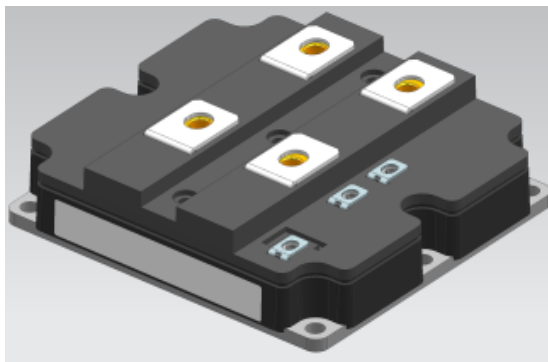


HCG1000S330H1K1

3300V 1000A IGBT 模块, H1封装, 内置续流二极管
3300V 1000A IGBT Module, H1 Package, with FWD

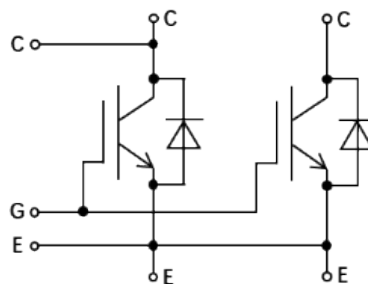
特点 Features

- 低饱和压降
Low $V_{CE(sat)}$
- 高鲁棒性
High Robustness
- 高可靠性
High Reliability
- 标准H封装
Standard H Package
- 工作结温 $T_{vj(op)} = 150^{\circ}\text{C}$
Junction Operating Temperature: 150°C



应用 Applications

- 静止无功发生器 SVG
Static Var Generator, SVG
- 牵引系统
Traction Drives
- 电机驱动
Motor Drives



最大额定值 Maximum Rated Values*1

参数 Parameter	符号 Symbol	条件 Conditions	数值 Value	单位 Unit
集电极-发射极电压 Collector-Emitter Voltage	V_{CES}	$V_{GE}=0V, T_{vj}=25^{\circ}\text{C}$	3300	V
集电极直流电流 DC Collector Current	I_C	$T_C=100^{\circ}\text{C}, T_{vj}=150^{\circ}\text{C}$	1000	A
集电极峰值电流 Peak Collector Current	I_{CM}	$t_p=1\text{ms}$	2000	A
栅极-发射极电压 Gate-Emitter Voltage	V_{GES}		± 20	V
总功耗 Total Power Dissipation	P_{tot}	$T_C=25^{\circ}\text{C}, T_{vj}=150^{\circ}\text{C}$	10	kW
额定正向工作电流 DC Forward Current	I_F		1000	A
正向峰值电流 Peak Forward Current	I_{FRM}	$t_p=1\text{ms}$	2000	A
浪涌电流 Surge Current	I_{FSM}	$V_R=0V, T_{vj}=150^{\circ}\text{C}, t_p=10\text{ms}, \text{half-sinewave}$	9000	A
IGBT短路耐受 IGBT Short Circuit SOA	t_{psc}	$V_{CC}=2500V, V_{CEM} \leq 3300V, V_{GE} \leq 15V, T_{vj} \leq 150^{\circ}\text{C}$	10	μs
最高结温 Maximum Junction Temperature	$T_{vj(max)}$		150	$^{\circ}\text{C}$
工作结温 Junction Operating Temperature	$T_{vj(op)}$		-40~150	$^{\circ}\text{C}$
环境温度 Case temperature	T_C		-40~150	$^{\circ}\text{C}$
存储温度范围 Storage Temperature	T_{stg}		-40~125	$^{\circ}\text{C}$

