

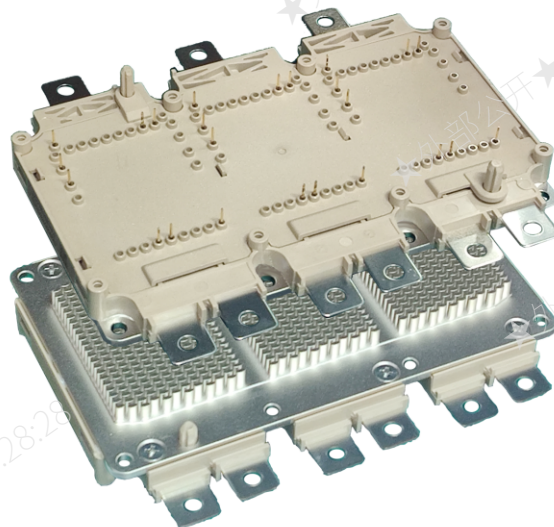


BGW950F08B34L6-D

IGBT Power Module

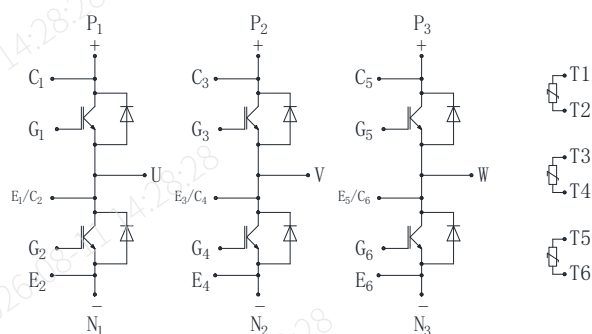
* General Description

BYD IGBT Power Module BGW950F08B34L6-D provides low conduction and switching loss as well as short circuit ruggedness. which introduce the advanced Fine Trench & field stop IGBT chip and ultra fast & soft recovery anti-parallel FRD to improved connection, it is able to take on a perfect performance in various applications with switching frequencies in the range of 10KHz.



* Key Features

- Full bridge module
- Compact & High power density design
- 750V Fine Trench&field stop technology
- Ultra low conduction and switching loss
- Short circuit ruggedness
- Including ultra fast & soft recovery anti-parallel FRD
- Low Inductive Design
- The direct cooled oval PinFin Base Plate
- $T_{vj\ op}=150^{\circ}\text{C}$
- Short-time extended Operation Temperature $T_{vj\ op}=175^{\circ}\text{C}$
- RoHS compliant



* Applications

- ☐ Automotive application
- ☐ Hybrid and electric vehicle
- ☐ Inverters for motor drive



● IGBT

□ Maximum Rated Values

Symbol	Parameter	Conditions	Value	Unit
V_{CES}	Collector-emitter voltage	$T_{vj}=25^{\circ}\text{C}$	750	V
V_{GES}	Gate-emitter voltage	$T_{vj}=25^{\circ}\text{C}$	± 20	V
I_{CN}	Implemented Collector current		950	A
$I_{C\text{ nom}}$	Continuous DC Collector current	$T_F=95^{\circ}\text{C}$, $T_{vj\text{ max}}=175^{\circ}\text{C}$	450	A
I_{CRM}	Repetitive peak collector current	Pulse, $t_P=1\text{ms}$, $T_{vj}=25^{\circ}\text{C}$	1900	A
P_{tot}	Total power dissipation	$T_F=65^{\circ}\text{C}$, $T_{vj\text{ max}}=175^{\circ}\text{C}$	1149	W

□ Characteristics Values

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{CE\text{ sat}}$	Collector-Emitter Saturation Voltage	$I_C=450\text{A}$, $V_{GE}=15\text{V}$, $T_{vj}=25^{\circ}\text{C}$		1.27		V
		$I_C=450\text{A}$, $V_{GE}=15\text{V}$, $T_{vj}=150^{\circ}\text{C}$		1.30		
		$I_C=450\text{A}$, $V_{GE}=15\text{V}$, $T_{vj}=175^{\circ}\text{C}$		1.30		
		$I_C=950\text{A}$, $V_{GE}=15\text{V}$, $T_{vj}=25^{\circ}\text{C}$		1.57		
		$I_C=950\text{A}$, $V_{GE}=15\text{V}$, $T_{vj}=175^{\circ}\text{C}$		1.90		
V_{GEth}	Gate threshold voltage	$V_{CE}=V_{GE}$, $I_C=9.6\text{mA}$, $T_{vj}=25^{\circ}\text{C}$	4.9	5.8	6.5	V
Q_G	Gate charge	$V_{GE}=-8\text{V}\dots+15\text{V}$, $V_{CE}=400\text{V}$		1.84		μC
R_{Gint}	Internal gate Resistance	$T_{vj}=25^{\circ}\text{C}$		0.8		Ω
C_{ies}	Input capacitance	$T_{vj}=25^{\circ}\text{C}$, $f=100\text{KHz}$, $V_{CE}=50\text{V}$, $V_{GE}=0\text{V}$		39.6		nF
C_{oes}	Output capacitance			1.45		nF
C_{res}	Reverse capacitance			0.19		nF
I_{CES}	Collector-emitter cut-off current	$V_{CE}=750\text{V}$, $V_{GE}=0\text{V}$, $T_{vj}=25^{\circ}\text{C}$			1	mA
I_{GES}	Gate-emitter leakage current	$V_{CE}=0\text{V}$, $V_{GE}=20\text{V}$, $T_{vj}=25^{\circ}\text{C}$			400	nA

