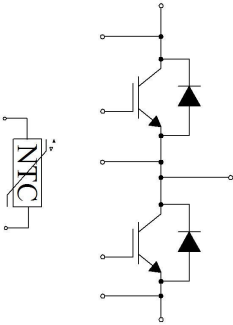


Half Bridge IGBT Module

电气特性:

- 沟槽栅+场截止技术
Trench-gate + Field-stop process
- 低开关损耗
Low switching losses
- Vcesat 正温度系数
Vcesat with positive temperature coefficient



典型应用:

- 电机驱动
Motor drives
- 伺服驱动
Servo drives
- UPS 系统
UPS system



V_{CES} =1700V, I_{C nom} =650A / I_{CRM} =1300A

IGBT, 逆变器 / IGBT, Inverter

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
集电极-发射极电压 Collector-Emitter voltage	T _{vj} =25°C	V _{CES}	1700	V
连续集电极直流电流 Continuous DC collector current	T _C =80°C, T _{vj max} =150°C	I _{C nom}	650	A
集电极重复峰值电流 Repetitive peak collector current	t _p =1 ms	I _{CRM}	1300	A
总功率损耗 Total power dissipation	T _C = 25°C, T _{vj max} = 150°C	P _{tot}	1040	W
栅极-发射极电压 Gate emitter voltage		V _{GE}	±20	V

- a. 当 $T_C > 80^\circ\text{C}$ 时, 按 $9.29\text{A}/^\circ\text{C}$ 的斜率线性降额。
 b. 当 $T_C > 25^\circ\text{C}$ 时, 按 $8.32\text{W}/^\circ\text{C}$ 的斜率线性降额。

注 1: 推荐使用频率不大于 20kHz 。

注 2: 静电放电敏感度等级: 2 级。

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
集电极-发射极饱和电压 Collector-Emitter saturation voltage	$V_{GE}=15\text{V}, I_C=650\text{A}$ $V_{GE}=15\text{V}, I_C=650\text{A}$ $V_{GE}=15\text{V}, I_C=650\text{A}$	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	V_{CEsat}	2.03 2.48 2.59		V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=24\text{mA}, V_{GE}=V_{CE}$	$T_{vj}=25^\circ\text{C}$	$V_{GE(th)}$	5.20	5.6	6.0
栅电荷 Gate charge	$V_{GE}=-15\text{V} \dots +15\text{V}$		Q_G	4.5		μC
内部栅极电阻 Internal gate resistor	$T_{vj}=25^\circ\text{C}$	R_{Gint}		2.3		Ω
输入电容 Input capacitance	$f=100\text{kHz}, V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $T_{vj}=25^\circ\text{C}$	C_{ies}		58.7		nF
输出电容 Output capacitance		C_{oes}		3.8		
反向传输电容 Reverse transfer capacitance		C_{res}		1.8		
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE}=1700\text{V}, V_{GE}=0\text{V}$	$T_{vj}=25^\circ\text{C}$	I_{CES}		5	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE}=0\text{V}, V_{GE}=20\text{V}$	$T_{vj}=25^\circ\text{C}$	I_{GES}		400	nA
开通延迟时间 Turn-on delay time	$I_C=650\text{A}, V_{CE}=900\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=2.0\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	t_{don}	400.9 413.1 433.7		ns
上升时间 Rise time	$I_C=650\text{A}, V_{CE}=900\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=2.0\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	t_r	129.1 141.9 143.3		
关断延迟时间 Turn-off delay time	$I_C=650\text{A}, V_{CE}=900\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=2.0\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	t_{doff}	656.3 716.1 742.8		
下降时间 Fall time	$I_C=650\text{A}, V_{CE}=900\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=2.0\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	t_f	290.7 303.2 352.1		
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=650\text{A}, V_{CE}=900\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=2.0\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	E_{on}	186.8 246.4 267.3		mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=650\text{A}, V_{CE}=900\text{V}$ $V_{GE}=\pm 15\text{V}, R_G=2.0\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	E_{off}	139.9 161.0 171.8		

Changes of this product data sheet are reserved.

