HCG450FH170D3E1A

1700V / 450A 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 (T_C= 90℃)	$V_{CE(SAT)}$ (T_{vj} = 25℃ , I_C = 450A, V_{GE} = 15V)	T_{vjmax}	Package
IGBT	1700V	450A	1.62V	175℃	D3

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Table 2 Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector emitter voltage	V_{CE}	T_{vj} = 25°C	1700	V
Continuous DC collector current	I_{CDC}	T_C = 90°C	450	A
Repetitive peak collector current	I_{CRM}	Tp=1ms	900	
Continuous DC forward current	I_F		450	A
Repetitive peak forward current	I_{FRM}	Tp=1ms	900	A
I^2t-value	I^2t	Tp=10ms,V_R=0V, T_{vj} = 175°C	45000	A^2S
Gate Source Voltage	V_{GE}	T_{vj} = 25°C	±20	V
Junction Temperature	T_{vj}		-40 to +175	℃
Storage Temperature	T_{stg}		-40 to +125	
Operating virtual junction temperature	T_{vjop}		-40 to +150	℃

Table 3 Thermal Resistance

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
IGBT Thermal resistance junction - case	R_{thJC}	Per IGBT	-	0.06	-	°C / W
Diode Thermal resistance junction - case	R_{thJC}	Per diode	-	0.098	-	°C / W

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Table 4 Static Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector emitter voltage	$V_{(BR)CES}$	T_{vj} = 25°C	1700	-	-	V
Collector emitter saturation voltage	V_{CEsat} (terminal)	V_{GE} = 15V, I_C =450A, T_{vj} = 25°C	-	1.76	-	V
		V_{GE} = 15V, I_C =450A, T_{vj} = 175℃	-	2.34	-	
	V_{CEsat} (chip)	V_{GE} = 15V, I_C =450A, T_{vj} = 25°C	-	1.62	-	
		V_{GE} = 15V, I_C =450A, T_{vj} = 175℃	-	2.13	-	
Diode forward voltage	V_F (terminal)	V_{GE} = 0V, I_C = 450A, T_{vj} = 25°C	-	1.72	-	V
		V_{GE} = 0V, I_C = 450A, T_{vj} = 175℃	-	1.87	-	
	V_F (chip)	V_{GE} = 0V, I_C = 450A, T_{vj} = 25°C	-	1.62	-	
		V_{GE} = 0V, I_C = 450A, T_{vj} = 175℃	-	1.80	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 18mA	-	5.87	-	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1700V, V_{GE} = 0V, T_{vj} = 25°C	-	-	100	uA
Gate-emitter leakage current	I_{GES}	V_{GE} = 20V, V_{CE} = 0V	-	-	100	nA
Input capacitance	C_{ies}	V_{GE} = 0 V, V_{CE} = 25 V, f = 100kHz	-	58.2	-	nF
Output capacitance	C_{oes}		-	2.44	-	
Reverse transfer capacitance	C_{res}		-	0.36	-	
Gate input resistance	R_G	f = 1M Hz	-	2.08	-	Ω
Gate charge	Q_G	V_{GE} = -15 V to 15 V, V_{CE} = 600 V	-	3.57	-	μC

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Table 5 Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	t_{don}	T_{vj} = 25°C, V_{CC} = 900V, I_C = 450A, V_{GE} = -15/15V, $R_{G(on)}$= 0.51Ω,$R_{G(off)}$= 0.51Ω	-	205	-	ns
Rise time	t_r		-	60	-	
Turn-off delay time	t_{doff}		-	350	-	
Fall time	t_f		-	485	-	
Turn-on energy	E_{on}		-	111	-	mJ
Turn-off energy	E_{off}		-	89	-	
Total switching energy	E_{ts}		-	200	-	
Turn-on delay time	t_{don}	T_{vj} = 150°C, V_{CC} = 900V, I_C = 450A, V_{GE} = -15/15V, $R_{G(on)}$= 0.51Ω,$R_{G(off)}$= 0.51Ω	-	250	-	ns
Rise time	t_r		-	75	-	
Turn-off delay time	t_{doff}		-	400	-	
Fall time	t_f		-	630	-	
Turn-on energy	E_{on}		-	157.3	-	mJ
Turn-off energy	E_{off}		-	111.8	-	
Total switching energy	E_{ts}		-	269.1	-	
Short circuit current	I_{SC}	T_{vj} = 175°C, V_{CC} = 1000V, V_{GE} = 15V, V_{CEmax} = V_{CES} -L_{sCE}*di/dt T_P ≤ 6 us	-	1800	-	A

