Application Specification

0.50mm and 0.65mm Pitch BGA Socket Adapter System

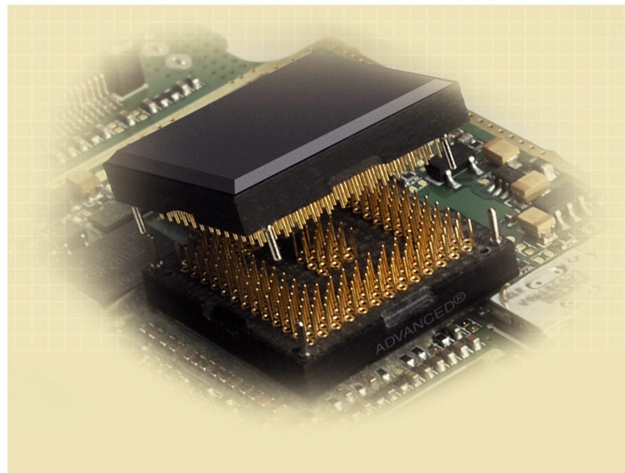

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Table of Contents

1.0	Introduction	3
2.0	Scope	3
3.0	Product Overview	3
4.0	Part Number Structure	6
5.0	Connector and PC Board layout	7
6.0	PC Board Design	8
7.0	PC Board Application Procedure	8
8.0	Solder Paste and Disposition	9
9.0	Solder Reflow	9
10.0	Double Sided Reflow	11
11.0	Cleaning	11
12.0	Protective – Pick and Place Cover Removal	11
13.0	Recommended Mating and Unmating Procedure	12
14.0	Storage	12
15.0	Revision History	13

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1.0 Introduction

The 0.50mm and 0.65mm pitch BGA Socket Adapter systems are designed for mating and unmating of a BGA or LGA device without having to solder the device to the PC board directly. The BGA or LGA device is attached through a reflow process to one half of the Socket Adapter System ("adapter") and the other half of the Socket Adapter system ("socket") is soldered directly to the PC board. The device and adapter can then be plugged into the socket as an assembly. Once testing, debugging, etc. is completed, the device/adapter assembly can then be easily removed from the PC board and another device/adapter assembly plugged into the socket.

2.0 Scope

This product specification sheet covers the 0.50mm and 0.65mm pitch Socket Adapter System with both eutectic Tin/Lead (Sn/Pb) solder spheres as well as lead-free (Sn/Ag/Cu) solder spheres.

3.0 Product Overview

Each half of the connector system (socket half and adapter half) consist of a male terminal, a female shell with a 3 finger contact, and an insulator [see Figs. 1A and 1B]. The socket and/or adapter may also contain a solder sphere in either Tin/Lead or lead-free compound. The “socket” is the portion of the connector system that would typically be mounted to the PC board (motherboard). The “adapter” would either have a BGA/LGA device attached to it, in device socketing applications, or be attached to a daughter card in board to board applications. The socket and adapter are shipped with a protective (pick and place) cover [see Fig. 5] that is removed after the solder-attach process and before product usage. This cover can be left in place for storage or for protection of the male terminals during the handling processes.

