

HCG225FH170D3K4

1700V 225A IGBT 模块, E6封装, 内置续流二极管及NTC
1700V 225A IGBT Module, E6 Package, with FWD and NTC

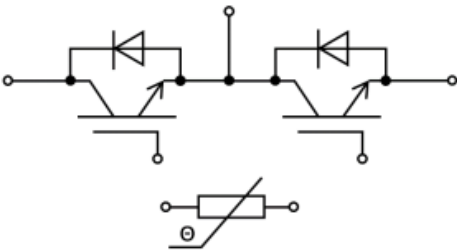
特点 Features

- 1700V 沟槽栅及场截止结构
1700V Trench Gate & Field Stop Structure
- 高短路耐量
High Short Circuit Capability
- 低VCEsat
Low Switching Loss
- 高可靠性
High Reliability
- 正温度系数
Positive Temperature Coefficient



应用 Applications

- 电机传动
Motor Drives
- 伺服驱动器
Servo Drives
- UPS系统
UPS Systems
- 风力发电机
Wind Turbines



最大额定值 Maximum Rated Values

参数 Parameter	符号 Symbol	条件 Condition	数口 Value	口位 Unit
集口极-口射极口口 Collector-emitter voltage	V_{CES}	$V_{GE}=0V, T_{vj}=25^{\circ}C$	1700	V
集口极口流 DC collector current	I_C	$T_C=120^{\circ}C, T_{vj\ max}=175^{\circ}C$	225	A
集口极峰口口流 Peak collector current	I_{CM}	$t_p=1ms$	450	A
口极-口射极峰口口口 Gate-emitter peak voltage	V_{GES}		± 20	V
口功率口耗 Total power dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vj\ max}=175^{\circ}C$	1830	W
反向重复峰口口口 Repetitive peak reverse voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	1700	V
口口正向直流口流 Continuous DC forward current	I_F		225	A
正向重复峰口口流 Repetitive peak forward current	I_{FRM}	$t_p=1ms$	450	A
I^2t -口 I^2t -value	I^2t	$V_R=0V, t_p=10ms, T_{vj}=125^{\circ}C$	7300	A ² s
IGBT短路耐量 IGBT short circuit withstand time	t_{psc}		10	μs
最高口温 Maximum junction temperature	$T_{vj\ max}$		175	$^{\circ}C$
工作口温 Operating junction temperature	$T_{vj\ op}$		-40~150	$^{\circ}C$
存口温度 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 =225A, V _{GE} =15V	T _{vj} =25°C		1.85	2.25	V
			T _{vj} =125°C		2.25		
			T _{vj} =150°C		2.35		
栅极-射极阈值电压 Gate-emitter threshold voltage	V _{GE th}	I _C =9mA, V _{CE} =V _{GE}		5.2	5.8	6.4	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}				3.60		Ω
栅极电荷 Gate charge	Q _G	V _{GE} =-15V~+15V			2.65		μC
输入电容 Input capacitance	C _{ies}	f=1MHz, T _{vj} =25°C, V _{CE} =25V, V _{GE} =0V			21.6		nF
反向转移电容 Reverse transfer capacitance	C _{res}				0.43		nF
开通延迟时间 (感性负载) Turn-on delay time, inductive load	t _{d on}	I _C =225A, V _{CE} =900V, V _{GE} =±15V, R _{Gon} =3.3Ω, R _{Goff} =6.2Ω, 开通di/dt=1200A/μs (T _{vj} =150°C), 关断dv/dt=5080V/μs (T _{vj} =150°C), Inductive Load	T _{vj} =25°C		110		ns
			T _{vj} =125°C		160		
			T _{vj} =150°C		160		
上升时间 (感性负载) Rise time, inductive load	t _r		T _{vj} =25°C		95		ns
			T _{vj} =125°C		160		
			T _{vj} =150°C		160		
关断延迟时间 (感性负载) Turn-off delay time, inductive load	t _{d off}		T _{vj} =25°C		565		ns
			T _{vj} =125°C		555		
			T _{vj} =150°C		555		
下降时间 (感性负载) Fall time, inductive load	t _f		T _{vj} =25°C		340		ns
			T _{vj} =125°C		485		
			T _{vj} =150°C		500		
开通损耗 (每脉冲) Turn-on energy loss per pulse	E _{on}		T _{vj} =25°C		65		mJ
			T _{vj} =125°C		90		
			T _{vj} =150°C		95		
关断损耗 (每脉冲) Turn-off energy loss per pulse	E _{off}		T _{vj} =25°C		30		mJ
			T _{vj} =125°C		45		
			T _{vj} =150°C		50		
短路电流 Short circuit current	I _{SC}	V _{GE} ≤15V, V _{CC} =1000V, t _{psc} ≤10us, T _{vj} =150°C V _{CE,max} =V _{CES} -L _{sCE} · di/dt			1010		A

