

Thermal Management Solutions for BGAs

BGA THERMAL SOLUTIONS MATRIX

The following table represents Wakefield's recommendations for a variety of standard BGA sizes. However, this is by no means a complete list of components that can be used with these heat sinks. To determine suitability for your particular component, request a BGA heat sink evaluation kit.

| BGA Sizes (mm) | Heat Sink Footprint (mm) | Heat Sink Height (inches) | | | | Recommended Series # | Attachment Method |
|----------------|--------------------------|---------------------------|-----|------|---------|----------------------|-------------------|
| 17 | 17 x 17 | .40 | | | | D10650 | Adhesive |
| 19 | 19 x 19 | 1.00 | | | | 602 | Adhesive |
| 21 | 21 x 21 | .40 | | | | D10850 | Adhesive |
| 21 | 21 x 21 | .25 | .35 | .45 | .60 | 624 | Adhesive |
| 23 | 22 x 22 | .40 .60 | | | | 604 | Adhesive |
| 23 | 22 x 22 | .75 | | | | 605 | Adhesive |
| 25 | 25 x 25 | .25 | .35 | .45 | .60 | 625 | Adhesive |
| 27 | 28 x 28 | .25 | .35 | .45 | .60 | 658 | Adhesive |
| 29 | 30 x 30 | .77 | | | | 606 | Adhesive |
| 31 | 31 x 28 | .65 | | | | 607 | Adhesive |
| 31 | 31 x 31 | .80 | | | | 611 | Adhesive |
| 33 | 32 x 32 | .35 .40 | | | | 610 | Adhesive |
| 35 | 35 x 35 | .65 | | | | 612 | Adhesive |
| 35 | 35 x 35 | .25 | .35 | .45 | .60 | 642 | Adhesive |
| 35 | 35 x 35 | .25 | .35 | .45 | .60 | 630 | Adhesive |
| 37.5 | 37 x 37 | .50 | | | | 613 | Adhesive |
| 37.5 | 37 x 37 | .65 | | | | 659 | Adhesive |
| 45.7 x 35.5 | 37 x 47 | .80 | | | | 617 | Adhesive |
| 40 | 38 x 38 | .30 | .50 | 1.00 | | 614 | Adhesive |
| 37.5 | 38 x 38 | .29 | | | | 660 | Adhesive |
| 40 | 40 x 28 | .35 | | | | 643 | Clip |
| 40 | 40 x 40 | .26 | .53 | | | 655 | Adhesive |
| 42.5 | 41 x 41 | .41 | | | | 615 | Adhesive |
| 45 | 43 x 43 | .20 | .25 | .35 | .45 .60 | 628 | Adhesive |
| 45 | 43 x 43 | .15 | | | | 662 | Adhesive |
| 47.5 | 47 x 47 | .80 | | | | 616 | Adhesive |
| 50 | 50 x 50 | .40 | .65 | .80 | 1.00 | 698 | Adhesive |
| 50 | 51 x 51 | .20 1.00 | | | | 618 | Adhesive |
| 50 | 52 x 51 | .80 | | | | 622 | Adhesive |
| 50 | 53 x 47 | .40 | .65 | .80 | 1.00 | 798 | Adhesive |
| 50 | 64 x 51 | .24 | | | | 620 | Adhesive |
| up to 45 | 73 x 50 | .50 1.00 | | | | 609 | Clip |
| up to 45 | 73 x 50 | .95 | | | | 619 | Clip |

RoHS COMPLIANCE

Please note that Wakefield part numbers designated with an "E" in this catalog denote new parts in compliance with the RoHS initiative, with the exception of our Precision Clamps. Wakefield will still continue to offer non-RoHS compliant versions of these parts. Please be aware that many Wakefield Standard parts have always been compliant since their design inception and therefore will not carry the "E" designation.

Wakefield requests that you refer to the RoHS compliance tool on our website at www.wakefield.com to verify RoHS compliance. If you require further clarification or information regarding RoHS, please contact the factory.

THERMAL INTERFACE MATERIAL PART NUMBER GUIDE

All of the heat sinks shown in this catalog are available with any of the following thermal tape and interface materials, pre-applied at the factory. Use the “T” series, thermally enhanced, pressure sensitive adhesives to attach the heat sink to the electronic package and provide a good thermal link to the heat sink. The “S” series interface materials have adhesives on only one side, for pre-attachment to the heat sink, and provide superior thermal performance. Specify these materials in applications where the heat sink will be fixed to the electronic package by some mechanical means other than a tape. Please note that none of these materials are for use in applications requiring electrical isolation from the electronic device. All options other than -T1 and -T4 are RoHS compliant.

Note: To obtain the estimated thermal resistance of the interface material in your application, divide the thermal impedance value by the area of the pad in square inches. For example, a 2” x 2” piece of T4 has a resistance of $1.10 \text{ C-in}^2/\text{W} \div 4 \text{ in}^2 = 0.275 \text{ C/W}$

“T” SERIES THERMALLY ENHANCED PRESSURE SENSITIVE ADHESIVES

| Suffix | Manufacturer Product | Thermal Impedance C-in ² /W | Thickness, Inches | Package Surface, Comments |
|--------|----------------------|---|----------------------|---|
| -T1 | Chomerics, T405 | 0.47 | 0.006 | Metal/ceramic; aluminum carrier |
| -T1E | Chomerics, T405R | 0.47 | 0.006 | RoHS-compliant version of -T1 |
| -T3 | Chomerics, T412 | 0.25 | 0.009 | Metal/ceramic; very good performance and conformity |
| -T4 | Chomerics, T410 | 1.10 | 0.007 | Plastic |
| -T4E | Chomerics, T410R | 1.10 | 0.007 | RoHS-compliant version of -T4 |
| -T5 | Chomerics, T411 | 1.00 | 0.011 | Plastic; conforms to out-of-flat packages |
| -T6 | 3M, 8810 | 0.88 | 0.010 | Metal/ceramic; very good adhesion and conformity |
| -T7 | Bergquist, BP 108 | 1.28 | 0.008 | Metal/ceramic; electrically insulating |

“S” SERIES THERMAL INTERFACE PADS

| Suffix | Manufacturer Product | Thermal Impedance C-in ² /W | Thickness, Inches | Package Surface, Comments |
|--------|----------------------|---|----------------------|--|
| -S4 | Berquist Softface | 0.06 | 0.005 | All surfaces; requires mechanical fasteners |

ORDERING INFORMATION

Once you have chosen heat sink and thermal interface material that meets your thermal & mechanical requirements it is easy to designate the part number. Simply add the interface material suffix referenced on the chart above to the base part number for the heat sink. The base part number already includes information regarding its size and finish.

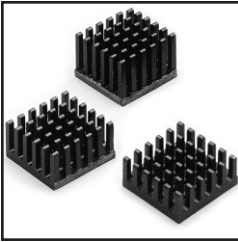
Example:

To order the 658 Series heat sink at .350” tall with the T5 thermal interface material, specify part number:

658-35AB - T5

Integrated Circuit Heat Sinks

HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs



624 SERIES Omnidirectional Pin Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. Sq. | Fin Height "A" in. (mm) | Typical Applications | Weight lbs. (grams) |
|--------------|-------------------------|-------------------------|----------------------|---------------------|
| 624-25AB | .827 (21) | .250 (6.4) | 21mm BGA | .009 (4.09) |
| 624-35AB | .827 (21) | .350 (8.9) | 21mm BGA | .011 (4.99) |
| 624-45AB | .827 (21) | .450 (11.4) | 21mm BGA | .015 (6.81) |
| 624-60AB | .827 (21) | .600 (15.2) | 21mm BGA | .026 (11.80) |

Material: Aluminum, Black Anodized

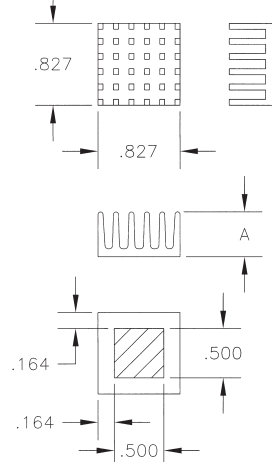
The 624 Series is an omnidirectional pin fin heat sink for both natural and forced-convection applications.

Applications include network routers and switches, high-resolution printers, digital cameras, consumer video games, digital video disks (DVD) and global positioning systems (GPS).

PRODUCT FEATURES

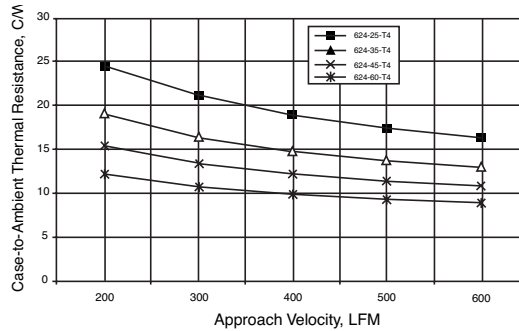
- Available in four standard heights, .25 inch, .35 inch, .45 inch, and .60 inch.
- Available with pressure sensitive adhesives for quick and easy mounting. See Page 3

MECHANICAL DIMENSIONS

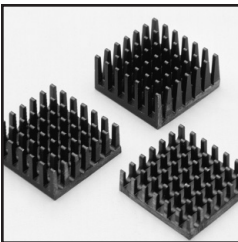


624 SERIES

624 THERMAL PERFORMANCE



Dimensions: in.



625 SERIES Omnidirectional Pin Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. Sq. | Fin Height "A" in. (mm) | Typical Applications | Weight lbs. (grams) |
|--------------|-------------------------|-------------------------|----------------------|---------------------|
| 625-25AB | .984 (25) | 0.250 (6.4) | 25 mm BGA | .012 (5.45) |
| 625-35AB | .984 (25) | 0.350 (8.9) | 25 mm BGA | .014 (6.36) |
| 625-45AB | .984 (25) | 0.450 (11.4) | 25 mm BGA | .018 (8.17) |
| 625-60AB | .984 (25) | 0.600 (15.2) | 25 mm BGA | .030 (13.62) |

Material: Aluminum, Black Anodized

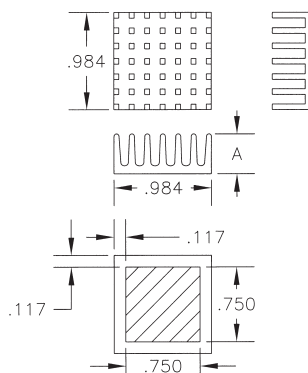
The 625 Series is an omnidirectional pin fin heat sink for both natural and forced-convection applications.

