HCG600FF120E3ME7

1200V/600A Half Bridge IGBT Module

Description

The HCG600FF120E3ME7 is a Half Bridge IGBT Power Module. 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
- Thermistor inside

Applications

- High Power Switching Applications
- Motor Drives
- Solar inverter Systems
- Uninterrupted Power Supply

Circuit diagram

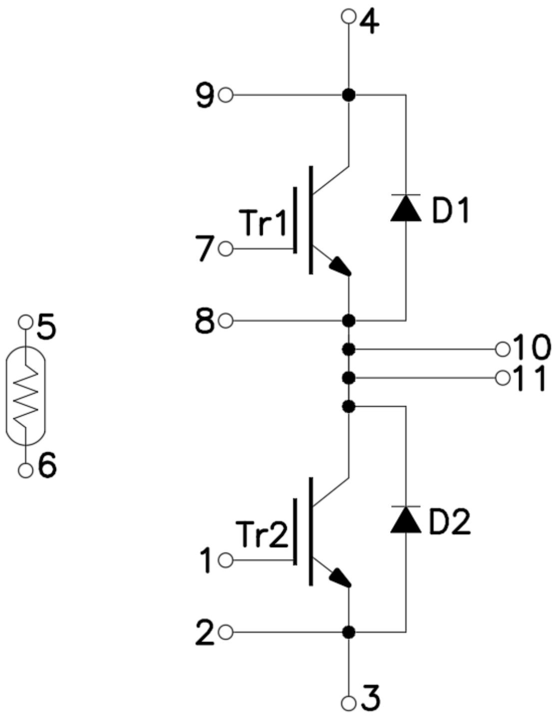

Figure 1. Out drawing & circuit diagram for HCG600FF120E3ME7

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Pin Configuration and Marking Information

