

HCS06FH120E1C1

1200V/6.2mΩ Half Bridge SiC MOSFET Module

Description

The HCS06FH120E1C1 is a half bridge SiC MOSFET Power Module. It integrates high performance SiC MOSFET chips designed for the applications such as Solar Inverter Systems, Fuel cell-DC/DC converter, Uninterruptible Power Supplier, Energy Storage Systems.



Features

- Blocking voltage:1200V
- $R_{ds(on)}$:6.2mΩ @25°C;10.3mΩ @175°C
- Low Switching Losses
- 175°C maximum junction temperature
- Si₃N₄AMB
- Thermistor inside

Applications

- Solar inverter Systems
- Fuel cell-DC/DC converter
- Uninterruptible Power Supplier
- Energy Storage Systems
- Solid State Relay

Circuit diagram

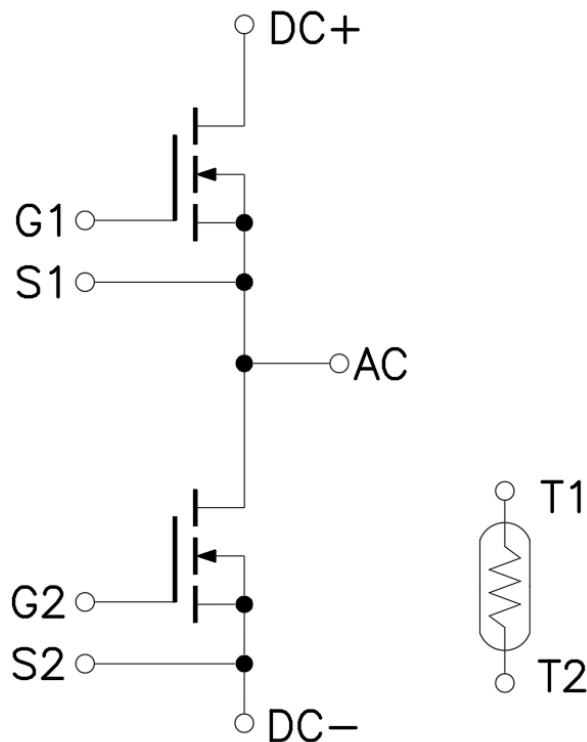


Figure 1. Out drawing & circuit diagram for HCS06FH120E1C1

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Pin Configuration and Marking Information

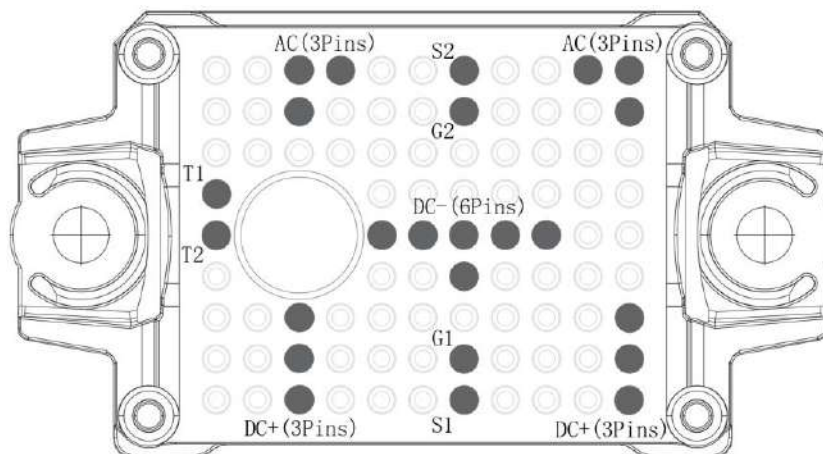


Figure 2. Pin configuration

Symbol	Description
AC	Output terminal of half bridge
S2	Low side source signal terminal
G2	Low side gate signal terminal
DC+	DC+ Bus connection
DC-	DC- Bus connection
S1	High side source signal terminal
G1	High side gate signal terminal
T1	Thermistor connection 1
T2	Thermistor connection 2

Module

Parameter	Condition	Value	Unit
Isolation voltage	RMS, f =50Hz, t =1min	3.4	kV
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
Comparative Tracking Index	-	600	-
Weight	-	26	g

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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, Note1	-10 to 22	V
I _{DS}	DC Continuous Drain Current	T _f =95°C, Note2	150	A
I _{SD}	Source (Body diode) Current	T _f =95°C, with ON signal	150	A
I _{DP}	Drain Pulse Current, Peak	Less than 1ms, Note3	300	A
T _{jop}	Operation junction temperature	-	-40 to 175	°C
T _{stg}	Storage temperature	-	-40 to 125	°C

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

Note2: Case temperature(T_c) is defined on the surface of base plate just under the chips.

