

关键参数

Key Parameters

V_{CES}		1700	V
$V_{CE(sat)}$	Typ.	1.95	V
I_c	Max.	3600	A
$I_{C(RM)}$	Max.	7200	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 Inverters

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
● 符合 RoHS	RoHS Compliant
● 预涂导热介质	Pre-applied Thermal Interface Material

电路结构

Circuit Configuration

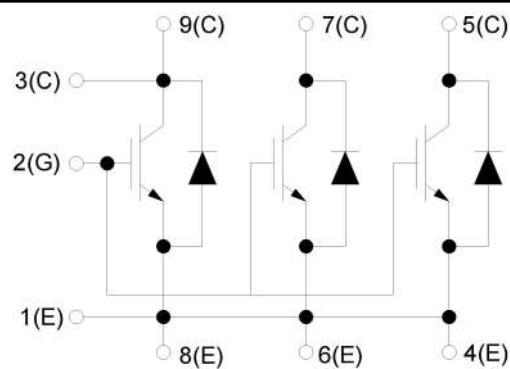


图 1. 电路结构

Fig. 1 Circuit configuration

模块外形

Module Appearance



图 2. 模块外形

Fig. 2 Module appearance

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	$V_{GE} = 0V, T_C = 25^\circ C$	1700	V
V_{GES}	栅极-发射极电压 Gate-emitter voltage	$T_C = 25^\circ C$	± 20	V
I_C	集电极电流 Collector-emitter current	$T_C = 95^\circ C, T_{vj} \max = 175^\circ C$	3600	A
$I_{C(RM)}$	集电极峰值电流 Peak collector current	$t_P = 1ms$	7200	A
P_{max}	晶体管部分最大损耗 Max. transistor power dissipation	$T_{vj} = 175^\circ C, T_C = 25^\circ C$	20	kW
I_{ft}	二极管 I_{ft} 值 Diode I_{ft}	$V_R = 0V, t_P = 10ms, T_{vj} = 150^\circ C$	2200	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, $T_C = 25^\circ C$	4000	V
Q_{PD}	局部放电电荷(模块) Partial discharge – per module	IEC1287. $V_1 = 1800V, V_2 = 1300V, 50Hz$ 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-散热器 Terminal to heatsink	33.0	mm
	端子-端子 Terminal to terminal	34.0	mm
绝缘间隙 Clearance	端子-散热器 Terminal to heatsink	20.0	mm
	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
$R_{th(J-H)} IGBT$	IGBT 结-散热器热阻 Thermal resistance, junction to heatsink – IGBT	安装力矩 5Nm, CRRC 预涂 TIM Mounting torque 5Nm, with CRRC pre-applied TIM			9.5	K / kW
$R_{th(J-H)} Diode$	二极管结-散热器热阻 Thermal resistance, junction to heatsink – Diode	安装力矩 5Nm, CRRC 预涂 TIM Mounting torque 5Nm, with CRRC pre-applied TIM			11.2	K / kW
$T_{vj op}$	工作结温 Operating junction temperature	IGBT 芯片 (IGBT)	-40		150	°C
		二极管芯片(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
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 125\text{ }^{\circ}\text{C}$			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	$I_C = 120\text{mA}, V_{GE} = V_{CE}$	5.5	6.1	6.7	V
$V_{CE(sat)}^{(*1)}$	集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 3600A$		1.95	2.35	V
		$V_{GE} = 15V, I_C = 3600A, T_{vj} = 125\text{ }^{\circ}\text{C}$		2.20		V
		$V_{GE} = 15V, I_C = 3600A, T_{vj} = 150\text{ }^{\circ}\text{C}$		2.25		V
I_F	二极管正向直流电流 Diode forward current	DC		3600		A
I_{FRM}	二极管正向重复峰值电流 Diode peak forward current	$t_P = 1\text{ms}$		7200		A
$V_F^{(*1)}$	二极管正向电压 Diode forward voltage	$I_F = 3600A, V_{GE} = 0V$		1.80	2.20	V
		$I_F = 3600A, V_{GE} = 0V, T_{vj} = 125\text{ }^{\circ}\text{C}$		1.85		V
		$I_F = 3600A, V_{GE} = 0V, T_{vj} = 150\text{ }^{\circ}\text{C}$		1.85		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		14400		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_{sCE} (*2) indicates L is the circuit stray inductance plus L_{sCE}).

