

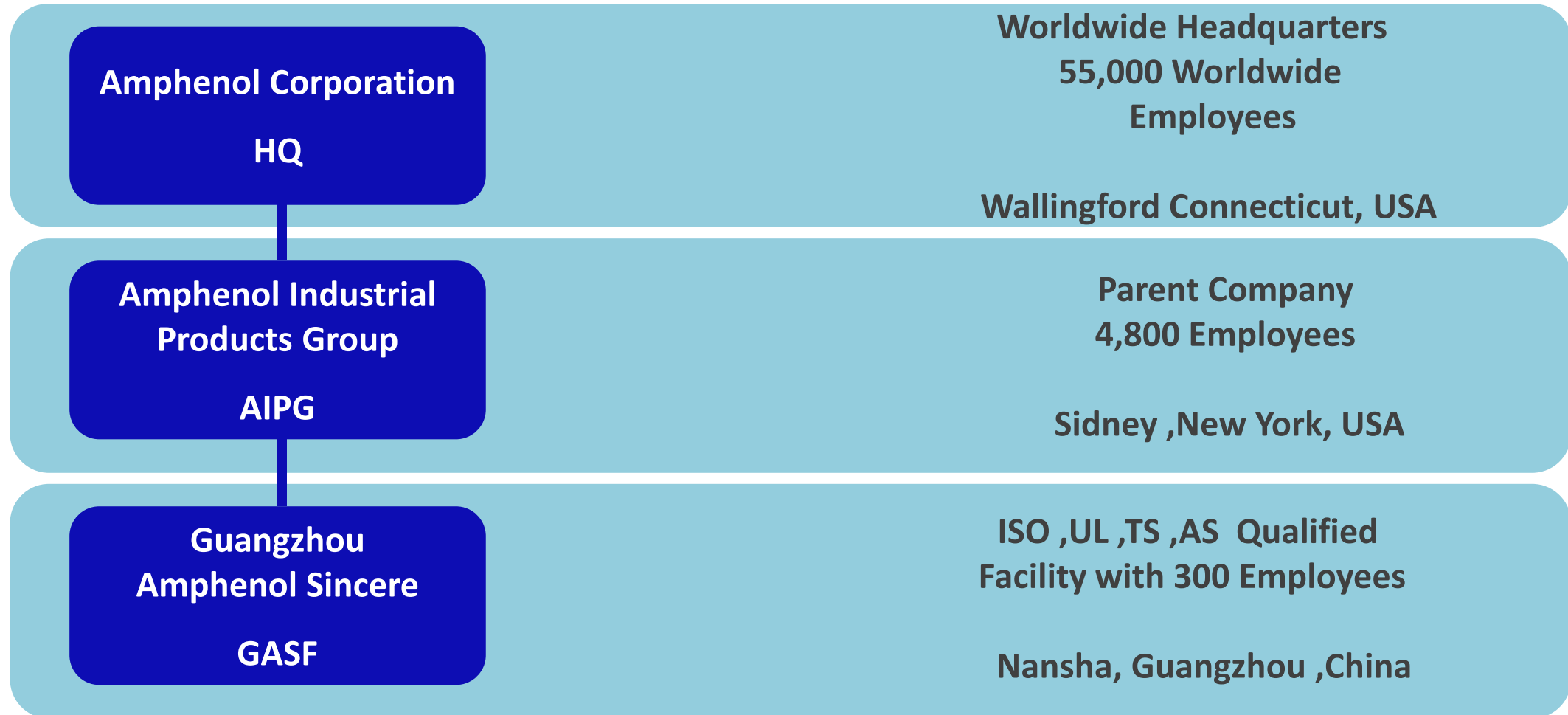
# Amphenol Sincere

Amphenol Industrial Group  
Electronic Integration & Flex Printed Circuit

Power Battery Pack Flex Solution

Amphenol - Internal data - Confidential

# 公司简介-Amphenol Organization





## GASF History

1994 GuangZhou Panyu Printed circuits Limited

2005 Guanzhou Amphenol Sincere Flex (August)

20 years+ manufacturing experience

Facility Area: 15,000 Square meter

Revenue :USD 31 million

Employee: 350

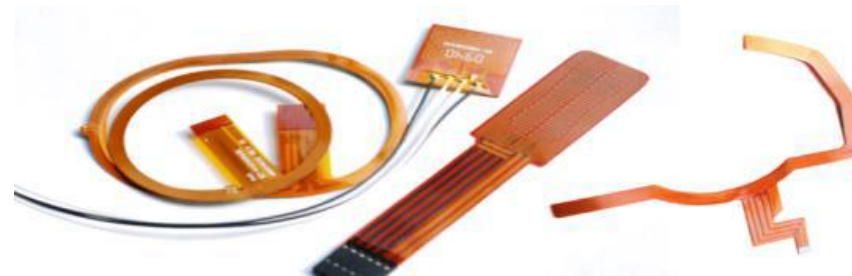
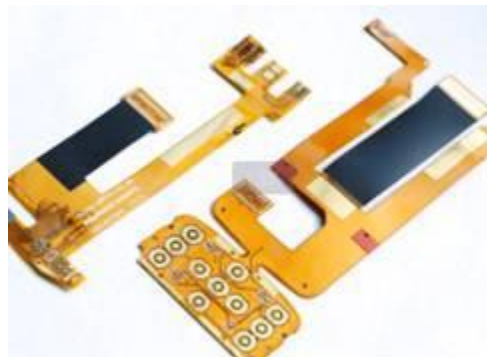
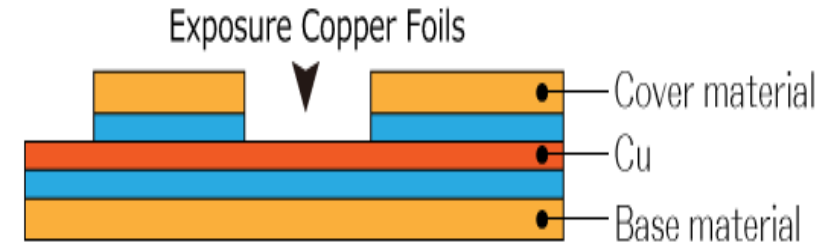
Location :Nansha District Guangzhou City ,China



# Flex Introduction

A Flex Circuit or Flex PCB is a patterned arrangement of printed circuitry and components that utilizes flexible based material with or without flexible coverlay. These flexible electronic assemblies may be fabricated using the same components used for rigid printed circuit boards, but allowing the board to conform to a desired shape (flex) during its application.

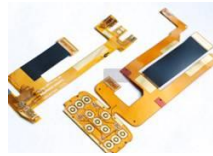
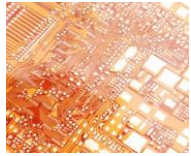
Flexible printed circuit technology provides solutions to packaging and tight spaces, accommodates harsh environments and is ideal for applications where the ability to bend or flex the substrate is necessary.



