

HCG600FH120A2E1

1200V / 600A 62 mm with Cu Baseplate

Features

- Low $V_{CE(SAT)}$
- High speed switching
- Low Inductance module structure

Applications

- Inverter for motor drives, AC and DC servo drives
- Uninterruptible power supply systems
- Industrial machines



Table 1 Key Performance and Package Parameters

Type	V_{CE}	I_C ($T_C = 100^\circ\text{C}$)	$V_{CE(SAT)}$ ($T_{vj} = 25^\circ\text{C}$, $I_C = 600\text{A}$, $V_{GE} = 15\text{V}$)	T_{vjmax}	Package
IGBT	1200V	600A	1.65V	175	62mm

Table 2 Absolute Maximum ratings

Parameter	Symbol	Conditions	Value	Unit
Collector emitter voltage	V_{CE}	$T_{vj} = 25^\circ\text{C}$	1200	V
DC collector current	I_{CDC}	$T_C = 100^\circ\text{C}$	600	A
Pulsed collector current	I_{CRM}		1200	
Maximum Diode forward current	I_F		600	A
Diode pulsed current	I_{FRM}	$T_p = 1\text{ms}$	1200	A
I^2t -value	I^2t	$T_p = 10\text{ms}$, $V_R = 0\text{V}$, $T_{vj} = 175^\circ\text{C}$	36000	A^2s
Gate Source Voltage	V_{GE}	$T_{vj} = 25^\circ\text{C}$	± 20	V
Junction Temperature	T_{vj}		-40 to +175	$^\circ\text{C}$
Storage Temperature	T_{stg}		-40 to +120	
Operating virtual junction temperature	T_{vjop}		150	$^\circ\text{C}$

HCG600FH120A2E1

1200V / 600A 62 mm with Cu Baseplate

Table 3 Thermal resistance

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
IGBT Thermal resistance junction - case	R_{thJC}	Per IGBT	-	0.054	-	$^{\circ}\text{C} / \text{W}$
Diode Thermal resistance junction - case	R_{thJC}	Per diode	-	0.08	-	$^{\circ}\text{C} / \text{W}$

Table 4 Static characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector emitter voltage	$V_{(BR)CES}$	$T_{vj} = 25^{\circ}\text{C}$	1200	-	-	V
Collector emitter saturation voltage	V_{CEsat} (terminal)	$V_{GE} = 15\text{V}, I_C = 600\text{A}$ $T_{vj} = 25^{\circ}\text{C}$	-	1.65	-	V
		$T_{vj} = 175^{\circ}\text{C}$	-	2.0	-	
	V_{CEsat} (chip)	$V_{GE} = 0\text{V}, I_C = 600\text{A}$ $T_{vj} = 25^{\circ}\text{C}$	-	1.5	-	
		$T_{vj} = 175^{\circ}\text{C}$	-	1.75	-	
Diode forward voltage	V_F (terminal)	$V_{GE} = 0\text{V}, I_C = 600\text{A}$ $T_{vj} = 25^{\circ}\text{C}$	-	1.6	-	V
		$T_{vj} = 175^{\circ}\text{C}$	-	1.65	-	
	V_F (chip)	$V_{GE} = 0\text{V}, I_C = 600\text{A}$ $T_{vj} = 25^{\circ}\text{C}$	-	1.45	-	
		$T_{vj} = 175^{\circ}\text{C}$	-	1.5	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 12\text{mA}$	5.3	5.8	6.3	V
Zero gate voltage collector current	I_{CES}	$V_{CE} = 1200\text{V}, V_{GE} = 0\text{V}$ $T_{vj} = 25^{\circ}\text{C}$	-	-	100	μA
Gate-emitter leakage current	I_{GES}	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$	-	-	100	nA
Input Capacitance	C_{ies}	$V_{GS} = 0\text{V}$ $V_{DS} = 25\text{V}$ $f = 100\text{kHz}$	-	87	-	nF
Output Capacitance	C_{oes}		-	3.8	-	
Reverse Transfer Capacitance	C_{res}		-	0.9	-	
Gate input resistance	R_G	$f = 1\text{M Hz}$	-	1	-	Ω
Gate Charge	Q_g	$V_{GE} = -15\text{V to } 15\text{V}$ $V_{CE} = 600\text{V}$	-	7.1	-	μC

