



微型热电制冷器件

Micro Thermoelectric Modules

广东富信科技股份有限公司
Guangdong Fuxin Technology Co., Ltd

广东富信热电器件科技有限公司
Guangdong Fuxin Thermoelectric Module Technology Co., Ltd

广东富信科技股份有限公司创建于2003年，是一家专注于半导体热电技术及应用产品研发、制造和销售的国家级高新技术企业，具备覆铜陶瓷基板、热电材料、热电器件、热电系统、热电整机应用产品全产业链技术解决方案，并于2021年4月在科创板上市。

公司目前建筑面积6万多平方米，具备陶瓷基板、热电材料、热电器件、热电系统、热电整机产品的全产业链生产能力，并拥有热电材料制备等多项自主核心技术、全自动化制造工艺以及SAP ERP、MES、PLM、SRM、WMS、QMS等IT化管理系统，质量体系通过GB/T 19001-2016/ISO 9001:2015质量管理体系、IATF16949汽车行业质量管理体系、GB/T 24001-2016/ISO 14001:2015环境管理体系、GB/T 45001-2020/ISO 45001:2018职业健康安全管理体系、IECQ QC080000:2017有害物质过程管理体系认证。

2021年公司注资9600万人民币成立控股子公司——广东富信热电器件科技有限公司，聚焦光通讯、汽车等领域微型热电制冷器件（Micro TEC）的研发、制造和销售，以不断的研发创新和持续的质量改善，致力于为客户提供“更优设计、更高可靠、更低功耗、更低成本”的产品及专业化的技术支持和服务，为客户持续创造价值。



Guangdong Fuxin Technology Co., Ltd. was founded in 2003 and is a national high-tech enterprise specializing in the research and development, manufacturing, and sales of semiconductor thermoelectric technology and application products. It has a full industry chain technology solution for copper clad ceramic substrates, thermoelectric materials, thermoelectric devices, thermoelectric systems, and thermoelectric application products. It was listed on the Science and Technology Innovation Board in April 2021.

The company currently has a construction area of over 60,000 square meters, with full production capabilities covering the entire industrial chain for ceramic substrates, thermoelectric materials, thermoelectric components, thermoelectric systems, and thermoelectric complete equipment products. It possesses multiple independent core technologies such as thermoelectric material preparation, fully automated manufacturing processes, and IT-based management systems including SAP ERP, MES, PLM, SRM, WMS, and QMS. The quality system has obtained certifications for the GB/T 19001-2016/ISO 9001:2015 Quality Management System, IATF 16949 Automotive Quality Management System, GB/T 24001-2016/ISO 14001:2015 Environmental Management System, GB/T 45001-2020/ISO 45001:2018 Occupational Health and Safety Management System, and IECQ QC080000:2017 Hazardous Substance Process Management System.

In 2021, the company injected 96 million yuan to establish a holding subsidiary, Guangdong Fuxin Thermoelectric Module Technology Co., Ltd., which focuses on the research, development, manufacturing, and sales of micro thermoelectric modules (Micro TEC) in optical communications, automobiles and other fields. With continuous R&D innovation and ongoing quality improvement, the company is committed to providing customers with products featuring "better design, higher reliability, lower power consumption, and lower cost" as well as professional technical support, services, and continuously creating value for customers.

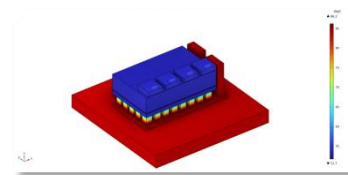


■ 技术研发能力 Technical R&D Capacity

➢ TEC仿真设计能力 Micro TEC Simulation Design Capability

公司拥有行业先进的仿真软件和专业化的设计团队，能够根据客户的具体使用场景对TEC进行模块化精准设计，从而为客户提供最佳的技术解决方案。

Fuxin has the industry's advanced simulation software and specialized design team, which can modularize and accurately design the TEC according to the customer's specific use scenarios, thus providing customers with the best technical solutions.

