

Air Purifier preliminary analysis

GOLDTeK_沅聖科技
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2022/11/18

GOLDTeK Company Profile

COMPANY NAME	GOLDTeK Technology Co., Ltd.
HQ LOCATION	Taiwan 16F, No.166, Jian 1st Rd., Zhonghe Dist., New Taipei City 23511, Taiwan (R.O.C)
FACTORY LOCATION	China Factory: Shenzhen (Foxconn Campus SMT + Assembly) None-China Factory: - Malaysia (SMT + Assembly) - Taiwan (SMT + Assembly)
ESTABLISH	August, 2008
CAPITAL	USD 10 Million
Foxconn Group	Joined the Group in 2014
IPO	June, 2017
HEAD COUNT	Headquarter: 145person Shenzhen Branch: 1,200 persons
ANNUAL TURNOVER	158M USD (2021)



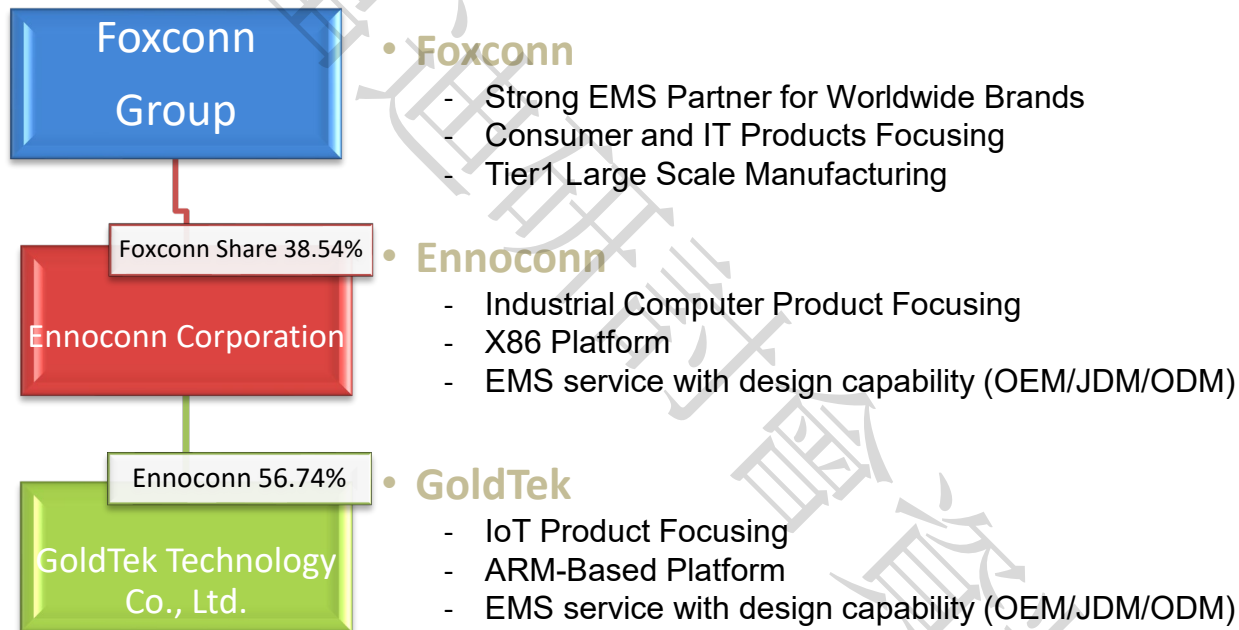
Subsidiary of Foxconn



Expert of Smart Home Products



GOLDTek Ownership Structure & Share



Product Portfolio: Smart Home



Smart Lock



Intercom



Security Camera



DOOR BELL



SMARTHOME



360° Camera

