Application Guidelines for Non-Isolated Converters
AN09-002: Block Pin Solder Joint Guidelines

Introduction

Lineage Power Austin Lynx™ SMT Point of Load power modules utilize block pins as interconnections between the module and the main customer board. The block pins are considered to be solid rectangular prisms; the block pins are not IPC standard components. Therefore, the solder joint visual requirement of the block pins is interpreted literally from the standard IPC-A-610D requirements. This application note intends to define the construction and visual solder joint inspection requirements for the block pins in conjunction with the IPC standards. Please consult Lineage Power Technical Representatives for guidelines in more specialized applications.

Block Pin Considerations

Block Pin Description

Lineage Power Austin Lynx™ SMT Point of Load modules use block pins as interconnections between the modules and the customer board as shown in Figs. 1 and 2. These block pins are designed in the shape of rectangular prisms. They are made up of solid copper with a nickel plated barrier with a thickness of 254 microns to 518 microns (100 to 200 micro-inches), and a 100% matte tin (Sn) layer with a thickness of 762 microns to 1270 microns (300 to 500 micro-inches).

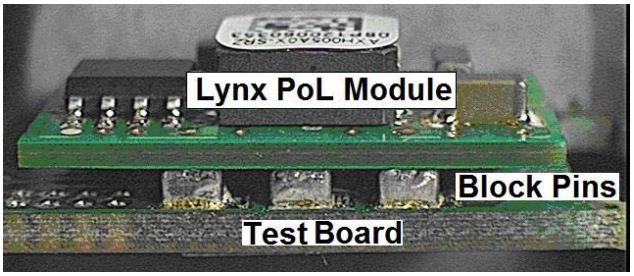

Figure 1. Example of module assembled on test board

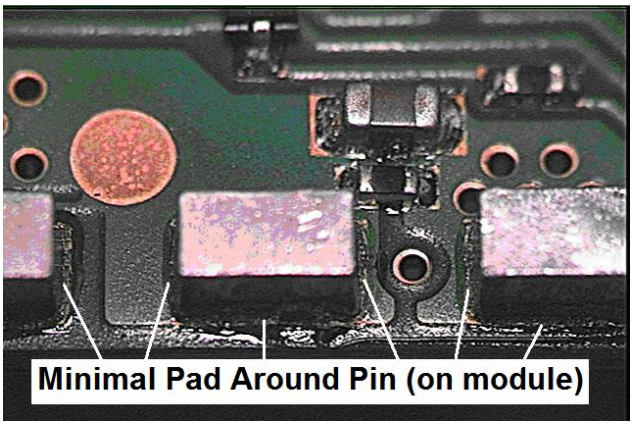

Figure 2. Block pin of rectangular prism shape

For the pin alignment purpose, the pad on the module is designed such that the foot print closely matches the pin size depending on the products as shown in Fig. 3. On the customer side, the PWB land can be larger to allow more a better process window for the placement and alignment of the Austin Lynx™ SMT module.

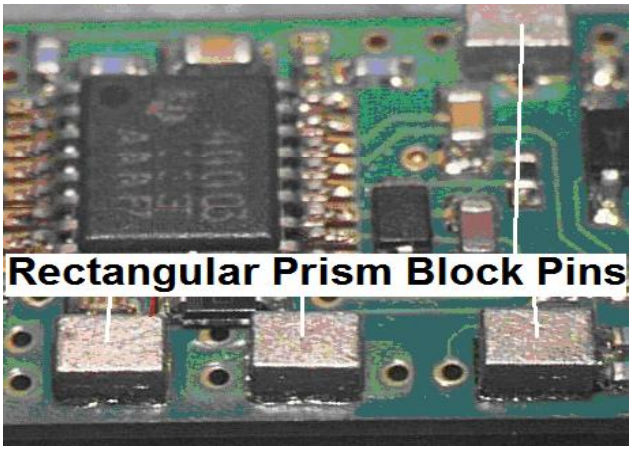

Figure 3. Assembly example of pin to pad size match.

