HCG300FF170E3RE1

1700V/300A Half Bridge IGBT Module

Description

The HCG300FF170E3RE1 is a Half Bridge IGBT Power Module. It integrates high performance IGBT chips and offers lower losses and higher energy for the applications such as motor drive、inverter and welding machines.

Features

- 1700V300A
- $V_{CE(sat)}$ (typ.)=1.65V@25°C
- Lower losses and higher energy
- High speed switching

Applications

- Motor drive
- Inverter
- Welding machines
- Power supply
- UPS

Circuit diagram

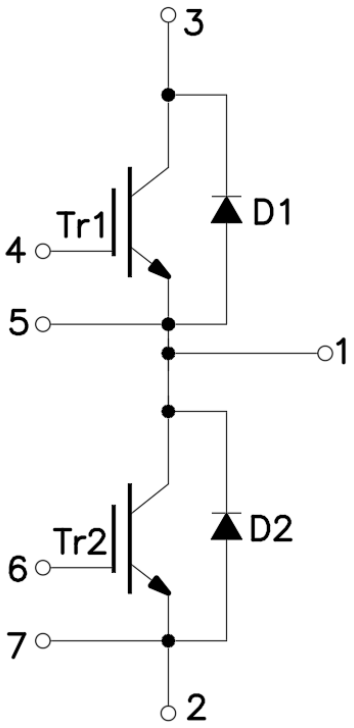

Figure 1. Out drawing & circuit diagram for HCG300FF170E3RE1

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Pin Configuration and Marking Information

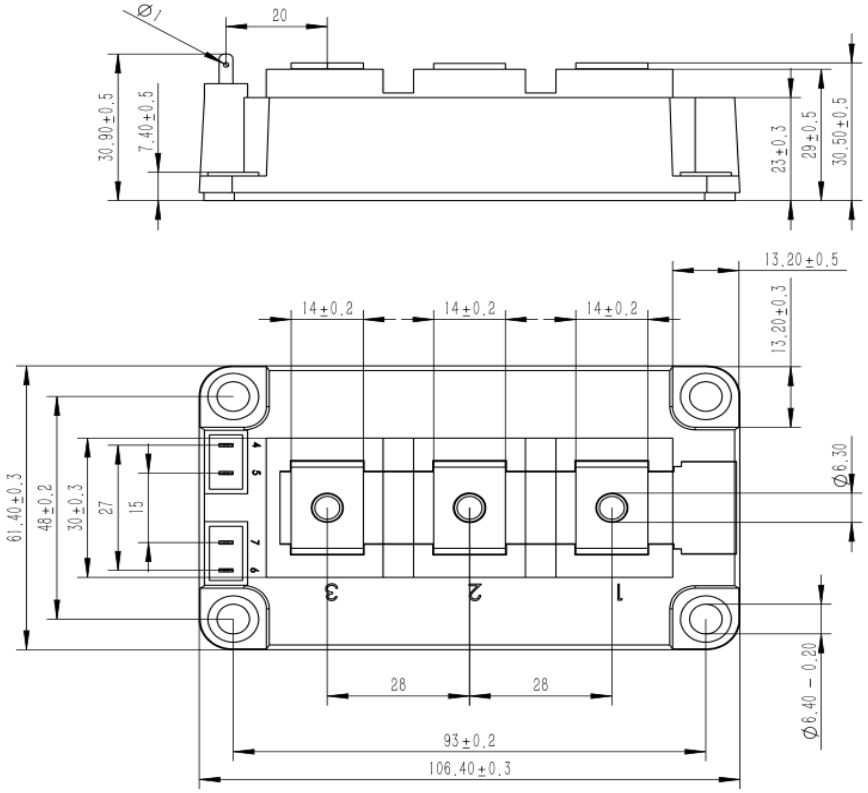

Figure 2. Pin configuration

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Module

Parameter	Condition	Value	Unit
Isolation Voltage	RMS, f =50Hz, t =1min	4.0	kV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink terminal to terminal	47 26	mm
Clearance	terminal to heatsink terminal to terminal	29 14	mm
CTI	-	>200	-
Module lead resistance, terminals – chip	T_C =25°C	0.8	mΩ
Mounting torque for module mounting	M6	3 to 6	Nm
Weight	-	315	g

