

关键参数
Key Parameters

V_{CES}		1200	V
$V_{CE(sat)}$	Typ.	1.75	V
I_C	Max.	300	A
$I_{C(RM)}$	Max.	600	A

典型应用
Typical Applications

● 马达驱动	Motor Drives
● 大功率变流器	High Power Converters
● 风力发电	Wind Turbines
● UPS 系统	UPS Systems

特点
Features

● 铜基板	Cu Baseplate
● 氧化铝衬板	Al_2O_3 Substrates
● 高热循环能力	High Thermal Cycling Capability
● 高功率密度	High Power Density

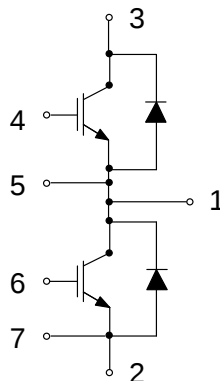
电路结构
Circuit Configuration


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


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	$V_{GE} = 0V, T_C = 25\text{ }^{\circ}\text{C}$	1200	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	$T_C = 100\text{ }^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	300	A
$I_{C(PK)}$	集电极峰值电流 Peak collector current	$t_P=1\text{ms}$	600	A
P_{max}	晶体管部分最大损耗 Max. transistor power dissipation	$T_C = 25\text{ }^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	1.55	kW
t_t	二极管 t_t 值 Diode t_t	$V_R=0V, t_P = 10\text{ms}, T_{vj} = 150\text{ }^{\circ}\text{C}$	16.2	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

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	29.0	mm
	端子-端子 Terminal to terminal	23.0	mm
绝缘间隙 Clearance	端子-散热器 Terminal to heatsink	23.0	mm
	端子-端子 Terminal to terminal	11.0	mm
相对漏电起痕指数 CTI (Comparative Tracking Index)		>400	

