HCS30F4120E0A1

1200V/30mΩH BridgeSiC MOSFETModule

Description

The HCS30F4120E0A1 is a H Bridge SiC MOSFET Power Module. It integrates high performance SiC MOSFET chips designed for the applications such as Solar Inverter, UPS, Fuel cell-DC/DC converter, Energy storage Systems.

Features

- Blocking voltage:1200V
- 30mΩ $R_{ds(on)}$@T_j=25• •
- 46mΩ $R_{ds(on)}$@T_j=175• •
- Low Switching Losses
- 175 maximum junction temperature
- Thermistor inside

Applications

- SolarInverter
- UPS
- Fuel cell-DC/DC converter
- Energy Storage Systems

Circuit diagram

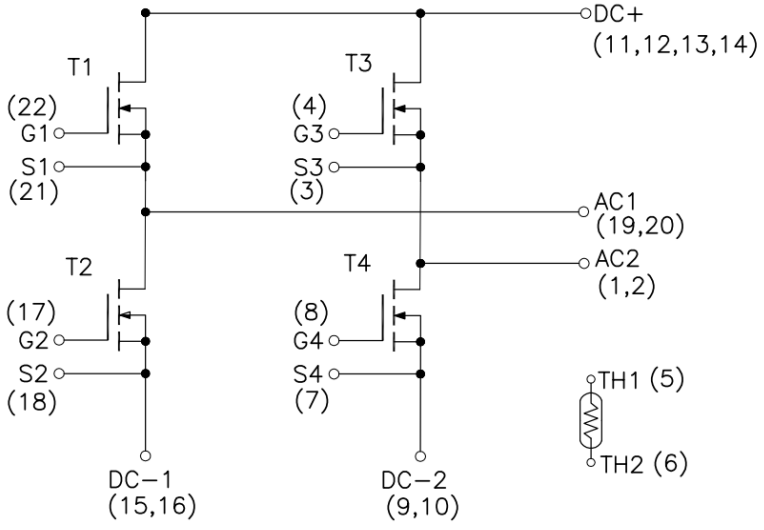

Figure 1. Out drawing & circuit diagram for HCS30F4120E0A1

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Pin Configuration and Marking Information

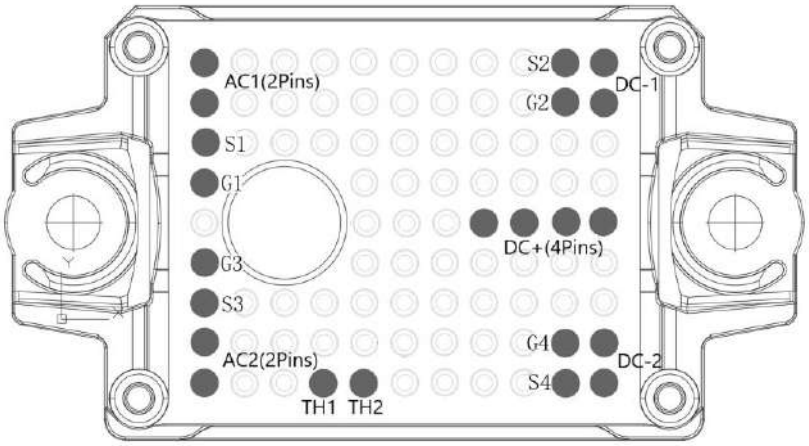

Figure 2. Pin configuration

PIN No.	Symbol	Description
1-2	AC2	Output terminal of half bridge
3	S3	T3 High side source signal terminal
4	G3	T3 High side gate signal terminal
5	TH1	Thermistor connection 1
6	TH2	Thermistor connection 2
7	S4	T4 Low side source signal terminal
8	G4	T4 Low side gate signal terminal
9-10	DC-2	DC – Bus connection
11-14	DC+	DC + Bus connection
15-16	DC-1	DC – Bus connection
17	G2	T2 Low side gate signal terminal
18	S2	T2 Low side source signal terminal
19-20	AC1	Output terminal of half bridge
21	G1	T1 High side gate signal terminal
22	S1	T1 High side source signal terminal

