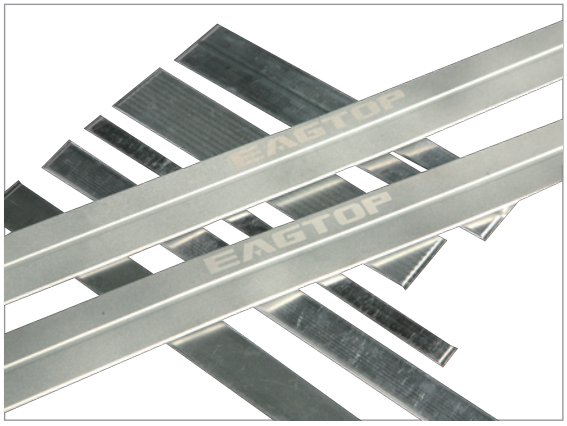
产品简述 (Product Profile)

复合超导平板热管一种具有超导热性能的传热元件。复合超导平板热管依靠内部特殊（复合）工质的相变传热传质，复合超导平板热管的表观热传导率是同样金属材质热传导率的一万倍左右，是具有同样表面积的传统圆形热管的换热能力的5～20倍，承压能力是后者的10～20倍以上，而成本则只有传统热管的1/3以下。

Composite Superconducting Flat Heat Pipe (SFHP) is a thermal conducting component with thermal superconductive performance. SFHP relies on the phase change of the internal special fluid to transfer heat and mass . The thermal conductivity of its surface area is about a million times as much as that of the metal thermal conductive products in the market.It transfers 5-20 times more heat and bears 10-20 times more pressure than the traditional cylinder-shape heat pipes with the same surface area,whereas the SFHP costs 1/3 or less of the tranditional pipes.

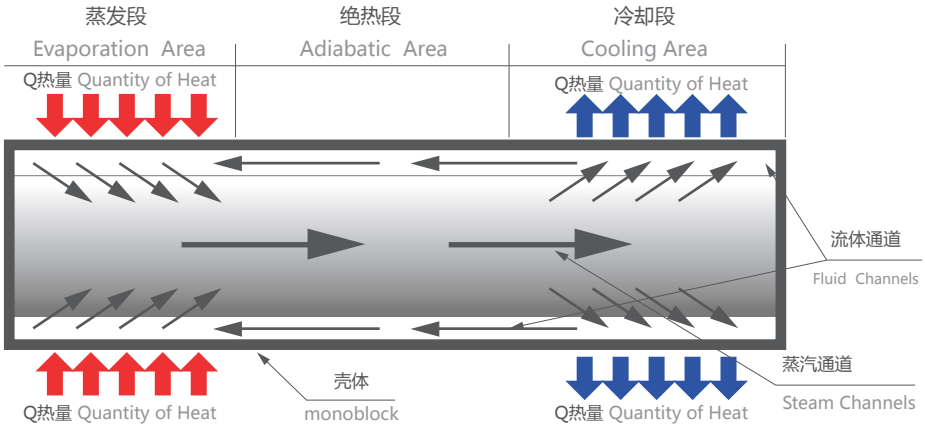


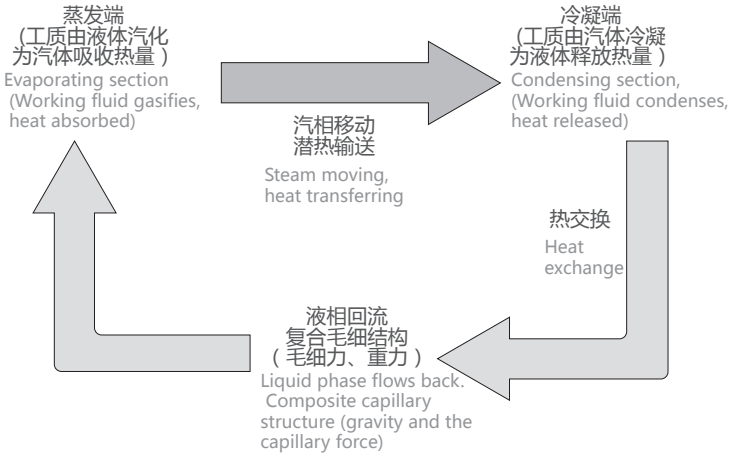
产品参数 (Product Parameters)

