



Socket FS1b Design Specification

Publication#	52119	Revision:	3.00
Issue Date:	April 2014		

Specification Agreement

This Specification Agreement (this “Agreement”) is a legal agreement between Advanced Micro Devices, Inc. (“AMD”) and “You” as the recipient of the attached AMD Specification (the “Specification”). If you are accessing the Specification as part of your performance of work for another party, you acknowledge that you have authority to bind such party to the terms and conditions of this Agreement. If you accessed the Specification by any means or otherwise use or provide Feedback (defined below) on the Specification, You agree to the terms and conditions set forth in this Agreement. If You do not agree to the terms and conditions set forth in this Agreement, you are not licensed to use the Specification; do not use, access or provide Feedback about the Specification.

In consideration of Your use or access of the Specification (in whole or in part), the receipt and sufficiency of which are acknowledged, You agree as follows:

1. You may review the Specification only (a) as a reference to assist You in planning and designing Your product, service or technology (“Product”) to interface with an AMD product in compliance with the requirements as set forth in the Specification and (b) to provide Feedback about the information disclosed in the Specification to AMD.
2. Except as expressly set forth in Paragraph 1, all rights in and to the Specification are retained by AMD. This Agreement does not give You any rights under any AMD patents, copyrights, trademarks or other intellectual property rights. You may not (i) duplicate any part of the Specification; (ii) remove this Agreement or any notices from the Specification, or (iii) give any part of the Specification, or assign or otherwise provide Your rights under this Agreement, to anyone else.
3. The Specification may contain preliminary information, errors, or inaccuracies, or may not include certain necessary information. Additionally, AMD reserves the right to discontinue or make changes to the Specification and its products at any time without notice. The Specification is provided entirely “AS IS.” AMD MAKES NO WARRANTY OF ANY KIND AND DISCLAIMS ALL EXPRESS, IMPLIED AND STATUTORY WARRANTIES, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT, TITLE OR THOSE WARRANTIES ARISING AS A COURSE OF DEALING OR CUSTOM OF TRADE. AMD SHALL NOT BE LIABLE FOR DIRECT, INDIRECT, CONSEQUENTIAL, SPECIAL, INCIDENTAL, PUNITIVE OR EXEMPLARY DAMAGES OF ANY KIND (INCLUDING LOSS OF BUSINESS, LOSS OF INFORMATION OR DATA, LOST PROFITS, LOSS OF CAPITAL, LOSS OF GOODWILL) REGARDLESS OF THE FORM OF ACTION WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE) AND STRICT PRODUCT LIABILITY OR OTHERWISE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.
4. Furthermore, AMD’s products are not designed, intended, authorized or warranted for use as components in systems intended for surgical implant into the body, or in other applications intended to support or sustain life, or in any other application in which the failure of AMD’s product could create a situation where personal injury, death, or severe property or environmental damage may occur.

5. You have no obligation to give AMD any suggestions, comments or feedback ("Feedback") relating to the Specification. However, any Feedback You voluntarily provide may be used by AMD without restriction, fee or obligation of confidentiality. Accordingly, if You do give AMD Feedback on any version of the Specification, You agree AMD may freely use, reproduce, license, distribute, and otherwise commercialize Your Feedback in any product, as well as has the right to sublicense third parties to do the same. Further, You will not give AMD any Feedback that You may have reason to believe is (i) subject to any patent, copyright or other intellectual property claim or right of any third party; or (ii) subject to license terms which seek to require any product or intellectual property incorporating or derived from Feedback or any Product or other AMD intellectual property to be licensed to or otherwise provided to any third party.
6. You shall adhere to all applicable U.S., European, and other export laws, including but not limited to the U.S. Export Administration Regulations ("EAR"), (15 C.F.R. Sections 730 through 774), and E.U. Council Regulation (EC) No 428/2009 of 5 May 2009. Further, pursuant to Section 740.6 of the EAR, You hereby certifies that, except pursuant to a license granted by the United States Department of Commerce Bureau of Industry and Security or as otherwise permitted pursuant to a License Exception under the U.S. Export Administration Regulations ("EAR"), You will not (1) export, re-export or release to a national of a country in Country Groups D:1, E:1 or E:2 any restricted technology, software, or source code You receive hereunder, or (2) export to Country Groups D:1, E:1 or E:2 the direct product of such technology or software, if such foreign produced direct product is subject to national security controls as identified on the Commerce Control List (currently found in Supplement 1 to Part 774 of EAR). For the most current Country Group listings, or for additional information about the EAR or Your obligations under those regulations, please refer to the U.S. Bureau of Industry and Security's website at <http://www.bis.doc.gov/>.
7. If You are a part of the U.S. Government, then the Specification is provided with "RESTRICTED RIGHTS" as set forth in subparagraphs (c) (1) and (2) of the Commercial Computer Software-Restricted Rights clause at FAR 52.227-14 or subparagraph (c) (1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7013, as applicable.
8. This Agreement is governed by the laws of the State of California without regard to its choice of law principles. Any dispute involving it must be brought in a court having jurisdiction of such dispute in Santa Clara County, California, and You waive any defenses and rights allowing the dispute to be litigated elsewhere. If any part of this agreement is unenforceable, it will be considered modified to the extent necessary to make it enforceable, and the remainder shall continue in effect. The failure of AMD to enforce any rights granted hereunder or to take action against You in the event of any breach hereunder shall not be deemed a waiver by AMD as to subsequent enforcement of rights or subsequent actions in the event of future breaches. This Agreement is the entire agreement between You and AMD concerning the Specification; it may be changed only by a written document signed by both You and an authorized representative of AMD.

© 2012 – 2014 Advanced Micro Devices, Inc. All rights reserved.

The information contained herein is for informational purposes only, and is subject to change without notice. While every precaution has been taken in the preparation of this document, it may contain technical inaccuracies, omissions and typographical errors, and AMD is under no obligation to update or otherwise correct this information. Advanced Micro Devices, Inc. makes no representations or warranties with respect to the accuracy or completeness of the contents of this document, and assumes no liability of any kind, including the implied warranties of noninfringement, merchantability or fitness for particular purposes, with respect to the operation or use of AMD hardware, software or other products described herein. No license, including implied or arising by estoppel, to any intellectual property rights is granted by this document. Terms and limitations applicable to the purchase or use of AMD's products are as set forth in a signed agreement between the parties or in AMD's Standard Terms and Conditions of Sale.

Trademarks

AMD, the AMD Arrow logo, and combinations thereof are trademarks of Advanced Micro Devices, Inc. Other product names used in this publication are for identification purposes only and may be trademarks of their respective companies.

Dolby Laboratories, Inc.

Manufactured under license from Dolby Laboratories.

Rovi Corporation

This device is protected by U.S. patents and other intellectual property rights. The use of Rovi Corporation's copy protection technology in the device must be authorized by Rovi Corporation and is intended for home and other limited pay-per-view uses only, unless otherwise authorized in writing by Rovi Corporation.

Reverse engineering or disassembly is prohibited.

USE OF THIS PRODUCT IN ANY MANNER THAT COMPLIES WITH THE MPEG ACTUAL OR DE FACTO VIDEO AND/OR AUDIO STANDARDS IS EXPRESSLY PROHIBITED WITHOUT ALL NECESSARY LICENSES UNDER APPLICABLE PATENTS. SUCH LICENSES MAY BE ACQUIRED FROM VARIOUS THIRD PARTIES INCLUDING, BUT NOT LIMITED TO, IN THE MPEG PATENT PORTFOLIO, WHICH LICENSE IS AVAILABLE FROM MPEG LA, L.L.C., 6312 S. FIDDLERS GREEN CIRCLE, SUITE 400E, GREENWOOD VILLAGE, COLORADO 80111.