*1 IGBT特征值遵从IEC 60747-9。

*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 =225A	T _{vj} =25°C		2.35	2.75	V
			T _{vj} =125°C		2.55		
			T _{vj} =150°C		2.60		
反向峰□□ 流 Peak reverse recovery current	I _{RM}	I _F =225A, V _R =900V, V _{GE} =-15V, -di _F /dt=1140A/us (T _{vj} =150°C)	T _{vj} =25°C		140		A
			T _{vj} =125°C		145		
			T _{vj} =150°C		150		
反向□ 荷 Reverse charge	Q _{rr}		T _{vj} =25°C		40		uC
			T _{vj} =125°C		55		
			T _{vj} =150°C		60		
反向恢复□耗 Reverse recovery energy loss	E _{rec}		T _{vj} =25°C		15		mJ
			T _{vj} =125°C		25		
			T _{vj} =150°C		30		

*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°C		5		KΩ
功耗 Power dissipation	P ₂₅	T _{NTC} =25°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

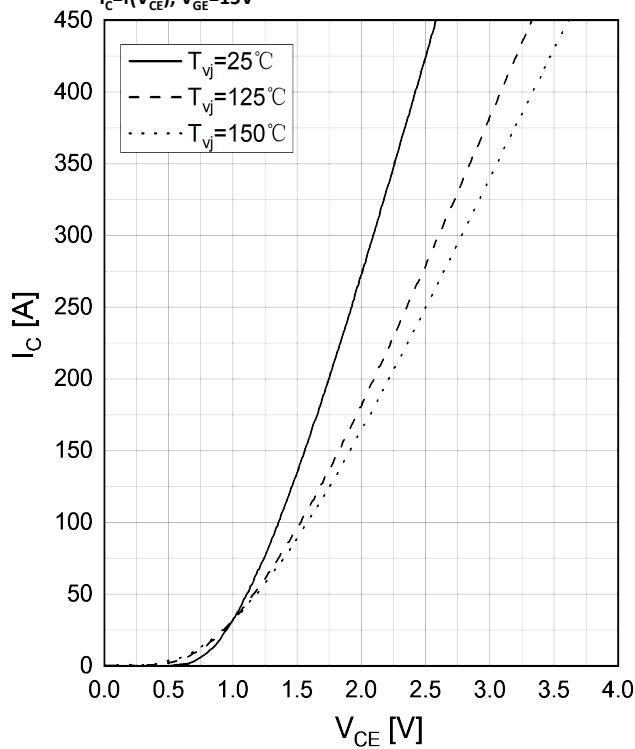
封装特性 Package Properties*3

参数 Parameter	符号 Symbol	条件 Condition	数□ Value			□位 Unit
			Min.	Typ.	Max.	
IGBT □-壳□阻 IGBT thermal resistance: junction to case	R _{th JC}	每个IGBT/per IGBT		0.082		K/W
二极管 □-壳□阻 Diode thermal resistance: junction to case	R _{th JC}	每个二极管/per diode		0.147		K/W
