THERMAL MANAGEMENT

BY

STELIAU
TECHNOLOGY

Introduction of the offer services and solutions.....

Fully understand the sales approach. .....

Identify potential customer.....

Initiate action plan/strategy per account / sector.....

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TURNOVER

Creation of Steliau Technology
2018

36 M€
2020

TARGET 2021
85 M€

Acquisition of the Italian company Special-Ind.
(Distributor of electronic components)

SPECIAL·IND EUROPE
special products for industry

More than 100 M€
2023

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AN INCOMPARABLE **PRODUCT COVERAGE**

ELECTRONIC COMPONENTS

STELIAU TECHNOLOGY

AUDIOVISUAL SOLUTIONS

STELIAU TECHNOLOGY

CONNECTIVITY & IOT

SPECIAL·IND EUROPE special products for industry

STELIAU TECHNOLOGY

THERMAL

SPECIAL·IND EUROPE special products for industry

STELIAU TECHNOLOGY

ENERGY CONVERSION

SPECIAL·IND EUROPE special products for industry

STELIAU TECHNOLOGY

DISPLAYS & TOUCHSCREEN SOLUTIONS

STELIAU TECHNOLOGY

MECHANIC & EMI

SPECIAL·IND EUROPE special products for industry

STELIAU TECHNOLOGY

EMBEDDED SYSTEMS

SPECIAL·IND EUROPE special products for industry

STELIAU TECHNOLOGY

CONNECTORS & CABLES

(INCLUDING WIRING HARNESSES FOR ELECTRIC VEHICLES)

SPECIAL·IND EUROPE special products for industry

STELIAU TECHNOLOGY

STELIAU TECHNOLOGY

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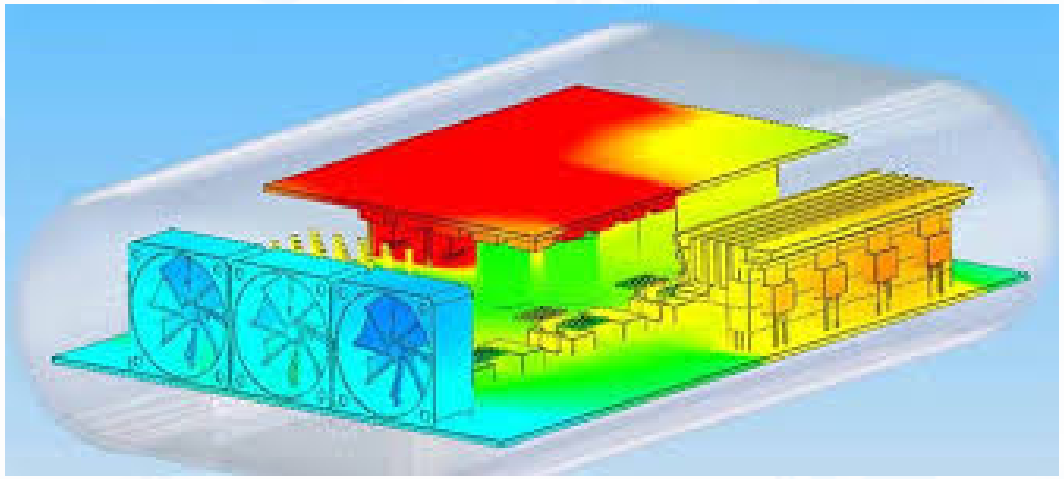
UNIQUE OFFER OF SERVICES AND SOLUTIONS

1. TIM Converting Activities
2. TIM « Thermal Interface Material »
3. Thermal Management Design Support
4. Heat Sink
5. Integration / Assembly services
6. Value Partners



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TIM CONVERTING ACTIVITIES

- Since 1992
- Fully dedicated to Thermal Interface Material
- 280 employees
- 2 production facilities
- Production output approx. 3 million parts per working day
- More than 10,000 active parts
- 2000 references materials in stock
- Widest material selection
- Global Presence Europe and Asia

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STELIAU TECHNOLOGY

GLOBAL PRESENCE

Headquarter and offices

- France
- Italy
- Spain
- Germany
- China
- Taïwan

Production site

- Fresnes (France)
- Dongguan (China)

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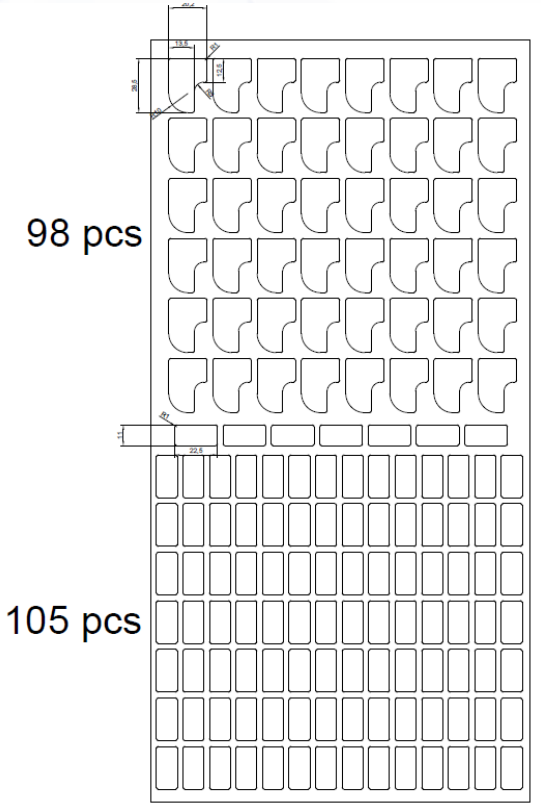
DESIGN SUPPORT

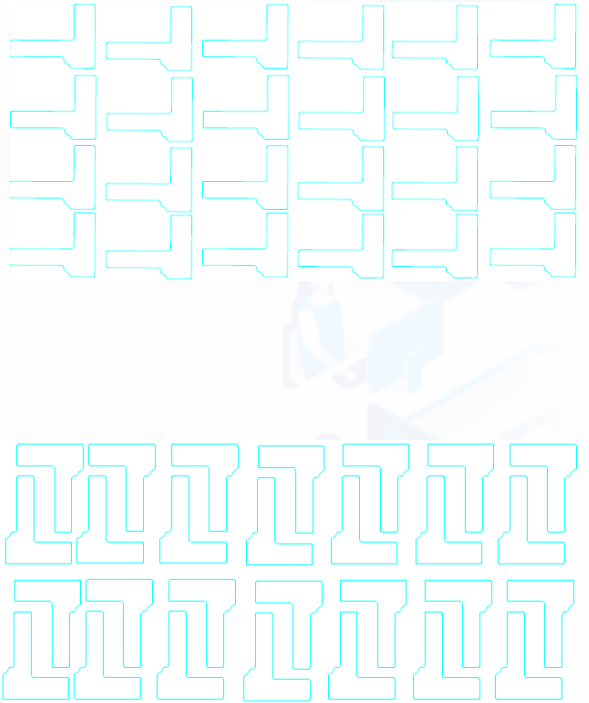
- Custom shape to complex shape capacity
- Optimize precision for each design
- Design layout Optimization
- Custom sheet/roll size
- Technical expert available to help choosing best
- material for each application :
- Phase change material, Gap Pad, Sil Pad,
- Adhesive, grease replacement pad, insulators
- Fast sampling 48H without hard tooling

