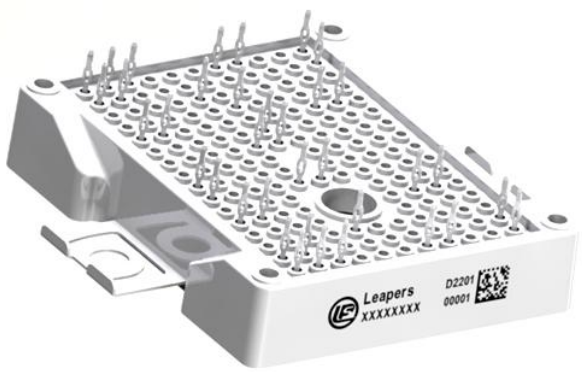
DFS06HF12EZT1

1200V/5.5mΩ Half Bridge SiC MOSFET Module

Description

The DFS06HF12EZT1 is a Half Bridge SiC MOSFET half bridge Power Module. It integrates high performance SiC MOSFET chips designed for the applications such as Solar Inverter Systems, UPS, DC/DC converter.



Features

- Blocking voltage:1200V
- $R_{DS(on)}$=5.5mΩ / T_j =25°C, V_{GS} =18V
- Low $R_{DS(on)}$/ low Switching Losses
- Low inductance design
- Zero reverse recovery from diodes
- Low diode forward voltage
- Integrated NTC temperature sensor
- Press-FIT contact technology
- Si_3N_4 ceramic substrate

