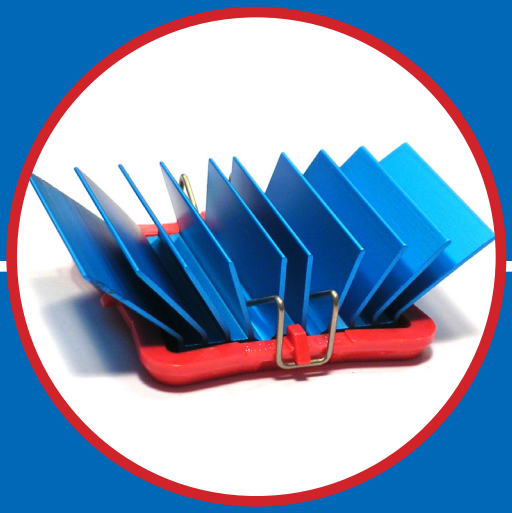

ATS Brochure Kit

HEAT SINKS

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

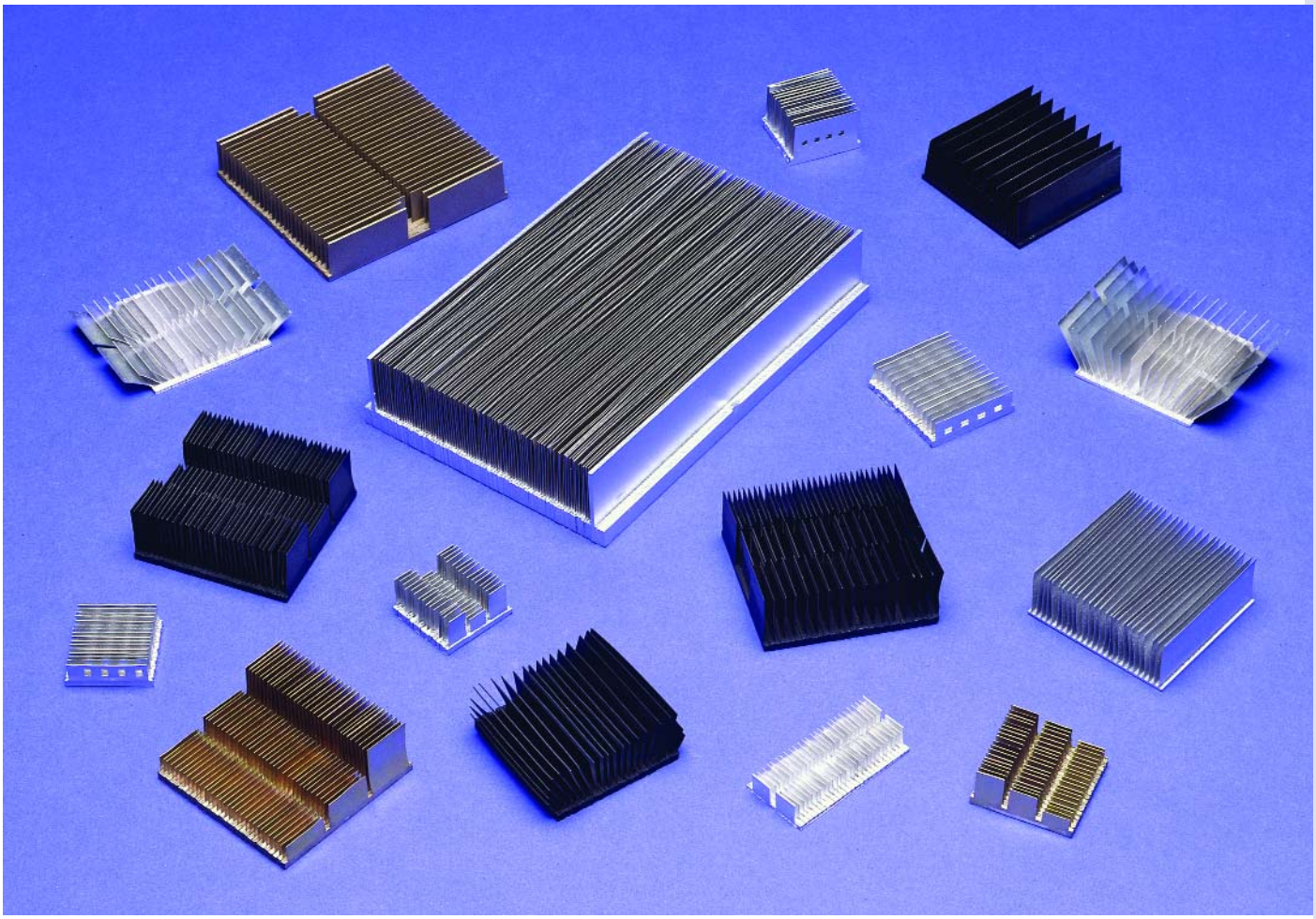
ATS Brochure Kit
HEAT SINKS

ATS Heat Sink Solutions

Innovation in Thermal Management™

The Only Heat Sink For Tough To Cool Electronics

We think “inside” the box



- **Ultra Performance**
  - **Low Profile**
    - **Light Weight**

ATS- *The Designer and Manufacturer of the Most Advanced Heat Sinks with the Highest Performance*

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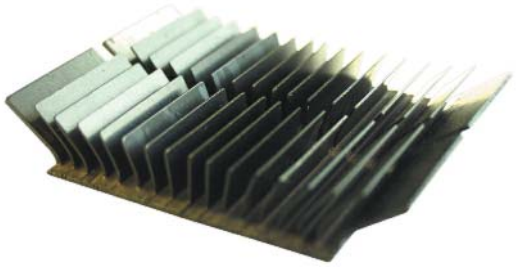
Heat Sink Comparison

Innovation in Thermal Management™



Vendor	P	T_{amb}	R_{sa} @200 LFM	T_j
ATS	50W	25°C	1.6	105°C
Competition	50W	25°C	3.0	175°C

Measuring The Impact Of Higher Thermal Resistance

The equation below is used to calculate the junction temperature of the device:

$\mathbf{R_{ja} = R_{jc} + R_{cs} + R_{sa}}$

and

$\mathbf{R_{ja} = (T_j - T_{amb})/P}$

Solving for T_j: $\mathbf{T_j = R_{sa} * P + T_{amb}}$

Where:

- P = Device Power Dissipation
- R_{sa} = Heatsink Thermal Resistance (°C/W)
- R_{cs} = Device Case To Heatsink Base Thermal Resistance (Interface Material)
- R_{ja} = Device Junction-To-Ambient Thermal Resistance
- R_{jc} = Device Junction-To-Case Thermal Resistance
- T_{amb} = Ambient Temperature
- T_j = Device Junction Temperature (Critical Parameter)

ATS BGA Heatsink ATS-97-09-034B

Dimensions

Height:	16.5mm
Width:	45mm
Length:	45mm

Note on Testing
Interface Material is T405

Method of Attachment
Double sided conductive tape

Weight: 11 gm

Thermal Resistance (R_{ca})

Velocity	*°C/W*
100	3.4
200	2.1
400	1.3
600	1.0
700	0.9

Competitions' BGA Heatsink

Dimensions

Height:	15.49mm
Width:	47.62 Circular
Length:	**

Note on Testing
Interface Material was Cool Link™ (thermal grease, 2 to 3 times better than T405)

Method of Attachment
Surround clip with phase change material at the interface

Weight: 52.25 gm

Thermal Resistance (R_{ca})

Velocity	*°C/W*
100	4.3 Ext.
200	3.0
400	1.8
600	1.4
700	1.3

To better understand how hot the T_j can get and why high performance heat sinks are important, compare T_j with the temperature of boiling water. Since water boils at 100°C (212°F), the junction temperature can be significantly above that of water boiling at sea level. Other considerations include device and system operational and marketing standpoints. Given that the expected life of an electronic part is exponentially dependent on temperature, cooler parts will have longer life. Systems with better reliability provide better market appeal. This can be attained by improved heat sinks while the system operates with lower air flow velocity within the system.

In short, a higher-performance heatsink will result in not only a reliable product with longer life, but also enhances product market appeal.

ATS Design Impact

Velocity	% of Improvement of Rca
100	**26%**
200	**42%**
400	**30%**
600	**41%**
700	**44%**

Remember, less is better

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BGA Cooling Solutions

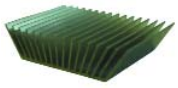
Innovation in Thermal Management™

MaxiFLOW™ HIGH PERFORMANCE, LOW PROFILE & LIGHTWEIGHT

Cool BGA packages with the latest patented compact high performance heat sinks

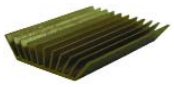
ATS-EX1

H(mm): 9.0	velocity ft/min	resistance (C°/W)
W: 30.0	100	5.8
	200	4.0
L: 30.0	400	2.6
weight gr : 10.0	600	2.0



ATS-34B-EX

H(mm): 15.0	velocity ft/min	resistance (C°/W)
W: 45.0	100	3.8
	200	2.4
L: 45.0	400	1.7
weight gr : 34.0	600	1.3



ATS-EX2A

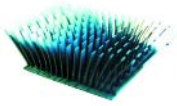
H(mm): 9.0	velocity ft/min	resistance (C°/W)
W: 30.0	100	5.3
	200	3.7
L: 58.0	400	2.3
weight gr : 18.0	600	1.7

ATS97-09-034B

H(mm): 16.3	velocity ft/min	resistance (C°/W)
W: 45.0	100	3.4
	200	2.1
L: 50.0	400	1.3
weight gr : 23.0	600	1.0

ATS-EX2

H(mm): 9.0	velocity ft/min	resistance (C°/W)
W: 30.0	100	5.5
	200	3.9
L: 58.0	400	2.4
weight gr : 16.0	600	1.8



ATS97-09-034B P2

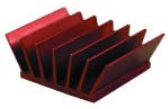
H(mm): 16.3	velocity ft/min	resistance (C°/W)
W: 45.0	100	3.6
	200	2.3
L: 50.0	400	1.4
weight gr : 20.0	600	1.1

ATS-EX3

H(mm): 5.0	velocity ft/min	resistance (C°/W)
W: 30.0	100	7.8
	200	6.1
L: 58.0	400	4.5
weight gr : 14.0	600	3.4

ATS97-09-037A

H(mm): 8.5	velocity ft/min	resistance (C°/W)
W: 45.0	100	6.8
	200	4.8
L: 50.0	400	3.1
weight gr : 14.0	600	2.4



ATS-EX4

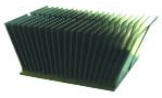
H(mm): 9.0	velocity ft/min	resistance (C°/W)
W: 26.0	100	7.8
	200	5.3
L: 19.0	400	3.4
weight gr : 4.0	600	2.7

ATS97-09-037B

H(mm): 8.5	velocity ft/min	resistance (C°/W)
W: 45.0	100	5.8
	200	4.0
L: 45.0	400	2.6
weight gr : 16.0	600	2.0

ATS-EX5

H(mm): 4.0	velocity ft/min	resistance (C°/W)
W: 25.4	100	12.0
	200	9.0
L: 25.4	400	6.0
weight gr : 4.0	600	5.0



ATS99-10-100

H(mm): 25.0	velocity ft/min	resistance (C°/W)
W: 50.0	100	2.8
	200	1.3
L: 50.0	400	0.6
weight gr : 38.0	600	0.6

ATS-EX7

H(mm): 9.0	velocity ft/min	resistance (C°/W)
W: 15.0	100	17.0
	200	12.0
L: 15.0	400	7.8
weight gr : 4.0	600	6.0

ATS99-11-103

H(mm): 12.5	velocity ft/min	resistance (C°/W)
W: 57.5	100	3.6
	200	2.3
L: 57.5	400	1.3
weight gr : 24.0	600	1.0

ATS designs & manufactures the most advanced heat sinks for cooling BGA packages. ATS will custom design heat sinks per your specific design requirements.