HCG600FH120A2E1

1200V / 600A 62 mm with Cu Baseplate

Table 5 Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	t_{don}	$T_{vj} = 25^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)}=0.5\Omega, R_{G(off)}= 0.5\Omega$	-	320	-	ns
Rise time	t_r		-	50	-	
Turn-off delay time	t_{doff}		-	425	-	
Fall time	t_f		-	95	-	
Turn-on energy	E_{on}		-	8	-	mJ
Turn-off energy	E_{off}		-	50	-	
Total switching energy	E_{ts}		-	58	-	
Turn-on delay time	t_{don}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)}=0.5\Omega, R_{G(off)}= 0.5\Omega$	-	290	-	ns
Rise time	t_r		-	60	-	
Turn-off delay time	t_{doff}		-	520	-	
Fall time	t_f		-	210	-	
Turn-on energy	E_{on}		-	20	-	mJ
Turn-off energy	E_{off}		-	77	-	
Total switching energy	E_{ts}		-	97	-	
Short circuit current	I_{SC}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 800\text{V}, V_{GE} = 15\text{V}$, $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ $T_P \leq 6\text{ us}$	-	1700	-	A

Table 6 Diode Recovery characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Recovery Time	T_{rr}	$T_{vj} = 25^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)}=0.5\Omega, R_{G(off)}= 0.5\Omega$	-	165	-	ns
Peak reverse recovery current	I_{rrm}		-	500	-	A
Reverse recovery charge	Q_{rr}		-	40	-	μC
Reverse recovery energy	E_{rec}		-	20	-	mJ
Reverse Recovery Time	T_{rr}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)}=0.5\Omega, R_{G(off)}= 0.5\Omega$	-	390	-	ns
Peak reverse recovery current	I_{rrm}		-	600	-	A
Reverse recovery charge	Q_{rr}		-	95	-	μC
Reverse recovery energy	E_{rec}		-	45	-	mJ

HCG600FH120A2E1

1200V / 600A 62 mm with Cu Baseplate

Table 7 Module characteristics

Parameter	Symbol	Conditions	Value	Unit
Isolation test voltage	V _{ISOL}	RMS, f = 50 Hz, t = 1min	4.0	kV
Material of module baseplate			Cu+Ni	
Internal isolation		Basic insulation	Improved Al ₂ O ₃ ceramic	
Mounting torque of screws to heat sink	Ms	M5	3.0-6.0	N·m
Mounting torque of screws to terminals	Mt	M6	2.5-5.0	N·m
Comperative tracking index	CTI		>175	

HCG600FH120A2E1

1200V / 600A 62 mm with Cu Baseplate

Characteristics diagrams

Fig.1 Typical Output Characteristic,IGBT,Inverter
 $I_c = f(V_{CE})$
 $V_{GE} = 15V$ (terminal)

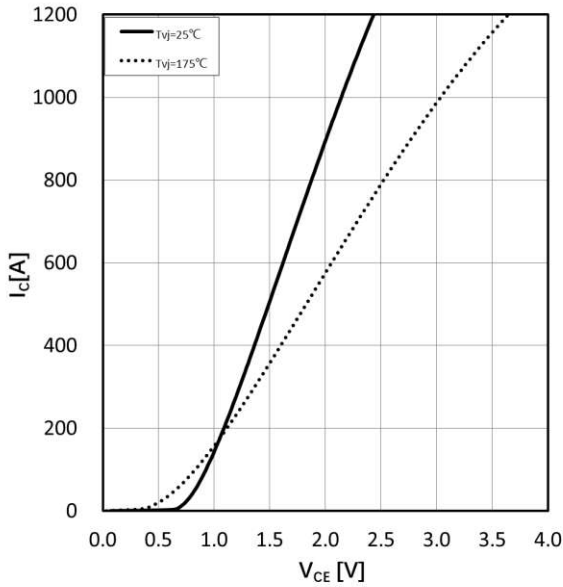


Fig.2 Typical Output Characteristic,IGBT,Inverter
 $I_c = f(V_{CE})$
 $T_{vj} = 175^{\circ}C$