Exemples of design optimization

- Different designs on the same sheet



- Optimize layout to reduce material usage



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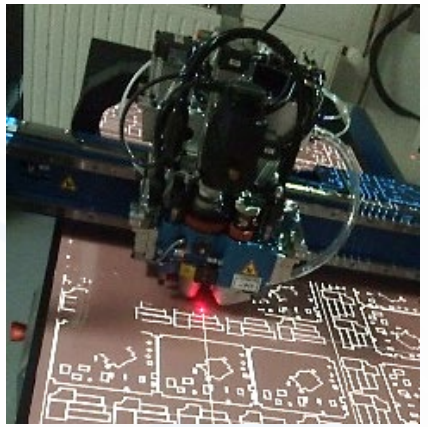
PRODUCTION

Rotary die cutting is die cutting using a cylindrical die on a rotary press

Plotter cutter is like a printer controls a nozzle, the computer controls the movement of a sharp blade over the surface of the material

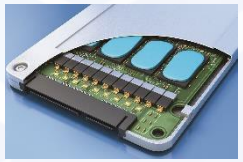


- From 1 to Mpcs
- Convert any Thermal interface interface
- Best practice to preserve the material
- Large capacities

Clamshell platen press

Full sheet cutting die for Clamsheel or clicker press

WIDEST MATERIAL CHOICE



Sil Pad®, Thermal insulation film
Gap Pad®, Thermal pad
Gap Filler®, Thermal liquid
Liqui Bond®, Thermal adhesive
High Flow®, Phase change
Bond Ply®, Thermal adhesive

+ 2000 references materials in stock
Widest material selection
Highest performance available in the market :

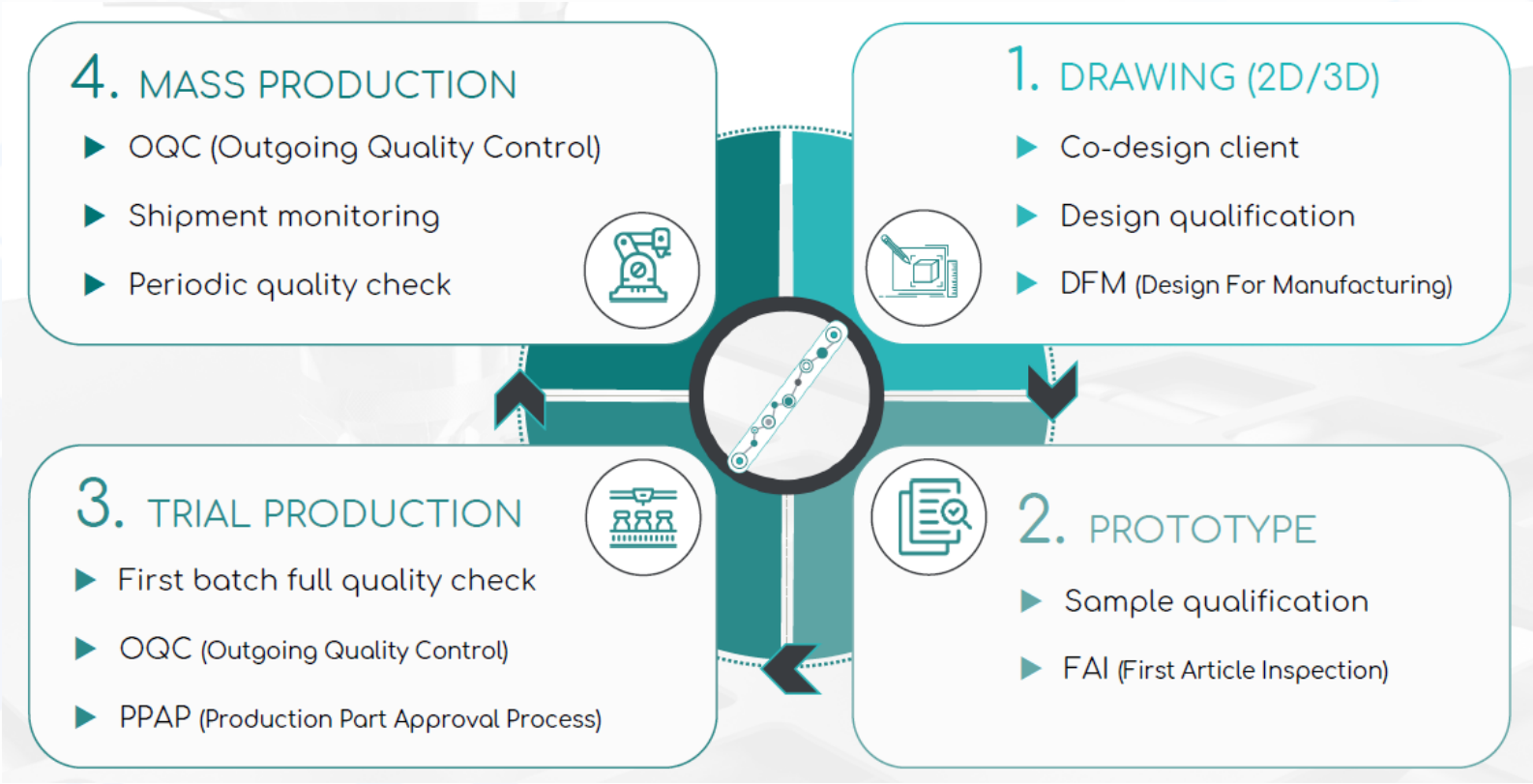
- From 0,88°c/w for a insulator film
- From 0,25°c/w for a non isolated film
- Up to 20W/m-K for a Gap Pad
- Highest conformable pad with 0 shore 00 hardness

BERGQUIST

Henkel

wakefield-vette

QUALITY MANAGEMENT



ISO 9001

IATF 16949

RoHS COMPLIANT

REACH COMPLIANT

UL

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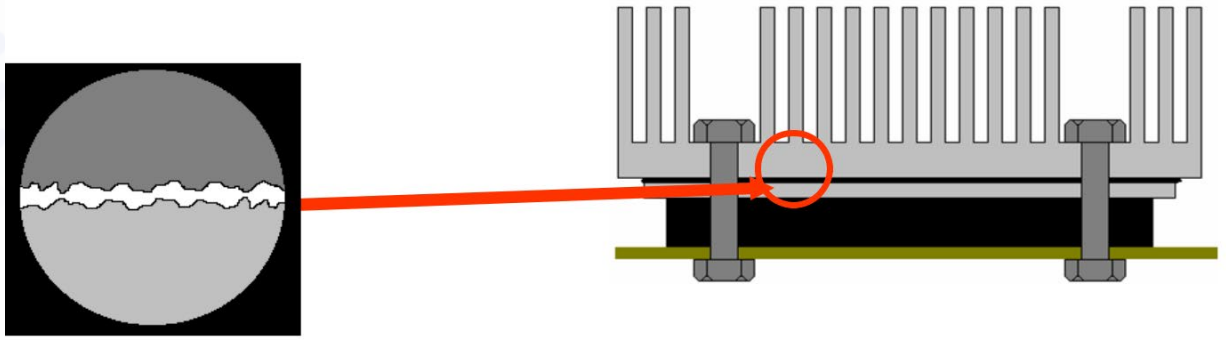
THERMAL INTERFACE MATERIAL

WHY A THERMAL INTERFACE MATERIAL ?

