delay Time	V_{DS} = 900V, I_{DS} = 600A V_{GS} = −4V / 18V, R_G = 4.7Ω Ls = Inductive load, T_J = 25°C	$T_{d(on)}$	-	162	-	ns
Rise Time		t_r	-	112	-	ns
Turn−off Delay Time		$T_{d(off)}$	-	556	-	ns
Fall Time		t_f	-	98	-	ns
Turn−on Switching Loss per Pulse		E_{ON}	-	50.7	-	mJ
Turn−off Switching Loss per Pulse		E_{OFF}	-	57.4	-	mJ
Turn−on Delay Time	V_{DS} = 900V, I_{DS} = 600A V_{GS} = −4V / 18V, R_G = 4.7Ω Ls = Inductive load, T_J = 150°C	$T_{d(on)}$	-	123	-	ns
Rise Time		t_r	-	93	-	ns
Turn−off Delay Time		$T_{d(off)}$	-	621	-	ns
Fall Time		t_f	-	113	-	ns
Turn−on Switching Loss per Pulse		E_{ON}	-	46.8	-	mJ
Turn−off Switching Loss per Pulse		E_{OFF}	-	62.3	-	mJ
Thermal Resistance, Junction to Case (MOSFET)	FET Thermal Resistance	R_{thJC}		0.052		°C/W
With thermal conductive grease	Contact thermal Resistance	R_{thCF}		0.015		°C/W

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SiC MOSFET CHARACTERISTICS						
Diode Forward Voltage	I_{SD} = 600A, T_J = 25°C	V_{SD}	-	5.6	5.9	V
	I_{SD} = 600A, T_J = 175°C		-	5.3		
Diode Reverse Recovery Charge	V_R = 600V, I_{SD} = 900A V_{GS} = −4V, R_G = 4.7Ω Ls = Inductive load,T_J = 25°C	Q_r	-	2.56		uC
Peak Reverse Recovery Current		T_{rr}	-	36		ns
Reverse Recovery Energy		E_{rr}	-	1.0		mJ
Diode Reverse Recovery Charge	V_R = 600V, I_{SD} = 900A V_{GS} = −4V, R_G = 4.7Ω Ls = Inductive load,T_J = 150°C	Q_r	-	13.95		uC
Peak Reverse Recovery Current		T_{rr}	-	125		ns
Reverse Recovery Energy		E_{rr}	-	8.1		mJ
THERMISTOR CHARACTERISTICS						
Rated Resistance		R_{25}	-	5.0	-	K Ω
Deviation of R_{100}	T_C = 100°C, R_{100} = 493.3Ω	ΔR/R	-5	-	5	%
Power Dissipation		P_{25}	-	-	20.0	mW
B-value	$R_2 = R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	$B_{25/50}$	-	3375	-	K
B-value	$R_2 = R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	$B_{25/80}$	-	3411	-	K

MODULE

Storage Temperature Range	T_{stg}	−40 to 150	°C
Module Operating Junction Temperature	T_J	−40 to 150	°C
Isolation Test Voltage, t = 1 s, 50 Hz	Viso	2500	V
Mounting torque to main terminals(M6 screw)	M_T	6.0	N.m
Mounting torque to main terminals(M5 screw)	M_H	6.0	N.m
Stray Inductance	L_{DS}	20	nH
Weight of Module	G	350	g

