

HCG450FH170D3K5

1700V 450A IGBT 模块, E6封装, 内置续流二极管及NTC
1700V 450A IGBT Module, E6 Package, with FWD and NTC

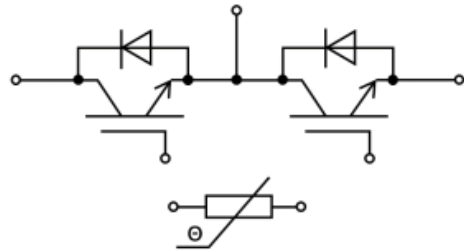
特点 Features

- 1700V 沟槽栅及场截止结构
1700V Trench Gate & Field Stop Structure
- 集成温度传感器
Integrated Temperature Sensor
- V_{CEsat} 正温度系数
 V_{CEsat} with Positive Temperature Coefficient
- 标准封装
Standard Housing
- 绝缘基板
Isolated Base Plate
- 高功率密度
High Power Density



应用 Applications

- SVG
Static Var Generator
- 风电变流器
Wind Converters



最大额定值 Maximum Rated Values

参数 Parameter	符号 Symbol	条件 Condition	数值 Value	单位 Unit
集电极-射极电压 Collector-emitter voltage	V_{CES}	$V_{GE}=0V, T_{vj}=25^{\circ}C$	1700	V
集电极直流电流 DC collector current	I_C	$T_C=118^{\circ}C, T_{vj\ max}=175^{\circ}C$	450	A
集电极峰值电流 Peak collector current	I_{CM}	$t_p=1ms$	900	A
栅极-射极峰值电压 Gate-emitter peak voltage	V_{GES}		± 20	V
总功率损耗 Total power dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vj\ max}=175^{\circ}C$	2630	W
反向重复峰值电压 Repetitive peak reverse voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	1700	V
正向直流电流 Continuous DC forward current	I_F		450	A
正向重复峰值电流 Repetitive peak forward current	I_{FRM}	$t_p=1ms$	900	A
IGBT短路耐受 IGBT short circuit withstand time	t_{psc}		10	μs
最高结温 Maximum junction temperature	$T_{vj\ max}$		175	$^{\circ}C$
工作结温 Operating junction temperature	$T_{vj\ op}$		-40~150	$^{\circ}C$
存储温度 Storage temperature	T_{stg}		-40~125	$^{\circ}C$

IGBT特征值 IGBT Characteristics Values^{*1} (T_{vj}=25°C unless otherwise noted)

参数 Parameter	符号 Symbol	条件 Condition		数 值 Value			单 位 Unit
				Min.	Typ.	Max.	
集电极-射极饱和电压 Collector-emitter saturation voltage	V _{CE sat}	I _C =450A, V _{GE} =15V	T _{vj} =25°C		1.80		V
			T _{vj} =150°C		2.20		
栅极-射极阈值电压 Gate-emitter threshold voltage	V _{GE th}	I _C =18mA, V _{CE} =V _{GE}		5.70	6.20	6.70	V
集电极-射极截止电流 Collector-emitter cut-off current	I _{CES}	V _{CE} =1700V, V _{GE} =0V				1	mA
栅极-射极漏电流 Gate-emitter leakage current	I _{GES}	V _{CE} =0V, V _{GE} =±20V		-100		100	nA
内置栅极电阻 Internal gate resistance	R _{G int}				1.6		Ω
输入电容 Input capacitance	C _{ies}	f=1MHz, T _{vj} =25°C, V _{CE} =25V, V _{GE} =0V			54.0		nF
反向转移电容 Reverse transfer capacitance	C _{res}				0.90		nF
开通延迟时间 (感性负载) Turn-on delay time, inductive load	t _{d on}	I _C =450A, V _{CE} =900V, V _{GE} =±15V, R _{Gon} =3.3Ω, R _{Goff} =3.3Ω, 开通di/dt=2800A/μs (T _{vj} =150°C), 关断dv/dt=3100V/μs (T _{vj} =150°C), Inductive Load	T _{vj} =25°C		445		ns
			T _{vj} =150°C		465		
上升时间 (感性负载) Rise time, inductive load	t _r		T _{vj} =25°C		125		ns
			T _{vj} =150°C		125		
关断延迟时间 (感性负载) Turn-off delay time, inductive load	t _{d off}		T _{vj} =25°C		1000		ns
			T _{vj} =150°C		1130		
下降时间 (感性负载) Fall time, inductive load	t _f		T _{vj} =25°C		470		ns
			T _{vj} =150°C		640		
开通损耗 (每脉冲) Turn-on energy loss per pulse	E _{on}		T _{vj} =25°C		210		mJ
			T _{vj} =150°C		250		
关断损耗 (每脉冲) Turn-off energy loss per pulse	E _{off}		T _{vj} =25°C		125		mJ
			T _{vj} =150°C		155		
短路电流 Short circuit current	I _{SC}	V _{GE} ≤15V, V _{CC} =1100V, t _{psc} ≤10us, T _{vj} =150°C V _{CEmax} =V _{CES} -I _{SC} E · di/dt			1800		A

