

HCH100FT120M2H1

1200V/100A 6 Units SiC Hybrid Module

Description

The HCH100FT120M2H1 offer lower losses and higher energy for application such as motor drive, inverter and soft switching applications.



Features

- 1200V100 A, $V_{CE(sat)}(typ.) = 1.40V$
- Lower losses and higher energy
- Excellent short-circuit capability
- Zero Reverse Recovery from SiC Diodes

Applications

- Motor drive
- Inverter
- Welding machines
- UPS

Circuit diagram

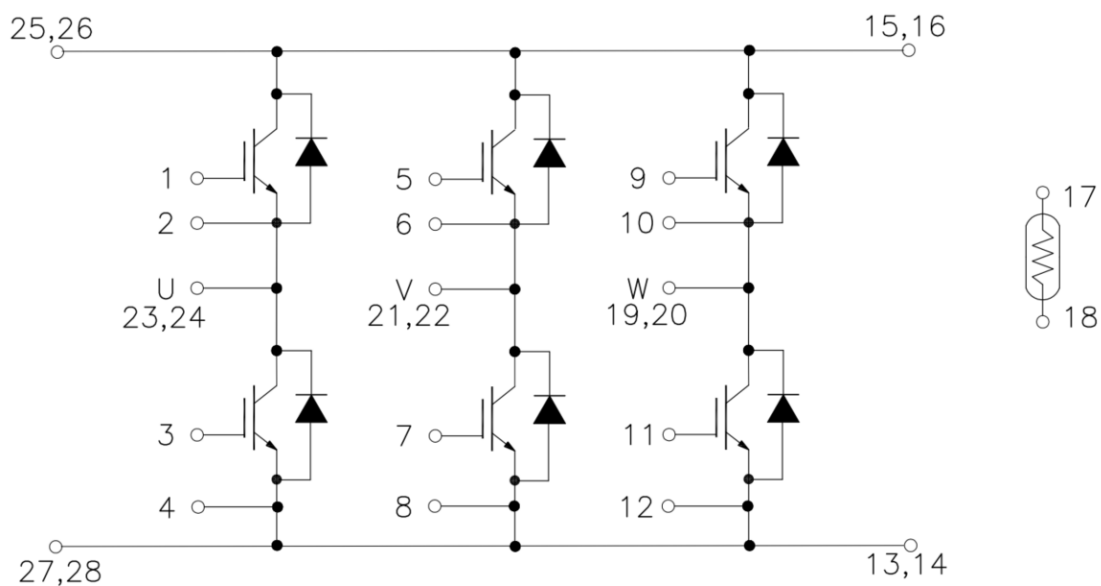


Figure 1. Out drawing & circuit diagram for HCH100FT120M2H1

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Pin Configuration and Marking Information