To minimize air-entrapments between two surfaces

Air:	0,025	W/m-K
Polymers:	0,1	W/m-K
Aluminium	~ 150	W/m-K
Copper:	~ 400	W/m-K
Ceramic Fillers:	~1000	W/m-K



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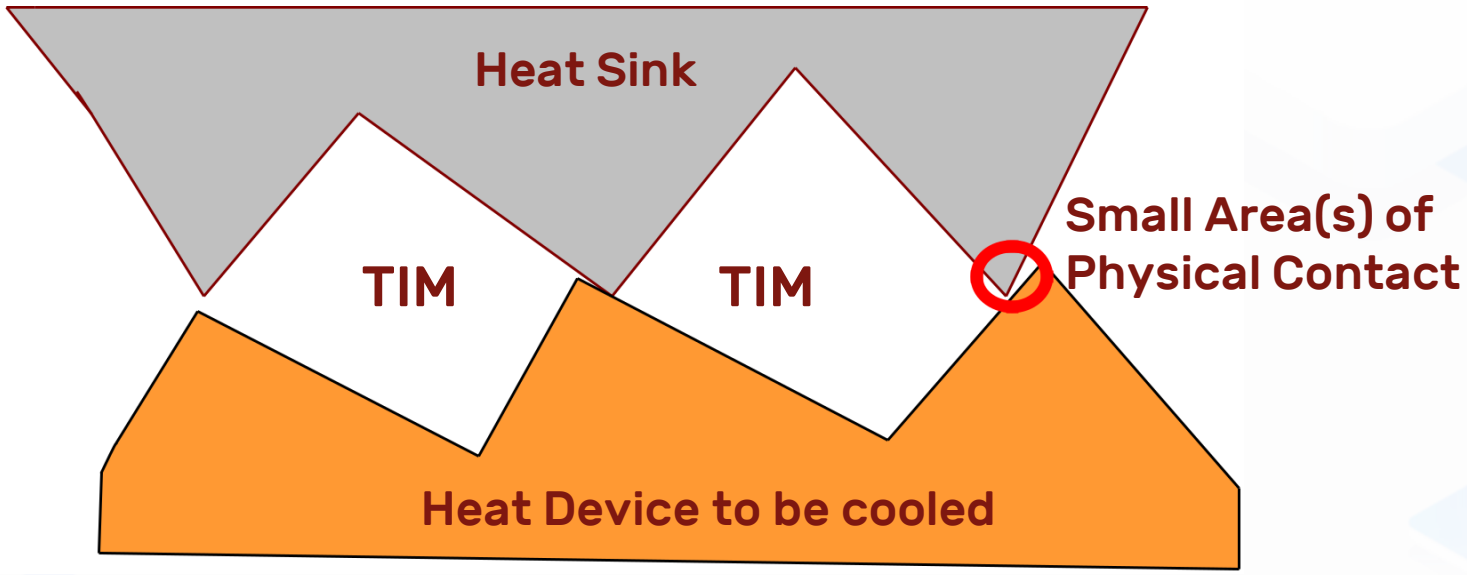
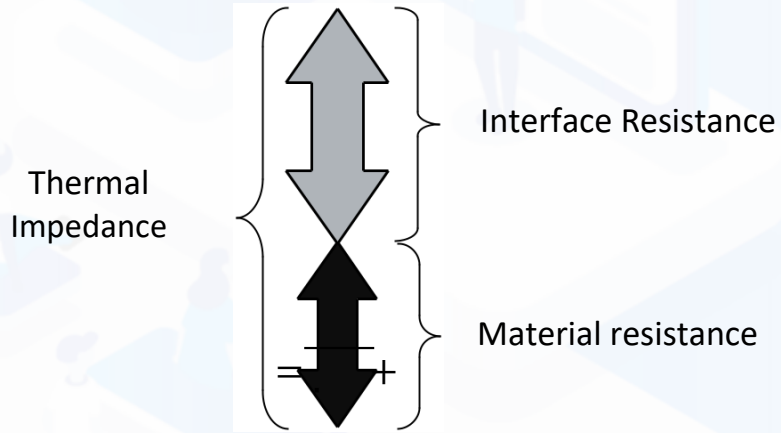
Minimize the microscopic deviation

« AS THIN AS POSSIBLE – AS THICK AS NECESSARY »



THERMAL IMPEDANCE DEPENDING ON :

- Contact pressure
- Surface roughness
- Surface flatness
- Time
- Temperature
- Bon-line thickness (t/k)
- Fillier attributes
- Oh… and thermal conductivity
  - Z = thickness of thermal interface
  - K = thermal conductivity of thermal interface
  - A = area



Zth = Z / k*A + Rth «contact»

STELIAU TECHNOLOGY

TIM

WHICH DATA IS MOST IMPORTANT WHEN CHOOSING A TIM, THERMAL RESISTANCE OR CONDUCTIVITY ?

THERMAL RESISTANCE

Thermal Resistance is the performance of the TIM in a specific application

If the TIM is thin then **thermal resistance** is more important

THERMAL CONDUCTIVITY

Conductivity is a property of the TIM material

If the TIM is thick, then the **thermal conductivity** drives thermal performance.

