APPLICATION SPECIFICATION

114-13092

LEVER-ACTUATED ZERO INSERTION FORCE (ZIF) MICRO PIN GRID ARRAY (PGA) SOCKETS 940, 939 & AM2

NOTE *All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimetres. Unless otherwise specified, dimensions have a tolerance of ±0.13 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 Sockets 940, 939 & AM2 onto printed circuit (PC) boards.

Sockets 940, 939 & AM2 are similar connectors with the same envelope. They accept corresponding PGA devices that are differentiated by number of pin positions and its 1.27 × 1.27 contact pattern. As such, Sockets 940, 939 & AM2 differ in number of contacts/solderballs and their arrangement, to which corresponding covers with appropriate markings and pin grid pattern are attached. In this document, Socket 940 is chosen as the exemplary model.

The sockets are designed to prevent damage to the devices during installation or replacement of the device. The socket consists of a housing and a cover. The housing features 0.76 diameter surface-mount solder balls, an integral lever, and contact cavities that accept the device pin contacts. Please see Figure 1.

The cover features a locking latch that holds the lever closed a molded triangle for Pin 1 identification, and finger reliefs. The finger reliefs allow proper handling of the device when removing it from the socket. These sockets are placed on the PC board by automatic application tooling (typically vacuum pick and place). The removable tape covering the top of the socket is used to facilitate this process. In addition, the tape protects the socket contact cavities until the device is installed. The tape must be removed before installing the device.

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 90° 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.

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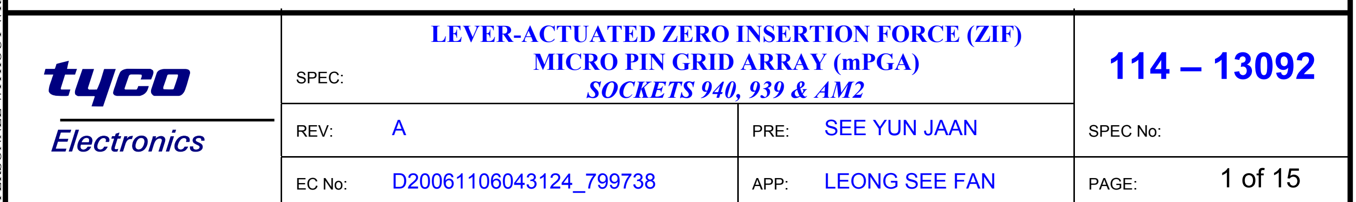

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When corresponding with personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