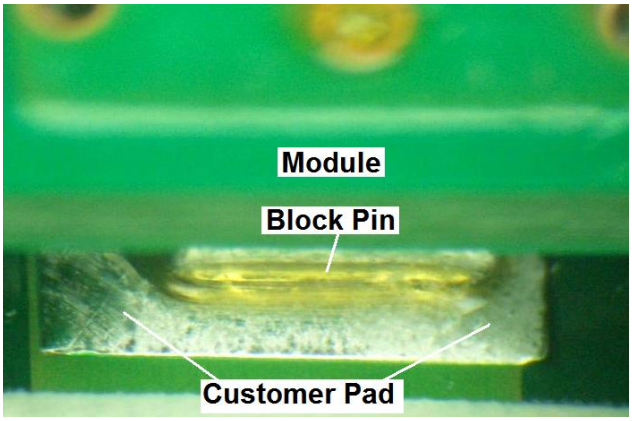

Figure 4. Larger pad on customer board to allow larger process window in placement

Solder Fillet Considerations

In the actual design of the block pin, the solder connections at the contacted faces between the module and the main board are most important since a very low contact resistance is preferred. For the pin alignment position on the module connection, the pad on the module is designed such that the foot print closely matches the pin size. There will then be a minimal solder fillet height at the base of the pins on the power module. The side fillet of the block pin depends greatly on the pad geometry and available solder volume from stencil thickness application. Therefore, fillets are preferred but not required.

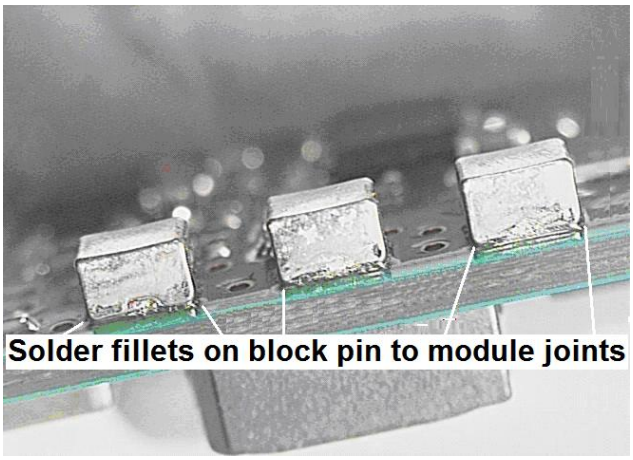

Figure 5. Solder fillet on the module side.

Because of the special physical feature, the solder connection of the block pins onto the module relies mainly on the interface bond between the bottom of the pin and the pad. It follows the solder visual requirement for tall profile component with bottom-only termination, section 8.2.10 of IPC-A-610-D.

When the module is attached to the customer board, the opposite end of the pins may have the side fillet depending on the available solder volume and pad geometry. On this end, the customer tends to observe the chip component with 5-side termination from IPC-A-610-D standard since it will allow them to have a larger process window.

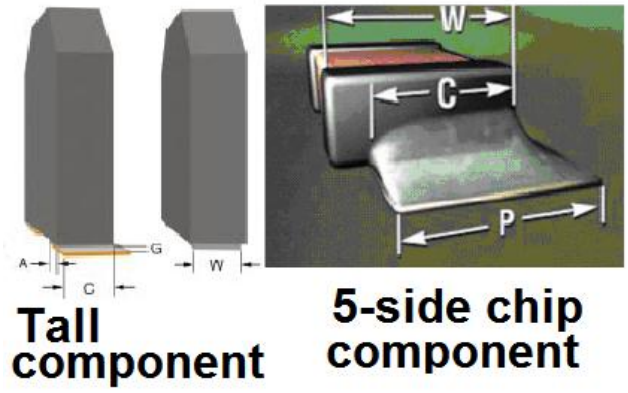

Figure 6. Tall profile component with bottom-only and 5-side chip component termination.

Solder Joint Verification

X-Ray Verification

The X-ray pictures of the block pin solder connections, as shown in Fig. 7, verified that both the solder connections at the interface of the block pins and the module as well as at the interface of the block pins with the test board are bonded with the solder to the pad.