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	$V_{CE} = 25V, V_{GE} = 0V, f = 100kHz$		601		nF
Q_g	栅极电荷 Gate charge	$\pm 15V$		37.8		μC
C_{res}	反向传输电容 Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 100kHz$		0.4		nF
L_{sCE}	模块杂散电感 Module stray inductance			6		nH
$R_{CC+EE'}$	模块引线电阻，端子-芯片 Module lead resistance, terminal-chip			85		$\mu\Omega$
R_{Gint}	内部栅极电阻 Internal gate resistor			0.6		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 =3600A, V_{CE} =900V, V_{GE} = $\pm 15V$, $R_{G(OFF)}$ = 0.5 Ω , L_S = 60 nH, dv/dt =3100V/ μ s (T_{vj} = 150 $^{\circ}C$)	T_{vj} = 25 $^{\circ}C$		2175		ns
			T_{vj} = 125 $^{\circ}C$		2280		
			T_{vj} = 150 $^{\circ}C$		2310		
t_f	下降时间 Fall time		T_{vj} = 25 $^{\circ}C$		245		ns
			T_{vj} = 125 $^{\circ}C$		300		
			T_{vj} = 150 $^{\circ}C$		315		
E_{OFF}	关断损耗 Turn-off energy loss		T_{vj} = 25 $^{\circ}C$		1585		mJ
			T_{vj} = 125 $^{\circ}C$		1760		
			T_{vj} = 150 $^{\circ}C$		1790		
$t_{d(on)}$	开通延迟时间 Turn-on delay time	I_C =3600A V_{CE} = 900V, V_{GE} = $\pm 15V$, $R_{G(ON)}$ = 0.5 Ω , L_S = 60nH, di/dt =11000A/ μ s (T_{vj} = 150 $^{\circ}C$)	T_{vj} = 25 $^{\circ}C$		970		ns
			T_{vj} = 125 $^{\circ}C$		970		
			T_{vj} = 150 $^{\circ}C$		970		
t_r	上升时间 Rise time		T_{vj} = 25 $^{\circ}C$		310		ns
			T_{vj} = 125 $^{\circ}C$		320		
			T_{vj} = 150 $^{\circ}C$		330		
E_{ON}	开通损耗 Turn-on energy loss		T_{vj} = 25 $^{\circ}C$		370		mJ
			T_{vj} = 125 $^{\circ}C$		600		
			T_{vj} = 150 $^{\circ}C$		650		
Q_{rr}	二极管反向恢复电荷 Diode reverse recovery charge	T_{vj} = 25 $^{\circ}C$		845		μ C	
		T_{vj} = 125 $^{\circ}C$		1410			
		T_{vj} = 150 $^{\circ}C$		1660			
I_{rr}	二极管反向恢复电流 Diode reverse recovery current	T_{vj} = 25 $^{\circ}C$		1960		A	
		T_{vj} = 125 $^{\circ}C$		2390			
		T_{vj} = 150 $^{\circ}C$		2550			
E_{rec}	二极管反向恢复损耗 Diode reverse recovery energy	T_{vj} = 25 $^{\circ}C$		650		mJ	
		T_{vj} = 125 $^{\circ}C$		1120			
		T_{vj} = 150 $^{\circ}C$		1240			

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 =3600A, V_{CE} =900V, V_{GE} = $\pm 15V$, $R_{G(OFF)}$ = 2.0 Ω , L_S = 60 nH, dv/dt =2100V/ μ s (T_{vj} = 150 $^{\circ}C$)	T_{vj} = 25 $^{\circ}C$		2810		ns
			T_{vj} = 125 $^{\circ}C$		2970		
			T_{vj} = 150 $^{\circ}C$		3010		
t_f	下降时间 Fall time		T_{vj} = 25 $^{\circ}C$		300		ns
			T_{vj} = 125 $^{\circ}C$		330		
			T_{vj} = 150 $^{\circ}C$		345		
E_{OFF}	关断损耗 Turn-off energy loss		T_{vj} = 25 $^{\circ}C$		1925		mJ
			T_{vj} = 125 $^{\circ}C$		2120		
			T_{vj} = 150 $^{\circ}C$		2170		
$t_{d(on)}$	开通延迟时间 Turn-on delay time	T_{vj} = 25 $^{\circ}C$		1205		ns	
		T_{vj} = 125 $^{\circ}C$		1100			
		T_{vj} = 150 $^{\circ}C$		1100			
t_r	上升时间 Rise time	T_{vj} = 25 $^{\circ}C$		500		ns	
		T_{vj} = 125 $^{\circ}C$		505			
		T_{vj} = 150 $^{\circ}C$		510			
E_{ON}	开通损耗 Turn-on energy loss	T_{vj} = 25 $^{\circ}C$		1680		mJ	
		T_{vj} = 125 $^{\circ}C$		2200			
		T_{vj} = 150 $^{\circ}C$		2400			
Q_{rr}	二极管反向恢复电荷 Diode reverse recovery charge	T_{vj} = 25 $^{\circ}C$		770		μ C	
		T_{vj} = 125 $^{\circ}C$		1300			
		T_{vj} = 150 $^{\circ}C$		1530			
I_{rr}	二极管反向恢复电流 Diode reverse recovery current	T_{vj} = 25 $^{\circ}C$		1570		A	
		T_{vj} = 125 $^{\circ}C$		1950			
		T_{vj} = 150 $^{\circ}C$		2060			
E_{rec}	二极管反向恢复损耗 Diode reverse recovery energy	T_{vj} = 25 $^{\circ}C$		535		mJ	
		T_{vj} = 125 $^{\circ}C$		890			
		T_{vj} = 150 $^{\circ}C$		975			