Contents

Revision History	8
Chapter 1 Introduction	9
1.1 Purpose.....	9
1.2 Supplier Requirements.....	10
Chapter 2 Processor Package Description	11
Chapter 3 Socket Mechanical Requirements	13
3.1 Socket Outline.....	13
3.2 Socket Base and Socket Cover	15
3.2.1 Socket Cover Finger Access	15
3.3 Package Seating Plane	16
3.3.1 Package Supports and Seating Plane Dimensional Requirements.....	16
3.3.2 Measurement Method for Package Supports and Seating Plane	17
3.4 Socket Contact	24
3.4.1 Contact Base Metal	24
3.4.2 Contact Plating.....	24
3.4.3 Surface Mount Technology (SMT) Solder Balls	24
3.5 Socket Actuation Lever	25
3.5.1 Lever Material.....	25
3.5.2 Package Insertion and Extraction Force	25
3.5.3 Socket Retention Force.....	25
3.5.4 Locking Latch	25
3.5.5 Lever Actuation and De-actuation Force.....	25
3.5.6 Pin Field Actuation Displacement	25
3.6 Socket Durability	25
3.7 Socket Weight.....	25
3.8 Socket Markings	26
3.9 Visual Inspection	26
3.9.1 Solder Balls.....	26
3.9.2 Contacts.....	26
3.9.3 Socket Cover and Socket Base	26

3.9.4	Actuation Lever	26
3.10	Critical-to-Function Parameters	27
Chapter 4	Socket Electrical Requirements	29
4.1	Contact Current Rating.....	29
4.2	Low Level Circuit Resistance (LLCR)	29
4.2.1	Initial Resistance	29
4.2.2	Final Resistance.....	29
4.3	Inductance	29
4.4	Capacitance	30
4.5	Differential Impedance.....	30
4.6	Propagation Delay	30
4.7	Crosstalk.....	30
4.8	Dielectric Withstanding Voltage (DWV).....	30
4.9	Insulation Resistance.....	30
Chapter 5	Socket Environmental Requirements.....	31
5.1	Thermal Shock	31
5.2	Cyclic Humidity	31
5.3	Thermal Cycling.....	31
5.4	Temperature Life.....	31
5.5	Industrial Mixed Flowing Gas	32
5.6	Mechanical Shock	32
5.7	Random Vibration.....	32
5.8	Resistance to Solder Heat.....	32
5.9	Resistance to Solvents.....	32
5.10	Heatsink Assembly.....	32

List of Figures

Figure 1. A 3-D View of Socket FS1b.....	9
Figure 2. AMD 721-Pin Organic μ PGA Package Drawing.....	11
Figure 3. Socket FS1b Outline Relative to A01 Solder Ball Position	13
Figure 4. Allowable PCB Component Keep-In and Keep-Out Area.....	14
Figure 5. Finger Access Cut-outs on Socket Cover.....	16
Figure 6. Illustration of Outer Support Measurement Locations.....	18
Figure 7. Definition of Step Height	19
Figure 8. Illustration of Best Fit Plane and Outer Support Flatness	19
Figure 9. Illustration of Center Support Ring Measurement Locations.....	20
Figure 10. Illustration of Outer Support region and Center Support ring Measurement Method ...	21
Figure 11. Illustration of Socket Base Four-Corner Measurement Locations	22
Figure 12. Illustration of Socket Base Internal Region Measurement Locations	23

List of Tables

Table 1. Package Supports and Seating Plane Dimensional Requirements.....	17
Table 2. Socket FS1b Critical-to-Function Parameters	27



Revision History

Date	Revision	Description
April 2014	3.00	Initial Public release

Chapter 1 Introduction

This design specification defines the requirements for a 721-position, 1.219-mm pitch, surface mount technology (SMT), zero insertion force (ZIF) socket (herein referred to as Socket FS1b) for use with the AMD 721-pin, organic, micro pin grid array (μPGA) package. The Socket FS1b, shown in Figure 1, is designed to provide a reliable electrical interconnect between the printed circuit board (PCB) and the 721 pins of the organic μPGA package throughout the life of the product.

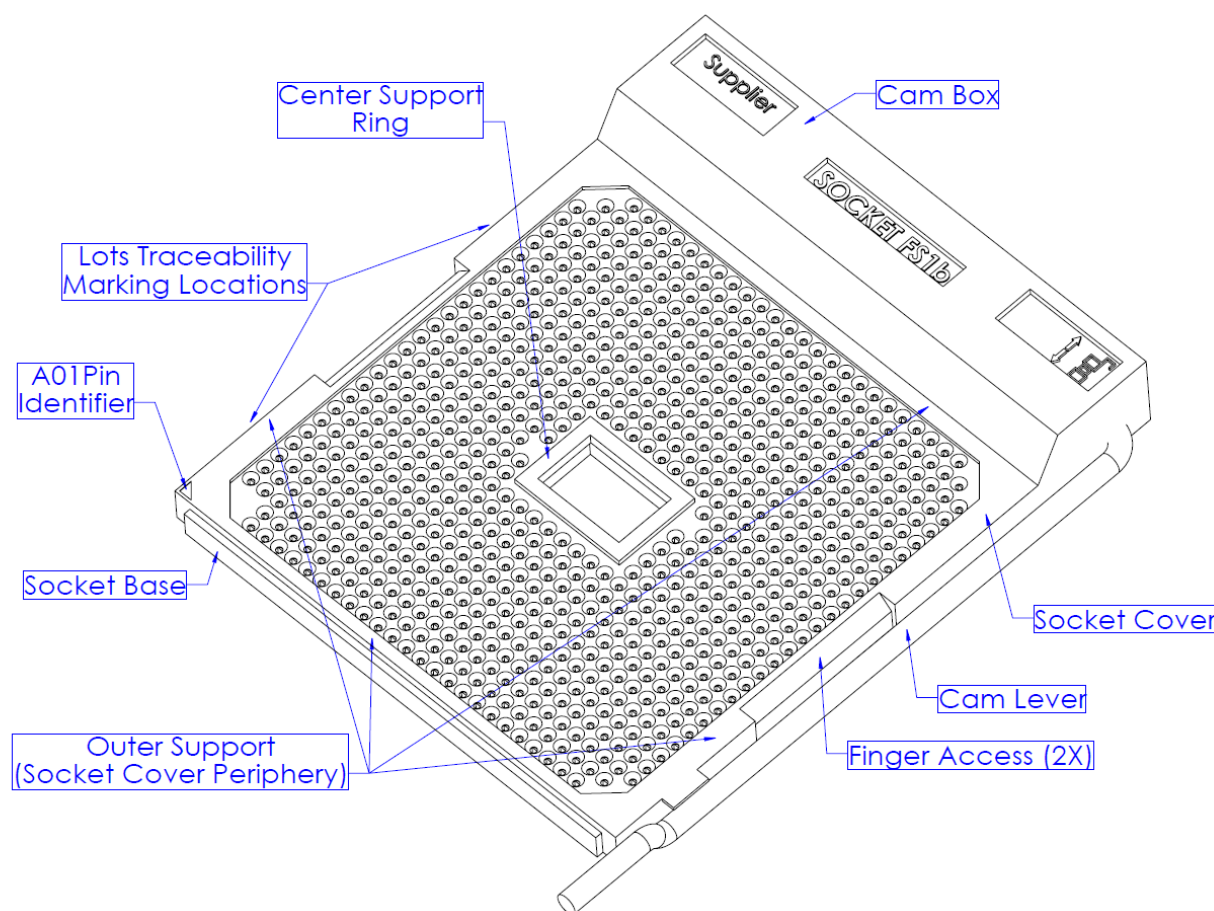


Figure 1. A 3-D View of Socket FS1b

1.1 Purpose

This design specification specifies the dimensional, mechanical, electrical, and reliability requirements for the Socket FS1b that are necessary to meet the performance requirements of AMD processor products.

1.2 Supplier Requirements

To become a qualified supplier for the Socket FS1b, the potential socket supplier must demonstrate that their product meets the requirements listed in this document and must conduct qualification testing on their production run sockets in accordance with the *Socket FS1b Qualification Plan*, order# 52120.

Chapter 2 Processor Package Description

Figure 2 provides dimensional information for the 721-pin organic μ PGA package that mates with the Socket FS1b.

The Socket FS1b is designed to be functional with the lidded package configuration.