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短路数据 SC data	$V_{GE} \leq 15V, V_{CE} = 1000V$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt \quad t_p \leq 6\mu s, T_{vj} = 125^\circ C$	I_{SC}		3400		A
结-外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT	R_{thJC}			0.12	K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\ op}$	-55		150	$^\circ C$

二极管，逆变器 / Diode, Inverter

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj} = 25^\circ C$	V_{RRM}	1700	V
连续正向直流电流 Continuous DC forward current		I_F	650	A
正向重复峰值电流 Repetitive peak forward current	$t_p = 1ms$	I_{FRM}	1300	A

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min	Typ	Max	
正向电压 Forward voltage	$I_F = 650A, V_{GE} = 0V$ $I_F = 650A, V_{GE} = 0V$ $I_F = 650A, V_{GE} = 0V$ $T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	V_F		1.96 2.07 2.08		V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 650A$ $-di_F/dt = 3550A/\mu s (T_{vj} = 150^\circ C)$ $V_R = 900V, V_{GE} = -15V$ $T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	I_{RM}		512 560 565		A
恢复电荷 Recovered charge	$I_F = 650A$ $-di_F/dt = 3550A/\mu s (T_{vj} = 150^\circ C)$ $V_R = 900V, V_{GE} = -15V$ $T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	Q_{rr}		143.2 256.3 284.3		μC
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F = 650A$ $-di_F/dt = 3550A/\mu s (T_{vj} = 150^\circ C)$ $V_R = 900V, V_{GE} = -15V$ $T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	E_{rec}		73.7 142.6 160.0		mJ
在开关状态下温度 Temperature under switching conditions		$T_{vj\ op}$	-55		150	$^\circ C$

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
额定电阻值 Rated resistances	$T_c=25^{\circ}\text{C}, \pm 5\%$	R_{25}		5.0		K Ω
最大额定功率 Rated power		$P_{\max}$		10		mW
B-值 B-value	$B=[(T_a \times T_b)/(T_a - T_b)] \times \ln(R_a/R_b)$	$B_{25/50}$		3380		K
B-值 B-value	$B=[(T_a \times T_b)/(T_a - T_b)] \times \ln(R_a/R_b)$	$B_{25/85}$		3486		K
B-值 B-value	$B=[(T_a \times T_b)/(T_a - T_b)] \times \ln(R_a/R_b)$	$B_{25/100}$		3523		K

模块 / Module

Parameter	Conditions	Symbol	Value			Unit
绝缘测试电压 Isolation test voltage	RMS, f=50Hz, t=1min	V_{ISOL}	4000			V
内部绝缘 Internal isolation			Al_2O_3			
储存温度 Storage temperature		T_{stg}	-55		150	$^{\circ}\text{C}$
重量 Weight		W	680		720	g

