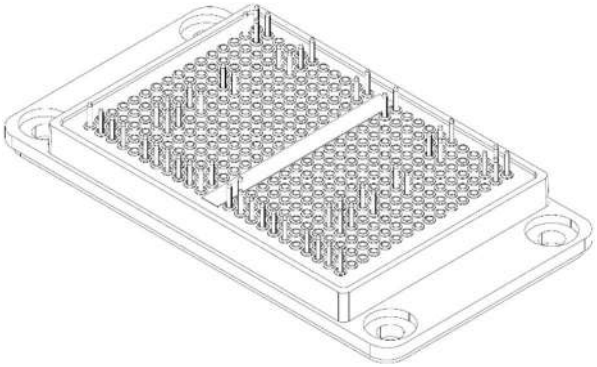
HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

Features

- 2−channel Boost in E3 Package
- Low Inductive Layout
- Solderable Pins



Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Low Conduction Losses Over Temperature

Applications

- Solar Inverters
- Uninterruptable Power Supplies Systems

HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

Table 1 Absolute Maximum Ratings (Ta = 25 °C)

Parameter	Symbol	Ratings	Unit
IGBT(Q11,Q12,Q21,Q22)			
Collector−emitter voltage	V_{CES}	1000	V
Gate−emitter voltage	V_{GE}	±23	V
Continuous collector current @ T_C = 80°C, T_j = 175°C	I_C	180	A
Pulsed collector current @ T_j = 175°C	I_{CP}	360	A
Junction temperature	T_j	-40 to +175	°C
INVERSE DIODE (D11,D12, D21,D22)			
Collector−emitter voltage	V_{CES}	1000	V
Gate−emitter voltage	V_{GE}	±23	V
Continuous collector current @ T_C = 80°C, T_j = 175°C	I_C	128	A
Pulsed collector current @ T_j = 175°C	I_{CP}	256	A
Junction temperature	T_j	-40 to +175	°C
SILICON CARBIDE SCHOTTKY DIODE (D13, D14, D23, D24)			
Peak repetitive reverse voltage	V_{RRM}	1000	V
Continuous forward current @ T_c = 80°C， T_j = 175°C	I_F	105	A
Repetitive peak forward current @ T_j = 175°C	I_{FRM}	210	A
I^2t-value@V_R = 0 V, T_P = 10 ms, Tvj = 150°C	I^2t	600	A^2s
Junction temperature	T_j	-40 to +175	°C
START−UP DIODE (D1, D15)			
Peak repetitive reverse voltage	V_{RRM}	1000	V
Continuous forward current @ Tc = 80°C， Tj = 175°C	I_F	128	A
Repetitive peak forward current @ T_j = 175°C	I_{FRM}	256	A
I^2t-value@V_R = 0 V, T_P = 10 ms, Tvj = 150°C	I^2t	1800	A^2s
Junction temperature	T_j	-40 to +175	°C
INSULATION PROPERTIES			
Isolation test voltage, t = 1 s, 50 Hz	Viso	4000	V_{RMS}
RECOMMENDED TEMPERATURE			
Storage temperature	T_{stg}	-40 to +125	°C
Operating temperature	T_{op}	-40 to +150	°C

HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

Table 2 Thermal resistance

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal resistance−chip−to−case, IGBT(Q11,Q12,Q21,Q22)	R_{thJC}	Thermal grease, λ = 2.8 W/mK	-	0.23	-	°C /W
Thermal resistance−chip−to− case, SILICON CARBIDE SCHOTTKY DIODE (D13, D14, D23, D24)	R_{thJC}		-	0.30	-	°C /W
Thermal resistance−chip−to− case, INVERSE DIODE (D11,D12, D21,D22)	R_{thJC}		-	0.41	-	°C /W
Thermal resistance−chip−to− case, START−UP DIODE (D1,D15)	R_{thJC}		-	0.41	-	°C /W

HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

Table 3 Characteristics values

IGBT(Q11,Q12,Q21,Q22)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15 V, I_C = 200 A	T_j = 25°C	-	1.91	-	V
		V_{GE} = 15 V, I_C = 200 A	T_j = 150°C	-	2.31	-	
Gate−emitter threshold voltage	$V_{GE(TH)}$	V_{GE} = V_{CE}, I_C = 9 mA	T_j = 25°C	-	5.25	-	V
Total gate charge	Q_g	V_{GE} = ±15 V, V_{CE} = 600 V	T_j = 25°C	-	0.75	-	µC
Gate-source leakage current	I_{GES}	V_{GE} = 20 V, V_{CE} = 0 V	T_j = 25°C	-	-	100	nA
Collector−emitter voltage	$V_{(BR)CES}$	V_{GE} = 0 V	T_j = 25°C	1000	-	-	V
Collector−emitter cut−off current	I_{CES}	V_{CE} = 1000 V, V_{GE} = 0 V	T_j = 25°C	-	-	100	µA
Input capacitance	C_{iss}	V_{GE} = 0 V, V_{CE} = 20 V, f = 100 KHz	T_j = 25°C	-	1.26	-	nF
Output capacitance	C_{oss}		T_j = 25°C	-	0.63	-	
Reverse transfer capacitance	C_{rss}		T_j = 25°C	-	0.071	-	
Turn-on delay time (inductive load)	$t_{d\ on}$	V_{GE} = -7 V / +15 V V_{CE} = 600 V I_C = 50 A R_{Gon} = 9 Ω R_{Goff} = 25 Ω	T_j = 25°C	-	95	-	ns
			T_j = 150°C	-	86	-	
Rise time (inductive load)	t_r		T_j = 25°C	-	32	-	
			T_j = 150°C	-	38	-	
Turn-off delay time, (inductive load)	$t_{d\ off}$		T_j = 25°C	-	552	-	
			T_j = 150°C	-	577	-	
Fall time (inductive load)	t_f		T_j = 25°C	-	32	-	
			T_j = 150°C	-	53	-	
Turn - on switching loss	E_{on}		T_j = 25°C	-	1.9	-	mJ
			T_j = 150°C	-	2.4	-	
Turn - off switching loss	E_{off}		T_j = 25°C	-	1.1	-	
			T_j = 150°C	-	1.4	-	

SILICON CARBIDE SCHOTTKY DIODE (D13, D14, D23, D24)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Diode forward voltage	V_F	I_F = 60 A	T_j = 25°C	-	1.31	-	V
		I_F = 60 A	T_j = 150°C	-	1.53	-	

HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Reverse recovery time	T_{RR}	V_{GE} = -7 V V_{CE} = 600 V I_C = 50 A	T_j = 25°C	-	42	-	ns
			T_j = 150°C	-	43	-	
Reverse recovery charge	Q_{RR}		T_j = 25°C	-	0.47	-	µC
			T_j = 150°C	-	0.62	-	
Peak reverse recovery current	I_{RRM}		T_j = 25°C	-	25	-	A
			T_j = 150°C	-	26	-	
Reverse recovery energy	E_{RR}		T_j = 25°C	-	74	-	uJ
			T_j = 150°C	-	95	-	

INVERSE DIODE (D11,D12, D21,D22)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Diode forward voltage	V_F	I_F = 50 A	T_j = 25°C	-	1.11	-	V
		I_F = 50 A	T_j = 150°C	-	1.06	-	

START−UP DIODE (D1,D15)

Diode forward voltage	V_F	I_F = 50 A	T_j = 25°C	-	1.11	-	V
		I_F = 50 A	T_j = 150°C	-	1.06	-	

HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

Table 4 NTC-Thermistor

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Rated resistance	R_{25}	T_C = 25°C	-	5	-	kΩ
Deviation of R100	ΔR/R	T_C = 100°C, R_{100} = 493 Ω	-5	-	5	%
Power Dissipation	P25	TNTC = 25°C	-	-	60	mW
B-value	$B_{25/50}$	B (25/50), tolerance ±3%	-	3375	-	K
B-value	B25/100	B (25/100), tolerance ±3%	-	3433	-	K

Table 5 Module Characteristics

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Stray Inductance	L_{CE}		-	16	-	nH
Mounting torque Screw:M5	M		3.0	-	5.0	N.m
Creepage distance	terminal to heatsink			11.5		
Clearance	terminal to heatsink			9.4		
CTI				≥600		
Flatness of base plate					0.3	mm
Weight				250		g

HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

Typical Performance Characteristics

Fig.1 Output characteristic IGBT, Boost (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V

