



株洲中车时代半导体有限公司
ZHUZHOU CRRC TIMES SEMICONDUCTOR CO.,LTD.

企业简介

COMPANY PROFILE

株洲中车时代半导体有限公司自 1964 年开始致力于功率半导体技术的研发与产业化,现已成为少数同时掌握 IGBT、SiC 器件、晶闸管、IGCT 及其组件技术 IDM (集成设计制造) 模式企业代表,拥有芯片 - 模块 - 组件完整产业链。公司目前在中国、英国两地设立研发中心,营销网络遍布全球。公司是功率半导体与集成技术全国重点实验室、国家能源大功率电力电子器件研发中心的依托单位, 功率半导体行业联盟理事长单位, 湖南省功率半导体创新中心的牵头共建单位。



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1964 年



Zhuzhou CRRC Times Semiconductor Co., Ltd. has contributed to the research and development and industrialization of power semiconductor technology since 1964, Now it has become the representative of IDM companies in the world who have the technology of IGBT、SiC、Thyristor、IGCT and their assembly simultaneously, owned complete industrial chain with wafer - module - power assmebly. The company currently has R&D centres in China and the United Kingdom, with marketing networks all over the world. The company is the supporting unit of the State Key Laboratory of Power Semiconductor and Integration Technology and the National Energy High-power Electronic Device R&D Centre, Chairman Unit of China Power Semiconductor Technology Innovation and Industry Alliance, Co-founder Company of Hunan Power Semiconductor Innovation Centre.

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700+

工程技术人员
Engineering employees

2300+
产业员工
Employees

300+

境外员工
Overseas employees

30

博士
Doctors

轨道交通
Rolling stock

IGBT模块占据中国 **50%** 份额
More than 50% Domestically

新能源汽车
NE

国内市占第 **3** 名
Ranking the 3rd

输配电
National Grid

双极器件占据中国 **50%** 份额
Bipolar, More than 50% Domestically

IGBT模块占据中国 **60%** 份额
IGBT, More than 60% Domestically

新能源及
高端工业装备
Solar,
Wind power and Industry

模块出货量超过 **100** 万只
Saled more than 1 Million modules

风电领域市占 **60%**
Wind power, More than 60% Domestically

1957年

在林肯投产功率半导体器件产线
Power semiconductor production
line invested in Lincoln, UK

2011年

IGBT进入轨道交通领域
开始SiC技术研究, 获02重大专项
支持
IGBT enters the field of rail transit
Start SiC technology research,
02 major special support

2021年

完成首批员工股权激励
参股设立广州青蓝半导体有限公司
汽车产品线建成并投产
获“绿色工厂”称号

1964年

开始研发大功率半导体技术
Start R&D of power semiconductors

2014年

8英寸IGBT线建成投产
国家能源大功率电力电子器件研发
中心
8-inch IGBT production line were
put into use
National Energy High-power
Electronic Device R&D Centre

Finish 1st round of employee
stock ownership incentive
Participated in the establishment
of Guangzhou Qinglan
Semiconductor Co., Ltd.
Green Factory

2008年

并购Dynex公司75%的股份
Acquired Dynex 75% holding

2017年

IGBT进入汽车领域
SiC产线完成调试并试运行
IGBT modules launched for
automotive application
SiC plant construction completed

2022年

IGBT芯片三期规划落地, 总投资
111.2亿元
功率半导体与集成技术全国重点
实验室

2009年

6英寸双极器件生产线、国内首条
IGBT模块封装线建设投产
6-inch bipolar production line, the
1st high power IGBT module assembly
line put into use

2019年

参股设立武汉智瑞半导体有限公司
全面控股Dynex100%
成立株洲中车时代半导体有限公司
Participated in the establishment of
Wuhan Zhirui Semiconductor Co., Ltd.
100% holding of Dynex
Set up Zhuzhou CRRC Times
Semiconductor Co., Ltd.

IGBT chip line phase planning
was launched, total investment
exceeds 11.1billion yuan
State Key Laboratory of Power
Semiconductor and Integration
Technology

第一章

CHAPTER ONE

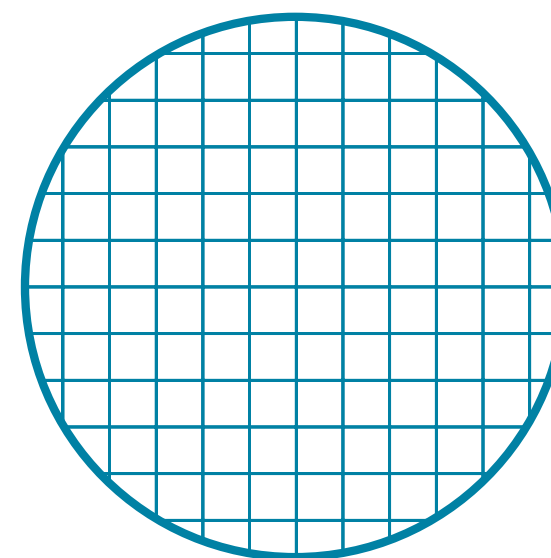
IGBT 及 FRD 芯片

IGBT & FRD CHIPS

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IGBT & FRD CHIPS

IGBT 及 FRD 芯片



第一章 CHAPTER ONE

IGBT 芯片

IGBT CHIPS

产品介绍

PRODUCT INTRODUCTION

中车 IGBT 芯片采用精细沟槽元胞设计结合软穿通技术，具有低导通损耗与开关损耗的特点，提供产品覆盖 750V-1200V 电压、40A-375A 电流范围。

CRRC IGBT combines fine-pattern trench & soft punch through technology, resulting low on-state loss and switching loss characteristics. The IGBT portfolio includes the voltage range from 750V up to 1200V and the current range from 40A up to 375A .

产品特点

CHARACTERISTIC

沟槽栅	Trench Gate
软穿通	Soft Punch Through
低导通损耗	Low On-State Loss
低开关损耗	Low Switching Loss
软关断	Soft Turn Off
高工作结温	T _{vjmax} =175℃

产品 /Product	技术 /Technology	尺寸 /Size	V _{CE}	I _{nom}	V _{CE(SAT)} @25℃		V _{GE(th)}	I _{CES}	I _{GES}	T _{vjmax}
					60A	I _{nom}				
		mm			V	A				
TI120SESGBS0	7 th STMOS	16*11.2	1200	300	0.95	1.45	6.0	2	100	175
TI120TESGCS0	5 th TMOS	16*12.1	1200	200	1.10	1.70	6.2	2	100	175
TI120TESFCH0	5 th TMOS	15.9*12	1200	200	1.10	1.70	6.2	2	100	175
TI120TESGCS5	5 th TMOS	16*12.1	1200	200	1.06	1.70	6.2	2	100	175
TI120FESEAH0	6 th RTMOS	14*10.9	1200	200	1.00	1.50	6.0	2	100	175
TI120FESB9S0	6 th RTMOS	11.1*9.7	1200	200	1.10	1.68	6.0	2	100	175
TI120SESB9S0	7 th STMOS	11.1*9.7	1200	200	1.10	1.55	6.0	2	100	175
TI120TESCCS0	5 th TMOS	12.6*12.6	1200	150	1.20	1.65	6.2	2	100	175
TI120TESEAH0	5 th TMOS	14*10.9	1200	150	1.15	1.75	6.2	2	100	175
TI120SESA6H1	7 th STMOS	10.7*6.7	1200	140	/	1.83	5.8	2	100	175
TI120TESE7S0	5 th TMOS	14.6*7.5	1200	110	1.30	1.90	6.2	2	100	175
TI120TESE7H0	5 th TMOS	14.5*7.4	1200	110	1.35	1.75	6.0	2	100	175
TI120SESA6S0	7 th STMOS	10.2*6.2	1200	100	/	1.65	5.9	2	100	175
TI120SESA6H0	7 th STMOS	10.2*6.2	1200	100	/	1.74	5.8	2	100	175
TI120SES55S0	7 th STMOS	5.6*5.2	1200	40	/	1.57	6.0	2	100	175
TI095SMS99S5	7 th STMOS	9*9	950	200	1.03	1.46	5.5	2	100	175
TI095SMS99H5	7 th STMOS	9*9	950	200	1.27	1.92	5.5	2	100	175
TI095SMS77H1	7 th STMOS	7.1*7.1	950	100	1.60	1.98	5.5	2	100	175
TI075SESC9S0	7 th STMOS	12.9*9.27	750	375	0.90	1.35	5.9	2	100	175
TI075FESBAS2	6 th RTMOS	11.1*10	750	315	0.95	1.65	6.0	2	100	175
TI075SESBAS0	7 th STMOS	11.2*10	750	315	0.95	1.40	6.0	2	100	175
TI075FESA9S0	6 th RTMOS	10.46*9.96	750	275	0.95	1.60	6.0	2	100	175
TI075TESA9S0	5 th TMOS	10.46*9.96	750	200	1.05	1.70	6.0	2	100	175

FRD 芯片

FRD CHIPS

产品介绍

PRODUCT INTRODUCTION

中车 FRD 芯片采用寿命控制与薄片技术，具有低导通损耗与开关损耗以及软恢复的特点，产品覆盖 750V-1200V 电压、30A-375A 电流范围。

CRRC FRD combines life time control and thin wafer technology, resulting low on-state loss and switching loss, as well as soft reverse recovery characteristics.The FRD portfolio includes the voltage range from 750V up to 1200V and the current range from 30A up to 375A .

产品特点

CHARACTERISTIC

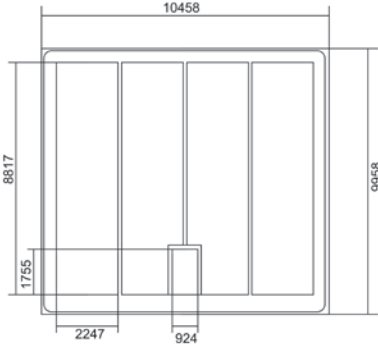
软恢复	Soft & Fast Switching
正温度系数	Positive Temperature Coefficient
易并联	Easy Paralleling
高工作结温	T _{vjmax} =175℃

产品 /Product	技术 /Technology	尺寸 /Size	V _R	I _{nom}	V _F @25℃		I _R	T _{vjmax}
					60A	I _{nom}		
		mm	V	A	V		μA	℃
TF120TLSAAS0	6 th FRD	10.8*10.8	1200	300	1.05	1.80	2	175
TF120TLSAAS5	5 th FRD	10.8*10.8	1200	267	1.09	1.50	2	175
TF120HLS8S1	5 th FRD	12.2*8.1	1200	200	1.26	1.80	2	175
TF120TLSB5S0	6 th FRD	11.1*5.6	1200	200	1.25	1.85	2	175
TF120SLSB5S0	7 th FRD	11.1*5.6	1200	200	1.26	1.95	2	175
TF120HLS99S0	5 th FRD	9.2*9.2	1200	150	1.36	1.85	2	175
TF120HLS88S0	5 th FRD	8.9*8.9	1200	150	1.25	1.75	2	175
TF120HLS88S1	5 th FRD	8.9*8.9	1200	150	1.25	1.75	2	175
TF120SLS94H0	7 th FRD	9.4*4.1	1200	140	/	2.38	2	175
TF120HHS77S1	5 th FRD	7.2*7.2	1200	110	1.07	1.45	2	175
TF120HLS77S1	5 th FRD	7.2*7.2	1200	110	1.50	1.90	2	175
TF120HLS77H0	5 th FRD	7.2*7.2	1200	110	1.45	1.75	2	175
TF120SLS84S0	7 th FRD	8.2*4.1	1200	100	/	1.53	2	175
TF120SLS84H0	7 th FRD	8.2*4.1	1200	100	/	1.96	2	175
TF120TLS43S0	7 th FRD	4.4*3.8	1200	40	/	1.51	2	175
TF120HHS44S1	5 th FRD	4.25*4.25	1200	30	/	1.25	2	175
TF095SLS55H5	7 th FRD	5.3*5.3	950	100	1.95	2.40	2	175
TF095SLS55S5	7 th FRD	5.3*5.3	950	100	1.35	1.61	2	175
TF075SLSC6S0	6 th FRD	12.1*6	750	375	1.05	1.70	2	175
TF075SLSC6S0	6 th FRD	12.1*6	750	375	1.05	1.70	2	175
TF075SLSB5S1	7 th FRD	11.1*5.4	750	315	1.10	1.95	2	175
TF075SLSB5S1	7 th FRD	11.1*5.4	750	315	1.10	1.95	2	175
TF075TLSA5S1	6 th FRD	10.4*5.3	750	275	1.10	1.60	2	175
TF075TLSA5S1	6 th FRD	10.4*5.3	750	275	1.10	1.60	2	175
TF075HLS95S3	5 th FRD	9.1*5.34	750	200	1.15	1.60	2	175
TF075HLS95S3	5 th FRD	9.1*5.34	750	200	1.15	1.60	2	175

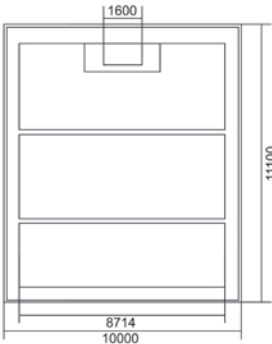
产品图示
PRODUCT
DIAGRAM

IGBT 芯片 IGBT CHIPS

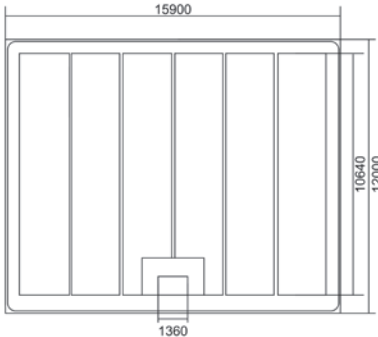
TI075TESA9S0



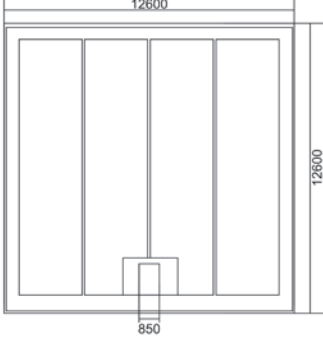
TI075FESBAS2



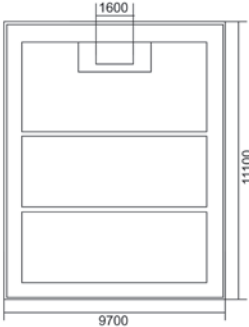
TI120TESFCH0



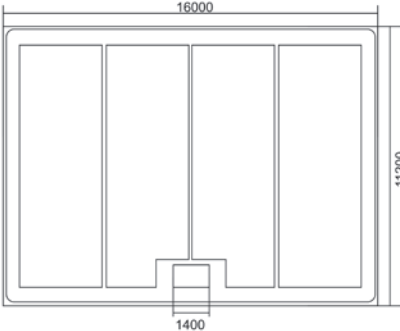
TI120TESCCS0



TI120FESB9S0



TI120FESGBS0

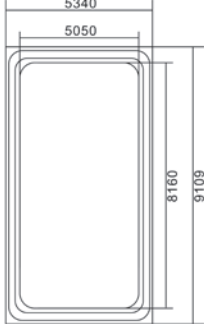


长度单位：微米
Unit: μm

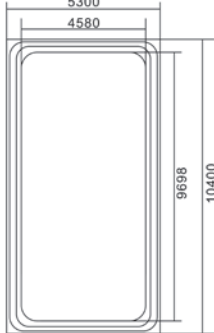
产品图示
PRODUCT
DIAGRAM

FRD 芯片 FRD CHIPS

TF075HLS95S3



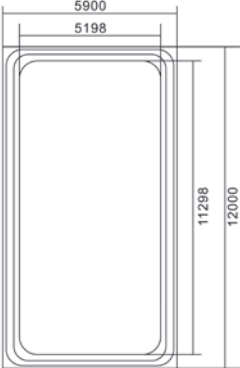
TF075TLA5S1



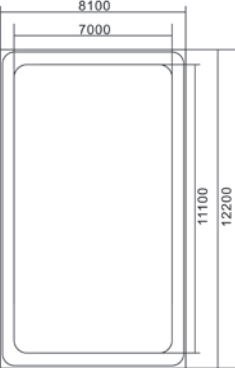
TF075SLSB5S1



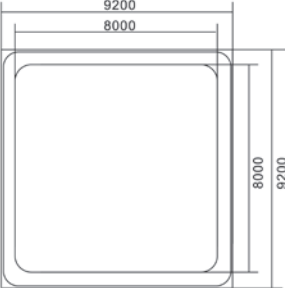
TF075TLC5S0



TF120HLSC8S1



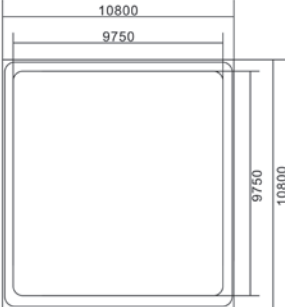
TF120HLS99S0



TF120TLB5S0



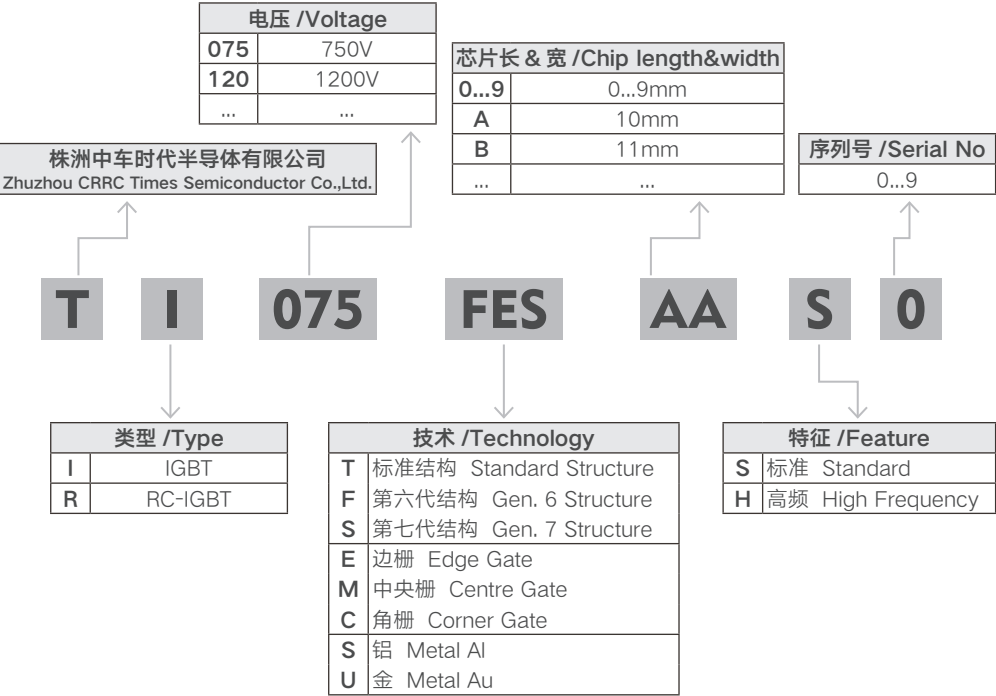
TF120TLAAS0



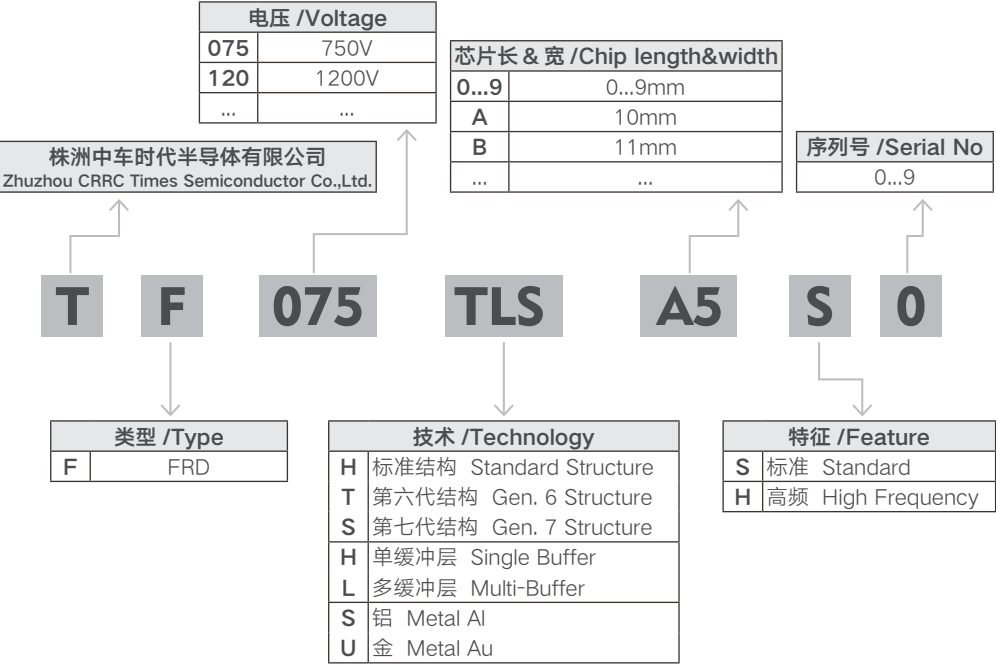
长度单位：微米
Unit: μm

命名规则
NAMING
SYSTEM

IGBT 芯片 IGBT CHIPS



FRD 芯片 FRD CHIPS



符号说明
SYMBOLS

符号 Symbols	参数名称	Characteristics
V_{CE}	集电极 - 发射极电压	Collector-Emitter Voltage
$V_{CE(SAT)}$	集电极 - 发射极饱和电压	Collector-Emitter Saturation Voltage
$V_{GE(TH)}$	栅极 - 发射极阈值电压	Gate-Emitter Threshold Voltage
I_{CES}	集电极 - 发射极漏电流	Zero Gate Voltage Collector Current
I_{GES}	栅极 - 发射极漏电流	Gate-Emitter Leakage Current
V_R	二极管反向电压	Diode Reverse Voltage
I_{NOM}	额定电流	Nominal Current
V_F	二极管正向电压	Diode Forward Voltage
I_R	二极管反向漏电流	Diode Reverse Leakage Current
T_{VJMAX}	最大工作结温	Max. Junction Temperature

第二章

CHAPTER TWO

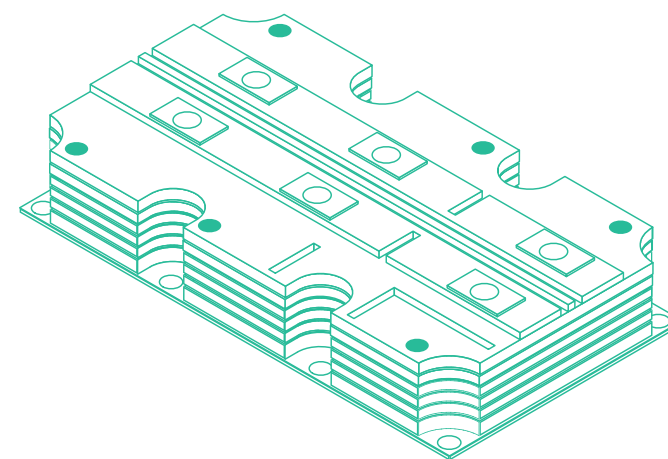
IGBT 及 FRD 模块

IGBT & FRD MODULES

株洲中车时代半导体有限公司
ZHUZHOU CRRC TIMES SEMICONDUCTOR CO.,LTD.

IGBT & FRD MODULES

IGBT 及 FRD 模块



第二章 CHAPTER TWO

高压 IGBT 模块

HV IGBT MODULES

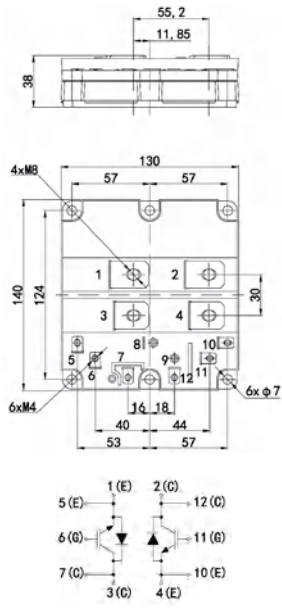
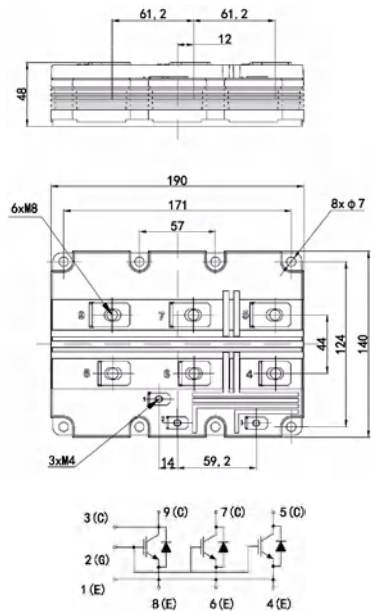
产品图示

PRODUCT
DIAGRAM

高压 IGBT 模块 HV IGBT MODULES

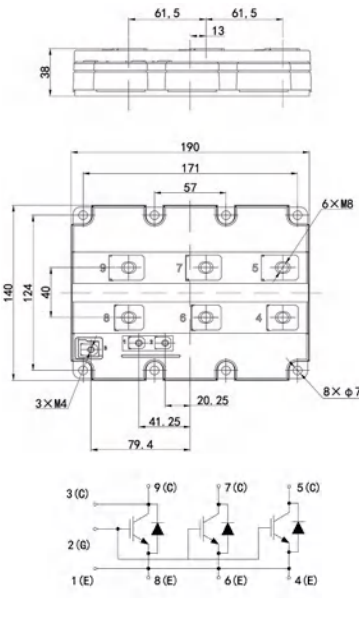
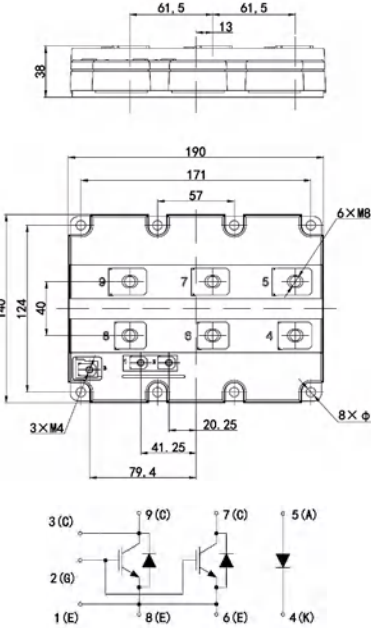
AS

DD



EC

ES



产品介绍

PRODUCT
INTRODUCTION

采用中车第四代 DMOS⁺ 芯片和第五代 TMOS 芯片，具有低导通压降、软关断特性、正温度系数和易并联等特点。该系列产品涵盖 3300V 至 6500V 电压范围，封装和电路结构灵活多变，适用于各种并联应用场景。产品采用高热匹配的 AISiC 基板和 AlN 衬板材料封装而成，在热循环、功率循环、机械冲击等可靠性方面具有明显优势，可以满足频繁启动和长距离运行的工况需求。已批量应用于电力机车、高速动车组、地铁等轨道交通领域和其他大功率变频器装置领域。

CRRC HV IGBT module family uses CRRC Gen4 DMOS⁺ and Gen5 TMOS IGBT chip featuring low on-state voltage drop, soft turn-off, positive temperature coefficient and parallel easily. CRRC HV IGBT module family covers voltage from 3300V to 6500V, has flexible package and circuit structure, can applicable to all kinds of parallel application scenarios. With CTE suitable AISiC baseplate and AlN substrate material, CRRC HV IGBT module family has obvious advantages in reliability capability, including of thermal cycling, power cycling and mechanical impact etc, can meet requirements of start-up and long-distance operating conditions. CRRC HV IGBT module family has been volume applied to locomotive, high speed train, urban rail and other high power converter applications.

产品特点

CHARACTERISTIC

低导通压降

Low $V_{CE(SAT)}$

高短路能力

High Short Circuit Capability

正温度系数电压

$V_{CE(SAT)}$ With Positive Temperature Coefficient

高功率循环及热循环能力

High Power And Thermal Cycling Capability



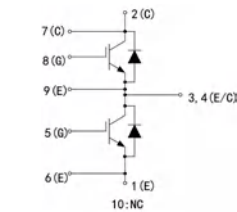
型号 Type	I_c		V_{CES}	I_{CRM}	$V_{CE(SAT)}$	E_{SW}	T_{VJM}	$R_{thJC\ IGBT}$	封装外形 Assembly Outline		
	A	$@T_c$			$@I_c$	$@T_{VJM}$			代码 Code	尺寸 Dimensions	基板材料 Base Material
		$^{\circ}C$			$\&T_c=25^{\circ}C$						
					V	V					
		$^{\circ}C$	V	A	V	mJ	$^{\circ}C$	K/W	/	mm	/
TIM750ASM65-PSA011	750	80	6500	1500	3.0	14280	125	0.0085	AS	190×140×48	AlSiC
TG750HF65P1-TSA000* ①	750	60	6500	1500	3.1	10835	125	0.023(JF)	PCU	278×226.3×56	Cu
TIM250P2SM65-PSA011	250	80	6500	500	3.2	3790	125	0.026	P2S	140×73×48	AlSiC
TIM1500A2SM45-TSA000*	1500	80	4500	3000	2.6	15675	150	0.008	AS	190×140×48	AlSiC
TIM1200ASM45-PSA011	1200	85	4500	2400	2.3	14060	125	0.008	AS	190×140×48	AlSiC
TIM1200ESM45-PSA011	1200	85	4500	2400	2.3	14060	125	0.008	ES	190×140×38	AlSiC
TIM800XSM45-PSA011	800	85	4500	1600	2.3	9425	125	0.013	XS	140×130×48	AlSiC
TIM2400E3SM33-TSA000*	2400	100	3300	4800	2.6	10950	150	0.01	ES	190×140×38	AlSiC
TIM1600N3SM33-TSA000	1600	100	3300	3200	2.6	7300	150	0.01	NS	140×130×38	AlSiC
TIM1500ESM33-PSA012	1500	95	3300	3000	2.4	8020	150	0.008	ES	190×140×38	AlSiC
TIM1500E2SM33-PSA012	1500	95	3300	3000	2.6	7800	150	0.0084	ES	190×140×38	AlSiC
TIM1000NSM33-PSA011	1000	95	3300	2000	2.4	5770	150	0.012	NS	140×130×38	AlSiC
TIM1000ECM33-PSA011	1000	95	3300	2000	2.1	6500	150	0.012	EC	190×140×38	AlSiC
TIM500GDM33-PSA011	500	100	3300	1000	2.4	2850	150	0.024	GD	160×130×38	AlSiC
TG450HF33X1-TSA000	450	95	3300	900	2.5	1695	150	0.031	X1	144×100×40	AlSiC
TIM250PHM33-PSA011	250	100	3300	500	2.5	1375	150	0.048	PH	140×73×38	AlSiC

注：未标注数量单位的统一为毫米 (mm)

Remarks: All dimensions shown in mm unless stated otherwise

高压 IGBT 模块 HV IGBT MODULES

PCU

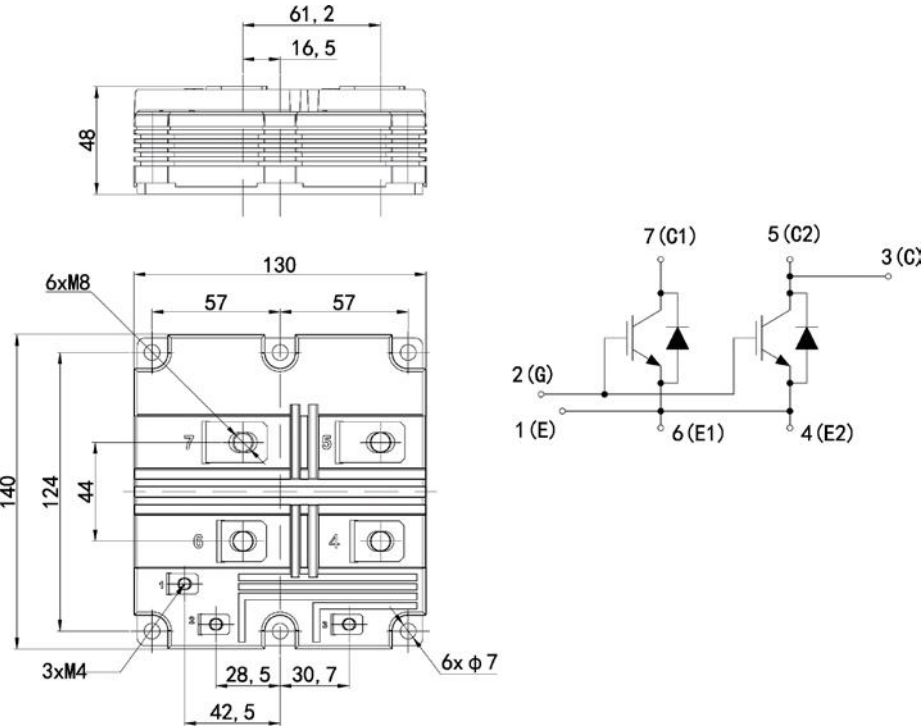


注:未标注数量单位的统一为毫米 (mm)
Remarks: All dimensions shown in mm unless stated otherwise

产品图示
PRODUCT
DIAGRAM

高压 IGBT 模块 HV IGBT MODULES

XS



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

产品介绍
PRODUCT
INTRODUCTION

汽车 IGBT 模块

AUTOMOTIVE IGBT MODULES

采用中车第七代超精细沟槽芯片，具有高电流密度、低开关损耗、高工作结温等特点。采用直接水冷基板，选用高性能导热材料，该系列产品涵盖 400A 至 1200A 电流范围，单模块最大可满足 250kW 电机需求。具备低运行损耗特征，满足汽车的急速启停、陡坡爬升、高速运行、振动颠簸等工况。产品已批量应用于新能源电动汽车领域。

CRRC automotive IGBT module uses CRRC Gen 7 super-fine Trench technology IGBT chip featuring high current density , low switching losses, high operation temperature. With direct water-cooling baseplate design and high thermal conduction material, the power density of CRRC automotive IGBT has been further increased which can meet all kinds of complex automotive application requirements. CRRC automotive IGBT family covers current range from 40A to 1200A , single module can meet the requirement of motor drive up to 250kW. CRRC automotive IGBT has been volume applied to various electric vehicles.