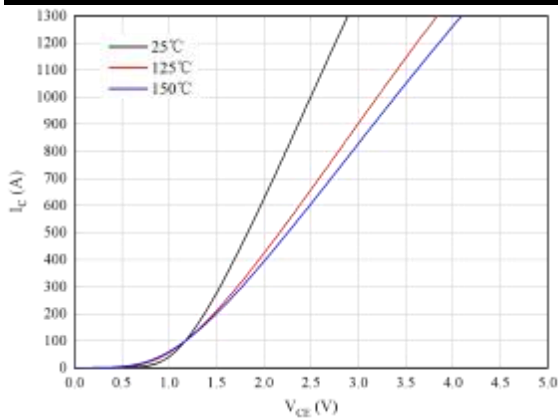
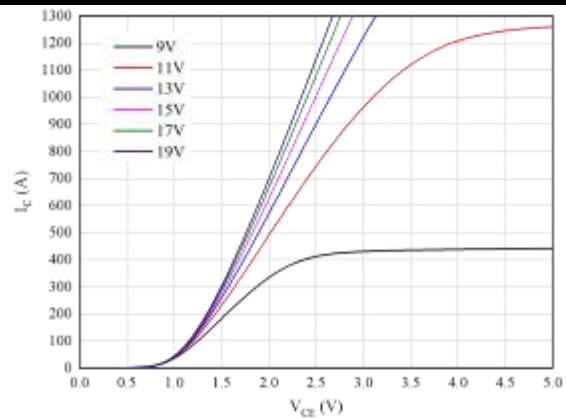
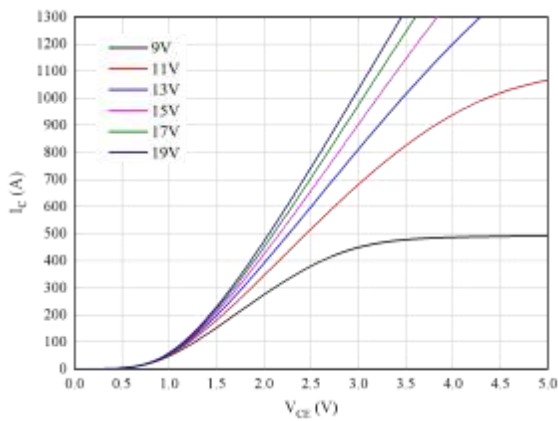
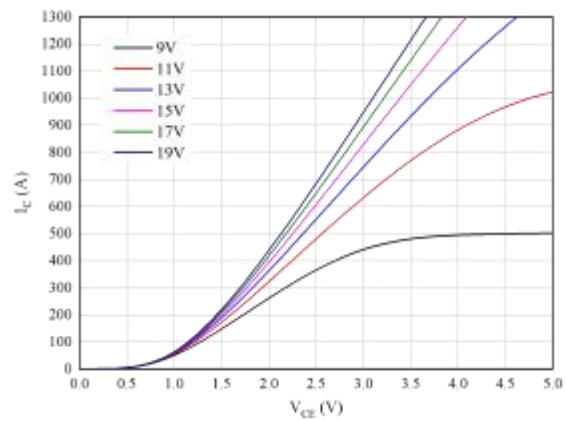
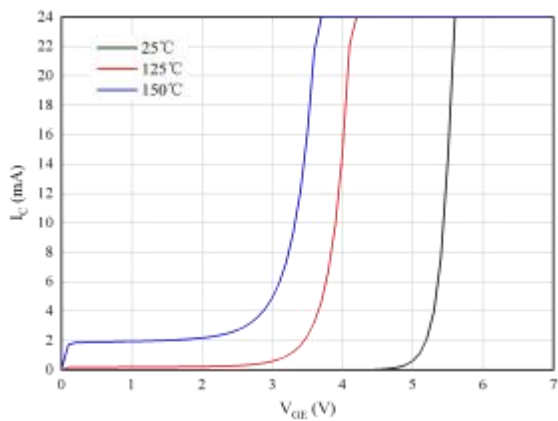
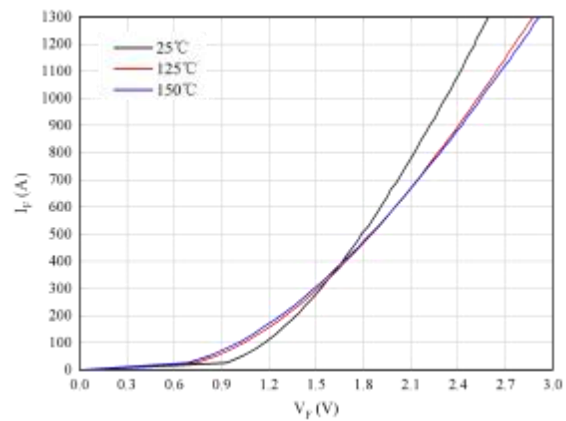
图 1. 典型输出特性 ($V_{GE}=15V$)Figure 1. Typical output characteristics ($V_{GE}=15V$)图 2. 典型输出特性 ($T_{vj}=25^{\circ}C$)Figure 2. Typical output characteristics ($T_{vj}=25^{\circ}C$)图 3. 典型输出特性 ($T_{vj}=125^{\circ}C$)Figure 3. Typical output characteristics ($T_{vj}=125^{\circ}C$)图 4. 典型输出特性 ($T_{vj}=150^{\circ}C$)Figure 4. Typical output characteristics ($T_{vj}=150^{\circ}C$)图 5. 典型传输特性 ($V_{GE}=V_{CE}$)Figure 5. Typical transfer characteristic ($V_{GE}=V_{CE}$)

