

HCG600FC170D3K4G1

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

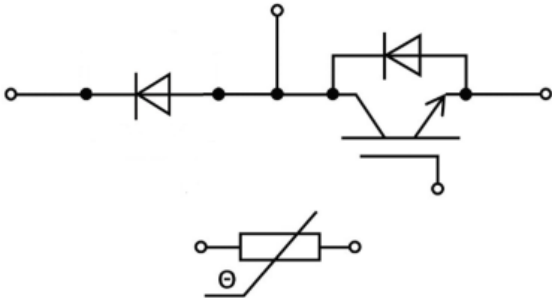
特点 Features

- 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	数口 Value	口位 Unit
集□极-□射极□□ Collector-emitter voltage	V_{CES}	$V_{GE}=0V, T_{vj}=25^{\circ}C$	1700	V
集□极□流 DC collector current	I_C	$T_C=105^{\circ}C, T_{vj\ max}=175^{\circ}C$	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}	$T_C=25^{\circ}C, T_{vj\ max}=175^{\circ}C$	3570	W
反向重复峰□□□ Repetitive peak reverse voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	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	$V_R=0V, t_p=10ms, T_{vj}=125^{\circ}C$	34000	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	$^{\circ}C$
工作□温 Operating junction temperature	$T_{vj\ op}$		-40~150	$^{\circ}C$
存□温度 Storage temperature	T_{stg}		-40~125	$^{\circ}C$

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

参数 Parameter	符号 Symbol	条件 Condition		数□ Value			□位 Unit
				Min.	Typ.	Max.	
集□极-□射极□和□□ Collector-emitter saturation voltage	V _{CE sat}	I _C =600A, V _{GE} =15V	T _{vj} =25°C		1.80	2.20	V
			T _{vj} =125°C		2.20		
			T _{vj} =150°C		2.25		
□极-□射极□□□□ Gate-emitter threshold voltage	V _{GE th}	I _C =24mA, V _{CE} =V _{GE}		5.9	6.4	6.9	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}				1.2		Ω
□极□荷 Gate charge	Q _G	V _{GE} =-15V~+15V			5.3		μC
□入□容 Input capacitance	C _{ies}	f=1MHz, T _{vj} =25°C, V _{CE} =25V, V _{GE} =0V			59.5		nF
反向□□□容 Reverse transfer capacitance	C _{res}				1.14		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=3220A/μs (T _{vj} =150°C), 关断dv/dt=3600V/μs (T _{vj} =150°C), Inductive Load	T _{vj} =25°C		330		ns
			T _{vj} =125°C		350		
			T _{vj} =150°C		355		
上升□□（□感□□） Rise time, inductive load	t _r		T _{vj} =25°C		130		ns
			T _{vj} =125°C		145		
			T _{vj} =150°C		145		
关断延□□□（□感□□） Turn-off delay time, inductive load	t _{d off}		T _{vj} =25°C		630		ns
			T _{vj} =125°C		760		
			T _{vj} =150°C		790		
下降□□（□感□□） Fall time, inductive load	t _f		T _{vj} =25°C		430		ns
			T _{vj} =125°C		700		
			T _{vj} =150°C		720		
开通□耗（每脉冲） Turn-on energy loss per pulse	E _{on}		T _{vj} =25°C		220		mJ
			T _{vj} =125°C		260		
			T _{vj} =150°C		275		
关断□耗（每脉冲） Turn-off energy loss per pulse	E _{off}		T _{vj} =25°C		130		mJ
			T _{vj} =125°C		185		
			T _{vj} =150°C		195		
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			2400		A

*1 IGBT特征值遵从IEC 60747-9。

*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		2.40		
			T _{vj} =150°C		2.45		
反向峰□□ 流 Peak reverse recovery current	I _{RM}	I _F =600A, V _R =900V, V _{GE} =-15V, -di _F /dt=3170A/μs (T _{vj} =150°C)	T _{vj} =25°C		345		A
			T _{vj} =125°C		385		
			T _{vj} =150°C		385		
反向□ 荷 Reverse charge	Q _{rr}		T _{vj} =25°C		100		uC
			T _{vj} =125°C		155		
			T _{vj} =150°C		170		
反向恢复□ 耗 Reverse recovery energy loss	E _{rec}	T _{vj} =25°C		40		mJ	
		T _{vj} =125°C		70			
		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