THERMAL RESISTANCE

Thin Bond Line

THERMAL CONDUCTIVITY

Thick Bond Line

HIGH PERFORMANCE

Thermal grease

Phase Change

MECHANICAL ATTACHMENT

Adhesive Paste

Sil Pad Film

MECHANICAL OFFSET

Gap Filler

THERMAL IMPEDANCE DEPENDING ON :

- Contact pressure
- Surface roughness
- Surface flatness
- Time
- Temperature
- Bon-line thickness (t/k)
- Fillier attributes
- Oh… and thermal conductivity
  - Z = thickness of thermal interface
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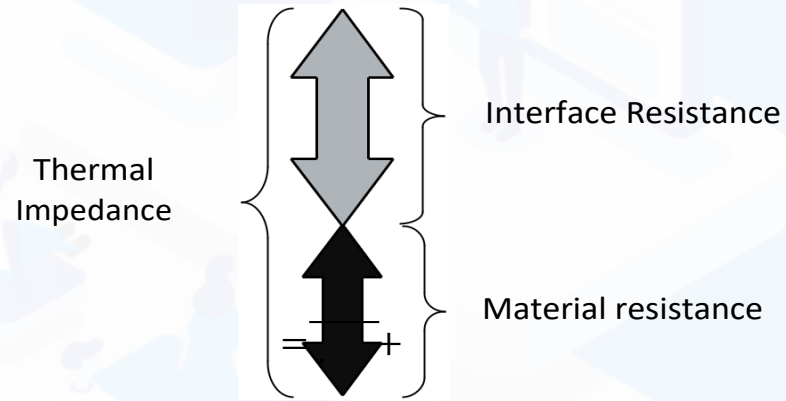

Z = Z / k*A + Rth «contact»

WHAT INFORMATIONS ARE NEEDED TO CHOOSE A TIM ?

- Project datas EAU/SOP sample/proto L/T
- What are the components the TIM is between? « component to cool and the heat sink »
- Components are in contact or there is a Gap to fill?
- How thick is the Gap between component and heat sink? Nominal + tolerance min and max.
- How the component is mount on the heat sink? (screws, clip…)
- Is there a print available and/or dimensions of the TIM?
- What is the total heat/power of the hot component the engineer is trying to cool? (Watts)
- Is there a rth or thermal conductivity value expected from the TIM?
- Is electrical insulation required?

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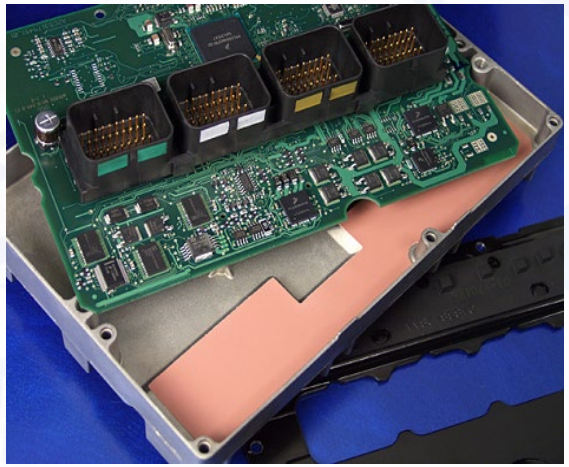
WIDEST RANGE OF THERMAL INTERFACE MATERIALS

Sil-Pad®	Thin Interface Pad Products
Hi-Flow®	Phase Change Pad Materials
Gap Filler	Curable Liquid Gap Filling Materials
Liqui-Form™	Non-Curing Liquid Gap Filling Materials
Gap Pad®	Conformable Gap Filling Pads
Liqui-Bond®	Thermally Conductive Liquid Adhesives
Bond-Ply®	Double-sided Adhesive Tapes & Laminates
TIC™	High Performance Grease

Sil-Pad® Thermal Interface Materials

- **Standard Product Offerings**
  - 0.8 - 3.0 W/m-K Performance Levels
  - Film and Fiberglass Reinforcement
  - Silicone & Non-Silicone Solutions
- **Typical Applications**
  - Applications Requiring High Dielectric Strength
  - Interface Components & Heat-sink
- **Design Considerations**
  - Requires Firm Pressure
- **Future Trends**
  - Higher thermal conductivity
  - Improved wet-out



INSULATED FILMS

Material	TO-220 Thermals (°C/W) @ 50 PSI	Thickness (inch)	Thermal Conductivity (W/m-K)	Voltage Breakdown
Sil-Pad 1500ST	**1.51**	**0.008**	**1.8**	**3000**
Sil-Pad A2000	1.86	0.015	3.0	4000
PR-27	**2.01**	**0.006**	**1.8**	**8000**
SH-3000	**2.02**	**0.015**	**3.0**	**5500**
Sil-Pad A1500	2.21	0.010	2.0	4000
Sil-Pad 1200	2.41	0.009	1.8	6000
Sil-Pad 800	2.45	0.005	1.6	2000
Sil-Pad 900S	**2.50**	**0.009**	**1.6**	**4500**
Sil-Pad 1100ST	2.68	0.012	1.1	3000
Sil-Pad K-6	2.76	0.006	1.1	6000
Sil-Pad K-4	3.13	0.006	0.9	6000
Sil-Pad 980	4.52	0.009	1.2	4000
Sil-Pad 400	5.14	0.007	0.9	3500

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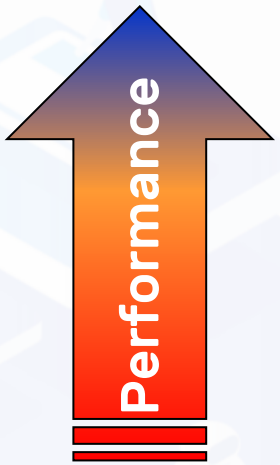
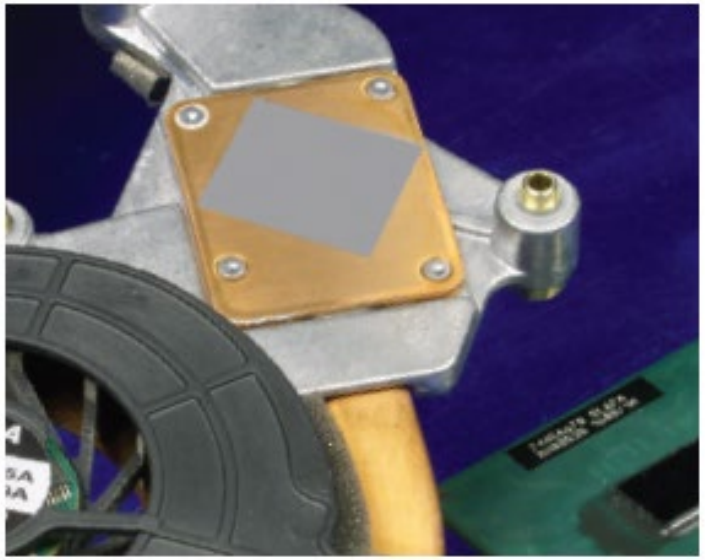
NON ELECTRICALLY ISOLATING FILMS



Material	TO-220 Thermals (°C/W) @ 50 PSI	Thickness (inch)	Thermal Conductivity (W/m-K)
Q-Pad II	1.23	0.006	2.5
Q-Pad 3	**1.76**	**0.005**	**2.0**

PHASE CHANGEMENT MATERIAL

- **Standard Product Offerings**
  - 1.0 – 4.0 W/m-K
  - Hi-Flow® Phase Change Materials
  - TIC® Thermal Greases
- **Typical Applications**
  - High Performance Computing
- **Design Considerations**
  - Assembly Process: Screen, Stencil, Pad Placement
  - Isolation Requirements
- **Future Trends**
  - Curable Materials for Maximum Reliability
  - Low Volatility