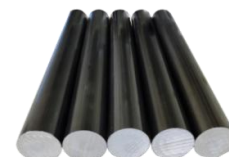


Micro TEC仿真设计示例图
Micro TEC simulation design example diagram

➢ 全流程自主工艺能力 Full-process Autonomous Process Capability

公司具有碲化铋热电材料制备自主核心技术以及Micro TEC全制造流程自主工艺能力，全制程无任何外包委外工序，从而有效保障了供应链的安全及产品质量的可控性。

Fuxin has mastered the independent core technology of the full manufacturing process of Micro TEC, including the preparation technology of bismuth telluride thermoelectric materials. The core raw materials are self-made and there are no outsourced processes throughout the entire process, effectively ensuring the safety of the supply chain and the controllability of product quality.



碲化铋热电材料
Bismuth telluride material

➢ 研发及可靠性评价能力 R&D and Reliability Analysis Capabilities

公司拥有省级企业技术中心和省级工程技术研究中心，TEC行业资深技术专家以及X-Ray、SEM、EDS、CTA等研发装备，可以对TEC的失效模式进行精确定位及方案解决。此外公司设有完备的TEC可靠性实验室，可以按照GR-468-CORE和MIL-STD-883测试标准对热电器件进行高温储存、恒温恒湿、温度循环、温度冲击、启停循环、冷热循环、振动、机械冲击、剪切力等可靠性试验。

Fuxin has provincial enterprise technology center and provincial engineering technology research center, senior technical experts in TEC industry and R&D equipments such as X-Ray, SEM, EDS, CTA, etc., which can accurately locate the failure mode of TEC and solve the solution. In addition, Fuxin has a complete thermoelectric module reliability laboratory, which can carry out reliability tests on thermoelectric modules such as high and low temperature storage, constant temperature and humidity, temperature cycle, temperature shock, on-off cycle, cold and heat cycle, vibration, mechanical shock, shear force, etc. according to GR-468-CORE and MIL-STD-883 test standards.

■ 制造交付能力 Manufacturing Delivery Capability

公司有超过20年TEC制造经验，依托超大规模无尘车间与高精度全自动化产线，具备Micro TEC大批量规模化交付能力，可充分满足客户大规模订单供货需求。

Fuxin has over 20 years of TEC manufacturing experience, leveraging ultra-large-scale cleanrooms and high-precision fully automated production lines to achieve large-scale and standardized delivery capabilities for Micro TEC, fully meeting customers' bulk order supply demands.

■ 品质管控能力 Quality Control Capability



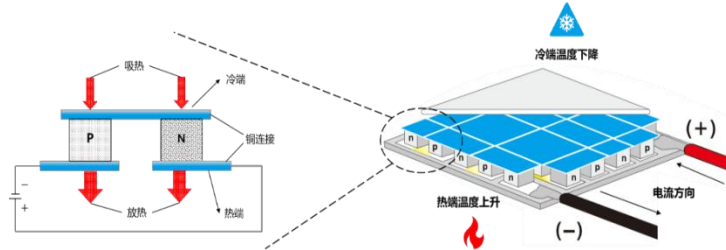
公司通过了IATF16949汽车行业质量管理体系认证，以及多家光通讯行业头部客户供应商体系认证。此外公司拥有SAP ERP、MES、PLM、QMS、WMS、SRM、OA等IT化管理系统，对产品开发管理、PCN变更管理、订单管理、生产计划管理、供应链管理、生产管控、质量管理、工艺管理、设备管理、仓储管理、交付管理、财务管理、成本管理等进行全面IT化管控，保证了产品质量的稳定可靠性、可追溯性以及产品交付的时效性。

Fuxin has passed the IATF16949 quality management system certification in the automotive industry and the supplier system certification of several leading customers in the Optical communication industry. In addition, the company has IT management systems such as SAP ERP, MES, PLM, QMS, WMS, SRM, OA, etc. It comprehensively controls product development management, PCN change management, order management, production plan management, supply chain management, production control, quality management, process management, equipment management, warehousing management, delivery management, financial management, cost management, etc., ensuring the stability and reliability of product quality and timeliness of product delivery.

