

关键参数		Key Parameters	
V_{CES}		1700	V
$V_{CE(sat)}$	Typ.	1.80	V
I_c	Max.	1200	A
$I_{C(RM)}$	Max.	2400	A

典型应用		Typical Applications	
● 牵引传动		Traction drives	
● 电机控制		Motor Controllers	
● 高可靠性逆变器		High Reliability Inverter	

特点		Features	
● AlSiC 基板		AlSiC Baseplate	
● AlN 衬板		AlN Substrates	
● 高热循环能力		High Thermal Cycling Capability	
● 10μs 短路承受能力		10μs Short Circuit Withstand	

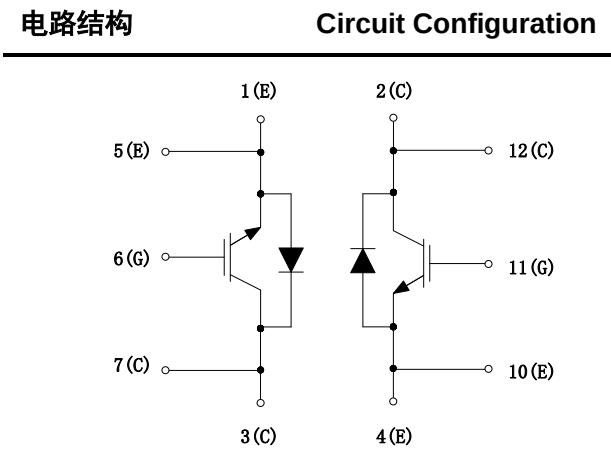


图 1.电路结构
Fig. 1 Circuit configuration

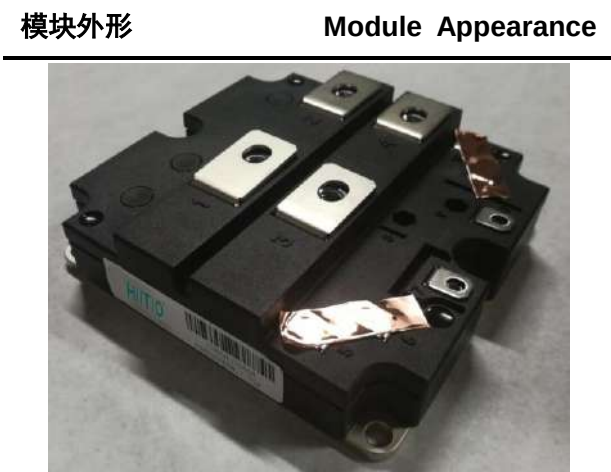


图 2. 模块外形
Fig. 2 Module appearance

模块标签说明		Module Label Code Instruction	
 ab1234567890		数据位置 Data position	数据内容 Content of data
		1--8	模块批次号 Module batch number
		9--12	模块序列号 Module serial number

最大额定值

Absolute Maximum Ratings

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	数值 Value	单位 Unit
V_{CES}	集电极-发射极电压 Collector-emitter voltage	$V_{GE} = 0V, T_C = 25\text{ }^{\circ}\text{C}$	1700	V
V_{GES}	栅极-发射极电压 Gate-emitter voltage	$T_C = 25\text{ }^{\circ}\text{C}$	± 20	V
I_C	集电极电流 Collector-emitter current	$T_C = 75\text{ }^{\circ}\text{C}$	1200	A
$I_{C(PK)}$	集电极峰值电流 Peak collector current	$t_P = 1\text{ms}$	2400	A
P_{max}	晶体管部分最大损耗 Max. transistor power dissipation	$T_{vj} = 150\text{ }^{\circ}\text{C}, T_C = 25\text{ }^{\circ}\text{C}$	5.68	kW
I^2t	二极管 I^2t 值 Diode I^2t	$V_R = 0V, t_P = 10\text{ms}, T_{vj} = 150\text{ }^{\circ}\text{C}$	130	kA^2s
V_{isol}	绝缘电压(模块) Isolation voltage – per module	短接所有端子，端子与基板间施加电压 (Connected terminals to base plate), AC RMS, 1 min, 50Hz, $T_C = 25\text{ }^{\circ}\text{C}$	4000	V
Q_{PD}	局部放电电荷 (模块) Partial Discharge – per module	IEC1287. V1 = 1800V, V2 = 1300V, 50Hz RMS	10	pC