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
$R_{th(J-C)} \text{ IGBT}$	IGBT 结壳热阻 Thermal resistance – IGBT				97.0	K / kW
$R_{th(J-C)} \text{ Diode}$	二极管结壳热阻 Thermal resistance – Diode				162.2	K / kW
$R_{th(C-H)} \text{ IGBT}$	接触热阻(IGBT) Thermal resistance – case to heatsink (IGBT)	安装力矩 3.5Nm, 导热脂 1W/m·K Mounting torque 3.5Nm, with mounting grease 1W/m·K		33.9		K / kW
$R_{th(C-H)} \text{ Diode}$	接触热阻(Diode) Thermal resistance – case to heatsink (Diode)	安装力矩 3.5Nm, 导热脂 1W/m·K Mounting torque 3.5Nm, with mounting grease 1W/m·K		37.5		K / kW
$T_{vj \text{ op}}$	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		125	°C
M	安装力矩 Screw torque	安装紧固用 – M6 Mounting – M6	3		6	Nm
		电路互连用 – M6 Electrical connections – M6	2.5		5.0	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
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 125\text{ }^{\circ}\text{C}$			5	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 150\text{ }^{\circ}\text{C}$			10	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	$I_C = 10\text{mA}, V_{GE} = V_{CE}$	5.50	6.10	6.70	V
$V_{CE(sat)}^{(*1)}$	集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 300A$		1.75	2.15	V
		$V_{GE} = 15V, I_C = 300A, T_{vj} = 125\text{ }^{\circ}\text{C}$		2.10		V
		$V_{GE} = 15V, I_C = 300A, T_{vj} = 150\text{ }^{\circ}\text{C}$		2.20		V
I_F	二极管正向直流电流 Diode forward current	DC		300		A
I_{FRM}	二极管正向重复峰值电流 Diode peak forward current	$t_P = 1\text{ms}$		600		A
$V_F^{(*1)}$	二极管正向电压 Diode forward voltage	$I_F = 300A, V_{GE} = 0V$		1.50	1.90	V
		$I_F = 300A, V_{GE} = 0V, T_{vj} = 125\text{ }^{\circ}\text{C}$		1.55		V
		$I_F = 300A, V_{GE} = 0V, T_{vj} = 150\text{ }^{\circ}\text{C}$		1.55		V
I_{SC}	短路电流 Short circuit current	$T_{vj} = 150\text{ }^{\circ}\text{C}, V_{CC} = 800V,$ $V_{GE} \leq 15V, t_p \leq 10\mu\text{s},$ $V_{CE(max)} = V_{CES} - L^{(*2)} \times di/dt,$ IEC 60747-9		1400		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	$V_{CE} = 25V, V_{GE} = 0V, f = 100kHz$		44.7		nF
Q_g	栅极电荷 Gate charge	$\pm 15V$		3.7		μC
C_{res}	反向传输电容 Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 100kHz$		0.6		nF
L_{sCE}	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			0.4		m Ω
R_{Gint}	内部栅极电阻 Internal gate resistor			2.1		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	$I_C=300A$, $V_{CE}=600V$, $V_{GE}=\pm 15V$, $R_{G(OFF)}=3.3\Omega$, $L_S=45nH$, $dv/dt=5200V/\mu s$ ($T_{vj}=150\text{ }^{\circ}C$).	$T_{vj}=25\text{ }^{\circ}C$		550		ns
			$T_{vj}=125\text{ }^{\circ}C$		600		
			$T_{vj}=150\text{ }^{\circ}C$		620		
t_f	下降时间 Fall time		$T_{vj}=25\text{ }^{\circ}C$		240		ns
			$T_{vj}=125\text{ }^{\circ}C$		350		
			$T_{vj}=150\text{ }^{\circ}C$		360		
E_{OFF}	关断损耗 Turn-off energy loss		$T_{vj}=25\text{ }^{\circ}C$		27.0		mJ
			$T_{vj}=125\text{ }^{\circ}C$		34.5		
			$T_{vj}=150\text{ }^{\circ}C$		37.0		
$t_{d(on)}$	开通延迟时间 Turn-on delay time	$T_{vj}=25\text{ }^{\circ}C$		270		ns	
		$T_{vj}=125\text{ }^{\circ}C$		280			
		$T_{vj}=150\text{ }^{\circ}C$		280			
t_r	上升时间 Rise time	$T_{vj}=25\text{ }^{\circ}C$		80		ns	
		$T_{vj}=125\text{ }^{\circ}C$		90			
		$T_{vj}=150\text{ }^{\circ}C$		90			
E_{ON}	开通损耗 Turn-on energy loss	$T_{vj}=25\text{ }^{\circ}C$		20.5		mJ	
		$T_{vj}=125\text{ }^{\circ}C$		27.0			
		$T_{vj}=150\text{ }^{\circ}C$		30.5			
Q_{rr}	二极管反向恢复电荷 Diode reverse recovery charge	$T_{vj}=25\text{ }^{\circ}C$		20.0		μC	
		$T_{vj}=125\text{ }^{\circ}C$		41.5			
		$T_{vj}=150\text{ }^{\circ}C$		49.5			
I_{rr}	二极管反向恢复电流 Diode reverse recovery current	$T_{vj}=25\text{ }^{\circ}C$		320		A	
		$T_{vj}=125\text{ }^{\circ}C$		360			
		$T_{vj}=150\text{ }^{\circ}C$		380			
E_{rec}	二极管反向恢复损耗 Diode reverse recovery energy	$T_{vj}=25\text{ }^{\circ}C$		7.0		mJ	
		$T_{vj}=125\text{ }^{\circ}C$		16.0			
		$T_{vj}=150\text{ }^{\circ}C$		18.5			