Product Portfolio: Location Finder



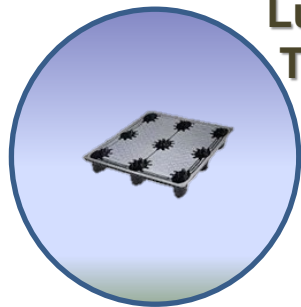
Luggage Tracker



Pet Tracker



BLE Tracker



Pallet Tracker



Health Care

Product Portfolio: Smart Life



Temperature Control



LOGISTIC



Baby Tech



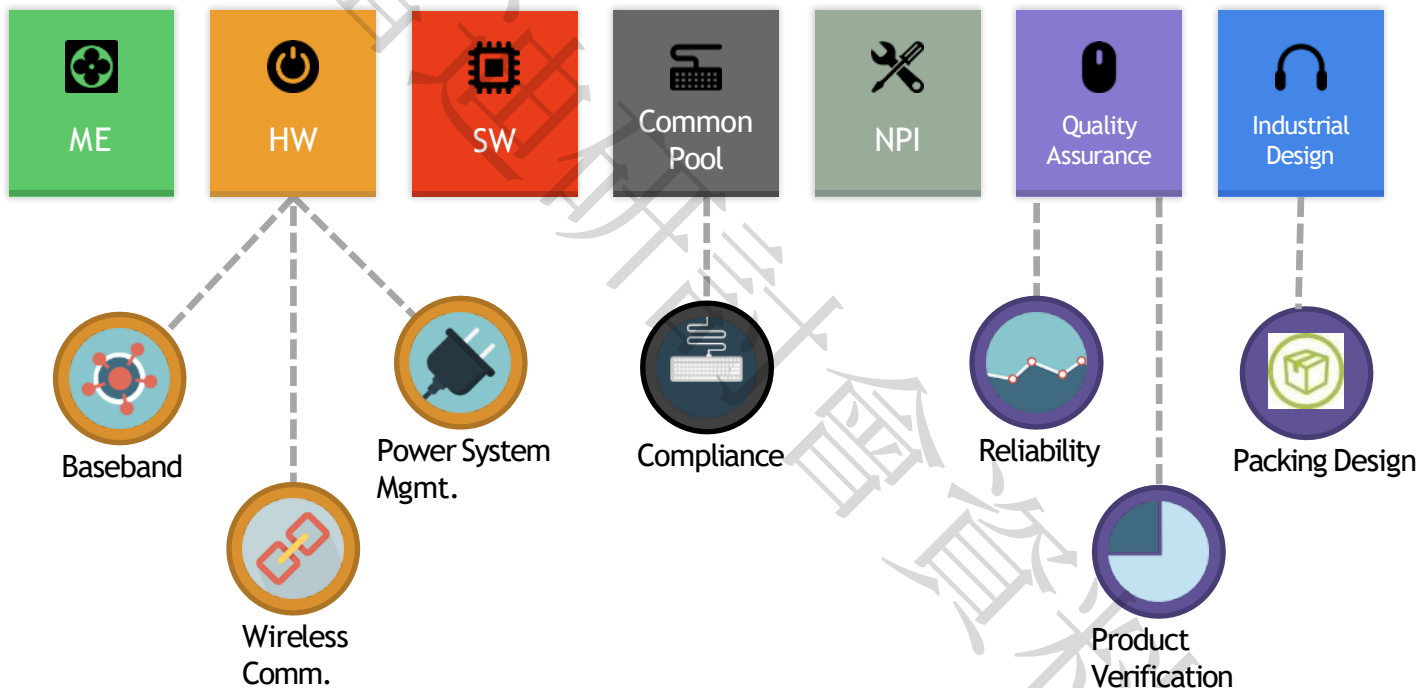
Smart Insole



Intelligent Mailbox

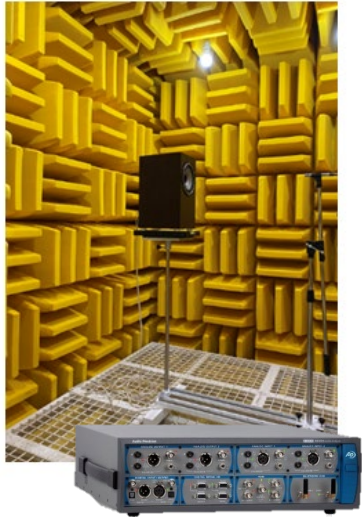
R&D Team

Full Function Engineering Team:
Consisting of more than 100 team members

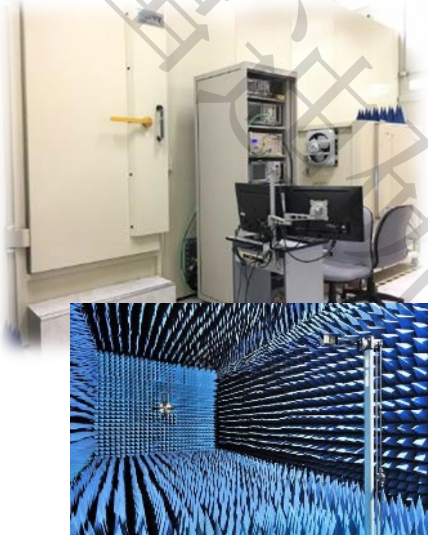


Laboratory

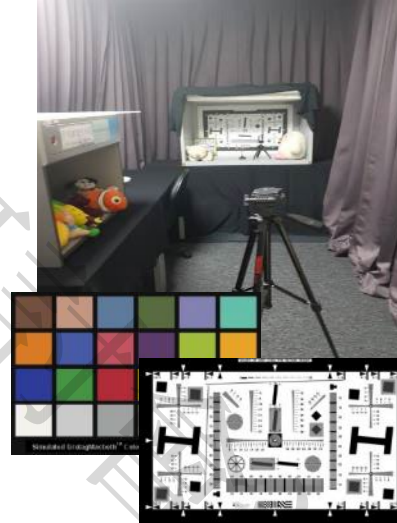
■ Anechoic Chamber



■ OTA Chamber



■ Image Lab

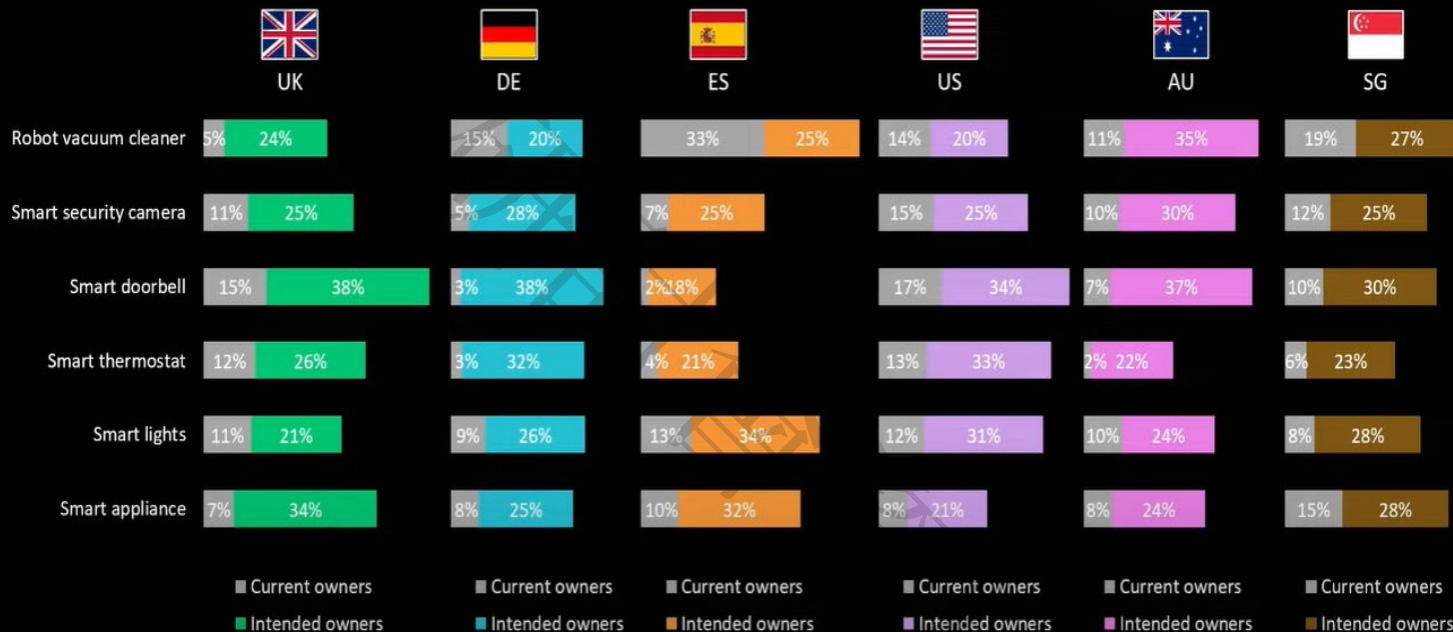


■ Reliability Lab



The Smart Home market Opportunity

Intended ownership of smart home devices, share of all households





Agenda

- **Key Parts disassembly**
- **Fan & Motor information**
- **CFD application**
- **Optimize concept**
- **Wind tunnel information**