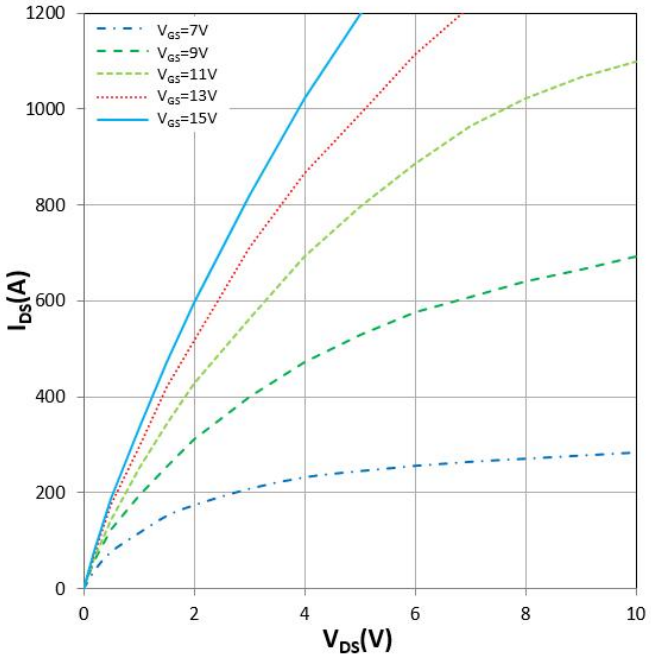


Figure 2. I_{DS} vs V_{DS}
T_j = 25°C, V_{GS} parameter

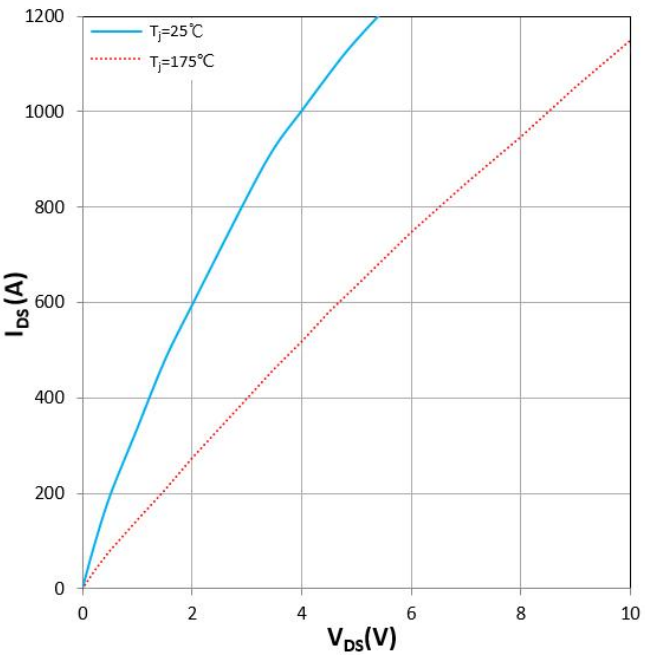


Figure 3. I_{DS} vs V_{DS}
V_{GS} = 15V, T_j parameter

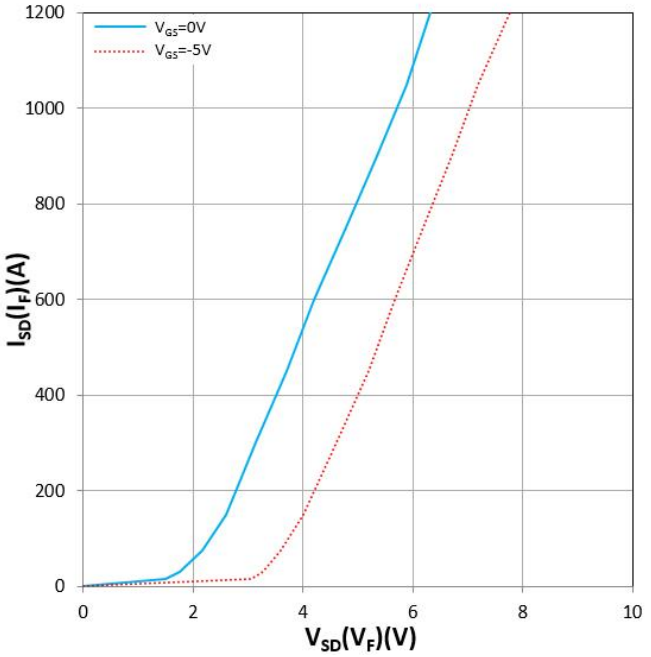


Figure 4. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$
T_j = 25°C, V_{GS} parameter

