

Lever actuated Land Grid Array LGA1366 / LGA1356 socket

1. INTRODUCTION

This specification covers the requirements for application of lever-actuated LGA1366 / LGA1356 Socket mounted onto printed circuit board (PCB). The socket accepts 1366 / 1356-position LGA package with 1.016mm x 1.016mm grid pattern. LGA1366 / LGA1356 socket is used with combination of ILM assembly and stiffener plate assembly (Back plate). The socket consists of housing, contacts, solder balls and a pick-and-place (PnP) cap. The housing retains contacts with grid array. The contacts have 0.64mm diameter solder ball for surface mount onto PCB. The ILM assembly is attached to the PC board and its frame holds a load plate and a lever. A locking latch on frame holds the lever in place after the load plate is closed. The socket is placed on the PC board by automatic application tooling (typically vacuum pick and place machine). The PnP cap covering the top of the socket is used to facilitate this process. Also, the PnP cap protects the contacts the package is installed.

Please see detailed installation process of CPU package in instruction sheet 411-78289.

1.1. Parts number and description

Table 1. Part number and description

Part Number	Description
X-1981837-X (*1)	LGA1366 Socket
X-1554116-X (*1)	LGA1356 Socket
X-1939738-X (*1)	ILM Assembly
X-1939739-X (*1)	Stiffener plate Assy – A (Desk top back plate)
X-1981467-X (*1)	Stiffener plate Assy – B (Server back plate)

*1. Refer to customer drawing for detail

1.2. Outline

The stiffener plate Assy (back plate) fixes the ILM Assembly through PC board. Frame of ILM Assy holds the lever and it has a hook to retain the lever after actuation to sustain the Z axis load. The housing holds an array of the contacts. Also the solder balls are attached to the bottom surface of the contact. The stiffener plate Assy and the load plate of ILM Assy clamp the housing and LGA package at same time so that the socket generates the Z axis load to make the electrical contact to all of the connecting pads on LGA package.

1.3. Notices

The sockets are placed on the PC board by automatic application tooling (typically vacuum pick and place). The plastic cap on the socket is used to facilitate this process, The socket must be with cap attached before mounting on the PC board.

Please see detailed process to attach the ILM Assy in instruction sheet 411-78289

1.4. Prohibitions

A. Touch contacts and solder balls

To prevent contact deformation and solder ball deformation, refrain to touch contacts and solder balls.

B. Storage after SMT

Do not leave the socket without the pick-up cap if package is not installed.

It may cause contact damage by accident.

Basic terms and features of this product are provided as below.



