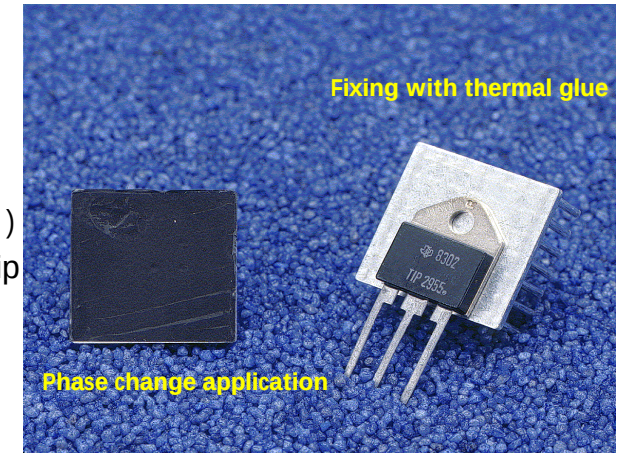
PINBLOC®

examples of superior cooling

Small Power application

heat sink:	dimension:	25 x 25 mm
	height:	6,5 mm (Typ 1) 18,5 mm (Typ 2)
	weight:	7 gr.
	mounting:	adhesive tape (3M 8940, Berquist) alternative: glue, rivets, screws. clip
performance:	P_V	8,7 W (Typ 1, 0,5 m/s, at 50K) 11,6 W (Typ 2, 0,5 m/s at 50K)



application: cooling small devices on PCB board eg. PGA, BGA

background:

- heat sink was created to offer a standardized pin fin heatsink
- superior in performance and at an efficient cost level
- air flow for for smal power application is natural convection or 0-1,5 m/s
- a variety of fastening and mounting possiblities are offerd

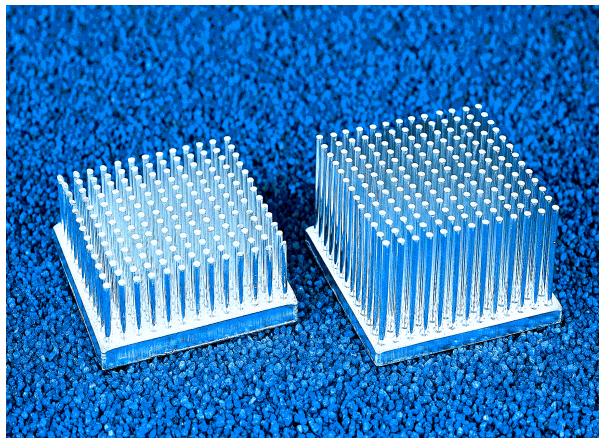
advantage:

- superior cooling for small devices (outperforming any conventional heat sink)
- efficient solution

evaluation: higher performance for high quantity production

IC / Processor application

heat sink:	dimension:	50 x 50 mm
	height:	20 mm
	weight:	50 gr.
performance:	P_V	21 W (0,5 m/s, 50K)
		31 W (1,0 m/s, 50K)
		49 W (2,0 m/s, 50K)
	R_{th}	2,398 K/W (0,5 m/s)
		1,004 K/W (2,0 m/s)



application: IC processors, PGA, BGA cooling

background:

- pin fin heat sink out of pure aluminium offer a high performance
- pin design and structure was optimized in a long testing set up (to the present)
- pin height and base plate can be manufactured according to the customer´s needs
- easy access to the new, outperforming technology by standardized PINBLOC® heat sinks

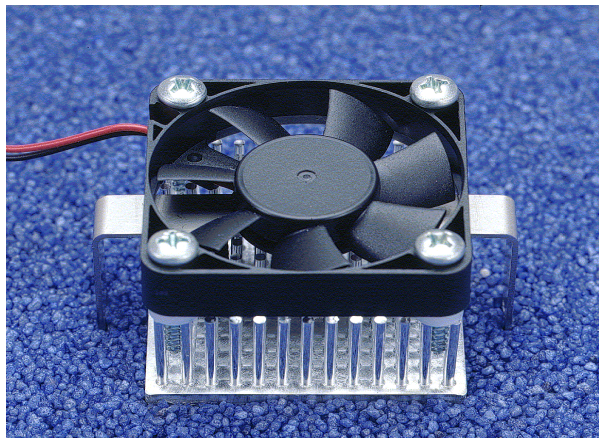
advantage:

- 20-40% higher performance to any conventional heat sink with the same dimensions
- possibility to serve customer´s demands in dimension, base, pin height

evaluation: an alternative technology for superior cooling

IC / Processor application

heat sink:	dimension:	50 x 50 mm
	height:	20 mm
	weight:	50 gr.
	mounting:	clip fastening, screws
	fan:	fan (YS Tech) air flow ca. 2-3 m/s
performance:	P_V	21 W (passive, natural convection)
		46 W (active modul, 2 m/s, 50K)
	R_{th}	0,922 K/W (active modul, 2 m/s)
		0,739 K/W (active, 3 m/s)



application: industrial application, processor

processor: Intel Celeron Pentium III, tualatin core, FC PGA 370 socket, first 800 MHz => 1,2 GHz

background:
- pin fin heat sink was planned to as a passive module, heat load 20 Watt (800MHz)
- an engineerial change brought a different set up situation, the air flow was insufficient

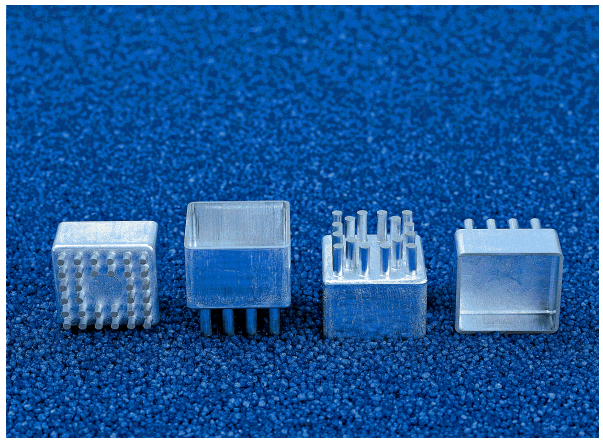
=> customer changed to an active solution

advantage:
- technology offers a variety of fixing possibilities (screws, rivets, clips)
- possibility to change from a passive to an active solution without changing the heat sink

evaluation: an alternative active cooling solution with superior performance

Solid State application

heat sink:	dimension:	mm
	height:	5-7 mm
	weight:	15-18 gr.
	mounting:	epoxy
performance:	P_V	4 W (die cast, customer data)
	P_V	8-10 W (0,5 ms at 50 K)
		10-12 W (2 ms at 50 K)
	R_{th}	4,88 - 5,68 K/W (0,5 m/s)



application: housing / cooling element for solid state relais (USA)

background:

- customer had a finished engineering with a die casted solution
- power to be dissipated increased due to an engineerial change, space was restricted
- a housing with cooling elements was developed (different pin settings were tested)
- optimal cooling solution was generated to fit into limited space as well as it matches the thermal requirements

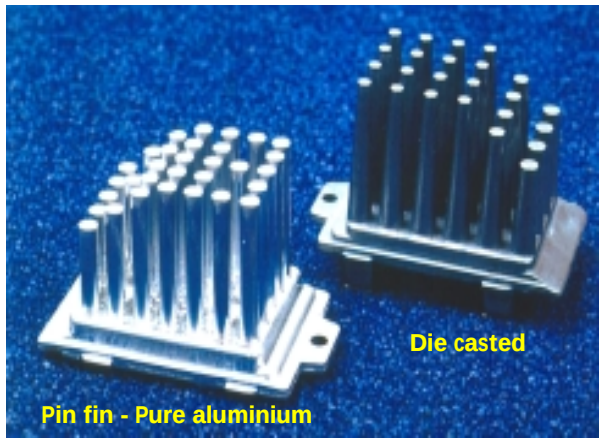
advantage:

- higher heat dissipation per mm² / in² due to the superior material characteristics
- forming flexibility comparable to die casted solutions

evaluation: substitution of thermally insufficient die casted solutions

Automotive application

heat sink:	dimension:	40 x 51 mm
	height:	36 mm (Typ 1) 50 mm (Typ 2)
	weight:	100 gr.
	mounting:	integrated rivets + clips
performance:	P_V	80 W (Typ 1, 5 m/s, 50K) 99 W (Typ 1, 5 m/s, 50K) 52 W (die casted-Typ 1 at 5 m/s)



application: automotive cooling for power module of the climate control system (VW)
1995 - first wide range application of a pin fin heat sink

background:
- automotive applications are classically die casted solution (+ cost, + flexibility in forming)
- quantities grew, due to limited life cycle of tools < 100.000 pcs tooling costs increased
- substitution of die casted heat sink by a pin fin heat sink

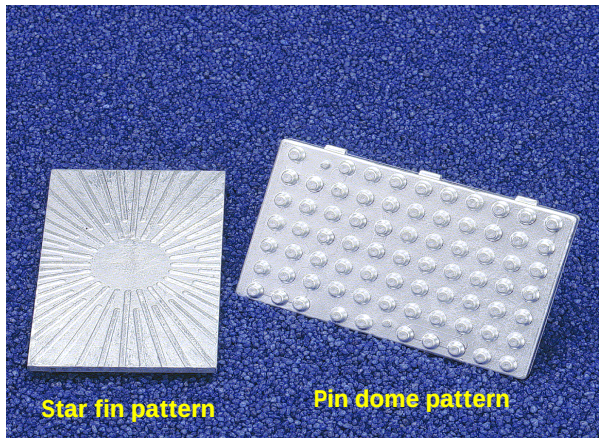
advantage:
- + 100 % higher performance (60 Watt (die casted), 120 Watt (pin fin) at 10 m/s)
- lower tooling costs (> 1 Mio. life cycle)

quantity: design for 2 Mio. units p.a.

evaluation: this application was the break through of pin fin technology for automotive

Automotive application

heat sink:	dimension:	52 x 86 mm
	height:	3 mm (pin pattern)
		5 mm (base)
	weight:	63 gr.
	mounting:	thermal glue
performance:	P_V	30 W at 10m/s



application: automotive cooling of the PCB Board for control system (climate control)
first wide range application of a pin dome heat sink

background:
- customer target: an efficient cooling for the PCB board
- total heat load of 10 W
- heat sink is functioning as a cooling as well as a protective element
- pin / fin pattern was optimized in development in 8 steps to the present design (domes)

advantage:
- efficient low cost solution
- variable design

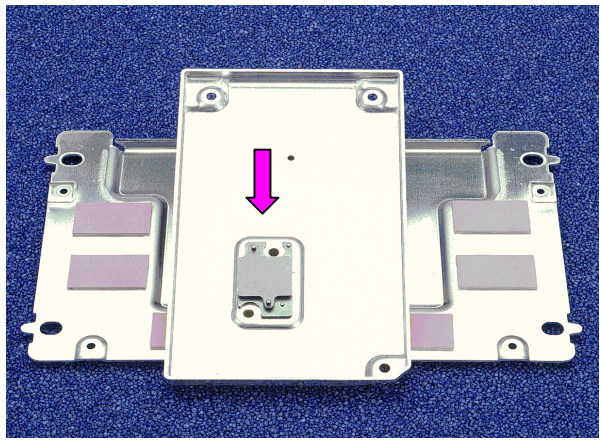
quantity: design for 2 Mio units p.a.