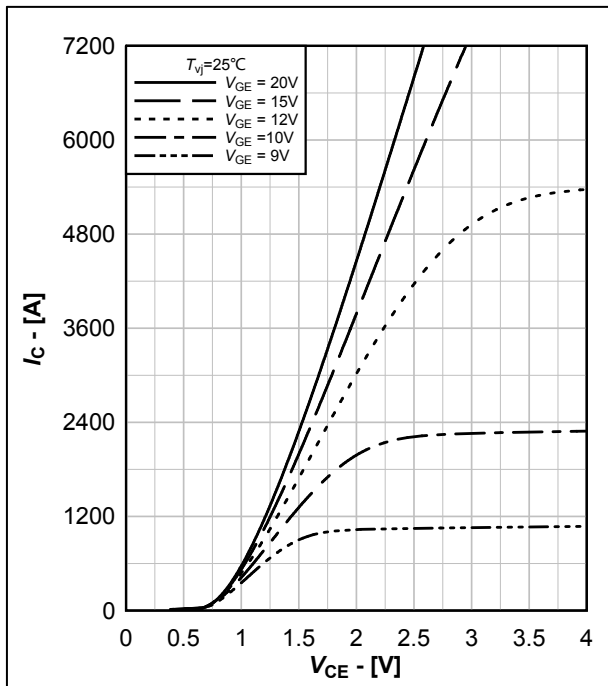

图 3. IGBT 输出特性典型曲线, $I_c = f(V_{CE})$

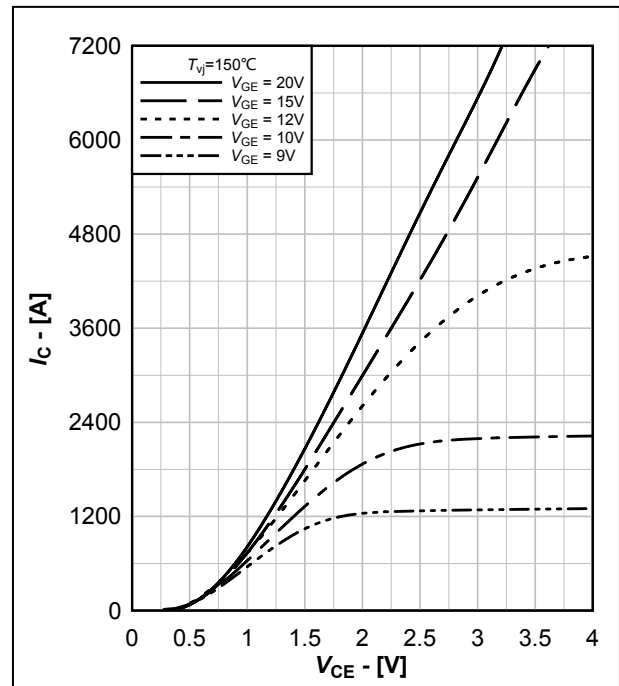
Fig.3 Typical IGBT output characteristics, $I_c = f(V_{CE})$