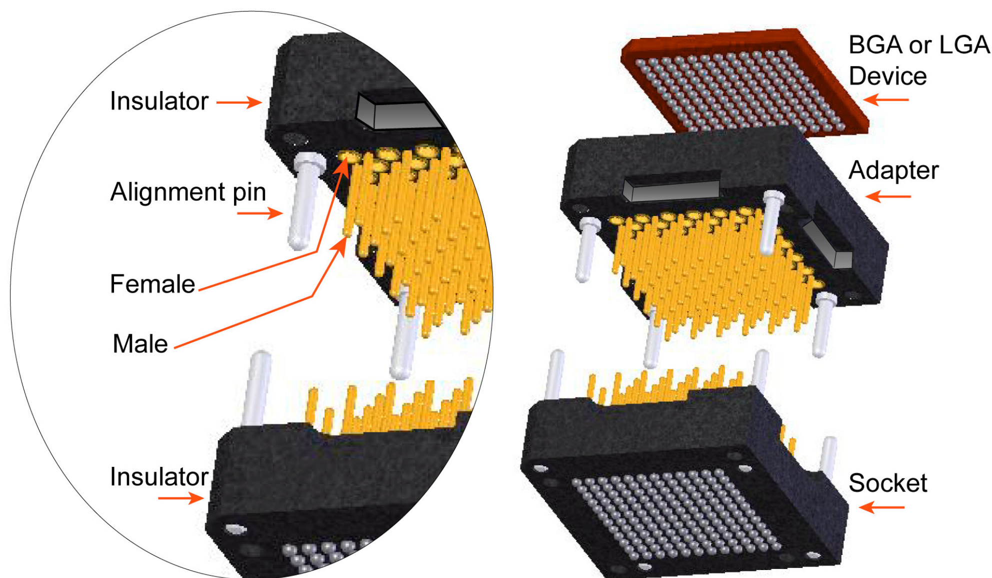

Figure 1A Figure 1B

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3.1 Dimension in the "X" axis is 2.0mm larger than the BGA/LGA Device. [Fig. 2]
3.2 Dimension in the "Y" axis is 2.0mm larger than the BGA/LGA Device. [Fig. 2]
3.3 0.020" (0.51mm) chamfer indicates "A1" location. [Fig. 2]

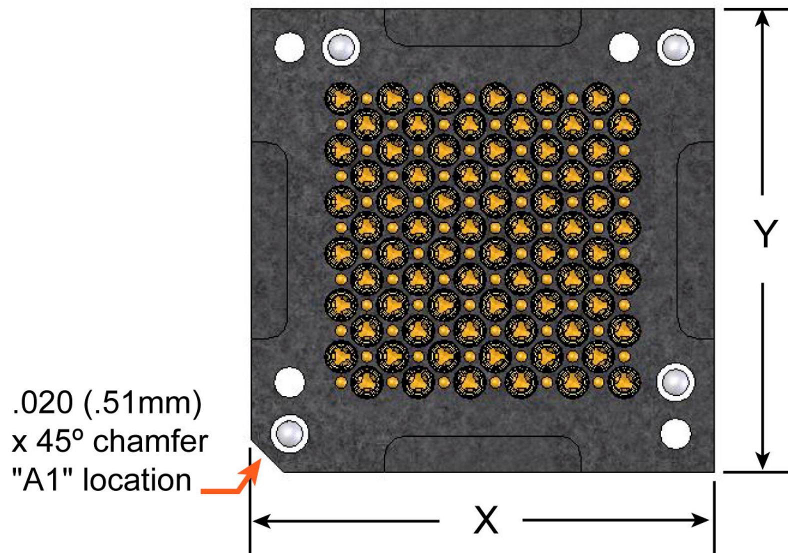

Fig. 2

3.4 Stack Height ("Z") as measured from the top of the PC board to the bottom of the device or mating PC board is 0.214" (5.44) approx. *Note: Mated height will vary depending on reflow profile, paste volume and PC board pad size. [Fig. 3]

