

Introduction to ATS Products and Capabilities

Thursday, February 13,
2014

Advanced Thermal Solutions | 89-27 Access Road, Norwood, MA 02062 | 781-769-2800 | www.qats.com



ATS ADVANCED
THERMAL
SOLUTIONS, INC.
Innovations in Thermal Management®

**Proudly Serving the
Electronics Industry
for over 24 years**



Innovation in Thermal Management™

ATS At A Glance

**Cooling Solutions — Air, Liquid,
Active and Passive**

**Mechanical and Thermal Design
Services**

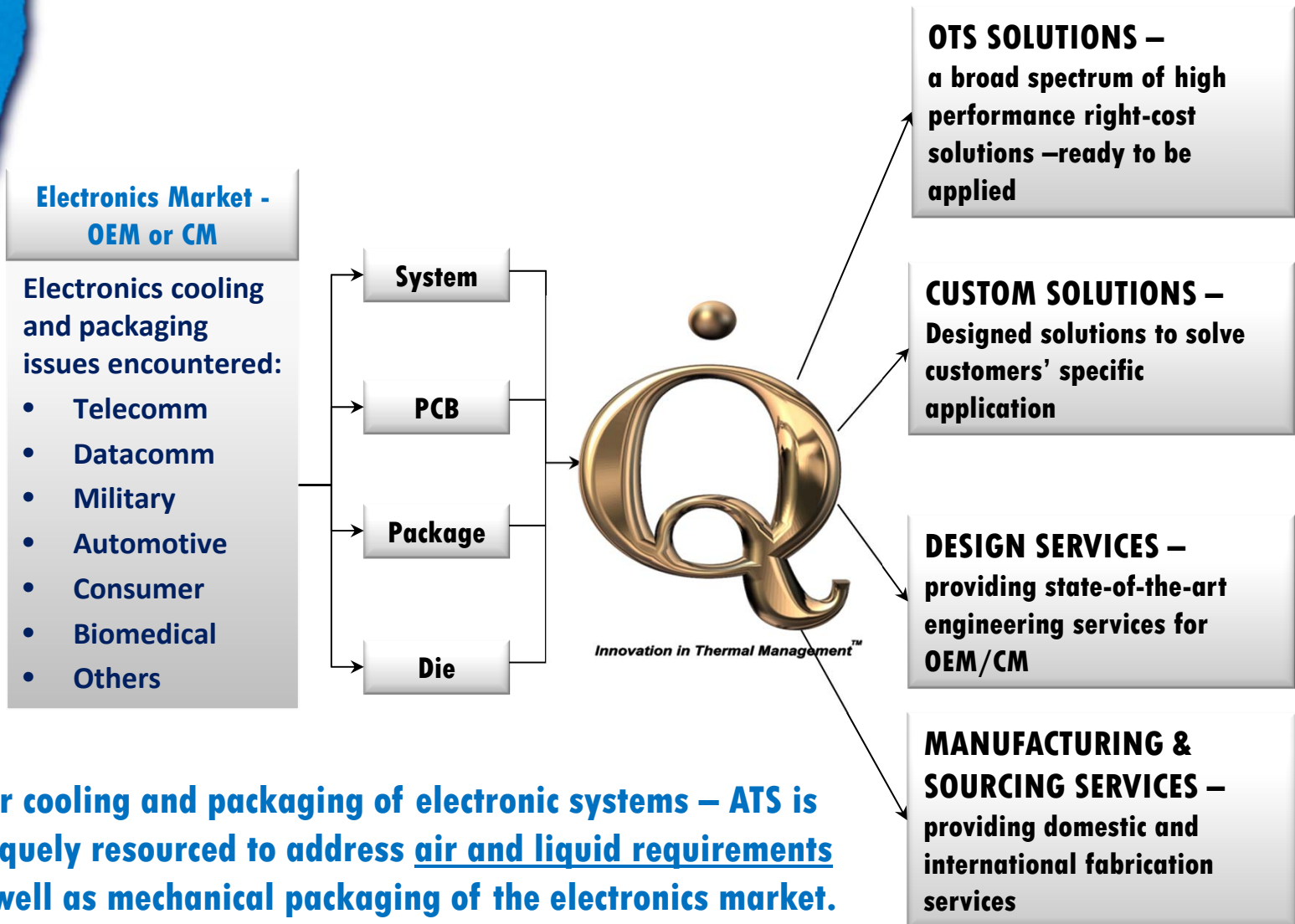
**Instrumentation and Control
Systems**

**Manufacturing Services and
Global Sourcing**

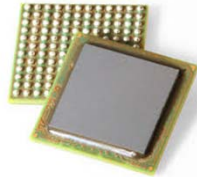
Compliance Testing

Training Programs

Role of ATS in Electronics Market

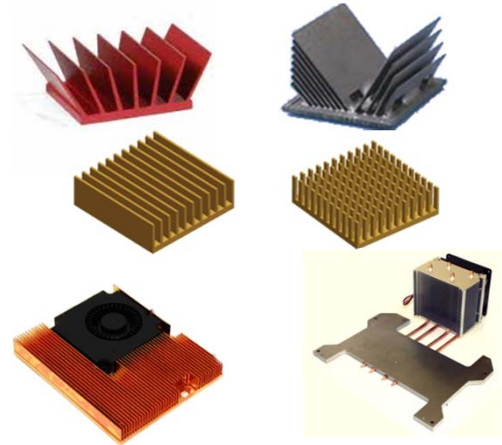


Cooling Solutions - Air



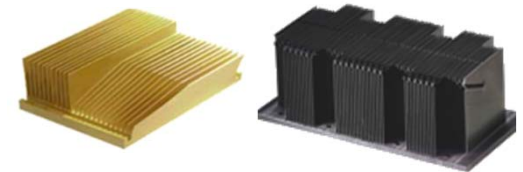
BGA/ASIC

- Over 700 Catalog parts
- Over 1300 low cost custom extrusion
- Over 3000 custom parts already designed for different applications



CPU/GPU

- Over several 100 designs
- Highest performance cooling with 0.13 °C/W – QuadFLOW™ and DualFLOW™ heat sinks