产品特点
CHARACTERISTIC

- | | |
|-------|-------------------------------------|
| 低导通压降 | Low $V_{CE(SAT)}$ |
| 低杂散电感 | Low Inductive Design |
| 低开关损耗 | Low Switching Losses |
| 高功率密度 | High Power Density |
| 高工作结温 | High Operating Junction Temperature |



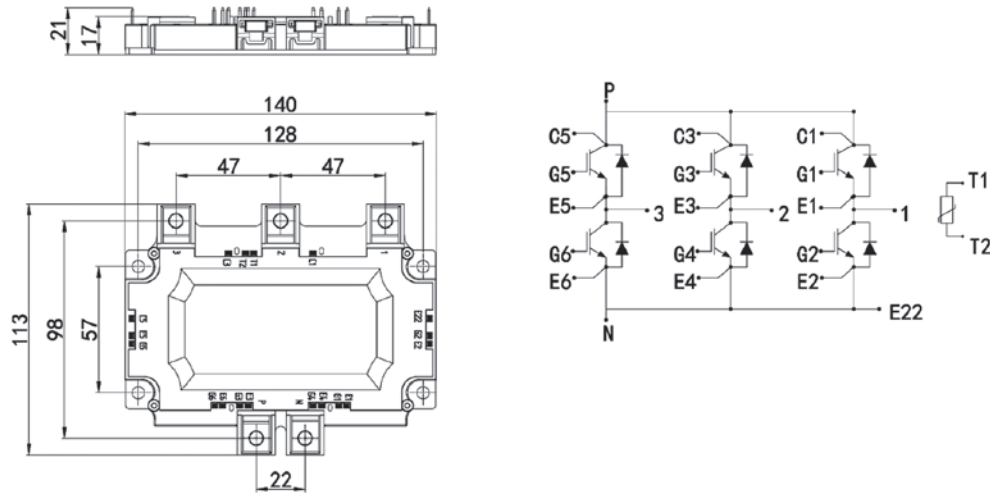
汽车 IGBT 模块 AUTOMOTIVE IGBT MODULES

型号 Type	I_C		V_{CES}	I_{CRM}	$V_{CE(SAT)}$	E_{SW}	T_{VJM}	$R_{thJC\ IGBT}$	封装外形 Assembly Outline		
	A	$@T_C$			$@I_C$	$@T_{VJM}$			代码 Code	尺寸 Dimensions	基板材料 Base Material
		$^{\circ}C$			$\&T_C=25^{\circ}C$						
TG600FF13S3-S5A02*	600	100	1300	1200	1.51	173	175	0.084(JF)	S3	154.5×126.5×32	Cu
TG900HF12M1-S5A00	900	100	1200	1800	1.45	281	175	0.052	M1	151.8×62×20.8	Cu
TG600HF12M1-G3A00	600	100	1200	1200	1.85	171	150	0.049	M1	151.8×62×20.8	Cu
TG600FF12S3-S4A01	600	80	1200	1200	1.5	211	175	0.10(JF)	S3	154.5×126.5×32	Cu
TG600FF12S3-S5A02*	600	80	1200	1200	1.4	200	175	0.10(JF)	S3	154.5×126.5×32	Cu
TG450HF12M1-S3A00	450	100	1200	900	1.65	142	150	0.052	M1	151.8×62×20.8	Cu
TG1200FF08S3-R6A02*	1200	100	750	2400	1.1	60	175	0.062(JF)	S3	154.5×126.5×32	Cu
TG1000HF08L5-S5A00*	1000	100	750	2000	1.1	60	175	0.07(JF)	L5	110×63×25.5	Cu
TG950FF08S3-S4A01	950	95	750	1900	1.2	66.1	175	0.10(JF)	S3	154.5×126.5×32	Cu
TG950FF08S3-S5A01	950	95	750	1900	1.15	62.5	175	0.10(JF)	S3	154.5×126.5×32	Cu
TG820FF08S6-S5A12*	820	100	750	1640	1.2	62	175	0.1(JF)	S6	139×92×33	Cu
TG820FF08S3-S4A11	820	80	750	1640	1.2	66.1	175	0.12(JF)	S3	154.5×126.5×32	Cu
TG820FF08S3-S5A01	820	65	750	1640	1.15	62.5	175	0.12(JF)	S3	154.5×126.5×32	Cu
TG800HF08L4-S4A00	800	110	750	1600	1.62	92.8	175	0.05	L4	79.3×55×15.75	/
TG660FF08S3-S4A03	660	80	750	1320	1.2	66.1	175	0.08(JF)	S3	154.5×126.5×32	Cu
TG650FF08S2-S5A01	650	80	750	1300	1.1	56.5	175	0.205(JF)	S2	140×113×22.35	Cu
TG600FF08S3-S3A01	600	65	750	1200	1.55	70	150	0.12(JF)	S3	154.5×126.5×32	Cu
TG550FF08S3-S5A01	550	80	750	1100	1.1	37	175	0.16(JF)	S3	154.5×126.5×32	Cu
TG400FF08S0-S3A00	400	65	750	800	1.7	44.5	150	0.12	S0	140×113×21	Cu
TG400FF08S0-S4A00	400	65	750	800	1.7	44.5	150	0.12	S0	140×113×21	Cu
TG400FF08S2-S3A11	400	60	750	800	1.7	50.5	150	0.165(JF)	S2	140×112×29.6	Cu
TG340SW08L6-S5A00*	340	100	750	680	1.24	27	175	0.088	L6	43.65×18.8×18.45	NA

产品图示
PRODUCT
DIAGRAM

汽车 IGBT 模块 AUTOMOTIVE IGBT MODULES

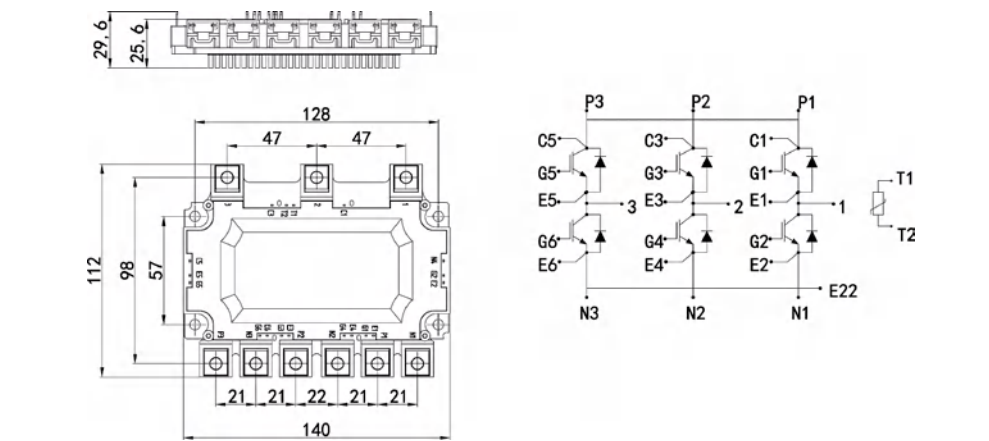
S0



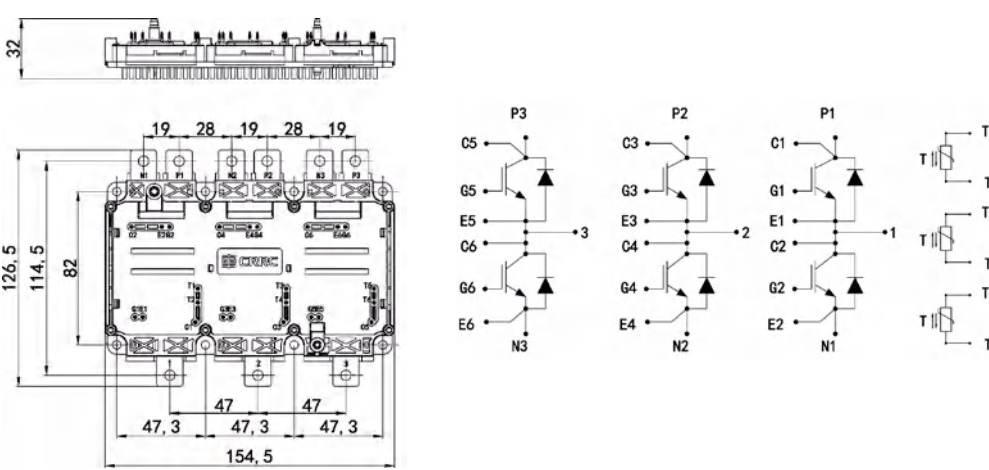
产品图示
PRODUCT
DIAGRAM

汽车 IGBT 模块 AUTOMOTIVE IGBT MODULES

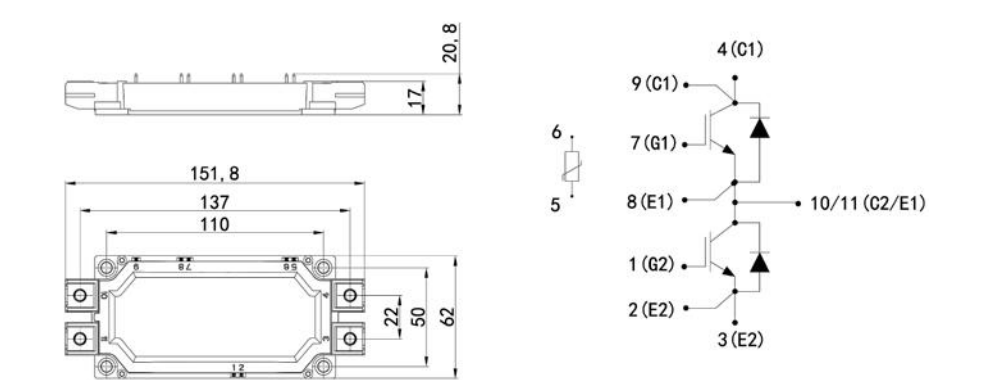
S2



S3



M1

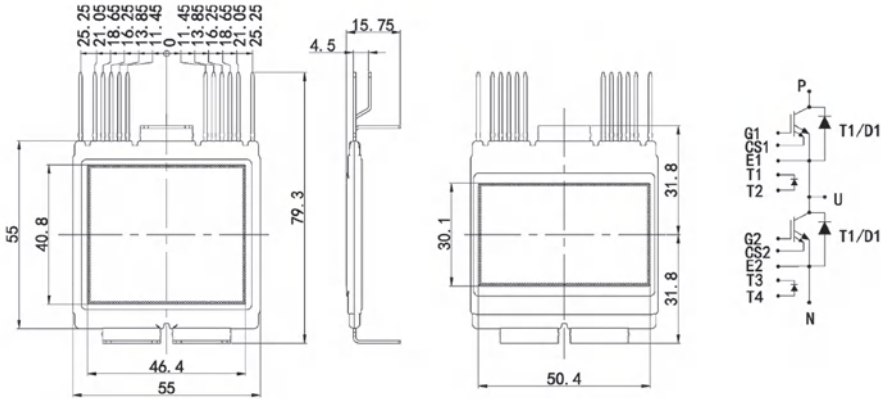


注：未标注数量单位的统一为毫米（mm）
Remarks:All dimensions shown in mm unless stated otherwise

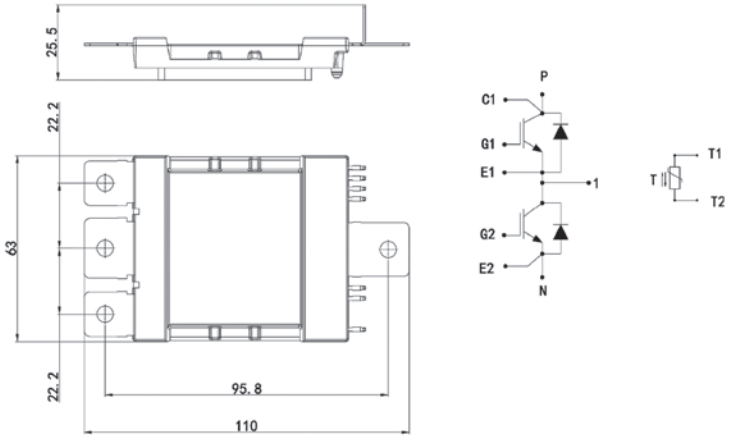
产品图示
PRODUCT
DIAGRAM

汽车 IGBT 模块 AUTOMOTIVE IGBT MODULES

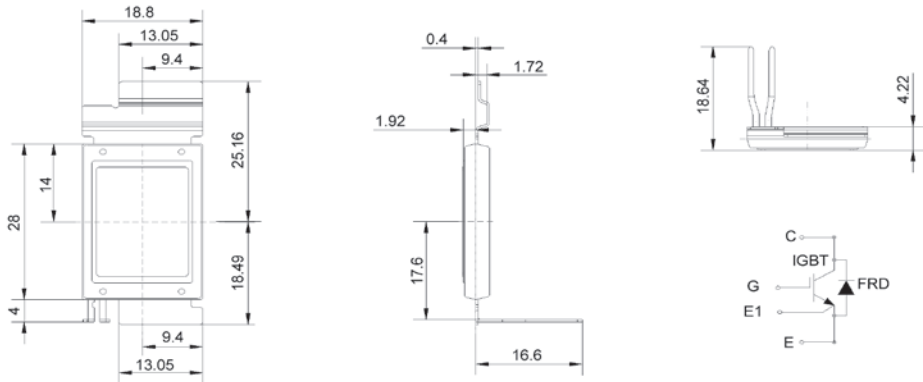
L4



L5



L6



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

压接式 IGBT 模块

PRESS-PACK IGBT MODULES

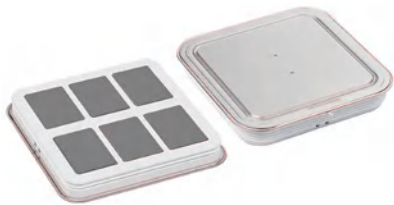
产品介绍
PRODUCT
INTRODUCTION

采用中车第四代 DMOS⁺ 和第五代 TMOS 芯片，具有低导通压降、低开关损耗、软关断特性等特点。该系列产品采用双面焊接和柔性压接技术，具有高压大容量、高可靠性、高过载能力等特点，可满足远距离、大容量的柔性直流输电工程的需求，满足复杂高压电磁环境适应性以及高可靠运行的要求。已批量应用于多个柔性直流输电工程。

CRRC press-pack IGBT uses CRRC Gen4 DMOS⁺ and Cen5 TMOS IGBT chip featuring low on-stage voltage drop, low switching losses and soft turn-off characteristics. CRRC Press-Pack IGBT module family uses double-sided soldering and flexible clamping technology, has the benefit of high power capacity, high reliability and high overload capacity. CRRC Press-Pack IGBT module family can meet the requirement of long distance, high power flexible HVDC application. CRRC Press-Pack IGBT module family has been volume applied to multiple HVDC projects.

产品特点
CHARACTERISTIC

- 双面散热 Double-Side Cooling
- 失效短路 Short-Circuit Failure Mode
- 低杂散电感 Low Inductive Design
- 高热循环能力 High Thermal Cycling Capability



型号 Type	I_C		V_{CES}	I_{CRM}	$V_{CE(SAT)}$	E_{SW}	T_{VJM}	R_{thJC} IGBT	封装外形 Assembly Outline		
	A	$@T_C$			$@I_C$	$@T_{VJM}$			代码 Code	尺寸 Dimensions	基板材料 Base Material
		$^{\circ}C$			$\&T_C=25^{\circ}C$						
TG3000SW65ZF-T200	3000	90	6500	6000	3.4	/	135	0.0025	ZF	228 × 228 × 26.5	Mo
TG5000SG45ZF-P200	5000	90	4500	10000	2.45	55800	135	0.00167	ZF	228 × 228 × 26.5	Mo
TG3000SW45ZC-P200	3000	90	4500	6000	2.3	39700	125	0.003	ZC	205.8 × 205.8 × 33.4	Cu
TG2000SW45ZC-P200	2000	90	4500	4000	2.3	27900	125	0.0043	ZC	205.8 × 205.8 × 33.4	Cu
TG1500SW45YB-P200	1500	90	4500	3000	2.3	19900	125	0.006	YB	φ 190 × 33.4	Cu
TG2000SW45YA-T200	2000	90	4000	2.7	2.25	31573	150	5.5	YA	φ 172 X 26.5	Cu

中低压 IGBT 模块

MV AND LV IGBT MODULES

产品介绍

PRODUCT INTRODUCTION

采用中车第七代超精细沟槽芯片，具有高电流密度、低开关损耗、高工作结温等特点。采用 Cu 基板，选用高性能导热材料，具有散热性能好、高电流密度、高可靠性等特点。该系列产品涵盖电流 40A 至 3600A，电压 950V 至 1700V，具备定制化调整的能力，可根据客户需求调整 IGBT 安全工作裕量、耗损分配、过载能力等特性，适应各行业应用。产品已批量应用于新能源风电、光伏、变频器、SVG、中频感应加热等领域。

CRRC MV&LV IGBT module family uses CRRC Gen 7 super-fine Trench technology IGBT chip,with benefit of low switching losses, high operation temperature. For package Cu baseplate and high thermal conduction material have been applied to further enhance thermal performance and current density and long term reliability. CRRC medium and low voltage IGBT family covers current from 40A to 3600A, voltage from 950V to 1700V, can meet requirements of renewable energy and industry applications. CRRC MV&LV IGBT has been volume applied to applications of wind power , PV, inverter, SVG and induction heating etc.

产品特点

CHARACTERISTIC

- 低导通压降

Low $V_{CE(SAT)}$
- 低开关损耗

Low Switching Losses
- 高功率密度

High Power Density
- 高工作结温

High Operating Junction Temperature



中低压 IGBT 模块 MV AND LV IGBT MODULES

型号 Type	I_C		V_{CES}	I_{CRM}	$V_{CE(SAT)}$	E_{SW}	T_{VJM}	$R_{\theta JC}$ IGBT	封装外形 Assembly Outline		
	A	$@T_C$			$@I_C$	$@T_{VJM}$			代码 Code	尺寸 Dimensions	基板材料 Base Material
		$^{\circ}C$			$\&T_C=25^{\circ}C$						
					V						
TIM3600E2SM17-TSA000	3600	95	1700	7200	1.95	3680	150	0.0075	ES	190×140×38	AlSiC
TIM2400ESM17-TSA000	2400	100	1700	4800	1.75	2840	150	0.0065	ES	190×140×38	AlSiC
TIM2400N2SM17-TSA000	2400	95	1700	4800	1.95	2070	150	0.0137	N2S	140×130×38	AlSiC
TG1800HF17H1-S500	1800	100	1700	3600	2.2	2250	150	0.0165	H1	250×89×38	Cu
TIM1600FSM17-PSA011	1600	80	1700	3200	2.3	1800	125	0.009	FS	140×130×38	AlSiC
TG1400HF17H1-S300	1400	100	1700	2800	1.75	1300	150	0.0166	H1	250×89×38	Cu
TIM1200FSM17-PSA011	1200	80	1700	2400	2.3	1300	125	0.012	FS	140×130×38	AlSiC
TG1000HF17H1-S300	1000	100	1700	2000	1.85	980	150	0.02	H1	250×89×38	Cu
TG800HF17M1-S500	800	100	1700	1600	1.95	665	150	0.039	M1	151.8×62×20.8	Cu
TG650CP17H2-S300	650	100	1700	1300	1.85	610	150	0.03	H2	171.8×89×38	Cu
TG650PC17H2-S300	650	100	1700	1300	1.85	610	150	0.03	H2	171.8×89×38	Cu
TG650HF17H2-S300	650	95	1700	1300	1.85	610	150	0.03	H2	171.8×89×38	Cu
TG600HF17M1-S310	600	100	1700	1200	1.7	401	150	0.046	M1	151.8×62×20.8	Cu
TG600HF17M1-S300	600	100	1700	1200	1.8	470	150	0.046	M1	151.8×62×20.8	Cu
TG500HF17M1-S310	500	100	1700	1000	1.85	410	150	0.06	M1	151.8×62×20.8	Cu
TG450HF17M1-S300	450	100	1700	900	1.8	381	150	0.055	M1	151.8×62×20.8	Cu
TG300HF17M1-S300	300	100	1700	600	1.8	235	150	0.08	M1	151.8×62×20.8	Cu
TG1400HF12H1-S300	1400	100	1200	2800	1.8	486	150	0.02	H1	250×89×38	Cu
TG900HF12H2-S300	900	100	1200	1800	1.8	300	150	0.0295	H2	171.8×89×38	Cu
TG800HF12W1-S400	800	100	1200	1600	1.5	298.6	150	0.0485	W1	106.4×61.4×30.9	Cu
TG800HF12W1-S500	800	90	1200	1600	1.4	224	175	0.0485	W1	106.4×61.4×30.9	/
TG750HF12M1-S500	750	90	1200	1500	1.6	274 (150℃)	175	0.051	M1	151.8×62×20.8	Cu
TG600HF12M1-S3A00	600	100	1200	1200	1.7	194	150	0.049	M1	151.8×62×20.8	Cu
TG600HF12M1-G3A00	600	100	1200	1200	1.85	115	150	0.049	M1	151.8×62×20.8	Cu
TG600DW12W1-S300	600	100	1200	1200	1.75	141.5	150	0.0485	W1	106.4×61.4×30.9	Cu
TG600HF12W1-G300	600	100	1200	1200	1.75	209.5	150	0.0485	W1	106.4×61.4×30.9	Cu
TG600HF12M1-S500	600	80	1200	1200	1.57	175.1(150℃)	175	0.057	M1	151.8×62×20.8	Cu
TG450HF12M1-S3A00	450	100	1200	900	1.65	91.5	150	0.052	M1	151.8×62×20.8	Cu
TG450HF12W1-S400	450	100	1200	900	1.77	164.23	150	0.058	W1	106.4×61.4×30.9	Cu
TG300HF12M1-S300	300	100	1200	600	1.65	98.9	150	0.078	M1	151.8×62×20.8	Cu
TG300HF12W1-S300	300	100	1200	600	1.75	104.75	150	0.093	W1	106.4×61.4×30.9	Cu
TG450NP11U4-S500	450	100	1100	900	1.5	43.31	150	0.076	U4	112×62×16.4	Cu
TG600NP10U4B-S500	600	50	950	1200	1.4	29.9	150	0.0882	U4	112×62×16.4	Cu
TH400AN10U4-S500	400	/	950	800	"1.28(T1\T4) 1.05(T2\T3) 1.6(T5\T6)"	"12.1(T1\T4) 24.3(T2\T3) 16.9(T5\T6)"	150	"0.15(T1\T4\T2\T3) 0.2847(T5\T6)"	U4	112×62×16.4	Cu
TH400AN10U3-S500	400	/	950	800	"1.28(T1\T4) 1.05(T2\T3) 1.6(T5\T6)"	"12.1(T1\T4) 24.3(T2\T3) 16.9(T5\T6)"	150	"0.14(T1\T4\T2\T3) 0.28(T5\T6)"	U3	109.9×62×16.4	/
TH200F3B10U4-S500	200	65	950	400	1.4	4.15	150	0.2048	U4	112×62×16.4	Cu
TH200D3B10U3-S500	100	/	950	200	1.23	1.21	150	0.35	U3	109.9×62×16.4	/
TH200D3B10U4-S500	100	/	950	200	1.23	1.21	150	0.428	U4	112×62×16.4	Cu

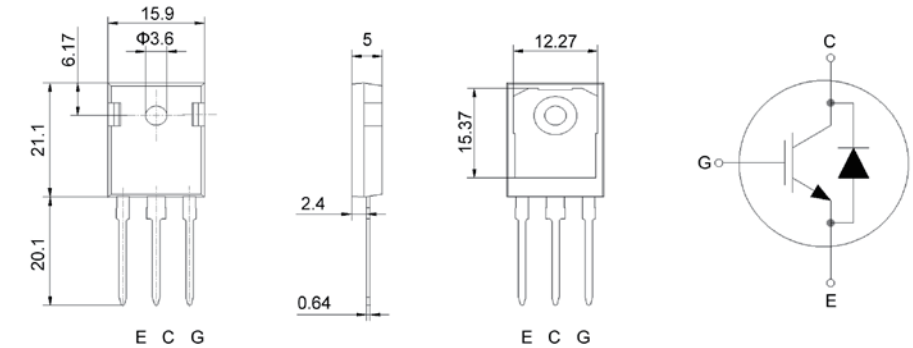
TO Si 器件 POWER DEVICE

型号 Type	I_C		V_{CES}	I_{CRM}	$V_{CE(SAT)}$	E_{SW}	T_{VJM}	R_{thJC} IGBT	封装外形 Assembly Outline		
	A	$@T_C$			$@I_C$	$@T_{VJM}$			代码 Code	尺寸 Dimensions	基板材料 Base Material
		$\&T_C=25^{\circ}C$									
		$^{\circ}C$			V						
TG100SW12B2-S500	126	100	1200	300	1.65	18.94	175	0.13	B2	41.2 × 15.9 × 5.1	/
TG40SW12B1-S500	56	100	1200	120	1.65	7.5	175	0.3	B1	41.9 × 16.3 × 5.3	/

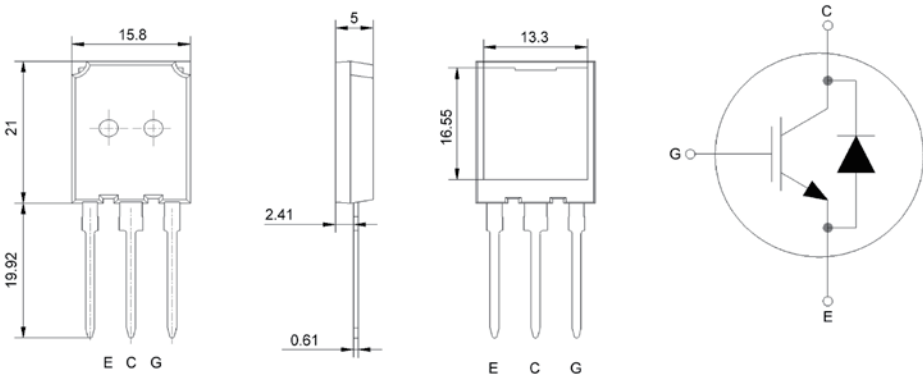
产品图示
PRODUCT
DIAGRAM

中低压 IGBT 模块 MV AND LV IGBT MODULES

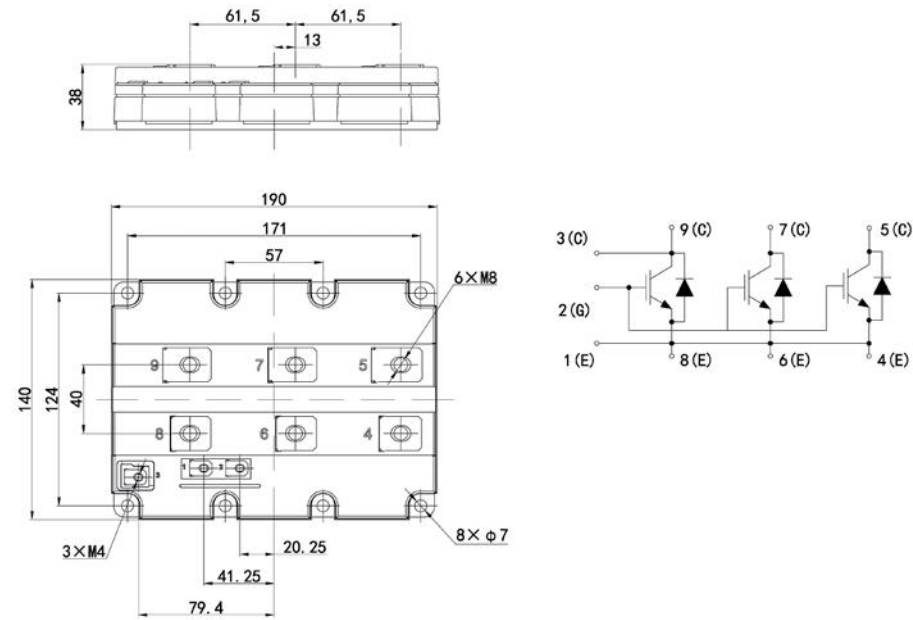
B1



B2



ES

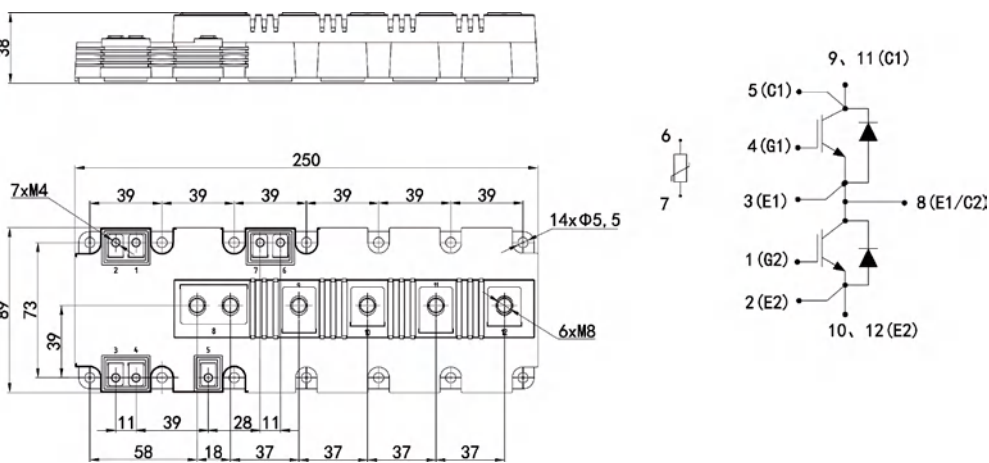


注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

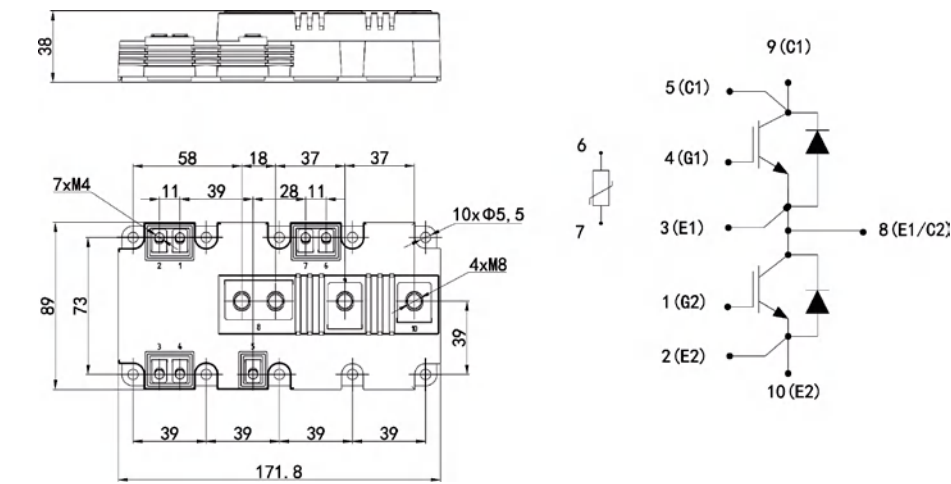
产品图示
PRODUCT
DIAGRAM

中低压 IGBT 模块 MV AND LV IGBT MODULES

H1



H2

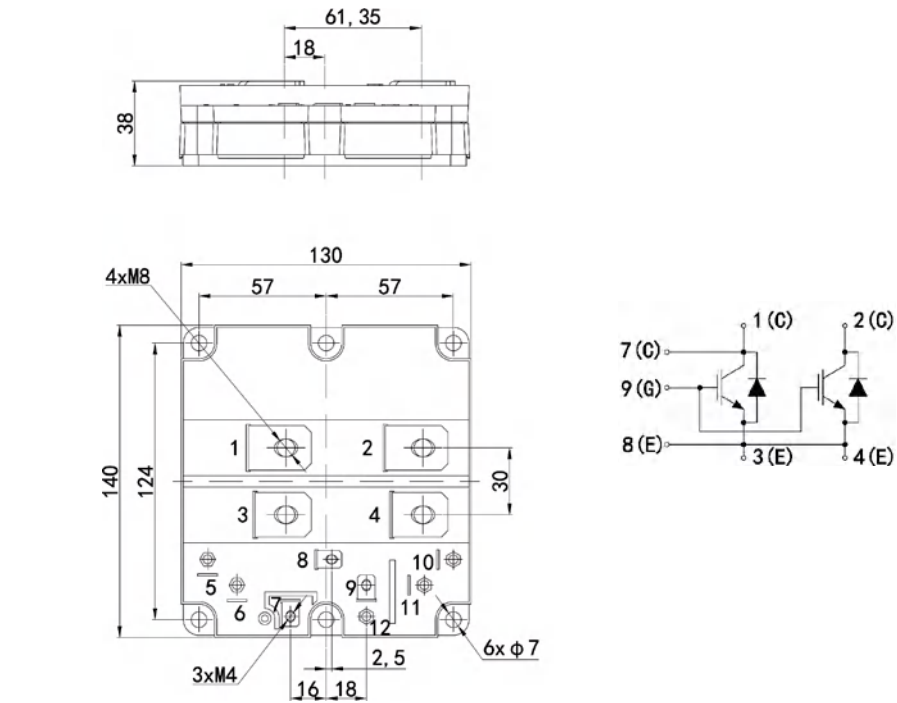


注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

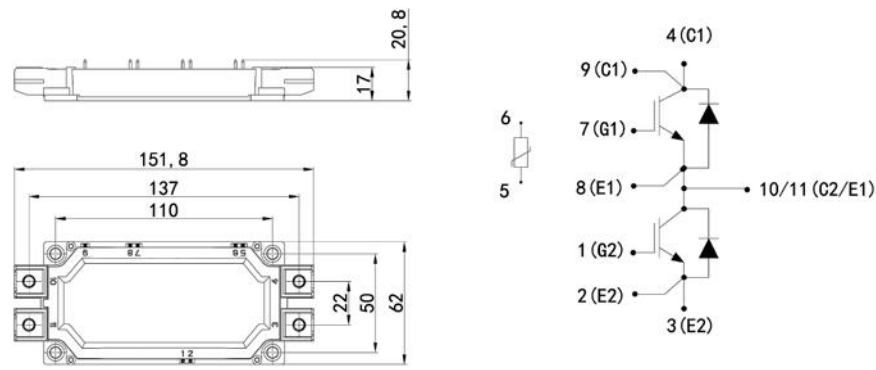
产品图示
PRODUCT
DIAGRAM

中低压 IGBT 模块 MV AND LV IGBT MODULES

FS



M1

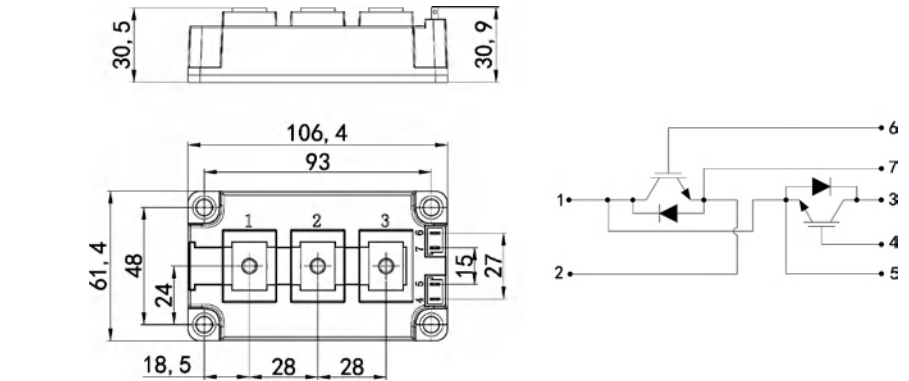


注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

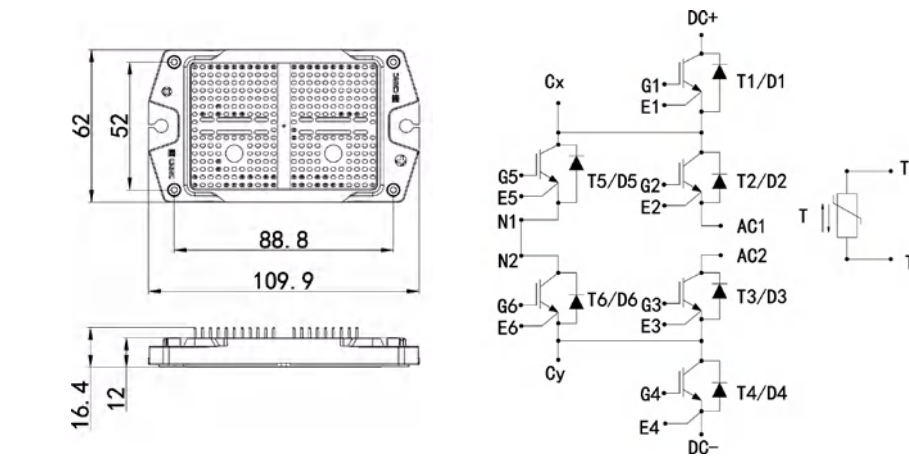
产品图示
PRODUCT
DIAGRAM

中低压 IGBT 模块 MV AND LV IGBT MODULES

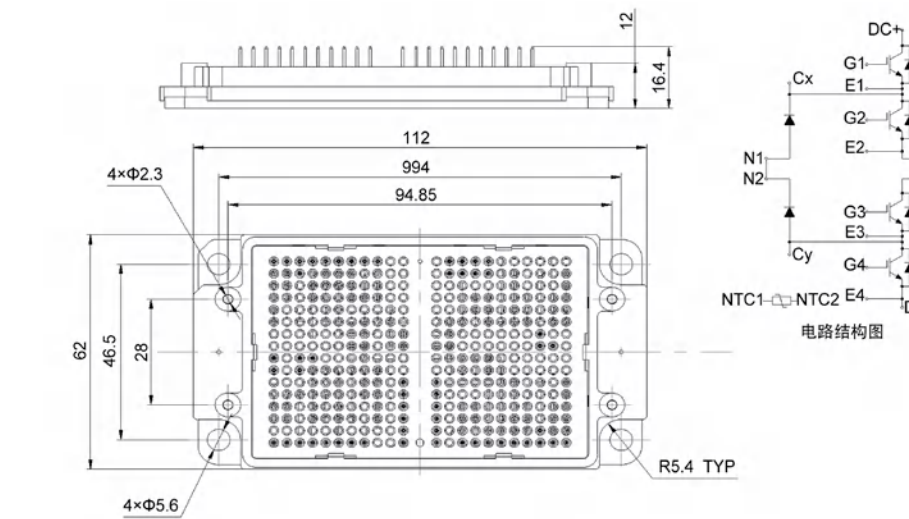
W1



U3



U4



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

FRD 模块

FRD MODULES

产品介绍

采用中车第六代注入效率控制 FRD，具有低导通损耗，软恢复特性，正温度系数，高工作结温等特点。该系列产品具备足够安全工作裕量和高可靠性，涵盖 1200V 至 6500V 电压范围，批量应用于轨道交通和工业领域。

CRRC FRD module uses CRRC Gen6 injection efficiency control chip featuring low on-state voltage drop,soft reverse recovery characteristic,positive temperature coefficient, high operation temperature.CRRC FRD family modules have high reliability and high overload capacity, they cover voltage from 1200V to 6500V,can meet requirements of railway application and industry applications.