A Full Line of BGA Heat Sinks for Superior Performance

Thermal performance exceeding extruded equivalents by 4 fold.

ATS's patented technology provides High Fin density design with maximum cooling per unit volume.

Light weight heat sinks eliminate the need for mechanical attachments. Some mechanical attachment methods have caused cracking of the silicon.

Low profile maxiFLOW™ heat sinks are ideally suited for today's compact electronics.

ATS custom designs maxiFLOW™ heat sinks for each individual application.

ATS also produces high performing heat sinks for low air velocity applications.

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blueICE™

Heat Sinks

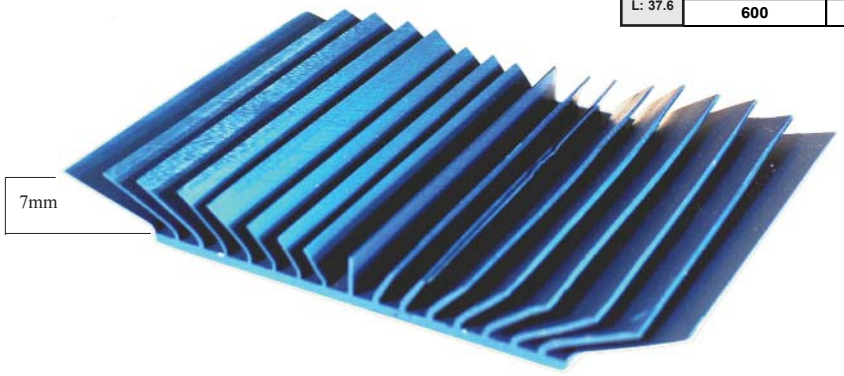
Innovation in Thermal Management™

ATS00-12-134 & ATS00-12-134A

H(mm): 4.0	Velocity (ft/min)	Resistance C°/W
W: 25.2	100	18.8
	200	14.8
L: 25.2	400	9.6
	600	6.9

ATS00-12-135

H(mm): 4.0	Velocity (ft/min)	Resistance C°/W
W: 37.6	100	9.9
	200	7.8
L: 37.6	400	4.9
	600	3.6



ATS01-00-136

H(mm): 7.0	Velocity (ft/min)	Resistance C°/W
W: 58.2	100	3.95
	200	2.88
L: 61.0	400	1.8
	600	1.23

Note: W is base width.

- **Low profile**
- **High performance**
- **Low velocity**
- **Reduces assembly time**
- **Saves valuable space**

Advanced Thermal Solutions introduces **blueICE™**, a family of low profile heat sinks ranging in height from 4 to 7 mm are produced for tough to cool electronic components. These high performance heat sinks are designed for low air velocity flows. This suits most telecommunication applications where space is limited.

Since these heat sinks are very light weight (4, 10, & 30gr.), no mechanical attachment is needed and a double-sided thermal adhesive tape will attach the heat sink to the component. This reduces assembly time and saves valuable space on the board.

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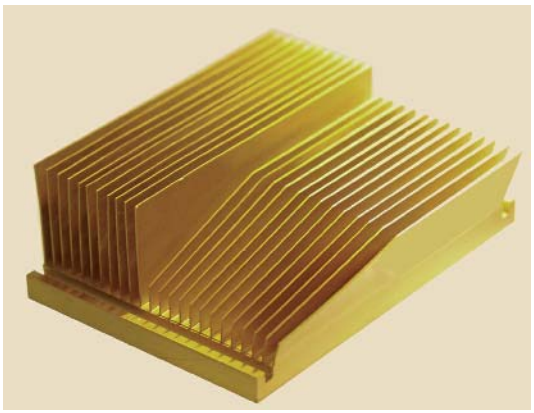
blackDIAMOND™

the passive cooling solution for intel's Xeon processor

Innovation in Thermal Management™

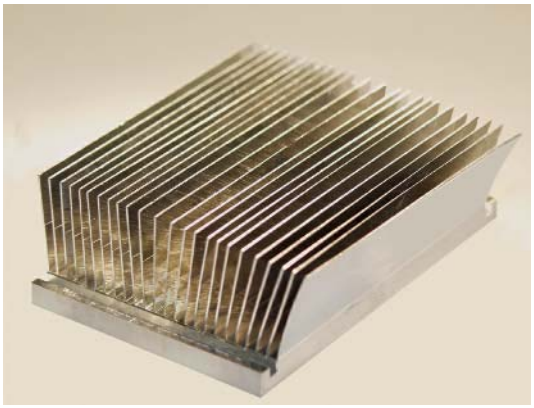


Advanced Thermal Solutions (ATS) presents the blackDIAMOND™ family of heat sinks for passive cooling (non-fansink) of high-powered processors.

ATS088063030-148

H: 30mm
W: 64mm
L: 89mm

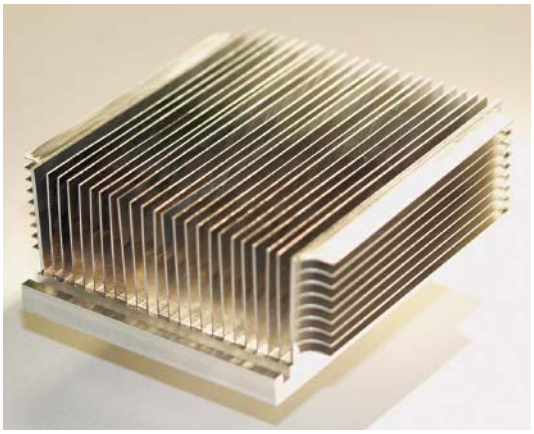
Velocity (ft/min)	Resistance °C/W
100	1.85
200	1.03
400	0.54
600	0.42
800	0.40



ATS088063030-148-1

H: 30mm
W: 64mm
L: 89mm

Velocity (ft/min)	Resistance °C/W
100	1.68
200	0.92
400	0.48
600	0.39
800	0.34



ATS088063030-148-3

H: 30mm
W: 64mm
L: 89mm

Velocity (ft/min)	Resistance °C/W
100	1.90
200	0.92
400	0.46
600	0.35
800	0.31

ATS will custom design and manufacture a heat sink that is best suited for your specific application. By providing your system and thermal requirements to our Engineering Department, we will present a design to you within 24 hours.

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powerICE™

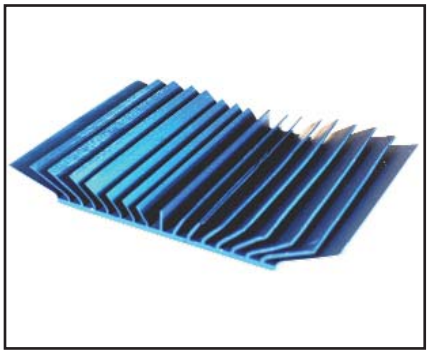
Innovation in Thermal Management™

Heat Sinks

The powerICE™ family of low profile, high performance heat sinks is designed to optimize the thermal management of PCB-mounted power modules in spatially constrained applications having inadequate airflow. Using the patented powerICE™ heat sinks enables circuit designers to achieve higher PCB performance levels than possible with conventional, over-sized heat sinks. Ideal for bypassed and unducted flow conditions, compact powerICE™ heat sinks save space, and their light weight helps reduce costs by eliminating the need for supplemental mechanical mounting clips. powerICE™ heat sinks can be customized for any power module.

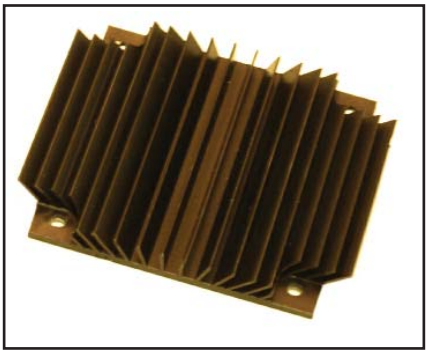
powerICE™ heat sinks utilize a patented design that outperforms conventional heat sinks in comparable applications and eliminates packaging problems associated with over-sized heat sinks that may have excessive spreading resistance.

For use with Power Module DC-DC Converters (e.g. TYCO- JFW050F, JFW075F, JFW100F, JFW150F)



ATS01-00-136 and 136A

	Vel.(ft/min)	Res.(R_{ea})
H: 7mm	100	3.95
W: 58mm	200	2.88
L: 61mm	400	1.80
	600	1.23

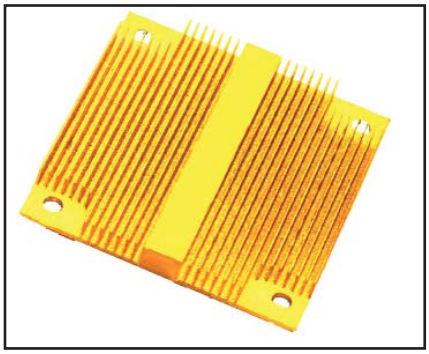


ATS061058006-136C

	Vel.(ft/min)	Res.(R_{ea})
H: 6mm	100	4.37
W: 58mm	200	3.55
L: 61mm	400	2.43
	600	1.99

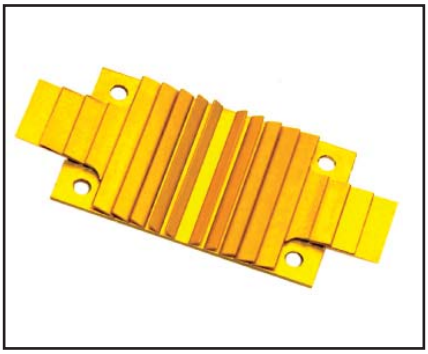
ATS061058005-136D

	Vel.(ft/min)	Res.(R_{ea})
H: 6mm	100	4.76
W: 58mm	200	3.55
L: 61mm	400	2.43
	600	1.99



