

HCG450FH120D3E1EA

1200V / 450A D3 (size similar to Econo Dual with Cu Baseplate)

Features

- LOW $V_{CE(SAT)}$
- $V_{CE(SAT)}$ with positive temperature coefficient

Applications

- Inverter for motor drives AC and DC servo drives
- High power converters
- UPS systems



Table 1 Key Performance and Package Parameters

Type	V_{CE}	I_C	$V_{CE(SAT)}$ ($T_{vj} = 25^{\circ}C$, $I_C = 450A$, $V_{GE} = 15V$)	T_{vjmax}	Package
IGBT	1200V	450A	1.50V	175°C	D3

Table 2 Absolute Maximum Ratings ($T_a = 25^{\circ}C$)

Parameter	Symbol	Conditions	Value	Unit
Collector emitter voltage	V_{CE}	$T_{vj} = 25^{\circ}C$	1200	V
Continuous DC collector current	I_{CDC}	$T_C = 90^{\circ}C$	450	A
Repetitive peak collector current	I_{CRM}	$T_p=1ms$	900	A
Continuous DC forward current	I_F		450	A
Repetitive peak forward current	I_{FRM}	$T_p=1ms$	900	A
Gate Emitter Voltage	V_{GE}	$T_{vj} = 25^{\circ}C$	± 20	V
Junction temperature	T_{vj}		-40 to +175	°C
Storage temperature	T_{stg}		-40 to +125	°C
Operating virtual junction temperature	T_{vjop}		-40 to +150	°C

HCG450FH120D3E1EA

1200V / 450A D3 (size similar to Econo Dual with Cu Baseplate)

Table 3 Thermal Resistance

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
IGBT Thermal resistance junction - case	R_{thJC}	Per IGBT	-	0.084	-	°C / W
Diode Thermal resistance junction - case	R_{thJC}	Per diode	-	0.125	-	°C / 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)	$V_{GE} = 15\text{V}, I_C = 450\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.50	-	V
		$V_{GE} = 15\text{V}, I_C = 450\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	1.82	-	
	V_{CESat} (Chip)	$V_{GE} = 15\text{V}, I_C = 450\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.40	-	
		$V_{GE} = 15\text{V}, I_C = 450\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	1.70	-	
Diode forward voltage	V_F (terminal)	$V_{GE} = 0\text{V}, I_C = 450\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.65	-	V
		$V_{GE} = 0\text{V}, I_C = 450\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	1.78	-	
	V_F (Chip)	$V_{GE} = 0\text{V}, I_C = 450\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.60	-	
		$V_{GE} = 0\text{V}, I_C = 450\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	1.70	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 9\text{mA}$	5.00	5.60	6.20	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	uA
Gate-emitter leakage current	I_{GES}	$V_{GE} = \pm 20, V_{CE} = 0\text{V},$	-100	-	100	nA
Input capacitance	C_{ies}	$V_{GE} = 0\text{V}, V_{CE} = 25\text{V}, f = 100\text{kHz}$	-	65.0	-	nF
Output capacitance	C_{oes}		-	1.81	-	
Reverse transfer capacitance	C_{res}		-	0.39	-	
Gate input resistance	R_G	$f = 1\text{M Hz}$	-	0.80	-	Ω
Gate charge	Q_G	$V_{GE} = -15\text{V to } 15\text{V}, V_{CE} = 600\text{V}$	-	3.17	-	μC