产品特点

- 高电流密度

High Current Density
- 高热循环能力

High Thermal Cycling Capability
- 高浪涌能力

High I²t Capability

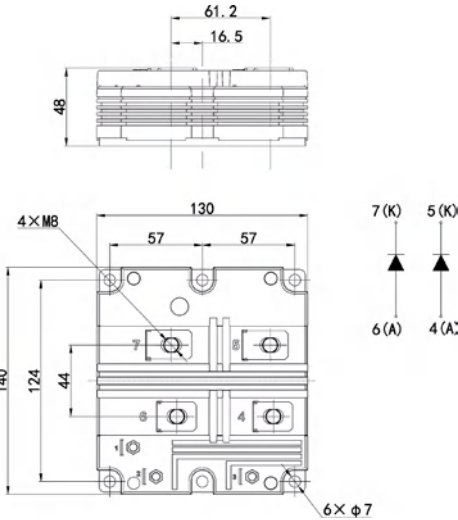
型号 Type	I _C		V _{CES}	I _{CRM}	V _F	E _{SW} (E _{REC})	T _{VJM}	R _{thJC} FRD	封装外形 Assembly Outline		
	A	@T _C			@I _C				代码 Code	尺寸 Dimensions	基板材料 Base Material
		°C			&T _C =25°C						
TFM750XDM65-D200	750	80	6500	1500	2.70	3300 (E _{REC})	125	0.018	XD	140×130×48	AlSiC
TFM1500XDM45-D200	1500	/	4500	3000	2.55	5300 (E _{REC})	150	0.016	XD	140×130×48	AlSiC
TFM1200XDM45-D200	1200	/	4500	2400	2.7	3900 (E _{REC})	125	0.016	XD	140×130×48	AlSiC
TFM1500NDM33-D200	1500	/	3300	3000	2.4	2600 (E _{REC})	150	0.015	ND	140×130×38	AlSiC
TF1500SF33K1-D200	1500	/	3300	3000	2.25	2200 (E _{REC})	150	0.0145	K1	130×90×38	AlSiC
TFM1000N2DM33-D200	1000	95	3300	2000	2.15	1800 (E _{REC})	150	0.021	ND	140×130×38	AlSiC
TFM3600E2SM17-D200	3600	95	1700	7200	1.85	1240 (E _{REC})	150	0.0095	ES	190×140×38	AlSiC
TF100HF12T1-D300	100	/	1200	200	1.6	/	150	0.28	T1	94×35×30	Cu

产品图示

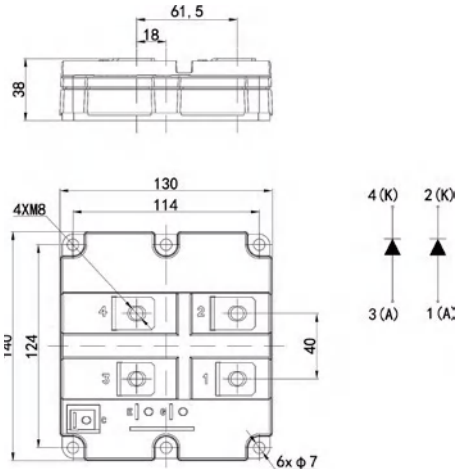
PRODUCT
DIAGRAM

FRD 模块 FRD MODULES

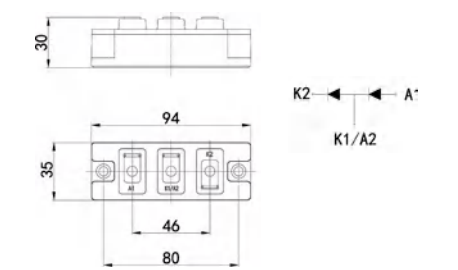
XD



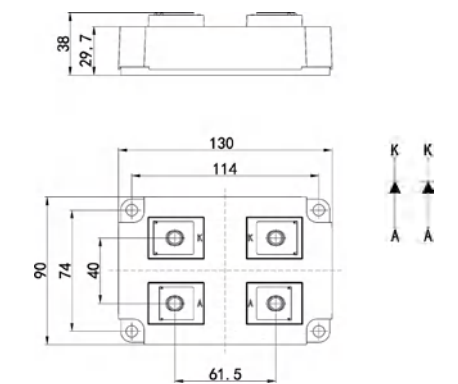
ND



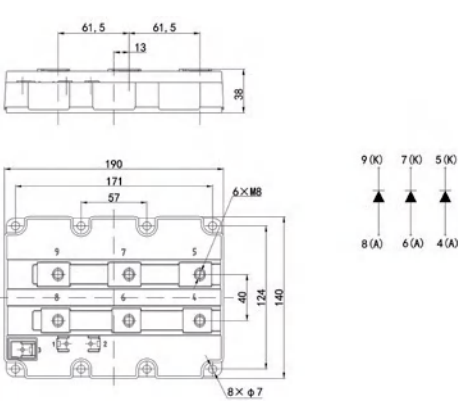
T1



K1



ES



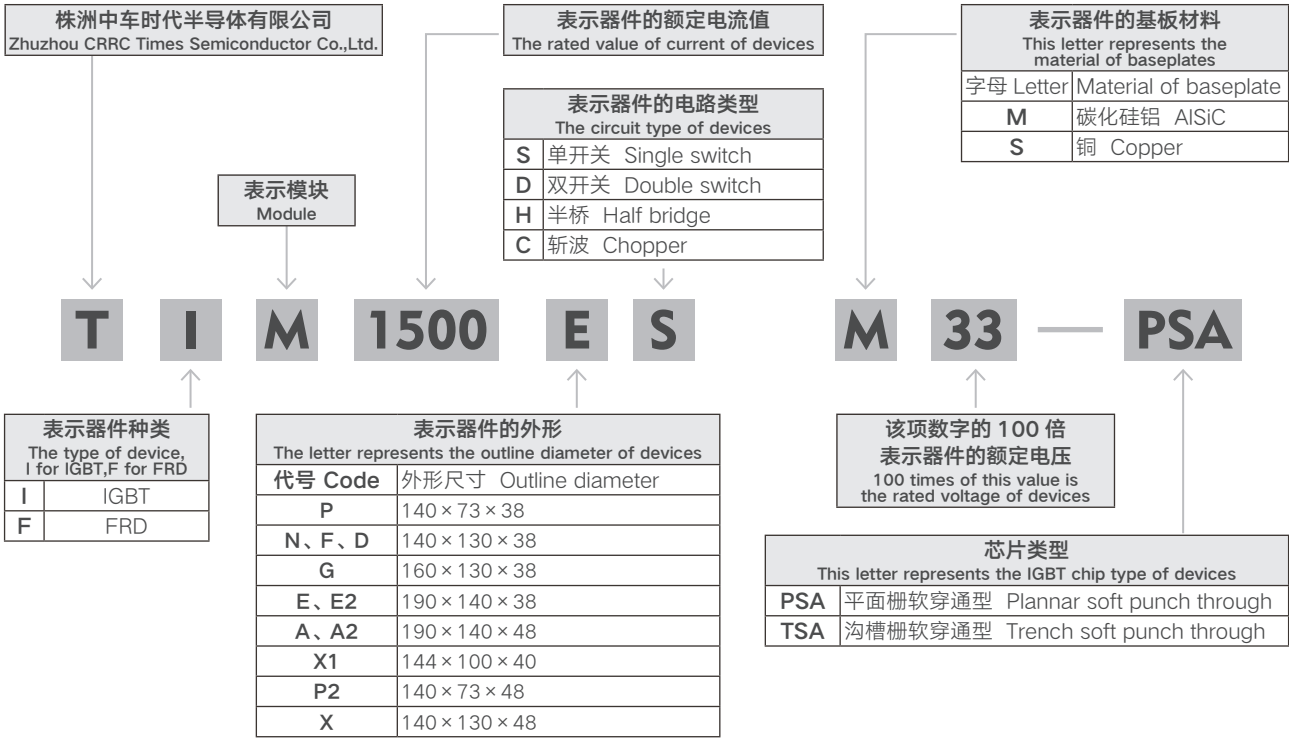
注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

命名规则

NAMING
SYSTEM

高压 IGBT 模块

HV IGBT MODULES

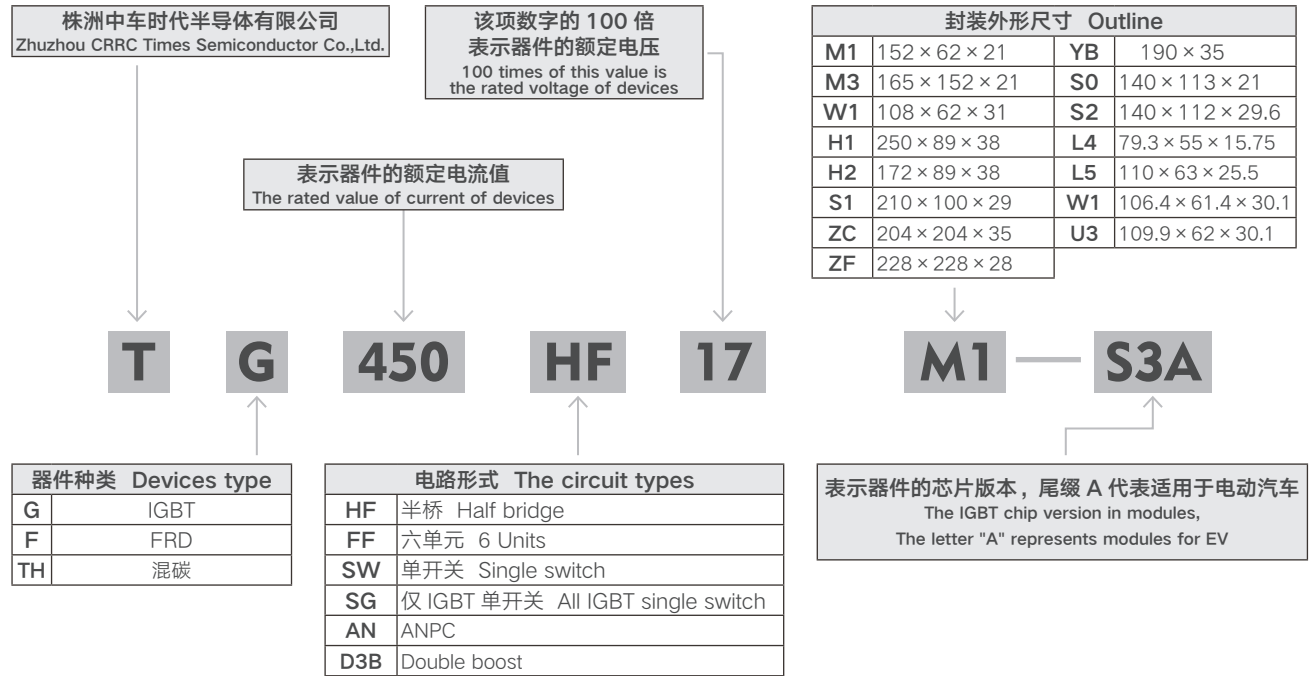


命名规则

NAMING
SYSTEM

中低压及压接式 IGBT 模块

MV&LV AND PRESS-PACK IGBT MODULES



符号说明

SYMBOLS

绝缘栅双极晶体管

INSULATED GATE BIPOLAR TRANSISTOR

符号 Symbols	参数名称	Characteristics
V_{CES}	集电极 - 发射极电压	Collector-emitter voltage
V_{GES}	栅极 - 发射极电压	Gate-emitter voltage
I_C	集电极直流电流	DC collector current
I_{CRM}	集电极重复峰值电流	Peak collector current
P_{tot}	总耗散功率	Total power dissipation
V_{isol}	绝缘电压	Isolation voltage
Q_{PD}	局部放电	Partial discharge
R_{thJC} IGBT	IGBT 结壳热阻	IGBT thermal resistance junction to case
R_{thJC} Diode	二极管结壳热阻	Diode thermal resistance junction to case
R_{thCH}	接触热阻	IGBT thermal resistance case to heatsink
T_{VJM}	最高 (等效) 结温	Max. (Virtual) junction temperature
T_{stg}	存储温度	Storage temperature
M	安装力矩	Mounting torque
I_{CES}	集电极截止电流	Collector cut-off current
I_{GES}	栅极漏电流	Gate leakage current
$V_{GE(TH)}$	栅极 - 发射极阈值电压	Gate-Emitter threshold voltage
$V_{CE(SAT)}$	集电极 - 发射极饱和电压	Collector-Emitter saturation voltage
I_F	二极管正向直流电流	Diode DC forward current
I_{FRM}	二极管正向重复峰值电流	Diode Peak forward current
V_F	二极管正向电压	Diode Forward voltage
C_{es}	输入电容	Input capacitance
Q_g	栅极电荷	Gate charge
C_{res}	反向传输电容	Reverse transfer capacitance
I_{SC}	短路电流	Short circuit current
$t_{d(off)}$	关断延迟时间	Turn-off delay time
t_f	下降时间	Falling time
E_{OFF}	关断能量	Turn off energy
$t_{d(on)}$	开通延迟时间	Turn-on delay time
t_r	上升时间	Rising time
E_{ON}	开通能量	Turn on energy
Q_{rr}	二极管反向恢复电荷	Diode Reverse recovery charge
I_{rr}	二极管反向恢复电流	Diode Reverse recovery current
E_{rec}	二极管反向恢复损耗	Diode Reverse recovery energy
E_{sw}	IGBT 总开关损耗	IGBT total switching energy ($E_{on}+E_{off}$)

第三章

CHAPTER THREE

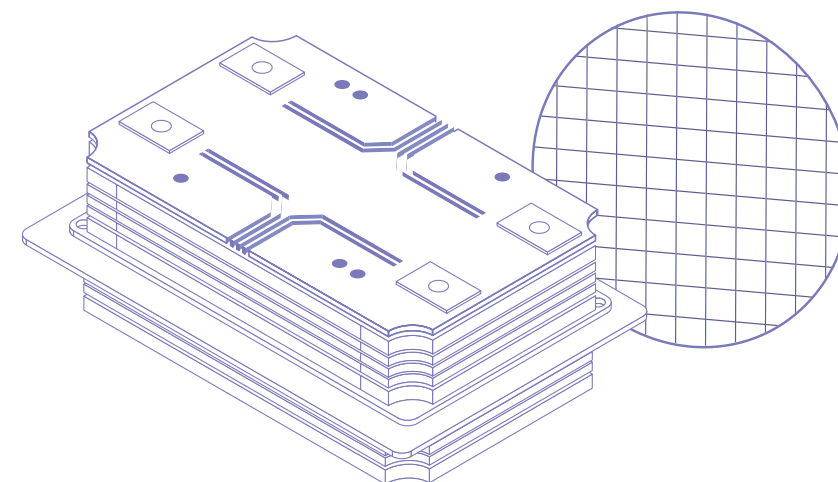
SiC 芯片及模块

SiC CHIPS & MODULES

株洲中车时代半导体有限公司
ZHUZHOU CRRC TIMES SEMICONDUCTOR CO.,LTD.

SiC CHIPS & MODULES

SiC 芯片及模块



SBD 芯片

SBD CHIPS

产品介绍
PRODUCT
INTRODUCTION

中车第 2 代中低压 SiC SBD 芯片，具有高浪涌能力等特点，适用于光伏领域；

中车第 2 代高压 SiC SBD 芯片，芯片具有正温度系数、高耐压等特点，适用于轨道交通、电网领域。

CRRC 2nd generation medium and low voltage SiC SBD applies to photovoltaic field for its high surge current capability.

CRRC 2nd generation high voltage SiC SBD applies to rail transit and power grid for its positive temperature coefficient and high withstand voltage.

产品特点
CHARACTERISTIC

- 零反向恢复电流
- Zero Reverse Recovery Current
- 温度依赖性低
- Reduced Temperature Dependence



中低压 SiC SBD 芯片 MV and LV SiC SBD

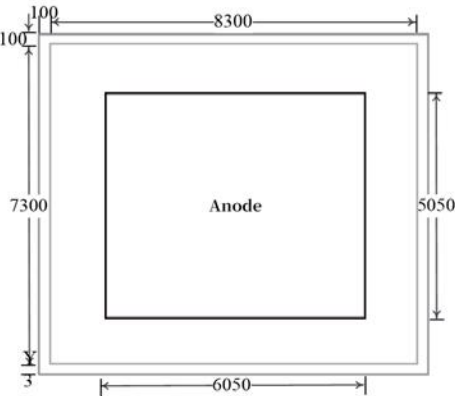
型号 Type	V_{DC}	V_{RRM}	$I_{F(AVG)}$	T_J	T_{stg}	V_F		I_R
						$T_J=25^{\circ}C$	$T_J=150^{\circ}C$	$T_J=150^{\circ}C$
	V	V	A	°C	°C	V		μ A
TS120PLS33A5	1200	1200	20	-40 ~ +150	-40 ~ +150	1.45	1.85	<20
TS120PLS22A2	1200	1200	10	-40 ~ +150	-40 ~ +150	1.45	1.85	<20

高压 SiC SBD 芯片 HV SiC SBD

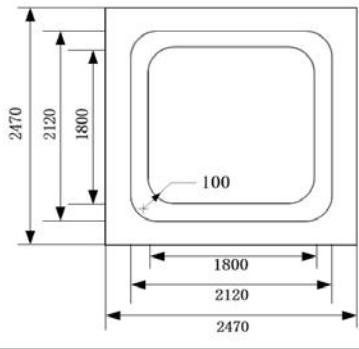
型号 Type	V_{DC}	V_{RRM}	$I_{F(AVG)}$	T_J	T_{stg}	V_F		I_R
						$T_J=25^{\circ}C$	$T_J=150^{\circ}C$	$T_J=150^{\circ}C$
	V	V	A	°C	°C	V		μ A
TS330PLS87A1	3300	3300	47	-40 ~ +150	-40 ~ +150	1.90	3.25	<100

产品图示
PRODUCT
DIAGRAM

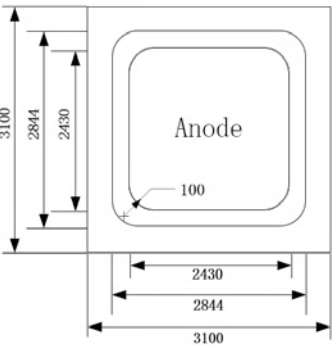
TS330PLS87A1



TS120PLS22A2



TS120PLS33A4



长度单位：微米
Unit: μm

产品介绍
PRODUCT
INTRODUCTION

MOSFET 芯片

MOSFET CHIPS

中车第 2 代中低压 SiC MOSFET 芯片，采用精细平面栅结构，高可靠性栅极氧化技术以及沟道自对准技术；中车第 2 代高压 SiC MOSFET 芯片，采用平面栅结构，高耐压终端技术，芯片内置栅电阻；芯片具有低开关损耗，高工作频率的特点。

CRRC Gen2 MV & LV SiC MOSFET chip adopts fine planar gate structure , high-reliability gate oxidation technology and channel self-alignment technology; CRRC Gen2 SiC MOSFET chip adopts planar gate structure,high-voltage terminal technology , and built-in gate resistance on the chip; The chip has the characteristics of low switching loss and high operating frequency.

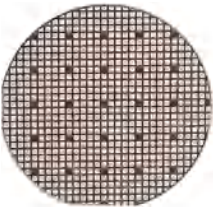
产品特点
CHARACTERISTIC

- 高系统效率

Higher System Efficiency
- 更高的工作频率

Higher Operating Frequency
- 低开关损耗

Low Switching Losses



高压 SiC MSOFET 芯片 HV SiC MSOFET Chips

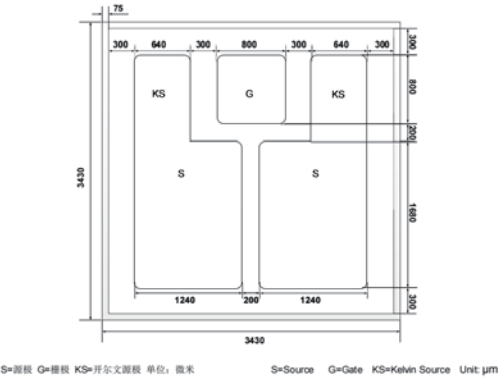
型号 Type	$V_{(BR)DSS}$	I_D	T_J	T_{stg}	V_F		$R_{DS(on)}@V_{GS}=17V$		I_R
					$T_J=25^{\circ}C$	$T_J=150^{\circ}C$	$T_J=25^{\circ}C$	$T_J=150^{\circ}C$	
					V		mΩ		
TM330PES87A2	3300V	47	-40 ~ +150	-40 ~ +150	3.0	2.0	40	65	<100

中低压 SiC MSOFET 芯片 MV and LV SiC MSOFET Chips

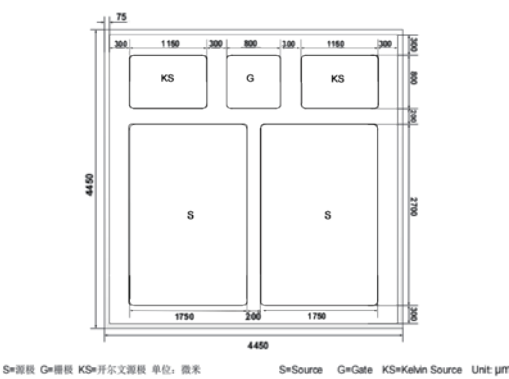
型号 Type	$V_{(BR)DSS}$	I_D	T_J	T_{stg}	V_F		$R_{DS(on)}@V_{GS}=17V$		I_R
					$T_J=25^{\circ}C$	$T_J=175^{\circ}C$	$T_J=25^{\circ}C$	$T_J=175^{\circ}C$	
					V		mΩ		
TM120PES55B0	1200V	125	-55 ~ +175	-55 ~ +175	2.6	1.9	16	24.5	<50
TM120PES55A2	1200V	91	-55 ~ +175	-55 ~ +175	2.6	1.9	25	38	<50
TM120PES55A6	1200V	91	-55 ~ +175	-55 ~ +175	2.6	1.6	25	38	<50
TM120PES44A7	1200V	69	-55 ~ +175	-55 ~ +175	2.7	2.0	40	52	<50
TM120PES33A1	1200V	44	-55 ~ +175	-55 ~ +175	3	2.2	80	107	<50

产品图示
PRODUCT
DIAGRAM

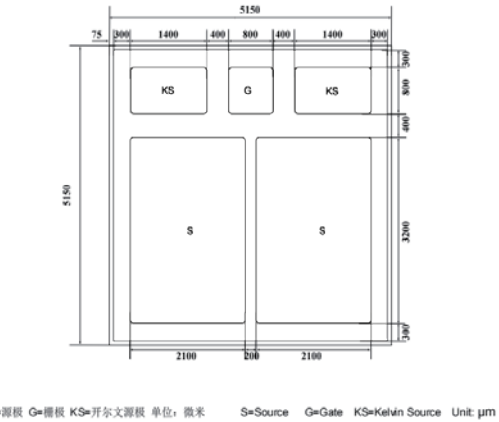
TM120PES33A1



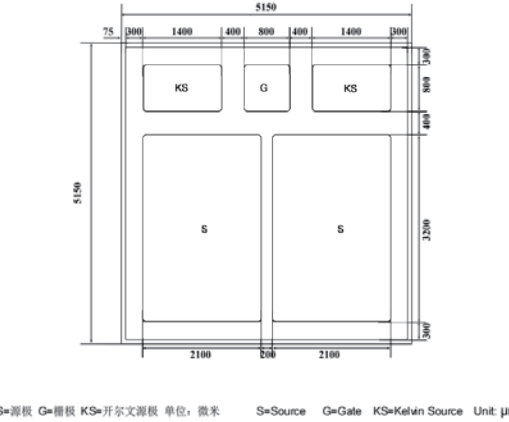
TM120PES44A7



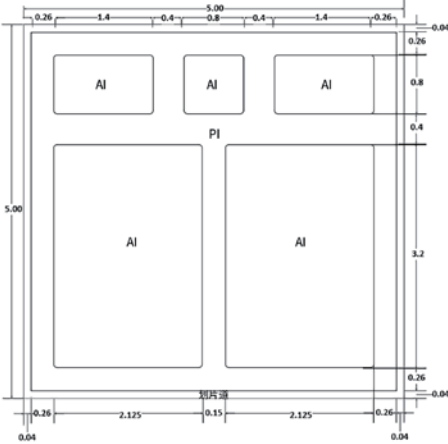
TM120PES55A2



TM120PES55A6



TM120PES55B0



长度单位：微米
Unit: μm

SiC 模块

SiC MODULES

产品介绍

PRODUCT INTRODUCTION

中车 SiC 模块采用中车第二代精细平面栅 SiC MOSFET，具有低开关损耗，高工作结温，低导通电阻等特点，配合银烧结、铜线键合等先进互连封装工艺，产品具备足够的鲁棒性。涵盖 1200V 至 3300V 电压范围，适用于电动汽车及轨道交通领域。

CRRC SiC power modules use CRRC Gen2 Fine planar gate SiC MOSFET, with the characteristics of low switching loss, high operating junction temperature and low on resistance. In combination with advanced interconnection and packaging processes such as silver sintering and copper wire bonding, the product has sufficient robustness. Covering the voltage range of 1200V to 3300V, it is suitable for electric vehicles and rail transit.