Applications

- Solar inverter Systems
- DC/DC converter
- EV Chargers
- UPS applications

Circuit diagram

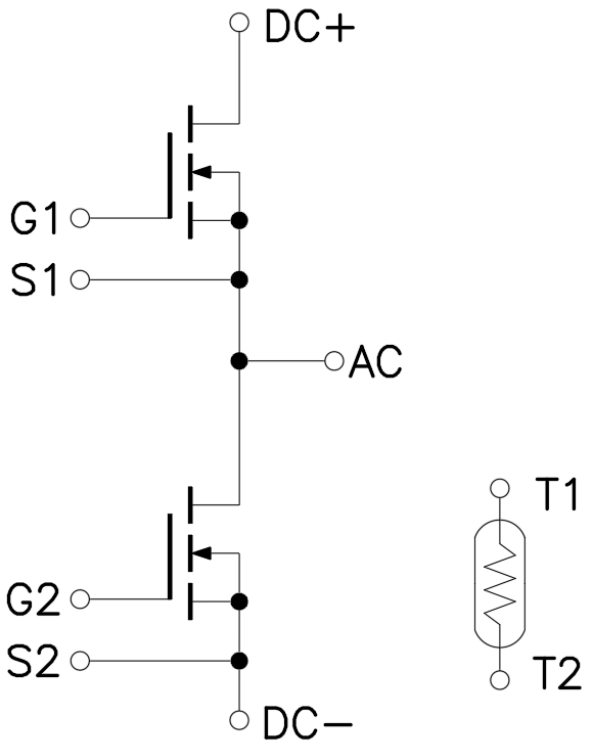


Figure 1. Out drawing & circuit diagram for DFS06HF12EZT1

Pin Configuration and Function Description

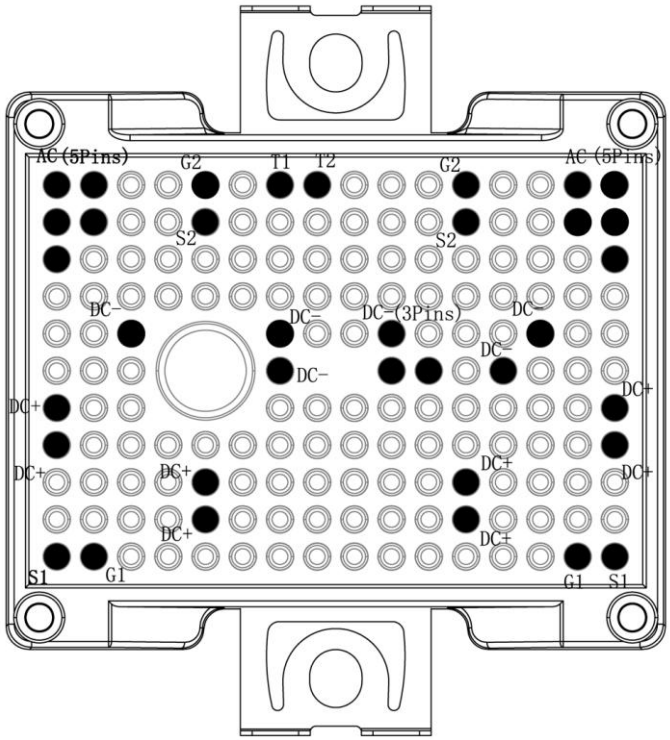


Figure 2. Pin configuration

PIN No.	Symbol	Description
1-5(5pins)	AC	Output terminal of half bridge
6	S2	Low side source signal terminal
7	G2	Low side gate signal terminal
8	TH1	Thermistor connection 1
9	TH2	Thermistor connection 2
10	S2	Low side source signal terminal
11	G2	Low side gate signal terminal
12-16(5pins)	AC	Output terminal of half bridge
17-24(8pins)	DC –	DC – Bus connection
25-32(8pins)	DC +	DC + Bus connection
33	S1	High side source signal terminal
34	G1	High side gate signal terminal
35	G1	High side gate signal terminal
36	S1	High side source signal terminal

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}	G-S Voltage	D-S Short, Note1	10 to 25	V
I_{DS}	DC Continuous Drain Current	T_C=80°C	240	A
I_{DP}	Drain Pulse Current, Peak	Less than 1ms, Note2	480	A
P_{tot}	Total Power Dissipation	T_C =25°C	782	W
T_{jmax}	Max Junction Temperature	-	175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

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

Note2: Pulse width limited by maximum junction temperature

Module

Parameter	Conditions	Value	Unit
Isolation voltage	RMS, f =50Hz, t =1min	3	kV
Internal isolation	basic insulation	Si_3N_4	
Clearance	Terminal to Terminal	5	mm
	Terminal to Heatsink	10	mm
Creepage distance	Terminal to Terminal	6.3	mm
	Terminal to Heatsink	12.7	mm
Stray inductance	-	7	μH
Comparative Tracking Index	-	200	-
Mounting force	-	40~80	N
Weight	-	40	g

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Resistance	T_C =25°C	-	5	-	k
ΔR/R	Deviation of R100	T_C =100°C, R_{100} =493	-5	-	5	%
P_{25}	Power dissipation	T_C =25°C	-	-	20	mW
$B_{25/50}$	B-value	R2 =R_{25} exp [$B_{25/50}$(1/T_2 - 1/(298,15 K))]	-	3375	-	K
$B_{25/80}$	B-value	R2 =R_{25} exp [$B_{25/80}$(1/T_2 - 1/(298,15 K))]	-	3411	-	K
$B_{25/100}$	B-value	R2 =R_{25} exp [$B_{25/100}$(1/T_2 - 1/(298,15 K))]	-	3433	-	K

