❒ General Description

This IGBT power module adopts IGBTs and fast recovery diode chips with low conduction loss and low switching loss,enabling designers to achieve high efficiency and excellent reliability.

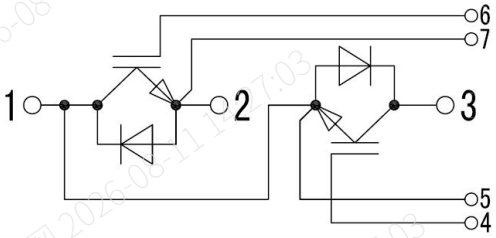
❒ 概述

这款 IGBT 功率模块采用低导通损耗和低开关损耗的 IGBT 和快恢复二极管芯片，使设计师能够实现高效率和卓越的可靠性能。

V_{CE}=1200V, I_C=150A

❒ Key Features

- Half-bridge module
- High short circuit withstand capability
- Ultra low conduction and switching loss
- Including ultra fast&soft recovery anti-parallel FWD



❒ 关键特性

- 半桥模块
- 高短路耐量
- 低导通和开关损耗
- 并联超快软恢复续流二极管

❒ Applications

- Inverters
- Servo
- UPS (Uninterruptible Power Supplies)

❒ 应用

- 逆变器
- 伺服系统
- 不间断电源

❒ IGBT/IGBT

● Maximum Rated Values/最大额定值

Symbol	Items	Conditions	Values	Units
V_{CES}	Collector-emitter voltage 集电极-发射极电压	T_{vj}=25℃	1200	V
I_C	Collector current 连续集电极直流电流	T_c=80℃，T_{vj}=175℃	150	A
V_{GES}	Gate-emitter voltage 栅极-发射极峰值电压	T_{vj}=25℃	±20	V
I_{CRM}	Repetitive peak collector current 集电极重复峰值电流	t_p=1ms，T_{vj}=25℃	300	A
t_{sc}	Short Circuit Withstand Time 短路耐受时间	V_{GE}≤15V,V_{CC}=600V V_{CEM}≤1200V, T_{vj}≤25℃	10	us
P_{tot}	Total power dissipation 总耗散功率	T_c=25℃，T_{vj}=175℃	600	W

● Characteristics Values/特征值

Symbol	Items	Conditions	Values			Units
			Min.	Typ.	Max.	
$V_{CE\ sat}$	Collector-Emitter Saturation Voltage 集电极-发射极饱和电压	I_C=150A,V_{GE}=15V,T_{vj}=25℃	-	2.05	-	V
		I_C=150A,V_{GE}=15V,T_{vj}=125℃	-	2.22	-	V
V_{GEth}	Gate threshold voltage 栅极阈值电压	V_{CE}=V_{GE},I_C=6mA,T_{vj}=25℃	5	5.7	7	V
Q_G	Gate charge 栅极电荷	V_{GE}=-15V…+15V	-	0.6	-	uC
R_{gint}	Internal gate resistance 内部栅极电阻	T_{vj}=25℃	-	4	-	Ω
C_{ies}	Input capacitance 输入电容	T_{vj}=25℃,f=1MHz, V_{GE}=0V, V_{CE}=25V	-	5	-	nF
C_{res}	Reverse capacitance 反向传输电容		-	0.25	-	nF
I_{CES}	Collector-emitter cut-off current 集电极-发射极截止电流	V_{CE}=1200V,V_{GE}=0V,T_{vj}=25℃	-	-	1	mA
I_{GES}	Gate-emitter leakage current 栅极-发射极漏电流	V_{CE}=0V,V_{GE}=20V,T_{vj}=25℃	-	-	1000	nA

$t_{d\ on}$	Turn-on delay time 开通延迟时间	I_C = 150 A, V_{CE} = 600 V, V_{GE}=±15V, R_{Gon} = R_{Goff} = 3.3Ω, L_s=35nH	T_{vj}=25℃	-	120	-	ns
			T_{vj}=125℃	-	122	-	ns
t_r	Rise time 上升时间		T_{vj}=25℃	-	60	-	ns
			T_{vj}=125℃	-	63	-	ns
$t_{d\ off}$	Turn-off delay time, 关断延迟时间		T_{vj}=25℃	-	330	-	ns
			T_{vj}=125℃	-	375	-	ns
t_f	Fall time 下降时间		T_{vj}=25℃	-	156	-	ns
			T_{vj}=125℃	-	164	-	ns
E_{on}	Turn-on energy loss 开通损耗能量		T_{vj}=25℃	-	12.5	-	mJ
			T_{vj}=125℃	-	15	-	mJ
E_{off}	Turn-off energy loss 关断损耗能量		T_{vj}=25℃	-	6.8	-	mJ
			T_{vj}=125℃	-	8	-	mJ

❒ FRD/二极管

● Maximum Rated Values/最大额定值

Symbol	Items	Conditions	Values	Units
V_{RRM}	Repetitive peak reverse voltage 反向重复峰值电压	T_{vj} = 25℃	1200	V
I_F	Forward current of diode 连续正向直流电流	T_C = 25℃	150	A
I_{FRM}	Repetitive peak forward current 正向重复峰值电流	T_C = 25℃，T_{vj} = 175℃	300	A