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	-

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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
$V_{GSSSurge}$	G-S Voltage(t_{surge}<300nsec)	D-S Short, Note1	-8 to 19	V
I_{DS}	DC Continuous Drain Current	T_C =25°C	70	A
I_{DS}	DC Continuous Drain Current	T_C=100°C	50	A
I_{SD}	Source (Body Diode) Current	T_C =25°C, with ON signal	70	A
I_{SD}	Source (Body Diode) Current	T_C=100°C, with ON signal	50	A
I_{DP}	Drain Pulse Current, Peak	Less than 1ms, Note2	150	A
T_j	junction temperature	-	-40 to 175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

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

Note2: 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} =493⊠	-5	-	5	%
P_{25}	Power dissipation	T_C =25°C	-	-	20	mW
$B_{25/50}$	B-value	R2 =R25 exp [$B_{25/50}$(1/T2 - 1/(298,15 K))]	-	3375	-	K
$B_{25/80}$	B-value	R2 =R25 exp [$B_{25/80}$(1/T2 - 1/(298,15 K))]	-	3411	-	K
$B_{25/100}$	B-value	R2 =R25 exp [$B_{25/100}$(1/T2 - 1/(298,15 K))]	-	3433	-	K

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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=100μA		1200	-1	-	V
I_{DSS}	Zero gate voltage drain Current	V_{DS}=1200V, V_{GS}=0V		-	2.	50	μA
$V_{GS(th)}$	Gate-Source threshold Voltage	I_D=13.5mA, V_{DS}=V_{GS}	T_j=25°C	1.8	82.	3.7	V
			T_j=175°C	-	0	-	V
I_{GSS+}	Gate-Source Leakage Current	V_{GS}=+15V, V_{DS}=0V, T_j=25°C		-	-	200	nA
I_{GSS-}		V_{GS}=-4V, V_{DS}=0V, T_j=25°C		-200	-	-	nA
$R_{DS(on)}$ (Chip)	Static drain-source On-state resistance	I_D=40A V_{GS}=+15V	T_j=25°C	-	29.5	40.0	mΩ
			T_j=175°C	-	46.1	-	mΩ
$V_{DS(on)}$ (Chip)	Static drain-source On-state Voltage	I_D=40A V_{GS}=+15V	T_j=25°C	-	1.18	1.60	V
			T_j=175°C	-	1.84	-	V
C_{iss}	Input Capacitance	V_{DS}=1000V, V_{GS}=0V, f=100kHz		-	3070	-	pF
C_{oss}	Output Capacitance			-	130	-	pF
C_{rss}	Reverse transfer Capacitance			-	10	-	pF
Q_G	Total gate charge	V_{DD}=800V, I_D=40A, V_{GS}=+15/-4V		-	134	-	nC
R_{Gint}	Internal Gate Resistance	T_j=25°C		-	1.0	-	Ω
$t_{d(on)}$	Turn-on delay time	V_{DD}=800V I_D=40A V_{GS}=+15/-4V R_G=2.2Ω Inductive load switching operation	T_j=25°C	-	18	-	ns
			T_j=150°C	-	19	-	
t_r	Rise time		T_j=25°C	-	20	-	ns
			T_j=150°C	-	24	-	
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	33	-	ns
			T_j=150°C	-	36	-	
t_f	Fall time		T_j=25°C	-	11	-	ns
			T_j=150°C	-	13	-	
E_{on}	Turn-on power dissipation		T_j=25°C	-	515	-	μJ
			T_j=150°C	-	726	-	
E_{off}	Turn-off power dissipation		T_j=25°C	-	26	-	μJ
			T_j=150°C	-	31	-	
$R_{th(j-c)}$	FET Thermal Resistance	Junction to Case/MOSFET		-	0.63	-	K/W
$R_{th(c-f)}$	Contact thermal resistance	With thermal conductive grease /MOSFET		-	0.55	-	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°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} =40A	T_j=25°C	-	4.3	-	V
			T_j=175°C	-	3.8	-	
T_{rr}	Reverse recovery time	V_{DD}=800V I_D=40A V_{GS}=+15/-4V R_G=2.2 Ω Inductive load switching operation	T_j=25°C	-	21	-	ns
			T_j=150°C	-	24	-	
Q_{rr}	Reverse recovery charge		T_j=25°C	-	105	-	nC
			T_j=150°C	-	265	-	
E_{rr}	Diode switching power dissipation		T_j=25°C	-	252	-	μJ
			T_j=150°C	-	328	-	