热和机械数据

Thermal & Mechanical Data

参数 Symbol	说明 Explanation	值 Value	单位 Unit
爬电距离 Creepage distance	端子-端子 Terminal to terminal	20.0	mm
绝缘间隙 Clearance	端子-端子 Terminal to terminal	10.0	mm
相对漏电起痕指数 CTI (Comparative Tracking Index)		>600	

热和机械数据

Thermal & Mechanical Data

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	最小值 Min.	最大值 Max.	单位 Unit
$R_{th(J-C)} IGBT$	IGBT 结壳热阻 Thermal resistance – IGBT			22	K / kW
$R_{th(J-C)} Diode$	二极管结壳热阻 Thermal resistance – Diode			44	K / kW
$R_{th(C-H)} IGBT$	接触热阻(IGBT) Thermal resistance – case to heatsink (IGBT)	安装力矩 5Nm, 导热脂 1W/m·K Mounting torque 5Nm, with mounting grease 1W/m·K		12	K / kW
$R_{th(C-H)} Diode$	接触热阻(Diode) Thermal resistance – case to heatsink (Diode)	安装力矩 5Nm, 导热脂 1W/m·K Mounting torque 5Nm, with mounting grease 1W/m·K		24	K / kW
$T_{vj op}$	工作结温 Operating junction temperature	IGBT 部分 (IGBT)	-40	150	°C
		二极管部分(Diode)	-40	150	°C
T_{stg}	存储温度 Storage temperature range		-40	150	°C
M	安装力矩 Screw torque	安装紧固用 – M6 Mounting – M6		5	Nm
		电路互连用 – M4 Electrical connections – M4		2	Nm
		电路互连用 - M8 Electrical connections – M8		10	Nm

电特性值

Electrical Characteristics

除非特别声明，否则 $T_C = 25\text{ }^{\circ}\text{C}$
 $T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise stated

符号 Symbol	参数名称 Parameter	条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
I_{CES}	集电极截止电流 Collector cut-off current	$V_{GE} = 0V, V_{CE} = V_{CES}$			1	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 125\text{ }^{\circ}\text{C}$			20	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 150\text{ }^{\circ}\text{C}$			30	mA
I_{GES}	栅极漏电流 Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			0.5	μA
$V_{GE(TH)}$	栅极-发射极阈值电压 Gate threshold voltage	$I_C = 40\text{mA}, V_{GE} = V_{CE}$	5.00	6.00	7.00	V
$V_{CE(sat)}^{(*1)}$	集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 1200A$		1.80	2.20	V
		$V_{GE} = 15V, I_C = 1200A, T_{vj} = 125\text{ }^{\circ}\text{C}$		2.10	2.50	V
		$V_{GE} = 15V, I_C = 1200A, T_{vj} = 150\text{ }^{\circ}\text{C}$		2.20	2.6	V
I_F	二极管正向直流电流 Diode forward current	DC		1200		A
I_{FRM}	二极管正向重复峰值电流 Diode peak forward current	$t_p = 1\text{ms}$		2400		A
$V_F^{(*1)}$	二极管正向电压 Diode forward voltage	$I_F = 1200A, V_{GE} = 0$		1.90	2.30	V
		$I_F = 1200A, V_{GE} = 0, T_{vj} = 125\text{ }^{\circ}\text{C}$		2.10	2.50	V
		$I_F = 1200A, V_{GE} = 0, T_{vj} = 150\text{ }^{\circ}\text{C}$		2.10	2.50	V
I_{SC}	短路电流 Short circuit current	$T_{vj} = 150\text{ }^{\circ}\text{C}, V_{CC} = 1000V,$ $V_{GE} \leq 15V, t_p \leq 10\mu\text{s},$ $V_{CE(max)} = V_{CES} - L^{(*2)} \times di/dt,$ IEC 60747-9		4700		A

注意: 1.(*1) 表示该参数的测试点为辅助母排端子(*1) indicates it is measured at the auxiliary busbar terminal),

Note: 2.(*2) 表示 L 是电路杂散电感加上 L_M (*2) indicates L is the circuit stray inductance plus L_M).