*1 根据IEC 60747, 最大额定值表明会使器件造成损伤的条件边界

IGBT特征值 IGBT Characteristic Values*2

参数 Parameter	符号 Symbol	条件 Conditions		数□ Value			□ 位 Unit	
				Min.	Typ.	Max.		
集□极-□射极反向□穿□□ Collector-Emitter Breakdown Voltage	$V_{(BR)CE\ S}$	$V_{GE}=0V, I_C=10mA, T_{vj}=25^{\circ}C$		3300			V	
集□极-□射极□和□□ *3 Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=1000A, V_{GE}=15V$	$T_{vj}=25^{\circ}C$		2.45	2.95	V	
			$T_{vj}=125^{\circ}C$		3.10	3.60	V	
			$T_{vj}=150^{\circ}C$		3.30	3.80	V	
集□极-□射极截止□流 Collector-Emitter Cut-off Current	I_{CES}	$V_{CE}=3300V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$			1	mA	
			$T_{vj}=125^{\circ}C$		15	40	mA	
			$T_{vj}=150^{\circ}C$		25		mA	
□极-□射极漏□流 Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V, T_{vj}=125^{\circ}C$		-500		500	nA	
□极-□射极开启□□ Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C=240mA, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$		5.8	6.8	7.8	V	
□极□荷 Gate Charge	Q_G	$I_C=1000A, V_{CE}=1800V, V_{GE}=-15V\sim+15V$			6.5		μC	
□入□容 Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=200KHz, T_{vj}=25^{\circ}C$			153		nF	
□出□容 Output Capacitance	C_{oes}				12		nF	
反向□□□容 Reverse Transfer Capacitance	C_{res}				3		nF	
内置□极□阻 Internal Gate Resistance	R_{Gint}				0.8		Ω	
开通延□□□ Turn-on Delay Time	$t_{d(on)}$	$I_C=1000A, V_{CE}=1800V, V_{GE}=\pm 15V, R_{Gon}=1.0\Omega, R_{Goff}=1.5\Omega, C_{ge}=330nF, L_S=150nH, \text{ Inductive Load}$	$T_{vj}=25^{\circ}C$		600		ns	
			$T_{vj}=125^{\circ}C$		660		ns	
			$T_{vj}=150^{\circ}C$		680		ns	
上升□□ Rise Time	t_r		$T_{vj}=25^{\circ}C$		260		ns	
			$T_{vj}=125^{\circ}C$		290		ns	
			$T_{vj}=150^{\circ}C$		300		ns	
关断延□□□ Turn-off Delay Time *2 $T_{vj}=125^{\circ}C$ *3 $V_{CE(sat)}$值为芯片值	$t_{d(off)}$		$T_{vj}=25^{\circ}C$		1700		ns	
			$T_{vj}=125^{\circ}C$		1850		ns	
			$T_{vj}=150^{\circ}C$		1900		ns	
下降□□	t_f		$T_{vj}=25^{\circ}C$		1000		ns	
			$T_{vj}=125^{\circ}C$		1200		ns	
			$T_{vj}=150^{\circ}C$					

*2 Turn-off Delay Time

*3 $V_{CE(sat)}$ 值为芯片值

IGBT特征值 IGBT Characteristic Values*2

参数 Parameter	符号 Symbol	条件 Conditions		数□ Value			□ 位 Unit
				Min.	Typ.	Max.	
开通□耗 Turn-on Switching Energy	E _{on}	I _C =1000A, V _{CE} =1800V, V _{GE} =±15V, R _{Gon} =1.0Ω, R _{Goff} =1.5Ω, C _{ge} =330nF, L _S =150nH, Inductive Load	T _{vj} =25℃		1600		mJ
			T _{vj} =125℃		2000		mJ
			T _{vj} =150℃		2200		mJ
关断□耗 Turn-off Switching Energy	E _{off}		T _{vj} =25℃		2100		mJ
			T _{vj} =125℃		2500		mJ
			T _{vj} =150℃		2700		mJ
*2 IGBT特征值遵从IEC 60747-9							
短路口流 Short Circuit Current 二极管特征值 Diode Characteristic Values	I _{SC}	V _{GE} ≤15V, t _{psc} ≤10μs, V _{CC} =2500V, T _{vj} =150℃ V _{EMCHIP} ≤3300V			4400		A