Test Conditions

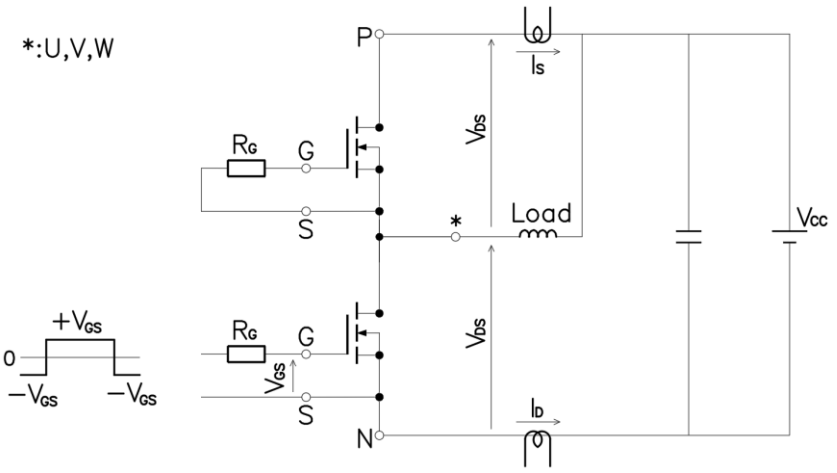

Figure 3. Switching time measure circuit

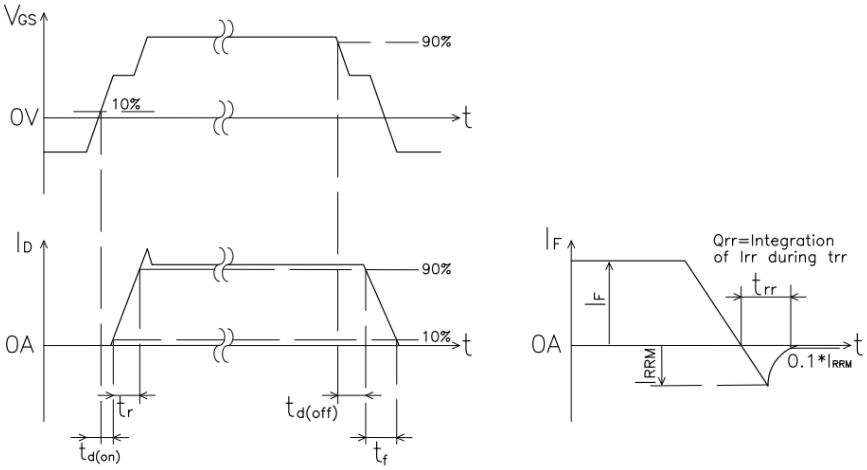

Figure 4. Switching time definition

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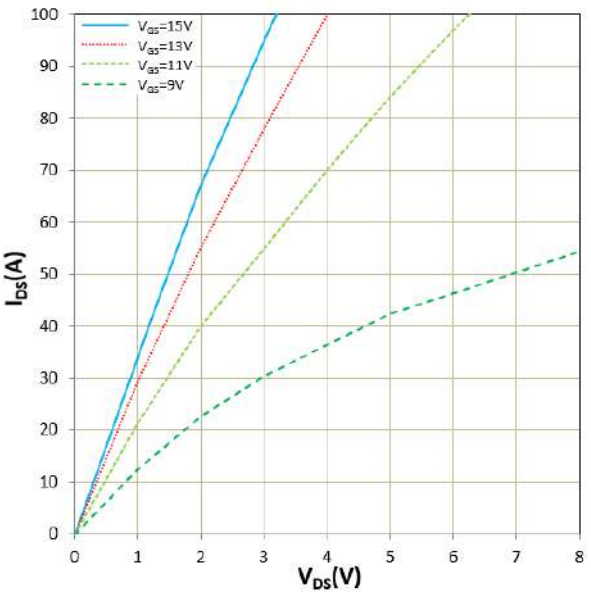