Applications include network routers and switches, high-resolution printers, digital cameras, consumer video games, digital video disks (DVD) and global positioning systems (GPS).

PRODUCT FEATURES

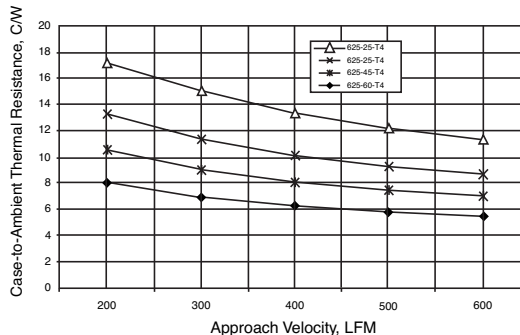
- Available in four standard heights, .25 inch, .35 inch, .45 inch, and .60 inch.
- Available with pressure sensitive adhesives for quick and easy mounting. See Page 3

MECHANICAL DIMENSIONS



625 SERIES

625 THERMAL PERFORMANCE



Dimensions: in.

HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs

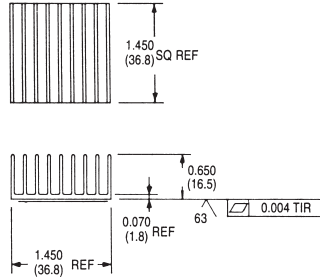


659 SERIES Unidirectional Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Typical Application | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|---------------------|------------------|---------------------|
| 659-65AB | 1.45 (36.8) sq | 0.650 (16.5) | 37mm BGA | Black Anodized | 0.050 (22.68) |

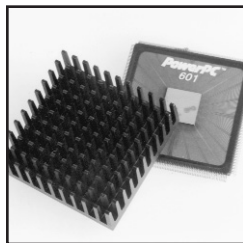
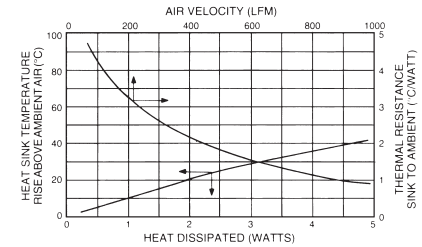
Notes: 1. Optional factory preapplied pressure-sensitive adhesive. See Page 3

MECHANICAL DIMENSIONS



Dimensions: in. (mm)

NATURAL AND FORCED CONVECTION CHARACTERISTICS

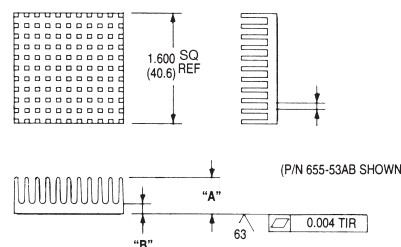


655 SERIES Omnidirectional Pin Fin Heat Sink for BGAs and PowerPC™

| Standard P/N | Base Dimensions in. (mm) | Dimension "A" in. (mm) | Dimension "B" in. (mm) | Typical Applications | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|------------------------|------------------------|----------------------|------------------|---------------------|
| 655-26AB | 1.600 (40.6) sq | 0.260 (6.6) | 0.125 (3.2) | 40mm BGA | Black Anodized | 0.038 (17.01) |
| 655-53AB | 1.600 (40.6) sq | 0.525 (13.3) | 0.145 (3.7) | 40mm BGA | Black Anodized | 0.050 (22.68) |

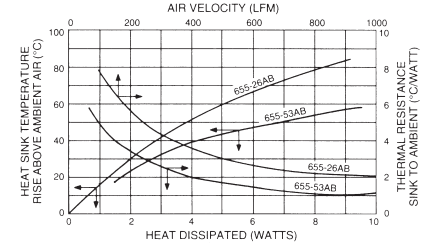
Notes: 1. Optional factory preapplied pressure-sensitive adhesive. See Page 3

MECHANICAL DIMENSIONS



Dimensions: in. (mm)

NATURAL AND FORCED CONVECTION CHARACTERISTICS

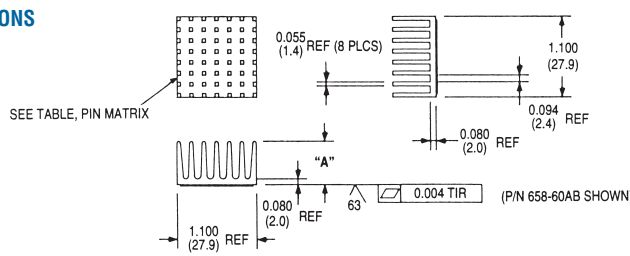


658 SERIES Omnidirectional Pin Fin Heat Sink for BGAs and PowerPC™

| Standard P/N | Base Dimensions in. (mm) | Dimension "A" in. (mm) | Typical Applications | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|------------------------|----------------------|------------------|---------------------|
| 658-25AB | 1.100 (27.9) sq | 0.250 (6.4) | 27mm BGA | Black Anodized | 0.013 (5.67) |
| 658-35AB | 1.100 (27.9) sq | 0.350 (8.9) | 27mm BGA | Black Anodized | 0.015 (6.70) |
| 658-45AB | 1.100 (27.9) sq | 0.450 (11.4) | 27mm BGA | Black Anodized | 0.019 (8.50) |
| 658-60AB | 1.100 (27.9) sq | 0.600 (15.2) | 27mm BGA | Black Anodized | 0.031 (14.17) |

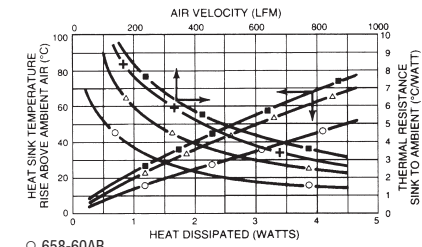
Notes: 1. Optional factory preapplied pressure-sensitive adhesive. See Page 3

MECHANICAL DIMENSIONS

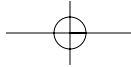


Dimensions: in. (mm)

NATURAL AND FORCED CONVECTION CHARACTERISTICS

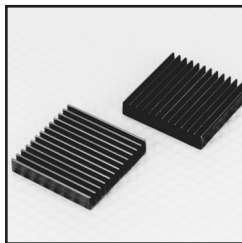


KEY: ■ 658-25AB + 658-35AB △ 658-45AB ○ 658-60AB



Integrated Circuit Heat Sinks

HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs

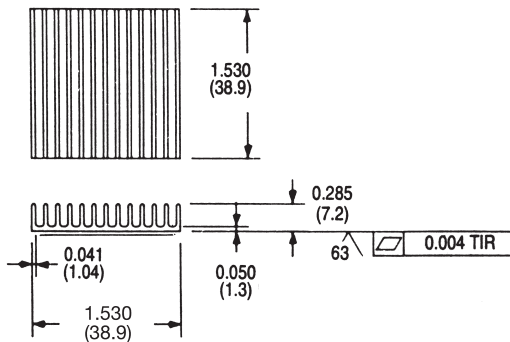


660 SERIES Unidirectional Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Typical Application | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|---------------------|------------------|---------------------|
| 660-29AB | 1.530SQ. (38.9)SQ. | 0.285 (7.2) | 37mm BGA | Black Anodized | 0.031 (14.17) |

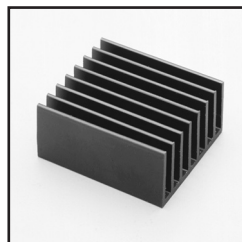
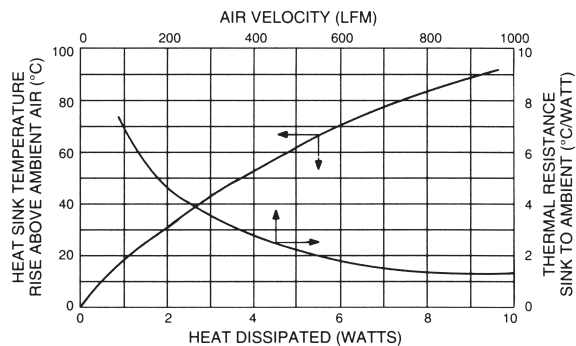
Notes: 1. Optional factory preapplied pressure-sensitive adhesive. See Page 3

MECHANICAL DIMENSIONS



Dimensions: in. (mm)

NATURAL AND FORCED CONVECTION CHARACTERISTICS



642 SERIES Unidirectional Pin Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. Sq. | Fin Height "A" in. (mm) | Typical Applications | Weight lbs. (grams) |
|--------------|-------------------------|-------------------------|----------------------|---------------------|
| 642-25AB | 1.378 (35) | .250 (6.4) | 35 mm BGA | .022 (9.99) |
| 642-35AB | 1.378 (35) | .350 (8.9) | 35 mm BGA | .027 (12.26) |
| 642-45AB | 1.378 (35) | .450 (11.4) | 35 mm BGA | .031 (14.07) |
| 642-60AB | 1.378 (35) | .600 (15.2) | 35 mm BGA | .039 (17.71) |

Material: Aluminum, Black Anodized

The 642 Series is an unidirectional pin fin heat sink for both natural and forced-convection applications.

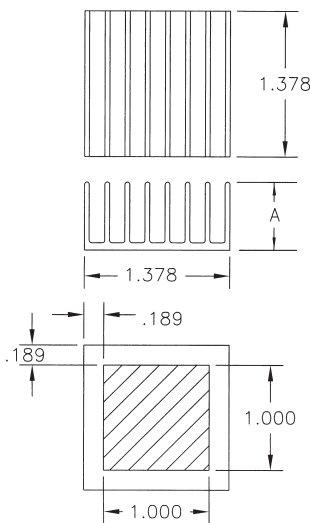
Applications include network routers and switches, high-resolution printers, digital cameras, consumer video games, digital video disks (DVD) and global positioning systems (GPS).