产品特点

CHARACTERISTIC

无反向恢复损耗 No Reverse Recovery Loss

低开关损耗 Low Switching Losses

高功率密度 High Power Density

高工作结温 High Operating Junction Temperature

低杂散电感 Low Inductive Design



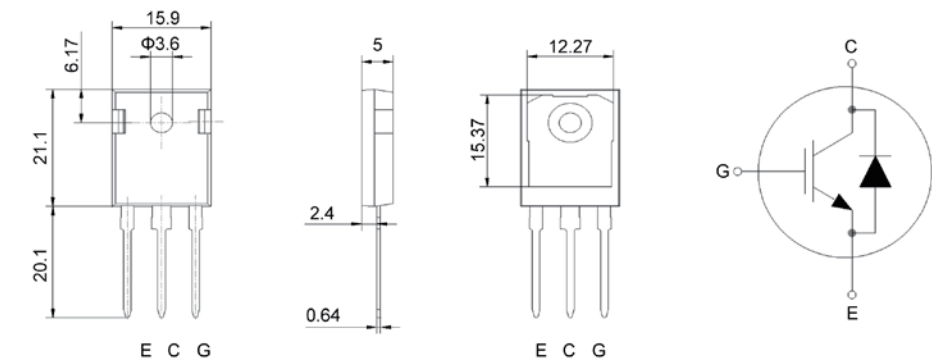
混合 SiC 功率模块 HYBRID SiC POWER MODULES												
型号 Type	I_C		V_{CES}	I_{CRM}	$V_{CE(SAT)}$	E_{SW}	T_{VJM}	R_{thJC}	封装 Assembly			
	A	@ T_C			@ I_C	@ T_{VJM}			代码 Code	尺寸 Dimensions	基板材料 Base Material	
		°C			& $T_C=25^{\circ}C$							V
THM1500ESM33-PSA012	1500	95	3300	3000	2	6035	150	0.008	ES	190 × 140 × 38	AlSiC	
THM500GDM33-PSA011	500	85	3300	1000	2.1	1900	150	0.021	GD	160 × 130 × 38	AlSiC	
THM1600FSM17-PSA011	1600	85	1700	3200	2.5	960	125	0.009	FS	140 × 130 × 38	AlSiC	

全 SiC 功率模块 FULL SiC POWER MODULES												
型号 Type	I_C		V_{CES}	I_{CRM}	$V_{CE(SAT)}$	E_{SW}	T_{VJM}	R_{thJC}	封装 Assembly			
	A	@ T_C			@ I_C	@ T_{VJM}			代码 Code	尺寸 Dimensions	基板材料 Base Material	
		℃			& $T_C=25^{\circ}C$							
TM750HF33X2-F100	750	90	3300	1500	1.8	800	150	0.024	X2	144 × 100 × 40	AlSiC	
TM500HF33X1-F100	500	90	3300	1000	1.9	590	150	0.036	X1	144 × 100 × 40	AlSiC	
TG660HF12L5-F2A01*	660	65	1200	1320	1.3	66.2	175	0.08(JF)	L5	110 × 63 × 25.5	Cu	
TM600FF12S3-W3A01	600	65	1200	1200	1.3	66.2	175	0.11(JF)	S3	154.5 × 126.5 × 32	Cu	
TM600FF12S3-F2A01*	600	65	1200	1200	1.5	147	175	0.08(JF)	S3	154.5 × 126.5 × 32	Cu	

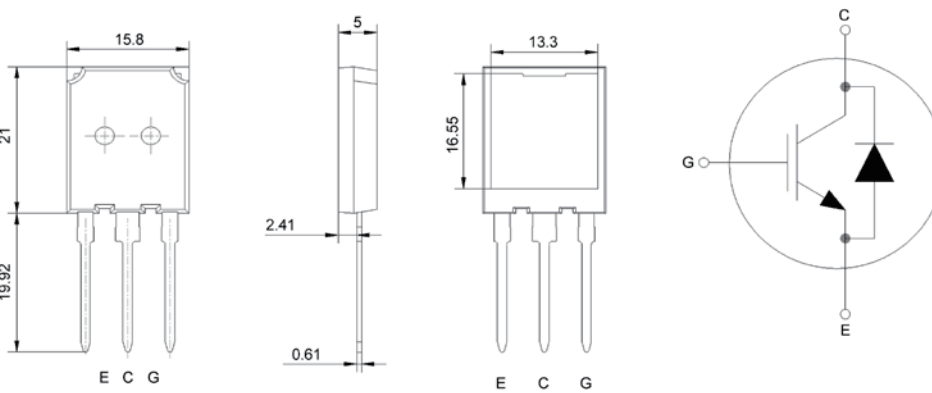
TO SiC 器件 TO SiC POWER DEVICE													
型号 Type		R_D		V_{DSS}	I_{DRM}	$V_{CE(SAT)}$	E_{SW}	T_{VJM}	R_{thJC}	封装 Assembly			
		mΩ	@ T_C			@ I_C	@ T_{VJM}			代码 Code	尺寸 Dimensions	基板材料 Base Material	
			°C			& $T_C=25^{\circ}C$							
				V	A	V	mJ	°C	K/W	/	mm	/	
TM40SW12B1-F201		40	25	1200	100	5.5	2.413	175	0.497	B1	41.42 × 16.13 × 5.21	/	
TM80SW12B1-F201		80	25	1200	80	5.4	1.247	175	0.717	B1	41.42 × 16.13 × 5.21	/	

产品图示
PRODUCT
DIAGRAM

B1



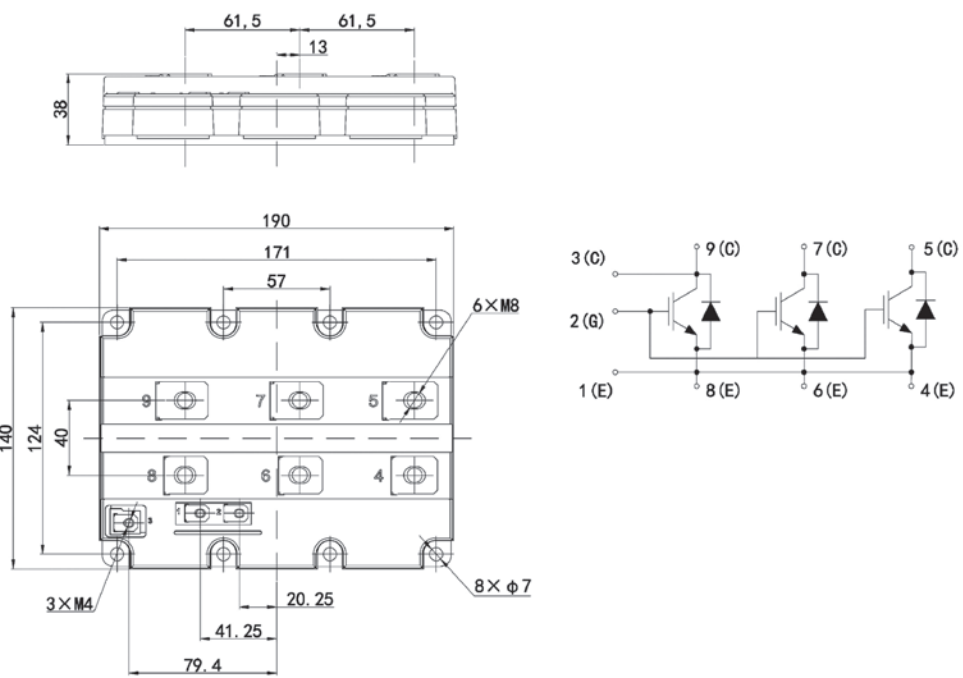
B2



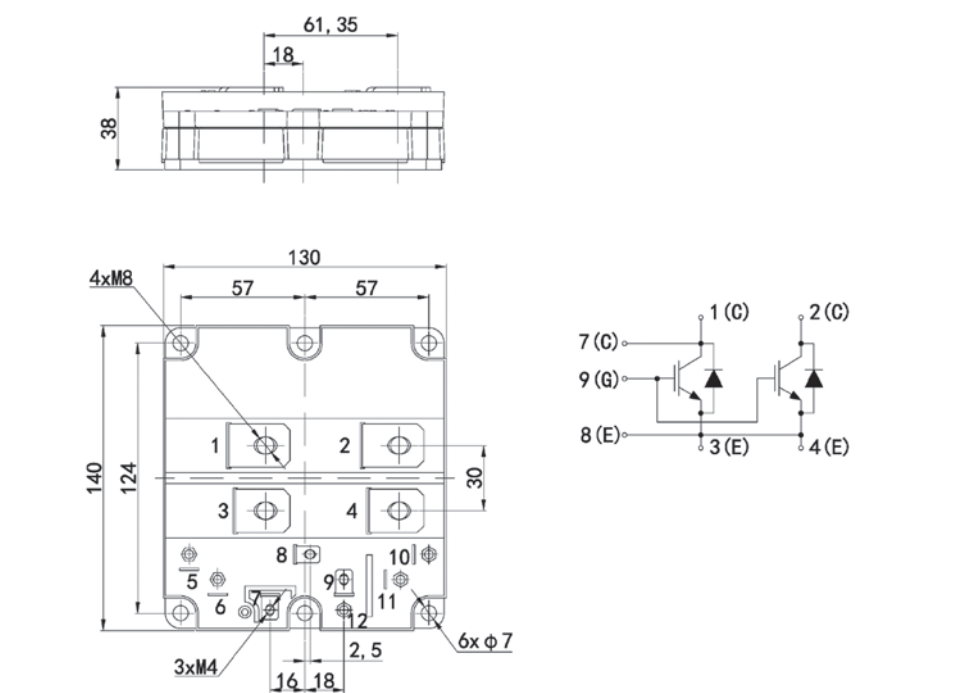
注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

产品图示
PRODUCT
DIAGRAM

ES



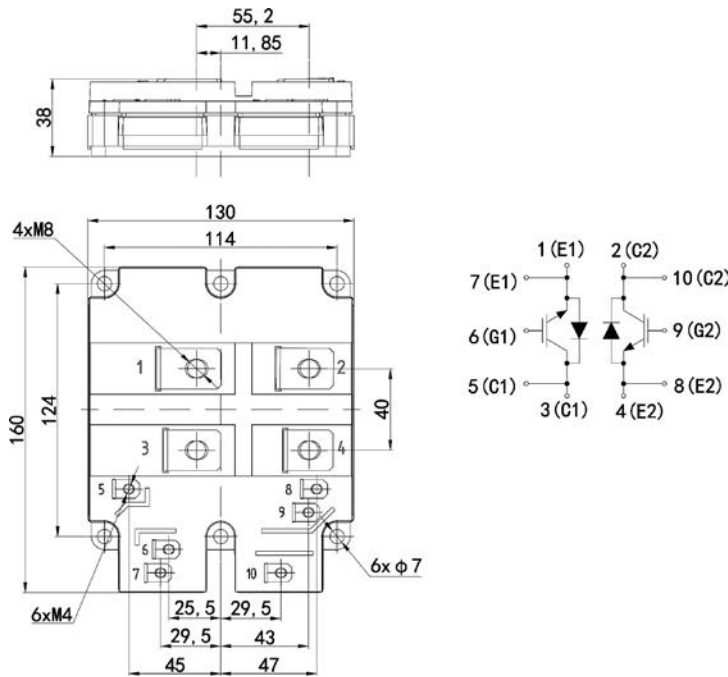
FS



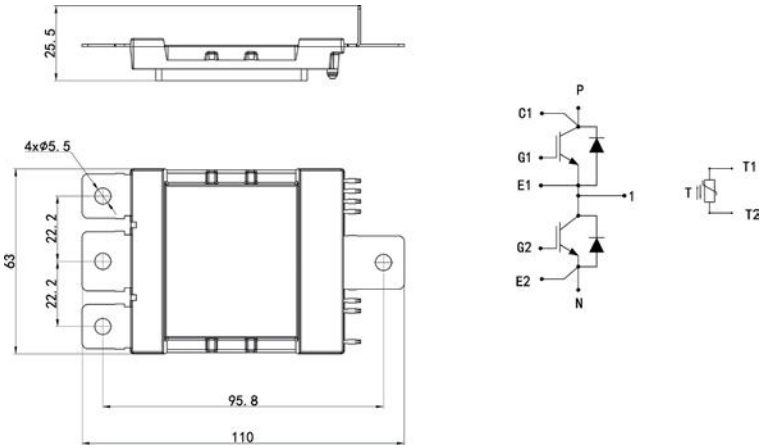
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Remarks: All dimensions shown in mm unless stated otherwise

产品图示
PRODUCT
DIAGRAM

GD



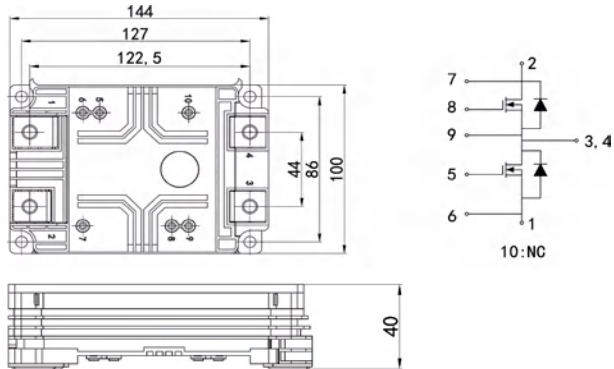
L5



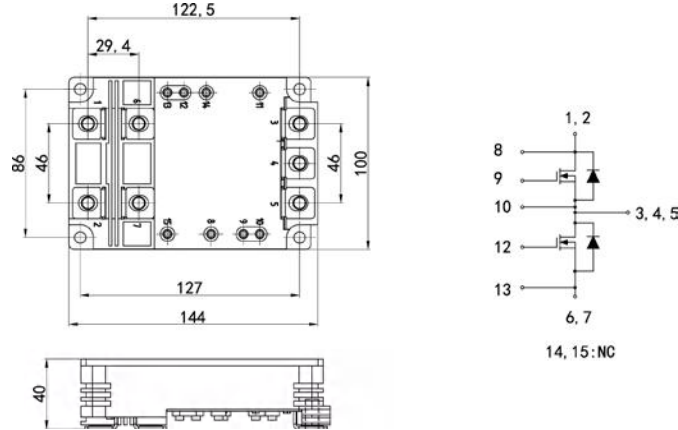
注：未标注数量单位的统一为毫米（mm）
Remarks:All dimensions shown in mm unless stated otherwise

产品图示
PRODUCT
DIAGRAM

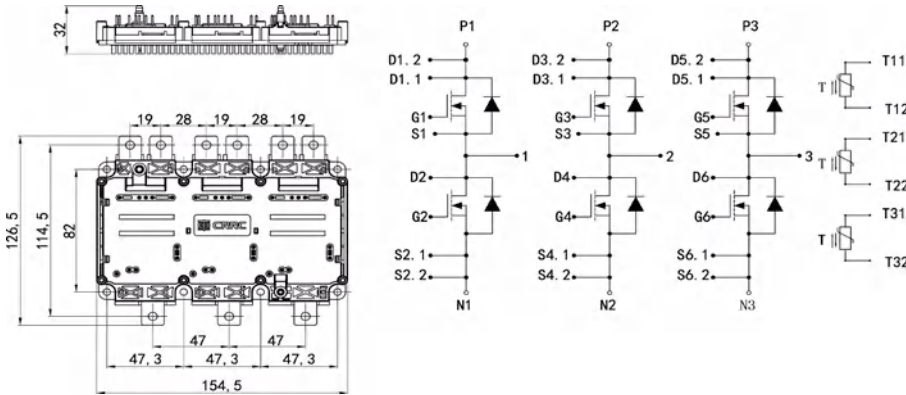
X1



X2



S3



注：未标注数量单位的统一为毫米（mm）
Remarks:All dimensions shown in mm unless stated otherwise

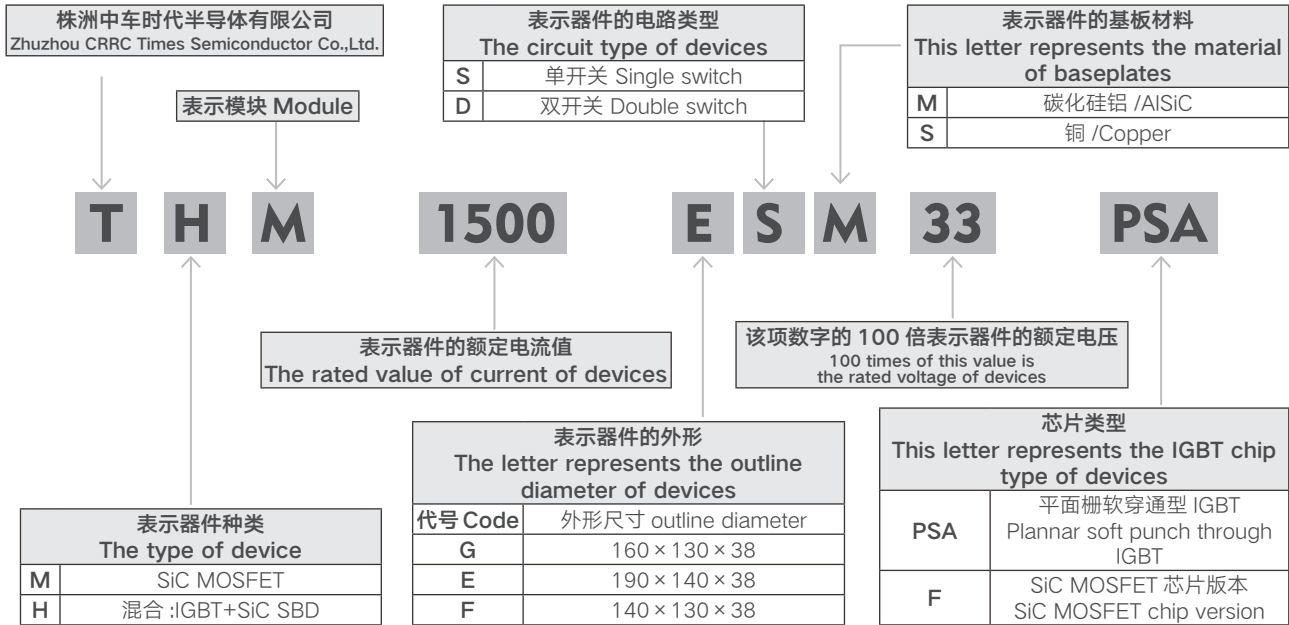
命名规则
NAMING
SYSTEM

SiC 器件型号说明
SiC DEVICE TYPES



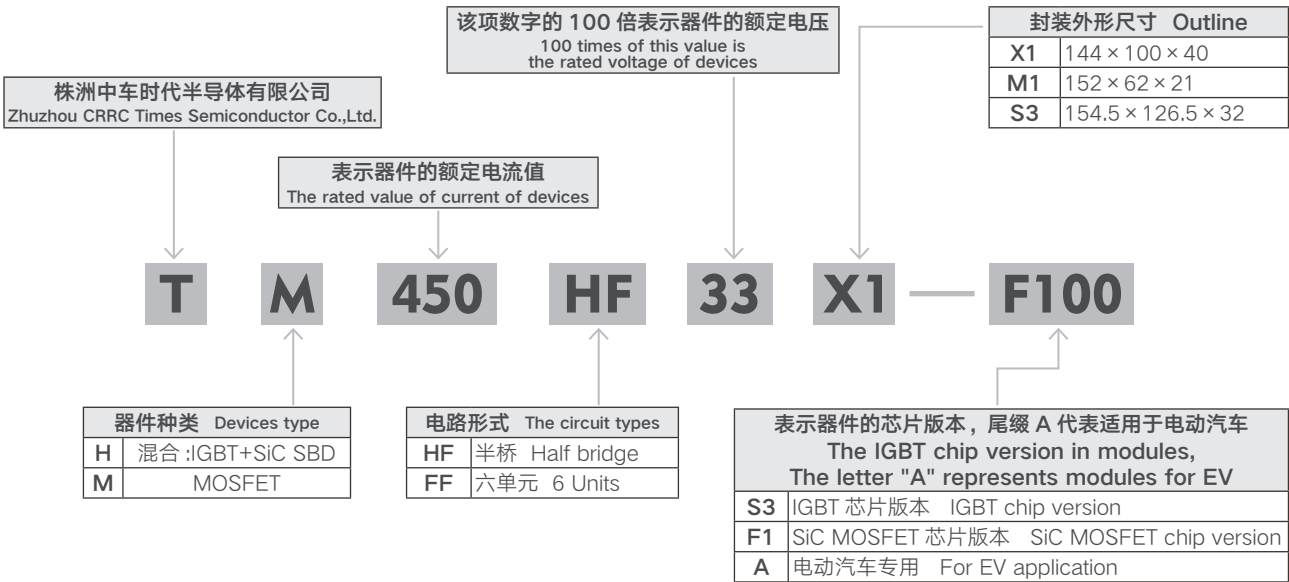
命名规则
NAMING
SYSTEM

高压 SiC 模块
HV SiC MODULES



命名规则
NAMING
SYSTEM

中低压 SiC 模块
MV SiC MODULES



符号说明
SYMBOLS

符号 Symbols	参数名称	Parameters
V_{RRM}	反向重复峰值电压	Repetitive Peak Reverse Voltage
V_{DC}	直流阻断电压	DC Peak Reverse Voltage
$I_{F(avg)}$	正向电流	Continuous Forward Current
V_F	正向压降	Forward Voltage
I_R	反向电流	Reverse Current

金属 - 氧化物 - 半导体场效应晶体管 SiC MOSFETS

符号 Symbols	参数名称	Characteristics
$V_{(BR)DSS}$	击穿电压	Drain-Source Breakdown Voltage
I_D	正向电流	Continuous Forward Current
$R_{DS(on)}$	通态电阻	Drain-Source On-State Resistance
$V_{GS(th)}$	阈值电压	Gate Threshold Voltage
$T_J、T_{stg}$	运行结温及存储温度	Operating Junction Temperature Range / Storage Temperature Range
I_{DSS}	漏极截止电流	Zero Gate Voltage Drain Current

符号说明
SYMBOLS

混合 SiC 模块 HYBRID SiC MODULES

符号 Symbols	参数名称	Characteristics
V_{CES}	集电极 - 发射极电压	Collector-emitter voltage
V_{GES}	栅极 - 发射极电压	Gate-emitter voltage
I_C	集电极直流电流	DC collector current
I_{CRM}	集电极重复峰值电流	Peak collector current
P_{tot}	总耗散功率	Total power dissipation
V_{isol}	绝缘电压	Isolation voltage
Q_{PD}	局部放电	Partial discharge
$R_{thJC\ IGBT}$	IGBT 结壳热阻	IGBT thermal resistance junction to case
$R_{thJC\ Diode}$	二极管结壳热阻	Diode thermal resistance junction to case
R_{thCH}	接触热阻	IGBT thermal resistance case to heatsink
T_{VJM}	最高（等效）结温	Max. (Virtual) junction temperature
T_{stg}	存储温度	Storage temperature
M	安装力矩	Mounting torque
I_{CES}	集电极截止电流	Collector cut-off current
I_{GES}	栅极漏电流	Gate leakage current
$V_{GE(TH)}$	栅极 - 发射极阈值电压	Gate-Emitter threshold voltage
$V_{CE(sat)}$	集电极 - 发射极饱和电压	Collector-Emitter saturation voltage
I_F	二极管正向直流电流	Diode DC forward current
I_{FRM}	二极管正向重复峰值电流	Diode Peak forward current
V_F	二极管正向电压	Diode Forward voltage
C_{ies}	输入电容	Input capacitance
Q_g	栅极电荷	Gate charge
C_{res}	反向传输电容	Reverse transfer capacitance
I_{SC}	短路电流	Short circuit current
$t_{d(off)}$	关断延迟时间	Turn-off delay time
t_f	下降时间	Fall time
E_{OFF}	关断损耗	Turn-off switching energy
$t_{d(on)}$	开通延迟时间	Turn-on delay time
t_r	上升时间	Rise time
E_{ON}	开通损耗	Turn-on switching energy
Q_{rr}	二极管反向恢复电荷	Diode Reverse recovery charge
I_{rr}	二极管反向恢复电流	Diode Reverse recovery current
E_{rec}	二极管反向恢复损耗	Diode Reverse recovery energy
E_{sw}	IGBT 模块总开关损耗	IGBT module 's total switching energy (Eon+Eoff+Erec))

全 SiC 模块 FULL SiC MODULES

符号 Symbols	参数名称	Characteristics
V_{DSS}	漏极 - 源极电压	Drain-Source voltage
V_{GSS}	栅极 - 源极电压	Gate-Source voltage
I_D	漏极直流电流	DC drain current
I_{DRM}	漏极重复峰值电流	Peak drain current
P_{tot}	总耗散功率	Total power dissipation
V_{isol}	绝缘电压	Isolation voltage
Q_{PD}	局部放电	Partial discharge
$R_{thJC\ MOSFET}$	MOSFET 结壳热阻	MOSFET thermal resistance junction to case
$R_{thJC\ Diode}$	二极管结壳热阻	Diode thermal resistance junction to case
R_{thCH}	接触热阻	MOSFET thermal resistance case to heatsink
T_{VJM}	最高（等效）结温	Max. (Virtual) junction temperature
T_{stg}	存储温度	Storage temperature
M	安装力矩	Mounting torque
I_{DSS}	漏极截止电流	Drain cut-off current
I_{GSS}	栅极漏电流	Gate leakage current
$V_{GS(TH)}$	栅极 - 源极阈值电压	Gate-Source threshold voltage
$V_{DS(on)}$	漏极 - 源极通态电压	Drain-Source saturation voltage
I_F	二极管正向直流电流	Diode DC forward current
I_{FRM}	二极管正向重复峰值电流	Diode Peak forward current
V_F	二极管正向电压	Diode Forward voltage
C_{iss}	输入电容	Input capacitance
Q_g	栅极电荷	Gate charge
C_{rss}	反向传输电容	Reverse transfer capacitance
I_{SC}	短路电流	Short circuit current
$t_{d(off)}$	关断延迟时间	Turn-off delay time
t_f	下降时间	Fall time
E_{OFF}	关断损耗	Turn-off switching energy
$t_{d(on)}$	开通延迟时间	Turn-on delay time
t_r	上升时间	Rise time
E_{ON}	开通损耗	Turn-on switching energy
Q_{rr}	二极管反向恢复电荷	Diode Reverse recovery charge
I_{rr}	二极管反向恢复电流	Diode Reverse recovery current
E_{rec}	二极管反向恢复损耗	Diode Reverse recovery energy
E_{sw}	MOSFET 总开关损耗	MOSFET total switching energy

第四章

CHAPTER FOUR

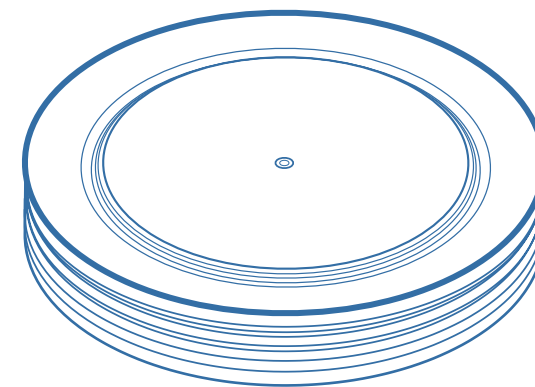
整流管及晶闸管

DIODES & THYRISTORS

株洲中车时代半导体有限公司
ZHUZHOU CRRC TIMES SEMICONDUCTOR CO.,LTD.

DIODES & THYRISTORS

整流管及晶闸管



第四章 CHAPTER FOUR

整流管 RECTIFIER DIODES

整流管及晶闸管

DIODES AND THYRISTORS

产品介绍
PRODUCT
INTRODUCTION

产品涵盖 6 英寸及以下、电压 8.5kV 及以下烧结型和压接型器件，包含普通整流管、普通晶闸管、快速晶闸管、双向晶闸管、快恢复二极管等器件。具有大功率容量、低损耗、双面散热等特点。产品已成功用于直流电力机车、直流内燃机车牵引与传动系统。在高压直流输电、高压无功率补偿、工业变流器、软启动等领域也得到了批量应用。

These series include 6 inches and below, free-floating and alloying devices below and including 8.5kV, including rectifier diodes, thyristor, fast thyristor, bi-directional thyristor, fast recovery diode and other devices. It has the characteristics of high power capacity, low loss and double-side cooling. The products have been successfully applied for traction and transmission system of DC power locomotive and internal combustion locomotive. It has also been widely used in high voltage DC transmission, high voltage SVG, industry converter, soft starters and other fields.

产品特点
CHARACTERISTIC

- 平板压装双面冷却

Double-Side Cooling
- 大功率容量

High Power Capability
- 低损耗

Low Loss

全压接型整流管

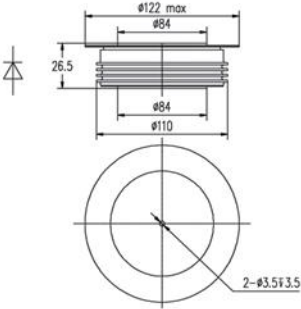
FREE FLOATING RECTIFIER DIODES

型号 TYPE --**=V _{RRM} /100	I _{F(AV)}		V _{RSM}	V _{RRM}	I _{FSM}	V _{FM}		V _{FO}	r _F	T _{VJM}	R _{thJC}	R _{thCH}	F	外形 Outline
	A	@T _C			@T _{VJM}	@I _{FM}		@T _{VJM}	@T _{VJM}				± 10%	
		℃			V	V	kA	A	V				V	
电压至 2200V(Up to 2200V)														
ZP _D 11200--**	11210	85	1600-2200	1600-2200	125.0	6000	0.98	0.77	0.035	160	0.0035	0.0008	120	ZP _D
ZP _D 10000--**	10200	85	1600-2200	1600-2200	125.0	6000	0.98	0.77	0.035	160	0.004	0.0008	120	ZH _D
ZP _C 8200--**	8280	90	1600-2200	1600-2200	94.0	6000	1.03	0.82	0.035	160	0.005	0.0015	90	ZP _C
ZP _C 7500--**	7570	90	1600-2200	1600-2200	94.0	6000	1.03	0.82	0.035	160	0.0057	0.0015	90	ZH _C
ZP _B 6900--**	6940	90	1600-2200	1600-2200	78.0	6000	1.09	0.82	0.045	175	0.007	0.002	70	ZP _B
ZP _B 5800--**	5840	90	1600-2200	1600-2200	78.0	6000	1.09	0.82	0.045	175	0.009	0.002	70	ZH _B
电压至 3400V(Up to 3400V)														
ZP _E 12000--**	12080	85	2400-3400	2400-3400	133.0	6000	0.97	0.68	0.048	160	0.0028	0.0005	180	ZH _E
ZP _D 9500--**	9500	85	2400-3400	2400-3400	118.0	6000	1.06	0.72	0.057	160	0.0035	0.0008	120	ZP _D
ZP _D 9000--**	9000	85	2400-3400	2400-3400	118.0	6000	1.06	0.72	0.057	160	0.004	0.0008	120	ZH _D
ZP _C 6600--**	6680	90	2400-3400	2400-3400	84.4	6000	1.17	0.75	0.070	160	0.005	0.0015	90	ZP _C
ZP _C 6200--**	6200	90	2400-3400	2400-3400	84.4	6000	1.17	0.75	0.070	160	0.0057	0.0015	90	ZH _C
ZP _B 5600--**	5660	90	2400-3400	2400-3400	64.2	6000	1.29	0.80	0.082	175	0.007	0.002	70	ZP _B
ZP _B 4800--**	4830	90	2400-3400	2400-3400	64.2	6000	1.29	0.80	0.082	175	0.009	0.002	70	ZH _B
电压至 4500V(Up to 4500V)														
ZP _D 7600--**	7670	90	3600-4500	3600-4500	99.4	6000	1.19	0.80	0.065	150	0.0035	0.0008	120	ZP _D
ZP _D 7000--**	7050	90	3600-4500	3600-4500	99.4	6000	1.19	0.80	0.065	150	0.004	0.0008	120	ZH _D
ZP _C 6000--**	6080	90	3600-4500	3600-4500	79.0	6000	1.32	0.80	0.086	160	0.005	0.0015	90	ZP _C
ZP _C 5600--**	5600	90	3600-4500	3600-4500	79.0	6000	1.32	0.80	0.086	160	0.0057	0.0015	90	ZH _C
ZP _B 4600--**	4630	90	3600-4500	3600-4500	59.4	6000	1.50	0.98	0.086	160	0.007	0.002	70	ZP _B
ZP _B 3900--**	3910	90	3600-4500	3600-4500	59.4	6000	1.50	0.98	0.086	160	0.009	0.002	70	ZH _B
电压至 5500V(Up to 5500V)														
ZP _E 8800--**	8860	100	4600-5500	4600-5500	120.0	6000	1.10	0.74	0.060	150	0.0025	0.0005	180	ZP _E
ZP _E 8200--**	8270	100	4600-5500	4600-5500	120.0	6000	1.10	0.74	0.060	150	0.0028	0.0005	180	ZH _E
ZP _D 6600--**	6680	100	4600-5500	4600-5500	96.9	6000	1.21	0.79	0.070	150	0.0035	0.0008	120	ZP _D
ZP _D 6100--**	6140	100	4600-5500	4600-5500	96.9	6000	1.21	0.79	0.070	150	0.004	0.0008	120	ZH _D
ZP _C 5100--**	5110	100	4600-5500	4600-5500	74.0	6000	1.44	0.82	0.104	160	0.005	0.0015	90	ZP _C
ZP _C 4700--**	4710	100	4600-5500	4600-5500	74.0	6000	1.44	0.82	0.104	160	0.0057	0.0015	90	ZH _C
ZP _B 4200--**	4220	90	4600-5500	4600-5500	53.9	3000	1.26	0.90	0.120	160	0.007	0.002	70	ZP _B
ZP _B 3600--**	3600	90	4600-5500	4600-5500	53.9	3000	1.26	0.90	0.120	160	0.009	0.002	70	ZH _B
电压至 6500V(Up to 6500V)														
ZP _D 6000--**	6000	100	5600-6500	4900-6000	88.4	6000	1.37	0.83	0.090	150	0.0035	0.0008	120	ZP _D
ZP _D 5500--**	5520	100	5600-6500	4900-6000	88.4	6000	1.37	0.83	0.090	150	0.004	0.0008	120	ZH _D
ZP _C 4300--**	4300	100	5600-6500	4900-6000	61.5	6000	1.56	0.84	0.120	150	0.005	0.0015	90	ZP _C
ZP _C 3900--**	3960	100	5600-6500	4900-6000	61.5	6000	1.56	0.84	0.120	150	0.0057	0.0015	90	ZH _C
ZP _B 3100--**	3150	100	5600-6500	4900-6000	51.0	3000	1.35	0.90	0.150	150	0.007	0.002	70	ZP _B
ZP _B 2600--**	2670	100	5600-6500	4900-6000	51.0	3000	1.35	0.90	0.150	150	0.009	0.002	70	ZH _B
电压至 7200V(Up to 7200V)														
ZP _D 5000--**	5030	100	6600-7200	6100-6700	80.4	6000	1.58	0.95	0.105	150	0.004	0.0008	120	ZH _D
ZP _C 3700--**	3700	100	6600-7200	6100-6700	52	3000	1.36	0.97	0.13	150	0.0057	0.0015	90	ZH _C
电压至 8500V(Up to 8500V)														
ZP _E 6500--**	6510	100	7400-8500	6900-8000	112.0	6000	1.59	1.05	0.090	150	0.0028	0.0005	180	ZH _E
ZP _D 4800--**	4800	100	7400-8500	6900-8000	76.2	6000	1.66	1.00	0.115	150	0.004	0.0008	120	ZH _D
ZP _C 3300--**	3360	100	7400-8500	6900-8000	53.0	6000	2.05	1.21	0.140	150	0.0057	0.0015	90	ZH _C
ZP _B 2200--**	2260	100	7400-8500	6900-8000	42.5	3000	1.70	1.07	0.210	150	0.009	0.002	70	ZH _B

