

关键参数
Key Parameters

V_{CES}		950	V
$V_{CE(sat)}$	Typ.	1.23	V
I_C	Max.	100	A
$I_{C(RM)}$	Max.	200	A

典型应用
Typical Applications

- 三电平应用 3-level-applications Converters
- 光伏应用 Solar Applications
- UPS 系统 UPS Systems

特点
Features

- SiC 二极管 Ultra-fast SiC Diode
- 低开关损耗 Low Switching Losses
- 低感设计 Low Inductive Design
- 集成 NTC Integrated NTC

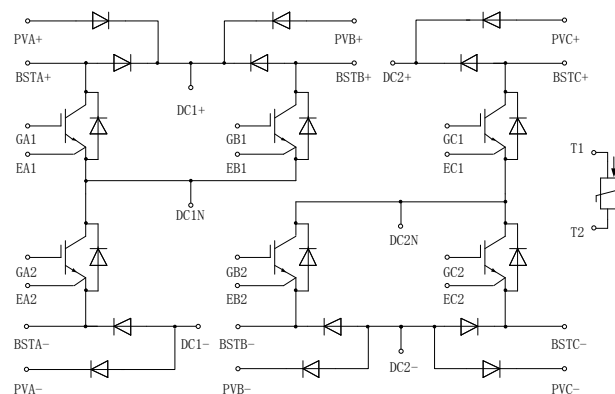
电路结构
Circuit Configuration


图 1. 电路结构

Fig. 1 Circuit configuration

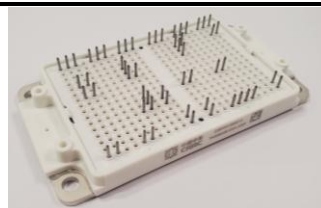
模块外形
Module Appearance


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
13--17	模块型号代码 Module type code
18--19	模块生产周数 Module production weeks

IGBT 提升, 二极管转换器
IGBT Boost, Diode Boost
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	$V_{GE} = 0V, T_C = 25\text{ }^{\circ}\text{C}$	950	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	$T_H = 65\text{ }^{\circ}\text{C}, T_{vj\text{ max}}=175\text{ }^{\circ}\text{C}$	70	A
	额定电流 Rating Current		100	A
$I_{C(PK)}$	集电极峰值电流 Peak collector current	$t_P=1\text{ms}$	200	A
P_{max}	晶体管部分最大损耗 Max. transistor power dissipation	$T_C = 25\text{ }^{\circ}\text{C}, T_{vj\text{ max}}=175\text{ }^{\circ}\text{C}$	339	W
V_{RRM}	二极管重复峰值电压 Diode repetitive voltage		1200	V
I_F	二极管正向直流电流 Diode forward current	DC	25	A
	二极管额定正向电流 Diode rating forward current		30	A
I_{FRM}	二极管正向重复峰值电流 Diode peak forward current	$t_P = 1\text{ms}$	60	A
I^2t	二极管 I^2t 值 Diode I^2t	$V_R = 0V, t_P = 10\text{ms}, T_{vj} = 150\text{ }^{\circ}\text{C}$	66	A^2s

热数据
Thermal 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				443	K / kW
$R_{th(J-C)} \text{ Diode}$	二极管结壳热阻 Thermal resistance – Diode				910	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 3.3W/m·K Mounting torque 3.5Nm, with mounting grease 3.3W/m·K		193		
$R_{th(C-H)} \text{ Diode}$	接触热阻(Diode) Thermal resistance – case to heatsink (Diode)	安装力矩 3.5Nm, 导热脂 3.3W/m·K Mounting torque 3.5Nm, with mounting grease 3.3W/m·K		311		
$T_{vj\text{ op}}$	工作结温 Operating junction temperature		-40		150	$^{\circ}\text{C}$

IGBT 提升，二极管转换器

IGBT Boost, Diode Boost

IGBT 提升，二极管转换器
IGBT Boost, Diode Boost
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 =25A, V_{CE} = 500V, V_{GE} = -7.5/+15V, $R_{G(OFF)}$ = 10Ω, L_S = 35nH, dv/dt =4300V/μs (T_{vj} = 150 °C).	T_{vj} = 25 °C		220		ns
			T_{vj} = 125 °C		260		
			T_{vj} = 150 °C		275		
t_f	下降时间 Fall time		T_{vj} = 25 °C		65		ns
			T_{vj} = 125 °C		65		
			T_{vj} = 150 °C		85		
E_{OFF}	关断损耗 Turn-off energy loss		T_{vj} = 25 °C		0.80		mJ
			T_{vj} = 125 °C		1.05		
			T_{vj} = 150 °C		1.10		
$t_{d(on)}$	开通延迟时间 Turn-on delay time	T_{vj} = 25 °C		85		ns	
		T_{vj} = 125 °C		80			
		T_{vj} = 150 °C		80			
t_r	上升时间 Rise time	T_{vj} = 25 °C		14		ns	
		T_{vj} = 125 °C		17			
		T_{vj} = 150 °C		18			
E_{ON}	开通损耗 Turn-on energy loss	T_{vj} = 25 °C		0.03		mJ	
		T_{vj} = 125 °C		0.10			
		T_{vj} = 150 °C		0.11			
Q_{rr}	二极管反向恢复电荷 Diode reverse recovery charge	T_{vj} = 25 °C		0.15		μC	
		T_{vj} = 125 °C		0.17			
		T_{vj} = 150 °C		0.19			
I_{rr}	二极管反向恢复电流 Diode reverse recovery current	T_{vj} = 25 °C		7		A	
		T_{vj} = 125 °C		10			
		T_{vj} = 150 °C		10			
E_{rec}	二极管反向恢复损耗 Diode reverse recovery energy	T_{vj} = 25 °C		0.060		mJ	
		T_{vj} = 125 °C		0.070			
		T_{vj} = 150 °C		0.073			