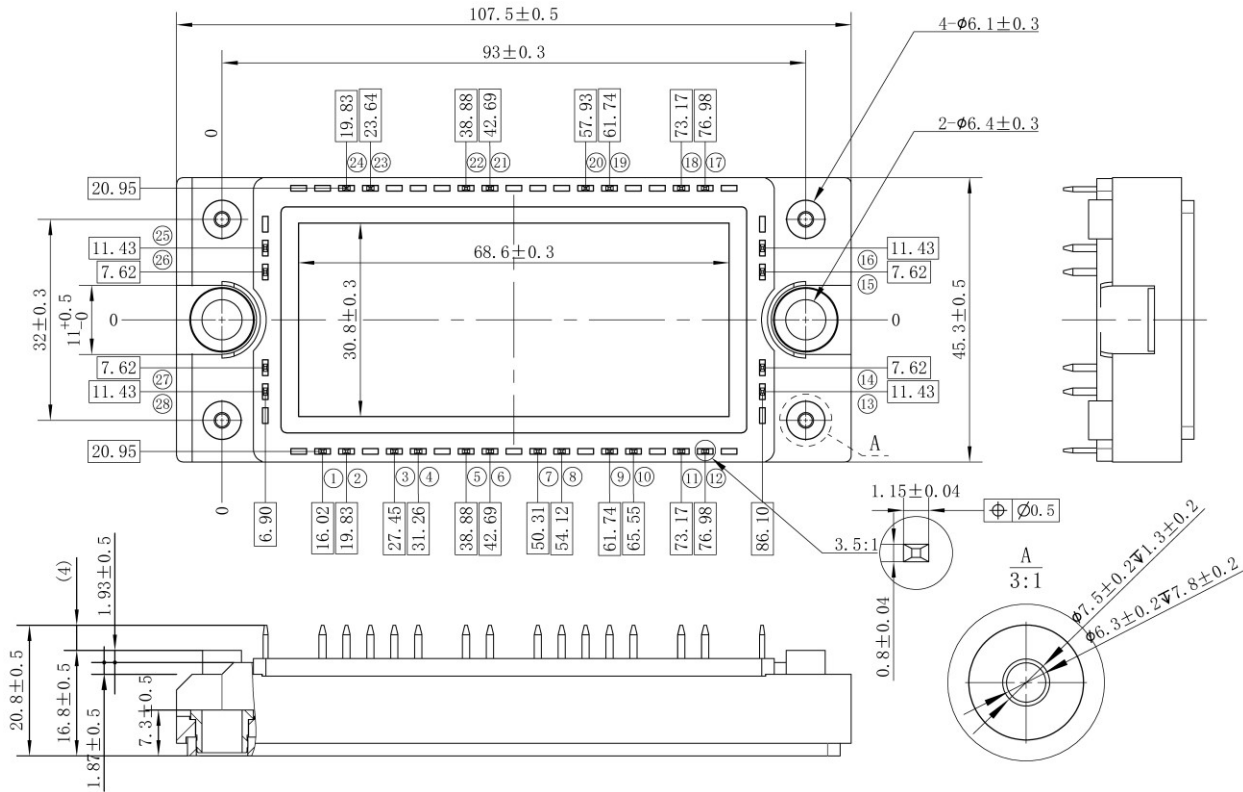


Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f = 50Hz, t = 1min	2.5	KV
CTI	-	>200	-
Module lead resistance, terminals – chip	T _C = 25°C	0.8	mΩ
Mounting torque for module mounting	M5	3.5	Nm
Weight	-	175	g

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Maximum Ratings ($T_j=25^{\circ}\text{C}$ 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	$\pm 20\text{V}$	V
I_C	DC Continuous Collector Current	$T_C=120^{\circ}\text{C}$, $T_{vjop}=150^{\circ}\text{C}$ (IGBT)	100	A
I_{CM}	Pulse Collector Current	$t_p=1\text{ms}$, Note1	200	A
P_C	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$, $T_{vjop}=150^{\circ}\text{C}$ (IGBT)	625	W
I_F	Diode forward Current	-	100	A
I_{FRM}	Repetitive peak forward Current	$t_p=1\text{ms}$, Note1	200	A
t_{sc}	Short Circuit Withstand Time	$V_{GE}=15\text{V}$, $V_{CE}=600\text{V}$	10	μs
T_{jmax}	Max junction temperature	-	175	$^{\circ}\text{C}$
T_{vjop}	Operating junction temperature	-	-40 to 150	$^{\circ}\text{C}$
T_{stg}	Storage temperature	-	-40 to 125	$^{\circ}\text{C}$

