LEVER–ACTUATED ZERO INSERTION FORCE (ZIF) MICRO PIN GRID ARRAY (PGA) 603– AND 604–POSITION SOCKETS

NOTE

All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of ±0.13 [±.005] and angles have a tolerance of ±2°.Figures and illustrations are for identification only and are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of lever–actuated ZIF micro PGA 603– and 604–position sockets onto printed circuit (pc) boards.

These sockets accept PGA devices with 1.27×1.27 [.050×.050] contact pattern. The 603–position sockets are used with 603–position devices; the 604–position sockets are used with 603– or 604–position devices. The sockets are designed to prevent damage to the device during installation or replacement of the device.

The socket consists of a cover and a housing. The cover features contact cavities that accept the device pin contacts and an embossed triangle for Pin 1 identification. The cover for the 604–position socket has a cutout on each side for ease in removing the device.

The housing features 0.76 [.030] diameter surface–mount solder balls, integral lever, and a locking latch that holds the lever closed. The housing also features 0.38 [.015] high standoffs to allow proper soldering of the socket to the pc board.

These sockets are placed on the pc board by automatic application tooling (typically vacuum pick and place). The removable pick–and–place cover on the top of the socket is used to facilitate this process. The pick–and–place cover must be removed before installing the device.

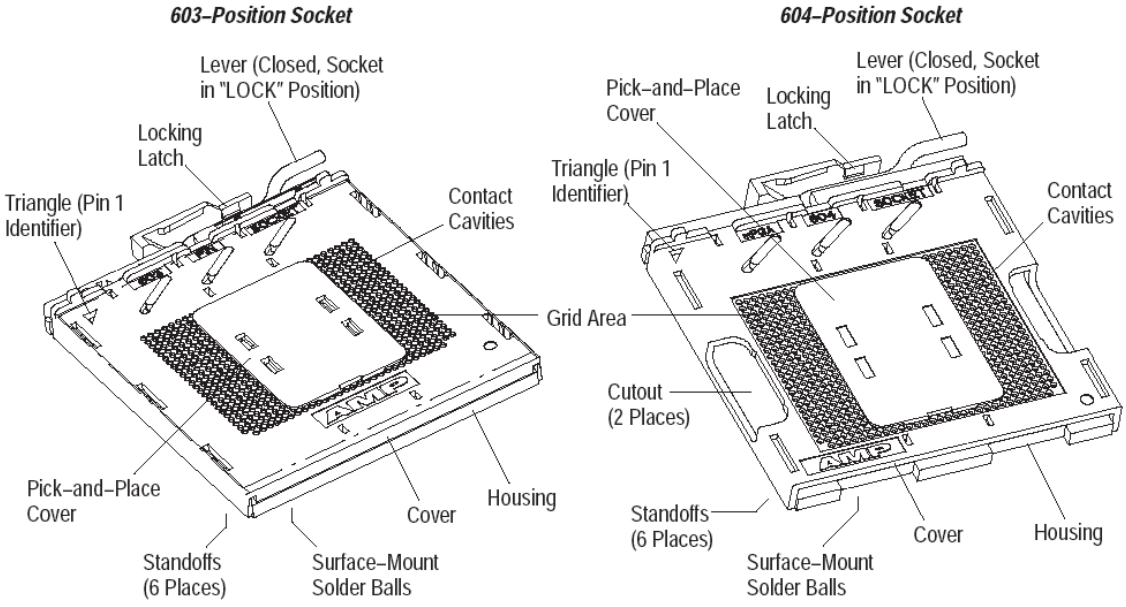

Figure 1

The socket must be in the “OPEN” position before the device is installed onto the socket. When the lever is disengaged from the locking latch and rotated to approximately a 135° angle, the lever is open, and the socket is in the “OPEN” position.

After the device is installed onto the socket, the socket must be in the “LOCK” position to secure the device to the socket. The lever is used to actuate the socket. When the lever is parallel with the housing and engaged by the locking latch, the lever is closed, and the socket is in the “LOCK” position. The socket is designed to remain in the “LOCK” position until the lever is disengaged.

When corresponding with Tyco Electronics personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

2. REFERENCE MATERIAL

2.1. Customer Assistance

Reference Product Base Part Numbers 1364448 (603 positions) and 1489688 (604 positions) and Product Code A379 are representative of lever–actuated ZIF micro PGA 603– and 604–position sockets. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information.

2.2. Drawings

Customer Drawings for product part numbers are available from the service network.