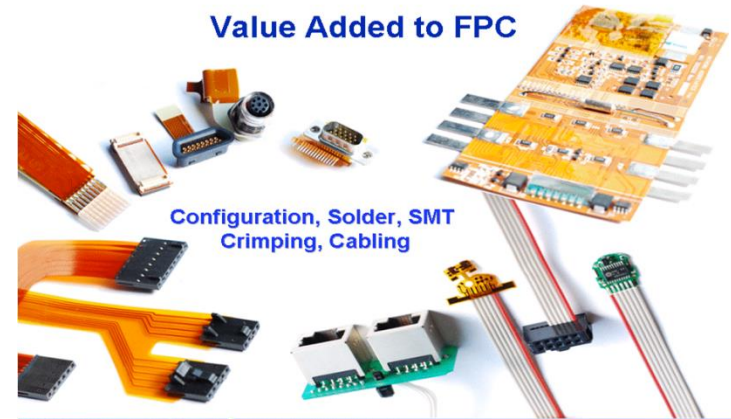
# 主要产品

Single side Flex Circuit  
double sides Flex Circuit  
Multi-layer Flex Circuit

Rigid Flex

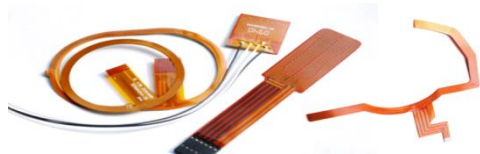


Value Added Service  
Turn Key Solution



## Functional Flex Circuit

Heater Flex



Power Flex



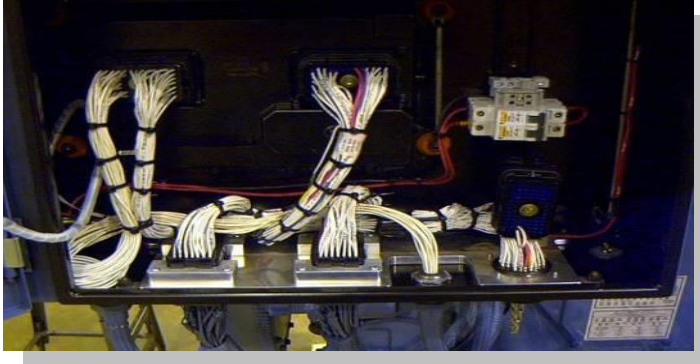
High Temperature Flex



High Speed Flex



# Flex Circuit Advantages



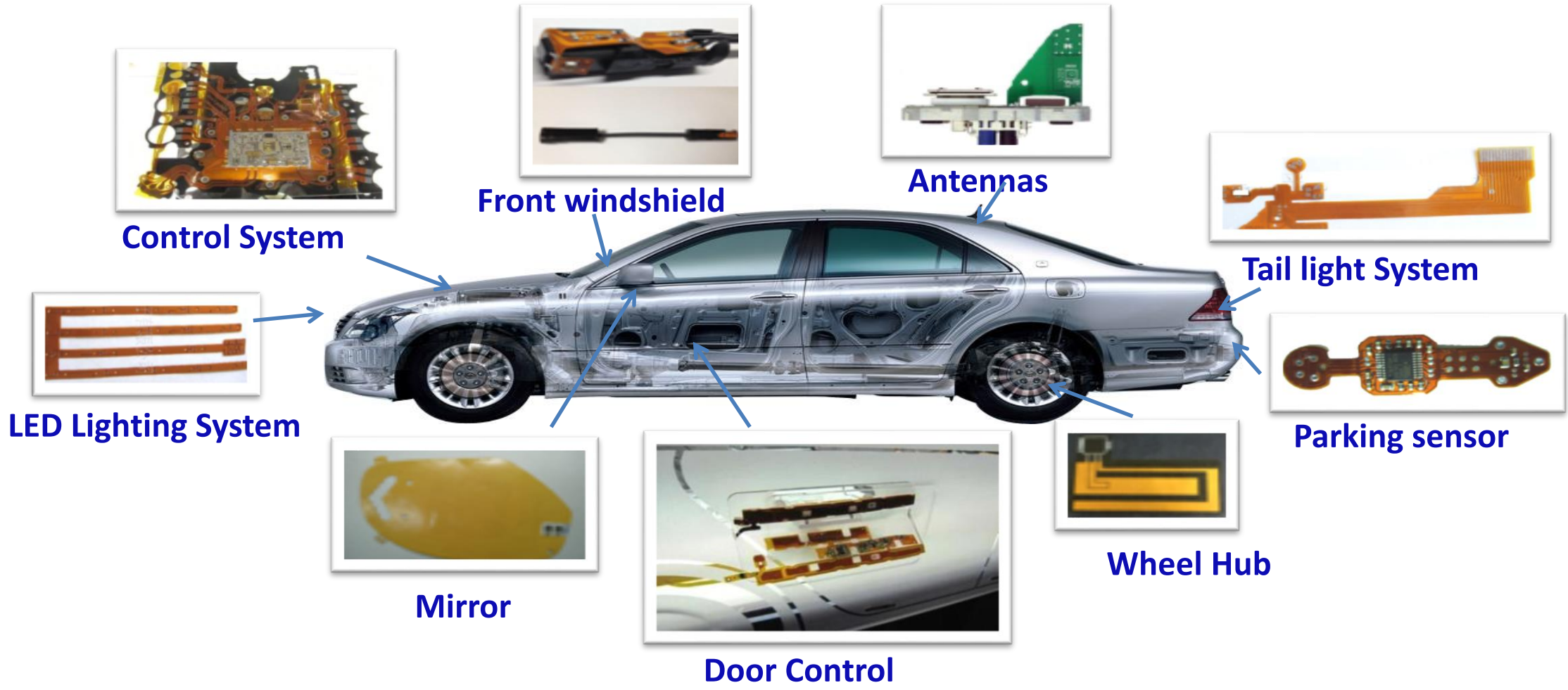
**Minimize Weight & Maximize Component Areas To Reduce The Size Of The Total Package**

**Eliminate Wiring Labor, Reduce Manual Cable Assembly Errors, Save Cost For Rework And Re-Inspection**

**Streamline Mechanical & Electrical Design  
Increase Flexibility in Performance & Packaging**

**Reduce Packaging Size & Increase Reliability**

# Product Application – Auto



# Flex Application in Power Battery Pack

## Application:

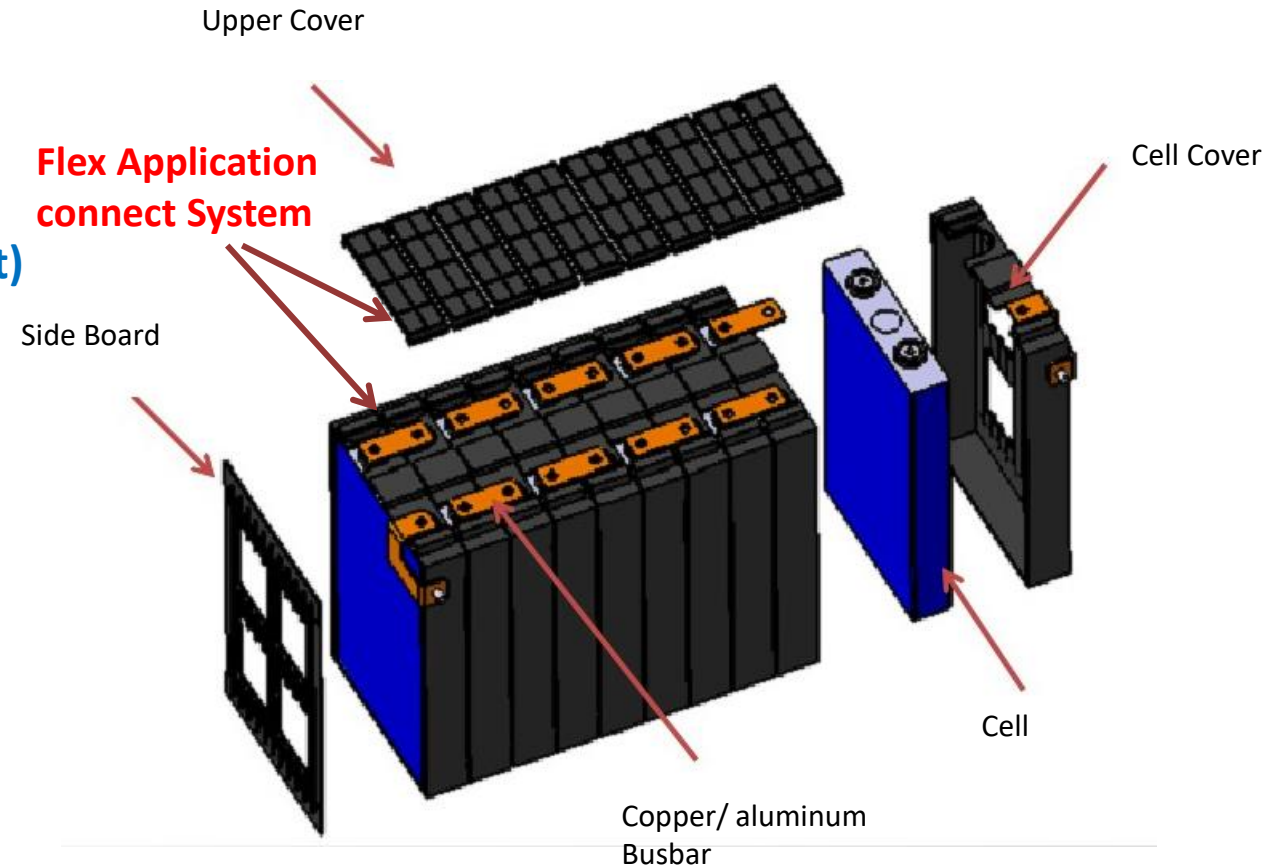
- Battery SOC Circuit(State of Charge)
- Battery Control Circuit
- BMS Control Circuit(Battery Management)

