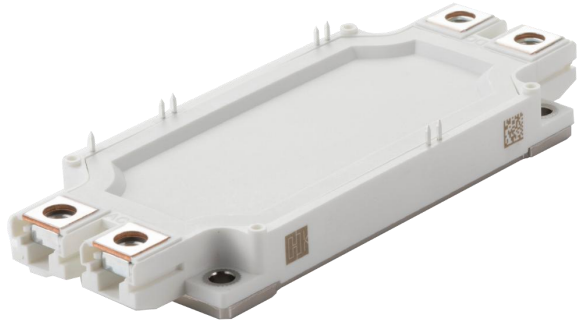


NI450B17E6K4

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

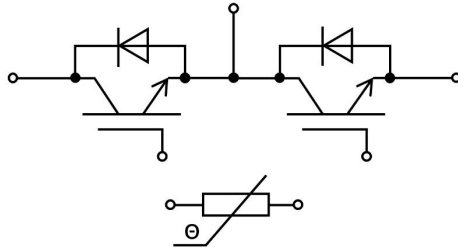
特点 Features

- 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

- 风电变流器
Wind Converters
- 电机传动
Motor Drives
- 伺服驱动器
Servo Drives
- UPS 系统
UPS Systems



IGBT, 逆变器/IGBT, Inverter

最大额定值/ Maximum Rated Values

参数 Parameter	符号 Symbol	数值 Value	单位 Unit
集电极-发射极电压 Collector-Emitter Voltage, $T_{vj}=25^{\circ}\text{C}$	V_{CES}	1700	V
集电极电流 DC Collector Current, $T_c=105^{\circ}\text{C}$, $T_{vj, max}=175^{\circ}\text{C}$	I_C	450	A
集电极峰值电流 Peak Collector Current, $t_p=1\text{ms}$	I_{CM}	900	A
栅极-发射极电压 Gate-Emitter Voltage	V_{GES}	± 20	V
IGBT最大功耗 IGBT Maximum Power Dissipation, $T_c=25^{\circ}\text{C}$, $T_{vj, max}=175^{\circ}\text{C}$	P_D	2500	W
IGBT短路耐受时间 IGBT Short Circuit Withstand Time	t_{sc}	10	μs
最高结温 Maximum Junction Temperature	$T_{vj, max}$	175	$^{\circ}\text{C}$
工作结温 Operating Junction Temperature	$T_{vj, op}$	-40~150	$^{\circ}\text{C}$
存储温度范围 Storage Temperature Range	T_{stg}	-40~125	$^{\circ}\text{C}$

IGBT特性 IGBT Electrical Characteristics ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)

参数 Parameter	符号 Symbol	条件 Condition	数值 Value			单位 Unit
			Min	Typ.	Max	
集电极-发射极饱和电压 Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=450\text{A}, V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$	1.8	2.2	V
			$T_{vj}=125^{\circ}\text{C}$	2.0		
			$T_{vj}=150^{\circ}\text{C}$	2.2		
栅极-发射极阈值电压 Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C=18\text{mA}, V_{CE}=V_{GE}$	5.2	5.9	6.4	V
集电极-发射极截止电流 Collector-Emitter Cut-off Current	I_{CES}	$V_{CE}=1700\text{V}, V_{GE}=0\text{V}$			3	mA
栅极-发射极漏电流 Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}$	-400		400	nA
内置栅极电阻 Internal Gate Resistance	R_{Gint}			1.2		Ω
栅极电荷 Gate Charge	Q_G	$V_{GE}=-15\text{V}\sim+15\text{V}$		5.2		μC
输入电容 Input Capacitance	C_{ies}	$f=1\text{MHz}, V_{GE}=0\text{V}, V_{CE}=25\text{V}$		72		nF
输出电容 Output Capacitance	C_{oes}			2.9		nF
反向传输电容 Reverse Transfer Capacitance	C_{res}			0.6		nF
开通延迟时间 Turn-on Delay Time	$t_{d(on)}$	$I_C=450\text{A},$ $V_{CE}=900\text{V},$ $V_{GE}=\pm 15\text{V}$ $R_{Gon}=3.3\Omega$ $R_{Goff}=3.3\Omega$ Inductive Load	$T_{vj}=25^{\circ}\text{C}$	260		ns
			$T_{vj}=125^{\circ}\text{C}$	280		
			$T_{vj}=150^{\circ}\text{C}$	280		
上升时间 Rise Time	t_r		$T_{vj}=25^{\circ}\text{C}$	140		ns
			$T_{vj}=125^{\circ}\text{C}$	160		
			$T_{vj}=150^{\circ}\text{C}$	160		
关断延迟时间 Turn-off Delay Time	$t_{d(off)}$		$T_{vj}=25^{\circ}\text{C}$	640		ns
			$T_{vj}=125^{\circ}\text{C}$	700		
			$T_{vj}=150^{\circ}\text{C}$	715		
下降时间 Fall Time	t_f		$T_{vj}=25^{\circ}\text{C}$	405		ns
		$T_{vj}=125^{\circ}\text{C}$	590			
		$T_{vj}=150^{\circ}\text{C}$	590			
开通损耗 Turn-on Energy Loss	E_{on}	$T_{vj}=25^{\circ}\text{C}$	75		mJ	
		$T_{vj}=125^{\circ}\text{C}$	110			
		$T_{vj}=150^{\circ}\text{C}$	130			
关断损耗 Turn-off Energy Loss	E_{off}	$T_{vj}=25^{\circ}\text{C}$	105		mJ	
		$T_{vj}=125^{\circ}\text{C}$	130			
		$T_{vj}=150^{\circ}\text{C}$	130			
短路电流 Short Circuit Current	I_{SC}	$V_{GE}\leq 15\text{V}, V_{CC}=1000\text{V},$ $V_{CE,max}=V_{CES}-L_S(CE) \cdot di/dt, T_{vj}=150^{\circ}\text{C}$ $t_p\leq 10\mu\text{s}$		2296		A