^{*1} IGBT特征值遵从IEC 60747-9。

二极管特征值 Diode Characteristics Values*2

参数 Parameter	符号 Symbol	条件 Condition		数□ Value			□位 Unit
				Min.	Typ.	Max.	
正向□□ Forward voltage	V _F	I _F =450A	T _{vj} =25°C		1.70		V
			T _{vj} =150°C		1.90		
反向恢复峰□□流 Peak reverse recovery current	I _{RM}	I _F =450A, V _R =900V, di _F /dt=-2800A/μs (T _{vj} =150°C) , V _{GE} =-15V, Inductive Load	T _{vj} =25°C		340		A
			T _{vj} =150°C		360		
反向□荷 Reverse charge	Q _{rr}		T _{vj} =25°C		110		μC
			T _{vj} =150°C		170		
反向恢复□耗 Reverse recovery energy loss	E _{rec}		T _{vj} =25°C		45		mJ
			T _{vj} =150°C		75		

*2 二极管特征值遵从IEC 60747-2。

负温度系数热敏电阻 NTC-Thermistor

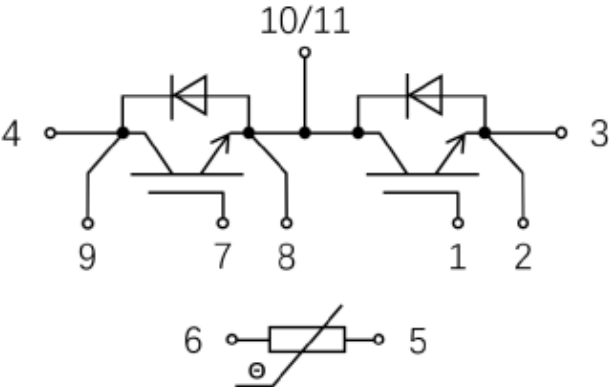
参数 Parameter	符号 Symbol	条件 Condition	数值 Value			单位 Unit
			Min.	Typ.	Max.	
额定阻值 Rated resistance	R_{25}	$T_{NTC}=25^{\circ}C$		5		k Ω
耗散功率 Power dissipation	P_{25}	$T_{NTC}=25^{\circ}C$			10	mW
B-值 B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298,15K))]$		3375		K