旁路二极管
Bypass Diode
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_{RRM}	反向重复峰值电压 Repetitive peak reverse voltage	$T_C = 25\text{ }^{\circ}\text{C}$	1200	V
I_{FRMSM}	最大正向均方根电流（每芯片） Maximum RMS forward current per chip	$T_H = 75\text{ }^{\circ}\text{C}$	50	A
I_{RMSM}	最大整流器输出均方根电流 Maximum RMS current at rectifier output	$T_H = 75\text{ }^{\circ}\text{C}$	50	A
I_{FSM}	浪涌电流 Surge current	$V_R = 0V, t_P = 10ms, T_{vj} = 110\text{ }^{\circ}\text{C}$	832	A
I^2t	二极管 I^2t 值 Diode I^2t	$V_R = 0V, t_P = 10ms, T_{vj} = 110\text{ }^{\circ}\text{C}$	3461	A^2s

特征值
Characteristic Values

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
V_F	正向电压 Forward voltage	$T_{vj} = 150^{\circ}\text{C}, I_F = 45A$		1.00	1.35	V
I_{RRM}	重复反向电流 Repetitive reverse current	$T_{vj} = 150^{\circ}\text{C}, V_R = 1200V$			5	mA
$R_{th(J-C) \text{ Diode}}$	二极管结壳热阻 Thermal resistance –Diode				415	K / kW
$R_{th(C-H) \text{ Diode}}$	接触热阻(Diode) Thermal resistance – case to heatsink (Diode)	安装力矩 1.3Nm, 导热脂 3.3W/m·K Mounting torque 1.3Nm, with mounting grease 3.3W/m·K		242		K / kW
$T_{vj \text{ op}}$	工作结温 Operating junction temperature		-40		110	$^{\circ}\text{C}$

反极性保护二极管
Inverse-polarity Protection Diode
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_{RRM}	反向重复峰值电压 Repetitive peak reverse voltage	$T_C = 25\text{ }^{\circ}\text{C}$	1200	V
I_{FRMSM}	最大正向均方根电流（每芯片） Maximum RMS forward current per chip	$T_H = 70\text{ }^{\circ}\text{C}$	30	A
I_{RMSM}	最大整流器输出均方根电流 Maximum RMS current at rectifier output	$T_H = 70\text{ }^{\circ}\text{C}$	30	A
I_{FSM}	浪涌电流 Surge current	$V_R = 0V, t_P = 10ms, T_{vj} = 150\text{ }^{\circ}\text{C}$	280	A
I^2t	二极管 I^2t 值 Diode I^2t	$V_R = 0V, t_P = 10ms, T_{vj} = 150\text{ }^{\circ}\text{C}$	392	A^2s

特征值
Characteristic Values

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
V_F	正向电压 Forward voltage	$T_{vj} = 150\text{ }^{\circ}\text{C}, I_F = 15A$		1.00	1.35	V
I_{RRM}	重复反向电流 Repetitive reverse current	$T_{vj} = 150\text{ }^{\circ}\text{C}, V_R = 1200V$			5	mA
$R_{th(J-C) \text{ Diode}}$	二极管结壳热阻 Thermal resistance –Diode				1062	K / kW
$R_{th(C-H) \text{ Diode}}$	接触热阻(Diode) Thermal resistance – case to heatsink (Diode)	安装力矩 1.3Nm, 导热脂 3.3W/m·K Mounting torque 1.3Nm, with mounting grease 3.3W/m·K		208		K / kW
$T_{vj \text{ op}}$	工作结温 Operating junction temperature		-40		110	$^{\circ}\text{C}$

热敏电阻数据
NTC-Thermistor 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_{25}	额定电阻值 Rated resistance	$T_C = 25\text{ }^{\circ}\text{C}$		5		k Ω
$\Delta R/R$	R100 偏差 Deviation of R100	$T_C = 100\text{ }^{\circ}\text{C}$, $R_{100}=493\Omega$	-5		5	%
P_{25}	耗散功率 Power dissipation	$T_C = 25\text{ }^{\circ}\text{C}$			20	mW
$B_{25/50}$	B-值 B-value	$R_2 = R_{25}\exp [B_{25/50}(1/T_2 - 1/(298.15\text{ K}))]$		3375		K
$B_{25/80}$	B-值 B-value	$R_2 = R_{25}\exp [B_{25/80}(1/T_2 - 1/(298.15\text{ K}))]$		3411		K
$B_{25/100}$	B-值 B-value	$R_2 = R_{25}\exp [B_{25/100}(1/T_2 - 1/(298.15\text{ K}))]$		3433		K

模块
Module

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	11.2	mm
	端子-端子 Terminal to terminal	6.8	mm
绝缘间隙 Clearance	端子-散热器 Terminal to heatsink	9.4	mm
	端子-端子 Terminal to terminal	5.5	mm
相对漏电起痕指数 CTI (Comparative Tracking Index)		>400	
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, $T_C= 25\text{ }^{\circ}\text{C}$	3200	V

模块
Module

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
L_{sCE}	模块电感 Module inductance			22		nH
T_{stg}	存储温度 Storage temperature range		-40		125	$^{\circ}\text{C}$
M	安装力矩 Screw torque	安装紧固用 Mounting	3		5	Nm