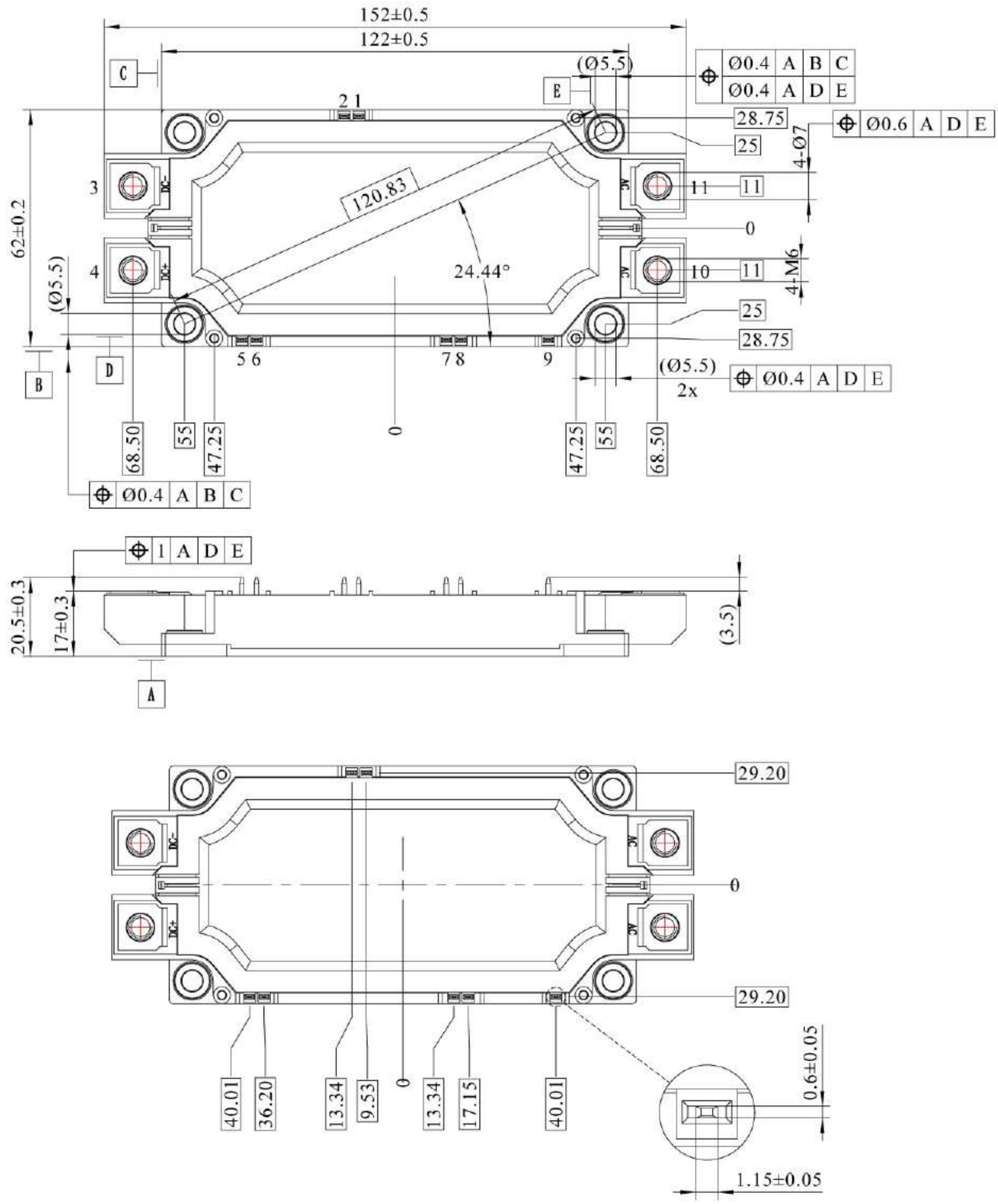

Figure 2. Pin configuration

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Module

Parameter	Condition	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	14.5 13	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	600	-
Module lead resistance, terminals – chip	T_C =25°C	0.8	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	350	g

Maximum Ratings (T_j =25℃ unless otherwise specified)

Symbol	Parameter	Condition	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_C =95°C	600	A
I_{CM}	Pulse Collector Current	t_p =1ms, Note1	1200	A
P_C	Maximum Power Dissipation	T_C =25°C, IGBT	3000	W
I_F	Diode Forward Current	-	600	A
I_{FRM}	Repetitive peak forward Current	t_p =1ms, Note1	1200	A
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	-	kΩ
$\Delta R/R$	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	$R2 = R25 \exp[B_{25/50}(1/T2 - 1/(298,15\ K))]$	-	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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IGBT Electrical characteristics (T_j =25℃ unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
$V_{CE(sat)}$ (Chip)	Collector-Emitter Saturation Voltage	I_C =600A V_{GE} =15V	T_j =25°C	-	1.60	1.92	V
			T_j =125°C	-	1.73	-	
			T_j =150°C	-	1.80	-	
			T_j =175°C	-	1.85	-	
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C =23mA, V_{CE} =V_{GE}		5.0	5.8	6.5	V
Q_G	Gate charge	V_{GE} = -15V to +15V		-	6.9	-	uC
R_{Gint}	Internal gate resistor	-	T_j =25°C	-	0.53	-	Ω
C_{ies}	Input Capacitance	V_{CE} =25V	T_j =25°C	-	86.4	-	nF
C_{oes}	Output Capacitance	V_{GE} =0V		-	2.35	-	nF
C_{res}	Reverse transfer Capacitance	f =1MHz		-	0.66	-	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	uA
$t_{d(on)}$	Turn-on delay time	V_{CC} =600V I_C =600A V_{GE} =+15V/-8V R_G =1.0⊠ Inductive load	T_j =25°C	-	222	-	ns
			T_j =125°C	-	196	-	
			T_j =150°C	-	196	-	
t_r	Rise time		T_j =25°C	-	56	-	ns
			T_j =125°C	-	58	-	
			T_j =150°C	-	63	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	690	-	ns
			T_j =125°C	-	861	-	
			T_j =150°C	-	924	-	
t_f	Fall time		T_j =25°C	-	144	-	ns
			T_j=125°C	-	273	-	
			T_j =150°C	-	302	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	26.62	-	mJ
			T_j =125°C	-	36.97	-	
			T_j =150°C	-	45.01	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	42.61	-	mJ
			T_j =125°C	-	77.19	-	
			T_j =150°C	-	80.63	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	0.05	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1			-	0.015	-	°C/W