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 =1mA		1200	-	-	V
I_{DSS}	Zero gate voltage drain Current	V_{DS} =1200V, V_{GS} =0V, T_j =25°C		-	6	120	μA
$V_{GS(th)}$	Gate-source threshold Voltage	I_D =78mA, V_{DS} =V_{GS}	T_j =25°C	3.0	4.0	5.0	V
I_{GSS+}	Gate-Source Leakage Current	V_{GS} =25V, V_{DS} =0V	T_j =25°C			0.6	nA
I_{GSS-}		V_{GS} =-10V, V_{DS} =0V	T_j =25°C			0.6	
$R_{DS(on)}$ (Include Thermal)	Static drain-source On-state resistance	I_D =240A, V_{GS} =18V	T_j =25°C	-	5.5	7.50	mΩ
			T_j =175°C	-	10.0	-	
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D =240A, V_{GS} =18V	T_j =25°C	-	5.0	6.90	mΩ
			T_j =175°C	-	8.5	-	
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	I_D =240A, V_{GS} =18V	T_j =25°C	-	1.20	-	V
			T_j =175°C	-	2.04	-	
C_{iss}	Input Capacitance	V_{DS} =800V, V_{GS} =0V, f =100kHz		-	17.6	-	nF
C_{oss}	Output Capacitance			-	0.9	-	nF
C_{rss}	Reverse transfer Capacitance			-	0.03	-	nF
Eoss	Coss stored energy	V_{DS} =800V, V_{GS} =0V			340.8		mJ
Q_g	Total gate charge	V_{DS} =800V, I_D =240A, V_{GS} =+18/-4V		-	492	-	nC
R_{gint}	Internal gate resistor	f =1MHz		-	0.37	-	
$t_{d(on)}$	Turn-on delay time	V_{DS} =800V, I_D =240A, V_{GS} =+18/-4V, $R_{G(ON)}$ =2.2Ω, $R_{G(OFF)}$ =2.2Ω, Inductive load switching operation	T_j =25°C	-	46.5	-	ns
			T_j =150°C	-	40.5	-	
t_r	Rise time		T_j =25°C	-	22.0	-	ns
			T_j =150°C	-	17.5	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	53.0	-	ns
			T_j =150°C	-	63.5	-	
t_f	Fall time		T_j =25°C	-	25.5	-	ns
			T_j =150°C	-	25.6	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	7.4	-	mJ
			T_j =150°C		5.7		
E_{off}	Turn-off power dissipation		T_j =25°C	-	1.8	-	
			T_j =150°C		1.7		
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case		-	0.09	-	K/W
$R_{th(c-f)}$	Contact thermal Resistance	With thermal conductive grease, Note3		-	0.10	-	K/W

Note3:Assumes Thermal Conductivity of grease is 2.8 W/m・K and thickness is 50um.

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

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_{SD}	Body Diode Forward Voltage	V_{GS} =-4V I_{SD} =240A	T_j =25°C	-	1.90	-	V
			T_j =175°C	-	3.30	-	
T_{rr}	Reverse recovery time	V_{DD} =800V，I_D =240A V_{GS} =+18/-4V $R_{G(ON)}$ =2.2Ω $R_{G(OFF)}$ =2.2Ω Inductive load switching operation	T_j =25°C	-	16.7	-	ns
			T_j =150°C	-	16.5	-	
Q_{rr}	Reverse recovery charge		T_j =25°C	-	1.6	-	μC
			T_j =150°C	-	1.9	-	
I_{rrm}	Peak Reverse Recovery Current		T_j =25°C	-	163.0	-	A
			T_j =150°C	-	197.0	-	
E_{rr}	Reverse recovery energy		T_j =25°C	-	160.0	-	μJ
			T_j =150°C	-	258.0	-	