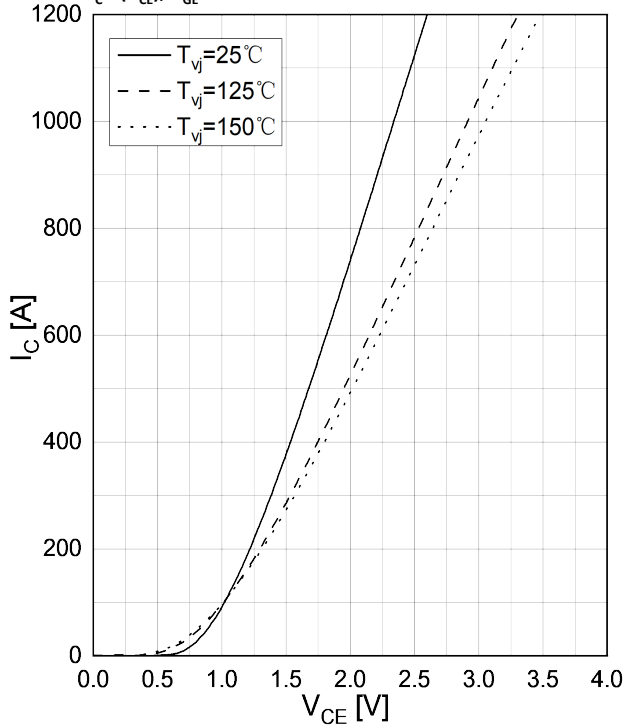
参数 Parameter	符号 Symbol	条件 Condition	数值 Value			单位 Unit
			Min.	Typ.	Max.	
额定电阻 Rated resistance	R_{25}	$T_{NTC}=25^{\circ}C$		5		K Ω
功耗 Power dissipation	P_{25}	$T_{NTC}=25^{\circ}C$			10	mW
B-值 B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298,15K))]$		3375		K

封装特性 Package Properties^{*3}

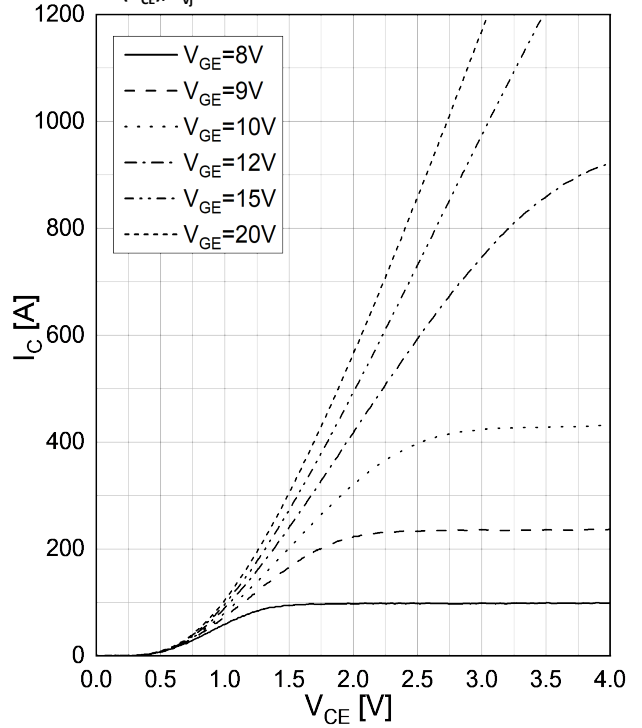
参数 Parameter	符号 Symbol	条件 Condition	数值 Value			单位 Unit
			Min.	Typ.	Max.	
IGBT 结-壳电阻 IGBT thermal resistance: junction to case	R_{thJC}	每个IGBT/per IGBT		0.042		K/W
二极管 结-壳电阻 Diode thermal resistance: junction to case	R_{thJC}	每个二极管/per diode		0.081		K/W
IGBT接触电阻 IGBT thermal resistance: case to heatsink	R_{thCH}	每个IGBT/per IGBT 硅脂系数 $\lambda_{grease}=1W/(m\cdot K)$		0.033		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 $\lambda_{grease}=1W/(m\cdot K)$		0.037		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	15.4			mm
电气间隙 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