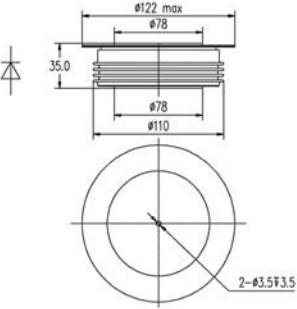
产品图示
PRODUCT
DIAGRAM

全压接型整流管 FREE FLOATING RECTIFIER DIODES

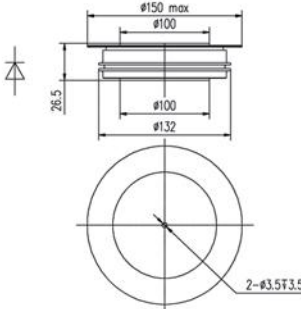
ZP_B



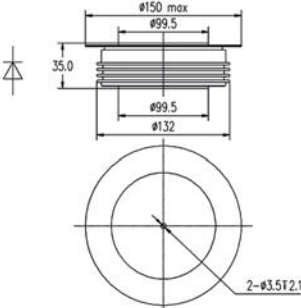
ZH_B



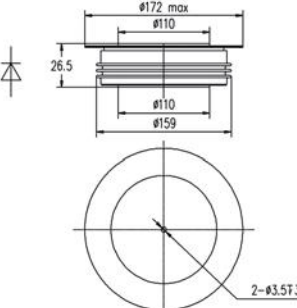
ZP_C



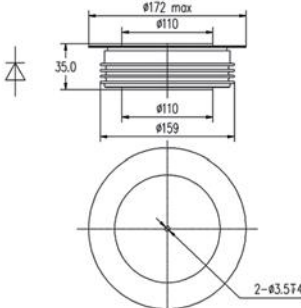
ZH_C



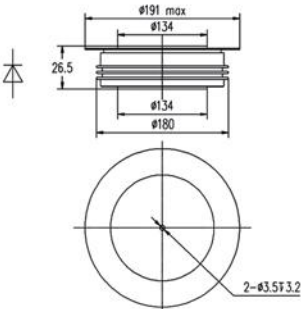
ZP_D



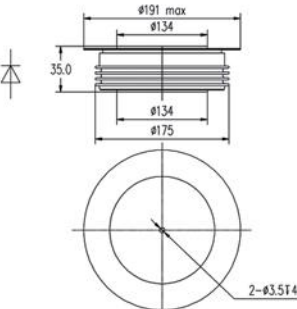
ZH_D



ZP_E



ZH_E



注：未标注数量单位的统一为毫米（mm）

Remarks:All dimensions shown in mm unless stated otherwise

烧结型整流管

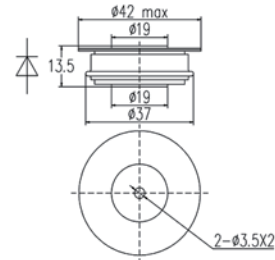
ALLOYING RECTIFIER DIODES

型号 TYPE -**= $V_{RRM}/100$	I_F (AV)	V_{RRM}	I_{FSM}	V_{FM}		V_{FO}	r_F	T_{VJM}	R_{thJC}	R_{thCH}	F	外形 Outline
	@ $T_c=100^{\circ}C$		@ T_{VJM}	@ I_{FM}		@ T_{VJM}	@ T_{VJM}				$\pm 10\%$	
	V		&10ms	& $T_c=25^{\circ}C$		V	mΩ				℃	
电压至 1400V(Up to 1400V)												
ZP _X 6000_**	6080	600-1400	60.0	3000	1.05	0.76	0.035	190	0.01	0.003	56	ZP _X
ZP _A 4600_**	4650	600-1400	45.0	3000	1.05	0.76	0.051	190	0.0125	0.004	45	ZP _A
ZP ₄ 3200_**	3220	600-1400	35.8	3000	1.15	0.77	0.073	190	0.018	0.005	30	ZP ₄
ZP ₉ 2700_**	2770	600-1400	31.0	1500	1.05	0.78	0.092	190	0.02	0.005	22	ZP ₉
ZP ₈ 1500_**	1510	600-1400	16.8	1500	1.20	0.78	0.188	190	0.035	0.008	15	ZP ₈
ZP ₇ 1300_**	1360	600-1400	15.2	1500	1.30	0.78	0.257	190	0.035	0.010	10	ZP ₇
ZP ₆ 500_**	520	600-1400	5.9	800	1.45	0.80	0.657	190	0.08	0.020	5	ZP ₆
电压至 2200V(Up to 2200V)												
ZP _X 4400_**	4460	1600-2200	56.4	3000	1.15	0.81	0.059	175	0.01	0.003	56	ZP _X
ZP _A 3400_**	3430	1600-2200	42.2	3000	1.20	0.79	0.086	175	0.0125	0.004	45	ZP _A
ZP ₄ 2300_**	2360	1600-2200	29.8	3000	1.35	0.81	0.125	175	0.018	0.005	30	ZP ₄
ZP ₉ 2000_**	2030	1600-2200	25.7	1500	1.20	0.82	0.156	175	0.02	0.005	22	ZP ₉
ZP ₈ 1100_**	1100	1600-2200	13.9	1500	1.45	0.82	0.318	175	0.035	0.008	15	ZP ₈
ZP ₇ 900_**	990	1600-2200	12.5	1500	1.60	0.82	0.433	175	0.035	0.010	10	ZP ₇
ZP ₆ 400_**	410	1600-2200	4.9	800	1.85	0.82	1.110	175	0.08	0.020	5	ZP ₆
电压至 3400V(Up to 3400V)												
ZP _X 3900_**	3920	2400-3400	49.5	3000	1.25	0.85	0.084	175	0.01	0.003	56	ZP _X
ZP _A 2900_**	2980	2400-3400	36.5	3000	1.35	0.82	0.128	175	0.0125	0.004	45	ZP _A
ZP ₄ 2000_**	2050	2400-3400	25.8	3000	1.55	0.86	0.180	175	0.018	0.005	30	ZP ₄
ZP ₉ 1800_**	1830	2400-3400	23.0	1500	1.35	0.88	0.200	175	0.02	0.005	22	ZP ₉
ZP ₈ 900_**	960	2400-3400	12.0	1500	1.70	0.88	0.450	175	0.035	0.008	15	ZP ₈
ZP ₇ 800_**	850	2400-3400	10.8	1500	1.95	0.88	0.613	175	0.035	0.010	10	ZP ₇
电压至 4500V(Up to 4500V)												
ZP _X 2600_**	2680	3600-4500	42.6	3000	1.35	0.80	0.135	150	0.01	0.003	56	ZP _X
ZP _A 1900_**	1980	3600-4500	32.0	3000	1.60	0.96	0.162	150	0.0125	0.004	45	ZP _A
ZP ₄ 1300_**	1370	3600-4500	22.8	3000	1.80	0.96	0.235	150	0.018	0.005	30	ZP ₄
ZP ₉ 1200_**	1200	3600-4500	19.6	1500	1.55	0.96	0.296	150	0.02	0.005	22	ZP ₉
ZP ₈ 600_**	640	3600-4500	10.6	1500	1.80	0.96	0.604	150	0.035	0.008	15	ZP ₈
电压至 6500V(Up to 6500V)												
ZP _X 1900_**	1950	5400-6500	30.0	3000	1.80	1.21	0.230	150	0.01	0.003	56	ZP _X
ZP _A 1400_**	1470	5400-6500	25.7	3000	1.90	1.00	0.290	150	0.015	0.004	45	ZP _A
ZP ₉ 1000_**	1060	5400-6500	16.5	1500	1.70	1.05	0.450	150	0.02	0.005	22	ZP ₉ /ZH ₉
ZP ₈ 600_**	600	5000-6500	9.5	1500	1.90	0.95	0.800	150	0.035	0.008	15	ZP ₈ /ZH ₈
ZP _X 2100_**	2140	4600-5200	35.0	3000	1.60	1.00	0.195	150	0.01	0.003	56	ZP _X
电压至 8500V(Up to 8500V)												
ZP ₉ 900_**	910	7500-8500	11.0	1500	2.10	1.25	0.550	150	0.02	0.005	22	ZH ₉
ZP ₈ 400_**	420	7500-8500	7.0	1500	2.65	1.15	0.900	150	0.035	0.008	15	ZH ₈
ZP ₉ 900_**	960	6600-7200	11.0	1500	2.00	1.20	0.500	150	0.02	0.005	22	ZH ₉
ZP ₈ 500_**	570	6600-7200	8.0	1500	2.25	1.10	0.850	150	0.035	0.008	15	ZH ₈

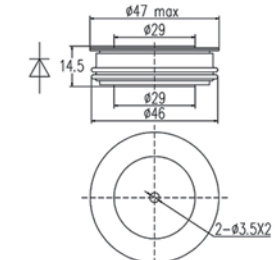
产品图示
PRODUCT
DIAGRAM

烧结型整流管 ALLOYING RECTIFIER DIODES

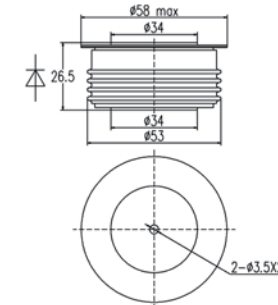
ZP₆



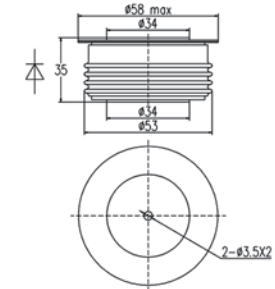
ZP₇



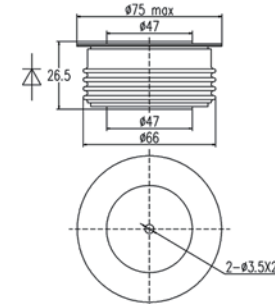
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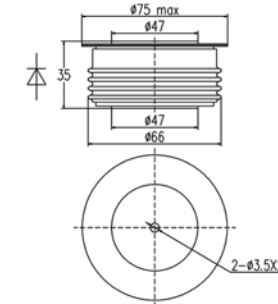
ZH₈



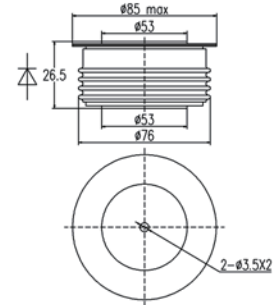
ZP₉



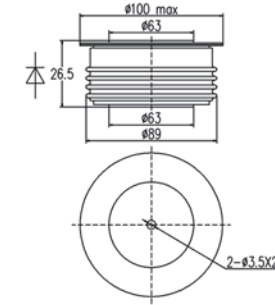
ZH₉



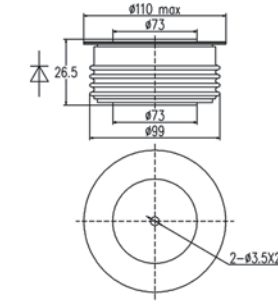
ZP₄



ZP_A



ZP_X



注：未标注数量单位的统一为毫米（mm）

Remarks:All dimensions shown in mm unless stated otherwise

晶闸管 THYRISTORS

全压接型晶闸管

FREE-FLOATING THYRISTORS

型号 TYPE -**-V _{DSM} /100	I _T (A _V)		V _{DSM}	V _{DRM}	I _{TSM}	V _{TM}		V _{TO}	r _T	T _{VJM}	R _{thJC}	R _{thCH}	F	外形 Outline
			V _{RSM}	V _{RRM}	@T _{VJM}	@I _{TM}		@T _{VJM}	@T _{VJM}				±10%	
	A	@T _C °C		V	V	kA	A	V	V	mΩ	°C	K/W	K/W	
电压至 2200V(Up to 2200V)														
KP _C 5700-**-	5750	70	1800-2200	1800-2200	80.0	3000	1.05	0.87	0.061	125	0.005	0.0015	90	KP _C
KP _C 5200-**-	5270	70	1800-2200	1800-2200	80.0	3000	1.05	0.87	0.061	125	0.0057	0.0015	90	KH _C
KP _B 3900-**-	3980	70	1800-2200	1800-2200	64.5	3000	1.15	0.86	0.095	125	0.007	0.002	70	KP _B
KP _B 3300-**-	3370	70	1800-2200	1800-2200	64.5	3000	1.15	0.86	0.095	125	0.009	0.002	70	KH _B
KP _C 6000-**-	6020	70	1400-1800	1400-1800	94.0	3000	1.00	0.83	0.056	125	0.005	0.0015	90	KP _C
KP _C 5500-**-	5510	70	1400-1800	1400-1800	94.0	3000	1.00	0.83	0.056	125	0.0057	0.0015	90	KH _C
电压至 2800V(Up to 2800V)														
KP _D 7600-**-	7670	70	2400-2800	2400-2800	105.0	3000	1.04	0.88	0.052	125	0.0035	0.0008	120	KP _D
KP _D 6800-**-	6810	70	2400-2800	2400-2800	105.0	3000	1.04	0.88	0.052	125	0.004	0.0008	120	KH _D
KP _C 5100-**-	5190	70	2400-2800	2400-2800	75.0	3000	1.14	0.90	0.080	125	0.005	0.0015	90	KP _C
KP _C 4700-**-	4760	70	2400-2800	2400-2800	75.0	3000	1.14	0.90	0.080	125	0.0057	0.0015	90	KH _C
KP _B 3300-**-	3300	70	2400-2800	2400-2800	60.0	3000	1.40	0.95	0.150	125	0.007	0.002	70	KP _B
KP _B 2800-**-	2800	70	2400-2800	2400-2800	60.0	3000	1.40	0.95	0.150	125	0.009	0.002	70	KH _B
电压至 3400V(Up to 3400V)														
KP _C 4600-**-	4610	70	3000-3400	3000-3400	69.0	3000	1.21	0.86	0.115	125	0.005	0.0015	90	KP _C
KP _C 4200-**-	4240	70	3000-3400	3000-3400	69.0	3000	1.21	0.86	0.115	125	0.0057	0.0015	90	KH _C
KP _B 3200-**-	3270	70	3000-3400	3000-3400	54.0	3000	1.41	0.95	0.153	125	0.007	0.002	70	KP _B
KP _B 2700-**-	2780	70	3000-3400	3000-3400	54.0	3000	1.41	0.95	0.153	125	0.009	0.002	70	KH _B
KP _D 6900-**-	6900	70	2800-3200	2800-3200	100.0	3000	1.09	0.88	0.070	125	0.0035	0.0008	120	KP _D
KP _D 6300-**-	6330	70	2800-3200	2800-3200	100.0	3000	1.09	0.88	0.070	125	0.004	0.0008	120	KH _D
电压至 4200V(Up to 4200V)														
KP _D 5700-**-	5700	70	3600-4200	3600-4200	97.5	3000	1.24	0.90	0.114	125	0.0035	0.0008	120	KH _D
KP _D 5200-**-	5250	70	3600-4200	3600-4200	97.5	3000	1.24	0.90	0.114	125	0.004	0.0008	120	KH _D
KP _C 4300-**-	4320	70	3600-4200	3600-4200	60.0	3000	1.35	0.97	0.126	125	0.005	0.0015	90	KP _C
KP _C 3900-**-	3970	70	3600-4200	3600-4200	60.0	3000	1.35	0.97	0.126	125	0.0057	0.0015	90	KH _C
KP _B 3000-**-	3000	70	3600-4200	3600-4200	52.0	3000	1.55	0.95	0.200	125	0.007	0.002	70	KP _B
KP _B 2500-**-	2530	70	3600-4200	3600-4200	52.0	3000	1.55	0.95	0.200	125	0.009	0.002	70	KH _B
KP _X 2000-**-	2030	70	3600-4200	3600-4200	32.0	1500	1.41	0.96	0.300	125	0.01	0.003	50	KL _X
KP _X 1900-**-	1910	70	3600-4200	3600-4200	32.0	1500	1.41	0.96	0.300	125	0.011	0.003	50	KH _X
KP ₉ 1000-**-	1090	70	3600-4200	3600-4200	18.0	1000	1.65	1.05	0.600	125	0.017	0.005	22	KP ₉
KP ₉ 900-**-	930	70	3600-4200	3600-4200	18.0	1000	1.65	1.05	0.600	125	0.022	0.005	22	KH ₉
KP ₈ 500-**-	500	70	3600-4200	3600-4200	8.1	1000	2.50	1.05	1.450	125	0.035	0.008	15	KP ₈
KP ₈ 400-**-	430	70	3600-4200	3600-4200	8.1	1000	2.50	1.05	1.450	125	0.045	0.008	15	KH ₈
电压至 5200V(Up to 5200V)														
KP _E 7300-**-	7390	55	4600-5200	4200-4600	100.0	6000	1.61	0.95	0.110	115	0.0025	0.0005	180	KP _E
KP _E 7000-**-	7000	55	4600-5200	4200-4600	100.0	6000	1.61	0.95	0.110	115	0.0028	0.0005	180	KH _E
KP _D 5300-**-	5380	70	4600-5200	4200-4600	85.2	3000	1.38	1.00	0.125	125	0.0035	0.0008	120	KH _D
KP _D 5000-**-	5000	70	4600-5200	4200-4600	85.2	3000	1.38	1.00	0.125	125	0.004	0.0008	120	KH _D
KP _C 3700-**-	3750	70	4600-5200	4200-4600	60.0	3000	1.54	1.00	0.180	125	0.005	0.0015	90	KP _C
KP _C 3400-**-	3460	70	4600-5200	4200-4600	60.0	3000	1.54	1.00	0.180	125	0.0057	0.0015	90	KH _C
KP _B 2700-**-	2770	70	4600-5200	4200-4600	54.5	3000	1.70	1.01	0.230	125	0.007	0.002	70	KP _B
KP _B 2300-**-	2360	70	4600-5200	4200-4600	54.5	3000	1.70	1.01	0.230	125	0.009	0.002	70	KH _B
KP _A 1400-**-	1470	70	4600-5200	4200-4600	20.0	1500	1.73	1.10	0.420	125	0.013	0.004	40	KP _A
KP _A 1300-**-	1300	70	4600-5200	4200-4600	20.0	1500	1.73	1.10	0.420	125	0.015	0.004	40	KH _A
KP ₉ 900-**-	980	70	4600-5200	4200-4600	12.4	1000	1.90	1.12	0.780	125	0.017	0.005	22	KP ₉
KP ₉ 800-**-	830	70	4600-5200	4200-4600	12.4	1000	1.90	1.12	0.780	125	0.022	0.005	22	KH ₉

全压接型晶闸管 FREE-FLOATING THYRISTORS

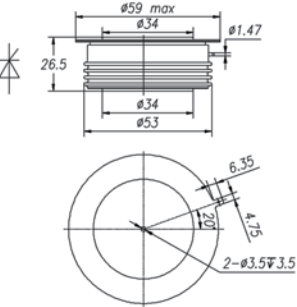
型号 TYPE --**= $V_{DSM}/100$	I_T (AV)		V_{DSM}	V_{DRM}	I_{TSM}	V_{TM}		V_{TO}	r_T	T_{VJM}	R_{thJC}	R_{thCH}	F	外形 Outline
	A	$@T_C$	V_{RSM}	V_{RRM}	$@T_{VJM}$	$@I_{TM}$		$@T_{VJM}$	$@T_{VJM}$				$\pm 10\%$	
		$^{\circ}C$	V	V	kA	A	V	V	m Ω					
KP _E 5200--**	5240	70	5400-6500	4500-5600	95.0	6000	2.01	1.05	0.160	115	0.0025	0.0005	180	KP _E
KP _E 5000--**	5000	70	5400-6500	4500-5600	95.0	6000	2.01	1.05	0.160	115	0.0027	0.0005	180	KH _E
KP _D 4500--**	4500	70	5400-6500	4500-5600	79.5	3000	1.69	1.13	0.185	125	0.0035	0.0008	120	KP _D
KP _D 4200--**	4250	70	5400-6500	4500-5600	79.5	3000	1.69	1.13	0.185	125	0.004	0.0008	120	KH _D
KP _C 3000--**	3070	70	5400-6500	4500-5600	64.8	3000	2.00	1.18	0.274	125	0.005	0.0015	90	KP _C
KP _C 2800--**	2800	70	5400-6500	4500-5600	64.8	3000	2.00	1.18	0.274	125	0.0057	0.0015	90	KH _C
KP _B 2100--**	2100	70	5400-6500	4500-5600	50.0	3000	2.49	1.25	0.412	125	0.007	0.002	70	KP _B
KP _B 1800--**	1800	70	5400-6500	4500-5600	50.0	3000	2.49	1.25	0.412	125	0.009	0.002	70	KH _B
KP _X 1400--**	1450	70	5400-6500	4500-5600	32.5	1500	2.12	1.15	0.645	125	0.01	0.003	50	KL _X
KP _X 1300--**	1360	70	5400-6500	4500-5600	32.5	1500	2.12	1.15	0.645	125	0.011	0.003	50	KH _X
KP _A 1100--**	1140	70	5400-6500	4500-5600	21.5	1500	2.37	1.20	0.780	125	0.013	0.004	40	KP _A
KP _A 1000--**	1010	70	5400-6500	4500-5600	21.5	1500	2.37	1.20	0.780	125	0.015	0.004	40	KH _A
KP ₉ 800--**	850	70	5400-6500	4500-5600	16.1	1000	2.25	1.20	1.050	125	0.017	0.005	22	KP ₉
KP ₉ 700--**	730	70	5400-6500	4500-5600	16.1	1000	2.25	1.20	1.050	125	0.022	0.005	22	KH ₉
KP ₈ 400--**	420	70	5400-6500	4500-5600	4.5	1000	3.50	1.20	2.300	125	0.035	0.008	15	KP ₈
KP ₈ 300--**	350	70	5400-6500	4500-5600	4.5	1000	3.50	1.20	2.300	125	0.045	0.008	15	KH ₈
电压至 7200V(Up to 7200V)														
KP _C 2600--**	2660	70	6800-7200	6300-6700	42.0	3000	2.15	1.19	0.320	125	0.0057	0.0015	90	KH _{C2}
KP _B 1600--**	1790	70	6800-7200	6300-6700	32.0	3000	2.50	1.25	0.420	125	0.009	0.002	70	KH _B
电压至 8000V(Up to 8000V)														
KP _E 4700--**	4700	70	7000-7500	6500-7000	91.0	5000	2.05	1.40	0.130	110	0.0027	0.0005	180	KH _E
KP _D 2800--**	2810	70	7500-8000	7000-7500	65.0	3000	2.05	1.15	0.300	110	0.004	0.0008	120	KH _D
KP _C 1900--**	1980	70	7500-8000	7000-7500	55.0	3000	2.55	1.25	0.435	115	0.0057	0.0015	90	KH _{C2}
KP ₉ 600--**	600	70	7500-8000	7000-7500	12.1	1000	2.90	1.35	1.550	125	0.022	0.005	22	KH ₉
KP ₈ 300--**	300	70	7500-8000	7000-7500	4.0	500	2.90	1.45	2.900	125	0.045	0.008	15	KH ₈
电压至 8500V(Up to 8500V)														
KP _E 4800--**	4800	55	8100-8500	7600-8000	90.0	5000	1.90	1.31	0.118	90	0.0027	0.005	180	KH _E
KP _D 3000--**	3000	55	8100-8500	7600-8000	53.3	3000	1.90	1.20	0.234	90	0.004	0.0008	120	KH _D
KP _C 2500--**	2580	70	8100-8500	7600-8000	56.0	1500	1.73	1.22	0.340	125	0.0057	0.0015	90	KH _{C2}
KP _C 1900--**	1900	70	8100-8500	7600-8000	35.0	3000	2.88	1.32	0.520	115	0.0057	0.0015	90	KH _{C2}
KP ₉ 500--**	540	70	8100-8500	7600-8000	12.1	1000	2.90	1.35	1.550	115	0.022	0.005	22	KH ₉
KP ₈ 300--**	300	70	8100-8500	7600-8000	4.0	500	2.95	1.47	2.950	125	0.045	0.008	15	KH ₈

产品图示

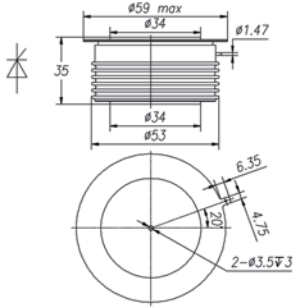
PRODUCT
DIAGRAM

全压接型晶闸管 FREE-FLOATING THYRISTORS

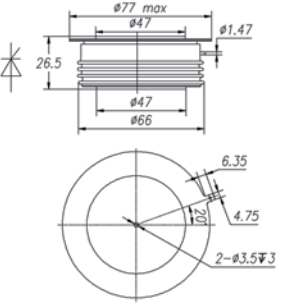
KP₈



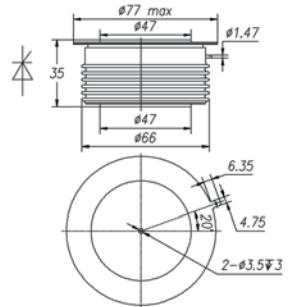
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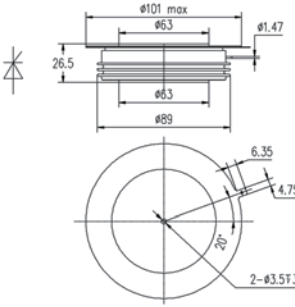
KP₉



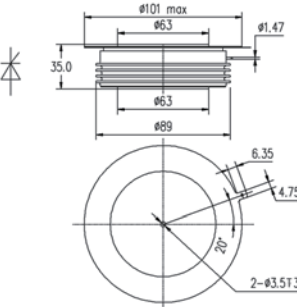
KH₉



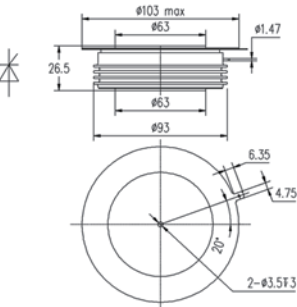
KP_A



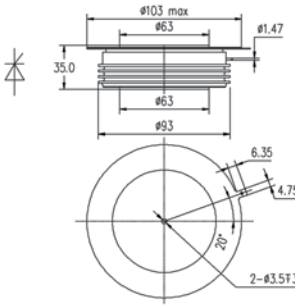
KH_A



KL_x



KH_x



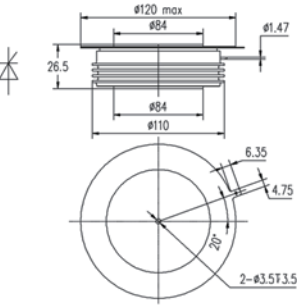
注：未标注数量单位的统一为毫米（mm）

Remarks:All dimensions shown in mm unless stated otherwise

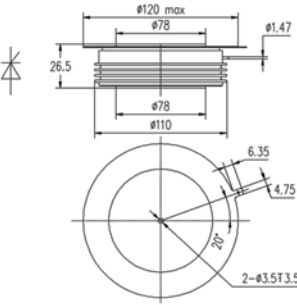
产品图示
PRODUCT
DIAGRAM

全压型晶闸管 FREE-FLOATING THYRISTORS

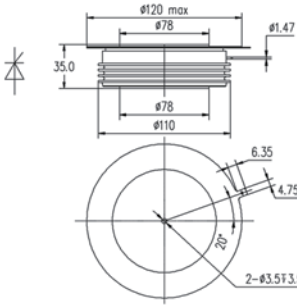
KP_B



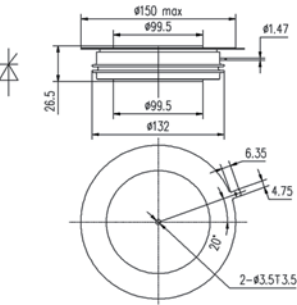
KP_{B2}



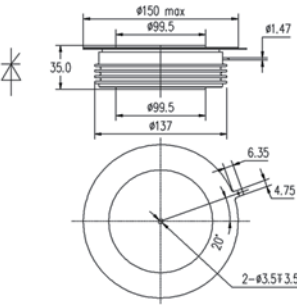
KH_B



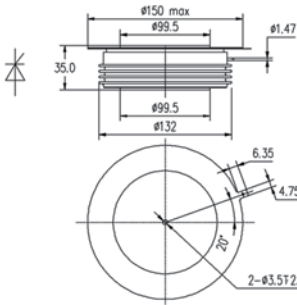
KP_C



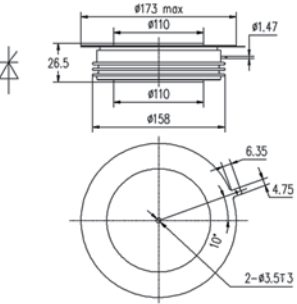
KH_C



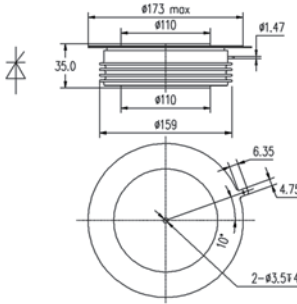
KH_{C2}



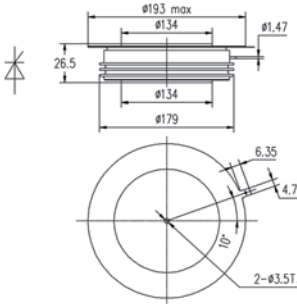
KP_D



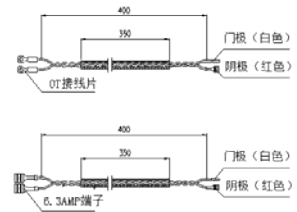
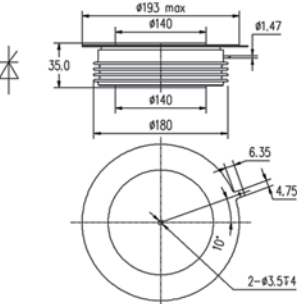
KH_D



KP_E



KH_E



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

烧结型晶闸管

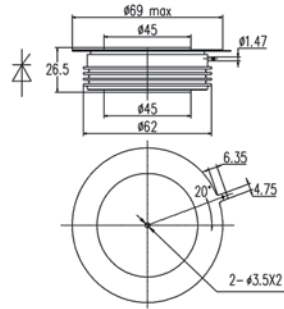
ALLOYING THYRISTORS

型号 TYPE --**= $V_{\text{DRM}}/100$	I_{T} (AV)	V_{DRM}	I_{TSM}	V_{TM}		V_{TO}	r_{T}	T_{VJM}	R_{thJC}	R_{thCH}	F	外形 Outline
	@ $T_{\text{C}}=70^{\circ}\text{C}$	V_{RRM}	@ T_{VJM} &10ms	@ I_{TM} & $T_{\text{C}}=25^{\circ}\text{C}$		@ T_{VJM}	@ T_{VJM}				$\pm 10\%$	
	A	V	kA	A	V	V	mΩ	℃	K/W	K/W	kN	
电压至 1400V(Up to 1400V)												
KP _X 3300--**	3310	600-1400	60.0	3000	1.15	0.83	0.092	125	0.01	0.003	56	KP _X
KP _A 2600--**	2640	600-1400	47.0	3000	1.30	0.87	0.098	125	0.0125	0.004	45	KP _A
KP ₄ 1800--**	1850	600-1400	29.0	3000	1.40	0.84	0.130	125	0.018	0.005	30	KP ₄
KP ₉ 1700--**	1700	600-1400	26.0	1500	1.20	0.86	0.160	125	0.02	0.005	22	KP ₉
KP ₈ 900--**	900	600-1400	15.0	1500	1.35	0.85	0.330	125	0.035	0.008	15	KP ₈
KP ₇ 800--**	850	600-1400	12.8	1500	1.60	0.87	0.382	125	0.035	0.01	10	KP ₇
KP ₅ 700--**	700	600-1400	9.1	1500	1.75	0.95	0.530	125	0.041	0.01	5	KP ₅
KP ₆ 400--**	400	600-1400	6.3	600	1.40	0.85	0.640	125	0.08	0.02	5	KP ₆
电压至 1800V(Up to 1800V)												
KP _X 3000--**	3030	1600-1800	60.0	3000	1.35	0.90	0.110	125	0.01	0.003	56	KP _X
KP _A 2500--**	2520	1600-1800	45.0	3000	1.45	0.91	0.120	125	0.0125	0.004	45	KP _A
KP ₄ 1700--**	1710	1600-1800	28.0	3000	1.50	0.88	0.160	125	0.018	0.005	30	KP ₄
KP ₉ 1500--**	1520	1600-1800	25.0	1500	1.35	0.88	0.200	125	0.02	0.005	22	KP ₉
KP ₃ 1200--**	1240	1600-1800	20.0	1500	1.40	0.88	0.262	125	0.024	0.006	20	KP ₃
KP ₈ 800--**	850	1600-1800	14.0	1500	1.60	0.91	0.360	125	0.035	0.008	15	KP ₈
KP ₇ 700--**	770	1600-1800	11.5	1500	1.80	0.90	0.500	125	0.035	0.01	10	KP ₇
KP ₅ 600--**	640	1600-1800	8.3	1500	1.90	1.09	0.587	125	0.041	0.01	5	KP ₅
KP ₆ 300--**	320	1600-1800	5.0	600	1.80	0.93	1.150	125	0.08	0.02	5	KP ₆
电压至 2400V(Up to 2400V)												
KP _X 2700--**	2730	2000-2400	45.0	3000	1.45	0.90	0.137	125	0.01	0.003	56	KP _X
KP _A 2100--**	2110	2000-2400	35.0	3000	1.65	0.96	0.179	125	0.0125	0.004	45	KP _A
KP ₄ 1400--**	1470	2000-2400	23.0	3000	1.80	0.96	0.230	125	0.018	0.005	30	KP ₄
KP ₉ 1400--**	1400	2000-2600	24.0	1500	1.50	0.89	0.270	125	0.02	0.005	22	KP ₉
KP ₈ 750--**	750	2000-2600	11.0	1500	1.85	0.95	0.500	125	0.035	0.008	15	KP ₈
KP ₇ 600--**	670	2000-2600	10.0	1500	2.15	0.92	0.720	125	0.035	0.01	10	KP ₇
KP ₅ 500--**	510	2000-2600	7.8	1500	2.40	0.94	1.036	125	0.041	0.01	5	KP ₅
电压至 3400V(Up to 3400V)												
KP _X 2100--**	2190	3000-3400	33.0	3000	1.85	1.00	0.235	125	0.01	0.003	56	KP _X /KH _X
KP _A 1700--**	1770	3000-3400	30.0	3000	2.10	1.05	0.298	125	0.0125	0.004	45	KP _A /KH _A
KP ₉ 1000--**	1010	3000-3400	17.0	1500	2.05	1.08	0.560	125	0.02	0.005	22	KP ₉
KP ₈ 500--**	580	3000-3400	8.4	1500	2.40	1.03	0.970	125	0.035	0.008	15	KP ₈
KP ₇ 500--**	530	3000-3400	8.0	1500	2.65	0.98	1.200	125	0.035	0.01	10	KP ₇
KP _X 2400--**	2470	2600-2800	43.0	3000	1.65	0.98	0.170	125	0.01	0.003	56	KP _X
KP _A 1800--**	1850	2600-2800	30.0	3000	1.90	1.02	0.250	125	0.0125	0.004	45	KP _A
KP ₉ 1300--**	1300	2600-2800	23.0	1500	1.55	0.95	0.300	125	0.02	0.005	22	KP ₉
KP ₄ 1200--**	1240	2600-3400	19.2	3000	2.25	1.06	0.350	125	0.018	0.005	30	KP ₄
KP ₈ 700--**	700	2600-2800	10.5	1500	1.90	1.00	0.600	125	0.035	0.008	15	KP ₈
KP ₅ 400--**	410	2600-3400	6.3	1500	2.80	1.04	1.725	125	0.041	0.01	5	KP ₅
电压至 5200V(Up to 5200V)												
KP _X 1400--**	1470	4600-5200	23.5	3000	2.80	1.18	0.525	125	0.01	0.003	56	KP _X /KH _X
KP _X 1800--**	1880	3600-4200	25.0	3000	2.20	1.14	0.360	125	0.01	0.003	56	KP _X /KH _X
KP _A 1400--**	1440	3600-4200	25.0	3000	2.45	1.15	0.452	125	0.0125	0.004	45	KP _A /KH _A
KP ₄ 900--**	960	3600-4200	14.7	3000	2.80	1.15	0.680	125	0.018	0.005	30	KP ₄
KP ₉ 800--**	870	3600-4200	15.0	1500	2.50	1.15	0.799	125	0.02	0.005	22	KP ₉ /KH ₉
KP ₈ 400--**	480	3600-4200	7.0	1500	3.25	1.15	1.470	125	0.035	0.008	15	KP ₈ /KH ₈

