

HCG600FH170D3E1A

1700V / 600A D3 (size similar to Econo Dual with Cu Baseplate)

Features

- LOW $V_{CE(SAT)}$
- Low inductance module structure
- Solder pin terminals

Applications

- Inverter for motor drives AC and DC servo drives
- Uninterruptible power supply systems
- Wind turbines
- PV power conditioning systems



Table 1 Key Performance and Package Parameters

Type	V_{CE}	I_C	$V_{CE(SAT)}$ ($T_{vj} = 25^{\circ}C$, $I_C = 600A$, $V_{GE} = 15V$)	T_{vjmax}	Package
IGBT	1700V	600A	1.70V	175°C	HB3

HCG600FH170D3E1A

1700V / 600A D3 (size similar to Econo Dual with Cu Baseplate)

Table 2 Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector emitter voltage	V_{CE}	$T_{vj} = 25^{\circ}\text{C}$	1700	V
Continuous DC collector current	I_{CDC}		600	A
Repetitive peak collector current	I_{CRM}	$T_p=1\text{ms}$	1200	
Continuous DC forward current	I_F		600	A
Repetitive peak forward current	I_{FRM}	$T_p=1\text{ms}$	1200	A
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 +125	
Operating virtual junction temperature	T_{vjop}		175	$^{\circ}\text{C}$

Table 3 Thermal Resistance

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
IGBT Thermal resistance junction - case	R_{thJC}	Per IGBT	-	0.062	-	$^{\circ}\text{C} / \text{W}$
Diode Thermal resistance junction - case	R_{thJC}	Per diode	-	0.092	-	$^{\circ}\text{C} / \text{W}$

HCG600FH170D3E1A

1700V / 600A D3 (size similar to Econo Dual with Cu Baseplate)

Table 4 Static Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector emitter voltage	$V_{(BR)CES}$	$T_{vj} = 25^{\circ}\text{C}$	1700	-	-	V
Collector emitter saturation voltage	V_{CESat} (chip)	$V_{GE} = 15\text{V}, I_C = 600\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.70	-	V
		$V_{GE} = 15\text{V}, I_C = 600\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	2.25	-	
	V_{CESat} (terminal)	$V_{GE} = 15\text{V}, I_C = 600\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.85	-	
		$V_{GE} = 15\text{V}, I_C = 600\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	2.36	-	
Diode forward voltage	V_F (chip)	$V_{GE} = 0\text{V}, I_C = 600\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.80	-	V
		$V_{GE} = 0\text{V}, I_C = 600\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	1.90	-	
	V_F (terminal)	$V_{GE} = 0\text{V}, I_C = 600\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.85	-	
		$V_{GE} = 0\text{V}, I_C = 600\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	1.95	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 24\text{mA}$	-	5.95	-	V
Zero gate voltage collector current	I_{CES}	$V_{CE} = 1700\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$	-	-	100	μA
Gate-emitter leakage current	I_{GES}	$V_{GE} = \pm 20\text{V}, V_{CE} = 0\text{V}$	-100	-	100	nA
Input capacitance	C_{ies}	$V_{GE} = 0\text{V}, V_{CE} = 30\text{V}, f = 100\text{kHz}$	-	78.7	-	nF
Output capacitance	C_{oes}		-	2.60	-	
Reverse transfer capacitance	C_{res}		-	0.336	-	
Gate charge	Q_G	$V_{GE} = -15\text{V to } 15\text{V}, V_{CE} = 900\text{V}$	-	5.01	-	μC

HCG600FH170D3E1A

1700V / 600A D3 (size similar to Econo Dual with Cu Baseplate)