封装特性 Package Properties*3

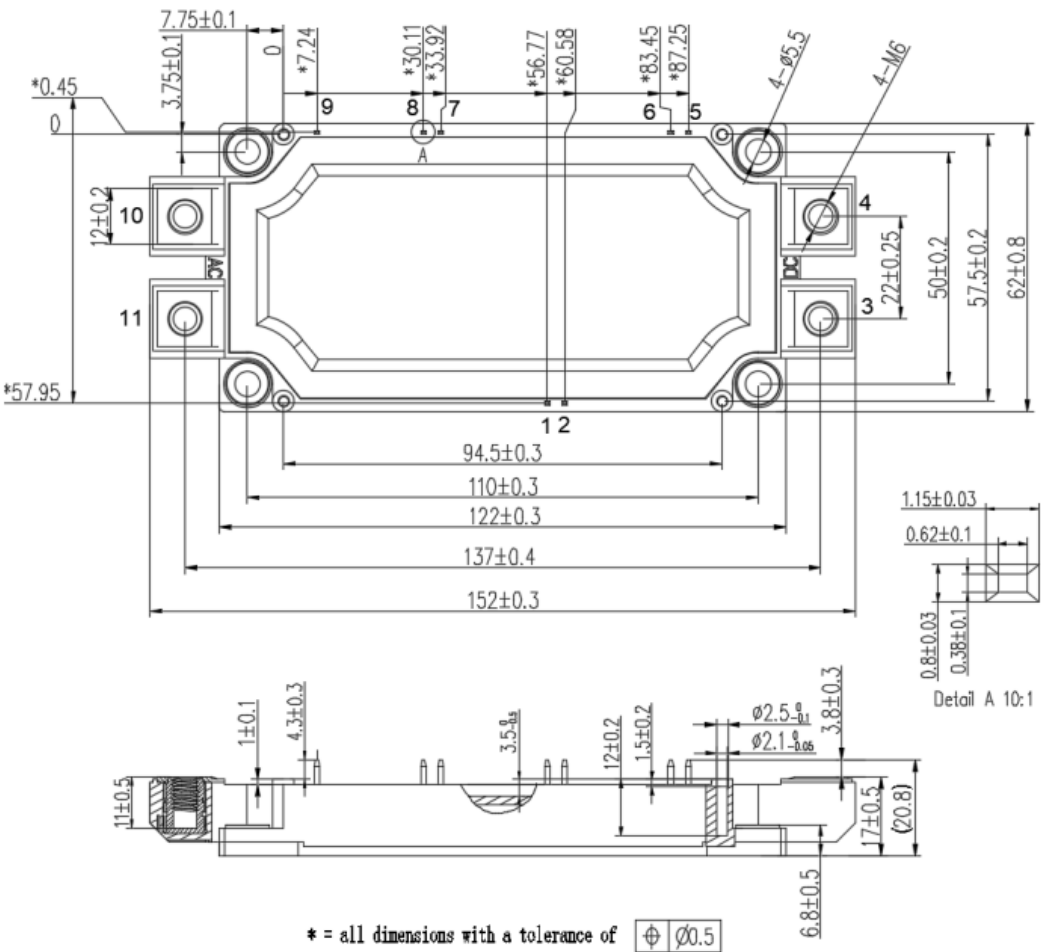
参数 Parameter	符号 Symbol	条件 Condition	数值 Value			单位 Unit
			Min.	Typ.	Max.	
IGBT 结-壳电阻 IGBT thermal resistance: junction to case	R_{thJC}	每个IGBT/per IGBT		0.057		K/W
二极管 结-壳电阻 Diode thermal resistance: junction to case	R_{thJC}	每个二极管/per diode		0.120		K/W
IGBT接触电阻 IGBT thermal resistance: case to heatsink	R_{thCH}	每个IGBT/per IGBT 硅脂系数 $\lambda_{grease}=1W/(m\cdot K)$		0.049		K/W
二极管接触电阻 Diode thermal resistance: case to heatsink	R_{thCH}	每个二极管/per diode 硅脂系数 $\lambda_{grease}=1W/(m\cdot K)$		0.055		K/W
绝缘电压 Isolation voltage	V_{isol}	RMS, f=50Hz, t=60s	3.4			kV
爬电距离 Creepage distance	d_{cr}	端子到散热器 Terminal to heatsink	14			mm
		端子到端子 Terminal to terminal	13.5			mm
气隙 Clearance distance	d_{cl}	端子到散热器 Terminal to heatsink	12.5			mm
		端子到端子 Terminal to terminal	10			mm
相漏起痕指数 Comparative tracking index	CTI		>200			
模块寄生电感 Module stray inductance	L_{sCE}	每个臂/per switch		20		nH
模块引脚内阻 Module lead resistance, terminal to chip	$R_{CC'+EE}$	每个臂/per switch, $T_C=25^{\circ}C$		1.1		mΩ
安装扭矩 Mounting torques	M	基板至散热器 Baseplate to heatsink, M5	3.0		6.0	Nm
		功率端子安装 Power terminal, M6	3.0		6.0	Nm
模块重量 Module weight	G			345		g

*3 封装特性遵从IEC 60747-15

电路图 Circuit Diagram



外形尺寸 Outline Drawing



修订记录 Revision History

版本 Version	日期 Date	描述 Description
A0	2025-5-29	初版

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