Key Parts disassembly



Blade and motor

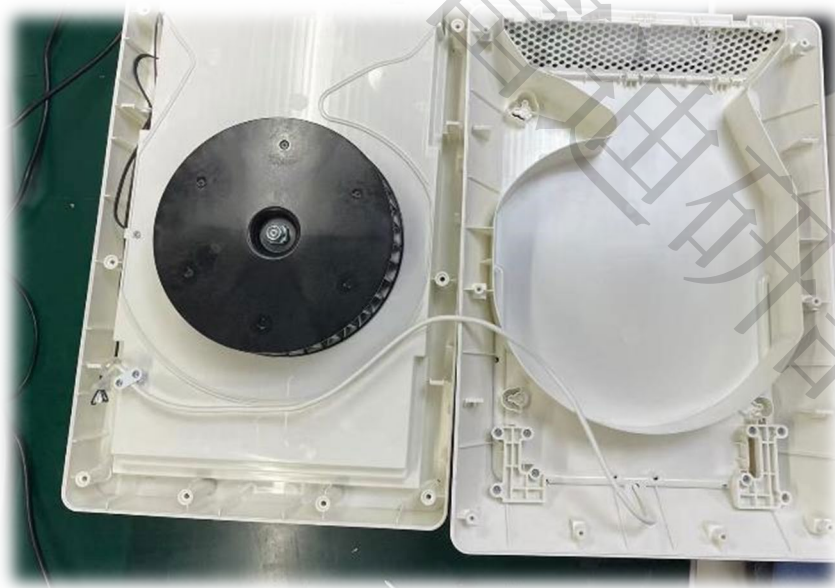


Motor assembly with Chassis



Motor unit

Key Parts disassembly



Chassis-
Front cover

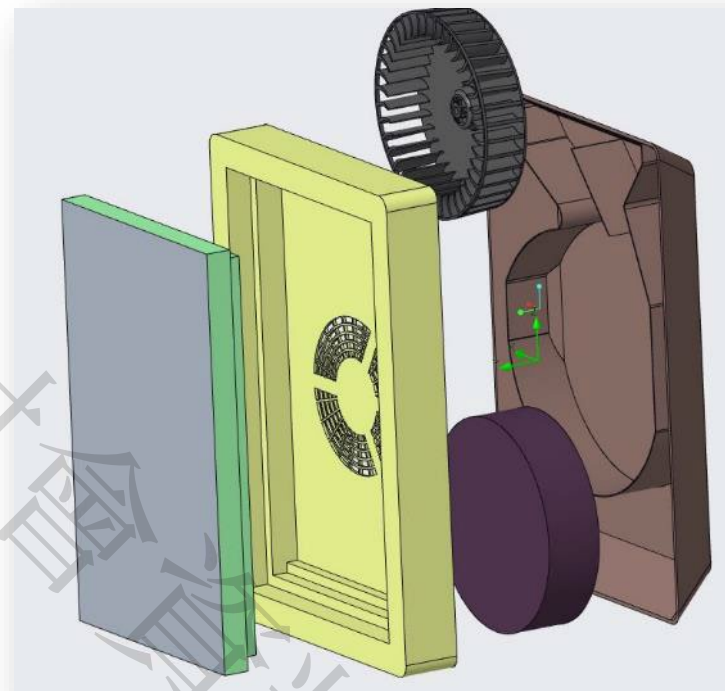
Chassis-
Rear cover



Motor unit

Explosive view & Fan rotation speed

	RPM
Low	387
Medium	882
High	1195



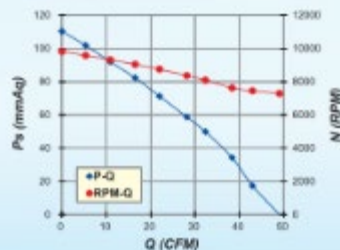
Key parts explosive chart

Wind tunnel

- Based on AMCA 210-07 standard

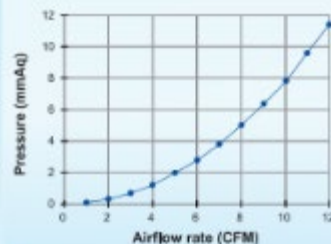
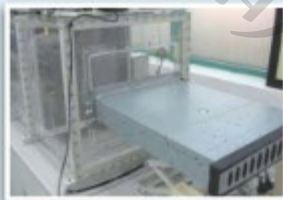
PQ curve

- The fan performance curve with pressure (P) and airflow rate (Q).



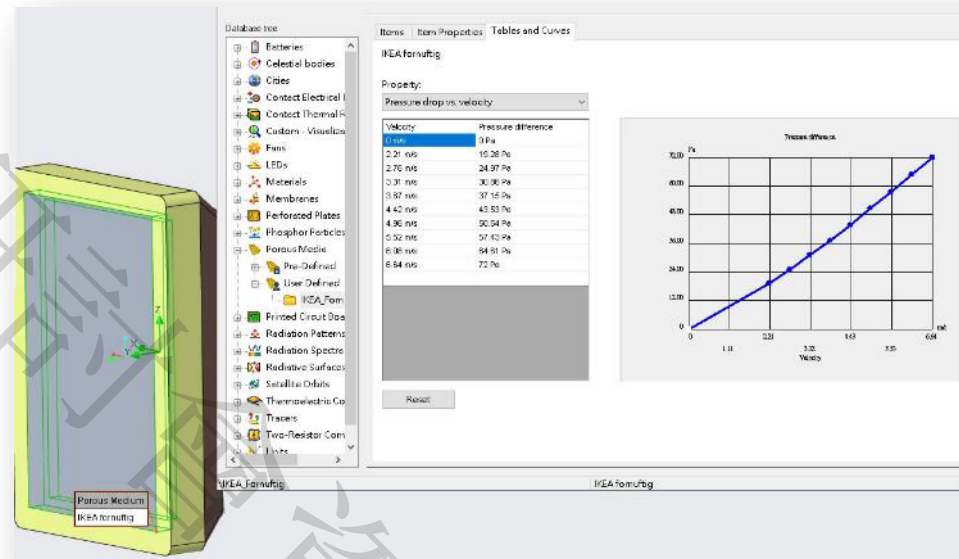
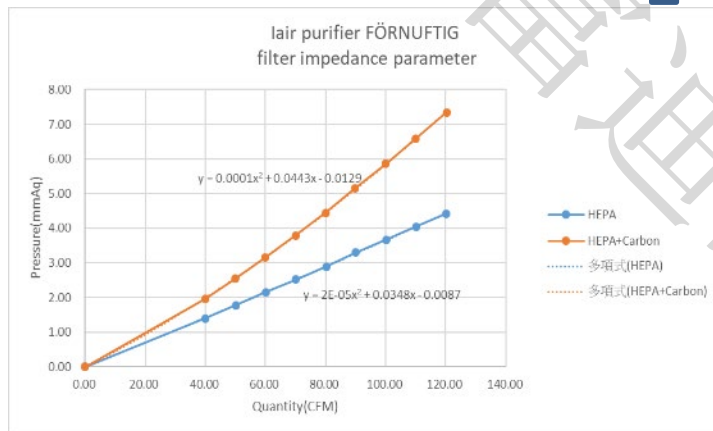
SRC curve

- Applicable to system resistance measurement for PC, Notebook, and server.