Note3: 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
R/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

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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 =200μA		1200	-	-	V	
I _{DSS}	Zero gate voltage drain current	V _{DS} =1200V, V _{GS} =0V		-	5	-	μA	
V _{GS(th)}	Gate-source threshold voltage	I _D =40mA, V _{DS} =V _{GS}		2.1	2.7	-	V	
I _{GSS+}	Gate-Source Leakage Current	V _{GS} =22V, V _{DS} =0V, T _j =25°C		-	-	200	nA	
I _{GSS-}		V _{GS} =-10V, V _{DS} =0V, T _j =25°C		-	-	-200	nA	
R _{DS(on)} (Chip)	Static drain-source On-state resistance	I _D =150A V _{GS} =+18V	T _j =25°C T _j =175°C	-	6.2 10.3	-	mΩ mΩ	
V _{DS(on)} (Chip)	Static drain-source On-state voltage	I _D =150A V _{GS} =+18V	T _j =25°C T _j =175°C	-	0.93 1.55	-	V V	
C _{iss}	Input capacitance	V _D =800V, V _{GS} =0V, f =100kHz, V _{AC} =25mV		-	14.4	-	nF	
C _{oss}	Output capacitance			-	0.4	-	nF	
C _{rss}	Reverse transfer capacitance			-	0.03	-	nF	
Q _G	Total gate charge	V _{DS} =800V, I _D =150A, V _{GS} =+18/-5V		-	400	-	nC	
R _{Gint}	Internal Gate Resistance	T _j =25°C		-	0.25	-	Ω	
t _{d(on)}	Turn-on delay time	V _{DD} =600V I _D =150A V _{GS} =+18/-4V R _G =3.3 Ω Inductive load switching operation	T _j =25°C T _j =150°C	- -	48 45	- -	ns	
t _r	Rise time		T _j =25°C T _j =150°C	- -	32 30	- -		ns
t _{d(off)}	Turn-off delay time		T _j =25°C T _j =150°C	- -	39 45	- -	ns	
t _f	Fall time		T _j =25°C T _j =150°C	- -	22 26	- -		ns
E _{on}	Turn-on power dissipation		T _j =25°C T _j =150°C	- -	1.52 1.99	- -	mJ	
E _{off}	Turn-off power dissipation		T _j =25°C T _j =150°C	- -	0.93 1.12	- -		mJ
R _{th(j-c)}	FET Thermal Resistance		Junction to Case/MOSFET		-	0.12	-	
R _{th(c-f)}	Contact thermal resistance		With thermal conductive grease/MOSFET		-	0.15	-	K/W

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

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Body Diode Electrical characteristics ($T_j=25^{\circ}\text{C}$ unless otherwise specified, chip: Target)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V_{SD}	Body Diode Forward Voltage	$V_{GS} = -5\text{V}$ $I_{SD} = 150\text{A}$	$T_j = 25^{\circ}\text{C}$	-	5.0	-	V
			$T_j = 150^{\circ}\text{C}$	-	4.5	-	
T_{rr}	Reverse recovery time	$V_{DD} = 600\text{V}$ $I_D = 150\text{A}$	$T_j = 25^{\circ}\text{C}$	-	41	-	ns
			$T_j = 150^{\circ}\text{C}$	-	45	-	
Q_{rr}	Reverse recovery charge	$V_{GS} = +18/-4\text{V}$ $R_G = 3.3\ \Omega$	$T_j = 25^{\circ}\text{C}$	-	1.05	-	μC
			$T_j = 150^{\circ}\text{C}$	-	1.93	-	