电特性值

Electrical Characteristics

除非特别声明，否则 $T_C = 25\text{ }^{\circ}\text{C}$
 $T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise stated

符号 Symbol	参数名称 Parameter	条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
C_{ies}	输入电容 Input capacitance	$V_{CE} = 25V, V_{GE} = 0V,$ $f = 100kHz$		109		nF
Q_g	栅极电荷 Gate charge	$\pm 15V$		11.6		μC
C_{res}	反向传输电容 Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V,$ $f = 100kHz$		3.0		nF
L_M	模块电感 Module inductance			20		nH
$R_{CC'+EE'}$	模块引线电阻，端子-芯片 Module lead resistance, terminal-chip			0.27		m Ω

电特性值

Electrical Characteristics

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions		最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$t_{d(off)}$	关断延迟时间 Turn-off delay time	I_C =1200A, V_{CE} = 900V, V_{GE} = $\pm 15V$, $R_{G(OFF)}$ = 0.5 Ω , L_S = 150nH, dv/dt =3500V/ μ s (T_{vj} = 150 ° C).	T_{vj} = 25 ° C		1200		ns
			T_{vj} = 125 ° C		1250		
			T_{vj} = 150 ° C		1280		
t_f	下降时间 Fall time		T_{vj} = 25 ° C		400		ns
			T_{vj} = 125 ° C		480		
			T_{vj} = 150 ° C		490		
E_{OFF}	关断损耗 Turn-off energy loss		T_{vj} = 25 ° C		570		mJ
			T_{vj} = 125 ° C		640		
			T_{vj} = 150 ° C		660		
$t_{d(on)}$	开通延迟时间 Turn-on delay time	T_{vj} = 25 ° C		480		ns	
		T_{vj} = 125 ° C		480			
		T_{vj} = 150 ° C		480			
t_r	上升时间 Rise time	T_{vj} = 25 ° C		230		ns	
		T_{vj} = 125 ° C		240			
		T_{vj} = 150 ° C		240			
E_{ON}	开通损耗 Turn-on energy loss	T_{vj} = 25 ° C		83		mJ	
		T_{vj} = 125 ° C		116			
		T_{vj} = 150 ° C		128			
Q_{rr}	二极管反向恢复电荷 Diode reverse recovery charge	T_{vj} = 25 ° C		240		μ C	
		T_{vj} = 125 ° C		380			
		T_{vj} = 150 ° C		415			
I_{rr}	二极管反向恢复电流 Diode reverse recovery current	T_{vj} = 25 ° C		710		A	
		T_{vj} = 125 ° C		835			
		T_{vj} = 150 ° C		870			
E_{rec}	二极管反向恢复损耗 Diode reverse recovery energy	T_{vj} = 25 ° C		155		mJ	
		T_{vj} = 125 ° C		265			
		T_{vj} = 150 ° C		295			