Note1: Pulse width limited by maximum junction temperature

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Resistance	$T_C=25^{\circ}\text{C}$	-	5	-	$\text{k}\Omega$
R/R	Deviation of R_{100}	$T_C=100^{\circ}\text{C}$, $R_{100}=493\Omega$	-5	-	5	%
P_{25}	Power dissipation	$T_C=25^{\circ}\text{C}$	-	-	20	mW
$B_{25/50}$	B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3375	-	K
$B_{25/80}$	B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3411	-	K
$B_{25/100}$	B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$	-	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 =100A V _{GE} =15V	T _J =25°C	-	1.30	-	V
			T _J =125°C	-	1.42	-	V
			T _J =150°C	-	1.45	-	V
			T _J =175°C	-	1.50	-	V
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =5.7mA, V _{CE} =V _{GE}		5.0	5.8	6.5	V
Q _G	Gate charge	V _{GE} = -15V to +15V		-	1728	-	nC
R _{Gint}	Internal gate resistor	-	T _J =25°C	-	2.1	-	Ω
C _{ies}	Input Capacitance	V _{CE} =25V	T _J =25°C	-	21.6	-	nF
C _{oes}	Output Capacitance	V _{GE} =0V		-	0.59	-	nF
C _{res}	Reverse transfer Capacitance	f=1MHz		-	0.17	-	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	μA
t _{d(on)}	Turn-on delay time	V _{CC} =600V I _C =100A V _{GE} =+15V/-8V R _{Gon} = R _{Goff} =4.7Ω Inductive load	T _J =25°C	-	212	-	ns
			T _J =125°C	-	210	-	
			T _J =150°C	-	209	-	
t _r	Rise time		T _J =25°C	-	22	-	ns
			T _J =125°C	-	33	-	
			T _J =150°C	-	37	-	
t _{d(off)}	Turn-off delay time		T _J =25°C	-	457	-	ns
			T _J =125°C	-	532	-	
			T _J =150°C	-	549	-	
t _f	Fall time		T _J =25°C	-	216	-	ns
			T _J =125°C	-	348	-	
			T _J =150°C	-	401	-	
E _{on}	Turn-on power dissipation		T _J =25°C	-	3.99	-	mJ
			T _J =125°C	-	5.34	-	
			T _J =150°C	-	5.70	-	
E _{off}	Turn-off power dissipation		T _J =25°C	-	10.21	-	mJ
			T _J =125°C	-	14.23	-	
			T _J =150°C	-	15.27	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)			-	0.20	-	K/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.05	-	K/W

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SiC SBDElectrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
V _F	Diode Forward Voltage	I _F =100A, V _{GE} =0V	T _j =25°C	-	1.65	-	V
			T _j =125°C	-	2.15	-	
			T _j =150°C	-	2.35	-	
			T _j =175°C	-	2.55	-	
t _{rr}	Diode Reverse Recovery Time	(Switch side) V _{CC} =600V, I _C =100A V _{GE} =+15V/-8V	T _j =25°C		22	-	ns
			T _j =125°C	-	33	-	
			T _j =150°C		32		
Q _{rr}	Recovered charge	R _{Gon} = R _{Goff} =4.7 Ω (SiC SBD side) V _{rr} =600V, I _F =100A	T _j =25°C	-	0.597	-	μC
			T _j =125°C	-	0.444	-	
			T _j =150°C	-	0.464	-	
E _{rr}	Reverse recovered energy	V _{GE} =-8V Inductive load switching operation	T _j =25°C	-	0.195	-	mJ
			T _j =125°C	-	0.114	-	
			T _j =150°C	-	0.104	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (SiC SBD)			-	0.45	-	K/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.05	-	K/W