## Purpose:

- Replace cable solution
- Replace PCB Circuit

## Benefit:

- Save Space & Weight
- High Reliability
- Better Heat Dissipation
- Easy assembly



Standard Battery Pack Module



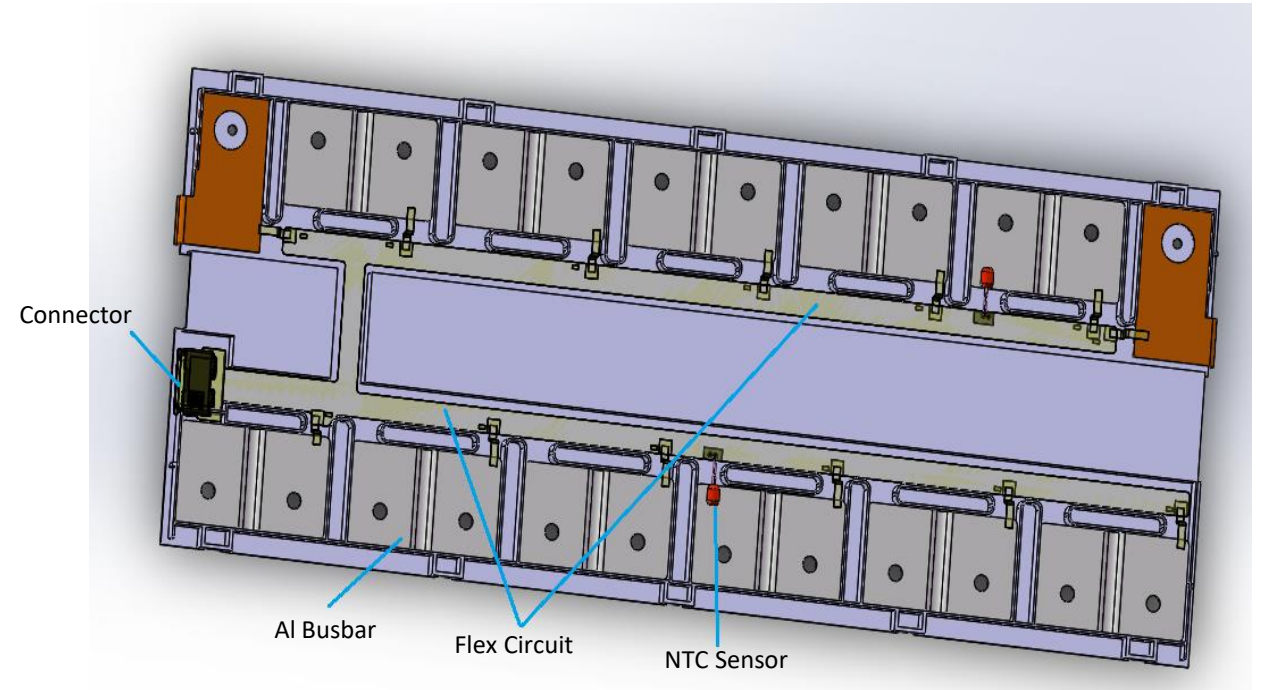
# Wireless SOC Solution for Power Battery Pack

## PRODUCT OFFERING:

SOC Solution for Power Battery Pack

## SOLUTION TYPES:

- Flex
- Flex+ BusBar
- Flex+ Busbar+Assembly (Including Sensor, fuse and insulation Cover)

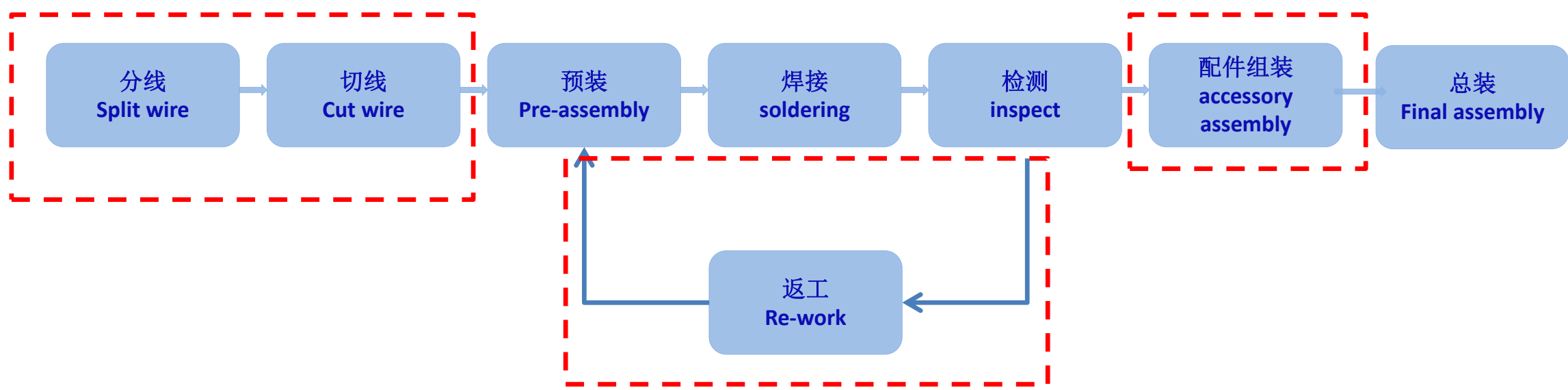


## Flex Solution Advantage in Power Battery Pack

	Cable Solution	Flex Solution	Cost Impact
Assembly	Complicated, bulky, and easy to mis-assemble	Integrated design, high efficiency assembly	Saving labor cost
Reliability	Low, will have break risk in connection area	High, Copper and aluminum are better malleable material, No solder embrittlement	Saving re-work cost
Heat Dissipation	bad	good, both Copper and aluminum are good heat dissipating material, Flat conductors have more surface area to dissipate heat better.	Increase battery pack output efficiency
Weight	Heavy weight	Light weight	Increase power density, reduce overall weight of pack/vehicle.
Circuit Design	Complicated and difficult to integrate with other components	Space saving, and easy to be integrated design	Saving Space and process cost

