

HCG900FF120E3H1L

1200V/900A Half Bridge IGBT Module

Description

The **HCG900FF120E3H1L** is a Half Bridge IGBT PowerModule. It integrates high performance IGBT chips designed for the applications such as High Power supply and Motor control



Features

- Blocking voltage 1200V
- Low saturation Voltage $V_{CE(sat)}$
- Low Switching Losses
- Direct Cooled Pin Fin Base Plate
- Thermistor inside

Applications

- High Power Switching Applications
- Motor Drives
- Solar inverter Systems
- Wind Turbin

Circuit diagram

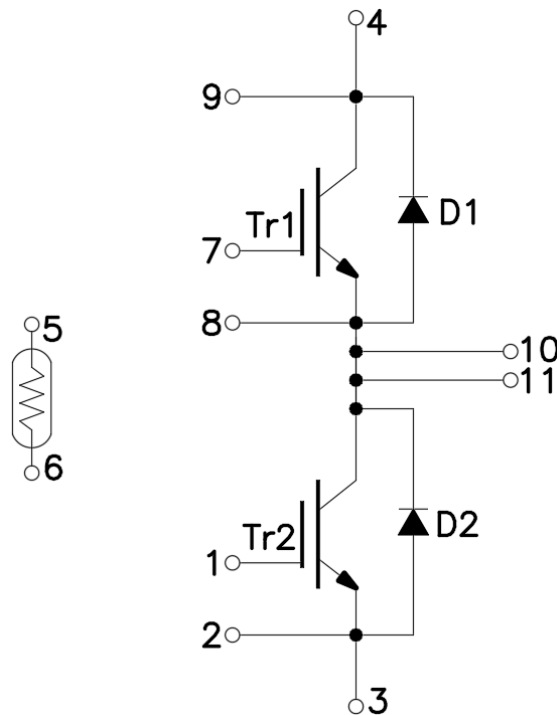


Figure 1. Out drawing & circuit diagram for HCG900FF120E3H1L

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Pin Configuration and Marking Information