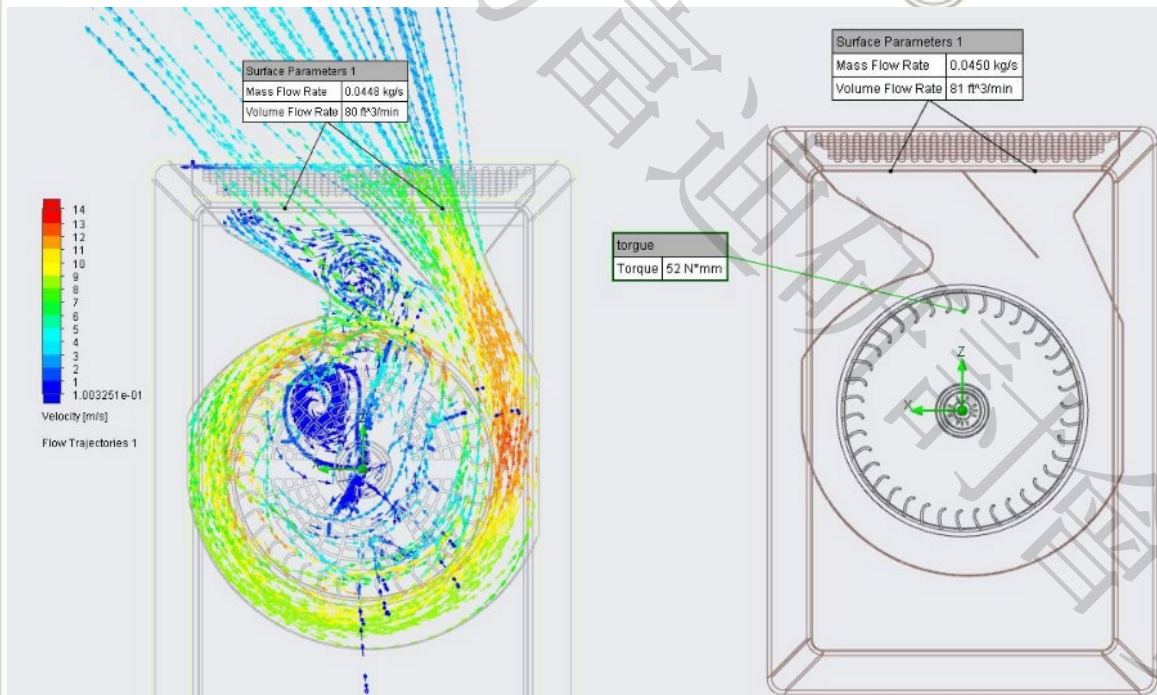
AI智能選擇	
流量	1-900CFM
操作範圍	dp: 結構式差壓測量範圍 127mmAq
	PS1: 靜壓測量範圍 25.4mmAq
	PS2: 靜壓測量範圍 101.6mmAq
	PS3: 靜壓測量範圍 254mmAq
測試項目	設計標準
	AMCA 210 Fig.12/ Fig.15
	測試項目
最大測試物開口	AC Fan PQ, SRC/DC Fan PQ, SRC
	25 * 25 (CM)
	重量
機構	700Kg
	機構尺寸
	4.0 * 1.0 * 1.7 (M)
電源系統	箱體材質
	Painted Stainless Steel
	輔助風機
控制系統	AC 220V, 單相, 15A
	控制系統電源
	AC 220V, 單相, 10A
輸出格式	控制方式
	PC Base/Manual
輸出格式	
HTML/XML/PDF	

Wind tunnel parameter transformation



Transfer measurement result to CFD parameter

Flow Dynamics

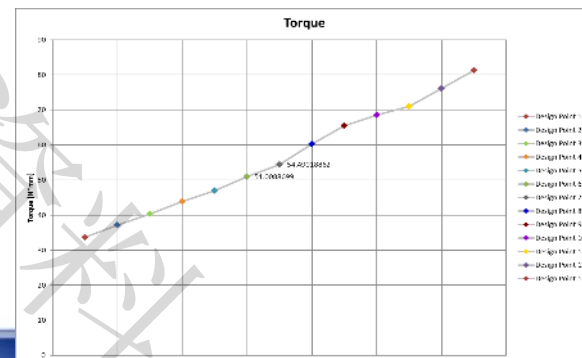


Requirement

120m³/h(Particle, according to GB/T18801-2015)
40m³/h(Formaldehyde, according to GB/T18801-2015)
Tolerance:-10%

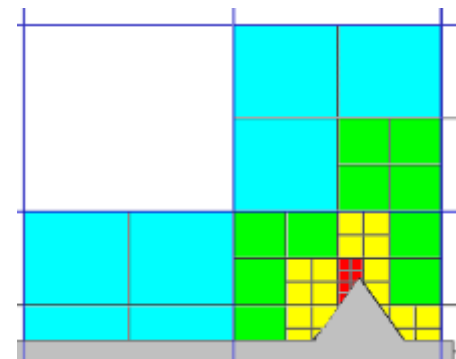
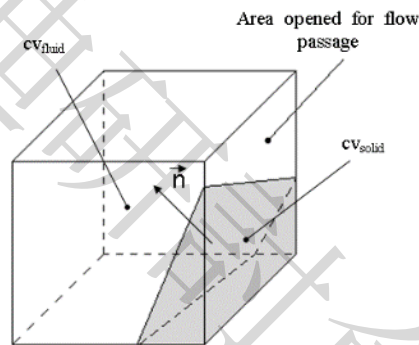
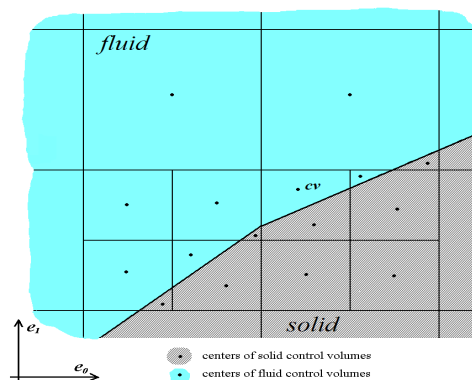
57.3CFM (Smoke according to AHAM)
66.1CFM (Dust according to AHAM)
82.7CFM (Pollen according to AHAM)
Tolerance:-10%

Real blade shape @ 1195 rpm
Out come air flow: 81 CFM
Out come : Torque=52 N*mm



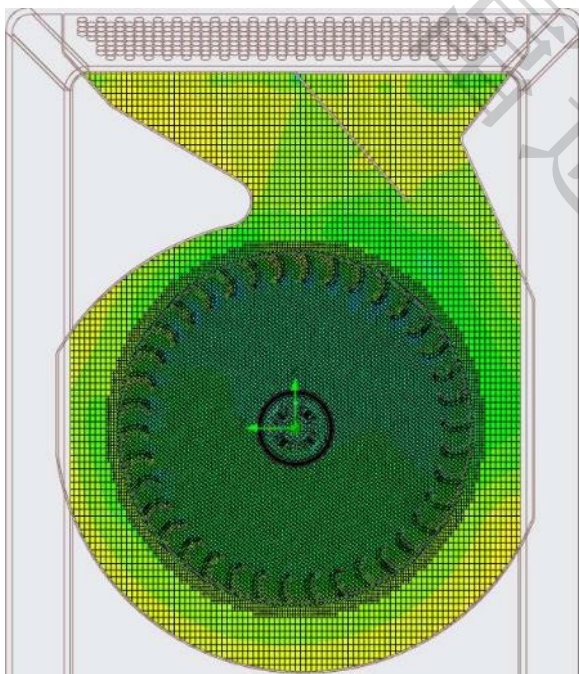
FLOEFD Mesh = Rectangular Polyhedron Hybrid