2.3. Manuals

Manual 402–40 can be used as a guide to soldering. This manual provides information on various flux types and characteristics with the commercial designation and flux removal procedures. A checklist is included in the manual as a guide for information on soldering problems.

2.4. Specifications

Product Specification 108–1946 provides product performance and test information.

2.5. Instructional Material

Instruction Sheets (408–series) provide assembly instructions. Documents available which pertain to this product are:

408–8407 Lever–Actuated ZIF Micro PGA 603–Position Sockets
408–8601 Lever–Actuated ZIF Micro PGA 604–Position Sockets

3. REQUIREMENTS

3.1. Device

The sockets accept devices having gold–plated pins with a diameter of 0.30±0.025 [.012±.001], length of 2.03±0.05 [.080±.002], and full radius tips. Pins must be straight with no damage. True position of the package pins must be within 0.20 [.008] maximum material condition (MMC).

3.2. Safety

Do not stack product packages so high that the shipping containers buckle or deform.

3.3. Limitations

The sockets are designed to operate in a temperature range of -55 to 125°C [-67 to 257°F].

3.4. Material

The housing and cover are made of glass–filled liquid crystal polymer (LCP) plastic. The solder balls are made of either eutectic 63/37 tin lead solder or lead-free SAC 405 tin solder.

3.5. Storage

Generally Tyco Electronics products should not be exposed to extreme high temperatures, high humidity or damaging media such as sulphurous, acid or basic atmospheres.
Unless other specific requirements are documented, Tyco Electronics recommends in accordance with EN 60068-1 as standard atmospheric conditions a storage temperature of 15 to 35 ° C (59 to 95 ° F) and a relative humidity of 25 to 75 %.

A. Ultraviolet Light

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the socket material.

B. Shelf Life

The sockets should remain in the shipping containers until ready for use to prevent deformation or oxidation to the solder balls. The sockets should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

3.6. Chemical Exposure

Do not store sockets near any chemical listed below as they may cause stress corrosion cracking in the solder balls.

Alkalies	Ammonia	Citrates	Phosphates Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur Nitrites	Tartrates

3.7. Special Assembly Considerations

If other components are required for the system into which the socket is installed, the socket, device, and those components must be assembled in the following sequence:

1) Socket onto pc board,
2) Retention mechanism onto socket,
3) Device onto socket,
4) Heat sink onto socket.

3.8. PC Board

A. Material and Thickness

The pc board material shall be glass epoxy (FR–4 or G–10). There is no required thickness for the pc board.

B. Tolerance

Maximum allowable bow of the pc board shall be 0.13 [.005] per 25.4 [1.00] over the length of the socket grid area.

C. Pads

The pc board circuit pads must be solderable in accordance with Test Specification 109–11.

D. Layout

The pc board circuit pads must be precisely located to ensure proper placement and optimum performance of the socket. The pc board layout must be designed using the dimensions provided in Tyco Electronics Customer Drawings.

3.9. Solder Paste Characteristics

1. Alloy type shall be either 63 Sn / 37 Pb for tin lead application, or 95.5 Sn / 4.0 Ag / 0.5 Cu for lead-free application.
2. Recommended flux incorporated in the paste should be “no clean” type. Other fluxes, such as rosin, mildly active (RMA) type, are acceptable.
3. Paste will be at least 80% solids by volume.
4. Mesh designation -200 to +325 (74 to 44 square micron openings, respectively).
5. Minimum viscosity of screen print shall be 5·10% cp (centipoise).
6. Minimum viscosity of stencil print shall be 7.5·10% cp (centipoise).

3.10. Solder Paste Thickness

Solder paste thickness for the solder balls shall be 0.15 [.006].

3.11. Screen

Recommended screen thickness is 0.15 [.006] with 0.51 [.020] circuit pad diameter.

3.12. Solder Volume

Minimum solder volume (V) (before curing) for each circuit pad is calculated by multiplying the area of the pad (A) by the stencil thickness (T):

$\pi \times (0.51 \text{ mm } [.020 \text{ in.}])^2/4 = 0.204 \text{ mm}^2 [.000314 \text{ in.}^2]$ (A)

$0.204 \text{ mm}^2 [.000314 \text{ in.}^2]$ (A)·0.15 mm [.006 in.] (T) = $0.031 \text{ mm}^3 [.0000019 \text{ in.}^3]$ (V)

Solder volume for each socket must be $0.031 \text{ mm}^3 [.0000019 \text{ in.}^3]$ per solder ball.