二极管,逆变器/Diode, Inverter

最大额定值/Maximum Rated Values ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)

反向重复峰值电压 Repetitive peak reverse voltage		V_{RRM}	1700	V
连续正向直流电流 Continuous DC forward current		I_F	450	A
正向重复峰值电流 Repetitive peak forward current	$t_p=1\text{ms}$	I_{FRM}	900	A
I^2t -值 I^2t -value	$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=125^{\circ}\text{C}$	I^2t	20000	A^2s

特征值/Characteristic Values

参数 Parameter	符号 Symbol	条件 Condition	数值 Value			单位 Unit	
			Min	Typ.	Max		
正向电压 Forward voltage	V_F	$I_F=450\text{A}$	$T_{vj}=25^{\circ}\text{C}$		2.0	2.4	V
			$T_{vj}=125^{\circ}\text{C}$		2.2		
			$T_{vj}=150^{\circ}\text{C}$		2.2		
反向恢复峰值电流 Peak reverse recovery current	I_{RM}	$I_F=450\text{A},$ $V_R=900\text{V},$ $di_F/dt=-2800\text{A}/\mu\text{s}$ $V_{GE}=-15\text{V}$ Inductive Load	$T_{vj}=25^{\circ}\text{C}$		245		A
			$T_{vj}=125^{\circ}\text{C}$		265		
			$T_{vj}=150^{\circ}\text{C}$		280		
反向恢复电荷 Reverse recovery charge	Q_{rr}	$I_F=450\text{A},$ $V_R=900\text{V},$ $di_F/dt=-2800\text{A}/\mu\text{s}$ $V_{GE}=-15\text{V}$ Inductive Load	$T_{vj}=25^{\circ}\text{C}$		60		μC
			$T_{vj}=125^{\circ}\text{C}$		100		
			$T_{vj}=150^{\circ}\text{C}$		120		
反向恢复损耗 Reverse recovery energy loss	E_{rec}	$I_F=450\text{A},$ $V_R=900\text{V},$ $di_F/dt=-2800\text{A}/\mu\text{s}$ $V_{GE}=-15\text{V}$ Inductive Load	$T_{vj}=25^{\circ}\text{C}$		40		mJ
			$T_{vj}=125^{\circ}\text{C}$		60		
			$T_{vj}=150^{\circ}\text{C}$		70		