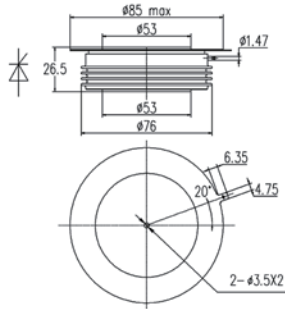
产品图示
PRODUCT
DIAGRAM

烧结型晶闸管 ALLOYING THYRISTORS

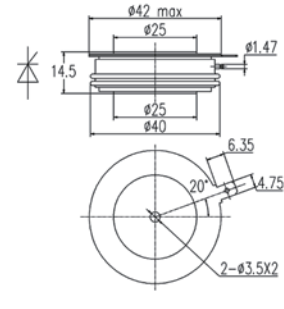
KP₃



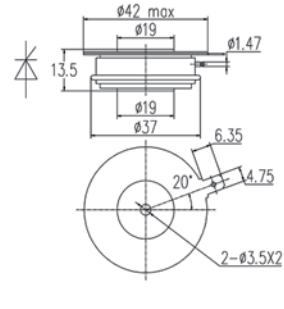
KP₄



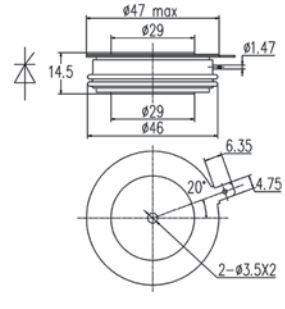
KP₅



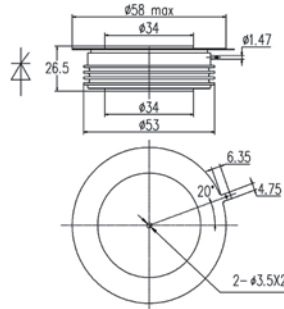
KP₆



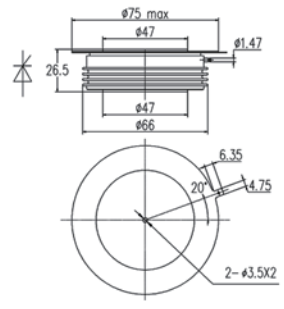
KP₇



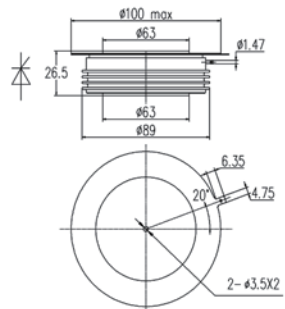
KP₈



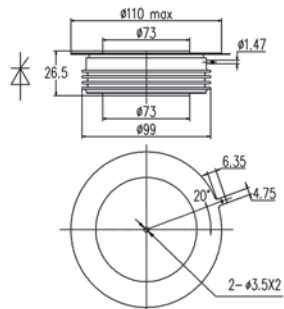
KP₉



KP_A



KP_x



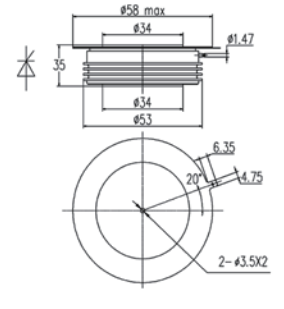
注：未标注数量单位的统一为毫米（mm）

Remarks:All dimensions shown in mm unless stated otherwise

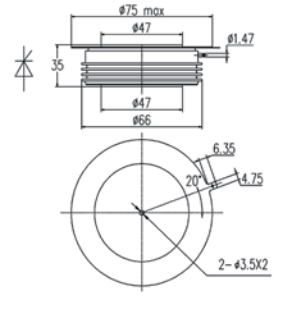
产品图示
PRODUCT
DIAGRAM

烧结型晶闸管 ALLOYING THYRISTORS

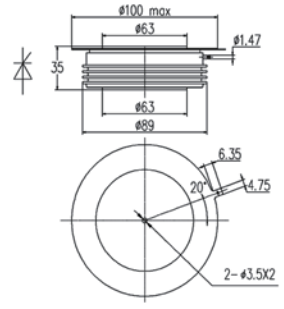
KH₈



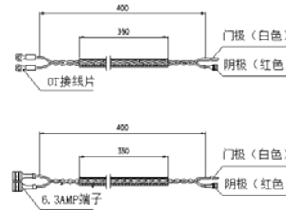
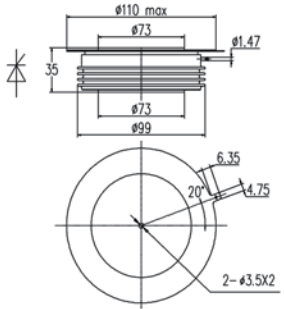
KH₉



KH_A



KH_x



注：未标注数量单位的统一为毫米（mm）

Remarks:All dimensions shown in mm unless stated otherwise

快速晶闸管

FAST SWITCHING THYRISTORS

型号 TYPE -**= $V_{\text{DRM}}/100$	$I_{\text{T(AV)}}$	V_{DRM}	V_{RRM}	I_{TSM}	V_{FM}		T_{VJM}	R_{thJC}	R_{thCH}	t_{q}	f	F	外形 Outline
	@ $T_{\text{C}}=55^{\circ}\text{C}$			@ T_{VJM}	@ I_{FM}	@ $T_{\text{C}}=T_{\text{VJM}}$				@ T_{VJM}		$\pm 10\%$	
	A	V	V	kA	A	V	$^{\circ}\text{C}$	K/W	K/W	μs	Hz	kN	
电压至 1200V (Up to 1200V)													
KK _X 2900-**	2950	800-1200	800-1200	31.6	4000	1.80	125	0.01	0.003	25	2000	56	KP _X
KK _A 2100-**	2190	800-1200	800-1200	27.5	3000	2.00	125	0.0124	0.004	25	2000	45	KP _A
KK ₄ 1600-**	1680	800-1200	800-1200	21.1	2000	1.75	125	0.018	0.005	25	2000	30	KP ₄
KK ₉ 1300-**	1380	800-1200	800-1200	17.4	2000	1.85	125	0.02	0.005	25	2000	22	KP ₉
KK ₈ 800-**	850	800-1200	800-1200	10.7	1500	2.08	125	0.035	0.008	25	2000	15	KP ₈
电压至 1400V (Up to 1400V)													
KK _X 2900-**	2900	1200-1400	1200-1400	30.9	4000	1.90	125	0.01	0.003	35	1500	56	KP _X
KK _A 2100-**	2110	1200-1400	1200-1400	26.6	3000	2.15	125	0.0124	0.004	35	1500	45	KP _A
KK ₄ 1600-**	1600	1200-1400	1200-1400	20.2	2000	1.85	125	0.018	0.005	35	1500	30	KP ₄
KK ₉ 1400-**	1400	1200-1400	200	17.6	2000	1.82	125	0.02	0.005	25	2500	22	KP ₉
KF ₉ 1200-**	1290	1200-1400	200	16.3	2000	2.00	125	0.02	0.005	19	3000	22	KP ₉
KK ₉ 1200-**	1270	1200-1400	1200-1400	16.0	2000	2.10	125	0.02	0.005	35	1500	22	KP ₉
KK ₈ 700-**	750	1200-1400	1200-1400	9.5	1500	2.45	125	0.035	0.008	35	1500	15	KP ₈
电压至 2000V (Up to 2000V)													
KF _X 3000-**	3030	1800-2000	200	36.0	4000	1.65	125	0.01	0.003	120	500	56	KP _X
KF _X 2900-**	2910	1800-2000	200	34.8	4000	1.75	125	0.01	0.003	80	1000	56	KP _X
KK _X 2700-**	2740	1600-2000	1600-2000	28.9	4000	2.15	125	0.01	0.003	50	1000	56	KP _X
KK _A 2000-**	2010	1600-2000	1600-2000	25.3	3000	2.35	125	0.0124	0.004	50	1000	45	KP _A
KK ₄ 1500-**	1510	1600-2000	1600-2000	19.0	2000	2.00	125	0.018	0.005	50	1000	30	KP ₄
KK ₉ 1200-**	1200	1600-2000	1600-2000	15.1	2000	2.15	125	0.02	0.005	50	1000	22	KP ₉
KK ₈ 600-**	680	1600-2000	1600-2000	8.6	1500	2.80	125	0.035	0.008	50	1000	15	KP ₈
KF ₉ 1500-**	1500	1600-1800	200	18.9	2000	1.71	125	0.02	0.005	50	1500	22	KP ₉
电压至 3000V (Up to 3000V)													
KK _X 2200-**	2260	2800-3000	2800-3000	23.7	4000	2.80	125	0.01	0.003	100	400	56	KP _X
KK _C 4000-**	4010	2500-3000	2500-3000	42.3	6000	2.80	125	0.0057	0.002	100	400	90	KH _{C2}
KK _B 3000-**	3000	2500-3000	2500-3000	32.2	4000	2.80	125	0.007	0.002	100	400	70	KP _B
KK _X 2500-**	2520	2500-2800	2500-2800	26.2	4000	2.50	125	0.01	0.003	65	800	56	KP _X
KK _A 2000-**	2000	2200-2500	2200-2500	25.2	3000	2.47	125	0.0124	0.004	65	700	45	KP _A
KK ₄ 1200-**	1240	2200-2500	2200-2500	15.6	2000	2.60	125	0.018	0.005	60	750	30	KP ₄
KK ₉ 1000-**	1010	2200-2500	2200-2500	12.7	2000	2.85	125	0.02	0.005	60	750	22	KP ₉
KK _X 2600-**	2600	2200-2500	2200-2500	27.3	4000	2.35	125	0.01	0.003	55	700	56	KP _X
KK _X 2700-**	2750	2000-2200	2000-2200	28.8	4000	2.00	125	0.01	0.003	55	800	56	KP _X
电压至 3500V (Up to 3500V)													
KK _C 3000-**	3000	3200-3500	3200-3500	32.3	4000	3.00	125	0.0057	0.002	120	250	90	KH _{C2}
KK _B 2500-**	2520	3200-3500	3200-3500	27.0	4000	3.20	125	0.007	0.002	120	250	70	K _{PB}
KK _X 2000-**	2020	3200-3500	3200-3500	21.3	3000	2.95	125	0.01	0.003	120	250	56	K _{PX}
电压至 4500V (Up to 4500V)													
KF _C 3600-**	3650	4200-4500	300	41.5	4000	2.10	125	0.0057	0.002	200	250	90	KH _{C2}
KK _C 2700-**	2780	4200-4500	4200-4500	36.8	4000	3.20	125	0.0057	0.002	200	150	90	KH _{C2}
KK _C 2700-**	2760	4000-4200	4000-4200	31.2	4000	3.40	125	0.0057	0.002	150	200	90	KH _{C2}
KK _B 2300-**	2320	4000-4200	4000-4200	24.9	3000	3.20	125	0.007	0.002	150	200	70	K _{PB}

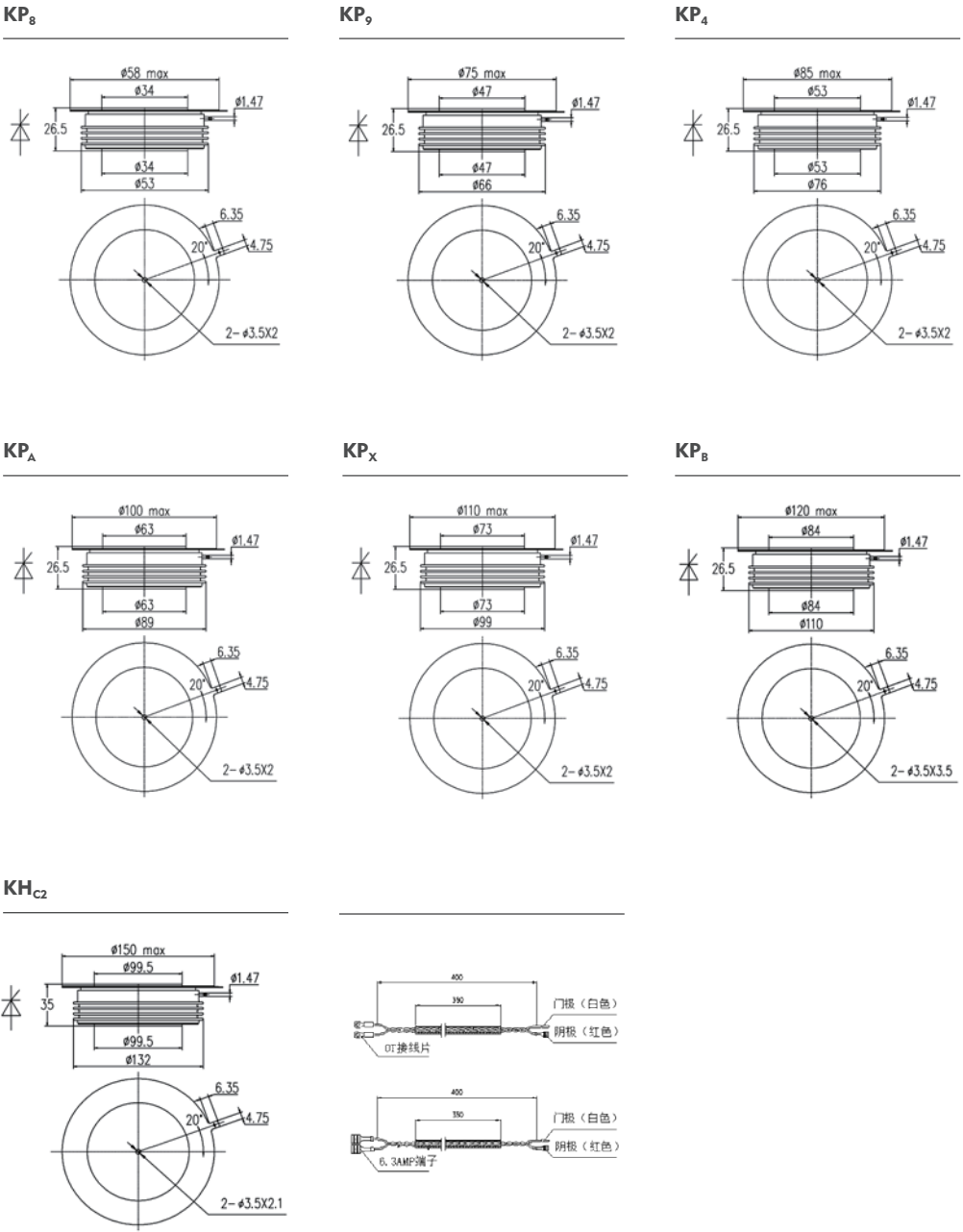
说明 Remarks :
1.f 为对应关断时间 t_{q} 下的推荐最大工作频率。
1.f is the recommended maximum operating frequency at the corresponding off time t_{q} .

产品图示

PRODUCT
DIAGRAM

快速晶闸管

FAST SWITCHING THYRISTORS



注：未标注数量单位的统一为毫米（mm）
Remarks:All dimensions shown in mm unless stated otherwise

双向晶闸管

BIDIRECTIONAL THYRISTORS

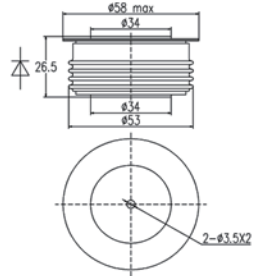
型号 TYPE --*=V _{DSM} /100	I _{T(AV)}	I _{T(RMS)F}	V _{DSM}	V _{DRM}	I _{TSM}	V _{TM}		V _{TO}	r _T	T _{VJM}	R _{thJC}	R _{thCH}	F	外形 Outline
	@T _C =70°C		V _{RSM}	V _{RRM}	@T _{VJM}	@T _{TM}		@T _{VJM}	@T _{VJM}				±10%	
					&10ms	&T _C =T _{VJM}								
	A	°C	V	V	kA	A	V	V	mΩ				°C	
电压至 2800V(Up to 2800V)														
KB _C 5500-**	2520	2520	2200-2800	2200-2800	38.0	3000	1.47	0.99	0.16	125	0.01	0.003	90	KB _{C2}
KB _C 5200-**	2360	5240	2200-2800	2200-2800	38.0	3000	1.47	0.99	0.16	125	0.011	0.003	90	KB _C
电压至 4200V(Up to 4200V)														
KB _D 5600-**	2560	5680	3600-4200	3600-4200	40.0	3000	1.50	0.90	0.200	125	0.009	0.002	120	KB _D
KB _C 4400-**	1980	4400	3600-4200	3600-4200	32.5	2000	1.52	1.00	0.260	125	0.011	0.003	90	KB _C
KB _B 2900-**	1310	2912	3600-4200	3600-4200	23.0	1500	1.65	1.02	0.420	125	0.016	0.004	70	KB _B
KB _X 2200-**	1000	2219	3600-4200	3600-4200	15.0	1000	1.55	1.05	0.500	125	0.022	0.005	50	KB _X
KB _A 1800-**	840	1850	3600-4200	3600-4200	12.0	1000	1.65	1.05	0.600	125	0.026	0.005	50	KB _A
KB ₉ 1000-**	460	1020	3600-4200	3600-4200	6.0	1000	2.25	1.15	1.000	125	0.045	0.008	22	KB ₉
电压至 6500V(Up to 6500V)														
KB _D 4200-**	1910	4242	5400-6500	4500-5600	32.0	3000	2.25	1.11	0.380	125	0.009	0.002	120	KB _D
KB _C 3100-**	1410	3124	5400-6500	4500-5600	22.5	3000	2.95	1.30	0.540	125	0.011	0.003	90	KB _C
KB _B 2300-**	1060	2347	5400-6500	4500-5600	14.0	1500	2.25	1.18	0.680	125	0.016	0.004	70	KB _B
KB _X 1600-**	740	1640	5400-6500	4500-5600	11.8	1000	2.25	1.25	1.000	125	0.022	0.005	50	KB _X
KB _A 1300-**	610	1360	5400-6500	4500-5600	11.0	1000	2.50	1.30	1.200	125	0.026	0.005	50	KB _A
KB ₉ 700-**	350	770	5400-6500	4500-5600	4.5	1000	3.50	1.20	2.300	125	0.045	0.008	22	KB ₉
KB ₈ 400-**	180	400	5400-6500	4500-5600	2.8	500	3.5	1.24	4.3	125	0.09	0.008	15	KB ₈

快速二极管 FAST DIODES

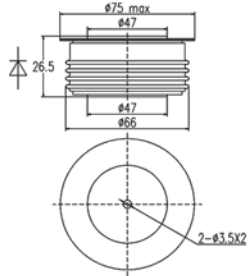
型号 TYPE ~**= $V_{DRR}/100$	$I_{T(AV)}$	V_{RRM}	I_{FSM}	V_{FM}		T_{VJM}	R_{thJC}	R_{thCH}	t_{ff}	F	外形 Outline
	$@T_C=70^{\circ}C$		$@T_{VJM}$	$@I_{FM}$					$@T_{VJM}$	$\pm 10\%$	
			$\&10ms$	$\&T_C=T_{VJM}$							
			A	V	kA						
电压至 2200V (Up to 2200V)											
ZK _X 2500- **	2598	1800-2200	34.3	4000	2.30	150	0.01	0.003	6.5	56	ZP _X
ZK _A 2000- **	2082	1800-2200	27.5	3000	2.30	150	0.0124	0.004	6.5	45	ZP _A
ZK ₉ 1200- **	1280	1800-2200	17.0	2000	2.40	150	0.02	0.005	6.0	22	ZP ₉
ZK ₈ 800- **	816	1800-2200	10.8	1500	2.40	150	0.035	0.008	6.0	15	ZP ₈
电压至 2800V (Up to 2800V)											
ZK _X 2500- **	2531	2500-2800	33.4	4000	2.50	150	0.01	0.003	6.7	56	ZP _X
ZK _A 2000- **	2030	2500-2800	26.8	3000	2.50	150	0.0125	0.004	6.7	45	ZP _A
ZK ₉ 1100- **	1190	2500-2800	15.8	2000	2.60	150	0.02	0.005	6.2	22	ZP ₉
ZK ₈ 700- **	770	2500-2800	10.1	1500	2.60	150	0.035	0.008	6.2	15	ZP ₈
电压至 3500V (Up to 3500V)											
ZK _X 2200- **	2228	3000-3500	29.4	4000	2.80	150	0.01	0.003	7.0	56	ZP _X
ZK _A 1800- **	1855	3000-3500	24.5	3000	2.80	150	0.0124	0.004	7.0	45	ZP _A
ZK ₉ 1000- **	1016	3000-3500	13.4	2000	3.00	150	0.02	0.005	6.5	22	ZP ₉
ZK ₈ 600- **	680	3000-3500	9.9	1500	3.00	150	0.035	0.008	6.5	15	ZP ₈
电压至 4500V (Up to 4500V)											
ZK _X 2000- **	2032	4000-4500	26.8	4000	3.20	150	0.01	0.003	7.5	56	ZP _X
ZK _A 1800- **	1820	4000-4500	24.1	3000	3.20	150	0.0124	0.004	7.5	45	ZP _A
ZK ₉ 900- **	925	4000-4500	12.2	2000	3.50	150	0.02	0.005	7.0	22	ZP ₉
ZK ₈ 500- **	530	4000-4500	7.1	1500	3.50	150	0.035	0.008	7.0	15	ZP ₈

产品图示
PRODUCT
DIAGRAM

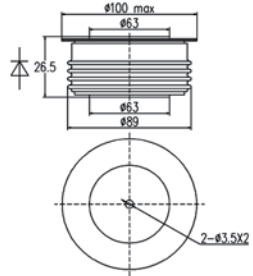
ZP₈



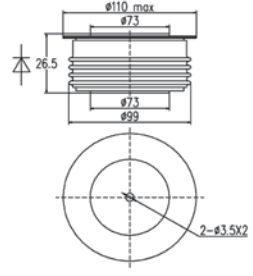
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ZP_A



ZP_X



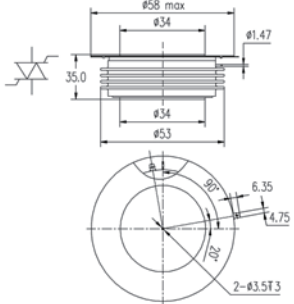
注：未标注数量单位的统一为毫米（mm）

Remarks:All dimensions shown in mm unless stated otherwise

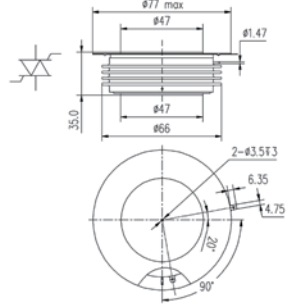
产品图示
PRODUCT
DIAGRAM

双向晶闸管 BIDIRECTIONAL THYRISTORS

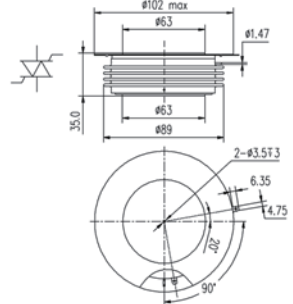
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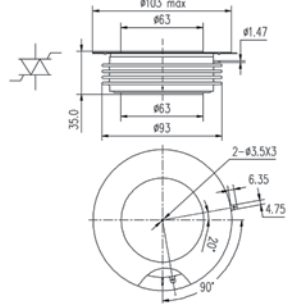
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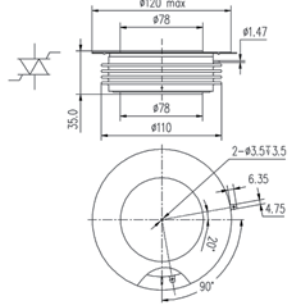
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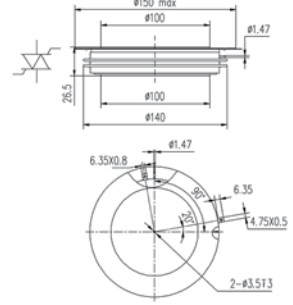
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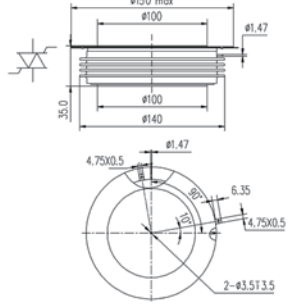
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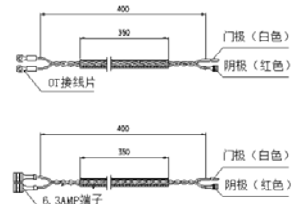
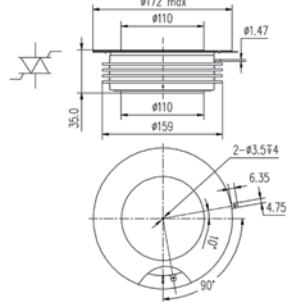
KB_{C2}



KB_C

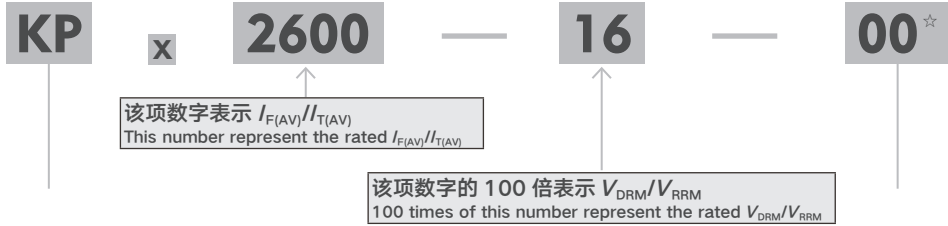


KB_D



注：未标注数量单位的统一为毫米（mm）
Remarks:All dimensions shown in mm unless stated otherwise

型号说明
NOMENCLATURE



两个字母表示器件的种类 the two letters represent the type of the device	
符号 Symbols	器件种类 Device Types
ZP	普通整流管 Rectifier diodes
ZK	快速二极管 Fast Diode
KP	普通晶闸管 Thyristor
KF	非对称晶闸管 Asymmetric Thyristor
KK	快速晶闸管 Fast switching thyristors
KB	双向晶闸管 Bi-directional control thyristors

表示器件结构及工艺等的变化序列 This numbers or letters represent ordinal numeral for varieties of device structure and process	
设计序号 Design number	具体含义 Specific meaning
00	原型设计 Original design
01	第一次修订 / 增补 The first revision
02	第二次修订 / 增补 The second revision
☆	新产品 New products

符号说明
SYMBOLS

符号 Symbols	参数名称	Description
F	紧固力	Mounting Force
$I_{F(AV)}$	正向平均电流	Mean Forward Current
I_{FM}	正向峰值电流	Peak Forward Current
I_{FSM}	浪涌电流	Surge Forward Current
$I_{T(AV)}$	通态平均电流	Mean On-state Current
$I_{F(RMS)}$	通态方均根电流	Rms On-state Current
I_{TM}	通态峰值电流	Peak On-state Current
I_{TSM}	通态浪涌电流	Surge (Non-repetitive) Current
R_{thCH}	接触热阻	Thermal Resistance, Case to Heatsink
R_{thJC}	结壳热阻	Thermal Resistance, Junction to Case
t_q	电路换向关断时间	Circuit commutated turn-off time
T_C	壳温	Case Temperature
T_{VJM}	最高（等效）结温	Max.Virtual Junction Temperature
V_{DSM}	断态不重复峰值电压	Non-repetitive Peak Off-state Voltage
V_{RSM}	反向不重复峰值电压	Non-repetitive Peak Reverse Voltage
V_{DRM}	断态重复峰值电压	Repetitive Peak Off-state Voltage
V_{RRM}	反向重复峰值电压	Repetitive Peak Reverse Voltage
V_{FM}	正向峰值电压	Peak Forward Voltage
V_{TM}	通态峰值电压	Peak On-state Voltage
V_{TO}	通态门槛电压	On-state Threshold Voltage
r_T	通态斜率电阻	On-state Slope Resistance
V_{FO}	正向门槛电压	Forward Threshold Voltage
r_F	正向斜率电阻	Forward Slope Resistance
Q_{rr}	反向恢复电荷	Reverse Recovery Charge

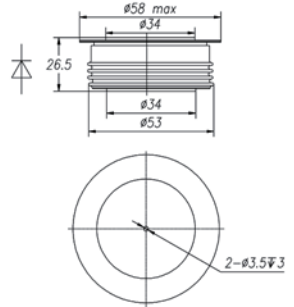
FRD 产品FRD PRODUCTS

型号 * TYPE	$I_{F(AV)}$	V_{RRM}	I_{FSM}	V_{FM}		V_{F0}	r_F	T_{VJM}	R_{thJC}	R_{thCH}	I_{rr}	Q_{rr}	F	外形 Outline
	@ $T_C=70^{\circ}C$ or $55^{\circ}C$		@ T_{VJM}	@ I_{FM}		@ T_{VJM}							$\pm 10\%$	
	A		V	kA	A	V	V						m Ω	
电压至 2500V (Up to 2500V)														
FY ₉ 1100-**	1150	2500	18	4500	2.80	1.05	0.39	125	0.020	0.005	1200	2600	22	ZP ₉
电压至 4500V (Up to 4500V)														
FY _E 6000-**	6000	4500	100	2500	1.65	1.15	0.20	125	0.0025	0.0005	3600	8000	180	ZP _E
FY _D 5000-**	4600	4500	85	2500	2.00	1.40	0.20	125	0.0033	0.001	3600	8000	120	ZP _{D2}
FY _D 4600-**	4600	4500	85	2500	2.00	1.45	0.22	125	0.0035	0.001	3400	7200	120	ZP _D
FY _B 2000-**-02	2620	4500	40	2500	2.00	1.00	0.40	125	0.007	0.002	3200	10000	40	ZS _B
FY _B 2000-**-01	2000	4500	25	2500	3.60	1.60	0.80	125	0.007	0.002	2300	5600	40	ZS _B
FY _X 1100-**	1184	4500	20	2500	3.60	2.06	0.62	125	0.010	0.003	1600	4500	40	ZS _X
FY ₉ 600-**	630	4500	16	2000	3.80	1.30	1.25	125	0.020	0.005	800	2500	22	ZP ₉
FY ₈ 400-**	400	4500	4	1000	3.20	1.70	1.50	125	0.035	0.008	360	650	15	ZP ₈
电压至 6500V (Up to 6500V)														
FY _D 4000-**	4100	6500	65	2500	2.10	1.47	0.25	125	0.0033	0.001	6000	16000	120	ZP _{D2}
FY _C 2000-**	2468	6500	40	2500	2.20	1.50	0.28	125	0.0057	0.0015	5100	14000	90	ZP _C
FY _B 1700-**	1864	6500	36	2500	2.70	1.55	0.46	125	0.007	0.002	4600	11000	40	ZS _B
FY ₉ 400-**	460	6500	10	900	4.00	1.50	2.80	125	0.020	0.005	650	1300	22	ZP ₉

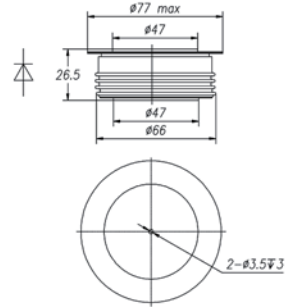
产品图示PRODUCT DIAGRAM

FRD 产品FRD PRODUCTS

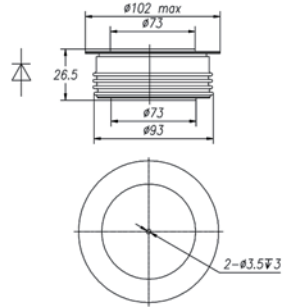
ZP₈



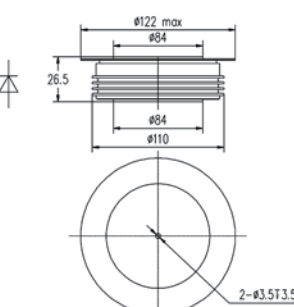
ZP₉



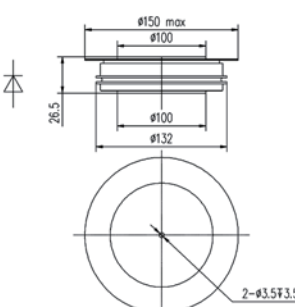
ZS_x



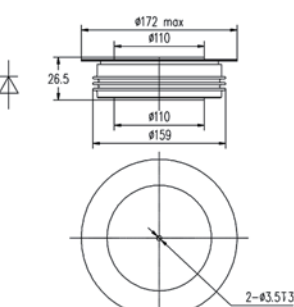
ZS_B



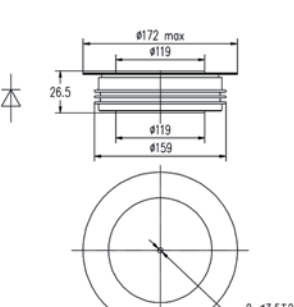
ZP_C



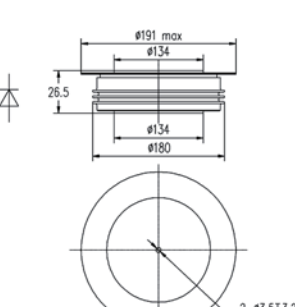
ZP_D



ZP_{D2}



ZP_E



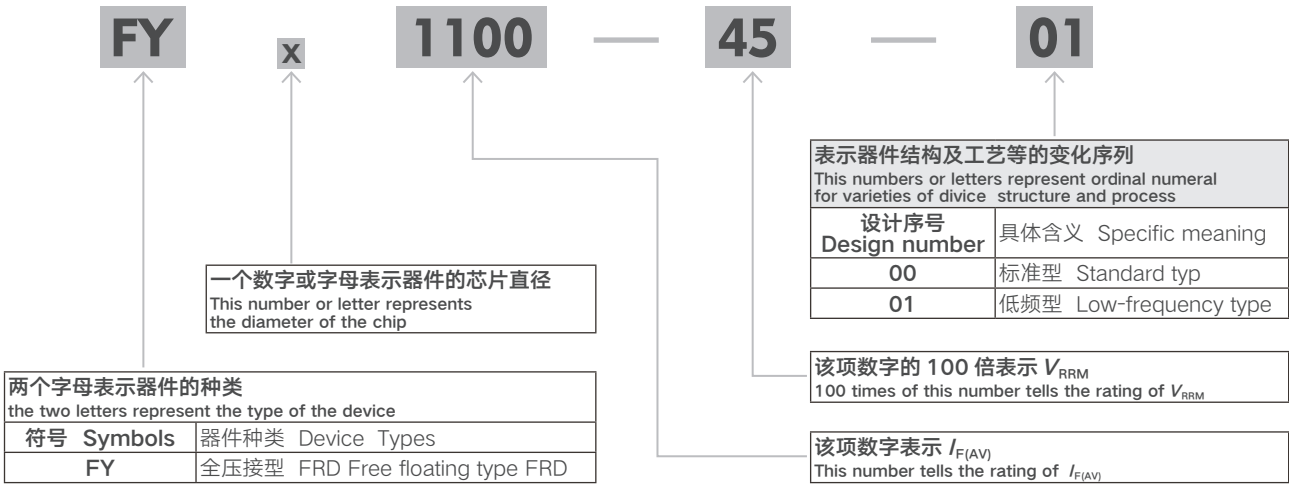
注：未标注数量单位的统一为毫米（mm）
Remarks:All dimensions shown in mm unless stated otherwise