Test Conditions

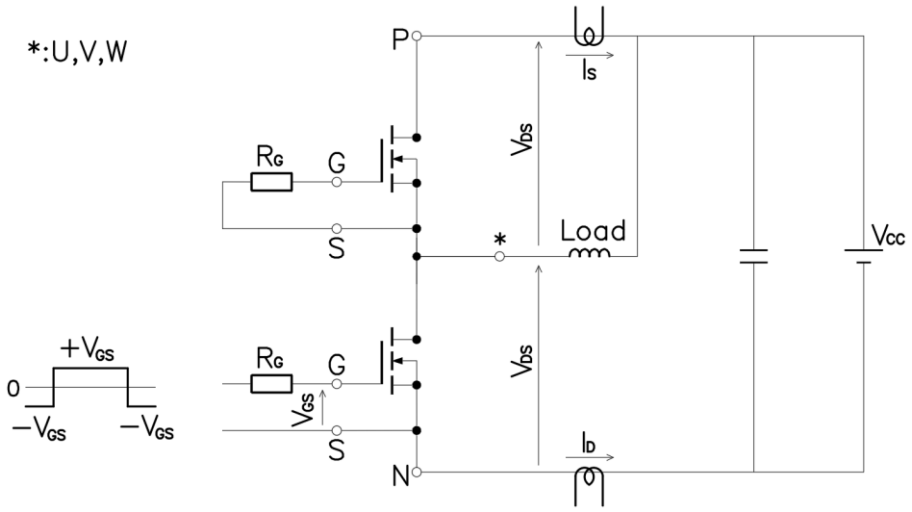


Figure 3. Switching time measure circuit

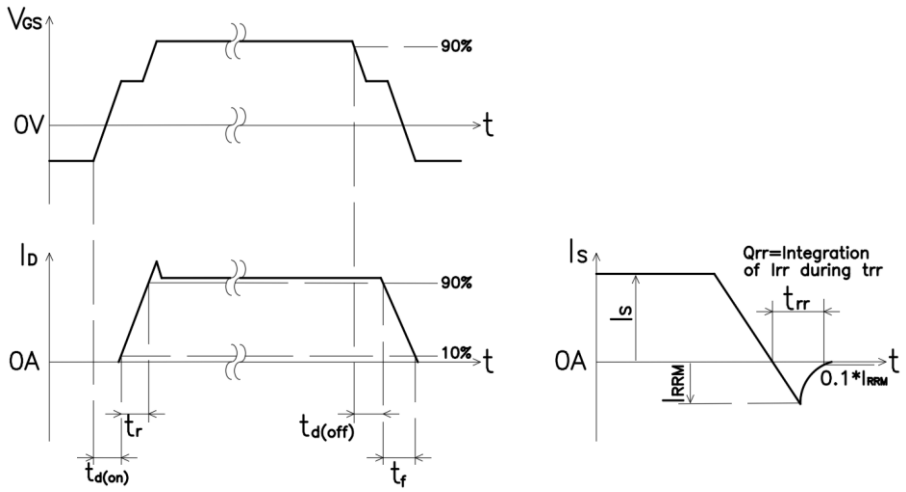


Figure 4. Switching time definition

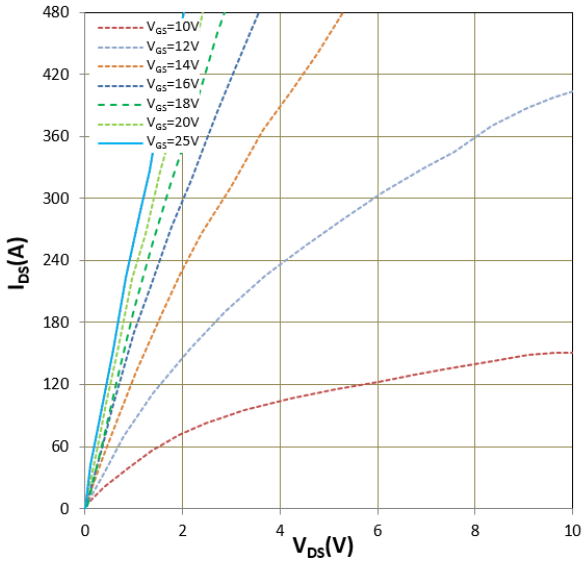


Figure 5. I_{DS} vs V_{DS}
T_j =25°C

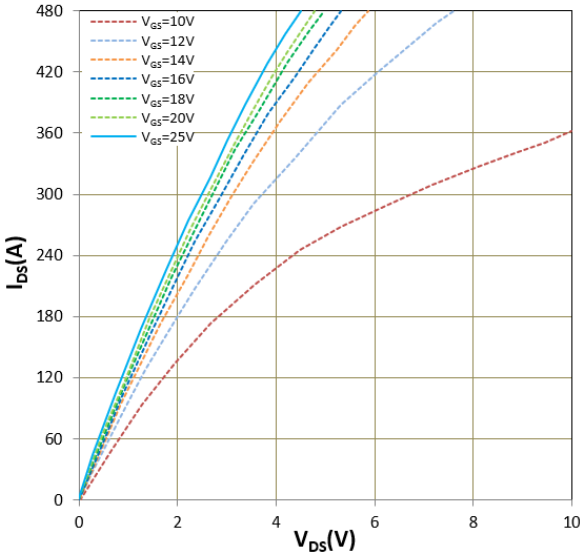