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m・K and thickness is 50um

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Freewheeling Diode Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value Min.	Value Typ.	Value Max.	Unit
V_F	Diode Forward Voltage	I_F =600A, V_{GE} =0V	T_j=25°C	-	1.64	1.97	V
			T_j=125°C	-	1.48	-	
			T_j=150°C	-	1.49	-	
			T_j=175°C	-	1.44	-	
t_{rr}	Reverse recovery time	(Switch side) V_{CC}=600V I_C=600A V_{GE}=+15V/-8V R_G=1.0Ω (FRD side) V_{rr}=600V I_F=600A V_{GE}=-8V Inductive load switching operation	T_j=25°C	-	0.566	-	us
			T_j=125°C	-	0.858	-	
			T_j=150°C	-	0.944	-	
I_{RM}	Peak reverse recovery Current		T_j=25°C	-	382	-	A
			T_j=125°C	-	495	-	
			T_j=150°C	-	521	-	
Q_{rr}	Recovered charge		T_j=25°C	-	88.32	-	uC
			T_j=125°C	-	161.9	-	
			T_j=150°C	-	183.6	-	
E_{rr}	Reverse recovered energy		T_j=25°C	-	41.55	-	mJ
			T_j=125°C	-	75.71	-	
			T_j=150°C	-	85.68	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.07	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1			-	0.02	-	°C/W

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m・K and thickness is 50um

Test Conditions

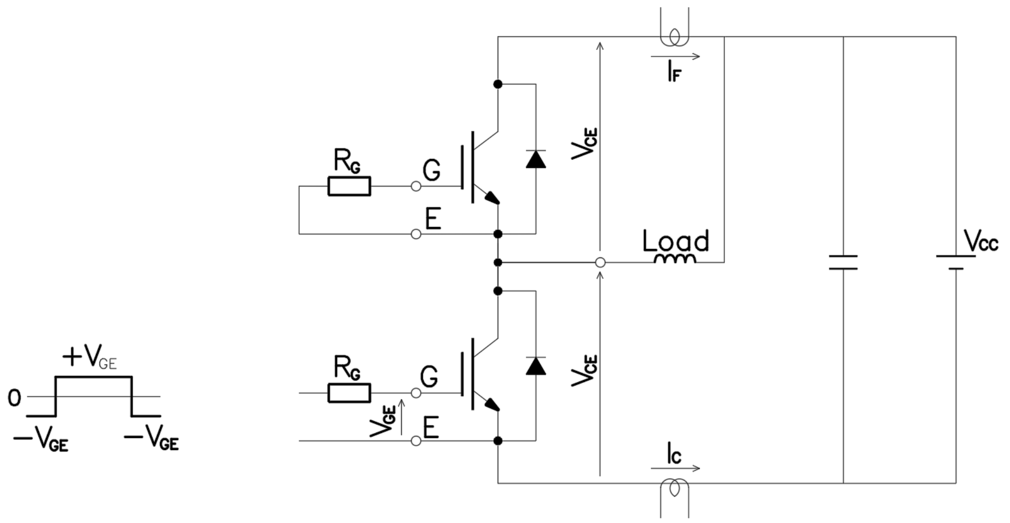

Figure 3. Switching time measure circuit

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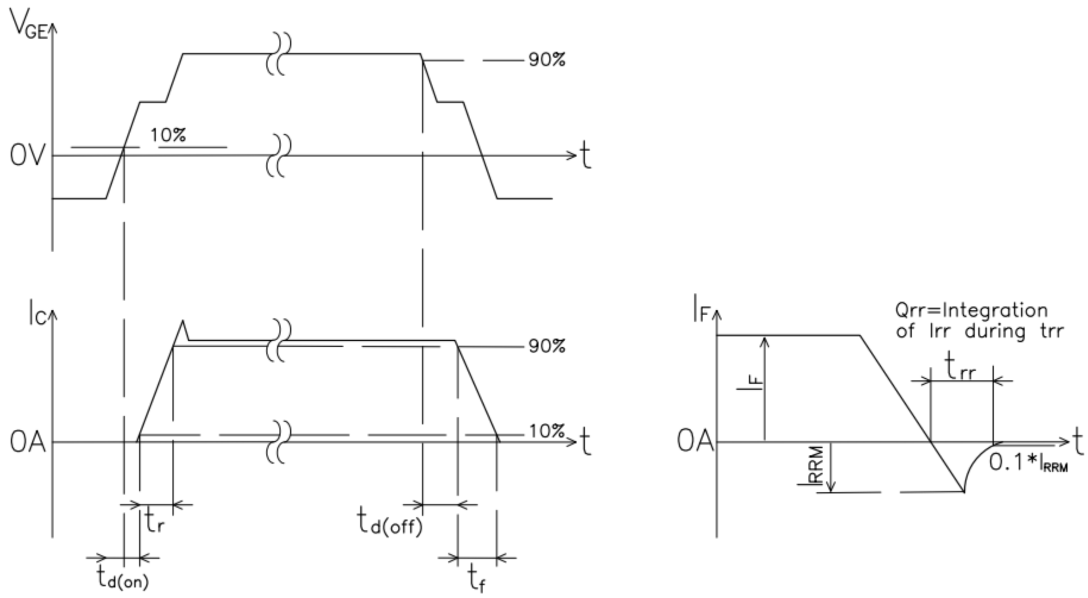

