HCG600FC170D3K4

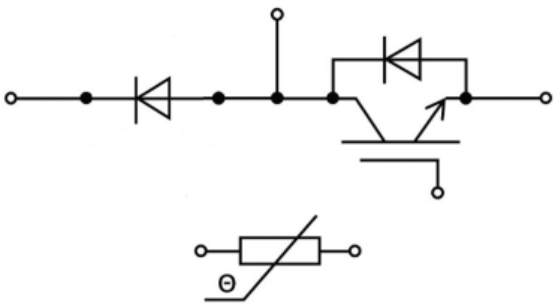
1700V 600A IGBT 模块, E6封装, 内置续流二极管及NTC
1700V 600A IGBT Module, E6 Package, with FWD and NTC

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
- 低开关损耗
  Low Switching Loss
- 高可靠性
  High Reliability
- 正温度系数
  Positive Temperature Coefficient

应用 Applications

- 斩波应用
  Chopper Applications
- 风电变流器
  Wind Power Converters



最大额定值 Maximum Rated Values

参数 Parameter	符号 Symbol	条件 Condition	数□ Value	□位 Unit
集□极-□射极□□ Collector-emitter voltage	V_{CES}	V_{GE}=0V, T_{vj}=25°C	1700	V
集□极□流 DC collector current	I_C	T_C=110°C, $T_{vj\,max}$=175°C	600	A
集□极峰□□流 Peak collector current	I_{CM}	t_p=1ms	1200	A
□极-□射极峰□□□ Gate-emitter peak voltage	V_{GES}		±20	V
□功率□耗 Total power dissipation	P_{tot}	T_C=25°C, $T_{vj\,max}$=175°C	3660	W
反向重复峰□□□ Repetitive peak reverse voltage	V_{RRM}	T_{vj}=25°C	1700	V
□□正向直流□流 Continuous DC forward current	I_F		600	A
正向重复峰□□流 Repetitive peak forward current	I_{FRM}	t_p=1ms	1200	A
I^2t-□ I^2t-value	I^2t	V_R=0V, t_p=10ms, T_{vj}=125°C	59000	A^2s
IGBT短路耐量 IGBT short circuit withstand time	t_{psc}		10	μs
最高□温 Maximum junction temperature	$T_{vj\,max}$		175	°C
工作□温 Operating junction temperature	$T_{vj\,op}$		-40~150	°C
存□温度 Storage temperature	T_{stg}		-40~125	°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□ Value Min.	Typ.	Max.	□位 Unit
集□极-□射极□和□□ Collector-emitter saturation voltage	$V_{CE\ sat}$	I_C=600A, V_{GE}=15V	T_{vj}=25°C		1.75	2.20	V
			T_{vj}=125°C		2.15		
			T_{vj}=150°C		2.20		
□极-□射极□□□□ Gate-emitter threshold voltage	$V_{GE\ th}$	I_C=24mA, V_{CE}=V_{GE}		5.3	5.9	6.5	V
集□极-□射极截止□流 Collector-emitter cut-off current	I_{CES}	V_{CE}=1700V, V_{GE}=0V				1	mA
□极-□射极漏□流 Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=±20V		-100		100	nA
内置□极□阻 Internal gate resistance	R_{Gint}				1.1		Ω
□极□荷 Gate charge	Q_G	V_{GE}=-15V~+15V			6.1		μC
□入□容 Input capacitance	C_{ies}	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V			60.9		nF
反向□□□ 容 Reverse transfer capacitance	C_{res}				1.17		nF
开通延□□□ （□感□□） Turn-on delay time, inductive load	$t_{d\ on}$	I_C=600A, V_{CE}=900V, V_{GE}=±15V, R_{Gon}=1Ω, R_{Goff}=1Ω, 开通di/dt=3190A/μs (T_{vj}=150°C), 关断dv/dt=4400V/μs (T_{vj}=150°C), Inductive Load	T_{vj}=25°C		185		ns
			T_{vj}=125°C		190		
			T_{vj}=150°C		195		
上升□□ （□感□□） Rise time, inductive load	t_r		T_{vj}=25°C		120		ns
			T_{vj}=125°C		145		
			T_{vj}=150°C		165		
关断延□□□ （□感□□） Turn-off delay time, inductive load	$t_{d\ off}$		T_{vj}=25°C		470		ns
			T_{vj}=125°C		535		
			T_{vj}=150°C		555		
下降□□ （□感□□） Fall time, inductive load	t_f		T_{vj}=25°C		300		ns
			T_{vj}=125°C		450		
			T_{vj}=150°C		485		
开通□耗（每脉冲） Turn-on energy loss per pulse	E_{on}		T_{vj}=25°C		180		mJ
			T_{vj}=125°C		225		
			T_{vj}=150°C		235		
关断□耗（每脉冲） Turn-off energy loss per pulse	E_{off}		T_{vj}=25°C		115		mJ
			T_{vj}=125°C		155		
			T_{vj}=150°C		160		
短路□流 Short circuit current	I_{SC}	V_{GE}≤15V, V_{CC}=1000V, t_{psc}≤10us, T_{vj}=150°C V_{CEmax}=V_{CES}-L_{sCE} · di/dt			3280		A