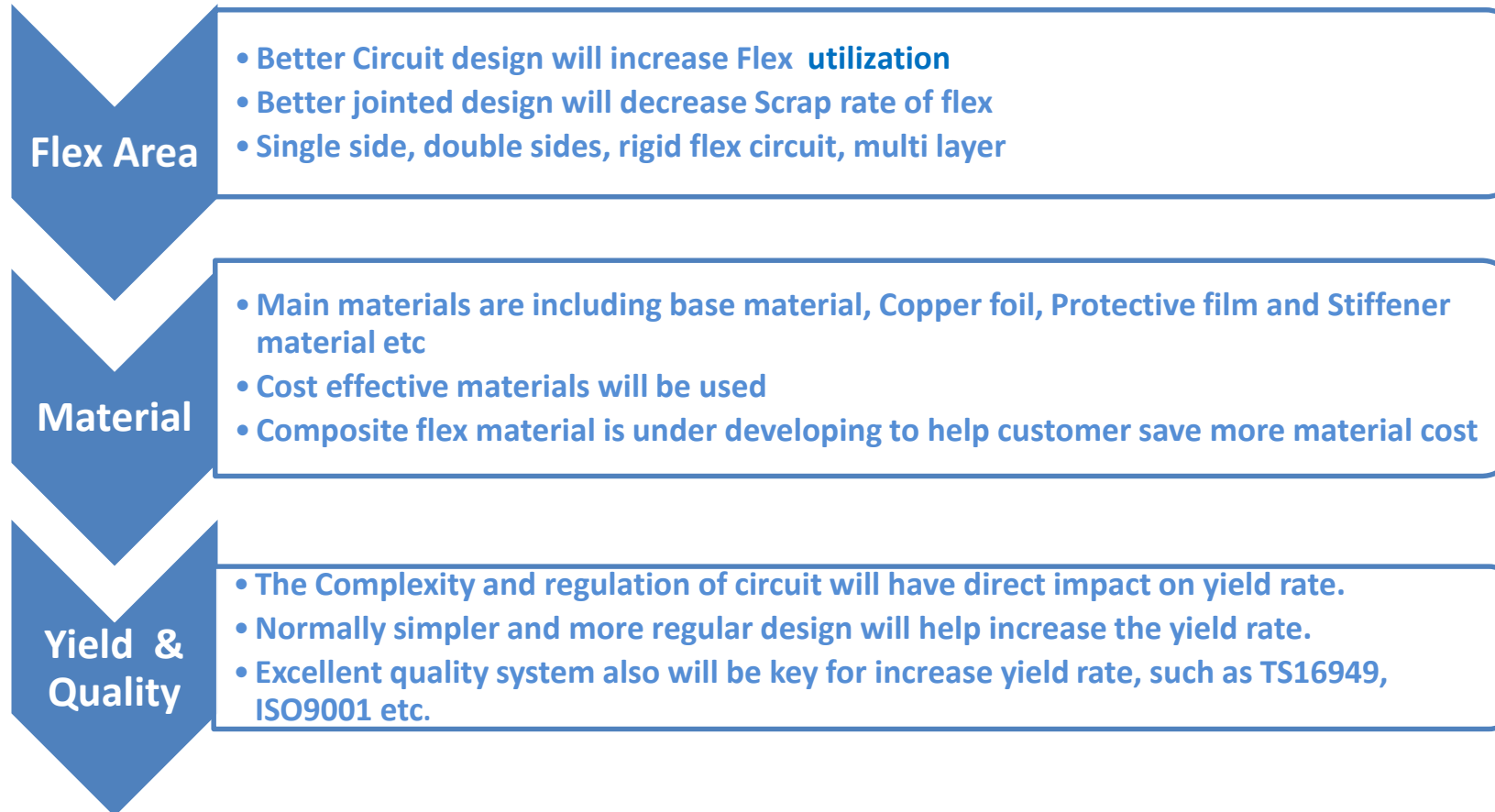
**Saving labor cost + Re-work cost + Process cost + increasing efficiency= Saving Money!**

# SOC circuit assembly main flow chart

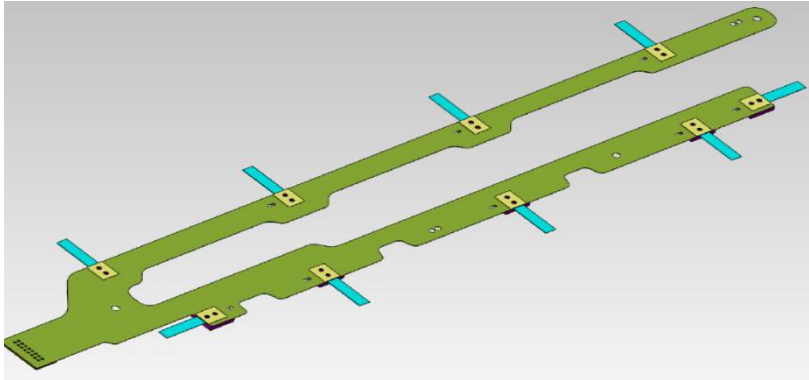


Will save red part process when use FPC solution

# Cost effect in Flex design



# FPC Application—Power Battery --prismatic cells



**Product information:**

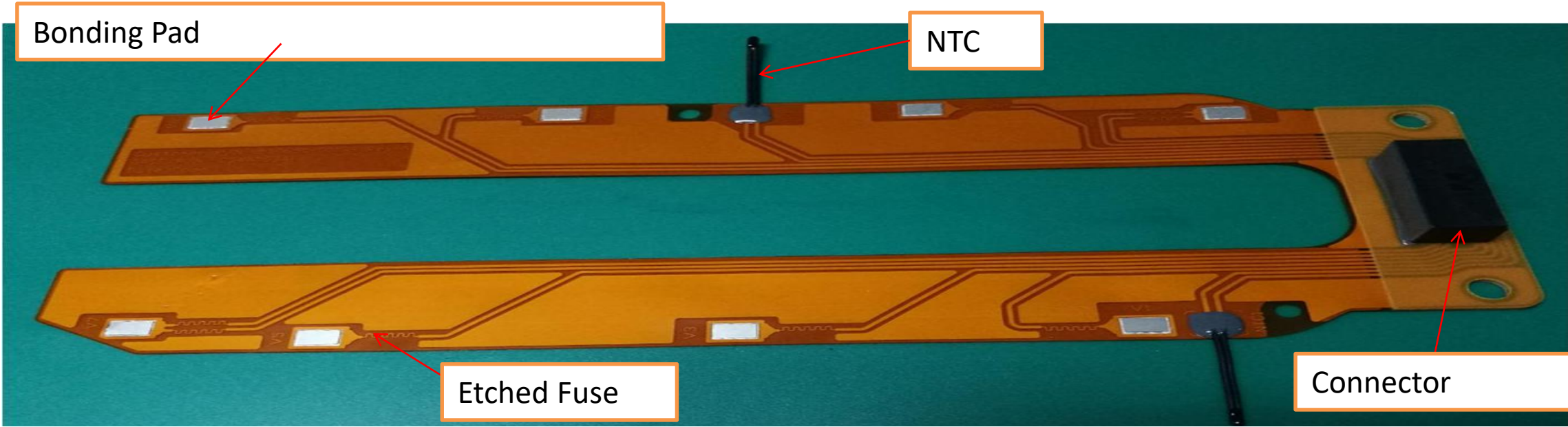
**Material type: Polyimide +Nickel strip+ Busbar + Connector**

**Lamination temperature: 185- 195 ° C.**

**Surface finish : ENIG**



Wire Bonding solution:

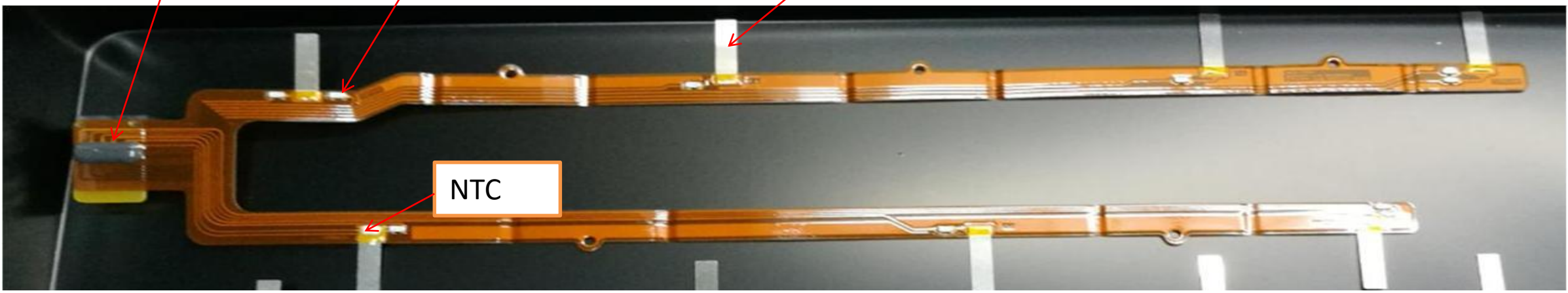


# Laser Soldering Solution:

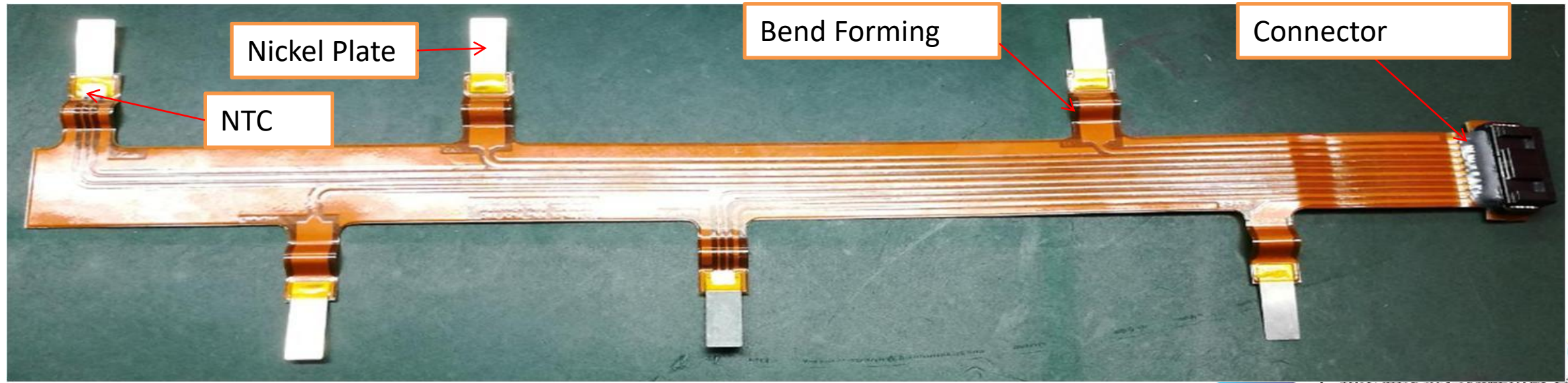
Connector

SMD Fuse

Nickel Plate



NTC



Nickel Plate

Bend Forming

Connector

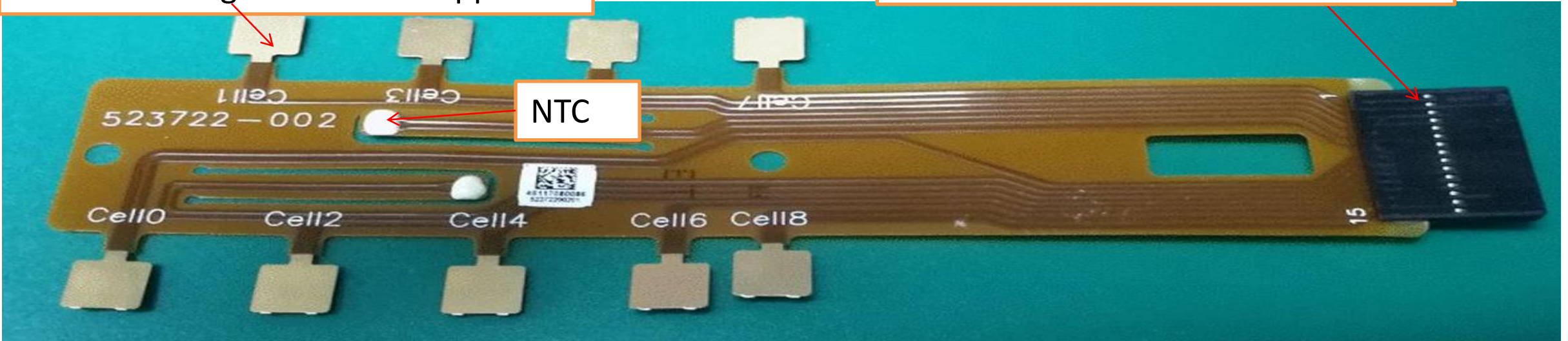
NTC

**Terminal Crimping Solution:**



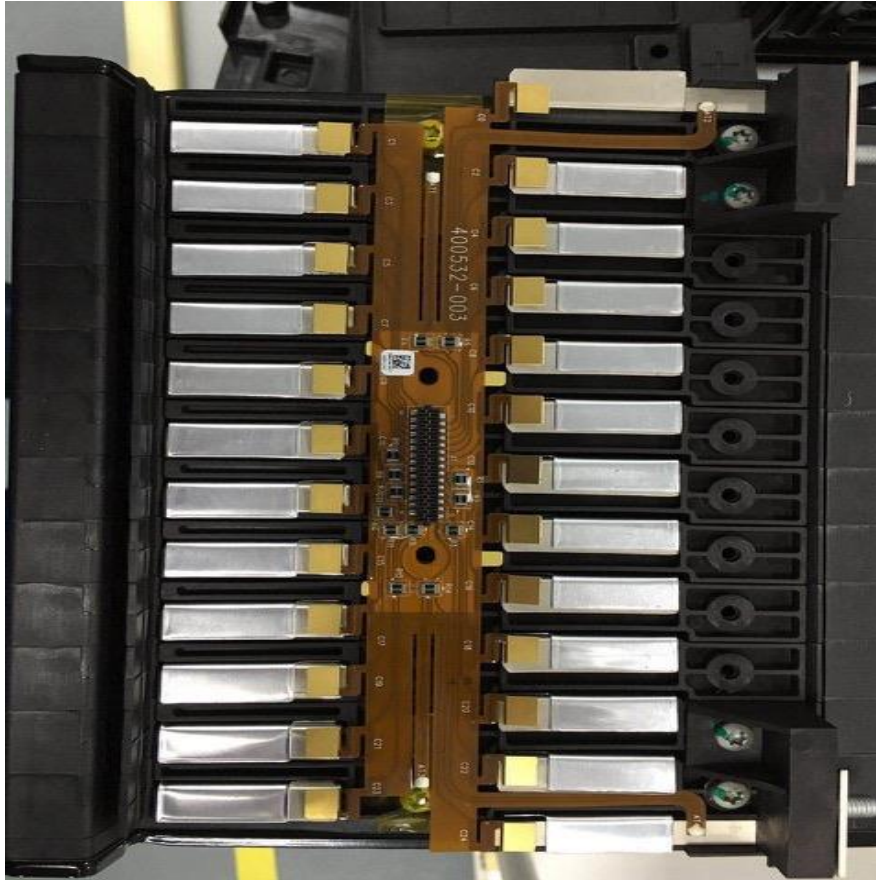
Laser Soldering PAD (thick copper)

CONNECTOR (Terminal Crimping)





# FPC Application—Power Battery –Soft pack

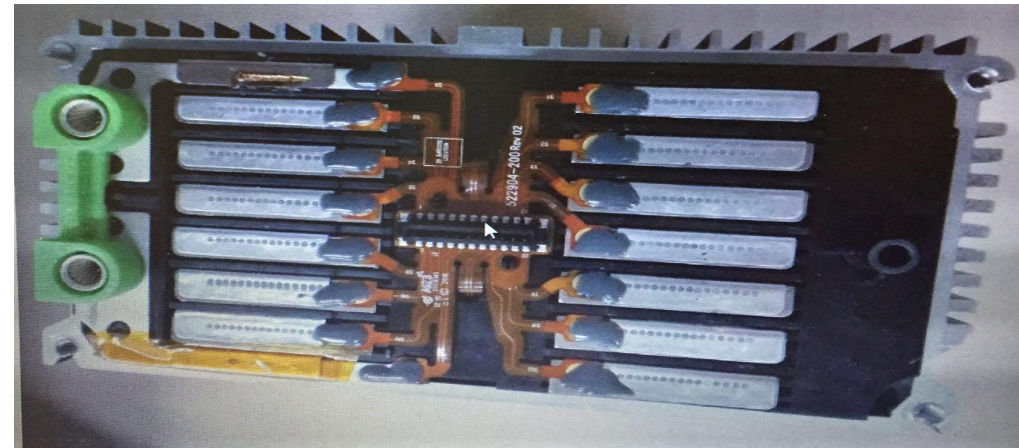


**Product information:**

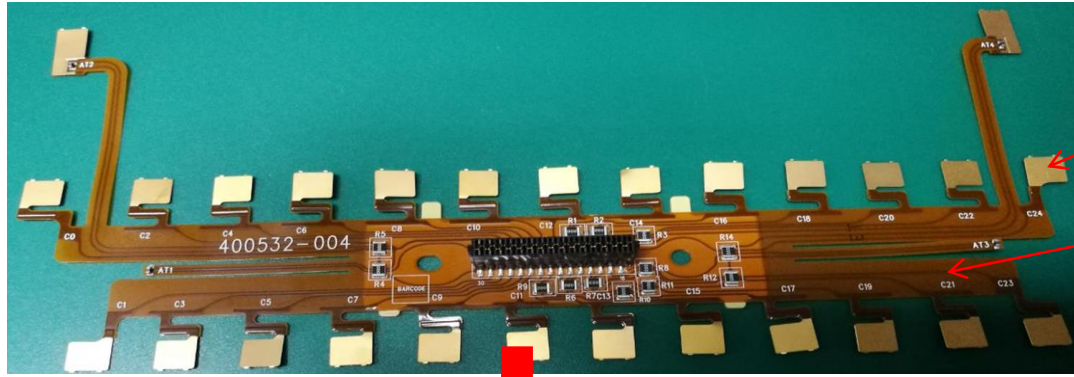
**Material type:** Polyimide +thick copper tail+ Connector