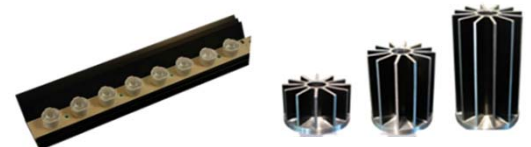
Power Brick

- Over 20 high performance heat sinks



LED

- Over 150 solutions for strip, down light and COB

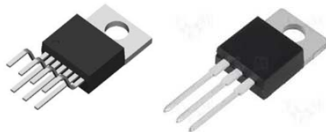
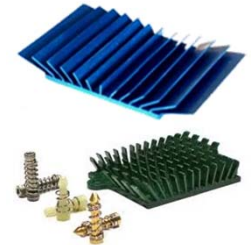


Cooling Solutions - Air



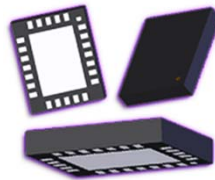
**DSP/TSOP/
DIP/etc.**

- Over 2000 heat sinks with tape-on
- Over 108K push-pin heat sinks



TO Packages

- Over 100 board level heat sinks



LGA Devices

- Over 100 board level heat sinks
- Over 108K pushpin HS



**Extrusion
Profiles**

- ATS offers an array of extrusion profiles ready for manufacturing a variety of heat sinks



**Heat Sink
Attachment**



Thermal Tape



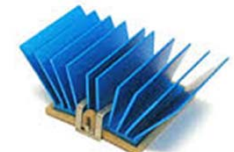
Push Pin



Z-clip



maxiGRIP™



superGRIP™

ATS Heat Sink Attachment

ATS Offers:

- Tape On
- Z-clip
- Push-pin
- maxiGRIP™
- superGRIP™



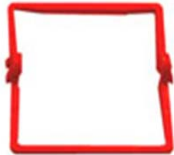
Z-Clip



Push Pin



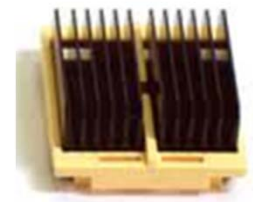
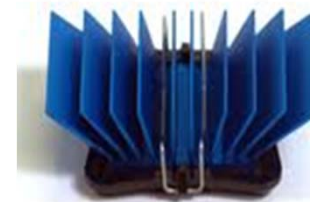
superGRIP™