Figure 5. I_{DS} vs V_{DS}
T_j =25°C, V_{GS} parameter

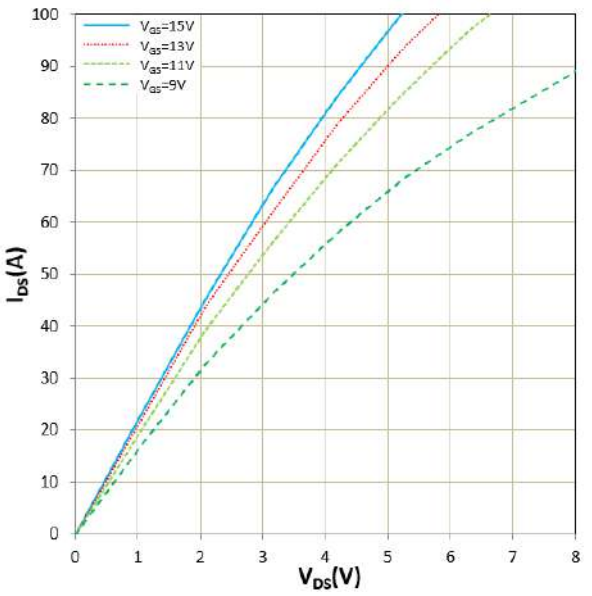

Figure 6. I_{DS} vs V_{DS}
T_j =175°C, V_{GS} parameter

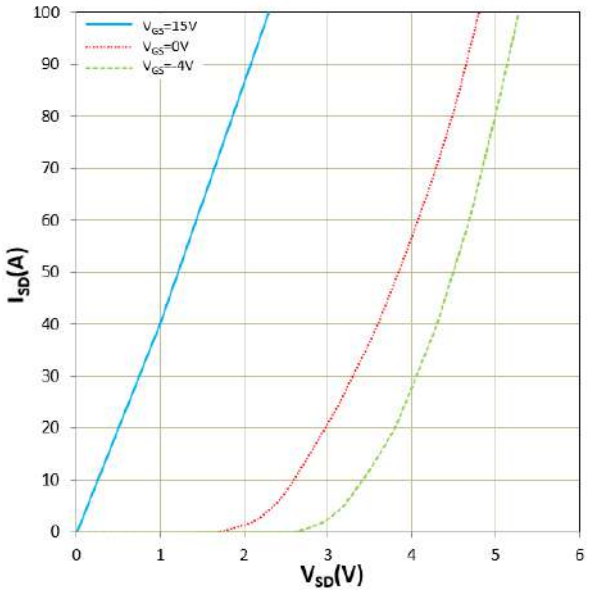

Figure 7. I_{SD}(I_F) vs V_{SD} (V_F)
T_j =25°C, V_{GS} parameter

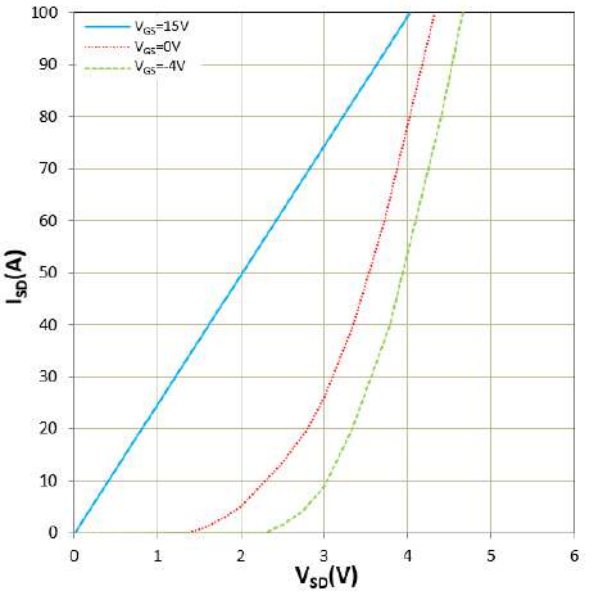

Figure 8. I_{SD}(I_F) vs V_{SD} (V_F)
T_j =175°C, V_{GS} parameter

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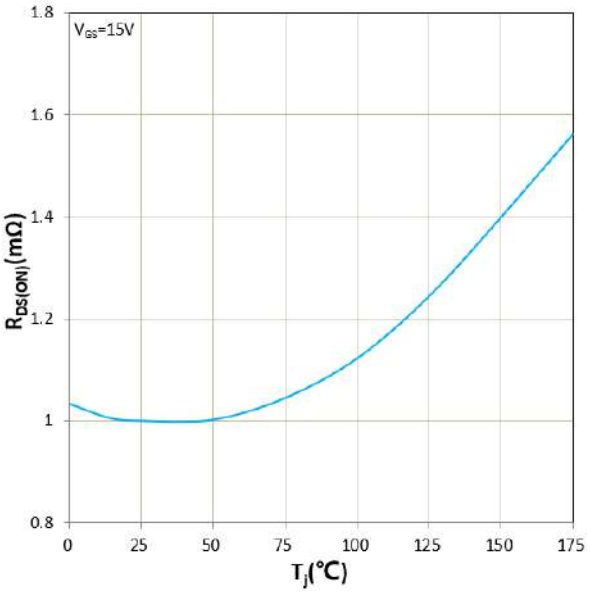