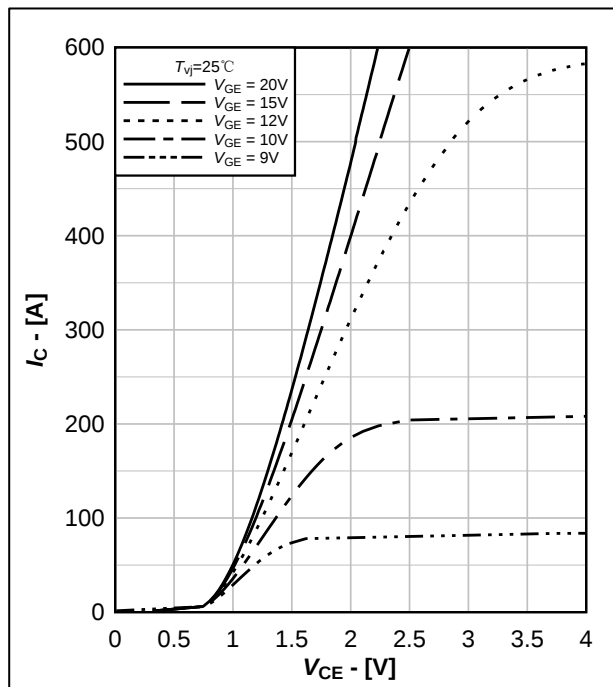

图 3. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

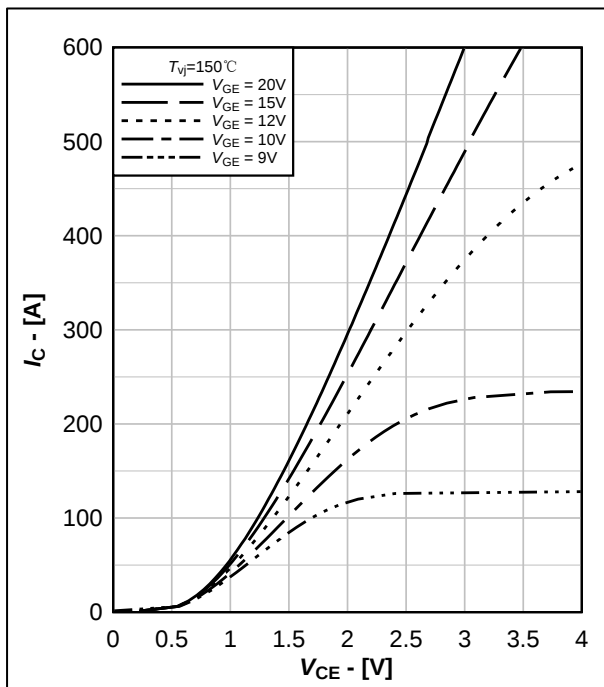
Fig.3 Typical IGBT output characteristic, $I_C = f(V_{CE})$

图 4. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

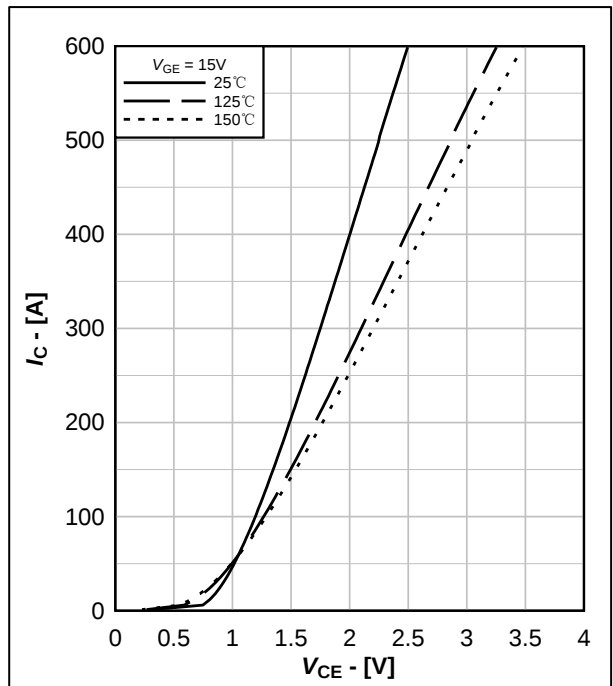
Fig.4 Typical IGBT output characteristic, $I_C = f(V_{CE})$