图 6. 正向偏压特性 二极管

Figure 6. Forward characteristic of Diode

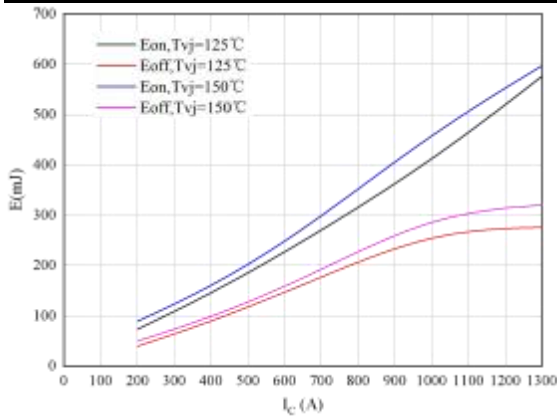


图 7. 开关损耗 逆变器

Figure 7. Switching losses of IGBT

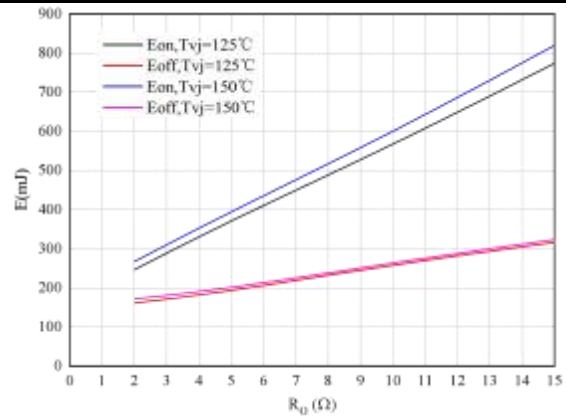
 $V_{GE}=\pm 15V, R_{Gon}=2.0\Omega, R_{Goff}=2.0\Omega, V_{CE}=900V$


图 8. 开关损耗 逆变器

Figure 8. Switching losses of IGBT

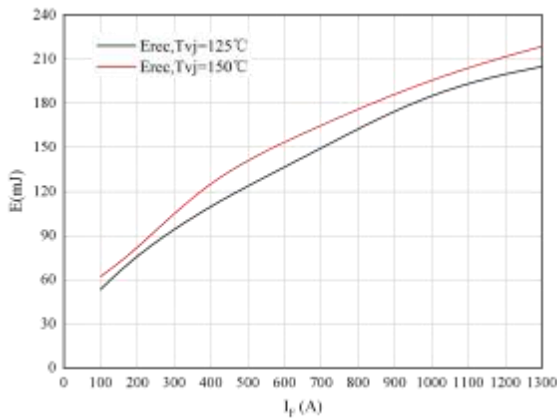
 $V_{GE}=\pm 15V, I_C=650A, V_{CE}=900V$


