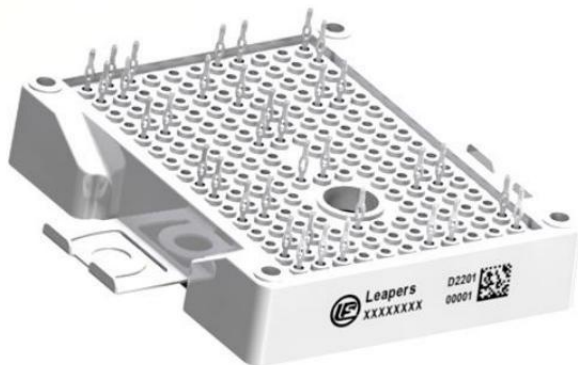


Description

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
- $R_{DS(on)}=5.5m\Omega$ / $T_j=25^{\circ}C$, $V_{GS}=18V$
- 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

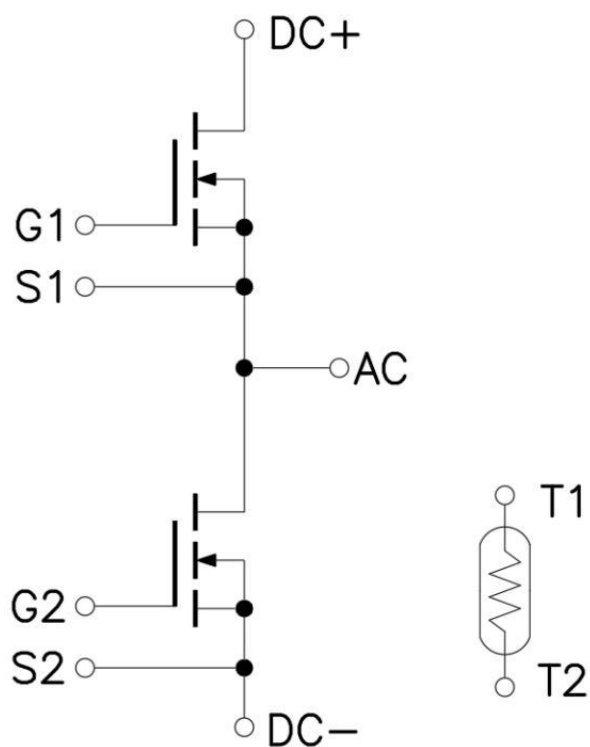


Figure 1. Out drawing & circuit diagram for DFS06HF12EZT1

Pin Configuration and Function Description

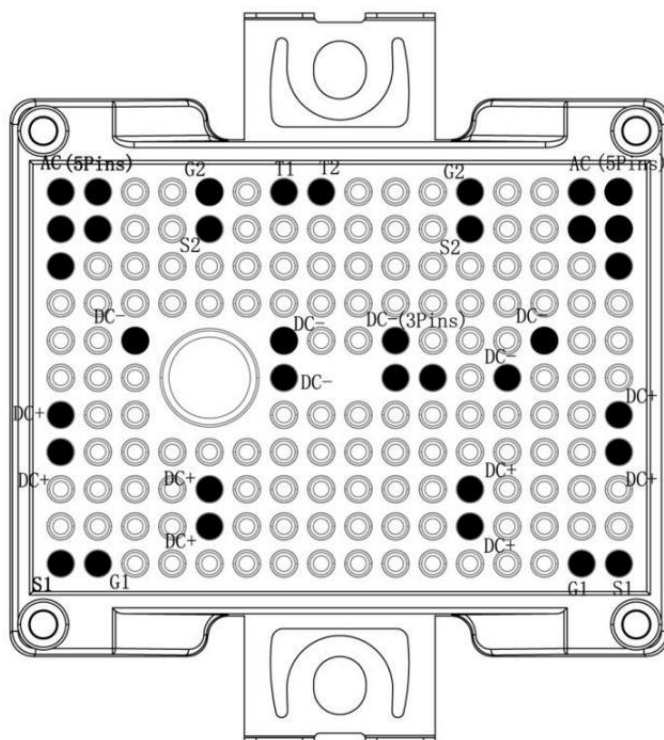


Figure 2. Pin configuration

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 halfbridge
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 ₃ N 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 R ₁₀₀	T _C =100°C, R ₁₀₀ =493	-5	-	5	%
P ₂₅	Power dissipation	T _C =25°C	-	-	20	mW
B _{25/50}	B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$	-	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