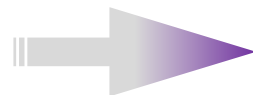
maxiGRIP™



Clip-On System - Most Popular



Features	ATS maxiGRIP™	Competition
BGA Solution	Yes	Yes
TIM	Phase change (+++)	Tape-on
Attachment	Frame & Spring Clips (applies load and retains the HS) (+++)	Tape-on (FC holds the HS from falling)
Removal/Installation	Super Easy – can be done by hand (++)	Requires a tool and FC often breaks
Temperature Stability	Plastic and SS spring clip – provides high degree of Temp stability (++)	Plastic clip only – the material yields with time and temperature
Thermal Performance	Superior (+++)	Average
Keep-out Area	Comparable	Comparable (+)
Cost	Comparable	Comparable

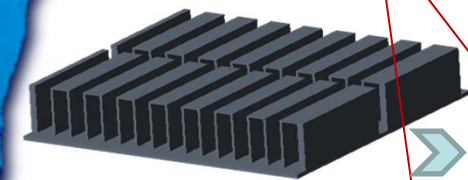


**superGRIP™ - the next generation of heat sink attachment
– highest strength with the least keep-out area**

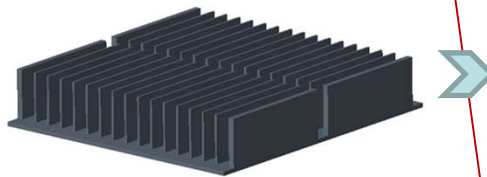
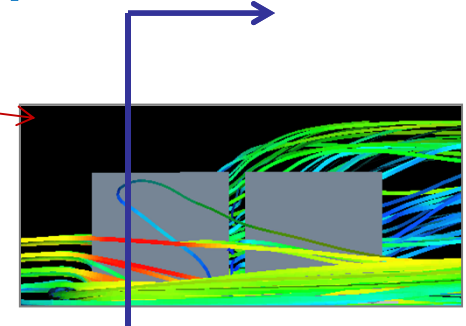
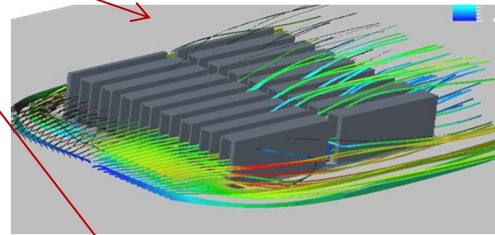
ATS Heat Sink Design Advantage

Impact of design on thermal performance

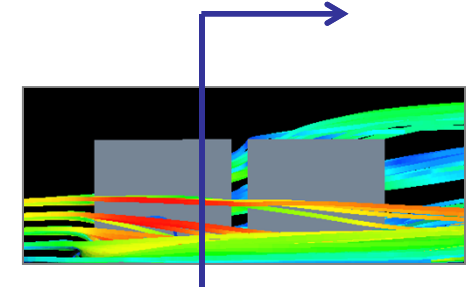
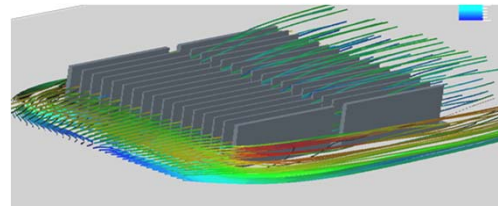
Premature flow egress of the airflow adversely impacts HS performance



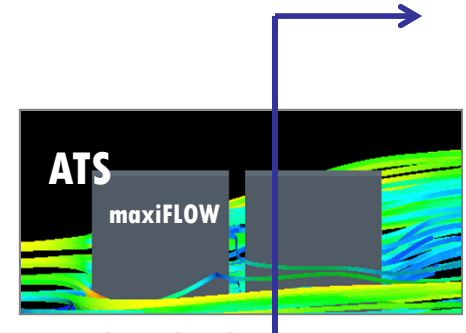
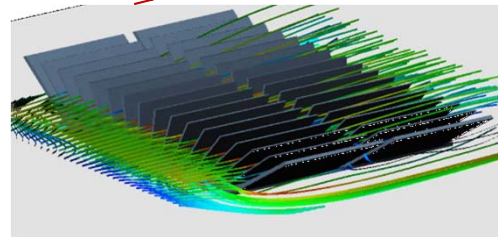
Folded fin heat sink