图 9. 开关损耗 二极管

Figure 9. Switching losses of Diode

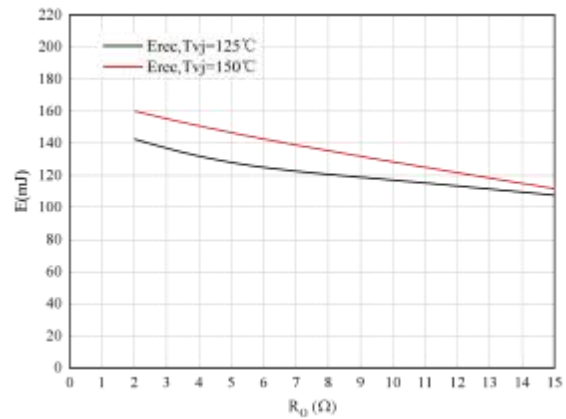
 $R_{Gon}=2.0\Omega, V_{CE}=900V$


图 10. 开关损耗 二极管

Figure 10. Switching losses of Diode

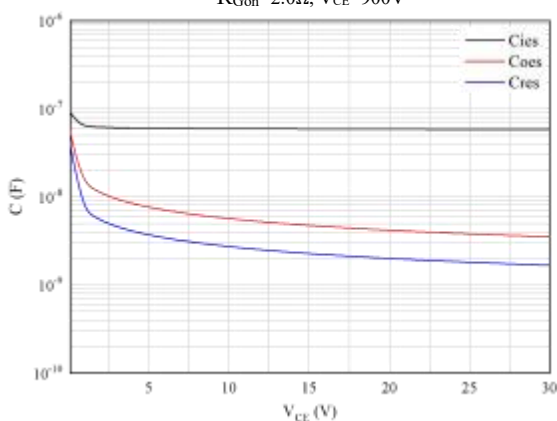
 $I_F=650A, V_{CE}=900V$


图 11. 电容特性

Figure 11. Capacitance characteristic

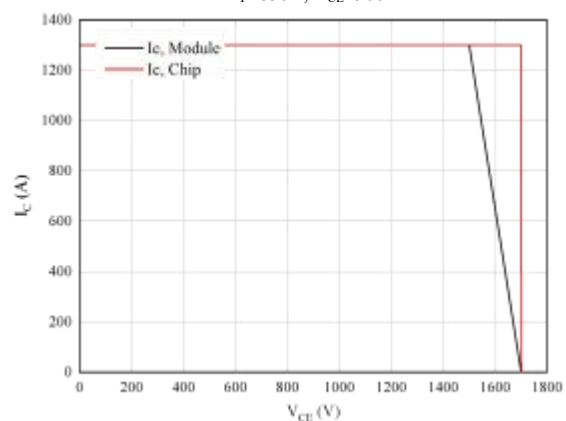
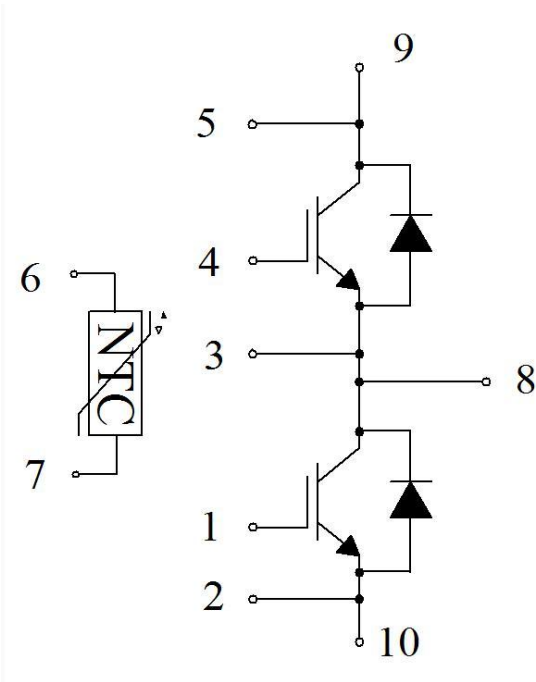


图 12. IGBT 反偏工作区 (RBSOA)