Test Conditions

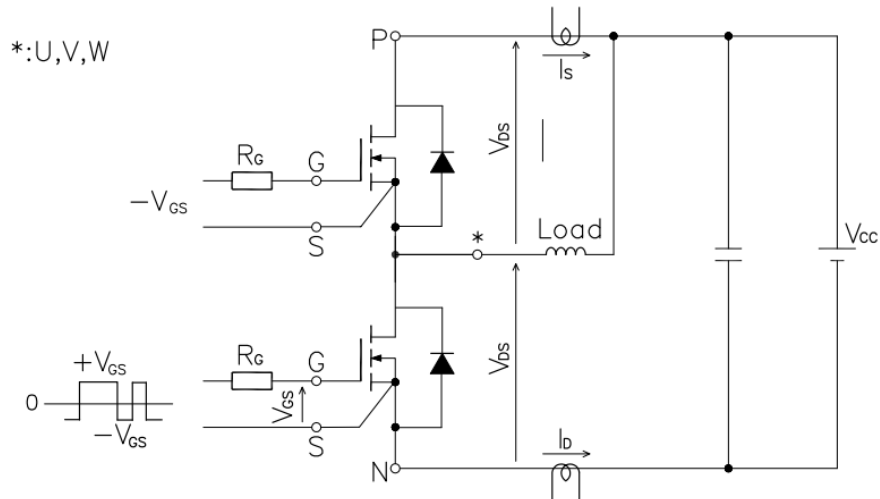


Figure 3. Switching time measure circuit

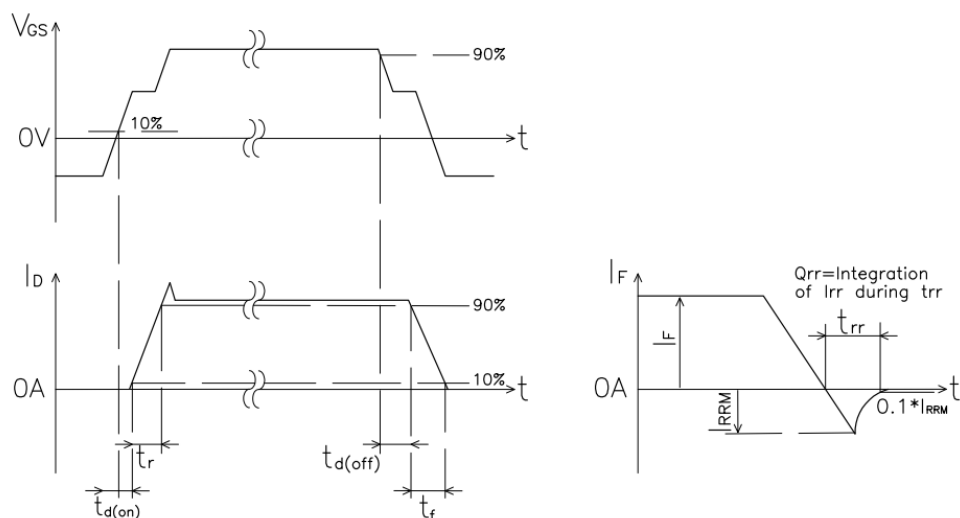


Figure 4. Switching time definition

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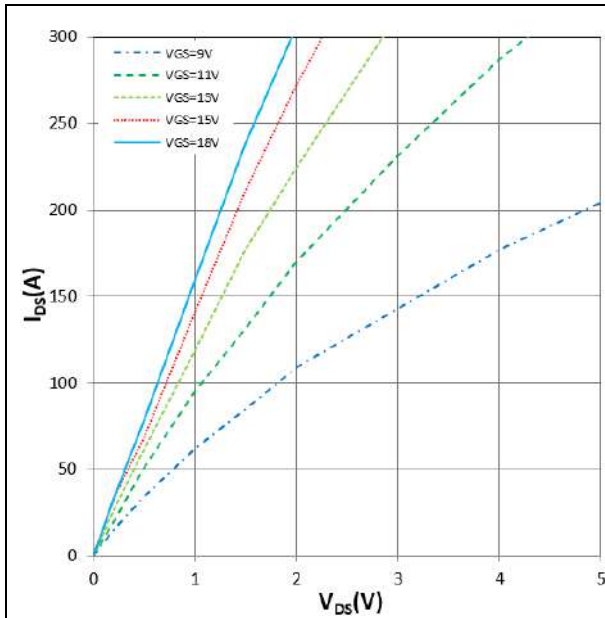