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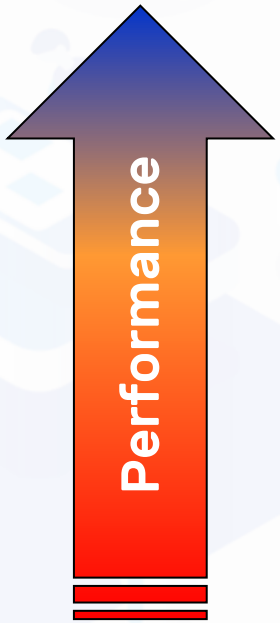
HIGH FLOW NON ISOLATED



Material	TO-220 Thermals (°C/W) @ 50 PSI	Thickness (inch)	Thermal Conductivity (W/m-K)
565U	**0.25**	**0.01**	**3.5**
565UT	0.34	0.005	3.0
225U	0.39	0.0015	1.0
225UT	0.46	0.003	0.7
225F-AC	**0.57**	**0.004**	**1.0**

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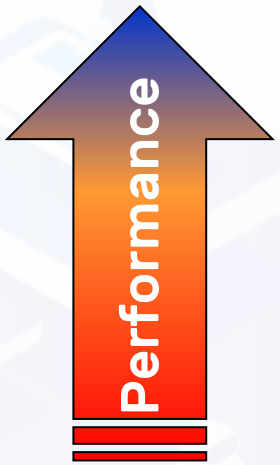
HIGH FLOW ISOLATED

Material	TO-220 Thermals (°C/W) @ 50 PSI	Thickness (inch)	Thermal Conductivity (W/m-K)	Dielectric Voltage (VAC)
300G	0.88	0.005	1.6	300
300P	0.92	0.004	1.6	5000
650P	**1.11**	**0.0045**	**1.5**	**5000**
625	2.0	0.005	0.5	4000

NON ELECTRICALLY ISOLATING FILMS



Material	TO-220 Thermals (°C/W) @ 50 PSI	Thickness (inch)	Thermal Conductivity (W/m-K)
Q-Pad II	1.23	0.006	2.5
Q-Pad 3	**1.76**	**0.005**	**2.0**

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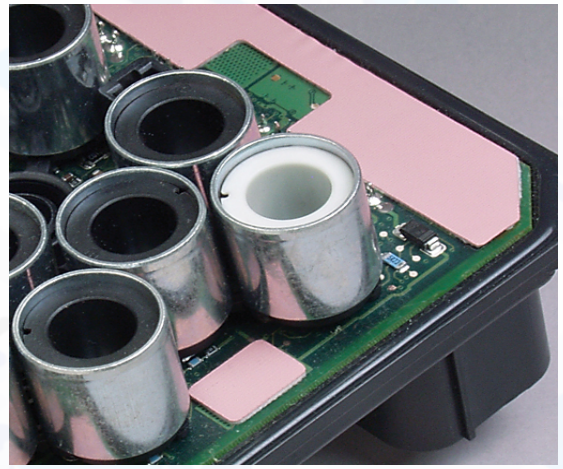
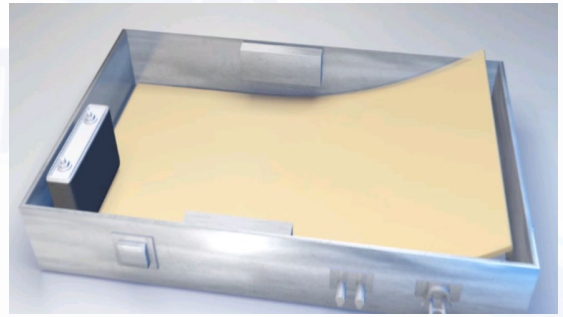
GAP PAD

- **Standard Product Offerings**
  - 0.8 – 20.0 W/m-K Performance Levels
  - Thickness up to 6.5 mm
  - Silicone & Non-Silicone Based
- **Typical Applications**
  - Thick Gap - Mixed Topography
  - Power Storage
- **Design Considerations**
  - Thermal Conductivity
  - Modulus Target
- **Future Trends**
  - Ultra Low Modulus
  - Very High Thermal Performance
  - EMI absorbing combination Pad





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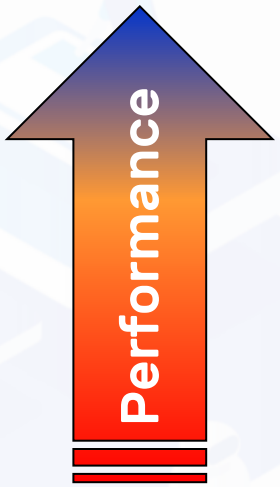

Material	Thickness Range (mil)	Youngs Modules (psi)	Thermal Conductivity (W/m-K)	Voltage Breakdown
S282	**20 to 300**	**20**	**1,7**	**5000**
Gap-Pad VO Ultimate	20 to 125	13	1.3	6000
Gap-Pad VO Ultra Soft	**20 to 250**	**8**	**1.0**	**6000**
Gap-Pad VO Soft	20 to 200	40	0.8	6000
Gap-Pad VO	20 to 250	100	0.8	6000
Gap-Pad 1000 HD	20 to 125	60	1.0	10000

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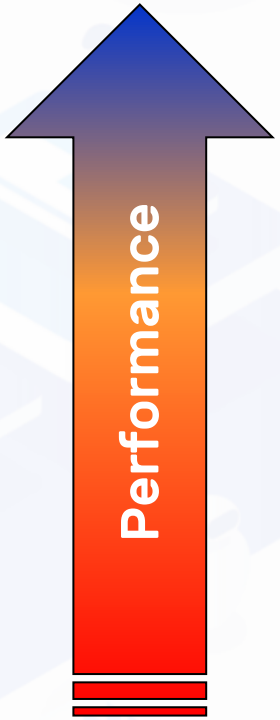

Material	Thickness Range (mil)	Youngs Modules (psi)	Thermal Conductivity (W/m-K)	Voltage Breakdown
TWORK 9000	20 to 300	40	20.0	4000
TWORK 8000	20 to 300	40	15.0	4000
Gap-Pad 12000ULM	20 to 125	15	12.0	6000
TTOP81	20 to 300	35	8,0	5000
Gap-Pad 7000ULM	20 to 125	22	7,0	5000
PK605	20 to 300	30	6.0	5000
Gap-Pad HC5.0	20 to 125	18	5.0	5000
PK404	20 to 300	25	4.0	5000
Gap-Pad 3500ULM	20 to 125	4	3.5	5000

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THERMAL CONDUCTIVE PUTTY

Standard Product Offerings

- 1.0 – 8.0 W/m-K Performance Levels
- Gap Filler Two-Part Curable Materials
- Liqui-Form® One-Part Pre-Cured Materials
- Silicone and Non-Silicone Solutions