● Characteristics Values/特征值

Symbol	Items	Conditions		Values			Units
				Min.	Typ.	Max.	
V_F	Forward voltage 正向电压	I_F=150A, V_{GE}=0V	T_{vj}=25℃	-	2.12	-	V
			T_{vj}=125℃	-	2.22	-	V
I_{RM}	Peak reverse recovery current 反向恢复峰值电流	I_F=150 A, V_R = 600 V, V_{GE}=-8V…+15V, R_{Gon} =3.3Ω, L_s=35nH	T_{vj}=25℃	-	100	-	A
			T_{vj}=125℃		110		A
Q_r	Recovered charge 恢复电荷		T_{vj}=25℃	-	12	-	uC
			T_{vj}=125℃		16		uC
E_{rec}	Reverse recovery energy 反向恢复损耗		T_{vj}=25℃	-	2.2	-	mJ
			T_{vj}=125℃		4.6		mJ

❒ Module/模块

Symbol	Items	Conditions	Values			Units
			Min.	Typ.	Max.	
T_{vjmax}	Maximum junction temperature 最大结温	-	-	-	175	℃
T_{vjop}	Temperature under switching conditions 工作结温	-	-40	-	150	℃
T_{stg}	Storage temperature 储存温度	-	-40	-	125	℃
$R_{thjc\ IGBT}$	IGBT, thermal resistance, junction to case 结-外壳热阻	per IGBT 单个 IGBT	-	-	0.25	K/W
$R_{thjc\ Diode}$	Diode, thermal resistance, junction to case 结-外壳热阻	per diode 单个二极管	-	-	0.34	K/W
V_{isol}	Isolation test voltage 绝缘测试电压	f = 50Hz, t = 1min.	2.5	-	-	KV
m	Weight 重量	-	-	160	-	g
-	Cree page distance 爬电距离	Terminal to terminal 端子到端子	-	20	-	mm
-		Terminal to base 端子到底板	-	17	-	
-	Clearance distance in air 空气间隙	Terminal to terminal 端子到端子	-	9.5	-	
-		Terminal to base 端子到底板	-	17	-	
M_1	Mounting torque for module mounting 模块的安装扭矩	Screw M6 M6 螺栓	3	-	5	N.m
M_2	Terminal connection torque 端子的连接扭矩	Screw M5 M5 螺栓	2.5	-	4	N.m
-	Internal isolation 内部绝缘	ceramics 陶瓷	Al_2O_3			-
-	Material of module baseplate 模块基板材料	-	Cu			-
L x W x H	Dimensions 尺寸	-	94 x 34 x 30.5			mm

Note: The typical reference values in the above parameters are based on laboratory test data under encapsulation conditions and are not to be used as a basis for production test acceptance.

