

关键参数		Key Parameters	
V_{CES}		3300	V
$V_{CE(sat)}$	Typ.	2.40	V
I_C	Max.	1000	A
$I_{C(RM)}$	Max.	2000	A

典型应用	Typical Applications
● 牵引传动	Traction Drives
● 电机控制	Motor Controllers
● 智能电网	Smart Grid
● 高可靠性逆变器	High Reliability Inverter

特点	Features
● AISiC 基板	AISiC 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
● 低开关损耗型器件	Low Switching Loss Device
● 高电流密度	High Current Density

模块标签说明



Module Label Code Instruction

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

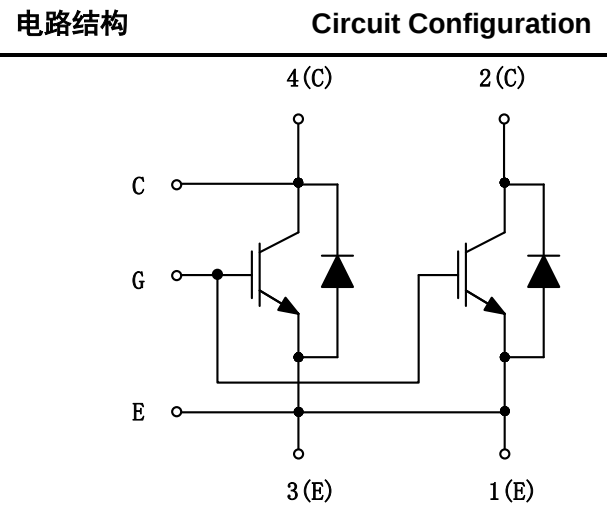


图 1. 电路结构

Fig. 1 Circuit configuration

模块外形 Module Appearance



图 2. 模块外形

Fig. 2 Module appearance

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	$V_{GE} = 0V, T_C = 25\text{ }^{\circ}C$	3300	V
V_{GES}	栅极-发射极电压 Gate-emitter voltage	$T_C = 25\text{ }^{\circ}C$	± 20	V
I_C	集电极电流 Collector-emitter current	$T_C = 95\text{ }^{\circ}C$	1000	A
$I_{C(PK)}$	集电极峰值电流 Peak collector current	$t_P = 1ms$	2000	A
P_{max}	晶体管部分最大损耗 Max. transistor power dissipation	$T_{vj} = 150^{\circ}C, T_C = 25\text{ }^{\circ}C$	10.4	kW
I^2t	二极管 I^2t 值 Diode I^2t	$V_R = 0V, t_P = 10ms, T_{vj} = 150\text{ }^{\circ}C$	320	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, $T_C = 25\text{ }^{\circ}C$	6000	V
Q_{PD}	局部放电电荷 (模块) Partial Discharge – per module	IEC1287. V1 = 3500V, V2 = 2600V, 50Hz RMS, $T_C = 25\text{ }^{\circ}C$	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	33.0	mm
绝缘间隙 Clearance	端子-端子 Terminal to terminal	20.0	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.	典型值 Typ.	最大值 Max.	单位 Unit
$R_{th(J-C)} IGBT$	IGBT 结壳热阻 Thermal resistance – IGBT	结壳恒定功耗 Continuous dissipation-junction to case			12	K / kW
$R_{th(J-C)} Diode$	二极管结壳热阻 Thermal resistance – Diode	结壳恒定功耗 Continuous dissipation-junction to case			24	K / kW
$R_{th(C-H)} IGBT$	接触热阻(模块) Thermal resistance – case to heatsink (per module)	安装力矩 5Nm, 导热脂 1W/m·K Mounting torque 5Nm, with mounting grease 1W/m·K		8		K / kW
T_{vj}	结温 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		125	°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
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 125\text{ }^{\circ}\text{C}$			60	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 150\text{ }^{\circ}\text{C}$			100	mA
I_{GES}	栅极漏电流 Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			1	μA
$V_{GE(TH)}$	栅极-发射极阈值电压 Gate threshold voltage	$I_C = 80\text{mA}, V_{GE} = V_{CE}$	5.50	6.10	7.00	V
$V_{CE(sat)}^{(*1)}$	集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 1000\text{A}$		2.40	2.90	V
		$V_{GE} = 15V, I_C = 1000\text{A}, T_{vj} = 125\text{ }^{\circ}\text{C}$		2.95	3.40	V
		$V_{GE} = 15V, I_C = 1000\text{A}, T_{vj} = 150\text{ }^{\circ}\text{C}$		3.10	3.60	V
I_F	二极管正向直流电流 Diode forward current	DC		1000		A
I_{FRM}	二极管正向重复峰值电流 Diode peak forward current	$t_p = 1\text{ms}$		2000		A
$V_F^{(*1)}$	二极管正向电压 Diode forward voltage	$I_F = 1000\text{A}, V_{GE} = 0$		2.10	2.60	V
		$I_F = 1000\text{A}, V_{GE} = 0, T_{vj} = 125\text{ }^{\circ}\text{C}$		2.25	2.70	V
		$I_F = 1000\text{A}, V_{GE} = 0, T_{vj} = 150\text{ }^{\circ}\text{C}$		2.25	2.70	V
I_{SC}	短路电流 Short circuit current	$T_{vj} = 150\text{ }^{\circ}\text{C}, V_{CC} = 2500\text{V},$ $V_{GE} \leq 15\text{V}, t_p \leq 10\mu\text{s},$ $V_{CE(max)} = V_{CES} - L^{(*2)} \times di/dt,$ IEC 60747-9		3900		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	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		170		nF
Q_g	栅极电荷 Gate charge	$\pm 15V$		17		μC
C_{res}	反向传输电容 Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		4		nF
L_M	模块电感 Module inductance			15		nH
R_{INT}	内阻 Internal transistor resistance			165		$\mu\Omega$