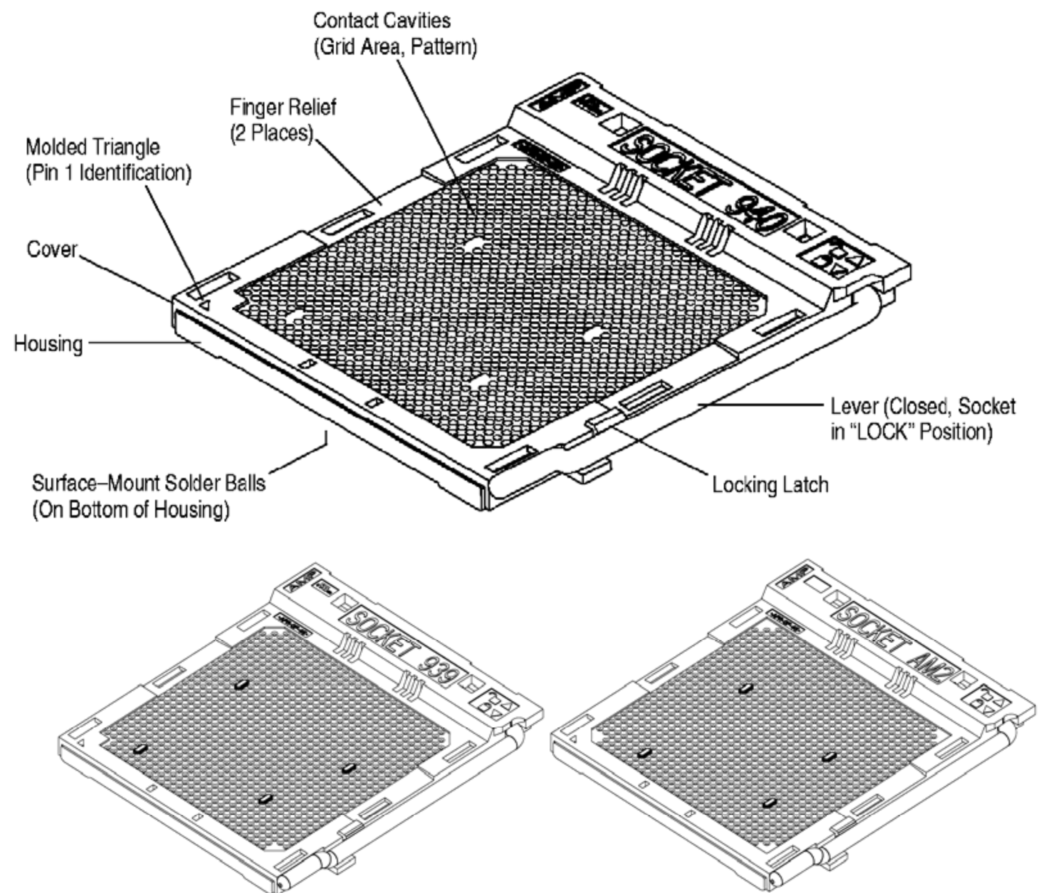

Figure 1

2. REFERENCE MATERIAL

2.1. CUSTOMER ASSISTANCE

Reference Product Part Numbers 1489228, 1761600, and Product Code A379 are representative of lever-actuated ZIF micro PGA Sockets. Usages of these numbers will identity 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.

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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 Specifications (108-series) provides product performance and test information. Documents available which pertain to this product are:

108-51077 Lever Actuated ZIF Micro PGA 939, 940 & AM2 Sockets.

Test Specification 109-11 provides solderability requirements and quality inspection methods.

2.5. INSTRUCTIONAL SHEETS

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

408-8702 Lever-Actuated ZIF Micro PGA Sockets 940, 939 & AM2.

3. REQUIREMENTS

3.1. MICRO PGA DEVICES

The sockets accept corresponding devices (940, 939 or AM2) having gold-plated pins with a diameter of 0.300±0.025, length of 2.16±0.13, and 0.025 to 0.065 radius tips. Pins must be straight with no damage. Package pins must be within 0.25 maximum material condition (MMC) for feature true position. The device must have the same pattern as the socket.

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 0° to 100°C [32° to 212° F].

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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

A. Environment

The temperature range allowance for storing the sockets is -55° to 110°C [-67° to 230° F].

B. Ultraviolet Light

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

C. 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.

B. 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

3.6. 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,
3) Device onto socket,
4) Heat sink.

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3.7. 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 per 25.4 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 circuit pads on the PC board must be precisely located to ensure proper placement and optimum performance of the socket. The PC board layout must be designed using the recommended dimensions provided in the respective Customer Drawings.

3.8. 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).

3.9. SOLDER PASTE THICKNESS

Solder paste thickness for the solder balls shall be 0.15.

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3.10. SCREEN

Recommended screen thickness is 0.15 with 0.51 aperture diameters.

3.11. 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):

$$\pi \times (0.56 \text{ mm})^2/4 = 0.246 \text{ mm}^2 \text{ (A)}$$

$$0.246 \text{ mm}^2 \text{ (A)} \times 0.15 \text{ mm (T)} = 0.037 \text{ mm}^3 \text{ (V)}$$

Solder volume for each socket should be 0.037 mm^3 per solder ball.

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

3.12. SOLDERING

A. Process

The PC board 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.*

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 lo ensure product and process compatibility.