PRODUCT FEATURES

- Available in four standard heights, .25 inch, .35 inch, .45 inch, and .60 inch.
- Available with pressure sensitive adhesives for quick and easy mounting. See Page 3

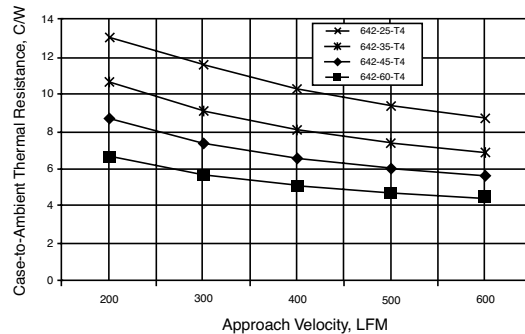
MECHANICAL DIMENSIONS

642 SERIES

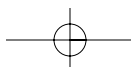


Dimensions: in. (mm)

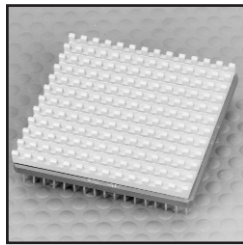
642 THERMAL PERFORMANCE



Performance shown is with T4 thermal adhesive applied.



HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs



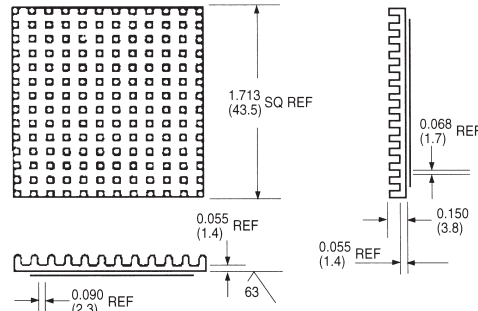
662 SERIES Omnidirectional Pin Fin Heat Sink for Limited Height BGAs

| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Typical Applications | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|----------------------|------------------|---------------------|
| 662-15AG | 1.713 (43.5) sq | 0.150 (3.8) | 45mm BGA | Gold Iridite | 0.019 (8.50) |
| 662-15AB | 1.713 (43.5) sq | 0.150 (3.8) | 45mm BGA | Black Anodized | 0.019 (8.50) |

Notes: 1. Optional factory preapplied pressure-sensitive adhesive. See Page 3

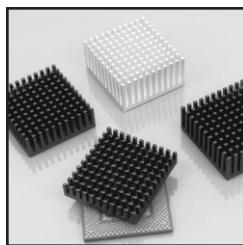
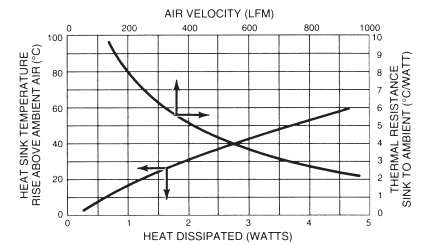
MECHANICAL DIMENSIONS

12 x 14 PINS



Dimensions: in. (mm)

NATURAL AND FORCED CONVECTION CHARACTERISTICS



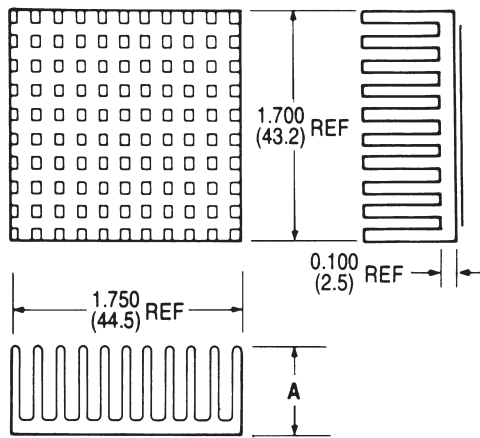
628 SERIES Omnidirectional Pin Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. (mm) | Dimensions "A" in. (mm) | Typical Applications | Heat Sink Finish | Weight lbs. (grams) |
|--------------|-----------------------------|-------------------------|----------------------|------------------|---------------------|
| 628-20AB | 1.750 (44.5) x 1.700 (43.2) | 0.200 (5.1) | 45mm BGA | Black Anodized | 0.031 (14.17) |
| 628-25AB | 1.750 (44.5) x 1.700 (43.2) | 0.250 (6.4) | 45mm BGA | Black Anodized | 0.038 (17.01) |
| 628-35AB | 1.750 (44.5) x 1.700 (43.2) | 0.350 (8.9) | 45mm BGA | Black Anodized | 0.044 (19.84) |
| 628-40AB | 1.750 (44.5) x 1.700 (43.2) | 0.400 (10.2) | 45mm BGA | Black Anodized | 0.050 (22.68) |
| 628-65AB | 1.750 (44.5) x 1.700 (43.2) | 0.650 (16.5) | 45mm BGA | Black Anodized | 0.056 (25.51) |

Notes: 1. Optional factory preapplied pressure-sensitive adhesive. See Page 3

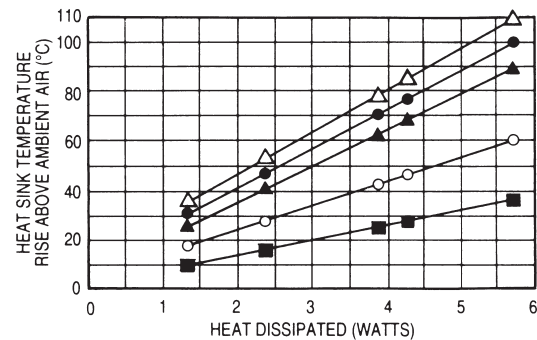
MECHANICAL DIMENSIONS

11 x 10 PINS

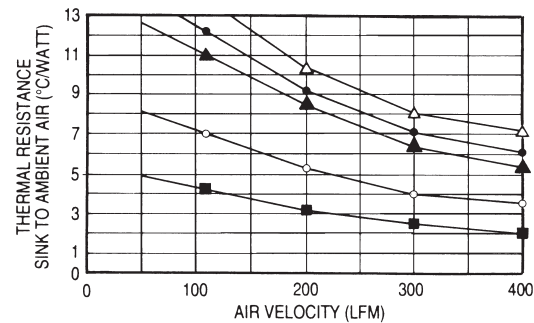


Dimensions: in. (mm)

NATURAL CONVECTION CHARACTERISTICS



FORCED CONVECTION CHARACTERISTICS

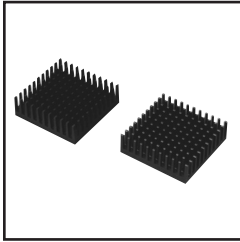


KEY: △ 628-20AB ● 628-25AB ▲ 628-35AB ○ 628-40AB ■ 628-65AB



Integrated Circuit Heat Sinks

HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs



630 SERIES Omnidirectional Pin Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. Sq. | Fin Height "A" in. (mm) | Typical Applications | Weight lbs. (grams) |
|--------------|-------------------------|-------------------------|----------------------|---------------------|
| 630-25AB | 1.378 (35) | .250 (6.4) | 35mm BGA | .009 (4.09) |
| 630-35AB | 1.378 (35) | .350 (8.9) | 35mm BGA | .011 (4.99) |
| 630-45AB | 1.378 (35) | .450 (11.4) | 35mm BGA | .015 (6.81) |
| 630-60AB | 1.378 (35) | .600 (15.2) | 35mm BGA | .026 (11.80) |

Material: Aluminum, Black Anodized

The 630 Series is an omnidirectional pin fin heat sink for both natural and forced-convection applications.

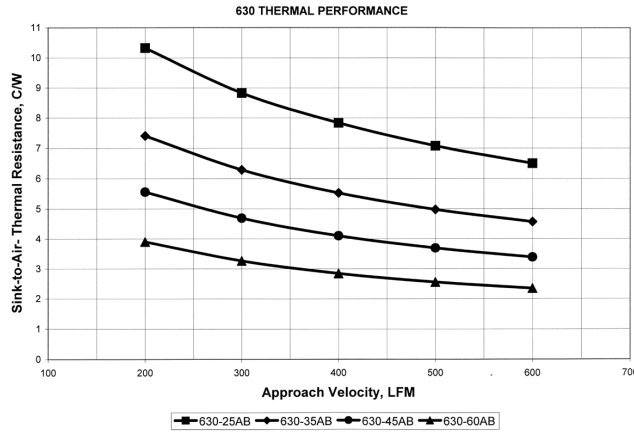
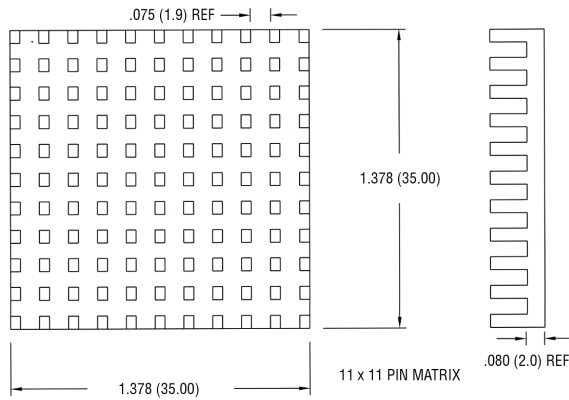
Applications include network routers and switches, high-resolution printers, digital cameras, consumer video games, digital video disks (DVD) and global positioning systems (GPS).

PRODUCT FEATURES

- Available in four standard heights, .25 inch, .35 inch, .45 inch, and .60 inch.
- Available with pressure sensitive adhesives for quick and easy mounting. See Page 3

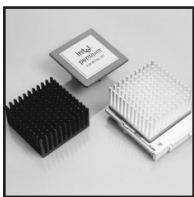
MECHANICAL DIMENSIONS

630 SERIES



Dimensions: in.

HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs

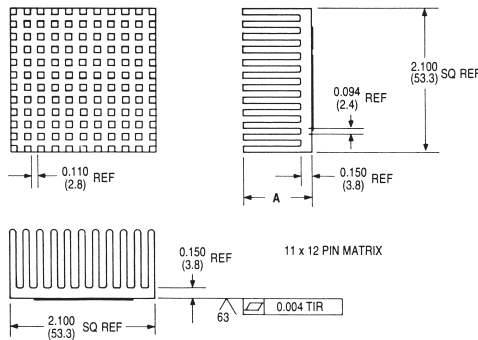


698 SERIES Omnidirectional Pin Fin Heat Sink For BGAs

| Standard P/N | Base Dimensions in. (mm) | Dimensions "A" in. (mm) | Typical Applications | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-------------------------|----------------------|------------------|---------------------|
| 698-40AB | 2.100 (53.3) sq. | 0.400 (10.2) sq. | 45mm BGA | Black Anodized | 0.075 (34.02) |
| 698-65AB | 2.100 (53.3) sq. | 0.650 (16.5) sq. | 45mm BGA | Black Anodized | 0.119 (53.86) |
| 698-80AB | 2.100 (53.3) sq. | 0.800 (20.3) sq. | 45mm BGA | Black Anodized | 0.125 (56.70) |
| 698-100AB | 2.100 (53.3) sq. | 1.000 (25.4) sq. | 45mm BGA | Black Anodized | 0.144 (65.20) |

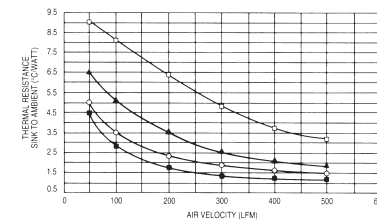
Notes: 1. Optional factory preapplied pressure-sensitive adhesive. See Page 3

MECHANICAL DIMENSIONS



Dimensions: in. (mm)

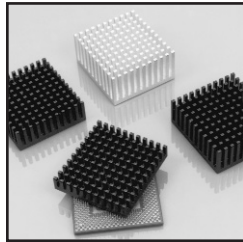
FORCED CONVECTION THERMAL PERFORMANCE DATA (FLOW PARALLEL TO EXTRUSION DIRECTION)



KEY: □ 698-40AB ▲ 698-65AB ○ 698-80AB ■ 698-100AB



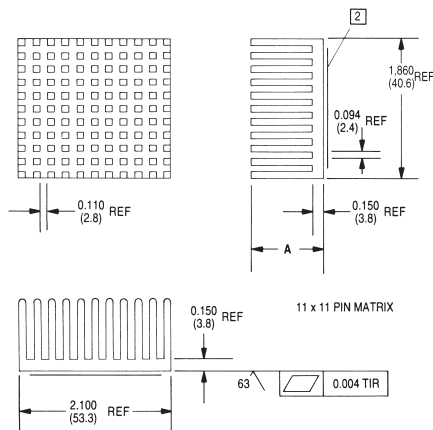
HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs



798 SERIES Pin Fin Heat Sink for BGAs

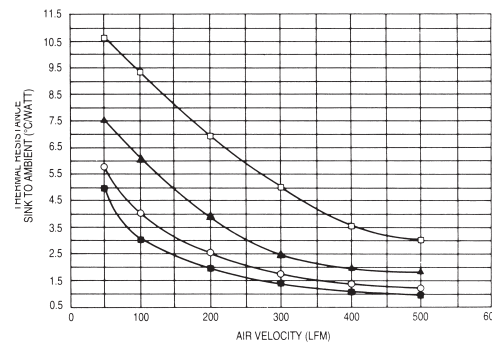
| Standard P/N | Base Dimensions in. (mm) | Dimensions "A" in. (mm) | Typical Applications | Heat Sink Finish | Weight lbs. (grams) |
|--------------|-----------------------------|-------------------------|----------------------|------------------|---------------------|
| 798-40AB | 2.100 (53.3) x 1.860 (47.2) | 0.400 (10.2) | 45mm BGA | Black Anodized | 0.063 (28.35) |
| 798-65AB | 2.100 (53.3) x 1.860 (47.2) | 0.650 (16.5) | 45mm BGA | Black Anodized | 0.106 (48.19) |
| 798-80AB | 2.100 (53.3) x 1.860 (47.2) | 0.800 (20.3) | 45mm BGA | Black Anodized | 0.113 (51.03) |
| 798-100AB | 2.100 (53.3) x 1.860 (47.2) | 1.000 (25.4) | 45mm BGA | Black Anodized | 0.131 (59.53) |

MECHANICAL DIMENSIONS



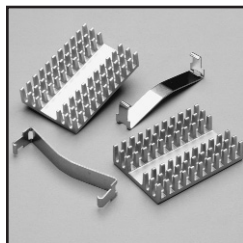
Dimensions: in. (mm)

**FORCED CONVECTION THERMAL PERFORMANCE DATA
(FLOW PARALLEL TO EXTRUSION DIRECTION)**



KEY: □ 798-40AB ▲ 798-65AB ○ 798-80AB ■ 798-100AB

- Notes:**
 1. Heat sink mounting surface flatness: 0.004" TIR
 2. Optional factory preapplied pressure-sensitive adhesive. See Page 3



643 SERIES Omnidirectional Pin Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. (mm) | Fin Height in. (mm) | Typical Applications | Weight lbs. (grams) |
|--------------|-----------------------------|---------------------|----------------------|---------------------|
| 643-35AP | 1.60 (40.64) x 1.10 (27.94) | 0.350 (8.89) | 40 mm BGA | .070 (31.78) |

Material: Aluminum, Plain Finish

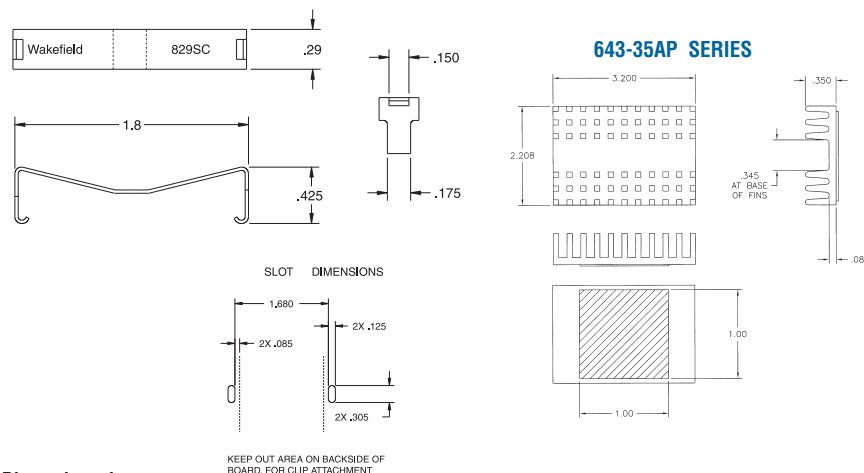
The Series 643-35AP is an omnidirectional pin fin heat sink for both natural and forced-convection applications designed to fit a 40 mm BGA.

Applications include network routers and switches, high-resolution printers, digital cameras, consumer video games, digital video disks (DVD) and global positioning systems (GPS).

PRODUCT FEATURES

- Available with pressure sensitive adhesives to ensure good thermal performance. See page 3
- Can be ordered with the 829SC clip. Order clip separately. (Clip cannot be purchased without heat sink)

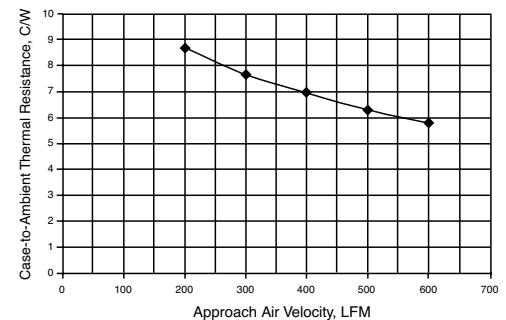
MECHANICAL DIMENSIONS



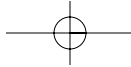
Dimensions: in.

KEEP OUT AREA ON BACKSIDE OF BOARD, FOR CLIP ATTACHMENT.

643 THERMAL PERFORMANCE

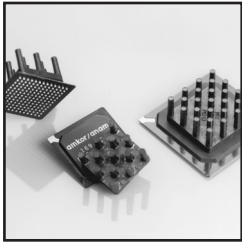


Performance shown is with S5 interface material applied.



Integrated Circuit Heat Sinks

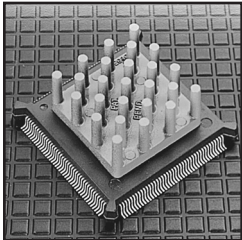
DELTEM™ COMPOSITE HEAT SINKS FOR BGAs



Deltem™ D10650-40 Pin Fin Heat Sink

| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|---------------------|
| D10650-40 | 0.650 (16.5) sq | 0.400 (10.2) | 0.004 (1.91) |

Notes: Available with pressure sensitive adhesives for quick and easy mounting. See Page 3



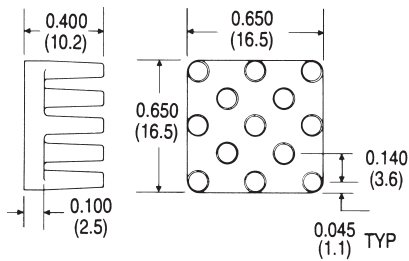
Deltem™ D10850-40 Pin Fin Heat Sink

| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Typical Applications | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|----------------------|---------------------|
| D10850-40 | 0.850 (21.6) sq | 0.400 (10.2) | 21mm BGA | 0.006 (3.9) |

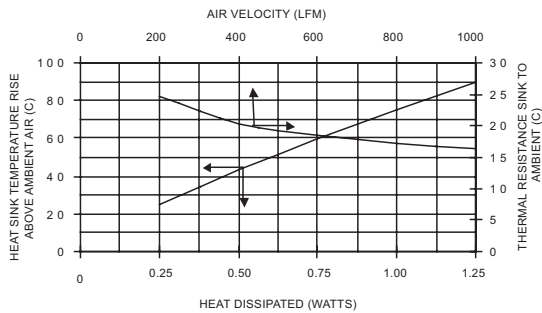
Notes: Available with pressure sensitive adhesives for quick and easy mounting. See Page 3

MECHANICAL DIMENSIONS

DELTEM™ D10650-40 PIN FIN HEAT SINK

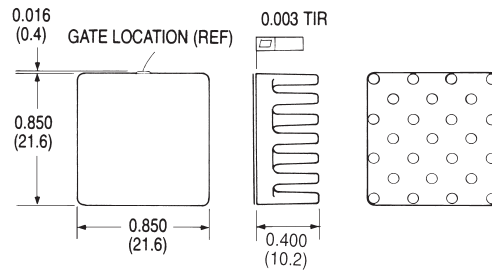


NATURAL AND FORCED CONVECTION CHARACTERISTICS

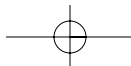
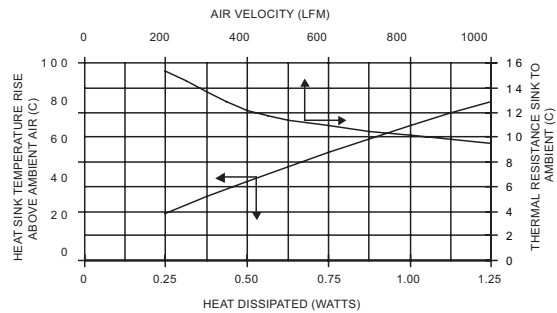