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	$I_C = 1000A$, $V_{CE} = 1800V$, $V_{GE} = \pm 15V$, $R_{G(OFF)} = 2.2\Omega$, $C_{GE} = 220nF$, $L_S = 150nH$, ($T_{vj} = 150^\circ C$).	$T_{vj} = 25^\circ C$		1800		ns
			$T_{vj} = 125^\circ C$		1940		
			$T_{vj} = 150^\circ C$		1950		
t_f	下降时间 Fall time		$T_{vj} = 25^\circ C$		530		ns
			$T_{vj} = 125^\circ C$		580		
			$T_{vj} = 150^\circ C$		600		
E_{OFF}	关断损耗 Turn-off energy loss		$T_{vj} = 25^\circ C$		1600		mJ
			$T_{vj} = 125^\circ C$		1950		
			$T_{vj} = 150^\circ C$		2100		
$t_{d(on)}$	开通延迟时间 Turn-on delay time	$T_{vj} = 25^\circ C$		680		ns	
		$T_{vj} = 125^\circ C$		660			
		$T_{vj} = 150^\circ C$		650			
t_r	上升时间 Rise time	$T_{vj} = 25^\circ C$		320		ns	
		$T_{vj} = 125^\circ C$		340			
		$T_{vj} = 150^\circ C$		340			
E_{ON}	开通损耗 Turn-on energy loss	$T_{vj} = 25^\circ C$		1240		mJ	
		$T_{vj} = 125^\circ C$		1600			
		$T_{vj} = 150^\circ C$		1750			
Q_{rr}	二极管反向恢复电荷 Diode reverse recovery charge	$T_{vj} = 25^\circ C$		780		μC	
		$T_{vj} = 125^\circ C$		1200			
		$T_{vj} = 150^\circ C$		1420			
I_{rr}	二极管反向恢复电流 Diode reverse recovery current	$T_{vj} = 25^\circ C$		810		A	
		$T_{vj} = 125^\circ C$		930			
		$T_{vj} = 150^\circ C$		970			
E_{rec}	二极管反向恢复损耗 Diode reverse recovery energy	$T_{vj} = 25^\circ C$		980		mJ	
		$T_{vj} = 125^\circ C$		1520			
		$T_{vj} = 150^\circ C$		1920			