Reference temperature profiles are shown in Figure 2 and Figure 3 for tin lead and lead-free sockets respectively.

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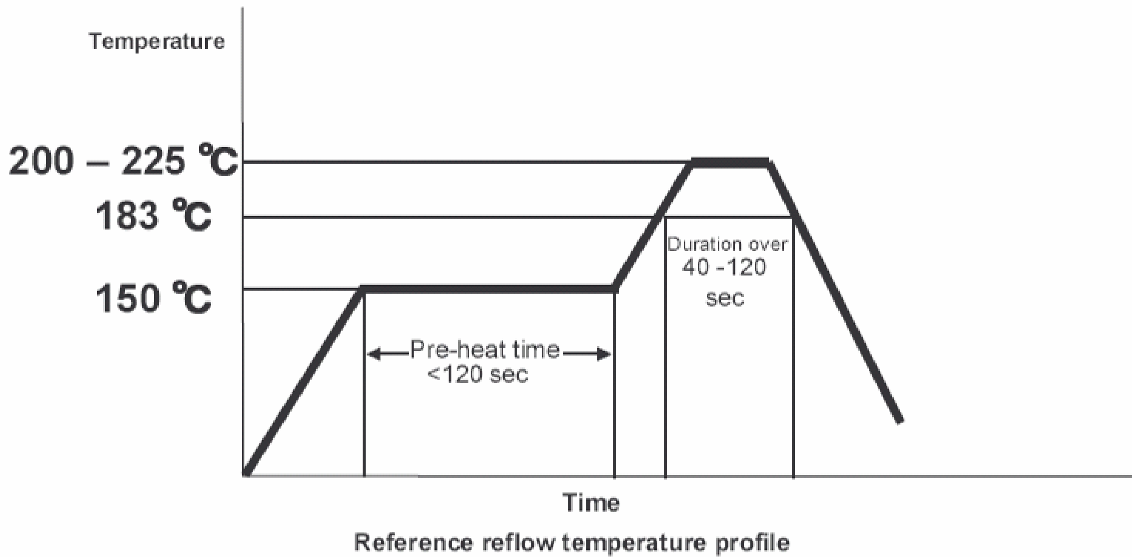

Figure 2

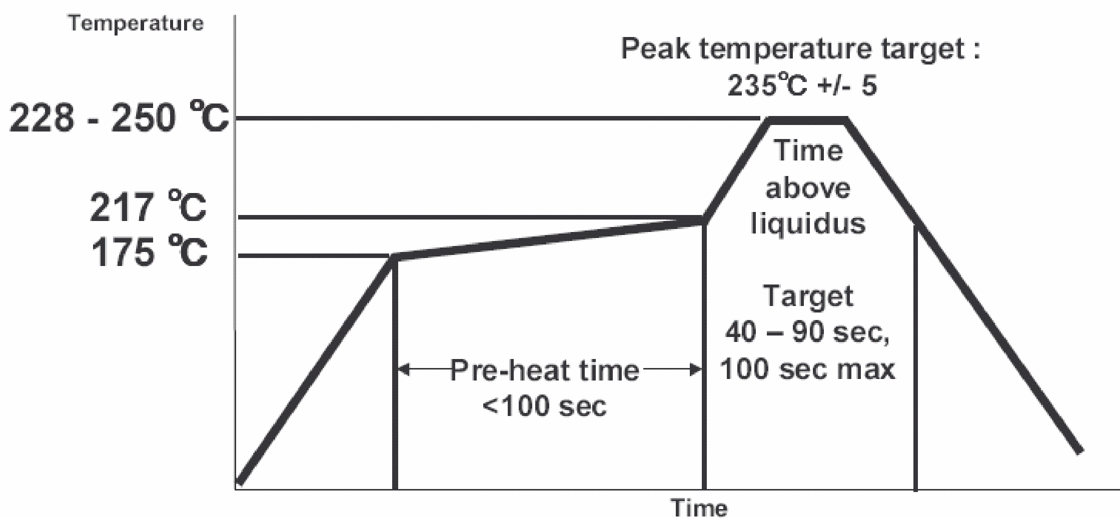

Figure 3

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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.