Automotive application

cooling module: heat spreader + plate

heat spreader (⇩)
dimension: 19 x 21 mm
height (base): 4,5 mm
weight: 7 gr.
mounting: Berquist Sil Pad

performance: max. 20 W (in peak)
performance of module (customer information)



application: shielding and cooling design of an ABS unit (FIAT)

background:
- heat was concentrated on a specific spot
- customer tried to avoid a complicated, expensi´ve cooling solution
- target was to combine cooling and shielding at an low cost level
- combination of heat spreader (pure aluminium 99,5%) with integrated mounting pins and an ordinary stamped plate fulfilled these prerequisites

advantage:
- efficient solution for cooling as well as shielding
- easy, intelligent combination of two technologies with cooling at alow cost level

quantity: design for 50.000 units p.a.

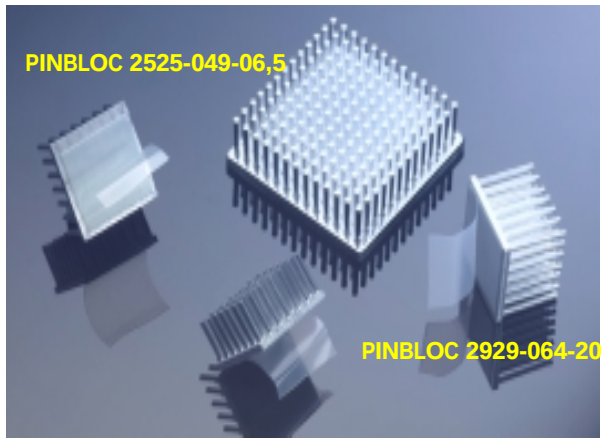
PINBLOC® adhesive application

Evaluating performance with adhesive tape:

heat sink:	dimension:	50 x 50 mm
	height:	20 mm
	mounting:	adhesive tape (here 3M 8940)

comparative measurement

performance / P_V:	20,85 W thermal grease	(0,5 m/s, at 50K)
	14,86 W Berquist bond ply	(0,5 m/s, at 50K)
	14,69 W 3M 8940 140 µ	(0,5 m/s, at 50K)



application: easy and efficient fixing of pin fin heat sinks to electronic devices eg. PGA, BGA

background:

- target was to find an efficient and thermally suitable solution for fasting a standardized PINBLOC® heat sink without any negative effect
- heat sink can be demounted without effecting the electronic device
- adhesive pads are pre-mounted to the heat sink
- comparative thermal qualification of adhesive tapes in addition to manufacturerer´s data

advantage:

- customer can choose the most suitable application - thermally as well as electrically
- technical support

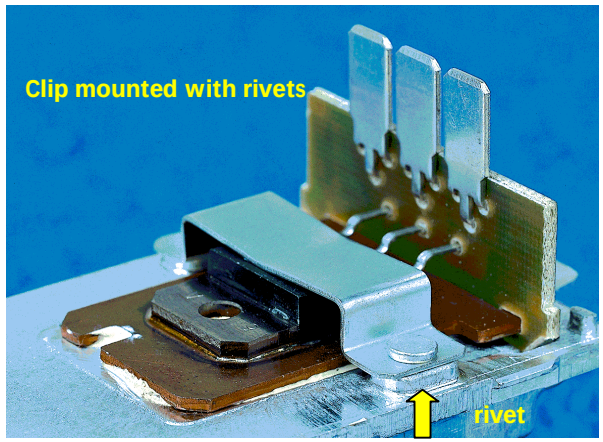
evaluation: adhesive tape though thermally not ideal, is easy to handle and resolvable

mounting application

heat sink: automotive application

rivets: integrated on the back of heat sink

design: socket of 2 mm for a defined contact of the clip:
rivet: 3 mm diameter



application: automotive application for the climate control system (VW)

background:
- mounting was first planned with a screwing process
- a screwing process had the disadvantage of being slow, expensive and causing burrs
- we proposed rivets for fixing - formed out on the back of the heat sink without any extra costs

advantage:
- mounting process was quicker
- burrs are avoided in the mounting process
- riveting could be easily integrated into an automatic production line of the customer

evaluation: interesting mounting alternative