Figure 9. $R_{DS(ON)}$ vs T_J
V_{GS} =+15V, I_D =40A, 1.0X =29.5m☒

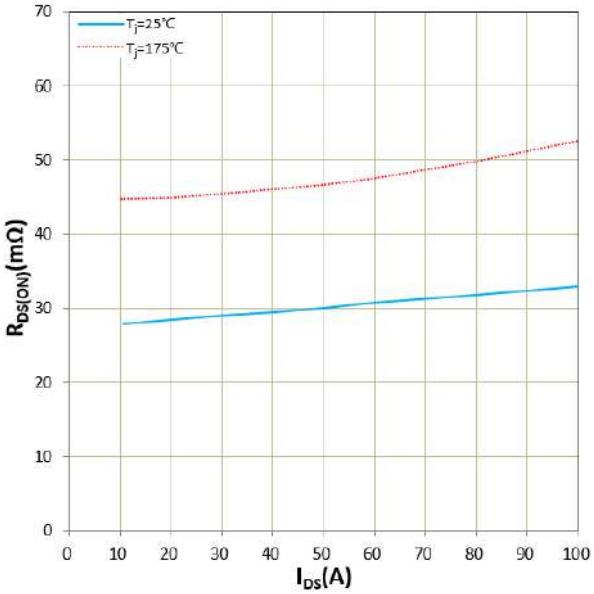

Figure 10. $R_{DS(ON)}$ vs I_{DS}
T_j =25℃/175℃,V_{GS} =+15V

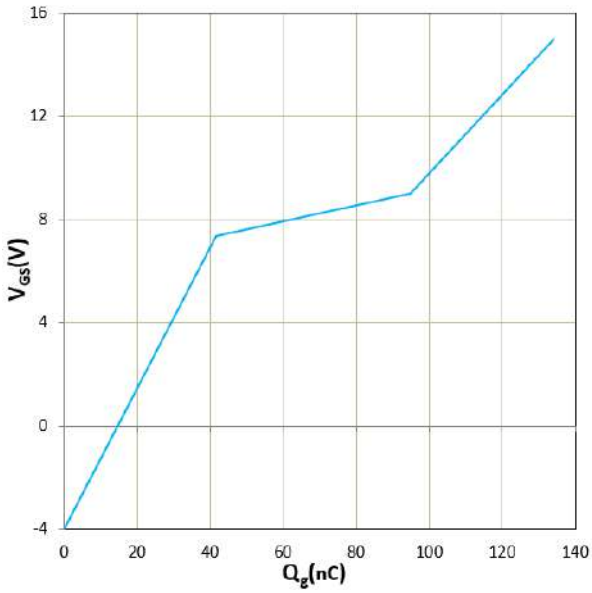

Figure 11. V_{GS} vs Q_g
T_j =25°C, V_{DS} =800V, I_D =40A

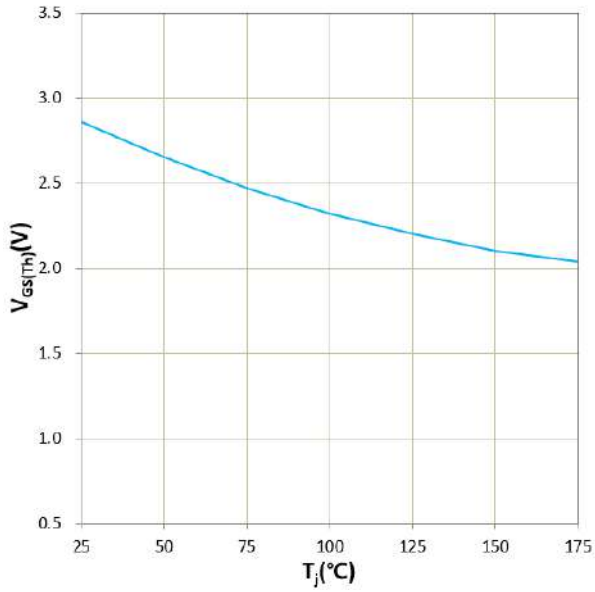

Figure 12. $V_{GS(TH)}$ vs T_j
V_{GS} =V_{DS}, I_D =13.5mA