Test Conditions

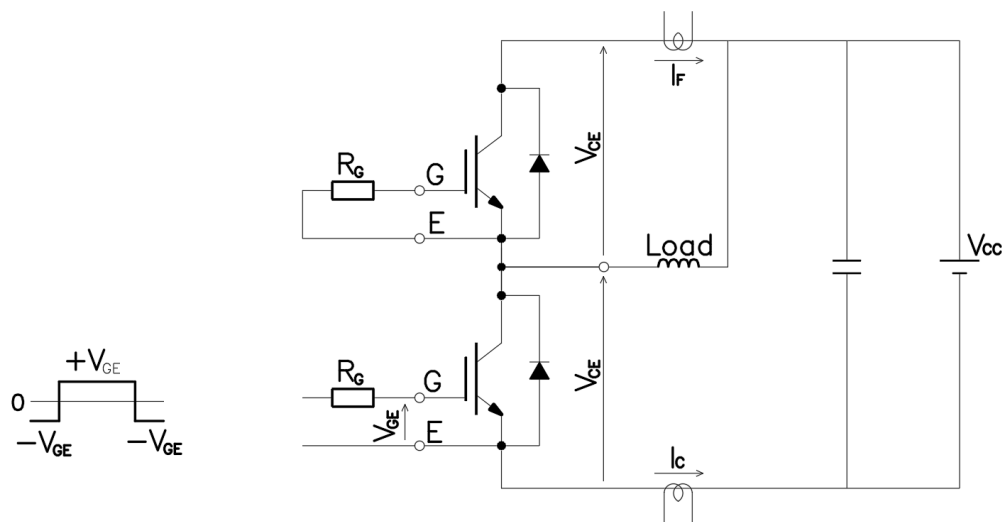


Figure 3. Switching time measure circuit

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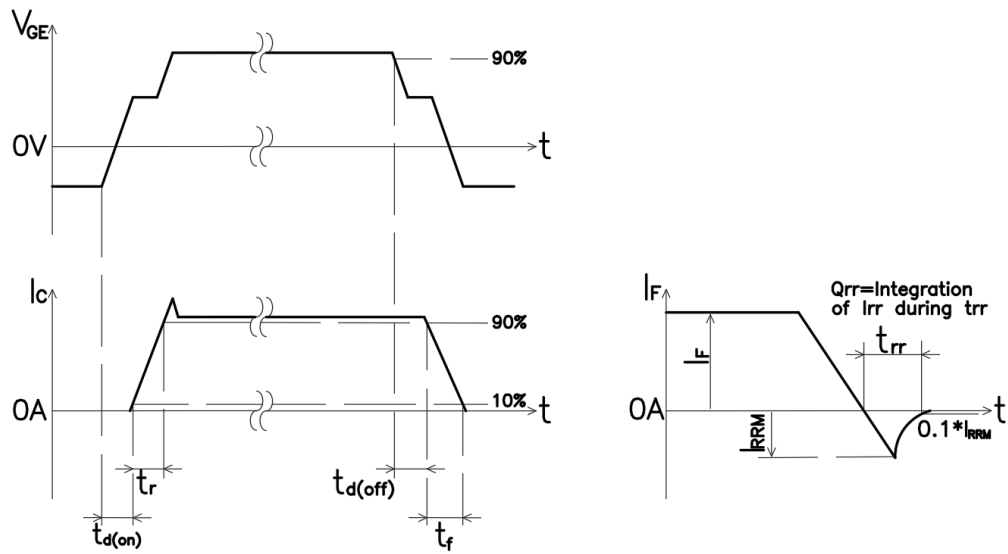
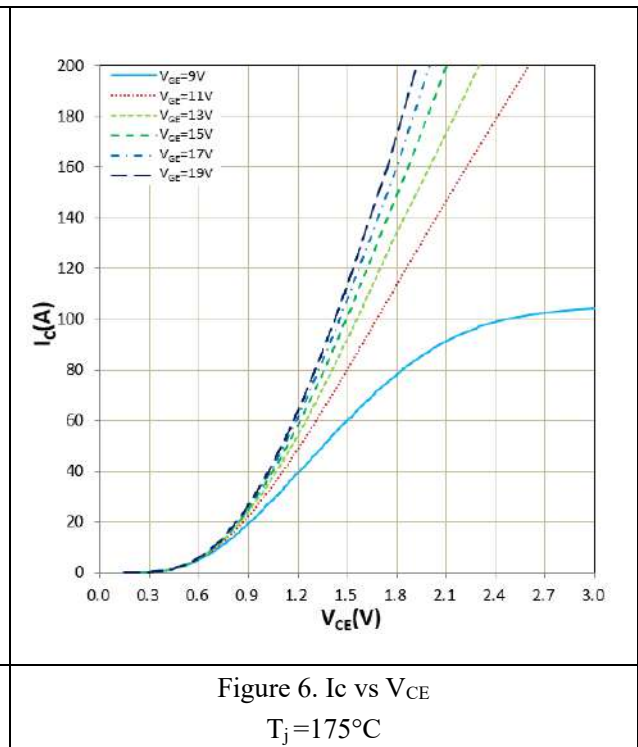
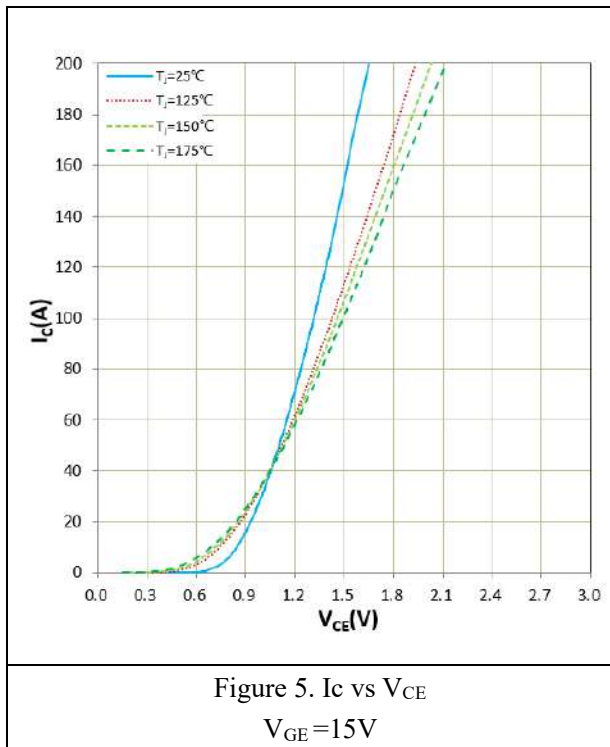