*1 IGBT特征值遵从IEC 60747-9。

斩波二极管特征值 Brake-Chopper 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=600A	T_{vj}=25°C		2.20	2.60	V
			T_{vj}=125°C		2.35		
			T_{vj}=150°C		2.40		
反向峰□□流 Peak reverse recovery current	I_{RM}	I_F=600A, V_R=900V, V_{GE}=-15V, $-di_F/dt$=3440A/μs (T_{vj}=150°C)	T_{vj}=25°C		345		A
			T_{vj}=125°C		370		
			T_{vj}=150°C		375		
反向□荷 Reverse charge	Q_{rr}		T_{vj}=25°C		100		uC
			T_{vj}=125°C		150		
			T_{vj}=150°C		165		
反向恢复□耗 Reverse recovery energy loss	E_{rec}		T_{vj}=25°C		45		mJ
			T_{vj}=125°C		75		
			T_{vj}=150°C		85		

*2 二极管特征值遵从IEC 60747-2。

负温度系数热敏电阻 NTC-Thermistor

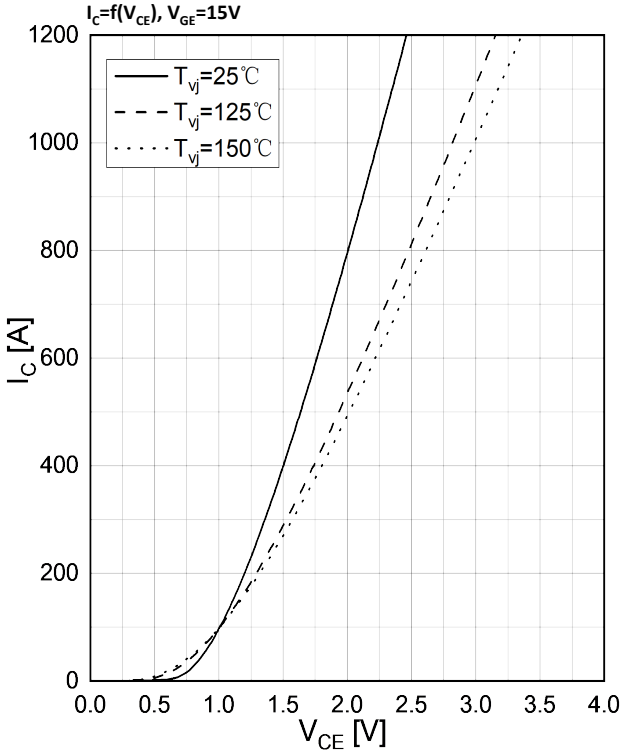
参数 Parameter	符号 Symbol	条件 Condition	数□ Value			□位 Unit
			Min.	Typ.	Max.	
□定□阻 Rated resistance	R_{25}	T_{NTC}=25°C		5		KΩ
功耗 Power dissipation	P_{25}	T_{NTC}=25°C			10	mW
B-□ B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298,15K))]$		3375		K