Figure 5. I_{DS} vs V_{DS}
 $T_j = 25^\circ\text{C}$, V_{GS} parameter

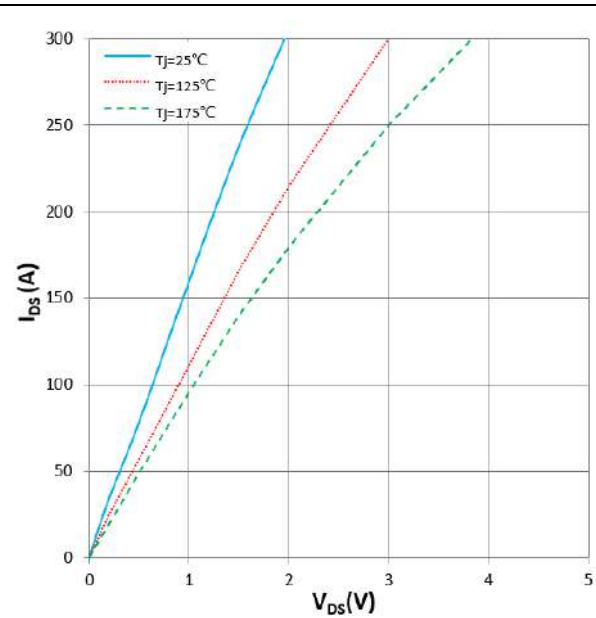


Figure 6. I_{DS} vs V_{DS}
 $V_{GS} = +18\text{V}$