图 5. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

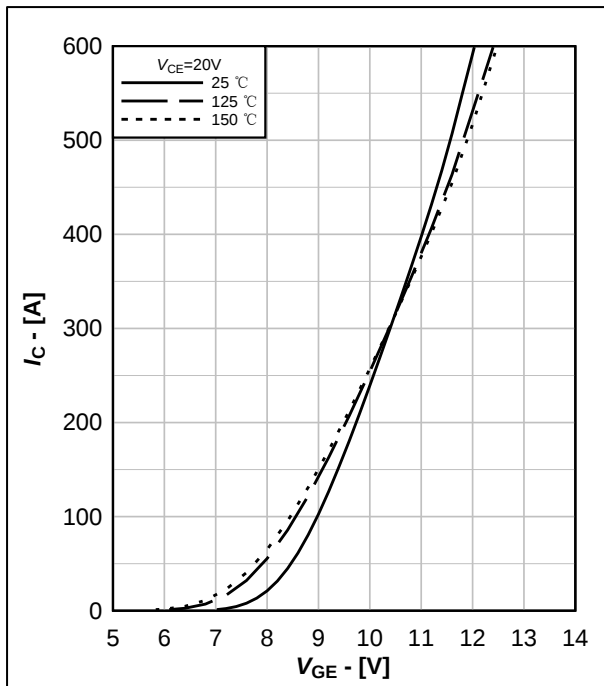
Fig.5 Typical IGBT output characteristic, $I_C = f(V_{CE})$

图 6. IGBT 传输特性典型曲线, $I_C = f(V_{GE})$

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

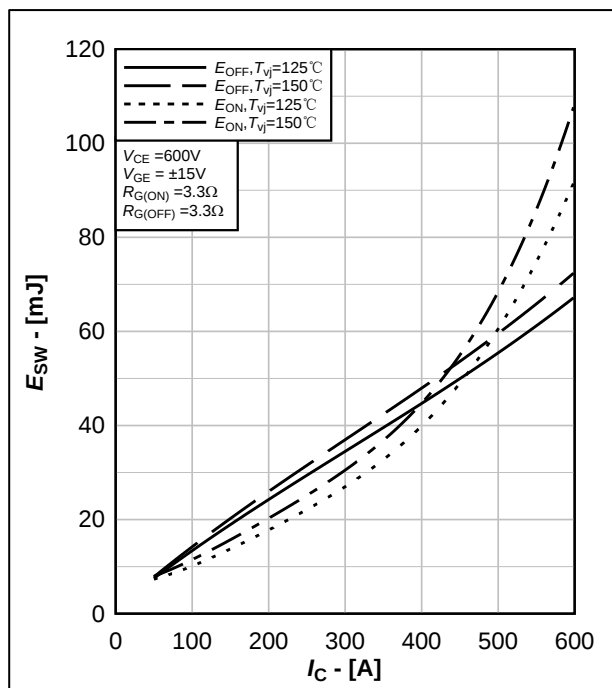

 图 7. IGBT 开关损耗典型曲线, $E_{on}=f(I_c)$, $E_{off}=f(I_c)$

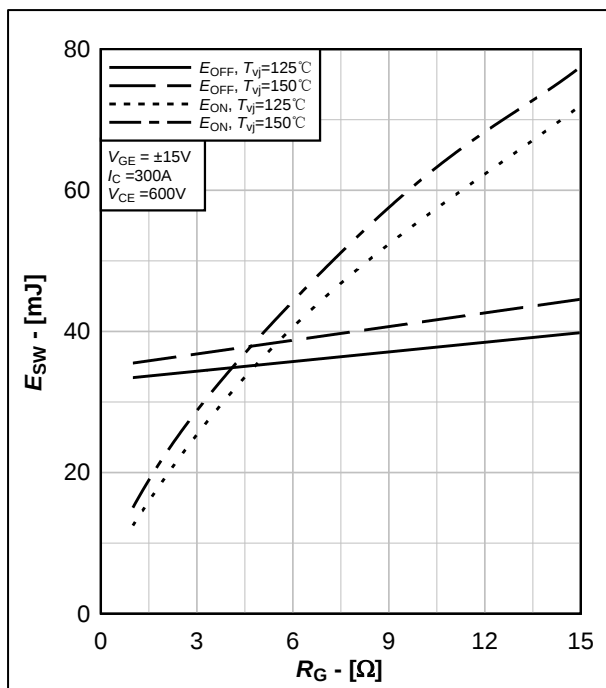
 Fig.7 Typical IGBT switching energy, $E_{on}=f(I_c)$, $E_{off}=f(I_c)$