Figure 6. I_{DS} vs V_{DS}
T_j =175°C

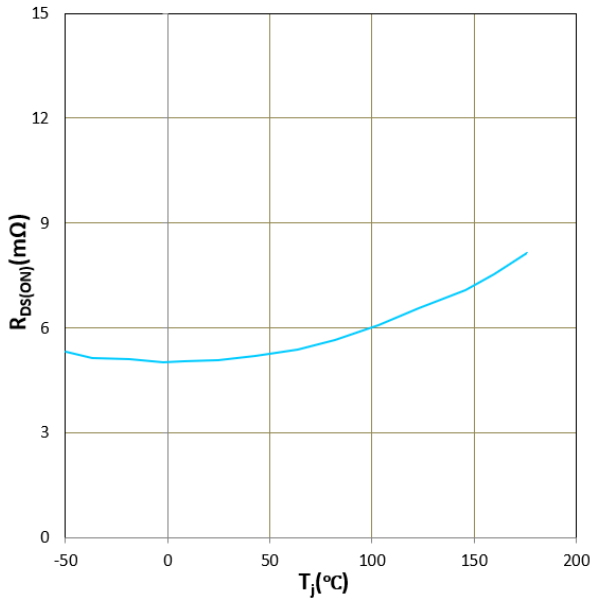


Figure 7. $R_{DS(ON)}$ vs T_j
I_D =240A, V_{GS} =+18V

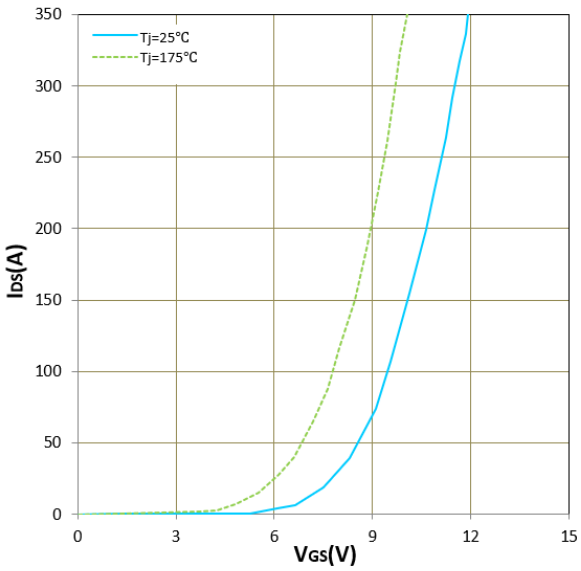


Figure 8. I_{DS} vs V_{GS}

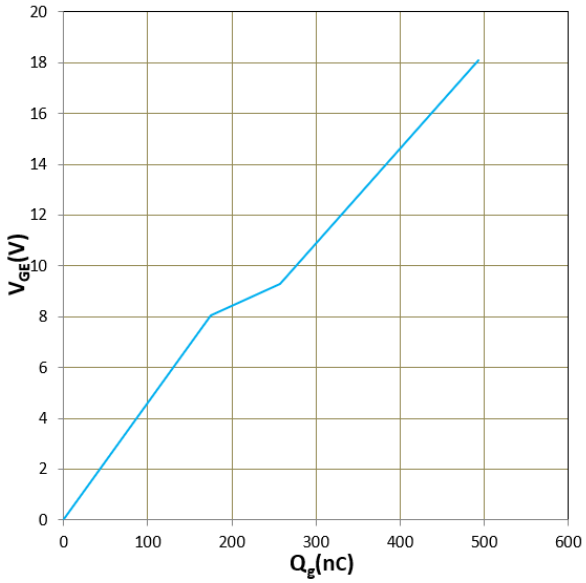


Figure 9. V_{GS} vs Q_g