Straight fin heat sink



ATS maxiFLOW™ heat sink

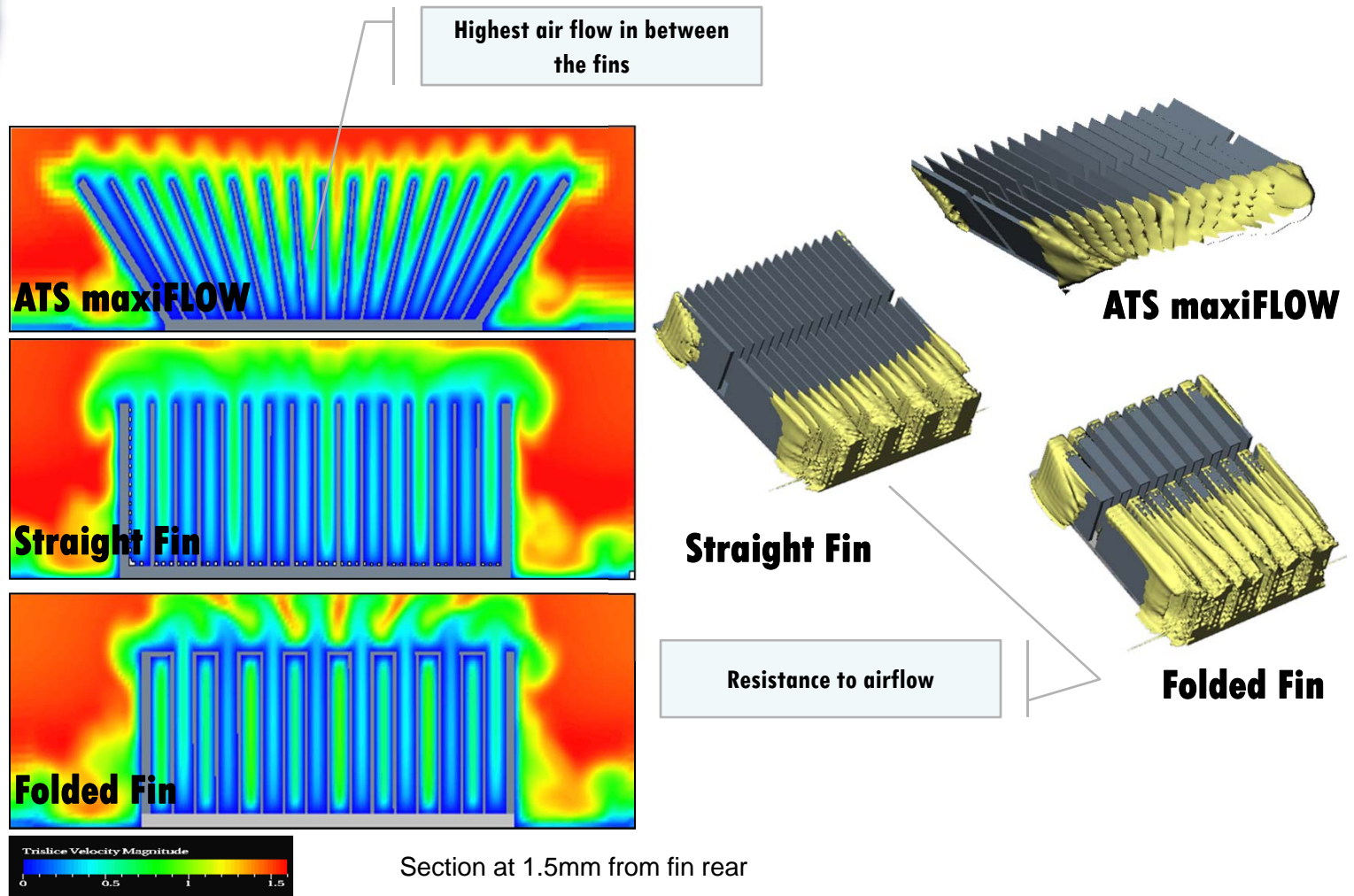


Advanced Thermal Solutions, Inc. Proprietary

maxiFLOW has the least egress

Advanced Thermal Solutions, Inc. (ATS) copyright©