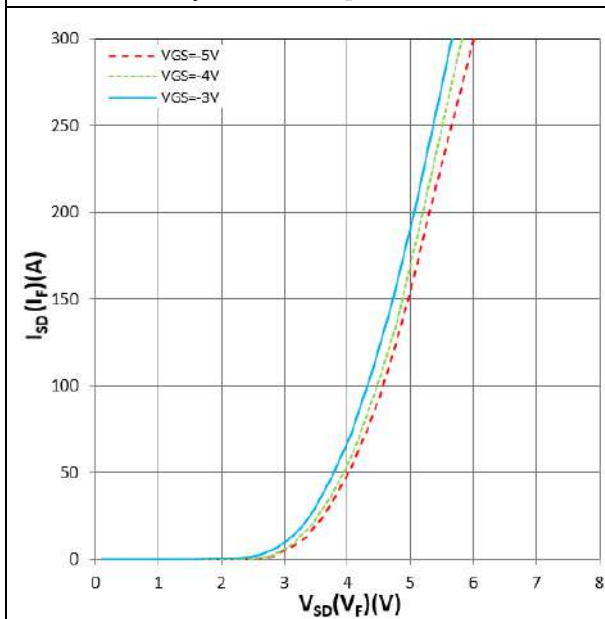


Figure 7. I_{SD} vs V_{SD} (V_F)
 $T_j = 25^\circ\text{C}$, V_{GS} parameter

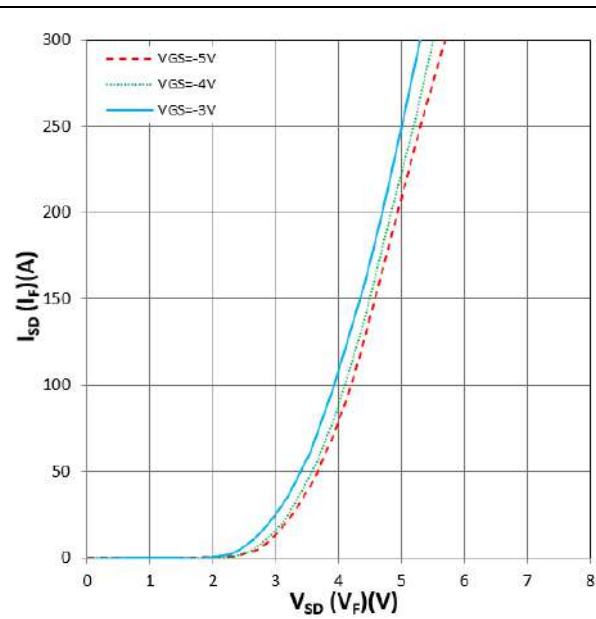
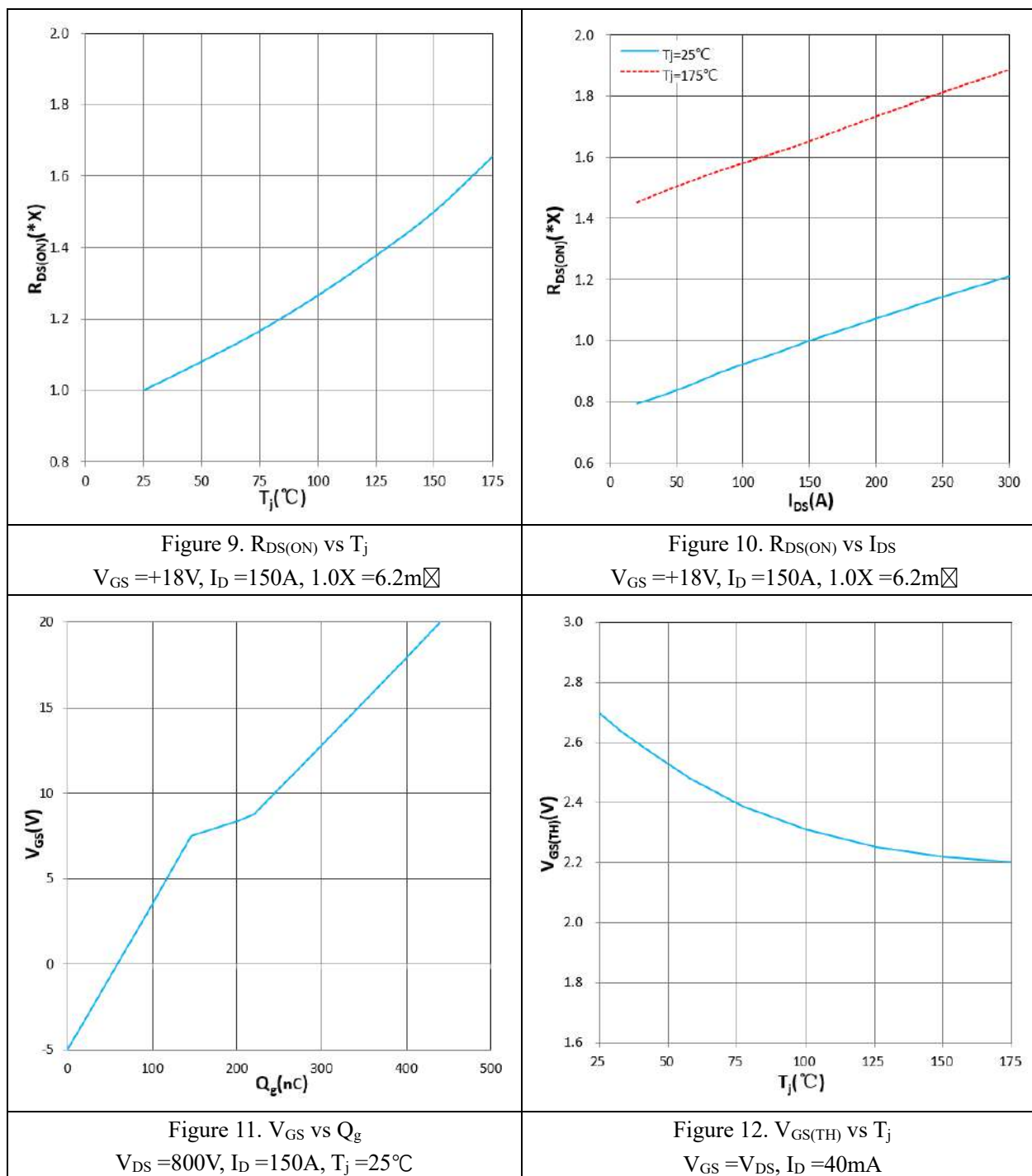