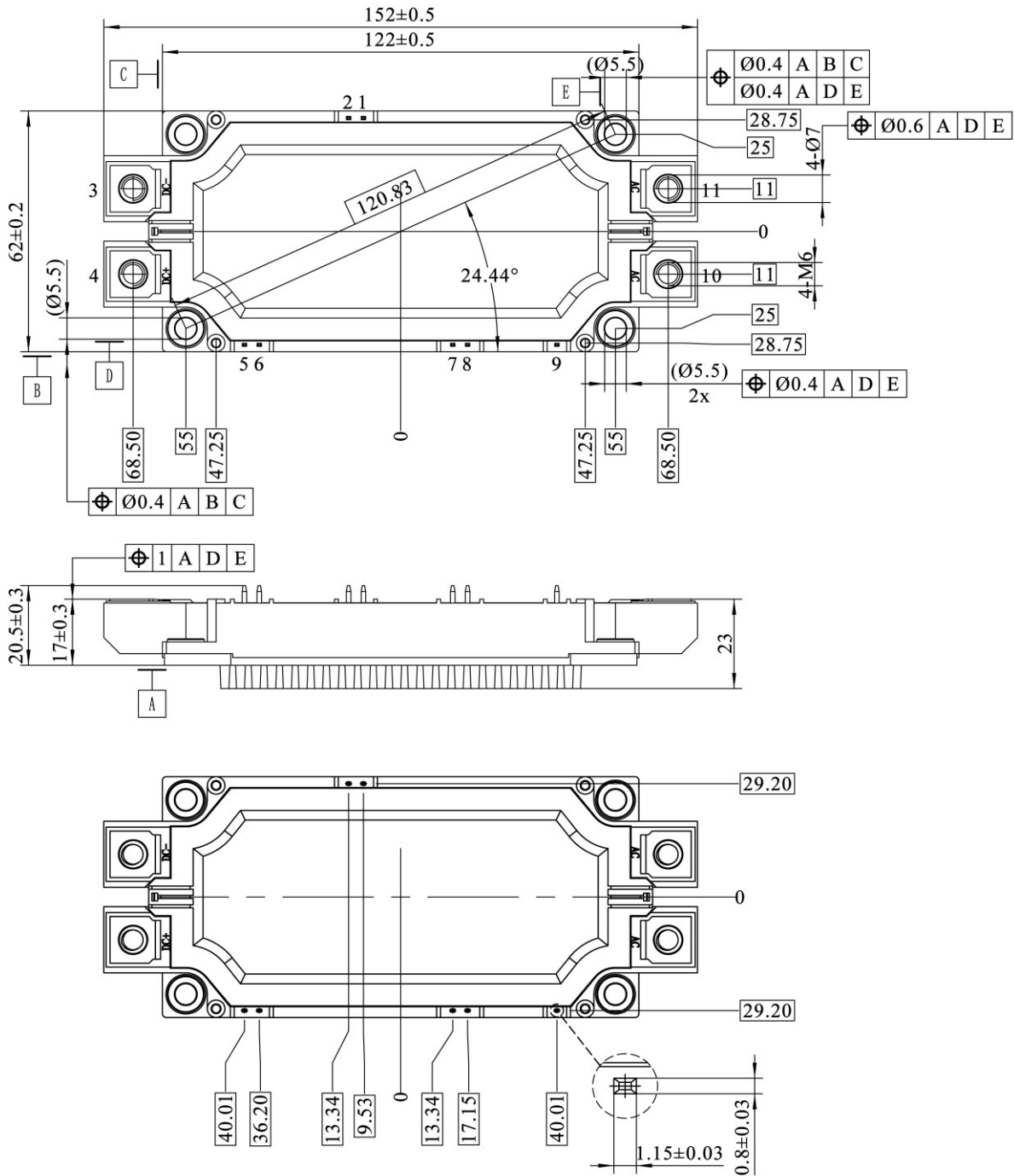


Figure 2. Pin configuration

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Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f = 50Hz, t = 1min	3.4	kV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink terminal to terminal	15 13	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	>400	-
Module lead resistance, terminals – chip	T _C = 25°C	0.8	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	430	g

Maximum Ratings (T_j = 25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V _{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V _{GES}	Gate-Emitter Voltage	C-E Short	±20	V
I _C	DC Continuous Collector Current	T _f = 55°C	900	A
I _{CM}	Pulse Collector Current	t _p = 1ms, Note1	1800	A
P _C	Maximum Power Dissipation	T _f = 25°C, T _{jmax} = 175°C(IGBT)	2500	W
I _F	Diode Forward Current	-	900	A
I _{FRM}	Repetitive peak forward Current	t _p = 1ms, Note1	1800	A
I ² t	I ² t-value	V _R = 0V, t _p = 10ms, T _j = 125°C(Diode)	40000	A ² s
I ² t	I ² t-value	V _R = 0V, t _p = 10ms, T _j = 150°C(Diode)	37500	A ² s
T _{vjop}	Operating junction temperature	Note2	-40 to 175	°C
T _{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

Note2: T_{vjop} > 150°C is only allowed for operation at overload conditions.

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R ₂₅	Resistance	T _C = 25°C	-	5	-	k
R/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	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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IGBT Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V _{CE(sat)} (Chip)	Collector-Emitter Saturation Voltage	I _C =900A V _{GE} =15V	T _j =25°C	-	1.75	2.10	V
			T _j =125°C	-	2.09	-	
			T _j =175°C	-	2.63	-	
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =25mA, V _{CE} =V _{GE}		5.0	-	6.5	V
Q _G	Gate charge	V _{GE} = -15V to +15V		-	7.6	-	uC
R _{Gint}	Internal gate resistor	-	T _j =25°C	-	0.5	-	
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V f=1MHz	T _j =25°C	-	133.8	-	nF
C _{oes}	Output Capacitance			-	4.35	-	nF
C _{res}	Reverse transfer Capacitance			-	1.18	-	nF
I _{CES}	Collector- Emitter Cut off Current	V _{CE} =1200V, V _{GE} =0V	T _j =25°C	-	-	1	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = 20V, V _{CE} =0V	T _j =25°C	-	-	1.5	uA
t _{d(on)}	Turn-on delay time	V _{CC} =600V I _C = 900A V _{GE} =+15V/-8V R _G =1.0Ω Inductive load	T _j =25°C	-	255	-	ns
			T _j =125°C	-	228	-	
			T _j =175°C	-	282	-	
t _r	Rise time		T _j =25°C	-	78	-	ns
			T _j =125°C	-	88	-	
			T _j =175°C	-	96	-	
t _{d(off)}	Turn-off delay time		T _j =25°C	-	579	-	ns
			T _j =125°C	-	624	-	
			T _j =175°C	-	646	-	
t _f	Fall time	T _j =25°C	-	150	-	ns	
		T _j =125°C	-	186	-		
		T _j =175°C	-	204	-		
E _{on}	Turn-on power dissipation	T _j =25°C	-	23.06	-	mJ	
		T _j =125°C	-	34.99	-		
		T _j =175°C	-	47.26	-		
E _{off}	Turn-off power dissipation	T _j =25°C	-	109.2	-	mJ	
		T _j =125°C	-	124.1	-		
		T _j =175°C	-	132.8	-		
R _{th(j-f)}	Thermal Resistance, Junction to cooling fluid, ΔV/Δt=10dm ³ /min, T _f =65°C			-	0.05	-	°C/W