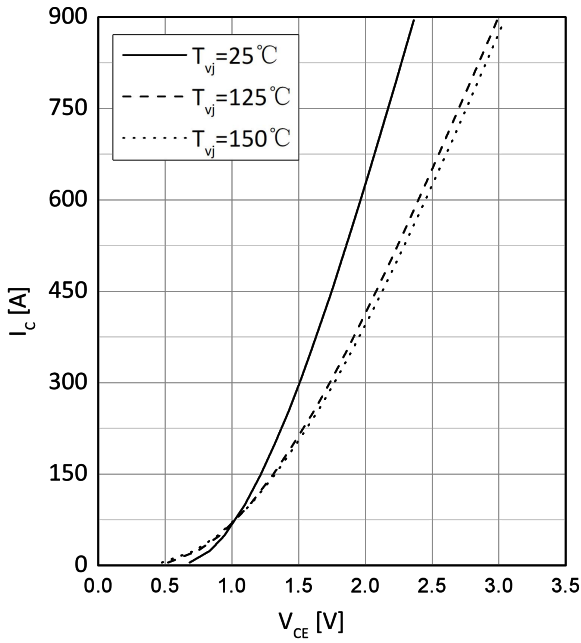
NTC- Thermistor

参数 Parameter	符号 Symbol	条件 Condition	Min	Typ.	Max	单位 Unit
额定电阻 Rated resistance	R_{25}	$T_C=25^{\circ}\text{C}$		5.00		$\text{k}\Omega$
功耗 Power dissipation	P_{25}				10	mW
B-值 B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298,15\text{K}))]$		3380		K

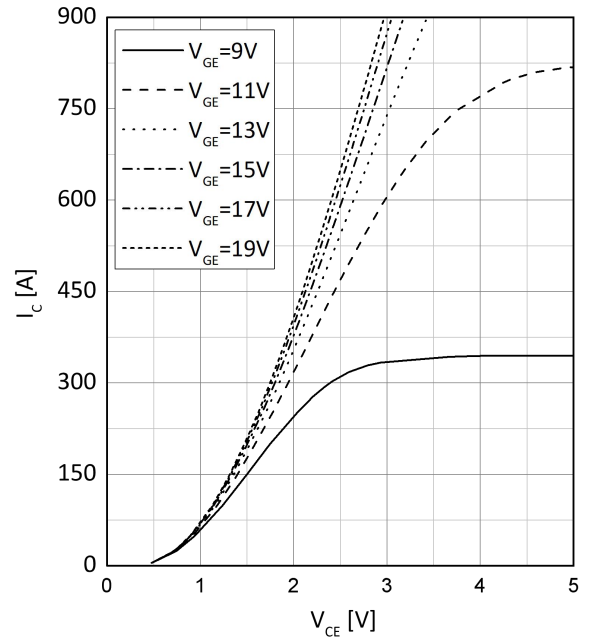
封装特性 Package Properties

参数 Parameter	符号 Symbol	条件 Condition	数值 Value			单位 Unit
			Min	Typ.	Max	
IGBT 结-壳热阻 IGBT Thermal Resistance: Junction to Case	$R_{th(J-C)}$	每个IGBT/per IGBT			0.06	K/W
二极管 结-壳热阻 Diode Thermal Resistance: Junction to Case	$R_{th(J-C)}$	每个二极管/per Diode			0.1	K/W
IGBT接触热阻 IGBT Thermal Resistance: Case to Heatsink	$R_{th(C-H)}$	每个IGBT/per IGBT 硅脂导热系数 $\lambda_{grease}=1W/(m\cdot K)$			0.029	K/W
二极管接触热阻 Diode Thermal Resistance: Case to Heatsink	$R_{th(C-H)}$	每个二极管/per Diode 硅脂导热系数 $\lambda_{grease}=1W/(m\cdot K)$			0.048	K/W
绝缘耐压 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
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
相对漏电起痕指数 Comparative Tracking Index	CTI		>200			
模块寄生电感 Module Stray Inductance	$L_{s, CE}$	每个桥臂/per Switch		20		nH
模块引线内阻 Module lead Resistance, Terminal to Chip	R_{CC+EE}	每个桥臂/per Switch, $T_C=25^\circ C$		1.1		m Ω
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