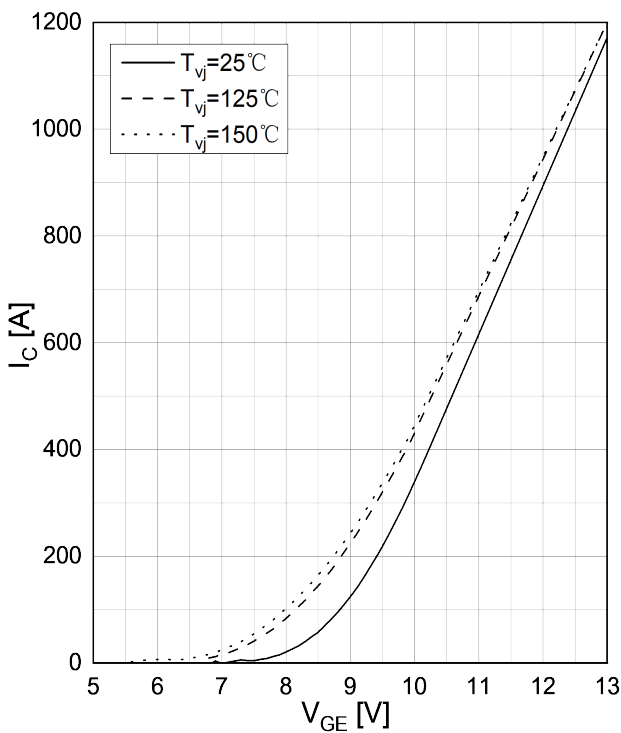
输出特性 IGBT
Output Characteristic IGBT
 $I_C = f(V_{CE}), V_{GE} = 15V$



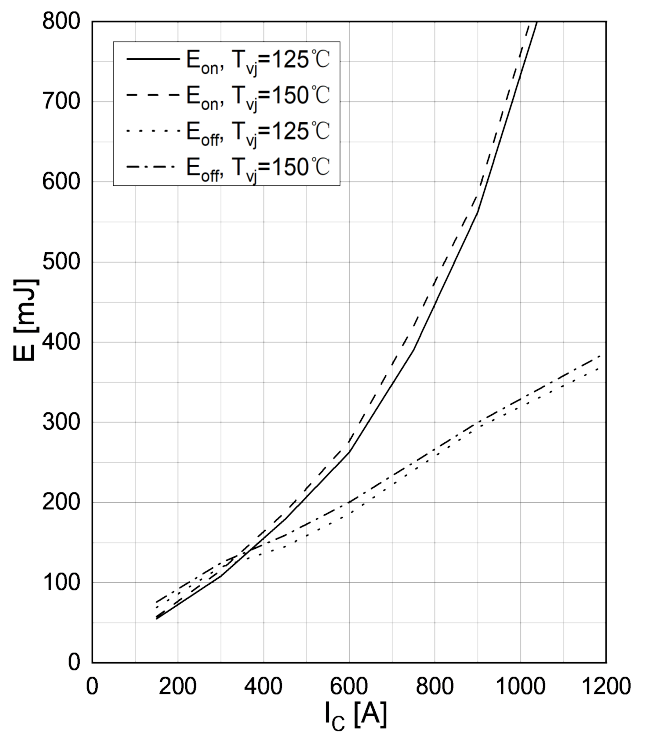
输出特性 IGBT
Output Characteristic IGBT
 $I_C = f(V_{CE}), T_{vj} = 150^\circ C$