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

Symbol	Item	Condition	Value			Unit	
			Min.	Typ.	Max		
V_F	Diode Forward Voltage	$I_F=900\text{A}, V_{GE}=0\text{V}$	$T_j=25^\circ\text{C}$	-	1.77	2.10	V
			$T_j=125^\circ\text{C}$	-	1.74	-	
			$T_j=175^\circ\text{C}$	-	2.02	-	
t_{rr}	Reverse recovery time	(Switch side) $V_{CC}=600\text{V}$ $I_C=900\text{A}$	$T_j=25^\circ\text{C}$	-	0.56	-	us
			$T_j=125^\circ\text{C}$	-	0.85	-	
			$T_j=175^\circ\text{C}$	-	0.97	-	
I_{RM}	Peak reverse recovery Current	$V_{GE}=+15\text{V}/-8\text{V}$ $R_G=1.0\Omega$ (FRD side)	$T_j=25^\circ\text{C}$	-	608	-	A
			$T_j=125^\circ\text{C}$	-	725	-	
			$T_j=175^\circ\text{C}$	-	792	-	
Q_{rr}	Recovered charge	$V_{rr}=600\text{V}$ $I_F=900\text{A}$ $V_{GE}=-8\text{V}$	$T_j=25^\circ\text{C}$	-	131.1	-	uC
			$T_j=125^\circ\text{C}$	-	213.9	-	
			$T_j=175^\circ\text{C}$	-	263.6	-	
E_{rr}	Reverse recovered energy	Inductive load switching operation	$T_j=25^\circ\text{C}$	-	70.56	-	mJ
			$T_j=125^\circ\text{C}$	-	111.4	-	
			$T_j=175^\circ\text{C}$	-	134.2	-	
$R_{th(c-f)}$	Thermal Resistance, Junction to cooling fluid, $\Delta V/\Delta t=10\text{dm}^3/\text{min}, T_f=65^\circ\text{C}$		-	0.07	-	$^\circ\text{C}/\text{W}$	