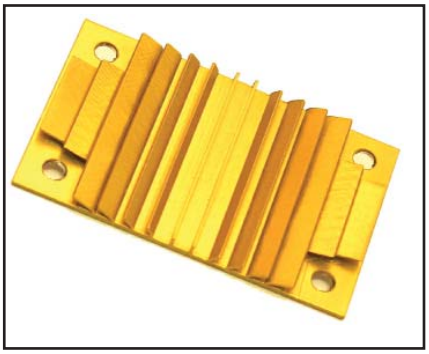
ATS061058006-178

	Vel.(ft/min)	Res.(R_{ea})
H: 6mm	100	5.75
W: 58mm	200	4.86
L: 61mm	400	3.39
	600	2.46



ATS036058004-184

	Vel.(ft/min)	Res.(R_{ea})
H: 5mm	100	7.26
W: 58mm	200	6.54
L: 36mm	400	3.92
	600	2.96



ATS036058004-202

	Vel.(ft/min)	Res.(R_{ea})
H: 4mm	100	14.0
W: 58mm	200	8.89
L: 36mm	400	5.76
	600	3.62

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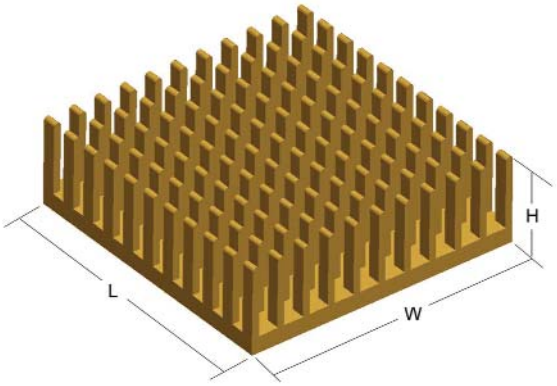
Pin Fin

Extrusion Heat Sinks

Innovation in Thermal Management™



	L (mm)	W (mm)	H (mm)																						
1	10	10	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
2	12	12	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
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16	60	60	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X

HOW TO ORDER:

1. Identify L,W, H of the heat sink suitable for your application
2. Find the correct part number: **e.g. For a 19L, 19W, 15H (mm) heat sink the number is ATS019019015-PF-6N**
   a. Use letters "PF" denoting **Pin Fin** style
   b. Record the number in the leftmost column- **6**
   c. Record the letter in the bottom row- **N**
3. Then visit our website or call for performance & pricing using **ATS019019015-PF-6N**
   www.qats.com, Tel: 781-769-2800

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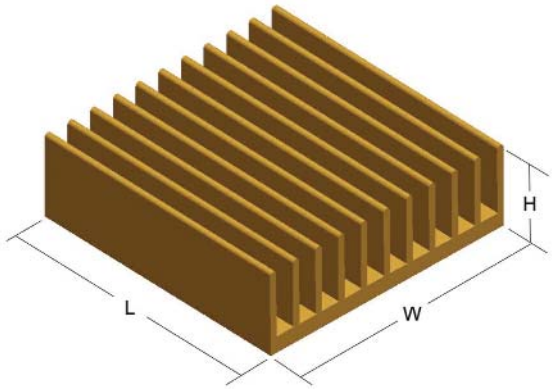
Straight Fin

High Performance Extrusion

Innovation in Thermal Management™



	L (mm)	W (mm)	H (mm)																						
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15	45	45	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
16	60	60	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X

HOW TO ORDER:

1. Identify L,W, H of the heat sink suitable for your application
2. Find the correct part number: **e.g. For a 19L, 19W, 15H (mm) heat sink the number is AT019019015-SF-6N**
   a. Use letters "SF" denoting **straight fin** style
   b. Record the number in the leftmost column- **6**
   c. Record the letter in the bottom row- **N**
3. Then visit our website or call for performance & pricing using **AT019019015-SF-6N** www.qats.com, Tel: 781-769-2800

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89-27 Access Road, Norwood, MA 02062 USA
Tel: 781-769-2800 / Fax: 781-769-9979 / Email: ats@qats.com / www.qats.com

Cross Cut Heatsinks

Innovation in Thermal Management™

Part No.	L - mm (in.)	W - mm (in.)	H - mm (in.)	Finish	Pin Array
ATS021021006-PF010	21 (.827)	21 (.827)	6.4 (.25)	BLACK ANODIZE	6 X 6
ATS021021009-PF011	21 (.827)	21 (.827)	8.9 (.35)	BLACK ANODIZE	6 X 6
ATS021021011-PF012	21 (.827)	21 (.827)	11.4 (.45)	BLACK ANODIZE	6 X 6
ATS021021015-PF013	21 (.827)	21 (.827)	15.2 (.6)	BLACK ANODIZE	6 X 6
ATS025025006-PF014	25 (.984)	25 (.984)	6.4 (.25)	BLACK ANODIZE	7 X 7
ATS025025009-PF015	25 (.984)	25 (.984)	8.9 (.35)	BLACK ANODIZE	7 X 7
ATS025025011-PF016	25 (.984)	25 (.984)	11.4 (.45)	BLACK ANODIZE	7 X 7
ATS025025015-PF017	25 (.984)	25 (.984)	15.2 (.6)	BLACK ANODIZE	7 X 7
ATS028028006-PF018	27.9 (1.1)	27.9 (1.1)	6.4 (.25)	BLACK ANODIZE	7 X 8
ATS028028009-PF019	27.9 (1.1)	27.9 (1.1)	8.9 (.35)	BLACK ANODIZE	7 X 8
ATS028028011-PF020	27.9 (1.1)	27.9 (1.1)	11.4 (.45)	BLACK ANODIZE	7 X 8
ATS028028015-PF021	27.9 (1.1)	27.9 (1.1)	15.2 (.6)	BLACK ANODIZE	7 X 8
ATS035035006-PF022	35 (1.378)	35 (1.378)	6.4 (.25)	BLACK ANODIZE	11 X 11
ATS035035009-PF023	35 (1.378)	35 (1.378)	8.9 (.35)	BLACK ANODIZE	11 X 11
ATS035035011-PF024	35 (1.378)	35 (1.378)	11.4 (.45)	BLACK ANODIZE	11 X 11
ATS035035015-PF025	35 (1.378)	35 (1.378)	15.2 (.6)	BLACK ANODIZE	11 X 11
ATS041041007-PF026	40.6 (1.6)	40.6 (1.6)	6.6 (.26)	BLACK ANODIZE	11 X 11
ATS041041013-PF027	40.6 (1.6)	40.6 (1.6)	13.3 (.525)	BLACK ANODIZE	11 X 11
ATS044044004-PF028	43.5 (1.713)	43.5 (1.713)	3.8 (.15)	BLACK ANODIZE	12 X 14
ATS043045005-PF029	44.5 (1.75)	43.2 (1.7)	5.1 (.2)	BLACK ANODIZE	11 X 10
ATS043045006-PF030	44.5 (1.75)	43.2 (1.7)	6.4 (.25)	BLACK ANODIZE	11 X 10
ATS043045009-PF031	44.5 (1.75)	43.2 (1.7)	8.9 (.35)	BLACK ANODIZE	11 X 10
ATS043045010-PF032	44.5 (1.75)	43.2 (1.7)	10.2 (.4)	BLACK ANODIZE	11 X 10
ATS043045016-PF033	44.5 (1.75)	43.2 (1.7)	16.5 (.65)	BLACK ANODIZE	11 X 10
ATS048054010-PF034	53.3 (2.1)	47.2 (1.86)	10.2 (.40)	BLACK ANODIZE	11 X 11
ATS048054016-PF035	53.3 (2.1)	47.2 (1.86)	16.5 (.65)	BLACK ANODIZE	11 X 11
ATS048054020-PF036	53.3 (2.1)	47.2 (1.86)	20.3 (.8)	BLACK ANODIZE	11 X 11
ATS048054025-PF037	53.3 (2.1)	47.2 (1.86)	25.4 (1)	BLACK ANODIZE	11 X 11
ATS054054010-PF038	53.3 (2.1)	53.3 (2.1)	10.2 (0.4)	BLACK ANODIZE	11 X 12
ATS054054016-PF039	53.3 (2.1)	53.3 (2.1)	16.5 (0.65)	BLACK ANODIZE	11 X 12
ATS054054020-PF040	53.3 (2.1)	53.3 (2.1)	20.3 (0.8)	BLACK ANODIZE	11 X 12
ATS054054025-PF041	53.3 (2.1)	53.3 (2.1)	25.4 (1)	BLACK ANODIZE	11 X 12

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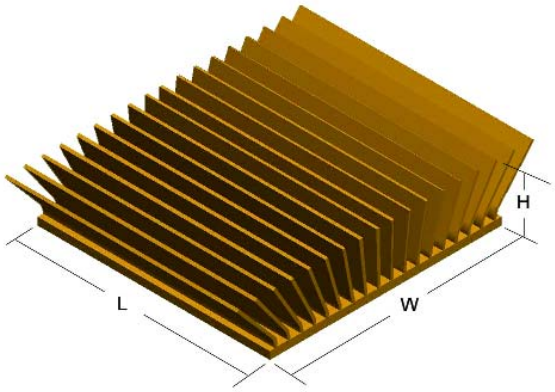
Tel: 781-769-2800 / Fax: 781-769-9979 / Email: ats@qats.com / www.qats.com

maxiFlow™

Ultra Performance Extrusion

Innovation in Thermal Management™



	L (mm)	W (mm)	H (mm)																						
1	10	10	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
2	12	12	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
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16	60	60	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X

HOW TO ORDER:

1. Identify L,W, H of the heat sink suitable for your application
2. Find the correct part number: **e.g. For a 19L, 19W, 15H (mm) heat sink the number is ATS019019015-MF-6N**
   a. Use letters "MF" denoting **maxiFLOW™** style
   b. Record the number in the leftmost column- **6**
   c. Record the letter in the bottom row- **N**
3. Then visit our website or call for performance & pricing using **ATS019019015-MF-6N** www.qats.com, Tel: 781-769-2800

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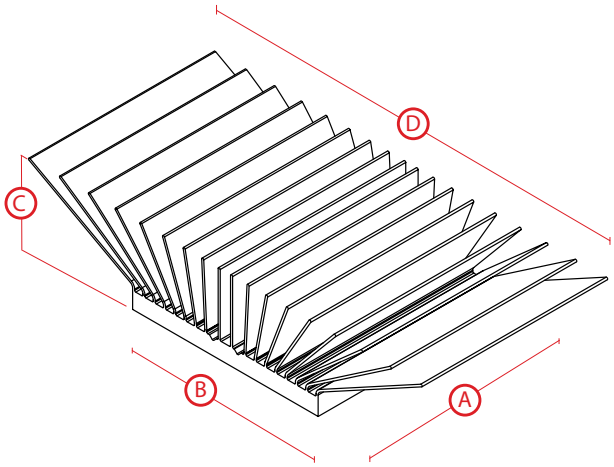
Ultra High Performance BGA Cooling Solutions w/ Thermal Tape Attachment

ATS PART # ATS-52350B-C2-R0

Features & Benefits

- maxiFLOW™ design features a low profile, spread fin array that maximizes surface area for more effective convection (air) cooling
- Fabricated from extruded aluminum, which minimizes thermal resistance from the base to the fins, reduces weight and keeps costs low
- Higher performance helps ensure reliable product life at a lower cost than other extruded heat sinks



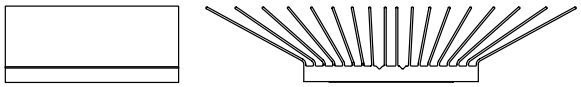


Image above is for illustration purposes only.