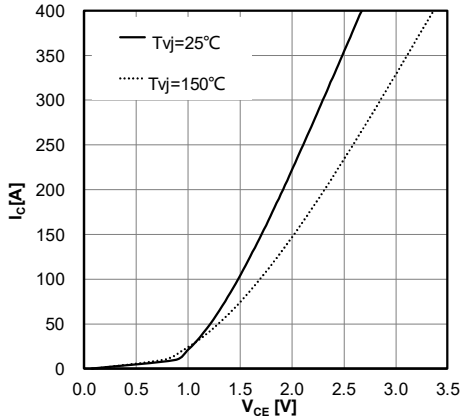


Fig.2 Output characteristic IGBT, Boost (typical)
$I_C = f(V_{CE})$
T_{vj} = 150°C

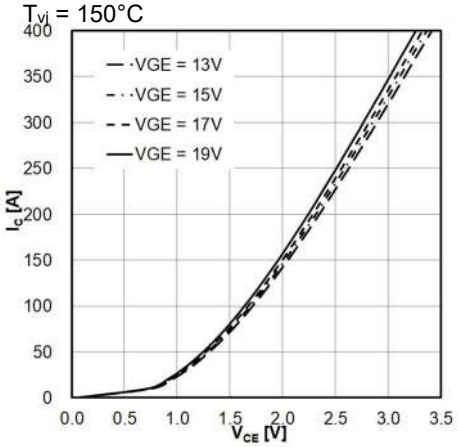


Fig.3 Transfer characteristic IGBT, Boost (typical)
$I_C = f(V_{GE})$
V_{CE} = 20 V

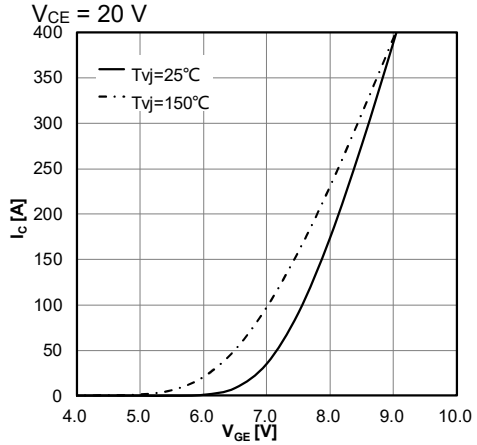


Fig.4 Switching losses IGBT, Boost (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = -7 V / +15 V, R_{Gon} = 9 Ω, R_{Goff} = 25 Ω, V_{CE} = 600 V

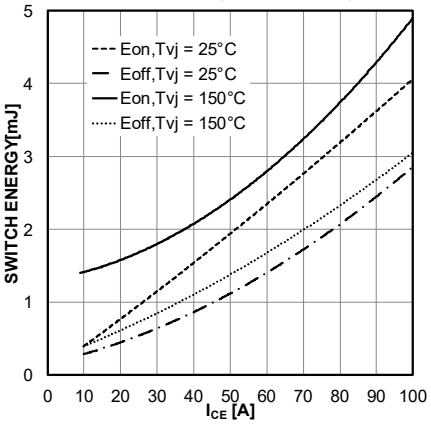


Fig.5 Switching losses IGBT, Boost (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
V_{GE} = -7 V / +15 V, V_{CE} = 600 V, I_C = 50 A

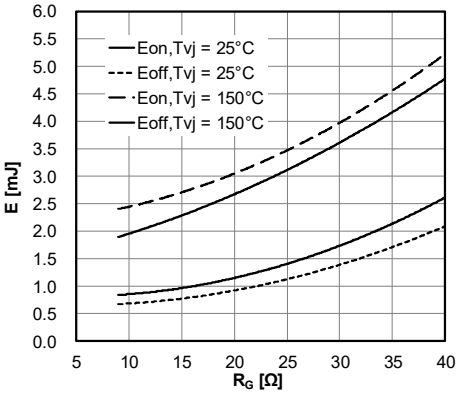
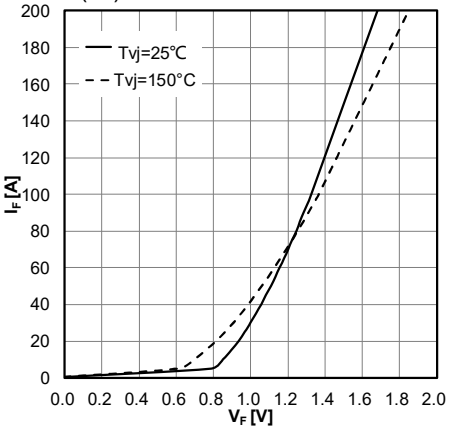