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t _{don}	Turn-on delay time	I _C = 450 A V _{CE} = 450 V V _{GE} =-8V...+15 V R _{Gon} = 2.5Ω R _{Goff} =13.5Ω L _S =30nH	T _{vj} =25℃		198		ns	
			T _{vj} =150℃		217		ns	
			T _{vj} =175℃		220		ns	
t _r	Rise time		T _{vj} =25℃		77		ns	
			T _{vj} =150℃		83		ns	
			T _{vj} =175℃		97		ns	
t _{d off}	Turn-off delay time,		T _{vj} =25℃		987		ns	
			T _{vj} =150℃		1079		ns	
			T _{vj} =175℃		1153		ns	
t _f	Fall time		T _{vj} =25℃		61		ns	
			T _{vj} =150℃		93		ns	
			T _{vj} =175℃		106		ns	
E _{on}	Turn-on energy loss		T _{vj} =25℃		17.6		mJ	
			T _{vj} =150℃		30.4		mJ	
			T _{vj} =175℃		33.5		mJ	
E _{off}	Turn-off energy loss		T _{vj} =25℃		24.0		mJ	
			T _{vj} =150℃		31.0		mJ	
			T _{vj} =175℃		31.5		mJ	
I _{sc}	SC data		V _{GE} ≤15V,V _{CC} =450V V _{CEmax} =V _{CES} -L _{sCE} *di/dt	tp≤6us,Tvj=25℃		3600		A
				tp≤3us,Tvj=175℃		2800		

● Diode

□ Maximum Rated Values

Symbol	Parameter	Conditions	Value	Unit
V_{RRM}	Repetitive peak reverse voltage	$T_{vj} = 25^\circ\text{C}$	750	V
I_{FN}	Implemented forward current		950	A
I_F	Continuous DC forward current		450	A
I_{FRM}	Repetitive peak forward current	Pulse, $t_P = 1\text{ ms}$, $T_{vj} = 25^\circ\text{C}$	1900	A
I^2t	I^2t -value	$V_R = 0\text{ V}$, $t_P = 10\text{ ms}$, $T_{vj} = 150^\circ\text{C}$ $V_R = 0\text{ V}$, $t_P = 10\text{ ms}$, $T_{vj} = 175^\circ\text{C}$	27000 25000	A ² s A ² s



□ Characteristics Values

Symbol	Parameter	Conditions	Value			Unit	
			Min.	Typ.	Max.		
V _F	Forward voltage	I _F =450A, V _{GE} =0V, T _{vj} =25℃		1.40		V	
		I _F =450A, V _{GE} =0V, T _{vj} =150℃		1.30			
		I _F =450A, V _{GE} =0V, T _{vj} =175℃		1.25			
		I _F =950A, V _{GE} =0V, T _{vj} =25℃		1.68			
		I _F =950A, V _{GE} =0V, T _{vj} =175℃		1.60			
I _{RM}	Peak reverse recovery current	I _F =450A V _R =450V V _{GE} =-8V	T _{vj} =25℃		247		A
			T _{vj} =150℃		327		
			T _{vj} =175℃		336		
Q _r	Recovered charge		T _{vj} =25℃		20		μC
			T _{vj} =150℃		43		μC
			T _{vj} =175℃		51		μC
E _{rec}	Reverse recovery energy		T _{vj} =25℃		6.0		mJ
			T _{vj} =150℃		11.4		mJ
			T _{vj} =175℃		16.0		mJ