注：以上参数中的典型参考值基于封装条件下实验室测试数据得出，不作为生产测试验收依据。

❒ Characteristics Diagrams/特性曲线

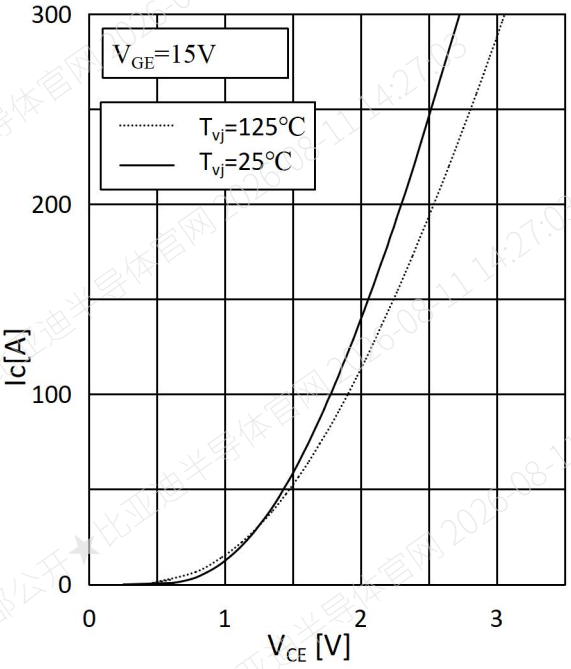


Fig.1 Typ. On-state Characteristics
图 1 开通状态特性

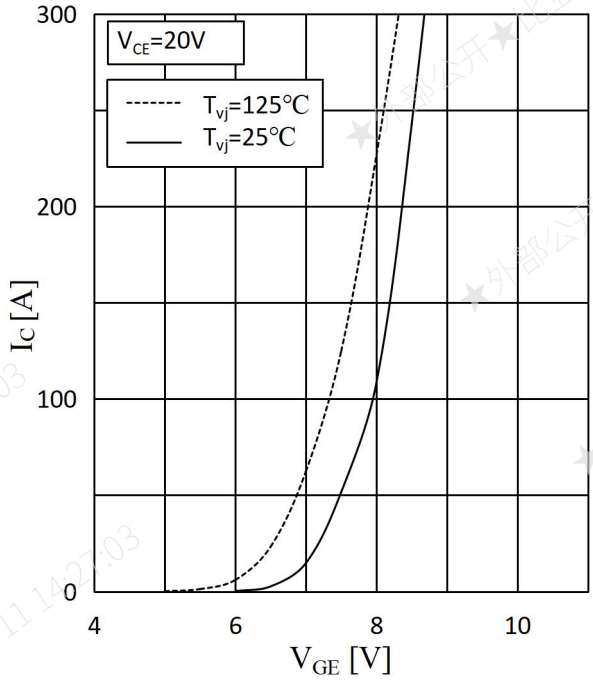


Fig.2 Typ. Transfer Characteristics
图 2 传输特性

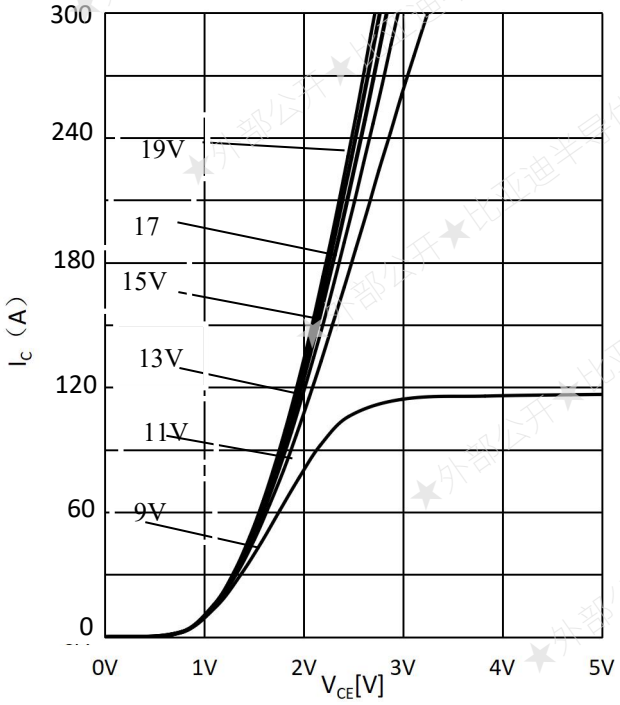


Fig.3 Typ. Output Characteristics
图 3 输出特性

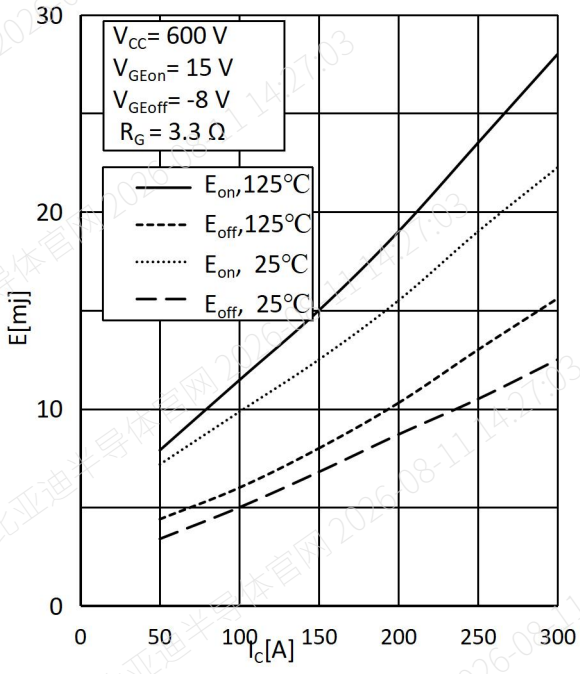