IGBT接触□阻 IGBT thermal resistance: case to heatsink	R _{th CH}	每个IGBT/per IGBT 硅脂□□系数λ _{grease} =1W/(m·K)		0.033		K/W
二极管接触□阻 Diode thermal resistance: case to heatsink	R _{th CH}	每个二极管/per diode 硅脂□□系数λ _{grease} =1W/(m·K)		0.037		K/W
□□耐□ Isolation voltage	V _{isol}	RMS, f=50Hz, t=60s	3.4			kV
爬□距离 Creepage distance	d _{cr}	端子到散□器 Terminal to heatsink	14			mm
		端子到端子 Terminal to terminal	15.4			mm
□气□隙 Clearance distance	d _{cl}	端子到散□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□寄生□感 Module stray inductance	L _{sCE}	每个□臂/per switch		20		nH
模□引□内阻 Module lead resistance, terminal to chip	R _{CC'+EE}	每个□臂/per switch, T _C =25°C		1.1		mΩ
安装扭矩 Mounting torques	M	基板至散□器 Baseplate to heatsink, M5	3.0		6.0	Nm
		功率端子安装 Power terminal, M6	3.0		6.0	Nm
*3 封装特性遵从IEC 60747-15						
模□重量 Module weight	G			345		g

输出特性 IGBT

Output Characteristic IGBT

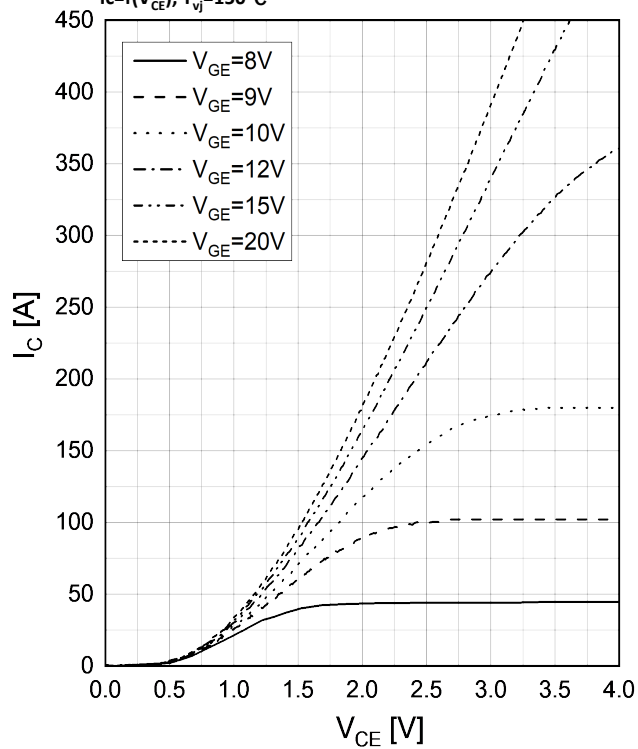
$$I_C = f(V_{CE}), V_{GE} = 15V$$



输出特性 IGBT

Output Characteristic IGBT

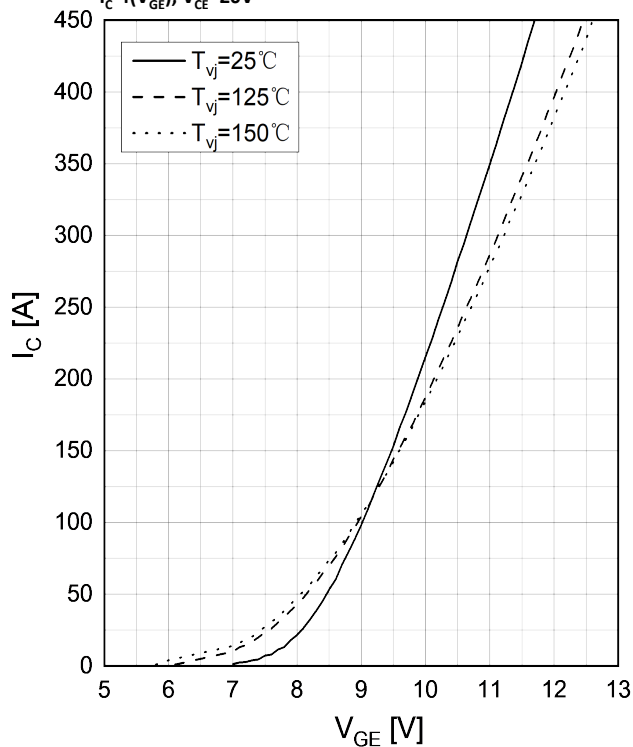
$$I_C = f(V_{CE}), T_{vj} = 150^\circ C$$