● NTC-Thermistor

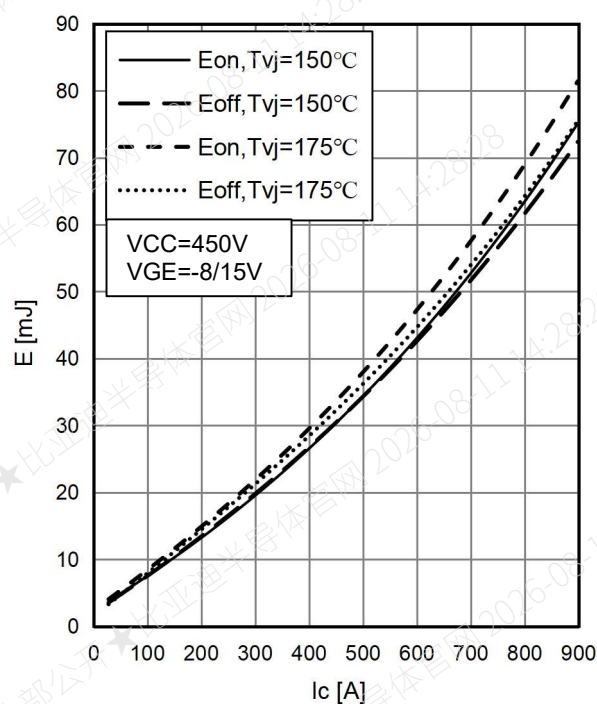
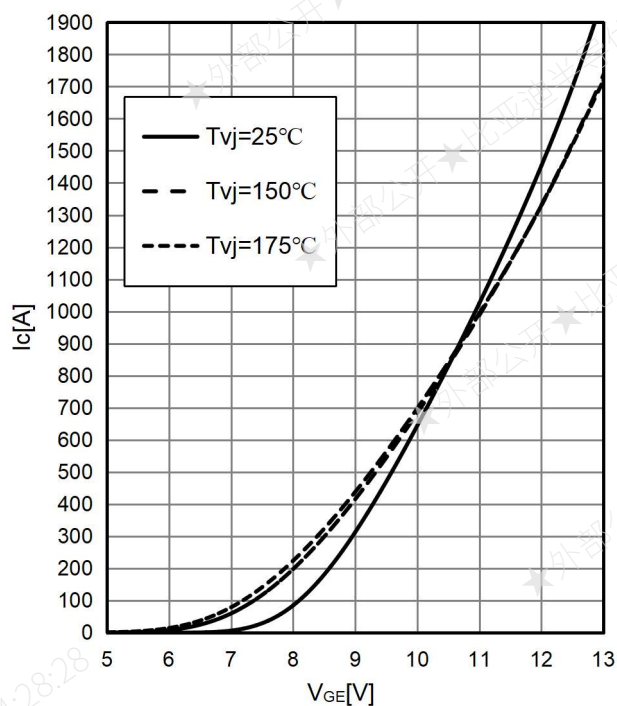
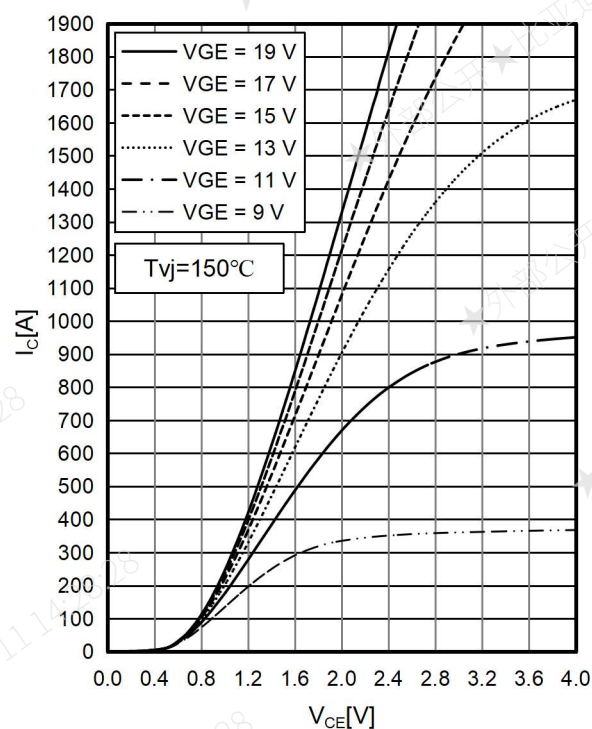
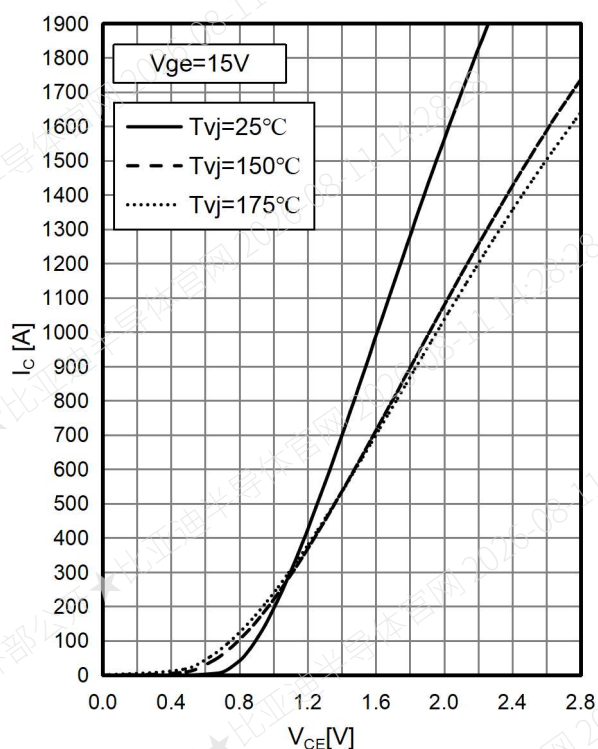
Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Rated resistance	$T_C=25^{\circ}C$		5.0		K Ω
$\Delta R/R$	Deviation of R100	$T_C=100^{\circ}C, R_{100}=493$	-5		5	%
P_{25}	Power dissipation	$T_C=25^{\circ}C$			20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K
$B_{25/80}$	B-value	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15K))]$		3411		K
$B_{25/100}$	B-value	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15K))]$		3433		K



● Module

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
$T_{vj\ max}$	Maximum junction temperature				175	℃
T_{vjop}	Temperature under switching conditions	T_{op} continuous	-40		150	℃
		For 10s within a period of 30s, occurrence maximum 3000 times over lifetime	150		175	
T_{stg}	Storage temperature	Storage Temperature Range	-40		125	℃
V_{ISOL}	Isolation test voltage	RMS, $f=50\text{Hz}$, $t=30\text{s}$	3800			V
Δp	Press drop in cooling circuit	$\Delta V/\Delta t=10.0\ \text{dm}^3/\text{min}$; $T_F=65^\circ\text{C}$		77		mbar
p	Maximum drop in cooling circuit (relative)	$T_{baseplate}<40^\circ\text{C}$ $T_{baseplate}>40^\circ\text{C}$			2.5 2.0	bar
L_{sCE}	Stray inductance module			8		nH
$R_{CC'+EE'}$	Module lead resistance terminal to chip	$T_{vj}=25^\circ\text{C}$, per switch		0.75		mΩ
$R_{thjF\ IGBT}$	thermal resistance, junction to cooling fluid	per IGBT, $\Delta V/\Delta t=10.0\ \text{dm}^3/\text{min}$; $T_F=65^\circ\text{C}$		0.0957		K/W
$R_{thjF\ Diode}$	thermal resistance, junction to cooling fluid	per diode, $\Delta V/\Delta t=10.0\ \text{dm}^3/\text{min}$; $T_F=65^\circ\text{C}$		0.142		K/W
M_1	Mounting torque for module mounting	Screw M4 baseplate to heatsink Screw EJOT Delta PT WN5451 30x10 PCB to frame	1.8 0.45	2.00 0.50	2.20 0.55	N.m
M_2	Terminal connection torque	Screw M5	3		6	N.m
m	Weight			710		g
D_{pin}	Pin Hole Diameter		1.5		1.7	mm
D	Pin Diameter	Designer Pin Diameter		0.84		mm
δ	Baseplate Warpage	Warpage along the length Warpage along the width	-0.25 -0.20		0.25 0.15	mm
	Material of module baseplate			Cu+Ni		
	Internal isolation	ceramics		Si_3N_4		
d_{Creep}	Creepage distance	Terminal to heatsink		9.0		mm
		Terminal to terminal		9.0		
d_{Clear}	Clearance	Terminal to heatsink		4.5		mm
		Terminal to terminal		4.5		
$L\times W\times H$	Dimension			154.5×126.5×32		mm