Fig.4 Switching Loss vs. Collector Current
图 4 开关损耗和集电极电流

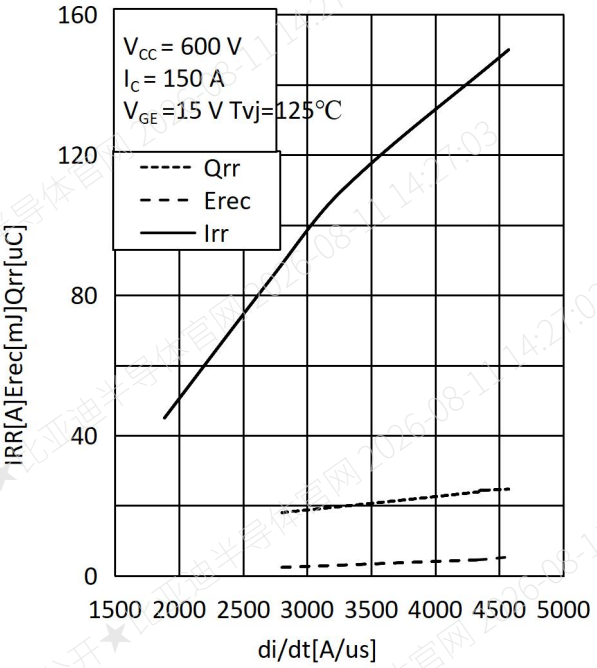


Fig.5 Typ. Reverse Recovery Characteristics vs. di/dt

图 5 反向恢复特性和 di/dt

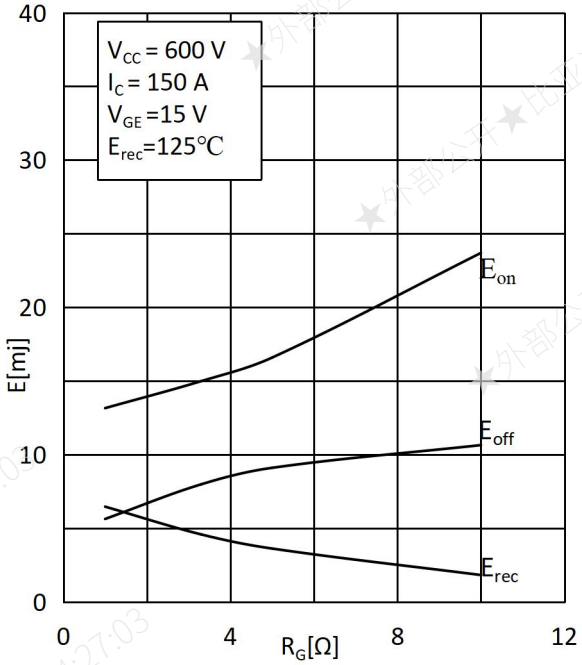


Fig.6 Switching Loss vs. Gate Resistor

图 6 开关损耗和门极电阻

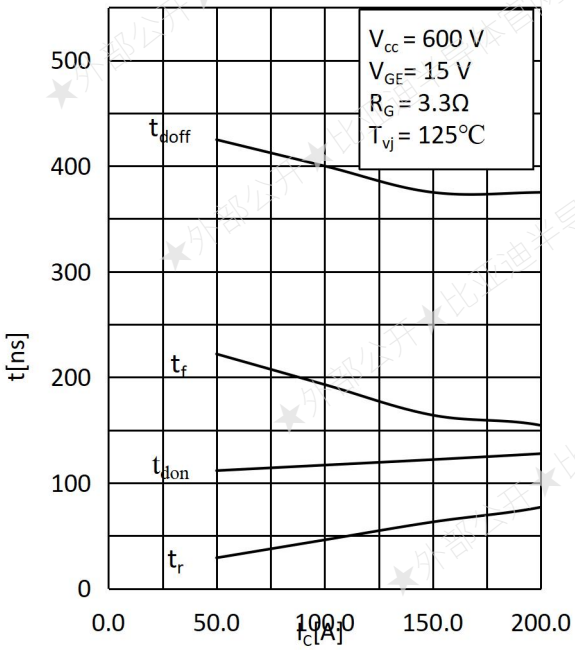


Fig.7 Typ. Switching Times vs. I_C

图 7 开关时间和集电极电流

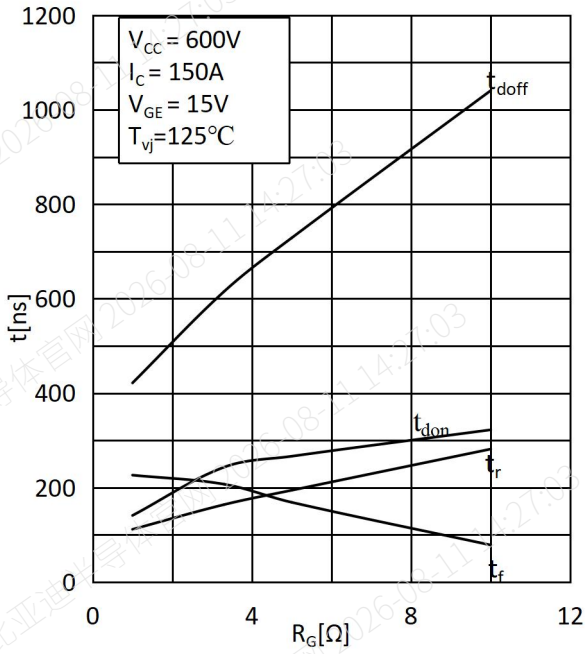