图 4. IGBT 输出特性典型曲线, $I_c = f(V_{CE})$

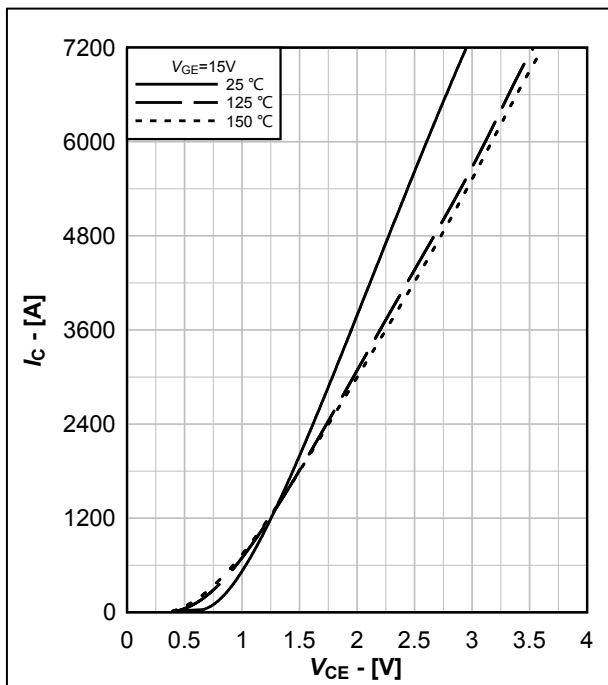
Fig.4 Typical IGBT output characteristics, $I_c = f(V_{CE})$

图 5. IGBT 输出特性典型曲线, $I_c = f(V_{CE})$

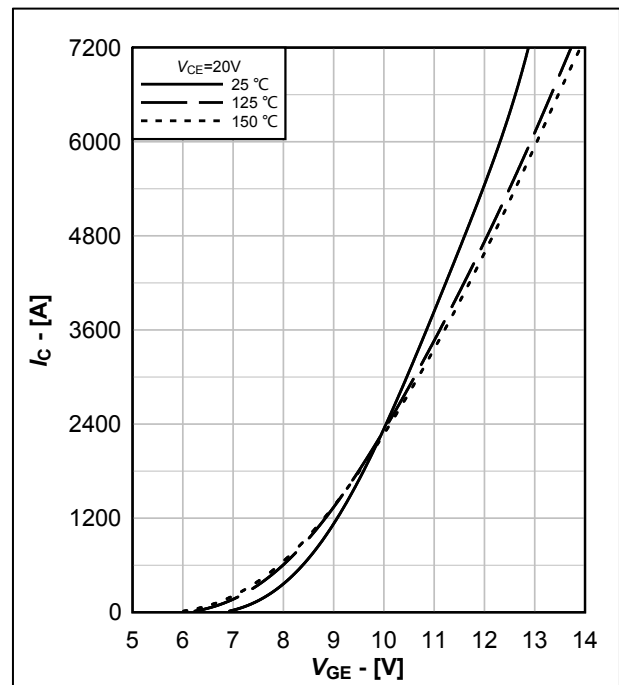
Fig.5 Typical IGBT output characteristics, $I_c = f(V_{CE})$