HCG450FH120D3E1EA

1200V / 450A 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}	$T_{vj} = 25^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 450\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)}=0.6\Omega, R_{G(off)}= 0.6\Omega$	-	290	-	ns
Rise time	t_r		-	75	-	
Turn-off delay time	t_{doff}		-	400	-	
Fall time	t_f		-	120	-	
Turn-on energy	E_{on}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 450\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)}= 0.6\Omega, R_{G(off)}= 0.6\Omega$	-	22.6	-	mJ
Turn-off energy	E_{off}		-	38.7	-	
Total switching energy	E_{ts}		-	61.3	-	
Turn-on delay time	t_{don}		-	305	-	ns
Rise time	t_r		-	85	-	
Turn-off delay time	t_{doff}		-	490	-	
Fall time	t_f		-	240	-	
Turn-on energy	E_{on}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 800\text{V}$, $V_{GE} = 15\text{V}$, $V_{CEmax} = V_{CES} - L_{sCE} * di/dt$ $T_P \leq 6 \text{ us}$	-	44.0	-	mJ
Turn-off energy	E_{off}		-	55.6	-	
Total switching energy	E_{ts}		-	99.6	-	
Short circuit current	I_{SC}		-	1400	-	A

Table 6 Diode Recovery Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse recovery time	T_{rr}	$T_{vj} = 25^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 450\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)} = 0.6\Omega$, $R_{G(off)} = 0.6\Omega$	-	180	-	ns
Peak reverse recovery current	I_{rrm}		-	34.1	-	A
Reverse recovery charge	Q_{rr}		-	370	-	μC
Reverse recovery energy	E_{rec}		-	12.8	-	mJ
Reverse recovery time	T_{rr}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 450\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)} = 0.6\Omega$, $R_{G(off)} = 0.6\Omega$	-	370	-	ns
Peak reverse recovery current	I_{rrm}		-	395	-	A
Reverse recovery charge	Q_{rr}		-	62	-	μC
Reverse recovery energy	E_{rec}		-	23.5	-	mJ

HCG450FH120D3E1EA

1200V / 450A 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		>200	

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

HCG450FH120D3E1EA

1200V / 450A D3 (size similar to Econo Dual with Cu Baseplate)

Characteristics Diagrams

Fig.1 Typical Output Characteristic, IGBT, Inverter
 $I_C = f(V_{CE})$ / (terminal)

$V_{GE} = 15V$

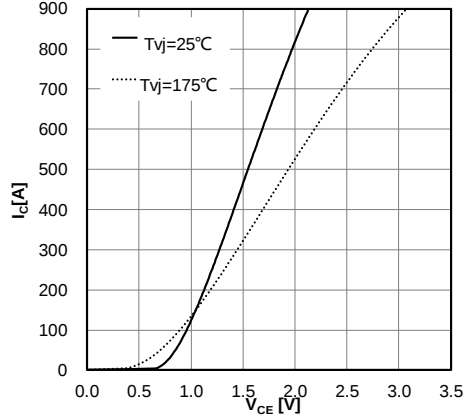


Fig.2 Typical Output Characteristic, IGBT, Inverter
 $I_C = f(V_{CE})$ / (terminal)

$T_{vj} = 175^\circ C$

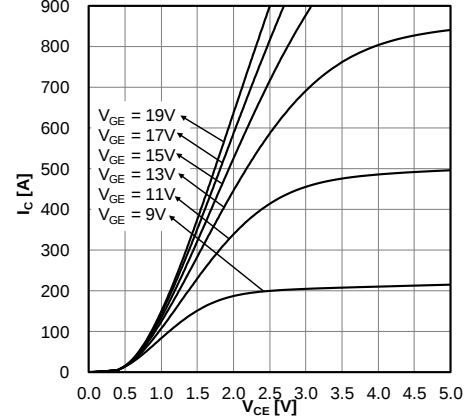


Fig.3 Typical Output Characteristic, IGBT, Inverter
 $I_C = f(V_{GE})$

$V_{CE} = 20V$

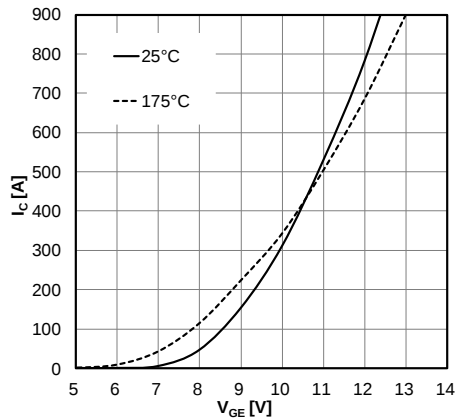


Fig.4 Switching losses, IGBT, Inverter
 $E = f(I_C)$

$R_{Goff} = 0.6\Omega$, $R_{Gon} = 0.6\Omega$, $V_{CE} = 600V$, $V_{GE} = \pm 15V$