Fig.8 Typ. Switching Times vs. Gate Resistor

图 8 开关时间和门极电阻

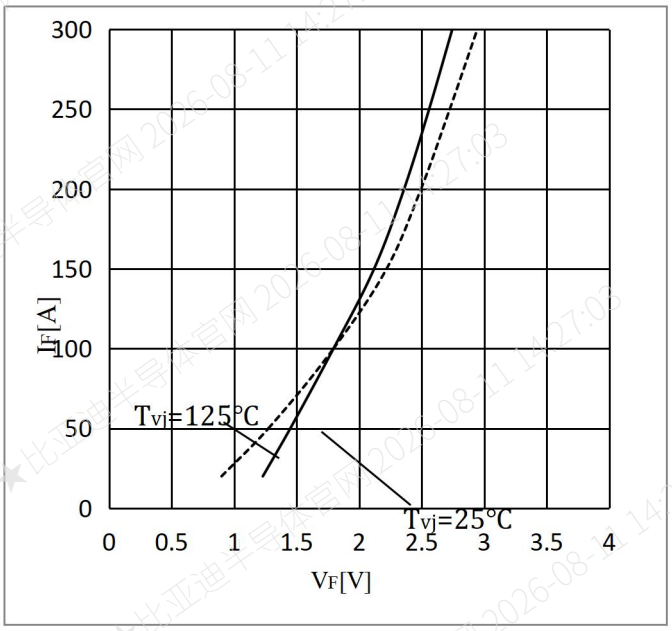


Fig.9 FWD Forward Characteristics
图 9 二极管输出特性

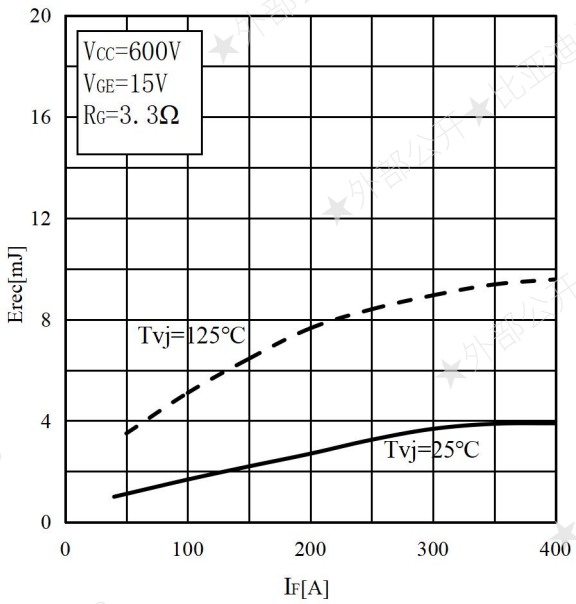


Fig.10 Typ. Switching Losses Diode-Inverter
图 10 开关损耗二极管-逆变器

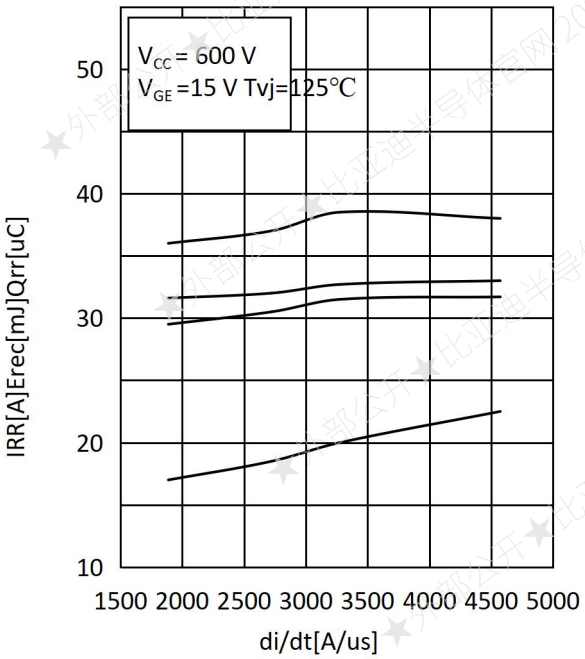


Fig.11 Typ. FRD Recovery Charge
图 11 二极管恢复电荷

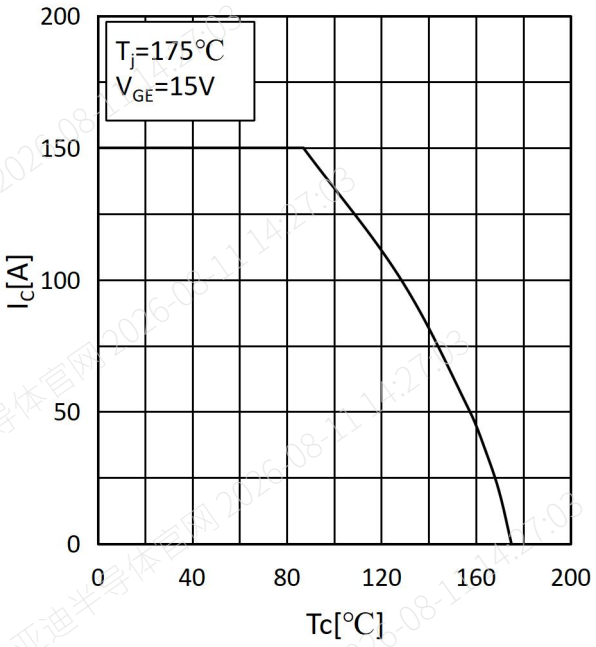


Fig. 12 Rate Current vs. Temperature（Tc）