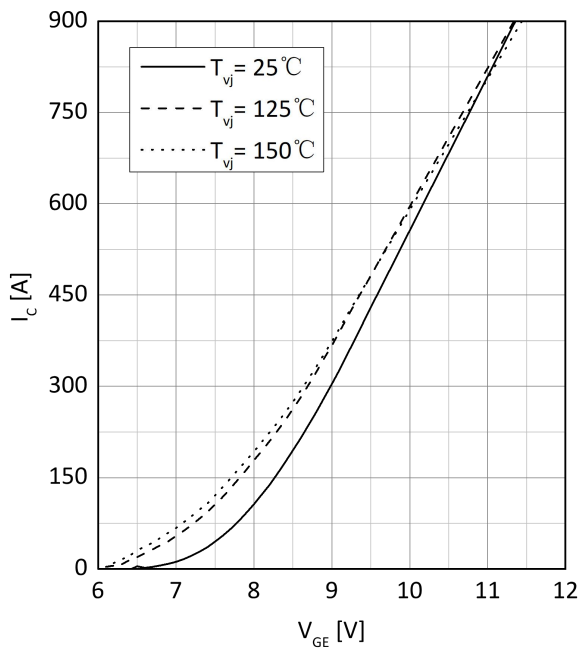
输出特性IGBT
Output characteristic IGBT
 $I_c=f(V_{CE}), V_{GE}=15V$



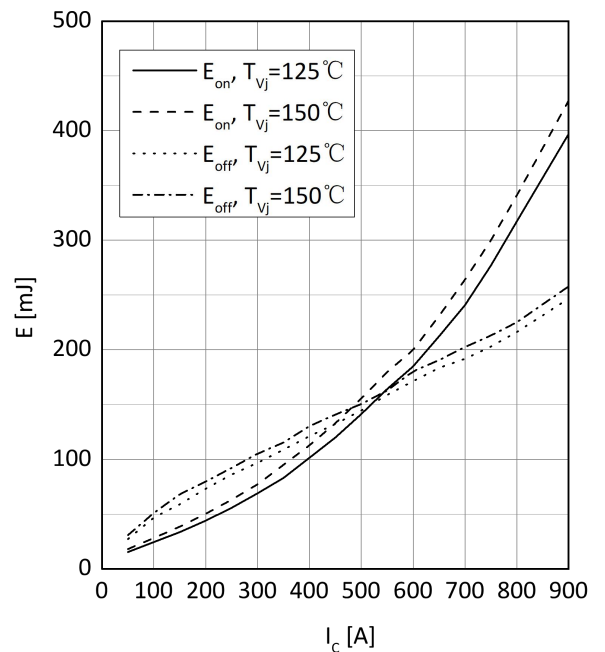
输出特性IGBT
Output characteristic IGBT
 $I_c=f(V_{CE}), T_{vj}=150^\circ C$



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



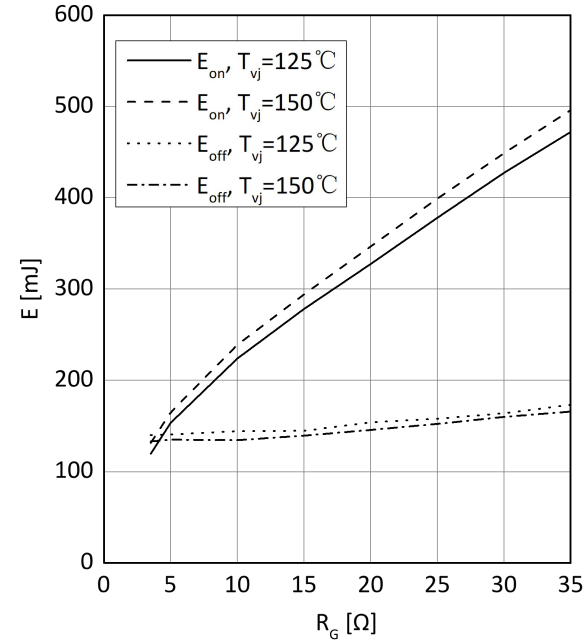
开关损耗 IGBT
Switching losses IGBT
 $E=f(I_c), V_{GE}=\pm 15V, R_{Gon}=R_{Goff}=3.3\Omega, V_{CE}=900V$