封装特性 Package Properties*3

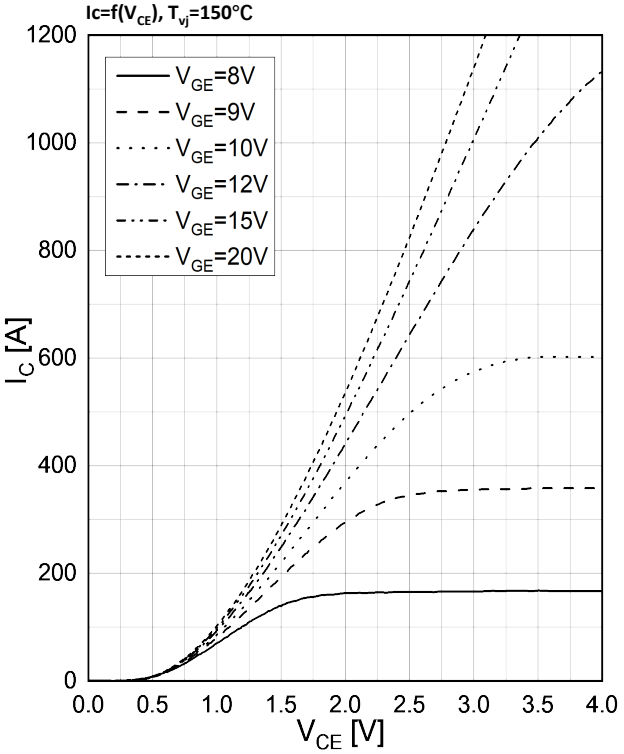
参数 Parameter	符号 Symbol	条件 Condition	数□ Value			□位 Unit
			Min.	Typ.	Max.	
IGBT □-壳□阻 IGBT thermal resistance: junction to case	$R_{th\ JC}$	每个IGBT/per IGBT		0.041		K/W
二极管 □-壳□阻 Diode thermal resistance: junction to case	$R_{th\ JC}$	每个二极管/per diode		0.060		K/W
IGBT接触□阻 IGBT thermal resistance: case 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
模□重量 Module weight	G			345		g

*3 封装特性遵从IEC 60747-15

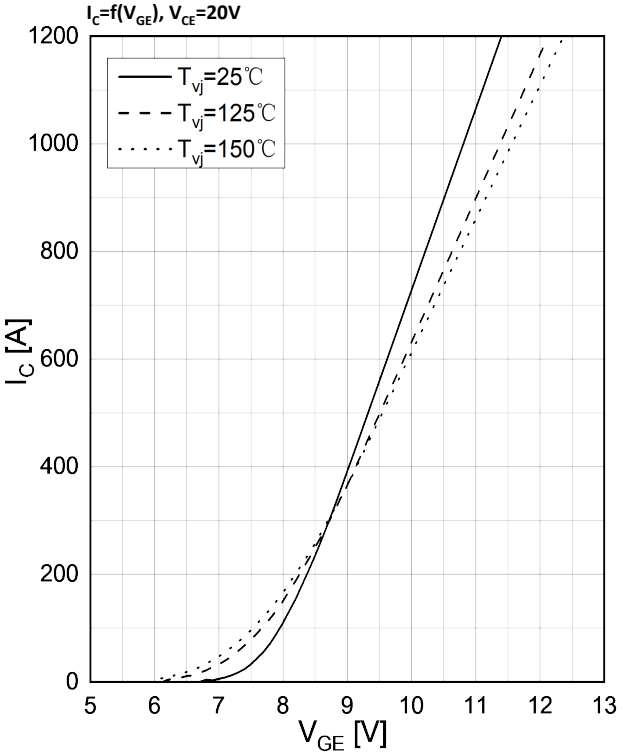
输出特性 IGBT
Output Characteristic IGBT
$I_C=f(V_{CE})$, $V_{GE}=15V$