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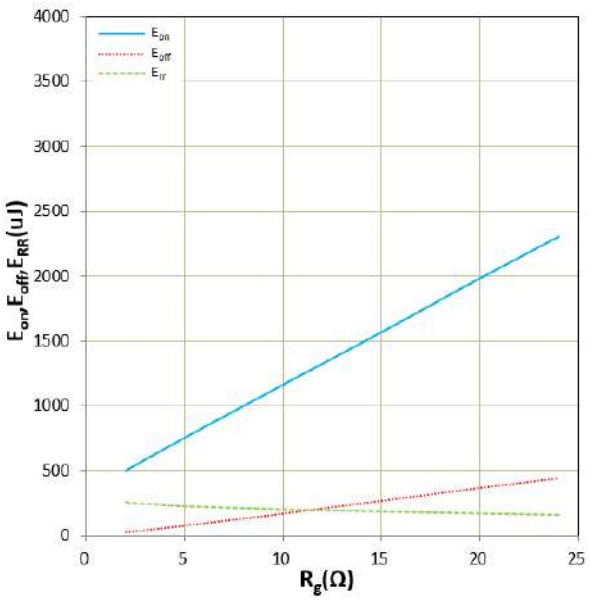

Figure 13. E_{on}, E_{off}, E_{rr} vs R_g
T_j =25°C, V_{DD} =800V, I_D =40A, V_{GS} =-4V/+15V
Inductive Load

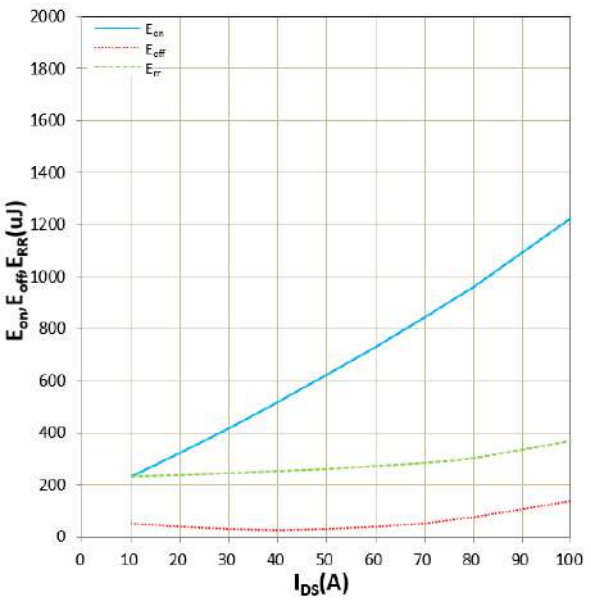

Figure 14. E_{on}, E_{off}, E_{rr} vs I_{DS}
T_j =25°C, V_{DD} =800V, R_g =2.2☒ V_{GS} =-4V/+15V
Inductive Load