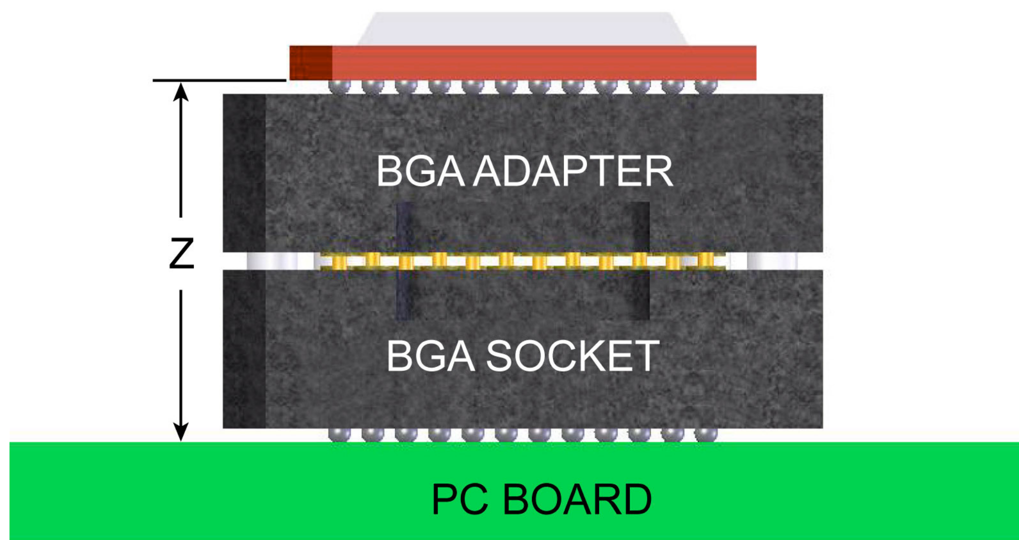

Fig. 3

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3.5 Unlike a typical socket/adapter system which has a female half (socket) and a male half (adapter), this design incorporates both the male and female terminals in each half of the connector. This patented design allows the use of existing screw machine technology and improved electrical performance over standard socket/adapter systems. [Fig. 4]

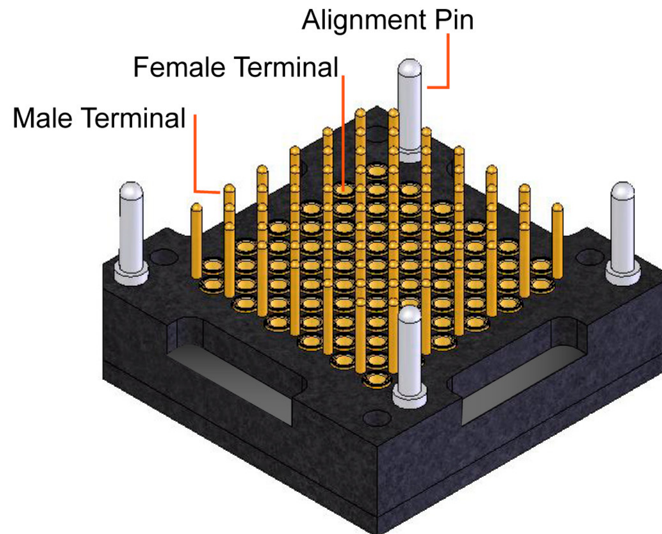

Fig. 4

3.6 The socket and the adapter both contain four (4) alignment pins; one (1) in each corner. These terminals are nickel-plated and do not serve any electrical purpose. There are three (3) functions of the alignment terminals. The first is to align the male terminal into the female terminal. The second is to hold the protective cover in place during shipping and the third is to protect the small diameter male terminals from damage. [Fig. 4]

3.7 Two (2) solder sphere compositions are available: 63%Sn/37%Pb leaded and 95.5%Sn/4.0%Ag/0.5%Cu lead-free.

3.8 A protective cover is standard on this product and is designed to function as a pick and place cover and a terminal protection cover. This cover needs to be removed before the product can be put into use, but only after the solder reflow procedure has taken place. [Fig. 5]

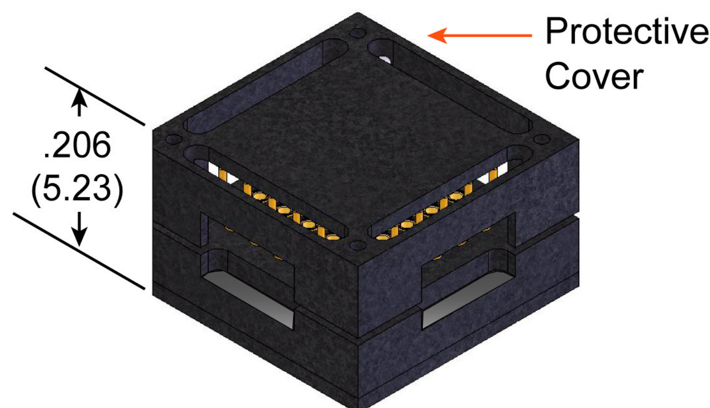

Fig. 5

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3.9 There are three (3) available alignment pin options for this product line. The standard configuration (no special code needed in part number) includes four alignment pins; one in each corner on the top side of socket and adapter. In addition to the standard pins (on top), the second option has four (4) connector-to-PC board standoffs on the bottom (ordering code 1), and the third option has three (3) PC board alignment pins and one (1) standoff (part of pin) located in "A1" position on the bottom (ordering code 2). [Fig. 6]