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



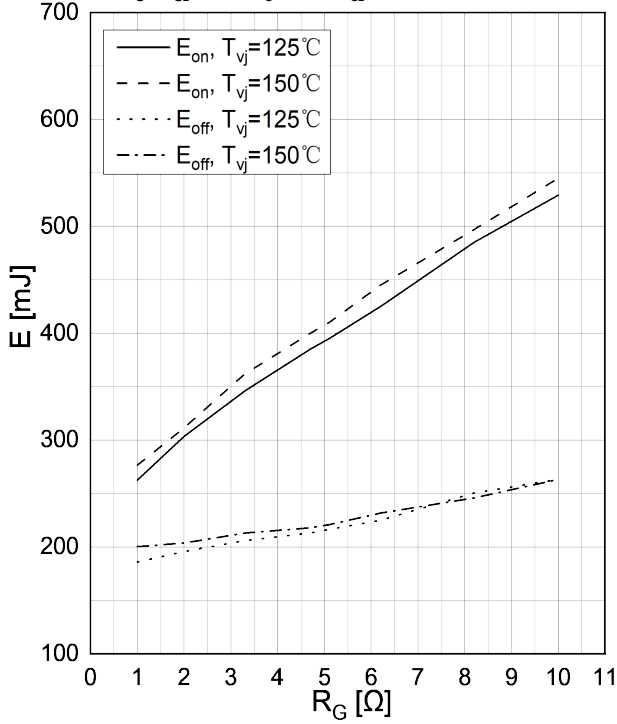
开关损耗 IGBT
Switching Losses IGBT
 $E = f(I_C), V_{GE} = \pm 15V, R_{Gon} = R_{Goff} = 1\Omega, V_{CE} = 900V$



开关损耗 IGBT

Switching Losses IGBT

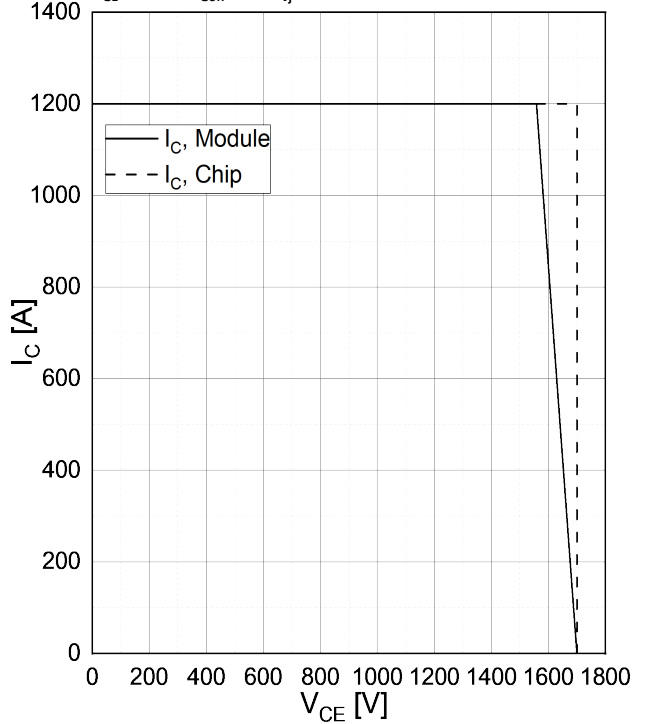
$E=f(R_G), V_{GE}=\pm 15V, I_C=600A, V_{CE}=900V$



反偏安全工作区 IGBT

Reverse Bias Safe Operating Area IGBT

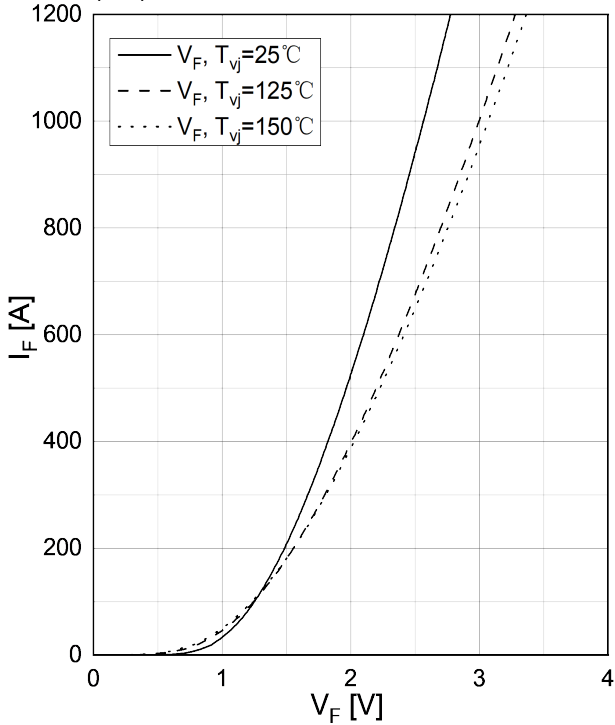
$V_{GE}=\pm 15V, R_{Goff}=1\Omega, T_{vj}=150^\circ C$