Figure 4. Switching time definition

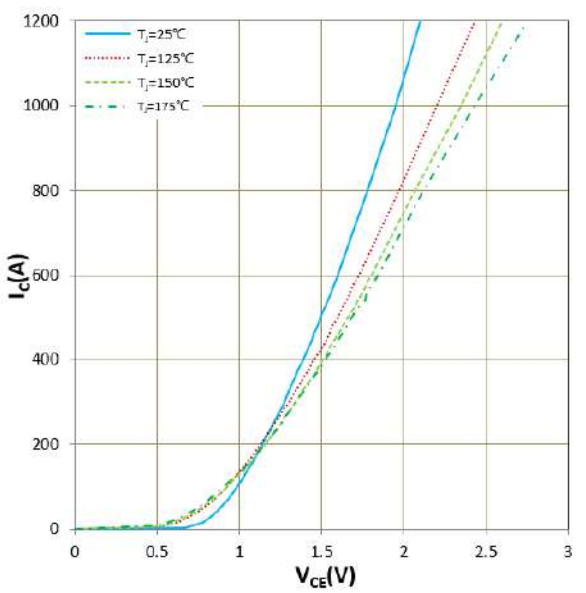	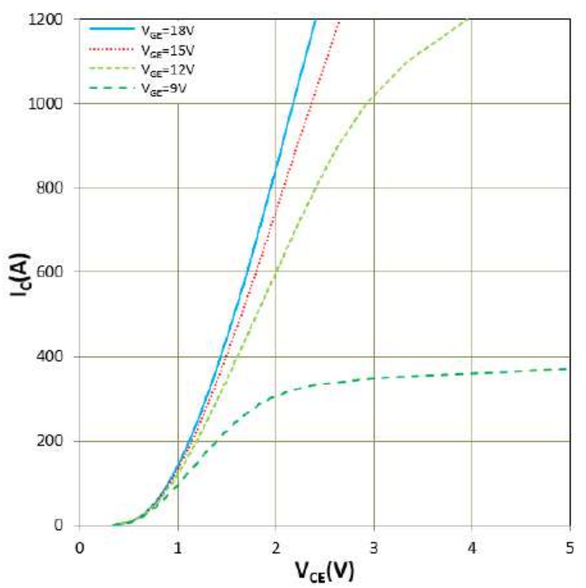
Figure 5. Ic vs V_{CE} V_{GE} =15V	Figure 6. Ic vs V_{CE} T_j =150°C

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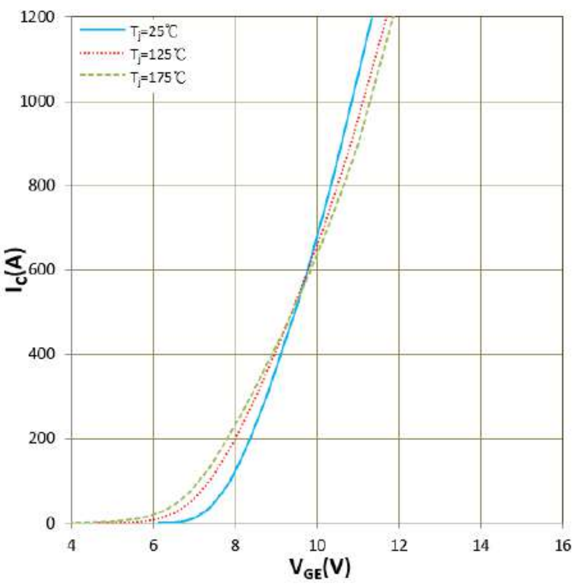