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

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	1700	V
V_{GES}	Gate-Emitter Voltage	C-E Short	±20	V
I_C	DC Continuous Collector Current	T_C =125°C	300	A
I_{CM}	Pulse Collector Current	t_p =1ms, Note1	1200	A
P_C	Maximum Power Dissipation	T_C =25°C, IGBT	2143	W
I_F	Diode Forward Current	-	300	A
I_{FRM}	Repetitive peak forward Current	t_p =1ms, Note1	600	A
T_j	junction temperature	-	-40 to 175	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: 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	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°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=300A, V_{GE}=15V	T_j=25°C	-	1.65	1.90	V
			T_j=125°C	-	1.78	-	V
			T_j=150°C	-	1.87	-	V
			T_j=175°C	-	1.91	-	V
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C=12mA, V_{CE}=V_{GE}		5.0	6.0	-	V
Q_G	Gate charge	V_{GE}= -15V to +15V, V_{CC}=900V		-	3.1	-	uC
R_{Gint}	Internal gate resistor	-	T_j=25°C	-	-	-	Ω
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=1MHz	T_j=25°C	-	28.0	-	nF
C_{oes}	Output Capacitance			-	1.02	-	nF
C_{res}	Reverse transfer Capacitance			-	0.38	-	nF
I_{CES}	Collector- Emitter Cut off Current	V_{CE}=1700V, 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}=900V, I_C=300A, V_{GE}=+15V/-8V, R_{Gon}=R_{Goff}=1.5Ω, Inductive load	T_j=25°C	-	279	-	ns
			T_j=150°C	-	304	-	ns
t_r	Rise time		T_j=25°C	-	160	-	ns
			T_j=150°C	-	192	-	ns
$t_{d(off)}$	Turn-off delay time		T_j=25°C	-	630	-	ns
			T_j=150°C	-	749	-	ns
t_f	Fall time		T_j=25°C	-	380	-	ns
			T_j=150°C	-	638	-	ns
E_{on}	Turn-on power dissipation		T_j=25°C	-	122.3	-	mJ
			T_j=150°C	-	202.1	-	mJ
E_{off}	Turn-off power dissipation		T_j=25°C	-	67.2	-	mJ
			T_j=150°C	-	99.9	-	mJ
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	0.070	-	°C /W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1			-	0.020	-	°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			Unit
				Min.	Typ.	Max.	
V_F	Diode Forward Voltage	I_F=300A, V_{GE}=0V	T_j=25°C	-	2.10	-	V
			T_j=125°C	-	2.12	-	V
			T_j=150°C	-	2.05	-	V
			Tj=175°C	-	2.10	-	V
t_{rr}	Reverse recovery time	(Switch side)	Tj=25°C	-	730	-	ns
		V_{CC}=900V, I_C=300A	Tj=150°C	-	1059	-	ns
I_{RM}	Peak reverse recovery Current	V_{GE}=+15V/-8V, R_G=1.5Ω	Tj=25°C	-	134	-	A
		(FRD side)	Tj=150°C	-	168	-	A
Q_{rr}	Recovered charge	V_{rr}=900V, I_F=300A	Tj=25°C	-	53	-	uC
		V_{GE}=-8V	Tj=150°C	-	124	-	uC
E_{rr}	Reverse recovered energy	Inductive load	Tj=25°C	-	35.9	-	mJ
		switching operation	Tj=150°C	-	60.3	-	mJ
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.118	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied), Note1			-	0.025	-	°C/W