Table 5 Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	t_{don}	$T_{vj} = 25^{\circ}\text{C}$, $V_{CC} = 900\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)} = 1\Omega, R_{G(off)} = 1\Omega$	-	410	-	ns
Rise time	t_r		-	75	-	
Turn-off delay time	t_{doff}		-	500	-	
Fall time	t_f		-	380	-	
Turn-on energy	E_{on}	$T_{vj} = 25^{\circ}\text{C}$, $V_{CC} = 900\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)} = 1\Omega, R_{G(off)} = 1\Omega$	-	125.8	-	mJ
Turn-off energy	E_{off}		-	132.9	-	
Total switching energy	E_{ts}		-	258.7	-	
Turn-on delay time	t_{don}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 900\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)} = 1\Omega, R_{G(off)} = 1\Omega$	-	440	-	ns
Rise time	t_r		-	100	-	
Turn-off delay time	t_{doff}		-	560	-	
Fall time	t_f		-	600	-	
Turn-on energy	E_{on}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 900\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)} = 1\Omega, R_{G(off)} = 1\Omega$	-	153.0	-	mJ
Turn-off energy	E_{off}		-	217.9	-	
Total switching energy	E_{ts}		-	370.9	-	
Short circuit current	I_{SC}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 1000\text{V}$, $V_{GE} = 15\text{V}$, $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ $T_P \leq 6 \mu\text{s}$	-	3200	-	A

Table 6 Diode Recovery Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse recovery time	T_{rr}	$T_{vj} = 25^{\circ}\text{C}$, $V_{CC} = 900\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)} = 1\Omega, R_{G(off)} = 1\Omega$	-	230	-	ns
Peak reverse recovery current	I_{rrm}		-	750	-	A
Reverse recovery charge	Q_{rr}		-	100	-	μC
Reverse recovery energy	E_{rec}		-	52.0	-	mJ
Reverse recovery time	T_{rr}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 900\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)} = 1\Omega, R_{G(off)} = 1\Omega$	-	370	-	ns
Peak reverse recovery current	I_{rrm}		-	706	-	A
Reverse recovery charge	Q_{rr}		-	130	-	μC
Reverse recovery energy	E_{rec}		-	75.2	-	mJ

HCG600FH170D3E1A

1700V / 600A D3 (size similar to Econo Dual with Cu Baseplate)

Table 7 Module characteristics

Parameter	Symbol	Conditions	Value	Typ
Isolation test voltage	V_{ISOL}	RMS, $f = 50\text{ Hz}$, $t = 1\text{ min}$	3.4	kV
Material of module baseplate			Cu+Ni	
Internal isolation		Basic insulation	Al_2O_3	
Mounting torque of screws to heat sink	M	M5	3.0-6.0	N·m
Mounting torque of screws to terminals	M	M6	3.0-6.0	N·m
Creepage distance	d_{Creep}	terminal to heatsink	15.0	mm
Creepage distance	d_{Creep}	terminal to terminal	13.0	mm
Clearance	d_{Clear}	terminal to heatsink	12.5	mm
Clearance	d_{Clear}	terminal to terminal	10.0	mm
Comperative tracking index	CTI		>175	

Table 8 NTC-Thermistor

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Rated resistance	R25	TC = 25°C	-	5	-	kΩ
Deviation of R100	$\Delta R/R$	TC = 100°C, R100 = 493 Ω	-5	-	5	%
B-value	B25/50	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298,15K))]$	-	3375	-	K

HCG600FH170D3E1A

1700V / 600A D3 (size similar to Econo Dual with Cu Baseplate)

Characteristics Diagrams

Fig.1 Typical Output Characteristic, IGBT, Inverter
 $I_C = f(V_{CE})$ / (terminal)
 $V_{GE} = 15V$
 $T_{vj} = 25^\circ C$

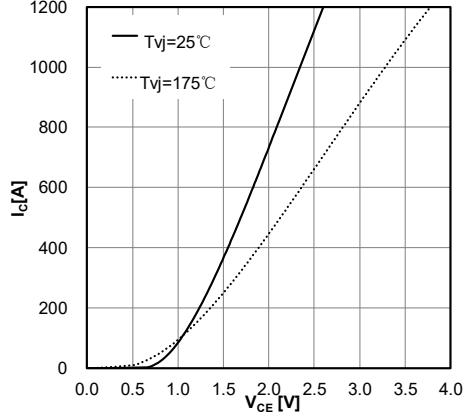


Fig.2 Typical Output Characteristic, IGBT, Inverter
 $I_C = f(V_{CE})$ / (terminal)
 $T_{vj} = 175^\circ C$