Table 6 Diode Recovery Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse recovery Time	T_{rr}	T_{vj} = 25°C, V_{CC} = 900V, I_C = 450A, V_{GE} = -15/15V, $R_{G(on)}$= 0.51Ω,$R_{G(off)}$= 0.51Ω	-	615	-	ns
Peak reverse recovery current	I_{rrm}		-	440	-	A
Reverse recovery charge	Q_{rr}		-	107	-	μC
Reverse recovery energy	E_{rec}		-	56.8	-	mJ
Reverse recovery Time	T_{rr}	T_{vj} = 150°C , V_{CC} = 900V, I_C = 450A, V_{GE} = -15/15V, $R_{G(on)}$= 0.51Ω,$R_{G(off)}$= 0.51Ω	-	1095	-	ns
Peak reverse recovery current	I_{rrm}		-	510	-	A
Reverse recovery charge	Q_{rr}		-	196	-	μC
Reverse recovery energy	E_{rec}		-	111.1	-	mJ

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Table 7 Module Characteristics

Parameter	Symbol	Conditions	Value	Typ
Isolation test voltage	V_{ISOL}	RMS, f = 50 Hz, t = 1min	3.4	kV
Material of module baseplate			Cu+Ni	
Internal isolation		Basic insulation	Al_2O_3	
Mounting torque of screws to heat sink	M_s	M5	3.0-6.0	N·m
Mounting torque of screws to terminals	M_t	M6	3.0-6.0	N·m
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	△R/R	TC = 100°C, R100 = 493 Ω	-5	-	5	%
B-value	B25/50	R2 = R25 exp[B25/50(1/T2-1/(298,15K))]	-	3375	-	K

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Characteristics Diagrams

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

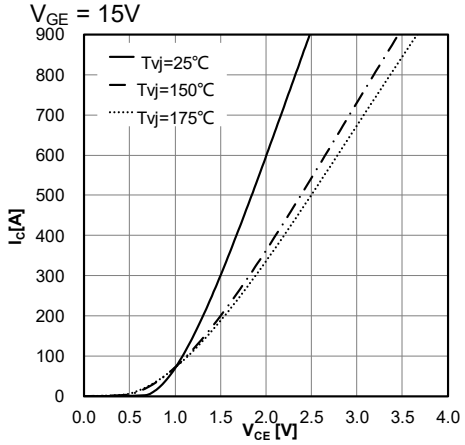


Fig.2 Typical Output Characteristic, IGBT, Inverter
I_C = f (V_{CE}) / (terminal)
T_{Vj} = 175℃

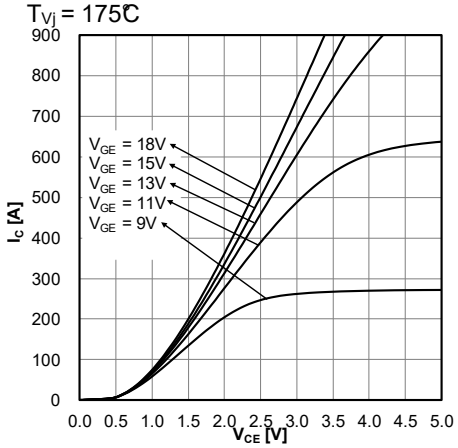


Fig.3 Typical Output Characteristic, IGBT, Inverter
I_C = f (V_{GE})
V_{CE} = 20V

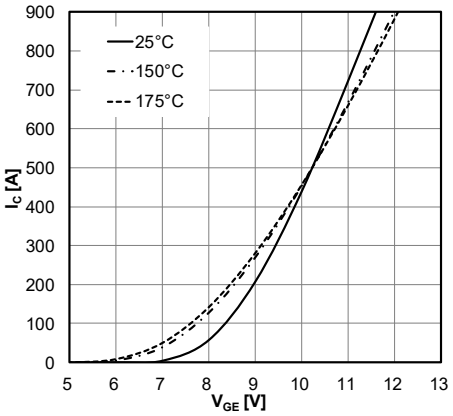


Fig.4 Switching losses, IGBT, Inverter
E = f(I_C)
R_{Goff} = 0.51Ω, R_{Gon} = 0.51Ω, V_{CE} = 900V, V_{GE} = ±15V