Figure 7. Ic vs V_{GE}

V_{CE} =20V

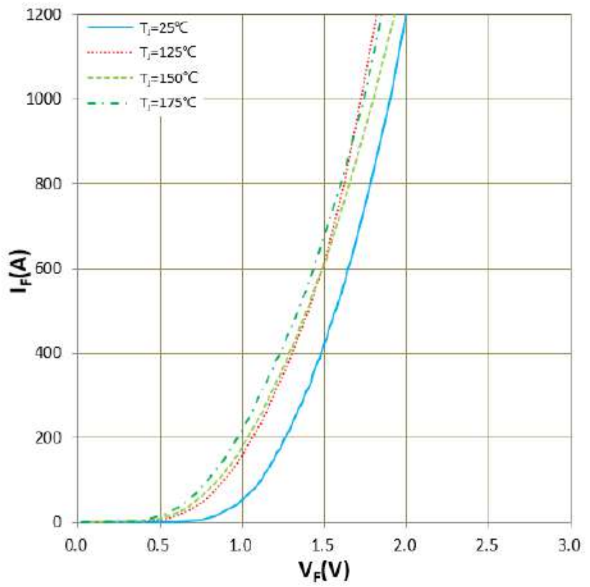

Figure 8. I_F vs V_F

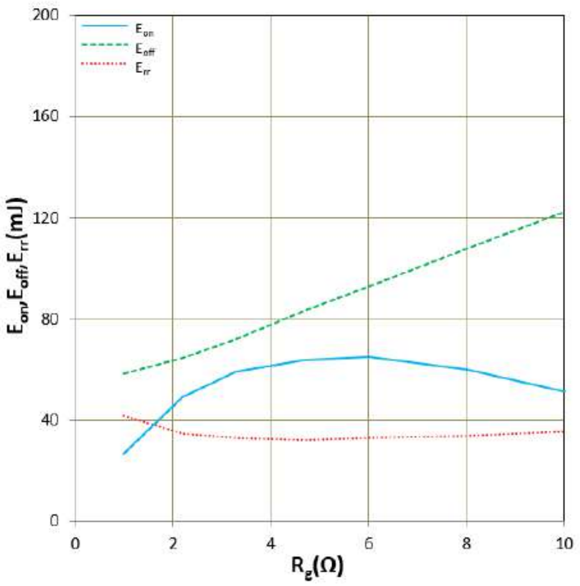

Figure 9. E_{on}, E_{off}, E_{rr} vs R_g(Typ)

V_{CC} =600V, V_{GE} =+15V/-8V, I_C =600A, T_j =25°C

Inductive Load

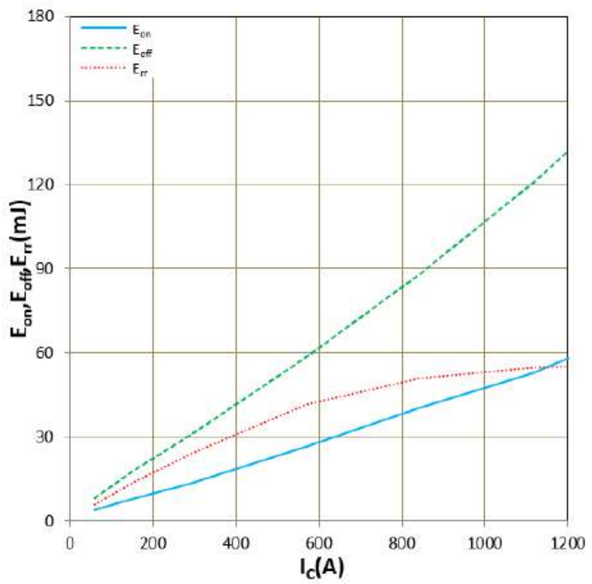

Figure 10. E_{on}, E_{off}, E_{rr} vs Ic(Typ)

V_{CC} =600V, V_{GE} =+15V/-8V, R_g =1.0Ω, T_j =25°C

Inductive Load

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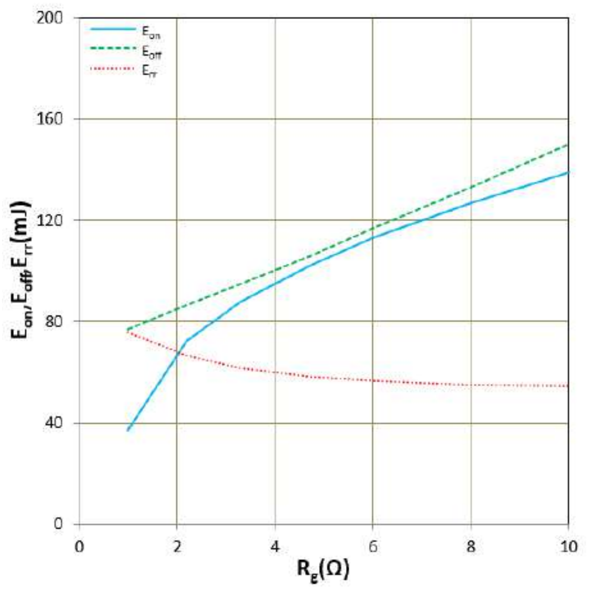