□ Characteristics Diagrams



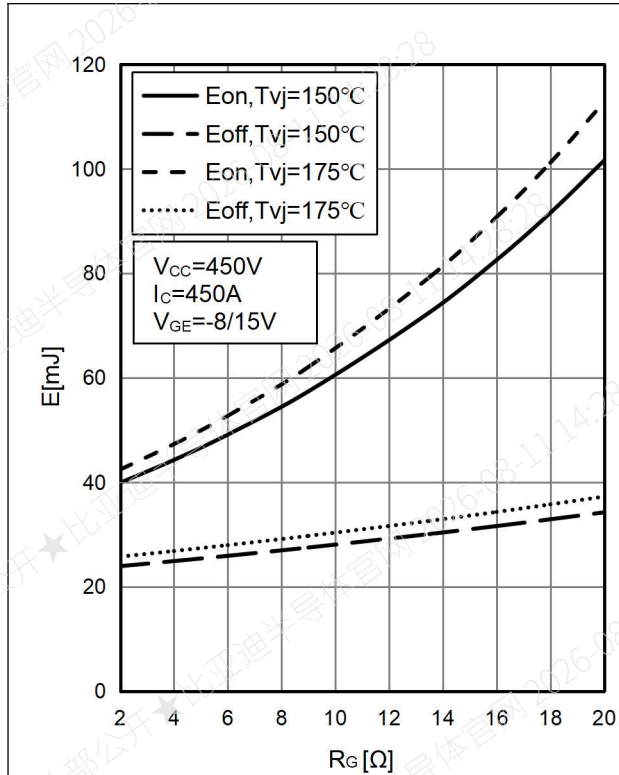


Fig.5: IGBT Switching Loss vs. R_G

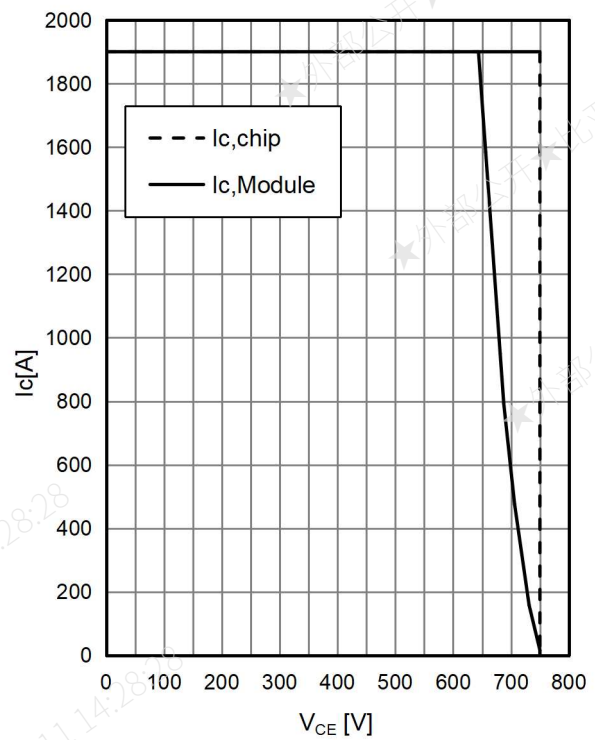


Fig.6: Reverse Bias Safe Operating Area

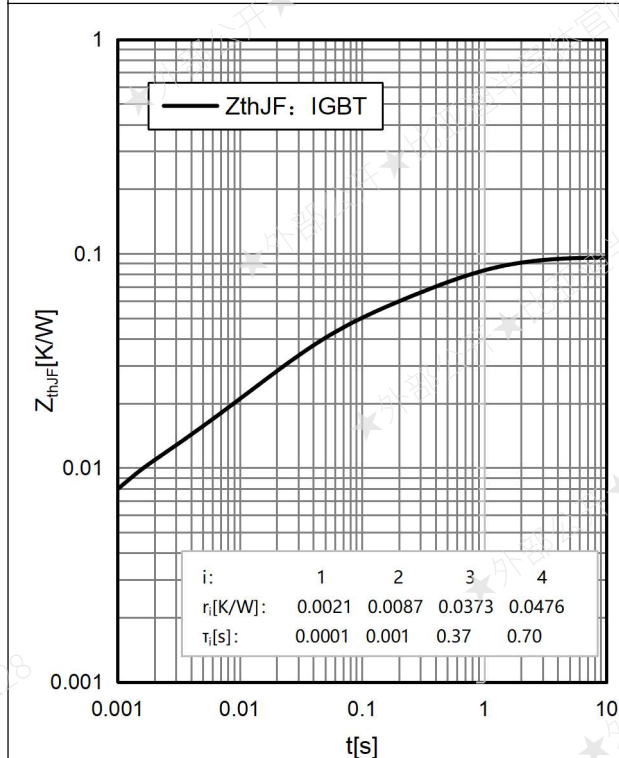


Fig.7: IGBT transient thermal impedance