Dimensions: in. (mm)

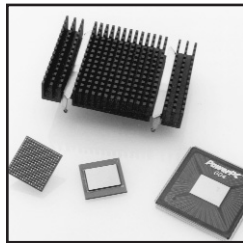
DELTEM™ D10850-40 PIN FIN HEAT SINK



NATURAL AND FORCED CONVECTION CHARACTERISTICS



HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs

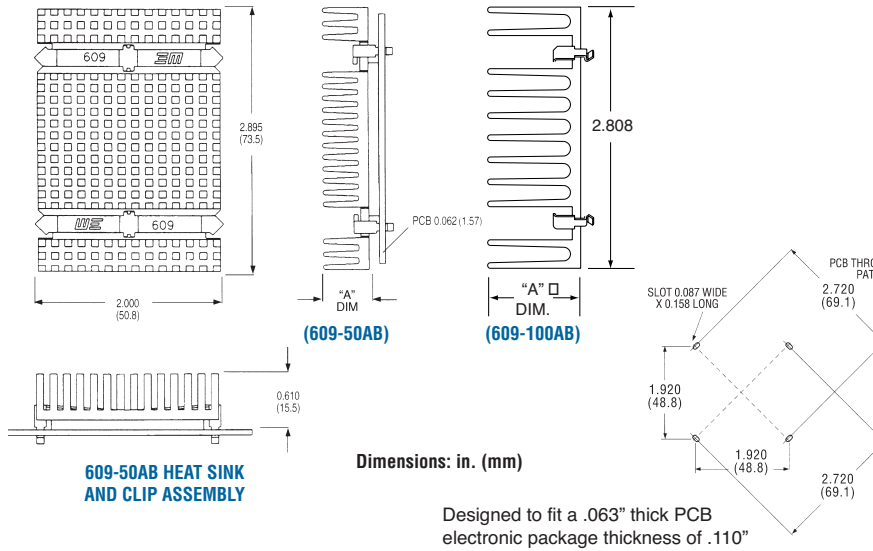


609 SERIES Pin Fin Heat Sink/Clip Assembly for BGAs and PowerPC™ Packages

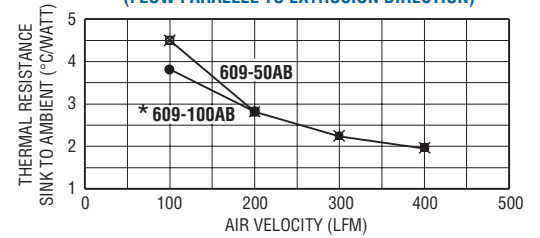
| Standard P/N | Base Dimensions in. (mm) | Dimensions "A" in. (mm) | Typical Applications | Heat Sink Finish | Weight lbs. (grams) |
|--------------|------------------------------|-------------------------|----------------------|------------------|---------------------|
| 609-50AB | 2.895 (73.5) x 2.000 (50.8) | 0.500 (12.7) | 40&45mm BGA | Black Anodized | 0.094 (42.5) |
| 609-100AB | 2.808 (71.32) x 1.700 (43.2) | 1.00 (25.4) | 40&45mm BGA | Black Anodized | 0.130 (59.0) |

Note: Optional factory preapplied thermal interface material.
 S3 (Bergquist Q-Pad 3, 0.14 °C in²/w)
 S4 (Bergquist Softface, 0.07 °C in²/w)

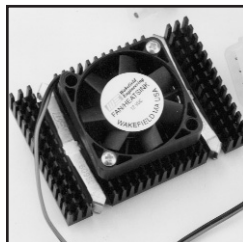
MECHANICAL DIMENSIONS



FORCED CONVECTION THERMAL PERFORMANCE DATA (FLOW PARALLEL TO EXTRUSION DIRECTION)



*Performance is for shrouded conditions. 609-100 will perform better than 609-50 in cases with bypass.



619 SERIES Fan Heat Sink for BGA and PowerPC™ Packages

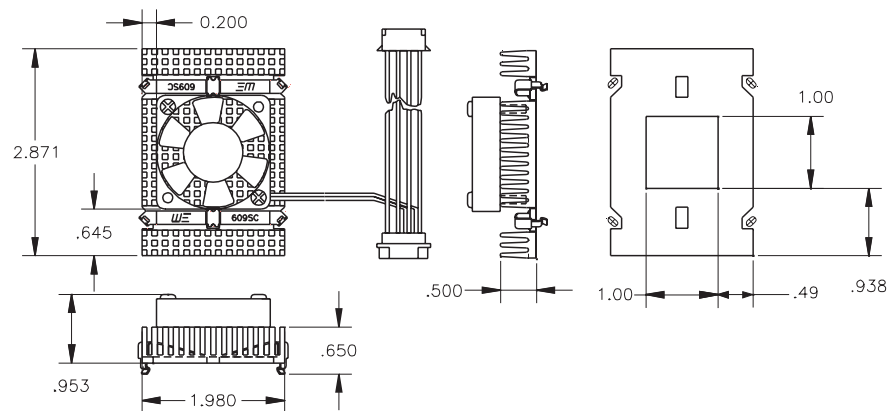
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Typical Applications | Heat Sink Finish | Thermal Performance | Weight lbs. (grams) |
|--------------|------------------------------|-----------------|----------------------|------------------|---------------------|---------------------|
| 61995AB124D1 | 2.871 (72.92) x 1.98 (50.29) | 0.953 (24.21) | 40&45mm BGA | Black Anodized | 1.2° C/W | .150 (68.10) |
| 61995AB054D1 | 2.871 (72.92) x 1.98 (50.29) | 0.953 (24.21) | 40&45mm BGA | Black Anodized | 1.2° C/W | .150 (68.10) |

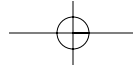
Note: Optional factory preapplied thermal interface material. See 609 series.

FEATURES AND BENEFITS:

- Captivated clips for ease of assembly
- Low acoustic noise
- Impingement air flow
- Accommodates BGA packages up to 45 mm in size

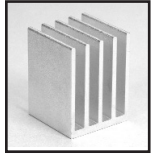
MECHANICAL DIMENSIONS





Integrated Circuit Heat Sinks

HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs



602 SERIES Unidirectional Fin Heat Sink for BGAs

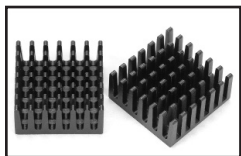
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 602-100AP | .750 (19.1) sq | 1.000 (25.4) | Plain | .021 (9.59) |

Material: Aluminum, Plain Finish

MECHANICAL DIMENSIONS

602 THERMAL PERFORMANCE

| Air Velocity (LFM) | Thermal Resistance Sink to Ambient (C) |
|--------------------|--|
| 200 | 6.2 |
| 300 | 5.0 |
| 400 | 4.5 |
| 500 | 4.2 |
| 600 | 3.8 |



604 SERIES Omnidirectional Pin Fin Heat Sink for BGAs

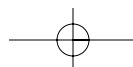
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 604-40AB | .850 (21.6) sq | .400 (10.2) | Black Anodized | .012 (5.60) |
| 604-60AB | .850 (21.6) sq | .600 (15.2) | Black Anodized | .016 (7.47) |

Material: Aluminum, Black Anodized

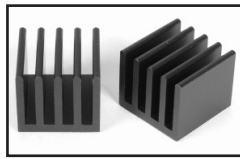
MECHANICAL DIMENSIONS

604 THERMAL PERFORMANCE

| Air Velocity (LFM) | 604-40AB Thermal Resistance (C) | 604-60AB Thermal Resistance (C) |
|--------------------|---------------------------------|---------------------------------|
| 200 | 12.5 | 7.5 |
| 300 | 10.5 | 6.5 |
| 400 | 9.5 | 6.0 |
| 500 | 8.5 | 5.5 |
| 600 | 8.0 | 5.2 |



HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs

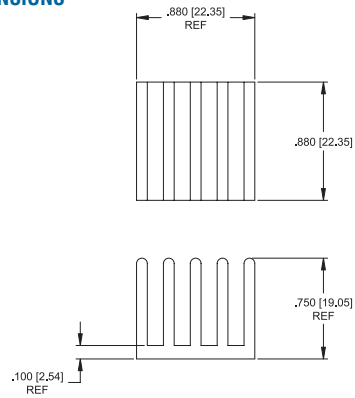


605 SERIES Unidirectional Fin Heat Sink for BGAs

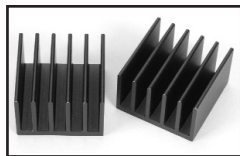
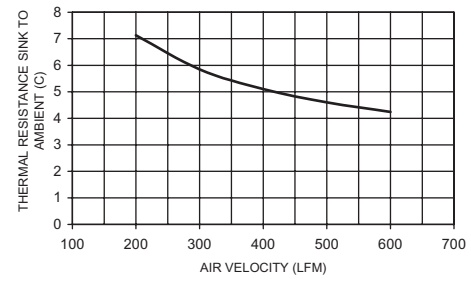
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 605-75AB | .880 (22.4) sq | .750 (19.1) | Black Anodized | .030 (13.5) |

Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS



605 THERMAL PERFORMANCE

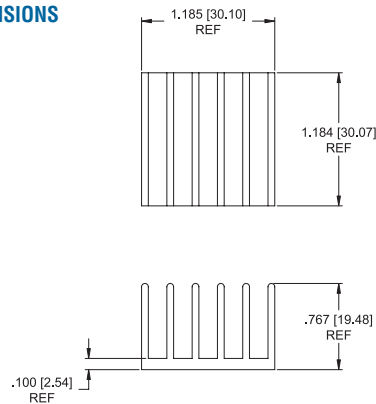


606 SERIES Unidirectional Fin Heat Sink for BGAs

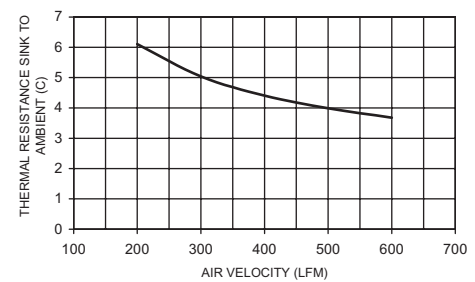
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 606-77AB | 1.185 (30.1) sq | .767 (19.5) | Black Anodized | .041 (18.7) |