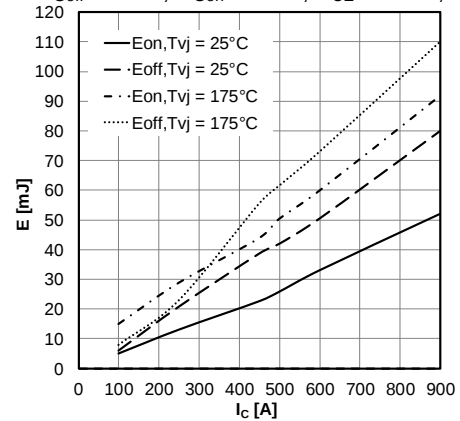


Fig.5 Switching losses, IGBT, Inverter
 $E = f(R_G)$

$I_C = 450A$, $V_{CE} = 600V$, $V_{GE} = \pm 15V$

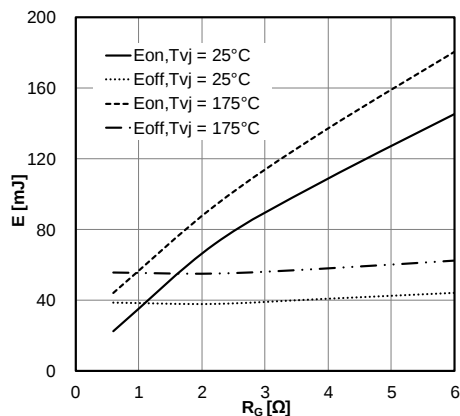
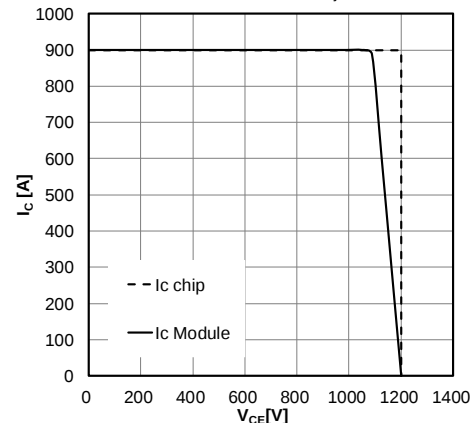


Fig.6 Reverse bias safe operating area (RBSOA), IGBT, Inverter

$I_C = f(V_{CE})$

$R_{Goff} = 0.6\Omega$, $V_{GE} = \pm 15V$, $T_{vj} = 175^\circ C$



HCG450FH120D3E1EA

1200V / 450A D3 (size similar to Econo Dual with Cu Baseplate)