热电制冷器件 (TEC) 是利用半导体材料的帕尔贴 (Peltier) 效应实现固态制冷或加热的一种功能器件, 广泛应用于通信、医疗实验、汽车、工业、消费电子、航天国防等领域。

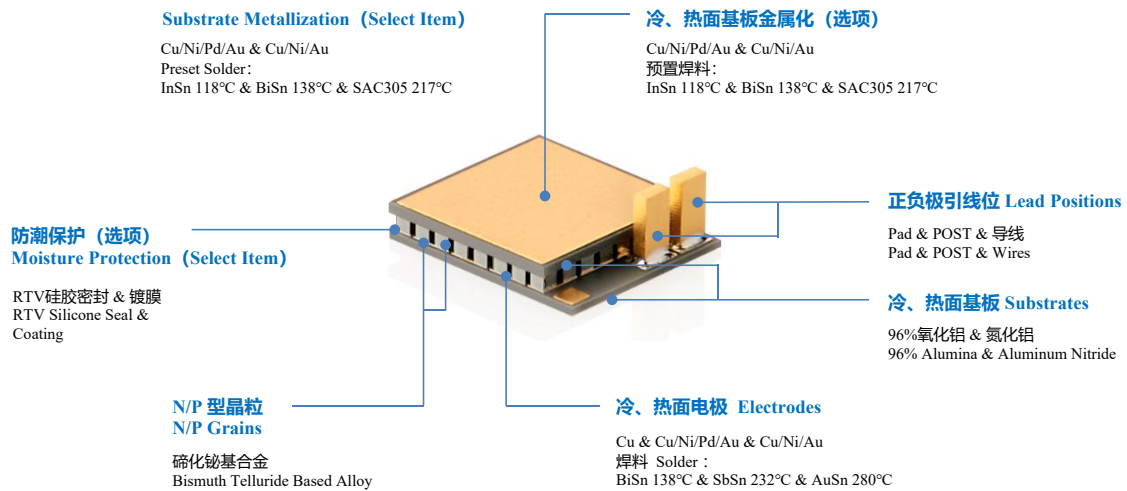
帕尔贴效应指直流电通过不同导电材料回路时, 结点处发生吸热或放热。如上图所示, p型与n型半导体晶粒通过铜片连接, 电流方向决定结点吸热成冷端或放热成热端, 热量转移量与电流强度成正比。多对电偶串联并固定于导热绝缘基板间构成热电制冷器件。通直流电后, TEC实现热量转移, 产生制冷或加热效果。

TEC具有体积小、重量轻、无振动、无噪音、可靠性高、绿色环保等特点, 特别是同时具有制冷和加热两种功能, 且通过调节输入电流, 就可以实现对温度的精确控制, 控温精度甚至可以达到 0.01°C , 因此非常适合光通讯等领域需要在狭小空间对物体进行精确温度控制的场合。



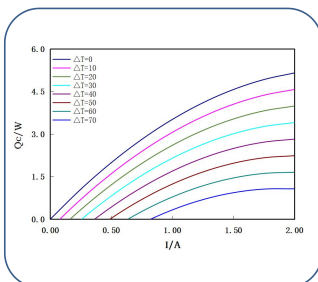
Thermoelectric modules (TEC) is a functional device that uses the Peltier effect of semiconductor materials to realize solid-state cooling or heating. It is widely used in communication, medical experiments, automotive, industry, consumer electronics, aerospace, national defense and other fields.

TEC has the characteristics of small size, light weight, no vibration, no noise, high reliability, green environmental protection, etc., especially it has two functions of cooling and heating at the same time. By adjusting the input current, it can achieve accurate control of temperature, and the temperature control accuracy can even reach 0.01°C . Therefore, it is very suitable for Optical communication and other fields that need accurate temperature control of objects in a narrow space.