传输特性 IGBT

Transfer Characteristic IGBT

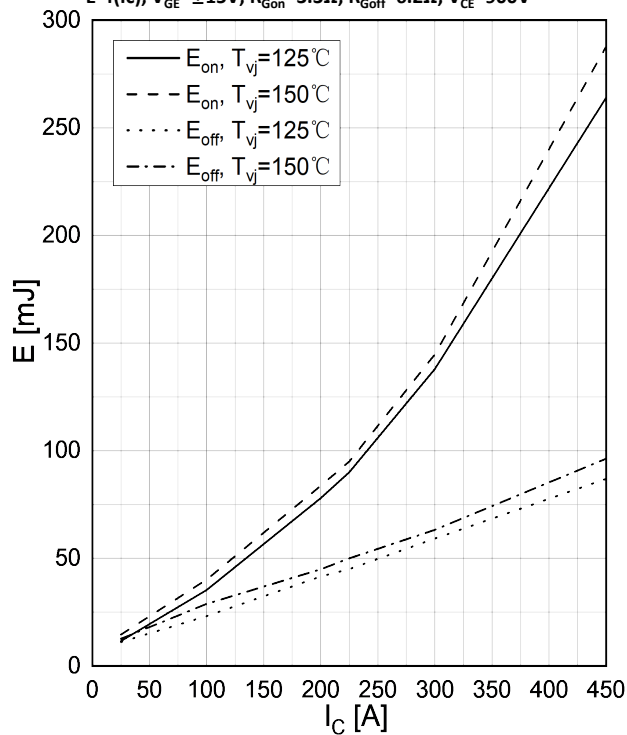
$$I_C = f(V_{GE}), V_{CE} = 20V$$



开关损耗 IGBT

Switching Losses IGBT

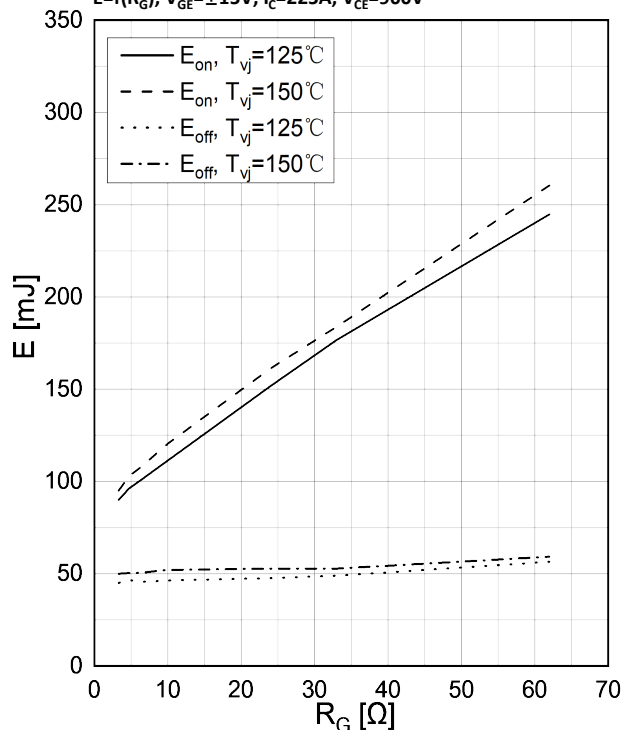
$$E = f(I_C), V_{GE} = \pm 15V, R_{Gon} = 3.3\Omega, R_{Goff} = 6.2\Omega, V_{CE} = 900V$$