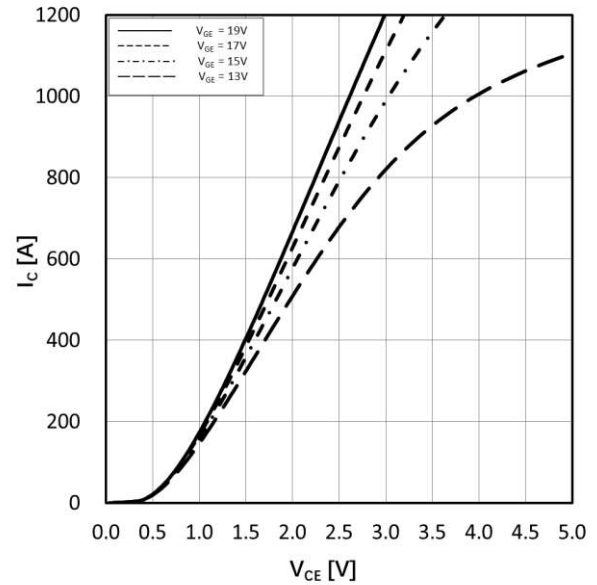


Fig.3 Typical Output Characteristic,IGBT,Inverter
 $I_c = f(V_{GE})$
 $V_{CE} = 20V$

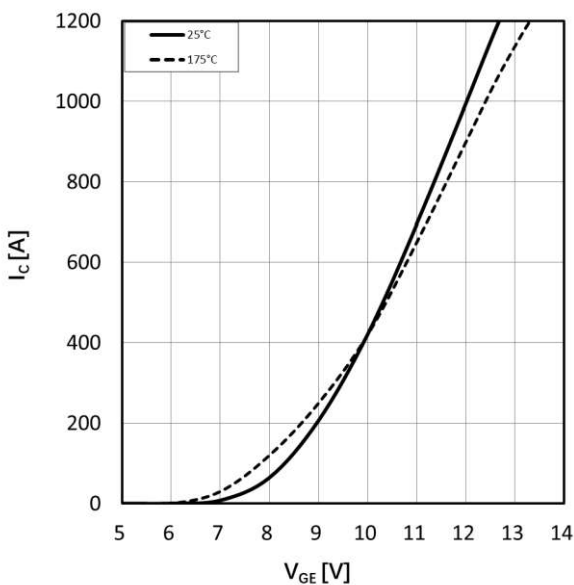
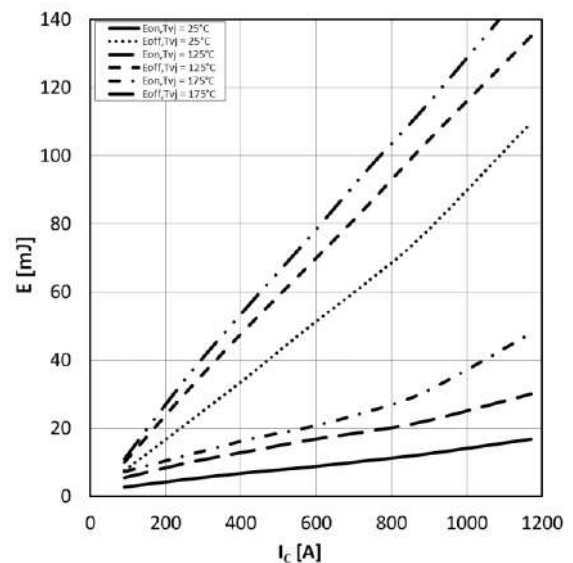


Fig.4 Switching losses,IGBT,Inverter
 $E = f(I_c)$
 $R_{Goff} = 0.5\Omega$, $R_{Gon} = 0.5\Omega$, $V_{CE} = 600V$, $V_{GE} = \pm 15V$



HCG600FH120A2E1

1200V / 600A 62 mm with Cu Baseplate

Fig.5 Switching losses,IGBT,Inverter
 $E = f(R_G)$
 $I_C = 600A$, $V_{CE} = 600V$, $V_{GE} = \pm 15V$