正向特性 Diode

Forward Characteristic Diode

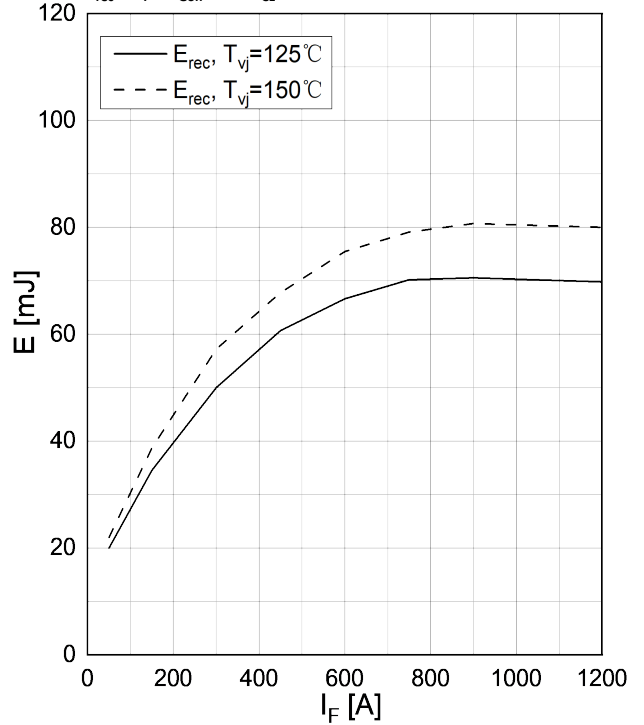
$I_F=f(V_F)$



开关损耗 Diode

Switching Losses Diode

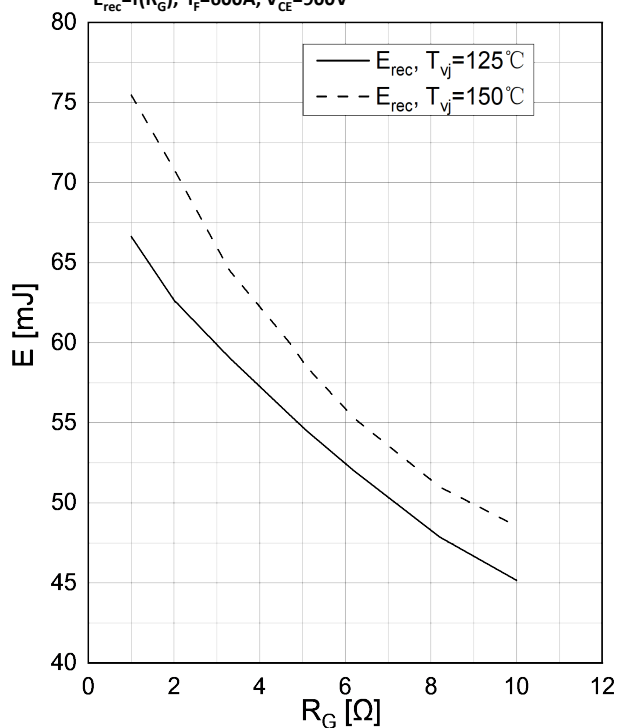
$E_{rec}=f(I_F), R_{Gon}=1\Omega, V_{CE}=900V$