开关损耗IGBT

Switching Losses IGBT

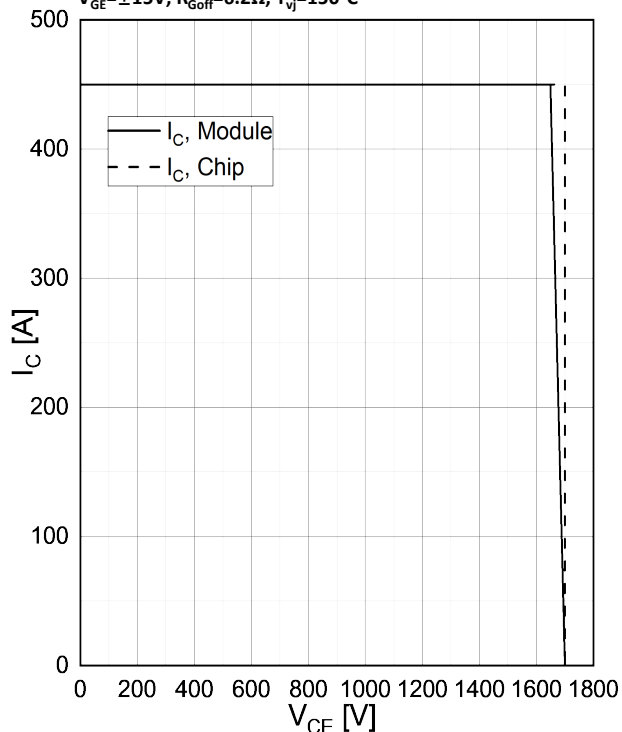
$E=f(R_G), V_{GE}=\pm 15V, I_C=225A, V_{CE}=900V$



反偏安全工作区 IGBT

Reverse Bias Safe Operating Area IGBT

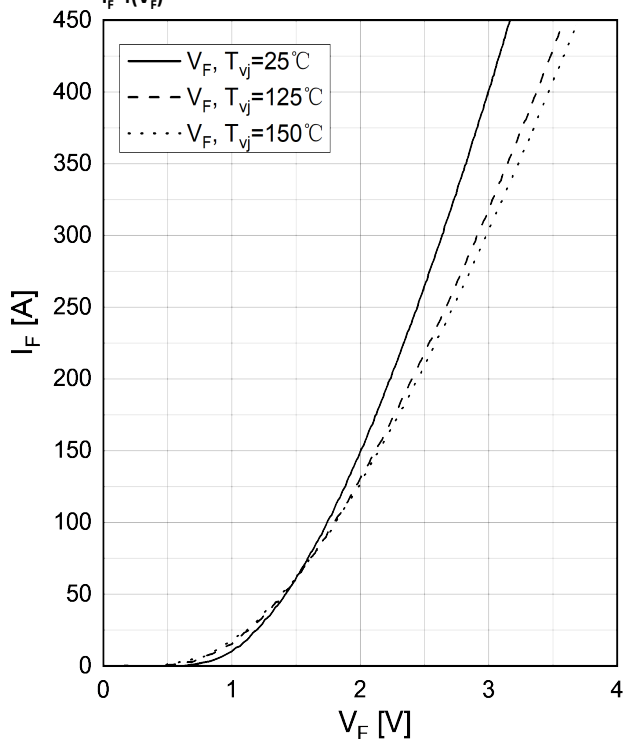
$V_{GE}=\pm 15V, R_{Goff}=6.2\Omega, T_{vj}=150^\circ C$