Figure 8. I_{SD} vs V_{SD} (V_F)
 $T_j = 150^\circ\text{C}$, V_{GS} parameter

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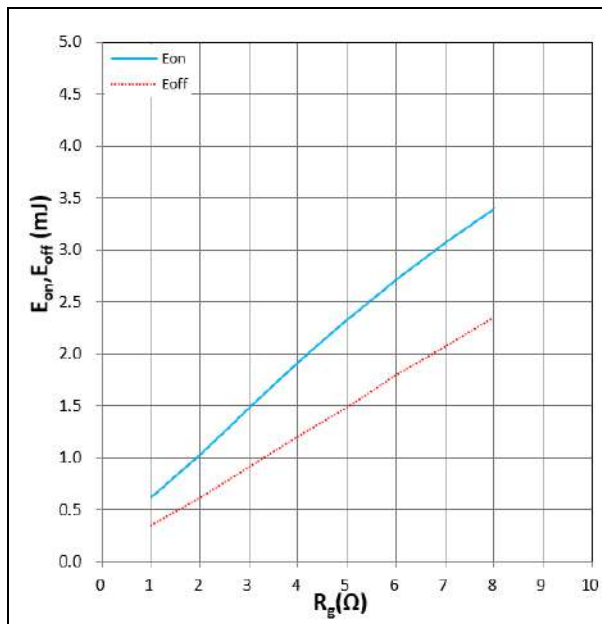