Test Conditions

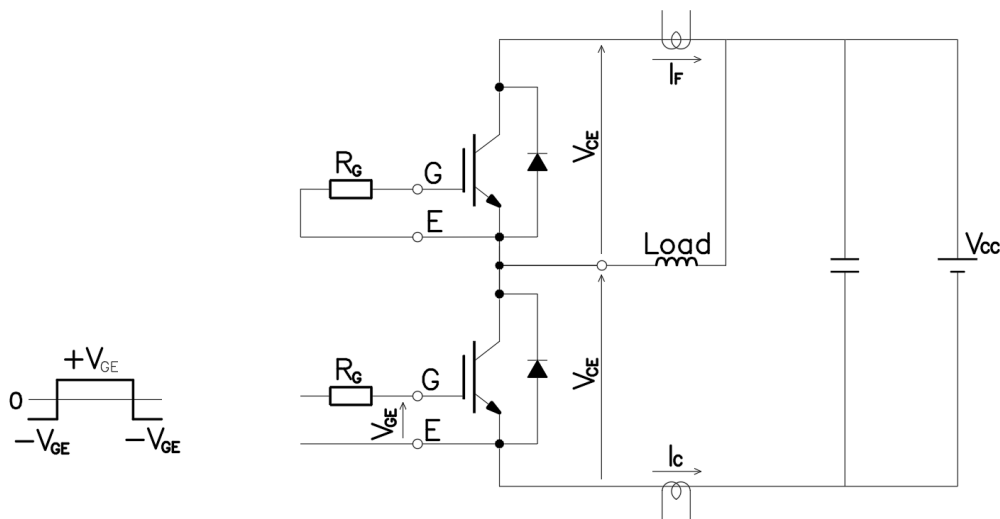


Figure 3. Switching time measure circuit

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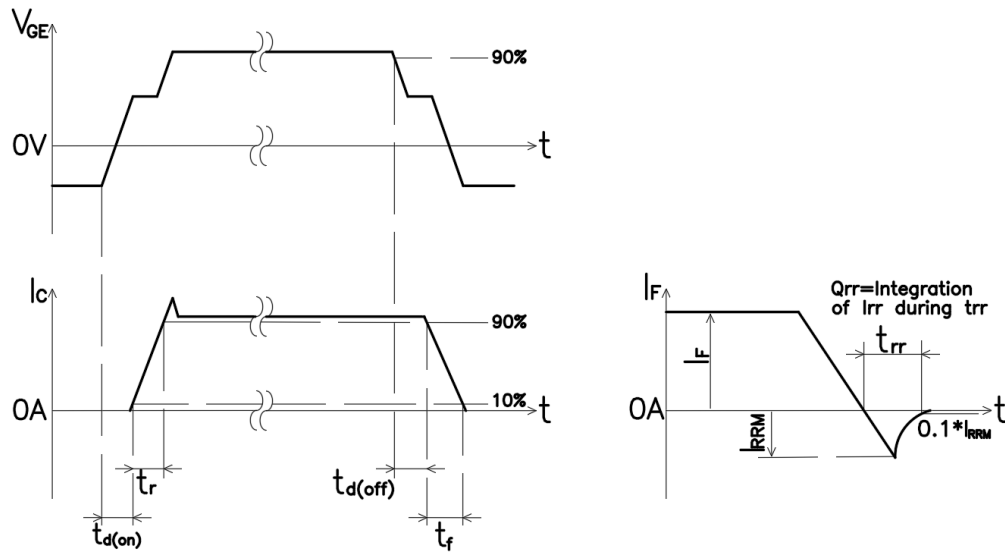
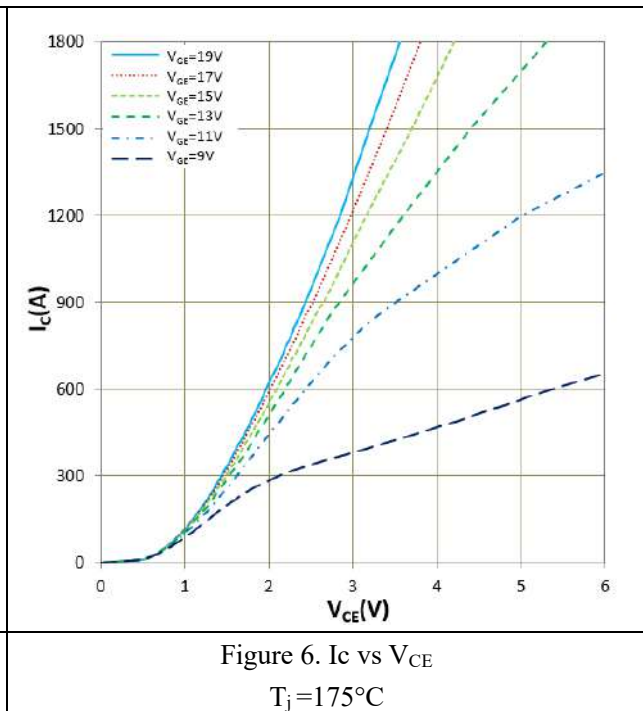
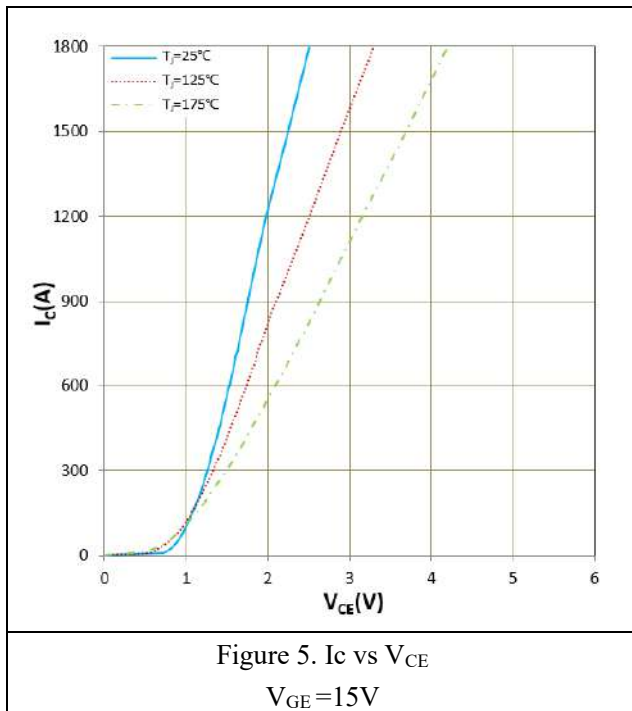