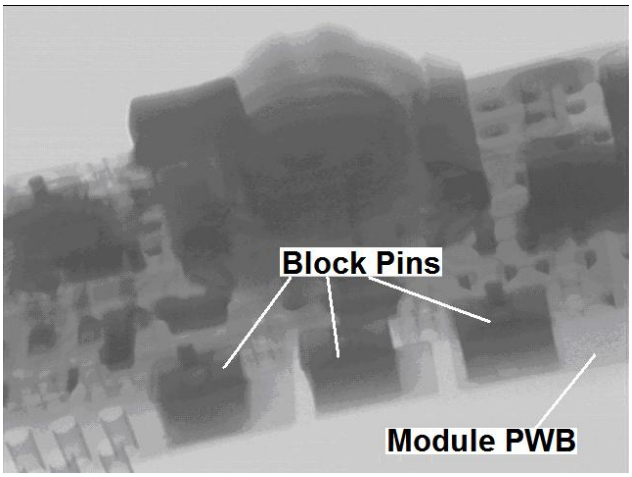

Figure 7. X-ray of solder connections.

Cross Sections

Figure 8 shows the cross-section of the solder connection also confirming the surface bonding at the base. There are some side fillets on some connections. The majority of the connections on the module side has solder fillet conforming to the visual requirements of tall profile components with bottom-only termination rather than the chip component with five-side termination. Figures 9 – 11 provide more detail on this.

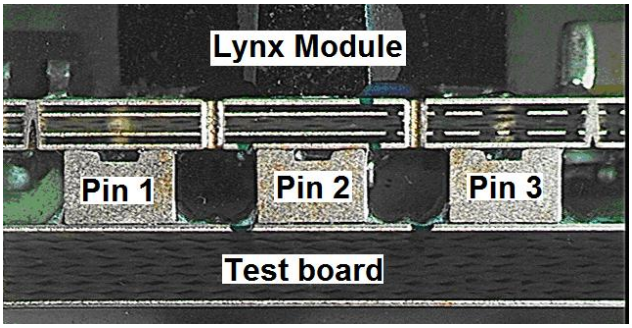

Figure 8. Pin cross sections.