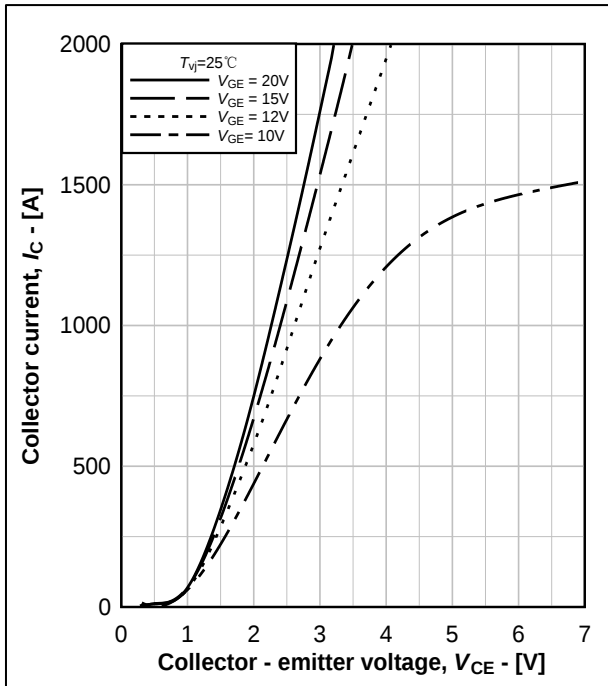

图 3. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

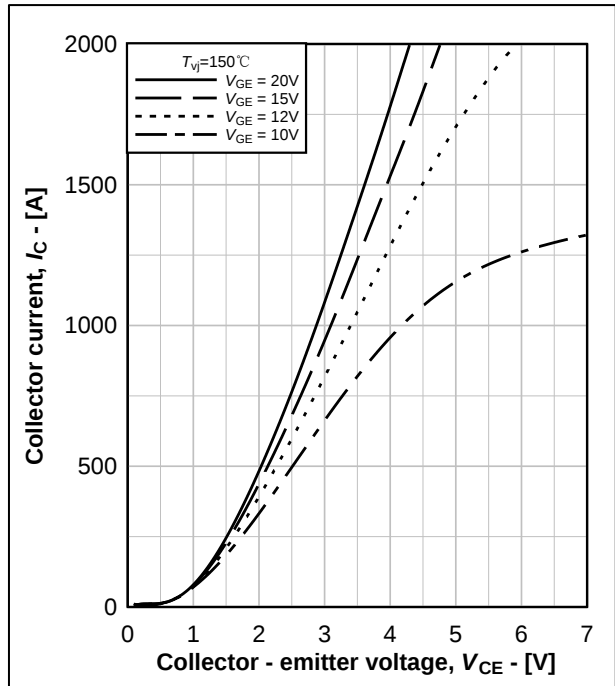
Fig.3 Typical IGBT output characteristics, $I_C = f(V_{CE})$

图 4. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

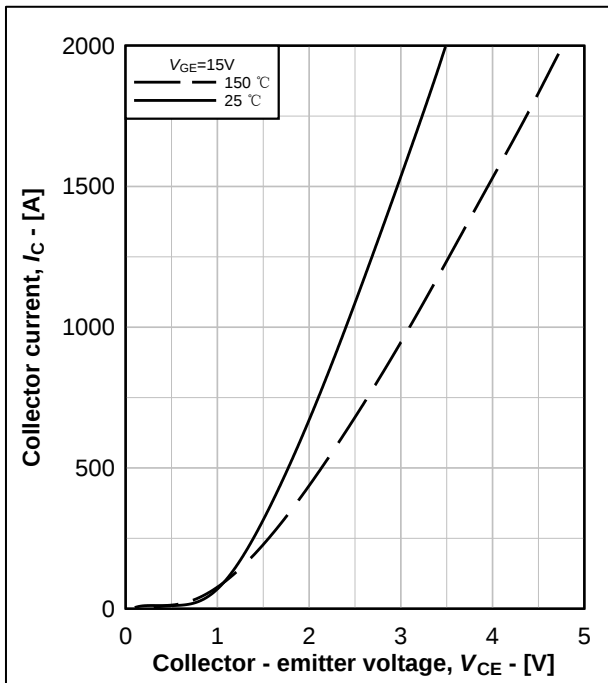
Fig.4 Typical IGBT output characteristics, $I_C = f(V_{CE})$