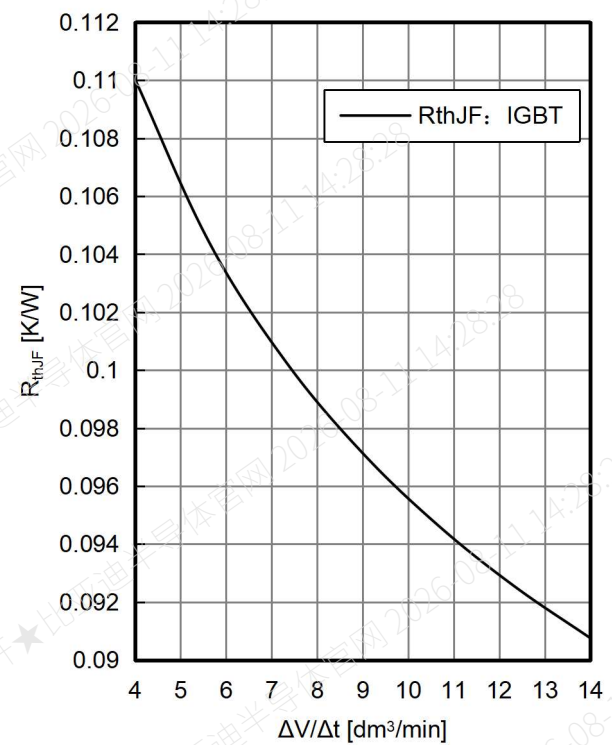


Fig.8: IGBT thermal impedance

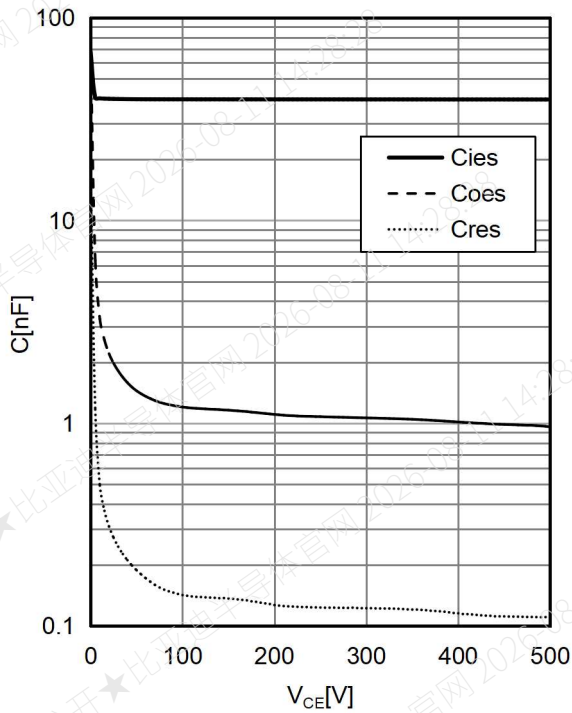


Fig.9: IGBT Capacity characteristic

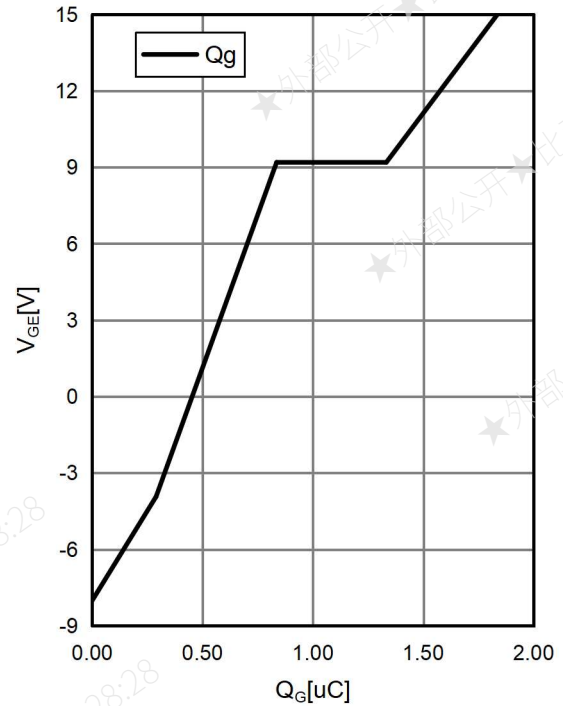


Fig.10: IGBT Gate charge characteristic

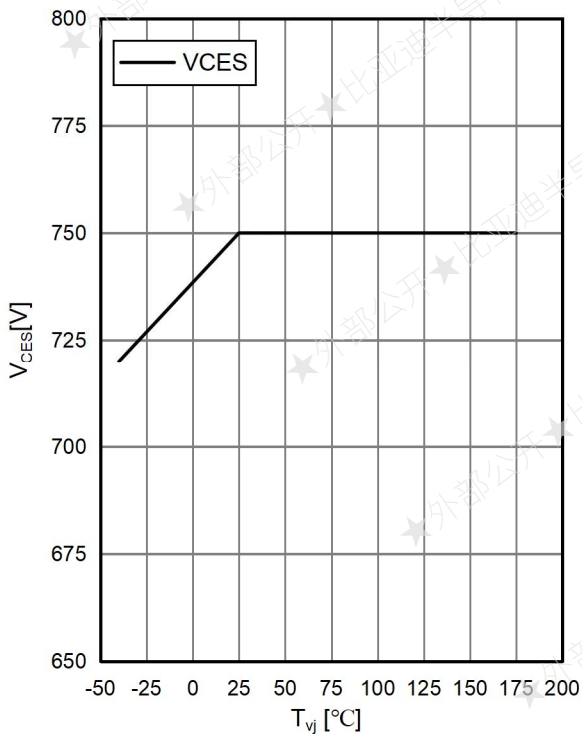