 图 8. IGBT 开关损耗典型曲线, $E_{on}=f(R_g)$, $E_{off}=f(R_g)$

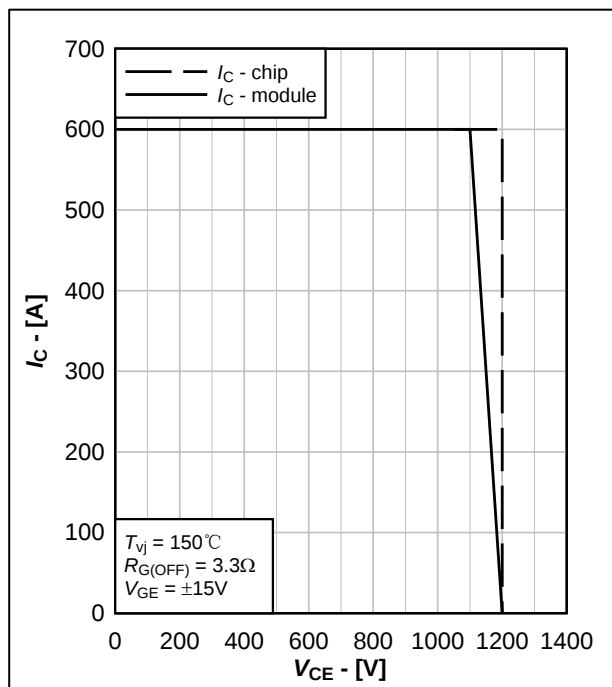
 Fig.8 Typical IGBT switching energy, $E_{on}=f(R_g)$, $E_{off}=f(R_g)$

 图 9. IGBT 反偏安全工作区, $I_c=f(V_{ce})$

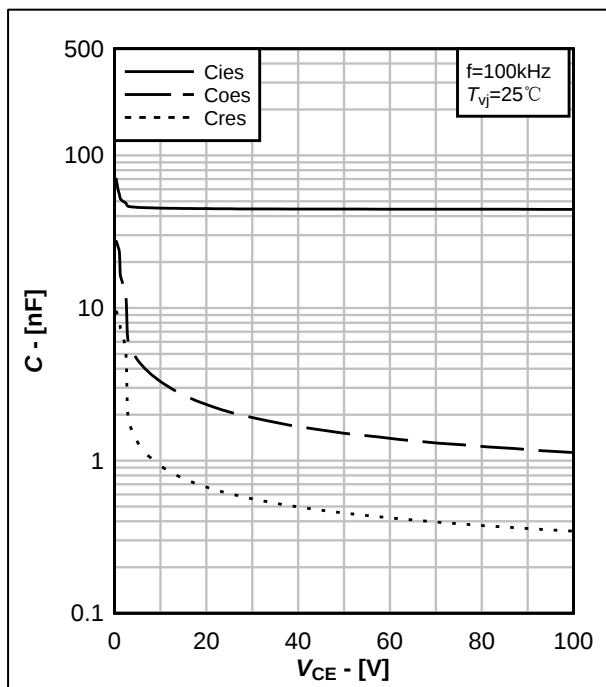
 Fig.9 Reverse bias safe operating area of IGBT, $I_c=f(V_{ce})$