Fig.6 Forward characteristic of Inverse-polarity protection Diode (typical)
$I_F = f(V_F)$



HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

Typical Performance Characteristics

Fig.7 Reverse bias safe operating area IGBT, Boost (RBSOA)
$I_C = f(V_{CE})$
V_{GE} = ±15 V, R_{Goff} = 15 Ω, T_{vj} = 150°C

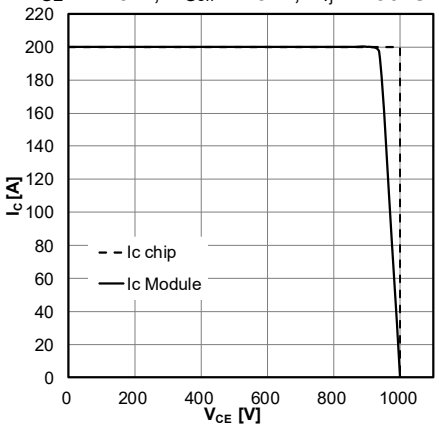


Fig.8 forward characteristic of SBD, Boost (typical)
$I_F = f(V_F)$

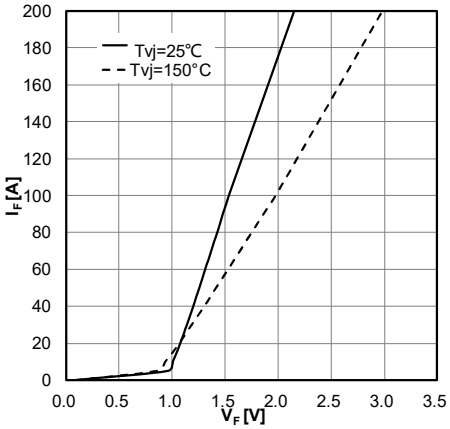


Fig.9 Switching losses Diode, Boost (typical)
$E_{rec} = f(I_F)$
R_{Gon} = 9 Ω, V_{CE} = 600 V

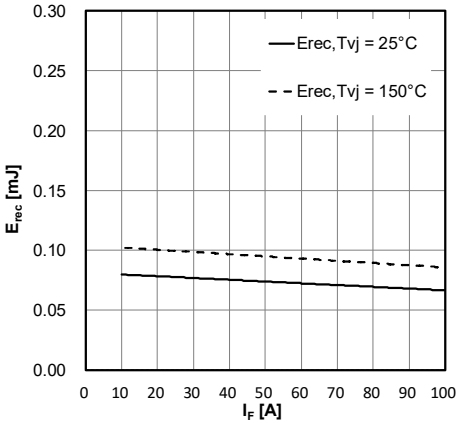


Fig.10 Switching losses Diode, Boost (typical)
$E_{rec} = f(R_G)$
I_F = 50 A, V_{CE} = 600 V