- Rectangular grid plus polyhedrons near boundaries
- Refinement that splits “parent” parallelepipeds into 8 “daughter” parallelepipeds



- Polyhedrons near boundary allow treating the geometry in a highly accurate way (surface in cv is presented by sets of connected polygons, and BL uses even its curvature)
- Grid ordering is intensively used for memory and calculation optimizations
- **Octree** refinement facilitates robust and effective multigrid solver technology – one of reason why FLOEFD solver is robust

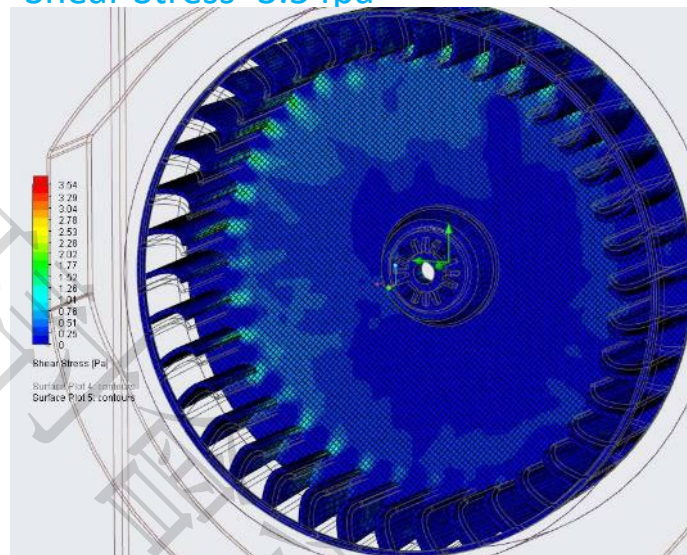
Flow dynamic



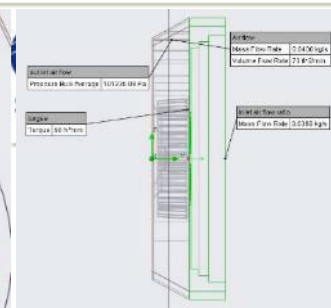
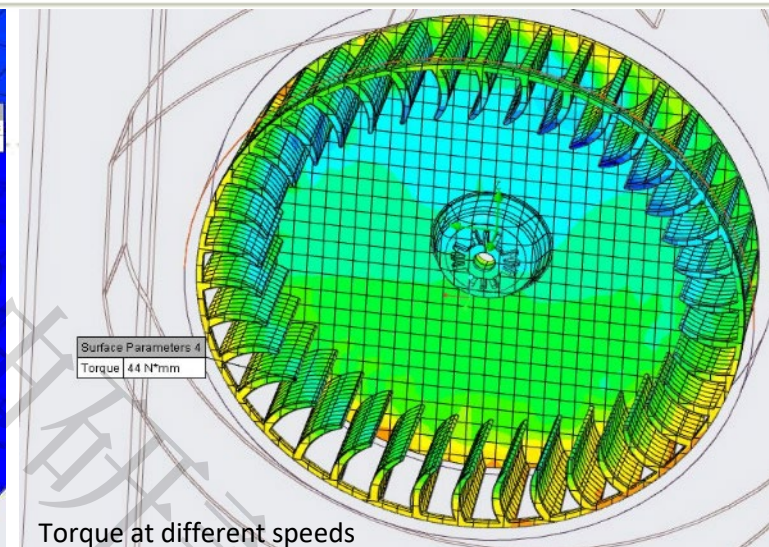
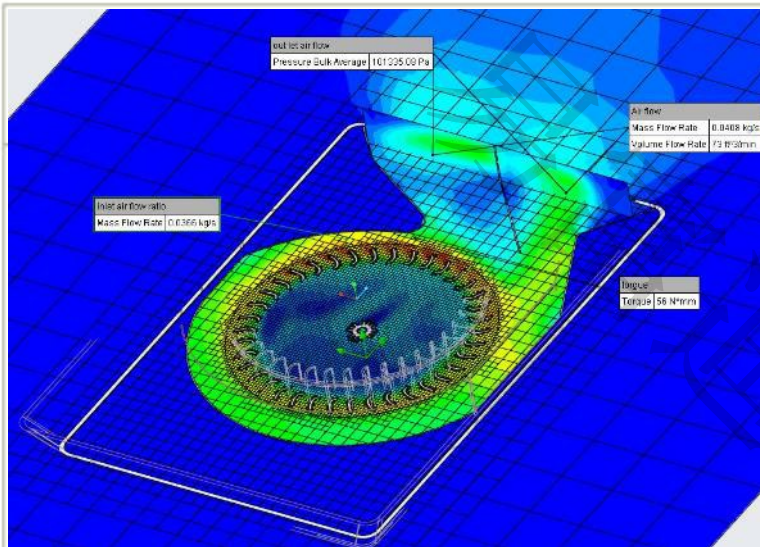
“Partial Cell”
for flow dynamic analysis

Using Flow dynamic analysis can take

Shear Stress=3.54pa



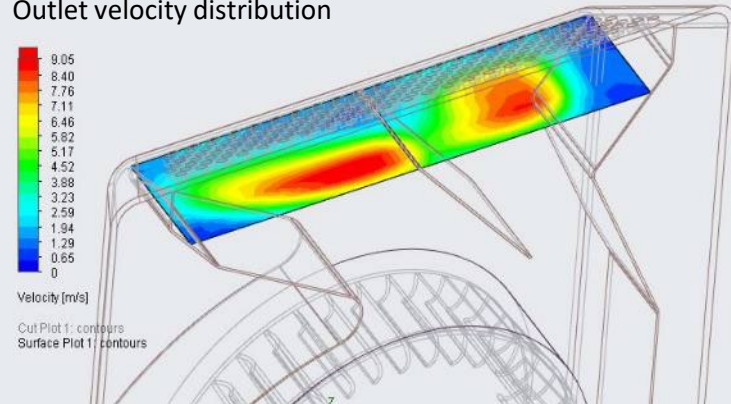
流體運動時，因流向橫斷面(cross section)上有流速的差異而發生的剪力效應，以單位面積所受的剪力表現之，稱為**剪應力**。剪應力之發生，有因流體分子黏性而存在者，稱為**黏性剪應力**，表為 $\tau_l = \mu_l du/dy$ ；有因亂流之擾動，產生橫斷面上有流向的動量的傳輸而表現出來的剪力效應，稱亂流雷諾茲應力(turbulent Reynolds shear stress)