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

Test Conditions

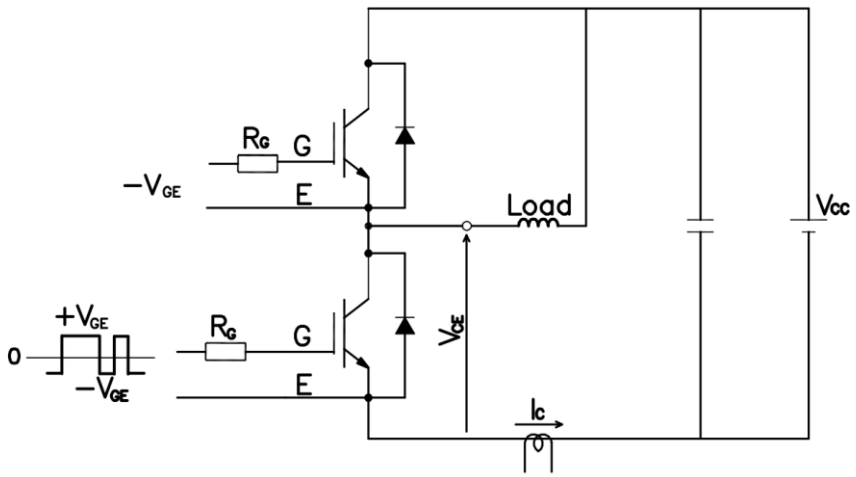

Figure 3. Switching time measure circuit

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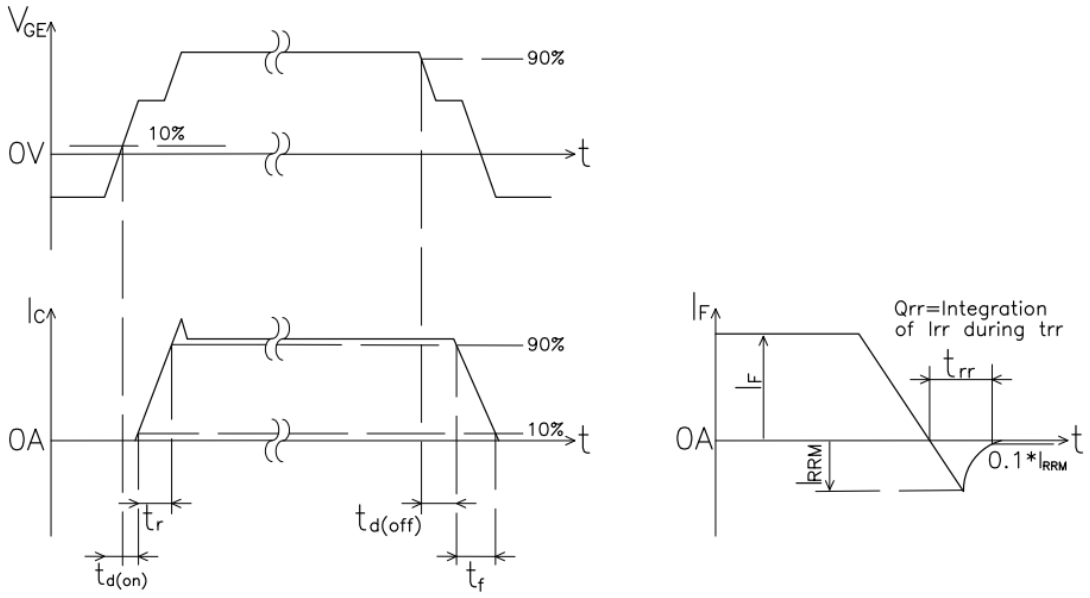