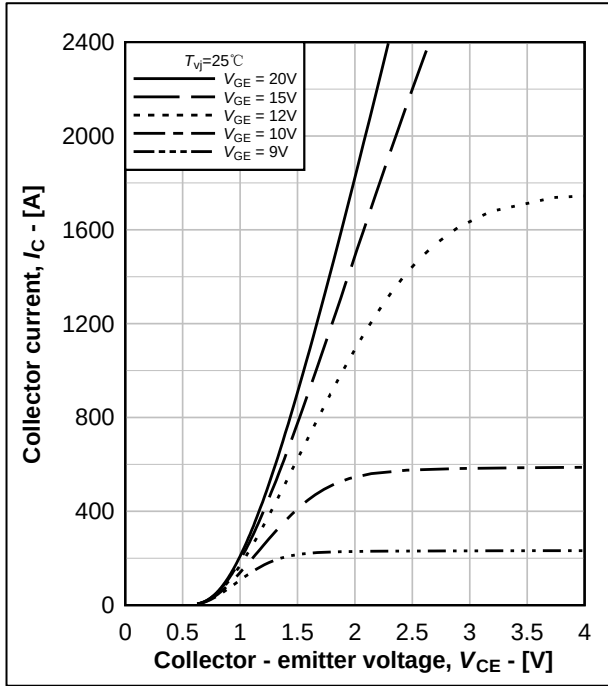


图 3. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

Fig.3 Typical IGBT output characteristics, $I_C = f(V_{CE})$

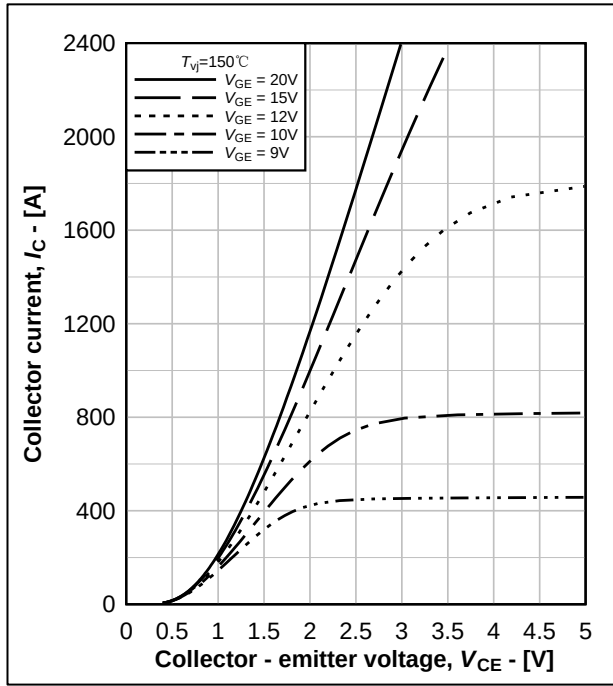


图 4. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

Fig.4 Typical IGBT output characteristics, $I_C = f(V_{CE})$

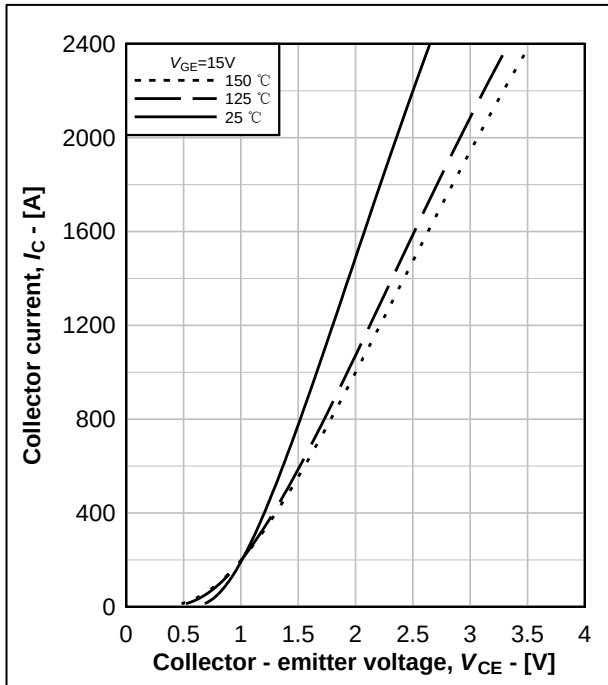