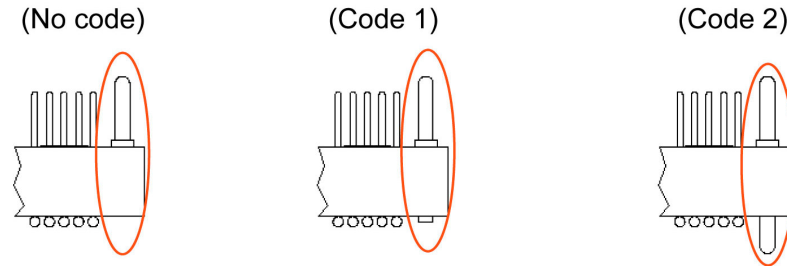


Fig. 6

3.10 The specially designed extraction tool is used to remove the adapter from the socket without damage to the PC board or socket/adapter system. **DO NOT USE A SCREWDRIVER OR ANY OTHER TOOL TO REMOVE THE ADAPTER FROM THE SOCKET OR PERMANENT DAMAGE WILL OCCUR.** Only use the recommended extraction tool; Advanced Interconnections part number 8794. [Fig. 7]

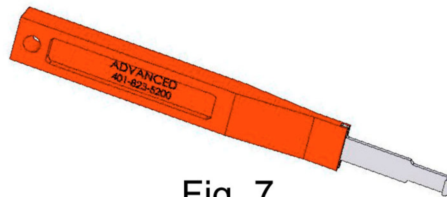
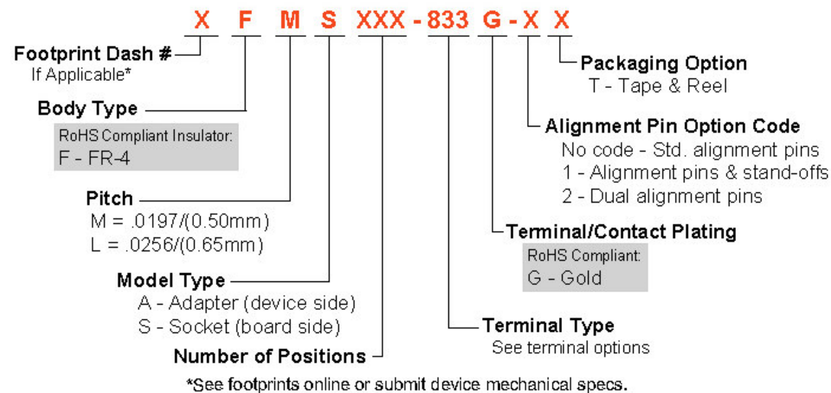


Fig. 7

4.0 Part Number Structure

4.1 Part number structure



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4.2 Terminal options [Fig. 8]:
Terminal Type 832 is a male and female terminal with a leaded solder sphere
Terminal Type 833 is a male and female terminal with a lead-free solder sphere
Terminal Type 834 is a male and female terminal without a solder sphere

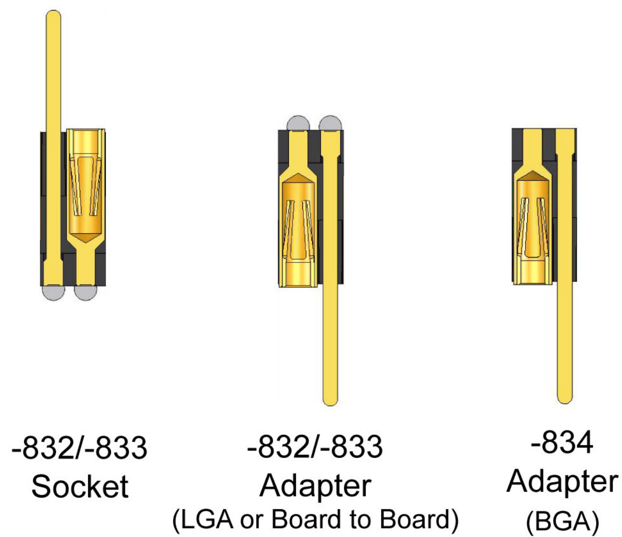

Fig. 8

5.0 Connector and PC Board Layout

5.1 Device to PC Board application – True position of one connector system to another and orientation are not critical. Minimum connector system spacing required is .125 (3.18mm) to allow space for extraction tool. [Fig. 9]