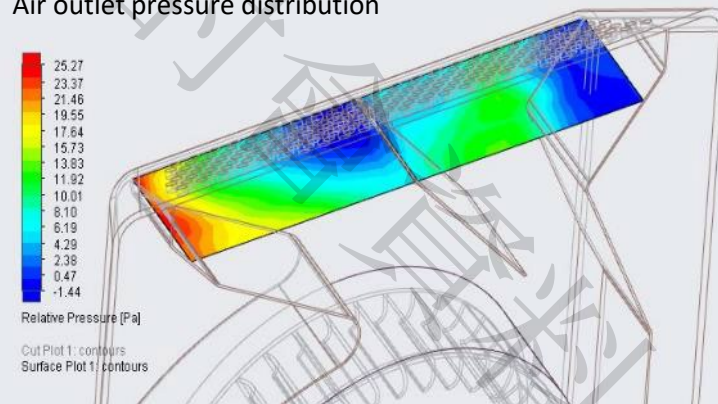
Section view

Torque at different speeds

Outlet velocity distribution

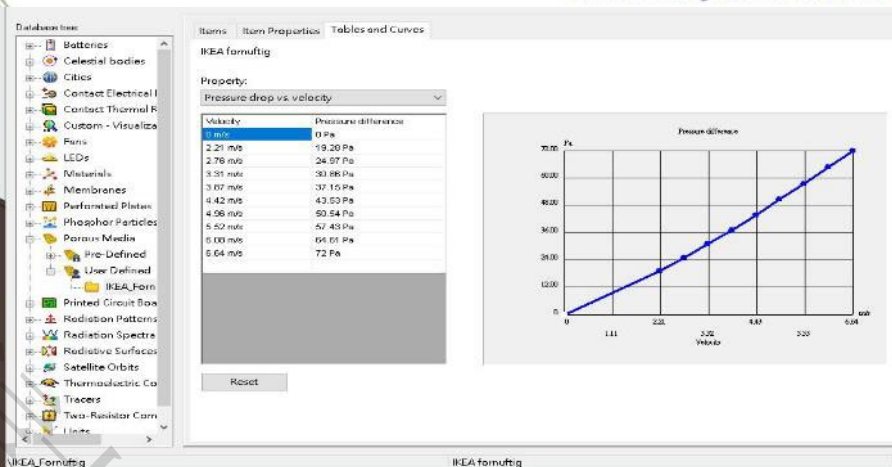
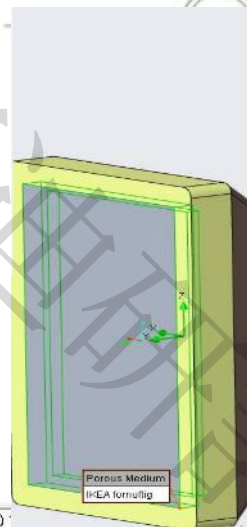
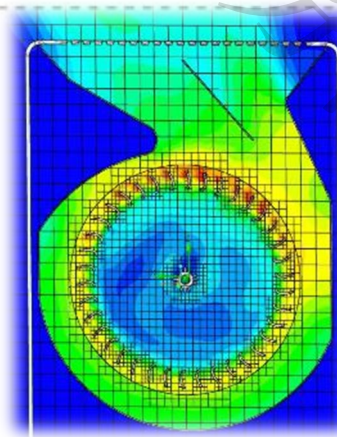


Air outlet pressure distribution



Obtain a variety of numerical parameters

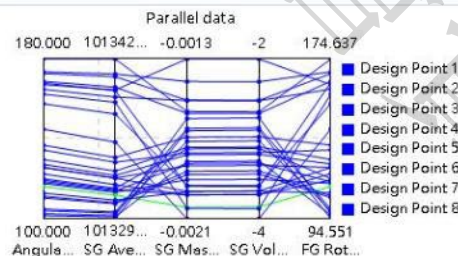
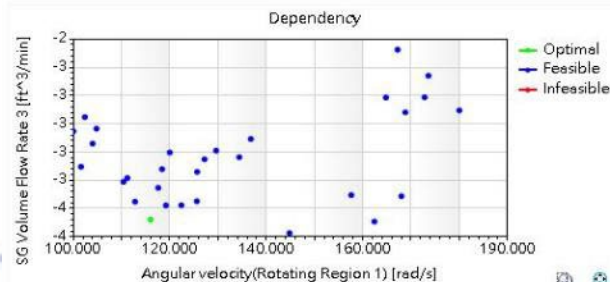
Powerful database & Heeds optimize function



Multiparameter Optimization (HEEDS) 1

Multiparameter Optimization (HEEDS) 1

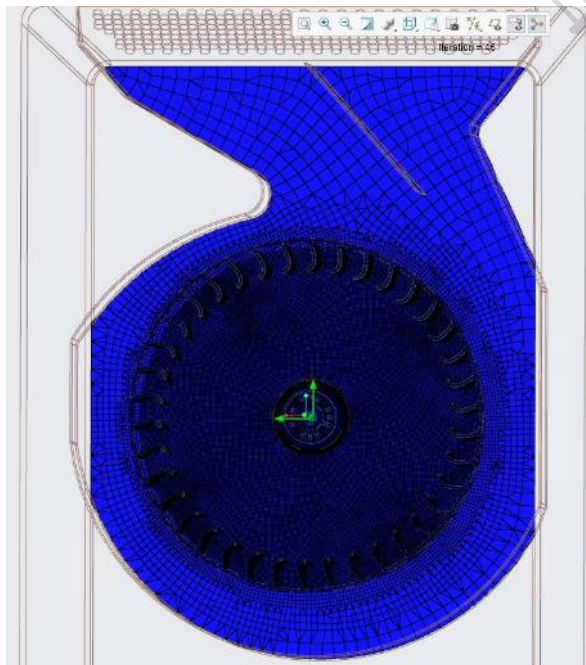
Input Variables Output Parameters Scenario Study Plots Results Summary Goals Mesh 1 Cut Plot 1 Cut Plot 2 Surface Plot 1 Flow



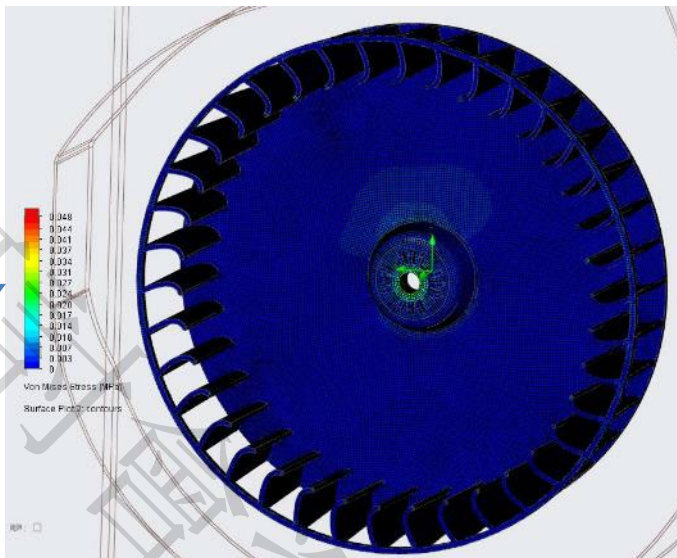
Using Heeds Optimized CFD module to find the accurate speed (RPM) and air output (CFM) of Air purifier