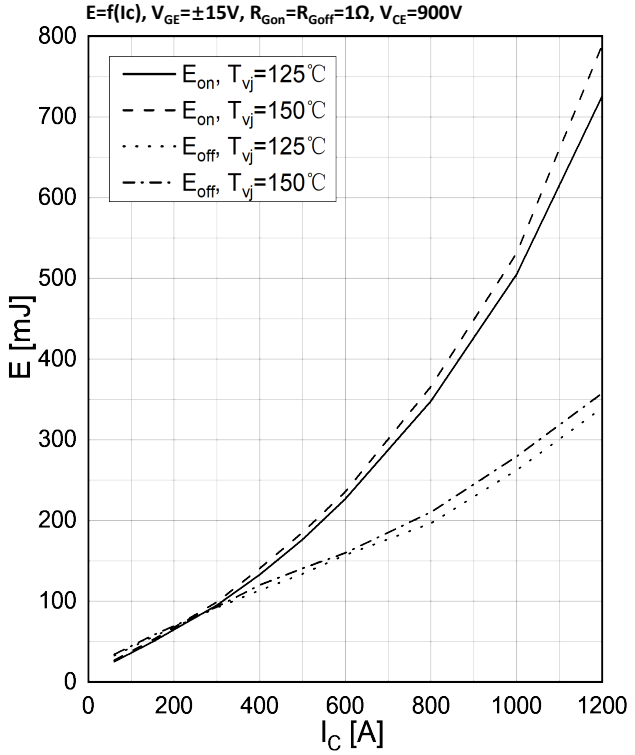
输出特性 IGBT
Output Characteristic IGBT
$Ic=f(V_{CE})$, T_{vj}=150°C



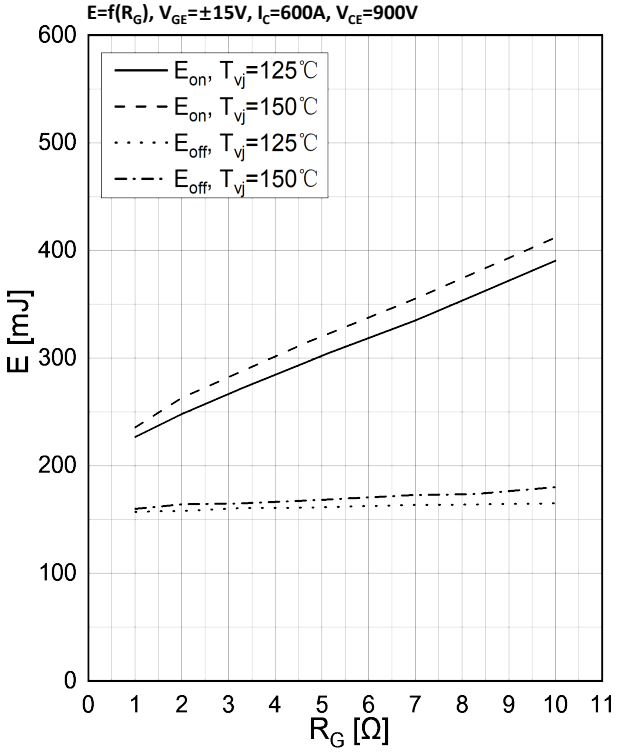
传输特性 IGBT
Transfer Characteristic IGBT
$I_C=f(V_{GE})$, V_{CE}=20V