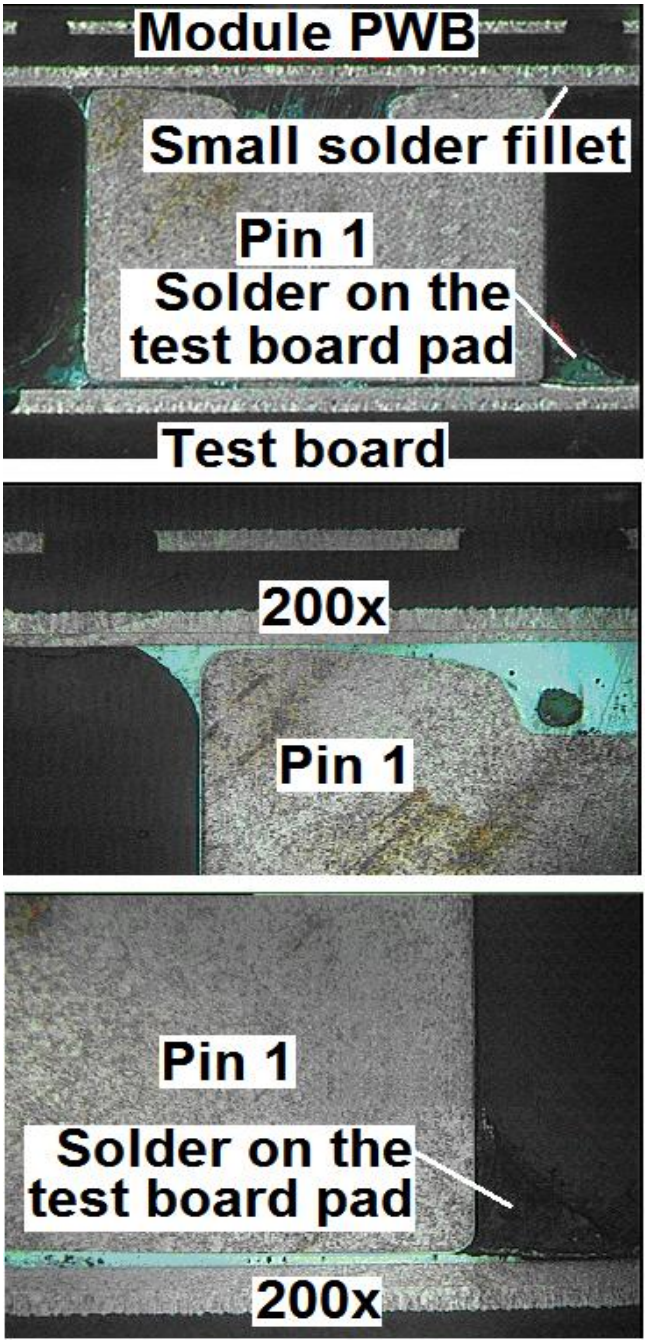

Figure 9. Pin 1 cross section detail.

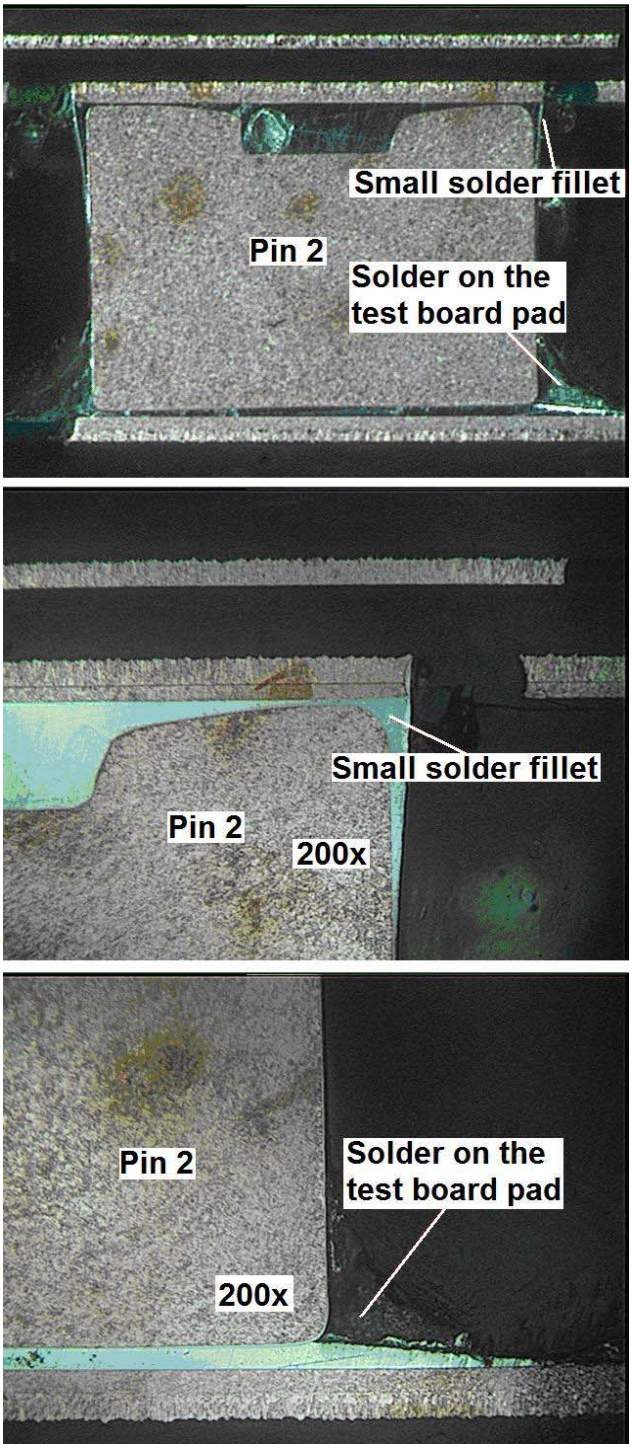

Figure 10. Pin 2 cross section detail.