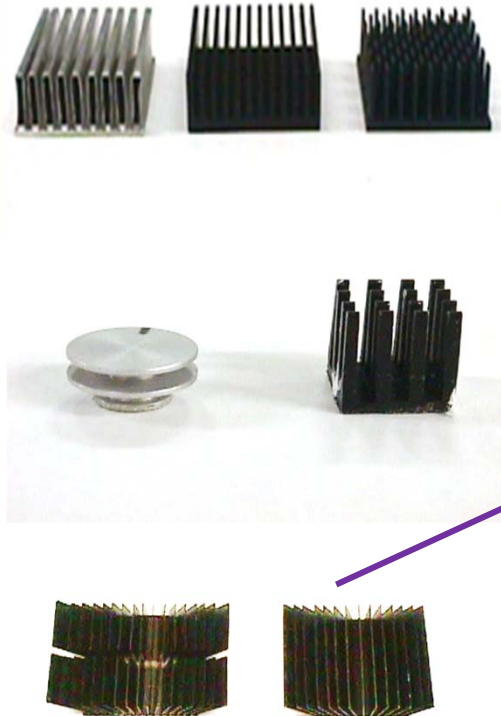
ATS Heat Sink Design Advantage



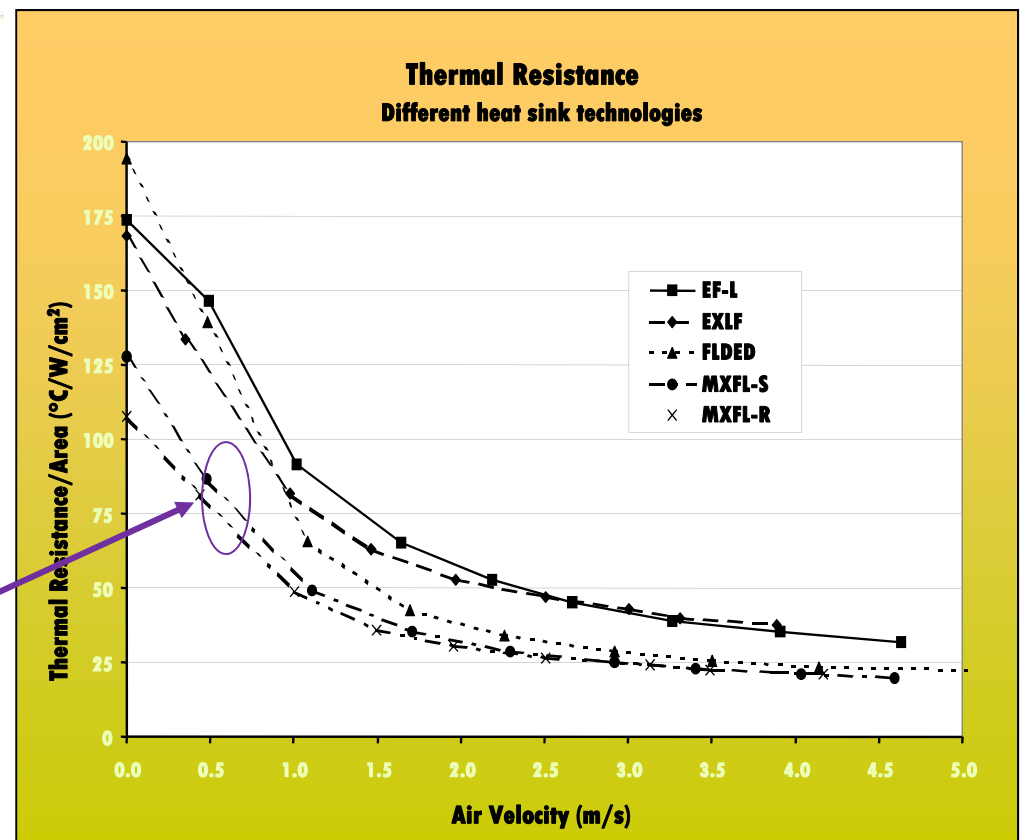
maxiFLOW™ exhibits the highest flow speed thru the fin field with the least flow stagnation, hence superior performance