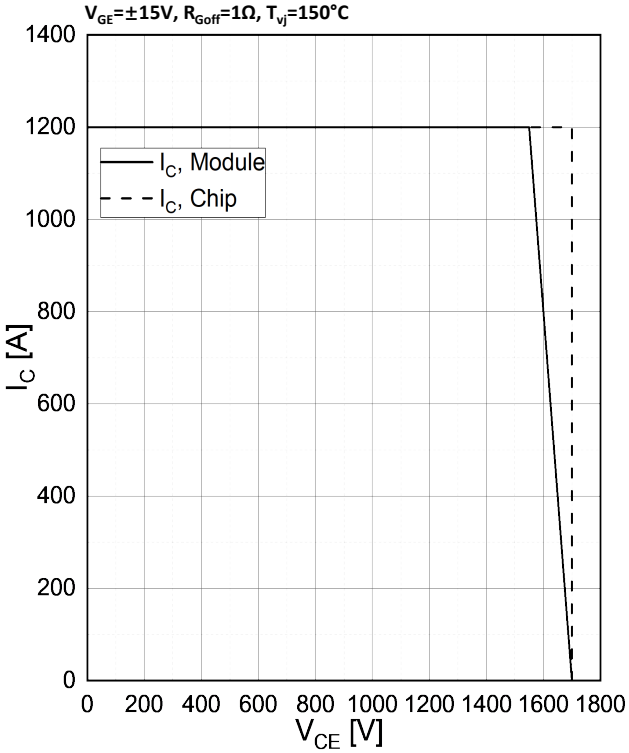
开关损耗 IGBT
Switching Losses IGBT
$E=f(Ic)$, $V_{GE}=\pm15V$, $R_{Gon}=R_{Goff}=1\Omega$, V_{CE}=900V



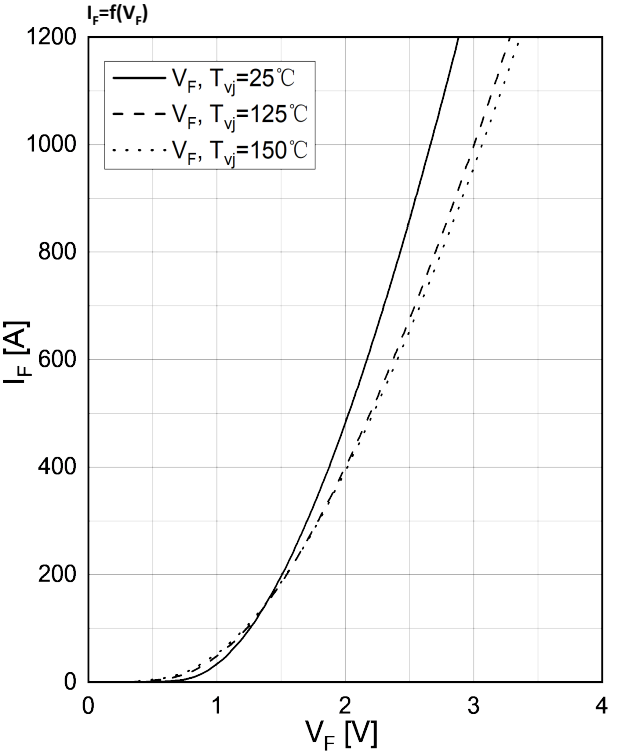
开关损耗 IGBT
Switching Losses IGBT
E=f(R_G), V_{GE}=±15V, I_C=600A, V_{CE}=900V



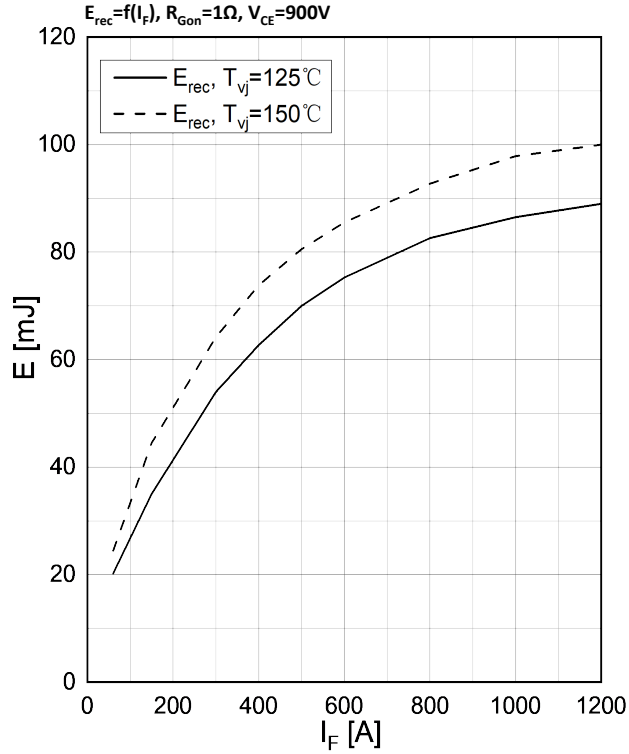
反偏安全工作区 IGBT
Reverse Bias Safe Operating Area IGBT
V_{GE}=±15V, R_{Goff}=1Ω, T_{vj}=150°C