T_j =25°C, V_{DS} =800V, I_D =240A

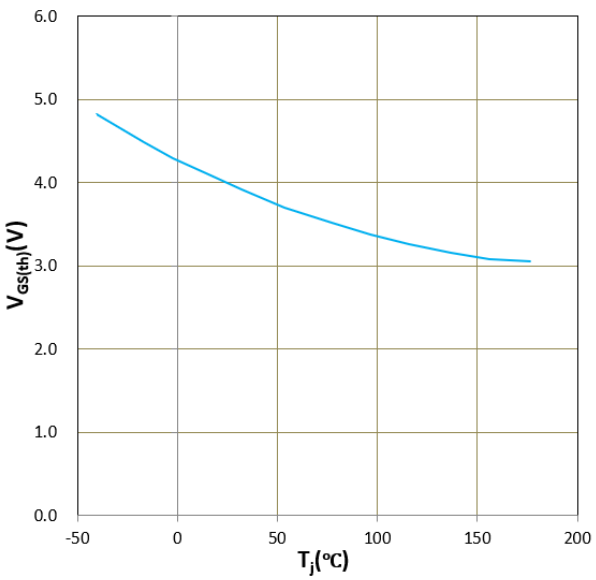


Figure 10. $V_{GS(th)}$ vs T_j
V_{GS} =V_{DS}, I_D =78mA

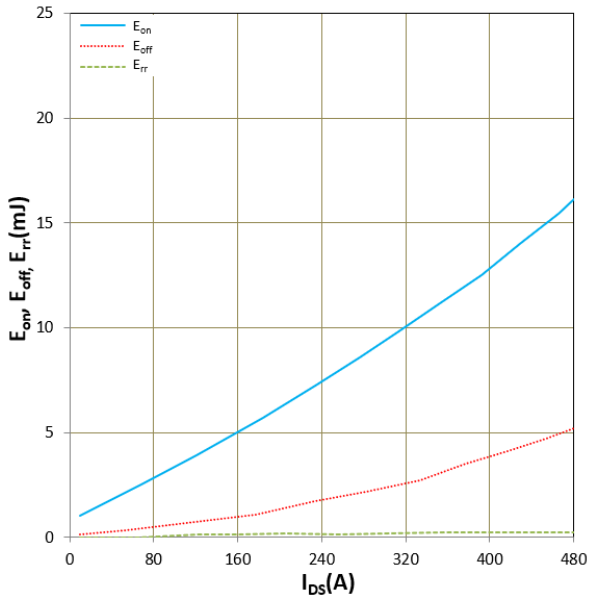


Figure 11. E_{on}, E_{off}, E_{rr} vs I_{DS}
T_j =25°C, V_{DS} =800V, V_{GS}=18/-4V,
$R_{G(on)}$/ $R_{G(off)}$=2.2Ω