图 6. IGBT 传输特性典型曲线, $I_c = f(V_{GE})$

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

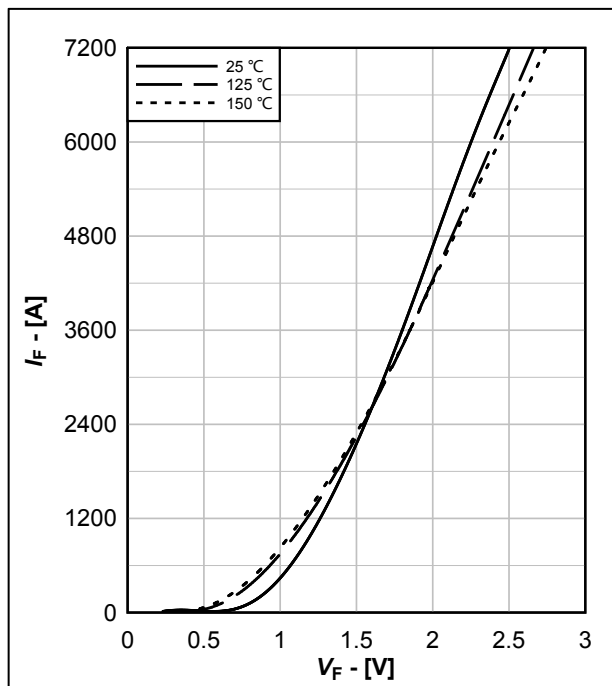

图 7. FRD 输出特性典型曲线, $I_F = f(V_F)$

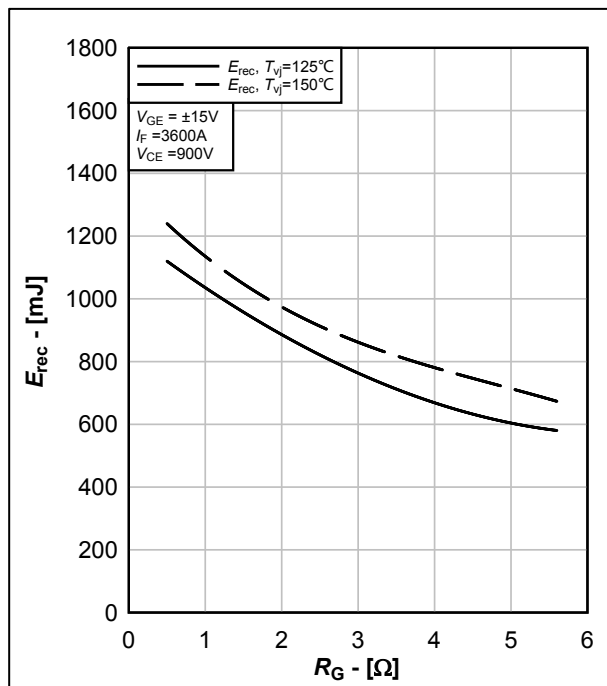
Fig.7 Typical FRD output characteristics, $I_F = f(V_F)$

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

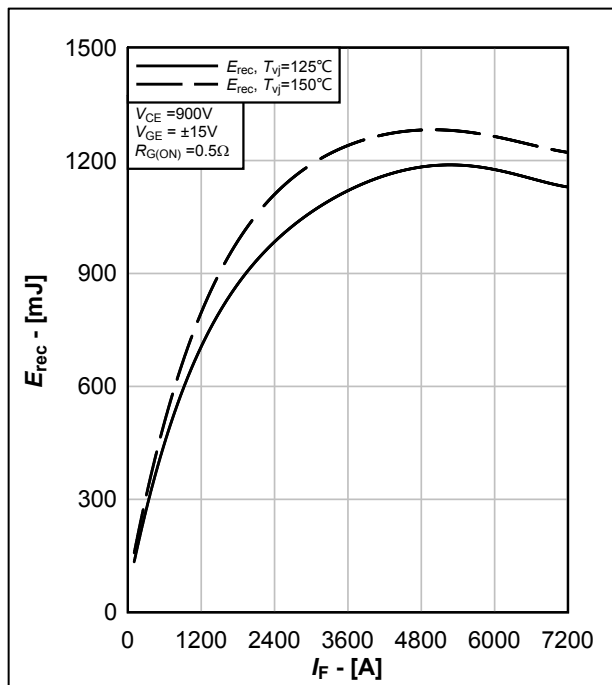
Fig.8 Typical FRD switching loss E_{rec} , $E_{rec} = f(R_G)$

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

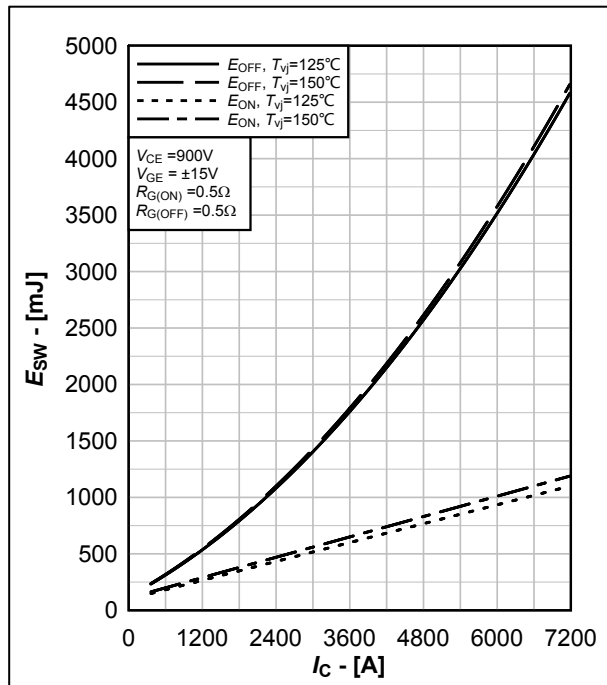
Fig.9 Typical FRD switching loss E_{rec} , $E_{rec} = f(I_F)$