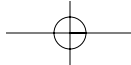
Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS



606 THERMAL PERFORMANCE





Integrated Circuit Heat Sinks

HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs



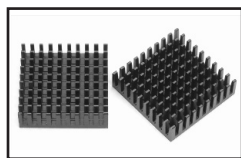
607 SERIES Unidirectional Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|-----------------------------|-----------------|------------------|---------------------|
| 607-65AB | 1.200 (30.5) x 1.105 (28.1) | .650 (16.5) | Black Anodized | .041 (18.7) |

Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS

607 THERMAL PERFORMANCE



610 SERIES Omnidirectional Pin Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 610-35AB | 1.240 (31.5) sq | .350 (8.9) | Black Anodized | .022 (10.0) |
| 610-40AB | 1.240 (31.5) sq | .400 (10.2) | Black Anodized | .024 (10.8) |

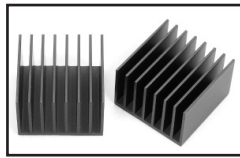
Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS

610 THERMAL PERFORMANCE



HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs

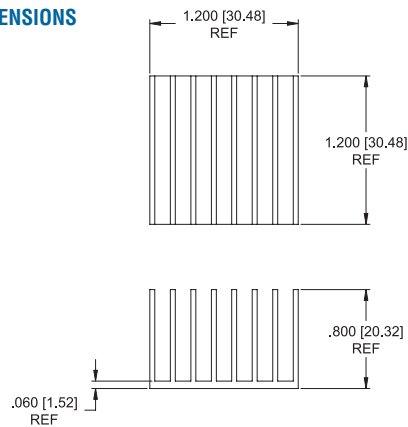


611 SERIES *Unidirectional Fin Heat Sink for BGAs*

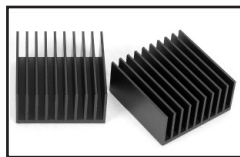
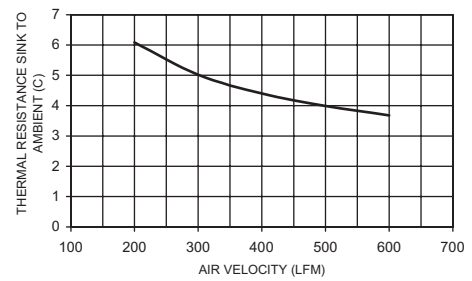
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 611-80AB | 1.200 (30.5) sq | .800 (20.3) | Black Anodized | .036 (16.3) |

Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS



611 THERMAL PERFORMANCE

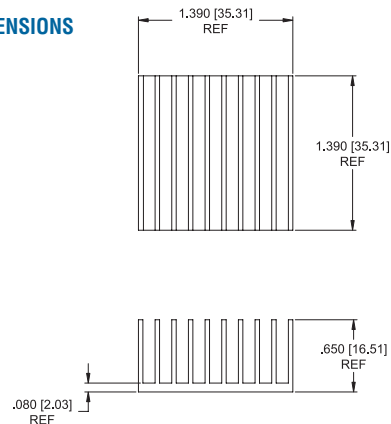


612 SERIES *Unidirectional Fin Heat Sink for BGAs*

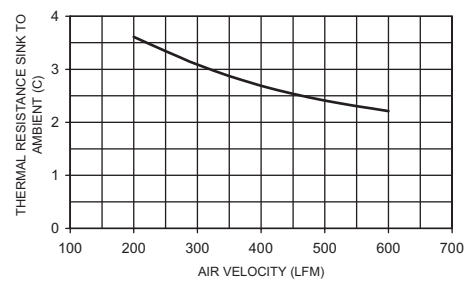
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 612-65AB | 1.390 (35.3) sq | .650 (16.5) | Black Anodized | .054 (24.5) |

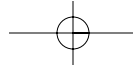
Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS



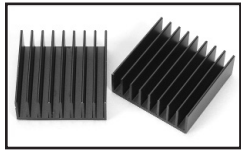
612 THERMAL PERFORMANCE





Integrated Circuit Heat Sinks

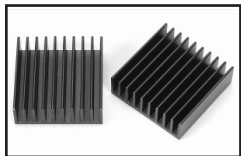
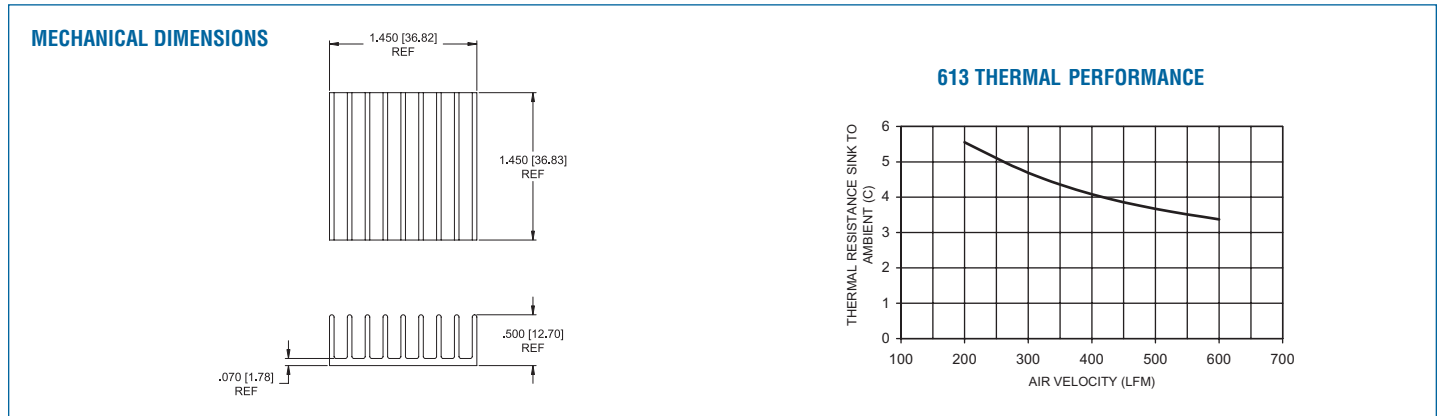
HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs



613 SERIES Unidirectional Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 613-50AB | 1.450 (36.8) sq | .500 (12.7) | Black Anodized | .046 (20.8) |

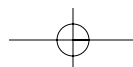
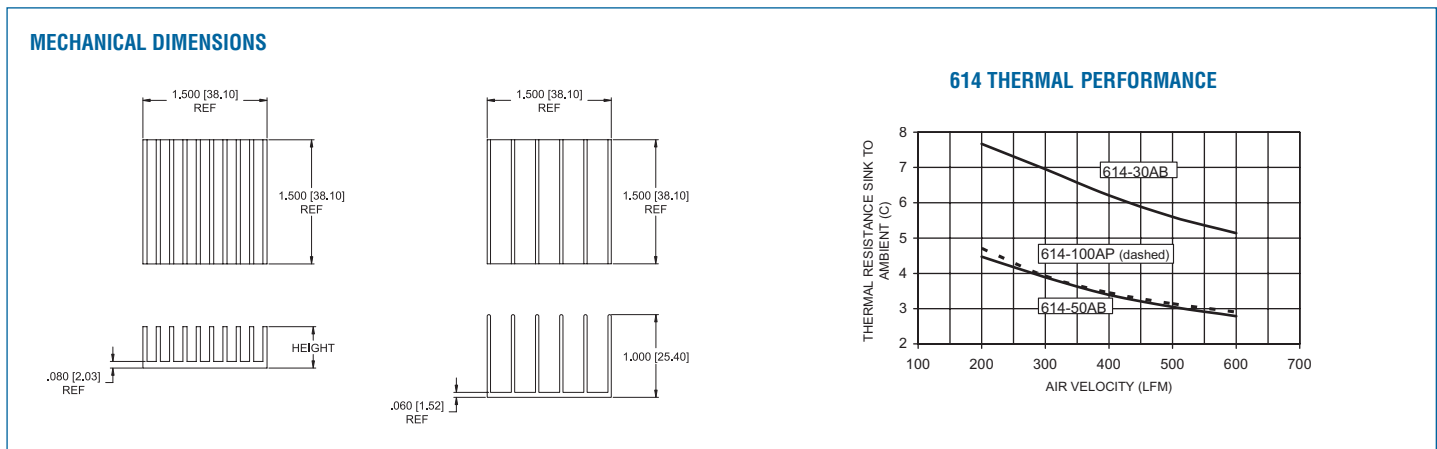
Material: Aluminum, Black Anodized



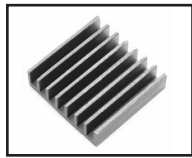
614 SERIES Unidirectional Fin Heat Sink for BGAs

| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 614-30AB | 1.500 (38.1) sq | .300 (7.6) | Black Anodized | .030 (13.8) |
| 614-50AB | 1.500 (38.1) sq | .500 (12.7) | Black Anodized | .048 (21.8) |
| 614-100AP | 1.500 (38.1) sq | 1.000 (25.4) | Plain | .046 (20.9) |

Material: Aluminum, Black Anodized or Plain



HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs

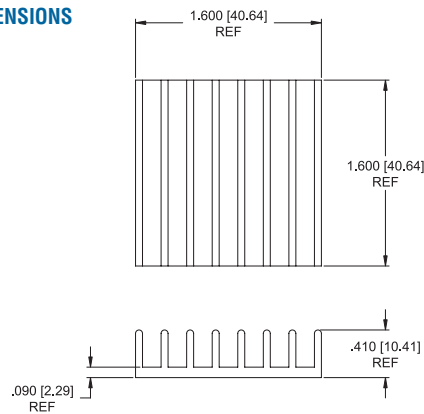


615 SERIES Unidirectional Fin Heat Sink for BGAs

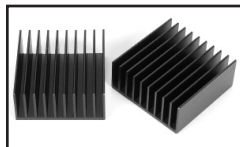
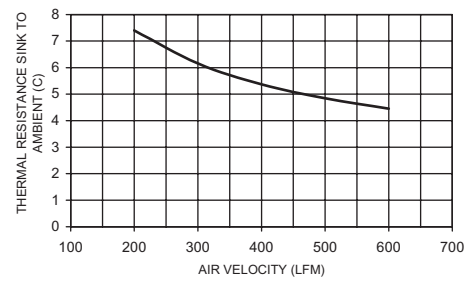
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 615-41AB | 1.600 (40.6) sq | .410 (10.4) | Black Anodized | .046 (21.0) |

Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS



615 THERMAL PERFORMANCE

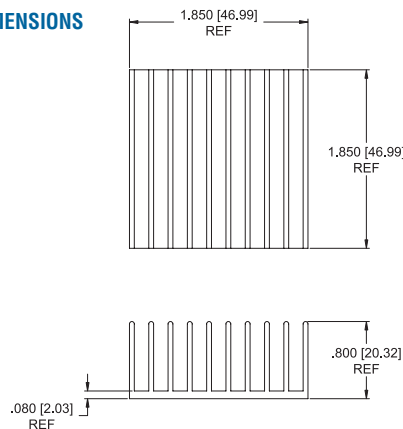


616 SERIES Unidirectional Fin Heat Sink for BGAs

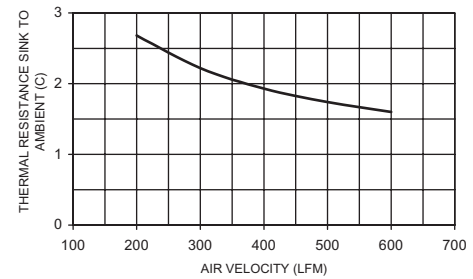
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 616-80AB | 1.85 (47.0) sq | .800 (20.3) | Black Anodized | .054 (24.5) |

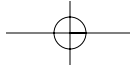
Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS



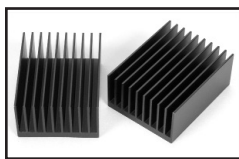
616 THERMAL PERFORMANCE





Integrated Circuit Heat Sinks

HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs

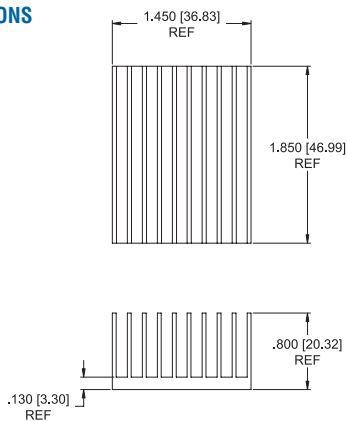


617 SERIES Unidirectional Fin Heat Sink for BGAs

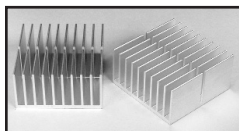
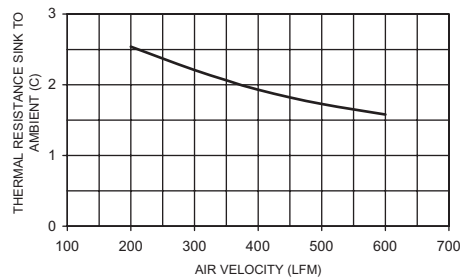
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|-----------------------------|-----------------|------------------|---------------------|
| 617-80AB | 1.450 (36.8) x 1.850 (47.0) | .800 (20.3) | Black Anodized | .082 (37.2) |

Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS



617 THERMAL PERFORMANCE

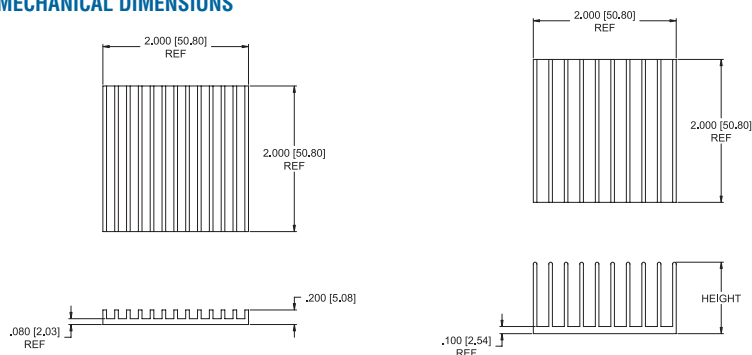


618 SERIES Unidirectional Fin Heat Sink for BGAs

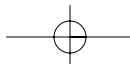
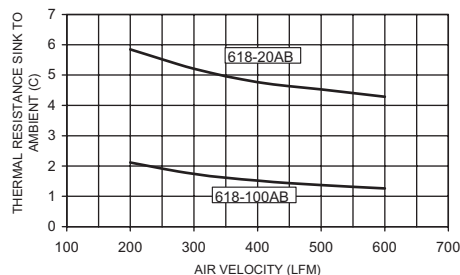
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|------------------|---------------------|
| 618-20AB | 2.00 (50.8) sq | .200 (5.1) | Black Anodized | .046 (21.0) |
| 618-100AP | 2.00 (80.8) sq | 1.000 (25.4) | Plain | .122 (55.5) |

Material: Aluminum, Black Anodized or Plain

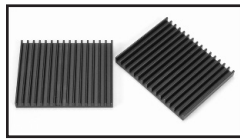
MECHANICAL DIMENSIONS



618 THERMAL PERFORMANCE



HEAT SINKS FOR BGAs, SUPER BGAs, PBGAs, and FPBGAs

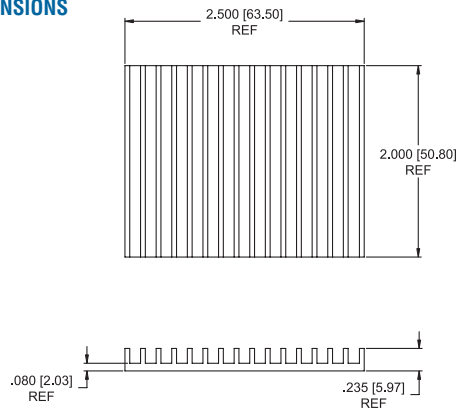


620 SERIES Unidirectional Fin Heat Sink for BGAs

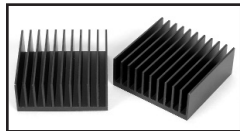
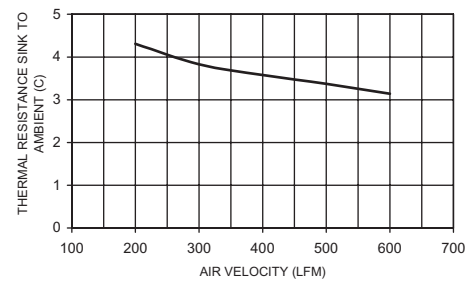
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|-----------------------------|-----------------|------------------|---------------------|
| 620-24AB | 2.500 (63.5) x 2.000 (50.8) | .235 (6.0) | Black Anodized | .063 (28.6) |

Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS



620 THERMAL PERFORMANCE

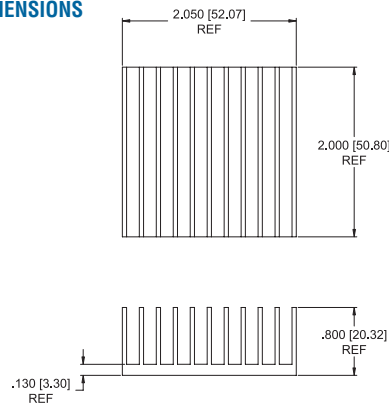


622 SERIES Unidirectional Fin Heat Sink for BGAs

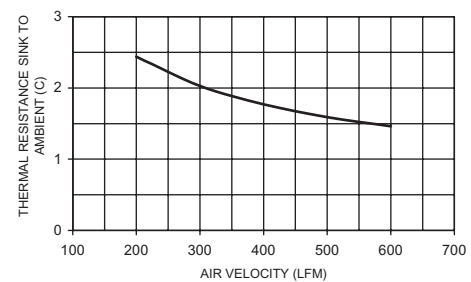
| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Heat Sink Finish | Weight lbs. (grams) |
|--------------|-----------------------------|-----------------|------------------|---------------------|
| 622-80AB | 2.050 (52.1) x 2.000 (50.8) | .800 (20.3) | Black Anodized | .123 (56.0) |

Material: Aluminum, Black Anodized

MECHANICAL DIMENSIONS



622 THERMAL PERFORMANCE



Integrated Circuit Heat Sinks

HEAT SINKS FOR MICROPROCESSORS AND ASICs

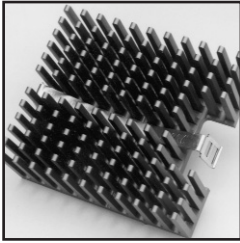
569, 579, 589, 599 SERIES Heat Sinks & Clip for Intel's Pentium, Pentium MMX, AMD's K6 & K62, CYRIX's 6x86 & Media GX, Centaur/IDT's WinChip C6

| Standard P/N | Base Dimensions in. (mm) | Fin Height in. (mm) | Thermal Resistance at 200 LFM (°C/W) | Interface Material Options |
|--------------|-----------------------------|---------------------|--------------------------------------|----------------------------|
| 569-100AK | 2.34 (59.44) x 2.68 (67.95) | 1.00 (25.4) | 1.7 | Pages 74-76 |
| 579-150AK | 2.15 (54.71) x 1.95 (49.53) | 1.50 (38.10) | 1.6 | Pages 74-76 |
| 589-150AK | 2.15 (54.71) x 3.10 (78.74) | 1.50 (38.10) | 1.5 | Pages 74-76 |
| 599X-100AB | 1.96 (49.78) x 2.67 (67.95) | 1.00 (25.4) | 1.9 | Pages 74-76 |

Material: Aluminum, Black Anodized

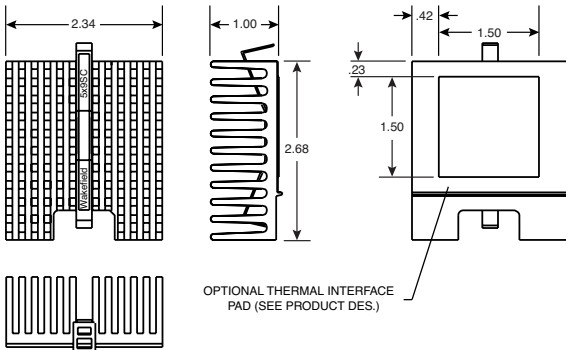
PRODUCT FEATURES

- Compact design heat sinks can comfortably fit a variety of Robust Socket 7-based PC boxes
- Robust clip attachments
- Clips are not captive to sink
- To order heat sink with optional interface material pre-applied at the factory, add S4 or S5 suffix to the part number. (See Product Designation)



569-100AK SERIES

MECHANICAL DIMENSIONS



OPTIONAL THERMAL INTERFACE PAD (SEE PRODUCT DES.)