图 12 额定电流和温度

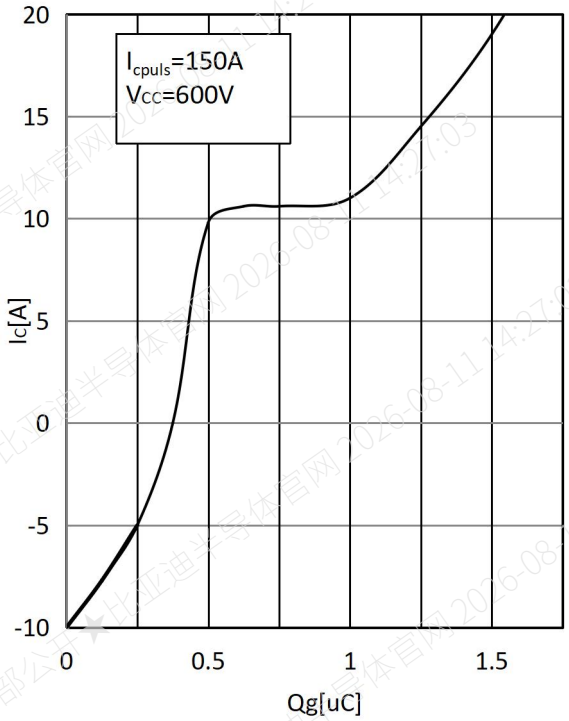


Fig.13 Typ. Gate Charge Characteristics
图 13 门极电荷特性

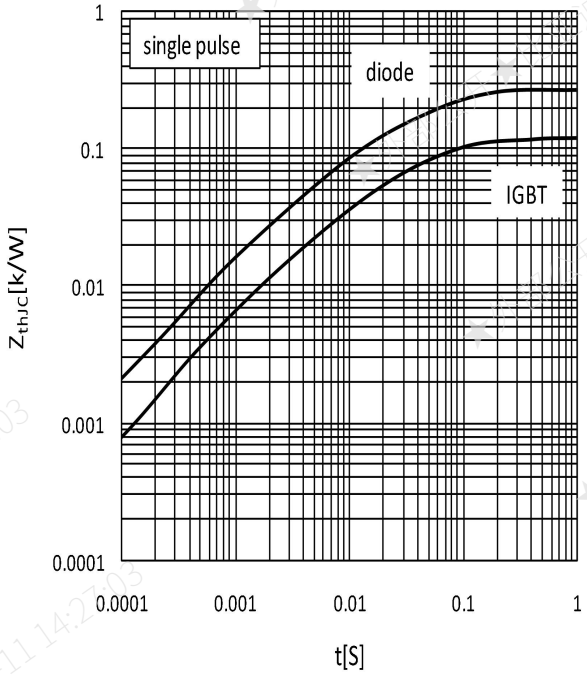


Fig.14 Typ. Transient Thermal Impedance
图 14 瞬态热阻

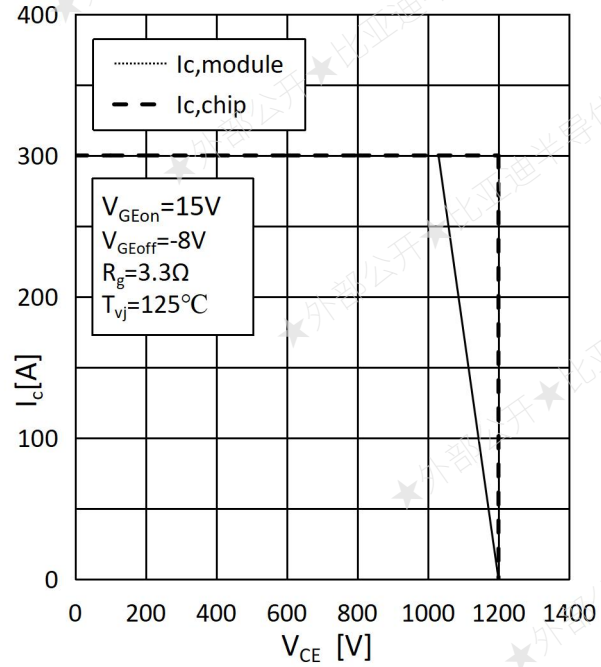
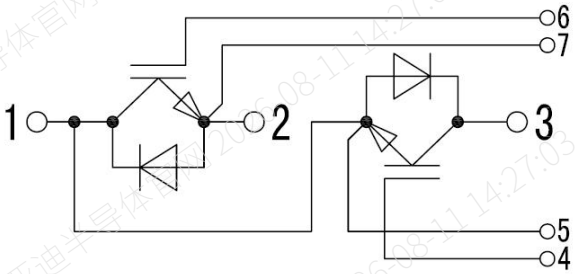


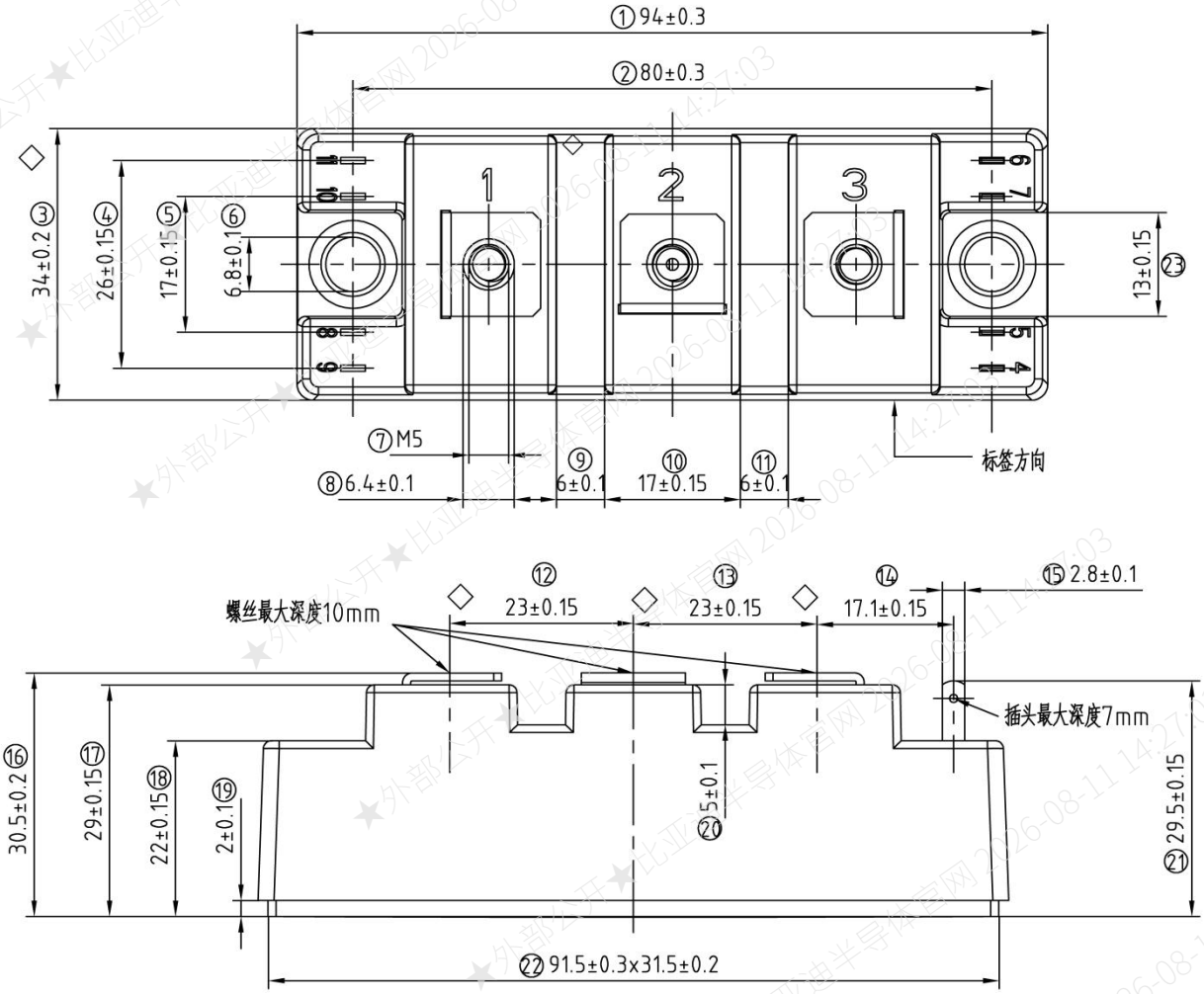
Fig.15 Reverse Bias Safe Operating Area (RBSOA)
图 15 反偏安全工作区