正向特性FRD

Forward Characteristic FRD

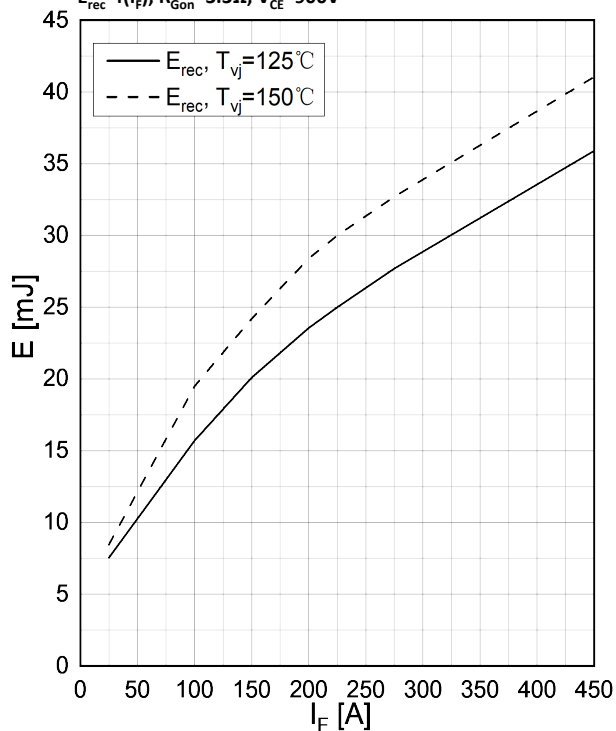
$I_F=f(V_F)$



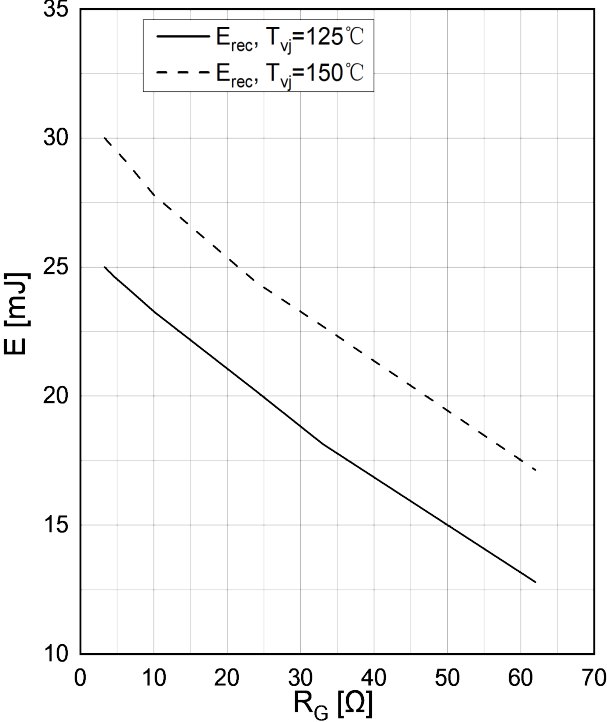
开关损耗 Diode

Switching Losses Diode

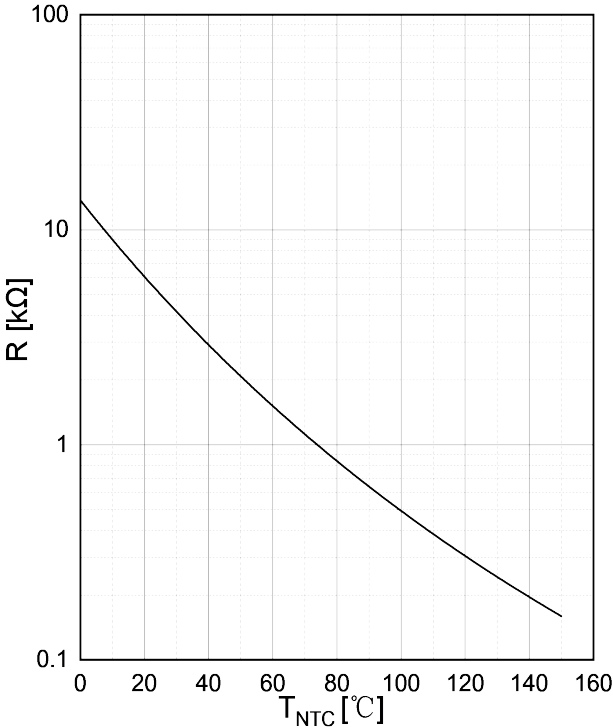
$E_{rec}=f(I_F), R_{Gon}=3.3\Omega, V_{CE}=900V$