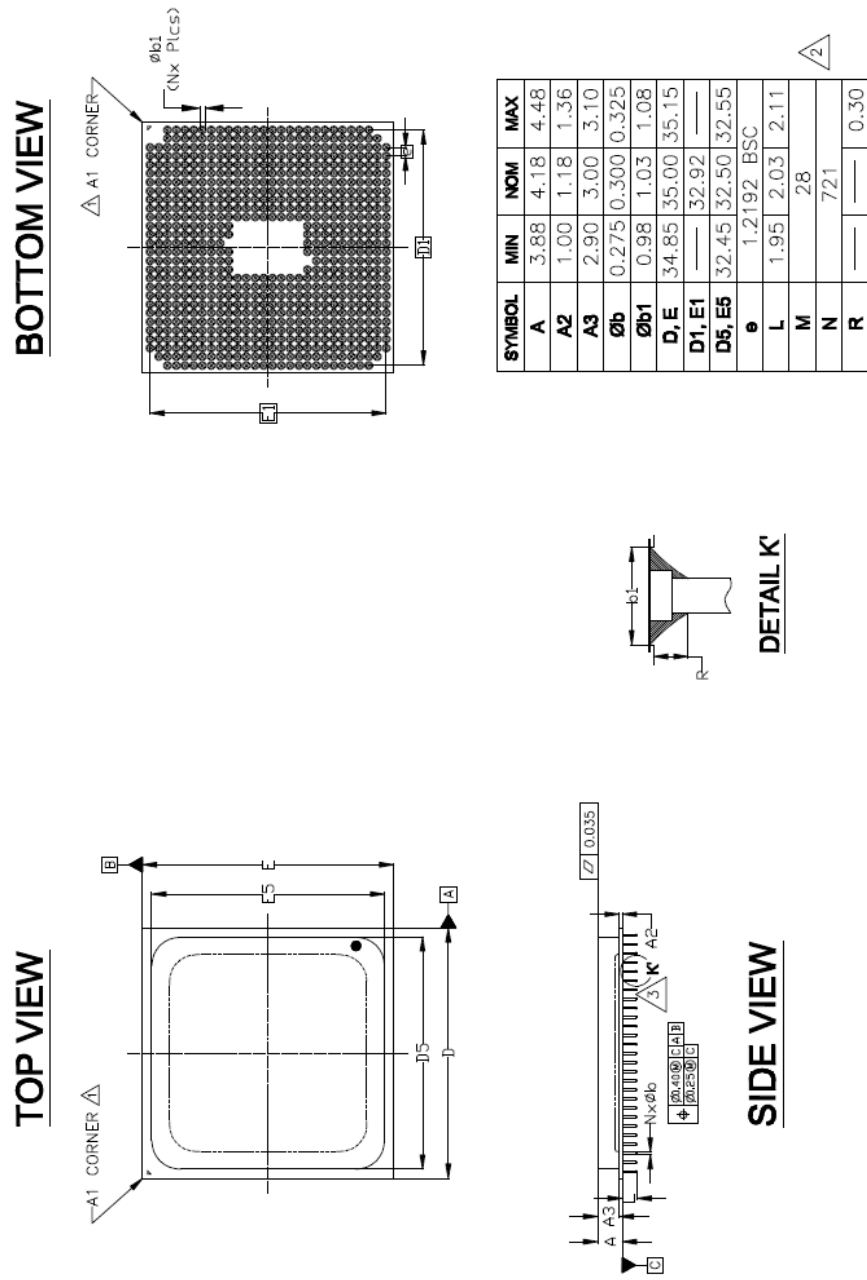


Figure 2. AMD 721-Pin Organic μ PGA Package Drawing

Chapter 3 Socket Mechanical Requirements

This chapter describes the socket outline and mechanical requirements for the Socket FS1b.

3.1 Socket Outline

Figure 3 shows the maximum allowable outline for the Socket FS1b.

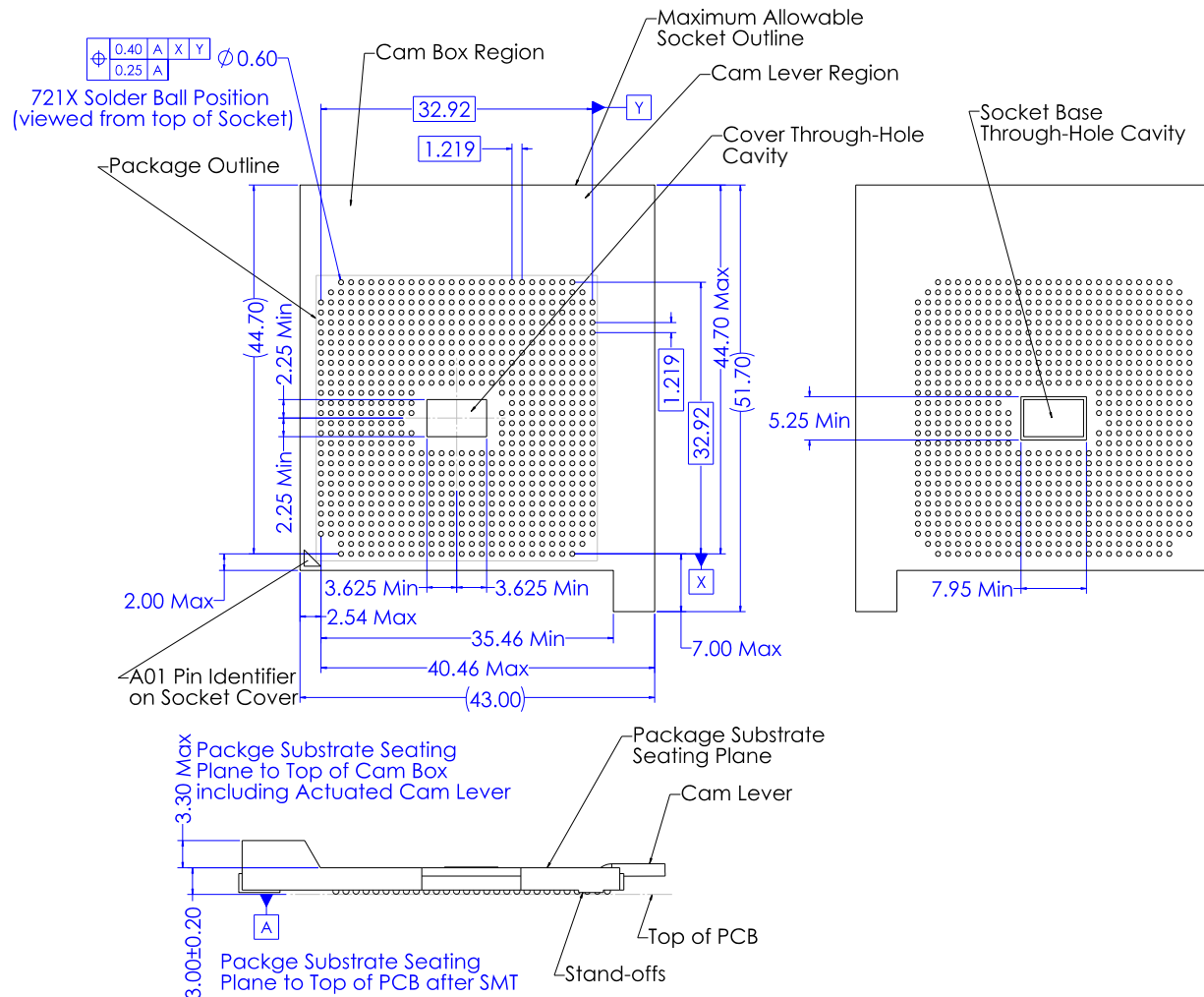


Figure 3. Socket FS1b Outline Relative to A01 Solder Ball Position

The minimum size of the through-hole cavity in the socket base is shown in Figure 3, on page 13. The through-hole cavity is located in the center of the solder ball array on the socket base, as well as in the center of the pin-hole array in the socket cover.

The allowable component keep-in area within the socket base cavity on the PCB is shown in the Figure 4. The height of the devices mounted on the PCB within the keep-in area of the socket base must be less than 1.50 mm.