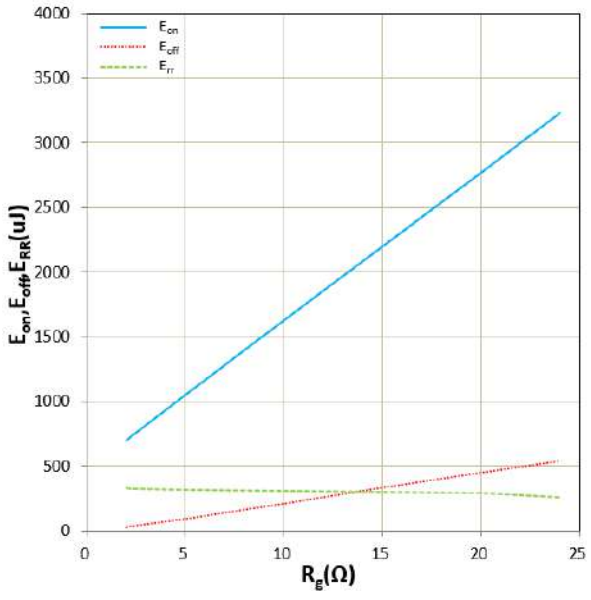

Figure 15. E_{on}, E_{off}, E_{rr} vs R_g
T_j =150°C, V_{DD} =800V, I_D =40A, V_{GS} =-4V/+15V
Inductive Load

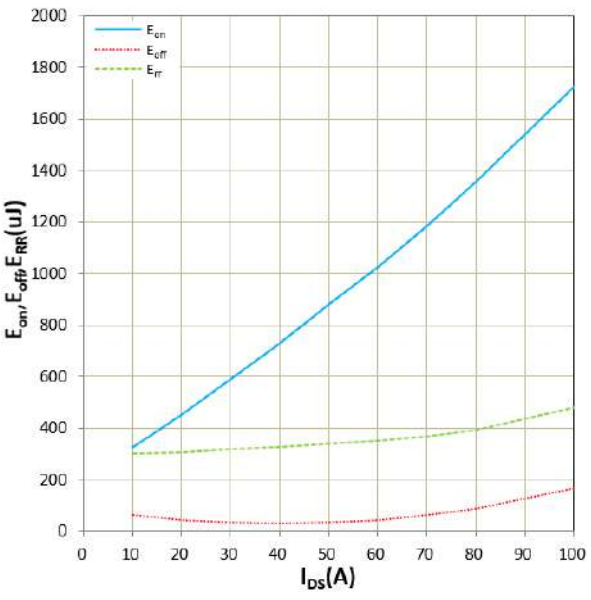

Figure 16. E_{on}, E_{off}, E_{rr} vs I_{DS}
T_j =150°C, V_{DD} =800V, R_g =2.2☒ V_{GS} =-4V/+15V
Inductive Load

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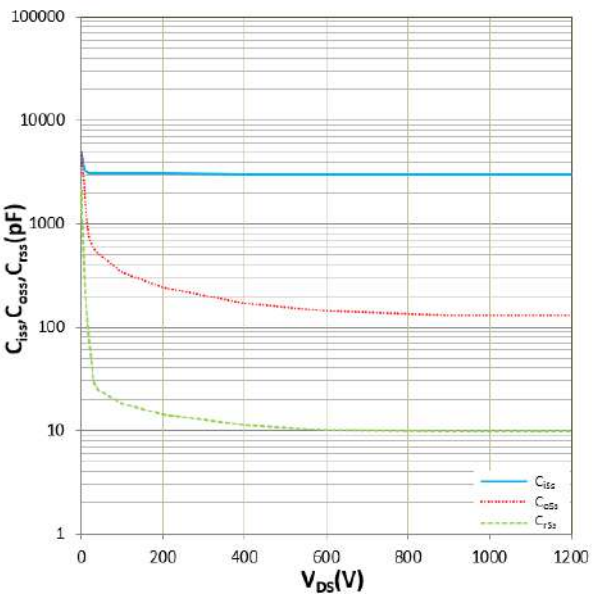