Typical Applications

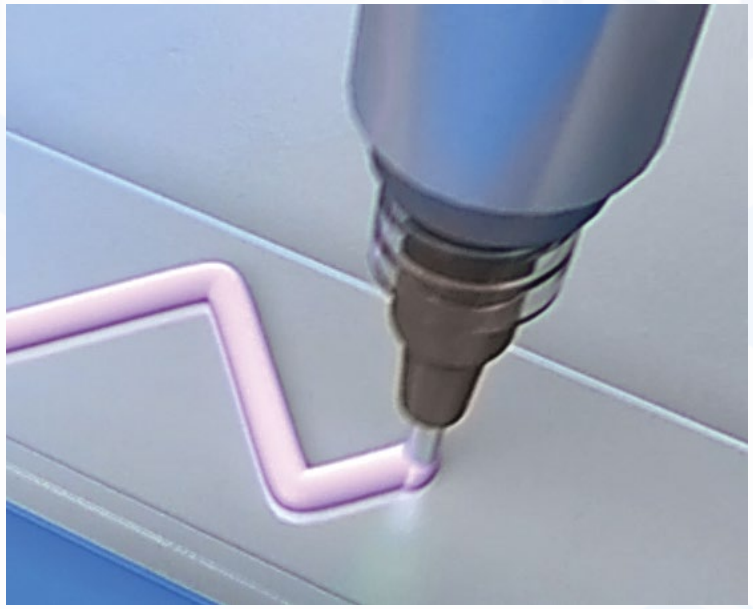
- High Volume

Design Considerations

- Dispensing Equipment

Future Trends

- Low Volatility
- Higher Performance Levels
- Softer / Reworkable



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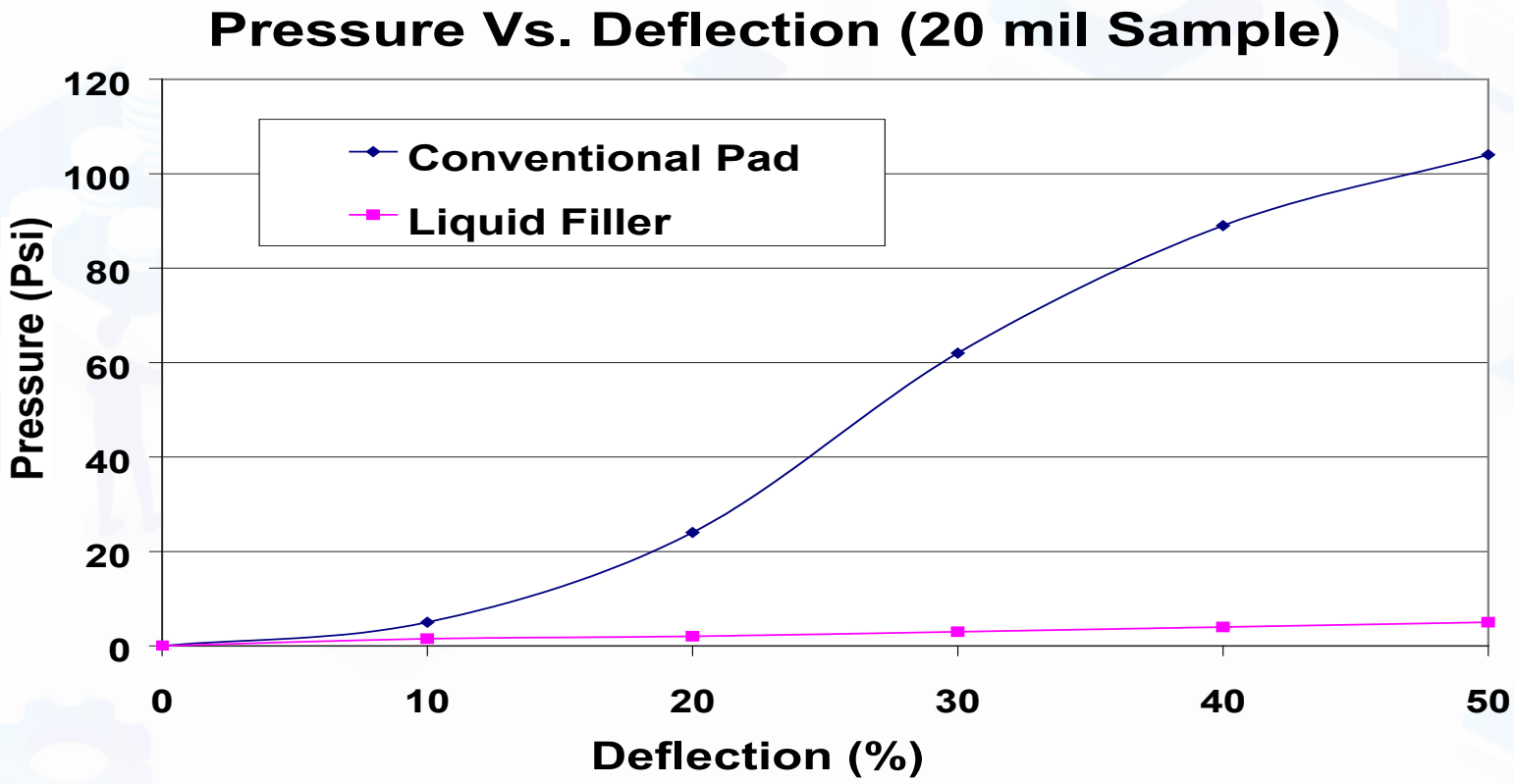
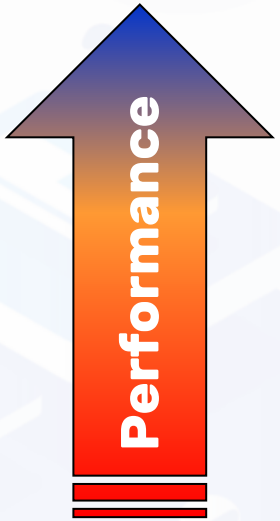
SELECTION CRITERIA THERMAL PUTTY