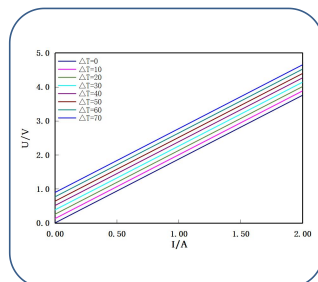


微型热电制冷器件 (Micro TEC) 结构示例图

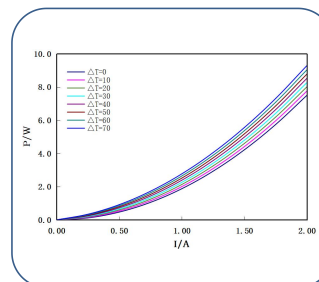
Example structure diagram of Micro TEC



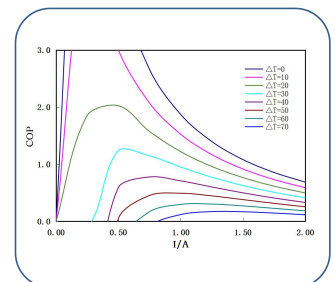
Qc-I: 表示在热面温度一定时, 不同温差下制冷功率与输入电流之间的关系。



U-I: 表示不同温差下, 输入电压与输入电流之间的对应关系。



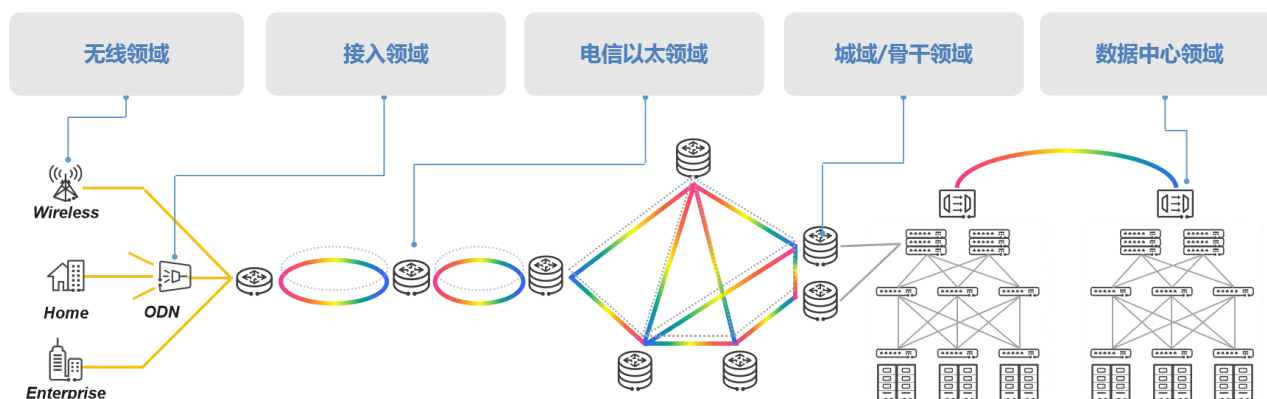
P-I: 表示在热面温度一定时, 不同温差下输入功率与输入电流之间的对应关系。



COP-I: 表示不同温差下, COP系数与输入电流之间的对应关系。

公司Micro TEC产品采用高性能热电材料及全自动化工艺制造，具有尺寸小巧，转化效率高，可靠性高等特点，产品性能已达到行业先进水平。典型应用于光通讯中的数据中心、骨干网、传输网、无线/接入网、Pump/Tunable激光器等，其中高速率光模块的Micro TEC产品已通过了通信领域头部企业的产品验证并实现批量供货。

The Micro TEC are manufactured using high-performance thermoelectric materials and fully automated processes. They feature compact size, high conversion efficiency, and high reliability, with product performance reaching the advanced level in the industry. It is typically applied in data centers, backbone network, transmission networks, wireless/access networks, and Pump/Tunable lasers within optical communications. Among these applications, the Micro TEC products for high-speed optical modules have passed product verification by leading enterprises in the communications field and have achieved mass supply.

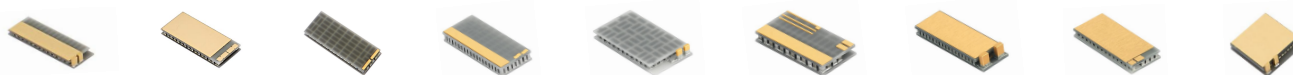


微型热电制冷器件 (Micro TEC) 光通讯领域应用场景
Application scenarios of Micro TEC in optical communication field

■ 数据中心 Data Center

应用于数据中心领域400G DR4/FR4、800G DR8/FR8/2xDR4/2xFR4、1.6T光模块及CPO技术方案。产品支持非气密性封装。

It is used in 400G DR4/FR4, 800G DR8/FR8/2xDR4/2xFR4, 1.6T optical modules of the data center and CPO. The product supports non airtight packaging.