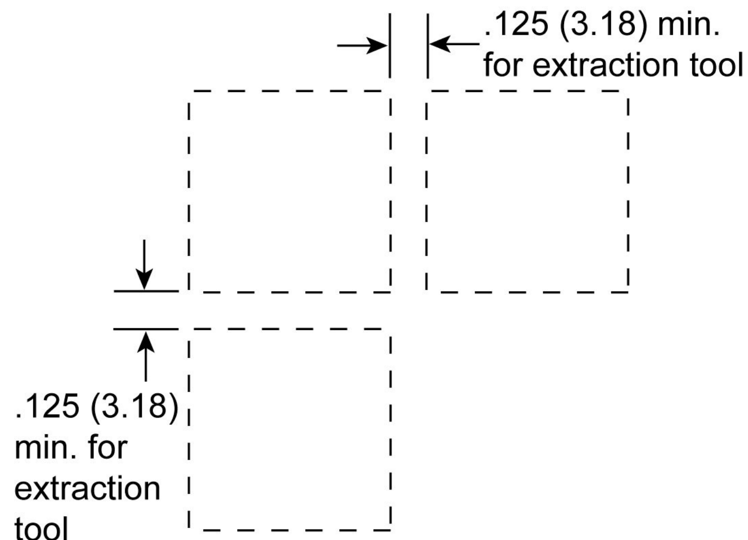

Fig. 9

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6.0 PC Board Design

Proper PC board design affects connector reliability and performance. The following recommendations are intended to ensure reliable electrical connections, while maximizing manufacturing yields and aiding in possible rework applications.

6.1 PC board pad diameter .012" (0.30mm).
6.2 Copper defined solder pads.
6.3 Pad materials: Copper with Immersion Gold, Immersion Silver, OSP or HASL.
6.4 Solder mask clearance diameter must be greater than the PC board pad diameter and be registered properly so that .002" (0.05mm) minimum clearance is met all around the pad.
6.5 PC board vias should not be included in the ball grid array solder pads. [Fig. 10] The connector side of the via shall be fully covered with solder mask. Solder mask may be truncated along interconnect trace.

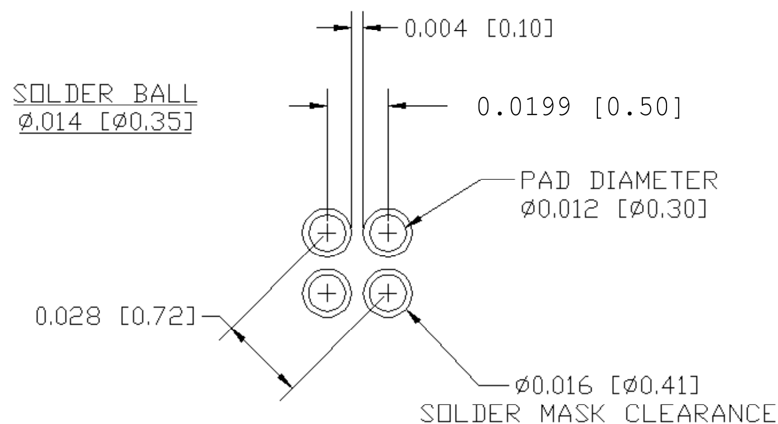

Fig. 10

7.0 PC Board Application

7.1 A protective cover is attached to the socket and can be used for vacuum pickup and placement with automated equipment. Placement by hand or with mechanical grippers that grip the outside of the socket will also work.
7.2 Socket will be placed so that solder balls are placed on top of or lightly pushed into the solder paste. Socket shall not be dragged into place, since this will track solder paste that may cause bridging and result in an electrical short.
7.3 Socket placement utilizes typical BGA placement procedures.