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

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

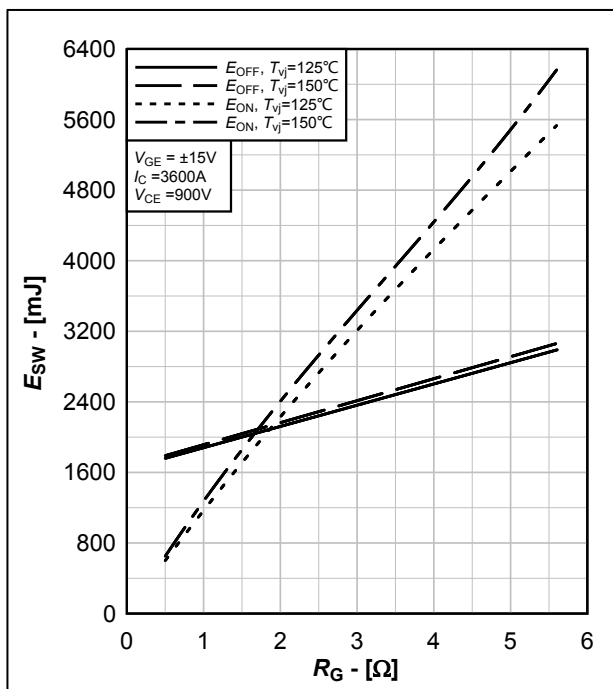

图 11. IGBT 开关损耗典型曲线, $E_{on}=f(R_G)$, $E_{off}=f(R_G)$

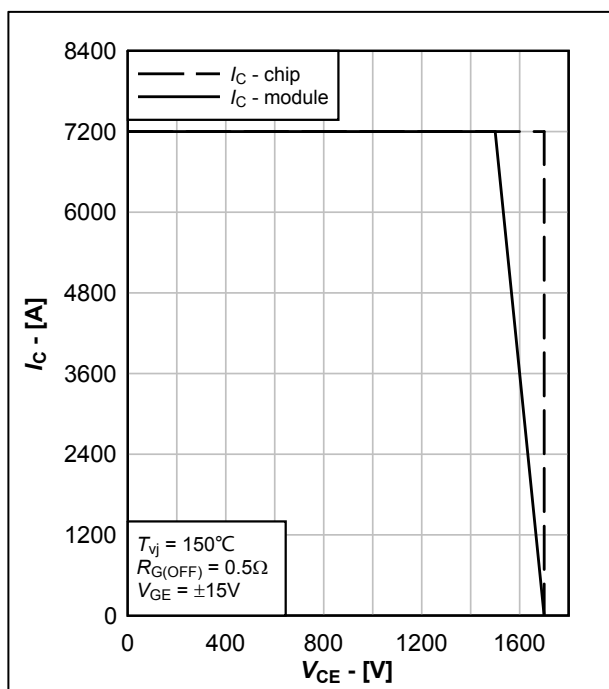
Fig.11 Typical IGBT switching energy, $E_{on}=f(R_G)$, $E_{off}=f(R_G)$

图 12. IGBT 反偏安全工作区, $I_C=f(V_{CE})$

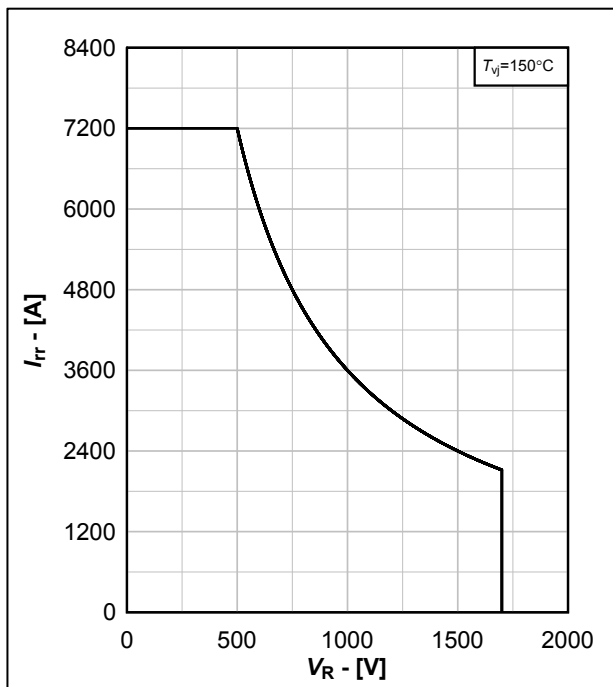
Fig.12 Reverse bias safe operating area of IGBT, $I_C=f(V_{CE})$