NOTE *Solder volume may vary depending on solder paste composition.*

3.13. Soldering

A. Process

The pc board circuit pads must be solderable in accordance with Test Specification 109–11. The sockets should be soldered using hot air convection oven with a minimum of five chambers (zones). The solder paste should be applied using an automatic screening process.

CAUTION *Even when using "no clean" solder paste, it is imperative that the solder ball interface be kept clean of residue, since it acts as an insulator.*

For guidelines on the temperature profiles for both tin lead and lead-free processes, please refer to Institute for Interconnecting and Packaging Electronic Circuits (IPC) / Joint Electron Devices Engineering Council (JEDEC) J-STD-020.

Due to the many variables involved with the reflow process (i.e., board size and thickness, component density, count, and orientation), it is recommended that trial runs be conducted under actual manufacturing conditions to ensure product and process compatibility.

B. Cleaning

When using "no clean" type solder paste, cleaning is not necessary, nor recommended. When using other types of solder paste, removal of residues and activators is necessary after soldering. Consult with the supplier of the solder for recommended cleaning solvents. Cleaners must be free of contaminants. The following is a list of common cleaning solvents that will not the affect the sockets for the time and temperature specified. See Figure 2.

CAUTION *When using solder paste other than "no clean" type, it is imperative that the contact interface be cleaned effectively. Since it acts as an insulator, flux and residue must be removed thoroughly.*

CLEANER		TIME (Minutes)	TEMPERATURE (Maximum)
NAME	TYPE		
ALPHA 2110	Aqueous	1	132°C [270°F]
BIOACT EC-7	Solvent	5	100°C [212°F]
Butyl CARBITOL	Solvent	1	Ambient Room
Isopropyl Alcohol	Solvent	5	100°C [212°F]
KESTER 5778	Aqueous	5	100°C [212°F]
KESTER 5779	Aqueous	5	100°C [212°F]
LONCOTERGE 520	Aqueous	5	100°C [212°F]
LONCOTERGE 53	Aqueous	5	100°C [212°F]
Terpene Solvent	Solvent	5	100°C [212°F]

Figure 2

DANGER *Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer. Refer to the manufacturer's Material Safety Data Sheet (MSDS) for characteristics and handling of cleaners. It is recommended to not use Trichloroethylene and Methylene Chloride because of harmful occupational and environmental effects. Both are carcinogenic (cancer–causing).*

C. Drying

When drying cleaned assemblies, make certain that temperature limitations are not exceeded: -55 to 105°C [-67 to 221°F]. Excessive temperatures may cause housing degradation.

NOTE *To obtain optimum insulation resistance or capacitance, it is recommended that the assembly be allowed to stabilize for 24 hours after drying.*

3.14. Socket Spacing

Care must be used to avoid interference between adjacent sockets and other components. The minimum allowable distance between sockets to ensure proper assembly is provided in Figure 3.

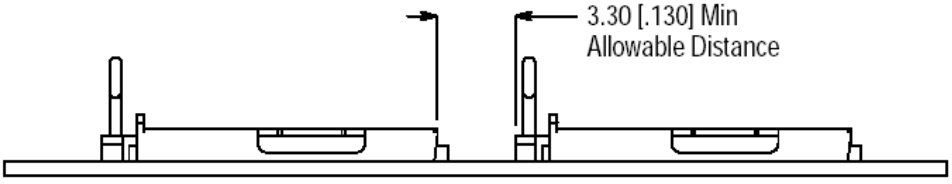

Figure 3

3.15. Socket Placement

The socket number one position must be aligned with the number one position pc board circuit pad. When placing the socket on the board, make sure that the solder balls are aligned with the matching pads before seating the socket onto the board.

CAUTION *The socket must be handled only by the outer perimeter of the cover or housing to avoid deformation, contamination, or damage to the solder balls.*

A. Seating

The socket solder balls must be seated flush on the pc board.

B. Position

Optimally, the solder balls should be centered on the pc board circuit pads. However, slight misalignment is permissible as shown in Figure 4.