Figure 11. E_{on}, E_{off}, E_{rr} vs R_g(Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, I_C =600A, T_j =125°C
Inductive Load

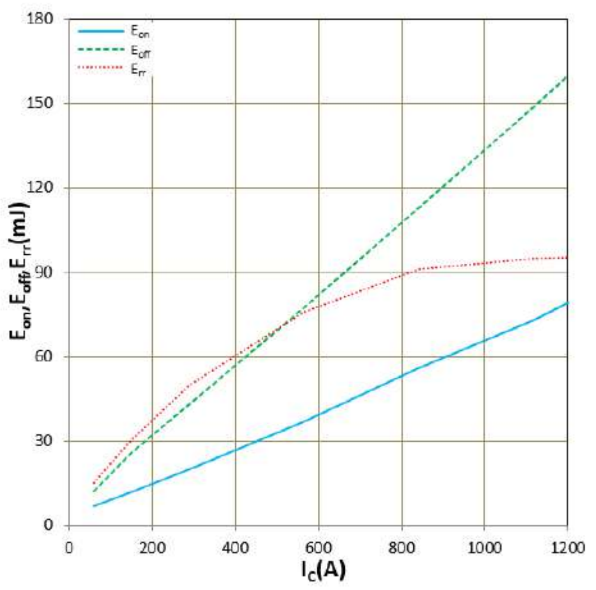


Figure 12. E_{on}, E_{off}, E_{rr} vs Ic(Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, R_g =1.0Ω, T_j =125°C
Inductive Load

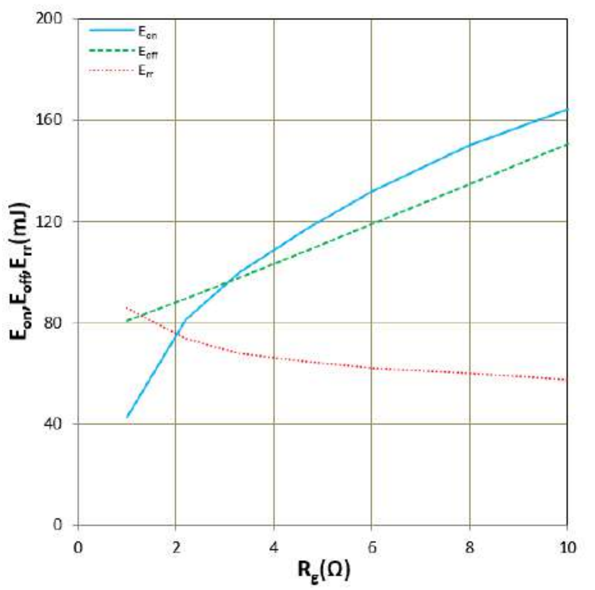


Figure 13. E_{on}, E_{off}, E_{rr} vs R_g(Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, I_C =600A, T_j =150°C
Inductive Load

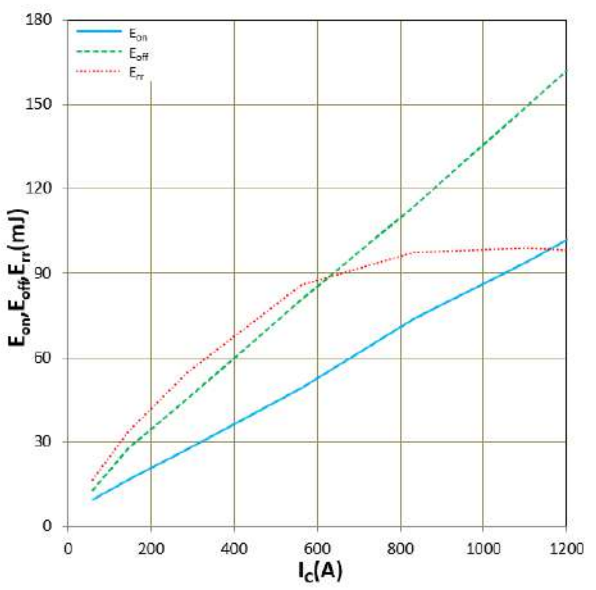


Figure 14. E_{on}, E_{off}, E_{rr} vs Ic(Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, R_g =1.0Ω, T_j =150°C
Inductive Load