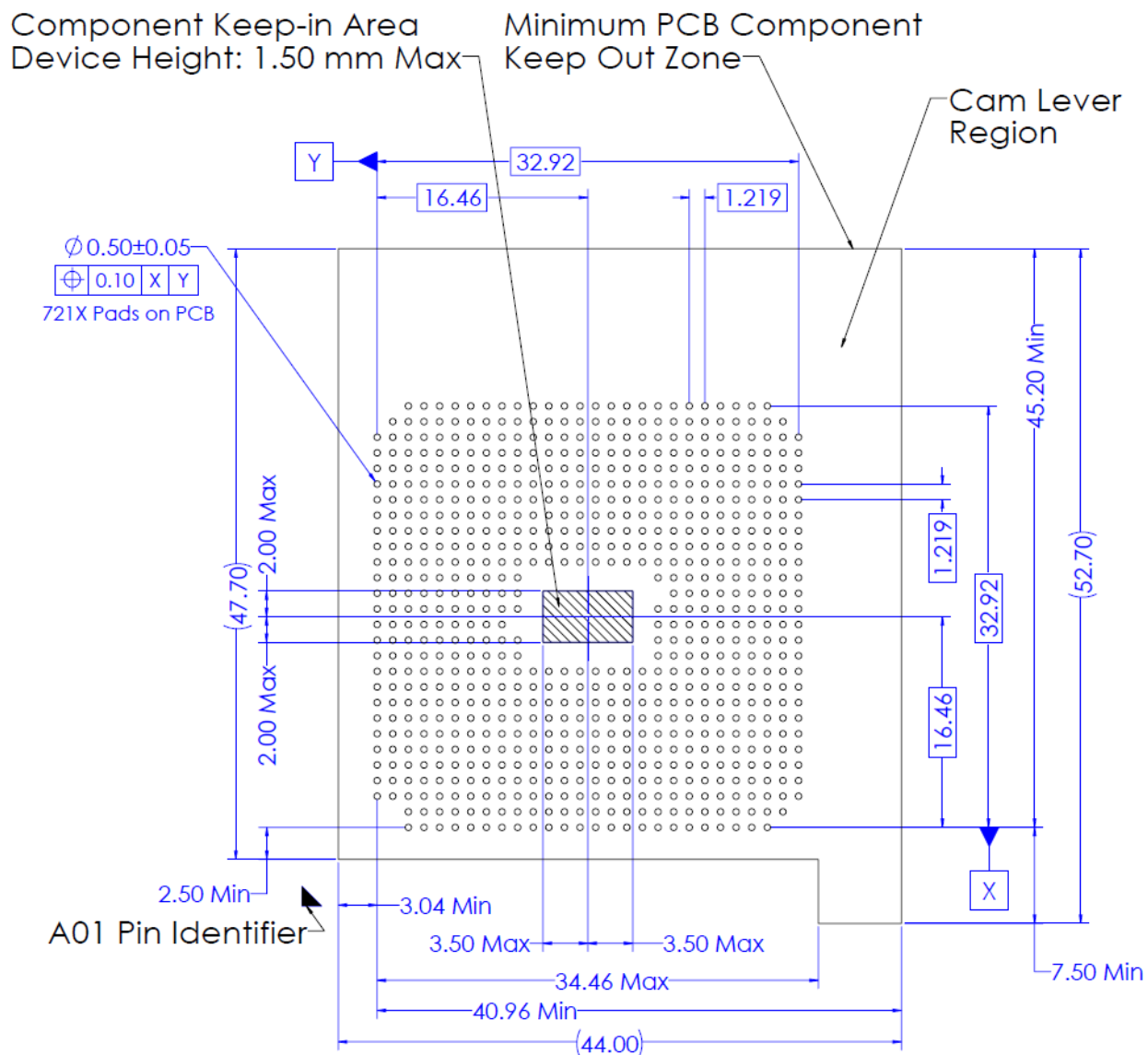


Figure 4. Allowable PCB Component Keep-In and Keep-Out Area

3.2 Socket Base and Socket Cover

The socket base and socket cover are made from liquid crystal polymer (LCP) with a UL flammability rating of 94 V-0. The colors for the socket base and cover are as follows:

- Socket base color — black.
- Socket cover color — black.

The thickness of the socket cover (including the 0.30 mm pocket recess) must not exceed 1.17 mm. The socket cover flatness is less than 0.25 mm before and after the SMT reflow to the PCB. The socket cover flatness must remain less than 0.25 mm after environmental and mechanical testing.

A plastic cover cap acts as an overlay on the top of the socket cover. The overlay facilitates socket pick-and-place operation with a vacuum nozzle during board assembly. The overlay must not outgas during the solder reflow processes or leave any residue upon removal prior to package pins insertion.

Before socket reflow to PCB, the latches on the cover cap must provide a minimum retention force of 0.5 kgf, when measured at the center of the cover cap. After socket reflow to PCB, the latches on the cover cap must provide a minimum retention force of 0.3 kgf, again measured at the center of cover cap. The force required at the removal tabs to remove the cover cap must be less than 1.0 kgf after socket reflow to PCB.

The height of the cam box must be less than 3.30 mm above the package seating plane, as shown in Figure 3, on page 13.

The socket cover pin holes must have a pattern relating true position of less than 0.25 mm and a feature relating true position of less than 0.13 mm.

3.2.1 Socket Cover Finger Access

The socket cover must incorporate finger access cut-outs as shown in Figure 1, on page 9. The cut-outs must be at least 12.0 mm long. The center-line of the cutouts must not be off-set from the center-line of the socket cover pin-hole array by more than 2.0 mm. Refer to Figure 5, on page 16 for details of the finger access cut-outs.

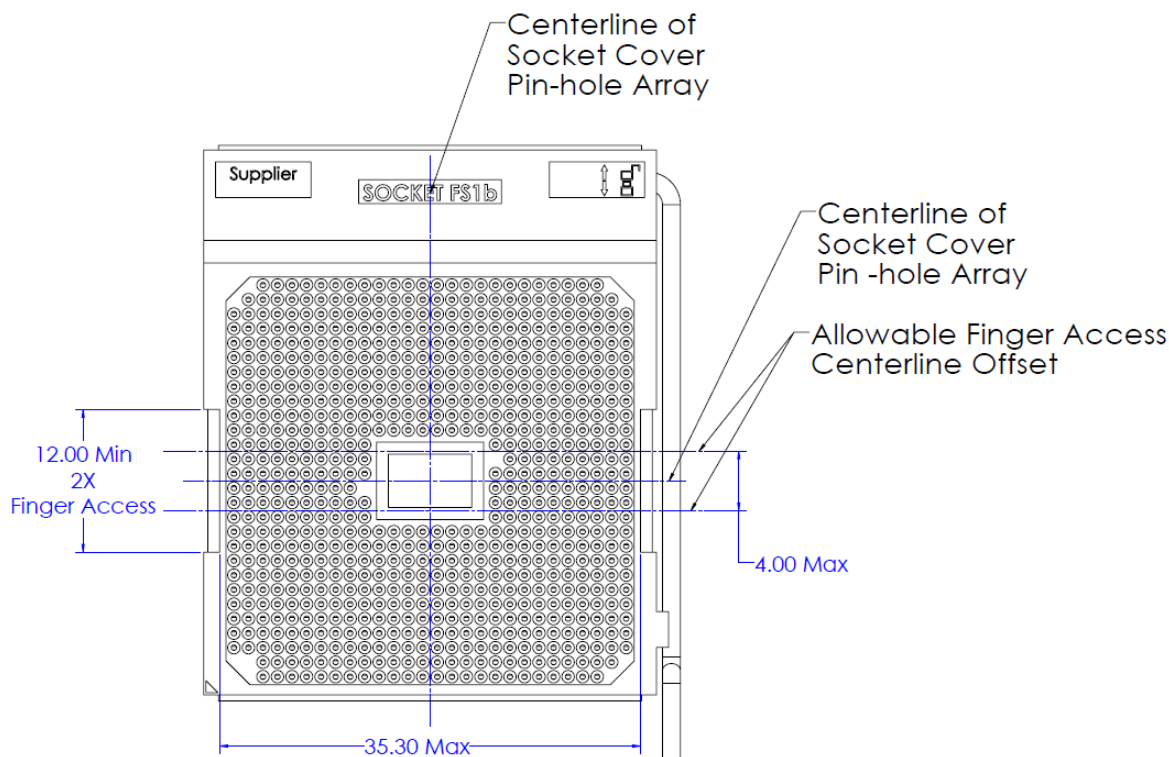


Figure 5. Finger Access Cut-outs on Socket Cover

3.3 Package Seating Plane

The cover for the Socket FS1b is designed to accommodate the package pin shoulder and braze/solder fillet as shown by the 721-pin organic μ PGA package drawings in Figure 2, on page 11. Package support structures are incorporated into the socket cover to provide sufficient mechanical support (seating plane) for the package substrate without causing damage to the package pins at any time.

The package seating plane on the socket cover has a surface flatness of less than 0.25 mm when unmated, as well as when mated, with a package. After the socket is mounted to the PCB, the package-seating plane on the socket cover is $3.00 \text{ mm} \pm 0.20 \text{ mm}$ from the mounting surface of the PCB.