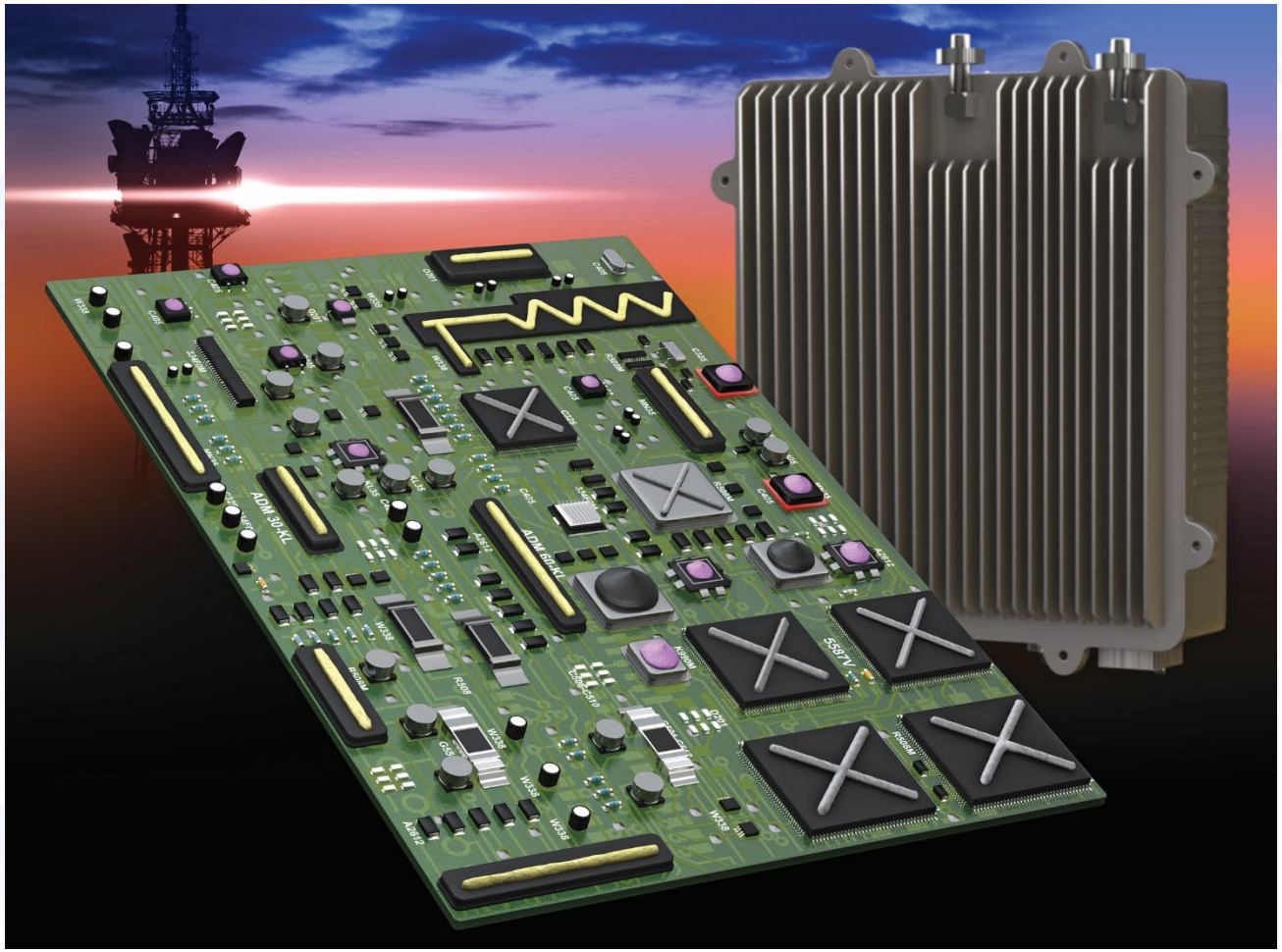


THERMAL PUTTY



Material	Thickness Range um	Part	Thermal Conductivity (W/m-K)	Voltage Breakdown (KV/mm)
SHPUTTY 3	**100 to 3000**	**1**	**8.0**	**7500**
SPUTTY	100 to 1500	1	3.5	7500
Gap Filler 3500S35	**200 to 3000**	**2**	**3.5**	**7000**
Gap Filler 1500	200 to 6000	2	1,8	10000

THERMAL CONDUCTIVE PUTTY



FOCUS THERMAL PAD, WIDE FIELD

- Automotive
- Controller
- Drives
- Health-Care
- Lightning
- Renewable Energy « Converter/Inverter »
- Power Modules / Power Supplies
- Embedded Systems
- Telecom
- Test Equipment
- Broadcasting Communication