Fig.2 Socket in "Close" position

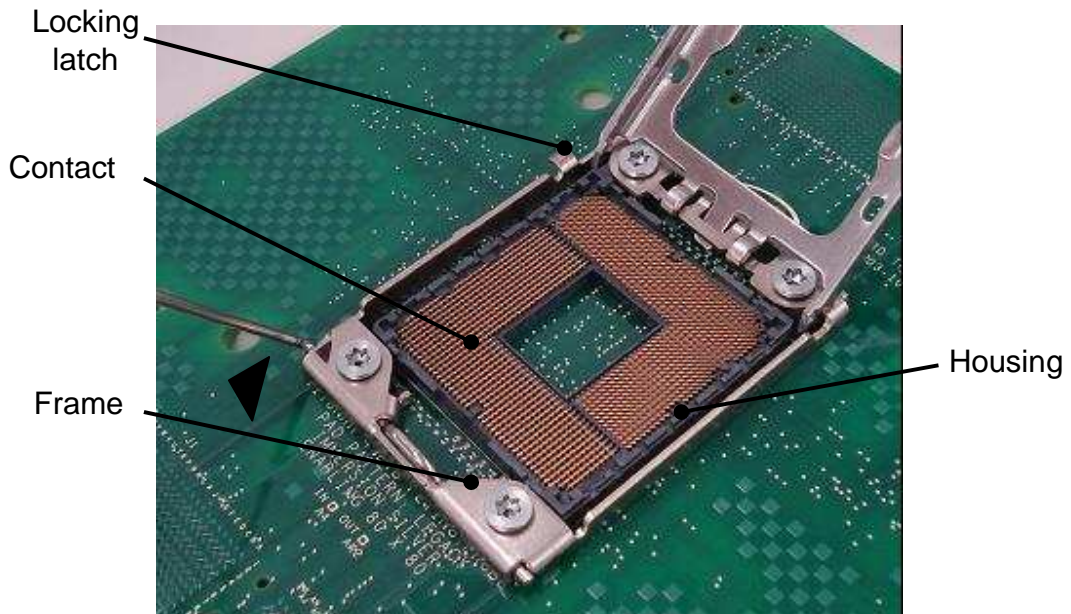


Fig.3 Socket in "Open" position

*Note: This socket is provided to customer with pick-up cap attached.
Remove the pick-up cap right before the CPU is installed.*

2. REFERENCE MATERIAL

2.1. Drawings

Customer Drawings for product part numbers are available from service network. If there is a conflict between the information contained in the Customer Drawings and the specification or with any other technical documentation supplied, the Customer Drawings shall take precedence.

2.2. Specification

Product Specifications (108-series) provides product performance and test information. The document which pertain to this product is 108-78496

2.3. Instructional material

Instruction Sheets (411-series) provide assembly instructions. The document which pertain to this product is 411-78289 Lever-Actuated LGA 1366 / LGA1356 Socket..

3. REQUIREMENTS

3.1. LGA package

The socket accept 1366 / 1356 position LGA package having gold-plated lands with dimension of 0.92+/-0.04mm x 0.57+/-0.04m. The lands of the package must be within 0.203 maximum material condition (MMC) for pattern true position.

3.2. Safety

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

3.3. Storage

A. Environment

The temperature range allowance for storing the sockets is -40 deg C to 60 deg C

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.

D. 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

3.4. PC board

A. Material

The PC board material shall be glass epoxy (FR-4).

B. Thickness

The PCboard thickness shall be from 1.6mm to 2.4mm.

C. Warpage

Maximum allowable bow of the PC board after reflow shall be 0.1mm per 25.4mm over the length of the socket grid area (Fig.4)