(Th=50°C)

Models	Size (mm)				ΔT_{max} (°C)	Q_c_{max} (W)	U_{max} (V)	I_{max} (A)
	W	Lh	Lc	H				
TEM1-020012	3.35	6.15	5.45	0.75	80.00	2.50	3.06	1.20
TEM1-020033	3.40	6.20	5.50	0.75	80.00	5.80	2.74	3.30
TEM1-030012	2.70	5.10	4.40	0.90	80.00	3.08	4.11	1.17
TEM1-030013	3.10	5.85	5.10	1.00	80.00	3.01	3.88	1.27
TEM1-030013	6.60	4.70	2.80	1.00	80.00	4.20	4.30	1.30
TEM1-030013	2.80	6.70	6.10	1.00	80.00	3.60	4.30	1.30
TEM1-030025	2.80	7.10	6.45	0.90	80.00	6.70	4.10	2.50
TEM1-031015	4.80	4.40	3.55	1.13	80.00	4.30	4.20	1.50
TEM1-032013	3.00	5.60	5.60	0.85	80.00	3.61	4.65	1.30
TEM1-032017	2.13	10.30	8.60	1.05	80.00	4.75	4.38	1.69
TEM1-032024	8.90	4.20	2.50	1.40	80.00	7.00	3.80	2.40
TEM1-033010	2.80	5.50	4.60	0.90	80.00	3.15	4.52	1.09
TEM1-034021	4.00	5.50	5.50	1.22	80.00	6.50	4.60	2.10
TEM1-035009	7.30	5.20	4.75	0.94	80.00	2.94	4.25	0.90

(Th=50°C)

Models	Size (mm)				ΔT_{max} (°C)	Q_c_{max} (W)	U_{max} (V)	I_{max} (A)
	W	Lh	Lc	H				
TEM1-035010	2.80	5.50	5.40	1.20	80.00	3.40	4.70	1.00
TEM1-035017	3.00	9.15	8.55	1.00	80.00	5.40	5.08	1.67
TEM1-044018	3.10	7.20	7.20	0.86	80.00	7.10	6.00	1.80
TEM1-050035	4.05	10.80	10.70	0.80	80.00	16.70	6.70	4.00
TEM1-054018	5.30	12.50	12.50	1.30	80.00	8.62	8.26	1.80
TEM1-063010	2.80	8.30	7.50	1.00	80.00	6.00	9.00	1.00
TEM1-076010	4.00	9.55	9.55	1.20	80.00	6.80	5.20	1.00
TEM1-080028	7.00	12.70	11.65	1.16	80.00	18.40	10.90	2.80
TEM1-090027	8.20	11.30	10.10	1.10	80.00	19.40	11.60	2.70
TES1-095031	9.20	17.20	18.20	1.70	80.00	17.00	8.20	3.20

■ 传输网 Transmission Network

典型应用于电信以太领域100G/400G LR4光模块以及城域/骨干领域相干光模块，产品支持金锡焊料和工温工况。

Typical applications include 100G/400G LR4 optical module and coherence module for metro/backbone field in optical communication transmission network. The product supports gold tin solder and industrial temperature conditions.



(Th=50°C)

Models	Size (mm)				ΔT_{max} (°C)	Q_c_{max} (W)	U_{max} (V)	I_{max} (A)
	W	Lh	Lc	H				
TEM1-020009	2.9	5.45	4.65	1.7	80	1.53	2.58	0.96
TEM1-020016	2.8	5.1	4.35	0.9	80	2.54	2.58	1.6
TEM1-024010	2.95	3.65	3.05	0.75	80	2.1	3.67	1
TEM1-024012	2.6	5.3	5.3	1.85	80	2.65	3.29	1.17
TEM1-025010	2.7	5.6	4.9	1.65	80	2.44	3.63	1.06
TEM1-025015	2.3	4.85	4.1	0.9	80	1.75	3.82	1.5
TEM1-027016	3	4.9	4.2	1	80	2.3	3.5	1.6
TEM1-028014	4.45	6.4	6.4	0.9	80	8.5	6	2.1
TEM1-029011	3.6	5.6	5.6	1.55	80	3.02	4.21	1.13
TEM1-030011	4	5.1	4.4	1.2	80	3	3.6	1.4
TEM1-030011	4.5	4.8	5.6	0.9	80	5	4.6	1.8
TEM1-030015	3	5.9	5.1	1	80	4.1	4.5	1.5
TEM1-031020	3.5	5.45	4.7	0.8	80	4.3	4.5	1.6
TEM1-032016	3.9	5.1	5.1	1.55	80	3.06	4.36	1.13
TEM1-035010	2.8	5.1	4.35	0.9	80	3.16	5.08	1
TEM1-042010	2.5	6.7	5.4	0.9	80	3.67	5.75	0.97
TEM1-042021	4.5	4.8	5.6	0.9	80	5	4.6	1.8

■ 无线 / 接入网 Wireless / access Network

典型应用于无线领域25G eCPRI彩光模块以及接入领域10G /25G/50G PON光模块。产品支持金锡焊料和工温工况。

It is typically used in 25G eCPRI, and 10G/25G/50G PON optical module of optical communication wireless network. The product supports gold tin solder and industrial temperature conditions.