Figure 4. Switching time definition



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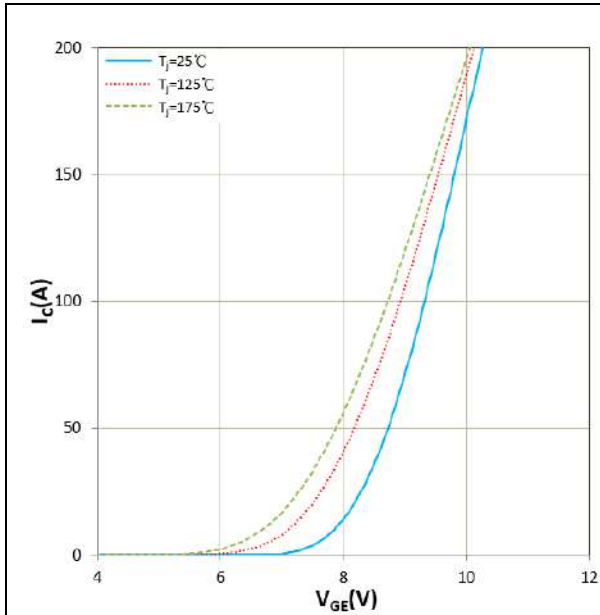


Figure 7. I_c vs V_{GE}
 $V_{CE} = 20\text{V}$

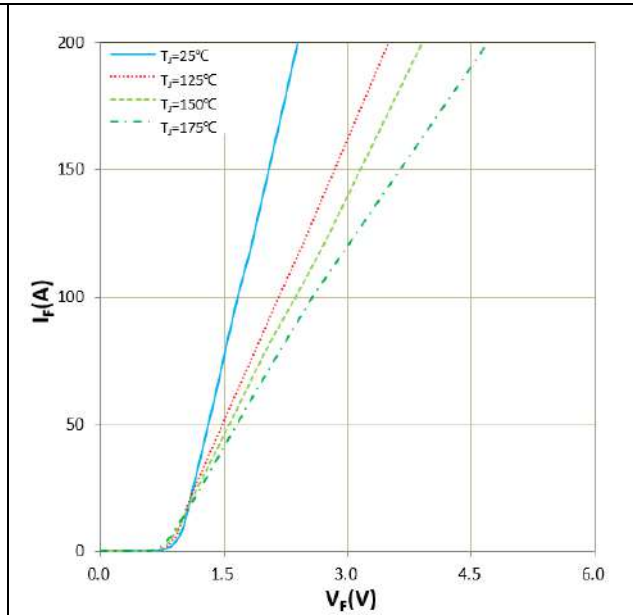


Figure 8. I_F vs V_F

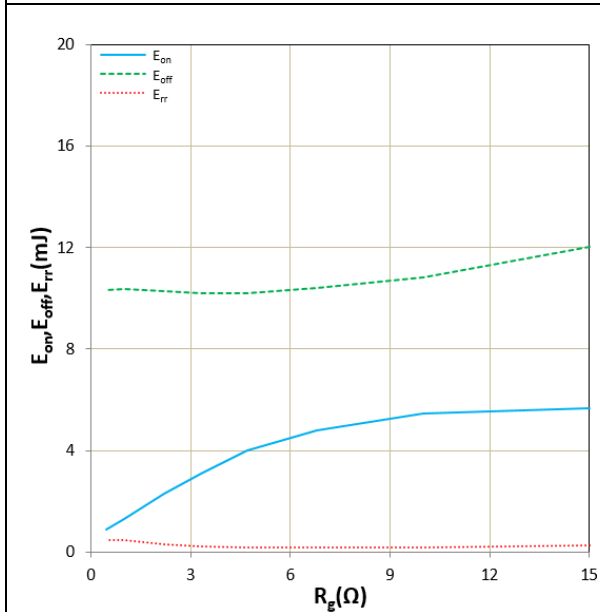


Figure 9. E_{on} , E_{off} , E_{rr} vs R_g (Typ)
 $V_{CC} = 600\text{V}$, $V_{GE} = +15\text{V}/-8\text{V}$, $I_c = 100\text{A}$, $T_j = 25^\circ\text{C}$
Inductive Load