Thermal Performance

AIR VELOCITY		THERMAL RESISTANCE	
FT/MIN	M/S	°C/W (UNDUCTED FLOW)	°C/W (DUCTED FLOW)
200	1.0	5.3	3.4
300	1.5	3.9	
400	2.0	3.2	
500	2.5	2.9	
600	3.0	2.6	
700	3.5	2.4	
800	4.0	2.2	

Product Details

DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION D	INTERFACE MATERIAL	FINISH
35 mm	35 mm	7.5 mm	44.9 mm	SAINT-GOBAIN C675	BLUE-ANODIZED

NOTES:

1) Dimension C = heat sink height from bottom of the base to the top of the fin field.
2) Thermal performance data are provided for reference only. Actual performance may vary by application.
3) ATS reserves the right to update or change its products without notice to improve the design or performance.
4) Contact ATS to learn about custom options available.

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

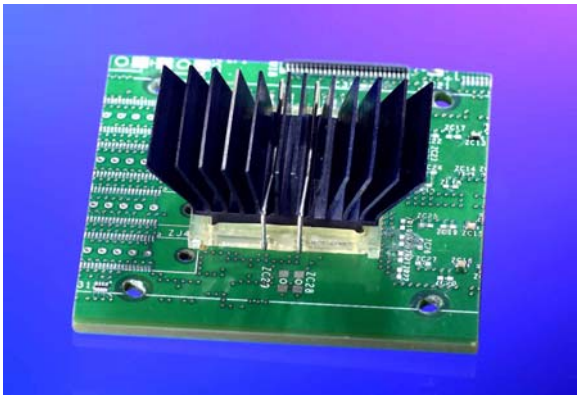
For more information, to find a distributor or to place an order, visit www.qats.com or call: 781.769.2800 (North America); +31 (0) 3569 84715 (Europe).

Clip N' Cool

The Ultimate Heat Sink Attachment Solution

Innovation in Thermal Management™

maxiGRIP™ is a patent-pending frame clip and metal spring clip to secure heat sinks to IC's. The product line is diverse enough to handle the increasing power requirements of today's advanced circuits that run at higher frequencies and are mounted on higher density boards.These BGA's are commonly used in today's telecom, server, storage and other electronic products.



Advantages

Advanced Thermal Solutions, Inc. exclusive heat sink and clip assembly allows for quick and easy installation and removal whenever it is needed. Due to this unique design we can provide suberb cooling, with a wide array of heat sinks, without the hassel of cracking the dies or ripping the component from the PCB during installation.

Application

Quick and easy installation and removal.

1. Place frame clip
2. Set heat sink
3. Snap the spring clip

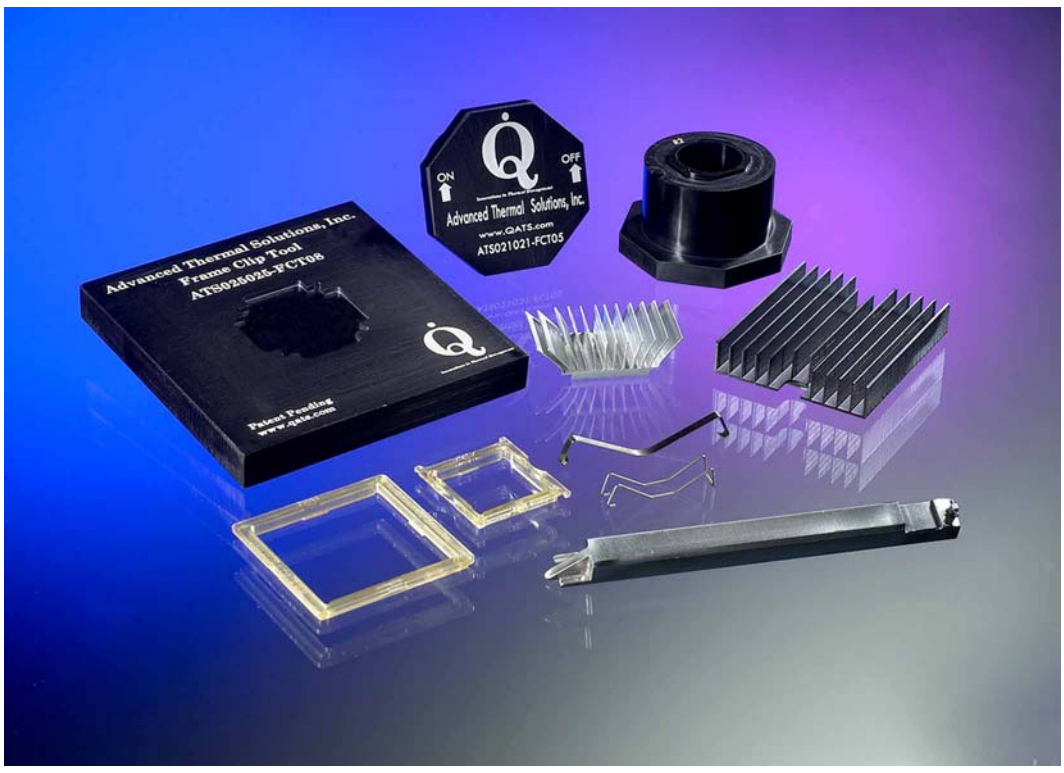
Removal

Simply reverse the steps described above.

Sizes Available

42 x 42 mm
29 x 29 mm
25 x 25 mm
21 x 21 mm

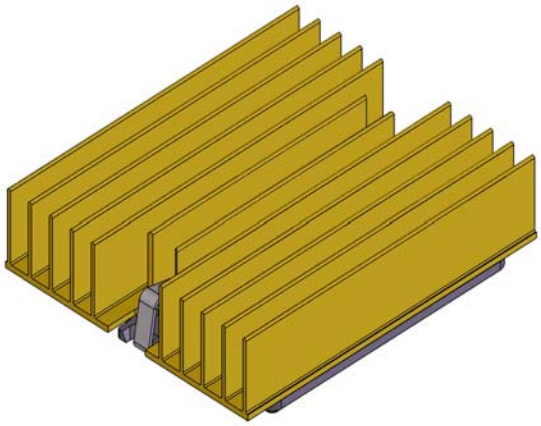
Please contact us for custom clip and cooling designs.

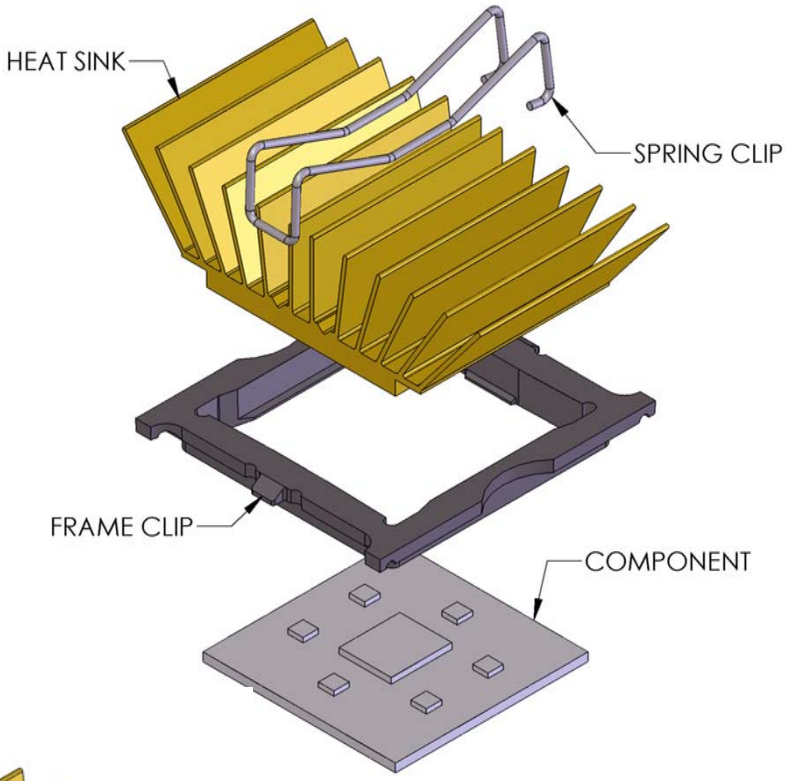


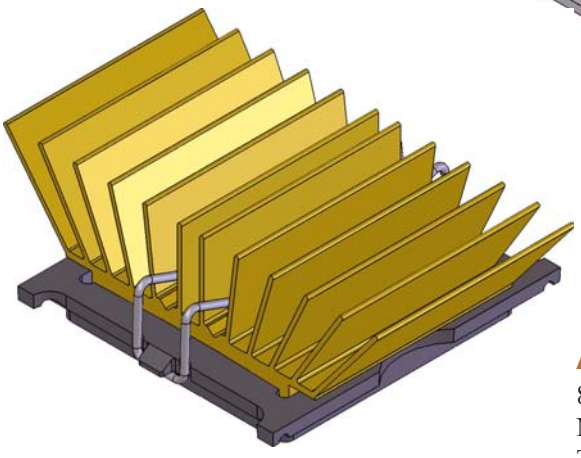
- No threading required. No cracking of die easy on, easy off clip combinations with superb performance
- Clip attachment tool: makes installation & removal a breeze.
- The unique clip design minimizes the effect of creep resulting in a long-lasting, dependable attachment.
- Meets NEBS testing requirements.
- Meets shock and vibration standards. Secures heat sink to component with uniform pressure for consistent thermal performance.
- The secured heat sink attachment results in superior thermal performance.
- Permits overhang of the heat sink on a component, extending the cooling surface.
- Frame and spring clips have negligible effect on air flow.
- Adaptable to a wide spectrum of heat sinks including those designed for high efficiency outputs.
- Doesn't need adjusting to obtain maximum contact area.
- ***maxi*GRIP™** neither rips the component off the PCB nor cracks the die during installation.