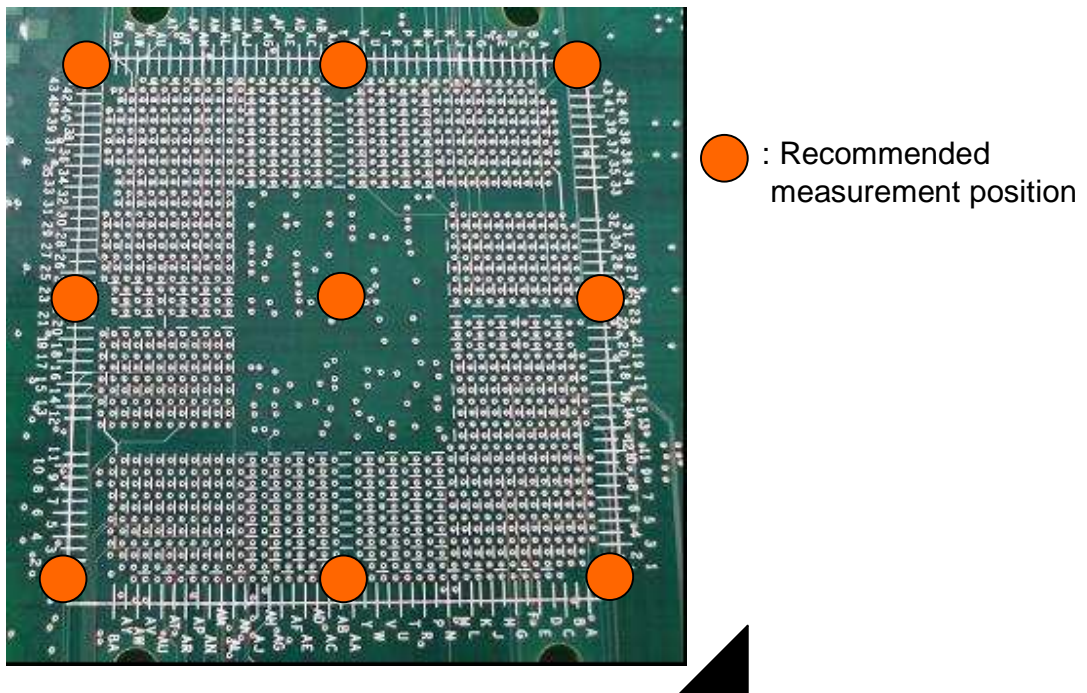


Fig.4 Recommended measurement position of PC board warpage after SMT

D. Pads

The PC board circuit pads must be solder able in accordance with test specification 109-11.

E. Layouts and the volumetric zone for center cavity component

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 referenced dimensions provided in customer drawings.

3.5. Stiffener plate Assy

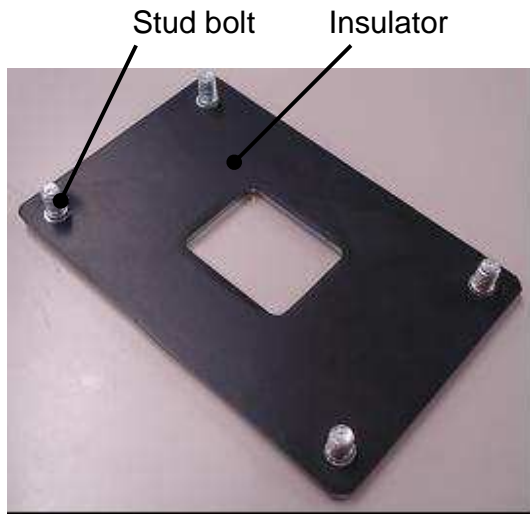
To use Tyco standard stiffener plate Assy will be necessary for quality control.

If customer's original design stiffener plate Assy is required below condition should be confirmed.

A. Design

The shape of stiffener plate top side (PC board mating side) should be flat.

If there is step near stud bolt, the stiffener plate Assy and ILM Assy may increase the socket and PC board warpage after fixing ILM Assy and stiffener plate Assy. (Fig.6)

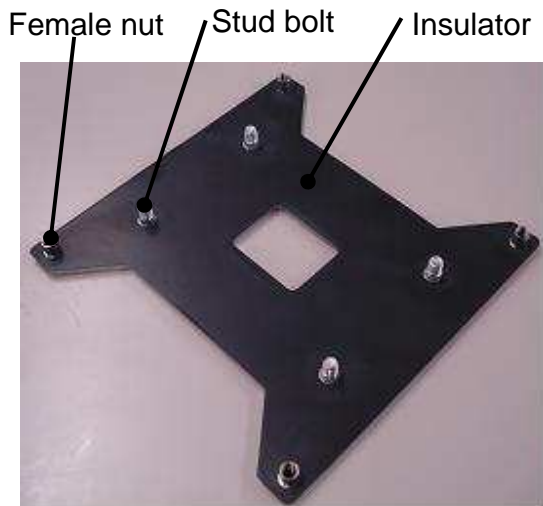


Top side (PC board mating side)