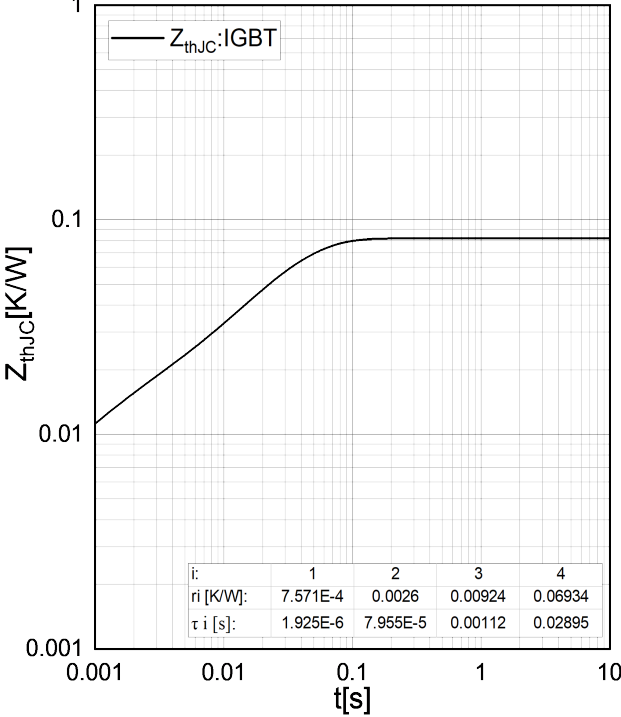
开关损耗Diode
Switching Losses Diode
 $E_{rec}=f(R_G), V_{CE}=900V$



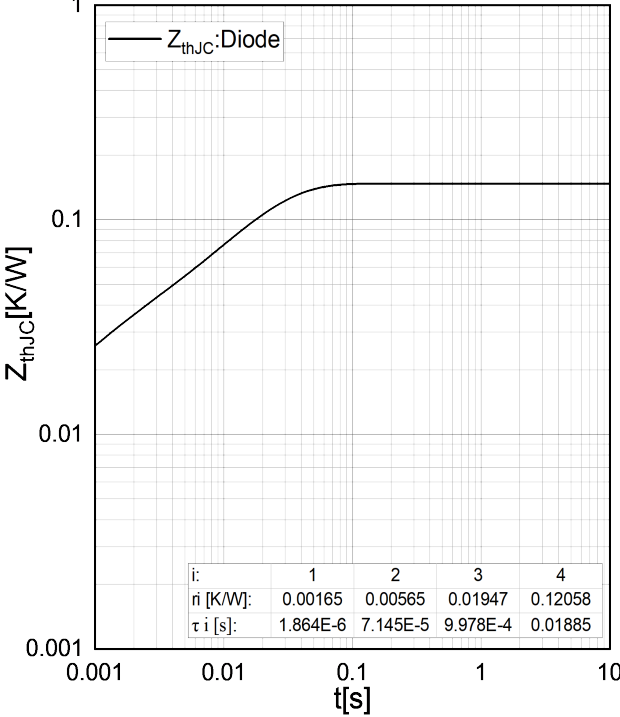
热敏电阻温度特性曲线
NTC Temperature Characteristic



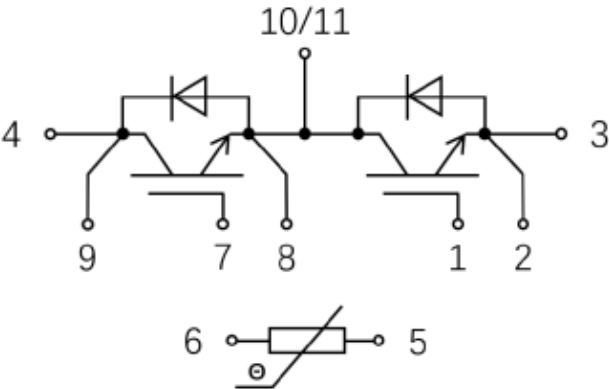
瞬态热阻抗 IGBT
Transient Thermal Impedance IGBT
 $Z_{thJC}=f(t)$