*maxi*GRIP™

The Ultimate Heat Sink Attachment Solution







Advanced Thermal Solutions
89-27 Access Road
Norwood, MA 02062
Tel: 781.769.2800 / Fax: 781.769.9979
Email:info@qats.com

www.qats.com

Innovation in Thermal Management™

Advanced Thermal Solutions, Inc. is a cutting-edge, one-stop thermal design/engineering/manufacturing company, with offices in the US & Holland. We provide the following products and services:

Cooling Solutions

- Liquid cooling solutions(0.02 C^0/W CPU cold-plate)
- Custom, standard, & high performance heat sinks
- *maxi*FLOW™, straight fin, pin fin heat sinks

Consulting services

- Analytical modeling
- CFD simulation
- Water flow testing
- JEDEC testing
- Thermal characterization of ICs, heat sinks, cold plates, PC boards and chasses
- Fan selection and its performance management

Test equipment

- Hot wire anemometers
- Wind tunnels and controllers
- Liquid crystal thermography
- High heat flux controller
- Precision temperature and pressure sensors

Other products and services

- Liquid cooling systems
- High capacity cooling solutions
- Fan trays for high powered laser and telecom applications

High Performance BGA Cooling Solutions with maxiGRIP™ Attachment

ATS PART # ATS-53350B-C1-R0

Features & Benefits

- High aspect ratio, straight fin heat sinks that are ideal for compact PCB environments
- maxiGRIP™ attachment applies steady, even pressure to the component and does not require holes in the PCB
- Designed specifically for BGAs and other surface mount packages
- Meets Telcordia GR-63-Core Office Vibration, ETSI 300 019 Transportation Vibration, and MIL-STD-810 Shock testing and Unpackaged Drop Testing standards
- Comes preassembled with high performance, phase change, thermal interface material
- "Keep-Out" Requirements: An "Un-Populated" boarder zone of 5 mm around the component is necessary to facilitate the Installation/ Removal of the maxiGRIP™. Please refer to the maxiGRIP™ Keep-Out Guidelines and maxiGRIP™ Installation/Removal Instructions for further details

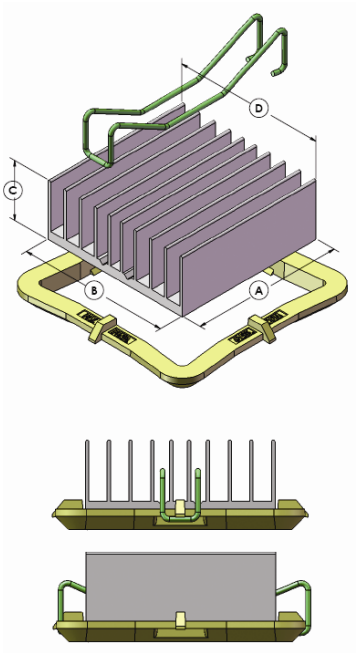


Image above is for illustration purposes only.

Thermal Performance

AIR VELOCITY		THERMAL RESISTANCE	
FT/MIN	M/S	°C/W (UNDUCTED FLOW)	°C/W (DUCTED FLOW)
200	1.0	10.3	4.8
300	1.5	7.6	
400	2.0	6.4	
500	2.5	5.7	
600	3.0	5.2	
700	3.5	4.8	
800	4.0	4.5	

Product Details

DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION D	INTERFACE MATERIAL	FINISH
35 mm	35 mm	7.5 mm	35 mm	CHOMERICS T766	BLUE ANODIZED

NOTES:

1) DIMENSIONS ARE MEASURED IN MILLIMETERS
2) DIMENSIONS A & B REFER TO COMPONENT SIZE
3) DIMENSION C = THE HEIGHT OF THE HEAT SINK SHOWN ABOVE AND DOES NOT INCLUDE THE HEIGHT OF THE ATTACHMENT METHOD
4) ATS RESERVES THE RIGHT TO UPDATE OR CHANGE IT PRODUCTS WITHOUT NOTICE
5) CONTACT ATS TO LEARN ABOUT CUSTOM OPTIONS AVAILABLE

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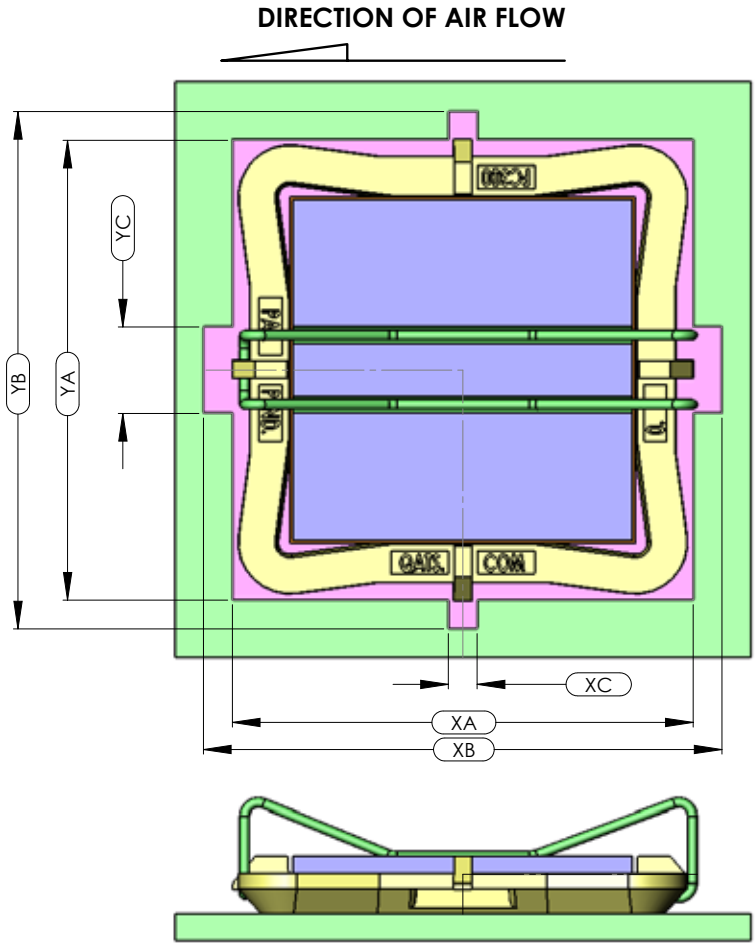
For more information, to find a distributor or to place an order, visit www.qats.com or call: 781.769.2800 (North America); +31 (0) 3569 84715 (Europe).

maxiGRIP™ Clearance Guidelines

Required Board Keep Out Region for maxiGRIP Heat Sink Attachment Hardware



NOM SIZE	XA	XB	XC	YA	YB	YC
17 x17	23.0	31.0	NA	23.0	23.0	11.0
19 x 19	27.0	31.0	2.5	27.0	31.0	8.0
21 x 21	29.0	33.0	2.5	29.0	33.0	8.0
23 x 23	32.5	36.5	2.5	32.5	36.5	8.0
25 x 25	34.0	38.0	2.5	34.0	38.0	8.0
27 x 27	36.0	40.0	2.5	36.0	40.0	8.0
29 x 29	38.5	42.5	2.5	38.5	42.5	8.0
30 x 30	40.0	44.0	2.5	40.0	44.0	8.0
31 x 31	41.0	45.0	2.5	41.0	45.0	8.0
32.5 x 32.5	43.0	47.0	2.5	43.0	47.0	8.0
33 x 33	43.5	47.5	2.5	43.5	47.5	8.0
35 x 35	45.5	49.5	2.5	45.5	49.5	8.0
37.5 x 37.5	48.5	52.5	2.5	48.5	52.5	8.0
40 x 40	52.0	56.0	2.5	52.0	56.0	8.0
42.5 x 42.5	54.5	58.5	2.5	54.5	58.5	8.0
45 x 45	57.0	61.0	2.5	57.0	61.0	8.0

NOTES:

1. Additional constraints may apply if / when heat sinks are used with length or width dimensions that exceed the XA and YA dimensions shown in the table. Please contact ATS for assistance with such applications.
2. Data provided for reference only and may vary by application.
3. ATS reserves the right to update or change its products without notice to improve the design or performance.
4. Contact ATS to learn about custom options available.

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High Performance BGA Cooling Solutions w/ superGRIP™ Attachment

ATS PART # ATS-X50350B-C1-R0

Features & Benefits

- Designed for 35 x 35 mm BGA components
- Requires minimal space around the component's perimeter; ideal for densely populated PCBs
- Allows the heat sink to be detached and reattached without damaging the component or the PCB, an important feature in the event a PCB may need to be reworked
- Strong, uniform attachment force helps achieve maximum performance from phase-changing TIMs
- Eliminates the need to drill mounting holes in the PCB
- Assembly comes standard with a high performance maxiFLOW™ heat sink which maximizes convection (air) cooling
- Comes standard with clean break, reworkable, Chomerics T-766 phase change material

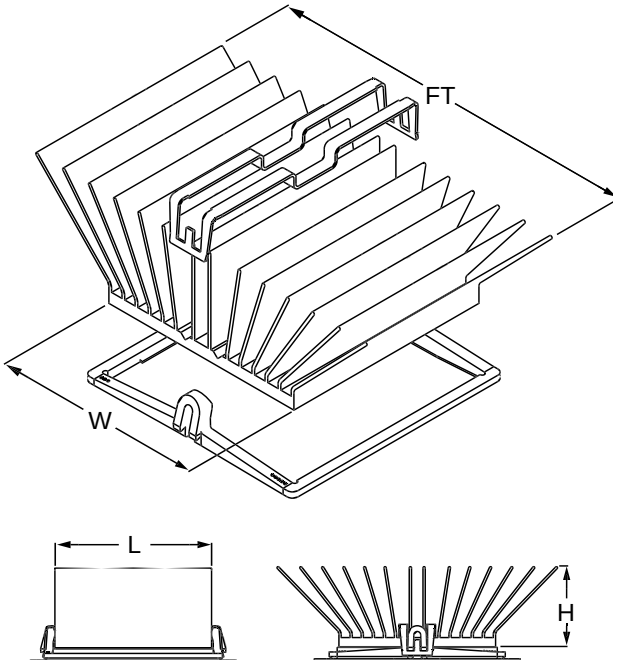

Image above is for illustration purposes only.

Thermal Performance

AIR VELOCITY		THERMAL RESISTANCE	
FT/MIN	M/S	°C/W (UNDUCTED FLOW)	°C/W (DUCTED FLOW)
200	1.0	5.3	3.4
300	1.5	3.9	
400	2.0	3.2	
500	2.5	2.9	
600	3.0	2.6	
700	3.5	2.4	
800	4.0	2.2	

Product Details

LENGTH	WIDTH	HEIGHT	FIN TIP to FIN TIP	INTERFACE MATERIAL	FINISH
35 mm	35 mm	7.5 mm	44.9 mm	CHOMERICS T766	BLUE-ANODIZED

NOTES:

1) Length and width dimensions refer to the size of the component. Dimensions of the heat sink are subject to tolerances of up to .99 mm in order to accommodate the clip assembly
2) Thermal performance data are provided for reference only. Actual performance may vary by application
3) ATS reserves the right to update or change its products without notice to improve the design or performance
4) Additional tooling fees may be required
5) Typical lead time is a minimum of 4-6 weeks
6) Contact ATS to learn about custom options available

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For more information, to find a distributor or to place an order, visit www.qats.com or call: 781.769.2800 (North America); +31 (0) 3569 84715 (Europe).