**Lamination temperature:** 185- 195 ° C.

**Surface finish :** ENIG

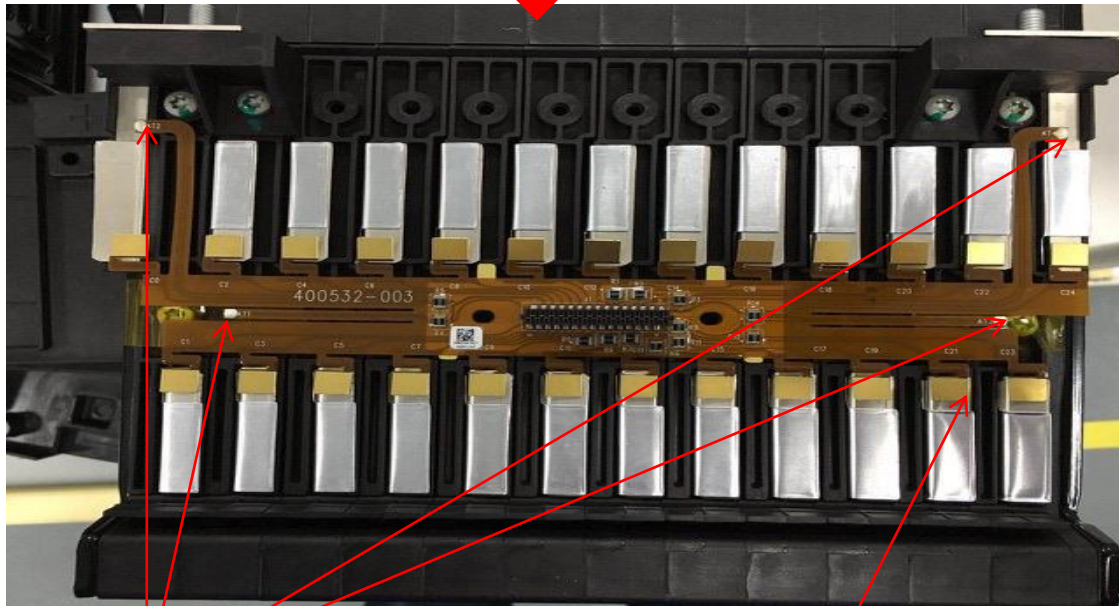


# FPC Application—Soft pack



Thick Copper

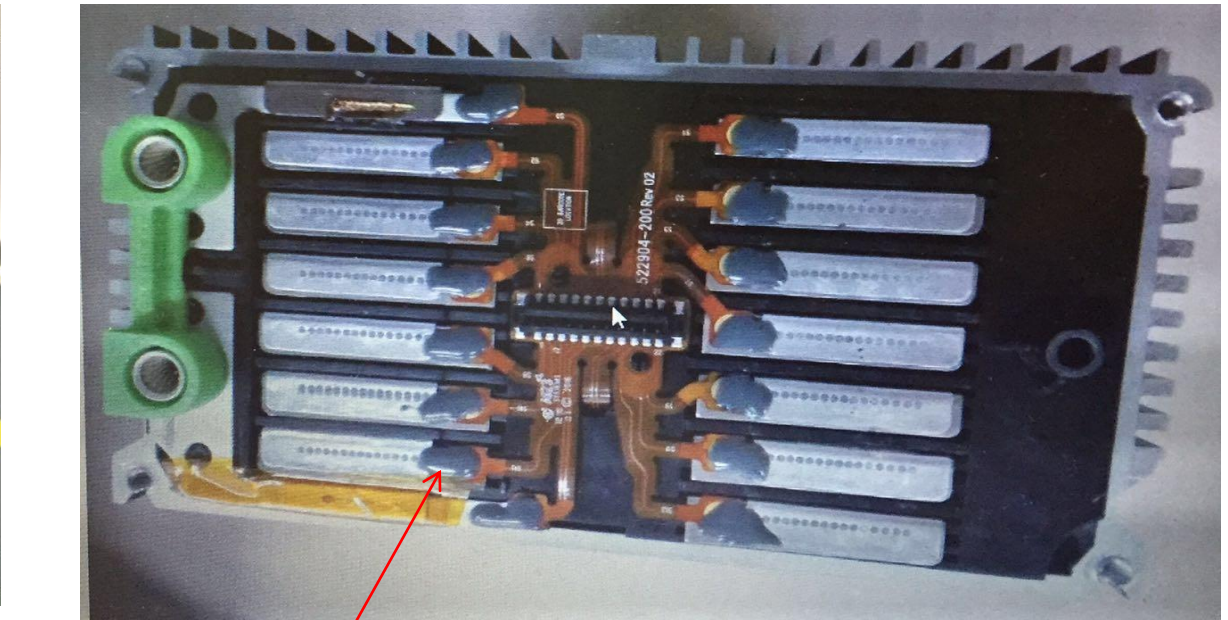
Standard Copper thickness



NTC

Laser Soldering

Amphenol - Int



Protection Glue

tial

# FPC Application—Power Battery –others

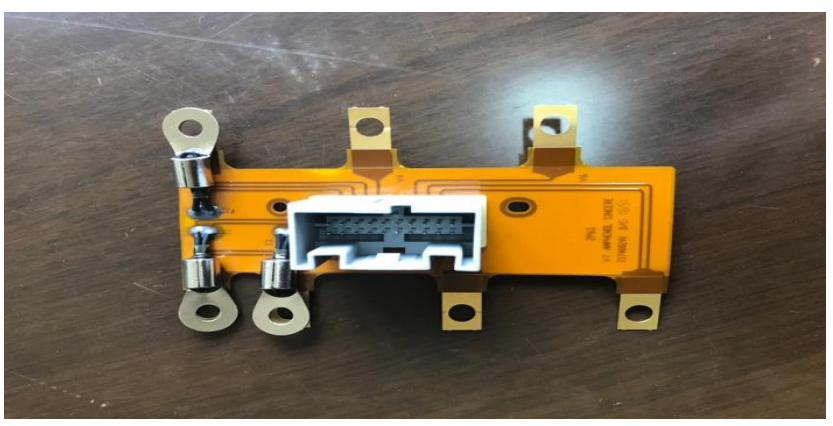
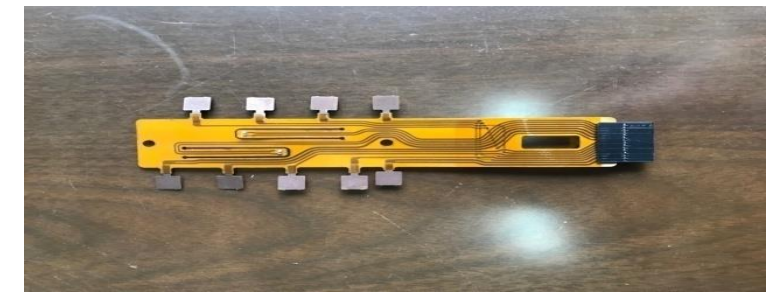
Product Application – HEV & Better



PCB+Cable design Solution



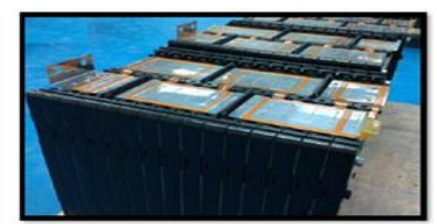
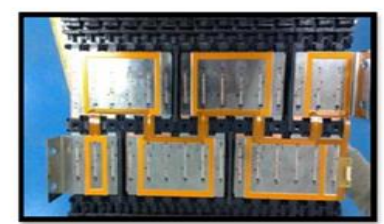
FPC Solution