图 13. FRD 反偏安全工作区, $I_{rr}=f(V_R)$

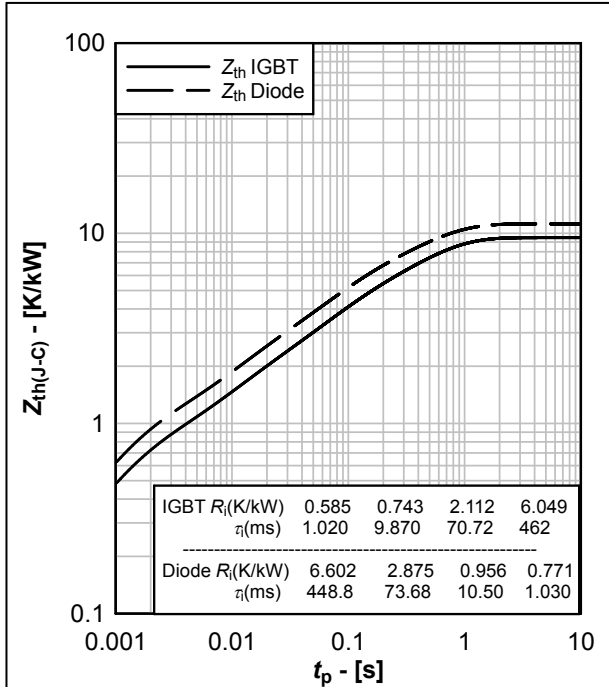
Fig.13 Reverse bias safe operating area of FRD, $I_{rr}=f(V_R)$