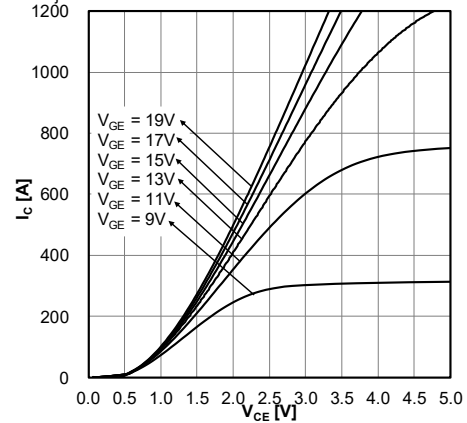


Fig.3 Capacity characteristic, IGBT, Inverter
 $C = f(V_{CE})$
 $f = 100 KHz$, $V_{GE} = 0V$, $T_{vj} = 25^\circ C$

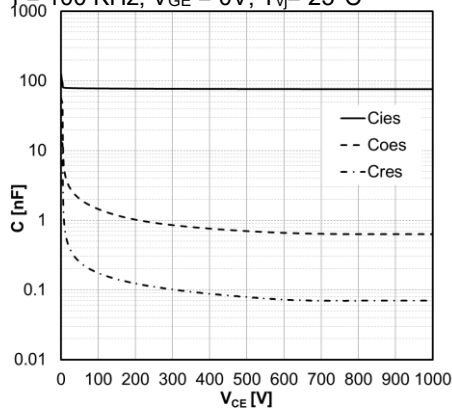


Fig.4 Switching losses, IGBT, Inverter
 $E = f(I_C)$
 $R_{Goff} = 1.0 \Omega$, $R_{Gon} = 1.0 \Omega$, $V_{CE} = 900V$, $V_{GE} = \pm 15V$

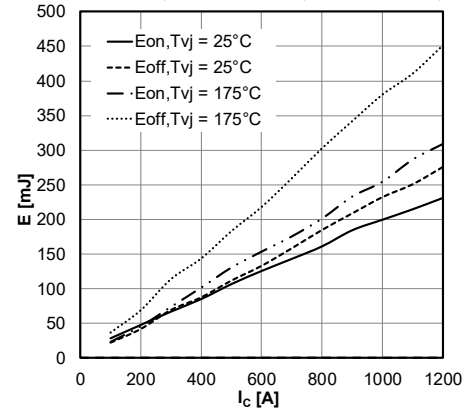


Fig.5 Switching losses, IGBT, Inverter
 $E = f(R_G)$
 $I_C = 600A$, $V_{CE} = 900V$, $V_{GE} = \pm 15V$

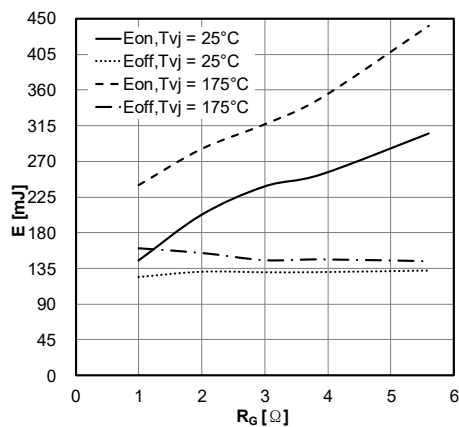
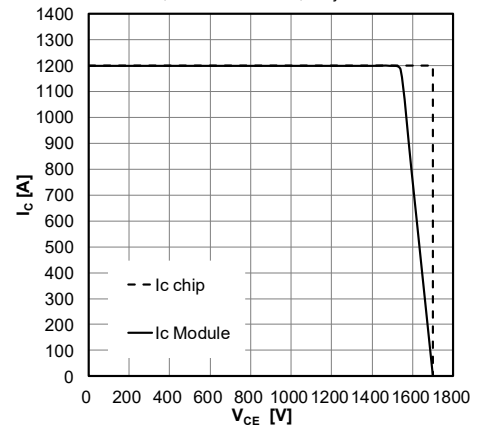