*2 IGBT特征值遵从IEC 60747-9

二极管特征值 Diode Characteristic Values*3

参数 Parameter	符号 Symbol	条件 Conditions		数□ Value			□ 位 Unit
				Min.	Typ.	Ma x.	
正向□□ *4 Forward Voltage	V _F	I _F =1000A	T _{vj} =25°C		2.10		V
			T _{vj} =125°C		2.30		V
			T _{vj} =150°C		2.30		V
反向恢复□流 Reverse Recovery Current	I _{rr}	I _F =1000A, V _R =1800V, di _F /dt=-2500A/μs, V _{GE} =15V, R _{Gon} =1.0Ω, L _S =150nH, Inductive load	T _{vj} =25°C		900		A
			T _{vj} =125°C		980		A
			T _{vj} =150°C		980		A
反向恢复□荷 Reverse Recovery Charge	Q _{rr}		T _{vj} =25°C		980		uC
			T _{vj} =125°C		1370		uC
			T _{vj} =150°C		1500		uC
反向恢复□□ Reverse Recovery Time	t _{rr}		T _{vj} =25°C		2.95		us
			T _{vj} =125°C		4.40		us
			T _{vj} =150°C		4.95		us
反向恢复□耗 Reverse Recovery Energy Loss	E _{rec}		T _{vj} =25°C		1060		mJ
			T _{vj} =125°C		1600		mJ
			T _{vj} =150°C		1700		mJ