型号说明

NOMENCLATURE

FRD 产品

FRD PRODUCTS



符号说明

SYMBOLS

FRD 产品

FRD PRODUCTS

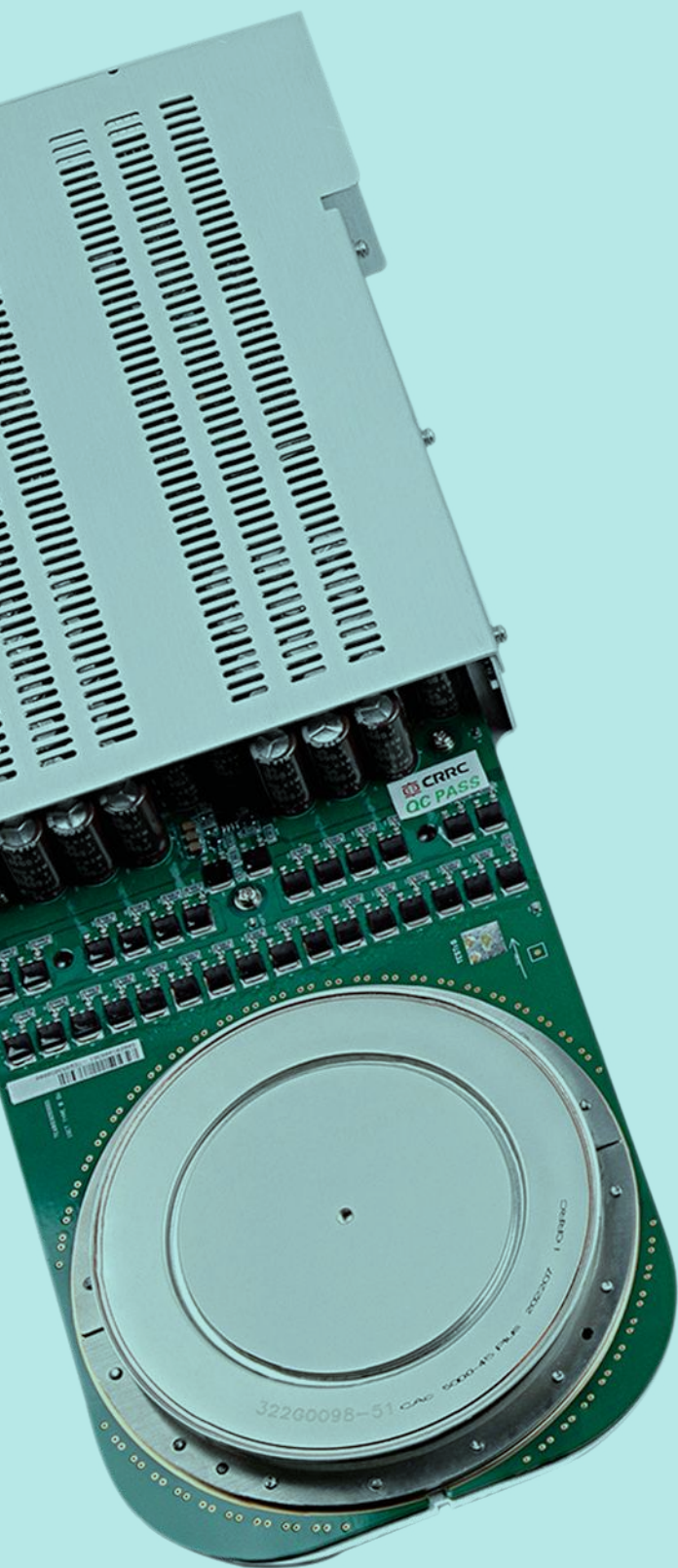
符号 Symbols	参数名称	Description
F	紧固力	Mounting Force
$I_{F(AV)}$	正向平均电流	Mean Forward Current
I_{FM}	正向峰值电流	Peak Forward Current
I_{FSM}	浪涌电流	Surge (Non-repetitive) Current
I_{rr}	反向恢复电流	Reverse Recovery Current
R_{thCH}	接触热阻	Thermal Resistance, Case to Heatsink
R_{thJC}	结壳热阻	Thermal Resistance, Junction to Case
Q_{rr}	反向恢复电荷	Reverse Recovery Charge
T_C	壳温	Case Temperature
T_{VJM}	最高（等效）结温	Max.VirtualJunction Temperature
V_{FM}	正向峰值电压	Peak Forward Voltage
V_{RRM}	反向重复峰值电压	Repetitive Peak Reverse Voltage

第五章

CHAPTER FIVE

集成门极换流晶闸管

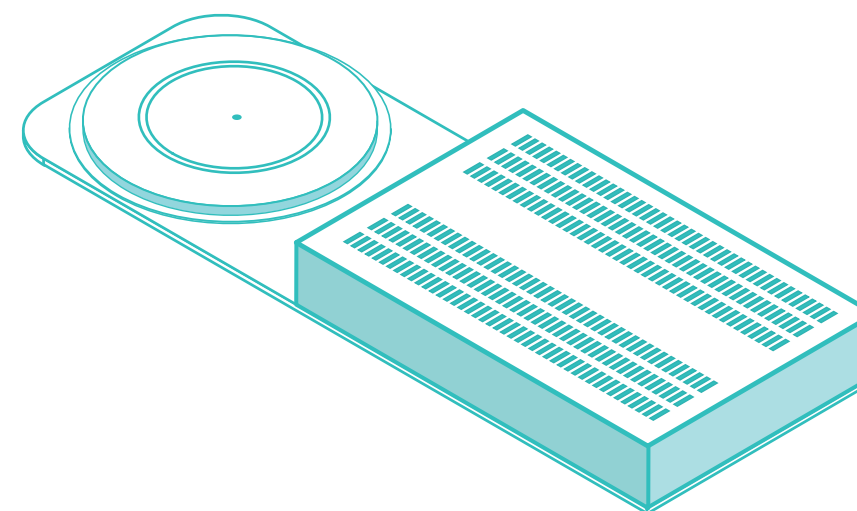
IGCT



株洲中车时代半导体有限公司
ZHUZHOU CRRC TIMES SEMICONDUCTOR CO.,LTD.

IGCT

集成门极换流晶闸管



第五章 CHAPTER FIVE

集成门极换流晶闸管

IGCT

产品介绍
PRODUCT
INTRODUCTION

IGCT- 集成门极换流晶闸管采用了缓冲层、透明阳极、门极硬驱动等新技术，是一种适用于5MVA 以上电能转换装置的中高压开关器件，广泛应用于电机驱动、节能环保、风力发电、船舶驱动、电能质量控制等功率装置中，促进电力电子成套装置在功率、可靠性、效率、成本、体积和重量等方面都取得了巨大进展。

The integrated gate commutated thyristor adopts new technologies such as buffer layer, transparent anode and gate hard drive. It is a medium and high voltage switching device suitable for power conversion devices above 5MVA. It has been widely used in power devices such as electric drive, energy conservation and environmental protection, wind power generation, ship drive, power quality control, etc., which has made great progress in power, reliability, efficiency, cost, volume and weight.

产品特点
CHARACTERISTIC

集成门极驱动	Integrated Gate Driver
功率等级高	High Power Grade
通态损耗小	Low Conduction Loss
浪涌电流大	High Surge Current
长期短路失效模式	Long-term Short-Circuit Failure Mode
电磁兼容能力强	Strong EMC Performance

非对称型号 A _S TYPE	<i>I</i> _{TGQM}	<i>I</i> _{T(AV)}	<i>V</i> _{DRM}	<i>V</i> _{RRM}	<i>I</i> _{TSM}	<i>V</i> _{TM} @ <i>I</i> _{TM}		<i>T</i> _{VJM}	<i>R</i> _{thJC}	<i>R</i> _{thCS}	<i>V</i> _{TO}	<i>r</i> _T	<i>F</i>	外形 Outline
	<i>T</i> _{VJM}	<i>T</i> _C =85℃	<i>T</i> _{VJM}	<i>T</i> _{VJM}	<i>T</i> _{VJM}	<i>T</i> _{VJM}					<i>T</i> _{VJM}		±10%	
	A	A	V	V	kA	V	A	℃	K/W	V	mΩ	kN		
CA _E 8000-65 ★	8000	2740	6500	17	48	2.74	6000	125	0.0046	0.0013	1.24	0.250	108	CA _E
CA _C 4000-65	4000	2000*	6500	17	26	3.75	4000	125	0.0085	0.003	1.88	0.560	40	CA _{2C}
CA _E 8000-45	8000	3670	4500	17	64	2.30	8000	125	0.0046	0.0013	1.54	0.097	108	CA _E
CA _C 6500-45 ★	6500	2450	4500	17	40	1.98	4000	125	0.0068	0.0022	1.19	0.187	55	CA _{2C}
CA _C 5000-45 Plus	5000	3000*	4500	17	35	2.61	5000	125	0.0085	0.003	1.22	0.280	40	CA _{3C}
CA _C 5000-45	5000	1870	4500	17	33	2.35	4000	125	0.0085	0.003	1.22	0.280	40	CA _{2C}
CA _C 4000-45-02	4000	2150	4500	17	35	1.9	4000	125	0.0085	0.003	1.05	0.213	40	CA _C
CA _C 4000-45	4000	1700	4500	17	32	2.7	4000	125	0.0085	0.003	1.40	0.325	40	CA _C

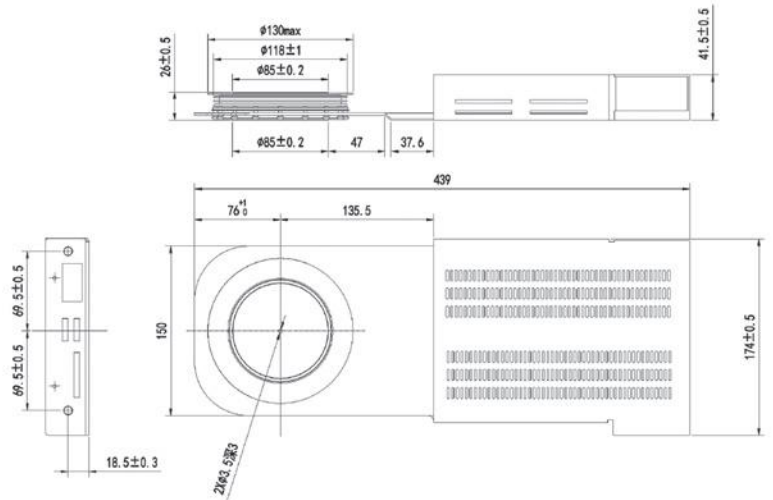
集成门极换流晶闸管 IGCT

逆阻型号 R _B TYPE	<i>I</i> _{TGQM}	<i>I</i> _{T(AV)}	<i>V</i> _{DRM}	<i>V</i> _{RRM}	<i>I</i> _{TSM}	<i>V</i> _{TM} @ <i>I</i> _{TM}		<i>T</i> _{VJM}	<i>R</i> _{thJC}	<i>R</i> _{thCS}	<i>V</i> _{TO}	<i>r</i> _T	<i>F</i>	外形 Outline
	<i>T</i> _{VJM}	<i>T</i> _C =60℃	<i>T</i> _{VJM}	<i>T</i> _{VJM}	<i>T</i> _{VJM}	<i>T</i> _{VJM}					<i>T</i> _{VJM}		±10%	
	A	A	V	V	kA	V	A	℃	K/W	V	mΩ	kN		
CS _E 6000-80 ★	6000	3570	8000	8000	52.5	2.73	6000	90	0.0032	0.0012	1.33	0.232	120	CS _E
CS _E 6000-45	6000	3500	4500	4500	50.2	2.00	6000	90	0.0046	0.0013	1.13	0.134	108	CA _E
CS _C 5000-33	5000	1930	3300	3300	34.5	1.61	2000	100	0.0085	0.003	1.11	0.261	40	CA _{2C}
CS _C 6000-25	6000	2620	2500	2500	42.2	1.04	1000	100	0.0085	0.003	0.87	0.18	40	CA _{2C}

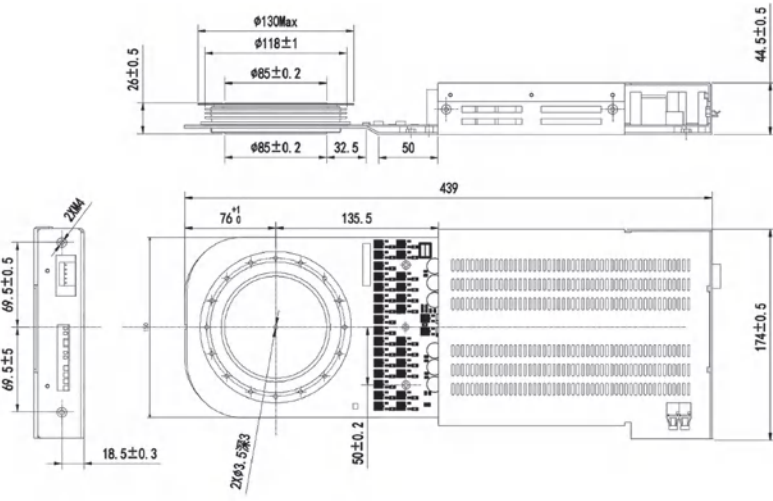
注：1、* 直流连续电流；2、★ 预研产品
Remark：1、*DC continuous current；2、★ Developing products

产品图示
PRODUCT
DIAGRAM

CA_C



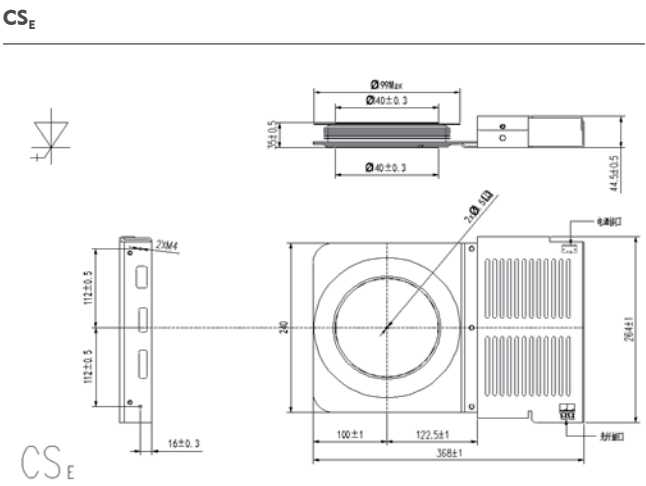
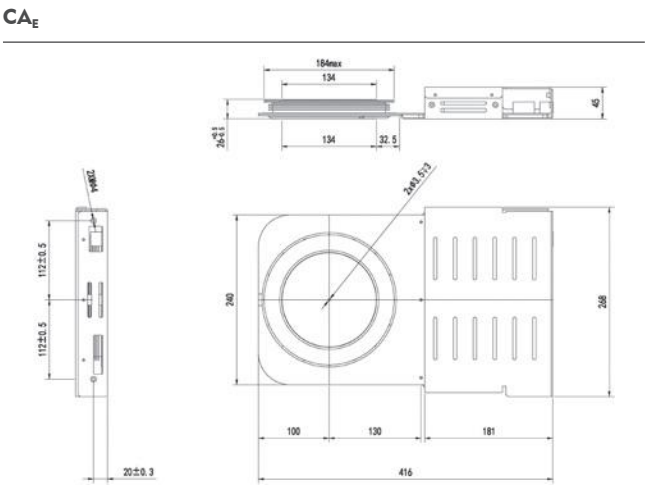
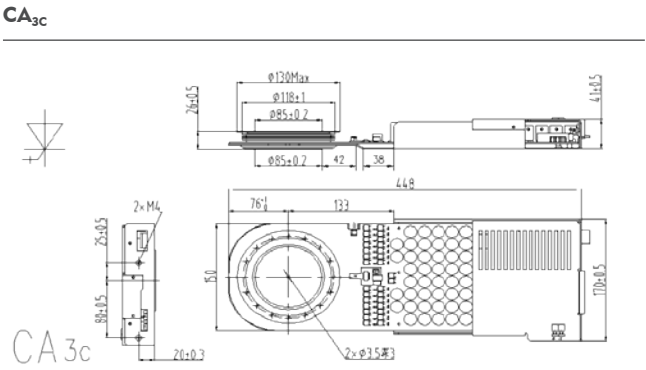
CA_{2c}



注：未标注数量单位的统一为毫米（mm）
Remarks:All dimensions shown in mm unless stated otherwise

产品图示
PRODUCT
DIAGRAM

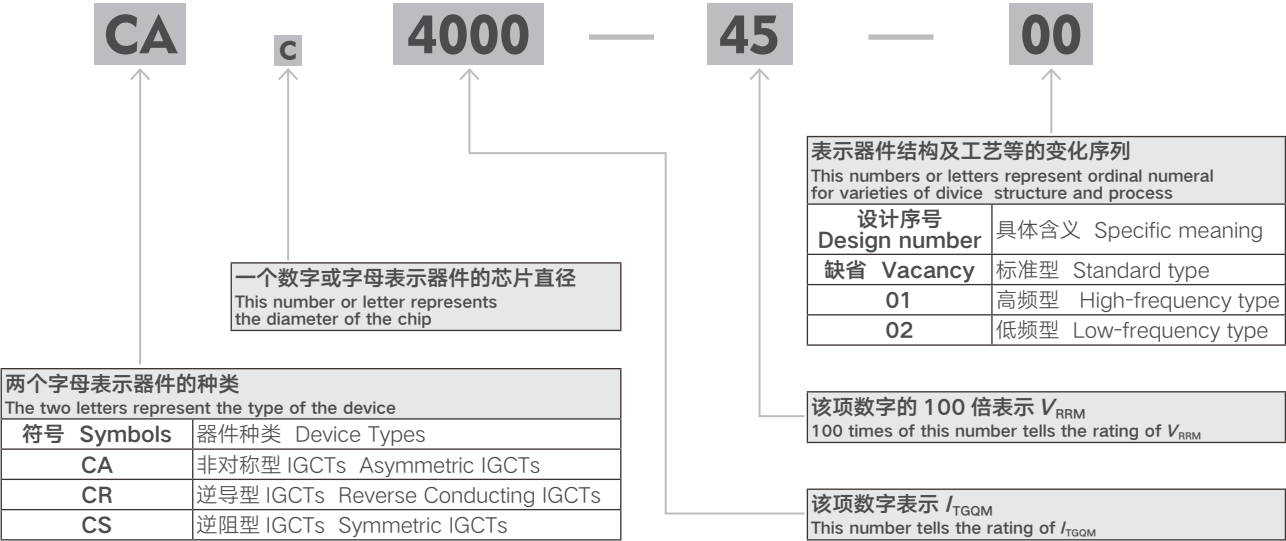
集成门极换流晶闸管 IGCT



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

型号说明
NOMENCLATURE

集成门极换流晶闸管 IGCT



符号说明
SYMBOLS

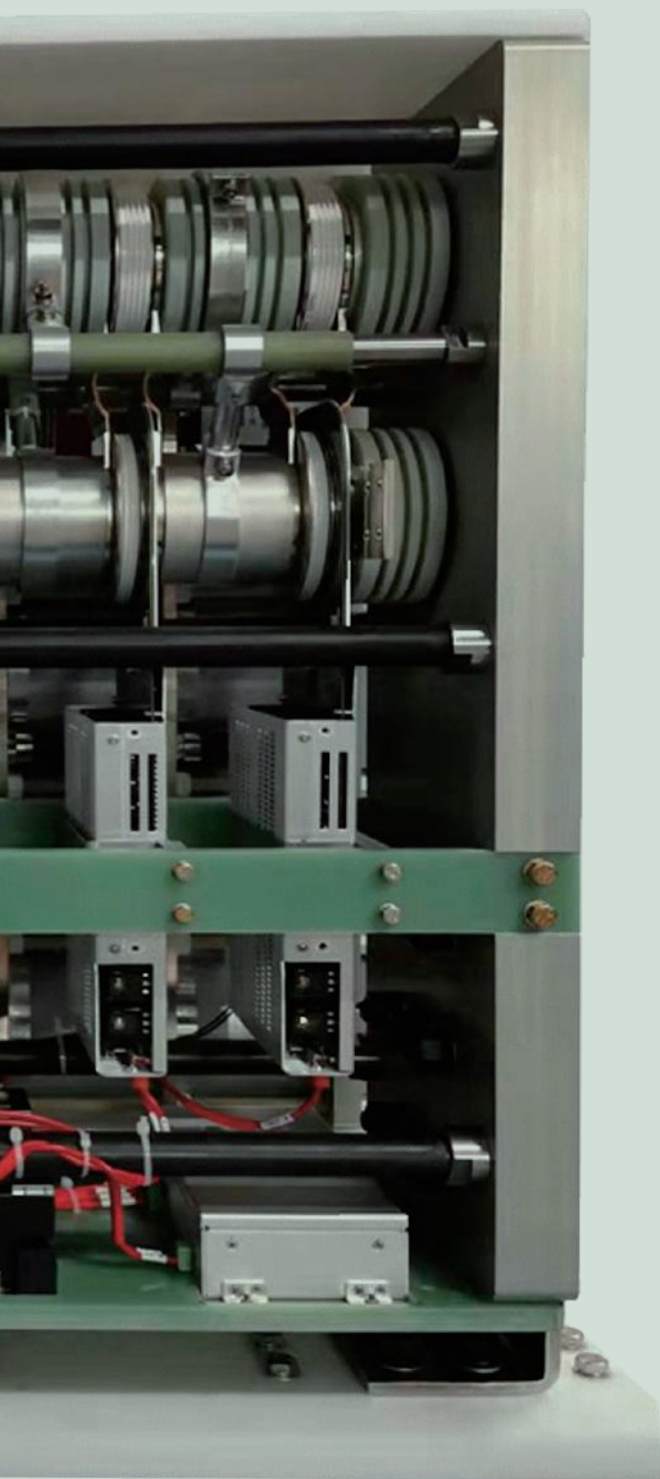
集成门极换流晶闸管 IGCT

符号 Symbols	参数名称	Characteristics
F	紧固力	Mounting Force
I_{DRM}	断态重复峰值电流	Repetitive Peak Off-state Current
$I_{\text{T(AV)}}$	GCT 通态平均电流	Average On-state Current
I_{TGQM}	可关断通态峰值电流	Maximum Controllable Peak On-state Current
I_{TM}	GCT 通态峰值电流	Peak On-state Current
I_{TSM}	GCT 通态不重复浪涌电流	Surge (Non-repetitive) On-state Current
r_{T}	GCT 斜率电阻	Slope Resistance for GCT
T_{C}	壳温	Case Temperature
T_{VJM}	最高（等效）结温	Max.Junction Operating Temperature
V_{DRM}	断态重复峰值电压	Repetitive Peak Off-state Voltage
V_{RRM}	反向重复峰值电压	Repetitive Peak Reverse Voltage
V_{TM}	通态峰值电压	Peak On-state Voltage at I_{TM}
V_{TO}	GCT 门槛电压	Threshold Voltage for GCT
CS	命令信号	Command Signal
SF	反馈信号	Transmitter for Status Feedback

第六章 CHAPTER SIX

功率组件

POWER ASSEMBLIES



株洲中车时代半导体有限公司
ZHUZHOU CRRC TIMES SEMICONDUCTOR CO.,LTD.

POWER ASSEMBLIES

功率组件



第六章 CHAPTER SIX

双极功率组件

BIPOLAR POWER ASSEMBLIES

功率组件

POWER ASSEMBLIES

产品介绍

PRODUCT INTRODUCTION

功率组件是集成了散热装置和用户使用端口 (控制和电源连接) 的功率半导体，我们拥有丰富的双极型半导体功率组件产品系列，同时也可以为客户量身定制可靠的功率组件，并为此提供优质的技术服务。

为提高组件产品性能和竞争力，中车时代半导体公司已开发出多款具备可靠性能和优良组装性的平台式组件。在此基础上，我们可以在很短的时间内，开发扩展出各种不同的组件形式，达到最佳的使用效果。系列化的组件比按照客户特殊要求生产的组件更有优势，它能很快的提供给用户并保证备件供应。因此，建议您尽可能采用现成的平台式组件。

Power assemblies are power semiconductors that integrate heat sink and user ports (control and power connections). We have a wide range of bipolar semiconductor power assemblies. Also, we provide reliable customized assemblies and high-quality technical service.

To improve assemblies performance and competitiveness, CRRC Times Semiconductor Co., LTD. has developed a number of platform assemblies with reliable performance and good assembly. On this basis, we can develop and expand different component forms in a very short period of time to achieve the best use effect. Serialized assemblies have advantages over assemblies produced according to customer-specific requirements, enabling short delivery time and an efficient spare part service at the same time. For this reason, we recommend that you use ready-made platform-based assemblies whenever possible.

产品特点

CHARACTERISTIC

- | | |
|------------|--|
| 集成压装、散热、驱动 | Integrated Press-fitting, Cooling, Gate driver |
| 高可靠性 | High Reliability |
| 国标通用 | National Standard |
| 定制研发 | Customized Development |

风冷双极功率组件

AIR-COOLING POWER ASSEMBLIES

国标风冷组件 GB AIR-COOLING ASSEMBLIES

型号 Type	散热器型号 Heatsink Type	元件数量 The Number of Devices	适应最大元件 Applicable Devices	冷却方式 Cooling Method	风速 Air Speed	热阻 Rsa Thermal Resistance	重量 (单个散热器) Weight (Heatsink)	散热器材质 Heatsink Material	外形图 Outline
					m/s				
tPower-SA. KP(ZP)****F	SF12 (国标)	1	KP ₈ 、ZP ₈	风冷 Air-cooling	6	≤ 0.090	2.6	铝型材 Aluminium Heatsink	Fig.1
	SF13 (国标)	1	KP ₉ 、ZP ₉	风冷 Air-cooling	6	≤ 0.071	3.5	铝型材 Aluminium Heatsink	Fig.2
	SF14 (国标)	1	KP ₉ 、ZP ₉	风冷 Air-cooling	6	≤ 0.056	4.9	铝型材 Aluminium Heatsink	Fig.3
	SF15 (国标)	1	KP ₉ 、ZP ₉	风冷 Air-cooling	6	≤ 0.048	6	铝型材 Aluminium Heatsink	Fig.4
	SF16 (国标)	1	KP _X 、ZP _X	风冷 Air-cooling	6	≤ 0.037	9.5	铝型材 Aluminium Heatsink	Fig.5
	SF17 (国标)	1	KP _B 、ZP _B	风冷 Air-cooling	6	≤ 0.030	13.5	铝型材 Aluminium Heatsink	Fig.6

产品图示

PRODUCT DIAGRAM



FIG.1

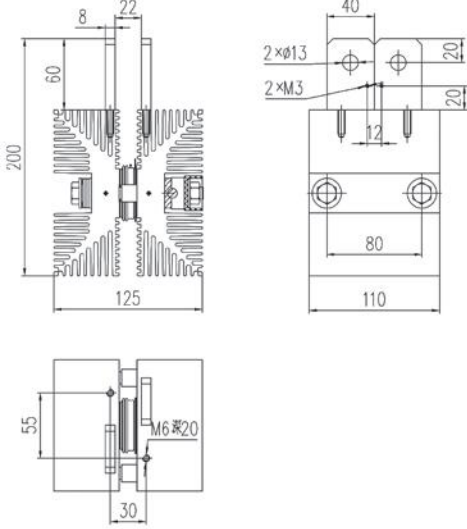
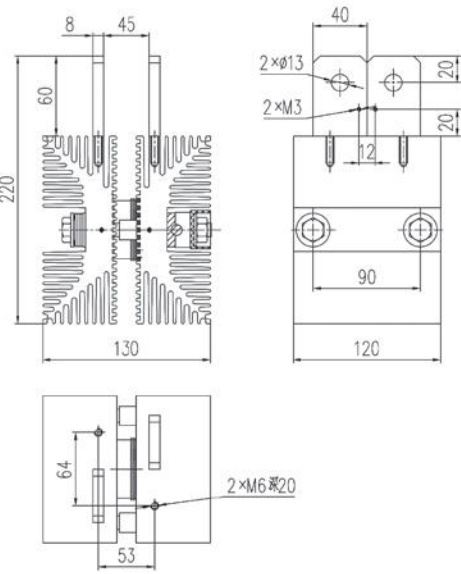


FIG.2



注：未标注数量单位的统一为毫米 (mm)
Remarks: All dimensions shown in mm unless stated otherwise

产品图示
PRODUCT
DIAGRAM

国标风冷组件 GB AIR-COOLING ASSEMBLIES

FIG.3

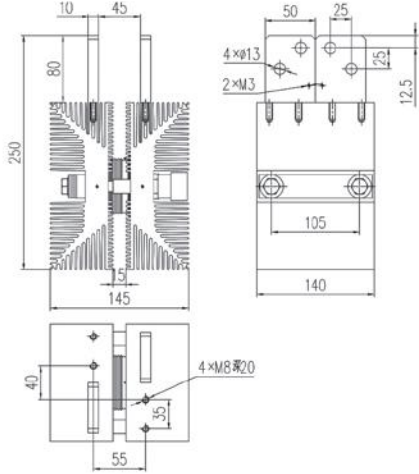


FIG.4

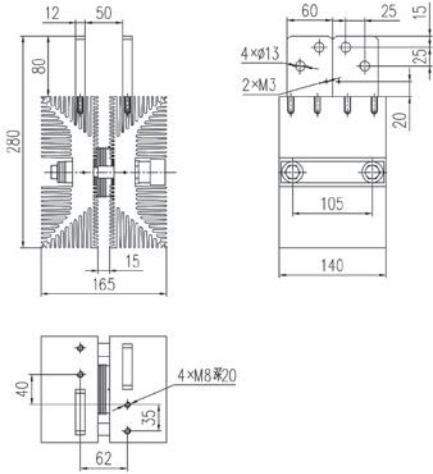


FIG.5

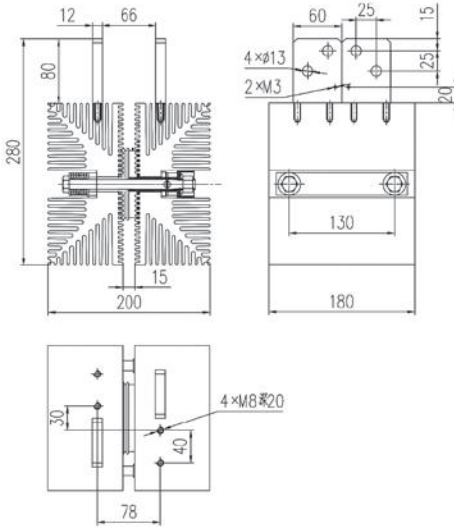
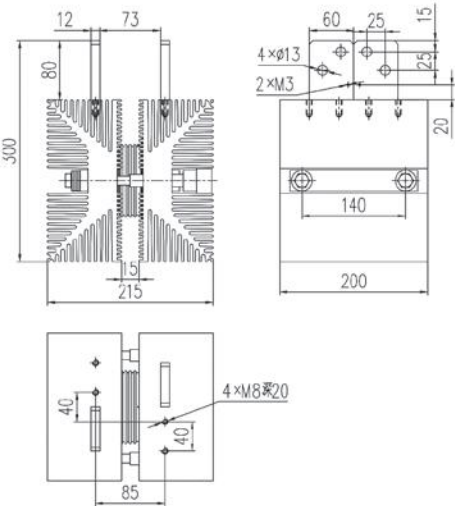


FIG.6



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

常用型材风冷组件 EXTRUDED ALUMINUM AIR-COOLING ASSEMBLIES

型号 Type	散热器型号 Heatsink Type	元件数量 The Number of Devices	适应最大元件 Applicable Devices	冷却方式 Cooling Method	风速 Air Speed	热阻曲线 Rsa Thermal Resistance Curve	散热器重量 Weight (Heatsink)	散热器材质 Heatsink Material	外形图 Outline
					m/s	K/W	kG/M		
tPower-SA. KP(ZP)*****F	ZB16	≤ 3	KP ₇ 、ZP ₇	风冷 Air-cooling	6	-	5.13	铝型材 Aluminium Heatsink	Fig.6
	ZB17	≤ 3	KP ₈ 、ZP ₈	风冷 Air-cooling	6	-	5.13	铝型材 Aluminium Heatsink	Fig.7
	ZB18	≤ 3	KP ₉ 、ZP ₉	风冷 Air-cooling	6	Fig.1	6.62	铝型材 Aluminium Heatsink	Fig.8
	XF12	≤ 3	KP ₉ 、ZP ₉	风冷 Air-cooling	6	Fig.2	8.4	铝型材 Aluminium Heatsink	Fig.9
	XF15	≤ 3	KP _x 、ZP _x	风冷 Air-cooling	6	Fig.3	23.8	铝型材 Aluminium Heatsink	Fig.10
	DXC615	≤ 3	KP _c 、ZP _c	风冷 Air-cooling	6	Fig.4	28.7	铝型材 Aluminium Heatsink	Fig.11
	XSF19	≤ 3	KP _D 、ZP _D	风冷 Air-cooling	6	Fig.5	37	铝型材 Aluminium Heatsink	Fig.12

热阻曲线
RSA THERMAL
RESISTANCE
CURVE

FIG.1

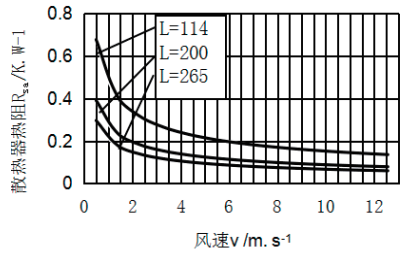


FIG.2

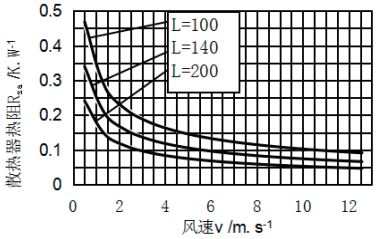


FIG.3

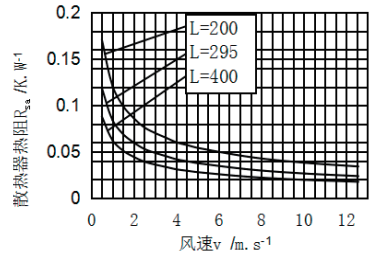


FIG.4

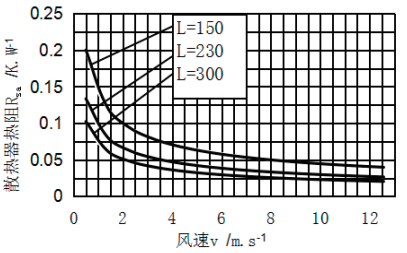
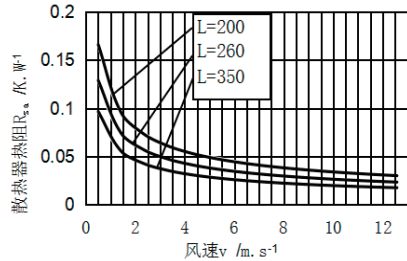