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8.0 Solder Flux/Paste

8.1 To make the product easier to use, a no-clean RMA Flux is recommended.
8.1.1 Recommended stencil thickness is .003 inches (0.08mm).
8.1.2 Recommend a round aperture diameter of .011 inches (0.28mm) for a .003 inches (0.08mm) thick stencil. This combination gives a paste volume of approximately .285 $^{10^{-6}}$ in^3
8.2 If using a solder paste, a no-clean solder paste is recommended.
8.2.1 **For Leaded**:
8.2.1.1 AIM solder paste p/n: NC257 type 4, Sn63/Pb37.
8.2.1.2 Stencil thickness 0.003 inches (0.076mm), aperture is .009 inches 0.23mm) dia.
8.2.2 **For Lead-Free**:
8.2.2.1 AIM solder paste p/n: nc257 type 5, 95.5Sn/4.0Ag /0.5Cu, RoHS compliant.
8.3 Stencil thickness 0.003 inches (0.08), aperture is .009 inches 0.23) dia.

9.0 Solder Reflow

All recommended temperatures are on top surface of the board, either inside or in close proximity to the connector ball grid array.

9.1 For standard SnPb product:

9.1.1 To obtain temperature equalization at all the BGA locations, soak at 130° C to 160° C before reflow for 120 seconds max.
9.1.2 Reflow time above 183° C should be between 45 seconds and 75 seconds.
9.1.3 Peak temperature should be between 210° C and 217° C.
9.1.4 The maximum temperature on the board should not exceed 230° C for more than 10 seconds.
9.1.5 A nitrogen environment of equal to or greater than 4,000 ppm O^2 can improve stability, but it is not required.
9.1.6 Maximum ramp rate should be 3° C per second.
9.1.7 See Figure 11a for sample profile.

9.2 For lead-free RoHS compliant product:

9.2.1 To obtain temperature equalization at all BGA locations, soak at 150° C to 210° C prior to reflow for 60-90 seconds.
9.2.2 Reflow time above 219° C should be a maximum of 90 seconds.
9.2.3 Peak temperature should be between 235° C and 250° C.
9.2.4 The maximum temperature on the board should not exceed 260° C for more than 10 seconds.
9.2.5 The maximum total cumulative time to ramp up, soak, and reflow the board shall be limited to 330 seconds.
9.2.6 Nitrogen environment of equal to or greater than 4,000 ppm O^2 can improve stability, but it is not required.
9.2.7 Maximum ramp rate should be <2.5° C per second. [Fig. 11b]

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Generic Reflow Profile

63Sn/37Pb Solder Liquidus @ 183˚C (361˚F)

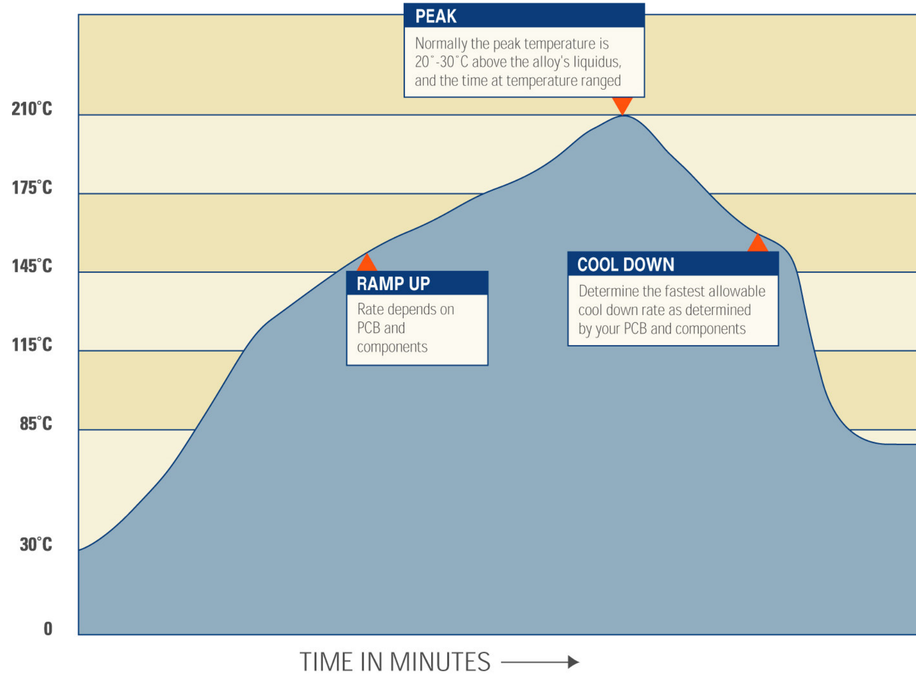

Fig. 11a

Generic Lead-free Reflow Profile

Sn/Ag/Cu Solder Liquidus at 218˚C (424˚F)