Figure 4. Switching time definition



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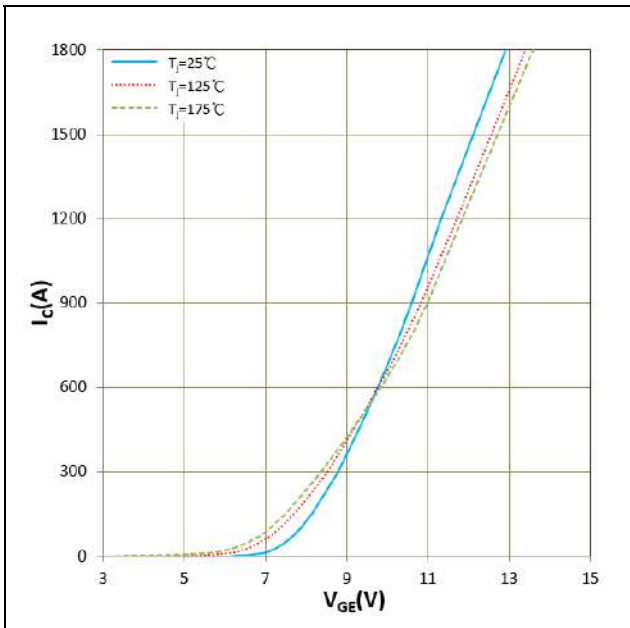