Figure 4. Switching time definition

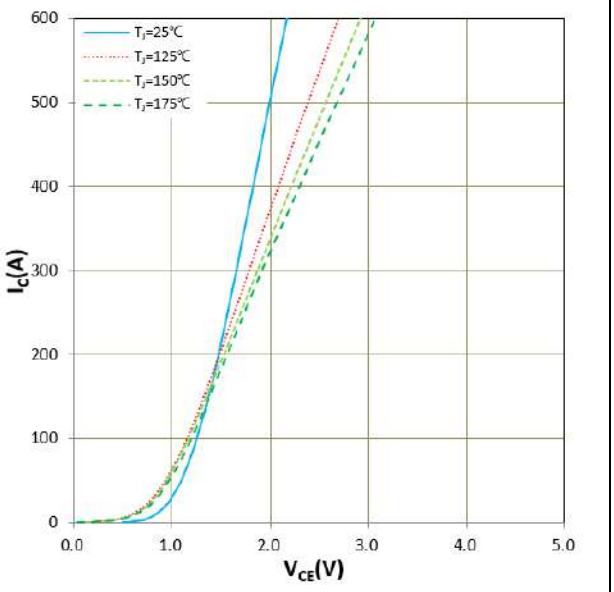

Figure 5. Ic vs V_{CE}
V_{GE}=15V

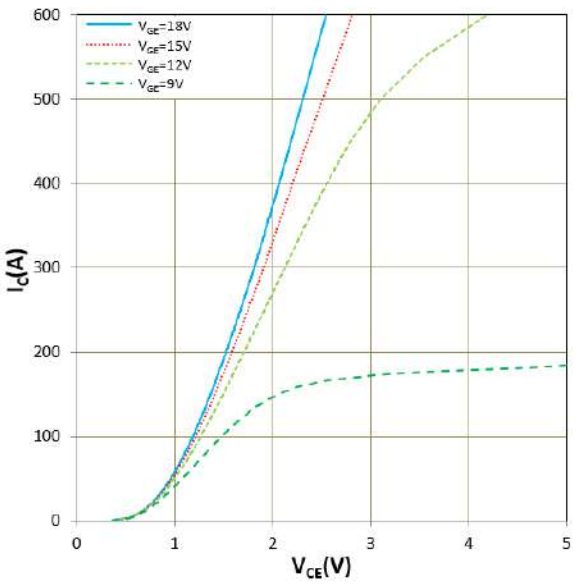

Figure 6. Ic vs V_{CE}
T_j=175°C

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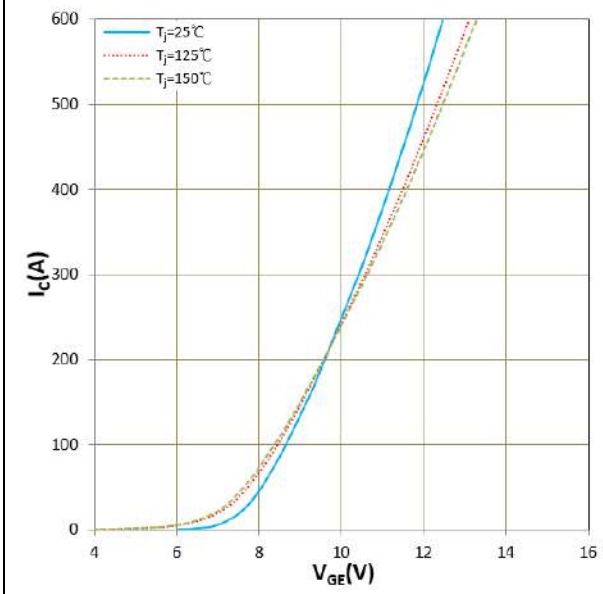