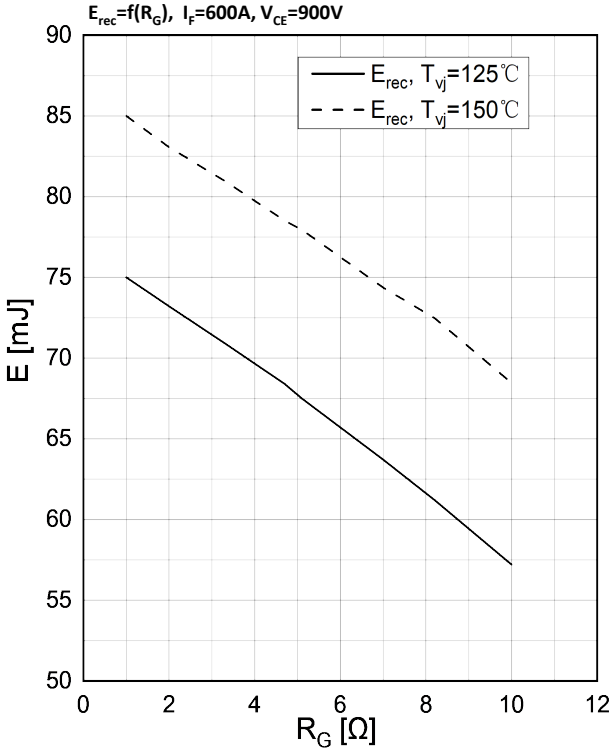
正向特性 Diode
Forward Characteristic Diode
I_F=f(V_F)



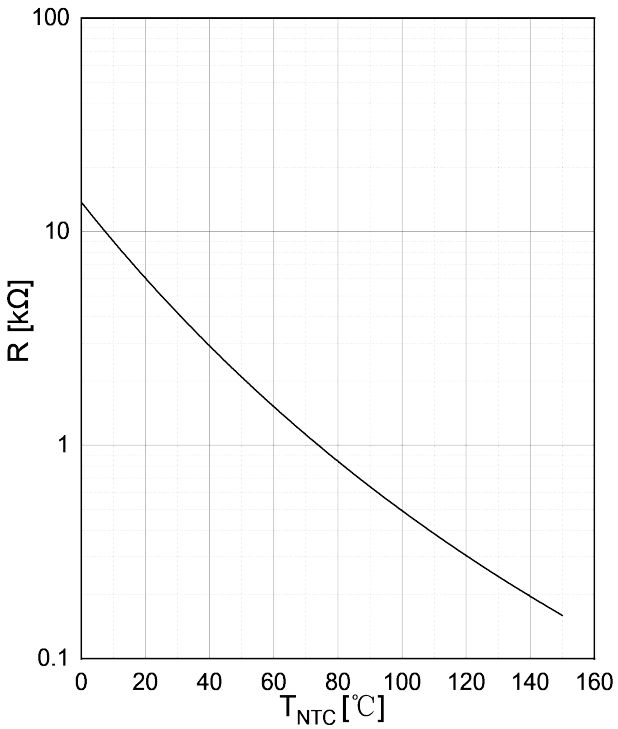
开关损耗 Diode
Switching Losses Diode
E_{rec}=f(I_F), R_{Gon}=1Ω, V_{CE}=900V