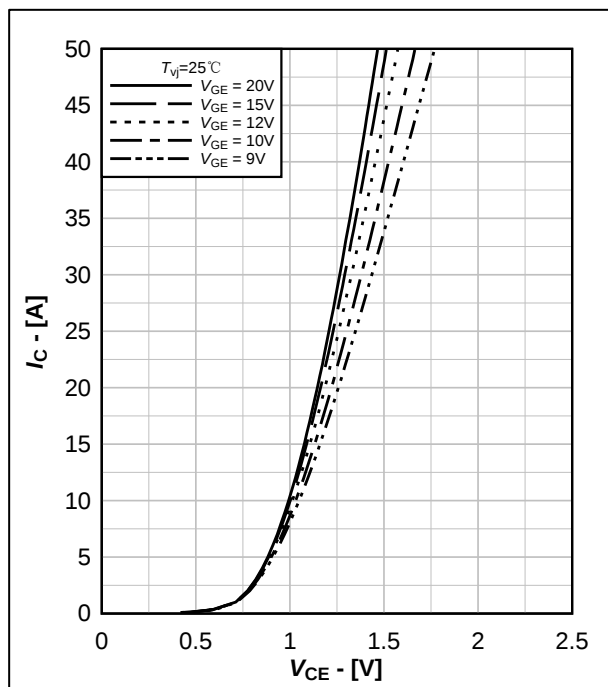
IGBT 提升，二极管转换器
IGBT Boost, Diode Boost

图 3. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

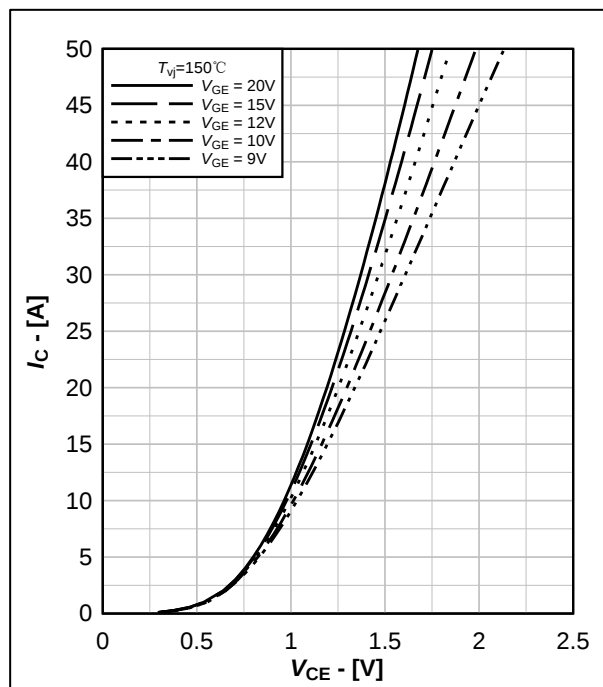
Fig.3 Typical IGBT output characteristic, $I_C = f(V_{CE})$

图 4. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

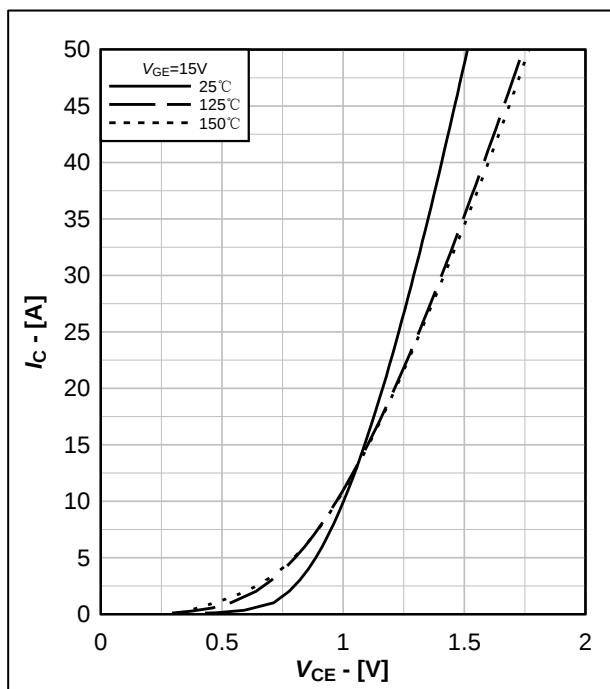
Fig.4 Typical IGBT output characteristic, $I_C = f(V_{CE})$

图 5. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$

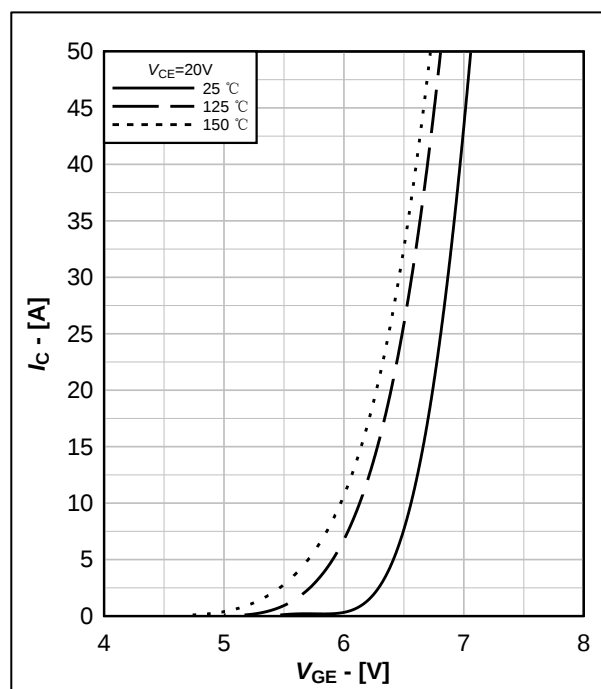
Fig.5 Typical IGBT output characteristic, $I_C = f(V_{CE})$