Figure 7. Ic vs V_{GE}
V_{CE} =20V

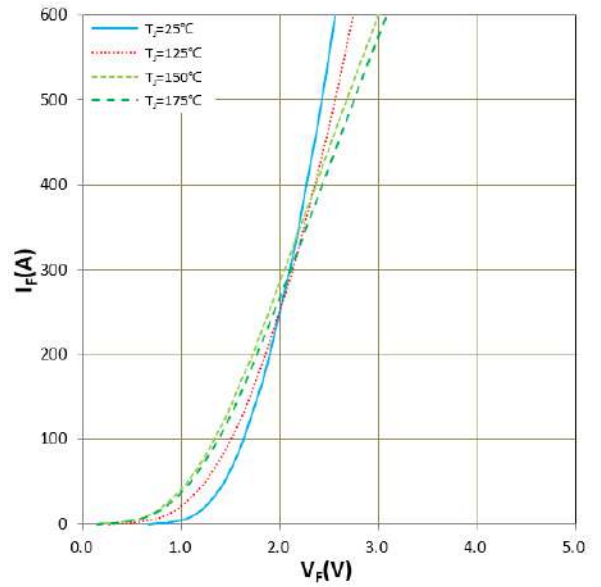

Figure 8. I_F vs V_F

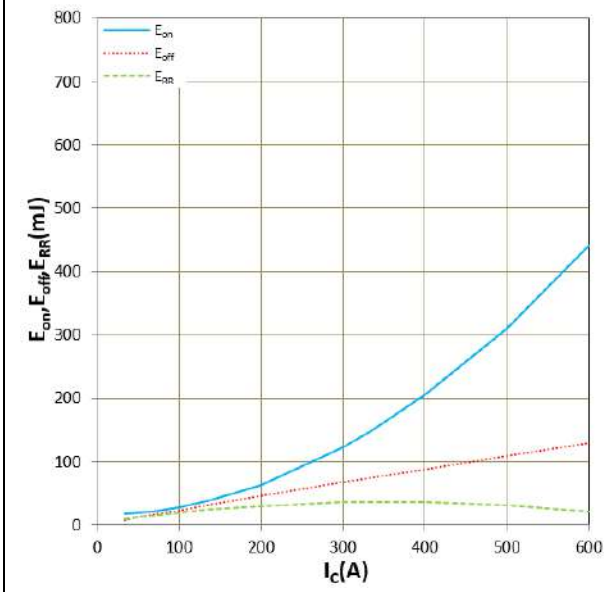

Figure 9. E_{on}, E_{off}, E_{rr} vs Ic(Typ)
V_{CC}=900V, V_{GE} =+15V/-8V, R_g =1.5Ω, T_j =25°C
Inductive Load

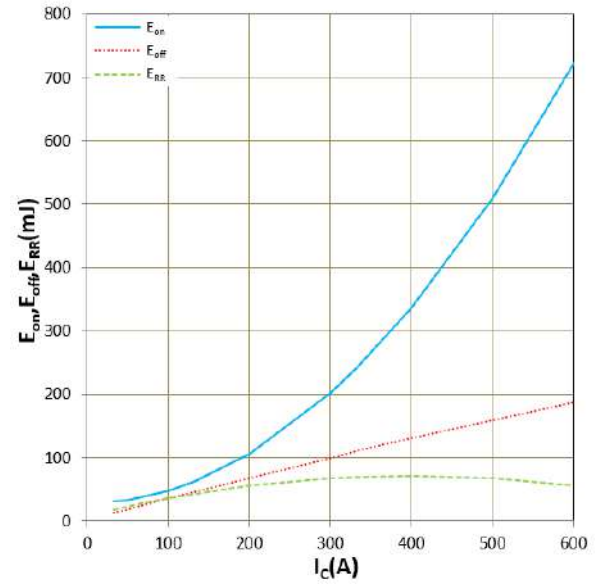

Figure 10. E_{on}, E_{off}, E_{rr} vs Ic(Typ)
V_{CC}=900V, V_{GE} =+15V/-8V, R_g =1.5Ω, T_j =150°C
Inductive Load

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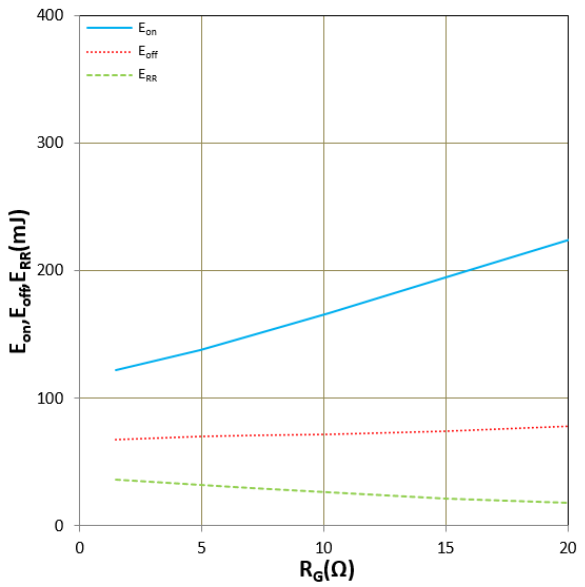