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	I _D =240A V _{GS} =18V	T _j =25°C	-	5.5	7.50	mΩ	
	On-state resistance		T _j =175°C	-	10.0	-		
R _{DS(on)} (Chip)	Static drain-source	I _D =240A V _{GS} =18V	T _j =25°C	-	5.0	6.90	mΩ	
	On-state resistance		T _j =175°C	-	8.5	-		
V _{DS(on)} (Chip)	Static drain-source	I _D =240A V _{GS} =18V	T _j =25°C	-	1.20	-	V	
	On-state Voltage		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	
E _{oss}	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	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

		Inductive load switching operation	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	T _j =25°C	-	1.90	-	V	
		I _{SD} =240A	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

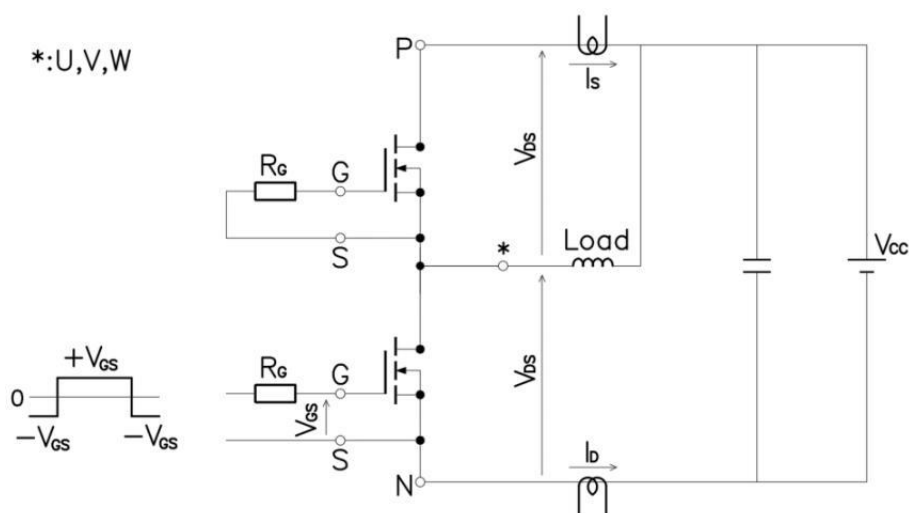


Figure 3. Switching time measure circuit

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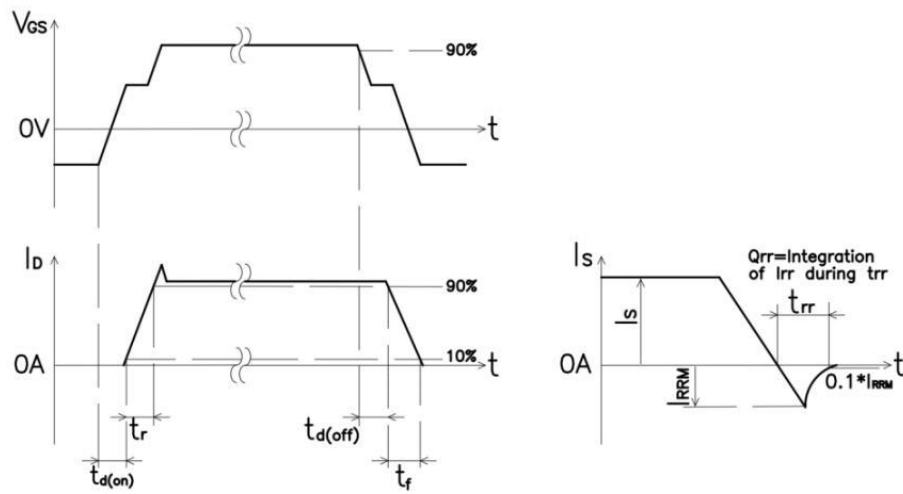