ATS Heat Sink Design Advantage

Highest performance heat sink in the market



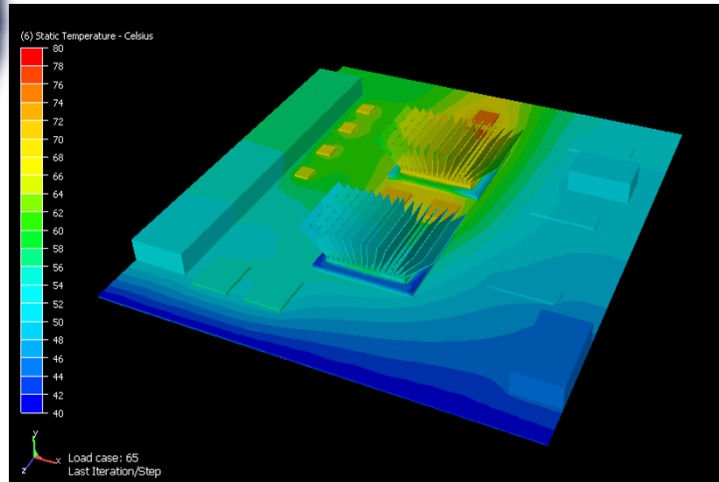
ATS maxiFLOW™



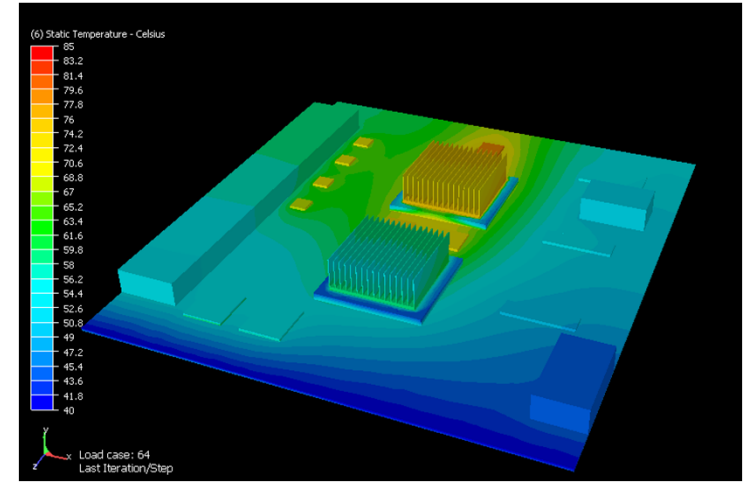
Source: F. Forghan, et. al., 2001

ATS Heat Sink Design Advantage

Superior Cooling



PCB with Two **maxiFLOWs** in Series



PCB with Two **Straight Fins** in Series

	Upstream Heat Sink		Downstream Heat Sink	
	T_j Rise over amb.	Heatsink T.R.	T_j Rise over amb.	Heatsink T.R.
maxiFLOW	24.7	0.97	35.3	0.98
Straight Fin	27.4	1.14	42.4	1.16

Air flow: 200LFM

Air Temp: 40°C

Channel height : 25mm

maxiFLOW and straight fin HSs are of equivalent height, fin number, fin thickness, and base dimensions. Material is aluminum & TIM is identical in both cases.

~10-17% In Temperature Reduction

ATS Edge- compact, low profile, light weight with unmatched thermal performance

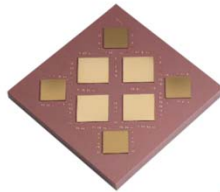
Cooling Solutions - Liquid



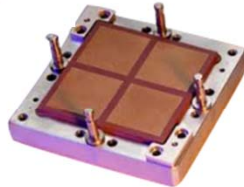
IGBT



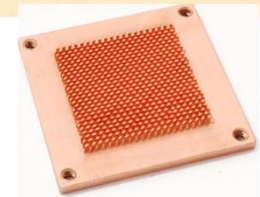
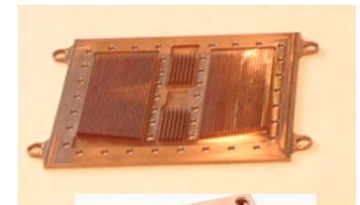
- **ATS offers the least thermal resistance cold plate for IGBTs**



High Power Devices



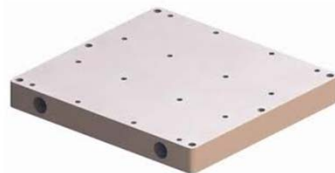
- **Forced Thermal Spreader, up to 1000 W/cm²**
- **Copper and aluminum cold plates for high power CPU and ASICs**



Complete Liquid Cooling Loop Offering



iFLOW-200™ for cold plate Characterization



Cold plate for device cooling



Chillers for conditioning the coolant



Flow controllers and leak detection



Heat exchangers for cooling of the coolant.