Fig.6 Reverse bias safe operating area (RBOSA), IGBT, Inverter
 $I_C = f(V_{CE})$
 $R_{Goff} = 1.0 \Omega$, $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$



HCG600FH170D3E1A

1700V / 600A D3 (size similar to Econo Dual with Cu Baseplate)

Characteristics Diagrams

Fig.7 Switching losses, Diode, Inverter

$$E_{rec} = f(R_G)$$

$V_{CE} = 900V$, $I_F = 600A$

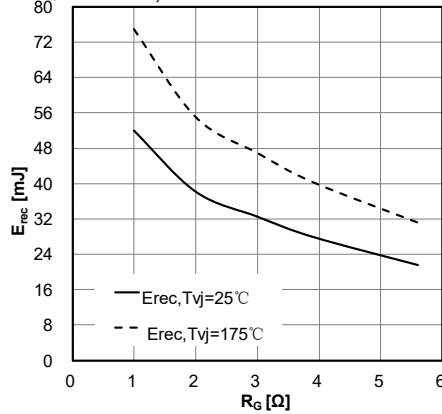


Fig.8 Temperature characteristic, NTC - Thermistor

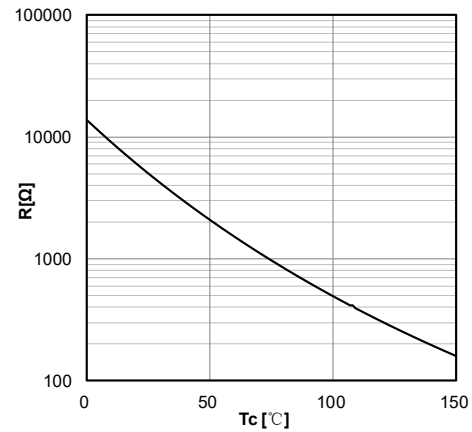


Fig.9 Forward characteristic, Diode, Inverter

$$I_F = f(V_F) / (\text{terminal})$$

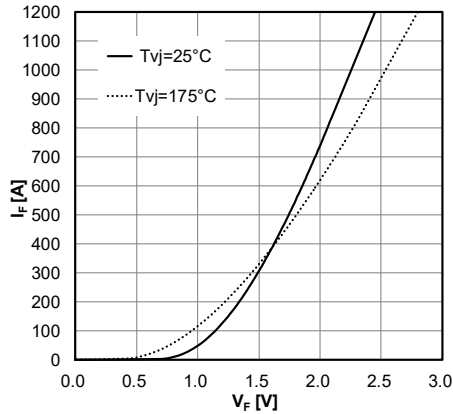


Fig.10 Switching losses, Diode, Inverter

$$E_{rec} = f(I_F)$$

$V_{CE} = 900V$, $R_{Goff} = 1.0 \Omega$, $R_{Gon} = 1.0 \Omega$, $V_{GE} = \pm 15V$