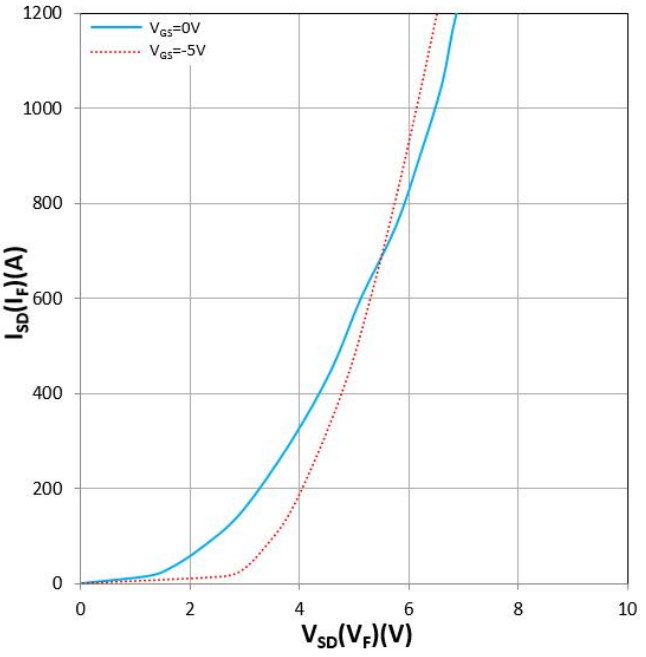


Figure 5. $I_{SD}(I_F)$ vs $V_{SD}(V_F)$
T_j = 175°C, V_{GS} parameter

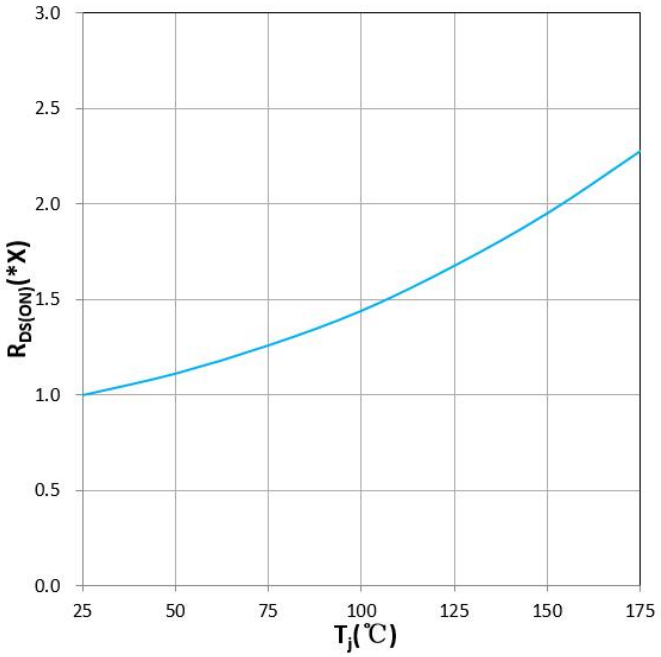


Figure 6. $R_{DS(ON)}$ vs T_j
V_{GS} = +15V, I_D = 600A, 1.0X = 3.4mΩ

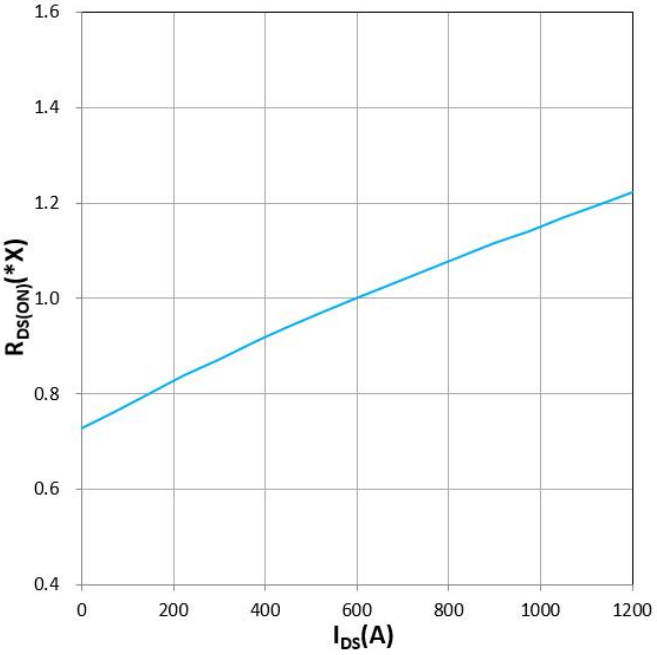


Figure 7. $R_{DS(ON)}$ vs I_{DS}
T_j = 25°C, V_{GS} = +15V, 1.0X = 3.4mΩ