Fig.11: Maximum allowed collector-emitter voltage

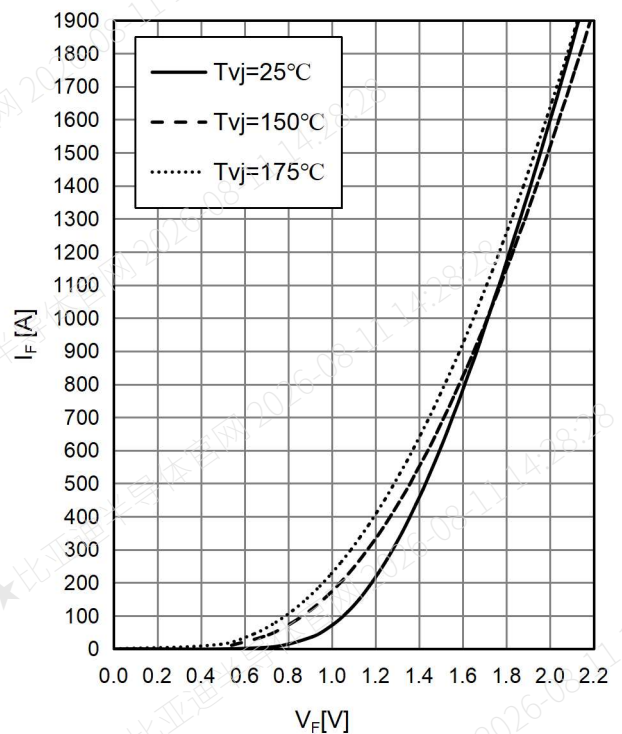
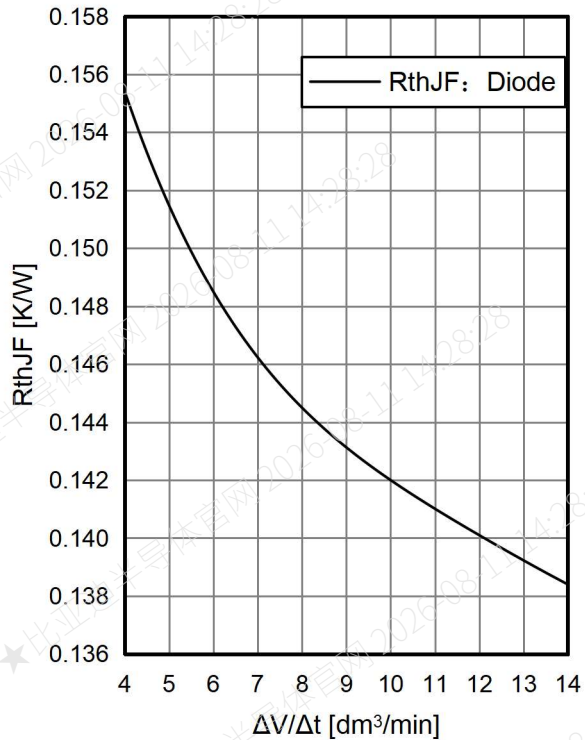
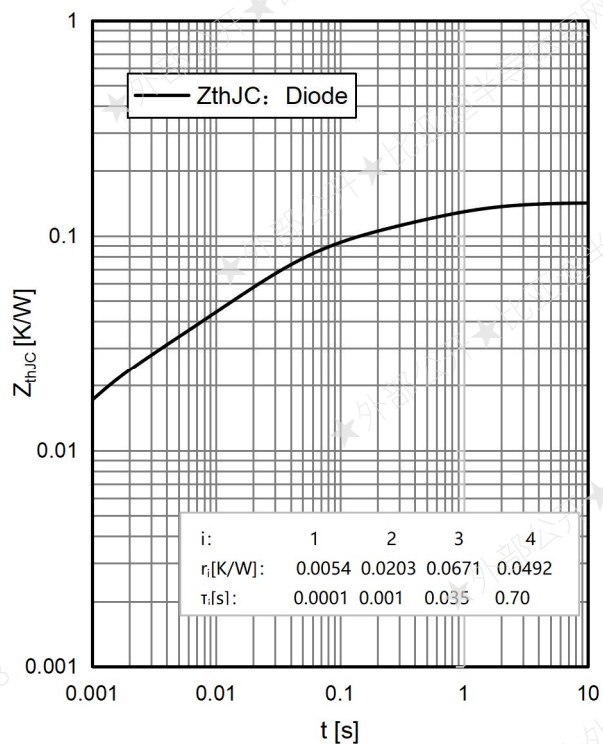
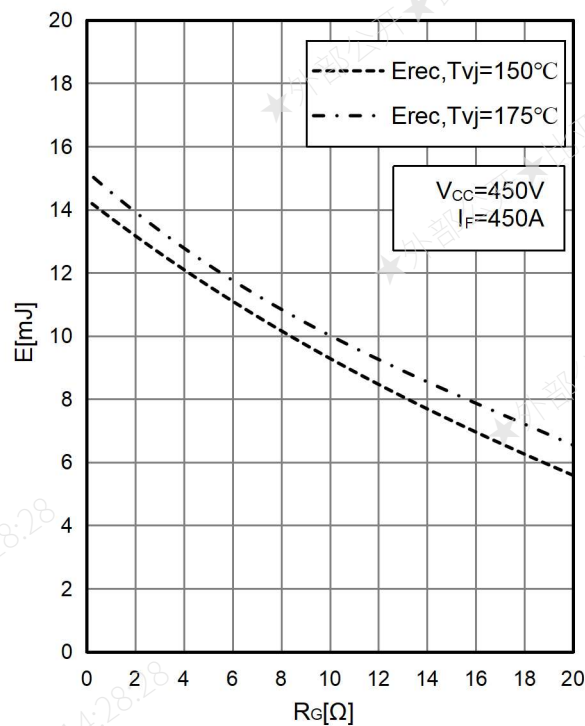
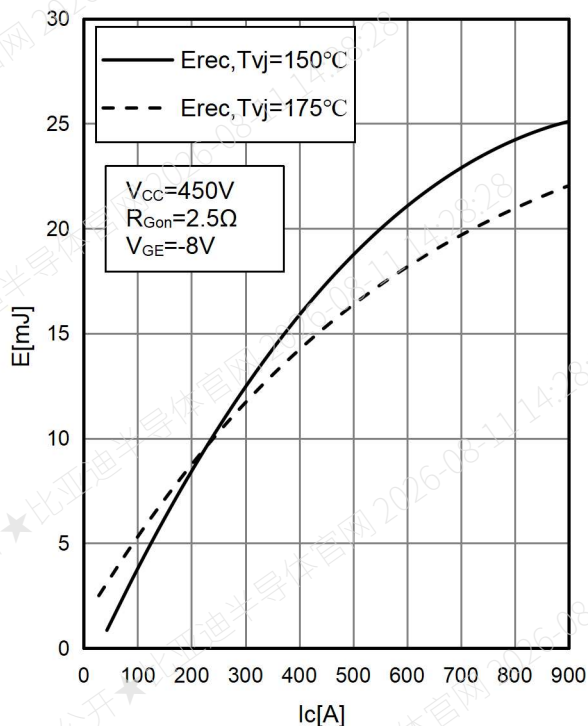