Common cleaning solvents that will not affect the sockets for the time and temperature specified are listed in Figure 4.

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.*

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).*

Cleaner		Time (Minutes)	TEMPERATURES (Maximum)	
Name	Type		CELSIUS	FAHRENHEIT
ALPHA 2110	Aqueous	1	132	270
BIOACT EC-7	Solvent	5	100	212
Butyl CARBITOL	Solvent	1	Room Ambient	
Isopropyl Alcohol	Solvent	5	100	212
KESTER 5778	Aqueous	5	100	212
KESTER 5779	Aqueous	5	100	212
LONCOTERGE 520	Aqueous	5	100	212
LONCOTERGE 530	Aqueous	5	100	212
Terpene Solvent	Solvent	5	100	212

Figure 4

C. Drying

When drying cleaned assemblies, make certain that temperature limitations are not exceeded: Q0 to 100°C [32° to 21 2° 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 dying.*

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3.13. 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 5.

NOTE *If a retention mechanism or heat sink is used, other space allowances will be required.*

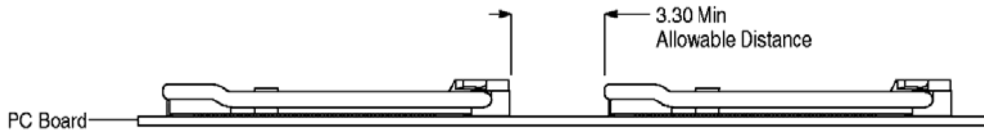

Figure 5

3.14. 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 centred on the PC board pads. However, slight misalignment is permissible as shown in Figure 6.

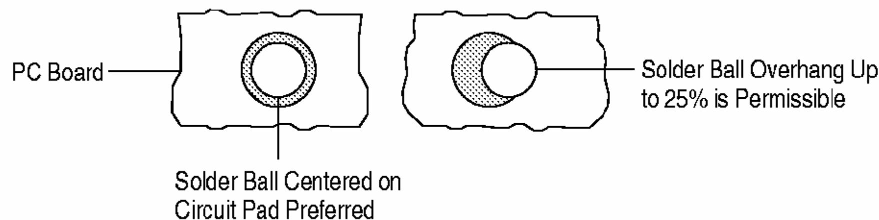

Figure 6

3.15. CHECKING INSTALLED SOCKET

All solder joints should conform to those specified in Institute for Interconnecting and Packaging Electronic Circuits (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 7.

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The tape on top of the socket must be removed (the device must not be installed unless this tape is removed).

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.*

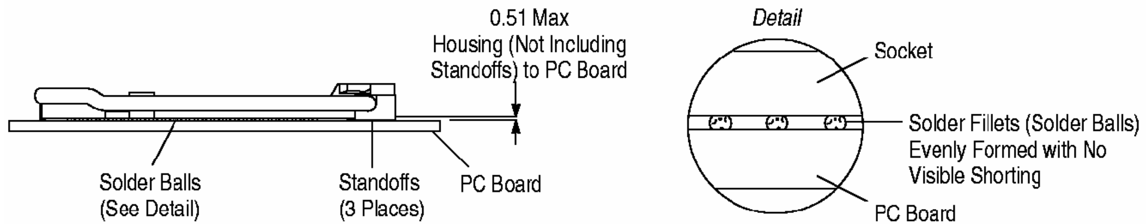

Figure 7

3.16. INSTALLING THE DEVICE

The device must be installed onto the socket according to the following criteria. Refer to Figure 8.