Figure 4. Switching time definition

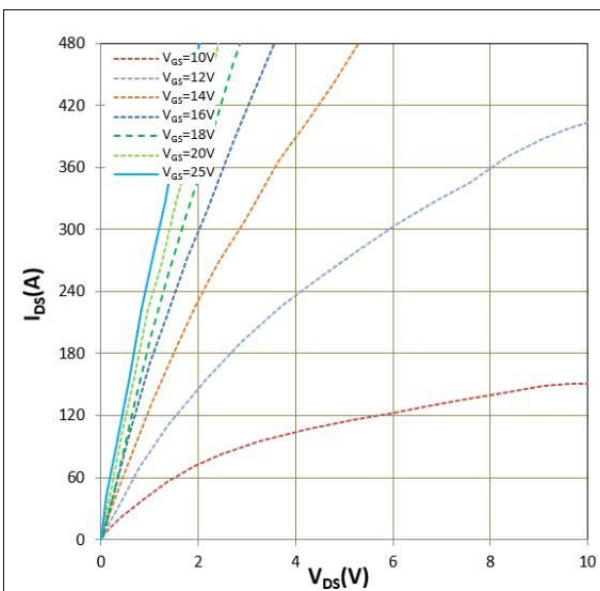


Figure 5. I_{DS} vs V_{DS}
 $T_j = 25^\circ\text{C}$

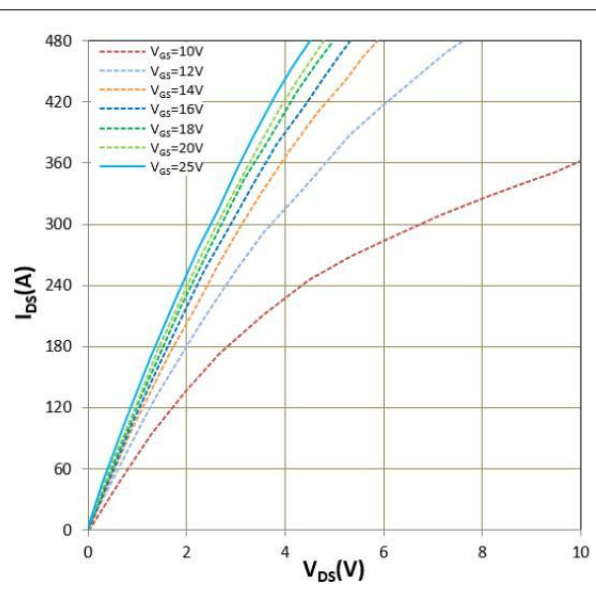


Figure 6. I_{DS} vs V_{DS}
 $T_j = 175^\circ\text{C}$

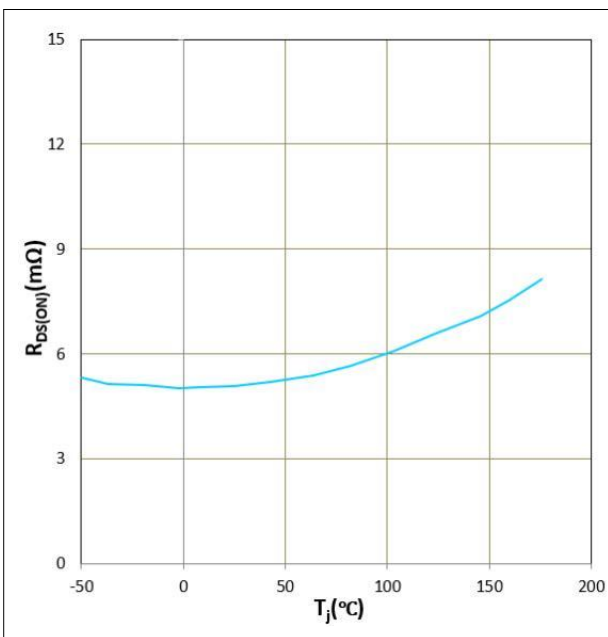


Figure 7. $R_{DS(ON)}$ vs T_j
 $I_D = 240A$, $V_{GS} = +18V$

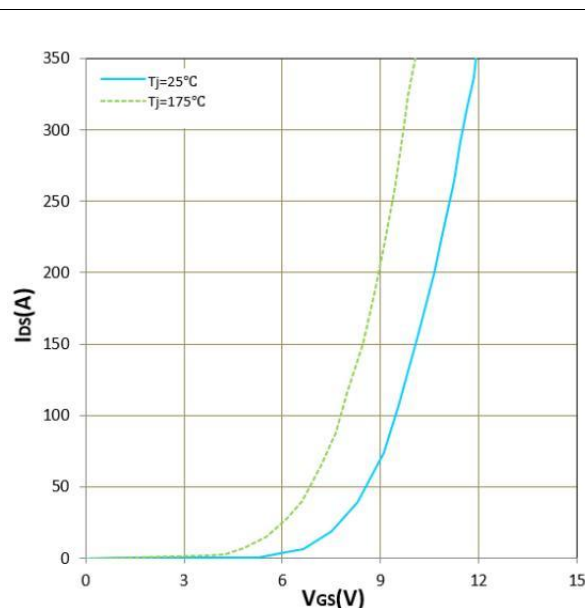


Figure 8. I_{DS} vs V_{GS}