开关损耗 Diode

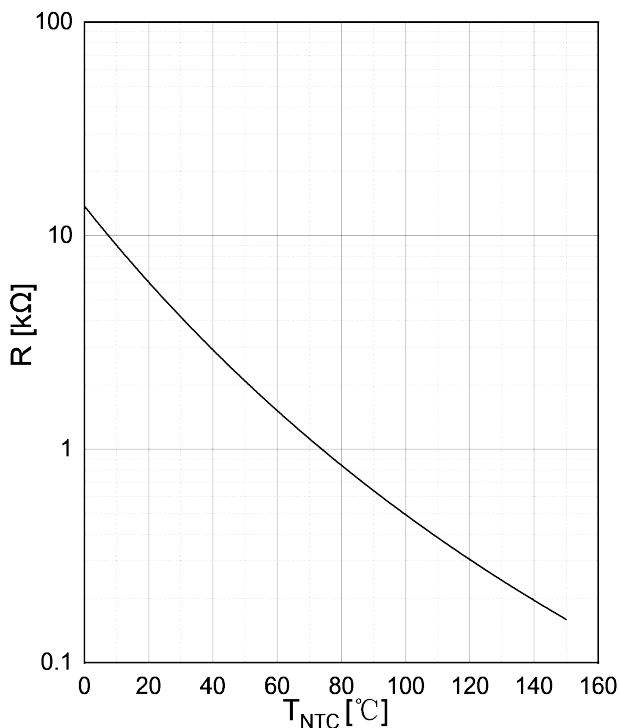
Switching Losses Diode

$E_{rec}=f(R_G)$, $I_F=600A$, $V_{CE}=900V$



热敏电阻温度特性曲线

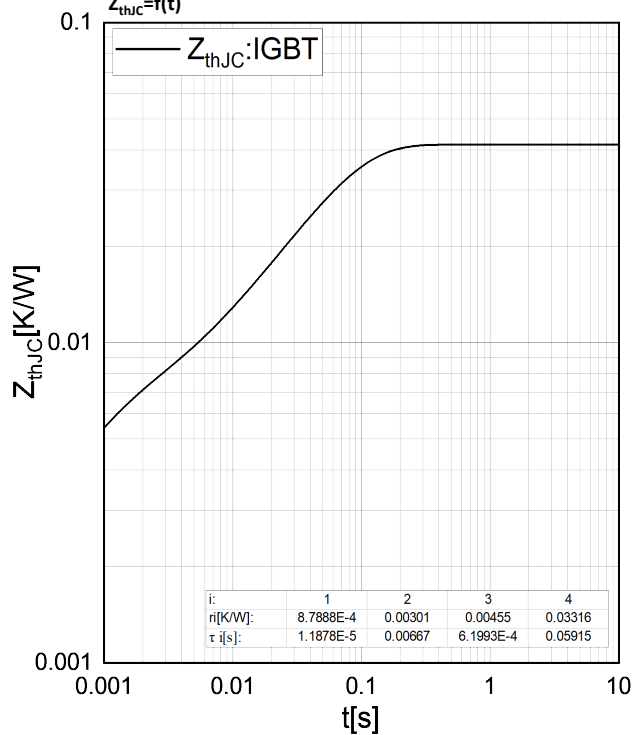
NTC Temperature Characteristic



瞬态热阻抗 IGBT

Transient Thermal Impedance IGBT

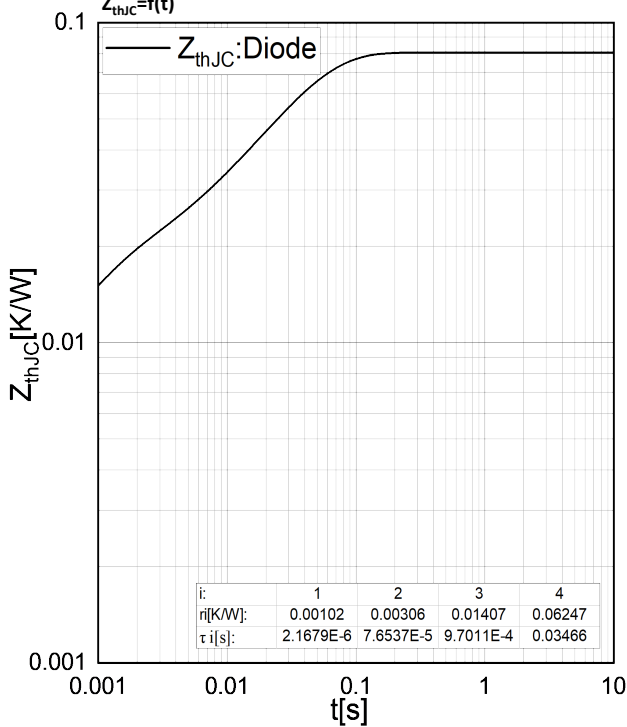