Figure 7. I_c vs V_{GE}
 $V_{CE}=20V$

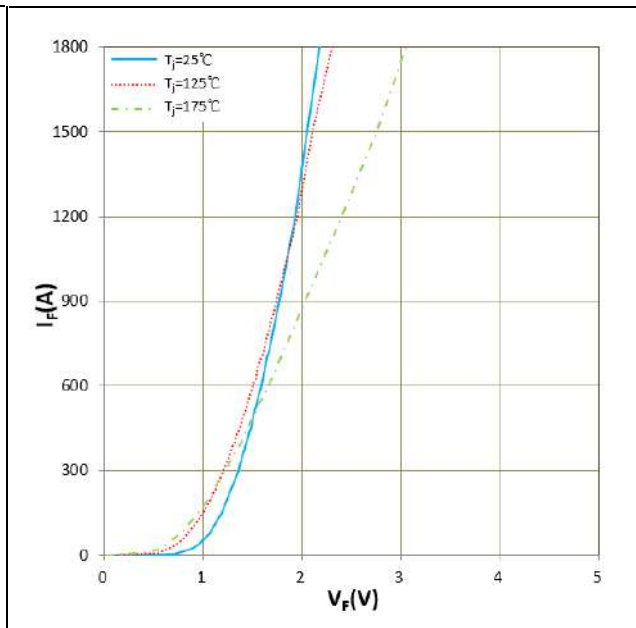


Figure 8. I_F vs V_F

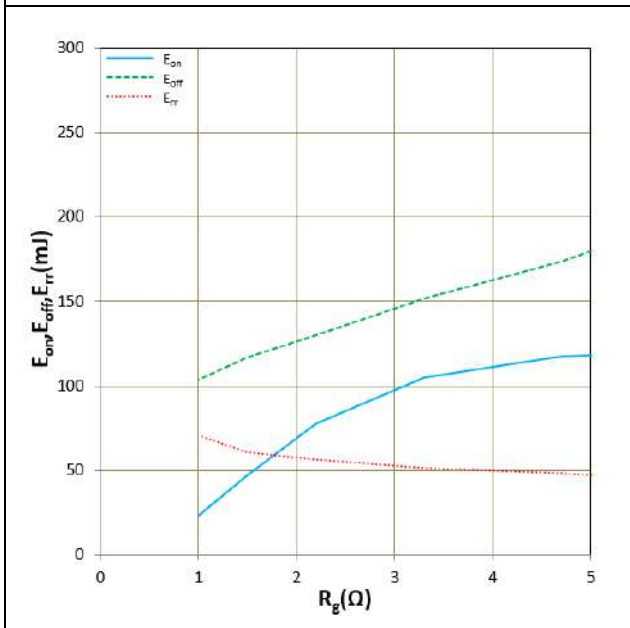


Figure 9. E_{on} , E_{off} , E_{rr} vs R_g (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_c=900A$, $T_j=25^\circ C$
Inductive Load

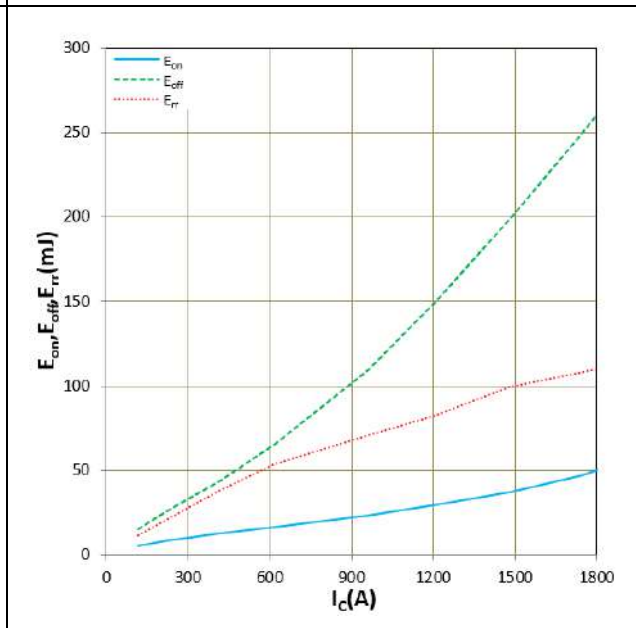
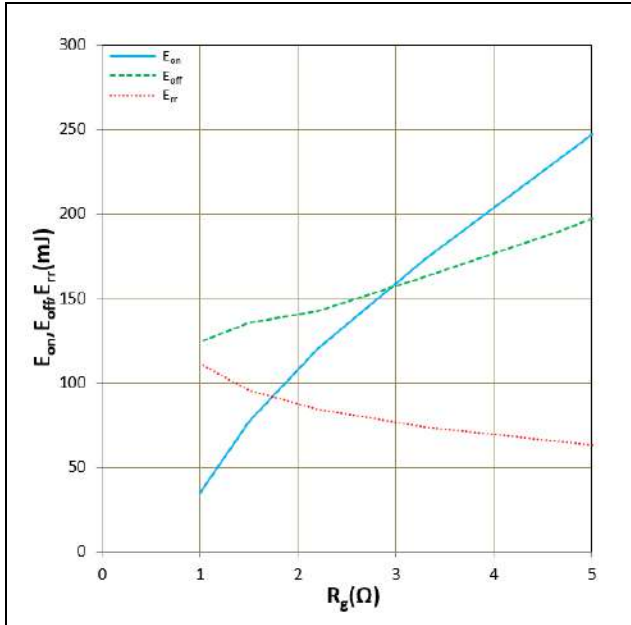