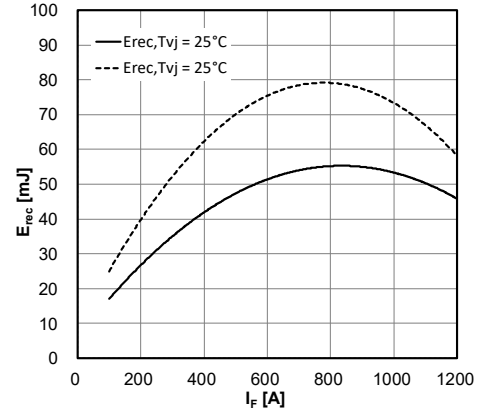


Fig.11 Transient thermal impedance IGBT, Inverter

$$Z_{thJC} = f(t)$$

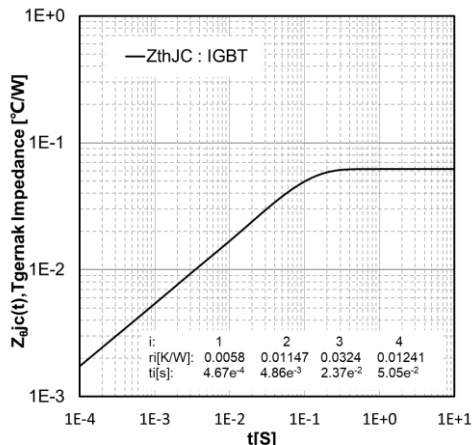
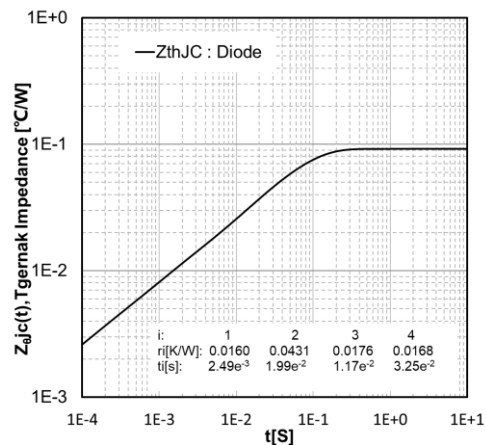


Fig.12 Transient thermal impedance Diode, Inverter

$$Z_{thJC} = f(t)$$

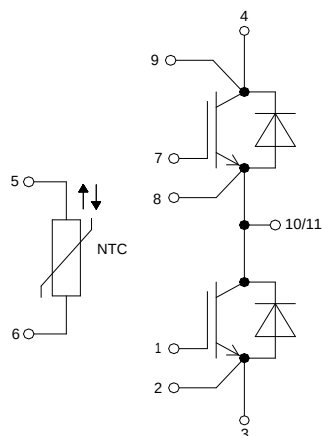


HCG600FH170D3E1A

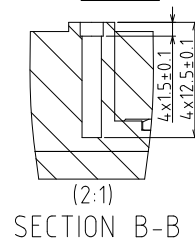
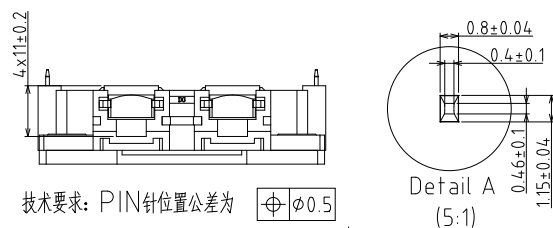
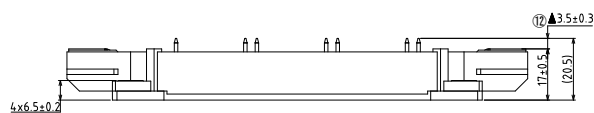
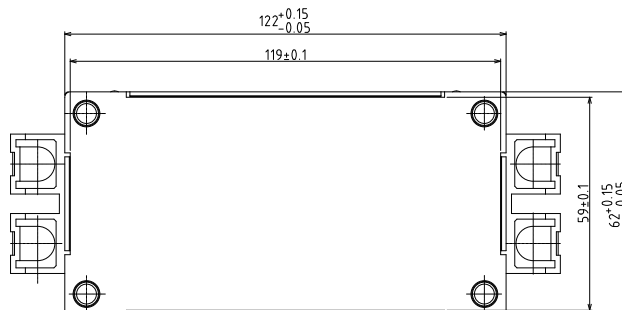
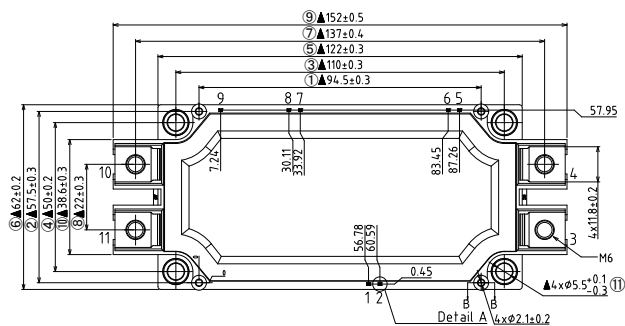
1700V / 600A D3 (size similar to Econo Dual with Cu Baseplate)

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