Fig.12: Diode forward characteristic



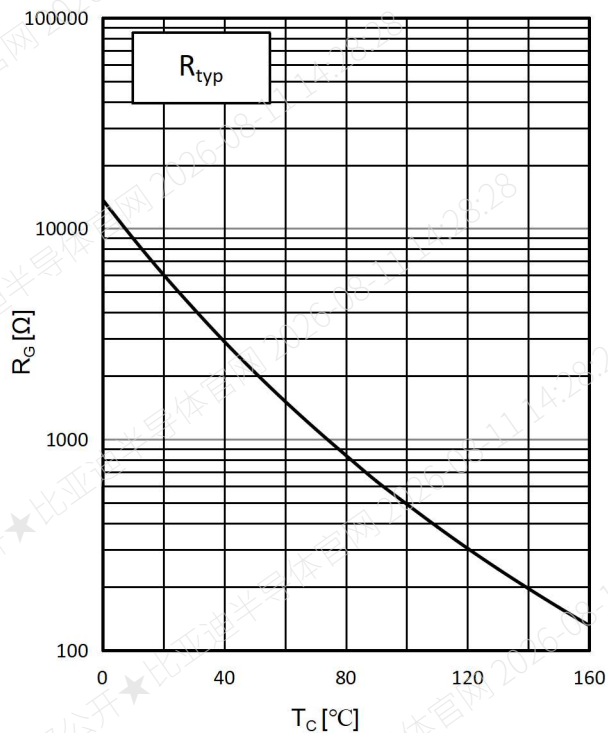


Fig.17: NTC temperature characteristic (typical)

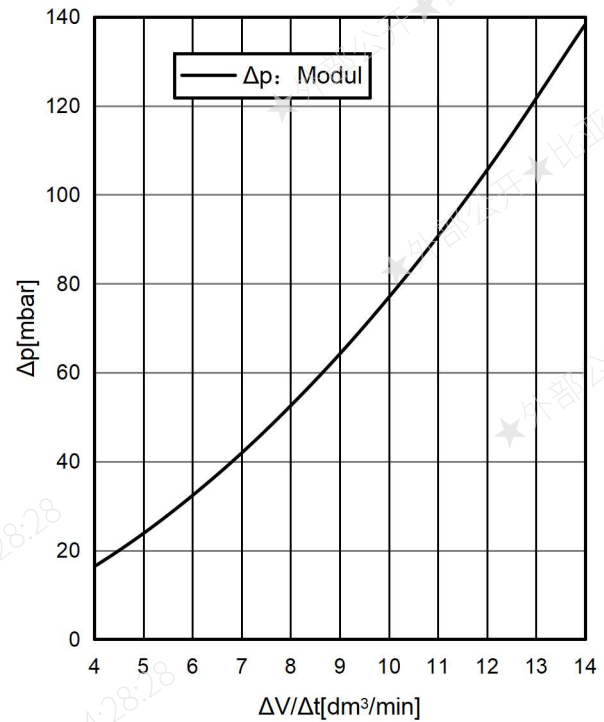
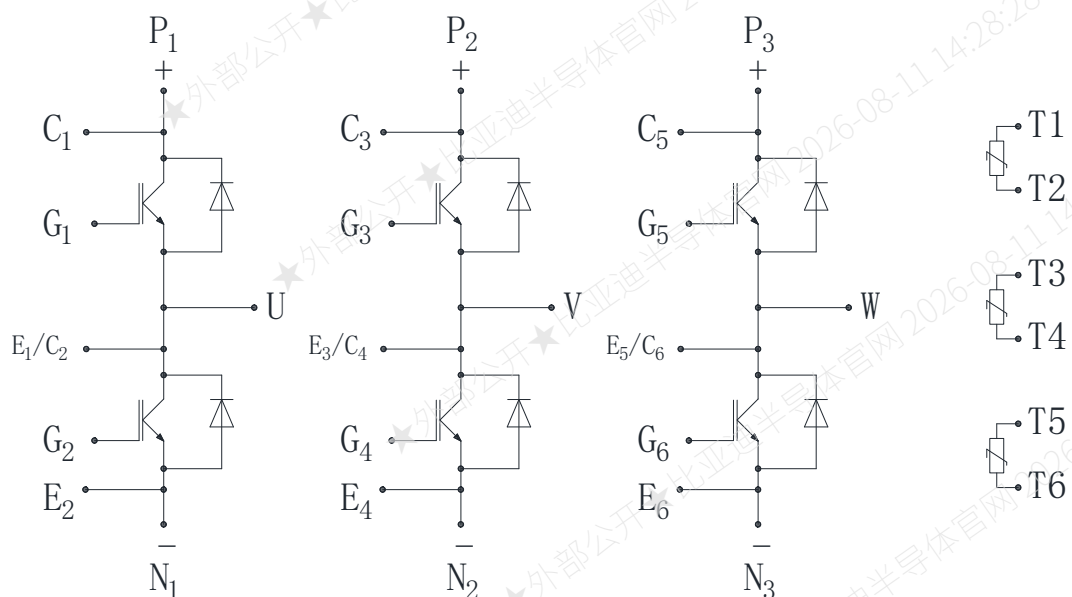