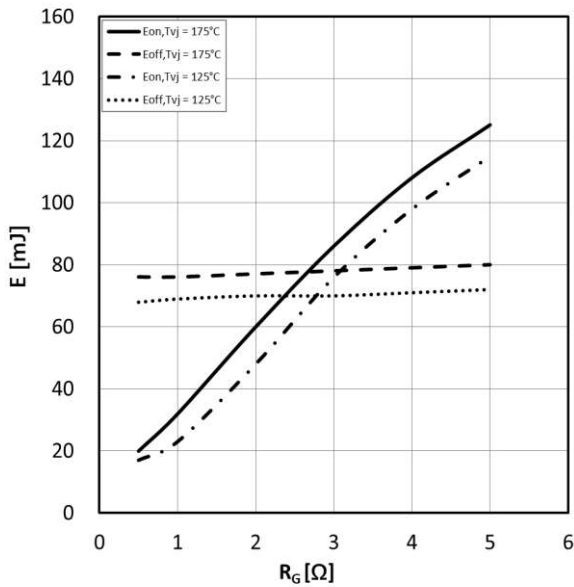


Fig. 6 Reverse bias safe operating area(RBOSA),
 IGBT,Inverter
 $I_C = f(V_{CE})$
 $R_{Goff} = 0.5\Omega$, $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$

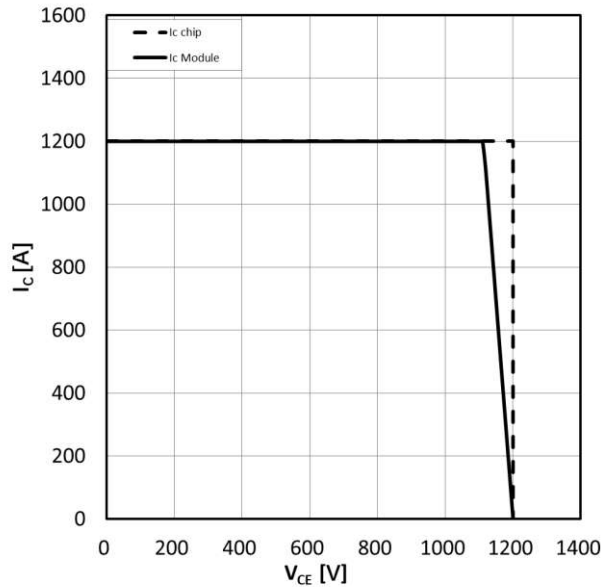


Fig.7 Switching times,IGBT,Inverter
 $t = f(I_C)$
 $R_{Goff} = 0.51\Omega$, $R_{Gon} = 0.51\Omega$, $V_{CE} = 600V$,
 $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$

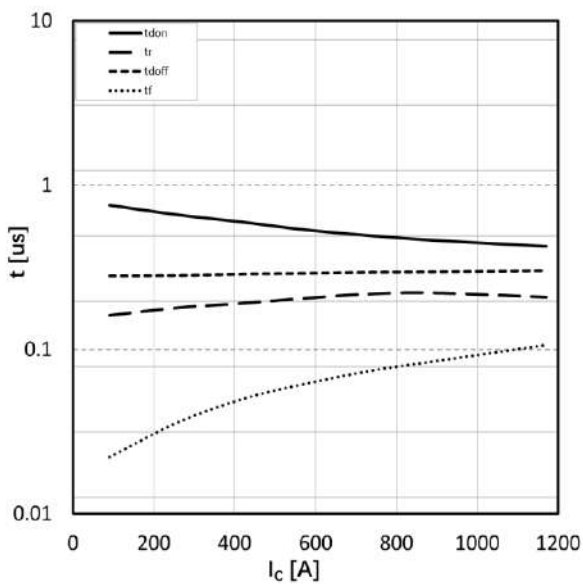
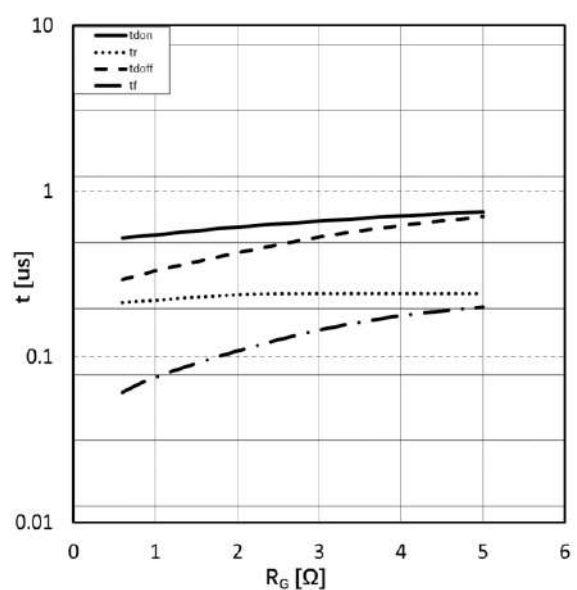