图 5. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

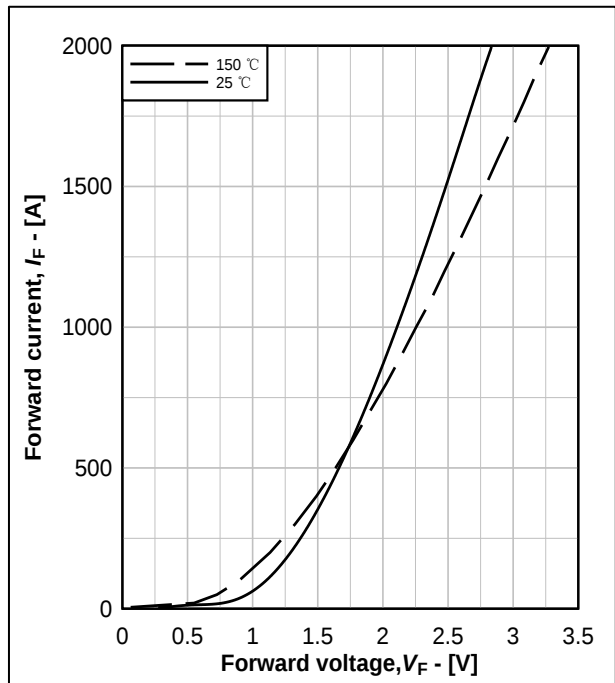
Fig.5 Typical IGBT output characteristics, $I_C = f(V_{CE})$

图 6. FRD 输出特性典型曲线, $I_F = f(V_F)$

Fig.6 Typical FRD output characteristics, $I_F = f(V_F)$

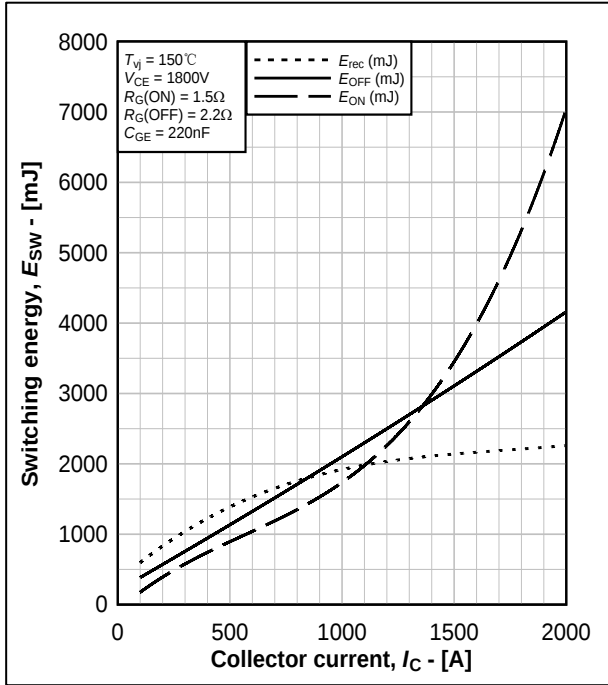

 图 7. 开关能耗与集电极电流关系曲线, $E_{sw} = f(I_c)$

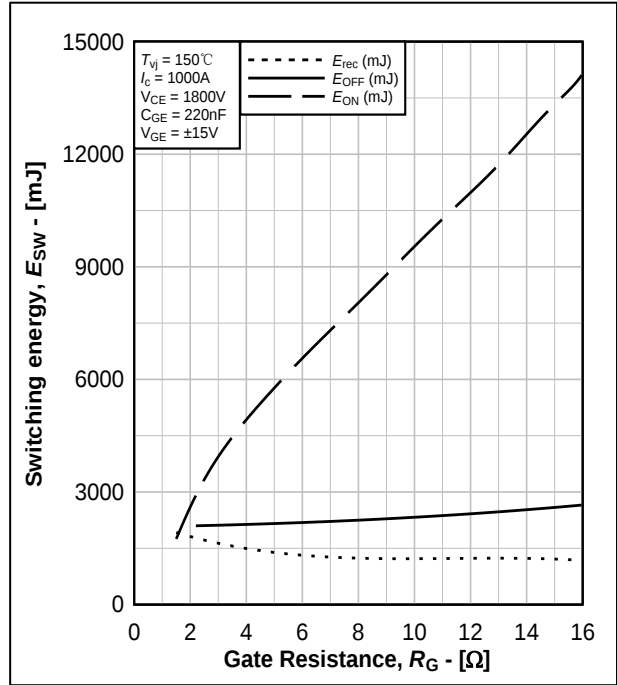
 Fig.7 Typical Switching energy, $E_{sw} = f(I_c)$