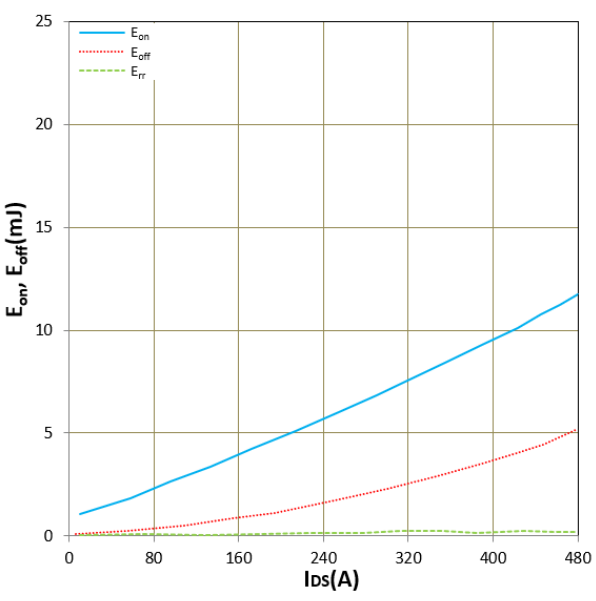


Figure 12. E_{on}, E_{off}, E_{rr} vs I_{DS}
T_j =150°C, V_{DS} =800V, V_{GS}=18/-4V,
$R_{G(on)}$/ $R_{G(off)}$=2.2Ω