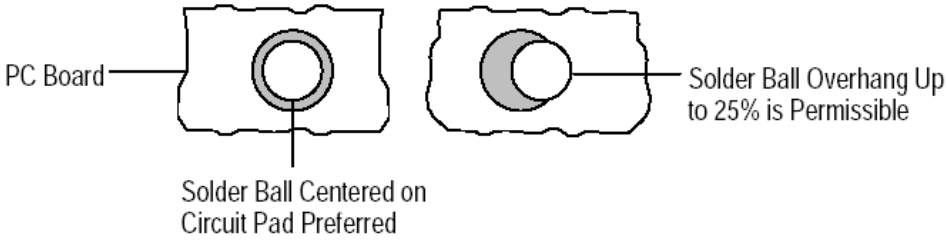

Figure 4

3.16. Checking Installed Socket

All solder joints should conform to those specified in IPC J–STD–013, and all other requirements specified in this document. The housing (not including standoffs) must be seated on the pc board not exceeding the dimension shown in Figure 5.

NOTE *Due to the tight pattern associated with these solder balls, inspection techniques must provide a clear picture of possible areas of shorting. X–ray or electrical test equipment must be used to inspect solder joints.*

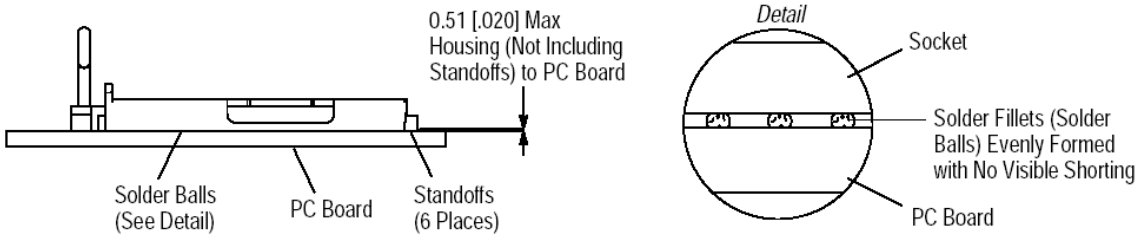

Figure 5

3.17. Polarization

The socket contact cavity pattern is designed with three (603–position sockets) or two (604–position sockets) contact cavities missing. The device is polarized to the socket by matching pin and contact cavity patterns. The patterns must align before the device can be installed onto the socket.

3.18. Checking Installed Device

CAUTION *A device with pins that are bent, damaged, contaminated, or worn (plating is thin) MUST NOT be used. Slightly bent pins can be straightened with soft–tipped pliers. Using a device with a bent pin will cause damage to the socket.*

The device must be installed onto the socket according to the following criteria. Refer to Figure 6.

1. The pick–and–place cover is removed from the socket (the device must not be installed unless the pick–and–place cover is removed).

2. The socket is in the “OPEN” position (the lever is open)—the lever is at approximately a 135° angle to the socket.

CAUTION *The socket must be in the “OPEN” position BEFORE installing the device. Attempting to install the device when the lever is NOT FULLY opened will cause permanent damage to the socket.*

3. Before seating the device, it is important that the device be oriented over the socket as follows:

   (a) The Pin 1 identifier (triangle) of the device is aligned with the triangle (Pin 1 identifier) on the socket.

   (b) The pins of the device are facing the contact cavities of the socket.

4. It is important that the device be seated onto the socket as follows:

   603–Position Device

   The device must be carefully lowered onto the socket so that the pins just start to enter the socket cavities, then carefully released so that the weight of the device seats it onto the socket.

   604–Position Device

   (a) The device must be positioned over the socket so that the end of the device is even with the end of the cover opposite the lever. The device must be centered between the cutouts in the socket.

   (b) The device must be carefully lowered onto the socket so that the pins just start to enter the socket cavities, then carefully released so that the weight of the device seats it onto the socket.

CAUTION *The device must NOT be forced onto the socket.*
The device must NOT be slid across the socket.

5. When seated, the device must be flush to the socket (if necessary, a slight pressure may be applied to the device until it is level with the surface of the socket). After the device is fully seated, the socket must be in the “LOCK” position (the lever is closed)—the lever is parallel with the housing and engaged by the locking latch.