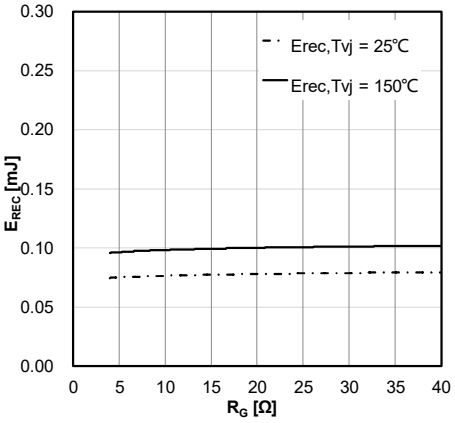


Fig.11 Forward characteristic of Bypass-Diode (typical)
$I_F = f(V_F)$

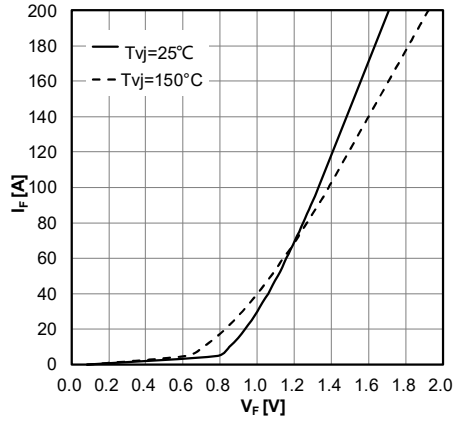
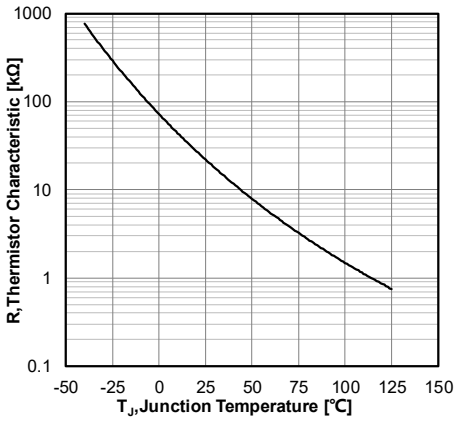


Fig.12 NTC-Thermistor-temperature characteristic (typical)
R = f (T)



HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

Typical Performance Characteristics

Fig.13 Transient thermal impedance IGBT, Boost
Z_{thJH} = f (t)

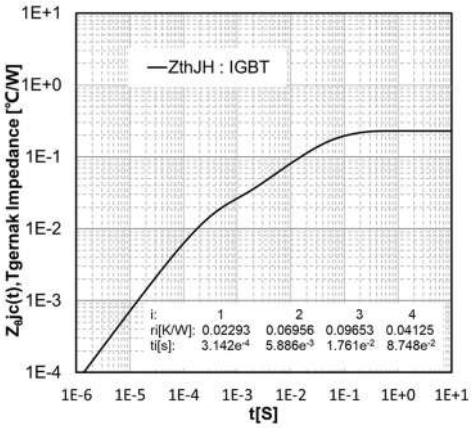


Fig.14 Transient thermal impedance SBD, Boost
Z_{thJH} = f (t)

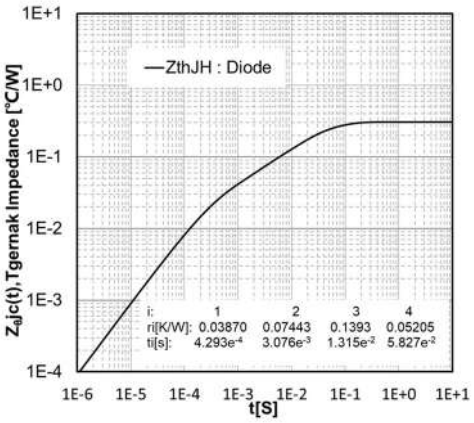


Fig.15 Transient thermal impedance Inverse-polarity protection diode
Z_{thJH} = f (t)

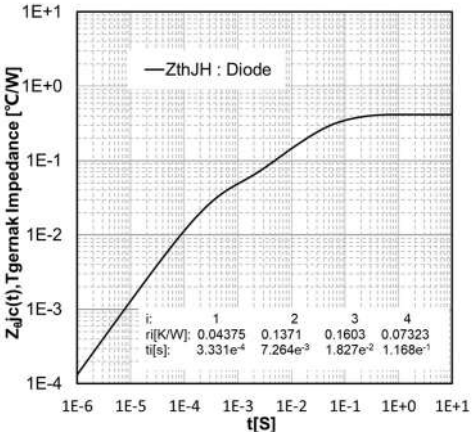
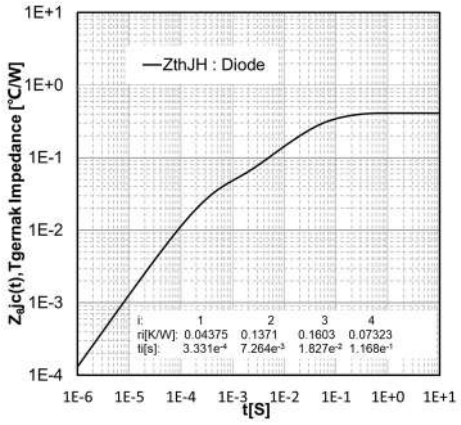