 图 8. 开关能耗与栅极电阻关系曲线, $E_{sw} = f(R_g)$

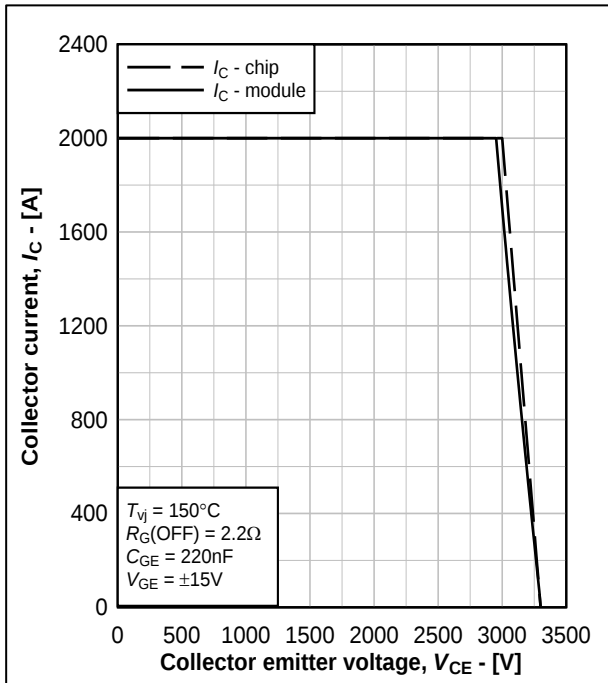
 Fig.8 Typical Switching energy, $E_{sw} = f(R_g)$

 图 9. IGBT 反偏安全工作区, $I_c = f(V_{ce})$

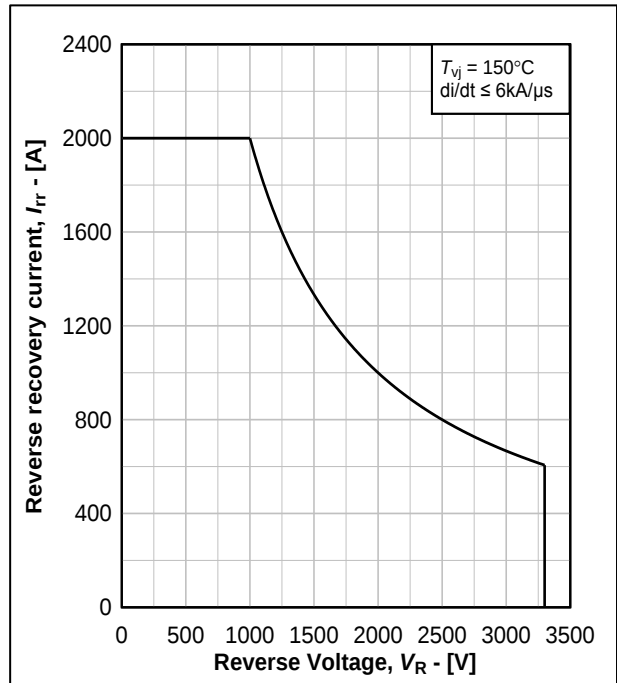
 Fig.9 Reverse bias safe operating area of IGBT, $I_c = f(V_{ce})$