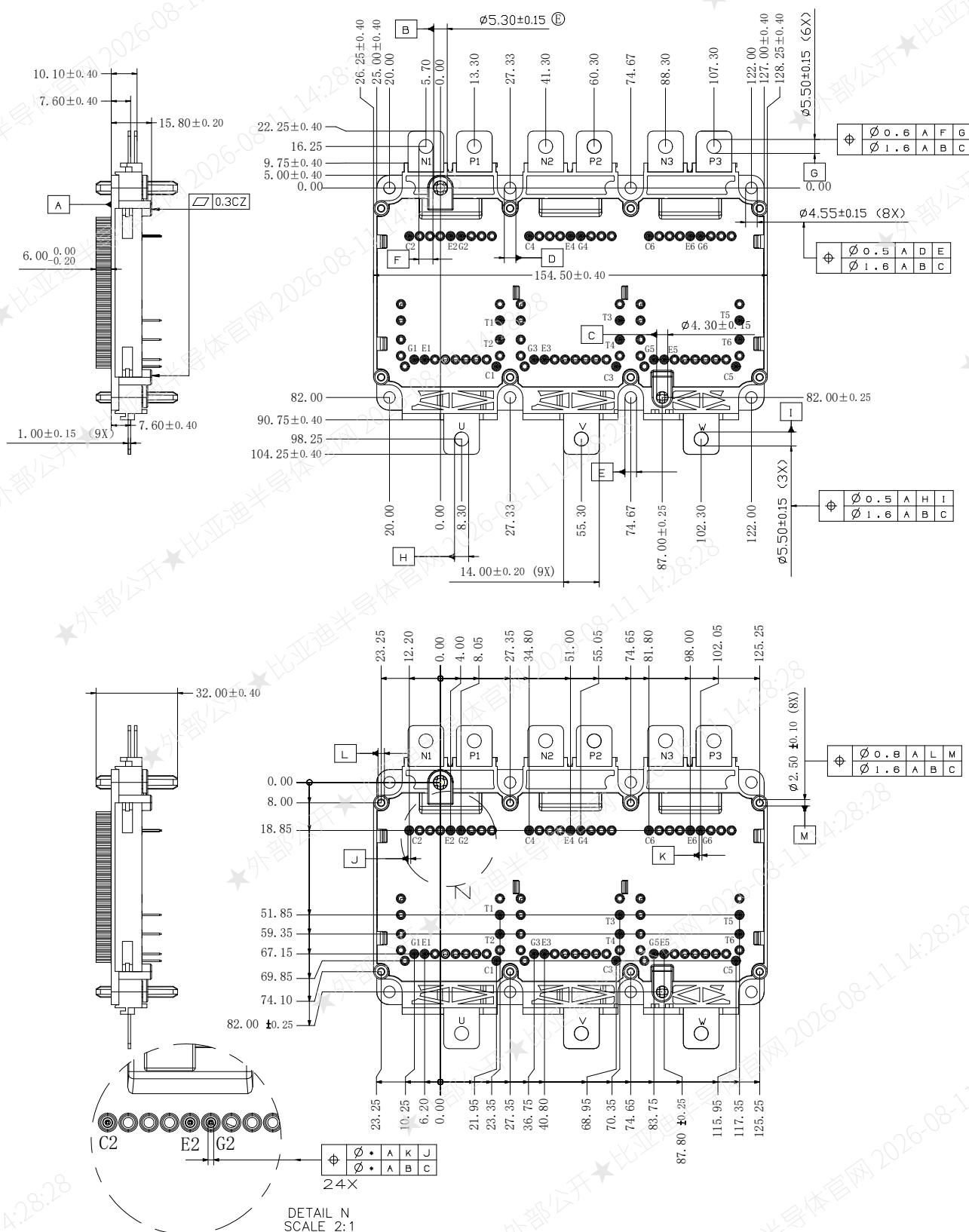
Fig.18: Pressure drop in cooling circuit

□ Circuit Diagram





● Package outlines



**免责声明 | DISCLAIMER**

- **Application:** This product is suitable for general vehicle-grade electrical applications.

使用范围: 本产品适用于一般车规级电气应用。

- **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 Notes Related to the Product :**

● **Transit:**

1) The tossing or dropping of a carton may lead to damage of the devices contained within.

2) If device comes into contact with water, it may result in malfunction or failure. Special precautions should be taken during rainy or snowy conditions to prevent the devices from becoming wet.

● **Storage:**

The storage environment for the devices should maintain a temperature range of 5~35° C and a humidity level of 30~75%RH. Storing the devices in an environment that falls outside of these specified ranges may jeopardize their performance and reliability.

● **Usage:**

1) Please install IGBT modules which potting with silicone properly with the pins up. Unsuitable operation (such as electrical, mechanical stress and so on) may lead to damage of power modules.

2) 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.

3) Anti-static Measures: To prevent static electricity accumulation that could damage the gate devices, the following precautions should be taken: The signal terminals should always be shorted to the emitter with conductive foam or other materials until the module is about to be used, at which point they should be removed. Never touch the signal terminals with bare hands. During installation (after removing the conductive foam or other materials), ensure that the equipment and your body are grounded. It is recommended to cover the workbench and the surrounding floor with conductive pads and ground them. Use a grounded soldering iron tip.

与产品相关的特别说明:

● **运输:**

1) 包装箱颠簸或坠落可能导致模块受损。

2) 模块遇水受潮可能导致故障失效。在雨雪天气尤其要注意保护模块防止淋湿。

● **贮存:**

贮存地点温度与湿度应分别控制在5~35° C和30~75%RH。如果贮存环境远高于或低于指示的变化范围, 将危害模块的性能与可靠性。

● **使用:**

1) 灌装硅胶的模块, 须插针向上正置安装。

2) 模块不当暴露在水, 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故障。

3) 防静电措施: 为了防止静电积累从而损坏栅极设备, 应采取以下预防措施: 信号端子与发射极之间应始终用导电泡棉或其他材料短接, 直到即将使用模块之前才移除。绝对不要用裸手触摸信号端子。在安装过程中(移除导电泡棉或其他材料后), 确保设备和您的身体接地。建议在工作台及其周围地板上覆盖导电垫并接地。使用接地烙铁头。

- 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。本规格书之目的, 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**

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- 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.

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