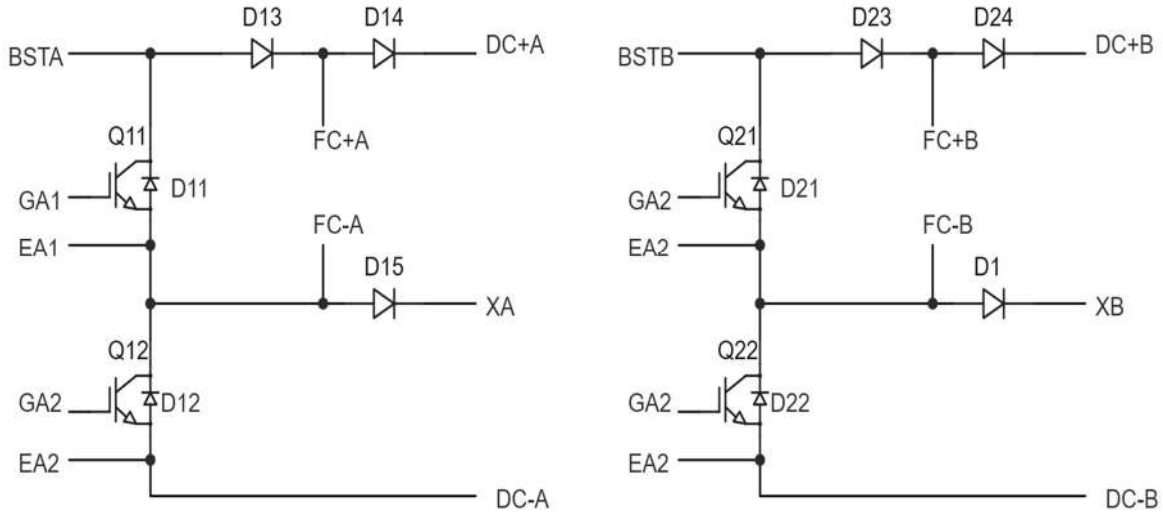
Fig.16 Transient thermal impedance Bypass-Diode
Z_{thJH} = f (t)