Cable design Solution

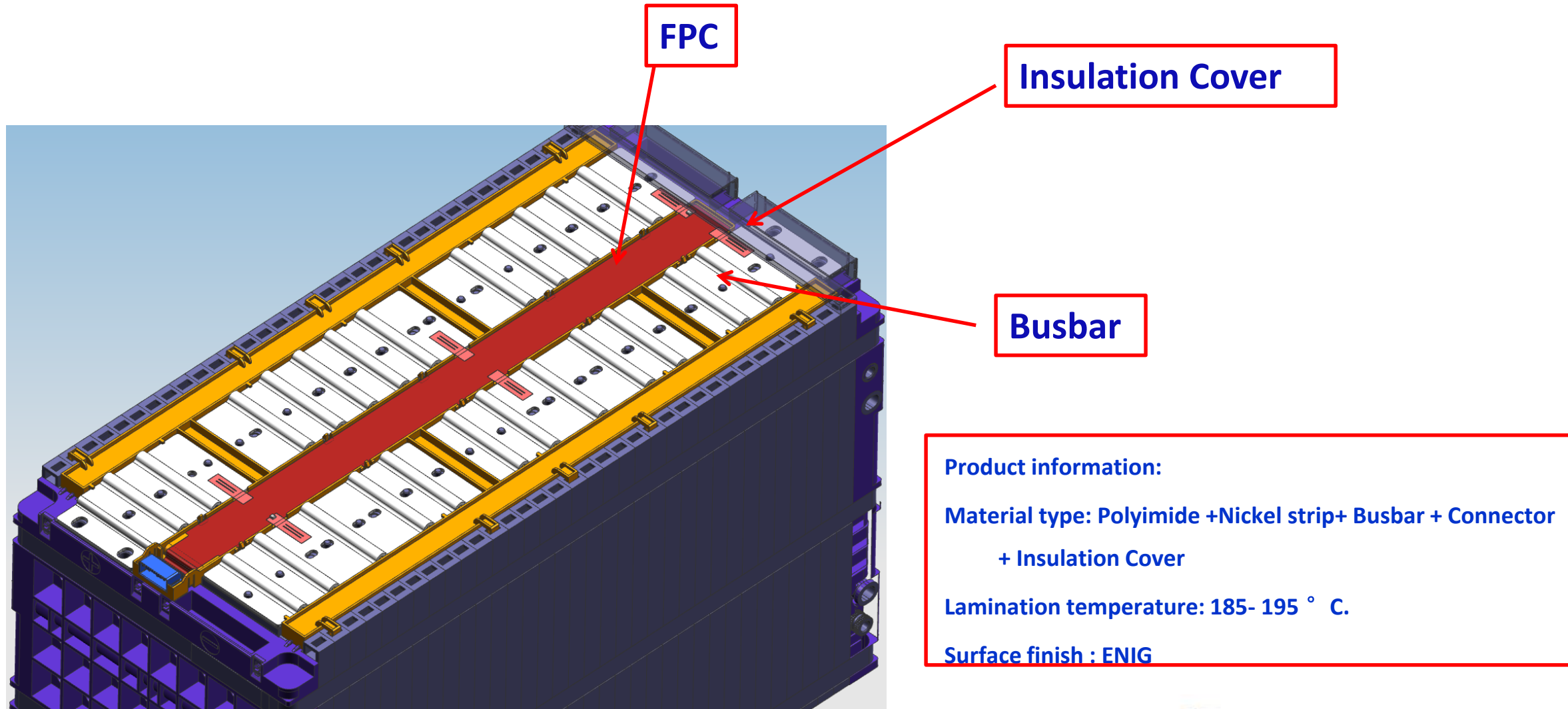


FPC Solution



FPC Battery pack

# FPC Application—Power Battery –FPC+Busbar+Insulation Cover



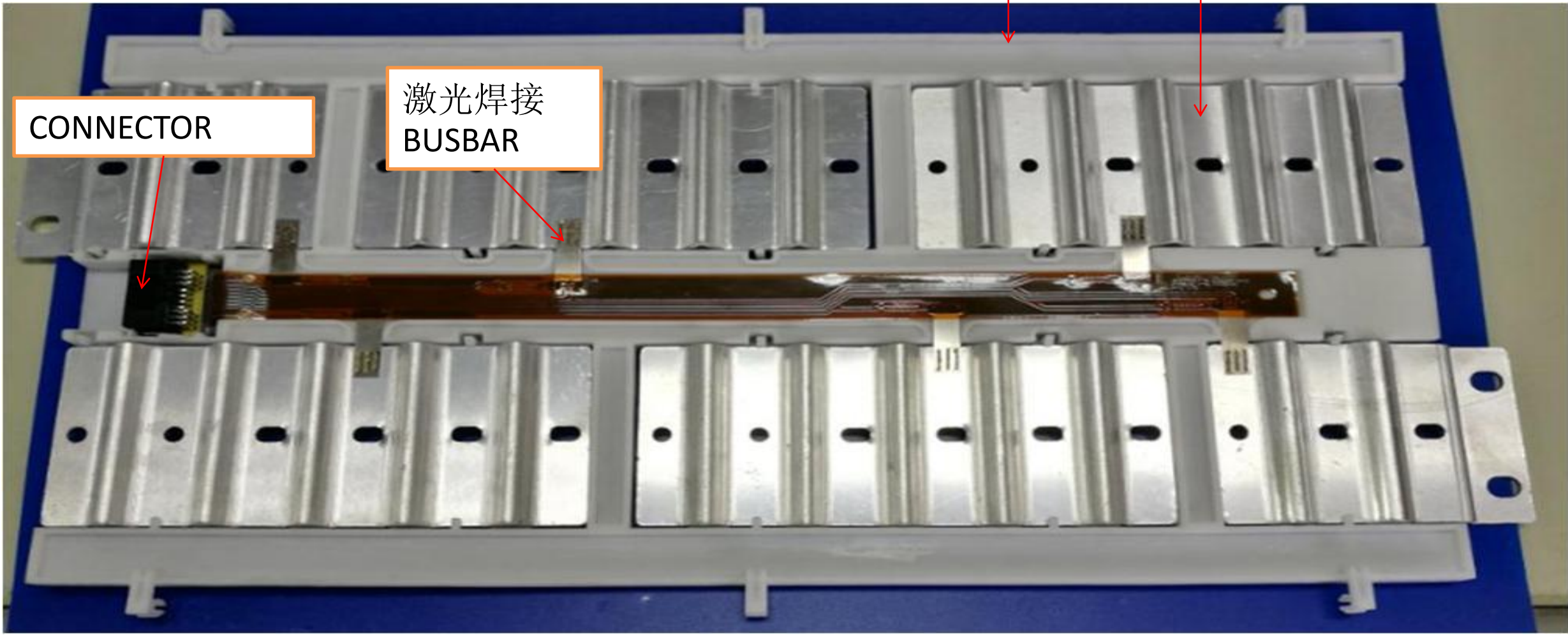
FPC+隔板+铝排整体设计方案。

隔板

铝排

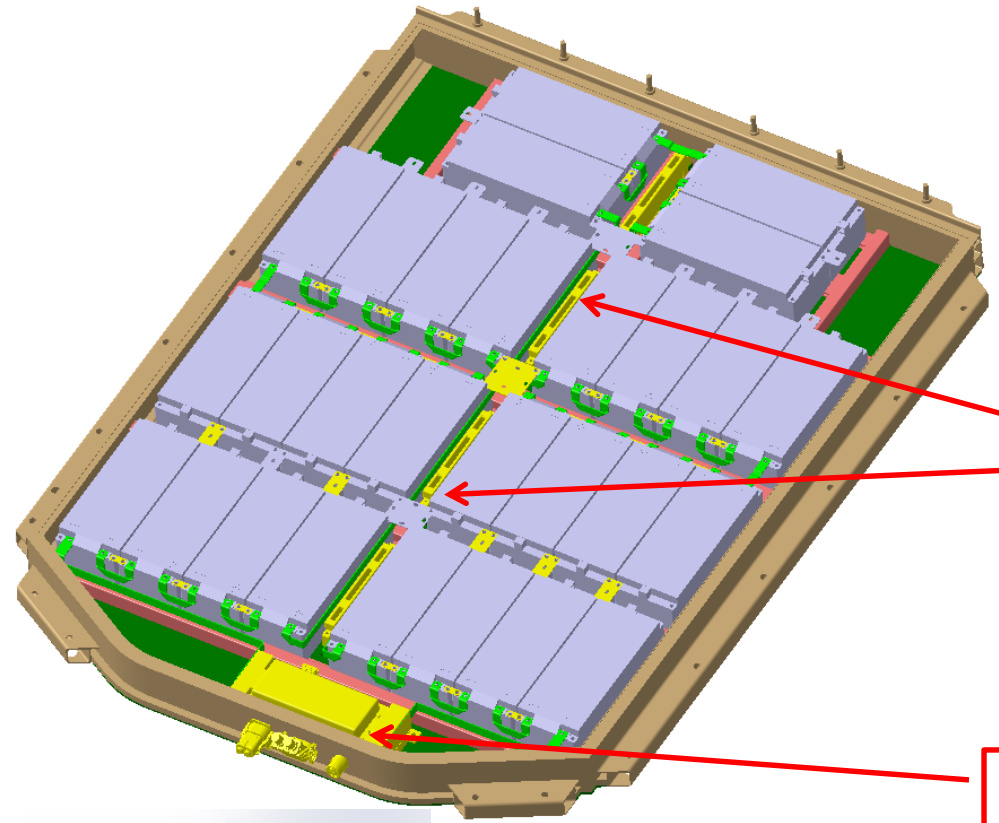
CONNECTOR

激光焊接  
BUSBAR



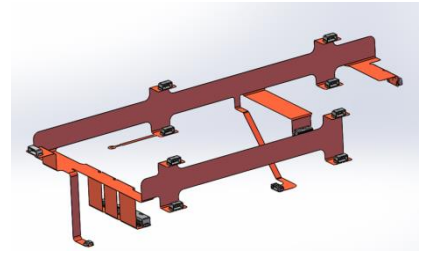
# FPC Application—Pack system

Product Information:  
Combine Power/Signal circuits  
BMS units integrated  
Quick-mate connection

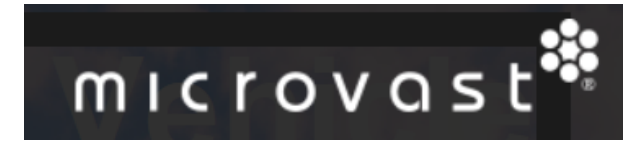


FPC+Busbar+Plastic holder

Quick-mate connector



## Project Summary on Battery—HEV Customers



Amphenol - Internal data - Confidential



# Quality System

- ✦ ISO 9001:2015
- ✦ ISO 14001:2015
- ✦ IATF16949:2016
- ✦ AS9100 2016



- ✦ UL
- ✦ ROHS
- ✦ REACH
- ✦ WEEE



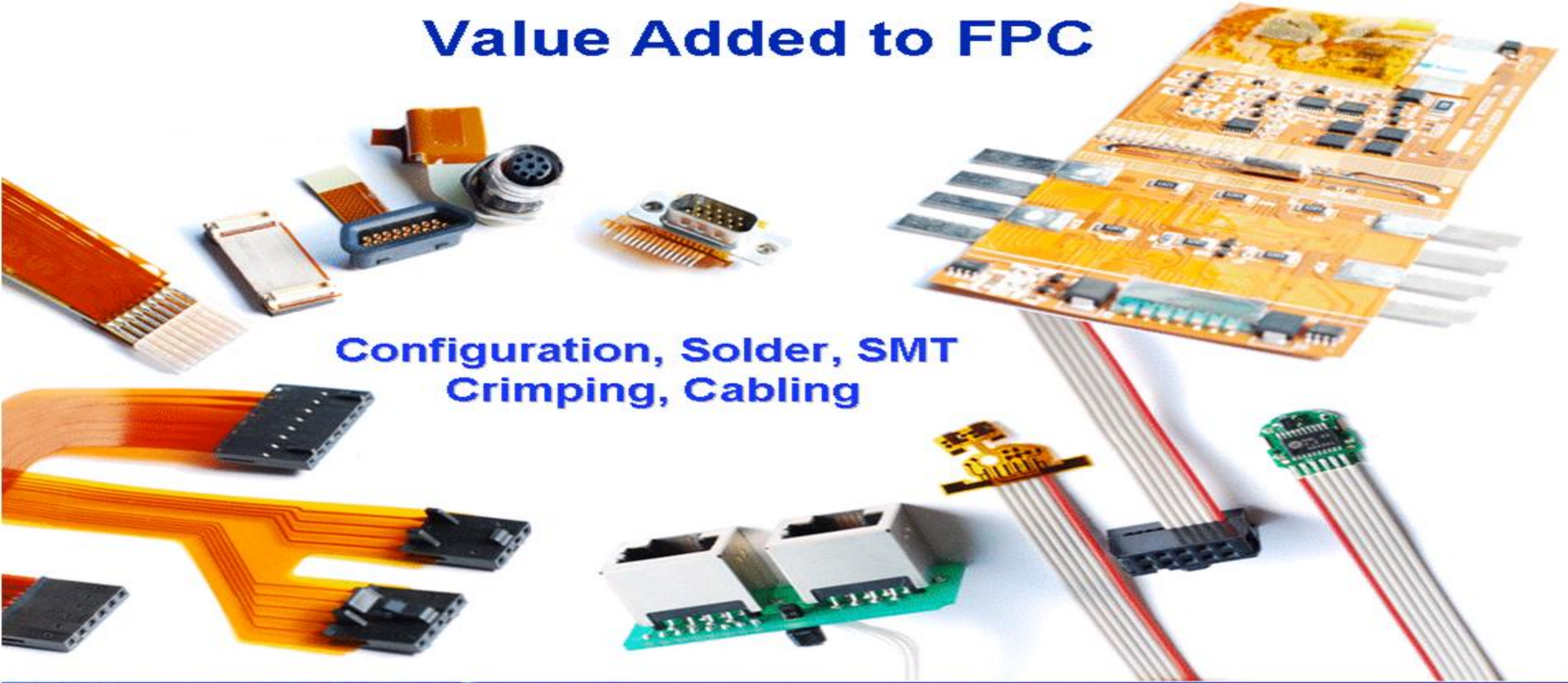


## Test items for Power battery Flex

	Test Items	Category	Refer Standard		Test Items	Category	Refer Standard
1	Appearance	Appearance	IPC-6013C	14	High & Low Temp Shock	Environmental	USCAR2-6