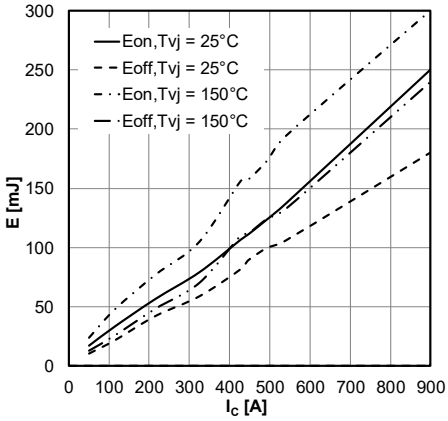


Fig.5 Switching losses, IGBT, Inverter
E = f (R_G)
I_C = 450A, V_{CE} = 900V, V_{GE} = ±15V

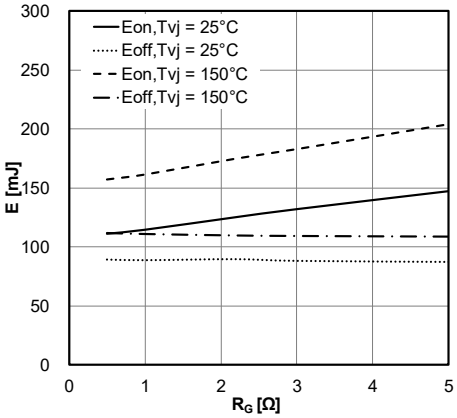
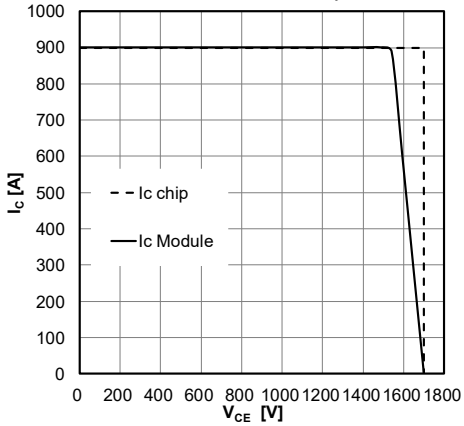


Fig.6 Reverse bias safe operating area (RBOSA), IGBT, Inverter
I_C = f (V_{CE})
R_{Goff} = 0.51Ω, V_{GE} = ±15V, T_{vj} = 175℃



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Characteristics Diagrams

Fig.7 Capacity characteristic, IGBT, Inverter
C= f (V_{CE})
f = 100 KHz, V_{GE} = 0V, T_{vj}= 25°C

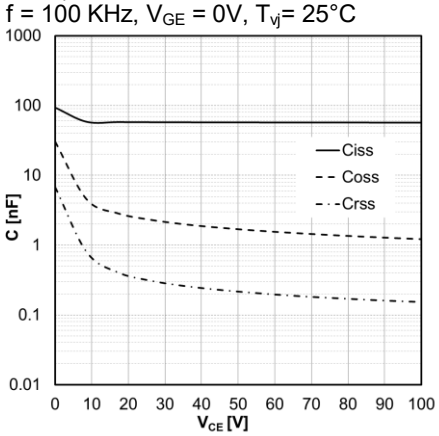


Fig.8 Transient thermal impedance IGBT, Inverter
Z_{thJC} = f (t)

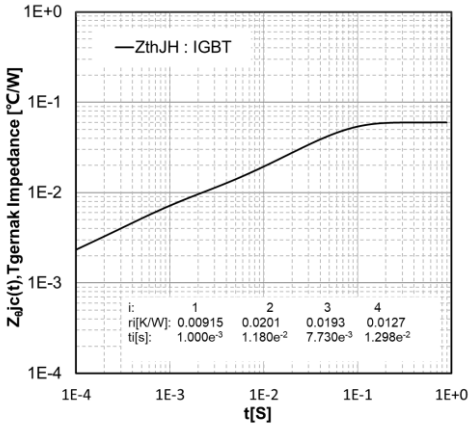


Fig.9 Forward characteristic, Diode, Inverter
I_F = f (V_F) / (terminal)