High Performance BGA Cooling Solutions with superGRIP™ Attachment

ATS PART # ATS-X53350B-C1-R0

Features & Benefits

- Designed for 35 x 35 mm BGA components
- superGRIP™ super strong, uniform attachment force helps achieve maximum performance from phase-changing TIM and does not require holes in the PCB
- Allows the heat sink to be detached and reattached without damaging the component and/or the PCB, an important feature in the event a PCB may need to be reworked
- Meets Telcordia GR-63-Core Office Vibration, ETSI 300 019 Transportation Vibration, and MIL-STD-810 Shock Testing and Unpackaged Drop Testing standards
- Requires minimal space around the component's perimeter; ideal for densely populated PCBs
- "Keep-Out" Requirements: An "Un-Populated" boarder zone of 3 mm around the component is necessary to facilitate the Installation/Removal of the superGRIP™. Please refer to the superGRIP™ Keep-Out Guidelines and superGRIP™ Installation/Removal Instructions for further details

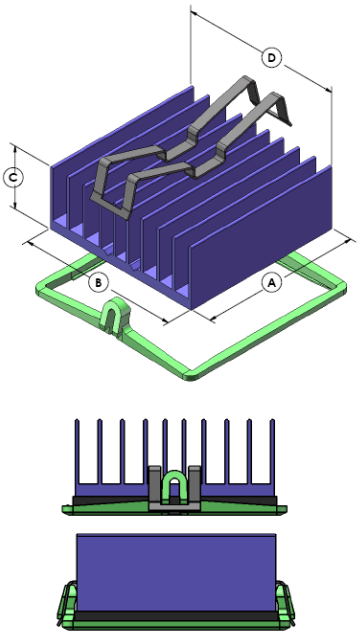


Image above is for illustration purposes only.

Thermal Performance

AIR VELOCITY		THERMAL RESISTANCE	
FT/MIN	M/S	°C/W (UNDUCTED FLOW)	°C/W (DUCTED FLOW)
200	1.0	10.3	4.8
300	1.5	7.6	
400	2.0	6.4	
500	2.5	5.7	
600	3.0	5.2	
700	3.5	4.8	
800	4.0	4.5	

Product Details

DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION D	INTERFACE MATERIAL	FINISH
35 mm	35 mm	7.5 mm	35 mm	CHOMERICS T-766	BLUE ANODIZED

NOTES:

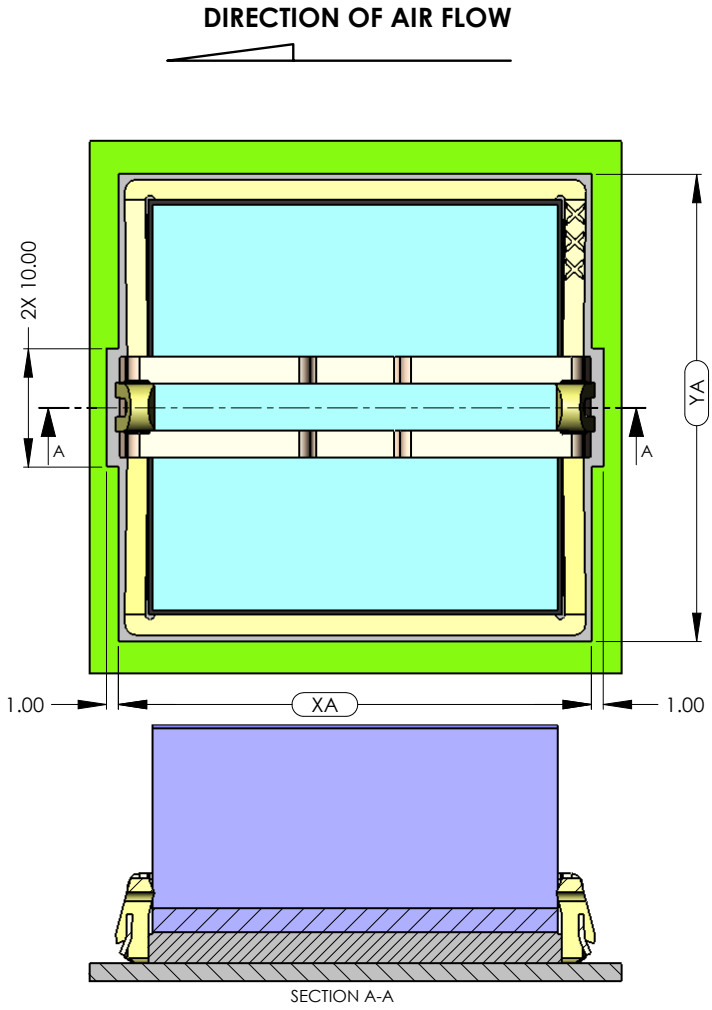
1) DIMENSIONS ARE MEASURED IN MILLIMETERS
2) DIMENSIONS A & B REFER TO COMPONENT SIZE
3) DIMENSION C = THE HEIGHT OF THE HEAT SINK SHOWN ABOVE AND DOES NOT INCLUDE THE HEIGHT OF THE ATTACHMENT METHOD
4) ATS RESERVES THE RIGHT TO UPDATE OR CHANGE IT PRODUCTS WITHOUT NOTICE
5) CONTACT ATS TO LEARN ABOUT CUSTOM OPTIONS AVAILABLE

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

For more information, to find a distributor or to place an order, visit www.qats.com or call: 781.769.2800 (North America); +31 (0) 3569 84715 (Europe).

superGRIP™ Clearance Guidelines

Required Board Keep Out Region for superGRIP Heat Sink Attachment Hardware



NOM SIZE (mm_	XA (mm)	YA (mm)
15 x 15	18.5	18
17 x 17	20.6	20.1
19 x 19	22.7	22.2
21 x 21	24.9	24.4
23 x 23	27.1	26.6
25 x 25	29.3	28.8
27 x 27	31.5	31
29 x 29	33.6	33.1
30 x 30	34.7	34.2
31 x 31	35.8	35.3
32.5 x 32.5	37.4	36.9
33 x 33	37.9	37.4
35 x 35	40	39.5
37.5 x 37.5	42.7	42.2
40 x 40	45.4	44.9
42.5 x 42.5	48	47.5
45 x 45	50.7	50.2

NOTES:

1. Additional constraints may apply if / when heat sinks are used with length or width dimensions that exceed the XA and YA dimensions shown in the table. Please contact ATS for assistance with such applications.
2. Data provided for reference only and may vary by application.
3. ATS reserves the right to update or change its products without notice to improve the design or performance.
4. Contact ATS to learn about custom options available.

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High Performance BGA Cooling Solutions w/ Thermal Tape Attachment

ATS PART # ATS-54350D-C2-R0

Features & Benefits

- High aspect ratio, straight fin heat sinks that are ideal for compact PCB environments
- Designed specifically for BGAs and other surface mount packages
- Comes preassembled with high performance thermal interface material

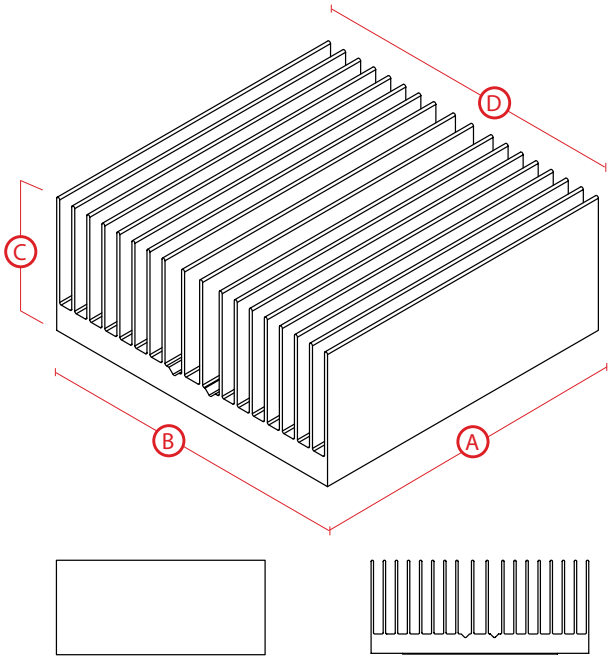

*Image above is for illustration purposes only.

Thermal Performance

AIR VELOCITY		THERMAL RESISTANCE	
FT/MIN	M/S	°C/W (UNDUCTED FLOW)	°C/W (DUCTED FLOW)
200	1.0	10.3	4.8
300	1.5	7.6	
400	2.0	6.4	
500	2.5	5.7	
600	3.0	5.2	
700	3.5	4.8	
800	4.0	4.5	

Product Details

DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION D	INTERFACE MATERIAL	FINISH
35 mm	35 mm	9.5 mm	35 mm	SAINT-GOBAIN C675	BLACK-ANODIZED

NOTES:

1) Dimension C = heat sink height from bottom of the base to the top of the fin field.
2) Thermal performance data are provided for reference only. Actual performance may vary by application.
3) ATS reserves the right to update or change its products without notice to improve the design or performance.
4) Contact ATS to learn about custom options available.

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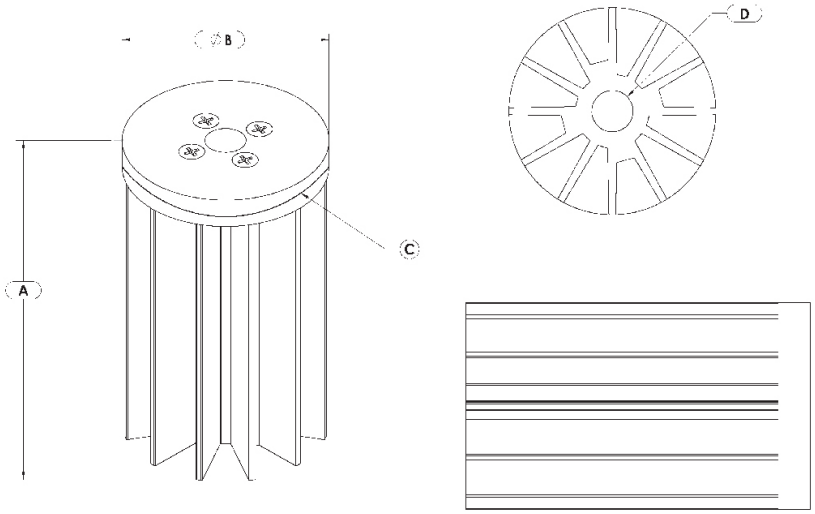
Star LED Heat Sink