3.3.1 Package Supports and Seating Plane Dimensional Requirements

To ensure proper seating plane support for the processor package while it is situated in the socket, the outer support, and the center support ring on the socket cover (indicated in Figure 1, on page 9), and the socket base must meet the dimensional requirements in Table 1, on page 17.

Table 1. Package Supports and Seating Plane Dimensional Requirements

Item No.	Requirement
1	Before and after the socket is reflowed to the PCB, the outer support step height on the socket cover is $0.30 \text{ mm} \pm 0.05 \text{ mm}$.
2	Before and after the socket is reflowed to the PCB, the flatness of the outer support on the socket cover must not exceed 0.25 mm.
3	After the socket is reflowed to the PCB, the height of the center support ring on the socket cover is $0.06 \text{ mm} \pm 0.05 \text{ mm}$ from the least mean square defined plane (LMS1) of the outer support region.
4	Before the socket is reflowed to the PCB, the flatness of inner region on the socket base is less than 0.25 mm from the least mean square defined plane (LMS2) of the four corner points on the socket base.
5	After the socket is reflowed to the PCB, the flatness of the inner region on the socket base is less than 0.25 mm from the least mean square defined plane (LMS2) of the four corner points on the socket base.

Refer to measurement requirements and methodologies in Section 3.3.2.

3.3.2 Measurement Method for Package Supports and Seating Plane

The features in Section 3.3.1 must be measured using the methodologies described in Sections 3.3.2.1 through 3.3.2.6, on pages 17 through 22, respectively.

3.3.2.1 Measurement Conditions

The socket to be measured must be reflowed to a PCB using the recommended reflow process for the socket with the particular solder ball composition.

Note: An AMD approved fixture that maintains the socket cover in contact with the socket base at the inner seating plane supports (center support ring) must be used for the socket measurement.

3.3.2.2 Outer Support Step Height Measurement

Use a local point-to-point method, as shown in Figure 6, to measure the outer support step height at 24 evenly-spaced points (6 points per side) around the outer support on the socket cover.

The step height is the difference in height between a point on the outer support and an adjacent point on the recessed plane of the socket cover. See Figure 7, on page 19, for the definition of step height.

Note: The outer support step height must conform to the dimensional requirements of item 1, in Table 1, on page 17.

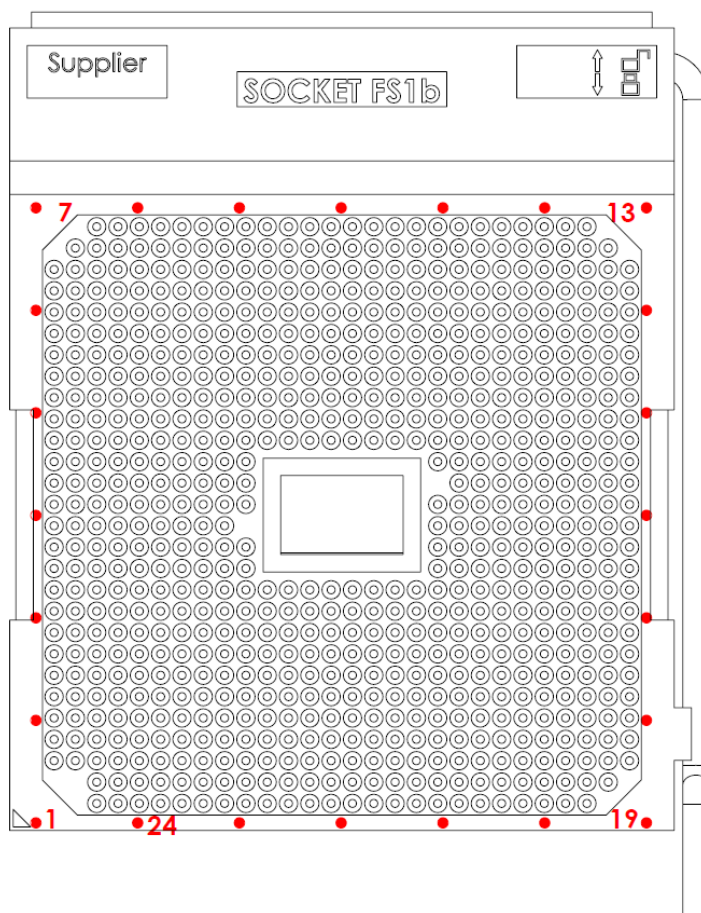


Figure 6. Illustration of Outer Support Measurement Locations

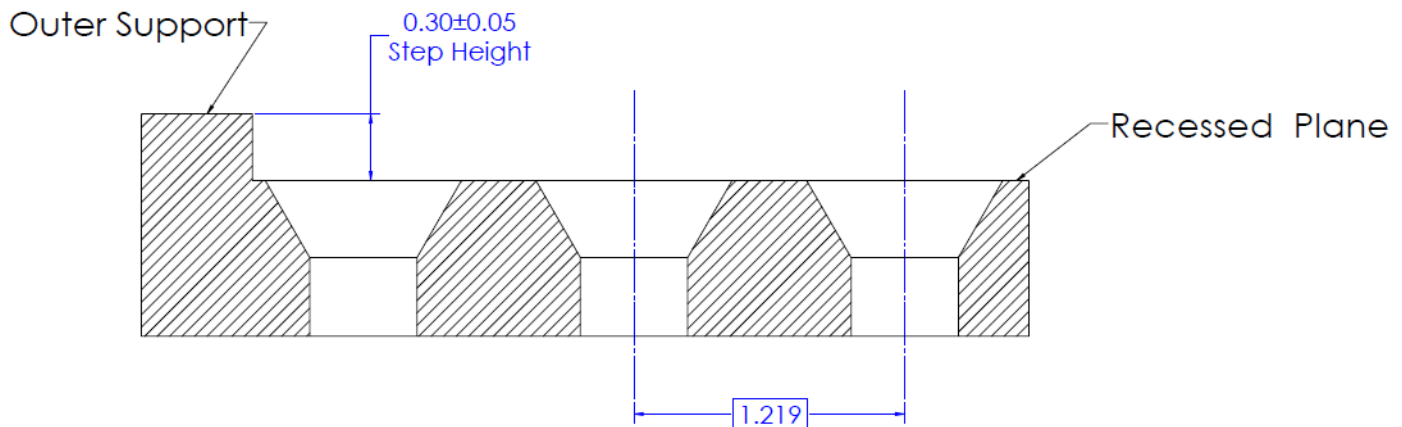


Figure 7. Definition of Step Height

3.3.2.3 Outer Support Flatness Measurement

Use the least mean square method to determine the best fit plane (LMS1) for the 24 points measured on the outer support, the same points used in the step height measurement in Section 3.3.2.2, on page 18.

Calculate the normal distance from each point to the LMS1 plane. The outer support flatness equals the maximum normal distance of all points above the LMS1 plane minus the maximum normal distance of all points beneath the LMS1 plane (the distance of all points beneath the LMS1 plane is a negative number). Refer to Figure 8 for detail illustration.

Note: The flatness of the outer support on the socket cover must meet the criteria in item 2, of Table 1, on page 17.

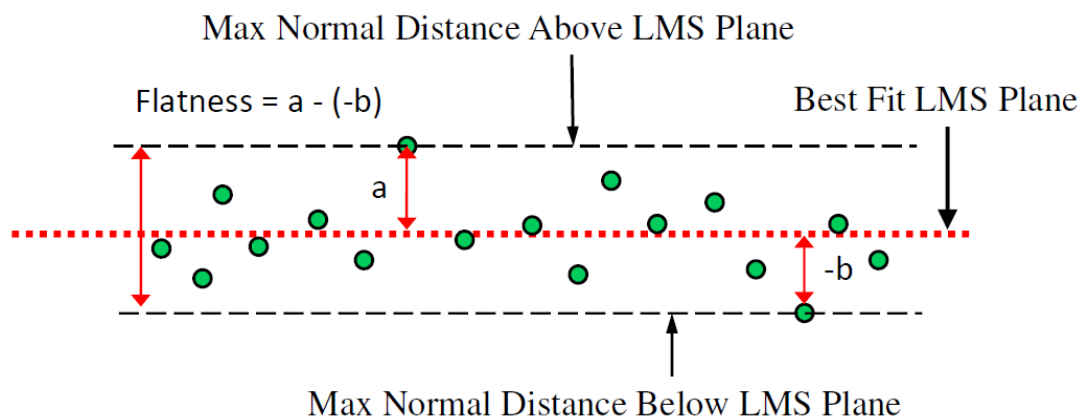


Figure 8. Illustration of Best Fit Plane and Outer Support Flatness

3.3.2.4 Center Support Ring Height Measurement

Use a local plane-to-point method to measure the height of the center support ring on the socket cover, at 8 evenly-spaced points (points 25 to 32 as shown in Figure 9) around the center support ring.