尺寸 Size range	长度*宽度*厚度：（100~2000）*（10~180）*（1.2~8.0）mm Length*Width*Thickness：
热传输性能Q max Heat transfer performance	20w~1000w
均温性 Thermal homogeneity	冷却端与加热端温差ΔT＜3℃ Temperature difference between the cooling end and heating ends ΔT＜3℃
工作环境 Operating temperature	-60℃~120℃
最大工作压力 Max. operating pressure	0.6MPa~2.5MPa
热阻 Thermal resistance	＜0.05 ℃/W
平面度 Planeness	＜0.05
冷却方式 Cooling method	自然对流，强制对流等 Natural convection, forced convection etc.
表面处理 Surface treatment	本色，阳极氧化，发黑，镀镍， 镀铬 Natural color, anodic oxidation, black oxide coating, nickel plating, chrome plating

复合超导平板热管
Composite Superconducting Flat Heat Pipe

工作原理 (Working Principle)

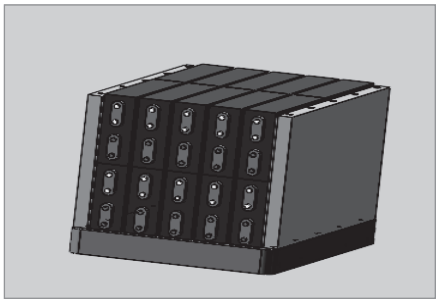




复合超导平板热管工作原理如图三所示，典型的设计都是由密闭多孔微槽群阵列管和工作液及复合毛细结构组成，将管内抽成1.0×(10^{-2} ~ 10^{-3})Pa的负压后充以适量的工作液体，密封。腔体的一端为蒸发段(加热段)，另一端为冷凝段(冷却段)。腔体的一端受热时腔体中的液体蒸发汽化，蒸汽在微小的压差下流向另一端放出热量凝结成液体，液体沿重力及毛细力方向流回蒸发段，如此循环不已，热量由热管的一端传至另一端。

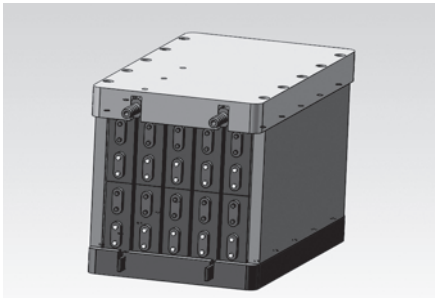
The working principle of FHP is shown in the Figurer 3, and its design is a typical one consisting of the sealed porous micro-capillary groove-array tube, working fluid and the composite capillary structure. After the tube is evacuated to the negative pressure of 1 x (10-2 ~ 10-3) Pa, it is filled with appropriate amount of working fluid and sealed. One end of the cavity is the evaporating section (heating section) and the other is the condensing section (cooling section). The evaporating section heated and the liquid evaporating, a slight differential pressure forces the steam to flow to the other end of the section. The heat released, it condenses into liquid and then flows back to the evaporating section in the direction of the gravity and the capillary force. So the constant loop goes and the heat transfers from one end of the pipe to the other.

热管在电池中的应用(Heat pipe in the application of the battery)

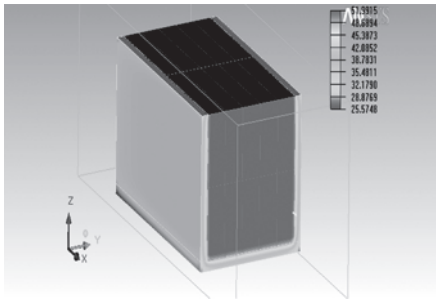


电池组普通风冷
Battery pack(Common air cooling)

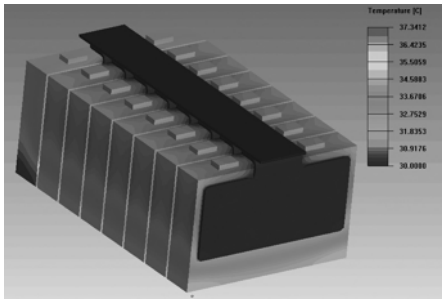
电池组热管水冷
Battery pack(Heat pipe&liquid cooling)



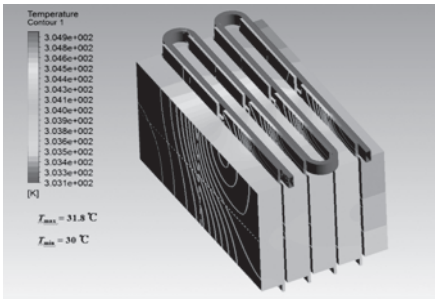
电池组热管水冷
Battery pack(Heat pipe&liquid cooling)