ATS PART # ATSEU-077D-C1-R0

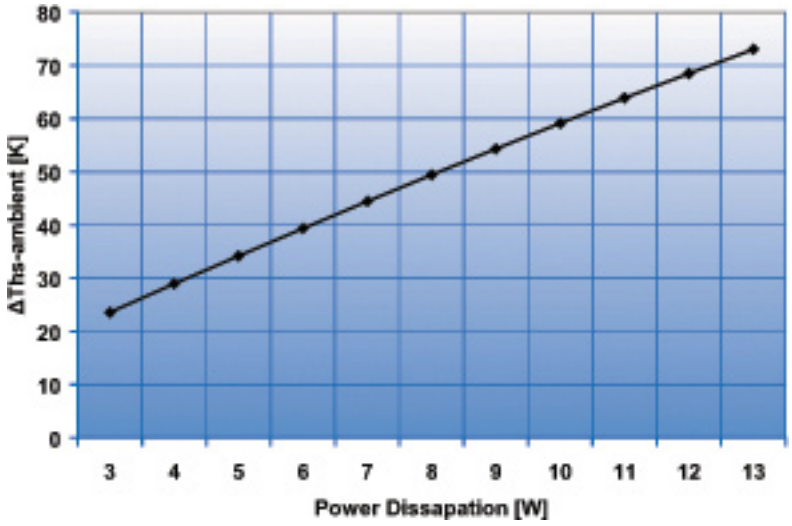
Features & Benefits

- Designed for high-performance convection cooling of high heat flux LEDs
- Base includes inner threads for attachment of brackets and other hardware
- Each Star series heat sink is made from lightweight, anodized aluminum for maximum thermal performance



FOR ILLUSTRATION PURPOSES ONLY

Thermal Performance



Product Details

LENGTH (A)	DIAMETER (B)	OUTER THREAD (C)	INNER THREAD (D)	WEIGHT	FINISH
45 mm	45 mm	NONE	M10X1	74 G	BLACK

NOTES:

1) Thermal Performance data are provided for reference only- Actual performace may vary by application
2) ATS reserves the right to update or change its products without notice
3) Contact ATS to learn about custom options available

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ATS Extrusion Profiles

ATS PART # ATS470105044-EXL10-R0

Features & Benefits

- Aluminum extrusions are the most cost-effective solution for the majority of electronic cooling applications
- This extrusion profile has 10 fins
- Extrusion type is straight fin, AL-6063
- Surface area (in^2/in) is 36.80

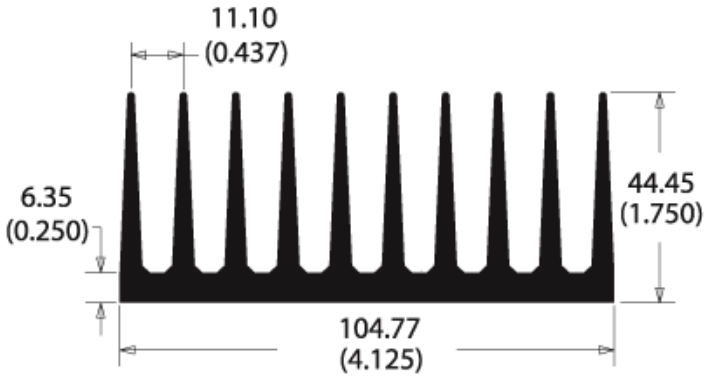
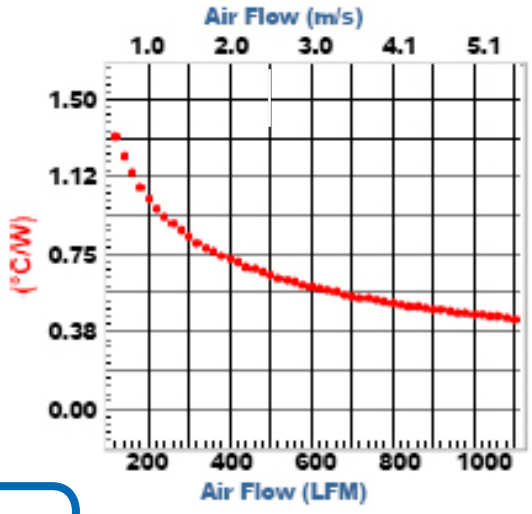


Image above is for illustration purposes only.

Thermal Performance

HEAT SINK THERMAL RESISTANCE



Product Details

LENGTH	WIDTH	HEIGHT	FIN SPACING	BASE THICKNESS	FINISH
470 mm	104.77 mm	44.45 mm	11.10 mm	6.35 mm	NONE

NOTES:

1) **Thermal curve based on 76 mm length.**
2) Thermal performance data are provided for reference only. Actual performance may vary by application.
3) ATS reserves the right to update or change its products without notice to improve the design or performance.
4) Contact ATS to learn about custom options available.

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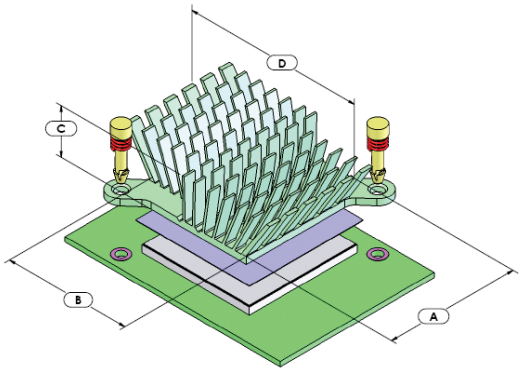
maxiFLOW™ Cross Cut High Performance Heat Sinks with Plastic Push Pin

ATS PART # ATS-1038-C1-R0



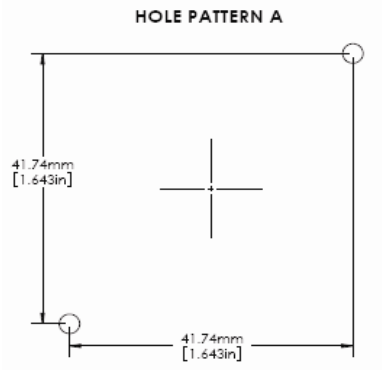


Image above is for illustration purposes only.

Features & Benefits

- For larger heat sinks and higher pre-loads, push pins with compression springs are an effective mounting choice. The push pin has a flexible barb at the end that is designed to engage with a pre-drilled hole in a PWB. The compression spring adds the necessary force to hold the assembly together. Provides better thermal performance than comparable size straight fin and pin fin heat sinks
- Features proven high performance maxiFLOW™ heat sink spread fin array to maximize cooling surfaces
- Ideal for tight spaced components where wider heat sinks can't be used
- Provided with pre-assembled thermal interface material centered on base
- Nylon push pin with steel compression spring
- Reccomended through hole size in PCB is 3.00 mm

Thermal Performance

AIR VELOCITY		THERMAL RESISTANCE (°C/W UNDUCTED)	
FT/MIN	M/S	AIR FLOW STRAIGHT	AIR FLOW SIDEWAYS
200	1.0	5	6.2
300	1.5	3.9	4.9
400	2.0	3.3	3.9
500	2.5	2.8	3.3
600	3.0	2.5	3

Product Details

DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION D	INTERFACE MATERIAL	FINISH
40 mm	38 mm	10 mm	47 mm	CHOMERICS T-766	GREEN ANODIZED

NOTES:

1) DIMENSION C = HEAT SINK HEIGHT FROM BOTTOM OF THE BASE TO THE TOP OF THE FIN FIELD
2) THERMAL PERFORMANCE DATA ARE PROVIDED FOR REFERENCE ONLY. ACTUAL PERFORMANCE MAY VARY BY APPLICATION.
3) ATS RESERVES THE RIGHT TO UPDATE OR CHANGE ITS PRODUCTS WITHOUT NOTICE
4) CONTACT ATS TO LEARN ABOUT CUSTOM OPTIONS AVAILABLE

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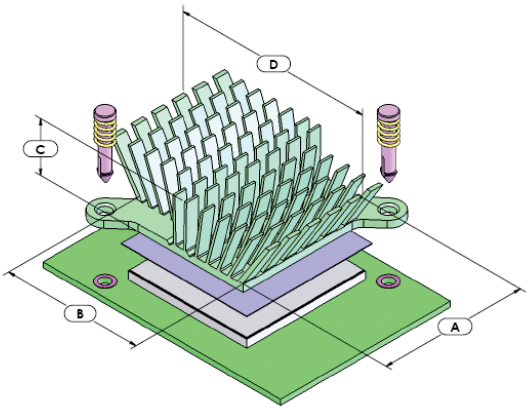
maxiFLOW™ Cross Cut High Performance Heat Sinks with Metal Push Pin

ATS PART # ATS-1038-C2-R0



HOLE PATTERN A

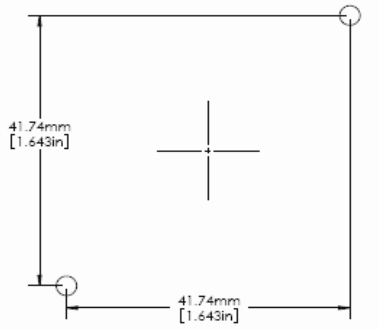


Image above is for illustration purposes only.

Features & Benefits

- For larger heat sinks and higher pre-loads, push pins with compression springs are an effective mounting choice. The push pin has a flexible barb at the end that is designed to engage with a pre-drilled hole in a PWB. The compression spring adds the necessary force to hold the assembly together. Provides better thermal performance than comparable size straight fin and pin fin heat sinks
- Features proven high performance maxiFLOW™ heat sink spread fin array to maximize cooling surfaces
- Ideal for tight spaced components where wider heat sinks can't be used
- Provided with pre-assembled thermal interface material centered on base
- Brass push pin with steel compression spring
- Reccomended through hole size in PCB is 3.00 mm

Thermal Performance

AIR VELOCITY		THERMAL RESISTANCE (°C/W UNDUCTED)	
FT/MIN	M/S	AIR FLOW STRAIGHT	AIR FLOW SIDEWAYS
200	1.0	5	6.2
300	1.5	3.9	4.9
400	2.0	3.3	3.9
500	2.5	2.8	3.3
600	3.0	2.5	3

Product Details

DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION D	INTERFACE MATERIAL	FINISH
40 mm	38 mm	10 mm	47 mm	CHOMERICS T-766	GREEN ANODIZED

NOTES:

1) DIMENSION C = HEAT SINK HEIGHT FROM BOTTOM OF THE BASE TO THE TOP OF THE FIN FIELD.
2) THERMAL PERFORMANCE DATA ARE PROVIDED FOR REFERENCE ONLY. ACTUAL PERFORMANCE MAY VARY BY APPLICATION.
3) ATS RESERVES THE RIGHT TO UPDATE OR CHANGE ITS PRODUCTS WITHOUT NOTICE
4) CONTACT ATS TO LEARN ABOUT CUSTOM OPTIONS AVAILABLE

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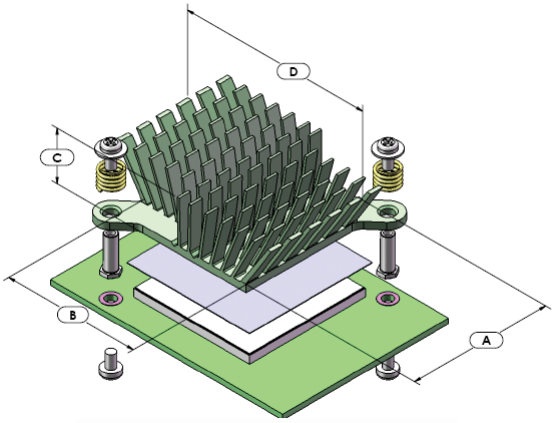
maxiFLOW™ Cross Cut High Performance Heat Sinks with Hardware Attachment

ATS PART # ATS-1038-C3-R0



HOLE PATTERN A

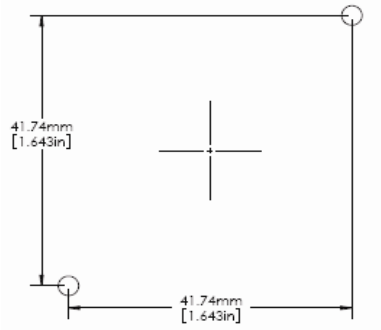


Image above is for illustration purposes only.