Thermal Test Equipment

**Temperature
Velocity
Pressure**

ATVS-family



PTM-100



IQ-200



**Wind Tunnels
- Air Flow
Simulation**

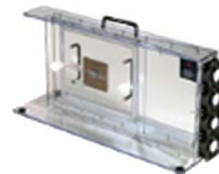
CWT-family



CLWT-family



BWT-100



**Airflow and
Heat Flux
Controllers**

iFLOW-200



WTC-100



FSC-200

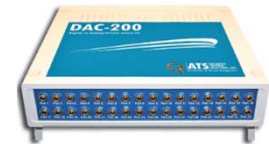


HFC-100



**Application
Specific Test
Equipment**

DAC-200

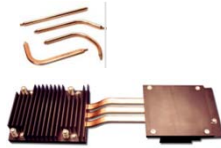


CIP-1000



thermVIEW





Heat Pipe



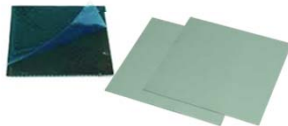
**TEC
Modules**



**TEC
Assemblies**



Chillers



TIMs

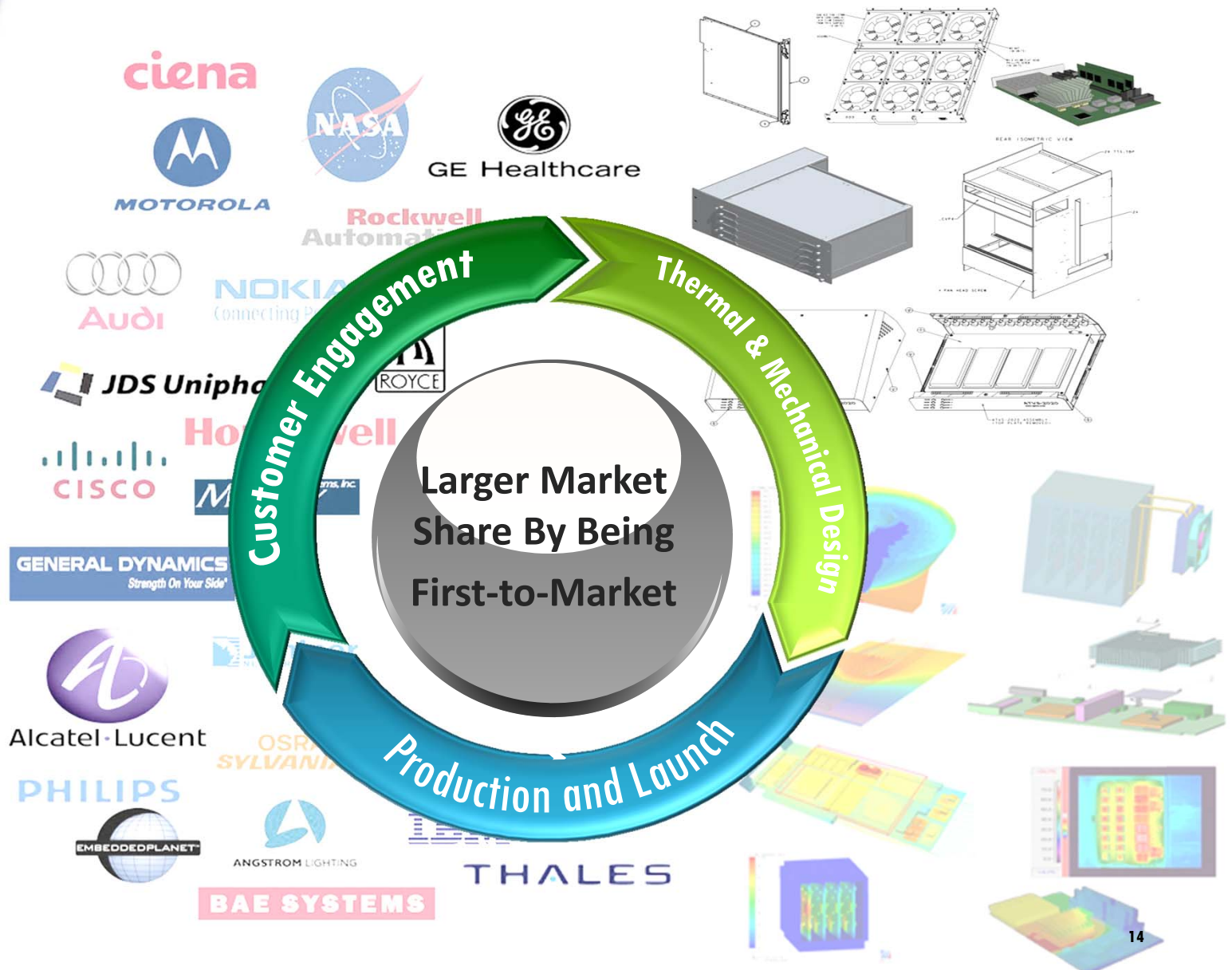


**Heat
Exchanger**

Cooling Solution Accessories

- **ATS Offers an array of OTS and custom designed heat pipes for a variety of applications**
- **ATS offers a host of high reliability TEC modules ranging from 5 to 340W cooling capacity**
- **ATS offers a broad range of air and liquid cooled TEC assemblies with cooling capacity of 1kW**
- **ATS offers several chillers with TEC as well as compressor based ones to address diverse needs of the market**
- **ATS offers a host of TIMs ranging from grease, tape, phase change and gap fillers.**
- **ATS offers nine different liquid-to-air heat exchangers for different cooling requirements**

Design Services



What Differentiates ATS

ATS	Competition
ATS heat sink products are offered from basic to state-of-the-art in cooling .	Basic products that are offered by 100s of companies across the globe.
ATS heat sinks provide the best thermal performance in a given volume.	No company can compete with what an ATS heat sink can do for cooling of a device.
Engineered and patented solutions.	Off-the-shelf products, easily sourced globally.
Strong engineering and manufacturing offering — uniquely positioned to solve customers problems right-the-first-time with the highest accuracy.	The largest company (Aavid) is heavily manufacturing focused - smaller companies can run first order CFD simulations.