电池铝壳温度 Tmax = 52.0℃
Battery aluminum enclosure Tmax=52.0℃

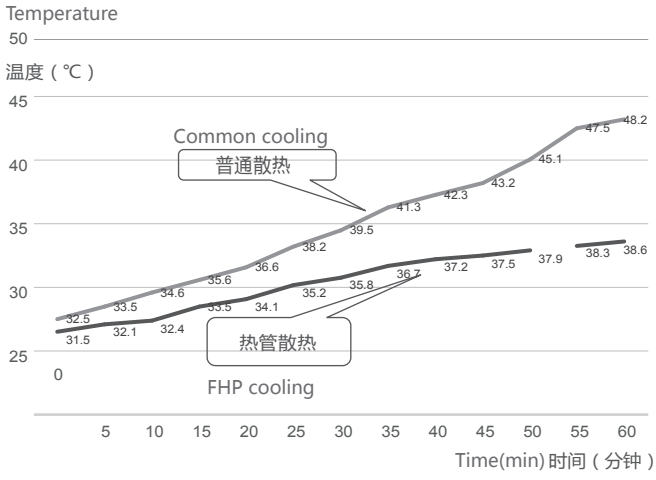


电池铝壳温度 Tmax 37℃
Battery aluminum enclosure Tmax=37℃

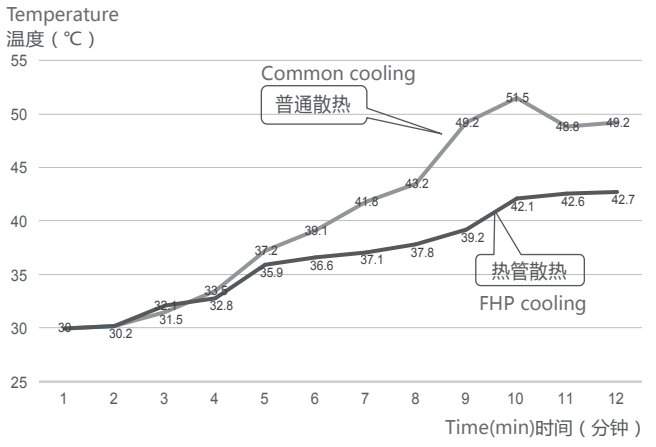


电池铝壳温度 Tmax 31.8℃
Battery aluminum enclosure Tmax=31.8℃

电池放电实验（30℃室温）
Battery charging experiment (30 ℃ room temperature)



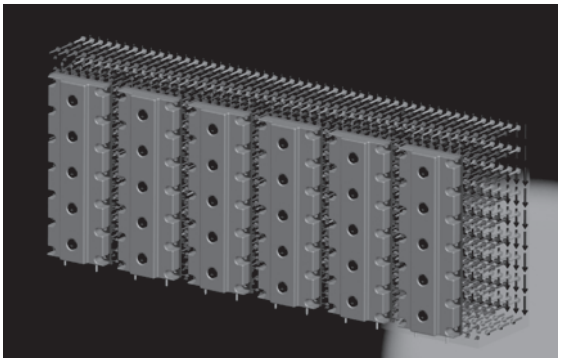
电池放电实验（30℃室温）
Battery discharging experiment (30 ℃ room temperature)



3D相变散热器
3D Phase Change Heat Sink

上海鹰峰3D复合超导平板热管散热模组（第三代）
SHANGHAI EAGTOP 3D Composite Superconducting Flat Heat Pipe Heat Sink Module (Third generation)

1、基板与复合超导平板热管(FHP)组成3D连通的相变传热体系
2、相变基板受热时，工质吸收热量，相变为蒸汽，蒸汽沿蒸汽通道将热量传递至每片热管（FHP）管道，并将热量传递至远端，
3、FHP散热翅片进行热量交换，释放热量，工质冷凝回流至相变基板区，从而形成热量交换循环 。



1.The base plate (substrate) and Composite Superconducting Flat Heat Pipe (FHP) constitute the 3D connected phase change heat transfer system.
2. When the phase change substrate is heated, the working medium absorbs heat and then is phased into steam, through which the heat is transferred to each heat pipe (FHP) along the channels and simultaneously to the far ends.
3. The FHP dissipating fins exchange and release the heat, after which the working medium condenses and flows back to the substrate, ending the heat circulation.