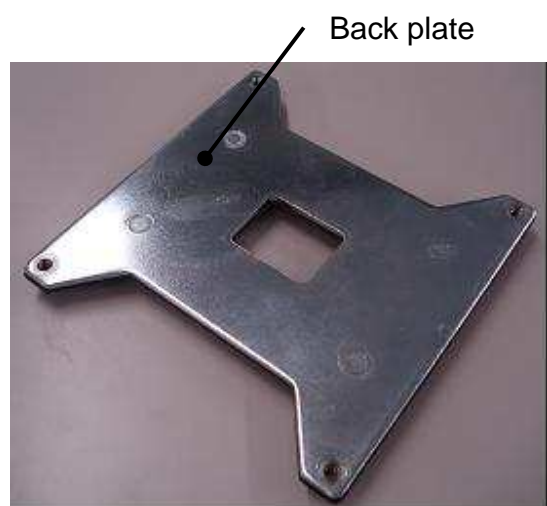


Bottom side

Fig.5a Recommended desktop back plate assy design (Reference PN: 1939739-1)



Top side (PC board mating side)



Bottom side

Fig.5b Recommended server back plate assy (Reference PN: 1981497-1)

B. Flatness

Maximum allowable bow of the stiffener plate flatness shall be under 0.2mm at socket area (71.2mmX46.4mm) (Fig.6)

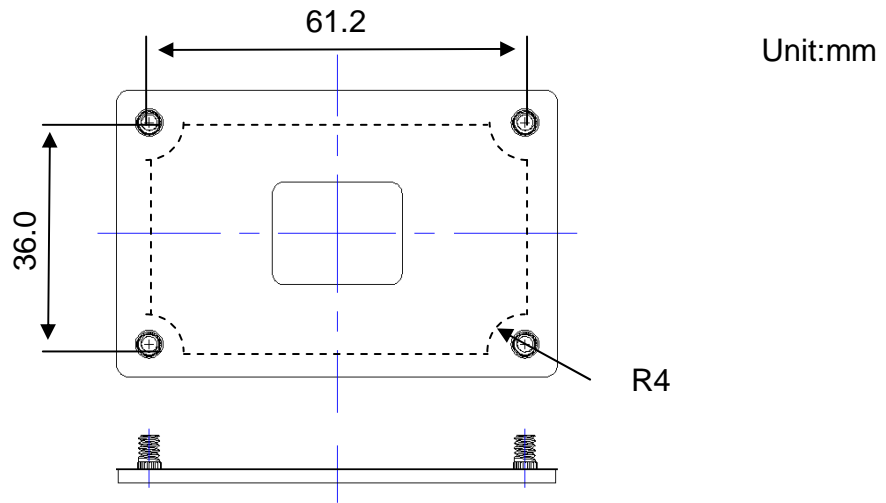


Fig.6a Required area to keep flatness under 0.2mm (Refer from PN: 1939739-1)

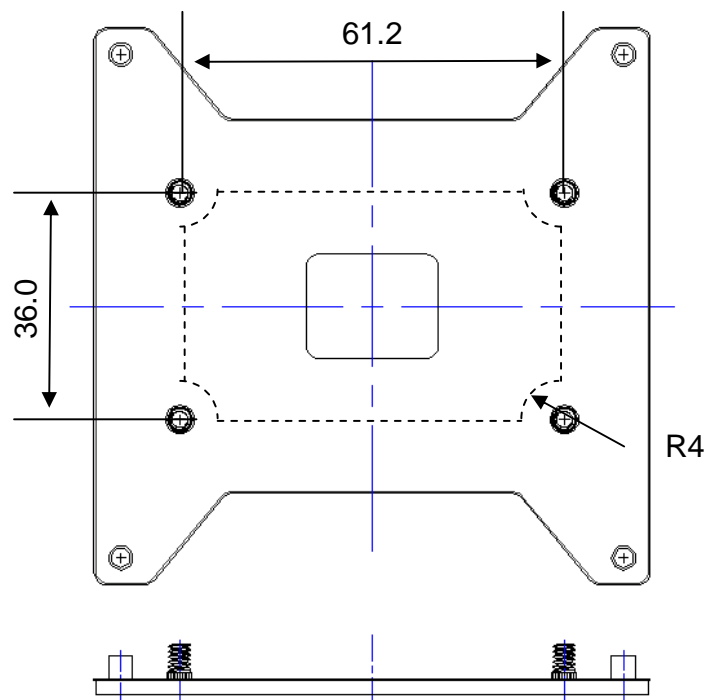


Fig.6b Required area to keep flatness under 0.2mm (Refer from PN: 1981467-1)