FIG.5



产品图示
PRODUCT
DIAGRAM

常用型材风冷组件 EXTRUDED ALUMINUM AIR-COOLING ASSEMBLIES

FIG.6

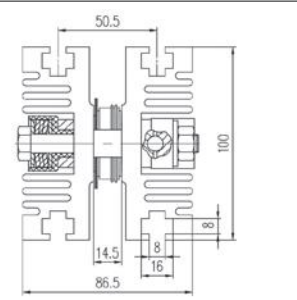


FIG.7

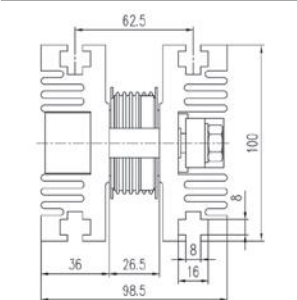


FIG.8

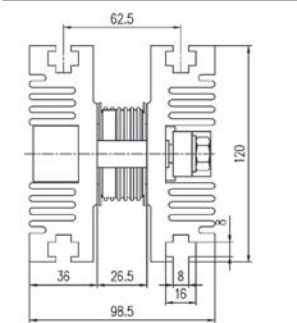


FIG.9

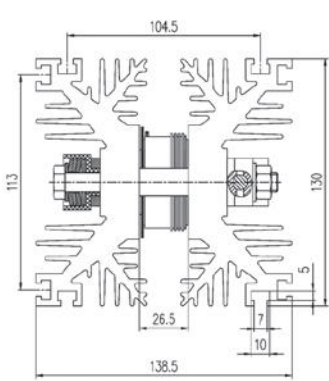


FIG.10

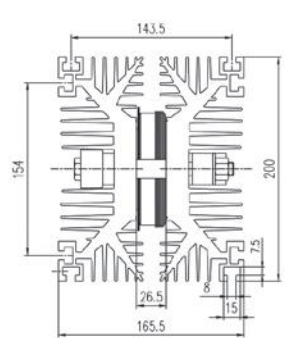


FIG.11

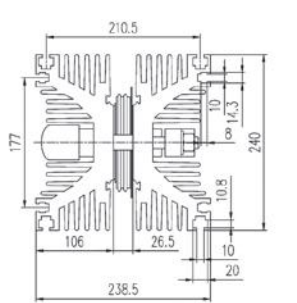
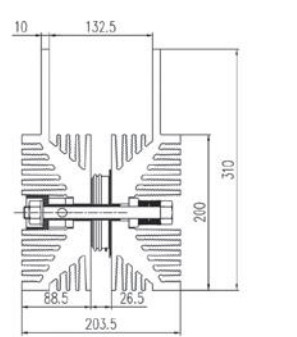


FIG.12



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

特殊风冷组件 SPECIAL AIR-COOLING ASSEMBLIES

型号 Type	散热器型号 Heatsink Type	元件数量 The Number of Devices	适应最大元件 Applicable Devices	冷却方式 Cooling Method	风速 Air Speed	热阻 Rsa Thermal Resistance	重量（单个散热器） Weight (Heatsink)	散热器材质 Heatsink Material	外形图 Outline
					m/s	K/W	kG		
tPower-SA. KP(ZP)*****F	LSP6	1	KP ₇ 、ZP ₇	自冷 Nature-cooling	-	≤ 0.8	2.2	铝型材 Aluminium Heatsink	Fig.1
	LSF8	1	KP ₈ 、ZP ₈	风冷 Air-cooling	6	≤ 0.09	4.5	铝型材 Aluminium Heatsink	Fig.2
	LSFA	1	KP _A 、ZP _A	风冷 Air-cooling	6	≤ 0.045	8.5	铝型材 Aluminium Heatsink	Fig.3
	TSFA-1	1	KP _A 、ZP _A	风冷 Air-cooling	6	≤ 0.05	12	铜 Copper	Fig.4
	TSFA-3	1	KP _A 、ZP _A	风冷 Air-cooling	6	≤ 0.044	13	铜 Copper	Fig.5
	ZS331	1	KP _X 、ZP _X	风冷 Air-cooling	6	≤ 0.026	18	铜 Copper	Fig.6

产品图示
PRODUCT
DIAGRAM



FIG.1

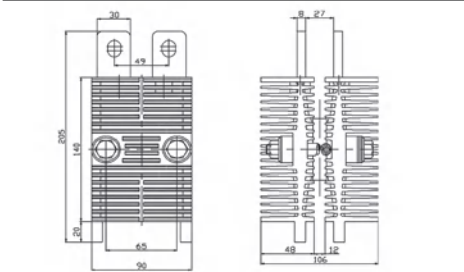


FIG.2

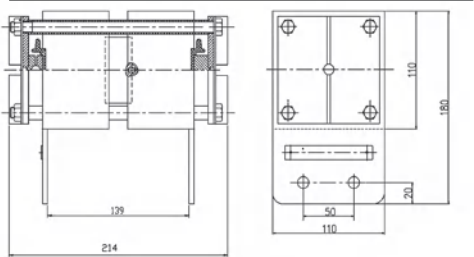


FIG.3

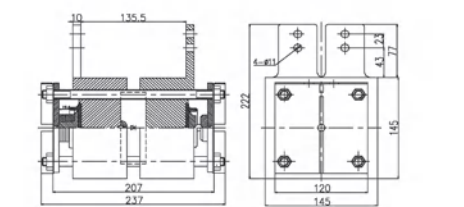


FIG.4

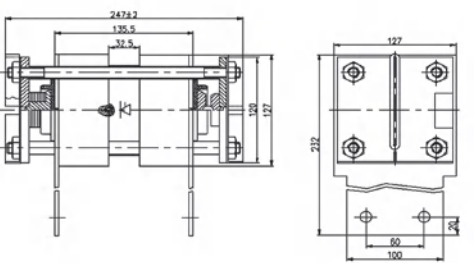


FIG.5

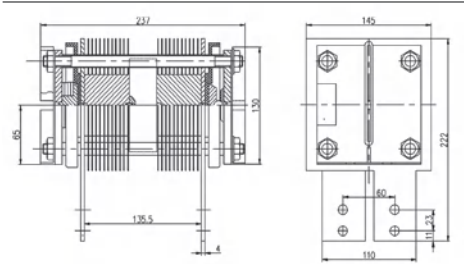
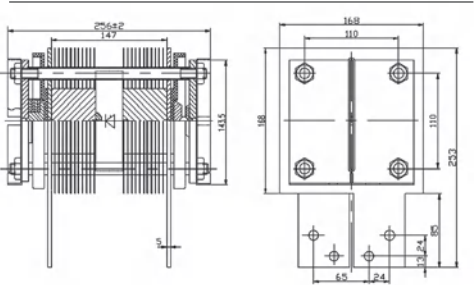


FIG.6



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

液冷双极功率组件

LIQUID-COOLING POWER ASSEMBLIES

型号 Type	散热器型号 Heatsink Type	元件数量 The Number of Devices	适应最大元件 Applicable Devices	冷却方式 Cooling Method	流量 Flow L/min	热阻 RsaThermal Resistance K/W	重量 Weight kG	外形图 Outline
tPower-SA. KP(ZP)*****S	SS12	1	KP8、ZP8	液冷 Liquid-cooling	4	≤ 0.018	1.1	Fig.1
	SS13	1	KP9、ZP9	液冷 Liquid-cooling	4	≤ 0.015	1.6	Fig.2
	SS14	1	KPX、ZPX	液冷 Liquid-cooling	4	≤ 0.013	2.2	
	SS15	1	KPB、ZPB	液冷 Liquid-cooling	4	≤ 0.010	4.4	Fig.3
	SS16	1	KPC、ZPC	液冷 Liquid-cooling	4	≤ 0.008	5	
	SS12 串联	2	KP8、ZP8	液冷 Liquid-cooling	4	≤ 0.018	1.9	Fig.4
	SS13 串联	2	KP9、ZP9	液冷 Liquid-cooling	4	≤ 0.015	2.9	Fig.5
	SS14 串联	2	KPX、ZPX	液冷 Liquid-cooling	4	≤ 0.013	4.1	
	SS15 串联	2	KPB、ZPB	液冷 Liquid-cooling	4	≤ 0.010	8	Fig.6

型号 Type	尺寸 Dimension																	
	H	H2	H3	H4	H5	H6	H7	D	D1	D2	D3	L	L1	L2	d1	d2	d3	d4
tPower-SA. KP(ZP)*****S	152	110	65	5	145	24.5	-	160	140	40	-	190	20	-	φ13	M3	φ13	φ11X14
	157	108	64	6	150	25	-	160	140	50	20	190	15	20	φ13	M4	φ13	φ11X14
	198	125	64	6	170	25	-	195	161	54	20	220	20	20	φ13	M4	φ13	φ11 开口
	230	158	80	8	220	35	-	260	220	80	40	263	20	40	φ13	M4	φ16	φ11 开口
	230	158	80	8	220	35	-	260	220	80	40	290	20	40	φ13	M4	φ16	φ11 开口
	240	180	65	5	230	24.5	44	160	140	40	-	190	20	-	φ13	M3	φ13	φ11X14
	240	178	64	6	230	25	44	160	140	50	20	190	15	20	φ13	M4	φ13	φ11X14
	250	188	64	6	240	25	44	195	161	54	20	220	20	20	φ13	M4	φ13	φ11 开口
	320	248	80	8	310	35	62	260	220	80	40	263	20	40	φ13	M4	φ16	φ11 开口

产品图示
PRODUCT
DIAGRAM



液冷双极功率组件 LIQUID-COOLING POWER ASSEMBLIES

FIG.1

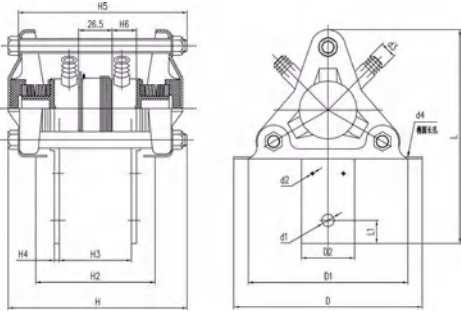


FIG.2

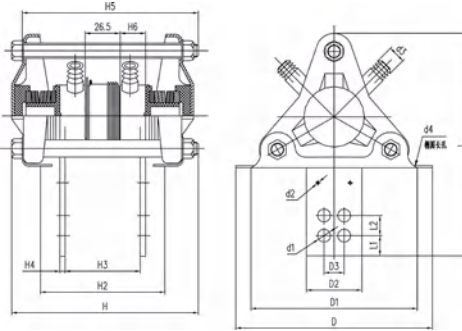


FIG.3

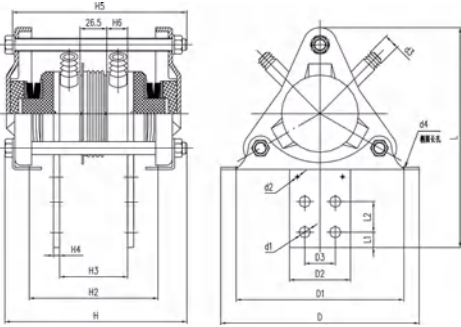


FIG.4

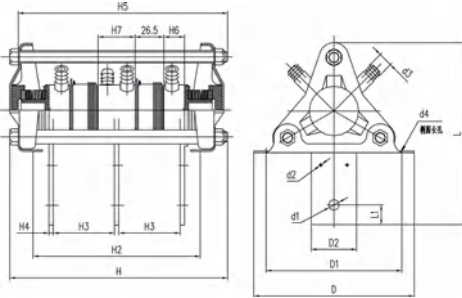


FIG.5

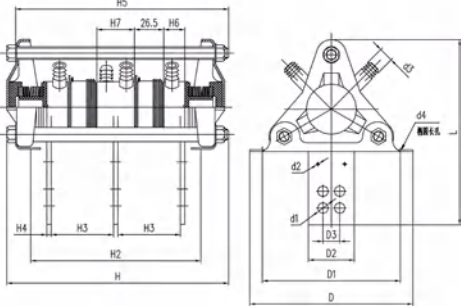
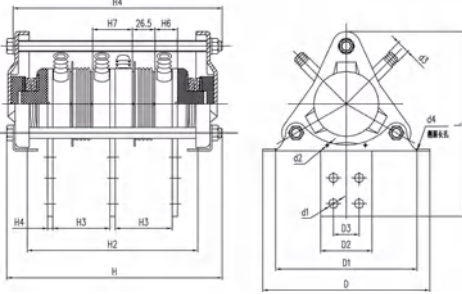


FIG.6



注：未标注数量单位的统一为毫米（mm）
Remarks:All dimensions shown in mm unless stated otherwise

液冷双极功率组件 LIQUID-COOLING POWER ASSEMBLIES

型号 Type	散热器型号 Heatsink Type	元件数量 The Number of Devices	适应最大元件 Applicable Devices	冷却方式 Cooling Method	流量 Flow	热阻 RsaThermal Resistance	外形图 Outline
					L/min	K/W	
tPower-SA. KP(ZP)*****S	SS16-1245G4C	4	KP _C 、ZP _C	液冷 Liquid-cooling	4	≤ 0.016	Fig.1
	SS15-886G6X	6	KP _X 、ZP _X	液冷 Liquid-cooling	4	≤ 0.020	Fig.2

产品图示
PRODUCT
DIAGRAM

FIG.1

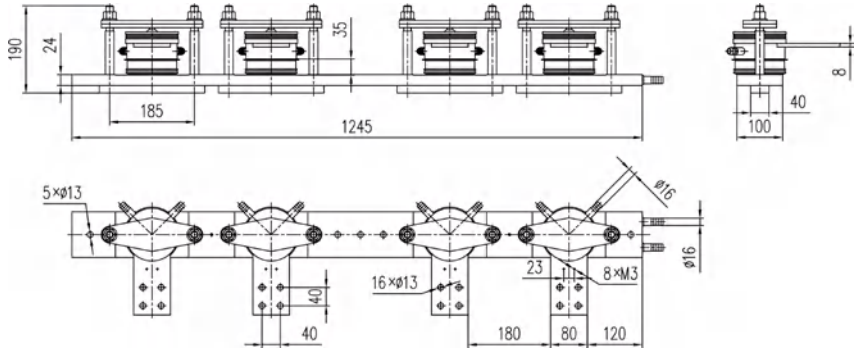
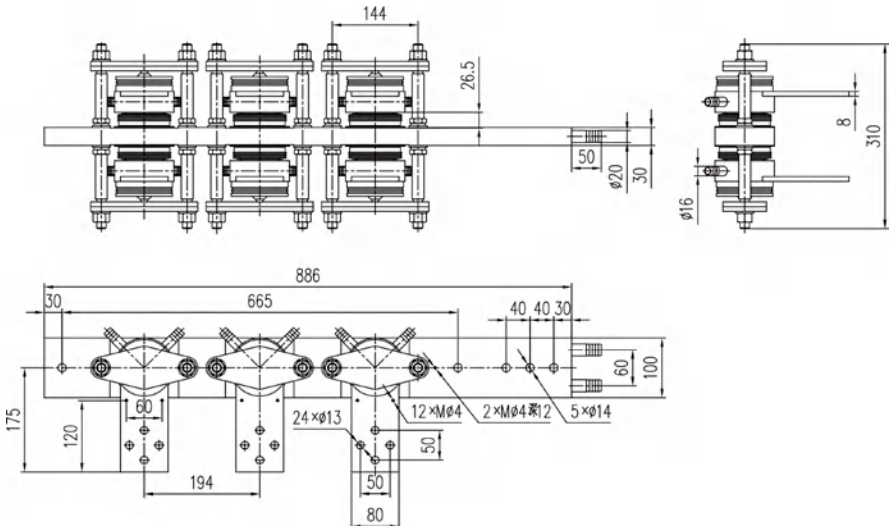


FIG.2



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

定制式双极功率组件

CUSTOMIZED POWER ASSEMBLIES

型号 Type	散热器型号 Heatsink Type	元件数量 The Number of Devices	适用元件 Applicable Devices	冷却方式 Cooling Method	输出电流 I _{rms}	V _{DRM} /V _{RRM}	触发接口 Trigger Interface	频率 Frequency	示意图 Sketch
					A	kV		Hz	
tPower-SA. KP(ZP)*****F	定制 Commission	≤ 6	相控晶闸管及整流管 PCT&Rectifier Diodes	风冷 Air-cooling	≤ 3000	≤ 25	-	≤ 100	Fig.1
tPower-SA. KK(KP)*****S	定制 Commission	≤ 8	相控晶闸管及整流管 PCT&Rectifier Diodes	液冷 Liquid-cooling	-	≤ 35	光纤 Optical fiber	≤ 100	Fig.2
tPower-SA. KP*****N	定制 Commission	≤ 12	相控晶闸管及整流管 PCT&Rectifier Diodes	自冷 Self-cooling	-	≤ 50	光纤 Optical fiber	≤ 100	Fig.3
	定制 Commission	≤ 14	相控晶闸管及整流管 PCT&Rectifier Diodes	自冷 Self-cooling	-	≤ 50	光纤 Optical fiber	≤ 100	Fig.4

产品图示
PRODUCT
DIAGRAM

FIG.1



FIG.2



FIG.3

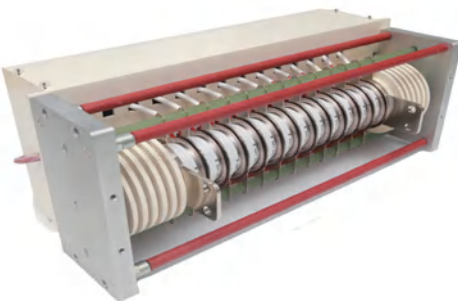


FIG.4



IGCT 功率组件

IGCT POWER ASSEMBLIES

型号 Type	散热器型号 Heatsink Type	拓扑结构 Topological Structure	冷却方式 Cooling Method	功率等级 Power	输出电流 I	V _{dc}	触发接口 Trigger Interface	频率 Frequency	示意图 Sketch
				MVA	A			Hz	
tPower-SA.C***ML**S	定制 Commission	3L-NPC	液冷 Liquid-cooling	≤ 14	≤ 2500	≤ 7	光纤 Optical fiber	≤ 1000	Fig.1
tPower-SA.C***B**S	定制 Commission	半桥 Half bridge	液冷 Liquid-cooling	≤ 5	≤ 1500	≤ 3.6	光纤 Optical fiber	≤ 1000	Fig.2
tPower-SA.C***H**F	定制 Commission	H 桥 H bridge	定制 Commission	—	≤ 5000	≤ 10	光纤 Optical fiber	—	Fig.3
tPower-SA.C***H**F	定制	断路器	定制	—	≤ 3000	≤ 10	光纤 Optical fiber	—	Fig.4

产品图示
PRODUCT
DIAGRAM

FIG.1



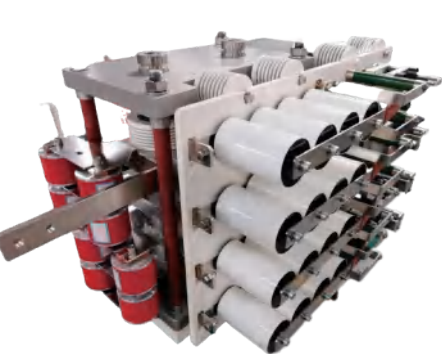
FIG.2



FIG.3



FIG.4



双极模块

BIPOLAR MODULES

软启动模块

SOFT STARTER MODULES

型号 Type	$I_{\text{overload}}(21\text{s})$	$V_{\text{DRM}}/V_{\text{RRM}}$	$I_{\text{TSM}} @ T_{\text{vj}}=125^{\circ}\text{C}, 10\text{ms}$	$I^2t @ T_{\text{vjmax}}$	$V_{\text{TO}} @ T_{\text{vj}} = 125^{\circ}\text{C}$	$r_{\text{T}} @ T_{\text{vj}} = 125^{\circ}\text{C}$	T_{vjmax}	重量 Weight	外形图 Outline
	A	V	kA	A ² s	V	mΩ	°C	kG	
tPower-SA.KP30X18FJ	3060	1800	25	313×10^4	0.88	0.2	150	3.4	Fig.3
tPower-SA.KP15X18FJ1	1560	1800	14	98×10^4	0.85	0.38	150	1.85	Fig.2
tPower-SA.KP15X18FJ	1500	1800	14	98×10^4	0.85	0.37	150	1.4	Fig.1
tPower-SA.KP12X18FJ	1200	1800	10	50×10^4	0.9	0.46	150	1.4	Fig.1
tPower-SA.KP30X14FJ	3120	1400	26	338×10^4	0.86	0.16	150	3.4	Fig.3
tPower-SA.KP15X14FJ1	1680	1400	15	113×10^4	0.85	0.33	150	1.85	Fig.2
tPower-SA.KP15X14FJ	1500	1400	15	113×10^4	0.85	0.33	150	1.4	Fig.1
tPower-SA.KP12X14FJ	1200	1400	12.8	81.9×10^4	0.87	0.382	150	1.4	Fig.1

产品图示
PRODUCT
DIAGRAM

FIG.1

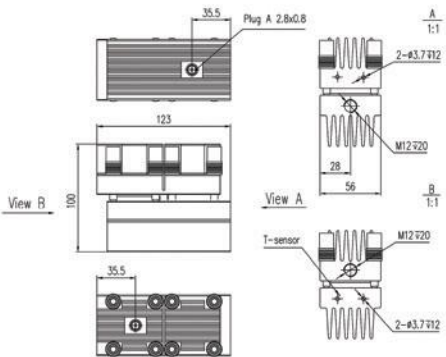


FIG.2

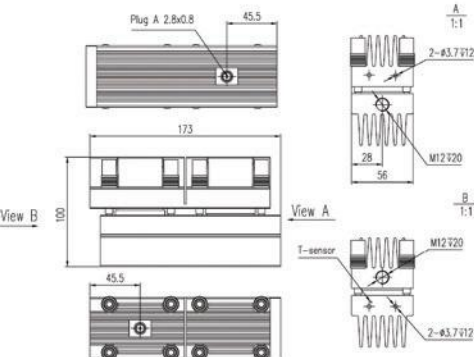
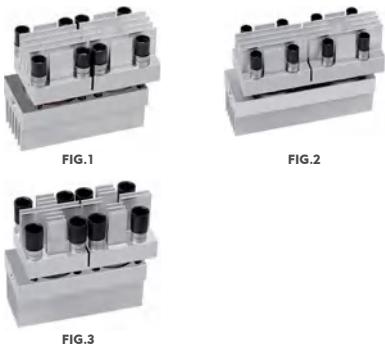
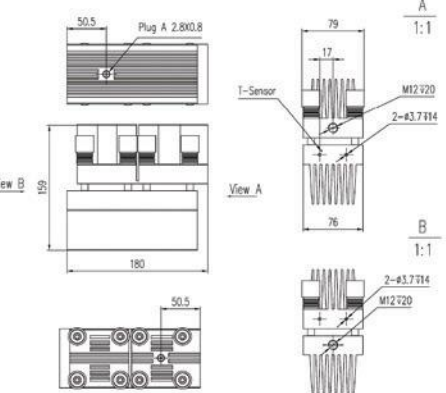


FIG.3



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

压接型晶闸管模块

PRESS-CONNECT THYRISTOR MODULES

产品图示
PRODUCT
DIAGRAM

型号 Type	$V_{\text{DRM}}/V_{\text{RRM}}$	I_{TAV}	I_{TSM} @ $T_{\text{vjM}} & 10\text{ms}$	V_{To} @ T_{vjM}	r_{T} @ T_{vjM}	T_{vj} Max	R_{thJC} Per Chip	R_{thCH} Per Chip	外形图 Outline
	V	A	kA	V	mΩ	℃	K/W	K/W	
TMTO 185-xx	5800-6500	185	2.3	1.45	2.9	125	0.078	0.02	Fig.1
TMTO 400-xx	4500-5600	398	16	1.2	1.05	125	0.045	0.01	Fig.3
TMTC 275-xx	3600-4200	277	6.8	1.15	1.47	125	0.068	0.02	Fig.2
TMTO 260-xx	3600-4200	274	6.5	1.15	1.47	125	0.068	0.02	Fig.1
TMTO 320-xx	3000-3600	325	7	1.03	0.97	125	0.068	0.02	Fig.1
TMTC 220-xx	2400-3600	222	7.5	0.98	1.2	125	0.11	0.02	Fig.4
TMTO 800-xx	1200-1800	800	32	0.91	0.158	125	0.042	0.01	Fig.3
TMTO 600-xx	1200-1800	600	20	0.88	0.27	130	0.065	0.02	Fig.1
TMTC 570-xx	1200-1800	570	4.5	0.93	1.15	130	0.2	0.06	Fig.2
TMTC 330-xx	1200-1800	330	10.5	0.87	0.45	130	0.11	0.02	Fig.4
TMTC 160-xx	1200-1800	160	20	0.85	0.27	130	0.065	0.02	Fig.6
TMTC 1000-xx	800-1400	1000	29	0.86	0.13	130	0.05	0.016	Fig.5

产品图示
PRODUCT
DIAGRAM



FIG.1

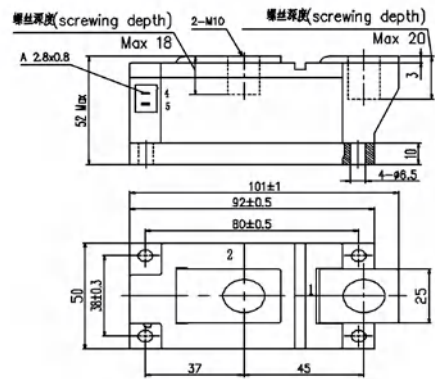


FIG.3

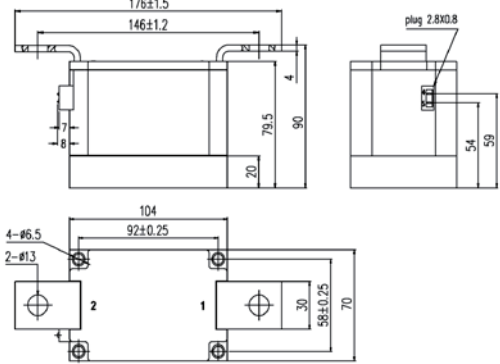


FIG.2

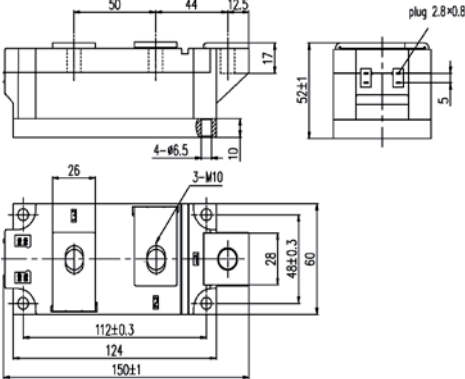


FIG.4

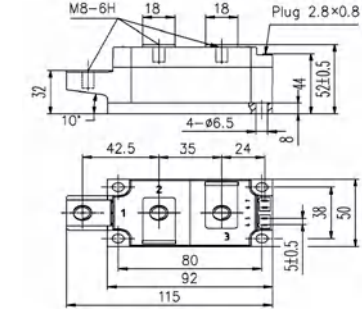


FIG.5

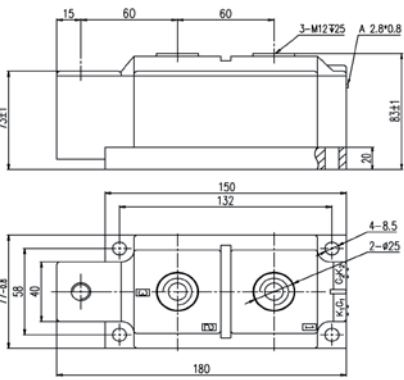
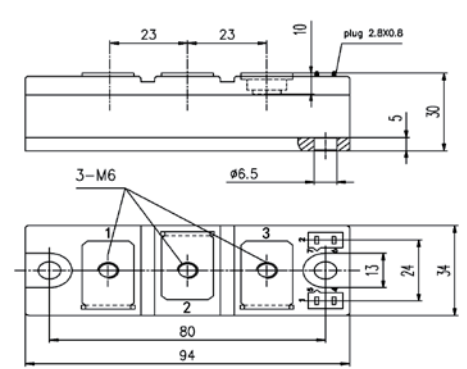


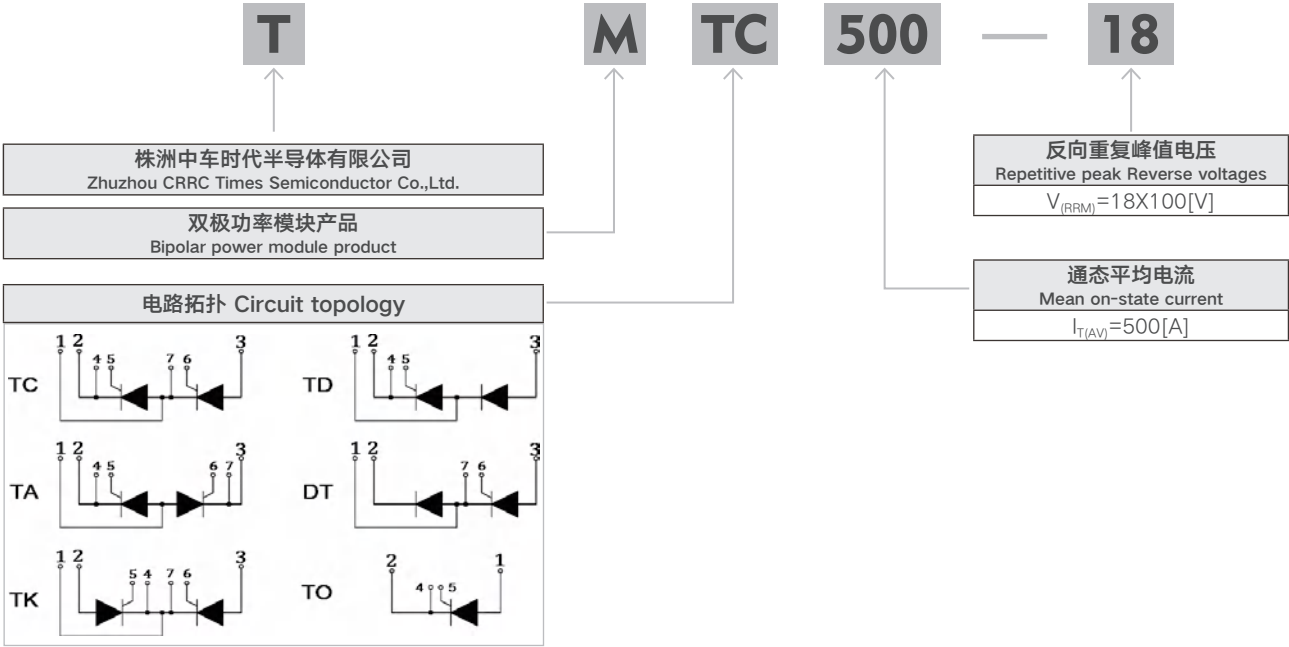
FIG.6



注：未标注数量单位的统一为毫米（mm）
Remarks: All dimensions shown in mm unless stated otherwise

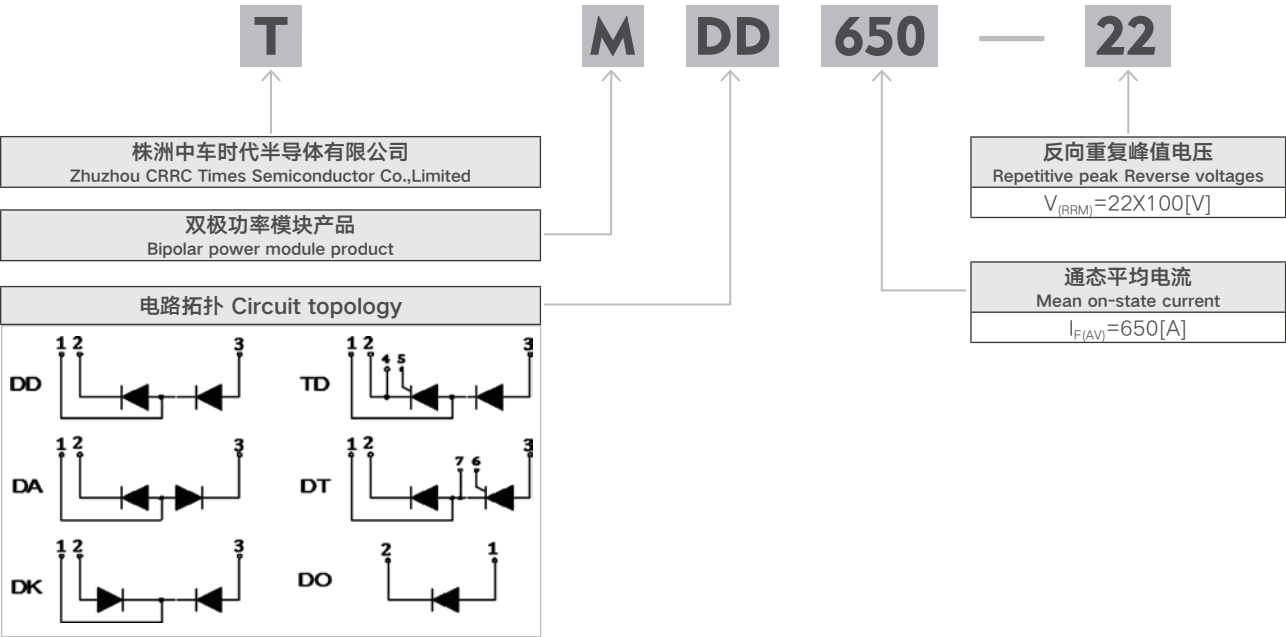
型号说明
NOMENCLATURE

晶闸管模块 THYRISTOR MODULE'S TYPES



型号说明
NOMENCLATURE

二极管模块 DIODE MODULE'S TYPES



符号说明
SYMBOLS

双极功率模块 BIPOLAR POWER MODULE

符号 Symbols	参数名称	Characteristics
I_{TAV}	通态平均电流	Mean on-state current
I_{TSM}	通态浪涌电流	Surge on-state current
V_{TO}	通态门槛电压	On-state threshold voltage
r_T	通态斜率电阻	On-state slope resistance
T_{vjmax}	最高结温	Max.junction temperature
R_{thJC}	结壳热阻	Thermal resistance,junction to case
R_{thCH}	接触热阻	Thermal resistance,case to heatsink
I_{FAV}	正向平均电流	Mean forward current
I_{FSM}	正向浪涌电流	Surge forward current
V_{FO}	正向门槛电压	Forward threshold voltage
r_F	正向斜率电阻	Forward slope resistance
V_{RRM}	反向重复峰值电压	Repetitive peak off revese voltage
V_{DRM}	断态重复峰值电压	Repetitive peak off-state voltage

质量体系与保障

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ISO9001
证书



TS22163
证书



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QC080000
证书



IATF16949
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