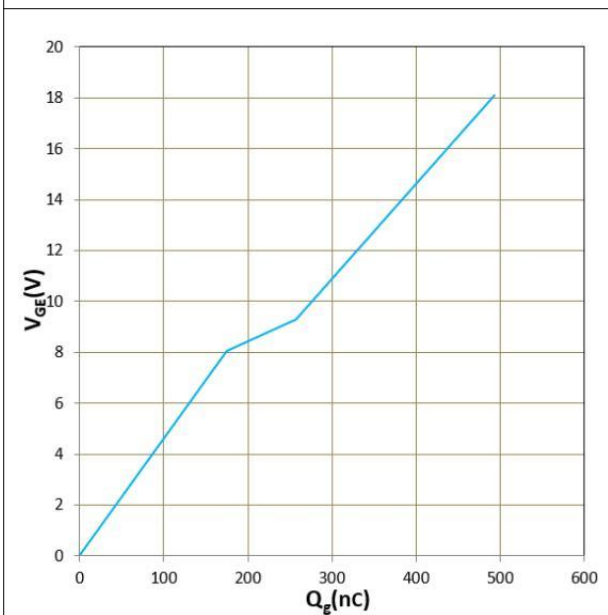


Figure 9. V_{GS} vs Q_g
 $T_j = 25^{\circ}C$, $V_{DS} = 800V$, $I_D = 240A$

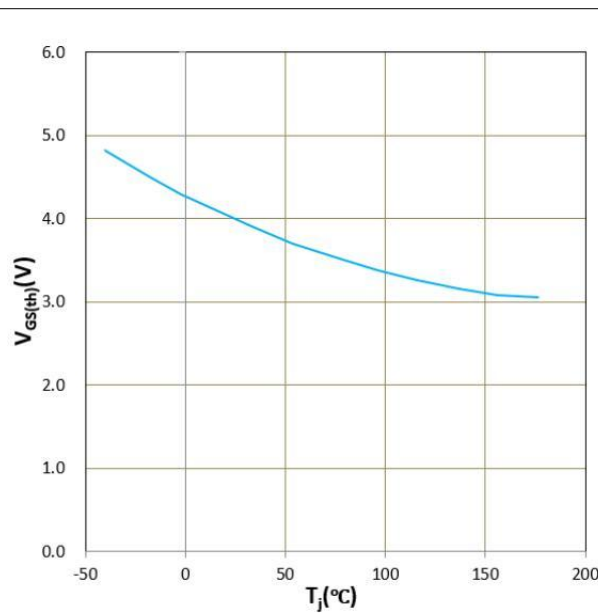


Figure 10. $V_{GS(th)}$ vs T_j
 $V_{GS} = V_{DS}$, $I_D = 78mA$

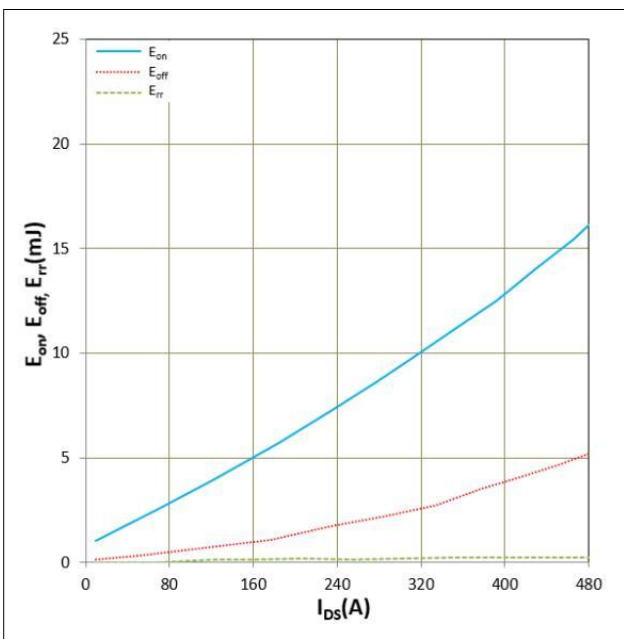


Figure 11. E_{on} , E_{off} , E_{rr} vs I_{DS}
 $T_j = 25^{\circ}\text{C}$, $V_{DS} = 800\text{V}$, $V_{GS} = 18/-4\text{V}$,