ATS has a complete offering — Design, Manufacturing, Training, Testing and Testing Equipment in addition to custom and off-the-shelf products... <i>truly a one-stop shop.</i>	There are over 5000 companies in the heat sink arena, with a “pass-thru” approach to thermal management — no company has the offering as ATS.
ATS is committed to R&D by developing and improving thermal management products in different verticals.	Commodity, low cost products that are readily available across the globe with no innovation and investment to develop new technology.

Testimonial – Why Partner With ATS

▶▶ **Best thermal engineering I have seen in my career – [Dialogic Corporation](#)**

▶▶ **Your products are “Enabling Technology” – [Siemens Corporation](#)**

▶▶ **“The clip-on solutions are the best on the market – it is God sent”
– [Alcatel-Lucent Corporation](#)**

▶▶ **“your maxiFLOW™ heat sink is the best performing
heat sink on the market” – [HP Corporation](#)**

▶▶ **“We would never use tape-on or epoxy for heat sink attachment – your
clip-on solution is a game changer” – [Infinera Corporation](#)**

▶▶ **“You are the only company whose thermal performance
data matches what we test in the lab” – [IBM Corporation](#)**

▶▶ **“When I come to ATS and engage your engineers and see your
facility, I feel I have come to Mini Bell Labs” – [Celestica Corporation](#)**

▶▶ **“Your design capabilities and engineered solutions are unmatched
in the industry” – [Starent Corporation \(now Cisco\)](#)**

- **Founded in 1989 to serve the thermal management market.**
- **50+ employees with extensive experience in thermal management and mechanical packaging of electronics.**
- **Experimental and computational labs with the latest software tools and state-of-the-art testing equipment.**
- **Company holds 8 patents with 9 in pending stages.**
- **Engineering and sales offices in U.S. and Europe.**
- **Worldwide manufacturing and distribution**
- **ISO 9001:2008 certified quality management system.**
- **Manufacturing and distribution centers in the US and Asia.**

ATS Beliefs -

In Pursuit of Excellence

Best in Class Customer Service



Administrative and Engineering Office



Manufacturing Building

Advanced Thermal Solutions Inc. (ATS) – A Partnership with Success