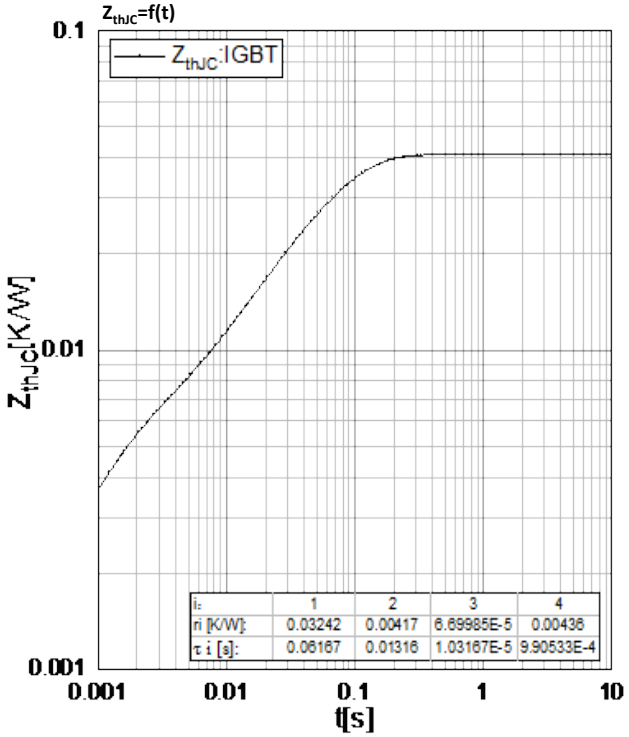
开关损耗 Diode
Switching Losses Diode
$E_{rec}=f(R_G)$, I_F=600A, V_{CE}=900V



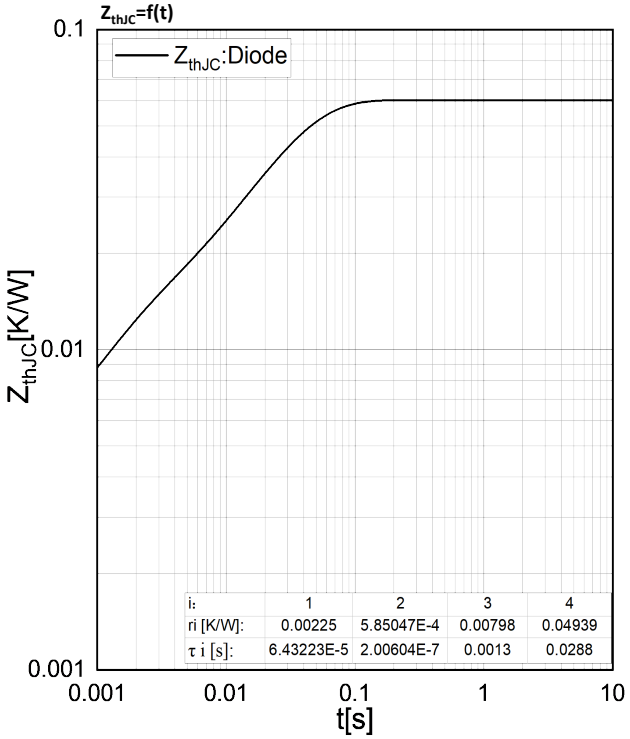
热敏电阻温度特性曲线
NTC Temperature Characteristic