Structural mechanics

“Hexahedral mesh”
for structure analysis

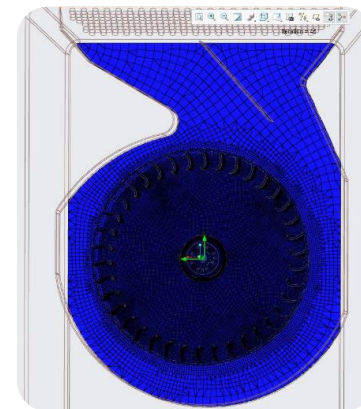
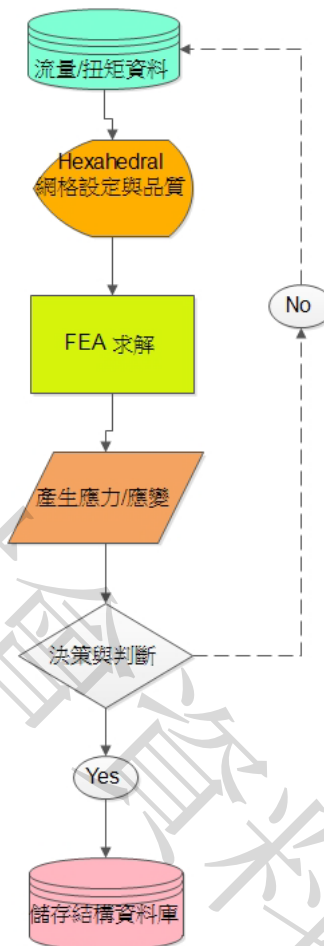
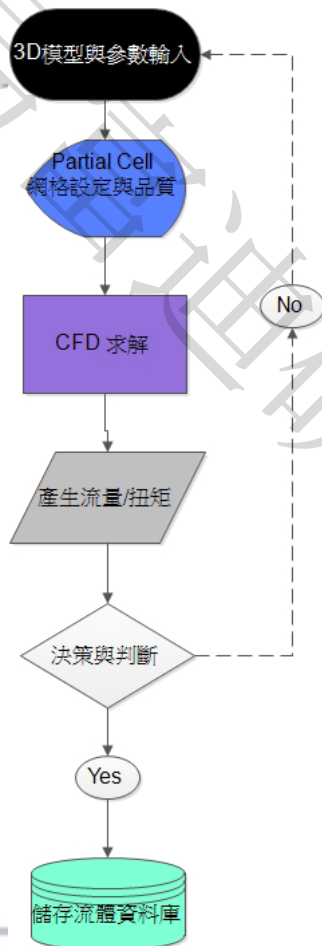
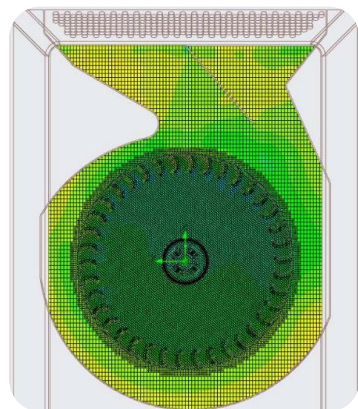


Stress concentration distribution area



1. Torque = 52 N*mm & 81 CFM is derived from the **actual shape** of the blade through **Flow analysis**.
2. Using **Stress analysis** for Blade's Von Mises Stress=0.048Mpa

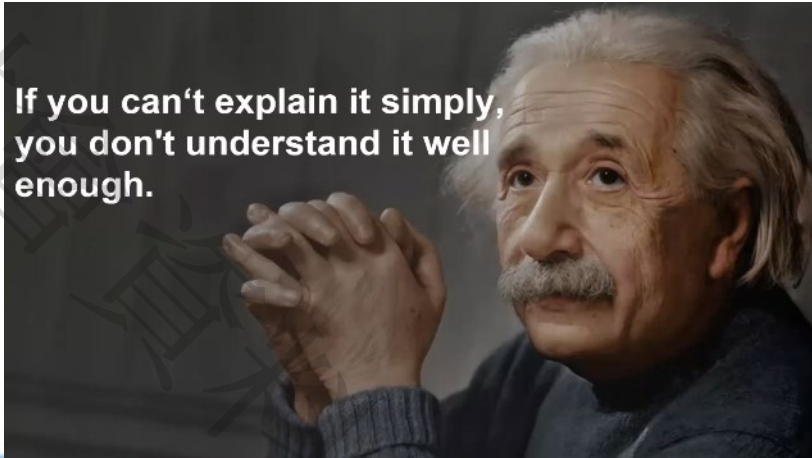
Analysis Process



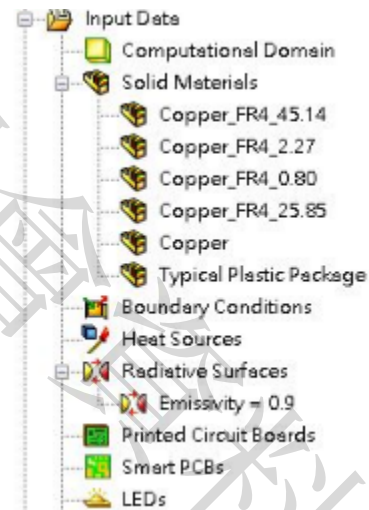
Summary

- FloEFD can provide unlimited possibilities for product planning, enhance the impression of customer proposals, design quality and risk assessment capabilities
- Good software providers can only accelerate the learning curve of the software, but the choice of quality suppliers with technical depth can accelerate the commercialization of products.

FloEFD™
for
PTC CREO

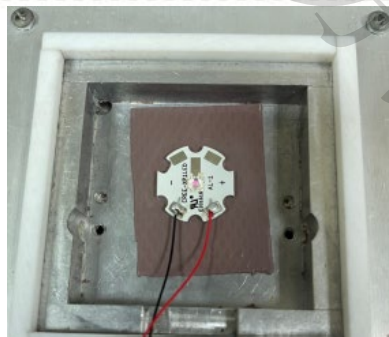


If you can't explain it simply,
you don't understand it well
enough.