Fig.8 Switching times,IGBT,Inverter
 $t = f(R_G)$
 $I_C = 600A$, $V_{CE} = 600V$,
 $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$



HCG600FH120A2E1

1200V / 600A 62 mm with Cu Baseplate

Fig.9 Capacity characteristic,IGBT,Inverter
 $C = f(V_{CE})$
 $f = 100\text{KHz}$, $V_{GE} = 0\text{V}$, $T_{vj} = 25^\circ\text{C}$

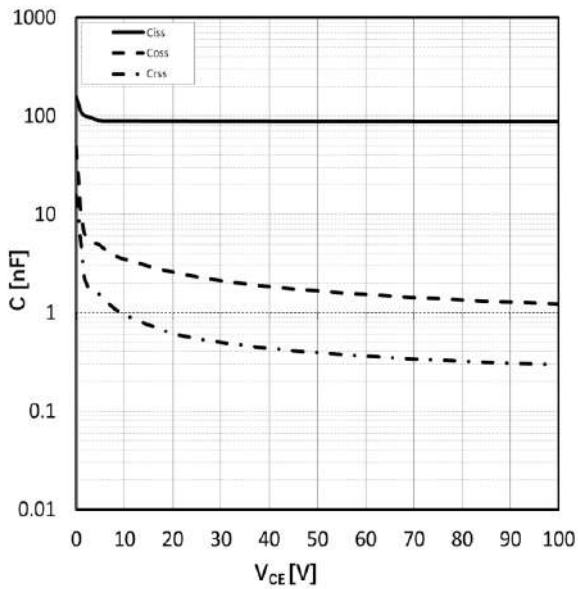


Fig.10 Forward characteristic,Diode,Inverter
 $I_F = f(V_F)$ (terminal)

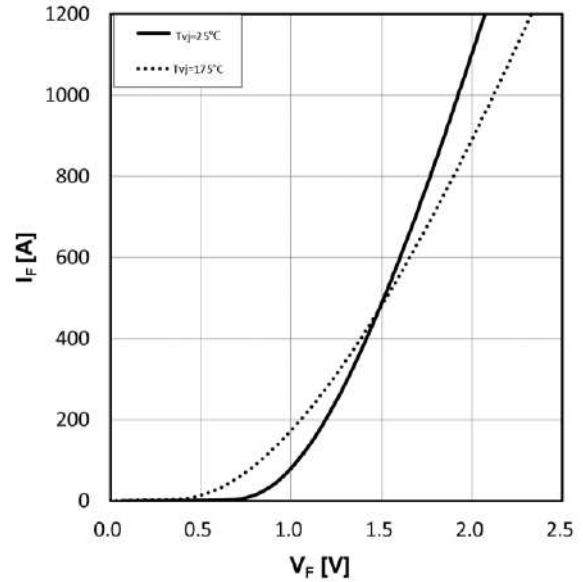


Fig.11 Swithing losses,Diode,Inverter
 $E_{rec} = f(I_F)$
 $V_{CE} = 600\text{V}$, $R_{Gon} = R_{Gon}$ (IGBT)