开关损耗IGBT

Switching losses IGBT

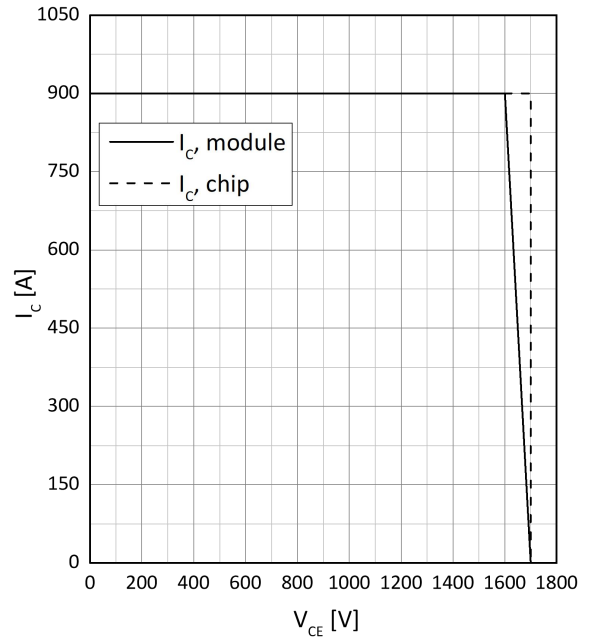
$V_{GE}=\pm 15V, I_C=450A, V_{CE}=900V$



反偏安全工作区 IGBT

Reverse bias safe operating area IGBT

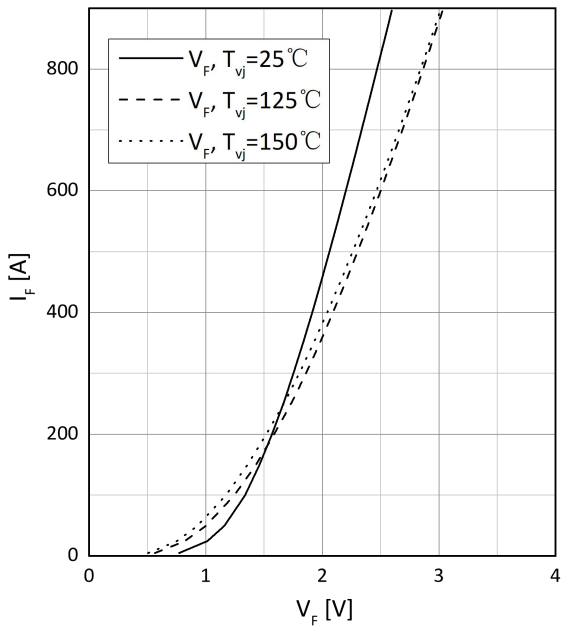
$V_{GE}=\pm 15V, R_{Goff}=3.3\Omega, T_{vj}=150^\circ C$