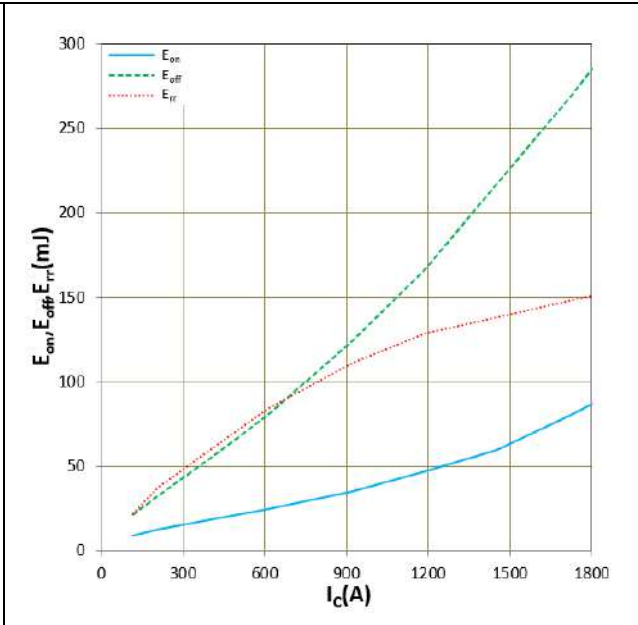
Figure 10. E_{on} , E_{off} , E_{rr} vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=1.0\Omega$, $T_j=25^\circ C$
Inductive Load

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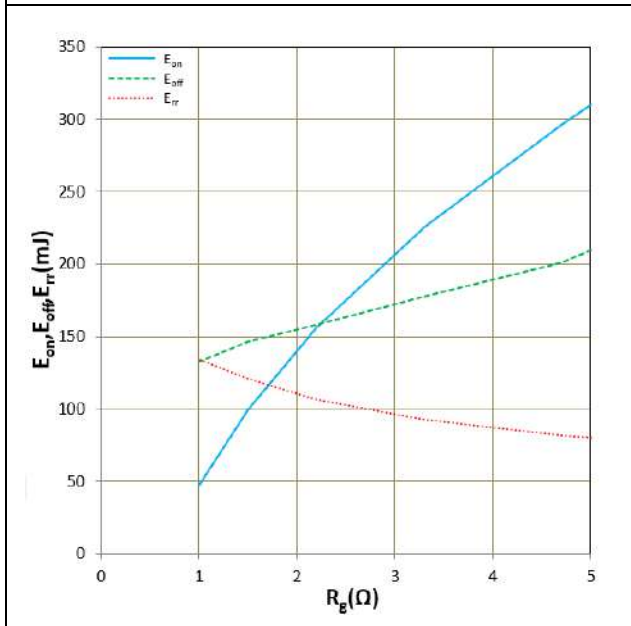
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 Figure 11. E_{on} , E_{off} , E_{tr} vs R_g (Typ)

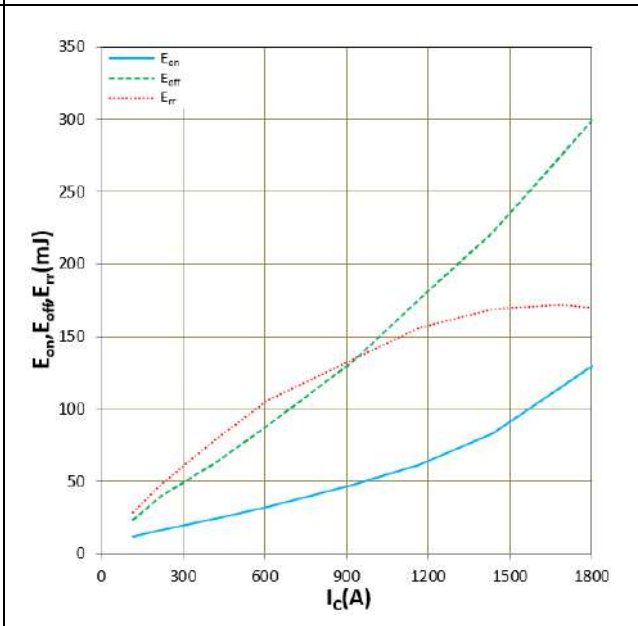
$V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_C=900A$, $T_j=125^\circ C$
Inductive Load


 Figure 12. E_{on} , E_{off} , E_{tr} vs I_c (Typ)

$V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=1.0\Omega$, $T_j=125^\circ C$
Inductive Load