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THERMAL PAD APPLICATIONS

SEGMENT POWER

POWER SUPPLY

DC/DC CONVERTER

BATTERY CHARGER

UPS

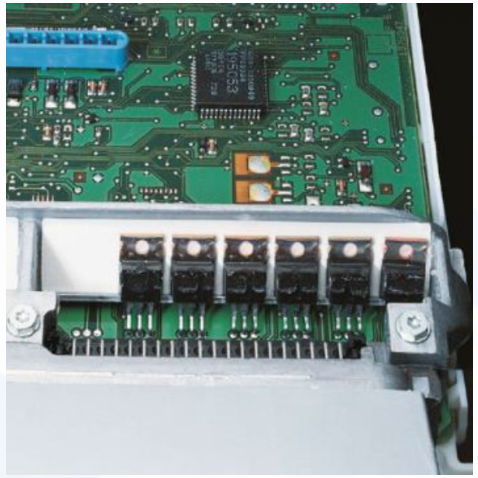
WELDING MACHINE

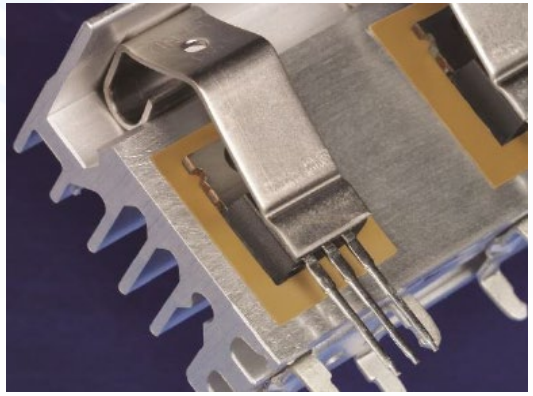
INDUCTIVE COOKING

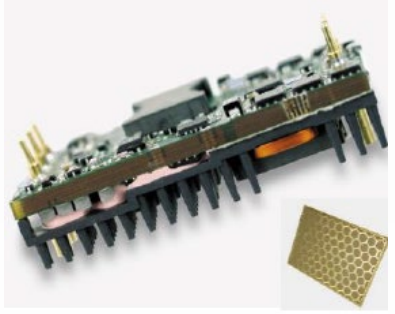
PUMP

EV

COOL : TO220 / TO247 / D2PACK / DIODE / MAGNETICS/ POWER MODULE







THERMAL PAD APPLICATIONS

SEGMENT DEFENSE
AEROSPACE / TELECOM

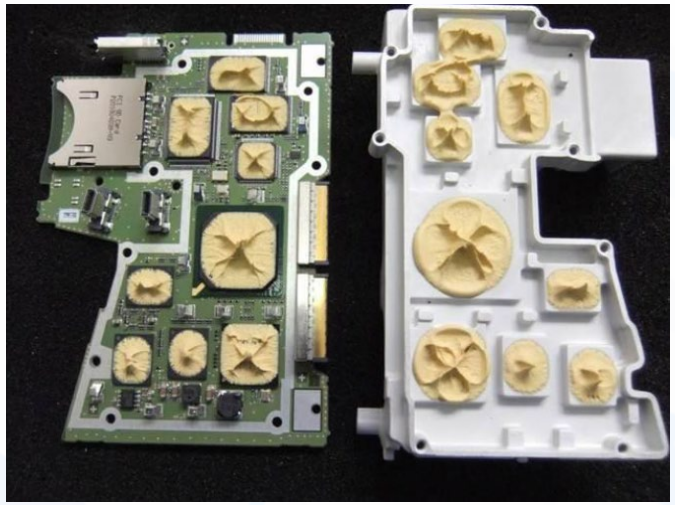
POWER SUPPLY

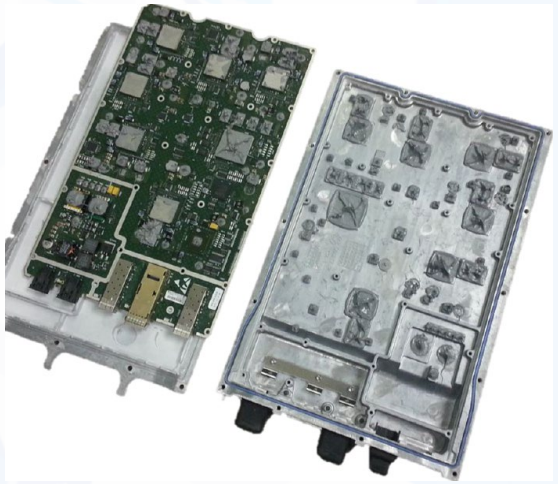
DC/DC CONVERTER

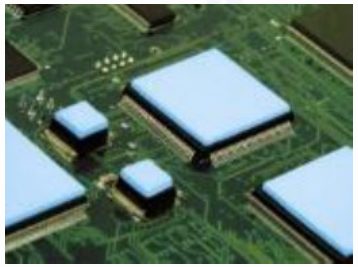
TELLECOM BOARDS

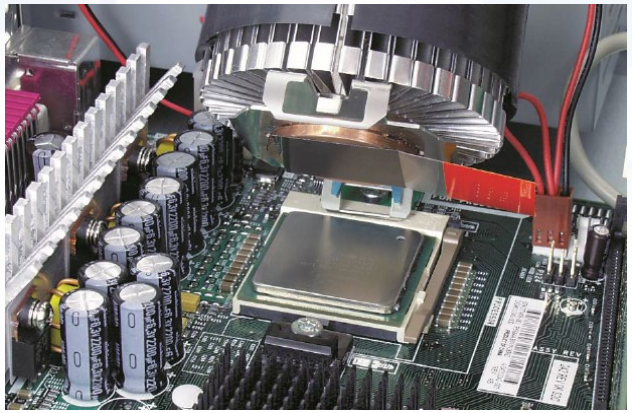
PC BOARDS

COOL :
Processor / FPGA / Memory …









THERMAL PAD APPLICATIONS

SEGMENT: INDUSTRY / LIGHTING / HEALTHCARE

STREET LIGHTING

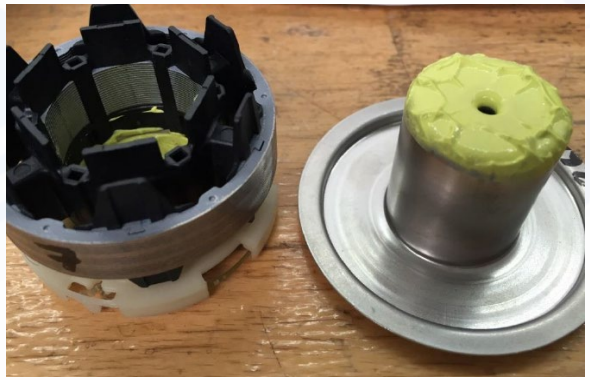
POWER LED

MEDICAL EQUIPMENT

MOTOR

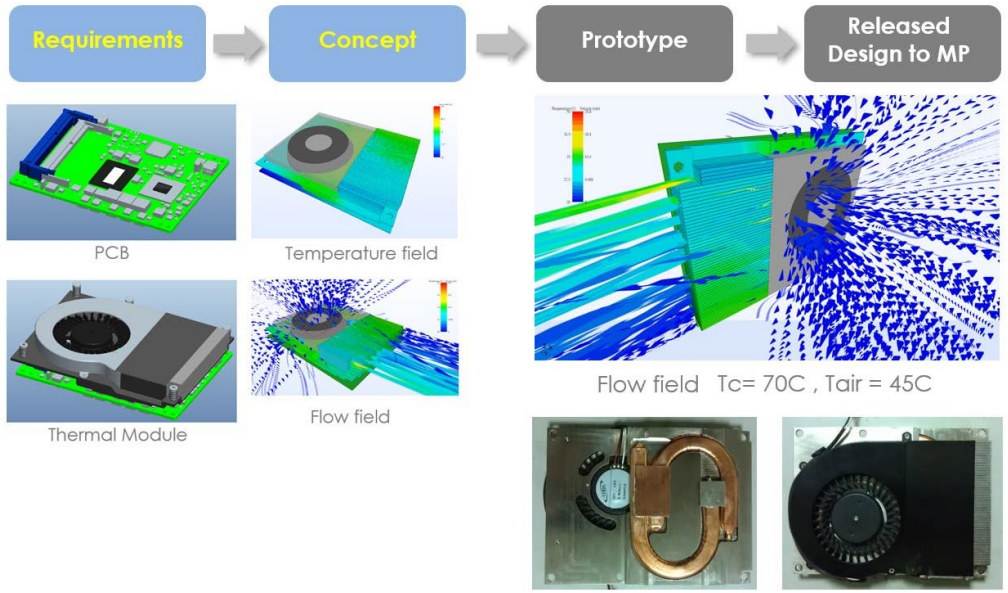
PC BOARDS

COOL : LED / LED BOARD / PCB / MOTOR …



THERMAL MANAGEMENT DESIGN SUPPORT

- Make accurate predictions as early as the drafting stage
- Best pratices for thermal management in electronics
- Simulate cooling processes for electronics development



TEAM OF 3 ENGINEERS « THERMAL MANAGEMENT »

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THERMAL DESIGN SUPPORT

20 years of experience in thermal management solutions
Help reduce the costs of product development for our customers.

We offer CFD analysis and consultation for the best possible arrangements and recommendations in thermal solutions.
Support for new product in need of a thermal solution or you have an existing product with non-functioning parts.

Simulation Software : Icepack

Icepack is a thermal modelling tool that uses advanced computational fluid dynamics (CFD) to create accurate models of electronic equipment.

Designed specifically for the electronics industry, this software is tailored to meet your requirements and to help you overcome thermal design challenges.

STELIAU TECHNOLOGY

THERMAL DESIGN SUPPORT

THERMAL CHECK LIST

- Thermal power to dissipate
- Ambient temperatures
- Maximum temperatures or thermal resistances
- Details of air or fluid flow
- PCB construction
- Dimensional limitations & tolerances
- Sketch or CAD models for component positions
- Weight limitations
- Method of fixing
- Thermal interface materials

CONTACT US !

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