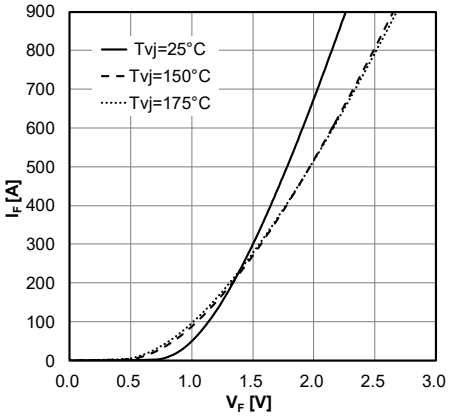


Fig.10 Switching losses, Diode, Inverter
E_{rec} = f (I_F)
V_{CE} = 900V, R_{Goff} = 0.51Ω, R_{Gon} = 0.51Ω, V_{GE} = ±15V

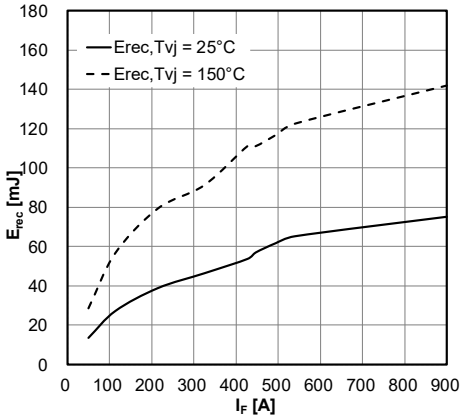


Fig.11 Switching losses, Diode, Inverter
E_{rec} = f (R_G)
V_{CE} = 900V, I_F= 450A

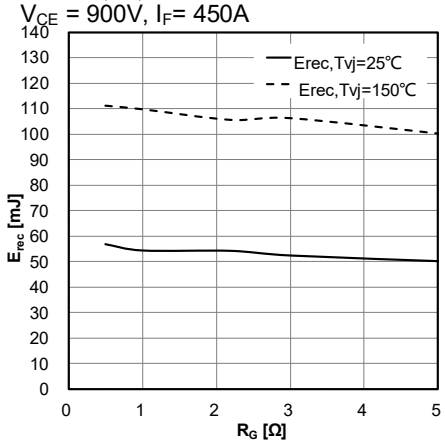
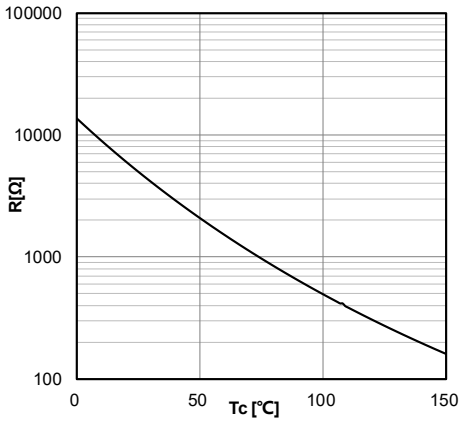


Fig.12 Temperature characteristic, NTC - Thermistor



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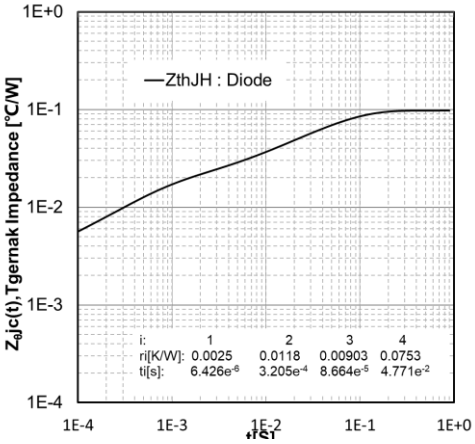
Characteristics Diagrams