 Figure 13. E_{on} , E_{off} , E_{tr} vs R_g (Typ)

$V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_C=900A$, $T_j=175^\circ C$
Inductive Load


 Figure 14. E_{on} , E_{off} , E_{tr} vs I_c (Typ)

$V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=1.0\Omega$, $T_j=175^\circ C$
Inductive Load

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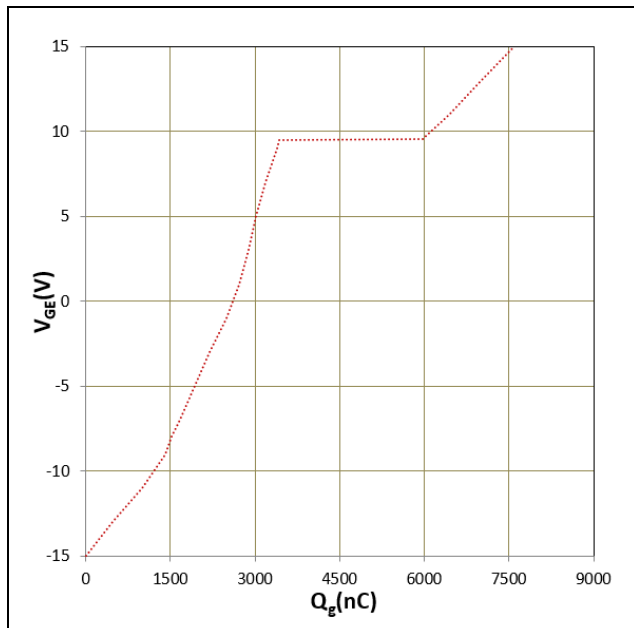


Figure 15. Gate charge
 $V_{CC}=600V, I_C=900A, T_j=25^\circ C$

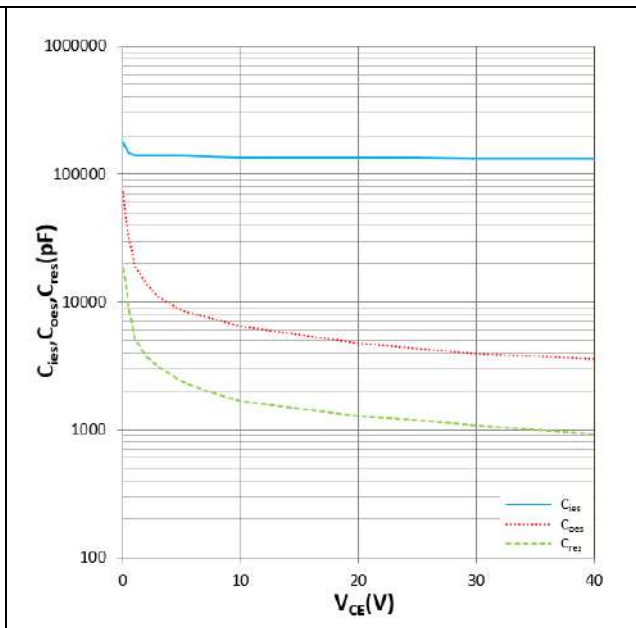


Figure 16. $C_{ies}, C_{oes}, C_{res}$ vs V_{CE}
 $T_j=25^\circ C, f=1MHz$

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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 (Email: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	G	100	FF	120	E3	A
Hecheng Code							
Module type G : IGBT module D : FRD module S : SiC module H : Si/SiC hybrid							
Current level (A) 50~900							
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		B1A		B1B...	
B1: Easy 1B		B3: Easy 3B...		D2: Flow1		D3: Flow2	
B2: Easy 2B...		E0: E0		E1: Econo 2...		E2: E2	
D1: Flow0		E3: ED3		E4: E4		E5: ED3S	
E0: E0		E6: EPM2		E7: EPM3		E8: EconoPIM3	
E3: ED3		E9: ED3H		F0: F0		P2: EPM2	
E6: EPM2							
E9: ED3H							
Feature :A: Special Code Nil: Standard							

Zhejiang HIITIO New Energy Co., Ltd

ADD : NO.1125 Zhixing Road,Qiaonan District, Xiaoshan Economic and Technological Development Zone, Hangzhou, Zhejiang

TEL :400-667-9977