● Circuit Diagram/接线图



(1)AC Output	(1)交流输出端
(2)N-Negative Power	(2) N-负电极
(3)P-Positive Power	(3) P-正电极
(4)GH-Gate High	(4) GH-上桥门极
(5)EH-Emitter High	(5) EH-上桥发射极
(6)GL-Gate Low	(6) GL-下桥门极
(7)EL-Emitter Low	(7) EL-下桥发射极

❒ Package outlines/封装尺寸



DISCLAIMER 免责声明

- Applications: This product is suitable for industrial electrical applications (including but not limited to: industrial motor drives, frequency converters, UPS, photovoltaic inverters, energy storage converters, industrial welding equipment, power quality devices (SVG, APF), etc.)

  使用范围：本产品适用于工业级电气应用（包括但不限于：工业电机驱动、变频器、不间断电源（UPS）、光伏逆变器、储能变流器、工业焊接设备、电能质量设备（如 SVG、APF）等）

- Warranty Period: Unless otherwise agreed in the COOPERATION AGREEMENT Or Other WRITTEN DOCUMENTS, The warranty period for the product described in this specification is 12 months from the date of shipment.

  质保期：除双方在合作协议或其他书面文件中另行约定外，本规格书所述产品质保期自出货起 12 个月。

- Special Instructions:

  特别说明：

  - Correct and Safety Use of Power Module: Unsuitable operation (such as electrical, mechanical stress and so on) may lead to damage of power modules. Please pay attention to the following descriptions and use this product according to the guidance.

    功率模块安全正确的使用方法：不当的操作（如电应力、机械应力等）可能导致模块损毁。请注意以下介绍，并根据指导来使用本产品。

  - During Transit: Tossing or dropping of a carton may damage devices inside. Devices exposed to moisture may result in failure. Special care should be taken during rainy or snowy weather to implement protective measures preventing the device from getting wet.

    运输过程中：包装箱颠簸或坠落可能导致内部器件损毁；器件遇水受潮将导致故障失效。在雨雪天气尤其要注意保护器件防止淋湿。

  - Storage: The temperature and humidity of the storage place should be 20±5℃ and 30%～60%RH respectively. The performance and reliability of devices may be jeopardized if devices are stored in an environment far above or below the range indicated above.

    贮存：贮存地点温度与湿度应分别控制在 20±5℃和 30%～60%RH。如果贮存环境远高于或低于指示的变化范围，将危害器件的性能与可靠性。

  - Prolonged Storage: When storing devices more than one year, dehumidifying measures should be provided for the storage place. When using devices after a long period of storage, please inspect them to ensure there are no scratches, dust, rust, or other defects on the surface.

    长期贮存：当存储器件时间超过一年，贮存地点应当采取去湿措施。器件经过长期存放使用时，检查器件确保外观没有刮伤，灰尘，锈迹等。

  - Operating Environment: Devices should not be exposed to water, organic solvents, corrosive gases, explosive gases, fine particles, or corrosive agents, since any of those can lead to a serious accident.

    应用环境：器件不应当暴露在水，有机溶剂，腐蚀性气体、易燃易爆性气体，微尘，腐蚀性药剂中，上述

任何一种情况都会导致严重事故。

- Anti-electrostatic Measures: Following precautions should be taken for gated devices to prevent static buildup which could damage the devices:

  防静电措施：带栅极器件应采取以下预警来防止可以损毁器件的静电生成：

  1. Static electricity of human bodies and cartons and/or excessive voltage applied across the gate to emitter may damage and rupture devices. Sense-emitter and temperature-sensor are also vulnerable to excessive voltage. The basis of anti-electrostatic is suppression of build-up and quick dissipation of the charged electricity.

     门极与发射极间产生的人体静电、包装箱静电和过电压将损毁或击穿器件。采样发射极和温度传感器同样容易受到过压损毁。防静电底板可以抑制电荷生成并快速耗散。

  2. Containers that are susceptible to static electricity should not be used for transit or for storage.

     不要用易受静电影响的容器运输或贮存器件。

  3. Signal terminals to emitter should be always shorted with a carbon cloth or the like until right before a module is used. Never touch the signal terminals with bare hands.