Features & Benefits

- For larger heat sinks and higher pre-loads, push pins with compression springs are an effective mounting choice. The push pin has a flexible barb at the end that is designed to engage with a pre-drilled hole in a PWB. The compression spring adds the necessary force to hold the assembly together. Provides better thermal performance than comparable size straight fin and pin fin heat sinks
- Features proven high performance maxiFLOW™ heat sink spread fin array to maximize cooling surfaces
- Ideal for tight spaced components where wider heat sinks can't be used
- Provided with pre-assembled thermal interface material centered on base
- PEM Standoff with compression and screws
- Reccomended through hole size in PCB is 3.00 mm

Thermal Performance

AIR VELOCITY		THERMAL RESISTANCE (°C/W UNDUCTED)	
FT/MIN	M/S	AIR FLOW STRAIGHT	AIR FLOW SIDEWAYS
200	1.0	5	6.2
300	1.5	3.9	4.9
400	2.0	3.3	3.9
500	2.5	2.8	3.3
600	3.0	2.5	3

Product Details

DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION D	INTERFACE MATERIAL	FINISH
40 mm	38 mm	10 mm	47 mm	CHOMERICS T-766	GREEN ANODIZED

NOTES:

1) DIMENSION C = HEAT SINK HEIGHT FROM BOTTOM OF THE BASE TO THE TOP OF THE FIN FIELD.
2) THERMAL PERFORMANCE DATA ARE PROVIDED FOR REFERENCE ONLY. ACTUAL PERFORMANCE MAY VARY BY APPLICATION.
3) ATS RESERVES THE RIGHT TO UPDATE OR CHANGE ITS PRODUCTS WITHOUT NOTICE
4) CONTACT ATS TO LEARN ABOUT CUSTOM OPTIONS AVAILABLE

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ATS fanSINK™ with maxiGRIP™ Attachment

ATS PART # ATS-61270D-C1-R0

Features & Benefits

- X-Cut Straight Fin Heat Sink Fins offer omni-directional air flow for optimum thermal performance independent of PCB lay-out
- Stainless Steel Screw Fan Attachment - Ensures dependable long-term fan to heat sink assembly
- Component Attachment - ATS maxiGRIP™ is a proven high reliability mechanical attachment system
- ATS maxiGRIP™ Hardware includes a High Performance Plastic “Frame Clip” and 300 Series Stainless Steel “Spring Clip”- avoiding PCB through holes
- Provided with pre-assembled Thermal Interface Material (TIM) centered on base
- “Keep-Out” Requirements: An “Un-Populated” boarder zone of 5 mm around the component is necessary to facilitate the Installation/Removal of the maxiGRIP™. Please refer to the maxiGRIP™ Keep-Out Guidelines and maxiGRIP™ Installation/Removal Instructions for further details
- **Please Note: FAN NOT INCLUDED. Fan type is specific to individual customer requirements. Fans need to be independently sourced.**

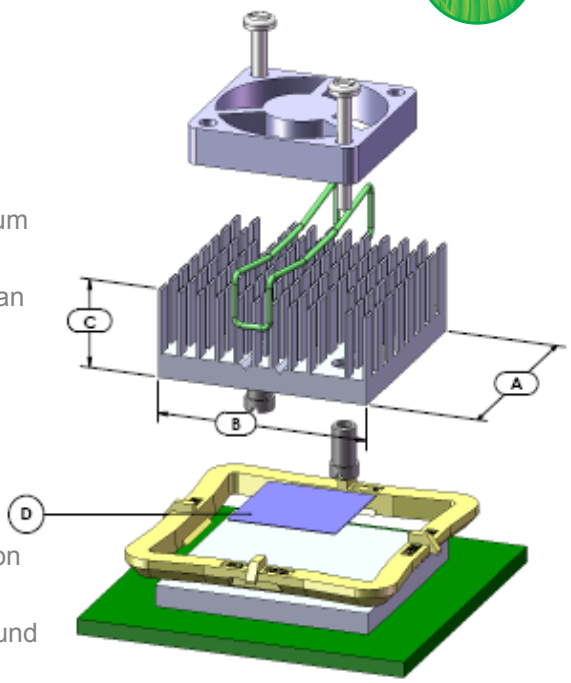
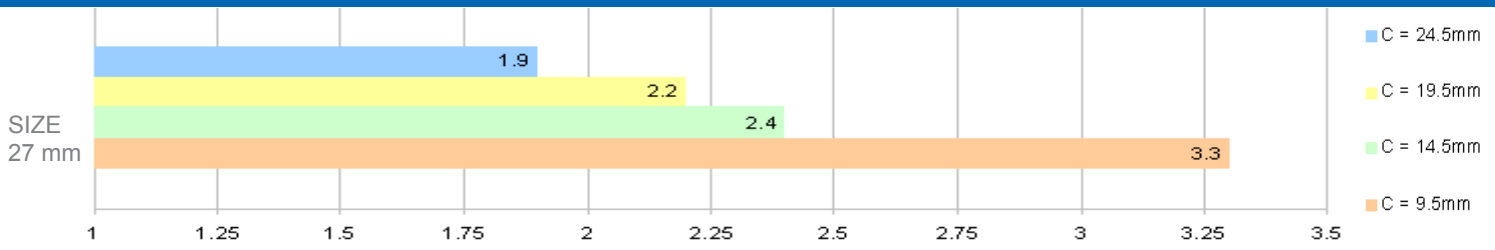


ILLUSTRATION ONLY
FAN NOT INCLUDED

Thermal Performance

ATS fanSINK™ HEIGHT COMPARISON — **HS HEIGHT**



HEAT SINK THERMAL PERFORMANCE (°C/W)

Product Details

DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION D	INTERFACE MATERIAL	FINISH
27 mm	27 mm	9.5 mm	15 X 15 mm	CHOMERICS T-412	BLACK ANODIZED

NOTES:

1) Dimension C = heat sink height from bottom of the base to the top of the fin field
2) Thermal data reference only. Actual performance may vary by application
3) ATS reserves the right to update or change its products without notice
4) Contact ATS to learn about custom options available
5) Standard Fan Dimensions L x W x H are: 25 mm x 25 mm x 6 mm
6) Standard Fan Hole Pattern is: 20mm C-C, (center-to-center)

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Thermal Consulting Services

The True Complete Solutions Provider

Innovation in Thermal Management™

Service

ATS will **Evaluate, Analyze & Design a Solution** to your electronics cooling problems.

Goal

ATS seeks to provide the most innovative and cost effective solutions for your thermal problems.

Process

ATS will address your problem with detailed thermal analysis and experimentation. We can examine the entire packaging domain that includes component, circuit boards (PCBs), shelf (rack) and the complete system.

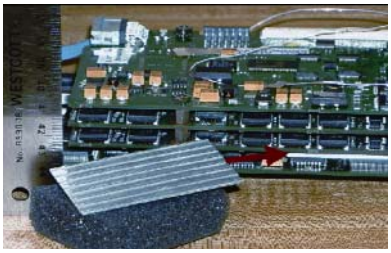
Facility

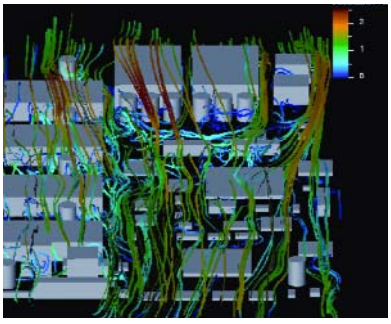
Computational Laboratory

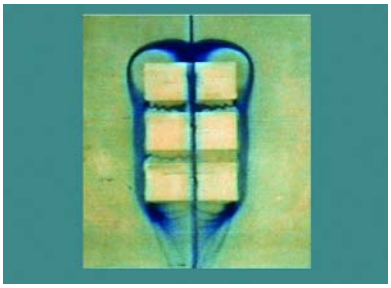
Analytical and computational modeling (supported by Flotherm & CFdesign thermal analysis software packages and ANSYS for thermal and mechanical studies).

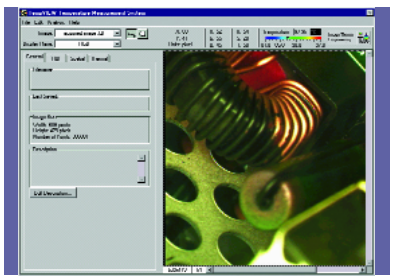
Thermal/Fluids Laboratory

A state-of-the-art facility for experimental characterization of components, boards, and systems.









The ATS Difference

Providing Solutions

ATS prides itself on being the true complete solutions' provider. We provide analysis, design recommendation, and deliver the hardware solution, e.g., custom design maxiFLOW™ heat sinks that are suited for your application(s).

Customized Solutions

At Advanced Thermal Solutions, we believe customers who wish to remain competitive should consider a design-to-suit opportunity strategy first. Contrary to common perception, this usually proves to be less expensive to the customer in the long run, because of the ensuing gain in product efficiency and compatibility.

Engineering-Driven

ATS is a thermal management company— the firm has several staff and consulting engineers with doctorates in the thermal sciences and over 100 years of collective experience. We deliver engineered solutions rich in innovation and least in cost.

- **Flow Simulation** High and low speed wind tunnels for component, heat sink and PCB level characterization at different operating ambient.
- **Thermography (Die Level)** Liquid Crystal Imaging system for temperature measurement and mapping of ICs and components. The measurement resolutions span from small scale (1 micron) to large PCBs.
- **Thermography (PCB and System)** IR thermography system for board and system thermal mapping.
- **Velocity Measurement** Hot wire anemometry for mapping velocity and temperature distributions in PCBs and systems.
- **Contact Resistance** Measurement capability
- **Thermal Conductivity** Material thermal conductivity measurement facility.
- **Heat Transfer Coefficient** Measurement facility.
- **Liquid Cooling Facility** For thermal characterization of heat sinks and boards, 3kW cooling capacity.
- **Elevated Temperature** Testing Facility for components and boards.
- **Sensor Calibration Services** For temperature, velocity, pressure and heat flux sensors.
- **Fan Characterization Facility** Pressure drop versus volumetric flow rate measure-

Advanced Thermal Solutions, Inc.
89-27 Access Road, Norwood, MA 02062 USA
Tel: 781-769-2800 / Fax: 781-769-9979 / Email: ats@qats.com / www.qats.com