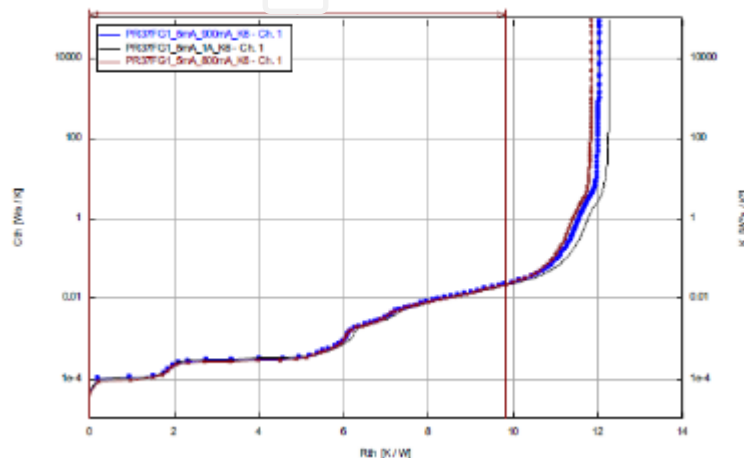


Layers	
top	
地線層	
l2_gnd	
地線層_1	
l3_vcc	
地線層_2	
bottom	
Components	
Active Components	
J1 [FPC-34P-19_0X3]	0 W
LED19 [LED-3_7X3_]	0 W
LED20 [LED-3_7X3_]	0 W
LED21 [LED-3_7X3_]	0 W
LED22 [LED-3_7X3_]	0 W
LED23 [LED-3_7X3_]	0 W
LED24 [LED-3_7X3_]	0 W
PAD1 [DOME5_0M]	0 W
PAD2 [DOME5_0M]	0 W
PAD3 [DOME5_0M]	0 W
PAD4 [DOME5_0M]	0 W

T3Ster (Thermal Transient Tester) - 暫態熱阻量測系統



T3Ster Master structure function(s)



JEDEC 自然對流腔體



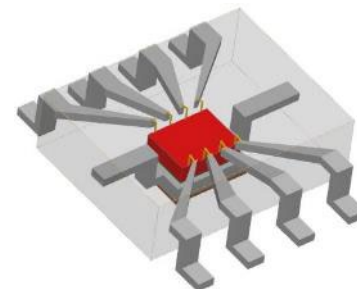
PELUS 恆溫控制裝置

應用範圍包括：

- 重建的熱流路徑
- 晶粒安裝品質
- 堆疊晶片封裝
- Power LED 特性
- 確定材料屬性
- 驗證熱模型
- 現場非破壞性故障分析
- 通過迴圈提供功率和結構函數分析，進行可靠性測試
- 應用環境中對現有系統內器件的熱測試



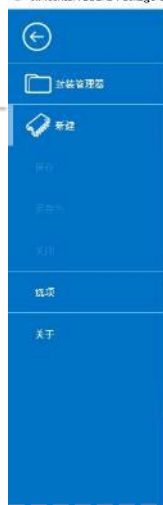
- Integral Structure Function@ 25 °C
- Use TDI Method (different Thermal PAD) , JESD 51-14
- Rthjc = ??? C/W



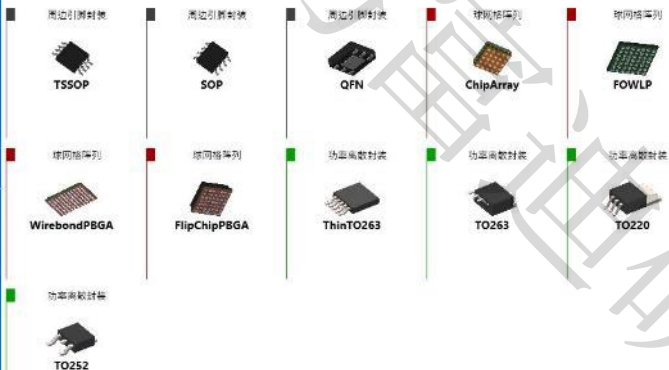
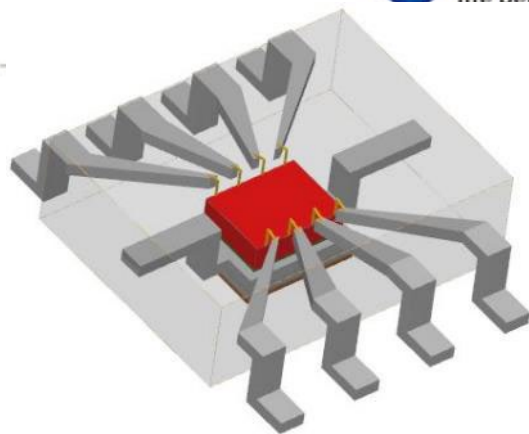
Items		Item Properties	Tables and Curves
Property	Value		
Name	Battery with real coefficients (Y)		
Comments	For Testing		
Density	2750 kg/m³		
Specific heat	823 J/(kg*K)		
Conductivity type	Orthotropic		
Thermal conductivity in X	28.05 W/(m*K)		
Thermal conductivity in Y	3.4 W/(m*K)		
Thermal conductivity in Z	28.05 W/(m*K)		
Electrical conductivity in X	Conductor		
Resistivity in X	7e-08 Ohm*m		
Electrical conductivity in Y	Conductor		
Resistivity in Y	7e-08 Ohm*m		
Electrical conductivity in Z	Conductor		
Resistivity in Z	7e-08 Ohm*m		
Radiation properties			
Sorption properties			
Melting temperature	☒ 1728.15 K		
Temperature	☐		
Elastic properties			



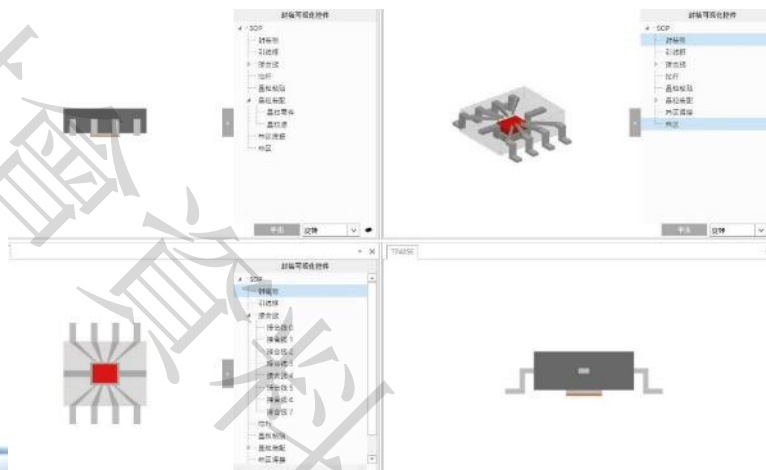
FLOEFD Package Creator



新建封装 选择起始模板


 远端模板
 全部


设计名称	SOP-8		✓
外形类型	标准外形		✓
Jedec 覆盖范围	3.81x4.93mm		✓
Jedec 引线	8		✓
热功率	1.4100	W	✓
晶粒长度	1.4790	mm	✓
晶粒宽度	1.1430	mm	✓
外露焊盘	☒		✓
引线框材料	基于合金 42		✓



Thank You!!