图 6. IGBT 传输特性典型曲线, $I_C = f(V_{GE})$

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

IGBT 提升, 二极管转换器

IGBT Boost, Diode Boost

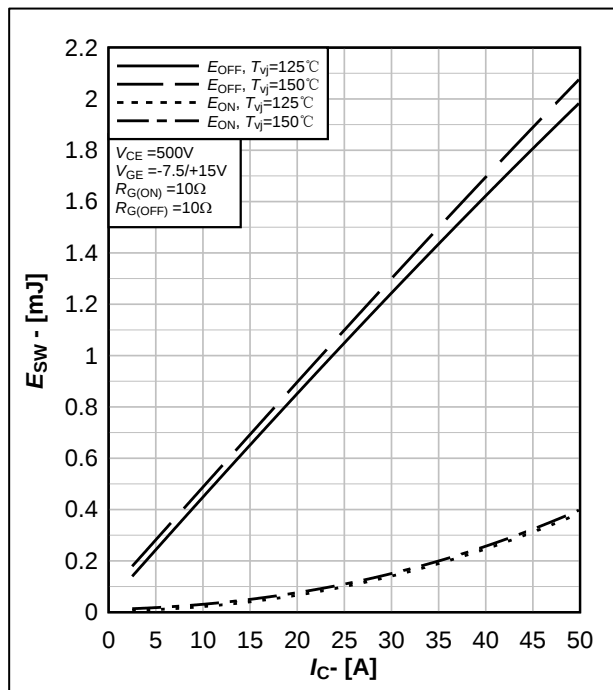

 图 7. IGBT 开关损耗典型曲线, $E_{on}=f(I_C)$, $E_{off}=f(I_C)$

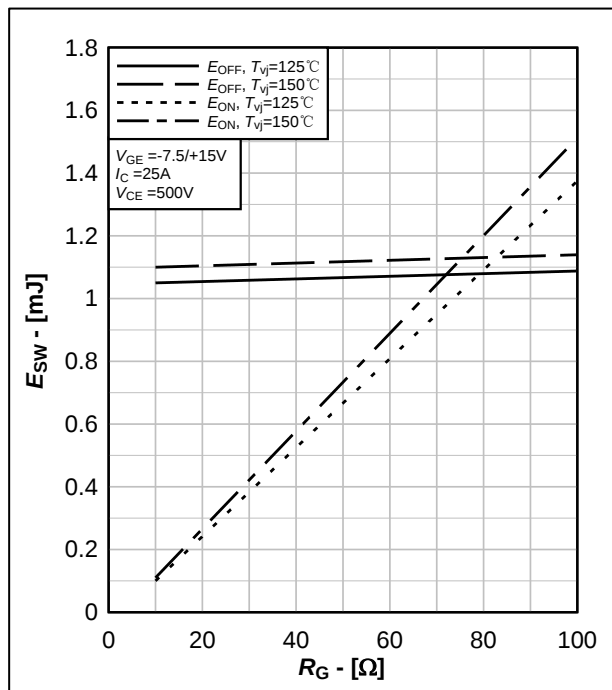
 Fig.7 Typical IGBT switching energy, $E_{on}=f(I_C)$, $E_{off}=f(I_C)$

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

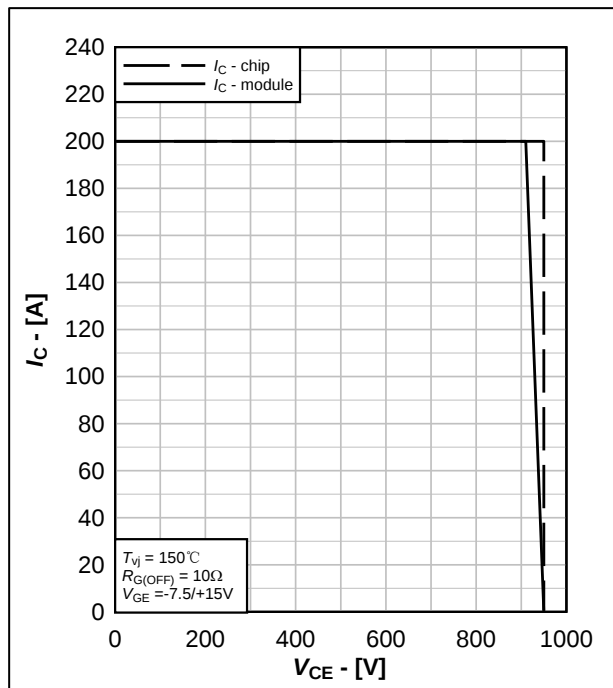
 Fig.8 Typical IGBT switching energy, $E_{on}=f(R_G)$, $E_{off}=f(R_G)$