图 5. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

Fig.5 Typical IGBT output characteristics, $I_C = f(V_{CE})$

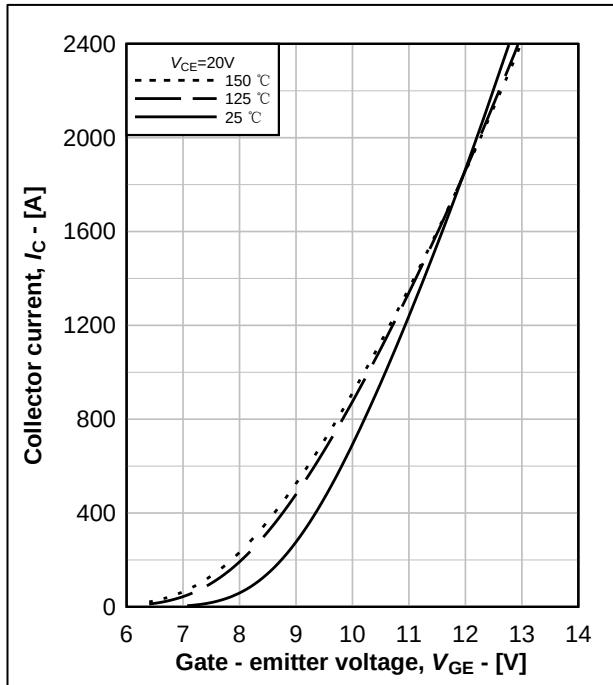


图 6. IGBT 传输特性典型曲线, $I_C = f(V_{GE})$

Fig.6 Typical IGBT transfer characteristics, $I_C = f(V_{GE})$

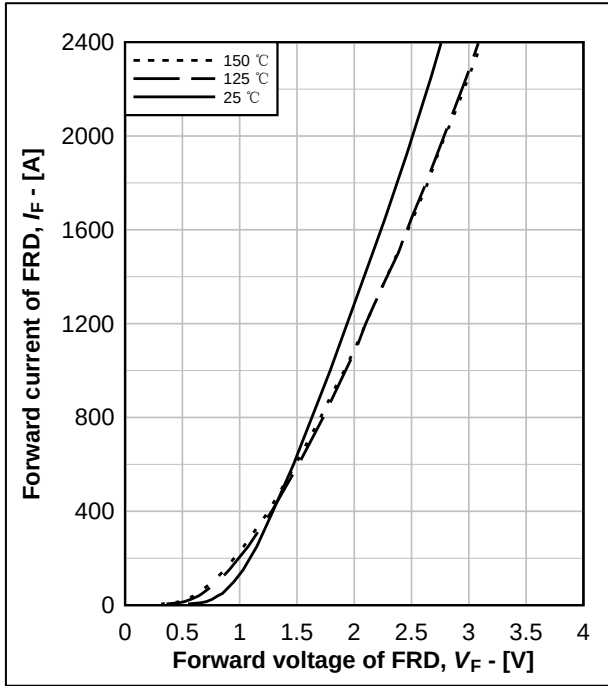


图 7. FRD 输出特性典型曲线, $I_F = f(V_F)$