$Z_{thJC}=f(t)$



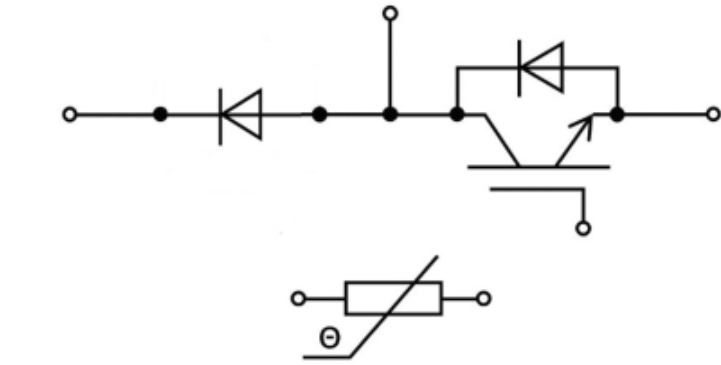
瞬态热阻抗 二极管

Transient Thermal Impedance Diode

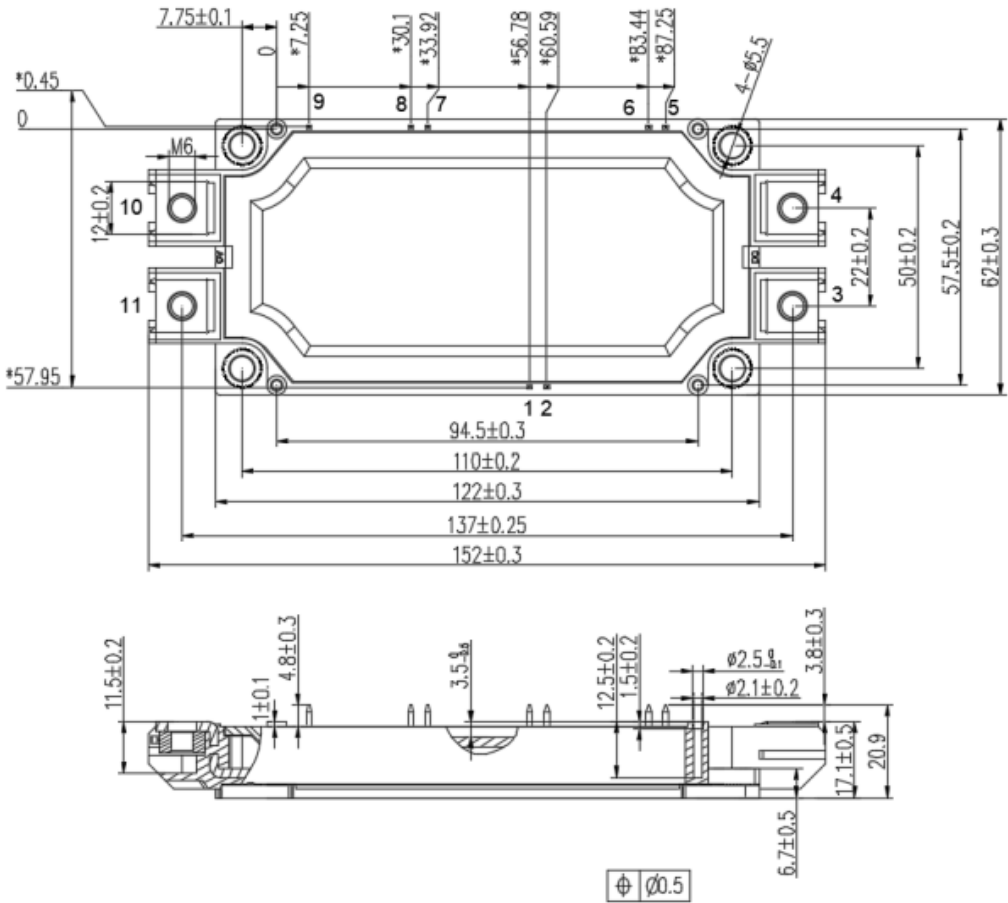
$Z_{thJC}=f(t)$



电路图 Circuit Diagram



外形尺寸 Outline Drawing



日期 Date	描述 Description
2025-03-04	初版

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