CAUTION *The device must never be forced into place when the socket is in the "LOCK" position. Damage to the device and socket will result.*

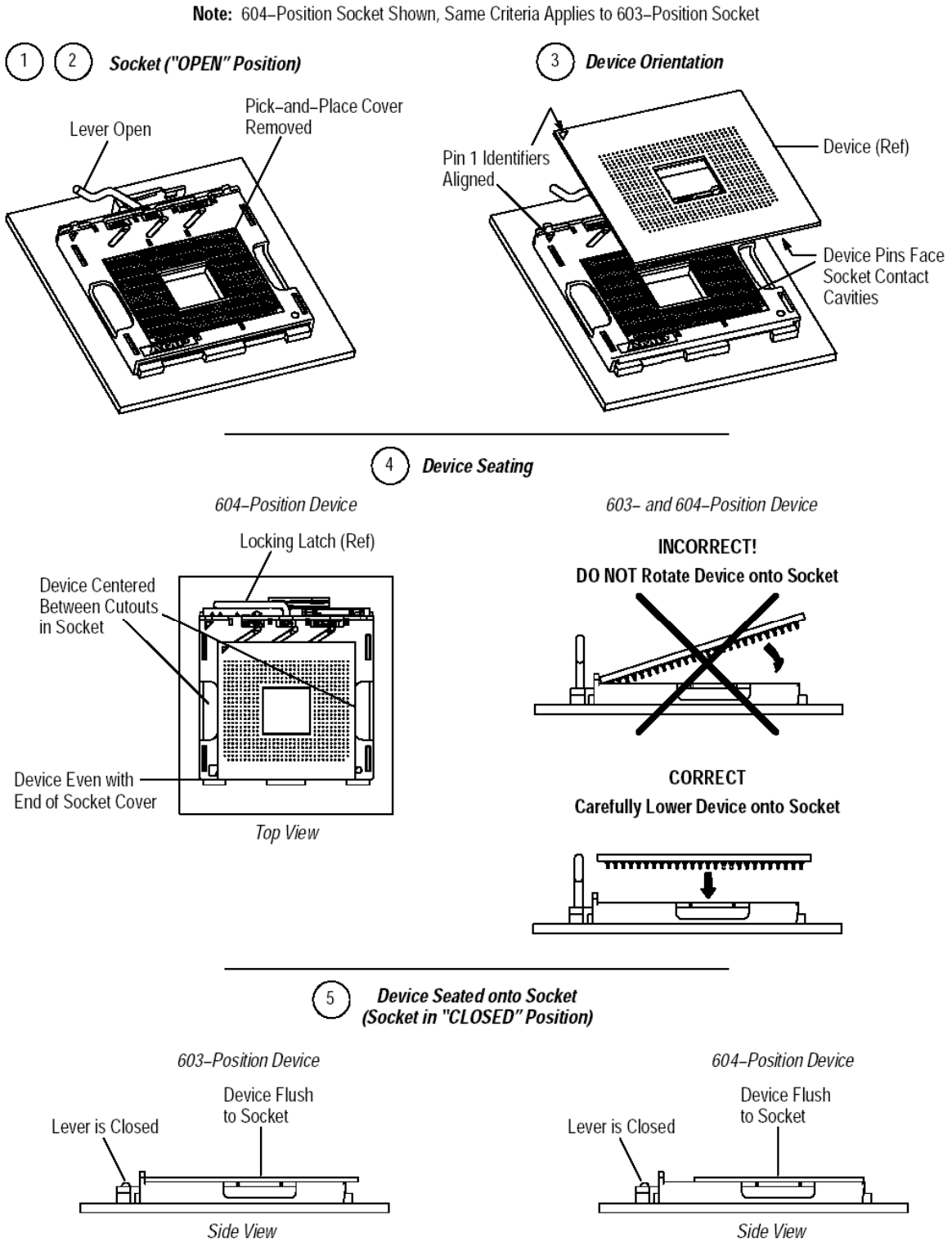

Figure 6

3.19. Removal and Repair

The solder balls will require de-soldering before removing the socket from the pc board. Methods for removing the sockets from the PC board are covered in IPC J–STD–013. It is highly recommended that the sockets NOT be reworked.

CAUTION *High temperatures necessary to rework sockets could cause housing distortion or damage to internal components, and therefore, would compromise the integrity of the socket.*

These sockets cannot be repaired. Damaged or defective sockets MUST NOT be used.

4. QUALIFICATION

Qualification Test Reports (501-series) provides results of testing to determine product conformance to the requirements of the product specification. Document(s) available which pertain to this product are:

501-533 *Lever-Actuated ZIF PGA 603 and 604 Position Sockets*

5. TOOLING

Robotic equipment must have a true position accuracy tolerance of 0.25 [.010] to feed, pick up, and place the sockets on the pc board. This includes gripper and fixture tolerances as well as equipment repeatability. See Figure 7.