Characteristics Diagrams

Fig.7 Capacity characteristic, IGBT, Inverter

$$C = f(V_{CE})$$

$f = 100\text{KHz}$, $V_{GE} = 0\text{V}$, $T_{vj} = 25^\circ\text{C}$

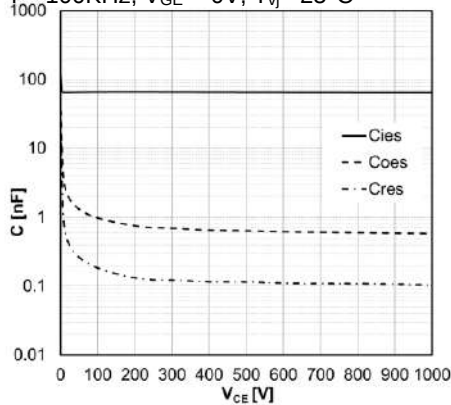


Fig.8 Transient thermal impedance IGBT, Inverter

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

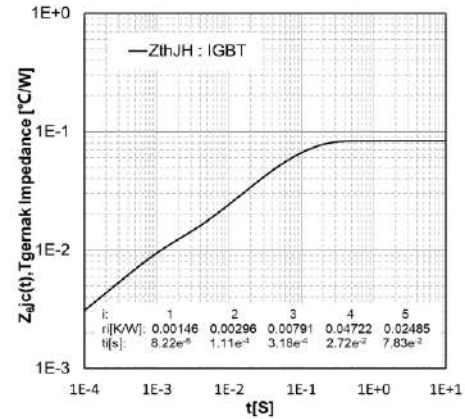


Fig.9 Forward characteristic, Diode, Inverter

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

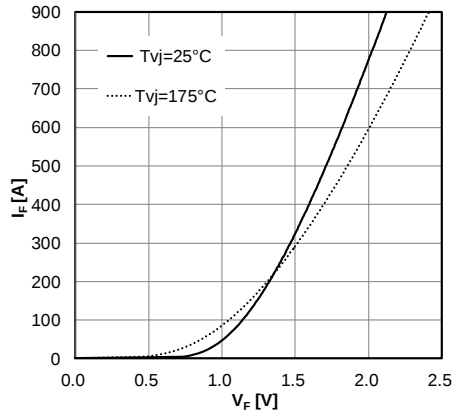


Fig.10 Switching losses, Diode, Inverter

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

$V_{CE} = 600\text{V}$, $R_{Goff} = 0.6\Omega$, $R_{Gon} = 0.6\Omega$, $V_{GE} = \pm 15\text{V}$

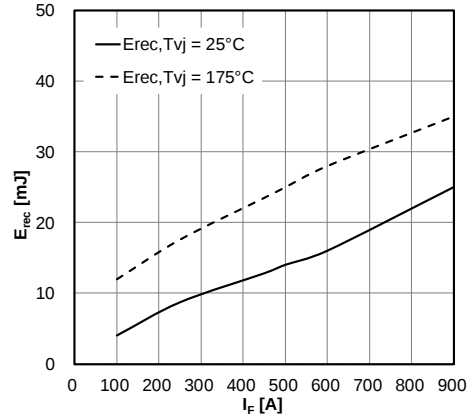


Fig.11 Switching losses, Diode, Inverter

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

$V_{CE} = 600\text{V}$, $I_F = 450\text{A}$

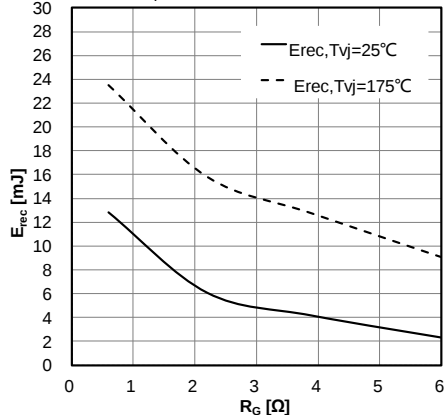
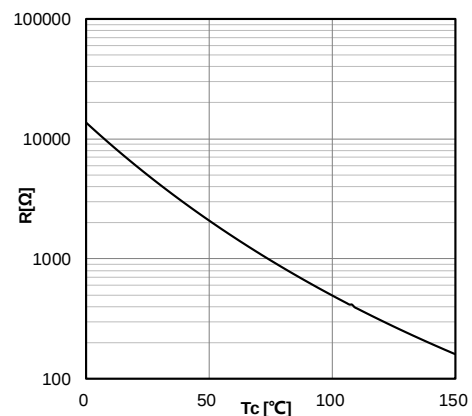