 $R_{G(on)}/R_{G(off)} = 2.2\Omega$

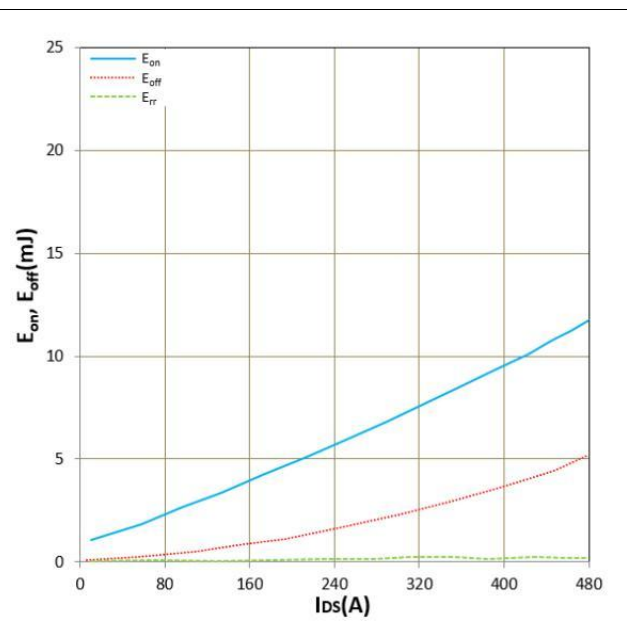


Figure 12. E_{on} , E_{off} , E_{rr} vs I_{DS}
 $T_j = 150^{\circ}\text{C}$, $V_{DS} = 800\text{V}$, $V_{GS} = 18/-4\text{V}$,
 $R_{G(on)}/R_{G(off)} = 2.2\Omega$

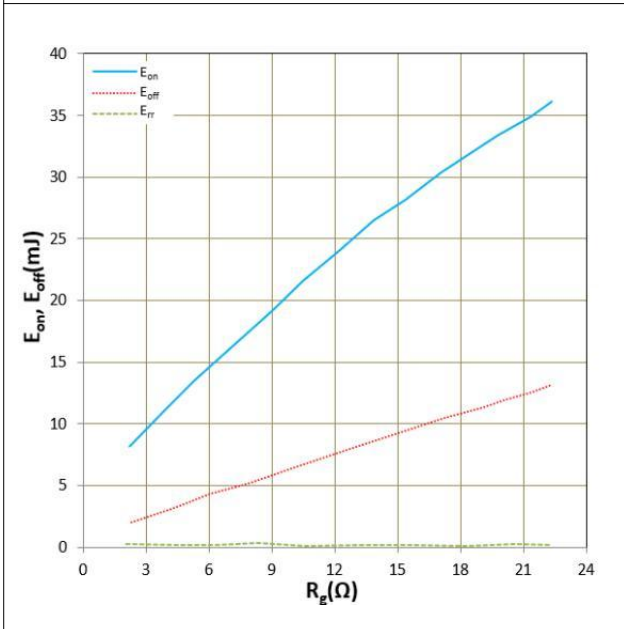


Figure 13. E_{on} , E_{off} , E_{rr} vs I_{DS}
 $T_j = 25^{\circ}\text{C}$, $V_{DS} = 800\text{V}$, $I_D = 240\text{A}$