 图 9. IGBT 反偏安全工作区, $I_C=f(V_{CE})$

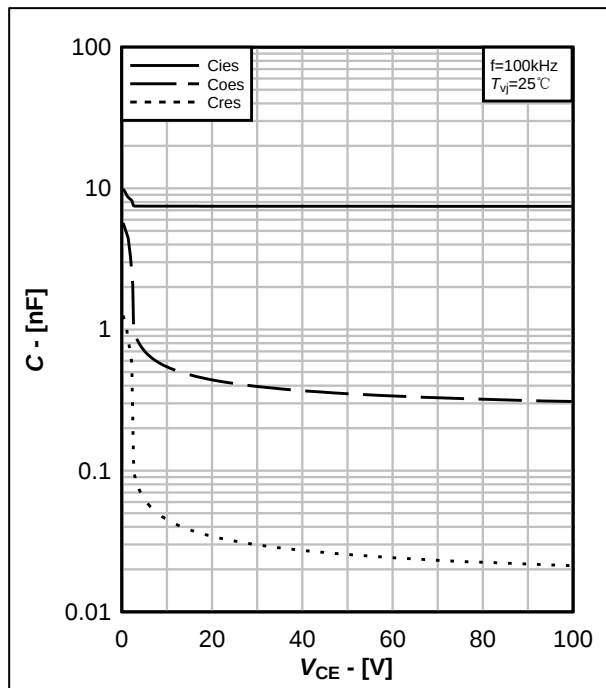
 Fig.9 Reverse bias safe operating area of IGBT, $I_C=f(V_{CE})$

 图 10. 电容特性典型曲线, $C=f(V_{CE})$

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

IGBT 提升，二极管转换器

IGBT Boost, Diode Boost

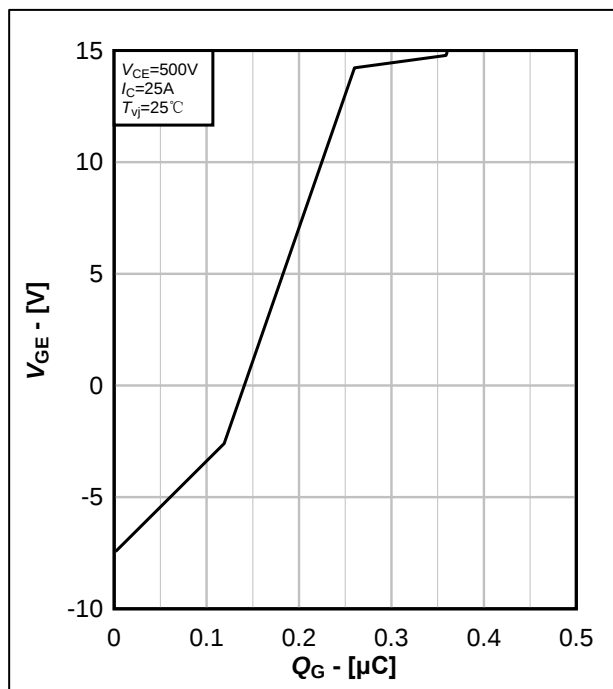

图 11. 栅极电荷特性典型曲线, $V_{GE} = f(Q_G)$

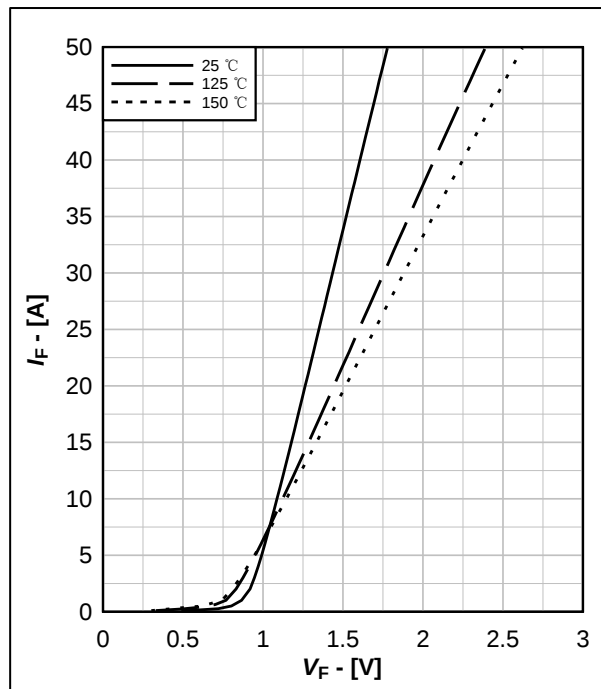
Fig.11 Typical gate charge characteristic, $V_{GE} = f(Q_G)$

图 12. FRD 输出特性典型曲线, $I_F = f(V_F)$

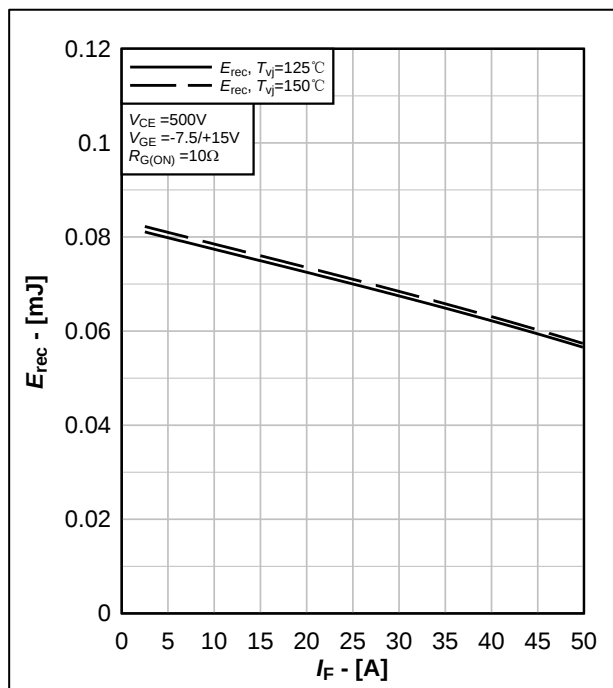
Fig.12 Typical FRD output characteristic, $I_F = f(V_F)$