Fig.7 Typical FRD output characteristics, $I_F = f(V_F)$

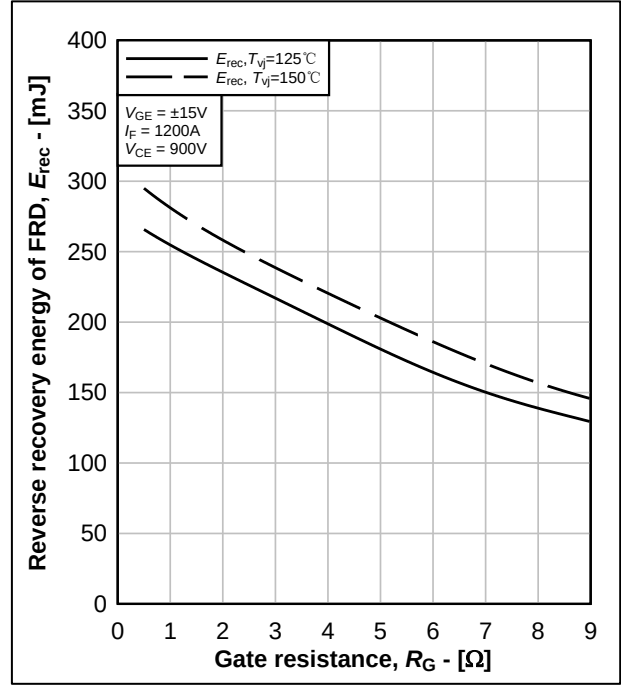


图 8. FRD 反向恢复能耗典型曲线, $E_{rec} = f(R_G)$

Fig.8 Typical FRD E_{rec} $E_{rec} = f(R_G)$

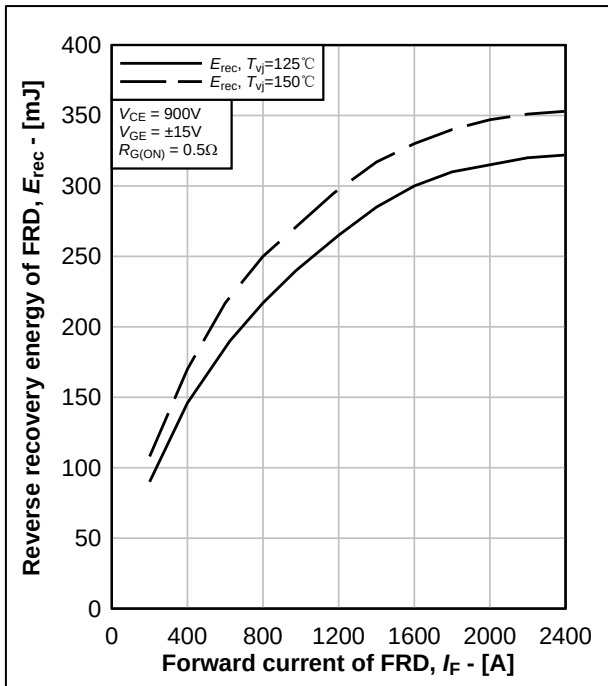


图 9. FRD 反向恢复能耗典型曲线, $E_{rec} = f(I_F)$

Fig.9 Typical FRD E_{rec} $E_{rec} = f(I_F)$

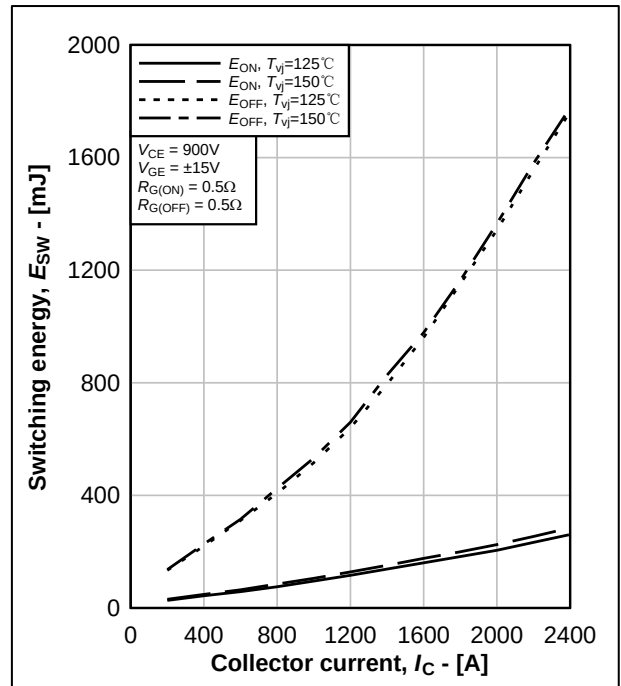