3.6. Solder paste characteristics

1. For sockets with lead free solder balls, alloy type shall be Sn/Ag/Cu (this type of alloy has a melting point temperature of 217deg C)
2. Recommended flux incorporated in the paste should be “no clean” type. Other fluxes, such as rosin mildly active (RMA) type, are acceptable. **DO NOT WASH THE SOCKET.**
3. Paste will be at least 80% solids by volume.
4. Minimum viscosity of screen print shall be 5X10% cp (centi-poise).
5. Minimum viscosity of stencil print shall be 7X10% cp (centi-poise).

3.7. Stencil design

Recommended stencil design is between 0.12mm and 0.15mm thickness with 0.457mm hole diameter.

3.8. Reference solder volume

Minimum solder volume for each circuit pad is calculated by multiplying the area of the pad by the stencil thickness: $(\text{Pi} \times (0.457)^2/4) \times 0.15 = 0.025\text{mm}^3$.

Note: Solder volume may vary depending in solder paste condition.

3.9. Soldering

The sockets should be soldered using hot air convection or nitrogen oven with a minimum of seven or eight chambers (zone) recommended. The solder paste should be applied using an automatic screening process. Due to 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 condition to ensure product and process compatibility. Reference reflow temperature profiles at solder ball positions are shown in the Figure 7.

Temperature at pick-up cap should be 260degC maximum.

Lead Free type

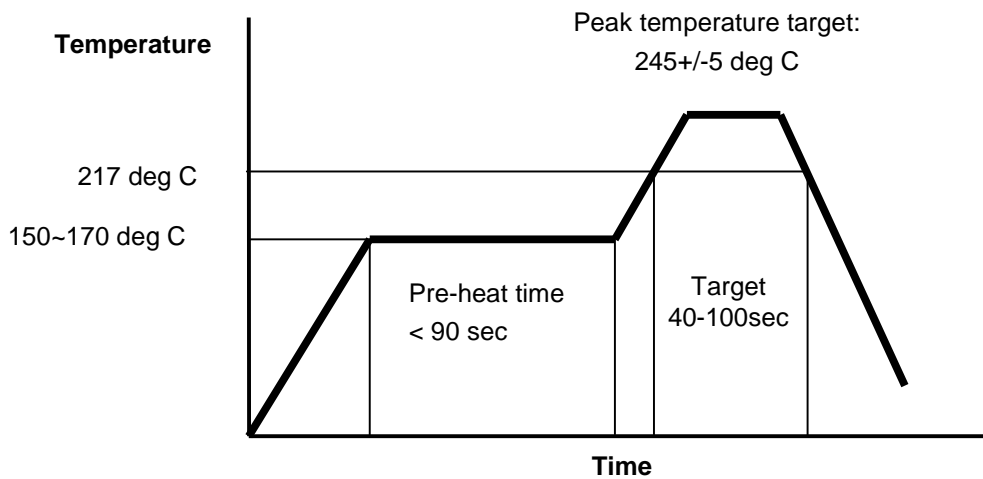


Fig.7a

Temperature measurement points should be on the surface of the pads under the solder ball of the socket.
(Fig.8) Temperature range in socket area should be less than 15deg C