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

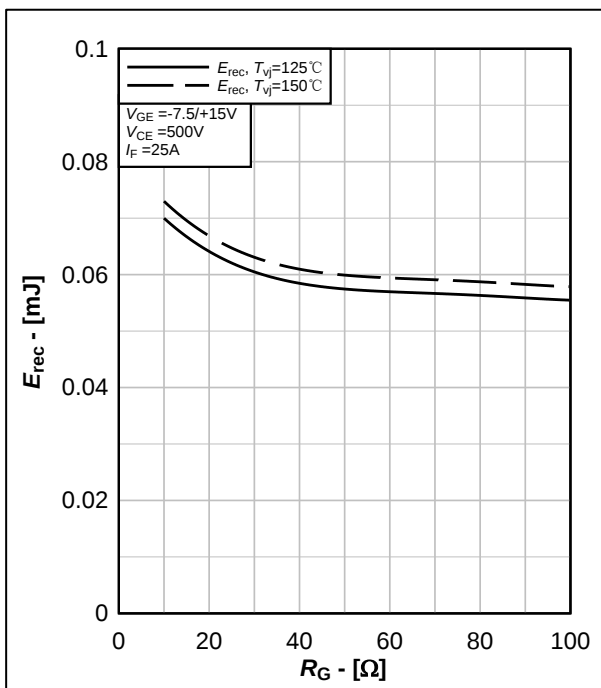
Fig.13 Typical FRD switching loss E_{rev} $E_{rec} = f(I_F)$