图 10. IGBT 开关能耗典型曲线, $E_{on} = f(I_C)$, $E_{off} = f(I_C)$

Fig.10 Typical IGBT switching energy, $E_{on} = f(I_C)$, $E_{off} = f(I_C)$

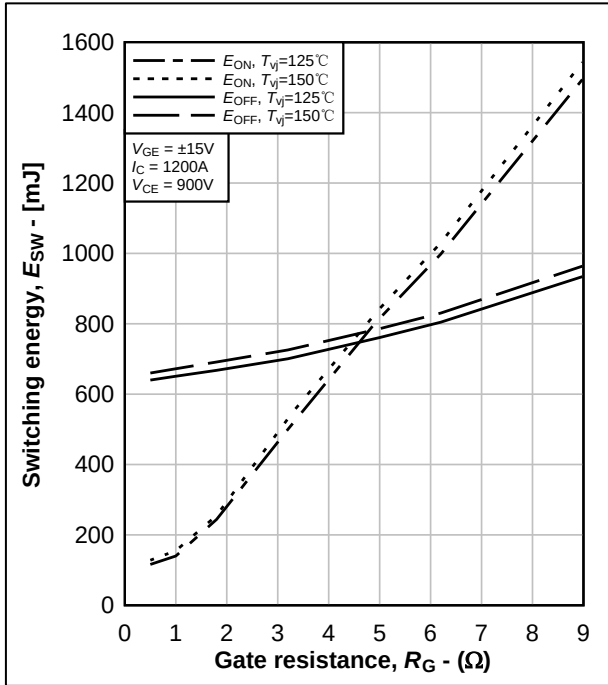


图 11. IGBT 开关能耗典型曲线, $E_{on} = f(R_G)$, $E_{off} = f(R_G)$

Fig.11 Typical IGBT switching energy, $E_{on} = f(R_G)$, $E_{off} = f(R_G)$

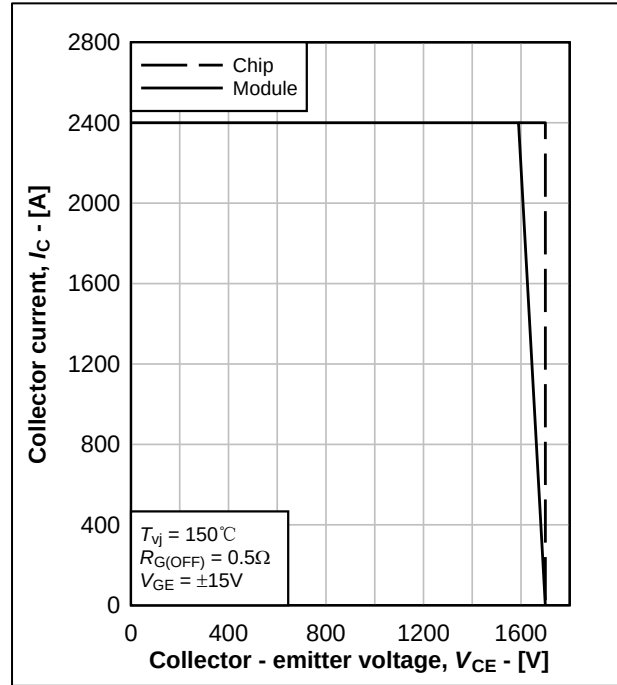


图 12. IGBT 反偏安全工作区, $I_C = f(V_{CE})$