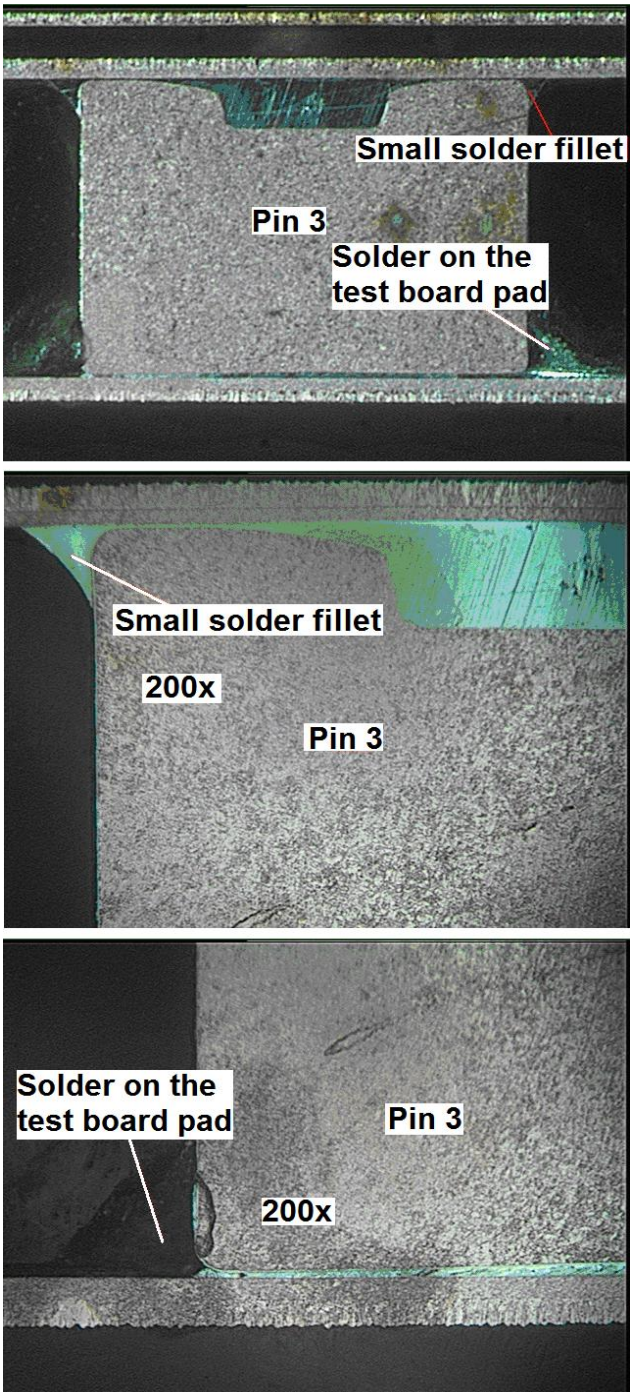

Figure 11. Pin 3 cross section detail.

Solder Joint Reliability Testing

Lineage Power has assembled the Austin Lynx™ SMT module on to test boards and subjected the assembly to pass IPC-9701 test requirements, 1000 hours of temperature cycles from -40 to 100 C, 10G shocks and vibration tests. None of the solder joints have failed on either module side, or on the customer side. This testing indicates that the block pin solder joint is reliable as bottom-only or as five-side termination requirements. These test reports are available upon request from your Lineage Power Technical Representatives.

Lineage Power Visual Requirement for Visual Inspection of Solder Joint to Block Pin

Ausint Lynx™ SMT Point of Load power modules utilize block pins as interconnections between the module and the main customer board. The connection of the pins on the module side follows the tall profile component with bottom only termination. The connection of the pins on the customer side may have the side fillet depending on the pad geometry and availability of solder volume, which may follow the chip component with 5-side termination. The block pin solder connection cannot have two requirements on the same connection whether they are on opposite end. Therefore, Lineage Power recommends the solder joint connection to follow the minimum requirement or the least robust connection requirement, which is for the tall profile component with bottom side termination. Therefore, for the visual soldering requirement, the block pins will follow the tall profile component with bottom-only termination, section 8.2.10 of IPC-A-610-D, which does not require a side solder fillet height on all sides of the pin.

Summary

This application note has described the construction and visual solder joint inspection requirements for block pin interconnections used on Austin Lynx™ SMT Point of Load power modules as interconnections between the module and the main customer board.

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