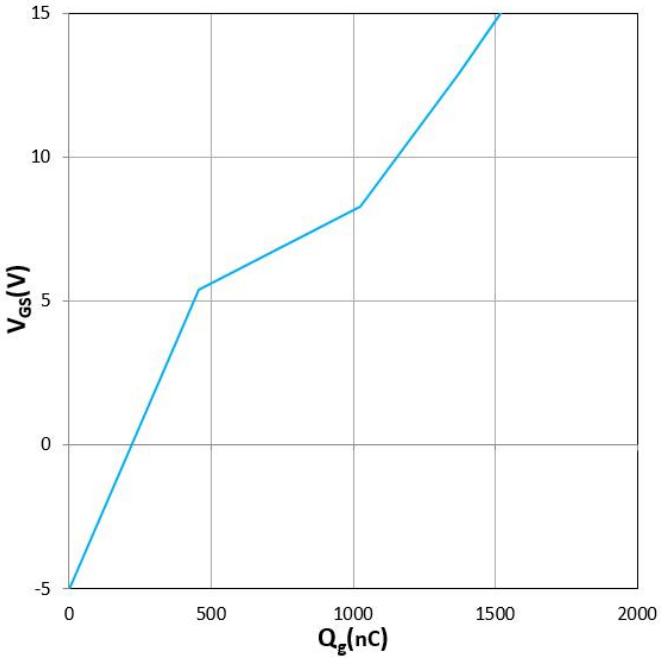


Figure 8. V_{GS} vs Qg
T_j = 25°C, V_{DS} = 1000V, I_D = 450A

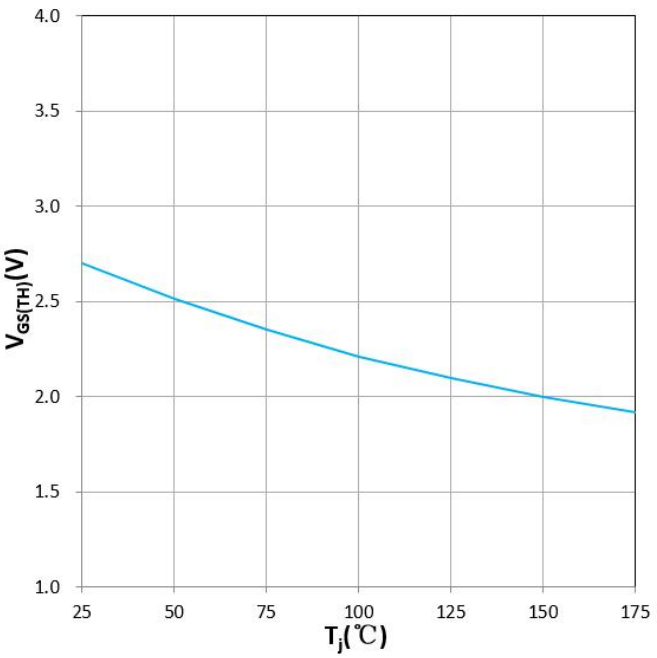


Figure 9. $V_{GS(TH)}$ vs T_j
V_{GS} = V_{DS}, I_D = 360mA

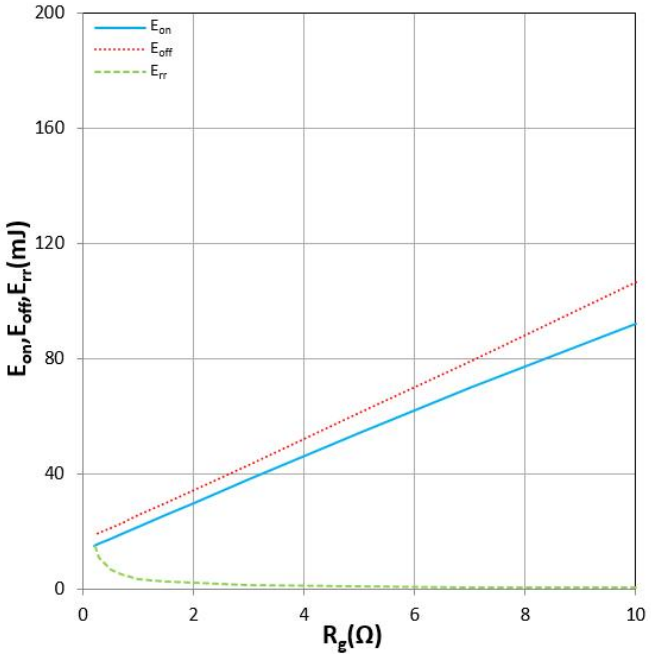


Figure 10. Eon,Eoff,Err vs Rg
T_j = 25°C, V_{DD} = 900V, V_{GS} = +15V/-5V, I_D = 600A
Inductive Load