1. The tape on top of the socket must be removed (the device must not be installed unless the tape is removed).
2. The socket must be in the "OPEN" position (the lever is open)—the lever is approximately 90° lo 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 open will cause permanent damage to the socket.*

A. Alignment and Orientation

Before sealing the device, it is important that the device be aligned with and oriented over the socket so that the Pin 1 identifier (chamfered corner) of the device is aligned with the Pin 1 identifier (molded triangle) on the socket. Positive orientation is ensured by aligning the Pin 1 identifiers.

B. Polarization

The socket contact cavity pattern is designed with missing contact cavities at each corner and eight selected contact cavities within the pattern. The device is polarized to the socket by matching the pin pattern with the contact cavity pattern. The patterns must align before the device can be installed onto the socket.

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C. Seating

The device must be carefully placed onto the socket so that the device pins enter the socket contact cavities. If necessary, a slight pressure may be applied to the device until it is level with the surface of the socket.

- There must be NO pressure applied to the cover when placing the device.
- The device must NOT be slid across the socket grid area.

CAUTION *The device must not be forced into place; otherwise, damage to the socket or device will occur. The device pins must be straight, and the pin pattern and contact cavity pattern must match for the device to install freely.*

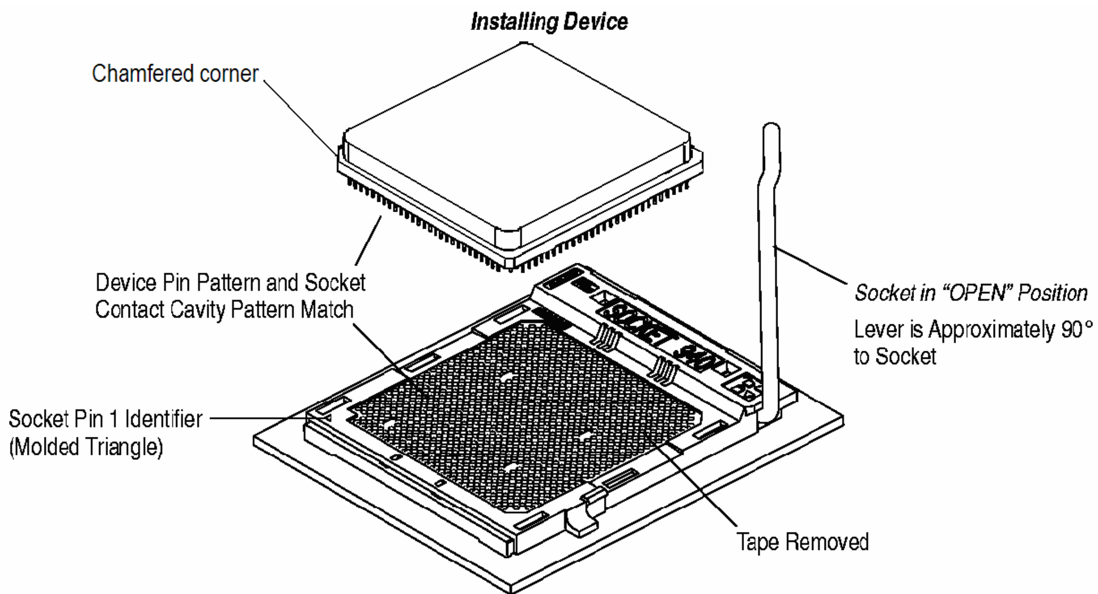

Figure 8

3.17. CHECKING INSTALLED DEVICE

The device must be flush to the socket. The socket must be in the "LOCK' position (the lever is closed) – the lever is parallel with the housing and engaged by the looking latch. See Figure 9.

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.*

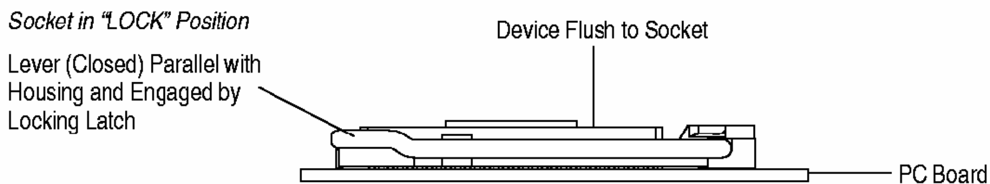

Figure 9

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3.18. REMOVAL

A. Device from Socket

The device must be removed from the socket according to the following criteria. Refer to Figure 10.