Figure 17. C_{iss}, C_{oss}, C_{rss} vs V_{DS}
V_{GS} =0V, f =100kHz, T_j =25°C

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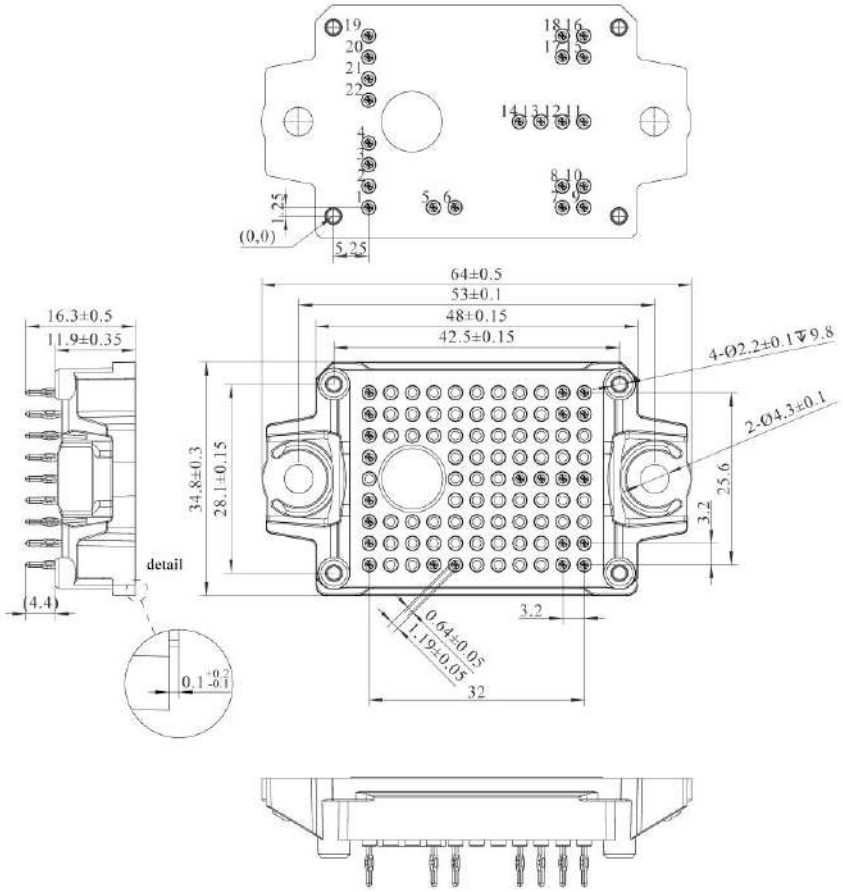
Package dimensions



Pin table		
Pin	X	Y
1	5.25	1.25
2	5.25	4.45
3	5.25	7.65
4	5.25	10.85
5	14.85	1.25
6	18.05	1.25
7	34.05	1.25
8	34.05	4.45
9	37.25	1.25
10	37.25	4.45
11	37.25	14.05
12	34.05	14.05
13	30.85	14.05
14	27.65	14.05
15	37.25	23.65
16	37.25	26.85
17	34.05	23.65
18	34.05	26.85
19	5.25	26.85
20	5.25	23.65
21	5.25	20.45
22	5.25	17.25

IMPORTANT NOTICE:

This product data sheet describes the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively under the terms and conditions of the supply agreement. There will be no guarantee or of any kind for the product and its characteristics.

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.

Instruction note

Naming rules for power module product models（Industrial module）

Product Model							
	HC	S	30	F4	120	E0	A1

Hecheng Code

Module type G : IGBT module
D : FRD module
S : SiC module
H : Si/SiC hybrid

On-state resistance (mΩ) 01~80

Topology structure FZ : A switch unit FF : Half bridge
FS : Three phase F4 : H Bridge
F3L : Three level DF : Boost Circuit
FD : Braking Circuit
FP : Rectification+Inverter+Control move
AL : ANPC CL : Chopper

Voltage level (x10)（V） 650~2200

Packaging form+features（A…Z）

A1： 34 mm	A2： 62 mm	
B1： Easy 1B	B1A	B1B…
B2： Easy 2B…	B3： Easy 3B…	
D1： Flow0	D2： Flow1	D3： Flow2
E0 : E0	E1： Econo 2…	E2： E2
E3： ED3	E4 : E4	E5 : ED3S
E6 : EPM2	E7 : EPM3	E8 : EconoPIM3
E9 : ED3H	F0 : F0	P2 : EPM2

Feature :A: Special Code Nil: Standard

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