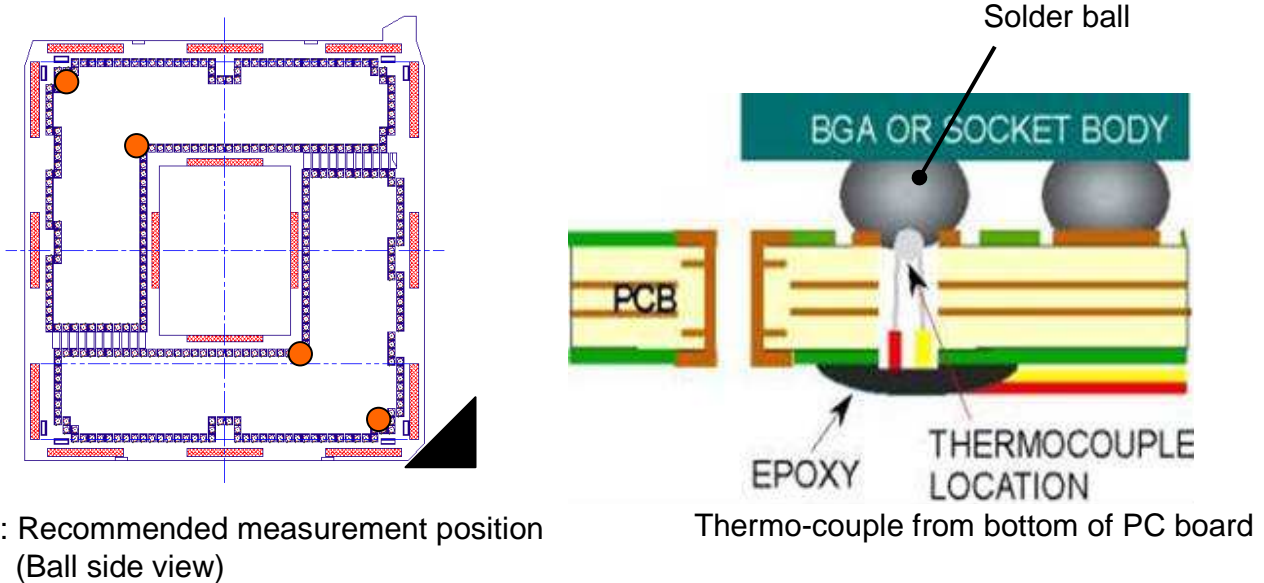


Fig.8 Recommended temperature measurement position for SMT

3.10. Socket placement

The socket is supplied with JEDEC tray. Refer to the customer drawing for the parts position in the tray. The recommendation for the placement is shown in Table 9. Pick-up cap assembled on the socket is for socket pick and place process and protection from contamination. Do not discard pick-up cap after reflow. Socket placement aims at gravity point of the socket. The gravity point is center of the socket and it is indicated on the customer drawing.

LGA1366 / LGA1356 Socket weights up to 13.4g, balance between appropriate nozzle selection and head traverse rate.

The socket A01 position must be aligned with the A01 position PCB 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 socket to avoid deformation, contamination, or damage to the solder balls.

Table 9

Item	Specification
Placement nozzle	15mm minimum vacuum nozzle or 10mm minimum nozzle with/inter O-Ring
Placement nozzle pick surface	Pick and place cap center
Table speed	Once the socket is on, slow the table speed down as slow as possible to avoid socket shifting
Placement sequence	Place socket last to avoid socket shifting

3.11. Checking Installed Socket

The housing must be seated on the PC board with recommended dimension shown in Figure 10.