Figure 13. Eon, Eoff vs RG
Tj = 25°C, ID = 150A, VGS = +18V/-4V

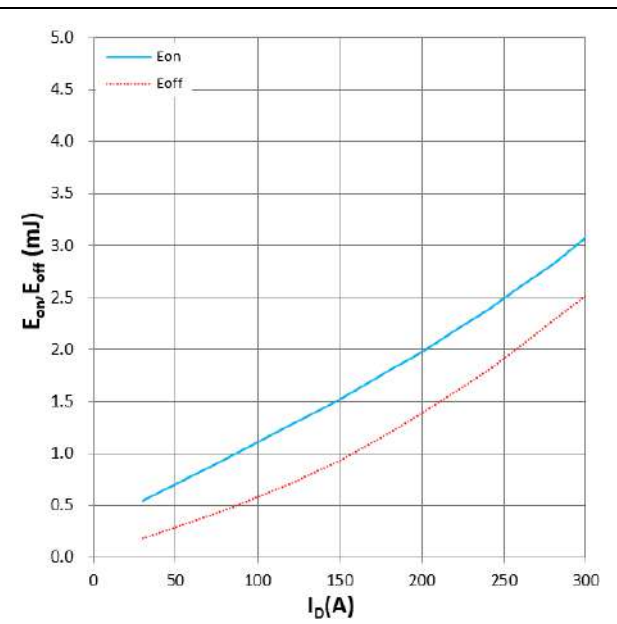


Figure 14. Eon, Eoff vs IDS
Tj = 25°C, RG = 3.3mΩ, VGS = +18V/-4V

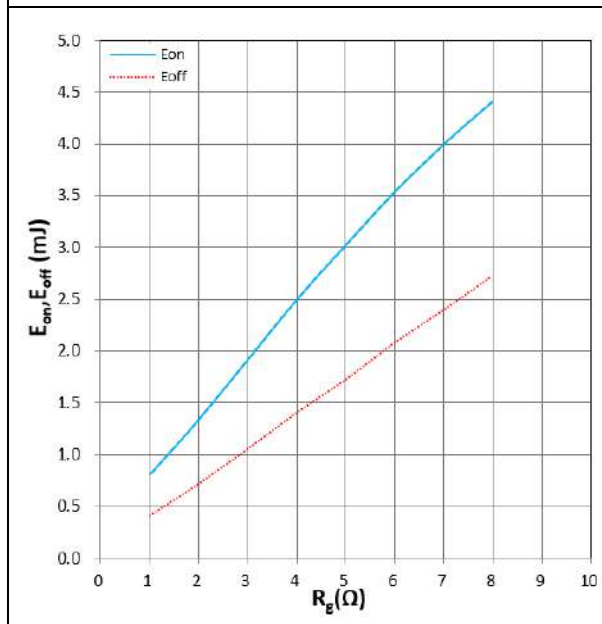


Figure 15. Eon, Eoff vs RG
Tj = 150°C, ID = 150A, VGS = +18V/-4V

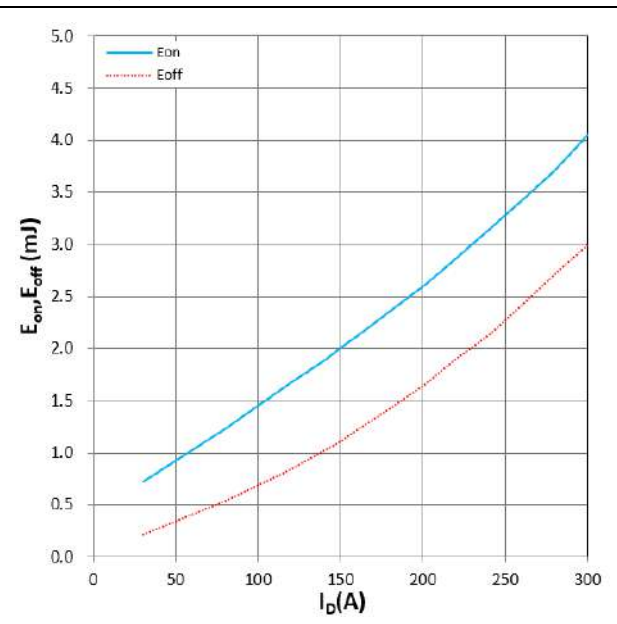
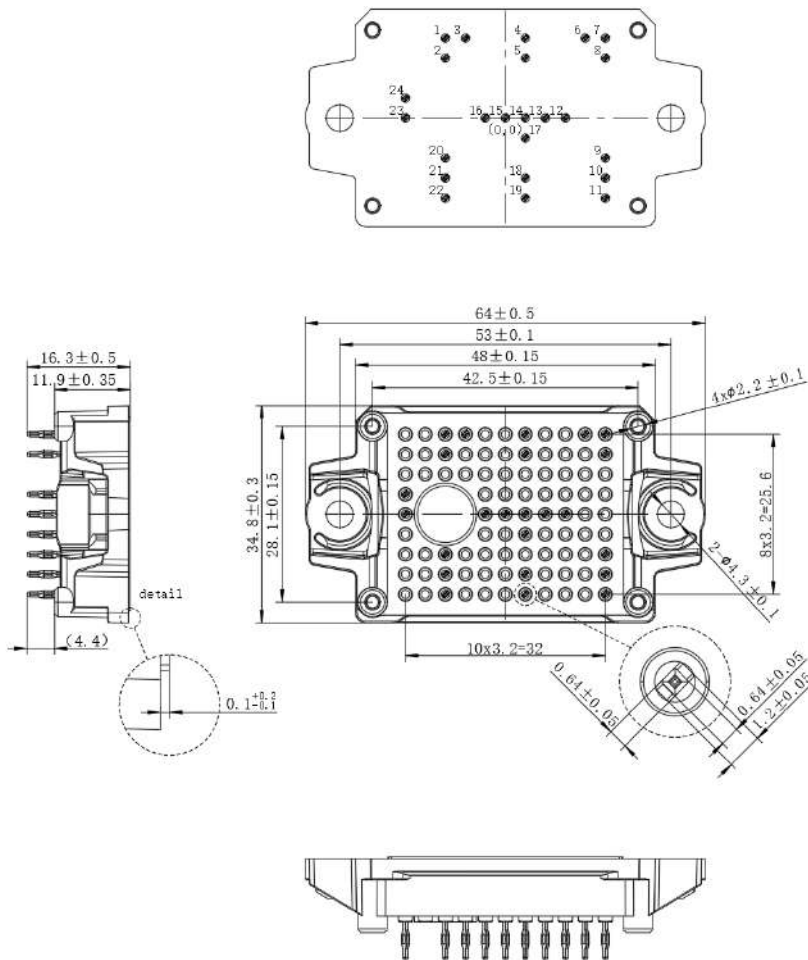


Figure 16. Eon, Eoff vs IDS
Tj = 150°C, RG = 3.3mΩ, VGS = +18V/-4V

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Package dimensions



Pin table		
Pin	X	Y
1	-9.6	12.8
2	-9.6	9.6
3	-6.4	12.8
4	3.2	12.8
5	3.2	9.6
6	12.8	12.8
7	16	12.8
8	16	9.6
9	16	-6.4
10	16	-9.6
11	16	-12.8
12	9.6	0
13	6.4	0
14	3.2	0
15	0	0
16	-3.2	0
17	3.2	-3.2
18	3.2	-9.6
19	3.2	-12.8
20	-9.6	-6.4
21	-9.6	-9.6
22	-9.6	-12.8
23	-16	0
24	-16	3.2

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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.

Changes to this product data sheet are reserved.

Please contact the sales staff (sales@hiitio.com) for further information on the product, technology, delivery terms, conditions and prices.

Revision History

Document Version	Description of Changes
RevX.0.1	Released

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