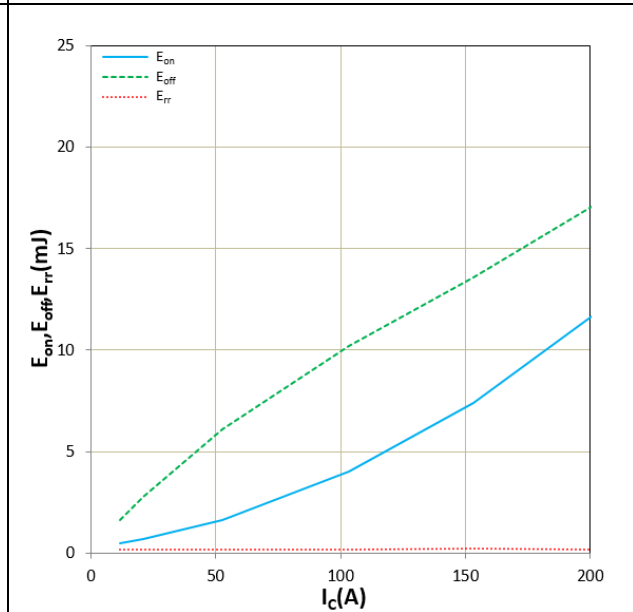


Figure 10. E_{on} , E_{off} , E_{rr} vs I_c (Typ)
 $V_{CC} = 600\text{V}$, $V_{GE} = +15\text{V}/-8\text{V}$, $R_g = 4.7\Omega$, $T_j = 25^\circ\text{C}$
Inductive Load

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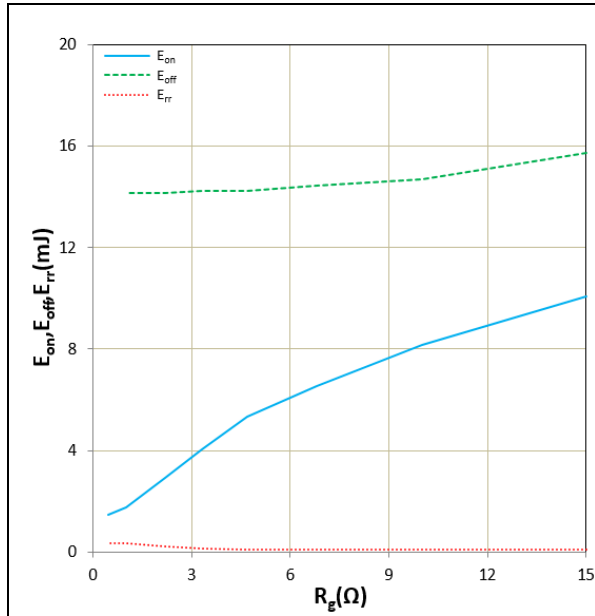


Figure 11. E_{on} , E_{off} , E_{tr} vs R_g (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_C=100A$, $T_j=125^\circ C$
Inductive Load