The height is the difference between a point on the center support ring relative to the outer support region least mean square plane (LMS1). Refer to Figure 10, on page 21, for an illustration of the measurement method.

Note: The height of the center support ring on the socket cover must conform to the dimensional requirements of item 3 in Table 1, on page 17.

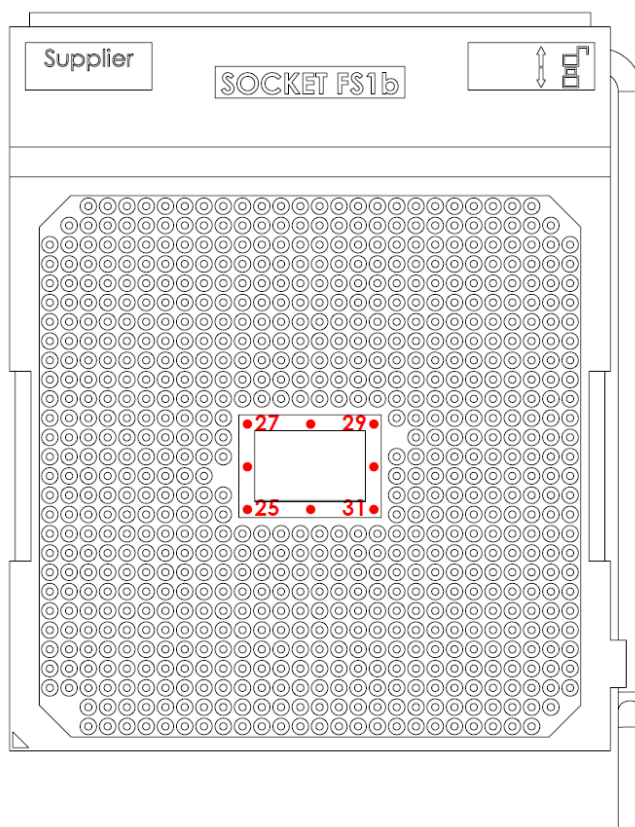


Figure 9. Illustration of Center Support Ring Measurement Locations

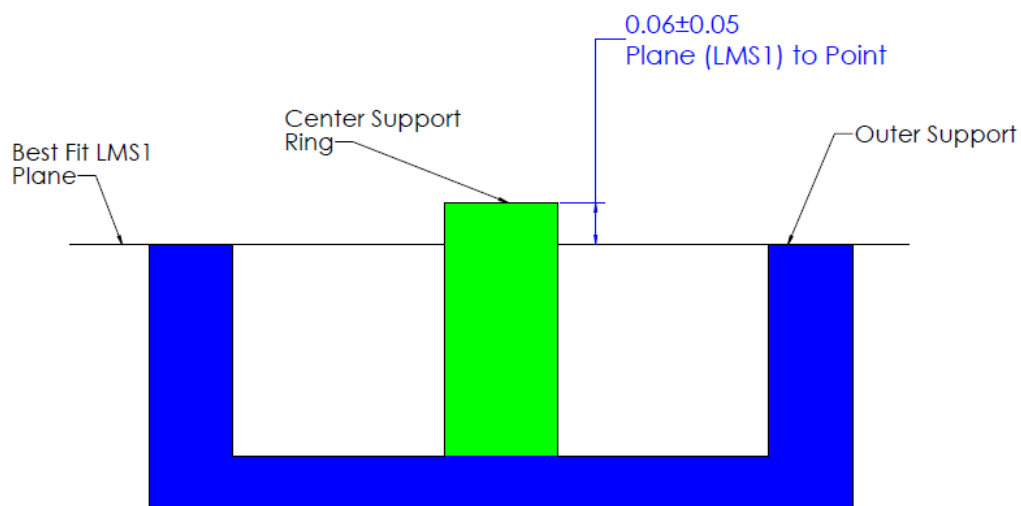


Figure 10. Illustration of Outer Support region and Center Support ring Measurement Method

3.3.2.5 Socket Base Flatness Requirements

The flatness of the socket base must be measured using the methodology described in Section 3.3.2.6, on page 22, for the following conditions:

Condition A: Before reflow to the PCB, flatness must meet the requirements of item 4 on Table 1 page 17.

Condition B: After reflow to the PCB, flatness must meet the requirements of item item 5 on Table 1 page 17.

3.3.2.6 Socket Base Flatness Measurement

The socket cover must be removed from the socket base before proceeding with the measurements described in this section. Use a local point-to-point method to measure the height of the four corner locations of the socket base shown in Figure 11. Use the least mean square method to determine the best fit plane (LMS2) for the 4 points measured on the corners of the socket base.

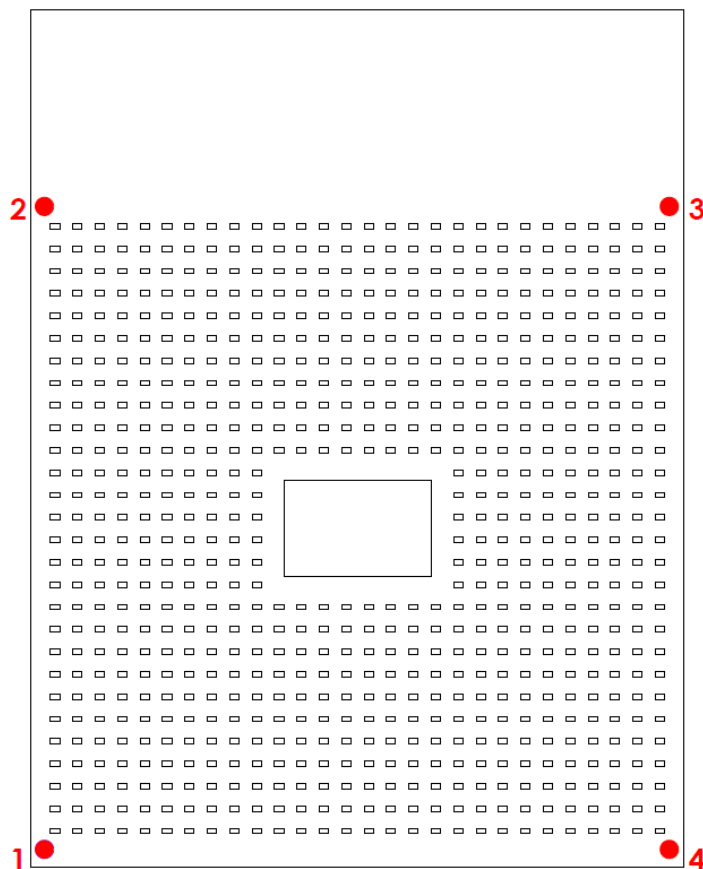


Figure 11. Illustration of Socket Base Four-Corner Measurement Locations

Next measure the height of the internal region of the socket base at the 56 locations (points 5 to 60) as shown in Figure 12, on page 23.