技术特点 (Technical Features)

1、由于与热源接触区域（基板）采用了相变技术，可以有效控制并降低接触热阻；
2、同时由于基板与每片热管（FHP）共同组成3D工质相变、传递通道，从而有效降低了从热源接触区域（基板）至热管（FHP）的热阻，并提高了热管（FHP）与翅片的热交换效率。
3、3D复合超导平板热管散热器具有更高的传热性能、散热性能及更优化的体积结构。

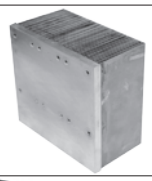
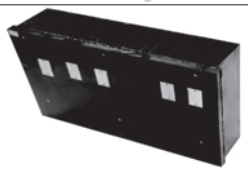
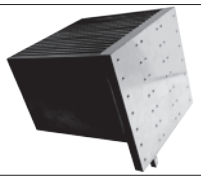
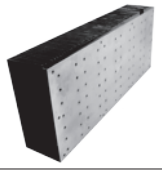
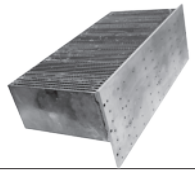
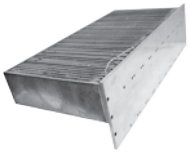
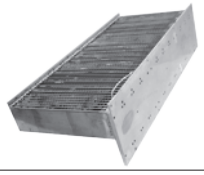
1. Due to the phase change technology used in the substrate which contacts the heat source area, the contact thermal resistance can be effectively controlled and reduced;
2. Simultaneously, the base plate and each heat pipe (FHP) constitute 3D working fluid phase change and transmission channels, thus effectively reducing the thermal resistance from the contact area (substrate) of the heat source to heat pipe (FHP), and improving the heat exchange efficiency of the heat pipes (FHP) and fins.
3. 3D Composite Superconducting Flat Heat Pipe Heat Sink is of higher heat transfer performance, thermal performance and a more optimized volumetric structure.

应用范围 (Application)

适用于功率模块、光伏逆变、SVG、高低压变频、APF、绿色能源、大型换热、轨道交通等领域大功率散热或换热组件。

Applicable to high power heat dissipation or exchange components in the fields involving the power modules, photovoltaic inverters, SVG, high and low voltage inverters, APF, green energy, large heat exchange, rail transit, etc.

3D相变散热器
3D Phase Change Heat Sink

产品系列 Product series		产品照片 Product picture	外形尺寸 Overall dimensions (mm)	热沉降功率 Thermal subsidence power (W)	接触热阻 Contact thermal resistance (W/k.m)	散热器(HP)热阻 Heat sink thermal resistance(HP) (W/k.m)	基板温差 Substrate temperature difference (℃)
2D相变散热器 2D phase change heat sink			L (280) xW(240) xH(110)	1500 ~ 2000	0.008 ~ 0.01	0.015 ~ 0.020	5
3D复合相变散热器 3D Phase Change Heat Sink	自然对流散热 Natural convection heat dissipation		L (550) xW(280) xH(140)	125*5	0.05	<0.01	5
	3 IGBT (Econo)		L (220 ~ 260) xW(220) xH(150 ~ 200)	1500 ~ 2000	<0.01	<0.005	3
	6 IGBT (PrimePack)		L (700) xW(290) xH(120)	10200 ~ 12500	<0.005	<0.005	5
	6 IGBT (PrimePack)		L (800) xW(350) xH(300 ~ 420)	9000 ~ 13000	<0.008	<0.005	5
	12 IGBT (Econo)		L (800 ~ 900) xW(300 ~ 400) xH(150 ~ 200)	8000 ~ 11000	<0.01	<0.005	3
	9 IGBT (Econo)		L (700 ~ 800) xW(300 ~ 400) xH(150 ~ 200)	8000 ~ 11000	<0.011	<0.005	3

散热器温升 Temperature rise of the heat sink (℃)	流体压降 Fluid pressure drop (Pa)	应用环温 Application of ring temperature (℃)	使用方向 Direction of use (℃)	表面处理 Surface treatment	风扇选择 Fan selection
28 ~ 32	150 ~ 200	-40 ~ 85	水平使用或垂直使用及负重力使用（性能衰减5 ~ 10%） Horizontal or vertical use and negative gravity use (performance attenuation 5 ~ 10%)	阳极、电泳、电化、烤漆等 Anode, electrophoresis, electrochemical, paint, etc	225(EBM)离心风机 225 (EBM) Centrifugal Fan
41 ~ 46	自然对流 Natural convection	-40 ~ 50	垂直使用 Vertical use		
25 ~ 38	<120	-40 ~ 85	水平使用或垂直使用（重力方向） Horizontal or vertical use (gravity direction)		225(EBM)离心风机 225 (EBM) Centrifugal fan
30 ~ 35	<350	-40 ~ 85			
30 ~ 35	<350	-40 ~ 85			225(EBM)离心风机 225 (EBM) Centrifugal fan
25 ~ 35	<120 ~ 150	-40 ~ 85			225(EBM)离心风机或 250轴流风机或 400(EBM)离心风机 225 (EBM) Centrifugal fan or 250 axial flow fan or 400 (EBM) Centrifugal fan
25 ~ 40	<120 ~ 150	-40 ~ 85			