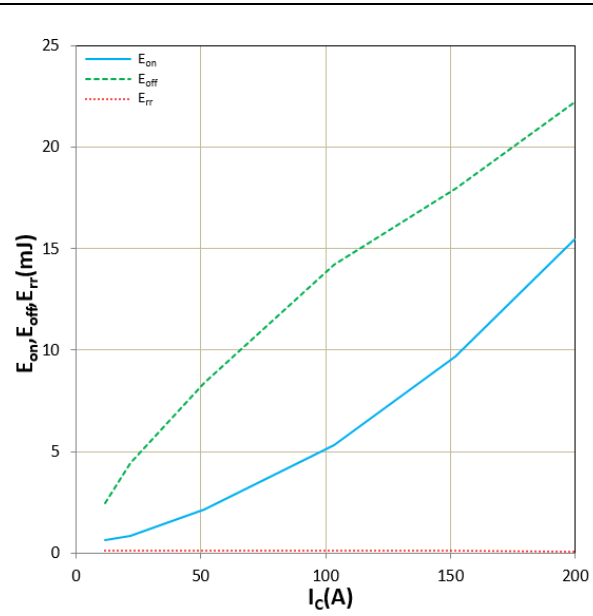


Figure 12. E_{on} , E_{off} , E_{tr} vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=4.7\Omega$, $T_j=125^\circ C$
Inductive Load

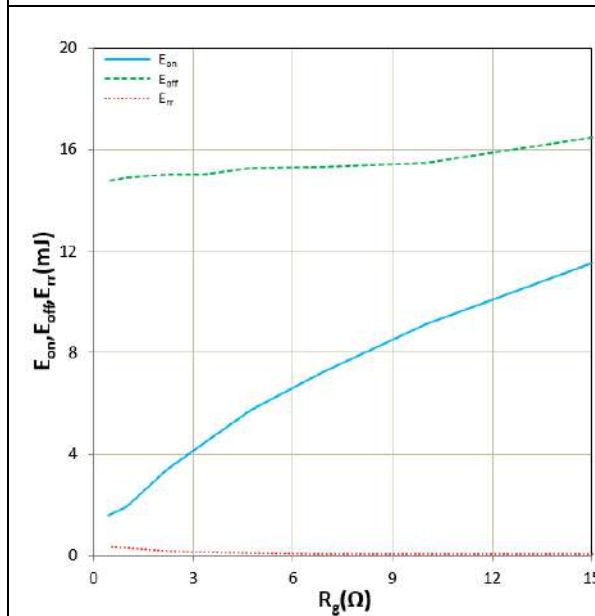


Figure 13. E_{on} , E_{off} , E_{tr} vs R_g (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $I_C=100A$, $T_j=150^\circ C$
Inductive Load

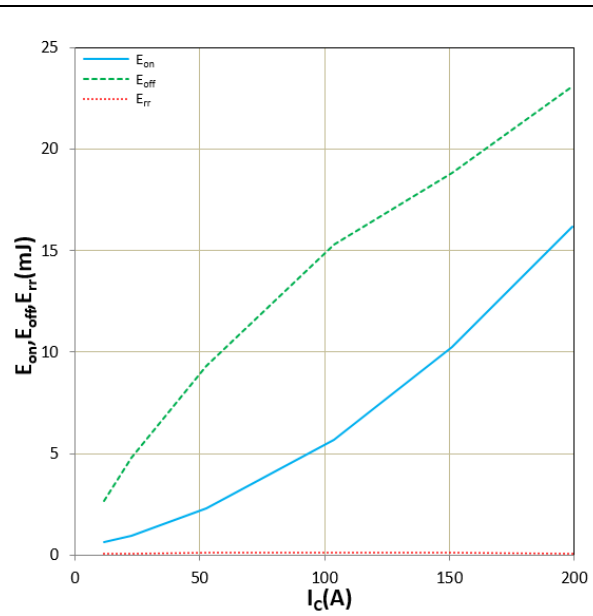


Figure 14. E_{on} , E_{off} , E_{tr} vs I_c (Typ)
 $V_{CC}=600V$, $V_{GE}=+15V/-8V$, $R_g=4.7\Omega$, $T_j=150^\circ C$
Inductive Load