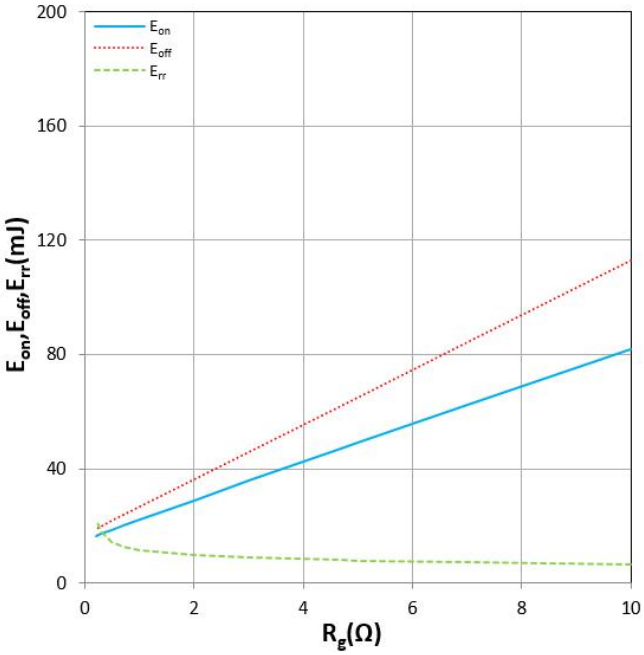


Figure 11. Eon,Eoff,Err vs Rg
T_j = 150°C, V_{DD}= 900V, V_{GS} = +15V/-5V, I_D= 600A
Inductive Load

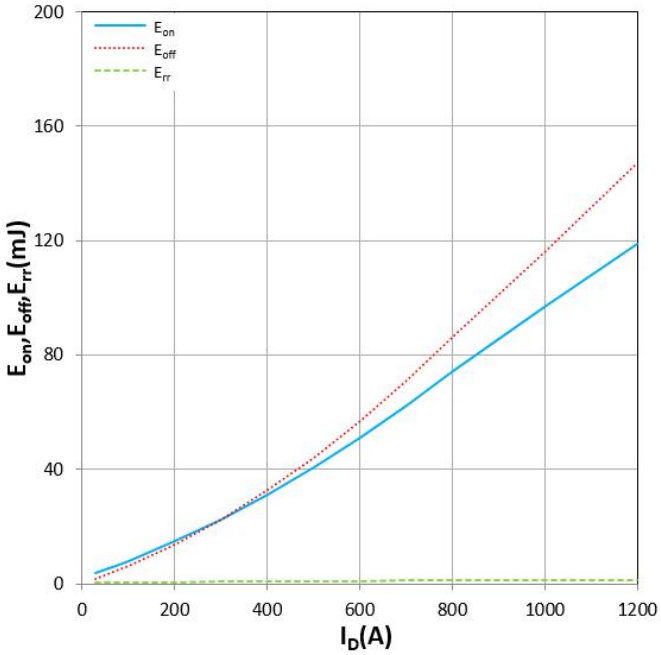


Figure 12. Eon,Eoff,Err vs ID
T_j = 25°C, V_{DD} = 900V, V_{GS} = +15V/-5V, R_g = 4.7Ω
Inductive Load