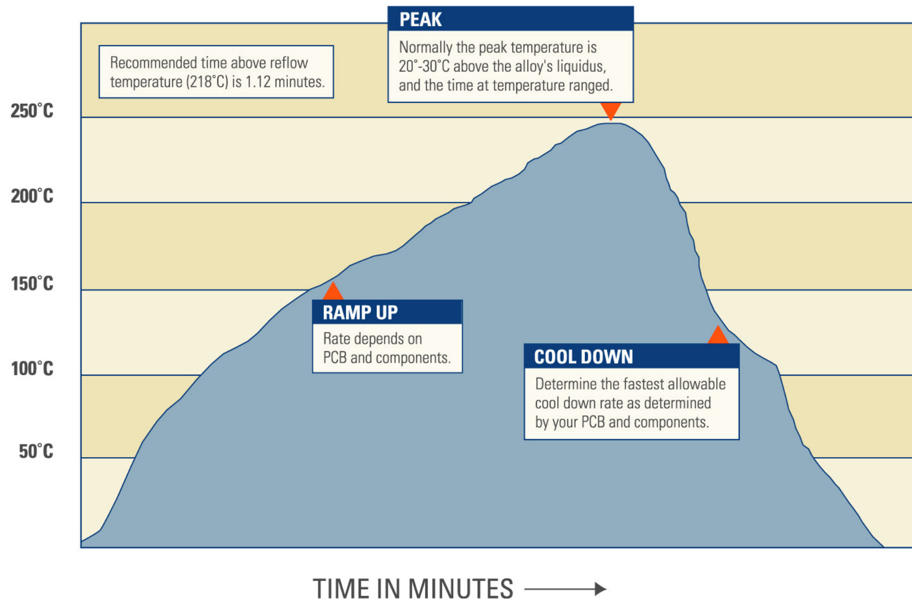

Fig. 11b

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10.0 Double Sided Reflow

All 0.50mm Socket Adapter Systems are suitable for double sided reflow. In all cases users should verify connector applicability for inverted reflow through process verification testing.

11.0 Cleaning

The connector and board assembly can be washed with an appropriate cleaner to remove any residue or contaminants after reflow. Vacuum pickup caps should be removed before cleaning to reduce the chance of trapping cleaning solutions.

12.0 Protective Cover Removal

To remove the protective cover:

12.1 Insert the extraction tool into one of the side slots. [Fig. 12a]
12.2 Rotate the tool approximately 30°. [Fig. 12b]
12.3 Repeat steps 12.1 and 12.2 on the opposite side of the socket. [Fig. 12c]
12.4 Repeat steps 12.1 and 12.2 on all four slots until the cover pulls free; clockwise or counter clockwise. [Figs. 12d and 12e]
12.5 Save protective cover.