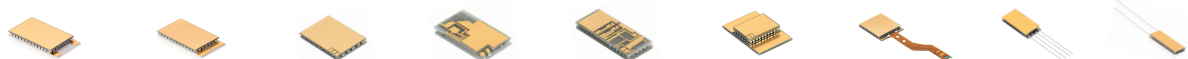
(Th=50°C)

Models	Size (mm)				ΔT_{max} (°C)	Q_c_{max} (W)	U_{max} (V)	I_{max} (A)
	W	Lh	Lc	H				
TEM1-007010	1.25	2.65	2.1	0.8	80	0.6	0.9	1
TEM1-008012	1.6	2.2	1.6	0.9	80	0.7	1	1.2
TEM1-010010	1.52	2.6	2	0.8	80	0.8	1.3	1
TEM1-014009	1.38	3.2	2.8	0.9	80	1.1	2.03	0.9
TEM1-015008	2.7	3	2.2	0.9	80	1	1.94	0.8
TEM1-015009	2.7	3	2.2	0.9	80	1.28	2.18	0.91
TEM1-015010	1.8	2.6	2	0.8	80	1.2	2.18	1
TEM1-015017	2.9	4.3	3.6	1.1	80	2.2	2.1	1.7
TEM1-018010	2	2.7	2	0.8	80	1.57	2.61	1
TEM1-024020	3.6	6	5	0.95	80	4	3.67	2
TEM1-027021	3.4	6.2	5.5	0.75	80	5.14	3.92	2.06
TEM1-028010	3.1	4.5	3.6	1	80	2.5	4	1
TEM1-030010	2.3	5.85	5.1	1	80	2.7	4.1	1
TEM1-030012	3	6.2	5.2	1	80	3.1	4.2	1.2

■ 激光器及其它 Pump / Tunable Laser & Other fields

典型应用于光通讯Pump激光器、Tunable激光器，和汽车车载及其它3C类产品应用。

Typical applications include optical communication pump lasers, tunable lasers, and automotive and other 3C products.



(Th=50°C)

Models	Size (mm)				ΔT_{max} (°C)	Q_c_{max} (W)	U_{max} (V)	I_{max} (A)
	W	Lc	Lh	H				
TEM1-035025	3.30	10.00	9.00	1.17	80	9.10	5.00	2.50
TEM1-030028	4.00	8.50	7.50	0.90	80	6.70	3.90	2.80
TEM1-031010	4.00	4.10	4.10	0.90	80	3.20	4.50	1.00
TEM1-045014	4.15	10.50	9.70	0.90	80	5.70	6.50	1.40
TES1-036021	6.00	14.00	12.00	1.40	80	6.30	5.00	2.10
TEM1-030020	6.00	16.50	15.50	1.65	80	15.80	8.10	3.10
TES1-024022	6.20	9.20	8.20	1.70	80	4.20	3.10	2.20
TES1-042058	7.80	14.80	12.80	1.30	80	19.33	5.43	5.80
TES1-052052	7.80	14.80	12.80	1.30	80	22.22	6.72	5.20
TEM1-040025	6.50	6.50	7.50	1.00	80	9.60	6.00	2.50
TEM1-051020	7.00	14.00	15.00	1.65	80	10.50	7.70	2.00
TEM1-098018	10.00	10.00	11.60	1.00	80	16.90	14.50	1.80

※ 如上述产品型号不能满足您的需求，我们可根据您的需求为您专门定制。

If the above product model cannot meet your needs, we can customize it specifically according to your needs.



码上关注官网



广东富信科技股份有限公司
广东富信热电器件科技有限公司

地址：广东省佛山市顺德高新区（容桂）科苑三路20号
电话：+86-159-1905-8522
邮箱：salestec@fuxin-cn.com
网址：www.fuxin-cn.com

Guangdong Fuxin Technology Co., Ltd
Guangdong Fuxin Thermoelectric Module Technology Co., Ltd

Add: No. 20, Keyuan Road 3, Ronggui, Shunde, Foshan, Guangdong
Tel: +86-159-1905-8522
E-mail: salestec@fuxin-cn.com
Web: www.fuxin-cn.com