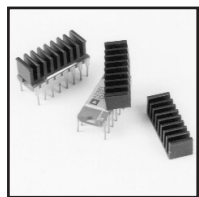
SPRING CLIP OPTION (SEE PRODUCT DES.)

PRODUCT DESIGNATION

569 - 100 XX - XX

| | | | | |
|-------------------|-------------------|------------------------|----|----|
| MODEL NUMBER | 569 | 100 | XX | XX |
| HEIGHT | 100 = 1.00" | | | |
| THERMAL INTERFACE | S4 = DELTALINK IV | BLANK = NO THERMAL PAD | | |
| CLIP | AK = SPRING CLIP | | | |

Dimensions: in.



650/651 SERIES Low-Cost Heat Sinks for DIPs and SRAMs

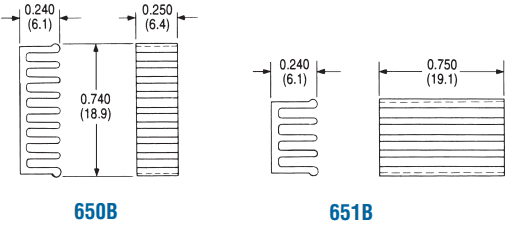
14-16 Pin DIPs

| Standard P/N | Length in. (mm) | Width in. (mm) | Height in. (mm) | Typical Applications | Weight lbs. (grams) |
|--------------|-----------------|----------------|-----------------|----------------------|---------------------|
| 650B | 0.250 (6.4) | 0.740 (18.9) | 0.240 (6.1) | 14-Pin, 16-Pin DIP | 0.003 (1.36) |
| 651B | 0.750 (19.1) | 0.415 (10.5) | 0.240 (6.1) | 14-Pin, 16-Pin DIP | 0.005 (2.27) |

These extruded heat sinks serve as low-cost heat dissipation solutions for DIPs with pin counts from 14 to 16. Use an epoxy such as Wakefield Engineering DeltaBond™ 152 or 155, or use Wakefield 2-part DeltaBond™ 156 modified acrylic adhesive. The 650 and 651 are also available in natural aluminum finish. They can be ordered as 650P or 651P.

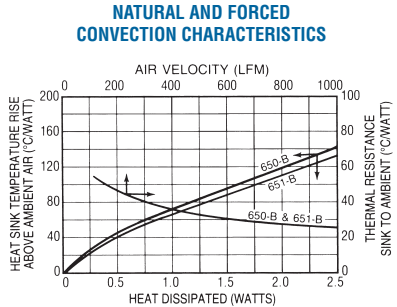
MECHANICAL DIMENSIONS

Notes:
 1. Finish: black anodize
 2. TIR: Total Indicator Reading. This is a measure of flatness across the greatest dimension of a surface.

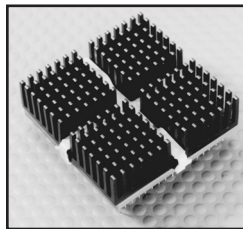


Dimensions: in. (mm)

NATURAL AND FORCED CONVECTION CHARACTERISTICS



HEAT SINKS FOR MICROPROCESSORS AND ASICs

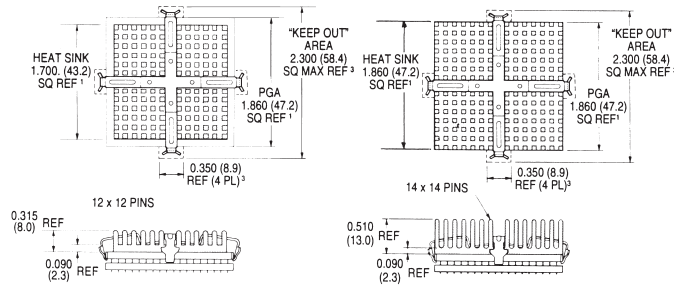


649 SERIES SpiderClip™ Heat Sink Assembly for Motorola MC68040™, MC68060

18 x 18 PGA

| Standard P/N | Base Dimensions in. (mm) | Height in. (mm) | Base Thickness in. (mm) | Clip Color | Heat Sink Finish | Weight lbs. (grams) |
|--------------|--------------------------|-----------------|-------------------------|------------|------------------|---------------------|
| 649-33AB | 1.70 (43.2) sq | 0.315 (8.0) | 0.090 (2.3) | Gray | Black Anodized | 0.044 (19.84) |
| 649-51AB | 1.86 (47.2) sq | 0.510 (13.0) | 0.090 (2.3) | Gray | Black Anodized | 0.056 (25.51) |

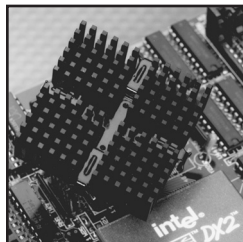
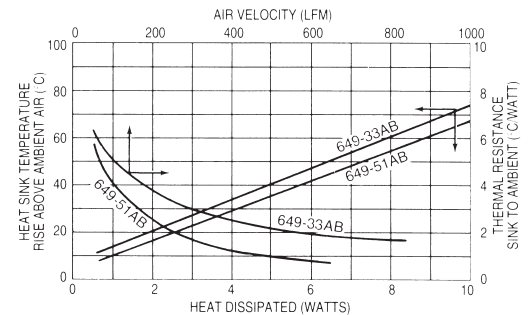
MECHANICAL DIMENSIONS



649-33AB SPIDERCLIP™ ASSEMBLY
Dimensions: in. (mm)

649-51AB SPIDERCLIP™ ASSEMBLY

NATURAL AND FORCED CONVECTION CHARACTERISTICS



669 SERIES SpiderClip™ Heat Sink Assembly for IntelDX4™, AMD AM486DX2, and AM486DX4

17 x 17 SPGA

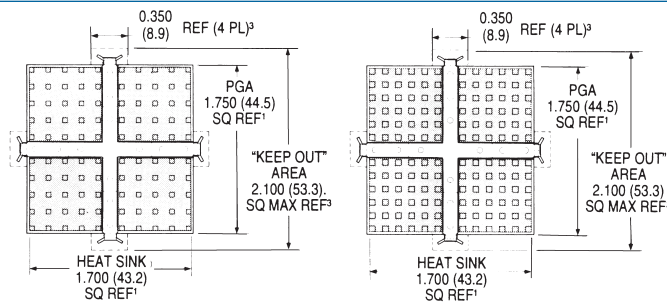
661 SERIES Heat Sink without clip

| Standard P/N | Base Dimensions in. (mm) | Dimensions "A" Height in. (mm) | Base Thickness in. (mm) | Clip Color | Standard Finish | Weight lbs. (grams) |
|--------------|--------------------------|--------------------------------|-------------------------|------------|-----------------|---------------------|
| 669-32AG | 1.70 (43.2) sq | 0.315 (8.0) | 0.090 (2.3) | Black | Gold Iridite | 0.044 (19.84) |
| 669-33AB | 1.70 (43.2) sq | 0.315 (8.0) | 0.090 (2.3) | Black | Black Anodized | 0.044 (19.84) |
| 669-40AB | 1.70 (43.2) sq | 0.400 (10.2) | 0.090 (2.3) | Black | Black Anodized | 0.044 (19.84) |
| 669-52AB | 1.70 (43.2) sq | 0.520 (13.2) | 0.090 (2.3) | Black | Black Anodized | 0.050 (22.68) |
| 661-32AG | 1.70 (43.2) sq | 0.315 (8.0) | 0.090 (2.3) | N/A | Gold Iridite | 0.044 (19.84) |
| 661-33AB | 1.70 (43.2) sq | 0.315 (8.0) | 0.090 (2.3) | N/A | Black Anodized | 0.044 (19.84) |
| 661-40AB | 1.70 (43.2) sq | 0.400 (10.2) | 0.090 (2.3) | N/A | Black Anodized | 0.044 (19.84) |
| 661-52AB | 1.70 (43.2) sq | 0.520 (13.2) | 0.090 (2.3) | N/A | Black Anodized | 0.050 (22.68) |

669 Series SpiderClip™ Heat Sink Assemblies may be applied to the following:

- Intel 80486DX and 80486DX2™ (168 PGA)
- Intel 82495 Cache Controller
- Intel DX4™ (168 PGA)
- Intel 80486SX (168 PGA) and I860XR (208 PGA)
- AMD Am 486 Microprocessors AM486DX2, AM486DX4
- AMD Am 29000 Microcontrollers
- Intel I960CA, I960CF Embedded Controllers

MECHANICAL DIMENSIONS

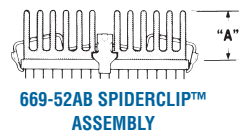


669-32AG 10 x 10 PIN MATRIX

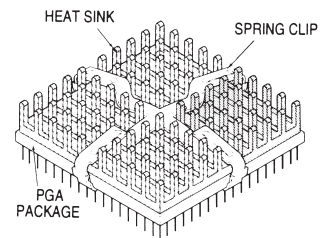
669-33AB 12 x 12 PIN MATRIX
669-40AB
669-52AB



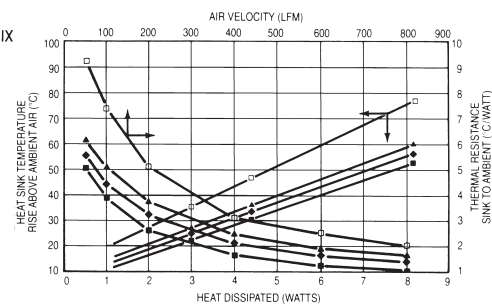
669-32AG SPIDERCLIP™ ASSEMBLY



669-52AB SPIDERCLIP™ ASSEMBLY



NATURAL AND FORCED CONVECTION CHARACTERISTICS



Dielectric Breakdown (Nylon Clip Coating)

Dimensions: in. (mm)
Dielectric Strength: 100 VDC/mil
Breakdown Voltage: 200 VDC (minimum)

KEY:

- 669-32AG 0.315 (8.0) Pin Height, low density pin pattern
- ▲ 669-33AB 0.315 (8.0) Pin Height, high density pin pattern
- ◆ 669-40AB 0.400 (10.2) Pin Height, high density pin pattern
- 669-52AB 0.520 (13.2) Pin Height, high density pin pattern