1. The socket must be in the "OPEN" position (the lever is open) – the lever is approximately 90° to the socket.

CAUTION *The socket must be in the "OPEN" position BEFORE removing the device. Attempting to remove the device when the lever is NOT FULLY open will cause permanent damage to the socket.*

2. The device must be grasped at the finger reliefs in the socket, and then lifted straight from the socket.

CAUTION *Handling the device at the socket finger reliefs helps to prevent the device from tilting and bending the pins.*

B. Socket from PC Board

The socket solder balls will require de-soldering before removing it from the PC board. Methods for removing the sockets from the PC board are covered in IPC J-STD-013.

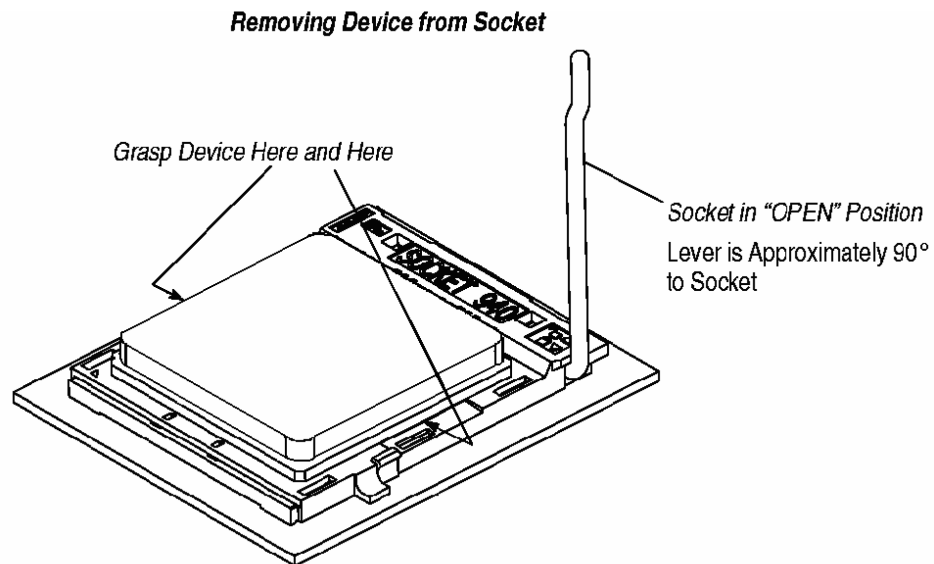

Figure 10

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3.19. REPAIR

These sockets must NOT be re-used. Damaged sockets must be removed, discarded, and replaced. 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, compromises the integrity of the socket.*

4. QUALIFICATION

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

501-571 Lever Actuated ZIF Micro PGA 939 and 940 Sockets.

5. TOOLING

For automatic machine placement, robotic equipment must have a true position accuracy tolerance of 0.25 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 11.

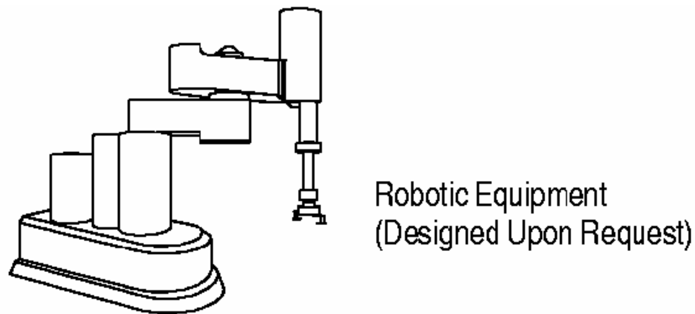

Figure 11

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6. VISUAL AID

The illustration below shows a typical application of lever-actuated ZIF micro PGA 940-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.