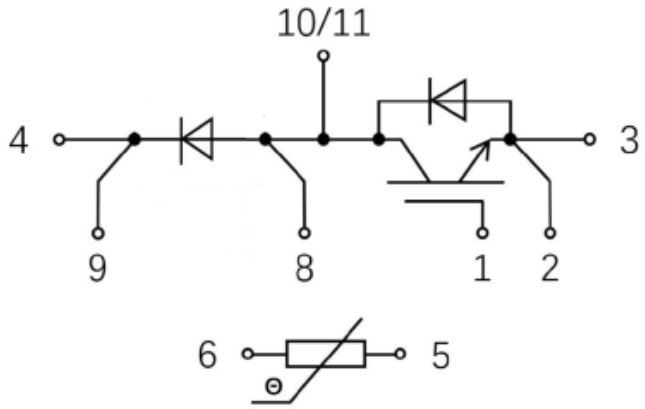
瞬态热阻抗 IGBT
Transient Thermal Impedance IGBT
$Z_{thJC}=f(t)$



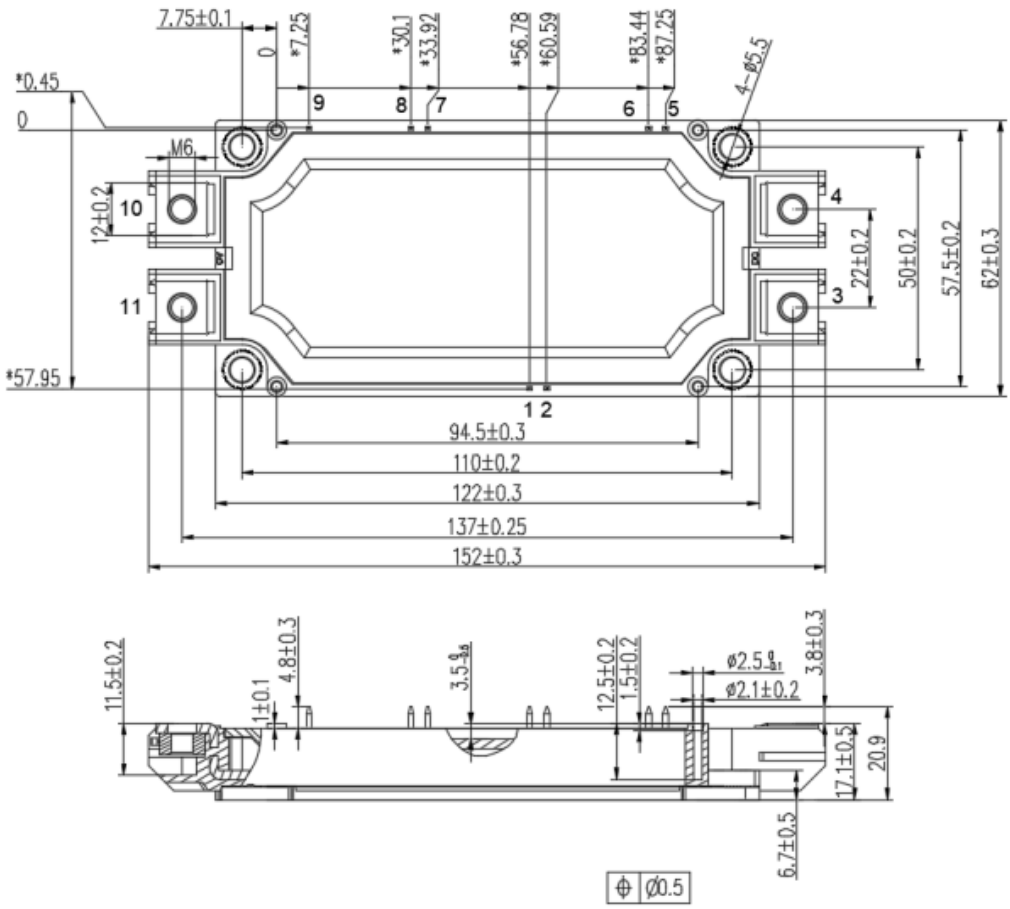
瞬态热阻抗 二极管
Transient Thermal Impedance Diode
$Z_{thJC}=f(t)$



电路图 Circuit Diagram



外形尺寸 Outline Drawing



修订记录 Revision History

日期 Date	描述 Description
2024-12-11	正式版

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