Fig.12 Temperature characteristic, NTC - Thermistor



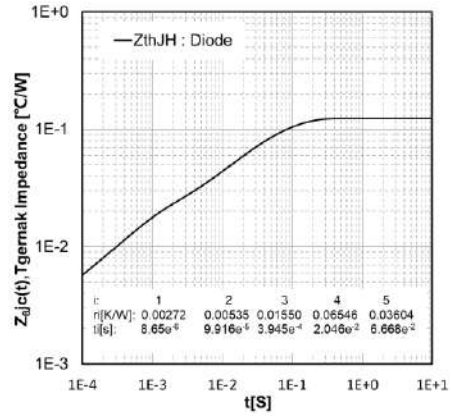
HCG450FH120D3E1EA

1200V / 450A D3 (size similar to Econo Dual with Cu Baseplate)

Characteristics Diagrams

Fig.13 Transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$

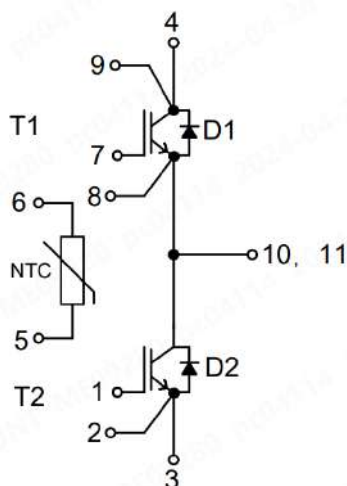


HCG450FH120D3E1EA

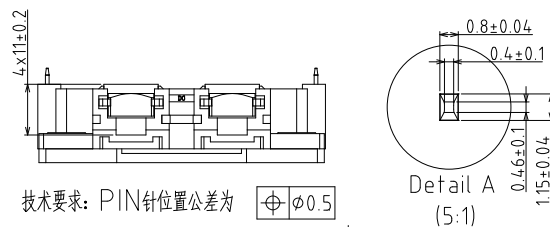
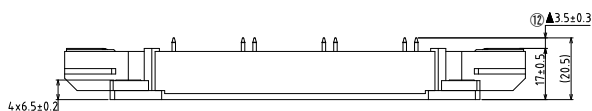
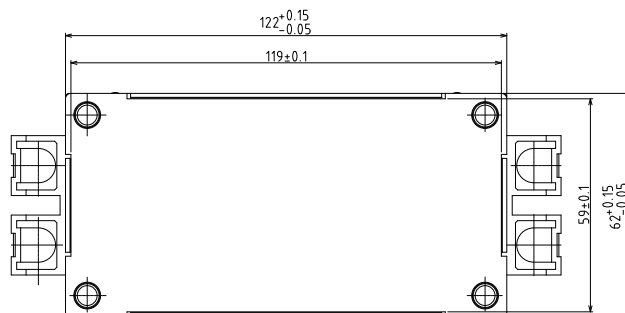
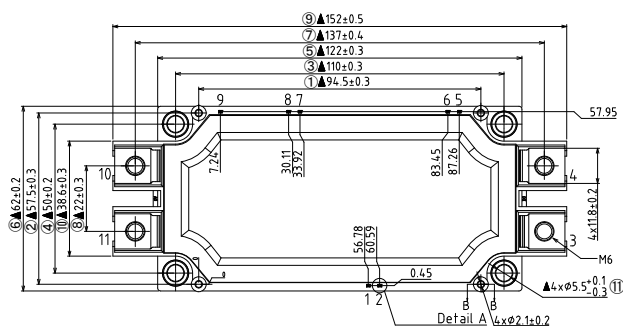
1200V / 450A D3 (size similar to Econo Dual with Cu Baseplate)

Package Information

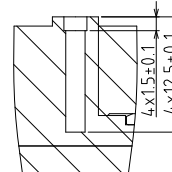
Circuit Diagram



Package Outlines



技术要求: PIN针位置公差为



(2:1)
SECTION B-B

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