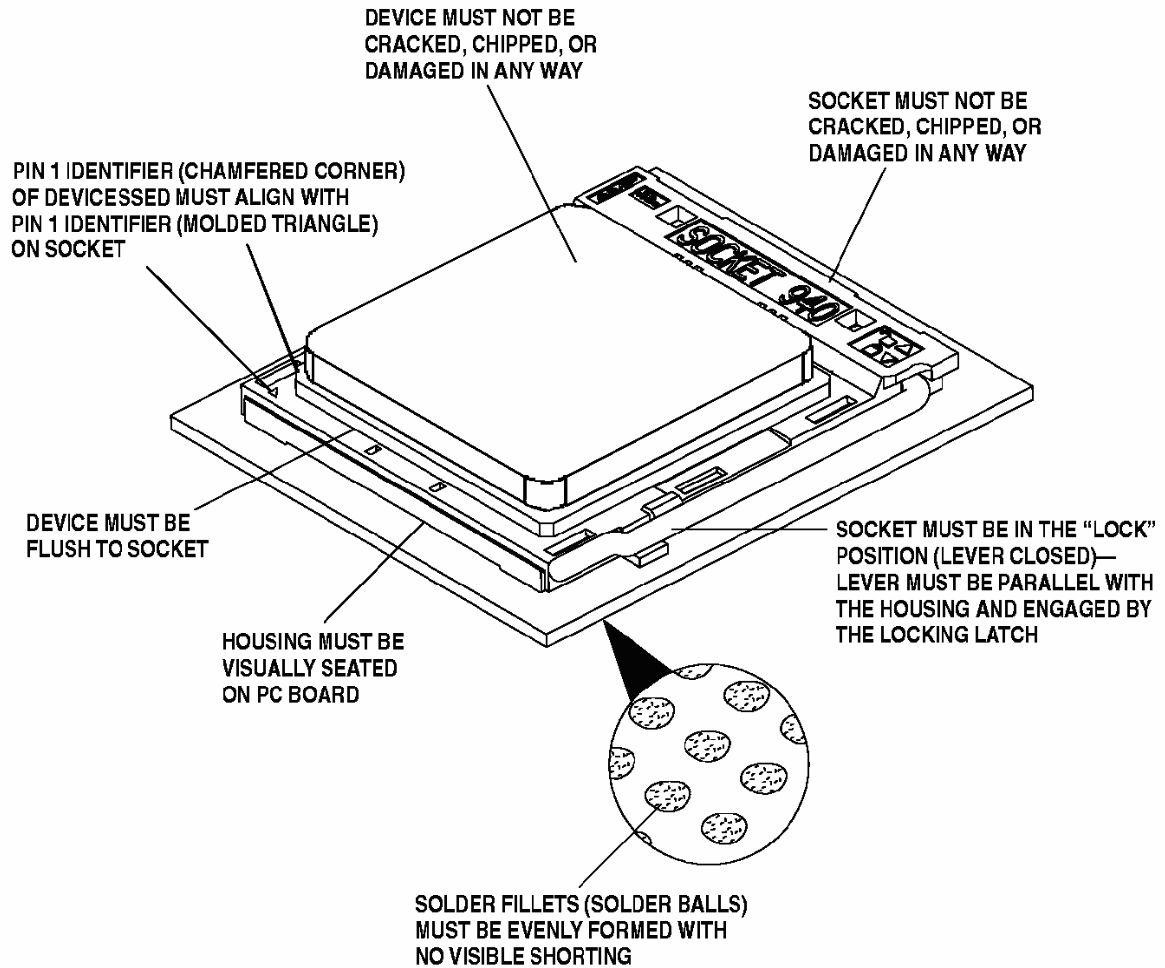

Figure 12

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7. VALIDATION

Approval:

Leong See Fan

Division Manager, Product Engineering Department

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