正向特性 Diode

Forward characteristic Diode

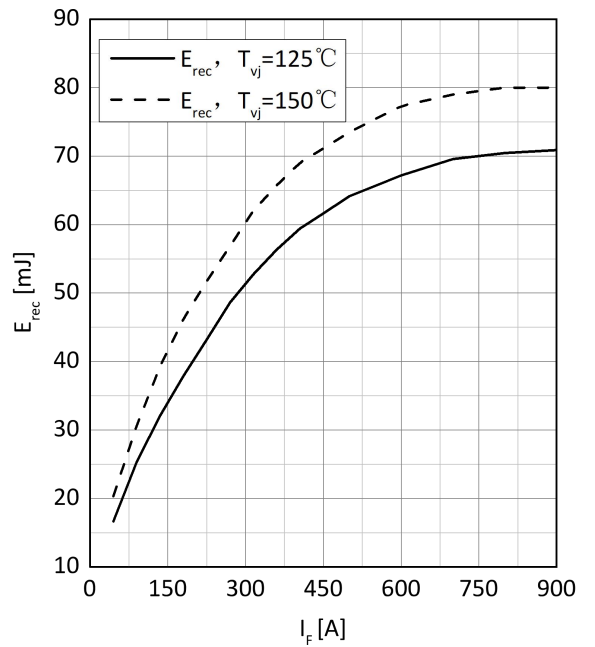
$I_F=f(V_F)$



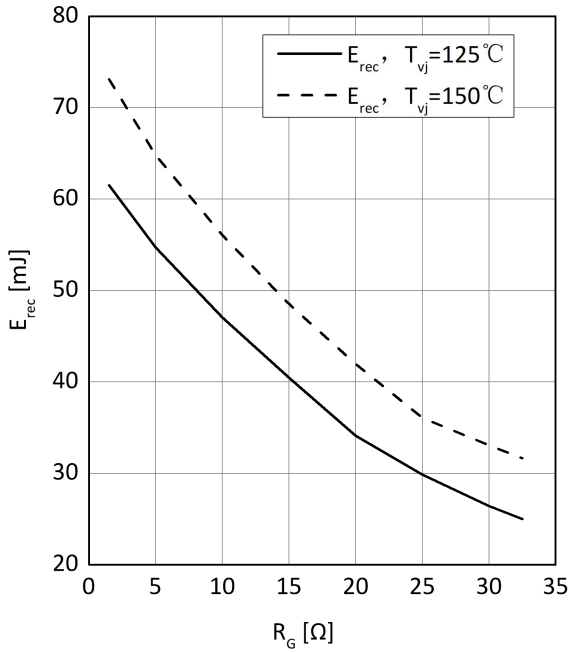
开关损耗 Diode

Switching losses Diode

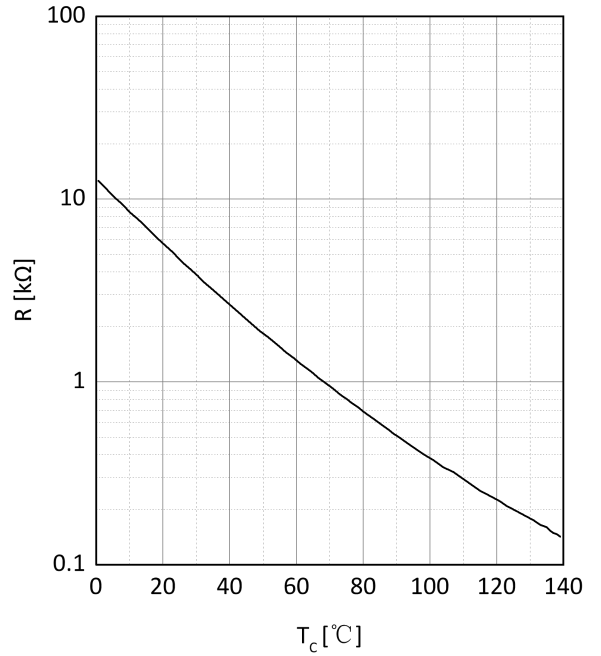
$E_{rec}=f(I_F), R_{Gon}=3.3\Omega, V_{CE}=900V$



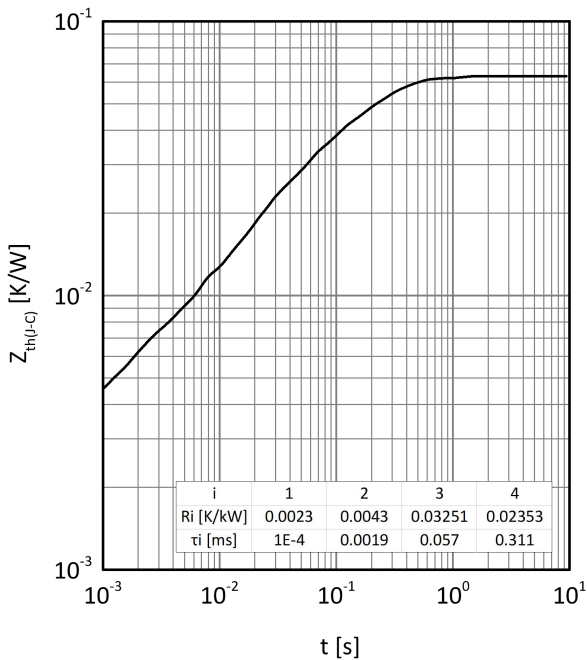
开关损耗Diode
Switching losses Diode
 $E_{rec}=f(R_G), V_{CE}=900V$



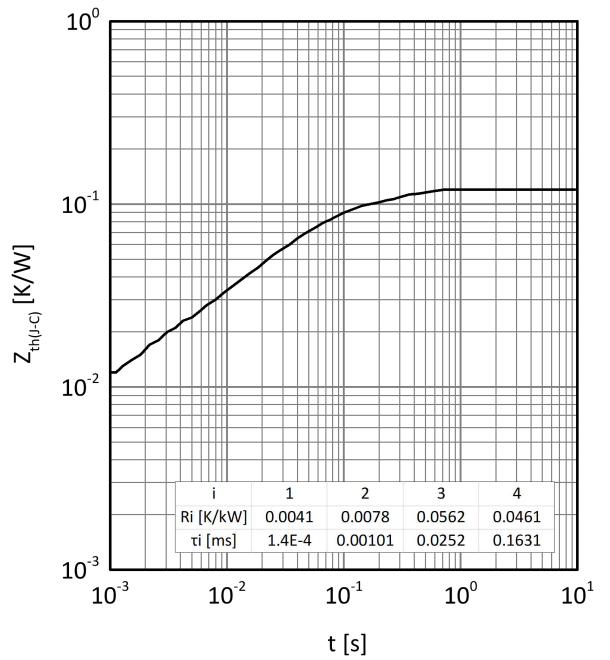
热敏电阻温度特性曲线
NTC temperature characteristic