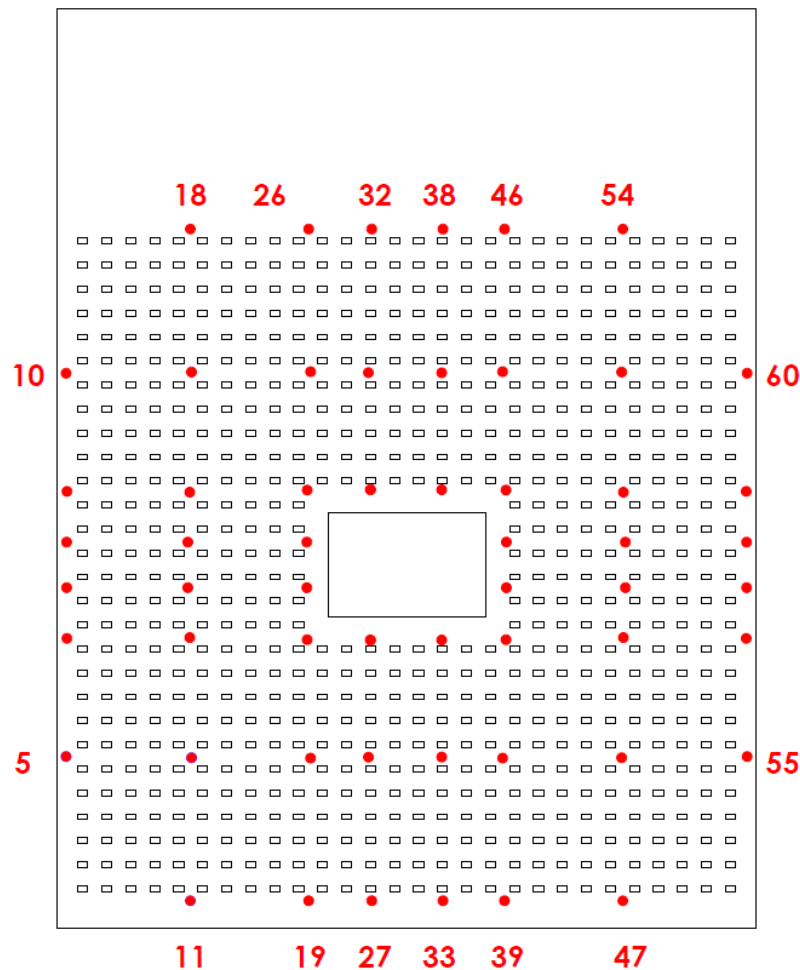


Figure 12. Illustration of Socket Base Internal Region Measurement Locations

Calculate the normal distance from each point on the socket base (points 5 to 60) to the LMS2 plane. The flatness of the socket base's internal region equals the maximum normal distance of all points above the LMS2 plane minus the maximum normal distance of all points beneath the LMS2 plane (the distance of all points beneath the LMS2 plane is a negative number). Refer to Figure 8, on page 19, for detail illustration.

Note: The flatness of the socket base internal region must meet the condition in items 4 and 5 of Table 1, on page 17.

3.4 Socket Contact

The contact material and solder balls for socket attachment to the PCB are described in this section.

Note: *No lubricants can be present on the contact mating areas of fully assembled sockets that are shipped to customers by the supplier.*

3.4.1 Contact Base Metal

The contact base metal is made of high-strength copper alloy.

3.4.2 Contact Plating

The specifications for the contact plating are as follows:

- The entire contact is plated with 1.27- μ m minimum thickness of nickel.
- The contact mating area is plated with 0.25- μ m minimum thickness of gold over the 1.27 μ m minimum thickness of nickel underplating. Gold porosity in the contact mating areas must be monitored, with no more than two pores with a diameter greater than 0.05 mm allowed per set of 25 contacts examined. This pore count should be maintained as a production quality control indicator.

3.4.3 Surface Mount Technology (SMT) Solder Balls

The specifications for the surface mount technology (SMT) solder balls are as follows:

- The socket is mounted to the PCB by SMT. The PCB solder pad diameter is 0.50 ± 0.05 mm.
- The solder balls on the socket have a diameter of 0.60mm (tolerance is supplier specific) and are lead-free in composition.
- Lead-free solder ball composition can be Sn4.0Ag0.5Cu (SAC405), Sn3.0Ag0.5Cu (SAC305), or Sn3.5Ag.
- The contact must include a solder barrier feature to prevent solder from wicking up into the contact mating area during solder reflow.
- The Socket FS1b solder ball field must meet the co-planarity requirement of 0.20 mm.
- Before SMT reflow to PCB, the force required to extract the solder ball from the contact must be a minimum of:
 - 750 g-f shear force for reflow attach type contact to solder ball interface,
or
 - 10 g-f retention force for mechanical attach type contact to solder ball interface.

3.5 Socket Actuation Lever

The socket incorporates a lever to the right side of the cam box for actuating and de-actuating the socket contacts with the package pins. This actuation lever provides the mechanical advantage in easily actuating the socket in an OEM high-volume manufacturing environment. The lever facilitates tool-less socket actuation and de-actuation operations by the end-user.

3.5.1 Lever Material

The recommended material for the actuation lever is stainless steel.

3.5.2 Package Insertion and Extraction Force

With the actuation lever in the open position, the package insertion and extraction forces, conceptually, are zero. These insertion and extraction forces must not exceed 0.075 kg-f in actual applications.

3.5.3 Socket Retention Force

With the actuation lever in the closed position, the force required to extract the package pins out of the socket contacts must be a minimum of 0.009 kg-f per pin.

3.5.4 Locking Latch

The socket cover incorporates a latch mechanism to lock the lever in the closed position after the socket contacts are mated with the package pins. Support tab(s) are added to the socket cover to cradle the actuation lever in the closed position. The tab(s) prevent the actuation lever from contacting the PCB.

3.5.5 Lever Actuation and De-actuation Force

The force required to actuate or de-actuate the lever must be less than 3.6 kg-f.

3.5.6 Pin Field Actuation Displacement

The package pins must be displaced less than 0.6 mm during socket actuation or de-actuation.

3.6 Socket Durability

The socket must maintain electrical and mechanical integrity after 50 actuation and de-actuation cycles with each mating package used no more than 5 mating cycles.

3.7 Socket Weight

The Socket FS1b with the pick-and-place cover cap attached must weigh 10 ± 2 g.

3.8 Socket Markings

The requirements for socket markings are as follows:

- The socket identifier marking “SOCKET FS1b” must be molded into the top surface of the socket cover cam box region. See Figure 1, on page 9.
- A locked and unlocked directional designator is molded into the top surface of the cam box in close proximity to the actuation lever. See Figure 1, on page 9.
- A triangular shaped symbol must be molded into the top of the socket cover for proper package pin A01 orientation. This orientation symbol is located so that it remains visible after the package is mated to the socket as shown in Figure 1, on page 9, and Figure 3, on page 13.
- The supplier’s trademark symbol must be molded on the socket cover. Locate this marking so that it remains visible and readable after the socket is solder mounted onto the PCB.
- The lot traceability number can be ink, laser, or impact marked on the socket cover. Locate the marking so that it remains visible and readable after the socket is solder mounted onto the PCB.

3.9 Visual Inspection

All visual inspections must be at 1X magnification, except for solder balls that must be inspected at 5X magnification.

3.9.1 Solder Balls

No missing, malformed, damaged, or misaligned solder balls attached to the contacts are allowed.

3.9.2 Contacts

No missing or damaged contacts that prevent the socket from functioning properly are allowed. Contact mating surface must not be missing gold plating.

After the socket is reflowed onto the board, both arms of the socket contact must be visible through the cover pin hole when the actuation lever is at approximately 45 degrees.

3.9.3 Socket Cover and Socket Base

No visible cracks or flashing are allowed on the socket cover and socket base. All tabs that secure the socket cover to the socket base must not be damaged or missing. The socket cover must fit properly on the socket base with no visible gap between them. The lever latch cannot be damaged or malformed.

3.9.4 Actuation Lever

The actuation lever cannot be damaged, malformed, or missing.

3.10 Critical-to-Function Parameters

All critical-to-function parameters are identified in Table 2. These parameters must be verified on 100% of the socket during production or on a sampling basis as a part of the quality control process (as specified by AMD).