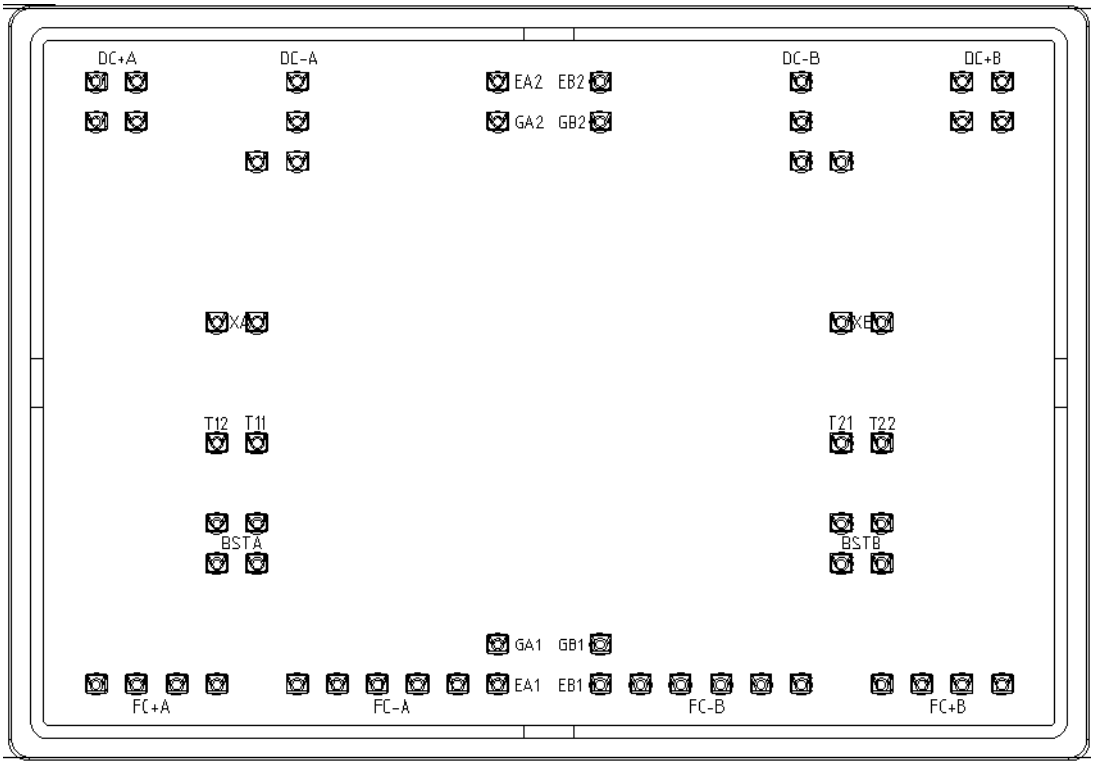


HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

Circuit Diagram

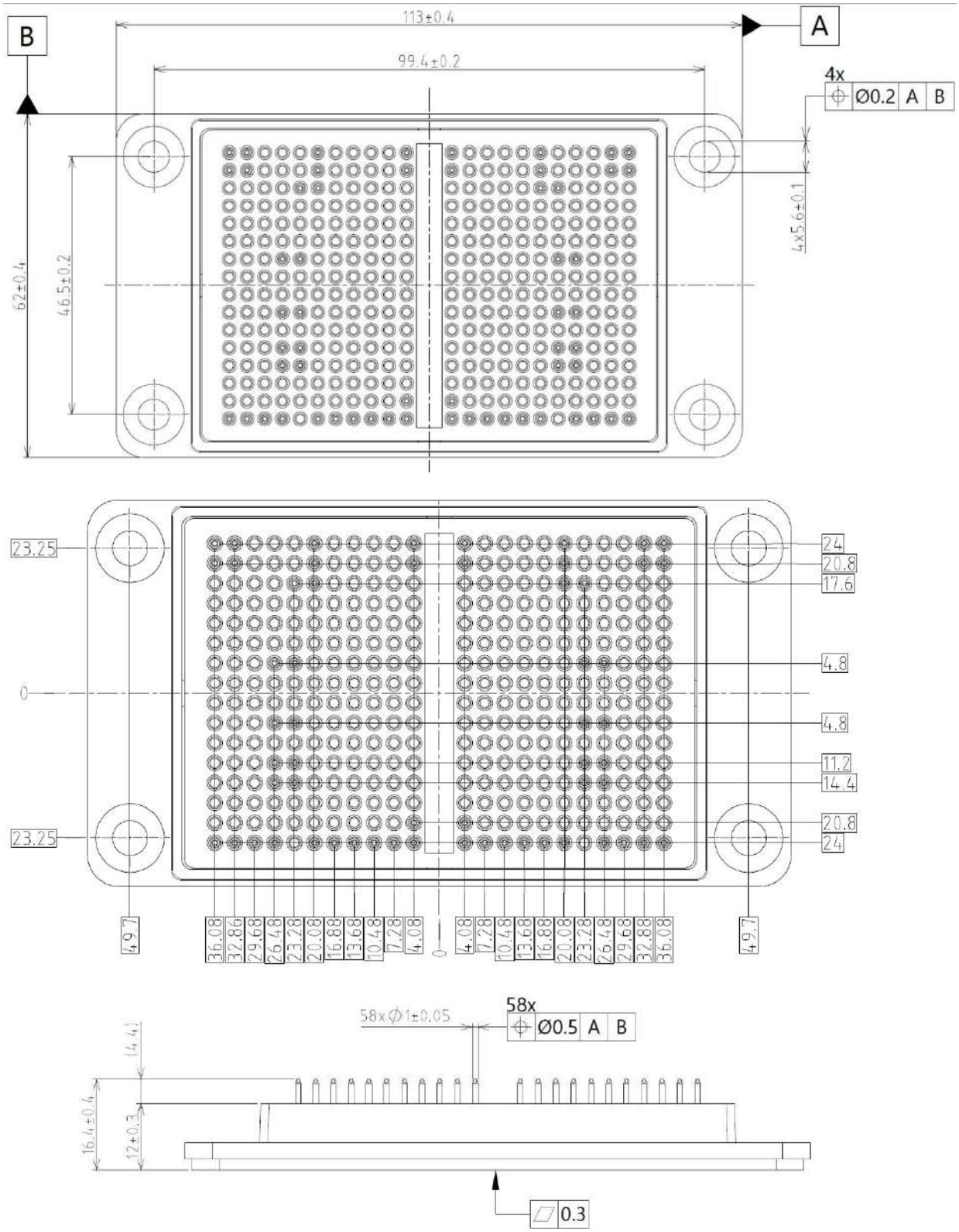




HCG400FB100E3T1

1000V / 400A E3 (size similar to Easy 3 with Cu Baseplate)

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.