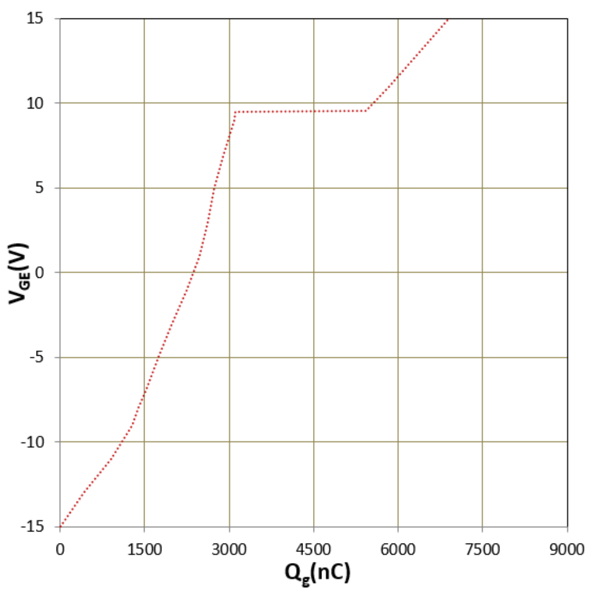


Figure 15. Gate charge

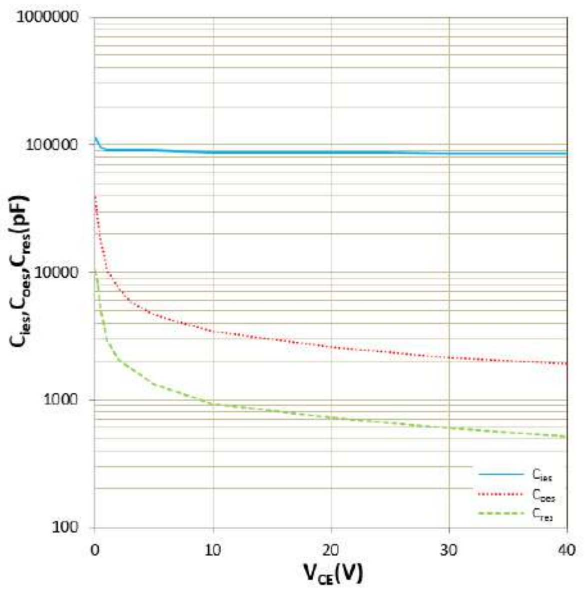
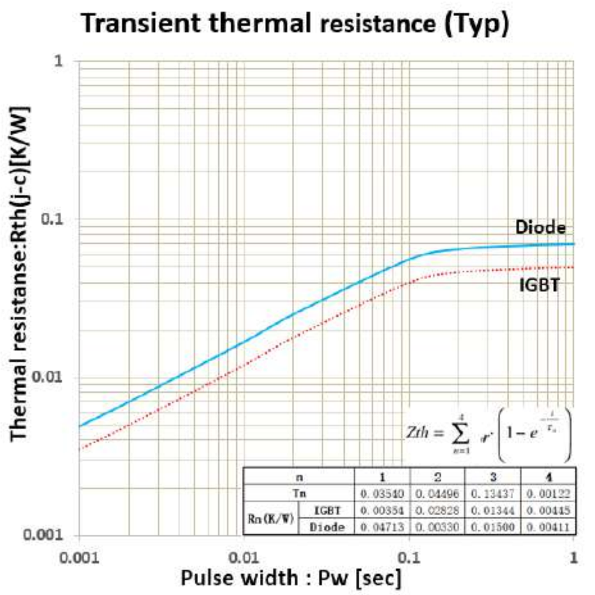


Figure 16. C_{ies}, C_{oes}, C_{res} vs V_{CE}

T_j =25°C, f =1MHz



n		1	2	3	4
Tn		0.03540	0.04496	0.13437	0.00122
Rn (K/W)	IGBT	0.00354	0.02828	0.01344	0.00445
	Diode	0.04713	0.00330	0.01500	0.00411

Figure 17. transient thermal impedance

IGBT/Diode

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 (ales@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	300	FF	1700	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	
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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