2	Dimension	Dimension	IPC-6013C	15	Thermal Stress	Environmental	IPC-TM-650
3	Open/Short	Reliability	IPC-9252	16	Salt Spray	Environmental	USCAR2-6
4	Bending	Reliability	IPC-6013C , IPC-2223	17	High Temp exposure	Environmental	USCAR2-6
5	Peel Strength	Reliability	IPC TM 650,IPC 6013	18	High Temp & Humidity	Environmental	USCAR2-6
6	Current cycle	Reliability	USCAR2-6	19	Short time High Temp	Environmental	Design requirement
7	Temp Rise	Reliability	USCAR2-6	20	Water Immersion	Environmental	Design requirement
8	High Voltage	Reliability	IPC-6013	21	Vibration	Environmental	USCAR2-6
9	Insulation	Reliability	IPC-6013	22	Electrolyte Immersion	Environmental	Design requirement
10	Fusible link	Reliability	Design requirement	23	Flame retardancy	Environmental	UL
11	Resistance	Reliability	Design requirement	24	Low Temp Shock	Environmental	Design requirement
12	Soldering	Reliability	IPC-610	25	NTC resistance	NTC	Design requirement
13	Nickel Peel Strength	Reliability	Design requirement				

# Value Added to FPC

Configuration, Solder, SMT  
Crimping, Cabling





**Thank You !**