Figure 11. E_{on}, E_{off}, E_{rr} vs R_g(Typ)
V_{CC} =900V, V_{GE} =+15V/-8V, I_C =300A, T_j =25°C
Inductive Load

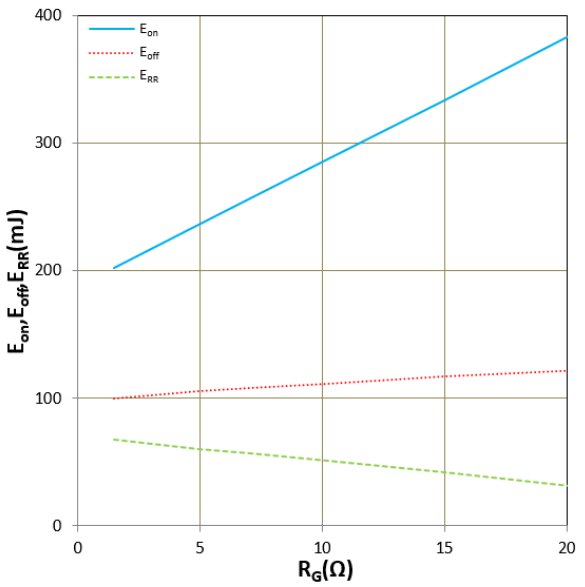

Figure 12. E_{on}, E_{off}, E_{rr} vs R_g(Typ)
V_{CC} =900V, V_{GE} =+15V/-8V, I_C =300A, T_j =150°C
Inductive Load

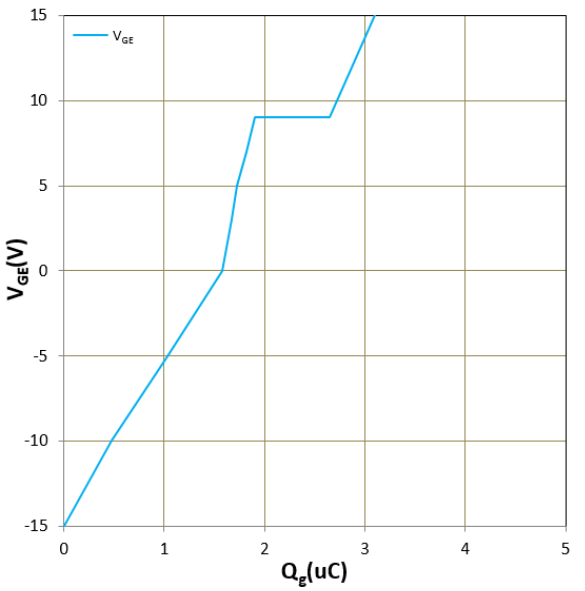

Figure 13. Gate charge

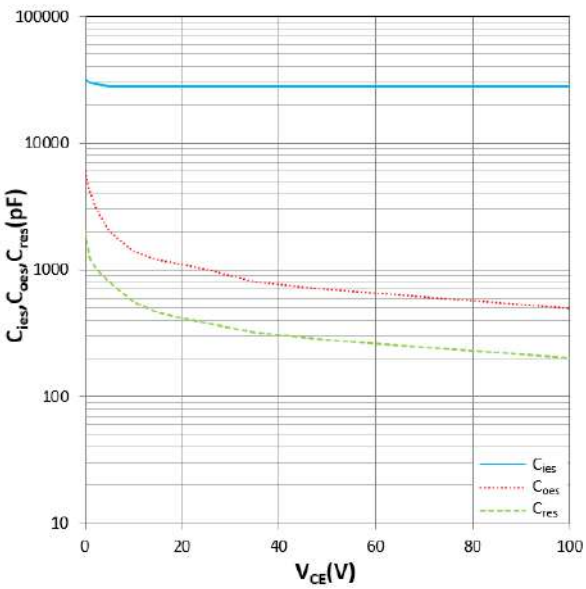

Figure 14. C_{ies}， C_{oes}， C_{res} vs V_{CE}
T_j =25°C, f =1MHz

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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	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 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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