 图 10. 电容特性典型曲线, $C=f(V_{ce})$

 Fig.10 Typical capacity characteristic, $C=f(V_{ce})$

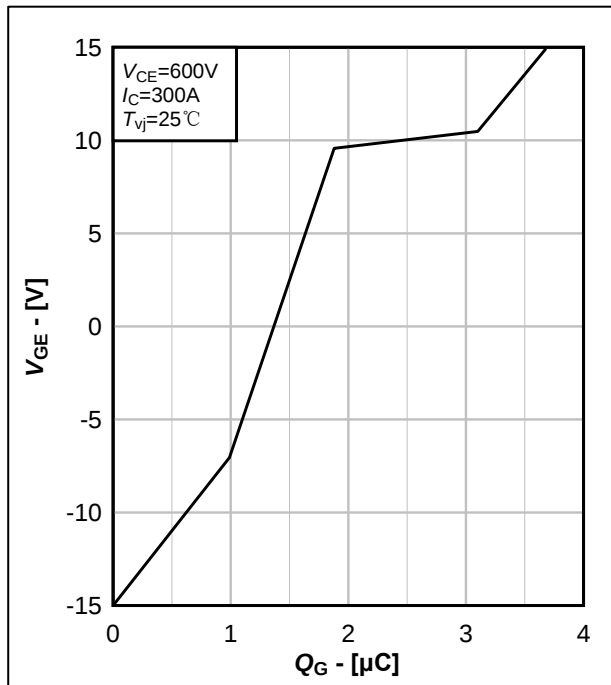

 图 11. 栅极电荷特性典型曲线, $V_{GE} = f(Q_G)$

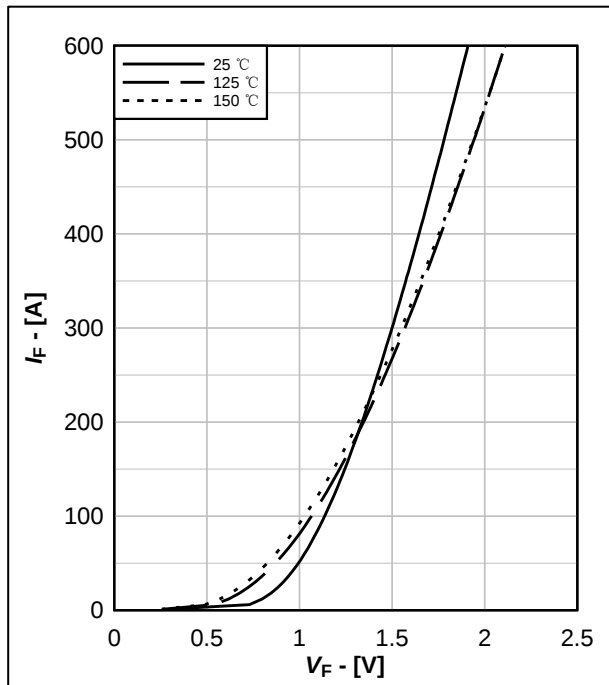
 Fig.11 Typical gate charge characteristic, $V_{GE} = f(Q_G)$

 图 12. FRD 输出特性典型曲线, $I_F = f(V_F)$

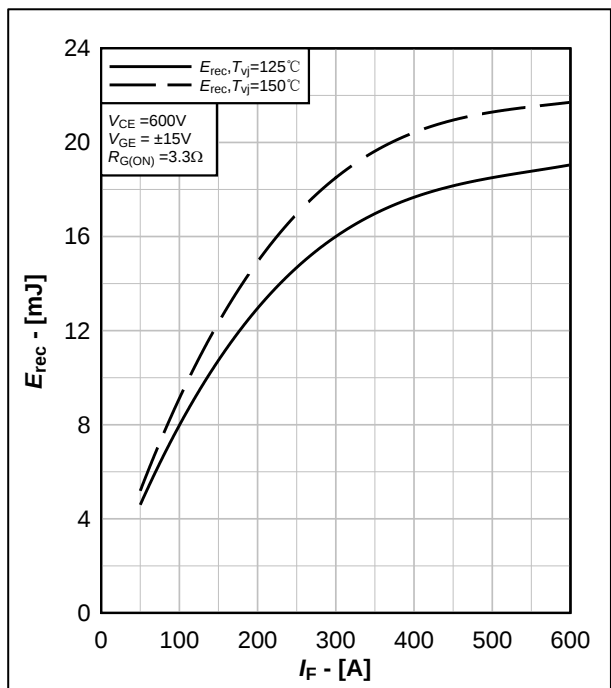
 Fig.12 Typical FRD output characteristic, $I_F = f(V_F)$