Fig.13 Transient thermal impedance Diode, Inverter
$Z_{thJC} = f(t)$



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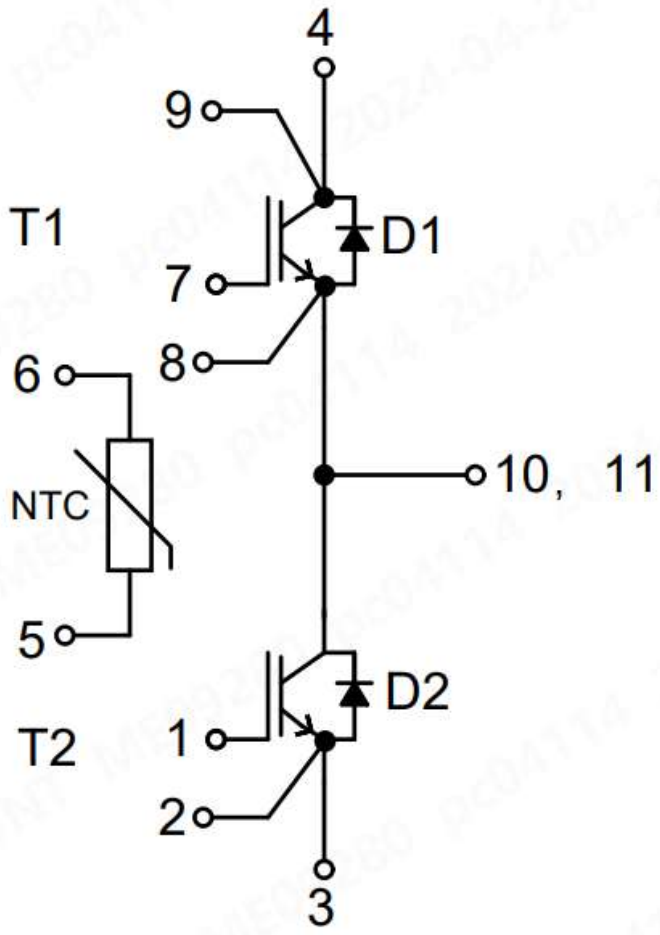
Package Information

Circuit Diagram



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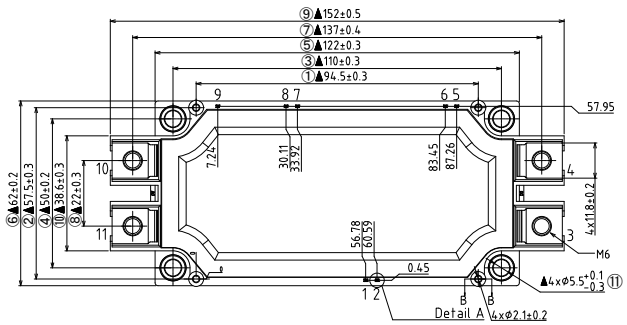
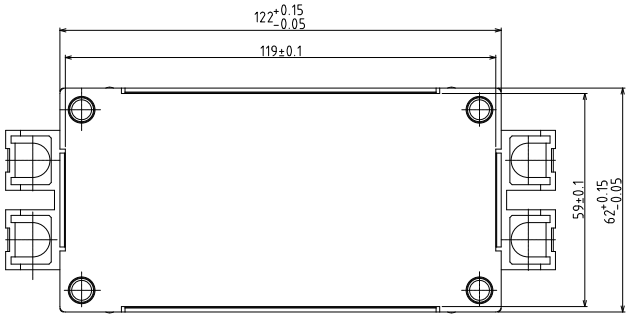
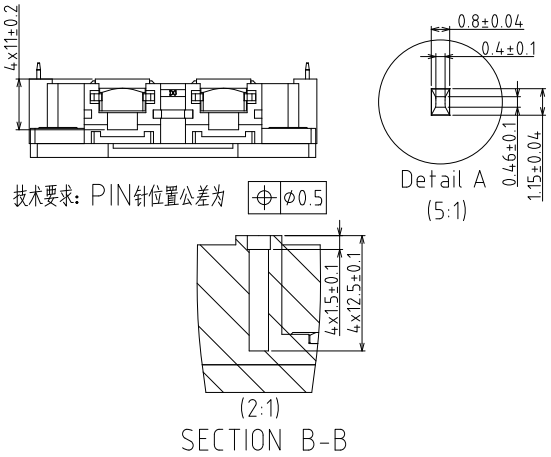
Package Outlines







Revision History

Document Version	Description of Changes
RevX.0.1	Released

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