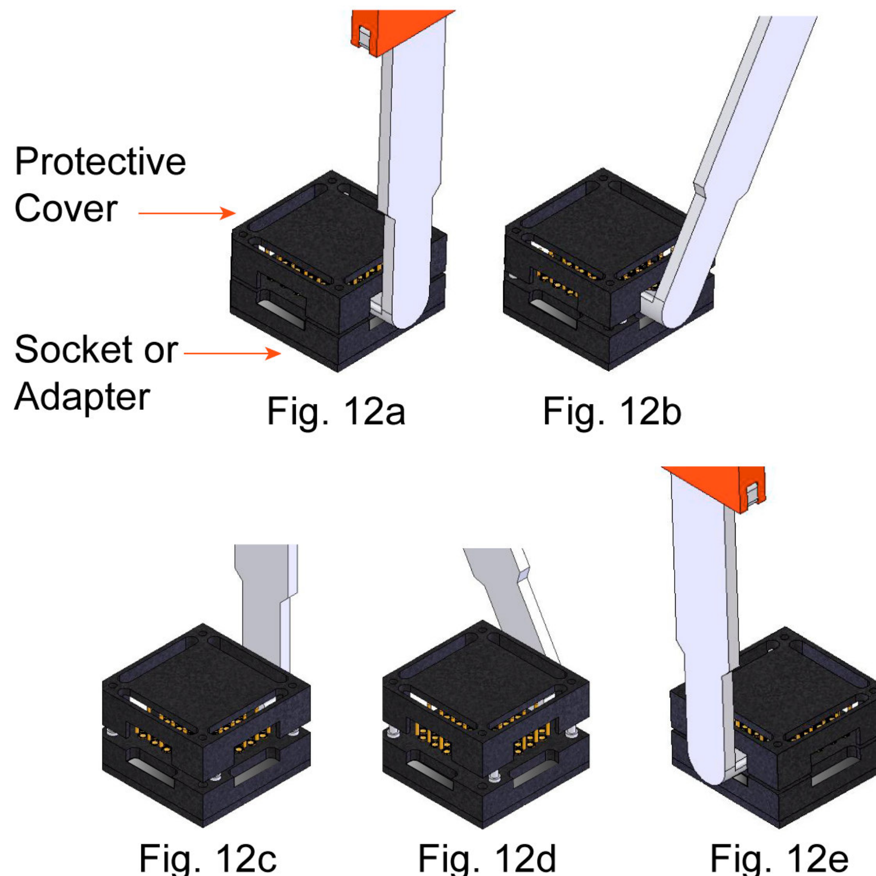

Fig. 12a Fig. 12b

Fig. 12c Fig. 12d Fig. 12e

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13.0 Recommended Mating and Unmating

13.1 Mating the two halves of the socket/adapter system:
- 13.1.1 Align the four alignment pins. [Fig. 13a]
- 13.1.2 Push down until the positive stop is contacted. [Figs. 13b and 13c]
- 13.1.3 Verify pins are fully seated.

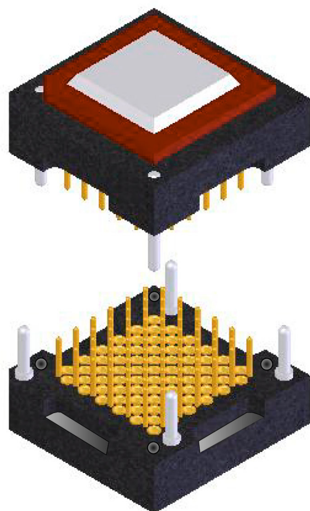

Fig. 13a

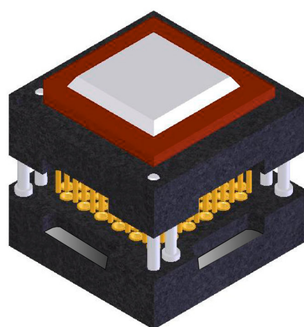

Fig. 13b

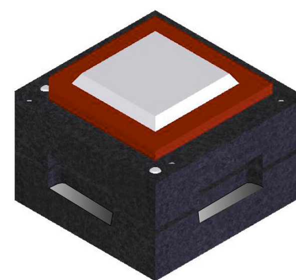

Fig. 13c

13.2 Unmating the two halves of the socket/adapter system:
- 13.2.1 Insert the extraction tool into one of the side slots.
- 13.2.2 Rotate the tool approximately 30°.
- 13.2.3 Repeat steps 13.1 and 13.2 on the opposite side of the socket.
- 13.2.4 Repeat steps 13.1 and 13.2 on all four slots until the socket pulls free.

14.0 Storage

14.1 It is recommended to install the cover if parts will not be used for an extended period of time.

14.2 See section 12.0 for cover installation/removal.

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15.0 Revision History

REV.	DESCRIPTION	BY	DATE
0	New release	G. Goodman	3/9/06
1	Update	G. Goodman	5/19/06
2	Clarify standoff and extraction slots	G. Goodman	6/21/06
3	Include specific solder flux/paste, add 0.65mm ref.	G. Goodman	12/18/08

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