 图 10. FRD 反偏安全工作区, $I_{rr} = f(V_r)$

 Fig.10 Reverse bias safe operating area of FRD, $I_{rr} = f(V_r)$

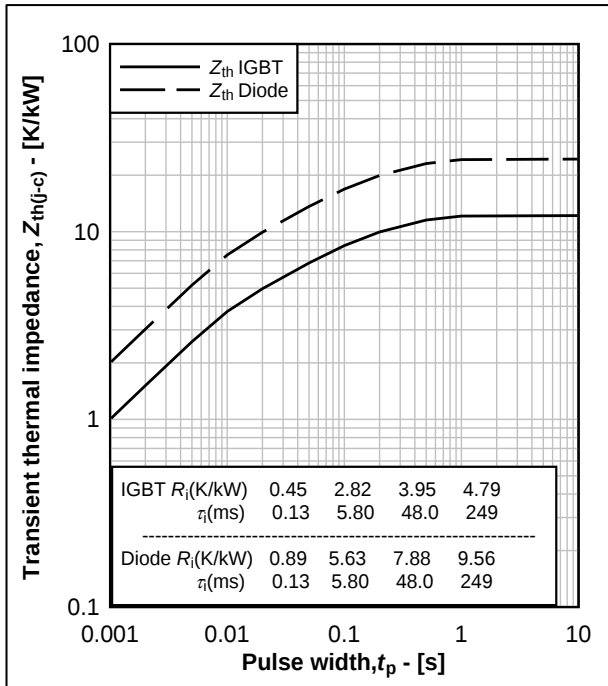
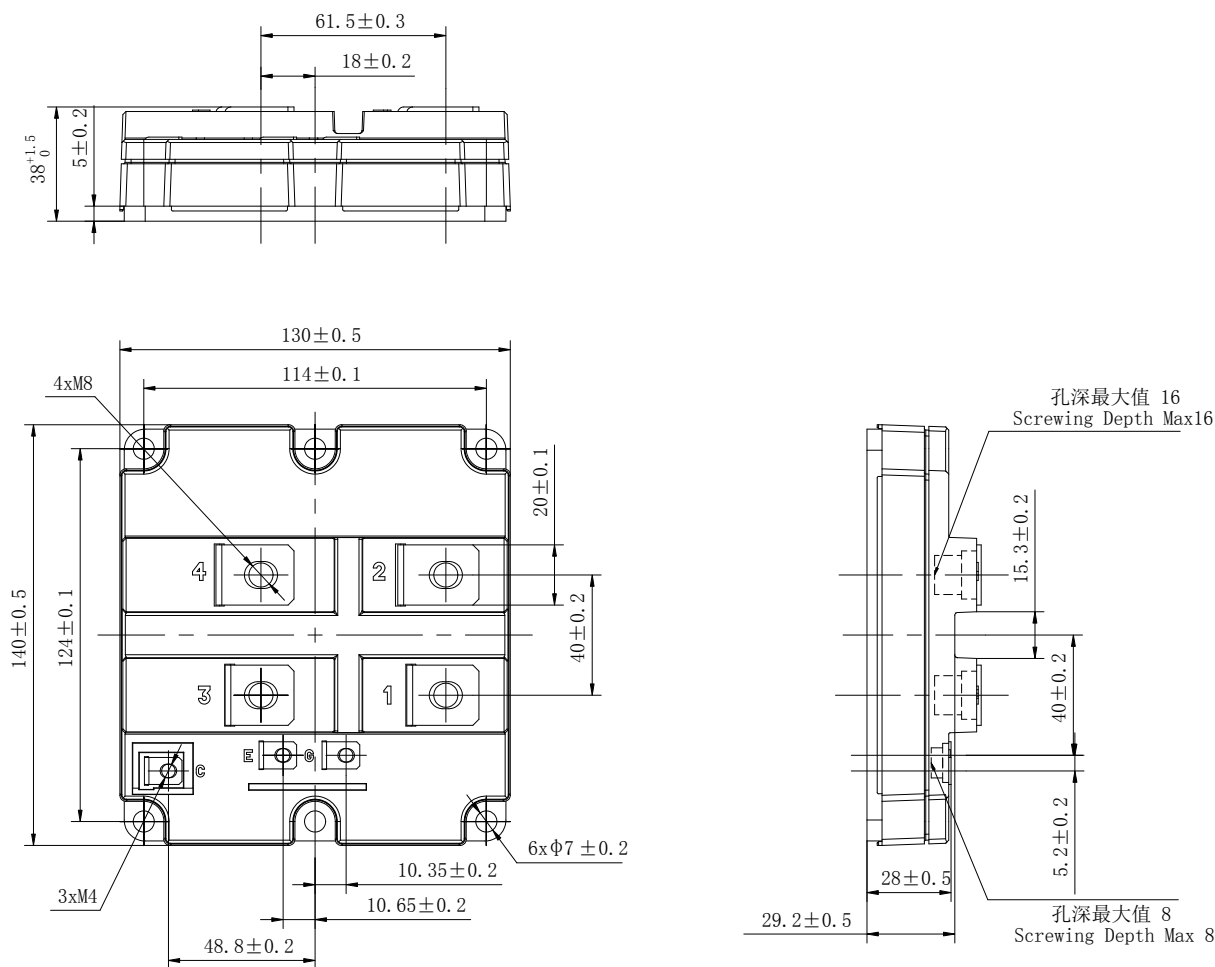


图 11 瞬态热阻抗曲线, $Z_{th(j-c)} = f(t_p)$

Fig.11 Transient thermal impedance, $Z_{th(j-c)} = f(t_p)$



重量 Weight: 900g 模块外观类型 Module outline code: N

图 12. 模块外观尺寸

Fig. 12 Module outlines

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