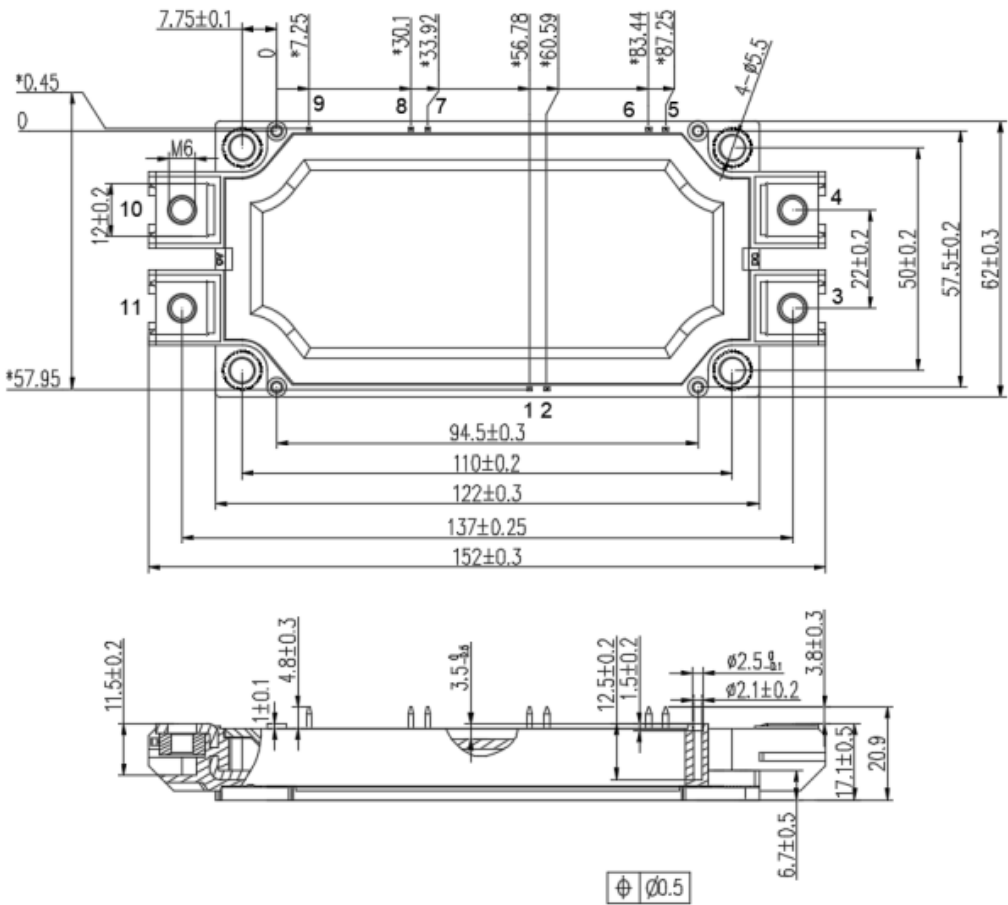
瞬态热阻抗 二极管
Transient Thermal Impedance Diode
 $Z_{thJC}=f(t)$



电路图 Circuit Diagram



外形尺寸 Outline Drawing



修订记录 Revision History

日期 Date	描述 Description
2024-12-05	初版

声明与使用条件/ Notices and conditions of use

1. HIITIO 保留手册的更改权；

HIITIO reserves the right to change the manual;

2. 本手册中提供的数据一部分为产品的典型值，实际出厂测试的数据与典型值略有差异，但我司保证这些差异不会影响产品的正常使用，如果产品信息发生变更，我司会及时更新手册，请随时关注；
Part of the data provided in this manual is the typical value of the product, the actual factory test data and the typical value are slightly different, but our company guarantees that these differences will not affect the normal use of the product, if the product information changes, our company will update the manual in time, please pay attention at any time;

3. 在应用我司产品时请不要超过产品的最大额定值，否则我司无法保证产品应用的可靠性；

When applying our products, please do not exceed the maximum rating of the product, otherwise our company can not guarantee the reliability of the product application;

4. 产品在使用时，严禁触碰，断电后确认无残余电荷且产品已完全冷却后，才可以在有静电防护措施下触碰产品；

When the product is in use, it is strictly forbidden to touch the product. After power off, it is confirmed that there is no residual charge and the product has been completely cooled, and it can only be touched under electrostatic protection measures;

5. 购买产品时请认准我司商标，如有疑问请与本司联系。

Please look for our trademark when purchasing products. If you have any questions, please contact us.