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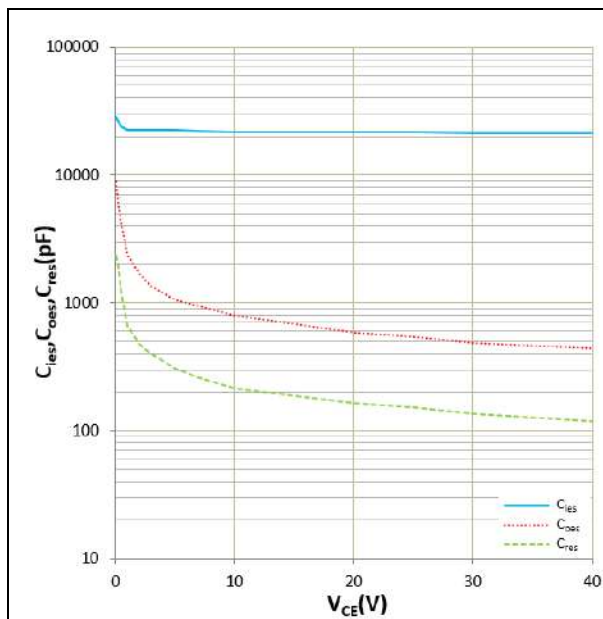


Figure 15. C_{ies} , C_{oes} , C_{res} vs V_{CE}
 $T_j=25^{\circ}\text{C}$, $f=1\text{MHz}$

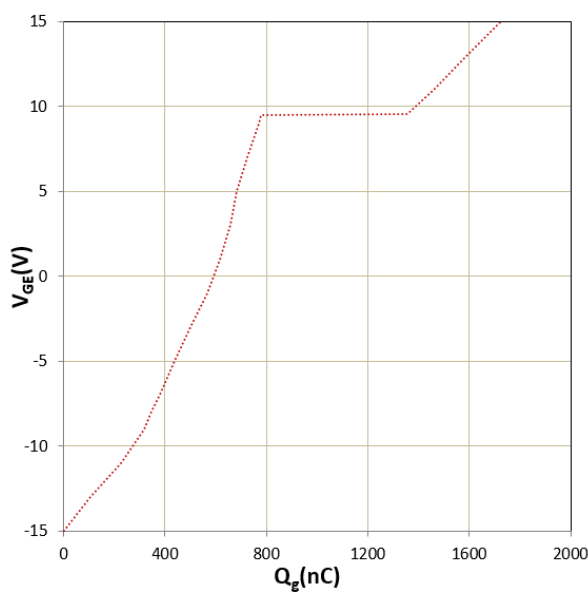


Figure 16. Gate charge
 $T_j=25^{\circ}\text{C}$

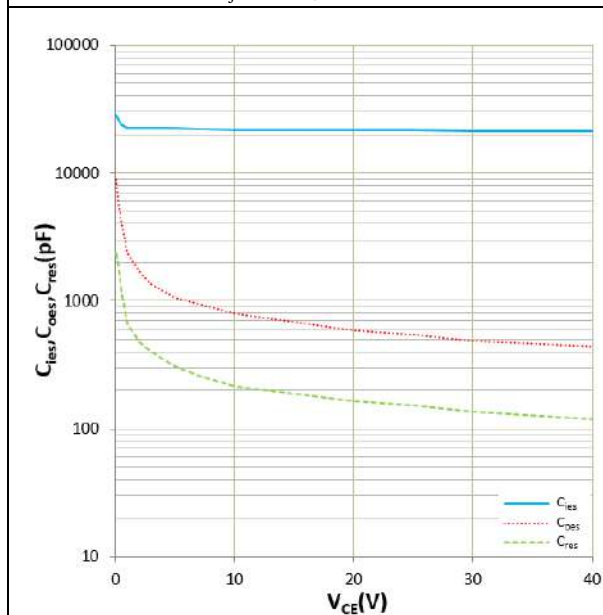


Figure 17. Transient thermal resistance

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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 (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

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