     发射极信号端子应一直用碳纤维布或类似物短接直到模块使用前。任何情况下不要徒手碰触信号端子。

  4. During the installation process, it is necessary to always maintain the equipment and the operator's body in contact with the ground after removing carbon fiber cloth or similar materials. It is advisable to cover the workstation and its surrounding floor with conductive mats and ground them.

     安装过程中始终保持设备和操作人员的身体接触地面（移除碳纤维布或类似物后）。用导电垫覆盖工作地点及周围地板并使其接地。

  5. Use soldering irons with grounded tips.

     使用接地的烙铁头。

- Our Company is committed to enhancing product quality and stability. This specification serves solely to delineate technical product details.

  本公司致力于提高产品质量与稳定性。本文件之目的，仅在于陈述产品相关技术信息。

- **Notwithstanding the Company's reasonable efforts and due diligence, the sensitive nature of the products and variations in testing environments and systems may result in a certain failure rate, including potential malfunctions or failures under specific conditions. Consequently, the Company does not warrant the accuracy of the information contained in this specification, nor the fitness for a particular purpose or merchantability of the products. The information in this specification shall not be construed as a guarantee or commitment regarding product functionality, condition, or quality.**

  尽管本公司已尽合理努力及注意，但由于产品本身敏感特性以及测试环境、系统的差异，存在一定的故障发生率以及可能在某些情况下出现故障或失效。因此，本公司不承诺本文件中所列信息准确性及产品适配、适销性。本文件所载信息不应被视为本公司对产品功能、条件或质量的保证与承诺。

- **The content contained in this specification shall not be construed as any express, implied, or otherwise grant and/or license to patents, trademarks, copyrights, or other intellectual property**

rights owned by the Company or third parties. The Company's commitments regarding product intellectual property are strictly limited to the terms expressly stated in SEPARATE WRITTEN AGREEMENTS with Customers. Reverse-engineering, disassembly, or any form of analysis of the product is strictly prohibited without the Company's prior written consent.

本文件所载内容，不应视为对本公司或他人所有的专利、商标（标识）及版权等知识产权做出的任何明示、默示或其他方式的转让及/或许可；本公司对本文件所列产品知识产权的承诺，仅限于与客户另行达成书面合作约定中示明的内容。未经本公司书面许可，禁止客户对产品进行任何形式的拆解和逆向工程分析。

- The Company shall not be held liable for any product damage or consequential incidents resulting from usage beyond the recommended storage conditions, operating parameters, or absolute maximum ratings (or other explicitly stated limits) specified in this specification. Customers must strictly adhere to the operational procedures and conditions outlined in the latest version of the specification when utilizing or testing the product. Customers are responsible for complying with safety standards, including but not limited to redundant design, fire prevention measures, and fault prevention, to design and maintain a safe and stable system environment. Customers must verify all functionalities described in this specification before or during actual application to ensure product suitability, safety (preventing potential accidents, fires, or public harm etc.), and reliability. It is recommended that Customers consult our company prior to testing to confirm whether the product information adequately covers the application requirements.

  任何超出本文件中建议存储条件、使用条件及绝对最大额定参数条件（或部分明确值）使用，造成的产品损坏或连带事故发生，本公司不承担相关责任。当客户在使用产品时，应根据最新版本文件上规定的操作步骤或示明条件进行使用或测试。客户有责任遵从安全规则（包括冗余设计、防火措施、故障预防等）设计安全及稳定的系统环境，在实际应用前、或实际应用中验证本文件所述的任何功能，以确保适用性、安全性（预防可能发生的任何事故、火灾或社会伤害等）及可靠性。建议客户在测试前可咨询本公司，以验证产品信息是否可以涵盖应用需求。

- This product shall not be used in any equipment or applications requiring higher reliability or quality standards where failure could result in personal injury, death, or catastrophic events, including but not limited to nuclear control systems, aircraft/aviation components, maritime/rail transport equipment, traffic signaling devices, combustion control systems, medical equipment, or other safety-critical applications. Customers must procure genuine products exclusively through the Company or authorized channels, and utilize them strictly within legally permitted boundaries and under conditions expressly defined in this specification. The Company disclaims all liability for losses, damages, or injuries arising from non-compliance with these requirements.

  本产品不能且禁止应用在一些需要更高稳定性及质量的特殊设备上，以免导致人员伤亡等意外发生，包括原子能控制设备，飞机及航空器件，船舶、轨道等运输设备，交通信号设备，燃烧控制设备，医药设备以及所有安全性设备等。客户应通过本公司或经本公司授权的渠道购买正品，并应在法律约束范围内及本文件明确条件下合法、合理使用，否则造成损失与伤害的，本公司概不负责。

- The information presented in this specification constitutes the latest product details compiled and recorded by our Company with reasonable efforts at the time of publication. To ensure greater accuracy, our Company reserves the right to make periodic corrections, modifications, and version updates to this specification without prior notice. Customers should always refer to the latest version when using or consulting this document.

  本文件示明信息，均为发布时本公司尽合理努力整理并记录的产品最新信息。为提供更加准确的信息，本公司保留对本文件不定期勘误修改及版本更新的权利。客户在使用或参阅时，请使用最新版本。

- This specification is written in both Chinese and English, and in case of any conflict between the Chinese and English versions, the Chinese version shall prevail.

  本文件以中英文双语书就，如有不同之处，以中文内容为准。