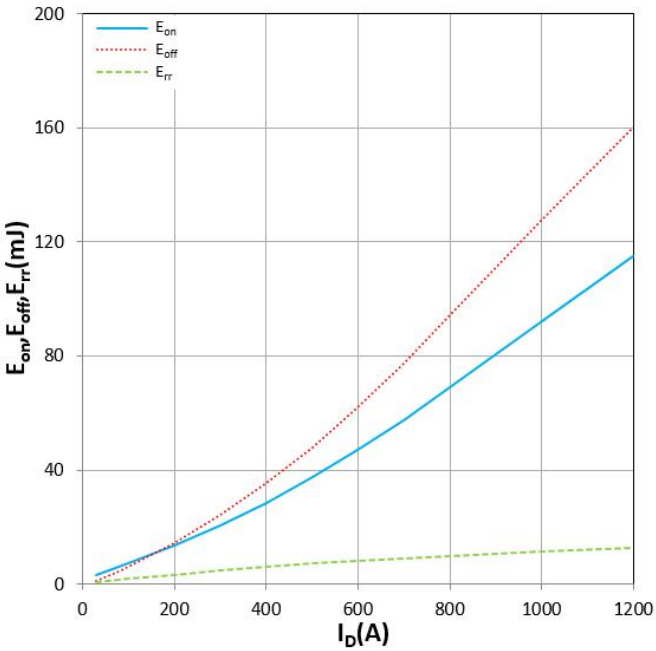
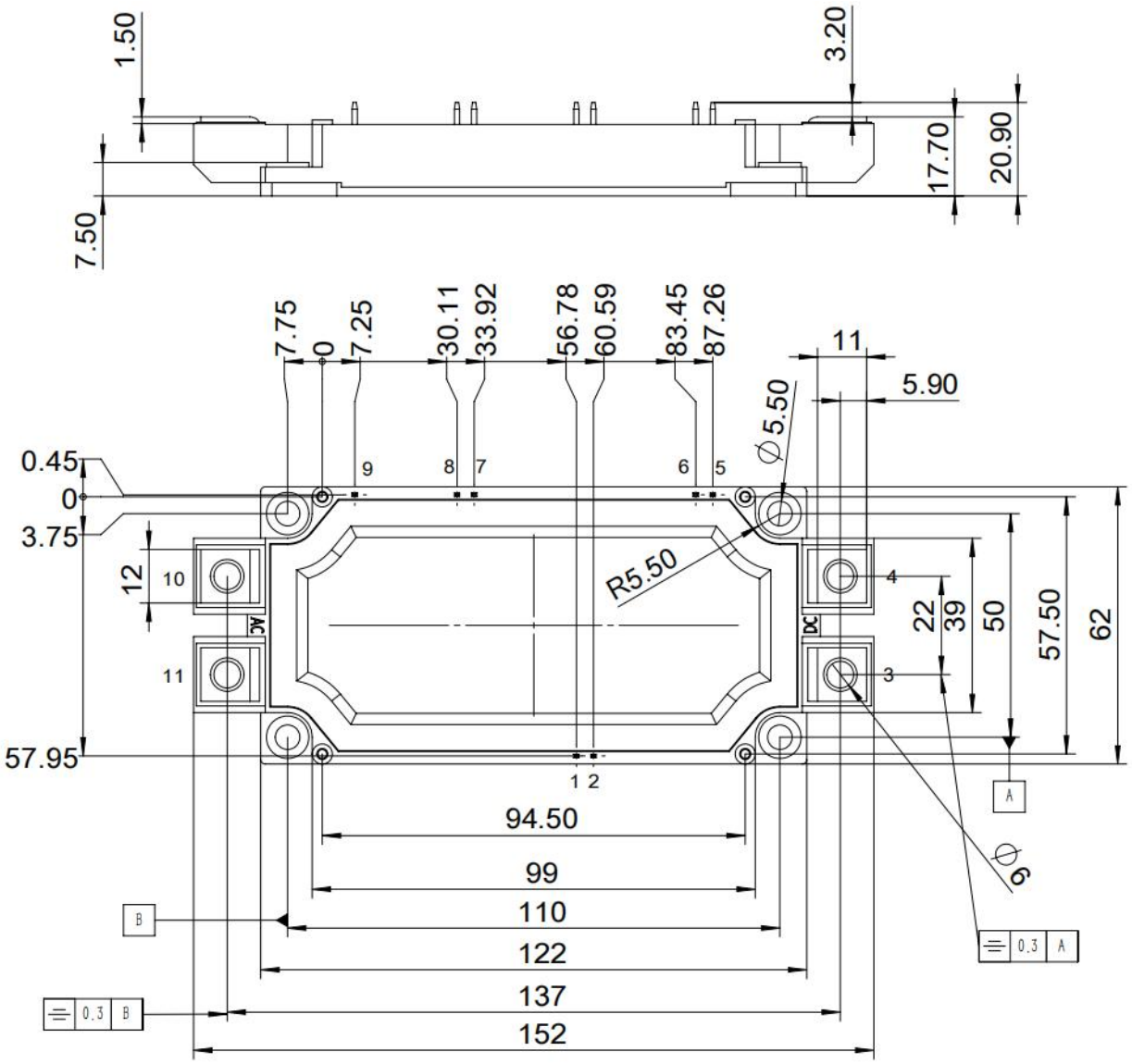


Figure 13. Eon,Eoff,Err vs ID
T_j = 150°C, V_{DD} = 900V, V_{GS} = +15V/-5V, R_g = 4.7Ω
Inductive Load

Package Drawing



UNIT:mm