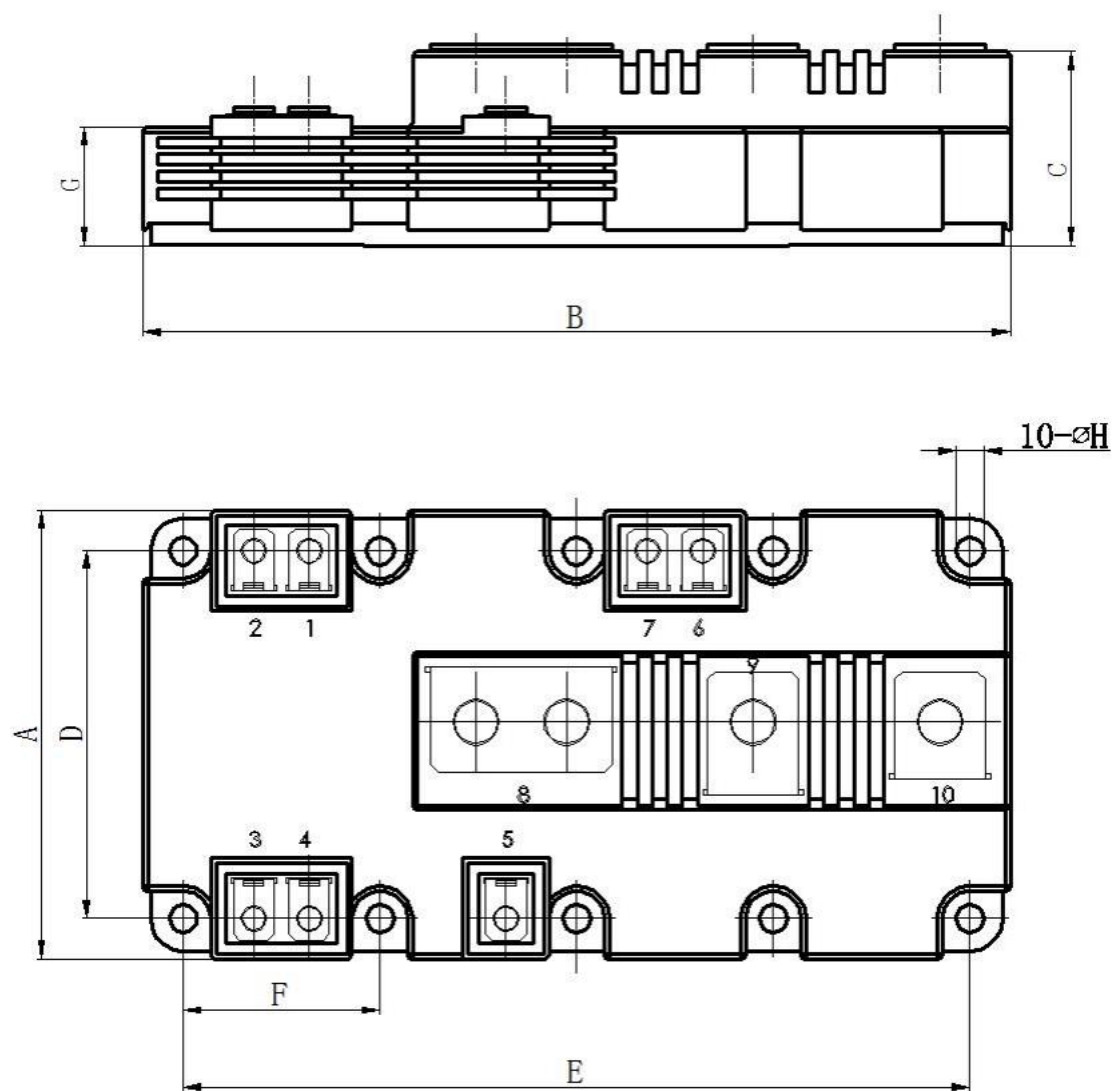
Figure 12. IGBT reverse bias safe operating area

 $V_{GE}=\pm 15V, R_{Goff}=2.0\Omega, T_{vj}=150^\circ C$

接线图 / Circuit diagram



封装尺寸 / Package outlines



单位：mm

89A					
符号	min	max	符号	min	max
A	88.3	89.3	E	155.7	156.7
B	172.3	173.3	F	38.7	39.3
C	38	38.6	G	23	23.6
D	72.8	73.4	ΦH	5.3	5.5