Table 2. Socket FS1b Critical-to-Function Parameters

Critical-to-Function Parameter List					
List	Parameters	Nominal	Tolerance	Unit	Monitoring
1	Socket Length	51.70	Max	mm	Sampling
2	Socket Width	43.00	Max	mm	Sampling
3	Socket Seating Plane Height From Top of PCB after SMT	3.00	± 0.20	mm	Sampling
4	Solder Ball Size	0.60	Supplier Specific	mm	100%
5	Solder Ball Pitch	1.219	Basic	mm	100%
6	Solder Ball Pattern TP	0.40	Max	mm	Sampling
7	Solder Ball Feature TP	0.25	Max	mm	100%
8	Solder Ball Co-Planarity	0.20	Max	mm	100%
9	Cover Pin Hole Diameter before SMT	Supplier Specific		mm	Sampling
10	Cover Pin Hole Diameter after SMT	Supplier Specific		mm	Sampling
11	Cover Flatness before SMT	0.25	Max	mm	Sampling
12	Cover Flatness after SMT	0.25	Max	mm	Sampling
13	Cover Pin Hole Pitch before SMT	Supplier Specific		mm	Sampling
14	Cover Pin Hole Pitch after SMT	1.219	Basic	mm	Sampling
15	Cover Pin Hole Pattern TP before SMT	Supplier Specific		mm	Sampling
16	Cover Pin Hole Pattern TP after SMT	0.25	Max	mm	Sampling
17	Cover Pin Hole Feature TP before SMT	Supplier Specific		mm	Sampling
18	Cover Pin Hole Feature TP after SMT	0.13	Max	mm	Sampling
19	Cover Cavity Length	7.25	Min	mm	Sampling
20	Cover Cavity Width	4.50	Min	mm	Sampling
21	Base Cavity Length	7.95	Min	mm	Sampling
22	Base Cavity Width	5.25	Min	mm	Sampling
23	Cam Box Height from Top of package Seating Plane	3.30	Max	mm	Sampling

Table 2. Socket FS1b Critical-to-Function Parameters (Continued)

Critical-to-Function Parameter List					
List	Parameters	Nominal	Tolerance	Unit	Monitoring
24	Outer Support Step Height (recessed plane for the Package pin fillet clearance) after SMT	0.30	± 0.05	mm	Sampling
25	Cover Outer Support Flatness after SMT	0.25	Max	mm	Sampling
26	Cover Center Support Ring Height above Outer Support Region LMS1 plane (Compressed, after SMT)	0.06	± 0.05	mm	Sampling
27	Base Inner Region Flatness relative to Base Corner LMS2 plane before SMT	0.25	Max	mm	Sampling
28	Base Inner Region Flatness relative to Base Corner LMS2 plane after SMT	0.25	Max	mm	Sampling
29	Contact Gold Plating Thickness	0.25	Min	um	Sampling
30	Contact Ni Plating Thickness	1.27	Min	um	Sampling
31	Contact Gap	Supplier Specific		mm	100%
32	Contact Normal Force (RSS)	15 to 30		gram	Sampling
33	Socket Weight	10	± 2	gram	Sampling

Chapter 4 Socket Electrical Requirements

This chapter describes the contact current rating, contact resistance, capacitance, differential impedance, propagation delay, crosstalk, dielectric withstanding voltage, and insulation resistance requirements for Socket FS1b.

4.1 Contact Current Rating

The contact must be rated at a current rating of 1.5 A per contact, with less than 30°C temperature rise, and with a minimum of twelve rows of mated contacts/pins energized. The current rating test is to be conducted with the associated heatsink assembly (AMD part number 7120040100G) attached to the processor package.

4.2 Low Level Circuit Resistance (LLCR)

Contact resistance applies to the mounted socket with actuated package pin and includes the bulk resistance of the contact, solder ball, package pin, and the interface resistance between the contact and the package pin, but does not include the package internal trace resistance.

4.2.1 Initial Resistance

Initial contact resistance is measured immediately after the first mating of the package pins to the socket contacts. A total of 361 daisy-chained pairs (721 contact locations) must be measured per socket sample. Initial LLCR must not exceed 17 mΩ per contact when mated with Cu-194 alloy pins, based on measurements made on a daisy-chain pair.

4.2.2 Final Resistance

Final contact resistance is measured after the mechanical and environmental testing of the mated package and socket is complete. The same 361 daisy-chained pairs (721-contact locations) must be measured per socket sample. Final LLCR must not exceed 17 mΩ per contact when mated with Cu-194 alloy pins, based on measurements made on a daisy-chain pair.

4.3 Inductance

The mated partial self-inductance of a single pin must be less than 3 nH.

The mated loop inductance of two nearest pins must be less than 2.25 nH.

The mated partial-loop inductance matrix of three neighboring pins must be less than 2.25 nH for the diagonal entries and must be less than 1.5 nH for the off-diagonal entries.

4.4 Capacitance

The mated capacitance between two nearest pins must be less than 1 pF.

The mated capacitance matrix of three neighboring pins must be less than 1 pF.

4.5 Differential Impedance

The differential (or odd mode) impedance for three mated pins configuration (one pin as the voltage/current reference: S1, S2, G) must be $100\ \Omega \pm 10\%$ between the two nearest pins. If the time domain method is used, the signal must have a rise time of 150 ps for the signal amplitude to go from 10% to 90%.

4.6 Propagation Delay

The propagation delay skew among single-ended signals must be less than 13 ps.

The propagation delay skew among differential signal pairs must be less than 13 ps.

4.7 Crosstalk

Crosstalk between the nearest single-ended and differential signals must be measured and compared to results from the measured partial loop inductance and the Maxwell capacitance matrices.

4.8 Dielectric Withstanding Voltage (DWV)

The contact-to-contact dielectric withstanding voltage between randomly selected adjacent lateral, diagonal, and vertical contacts must be a minimum of 650 VAC.

4.9 Insulation Resistance

The contact-to-contact insulation resistance between randomly selected adjacent lateral, diagonal, and vertical contacts must be a minimum of 1000 M Ω .

Chapter 5 Socket Environmental Requirements

This section describes the socket design required to meet reliability requirements for the end-user field-use environment, OEM high-volume manufacturing environment, and shipping and handling conditions of desktop computers.

5.1 Thermal Shock

Sockets must meet LLCR and visual inspection requirements after being subjected to 10 thermal shock cycles with the cold temperature extreme at -55°C and the hot temperature extreme at $+110^{\circ}\text{C}$. The dwell at each temperature extreme is 30 minutes with less than 15 seconds transition time. The test should be conducted with the associated heatsink assembly (AMD part number 7120040100G) attached to the processor package.

5.2 Cyclic Humidity

Sockets must meet low-level circuit resistance (LLCR), dielectric withstanding voltage (DWV), insulation resistance (IR), and visual inspection requirements after being subjected to 1000 hours of cyclic humidity tests with a cycle time of eight hours. Temperature range is 25°C to 85°C with relative humidity maintained between 90% to 95%. This test should be conducted with the associated heatsink assembly (AMD part number 7120040100G) attached to the processor package.

5.3 Thermal Cycling

Sockets must meet LLCR and visual inspection requirements after being subjected to a minimum of 1000 cycles of thermal cycles with testing continued until 60% of the sockets fail or 3000 cycles are completed. Cold temperature extreme is -55°C with a dwell time of 20 minutes, and hot temperature extreme is $+110^{\circ}\text{C}$ with a dwell time of 15 minutes. The average rate of temperature change between the hot and cold temperature extremes must not exceed 10°C per minute. This test should be conducted with the associated heatsink assembly (AMD part number 7120040100G) attached to the processor package.

5.4 Temperature Life

Sockets must meet LLCR and visual inspection requirements after being subjected to 500 hours of temperature life testing at 115°C . This test should be conducted with the associated heatsink assembly (AMD part number 7120040100G) attached to the processor package.

5.5 Industrial Mixed Flowing Gas

Sockets must meet LLCR and visual inspection requirements after being subjected to mixed flowing gas testing with half the samples mated and the other half samples unmated for the first five days, and then all samples mated for the final five days. The test temperature is 30°C with a relative humidity of 70%. Mixed flowing gas constituents are 10-ppb chlorine, 10-ppb hydrogen sulfide, 200-ppb nitrogen dioxide, and 100-ppb sulfur dioxide.

5.6 Mechanical Shock

Sockets must meet LLCR, continuity intermittency of less than 1- μ s duration, and visual inspection requirements after being subjected to mechanical shock testing at 50 g, 11-ms duration, half-sine waveform with three shocks per positive and negative directions on all three axes — totaling 18 shocks. This test should be conducted with the associated heatsink assembly (AMD part number 7120040100G) attached to the processor package.

5.7 Random Vibration

Sockets must meet LLCR, continuity intermittency of less than 1- μ s duration, and visual inspection requirements after being subjected to random vibration testing at 3.1 g rms between 20 Hz to 500 Hz for a duration of 15 minutes per axis for each of the three axes. This test should be conducted with the associated heatsink assembly (AMD part number 7120040100G) attached to the processor package.

5.8 Resistance to Solder Heat

Sockets must meet LLCR, cover flatness, and visual inspection requirements after being subjected to four convection-solder-reflow processes for mounting the socket to the PCB. No deterioration of the markings on the socket is allowed.

5.9 Resistance to Solvents

Sockets must meet visual inspection requirements after being subjected to the Four Solutions test. No deterioration of the markings on the socket is allowed.

5.10 Heatsink Assembly

The associated heatsink assembly (AMD part number 7120040100G) attached to the processor package in the environmental testing can weigh up to 120 grams.