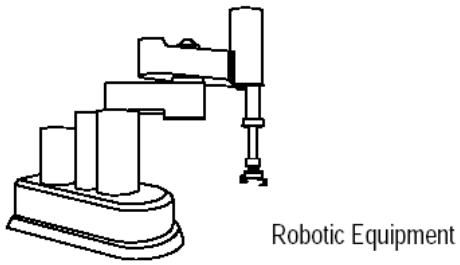

Figure 7

6. VISUAL AID

The illustration below shows a typical application of lever–actuated ZIF micro PGA 603– and 604–position sockets. This illustration should be used by production personnel to ensure a correctly applied product.

Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.

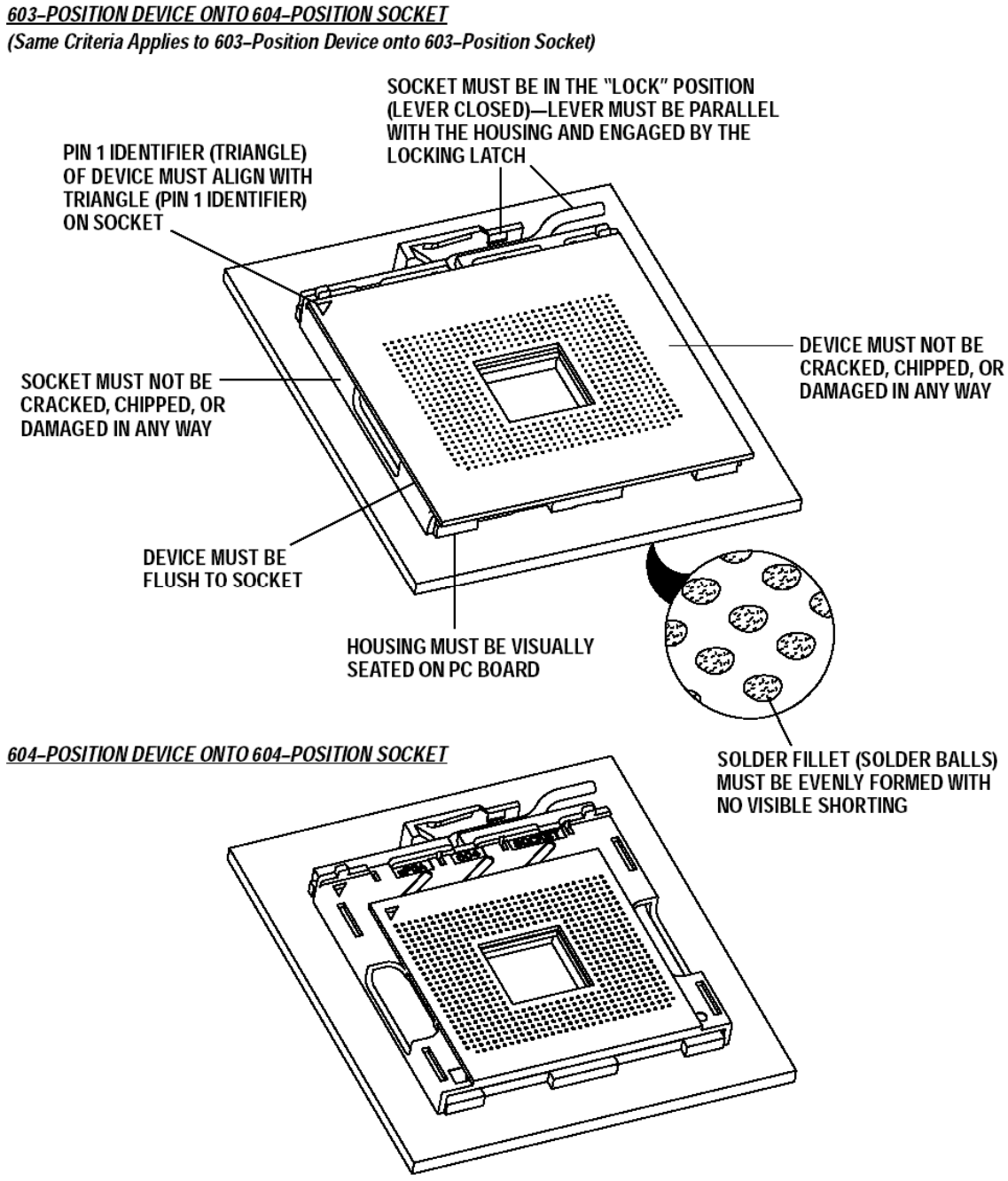

Figure 8