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_{rev} $E_{rec} = f(R_G)$

IGBT 提升, 二极管转换器

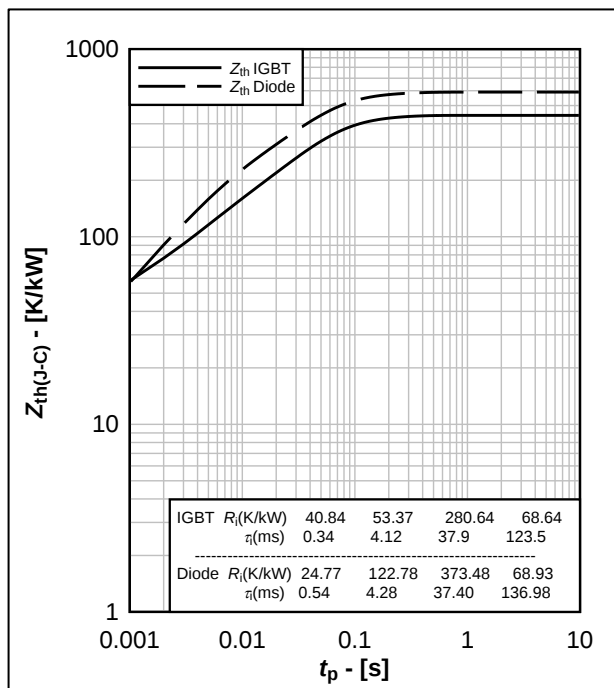

 图 15. 瞬态热阻抗曲线, $Z_{th(j-c)} = f(t_p)$

 Fig.15 Transient thermal impedance, $Z_{th(j-c)} = f(t_p)$

IGBT Boost, Diode Boost

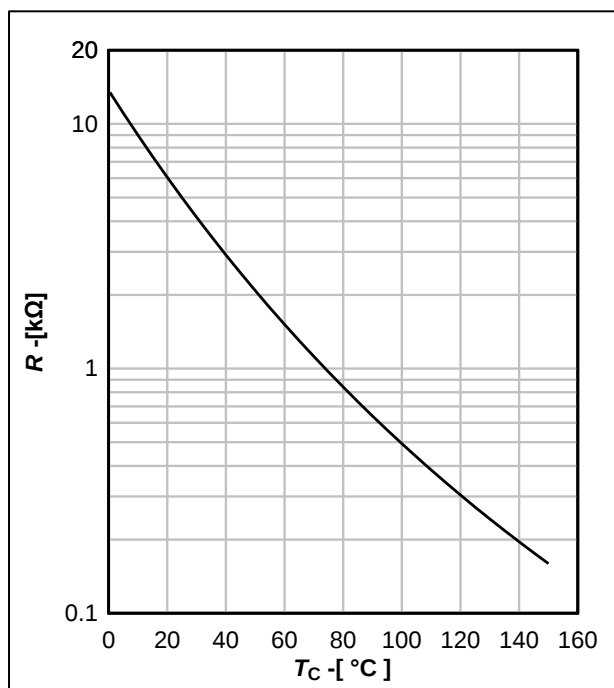

 图 16. 热敏电阻典型特性曲线, $R = f(T_c)$

 Fig.16 Typical NTC thermistor characteristic, $R = f(T_c)$

旁路二极管

Bypass Diode

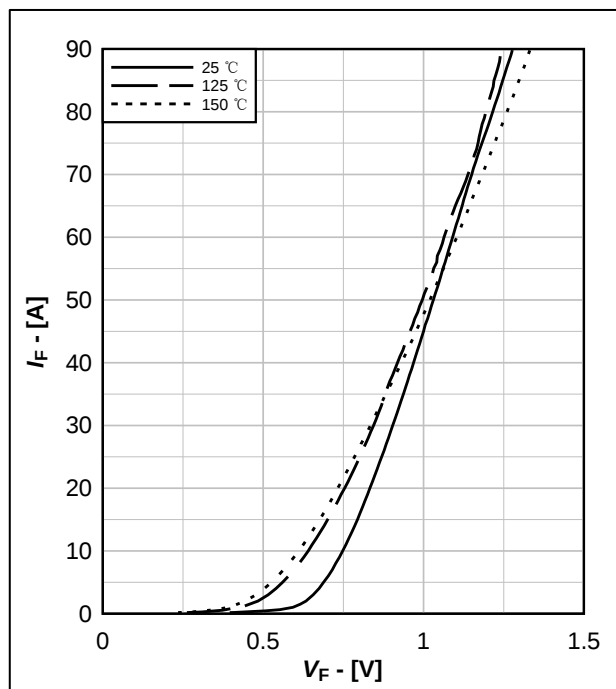


图 17. FRD 输出特性典型曲线, $I_F = f(V_F)$

Fig.17 Typical FRD output characteristic, $I_F = f(V_F)$

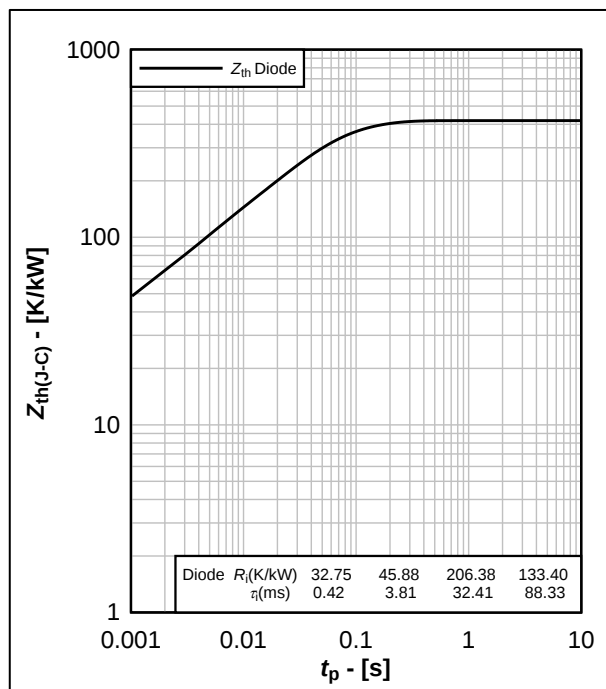


图 18. 瞬态热阻抗曲线, $Z_{th(J-C)} = f(t_p)$

Fig.18 Transient thermal impedance, $Z_{th(J-C)} = f(t_p)$

反极性保护二极管

Inverse-polarity Protection Diode

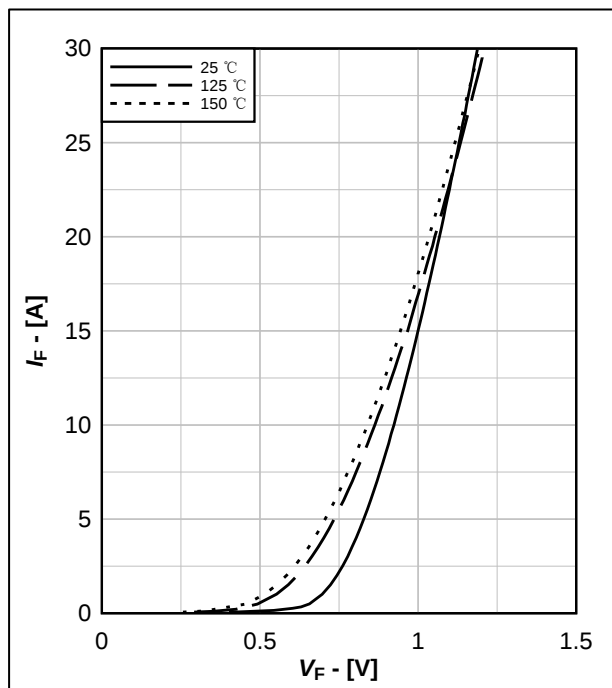


图 19. FRD 输出特性典型曲线, $I_F = f(V_F)$

Fig.19 Typical FRD output characteristic, $I_F = f(V_F)$

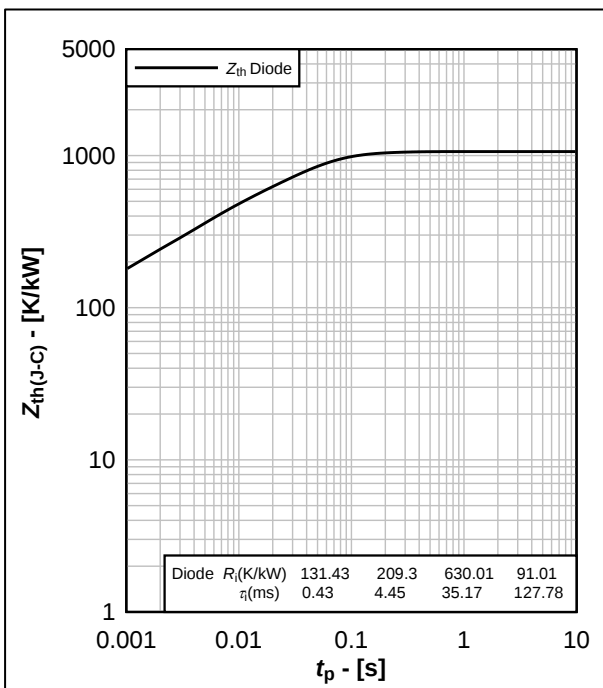
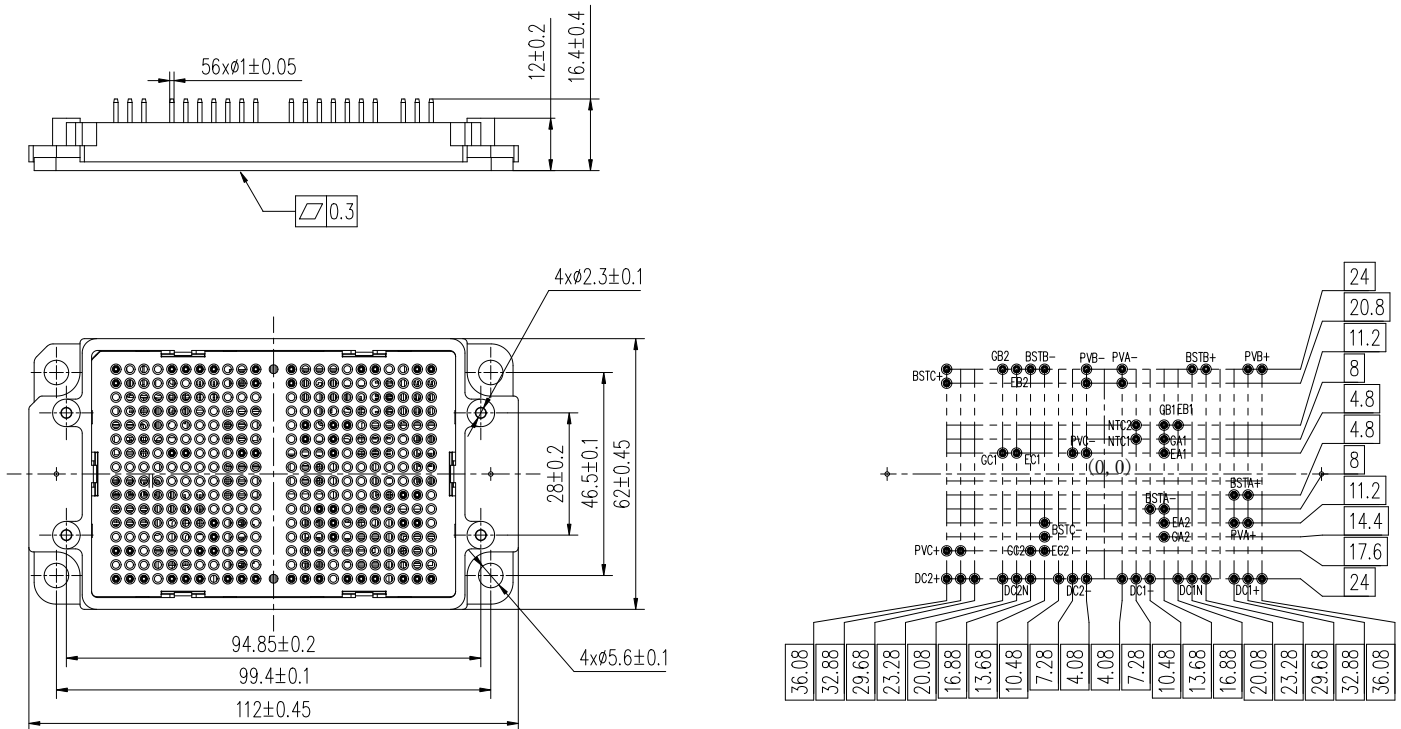


图 20. 瞬态热阻抗曲线, $Z_{th(J-C)} = f(t_p)$

Fig.20 Transient thermal impedance, $Z_{th(J-C)} = f(t_p)$



重量 Weight: 104g 模块外观类型 Module outline code: U3

图 21. 模块外观尺寸

Fig. 21 Module outlines

株洲中车时代半导体有限公司

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(6) 产品数据手册首页的右上角，会显示产品的状态。如果它尚未完全批准，会标示**初版（preliminary）**，该标示意味着该产品已完成设计，量产的产品参数正在确定中，数据手册中的产品信息目前是可以参考的，但将来某些细节可能会发生变化。如果产品数据手册首页的右上角没有标注，则表示该产品已可以批量生产。

Terms and conditions of usage

(1) The product information in this datasheet are intended for use by technical personnel. Due to the diversity of product applications, the information contained in this document can only be used as a general guide, the application applicability cannot be guaranteed in some special applications. It is recommended that users do the assessment of the application applicability before applied. If users need additional product information and help, please contact our sales or technical support.

(2) Some product data in the datasheet of this product are the typical values, the actual factory testing data may deviate slightly from typical values, but our company guarantees that these deviations will not affect the normal use of the product. If the product information changes, our company will promptly amend the datasheet, please keeps your attention to product information changing in our company website.

(3) If there are special requirements for the product, or apply it in special industries (such as aerospace, medical, life support, etc.), we strongly recommend that to perform joint application risk and quality assessments, get the quality agreements.

(4) During the application, if the working conditions are beyond the limitation of temperature, voltage, current or safe operating area of the product defined in the product datasheet, our company cannot guarantee the reliability of the product.

(5) When the products are in use, it is strictly prohibited to touch. After power off, to ensure that there is no residual charge and the products have been cooled before they can be touched. And all operations must be under ESD protection measures.

(6) We annotate datasheet in the top right hand corner of the front page, to indicate product status. The annotation “Preliminary” indicates the product design is complete and final characterization for volume production is in progress, the product information in the datasheet is currently can be referenced, but some details may change in the future. There is no annotation indicates the product is capable to produce in batch quantity.