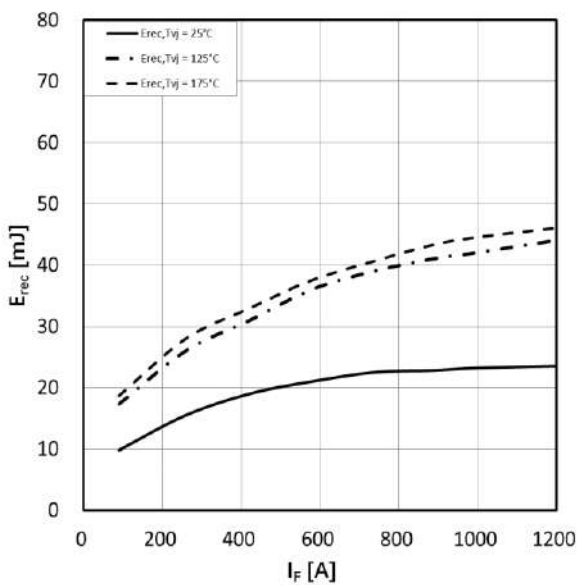
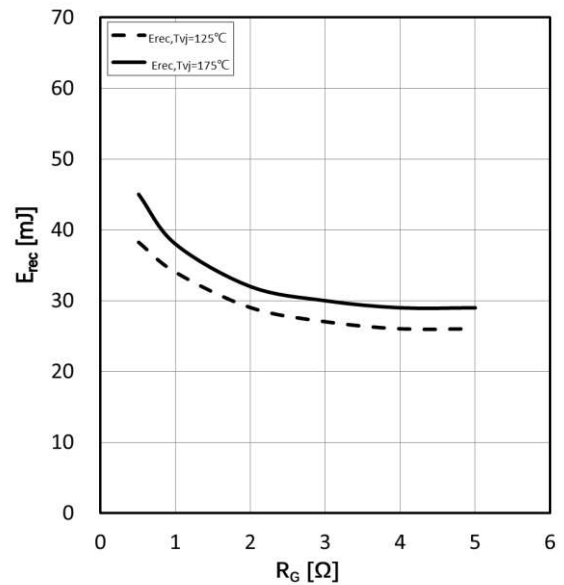


Fig.12 Swithing losses,Diode,Inverter
 $E_{rec} = f(R_G)$
 $V_{CE} = 600\text{V}$, $I_F = 600\text{A}$

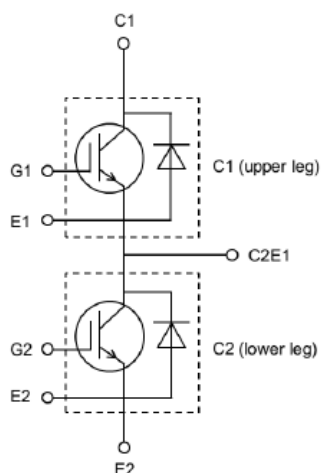


HCG600FH120A2E1

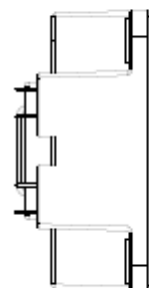
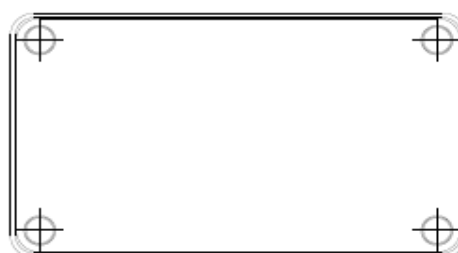
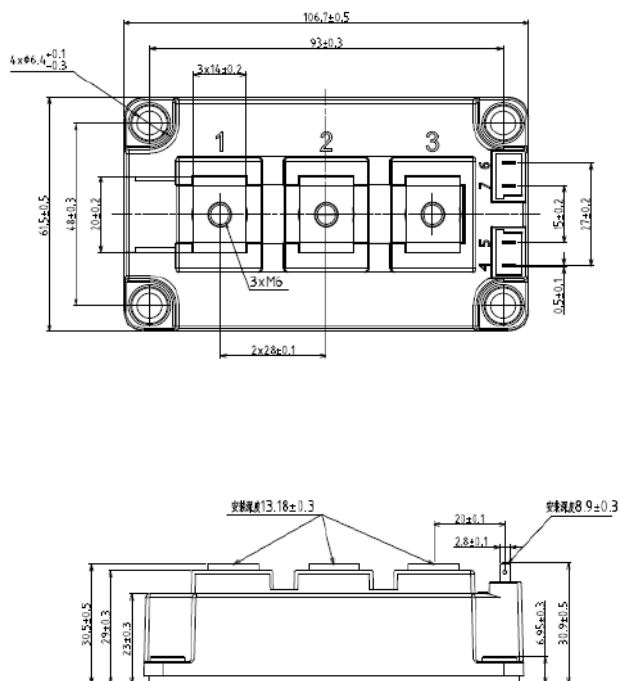
1200V / 600A 62 mm with Cu Baseplate

Package information

Circuit diagram



Package outlines



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



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