Fig.12 Reverse bias safe operating area of IGBT, $I_C = f(V_{CE})$

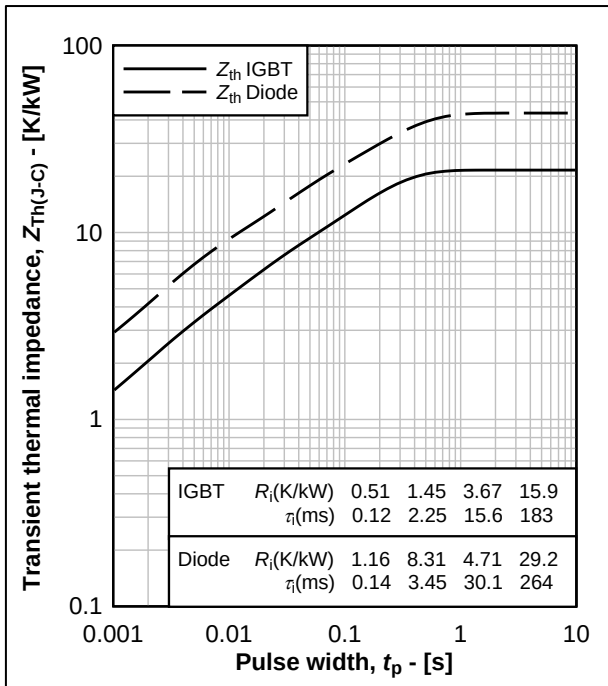


图 13. 瞬态热阻抗曲线, $Z_{Th(J-C)} = f(t_p)$

Fig.13 Transient thermal impedance, $Z_{Th(J-C)} = f(t_p)$

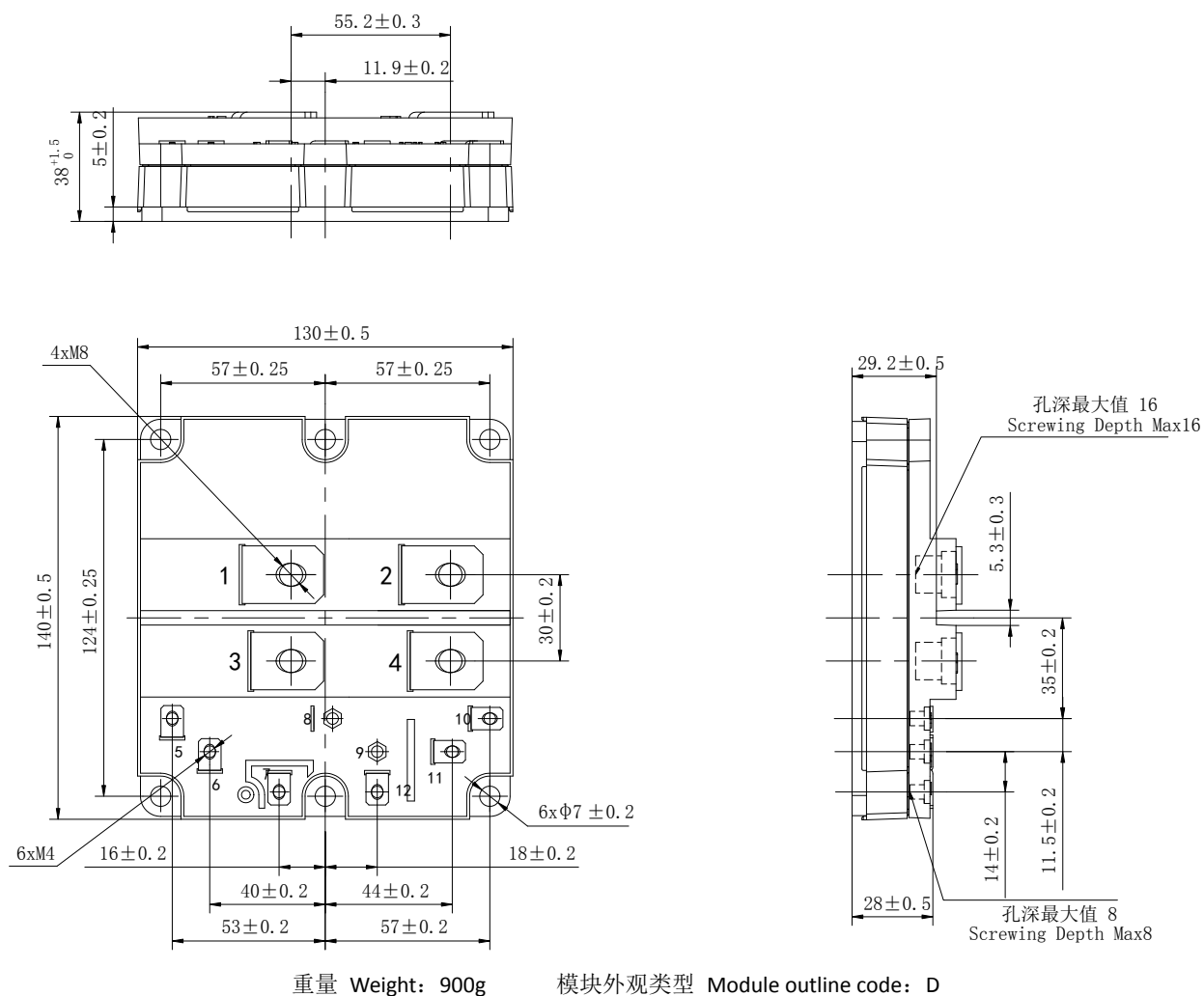


图 14. 模块外观尺寸

Fig. 14 Module outlines

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