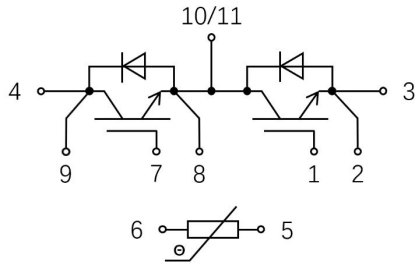
瞬态热阻抗 IGBT
Transient thermal impedance IGBT
 $Z_{th(j-c)} = f(t)$



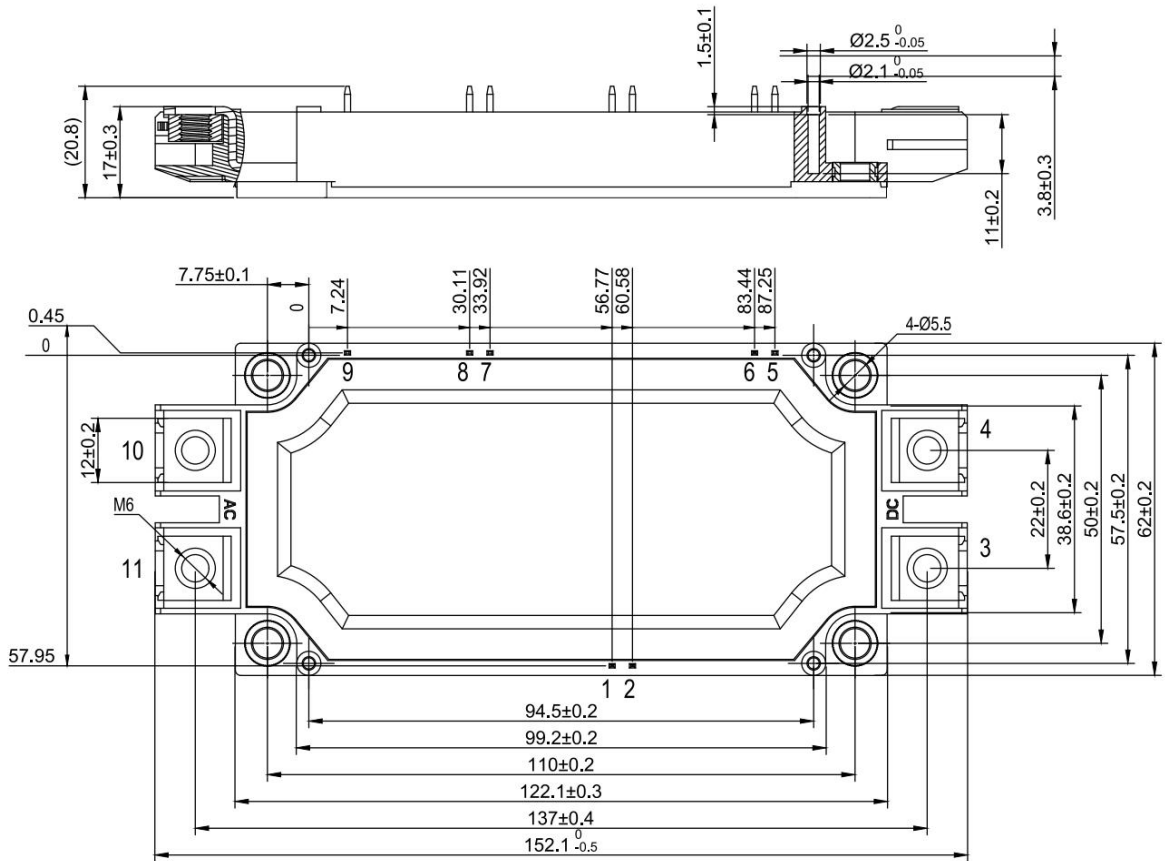
瞬态热阻抗 Diode
Transient thermal impedance Diode
 $Z_{th(j-c)} = f(t)$



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
v2.0	2022-02-25	量产版