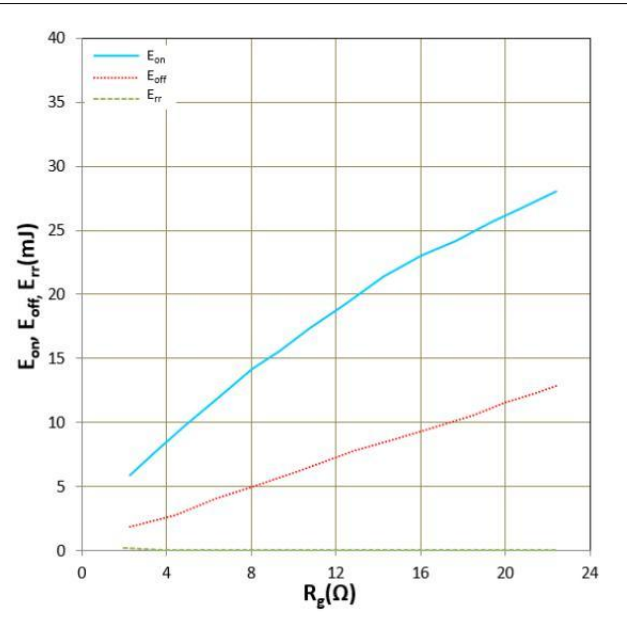
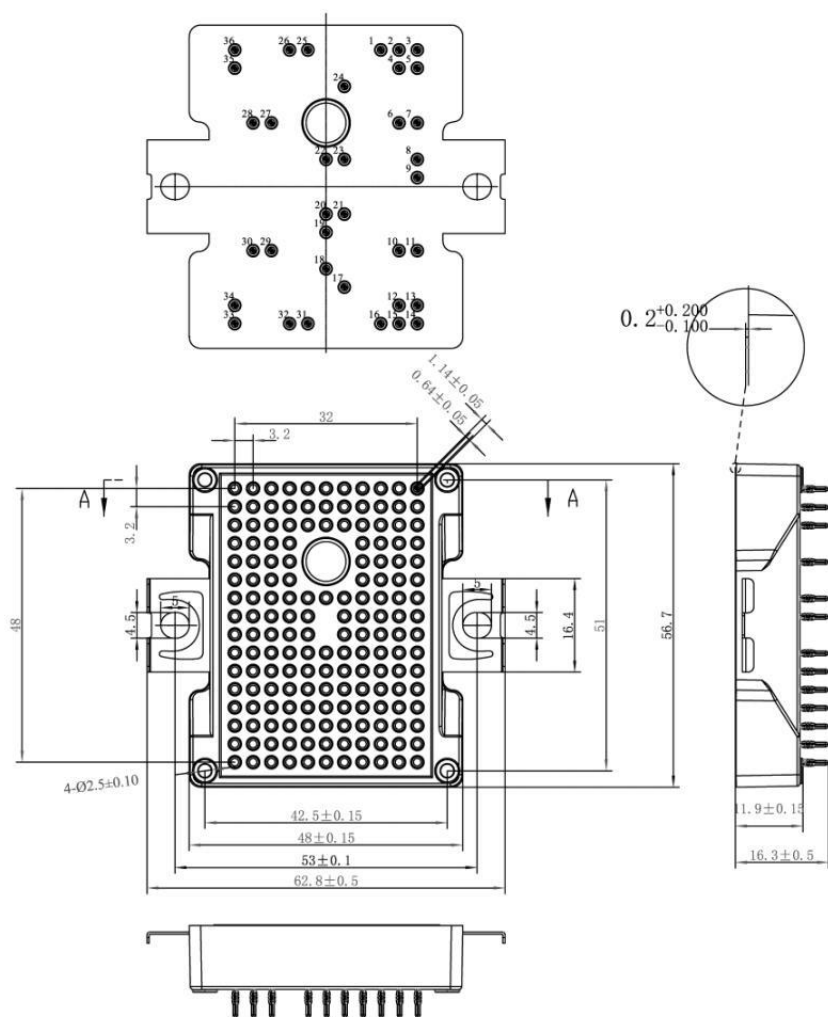


Figure 14. E_{on} , E_{off} , E_{rr} vs I_{DS}
 $T_j = 150^{\circ}\text{C}$, $V_{DS} = 800\text{V}$, $I_D = 240\text{A}$

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

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