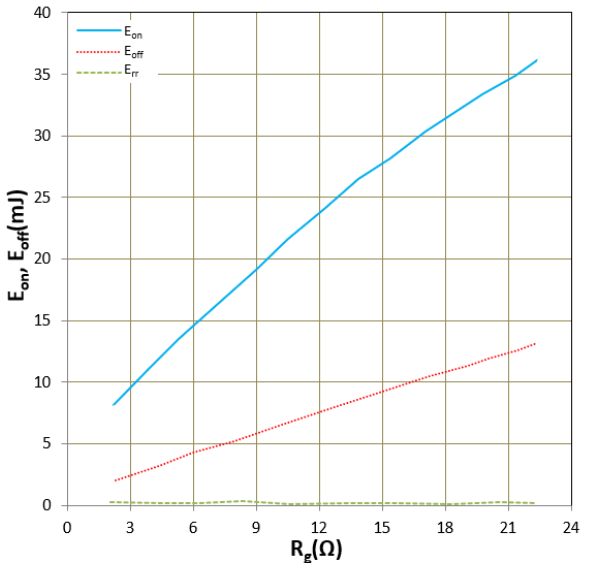


Figure 13. E_{on}, E_{off}, E_{rr} vs I_{DS}
T_j =25°C, V_{DS} =800V, I_D =240A

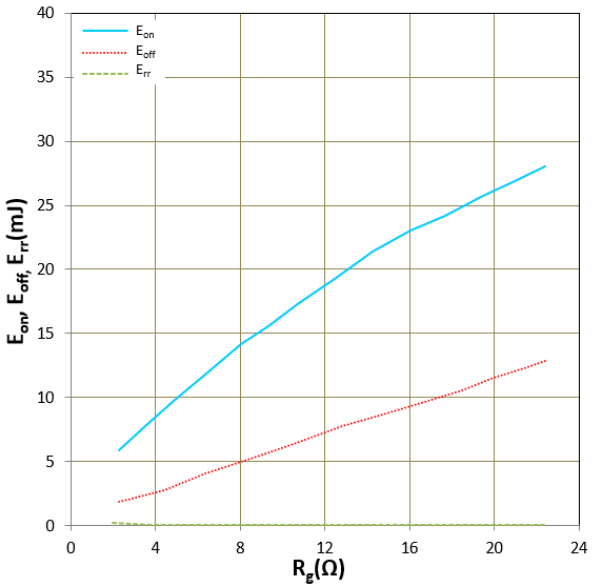
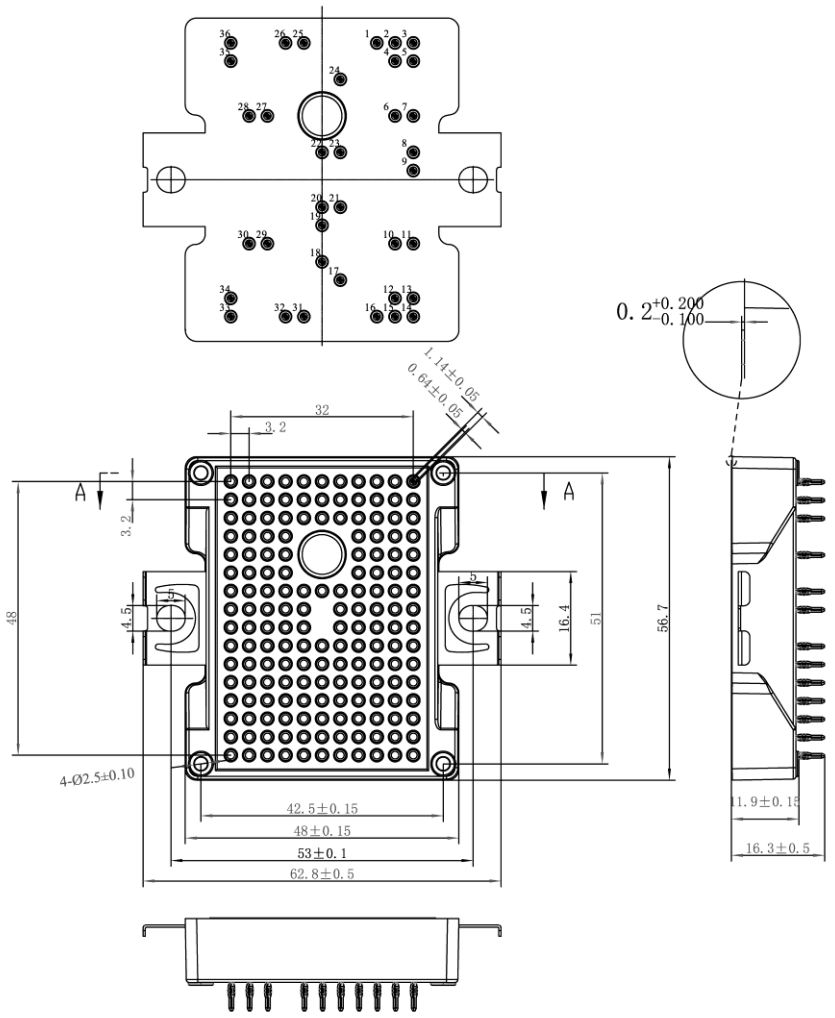


Figure 14. E_{on}, E_{off}, E_{rr} vs I_{DS}
T_j =150°C, V_{DS} =800V, I_D =240A

Package dimensions



Pin	X	Y
1	25,6	48
2	28,8	48
3	32	48
4	28,8	44,8
5	32	44,8
6	28,8	35,2
7	32	35,2
8	32	28,8
9	32	25,6
10	28,8	12,8
11	32	12,8
12	28,8	3,2
13	32	3,2
14	32	0
15	28,8	0
16	25,6	0
17	19,2	6,4
18	16	9,6
19	16	16
20	16	19,2
21	19,2	19,2
22	16	28,8
23	19,2	28,8
24	19,2	41,6
25	12,8	48
26	9,6	48
27	6,4	35,2
28	3,2	35,2
29	6,4	12,8
30	3,2	12,8
31	12,8	0
32	9,6	0
33	0	0
34	0	3,2
35	0	44,8
36	0	48

Unit: mm

IMPORTANT NOTICE

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The data contained in this document is exclusively intended for technically trained staff. You and your technical departments will have to evaluate the product's suitability for the intended application and the completeness of the product data concerning such application.

Due to technical requirements, our product may contain dangerous substances. For information on the types in question, please contact the sales staff responsible for you.

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