 图 13. FRD 反向恢复损耗典型曲线, $E_{rec} = f(I_F)$

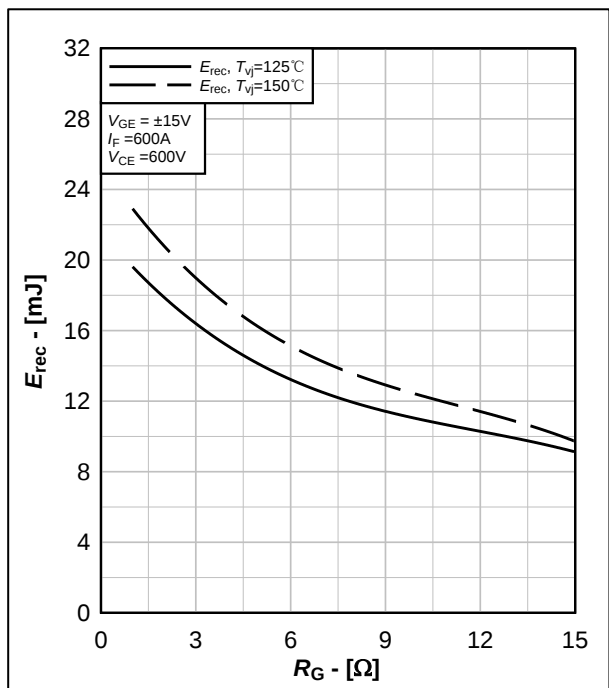
 Fig.13 Typical FRD switching loss E_{rec} , $E_{rec} = f(I_F)$

 图 14. FRD 反向恢复损耗典型曲线, $E_{rec} = f(R_G)$

 Fig.14 Typical FRD switching loss E_{rec} , $E_{rec} = f(R_G)$

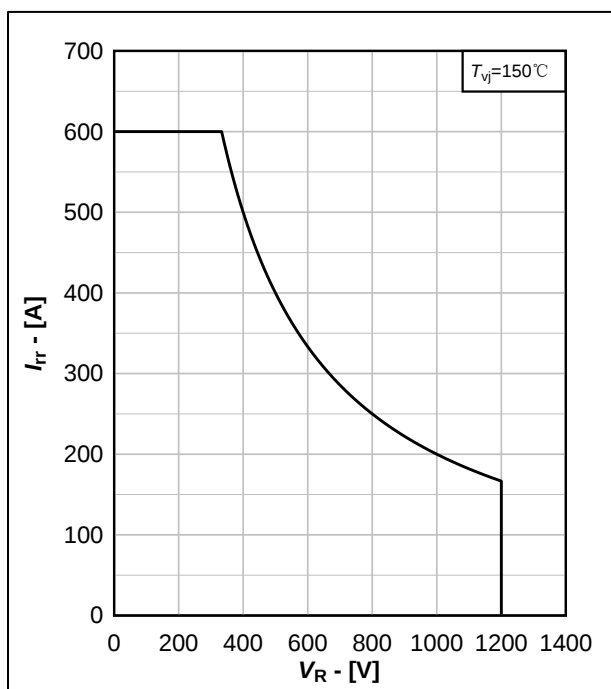


图 15. FRD 反偏安全工作区, $I_{rr} = f(V_R)$

Fig.15 Reverse bias safe operating area of FRD, $I_{rr} = f(V_R)$

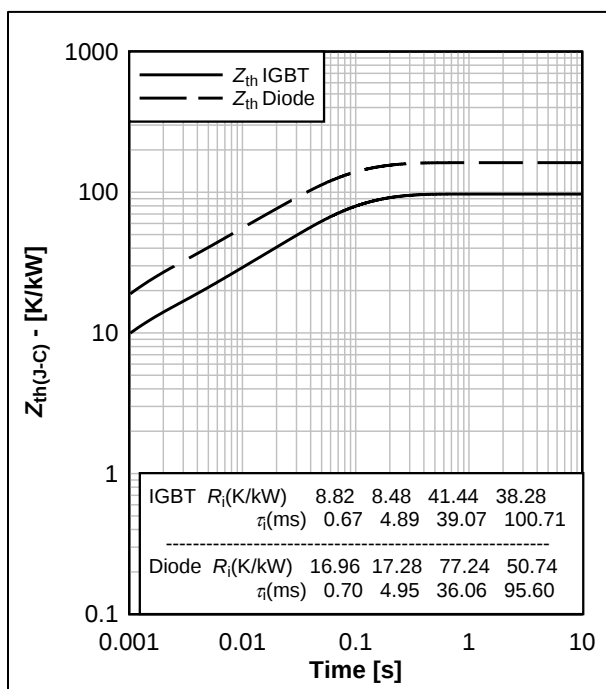


图 16. 瞬态热阻抗曲线, $Z_{th(j-c)} = f(t_p)$

Fig.16 Transient thermal impedance, $Z_{th(j-c)} = f(t_p)$



图 17. 模块外观尺寸

Fig. 17 Module outlines

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