*3 二极管特征值遵从IEC 60747-2

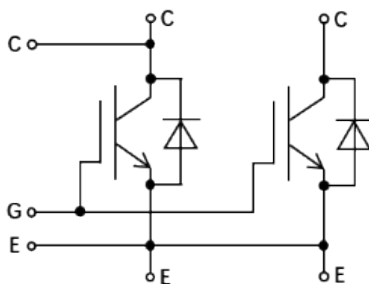
*4 V_F 值为芯片值

封装特性 Package Properties*5

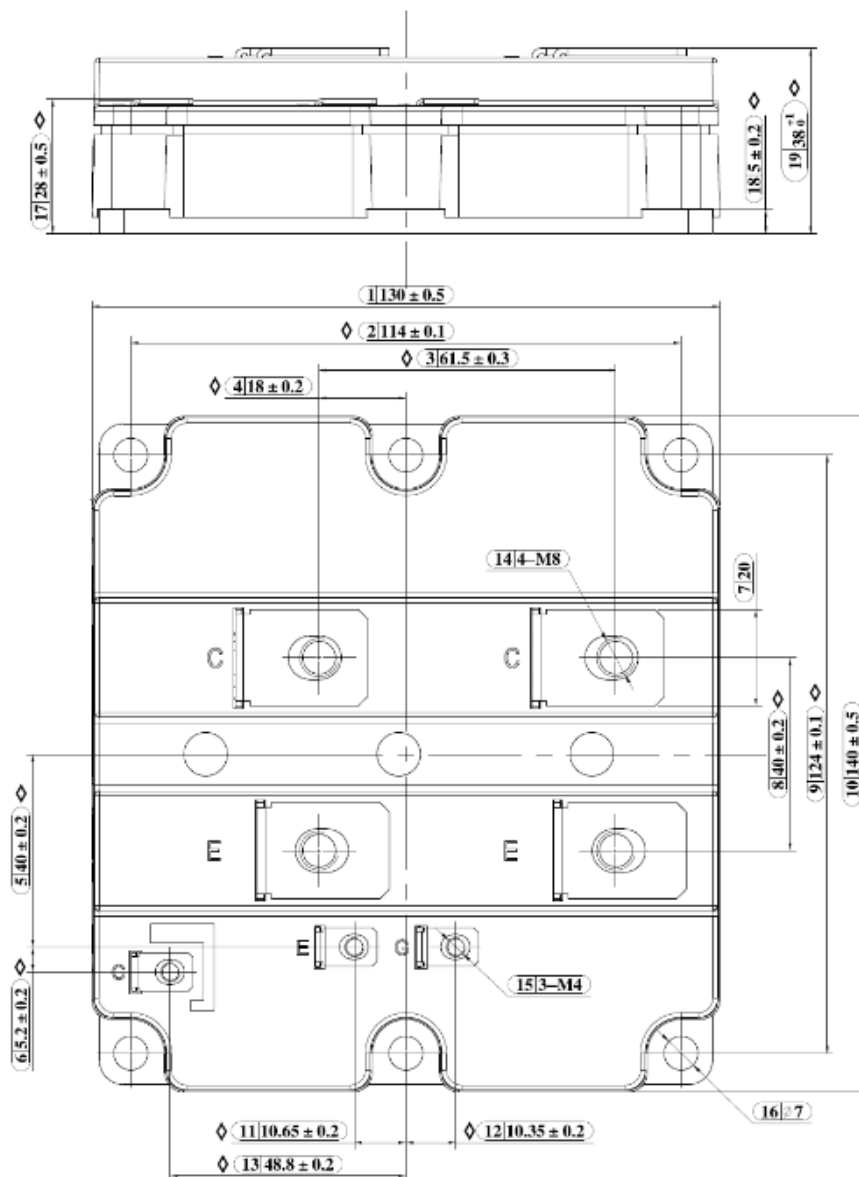
参数 Parameter	符号 Symbol	条件 Condition	数值 Value			单位 Unit
			Min	Typ.	Max	
IGBT 壳阻 IGBT Thermal Resistance: Junction to Case	$R_{th(J-C)}$	每个IGBT/per IGBT			0.013	K/W
二极管 壳阻 Diode Thermal Resistance: Junction to Case	$R_{th(J-C)}$	每个二极管/per Diode			0.024	K/W
IGBT接触阻 IGBT Thermal Resistance: Case to Heatsink	$R_{th(C-H)}$	每个IGBT/per IGBT 硅脂系数 $\lambda_{grease}=1W/(m \cdot K)$		0.012		K/W
二极管接触阻 Diode Thermal Resistance: Case to Heatsink	$R_{th(C-H)}$	每个二极管/per Diode 硅脂系数 $\lambda_{grease}=1W/(m \cdot K)$		0.024		K/W
耐压 Isolation Voltage	V_{isol}	RMS, f=50Hz, t=60s		6000		V
局部放电停止电压 Partial discharge extinction voltage	V_{isol}	RMS, f=50Hz, $Q_{PD} \leq 10pC$		2600		V
爬电距离 Clearance Distance	d_{cl}	端子到散热器 Terminal to Heatsink		23		mm
		端子到端子 Terminal to Terminal		19		mm
爬电距离 Creepage Distance	d_{cr}	端子到散热器 Terminal to Heatsink		33		mm
		端子到端子 Terminal to Terminal		32		mm
相漏起痕指数 Comparative Tracking Index	CTI			>600		
模块寄生电感 Module Stray Inductance	$L_{s, CE}$	每个臂/per Switch		8.0		nH
模块引脚内阻 Module lead Resistance, Terminal to Chip	R_{CC+EE}	每个臂/per Switch, $T_C=25^{\circ}C$		0.08		mΩ
安装扭矩 Mounting Torques	M	基板至散热器, Baseplate to Heatsink, M6	4.0		6.0	Nm
		功率端子安装, Power Terminal, M8	8.0		10	Nm
		信号端子安装, Power Terminal, M4	2.0		3.0	Nm
模块重量 Module Weight	G			820		g

*5 封装特性遵从IEC 60747-15、IEC 60270

接线图



封装尺寸



修订记录Revision History

版本Version	日期Date	描述Description
A0	2024-03-13	初版

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