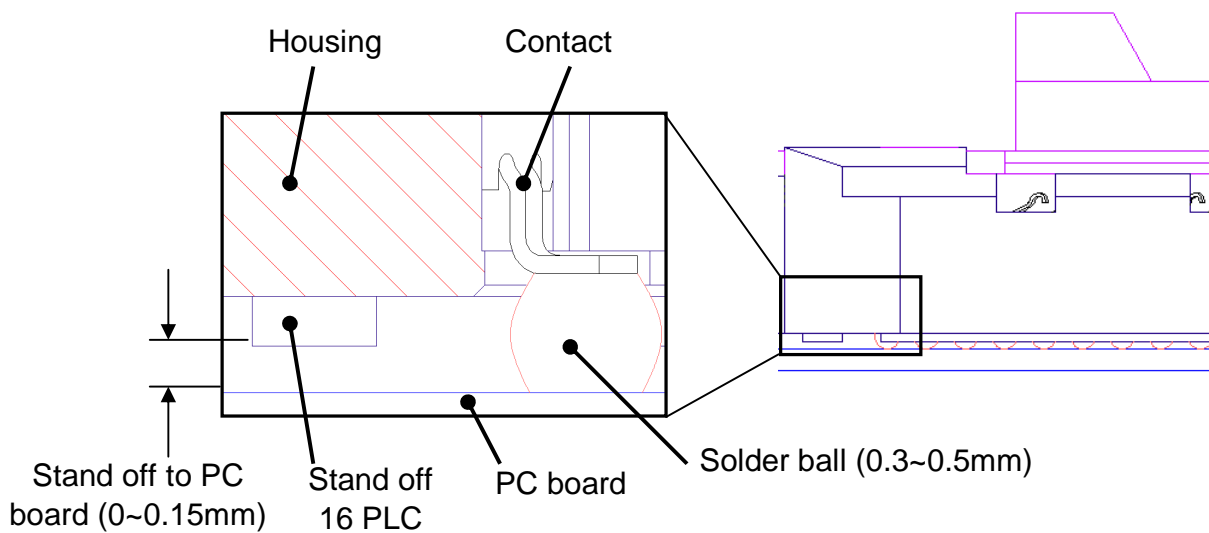


Fig.10 After SMT on PC board

The pick-up cap on top of the socket must be removed right before CPU installation (the device must not be installed unless this pick-up cap 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 will be used to inspect solder joints.

3.12. Alignment

Proper installation is ensured by aligning the A01 identifier (embossed triangle) of the device with the triangle mark (A01 identifier) of the socket.

3.13. Polarization

The socket contact cavity pattern is designed with missing cavities. The device is polarized to the socket by matching half circle bytes of CPU and alignment key. The patterns must align before the package is installed onto the socket.

3.14. Repair or rework

The socket is not repairable. Discard and replace any defective or damaged socket. Do not re-use the socket after removing it from the PCB.

The rework process specification is shown in Table 11 for LGA1366 / LGA1356 Socket (lead free).

Improper rework set up may induce damage to surrounding components. Surrounding components may reach partial reflow during rework process. Recommend to monitor both socket and other component solder joint temperature during socket rework.

Recommend each board not see more than two rework cycles on a product. De-soldering could cause delaminating and lifting pad.

Recommended rework profile measurement positions are at solder ball pad surface, same with Fig.8. Housing surface should be monitored also

Table 11

LGA1366 / LGA1356 Socket (Lead free)rework process	Specification
Peak socket body temperature	260deg C for 40 seconds
Peak solder joint temperature	228-250 deg C
Time above liquidus	45-280 seconds
Critical ramp rate (210-220 deg C)	0.35-0.75 deg C/second
Placement force	50gf maximum
Peak solder joint temperature at post solidify time	190deg C maximum
Temperature readings difference between TC's	15deg C maximum

3.15. Heat sink load

Static compressive load from heat sink must meet the requirement shown in Table 12. If the compression load reduction during the usage is estimated, the heat sink must be designed by considering the load reduction during the product life.

All of the reliability evaluation has been done with the samples having the static compressive load shown Table12. Tyco Electronics can't ensure the product reliability that doesn't meet the static compressive load requirement

Table 12

Maximum static compressive load	960N(*2)
Minimum static compressive load	470N(*2)

*2:Static compressive load include both ILM load and heat sink load

Rev.	Rev. Record	Prepared		Check		Approval	
A	RELEASE	Y.S	24 th Sep 2008	Y.S	18 th Aug 2008	S.H	18 th Aug 2008
B	REVISED	Y.T	26 th Apr 2011	Y.S	26 th Apr 2011	T.N	26 th Apr 2011