图 14. 瞬态热阻抗曲线, $Z_{th(j-c)}=f(t_p)$

Fig.14 Transient thermal impedance, $Z_{th(j-c)}=f(t_p)$

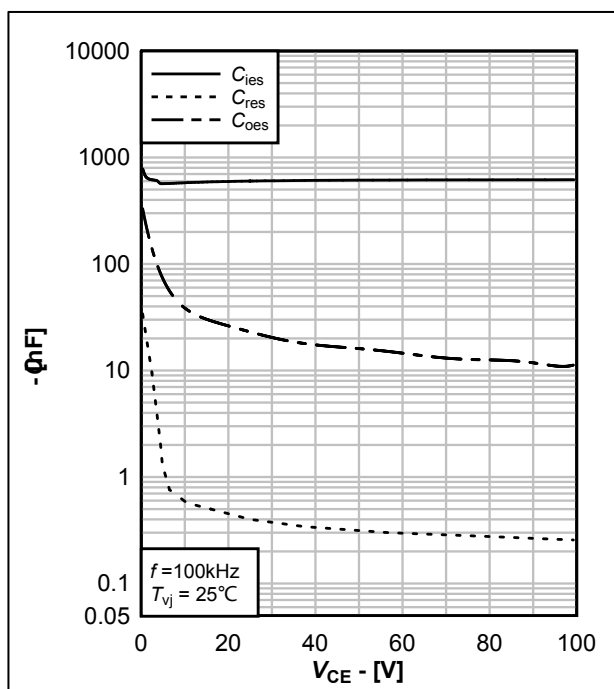

图 15. 电容特性典型曲线, $C = f(V_{CE})$

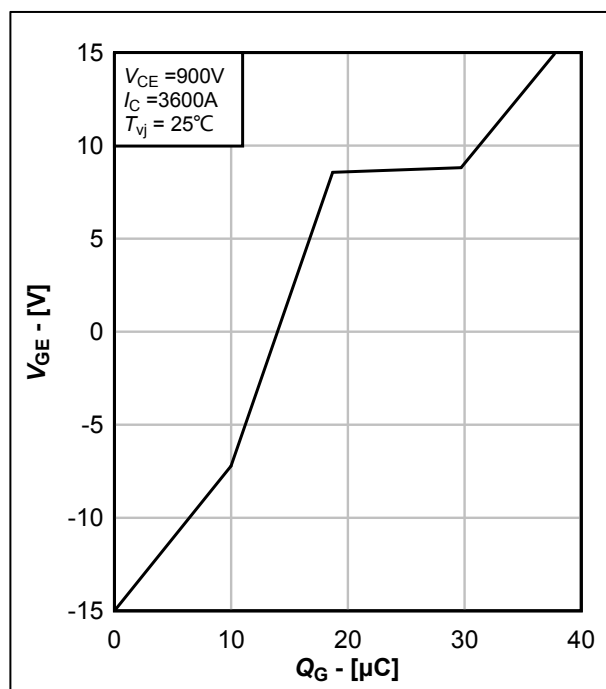
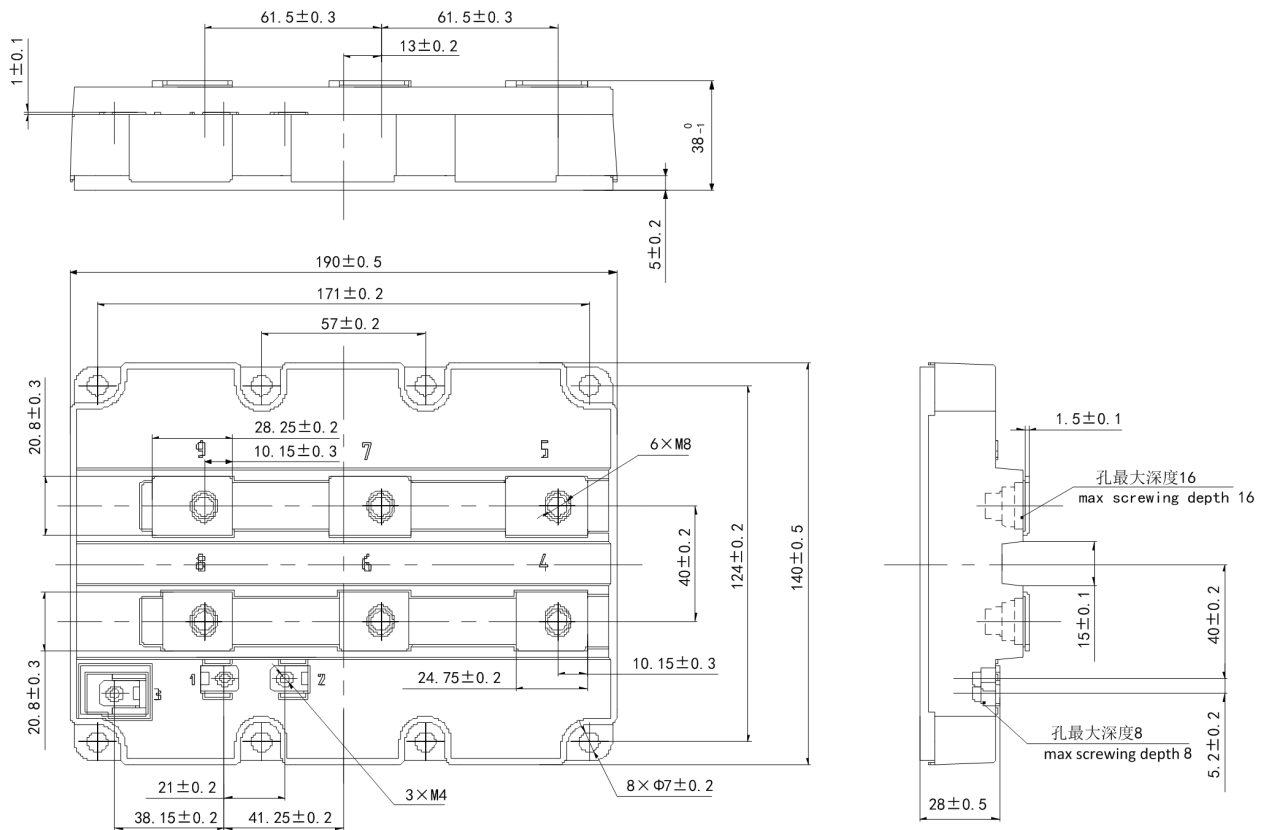
Fig.15 Typical capacity characteristic, $C = f(V_{CE})$

图 16. 栅极电荷特性典型曲线, $V_{GE} = f(Q_G)$

Fig.16 Typical gate charge characteristic, $V_{GE} = f(Q_G)$



重量 Weight: 1100g 模块外观类型 Module outline code: E2

图 17. 模块外观尺寸

Fig. 17 Module outlines

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